EtherNet/IP

Instruction Manual Thirteenth Edition

Positioner Type Controller Edition

EtherNet/IP™

IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This instruction manual explains the handling methods, structure and maintenance of this product, providing the information you need in order to use the product safely.

Before using the product, be sure to read this manual and fully understand the contents explained herein to ensure safe use of the product.

Please downloaded the user's manual from our website.
You can download it free of charge. User registration is required for the first time downloading.
URL : www.iai-robot.co.jp/data_dl/CAD_MANUAL/

When using the product, print out of the necessary portions of the relevant manual, or please display it on your computer, tablet terminal, etc. so that you can check it immediately.

After reading the instruction manual, keep it in a convenient place so that whoever is handling the product can refer to it quickly when necessary.

[Important]

- This instruction manual is an original document dedicated for this product.
- This product cannot be used in ways not shown in this instruction manual. IAI shall not be liable for any result whatsoever arising from the use of the product in any other way than what is noted in the manual.
- The information contained in this instruction manual is subject to change without notice for the purpose of product improvement.
- If any issues arise regarding the information contained in this instruction manual, contact our customer center or the nearest sales office.
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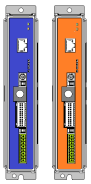
Construction of Instruction Manual for Each Controller Model and This Manual

ACON-CB/CGB
ACON-CA
ACON-C/CG
DCON-CB/CGB
DCON-CA



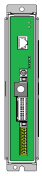
●Operation Patterns
・Remote I/O Control Operation
・Direct Number Indication Operation
- EtherNet/IP (This Manual) ME0278

◎ Basic Specifications and Functions
- ACON-CB/CGB ME0343
- DCON-CB/CGB ME0343
- ACON-CA, DCON-CA ME0326
- ACON-C/CG ME0176

■Teaching Tool
・PC Software
- RC/EC PC Software ME0155

・Teachiong BOX
- TB-02 Touch Panel Teaching ME0355
- TB-03 Touch Panel Teaching ME0376

PCON-CB/CFB/CGB/CGFB/CBP/CGBP
PCON-CA/CFA
PCON-C/CG



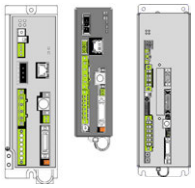
●Operation Patterns
・Remote I/O Control Operation
・Direct Number Indication Operation
- EtherNet/IP (This Manual) ME0278

◎ Basic Specifications and Functions
- PCON-CB/CFB/CGB/CGFB/CBP/CGBP ME0342
- PCON-CA/CFA ME0289
- PCON-C/CG ME0170

■Teaching Tool
・PC Software
- RC/EC PC Software ME0155

・Teachiong BOX
- TB-02 Touch Panel Teaching ME0355
- TB-03 Touch Panel Teaching ME0376

SCON-CB/CGB
SCON-CA
SCON-CAL/CGAL



●Operation Patterns
・Remote I/O Control Operation
・Direct Number Indication Operation
- EtherNet/IP (This Manual) ME0278

◎ Basic Specifications and Functions
- SCON-CB/CGB ME0340
- SCON-CB (Servo Press Type) ME0345
- SCON-CA/CAL/CGAL ME0243

■Teaching Tool
・PC Software
- RC/EC PC Software ME0155

・Teachiong BOX
- TB-02 Touch Panel Teaching ME0355
- TB-03 Touch Panel Teaching ME0376

Table of Contents

Safety Guide

"Safety Guide" has been written to use the machine safely and so prevent personal injury or property damage beforehand. Make sure to read it before the operation of this product.

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation.

No.	Operation Description	Description
1	Model Selection	● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications. 1) Medical equipment used to maintain, control or otherwise affect human life or physical health. 2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility) 3) Important safety parts of machinery (Safety device, etc.) ● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product. ● Do not use it in any of the following environments. 1) Location where there is any inflammable gas, inflammable object or explosive 2) Place with potential exposure to radiation 3) Location with the ambient temperature or relative humidity exceeding the specification range 4) Location where radiant heat is added from direct sunlight or other large heat source 5) Location where condensation occurs due to abrupt temperature changes 6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid) 7) Location exposed to significant amount of dust, salt or iron powder 8) Location subject to direct vibration or impact ● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

No.	Operation Description	Description
2	Transportation	● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment’s capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	(1) Installation of Robot Main Body and Controller, etc. ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal (PE) on the AC power cable of the controller and the grounding plate in the control panel, make sure for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment standards and criteria). For detail, follow the description in [an instruction manual of each controller or controller built-in actuator]. ● Conduct functional grounding on the FG terminal for a controller supplying 24V DC or a controller built-in type actuator. In order to minimize influence to mechanical operation given by electromagnetic interference (noise) to an electrical device or insulation failure, conduct grounding on a terminal or a conductor that is electrically stable. The reference impedance should be Type D (Former Class 3, ground resistance 100Ω or less).

No.	Operation Description	Description
4	Installation and Start	(4) Safety Measures ● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot’s movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as “Under Operation; Do not turn ON the power!” etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.

No.	Operation Description	Description
6	Trial Operation	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation. ● When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation. ● Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc. ● Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	● Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence. ● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication. ● Make sure to operate automatic operation start from outside of the safety protection fence. ● In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product. ● When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

No.	Operation Description	Description
8	Maintenance and Inspection	● When the work is carried out with 2 or more persons, make it clear who is to be the “leader” and who to be the “follower(s)” and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the instruction manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the removed cover or screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. * Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.
9	Modification and Dismantle	● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Operation Manual for each model.

Level	Degree of Danger and Damage	Symbol
Danger	This indicates an imminently hazardous situation which, if the product is not handled correctly, will result in death or serious injury.	 Danger
Warning	This indicates a potentially hazardous situation which, if the product is not handled correctly, could result in death or serious injury.	 Warning
Caution	This indicates a potentially hazardous situation which, if the product is not handled correctly, may result in minor injury or property damage.	 Caution
Notice	This indicates lower possibility for the injury, but should be kept to use this product properly.	 Notice

Handling Precautions

1. Please see in the table below for the products explained in this instruction manual (and the chapter number explained in this manual).

○: Applied, ×: N/A, Slash: No applicable model (**): Chapter number to describe in this manual

Type / Series	C/CG	CA/CB/CFA/CFB /CGB/CGFB /CBP/CGBP (Note 1)	CAL/CGAL	SE/PL/PO/CY	Servo Press Type
ACON	○ (Chapter 2)	○ (Chapter 3)		×	
PCON	○ (Chapter 2)	○ (Chapter 3)		×	
SCON	×	○ (Chapter 4)	○ (Chapter 4)		○ (Chapter 5)
DCON		○ (Chapter 3)			

Note 1 CFA, CFB, CGFB, CBP, CGBP Type is set to only PCON.

In this instruction, describes explanations when using PROFINET IO Communication in the controllers above.
For explanations regarding other controllers, refer to the following instruction manuals.
Series Document Name Control Number Models

Series	Document Name	Manual No.	Models
SEL type Controller	EtherNet/IP Controller Instruction Manual Program Controller Edition	ME0308	XSEL-RA/SA XSEL-R/S TTA ASEL/PSEL/SSEL/MSEL
MSEP	MSEP-C/LC Controller Instruction Manual	ME0299	MSEP-C
MSCON	MSCONC Controller Instruction Manual	ME0306	MSCON-C
MCON	MCON-C/CG Controller Instruction Manual	ME0341	MCON-C/CG
RCP6S Gateway	RCP6S Fieldbus Communication Instruction manual	ME0349	RCM-P6GW/P6GWG, RCM-P6PC/P6AC/P6DC
RCON	RCON System Instruction Manual	ME0384	RCON-GW/GWG/LC/LCG
REC	REC System Instruction Manual	ME0394	REC-GW
RSEL	RSEL System Instruction Manual	ME0392	RSEL-G
RCON-NCN	RCON Gateway unit Driver non-connection specification Instruction Manual	ME0456	RCON-GWG-NCN

2. It is recommended that the baud rate be set based on auto negotiation.

Make sure the link setting of the EtherNet/IP unit matches the communication mode set for the connected switching hub. If not, the link becomes unstable and communication cannot be performed properly.
It is recommended to enable auto negotiation using an appropriate ACON or PCON or SCON parameter.
The table below lists settings for each communication mode of the switching hub:

Switching hub \ EtherNet/IP unit		Auto negotiation	Fixed to 10 M		Fixed to 100 M	
			Full-duplex	Half-duplex	Full-duplex	Half-duplex
Auto negotiation		◉ (recommended)	×	○	×	○
Fixed to 10 M	Full-duplex	×	○	×	×	×
	Half-duplex	○	×	○	×	×
Fixed to 100 M	Full-duplex	×	×	×	○	×
	Half-duplex	○	×	×	×	○

(◉: Connection possible (recommended), ○: Connection possible, ×: Connection not possible)

3. Use a switching hub.

Build your network using a switching hub, without using a repeater hub. If a repeater hub is used, tag data link operation may become unstable. For details, refer to [the operation manual for your master unit].

4. Servo press type, RC gateway function and ROBONET the extension I/O unit cannot be connected (control).

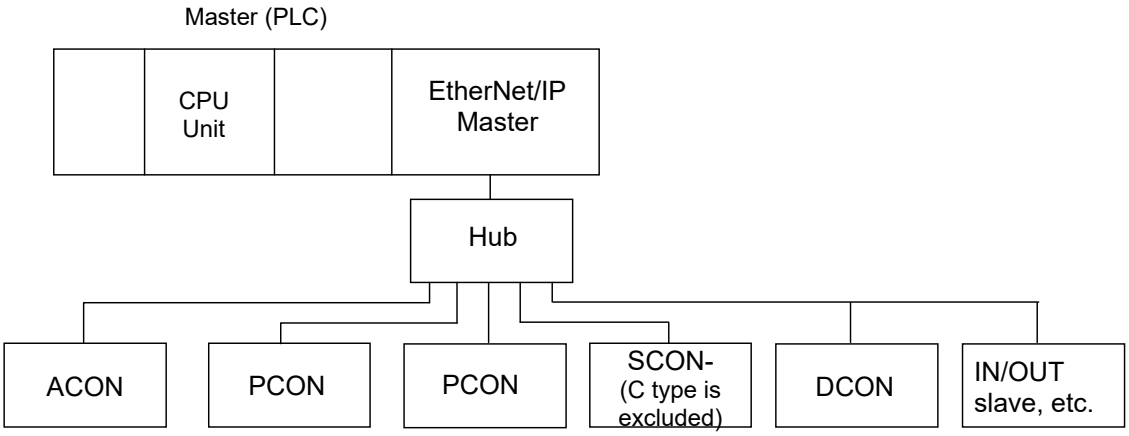
1. Overview

EtherNet/IP is an open field network. It is a standardized global open network specified by the IEC 61158 series of international standards.
You can connect ACON, PCON, SCON (C type is excluded) and DCON controllers (hereinafter referred to as “the controllers” or “the IAI controllers”) to EtherNet/IP to build a system with minimum wiring.

(Note 1) For detailed explanations of EtherNet/IP, refer to [the operation manual for the programmable controller (hereinafter referred to as “PLC”)] in which the master unit is installed.

Use this operation manual along with operation manual of each controller.
Usage other than the ones described in this operation manual is prohibited.

・System Configuration Example



1.1 EtherNet/IP Specifications

Item	Specification
Communication standards	IEC61158 (IEEE802.3)
Baud rate	10BASE-T/100 BASE-T (Auto negotiation setting is recommended.)
Communication cable length	Refer to EtherNet/IP specifications (The distance between the hub and each node must be within 100 m Note 1)
Number of connections	Varies depending on the master unit.
Applicable node address	0.0.0.0 to 255.255.255.255
Communications cable	Category 5 or above (Aluminum tape and braided double-shielded cable are recommended.)
Connector	RJ-45 connector (1 per connector)

(Note 1) For details, refer to the installation manual for ODVA, etc.

2. ACON-C/CG, PCON-C/CG

2.1 Operation Modes and Functions

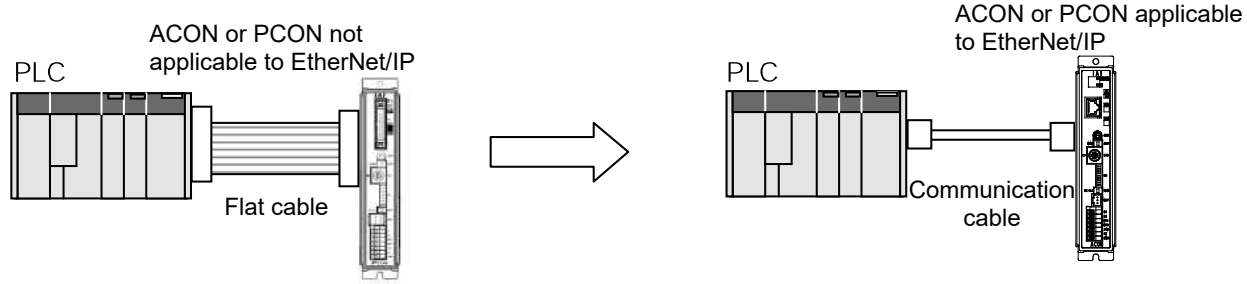
ACON and PCON controllers equipped with EtherNet/IP can be operated in the following five operational modes:

Operation Modes and Main Functions

Main functions	Remote I/O mode	Position/ Simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
Number of occupied bytes	2	8	16	32	12
Position data setup operation	X	○ (*1)	○	○	X
Speed and acceleration direct setup	X	X	○	○	X
Pressing operation	○	○	○	○	○
Current position read	X	○	○	○	○
Current speed read	X	X	○	○	X
Operation with the position No. specified	○	○	X	X	○
Completion position No. read	○	○	X	X	○
No. of max. position tables	512	768	Unused	Unused	512

(*1) For the position data items except for position data, operate the system with the position No. set up.

[1] Remote I/O mode: In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Number of occupied bytes: 2 bytes

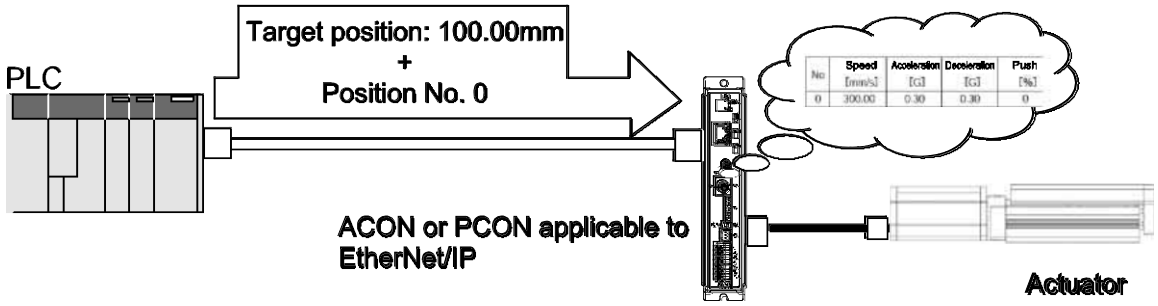


In the case of the connection using PIO

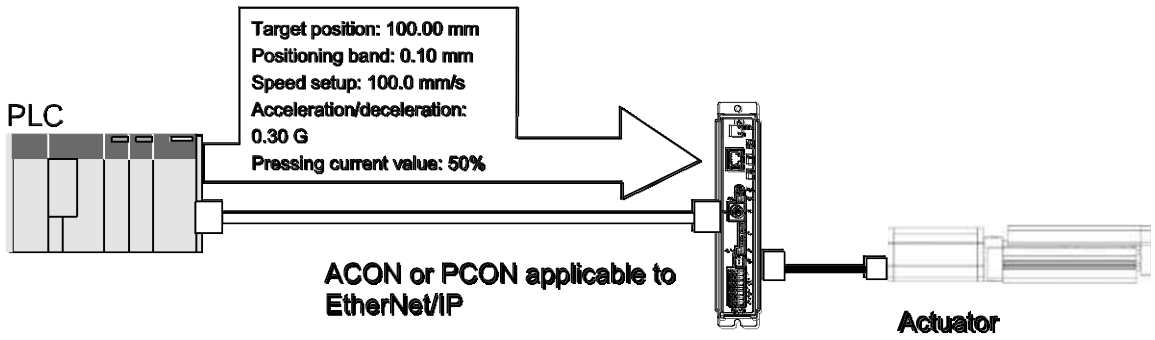
In the case of the connection using EtherNet/IP

[2] Position/simplified direct value mode:

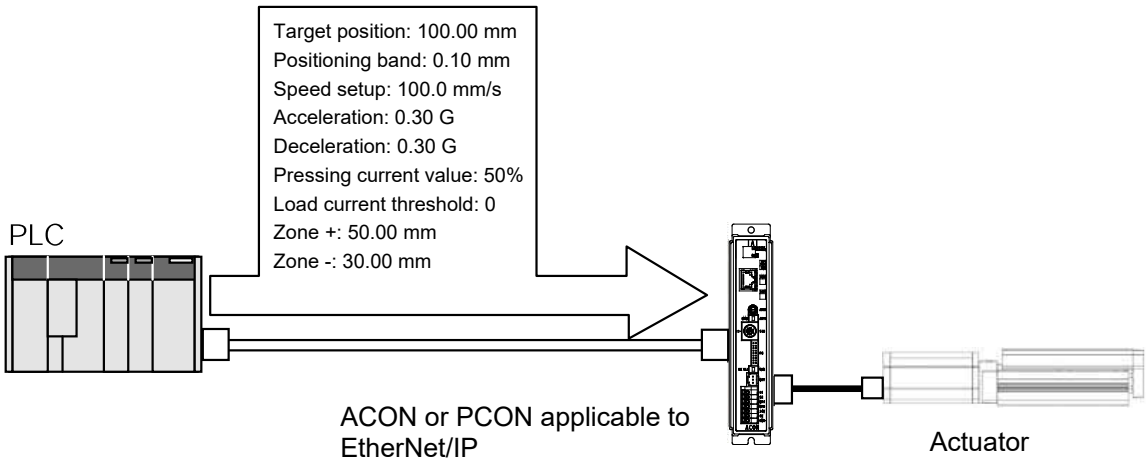
In this operation mode, EtherNet/IP communication is used to select and command movements that have been predefined in the controller's position data table. Alternatively, this mode also allows the target position to be established directly.
For "Speed", "Acceleration/Deceleration" and "Positioning Band", use the values already registered on the position data. The settable No. of position data items is max 768 points.
Number of occupied bytes: 8 bytes



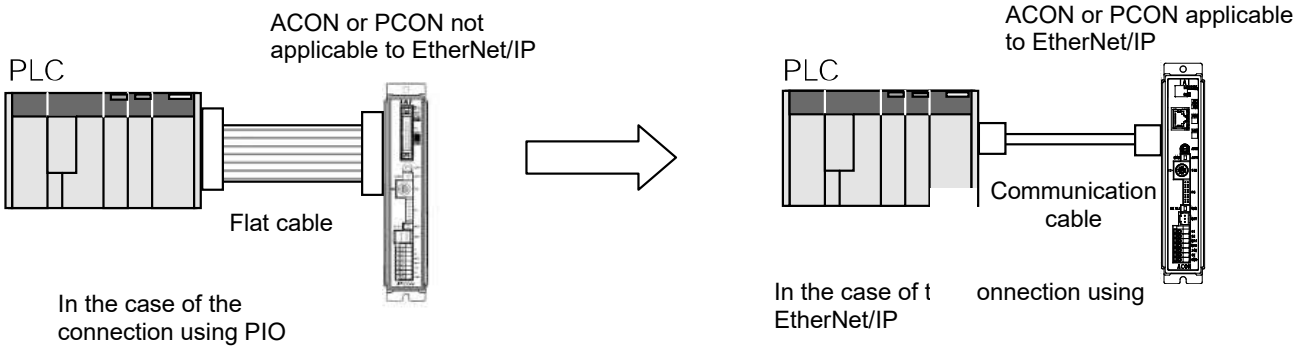
[3] Half direct value mode: In this operation mode, "Speed", "Acceleration/Deceleration," and "Pressing Current Values," are directly established along with the "Target Position."
Number of occupied bytes: 16 bytes



[4] Full direct value mode: In this operation mode, all values regarding position control (“Target Position,” "Speed” and "Acceleration/Deceleration,” etc.) are directly established.
Number of occupied bytes: 32 bytes



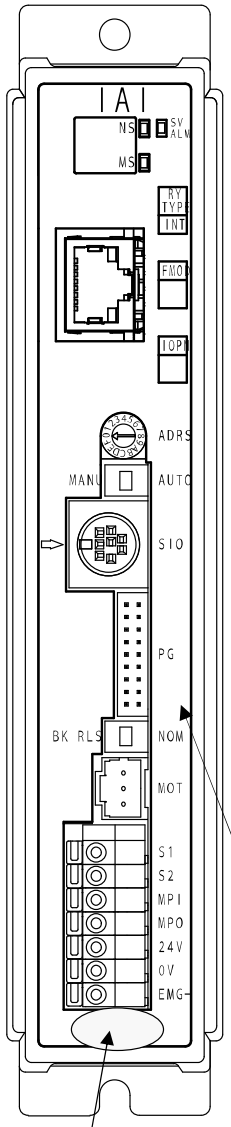
[5] Remote I/O mode 2: In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O). The use of this mode expands the functionality of “Remote I/O Mode” to include position and command current feedback.
Number of occupied bytes: 12 bytes



2.2 Model

The Model numbers of ACON and PCON applicable to EtherNet/IP are described as follows.

- ACON-C/CG-☐-EP-☐
- PCON-C/CG-☐-EP-☐



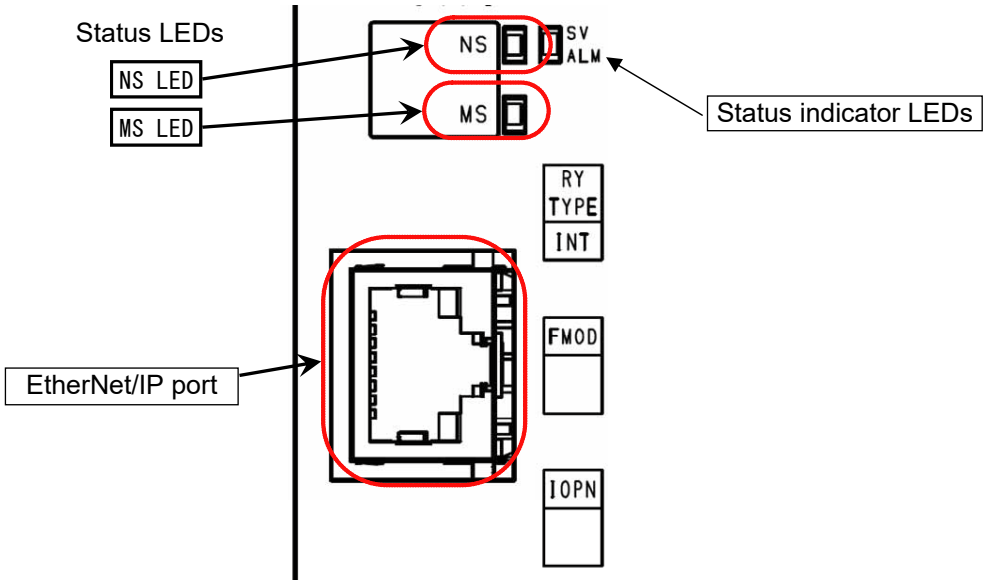
Printed series name
- ACON
- PCON

Front panel color
- ACON: Dark blue
- PCON: Dark green

2.3 EtherNet/IP Interface

2.3.1 Names of the Parts

The names of each section related to EtherNet/IP are described as follows.



2.3.2 Monitor LED Indications

The slave condition (each controller), as well as network condition, can be checked using the two LEDs, MS and NS, provided on the front panel of the controller.
The description of each is explained in the following table.

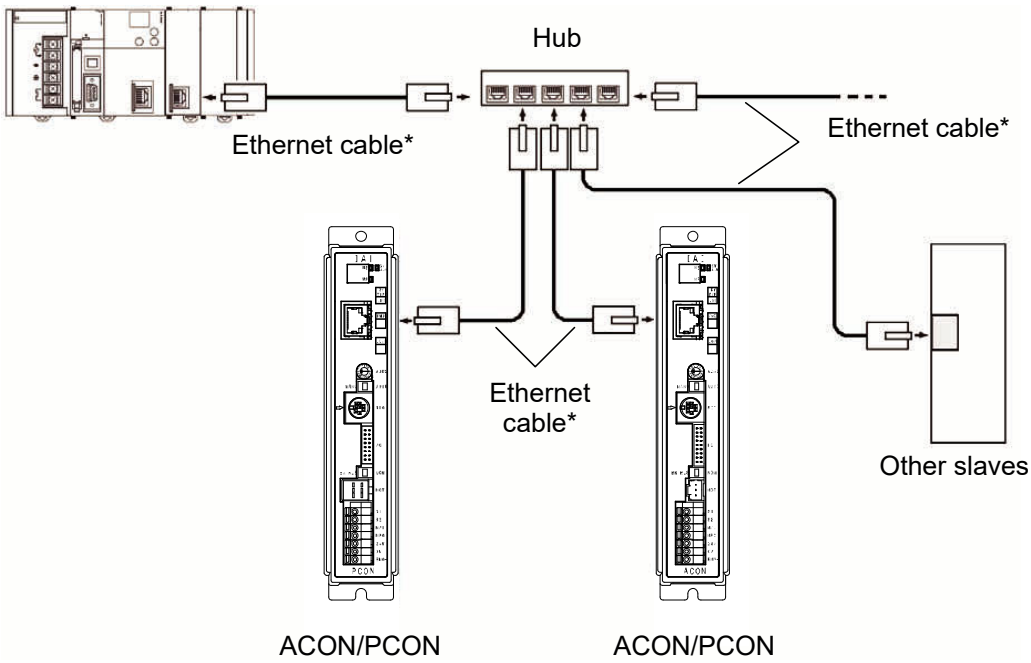
○ : Illuminating, ☆ : Flashing, × : OFF

Name	Color	Display	Explanation	
NS	-	×	The power is turned off or IP address is not yet set.	
	Green	○	Connection has been established and proper communication is in progress.	
	Green	☆	The system is online but connection is not yet established. Communication is stopped (the network is normal). Check the status of the master unit.	
	Red	○	A communication error is present. Communication cannot be established because an error, such as duplicate IP addresses, has been detected.	Check the IP address setting, wiring condition of the communication line, power supply for the hub, noise measures, etc.
	Red	☆	A communication error is present. (A communication timeout has been detected.)	
MS	-	×	The power is turned off.	
	Green	○	Operation is normal. The system is in the scanner (master) control mode.	
	Green	☆	Connection is not yet established with the scanner (master). Check the setting of configuration information. Check if the scanner (master) is idle.	
	Red	○	A hardware error is present. The board must be replaced. Please contact IAI.	
	Red	☆	A configuration error, invalid setting or other minor error is present. The problem can be resolved by, for example, setting the problem item or items again.	

2.4 Wiring Example

2.4.1 Connection Diagram

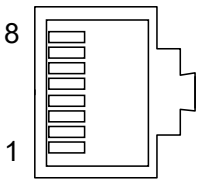
PLC (EtherNet/IP master unit)



* Ethernet cable: Straight cable of category 5 or above, 100 m max
(Aluminum tape and braided double-shielded cable are recommended.)

(Note) Terminal processing is not required.

2.4.2 Connector Pin Layout



RJ45 8-pin
modular connector
(Controller side)

Pin number	Signal name	Signal abbreviation
1	Data transmitted +	TD+
2	Data transmitted -	TD-
3	Data received +	RD+
4	Not used	
5	Not used	
6	Data received -	RD-
7	Not used	
8	Not used	
Connector hood	Grounding pin for security	FG

2.5 Setting

Using a teaching tool, set controller parameters. Set the mode toggle switch on the front panel of the controller to “MANU” side. The versions of teaching tool compatible with EtherNet/IP are as follows:

- IA-OS: V2.00.00.00 or later
- RC/EC PC software: V8.02.00.00 or later
- TB-03: V1.80 or later
- TB-02: V1.00 or later
- TB-01: V2.00 or later
- CON-T/TG: V1.10 or later
- CON-PT/PD/PG: V1.20 or later
- RCM-E/P: V2.20 (Planned)

2.5.1 Operation Mode Selecting

Set parameter No. 84 “Field bus operation mode.”
Refer to [2.9 EtherNet/IP Related Parameters].

Set value	Operation mode	Number of occupied bytes
0 (Factory setting)	Remote I/O mode	2
1	Position/simplified direct value mode	8
2	Half direct value mode	16
3	Full direct value mode	32
4	Remote I/O mode 2	12

* Entering any value except for the ones described above will cause an “Excessive Input Value Error”.

2.5.2 Setting the Baud Rate

Set parameter No. 86 “Fieldbus baud rate.”

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

2.5.3 Setting the IP Address

Set parameter No. 140 “IP address.”
Refer to [2.9, EtherNet/IP Parameters].

Settable Range:0.0.0.0 to 255.255.255.255 (It is set to “192.168.0.1” when the machine is delivered from the factory.)

(Note 1) Exercise caution to avoid IP address duplication.
For details, refer to [the operation manuals of the master unit and PLC in which in the master unit] is installed.
(Note 2) When this parameter is set to 0.0.0.0, DHCP (automatic assignment of IP address) is enabled.
Since this setting may result in the IP address being changed unintentionally, it is recommended that you set the address manually.

2.5.4 Setting the Subnet Mask

Set parameter No. 141 “Subnet mask.”
Set the same value you have set in the master unit and other slaves (on the same network).
Refer to [2.9, EtherNet/IP Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 255.255.255.0.)

2.5.5 Setting the Default Gateway

If necessary, set parameter No. 142 “Default gateway.”
Refer to 2.9, [EtherNet/IP Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 0.0.0.0.)

(Note) After the parameter setting, turn on the power to the controller again and return the mode toggle switch on the front of the controller to “AUTO” side.
When the switch is set to “MANU”, the operation using PLC is not available.

2.6 Communicating with the Master Station

2.6.1 Operation Modes and Corresponding PLC I/O Areas

The addresses allocated for each operation mode are described as follows.

- PLC output → ACON/PCON input (* “n” indicates the first address of each axis.)

PLC output area (bytes)	DI on the ACON or PCON side and input data register				
	Remote I/O mode	Position/simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Target position	Target position	Target position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Specified position number	Positioning band	Positioning band	
n+6, n+7		Control signal			
n+8, n+9			Speed	Speed setup	
n+10, n+11			Acceleration/ deceleration		
n+12, n+13			Pressing current-limiting value	Zone boundary+	
n+14, n+15			Control signal		
n+16, n+17				Zone boundary-	
n+18, n+19					
n+20, n+21				Acceleration	
n+22, n+23				Deceleration	
n+24, n+25				Pressing current-limiting value	
n+26, n+27				ACON: Occupied area / PCON: Load current threshold	
n+28, n+29				Control signal 1	
n+30, n+31				Control signal 2	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

- ACON/PCON output→PLC input side (* “n” indicates the first address of each axis.)

PLC input area (bytes)	DO on the ACON or PCON side and output data register				
	Remote I/O mode	Position/simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Current position	Current position	Current position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Completed position No. (simple alarm ID)	Command current	Command current	Current position
n+6, n+7		Status Signal			
n+8, n+9			Current speed	Current speed	Command current
n+10, n+11					
n+12, n+13			Alarm code	Alarm code	
n+14, n+15			Status signal	Occupied area	
n+16, n+17					
n+18, n+19					
n+20, n+21					
n+22, n+23					
n+24, n+25					
n+26, n+27					
n+28, n+29					
n+30, n+31				Status signal	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

2.6.2 Remote I/O Mode (Number of Occupied Bytes: 2)

In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
The I/O specifications for the PIO pattern are described as follows. Refer to [operation manual for the controller main body] for more information.

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	PIO pattern					
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Electro-magnetic valve mode 1	5: Electro-magnetic valve mode 2
Home-return operation	○	○	○	○	○	x
Positioning operation	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x
Speed change during the movement	○	○	○	○	x	○
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)
Zone signal output	○	○	○	x	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○

○: Supported, X: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	ACON/PCON side DI (Port No.)	PLC side output address (bytes)	ACON/PCON side DO (Port No.)	PLC side input address (bytes)
0	0 to 15	n+0, n+1	0 to 15	n+0, n+1

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis
The I/O signals of each axis consist of one input word (1 word = 2 bytes) and one output word in the I/O areas.
- This is controlled by ON/OFF bit signals from the PLC.

PCL output
Address (* “n” indicates the first address of each axis.)

	1 word = 2 bytes =16 bit															
n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PCL input
Address (* “n” indicates the first address of each axis.)

	1 word = 2 bytes =16 bit															
n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

(3) I/O signal assignment

The controller's I/O port signal varies depending on the parameter No. 25 setting.
Refer to [operation manual for the controller main body] for more information.

ACON

		Parameter No. 25 setting					
		Positioning mode		Teaching mode		256-point mode	
		0		1		2	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → ACON input	0	PC1	Command position No.	PC1	Command position No.	PC1	Command position No.
	1	PC2		PC2		PC2	
	2	PC4		PC4		PC4	
	3	PC8		PC8		PC8	
	4	PC16		PC16		PC16	
	5	PC32		PC32		PC32	
	6	-	Unavailable	MODE	Teaching mode command	PC64	
	7	-		JISL	Jog/inching selector	PC128	
	8	-		JOG+	+Jog	-	Unavailable
	9	BKRL	Forced brake release	JOG-	-Jog	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause	*STP	Pause
	13	CSTR	Positioning start	CSTR/ PWRT	Positioning start/position data import command	CSTR	Positioning start
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
ACON output → PLC input	0	PM1	Completed position No.	PM1	Completed position No.	PM1	Completed position No.
	1	PM2		PM2		PM2	
	2	PM4		PM4		PM4	
	3	PM8		PM8		PM8	
	4	PM16		PM16		PM16	
	5	PM32		PM32		PM32	
	6	MOVE	Moving signal	MOVE	Moving signal	PM64	
	7	ZONE1	Zone 1	MODES	Teaching mode signal	PM128	
	8	PZONE	Position zone	PZONE	Position zone	PZONE	Position zone
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND/ WEND	Positioning completion signal/ position-data read complete	PEND	Positioning completion signal
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	-	Unavailable	-	Unavailable	-	Unavailable

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)

ACON

		Parameter No. 25 setting					
		512-point mode		Electromagnetic valve mode 1		Electromagnetic valve mode 2	
		3		4		5	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → ACON input	0	PC1	Command position No.	ST0	Start position 0	ST0	Start position 0
	1	PC2		ST1	Start position 1	ST1	Start position 1
	2	PC4		ST2	Start position 2	ST2	Start position 2
	3	PC8		ST3	Start position 3	-	Unavailable
	4	PC16		ST4	Start position 4	-	
	5	PC32		ST5	Start position 5	-	
	6	PC64		ST6	Start position 6	-	
	7	PC128		-	Unavailable	-	
	8	PC256		-		-	
	9	BKRL	Forced brake release	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	-	Unavailable
	12	*STP	Pause	*STP	Pause	-	
	13	CSTR	Positioning start	-	Unavailable	-	
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
ACON output → PLC input	0	PM1	Completed position No.	PE0	Position 0 complete	LS0	Limit switch 0
	1	PM2		PE1	Position 1 complete	LS1	Limit switch 1
	2	PM4		PE2	Position 2 complete	LS2	Limit switch 2
	3	PM8		PE3	Position 3 complete	-	Unavailable
	4	PM16		PE4	Position 4 complete	-	
	5	PM32		PE5	Position 5 complete	-	
	6	PM64		PE6	Position 6 complete	-	
	7	PM128		ZONE1	Zone 1	ZONE1	Zone 1
	8	PM256		PZONE	Position zone	PZONE	Position zone
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND	Positioning completion signal	-	Unavailable
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	-	Unavailable	-	Unavailable	-	Unavailable

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled.(ON/OFF is undefined.)

PCON

		Parameter No. 25 setting					
		Positioning mode		Teaching mode		256-point mode	
		0		1		2	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → PCON input	0	PC1	Command position No.	PC1	Command position No.	PC1	Command position No.
	1	PC2		PC2		PC2	
	2	PC4		PC4		PC4	
	3	PC8		PC8		PC8	
	4	PC16		PC16		PC16	
	5	PC32		PC32		PC32	
	6	-	Unavailable	MODE	Teaching mode command	PC64	
	7	-		JISL	Jog/inching selector	PC128	
	8	-		JOG+	+Jog	-	Unavailable
	9	BKRL	Forced brake release	JOG-	-Jog	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause	*STP	Pause
	13	CSTR	Positioning start	CSTR/ PWRT	Positioning start/position data import command	CSTR	Positioning start
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
PCON output → PLC input	0	PM1	Completed position No.	PM1	Completed position No.	PM1	Completed position No.
	1	PM2		PM2		PM2	
	2	PM4		PM4		PM4	
	3	PM8		PM8		PM8	
	4	PM16		PM16		PM16	
	5	PM32		PM32		PM32	
	6	MOVE	Moving signal	MOVE	Moving signal	PM64	
	7	ZONE1	Zone 1	MODES	Teaching mode signal	PM128	
	8	PZONE	Position zone	PZONE	Position zone	PZONE	Position zone
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND/ WEND	Positioning completion signal/ position-data read complete	PEND	Positioning completion signal
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	LOAD/ TRQS	Load output judgment/ torque level	-	Unavailable	LOAD/ TRQS	Load output judgment/ torque level

The symbol with a * mark shows the ON signal in normal condition.

The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)

PCON

		Parameter No. 25 setting					
		512-point mode		Electromagnetic valve mode 1		Electromagnetic valve mode 2	
		3		4		5	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → PCON input	0	PC1	Command position No.	ST0	Start position 0	ST0	Start position 0
	1	PC2		ST1	Start position 1	ST1	Start position 1
	2	PC4		ST2	Start position 2	ST2	Start position 2
	3	PC8		ST3	Start position 3	-	Unavailable
	4	PC16		ST4	Start position 4	-	
	5	PC32		ST5	Start position 5	-	
	6	PC64		ST6	Start position 6	-	
	7	PC128		-	Unavailable	-	
	8	PC256		-		-	
	9	BKRL	Forced brake release	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	-	Unavailable
	12	*STP	Pause	*STP	Pause	-	
	13	CSTR	Positioning start	-	Unavailable	-	
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
PCON output → PLC input	0	PM1	Completed position No.	PE0	Position 0 complete	LS0	Limit switch 0
	1	PM2		PE1	Position 1 complete	LS1	Limit switch 1
	2	PM4		PE2	Position 2 complete	LS2	Limit switch 2
	3	PM8		PE3	Position 3 complete	-	Unavailable
	4	PM16		PE4	Position 4 complete	-	
	5	PM32		PE5	Position 5 complete	-	
	6	PM64		PE6	Position 6 complete	-	
	7	PM128		ZONE1	Zone 1	ZONE1	Zone 1
	8	PM256		PZONE	Position zone	PZONE	Position zone
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND	Positioning completion signal	-	Unavailable
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	LOAD/ TRQS	Load output judgment/ torque level	LOAD/ TRQS	Load output judgment/ torque level	-	Unavailable

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled.(ON/OFF is undefined.)

2.6.3 Position/Simplified Direct Value Mode (Number of Occupied Bytes: 8)

In this operation mode, EtherNet/IP communication is used to select and command movements that have been predefined in the controller's position data table. Alternatively, through use of a PMOD signal, this mode also allows the target position to be established directly.
For the speed, acceleration/deceleration and positioning band, etc., except for the target position, the values in the position table within the controller are used. Setup the position data by referring to [the instructions provided in the controller's operation manual].
The settable No. of position data items is max 768 points.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control △: Indirect control x: Disable	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	△	These items must be set in the position data table.
Pitch feed (inching)	△	
Pressing operation	△	
Speed change during the movement	△	
Individual Setting for Acceleration/Deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using parameters.
PIO pattern selection	x	

(1) PLC address configuration (* "n" indicates the first address of each axis.)

Parameter No.84	ACON/PCON side input register	PLC side output address (bytes)	ACON/PCON side output register	PLC side input address (bytes)
1	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Specified position number	n+4, n+5	Completed position No. (Simple alarm code)	n+4, n+5
	Control signal	n+6, n+7	Status signal	n+6, n+7

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of four input words (4 words = 8 bytes) and four output words in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2 words (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The specified position No. and completed position No. are expressed using 1-word (16 bits) binary data. The figures from 0 to 767 can be set in PLC. However, set the position No. for which the operation conditions have been set in advance using the teaching tools.

PLC output

Address (* "n" indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Target position (lower word)																
n+2, n+3 Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Specified position number	—	—	—	—	—	—	PC512	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1
n+6, n+7 Control signal	BKRL	RMOD	—	—	PMOD	MODE	PWRT	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Completed position No.	—	—	—	—	—	—	PM512	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	PZONE	MODES	WEND	RMDS	—	—	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* "ON" in the table shows the corresponding bit of "1" and "OFF" shows "0".)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to 999999. (Example) When it is "+25.40mm", set it as "2540". If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	2.8.1
	Specified position number	16-bit data	PC1 to PC512	16-bit integer For the operation, the position data is required, for which the operation conditions have been set in advance using the teaching tools. Set up the position No. for which the data has been input using this register. The settable range is 0 to 767. In the case that any value out of the range is set, or position No. that has not been set is specified, an alarm is output.	2.8.1
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	2.6.7 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	2.6.7 (19)
		b13 b12	-	Unavailable	-
		b11	PMOD	Position/simple-direct switching: The position mode is selected when this signal is OFF, and the simple direct mode is selected when the signal is ON.	2.6.7 (20)
		b10	MODE	Teaching mode command: The normal mode is selected when this signal is OFF, and the teaching mode is selected when the signal is ON.	2.6.7 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	2.6.7 (17)
		b8	JOG+	+Jog: "ON" for Movement in the Opposite Direction of Home	2.6.7 (13)
		b7	JOG-	-Jog: "ON" for Movement in the Home Direction	2.6.7 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, "Jog speed" and parameter No. 48, "Inch distance" are used when this signal is OFF, and the values set in parameter No. 47, "Jog speed 2" and parameter No. 49, "Inch distance 2" are used when the signal is ON.	2.6.7 (14)
		b5	JISL	Jog/inching selector: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	2.6.7 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	2.6.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.6.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.6.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.6.7 (6)
		b0	CSTR	Positioning start: A move command is issued when this signal turns ON.	2.6.7 (7)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit	-	Current position: 32-bit signed Integer. Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.8.1
	Completed position No. (Simple alarm code)	16-bit	PM1 to PM512	16-bit integer It is moved to the target position and the positioning completed position No. within the positioning band is output. In the case that the position movement has not been performed at all, or during the movement, “0” is output. When an alarm is issued (in the case that the status signal ALM is “ON”), the simplified alarm code Refer to [the operation manual for the controller main body] is output.	2.8.1
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	2.6.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	2.6.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	2.6.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	2.6.7 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	2.6.7 (12)
		b10	MODES	Teaching mode signal: This signal is ON while the teaching mode is selected.	2.6.7 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	2.6.7 (17)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	2.6.7 (19)
		b7	-	Unavailable	-
		b6			
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	2.6.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	2.6.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	2.6.7 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	2.6.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	2.6.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	2.6.7 (10)

2.6.4 Half Direct Value Mode (Number of Occupied Bytes: 16)

This is the operation mode with the target position, positioning band, speed, acceleration/deceleration and pressing current value set up in the PLC. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration. (* "n" indicates the first address of each axis.)

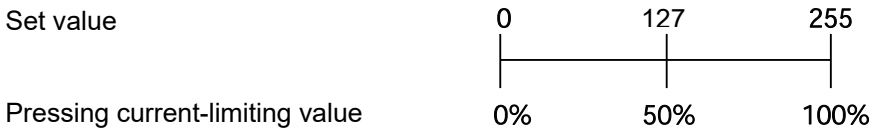
Parameter No.84	ACON/PCON side input register	PLC side output address (bytes)	ACON/PCON side output register	PLC side input address (bytes)
2	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The speed is expressed using 1-word (16 bits) binary data. The figures from 0 to +65535 (Unit: 1.0mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value Refer to [the Catalog or operation manual for the actuator] for the actuator concerned.



- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (Lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (Upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration/ deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing current-limitin	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	DIR	PUSH	—	—	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Alarm code																

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	—	RMDS	—	—	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to 999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	2.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is between 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	2.8.2
	Speed	16-bit data	-	16-bit integer Specify the speed at which to move the actuator. The unit is 1.0mm/s and settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “254.0mm/s”, set it as “254”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	2.8.2
	Acceleration/ Deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 300. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	2.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Pressing current-limiting value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%). The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the actuator]. If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.	2.8.2
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	2.6.7 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	2.6.7 (19)
		b13	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position, “ON” for the direction adding the positioning band to the target position	2.6.7 (22)
		b12	PUSH	Pressing specification: Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	2.6.7 (21)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	JOG+	+ Jog: “ON” for movement in the opposite direction of home	2.6.7 (13)
		b7	JOG-	-Jog: “ON” for movement in the home direction	2.6.7 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	2.6.7 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	2.6.7 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	2.6.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.6.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.6.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.6.7 (6)
		b0	DSTR	Positioning command: A move command is issued when this signal turns ON.	2.6.7 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.8.2
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is 1mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA	2.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller main body] for the details of the alarms.	2.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	2.6.7 (2)
		b14	PWR	Controller ready: This signal turns ON when the controller becomes ready.	2.6.7 (1)
		b13	ZONE2	Zone 2: “ON” for the current position within the zone set range	2.6.7 (12)
		b12	ZONE1	Zone 1: “ON” for the current position within the zone set range	2.6.7 (12)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	2.6.7 (19)
		b7	-	Unavailable	-
		b6			
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	2.6.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	2.6.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	2.6.7 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	2.6.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	2.6.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	2.6.7 (10)

2.6.5 Full Direct Value Mode (Number of Occupied Bytes: 32)

This is the operation mode with all the values (target position, speed, etc.) set up directly using values from PLC. Set each value in the I/O area.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control x: Disable
Home-return operation	○
Positioning operation	○
Speed and acceleration / deceleration setting	○
Pitch feed (inching)	○
Pressing operation	○
Speed change during the movement	○
Individual Setting for Acceleration/Deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC address configuration (* "n" indicates the first address of each axis.)

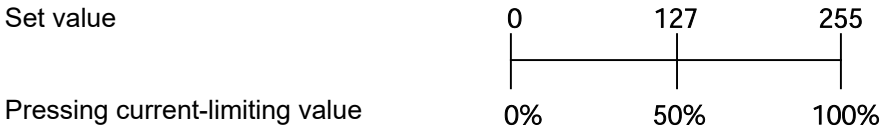
Parameter No.84	ACON/PCON side input register		PLC side output address (bytes)	ACON/PCON side output register	PLC side input address (bytes)
3	Target position		n+0, n+1	Current position	n+0, n+1
			n+2, n+3		n+2, n+3
	Positioning band		n+4, n+5	Command current	n+4, n+5
			n+6, n+7		n+6, n+7
	Speed		n+8, n+9	Current speed	n+8, n+9
			n+10, n+11		n+10, n+11
	Zone boundary +		n+12, n+13	Alarm code	n+12, n+13
			n+14, n+15	Occupied area	n+14, n+15
	Zone boundary -		n+16, n+17		n+16, n+17
			n+18, n+19		n+18, n+19
	Acceleration		n+20, n+21		n+20, n+21
	Deceleration		n+22, n+23		n+22, n+23
	Pressing current-limiting value		n+24, n+25		n+24, n+25
	ACON	Occupied area	n+26, n+27		n+26, n+27
	PCON	Load current threshold			
	Control signal 1		n+28, n+29		n+28, n+29
	Control signal 2		n+30, n+31	Status signal	n+30, n+31

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of one input word (16 words = 32 bytes) and one output word in the I/O areas.

- Control signals 1 and 2 and status signals are ON/OFF bit signals.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The specified speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value Refer to [the Catalog or operation manual for the actuator] for the actuator concerned.



- Set the load current threshold. The load current threshold is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. Refer to [the graph of pressing current-limiting value (above graph)].
- Zone Boundary “+” and Zone Boundary “–“ are expressed using 2-word (32 bits) binary data. The figures from -999999 to +999999 (Unit: 0.01mm) can be set in PLC. However make sure to set the smaller value for the Zone Boundary “-“ than that for the Zone Boundary “+”.
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Target position (lower word)																
n+2, n+3 Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9 Speed (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11 Speed (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+12, n+13 Zone boundary + (lower word)																
n+14, n+15 Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17 Zone boundary - (lower word)																
n+18, n+19 Zone boundary - (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+20, n+21 Acceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+22, n+23 Deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+24, n+25 Pressing current-limiting value	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+26, n+27 Load current threshold (*3)	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+28, n+29 Control signal 1	—	—	—	—	—	(※1)	ASO1	ASO0	(※2)		—	—	INC	DIR	PUSH	—
n+30, n+31 Control signal 2	BKRL	RMOD	—	—	—	—	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

(*1) Signal assignment for b10 of n+28, n+29

	Symbol	
Controller	ACON	PCON
b10	-	SMOD

(*2) Signal assignment for b7 and b6 of n+28, n+29

	Symbol	
Controller	ACON	PCON
b7	MOD1	-
b6	MOD0	-

(*3) This is a dedicated function for PCON controllers. It is not available with ACON controllers.

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7																
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9																
Current speed (lower word)																
n+10, n+11																
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14 ~ n+29																
Unavailable																
n+30, n+31																
Status signal	EMGS	PWR	ZONE2	ZONE1	PZONE	(※1)		RMDS	GHMS	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

(*1) Signal assignment for b10 and b9 of n+30, n+31

	Symbol	
Controller	ACON	PCON
b10	-	LOAD
b9	-	TRQS

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is–999999 to +999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	2.8.3
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. 1) In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. 2) In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	2.8.3
	Speed	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/s and the settable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	2.8.3
	Zone boundary+ /Zone boundary–	32-bit data	-	32-bit signed integer indicating the current position After completion of home return, an effective zone signal can be output separately from the zone boundaries specified by parameters. The status signal PZONE turns ON when the current position is inside these +/- boundaries. The unit is 0.01mm and the settable range is -999999 to 999999. Enter a value that satisfies the relationship of “Zone boundary +> Zone boundary –”. If this function is not used, enter the same value for both the positive and negative boundaries. (Example) When it is “+25.40mm”, set it as “2540”. * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	2.8.3

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th colspan="2">Symbol</th><th>Contents</th><th>Details</th></tr>
<tr><td rowspan="15">PLC output</td><td>Acceleration</td><td>16-bit data</td><td colspan="2">-</td><td rowspan="2">16-bit integer
Specify the acceleration and deceleration at which to move the actuator.
The unit is 0.01G and settable range is 1 to 300.
(Example) When it is “0.30G”, set it as “30”.
If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.</td><td rowspan="2">2.8.3</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td colspan="2">-</td></tr>
<tr><td>Pressing current-limiting value</td><td>16-bit data</td><td colspan="2">-</td><td>16-bit integer
Specify the current- limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%).
The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the each actuator].
If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.</td><td>2.8.3</td></tr>
<tr><td>Load current threshold</td><td>16-bit data</td><td colspan="2">-</td><td>16-bit integer
Set the current threshold in this register when whether or not the load current exceeds the threshold is judged.
The allowable specification range is 0 (0%) to 255 (100%).
If threshold judgment is not required, enter “0”.</td><td>2.8.3</td></tr>
<tr><td rowspan="13">Control signal 1</td><td>b15</td><td colspan="2" rowspan="5">-</td><td rowspan="5">Unavailable</td><td rowspan="5">-</td></tr>
<tr><td>b14</td></tr>
<tr><td>b13</td></tr>
<tr><td>b12</td></tr>
<tr><td>b11</td></tr>
<tr><td rowspan="2">b10</td><td>ACON</td><td>-</td><td>Unavailable</td><td>-</td></tr>
<tr><td>PCON</td><td>SMOD</td><td>Stopping control mode: When this signal is ON, servo control is performed during stopping.</td><td>2.6.7 (28)</td></tr>
<tr><td>b9</td><td colspan="2">ASO1</td><td>Stop Mode 1</td><td rowspan="2">Select stop mode while standing by
<table><tr><th>ASO1</th><th>ASO0</th><th>Functions</th></tr><tr><td>OFF</td><td>OFF</td><td>Disable
(Servo is ON at all times)</td></tr><tr><td>OFF</td><td>ON</td><td>Sever turns OFF in time set in Parameter No. 36</td></tr><tr><td>ON</td><td>OFF</td><td>Sever turns OFF in time set in Parameter No. 37</td></tr><tr><td>ON</td><td>ON</td><td>Sever turns OFF in time set in Parameter No. 38</td></tr></table></td><td rowspan="2">2.6.7 (30)</td></tr>
<tr><td>b8</td><td colspan="2">ASO0</td><td>Stop Mode 0</td></tr>
<tr><td>b7</td><td rowspan="2">ACON</td><td>MOD1</td><td rowspan="2">Acceleration / deceleration mode:
When both signals are OFF, the trapezoid pattern mode is selected.
When one signal is OFF and the other signal is ON, the S-motion mode is selected. When one signal is ON and the other signal is OFF, the primary delay filter mode is selected.</td><td rowspan="2">2.6.7 (29)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
<tr><td>b7</td><td rowspan="2">PCON</td><td rowspan="2">-</td><td rowspan="2">Unavailable</td><td rowspan="2">-</td></tr>
<tr><td>b6</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal 1	b5	-	Unavailable	-
		b4			
		b3	INC	Incremental Command: Absolute position commands are issued when this signal is OFF, and incremental position commands are issued when the signal is ON.	2.6.7 (24)
		b2	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position “ON” for the direction adding the positioning band to the target position	2.6.7 (22)
		b1	PUSH	Pressing specification : Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	2.6.7 (21)
		b0	-	Unavailable	-
	Control signal 2	b15	BKRL	Forced brake release: When it is turned ON, the brake is released	2.6.7 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	2.6.7 (19)
		b13	-	Unavailable	-
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	2.6.7 (13)
		b7	JOG-	-Jog: “ON” for Movement in the Home Direction	2.6.7 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	2.6.7 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	2.6.7 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	2.6.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.6.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.6.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.6.7 (6)
		b0	DSTR	Positioning start: A move command is issued when this signal turns ON.	2.6.7 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol		Contents	Details
PLC input	Current position	32-bit data	-		32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.8.3
	Command current	32-bit data	-		32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal)=1023mA	2.8.3
	Current speed	32-bit data	-		32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading:000003FF$_H$=1023 (decimal)=10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.8.3
	Alarm code	16-bit data	-		16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller main body] for the details of the alarms.	2.8.3
	Status signal	b15	EMGS		Emergency stop: An emergency stop is actuated when this signal turns ON.	2.6.7 (2)
		b14	PWR		Controller ready : This signal turns ON when the controller becomes ready.	2.6.7 (1)
		b13	ZONE2		Zone 2:“ON” for the current position within the zone set range	2.6.7 (12)
		b12	ZONE1		Zone 1:“ON” for the current position within the zone set range	2.6.7 (12)
		b11	PZONE		Position zone: This signal turns ON when the current position is inside the specified position zone.	2.6.7 (12)
		b10	ACON	-	Unavailable (ON/OFF is undefined)	-
			PCON	LOAD	Load output judgment: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	2.6.7 (26)
		b9	ACON	-	Unavailable (ON/OFF is undefined)	-
			PCON	TROS	Torque level: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	2.6.7 (27)
		b8	RMDS		Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	2.6.7 (19)
		b7	GHMS		Under Home return Operation: This signal remains ON while home return is in progress.	2.6.7 (6)
		b6	PUSHS		Pressing in progress: This signal remains ON while pressing operation is in progress.	2.6.7 (25)
		b5	PSFL		Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	2.6.7 (23)
		b4	SV		Operation preparation end: This signal turns ON when the servo turns ON.	2.6.7 (5)
		b3	ALM		Alarm: This signal turns ON when an alarm occurs.	2.6.7 (3)
		b2	MOVE		Moving signal: This signal remains ON while the actuator is moving.	2.6.7 (9)
		b1	HEND		Home return completion: This signal turns ON when home return is completed.	2.6.7 (6)
		b0	PEND		Positioning completion signal: This signal turns ON when positioning is completed.	2.6.7 (10)

2.6.6 Remote I/O Mode 2 (Number of Occupied Bytes: 12)

In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
This mode is the same as the remote I/O mode, but the current-position read function and command-current read function are also available.
The features of each PIO pattern are shown below. Refer to [operation manual for the controller main body] for more information

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	PIO Pattern					
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Electro-magnetic valve mode 1	5: Electro-magnetic valve mode 2
Home-return operation	○	○	○	○	○	x
Positioning operation	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x
Speed change during the movement	○	○	○	○	x	○
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)
Zone signal output	○	○	○	x	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○

○: Supported, x: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	ACON/PCON side DI and input register	PLC side output address (bytes)	ACON/PCON side DO and output register	PLC side input address (bytes)
4	Port No.0 to 15	n+0, n+1	Port No.0 to 15	n+0, n+1
	Occupied area	n+2, n+3	Occupied area	n+2, n+3
		n+4, n+5	Current position	n+4, n+5
		n+6, n+7		n+6, n+7
		n+8, n+9	Command current	n+8, n+9
		n+10, n+11		n+10, n+11

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of 6 input words (channels) and 6 output words (6 words=12 bytes) in the I/O areas.

- The areas controlled by port number are controlled using ON/OFF bit signals.
- The current position is a 2-word (32-bit) binary data (unit: 0.01 mm).
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0, n+1																
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2, n+3																
Unavailable																
n+4, n+5																
Current position (lower word)																
n+6, n+7																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11																
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

(3) I/O signal assignment

For the signal assignments corresponding to each PIO pattern, refer to [the I/O signal assignments for the remote I/O mode explained in 2.6.2 (3)].

The signal allocation for the Command current and Current position is shown in the following table.

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is 1mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	-

2.6.7 I/O Signal Controls and Function

* ON indicates that the applicable bit signal is “1”, while OFF indicates that the bit signal is “0”.
The I/O control and functions used in the Position/Simplified Direct Value Mode, Half direct value mode and Full direct value mode, are described as follows. For the I/O signals for the Remote I/O mode and Remote I/O mode 2, refer to [the controller’s operational manua main body].

(1) Controller ready (PWR) PLC input signal

When the controller can control the system after the power is applied, it is turned “ON”.

■ Function

Regardless of the alarm or servo conditions, when the controller initialization is completed normally after the power is applied and the controller can control the system, it is turned “ON”.
Even in the alarm condition, when the controller can control the system, it is turned “ON”.

(2) Emergency stop (EMGS) PLC input signal

When the controller is stopped in an emergency, it is turned “ON”.

■ Function

When the controller is stopped in an emergency (motor driving power is cut off), it is turned “ON”. When the emergency stop status is cleared, it is turned “OFF”.

* This signal should behave as a signal of a break contact (*EMGS) in Remote I/O Mode and Remote I/O Mode 2 thus switching on/off gets reversed to above.

(3) Alarm (ALM) PLC input signal

When any error is detected using the controller protection circuit (function), it is turned “ON”.

■ Function

When any error is detected and the protection circuit (function) is activated, this signal is turned “ON”.
When the cause of the alarm is eliminated and the reset signal is turned “ON”, the alarm is turned “OFF” in the case that it is the alarm with the operation cancellation level. (In the case of the alarm with the cold start level, cycling of the power is required)
When the alarm is detected, the Status Indicator LED Refer to [2.3, EtherNet/IP Interface] on the front surface of the controller illuminates in red.

* This signal should behave as a signal of a break contact (*ALM) in Remote I/O Mode and Remote I/O Mode 2 thus switching on/off gets reversed to above.

(4) Reset (RES) PLC output signal

This signal has two functions. It can reset the controller alarm and cancel the reminder for planned movements during pause conditions.

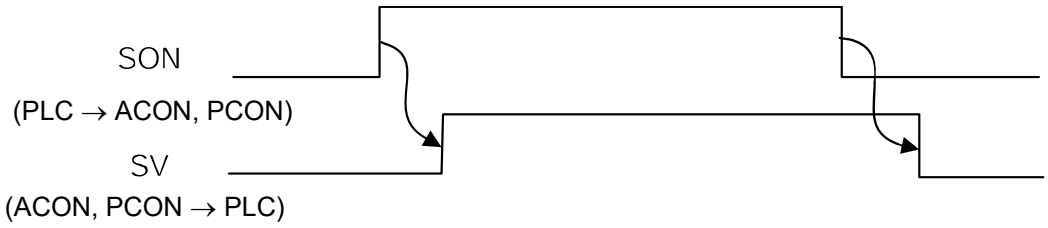
■ Function

[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset. (In the case of the alarm with the cold start level, cycling of the power is required)
[2] When this signal is turned ON from OFF condition during the pause condition, the reminder of the planned movement left can be cancelled.

(5) Servo ON command (SON) PLC output signal
Operation preparation end (SV) PLC input signal

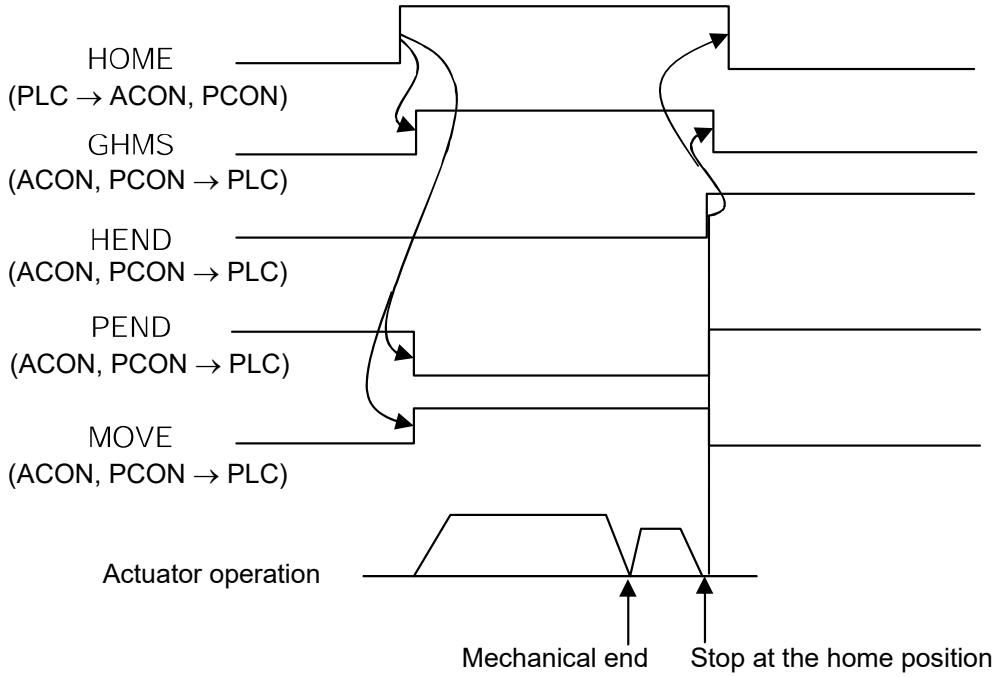
When the SON signal is turned ON, the servo will turn ON.
When “SON” signal is turned “ON”, the servo-motor is turned “ON”. When the servo-motor is turned ON, the Status Indicator LED refer to [2.3, EtherNet/IP Interface] on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

■Function
Using the “SON” signal, the turning ON/OFF of the controller is available.
While the “SV” signal is ON, the controller's servo-motor is turned “ON” and the operation becomes available.
The relationship between the “SON” signal and “SV” signal is as follows.



(6) Home return (HOME) PLC output signal
Home return completion (HEND) PLC input signal
Under home return operation (GHMS) PLC input signal

When the “HOME” signal is turned “ON”, this command is processed at the startup (ON edge), and the home return operation is performed automatically. During the home return operation, the “GHMS” signal is turned “ON”.
When the “HEND” signal is turned “ON”, turn “OFF” the “HOME” signal.
Once the “HEND” signal is turned “ON”, it can not be turned “OFF” until the power is turned “OFF” or the “HOME” signal is input again. Once the HEND signal is turned ON, it can not be turned OFF until the power is turned OFF or the HOME signal is input again.
Even after the completion of the home return operation, when the “HOME” signal is turned “ON”, the home return operation can be performed.



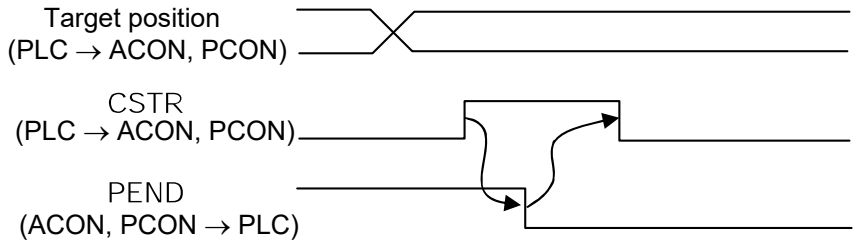
⚠ Caution: In the Remote I/O mode, Remote I/O mode 2 and Position/Simplified Direct Value Mode, when the positioning command is issued without performing the home return operation after the power is applied, the positioning is performed after the automatic home return operation. Exercise caution that in the half direct mode or full direct mode, issuing a positioning command to a given position following the power on, without performing a home return first, will generate an alarm “Error Code 83: ALARM HOME ABS (absolute position move command when home return is not yet completed)” (operation-reset alarm).

(7) Positioning start (CSTR): Used in the position/simple direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning is performed to the target position with the specified position No. or set using the PLC's target position register.
Whether if the target position with the specified position No. is used or the setting using the PLC's target position register is used, depends on the Control signal b11: “Position/Simplified Direct Value Change-Over (PMOD) Signal”.

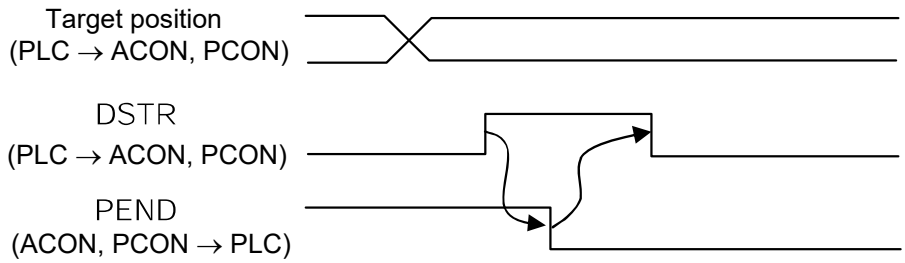
- PMOD＝OFF: Target position data for the specified position No. is used.
- PMOD＝ON : Value for the target position set using the PLC's target position register is used.

When this signal is issued in the condition where the home return operation has not performed at all after the power is applied (HEND signal OFF), the positioning to the target position is performed after the home return operation is performed automatically.
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned “OFF”.



(8) Positioning command (DSTR): Used in the half direct mode and full direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning to the target position input in the PLC's target position register is performed. When this signal is issued in the condition where the home return operation has not performed at all after the power is applied (HEND signal OFF), an alarm is issued (Operation Cancellation Level).
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned “OFF”.

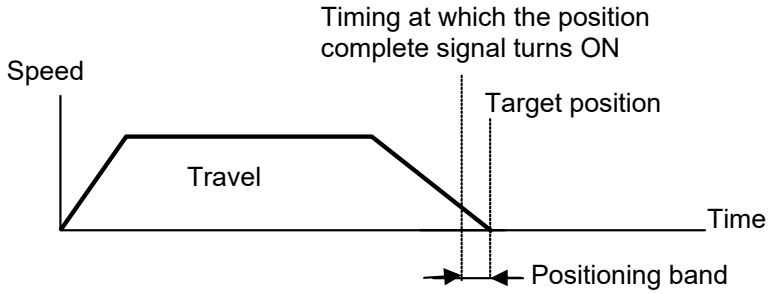


(9) Moving signal (MOVE) PLC input signal

This signal is turned ON while the actuator's slider or rod is moving. (Including the pressing or jog operation after the home return operation)
After the completion of the positioning, home return or pressing operation, or during the pause condition, this signal is turned “OFF”.

(10) Positioning completion signal (PEND) PLC input signal

This signal is turned “ON” when the actuator is moved to the target position and reaches the positioning band and the pressing is completed.
However, when the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.



When the servo-motor is turned ON from OFF condition, the positioning is performed with the position set as the target position. Accordingly, this signal is turned “ON” and after that, when the positioning operation is started with the home return (HOME) signal, positioning start (CSTR) signal and positioning command (DSTR) signal, this signal is turned “OFF”.

⚠ Caution: When the servo-motor is turned OFF or stopped in an emergency while the actuator is stopped at the target position, the PEND signal is turned “OFF” temporarily.
Then, when the servo-motor is turned “ON”, the PEND signal is turned “ON” again.

(11) Pause (STP) PLC output signal

When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position No. set using the specified position No. resister in the Position/Simplified Direct Value Mode, and as the value set in the acceleration/deceleration register in the Half direct value mode.
In the Full direct value mode, the value is expressed as the value set in the acceleration register or deceleration register.

* This signal should behave as a signal of a break contact (*STP) in Remote I/O Mode and Remote I/O Mode 2 thus switching on/off gets reversed to above.

(12) Zone 1 (ZONE1) PLC input signal
Zone 2 (ZONE2) PLC input signal
Position zone (PZONE) PLC input signal

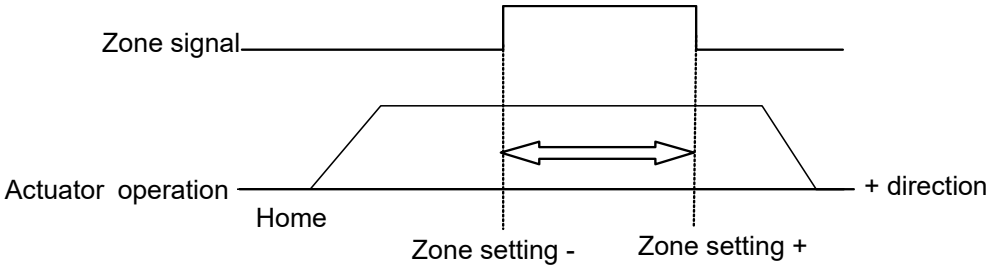
These signals are turned ON when the current position of the actuator is within the set area and turned OFF when the current position is out of the set area.

[1] Zone 1, Zone 2

The zone is set using the user parameters.
The Zone 1 Signal is set using the parameter No. 1 “Zone Boundary 1 “+” Side” and No. 2 “Zone Boundary 1 “–“ Side”.
The Zone 2 Signal is set using the parameter No. 23 “Zone Boundary 2 “+” Side” and No. 24 “Zone Boundary 2 “–“ Side”.
The Zone 1 Signal and Zone 2 Signal become effective when the home return operation is completed. After that, even during the servo OFF, it is effective.

[2] Position zone

Each zone is set in the position table or using the zone boundary resister.
In the case of the Position/Simplified Direct Value Mode, the PZONE signal is set using the position table.
In the case of the Full direct value mode, the PZONE signal is set using the Zone Boundary Value Register.
(*) In the half direct value mode, there is no PZONE signal.
The PZONE signal becomes effective with the movement command after the home return operation. After that, even during the servo OFF, it is effective.



(13) +Jog (JOG+) PLC output signal
–Jog (JOG–) PLC output signal

This signal is the command for the jog operation startup or inching operation startup.
If a + command is issued, the actuator will operate in the direction opposite home. When a – command is issued, the actuator will operate in the direction of home.

[1] Jog operation

Jog operation can be performed when the jog/inch switching (JISL) signal is OFF.
While the “JOG+” is turned “ON”, the movement direction is to the opposite of the home and when it is turned “OFF”, the actuator is decelerated and stopped.
While the JOG – is ON, the actuator will operate in the direction of home and when it is turned OFF, it is decelerated to a stop.
The operation is performed based on the set values of the following parameters.

- The speed is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (JVEL) signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, “PIO jog speed”.
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, “PIO jog speed 2”.
- The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
- When both the JOG+ and JOG- signals are turned “ON”, the actuator is decelerated and stopped.

[2] Inch operation

The inching operation is available while the JISL signal is turned “ON”.
Once it is turned “ON”, the actuator is moved as much as the inching distance.
When the JOG+ is turned “ON”, the movement is to the opposite of the home and when the JOG- is turned “ON”, the movement is to the home.
The operation is performed based on the set values of the following parameters.

- The speed conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, “PIO jog speed”.
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, “PIO jog speed 2”.
- The travel conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 48, “PIO inch distance”.
  If the JVEL signal is ON, the actuator operates according to parameter No. 49, “PIO inch distance 2”.
- The Acceleration/deceleration is based on the rated acceleration/deceleration (depending on the actuator).

During the normal operation, even when the “+” Jog Signal or “-“ Jog Signal is turned “ON”, the normal operation is continued. (The Jog signal is ignored)
In the pause condition, even when the “+” Jog Signal or “-“ Jog Signal is turned “ON”, the actuator is not moved.

(Note) Because the software stroke limit is disabled before the home return operation, the actuator might run against the mechanism end. Take the greatest care.

(14) Jog-speed/inch-distance switching (JVEL) PLC output signal

This change-over signal is used for the parameters specifying the jog speed when the jog operation is selected or the inching distance when the inching operation is selected.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

(15) Jog/inch switching (JISL) PLC output signal

This signal changes over the jog operation and the inching operation.
JISL=OFF: Jog operation
JISL=ON : Inch operation
When the JISL signal is turned “ON” (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.
When the JISL signal is turned OFF (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

[Relation Between Setting and Operation for JVEL/JISL]

The relation between the jog velocity / inching distance switchover signal (JVEL) and the jog / inching switchover signal (JISL) turned on and off is as described below.

JISL		OFF (Jog operation)	ON (Inch operation)
Operating conditions		When the JOG +/JOG - signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG - signal.
JVEL=OFF	Speed	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed”
	Travel	-	Parameter No. 48, “Inch distance”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
JVEL=ON	Speed	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	Travel	-	Parameter No. 49, “Inch distance 2”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)

(16) Teaching mode command (MODE) PLC output signal
Teaching mode signal (MODES) PLC input signal

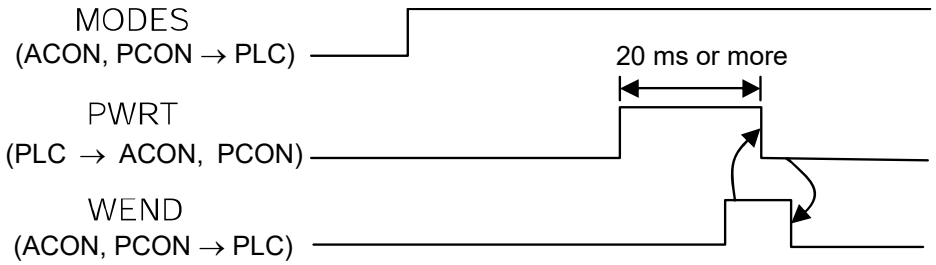
When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the controllers for each actuator is changed to the teaching mode, the MODES signal is turned ON.
After confirming that the MODES signal is turned “ON” on the PLC side, start the teaching operation.
(Note) In order to change the normal operation mode to the teaching mode, the following conditions are required.

- The actuator operation (motor) is stopped.
- The + JOG (JOG+) signal and – JOG (JOG-) signal are turned “OFF”.
- The Position Data Import Command (PWRT) Signal and Positioning start (CSTR) Signal are turned “OFF”.

(Note) When the PWRT signal is not turned OFF, the mode is not returned to the normal operation mode.

(17) Position data import command (PWRT) PLC output signal
Position data import complete (WEND) PLC input signal

The PWRT signal is available when the teaching mode signal (MODES) is turned “ON”.
Turn the PWRT signal ON (*1), and the data of the current position will be written to the “Position” field under the position number set to the specified position number resister of the PLC (*2).
When the data writing is completed, the WEND signal is turned “ON”.
After the WEND signal is turned ON, turn OFF the PWRT signal in the host machine.
When the PWRT signal is turned ON before the WEND signal is turned “ON”, the WEND signal is not turned “ON”.
When the PWRT signal is turned “OFF” the WEND signal is also turned “OFF”.
(*1) Turn it on for 20ms or more. If the time is shorter than 20ms, the writing is not completed.
(*2) When the data items except for the position have not been defined, the parameter initial values are written. Refer to [the operation manual for the controller main body]



(18) Forced brake release (BKRL) PLC output signal

Turning this signal “ON” can release the brake forcibly.

(19) Operating mode selector (RMOD) PLC output signal
Operation mode status (RMDS) PLC input signal

The operation mode is selected with the RMOD signal and the MODE switch located on the front surface of the controller.
Also, which mode is currently set, AUTO or MANU, can be confirmed using the RMDS signal.
The operation modes with the combination of the RMOD signal and the MODE switch ON/OFF are described as follows.

	Controller MODE Switch = AUTO	Controller MODE Switch = MANU
RMOD signal = OFF (AUTO mode is specified)	AUTO mode (RMDS=OFF)	MANU mode (RMDS=ON)
RMOD signal = ON (MANU mode is specified)	MANU mode (RMDS=ON)	MANU mode (RMDS=ON)

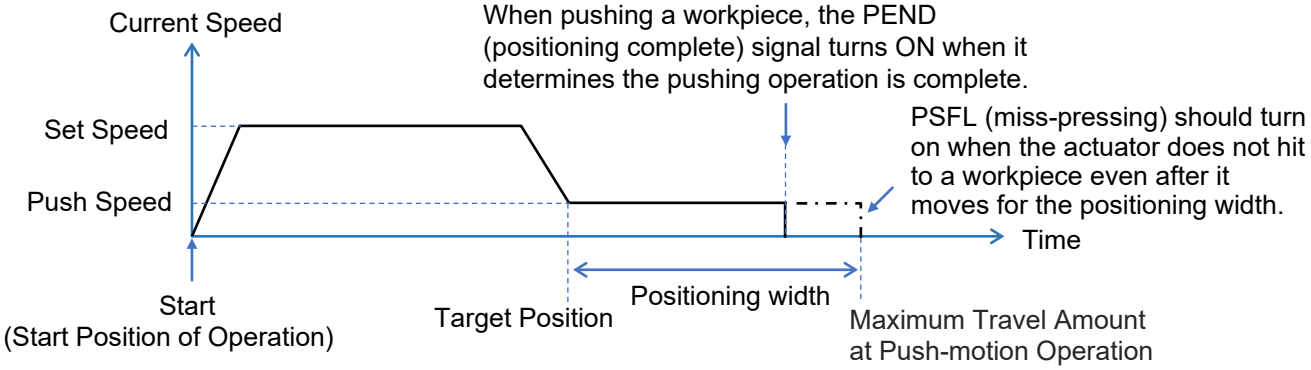
(Note) In MANU mode, the startup of the operation from PLC is not available.

(20) Position/simple-direct switching (PMOD) PLC output signal

This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON :Use the value of the target position resister

(21) Pressing specification (PUSH) PLC output signal

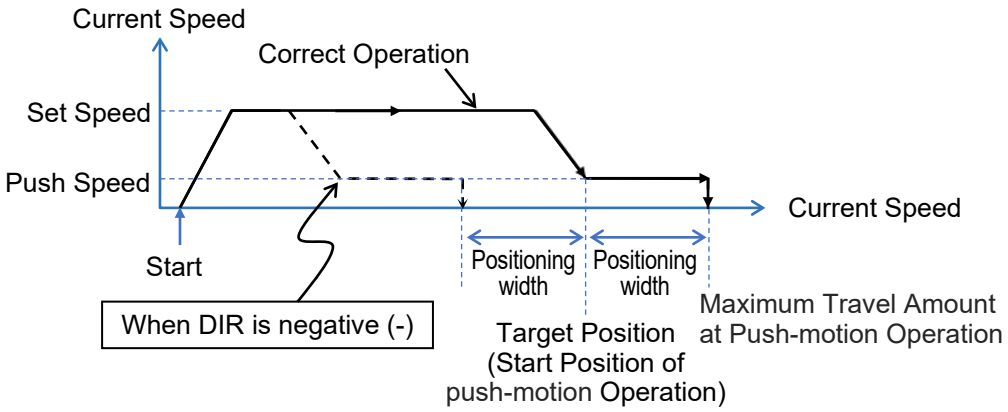
When the movement command signal is output after this signal is turned ON, the pressing operation is performed.
When this signal is set to “OFF”, the normal positioning operation is performed.
Refer to [Item 2.8.2 Operation in Half direct value mode in 2.8 Operation] for the setting timing for this signal



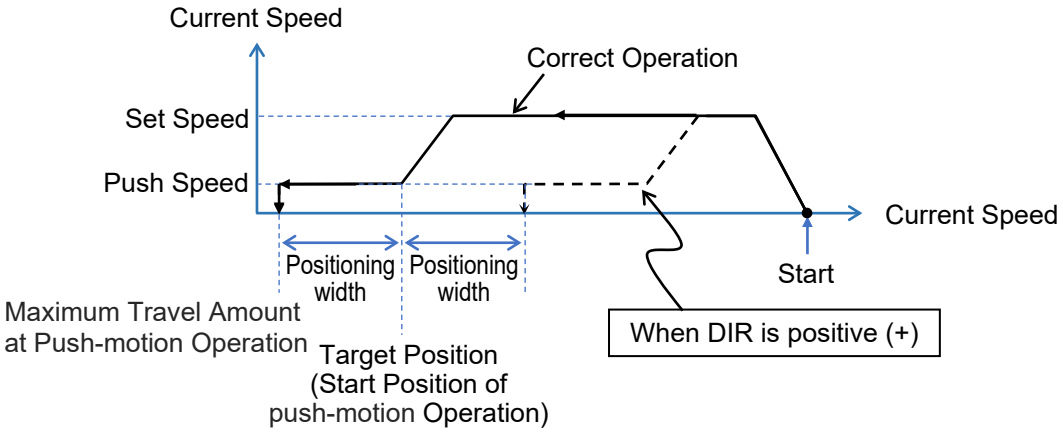
(22) Pressing direction specification (DIR) PLC output signal

This signal specifies the pressing direction.
When this signal is turned “ON”, the pressing operation is performed to the direction of the value determined by adding the positioning band to the target position.
When this signal is turned “OFF”, the pressing operation is performed to the position expressed using the value reducing the positioning band from the target position.
In the case of the normal positioning operation, this signal is disabled.
Refer to [Item 2.8.2 Operation in Half direct value mode in 2.8 Operation] for the setting timing for this signal

1) For Pressing Operation Towards Positive from Start Point



2) For Pressing Operation Towards Negative from Start Point



As shown in the figure 1) above, when pushing from the start point toward the target position in the direction in which the coordinate value increases, the push direction is positive (+), and when pushing in the direction in which the coordinate value decreases as the 2) above, the push direction is negative (-).
Pushing in the wrong direction will lead to improper operation, as the push-motion operation will start at the start point and continue to the distance (positioning width × 2); take care.

(23) Pressing and a miss (PSFL) PLC input signal

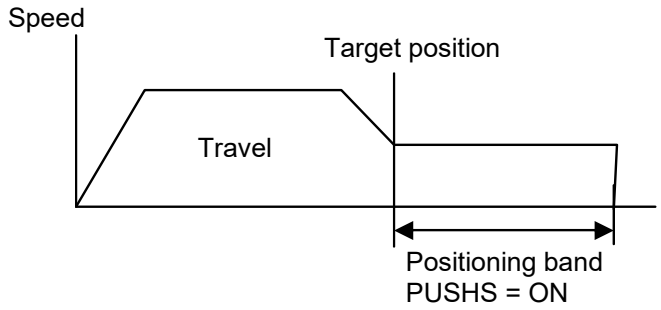
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
Refer to [Item 2.8.2 Operation in Half direct value mode in 2.8 Operation] for the setting timing for this signal

(24) Incremental command (INC) PLC output signal

When the movement command is issued while this signal is turned “ON”, the actuator is moved to the position expressed as the value input in the PLC's target position register based on the current position. (Incremental move)
When this signal is turned “OFF”, the actuator is moved to the position expressed as the value set in the PLC's target position register.

(25) Pressing in progress (PUSHS) PLC input signal

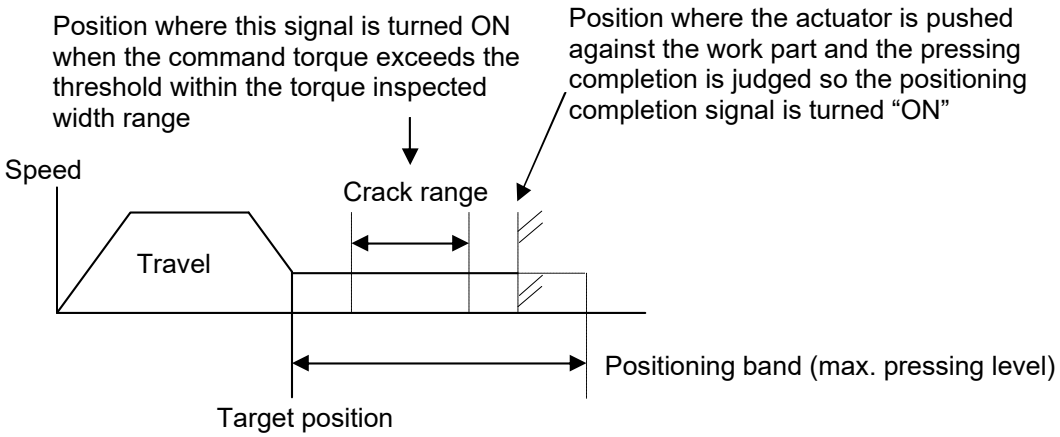
This signal is turned “ON” during the pressing operation.



This signal is turned “OFF” when the pressing and a miss signal or the next movement command signal is output, or the servo-motor is turned “OFF”.
Refer to [Item 2.8.2 Operation in Half direct value mode in 2.8 Operation] for the setting timing for this signal

(26) Load output judgment (LOAD) PLC input signal Dedicated PCON function

This signal is available only in the pressing operation.
When this signal is used for pressing-in purpose, it should be known if the set load threshold is reached during the pressing operation.
The load threshold and check range are set by the PLC and the LOAD signal will turn ON when the command torque (motor current) exceeds the threshold inside the check range.
This signal judges the load output based on the fact that the command torque exceeds the threshold for the specified time period.
This processing procedure is the same as for the pressing judgment. The judgment time period can be changed freely using the parameter No. 50 “Load Output Judgment Time Period”.
This signal is continued until the next movement command is received.

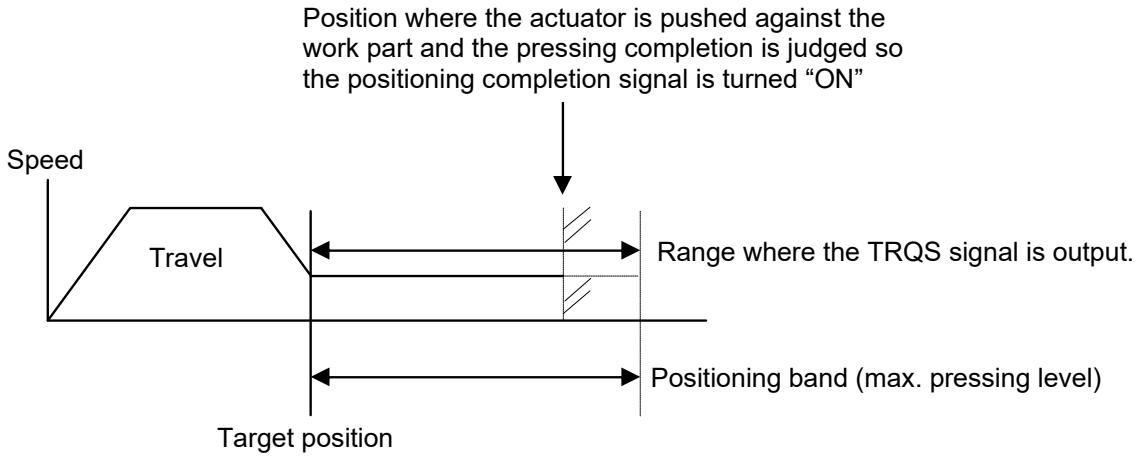


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the parameter No. 51 “Torque Inspected Range” to “0” (enabled).
- Set the threshold inspected width using the PLC's Zone Boundary + Register or Zone Boundary - Register.
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the operation manual for the controller main body] for more information.

⚠ Caution:
- If the actuator pushes against the work part before the target position, it is regarded as a servo-motor error.
  Take care of the positional relationship between the target position and the work part position.
- The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
  It is not the stop condition, so take the greatest care to deal with it.

(27) Torque level (TRQS) PLC input signal Dedicated PCON function

This signal is available only in the pressing operation.
When the motor current reaches the load threshold during the pressing operation (moving up to the positioning band), this signal is turned “ON”.
Because the current level is monitored, when the current level is changed, this signal is turned “ON” or "OFF.”
The speed available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the parameter No. 51 “Torque Inspected Range” to “1” (disable).
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the operation manual for the controller main body] for more information.

⚠ Caution:
- If the actuator pushes against the work part before the target position, it is regarded as a servo-motor error.
  Take care of the positional relationship between the target position and the work part position.
- The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
  It is not the stop condition, so take the greatest care to deal with it.

(28) Stopping control mode (SMOD) PLC output signal Dedicated PCON function

One of the pulse motor general characteristics is that that the holding current in the stop mode is larger than that for the AC servo-motor. Because of this, when the stop time is longer at the standby position, the measure to reduce the power consumption at the stop mode is taken as one of the energy saving measures.
SMOD=ON: Full Servo Control System is used in the standby condition.
SMOD=OFF: Standby condition

- Full-servo control mode
  By means of servo control of the pulse motor, the holding current can be reduced.
  The reduction level varies depending on the actuator type or load conditions. However, generally, the holding current will be 1/2 to 1/4.
  The actual holding current can be confirmed in the current monitor window in the IA-OS or RC/EC PC Software.
  (Note) Under the condition where any external force is given or depending on the stop position, slight vibration or abnormal noise might be caused.

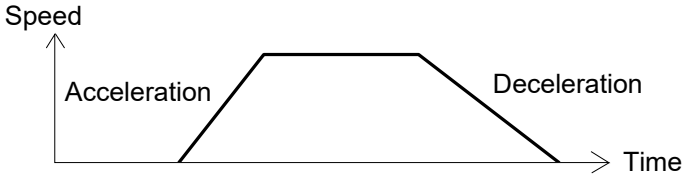
Before implementing this feature, take care to investigate its effects on the whole system in a controlled manner.

(29) Acceleration/deceleration mode (MOD1、MOD0) PLC output signal Dedicated ACON function

This signal is used to select the acceleration/deceleration pattern characteristics. Select one of them before the actuator movement command.

MOD1	MOD0	Pattern name	Remarks
OFF	OFF	Trapezoid pattern	Factory setting
OFF	ON	S-shaped motion	
ON	OFF	First-order lag filter	
ON	ON	Unavailable	

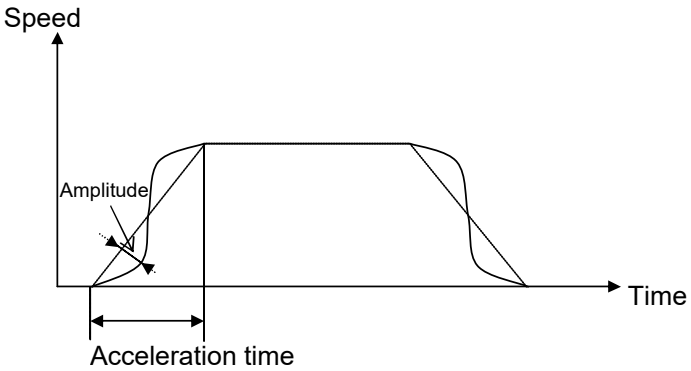
Trapezoid pattern



* The Acceleration and Deceleration are set in the “Acceleration” and “Deceleration” data boxes on the position data.

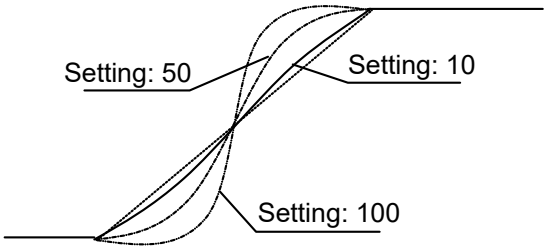
S-shaped motion

When the value in the “Acceleration/deceleration mode” field in the position table is set to 1 (S-shaped motion), the S-shaped motion degree is defined by parameter No. 56.
The setting unit is % and the setting range is from “0" to “100.”
This is set to 0% (S-shaped motion disabled) in the factory setting.



An S-shaped motion becomes a sine waveform after one cycle of the acceleration time.
Specify the degree of amplitude by parameter No. 56.

Parameter No. 56 setting [%]	Degree of amplitude
0 [Factory setting]	S-shaped motion disabled (Dashed line in the figure below)
100	Sine waveform amplitude x 1 (Chain double-dotted line in the figure below)
50	Sine waveform amplitude x 0.5 (Chain single-dotted line in the figure below)
10	Sine waveform amplitude x 0.1 (Solid line in the figure below)



⚠ Caution: [1] Even if a position command or direct value command with S-shaped motion setting is issued when the actuator is running, S-shaped motion control will not be executed. Issue these commands when the actuator is stopped.

[2] When the index mode is set on the rotary actuator, S-shaped motion is not executed, and, instead, trapezoid control will be executed.

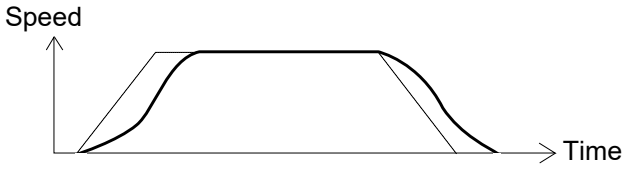
[3] Set the acceleration/deceleration speed so that the time for each will be within two seconds.

[4] An input to pause is not allowed during acceleration or deceleration. It may cause an excessive change in speed.

[5] If a large value is set, the speed will accelerate significantly at around the mid-point of the acceleration/deceleration time. Do not exceed the rated acceleration/deceleration time of the actuator.

First-order lag filter

This describes a much gentler acceleration/deceleration curve than that for the linear acceleration/deceleration (trapezoid pattern).
Use it when it is not desired to give any slight vibration to the work part in acceleration/deceleration operation.

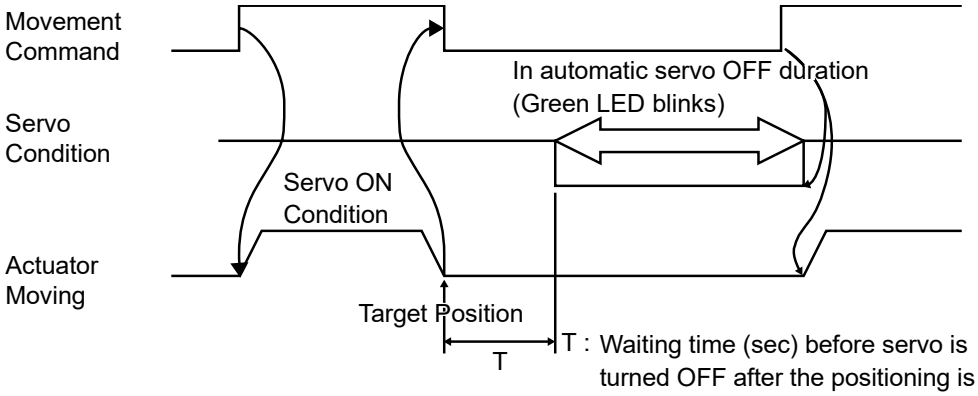


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1ms and setting range is from “0.0” to “100.0”.
When it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

(30) Stop Mode Selection (ASO1, ASO0) PLC Output Signal

Select the stop mode for the duration before the movement to the next position after a positioning is completed.
If the duration for a stop is long, the system automatically turns the servo OFF to reduce the power consumption.
Refer to [the operation manual for the controller main body] for more information.

ASO1	ASO0	Functions	Reference
OFF	OFF	Disabled	(Factory setting)
OFF	ON	Automatic Servo OFF Method Parameter No. 36 is valid for T	
ON	OFF	Automatic Servo OFF Method Parameter No. 37 is valid for T	
ON	ON	Automatic Servo OFF Method Parameter No. 38 is valid for T	



2.7 I/O Signal Timings

Turn any control signal on in order to operate ROBO Cylinder with a sequence program in PLC, the response (status) signal for that would be returned to the PLC. The maximum respond time should be expressed with the formula below.

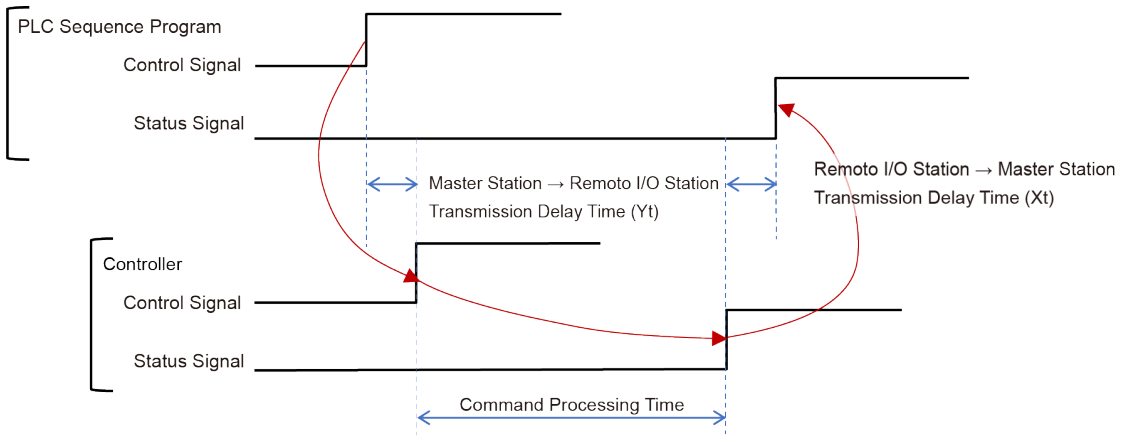
Max. Response Time [ms] = Yt + Xt + 2 + Command Processing Time (Operation Time, etc.)

Yt: Master Station → Remote I/O Station Transmission Delay Time

Xt: Remote I/O Station → Master Station Transmission Delay Time

} Field Network Transmission Delay Time

For the Master Station to Remote I/O Station Transmission Delay Time (Yt) and the Remote I/O Station to Master Station Transmission Delay Time (Xt), refer to [the instruction manuals for the EtherNet/IP Master Unit and mounted PLC].



2.8 Operation

The timings for the basic operation examples in the Position/Simplified Direct Value Mode, Half direct value mode and Full direct value mode, are described.
For the Remote I/O mode and Remote I/O mode 2, refer to [the controller's operational manual].
(In remote I/O mode 2, read the current position and current speed from the respective byte of the PLC, as deemed appropriate.)

2.8.1 Operation in the Position/Simplified Direct Value Mode

It is operated with the position data written in the PLC's register and the speed, acceleration /deceleration, positioning band and pressing current-limiting value, etc. set using the position table.

[1] Operation Example (General Positioning Operation)

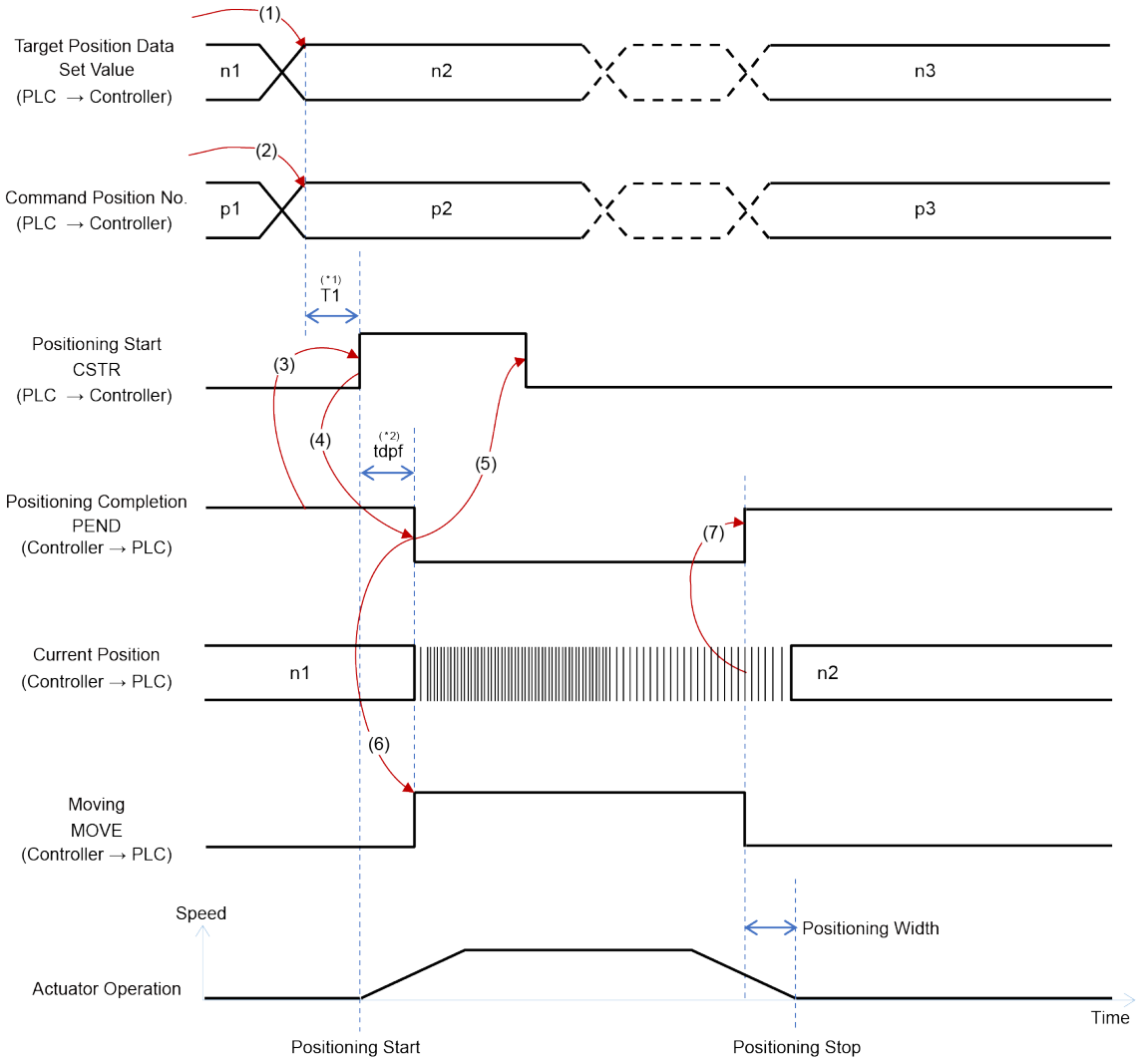
(Preparation) Set the position data items (speed, acceleration/deceleration, positioning width, etc) except for the target position item, in the position table.
Turn ON the Position/Simplified Direct Value Change-Over Signal (PMOD).

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
* The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned "ON", the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned "OFF".
(6) At the same time when the PEND signal is turned "OFF", the MOVE signal is turned "ON".
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(7) The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning width set in the position data, and the CSTR signal is turned "OFF", the PEND signal is turned "ON". (Note 1)
The complete position number should get output to the complete position number register at the same time.

Note 1 PEND Signal would not turn on while CSTR Signal is on.
When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.
(*) The target position data can be changed during the actuator movement.
In order to change the target position, change the target data and turn ON the CSTR signal after the time longer than the PLC scanning time has passed.
Change the value for the CSTR signal after the time longer than the PLC scanning time has passed.

Operation in the Position/Simplified Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

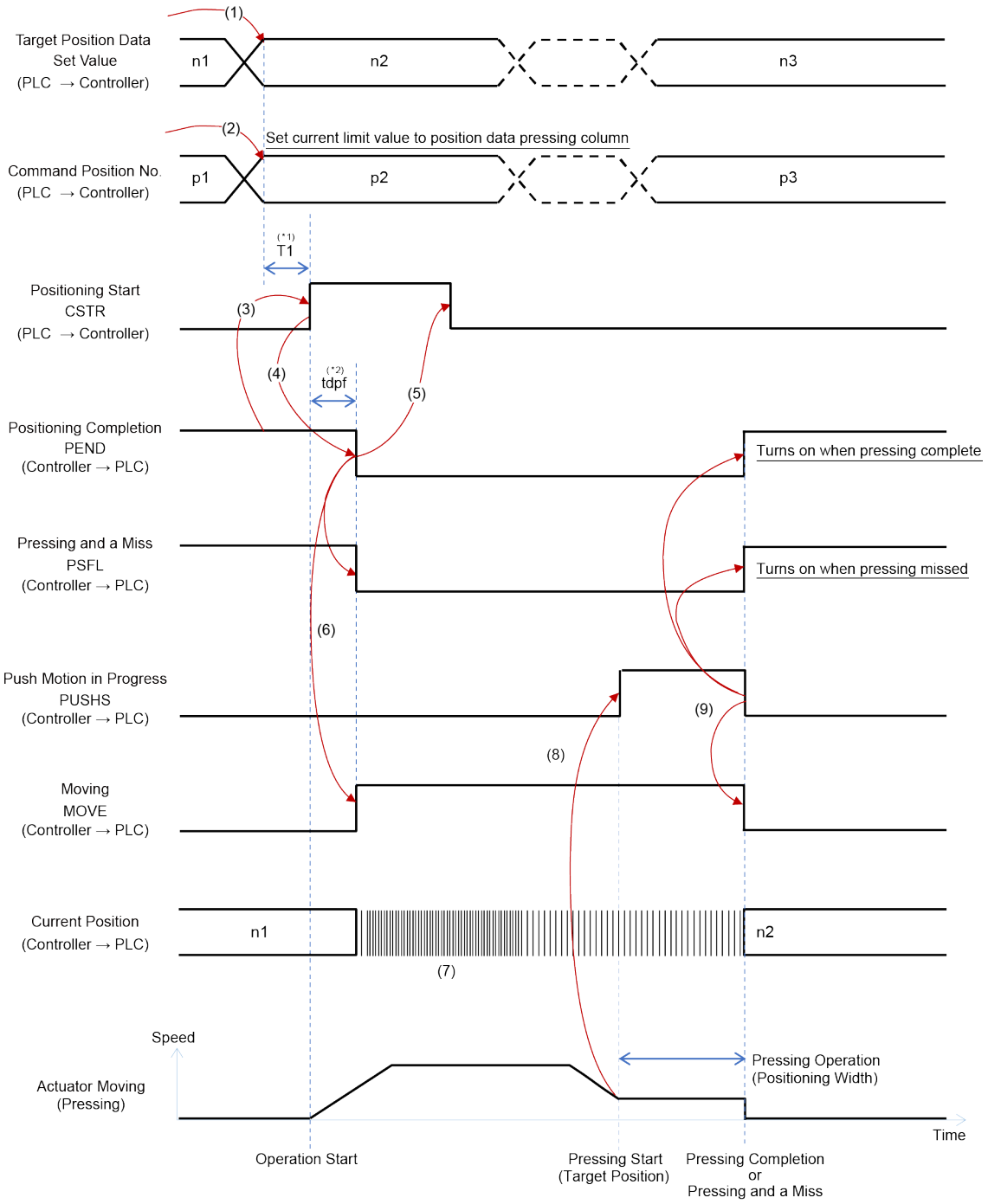
For the pressing operation, the current limit value is set in the pressing data box on the position data at the preparation stage.

When the positioning is performed onto the position No. for which the value is set in the pressing data box, the pressing operation is performed.

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
 * The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned “OFF”.
(6) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
 * Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(7) The current position data is continuously updated.
(8) Once it reaches the target position, PUSHS Signal turns on as well as the pressing operation starts.
(9) Once the pressing operation completes, PUSHS Signal and MOVE Signal should turn off.
 If the pressing operation completes in the normal condition, PEND Signal should turn on when CSTR signal is off and the complete position number should get output to the complete position number register.
 When the pressing operation is missed, PSFL Signal should turn on, and the complete position number should get output the complete position number register.
 (Note) PEND Signal would not turn on while CSTR Signal is on.
 When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.

Operation in the Position/Simplified Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

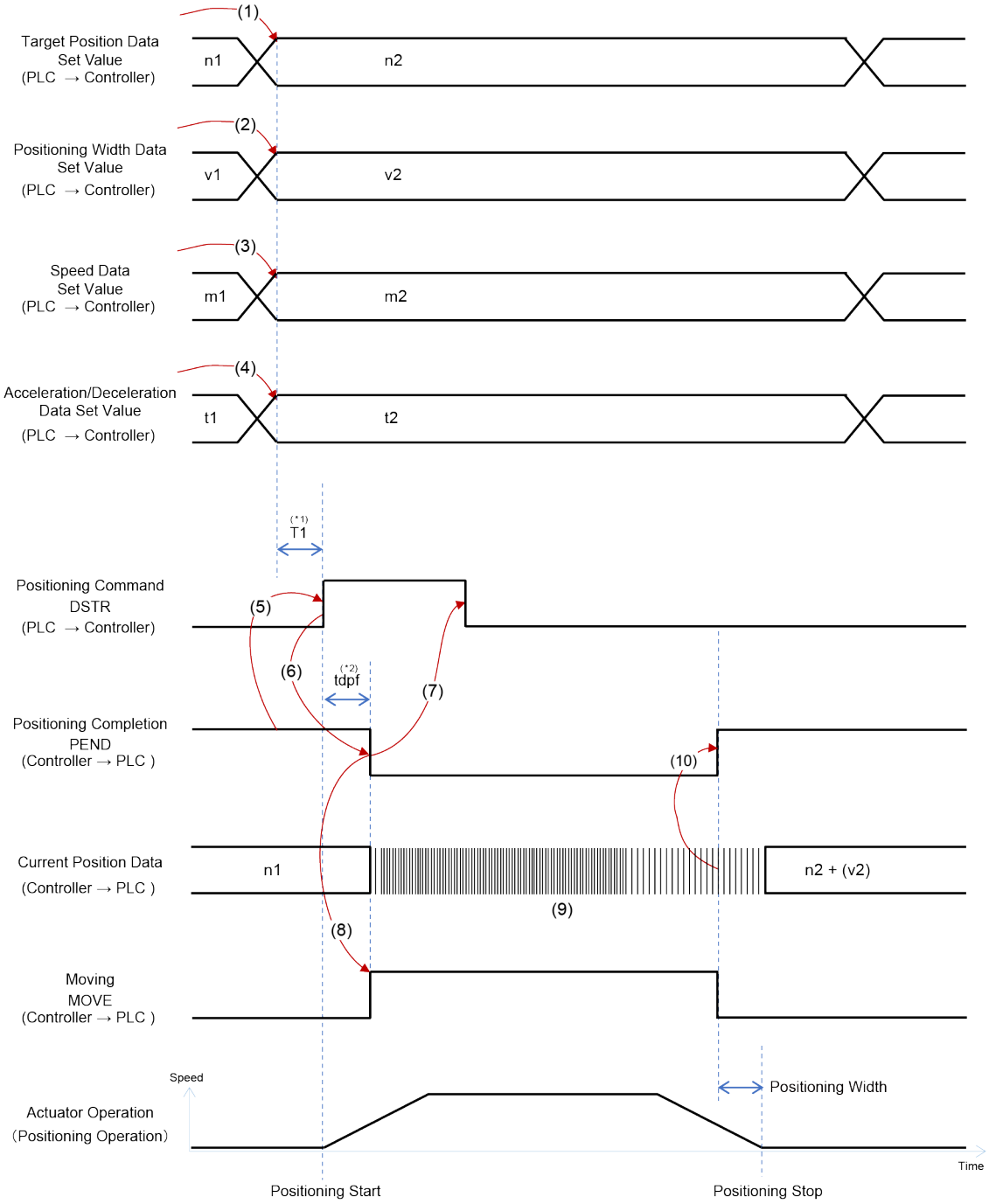
2.8.2 Operation in the Half Direct Value Mode

It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current-limiting setup register.

[1] Operation Example (General Positioning Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (4) are read in the controller at the startup (ON edge) of the DSTR signal.
(6) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(7) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(8) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(9) The current position data is continuously updated.
(10) PEND Signal should turn on when remaining movement amount gets into the range of the positioning band set in the position data while DSTR Signal is off.

Operation in the Half Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

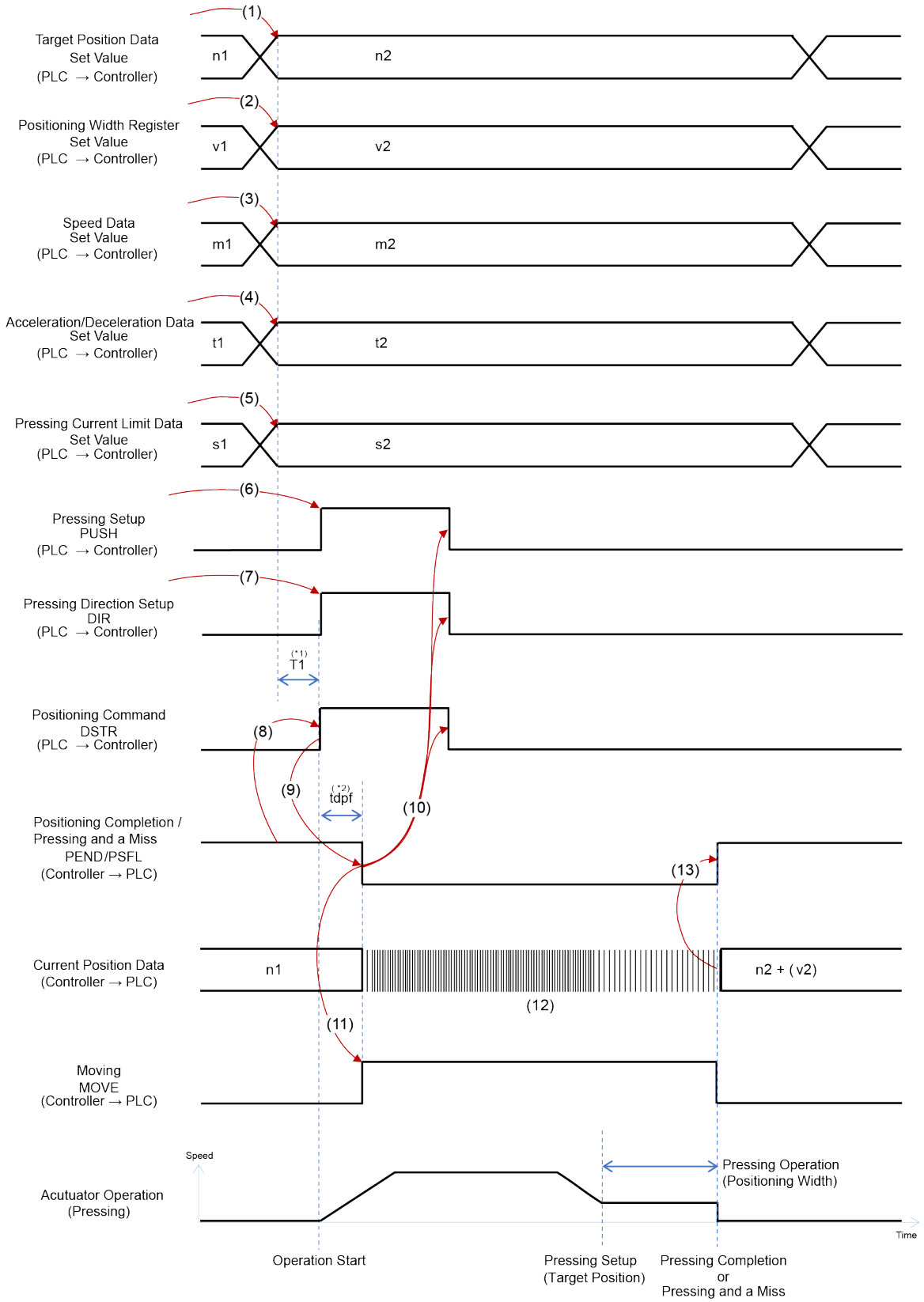
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Set the pressing current limit data in the pressing current limit value register.
(6) Turn “ON” the pressing setup (PUSH) signal.
(7) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [2.6.7 (22)]
(8) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (7) are read in the controller at the startup (ON edge) of the DSTR signal.
(9) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(10) Confirm that PEND Signal is turned off, and then turn off DSTR Signal, PUSH Signal and DIR Signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(11) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(12) The current position data is continuously updated.
(13) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (5), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (5), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Half Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

2.8.3 Operation in the Full Direct Value Mode

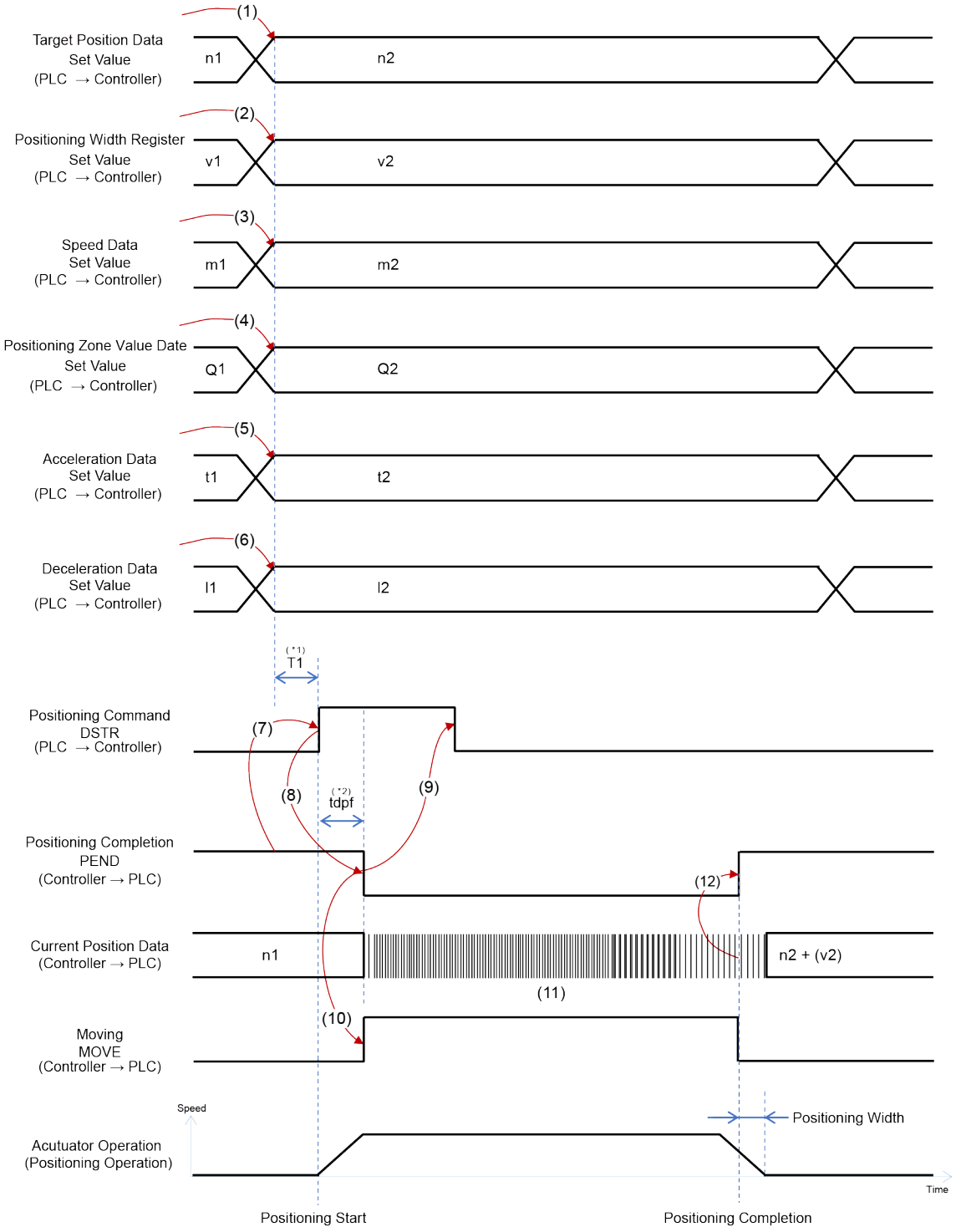
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

[1] Operation Example (General Positioning Operation)

When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register and zone value - register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
    * The data items set in Steps (1) through (6) are read in the controller at the startup (ON edge) of the DSTR signal.
(8) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(9) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
    * Do not change any value in each data until the DSTR signal has been turned “OFF”.
(10) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
    * However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(11) The current position data is continuously updated.
(12) When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

Operation in the Full Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

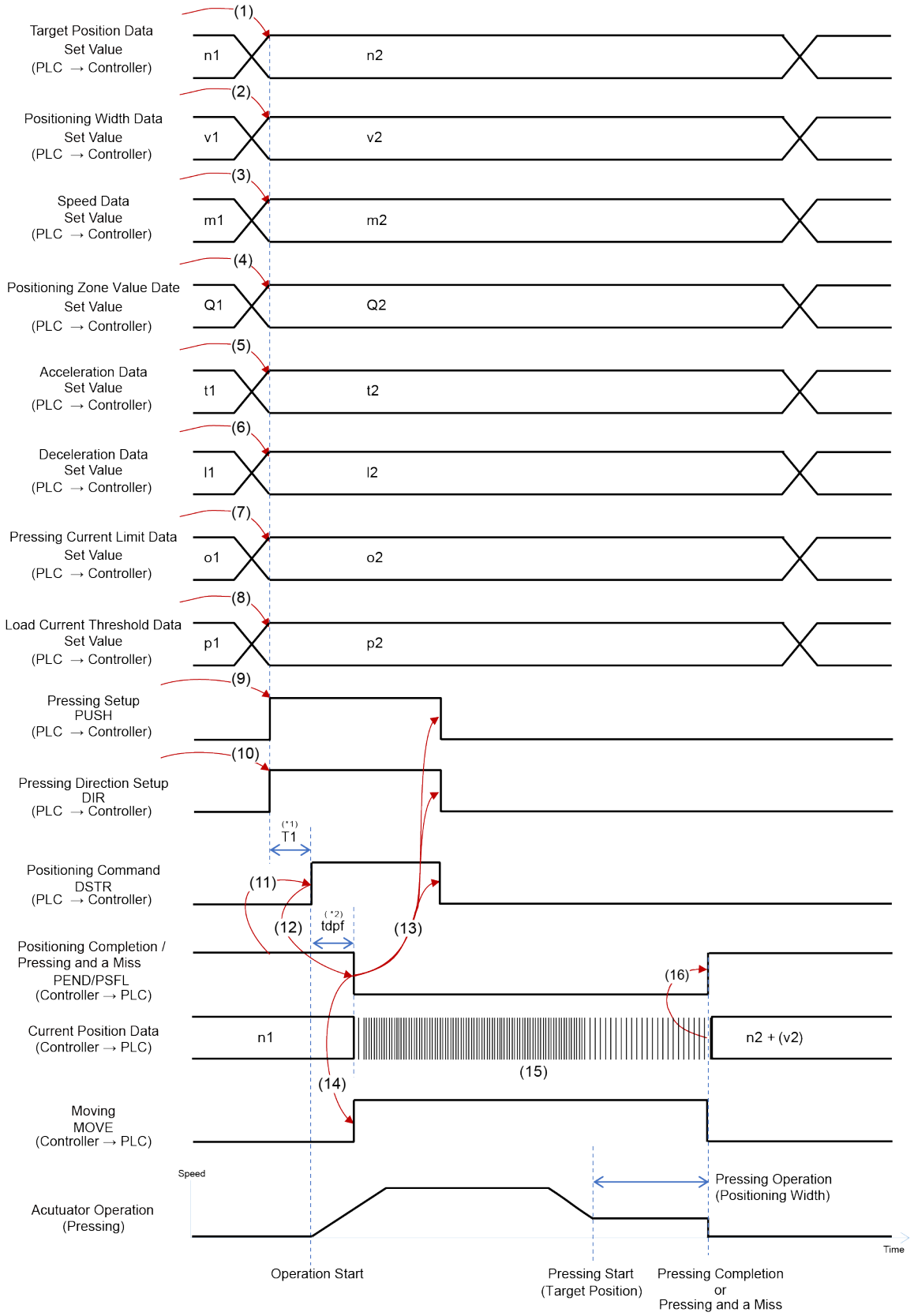
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register or zone value -register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Set the pressing current limit data in the pressing current limit value register.
(8) Set the load current threshold data in the load current threshold setup register.
(9) Turn “ON” the pressing setup (PUSH) signal.
(10) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [2.6.7 (22)]
(11) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (10) are read in the controller at the startup (ON edge) of the DSTR signal.
(12) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(13) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(14) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(15) The current position data is continuously updated.
(16) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (7), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (7), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON” In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Full Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

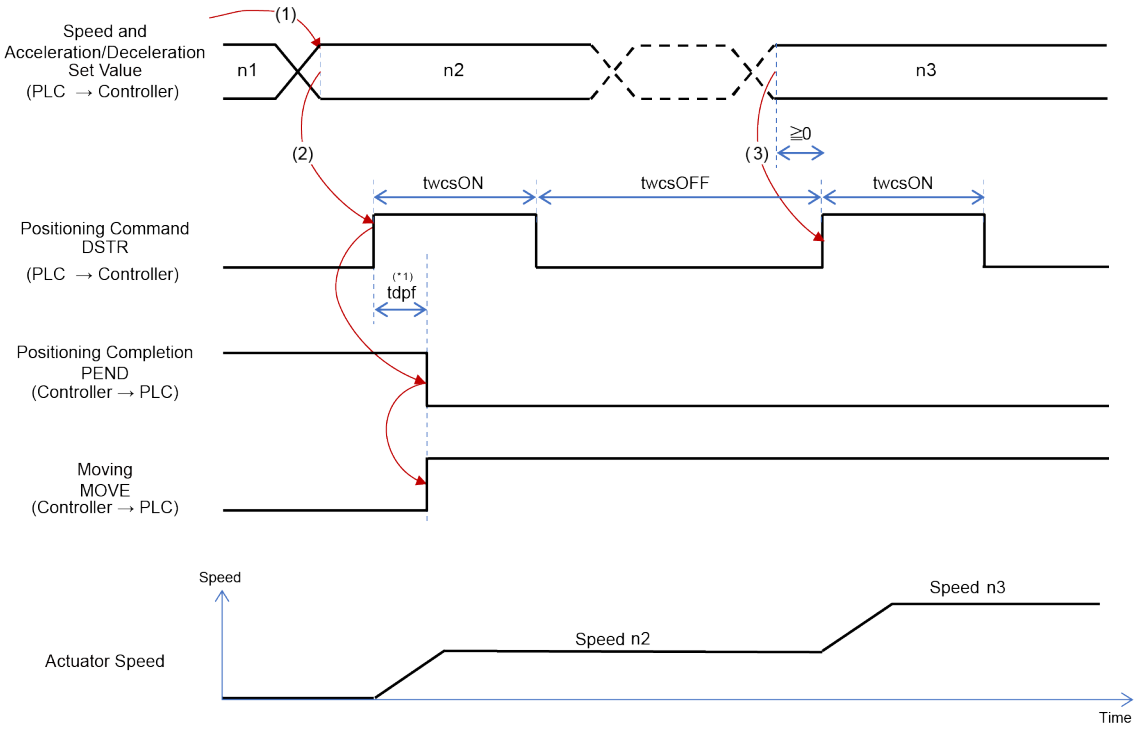
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

2.8.4 Data Change During Movement

The half direct mode and full direct mode are capable of changing the settings for the output data registers (target position data, acceleration/deceleration data, velocity data, positioning band and current limit during pressing) during operation.

Shown in the figure below is an example of changing the velocity and acceleration/deceleration.

(1) Set the velocity data and acceleration/deceleration data.
(2) After a change is made to the data, set the positioning command (DSTR) on for more than tdpf.
(3) Leave time for more than twcsON + twcsOFF before turning the next DSTR on after setting DSTR off.



twcsON ≥ Yt＋xt＋3 (ms)
twcsOFF ≥ Yt＋xt＋3 (ms)
*Yt＋xt ≤ tdpf ≤ Yt＋xt＋3 (ms)

⚠ Caution
1. When the speed has not been set or it is set to “0”, the actuator is not moved, but an alarm is not issued.
2. When the speed setting is changed to “0” during the movement, the actuator is decelerated and stopped, but an alarm is not issued.
3. Even when the acceleration/deceleration data only is changed during the movement, the setting of the target position data is required.
4. Even when the target position data only is changed during the movement, the setting of the acceleration/deceleration data is required.

2.9 EtherNet/IP Related Parameters

Parameters relating to EtherNet/IP are No. 84, No. 86 to 87, No. 90 and No. 140 to 142.

Category: C: External interface parameter

No.	Category	Name	Default value set in the factory before delivery
1 to 83		Refer to [operation manual for the controller] for the parameters No. 1 through No. 83.	
84	C	Field bus operation mode	0
86	C	Field bus baud rate	0
87	C	Network type	7
90	C	Field I/O format	3
140	C	IP address	192.168.0.1
141	C	Subnet mask	255.255.255.0
142	C	Default gateway	0.0.0.0

- Field bus operation mode (No.84)
  Specify the operation mode in parameter No. 84 using a value between 0 and 4.

Value set in parameter No. 84	Mode	Number of occupied bytes	Contents
0 (Factory setting)	Remote I/O mode	2	Operation using PIOs (24 V I/Os) is performed via EtherNet/IP.
1	Position/simple direct mode	8	The target position can be set directly using the value or the operation can be performed using position data value. The other values required for the operation are set on the position data.
2	Half direct value mode	16	In addition to the target position, the speed, acceleration/deceleration and pressing current value are set directly using the values to perform the operation.
3	Full direct value mode	32	All the values related to the position control are set using the values to perform the operation.
4	Remote I/O mode 2	12	The current position and current speed reading functions are added to the functions in the remote I/O mode.

- Fieldbus baud rate (No. 86)
  Specify the baud rate in parameter No. 86.

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

- Network type (No.87)
  The network module type is set for the parameter No. 87. Do not change the default value.

- Field I/O format (No.90)
  By changing the setting of parameter No. 90, data elements can be swapped within a boundary of two words or less in units of bytes during communication using the I/O areas of the PLC.

Value set in parameter No. 90	Contents
0	Data exchange is not performed. The data is sent directly to the PLC. Refer to [the Example i].
1	The host bytes are exchanged with slave bytes in the host words and slave words. Refer to [the Example ii].
2	In the case of word register, the host words are exchanged with the slave words. Refer to [the Example iii].
3 (Factory setting)	The host bytes are exchanged with slave bytes in the host words and slave words. In addition, the upper word and lower word are swapped for word resisters. Refer to [the Example iv].

(Example i) Set value = “0”

● indicates ON, while ○ indicates OFF

ACON, PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇧

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

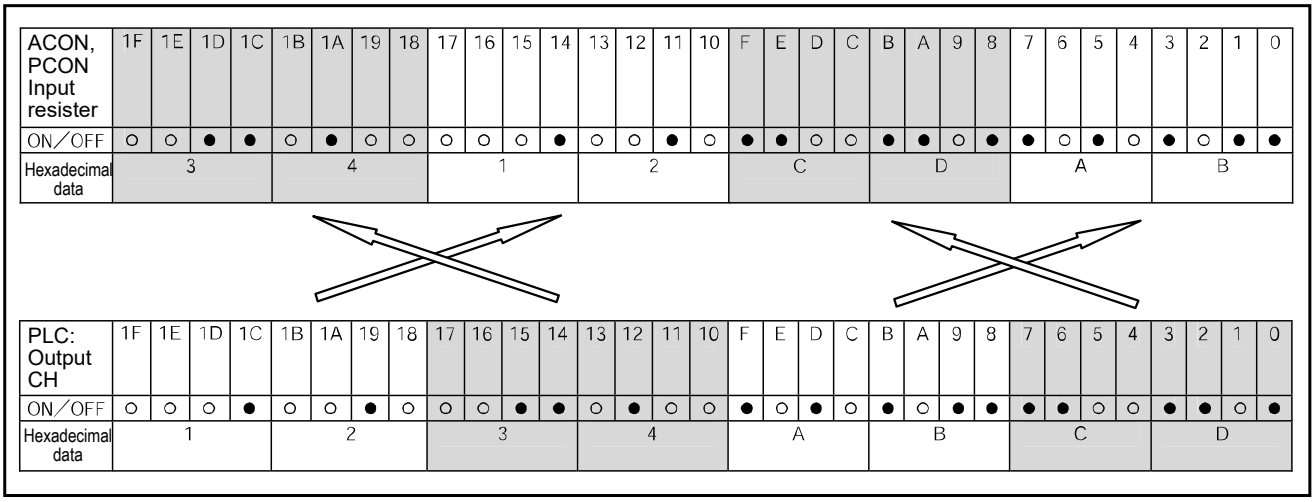
ACON, PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

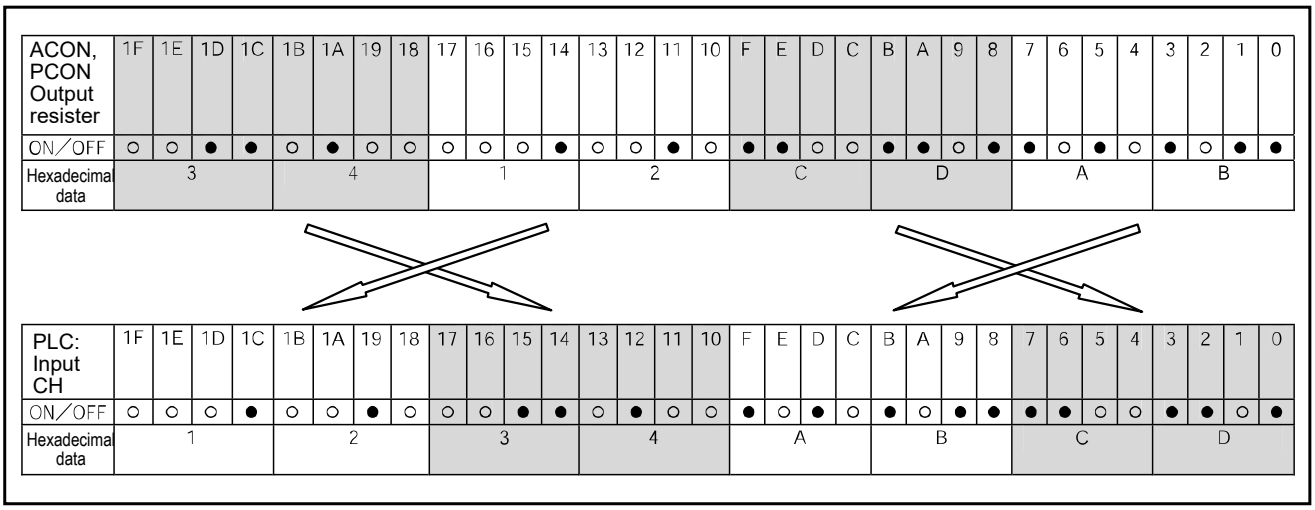
⇩

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example ii) Set value = “1”

● indicates ON, while ○ indicates OFF





(Example iii) Set value = “2”

● indicates ON, while ○ indicates OFF

ACON, PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

ACON, PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example iv) Set value = “3”

● indicates ON, while ○ indicates OFF

ACON, PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

ACON, PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

- IP address (No. 140)
  Specify the IP address in parameter No. 140.

  Setting range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.1)
  (Note) When this parameter is set to 0.0.0.0, DHCP is enabled. Manual setting is recommended.

- Subnet mask (No. 141)
  Specify the subnet mask in parameter No. 141.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 255.255.255.0)

- Default gateway (No. 142)
  Specify the default gateway in parameter No. 142.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 0.0.0.0)

2.10 Troubleshooting

- Alarm messages and causes/actions
  When an alarm occurs, a corresponding simple alarm code is indicated by the completed position number bits (four bits of PM1 to PM8) in remote I/O mode 1, 2 or 3.
  In position/simple direct mode 1 or 2, this simple alarm code is output to the (n+4, n+5) bytes.
  In half direct mode 1, 2 or 3 or in the full direct mode, this alarm code is output to the (n+12, n+13) bytes
  [1] Check the alarm code using the monitor function of the PLC, etc., or connect the teaching tool and check the status monitor screen.
  [2] Search the alarm list in the operation manual for your controller to find the section corresponding to the identified alarm code.
  [3] Take an appropriate action according to the explanation of the alarm code.
  For the alarm codes listed below, take the corresponding actions:

Code	Error name	ID (*1)	Alarm reset	Cause/action
0F2	Fieldbus module error	05	Cannot	Cause: A fieldbus module error has been detected. Action: Check the applicable parameters.
0F3	Fieldbus module non-detection error	04	Cannot	Cause: The module could not be detected. Action: Reconnect the power. If the problem persists, please contact IAI.

(*1) ID → Simple alarm code

3. ACON-CA/CB/CGB, PCON-CA/CB/CFA/CFB/CGB/CGFB/CBP/CGBP, DCON-CA/CB/CGB

3.1 Operation Modes and Functions

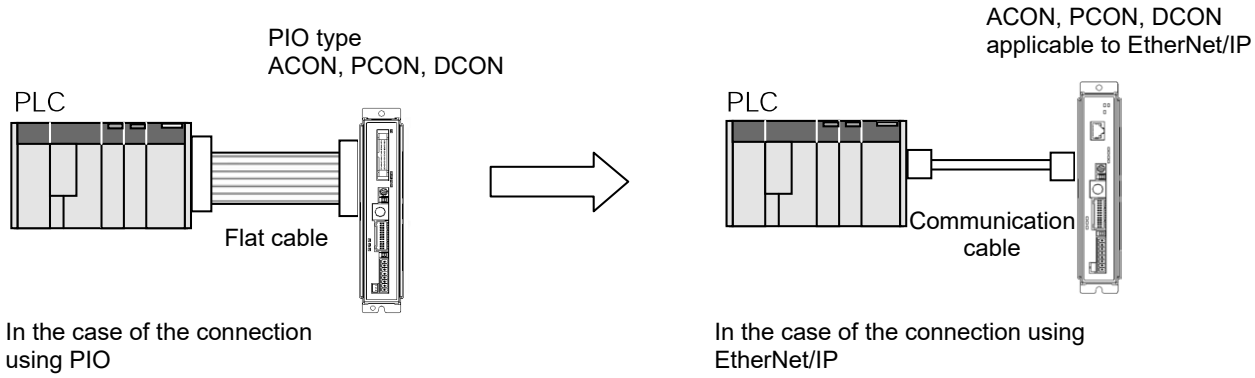
ACON, PCON and DCON controllers (hereinafter referred to as “IAI controllers”) equipped with EtherNet/IP can be operated in the following eight (PCON-CB/CFB/CGB/CGFB/CBP/CGBP is nine) operational modes:

Operation Modes and Main Functions

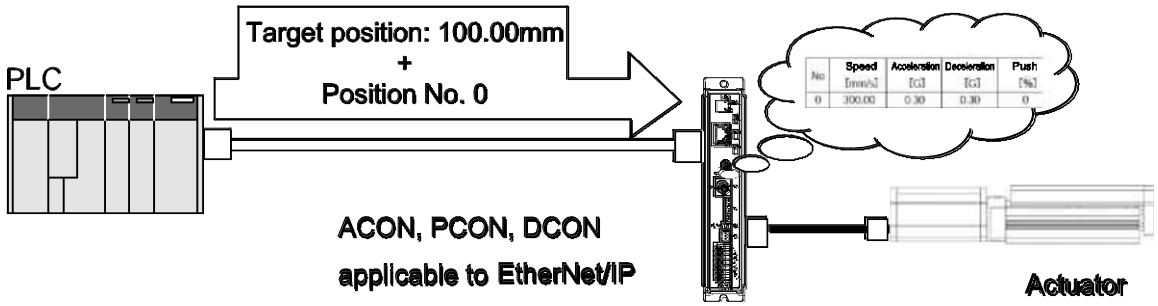
Main functions	Remote I/O mode	Position/ Simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2	Position/ Simplified direct value mode 2	Half direct value mode 2	Remote I/O mode 3	Full direct value mode 2 (*4)
Number of occupied bytes	2	8	16	32	12	8	16	12	32
Position data setup operation	X	○ (*1)	○	○	X	○ (*1)	○	X	○
Speed and acceleration direct setup	X	X	○	○	X	X	○	X	○
Pressing operation	○	○	○	○	○	○	○	○	○
Current position read	X	○	○	○	○	○	○	○	○
Current speed read	X	X	○	○	X	X	○	X	○
Operation with the position No. specified	○	○	X	X	○	○	X	○	X
Completion position No. read	○	○	X	X	○	○	X	○	X
No. of max. position tables	512	768	Unused	Unused	512	768	Unused	512	Unused
Force control (*2)	△ (*3)	X	X	○	△ (*3)	○	○	△ (*3)	○

(*1) For the position data items except for position data, operate the system with the position No. set up.
(*2) Force Control is a feature available only for PCON-CBP/CGBP types.
(*3) It is available when the PIO pattern setting is established at 6 or 7 in PCON-CBP/CGBP types.
(*4) It can be used only in PCON-CB/CFB/CGB/CGFB/CBP/CGBP.
Applicable Controller Versions: V0013 or later.
(*) Position/Simple Direct Mode 2, Half Direct Mode 2 and Remote I/O Mode 3 are available only for PCON-CBP/CGBP types.

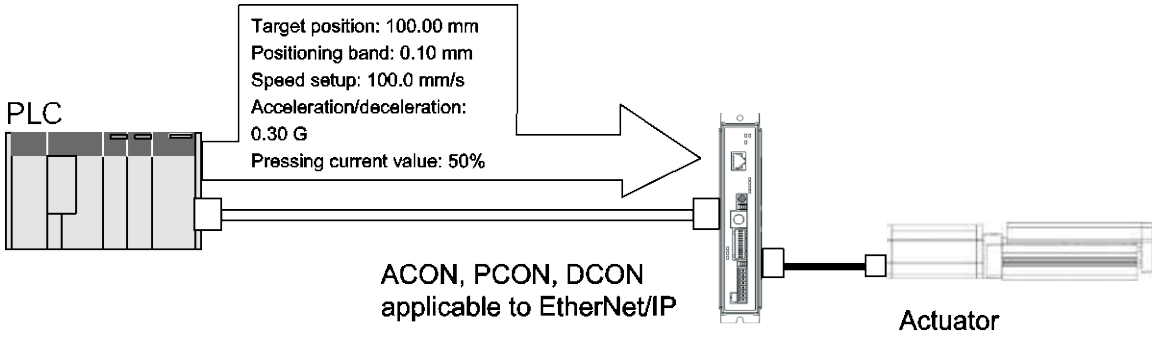
[1] Remote I/O mode: In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Number of occupied bytes: 2 bytes



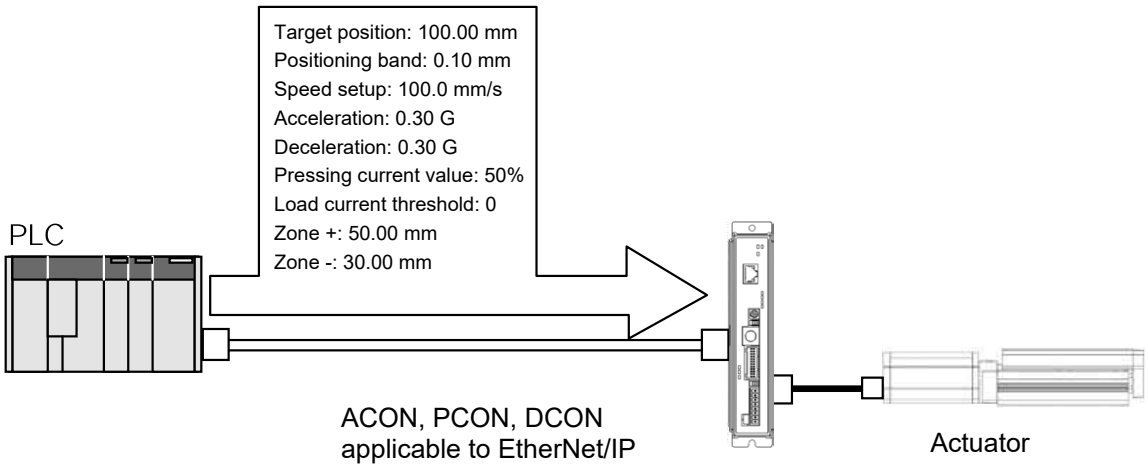
[2] Position/simplified direct value mode:
In this operation mode, EtherNet/IP communication is used to select and command movements that have been predefined in the controller's position data table. Alternatively, this mode also allows the target position to be established directly.
For "Speed", "Acceleration/Deceleration" and "Positioning Band", use the values already registered on the position data. The settable No. of position data items is max 768 points.
Number of occupied bytes: 8 bytes



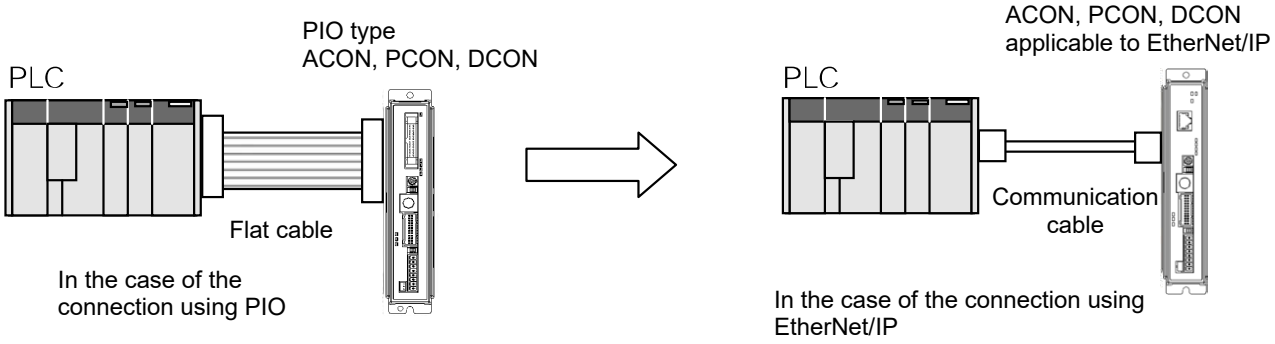
[3] Half direct value mode: In this operation mode, "Speed", "Acceleration/Deceleration," and "Pressing Current Values," are directly established along with the "Target Position."
Number of occupied bytes: 16 bytes



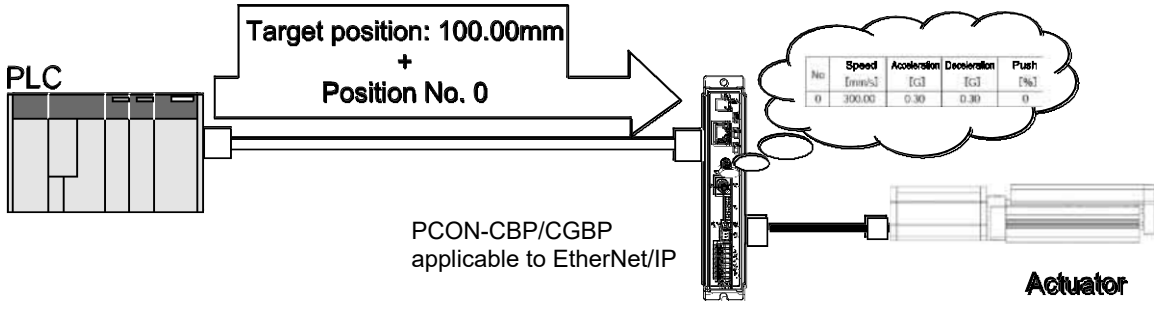
[4] Full direct value mode: In this operation mode, all values regarding position control (“Target Position,” "Speed” and "Acceleration/Deceleration,” etc.) are directly established.
Number of occupied bytes: 32 bytes



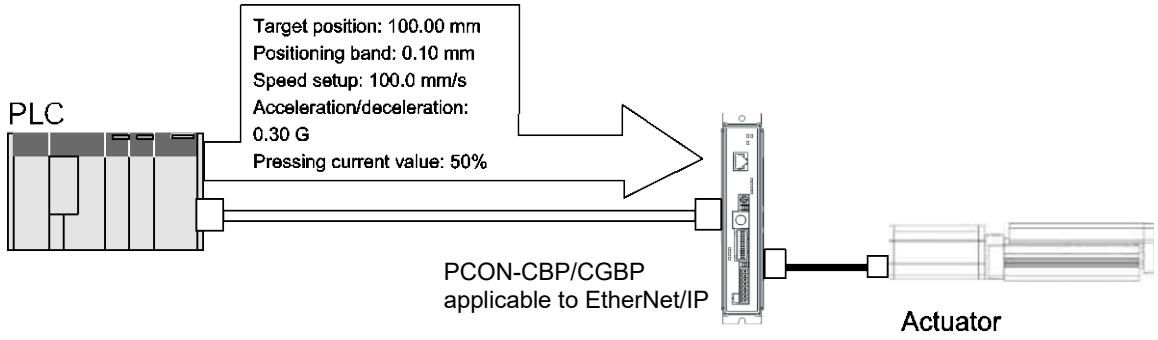
[5] Remote I/O mode 2: In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O). The use of this mode expands the functionality of “Remote I/O Mode” to include position and command current feedback.
Number of occupied bytes: 12 bytes



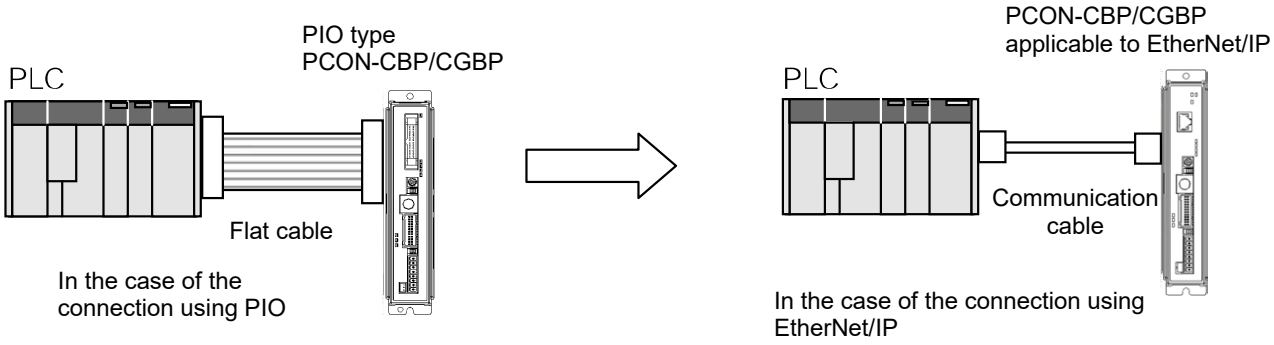
[6] Position/simplified direct value mode2: In this mode, the actuator is operated by specifying position numbers.
(Applicable only for PCON-CBP)
In this mode, the force control function is available instead of the teaching function and zone function available in mode [2].
Number of occupied bytes: 8 bytes



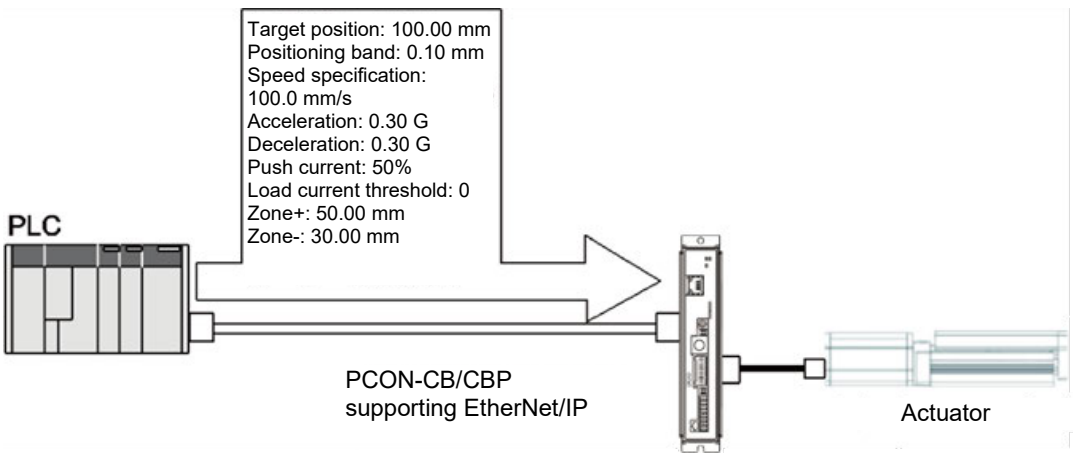
[7] Half direct value mode 2 (Applicable only for PCON-CBP) : In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and pressing current, in addition to the target position, directly as values.
Unlike in mode [3], command current cannot be read in this mode. However, load cell data can be read instead. This mode also supports force control.
Number of occupied bytes: 16 bytes



[8] Remote I/O mode 3 (Applicable only for PCON-CBP) : In this mode, the actuator is operated by PROFINET IO instead of PIO (24V I/O).
Unlike in mode [5], command current cannot be read in this mode. However, load cell data can be read instead. This mode also supports force control.
Number of occupied bytes: 12 bytes



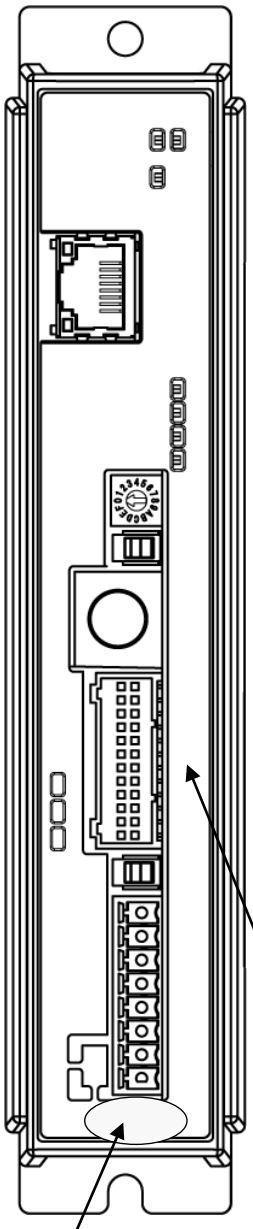
[9] Full direct value mode2 : In this operation mode, all values regarding position control (“Target position,” "Speed” and "Acceleration/Deceleration,” etc.) are directly stablished. A current command and the overload level can be monitored.
Number of occupied bytes:
32 bytes (PCON-CB/CFB/CGB/CGFB/CBP/CGBP only)



3.2 Model Numbers

The Model numbers of IAI controllers applicable to EtherNet/IP are described as follows.

- ACON-CA/CB-☐-EP-☐
- PCON-CA/CB/CGB/CBP/CGBP-☐-EP-☐
- PCON-CFA/CFB/CGFB-☐-EP-☐
- DCON-CA/CB-☐-EP-☐



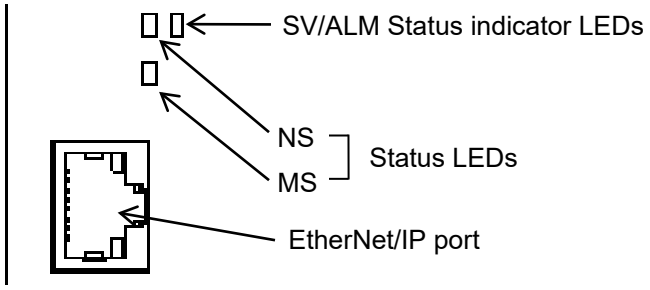
Printed series name
- ACON
- PCON
- DCON

Front panel color
- ACON-CA/CB : Dark blue
- PCON-CA/CB/CGB/CBP/CGBP : Dark green
- PCON-CFA/CFB/CGFB : Light green
- DCON-CA/CB : Dark orange

3.3 EtherNet/IP Interface

3.3.1 Names of the Parts

The names of each section related to EtherNet/IP are described as follows.



3.3.2 Monitor LED Indications

The slave condition (each controller), as well as network condition, can be checked using the two LEDs, MS and NS, provided on the front panel of the controller.
The description of each is explained in the following table.

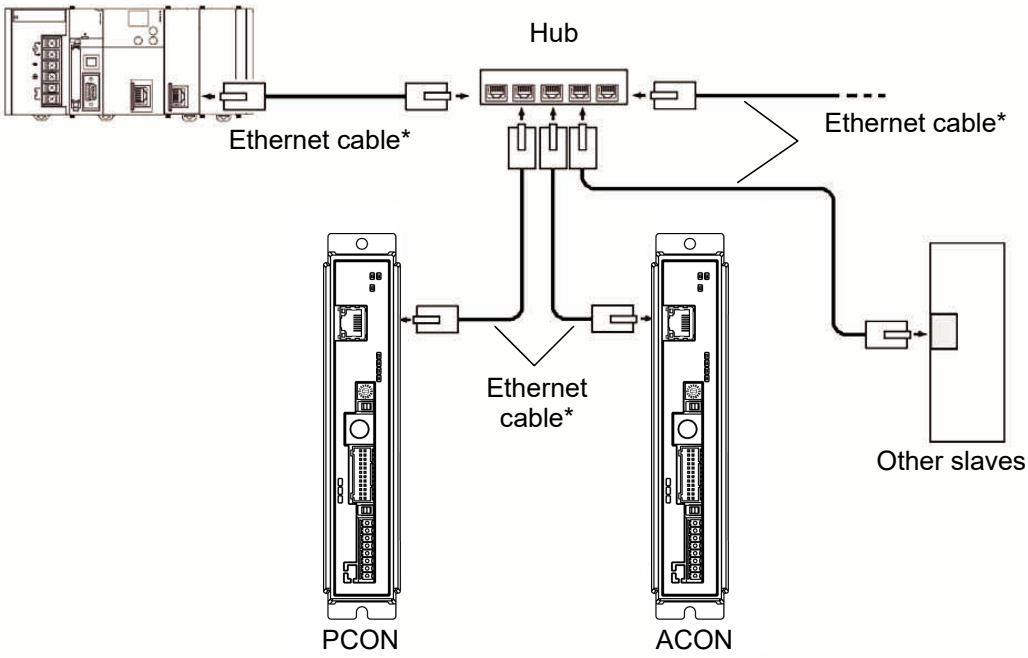
○ : Illuminating, ☆ : Flashing, × : OFF

Name	Color	Display	Explanation	
NS	-	×	The power is turned off or IP address is not yet set.	
	Green	○	Connection has been established and proper communication is in progress.	
	Green	☆	The system is online but connection is not yet established. Communication is stopped (the network is normal). Check the status of the master unit.	
	Red	○	A communication error is present. Communication cannot be established because an error, such as duplicate IP addresses, has been detected.	Check the IP address setting, wiring condition of the communication line, power supply for the hub, noise measures, etc.
	Red	☆	A communication error is present. (A communication timeout has been detected.)	
MS	-	×	The power is turned off.	
	Green	○	Operation is normal. The system is in the scanner (master) control mode.	
	Green	☆	Connection is not yet established with the scanner (master). Check the setting of configuration information. Check if the scanner (master) is idle.	
	Red	○	A hardware error is present. The board must be replaced. Please contact IAI.	
	Red	☆	A configuration error, invalid setting or other minor error is present. The problem can be resolved by, for example, setting the problem item or items again.	

3.4 Wiring Example

3.4.1 Connection Diagram

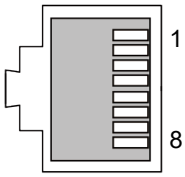
PLC (EtherNet/IP master unit)



* Ethernet cable: Straight cable of category 5 or above, 100 m max
(Aluminum tape and braided double-shielded cable are recommended.)

(Note) Terminal processing is not required.

3.4.2 Connector Pin Layout



RJ45 8-pin
modular connector
(Controller side)

Pin number	Signal name	Signal abbreviation
1	Data transmitted +	TD+
2	Data transmitted -	TD-
3	Data received +	RD+
4	Not used	
5	Not used	
6	Data received -	RD-
7	Not used	
8	Not used	
Connector hood	Grounding pin for security	FG

3.5 Setting

Using a teaching tool, set controller parameters. Set the mode toggle switch on the front panel of the controller to “MANU” side. Refer to [the instruction manual for each teaching tool] for the applicable version of the teaching tool that can be applied to EtherNet/IP.

3.5.1 Operation Mode Selecting

Set parameter No. 84 “Field bus operation mode.”
Refer to [3.9 EtherNet/IP Related Parameters].

Set value	Operation mode	Number of occupied bytes
0 (Factory setting)	Remote I/O mode	2
1	Position/simplified direct value mode	8
2	Half direct value mode	16
3	Full direct value mode	32
4	Remote I/O mode 2	12
5 (Note 1)	Position/simplified direct value mode 2	8
6 (Note 1)	Half direct value mode 2	16
7 (Note 1)	Remote I/O mode 3	12
9 (Note 2)	Full direct value mode 2	32

(Note) Entering any value except for the ones described above will cause an “Excessive Input Value Error”.
(Note 1) An alarm of a parameter data error should occur if a number from 5 to 7 is set in this parameter for controllers other than PCON-CBP/CGBP types.
(Note 2) An alarm of a parameter data error should occur if a number from 9 is set in this parameter for controllers other than PCON-CB/CFB/CGB/CGFB/CBP/CGBP types.
(Applicable Controller Versions: V0013 or later)

3.5.2 Setting the Baud Rate

Set parameter No. 86 “Fieldbus baud rate.”

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

3.5.3 Setting the IP Address

Set parameter No. 140 “IP address.”
Refer to [3.9 EtherNet/IP Related Parameters].

Settable Range:0.0.0.0 to 255.255.255.255 (It is set to “192.168.0.1” when the machine is delivered from the factory.)

(Note 1) Exercise caution to avoid IP address duplication.
For details, refer to [the operation manuals of the master unit and PLC in which in the master unit] is installed.
(Note 2) When this parameter is set to 0.0.0.0, DHCP (automatic assignment of IP address) is enabled.
Since this setting may result in the IP address being changed unintentionally, it is recommended that you set the address manually.

3.5.4 Setting the Subnet Mask

Set parameter No. 141 “Subnet mask.”
Set the same value you have set in the master unit and other slaves (on the same network).
Refer to [3.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 255.255.255.0.)

3.5.5 Setting the Default Gateway

If necessary, set parameter No. 142 “Default gateway.”
Refer to [3.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 0.0.0.0.)

(Note) After the parameter setting, turn on the power to the controller again and return the mode toggle switch on the front of the controller to “AUTO” side.
When the switch is set to “MANU”, the operation using PLC is not available.

3.6 Communicating with the Master Station

3.6.1 Operation Modes and Corresponding PLC I/O Areas

The addresses allocated for each operation mode are described as follows.

- PLC output → IAI controllers input (* “n” indicates the first address of each axis.)

PLC output area (bytes)	DI on the ACON, PCON, DCON side and input data register				
	Remote I/O mode	Position/simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Target position	Target position	Target position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Specified position number	Positioning band	Positioning band	
n+6, n+7		Control signal			
n+8, n+9			Speed	Speed setup	
n+10, n+11			Acceleration/ deceleration		
n+12, n+13			Pressing current-limiting value	Zone boundary+	
n+14, n+15			Control signal		
n+16, n+17				Zone boundary-	
n+18, n+19					
n+20, n+21				Acceleration	
n+22, n+23				Deceleration	
n+24, n+25				Pressing current-limiting value	
n+26, n+27				Load current threshold	
n+28, n+29				Control signal 1	
n+30, n+31				Control signal 2	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

- PLC output → IAI controllers input (* “n” indicates the first address of each axis.)

PLC output area (bytes)	DO on the ACON, PCON, DCON side and output data register			
	Position/simplified direct value mode 2	Half direct value mode 2	Remote I/O mode 3	Full direct value mode 2
	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 12	Number of occupied bytes: 32
n+0, n+1	Target position	Target position	Port No.0 to 15	Target position
n+2, n+3			Occupied area	
n+4, n+5	Specified position number	Positioning band		Positioning band
n+6, n+7	Control signal			
n+8, n+9		Speed		Speed setup
n+10, n+11		Acceleration/ deceleration		
n+12, n+13		Pressing current-limiting value		Zone boundary+
n+14, n+15		Control signal		
n+16, n+17				Zone boundary-
n+18, n+19				
n+20, n+21				Acceleration
n+22, n+23				Deceleration
n+24, n+25				Pressing current-limiting value
n+26, n+27				Load current threshold
n+28, n+29				Control signal 1
n+30, n+31				Control signal 2

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.
(Note) Position/Simple Direct Value Mode 2, Half Direct Value Mode 2 and Remote I/O Mode 3 are available only for PCON-CBP/CGBP types.
(Note) Full direct value mode 2 are available only for PCON-CB/CFB/CGB/CGFB/CBP/CGBP types.

- IAI controllers output→PLC input side (* “n” indicates the first address of each axis.)

PLC input area (bytes)	DO on the ACON, PCON, DCON side and output data register				
	Remote I/O mode	Position/simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Current position	Current position	Current position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Completed position No. (simple alarm ID)	Command current	Command current	Current position
n+6, n+7		Status Signal			
n+8, n+9			Current speed	Current speed	Command current
n+10, n+11					
n+12, n+13			Alarm code	Alarm code	
n+14, n+15			Status signal	Occupied area	
n+16, n+17				Current load (Note 1)	
n+18, n+19					
n+20, n+21				Total moving count	
n+22, n+23					
n+24, n+25				Total moving distance	
n+26, n+27					
n+28, n+29				Status Signal 1	
n+30, n+31				Status signal 2	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

(Note 1) The current load output in Full Direct Value Modes is a feature available only for PCON-CBP/CGBP types.

- IAI controllers output→PLC input side (* “n” indicates the first address of each axis.)

PLC input area (bytes)	DO on the ACON, PCON, DCON side and output data register			
	Position/simplified direct value mode 2	Half direct value mode 2	Remote I/O mode 3	Full direct value mode 2
	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 12	Number of occupied bytes: 32
n+0, n+1	Current position	Current position	Port No.0 to 15	Current position
n+2, n+3			Occupied area	
n+4, n+5	Completed position No. (simple alarm ID)	Current load	Current position	Command current
n+6, n+7	Status Signal			
n+8, n+9		Current speed	Current load	Current speed
n+10, n+11				
n+12, n+13		Alarm code		Alarm code
n+14, n+15		Status signal		Overload level monitor
n+16, n+17				Current command value
n+18, n+19				
n+20, n+21				Occupied area
n+22, n+23				
n+24, n+25				Total moving distance
n+26, n+27				
n+28, n+29				Status Signal 1
n+30, n+31				Status Signal 2

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

(Note) Position/Simple Direct Value Mode 2, Half Direct Value Mode 2 and Remote I/O Mode 3 are available only for PCON-CBP/CGBP types.

(Note) Full direct value mode 2 are available only for PCON-CB/CFB/CGB/CGFB/CBP/CGBP types.

3.6.2 Remote I/O Mode (Number of Occupied Bytes: 2)

In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Set the position data using compatible teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
The I/O specifications for the PIO pattern are described as follows. Refer to [operation manual for the controller main body] for more information.
(Note) Force Mode 1 and 2 are available only for PCON-CBP/CGBP types.

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points and one zone output point are available.
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points and one zone output point are available. The direct operation command is available for each position No. A position complete signal is output for each position number.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Electro-magnetic valve mode 1	5: Electro-magnetic valve mode 2	6: Force control mode 1	7: Force control mode 2
Home-return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during the movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○	○	○

○: Supported, X: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	IAI controllers side DI (Port No.)	PLC side output address (bytes)	IAI controllers side DO (Port No.)	PLC side input address (bytes)
0	0 to 15	n+0, n+1	0 to 15	n+0, n+1

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis
The I/O signals of each axis consist of one input word (1 word = 2 bytes) and one output word in the I/O areas.
- This is controlled by ON/OFF bit signals from the PLC.

PCL output
Address (* “n” indicates the first address of each axis.)

	1 word = 2 bytes =16 bit															
n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PCL input
Address (* “n” indicates the first address of each axis.)

	1 word = 2 bytes =16 bit															
n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

(3) I/O signal assignment

The controller's I/O port signal varies depending on the parameter No. 25 setting.
Refer to [operation manual for the controller main body] for more information.

		Parameter No. 25 setting					
		Positioning mode		Teaching mode		256-point mode	
		0		1		2	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → ACON, PCON, DCON input	0	PC1	Command position No.	PC1	Command position No.	PC1	Command position No.
	1	PC2		PC2		PC2	
	2	PC4		PC4		PC4	
	3	PC8		PC8		PC8	
	4	PC16		PC16		PC16	
	5	PC32		PC32		PC32	
	6	-	Unavailable	MODE	Teaching mode command	PC64	
	7	-		JISL	Jog/inching selector	PC128	
	8	-		JOG+	+Jog	-	Unavailable
	9	BKRL	Forced brake release	JOG-	-Jog	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause	*STP	Pause
	13	CSTR	Positioning start	CSTR/ PWRT	Positioning start/position data import command	CSTR	Positioning start
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
ACON, PCON, DCON output → PLC input	0	PM1	Completed position No.	PM1	Completed position No.	PM1	Completed position No.
	1	PM2		PM2		PM2	
	2	PM4		PM4		PM4	
	3	PM8		PM8		PM8	
	4	PM16		PM16		PM16	
	5	PM32		PM32		PM32	
	6	MOVE	Moving signal	MOVE	Moving signal	PM64	
	7	ZONE1	Zone 1	MODES	Teaching mode signal	PM128	
	8	PZONE/ ZONE2	Position zone/ Zone 2	PZONE/ ZONE1	Position zone/ Zone 1	PZONE/ ZONE1	Position zone/ Zone 1
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND/ WEND	Positioning completion signal/ position-data read complete	PEND	Positioning completion signal
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15 (Note 1)	LOAD/ TRQS/ *ALML	Load output judgment/ torque level/ Light error status	*ALML	Light error status	LOAD/ TRQS/ *ALML	Load output judgment/ torque level/ Light error status

The symbol with a * mark shows the ON signal in normal condition.

The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)

Note 1 For ACON and DCON, the signals change as explained below;
ACON: *BALM (Battery Alarm) / *ALML (Light error status)
DCON: *ALML(Light error status)

		Parameter No. 25 setting					
		512-point mode		Electromagnetic valve mode 1		Electromagnetic valve mode 2	
		3		4		5	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → ACON, PCON, DCON input	0	PC1	Command position No.	ST0	Start position 0	ST0	Start position 0
	1	PC2		ST1	Start position 1	ST1	Start position 1
	2	PC4		ST2	Start position 2	ST2	Start position 2
	3	PC8		ST3	Start position 3	-	Unavailable
	4	PC16		ST4	Start position 4	-	
	5	PC32		ST5	Start position 5	-	
	6	PC64		ST6	Start position 6	-	
	7	PC128		-	Unavailable	-	
	8	PC256		-		-	
	9	BKRL	Forced brake release	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	-	Unavailable
	12	*STP	Pause	*STP	Pause	-	
	13	CSTR	Positioning start	-	Unavailable	-	
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
ACON, PCON, DCON output → PLC input	0	PM1	Completed position No.	PE0	Position 0 complete	LS0	Limit switch 0
	1	PM2		PE1	Position 1 complete	LS1	Limit switch 1
	2	PM4		PE2	Position 2 complete	LS2	Limit switch 2
	3	PM8		PE3	Position 3 complete	-	Unavailable
	4	PM16		PE4	Position 4 complete	-	
	5	PM32		PE5	Position 5 complete	-	
	6	PM64		PE6	Position 6 complete	-	
	7	PM128		ZONE1	Zone 1	ZONE1	Zone 1
	8	PM256		PZONE/ ZONE2	Position zone/ Zone2	PZONE/ ZONE2	Position zone/ Zone2
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND	Positioning completion signal	-	Unavailable
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15 (Note 1)	LOAD/ TRQS/ *ALML	Load output judgment/ torque level/ Light error status	LOAD/ TRQS/ *ALML	Load output judgment/ torque level/ Light error status	*ALML	Light error status

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)
Note 1 For ACON and DCON, the signals change as explained below;
ACON : *BALM (Battery Alarm) / *ALML (Light error status)
DCON : *ALML(Light error status)

		Parameter No. 25 setting			
		Force control mode 1*1		Force control mode 2*1	
		6		7	
Category	Port No.	Symbol	Signal name	Symbol	Signal name
PLC output → PCON input	0	PC1	Command position No.	ST0	Start position 0
	1	PC2		ST1	Start position 1
	2	PC4		ST2	Start position 2
	3	PC8		ST3	Start position 3
	4	PC16		ST4	Start position 4
	5	-	Unavailable	-	Unavailable
	6	-		-	
	7	-		-	
	8	CLBR	Load cell calibration command	CLBR	Load cell calibration command
	9	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause
	13	CSTR	Positioning start	-	Unavailable
	14	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command
PCON output → PLC input	0	PM1	Completed position No.	PE0	Position 0 complete
	1	PM2		PE1	Position 1 complete
	2	PM4		PE2	Position 2 complete
	3	PM8		PE3	Position 3 complete
	4	PM16		PE4	Position 4 complete
	5	TRQS	Torque level status	TRQS	Torque level status
	6	LOAD	Load output judgment status	LOAD	Load output judgment status
	7	CEND	Load cell calibration complete	CEND	Load cell calibration complete
	8	PZONE/ ZONE1	Position zone/ Zone 1	PZONE/ ZONE1	Position zone/ Zone 1
	9	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND	Positioning completion signal
	12	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm
	15	*ALML	Light malfunction status	*ALML	Light malfunction status

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)

*1 Force Mode 1 and 2 are available only for PCON-CBP/CGBP types.

3.6.3 Position/Simplified Direct Value Mode (Number of Occupied Bytes: 8)

In this operation mode, EtherNet/IP communication is used to select and command movements that have been predefined in the controller's position data table. Alternatively, through use of a PMOD signal, this mode also allows the target position to be established directly.
For the speed, acceleration/deceleration and positioning band, etc., except for the target position, the values in the position table within the controller are used. Setup the position data by referring to [the instructions provided in the controller's main body operation manual].
The settable No. of position data items is max 768 points.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control △: Indirect control x: Disable	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	△	These items must be set in the position data table.
Pitch feed (inching)	△	
Pressing operation	△	
Speed change during the movement	△	
Individual Setting for Acceleration/Deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using parameters.
PIO pattern selection	x	

(1) PLC address configuration (* "n" indicates the first address of each axis.)

Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
1	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Specified position number	n+4, n+5	Completed position No. (Simple alarm code)	n+4, n+5
	Control signal	n+6, n+7	Status signal	n+6, n+7

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of four input words (4 words = 8 bytes) and four output words in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2 words (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The specified position No. and completed position No. are expressed using 1-word (16 bits) binary data. The figures from 0 to 767 can be set in PLC. However, set the position No. for which the operation conditions have been set in advance using the teaching tools.

PLC output

Address (* "n" indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																	

	n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																	

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified position number		—	—	—	—	—	—	PC512	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

	n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal		BKRL	RMOD	—	—	PMOD	MODE	PWRT	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Current position (lower word)																
n+2, n+3 Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Completed position No.	—	—	—	—	—	—	PM512	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1
n+6, n+7 Status signal	EMGS	PWR	ZONE1	ZONE2	PZONE	MODES	WEND	RMDS	(Note 1) ALML	—	PSFL	SV	ALM	MOVE	HEND	PEND

Note 1 For ACON, it can be changed to BALM by the setting in Parameter No. 151.

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to +999999. (Example) When it is “+25.40mm”, set it as “2540”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.1
	Specified position number	16-bit data	PC1 to PC512	16-bit integer For the operation, the position data is required, for which the operation conditions have been set in advance using the teaching tools. Set up the position No. for which the data has been input using this register. The settable range is 0 to 767. In the case that any value out of the range is set, or position No. that has not been set is specified, an alarm is output.	3.8.1
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	3.6.11 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	3.6.11 (19)
		b13	-	Unavailable	-
		b12			
		b11	PMOD	Position/simple-direct switching: The position mode is selected when this signal is OFF, and the simple direct mode is selected when the signal is ON.	3.6.11 (20)
		b10	MODE	Teaching mode command: The normal mode is selected when this signal is OFF, and the teaching mode is selected when the signal is ON.	3.6.11 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	3.6.11 (17)
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	3.6.11 (13)
		b7	JOG-	-Jog: “ON” for Movement in the Home Direction	3.6.11 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	3.6.11 (14)
		b5	JISL	Jog/inching selector: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	3.6.11 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	3.6.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.6.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.6.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.6.11 (6)
		b0	CSTR	Positioning start: A move command is issued when this signal turns ON.	3.6.11 (7)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit	-	Current position: 32-bit signed Integer. Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.1
	Completed position No. (Simple alarm code)	16-bit	PM1 to PM512	16-bit integer It is moved to the target position and the positioning completed position No. within the positioning band is output. In the case that the position movement has not been performed at all, or during the movement, “0” is output. When an alarm is issued (in the case that the status signal ALM is “ON”), the simplified alarm code refer to [the operation manual for the controller main body] is output.	3.8.1
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.6.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.6.11 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	3.6.11 (12)
		b10	MODES	Teaching mode signal: This signal is ON while the teaching mode is selected.	3.6.11 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	3.6.11 (17)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	ALML	Light error status: Turns ON when light alarm (threshold exceeded for number of movement, etc.) that the operation can be continued with is issued. Note: ALM LED would not turn ON with a light error.	3.6.11 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.6.11 (32)
		b6	-	Unavailable	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

3.6.4 Half Direct Value Mode (Number of Occupied Bytes: 16)

This is the operation mode with the target position, positioning band, speed, acceleration/deceleration and pressing current value set up in the PLC. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration. (* "n" indicates the first address of each axis.)

Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
2	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

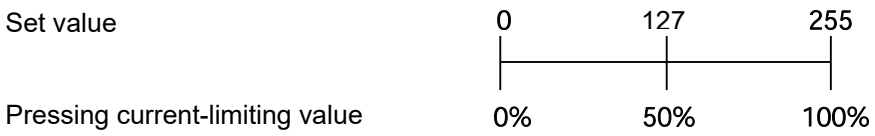
(2) I/O signal allocation for each axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The specified speed is expressed using 1-word (16 bits) binary data. The figures from 0 to +65535 (Unit: 1.0mm/s or 0.1mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator in question.
  The unit can be established in Parameter No. 159 FB Half Direct Mode Speed Unit.

Parameter No.159 Setting Value	Indicated Speed Unit
0	1.0mm/s
1	0.1mm/s

- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the Catalog or operation manual for the actuator] for the actuator concerned.



- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (Lower word)																
n+2, n+3																
Target position (Upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7																
Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9																
Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11																
Acceleration/ deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+12, n+13																
Pressing current-limitin	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+14, n+15																
Control signal	BKRL	RMOD	DIR	PUSH	—	—	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Current position (lower word)																
n+2, n+3 Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9 Current speed (lower word)																
n+10, n+11 Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13 Alarm code																
n+14, n+15 Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	—	RMDS	(Note 1) ALML	—	PSFL	SV	ALM	MOVE	HEND	PEND

Note 1 For ACON, it can be changed to BALM by the setting in Parameter No. 151.

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to +999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is between 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	3.8.2
	Speed	16-bit data	-	16-bit integer Specify the speed at which to move the actuator. The unit is 1.0mm/s or 0.1mm/s and settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. The change of unit is to be conducted in Parameter No.159 FB Half Direct Mode Speed Unit. (Example) When it is “254.0mm/s”, set it as “254”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.8.2
	Acceleration/ Deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 300. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	3.8.2
	Pressing current-limiting value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%). The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the actuator]. If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.	3.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	3.6.11 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	3.6.11 (19)
		b13	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position, “ON” for the direction adding the positioning band to the target position	3.6.11 (22)
		b12	PUSH	Pressing specification: Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	3.6.11 (21)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	JOG+	+ Jog: “ON” for movement in the opposite direction of home	3.6.11 (13)
		b7	JOG-	-Jog: “ON” for movement in the home direction	3.6.11 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	3.6.11 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	3.6.11 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	3.6.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.6.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.6.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.6.11 (6)
		b0	DSTR	Positioning command: A move command is issued when this signal turns ON.	3.6.11 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading: 000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.2
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading: 000003FF$_H$=1023 (decimal)=1023mA	3.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal)=10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller] for the details of the alarms.	3.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready: This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	ZONE2	Zone 2: “ON” for the current position within the zone set range	3.6.11 (12)
		b12	ZONE1	Zone 1: “ON” for the current position within the zone set range	3.6.11 (12)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	ALML	Light error status: Turns ON when light alarm (threshold exceeded for number of movement, etc.) that the operation can be continued with is issued. Note: ALM LED would not turn ON with a light error.	3.6.11 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.6.11 (32)
		b6	-	Unavailable	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

3.6.5 Full Direct Value Mode (Number of Occupied Bytes: 32)

This is the operation mode with all the values (target position, speed, etc.) set up directly using values from PLC. Set each value in the I/O area.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control x: Disable
Home-return operation	○
Positioning operation	○
Speed and acceleration / deceleration setting	○
Pitch feed (inching)	○
Pressing operation	○
Speed change during the movement	○
Individual Setting for Acceleration/Deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC address configuration (* "n" indicates the first address of each axis.)

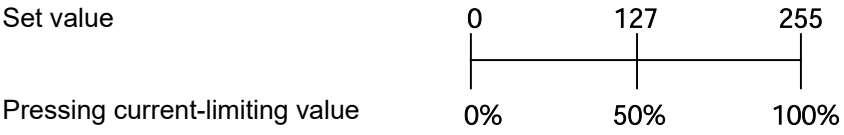
Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
3	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
		n+10, n+11		n+10, n+11
	Zone boundary +	n+12, n+13	Alarm code	n+12, n+13
		n+14, n+15	Occupied area	n+14, n+15
	Zone boundary -	n+16, n+17	Current load	n+16, n+17
		n+18, n+19		n+18, n+19
	Acceleration	n+20, n+21	Total moving count	n+20, n+21
	Deceleration	n+22, n+23		n+22, n+23
	Pressing current-limiting value	n+24, n+25	Total moving distance	n+24, n+25
	Load current threshold	n+26, n+27		n+26, n+27
	Control signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Control signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of one input word (16 words = 32 bytes) and one output word in the I/O areas.

- Control signals 1 and 2 and status signals are ON/OFF bit signals.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The specified speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the catalog or operation manual for the actuator] for the actuator concerned.



- Set the load current threshold. The load current threshold is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. Refer to [the graph of pressing current-limiting value (above graph)].
- Zone Boundary “+” and Zone Boundary “–“ are expressed using 2-word (32 bits) binary data. The figures from -999999 to +999999 (Unit: 0.01mm) can be set in PLC. However make sure to set the smaller value for the Zone Boundary “-“ than that for the Zone Boundary “+”.
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.
- The total moving count is a 2-word (32-bit) binary data (Unit: times).
- The total moving distance is a 2-word (32-bit) binary data (Unit: m).

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Target position (lower word)																
n+2, n+3 Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9 Speed (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11 Speed (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+12, n+13 Zone boundary + (lower word)																
n+14, n+15 Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17 Zone boundary + (lower word)																
n+18, n+19 Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+20, n+21 Acceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+22, n+23 Deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+24, n+25 Pressing current-limiting value	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+26, n+27 Load current threshold (Note 1)	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+28, n+29 Control signal 1	—	—	(Note 2) NTC1	(Note 2) NTC0	—	(Note 1) SMOD	ASO1	ASO0	MOD1	MOD0	(Note 2) GSL1	(Note 2) GSL0	INC	DIR	PUSH	—
n+30, n+31 Control signal 2	BKRL	RMOD	—	—	—	—	(Note 3) CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

Note 1 It can be used only in PCON.
Note 2 It can be used only in ACON.
Note 3 It can be used only in PCON-CBP/CGBP.

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)													524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Unavailable																

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes = 16 bits

n+16, n+17	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (Slave Word) PCON-CBP/CGBP only																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (Host Word) PCON-CBP/CGBP only																

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving count (Slave Word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving count (Host Word)													524,288	262,144	131,072	65,536

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (Slave Word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (Host Word)													524,288	262,144	131,072	65,536

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 1															(Note 3) CEND	(Note 2) ALML

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 2	EMGS	PWR	ZONE2	ZONE1	PZONE	(Note 1) LOAD	(Note 1) TRQS	RMDS	GHMS	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

Note 1 It can be used only in PCON.
Note 2 For ACON, it can be changed to BALM by the setting in Parameter No. 151.
Note 3 It is a signal assigned only to PCON-CBP/CGBP.

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is–999999 to +999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.3
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. 1) In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. 2) In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	3.8.3
	Speed	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/s and the settable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.8.3
	Zone boundary+ /Zone boundary–	32-bit data	-	32-bit signed integer indicating the current position After completion of home return, an effective zone signal can be output separately from the zone boundaries specified by parameters. The status signal PZONE turns ON when the current position is inside these +/- boundaries. The unit is 0.01mm and the settable range is -999999 to 999999. Enter a value that satisfies the relationship of “Zone boundary +> Zone boundary –”. If this function is not used, enter the same value for both the positive and negative boundaries. (Example) When it is “+25.40mm”, set it as “2540”. * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.3

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th>Contents</th><th>Details</th></tr>
<tr><td rowspan="15">PLC output</td><td>Acceleration</td><td>16-bit data</td><td>-</td><td rowspan="2">16-bit integer
Specify the acceleration and deceleration at which to move the actuator.
The unit is 0.01G and settable range is 1 to 300.
(Example) When it is “0.30G”, set it as “30”.
If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.</td><td rowspan="2">3.8.3</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Pressing current-limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current- limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%).
The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the each actuator].
If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.</td><td>3.8.3</td></tr>
<tr><td>Load current threshold (PCON only)</td><td>16-bit data</td><td>-</td><td>16-bit integer
Set the current threshold in this register when whether or not the load current exceeds the threshold is judged.
The allowable specification range is 0 (0%) to 255 (100%).
If threshold judgment is not required, enter “0”.</td><td>3.8.3</td></tr>
<tr><td rowspan="11">Control signal 1</td><td>b15</td><td rowspan="2">-</td><td colspan="2" rowspan="2">Unavailable</td><td rowspan="2">-</td></tr>
<tr><td>b14</td></tr>
<tr><td>b13</td><td>NTC1 (ACON only)</td><td>Vibration damping control mode selection 1</td><td rowspan="2">Select the vibration damping control parameter set to be used.<table><tr><th>NTC1</th><th>NTC0</th><th>Function</th></tr><tr><td rowspan="2">OFF</td><td rowspan="2">OFF</td><td rowspan="2">Do not use vibration damping control.</td></tr><tr></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">3.6.11 (33)</td></tr>
<tr><td>b12</td><td>NTC0 (ACON only)</td><td>Vibration damping control mode selection 0</td></tr>
<tr><td>b11</td><td>-</td><td colspan="2">Unavailable</td><td>-</td></tr>
<tr><td>b10</td><td>SMOD (PCON only)</td><td colspan="2">Stopping control mode: When this signal is ON, servo control is performed during stopping.</td><td>3.6.11 (28)</td></tr>
<tr><td>b9</td><td>ASO1</td><td>Stop Mode 1</td><td rowspan="2">Select stop mode while standing by<table><tr><th>ASO1</th><th>ASO0</th><th>Functions</th></tr><tr><td>OFF</td><td>OFF</td><td>Disable
(Servo is ON at all times)</td></tr><tr><td>OFF</td><td>ON</td><td>Sever turns OFF in time set in Parameter No. 36</td></tr><tr><td>ON</td><td>OFF</td><td>Sever turns OFF in time set in Parameter No. 37</td></tr><tr><td>ON</td><td>ON</td><td>Sever turns OFF in time set in Parameter No. 38</td></tr></table></td><td rowspan="2">3.6.11 (30)</td></tr>
<tr><td>b8</td><td>ASO0</td><td>Stop Mode 0</td></tr>
<tr><td>b7</td><td>MOD1</td><td colspan="2" rowspan="2">Acceleration / deceleration mode:
When both signals are OFF, the trapezoid pattern mode is selected.
When one signal is OFF and the other signal is ON, the S-motion mode is selected. When one signal is ON and the other signal is OFF, the primary delay filter mode is selected.</td><td rowspan="2">3.6.11 (29)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th colspan="2">Contents</th><th>Details</th></tr>
<tr><td rowspan="20">PLC output</td><td rowspan="6">Acceleration</td><td>b5</td><td>GSL1
(ACON only)</td><td>Servo gain parameter set selection 1</td><td rowspan="2">Select the servo gain parameter set to be used.
<table><tr><th>GSL1</th><th>GSL0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Select parameter set 0.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">3.6.11
(34)</td></tr>
<tr><td>b4</td><td>GSL0
(ACON only)</td><td>Servo gain parameter set selection 0</td></tr>
<tr><td>b3</td><td>INC</td><td colspan="2">Incremental Command:
Absolute position commands are issued when this signal is OFF, and incremental position commands are issued when the signal is ON.</td><td>3.6.11
(24)</td></tr>
<tr><td>b2</td><td>DIR</td><td colspan="2">Pressing direction specification:
“OFF” for the direction reducing the positioning band from the target position
“ON” for the direction adding the positioning band to the target position</td><td>3.6.11 (22)</td></tr>
<tr><td>b1</td><td>PUSH</td><td colspan="2">Pressing specification :
Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.</td><td>3.6.11 (21)</td></tr>
<tr><td>b0</td><td>-</td><td colspan="2">Unavailable</td><td>-</td></tr>
<tr><td rowspan="14">Control signal 2</td><td>b15</td><td>BKRL</td><td colspan="2">Forced brake release: When it is turned ON, the brake is released</td><td>3.6.11 (18)</td></tr>
<tr><td>b14</td><td>RMOD</td><td colspan="2">Operating mode selector:
The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.</td><td>3.6.11 (19)</td></tr>
<tr><td>b13</td><td rowspan="4">-</td><td colspan="2" rowspan="4">Unavailable</td><td rowspan="4">-</td></tr>
<tr><td>b12</td></tr>
<tr><td>b11</td></tr>
<tr><td>b10</td></tr>
<tr><td>b9</td><td>CLBR</td><td colspan="2">Load cell calibration command:
Calibration is performed when this signal turns ON.
(Dedicated for PCON-CBP/CGBP)</td><td>3.6.11 (35)</td></tr>
<tr><td>b8</td><td>JOG+</td><td colspan="2">+Jog: “ON” for Movement in the Opposite Direction of Home</td><td>3.6.11 (13)</td></tr>
<tr><td>b7</td><td>JOG-</td><td colspan="2">-Jog: “ON” for Movement in the Home Direction</td><td>3.7.11 (13)</td></tr>
<tr><td>b6</td><td>JVEL</td><td colspan="2">Jog-speed/inch-distance switching:
The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.</td><td>3.6.11 (14)</td></tr>
<tr><td>b5</td><td>JISL</td><td colspan="2">Jog/inch switching:
Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.</td><td>3.6.11 (15)</td></tr>
<tr><td>b4</td><td>SON</td><td colspan="2">Servo ON command: The servo turns ON when this signal turns ON.</td><td>3.6.11 (5)</td></tr>
<tr><td>b3</td><td>RES</td><td colspan="2">Reset: A reset is performed when this signal turns ON.</td><td>3.6.11 (4)</td></tr>
<tr><td>b2</td><td>STP</td><td colspan="2">Pause: A pause command is issued when this signal turns ON.</td><td>3.6.11 (11)</td></tr>
<tr><td>b1</td><td>HOME</td><td colspan="2">Home return: A home-return command is issued when this signal turns ON.</td><td>3.6.11 (6)</td></tr>
<tr><td>b0</td><td>DSTR</td><td colspan="2">Positioning start:
A move command is issued when this signal turns ON.</td><td>3.6.11 (8)</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.3
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA	3.8.3
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.3
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller] for the details of the alarms.	3.8.3
	Current load (Dedicated for PCON-CBP/CGBP)	32-bit data	-	32-bit signed integer The unit is 0.01N. * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.3
	Total moving count	32-bit data	-	32-bit integer (unit: times)	-
	Total moving distance	32-bit data	-	32-bit integer (unit: m)	-
	Status signal 1	b15	-	Unavailable	-
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1	CEND	Load cell calibration command: Calibration is performed when this signal turns ON. (Dedicated for PCON-CBP/CGBP)	3.6.11 (35)
		b0	ALML	Light error status: Turns ON when light alarm (threshold exceeded for number of movement, etc.) that the operation can be continued with is issued. Note: ALM LED would not turn ON with a light error.	3.6.11 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.6.11 (32)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.6.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.6.11 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	3.6.11 (12)
		b10	LOAD (Note 1)	Load output judgment: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	3.6.11 (26)
		b9	TRQS (Note 1)	Torque level: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	3.6.11 (27)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	GHMS	Under Home return Operation: This signal remains ON while home return is in progress.	3.6.11 (6)
		b6	PUSHS	Pressing in progress: This signal remains ON while pressing operation is in progress.	3.6.11 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

Note 1 It can be used only in PCON.

3.6.6 Remote I/O Mode 2 (Number of Occupied Bytes: 12)

In this operation method, EtherNet/IP communications is used to mimic the operation of hardware PIO (24V I/O).
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
This mode is the same as the remote I/O mode, but the current-position read function and command-current read function are also available.
The features of each PIO pattern are shown below. Refer to [operation manual for the controller main body] for more information
(Note) Force Mode 1 and 2 are available only for PCON-CBP/CGBP types.

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points and one zone output point are available.
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points and one zone output point are available. The direct operation command is available for each position No. A position complete signal is output for each position number.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Electro-magnetic valve mode 1	5: Electro-magnetic valve mode 2	6: Force control mode 1	7: Force control mode 2
Home-return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during the movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○	○	○

○: Supported, x: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	IAI controllers side DI and input register	PLC side output address (bytes)	IAI controllers side DO and output register	PLC side input address (bytes)
4	Port No.0 to 15	n+0, n+1	Port No.0 to 15	n+0, n+1
	Occupied area	n+2, n+3	Occupied area	n+2, n+3
		n+4, n+5	Current position	n+4, n+5
		n+6, n+7		n+6, n+7
		n+8, n+9	Command current	n+8, n+9
		n+10, n+11		n+10, n+11

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of 6 input words (channels) and 6 output words (6 words=12 bytes) in the I/O areas.

- The areas controlled by port number are controlled using ON/OFF bit signals.
- The current position is a 2-word (32-bit) binary data (unit: 0.01 mm).
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0, n+1																
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2, n+3																
Unavailable																
n+4, n+5																
Current position (lower word)																
n+6, n+7																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11																
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

(3) I/O signal assignment

For the signal assignments corresponding to each PIO pattern, refer to [the I/O signal assignments for the remote I/O mode explained in 3.6.2 (3)].

The signal allocation for the Command current and Current position is shown in the following table.

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is 1mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	-

3.6.7 Position/Simplified Direct Value Mode 2 (Number of Occupied Bytes: 8)

(Note) This mode is applicable only for PCON-CBP/CGBP.

In this mode, the actuator is operated by means of force control (pressing operation based on feedback of load cell values) and also by specifying position numbers. Whether the target position is set directly the control signals (PMOD signals), or the value registered on the position data is used can be selected.
For the speed, acceleration/deceleration and positioning band, etc., except for the target position, the values in the position table within the controller are used. Setup the position data by referring to [the instructions provided in the controller's main body operation manual].
The settable No. of position data items is max 768 points.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control △: Indirect control x: Disable	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	△	These items must be set in the position data table.
Pitch feed (inching)	△	
Pressing operation	△	
Speed change during the movement	△	
Individual Setting for Acceleration/Deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using position data or parameters.
PIO pattern selection	x	

(1) PLC address configuration (* "n" indicates the first address of each axis.)

Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
5	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Specified position number	n+4, n+5	Completed position No. (Simple alarm code)	n+4, n+5
	Control signal	n+6, n+7	Status signal	n+6, n+7

(Note) Be careful of using duplicated addresses.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of four input words (4 words = 8 bytes) and four output words in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2 words (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The specified position No. and completed position No. are expressed using 1-word (16 bits) binary data. The figures from 0 to 767 can be set in PLC. However, set the position No. for which the operation conditions have been set in advance using the teaching tools.

PLC output

Address (* "n" indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified position number	—	—	—	—	—	—	PC512	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	—	—	PMOD	—	CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Completed position number	—	—	—	—	—	—	PM512	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+6, n+7																
Status signal	EMGS	PWR	CEND	ZONE1	PZONE/ ZONE2	LOAD	TRQS	RMDS	BALM	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* "ON" in the table shows the corresponding bit of "1" and "OFF" shows "0".)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to 999999. (Example) When it is "+25.40mm", set it as "2540". If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.1
	Specified position number	16-bit data	PC1 to PC512	16-bit integer For the operation, the position data is required, for which the operation conditions have been set in advance using the teaching tools. Set up the position No. for which the data has been input using this register. The settable range is 0 to 767. In the case that any value out of the range is set, or position No. that has not been set is specified, an alarm is output.	3.8.1
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	3.6.11 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	3.6.11 (19)
		b13	-	Unavailable	-
		b12			
		b11	PMOD	Position/simple-direct switching: The position mode is selected when this signal is OFF, and the simple direct mode is selected when the signal is ON.	3.6.11 (20)
		b10	-	Unavailable	-
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	3.6.11 (32)
		b8	JOG+	+Jog: "ON" for Movement in the Opposite Direction of Home	3.6.11 (13)
		b7	JOG-	-Jog: "ON" for Movement in the Home Direction	3.6.11 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, "Jog speed" and parameter No. 48, "Inch distance" are used when this signal is OFF, and the values set in parameter No. 47, "Jog speed 2" and parameter No. 49, "Inch distance 2" are used when the signal is ON.	3.6.11 (14)
		b5	JISL	Jog/inching selector: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	3.6.11 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	3.6.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.6.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.6.11(11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.6.11 (6)
		b0	CSTR	Positioning start: A move command is issued when this signal turns ON.	3.6.11 (7)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit	-	Current position: 32-bit signed Integer. Stores the current position. The unit is 0.01mm. (Example) Reading:000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.1
	Completed position No. (Simple alarm code)	16-bit	PM1 to PM512	16-bit integer It is moved to the target position and the positioning completed position No. within the positioning band is output. In the case that the position movement has not been performed at all, or during the movement, “0” is output. When an alarm is issued (in the case that the status signal ALM is “ON”), the simplified alarm code refer to the [operation manual for the controller main body] is output.	3.8.1
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	CEND	Load cell calibration complete: This signal turns ON when the load cell calibration is complete.	3.6.11 (35)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.6.11 (12)
		b11	PZONE/ ZONE2	PZONE and ZONE2 can be switched in Parameter No.149. No.149 = 0 : This signal turns ON when the current Position zone position is inside the specified position zone. No.149 = 1 : This signal turns ON when the Zone2 current position is inside the specified zone.	3.6.11 (12)
		b10	LOAD	Load output judgment: When this signal is ON, the specified load output judgment has been reached. If the signal is OFF, it is not yet reached. For details, refer to [the instruction manual for your controller main body]	3.6.11 (26)
		b9	TRQS	Torque level: When this signal is ON, the specified torque level has been reached. If the signal is OFF, it is not yet reached. For details, refer to [the instruction manual for your controller main body].	3.6.11 (27)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	ALML	Light error status: Turns ON when light alarm (threshold exceeded for number of movement, etc.) that the operation can be continued with is issued. Note: ALM LED would not turn ON with a light error.	3.6.11 (31)
		b6	PUSHS	Pressing operation in progress: The signal is ON when the Pressing operation in progress.	3.6.11 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

3.6.8 Half Direct Value Mode 2 (Number of Occupied Bytes: 16)

(Note) This mode is applicable only for PCON-CBP/CGBP.

In this mode, the actuator is operated by means of force control (pressing operation based on feedback of load cell values) and also by specifying the target position, positioning band, speed, acceleration/deceleration and pressing current directly as numerical values. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration. (* "n" indicates the first address of each axis.)

Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
6	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Current load	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

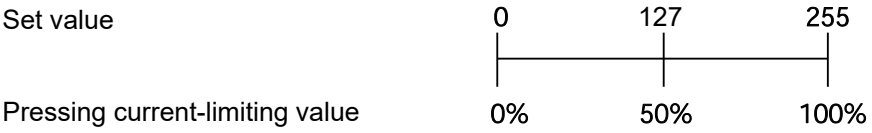
(2) I/O signal allocation for each axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The specified speed is expressed using 1-word (16 bits) binary data. The figures from 0 to +65535 (Unit: 1.0mm/s or 0.1mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator in question.
  The unit can be established in Parameter No. 159 FB Half Direct Mode Speed Unit.

Parameter No.159 Setting Value	Indicated Speed Unit
0	1.0mm/s
1	0.1mm/s

- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the catalog or operation manual for the actuator] for the actuator concerned.



- The current load is expressed using 2-word (32 bits) binary data (Unit: 0.01N).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (Lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (Upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration/ deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing current-limitin	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	DIR	PUSH	—	—	CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Current load (lower word)																
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9																
Current speed (lower word)																
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	CEND	RMDS	BALM	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is between –999999 to 999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is between 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	3.8.2
	Speed	16-bit data	-	16-bit integer Specify the speed at which to move the actuator. The unit is 1.0mm/s or 0.1mm/s and settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. The change of unit is to be conducted in Parameter No.159 FB Half Direct Mode Speed Unit. (Example) In the case of the unit of 1.0mm/s: When it is “254.0mm/s”, set it as “254”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.8.2
	Acceleration/ Deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 300. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	3.8.2
	Pressing current-limiting value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%). The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the each actuator]. If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.	3.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	3.6.11 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	3.6.11 (19)
		b13	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position, “ON” for the direction adding the positioning band to the target position	3.6.11 (22)
		b12	PUSH	Pressing specification: Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	3.6.11 (21)
		b11	-	Unavailable	-
		b10			
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	3.6.11 (32)
		b8	JOG+	+ Jog: “ON” for movement in the opposite direction of home	3.6.11 (13)
		b7	JOG-	-Jog: “ON” for movement in the home direction	3.6.11 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	3.6.11 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	3.6.11 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	3.6.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.6.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.6.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.6.11 (6)
		b0	DSTR	Positioning command: A move command is issued when this signal turns ON.	3.6.11 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading: 000003FF$_H$=1023 (decimal)=10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.2
	Current load	32-bit data	-	32-bit signed Integer The setting unit is 0.01N. * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal)=10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller] for the details of the alarms.	3.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready: This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	ZONE2	Zone 2: “ON” for the current position within the zone set range	3.6.11 (12)
		b12	ZONE1	Zone 1: “ON” for the current position within the zone set range	3.6.11 (12)
		b11	-	Unavailable	-
		b10			
		b9	CEND	Load cell calibration is complete: This signal turns ON when calibration is complete.	3.6.11 (35)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	3.6.11 (32)
		b6	PUSHS	Pressing operation in progress: The signal is ON when the Pressing operation in progress.	3.6.11 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

3.6.9 Remote I/O Mode 3 (Number of Occupied Bytes: 12)

(Note) This mode is applicable only for PCON-CBP/CGBP.

In this mode, force control (feedback pressing of load cell values) is used in addition to the remote I/O mode 2 function for operation.
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.

The features of each PIO pattern are shown below. Refer to [operation manual for the controller main body] for more information

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points and one zone output point are available.
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points and one zone output point are available. The direct operation command is available for each position No. A position complete signal is output for each position number.

The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Electro-magnetic valve mode 1	5: Electro-magnetic valve mode 2	6: Force control mode 1	7: Force control mode 2
Home-return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during the movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○	○	○

○: Supported, x: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	IAI controllers side DI and input register	PLC side output address (bytes)	IAI controllers side DO and output register	PLC side input address (bytes)
7	Port No.0 to 15	n+0, n+1	Port No.0 to 15	n+0, n+1
	Occupied area	n+2, n+3	Occupied area	n+2, n+3
		n+4, n+5	Current position	n+4, n+5
		n+6, n+7		n+6, n+7
		n+8, n+9	Current load	n+8, n+9
		n+10, n+11		n+10, n+11

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of 6 input words (channels) and 6 output words (6 words=12 bytes) in the I/O areas.

- The areas controlled by port number are controlled using ON/OFF bit signals.
- The current position is a 2-word (32-bit) binary data (unit: 0.01 mm).
- The command current is expressed using 2-word (32 bits) binary data (Unit: 0.01N).

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0, n+1 Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2, n+3 Unavailable																
n+4, n+5 Current position (lower word)																
n+6, n+7 Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9 Current load (lower word)																
n+10, n+11 Current load (upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

(3) I/O signal assignment

For the signal assignments corresponding to each PIO pattern, refer to [I/O signal assignments for the remote I/O mode explained in 3.6.2 (3)].

The signal allocation for the Command current and Current position is shown in the following table.

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer Stores the current position. The unit is 0.01mm (other than DD motor) and 0.001° (DD motor). (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Current load	32-bit data	-	32-bit signed integer The setting unit is 0.01N. * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-

3.6.10 Full Direct Value Mode 2 (Number of Occupied Bytes: 32)

This Mode are available only for PCON-CB/CFB/CGB/CGFB/CBP/CGBP types.
(Applicable Controller Versions: V0013 or later)

This is the operation mode with all the values (target position, speed, etc.) set up directly using values from PLC. Set each value in the I/O area.
The overload level monitoring and current indication value monitoring are available.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

ROBO cylinder function	○: Direct control x: Disable
Home-return operation	○
Positioning operation	○
Speed and acceleration / deceleration setting	○
Pitch feed (inching)	○
Pressing operation	○
Speed change during the movement	○
Individual Setting for Acceleration/Deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC address configuration (* "n" indicates the first address of each axis.)

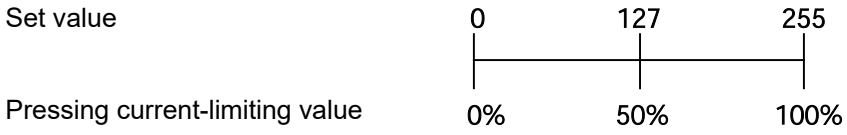
Parameter No.84	IAI controllers side input register	PLC side output address (bytes)	IAI controllers side output register	PLC side input address (bytes)
9	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
		n+10, n+11		n+10, n+11
	Zone boundary +	n+12, n+13	Alarm code	n+12, n+13
		n+14, n+15	Overload level monitor	n+14, n+15
	Zone boundary -	n+16, n+17	Current command value	n+16, n+17
		n+18, n+19		n+18, n+19
	Acceleration	n+20, n+21	Occupied area	n+20, n+21
	Deceleration	n+22, n+23		n+22, n+23
	Pressing current-limiting value	n+24, n+25	Total moving distance	n+24, n+25
	Load current threshold	n+26, n+27		n+26, n+27
	Control signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Control signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O signal allocation for each axis

The I/O signals of each axis consist of 16 word (16 words = 32 bytes) and one output word in the I/O areas.

- Control signals 1 and 2 and status signals are ON/OFF bit signals.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +999999 (Unit: 0.01mm) can be set in PLC.
- The specified speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 300 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value (refer to [the catalog or operation manual for the actuator] for the actuator concerned).



- Set the load current threshold. The load current threshold is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC. Refer to [the graph of pressing current-limiting value (above graph)].
- Zone Boundary “+” and Zone Boundary “–“ are expressed using 2-word (32 bits) binary data. The figures from -999999 to +999999 (Unit: 0.01mm) can be set in PLC. However make sure to set the smaller value for the Zone Boundary “-“ than that for the Zone Boundary “+”.
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.
- The overload level monitor is a 1-word (16-bit) binary data (Unit: %).
- The current command value is a 2-word (32-bit) binary data (Unit: 0.01mm).
- The total moving distance is a 2-word (32-bit) binary data (Unit: m).

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (lower word)																
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17																
Zone boundary- (lower word)																
n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary- (upper word)																

When the zone boundary - is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+20, n+21																
Acceleration								256	128	64	32	16	8	4	2	1
n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Deceleration								256	128	64	32	16	8	4	2	1
n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Push-current limiting value									128	64	32	16	8	4	2	1
n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Load current threshold (Note 1)									128	64	32	16	8	4	2	1
n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 1						SMOD	ASO1	ASO0	MOD1	MOD0			INC	DIR	PUSH	
n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 2	BKRL	RMOD					(Note 1) CLBR	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	DSTR

Note 1 It can be used only in PCON-CBP/CGBP.

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes = 16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (lower word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)													524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Alarm code																

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Overload level monitor																

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes = 16 bits

n+16, n+17	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current command value (lower word)																

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current command value (upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Occupied area																

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Occupied area																

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (upper word)													524,288	262,144	131,072	65,536

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 1															(Note 1) CEND	ALML

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 2	EMGS	PWR	ZONE2	ZONE1	PZONE	LOAD	TRQS	RMDS	GHMS	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

Note 1 It is a signal assigned only to PCON-CBP/CGBP.

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is–999999 to +999999. (Example) When it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.3
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01mm and settable range is 1 to 999999. (Example) When it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. 1) In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. 2) In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	3.8.3
	Speed	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/s and the settable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.8.3
	Zone boundary+ /Zone boundary–	32-bit data	-	32-bit signed integer indicating the current position After completion of home return, an effective zone signal can be output separately from the zone boundaries specified by parameters. The status signal PZONE turns ON when the current position is inside these +/- boundaries. The unit is 0.01mm and the settable range is -999999 to 999999. Enter a value that satisfies the relationship of “Zone boundary +> Zone boundary –”. If this function is not used, enter the same value for both the positive and negative boundaries. (Example) When it is “+25.40mm”, set it as “2540”. * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.8.3

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th>Contents</th><th>Details</th></tr>
<tr><td rowspan="11">PLC output</td><td>Acceleration</td><td>16-bit data</td><td>-</td><td rowspan="2">16-bit integer
Specify the acceleration and deceleration at which to move the actuator.
The unit is 0.01G and settable range is 1 to 300.
(Example) When it is “0.30G”, set it as “30”.
If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.</td><td rowspan="2">3.8.3</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Pressing current-limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current- limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 255 (100%).
The actual settable range varies depending on each actuator. Refer to [the catalog or operation manual for the each actuator].
If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.</td><td>3.8.3</td></tr>
<tr><td>Load current threshold</td><td>16-bit data</td><td>-</td><td>16-bit integer
Set the current threshold in this register when whether or not the load current exceeds the threshold is judged.
The allowable specification range is 0 (0%) to 255 (100%).
If threshold judgment is not required, enter “0”.</td><td>3.8.3</td></tr>
<tr><td rowspan="7">Control signal 1</td><td>b15</td><td rowspan="5">-</td><td colspan="2" rowspan="5">Unavailable</td><td rowspan="5">-</td></tr>
<tr><td>b14</td></tr>
<tr><td>b13</td></tr>
<tr><td>b12</td></tr>
<tr><td>b11</td></tr>
<tr><td>b10</td><td>SMOD</td><td colspan="2">Stopping control mode: When this signal is ON, servo control is performed during stopping.</td><td>3.6.11 (28)</td></tr>
<tr><td>b9</td><td>ASO1</td><td rowspan="2">Stop Mode 1</td><td rowspan="2">Select stop mode while standing by
<table><tr><th>ASO1</th><th>ASO0</th><th>Functions</th></tr><tr><td>OFF</td><td>OFF</td><td>Disable
(Servo is ON at all times)</td></tr><tr><td>OFF</td><td>ON</td><td>Servo turns OFF in time set in Parameter No. 36</td></tr><tr><td>ON</td><td>OFF</td><td>Servo turns OFF in time set in Parameter No. 37</td></tr><tr><td>ON</td><td>ON</td><td>Servo turns OFF in time set in Parameter No. 38</td></tr></table></td><td rowspan="2">3.6.11 (30)</td></tr>
<tr><td>b8</td><td>ASO0</td></tr>
<tr><td>b7</td><td>MOD1</td><td colspan="2" rowspan="2">Acceleration / deceleration mode:
When both signals are OFF, the trapezoid pattern mode is selected.
When one signal is OFF and the other signal is ON, the S-motion mode is selected. When one signal is ON and the other signal is OFF, the primary delay filter mode is selected.</td><td rowspan="2">3.6.11 (29)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal 1	b5	-	Unavailable	-
		b4			
		b3	INC	Incremental Command: Absolute position commands are issued when this signal is OFF, and incremental position commands are issued when the signal is ON.	3.6.11 (24)
		b2	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position “ON” for the direction adding the positioning band to the target position	3.6.11 (22)
		b1	PUSH	Pressing specification : Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	3.6.11 (21)
		b0	-	Unavailable	-
	Control signal 2	b15	BKRL	Forced brake release: When it is turned ON, the brake is released	3.6.11 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	3.6.11 (19)
		b13	-	Unavailable	-
		b12			
		b11			
		b10			
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON. (Dedicated for PCON-CBP/CGBP)	3.6.11 (35)
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	3.6.11 (13)
		b7	JOG-	-Jog: “ON” for Movement in the Home Direction	3.7.11 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	3.6.11 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	3.6.11 (15)
		b4	SON	Servo ON command: The servo turns ON when this signal turns ON.	3.6.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.6.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.6.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.6.11 (6)
		b0	DSTR	Positioning start: A move command is issued when this signal turns ON.	3.6.11 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01mm. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.3
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA	3.8.3
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.8.3
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated. Refer to [the operation manual for the controller] for the details of the alarms.	3.8.3
	Overload level monitor	16-bit data	-	16-bit integer The motor load [%] should be displayed.	-
	Current command value	32-bit data	-	32-bit signed integer It is the position in the operation plan that the controller currently indicates. The unit is 0.01mm/s. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Total moving distance	32-bit data	-	32-bit integer (unit: m)	-
	Status signal 1	b15	-	Unavailable	-
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Status signal 1	b1	CEND (Note 1)	Load cell calibration command: Calibration is performed when this signal turns ON. (Dedicated for PCON-CBP/CGBP)	3.6.11 (35)
		b0	ALML	Light error status: Turns ON when light alarm (threshold exceeded for number of movement, etc.) that the operation can be continued with is issued. Note: ALM LED would not turn ON with a light error.	3.6.11 (31)
	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.6.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.6.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.6.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.6.11 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	3.6.11 (12)
		b10	LOAD	Load output judgment: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	3.6.11 (26)
		b9	TRQS	Torque level: When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. Refer to [operation manual for the controller main body] for more information	3.6.11 (27)
		b8	RMDS	Operation mode status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.6.11 (19)
		b7	GHMS	Under Home return Operation: This signal remains ON while home return is in progress.	3.6.11 (6)
		b6	PUSHS	Pressing in progress: This signal remains ON while pressing operation is in progress.	3.6.11 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	3.6.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.6.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.6.11 (3)
		b2	MOVE	Moving signal: This signal remains ON while the actuator is moving.	3.6.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.6.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.6.11 (10)

Note 1 It can be used only in PCON-CBP/CGBP.

3.6.11 I/O Signal Controls and Function

* ON indicates that the applicable bit signal is “1”, while OFF indicates that the bit signal is “0”.
The I/O control and functions used in the Position/Simplified Direct Value Mode, Half direct value mode and Full direct value mode, are described as follows. For the I/O signals for the Remote I/O mode and Remote I/O mode 2, refer to [the controller’s main body operational manual].

(1) Controller ready (PWR) PLC input signal

When the controller can control the system after the power is applied, it is turned “ON”.

■ Function

Regardless of the alarm or servo conditions, when the controller initialization is completed normally after the power is applied and the controller can control the system, it is turned “ON”.
Even in the alarm condition, when the controller can control the system, it is turned “ON”.

(2) Emergency stop (EMGS) PLC input signal

When the controller is stopped in an emergency, it is turned “ON”.

■ Function

When the controller is stopped in an emergency (motor driving power is cut off), it is turned “ON”. When the emergency stop status is cleared, it is turned “OFF”.

* This signal should behave as a signal of a break contact (*EMGS) in Remote I/O Mode thus switching on/off gets reversed to above.

(3) Alarm (ALM) PLC input signal

When any error is detected using the controller protection circuit (function), it is turned “ON”.

■ Function

When any error is detected and the protection circuit (function) is activated, this signal is turned “ON”.
When the cause of the alarm is eliminated and the reset signal is turned “ON”, the alarm is turned “OFF” in the case that it is the alarm with the operation cancellation level. (In the case of the alarm with the cold start level, cycling of the power is required)
When the alarm is detected, the Status Indicator LED refer to [3.3, EtherNet/IP Interface] on the front surface of the controller illuminates in red.

* This signal should behave as a signal of a break contact (*ALM) in Remote I/O Mode thus switching on/off gets reversed to above.

(4) Reset (RES) PLC output signal

This signal has two functions. It can reset the controller alarm and cancel the reminder for planned movements during pause conditions.

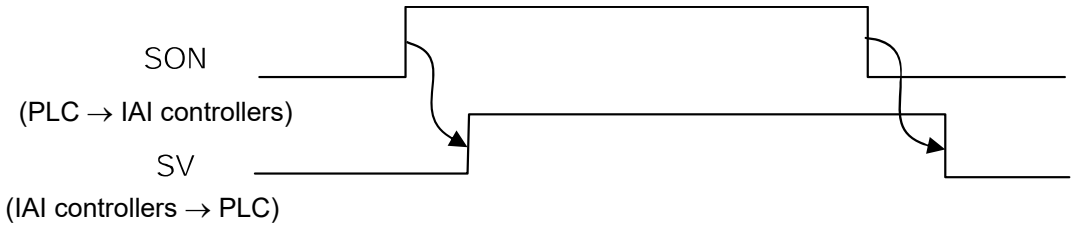
■ Function

[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset. (In the case of the alarm with the cold start level, cycling of the power is required)
[2] When this signal is turned ON from OFF condition during the pause condition, the reminder of the planned movement left can be cancelled.

(5) Servo ON command (SON) PLC output signal
Operation preparation end (SV) PLC input signal

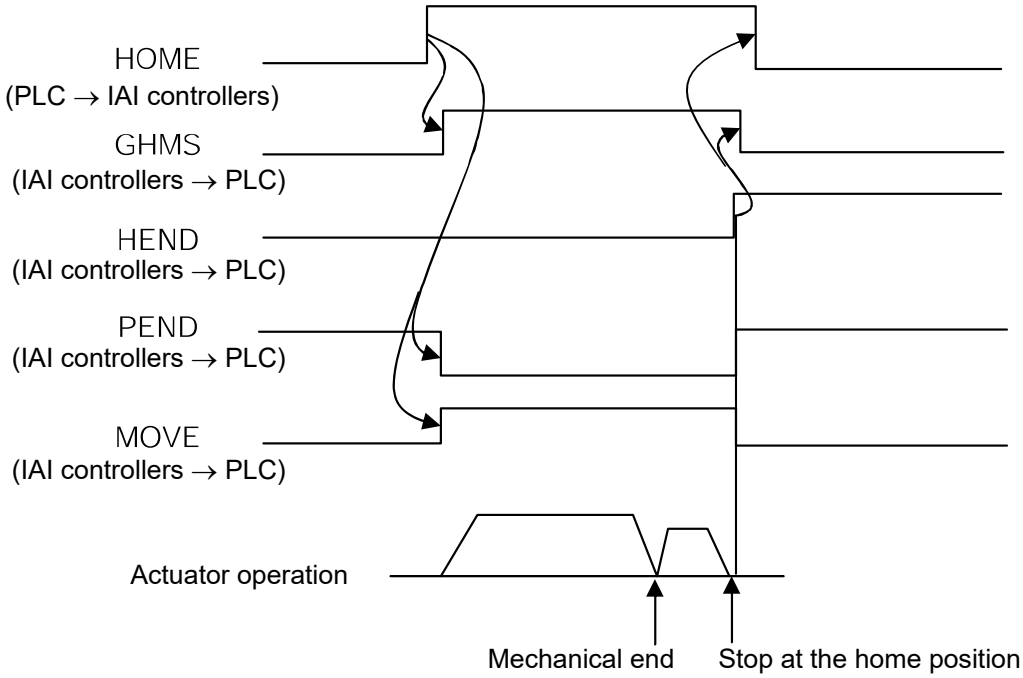
When the SON signal is turned ON, the servo will turn ON.
When “SON” signal is turned “ON”, the servo-motor is turned “ON”. When the servo-motor is turned ON, the Status Indicator LED refer to [3.3, EtherNet/IP Interface] on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

■Function
Using the “SON” signal, the turning ON/OFF of the controller is available.
While the “SV” signal is ON, the controller's servo-motor is turned “ON” and the operation becomes available.
The relationship between the “SON” signal and “SV” signal is as follows.



(6) Home return (HOME) PLC output signal
Home return completion (HEND) PLC input signal
Under home return operation (GHMS) PLC input signal

When the “HOME” signal is turned “ON”, this command is processed at the startup (ON edge), and the home return operation is performed automatically. During the home return operation, the “GHMS” signal is turned “ON”.
When the “HEND” signal is turned “ON”, turn “OFF” the “HOME” signal.
Once the “HEND” signal is turned “ON”, it can not be turned “OFF” until the power is turned “OFF” or the “HOME” signal is input again. Once the HEND signal is turned ON, it can not be turned OFF until the power is turned OFF or the HOME signal is input again.
Even after the completion of the home return operation, when the “HOME” signal is turned “ON”, the home return operation can be performed.



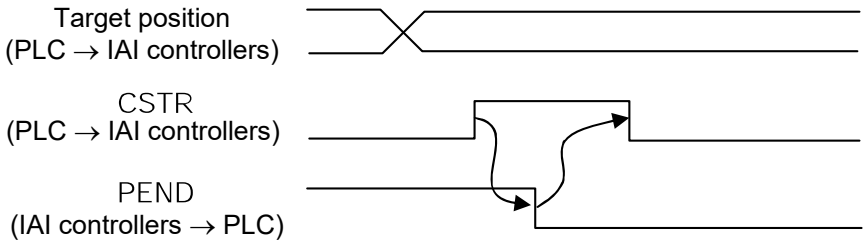
⚠ Caution: In the Remote I/O mode, Remote I/O mode 2 and Position/Simplified Direct Value Mode, when the positioning command is issued without performing the home return operation after the power is applied, the positioning is performed after the automatic home return operation. Exercise caution that in the half direct mode or full direct mode, issuing a positioning command to a given position following the power on, without performing a home return first, will generate an alarm “Error Code 83: ALARM HOME ABS (absolute position move command when home return is not yet completed)” (operation-reset alarm).

(7) Positioning start (CSTR): Used in the position/simple direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning is performed to the target position with the specified position No. or set using the PLC's target position register.
Whether if the target position with the specified position No. is used or the setting using the PLC's target position register is used, depends on the Control signal b11: “Position/Simplified Direct Value Change-Over (PMOD) Signal”.

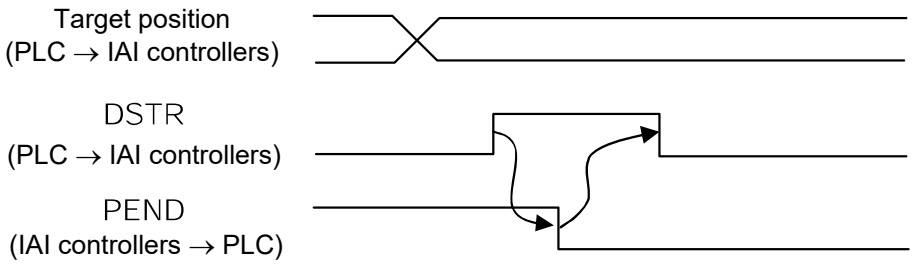
- PMOD＝OFF: Target position data for the specified position No. is used.
- PMOD＝ON : Value for the target position set using the PLC's target position register is used.

When this signal is issued in the condition where the home return operation has not performed at all after the power is applied (HEND signal OFF), the positioning to the target position is performed after the home return operation is performed automatically.
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned “OFF”.



(8) Positioning command (DSTR): Used in the half direct mode and full direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning to the target position input in the PLC's target position register is performed. When this signal is issued in the condition where the home return operation has not performed at all after the power is applied (HEND signal OFF), an alarm is issued (Operation Cancellation Level).
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned “OFF”.

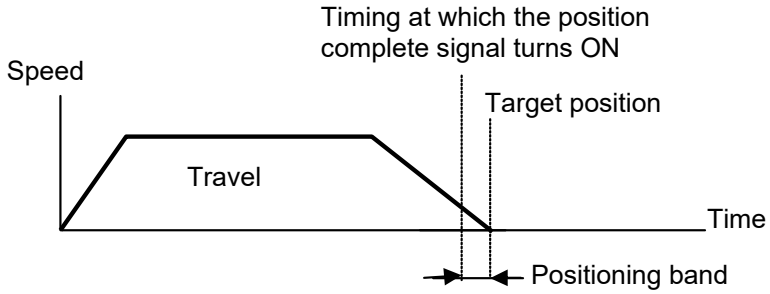


(9) Moving signal (MOVE) PLC input signal

This signal is turned ON while the actuator's slider or rod is moving. (Including the pressing or jog operation after the home return operation)
After the completion of the positioning, home return or pressing operation, or during the pause condition, this signal is turned “OFF”.

(10) Positioning completion signal (PEND) PLC input signal

This signal is turned “ON” when the actuator is moved to the target position and reaches the positioning band and the pressing is completed.
However, when the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.



When the servo-motor is turned ON from OFF condition, the positioning is performed with the position set as the target position. Accordingly, this signal is turned “ON” and after that, when the positioning operation is started with the home return (HOME) signal, positioning start (CSTR) signal and positioning command (DSTR) signal, this signal is turned “OFF”.

⚠ Caution: When the servo-motor is turned OFF or stopped in an emergency while the actuator is stopped at the target position, the PEND signal is turned “OFF” temporarily.
Then, when the servo-motor is turned “ON”, the PEND signal is turned “ON” again.

(11) Pause (STP) PLC output signal

When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position No. set using the specified position No. resister in the Position/Simplified Direct Value Mode, and as the value set in the acceleration/deceleration register in the Half direct value mode.
In the Full direct value mode, the value is expressed as the value set in the acceleration register or deceleration register.

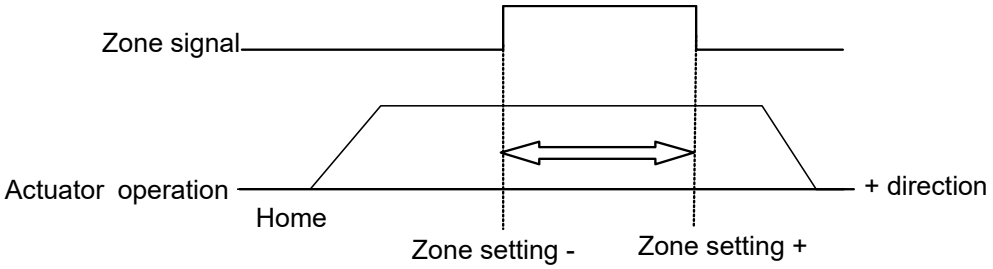
* This signal should behave as a signal of a break contact (*STP) in Remote I/O Mode thus switching on/off gets reversed to above.

(12) Zone 1 (ZONE1) PLC input signal
Zone 2 (ZONE2) PLC input signal
Position zone (PZONE) PLC input signal

These signals are turned ON when the current position of the actuator is within the set area and turned OFF when the current position is out of the set area.

[1] Zone 1, Zone 2
The zone is set using the user parameters.
The Zone 1 Signal is set using the parameter No. 1 “Zone Boundary 1 “+” Side” and No. 2 “Zone Boundary 1 “–“ Side”.
The Zone 2 Signal is set using the parameter No. 23 “Zone Boundary 2 “+” Side” and No. 24 “Zone Boundary 2 “–“ Side”.
The Zone 1 Signal and Zone 2 Signal become effective when the home return operation is completed. After that, even during the servo OFF, it is effective.

[2] Position zone
Each zone is set in the position table or using the zone boundary resister.
In the case of the Position/Simplified Direct Value Mode, the PZONE signal is set using the position table.
In the case of the Full direct value mode, the PZONE signal is set using the Zone Boundary Value Register.
(*) In the half direct value mode, there is no PZONE signal.
The PZONE signal becomes effective with the movement command after the home return operation. After that, even during the servo OFF, it is effective.



(13) +Jog (JOG+) PLC output signal
–Jog (JOG–) PLC output signal

This signal is the command for the jog operation startup or inching operation startup.
If a + command is issued, the actuator will operate in the direction opposite home. When a – command is issued, the actuator will operate in the direction of home.

[1] Jog operation

Jog operation can be performed when the jog/inch switching (JISL) signal is OFF.
While the "JOG+" is turned "ON", the movement direction is to the opposite of the home and when it is turned "OFF", the actuator is decelerated and stopped.
While the JOG – is ON, the actuator will operate in the direction of home and when it is turned OFF, it is decelerated to a stop.
The operation is performed based on the set values of the following parameters.

- The speed is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (JVEL) signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
- When both the JOG+ and JOG- signals are turned "ON", the actuator is decelerated and stopped.

[2] Inch operation

The inching operation is available while the JISL signal is turned "ON".
Once it is turned "ON", the actuator is moved as much as the inching distance.
When the JOG+ is turned "ON", the movement is to the opposite of the home and when the JOG- is turned "ON", the movement is to the home.
The operation is performed based on the set values of the following parameters.

- The speed conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The travel conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 48, "PIO inch distance".
  If the JVEL signal is ON, the actuator operates according to parameter No. 49, "PIO inch distance 2".
- The Acceleration/deceleration is based on the rated acceleration/deceleration (depending on the actuator).

During the normal operation, even when the "+" Jog Signal or "-" Jog Signal is turned "ON", the normal operation is continued. (The Jog signal is ignored)
In the pause condition, even when the "+" Jog Signal or "-" Jog Signal is turned "ON", the actuator is not moved.

(Note) Because the software stroke limit is disabled before the home return operation, the actuator might run against the mechanism end. Take the greatest care.

(14) Jog-speed/inch-distance switching (JVEL) PLC output signal

This change-over signal is used for the parameters specifying the jog speed when the jog operation is selected or the inching distance when the inching operation is selected.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

(15) Jog/inch switching (JISL) PLC output signal

This signal changes over the jog operation and the inching operation.
JISL=OFF: Jog operation
JISL=ON : Inch operation
When the JISL signal is turned “ON” (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.
When the JISL signal is turned OFF (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

[Relation Between Setting and Operation for JVEL/JISL]

The relation between the jog velocity / inching distance switchover signal (JVEL) and the jog / inching switchover signal (JISL) turned on and off is as described below.

JISL		OFF (Jog operation)	ON (Inch operation)
Operating conditions		When the JOG +/JOG - signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG - signal.
JVEL=OFF	Speed	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed”
	Travel	-	Parameter No. 48, “Inch distance”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
JVEL=ON	Speed	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	Travel	-	Parameter No. 49, “Inch distance 2”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)

(16) Teaching mode command (MODE) PLC output signal
Teaching mode signal (MODES) PLC input signal

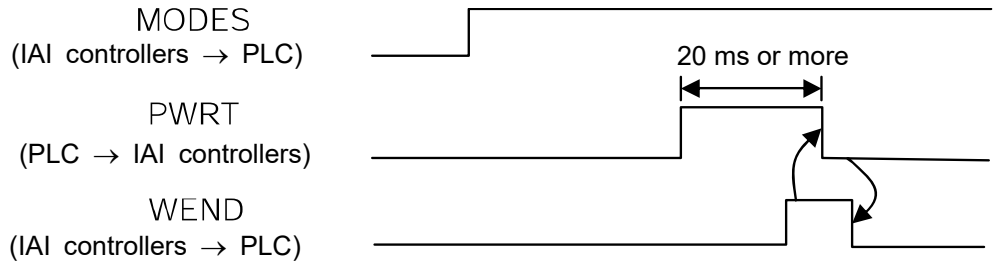
When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the controllers for each actuator is changed to the teaching mode, the MODES signal is turned ON.
After confirming that the MODES signal is turned “ON” on the PLC side, start the teaching operation.
(Note) In order to change the normal operation mode to the teaching mode, the following conditions are required.

- The actuator operation (motor) is stopped.
- The + JOG (JOG+) signal and – JOG (JOG-) signal are turned “OFF”.
- The Position Data Import Command (PWRT) Signal and Positioning start (CSTR) Signal are turned “OFF”.

(Note) When the PWRT signal is not turned OFF, the mode is not returned to the normal operation mode.

(17) Position data import command (PWRT) PLC output signal
Position data import complete (WEND) PLC input signal

The PWRT signal is available when the teaching mode signal (MODES) is turned “ON”.
Turn the PWRT signal ON (*1), and the data of the current position will be written to the “Position” field under the position number set to the specified position number resister of the PLC (*2).
When the data writing is completed, the WEND signal is turned “ON”.
After the WEND signal is turned ON, turn OFF the PWRT signal in the host machine.
When the PWRT signal is turned ON before the WEND signal is turned “ON”, the WEND signal is not turned “ON”.
When the PWRT signal is turned “OFF” the WEND signal is also turned “OFF”.
(*1) Turn it on for 20ms or more. If the time is shorter than 20ms, the writing is not completed.
(*2) When the data items except for the position have not been defined, the parameter initial values are written. Refer to [the operation manual for the controller main body]



(18) Forced brake release (BKRL) PLC output signal

Turning this signal “ON” can release the brake forcibly.

(19) Operating mode selector (RMOD) PLC output signal
Operation mode status (RMDS) PLC input signal

The operation mode is selected with the RMOD signal and the MODE switch located on the front surface of the controller.
Also, which mode is currently set, AUTO or MANU, can be confirmed using the RMDS signal.
The operation modes with the combination of the RMOD signal and the MODE switch ON/OFF are described as follows.

	Controller MODE Switch = AUTO	Controller MODE Switch = MANU
RMOD signal = OFF (AUTO mode is specified)	AUTO mode (RMDS=OFF)	MANU mode (RMDS=ON)
RMOD signal = ON (MANU mode is specified)	MANU mode (RMDS=ON)	MANU mode (RMDS=ON)

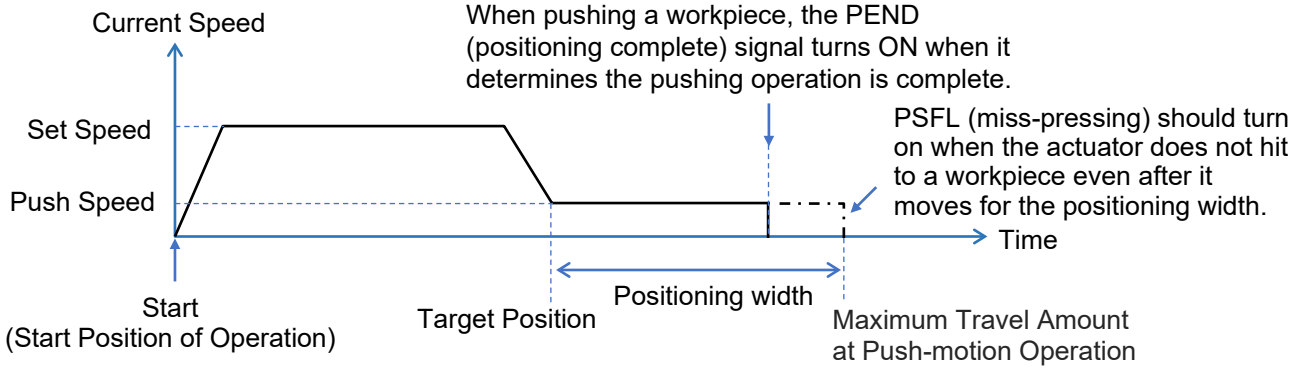
(Note) In MANU mode, the startup of the operation from PLC is not available.

(20) Position/simple-direct switching (PMOD) PLC output signal

This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON: Use the value of the target position resister

(21) Pressing specification (PUSH) PLC output signal

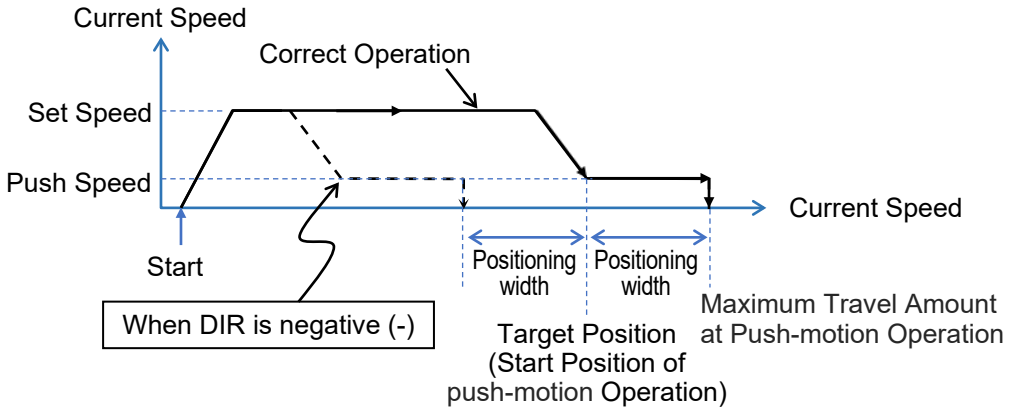
When the movement command signal is output after this signal is turned ON, the pressing operation is performed.
When this signal is set to “OFF”, the normal positioning operation is performed.
Refer to [Item 3.8.2 Operation in Half direct value mode in 3.8 Operation] for the setting timing for this signal



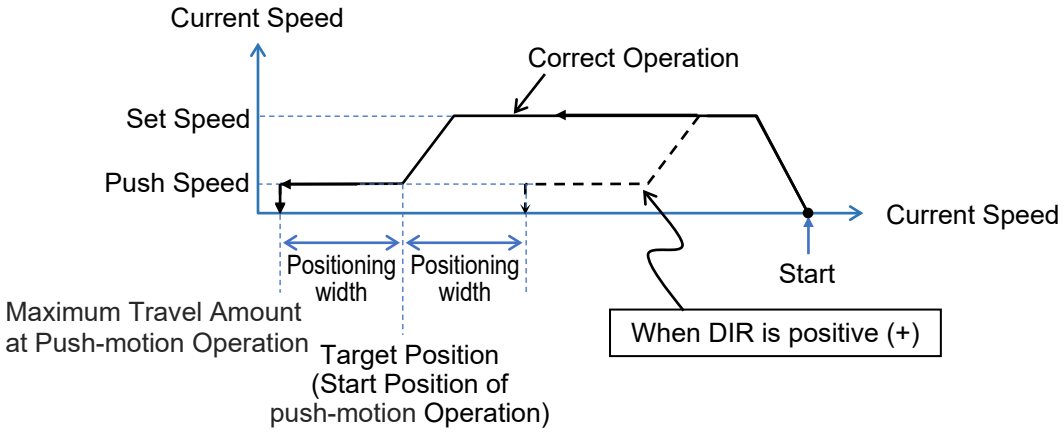
(22) Pressing direction specification (DIR) PLC output signal

This signal specifies the pressing direction.
When this signal is turned “ON”, the pressing operation is performed to the direction of the value determined by adding the positioning band to the target position.
When this signal is turned “OFF”, the pressing operation is performed to the position expressed using the value reducing the positioning band from the target position.
In the case of the normal positioning operation, this signal is disabled.
Refer to [Item 3.8.2 Operation in Half direct value mode in 3.8 Operation] for the setting timing for this signal

1) For Pressing Operation Towards Positive from Start Point



2) For Pressing Operation Towards Negative from Start Point



As shown in the figure 1) above, when pushing from the start point toward the target position in the direction in which the coordinate value increases, the push direction is positive (+), and when pushing in the direction in which the coordinate value decreases as the 2) above, the push direction is negative (-).
Pushing in the wrong direction will lead to improper operation, as the push-motion operation will start at the start point and continue to the distance (positioning width × 2); take care.

(23) Pressing and a miss (PSFL) PLC input signal

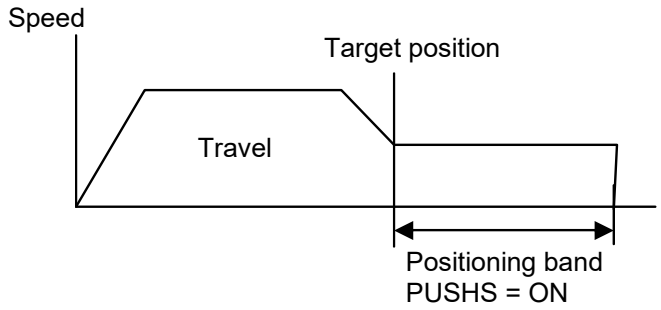
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
Refer to [Item 3.8.2 Operation in Half direct value mode in 3.8 Operation] for the setting timing for this signal

(24) Incremental command (INC) PLC output signal

When the movement command is issued while this signal is turned “ON”, the actuator is moved to the position expressed as the value input in the PLC's target position register based on the current position. (Incremental move)
When this signal is turned “OFF”, the actuator is moved to the position expressed as the value set in the PLC's target position register.

(25) Pressing in progress (PUSHS) PLC input signal

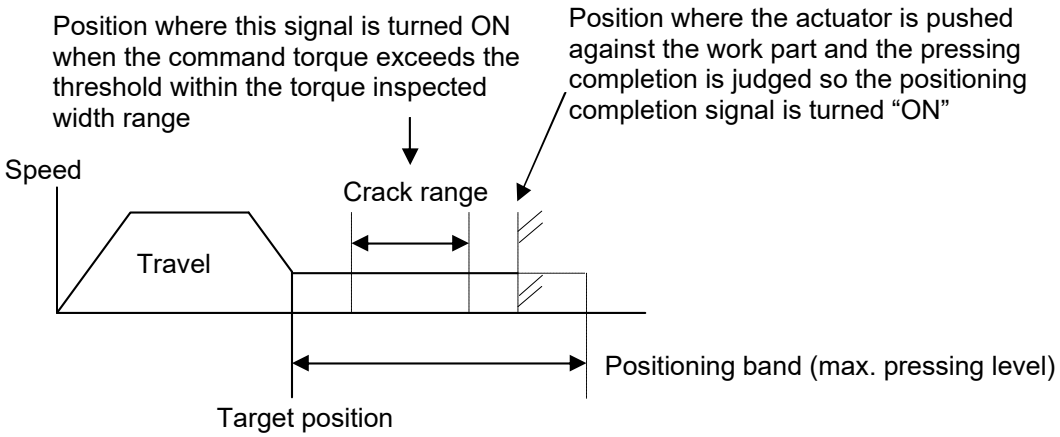
This signal is turned “ON” during the pressing operation.



This signal is turned “OFF” when the pressing and a miss signal or the next movement command signal is output, or the servo-motor is turned “OFF”.
Refer to [Item 3.8.2 Operation in Half direct value mode in 3.8 Operation] for the setting timing for this signal

(26) Load output judgment (LOAD) PLC input signal PCON only

This signal is available only in the pressing operation.
When this signal is used for pressing-in purpose, it should be known if the set load threshold is reached during the pressing operation.
The load threshold and check range are set by the PLC and the LOAD signal will turn ON when the command torque (motor current) exceeds the threshold inside the check range.
This signal judges the load output based on the fact that the command torque exceeds the threshold for the specified time period.
This processing procedure is the same as for the pressing judgment. The judgment time period can be changed freely using the parameter No. 50 “Load Output Judgment Time Period”.
This signal is continued until the next movement command is received.

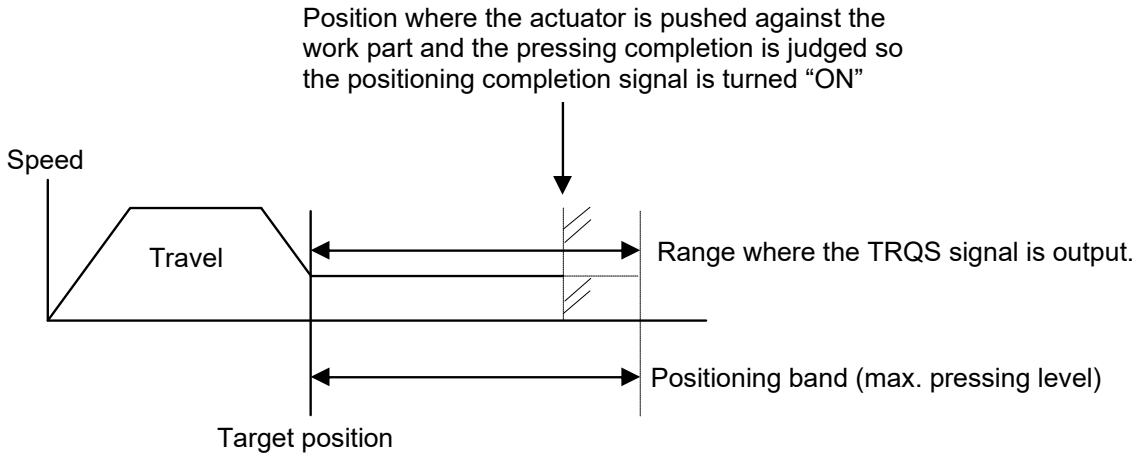


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the parameter No. 51 “Torque Inspected Range” to “0” (enabled).
- Set the threshold inspected width using the PLC's Zone Boundary + Register or Zone Boundary - Register.
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the operation manual for the controller main body] for more information.

⚠ Caution:
- If the actuator pushes against the work part before the target position, it is regarded as a servo-motor error.
  Take care of the positional relationship between the target position and the work part position.
- The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
  It is not the stop condition, so take the greatest care to deal with it.

(27) Torque level (TRQS) PLC input signal PCON only

This signal is available only in the pressing operation.
When the motor current reaches the load threshold during the pressing operation (moving up to the positioning band), this signal is turned “ON”.
Because the current level is monitored, when the current level is changed, this signal is turned “ON” or "OFF.”
The speed available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the parameter No. 51 “Torque Inspected Range” to “1” (disable).
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the operation manual for the controller main body] for more information.

⚠ Caution:
- If the actuator pushes against the work part before the target position, it is regarded as a servo-motor error.
  Take care of the positional relationship between the target position and the work part position.
- The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
  It is not the stop condition, so take the greatest care to deal with it.

(28) Stopping control mode (SMOD) PLC output signal PCON only

One of the pulse motor general characteristics is that that the holding current in the stop mode is larger than that for the AC servo-motor. Because of this, when the stop time is longer at the standby position, the measure to reduce the power consumption at the stop mode is taken as one of the energy saving measures.
SMOD=ON: Full Servo Control System is used in the standby condition.
SMOD=OFF: Standby condition

- Full-servo control mode
  By means of servo control of the pulse motor, the holding current can be reduced.
  The reduction level varies depending on the actuator type or load conditions. However, generally, the holding current will be 1/2 to 1/4.
  The actual holding current can be confirmed in the current monitor window in the IA-OS or RC/EC PC Software.
  (Note) Under the condition where any external force is given or depending on the stop position, slight vibration or abnormal noise might be caused.

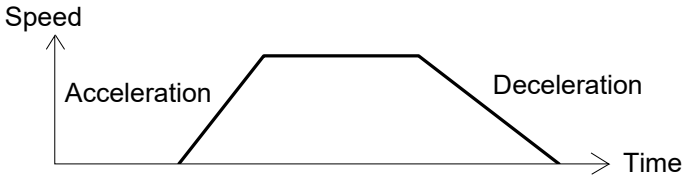
Before implementing this feature, take care to investigate its effects on the whole system in a controlled manner.

(29) Acceleration/deceleration mode (MOD1、MOD0) PLC output signal

This signal is used to select the acceleration/deceleration pattern characteristics. Select one of them before the actuator movement command.

MOD1	MOD0	Pattern name	Remarks
OFF	OFF	Trapezoid pattern	Factory setting
OFF	ON	S-shaped motion	
ON	OFF	First-order lag filter	
ON	ON	Unavailable	

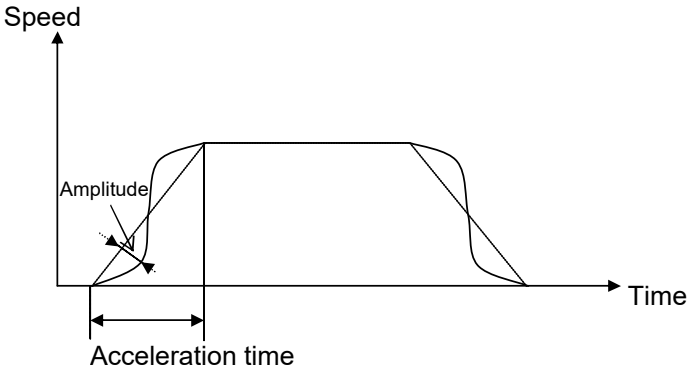
Trapezoid pattern



* The Acceleration and Deceleration are set in the “Acceleration” and “Deceleration” data boxes on the position data.

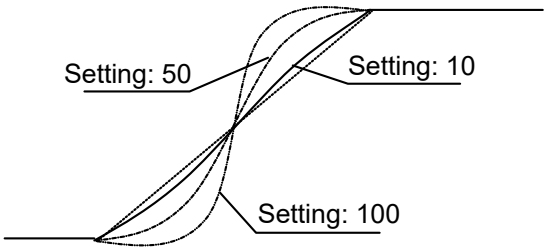
S-shaped motion

When the value in the “Acceleration/deceleration mode” field in the position table is set to 1 (S-shaped motion), the S-shaped motion degree is defined by parameter No. 56.
The setting unit is % and the setting range is from “0" to “100.”
This is set to 0% (S-shaped motion disabled) in the factory setting.



An S-shaped motion becomes a sine waveform after one cycle of the acceleration time.
Specify the degree of amplitude by parameter No. 56.

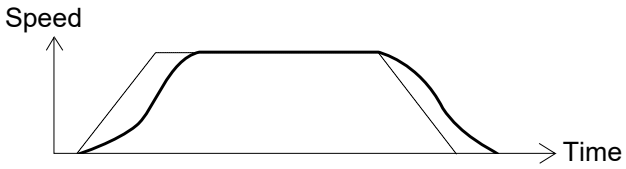
Parameter No. 56 setting [%]	Degree of amplitude
0 [Factory setting]	S-shaped motion disabled (Dashed line in the figure below)
100	Sine waveform amplitude x 1 (Chain double-dotted line in the figure below)
50	Sine waveform amplitude x 0.5 (Chain single-dotted line in the figure below)
10	Sine waveform amplitude x 0.1 (Solid line in the figure below)



⚠ Caution: [1] Even if a position command or direct value command with S-shaped motion setting is issued when the actuator is running, S-shaped motion control will not be executed. Issue these commands when the actuator is stopped.
[2] When the index mode is set on the rotary actuator, S-shaped motion is not executed, and, instead, trapezoid control will be executed.
[3] Set the acceleration/deceleration speed so that the time for each will be within two seconds.
[4] An input to pause is not allowed during acceleration or deceleration. It may cause an excessive change in speed.
[5] If a large value is set, the speed will accelerate significantly at around the mid-point of the acceleration/deceleration time. Do not exceed the rated acceleration/deceleration time of the actuator.

First-order lag filter

This describes a much gentler acceleration/deceleration curve than that for the linear acceleration/deceleration (trapezoid pattern).
Use it when it is not desired to give any slight vibration to the work part in acceleration/deceleration operation.

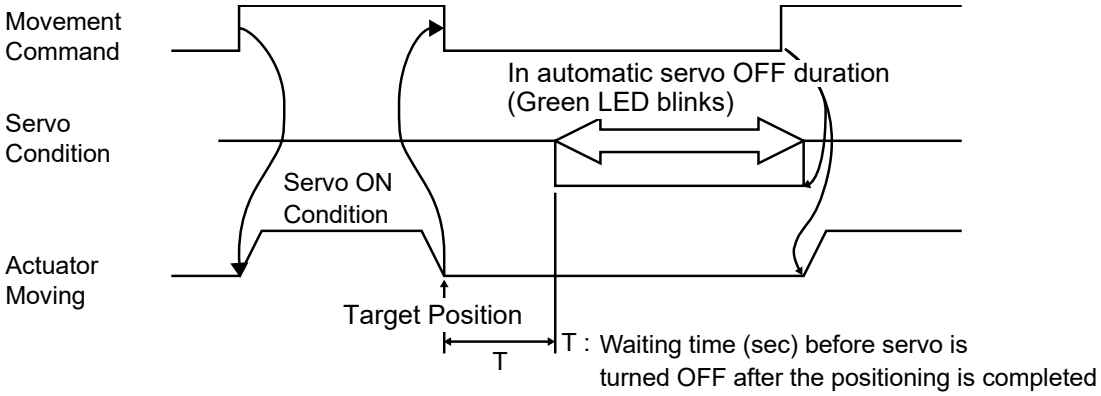


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1ms and setting range is from “0.0” to “100.0”.
When it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

(30) Stop Mode Selection (ASO1, ASO0) PLC Output Signal

Select the stop mode for the duration before the movement to the next position after a positioning is completed.
If the duration for a stop is long, the system automatically turns the servo OFF to reduce the power consumption.
Refer to [the operation manual for the controller main body] for more information.

ASO1	ASO0	Function	Reference
OFF	OFF	Disabled	(Set in delivery)
OFF	ON	Automatic Servo OFF Method Parameter No. 36 is valid for T	
ON	OFF	Automatic Servo OFF Method Parameter No. 37 is valid for T	
ON	ON	Automatic Servo OFF Method Parameter No. 38 is valid for T	



(31) Light error status (ALML) PLC Input Signal

This becomes 1 when a message level (light alarm that the operation can be kept on) is generated.
This signal is not linked with ALM_LED on the front panel of the controller.
Refer to [the instruction manual for the controller main body] for the details of the alarms.

* This signal should behave as a signal of a break contact (*ALML) in Remote I/O Mode thus switching on/off gets reversed to above.

(32) Absolute Battery Voltage Low Warning (BALM) PLC Input signals ACON only

With an serial absolute system, this signal is OFF when the absolute battery voltage is normal. It remains OFF with an incremental system.
This BALM signal turns ON when the absolute battery voltage drops to 3.1 V. If the controller is operated continuously and the voltage drops further to 2.5 V, the controller can no longer retain position information. (If you are using an absolute system and this signal turns ON, replace the battery at the earliest opportunity.)

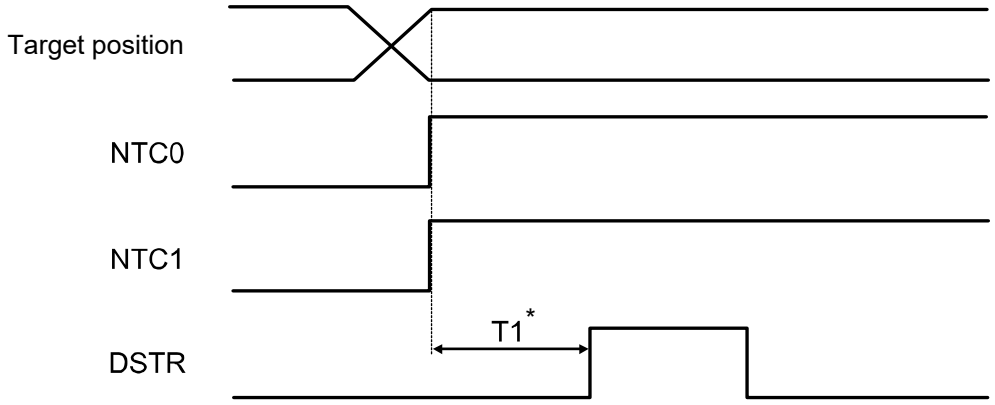
* This signal should behave as a signal of a break contact (*BALM) in Remote I/O Mode thus switching on/off gets reversed to above.

(33) Vibration damping mode selection 0, 1 (NTC0, NTC1) PLC output signals ACON only

The vibration damping control function suppresses the load vibration induced by IAI's actuator. Measure the vibration frequency and set it in a parameter. In another parameter, select and set an appropriate option based on a combination of these signals.
For details, refer to [the operation manual for your controller main body].

NTC1	NTC0	Function	Remarks
OFF	OFF	Do not use vibration damping control.	Factory setting
OFF	ON	Select parameter set 1	
ON	OFF	Select parameter set 2	
ON	ON	Select parameter set 3	

Input timing
An input timing chart of NTC0/NTC1 signals is shown below.



*T1 : Have an enough period of interval considering the scanning time of the host controller.

⚠ Caution: Since the statuses of NTC0/NTC1 signals are loaded when a movement command (DSTR) is recognized, nothing happens when the NTC0/NTC1 signals are turned ON/OFF while the actuator is moving.

(34) Servo gain parameter set selection (GSL0, GSL1) PLC output signals ACON only

The actuator can be operated by selecting, for each position movement, any one of the following four pre-defined sets of servo gain parameters (six different parameters).
For details, refer to [the operation manual for your controller main body].

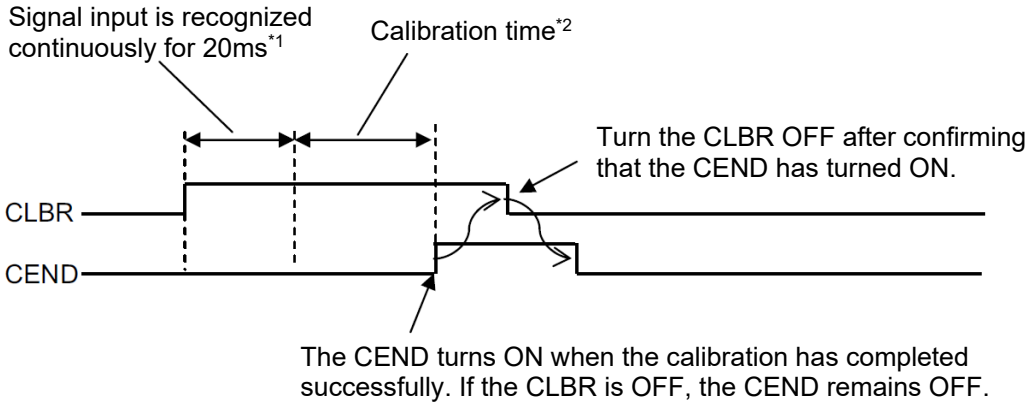
GSL1	GSL0	Function	Remarks
OFF	OFF	Select parameter set 0	Factory setting
OFF	ON	Select parameter set 1	
ON	OFF	Select parameter set 2	
ON	ON	Select parameter set 3	

(35) Load cell calibration command (CLBR) PLC output signal PCON-CBP only
Load cell calibration complete (CEND) PLC input signal PCON-CBP only

The factory setting for the load cell is 0N when no load is applied. If you want to use the loaded condition as the reference (0N), perform the following calibration. Also perform this calibration in other conditions as necessary (such as during readjustment, inspection, etc.).

[1] Stop the operation. (Calibration cannot be performed while any axis is operating, pushing a work part or paused, in which case an attempt to perform calibration will generate a 0E1 (load cell calibration error) alarm.
[2] Turn ON the load cell calibration signal (CLBR) and keep it ON for at least 20ms.
[3] Once the calibration is complete, the calibration complete signal (CEND) turns ON. Thereafter, turn OFF the CLBR signal.
If the calibration was not successful, a 0E1 (load cell calibration error) alarm generates.

⚠ Caution: Normal operation commands are not accepted while the CLBR signal is ON.



*1 If the CLBR is turned OFF during this period, the signal is not recognized and therefore calibration is not performed.
*2 If the CLBR is turned OFF during this period, an alarm generates.

3.7 I/O Signal Timings

Turn any control signal on in order to operate ROBO Cylinder with a sequence program in PLC, the response (status) signal for that would be returned to the PLC. The maximum respond time should be expressed with the formula below.

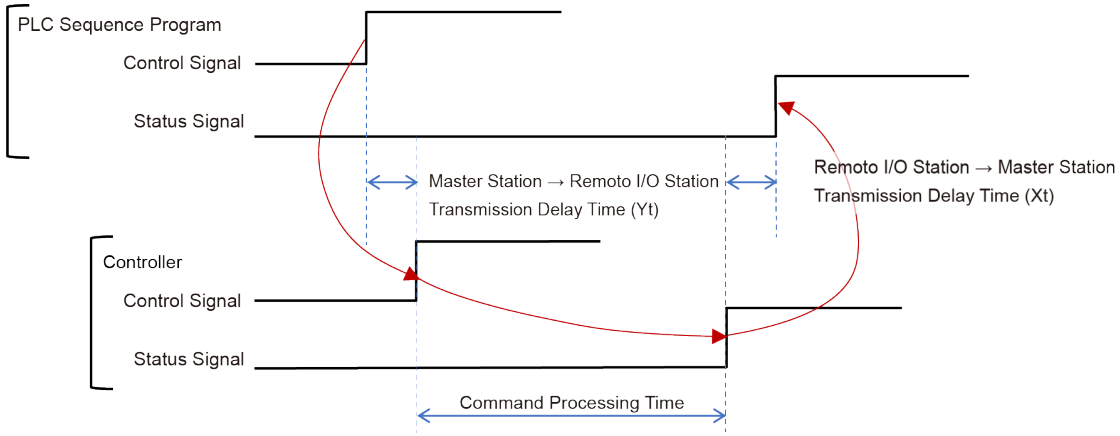
Max. Response Time [ms] = Yt + Xt + 2 + Command Processing Time (Operation Time, etc.)

Yt: Master Station → Remote I/O Station Transmission Delay Time

Xt: Remote I/O Station → Master Station Transmission Delay Time

} Field Network Transmission Delay Time

For the Master Station to Remote I/O Station Transmission Delay Time (Yt) and the Remote I/O Station to Master Station Transmission Delay Time (Xt), refer to [the instruction manuals for the EtherNet/IP Master Unit and mounted PLC].



3.8 Operation

The timings for the basic operation examples in the Position/Simplified Direct Mode (Position/Simplified Direct Mode, Position/Simplified Direct Mode 2), Half direct mode (Half direct mode, half direct mode 2) and Full direct mode (Full direct mode, Full direct mode 2), are described.
For the Remote I/O Mode (Remote I/O Mode, Remote I/O Mode 2 and Remote I/O Mode 3), refer to [the operation manual for the controller].
(In remote I/O mode 2, read the current position and current speed from the respective byte of the PLC, as deemed appropriate.)

3.8.1 Operation in the Position/Simplified Direct Value Mode

It is operated with the position data written in the PLC's register and the speed, acceleration /deceleration, positioning band and pressing current-limiting value, etc. set using the position table.

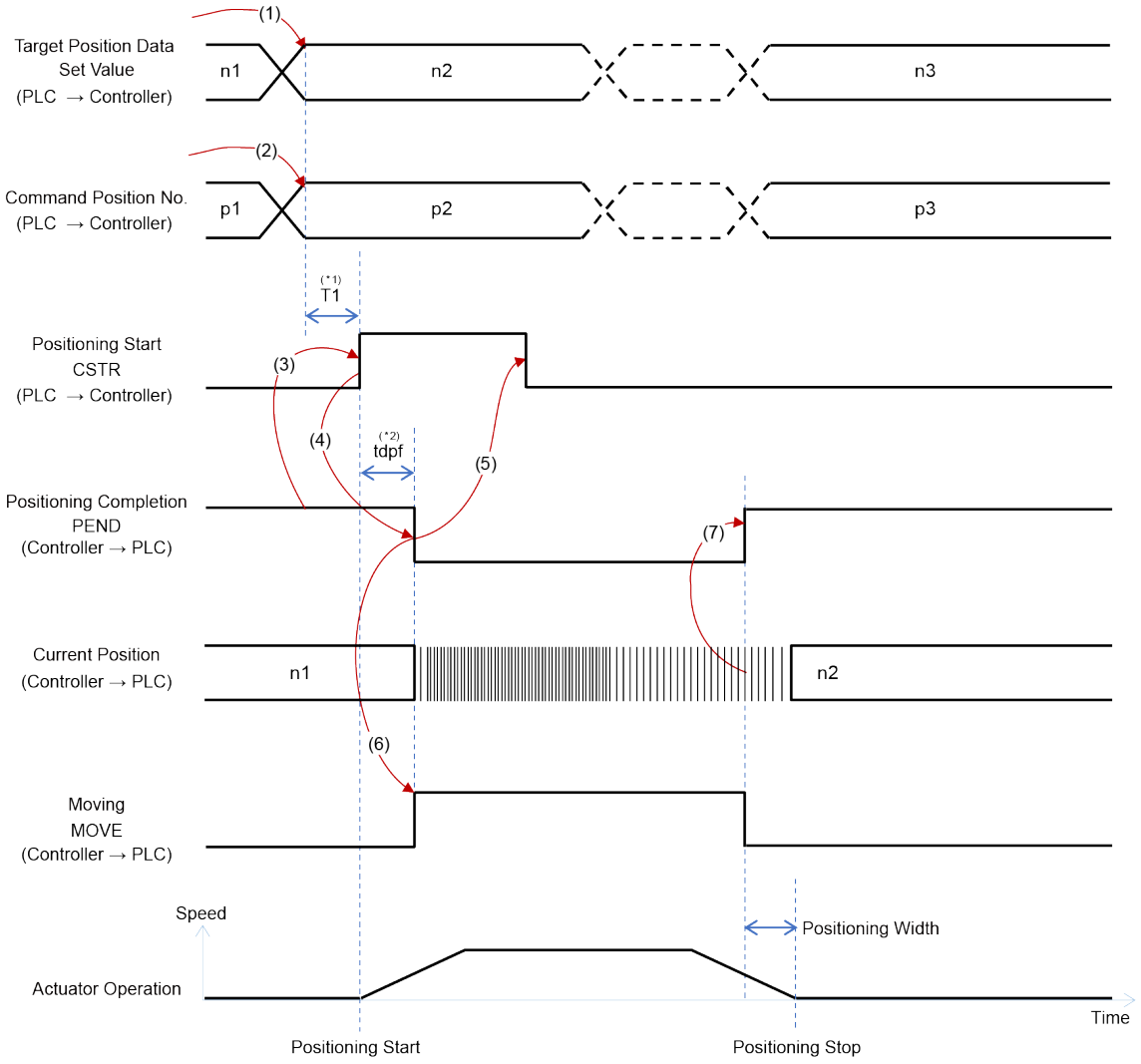
[1] Operation Example (General Positioning Operation)

(Preparation) Set the position data items (speed, acceleration/deceleration, positioning width, etc) except for the target position item, in the position table.
Turn ON the Position/Simplified Direct Value Change-Over Signal (PMOD).

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
* The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned “OFF”.
(6) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(7) The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning width set in the position data, and the CSTR signal is turned “OFF”, the PEND signal is turned “ON”. (Note 1)
The complete position number should get output to the complete position number register at the same time.
Note 1 PEND Signal would not turn on while CSTR Signal is on.
When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.
(*) The target position data can be changed during the actuator movement.
In order to change the target position, change the target data and turn ON the CSTR signal after the time longer than the PLC scanning time has passed.
Change the value for the CSTR signal after the time longer than the PLC scanning time has passed.

Operation in the Position/Simplified Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

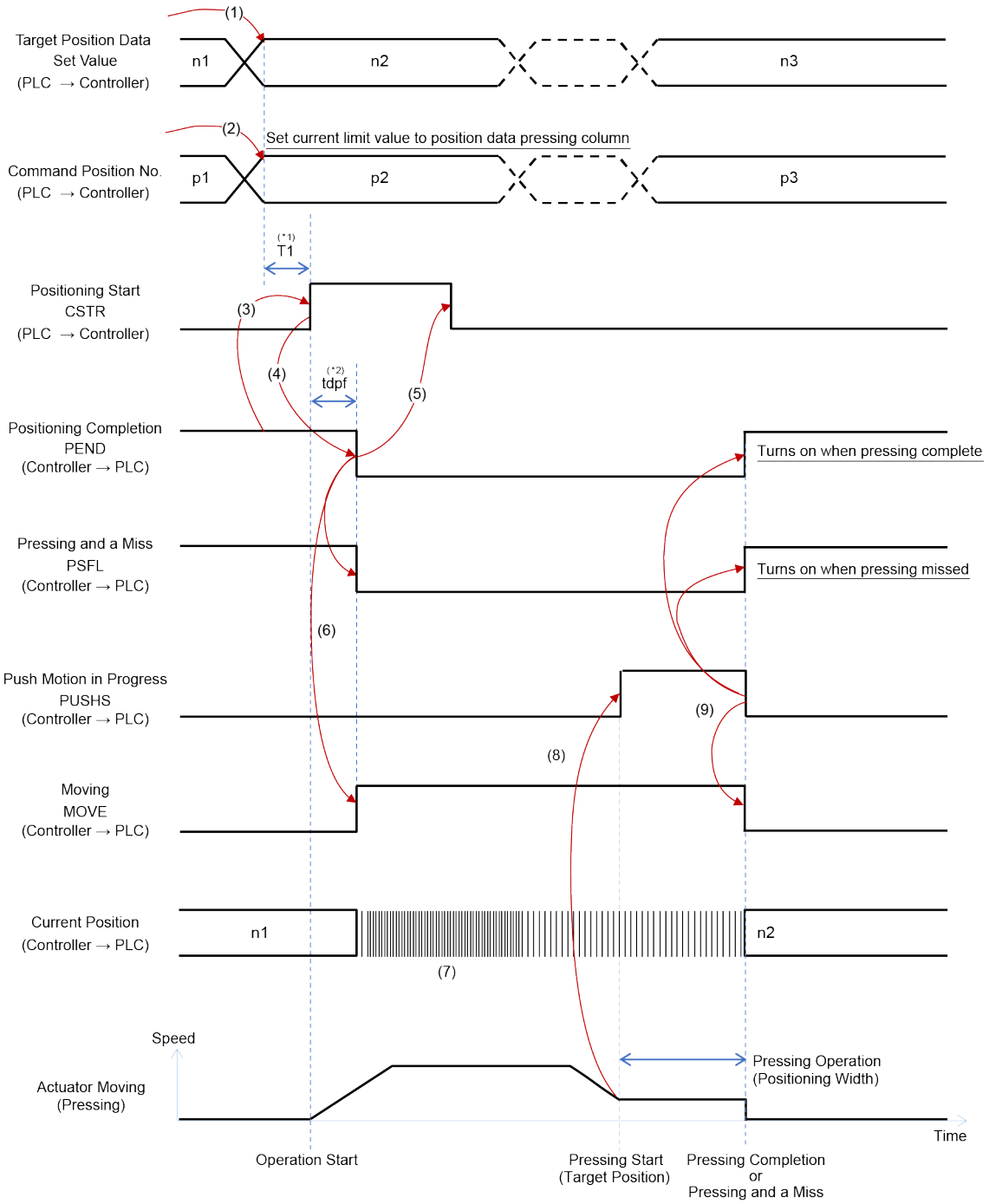
For the pressing operation, the current limit value is set in the pressing data box on the position data at the preparation stage.

When the positioning is performed onto the position No. for which the value is set in the pressing data box, the pressing operation is performed.

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
 * The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned “OFF”.
(6) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
 * Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(7) The current position data is continuously updated.
(8) Once it reaches the target position, PUSHS Signal turns on as well as the pressing operation starts.
(9) Once the pressing operation completes, PUSHS Signal and MOVE Signal should turn off.
 If the pressing operation completes in the normal condition, PEND Signal should turn on when CSTR signal is off and the complete position number should get output to the complete position number register.
 When the pressing operation is missed, PSFL Signal should turn on, and the complete position number should get output the complete position number register.
 (Note) PEND Signal would not turn on while CSTR Signal is on.
 When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.

Operation in the Position/Simplified Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

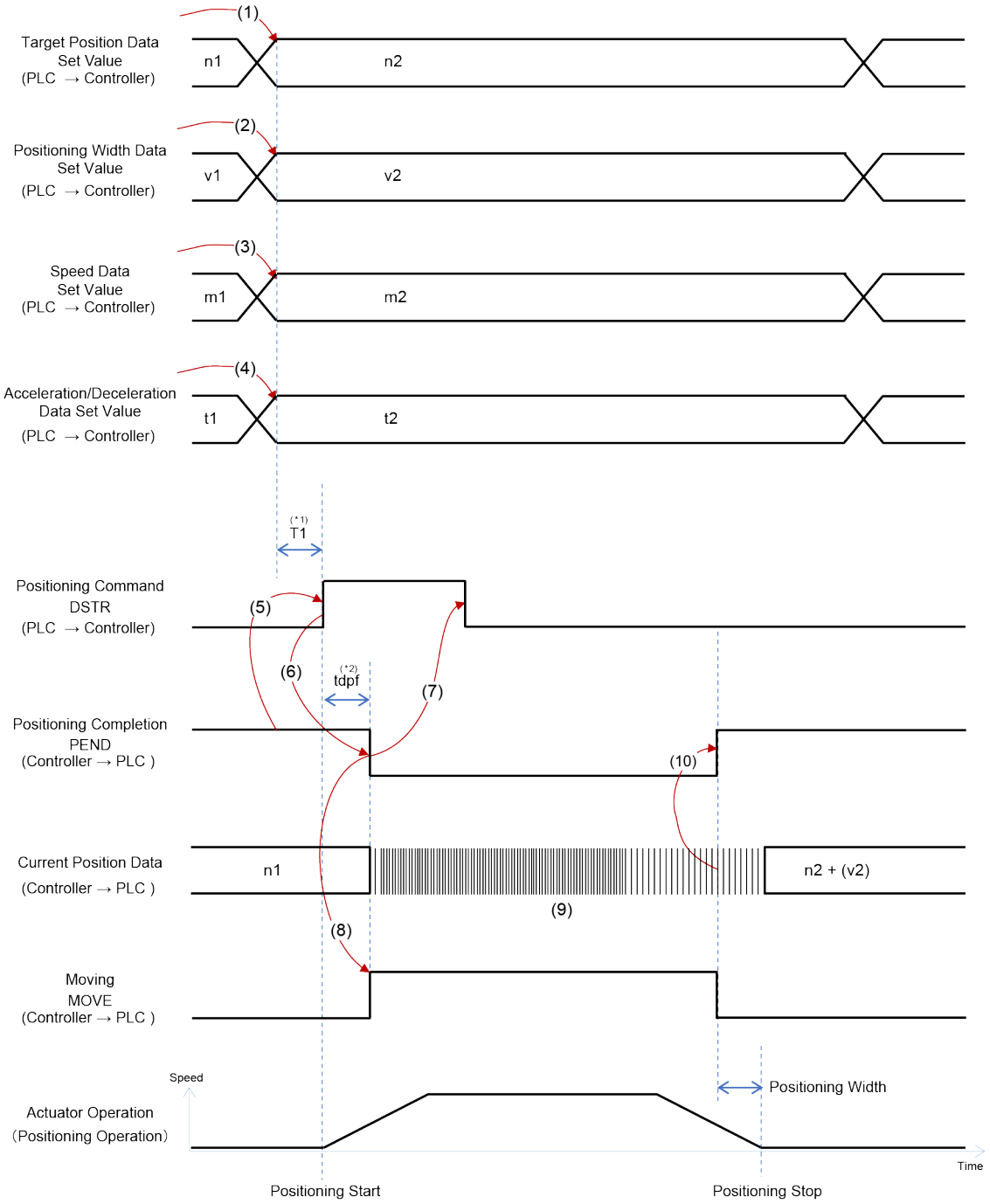
3.8.2 Operation in the Half Direct Value Mode

It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current-limiting setup register.

[1] Operation Example (General Positioning Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (4) are read in the controller at the startup (ON edge) of the DSTR signal.
(6) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(7) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(8) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(9) The current position data is continuously updated.
(10) PEND Signal should turn on when remaining movement amount gets into the range of the positioning band set in the position data while DSTR Signal is off.

Operation in the Half Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

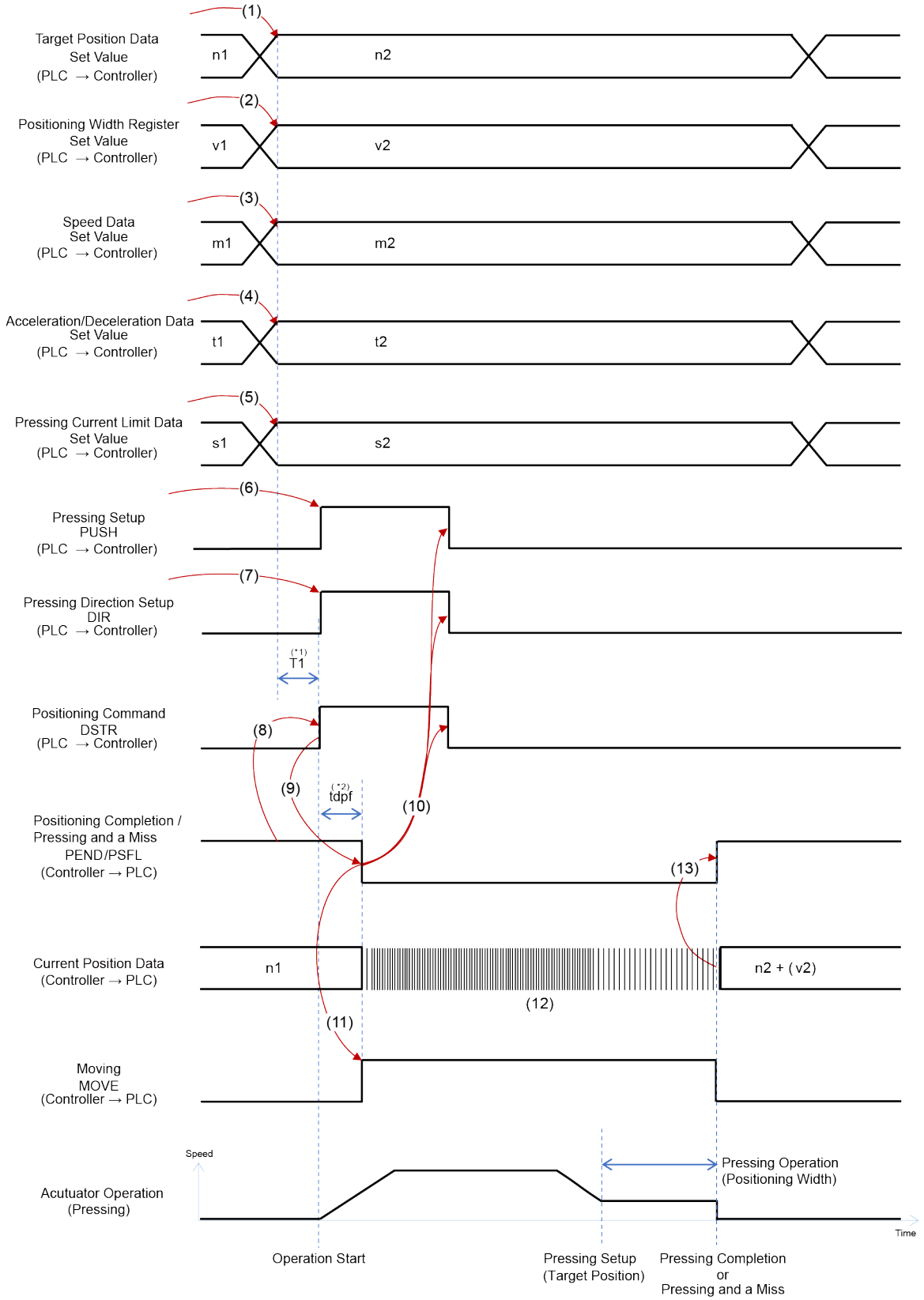
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Set the pressing current limit data in the pressing current limit value register.
(6) Turn “ON” the pressing setup (PUSH) signal.
(7) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [3.6.10 (22)]
(8) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (7) are read in the controller at the startup (ON edge) of the DSTR signal.
(9) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(10) Confirm that PEND Signal is turned off, and then turn off DSTR Signal, PUSH Signal and DIR Signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(11) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(12) The current position data is continuously updated.
(13) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (5), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (5), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Half Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

3.8.3 Operation in the Full Direct Value Mode

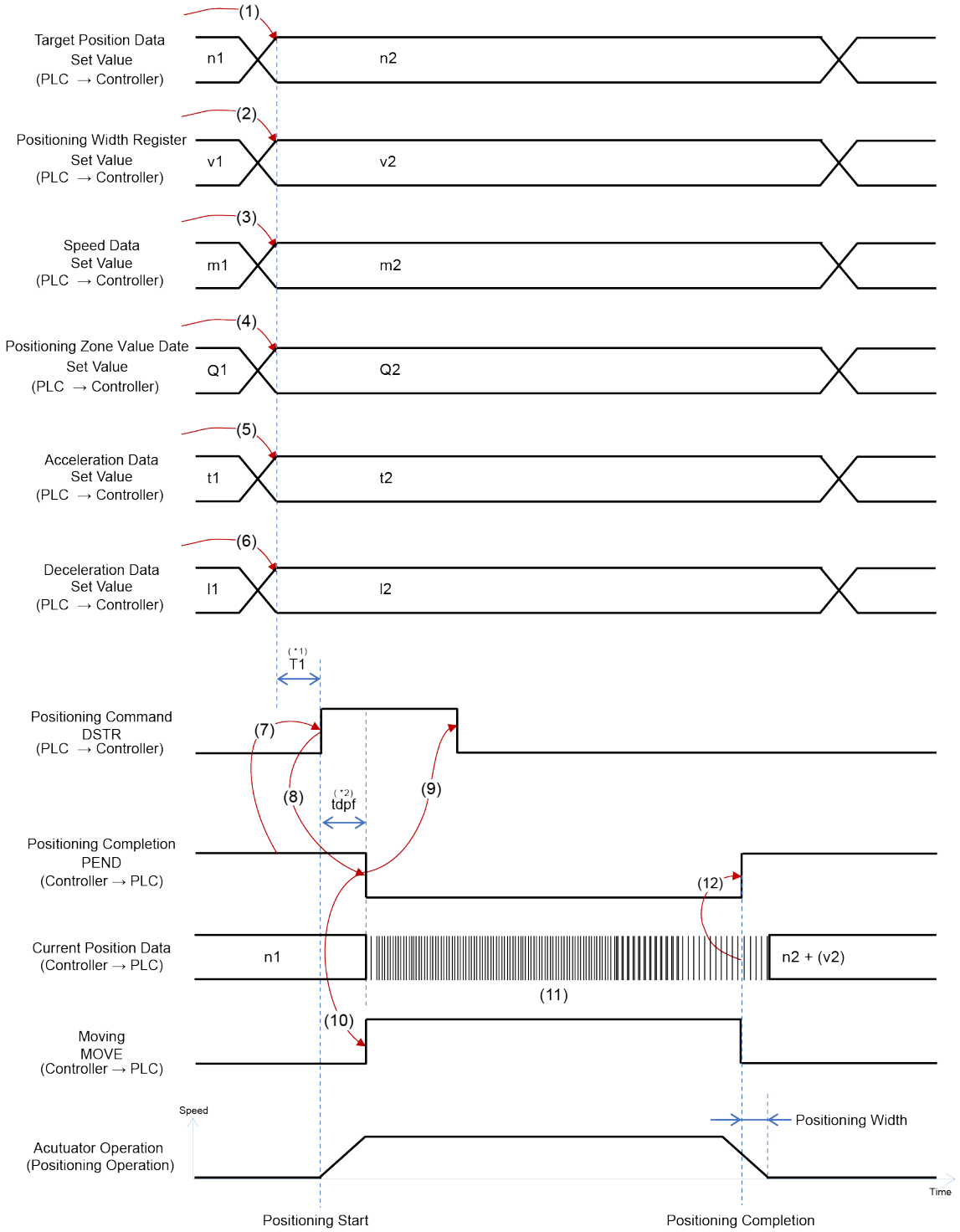
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

[1] Operation Example (General Positioning Operation)

When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register and zone value - register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
    * The data items set in Steps (1) through (6) are read in the controller at the startup (ON edge) of the DSTR signal.
(8) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(9) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
    * Do not change any value in each data until the DSTR signal has been turned “OFF”.
(10) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
    * However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(11) The current position data is continuously updated.
(12) When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

Operation in the Full Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

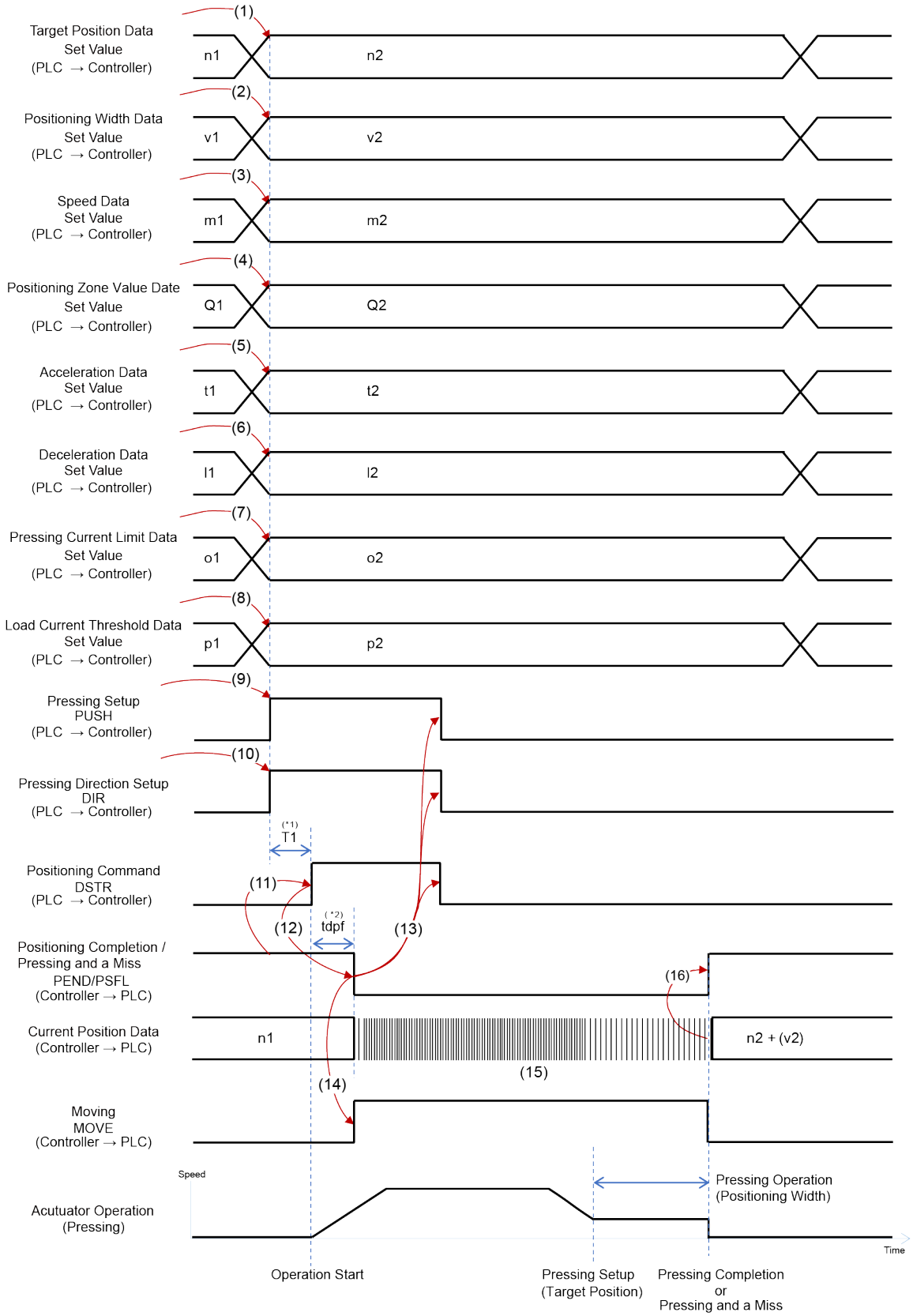
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register or zone value -register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Set the pressing current limit data in the pressing current limit value register.
(8) Set the load current threshold data in the load current threshold setup register.
(9) Turn “ON” the pressing setup (PUSH) signal.
(10) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [3.6.10 (22)]
(11)Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (10) are read in the controller at the startup (ON edge) of the DSTR signal.
(12) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(13) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(14) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(15) The current position data is continuously updated.
(16) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (7), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (7), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON” In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Full Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

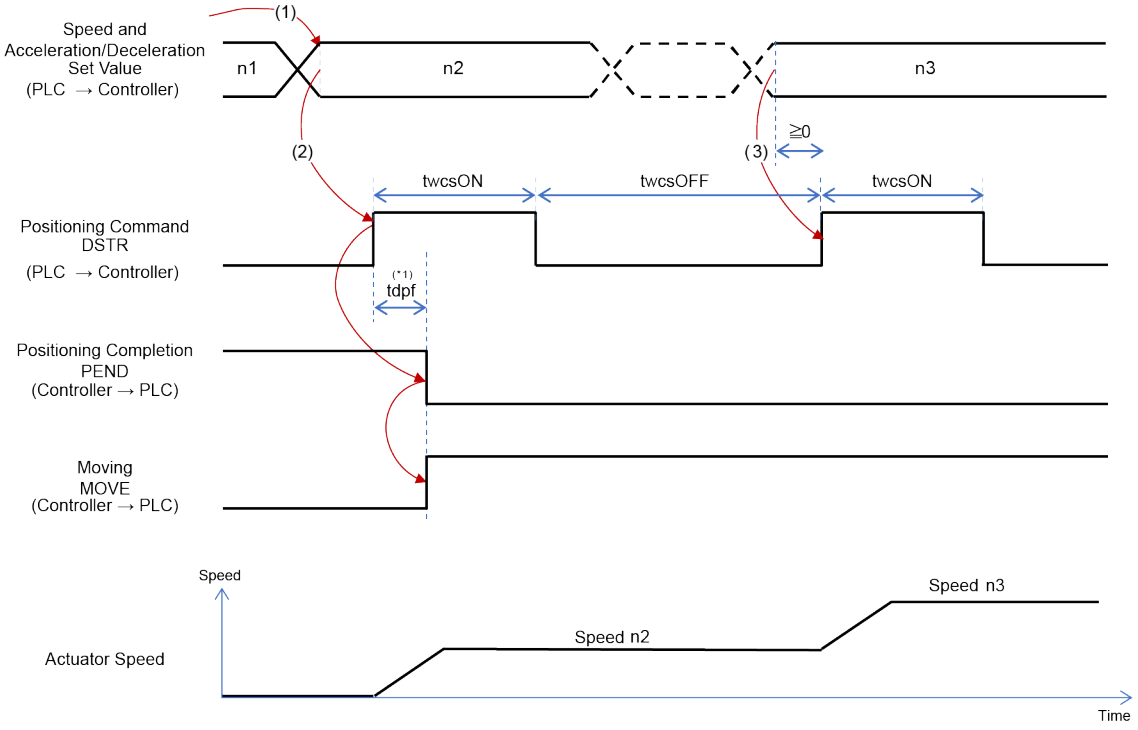
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

3.8.4 Data Change During Movement

The half direct mode and full direct mode are capable of changing the settings for the output data registers (target position data, acceleration/deceleration data, velocity data, positioning band and current limit during pressing) during operation.

Shown in the figure below is an example of changing the velocity and acceleration/deceleration.

(1) Set the velocity data and acceleration/deceleration data.
(2) After a change is made to the data, set the positioning command (DSTR) on for more than tdpf.
(3) Leave time for more than twcsON + twcsOFF before turning the next DSTR on after setting DSTR off.



twcsON ≥ Yt+Xt+3 (ms)
twcsOFF ≥ Yt+Xt+3 (ms)
*Yt+Xt ≤ tdpf ≤ Yt+Xt+3 (ms)

⚠ Caution
1. When the speed has not been set or it is set to “0”, the actuator is not moved, but an alarm is not issued.
2. When the speed setting is changed to “0” during the movement, the actuator is decelerated and stopped, but an alarm is not issued.
3. Even when the acceleration/deceleration data only is changed during the movement, the setting of the target position data is required.
4. Even when the target position data only is changed during the movement, the setting of the acceleration/deceleration data is required.

3.9 EtherNet/IP Related Parameters

Parameters relating to EtherNet/IP are No. 84, No. 86 to 87, No. 90, No. 140 to 142 and No. 159.

Category: C: External interface parameter

No.	Category	Name	Default value set in the factory before delivery
1 to 83		Refer to [operation manual for the controller] for the parameters No. 1 through No. 83.	
84	C	Field bus operation mode	0
86	C	Field bus baud rate	0
87	C	Network type	7
90	C	Field I/O format	3
140	C	IP address	192.168.0.1
141	C	Subnet mask	255.255.255.0
142	C	Default gateway	0.0.0.0
159	C	FB Half Direct Mode Speed Unit	0

- Field bus operation mode (No.84)
  Specify the operation mode in parameter No. 84 using a value between 0 and 4.

Value set in parameter No. 84	Mode	Number of occupied bytes	Contents
0 (Factory setting)	Remote I/O mode	2	Operation using PIOs (24 V I/Os) is performed via EtherNet/IP.
1	Position/simple direct mode	8	The target position can be set directly using the value or the operation can be performed using position data value. The other values required for the operation are set on the position data.
2	Half direct value mode	16	In addition to the target position, the speed, acceleration/deceleration and pressing current value are set directly using the values to perform the operation.
3	Full direct value mode	32	All the values related to the position control are set using the values to perform the operation.
4	Remote I/O mode 2	12	The current position and current speed reading functions are added to the functions in the remote I/O mode.
5	Position/simple direct mode 2	8	Set this value to implement force control in the position/simple direct numerical mode.
6	Half direct value mode 2	16	Set this value to implement force control in the half direct numerical mode.
7	Remote I/O mode 3	12	Set this value to implement force control in the remote I/O mode.
9	Full direct value mode 2	32	All the values related to the position control are set using the values to perform the operation. Also, the overload level monitoring and current indication value monitoring are available.

(Note) Position/Simple Direct Mode 2, Half Direct Mode 2 and Remote I/O Mode 3 are available only for PCON-CBP/CGBP types.

(Note) Full direct value mode 2 are available only for PCON-CB/CFB/CGB/CGFB/CBP/CGBP types.

- Fieldbus baud rate (No. 86)
  Specify the baud rate in parameter No. 86.

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

- Network type (No.87)
  The network module type is set for the parameter No. 87. Do not change the default value.

- Field I/O format (No.90)
  By changing the setting of parameter No. 90, data elements can be swapped within a boundary of two words or less in units of bytes during communication using the I/O areas of the PLC.

Value set in parameter No. 90	Contents
0	Data exchange is not performed. The data is sent directly to the PLC. Refer to [the Example i].
1	The host bytes are exchanged with slave bytes in the host words and slave words. Refer to [the Example ii].
2	In the case of word register, the host words are exchanged with the slave words. Refer to [the Example iii].
3 (Factory setting)	The host bytes are exchanged with slave bytes in the host words and slave words. In addition, the upper word and lower word are swapped for word resisters. Refer to [the Example iv].

(Example i) Set value = “0”

● indicates ON, while ○ indicates OFF

PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇧

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇩

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example ii) Set value = “1”

● indicates ON, while ○ indicates OFF

PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example iii) Set value = “2”

● indicates ON, while ○ indicates OFF

PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

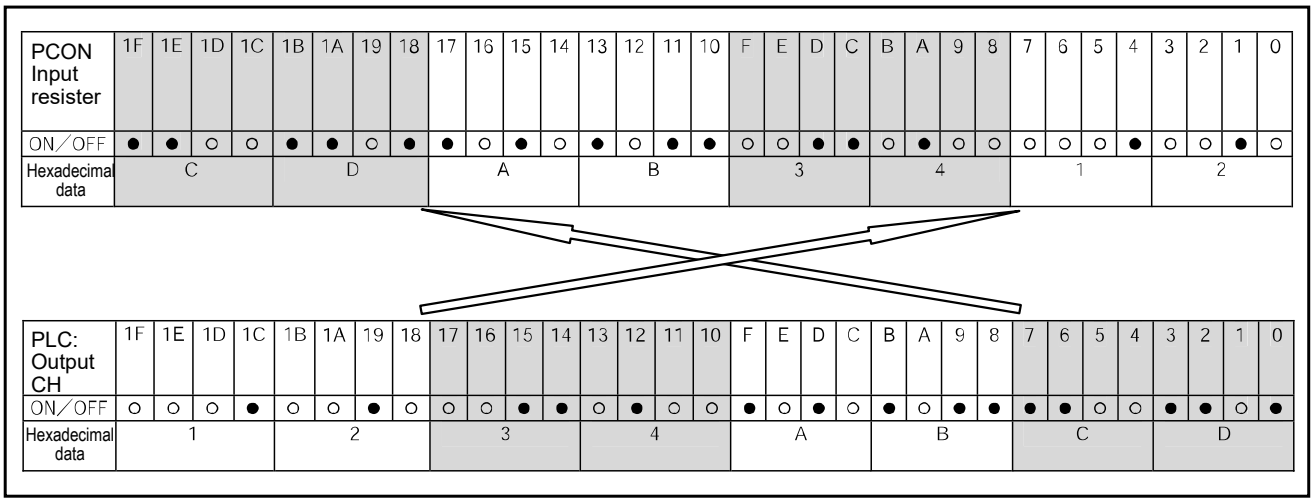
PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

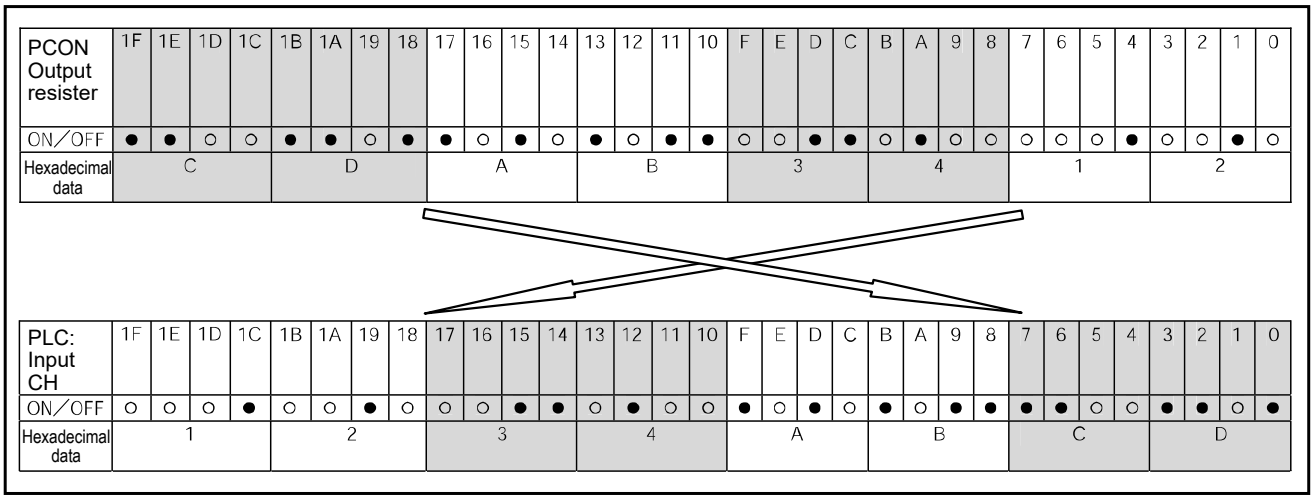
PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example iv) Set value = “3”

● indicates ON, while ○ indicates OFF





- IP address (No. 140)
  Specify the IP address in parameter No. 140.

  Setting range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.1)
  (Note) When this parameter is set to 0.0.0.0, DHCP is enabled. Manual setting is recommended.

- Subnet mask (No. 141)
  Specify the subnet mask in parameter No. 141.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 255.255.255.0)

- Default gateway (No. 142)
  Specify the default gateway in parameter No. 142.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 0.0.0.0)

- FB Half Direct Mode Speed Unit (No.159)
  Determines the unit of measure when operating the unit in Half Direct Mode.

Parameter No. 159 Setting Value	Speed Setting Unit
0 (Set in delivery)	1mm/s
1	0.1mm/s

3.10 Troubleshooting

- Alarm messages and causes/actions
  When an alarm occurs, a corresponding simple alarm code is indicated by the completed position number bits (four bits of PM1 to PM8) in remote I/O mode 1 to 3.
  In position/simple direct mode 1 and 2, this simple alarm code is output to the (n+4, n+5) bytes.
  In half direct mode 1 and 2 or in the full direct mode 1 and 2, this alarm code is output to the (n+12, n+13) bytes
  [1] Check the alarm code using the monitor function of the PLC, etc., or connect the teaching tool and check the status monitor screen.
  [2] Search the alarm list in the operation manual for your controller to find the section corresponding to the identified alarm code.
  [3] Take an appropriate action according to the explanation of the alarm code.
  For the alarm codes listed below, take the corresponding actions:

Code	Error name	ID (*1)	Alarm reset	Cause/action
0F2	Fieldbus module error	05	Cannot	Cause: A fieldbus module error has been detected. Action: Check the applicable parameters.
0F3	Fieldbus module non-detection error	04	Cannot	Cause: The module could not be detected. Action: Reconnect the power. If the problem persists, please contact IAI.

(*1) ID → Simple alarm code

4. SCON-CA/CB/CGB/CAL/CGAL

(Note) As CAL and CGAL Types possess the same functions, this manual describes them together as CAL Type.

4.1 Operation Modes and Functions

All of the operation modes described in the table below for SCON-CA/CB Type applicable for Ethernet/IP and those except for the ones in the shaded area for CAL Type are available to choose from for operation.

Operation modes and key functions

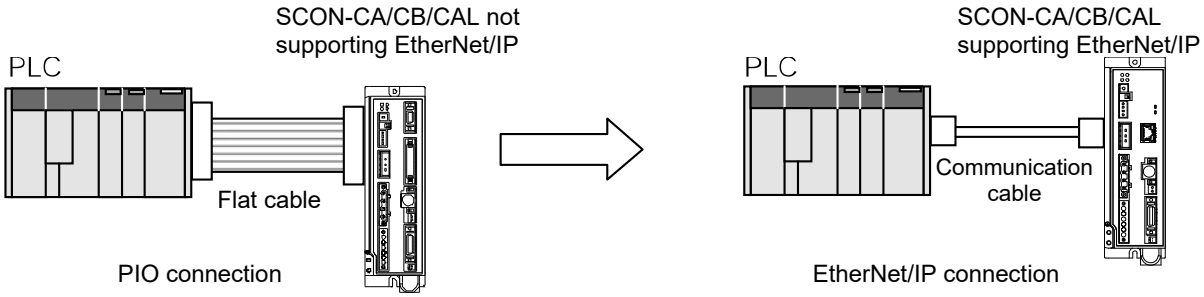
Key function	Remote I/O mode	Position/ simple direct mode	Half direct mode	Full direct mode	Remote I/O mode 2	Position/ simple direct mode 2	Half direct mode 2	Remote I/O mode 3	Half direct mode 3	Full direct mode 2 (*3)
Number of occupied bytes	2	8	16	32	12	8	16	12	16	32
Operation by position data specification	x	○ (*1)	○	○	x	○ (*1)	○	x	○	○
Direct speed/ acceleration specification	x	x	○	○	x	x	○	x	○	○
Pressing operation	○	○	○	○	○	○	○	○	○	○
Current position read	x	○	○	○	○	○	○	○	○	○
Current speed read	x	x	○	○	x	x	○	x	○	○
Operation by position number specification	○	○	x	x	○	○	x	○	x	x
Completed position number read	○	○	x	x	○	○	x	○	x	x
Maximum position table size	512	768	Not used	Not used	512	768	Not used	512	Not used	Not used
Force control	Δ (*2)	x	x	○	Δ (*2)	○	○	Δ (*2)	x	○
Vibration damping control	○	○	x	○	○	○	x	○	○	○
Servo gain switching	○	○	○	○	○	○	x	○	○	○

(*1) The actuator is operated by specifying all position data, other than positions, using position numbers.

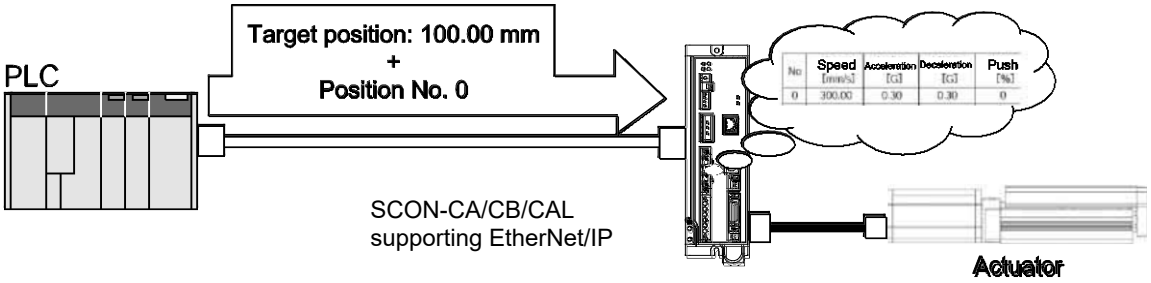
(*2) These functions can be used when the PIO pattern is set to 6 or 7.
However, SCON-CAL is not applicable for PIO patterns 6 and 7.

(*3) It can be used only in SCON-CB/CGB. Applicable Controller Versions: V0022 or later.

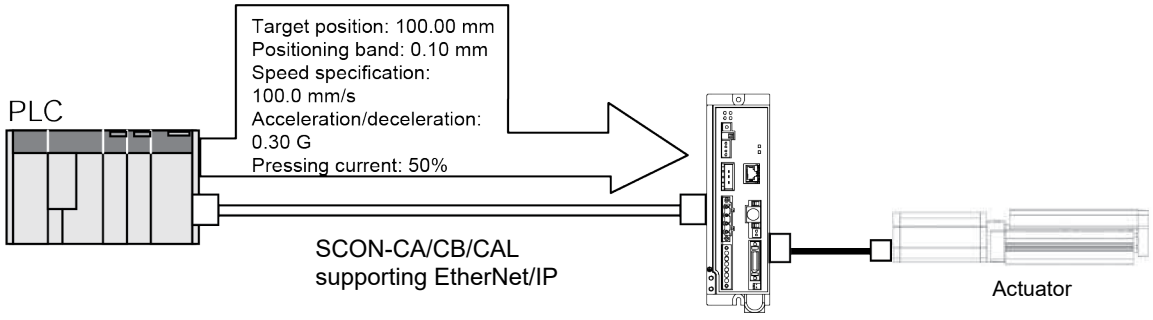
[1] Remote I/O mode: In this mode, the actuator is operated by PIOs (24V I/Os) via EtherNet/IP communication.
Number of occupied bytes: 2 bytes



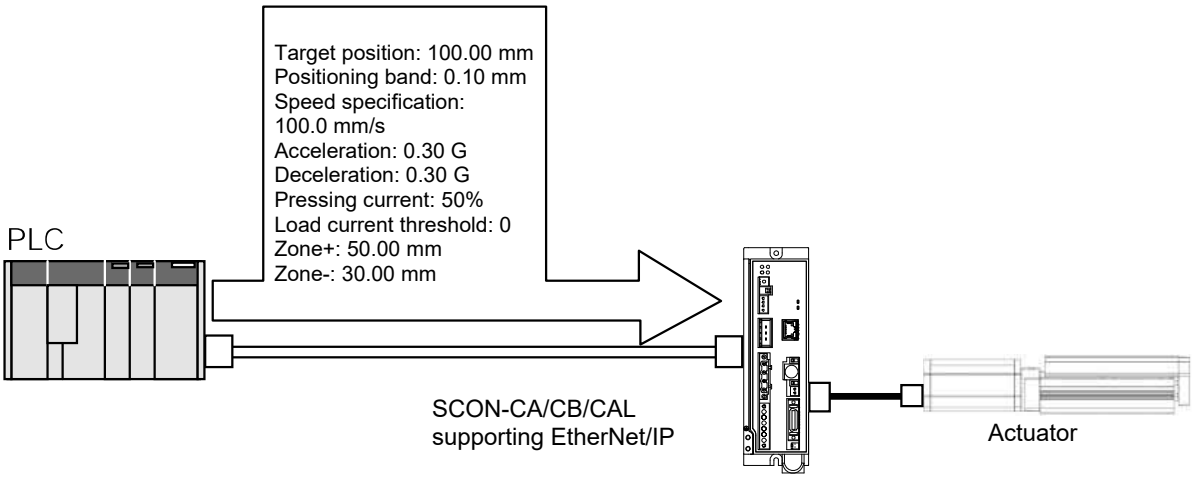
[2] Position/simple direct mode: In this mode, the actuator is operated by specifying position numbers. You can select whether to specify the target position directly as a value, or use a value registered in the position data table, by switching a control signal.
For the speed, acceleration/deceleration, positioning band, etc., values preregistered in the position data table are used. Up to 768 position data points can be set.
Number of occupied bytes: 8 bytes



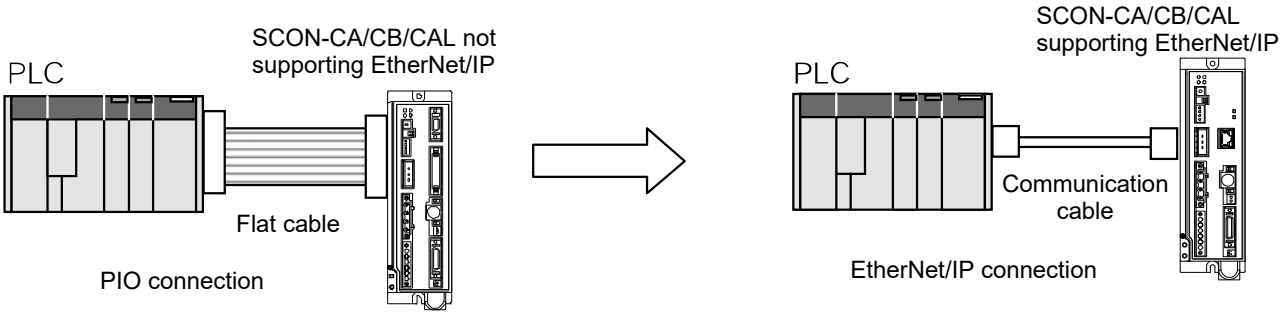
[3] Half direct mode: In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and pressing current, in addition to the target position, directly as values.
Number of occupied bytes: 16 bytes



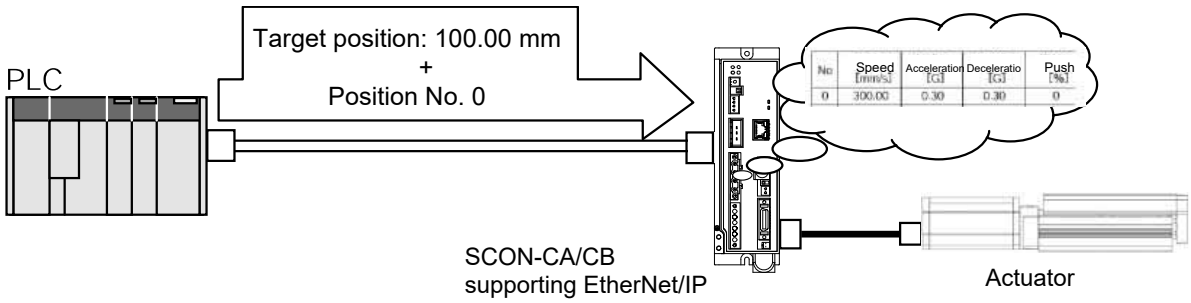
[4] Full direct mode: In this mode, the actuator is operated by specifying all values relating to position control (target position, speed, acceleration/deceleration, etc.) directly as values.
Number of occupied bytes: 32 bytes



[5] Remote I/O mode 2: In this mode, the actuator is operated by PIOs (24V I/Os) via EtherNet/IP communication.
The current-position and command-current read functions are available in addition to the functions provided in mode [1].
Number of occupied bytes: 12 bytes

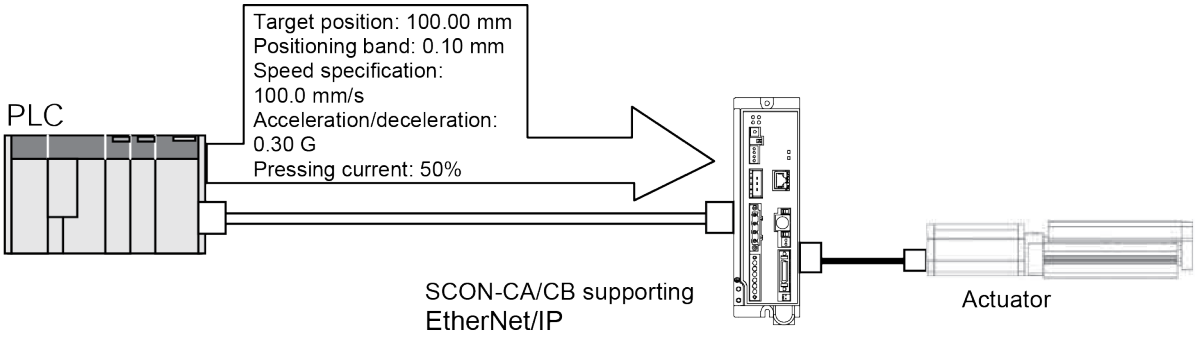


[6] Position/simple direct mode 2: In this mode, the actuator is operated by specifying position numbers.
(Not applicable for CAL Type) In this mode, the force control function is available instead of the teaching function and zone function available in mode [2].
Number of occupied bytes: 8 bytes



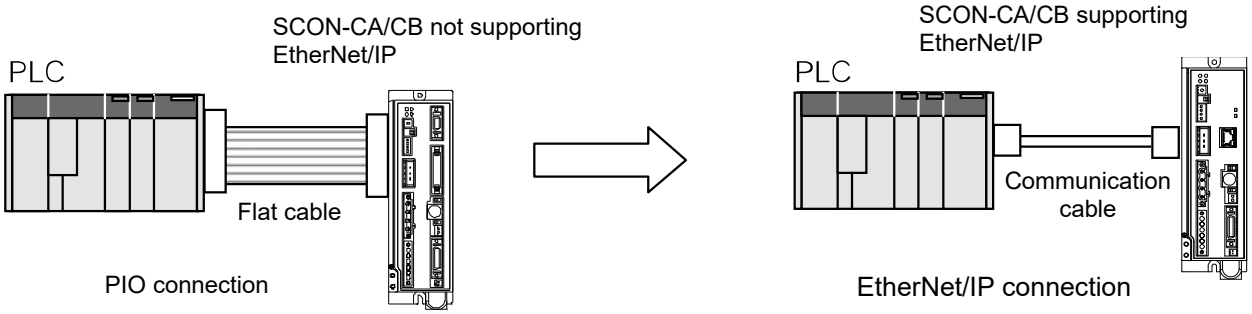
[7] Half direct mode 2:
(Not applicable for CAL Type)

In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and pressing current, in addition to the target position, directly as values.
Unlike in mode [3], command current cannot be read in this mode. However, load cell data can be read instead. This mode also supports force control.
Number of occupied bytes: 16 bytes



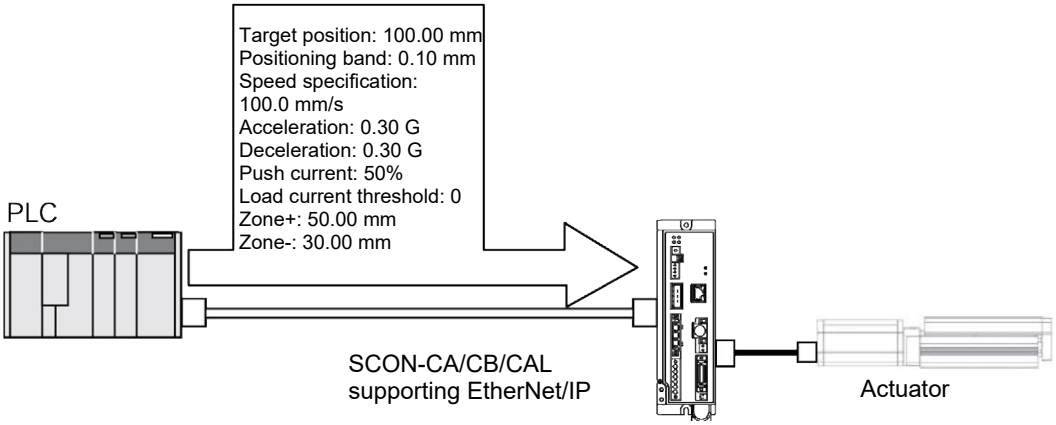
[8] Remote I/O mode 3:
(Not applicable for CAL Type)

In this mode, the actuator is operated by EtherNet/IP instead of PIO (24 V I/O).
Current position and command current function is added to the function [1].
Number of occupied bytes: 12 bytes

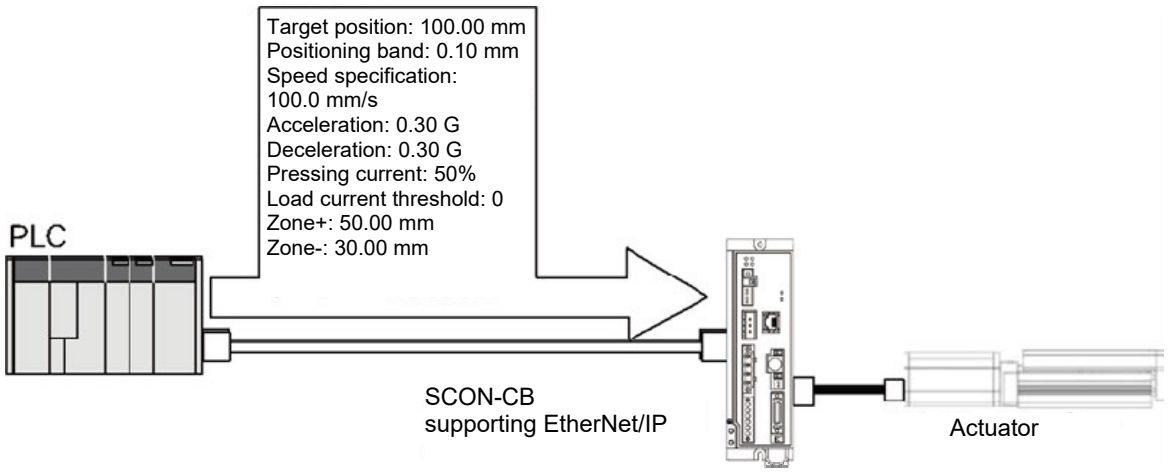


[9] Half direct mode 3:

In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and pressing current, in addition to the target position, directly as values.
In this mode, the vibration damping function is supported instead of the jog function available in mode [3].
Number of occupied bytes: 16 bytes



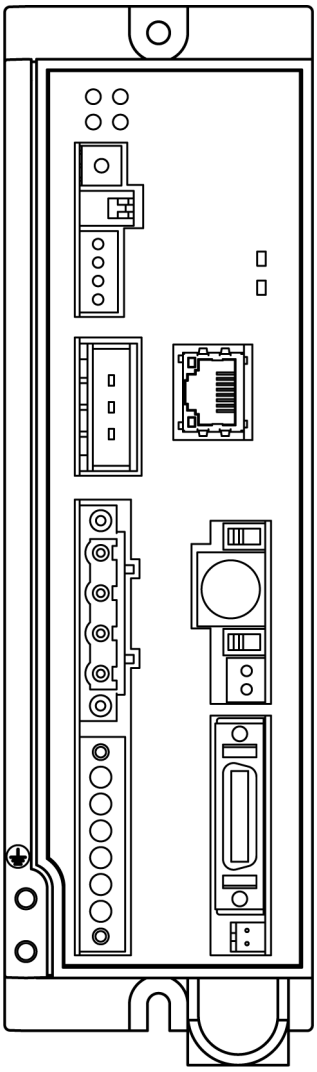
[10] Full direct mode 2: In this mode, the actuator is operated by specifying all values relating to position control (target position, speed, acceleration/deceleration, etc.) directly as values. The overload level monitoring, current indication value and monitoring of the estimated regenerative discharge power volume are available.
Number of occupied bytes: 32 bytes (SCON-CB/CG only)



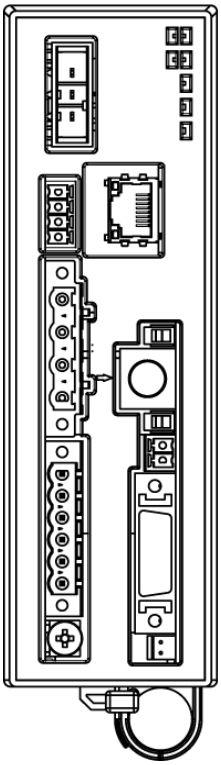
4.2 Model Numbers

The model numbers of SCON-CA/CB/CAL controller supporting EtherNet/IP are indicated as follows, respectively:

●SCON-CA/CB-☐-EP-☐



●SCON-CAL-☐-EP-☐

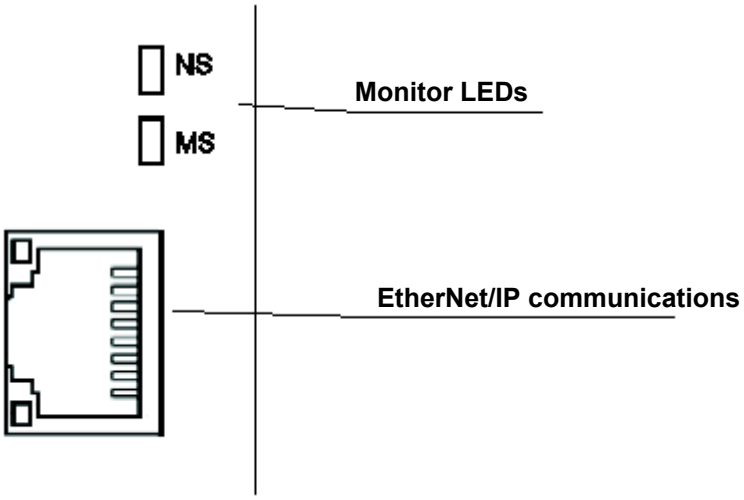


4.3 EtherNet/IP Interface

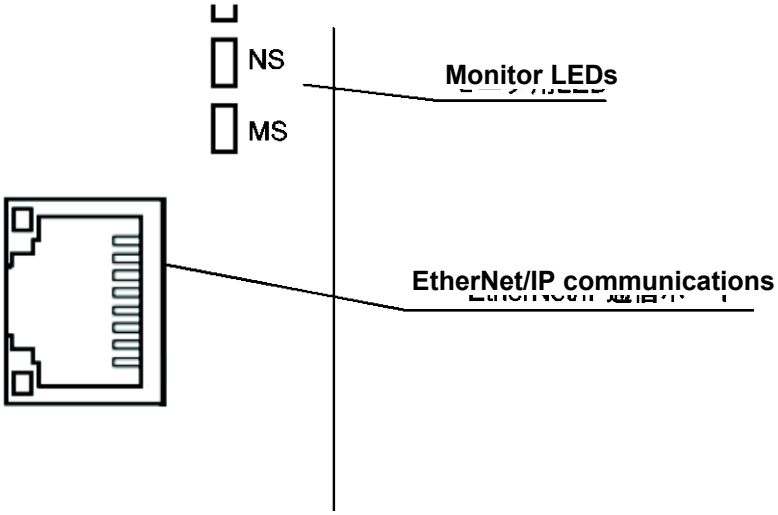
4.3.1 Names of the Parts

The names of each section related to EtherNet/IP are described as follows.

●SCON-CA/CB



●SCON-CAL



4.3.2 Monitor LED Indications

The slave condition (each controller), as well as network condition, can be checked using the two LEDs, MS and NS, provided on the front panel of the controller.
The description of each is explained in the following table.

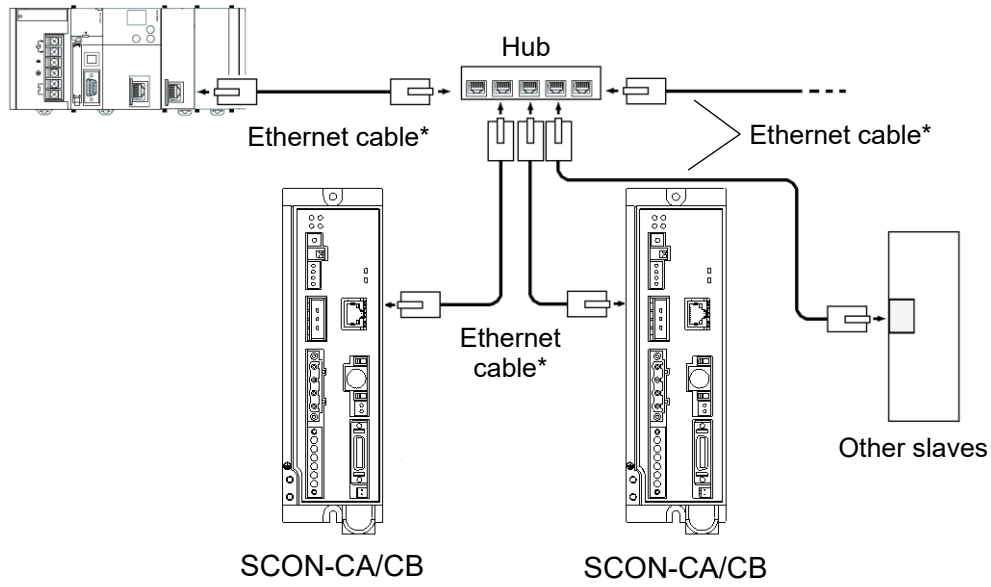
○ : Illuminating, ☆ : Flashing, × : OFF

Name	Color	Display	Explanation	
NS	-	×	The power is turned off or IP address is not yet set.	
	Green	○	Connection has been established and proper communication is in progress.	
	Green	☆	The system is online but connection is not yet established. Communication is stopped (the network is normal). Check the status of the master unit.	
	Red	○	A communication error is present. Communication cannot be established because an error, such as duplicate IP addresses, has been detected.	Check the IP address setting, wiring condition of the communication line, power supply for the hub, noise measures, etc.
	Red	☆	A communication error is present. (A communication timeout has been detected.)	
MS	-	×	The power is turned off.	
	Green	○	Operation is normal. The system is in the scanner (master) control mode.	
	Green	☆	Connection is not yet established with the scanner (master). Check the setting of configuration information. Check if the scanner (master) is idle.	
	Red	○	A hardware error is present. The board must be replaced. Please contact IAI.	
	Red	☆	A configuration error, invalid setting or other minor error is present. The problem can be resolved by, for example, setting the problem item or items again.	

4.4 Wiring

4.4.1 Connection Diagram

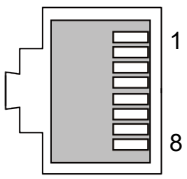
PLC (EtherNet/IP master unit)



* Ethernet cable: Straight cable of category 5 or above, 10m max
(Aluminum tape and braided double-shielded cable are recommended.)

(Note) Terminal processing is not required.

4.4.2 Connector Pin Layout



RJ45 8-pin
modular connector
(Controller side)

Pin number	Signal name	Signal abbreviation
1	Data transmitted +	TD+
2	Data transmitted -	TD-
3	Data received +	RD+
4	Not used	
5	Not used	
6	Data received -	RD-
7	Not used	
8	Not used	
Connector hood	Grounding pin for security	FG

4.5 Setting

Using a teaching tool, set controller parameters. Set the mode toggle switch on the front panel of the controller to “MANU” side. The versions of teaching tool compatible with EtherNet/IP are as follows:
Refer to [the instruction manual for each teaching tool] for the applicable version of the teaching tool that can be applied to EtherNet/IP.

4.5.1 Operation Mode Selecting

Set parameter No. 84 “Field bus operation mode.”
Refer to [4.9 EtherNet/IP Related Parameters].

Set value	Operation mode	Number of occupied bytes
0 (Factory setting)	Remote I/O mode	2
1	Position / Simplified direct value mode	8
2	Half direct value mode	16
3	Full direct value mode	32
4	Remote I/O mode	12
5	Position / Simplified direct value mode2	8
6	Half direct value mode 2	16
7	Remote I/O mode 3	12
8	Half direct value mode 3	16
9	Full direct value mode 2	32

* Entering any value except for the ones described above will cause an “Excessive Input Value Error”.
The modes in the shaded area are not available for SCON-CAL.
* Full direct value mode 2 can be used only in SCON-CB/CGB.
Applicable Controller Versions: V0022 or later.

4.5.2 Setting the Baud Rate

Set parameter No. 86 “Fieldbus baud rate.”

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

4.5.3 Setting the IP Address

Set parameter No. 140 “IP address.”
Refer to [4.9 EtherNet/IP Related Parameters].

Settable Range:0.0.0.0 to 255.255.255.255 (It is set to “192.168.0.1” when the machine is delivered from the factory.)

(Note 1) Exercise caution to avoid IP address duplication.
For details, refer to [the operation manuals of the master unit and PLC] in which in the master unit is installed.

4.5.4 Setting the Subnet Mask

Set parameter No. 141 “Subnet mask.”
Set the same value you have set in the master unit and other slaves (on the same network).
Refer to [4.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 255.255.255.0.)

4.5.5 Setting the Default Gateway

If necessary, set parameter No. 142 “Default gateway.”
Refer to [4.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 192.168.0.0.)

(Note) After the parameter setting, turn on the power to the controller again and return the mode toggle switch on the front of the controller to “AUTO” side.
When the switch is set to “MANU”, the operation using PLC is not available.

4.6 Communicating with the Master Station

4.6.1 Operation Modes and Corresponding PLC I/O Areas

The channels allocated for each operation mode are described as follows.

- PLC output → SCON-CA/CB/CAL input (* “n” indicates the first address of each axis.)

PLC output area (bytes)	DI on the SCON-CA/CB/CAL side and input data register				
	Remote I/O mode	Position/ Simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Target position	Target position	Target position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Specified position number	Positioning band	Positioning band	
n+6, n+7		Control signal			
n+8, n+9			Speed	Speed setup	
n+10, n+11			Acceleration/ Deceleration		
n+12, n+13			Pressing current-limiting value	Zone boundary+	
n+14, n+15			Control signal		
n+16, n+17				Zone boundary-	
n+18, n+19					
n+20, n+21				Acceleration	
n+22, n+23				Deceleration	
n+24, n+25				Pressing current-limiting value	
n+26, n+27				Load current threshold	
n+28, n+29				Control signal 1	
n+30, n+31				Control signal 2	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

- PLC output → SCON-CA/CB/CAL input side (* “n” indicates the first address of each axis.)

PLC input area (bytes)	DO on the SCON-CA/CB/CAL side and output data register				
	Position/Simplified direct value mode 2	Half direct value mode 2	Remote I/O mode 3	Half direct value mode 3	Full direct value mode 2
	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 12	Number of occupied bytes: 16	Number of occupied bytes: 32
n+0, n+1	Target position	Target position	Port No.0 to 15	Target position	Target position
n+2, n+3			Occupied area		
n+4, n+5	Specified position number	Positioning band		Positioning band	Positioning band
n+6, n+7	Control signal				
n+8, n+9		Speed		Speed	Speed setup
n+10, n+11		Acceleration/ Deceleration		Acceleration/ Deceleration	
n+12, n+13		Pressing current-limiting value		Pressing current-limiting value	Zone boundary+
n+14, n+15		Control signal		Control signal	
n+16, n+17					Zone boundary-
n+18, n+19					
n+20, n+21					Acceleration
n+22, n+23					Deceleration
n+24, n+25					Push-current limiting value
n+26, n+27					Load current threshold
n+28, n+29					Control signal 1
n+30, n+31					Control signal 2

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

(Note) Position / Simplified Direct Value Mode 2, Half Direct Value Mode 2 and Remote I/O Mode 3 are not available for SCON-CAL.

(Note) Full direct value mode 2 are available only for SCON-CB/CGB types.

• SCON-CA/CB/CAL output → PLC input (* “n” indicates the first address of each axis.)

PLC output area (bytes)	DO on the SCON-CA/CB/CAL side and output data register				
	Remote I/O mode	Position/ Simplified direct value mode	Half direct value mode	Full direct value mode	Remote I/O mode 2
	Number of occupied bytes: 2	Number of occupied bytes: 8	Number of occupied bytes: 16	Number of occupied bytes: 32	Number of occupied bytes: 12
n+0, n+1	Port No.0 to 15	Current position	Current position	Current position	Port No.0 to 15
n+2, n+3					Occupied area
n+4, n+5		Completed position No. (simple alarm ID)	Command current	Command current	Current position
n+6, n+7		Status signal			
n+8, n+9			Current speed	Current speed	Command current
n+10, n+11					
n+12, n+13			Alarm code	Alarm code	
n+14, n+15			Status signal	Occupied area	
n+16, n+17				Current load	
n+18, n+19					
n+20, n+21				Total moving count	
n+22, n+23					
n+24, n+25				Total moving distance	
n+26, n+27					
n+28, n+29				Status signal 1	
n+30, n+31				Status signal 2	

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

• SCON-CA/CB/CAL output→PLC input Side (* “n” indicates the first address of each axis.)

PLC input area (bytes)	DO on the SCON-CA/CB/CAL side and output data register				
	Position/Simplified direct value mode 2	Half direct value mode 2	Remote I/O node 3	Half direct value node 3	Full direct value mode 2
	Number of occupied bytes:8	Number of occupied bytes: 16	Number of occupied bytes: 12	Number of occupied bytes: 16	Number of occupied bytes: 32
n+0, n+1	Current position	Current position	Port number 0 to 15	Current position	Current position
n+2, n+3			Occupied area		
n+4, n+5	Completed position number (simple alarm ID)	Current load	Current position	Command current	Command current
n+6, n+7	Status signal				
n+8, n+9		Current speed	Current load	Current speed	Current speed
n+10, n+11					
n+12, n+13		Alarm code		Alarm code	Alarm code
n+14, n+15		Status signal		Status signal	Overload level monitor
n+16, n+17					Current command value
n+18, n+19					
n+20, n+21					Estimated regenerative discharge power volume
n+22, n+23					
n+24, n+25					Total moving distance
n+26, n+27					
n+28, n+29					Status signal 1
n+30, n+31					Status signal 2

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

(Note) Position / Simplified Direct Value Mode 2, Half Direct Value Mode 2 and Remote I/O Mode 3 are not available for SCON-CAL.

(Note) Full direct value mode 2 are available only for SCON-CB/CGB types.

4.6.2 Remote I/O Mode (Number of Occupied Bytes: 2)

This is the operation mode with the position No. set up as the same as using PIO (24V I/O).
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
The I/O specifications for the PIO pattern are described as follows. Refer to [Operation Manual for the controller main body] for more information.
(Note) Force control mode 1 and 2 are not available for SCON-CAL.

Value set in parameter No. 25	Operation Mode	I/O Specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points, one zone output point.
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points, one zone output point. An operation command can be specified directly for each position number. A positioning complete signal is output for each position number.

The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Solenoid valve mode 1	5: Solenoid valve mode 2	6: Force control mode 1	7: Force control mode 2
Home return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed & acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by parameter)	○	○	○	○	○	○	○	○

○: Supported, x: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB/CAL side DI(Port No.)	PLC side output address (bytes)	SCON-CA/CB/CAL side DO(Port No.)	PLC side input address (bytes)
0	0 to 15	n+0, n+1	0 to 15	n+0, n+1

(Note) Be careful of using duplicated addresses.

(2) I/O Signal Allocation for each Axis
The I/O signals of each axis consist of one input (1 word=2 bytes) and one output word (channel) in the I/O areas.

- Each address is controlled by ON/OFF bit signals.

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bit

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bit

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

(3) I/O signal assignment
The controller's I/O port signal varies depending on the parameter No. 25 setting.
Refer to [Operation Manual for the controller main body] for more information.

		Parameter No. 25 setting					
		Positioning mode		Teaching mode		256-point mode	
		0		1		2	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → SCON-CA /CB/CAL input	0	PC1	Command position No.	PC1	Command position No.	PC1	Command position No.
	1	PC2		PC2		PC2	
	2	PC4		PC4		PC4	
	3	PC8		PC8		PC8	
	4	PC16		PC16		PC16	
	5	PC32		PC32		PC32	
	6	-	Unavailable	MODE	Teaching mode command	PC64	
	7	-		JISL	Jog/inching selector	PC128	
	8	-		JOG+	+Jog	-	Unavailable
	9	BKRL	Forced brake release	JOG-	-Jog	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause	*STP	Pause
	13	CSTR	Positioning Start	CSTR/ PWRT	Positioning Start/ Position Data Import Command	CSTR	Positioning Start
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
SCON-CA /CB/CAL output → PLC Input	0	PM1	Completed position No.	PM1	Completed position No.	PM1	Completed position No.
	1	PM2		PM2		PM2	
	2	PM4		PM4		PM4	
	3	PM8		PM8		PM8	
	4	PM16		PM16		PM16	
	5	PM32		PM32		PM32	
	6	MOVE	Moving signal	MOVE	Moving signal	PM64	
	7	ZONE1	Zone 1	MODES	Teaching mode Signal	PM128	
	8	PZONE/ ZONE2	Position zone/Zone 2	PZONE/ ZONE1	Position zone/Zone 1	PZONE/ ZONE1	Position zone/Zone 1
	9	RMDS	Operation mode status	RMDS	Operation mode status	RMDS	Operation mode status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND/ WEND	Positioning completion signal/ position-data read complete	PEND	Positioning completion signal
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	*BALM	Battery alarm	*BALM	Battery alarm	*BALM	Battery alarm

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled. (ON/OFF is undefined.)

		Parameter No. 25 setting					
		512-point mode		Electromagnetic valve mode 1		Electromagnetic valve mode 2	
		3		4		5	
Category	Port No.	Symbol	Signal name	Symbol	Signal name	Symbol	Signal name
PLC output → SCON-CA /CB/CAL input	0	PC1	Command position No.	ST0	Start position 0	ST0	Start position 0
	1	PC2		ST1	Start position 1	ST1	Start position 1
	2	PC4		ST2	Start position 2	ST2	Start position 2
	3	PC8		ST3	Start position 3	-	Unavailable
	4	PC16		ST4	Start position 4	-	
	5	PC32		ST5	Start position 5	-	
	6	PC64		ST6	Start position 6	-	
	7	PC128		-	Unavailable	-	
	8	PC256		-		-	
	9	BKRL	Forced brake release	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector
	11	HOME	Home return	HOME	Home return	-	Unavailable
	12	*STP	Pause	*STP	Pause	-	
	13	CSTR	Positioning Start	-	Unavailable	-	
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command	SON	Servo ON command
SCON-CA /CB/CAL output → PLC input	0	PM1	Completed Position No.	PE0	Position 0 complete	LS0	Limit switch 0
	1	PM2		PE1	Position 1 complete	LS1	Limit switch 1
	2	PM4		PE2	Position 2 complete	LS2	Limit switch 2
	3	PM8		PE3	Position 3 complete	-	Unavailable
	4	PM16		PE4	Position 4 complete	-	
	5	PM32		PE5	Position 5 complete	-	
	6	PM64		PE6	Position 6 complete	-	
	7	PM128		ZONE1	Zone 1	ZONE1	Zone 1
	8	PM256		PZONE/ ZONE2	Position zone/Zone 2	PZONE/ ZONE2	Position zone/Zone 2
	9	RMDS	Operation Mode Status	RMDS	Operation Mode Status	RMDS	Operation Mode Status
	10	HEND	Home return completion	HEND	Home return completion	HEND	Home return completion
	11	PEND	Positioning completion signal	PEND	Positioning completion signal	-	Unavailable
	12	SV	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end
	13	*EMGS	Emergency stop	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	*BALM	Battery alarm	*BALM	Battery alarm	*BALM	Battery alarm

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled.(ON/OFF is undefined.)

		Setting of parameter No. 25			
		Force control mode 1		Force control mode 2	
		6		7	
Category	Port No.	Symbol	Signal name	Symbol	Signal name
PLC output → SCON-CA/CB input	0	PC1	Command position number	ST0	Start position 0
	1	PC2		ST1	Start position 1
	2	PC4		ST2	Start position 2
	3	PC8		ST3	Start position 3
	4	PC16		ST4	Start position 4
	5	-	Cannot be used.	-	Cannot be used.
	6	-		-	
	7	-		-	
	8	CLBR	Load cell calibration command	CLBR	Load cell calibration command
	9	BKRL	Forced brake release	BKRL	Forced brake release
	10	RMOD	Operation mode	RMOD	Operation mode
	11	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause
	13	CSTR	Positioning start	-	Cannot be used.
	14	RES	Reset	RES	Reset
	15	SON	Servo ON command	SON	Servo ON command
SCON-CA/CB output → PLC input	0	PM1	Completed position number	PE0	Completed position number 0
	1	PM2		PE1	Completed position number 1
	2	PM4		PE2	Completed position number 2
	3	PM8		PE3	Completed position number 3
	4	PM16		PE4	Completed position number 4
	5	TRQS	Torque level status	TRQS	Torque level status
	6	LOAD	Load output judgment status	LOAD	Load output judgment status
	7	CEND	Load cell calibration complete	CEND	Load cell calibration complete
	8	PZONE/ ZONE1	Position zone/Zone 1	PZONE/ ZONE1	Position zone/Zone 1
	9	RMDS	Operation mode	RMDS	Operation mode
	10	HEND	Home return complete	HEND	Home return complete
	11	PEND	Positioning complete signal	PEND	Positioning complete signal
	12	SV	Operation ready	SV	Operation ready
	13	*EMGS	Emergency stop	*EMGS	Emergency stop
	14	*ALM	Alarm	*ALM	Alarm
	15	*BALM	Battery alarm	*BALM	Battery alarm

The symbol with a * mark shows the ON signal in normal condition.
The signal described as “Unavailable” is not controlled.(ON/OFF is undefined.)
(Note) Force control mode 1 and 2 are not available for SCON-CAL.

4.6.3 Position/Simplified Direct Value Mode (Number of Occupied Bytes: 8)

This is the operation mode with the position No. set up. Whether the target position is set directly the control signals (PMOD signals), or the value registered on the position data is used can be selected. For the speed, acceleration/deceleration and positioning band, etc., except for the target position, the values in the position table within the controller are used. Setup the position data referring the [operation manual for the controller main body].
The settable No. of position data items is max 768 points.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control △ : Indirect control x : Disable	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	△	These items must be set in the position data table.
Pitch feed (inching)	△	
Pressing Operation	△	
Speed change during the movement	△	
Individual Setting for Acceleration/Deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using position data or parameters.
PIO pattern selection	x	

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB/CAL side input register	PLC side output address (bytes)	SCON-CA/CB/CAL side output register	PLC side input address (bytes)
1	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Specified position number	n+4, n+5	Completed position No. (Simple alarm code)	n+4, n+5
	Control signal	n+6, n+7	Status signal	n+6, n+7

(Note) Be careful of using duplicated addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of four input words (4 words = 8 bytes) and four output words in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The specified position No. and completed position No. are expressed using 1-word (16 bits) binary data. The figures from 0 to 767 can be set in PLC. However, set the position No. for which the operation conditions have been set in advance using the teaching tools.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified position number	—	—	—	—	—	—	PC512	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	—	—	PMOD	MODE	PWRT	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Completed position number	—	—	—	—	—	—	PM512	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	PZONE	MODES	WEND	RMDS	BALM	—	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) If the unit is 0.01mm and When it is “+25.40mm”, set it as “2540”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.1
	Specified position number	16-bit data	PC1 to PC512	16-bit integer For the operation, the position data is required, for which the operation conditions have been set in advance using the teaching tools. Set up the position No. for which the data has been input using this register. The settable range is 0 to 767. In the case that any value out of the range is set, or position No. that has not been set is specified, an alarm is output.	4.8.1
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	4.6.12 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	4.6.12 (19)
		b13	-	Unavailable	-
		b12			
		b11	PMOD	Position/simple-direct switching: The position mode is selected when this signal is OFF, and the simple direct mode is selected when the signal is ON.	4.6.12 (20)
		b10	MODE	Teaching Mode Command: The normal mode is selected when this signal is OFF, and the teaching mode is selected when the signal is ON.	4.6.12 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	4.6.12 (17)
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	4.6.12 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	4.6.12 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	4.6.12 (14)
		b5	JISL	Jog/inching selector: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	4.6.12 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	4.6.12 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	4.6.12 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	4.6.12 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	4.6.12 (6)
		b0	CSTR	Positioning Start: A move command is issued when this signal turns ON.	4.6.12 (7)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit	-	Current Position: 32-bit signed Integer. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading : 000003FF$_H$ = 1023 (decimal) = 10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.1
	Completed position No. (Simple alarm code)	16-bit	PM1 to PM512	16-bit integer It is moved to the target position and the positioning completed position No. within the positioning band is output. In the case that the position movement has not been performed at all, or during the movement, “0” is output. When an alarm is issued (in the case that the status signal ALM is “ON”), the simplified alarm code refer to the [Operation Manual for the controller main body] is output.	4.8.1
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.6.12 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.6.12 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.6.12 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	4.6.12 (12)
		b10	MODES	Teaching mode Signal: This signal is ON while the teaching mode is selected.	4.6.12 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	4.6.12 (17)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)
		b6	-	Unavailable	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	4.6.12 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.6.12 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.6.12 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.6.12 (10)

4.6.4 Half Direct Value Mode (Number of Occupied Bytes: 16)

This is the operation mode with the target position, positioning band, speed, acceleration/deceleration and pressing current value set up in the PLC. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration/ deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB/CAL side input register	PLC side output address (bytes)	SCON-CA/CB/CAL side output register	PLC side input address (bytes)
2	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ Deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

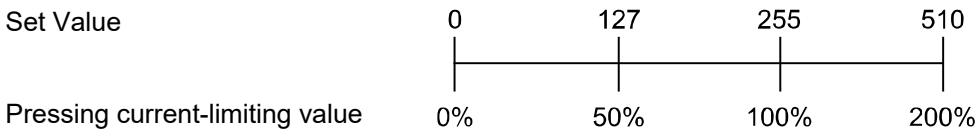
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC.
- The speed is a 1-word (16-bit) binary data. Although values from 0 to +65535 (unit: 1.0 mm/s or 0.1 mm/s) can be handled by the PLC, set a value not exceeding the maximum speed of the applicable actuator.
  Parameter No. 159, FB Half Direct Mode Speed Unit, determines the unit of measure.

Parameter No.159 setting value	Speed setting unit
0	1.0 mm/s
1	0.1 mm/s

- The Acceleration/Deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the Catalog or Operation Manual for the actuator] for the actuator concerned.



- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Target position (lower word)																
n+2, n+3 Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Positioning band (upper word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536
n+8, n+9 Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11 Acceleration/ deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1
n+12, n+13 Pressing current-limiting value	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+14, n+15 Control signal	BKRL	RMOD	DIR	PUSH	GSL1	GSL0	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																

n+10 n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Alarm code																

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	—	RMDS	BALM	—	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) “+25.41mm” in the unit of 0.01mm should be indicated as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is 1 to 9999999. (Example) “25.40mm” in the unit of 0.01mm should be indicated as “2540”. This register value has two meanings depending on the operation type. 1) In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. 2) In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	4.8.2
	Speed	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/s or 0.1mm/s. The settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. Unit of measure is selected by Parameter No. 159 FB Half Direct Mode Speed Unit. (Example) In the case of the unit of 1.0mm/s: To set 254.0 mm/s, specify “254.” If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.8.2
	Acceleration/ deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 999. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	4.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th>Contents</th><th>Details</th></tr>
<tr><td rowspan="18">PLC output</td><td>Pressing current-limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current-limiting value to be used during pressing operation.
The allowable specification range is 0 (0%) to 510 (200%).
The actual settable range varies depending on each actuator. Refer to [the catalog or Operation Manual for the each actuator]. If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.</td><td>4.8.2</td></tr>
<tr><td rowspan="17">Control signal</td><td>b15</td><td>BKRL</td><td>Forced brake release: When it is turned ON, the brake is released.</td><td>4.6.12 (18)</td></tr>
<tr><td>b14</td><td>RMOD</td><td>Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.</td><td>4.6.12 (19)</td></tr>
<tr><td>b13</td><td>DIR</td><td>Pressing direction specification:
“OFF” for the direction reducing the positioning band from the target position,
“ON” for the direction adding the positioning band to the target position</td><td>4.6.12 (22)</td></tr>
<tr><td>b12</td><td>PUSH</td><td>Pressing specification: Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.</td><td>4.6.12 (21)</td></tr>
<tr><td>b11</td><td>GSL1</td><td>Servo gain parameter set selection 1</td><td rowspan="2">Select the servo gain parameter set to be used.
<table><tr><th>GSL1</th><th>GSL0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Select parameter set 0.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (33)</td></tr>
<tr><td>b10</td><td>GSL0</td><td>Servo gain parameter set selection 0</td></tr>
<tr><td>b9</td><td>-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b8</td><td>JOG+</td><td colspan="2">+ Jog: “ON” for Movement in the Opposite Direction of Home</td><td>4.6.12 (13)</td></tr>
<tr><td>b7</td><td>JOG-</td><td colspan="2">-Jog: “ON” for Movement to the Home Direction</td><td>4.6.12 (13)</td></tr>
<tr><td>b6</td><td>JVEL</td><td colspan="2">Jog-speed/inch-distance switching:
The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.</td><td>4.6.12 (14)</td></tr>
<tr><td>b5</td><td>JISL</td><td colspan="2">Jog/inch switching:
Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.</td><td>4.6.12 (15)</td></tr>
<tr><td>b4</td><td>SON</td><td colspan="2">Servo ON Command: The servo turns ON when this signal turns ON.</td><td>4.6.12 (5)</td></tr>
<tr><td>b3</td><td>RES</td><td colspan="2">Reset: A reset is performed when this signal turns ON.</td><td>4.6.12 (4)</td></tr>
<tr><td>b2</td><td>STP</td><td colspan="2">Pause: A pause command is issued when this signal turns ON.</td><td>4.6.12 (11)</td></tr>
<tr><td>b1</td><td>HOME</td><td colspan="2">Home return: A home-return command is issued when this signal turns ON.</td><td>4.6.12 (6)</td></tr>
<tr><td>b0</td><td>DSTR</td><td colspan="2">Positioning Command: A move command is issued when this signal turns ON.</td><td>4.6.12 (8)</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA	4.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. Refer to [the Operation Manual for the controller] for the details of the alarms.	4.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.6.12 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.6.12 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.6.12 (12)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)
		b6	-	Cannot be used.	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	4.6.12 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.6.12 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.6.12 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.6.12 (10)

4.6.5 Full Direct Value Mode (Number of Occupied Bytes: 32)

This is the operation mode with all the values (target position, speed, etc.) set up directly using values from PLC. Set each value in the I/O area.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control x : Disable
Home-return operation	○
Positioning operation	○
Speed and acceleration / deceleration setting	○
Pitch feed (inching)	○
Pressing Operation	○
Speed change during the movement	○
Individual Setting for Acceleration/Deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC address configuration (* “n” indicates the first address of each axis.)

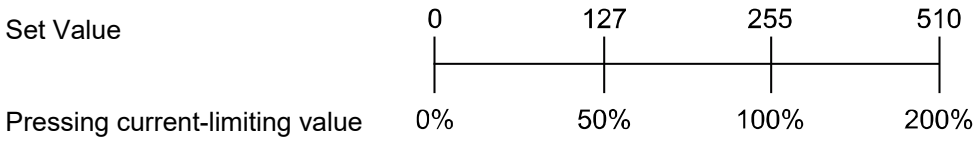
Parameter No. 84	SCON-CA/CB/CAL side input register	PLC side output address (bytes)	SCON-CA/CB/CAL side output register	PLC side input address (bytes)
3	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
		n+10, n+11		n+10, n+11
	Zone boundary+	n+12, n+13	Alarm code	n+12, n+13
		n+14, n+15	Occupied area	n+14, n+15
	Zone boundary-	n+16, n+17	Current load	n+16, n+17
		n+18, n+19		n+18, n+19
	Acceleration	n+20, n+21	Total moving count	n+20, n+21
	Deceleration	n+22, n+23		n+22, n+23
	Pressing current-limiting value	n+24, n+25	Total moving distance	n+24, n+25
	Load current threshold	n+26, n+27		n+26, n+27
	Control signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Control signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) The areas denoted by occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (16 words = 32 bytes) and one output word in the I/O areas.

- Control signals 1 and 2 and status signals are ON/OFF bit signals.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC.
- The specified speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/Deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the Catalog or Operation Manual for the actuator] for the actuator concerned.



- Set the load current threshold. The load current threshold is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. Refer to [the graph of pressing current-limiting value (above graph)].
- Zone Boundary “+” and Zone Boundary “–” are expressed using 2-word (32 bits) binary data. The figures from -9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However make sure to set the smaller value for the Zone Boundary “-“ than that for the Zone Boundary “+”.
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.
- The current load is 2-word (32-bit) binary data (unit: 0.01 N).
- The total moving count is a 2-word (32 bits) binary data (unit: times).
- The total moving distance is a 2-word (32 bits) binary data (unit: m).

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (lower word)																

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+16, n+17	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary - (lower word)																

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary - (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing current-limitin	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Load current threshold (*3)	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 1	—	—	NTC1	NTC0	—	—	ASO1	ASO0	MOO0	MOD0	GSL1	GSL0	INC	DIR	PUSH	—

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 2	BLRL	RMOD	—	—	—	—	CLBR*	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

* Applicable only for SCON-CA/CB

PLC input
Channel (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)													524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Cannot be used																

Channel (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+16, n+17	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (lower word) (Specified only for SCON-CA/CB)																

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (lower word) (Specified only for SCON-CA/CB)																

If the current load data is a negative value, it is expressed by a 2’s complement.

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving count (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving count (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total driving distance (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total driving distance (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	CEND*	BALM

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal 2	EMGS	PWR	ZONE1	ZONE2	PZONE	LOAD	TRQS	RMDS	GHMS	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

* Applicable only for SCON-CA/CB

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) “+25.41mm” in the unit of 0.01mm should be indicated as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.3
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is 1 to 9999999. (Example) “25.40mm” in the unit of 0.01mm should be indicated as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	4.8.3
	Speed	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/s and the settable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	4.8.3
	Zone boundary+/ Zone boundary–	32-bit data	-	32-bit signed integer indicating the current position After completion of home return, an effective zone signal can be output separately from the zone boundaries specified by parameters. The status signal PZONE turns ON when the current position is inside these +/- boundaries. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. Enter a value that satisfies the relationship of “Zone boundary + > Zone boundary –”. If this function is not used, enter the same value for both the positive and negative boundaries. (Example) “+25.40mm” in the unit of 0.01mm should be indicated as “2540”. * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.3

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th>Contents</th><th>Details</th></tr>
<tr><td rowspan="19">PLC output</td><td>Acceleration</td><td>16-bit data</td><td>-</td><td rowspan="2">16-bit integer.
Specify the acceleration and deceleration at which to move the actuator.
The unit is 0.01 G, while the specifiable range is 1 to 999.
(Example)To set 0.30 G, specify “30.”
If a move command is issued by specifying “0” or a value exceeding the maximum acceleration or maximum deceleration, an alarm will occur.</td><td rowspan="2">4.8.3</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Pressing current-limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current-limiting value to be used during pressing operation.
The allowable specification range is 0 (0%) to 510 (200%).
The actual settable range varies depending on each actuator.
Refer to [the catalog or Operation Manual for the each actuator].
If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.</td><td>4.8.3</td></tr>
<tr><td>Load current threshold</td><td>16-bit data</td><td>-</td><td>16-bit integer.
If judgment will be made as to whether or not the load current exceeded the set value, specify the threshold value for current using this register.
The specifiable range is 0 (0%) to 510 (200%).
If judgment is not performed, enter “0.”</td><td>4.8.3</td></tr>
<tr><td rowspan="15">Control signal 1</td><td>b15</td><td rowspan="2">-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b14</td></tr>
<tr><td>b13</td><td>NTC1</td><td>Vibration damping control mode selection 1</td><td rowspan="2">Select the vibration damping control parameter set to be used.
<table><tr><th>NTC1</th><th>NTC0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Do not use vibration damping control.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (29)</td></tr>
<tr><td>b12</td><td>NTC0</td><td>Vibration damping control mode selection 0</td></tr>
<tr><td>b11</td><td rowspan="2">-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b10</td></tr>
<tr><td>b9</td><td>ASO1</td><td>Stop mode 1</td><td rowspan="2">Select the stop mode during standby.
<table><tr><th>ASO1</th><th>ASO0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Invalid (The servo is always on.)</td></tr><tr><td>OFF</td><td>ON</td><td>The servo turns off after the time is set in parameter No. 36.</td></tr><tr><td>ON</td><td>OFF</td><td>The servo turns off after the time is set in parameter No. 37.</td></tr><tr><td>ON</td><td>ON</td><td>The servo turns off after the time is set in parameter No. 38.</td></tr></table></td><td rowspan="2">4.6.12 (31)</td></tr>
<tr><td>b8</td><td>ASO0</td><td>Stop mode 0</td></tr>
<tr><td>b7</td><td>MOD1</td><td colspan="2" rowspan="2">Acceleration/deceleration mode:
Trapezoid pattern when both signals are OFF,
S-motion when MOD1 is OFF and MOD0 is ON, or
primary delay filter when MOD1 is ON and MOD0 is OFF.</td><td rowspan="2">4.6.12 (30)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
<tr><td>b5</td><td>GSL1</td><td>Servo gain parameter set selection 1</td><td rowspan="2">Select the servo gain parameter set to be used.
<table><tr><th>GSL1</th><th>GSL0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Select parameter set 0.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (33)</td></tr>
<tr><td>b4</td><td>GSL0</td><td>Servo gain parameter set selection 0</td></tr>
</table>

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal 1	b3	INC	Incremental specification: Absolute position command when the signal is OFF, or incremental position command when the signal is ON.	4.6.12 (24)
		b2	DIR	Pressing direction specification: When the signal is OFF, the direction of the position obtained by subtracting the positioning band from the target position is used. When the signal is ON, the direction of the position obtained by adding the positioning band to the target position is used.	4.6.12 (22)
		b1	PUSH	Pressing specification: Positioning operation when the signal is OFF, or pressing operation when the signal is ON.	4.6.12 (21)
		b0	-	Cannot be used.	-
	Control signal 2	b15	BKRL	Forced brake release: The brake is released when the signal turns ON.	4.6.12 (18)
		b14	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	4.6.12 (19)
		b13	-	Cannot be used.	-
		b12			
		b11			
		b10			
		b9	CLBR (Note 1)	Load cell calibration command: Calibration is performed when this signal turns ON.	4.6.12 (32)
		b8	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	4.6.12 (13)
		b7	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	4.6.12 (13)
		b6	JVEL	Jog speed/inching distance switching: Parameter No. 26, “Jog speed” and parameter No. 48, “Inching distance” are used when the signal is OFF, or parameter No. 47, “Jog speed 2” and parameter No. 49, “Inching distance 2” are used when the signal is ON.	4.6.12 (14)
		b5	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	4.6.12 (15)
		b4	SON	Servo ON command: The servo is ON when the signal is ON.	4.6.12 (5)
		b3	RES	Reset: A reset is performed when the signal turns ON.	4.6.12 (4)
		b2	STP	Pause: A pause command is issued when the signal turns ON.	4.6.12 (11)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	4.6.12 (6)
		b0	DSTR	Positioning start: A move command is issued when the signal turns ON.	4.6.12 (8)

Note 1 Applicable only for SCON-CA/CB

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Description	Details
PLC input	Current position	32 bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm (when unit is 0.01mm) * If this data is read as a hexadecimal, a negative value is indicated by a complement of 2.	4.8.3
	Command current	32-bit data	-	32-bit integer. Stores the currently commanded current. The unit is mA. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 1023 mA	4.8.3
	Current speed	32-bit data	-	32-bit signed integer. Stores the current velocity. The unit is 0.01 mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm/s * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	4.8.3
	Alarm code	16-bit data	-	16-bit integer. Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. For details on alarms, refer to [the operation manual for the controller].	4.8.3
	Current load (Specified only for SCON -CA/CB function)	32-bit data	-	32-bit signed integer. The unit is 0.01 N. * If this data is read as a hexadecimal, a negative value is indicated by a compliment of 2.	4.8.3
	Total moving count	32-bit data	-	32-bit integer. The unit is times.	-
	Total moving distance	32-bit data	-	32-bit integer. The unit is m.	-
	Status signal 1	b15	-	Cannot be used.	-
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1	CEND (Note 1)	Load cell calibration is complete: This signal turns ON when calibration is complete.	4.6.12 (32)
		b0	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)

Note 1 Applicable only for SCON-CA/CB

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Description	Details
PLC input	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is being executed when the signal is ON.	4.6.12 (2)
		b14	PWR	Controller ready: The signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	4.6.12 (12)
		b12	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	4.6.12 (12)
		b11	PZONE	Position zone: The signal is ON when the current position is inside the specified position zone.	4.6.12 (12)
		b10	LOAD	Load output judgment: Reached when the signal is ON, or not yet reached when the signal is OFF. For details, refer to [the operation manual for the controller main body].	4.6.12 (26)
		b9	TRQS	Torque level: Reached when the signal is ON, or not yet reached when the signal is OFF. For details, refer to [the operation manual for the controller main body].	4.6.12 (27)
		b8	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	GHMS	Home return in progress: The signal is ON while the home return is in progress.	4.6.12 (6)
		b6	PUSHS	Pressing operation in progress: The signal is ON while the pressing operation is in progress.	4.6.12 (25)
		b5	PSFL	Missed work part during pressing operation: The signal turns ON when the actuator missed the work part during pressing operation.	4.6.12 (23)
		b4	SV	Ready: The signal is ON when the servo is ON.	4.6.12 (5)
		b3	ALM	Alarm: The signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving signal: The signal is ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return complete: The signal turns ON when the home return is completed.	4.6.12 (6)
		b0	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	4.6.12 (10)

4.6.6 Remote I/O Mode 2 (Number of Occupied Bytes: 12)

This is the operation mode with the position No. set up as the same as using PIO (24V I/O).
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
This mode is the same as the remote I/O mode, but the current-position read function and command-current read function are also available.
The features of each PIO pattern are shown below. Refer to [Operation Manual for the controller main body] for more information
(Note) Force control mode 1 and 2 are not available for SCON-CAL.

Value set in parameter No. 25	Operation mode	I/O specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points, one zone output point.
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points, one zone output point. An operation command can be specified directly for each position number. A positioning complete signal is output for each position number.

The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Solenoid valve mode 1	5: Solenoid valve mode 2	6: Force control mode 1	7: Force control mode 2
Home return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed & acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by parameter)	○	○	○	○	○	○	○	○

○: Supported, x: Not supported
(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No. 84	SCON-CA/CB/CAL side DI and input register	PLC side output address (bytes)	SCON-CA/CB/CAL side DO and output register	PLC side input address (bytes)
4	Port number 0 to 15	n+0, n+1	Port number 0 to 15	n+0, n+1
	Occupied area	n+2, n+3	Occupied area	n+2, n+3
		n+4, n+5	Current position	n+4, n+5
		n+6, n+7		n+6, n+7
		n+8, n+9	Command current	n+8, n+9
		n+10, n+11		n+10, n+11

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (6 words = 12 bytes) and one output word in the I/O areas.

- The areas controlled by port number are controlled using ON/OFF bit signals.
- The current position is a 2-word (32-bit) binary data (unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)).
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Cannot be used																

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536

(3) I/O signal assignment

For the signal assignments corresponding to each PIO pattern, refer to [the I/O signal assignments for the remote I/O mode explained in 4.6.2 (3)].

The signal allocation for the Command Current and Current Position, is shown in the following table.

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is 1mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA	-

4.6.7 Position/Simplified Direct Value Mode 2 (Number of Occupied Bytes: 8)

(Note) This mode is applicable only for SCON-CA/CB.
In this mode, the actuator is operated by means of force control (pressing operation based on feedback of load cell values) and also by specifying position numbers. Whether the target position is set directly the control signals (PMOD signals), or the value registered on the position data is used can be selected.
For the speed, acceleration/deceleration and positioning band, etc., except for the target position, the values in the position table within the controller are used. Setup the position data referring [the operation manual for the controller main body].
The settable No. of position data items is max 768 points.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control △ : Indirect control x : Disable	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	△	These items must be set in the position data table.
Pitch feed (inching)	△	
Pressing operation	△	
Speed change during the movement	△	
Individual Setting for Acceleration/Deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using position data or parameters.
PIO pattern selection	x	

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB side input register	PLC side output address (bytes)	SCON-CA/CB side output register	PLC side input address (bytes)
5	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Specified position number	n+4, n+5	Completed position No. (Simple alarm code)	n+4, n+5
	Control signal	n+6, n+7	Status signal	n+6, n+7

(Note) Be careful of using duplicated addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (4 words = 8 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The specified position No. and completed position No. are expressed using 1-word (16 bits) binary data. The figures from 0 to 767 can be set in PLC. However, set the position No. for which the operation conditions have been set in advance using the teaching tools.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified position number	—	—	—	—	—	—	PC512	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	—	—	PMOD	—	CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Completed position number	—	—	—	—	—	—	PM512	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	CEND	ZONE1	PZONE/ ZONE2	LOAD	TRQS	RMDS	BALM	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignments (* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Description	Details
PLC output	Target position	32-bit data	-	32-bit signed integer. Specify the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) If the unit is 0.01mm and to set +25.40 mm, specify “2540.” If the entered value exceeds the range of soft limit parameters (within 0.2 mm inside of the parameter values), the movement will be limited to within the range of soft limits (within 0.2 mm inside of the parameter values). * If this data is entered using a hexadecimal, enter a negative value as a compliment of 2.	4.8.1
	Specified position number	16-bit data	PC1 to PC512	16-bit integer. To operate the actuator, position data is needed for which operation conditions have already been entered using the teaching tools. Use this register to specify the position number for which data has been entered. The specifiable range is 0 to 767. If an out-of-range value is specified or the specified position number is not yet set, an alarm will occur when the start signal is turned ON.	4.8.1
	Control signal	b15	BKRL	Forced brake release: The brake is released when the signal turns ON.	4.6.12 (18)
		b14	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	4.6.12 (19)
		b13	-	Cannot be used.	-
		b12			
		b11	PMOD	Position/simple direct switching: Position mode when the signal is OFF, or simple direct mode when the signal is ON.	4.6.12 (20)
		b10	-	Cannot be used.	-
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	4.6.12 (32)
		b8	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	4.6.12 (13)
		b7	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	4.6.12 (13)
		b6	JVEL	Jog speed/inching distance switching: Parameter No. 26, “Jog speed” and parameter No. 48, “Inching distance” are used when the signal is OFF, or parameter No. 47, “Jog speed 2” and parameter No. 49, “Inching distance 2” are used when the signal is ON.	4.6.12 (14)
		b5	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	4.6.12 (15)
		b4	SON	Servo ON command: The servo is ON when the signal is ON.	4.6.12 (5)
		b3	RES	Reset: A reset is performed when the signal turns ON.	4.6.12 (4)
		b2	STP	Pause: A pause command is issued when the signal turns ON.	4.6.12 (11)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	4.6.12 (6)
		b0	CSTR	Positioning start: A move command is issued when the signal turns ON.	4.6.12 (7)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit	-	Current Position: 32-bit signed Integer. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading : 000003FF$_H$ = 1023 (decimal) = 10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.1
	Completed position number (Simple alarm code)	16-bit	PM1 to PM512	16-bit integer It is moved to the target position and the positioning completed position No. within the positioning band is output. In the case that the position movement has not been performed at all, or during the movement, “0” is output. When an alarm is issued (in the case that the status signal ALM is “ON”), the simplified alarm code refer to [the Operation Manual for the controller main body] is output.	4.8.1
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.6.12 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	CEND	Load cell calibration complete: This signal turns ON when the load cell calibration is complete.	4.6.12 (32)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.6.12 (12)
		b11	PZONE/ ZONE2	PZONE and ZONE2 can be switched in Parameter No.149. No.149 = 0 : This signal turns ON when the current Position zone position is inside the specified position zone. No.149 = 1 : This signal turns ON when the Zone2 current position is inside the specified zone.	4.6.12 (12)
		b10	LOAD	Load output judgment: When this signal is ON, the specified load output judgment has been reached. If the signal is OFF, it is not yet reached. For details, refer to [the operation manual for your controller main body].	4.6.12 (26)
		b9	TRQS	Torque level: When this signal is ON, the specified torque level has been reached. If the signal is OFF, it is not yet reached. For details, refer to [the operation manual for your controller main body].	4.6.12 (27)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)
		b6	PUSHS	Pressing operation in progress: The signal is ON when the Pressing operation in progress.	4.6.12 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	4.6.12 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.6.12 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.6.12 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.6.12 (10)

4.6.8 Half Direct Value Mode 2 (Number of Occupied Bytes: 16)

(Note) This mode is applicable only for SCON-CA/CB.
In this mode, the actuator is operated by means of force control (pressing operation based on feedback of load cell values) and also by specifying the target position, positioning band, speed, acceleration/deceleration and pressing current directly as numerical values. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB side input register	PLC side output address (bytes)	SCON-CA/CB side output register	PLC side input address (bytes)
6	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Current load	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

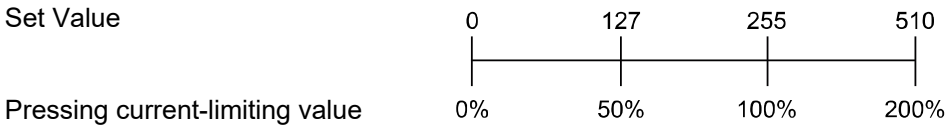
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC.
- The speed is a 1-word (16-bit) binary data. Although values from 0 to +65535 (unit: 1.0 mm/s or 0.1 mm/s) can be handled by the PLC, set a value not exceeding the maximum speed of the applicable actuator.
  Parameter No. 159, FB Half Direct Mode Speed Unit, determines the unit of measure.

Parameter No.159 setting value	Speed setting unit
0	1.0 mm/s
1	0.1 mm/s

- The Acceleration/Deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the Catalog or Operation Manual for the actuator] for the actuator concerned.



- The current load is 2-word (32-bit) binary data (unit: 0.01 N).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (lower word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration/ deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing current-limitin	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	DIR	PUSH	—	—	CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is a negative figure, it is expressed using the complement of 2.

1 Word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Current load (lower word)																
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (upper word)																

When the current load is a negative value, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9																
Current speed																
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is a negative value, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	CEND	RMDS	BALM	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) If the unit is 0.01mm and it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is 1 to 9999999. (Example) If the unit is 0.01mm and it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. 1) In the case of positioning operation, it shows the allowable range from the target position that is regarded as the positioning completion. 2) In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	4.8.2
	Speed	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/s or 0.1mm/s. The settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. Unit of measure is selected by Parameter No. 159 FB Half Direct Mode Speed Unit. (Example) In the case of the unit of 1.0mm/s: To set 254.0 mm/s, specify “254.” If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.8.2
	Acceleration/ Deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 999. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	4.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Pressing current-limiting value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during pressing operation. The allowable specification range is 0 (0%) to 510 (200%). The actual settable range varies depending on each actuator. Refer to [the catalog or Operation Manual for the each actuator]. If a move command is issued by specifying a value exceeding the maximum pressing current, an alarm will occur.	4.8.2
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	4.6.12 (18)
		b14	RMOD	Operating mode selector: The AUTO mode is selected when this signal is OFF, and the MANU mode is selected when the signal is ON.	4.6.12 (19)
		b13	DIR	Pressing direction specification: “OFF” for the direction reducing the positioning band from the target position, “ON” for the direction adding the positioning band to the target position	4.6.12 (22)
		b12	PUSH	Pressing specification: Positioning operation is performed when this signal is OFF, and pressing operation is performed when the signal is ON.	4.6.12 (21)
		b11	-	Unavailable	-
		b10			
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	4.6.12 (32)
		b8	JOG+	+ Jog: “ON” for Movement in the Opposite Direction of Home	4.6.12 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	4.6.12 (13)
		b6	JVEL	Jog-speed/inch-distance switching: The values set in parameter No. 26, “Jog speed” and parameter No. 48, “Inch distance” are used when this signal is OFF, and the values set in parameter No. 47, “Jog speed 2” and parameter No. 49, “Inch distance 2” are used when the signal is ON.	4.6.12 (14)
		b5	JISL	Jog/inch switching: Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	4.6.12 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	4.6.12 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	4.6.12 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	4.6.12 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	4.6.12 (6)
		b0	DSTR	Positioning Command: A move command is issued when this signal turns ON.	4.6.12 (8)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Current load	32-bit data	-	32-bit signed integer indicating the current position The unit is 0.01N. * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. Refer to [the Operation Manual for the controller] for the details of the alarms.	4.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.6.12 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.6.12 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.6.12 (12)
		b11 b10	-	Unavailable	-
		b9	CEND	Load cell calibration is complete: This signal turns ON when calibration is complete.	4.6.12 (32)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops	4.6.12 (28)
		b6	PUSHS	Pressing operation in progress: The signal is ON when the Pressing operation in progress.	4.6.12 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	4.6.12 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.6.12 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.6.12 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.6.12 (10)

4.6.9 Remote I/O Mode 3 (Number of Occupied Bytes: 12)

(Note) This mode is applicable only for SCON-CA/CB.
In this mode, force control (feedback pressing of load cell values) is used in addition to the remote I/O mode 2 function for operation.
Set the position data using a teaching tools.
The number of operable positions varies depending on the parameter No. 25 “PIO Pattern” setting.
The features of each PIO pattern are shown below. Refer to [Operation Manual for the controller main body] for more information

Value set in parameter No. 25	Operation Mode	I/O Specification
0	Positioning mode	64 positioning points and two zone output points are available.
1	Teaching mode	64 positioning points and one zone output point are available. Positioning operation and jog operation are supported. The current position can be written to a specified position.
2	256-point mode	256 positioning points and one zone output point are available.
3	512-point mode	512 positioning points are available. There are no zone outputs.
4	Electromagnetic valve mode 1	7 positioning points and two zone output points are available. The direct operation command is available for each position No. A position complete signal is output for each position number.
5	Electromagnetic valve mode 2	3 positioning points and two zone output points are available. The actuator is operated by specifying forward, backward and intermediate position commands. A position complete signal is output separately for the front end, rear end and intermediate position.
6	Force control mode 1 (when a dedicated load cell is used)	32 positioning points, one zone output point
7	Force control mode 2 (when a dedicated load cell is used)	5 positioning points, one zone output point An operation command can be specified directly for each position number. A positioning complete signal is output for each position number.

The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	PIO pattern							
	0: Positioning mode	1: Teaching mode	2: 256-point mode	3: 512-point mode	4: Solenoid valve mode 1	5: Solenoid valve mode 2	6: Force control mode 1	7: Force control mode 2
Home return operation	○	○	○	○	○	x	○	○
Positioning operation	○	○	○	○	○	○	○	○
Speed & acceleration/ deceleration setting	○	○	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	x	○	○	x
Individual Setting for Acceleration/Deceleration	○	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○ (*1)	○	○
Zone signal output	○	○	○	x	○	○	○	○
PIO pattern selection (set by parameter)	○	○	○	○	○	○	○	○

○: Supported, x: Not supported

(*1) It is available when the parameter No. 27 “Movement Command Type” is set to “0”.
Turning “OFF” the “Movement Command” can stop the system temporarily.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No. 84	SCON-CA/CB side DI and input register	PLC side output address (bytes)	SCON-CA/CB side DO and output register	PLC side input address (bytes)
7	Port number 0 to 15	n+0, n+1	Port number 0 to 15	n+0, n+1
	Occupied area	n+2, n+3	Occupied area	n+2, n+3
		n+4, n+5	Current position	n+4, n+5
		n+6, n+7		n+6, n+7
		n+8, n+9	Current load	n+8, n+9
		n+10, n+11		n+10, n+11

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (6 words = 12 bytes) and one output word in the I/O areas.

- The areas controlled by port number are controlled using ON/OFF bit signals.
- The current position is a 2-word (32-bit) binary data (unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)).
- The current load is a 2-word (32-bit) binary data (unit: 0.01N).

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0, n+1																
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2, n+3																
Cannot be used																
n+4, n+5																
Current position (lower word)																
n+6, n+7																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9																
Current load (lower word)																
n+10, n+11																
Current load (upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

(3) I/O signal assignment

For the signal assignments corresponding to each PIO pattern, refer to [the I/O signal assignments for the remote I/O mode explained in 4.6.2 (3)].

The signal allocation for the Current load and Current Position, is shown in the following table.

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-
	Current load	32-bit data	-	32-bit signed integer The setting unit is 0.01N. * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	-

4.6.10 Half Direct Value Mode 3 (Number of Occupied Bytes: 16)

In this mode, the jog function in the half direct numerical mode is not available, but the vibration damping parameter set can be changed. Set each value in the I/O areas. When the zone function is used, set it using the parameter Nos. 1, 2, 23 and 24.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control △ : Indirect control x : Disable	Remark
Home-return operation	○	
Positioning operation	○	
Speed and acceleration / deceleration setting	○	
Pitch feed (inching)	○	
Pressing Operation	○	
Speed change during the movement	○	
Individual Setting for Acceleration/Deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No.84	SCON-CA/CB/CAL side input register	PLC side output address (bytes)	SCON-CA/CB/CAL side output register	PLC side input address (bytes)
8	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
	Acceleration/ deceleration	n+10, n+11		n+10, n+11
	Pressing current-limiting value	n+12, n+13	Alarm code	n+12, n+13
	Control signal	n+14, n+15	Status signal	n+14, n+15

(Note) Be careful of using duplicated addresses.

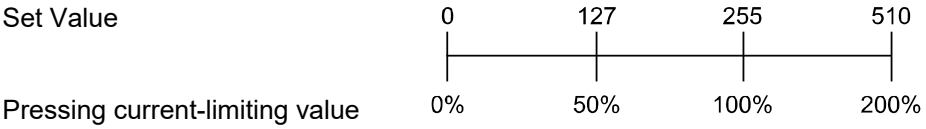
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (8 words = 16 bytes) and one output word in the I/O areas.

- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC.
- The speed is a 1-word (16-bit) binary data. Although values from 0 to +65535 (unit: 1.0 mm/s or 0.1 mm/s) can be handled by the PLC, set a value not exceeding the maximum speed of the applicable actuator.
  Parameter No. 159, FB Half Direct Mode Speed Unit, determines the unit of measure.

Parameter No.159 setting value	Speed setting unit
0	1.0 mm/s
1	0.1 mm/s

- The Acceleration/Deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value refer to [the Catalog or Operation Manual for the actuator] for the actuator concerned.



- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning band (upper word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration/ deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1
n+11, n+12	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing current-limitin	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+13, n+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal	BKRL	RMOD	DIR	PUSH	GSL1	GSL0	NTC1	NTC0	MOD1	MOD0	—	SON	RES	STP	HOME	DSTR

PLC input
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Command current (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (lower word)																
n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+11, n+12																
Alarm code																
n+13, n+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal	EMGS	PWR	ZONE2	ZONE1	—	—	—	RMDS	BALM	—	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed Integer. Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) If the unit is 0.01mm and it is “+25.41mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.2
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is 1 to 9999999. (Example) If the unit is 0.01mm and it is “25.40mm”, set it as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	4.8.2
	Speed	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/s or 0.1mm/s. The settable range is 0 to 65535. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. Unit of measure is selected by Parameter No. 159 FB Half Direct Mode Speed Unit. (Example) In the case of the unit of 1.0mm/s: To set 254.0 mm/s, specify “254.” If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.8.2
	Acceleration/ deceleration	16-bit data	-	16-bit integer Specify the acceleration / deceleration at which to move the actuator (the acceleration and deceleration will be the same value). The unit is 0.01G and settable range is 1 to 999. (Example) To set “0.30 G”, specify “30”. If a move command is issued by specifying “0” or any value exceeding the maximum acceleration or deceleration, an alarm will occur.	4.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th>Description</th><th>Details</th></tr>
<tr><td rowspan="20">PLC output</td><td>Pressing current-limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer.
Specify the current-limiting value during pressing operation.
The specified range is 0 (0%) to 510 (200%).
The actual specifiable range varies with each actuator. Refer to [the catalog or operation manual for each actuator].
If a move command is issued by specifying a value exceeding the maximum pressing current value, an alarm will occur.</td><td>4.8.2</td></tr>
<tr><td rowspan="19">Control signal</td><td>b15</td><td>BKRL</td><td colspan="2">Forced brake release: The brake is released when the signal turns ON.</td><td>4.6.12 (18)</td></tr>
<tr><td>b14</td><td>RMOD</td><td colspan="2">Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.</td><td>4.6.12 (19)</td></tr>
<tr><td>b13</td><td>DIR</td><td colspan="2">Pressing direction specification:
When the signal is OFF, the direction of the position obtained by subtracting the positioning band from the target position is used.
When the signal is ON, the direction of the position obtained by adding the positioning band to the target position is used.</td><td>4.6.12 (22)</td></tr>
<tr><td>b12</td><td>PUSH</td><td colspan="2">Pressing specification: Positioning operation when the signal is OFF, or pressing operation when the signal is ON.</td><td>4.6.12 (21)</td></tr>
<tr><td>b11</td><td>GSL1</td><td>Servo gain parameter set selection 1</td><td rowspan="2">Select the servo gain parameter set to be used.
<table><tr><th>GSL1</th><th>GSL0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Select parameter set 0.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (33)</td></tr>
<tr><td>b10</td><td>GSL0</td><td>Servo gain parameter set selection 0</td></tr>
<tr><td>b9</td><td>NTC1</td><td>Vibration damping control mode selection 1</td><td rowspan="2">Select the vibration damping control parameter set to be used.
<table><tr><th>NTC1</th><th>NTC0</th><th>Function</th></tr><tr><td rowspan="2">OFF</td><td rowspan="2">OFF</td><td rowspan="2">Do not use vibration damping control.</td></tr><tr></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (29)</td></tr>
<tr><td>b8</td><td>NTC0</td><td>Vibration damping control mode selection 0</td></tr>
<tr><td>b7</td><td>MOD1</td><td colspan="2" rowspan="2">Acceleration / deceleration mode:
When both MOD1 and MOD0 are OFF, the trapezoid pattern mode is selected.
When MOD1 is OFF and MOD0 is ON, the S-motion mode is selected.
When MOD1 is ON and MOD0 is OFF, the primary delay filter mode is selected.</td><td rowspan="2">4.6.12 (30)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
<tr><td>b5</td><td>-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b4</td><td>SON</td><td colspan="2">Servo ON command: The servo is ON when the signal is ON.</td><td>4.6.12 (5)</td></tr>
<tr><td>b3</td><td>RES</td><td colspan="2">Reset: A reset is performed when the signal turns ON.</td><td>4.6.12 (4)</td></tr>
<tr><td>b2</td><td>STP</td><td colspan="2">Pause: A pause command is issued when the signal turns ON.</td><td>4.6.12 (11)</td></tr>
<tr><td>b1</td><td>HOME</td><td colspan="2">Home return: A home return command is issued when the signal turns ON.</td><td>4.6.12 (6)</td></tr>
<tr><td>b0</td><td>DSTR</td><td colspan="2">Positioning start command: A move command is issued when the signal turns ON.</td><td>4.6.12 (8)</td></tr>
</table>

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm (when unit is 0.01mm) * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Command current	32-bit data	-	32-bit integer Stores the currently commanded current. The setting unit is mA. (Example) Reading: 000003FF$_H$=1023 (decimal) =1023mA (when unit is 0.01mm)	4.8.2
	Current speed	32-bit data	-	32-bit signed integer indicating the current position Stores the current velocity. The unit is 0.01mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm/s * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.8.2
	Alarm code	16-bit data	-	16-bit integer Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. Refer to [the Operation Manual for the controller] for the details of the alarms.	4.8.2
	Status signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.6.12 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.6.12 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.6.12 (12)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)
		b6	-	Unavailable	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the work part in pressing operation.	4.6.12 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.6.12 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.6.12 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.6.12 (10)

4.6.11 Full Direct Value Mode 2 (Number of Occupied Bytes: 32)

This Mode are available only for SCON-CB/CGB types. (Applicable Versions：V0022 or later)

This is the operation mode with all the values (target position, speed, etc.) set up directly using values from PLC. Set each value in the I/O area.
The overload level monitoring, current indication value and monitoring of the estimated regenerative discharge power volume are available.
The actuator's effective main functions that can be controlled using this mode, are as shown in the following table.

Actuator function	○ : Direct control x : Disable
Home-return operation	○
Positioning operation	○
Speed and acceleration / deceleration setting	○
Pitch feed (inching)	○
Pressing Operation	○
Speed change during the movement	○
Individual Setting for Acceleration/Deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC address configuration (* “n” indicates the first address of each axis.)

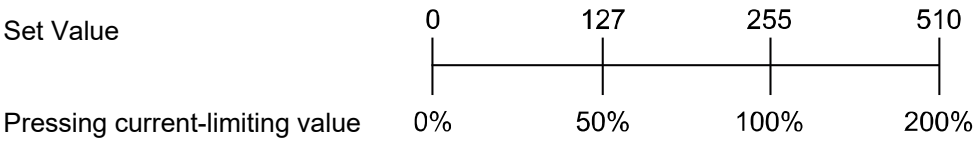
Parameter No. 84	SCON-CA/CB/CAL side input register	PLC side output address (bytes)	SCON-CA/CB/CAL side output register	PLC side input address (bytes)
9	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Command current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
		n+10, n+11		n+10, n+11
	Zone boundary+	n+12, n+13	Alarm code	n+12, n+13
		n+14, n+15	Overload level monitor	n+14, n+15
	Zone boundary-	n+16, n+17	Current command value	n+16, n+17
		n+18, n+19		n+18, n+19
	Acceleration	n+20, n+21	Estimated regenerative discharge power volume	n+20, n+21
	Deceleration	n+22, n+23		n+22, n+23
	Pressing current-limiting value	n+24, n+25	Total moving distance	n+24, n+25
	Load current threshold	n+26, n+27		n+26, n+27
	Control signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Control signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) Exercise caution to avoid address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of 16 word (16 words = 32 bytes) in the I/O areas.

- Control signals 1 and 2 and status signals are ON/OFF bit signals.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- Set the positioning band. The positioning band is expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC.
- The specified speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/s) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
- The Acceleration/Deceleration is expressed using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01G) can be set in PLC. However, set the value that does not exceed the max. acceleration/deceleration value for the actuator in question.
- The pressing current-limiting value is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. However, set the value within the settable range for the pressing current-limiting value (refer to [the Catalog or Operation Manual for the actuator]) for the actuator concerned.



- Set the load current threshold. The load current threshold is expressed using 1-word (16 bits) binary data. The figures from 0 (0%) to 510 (200%) can be set in PLC. Refer to [the graph of pressing current-limiting value (above graph)].
- Zone Boundary “+” and Zone Boundary “–” are expressed using 2-word (32 bits) binary data. The figures from -9999999 to +9999999 (Unit: 0.01 mm (other than DD motor) and 0.001° (DD motor)) can be set in PLC. However make sure to set the smaller value for the Zone Boundary “-“ than that for the Zone Boundary “+”.
- The command current is expressed using 2-word (32 bits) binary data (Unit: 1mA).
- The current speed is expressed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code is expressed using 1-word (16 bits) binary data.
- The overload level monitor is a 1-word (16-bit) binary data (Unit: %).
- The current command value is a 2-word (32-bit) binary data (Unit: 0.01m).
- The estimated regenerative discharge power volume should be in 2-word (32-bit) binary data (unit: 0.01W).
- The total moving distance is a 2-word (32 bits) binary data (unit: m).

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Target position (lower word)																
n+2, n+3																
Target position (upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Positioning band (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7																
Positioning band (upper word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536
n+8, n+9																
Speed (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11																
Speed (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+12, n+13																
Zone boundary + (lower word)																
n+14, n+15																
Zone boundary + (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17																
Zone boundary - (lower word)																
n+18, n+19																
Zone boundary - (upper word)																

When the zone boundary is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+20, n+21																
Acceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+22, n+23																
Deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+24, n+25																
Pressing current-limiting value	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+26, n+27																
Load current threshold	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+28, n+29																
Control signal 1	—	—	NTC1	NTC0	—	—	ASO1	ASO0	MOD1	MOD0	GSL1	GSL0	INC	DIR	PUSH	—
n+30, n+31																
Control signal 2	BLRL	RMOD	—	—	—	—	CLBR *1	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

*1 It is available to use only when an actuator is equipped with a loadcell.

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1																
Current position (lower word)																
n+2, n+3																
Current position (upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5																
Command current (lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7																
Command current (upper word)													524,288	262,144	131,072	65,536
n+8, n+9																
Current speed (lower word)																
n+10, n+11																
Current speed (upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13																
Alarm code																
n+14, n+15																
Overload level monitor																

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes = 16 bits

n+16, n+17	b15	bb14	13	b12	b11	b10	b9	b8	bb7	6	b5	b4	bb3	2	bb1	0
Current command value (lower word)																

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current command value (Upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Estimated regenerative discharge power volume (lower word)																

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Estimated regenerative discharge power volume (Upper word)																

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (lower Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Total moving distance (Upper Word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	CEND*1	ALML

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 2	EMGS	PWR	ZONE2	ZONE1	PZONE	LOAD	TRQS	RMDS	GHMS	PUSHS	PSFL	SV	ALM	MOVE	HEND	PEND

*1 It is available to use only when an actuator is equipped with a loadcell.

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. (Example) “+25.41mm” in the unit of 0.01mm should be indicated as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.3
	Positioning band	32-bit data	-	32-bit integer The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is 1 to 9999999. (Example) “25.40mm” in the unit of 0.01mm should be indicated as “2540”. This register value has two meanings depending on the operation type. [1] In the case of positioning operation, it shows the allowable range from the target position, that is regarded as the positioning completion. [2] In the case of pressing operation, it shows the pressing width value. Specify the normal operation or pressing operation using the “PUSH” control signal setting.	4.8.3
	Speed	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/s and the settable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	4.8.3
	Zone boundary+/ Zone boundary–	32-bit data	-	32-bit signed integer indicating the current position After completion of home return, an effective zone signal can be output separately from the zone boundaries specified by parameters. The status signal PZONE turns ON when the current position is inside these +/- boundaries. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable range is -9999999 to 9999999. Enter a value that satisfies the relationship of “Zone boundary + > Zone boundary –”. If this function is not used, enter the same value for both the positive and negative boundaries. (Example) “+25.40mm” in the unit of 0.01mm should be indicated as “2540”. * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.8.3

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th colspan="2">Contents</th><th>Details</th></tr>
<tr><td rowspan="19">PLC output</td><td>Acceleration</td><td>16-bit data</td><td>-</td><td colspan="2" rowspan="2">16-bit integer.
Specify the acceleration and deceleration at which to move the actuator.
The unit is 0.01 G, while the specifiable range is 1 to 999.
(Example)To set 0.30 G, specify “30.”
If a move command is issued by specifying “0” or a value exceeding the maximum acceleration or maximum deceleration, an alarm will occur.</td><td rowspan="2">4.8.3</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Load current threshold</td><td>16-bit data</td><td>-</td><td colspan="2">16-bit integer.
If judgment will be made as to whether or not the load current exceeded the set value, specify the threshold value for current using this register.
The specifiable range is 0 (0%) to 510 (200%).
If judgment is not performed, enter “0.”</td><td>4.8.3</td></tr>
<tr><td rowspan="9">Control signal 1</td><td>b15
b14</td><td>-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b13</td><td>NTC1</td><td>Vibration damping control mode selection 1</td><td rowspan="2">Select the vibration damping control parameter set to be used.<table><tr><th>NTC1</th><th>NTC0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Do not use vibration damping control.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (29)</td></tr>
<tr><td>b12</td><td>NTC0</td><td>Vibration damping control mode selection 0</td></tr>
<tr><td>b11
b10</td><td>-</td><td colspan="2">Cannot be used.</td><td>-</td></tr>
<tr><td>b9</td><td>ASO1</td><td>Stop mode 1</td><td rowspan="2">Select the stop mode during standby.<table><tr><th>ASO1</th><th>ASO0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Invalid (The servo is always on.)</td></tr><tr><td>OFF</td><td>ON</td><td>The servo turns off after the time is set in parameter No. 36.</td></tr><tr><td>ON</td><td>OFF</td><td>The servo turns off after the time is set in parameter No. 37.</td></tr><tr><td>ON</td><td>ON</td><td>The servo turns off after the time is set in parameter No. 38.</td></tr></table></td><td rowspan="2">4.6.12 (31)</td></tr>
<tr><td>b8</td><td>ASO0</td><td>Stop mode 0</td></tr>
<tr><td>b7</td><td>MOD1</td><td colspan="2" rowspan="2">Acceleration/deceleration mode:
Trapezoid pattern when both signals are OFF,
S-motion when MOD1 is OFF and MOD0 is ON, or
primary delay filter when MOD1 is ON and MOD0 is OFF.</td><td rowspan="2">4.6.12 (30)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
<tr><td>b5</td><td>GSL1</td><td>Servo gain parameter set selection 1</td><td rowspan="2">Select the servo gain parameter set to be used.<table><tr><th>GSL1</th><th>GSL0</th><th>Function</th></tr><tr><td>OFF</td><td>OFF</td><td>Select parameter set 0.</td></tr><tr><td>OFF</td><td>ON</td><td>Select parameter set 1.</td></tr><tr><td>ON</td><td>OFF</td><td>Select parameter set 2.</td></tr><tr><td>ON</td><td>ON</td><td>Select parameter set 3.</td></tr></table></td><td rowspan="2">4.6.12 (33)</td></tr>
<tr><td>b4</td><td>GSL0</td><td>Servo gain parameter set selection 0</td></tr>
</table>

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal 1	b3	INC	Incremental specification: Absolute position command when the signal is OFF, or incremental position command when the signal is ON.	4.6.12 (24)
		b2	DIR	Pressing direction specification: When the signal is OFF, the direction of the position obtained by subtracting the positioning band from the target position is used. When the signal is ON, the direction of the position obtained by adding the positioning band to the target position is used.	4.6.12 (22)
		b1	PUSH	Pressing specification: Positioning operation when the signal is OFF, or pressing operation when the signal is ON.	4.6.12 (21)
		b0	-	Cannot be used.	-
	Control signal 2	b15	BKRL	Forced brake release: The brake is released when the signal turns ON.	4.6.12 (18)
		b14	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	4.6.12 (19)
		b13	-	Cannot be used.	-
		b12			
		b11			
		b10			
		b9	CLBR (Note 1)	Load cell calibration command: Calibration is performed when this signal turns ON.	4.6.12 (32)
		b8	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	4.6.12 (13)
		b7	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	4.6.12 (13)
		b6	JVEL	Jog speed/inching distance switching: Parameter No. 26, “Jog speed” and parameter No. 48, “Inching distance” are used when the signal is OFF, or parameter No. 47, “Jog speed 2” and parameter No. 49, “Inching distance 2” are used when the signal is ON.	4.6.12 (14)
		b5	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	4.6.12 (15)
		b4	SON	Servo ON command: The servo is ON when the signal is ON.	4.6.12 (5)
		b3	RES	Reset: A reset is performed when the signal turns ON.	4.6.12 (4)
		b2	STP	Pause: A pause command is issued when the signal turns ON.	4.6.12 (11)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	4.6.12 (6)
		b0	DSTR	Positioning start: A move command is issued when the signal turns ON.	4.6.12 (8)

Note 1 It is available to use only when an actuator is equipped with a loadcell.

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Description	Details
PLC input	Current position	32 bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm (when unit is 0.01mm) * If this data is read as a hexadecimal, a negative value is indicated by a complement of 2.	4.8.3
	Command current	32-bit data	-	32-bit integer. Stores the currently commanded current. The unit is mA. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 1023 mA	4.8.3
	Current speed	32-bit data	-	32-bit signed integer. Stores the current velocity. The unit is 0.01 mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm/s * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	4.8.3
	Alarm code	16-bit data	-	16-bit integer. Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. For details on alarms, refer to [the operation manual for the controller].	4.8.3
	Overload level monitor	16-bit data	-	16-bit integer The motor load [%] should be displayed.	-
	Current command value	32-bit data	-	32-bit signed integer It is the position in the operation plan that the controller currently indicates. The unit is 0.01mm/s. (Example) Reading: 000003FF$_H$=1023 (decimal) =10.23mm * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	-
	Estimated regenerative discharge power volume	32-bit data	-	32-bit signed integer It is an estimate value of the average power volume applied to the regenerative resistance. The frequency of update should be 512ms. CA: Overheat Alarm should be output when the estimate value gets to the value of each controller or above. Consider revising operational conditions or adding some external regenerative resistances.	-
	Total moving distance	32-bit data	-	32-bit integer. The unit is m.	

(* In the table, ON indicates that the applicable bit is “1,” while OFF indicates that the applicable bit is “0.”)

Signal type		Bit	Symbol	Description	Details
PLC input	Status signal 1	b15	-	Cannot be used.	-
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1	CEND (*1)	Load cell calibration is complete: This signal turns ON when calibration is complete.	4.6.12 (32)
		b0	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.6.12 (28)
	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is being executed when the signal is ON.	4.6.12 (2)
		b14	PWR	Controller ready: The signal turns ON when the controller becomes ready.	4.6.12 (1)
		b13	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	4.6.12 (12)
		b12	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	4.6.12 (12)
		b11	PZONE	Position zone: The signal is ON when the current position is inside the specified position zone.	4.6.12 (12)
		b10	LOAD	Load output judgment: Reached when the signal is ON, or not yet reached when the signal is OFF. For details, refer to [the operation manual for the controller main body].	4.6.12 (26)
		b9	TRQS	Torque level: Reached when the signal is ON, or not yet reached when the signal is OFF. For details, refer to [the operation manual for the controller main body].	4.6.12 (27)
		b8	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	4.6.12 (19)
		b7	GHMS	Home return in progress: The signal is ON while the home return is in progress.	4.6.12 (6)
		b6	PUSHS	Pressing operation in progress: The signal is ON while the pressing operation is in progress.	4.6.12 (25)
		b5	PSFL	Missed work part during pressing operation: The signal turns ON when the actuator missed the work part during pressing operation.	4.6.12 (23)
		b4	SV	Ready: The signal is ON when the servo is ON.	4.6.12 (5)
		b3	ALM	Alarm: The signal turns ON when an alarm occurs.	4.6.12 (3)
		b2	MOVE	Moving signal: The signal is ON while the actuator is moving.	4.6.12 (9)
		b1	HEND	Home return complete: The signal turns ON when the home return is completed.	4.6.12 (6)
		b0	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	4.6.12 (10)

*1 It is available to use only when an actuator is equipped with a loadcell.

4.6.12 I/O Signal Controls and Function

* ON indicates that the applicable bit signal is “1”, while OFF indicates that the bit signal is “0”.
The I/O control and functions used in the Position/Simplified Direct Value Modes 1 and 2, Half Direct Value Modes 1 to 3 and Full Direct Value Mode, are described as follows. For the I/O signals for the Remote I/O Modes 1 to 3, refer to [the Operation Manual for the controller main body].

(1) Controller ready (PWR) PLC input signal

When the controller can control the system after the power injection, it is turned “ON”.

■ Function

Regardless of the alarm or servo conditions, when the controller initialization is completed normally after the power injection and the controller can control the system, it is turned “ON”.
Even in the alarm condition, when the controller can control the system, it is turned “ON”.

(2) Emergency stop (EMGS) PLC input signal

When the controller is stopped in an emergency, it is turned “ON”.

■ Function

When the controller is stopped in an emergency (motor driving power is cut off), it is turned “ON”. When the emergency stop status is cleared, it is turned “OFF”.

* This signal should behave as a signal of a break contact (*EMGS) in Remote I/O Mode thus switching on/off gets reversed to above.

(3) Alarm (ALM) PLC input signal

When any error is detected using the controller protection circuit (function), it is turned “ON”.

■ Function

When any error is detected and the protection circuit (function) is activated, this signal is turned “ON”.
When the cause of the alarm is eliminated and the reset signal is turned “ON”, the alarm is turned “OFF” in the case that it is the alarm with the operation cancellation level. (In the case of the alarm with the cold start level, re-injection of the power is required)
When the alarm is detected, the Status Indicator LED refer to [4.3, EtherNet/IP Interface] on the front surface of the controller illuminates in red.

* This signal should behave as a signal of a break contact (*ALM) in Remote I/O Mode thus switching on/off gets reversed to above.

(4) Reset (RES) PLC output signal

This signal has two functions. It can reset the controller alarm and cancel the reminder for planned movements during pause conditions.

■ Function

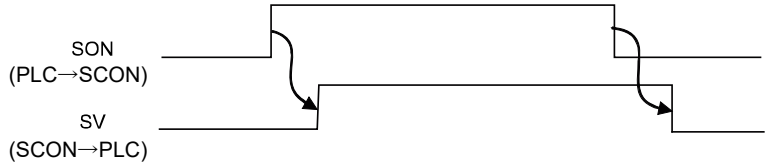
[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset. (In the case of the alarm with the cold start level, re-injection of the power is required)
[2] When this signal is turned ON from OFF condition during the pause condition, the reminder of the planned movement left can be cancelled.

(5) Servo ON command (SON) PLC output signal
Operation preparation end (SV) PLC input signal

When the SON signal is turned ON, the servo will turn ON.
When “SON” signal is turned “ON”, the servo-motor is turned “ON”. When the servo-motor is turned ON, the Status Indicator LED refer to [4.3, EtherNet/IP Interface] on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

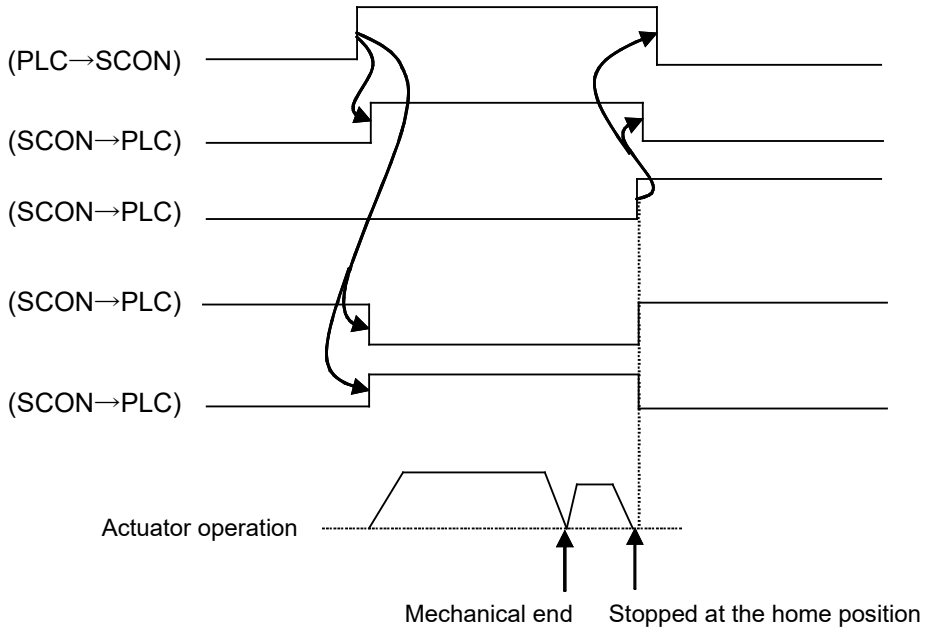
■ Function

Using the “SON” signal, the turning ON/OFF of the controller is available.
While the “SV” signal is ON, the controller's servo-motor is turned “ON” and the operation becomes available.
The relationship between the “SON” signal and “SV” signal is as follows.



(6) Home return (HOME) PLC output signal
Home return completion (HEND) PLC input signal
Under Home return Operation (GHMS) PLC input signal

When the “HOME” signal is turned “ON”, this command is processed at the startup (ON edge), and the home return operation is performed automatically. During the home return operation, the “GHMS” signal is turned “ON”.
When the “HEND” signal is turned “ON”, turn “OFF” the “HOME” signal.
Once the “HEND” signal is turned “ON”, it can not be turned “OFF” until the power is turned “OFF” or the “HOME” signal is input again. Once the HEND signal is turned ON, it can not be turned OFF until the power is turned OFF or the HOME signal is input again.
Even after the completion of the home return operation, when the “HOME” signal is turned “ON”, the home return operation can be performed.



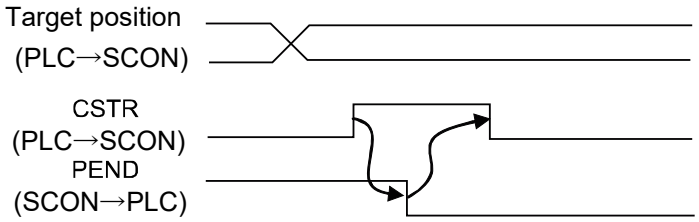
⚠ Caution: In the Remote I/O Modes 1 to 3 and Position/Simplified Direct Value Modes 1 and 2, when the positioning command is issued without performing the home return operation after the power injection, the positioning is performed after the automatic home return operation.
Exercise caution that in the Half Direct Modes 1 to 3 or Full Direct Mode, issuing a positioning command to a given position following the power on, without performing a home return first, will generate an alarm “Error Code 83: ALARM HOME ABS (absolute position move command when home return is not yet completed)” (operation-reset alarm).

(7) Positioning start (CSTR):Used in the position/simple direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning is performed to the target position with the specified position No. or set using the PLC's target position register.
Whether if the target position with the specified position No. is used or the setting using the PLC's target position register is used, depends on the Control Signal b11: “Position/Simplified Direct Value Change-Over (PMOD) Signal”.

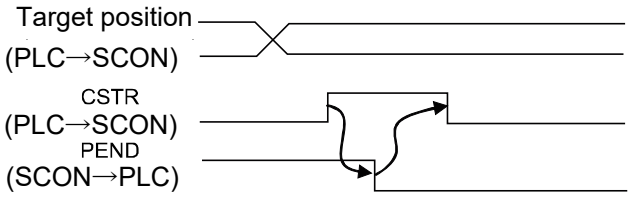
- PMOD＝OFF:Target position data for the specified position No. is used.
- PMOD＝ON : Value for the target position set using the PLC's target position register is used.

When this signal is issued in the condition where the home return operation has not performed at all after the power injection (HEND signal OFF), the positioning to the target position is performed after the home return operation is performed automatically.
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PND) signal has been turned “OFF”.



(8) Positioning command (DSTR): Used in the half direct mode and full direct mode PLC output signal

This signal is processed at the startup (ON edge) and the positioning to the target position input in the PLC's target position register is performed. When this signal is issued in the condition where the home return operation has not performed at all after the power injection (HEND signal OFF), an alarm is issued (Operation Cancellation Level).
Turn “OFF” this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned “OFF”.

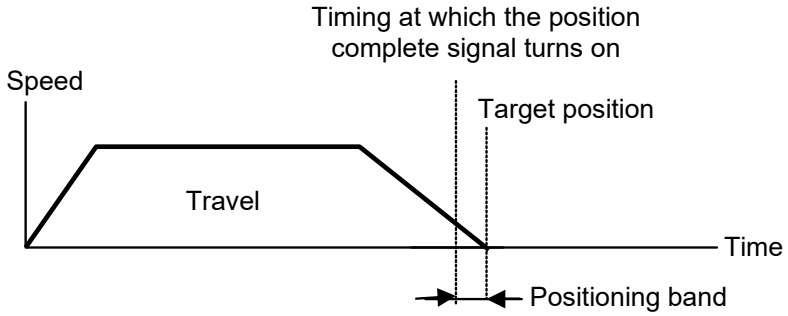


(9) Moving signal (MOVE) PLC input signal

This signal is turned ON while the actuator's slider or rod is moving.(Including the pressing or jog operation after the home return operation)
After the completion of the positioning, home return or pressing operation, or during the pause condition, this signal is turned “OFF

(10) Positioning completion signal (PEND) PLC input signal

This signal is turned “ON” when the actuator is moved to the target position and reaches the positioning band and the pressing is completed.
However, when the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.



When the servo-motor is turned ON from OFF condition, the positioning is performed with the position set as the target position. Accordingly, this signal is turned “ON” and after that, when the positioning operation is started with the home return (HOME) signal, positioning start (CSTR) signal and positioning command (DSTR) signal, this signal is turned “OFF”.

⚠ Caution: When the servo-motor is turned OFF or stopped in an emergency while the actuator is stopped at the target position, the PEND signal is turned “OFF” temporarily.
Then, when the servo-motor is turned “ON”, the PEND signal is turned “ON” again.

(11) Pause (STP) PLC output signal

When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position No. set using the specified position No. resister in the Position/Simplified Direct Value Modes 1 and 2, and as the value set in the acceleration/deceleration register in the Half Direct Value Modes 1 to 3.
In the Full Direct Value Mode, the value is expressed as the value set in the acceleration register or deceleration register.

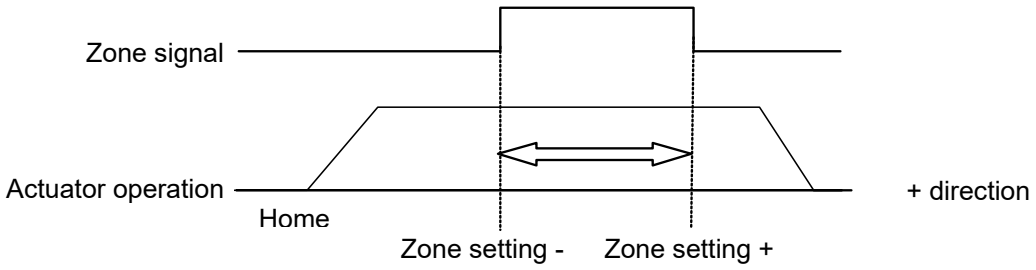
* This signal should behave as a signal of a break contact (*STP) in Remote I/O Mode thus switching on/off gets reversed to above.

(12) Zone 1 (ZONE1) PLC input signal
Zone 2 (ZONE2) PLC input signal
Position zone (PZONE) PLC input signal

These signals are turned ON when the current position of the actuator is within the set area and turned OFF when the current position is out of the set area.

[1] Zone 1, Zone 2
The zone is set using the user parameters.
The Zone 1 Signal is set using the parameter No. 1 “Zone Boundary 1 “+” Side” and No. 2 “Zone Boundary 1 “–“ Side”.
The Zone 2 Signal is set using the parameter No. 23 “Zone Boundary 2 “+” Side” and No. 24 “Zone Boundary 2 “–“ Side”.
The Zone 1 Signal and Zone 2 Signal become effective when the home return operation is completed. After that, even during the servo OFF, it is effective.

[2] Position zone
Each zone is set in the position table or using the zone boundary resister.
In the case of the Position/Simplified Direct Value Modes 1 and 2, the PZONE signal is set using the position table.
In the case of the Full Direct Value Mode, the PZONE signal is set using the Zone Boundary Value Register.
(*) In the Half Direct Value Modes 1 to 3, there is no PZONE signal.
The PZONE signal becomes effective with the movement command after the home return operation. After that, even during the servo OFF, it is effective.



(13) +Jog (JOG+) PLC output signal
–Jog (JOG–) PLC output signal

This signal is the command for the jog operation startup or inching operation startup.
If a + command is issued, the actuator will operate in the direction opposite home. When a – command is issued, the actuator will operate in the direction of home.

[1] Jog operation
Jog operation can be performed when the jog/inch switching (JISL) signal is OFF.
While the "JOG+" is turned "ON", the movement direction is to the opposite of the home and when it is turned "OFF", the actuator is decelerated and stopped.
While the JOG – is ON, the actuator will operate in the direction of home and when it is turned OFF, it is decelerated to a stop.
The operation is performed based on the set values of the following parameters.

- The speed is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (JEL) signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
- When both the JOG+ and JOG- signals are turned "ON", the actuator is decelerated and stopped.

[2] Inch operation
The inching operation is available while the IISI signal is turned "ON".
Once it is turned "ON", the actuator is moved as much as the inching distance.
When the JOG+ is turned "ON", the movement is to the opposite of the home and when the JOG- is turned "ON", the movement is to the home.
The operation is performed based on the set values of the following parameters.

- The speed conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The travel conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 48, "PIO inch distance".
  If the JVEL signal is ON, the actuator operates according to parameter No. 49, "PIO inch distance 2".
- The Acceleration/Deceleration is based on the rated acceleration/deceleration (depending on the actuator).

During the normal operation, even when the "+" Jog Signal or "-" Jog Signal is turned "ON", the normal operation is continued. (The Jog signal is ignored)
In the pause condition, even when the "+" Jog Signal or "-" Jog Signal is turned "ON", the actuator is not moved.

(Note) Because the software stroke limit is disabled before the home return operation, the actuator might run against the mechanism end. Take the greatest care.

(14) Jog-speed/inch-distance switching (JVEL) PLC output signal

This change-over signal is used for the parameters specifying the jog speed when the jog operation is selected or the inching distance when the inching operation is selected.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

(15) Job/inch switching (JISL) PLC output signal

This signal changes over the jog operation and the inching operation.
JISL=OFF: Jag operation
JISL=ON :Inch operation
When the JISL signal is turned “ON” (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.
When the JISL signal is turned OFF (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

[Relation Between Setting and Operation for JVEL/JISL]

The relation between the jog velocity / inching distance switchover signal (JVEL) and the jog / inching switchover signal (JISL) turned on and off is as described below.

JISL		OFF (Jog operation)	ON (Inch operation)
Operating conditions		When the JOG +/JOG - signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG - signal.
JVEL=OFF	Speed	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed”
	Travel	-	Parameter No. 48, “Inch distance”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
JVEL=ON	Speed	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	Travel	-	Parameter No. 49, “Inch distance 2”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)

(16) Teaching mode command (MODE) PLC output signal
Teaching mode signal (MODES) PLC input signal

When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the controllers for each actuator is changed to the teaching mode, the MODES signal is turned ON.
After confirming that the MODES signal is turned “ON” on the PLC side, start the teaching operation.

(Note) In order to change the normal operation mode to the teaching mode, the following conditions are required.

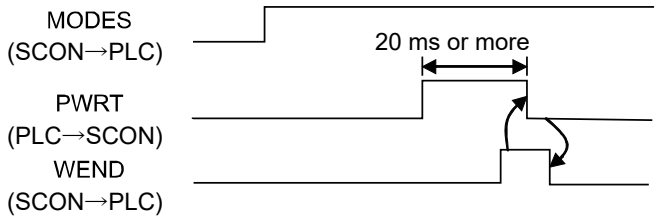
- The actuator operation (motor) is stopped.
- The + JOG (JOG+) signal and – JOG (JOG-) signal are turned “OFF”.
- The Position Data Import Command (PWRT) Signal and Positioning Start (CSTR) Signal are turned “OFF”.

(Note) When the PWRT signal is not turned OFF, the mode is not returned to the normal operation mode.

(17) Position data import command (PWRT) PLC output signal
Position data import complete (WEND) PLC input signal

The PWRT signal is available when the teaching mode signal (MODES) is turned “ON”.
Turn the PWRT signal ON (*1), and the data of the current position will be written to the “Position” field under the position number set to the specified position number resister of the PLC (*2).
When the data writing is completed, the WEND signal is turned “ON”.
After the WEND signal is turned ON, turn OFF the PWRT signal in the host machine.
When the PWRT signal is turned ON before the WEND signal is turned “ON”, the WEND signal is not turned “ON”.
When the PWRT signal is turned “OFF” the WEND signal is also turned “OFF”.

(*1) Turn it on for 20ms or more. If the time is shorter than 20ms, the writing is not completed.
(*2) When the data items except for the position have not been defined, the parameter initial values are written. [Refer to the Operation Manual for the controller main body]



(18) Forced brake release (BKRL) PLC output signal

Turning this signal “ON” can release the brake forcibly.

(19) Operating mode selector (RMOD) PLC output signal
Operation Mode Status (RMDS) PLC input signal

The operation mode is selected with the RMOD signal and the MODE switch located on the front surface of the controller.
Also, which mode is currently set, AUTO or MANU, can be confirmed using the RMDS signal.
The operation modes with the combination of the RMOD signal and the MODE switch ON/OFF are described as follows.

	Controller MODE Switch = AUTO	Controller MODE Switch = MANU
RMOD signal = OFF (AUTO mode is specified)	AUTO mode (RMDS=OFF)	MANU mode (RMDS=ON)
RMOD signal = ON (MANU mode is specified)	MANU mode (RMDS=ON)	MANU mode (RMDS=ON)

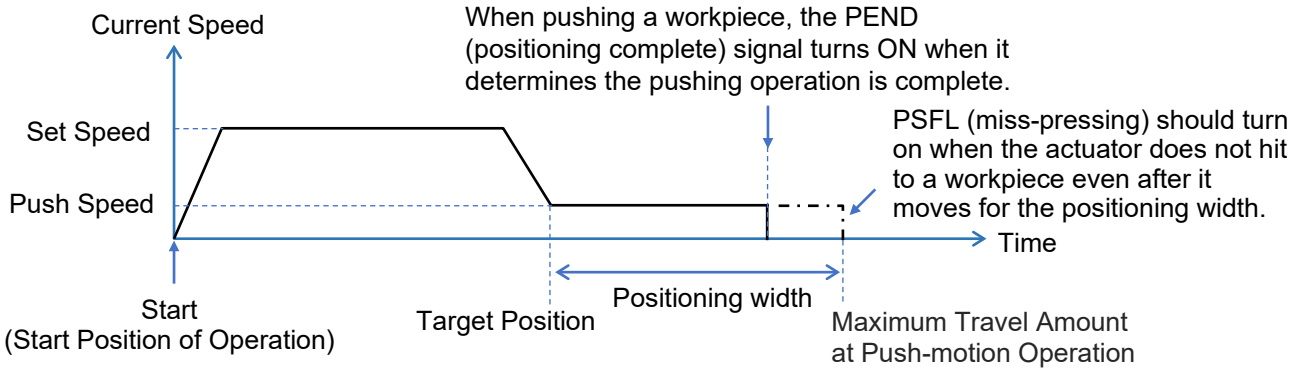
(Note) In MANU mode, the startup of the operation from PLC is not available.

(20) Position/simple-direct switching (PMOD) PLC output signal

This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON: Use the value of the target position resister

(21) Pressing specification (PUSH) PLC output signal

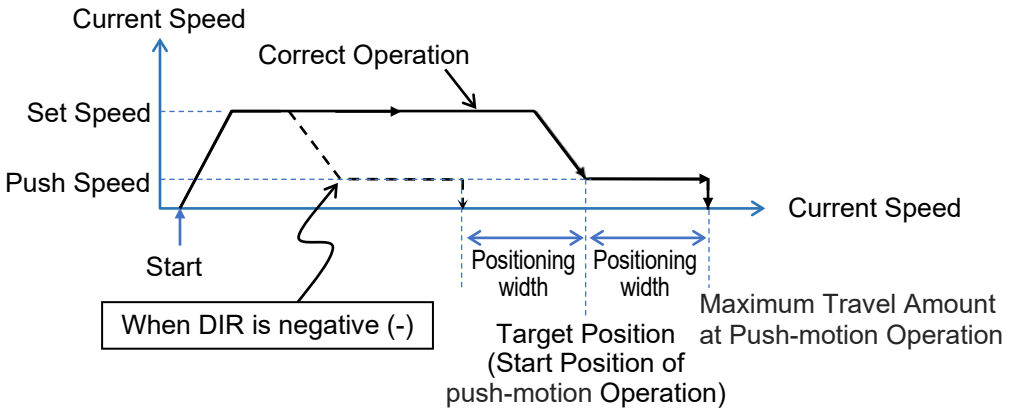
When the movement command signal is output after this signal is turned ON, the pressing operation is performed.
When this signal is set to “OFF”, the normal positioning operation is performed.
Refer to [Item 4.8.2 Operation in Half Direct Value Mode in 4.8 Operation] for the setting timing for this signal



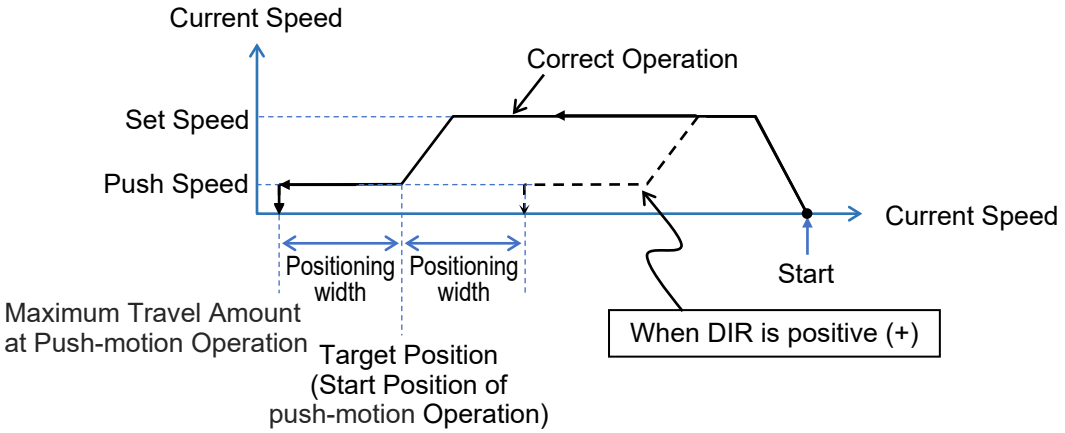
(22) Pressing direction specification (DIR) PLC output signal

This signal specifies the pressing direction.
When this signal is turned “ON”, the pressing operation is performed to the direction of the value determined by adding the positioning band to the target position.
When this signal is turned “OFF”, the pressing operation is performed to the position expressed using the value reducing the positioning band from the target position.
In the case of the normal pressing operation, this signal is disabled.
Refer to [Item 4.8.2 Operation in Half Direct Value Mode in 4.8 Operation] for the setting timing for this signal

1) For Pressing Operation Towards Positive from Start Point



2) For Pressing Operation Towards Negative from Start Point



As shown in the figure 1) above, when pushing from the start point toward the target position in the direction in which the coordinate value increases, the push direction is positive (+), and when pushing in the direction in which the coordinate value decreases as the 2) above, the push direction is negative (-).
Pushing in the wrong direction will lead to improper operation, as the push-motion operation will start at the start point and continue to the distance (positioning width × 2); take care.

(23) Pressing and a miss (PSFL) PLC input signal

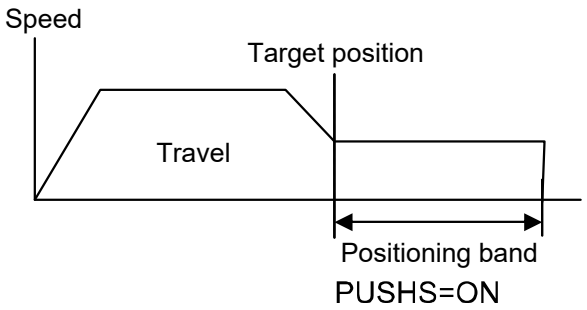
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
Refer to [Item 4.8.2 Operation in Half Direct Value Mode in 4.8 Operation] for the setting timing for this signal

(24) Incremental command (INC) PLC output signal

When the movement command is issued while this signal is turned “ON”, the actuator is moved to the position expressed as the value input in the PLC's target position register based on the current position. (Incremental move)
When this signal is turned “OFF”, the actuator is moved to the position expressed as the value set in the PLC's target position register.

(25) Pressing in progress (PUSHS) PLC input signal

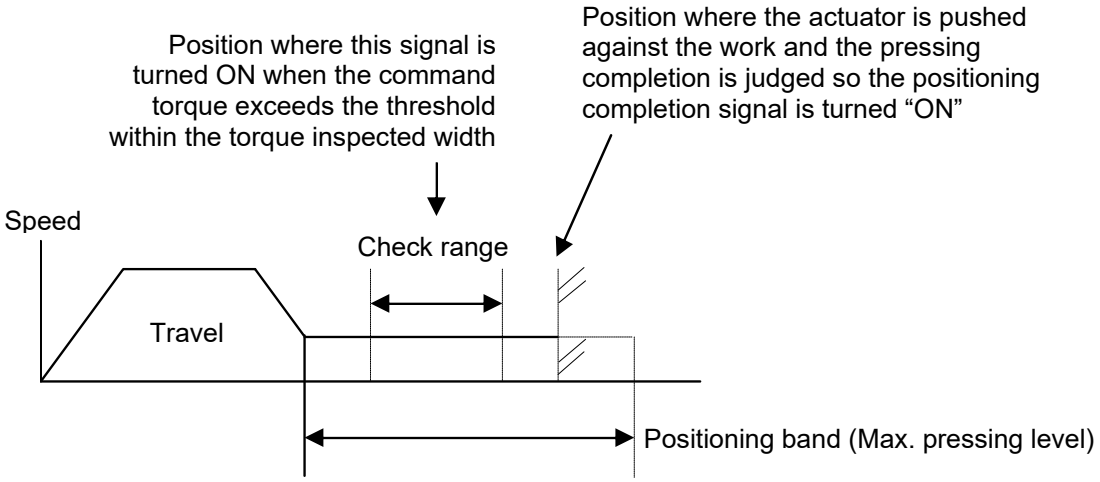
This signal is turned “ON” during the pressing operation.



This signal is turned “OFF” when the pressing and a miss signal or the next movement command signal is output, or the servo-motor is turned “OFF”.
Refer to [Item 4.8.2 Operation in Half Direct Value Mode in 4.8 Operation] for the setting timing for this signal

(26) Load output judgment (LOAD) PLC input signal

This signal is available only in the pressing operation.
When this signal is used for pressing-in purpose, it should be know whether if the set load threshold is reached during the pressing operation.
The load threshold and check range are set by the PLC and the LOAD signal will turn ON when the command torque (motor current) exceeds the threshold inside the check range.
This signal judges the load output based on the fact that the command torque excesses the threshold for the specified time period.
This processing procedure is the same as for the pressing judgment. The judgment time period can be changed freely using the parameter No. 50 “Load Output Judgment Time Period”.
This signal is continued until the next movement command is received.

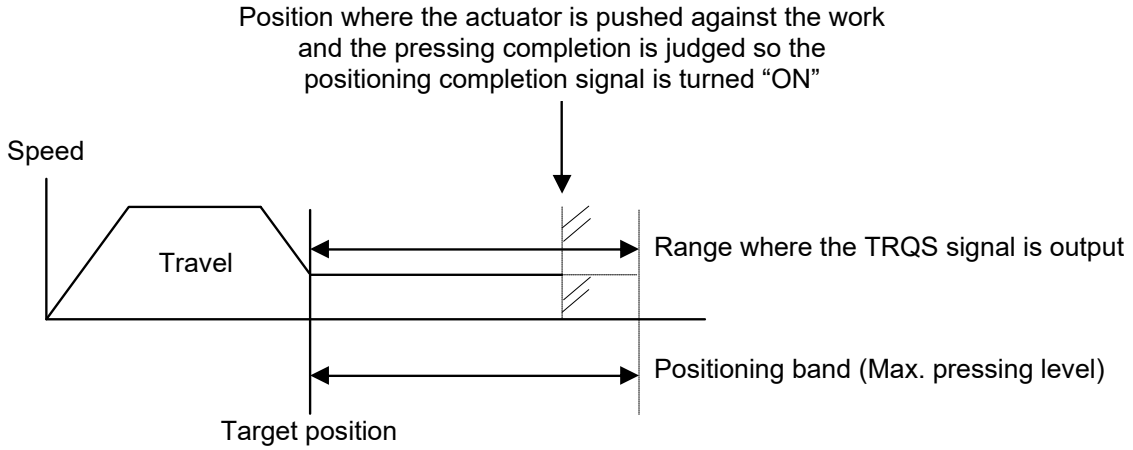


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the threshold inspected width using the PLC's Zone Boundary + Register or Zone Boundary - Register.
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the Operation Manual for the controller main body] for more information.

⚠ Caution: The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
It is not the stop condition, so take the greatest care to deal with it.

(27) Torque level (TRQS) PLC input signal

This signal is available only in the pressing operation.
When the motor current reaches the load threshold during the pressing operation (moving up to the positioning band), this signal is turned “ON”.
Because the current level is monitored, when the current level is changed, this signal is turned “ON” or “OFF”.
The speed available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate speed considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time Period”.
- Set the threshold using the PLC's Load Current Threshold Register.
- Set the positioning band using the PLC's Positioning Band Register.
  Set it a bit longer from the backmost position considering the mechanical dispersion of the work part.
  Refer to [the Operation Manual for the controller main body] for more information.

⚠ Caution: The actuator continues to push the work part with the pressing current at the stop time decided with the current-limiting value.
It is not the stop condition, so take the greatest care to deal with it.

(28) Absolute battery voltage low 2arning (BALM) PLC input signal

With an absolute system, this signal is OFF when the absolute battery voltage is normal. It remains OFF with an incremental system.
This BALM signal turns ON when the absolute battery voltage drops to 3.1 V. If the controller is operated continuously and the voltage drops further to 2.5 V, the controller can no longer retain position information. (If you are using an absolute system and this signal turns ON, replace the battery at the earliest opportunity.)

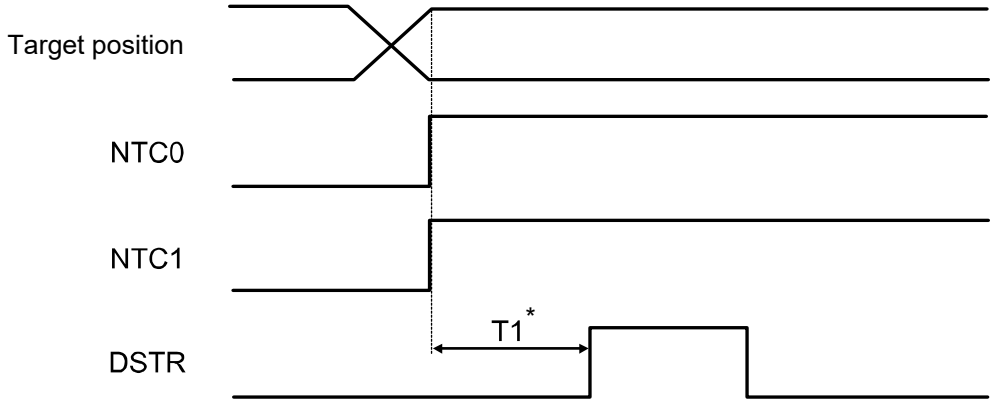
* This signal should behave as a signal of a break contact (*BALM) in Remote I/O Mode thus switching on/off gets reversed to above.

(29) Vibration damping mode selection 0, 1 (NTC0, NTC1) PLC output signals

The vibration damping control function suppresses the load vibration induced by IAI's actuator. Measure the vibration frequency and set it in a parameter. In another parameter, select and set an appropriate option based on a combination of these signals.
Refer to [the Operation Manual for the controller main body] for more information.

NTC1	NTC0	Function	Remarks
OFF	OFF	Do not use vibration damping control.	Factory setting
OFF	ON	Select parameter set 1	
ON	OFF	Select parameter set 2	
ON	ON	Select parameter set 3	

Input timing
An input timing chart of NTC0/NTC1 signals is shown below.



* T1 : Have an enough period of interval considering the scanning time of the host controller.

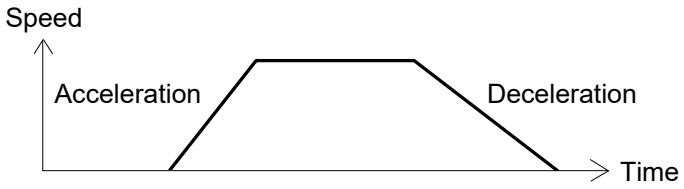
⚠Caution: Since the statuses of NTC0/NTC1 signals are loaded when a movement command (DSTR) is recognized, nothing happens when the NTC0/NTC1 signals are turned ON/OFF while the actuator is moving.

(30) Acceleration/deceleration mode (MOD1, MOD0) PLC output signal

This signal is used to select the acceleration/deceleration pattern characteristics. Select one of them before the actuator movement command.

MOD1	MOD0	Pattern name	Remarks
OFF	OFF	Trapezoid Pattern	Factory setting
OFF	ON	S-shaped Motion	
ON	OFF	First-Order Lag Filter	
ON	ON	Unavailable	

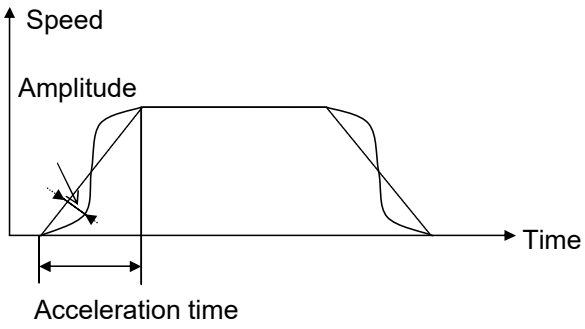
Trapezoid Pattern



* The Acceleration and Deceleration are set in the “Acceleration” and “Deceleration” data boxes on the position data.

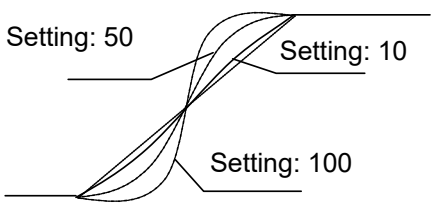
S-shaped Motion

When the value in the “Acceleration/deceleration mode” field in the position table is set to 1 (S-shaped motion), the S-shaped motion degree is defined by parameter No. 56.
The setting unit is % and the setting range is from “0" to “100.”
This is set to 0% (S-shaped motion disabled) in the factory setting.



An S-shaped motion becomes a sine waveform after one cycle of the acceleration time.
Specify the degree of amplitude by parameter No. 56.

Parameter No. 56 setting [%]	Degree of amplitude
0 [Factory setting]	S-shaped motion disabled (Dotted line in the figure below)
100	Sine waveform amplitude x 1 (Chain double-dashed line in the figure below)
50	Sine waveform amplitude x 0.5 (Chain line in the figure below)
10	Sine waveform amplitude x 0.1 (Solid line in the figure below)



⚠ Caution: [1] Even if a position command or direct value command with S-shaped motion setting is issued when the actuator is running, S-shaped motion control will not be executed. Issue these commands when the actuator is stopped.

[2] When the index mode is set on the rotary actuator, S-shaped motion is not executed, and, instead, trapezoid control will be executed.

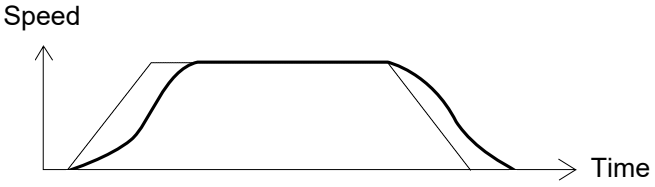
[3] Set the acceleration/deceleration speed so that the time for each will be within two seconds.

[4] An input to pause is not allowed during acceleration or deceleration. It may cause an excessive change in speed.

[5] If a large value is set, the speed will accelerate significantly at around the mid-point of the acceleration/deceleration time. Do not exceed the rated acceleration/deceleration time of the actuator.

First-Order Lag Filter

This describes much gentle acceleration/deceleration curve than that for the linear acceleration/deceleration (trapezoid pattern).
Use it when it is not desired to give any slight vibration to the work part in acceleration/deceleration operation.

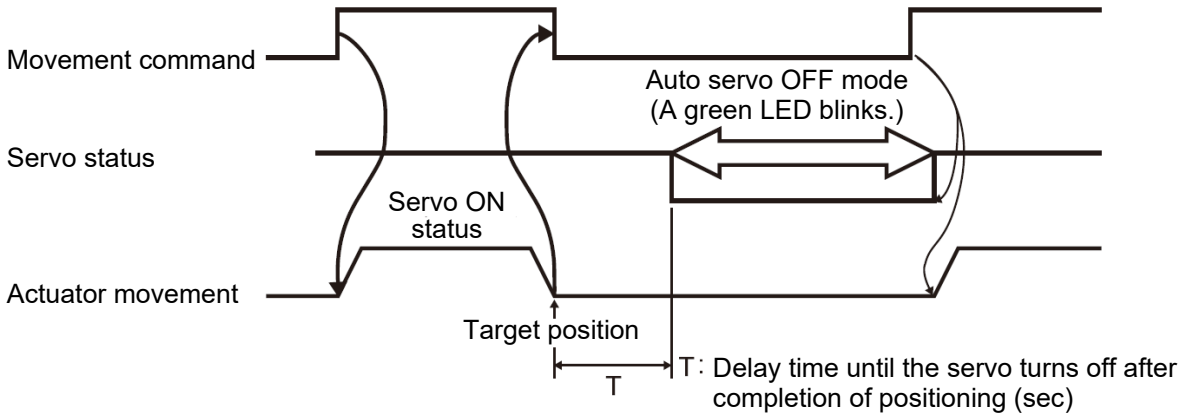


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1ms and setting range is from “0.0” to “100.0”.
When it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

(31) Standstill mode selection (ASO0, ASO1) PLC output signals

Select the stop mode to be applied while the actuator is standing by to move to the next position after completing a positioning.
If the actuator remains standstill for a long time, the servo is turned off automatically to lower the power consumption.
For details, refer to [the operation manual for your controller].

ASO1	ASO0	Function	Remarks
OFF	OFF	Disabled	Factory setting
OFF	ON	Automatic servo OFF method Parameter No. 36 is enabled for T in the figure below.	
ON	OFF	Automatic servo OFF method Parameter No. 37 is enabled for T in the figure below.	
ON	ON	Automatic servo OFF method Parameter No. 38 is enabled for T in the figure below.	

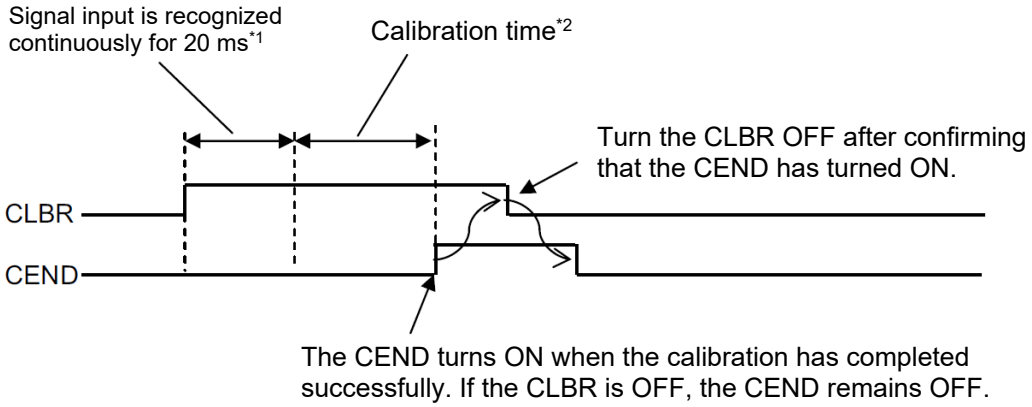


(32) Load cell calibration command (CLBR) PLC output signal
Load cell calibration complete (CEND) PLC input signal

The factory setting for the load cell is 0 N when no load is applied. If you want to use the loaded condition as the reference (0 N), perform the following calibration. Also perform this calibration in other conditions as necessary (such as during readjustment, inspection, etc.).

[1] Stop the operation. (Calibration cannot be performed while any axis is operating, pushing a work part or paused, in which case an attempt to perform calibration will generate a 0E1 (load cell calibration error) alarm.
[2] Turn ON the load cell calibration signal (CLBR) and keep it ON for at least 20 ms.
[3] Once the calibration is complete, the calibration complete signal (CEND) turns ON. Thereafter, turn OFF the CLBR signal.
If the calibration was not successful, a 0E1 (load cell calibration error) alarm generates.

⚠ Caution: Normal operation commands are not accepted while the CLBR signal is ON.



*1 If the CLBR is turned OFF during this period, the signal is not recognized and therefore calibration is not performed.
*2 If the CLBR is turned OFF during this period, an alarm generates.

(33) Servo gain parameter set selection (GSL0, GSL1) PLC output signals

The actuator can be operated by selecting, for each position movement, any one of the following four pre-defined sets of servo gain parameters (six different parameters).
Refer to [the Operation Manual for the controller main body] for more information.

GSL1	GSL0	Function	Remarks
OFF	OFF	Select parameter set 0	Factory setting
OFF	ON	Select parameter set 1	
ON	OFF	Select parameter set 2	
ON	ON	Select parameter set 3	

4.7 I/O Signal Timings

Turn any control signal on in order to operate ROBO Cylinder with a sequence program in PLC, the response (status) signal for that would be returned to the PLC. The maximum respond time should be expressed with the formula below.

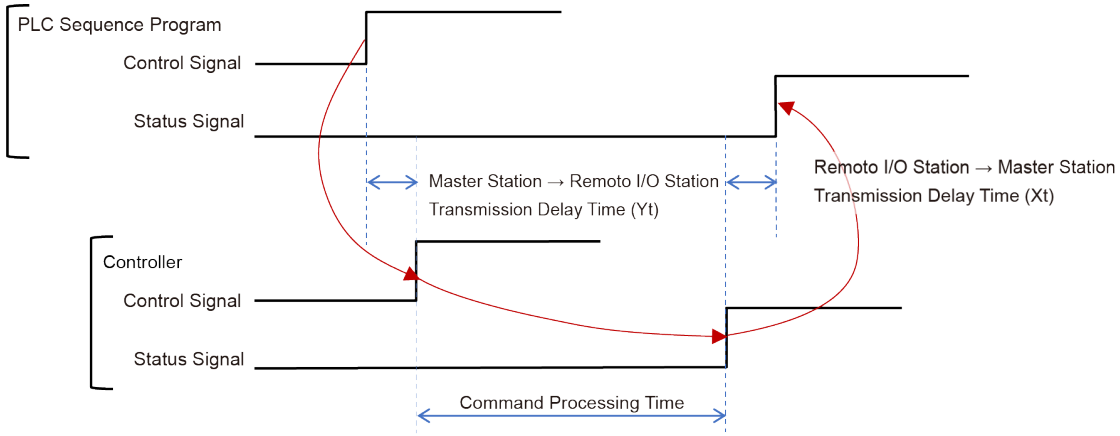
Max. Response Time [ms] = Yt + Xt + 2 + Command Processing Time (Operation Time, etc.)

Yt: Master Station → Remote I/O Station Transmission Delay Time

Xt: Remote I/O Station → Master Station Transmission Delay Time

} Field Network Transmission Delay Time

For the Master Station to Remote I/O Station Transmission Delay Time (Yt) and the Remote I/O Station to Master Station Transmission Delay Time (Xt), refer to [the instruction manuals for the EtherNet/IP Master Unit and mounted PLC].



4.8 Operation

The timings for the basic operation examples in the Position/Simplified Direct Value Mode (Position/Simplified Direct Mode, Position/Simplified Direct Mode 2), Half Direct Value Mode (Half direct value mode, Half direct value mode 2 and Half direct value mode 3) and Full Direct Value Mode (Full direct value mode, Full direct value mode 2), are described.
For the Remote I/O Mode (Remote I/O Mode, Remote I/O Mode 2 and Remote I/O Mode 3), refer to [the Operation Manual for the controller].
(In remote I/O mode 2 and 3, read the current position and command current or current load from the respective byte of the PLC, as deemed appropriate.)

4.8.1 Operation in the Position/Simplified Direct Value Mode

It is operated with the position data written in the PLC's register and the speed, acceleration /deceleration, positioning band and pressing current-limiting value, etc. set using the position table.

[1] Operation Example (General Positioning Operation)

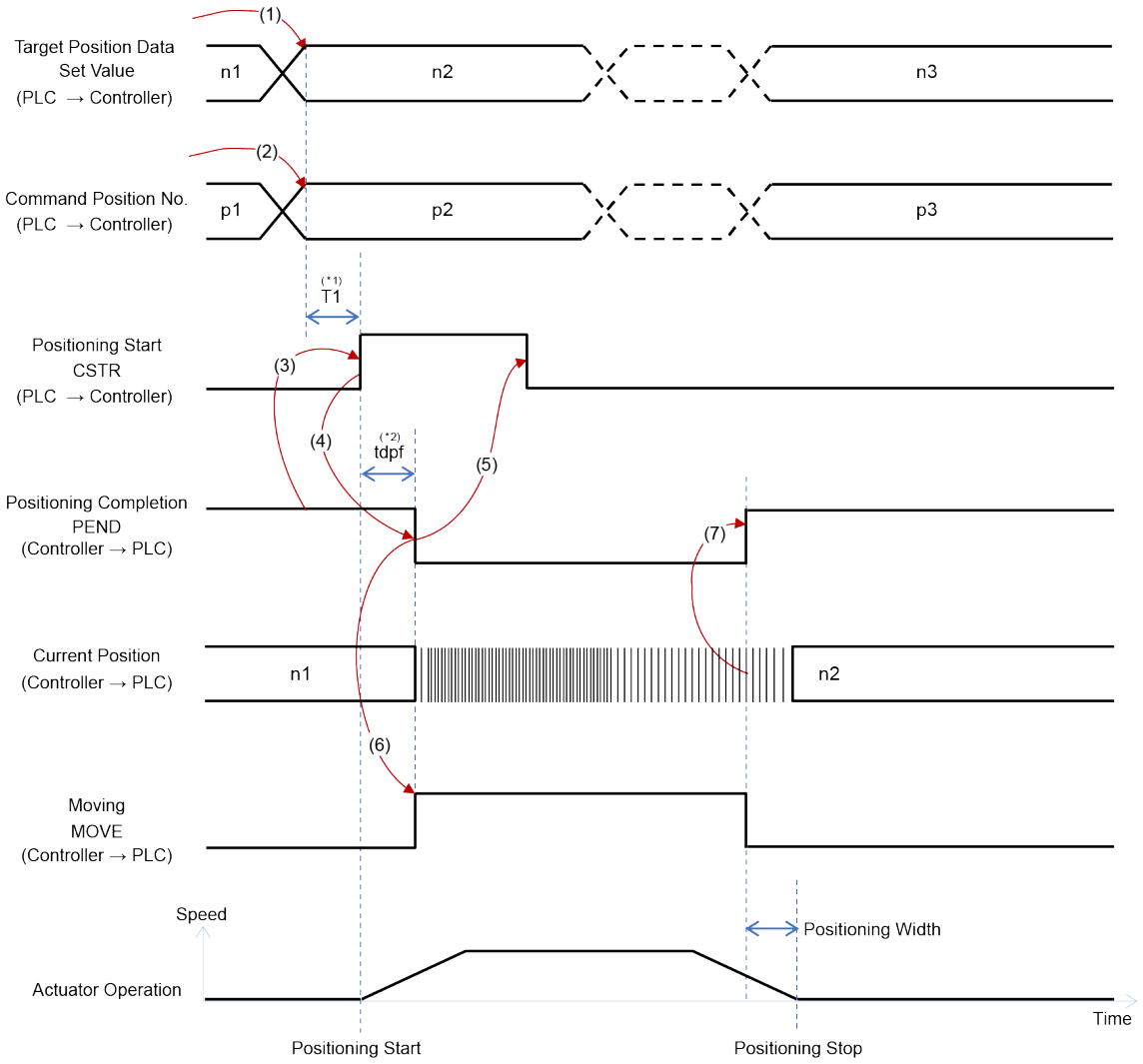
(Preparation) Set the position data items (speed, acceleration/deceleration, positioning width, etc) except for the target position item, in the position table.
Turn ON the Position/Simplified Direct Value Change-Over Signal (PMOD).

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
* The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned “OFF”.
(6) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(7) The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning width set in the position data, and the CSTR signal is turned “OFF”, the PEND signal is turned “ON”. (Note 1)
The complete position number should get output to the complete position number register at the same time.

Note 1 PEND Signal would not turn on while CSTR Signal is on.
When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.
(*) The target position data can be changed during the actuator movement.
In order to change the target position, change the target data and turn ON the CSTR signal after the time longer than the PLC scanning time has passed.
Change the value for the CSTR signal after the time longer than the PLC scanning time has passed.

Operation in the Position/Simplified Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

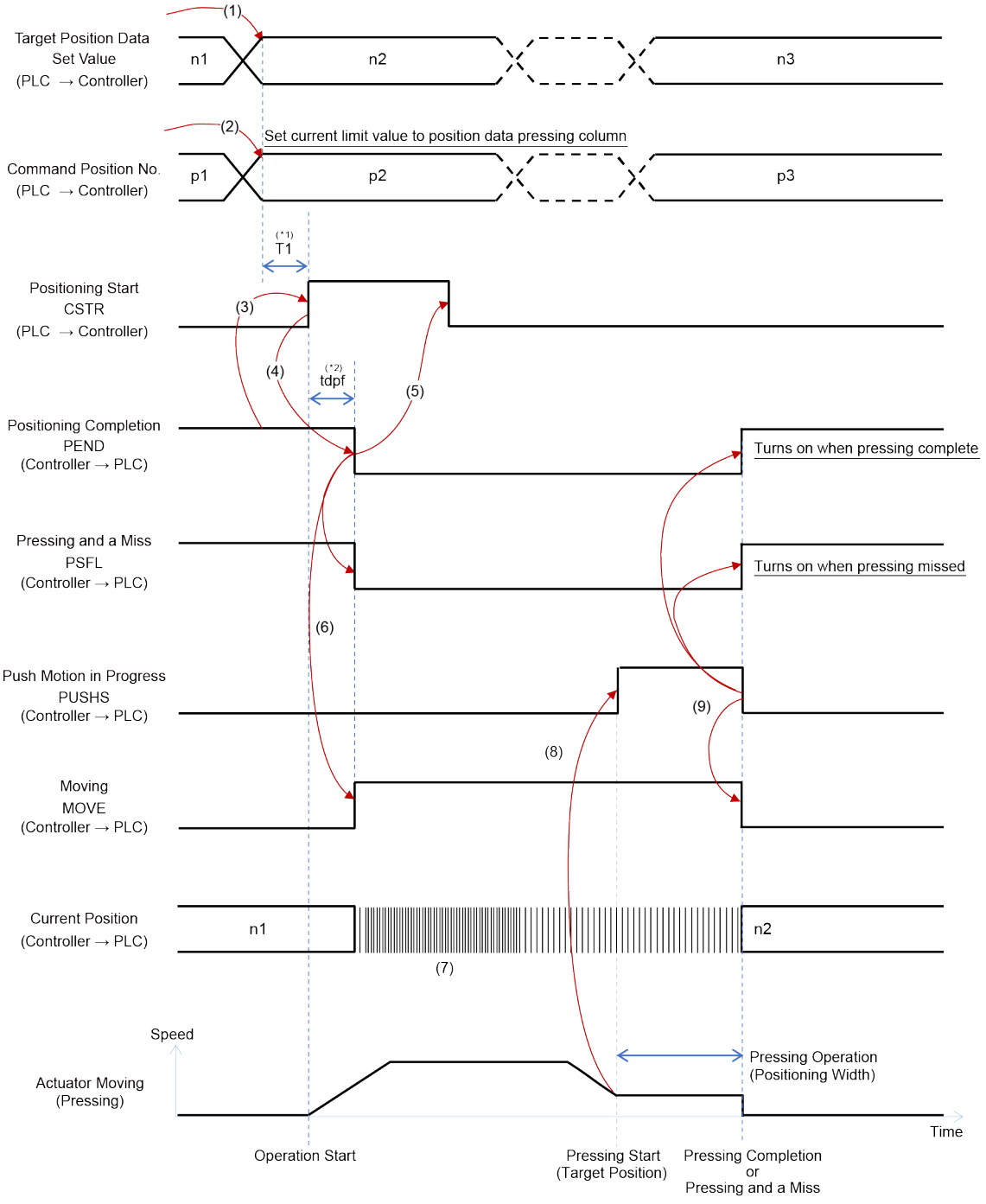
For the pressing operation, the current limit value is set in the pressing data box on the position data at the preparation stage.

When the positioning is performed onto the position No. for which the value is set in the pressing data box, the pressing operation is performed.

(1) Set the target position data in the target position register.
(2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
(3) Turn the positioning start (CSTR) signal on while the positioning complete (PEND) is on.
 * The data items set in Steps (1) and (2) are read in the controller at the startup (ON edge) of the CSTR signal.
(4) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
(5) Confirm that PEND Signal is turned off, and then turn CSTR Signal off. Do not change the value in the target position register until the CSRT signal is turned “OFF”.
(6) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
 * Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(7) The current position data is continuously updated.
(8) Once it reaches the target position, PUSHS Signal turns on as well as the pressing operation starts.
(9) Once the pressing operation completes, PUSHS Signal and MOVE Signal should turn off.
 If the pressing operation completes in the normal condition, PEND Signal should turn on when CSTR signal is off and the complete position number should get output to the complete position number register.
 When the pressing operation is missed, PSFL Signal should turn on, and the complete position number should get output the complete position number register.
 (Note) PEND Signal would not turn on while CSTR Signal is on.
 When it is necessary to read the complete position number register at the timing of positioning complete, check it after an appropriate period of time (remaining moving distance time) has been passed after PEND Signal has turned on.

(*) The current position data might be changed slightly even when the system is stopped.

Operation in the Position/Simplified Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

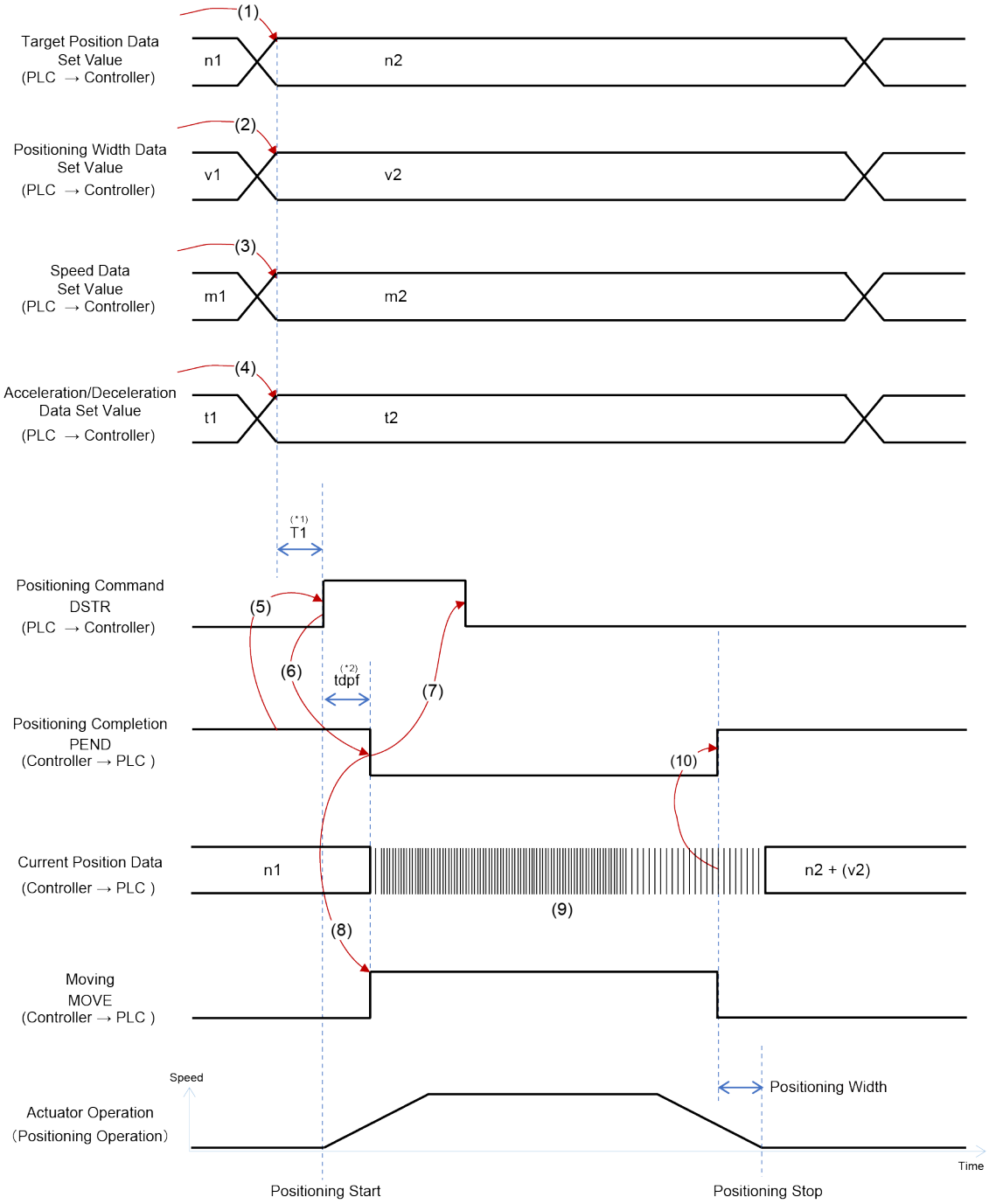
4.8.2 Operation in the Falf Direct Value Mode

It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current-limiting setup register.

[1] Operation Example (General Positioning Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (4) are read in the controller at the startup (ON edge) of the DSTR signal.
(6) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(7) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(8) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(9) The current position data is continuously updated.
(10) PEND Signal should turn on when remaining movement amount gets into the range of the positioning band set in the position data while DSTR Signal is off.

Operation in the Half Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

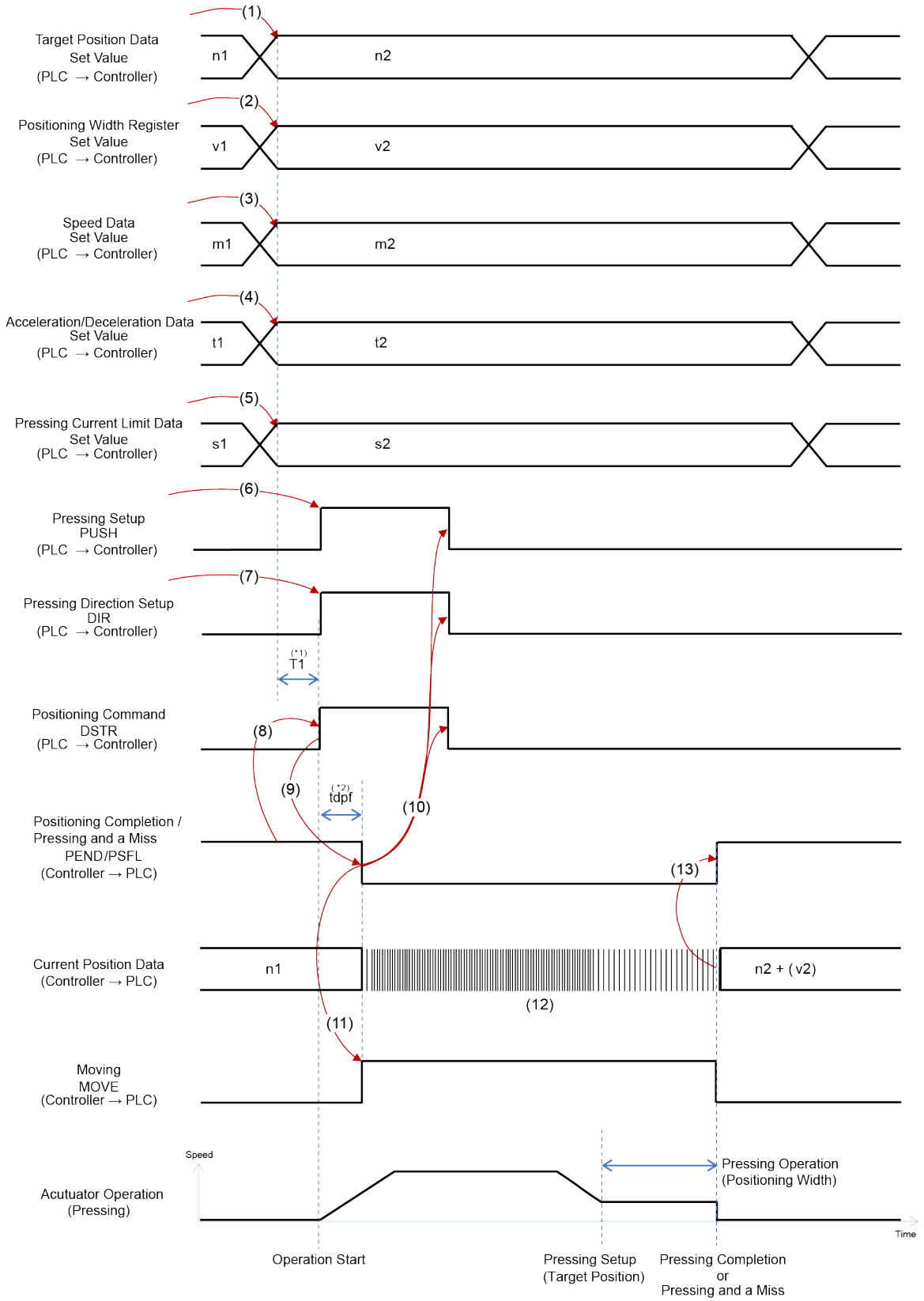
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the acceleration/deceleration data in the acceleration/deceleration register.
(5) Set the pressing current limit data in the pressing current limit value register.
(6) Turn “ON” the pressing setup (PUSH) signal.
(7) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [4.6.11 (22)]
(8) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (7) are read in the controller at the startup (ON edge) of the DSTR signal.
(9) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(10) Confirm that PEND Signal is turned off, and then turn off DSTR Signal, PUSH Signal and DIR Signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(11) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(12) The current position data is continuously updated.
(13) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (5), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (5), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON” In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Half Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

4.8.3 Operation in the Full Direct Value Mode

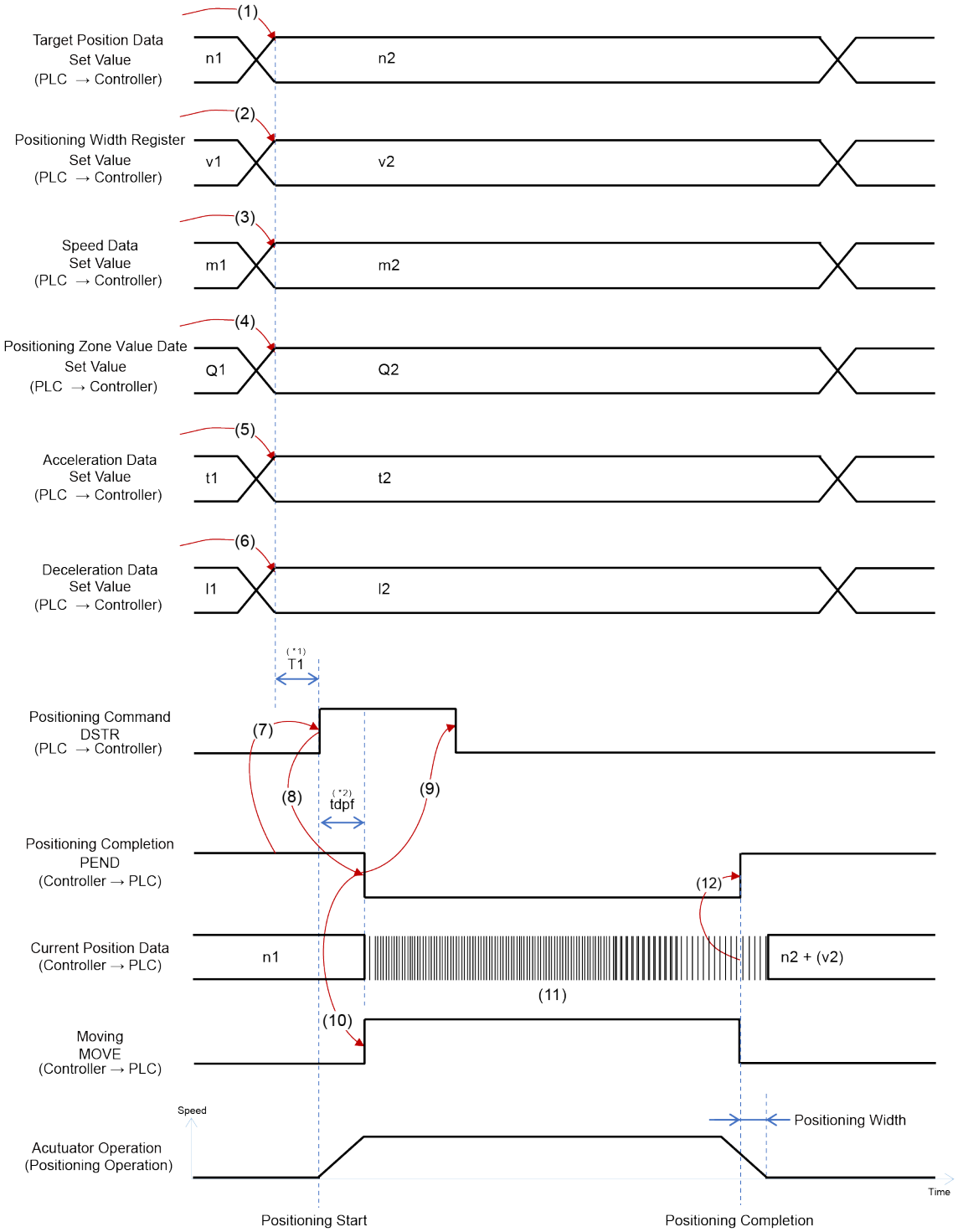
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

[1] Operation Example (General Positioning Operation)

When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register and zone value - register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (6) are read in the controller at the startup (ON edge) of the DSTR signal.
(8) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(9) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(10) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* However, note that MOVE Signal would not turn on if positioning is made at the same position as the stop (complete) position.
(11) The current position data is continuously updated.
(12) When the remaining travel distance becomes within the range of the positioning width set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.

Operation in the Full Direct Value Mode (General Positioning Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

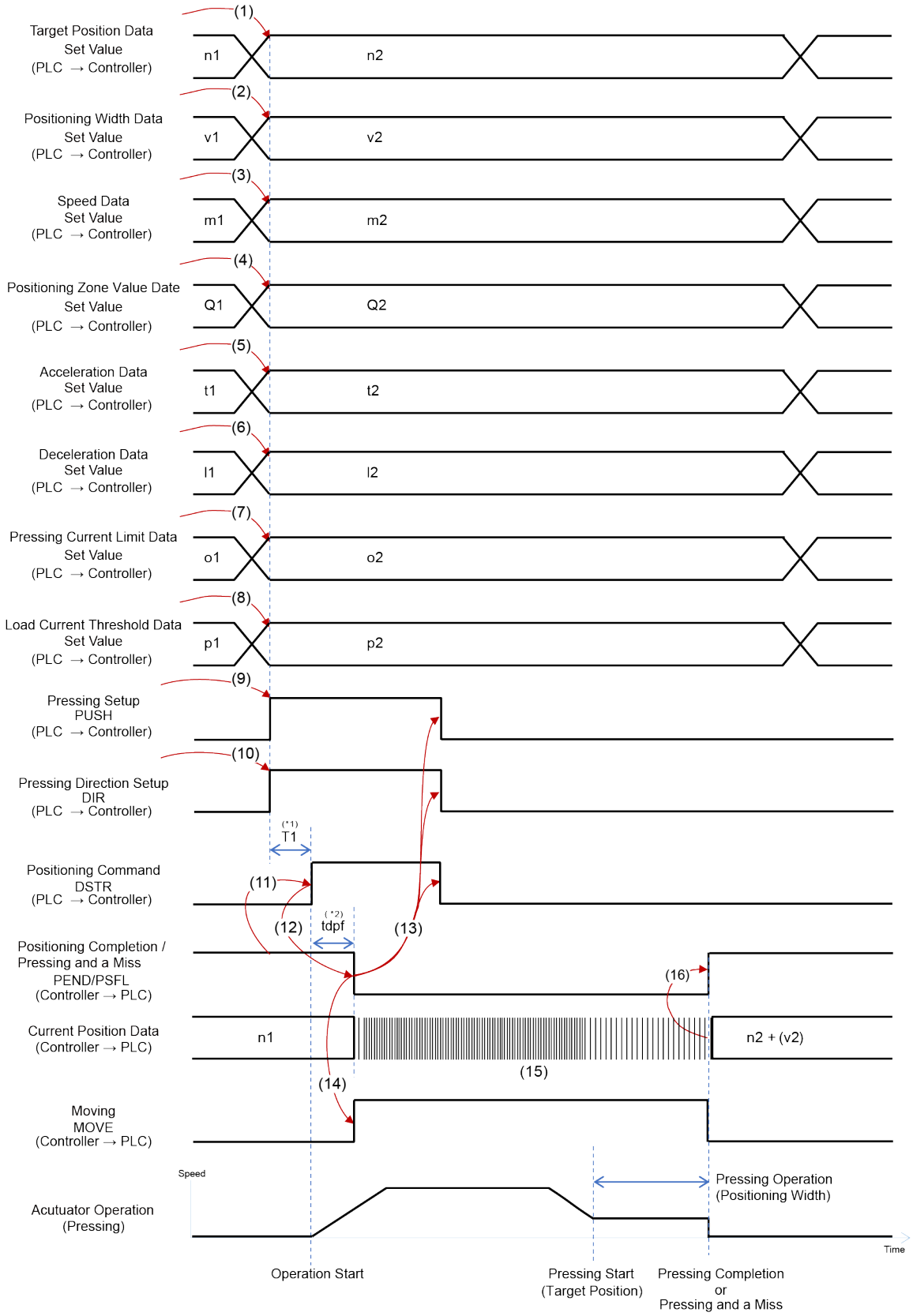
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

[2] Operation Example (Pressing Operation)

(1) Set the target position data in the target position register.
(2) Set the positioning width data in the positioning width register.
(3) Set the speed data in the speed register.
(4) Set the position zone output value data in the zone value + register or zone value -register.
(5) Set the acceleration data in the acceleration register.
(6) Set the deceleration data in the deceleration register.
(7) Set the pressing current limit data in the pressing current limit value register.
(8) Set the load current threshold data in the load current threshold setup register.
(9) Turn “ON” the pressing setup (PUSH) signal.
(10) Specify the pressing direction using the pressing direction setup (DIR) signal. Refer to [4.6.11 (22)]
(11) Turn the positioning command (DSTR) signal on while the positioning complete (PEND) signal is on.
* The data items set in Steps (1) through (10) are read in the controller at the startup (ON edge) of the DSTR signal.
(12) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(13) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
* Do not change any value in each data until the DSTR signal has been turned “OFF”.
(14) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
* Conduct the pressing command to the position same as the position that an actuator is stopped at this time, and a pressing operation from the stopped position should start.
(15) The current position data is continuously updated.
(16) When the DSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step (7), the PEND signal is turned “ON”. (Pressing Completion)

Even when the positioning width set in Step (2) is reached, in the case that the current does not reach the motor current limit value set in Step (7), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON” In this case, the PEND signal is not turned “ON”. (Pressing and a Miss)

Operation in the Full Direct Value Mode (Pressing Operation)



*1 T1 : Have an enough period of interval considering the scanning time of the host controller.

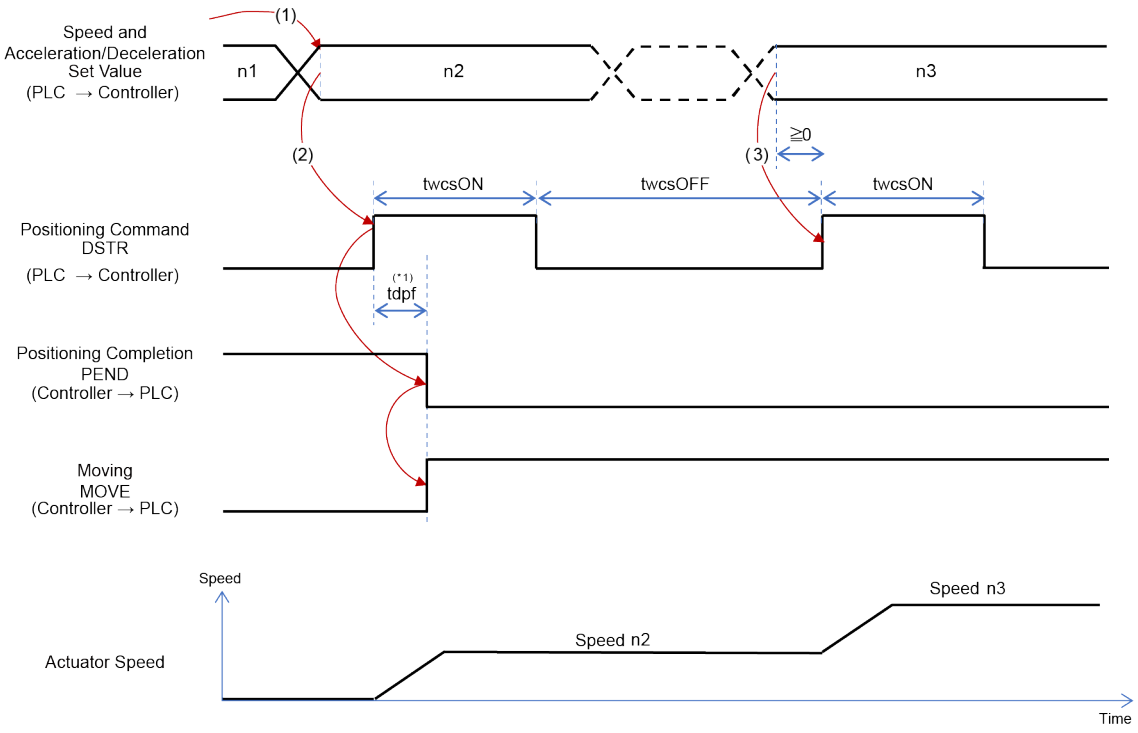
*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

4.8.4 Data Change During Movement

The half direct mode and full direct mode are capable of changing the settings for the output data registers (target position data, acceleration/deceleration data, velocity data, positioning band and current limit during pressing) during operation.

Shown in the figure below is an example of changing the velocity and acceleration/deceleration.

(1) Set the velocity data and acceleration/deceleration data.
(2) After a change is made to the data, set the positioning command (DSTR) on for more than tdpf.
(3) Leave time for more than twcsON + twcsOFF before turning the next DSTR on after setting DSTR off.



twcsON ≥ Yt+Xt+3 (ms)
twcsOFF ≥ Yt+Xt+3 (ms)
*Yt+Xt ≤ tdpf ≤ Yt+Xt+3 (ms)

⚠ Caution :
1. When the speed has not been set or it is set to “0”, the actuator is not moved, but an alarm is not issued.
2. When the speed setting is changed to “0” during the movement, the actuator is decelerated and stopped, but an alarm is not issued.
3. Even when the acceleration/deceleration data only is changed during the movement, the setting of the target position data is required.
4. Even when the target position data only is changed during the movement, the setting of the acceleration/deceleration data is required.

4.9 EtherNet/IP Related Parameters

Parameters relating to EtherNet/IP are No. 84 to No. 87, No. 90, No. 140 to No. 142 and No.159.

Category: C: External interface parameter

No.	Category	Name	Default value set in the factory before delivery
1 to 83		Refer to [operation manual for the controller] for the parameters No. 1 through No. 83.	
84	C	Field bus operation mode	0
86	C	Field bus baud rate	0
87	C	Network type	7
90	C	Field I/O format	3
140	C	IP address	192.168.0.1
141	C	Subnet mask	255.255.255.0
142	C	Default gateway	0.0.0.0
159	C	FB Half Direct Mode Speed Unit	0

● Field bus operation mode (No.84)
Specify the operation mode in parameter No. 84 using a value between 0 and 8.

Value set in parameter No. 84	Mode	Number of occupied bytes	Contents
0 (Factory setting)	Remote I/O mode	2	Operation using PIOs (24 V I/Os) is performed via EtherNet/IP.
1	Position/simple direct mode	8	The target position can be set directly using the value or the operation can be performed using position data value. The other values required for the operation are set on the position data.
2	Half direct value mode	16	In addition to the target position, the speed, acceleration/deceleration and pressing current value are set directly using the values to perform the operation.
3	Full direct value mode	32	All the values related to the position control are set using the values to perform the operation.
4	Remote I/O mode 2	12	The current position and current speed reading functions are added to the functions in the remote I/O mode.
5	Position/simple direct mode 2	8	Set this value to implement force control in the position/simple direct numerical mode.
6	Half direct mode 2	16	Set this value to implement force control in the half direct numerical mode.
7	Remote I/O mode 3	12	Set this value to implement force control in the remote I/O mode.
8	Half direct mode 3	16	Set this value to switch servo gains or vibration damping control parameters in the half direct numerical mode.
9	Full direct value mode 2	32	All the values related to the position control are set using the values to perform the operation. Also, the overload level monitoring and current indication value monitoring are available.

(Note) SCON-CAL is not applicable for the operation modes 5 to 7.
(Note) Full direct value mode 2 can be used only in SCON-CB/CGB. (Applicable Versions : V0022 or later)

● Fieldbus baud rate (No. 86)
Specify the baud rate in parameter No. 86.

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

● Network type (No.87)
The network module type is set for the parameter No. 87. Do not change the default value.

● Field I/O format (No.90)
By changing the setting of parameter No. 90, data elements can be swapped within a boundary of two words or less in units of bytes during communication using the I/O areas of the PLC.

Value set in parameter No. 90	Contents
0	Data exchange is not performed. The data is sent directly to the PLC. Refer to [the Example i].
1	The host bytes are exchanged with slave bytes in the host words and slave words. Refer to [the Example ii].
2	In the case of word register, the host words are exchanged with the slave words. Refer to [the Example iii].
3 (Factory setting)	The host bytes are exchanged with slave bytes in the host words and slave words. In addition, the upper word and lower word are swapped for word resisters. Refer to [the Example iv].

(Example i) Set value = “0”

● indicates ON, while ○ indicates OFF

SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇧

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇩

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example ii) Set value = “1”

● indicates ON, while ○ indicates OFF

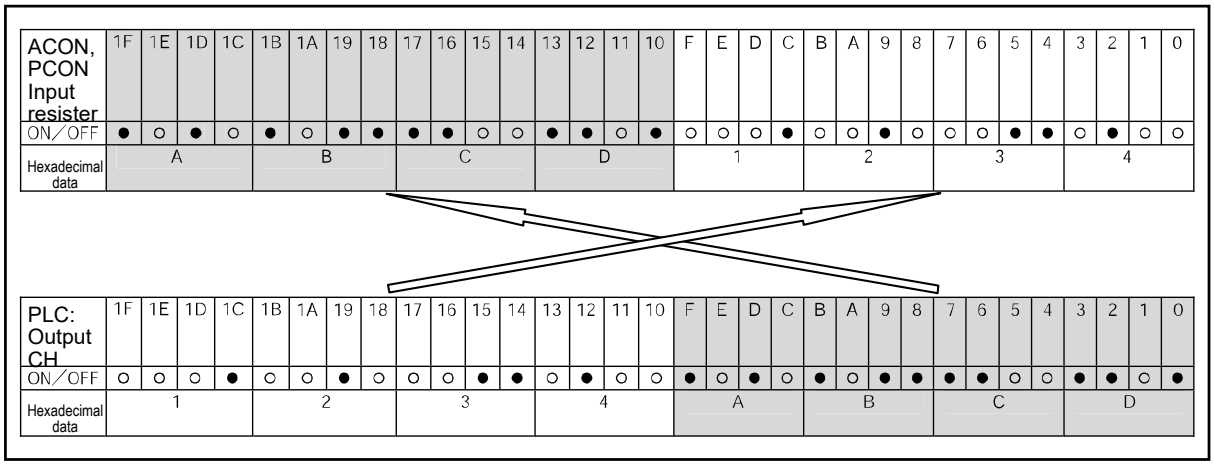
SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

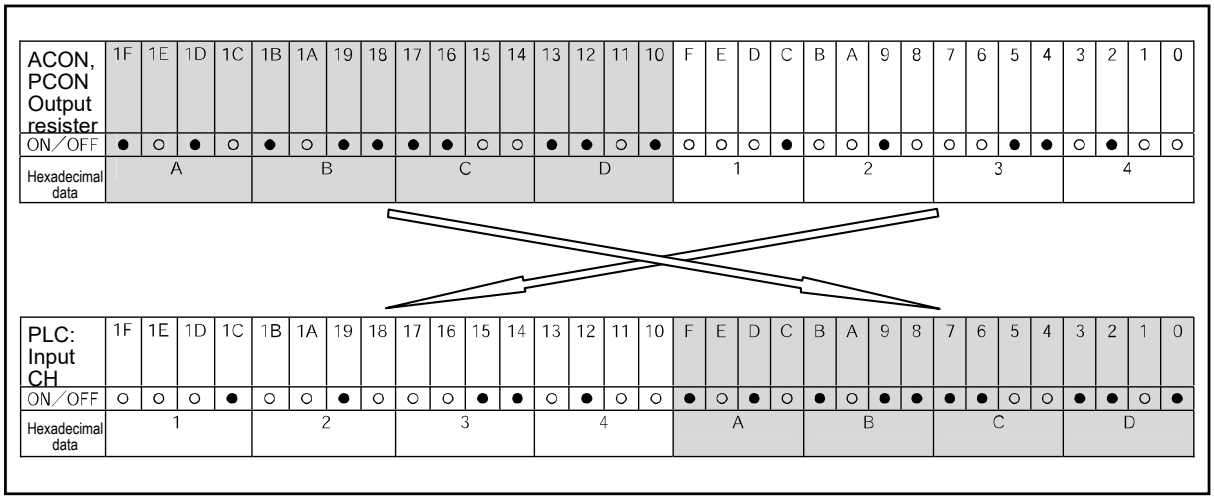
PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example iii) Set value = “2”　　● indicates ON, while ○ indicates OFF





(Example iv) Set value = “3”

● indicates ON, while ○ indicates OFF

SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

- IP address (No. 140)
  Specify the IP address in parameter No. 140.

  Setting range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.1)

- Subnet mask (No. 141)
  Specify the subnet mask in parameter No. 141.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 255.255.255.0)

- Default gateway (No. 142)
  Specify the default gateway in parameter No. 142.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.0)

- FB Half Direct Mode Speed Unit (No.159)
  Determines the unit of measure when operating the unit in Half Direct Mode.

Parameter No.159 setting value	Speed setting unit
0 (Set in delivery)	1.0 mm/s
1	0.1 mm/s

4.10 Troubleshooting

- Alarm messages and causes/actions

When an alarm occurs, a corresponding simple alarm code is indicated by the completed position number bits (four bits of PM1 to PM8) in remote I/O mode 1 to 3.
In position/simple direct mode 1 and 2, this simple alarm code is output to the (n+4, n+5) bytes.
In half direct mode 1 to 3, full direct mode 1 and 2, this alarm code is output to the (n+12, n+13) bytes.

[1] Check the alarm code using the monitor function of the PLC, etc., or connect the teaching tool and check the status monitor screen.
[2] Search the alarm list in the operation manual for your controller to find the section corresponding to the identified alarm code.
[3] Take an appropriate action according to the explanation of the alarm code.
For the alarm codes listed below, take the corresponding actions:

Code	Error name	ID (*1)	Alarm reset	Cause/action
0F2	Fieldbus module error	05	Cannot	Cause: A fieldbus module error has been detected. Action: Check the applicable parameters.
0F3	Fieldbus module non-detection error	04	Cannot	Cause: The module could not be detected. Action: Reconnect the power. If the problem persists, please contact IAI.

(*1) ID → Simple alarm code

5. Servo Press Type SCON-CB/CGB

(Note) As CB and CGB Types possess the same functions, this manual describes them together as CB Type.

5.1 Operation Modes and Functions

SCON-CB Servo-press Type applicable to EtherNet/IP can be operated by means of selecting one mode out of the following three operation modes.

Operation modes and key functions ○ : Direct Control, × : Invalid

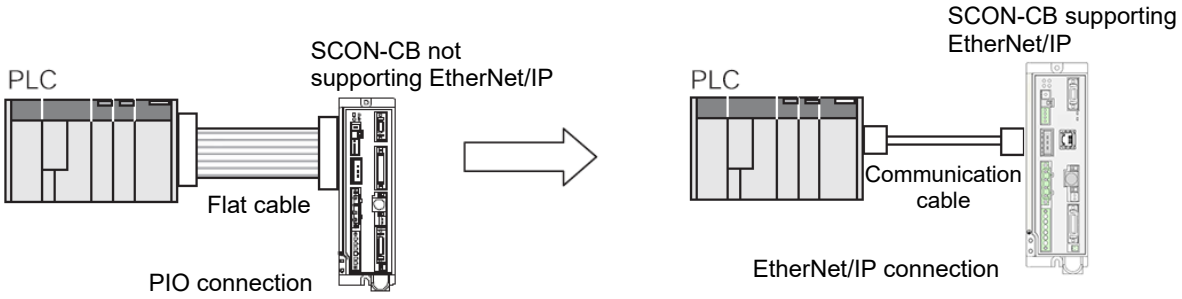
Key function	Remote I/O mode	Full function mode	Pressing Direct Mode
Number of occupied bytes	2	32	32
Operation by position data specification	×	○	○
Direct speed/acceleration specification	×	○	○
Pressurizing load direct indication	×	×	○
Current position reading	×	○	○
Current speed reading	×	○	○
Program number command operation	○	○	×
Judgement result reading	○	○	○
Current load data reading	×	○	○
Overload level monitor	×	○	○
Servo gain switching	○(*1)	○(*1)	○

(*1) One servo gain can be registered to one press program.

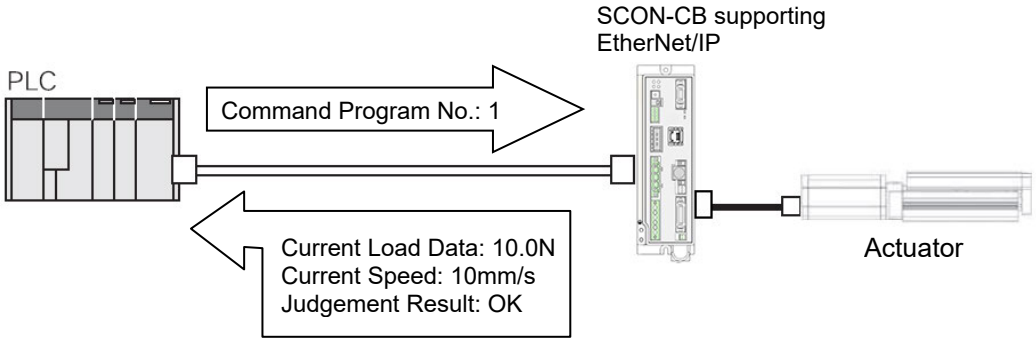
Pressing Direct Mode Applicable Firmware Versions

Device	Product Name / Model Code	Applicable Version
Controller	SCON-CB-F	V0007 or later
Teaching Tool	IA-OS	V2.00.00.00
	RC/EC PC software (RCM-101)	V12.00.01.00 or later
	TB-02	V1.50 or later
	TB-03	V1.80 or later (Applicable from first lot of delivery)

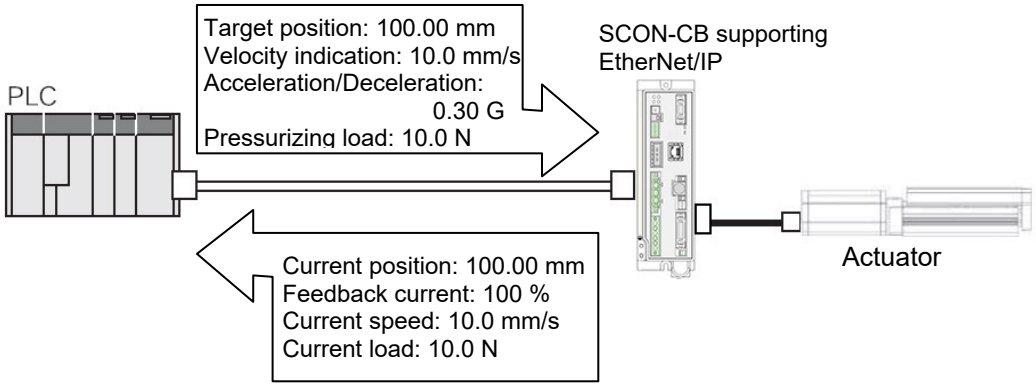
[1] Remote I/O mode: In this mode, the actuator is operated by PIOs (24 V I/Os) via EtherNet/IP communication.
Number of occupied bytes: 2 bytes



[2] Full function mode: It is the system to support all the features such as movement by direct indication or current load reading in addition to those for servo press such as startup of press program or judgment result reading.
Number of occupied bytes: 32 bytes



[3] Pressing Direct Mode: It is an operation mode to indicate the "pressurizing stage" in a pressing program directly in numbers. The pressing direct operation and positioning direct operation are available.
Number of occupied bytes: 32 bytes

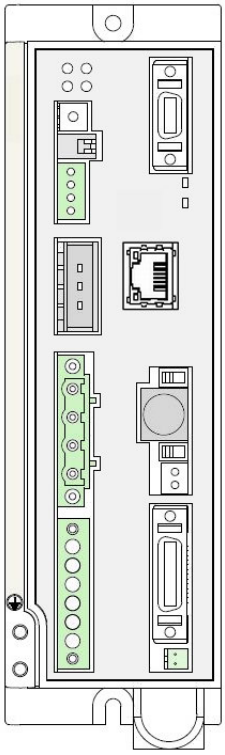


5.2 Model Numbers

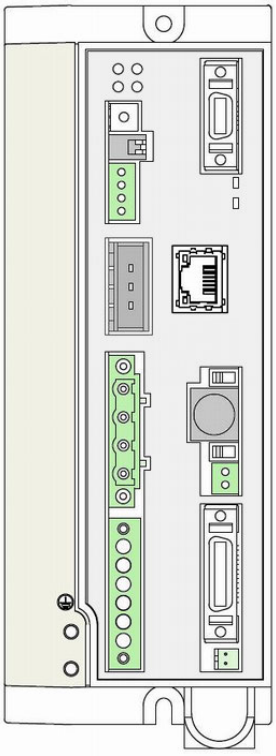
The model numbers of SCON-CB controller supporting EtherNet/IP are indicated as follows, respectively:

●SCON-CB-☐F-EP-☐

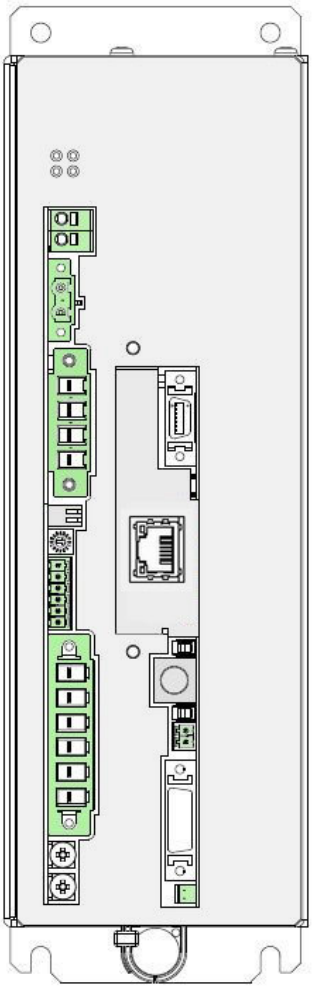
For 12 to 300W motor



For 400 to 750W motor



For 3000 to 3300W motor

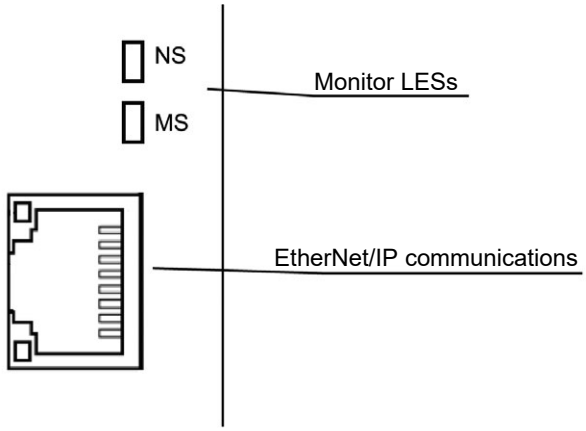


5.3 EtherNet/IP Interface

5.3.1 Name of the Parts

The names of each section related to EtherNet/IP are described as follows.

● SCON-CB



5.3.2 Monitor LED Indications

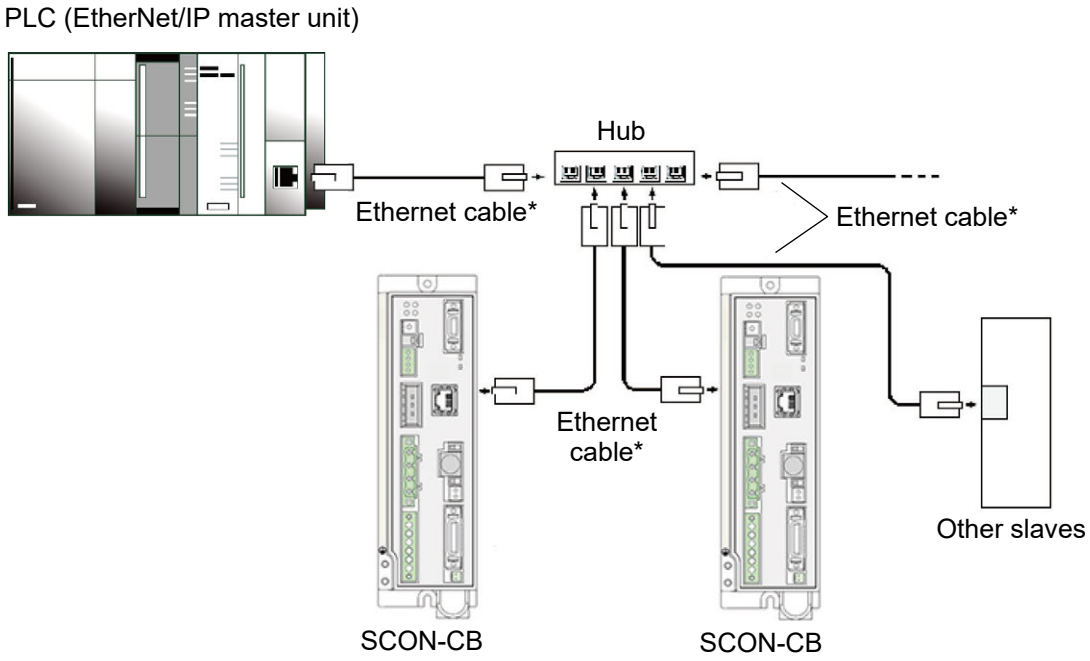
The slave condition (each controller), as well as network condition, can be checked using the two LEDs, MS and NS, provided on the front panel of the controller.
The description of each is explained in the following table.

○ : Illuminating, ☆ : Flashing, × : OFF

Name	Color	Display	Explanation	
NS	-	×	The power is turned off or IP address is not yet set.	
	Green	○	Connection has been established and proper communication is in progress.	
	Green	☆	The system is online but connection is not yet established. Communication is stopped (the network is normal). Check the status of the master unit.	
	Red	○	A communication error is present. Communication cannot be established because an error, such as duplicate IP addresses, has been detected.	Check the IP address setting, wiring condition of the communication line, power supply for the hub, noise measures, etc.
	Red	☆	A communication error is present. (A communication timeout has been detected.)	
MS	-	×	The power is turned off.	
	Green	○	Operation is normal. The system is in the scanner (master) control mode.	
	Green	☆	Connection is not yet established with the scanner (master). Check the setting of configuration information. Check if the scanner (master) is idle.	
	Red	○	A hardware error is present. The board must be replaced. Please contact IAI.	
	Red	☆	A configuration error, invalid setting or other minor error is present. The problem can be resolved by, for example, setting the problem item or items again.	

5.4 Wiring

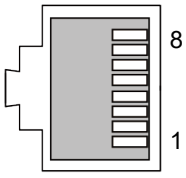
5.4.1 Wiring (Example)



* Ethernet cable: Straight cable of category 5 or above, 100m max
(Aluminum tape and braided double-shielded cable are recommended.)

(Note) Terminal processing is not required.

5.4.2 Connector Pin Layout



RJ45 8-pin
modular connector
(Controller side)

Pin number	Signal name	Signal abbreviation
1	Data transmitted +	TD+
2	Data transmitted -	TD-
3	Data received +	RD+
4	Not used	
5	Not used	
6	Data received -	RD-
7	Not used	
8	Not used	
Connector hood	Grounding pin for security	FG

5.5 Setting

Using a teaching tool, set controller parameters.
Set the mode toggle switch on the front panel of the controller to “MANU” side.
Refer to [the instruction manual for each teaching tool] for the applicable version of the teaching tool that can be applied to EtherNet/IP.

5.5.1 Operation Mode Selecting

Set parameter No. 84 “Field bus operation mode.”
Refer to [5.9 EtherNet/IP Related Parameters].

Set value	Operation mode	Number of occupied bytes
0 (Factory setting)	Remote I/O mode	2
1	Full function mode	32
2	Pressing Direct Mode	32

* Entering any value except for the ones described above will cause an “Excessive Input Value Error”.

5.5.2 Setting the Baud Rate

Set parameter No. 86 “Fieldbus baud rate.”

Set value	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

5.5.3 Setting the IP Address

Set parameter No. 140 “IP address.”
Refer to [5.9 EtherNet/IP Related Parameters].

Settable Range: 0.0.0.0 to 255.255.255.255 (It is set to “192.168.0.1” when the machine is delivered from the factory.)

(Note 1) Exercise caution to avoid IP address duplication.
For details, refer to [the operation manuals of the master unit and PLC in which in the mastenr unit] is installed.

5.5.4 Setting the Subnet Mask

Set parameter No. 141 “Subnet mask.”
Set the same value you have set in the master unit and other slaves (on the same network).
Refer to [5.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 255.255.255.0.)

5.5.5 Setting the Default Gateway

If necessary, set parameter No. 142 “Default gateway.”
Refer to [5.9 EtherNet/IP Related Parameters].

Settable range: 0.0.0.0 to 255.255.255.255 (The factory setting is 192.168.0.0.)

(Note) After the parameter setting, turn on the power to the controller again and return the mode toggle switch on the front of the controller to “AUTO” side.
When the switch is set to “MANU”, the operation using PLC is not available.

5.6 Communicating with the Master Station

5.6.1 Operation Modes and Corresponding PLC I/O Areas

The channels allocated for each operation mode are described as follows.

• PLC output → SCON-CB input (* "n" indicates the first address of each axis.)

PLC output area (bytes)	DI on the SCON-CB side and input data register		
	Remote I/O mode	Full function mode	Pressing Direct Mode
	Number of occupied bytes: 2	Number of occupied bytes: 32	Number of occupied bytes: 32
n+0, n+1	Port No. 0 to 15	Target position	Target position
n+2, n+3			
n+4, n+5		Positoning band	Speed
n+6, n+7			
n+8, n+9		Speed	Acceleration
n+10, n+11			Deceleration
n+12, n+13		Occupied area	Pressurizing Load
n+14, n+15			Occupied area
n+16, n+17			Position Zone Boundary +
n+18, n+19			
n+20, n+21		Acceleration	Position Zone Boundary -
n+22, n+23		Deceleration	
n+24, n+25		Occupied area	Load Zone Boundary +
n+26, n+27		Command program No.	Load Zone Boundary -
n+28, n+29		Control signal 1	Control signal 1
n+30, n+31		Control signal 2	Control signal 2

• SCON-CB output → PLC input (* "n" indicates the first address of each axis.)

PLC output area (bytes)	DO on the SCON-CB side and output data register		
	Remote I/O mode	Full function mode	Pressing Direct Mode
	Number of occupied bytes: 2	Number of occupied bytes: 32	Number of occupied bytes: 32
n+0, n+1	Port No. 0 to 15	Current position	Current position
n+2, n+3			
n+4, n+5		Feedback current	Feedback current
n+6, n+7			
n+8, n+9		Current speed	Current speed
n+10, n+11			
n+12, n+13		Current load	Current load
n+14, n+15			
n+16, n+17		Occupied area	Occupied area
n+18, n+19			
n+20, n+21		Program alarm code	
n+22, n+23		Alarm code	
n+24, n+25		Overload level monitor	Overload level monitor
n+26, n+27		Execution program No.	Alarm code
n+28, n+29		Status signal 1	Status signal 1
n+30, n+31		Status signal 2	Status signal 2

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

5.6.2 Remote I/O Mode (Number of Occupied Bytes: 2)

This is the operation mode with the fieldbus communication indicate each I/O signal is ON/OFF instead of PIO (Actuial 24V I/O).
Create a press program on the using a teaching tools.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

Operation modes and key functions

Key function	○: Directly controls, ×: Invalid
Operation by position data specification	×
Direct speed/acceleration specification	×
Pressurizing load direct indication	×
Current position reading	×
Current speed reading	×
Program number command operation	○
Judgement result reading	○
Current load data reading	×
Overload level monitor	×
Servo gain switching	○ (*1)

(*1) One servo gain can be registered to one press program.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No. 84	SCON-CB side DI (Port No.)	PLC side output address (bytes)	SCON-CB side DO (Port No.)	PLC side input address (bytes)
0	0 to 15	n+0, n+1	0 to 15	n+0, n+1

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input (1 word=2 bytes) and one output word (channel) in the I/O areas.

- Each address is controlled by ON/OFF bit signals.

PLC output

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bit

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller input port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bit

n+0, n+1	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

(3) I/O signal assignment Refer to [Instruction manual for the controller main body] for more information.

Category	Port No.	Symbol	Signal name
PLC output → SCON-CB input	0	PC1	Command program No.
	1	PC2	
	2	PC4	
	3	PC8	
	4	PC16	
	5	PC32	
	6	PSTR	Program start
	7	PHOM	Program home movement
	8	ENMV	Axis movement permission
	9	FPST	Program compulsory stop
	10	CLBR	Loadcell calibration command
	11	BKRL	Forced brake release
	12	RMOD	Operation mode switching
	13	HOME	Home-return
	14	RES	Reset
	15	SON	Servo ON command

Category	Port No.	Symbol	Signal name
SCON-CB output →PLC input	0	PCMP	Program finished in normal condition
	1	PRUN	Program execution
	2	PORG	Program home position
	3	APRC	While in aproaching operation
	4	SERC	While in probing operation
	5	PRSS	While in pressurizing operation
	6	PSTP	While in pressurizing stop
	7	MPHM	While in program home movement
	8	JDOK	Judgement OK
	9	JDNG	Judgement NG
	10	CEND	Loadcell calibration completion
	11	RMDS	Operation mode status
	12	HEND	Home-return completion
	13	SV	Servo ON status
	14	* ALM	Alarm
	15	* ALML	Light failure alarm

The symbol with a * mark shows the ON signal in normal condition.

5.6.3 Full Function Mode (Number of Occupied Bytes: 32)

It is the mode operation system to conduct all the servo press features in fieldbus communication. Set each value in the input and output areas.
The robot cylinder's effective main functions that can be controlled using this mode, are as shown in the following table.

Operation modes and key functions

Key function	○: Directly controls, ×: Invalid
Operation by position data specification	○
Direct speed/acceleration specification	○
Pressurizing load direct indication	×
Current position reading	○
Current speed reading	○
Program number command operation	○
Judgement result reading	○
Current load reading	○
Overload level monitor	○
Servo gain switching	○(*1)

(*1) One servo gain can be registered to one press program.

(1) PLC address configuration (* “n” indicates the first address of each axis.)

Parameter No. 84	SCON-CB side input side resister	PLC side output address (bytes)	SCON-CB side output side resister	PLC side input address (bytes)
1	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Positioning band	n+4, n+5	Feedback current	n+4, n+5
		n+6, n+7		n+6, n+7
	Speed	n+8, n+9	Current speed	n+8, n+9
		n+10, n+11		n+10, n+11
	Occupied area	n+12, n+13	Current load	n+12, n+13
		n+14, n+15		n+14, n+15
	Occupied area	n+16, n+17	Occupied area	n+16, n+17
		n+18, n+19		n+18, n+19
	Acceleration	n+20, n+21	Program alarm code	n+20, n+21
	Deceleration	n+22, n+23	Alarm code	n+22, n+23
	Occupied area	n+24, n+25	Overload level monitor	n+24, n+25
	Command program No.	n+26, n+27	Execution program No.	n+26, n+27
	Status signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Status signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) The Occupied area shows the area to be occupied with the operation mode setting. Therefore, this area cannot be used for any other purpose. Also, exercise caution to avoid address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of sixteen input words (16-words = 32 bytes) and four output words in the I/O areas.

- The control signals 1,2 and status signals 1,2 are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.001 mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The positioning band are expressed using 2-word (32 bits) binary data. The figures from 1 to +9999999 (Unit: 0.001 mm/s) can be set in PLC.
- The speed are expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01 mm/s) can be set in PLC. However, Set a value that does not exceed the max. speed of the applicable actuator.
- The acceleration/deceleration using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01 G) can be set in PLC. However, Set a value that does not exceed the max. acceleration/deceleration of the applicable actuator.
- The command program No. using 1-word (16 bits) binary data. The figures from 0 to 63 can be set in PLC.
- The feedback current using 2-word (32 bits) binary data (Unit: 0.1%).
- The current speed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The alarm code, program alarm code using 1-word (16 bits) binary data.
- The current load data using 2-word (32 bits) binary data (Unit: 0.01N).
- The overload level monitor using 1-word (16 bits) binary data (Unit: %).
- The execution program No. using 1-word (16 bits) binary data.

PLC output
Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Target position (Lower word)																
n+2, n+3 Target position (Upper word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Positioning band (Lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Positioning band (Upper word)	-	-	-	-	-	-	-	-	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536
n+8, n+9 Speed (Lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+10, n+11 Speed (Upper word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536
n+12, n+13 Can not be used																
n+14, n+15 Can not be used																

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17 Can not be used																
n+18, n+19 Can not be used																
n+20, n+21 Acceleration	-	-	-	-	-	1,024	512	256	128	64	32	16	8	4	2	1
n+22, n+23 Deceleration	-	-	-	-	-	1,024	512	256	128	64	32	16	8	4	2	1
n+24, n+25 Can not be used																
n+26, n+27 Command program No.	-	-	-	-	-	-	-	-	-	-	PC32	PC16	PC8	PC4	PC2	PC1
n+28, n+29 Status signal 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n+30, n+31 Status signal 2	DSTR	JOG-	JOG+	JVEL	JISL	SSTP	FPST	ENMV	PHOM	PSTR	BKRL	RMOD	CLBR	RES	HOME	SON

PLC input

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0, n+1 Current position (Lower word)																
n+2, n+3 Current position (Upper word)																

When the current position is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+4, n+5 Feedback current (Lower word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+6, n+7 Feedback current (Upper word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8, n+9 Current speed (Lower word)																
n+10, n+11 Current speed (Upper word)																

When the current speed is shown using the negative figure, it is expressed using the complement of 2.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+12, n+13 Current load (Lower word)																
n+14, n+15 Current load (Upper word)																

When the current load is shown using the negative figure, it is expressed using the complement of 2.

Address (* “n” indicates the first address of each axis.)

1 word = 2 bytes =16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17 Can not be used																
n+18, n+19 Can not be used																
n+20, n+21 Program alarm code																
n+22, n+23 Alarm code																
n+24, n+25 Overload lebel monitor	-	-	-	-	-	-	-	-	-	PC64	PC32	PC16	PC8	PC4	PC2	PC1
n+26, n+27 Execution program No.	-	-	-	-	-	-	-	-	-	-	PC32	PC16	PC8	PC4	PC2	PC1
n+28, n+29 Status signal 1	JDNG	JDOK	LJNG	LJOK	PJNG	PJOK	-	-	-	WAIT	RTRN	DCMP	PSTP	PRSS	SERC	APRC
n+30, n+31 Status signal 2	EMGS	ALM	ALML	PALM	MPHM	PORG	PRUN	PCMP	ZONE2	ZONE1	-	PEND	RMDS	CEND	HEND	SV

(3) I/O signal assignment (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Target position	32-bit data	-	32-bit signed integer. Indicate the target position in the direct movement commands on the absolute coordinates. The unit is 0.001 mm, while the specifiable range is -9999999 to 9999999. (Example) When it is “+2.541mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	5.8.2
	Positioning band	32-bit data	-	32-bit integer. Indicate the positioning band in the direct movement commands. The unit is 0.001 mm, while the specifiable range is 1 to 9999999. (Example) When it is “2.540mm”, set it as “2540”. It shows the allowable range from the target position, that is regarded as the positioning completion.	5.8.2
	Speed	32-bit data	-	32-bit integer. Indicate the speed in the direct movement commands. The unit is 0.01 mm/s, while the specifiable range is 0 to 999999. Deceleration stop if and to specify in motion 0. It under suspension, it will remain stopped on the spot. (Example) When it is “25.41mm/s”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	5.8.2
	Acceleration	16-bit data	-	16-bit integer. Indicate the acceleration and deceleration in the direct movement commands. The unit is 0.01G, while the specifiable range is 1 to 999. (Example) To set 0.30G, specify “30.” If a move command is issued by specifying “0” or a value exceeding the maximum acceleration or maximum deceleration, an alarm will occur.	5.8.2
	Deceleration	16-bit data	-		
	Command program No.	16-bit data	-	16-bit integer. Indicate the pressing program number in the program startup command or program home-return command. Excection, or specify the movement to press program number for press program home. Available range is from 0 to 63. After specified, excective program when turns ON press program start signal (PSTR). Also, movement press program home movement signal when turns ON press program home movement signal (PHOM).	5.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC output	Control signal 1	b15	-	Can not be used.	-
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1			
		b0			
	Control signal 2	b15	DSTR	Positioning start: when the movement command is ON	5.6.5 (15)
		b14	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	5.6.5 (14)
		b13	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	5.6.5 (14)
		b12	JVEL	Jog speed/inching distance switching: Parameter No. 26, “Jog speed” and parameter No. 48, “Inching distance” are used when the signal is OFF, or parameter No. 47, “Jog speed 2” and parameter No. 49, “Inching distance 2” are used when the signal is ON.	5.6.5 (13)
		b11	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	5.6.5 (12)
		b10	SSTP	Probing stage: When this bit is ON at the time when probing stage completes, stops at probing stage complete position	5.6.5 (11)
		b9	FPST	Program compulsory stop: Executed press program stopped when it turns ON.	5.6.5 (10)
		b8	ENMV	Axis operation permission: Axis operation permitted when it turns ON.	5.6.5 (9)
		b7	PHOM	Program home return movement	5.6.5 (8)
		b6	PSTR	Program start	5.6.5 (7)
		b5	BKRL	Forced brake release: The brake is released when the signal turns ON.	5.6.5 (6)
		b4	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	5.6.5 (5)
		b3	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	5.6.5 (4)
		b2	RES	Reset: A reset is performed when the signal turns ON.	5.6.5 (3)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	5.6.5 (2)
		b0	SON	Servo ON command: The servo is ON when the signal is ON.	5.6.5 (1)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	-	32-bit signed integer indicating the current position. Stores the current position. The unit is 0.001 mm. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 1.023 mm * If this data is read as a hexadecimal, a negative value is indicated by a complement of 2.	5.8.2
	Feedback current	32-bit data	-	32-bit integer. Stores the feedback current of a motor. The unit is 0.1 %. (Example) Reading: 000000FF$_H$ = 255 (decimal) = 25.5 %	5.8.2
	Current speed	32-bit data	-	32-bit signed integer. Stores the current velocity. The unit is 0.01 mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm/s * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.8.2
	Current load data	32-bit data	-	32-bit signed integer. Stores the feedback values of the load data obtained from the loadcell mounted at the tip of an axis. The unit is 0.01N. * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.8.2
	Program alarm code	16-bit data	-	16-bit integer. Stores a currently occurred program alarm code. Stores 0H when no alarm is generated. For details on alarms, refer to [the instruction manual for the controller].	5.8.2
	Alarm code	16-bit data	-	16-bit integer. Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. For details on alarms, refer to [the instruction manual for the controller].	5.8.2
	Overload level monitor	16-bit data	-	16-bit integer. Stores an estimated motor temperature rise calculated from the feedback current of a motor. The unit is %. Overload alarm (E0) will be generated when this value gets to 100%.	5.8.2
	Execution program No.	16-bit data	-	16-bit integer. Stores a program number executed with a program startup command. The program numbers stored in this register should be retained after the program is finished until the next program startup command, movement command or the servo-off command is issued. Also, a program alarm should be retained until the alarm reset in case it is generated while a program is executed. It should be FFFF$_H$ if the executed program number is cleared.	5.8.2

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Status signal 1	b15	JDNG	Overall Judgment NG: Turns ON when overall judgment was made for load and position (distance) as a NG.	5.6.5 (30)
		b14	JDOK	Overall Judgment OK: Turns ON when Overall judgment was made for load and position (distance) as a OK.	5.6.5 (30)
		b13	LJNG	Load judgement NG: Turns ON when load for pressing operation judged NG.	5.6.5 (29)
		b12	LJOK	Load judgement OK: Turns ON when load for pressing operation judged OK.	5.6.5 (29)
		b11	PJNG	Position (distance) judgement OK: Turns ON when load for pressing operation position (distance) judged NG.	5.6.5 (29)
		b10	PJOK	Position (distance) judgement NG: Turns ON when load for pressing operation position (distance) judged OK.	5.6.5 (29)
		b9	-	Can not be used.	-
		b8	-		
		b7	-		
		b6	WAIT	Press program standby: Turns ON in standby status after press program finished in normal condition.	5.6.5 (28)
		b5	RTRN	Returned during the operation: Turns ON during returning stage.	5.6.5 (27)
		b4	DCMP	While in decompressing operation: Turns ON during decompressing stage.	5.6.5 (26)
		b3	PSTP	Pressurize during the stop: Turns ON during stop in pressurizing stage.	5.6.5 (25)
		b2	PRSS	While in pressurizing operation: Turns ON while pressurizing operation executed in pressurizing stage.	5.6.5 (24)
		b1	SERC	While in probing operation: Turns ON when probing stage executed.	5.6.5 (23)
		b0	APRC	While in approaching the operation: Turns ON when approaching stage executed.	5.6.5 (22)

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is being executed when the signal is ON.	5.6.5 (21)
		b14	ALM	Alarm: The signal turns ON when an alarm occurs.	5.6.5 (20)
		b13	ALML	Light failure alarm: The signal turns ON when an light failure alarm occurs.	5.6.5 (19)
		b12	PALM	Program alarm: The signal turns ON when an program alarm occurs.	5.6.5 (18)
		b11	MPHM	Program home return during the movement: Turns ON while in movement to home position set to each press program.	5.6.5 (8)
		b10	PORG	Program home position: Turns ON while in achieve to reach to home position set to each press program.	5.6.5 (8)
		b9	PRUN	Press program excecuted: Turns ON when press program executed.	5.6.5 (7)
		b8	PCMP	Press program finished in normal condition: Turns ON when press program finished with no alarm generated. (Note) There is no relation to press judgment.	5.6.5 (7)
		b7	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	5.6.5 (17)
		b6	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	5.6.5 (17)
		b5	-	Can not be used.	-
		b4	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	5.6.5 (16)
		b3	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	5.6.5 (5)
		b2	CEND	Loadcell calibration completion: ON when the calibration completion.	5.6.5 (4)
		b1	HEND	Home return completion: ON when the home return completion	5.6.5 (2)
		b0	SV	Operation ready: ON when the Servo ON	5.6.5 (1)

5.6.4 Pressing Direct Mode (Number of Occupied Stations: Four Stations)

The pressing direct mode is an operation mode to indicate the "pressurizing stage" in a pressing program directly in numbers. The pressing direct operation and positioning direct operation are available in this mode.

The main features valid in a ROBO Cylinder capable of controlling in this mode should be as shown in the table below.

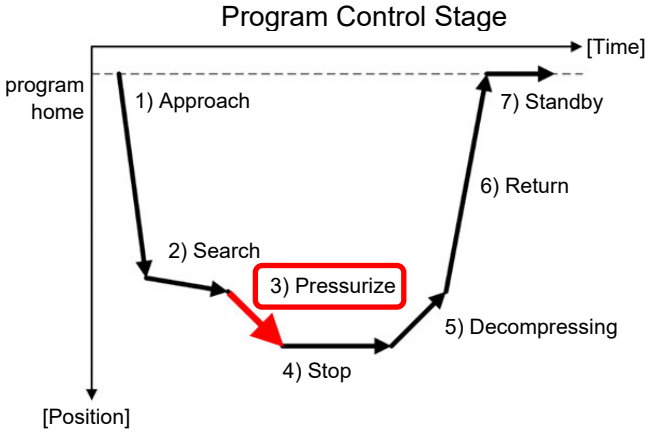
Operation modes and key functions

Key function	○: Directly controls ×: Invalid
Operation by position data specification	○
Direct speed/acceleration specification	○
Pressurizing load direct indication	○
Current position reading	○
Current speed reading	○
Program number command operation	×
Judgement result reading	○
Current load reading	○
Overload level monitor	○
Servo gain switching	○

[Main Features]
- Control Mode and Stop System are available for indication like pressurizing stage in a pressing program
- Equipped with position zone and load zone features
- Stop in distance and stop with incremental load are not available (2), 4), 6) and 8) in Table for Pressurizing Operation Mode below)
- Pressing program not available for use
- Later one prioritized from pressing direct command and positioning command

The upper limit of the velocity during the pressing direct operation should be the "maximum pressurizing velocity". However, the "maximum pressing velocity" should be the upper limit when a contact to a workpiece is not detected. Also, for both of the pressing direct operation and positioning direct operation, the positioning band should use the "positioning band width initial value".

* "Maximum pressurizing velocity", "maximum pressing velocity" and "positioning band width initial value" are fixed by the system and 1mm/s for "minimum velocity"



Pressurizing Operation Mode

No.	Pressurizing Mode	Stop System	Stop State
1)	Velocity Control	Stop at Position	Positioning Stop
2)		Stop in Distance	
3)		Stop with Load	
4)		Stop with Incremental Load	
5)	Force Control	Stop at Position	Continues pressing operation
6)		Stop in Distance	
7)		Stop with Load	
8)		Stop with Incremental Load	
9)		Stop at Position2	Positioning Stop

(1) PLC address configuration (* “n” indicates the head resister address of each axis.)

Parameter No. 84	SCON-CB side input side resister	PLC side Output address (byte)	SCON-CB side output side resister	PLC side Input address (byte)
2	Target position	n+0, n+1	Current position	n+0, n+1
		n+2, n+3		n+2, n+3
	Speed	n+4, n+5	Feedback current	n+4, n+5
		n+6, n+7		n+6, n+7
	Acceleration	n+8, n+9	Current speed	n+8, n+9
	Deceleration	n+10, n+11		n+10, n+11
	Pressurizing Load	n+12, n+13	Current load	n+12, n+13
	Occupied area	n+14, n+15		n+14, n+15
	Position Zone Boundary+	n+16, n+17	Occupied area	n+16, n+17
		n+18, n+19		n+18, n+19
	Position Zone Boundary -	n+20, n+21		n+20, n+21
		n+22, n+23		n+22, n+23
	Position Zone Boundary +	n+24, n+25	Overload level monitor	n+24, n+25
	Position Zone Boundary -	n+26, n+27	Alarm code.	n+26, n+27
	Control signal 1	n+28, n+29	Status signal 1	n+28, n+29
	Control signal 2	n+30, n+31	Status signal 2	n+30, n+31

(Note) The Occupied Area stands for the area occupied by means of the setting of the number of remote device stations.
These areas are not used for any other purpose. Also take care about duplicating the use of the address.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of sixteen input words (16-words = 32 bytes) and four output words in the I/O areas.

- The control signals 1, 2 and status signals 1, 2 are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from –9999999 to +9999999 (Unit: 0.001 mm) can be set in PLC. However, set the position data within the soft stroke range (0 to effective stroke length) for the actuator concerned.
- The speed are expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01 mm/s) can be set in PLC. However, Set a value that does not exceed the max. speed of the applicable actuator.
- The acceleration and deceleration using 1-word (16 bits) binary data. The figures from 1 to 999 (Unit: 0.01 G) can be set in PLC. However, Set a value that does not exceed the max. acceleration and max. deceleration of the applicable actuator.
- The pressurizing load should be the binary data in 1 word (16 bits). Numbers from 1 to 32767 are available for handling in PLC. The unit can be selected from 0.01N to 10N in Parameter No. 189 [Direct Command Pressurizing Load Unit].
- Position Zone Boundary + and Position Zone Boundary - are the binary data in 2 words (32 bits) and numbers from -9999999 to +9999999 (unit: 0.001mm) are available for handling in PLC. Do not attempt to set the value in Position Zone Boundary + smaller than the value in Position Zone Boundary -.
- Load Zone Boundary + and Load Zone Boundary - are the binary data in 1 word (16 bits) and numbers from -32767 to 32767 are available for handling in PLC. Do not attempt to set the value in Load Zone Boundary + smaller than the value in Load Zone Boundary -. The unit can be selected from 0.01N to 10N in Parameter No. 189 [Direct Command Pressurizing Load Unit].
- The feedback current should be the binary data (unit: 0.1%) in 2 words (32 bits).
- The current speed using 2-word (32 bits) binary data (Unit: 0.01mm/s).
- The current load data using 2-word (32 bits) binary data (Unit: 0.01N).
- The overload level monitor and alarm code using 1-word (16 bits) binary data.

PLC output
Address (* “n” indicates the first address of each axis.)
The upper words and lower words are available for swapping in Parameter No. 90.

1 word = 2 bytes = 16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Slave Word)																

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Host Word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (Slave Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (Host Word)	—	—	—	—	—	—	—	—	8,388,608	4,194,304	2,097,152	1,048,576	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressurizing Load	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reserved (Unavailable)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

PLC output

Address (* “n” indicates the first address of each axis.)

The upper words and lower words are available for swapping in Parameter No. 90.

1 word = 2 bytes = 16 bits

n+16, n+17	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Position Zone Boundary + (Slave Word)																

n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Position Zone Boundary + (Host Word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Position Zone Boundary - (Slave Word)																

n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Position Zone Boundary - (Host Word)																

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressurizing Zone Boundary +	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressurizing Zone Boundary -	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 1	—	—	—	—	STM2	STM1	STM0	PRMD	—	—	GSL1	GSL0	—	—	—	—

n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control signal 2	DSTR	JOG-	JOG+	JVEL	JISL	—	—	ZNRF	DPST	ENMV	BKRL	RMOD	CLBR	RES	HOME	SON

PLC Input

Address (* “n” indicates the first address of each axis.)

The upper words and lower words are available for swapping in Parameter No. 90.

1 word = 2 bytes = 16 bits

n+0, n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (Slave Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+2, n+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (Host Word)													524,288	262,144	131,072	65,536

When the target position is shown using the negative figure, it is expressed using the complement of 2.

n+4, n+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Feedback current (Slave Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+6, n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Feedback current (Host Word)	I	I	I	I	I	I	I	I	I	I	I	I	524,288	262,144	131,072	65,536

n+8, n+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (Slave Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+10, n+11	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current speed (Host Word)	I	I	I	I	I	I	I	I	I	I	I	I	524,288	262,144	131,072	65,536

n+12, n+13	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (Slave Word)	32,768	16,384	8,192	4,096	2048	1,024	512	256	128	64	32	16	8	4	2	1

n+14, n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (Host Word)	I	I	I	I	I	I	I	I	I	I	I	I	524,288	262,144	131,072	65,536

PLC Input

Address (* “n” indicates the first address of each axis.)

The upper words and lower words are available for swapping in Parameter No. 90.

1 word = 2 bytes = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+16, n+17																
Reserved (Unavailable)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
n+18, n+19	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reserved (Unavailable)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
n+20, n+21	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reserved (Unavailable)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
n+22, n+23	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reserved (Unavailable)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
n+24, n+25	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Overload level monitor																
n+26, n+27	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Alarm code																
n+28, n+29	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal 1 (Unavailable)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
n+30, n+31	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal 2	EMGS	ALM	ALML	—	DPED	DPRS	L ZONE	P ZONE	ZONE 2	ZONE 1	—	PEND	RMDS	CEND	HEND	SV

(3) I/O Signal Allocation (* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC Output	Target Position	32-bits Data	—	32-bit Signed Integer Target positions for the pressing direct command and the positioning direct command should be indicated with positions on the absolute coordinates. The unit is 0.001 mm While the specifiable range is -9999999 to 9999999. (Example) When it is “+2.541mm”, set it as “2541”. If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	5.8.3
	Speed	32-bits Data	—	32-bit integer. Velocities for the pressing direct command and the positioning direct command should be indicated. The unit is 0.01 mm/s While the specifiable range is 0 to 999999. Indicate 0 and it makes a deceleration and stop if during movement and it makes to stay stopped if during stop. (Example) When it is “25.41mm”, set it as “2541”. An alarm should be generated if a movement command is made with a value above the maximum velocity.	5.8.3
	Acceleration	16-bits Data	—	16-bit integer. Acceleration and deceleration during movement for the pressing direct command and the positioning direct command should be indicated. The unit is 0.001 G, while the specifiable range is 1 to 999. (Example) When it is “0.30G”, set it as “30”. An alarm should be generated if a movement command is made with a value above 0, the maximum acceleration and maximum deceleration.	5.8.3
	Deceleration	16-bits Data	—		
	Pressurizing Load	16-bits Data	—	16-bit integer. Pressurizing target load or pressurizing maximum load for the pressing direct command should be indicated. Whether it should be the target load or the maximum load should be determined by the signals from STM0 to 2 in Control Signal 1. The unit can be selected from 0.01N to 10N in Parameter No. 189 [Direct Command Pressurizing Load Unit]. While the specifiable range is 1 to 32767. This signal should not be used for the positioning direct command.	5.8.3
	Position Zone Boundary ±	32-bits Data	—	32-bit Signed Integer Apart from the zone boundaries set up with parameters, the zone boundaries for the position available for change from the host PLC should be indicated. The unit is 0.001 mm While the specifiable range is -9999999 to 9999999. The current position turns on when Position Zone Boundary - < Position Zone Boundary +, and PZONE Signal turns on in the range between Position Zone Boundary - and Position Zone Boundary +. The current position turns on when Position Zone Boundary - > Position Zone Boundary +, and PZONE Signal turns on in the range between Position Zone Boundary + and Position Zone Boundary -. Set to Position Zone Boundary + = Position Zone Boundary - when it is required to have the position zone output disabled.	5.8.3

* “Maximum velocity”, “maximum pressurizing velocity”, “maximum pressing velocity”, “maximum acceleration” and “maximum deceleration” are fixed by the system

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

<table>
<tr><th colspan="2">Signal type</th><th>Bit</th><th>Symbol</th><th colspan="2">Contents</th><th>Details</th></tr>
<tr><td rowspan="15">PLC Output</td><td>Load Zone Boundary ±</td><td>16-bits Data</td><td>—</td><td colspan="2">16-bit Signed Integer
The zone boundaries for the load available for change from the host PLC should be indicated. The unit can be selected from 0.01N to 10N in Parameter No. 189 [Direct Command Pressurizing Load Unit] like the pressurizing load.
While the specifiable range is -32768 to 32767.
LZONE Signal turns on when the current load is in the range of the load zone only when Load Zone Boundary - < Load Zone Boundary +.
Set to Load Zone Boundary - ≧ Load Zone Boundary + when it is required to have the load zone output disabled.
* When the input is performed in hexadecimal notation, input the negative value using a complement of 2.</td><td>5.8.3</td></tr>
<tr><td rowspan="13">Control signal 1</td><td>b15</td><td rowspan="4">—</td><td colspan="2" rowspan="4">Unavailable</td><td rowspan="4">—</td></tr>
<tr><td>b14</td></tr>
<tr><td>b13</td></tr>
<tr><td>b12</td></tr>
<tr><td>b11</td><td>STM2</td><td>Pressurizing Operation Stop System 2</td><td rowspan="3">Indicate the stop system for pressurizing operation by the pressing direct command. (Note 1)
<table><tr><th>STM2</th><th>STM1</th><th>STM0</th><th>Pressurizing Operation Stop system</th></tr><tr><td>OFF</td><td>OFF</td><td>OFF</td><td>0:Stop at Position</td></tr><tr><td>OFF</td><td>OFF</td><td>ON</td><td>1:Stop with Load</td></tr><tr><td>OFF</td><td>ON</td><td>OFF</td><td>2:Stop at Position 2</td></tr><tr><td colspan="3">Except for the above</td><td>3 to 7: Not available for setting</td></tr></table></td><td rowspan="3">5.6.5 (33)</td></tr>
<tr><td>b10</td><td>STM1</td><td>Pressurizing Operation Stop System 1</td></tr>
<tr><td>b9</td><td>STM0</td><td>Pressurizing Operation Stop System 0</td></tr>
<tr><td>b8</td><td>PRMD</td><td colspan="2">Pressurizing Operation Control Mode
Indicate the control mode for pressurizing operation by the pressing direct command. This signal is to be read in when DPST Signal turns OFF ⇒ ON.
0: Velocity Control Mode, 1: Force Control Mode
Do not attempt to use this in a positioning command by DSTR Signal.</td><td>5.6.5 (32)</td></tr>
<tr><td>b7</td><td rowspan="2">—</td><td colspan="2" rowspan="2">Unavailable</td><td rowspan="2">—</td></tr>
<tr><td>b6</td></tr>
<tr><td>b5</td><td>GSL1</td><td>Select the servo gain parameter set 1</td><td rowspan="2">Select the servo gain parameter set to be used
<table><tr><th>GSL1</th><th>GSL0</th><th>Functions</th></tr><tr><td>OFF</td><td>OFF</td><td>Parameter set 0 selected</td></tr><tr><td>OFF</td><td>ON</td><td>Parameter set 1 selected</td></tr><tr><td>ON</td><td>OFF</td><td>Parameter set 2 selected</td></tr><tr><td>ON</td><td>ON</td><td>Parameter set 3 selected</td></tr></table></td><td rowspan="2">5.6.5 (31)</td></tr>
<tr><td>b4</td><td>GSL0</td><td>Select the servo gain parameter set 0</td></tr>
<tr><td>b3</td><td rowspan="4">—</td><td colspan="2" rowspan="4">Unavailable</td><td rowspan="4">—</td></tr>
<tr><td>b2</td></tr>
<tr><td>b1</td></tr>
<tr><td>b0</td></tr>
</table>

* “Maximum velocity”, “maximum pressurizing velocity”, “maximum pressing velocity”, “maximum acceleration” and “maximum deceleration” are fixed by the system

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal type		Bit	Symbol	Contents	Details
PLC Output	Control signal 2	b15	DSTR	Positioning start: when the movement command is ON	5.6.5 (15)
		b14	JOG-	- Jog: “ON” for Movement to the Home Direction	5.6.5 (14)
		b13	JOG+	+ Jog: “ON” for Movement in the Opposite Direction of Home	5.6.5 (14)
		b12	JVEL	Jog speed/inching distance switching: Parameter No. 26, “Jog speed” and parameter No. 48, “Inching distance” are used when the signal is OFF, or parameter No. 47, “Jog speed 2” and parameter No. 49, “Inching distance 2” are used when the signal is ON.	5.6.5 (13)
		b11	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	5.6.5 (12)
		b10	—	Unavailable	—
		b9			
		b8	ZNRF	Zone Boundary Update: Position zone boundaries and load zone boundaries to be updated	5.6.5 (36)
		b7	DPST	Pressing Direct Start: Turn this signal on and the pressing direct operation should be started.	5.6.5 (35)
		b6	ENMV	Axis operation permission: Axis operation permitted when it turns ON.	5.6.5 (34)
		b5	BKRL	Forced brake release: The brake is released when the signal turns ON.	5.6.5 (6)
		b4	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	5.6.5 (5)
		b3	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	5.6.5 (4)
		b2	RES	Reset: A reset is performed when the signal turns ON.	5.6.5 (3)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	5.6.5 (2)
		b0	SON	Servo ON command: The servo is ON when the signal is ON.	5.6.5 (1)

* “Maximum velocity”, “maximum pressurizing velocity”, “maximum pressing velocity”, “maximum acceleration” and “maximum deceleration” are fixed by the system

Note 1 The outline of the stop systems indicated with this group of signals is the same as that for the stop systems of the pressurizing stages in a pressing program.
"A3: Position Command Information Data Error Alarm" should be generated when [2] or more is set in Velocity Control Mode or [3] or more is set in Force Control Mode. Do not attempt to use this in a positioning command by DSTR Signal.

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Current position	32-bit data	—	32-bit signed integer. Stores the current position. The unit is 0.001 mm. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 1.023 mm * If this data is read as a hexadecimal, a negative value is indicated by a complement of 2.	5.8.3
	Feedback current	32-bit data	—	32-bit integer. Stores the feedback current of a motor. The unit is 0.1 %. (Example) Reading: 00000FF$_H$ = 255 (decimal) = 25.5 %	5.8.3
	Current speed	32-bit data	—	32-bit signed integer. Stores the current velocity. The unit is 0.01 mm/s. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm/s * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.8.3
	Current load data	32-bit data	—	32-bit signed integer. Stores the feedback values of the load data obtained from the loadcell mounted at the tip of an axis. The unit is 0.01N. * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.8.3
	Overload level monitor	16-bit data	—	16-bit integer. Stores an estimated motor temperature rise calculated from the feedback current of a motor. The unit is %. Overload alarm (E0) will be generated when this value gets to 100%.	5.8.3
	Alarm code	16-bit data	—	16-bit integer. Stores an alarm code when an alarm (all alarms including message level ones) is generated. Stores 0$_H$ when no alarm is generated and during battery voltage drop warning. For details on alarms, refer to [the instruction manual for the controller].	5.8.3
	Status signal 1	b15	—	Unavailable	—
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			

(* “ON” in the table shows the corresponding bit of “1” and “OFF” shows “0”.)

Signal Type		Bit	Symbol	Contents	Details
PLC input	Status signal 1	b3	—	Unavailable	—
		b2			
		b1			
		b0			
	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is being executed when the signal is ON.	5.6.5 (21)
		b14	ALM	Alarm: The signal turns ON when an alarm occurs.	5.6.5 (20)
		b13	ALML	Light failure alarm: The signal turns ON when an light failure alarm occurs.	5.6.5 (19)
		b12	—	Unavailable	—
		b11	DPED	Pressurizing Operation Terminated: Turns on when pressurizing operation by pressing direct command finishes in normal condition	5.6.5 (39)
		b10	DPRS	In Pressurizing Operation: Turns on during pressurizing operation by pressing direct command	5.6.5 (38)
		b9	LZONE	Load Zone: Turns on when current load is in zone range	5.6.5 (37)
		b8	PZONE	Position Zone: “ON” with the current position within the position zone set range	5.6.5 (17)
		b7	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	5.6.5 (17)
		b6	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	5.6.5 (17)
		b5	—	Unavailable	—
		b4	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	5.6.5 (16)
		b3	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	5.6.5 (5)
		b2	CEND	Loadcell calibration completion: ON when the calibration completion.	5.6.5 (4)
		b1	HEND	Home return completion: ON when the home return completion	5.6.5 (2)
		b0	SV	Operation ready: ON when the Servo ON	5.6.5 (1)

About PEND Signal and DPEND Signal

The timing to turn these two signals on may change depending on the operation mode and stop system when the pressing direct operation (operation started by DPST) is conducted. Also, there is a case that PEND would not turn on.

Therefore, there may be a case that the judgement cannot be made well or judgment for completion will take time more than excepted if PEND is referred in the judgment for completion in the pressing direct operation.

These two signals are assumed to be used in different purposes as described below.

- PEND : Judgment for completion of positioning operation (operation started by DSTR)
- DPED : Judgment for completion of pressing operation (operation started by DPST)

5.6.5 I/O Signal Controls and Function

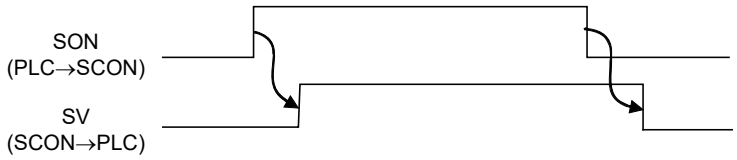
* ON indicates that the applicable bit signal is “1”, while OFF indicates that the bit signal is “0”.
The I/O control and functions used in the full function mode are described as follows. For the I/O signals for the Remote I/O Modes, refer to [the instruction manual for the controller main body for servo press].

(1) Servo ON command (SON) PLC output signal
Operation preparation end (SV) PLC input signal

When the SON signal is turned ON, the servo will turn ON.
When “SON” signal is turned “ON”, the servo-motor is turned “ON”. When the servo-motor is turned ON, the Status Indicator LED refer to [5.3, PROFINET IO Interface] on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

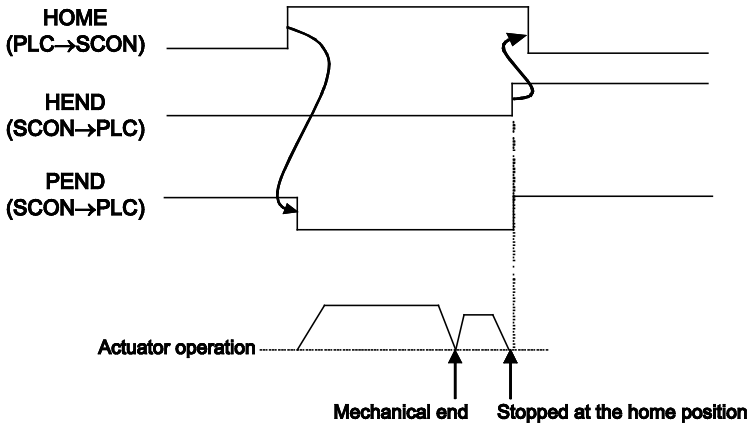
■Function

Using the “SON” signal, the turning ON/OFF of the controller is available.
While the “SV” signal is ON, the controller's servo-motor is turned “ON” and the operation becomes available.
The relationship between the “SON” signal and “SV” signal is as follows.



(2) Home return (HOME) PLC output signal
Home return completion (HEND) PLC input signal

When the “HOME” signal is turned “ON”, this command is processed at the startup (ON-edge), and the home return operation is performed automatically. During the home return operation, the “HEND” signal is turned “ON”.
When the “HEND” signal is turned “ON”, turn “OFF” the “HOME” signal.
Once the “HEND” signal is turned “ON”, it can not be turned “OFF” until the power is turned “OFF” or the “HOME” signal is input again. Once the HEND signal is turned ON, it can not be turned OFF until the power is turned OFF or the HOME signal is input again.
Even after the completion of the home return operation, when the “HOME” signal is turned “ON”, the home return operation can be performed.



⚠ Caution: In the Remote I/O Modes when the movement command is issued without performing the home return operation, the movement is performed after the automatic home return operation.
In the full function mode, issuing a movement command following the power on, without performing a home return first, will generate an alarm “Error Code 83: ALARM HOME ABS (absolute position move command when home return is not yet completed)” (operation-reset alarm).

(3) Reset (RES) PLC output signal

This signal has two functions. It can reset the controller alarm and cancel the reminder for planned movements during pause conditions.

■ Function

[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset. (In the case of the alarm with the cold start level, re-injection of the power is required)

[2] When this signal is turned ON from OFF condition during the pause condition, the reminder of the planned movement left can be cancelled.

(4) Load cell calibration command (CLBR) PLC output signal

Load cell calibration complete (CEND) PLC input signal

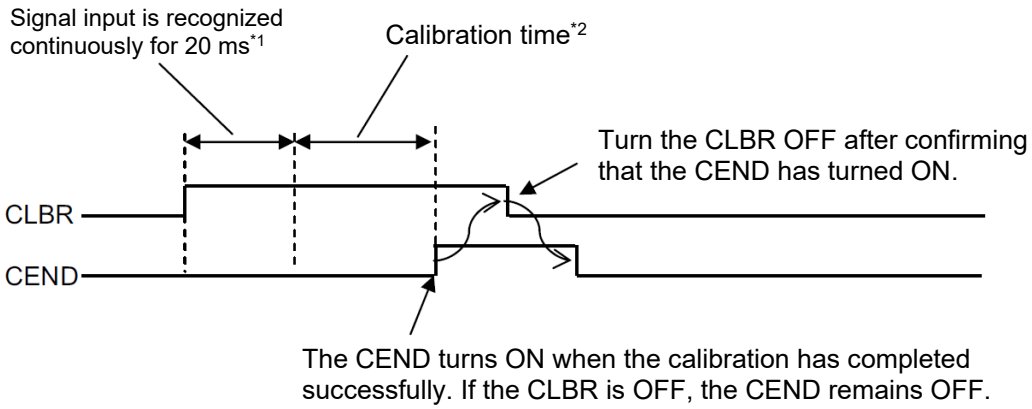
The factory setting for the load cell is 0N when no load is applied. If you want to use the loaded condition as the reference (0N), perform the following calibration. Also perform this calibration in other conditions as necessary (such as during readjustment, inspection, etc.).

[1] Stop the operation. (Calibration cannot be performed while any axis is operating, pushing a work part or paused, in which case an attempt to perform calibration will generate a 0E1 (load cell calibration error) alarm.

[2] Turn ON the load cell calibration signal (CLBR) and keep it ON for at least 20 ms.

[3] Once the calibration is complete, the calibration complete signal (CEND) turns ON. Thereafter, turn OFF the CLBR signal.
If the calibration was not successful, a 0E1: (load cell calibration error) alarm generates.

⚠ Caution: Normal operation commands are not accepted while the CLBR signal is ON.



*1 If the CLBR is turned OFF during this period, the signal is not recognized and therefore calibration is not performed.

*2 If the CLBR is turned OFF during this period, an alarm generates.

(5) Operating mode selector (RMOD) PLC output signal
Operation mode status (RMDS) PLC input signal

The operation mode is selected with the RMOD signal and the MODE switch located on the front surface of the controller.

Also, which mode is currently set, AUTO or MANU, can be confirmed using the RMDS signal.
The operation modes with the combination of the RMOD signal and the MODE switch ON/OFF are described as follows.

	Controller MODE Switch = AUTO	Controller MODE Switch = MANU
RMOD signal = OFF (AUTO mode is specified)	AUTO mode (RMDS=OFF)	MANU mode (RMDS=ON)
RMOD signal = ON (MANU mode is specified)	MANU mode (RMDS=ON)	MANU mode (RMDS=ON)

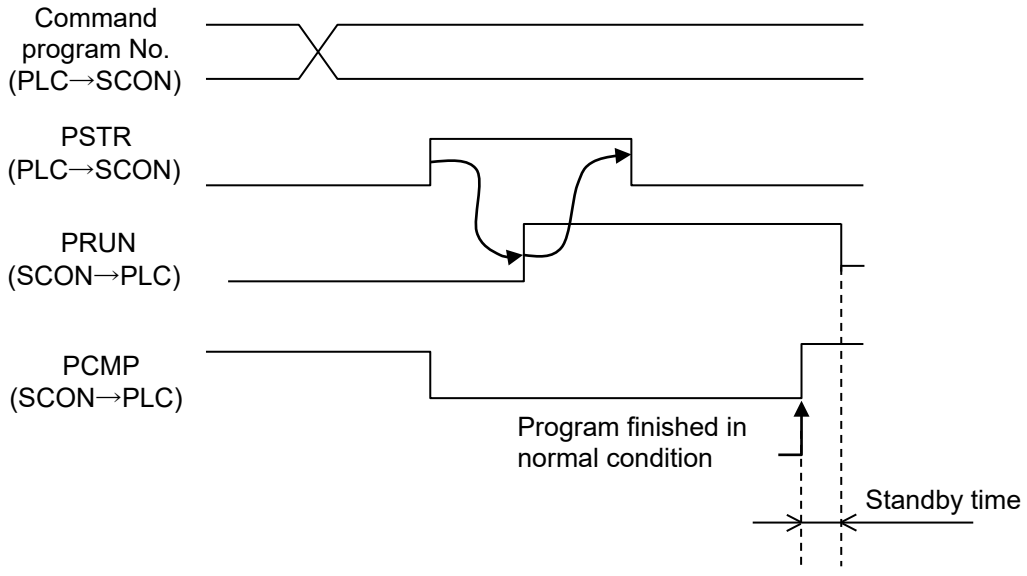
(Note) In MANU mode, the startup of the operation from PLC is not available.

(6) Brake release (BKRL) PLC output signal

Turning this signal “ON” can release the brake forcibly.

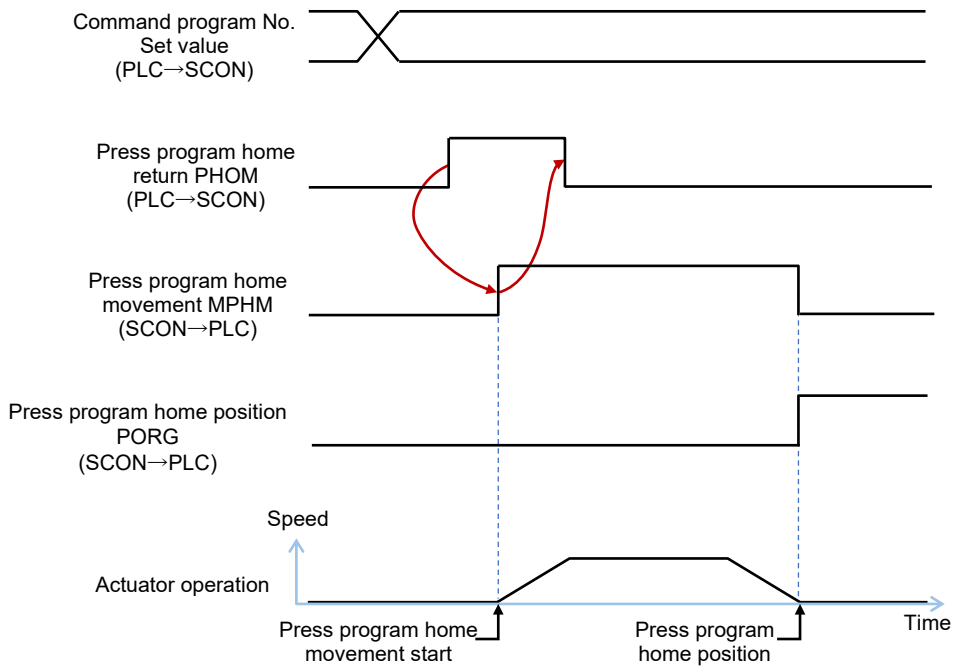
(7) Press program start (PSTR) PLC output signal
Press program executed (PRUN) PLC input signal
Press program finished in normal condition (PCMP) PLC input signal

PSTR signal gets processed at the startup (ON-edge), and executes the press program in the program number input in the PLC command program number register.
PCMP signal turns ON when a program is finished in normal condition with no alarm being generated, and it is transited to the standby stage. PCMP Signal will be retained until the start of the next program, movement command or servo gets turned OFF. Also, PCMP signal will not turn on when the press program.home-return is finished. Turn PSTR signal off after confirming the program executing (PRUN) signal has been turned ON.



(8) Press program home return (PHOM) PLC output signal
Press program home movement (MPHM) PLC input signal
Press program home position (PORG) PLC input signal

This command gets processed at the startup (ON-edge) when PHOM signal is ON, and executes to move to the home position in the program number input in the PLC command program number register. MPHM signal turns ON during movement. Turn PHOM Signal OFF once MPHM Signal turns ON.
PORG signal turns ON once completes to move to the home position.
For the speed to move to home position, the setting in parameter No. 8 velocity initial value, and for the acceleration/deceleration, the setting in Parameter No. 9 acceleration/deceleration initial value is used.



⚠ Caution: The program alarm occurs if press program home position movement signal get input while the press program is executed.

(9) Axis operation permission (ENMV) PLC output signal

Operation of axis and execution of program are permitted while this signal is turned ON.
Servo will not turn OFF even when this signal turns from ON → OFF.
If the axis movement and program are stopped by turning this signal from ON → OFF, the stopped axis movement and program will not resume even if this signal is turned from OFF → ON.

(10) Program compulsory stop (FPST) PLC output signal

Turn FPST Signal ON, and the executed press program stops.
The operation after stop can be selected from returning to press program home position and parameter No. 179 stopping at the point by establishing the setting in the return operation setting at press program compulsory stop.
For the speed to move to home position, the setting in parameter No. 8 velocity initial value, and for the acceleration/deceleration, the setting in parameter No. 9 acceleration/deceleration initial value is used.
This signal is invalid if input while moving to the press program home position.

(11) Probing stop (SSTP) PLC output signal

When SSTP signal is ON at the time when probing stage completes, stops at probing stage complete position, and press program stop. Servo ON is continued.
After program is turn off, even if SSTP signal return OFF will not resume press program.

(12) Jog/Inching switching (JISL) PLC output signal

This signal changes over the jog operation and the inching operation.
JISL=OFF : Jog operation
JISL=ON : Inching operation
When the JISL signal is turned “ON” (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.
When the JISL signal is turned OFF (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

(13) Jog-speed/Inching-distance switching (JVEL) PLC output signal

This change-over signal is used for the parameters specifying the jog speed when the jog operation is selected or the inching distance when the inching operation is selected.
Refer to [Relation Between Setting and Operation for JVEL/JISL] for the relation between the setting and the operation.

[Relation Between Setting and Operation for JVEL/JISL]

The relation between the jog velocity / inching distance switchover signal (JVEL) and the jog / inching switchover signal (JISL) turned on and off is as described below.

JISL		OFF (Jog operation)	ON (Inch operation)
Operating conditions		When the JOG +/JOG - signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG - signal.
JVEL=OFF	Speed	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed”
	Travel	-	Parameter No. 48, “Inch distance”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
JVEL=ON	Speed	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	Travel	-	Parameter No. 49, “Inch distance 2”
	Acceleration/deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)

(14) +Jog (JOG+) PLC output signal
-Jog (JOG-) PLC output signal

This signal is the command for the jog operation startup or inching operation startup.
If a + command is issued, the actuator will operate in the direction opposite home. When a – command is issued, the actuator will operate in the direction of home.

[1] Jog operation
Jog operation can be performed when the jog/inching switching (JISL) signal is OFF.
While the "JOG+" is turned "ON", the movement direction is to the opposite of the home and when it is turned "OFF", the actuator is decelerated and stopped.
While the JOG – is ON, the actuator will operate in the direction of home and when it is turned OFF, it is decelerated to a stop.
The operation is performed based on the set values of the following parameters.

- The speed is based on the parameter value specified using the Jog speed/Inching distance change-over (JVEL) signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
- When both the JOG+ and JOG- signals are turned "ON", the actuator is decelerated and stopped.

[2] Inching operation
The inching operation is available while the IISI signal is turned "ON".
Once it is turned "ON", the actuator is moved as much as the inching distance.
When the JOG+ is turned "ON", the movement is to the opposite of the home and when the JOG- is turned "ON", the movement is to the home.
The operation is performed based on the set values of the following parameters.

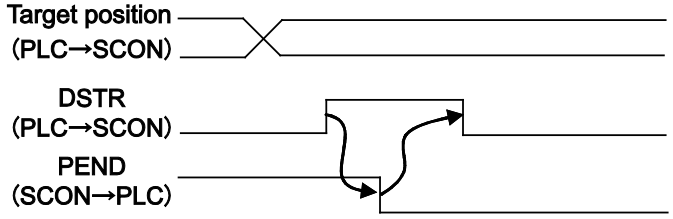
- The speed conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The travel conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 48, "PIO inch distance".
  If the JVEL signal is ON, the actuator operates according to parameter No. 49, "PIO inch distance 2".
- The Acceleration/Deceleration is based on the rated acceleration/deceleration (depending on the actuator).

During the normal operation, even when the "+" Jog signal or "-" Jog signal is turned "ON", the normal operation is continued. (The Jog signal is ignored)
In the pause condition, even when the "+" Jog signal or "-" Jog signal is turned "ON", the actuator is not moved.

(Note) Because the software stroke limit is disabled before the home return operation, the actuator might run against the mechanism end. Take the greatest care.

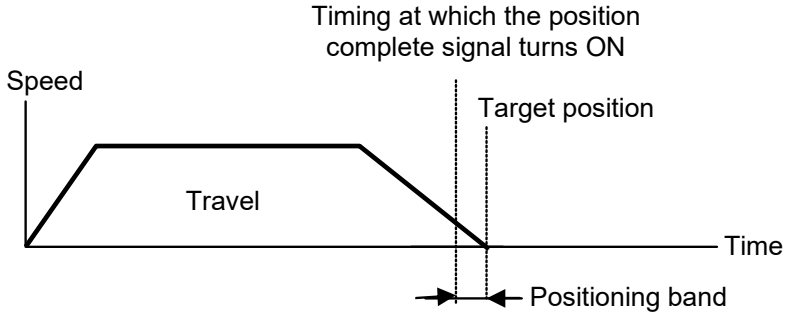
(15) Positioning command (DSTR) PLC output signal

This signal is processed at the startup (ON-edge) and the positioning to the target position input in the PLC's target position register is performed. When this signal is issued in the condition where the home return operation has not performed at all after the power injection (HEND signal OFF), an alarm is issued (Operation Cancellation Level).
Turn "OFF" this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned "OFF".



(16) Positioning completion signal (PEND) PLC input signal

This signal is turned “ON” when the actuator is moved to the target position and reaches the positioning band and the pressing is completed.
However, when the positioning is completed with the DSTR signal turned “ON”, the PEND signal is not turned “ON”.



When the servo-motor is turned ON from OFF condition, the positioning is performed with the position set as the target position. Accordingly, this signal is turned “ON” and after that, when the positioning operation is started with the home return (HOME) signal, positioning command (DSTR) signal, this signal is turned “OFF”.

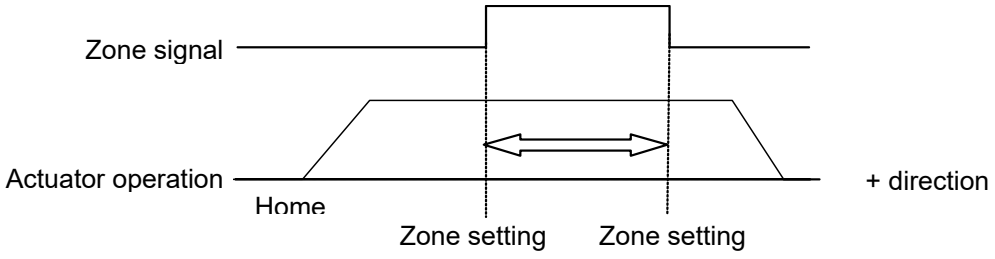
⚠ Caution: When the servo-motor is turned OFF or stopped in an emergency while the actuator is stopped at the target position, the PEND signal is turned “OFF” temporarily.
Then, when the servo-motor is turned “ON”, the PEND signal is turned “ON” again.

(17) Zone 1 (ZONE1) PLC input signal
Zone 2 (ZONE2) PLC input signal
Position zone (PZONE) PLC input signal

These signals are turned ON when the current position of the actuator is within the set area and turned OFF when the current position is out of the set area.

[1] Zone 1, Zone 2
The zone is set using the user parameters.
The Zone 1 Signal is set using the parameter No. 1 “Zone Boundary 1 “+” Side” and No. 2 “Zone Boundary 1 “–“ Side”.
The Zone 2 Signal is set using the parameter No. 23 “Zone Boundary 2 “+” Side” and No. 24 “Zone Boundary 2 “–“ Side”.
The Zone 1 Signal and Zone 2 Signal become effective when the home return operation is completed. After that, even during the servo OFF, it is effective.

[2] Position zone
Each zone is set in the position table or using the zone boundary resister.
In the case of the Position/Simplified Direct Value Modes 1 and 2, the PZONE signal is set using the position table.
In the case of the Full Direct Value Mode, the PZONE signal is set using the Zone Boundary Value Register.
(*) In the Half Direct Value Modes 1 to 3, there is no PZONE signal.
The PZONE signal becomes effective with the movement command after the home return operation. After that, even during the servo OFF, it is effective.



(18) Program alarm (PALM) PLC input signal

This turns ON when a press program alarm is detected.
The alarm turns OFF when the reset (RES) signal gets turned ON if it is an operation cancelation level alarm. (without removing the cause of alarm, the alarm will be generated again when press program is executed.)

(19) Light failure status (ALML) PLC input signal

It turns to 1 when a message level (light alarm available to continue) alarm is ON.
This signal is not linked to ALM_LED on the controller front panel.
Detail of the alarm refer to [SCON controller instruction manual for servo press].

* This signal should behave as a signal of a break contact (*ALML) in Remote I/O Mode thus switching on/off gets reversed to above.

(20) Alarm (ALM) PLC input signal

When any error is detected using the controller protection circuit (function), it is turned “ON”.
■ Function
When any error is detected and the protection circuit (function) is activated, this signal is turned “ON”.
When the cause of the alarm is eliminated and the reset (RES) signal is turned “ON”, the alarm is turned “OFF” in the case that it is the alarm with the operation cancellation level. (In the case of the alarm with the cold start level, re-injection of the power is required)
When the alarm is detected, the status indicator LED on the front surface of the controller illuminates in red.

* This signal should behave as a signal of a break contact (*ALM) in Remote I/O Mode thus switching on/off gets reversed to above.

(21) Emergency stop (EMGS) PLC input signal

When the controller is stopped in an emergency, it is turned “ON”.
■ Function
When the controller is stopped in an emergency (motor driving power is cut OFF), it is turned “ON”. When the emergency stop status is cleared, it is turned “OFF”.

(22) While in approaching operation (APRC) PLC input signal

It turns ON during the approaching stage in press program.

(23) While in probing operation (SERC) PLC input signal

It turns ON during the probing stage in press program.

(24) While in pressurizing operation (PRSS) PLC input signal

It turns ON during the pressurizing stage in press program.

(25) While in pressurizing stop (PSTP) PLC input signal

It turns ON at the stop after pressurizing in the pressurizing stage in press program.

(26) While in decompressing operation (DCMP) PLC input signal

It turns ON during the decompressing stage in press program.

(27) While in returning operation (RTRN) PLC input signal

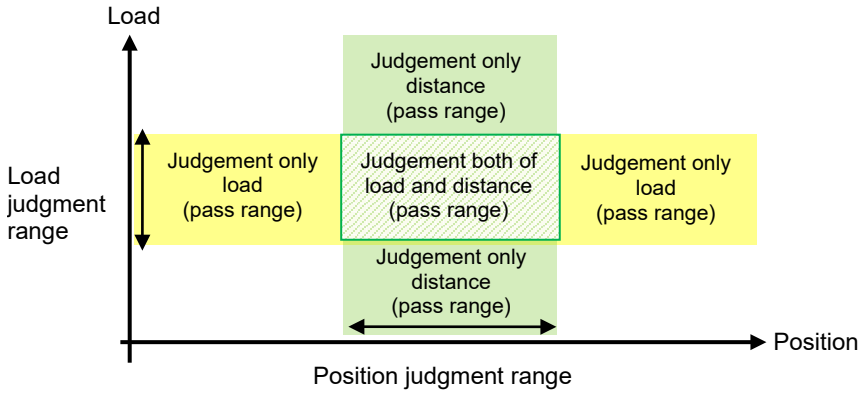
It turns ON during the returning stage in press program.

(28) Press program standby (WAIT) PLC input signal

It turns ON during standby after press program finished in normal condition.

(29) Position (distance) judgment OK (PJOK) PLC input signal
Position (distance) judgment NG (PJNG) PLC input signal
Load judgment OK (LJOK) PLC input signal
Load judgment NG (LJNG) PLC input signal

PJOK signal turns ON when the position (distance) range set as the judgment of press program is kept when the pressurizing operation is finished, and PJNG signal turns ON when it is not kept.
LJNG signal turns ON when the position (distance) range set as the judgment of press program is kept when the pressurizing operation is finished, and LJNG signal turns ON when it is not kept.



(30) Overall Judgment OK (JDOK) PLC input signal
Overall Judgment NG (JDNG) PLC input signal

Overall judgment is made from the position (distance) judgment and the load judgment, and JDOK signal turns ON when it passes and JDNG signal is turned ON when it fails.

(31) Select the servo gain parameter set (GSL0 to 1) PLC Output signal

In addition to the servo gain parameter set, selection should be made from four patterns also for the gain in a force control device when the pressurizing operation mode is set to Force Operation Mode.

GSL1	GSL0	Servo gain	Force Gain (Parameter No.)	Remarks
OFF	OFF	Parameter set 0	Force Gain (No.94)	Default value
OFF	ON	Parameter set 1	Force Gain1 (No.174)	
ON	OFF	Parameter set 2	Force Gain2 (No.175)	
ON	ON	Parameter set 3	Force Gain2 (No.176)	

(32) Pressurizing Operation Control Mode (PRMD) PLC Output signal

Indicate a control mode in the pressurizing operation by the pressing direct command. This signal should be read in only when DPST Signal turns OFF ⇒ ON.

PRMD	Pressurizing Operation Control Mode	Remarks
0	Velocity Control Mode	
1	Force Control Mode	

The outline of the control modes indicated with this signal is the same as that for the control modes of the pressurizing stages in a pressing program. Refer to ["Pressurizing Operation Modes" in SCON-CB Servo Pressing Instruction Manual (ME0345)]

Do not attempt to use this in a positioning command by DSTR Signal.

(33) Pressurizing Operation Stop System (STM0 to 2) PLC Output signal

Indicate a stop system in the pressurizing operation by the pressing direct command. This signal should be read in only when DPST Signal turns OFF ⇒ ON.

STM2	STM1	STM0	Pressurizing Operation Stop System	Remarks
OFF	OFF	OFF	0 : Stop at Position	
OFF	OFF	ON	1 : Stop with Load	
OFF	ON	OFF	2 : Stop at Position 2	Available for setting only in Force Control Mode
Except for the above			3to 7 : Not available for setting	For future extension

The outline of the stop systems indicated with this group of signals is the same as that for the stop systems of the pressurizing stages in a pressing program. Refer to ["Pressurizing Operation Modes" in SCON-CB Servo Pressing Instruction Manual (ME0345)]

"A3: Position Command Information Data Error Alarm" should be generated when [2] or more is set in Velocity Control Mode or [3] or more is set in Force Control Mode.

Do not attempt to use this in a positioning command by DSTR Signal.

(34) Permission for Axis Operation (ENMV) PLC output signal

As it takes the interlock of an axis operation, this signal has to be turned on in order to operate an axis. The axis operation should stop while this signal is off. However, the condition of the servo turned on should be kept.

When an axis operation is stopped with this signal getting turned off, the stopped axis operation should not resume even if the signal gets turned back on.

(35) Pressing Direct Start (DPST) PLC output signal

Turn this signal on with all the data necessary for the pressing direct operation is set in each signal, and the pressing direct operation should start. This signal should be received as a new command if it gets turned on during the pressing operation or during the positioning operation.

With this signal kept on, the output signals, PEND and DPED Signals, should remain off.

(36) Zone Boundary Update (ZNRF) PLC output signal

Only Position Zone Boundaries ± and Load Zone Boundaries ± should be updated.

It should be utilized when a change is required only to the zone boundaries without any influence to an axis operation.

(37) Load Zone (LZONE) PLC input signal

The result of the load zone judgment with Load Zone Boundaries ± should be shown.

It turns on when the current load is in the zone range, and off when out of the zone range.

Different from the position zone, the load zone makes a judgment regardless of the condition of the home-return complete. This signal should always be off if the communication with the loadcell is not available.

(38) Pressurizing Operation (DPRS) PLC input signal

It turns on during the pressurizing operation by the pressing direct command.

(39) Pressurizing Operation Terminated (DPED) PLC input signal

It turns on when the pressurizing operation by the pressing direct command finishes in the normal condition.

Even if the pressurizing operation is actually finished, with DPST Signal in Control Signal 2 being on, this signal should kept off.

It should also get turned off when another movement command is detected or servo is turned off.

5.7 I/O Signal Timings

Turn any control signal on in order to operate ROBO Cylinder with a sequence program in PLC, the response (status) signal for that would be returned to the PLC. The maximum respond time should be expressed with the formula below.

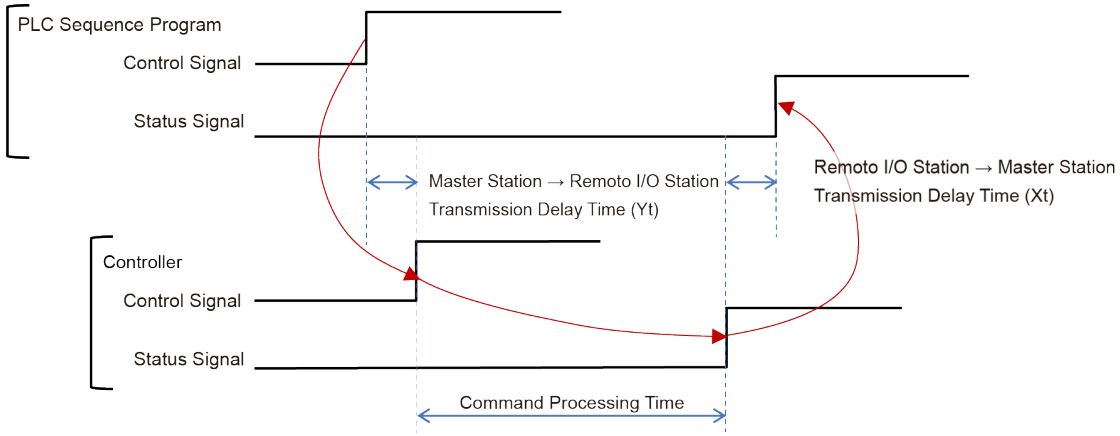
Max. Response Time [ms] = Yt + Xt + 2 + Command Processing Time (Operation Time, etc.)

Yt: Master Station → Remote I/O Station Transmission Delay Time

Xt: Remote I/O Station → Master Station Transmission Delay Time

} Field Network Transmission Delay Time

For the Master Station to Remote I/O Station Transmission Delay Time (Yt) and the Remote I/O Station to Master Station Transmission Delay Time (Xt), refer to [the instruction manuals for the EtherNet/IP Master Unit and mounted PLC].



5.8 Operation

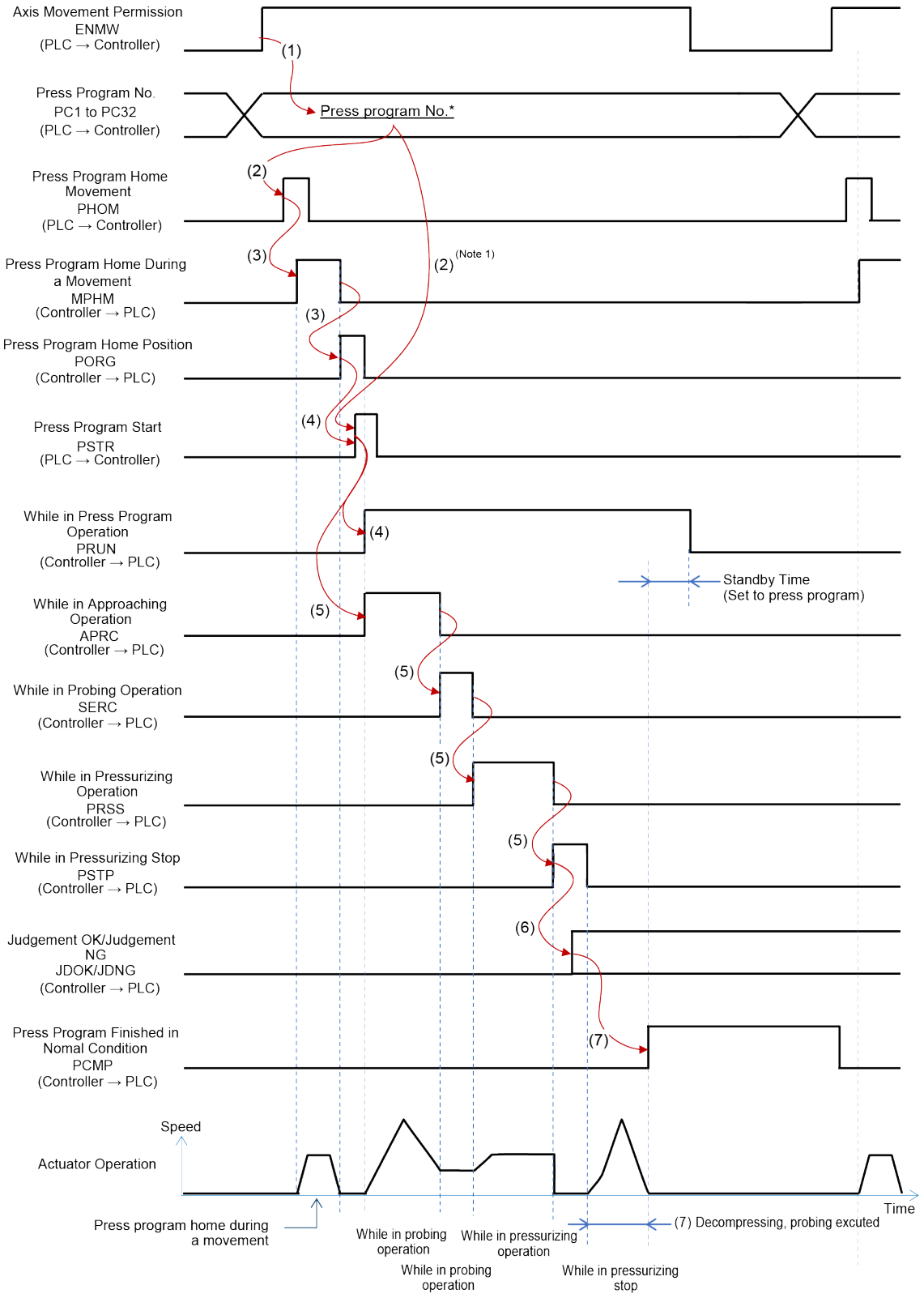
The timings for the basic operation examples.

5.8.1 Operation in the Remote I/O Mode

Here, it shows examples for when executing one press program to turn the servo ON, return to home position and having loadcell calibration.

- Example of operation

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Indicate the press program number (PC1 to PC32).
(3) Turn the press program home position movement signal (PHOM) ON. During the movement to home position, the press program home position movement signal is kept ON. The press program home position signal (PORG) turns ON once the home position movement completes.
(4) Turn the press program start signal (PSTR) on to execute the press program.
The press program execution signal (PRUN) turns ON while the press program is executed *.
* Duration from program start till standby time pass after return stage
(5) Each stage execution signal is kept on while each stage in the press program is executed.
• While in approaching stage executed = While in approaching operation signal (APRC)
• While in probing stage executed = While in probing operation signal (SERC)
• While in pressurizing stage (pressurize) executed = While in pressurizing operation (PRSS)
• While in pressurizing stage (stop) executed = While in pressurizing stop (PSTP)
(6) Judgment made for pressurizing stop (PSTP ON).
The result is output in judgment OK signal (JDOK) and judgment NG signal (JDNG).
(7) Once each of decompressing and return stage is finished, the press program normal complete signal (PCMP) turns ON.



Note 1 Input the pressing program number and then turn on PSTR.

5.8.2 Operation in the Full Function Mode

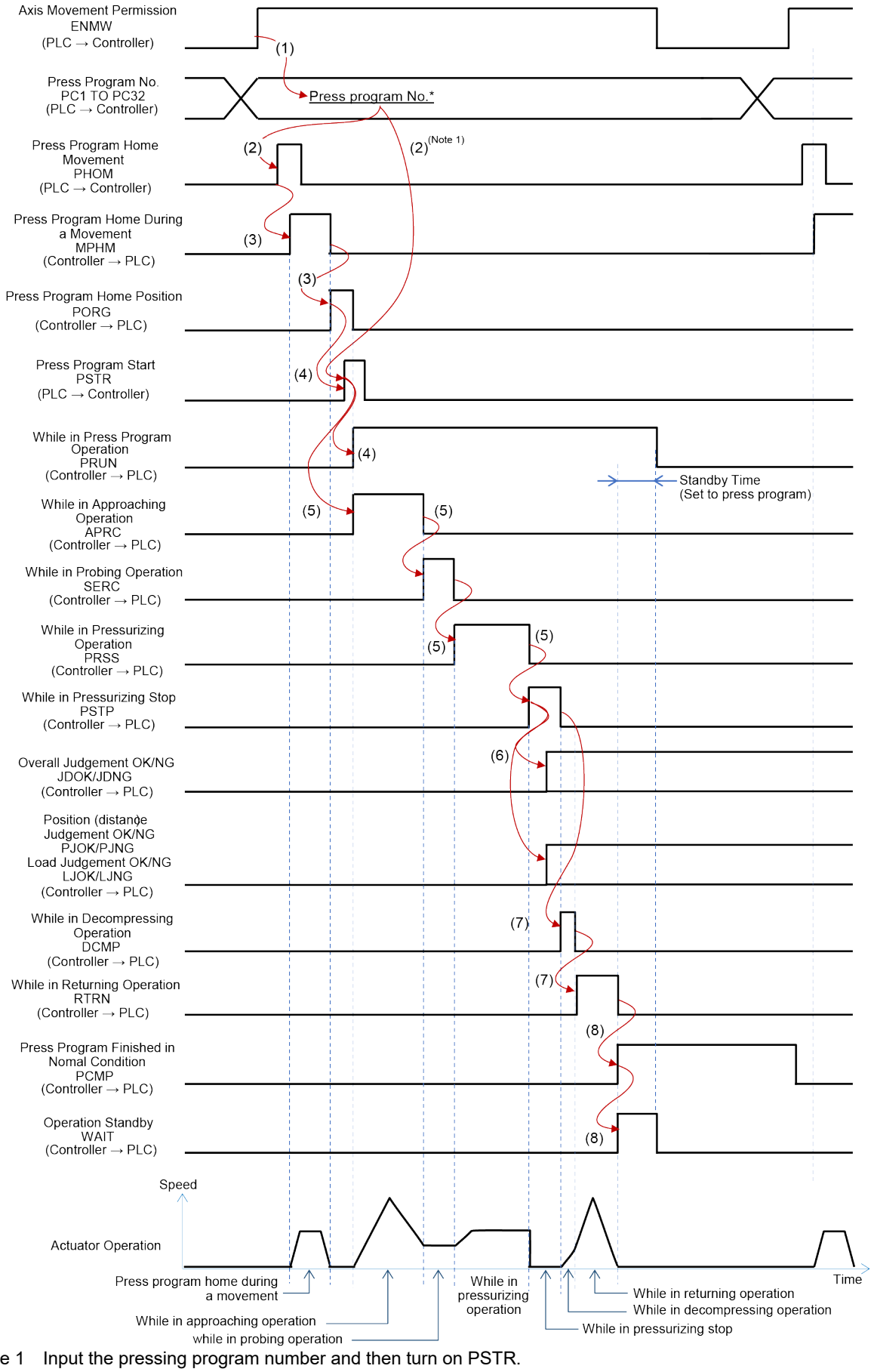
From the condition that the servo is on, home-return is performed and the loadcell calibration is completed;
[1] when executing one press program
[2] when performing direct indication
Here shows an example of two patterns of operation.

[1] Example for when executing one press program

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the press program number to execute to the command program number register.
(3) Turn the press program home position movement signal (PHOM) ON. During the movement to home position, the press program home position movement signal is kept ON. The press program home position signal (PORG) turns ON once the home position movement completes.
(4) Turn the press program start signal (PSTR) on to execute the press program.
The press program execution signal (PRUN) turns ON while the press program is executed *.
*Duration from program start till standby time pass after return stage
(5) Each stage execution signal is kept on while each stage in the press program is executed.
- While in approaching stage executed = While in approaching operation signal (APRC)
- While in probing stage executed = While in probing operation signal (SERC)
- While in pressurizing stage (pressurize) executed = While in pressurizing operation (APRC)
- While in pressurizing stage (stop) executed = While in pressurizing stop (PRSS)

(6) Judgment made for pressurizing stop (PSTP ON).
The position (distance) result is output in judgement OK signal (PJOK), judgment NG signal (PJNG).
The load result is output in judgment OK signal (LJOK), judgment NG signal (LJNG).
The overall judgement result is output in judgment OK signal (JDOK), judgment NG signal (JDNG).
(7) Each stage execution signal is kept on while each stage in the press program is executed.
- While decompressing stage executed = While decompressing operation signal (DCMP)
- While returning stage executed = While returning operation signal (RTRN)

(8) Once each of decompressing and return stage is finished, the press program normal complete signal (PCMP) turns ON, stops operation for the duration of standby time set in the press program, and turns ON the press program standby signal (WAIT). Wait for the standby time before making a command when the next press program is to be executed.

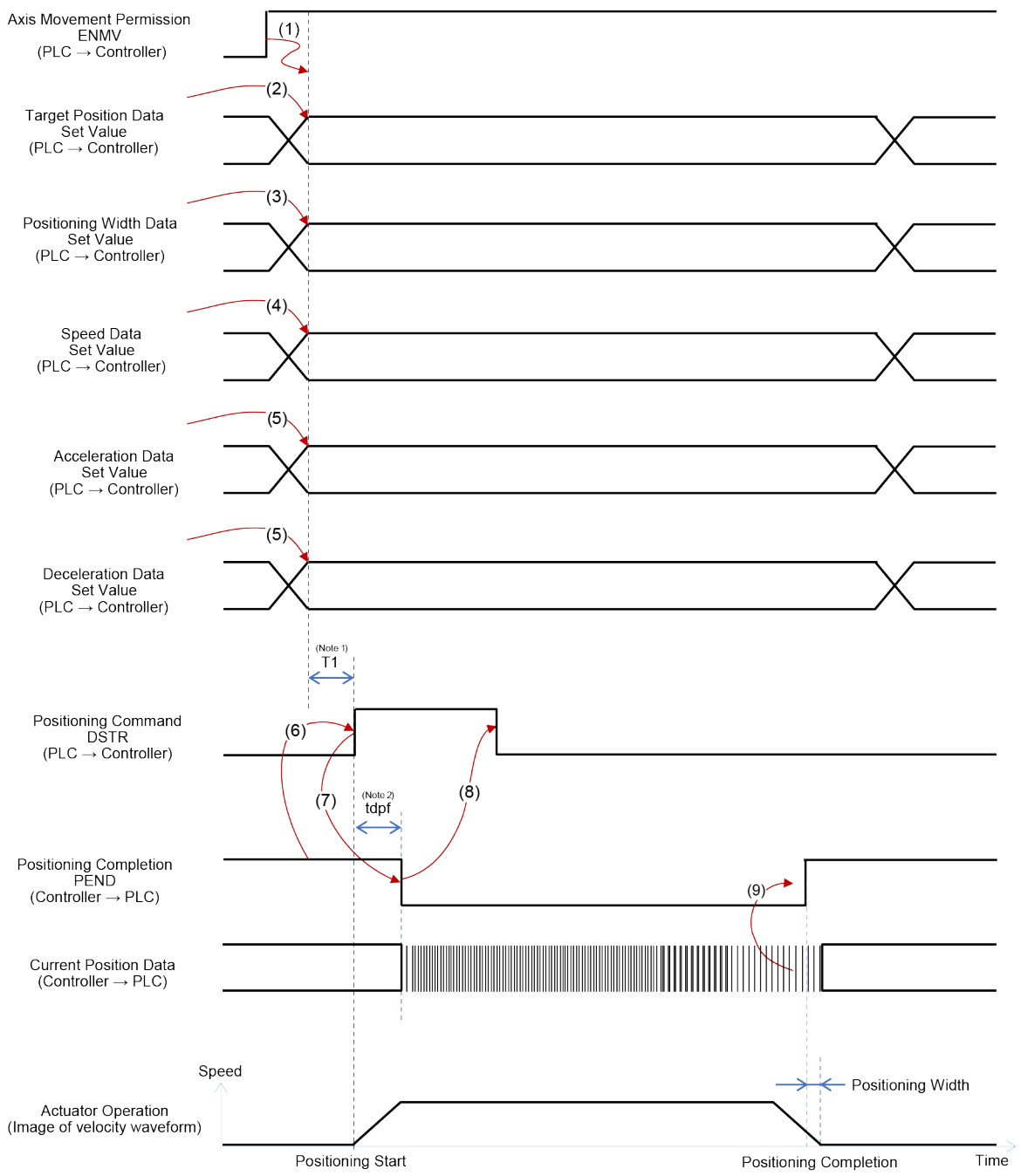


Note 1 Input the pressing program number and then turn on PSTR.

[2] Example for when performing direct indication movement to the target position

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the target position data in the target position register.
(3) Set the positioning band data in the positioning band register.
(4) Set the speed data to the speed resister.
(5) Set the acceleration/deceleration data in the acceleration/deceleration register.
(6) In the condition where the positioning completion (PEND) signal is turned “ON”, turn “ON” the positioning command (DSTR) signal.
  * The data items set in Steps (2) through (5) are read in the controller at the startup (ON-edge) of the DSTR signal.
(7) After the DSTR signal is turned “ON”, the PEND signal is turned “OFF” after tdpf.
(8) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal. Do not change any value in each data until the DSTR signal has been turned “OFF”.
(9) When the DSTR signal is turned “OFF” and the motor current reaches the current-limiting value set in Step (3), the PEND signal is turned “ON”

* The example of this3348-349 operation shows how to perform the positioning. It will not be operated as the pressurizing or depressurizing operations.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Yt + Xt ≤ tdpf ≤ Yt + Xt + 3 (ms)

* The example of this operation shows how to perform the positioning. It will not be operated as the pressurizing or depressurizing operations.

5.8.3 Operation in Pressing Direct Mode

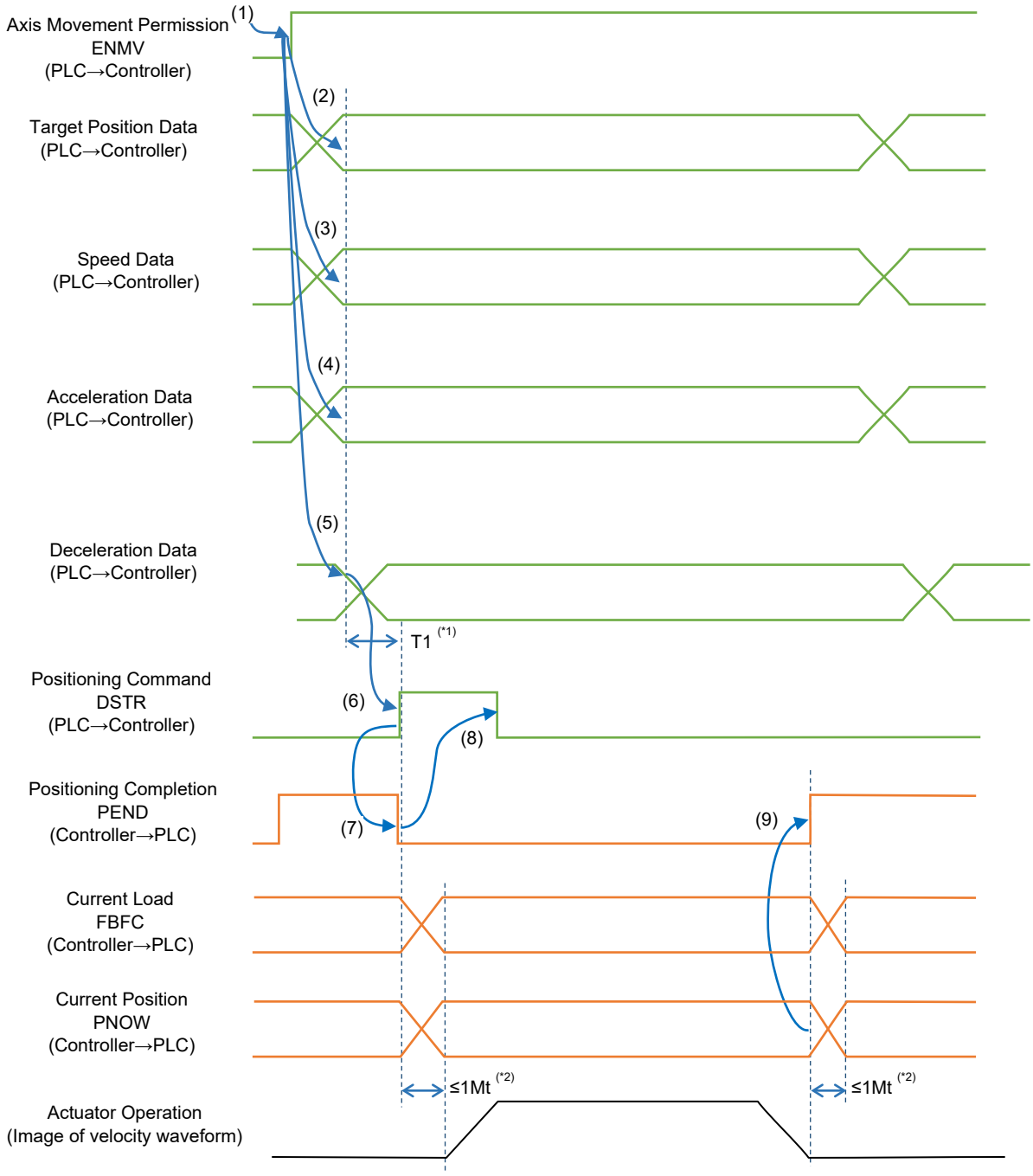
Here, shows an example of having an operation equivalent to a pressing program in a condition of the servo turned on, home-return operation completed and the loadcell calibration completed.

[1] Approach
[2] Search
[3] Pressurize
[4] Stop
[5] Depressurize
[6] Return

[1] Approach
An approaching operation with the positioning complete signal (PEND) turned on should be executed.

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the target position data in the target position register (PCMD).
(3) Set the velocity data in the velocity register (VCMD).
(4) Set the Acceleration data in the acceleration register (ACMD).
(5) Set the deceleration data in the deceleration register (DCMD).
(6) Turn on the positioning command signal (DSTR).
    * The data items set in Steps (2) through (5) are read in the controller at the startup (ON-edge) of the DSTR signal.
(7) Turn PEND Signal off after DSTR Signal gets turned on.
(8) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
    * Do not change any value in each data until the DSTR signal has been turned “OFF”.
(9) PEND Signal turns on while DSTR Signal is off and also reached the target position set in (2) at the same time.

Stop operation from the PLC when the current load register (FBFC) has exceeded the load specified by you during the positioning operation.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

[2] Search

Conduct the searching operation while the positioning complete signal (PEND) is on.

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the pressurizing operation control mode signal (PRMD) to “0: Velocity Control Mode”.

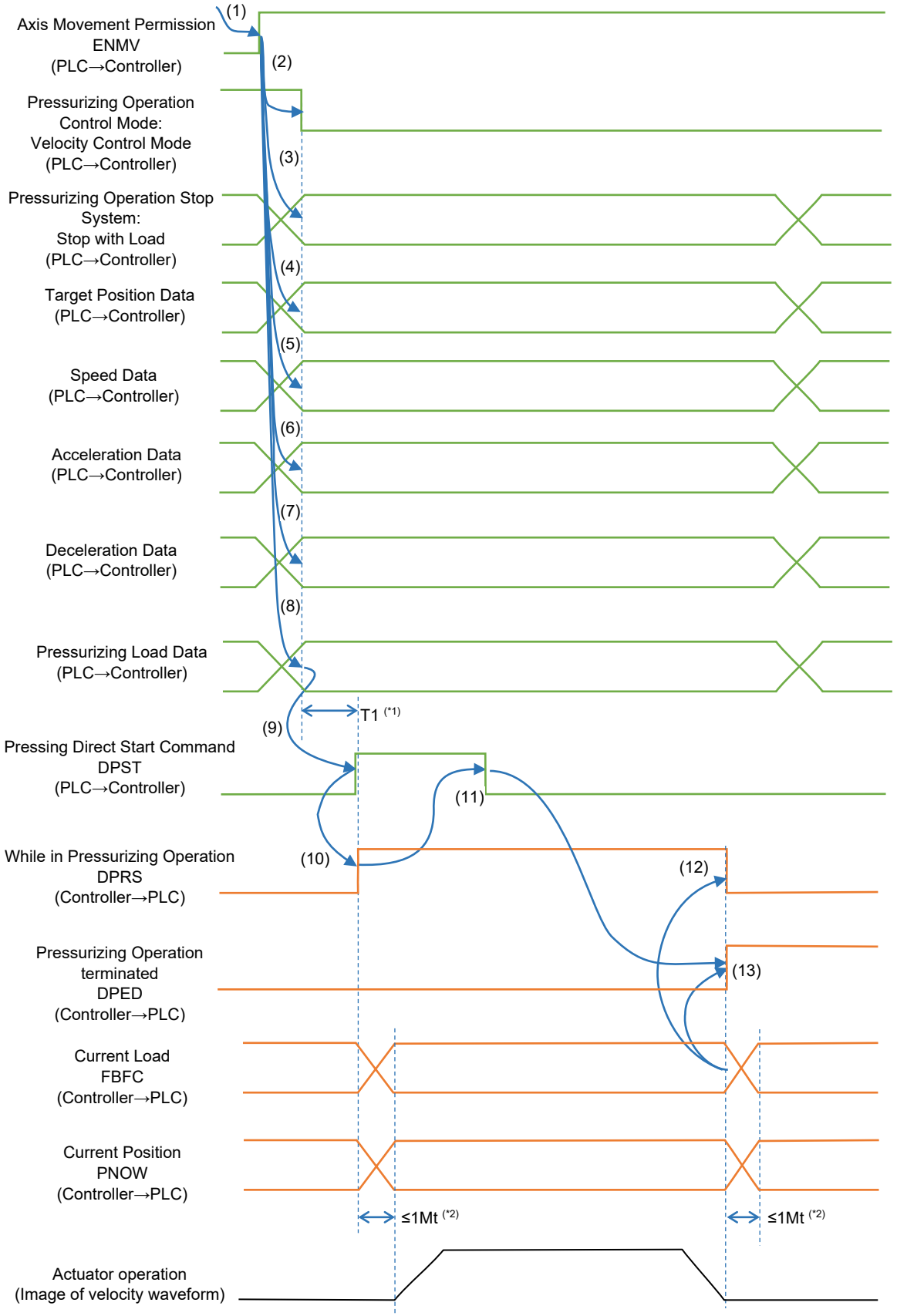
PRMD	Pressurizing Operation Control Mode
OFF	0: Velocity Control Mode

(3) Set the pressurizing operation stop system signal (STM0 to 2) to “1: Stop with Load”.

STM2	STM1	STM0	Pressurizing Operation Stop System
OFF	OFF	ON	1: Stop with Load

(4) Set the control position data to the target position register (PCMD).
(5) Set the velocity data in the velocity register (VCMD).
(6) Set the acceleration data to the acceleration register (ACMD).
(7) Set the deceleration data to the deceleration register (DCOM).
(8) Set the termination load data to the pressurizing load register (PRLD).
(9) Turn the pressing direct start signal (DPST) on.
    * The data set in (2) to (8) should be read into a controller with the rising edge of DPST Signal.
(10) The pressurizing operation ongoing signal (DPRS) should turn on after DPST Signal turns on.
(11) Turn DPST Signal off after confirming that DPRS Signal has been turned on.
    * Do not attempt to make any change to a value in each data unless DPST Signal is confirmed off.
(12) DPRS Signal should get turned off once the load has reached the termination load set in (8).
(13) The pressurizing operation termination signal (DPED) turns on while DPST Signal is off and also reached the termination load set in (8) at the same time.

An alarm should be generated when the current position register (PNOW) has exceeded the target position register (PCMD) during the pressing direct operation.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

[3] Pressurize

Conduct the pressurizing operation while the pressurizing operation termination signal (DPED) is on.

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the pressurizing operation control mode signal (PRMD) in a purpose of your use.

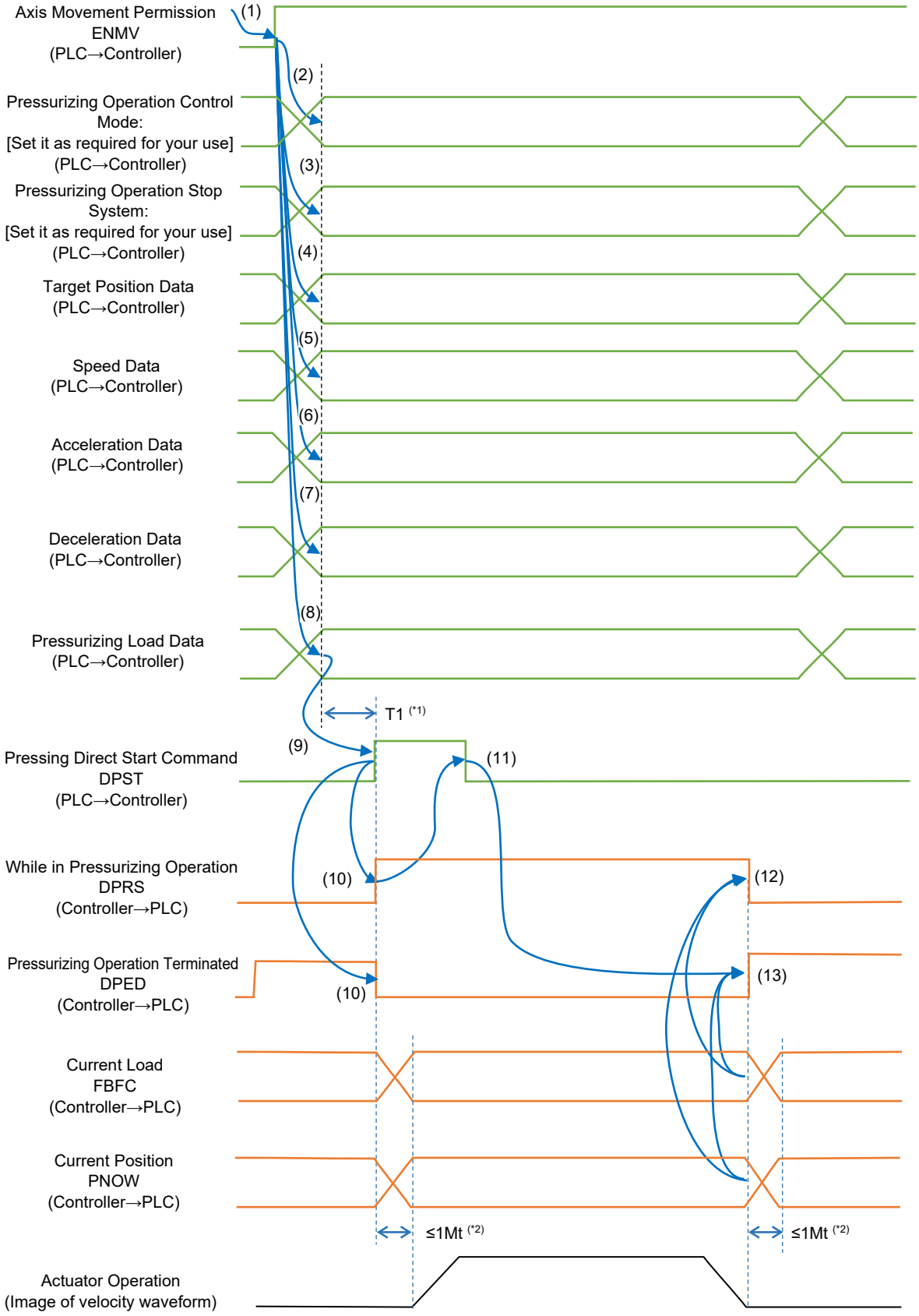
PRMD	Pressurizing Operation Control Mode
OFF	0: Velocity Control Mode
ON	1: Force Control Mode

(3) Set the pressurizing operation stop system signal (STM0 to 2) in a purpose of your use.

STM2	STM1	STM0	Pressurizing Operation Stop System
OFF	OFF	OFF	0: Stop at Position
OFF	OFF	ON	1: Stop with Load
OFF	ON	OFF	2: Stop at Position 2

(4) Set the termination position data or control position data to the target position register (PCMD).
(5) Set the velocity data in the velocity register (VCMD).
(6) Set the acceleration data to the acceleration register (ACMD).
(7) Set the deceleration data to the deceleration register (DCOM).
(8) Set the maximum load data or termination load data to the pressurizing load register (PRLD).
(9) Turn the pressing direct start signal (DPST) on.
* The data set in (2) to (8) should be read into a controller with the rising edge of DPST Signal.
(10) The pressurizing operation ongoing signal (DPRS) should turn on and the pressurizing termination signal (DPED) off after DPST Signal gets turned on.
(11) Turn DPST Signal off after confirming that DPRS Signal has been turned on.
* Do not attempt to make any change to a value in each data unless DPST Signal is confirmed off.
(12) DPRS Signal should turn off once reached the termination position set in (4) or the termination load set in (8). (*1)
(13) DPED Signal should turn on while DPST Signal is off and it reaches the termination position set in (4) or the termination load set in (8) at the same time. (*1)

*1 When the pressurizing stop system is “0: Stop at Position” or “2: Stop at Position 2”, the condition to terminate the pressurizing operation should be a position.
When the pressurizing stop system is “1: Load Stop”, the condition to terminate the pressurizing operation should be a load.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

[4] Stop

Have the host PLC perform a stop control with a timer.

[5] Depressurize

There are two ways to depressurize.

Use "A) Positioning Direct" when velocity is to be prioritized for depressurizing.

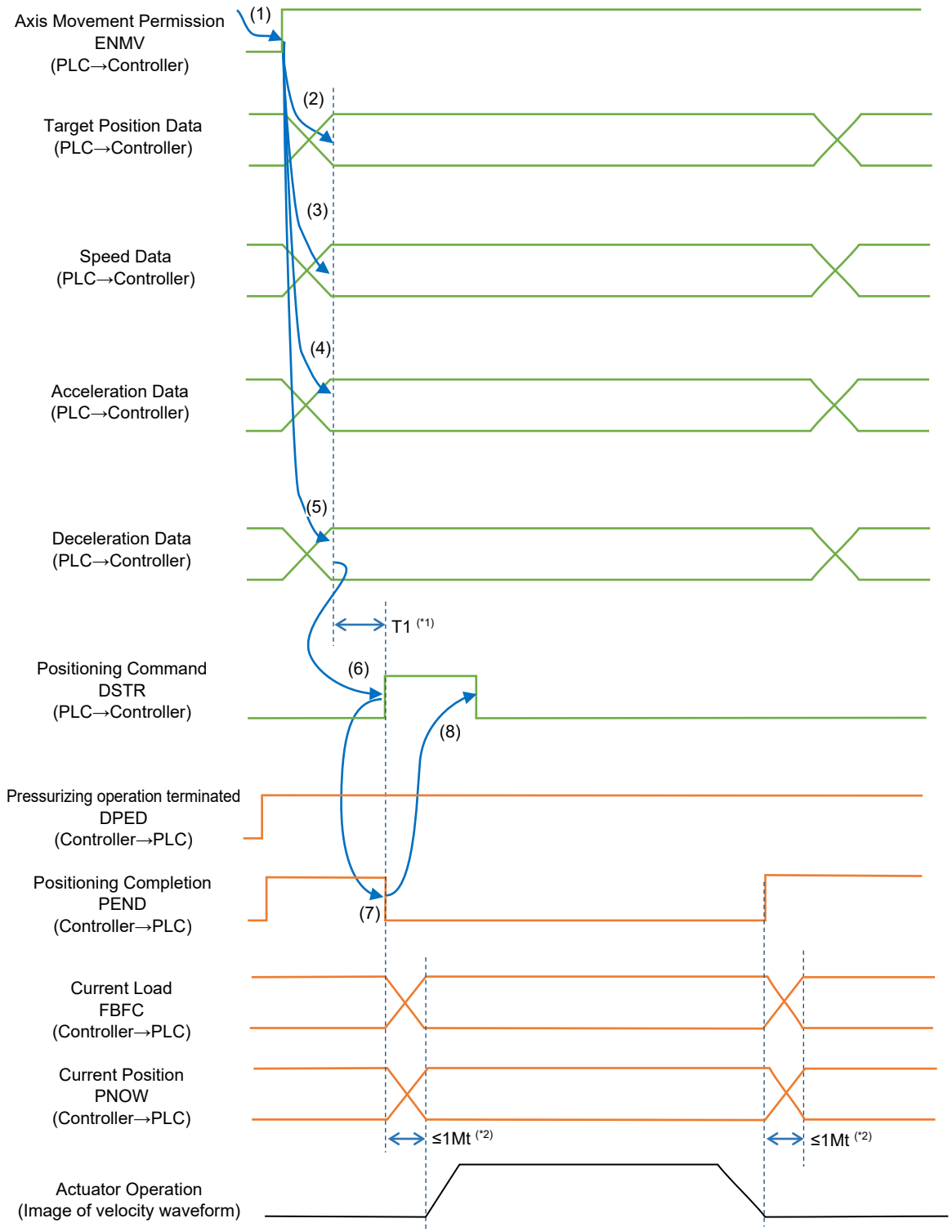
Use "B) Pressing Direct" when it is required to control sudden depressurizing.

A) Positioning Direct

Depressurizing operation should be conducted while the pressurizing operation termination signal (DPED) is on.

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the target position data in the target position register (PCMD).
(3) Set the velocity data in the velocity register (VCMD).
(4) Set the acceleration data to the acceleration register (ACMD).
(5) Set the deceleration data to the deceleration register (DCOM).
(6) Turn on the positioning command signal (DSTR).
    * The data items set in Steps (2) through (5) are read in the controller at the startup (ON-edge) of the DSTR signal.
(7) The positioning complete signal (PEND) should turn off after DSTR Signal turns on.
(8) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
    * Do not change any value in each data until the DSTR signal has been turned “OFF”.

Terminate the depressurizing operation once the current load register (FBFC) has undergone the load specified by you during the positioning operation.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

B) Pressing Direct

Depressurizing operation should be conducted while the pressurizing operation termination signal (DPED) is on.

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the pressurizing operation control mode register (PRMD) to “1: Force Control Mode”.

PRMD	Pressurizing Operation Control Mode
ON	1: Force Control Mode

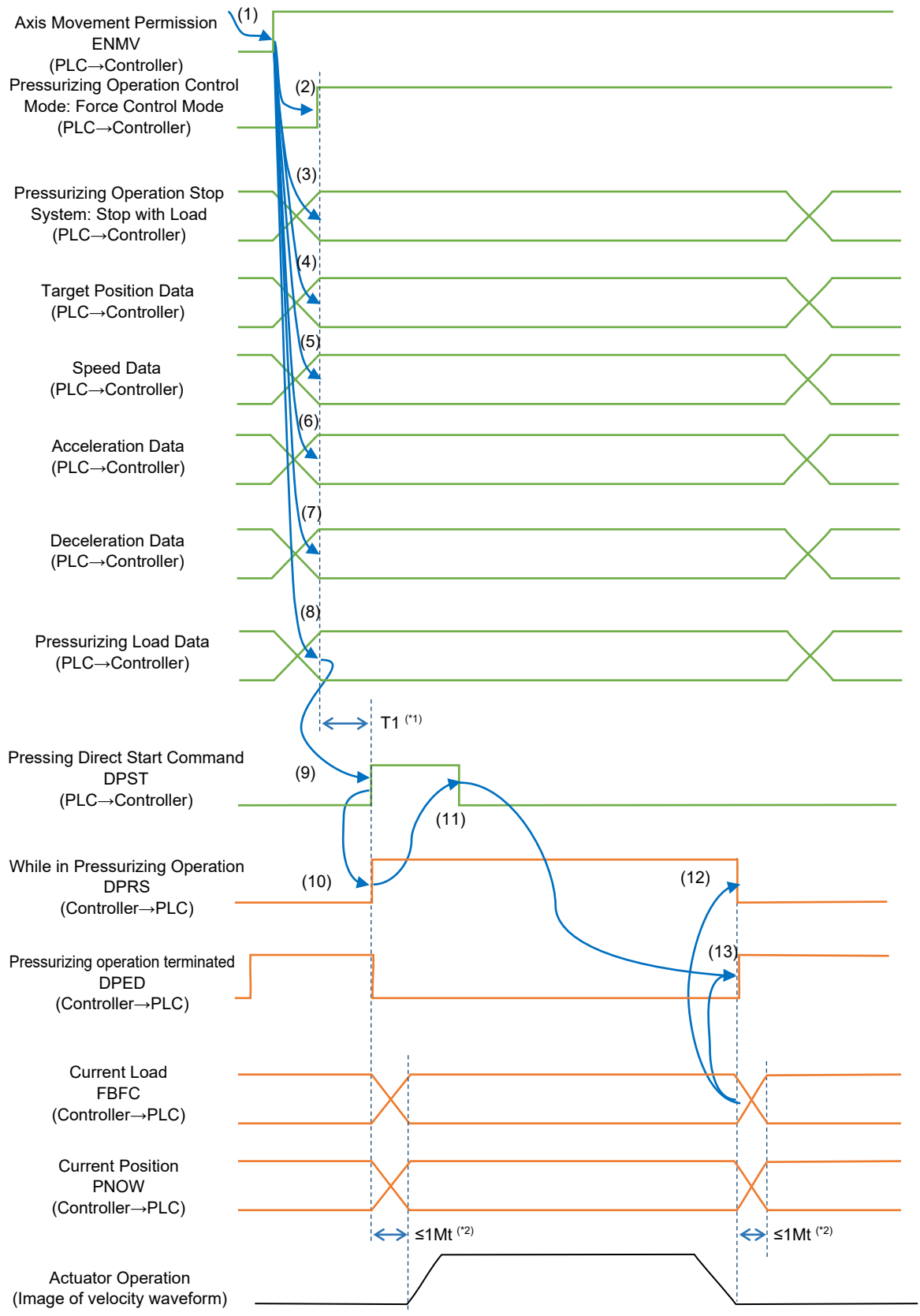
(3) Set the pressurizing operation stop system signal (STM0 to 2) to “1: Stop with Load”.

STM2	STM1	STM0	Pressurizing Operation Stop System
OFF	OFF	ON	1: Stop with Load

(4) Set the control position data to the target position register (PCMD).
(5) Set the velocity data in the velocity register (VCMD).
(6) Set the acceleration data to the acceleration register (ACMD).
(7) Set the deceleration data to the deceleration register (DCOM).
(8) Set the termination load to the pressurizing load register (PRLD).
(9) Turn the pressing direct start signal (DPST) on.
    * The data set in (2) to (8) should be read into a controller with the rising edge of DPST Signal.
(10) The pressurizing operation ongoing signal (DPRS) should turn on after DPST Signal turns on.
(11) Turn DPST Signal off after confirming that DPRS Signal has been turned on.
    * Do not attempt to make any change to a value in each data unless DPST Signal is confirmed off.
(12) DPRS Signal should get turned off once the load has reached the termination load set in (8).
(13) DPED Signal turns on while DPST Signal is off and also reached the termination load set in (8) at the same time.

When the current position register (PNOW) exceeds the target position register (PCMD) during the pressing direct operation, Alarm Code: OAE “Pressing Direct Operation Error (Detail Code: 0002 “Pressurizing Limit Position Exceeded”)” should occur. Therefore, in order to depressurize, set the target position to the positive side of the current position.

* By having the pressurizing load set smaller than the current load, operation should be made to balance to the pressurizing load, it will go backward as a result.

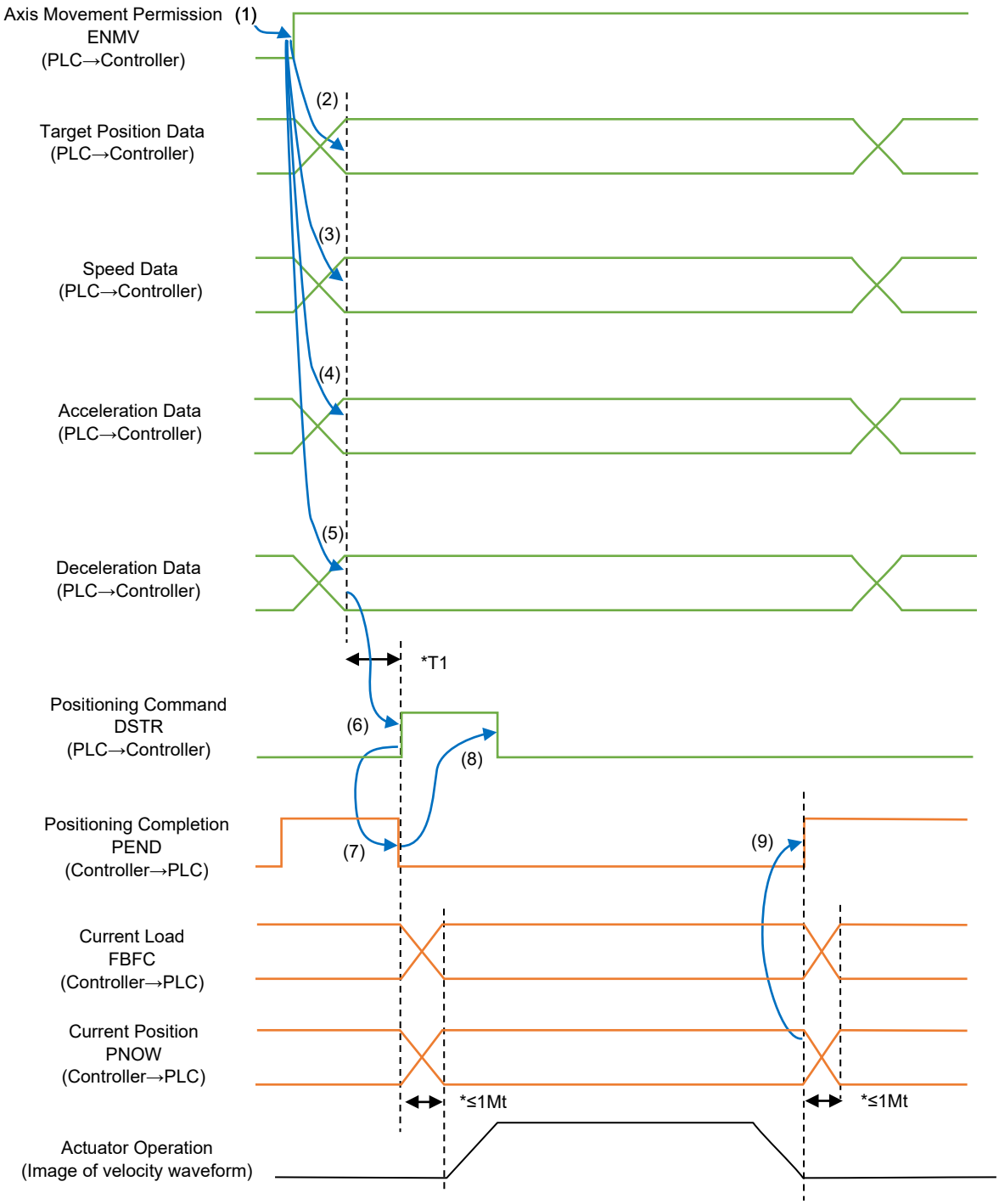


*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

[6] Return

(1) Turn ON (operation enable) axis movement permission signal (ENMV).
(2) Set the target position data in the target position register (PCMD).
(3) Set the velocity data in the velocity register (VCMD).
(4) Set the Acceleration data in the acceleration register (ACMD).
(5) Set the deceleration data in the deceleration register (DCMD).
(6) Turn on the positioning command signal (DSTR).
    * The data items set in Steps (2) through (5) are read in the controller at the startup (ON-edge) of the DSTR signal.
(7) Turn PEND Signal off after DSTR Signal gets turned on.
(8) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal.
    * Do not change any value in each data until the DSTR signal has been turned “OFF”.
(9) PEND Signal turns on while DSTR Signal is off and also reached the target position set in (2) at the same time.



*1 T1: Have an enough period of interval considering the scanning time of the host controller.

*2 Refer to [the specifications of the fieldbus to be used] for Mt.

5.9 EtherNet/IP Related Parameters

Parameters relating to EtherNet/IP are No. 84 to No. 87, No. 90, No. 140 to No. 142, No.159 and No.189.

Category: C: External interface parameter

No.	Category	Name	Default value set in the factory before delivery
1 to 83		Refer to [operation manual for the controller] for the parameters No. 1 through No. 83.	
84	C	Field bus operation mode	0
86	C	Field bus baud rate	0
87	C	Network type	7
90	C	Field I/O format	3
140	C	IP address	192.168.0.1
141	C	Subnet mask	255.255.255.0
142	C	Default gateway	192.168.0.0
159	C	FB Half Direct Mode Speed Unit	0
189	C	Direct Command Pressurizing Load Unit	Depends on actuator

- Field bus operation mode (No. 84)
  Specify the operation mode in parameter No. 84.

Value set in parameter No. 84	Mode	Number of occupied bytes	Contents
0 (Factory setting)	Remote I/O mode	2	Operation using PIOs (24-V I/Os) is performed via EtherNet/IP
1	Full function mode	32	It is the system to support all the features such as movement by direct indication or current load reading in addition to those for servo press such as startup of press program or judgment result reading.
2	Pressing direct mode	4	It is an operation mode to indicate the "pressurizing stage" in a pressing program directly in numbers.

- Fieldbus baud rate (No. 86)
  Specify the baud rate in parameter No. 86.

Value set in parameter No. 84	Baud rate
0 (Factory setting)	Auto negotiation (recommended)
1	10 Mbps, half-duplex
2	10 Mbps, full-duplex
3	100 Mbps, half-duplex
4	100 Mbps, full-duplex
Other than the above	Baud rate setting error

- Network type (No. 87)
  The network module type is set for the parameter No. 87. Do not change the default value.

● Field bus I/O format (No. 90)
By changing the setting of parameter No. 90, data elements can be swapped within a boundary of two words or less in units of bytes during communication using the I/O areas of the PLC.

Value set in parameter No. 90	Contents
0	Data exchange is not performed. The data is sent directly to the PLC. Refer to [the Example i].
1	The host bytes are exchanged with slave bytes in the host words and slave words. Refer to [the Example ii].
2	In the case of word register, the host words are exchanged with the slave words. Refer to [the Example iii].
3 (Factory setting)	The host bytes are exchanged with slave bytes in the host words and slave words. In addition, the upper word and lower word are swapped for word resisters. Refer to [the Example iv].

(Example i) Set value = “0”

● indicates ON, while ○ indicates OFF

SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example ii) Set value = “1”

● indicates ON, while ○ indicates OFF

SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

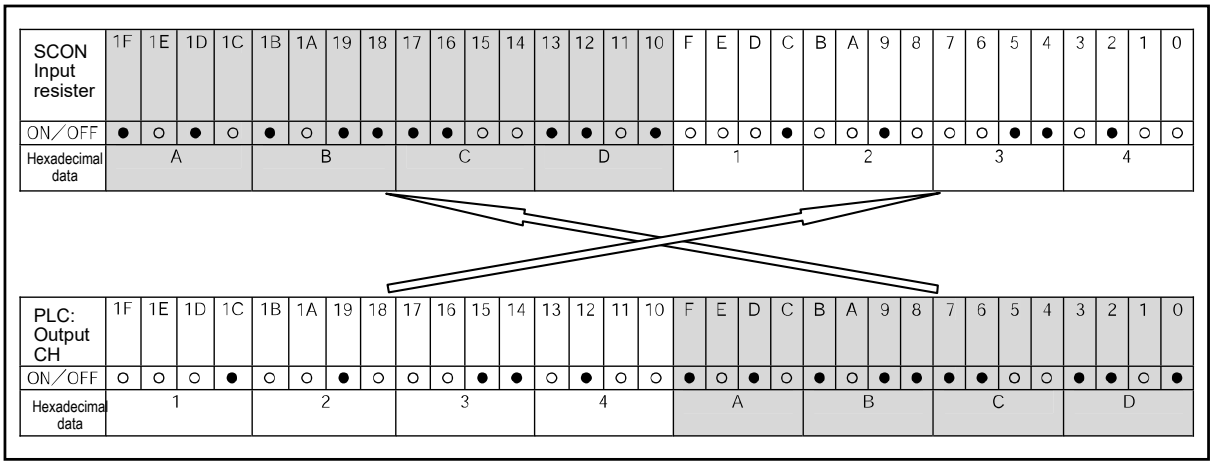
PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

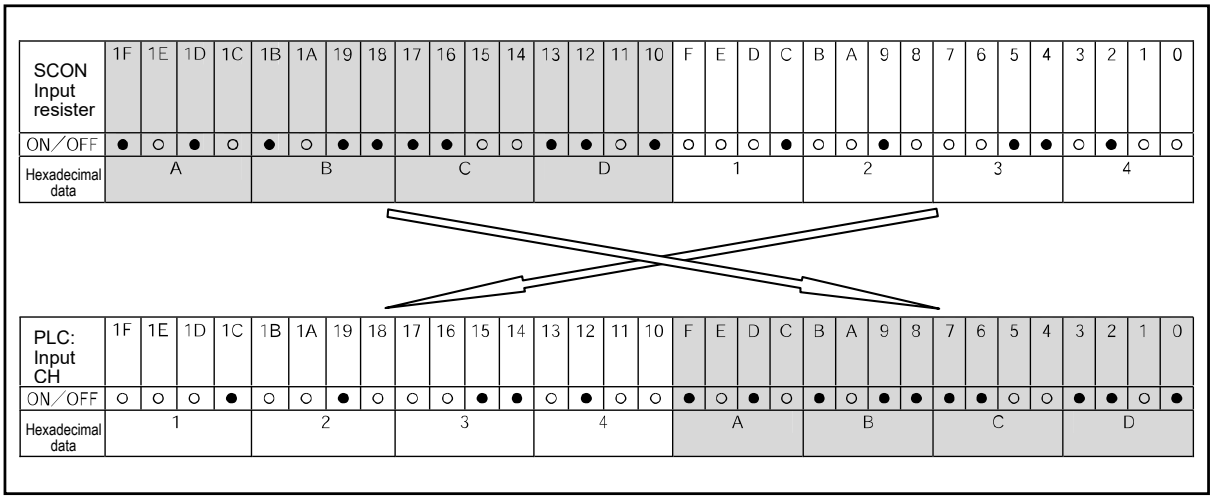
SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

(Example iii) Set value = “2”

● indicates ON, while ○ indicates OFF





(Example iv) Set value = “3” ● indicates ON, while ○ indicates OFF

SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○
Hexadecimal data	C				D				A				B				3				4				1				2			

PLC: Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

- IP address (No. 140)
  Specify the IP address in parameter No. 140.

  Setting range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.1)

- Subnet mask (No. 141)
  Specify the subnet mask in parameter No. 141.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 255.255.255.0)

- Default gateway (No. 142)
  Specify the default gateway in parameter No. 142.

  Settable range: 0.0.0.0 to 255.255.255.255 (Factory setting: 192.168.0.0)

- FB Half Direct Mode Speed Unit (No. 159)
  Parameter No. 159 determines the unit of measure when operating the unit in half direct mode.

Parameter No.159 setting value	Speed setting unit
0 (Set in delivery)	1.0 mm/s
1	0.1 mm/s

- Direct Command Pressurizing Load Unit (No. 189)
  Set up Parameter No. 189 "Direct Command Pressurizing Load Unit".
  It should be the selection of "Pressurizing load" and "Load zone boundaries ±" in the pressing direct command.

Setting value	Direct Command Pressurizing Load Unit
0	0.01N
1	0.1N
2	N
3	10N

The initial settings on delivery should be as shown below. (Dependent to actuator)

Model	Max. Pressing Force	Initial Value	Range Available for Command
RCS3-RA4R	200N	2 (N)	-32768N to 32767N
RCS3-RA6R	600N		
RCS3-RA7R	1200N		
RCS3-RA8R	2000N		
RCS3-RA10R	6000N		
RCS2-RA13R(1t)	9800N	3 (10N)	-327680N to 327670N
RCS2-RA13R(2t)	19600N		
RCS3-RA15R	30000N		
RCS3-RA20R	50000N		

Negative values not available for input in pressurizing load

5.10 Troubleshooting

(1) Alarm messages and causes/actions

The alarm signal (ALM) or light malfunction alarm (ALML) is output in active low in the remote I/O mode when an alarm is generated.

In the full functional mode, an alarm code gets output to the press program alarm code register and alarm code register.

[1] Check the alarm code using the monitor function of the PLC, etc., or connect the teaching tool and check the status monitor screen.

[2] Search the alarm list in the instruction manual for your controller to find the section corresponding to the identified alarm code.

[3] Take an appropriate action according to the explanation of the alarm code.
For the alarm codes listed below, take the corresponding actions:

Code	Error name	ID (*1)	Alarm reset	Cause/action
094	Press program alarm detection	02	Can	Cause: It shows an alarm has occurred while the press program is executed. Action: Have a countermeasure by referring to the press program alarm list provided below. [Program Alarm in SCON-CB Series Controller Servo Press Function Instruction Manual (ME0345)]
0AD	Press program data error	06	Can	Cause: Program check at controller startup, program startup command and program home position movement command has detected an error. Action: As the program number is stored in the detail code, check the applicable grogram setting.
0F2	Fieldbus module error	05	Cannot	Cause: A fieldbus module error has been detected. Action: Check the applicable parameters.
0F3	Fieldbus module non-detection error	04	Cannot	Cause: The module could not be detected. Action: Reconnect the power. If the problem persists, please contact IAI.
0FD	Extension device error	05	Cannot	Cause: Error in load data analog output component (Note) An error will not be detected when parameter No. 180 “DAC Output” is set inactivated. Action: Check the wires for analog output. In case there is no fault wiring, please contact IAI.

(*1) ID → Simple alarm code

(2) Alarm Codes Specific to Pressing Direct Mode

Code	Name	ID (*1)	Alarm Reset	Detail Code	Contents
0A3	Position Command Information Data Error	3	Can	**	
0AE	Pressing Direct Operation Error	3	Can	01	Max. Pressurizing Load Exceeded
				02	Pressurizing Position Limit Exceeded
				03	Target Load Undetected
				04	Allowable Velocity Exceeded during Pressurizing Operation Before Contact to Workpiece

(*1) ID → Simple alarm code

● Details of Alarm Codes

0A3H : Position Command Information Data Error

This alarm should be generated when there is a data error in the pressing direct command.
Refer to [the table below] for the addresses of the signals related to the pressing direct command.

Adress	Symbol
0F00	Target position
0F02	Speed
0F04	Acceleration
0F06	Deceleration
0F14	Pressurizing Load
0D0A	Control signal 1

0AEH : Pressing Direct Operation Error

This alarm should be generated when there is an error during operation with the pressing direct command.

< Detail Code 01 >
The load has exceeded the pressurizing load before reaching the target position when the stop system is "Stop at Position".

< Detail Code 02>
The position has reached the target position before reaching the pressurizing load when the stop system is "Stop with Load".

< Detail Code 03>
The pressurizing load was not detected before reaching the target position when the stop system is "Stop at Position 2".

< Detail Code 04>
It occurs in a condition that a workpiece is not in contact when the pressing direct start is contacted with velocity that exceeds "Max. Pressing Velocity" in the system parameter.

* While in the pressing direct command, the condition that the current load is at or above "Deviation Error Monitoring Resuming Load" in the system parameter should be determined as the condition of a workpiece being in contact.

6. Appendix

Examples of connection settings with Omron's master and Keyence's master are provided.

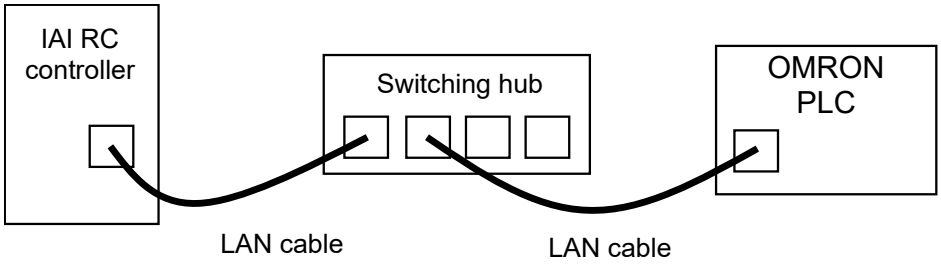
6.1 Example of Connection Settings with Omron's Master

The following devices and software are needed to connect to Omron's master:

[1] PLC CPU unit: (Example) CJ2M-CPU31 (with built-in EtherNet/IP)
[2] Power unit: (Example) PA202
[3] Configuration software: CX-One V4.0 or later, CX-Programmer V9.12 or later
[4] Configuration software: CX-One V4.0 or later, Network Configurator V3.20 or later
[5] Commercially available switching hub (supporting 100BASE-TX)
[6] IAI controller (ACON-C, PCON-C/CA, SCON-CA) of EtherNet/IP specification
[7] Straight LAN cable (category 5 or larger) x 2 pcs

6.1.1 Connection Example

A setting example based on the following connection configuration is given.



(Note) The power supply, actuator, etc., are not illustrated.

The connection procedure explained on the following pages is based on the following settings:

Item	Controller	PLC	Remarks
IP address	192.168.0.1	192.168.0.10	
Subnet mask	255.255.255.0	255.255.255.0	
Default gateway	0.0.0.0	0.0.0.0	Disable the default gateway.
Baud rate	Set automatically.	Set automatically.	100 Mbps/full-duplex when link is established (The specific settings vary depending on the switching hub specification.)

6.1.2 Setting the Controller

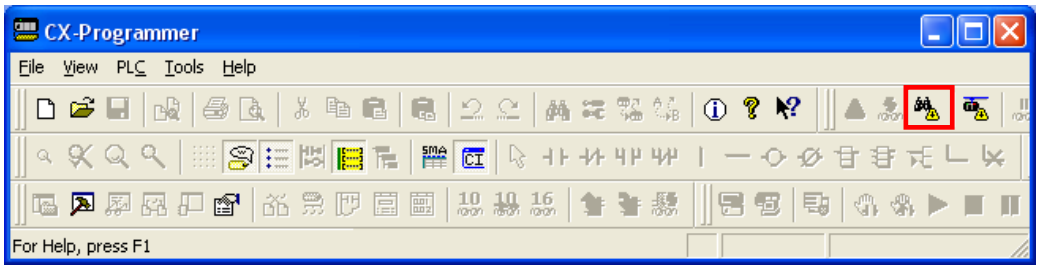
Actuate an emergency stop on the controller and then start the controller with the MODE switch set to MANU. (This is to prevent the motor from starting due to output signals from the PLC.)
Start the RC PC software and set the user parameters for the controller.

No.	Name	Factory setting value	Remarks
25	PIO pattern selection	0	Standard mode
84	Fieldbus operation mode	0	Remote I/O mode (I/O sizes: 2 bytes/2 bytes)
86	Fieldbus baud rate	0	Automatically negotiated.
87	Network type	7	EtherNet/IP
90	Fieldbus I/O format	3	Byte swap/word swap
140	IP address	192.168.0.1	
141	Subnet mask	255.255.255.0	
142	Default gateway	0.0.0.0	Disable the default gateway.

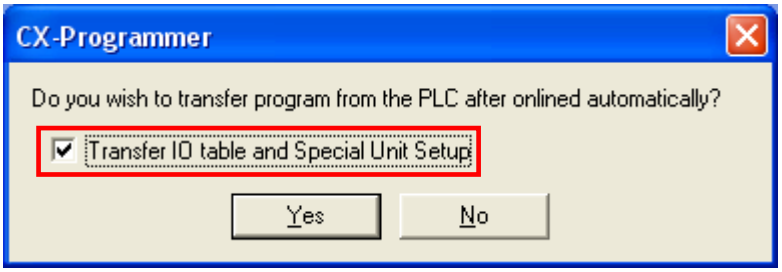
6.1.3 Setting the PLC (1) [CX-Programmer]

[1] Set “NODE No.” rotary switches “x16^1” and “x16^0” to “0” and “A,” respectively, on the front face of the CJ2M-CPU31 unit, and start the PLC.

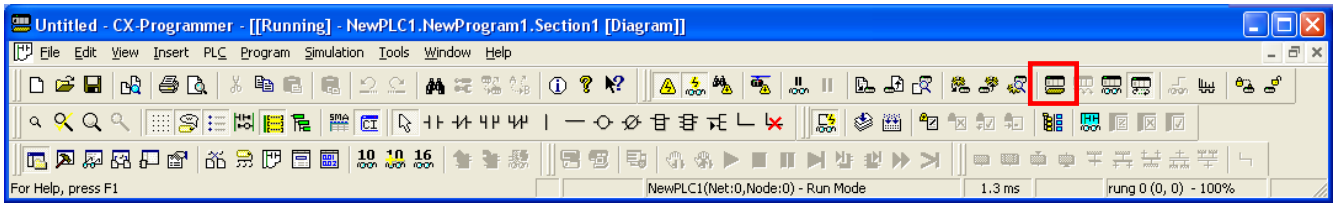
[2] Start CX-Programmer and click the Connect Directly button on the toolbar to connect to the PLC.



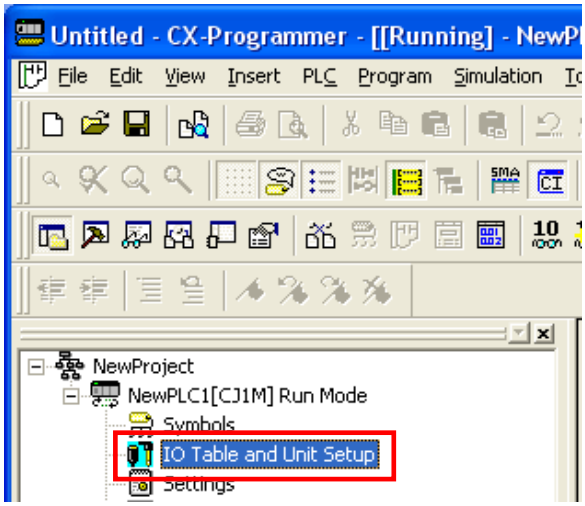
[3] When the following message appears, select the [Also transfer I/O table and high-function unit settings] check box and click the Yes button.



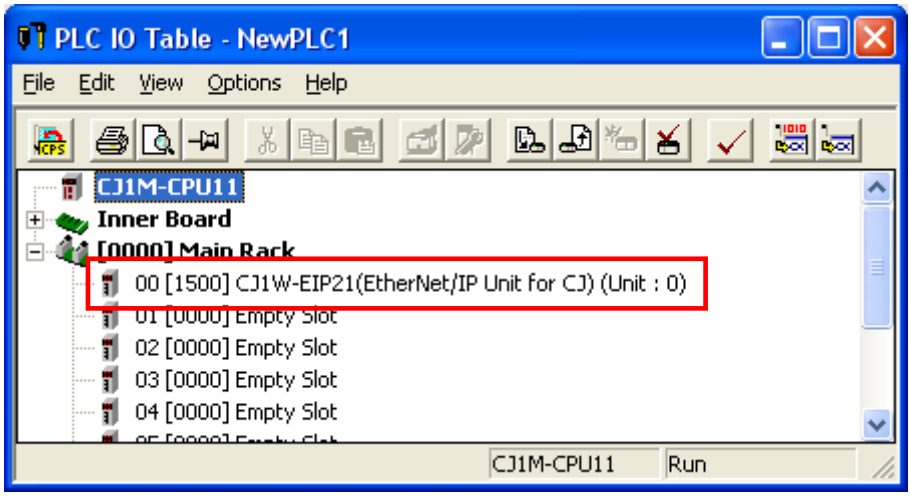
[4] Click the Program Mode button to switch the PLC to the program mode.



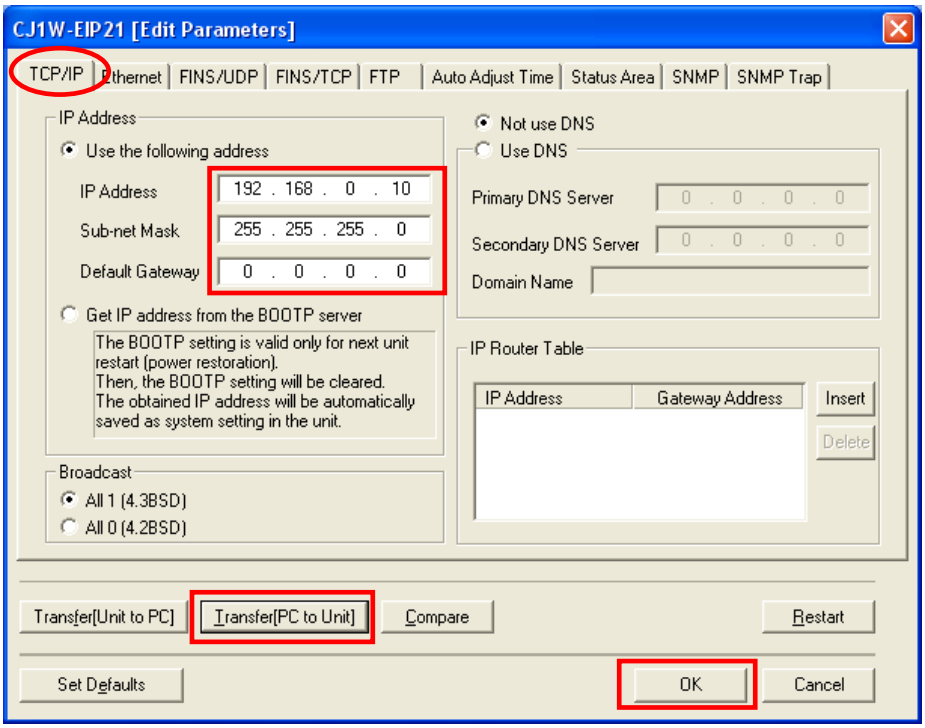
[5] Double-click “I/O Table/Unit Settings” in the workspace.



[6] In the “PLC I/O Table” window, double-click “Built-in Ports/Inner Boards” and then double-click “[1500] CJ2M-EIP21.”



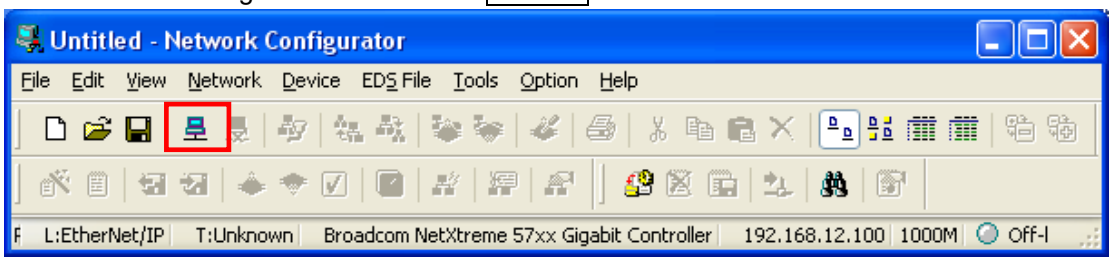
[7] In the “CJ2M-EIP21 [Edit Parameters]” dialog box, select the “TCP/IP” tab and set as follows, and then click the Transfer [PC → Unit] button to transfer the parameters to the PLC. Keep the default settings on other tabs.



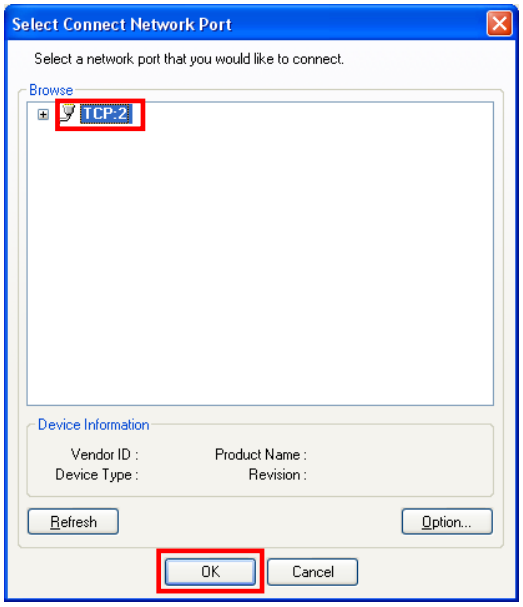
After the parameters have been transferred, follow the onscreen instructions to complete all necessary steps, until restarting of the PLC, and then click the OK button.

6.1.4 Setting the PLC (2) [Network Configurator]

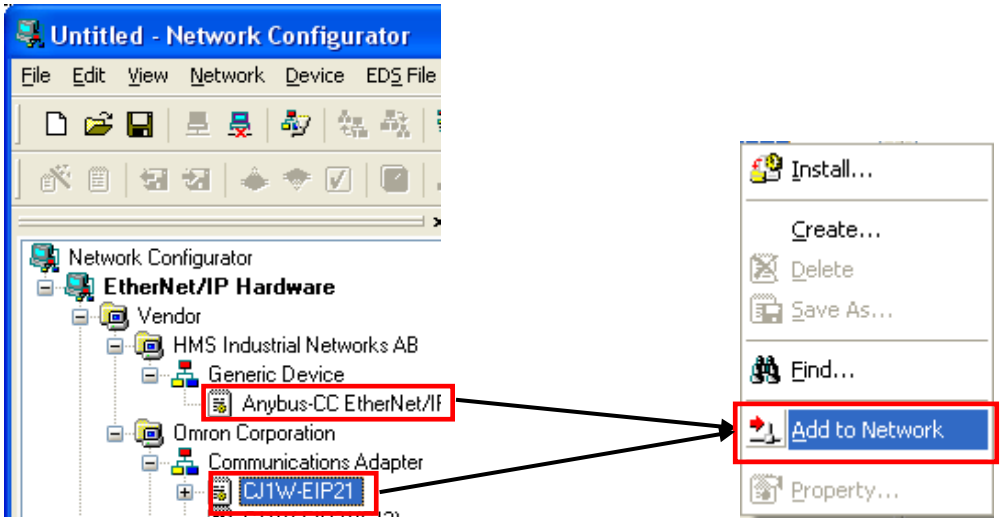
[1] Start Network Configurator and click the Connect button on the toolbar to connect to the PLC.



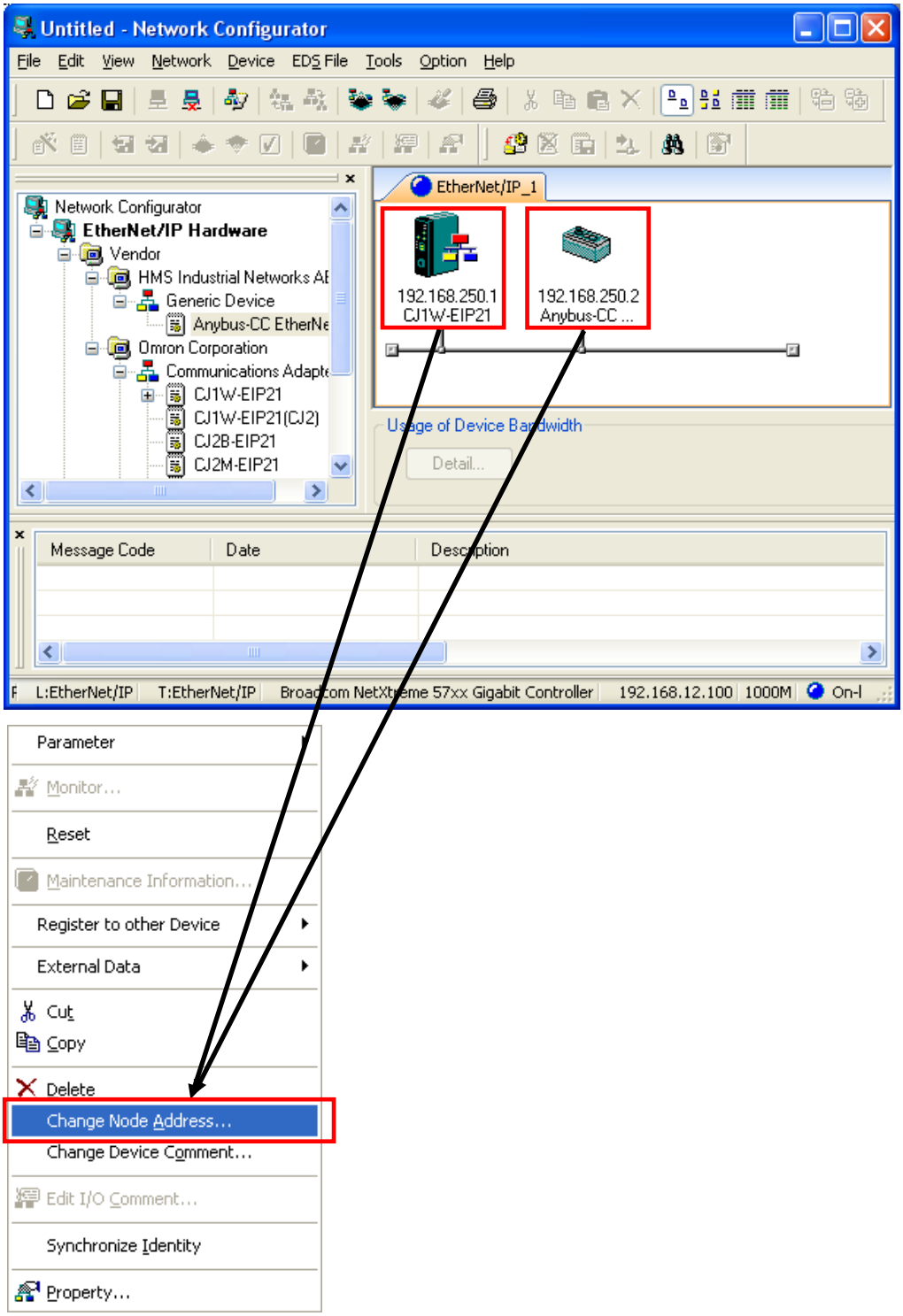
[2] In the “Select Connection Network Port” dialog box, select “TCP:2” and click the OK button.

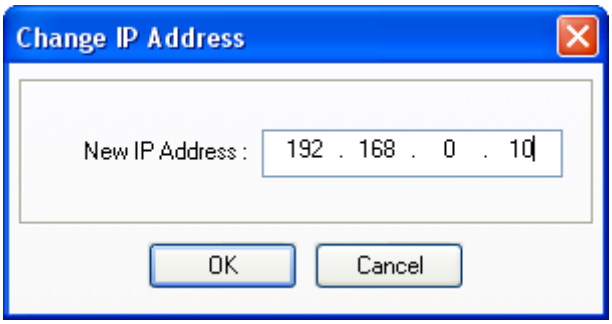


[3] Right-click “CJ2M-EIP21” (OMRON PLC) and “Anybus-CC EtherNet/IP” (Controller) in the hardware list, and select [Add to Network] in the pop-up menu for each device.

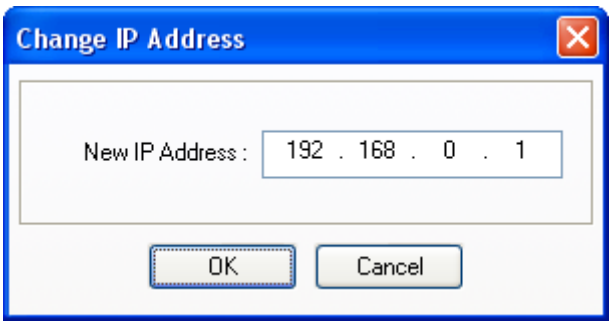


[4] Right-click each device in the main window and select [Change Node Address] in the pop-up menu to set the IP address.





PLC's IP Address

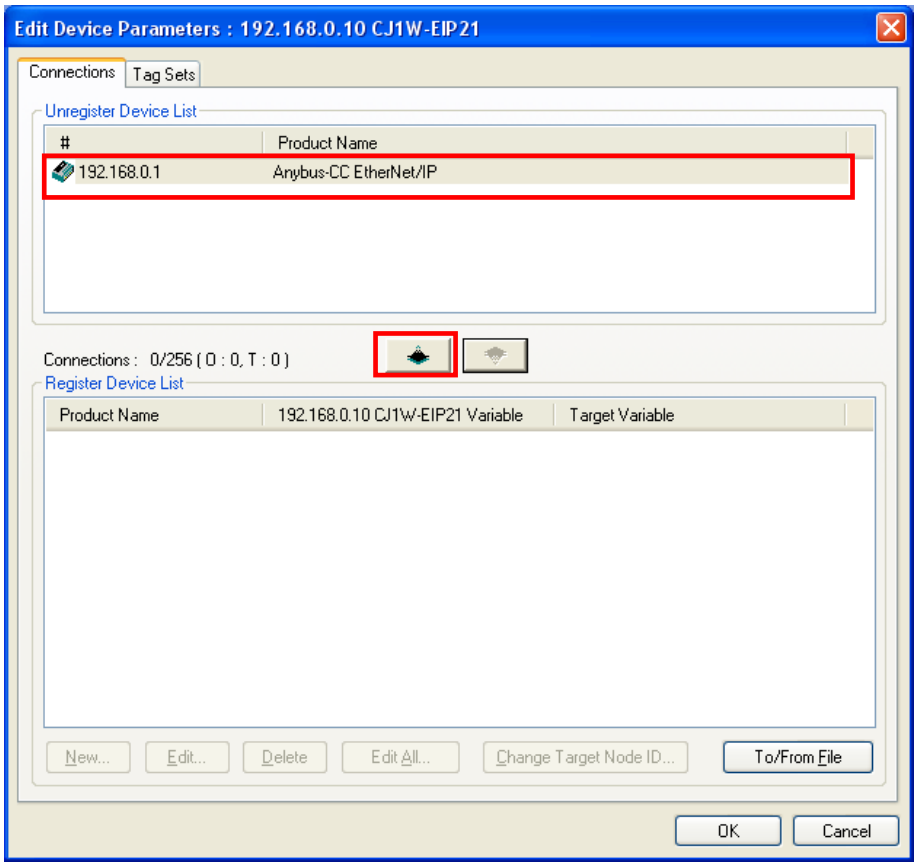


Controller's IP Address

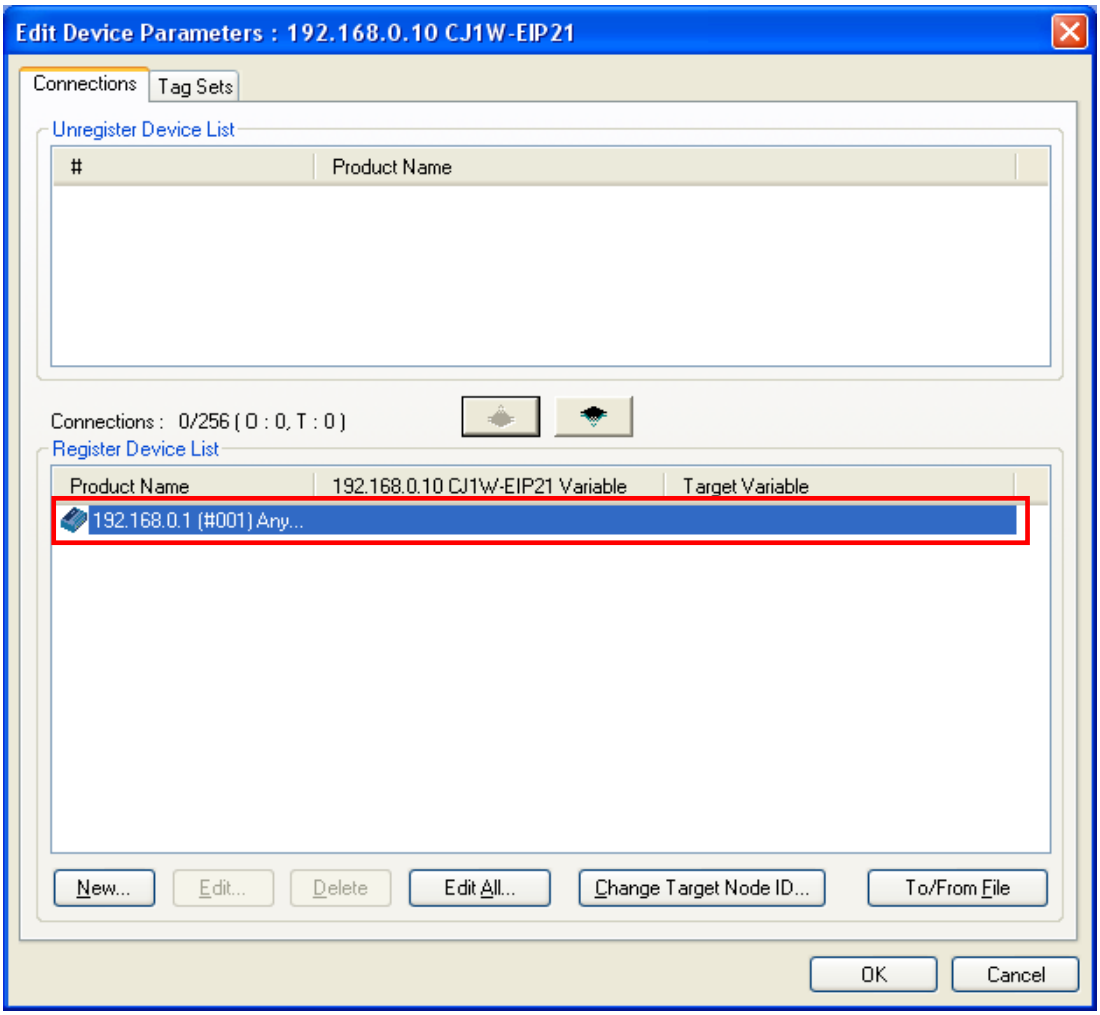
[5] Double-click “Anybus-CC EtherNet/IP” in the main window and set the controller device parameters as follows:

Item	Set value
0001 Output Size	2
0002 Input Size	2
0003 RPI Range	10000 (default value)

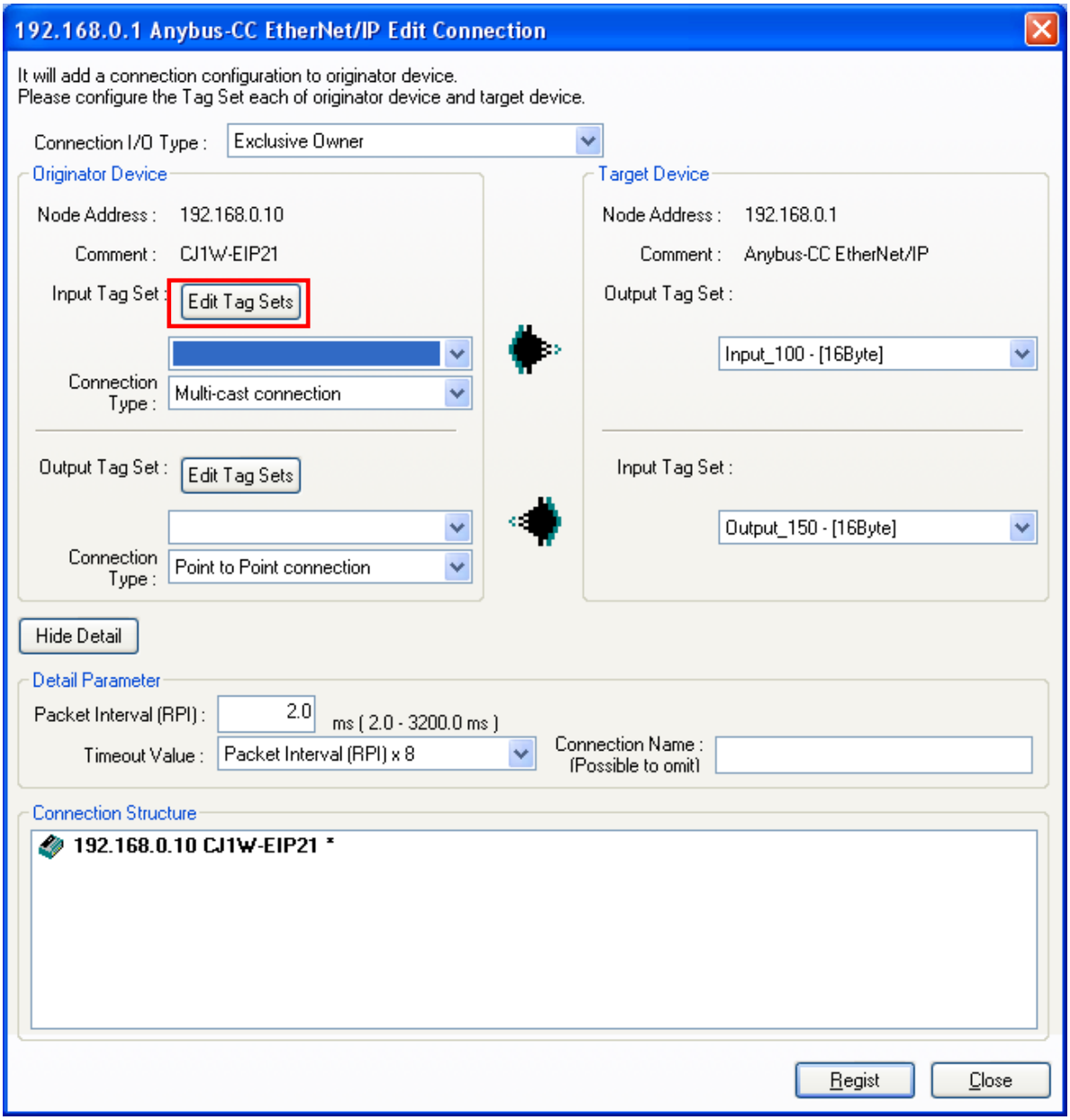
[6] Double-click “CJ2M EIP21” in the main window to open the PLC’s “Edit Device Parameters” dialog box, and select “Anybus-CC EtherNet/IP” under “List of Unregistered Devices” and register the device.



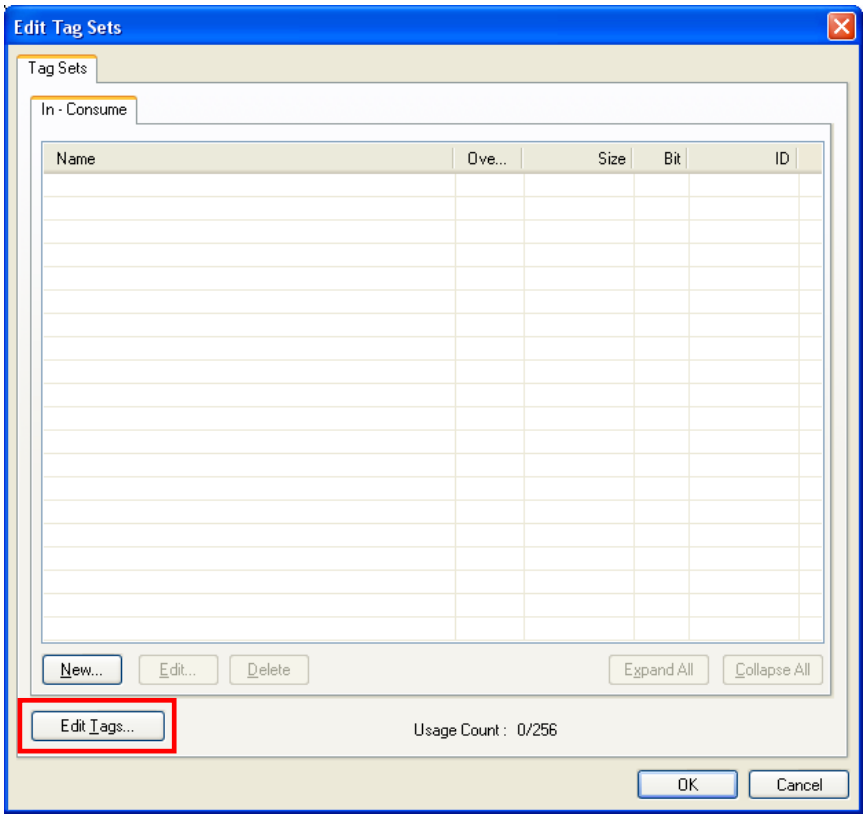
[7] Once the device is registered, “Anybus-CC EtherNet/IP” moves to “List of Registered Devices.” Double-click “Anybus-CC EtherNet/IP” you have just registered.



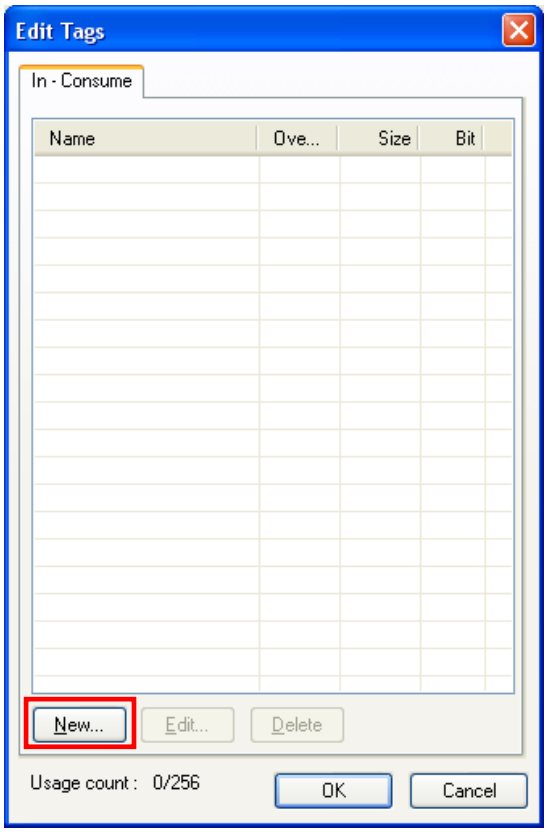
[8] In the “Assign Connection” dialog box, click the Edit Tag Set button next to “Input Tag Set” in the Originator Device area.



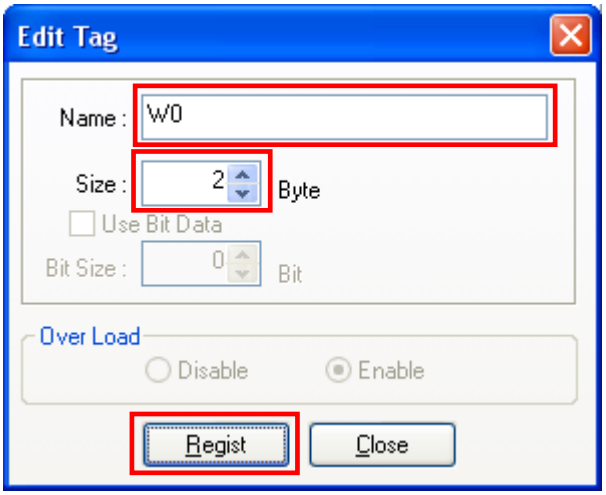
[9] In the “Edit Tag Set” dialog box, click the Edit Tag button.



[10] In the “Edit Tag” dialog box, click the New button.

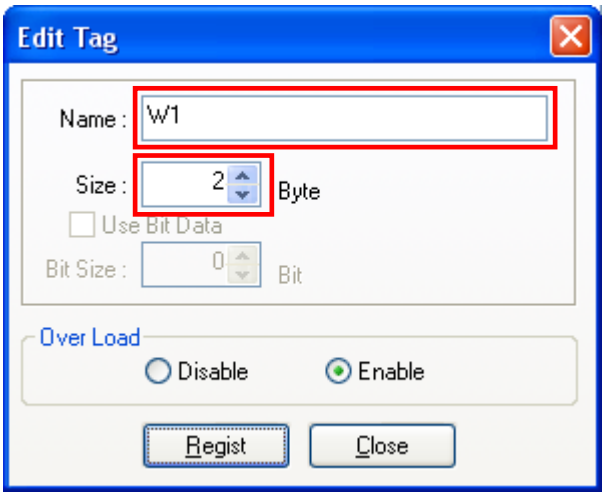


[11] In the “Set Tag” dialog box, set as follows and click the Register button.

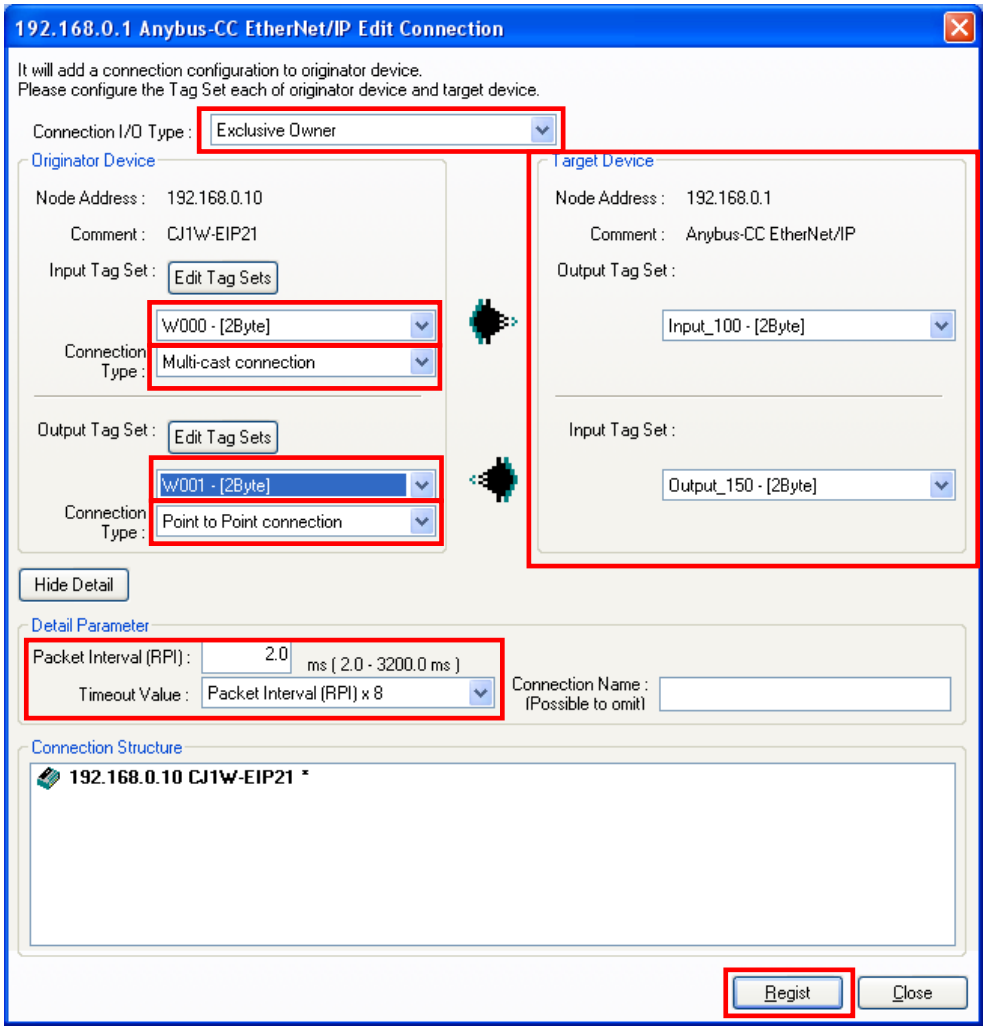


[12] When tag “W0’” has been registered in the “Set Tag” dialog box, close the “Set Tag” dialog box. (No other tag is registered continuously.)
Click the OK button in the “Edit Tag” dialog box and again in the “Edit Tag Set” dialog box, to close each dialog box.

[13] Register a tag from “Output Tag Set” in the Originator Device area, just like you did from “Input Tag Set.”
For the output tag set, set as follows in the “Set Tag” dialog box:

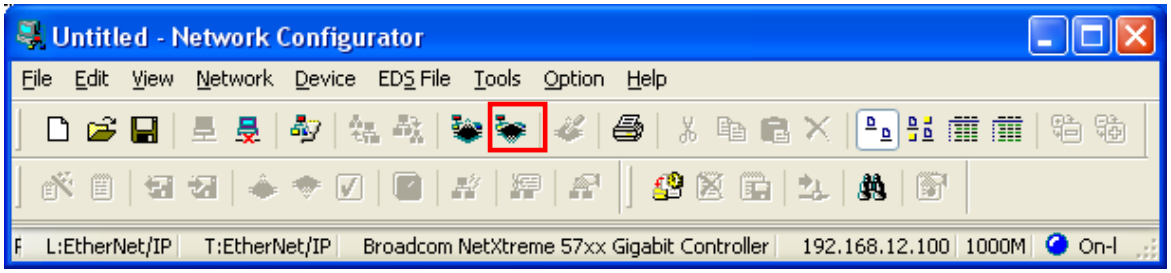


[14] In the “Assign Connection” dialog box, set as follows and click the Register button.
Confirm that the values in the “Target Device” area match those set in step [5].



[15] When the registration in “Assign Connection” is complete, the “Assign Connection” dialog box opens again.
Click the Close button to close the dialog box.

[16] In the “Edit Device Parameters” dialog box, click the OK button.
Click the Download to Network button on the toolbar to start writing the parameters to the PLC, after which the PLC is restarted. Wait for several seconds, and link will be established between the PLC and controller.



[17] Upon establishment of link, the LEDs on the PLC and controller change their statuses as follows:

LED statuses on PLC

LED	Status
MS	Steady green light
NS	Steady green light
COMM	Steady orange light
100M	Steady orange light
10M	Unlit

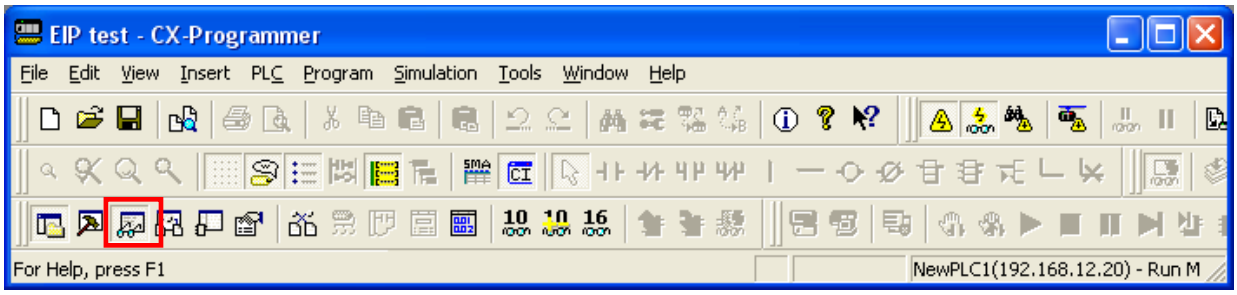
LED statuses on Controller

LED	Status
MS	Steady green light
NS	Steady green light
Link/Activity	Blinking green light

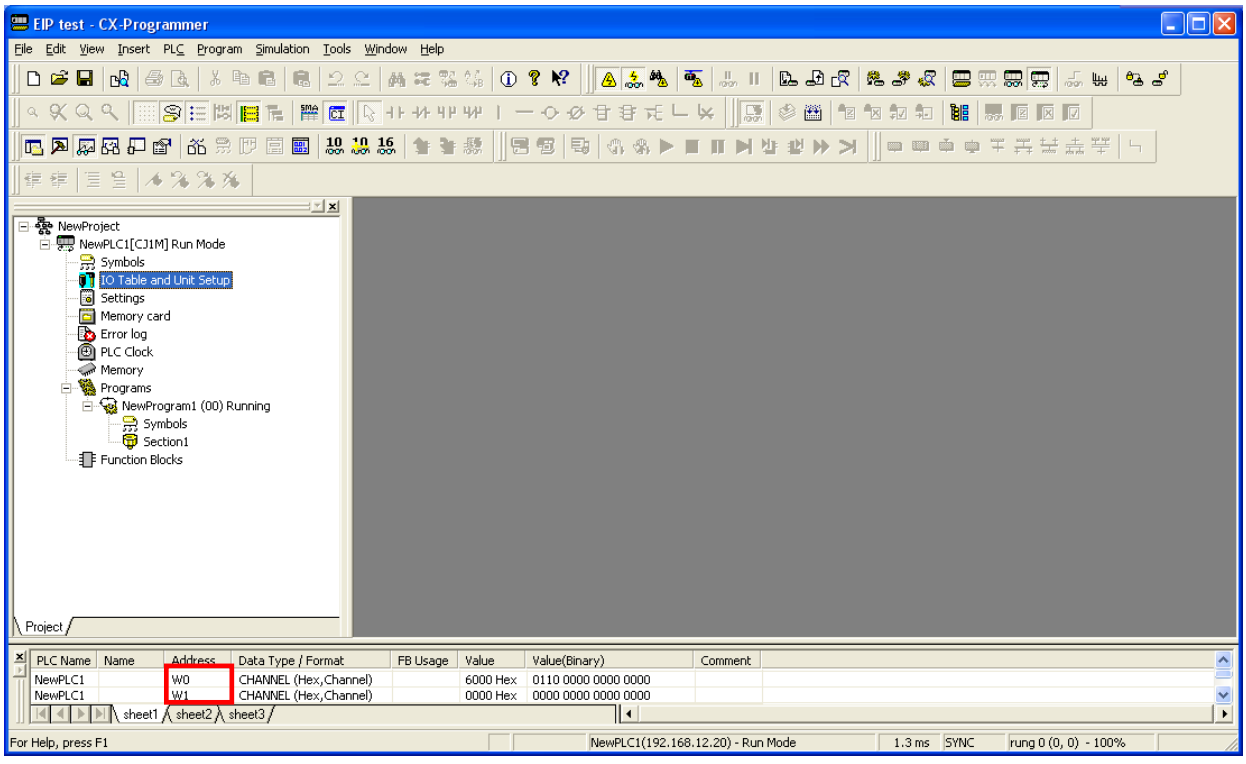
6.1.5 Checking the I/O Data on the PLC

[1] Start CX-Programmer.

[2] Click the Switch Watch Window button on the toolbar.



[3] Register the tag names “W0” and “W1” in the “Address” fields of the “Watch Window,” and the current values of the registered tags will appear in the “Value” fields.



The description of each device is given below:

Tag name	Description
W0	Controller ⇒ PLC output
W1	PLC ⇒ Controller output

[4] Change the value of “W1” in the “Watch Window” and also change the controller output data, and check if the controller’s I/O port data match the values of tags “W0” and “W1.”

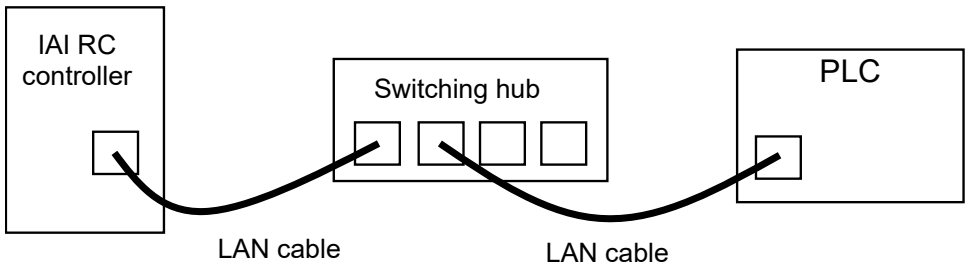
6.2 Example of Connection Settings with Keyence's Master

The following devices and software are needed to connect to Keyence's master:

[1] PLC CPU unit: (Example) KV-5500 (with built-in EtherNet/IP)
[2] Configuration software: (Example) KV-STUDIO Ver 6.10 or later
[3] Commercially available switching hub (supporting 100BASE-TX)
[4] IAI controller (ACON-C, PCON-C/CA, SCON-CA) of EtherNet/IP specification
[5] Straight LAN cable (category 5, or larger) x 2 pcs

6.2.1 Connection Example

A setting example based on the following connection configuration is given.



(Note) The power supply, actuator, etc., are not illustrated.

The connection procedure explained on the following pages is based on the following settings:

Item	Controller	PLC	Remarks
IP address	192.168.0.1	192.168.9.10	
Subnet mask	255.255.255.0	255.255.255.0	
Default gateway	0.0.0.0	0.0.0.0	Disable the default gateway.
Baud rate	Set automatically.	Set automatically.	100 Mbps/full-duplex when link is established (The specific settings vary depending on the switching hub specification.)

6.2.2 Setting the Controller

Actuate an emergency stop on the controller and then start the controller with the MODE switch set to MANU. (This is to prevent the motor from starting due to output signals from the PLC.)
Start the RC PC software and set the user parameters for the controller.

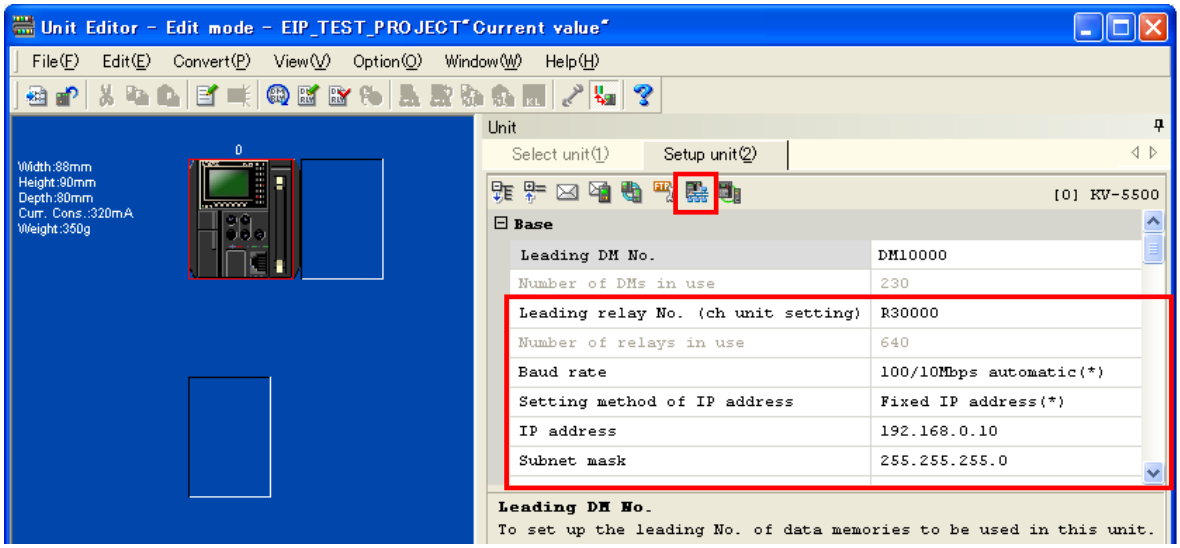
No.	Name	Factory setting value	Remarks
25	PIO pattern selection	0	Standard mode
84	Fieldbus operation mode	0	Remote I/O mode (I/O sizes: 2 bytes/2 bytes)
86	Fieldbus baud rate	0	Automatically negotiated.
87	Network type	7	EtherNet/IP
90	Fieldbus I/O format	3	Byte swap/word swap
140	IP address	192.168.0.1	
141	Subnet mask	255.255.255.0	
142	Default gateway	0.0.0.0	Disable the default gateway.

6.2.3 Setting the PLC

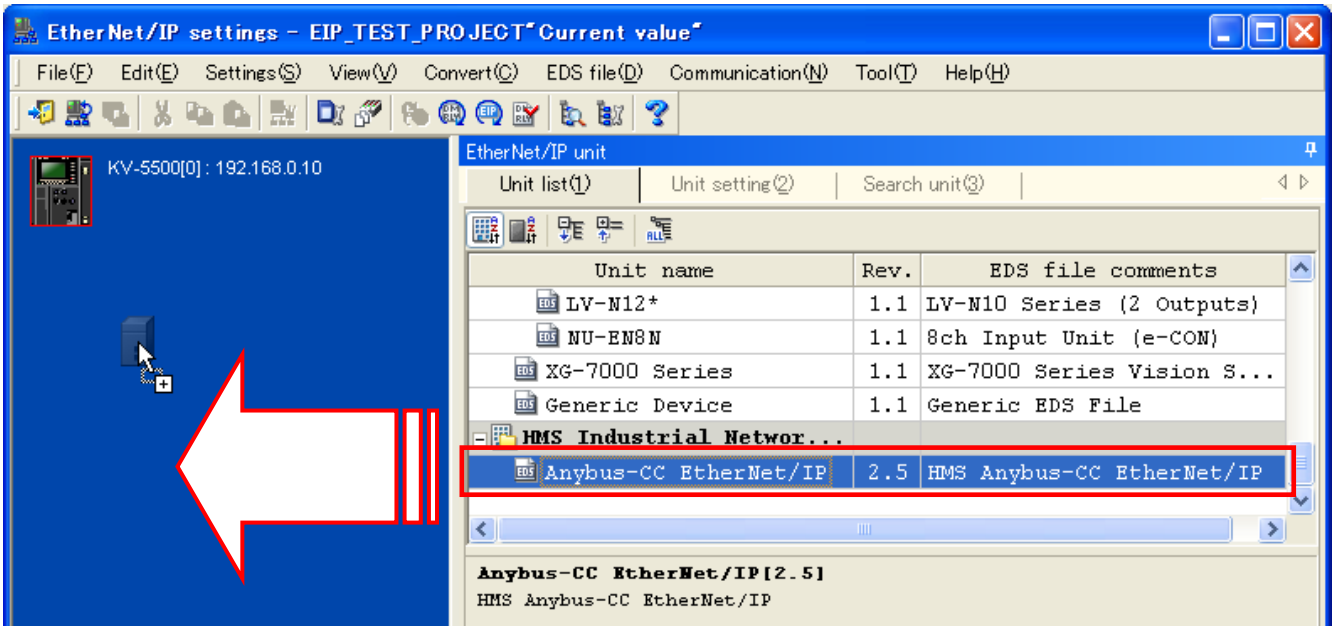
[1] Start Keyence's ladder support software "KV-STUDIO."

[2] Start the Unit Editor and set the baud rate, IP address setting method, IP address, subnet mask and default gateway on the "CPU Unit Settings (2)" tab.

When all items have been set, click the  button to start "EtherNet/IP Setup."

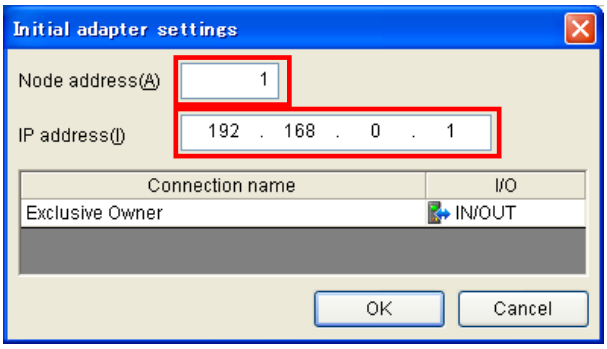


[3] When "EtherNet/IP Setup" has started, select "Anybus-CC EtherNet/IP" on the "Device List (1)" tab and drag & drop it in the scan list area on the left side of the screen.

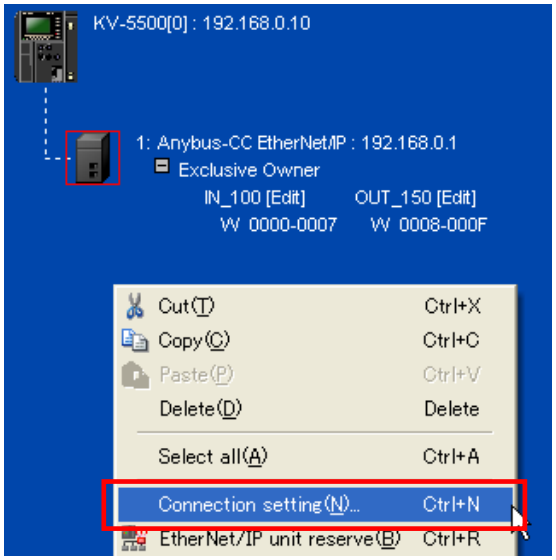


[4] When the device is registered in the tree below the PLC, the “Default Adapter Settings” dialog box appears. Set the IP address and node address here.

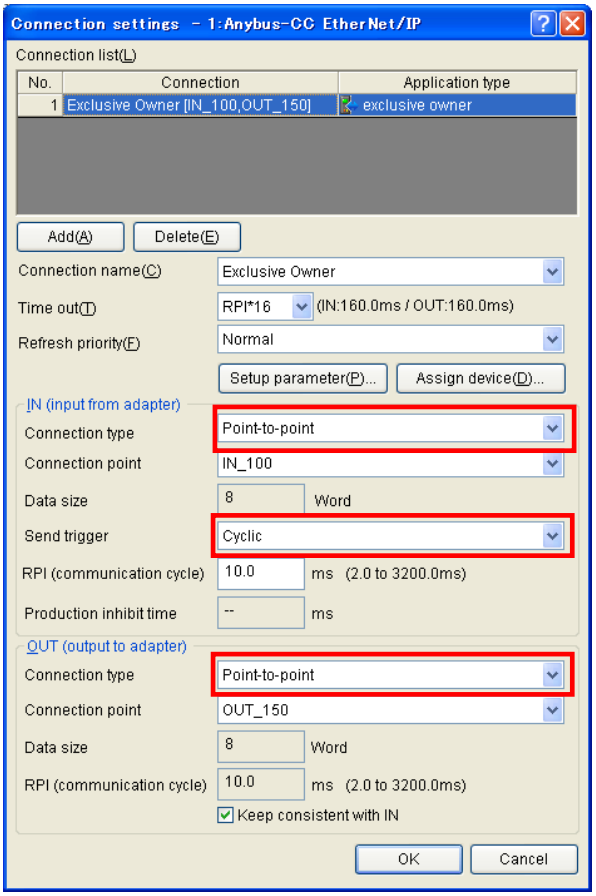
* The node address is an internal address used by the PLC. It has nothing to do with the IP address. Assign a unique value to each PLC.



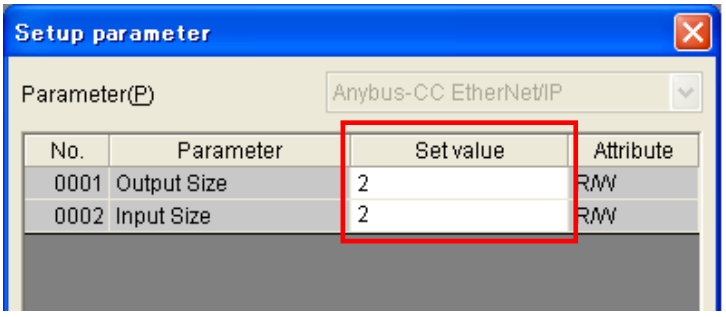
[5] Select “Anybus-CC EtherNet/IP” you have just registered in the scan list area, and then click the right mouse button and select “Set Connection.”



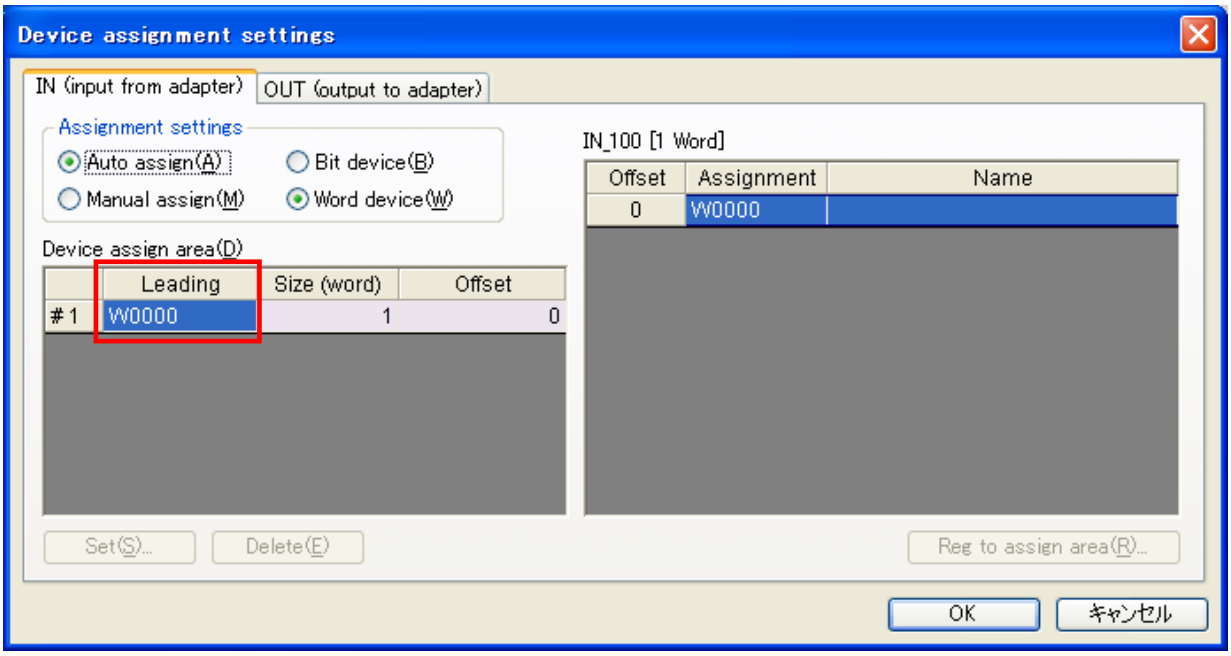
[6] In the “Set Connection” dialog box, set the connection type and send trigger. Select “Point-to-Point” for the connection type for both IN and OUT, and select “Cyclic” for the send trigger.



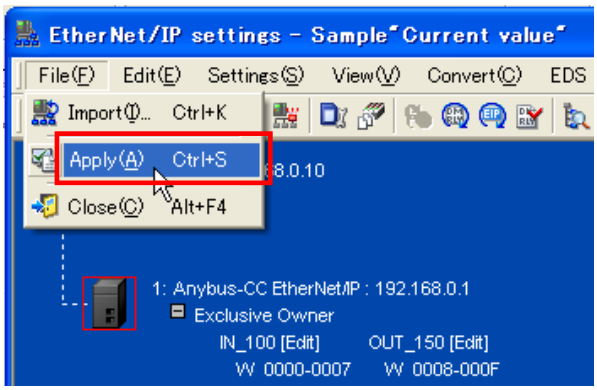
[7] Click the Set Parameters button in the “Set Connection” dialog box and set the numbers of input and output bytes. In this example, the fieldbus operation mode is “Remote I/O Mode 1,” so there are two input bytes and two output bytes. When the setting is complete, click the OK button to close the “Set Parameters” dialog box. Click the OK button again to close the “Set Connection” dialog box.



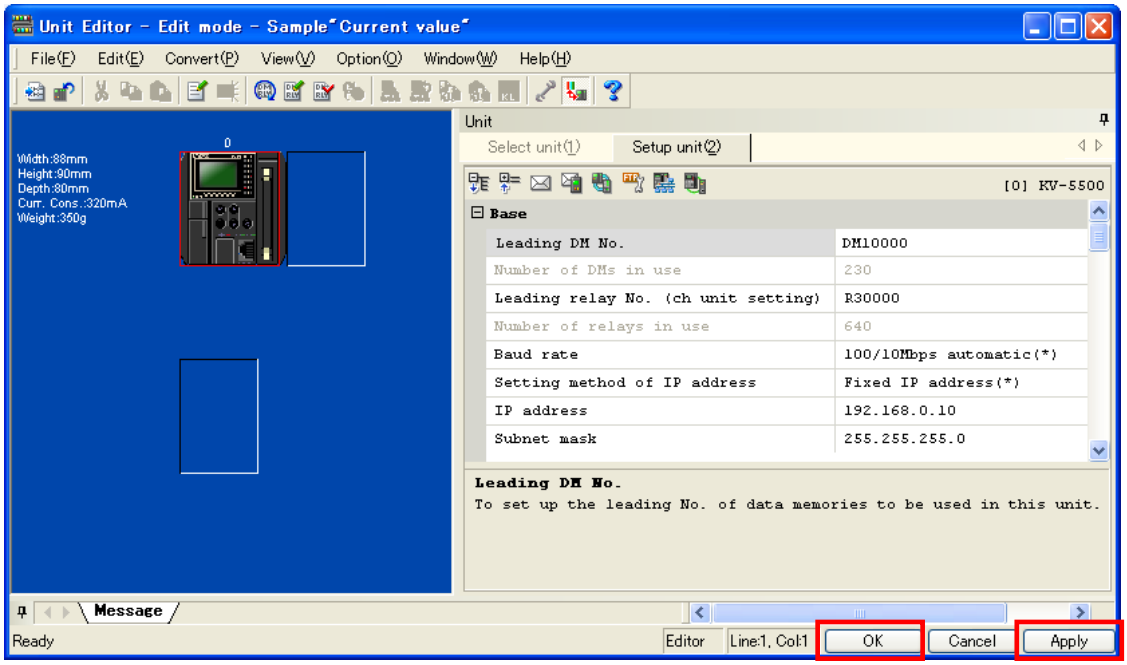
[8] Click the Assign Device button in the “Set Connection” dialog box to open the “Set Devices” dialog box. In this dialog box, set the devices to assign I/O data to. In this example, set W0000 for IN data and W0002 for OUT data using the “Auto Setting” function.



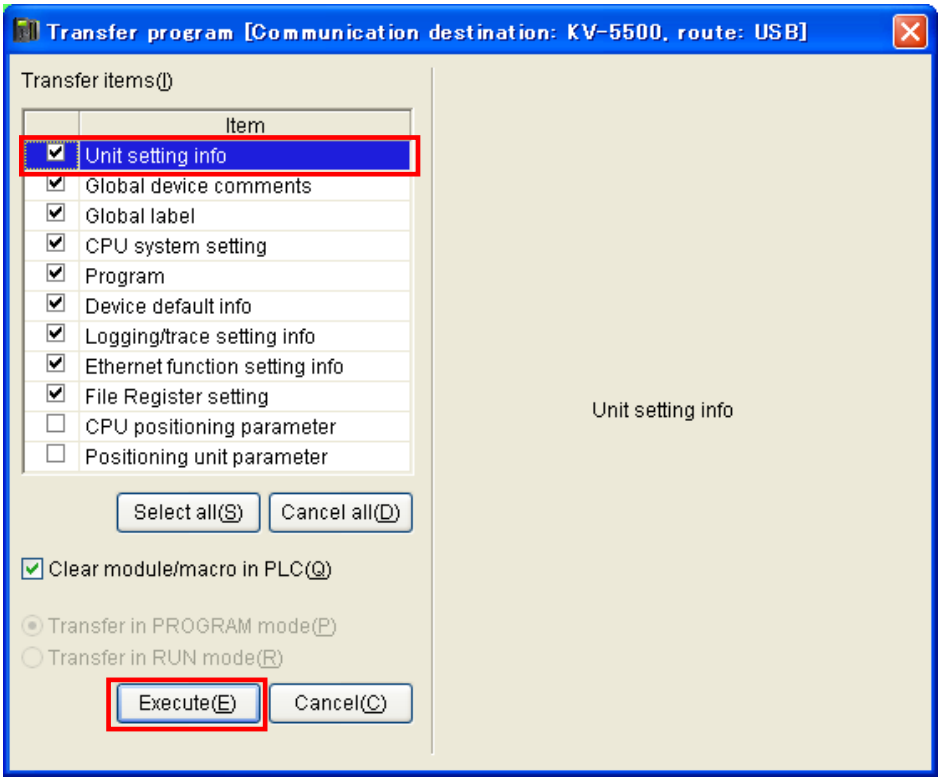
[9] Click the “File” menu in the “EtherNet/IP Setup” dialog box, and then select “Apply.” When the menu drop-down list disappears, close the “EtherNet/IP Setup” dialog box.



[10] Click the Apply button in the bottom right-hand corner of the “Unit Editor” to update the EtherNet/IP setting information. Next, click the OK button to close the “Unit Editor.” Next, you must transfer the “Unit Settings” to the PLC to reflect the settings you have just made.



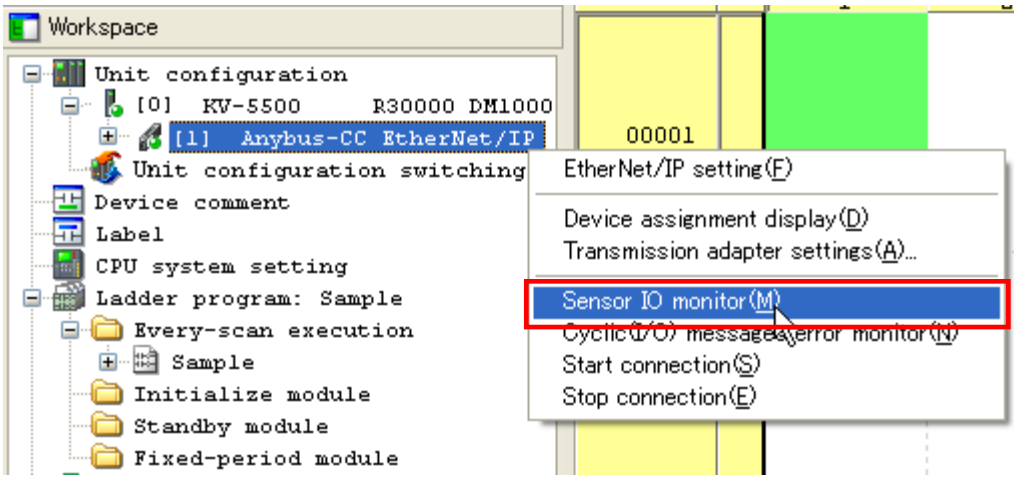
[11] From the KV-STUDIO menu, select “Monitor/Simulator” and then select “Transfer to PLC.” Click “Execute” after confirming that the “Unit Setting Information” check box is selected under Transfer Items.



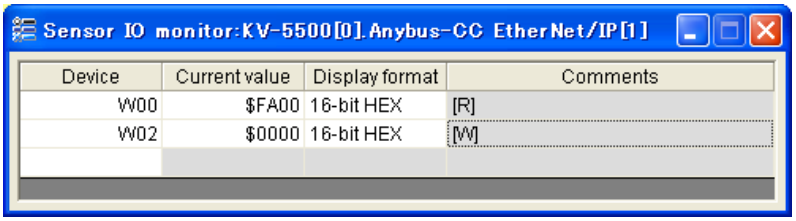
6.2.4 Checking the I/O Data on the PLC

[1] Start KV-STUDIO in the “Monitor Mode.”

[2] In the “Workspace” window, right-click “Anybus-CC EtherNet/IP (IANP3802-EPO)” registered in the tree under KV-5500 (KV-7500), and select “Sensor I/O Monitor.”



[3] After “Sensor I/O Monitor” has been selected, the “Sensor I/O Monitor” dialog box appears. In this dialog box, you can monitor the devices to which I/O data has been assigned.



The description of each device is given below:

Tag name	Description
W00	PLC ← Controller
W02	PLC → Controller

Change History

Revision date	Description of revision
February 2011	First edition
November 2011	Second edition Contents changed in Safety Guide Caution notes added for when working with two or more persons SCON-CA added
June 2012	Third edition Contents added and changed in Safety Guide PCON-CA/CFA added
November 2012	Fourth edition Unit of measurement parameter adjustment added for SCON-CA half direct value mode, half direct value mode 2 and half direct value mode 3 Maintenance information added to the SCON-CA full direct mode
August 2013	Fifth edition Positioning unit changed to 0.001° when DD motor is connected
October 2013	Sixth edition ACON-CA, DCON-CA added
August 2014	Seventh edition SCON-CAL added
March 2015	Eighth edition ACON-CB, DCON-CB, PCON-CB ,SCON-CB added
August 2015	Ninth edition Servo press type SCON-CB/CGB added
December 2015	Tenth edition PCON-CB series added
February 2016	10C edition SCON for servo press (3000 ~ 3300W) added
January 2017	10D edition Servo Press Type SCON-CB/CGB correction made
May 2021	Eleventh edition • Chapter 3 Added PCON-CBP/CGBP applicable for pulse pressing • Contents revised regarding relation between construction of instructions manual for each controller model code and this manual • Symbols deleted in all parameters • Chapter 5 Pressing Direct Mode added • Correction made to image of front panel in 5.2 Model Codes • Terms integrated, correction made

Revision date	Description of revision
January 2022	Twelfth Edition • Handling Precautions Series added to 1. explanation of controllers other than this manual • 2.7, 3.7, 4.7, 5.7 Change made to image of input and output signal timing • 2.8, 3.8, 4.8, 5.8 Change made to operation contents • Pg. 34, 41, 50, 115, 122, 133, 142, 149, 216, 218,225,252 Correction made from PSEL to PSFL for symbol of Bit: b5 • Pg. 305 IA-OS to the device teaching tools in the table added • Pg. 341 Change made to (8) Partial content change and illustration
March 2023	12B edition • Safety Guide contents revised • 2.5 Contents revised of the compatible teaching tool • 2.6.7 (21) Explanation image added • 2.6.7 (22) Image changed and explanation added • 3.6.5 Full Direct Value Mode Correction made in PLC input signals • 3.6.7 Position/Simplified Direct Value Mode 2 Correction made in PLC input signals • 3.6.8 Half Direct Value Mode 2 Correction made in PLC input signals • 3.6.10 (21) Explanation image added • 3.6.10 (22) Image changed and explanation added • 4.6.11 (21) Explanation image added • 4.6.11 (22) Image changed and explanation added • 5.8.3 Change made in time chart (DPED Signal) in [5] A) Positioning Direct for operation in Pressing Direct Mode • General Description of terms revised
November 2023	12C edition Correction made for symbols regarding pressuring operation stop method signals • 5.8.3 Operation in Pressing Direct Mode [5] A) Explanation partially deleted for positioning direct Correction made in chart for pressuring operation complete (DPED) B) Alarm details and occurrence conditions added in explanation for pressing direct
January 2025	Thirteenth Edition • Full Direct Value Mode 2 added in Chapter 3 and Chapter 4

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