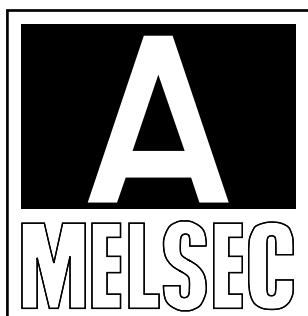
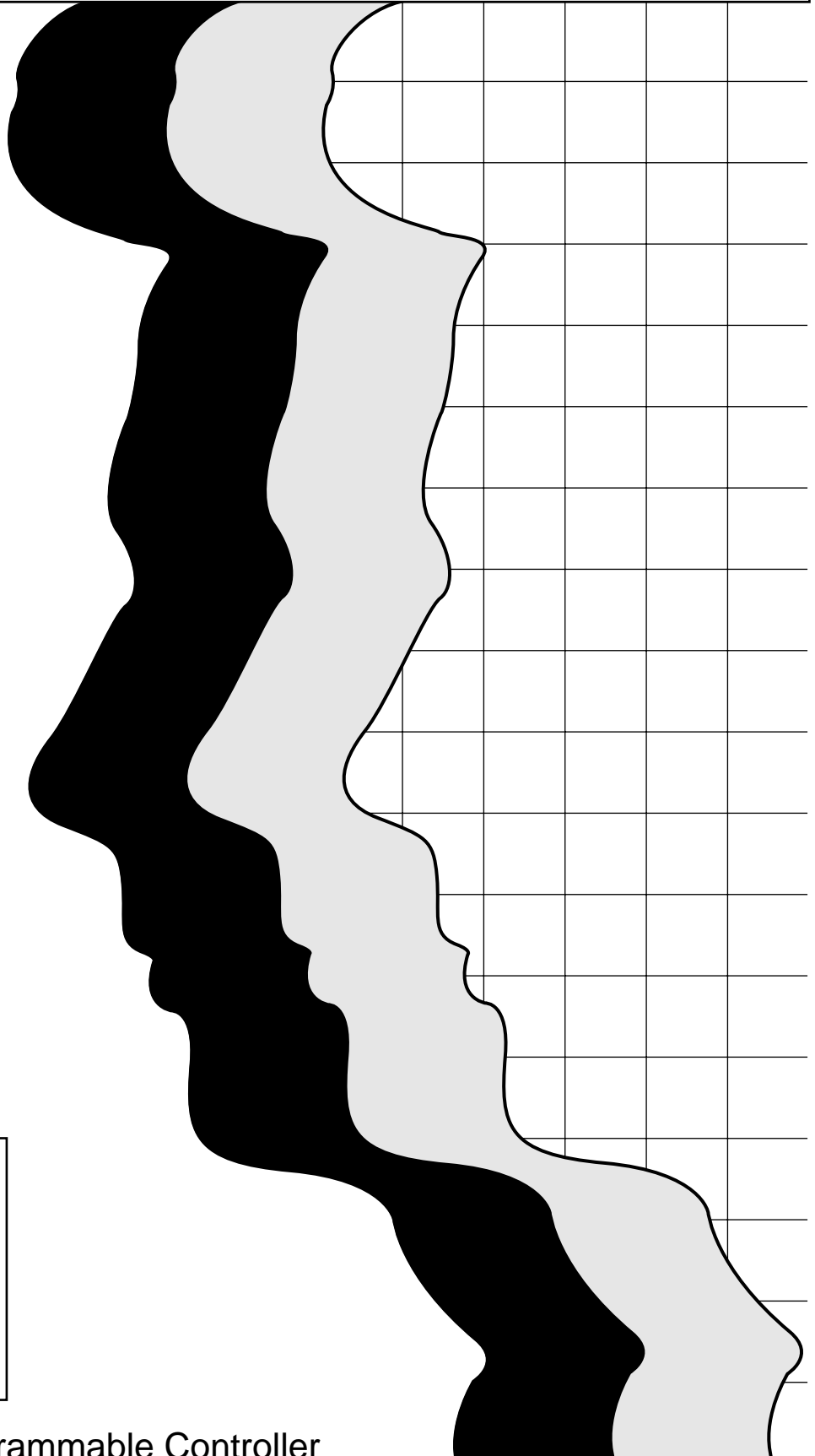


MITSUBISHI

PROFIBUS-DP Slave Module Type A1SJ71PB93D

User's Manual



Mitsubishi Programmable Controller

• 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 user's manual of the CPU module used.

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




DANGER

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



CAUTION

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-DP, 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 programmable controller CPU.
Writing data into the "system area" or outputting a signal for "prohibited to use" may cause system malfunction in the programmable controller.

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 programmable controller under the environment specified in the user's manual of the CPU module to be used.
Otherwise, it may cause electric shocks, fires, malfunctions, product deterioration or damage.
- 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.
- Be sure to shut off all phases of the external power supply used by the system before mounting or removing the module.
Failure to do so may damage 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

- Be sure to shut off all phases of the external power supply used by the system before wiring PROFIBUS cables.
Failure to do so may result in failure or malfunctions 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.
- Be sure to place the PROFIBUS cables in a duct or clamp them.
If not, dangling cables may be shifted or inadvertently pulled, resulting in damages to the module or cables or malfunctions due to poor cable contact.
- 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

- Before cleaning, be sure to shut off all phases of the external power supply used by the system. Failure to do so may cause electrical shocks.

CAUTION

- Never disassemble or modify the module.
This may cause breakdowns, malfunctioning, injury and/or fire.
- When using a wireless communication device such as a cellular phone, keep a distance of 25cm (9.85 inch) or more from the programmable controller in all directions. Failure to do so can cause a malfunction.
- Be sure to shut off all phases of the external power supply before mounting or removing the module.
Failure to do so may result in failure or malfunctions of the module.
- Always make sure to touch the grounded metal to discharge the electricity charged in the body, etc., before touching the module.
Failure to do so may cause a failure or malfunctions 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 Edition
Nov., 2001	SH (NA)-080195-B	<p>Correction</p> <p>Section 1.1, Section 3.5.2, Section 5.3, Section 7.3.1, Section 7.3.2</p>
Apr., 2004	SH (NA)-080195-C	<p>Correction</p> <p>Section 3.2, Section 3.4.2, Section 3.5.2, Section 3.6, Section 5.2.1, Section 7.3.1, Section 7.3.2</p> <p>Addition</p> <p>SAFETY PRECAUTIONS, Section 3.4.2</p>
Nov., 2006	SH (NA)-080195-D	<p>Correction</p> <p>SAFETY PRECAUTIONS, About Manuals, About the Generic Terms and Abbreviations, Definitions of the Terms, Section 1.1, Section 2.1, Section 2.2, Section 3.1 to 3.5, Section 4.1.1 to 4.1.3, Section 5.1, Section 5.2, Section 5.2.1 to 5.2.3, Section 5.5 to 5.7, CHAPTER 6, Section 6.2, CHAPTER 7, Section 7.2 to 7.4, Section 8.1, Section 8.4</p> <p>Addition</p> <p>COMPLIANCE WITH THE EMC AND LOW VOLTAGE DIRECTIVES, Section 5.3</p> <p>Section number changes</p> <p>Section 3.6 → Section 5.2, Section 3.6.1 to 3.6.3 → Section 5.2.1 to Section 5.2.3, Section 3.7 → Section 3.6, Section 5.2 to 5.5 → Section 5.4 to 5.7</p>
Jul., 2007	SH (NA)-080195-E	<p>Change of a term</p> <p>"PLC" was changed to "programmable controller".</p> <p>Correction</p> <p>About the Generic Terms and Abbreviations, Section 3.2, Section 3.5.1, Section 5.5, Section 8.4</p>

Japanese Manual Version SH-080194-E

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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
PROFIBUS-DP Master Module User's Manual Describes the overview, system configuration, specifications, functions, procedures before system operation, programming and dedicated instructions of the QJ71PB92V. (Sold separately)	SH-080572ENG (13JR84)
PROFIBUS-DP Interface Module User's Manual Describes the overview, system configuration, specifications, functions, procedures before system operation, programming and dedicated instructions of the QJ71PB92D. (Sold separately)	SH-080127 (13JR22)
Type AJ71PB92D/A1SJ71PB92D PROFIBUS-DP Interface Module User's Manual Describes the overview, system configuration, specifications, functions, procedures before system operation and programming of the A1SJ71PB92D/AJ71PB92D. (Sold separately)	IB-66773 (13JL20)
GX Configurator-DP Version 7 Operating Manual Explains the overview, installation method, screen operations, etc. of GX Configurator-DP Version 7. (Sold separately)	SH-080579ENG (13JU54)

Conformation to the EMC Directive and Low Voltage Instruction

When incorporating the Mitsubishi programmable controller into other machinery or equipment and keeping compliance with the EMC and low voltage directives, refer to Chapter 3 "EMC Directive and Low Voltage Instruction" of the User's Manual (hardware) supplied with your CPU module or base unit.

The CE logo is printed on the rating plate of the programmable controller, indicating compliance with the directives.

Note that no additional measures are necessary for this product to make compliance with the directives.

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	Abbreviation for the model A1SJ71PB93D PROFIBUS-DP slave module
QJ71PB92V	Abbreviation for the model QJ71PB92V PROFIBUS-DP master module
QJ71PB92D	Abbreviation for the model QJ71PB92D PROFIBUS-DP interface module
A1SJ71PB92D	Abbreviation for the model A1SJ71PB92D PROFIBUS-DP interface module
AJ71PB92D	Abbreviation for the model AJ71PB92D PROFIBUS-DP interface module
GX Developer	Generic product name for SWnD5C-GPPW-E, SWnD5C-GPPW-EA, SWnD5C-GPPW-EV, and SWnD5C-GPPW-EVA. ("n" means version 4 or later.) "-A" and "-V" mean "volume license product" and "version-upgrade product" respectively.
GX Configurator-DP	Generic term for the product name SWnD5C-PROFID-E ("n" means version 4 or later.)
PROFIBUS-DP	Abbreviation for PROFIBUS-DP network

Meanings and Definitions of the Terms

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

Term	Definition
PROFIBUS-DPV0	A basic version of PROFIBUS-DP. The following functions are executable: <ul style="list-style-type: none"> • I/O data exchange • Diagnostic information notification etc.
PROFIBUS-DPV1	A PROFIBUS-DP version for which the following functions have been added to the basic functionality of PROFIBUS-DPV0. <ul style="list-style-type: none"> • Acyclic communication • Alarm function etc.
PROFIBUS-DPV2	A PROFIBUS-DP version for which the following functions have been added to the PROFIBUS-DPV1 functionality. <ul style="list-style-type: none"> • Time stamping etc.
Class 1 master station	A device exchanging I/O data with a slave stations. (QJ71PB92V, QJ71PB92D, etc.)
Class 2 master station	A device that communicates with slave stations and checks their station number settings and/or operation states. The Class 2 master station is used as a master station for supervising the network, which can start, maintain, and diagnose the system.
Slave station	A device that exchanges I/O data with a Class 1 master station. (A1SJ71PB93D etc.)
Repeater	A device used to connect different segments of PROFIBUS-DP.
Bus terminator	A terminating resistor that is connected to either end of each segment on PROFIBUS-DP.
Configuration tool	Software used to set slave parameters, etc. and to write them to a master station. (GX Configurator-DP, etc.)
GSD file	An electronic file that contains parameters of a slave station. The GSD file is used to set up the slave parameters on configuration tool.
Station number	The numbers assigned to a master station and slave stations. The station number is set within the range from 0 to 125.
Slave parameter	The parameter for a slave station, which is set on the master station. The setting items are described on the GSD File.
I/O configuration information (Data module)	Information on I/O configuration of a slave station.
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.)
Global control	This function enables synchronization command transmission for I/O data from a Class 1 master station to slave stations.
Communication watchdog timer	Watchdog timer set in the slave parameter of the master station.
Extended diagnostic error information	Diagnostic information specific to each slave station. Each of slave stations notifies of it to the master station when an error is detected.
Bus cycle time	PROFIBUS-DP processing time for the master station to perform cyclic transfer with each slave station.
Module watchdog timer	Watchdog timer in the A1SJ71PB93D.

Product Structure

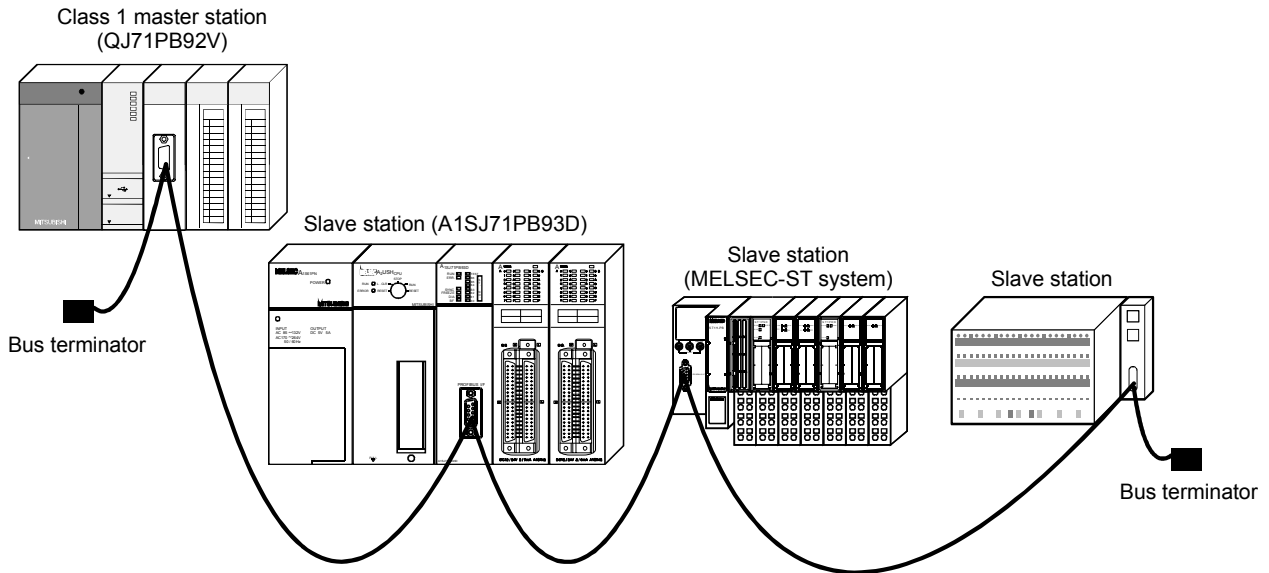
The product structure of this product is given in the table below.

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

1 OVERVIEW

1

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

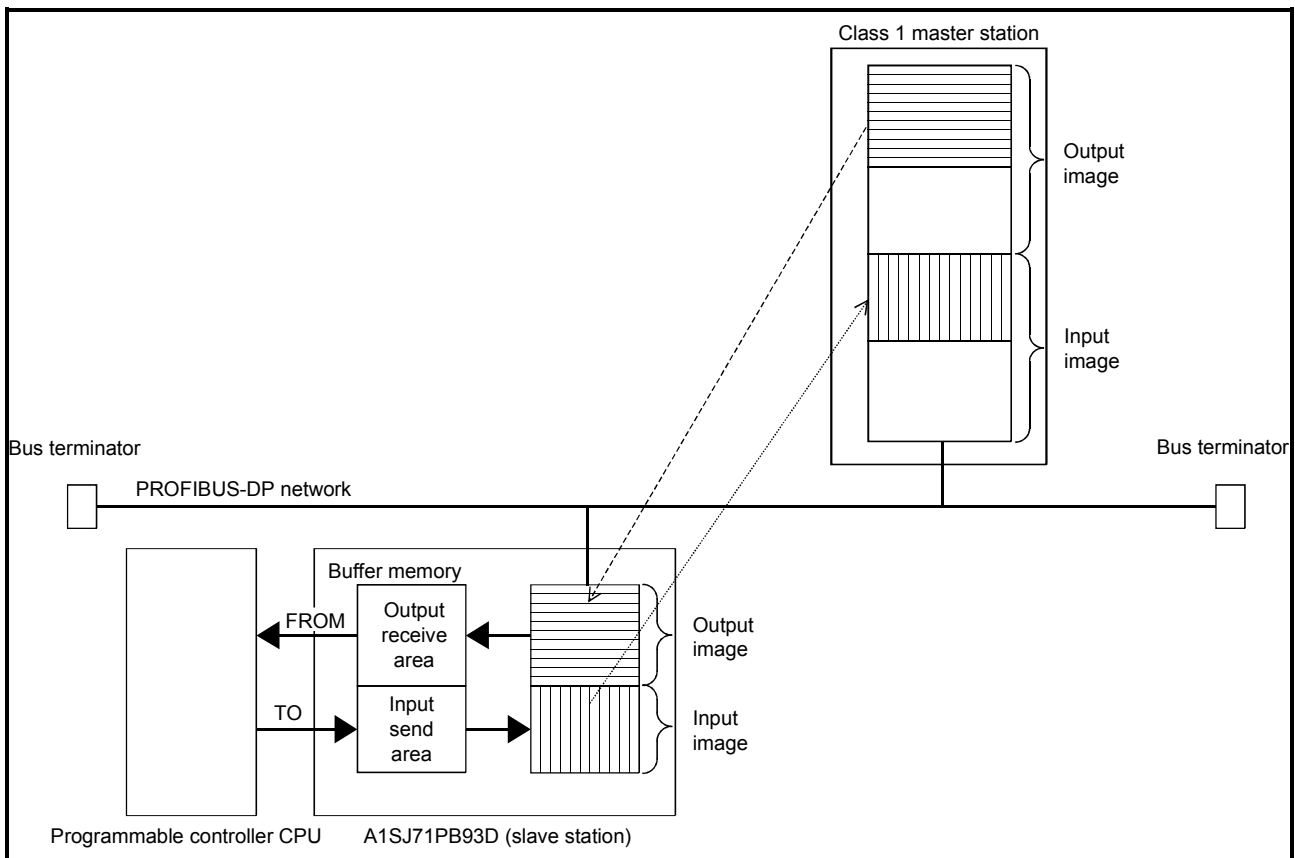
(1) Conformance with EN50170 Volume 2 (Part 1, 2, 3, 4, 8)
 The module conforms with EN50170 Volume 2 (Part 1, 2, 3, 4, 8) and can communicate with the master station as a PROFIBUS-DP slave station.

(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.
 The A1SJ71PB93D supports the PROFIBUS-DPV0 function.
 PROFIBUS-DPV1 and PROFIBUS-DPV2, which are extended versions of PROFIBUS-DP, are not supported.

(a) Available data size

The A1SJ71PB93D can handle the following size of data. (Refer to Section 4.1.1)

Input data	: Max. 122 words	} Max. 192 words in total
Output data	: Max. 122 words	



- (3) **Communication can be made by merely setting the master station parameters**

After you have set the parameters at the master station, the A1SJ71PB93D can make communication by merely setting the station number. (Refer to Section 5.1)
- (4) **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. (Refer to Section 4.1.3)
- (5) **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. (Refer to Section 4.1.1)
- (6) **Extended trouble notification function**

Data stored in the extended trouble information area of the buffer memory can be sent to the master station as extended trouble information *1 when the host is faulty, for example.
When the host is not faulty anymore, notify the master station that there is no fault. (Refer to Section 3.5.2 (9))
*1: Diagnostics Information (device-related trouble information set by the user as desired)
- (7) **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. (Refer to Section 4.1.2)
- (8) **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 Applicable Systems

(1) Applicable programmable controller CPU

The following are the programmable controller CPU compatible with the A1SJ71PB93D and the number of mountable modules.

- A1SCPU
- 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 programmable controller 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

Refer to Section 5.7.1 for the applicable cable.

(5) Bus terminator

Refer to Section 5.5.1 for the wiring of the bus terminator.

REMARKS

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

2.2 Precautions for Configuring a System

(1) Precaution for station number setting

- (a) If a station number different from the one of the currently operating station is set during I/O data communication, the communication is suspended to execute the setting.

It is restarted after completion of the station number setting.

- (b) Do not change the operation mode during execution of the station number setting.

Doing so may disable proper station number setting or mode change.

(2) When switching the operation mode using Y11/X11 on the sequence program

Be sure to switch the mode while the module READY signal (X1D) of the A1SJ71PB93D is ON.

If data are read from or written to the buffer memory with the X1D status ignored, the programmable controller CPU may detect an error to stop the sequence calculation.

(3) Use on MELSECNET remote I/O stations

The A1SJ71PB93D does not work on a remote I/O station of MELSECNET(II), MELSECNET/10.

3 SPECIFICATIONS

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

3.1 General Specifications

The following 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 3502, IEC 61131-2	—	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 B3502, IEC 61131-2 (147 m/s ² , 3 times each in 3 directions)					
Operating environment	No corrosive gas present					
Operating height *3	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: Do not use or store the programmable controller under pressure higher than the atmospheric pressure of altitude 0m. Doing so can cause a malfunction.

When using the programmable controller under pressure, please contact your sales representative.

3.2 Performance Specifications

Item	Specifications	
PROFIBUS-DP station type	Slave station (Complies with EN50170 Volume2 (Part 1, 2, 3, 4, 8))	
Transmission specifications	Electrical standard/characteristics	Complies with EIA-RS485
	Medium	Shielded twisted pair cable (Type A) (Refer to Section 5.7.1)
	Network topology	Bus topology (Tree topology when repeaters are used)
	Data link method	Polling method
	Encoding method	NRZ
	Transmission speed *1	9.6 kbps to 12 Mbps (Refer to (1) in this section)
	Transmission distance	Differs depending on the transmission speed (Refer to (1) in this section)
	Maximum number of repeaters	3 units (Refer to (1) in this section)
	Number of connectable modules (Per segment)	32 units (including repeaters)
	Station numbers that may be set	0 to 125 *2
Max. number of data that may be communicated	Number of I/O data is 192 words in total. (Size of I/O 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 current consumption	0.36 A	
External dimensions	130(5.12 in.)(H) × 34.5(1.36 in.)(W) × 93.6(3.69 in.)(D) [mm]	
Weight	0.18 kg	

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

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

Set a station number within 0 to 125 for I/O data communication.

For the noise immunity, withstand voltage, insulation resistance and others in the programmable controller system using this module, refer to the power supply module specifications given in the programmable controller CPU User's Manual.

(1) Transmission distance

Transmission Speed	Transmission Distance	Max. Transmission Distance when Repeater is Used *1
9.6 kbps	1200 m (3937 ft.)/segment	4800 m (15748 ft.)/network
19.2 kbps		
93.75 kbps		
187.5 kbps	1000 m (3281 ft.)/segment	4000 m (13123 ft.)/network
500 kbps	400 m (1312 ft.)/segment	1600 m (5249 ft.)/network
1.5 Mbps	200 m (656 ft.)/segment	800 m (2625 ft.)/network
3 Mbps	100 m (328 ft.)/segment	400 m (1312 ft.)/network
6 Mbps		
12 Mbps		

*1 The max. transmission distance in the table above is based on the case where 3 repeaters are used.

The calculation formula for the transmission distance extended using a repeater(s) is:

Max. transmission distance [m/network] = (Number of repeaters + 1) x Transmission distance [m/segment]

3.3 Network Configuration

This section explains the basic PROFIBUS-DP configuration for using the A1SJ71PB93D as a slave station.

(1) System equipment

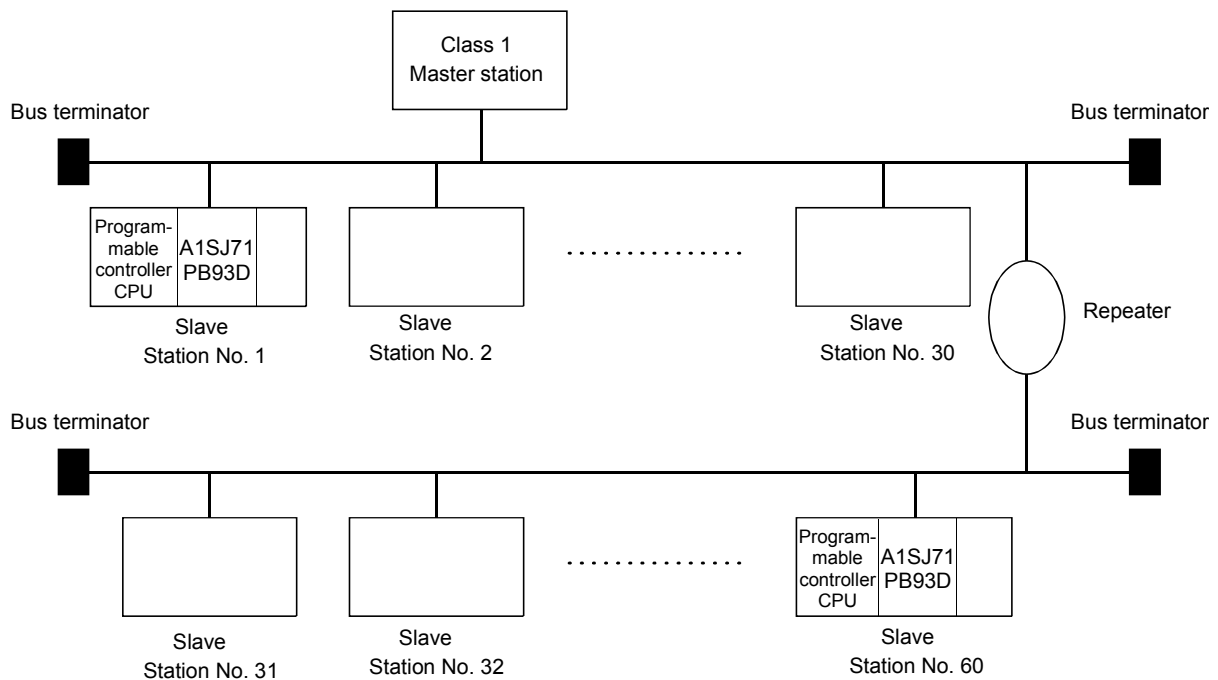
The following table shows the equipment required for the PROFIBUS-DP system.

System Equipment	Description
Slave station	A1SJ71PB93D
Class 1 master station	QJ71PB92V, QJ71PB92D, etc.
Configuration tool	Configurator applicable to the master station
Repeater	Required when 32 or more slave stations are connected
PROFIBUS cable	Refer to Section 5.7.1
Bus terminator	

(2) Network configuration

In the PROFIBUS-DP system configuration, the following conditions must be satisfied:

- (a) Number of connectable modules in the whole network (when repeaters are used)
 Master station + Slave station *1 \leq 126
 *1: Including the A1SJ71PB93D
- (b) Number of connectable modules per segment
 Master station + Slave station *1 + repeaters *2 \leq 32
 *1: Including the A1SJ71PB93D
 *2: A repeater is counted for both segments.
- (c) Maximum number of repeaters
 Up to 3 repeaters can be used for communication between master station and the A1SJ71PB93D.
- (d) Number of slave stations that are connectable to master station
 The maximum number of slave stations that may be connected to one master station depends on the specifications of the master station.



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 programmable controller CPU are described below.
 The following I/O signal assignment is based on the case where the start I/O No. of the A1SJ71PB93D is "0" (installed to slot 0 of the main base unit).
 Device X represents an input signal from the A1SJ71PB93D to the programmable controller CPU.
 Device Y shows an output signal from the programmable controller CPU to the A1SJ71PB93D.
 Refer to the corresponding reference sections for details.

Signal direction: A1SJ71PB93D → Programmable controller CPU		Signal direction: Programmable controller CPU → A1SJ71PB93D	
Device No.	Description	Device No.	Description
X00	Use prohibited	Y00	Input send area refresh directive
X01	I/O communication	Y01	Use prohibited
X02	Expansion trouble notification completion	Y02	Expansion trouble notification request
X03	Module error	Y03	Module error reset request
X04	Use prohibited	Y04	Use prohibited
X05	SYNC mode	Y05	
X06	SYNC receive	Y06	
X07	FREEZE mode	Y07	
X08		Y08	
X09		Y09	
X0A	Use prohibited	Y0A	
X0B		Y0B	
X0C		Y0C	
X0D	Module watchdog timer error	Y0D	
X0E		Y0E	
X0F	Use prohibited	Y0F	
X10		Y10	
X11	Operation mode change completion	Y11	Operation mode change request
X12	Use prohibited	Y12	Use prohibited
X13	Station number setting completion	Y13	Station number setting request
X14	Use prohibited	Y14	Use prohibited
X15		Y15	
X16		Y16	
X17		Y17	
X18		Y18	
X19		Y19	
X1A		Y1A	
X1B		Y1B	
X1C		Y1C	
X1D		Module ready	
X1E	Use prohibited	Y1E	
X1F		Y1F	

POINT
Do not output (turn ON) the "Use prohibited" signals. Doing so may cause the programmable controller system malfunction.

3.4.2 I/O signal detail description

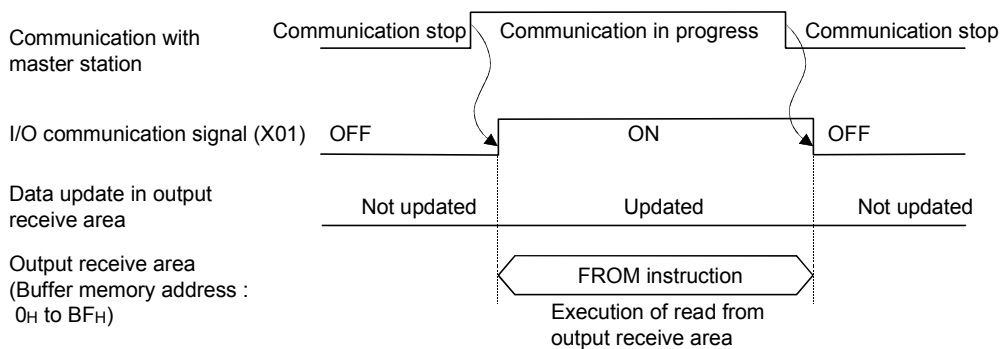
(1) I/O communication signal (X01)

- (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 area refresh directive signal (Y00).)
- (c) The I/O communication signal (X01) turns off when communication with the master station stops and a communication timeout error occurs. However, if the communication watchdog timer 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 watchdog timer Setting in Master Station Side Parameters	Operation at Master Station Fault
Invalid	No error (I/O communication signal (X01) remains on)
Valid (2 to 65025)	Communication time-out error occurrence (I/O communication signal (X01) turns off)

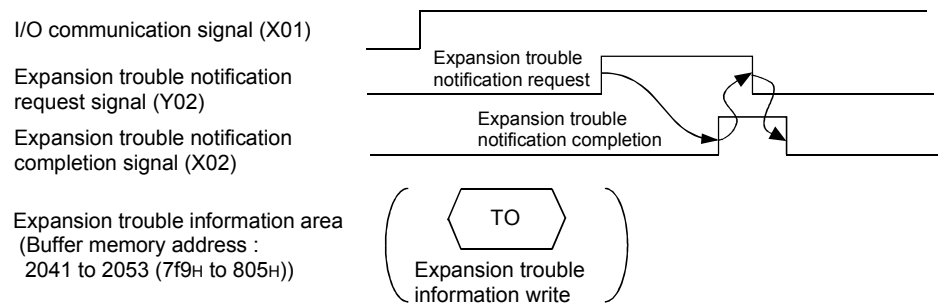
The communication watchdog timer setting can be confirmed in the "Current communication watchdog timer value (buffer memory address: 2257 (8D1H))" of the A1SJ71PB93D.

- (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 when the expansion trouble information was sent to the master station by ON of 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).

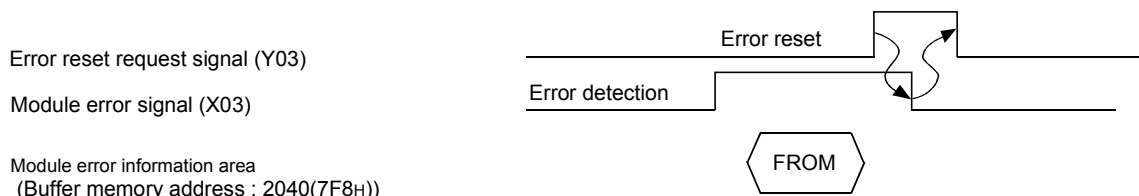


POINT

When issuing an expansion trouble notification request consecutively, provide an interlock using the expansion trouble notification completion signal (X02) in the above procedure.

(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 turning on the module error reset request signal (Y03) or resetting the programmable controller CPU, for example. At this time, the ERR. LED goes off and the error code is cleared.
- (c) The module error reset request signal (Y03) turns off after confirming that the module error signal (X03) have turned off.



The error code is read from the buffer memory to the programmable controller 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 programmable controller CPU reset.
- (c) The SYNC LED turns on/off in synchronization with the on/off of the SYNC mode signal (X05).
- (d) The SYNC mode signal (X05) turns off if a communication timeout error occurs due to a stop of communication with the master station with the SYNC mode signal (X05) on.

When the communication watchdog timer setting of the master station side parameter is "invalid", however, the SYNC mode signal (X05) does not turn off since a communication timeout error does not occur.

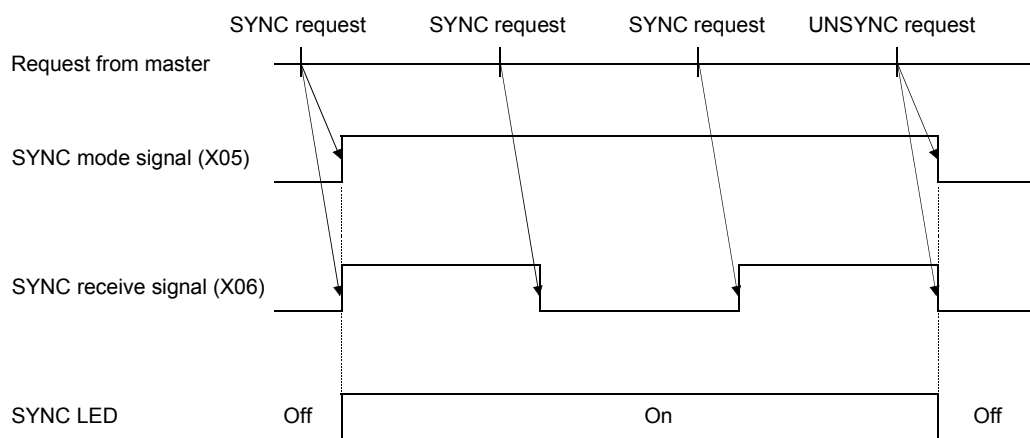
(The output data of the output receive area are held.)

Communication watchdog timer setting of master station side parameter	When master station becomes faulty
Invalid	No error (SYNC mode signal (X05) remains on)
Valid (2 to 65025)	Communication timeout error occurrence (SYNC mode signal (X05) turns off)

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

(5) SYNC receive signal (X06)

- (a) The SYNC receive signal (X06) turns 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 programmable controller CPU reset.



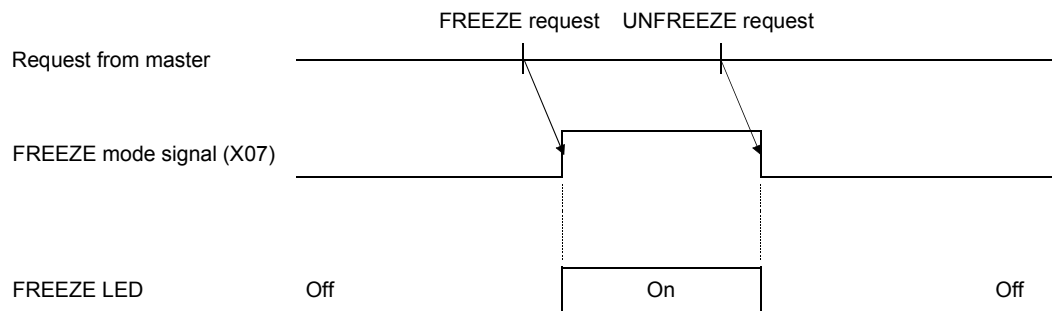
- (d) The SYNC receive signal (X06) turns off if a communication timeout error occurs due to a stop of communication with the master station with the SYNC receive signal (X06) on.
When the communication watchdog timer setting of the master station side parameter is "invalid", however, the SYNC receive signal (X06) does not turn off since a communication timeout error does not occur.
(The output data of the output receive area are held.)

Communication watchdog timer setting of master station side parameter	When master station becomes faulty
Invalid	No error (SYNC receive signal (X06) remains on)
Valid (2 to 65025)	Communication timeout error occurrence (SYNC receive signal (X06) turns off)

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

(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 programmable controller CPU reset.
- (c) The FREEZE LED turns on/off in synchronization with the on/off of the FREEZE mode signal (X07).



- (d) The FREEZE mode signal (X07) turns off if a communication timeout error occurs due to a stop of communication with the master station with the FREEZE mode signal (X07) on.

When the communication watchdog timer setting of the master station side parameter is "invalid", however, the FREEZE mode signal (X07) does not turn off since a communication timeout error does not occur.

(The output data of the output receive area are held.)

Communication watchdog timer setting of master station side parameter	When master station becomes faulty
Invalid	No error (FREEZE mode signal (X07) remains on)
Valid (2 to 65025)	Communication timeout error occurrence (FREEZE mode signal (X07) turns off)

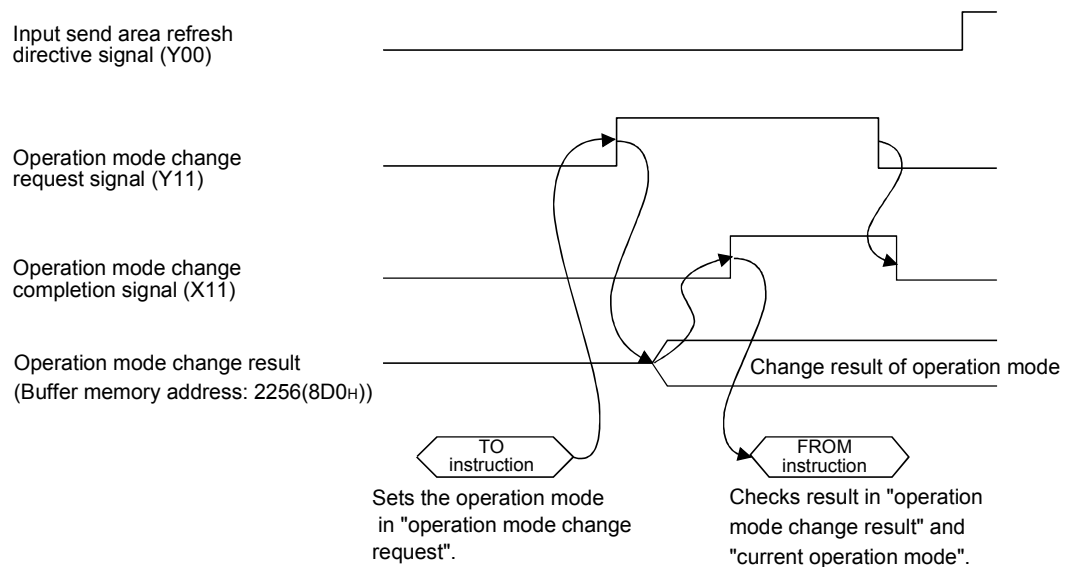
The set value of the communication watchdog timer can be confirmed in the "Current communication watchdog timer value (buffer memory address: 2257 (8D1H))" of the A1SJ71PB93D.

(7) Module watchdog timer error signal (X0D)

- (a) This signal turns on when a module watchdog timer error occurs.
- (b) The module watchdog timer error signal (X0D) does not turn off until the following operation is performed.
 - Turning the programmable controller power OFF to ON
 - Resetting the programmable controller CPU
 If the signal turns on again, a hardware fault may be the cause.

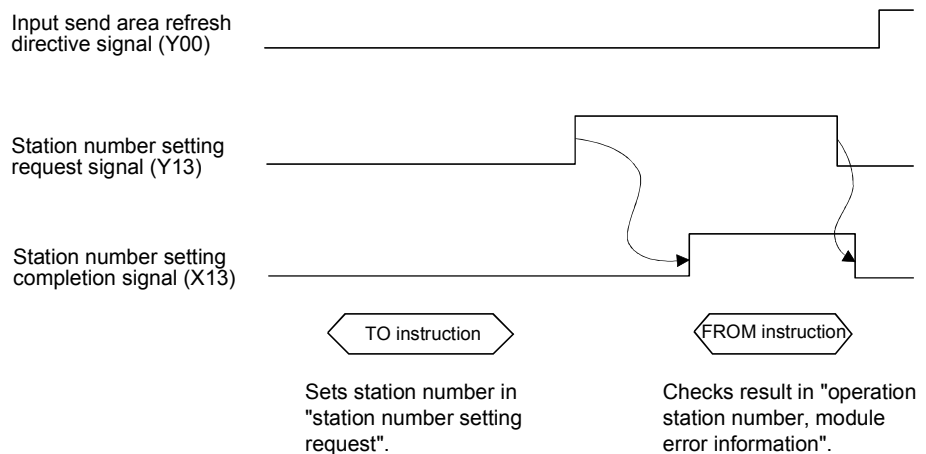
(8) Operation mode change completion signal (X11)

- (a) This signal turns on when an operation mode change is completed by setting the required operation mode to the operation mode change request (buffer memory address: 2255 (8CFH)) and turning on the operation mode change request signal (Y11).
At this time, the result is stored into the operation mode change result (buffer memory address: 2256 (8D0H)) of the buffer memory.
- (b) Turning off the operation mode change request signal (Y11) after confirmation of the result 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 when the station number setting is completed by setting the station number to the station number setting request (buffer memory address: 515 (203H)) and turning on the station number setting request signal (Y13).
- (b) Check the setting result in the operation station number (buffer memory address: 513 (201H)) and module error information area (buffer memory address: 2040 (7F8H)) of the buffer memory.
- (c) Turning off the station number setting request signal (Y13) after confirmation of the result turns off the station number setting completion signal (X13).
- (d) 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.
- (e) 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.

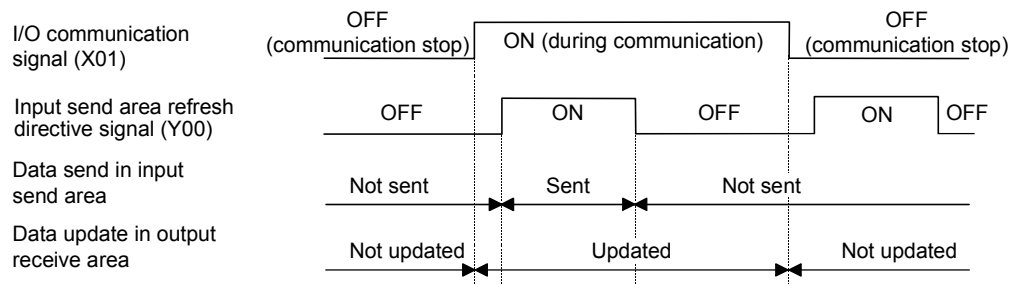


(10) Module ready signal (X1D)

- (a) This signal turns on when the A1SJ71PB93D is enabled for access from the programmable controller CPU module. (It turns on regardless of the operation mode.)
- (b) This signal turns off when the A1SJ71PB93D is disabled for access from the programmable controller CPU due to a module watchdog timer 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) starts 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 'Not sent' from A1SJ71PB93D to Master station and 'Not updated' from Master station to A1SJ71PB93D.</p>
ON	ON	<p>Master station: Input area, Output area. A1SJ71PB93D: Input send area, Output receive area. Solid arrows indicate 'Sent' from A1SJ71PB93D to Master station and 'Updated' from Master station to A1SJ71PB93D.</p>
	OFF	<p>Master station: Input area, Output area. A1SJ71PB93D: Input send area, Output receive area. Solid arrows indicate '0 data sent' from A1SJ71PB93D to Master station and 'Updated' from Master station to A1SJ71PB93D.</p>

(12) Expansion trouble notification request signal (Y02)

- (a) Turning on the expansion trouble notification request signal (Y02) sends the data set in the expansion trouble information area (buffer memory address: 2041 to 2053 (7F9_H to 805_H)) 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 (X02) is on, turn off the expansion trouble notification request signal (Y02).
- (c) Refer to (2) in this section for the on/off timing.

POINT

To turn on/off Y02, provide an interlock using X02.

(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 off the module error reset request signal (Y03).
- (c) Making an error reset clears the error code in the module error information area (buffer memory address: 2040 (7F8_H)).
- (d) Refer to (3) in this section for the on/off timing.

(14) Operation mode change request signal (Y11)

- (a) Turn on the operation mode change request signal (Y11) when changing the operation mode to the one set in the operation mode change request (buffer memory address: 2255 (8CF_H)).
- (b) When you have checked that the operation mode change completion signal (X11) is on, turn off the operation mode change request signal (Y11).
- (c) Refer to (8) in this section for the on/off timing.

(15) Station number setting request signal (Y13)

- (a) Turn on the station number setting request signal (Y13) when changing the station number to the one set in the station number setting request (buffer memory address: 515 (203_H)).
- (b) When you have checked that the station number setting completion signal (X13) is on, turn off the station number setting request signal (Y13).
- (c) Refer to (9) in this section for the on/off timing.

POINT
Station numbers can be set from the class 2 master station. In this case, specifying "TRUE" for "No_Add_Chg" disables the station number change on the A1SJ71PB93D. The station number of the A1SJ71PB93D cannot be changed while the station number change is disabled. To change the station number again, clear the station number in the station number setting request of the A1SJ71PB93D (buffer memory address: 515(203 _H)) to cancel the disabled status. (Refer to Section 3.5.2 (6))

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 programmable controller 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)	System area (Use prohibited)	—	—
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)	Read /Write
448 (1C0 _H)			
511 (1FF _H)	System area (Use prohibited)	—	—
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).	Read /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)	System area (Use prohibited)	—	—
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.	Read /Write
2054 (806 _H)			
2055 (807 _H)			
2253 (8CD _H)	System area (Use prohibited)	—	—
2254 (8CE _H)			
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).	Read /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 watchdog timer value	Stores the communication watchdog timer value in current operation.	Read
2258 (8D2 _H)	System area (Use prohibited)	—	—
2259 (8D3 _H)			
2260 (8D4 _H)	System area (Use prohibited)	—	—
2271 (8DF _H)			
2272 (8E0 _H)			
2283 (8EB _H)	Output receive area used status	Stores the current used status of the output receive area.	Read
2284 (8EC _H)	System area (Use prohibited)	—	—
2287 (8EF _H)			
2288 (8F0 _H)	Input send area used status	Stores the current used status of the input send area.	Read
2299 (8FB _H)			
2300 (8FC _H)	System area (Use prohibited)	—	—
2815 (AFF _H)			

POINT

Do not write any data in the "system area (Use prohibited)" of the buffer memory. If data is written to the "system area (Use prohibited)", there is a risk that the programmable controller system may malfunction.

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 slave parameters. (Refer to Section 5.2.1 to 5.2.3)
- (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 slave parameters. (Refer to Section 5.2.1 to 5.2.3)
- (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
1.5 Mbps	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.
The stored value while the I/O communication signal (X01) is on is valid.
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.

(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), "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
0000H to 007DH or 0100H to 017DH	<p>Set a station number. By turning on b8, the station number is saved onto the flash ROM.</p> <p>b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0</p> <p>0: Not save onto the flash ROM 1: Save onto the flash ROM</p> <p>Set a station number within the range from 0H to 7DH (0 to 125).</p> <p>(Example 1) Set the station number to 12. (Not saved onto the flash ROM): 000CH (Example 2) Set the station number to 12. (Saved onto the flash ROM): 010CH</p>
FFFFH	<p>Clears the station number. After clearing, the operation station number is "126". The station number set to the flash ROM is "FFFEH".</p>

POINT
<p>(1) Saving the station number to the flash ROM enables the operation based on the station number setting stored in the flash ROM even if the module is powered OFF and then ON or the programmable controller CPU is reset.</p> <p>(2) At power-on or at programmable controller CPU reset, "FFFEH" is stored. Turn on the station number setting request signal (Y13) after storing a setting value given in the above table. Executing the station number setting request with any invalid value results in a station number error (error code: 1002H).</p>

(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.

The initial value is 60.

(a) Counting down the number of times

Every time the station number is changed on the flash ROM, the count is decremented by 1.

The count is not decremented when station number setting is requested with the same station number as the one saved on the flash ROM (buffer memory address: 514 (202H)).

(b) Resetting the count

The count is reset to 60 by resetting the programmable controller CPU, by powering on the A1SJ71PB93D or by clearing the station number on the flash ROM using the station number setting request signal (Y13).

(c) If an attempt is made to rewrite the station number on the flash ROM at the remaining count of 0

A station number rewrite count excess error (error code: 2001H) occurs and the station number on the flash ROM is not changed.

If the station number rewrite count excess error has occurred, switch power on again, reset the programmable controller 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.)

(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)

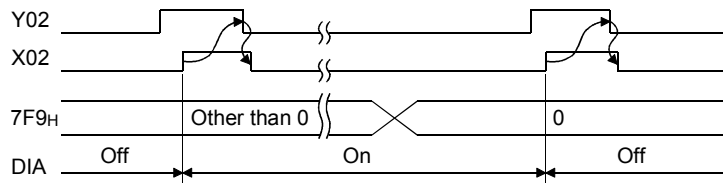
2041(7F9H)	Data length
2042(7FAH)	Expansion trouble information
}	
2053(805H)	

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

- (a) When extended trouble occurs
 When the host becomes faulty, for example, the data stored in the extended trouble information area of the buffer memory is sent to the master station as extended trouble information.
 In the following procedure, the A1SJ71PB93D can notify the master station of the extended trouble of the host.
- 1) In the buffer memory 2042 (7FAH) to 2053 (805H), 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 expansion trouble notification request (Y02).
 - 4) After the expansion trouble notification completion (X02) has turned ON, turn OFF the expansion trouble notification request (Y02).

- (b) When extended trouble 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 trouble of the host has been removed.
- 1) In the buffer memory 2041 (7F9H), set the data length 0.
 - 2) Turn ON the expansion trouble notification request (Y02).
 - 3) After the expansion trouble notification completion (X02) has turned ON, turn OFF the expansion trouble notification request (Y02).

- (c) The DIA LED on the front of the A1SJ71PB93D turns on as shown below.



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

Stores the current operation mode.

Refer to Section 3.6 for the operation mode.

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

At power-on or programmable controller 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 programmable controller 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 (buffer memory address: 2255 (8CFH))

(13) Current communication watchdog timer value
(buffer memory address: 2257 (8D1H))

Stores the communication watchdog timer value set in the master side parameters.

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

0 : Communication watchdog timer setting invalid

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

When the master station becomes faulty, the send/receive data and I/O communication signal (X01) statuses change depending on the communication watchdog timer setting.

Statuses at master station fault	Current communication watchdog timer value (This area)	
	0	Other than 0
Send data to master station *1	Retained *2	Cleared
Data update in output receive area	Retained *2	Cleared
I/O communication (X01)	ON *2	OFF

*1: The send data to the master station indicates the data that flows on the PROFIBUS-DP actually. It differs from the data in the input send area of the A1SJ71PB93D.

*2: If the communication watchdog timer setting is invalid (This area is 0), the data is retained since the communication watchdog timer 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.

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

0 : Without swap setting

1 : With swap setting

(15) Output receive area used status

(buffer memory address: 2272 to 2283 (8E0H to 8EBH))

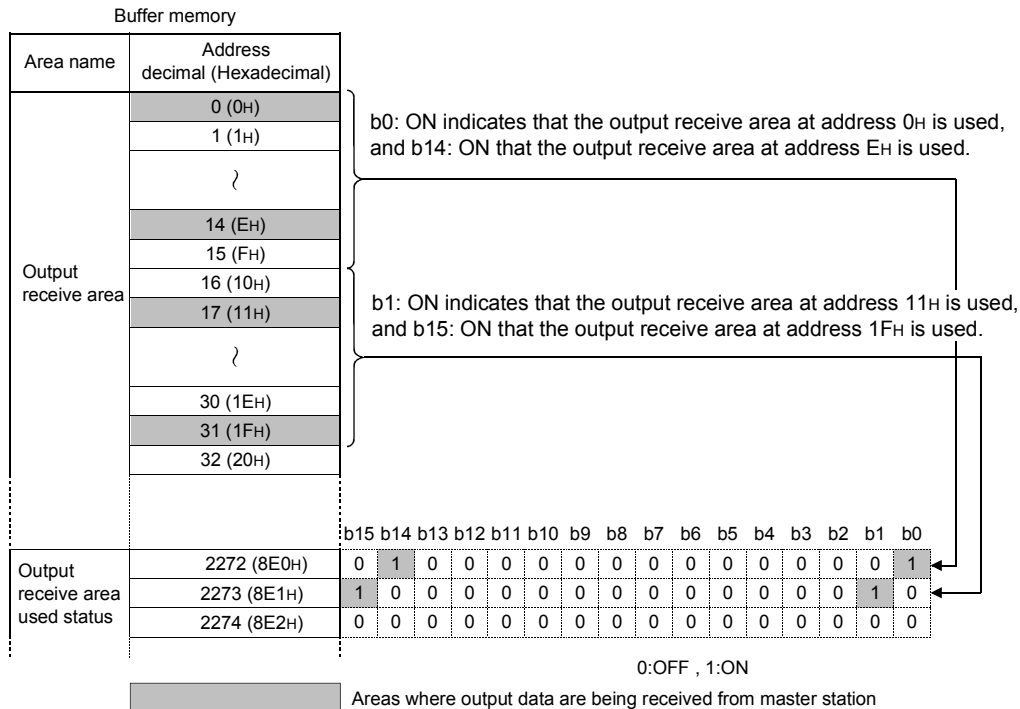
Stores the used status of the output receive area.

The bits corresponding to the buffer memory addresses in output receive area set by the master station parameters (Data module setting) 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

(buffer memory address: 2288 to 2299 (8F0H to 8FBH))

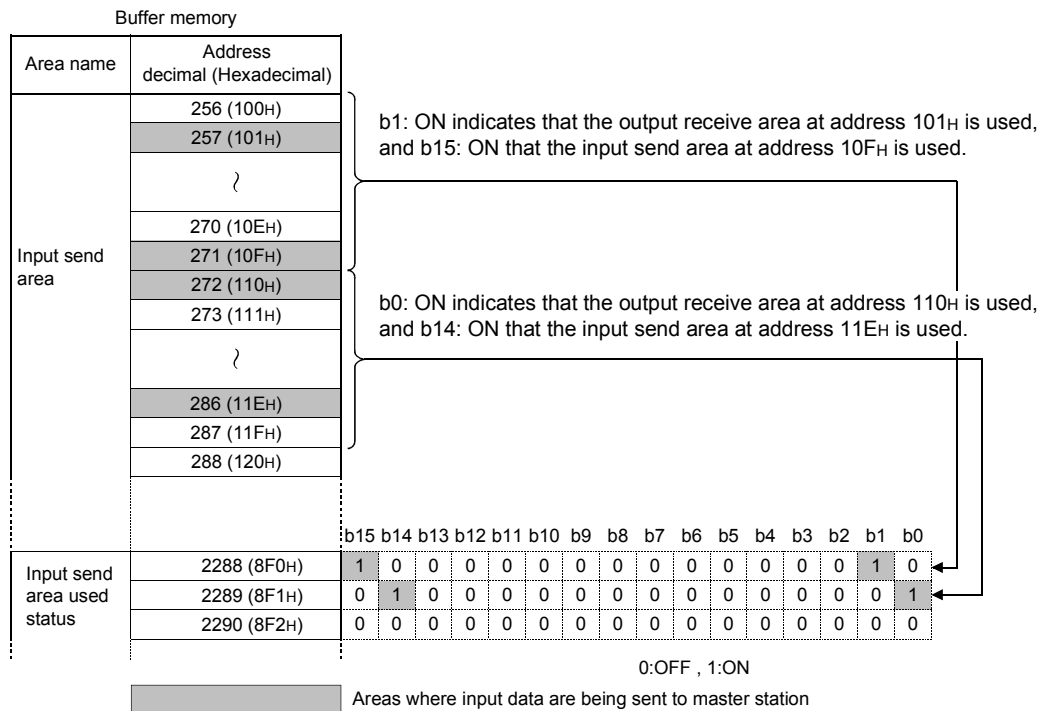
Stores the used status of the input send area.

The bits corresponding to the buffer memory addresses of the input send area set in the master station parameters (Data module setting) 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 Operation Mode

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

The modes will be described.

Operation Mode	Description	Reference Section
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 5.6

Set the operation mode using the operation mode change request (Buffer memory address: 2255 (8CFH) and the operation mode change request signal (Y11).

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

REMARKS

Refer to Section 5.6 for changing the operation mode.

4 FUNCTIONS

4.1 Functions for Communication with Class 1 Master

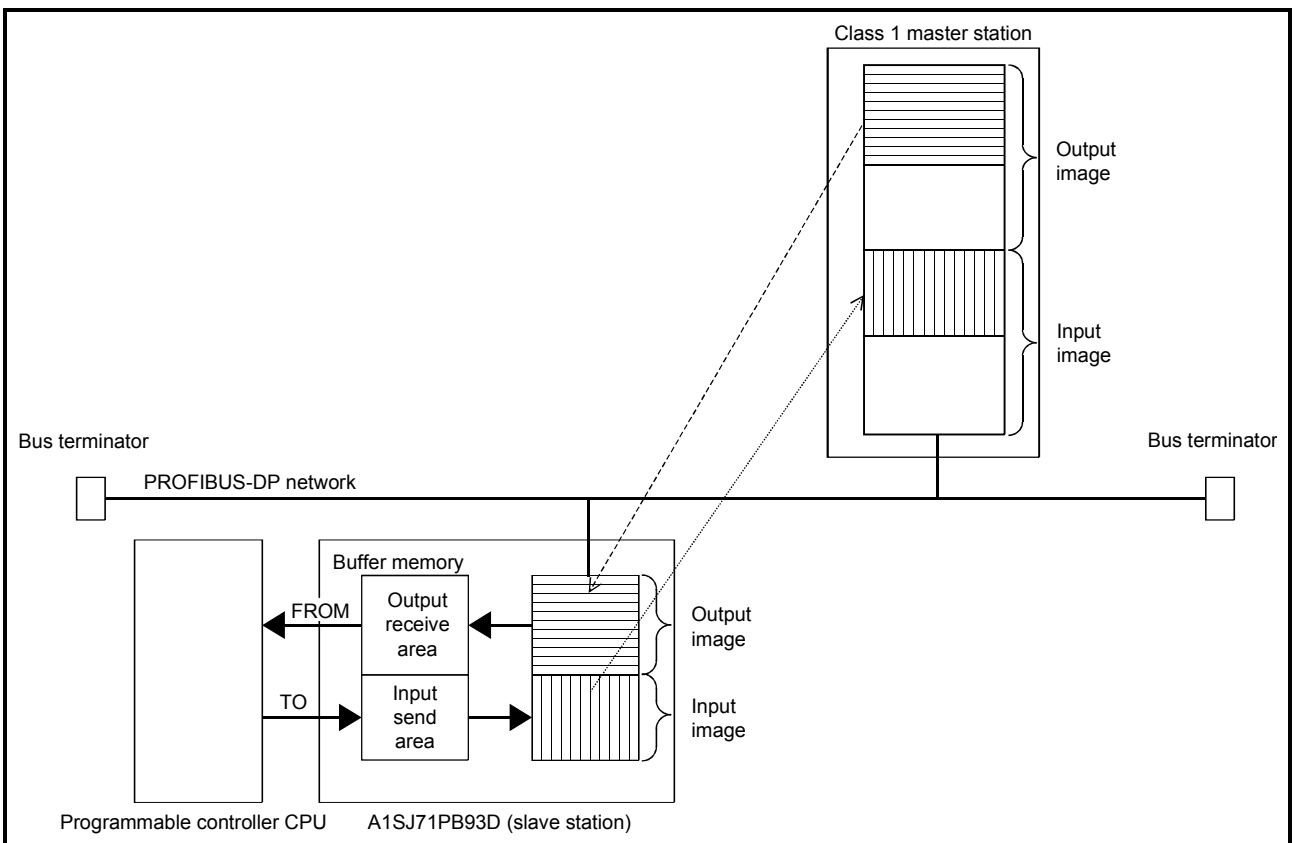
This section explains the functions provided for communication between the A1SJ71PB93D and class 1 master station.

4.1.1 I/O data communication function

This function allows the A1SJ71PB93D to operate as a PROFIBUS-DP slave station and to communicate I/O data with the master station.

A single A1SJ71PB93D can handle the following size of data.

Input data : Max. 122 words	} Max. 192 words in total
Output data : Max. 122 words	



(1) Reading/writing I/O data

(a) Where to be stored

The I/O data are stored in the following buffer memory of the A1SJ71PB93D.

- Input data: Input send area
(Buffer memory address: 256 to 447 (100H to 1BFH))
- Output data: Output receive area
(Buffer memory address: 0 to 191 (0H to BFH))

(b) Read/write methods

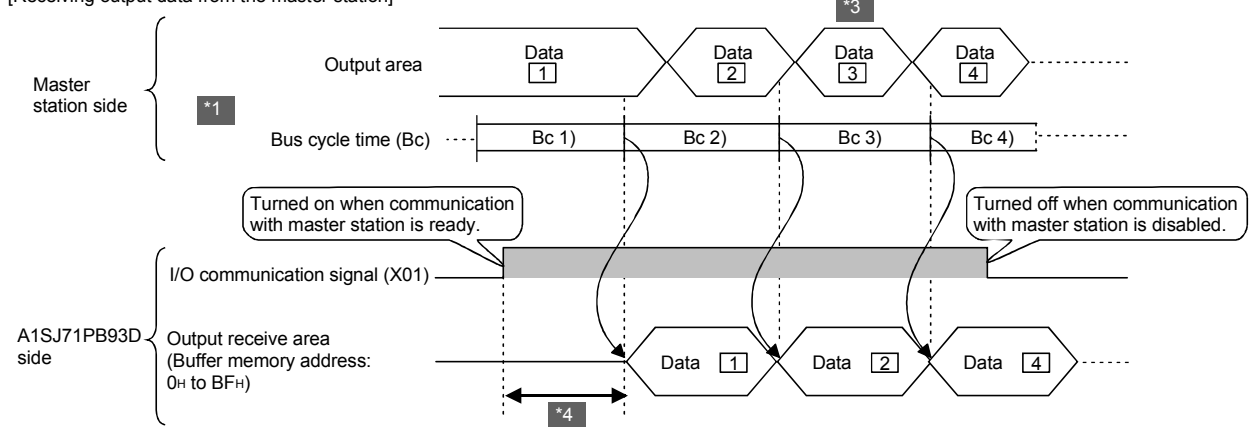
Read or write I/O data (from the buffer memory) to devices in CPU module by the FROM/TO instruction.

(2) Sending/receiving I/O data

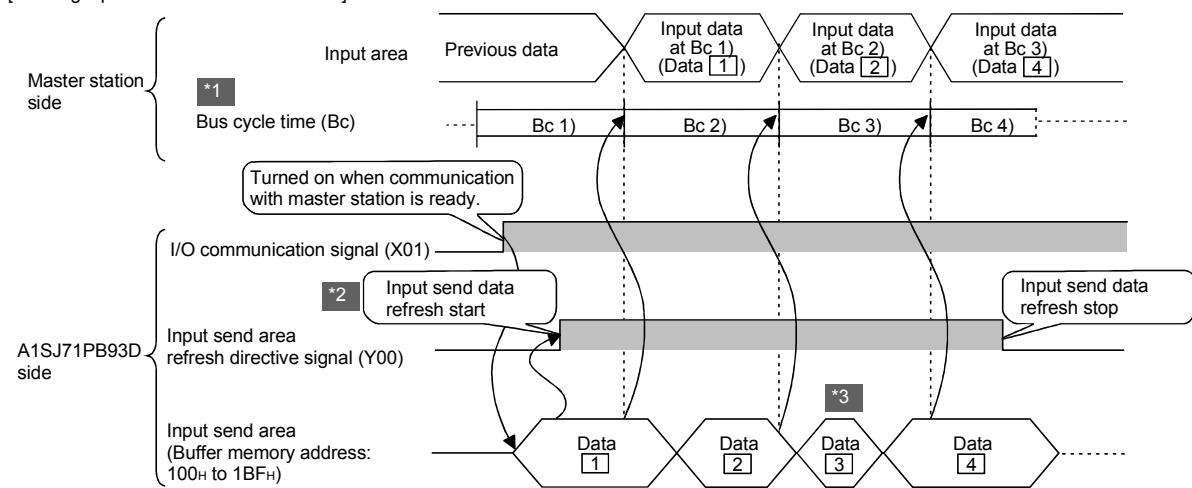
The sending and receiving process is described below.

- (a) The I/O communication signal (X01) turns on when the A1SJ71PB93D is ready to communicate with the master station.
- (b) When the I/O communication signal (X01) turns on, data output from the master station are stored into the output receive area (Buffer memory address: 0 to 191 (0H to BFH)).
- (c) When sending input data to the master station, write the initial value to the input send area (Buffer memory address: 256 to 447 (100H to 1BFH)).
- (d) Turning on the input send area refresh directive signal (Y00) starts input data communication.
Turning off the signal stops the input data communication.
- (e) The I/O communication signal of the A1SJ71PB93D is turn off when communication with the master station is stopped.

[Receiving output data from the master station]



[Sending input data to the master station]



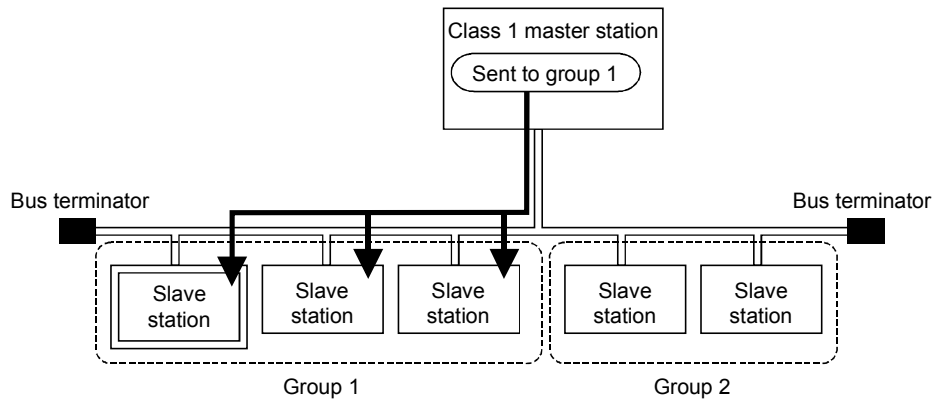
- * 1: For the bus cycle time calculation formula, refer to the manual for the PROFIBUS-DP module used as the master station.
- * 2: Y00 must be turned ON after X01 turns ON and data are stored in the input send area.
- * 3: Hold the data for more than 1 bus cycle time.
If the data are held for the time less than 1 bus cycle time, they may not be sent.
- * 4: Transmission delay equal to 1 bus cycle time occurs to read the data in the output receive area after X01 turns on.
Transmission delay equal to a maximum of 1 bus cycle time occurs to store data in the input send area after X01 turns on.

4.1.2 Global control functions

The inputs/outputs of slave stations are controlled simultaneously for each specified group by multicasting (broadcasting) from the master station. (Refer to (1) in this section)

Set group numbers when using the global control function.

The group numbers are set to the slave parameters of the master station. (Refer to (2) in this section.)



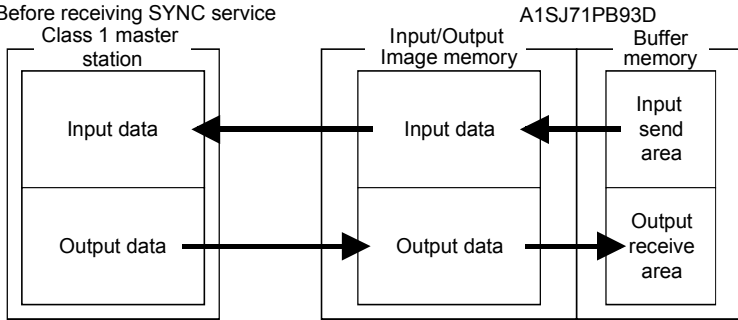
(1) Global control services available for A1SJ71PB93D

The following table describes the global control services available for the global control function of the A1SJ71PB93D.

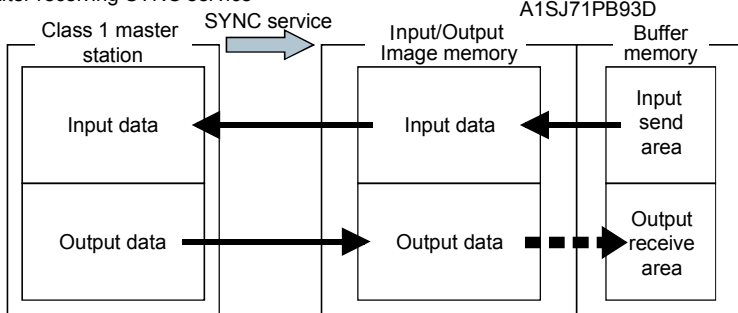
Service name	Description
SYNC	Starts the SYNC (output synchronization) mode. During the SYNC mode, the output status is refreshed every time the SYNC service is received. The output status is held as long as the SYNC service is not received.
UNSYNC	Ends the SYNC (output synchronization) mode.
FREEZE	Starts the FREEZE (input synchronization) mode. During the FREEZE mode, the input status is refreshed every time the FREEZE service is received. The input status is held as long as the FREEZE service is not received.
UNFREEZE	Ends the FREEZE (input synchronization) mode.

(a) At receive of SYNC and UNSYNC services

1) Before receiving SYNC service
Class 1 master station



2) After receiving SYNC service



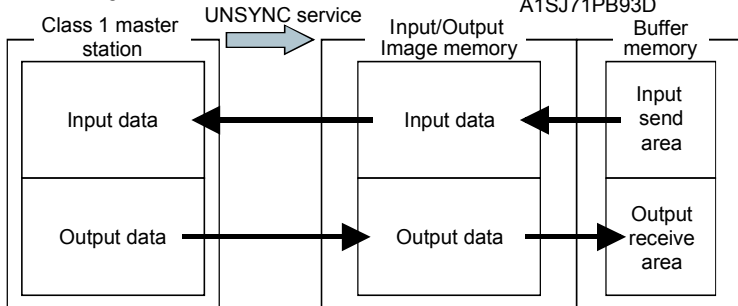
- Upon reception of the SYNC service, the SYNC mode is started and refresh from the output data area to the output receive area is stopped.

- During the SYNC mode, the SYNC LED of the A1SJ71PB93D is on

- When the SYNC service is received during the SYNC mode, refresh to the output receive area is performed only once.

- Even during the SYNC mode, refresh from the input send area to the input data area is executed continuously.

3) After receiving UNSYNC service

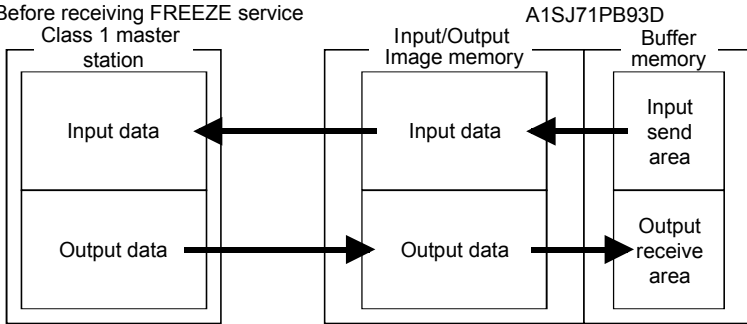


- Upon reception of the UNSYNC service, the SYNC mode is terminated and refresh from the output data area to the output receive area is restarted.

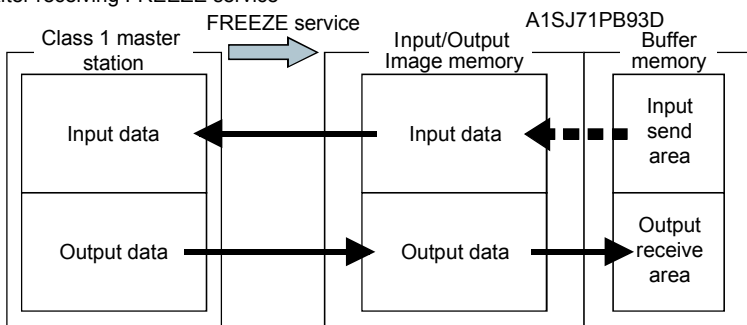
- When the UNSYNC service is received and the SYNC mode is ended, the SYNC LED of the A1SJ71PB93D turns off.

(b) At receive of FREEZE and UNFREEZE services

1) Before receiving FREEZE service

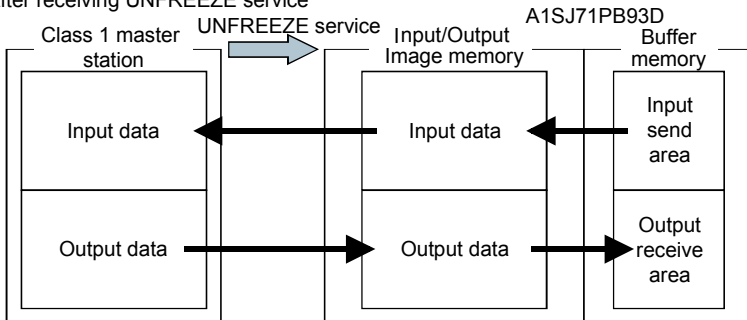


2) After receiving FREEZE service



- Upon reception of the FREEZE service, the FREEZE mode is started and refresh from the input send area to the input data area is stopped.
- During the FREEZE mode, the FREEZE LED of the A1SJ71PB93D is on.
- When the FREEZE service is received during the FREEZE mode, refresh to the input sending area is performed only once.
- Even during the FREEZE mode, refresh from the output data area to the output receive area is executed continuously.

3) After receiving UNFREEZE service



- Upon reception of the UNFREEZE service, the FREEZE mode is terminated and refresh from the input send area to the input data area is restarted.
- When the UNFREEZE service is received and the FREEZE mode is ended, the FREEZE LED of the A1SJ71PB93D turns off.

(2) Group selection

There are a total of 8 groups from 1 to 8.

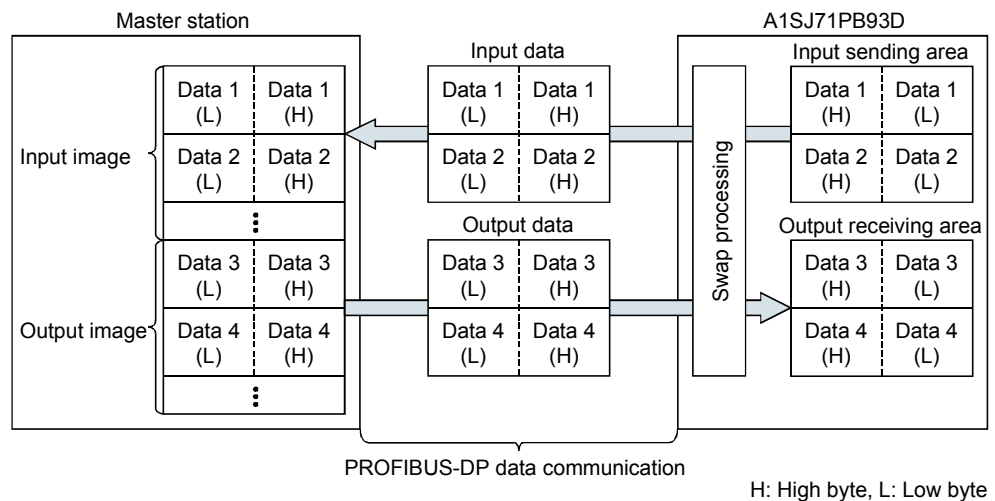
The A1SJ71PB93D is allowed to belong to any of the 8 groups. (Specify the group using the configuration tool of the master station.)

4.1.3 Word data swapping function

The high and low bytes are swapped in word units when input or output data are sent to or received from the master station.
 Use this function when the used master station handles the high and low bytes of word data in reverse to those of the A1SJ71PB93D.
 Data can be swapped for communication without the need for creating a program for swapping the high and low bytes.

(1) Operation outline for swap function

The data stored in the input sending area are sent to the master station after their high and low bytes have been swapped.
 The data received from the master station are stored into the output receiving area after their high and low bytes have been swapped.



(2) Swap function setting

The setting required for swapping I/O data, the setting by master station type and the operation outline are described below.

(a) Swap function setting by master station type

The swap function setting changes depending on the master station type as described below.

Guideline of Swapping Function Setting Depending on Master Station Type

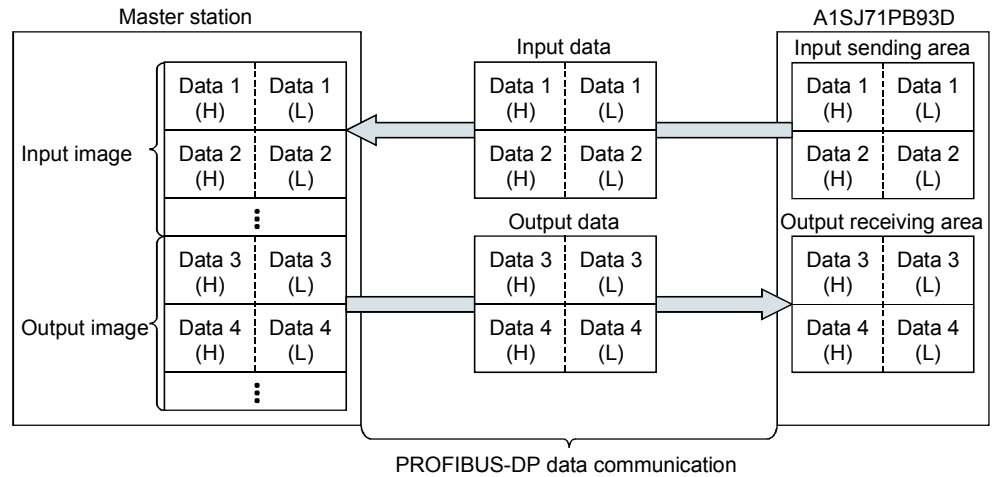
Master Station Type		Setting of Swapping Function on A1SJ71PB93D
QJ71PB92V, QJ71PB92D	When swap is not performed on the master station side (default setting)	Disable (Not swapped)
	When swap is performed on the master station side	Enable (Swapped)
A1SJ71PB92D, AJ71PB92D		Disable (Not swapped)
Master station other than above		Set according to the specifications of the used master station.

(b) Operation outline

When the QJ71PB92V, QJ71PB92D, A1SJ71PB92D or AJ71PB92D is used as the master station, the operation outline is as shown below.

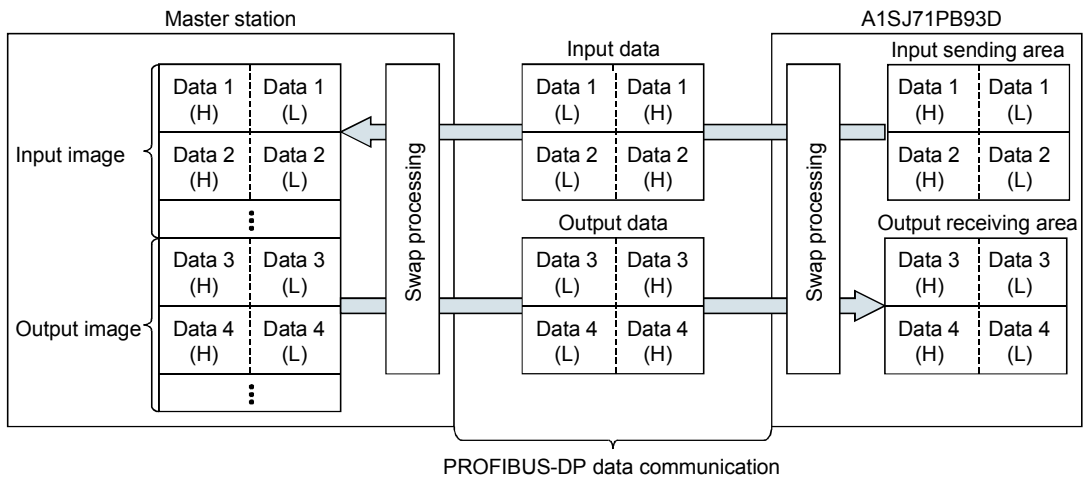
1) When the master station is the

QJ71PB92V/QJ71PB92D/A1SJ71PB92D/AJ71PB92D (Not swapped)



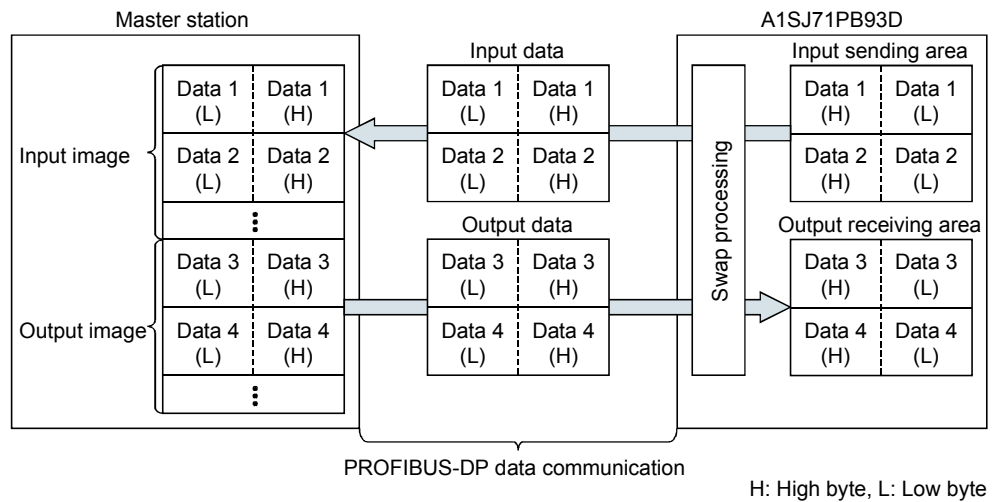
H: High byte, L: Low byte

2) When the master station is the QJ71PB92V/QJ71PB92D (Swapped)



H: High byte, L: Low byte

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

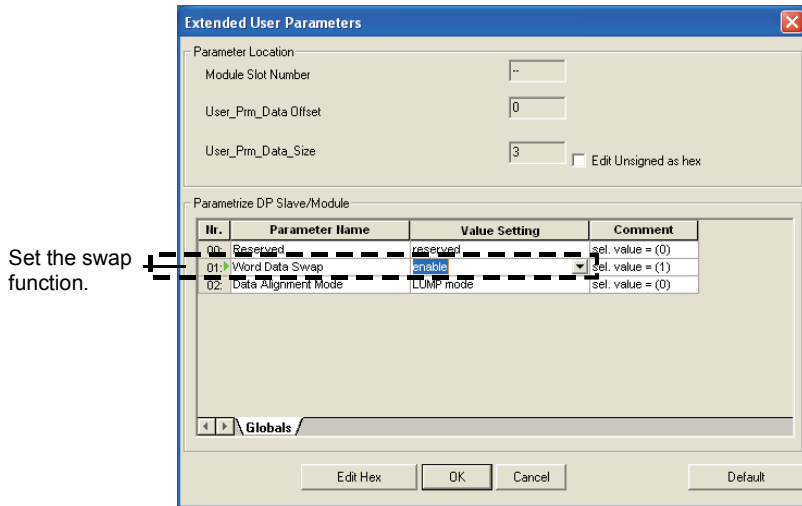


(c) How to set the swap function

The swap function can be set as a slave parameter of the master station (Word Data Swap in the user parameters setting).

Slave parameters of the master station are set from configuration tool on the master station.

In the case of GX Configurator-DP



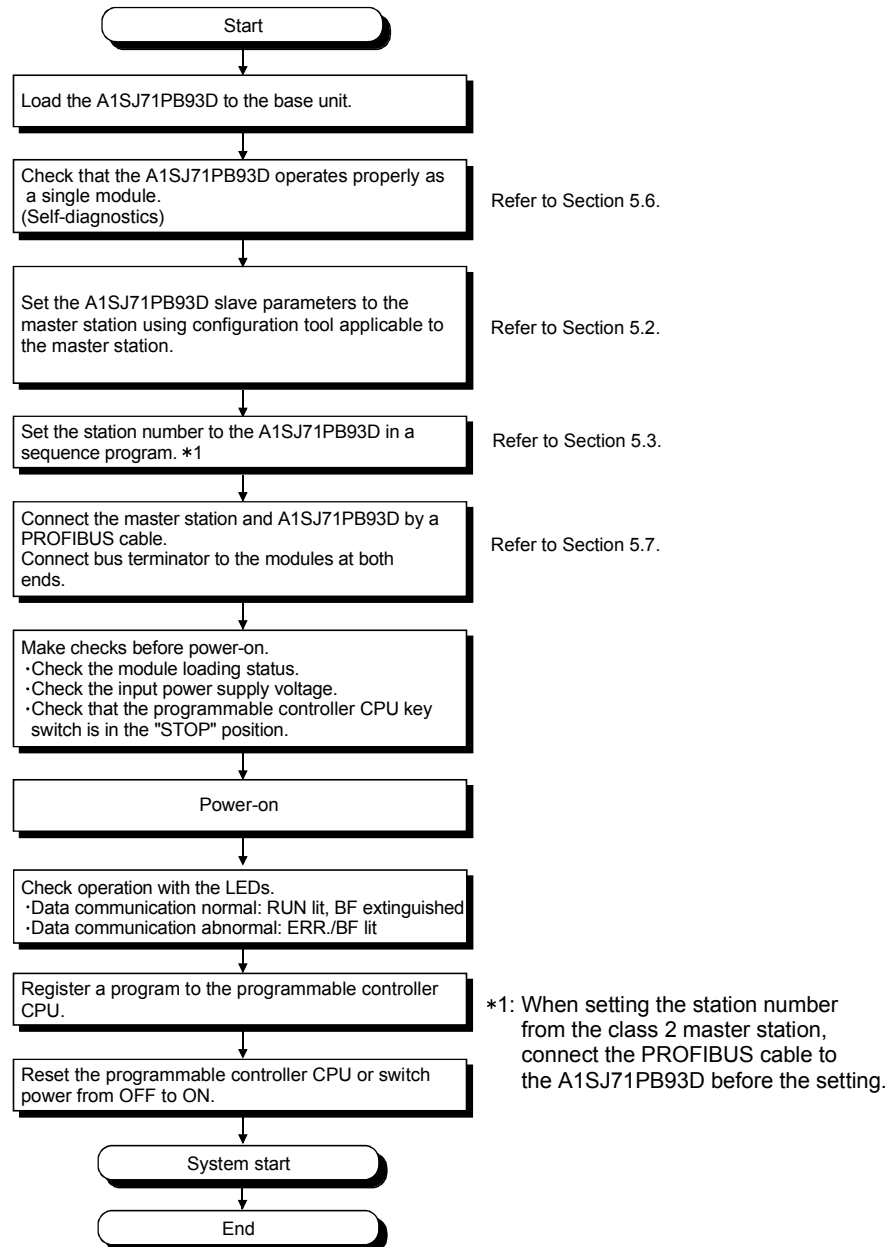
REMARKS

Refer to Section 5.2.3 for a setting example using GX Configurator-DP.
When using another configuration tool, refer to the relevant manual.

5 PROCEDURES BEFORE SYSTEM OPERATION

5.1 Procedures before Operation

The following diagram illustrates the procedure before system operation.



5.2 Parameter Setting to Master Station

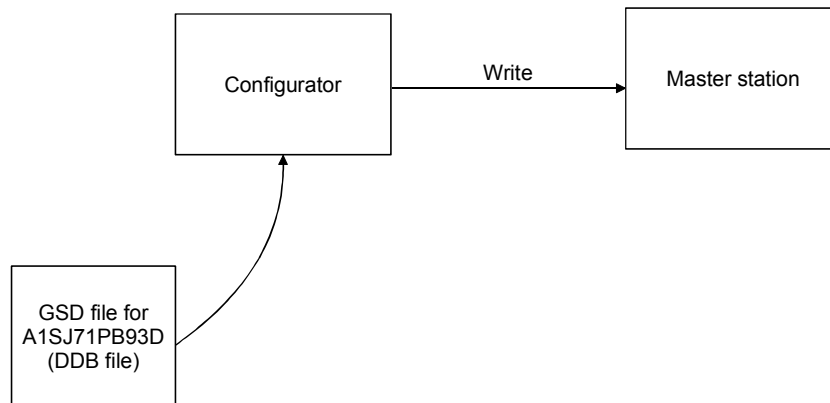
In PROFIBUS-DP systems, slave parameters for the A1SJ71PB93D must be set to the master station.

For the setting method, refer to the manual of the configuration tool to be used.

Item	Description	Reference
FDL Address	Set the station number of the A1SJ71PB93D. Setting range: 0 to 125	—
Watchdog	Set the watchdog timer period of the communication watchdog timer. The A1SJ71PB93D detects a communication error if data cannot be received from the master station within the configured time. If the communication watchdog timer has not been set, no error is detected. Setting range: 2 to 65025 (set value × 10ms)	—
Min T_sdr	Set the minimum response time during which the response frame is sent from the A1SJ71PB93D to the master station. Usually the default value is used. Setting range: 1 to 255	—
Group identification number	Specify groups (Grp1 to Grp8) to which the A1SJ71PB93D belongs. Multiple groups (Grp1 to Grp8) can be set.	—
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 5.2.1
Data assignment mode setting	Set the data layout of the output receive area/input send area of the buffer memory (set to "User_Prm_Data" of the master station). • Setting range 0 : LUMP mode (default) 1 : DIVIDED mode	Section 5.2.2
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 5.2.3

(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. (Refer to (2) in this section)
2. Set the A1SJ71PB93D slave parameters using the configurator.
3. Write the parameters to the master station.



REMARKS

Refer to Section 5.2.1 to 5.2.3 for setting examples using GX Configurator-DP. When using another configuration tool on the master station, refer to the relevant manual.

(2) GSD (DDB) file

- (a) When using GX Configurator-DP Version 4.01B or later
GSD files have been incorporated into GX Configurator-DP.
GSD file installation is, therefore, unnecessary.
- (b) When using GX Configurator-DP Version 4.00A earlier, or another configuration tool on the master station
Please consult your local system service center or representative for the GSD (DDB) file of the A1SJ71PB93D.

5.2.1 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 (con word)/data module unit (con whole)

POINT

When even one data module is set to “data module unit (con whole)” in the separation prevention setting, data inconsistency is prevented based on the specified data size.

(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
Programmable controller CPU	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.

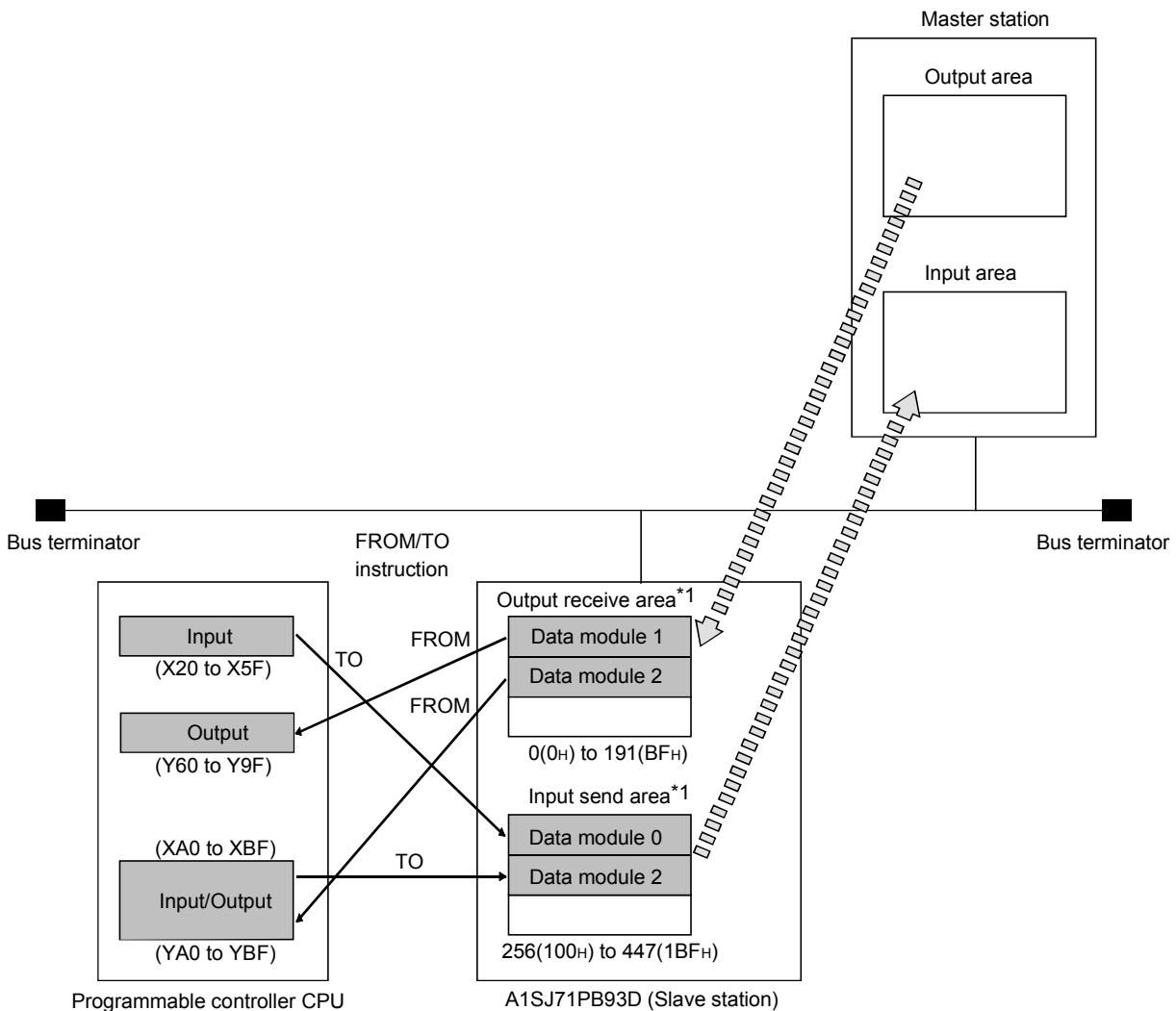
(a) Total data size

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

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

(b) Flows of data

The following indicates the flows of data between the modules.



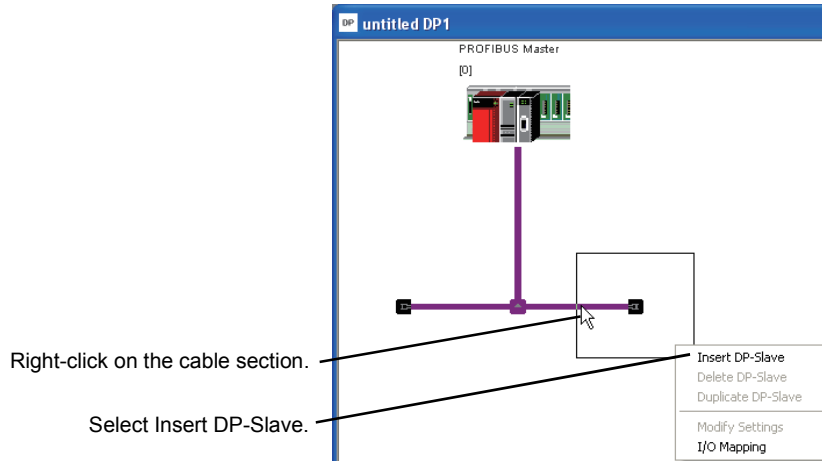
*1: Use the data assignment mode setting to set the layout on the buffer memory. (Refer to Section 5.2.2)

(4) Setting method when using GX Configurator-DP

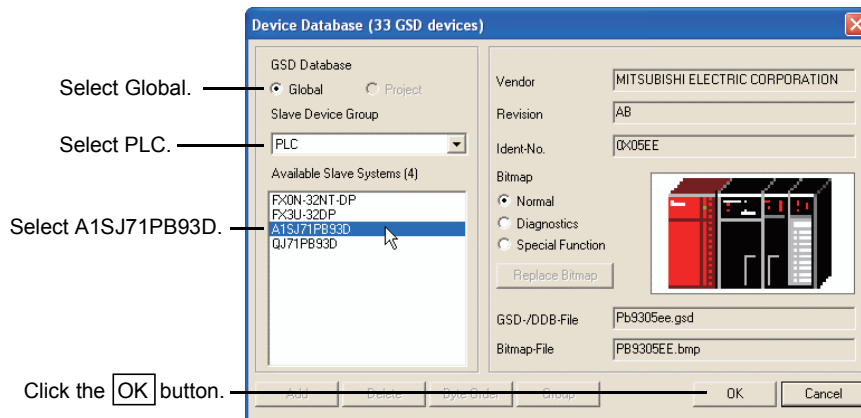
This section describes how to make setting from GX Configurator-DP.

When using another configuration tool, refer to the relevant manual.

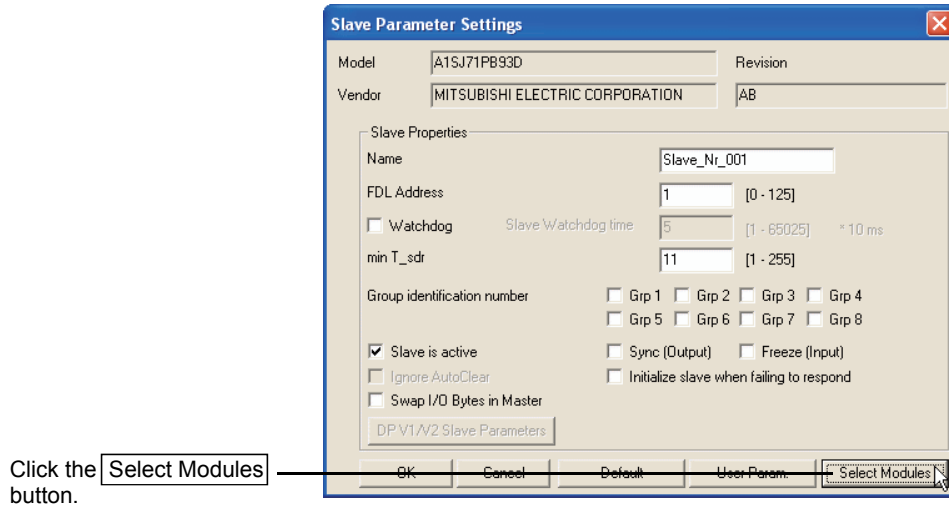
- 1) Add a slave station on the graphical network editor.



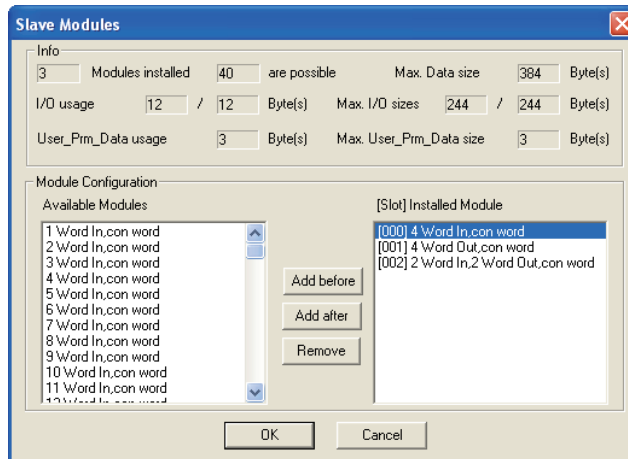
- 2) The screen for selecting a slave station appears. Select the A1SJ71PB93D.



- 3) Click the **Select Modules** button in the Slave Parameter Settings dialog box.



- 4) Perform the data module setting.



- 5) Write the configured parameters into the master station.

REMARKS

Refer to the GX Configurator-DP Operating Manual for creating projects and writing parameters to the master station by GX Configurator-DP.

5.2.2 Data assignment mode setting

Set how to assign each module in the output receive area or the input send area of the buffer memory.

This section gives an example of the output receive area and the input send area in the following data module setting.

		Data module 0	Data module 1	Data module 2	Data module 3	Data module 4	Data module 5
Programmable controller CPU	A1SJ71PB93D	Input 1 word	Output 2 words	I/O 1 word	Output 1 word	Input 2 words	Output 1 word

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	

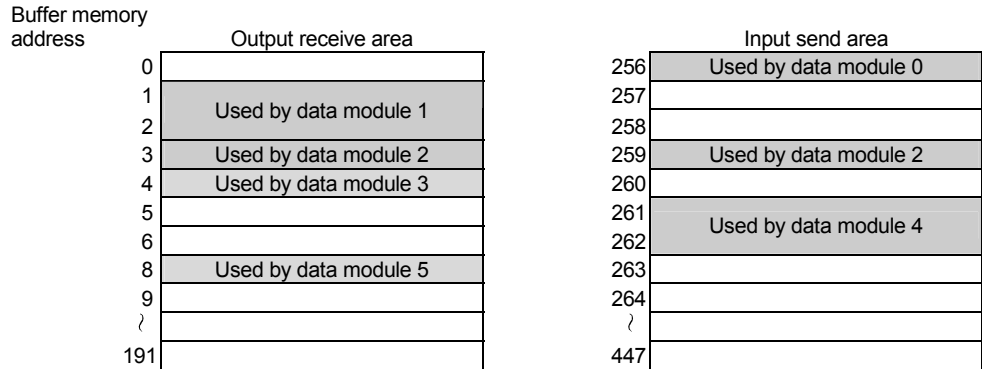
(1) Data assignment modes

There are the following two assignment modes.

(a) DIVIDED mode

In this mode, storage location of I/O data is assigned in the same way as the actual input/output of data modules.

Since arrangement in the assignment is the same as that of the actual inputs and outputs, reading from or writing to I/O modules and/or special function modules can be done with a single FROM/TO instruction.

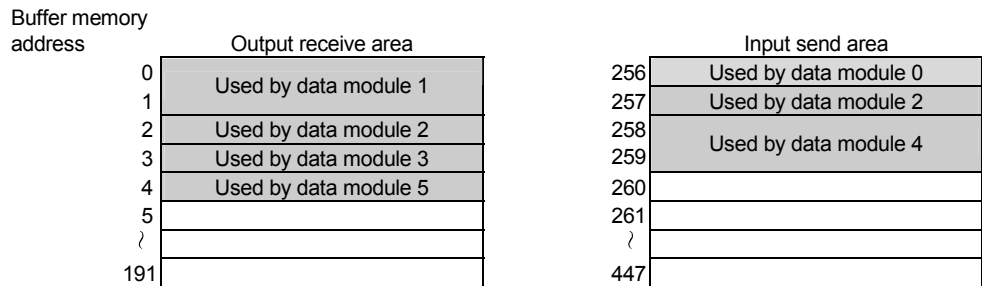


(b) LUMP mode (Default)

In this mode, the areas for storing input and output data are assigned in order of the data modules without allowing any empty space.

Because of this, reading from or writing to I/O modules and/or special function modules may not be executable with a single FROM/TO instruction.

When storing data in the output receive area and the input send area, device areas can be used effectively.



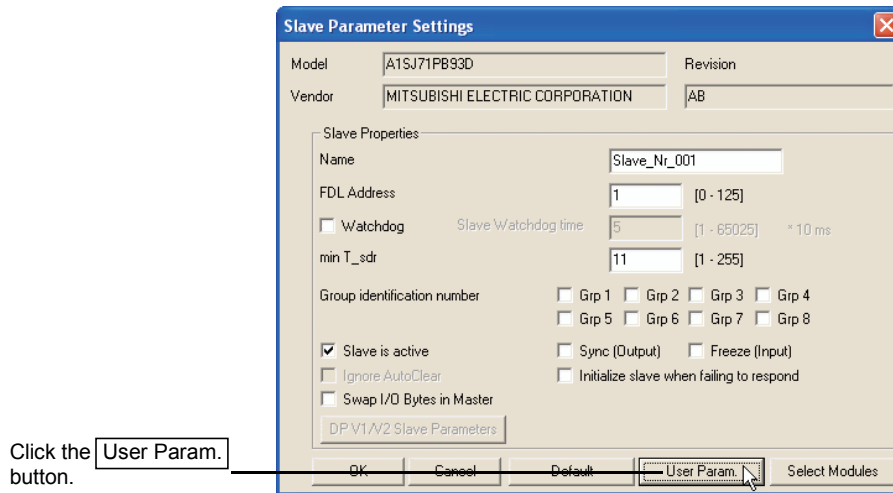
(2) Setting method when using GX Configurator-DP

This section describes how to make setting from GX Configurator-DP.

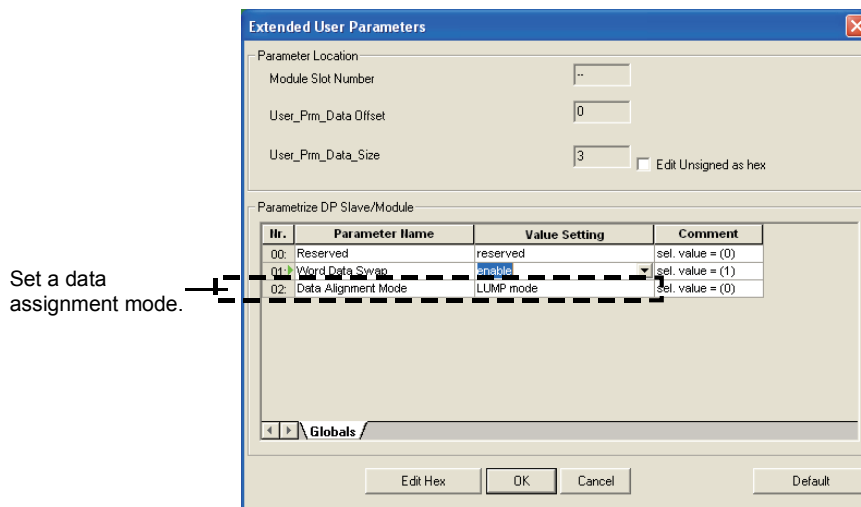
When using another configuration tool, refer to the relevant manual.

- 1) From GX Configurator-DP, open the Slave Parameter Settings dialog box. (Refer to Section 5.2.1 (4)).

Click the **User Param.** button in the Slave Parameter Settings dialog box.



- 2) Set a mode for the Data Alignment Mode.



Item	Description
Data Alignment Mode	LUMP mode : Assigns data as a lump. (Default) DIVIDED mode : Assigns data individually.

- 3) Write the configured parameters into the master station.

REMARKS

Refer to the GX Configurator-DP Operating Manual for creating projects and writing parameters to the master station by GX Configurator-DP.

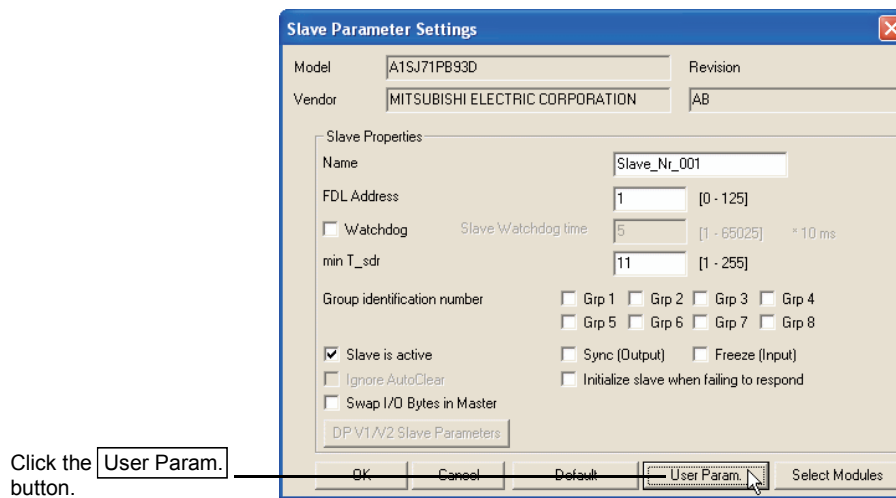
5.2.3 Swap setting

Set whether the word data swap function will be used or not.
Refer to Section 4.1.3 for the word data swap function.

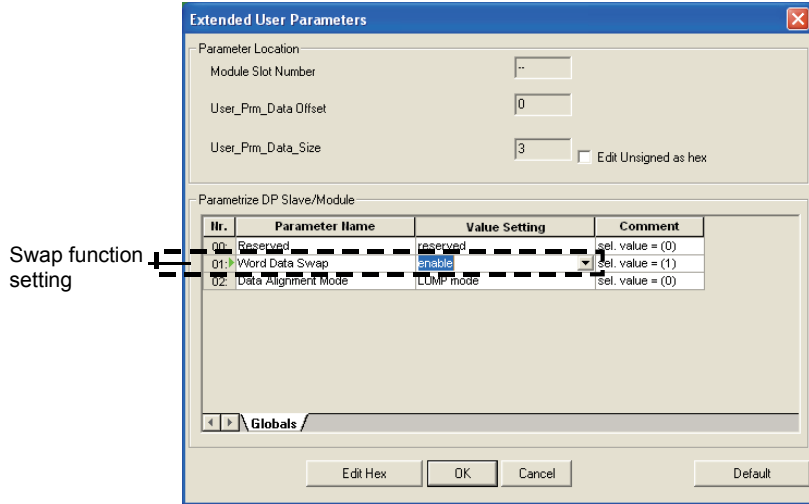
(1) Setting method when using GX Configurator-DP

This section describes how to make setting from GX Configurator-DP.
When using another configuration tool, refer to the relevant manual.

- 1) From GX Configurator-DP, open the Slave Parameter Settings dialog box. (Refer to Section 5.2.1 (4))
Click the **User Param.** button in the Slave Parameter Settings dialog box.



2) Make a desired setting for Word Data Swap.



Item	Description
Word Data Swap	enable : Swaps the high and low bytes of data in units of words when receiving or sending I/O data. disable : Sends or receives I/O data as they are. (Default)

3) Write the configured parameters into the master station.

REMARKS

Refer to the GX Configurator-DP Operating Manual for creating projects and writing parameters to the master station by GX Configurator-DP.

5.3 Station Number Setting to Slave Station (A1SJ71PB93D)

To use the A1SJ71PB93D, set a station number (0 to 125) to the A1SJ71PB93D.

(1) Setting a station number

Set a station number with the sequence program.

For the sequence program used for station number setting, refer to Section 7.2.

POINT
To change the FDL address, perform the following to stop the refresh of the I/O data between the master and slave stations. <ul style="list-style-type: none">• Turn off the Input send area refresh directive (Y0) of the A1SJ71PB93D.• Stop I/O data communication on the master station side. A new FDL address becomes effective right after the setting. If the FDL address is changed during system operation, I/O data may be updated to those for the new FDL address.

REMARKS

Station numbers (FDL addresses) can also be set from a class 2 master station.

When setting the station number from the class 2 master station, setting "TRUE" for "No_Add_Chg" disables the station number change on the A1SJ71PB93D.

The station number of the A1SJ71PB93D cannot be changed with the station number change disabled.

To change the station number again, clear it by a station number setting request (buffer memory address: 515 (203H)) and then cancel the disabled status. (Refer to Section 3.5.2 (6))

5.4 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 programmable controller CPU used.

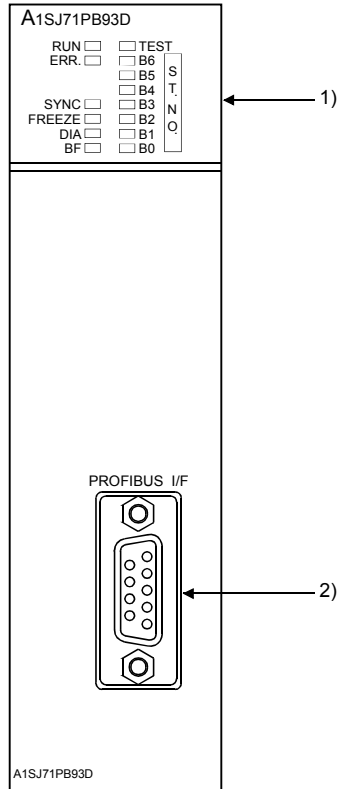
5.4.1 Handling precautions

- (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 fixing screws and connector mounting screws using torque within the following ranges.

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

5.5 Part Names and Settings

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



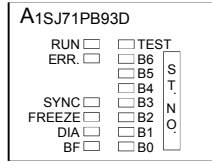
No.	Name	Description
1)	LED	Displays the A1SJ71PB93D status. (Refer to (1) in this section)
2)	PROFIBUS interface connector	Connector for connecting the table for the PROFIBUS-DP network. * 1

* 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 5.7.)

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

(1) LED



LED Name	Description		Reference									
	ON	OFF										
RUN	Normal	Hardware fault (module watchdog timer error) or power failure	Section 8.1									
ERR.	Parameter setting error or module error occurrence	Normal	Section 8.1									
SYNC	During SYNC mode	—	Section 4.1.2									
FREEZE	During FREEZE mode	—	Section 4.1.2									
DIA	Extended trouble information present	Extended trouble information absent	Section 3.5.2 (9)									
BF	Before data communication or communication error detected	During data communication	Section 8.1									
TEST	During execution of self-diagnostics	—	Section 5.6									
B6 to B0	Indicate the station number of the host in binary. Example: Station No.52 (34H) <table style="margin-left: 20px;"> <tr> <td><input type="checkbox"/> B6</td> <td rowspan="3" style="vertical-align: middle;">3H</td> </tr> <tr> <td><input checked="" type="checkbox"/> B5</td> </tr> <tr> <td><input checked="" type="checkbox"/> B4</td> </tr> <tr> <td><input type="checkbox"/> B3</td> <td rowspan="4" style="vertical-align: middle;">4H</td> </tr> <tr> <td><input checked="" type="checkbox"/> B2</td> </tr> <tr> <td><input type="checkbox"/> B1</td> </tr> <tr> <td><input type="checkbox"/> B0</td> </tr> </table> OFF: <input type="checkbox"/> ON: <input checked="" type="checkbox"/>		<input type="checkbox"/> B6	3H	<input checked="" type="checkbox"/> B5	<input checked="" type="checkbox"/> B4	<input type="checkbox"/> B3	4H	<input checked="" type="checkbox"/> B2	<input type="checkbox"/> B1	<input type="checkbox"/> B0	
<input type="checkbox"/> B6	3H											
<input checked="" type="checkbox"/> B5												
<input checked="" type="checkbox"/> B4												
<input type="checkbox"/> B3	4H											
<input checked="" type="checkbox"/> B2												
<input type="checkbox"/> B1												
<input type="checkbox"/> B0												

5.6 Execution Method for Self-diagnosis

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

It takes about 5 seconds to complete the self-diagnosis.

(1) Procedure for self-diagnosis

The procedure for self-diagnosis is as follows.

- 1) Set the programmable controller CPU to STOP.
- 2) In the [Online] → [Debug] → [Device test] of GX Developer, set 2H (self-diagnosis mode) in the operation mode change request (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.

(2) Self-diagnosis results

(a) When completed normally

The "TEST LED" and "ERR. LED" go off.

(b) When completed abnormally

The "TEST LED" and "ERR. LED" will light up.

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]

(3) Completion of the self-diagnostics

Perform the following operation after checking normal or abnormal termination of the self-diagnostics.

(a) When completed normally

Return the operation mode of the A1SJ71PB93D to the normal operation mode.

Select [Online] – [Debug] – [Device test] in GX Developer. Set 0H (Normal operation mode) in the Operation mode change request (buffer memory address: 2255 (8CFH)) and turn on the operation mode change request signal (Y11). As a result of this, the A1SJ71PB93D enters the wait state and waits for parameter reception from the master station.

(b) When completed abnormally

If the self-diagnostics results in an error, please consult your local Mitsubishi representative, explaining a detailed description of the problem.

(4) Instructions

During the self-diagnosis, do not monitor the A1SJ71PB93D buffer memory from GX Developer.

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

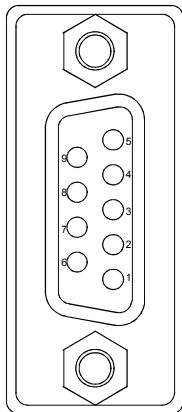
5.7 Wiring

5.7.1 PROFIBUS cable wiring

The following describes the pin assignments of the PROFIBUS interface connector on the A1SJ71PB93D, the PROFIBUS cable wiring specifications, bus terminator and other information.

(1) Pin assignments of the PROFIBUS interface connector

The following shows the pin assignments of the PROFIBUS interface connector (D-sub 9 pin female connector) on the A1SJ71PB93D.



Pin No.	Signal Code	Name	Description	Cable color
1	—	SHIELD *1	Shield, protective ground	—
2	—	—	Open	—
3	B/B'	RxD/TxD-P	Receive/send data-P	Red
4	—	—	Open	—
5	C/C'	DGND *2	Data Ground	—
6	—	VP *2	Voltage +	—
7	—	—	Open	—
8	A/A'	RxD/TxD-N	Receive/send data-N	Green
9	—	—	Open	—

*1: Optional signal.

*2: Signal used to connect the bus terminator.

(2) PROFIBUS cable

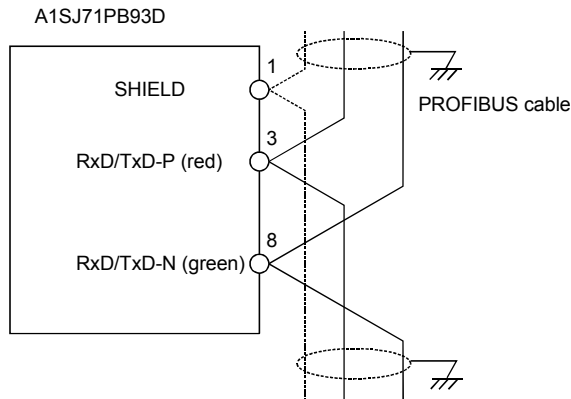
The following shows the PROFIBUS cable and wiring specifications.

(a) PROFIBUS cable

Use a PROFIBUS cable that meets the following specifications (EN50170 Volume 2: Type A compliant).

Item	Transmission line
Applicable cable	Shielded twisted pair cable
Impedance	135 to 165Ω (f=3 to 20 MHz)
Capacity	Less than 30 pF/m
Conductor resistance	Less than 110Ω/km
Cross-sectional area	0.34mm ² or more (22AWG)

(b) Wiring

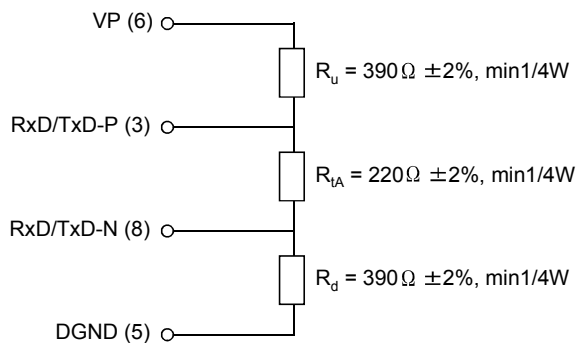


(3) Connector

Use a D-sub 9 pin male connector for the PROFIBUS cable.
The applicable screw size is #4-40 UNC.

(4) Wiring specifications for bus terminator

When the A1SJ71PB93D is a terminal station, use a connector with built-in bus terminator that meets the following wiring specifications.



(5) PROFIBUS equipment

The PROFIBUS cables, connectors and other PROFIBUS equipment must be purchased or obtained at user's discretion.

For details on PROFIBUS equipment, access the following website.

- PROFIBUS International : <http://www.profibus.com/>

5.7.2 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.

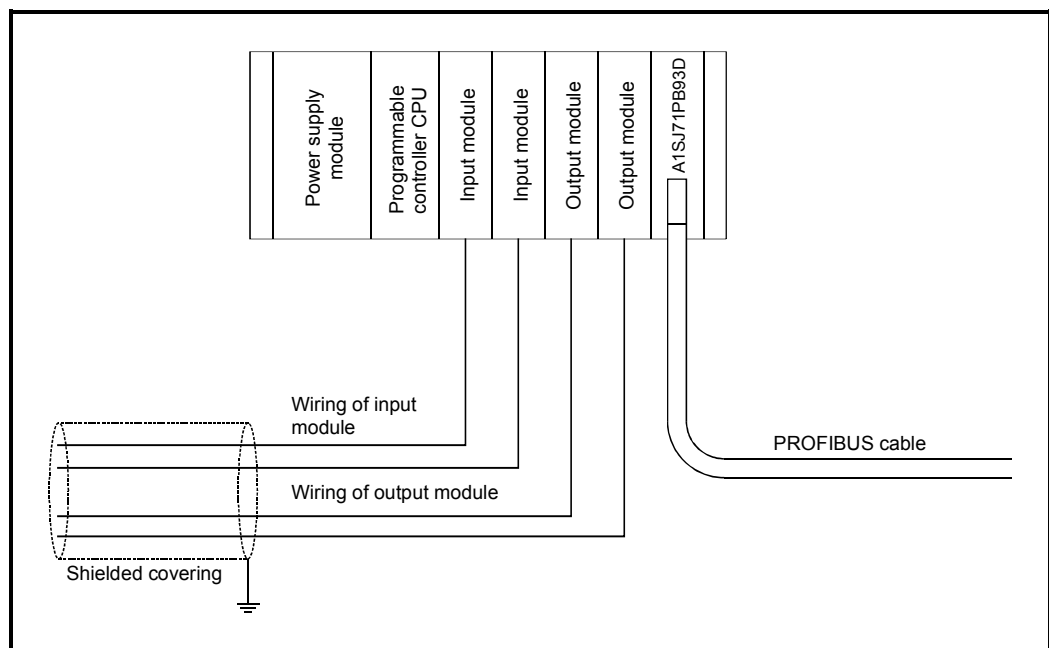
(1) Communication cable wiring

Do not install the A1SJ71PB93D communication cable together with the main circuit, power lines and/or load carrying wires for other than the programmable controller, or bring them close.

Doing so may cause the A1SJ71PB93D to be affected by noise and surge induction.

(2) Wiring from I/O modules among programmable controllers

Keep the PROFIBUS cable away from I/O module cables as much as possible.



(3) Grounding

(a) When using the A1SJ71PB93D, ground the FG and LG terminals of the power supply module of the programmable controller.

(b) Grounding the module and other device with the same FG terminal may apply noise through the FG terminal and result in a communication error. If this error occurs, disconnect the FG terminal from the module.

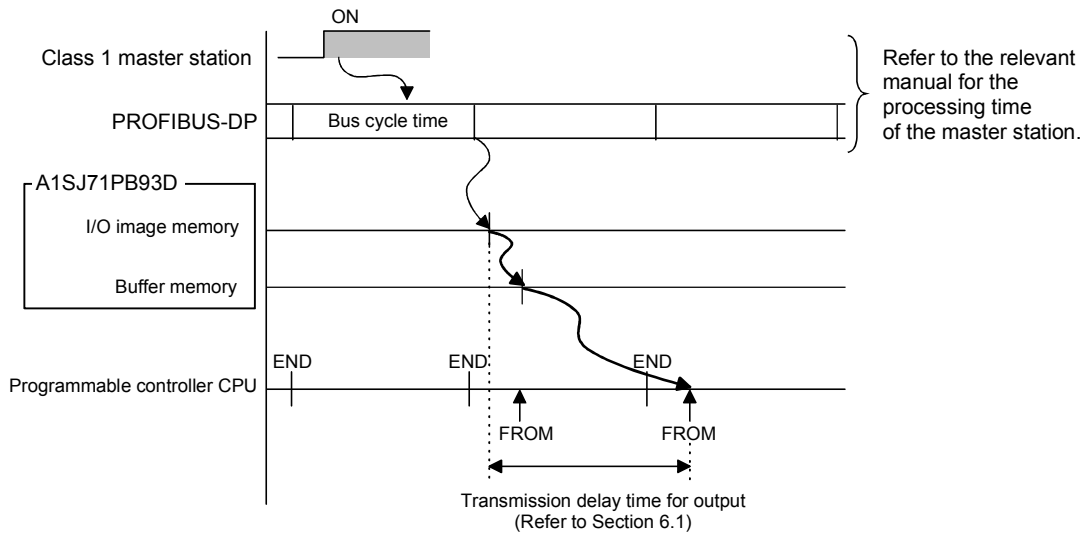
6 TRANSMISSION DELAY TIME

This section explains the processing time of the A1SJ71PB93D.

Communication processing between the master station and A1SJ71PB93D is shown below.

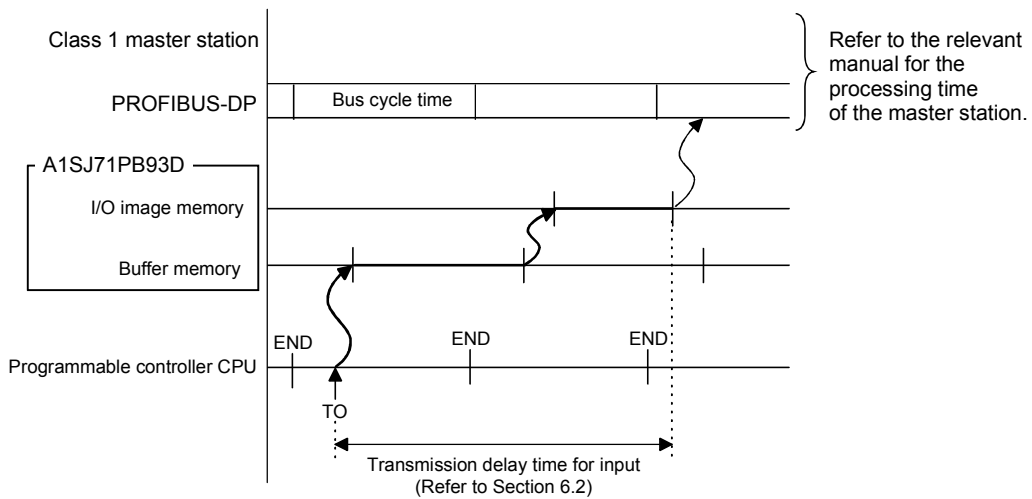
(1) The processing of the output receive data

The following shows how the output data from the master station are read out to a programmable controller CPU.



(2) The processing of the input send data

The following shows how the programmable controller CPU data are sent to the master station.



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 = Bus cycle time \times 2 + 0.2 [ms]

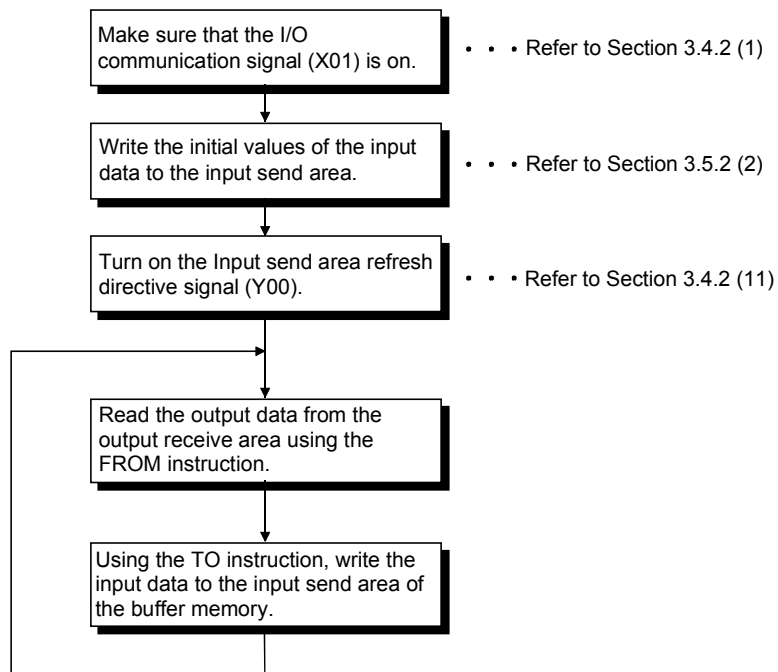
7 PROGRAMMING

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

Before using the program examples introduced in this chapter in an actual system, fully check that there is no problem in control on the target system.

7.1 Communication Sequence

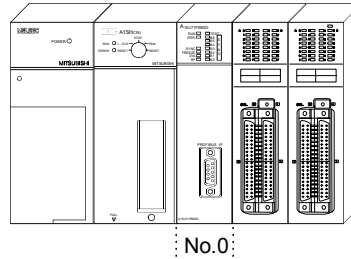
The following is the sequence of I/O data communication with the master station. Refresh between the programmable controller CPU and A1SJ71PB93D and refresh of the A1SJ71PB93D buffer memory (output receive area, input send area) are executed asynchronously.



7.2 Station Number Setting

(1) System configuration example

This section gives a program example for setting a station number to the A1SJ71PB93D in the following configuration.



No. *1	Module	Input signal	Output signal
0	A1SJ71PB93D	X0 to X1F	Y0 to Y1F

*1: The A1SJ71PB93D to be set shall be installed to slot 0 of the base unit.

(2) Settings

In the program example, the station number of the A1SJ71PB93D is set to 1.

(3) Assignment of device in program example

The program example given in this section uses the following device assignments.

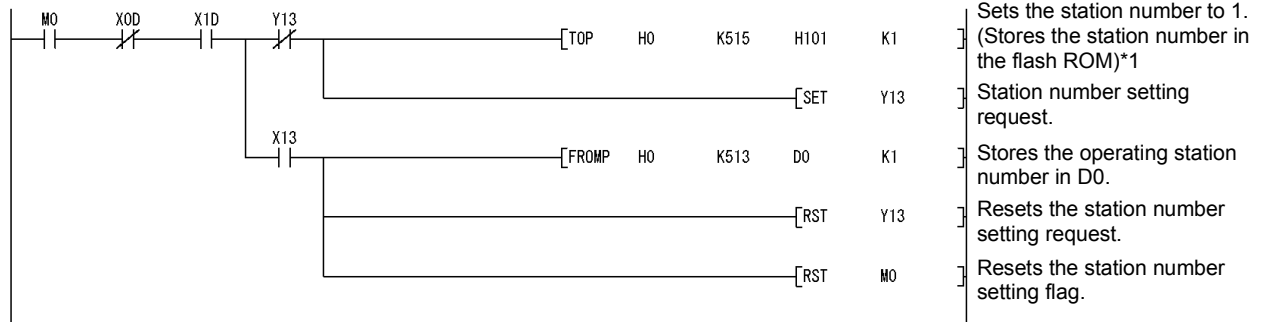
(a) Devices used by the A1SJ71PB93D

Device	Description	Device	Description
X0D	Module watchdog timer error	—	—
X13	Station number setting completion	Y13	Station number setting request
X1D	Module READY	—	—

(b) Devices used by user

Device	Description	Device	Description
M0	Station number setting flag	D0	Operation station number storage device

(4) Program example



*1: When not writing the station number to the flash ROM, replace "H101" with "H1".

POINT

Storing a station number in the flash ROM allows the A1SJ71PB93D to operate as the station number even if the power is switched from off to on or if the programmable controller CPU is reset.

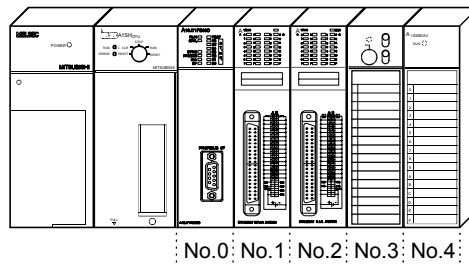
7.3 Communication of I/O Data

7.3.1 LUMP mode

(1) System configuration example

A program example for I/O data communication is provided here to show the case where the LUMP mode is used for data assignment of the following configuration.

Refer to (2) for the outline of the program example.



No. *1	Module	Input signal	Output signal
0	A1SJ71PB93D	X0 to X1F	Y0 to Y1F
1	A1SX41	X20 to X3F	—
2	A1SY41	—	Y40 to Y5F
3	A1S64AD	X60 to X7F	Y60 to Y7F
4	A1S68DA	X80 to X9F	Y80 to Y9F

*1: The modules shall be installed to the slots in order from slot 0.

REMARKS

Refer to Section 5.2.2 for details of the LUMP mode.

(2) Settings

The following configuration and operation are set in the program example given in this section.

(a) 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

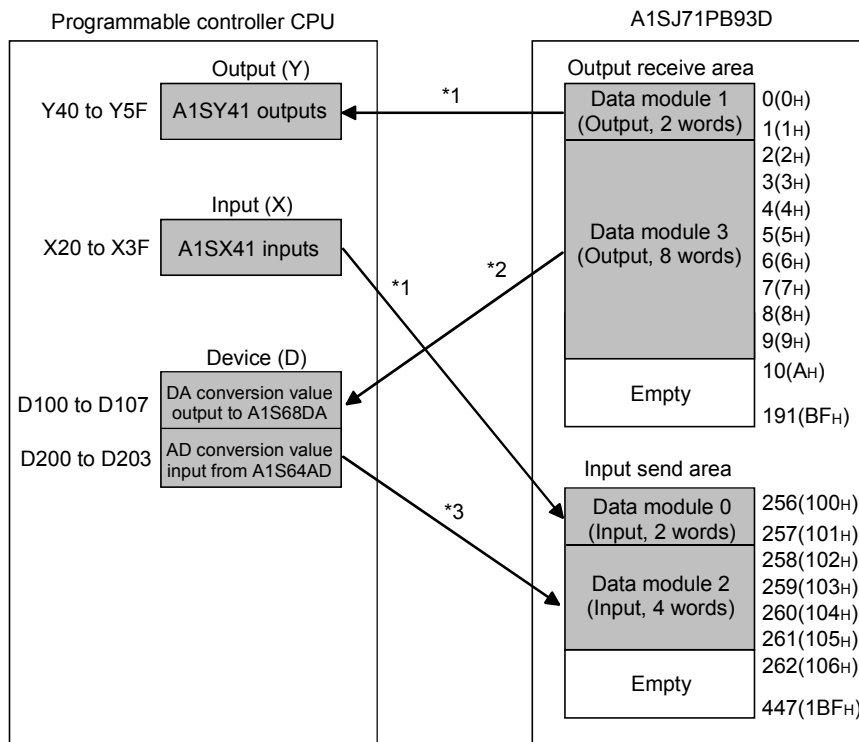
(b) Used states of A1SJ71PB93D output receive area and input send area

Data in the output receive area (buffer memory address: 0 to 1 (0H to 1H)) are output to the A1SY41.

Data in the output receive area (buffer memory address: 2 to 9 (2H to 9H)) are stored in D100 to D107, and output to the A1SD68DA.

Data of the A1SX41 are stored in the input send area (buffer memory address: 256 to 257 (100H to 101H)).

Data of the A1S64AD are stored in D200 to D203, and then written to the input send area (buffer memory address: 258 to 261 (102H to 105H)).



*1: Data are read from Input (X) or written to Output (Y) using the FROM/TO instruction.

*2: The output receive area data are read to D100 to D107 using the FROM instruction. The data in D100 to D107 are written to the A1S68DA.

*3: Data of the A1S64AD are read to D200 to D203 beforehand. With the TO instruction, the data in D200 to D203 are written to the input send area.

REMARKS

Refer to Section 5.2.1 for the data module setting.

(3) Assignment of devices in program examples

The program examples given in this section use the following device assignments.

(a) Devices used by module

1) A1SJ71PB93D

Device	Description	Device	Description
	—	Y0	Input send area refresh directive
X1	I/O communication		—
X2	Expansion trouble notification completion	Y2	Expansion trouble notification request
X3	Module error	Y3	Module error reset request
X0D	Module watchdog timer error		—
X11	Operation mode change completion	Y11	Operation mode change request
X1D	Module READY		—

2) A1SX41

Device	Description	Device	Description
X20 to X3F	Inputs of A1SX41		—

3) A1SY41

Device	Description	Device	Description
	—	Y40 to Y5F	Outputs of A1SY41

4) A1S64AD

Device	Description	Device	Description
X61	A/D conversion READY		—

5) A1S68DA

Device	Description	Device	Description
X81	D/A conversion READY		—

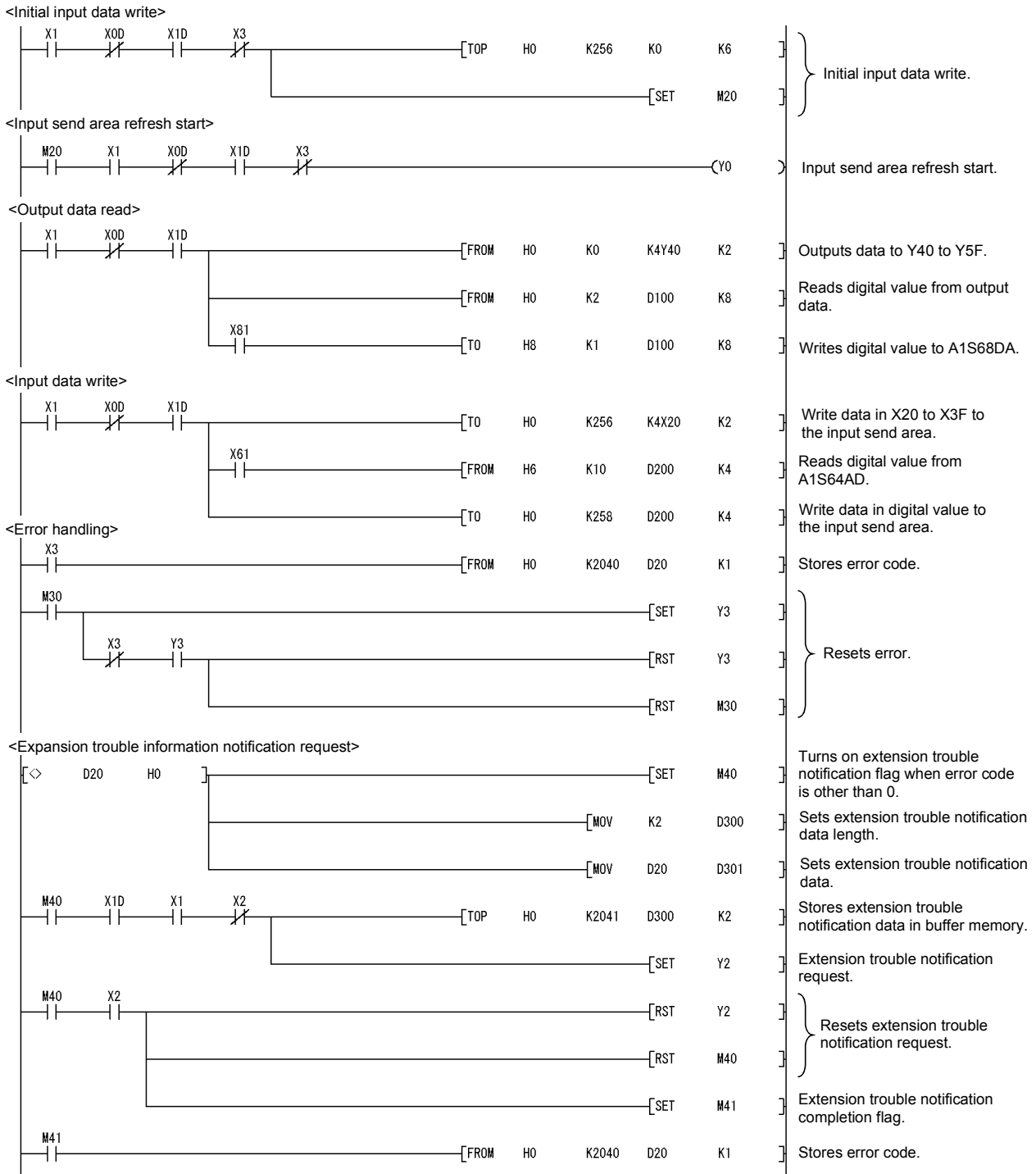
(b) Devices used by user

Device	Description	Device	Description
M10	Operation mode change flag	M40	Extension trouble notification flag
M11	Operation mode change storage	M41	Extension trouble notification completion flag
M20	Initial input data write	M42	Extension trouble cancel flag
M30	Error handling flag	M100	Self-diagnosis mode change

(c) Devices used for buffer memory reading

Device	Description	Device	Description
D10	Operation mode storage	D200	Analog-to-digital conversion value to be input from the A1S64AD (CH.1 to 4)
D11	Operation mode change result	D300	Extension trouble information data length
D20	Error code storage	D301	Extension trouble information data
D100	Digital-to-analog conversion value to be output to A1S68DA (CH.1 to 8)		—

(4) Program example

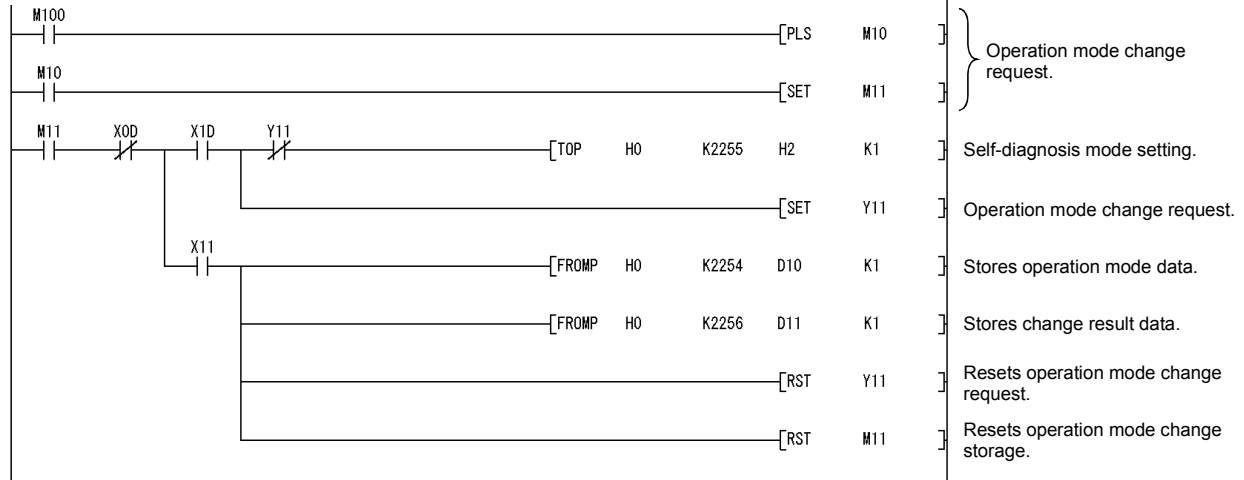


<Cancel of extension trouble information notification>



[SET M42] } Cancels extension trouble information notification.
 [RST M41] }
 [T0 H0 K2041 K0] } Notifies master station of canceling extension trouble notification.
 [SET Y2] } Extension trouble notification request.
 [RST Y2] }
 [RST M42] } Resets extension trouble information notification flag.

<Operation mode change (Self-diagnosis mode)>



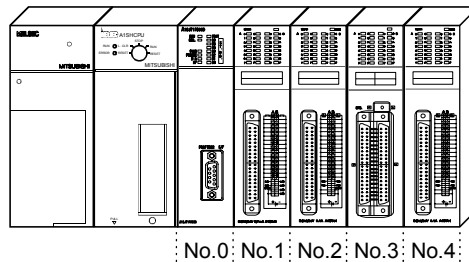
[PLS M10] } Operation mode change request.
 [SET M11] }
 [TOP H0 K2255 H2] } Self-diagnosis mode setting.
 [SET Y11] } Operation mode change request.
 [FROMP H0 K2254 D10] } Stores operation mode data.
 [FROMP H0 K2256 D11] } Stores change result data.
 [RST Y11] } Resets operation mode change request.
 [RST M11] } Resets operation mode change storage.

7.3.2 DIVIDED mode

(1) System configuration example

A program example for I/O data communication is provided here to show the case where the DIVIDED mode is used for data assignment of the following configuration.

Refer to (2) for the outline of the program example.



No. *1	Module	Input signal	Output signal
0	A1SJ71PB93D	X0 to X1F	Y0 to Y1F
1	A1SX41	X20 to X3F	—
2	A1SY41	—	Y40 to Y5F
3	A1SH42	X60 to X7F	Y60 to Y7F
4	A1SY41	—	Y80 to Y9F

*1: The modules shall be installed to the slots in order from slot 0.

REMARKS

Refer to Section 5.2.2 for details of the DIVIDED mode.

(2) Settings

The following configuration and operation are set in the program example given in this section.

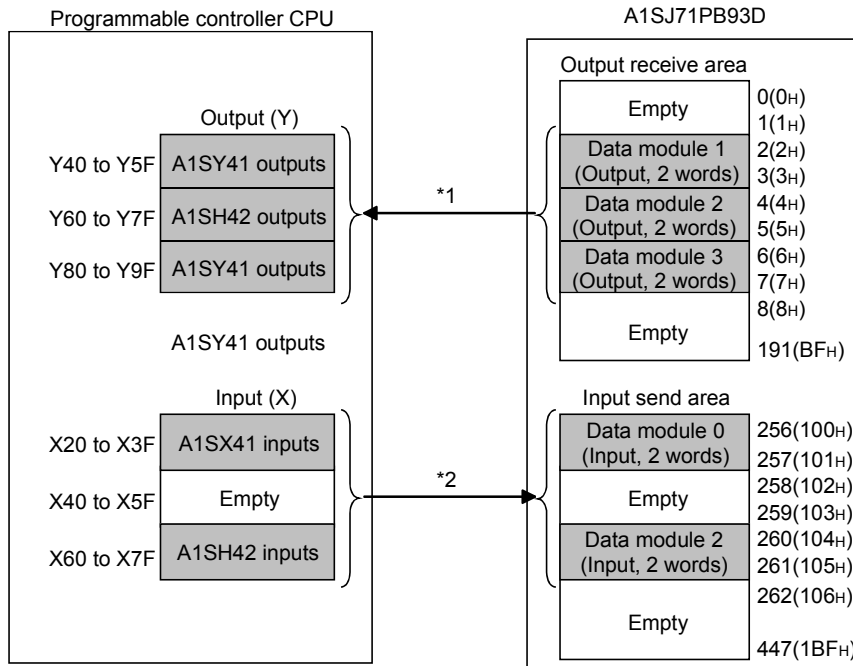
(a) Data module setting of A1SJ71PB93D

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

(b) Used states of A1SJ71PB93D output receive area and input send area

Data in the output receive area (buffer memory address: 2 to 7 (2H to 7H)) are output to the Y40 to Y9F.

Data of the X20 to X7F are stored in the input send area (buffer memory address: 256 to 261 (100H to 105H)).



*1: The output receive area data are read to output (Y) using the FROM instruction.

*2: With the TO instruction, the data in input (X) are written to the input send area.

REMARKS

Refer to Section 5.2.1 for the data module setting.

(3) Assignment of devices in program examples

The program examples given in this section use the following device assignments.

(a) Devices used by module

1) A1SJ71PB93D

Device	Description	Device	Description
	—	Y0	Input send area refresh directive
X1	I/O communication		—
X2	Expansion trouble notification completion	Y2	Expansion trouble notification request
X3	Module error	Y3	Module error reset request
X0D	Module watchdog timer error		—
X11	Operation mode change completion	Y11	Operation mode change request
X1D	Module READY		—

2) A1SX41

Device	Description	Device	Description
X20 to X3F	Inputs of A1SX41		—

3) A1SY41

Device	Description	Device	Description
	—	Y40 to Y5F	Outputs of A1SY41

4) A1SH42

Device	Description	Device	Description
X60 to X7F	Inputs of A1SH42	Y60 to Y7F	Outputs of A1SH42

5) A1SY41

Device	Description	Device	Description
	—	Y80 to Y9F	Outputs of A1SY41

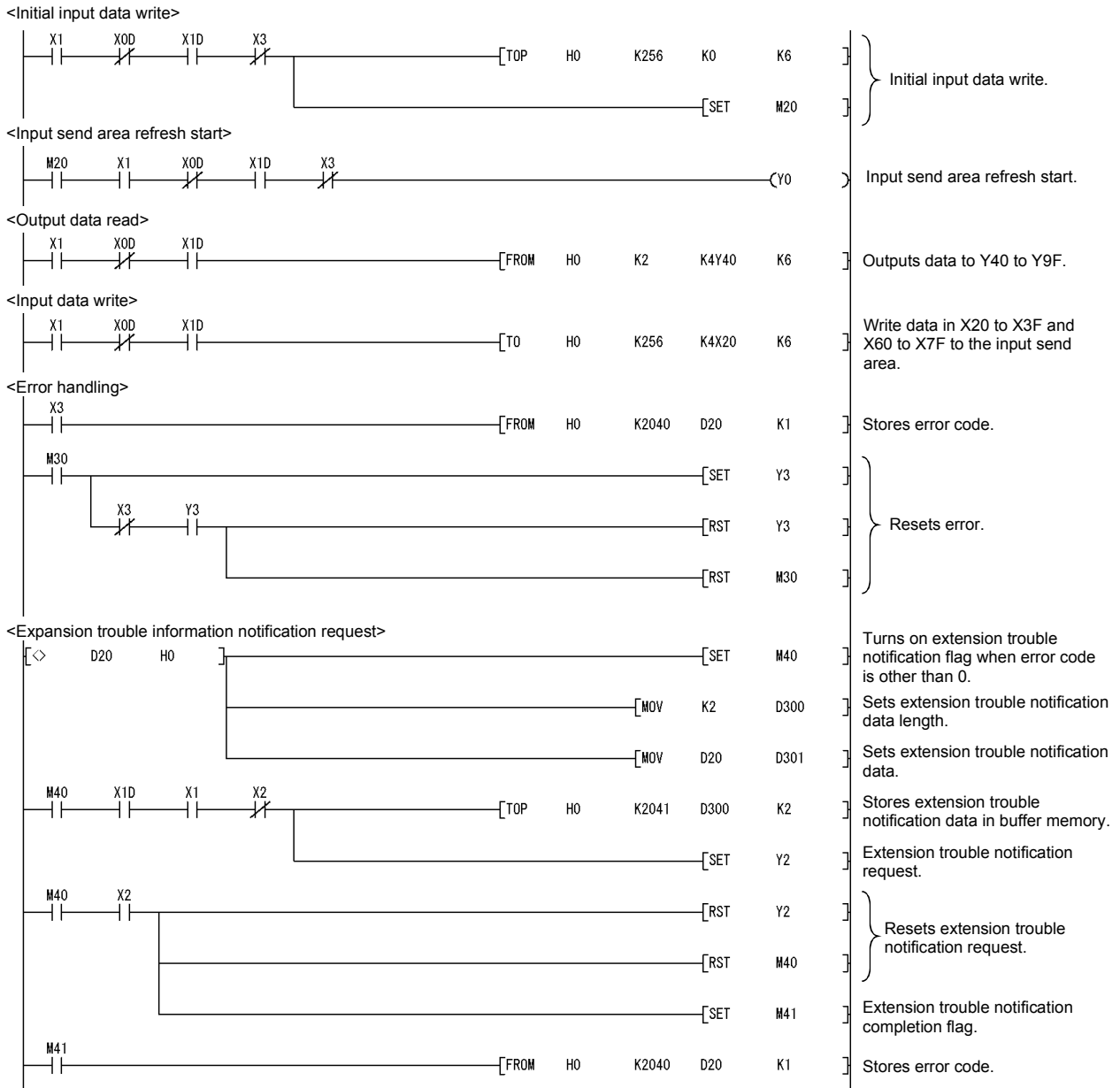
(b) Devices used by user

Device	Description	Device	Description
M10	Operation mode change flag	M40	Extension trouble notification flag
M11	Operation mode change storage	M41	Extension trouble notification completion flag
M20	Initial input data write	M42	Extension trouble cancel flag
M30	Error handling flag	M100	Self-diagnosis mode change

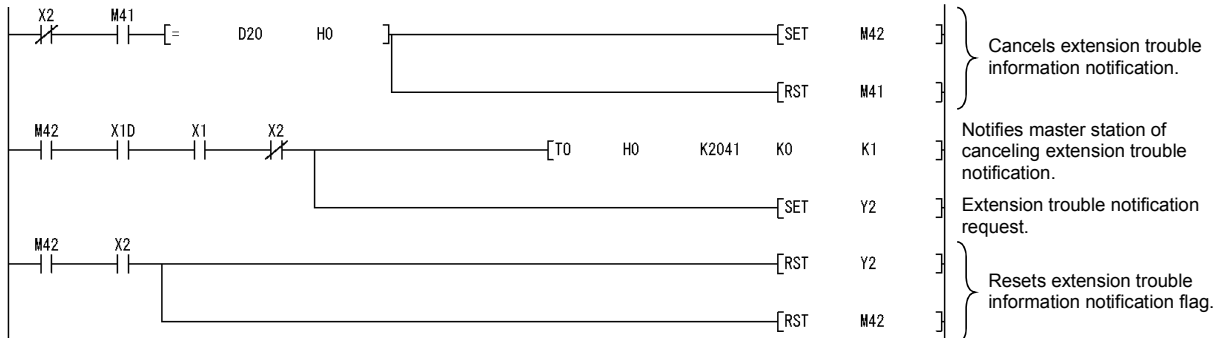
(c) Devices used for buffer memory reading

Device	Description	Device	Description
D10	Operation mode storage	D300	Extension trouble information data length
D11	Operation mode change result	D301	Extension trouble information data
D20	Error code storage		—

(4) Program example

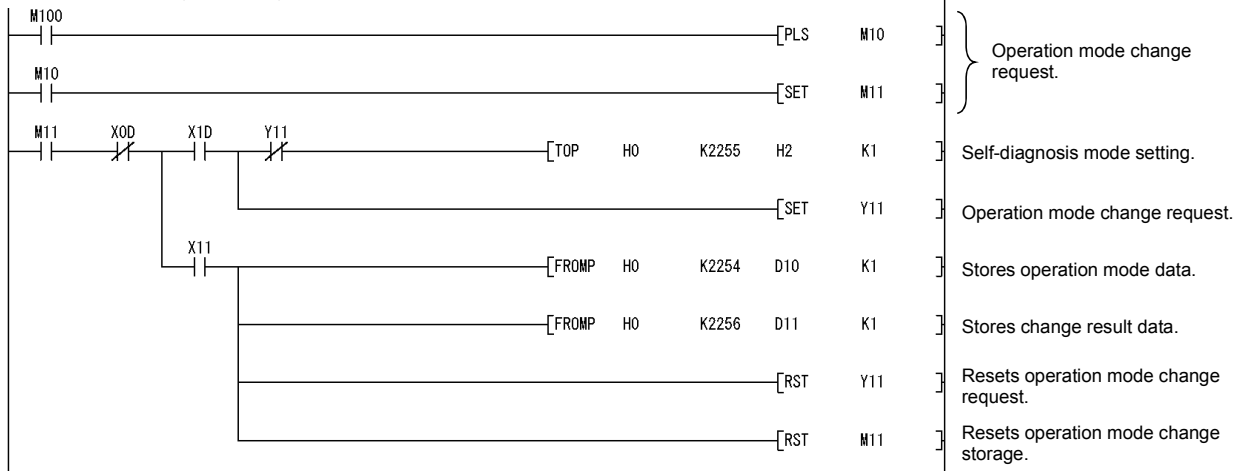


<Cancel of extension trouble information notification>



- Cancel extension trouble information notification.
- Notifies master station of canceling extension trouble notification.
- Extension trouble notification request.
- Resets extension trouble information notification flag.

<Operation mode change (Self-diagnosis mode)>

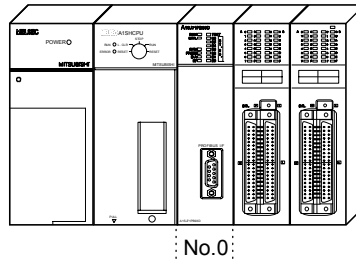


- Operation mode change request.
- Self-diagnosis mode setting.
- Operation mode change request.
- Stores operation mode data.
- Stores change result data.
- Resets operation mode change request.
- Resets operation mode change storage.

7.4 Global Control-driven Program Execution

(1) System configuration example

This section shows a program example added when the program for the following configuration is executed using global control reception as a trigger.



No. *1	Module	Input signal	Output signal
0	A1SJ71PB93D	X0 to X1F	Y0 to Y1F

*1: The A1SJ71PB93D to be set shall be installed to slot 0 of the base unit.

(2) Assignment of devices in program examples

The program example given in this section use the following device assignments.

(a) Devices used by the A1SJ71PB93D

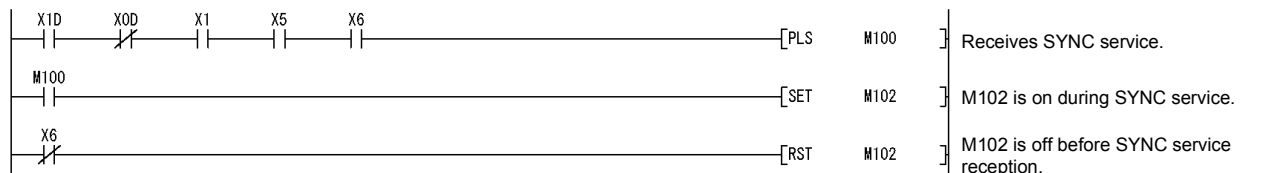
Device	Description	Device	Description
X1	I/O communication	X7	FREEZE mode
X5	SYNC mode	X0D	Module watchdog timer error
X6	SYNC receive	X1D	Module READY

(b) Devices used by user

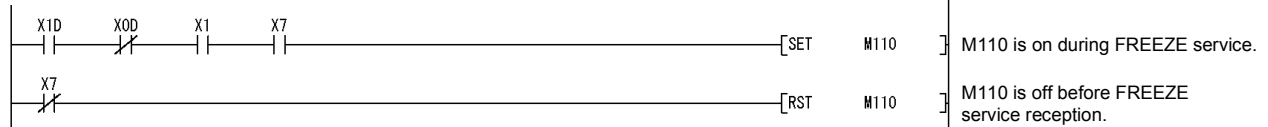
Device	Description	Device	Description
M100	X6 ON processing	M110	FREEZE processing
M102	SYNC processing		—

(3) Program example

<Global control (SYNC)>



<Global control (FREEZE)>



8 TROUBLESHOOTING

The following is the troubleshooting of the A1SJ71PB93D.

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

When the programmable controller CPU 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.

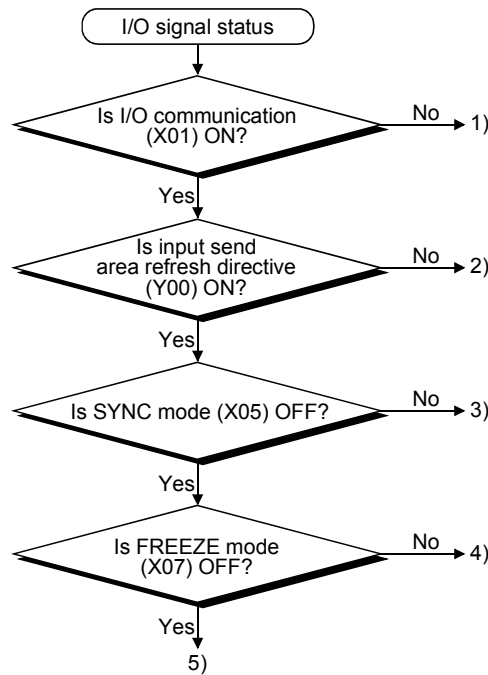
LED	Status	Cause	Action
RUN	Off	Module watchdog timer error occurred.	Consult your local service center or representative.
ERR.	On	Parameter setting error or module error occurred.	Check the error code and take corrective actions. (Refer to Section 8.4)
BF	On	Communication error was detected or data 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 bus terminator 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 (refer to Section 5.7).
	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 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.	<ul style="list-style-type: none"> • Check the master station. • Check the transmission path (refer to Section 8.2).
2) Output data is not sent to master station.	The output refresh directive is not given.	Turn on the input send area 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.
5)	Data is not communicated to a correct area.	<ul style="list-style-type: none"> • 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)) *1. • Check the sequence program.
	Error does not occur in A1SJ71PB93D when master station becomes faulty.	<ul style="list-style-type: none"> • Check the current setting with the current communication watchdog timer value (buffer memory address: 2257 S(8D1H)) *1. • Set the communication watchdog timer in the master parameter.
	Upper and lower bytes of data sent and received are inverse.	<ul style="list-style-type: none"> • Check the current setting with the swapping function setting status (buffer memory address: 2259 (8D3H)) *1. • Set "Yes/No" of swap setting in the master station parameter according to the data sent/received by the master station.

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

8.4 Error Code List

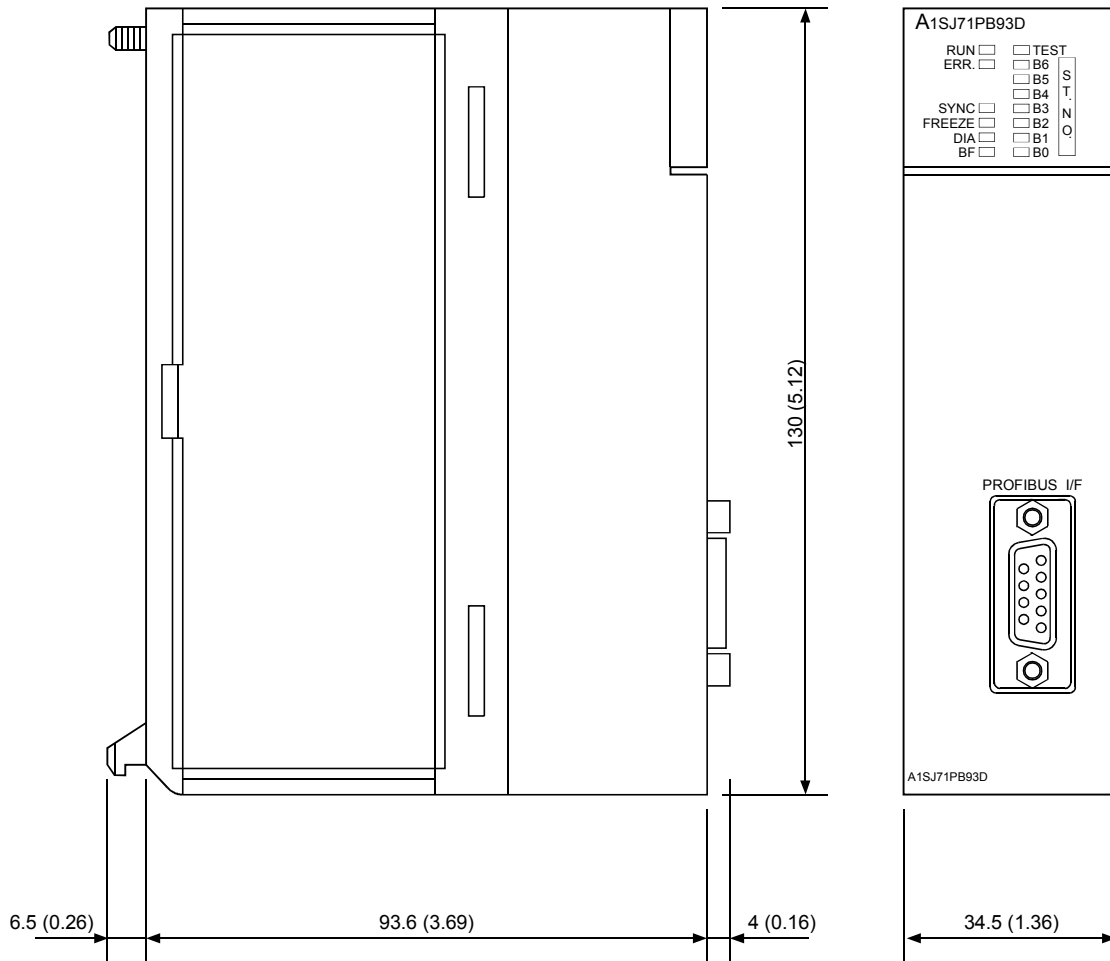
The following are the error codes of the A1SJ71PB93D.

Any of the error codes is stored into the module error information (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 setting 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 watchdog timer is too long.	Check the slave parameters of the master station.
3003H		The "Min_Tsdr" value is outside the setting range.	
3004H		The data length of a user parameter is incorrect.	Check "User_Prm_Data_Size" in GX Configurator-DP. (Refer to Sections 5.2.2 (2) and 5.2.3 (1).)
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 watchdog timer.
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.	

APPENDIX

Appendix 1 External Dimensions



Unit : mm (inch)



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App

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Ind

WARRANTY

Please confirm the following product warranty details before using this product.

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 sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[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 that admitted not to be so by 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 available 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 loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation of damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for accidents, and compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

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 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 controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.
- (2) The Mitsubishi programmable 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 Public service purposes shall be excluded from the programmable controller applications.

In addition, applications in which human life or property that could be greatly affected, such as in aircraft, medical applications, incineration and fuel devices, manned transportation, equipment for recreation and amusement, and safety devices, shall also be excluded from the programmable controller range of applications.

However, in certain cases, some applications may be possible, providing the user consults their local Mitsubishi representative outlining the special requirements of the project, and providing that all parties concerned agree to the special circumstances, solely at the users discretion.

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PROFIBUS-DP Slave Module Type A1SJ71PB93D

User's Manual

MODEL	A1SJ71PB93D-U-S-E
MODEL CODE	13JR47
SH(NA)-080195-E(0707)MEE	



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NAGOYA WORKS : 1-14, YADA-MINAMI 5-CHOME, HIGASHI-KU, NAGOYA, JAPAN

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