CompoNet

Operation Manual, Eleventh Edition

Describes Model	
ACON	C/CG/CA/CB/CGB
PCON	C/CG/CA/CFA CB/CFB/CGB/CGFB
DCON	CA/CB/CGB
SCON	CA/CAL/CGAL /CB/CGB (Servo Press)

IAI America, Inc.

Please Read Before Use

Thank you for purchasing our product.

This Operation Manual explains the handling methods, structure and maintenance of this product, among others, providing the information you need to know 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.
The DVD that comes with the product contains operation manuals for IAI products.
When using the product, refer to the necessary portions of the applicable operation manual by printing them out or displaying them on a PC.

After reading the Operation Manual, keep it in a convenient place so that whoever is handling this product can reference it quickly when necessary.

[Important]

- This Operation Manual is original.
- The product cannot be operated in any way unless expressly specified in this Operation Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Operation Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
- Using or copying all or part of this Operation Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

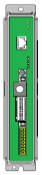
Construction of Instruction Manual for Each Controller Model and This Manual

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



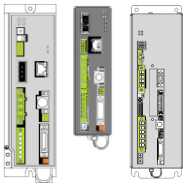
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  - ・Remote I/O Control Operation
  - ・Direct Number Indication Operation
  - → CompoNet (This Manual) ME0220
- ◎Basic Specifications and Functions
  - → ACON-CB/CGB ME0343
  - → DCON-CB/CGB ME0343
  - → ACON-CA, DCON-CA ME0326
  - → ACON-C/CG ME0176
- ■Teaching Tool
  - ・PC Software → PC Software ME0155
  - ・Teachiong BOX (i) TB-01 → Touch Panel Teaching ME0324

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



- ●Operation Patterns
  - ・Remote I/O Control Operation
  - ・Direct Number Indication Operation
  - → CompoNet (This Manual) ME0220
- ◎Basic Specifications and Functions
  - → PCON-CB/CFB/CGB/CGFB ME0342
  - → PCON-CA/CFA ME0289
  - → PCON-C/CG ME0170
- ■Teaching Tool
  - ・PC Software → PC Software ME0155
  - ・Teachiong BOX (i) TB-01 → Touch Panel Teaching ME0324

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



- ●Operation Patterns
  - ・Remote I/O Control Operation
  - ・Direct Number Indication Operation
  - → CompoNet (This Manual) ME0220
- ◎Basic Specifications and Functions
  - → SCON-CB/CGB ME0340
  - → SCON-CB (Servo Press Type) ME0345
  - → SCON-CA/CAL/CGAL ME0243
- ■Teaching Tool
  - ・PC Software → PC Software ME0155
  - ・Teachiong BOX (i) TB-01 → Touch Panel Teaching ME0324

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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 operation 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 on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more 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 technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

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 Operation 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 cover or untightened 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 operation 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 (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 Type is set to only PCON.

2. Registration Table Function

Omron's Master Unit includes the "Registration Table function" that adds only the slaves that are registered in advance to the network. However, this function is only available in the remote I/O mode. * It is not available in remote I/O modes 2 or 3.

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

1. Overview

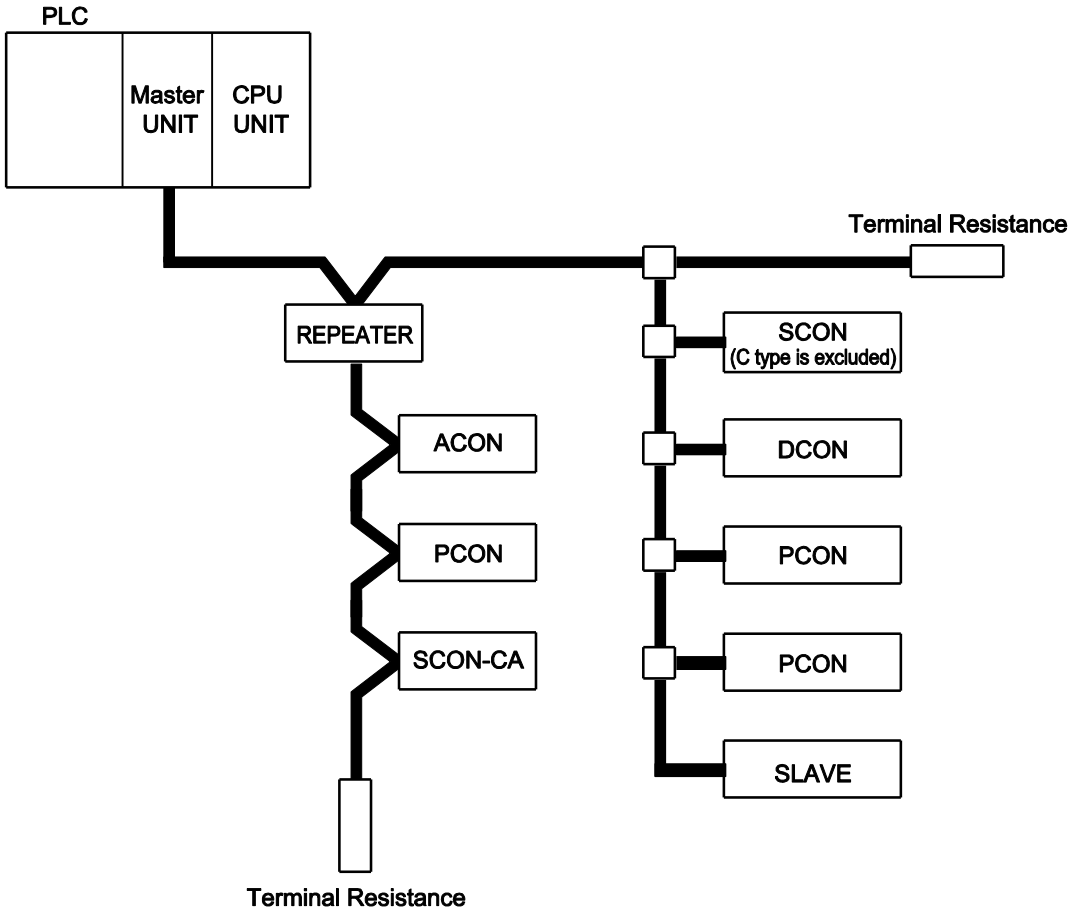
CompoNet, which is an open field network, is a global open network that combines controls and data on a machine/line control level.
By connecting to CompoNet, ACON, PCON, SCON (C type is excluded) and DCON controllers (hereinafter referred to collectively as “IAI controllers” or individually as a controllers) can be used to configure a system based on minimal wiring.

Each controller is treated as a word mixed slave on CompoNet.

* For further information on CompoNet, refer to the Operation Manuals for the master unit and the programmable controller (PLC) to be mounted.
When reading this Operation Manual, also refer to the Operation Manuals for the ACON and PCON controller you are using.

CompoNet cannot be used for any method other than those described as possible in this Operation Manual.

System Configuration Example



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

2.1 Operation Modes and Functions

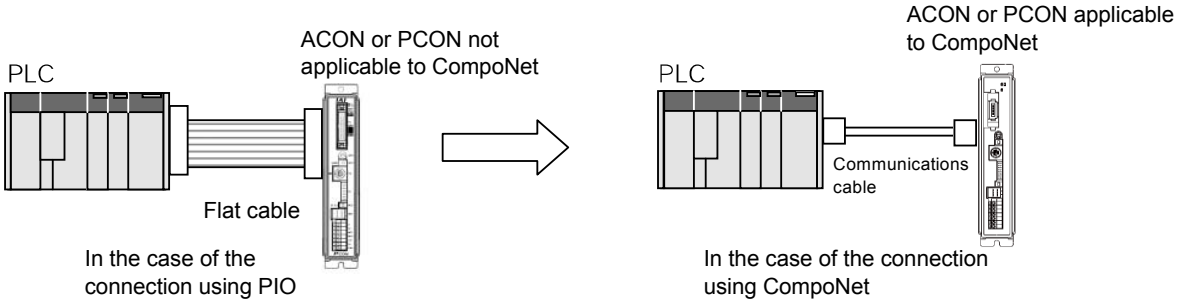
ACON or PCON applicable to CompoNet can be operated by means of selecting one mode out of the following five operation modes.

Operation Modes and Main Functions

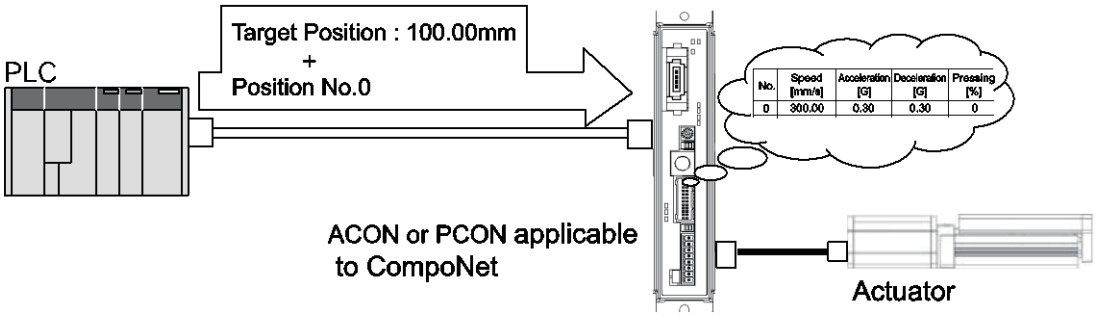
Main Functions	Remote I/O Mode	Position/ Simplified Direct Value Mode	Half Direct Value Mode	Full Direct Value Mode	Remote I/O Mode 2
Number of occupied bytes	2	8	16	32	12
Position Data Setup Operation	x	○(*1)	○	○	x
Velocity and Acceleration Direct Setup	x	x	○	○	x
Pressing Operation	○	○	○	○	○
Current 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.

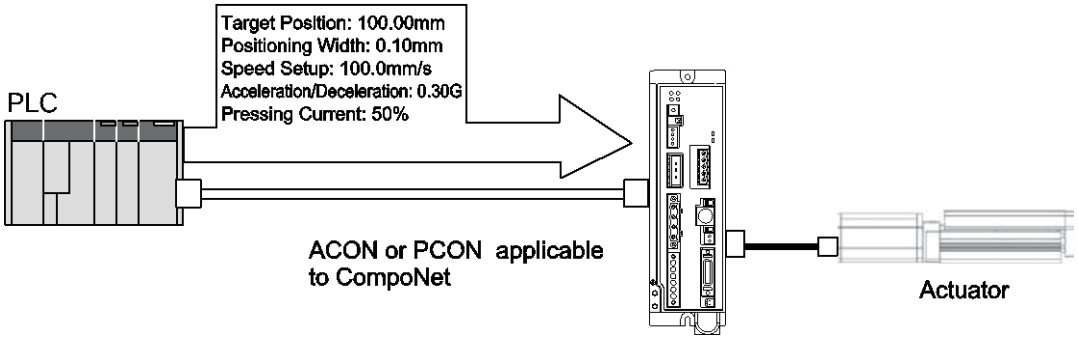
[1] Remote I/O Mode: This is the operation method using CompoNet, instead of PIO (24V I/O).
Number of occupied bytes: 2 bytes



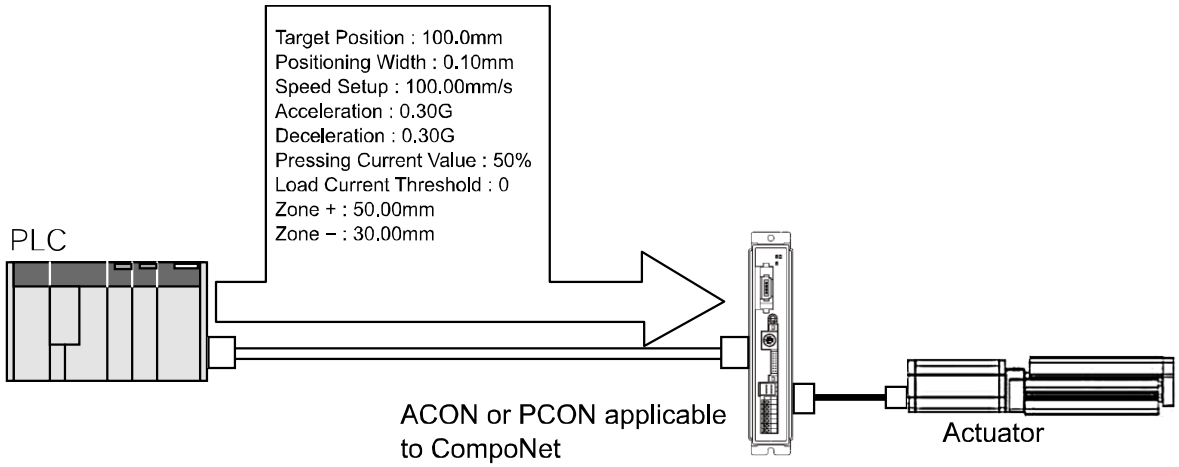
[2] Position / Simplified Direct Value Mode: This is the operation mode with the position No. set up.
Whether the target position is set directly by means of the changeover of the control signal, or the value registered on the position data is used can be selected.
For “Speed”, “Acceleration/Deceleration” 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



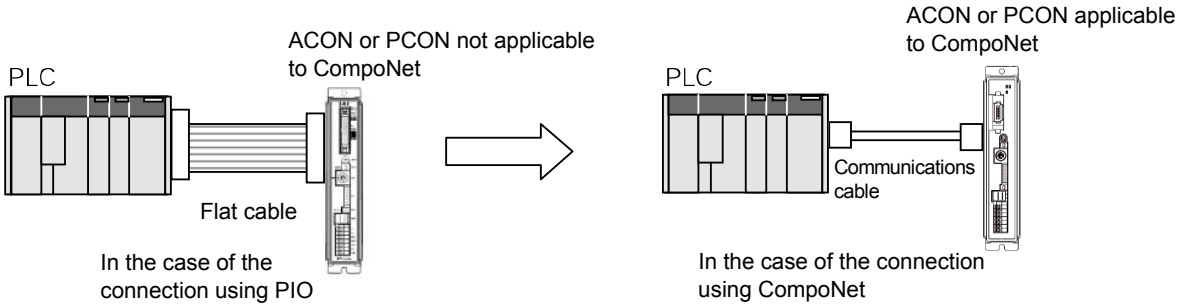
[3] Half Direct Value Mode: This is the operation method with the “Speed”, “Acceleration/Deceleration”, “Pressing Current Value” set up directly using the numerical values, in addition to the “Target Position”.
Number of occupied bytes: 16 bytes



[4] Full Direct Value Mode: This is the operation method with all the values (“Target Position”, “Speed”, “Acceleration/Deceleration”, etc.) related to the position control set up directly by using the numerical values.
Number of occupied bytes: 32 bytes



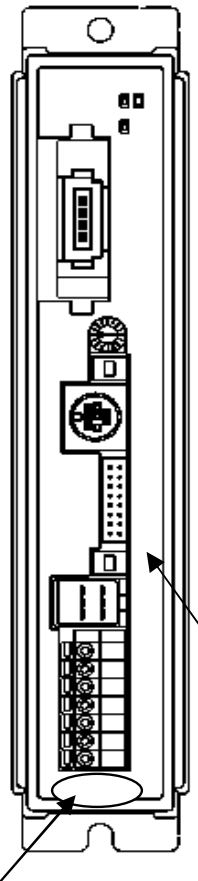
[5] Remote I/O Mode 2:This is the operation method using CompoNet, instead of PIO (24V I/O). The current position and command current value reading functions are added to the functions of [1].
Number of occupied bytes: 12 bytes



2.2 Model Numbers

The Model numbers of ACON and PCON applicable to CompoNet are described as follows.

●ACON-C/CG-☐-CN-☐
●PCON-C/CG-☐-CN-☐



Printed Series Name
● ACON
● PCON

Front Panel Color
● ACON : Dark Blue
● PCON : Dark Green

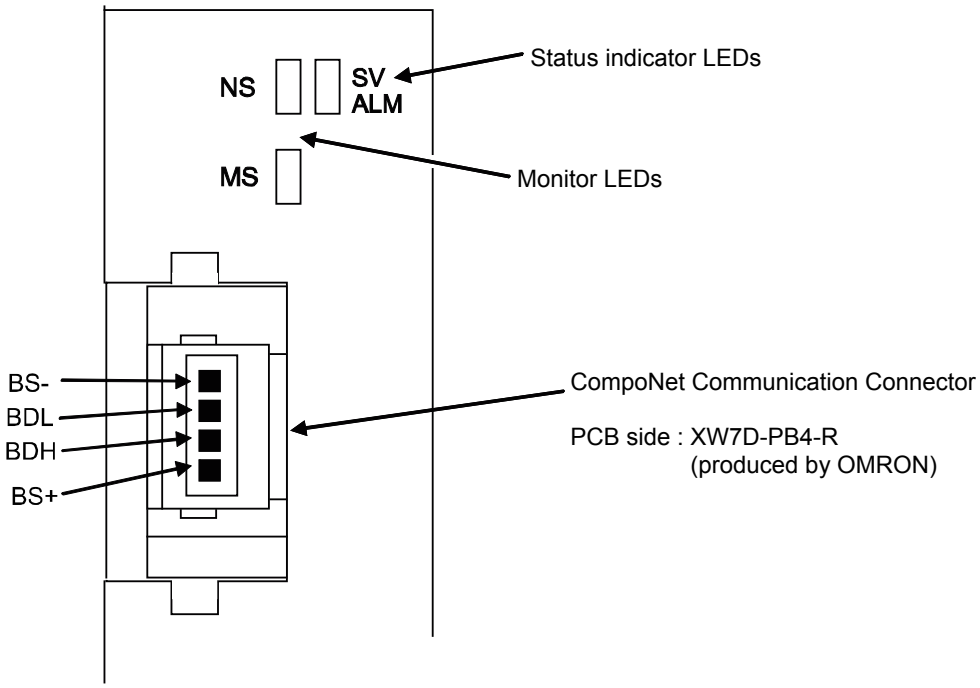
2.3 Interface Specifications

Item	Specification
Communication protocol	CompoNet specialized protocol
Communication type	Remote I/O communication
Baud rate	Automatically set to the same value as the baud rate set in the master
Communication Cable Length	Refer to CompoNet specifications
Slave type	Word mixed slave
Applicable note address	0 to 63 (set by controller parameter)
Communications cable	Round-type cable (JIS C3306,VCTF2 conductors) Flat cable 1 (not sheathed) Flat cable 2 (sheathed)
Connector	Connector recommended by OMRON is to be used. Controller-end connector:XW7D-PB4-R (OMRON)

2.4 CompoNet Interface

2.4.1 Names of the Parts

The names of each section related to CompoNet are described as follows.



2.4.2 Monitor LED indications

The node conditions of 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.
LEDs are 2-colored illumination type (orange / green), and the colors show the status as listed below.

MS (ModuleStatus) LED · · · · · · · · · Condition of the node (each controller)
NS (NetworkStatus) LED · · · · · · · · Condition of network

○: Illuminating, x: OFF, ☆: Flashing

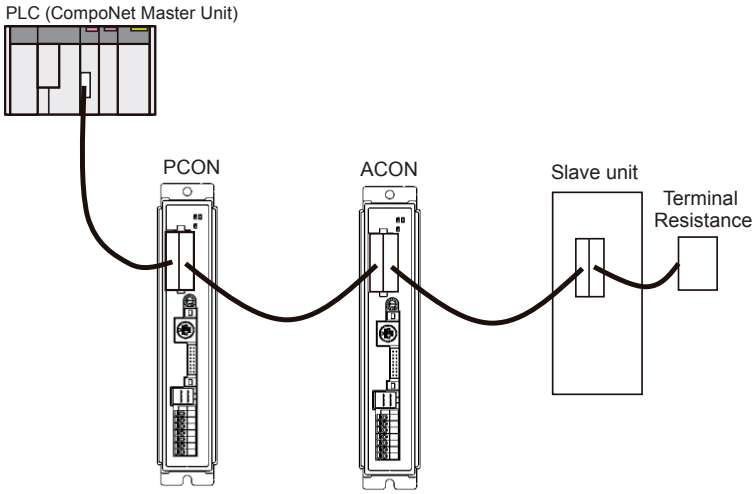
LED	Color	Indication Status	Description
MS	GN	○	In the normal operation
	RD	○	A hardware error. The replacement of the board is required.
		☆	It is a minor error such as a user setting error or configuration error. It can be recovered by re-setting, etc.
	—	x	The CompoNet is being initialized, or the power is not supplied.
NS	GN	○	The connection has been established and the communication is being performed normally.
		☆	The machine is on-line, but the connection has not been established. Communication Stop. (Network is normal)
	RD	○	Node address duplication.
		☆	Communication Error. (Communication timeout has been detected)
	—	x	The machine is not on-line. The power to the CompoNet is not supplied.

2.5 Wiring Example

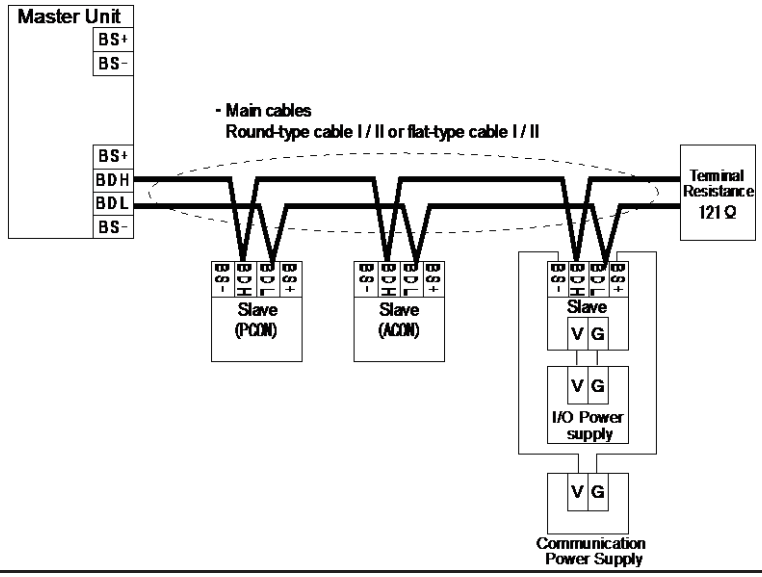
2.5.1 Connection Diagram

An example for wiring is as shown below.

- Wiring Example



- Connecting Example



*1: ACON and PCON for CompoNet specifications do not require the communication power supply. However, when multiple power supply is conducted, connection of the communication power of ACON and PCON to BS+ and BS- terminals is required.

*2: Make sure to read the Operation Manual for the master unit for the details of CompoNet wiring, precautions, etc.

2.6 Setting

2.6.1 Operation Mode Selecting

The operation mode is set using the parameters.
Set the mode toggle switch on the front surface of the controller to “MANU” side and set the parameter No. 84 “FMOD: Field Bus Operation Mode” using the RC PC software (V6.00.08.00 or later). (Refer to 2.10, "CompoNet 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

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

2.6.2 Station No. Setting

The node address is set by the parameters.
Set the parameter No. 85 “NADR: Field Bus Node Address” using the RC PC software.
(Refer to 2.10, "CompoNet Related Parameters”.)

Settable Range:0 to 63 (It is set to “0” when the machine is delivered from the factory.)

(Note) Exercise caution to avoid node address duplication.
The nodes (controllers) are assigned in the order of their node address in the remote I/O address areas of the PLC.
For details, refer to the Operation Manuals of the master unit and PLC in which in the master unit is installed.

(Note) The setting for the communication speed is not required because it automatically follows the master’s communication speed.

(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.

2.7 Communicating with the Master Station

2.7.1 Operation Modes and Corresponding PLC I/O Areas

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

- PLC Output → ACON/PCON input (* “n” shows the node address of each axis.)

<table>
<tr><td rowspan="2">PLC output area (CH)</td><td colspan="6">DI on the ACON or PCON side and Input Data Register</td></tr>
<tr><td>Remote I/O Mode</td><td>Position / Simplified Direct Value Mode</td><td>Half Direct Value Mode</td><td colspan="2">Full Direct Value Mode</td><td>Remote I/O Mode 2</td></tr>
<tr><td></td><td>Number of occupied channels:1CH</td><td>Number of occupied channels:4CH</td><td>Number of occupied channels:8CH</td><td colspan="2">Number of occupied channels:16CH</td><td>Number of occupied channels:6CH</td></tr>
<tr><td>n</td><td>Port No.0 to 15</td><td rowspan="2">Target Position</td><td rowspan="2">Target Position</td><td colspan="2" rowspan="2">Target Position</td><td>Port No.0 to 15</td></tr>
<tr><td>n＋1</td><td rowspan="15"></td><td rowspan="15"></td><td rowspan="15"></td><td rowspan="15"></td><td rowspan="5">Occupied area</td></tr>
<tr><td>n＋2</td><td>Specified position number</td><td rowspan="2">Positioning Band</td><td colspan="2" rowspan="2">Positioning Band</td></tr>
<tr><td>n＋3</td><td>Control Signal</td></tr>
<tr><td>n＋4</td><td rowspan="14"></td><td>Velocity</td><td colspan="2" rowspan="2">Speed Setup</td></tr>
<tr><td>n＋5</td><td>Acceleration/ Deceleration</td></tr>
<tr><td>n＋6</td><td>Pressing Current Limit Value</td><td colspan="2" rowspan="2">Zone boundary+</td><td rowspan="14"></td></tr>
<tr><td>n＋7</td><td>Control Signal</td></tr>
<tr><td>n＋8</td><td rowspan="13"></td><td colspan="2" rowspan="2">Zone boundary-</td></tr>
<tr><td>n＋9</td></tr>
<tr><td>n＋10</td><td colspan="2">Acceleration</td></tr>
<tr><td>n＋11</td><td colspan="2">Deceleration</td></tr>
<tr><td>n＋12</td><td colspan="2">Pressing Current Limit Value</td></tr>
<tr><td rowspan="2">n＋13</td><td>ACON</td><td>Occupied area</td></tr>
<tr><td>PCON</td><td>Load current threshold</td></tr>
<tr><td>n＋14</td><td colspan="2">Control Signal 1</td></tr>
<tr><td>n＋15</td><td colspan="2">Control Signal 2</td></tr>
</table>

(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 node address duplication.

- ACON/PCON output→PLC Input Side (* “n” shows the node address of each axis.)

PLC input area (CH)	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 channels:1CH	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:16CH	Number of occupied channels:6CH
n	Port No.0 to 15	Target Position	Target Position	Target Position	Port No.0 to 15
n+1					Occupied area
n+2		Completed Position No. (simple alarm ID)	Command Current	Command Current	Target Position
n+3		Status Signal			
n+4			Current Speed	Current Speed	Command Current
n+5					
n+6			Alarm Code	Alarm Code	
n+7			Status Signal	Occupied area	
n+8					
n+9					
n+10					
n+11					
n+12					
n+13					
n+14					
n+15				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 node address duplication.

2.7.2 Remote I/O Mode (Number of occupied channels 1CH)

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 the teaching tools such as RC PC software.
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	○	○	○	○	○	○
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	ACON/PCON DI(Port No.)	PLC output CH	ACON/PCON DO(Port No.)	PLC input CH
0	0 to 15	n+0	0 to 15	n+0

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (channel) and one output word (channel) in the I/O areas.

- Each channel is controlled by ON/OFF bit signals.

PLC output (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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 (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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	Comma4nd 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	Retracting end movement command 0
	1	PM2		PE1	Position 1 complete	LS1	Retracting end movement command 1
	2	PM4		PE2	Position 2 complete	LS2	Retracting end movement command 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	Retracting end movement command 0
	1	PM2		PE1	Position 1 complete	LS1	Retracting end movement command 1
	2	PM4		PE2	Position 2 complete	LS2	Retracting end movement command 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.)

2.7.3 Position/Simplified Direct Value Mode (Number of occupied channels 4CH)

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 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	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using parameters.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

ParameterNo.84	ACON/PCON input register	PLC output CH	ACON/PCON output register	PLC input CH
1	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Specified position number	n+2	Completed Position No. (Simple alarm code)	n+2
	Control Signal	n+3	Status Signal	n+3

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of four input words (channels) and four output words (channels) 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.
- 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 such as PC software.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	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+2	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+3	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+1																
Current 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+2																
Completed Position No.	—	—	—	—	—	—	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+3																
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.	2.9 (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 such as PC software. 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.	2.9 (1)
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	2.7.7 (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.	2.7.7 (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.	2.7.7 (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.	2.7.7 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	2.7.7 (17)
		b8	JOG+	+Jog: "ON" for Movement in the Opposite Direction of Home	2.7.7 (13)
		b7	JOG-	-Jog: "ON" for Movement to the Home Direction	2.7.7 (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.	2.7.7 (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.	2.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	2.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.7.7 (6)
		b0	CSTR	Positioning Start: A move command is issued when this signal turns ON.	2.7.7 (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. The setting 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.	2.9 (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.	2.9 (1)
	Status code	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	2.7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	2.7.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	2.7.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	2.7.7 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	2.7.7 (12)
		b10	MODES	Teaching mode Signal: This signal is ON while the teaching mode is selected.	2.7.7 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	2.7.7 (17)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	2.7.7 (19)
		b7	-	Unavailable	-
		b6			
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	2.7.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	2.7.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	2.7.7 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	2.7.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	2.7.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	2.7.7 (10)

2.7.4 Half Direct Value Mode (Number of occupied channels 8CH)

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	○	
Operation at different acceleration and deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

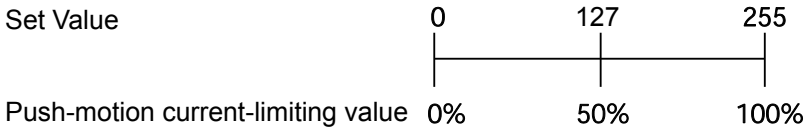
ParameterNo.84	ACON/PCON input register	PLC output CH	ACON/PCON output register	PLC input CH
2	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Command Current	n+2
		n+3		n+3
	Velocity	n+4	Current Speed	n+4
	Acceleration/Deceleration	n+5		n+5
	Pressing Current Limit Value	n+6	Alarm Code	n+6
	Control signal	n+7	Status Signal	n+7

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of eight input words (channels) and eight output words (channels) 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/sec) 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 limit 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 limit 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Target Position (lower word)																
n+1 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+2 Positioning Width (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+3 Positioning Width (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+4 Velocity	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+5 Acceleration/ Deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+6 Pressing Current Limit Value	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+7 Control Signal	BKRL	RMOD	DIR	PUSH	—	—	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Current Position (lower word)																
n+1																
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+2																
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+3																
Command Current (upper word)													524,288	262,144	131,072	65,536
n+4																
Current Speed (lower word)																
n+5																
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+6																
Alarm Code																
n+7																
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.	2.9 (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.	2.9 (2)
	Velocity	16-bit data	-	16-bit integer Specify the speed at which to move the actuator. The unit is 1.0mm/sec 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/sec", set it as "254". When the movement command is set with the value bigger than the max. speed, an alarm is issued.	2.9 (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.	2.9 (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 Limit Value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during push-motion 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 push-motion current, an alarm will occur.	2.9 (2)
	Control Signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	2.7.7 (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.	2.7.7 (19)
		b13	DIR	Push 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	2.7.7 (22)
		b12	PUSH	Push-motion specification: Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.	2.7.7 (21)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	JOG+	+ Jog: “ON” for Movement in the Opposite Direction of Home	2.7.7 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	2.7.7 (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.	2.7.7 (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.	2.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	2.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.7.7 (6)
		b0	DSTR	Positioning Command: A move command is issued when this signal turns ON.	2.7.7 (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 The setting 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.	2.9 (2)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	2.9 (2)
	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.9 (2)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0$_H$”. Refer to the Operation Manual for the controller main body for the details of the alarms.	2.9 (2)
	Status Signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	2.7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	2.7.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	2.7.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	2.7.7 (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.	2.7.7 (19)
		b7	-	Unavailable	-
		b6			
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	2.7.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	2.7.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	2.7.7 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	2.7.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	2.7.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	2.7.7 (10)

2.7.5 Full Direct Value Mode (Number of occupied channels 16CH)

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	○
Operation at different acceleration and deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC channel configuration (* “n” shows the node address of each axis.)

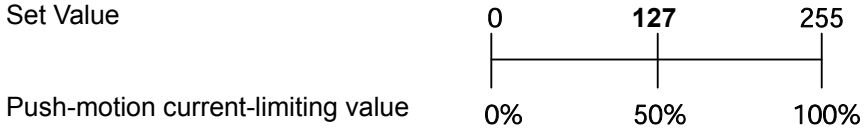
ParameterNo.84	ACON/PCON input register		PLC output CH	ACON/PCON output register	PLC input CH
3	Target Position		n+0	Current Position	n+0
			n+1		n+1
	Positioning Band		n+2	Command Current	n+2
			n+3		n+3
	Velocity		n+4	Current Speed	n+4
			n+5		n+5
	Zone boundary +		n+6	Alarm Code	n+6
			n+7	Occupied area	n+7
	Zone boundary -		n+8		n+8
			n+9		n+9
	Acceleration		n+10		n+10
	Deceleration		n+11		n+11
	Pressing Current Limit Value		n+12		n+12
	ACON	Occupied area	n+13		n+13
	PCON	Load current threshold			
	Control Signal 1		n+14		n+14
	Control Signal 2		n+15	Status Signal	n+15

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

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of 16 input words (channels) and 16 output words (channels) 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 speed is expressed using 2-word (32 bits) binary data. The figures from 0 to +999999 (Unit: 0.01mm/sec) 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 limit 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 limit 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 push-motion 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 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Target Position (lower word)																
n+1	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+2																
Positioning Width (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+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning Width (upper word)													524,288	262,144	131,072	65,536
n+4	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Velocity (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+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Velocity (upper word)													524,288	262,144	131,072	65,536
n+6	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (lower word)																
n+7	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.

Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8 Zone boundary – (lower word)																
n+9 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+10 Acceleration								256	128	64	32	16	8	4	2	1
n+11 Deceleration								256	128	64	32	16	8	4	2	1
n+12 Pressing Current Limit Value									128	64	32	16	8	4	2	1
n+13 Load current threshold (*3)									128	64	32	16	8	4	2	1
n+14 Control Signal 1						(*1)	ASO1	ASO0	(*2)				INC	DIR	PUSH	
n+15 Control Signal 2	BKRL	RMOD						JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

(*1) Signal assignment for b10 of n+14

	Symbol	
Controller	ACON	PCON
b10	-	SMOD

(*2) Signal assignment for b7 and b6 of n+14

	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Current Position (lower word)																
n+1	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+2																
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+3	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+4	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Speed (lower word)																
n+5	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+6																
Alarm Code																
n+7 to n+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Unavailable																
n+15	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal	EMGS	PWR	ZONE2	ZONE1	PZONE	(*1)		RMDS	GHMS	PUSH	PSFL	SV	ALM	MOVE	HEND	PEND

(*1) Signal assignment for b10 and b9 of n+15

	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. (Examle) 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.	2.9 (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.	2.9 (3)
	Velocity	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/sec 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/sec", set it as "2541". When the movement command is set with the value bigger than the max. speed, an alarm is issued.	2.9 (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. (Example) When it is "+25.40mm", set it as "2540". 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. *When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	2.9 (3)

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

<table>
<tr><th colspan="2">Address</th><th>Bit</th><th colspan="2">Symbol</th><th>Function</th><th>Details</th></tr>
<tr><td rowspan="19">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">2.9 (3)</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td colspan="2">-</td></tr>
<tr><td>Pressing Current Limit Value</td><td>16-bit data</td><td colspan="2">-</td><td>16-bit integer
Specify the current- limit value to be used during push-motion 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 push-motion current, an alarm will occur.</td><td>2.9 (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>2.9 (3)</td></tr>
<tr><td rowspan="15">Control Signal 1</td><td>b15</td><td rowspan="5" colspan="2">-</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>2.7.7 (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">2.7.7 (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</td><td rowspan="2">2.7.7 (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>
<tr><td>b5</td><td colspan="2" rowspan="2">-</td><td rowspan="2">Unavailable</td><td rowspan="2">-</td></tr>
<tr><td>b4</td></tr>
<tr><td>b3</td><td colspan="2">INC</td><td>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>2.7.7 (24)</td></tr>
</table>

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

Address		Bit	Symbol	Function	Details
PLC Output	Control Signal 1	b2	DIR	Push 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	2.7.7 (22)
		b1	PUSH	Push-motion specification : Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.	2.7.7 (21)
		b0	-	Unavailable	-
	Control Signal 2	b15	BKRL	Forced brake release: When it is turned ON, the brake is released	2.7.7 (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.	2.7.7 (19)
		b13	-	Unavailable	-
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	2.7.7 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	2.7.7 (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.	2.7.7 (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.	2.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	2.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	2.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	2.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	2.7.7 (6)
		b0	DSTR	Positioning Start: A move command is issued when this signal turns ON.	2.7.7 (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 The setting 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.	2.9 (3)
	Command Current	32-bit data	-		32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	2.9 (3)
	Current Speed	32-bit data	-		32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	2.9 (3)
	Alarm Code	16-bit data	-		16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0”. Refer to the operation manual for the controller main body for the details of the alarms.	2.9 (3)
	Status Signal	b15	EMGS		Emergency stop: An emergency stop is actuated when this signal turns ON.	2.7.7 (2)
		b14	PWR		Controller ready : This signal turns ON when the controller becomes ready.	2.7.7 (1)
		b13	ZONE2		Zone 2:“ON” for the current position within the zone set range	2.7.7 (12)
		b12	ZONE1		Zone 1:“ON” for the current position within the zone set range	2.7.7 (12)
		b11	PZONE		Position zone: This signal turns ON when the current position is inside the specified position zone.	2.7.7 (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)	2.7.7 (26)
		b9	ACON	-	Unavailable (ON/OFF is undefined)	-
			PCON	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)	2.7.7 (27)
		b8	RMDS		Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	2.7.7 (19)
		b7	GHMS		Under Home return Operation: This signal remains ON while home return is in progress.	2.7.7 (6)
		b6	PUSHS		Push motion in progress: This signal remains ON while push-motion operation is in progress.	2.7.7 (25)
		b5	PSEL		Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	2.7.7 (23)
		b4	SV		Operation preparation end: This signal turns ON when the servo turns ON.	2.7.7 (5)
		b3	ALM		Alarm: This signal turns ON when an alarm occurs.	2.7.7 (3)
		b2	MOVE		Moving Signal: This signal remains ON while the actuator is moving.	2.7.7 (9)
		b1	HEND		Home return completion: This signal turns ON when home return is completed.	2.7.7 (6)
		b0	PEND		Positioning completion signal: This signal turns ON when positioning is completed.	2.7.7 (10)

2.7.6 Remote I/O Mode 2 (Number of occupied channels 6CH)

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 the teaching tools such as PC software.
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	○	○	○	○	○	○
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	ACON/PCON DI and input register	PLC output CH	ACON/PCON DO and output register	PLC input CH
4	Port No.0 to 15	N+0	Port No.0 to 15	n+0
	Occupied area	n+1	Occupied area	n+1
		n+2	Current Position	n+2
		n+3		n+3
		n+4	Command Current	n+4
		n+5		n+5

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid node 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 (channels) 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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

n+0	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0																
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+1																
Unavailable																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2																
Current Position (lower word)																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
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																
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

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+5																
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 2.7.2 (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 The setting 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 The value of electrical current specified by the current command is indicated. The setting unit is 1mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	-

2.7.7 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 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”.

(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 2.4, "CompoNet Interface”) on the front surface of the controller illuminates in red.

(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

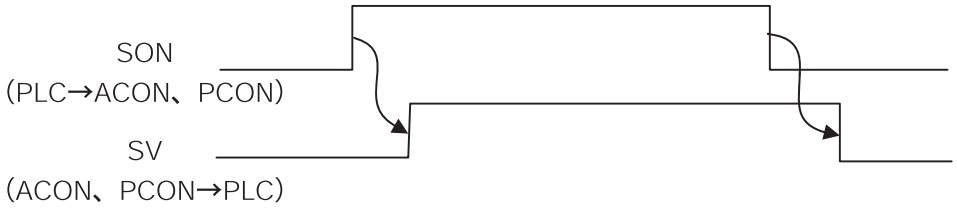
[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset.(In the case of the alarm with the cold start level, re-injection of the power is required)
[2] When this signal is turned ON from OFF condition during 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 2.4, "CompoNet Interface”) on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

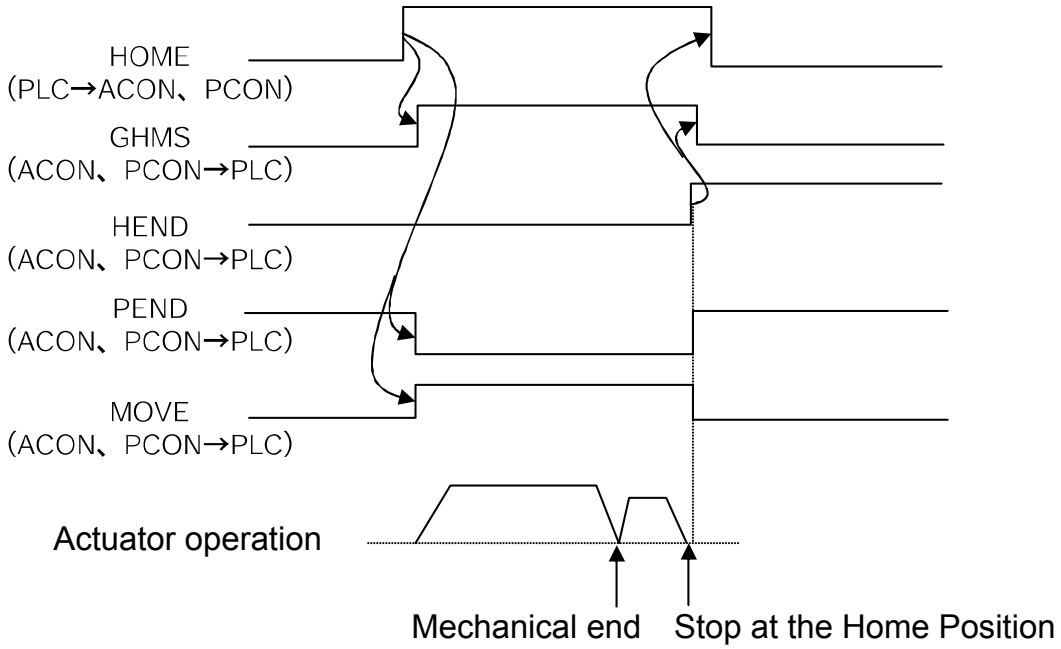
■Function

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.



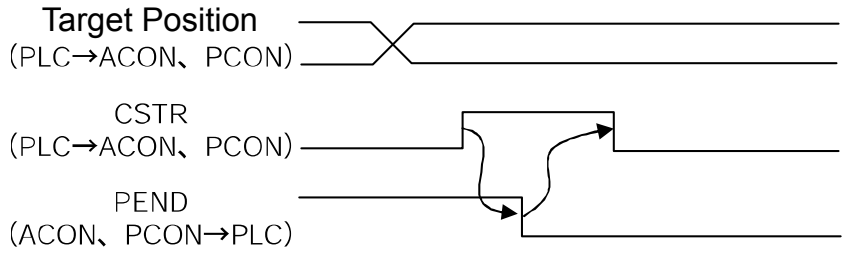
⚠ Caution: In the Remote I/O mode, Remote I/O Mode 2 and Position/Simplified Direct Value Mode, when the positioning command is issued without performing the home return operation after the power injection, the positioning is performed after the automatic home return operation. Exercise caution that 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”.

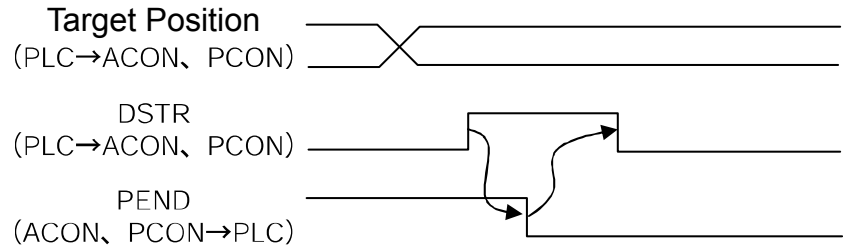
- PMOD＝OFF: Target position data for the specified position No. is used.
- PMOD＝ON :Value for the target position set using the PLC's target position register is used.

When this signal is issued in the condition where the home return operation has not performed at all after the power 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 (HEND) 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”.

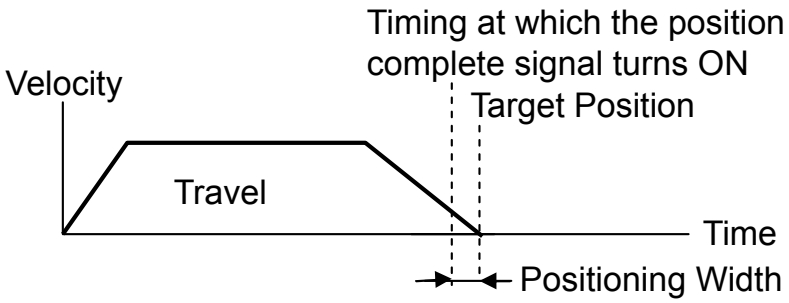


(9) Moving Signal (MOVE) PLC input signal

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 “ON”.

(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.



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” and the actuator is within the positioning band, the PEND signal is turned “ON” again.
When the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.

(11) Pause (STP) PLC output signal

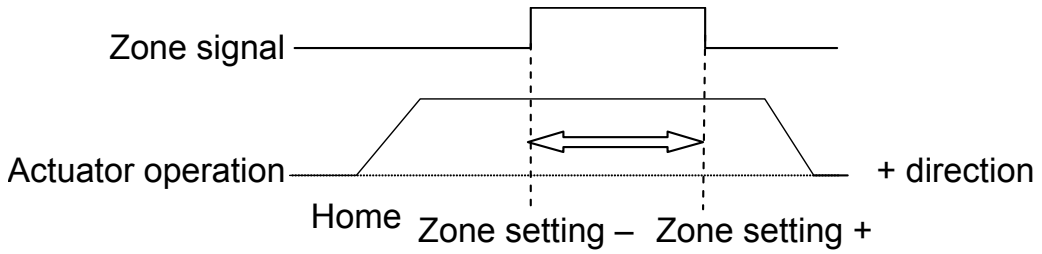
When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position 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.

(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 velocity is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (IVEL) 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.
The relationship is as follows.

Controller ready	Jog operation: JISL=OFF	Inch operation: JISL=ON
OFF	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed” Parameter No. 48, “Inch distance”
ON	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2” Parameter No. 49, “Inch distance 2”

(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.
The table below summarizes the relationship of the ON/OFF statuses of the JISL signal and jog speed/inch-distance switching (JVEL) signal.

		Jog operation	Inch operation
JISL		OFF	ON
JVEL=OFF	Velocity	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	Velocity	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	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.)
Operation		When the JOG +/JOG – signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG – signal.

(16) Teaching Mode Command (MODE) PLC output signal
Teaching mode Signal (MODES) PLC input signal

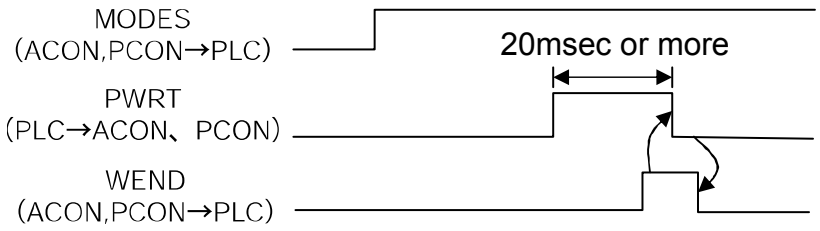
When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the controllers for each actuator is changed to the teaching mode, the MODES signal is turned ON.
After confirming that the MODES signal is turned “ON” on the PLC side, start the teaching 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 20msec or more. If the time is shorter than 20msec, 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

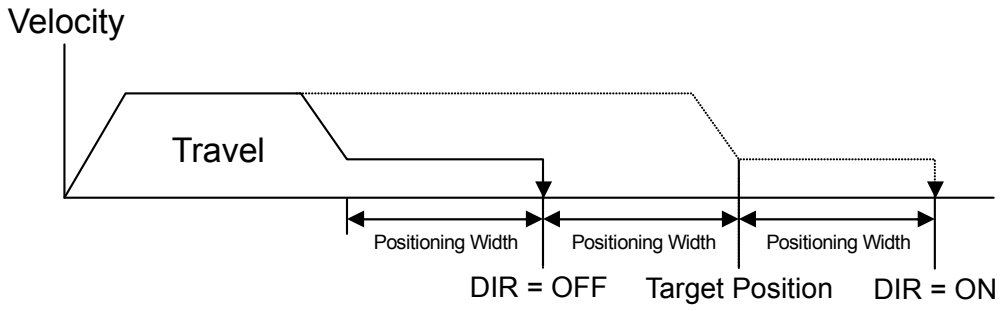
This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON :Use the value of the target position resister

(21) Push-motion 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) Operation in Half Direct Value Mode in “2.9 Operation” for the setting timing for this signal)

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

This signal specifies the pressing direction.
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.
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.
In the case of the normal pressing operation, this signal is disabled.
(Refer to Item (2) Operation in Half Direct Value Mode in “2.9 Operation” for the setting timing for this signal)



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

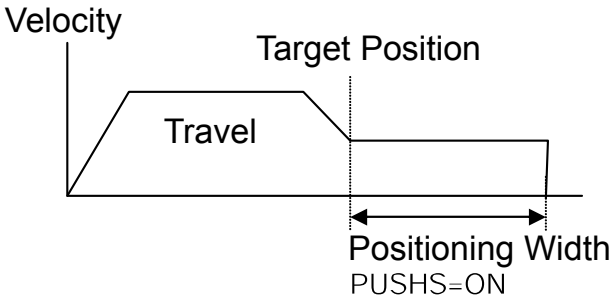
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
(Refer to Item (2) Operation in Half Direct Value Mode in “2.9 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) Push motion in progress (PUSHS) PLC input signal

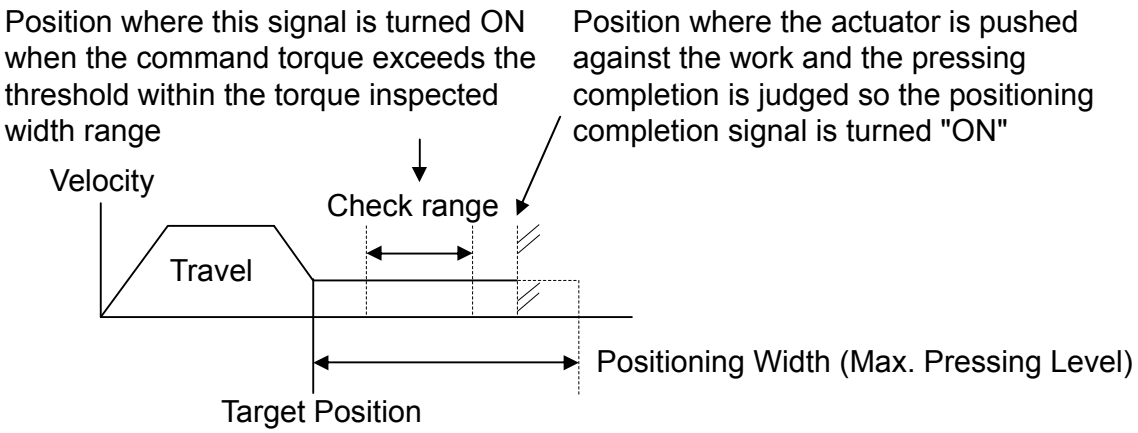
This signal is turned “ON” during the pressing operation.



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) Operation in Half Direct Value Mode in “2.9 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 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.

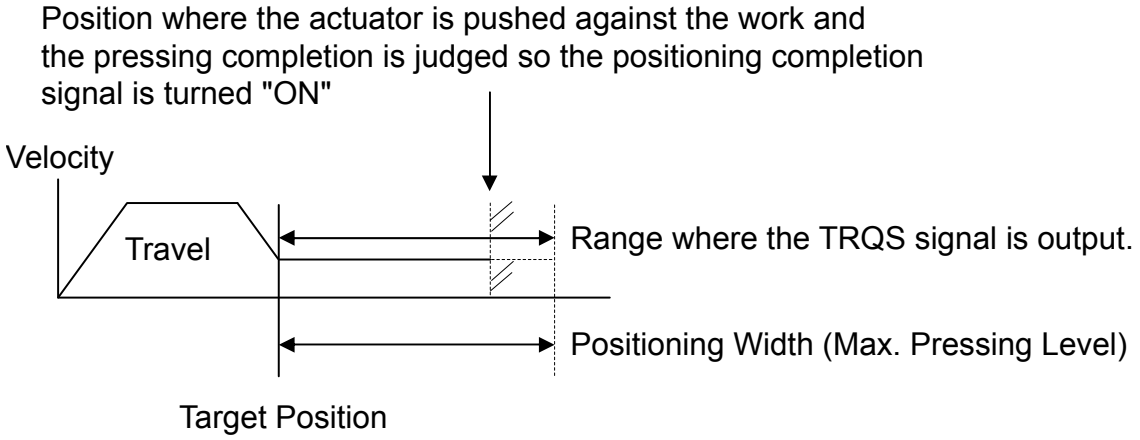


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics. Set an appropriate velocity considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time 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 for more information.

⚠ Caution:
- If the actuator pushes against the work 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 position.
- The actuator continues to push the work with the pressing current at the stop time decided with the current limit 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”.
The velocity available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing velocity 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 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 limit 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 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.

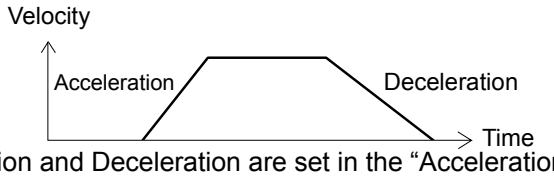
After confirming that there would be no trouble in whole system, use this signal.

(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	

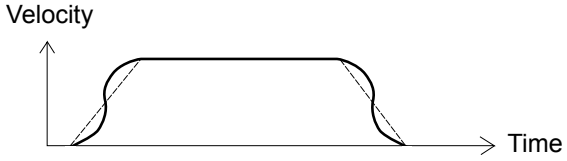
Trapezoid Pattern



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

S-shaped Motion

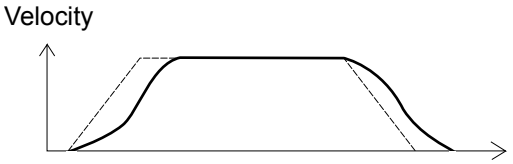
The S-shaped curve is described where at first in the acceleration, the line is gentle, but along the way, it suddenly becomes steep.
Use it in such application that setting the acceleration/deceleration rate high is desired because high tact time is required, but in the movement start or immediately before stop, low acceleration/deceleration rate is favorable.



* The S-shaped motion degree is set using the parameter No. 56 “S-Shaped Motion Ratio Setting”. The setting unit is % and setting range is from “0” to “100”.
(The above figure shows the image graph with the Parameter No. 56 set to “100”.)
When it is set to “0”, the S-shaped motion is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

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.

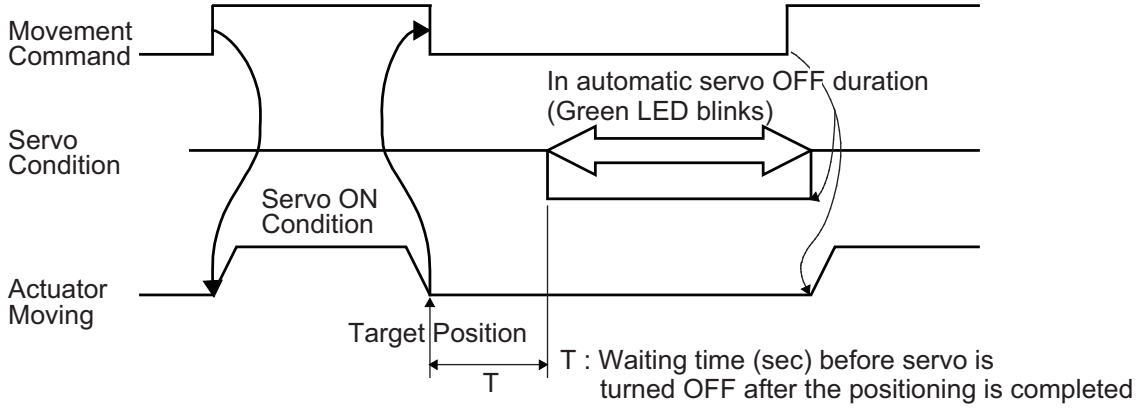


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1msec and setting range is from “0.0” to “100.0”.
When it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation 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 for more information.

ASO1	ASO0	Functions	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	



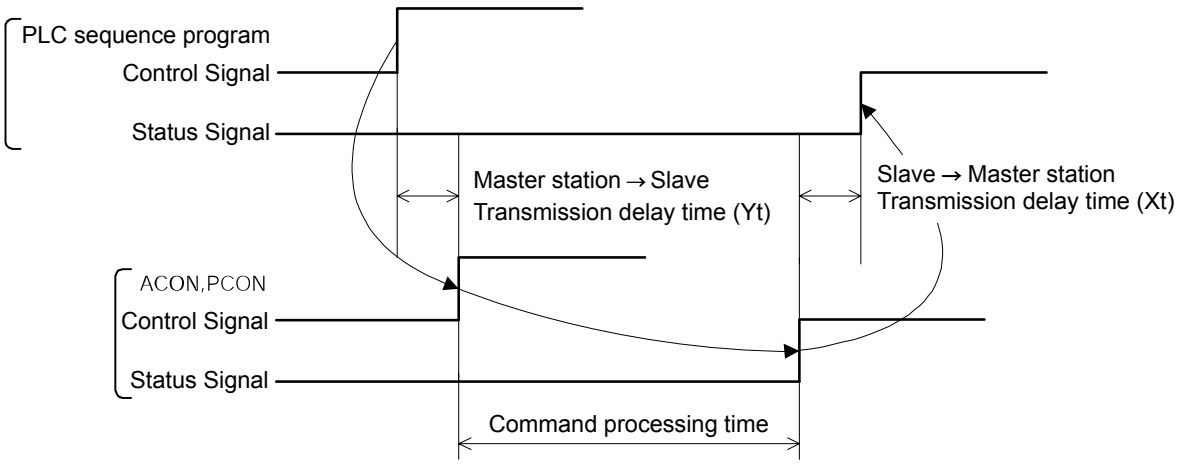
2.8 I/O Signal Timings

When any of the control signal is turned ON to perform the operation of the robot cylinder using the PLC's sequence program, the response (status) is returned to the PLC. The maximum response time is expressed using the following formula.

Maximum response time (msec)＝Yt+xt+3+ command processing time (operation time, etc.)

Yt: Master Station→slave transmission delay time
xt: Slave→Master Station Transmission Delay Time
} Filed Network Transmission Delay Time

Master Station→ For the master station -> slave transmission delay (Yt) and slave → master station transmission delay (xt), refer to the Operation Manuals for the CompoNet master unit and PLC installed in the master unit.



2.9 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 Operation Manual for the controller main body.
(In remote I/O mode 2, read the current position and current speed from the respective byte of the PLC, as deemed appropriate.)

(1) Operation in the position/simple-direct mode

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

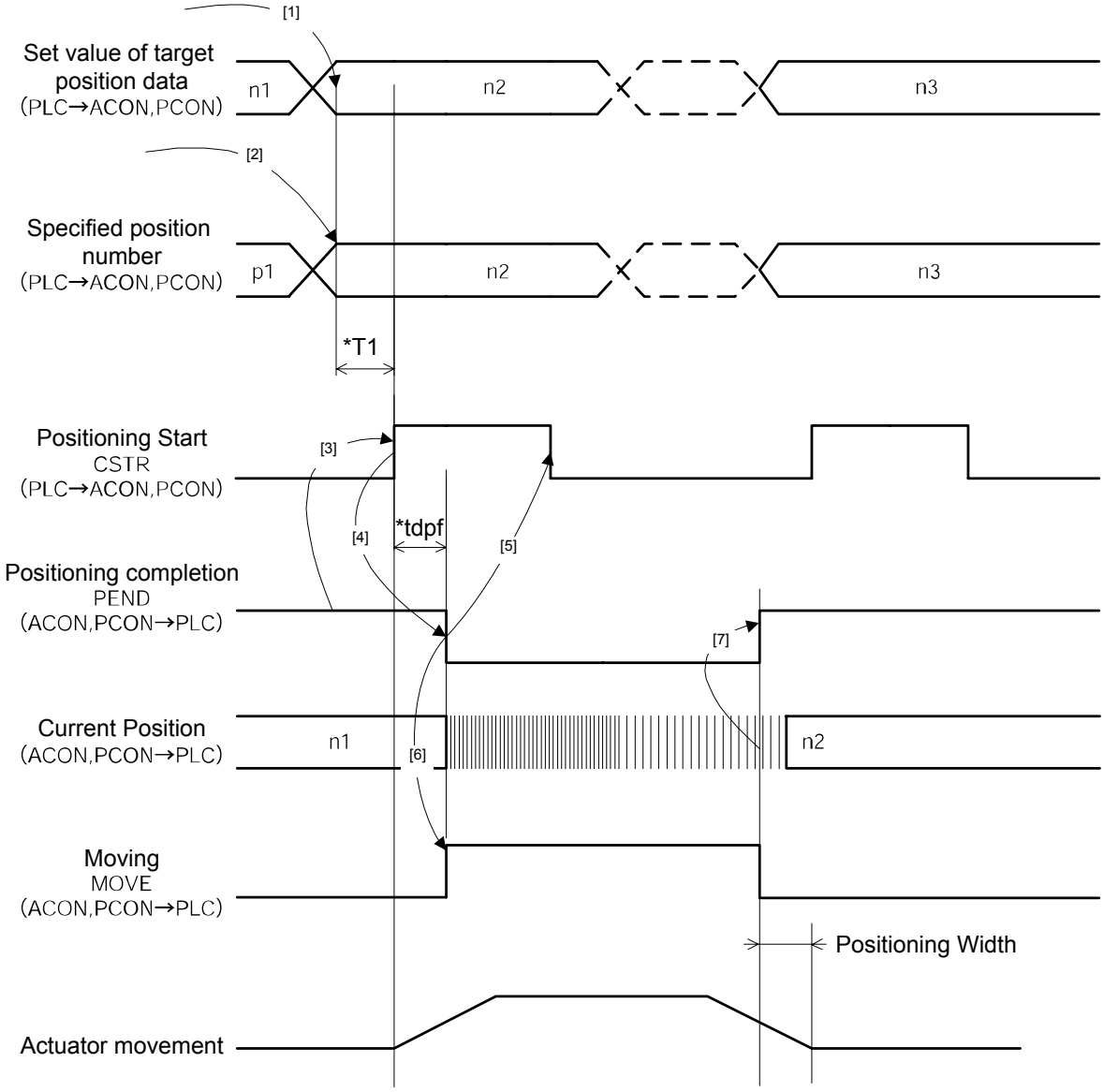
● Example of operation (normal positioning operation)

(Preparation) Set the position data items (speed, acceleration/deceleration, positioning band, 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] In the condition where the positioning completion (PEND) signal is turned “ON” or, Under Movement (MOVE) signal is turned “OFF”, turn “ON” the Positioning Start (CSTR) signal. The data items set in Steps 1) and 2) are read in the controller at the startup (ON edge) of the CSTR signal.
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 CST signal is turned “ON”, the PEND signal is turned OFF after tdpf.
[5] After confirming that the PEND signal is turned “OFF” or MOVE signal is turned “ON”, turn “OFF” the CSTR signal. 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”.
[7] The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning band set in the position data, and the CSTR signal is turned “OFF”, the PEND signal is turned “ON”. Then, the completed position No. is output to the completed position No. register.
Accordingly, for the read of the completed position No. register when the positioning is completed, confirm it some time (Remaining Travel Distance Movement Time) after the PEND signal is turned “ON”.
The current position data might be changed slightly even when the system is stopped.
[8] 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.

● Example of operation (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.



*T1: Considering the scanning time of the host controller, set it so that "T1 ≥ 0ms".

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(2) Operation in the half direction mode

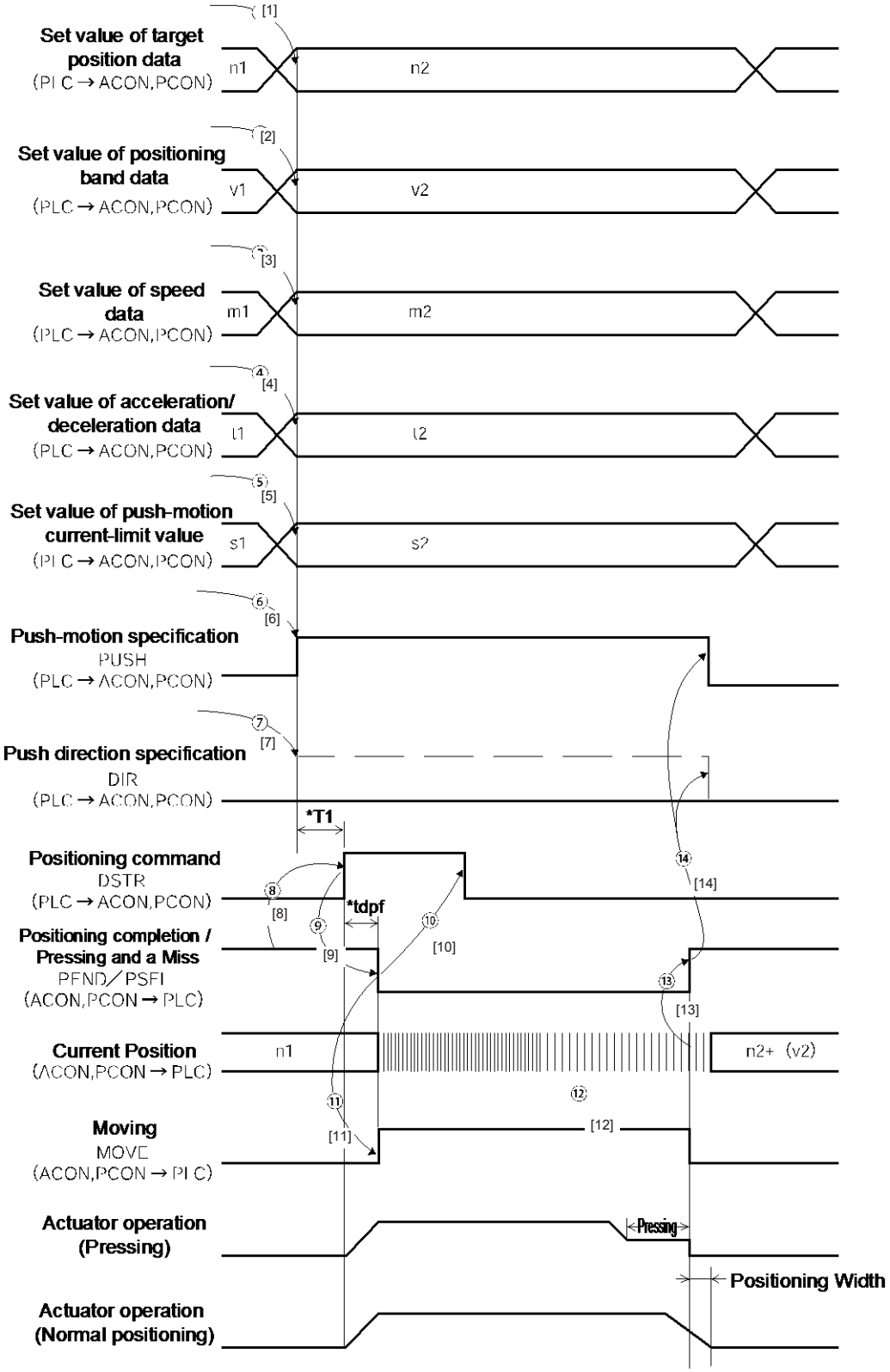
It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current limit setup register.

● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the acceleration/deceleration data to the acceleration/deceleration resister.
[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 2.7.7 (22))
[8] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 5) 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] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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”. (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[14] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 6 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.



*T1: Considering the scanning time of the host controller, set it so that "T1 ≥ 0ms".

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(3) Operation in the full direct mode

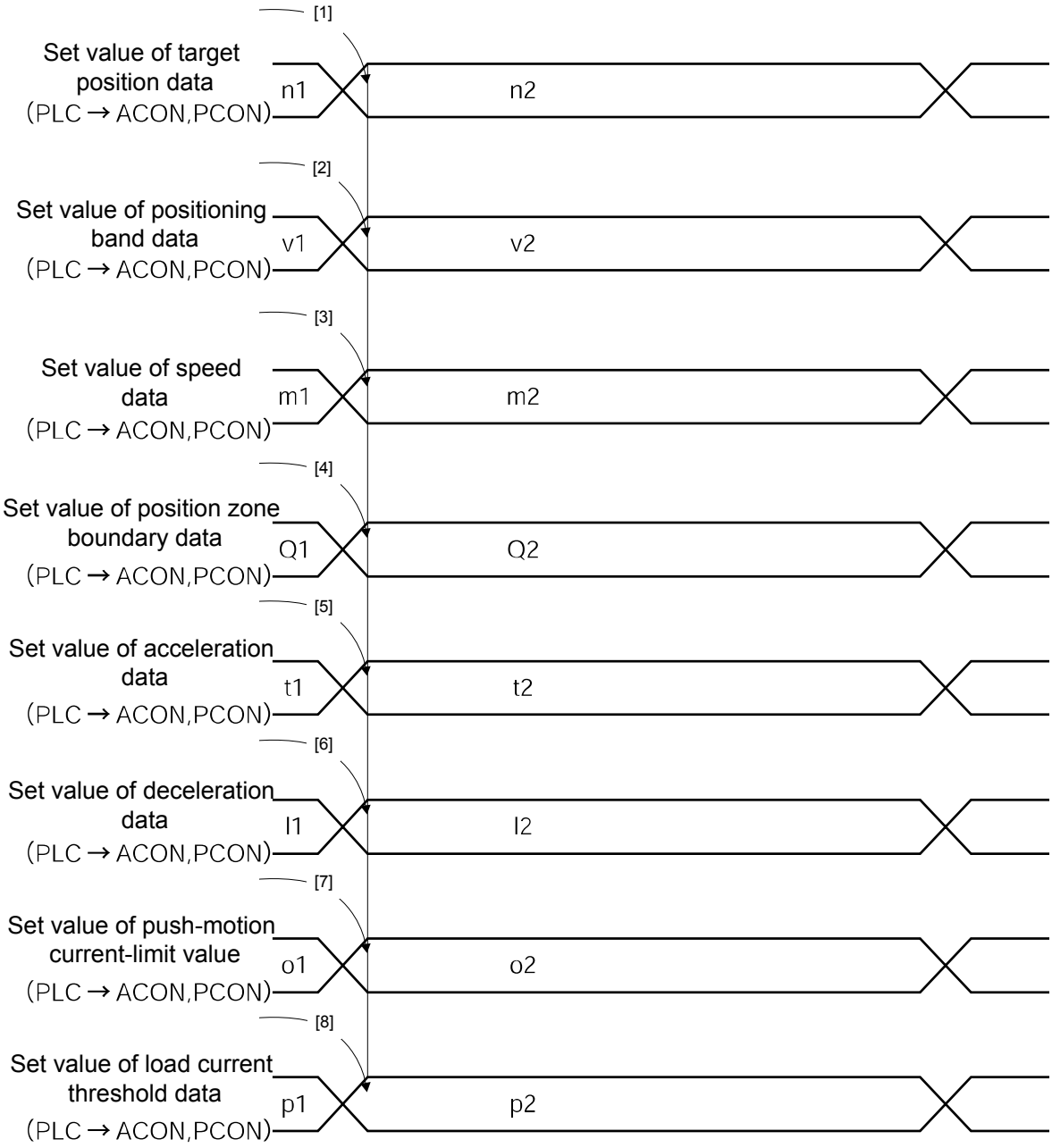
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

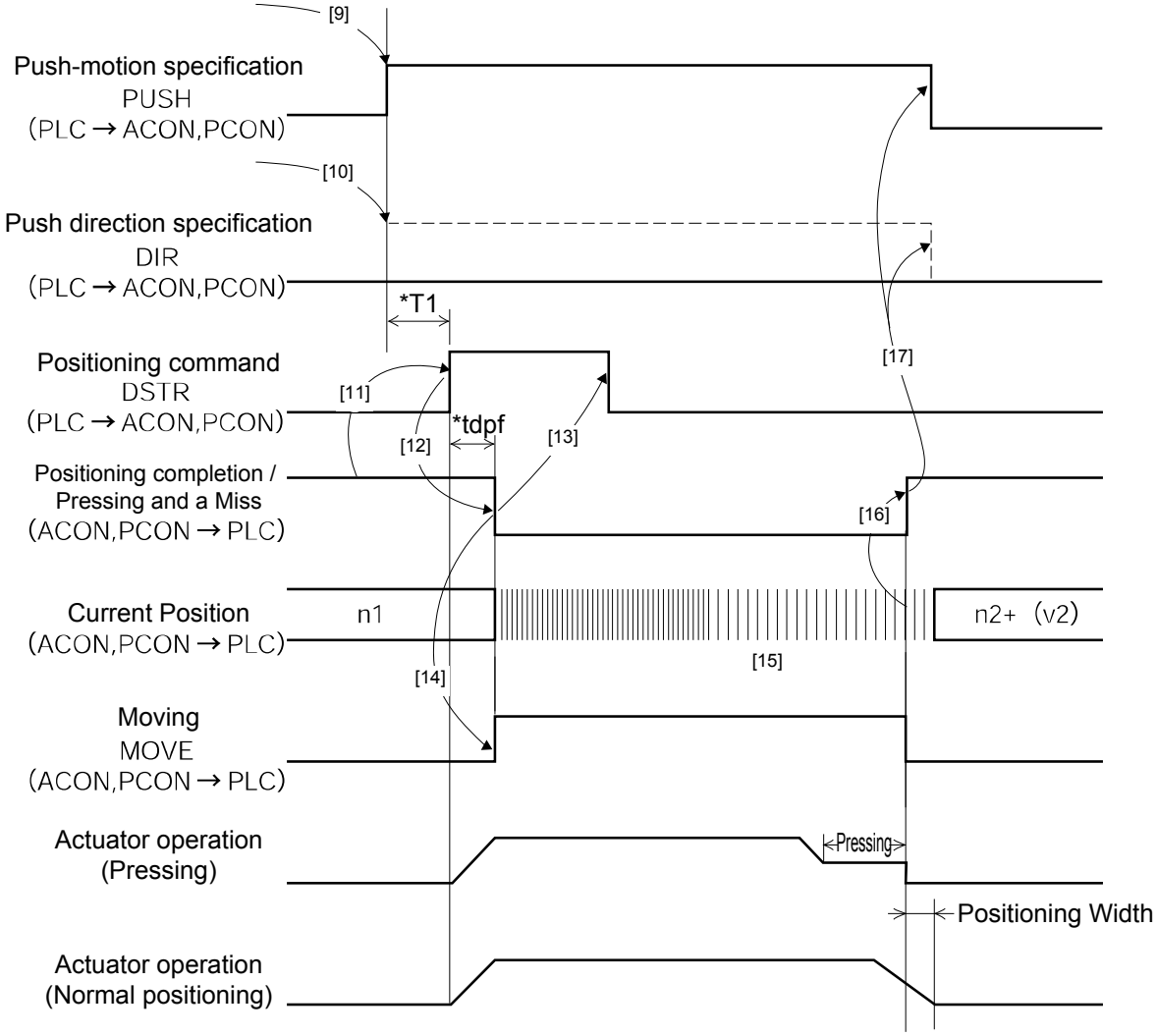
● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the position zone output boundary data in the zone boundary + register or zone boundary - 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 2.7.7 (22))
[11] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 8) 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 tpdf.
[13] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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” (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[17] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 9 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.


[1]
Set value of target position data (PLC → ACON,PCON)
n1
n2
[2]
Set value of positioning band data (PLC → ACON,PCON)
v1
v2
[3]
Set value of speed data (PLC → ACON,PCON)
m1
m2
[4]
Set value of position zone boundary data (PLC → ACON,PCON)
Q1
Q2
[5]
Set value of acceleration data (PLC → ACON,PCON)
t1
t2
[6]
Set value of deceleration data (PLC → ACON,PCON)
l1
l2
[7]
Set value of push-motion current-limit value (PLC → ACON,PCON)
o1
o2
[8]
Set value of load current threshold data (PLC → ACON,PCON)
p1
p2

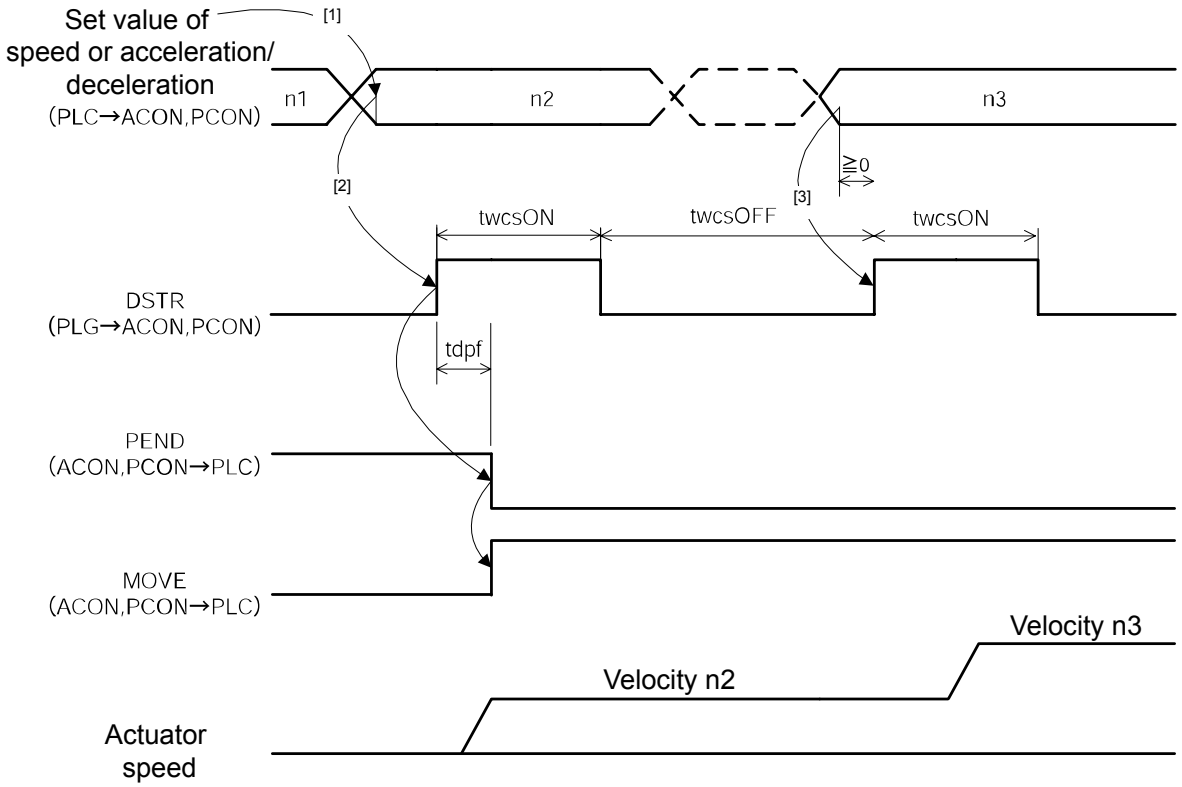


*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(4) Data change during movement

In the half direct mode or full direct mode, the value currently set to a given resister among the resisters for target position data, acceleration/deceleration data, speed data, positioning band and push-motion current-limiting value, can be changed while the actuator is moving.
After changing the data, turn “ON” the positioning command (DSTR) for more than tdpf.
Also, after turning “OFF” the DSTR, set aside some time for “twcsON + twcsOFF” or more, until the next DSTR is turned “ON”.
The example is shows as follows, where the speed and acceleration/deceleration data items have been changed.



twcsON ≥ Yt＋xt＋3(msec)
twcsOFF ≥ Yt＋xt＋3(msec)
*Yt＋xt ≤ tpdf ≤ Yt＋xt＋3(msec)

⚠ 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.

2.10 CompoNet Related Parameters

Parameters relating to CompoNet are No. 84 to No. 85 and No. 90.

Category:C:External interface parameter

No.	Category	Symbol	Name	Default Value set in the Factory before Delivery
1			Refer to Operation Manual for the controller for the parameters No. 1 through No. 83.	
~				
83				
84	C	FMOD	Field bus operation mode	0
85	C	NADR	Field bus node address	0
86	C	FBRS	Field bus baud rate	0
87	C	NTYP	Network type	4
90	C	FMIO	Field I/O format	3

● Field bus operation mode (No.84 FMOD)
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 CompoNet.
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.

● Field bus node address (No.85 NADR)
Specify the node address number in parameter No. 85.

Setting Range 0 to 63 (It is set to “0” when the machine is delivered from the factory.)

● Field bus baud rate (No.86 FBRS)
The baud rate is automatically set to the same value as the baud rate set in the master. Accordingly, you do not need to set the baud rate.

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

● Field I/O format (No.90 FMIO)
Addresses in the PLC are assigned in units of 16 points (2 bytes) based on the node address set in the controller and the occupied bytes in each operation mode.
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 “Example i”.)
1	The host bytes are exchanged with slave bytes in the host words and slave words. (Refer to “Example ii”.)
2	In the case of word register, the host words are exchanged with the slave words. (Refer to “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 “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			

⇧

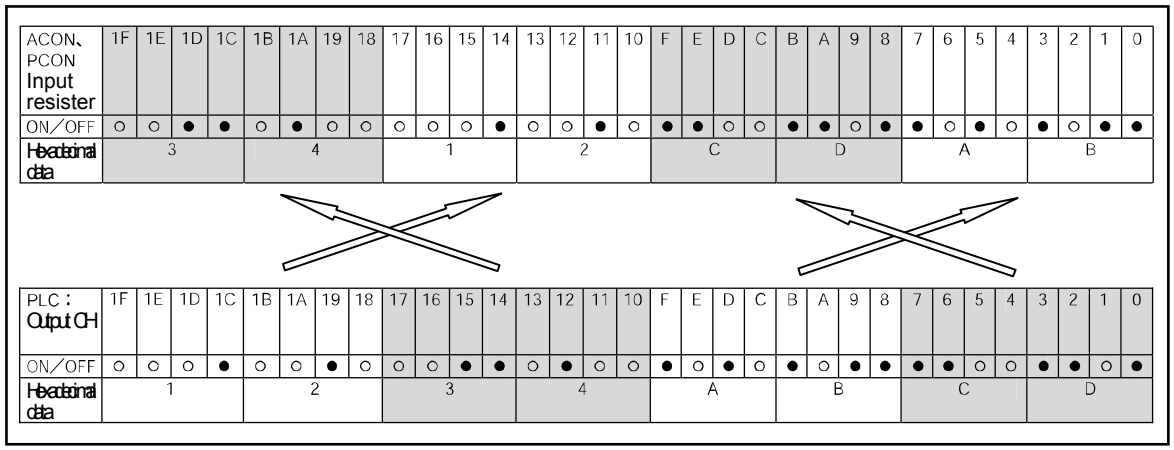
PLC：Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

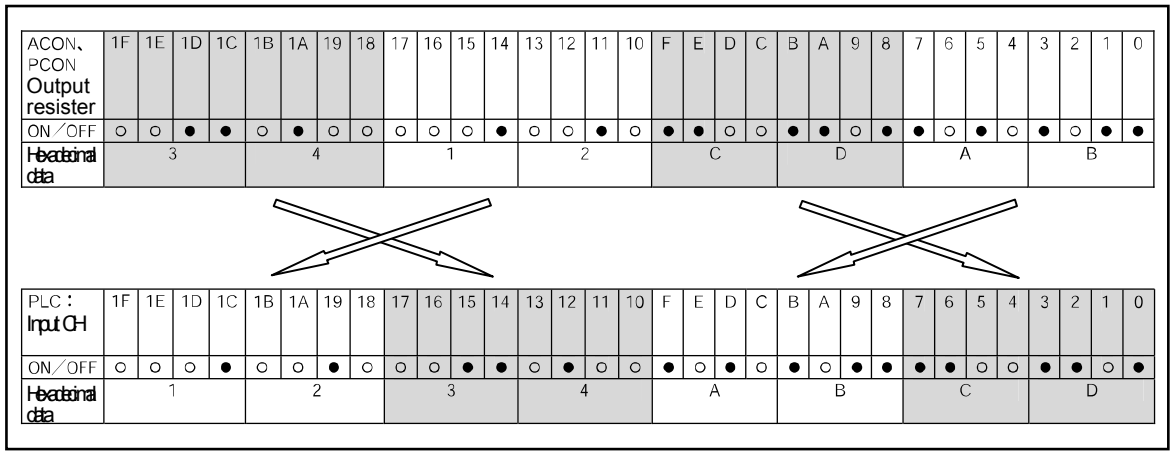
ACON、PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇩

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.

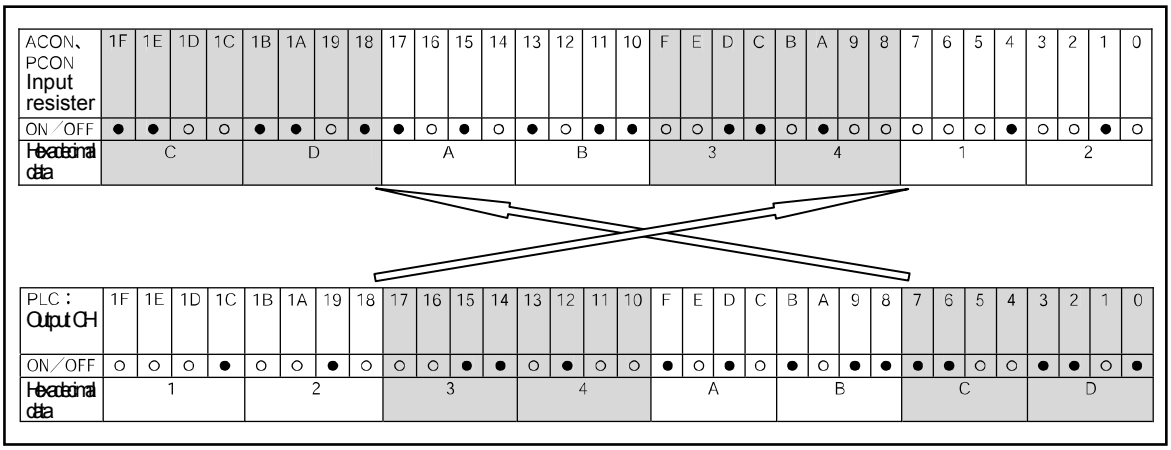
ACON、PCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

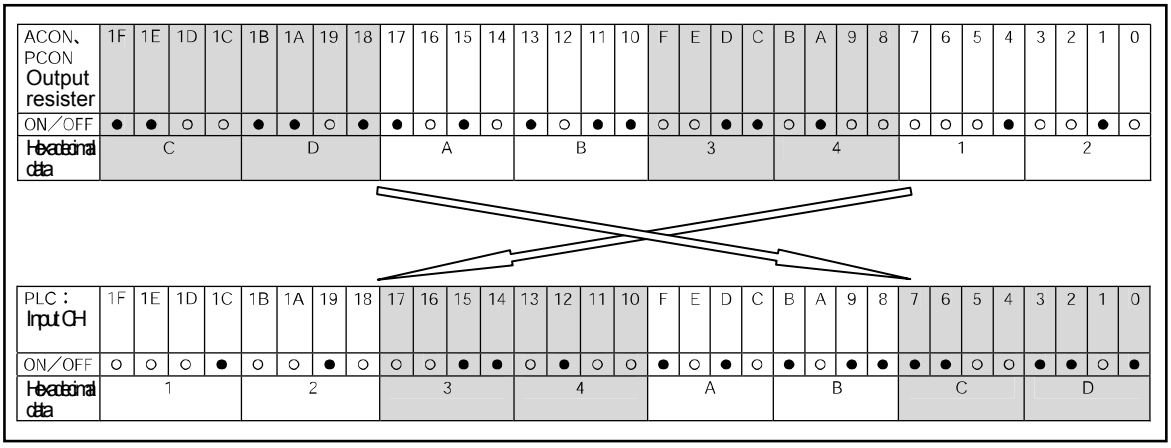
PLC：Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

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.





2.11 Troubleshooting

● Alarm Description and Cause/Treatment

[1] **When an alarm is issued, the completed position No. (4 bits for PM1 to PM8) shows the simplified alarm code in the Remote I/O Mode or Remote I/O Mode 2.**

In the position/simple direct mode, this simple alarm code is output to the (n+4, n+5) bytes.
In the half direct mode and full direct mode, this simple alarm code is output to the (n+12, n+13) bytes.

1) Confirm the alarm code using the PLC's monitor function, etc., or using the status monitor, connecting the teaching tools such as RC PC software.
2) Based on the read alarm code, search the alarm description list in the operation manual for the controller.
3) Deal with it based on the description for the alarm code in question.
For the following alarm code, deal with it according to the following table.

Code	Error name	ID (*1)	RES (*2)	Cause/Treatment
0F2	Field bus module error	05	x	Cause: The filed bus module error is detected Treatment: Confirm the parameter.
0F3	Field bus module not detected	04	x	Cause: The module can not be detected. Treatment: Turn ON the power again. If the error is not removed, contact our company.

(*1) ID→Simple alarm code
(*2) RES→ Whether or not the alarm can be reset ○: Alarm can be reset / x: Alarm cannot be reset

[2] If the alarm is occurred, checking the network status on the display of monitor LEDs is possible.

○: Illuminating, x: OFF, ☆: Flashing

MS	NS	Item	Cause of error occurrence	Unit operation after error detection	Measure
x	-	No power supply input	Specified power voltage is not supplied.	ACON / PCON stop the operation.	Remove the cause of no power supply input and input the power supply again.
○ GN	☆ RD	Communication Error	Remote I/O communication that the connection was set up with the master unit has stopped by timeout.	ACON / PCON continue the operation.	The following cases are considered to be the possible causes of communication error. Find the most suitable case and remove the cause. 1) A stop was cased by an error on the PLC system including the master unit. → Check the PLC system condition and cancel the error. 2) Communication with the master unit is disabled by broken connector, repeater, etc. → Check the conditions of cables, terminals and repeater. Supply the communication power again after an error cause is removed. 3) Master unit stopped the communication due to the communication retries with the applicable ACON / PCON continuously exceeded the specified value caused by noise. → Check the noise condition around the applicable ACON / PCON For the items above excluding 1) restart of master unit is not necessary.
○ GN	○ RD	Address duplication error	There are ACON / PCON with the same node existing on the network.	ACON / PCON stop the operation.	Confirm the node number of ACON / PCON, correct the duplicated number, then conduct operations in the following procedure. 1) Turn OFF the communication power supply between the master unit and ACON / PCON. 2) Turn ON the communication power supply between the master unit and ACON / PCON again.
○ RD	-	Unit error	An error has occurred to ACON / PCON due to the following causes.	ACON / PCON stop the operation.	Check the set value for the node address to remove the possibility of the error cause for 1). Then, restart (turn on the communication power supply again) ACON / PCON. If the error occurs again, replace ACON / PCON

2.12 CE Mark

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

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

3.1 Operation Modes and Functions

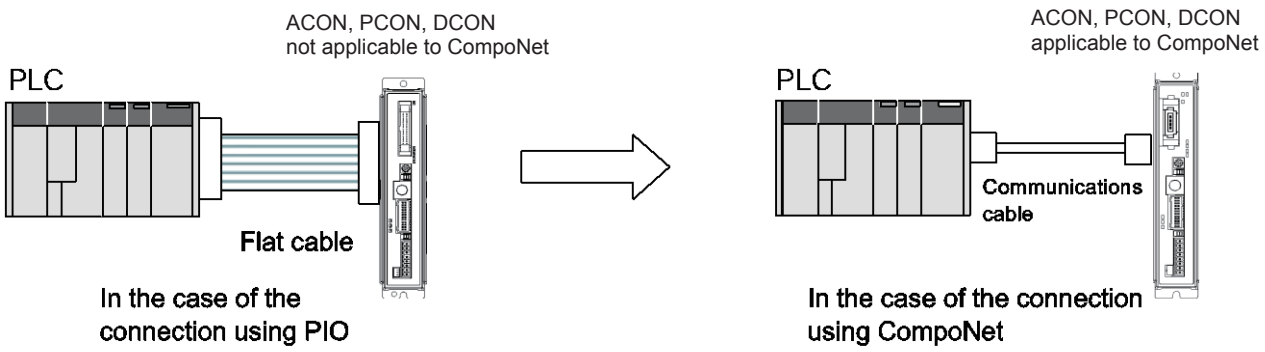
ACON, PCON and DCON (hereinafter referred to as “IAI controllers”) applicable to CompoNet can be operated by means of selecting one mode out of the following five operation modes.

Operation Modes and Main Functions

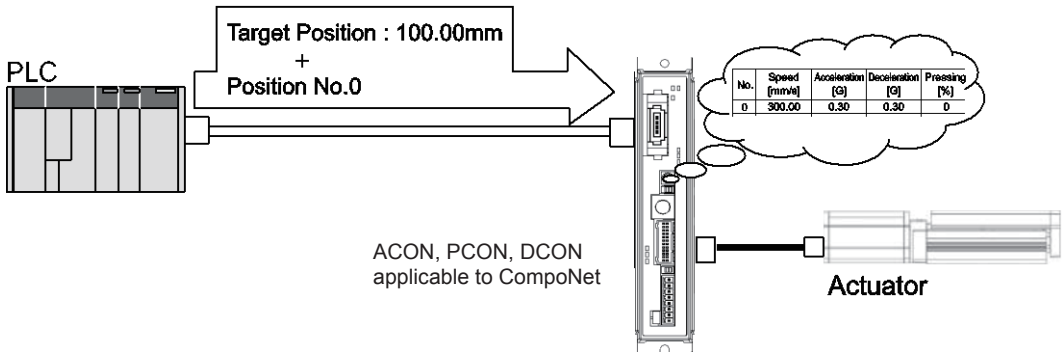
Main Functions	Remote I/O Mode	Position/ Simplified Direct Value Mode	Half Direct Value Mode	Full Direct Value Mode	Remote I/O Mode 2
Number of occupied bytes	2	8	16	32	12
Position Data Setup Operation	x	○(*1)	○	○	x
Velocity and Acceleration Direct Setup	x	x	○	○	x
Pressing Operation	○	○	○	○	○
Current 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.

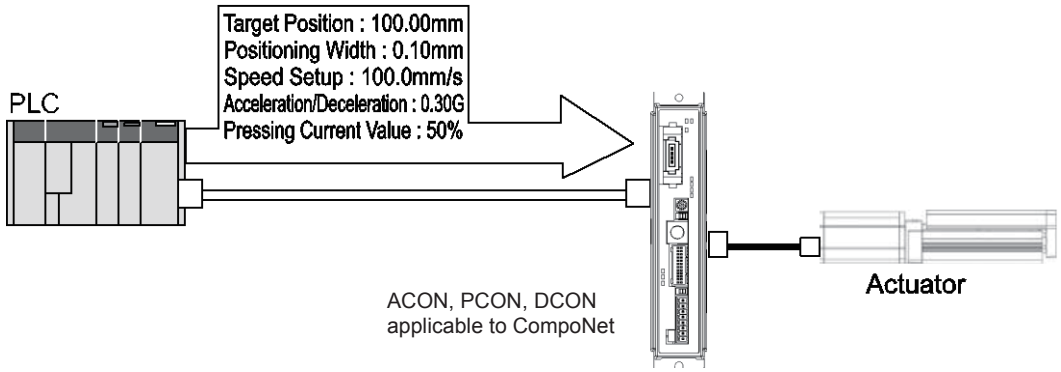
[1] Remote I/O Mode: This is the operation method using CompoNet, instead of PIO (24V I/O).
Number of occupied bytes: 2 bytes



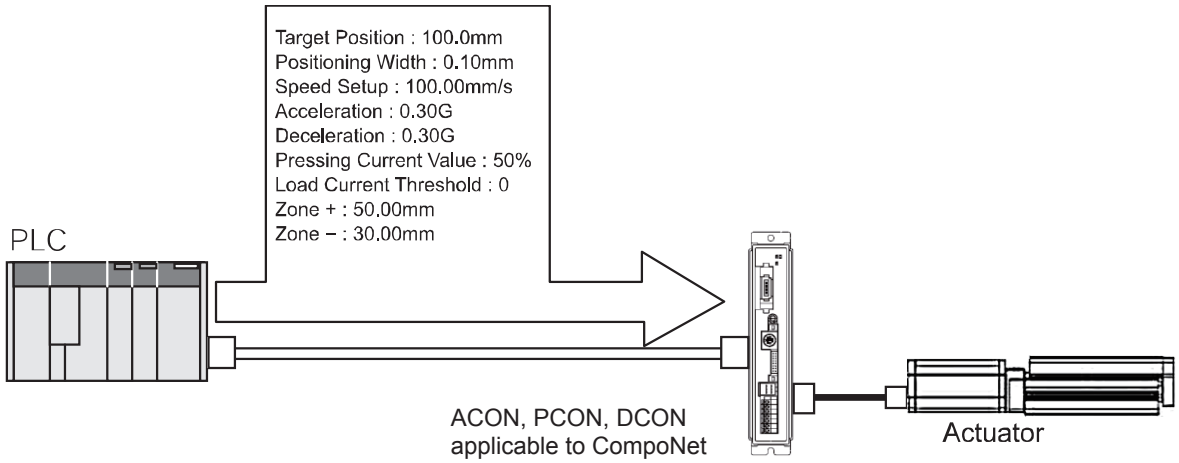
[2] Position / Simplified Direct Value Mode: This is the operation mode with the position No. set up.
Whether the target position is set directly by means of the changeover of the control signal, or the value registered on the position data is used can be selected.
For “Speed”, “Acceleration/Deceleration” 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



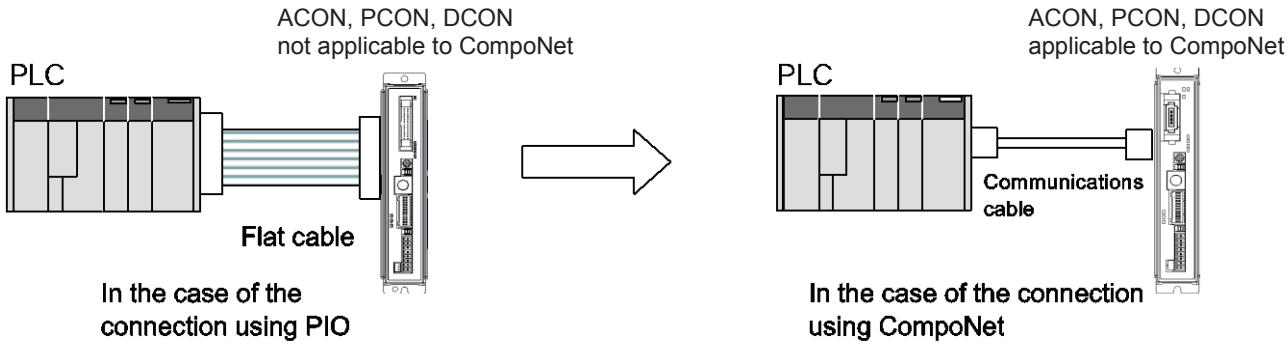
[3] Half Direct Value Mode: This is the operation method with the “Speed”, “Acceleration/Deceleration”, “Pressing Current Value” set up directly using the numerical values, in addition to the “Target Position”.
Number of occupied bytes: 16 bytes



[4] Full Direct Value Mode: This is the operation method with all the values (“Target Position”, “Speed”, “Acceleration/Deceleration”, etc.) related to the position control set up directly by using the numerical values.
Number of occupied bytes: 32 bytes



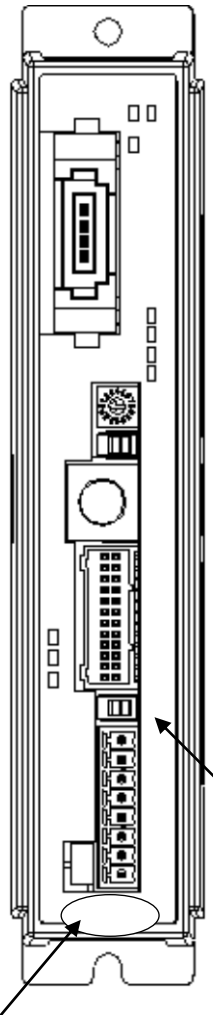
[5] Remote I/O Mode 2:This is the operation method using CompoNet, instead of PIO (24V I/O). The current position and command current value reading functions are added to the functions of [1].
Number of occupied bytes: 12 bytes



3.2 Model Numbers

The Model numbers of IAI controllers applicable to CompoNet are described as follows.

●ACON-CA/CB-☐-CN-☐
●PCON-CA/CB/CGB-☐-CN-☐
●PCON-CFA/CFB/CGFB-☐-CN-☐
●DCON-CA/CB-☐-CN-☐



Front Panel Color
- ACON-CA/CB : Dark Blue
- PCON-CA/CB/CGB : Dark Green
- PCON-CFA/CFB/CGFB : Light Green
- DCON-CA/CB : Dark Orange

Printed Series Name
- ACON
- PCON
- DCON

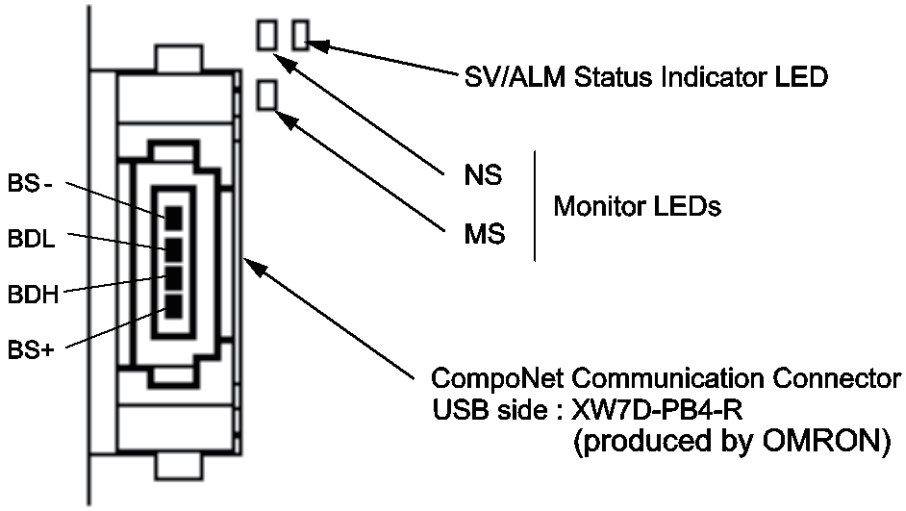
3.3 Interface Specifications

Item	Specification
Communication protocol	CompoNet specialized protocol
Communication type	Remote I/O communication
Baud rate	Automatically set to the same value as the baud rate set in the master
Communication Cable Length	Refer to CompoNet specifications
Slave type	Word mixed slave
Applicable note address	0 to 63 (set by controller parameter)
Communications cable	Round-type cable (JIS C3306,VCTF2 conductors) Flat cable 1 (not sheathed) Flat cable 2 (sheathed)
Connector	Connector recommended by OMRON is to be used. Controller-end connector:xW7D-PB4-R (OMRON)

3.4 CompoNet Interface

3.4.1 Names of the Parts

The names of each section related to CompoNet are described as follows.



3.4.2 Monitor LED indications

The node conditions of 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.
LEDs are 2-colored illumination type (orange / green), and the colors show the status as listed below.

MS (ModuleStatus) LED · · · · · · · · · Condition of the node (each controller)
NS (NetworkStatus) LED · · · · · · · · Condition of network

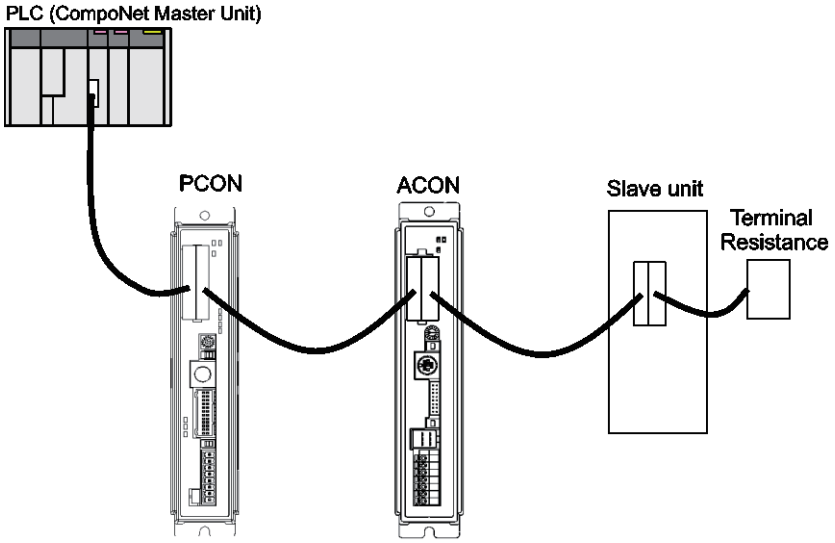
LED	Color	Indication Status	Description
MS	GN	Illuminating	In the normal operation
	RD	Illuminating	A hardware error. The replacement of the board is required.
		Flashing	It is a minor error such as a user setting error or configuration error. It can be recovered by re-setting, etc.
	—	OFF	The CompoNet is being initialized, or the power is not supplied.
NS	GN	Illuminating	The connection has been established and the communication is being performed normally.
		Flashing	The machine is on-line, but the connection has not been established. Communication Stop. (Network is normal)
	RD	Illuminating	Node address duplication.
		Flashing	Communication Error. (Communication timeout has been detected)
	—	OFF	The machine is not on-line. The power to the CompoNet is not supplied.

3.5 Wiring Example

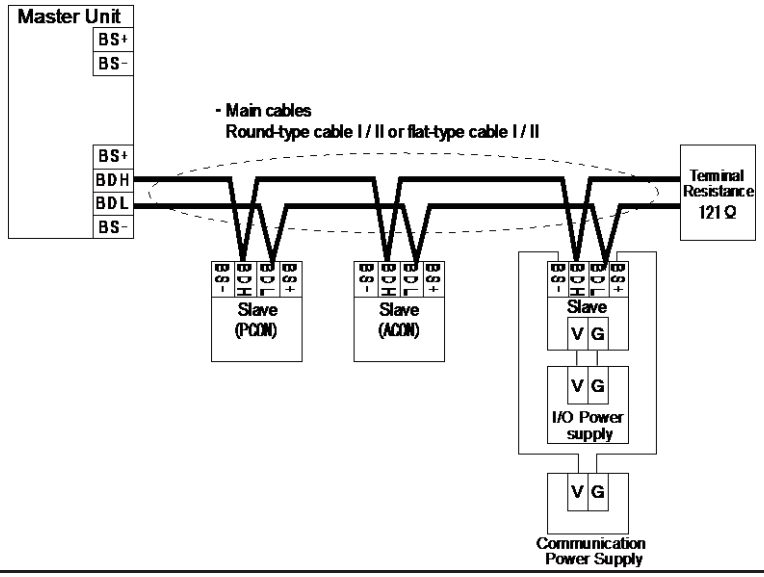
3.5.1 Connection Diagram

An example for wiring is as shown below.

- Wiring Example



- Connecting Example



*1: ACON, PCON and DCON for CompoNet specifications do not require the communication power supply. However, when multiple power supply is to be conducted to another slave, connection of the communication power of ACON and PCON to BS+ and BS- terminals is required.

*2: Make sure to read the Operation Manual for the master unit for the details of CompoNet wiring, precautions, etc.

3.6 Setting

3.6.1 Operation Mode Selecting

The operation mode is set using the parameters.
Set the mode toggle switch on the front surface of the controller to “MANU” side and set the parameter No. 84 “FMOD: Field Bus Operation Mode” using the RC PC software (V6.00.08.00 or later). (Refer to 3.10, "CompoNet Related Parameters”.)

(Note) Refer to instruction manual of RC PC Software for the applicable version.

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

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

3.6.2 Station No. Setting

The node address is set by the parameters.
Set the parameter No. 85 “NADR: Field Bus Node Address” using the RC PC software.
(Refer to 3.10, "CompoNet Related Parameters”.)

Settable Range:0 to 63 (It is set to “0” when the machine is delivered from the factory.)

(Note) Exercise caution to avoid node address duplication.
The nodes (controllers) are assigned in the order of their node address in the remote I/O address areas of the PLC.
For details, refer to the Operation Manuals of the master unit and PLC in which in the master unit is installed.

(Note) The setting for the communication speed is not required because it automatically follows the master’s communication speed.

(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.

3.7 Communicating with the Master Station

The remote device station consists of 2 words for each I/O point and 4 words for the remote I/O data register per station.
Set the station data for the master station to the number of stations setup in the operation mode for each station No.

3.7.1 Operation Modes and Corresponding PLC I/O Areas

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

- PLC Output → IAI controllers input (* "n" shows the node address of each axis.)

<table>
<tr><td rowspan="2">PLC output area (CH)</td><td colspan="5">DI on the ACON, PCON, DCON side and Input Data Register</td></tr>
<tr><td>Remote I/O Mode</td><td>Position / Simplified Direct Value Mode</td><td>Half Direct Value Mode</td><td>Full Direct Value Mode</td><td>Remote I/O Mode 2</td></tr>
<tr><td></td><td>Number of occupied channels:1CH</td><td>Number of occupied channels:4CH</td><td>Number of occupied channels:8CH</td><td>Number of occupied channels:16CH</td><td>Number of occupied channels:6CH</td></tr>
<tr><td>n</td><td>Port No.0 to 15</td><td rowspan="2">Target Position</td><td rowspan="2">Target Position</td><td rowspan="2">Target Position</td><td>Port No.0 to 15</td></tr>
<tr><td>n＋1</td><td rowspan="15"></td><td rowspan="15">Occupied area</td></tr>
<tr><td>n＋2</td><td>Specified position number</td><td rowspan="2">Positioning Band</td><td rowspan="2">Positioning Band</td></tr>
<tr><td>n＋3</td><td>Control Signal</td></tr>
<tr><td>n＋4</td><td rowspan="13"></td><td>Velocity</td><td rowspan="2">Speed Setup</td></tr>
<tr><td>n＋5</td><td>Acceleration/ Deceleration</td></tr>
<tr><td>n＋6</td><td>Pressing Current Limit Value</td><td rowspan="2">Zone boundary+</td><td rowspan="13"></td></tr>
<tr><td>n＋7</td><td>Control Signal</td></tr>
<tr><td>n＋8</td><td rowspan="6"></td><td rowspan="2">Zone boundary-</td></tr>
<tr><td>n＋9</td></tr>
<tr><td>n＋10</td><td>Acceleration</td></tr>
<tr><td>n＋11</td><td>Deceleration</td></tr>
<tr><td>n＋12</td><td>Pressing Current Limit Value</td></tr>
<tr><td>n＋13</td><td>Load current threshold</td></tr>
<tr><td>n＋14</td><td></td><td>Control Signal 1</td></tr>
<tr><td>n＋15</td><td></td><td>Control Signal 2</td></tr>
</table>

(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 node address duplication.

- IAI controllers output→PLC Input Side (* “n” shows the node address of each axis.)

PLC input area (CH)	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 channels:1CH	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:16CH	Number of occupied channels:6CH
n	Port No.0 to 15	Target Position	Target Position	Target Position	Port No.0 to 15
n+1					Occupied area
n+2		Completed Position No. (simple alarm ID)	Command Current	Command Current	Target Position
n+3		Status Signal			
n+4			Current Speed	Current Speed	Command Current
n+5					
n+6			Alarm Code	Alarm Code	
n+7			Status Signal	Occupied area	
n+8					
n+9					
n+10				Total moving count	
n+11					
n+12				Total moving distance	
n+13					
n+14				Status Signal 1	
n+15				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 node address duplication.

3.7.2 Remote I/O Mode (Number of occupied channels 1CH)

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 the teaching tools such as RC PC software.
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	○	○	○	○	○	○
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	IAI controllers DI(Port No.)	PLC output CH	IAI controllers DO(Port No.)	PLC input CH
0	0 to 15	n+0	0 to 15	n+0

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (channel) and one output word (channel) in the I/O areas.

- Each channel is controlled by ON/OFF bit signals.

PLC output (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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 (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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/ PZONE2	Position zone/zone2	PZONE/ PZONE1	Position zone/zone1	PZONE/ PZONE1	Position zone/zone1
	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/ WEND	Positioning completion signal	PEND	Positioning completion signal/ position-data read complete	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	Retracting end movement command 0
	1	PM2		PE1	Position 1 complete	LS1	Retracting end movement command 1
	2	PM4		PE2	Position 2 complete	LS2	Retracting end movement command 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/ PZONE2	Position zone/zone2	PZONE/ PZONE2	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)

3.7.3 Position/Simplified Direct Value Mode (Number of occupied channels 4CH)

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 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	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using parameters.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

ParameterNo.84	IAI controllers input register	PLC output CH	IAI controllers output register	PLC input CH
1	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Specified position number	n+2	Completed Position No. (Simple alarm code)	n+2
	Control Signal	n+3	Status Signal	n+3

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of four input words (channels) and four output words (channels) 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.
- 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 such as PC software.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	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+2	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+3	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (upper word)																

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

n+2	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+3	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	ALML (Note 1)	—	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.	3.9 (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 such as PC software. 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.	3.9 (1)
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	3.7.7 (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.	3.7.7 (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.	3.7.7 (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.	3.7.7 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	3.7.7 (17)
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	3.7.7 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	3.7.7 (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.	3.7.7 (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.	3.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	3.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.7.7 (6)
		b0	CSTR	Positioning Start: A move command is issued when this signal turns ON.	3.7.7 (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. The setting 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.	3.9 (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.	3.9 (1)
	Status code	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.7.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.7.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.7.7 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	3.7.7 (12)
		b10	MODES	Teaching mode Signal: This signal is ON while the teaching mode is selected.	3.7.7 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	3.7.7 (17)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.7.7 (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.	3.7.7 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.7.7 (32)
		b6	-	Unavailable	-
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	3.7.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.7.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.7.7 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	3.7.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.7.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.7.7 (10)

3.7.4 Half Direct Value Mode (Number of occupied channels 8CH)

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	○	
Operation at different acceleration and deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

ParameterNo.84	IAI controllers input register	PLC output CH	IAI controllers output register	PLC input CH
2	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Command Current	n+2
		n+3		n+3
	Velocity	n+4	Current Speed	n+4
	Acceleration/Deceleration	n+5		n+5
	Pressing Current Limit Value	n+6	Alarm Code	n+6
	Control signal	n+7	Status Signal	n+7

(Note) Be careful of using duplicated node addresses.

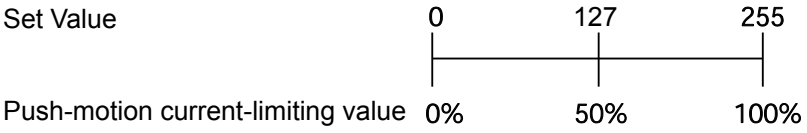
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of eight input words (channels) and eight output words (channels) 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/sec or 0.1mm/sec) can be set in PLC. Set the value that does not exceed the max. speed value for the actuator concerned.
  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/sec
1	0.1mm/sec

- 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 limit 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 limit 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Target Position (lower word)																
n+1																
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+2																
Positioning Width (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+3																
Positioning Width (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+4																
Velocity	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+5																
Acceleration/ Deceleration	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+6																
Pressing Current Limit Value	—	—	—	—	—	—	—	—	128	64	32	16	8	4	2	1
n+7																
Control Signal	BKRL	RMOD	DIR	PUSH	—	—	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Current Position (lower word)																
n+1																
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+2																
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+3																
Command Current (upper word)													524,288	262,144	131,072	65,536
n+4																
Current Speed (lower word)																
n+5																
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+6																
Alarm Code																
n+7																
Status Signal	EMGS	PWR	ZONE2	ZONE1	—	—	—	RMDS	ALML (Note 1)	—	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.	3.9 (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.	3.9 (2)
	Velocity	16-bit data	-	16-bit integer Specify the speed at which to move the actuator. The unit is 1.0mm/sec or 0.1mm/sec 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/sec”, set it as “254”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.9 (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.	3.9 (2)
	Pressing Current Limit Value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during push-motion 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 push-motion current, an alarm will occur.	3.9 (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.	3.7.7 (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.	3.7.7 (19)
		b13	DIR	Push 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	3.7.7 (22)
		b12	PUSH	Push-motion specification: Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.	3.7.7 (21)
		b11	-	Unavailable	-
		b10			
		b9			
		b8	JOG+	+ Jog: “ON” for Movement in the Opposite Direction of Home	3.7.7 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	3.7.7 (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.	3.7.7 (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.	3.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	3.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.7.7 (6)
		b0	DSTR	Positioning Command: A move command is issued when this signal turns ON.	3.7.7 (8)
	Current Position	32-bit data	-	32-bit signed integer indicating the current position The setting 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.	3.9 (2)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	3.9 (2)

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

Signal Type		Bit	Symbol	Contents	Details
PLC Input	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.9 (2)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0$_H$”. Refer to the Operation Manual for the controller main body for the details of the alarms.	3.9 (2)
	Status Signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	3.7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.7.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.7.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.7.7 (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.	3.7.7 (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.	3.7.7 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.7.7 (32)
		b6	-	Unavailable	-
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	3.7.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.7.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.7.7 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	3.7.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.7.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.7.7 (10)

3.7.5 Full Direct Value Mode (Number of occupied channels 16CH)

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	○
Operation at different acceleration and deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC channel configuration (* “n” shows the node address of each axis.)

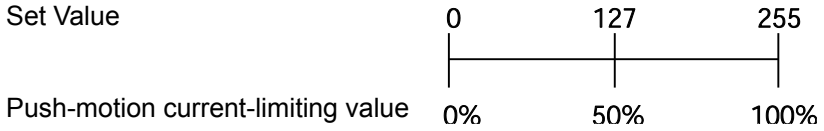
ParameterNo.84	IAI controllers input register	PLC output CH	IAI controllers output register	PLC input CH
3	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Command Current	n+2
		n+3		N+3
	Velocity	n+4	Current Speed	n+4
		n+5		n+5
	Zone boundary +	n+6	Alarm Code	n+6
		n+7	Occupied area	n+7
	Zone boundary -	n+8		n+8
		n+9		n+9
	Acceleration	n+10	Total moving count	n+10
	Deceleration	n+11		n+11
	Pressing Current Limit Value	n+12	Total moving distance	n+12
	Load current threshold	n+13		n+13
	Control Signal 1	n+14	Status Signal 1	n+14
	Control Signal 2	n+15	Status Signal 2	n+15

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

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of 16 input words (channels) and 16 output words (channels) 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/sec) 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 limit 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 limit 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 push-motion 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 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/sec).
- 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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Target Position (lower word)																
n+1																
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+2																
Positioning Width (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+3																
Positioning Width (upper word)													524,288	262,144	131,072	65,536
n+4																
Velocity (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+5																
Velocity (upper word)													524,288	262,144	131,072	65,536
n+6																
Zone boundary + (lower word)																
n+7																
Zone boundary + (upper word)																

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

Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8																
Zone boundary – (lower word)																
n+9																
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+10																
Acceleration								256	128	64	32	16	8	4	2	1
n+11																
Deceleration								256	128	64	32	16	8	4	2	1
n+12																
Pressing Current Limit Value									128	64	32	16	8	4	2	1
n+13																
Load current threshold (Note 1)									128	64	32	16	8	4	2	1
n+14																
Control Signal 1			NTC1 (Note 2)	NTC0 (Note 2)		SMOD (Note 1)	ASO1	ASO0	MOD1	MOD0	GSL1 (Note 2)	GSL0 (Note 2)	INC	DIR	PUSH	—
n+15																
Control Signal 2	BKRL	RMOD						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.

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Current Position (lower word)																
n+1 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+2 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+3 Command Current (upper word)													524,288	262,144	131,072	65,536
n+4 Current Speed (lower word)																
n+5 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+6 Alarm Code																
n+7 to n+9 Unavailable																

Address (* “n” shows the head register address per each axis).

1 word (1CH) = 16 bits

n+10	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+11	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+12	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+13	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+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	ALML (Note 2)

n+15	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 (Note 1)	TRQS (Note 1)	RMDS	GHMS	PUSH	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.

(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. (Examle) 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.	3.9 (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.	3.9 (3)
	Velocity	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/sec 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/sec”, set it as “2541”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	3.9 (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. (Example) When it is “+25.40mm”, set it as “2540”. 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. *When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	3.9 (3)

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

<table>
<tr><th colspan="2">Address</th><th>Bit</th><th>Symbol</th><th>Function</th><th>Details</th></tr>
<tr><td rowspan="12">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">3.9 (3)</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Pressing Current Limit Value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current- limit value to be used during push-motion 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 push-motion current, an alarm will occur.</td><td>3.9 (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>3.9 (3)</td></tr>
<tr><td rowspan="10">Control Signal 1</td><td>b15</td><td rowspan="2">-</td><td colspan="2" rowspan="2">Unavailable</td><td rowspan="5">3.7.7 (33)</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>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></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></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>3.7.7 (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">3.7.7 (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:
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">3.7.7 (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”.)

Address		Bit	Symbol	Function	Details
PLC Output	Control Signal 1	b5	GSL1 (ACON only)	Servo gain parameter set selection 1 Select the servo gain parameter set to be used GSL1 / GSL0 / Function OFF / OFF / Select parameter set 0. OFF / ON / Select parameter set 1. ON / OFF / Select parameter set 2. ON / ON / Select parameter set 3.	3.7.7 (34)
		b4	GSL0 (ACON only)	Servo gain parameter set selection 2	
		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.	3.7.7 (24)
		b2	DIR	Push 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	3.7.7 (22)
		b1	PUSH	Push-motion specification : Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.	3.7.7 (21)
		b0	-	Unavailable	-
	Control Signal 2	b15	BKRL	Forced brake release: When it is turned ON, the brake is released	3.7.7 (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.	3.7.7 (19)
		b13	-	Unavailable	-
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog: “ON” for Movement in the Opposite Direction of Home	3.7.7 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	3.7.7 (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.	3.7.7 (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.	3.7.7 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	3.7.7 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	3.7.7 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	3.7.7 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	3.7.7 (6)
		b0	DSTR	Positioning Start: A move command is issued when this signal turns ON.	3.7.7 (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 The setting 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.	3.9 (3)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	3.9 (3)
	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	3.9 (3)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0”. Refer to the operation manual for the controller main body for the details of the alarms.	3.9 (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			
		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.	3.7.7 (31)
			BALM	☆When Parameter No. 151 is set to 1 in ACON, absolute battery voltage drop warning turns ON when the voltage is dropped.	3.7.7 (32)

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.	3.7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	3.7.7 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	3.7.7 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	3.7.7 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	3.7.7 (12)
		b10	LOAD(Note 1)	Load Output Judgment: “ON” for Reached “OFF” for Not reached [Refer to the instruction manual for the controller main body for more information.]	3.7.7 (26)
		b9	TRQS(Note 1)	Torque Level: “ON” for Reached “OFF” for Not Reached [Refer to the instruction manual for the controller main body for more information.]	3.7.7 (27)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	3.7.7 (19)
		b7	GHMS	Under Home return Operation: This signal remains ON while home return is in progress.	3.7.7 (6)
		b6	PUSHS	Push motion in progress: This signal remains ON while push-motion operation is in progress.	3.7.7 (25)
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	3.7.7 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	3.7.7 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	3.7.7 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	3.7.7 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	3.7.7 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	3.7.7 (10)

Note 1 It can be used only in PCON.

3.7.6 Remote I/O Mode 2 (Number of occupied channels 6CH)

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 the teaching tools such as PC software.
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	○	○	○	○	○	○
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	IAI controllers DI and input register	PLC output CH	IAI controllers DO and output register	PLC input CH
4	Port No.0 to 15	N+0	Port No.0 to 15	n+0
	Occupied area	n+1	Occupied area	n+1
		n+2	Current Position	n+2
		n+3		n+3
		n+4	Command Current	n+4
		n+5		n+5

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid node 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 (channels) 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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

n+0	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0																
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+1																
Unavailable																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2																
Current Position (lower word)																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
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																
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

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+5																
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 3.7.2 (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 The setting 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 The value of electrical current specified by the current command is indicated. The setting unit is 1mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	-

3.7.7 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 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”.

(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 3.4, "CompoNet Interface”) on the front surface of the controller illuminates in red.

(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

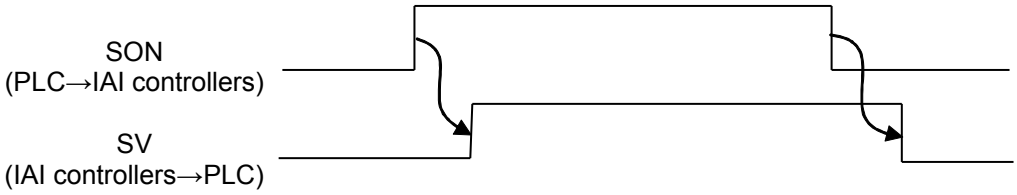
[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset.(In the case of the alarm with the cold start level, re-injection of the power is required)
[2] When this signal is turned ON from OFF condition during 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 3.4, "CompoNet Interface”) on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

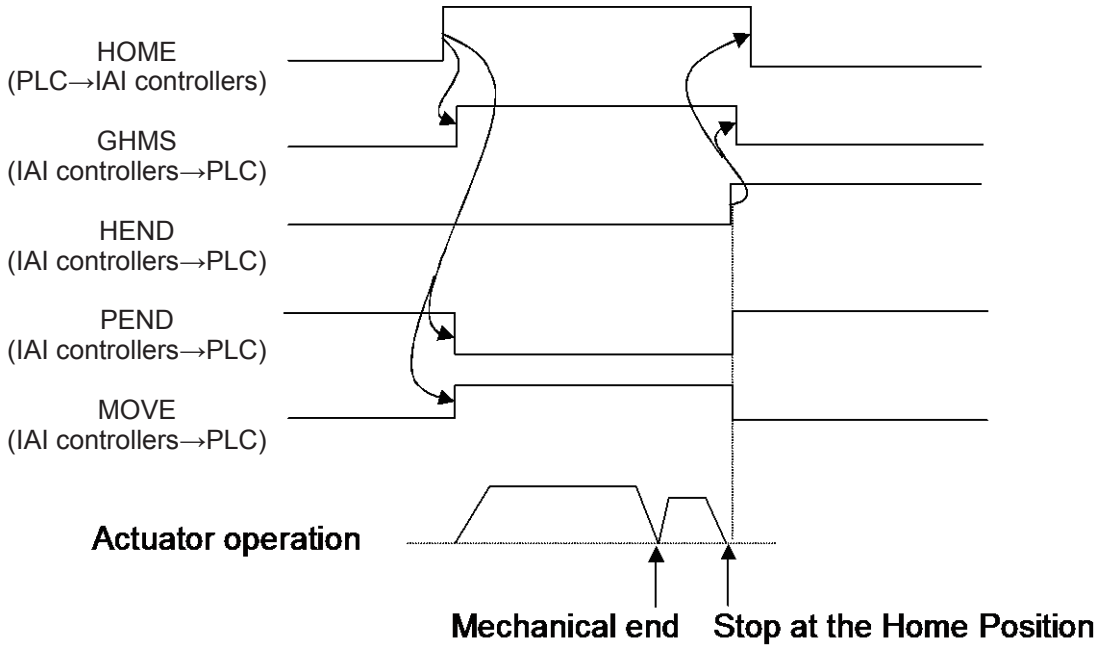
■Function

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.



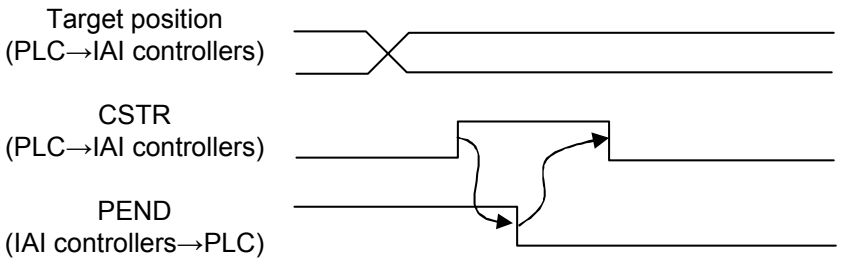
⚠ Caution: In the Remote I/O mode, Remote I/O Mode 2 and Position/Simplified Direct Value Mode, when the positioning command is issued without performing the home return operation after the power injection, the positioning is performed after the automatic home return operation. Exercise caution that 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”.

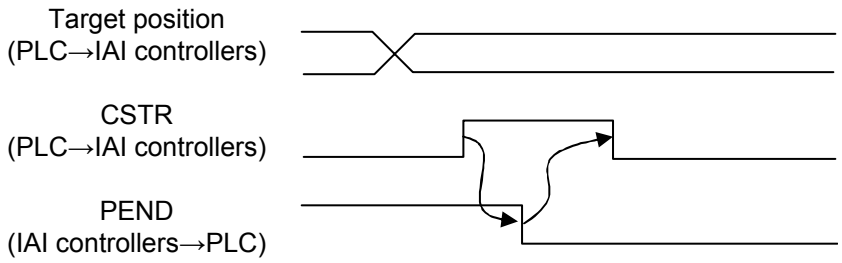
- PMOD＝OFF: Target position data for the specified position No. is used.
- PMOD＝ON :Value for the target position set using the PLC's target position register is used.

When this signal is issued in the condition where the home return operation has not performed at all after the power 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 (HEND) 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”.

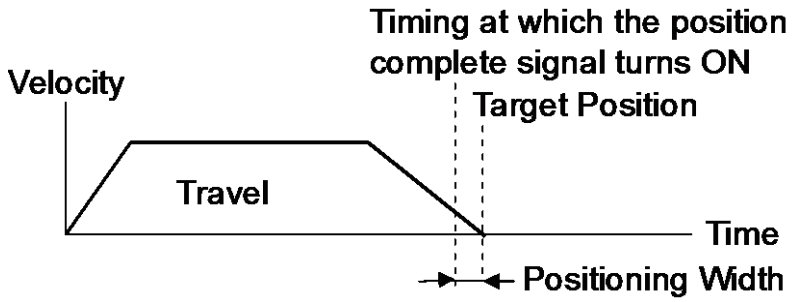


(9) Moving Signal (MOVE) PLC input signal

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 “ON”.

(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.



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” and the actuator is within the positioning band, the PEND signal is turned “ON” again.
When the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.

(11) Pause (STP) PLC output signal

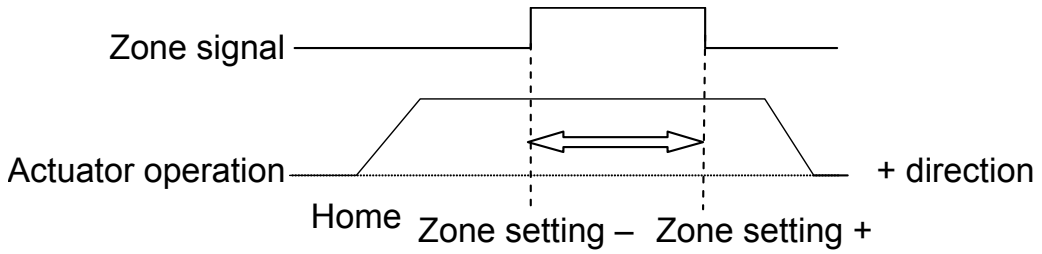
When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position 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.

(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 velocity is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (IVEL) 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.
The relationship is as follows.

Controller ready	Jog operation: JISL=OFF	Inch operation: JISL=ON
OFF	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed” Parameter No. 48, “Inch distance”
ON	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2” Parameter No. 49, “Inch distance 2”

(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.
The table below summarizes the relationship of the ON/OFF statuses of the JISL signal and jog speed/inch-distance switching (JVEL) signal.

		Jog operation	Inch operation
JISL		OFF	ON
JVEL=OFF	Velocity	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	Velocity	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	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.)
Operation		When the JOG +/JOG – signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG – signal.

(16) Teaching Mode Command (MODE) PLC output signal
Teaching mode Signal (MODES) PLC input signal

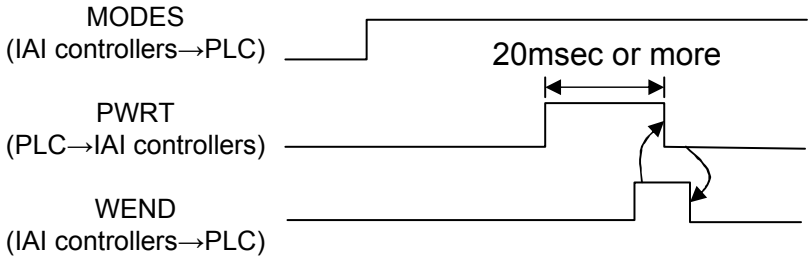
When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the controllers for each actuator is changed to the teaching mode, the MODES signal is turned ON.
After confirming that the MODES signal is turned “ON” on the PLC side, start the teaching 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 20msec or more. If the time is shorter than 20msec, 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

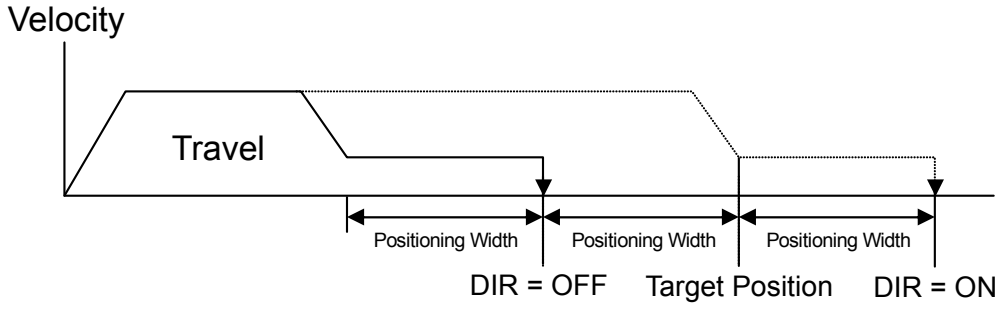
This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON :Use the value of the target position resister

(21) Push-motion 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) Operation in Half Direct Value Mode in “3.9 Operation” for the setting timing for this signal)

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

This signal specifies the pressing direction.
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.
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.
In the case of the normal pressing operation, this signal is disabled.
(Refer to Item (2) Operation in Half Direct Value Mode in “3.9 Operation” for the setting timing for this signal)



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

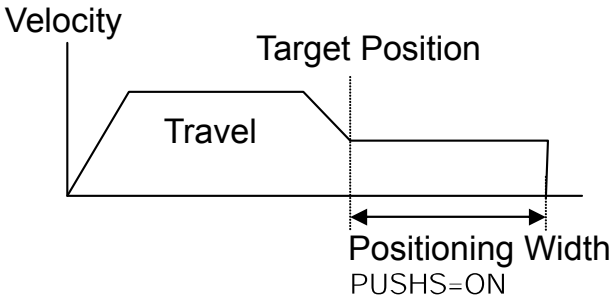
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
(Refer to Item (2) Operation in Half Direct Value Mode in “3.9 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) Push motion in progress (PUSHS) PLC input signal

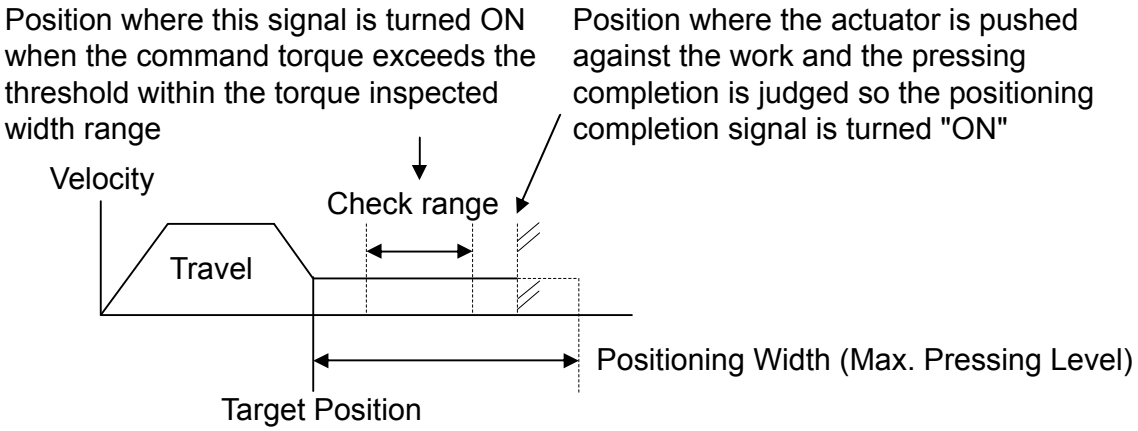
This signal is turned “ON” during the pressing operation.



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) Operation in Half Direct Value Mode in “3.9 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 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.

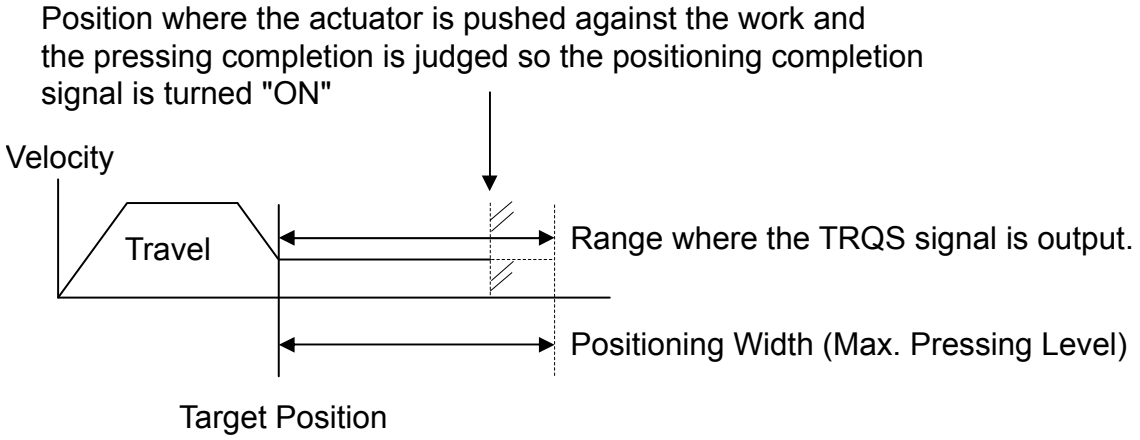


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics.
  Set an appropriate velocity considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time 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 for more information.

⚠ Caution:
- If the actuator pushes against the work 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 position.
- The actuator continues to push the work with the pressing current at the stop time decided with the current limit 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”.
The velocity available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing velocity 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 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 limit 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 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.

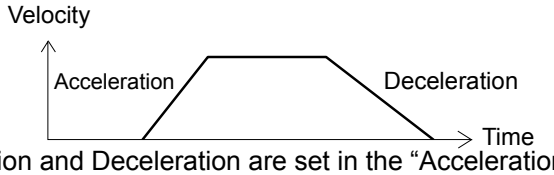
After confirming that there would be no trouble in whole system, use this signal.

(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	

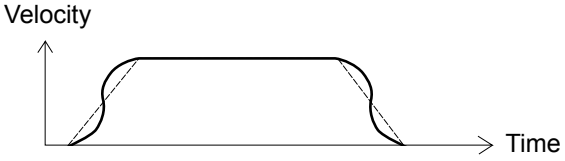
Trapezoid Pattern



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

S-shaped Motion

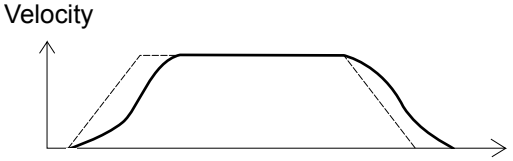
The S-shaped curve is described where at first in the acceleration, the line is gentle, but along the way, it suddenly becomes steep.
Use it in such application that setting the acceleration/deceleration rate high is desired because high tact time is required, but in the movement start or immediately before stop, low acceleration/deceleration rate is favorable.



* The S-shaped motion degree is set using the parameter No. 56 “S-Shaped Motion Ratio Setting”. The setting unit is % and setting range is from “0” to “100”.
(The above figure shows the image graph with the Parameter No. 56 set to “100”.)
When it is set to “0”, the S-shaped motion is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

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.

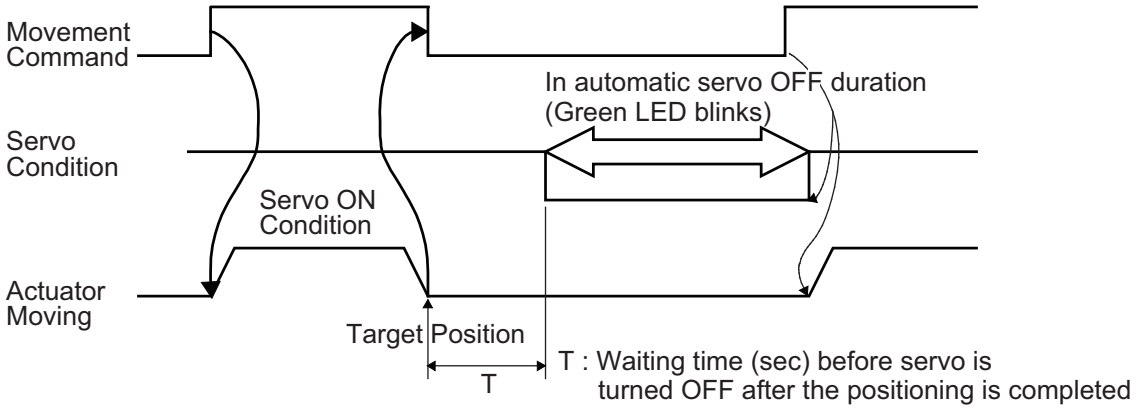


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1msec and setting range is from “0.0” to “100.0”.
W hen it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation 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 for more information.

ASO1	ASO0	Functions	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.]

(32) Absolute Battery Voltage Low Warning (BALM) PLC input signal 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.)

(33) Vibration Damping Control Mode Selection 0, 1 (NTC0, NTC1)

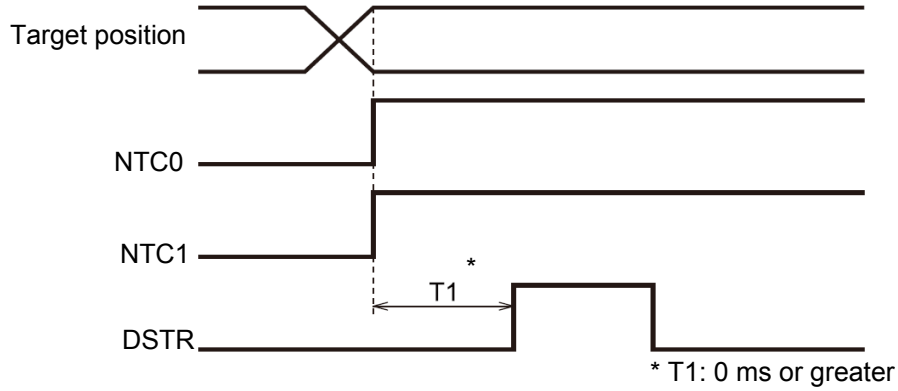
PLC output signal ACON only

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.

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.



⚠ 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 signal 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.

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	

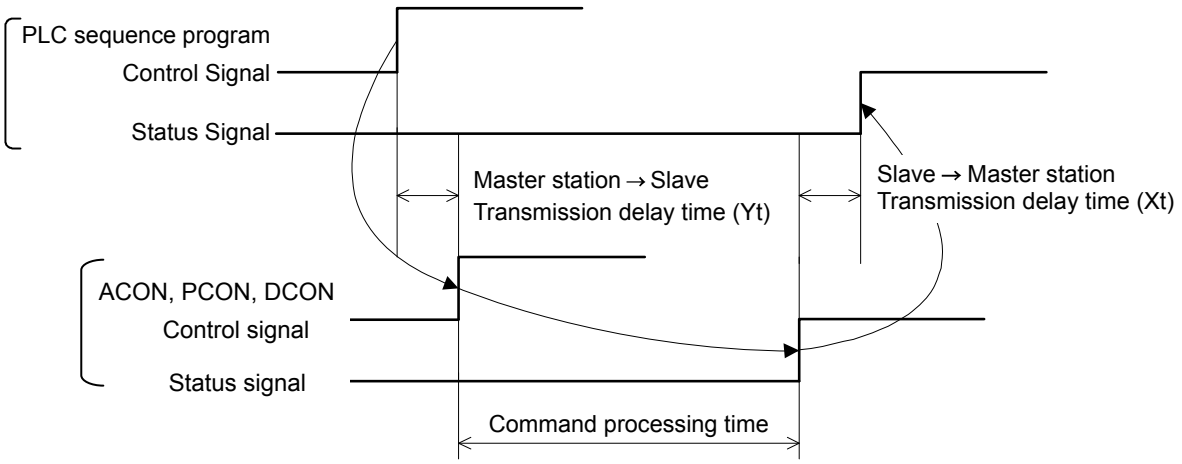
3.8 I/O Signal Timings

When any of the control signal is turned ON to perform the operation of the robot cylinder using the PLC's sequence program, the response (status) is returned to the PLC. The maximum response time is expressed using the following formula.

Maximum response time (msec)＝Yt+xt+3+ command processing time (operation time, etc.)

Yt: Master Station→slave transmission delay time
xt: Slave→Master Station Transmission Delay Time
} Filed Network Transmission Delay Time

Master Station→ For the master station -> slave transmission delay (Yt) and slave → master station transmission delay (xt), refer to the Operation Manuals for the CompoNet master unit and PLC installed in the master unit.



3.9 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 Operation Manual for the controller main body.
(In remote I/O mode 2, read the current position and current speed from the respective byte of the PLC, as deemed appropriate.)

(1) Operation in the position/simple-direct mode

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

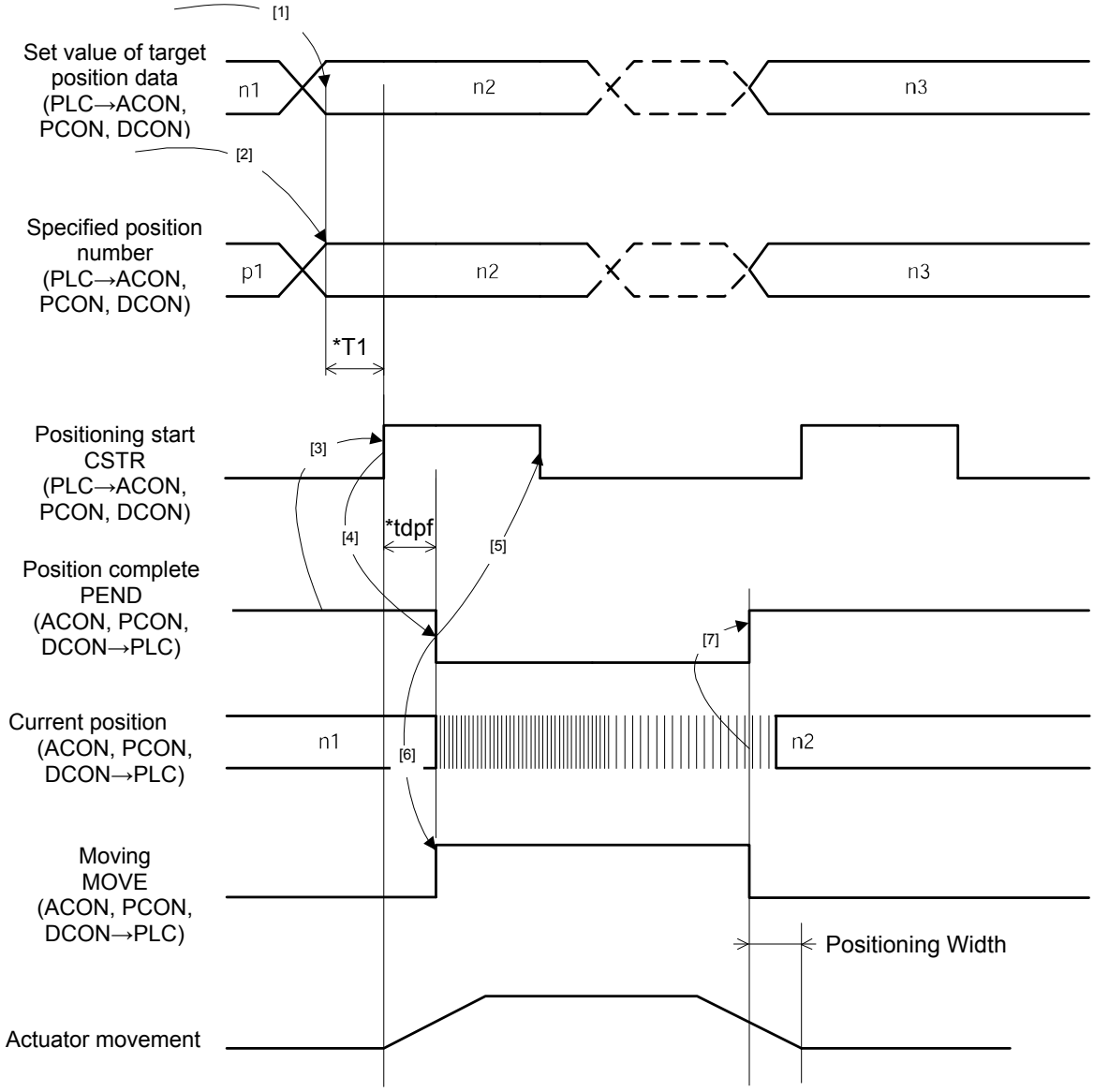
● Example of operation (normal positioning operation)

(Preparation) Set the position data items (speed, acceleration/deceleration, positioning band, 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] In the condition where the positioning completion (PEND) signal is turned “ON” or, Under Movement (MOVE) signal is turned “OFF”, turn “ON” the Positioning Start (CSTR) signal. The data items set in Steps 1) and 2) are read in the controller at the startup (ON edge) of the CSTR signal.
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 CST signal is turned “ON”, the PEND signal is turned OFF after tdpf.
[5] After confirming that the PEND signal is turned “OFF” or MOVE signal is turned “ON”, turn “OFF” the CSTR signal. 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”.
[7] The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning band set in the position data, and the CSTR signal is turned “OFF”, the PEND signal is turned “ON”. Then, the completed position No. is output to the completed position No. register.
Accordingly, for the read of the completed position No. register when the positioning is completed, confirm it some time (Remaining Travel Distance Movement Time) after the PEND signal is turned “ON”.
The current position data might be changed slightly even when the system is stopped.
[8] 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.

● Example of operation (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.



*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(2) Operation in the half direction mode

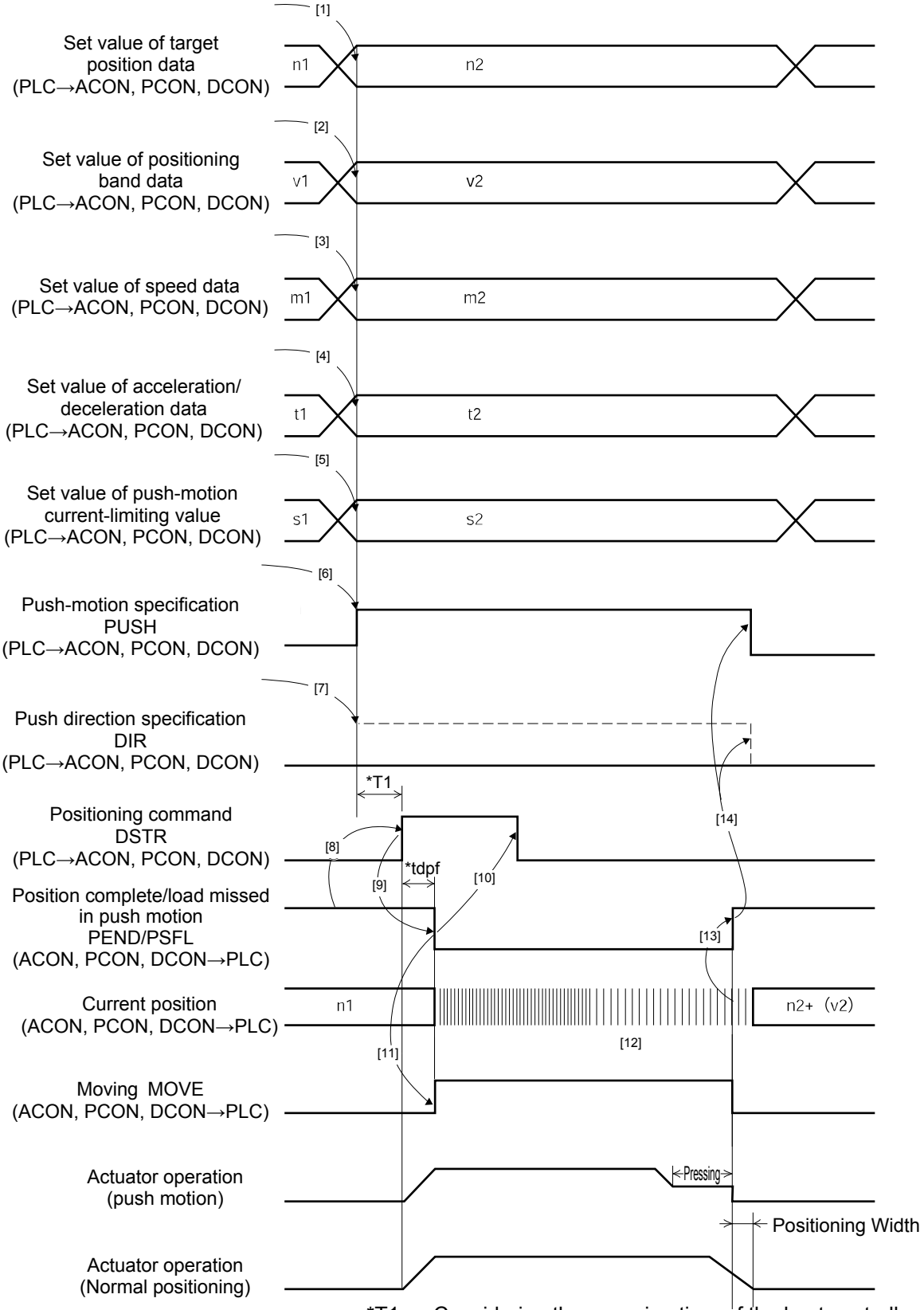
It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current limit setup register.

● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the acceleration/deceleration data to the acceleration/deceleration resister.
[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 3.7.7 (22))
[8] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 5) 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] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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”. (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[14] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 6 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.



*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt < tdpf < Yt+xt+3(msec)

(3) Operation in the full direct mode

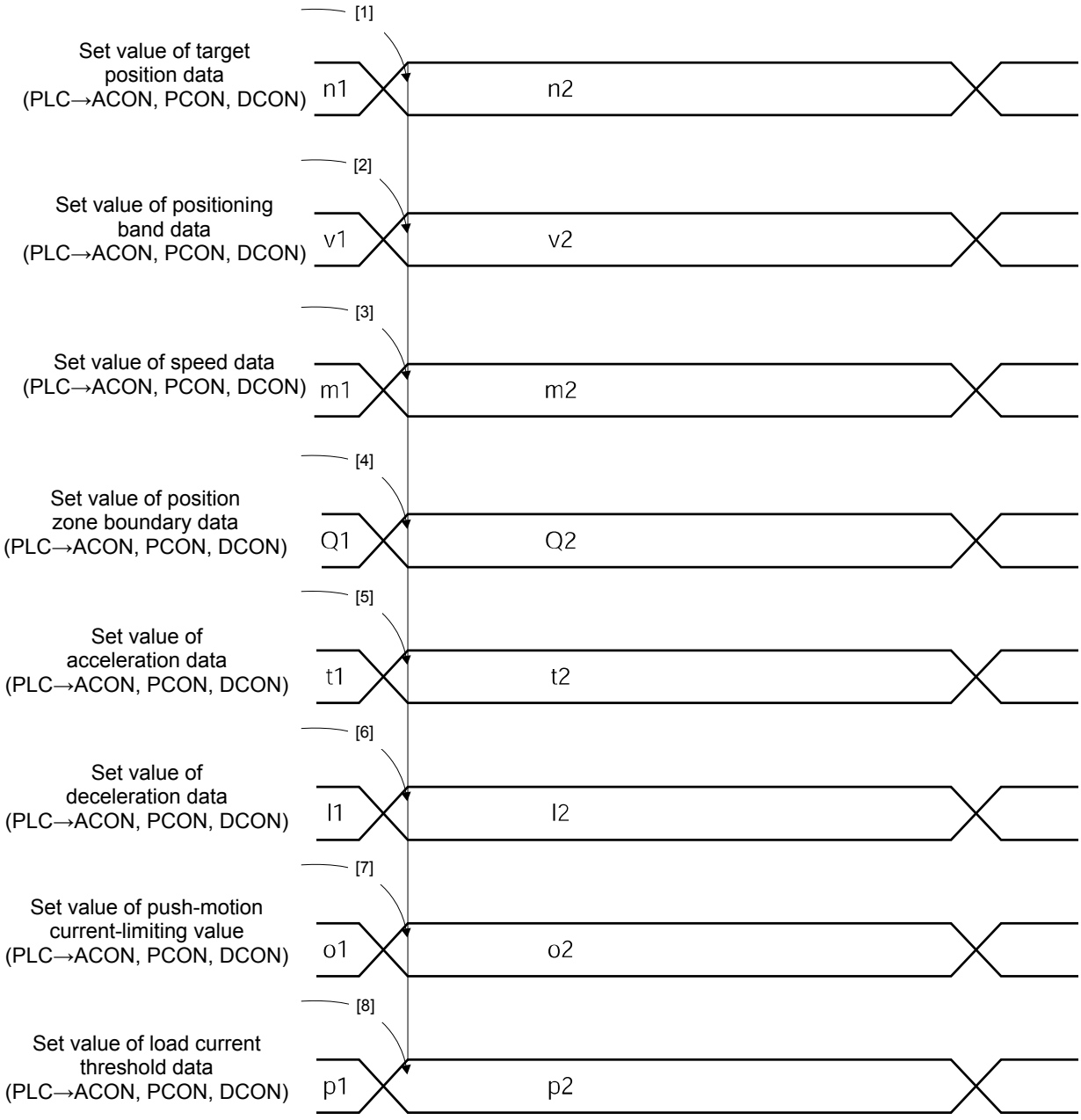
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

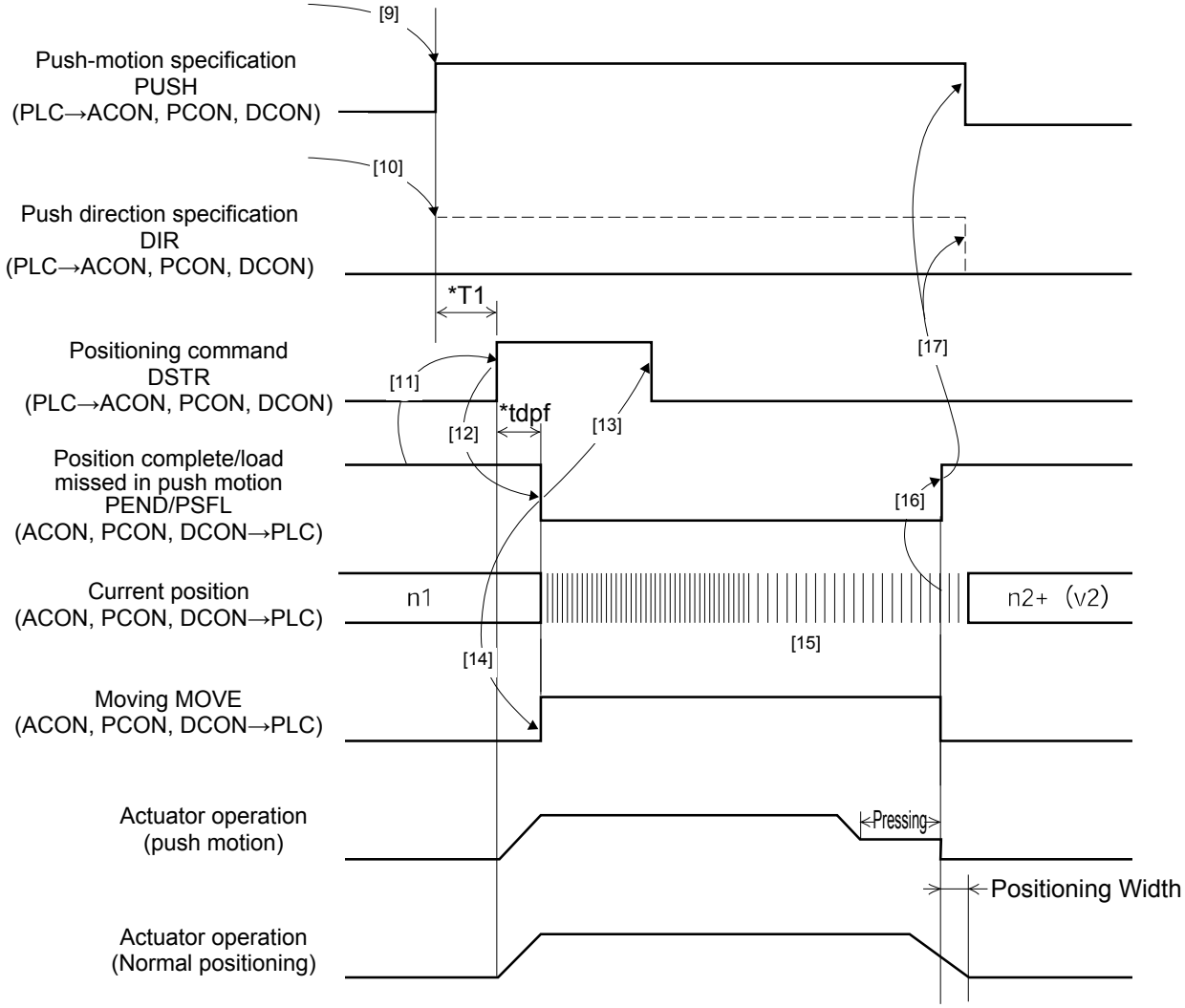
● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the position zone output boundary data in the zone boundary + register or zone boundary - 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 3.7.7 (22))
[11] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 8) 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 tpdf.
[13] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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” (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[17] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 9 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.


[1]
Set value of target position data (PLC→ACON, PCON, DCON)
n1
n2
[2]
Set value of positioning band data (PLC→ACON, PCON, DCON)
v1
v2
[3]
Set value of speed data (PLC→ACON, PCON, DCON)
m1
m2
[4]
Set value of position zone boundary data (PLC→ACON, PCON, DCON)
Q1
Q2
[5]
Set value of acceleration data (PLC→ACON, PCON, DCON)
t1
t2
[6]
Set value of deceleration data (PLC→ACON, PCON, DCON)
l1
l2
[7]
Set value of push-motion current-limiting value (PLC→ACON, PCON, DCON)
o1
o2
[8]
Set value of load current threshold data (PLC→ACON, PCON, DCON)
p1
p2

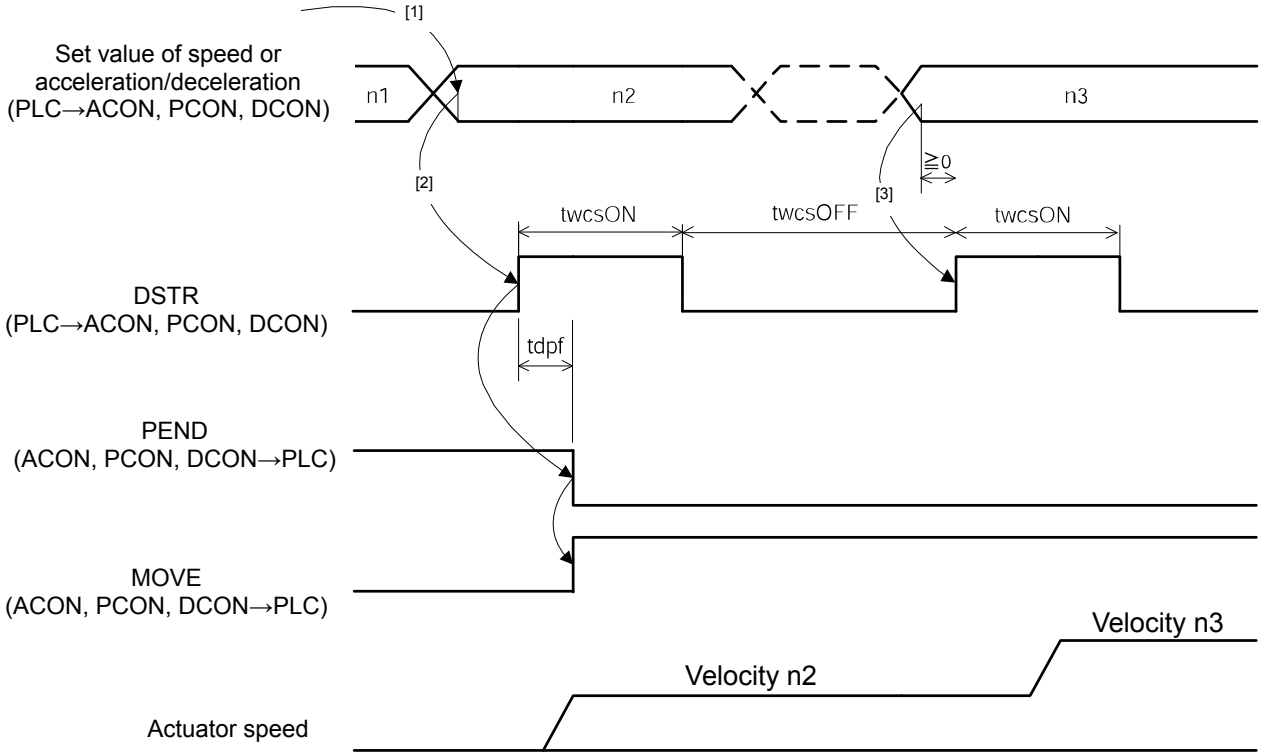


*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(4) Data change during movement

In the half direct mode or full direct mode, the value currently set to a given resister among the resisters for target position data, acceleration/deceleration data, speed data, positioning band and push-motion current-limiting value, can be changed while the actuator is moving.
After changing the data, turn “ON” the positioning command (DSTR) for more than tdpf.
Also, after turning “OFF” the DSTR, set aside some time for “twcsON + twcsOFF” or more, until the next DSTR is turned “ON”.
The example is shows as follows, where the speed and acceleration/deceleration data items have been changed.



twcsON ≥ Yt＋xt＋3(msec)
twcsOFF ≥ Yt＋xt＋3(msec)
*Yt＋xt ≤ tpdf ≤ Yt＋xt＋3(msec)

⚠ 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.

3.10 CompoNet Related Parameters

Parameters relating to CompoNet are No. 84 to No. 85 and No. 90.

Category:C:External interface parameter

No.	Category	Symbol	Name	Default Value set in the Factory before Delivery
1			Refer to Operation Manual for the controller for the parameters No. 1 through No. 83.	
~				
83				
84	C	FMOD	Field bus operation mode	0
85	C	NADR	Field bus node address	0
86	C	FBRS	Field bus baud rate	0
87	C	NTYP	Network type	4
90	C	FMIO	Field I/O format	3
159	C	FBVS	FB half direct mode speed unit	0

● Field bus operation mode (No.84 FMOD)
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 CompoNet.
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.

● Field bus node address (No.85 NADR)
Specify the node address number in parameter No. 85.

Setting Range 0 to 63 (It is set to “0” when the machine is delivered from the factory.)

● Field bus baud rate (No.86 FBRS)
The baud rate is automatically set to the same value as the baud rate set in the master. Accordingly, you do not need to set the baud rate.

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

● Field I/O format (No.90 FMIO)
Addresses in the PLC are assigned in units of 16 points (2 bytes) based on the node address set in the controller and the occupied bytes in each operation mode.
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 “Example i”.)
1	The host bytes are exchanged with slave bytes in the host words and slave words. (Refer to “Example ii”.)
2	In the case of word register, the host words are exchanged with the slave words. (Refer to “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 “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			

⇧

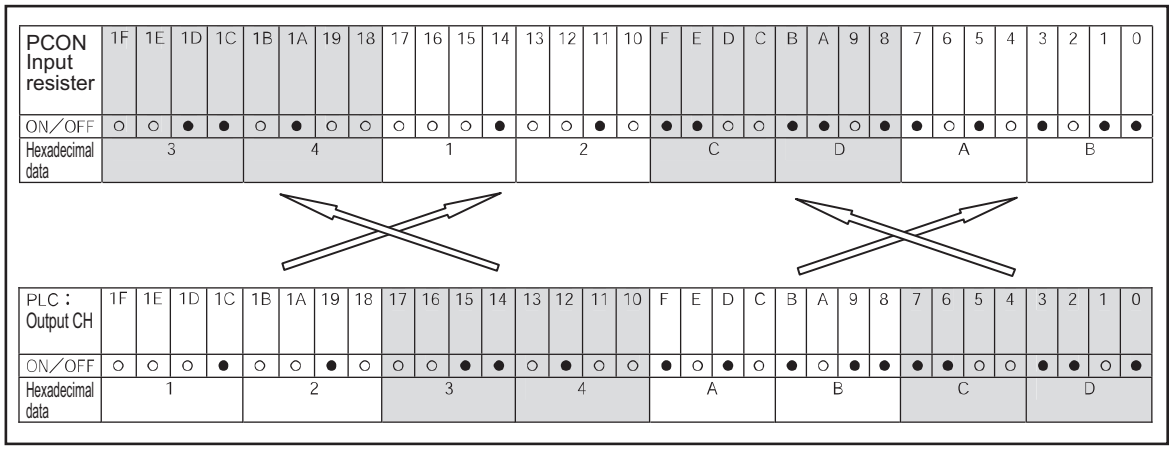
PLC： Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

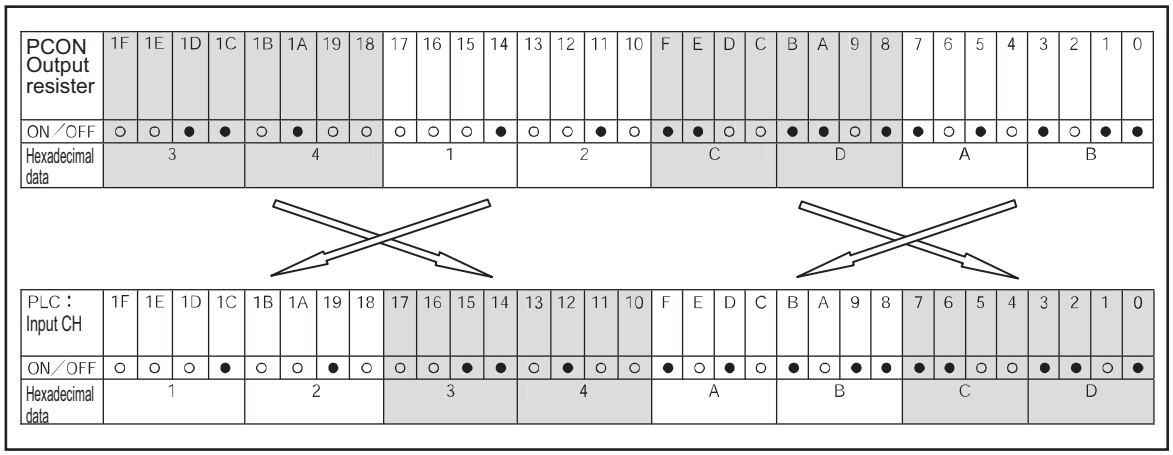
PCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

⇩

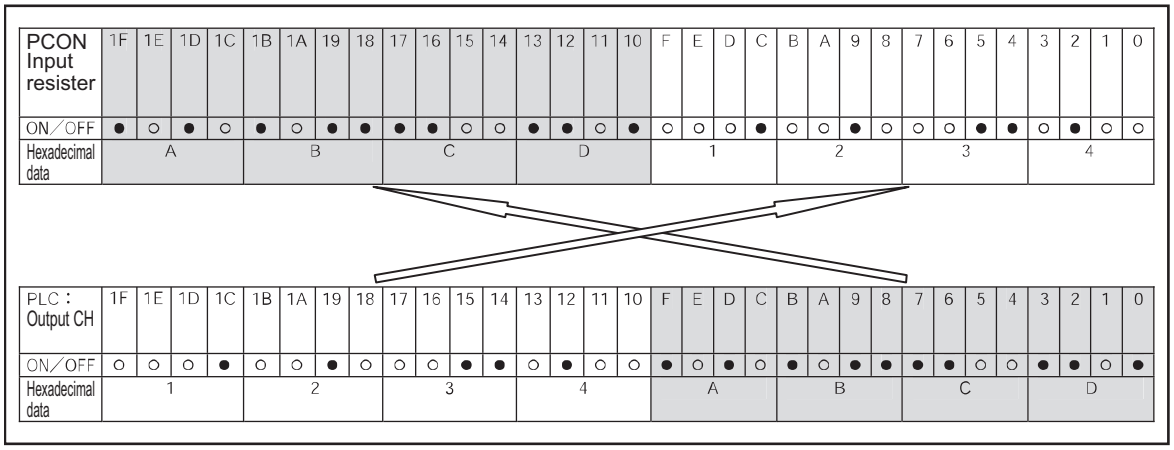
PLC： Input CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

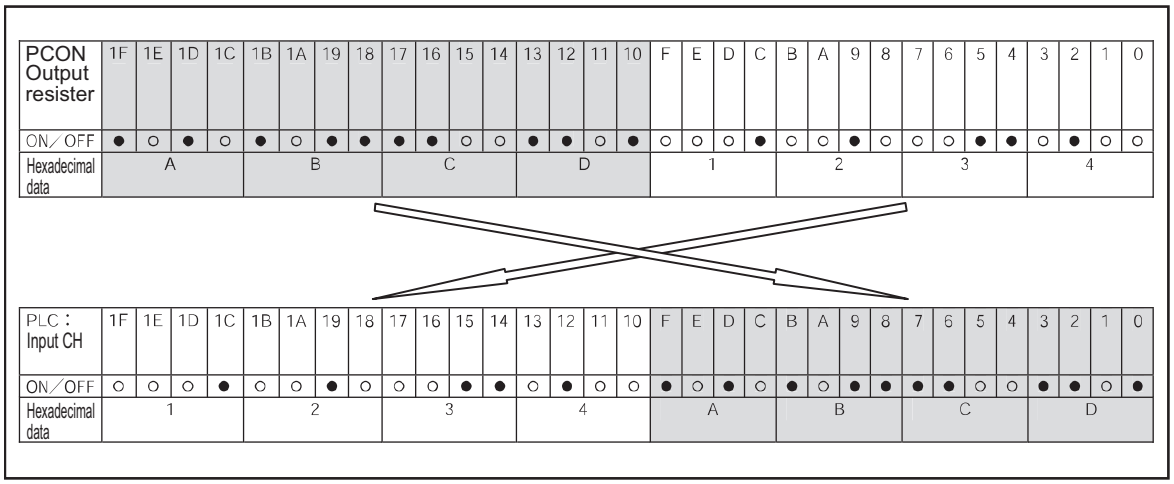
(Example ii) Set value = “1”　　● indicates ON, while ○ indicates OFF.



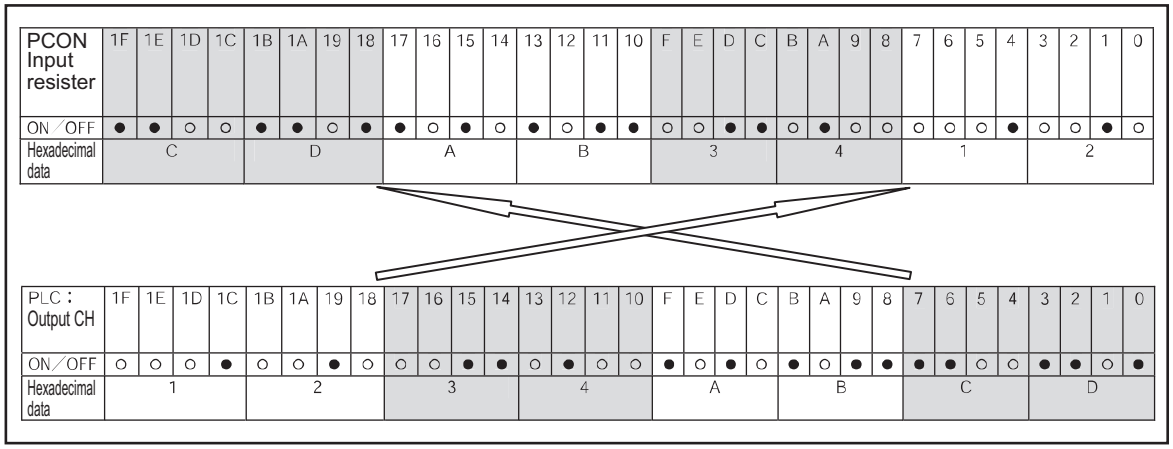


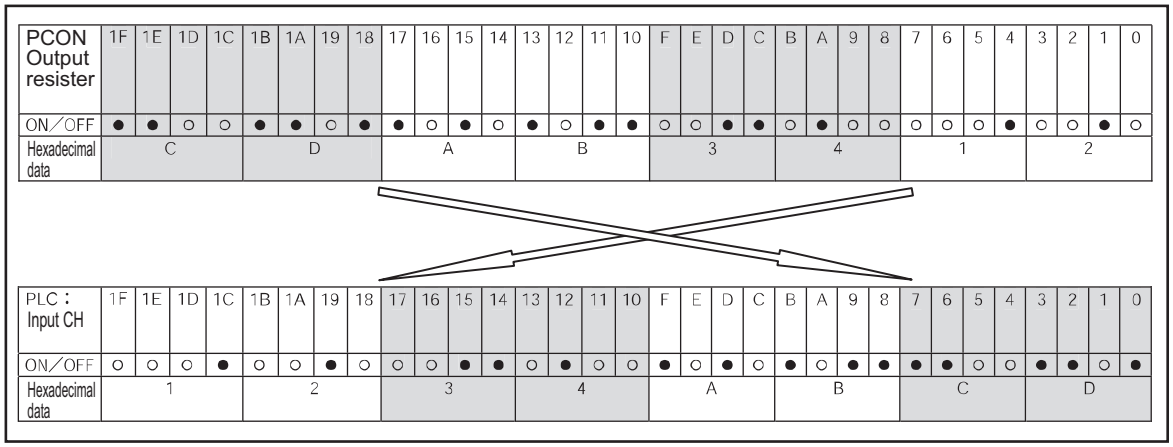
(Example iii) Set value = “2”　　● indicates ON, while ○ indicates OFF.





(Example iv) Set value = “3”　　● indicates ON, while ○ indicates OFF.





● FB Half Direct Mode Speed Unit (No.159 FBVS)
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/sec
1	0.1mm/sec

3.11 Troubleshooting

● Alarm Description and Cause/Treatment

[1] **When an alarm is issued, the completed position No. (4 bits for PM1 to PM8) shows the simplified alarm code in the Remote I/O Mode or Remote I/O Mode 2.**

In the position/simple direct mode, this simple alarm code is output to the (n+4, n+5) bytes.
In the half direct mode and full direct mode, this simple alarm code is output to the (n+12, n+13) bytes.

1) Confirm the alarm code using the PLC's monitor function, etc., or using the status monitor, connecting the teaching tools such as RC PC software.
2) Based on the read alarm code, search the alarm description list in the operation manual for the controller.
3) Deal with it based on the description for the alarm code in question.
For the following alarm code, deal with it according to the following table.

Code	Error name	ID (*1)	RES (*2)	Cause/Treatment
0F2	Field bus module error	05	x	Cause: The filed bus module error is detected Treatment: Confirm the parameter.
0F3	Field bus module not detected	04	x	Cause: The module can not be detected. Treatment: Turn ON the power again. If the error is not removed, contact our company.

(*1) ID→Simple alarm code
(*2) RES→ Whether or not the alarm can be reset ○: Alarm can be reset / x: Alarm cannot be reset

[2] If the alarm is occurred, checking the network status on the display of monitor LEDs is possible.

○: Illuminating, x: OFF, ☆: Flashing

MS	NS	Item	Cause of error occurrence	Unit operation after error detection	Measure
x	-	No power supply input	Specified power voltage is not supplied.	PCON stop the operation.	Remove the cause of no power supply input and input the power supply again.
○ GN	☆ RD	Communication Error	Remote I/O communication that the connection was set up with the master unit has stopped by timeout.	PCON continue the operation.	The following cases are considered to be the possible causes of communication error. Find the most suitable case and remove the cause. 1) A stop was cased by an error on the PLC system including the master unit. → Check the PLC system condition and cancel the error. 2) Communication with the master unit is disabled by broken connector, repeater, etc. → Check the conditions of cables, terminals and repeater. Supply the communication power again after an error cause is removed. 3) Master unit stopped the communication due to the communication retries with the applicable PCON continuously exceeded the specified value caused by noise. → Check the noise condition around the applicable PCON For the items above excluding 1) restart of master unit is not necessary.
○ GN	○ RD	Address duplication error	There is PCON with the same node existing on the network.	PCON stop the operation.	Confirm the node number of PCON, correct the duplicated number, then conduct operations in the following procedure. 1) Turn OFF the communication power supply between the master unit and PCON. 2) Turn ON the communication power supply between the master unit and PCON again.
○ RD	-	Unit error	An error has occurred to PCON due to the following causes.	PCON stop the operation.	Check the set value for the node address to remove the possibility of the error cause for 1). Then, restart (turn on the communication power supply again) PCON. If the error occurs again, replace PCON.

3.12 CE Mark

If a compliance with the CE Marking is required, please follow Overseas Standards Compliance Manual (ME0287) that is provided separately.

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.

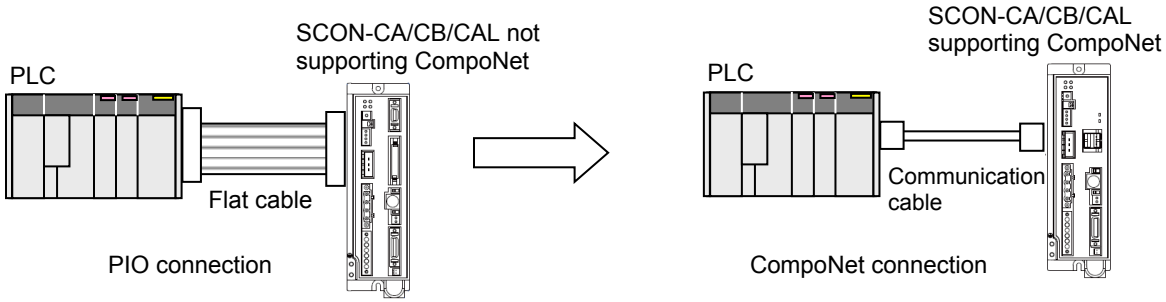
4.1 Operation Modes and Functions

All of the operation modes described in the table below for SCON-CA/CB Type applicable for CompoNet and those except for the ones in the shaded area for CAL Type are available to choose from for operation.

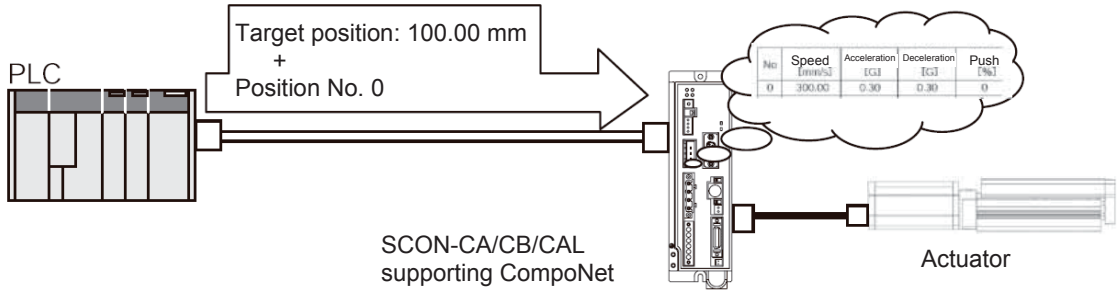
Key function	Remote I/O mode	Position/simple direct mode	Half direct mode	Full direct mode	Remote I/O mode 2	Position/ simple direct mode 2	Half direct mode 2	Remote I/O mode 3	Half direct mode 3
Number of occupied bytes	2	8	16	32	12	2	8	16	8
Operation by position data specification	x	○(*1)	○	○	x	○(*1)	○	x	○
Direct speed/acceleration specification	x	x	○	○	x	x	○	x	○
Push-motion operation	○	○	○	○	○	○	○	○	○
Current position read	x	○	○	○	○	○	○	○	○
Current speed read	x	x	○	○	x	x	○	x	○
Operation by position number specification	○	○	x	x	○	○	x	○	x
Completed position number read	○	○	x	x	○	○	x	○	x
Maximum position table size	512	768	Not used	Not used	512	768	Not used	512	Not used
Force control	△(*2)	x	x	○	△(*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.

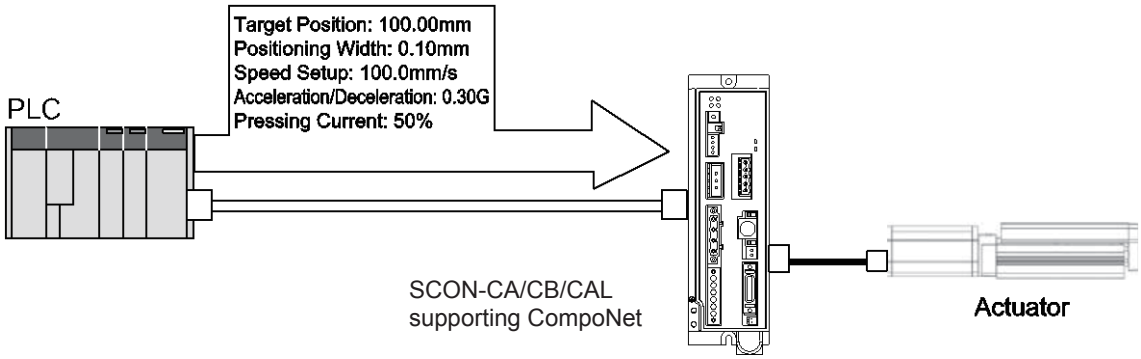
[1] Remote I/O mode: In this mode, the actuator is operated by PIOs (24 V I/Os) via CompoNet communication.
Number of occupied bytes: 2 bytes



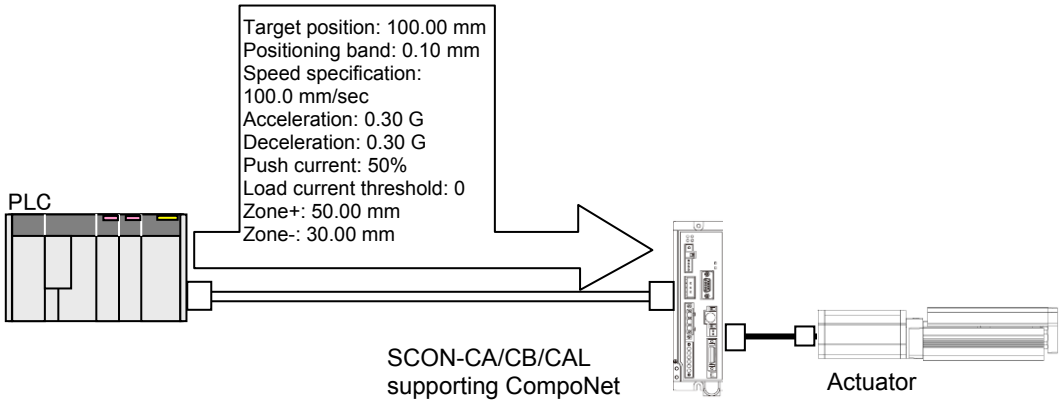
[2] Position/simple direct mode: In this mode, the actuator is operated by specifying position numbers.
You can select whether to specify the target position directly as a value, or use a value registered in the position data table, by switching a control signal.
For the speed, acceleration/deceleration, 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



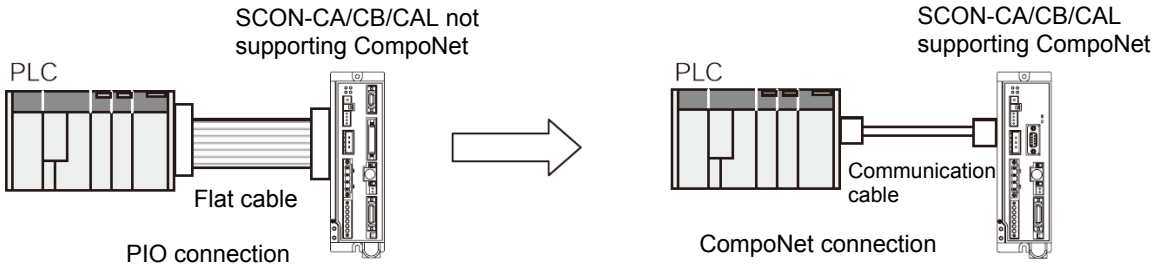
[3] Half direct mode: In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and push current, in addition to the target position, directly as values.
Number of occupied bytes: 16 bytes



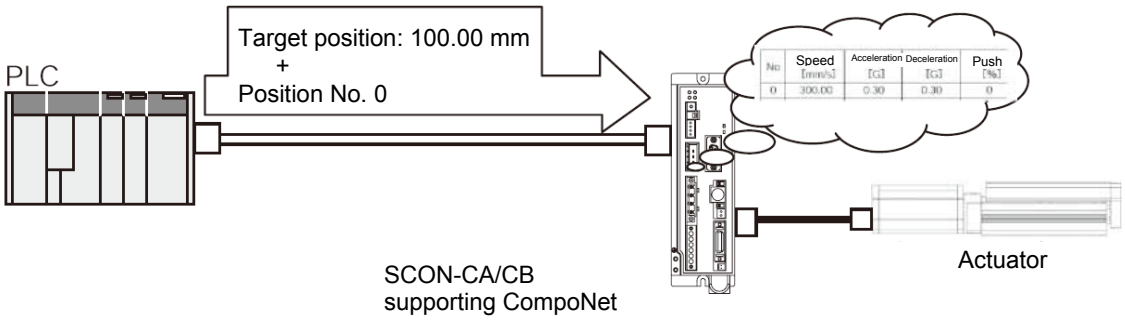
[4] Full direct mode: In this mode, the actuator is operated by specifying all values relating to position control (target position, speed, acceleration/deceleration, etc.) directly as values.
Number of occupied bytes: 32 bytes



[5] Remote I/O mode 2: In this mode, the actuator is operated by PIOs (24-V I/Os) via CompoNet 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

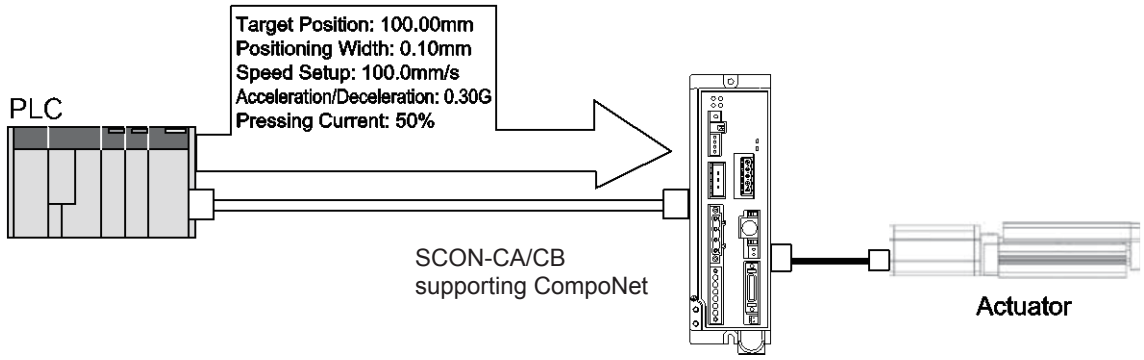


[6] Position/simple direct mode 2: In this mode, the actuator is operated by specifying position numbers.
(Not applicable for CAL Type) In this mode, the force control function is available instead of the teaching function and zone function available in mode [2].
Number of occupied bytes: 8 bytes



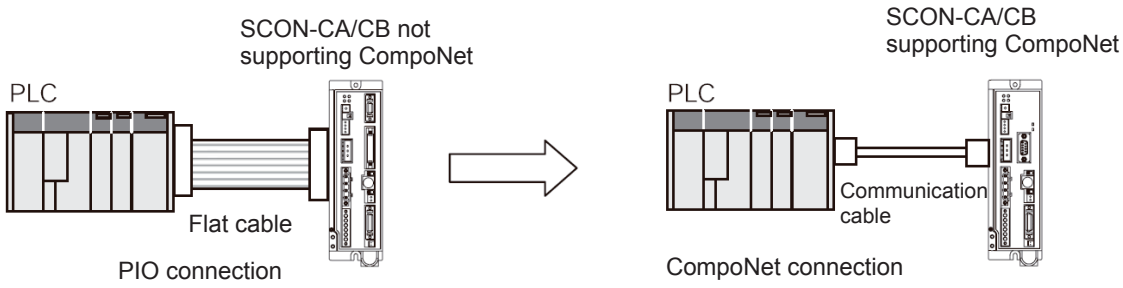
[7] Half direct mode 2:
(Not applicable for CAL Type)

In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and push 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



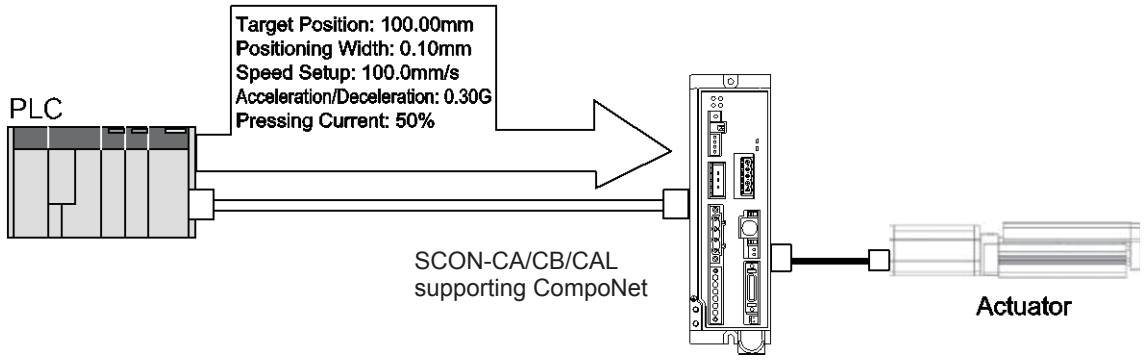
[8] Remote I/O mode 3:
(Not applicable for CAL Type)

In this mode, the actuator is operated by CompoNet 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:

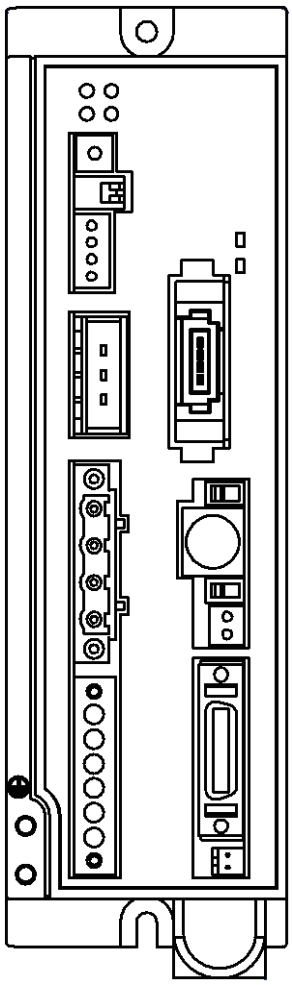
In this mode, the actuator is operated by specifying the speed, acceleration/deceleration and push current, in addition to the target position, directly as values.
In this mode, the vibration damping function is supported instead of the jog function available in mode [3].
Number of occupied bytes: 16 bytes



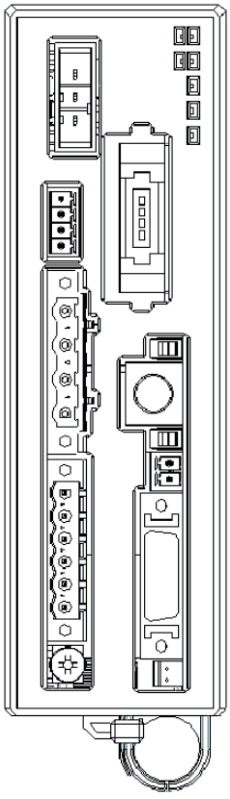
4.2 Model Numbers

The model numbers of SCON-CA/CB/CAL controller supporting CompoNet are indicated as follows, respectively:

● SCON-CA/CB-□-CN-□



● SCON-CAL-□-CN-□



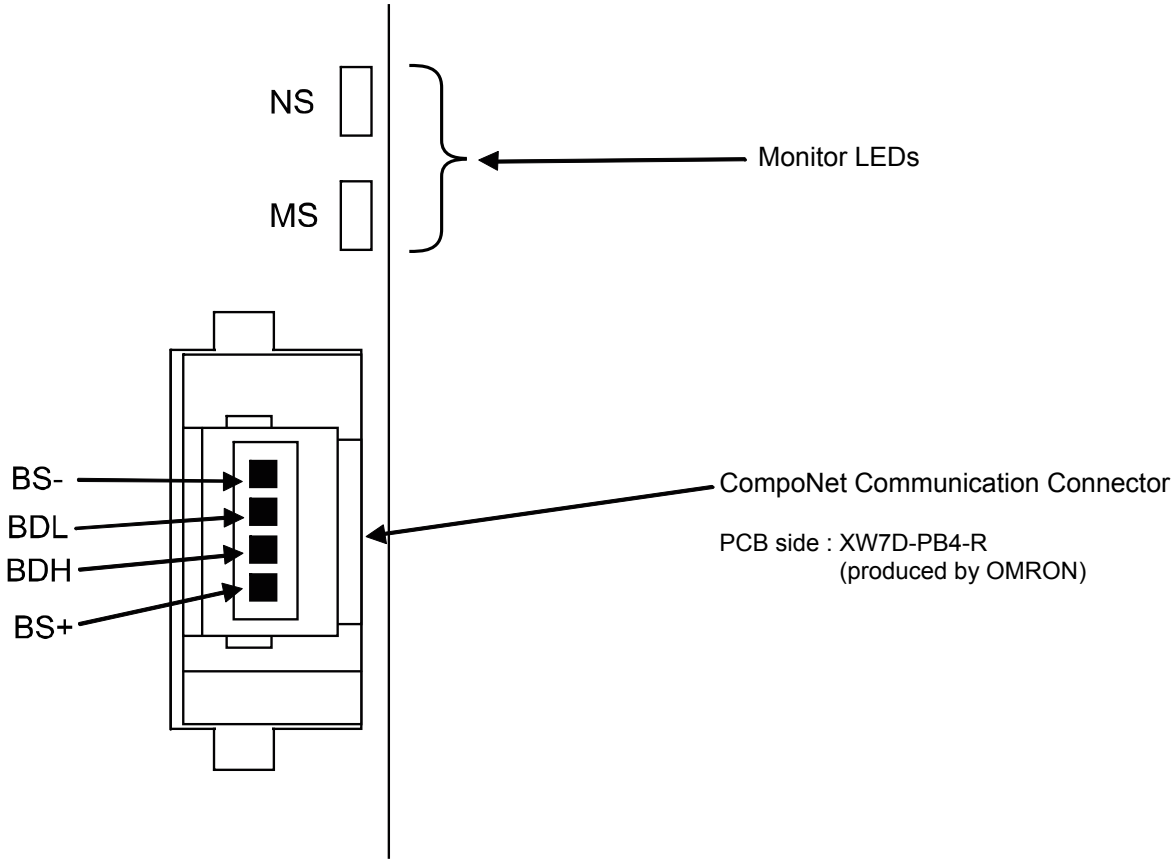
4.3 Interface Specifications

Item	Specification
Communication protocol	CompoNet specialized protocol
Communication type	Remote I/O communication
Baud rate	Automatically set to the same value as the baud rate set in the master
Communication Cable Length	Refer to CompoNet specifications
Slave type	Word mixed slave
Applicable note address	0 to 63 (set by controller parameter)
Communications cable	Round-type cable (JIS C3306,VCTF2 conductors) Flat cable 1 (not sheathed) Flat cable 2 (sheathed)
Connector	Connector recommended by OMRON is to be used. Controller-end connector:xW7D-PB4-R (OMRON)

4.4 CompoNet Interface

4.4.1 Names of the Parts

The names of each section related to CompoNet are described as follows.



4.4.2 Monitor LED indications

The node conditions of 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.
LEDs are 2-colored illumination type (orange / green), and the colors show the status as listed below.

MS (ModuleStatus) LED · · · · · · · · · Condition of the node (each controller)
NS (NetworkStatus) LED · · · · · · · · Condition of network

○: Illuminating, x: OFF, ☆: Flashing

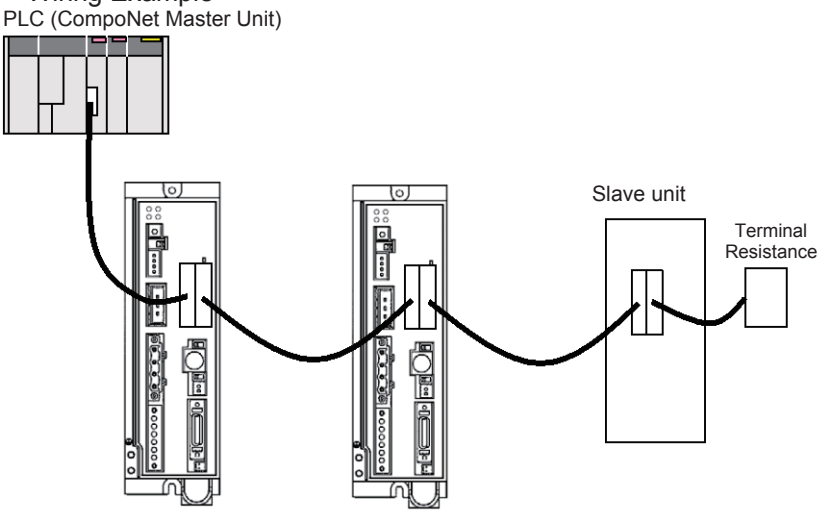
LED	Color	Indication Status	Description
MS	GN	○	In the normal operation
	RD	○	A hardware error. The replacement of the board is required.
		☆	It is a minor error such as a user setting error or configuration error. It can be recovered by re-setting, etc.
	—	x	The CompoNet is being initialized, or the power is not supplied.
NS	GN	○	The connection has been established and the communication is being performed normally.
		☆	The machine is on-line, but the connection has not been established. Communication Stop. (Network is normal)
	RD	○	Node address duplication.
		☆	Communication Error. (Communication timeout has been detected)
	—	x	The machine is not on-line. The power to the CompoNet is not supplied.

4.5 Wiring Example

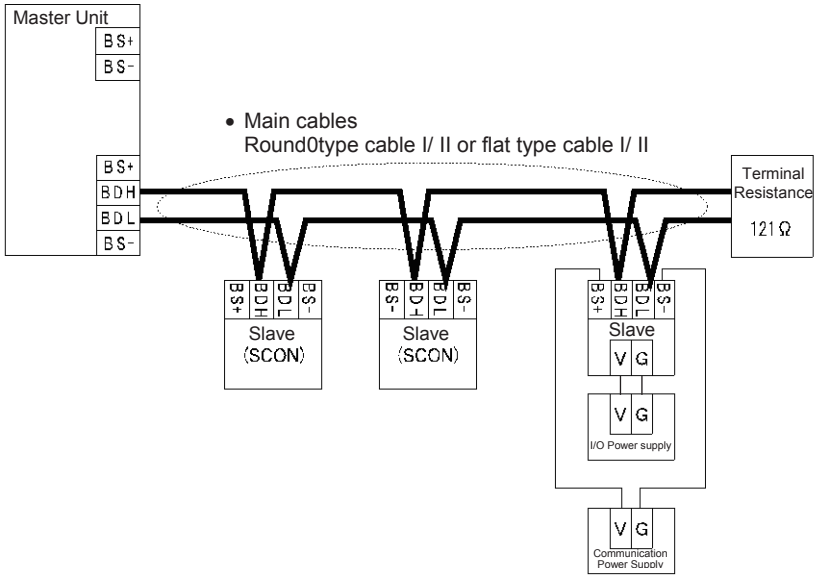
4.5.1 Connection Diagram

An example for wiring is as shown below.

- Wiring Example



- Connecting Example



*1: SCON-CA/CB/CAL for CompoNet specifications does not require the communication power supply. However, when multiple power supply is conducted, connection of the communication power of SCON-CA/CB to BS+ and BS- terminals is required.

*2: Make sure to read the Operation Manual for the master unit for the details of CompoNet wiring, precautions, etc.

4.6 Setting

4.6.1 Operation Mode Selecting

The operation mode is set using the parameters.
Set the mode toggle switch on the front surface of the controller to “MANU” side and set the parameter No. 84 “FMOD: Field Bus Operation Mode” using the RC PC software (V8.00.00.00 or later). (Refer to 4.10, "CompoNet 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	Position / Simplified Direct Value Mode 2	8
6	Half Direct Value Mode 2	16
7	Remote I/O Mode 3	12
8	Half Direct Value Mode 3	16

* 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.

4.6.2 Station No. Setting

The node address is set by the parameters.
Set the parameter No. 85 “NADR: Field Bus Node Address” using the RC PC software.
(Refer to 4.10, "CompoNet Related Parameters”.)

Settable Range:0 to 63 (It is set to “0” when the machine is delivered from the factory.)

(Note) Exercise caution to avoid node address duplication.
The nodes (controllers) are assigned in the order of their node address in the remote I/O address areas of the PLC.
For details, refer to the Operation Manuals of the master unit and PLC in which in the master unit is installed.

(Note) The setting for the communication speed is not required because it automatically follows the master’s communication speed.

(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.

4.7 Communicating with the Master Station

4.7.1 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” shows the node address of each axis.)

PLC output area (CH)	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 channels:1CH	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:16CH	Number of occupied channels:6CH
n	Port No.0 to 15	Target Position	Target Position	Target Position	Port No.0 to 15
n+1					Occupied area
n+2		Specified position number	Positioning Band	Positioning Band	
n+3		Control Signal			
n+4			Velocity	Speed Setup	
n+5			Acceleration/ Deceleration		
n+6			Pressing Current Limit Value	Zone boundary+	
n+7			Control Signal		
n+8				Zone boundary-	
n+9					
n+10				Acceleration	
n+11				Deceleration	
n+12				Pressing Current Limit Value	
n+13				Load current threshold	
n+14				Control Signal 1	
n+15				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 node address duplication.

- PLC output → SCON-CA/CB/CAL Input Side (* “n” shows the node address of each axis.)

PLC input area (CH)	DI on the SCON-CA/CB/CAL side and input Data Register			
	Position / Simplified Direct Value Mode 2	Half Direct Value Mode 2	Remote I/O Mode 3	Half Direct Value Mode 3
	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:6CH	Number of occupied channels:8CH
n	Target Position	Target Position	Port No.0 to 15	Target Position
n+1			Occupied area	
n+2	Specified position number	Positioning Band		Positioning Band
n+3	Control Signal			
n+4		Velocity		Velocity
n+5		Acceleration/ Deceleration		Acceleration/ Deceleration
n+6		Pressing Current Limit Value		Pressing Current Limit Value
n+7		Control Signal		Control Signal
n+8				
n+9				
n+10				
n+11				
n+12				
n+13				
n+14				
n+15				

(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 node 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.

- SCON-CA/CB/CAL output → PLC input (* “n” shows the node address of each axis.)

PLC output area (CH)	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 channels:1CH	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:16CH	Number of occupied channels:6CH
n	Port No.0 to 15	Current Position	Current Position	Current Position	Port No.0 to 15
n+1					Occupied area
n+2		Completed Position No. (simple alarm ID)	Command Current	Command Current	Current position
n+3		Status Signal			
n+4			Current Speed	Current Speed	Command current
n+5					
n+6			Alarm Code	Alarm Code	
n+7			Status Signal	Occupied area	
n+8				Current load	
n+9					
n+10				Total moving count	
n+11					
n+12				Total moving distance	
n+13					
n+14				Status signal 1	
n+15				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 node address duplication.

- SCON-CA/CB/CAL output→PLC Input Side (* “n” shows the node address of each axis.)

PLC input area (CH)	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
	Number of occupied channels:4CH	Number of occupied channels:8CH	Number of occupied channels:6CH	Number of occupied channels:8CH
n	Current position	Current position	Port number 0 to 15	Current position
n+1			Occupied area	
n+2	Completed position number (simple alarm ID)	Current load	Current position	Command current
n+3	Status signal			
n+4		Current speed	Current load	Current speed
n+5				
n+6		Alarm code		Alarm code
n+7		Status signal		Status signal
n+8				
n+9				
n+10				
n+11				
n+12				
n+13				
n+14				
n+15				

(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 node 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.

4.7.2 Remote I/O Mode (Number of occupied channels 1CH)

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 the teaching tools such as PC software.
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 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: 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)	○	○	○	○	○	○	○	○
Push-motion operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	○	○	○	x
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	SCON-CA/CB/CAL DI(Port No.)	PLC output CH	SCON-CA/CB/CAL DO(Port No.)	PLC input CH
0	0 to 15	n+0	0 to 15	n+0

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of one input word (channel) and one output word (channel) in the I/O areas.

- Each channel is controlled by ON/OFF bit signals.

PLC output (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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 (* “n” shows the node address of each axis.)

Channel

1 word (1CH) = 16 bits

n+0	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	Retracting end movement command 0
	1	PM2		PE1	Position 1 complete	LS1	Retracting end movement command 1
	2	PM4		PE2	Position 2 complete	LS2	Retracting end movement command 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

* Indicates a signal that is normally ON.
The signals denoted by “Cannot be used” are not controlled. (ON/OFF statuses of these signals are indeterminable.)

(Note) Force control mode 1 and 2 are not available for SCON-CAL.

4.7.3 Position/Simplified Direct Value Mode (Number of occupied channels 4CH)

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 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	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using position data or parameters.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	SCON-CA/CB/CAL input register	PLC output CH	SCON-CA/CB/CAL output register	PLC input CH
1	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Specified position number	n+2	Completed Position No. (Simple alarm code)	n+2
	Control Signal	n+3	Status Signal	n+3

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of four input words (channels) and four output words (channels) 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: 0.01 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 such as PC software.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	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+2	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+3	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+1 **Current 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+2 **Completed Position No.**	—	—	—	—	—	—	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+3 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 -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.	4.9 (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 such as PC software. 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.	4.9 (1)
	Control signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	4.7.11 (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.	4.7.11 (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.	4.7.11 (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.	4.7.11 (16)
		b9	PWRT	Position Data Import Command: Position data is read when this signal is ON.	4.7.11 (17)
		b8	JOG+	+Jog: "ON" for Movement in the Opposite Direction of Home	4.7.11 (13)
		b7	JOG-	-Jog: "ON" for Movement to the Home Direction	4.7.11 (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.	4.7.11 (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.	4.7.11 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	4.7.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	4.7.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	4.7.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	4.7.11 (6)
		b0	CSTR	Positioning Start: A move command is issued when this signal turns ON.	4.7.11 (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. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	4.9 (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.	4.9 (1)
	Status code	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.7.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.7.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.7.11 (12)
		b11	PZONE	Position zone: This signal turns ON when the current position is inside the specified position zone.	4.7.11 (12)
		b10	MODES	Teaching mode Signal: This signal is ON while the teaching mode is selected.	4.7.11 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	4.7.11 (17)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.7.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.7.11 (28)
		b6	-	Unavailable	-
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	4.7.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.7.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.7.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.7.11 (10)

4.7.4 Half Direct Value Mode (Number of occupied channels 8CH)

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	○	
Operation at different acceleration and deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	SCON-CA/CB/CAL input register	PLC output CH	SCON-CA/CB/CAL output register	PLC input CH
2	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Command Current	n+2
		n+3		n+3
	Velocity	n+4	Current Speed	n+4
	Acceleration/Deceleration	n+5		n+5
	Pressing Current Limit Value	n+6	Alarm Code	n+6
	Control signal	n+7	Status Signal	n+7

(Note) Be careful of using duplicated node addresses.

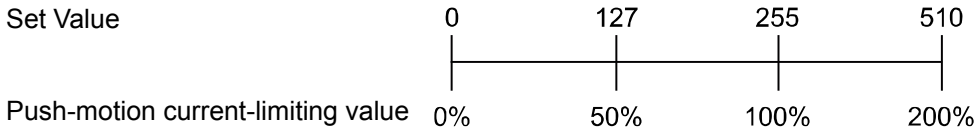
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of eight input words (channels) and eight output words (channels) 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: 0.01 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 +999999 (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/sec or 0.1 mm/sec) 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/sec
1	0.1 mm/sec

- 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 limit 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 limit 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Target Position (lower word)																
n+1 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+2 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+3 Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+4 Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+5 Acceleration/ deceleration	—	—	—	—	—	**1,024**	**512**	256	128	64	32	16	8	4	2	1
n+6 Push-current limiting value	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+7 Control signal	BKRL	RMOD	DIR	PUSH	GSL1	GSL0	—	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Current Position (lower word)																
n+1 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+2 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+3 Command Current (upper word)													524,288	262,144	131,072	65,536
n+4 Current Speed (lower word)																
n+5 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+6 Alarm code																
n+7 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 -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.	4.9 (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 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.	4.9 (2)
	Velocity	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/sec or 0.1mm/sec. 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/sec: To set 254.0 mm/sec, specify "254." If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.9 (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.	4.9 (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="17">PLC Output</td><td>Pressing Current Limit Value</td><td>16-bit data</td><td>-</td><td>16-bit integer
Specify the current-limiting value to be used during push-motion 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 push-motion current, an alarm will occur.</td><td>4.9 (2)</td></tr>
<tr><td rowspan="16">Control Signal</td><td>b15</td><td>BKRL</td><td>Forced brake release: When it is turned ON, the brake is released.</td><td>4.7.11 (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>4.7.11 (19)</td></tr>
<tr><td>b13</td><td>DIR</td><td>Push 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>4.7.11 (22)</td></tr>
<tr><td>b12</td><td>PUSH</td><td>Push-motion specification: Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.</td><td>4.7.11 (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">4.7.11 (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>Cannot be used.</td><td>-</td></tr>
<tr><td>b8</td><td>JOG+</td><td>+ Jog: “ON” for Movement in the Opposite Direction of Home</td><td>4.7.11 (13)</td></tr>
<tr><td>b7</td><td>JOG-</td><td>-Jog: “ON” for Movement to the Home Direction</td><td>4.7.11 (13)</td></tr>
<tr><td>b6</td><td>JVEL</td><td>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>4.7.11 (14)</td></tr>
<tr><td>b5</td><td>JISL</td><td>Jog/inch switching:
Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.</td><td>4.7.11 (15)</td></tr>
<tr><td>b4</td><td>SON</td><td>Servo ON Command: The servo turns ON when this signal turns ON.</td><td>4.7.11 (5)</td></tr>
<tr><td>b3</td><td>RES</td><td>Reset: A reset is performed when this signal turns ON.</td><td>4.7.11 (4)</td></tr>
<tr><td>b2</td><td>STP</td><td>Pause: A pause command is issued when this signal turns ON.</td><td>4.7.11 (11)</td></tr>
<tr><td>b1</td><td>HOME</td><td>Home return: A home-return command is issued when this signal turns ON.</td><td>4.7.11 (6)</td></tr>
<tr><td>b0</td><td>DSTR</td><td>Positioning Command: A move command is issued when this signal turns ON.</td><td>4.7.11 (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 The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	4.9 (2)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	4.9 (2)
	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.9 (2)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0$_H$”. Refer to the Operation Manual for the controller main body for the details of the alarms.	4.9 (2)
	Status Signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.7.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.7.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.7.11 (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.	4.7.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.7.11 (28)
		b6	-	Cannot be used.	-
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	4.7.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.7.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.7.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.7.11 (10)

4.7.5 Full Direct Value Mode (Number of occupied channels 16CH)

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	○
Operation at different acceleration and deceleration	○
Pause	○
Zone signal output	○
PIO pattern selection	x

(1) PLC channel configuration (* “n” shows the node address of each axis.)

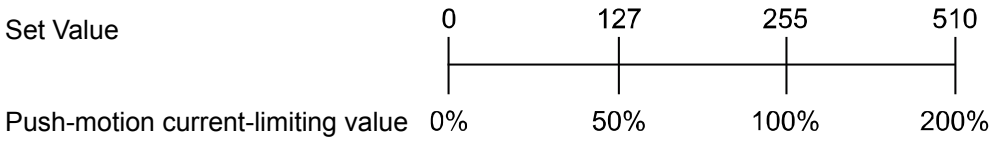
Parameter No. 84	SCON-CA/CB/CAL input register	PLC output address	SCON-CA/CB/CAL output register	PLC input address
3	Target position	n+0	Current position	n+0
		n+1		n+1
	Positioning band	n+2	Command current	n+2
		n+3		n+3
	Speed	n+4	Current speed	n+4
		n+5		n+5
	Zone boundary+	n+6	Alarm code	n+6
		n+7	Occupied area	n+7
	Zone boundary-	n+8	Current load	n+8
		n+9		n+9
	Acceleration	n+10	Total moving count	n+10
	Deceleration	n+11		n+11
	Push-current limiting value	n+12	Total moving distance	n+12
	Load current threshold	n+13		n+13
	Control signal 1	n+14	Status signal 1	n+14
	Control signal 2	n+15	Status signal 2	n+15

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

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of 16 input words (channels) and 16 output words (channels) 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: 0.01 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 +999999 (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/sec) 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 limit 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 limit 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 push-motion 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: 0.01 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/sec).
- 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-bit) binary data (Unit: times).
- The total moving distance is a 2-word (32-bit) binary data (Unit: m).

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0																
Target Position (lower word)																
n+1	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+2																
Positioning Width (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+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning Width (upper word)													524,288	262,144	131,072	65,536
n+4	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Velocity (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+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Velocity (upper word)													524,288	262,144	131,072	65,536
n+6	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Zone boundary + (lower word)																
n+7	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.

Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8																
Zone boundary – (lower word)																
n+9																
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+10																
Acceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1
n+11																
Deceleration	—	—	—	—	—	1,024	512	256	128	64	32	16	8	4	2	1
n+12																
Push-current limiting value	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+13																
Load current threshold (*3)	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+14																
Control signal 1	—	—	NTC1	NTC0	—	—	ASO1	ASO0	MOD1	MOD0	GSL1	GSL0	INC	DIR	PUSH	—
n+15																
Control signal 2	BKRL	RMOD	—	—	—	—	CLBR*	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

* Applicable only for SCON-CA/CB

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	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+2	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+3	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+4	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Speed (lower word)																

n+5	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+6	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Alarm Code																

n+7 to n+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Cannot be used.																

n+8	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+9	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current load (upper word) (Specified only for SCON-CA/CB)																

If the current load is a negative value, it is expressed by a 2's complement.

n+10	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+11	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+12	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+13	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+14	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status signal 1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	CEND *	BALM

n+15	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 -999999 to 999999. (Examle) 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.	4.9 (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 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.	4.9 (3)
	Velocity	32-bit data	-	32-bit integer Specify the speed at which to move the actuator. The unit is 0.01 mm/sec 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/sec", set it as "2541". When the movement command is set with the value bigger than the max. speed, an alarm is issued.	4.9 (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. (Example) When it is "+25.40mm", set it as "2540". The specified unit is 0.01 mm (other than DD motor) and 0.001° (DD motor), while the specifiable 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. *When the input is performed in hexadecimal notation, input the negative value using a complement of 2.	4.9 (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">Address</th><th>Bit</th><th>Symbol</th><th>Function</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 0.01 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">4.9 (3)</td></tr>
<tr><td>Deceleration</td><td>16-bit data</td><td>-</td></tr>
<tr><td>Push-current limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer.
Specify the current-limiting value during push-motion operation.
The specified range is 0 (0%) to 255 (100%).
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 push current value, an alarm will occur.</td><td>4.9 (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 255 (100%).
If judgment is not performed, enter “0.”</td><td>4.9 (3)</td></tr>
<tr><td rowspan="13">Control signal 1</td><td>b15</td><td rowspan="2">-</td><td colspan="2" rowspan="2">Cannot be used.</td><td rowspan="2">-</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">4.7.11 (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" rowspan="2">Cannot be used.</td><td rowspan="2">-</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">4.7.11 (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">4.7.11 (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">4.7.11 (33)</td></tr>
<tr><td>b4</td><td>GSL0</td><td>Servo gain parameter set selection 0</td></tr>
</table>

Address		Bit	Symbol	Function	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.	4.7.11 (24)
		b2	DIR	Push 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.	4.7.11 (22)
		b1	PUSH	Push specification: Positioning operation when the signal is OFF, or push-motion operation when the signal is ON.	4.7.11 (21)
		b0	-	Cannot be used.	-
	Control signal 2	b15	BKRL	Forced brake release: The brake is released when the signal turns ON.	4.7.11 (18)
		b14	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	4.7.11 (19)
		b13	-	Cannot be used.	-
		b12			
		b11			
		b10			
		b9	CLBR*	Load cell calibration command: Calibration is performed when this signal turns ON.	4.7.11 (32)
		b8	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	4.7.11 (13)
		b7	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	4.7.11 (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.	4.7.11 (14)
		b5	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	4.7.11 (15)
		b4	SON	Servo ON command: The servo is ON when the signal is ON.	4.7.11 (5)
		b3	RES	Reset: A reset is performed when the signal turns ON.	4.7.11 (4)
		b2	STP	Pause: A pause command is issued when the signal turns ON.	4.7.11 (11)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	4.7.11 (6)
		b0	DSTR	Positioning start: A move command is issued when the signal turns ON.	4.7.11 (8)

* 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. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (Example) Reading: 000003FFH = 1023 (decimal) = 10.23 mm * If this data is read as a hexadecimal, a negative value is indicated by a complement of 2.	4.9 (3)
	Command current	32-bit data	-	32-bit integer. The value of electrical current specified by the present command is indicated. The unit is mA. (Example) Reading: 000003FFH = 1023 (decimal) = 1023 mA	4.9 (3)
	Current speed	32-bit data	-	32-bit signed integer. The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The unit is 0.01 mm/sec. (Example) Reading: 000003FFH = 1023 (decimal) = 10.23 mm/sec * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	4.9 (3)
	Alarm code	16-bit data	-	16-bit integer. If an alarm occurs, an alarm code will be output. 0 is output when no alarm is present. For details on alarms, refer to the operation manual for the controller.	4.9 (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.	4.9 (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	-	Cannot be used.	-
		b14	-		
		b13	-		
		b12	-		
		b11	-		
		b10	-		
		b9	-		
		b8	-		
		b7	-		
		b6	-		
		b5	-		
		b4	-		
		b3	-		
		b2	CEND*	Load cell calibration is complete: This signal turns ON when calibration is complete.	4.7.11 (32)
		b1	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.7.11 (28)

* 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.	4.7.11 (2)
		b14	PWR	Controller ready: The signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	4.7.11 (12)
		b12	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	4.7.11 (12)
		b11	PZONE	Position zone: The signal is ON when the current position is inside the specified position zone.	4.7.11 (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.)	4.7.11 (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.)	4.7.11 (27)
		b8	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	4.7.11 (19)
		b7	GHMS	Home return in progress: The signal is ON while the home return is in progress.	4.7.11 (6)
		b6	PUSHS	Push-motion operation in progress: The signal is ON while the push-motion operation is in progress.	4.7.11 (25)
		b5	PSFL	Missed load during push-motion operation: The signal turns ON when the actuator missed the load during push-motion operation.	4.7.11 (23)
		b4	SV	Ready: The signal is ON when the servo is ON.	4.7.11 (5)
		b3	ALM	Alarm: The signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving signal: The signal is ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return complete: The signal turns ON when the home return is completed.	4.7.11 (6)
		b0	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	4.7.11 (10)

4.7.6 Remote I/O Mode 2 (Number of occupied channels 6CH)

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 the teaching tools such as RC PC software.
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 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: 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)	○	○	○	○	○	○	○	○
Push-motion operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	x	○	○	x
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No. 84	SCON-CA/CB/CAL DI and input register	PLC output address	SCON-CA/CB/CAL DO and output register	PLC input address
4	Port number 0 to 15	n+0	Port number 0 to 15	n+0
	Occupied area	n+1	Occupied area	n+1
		n+2	Current position	n+2
		n+3		n+3
		n+4	Command current	n+4
		n+5		n+5

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid node 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 (channels) 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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

n+0	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

n+0	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+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Unavailable																

n+2	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (lower word)																

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	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+5	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 4.7.2 (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 The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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 The value of electrical current specified by the current command is indicated. The setting unit is 1mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	-

4.7.7 Position/Simplified Direct Value Mode (Number of occupied channels 4CH)

(Note) This mode is applicable only for SCON-CA/CB.
In this mode, the actuator is operated by means of force control (push-motion 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 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	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using position data or parameters.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

ParameterNo.84	SCON-CA/CB input register	PLC output CH	SCON-CA/CB output register	PLC input CH
5	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Specified position number	n+2	Completed Position No. (Simple alarm code)	n+2
	Control Signal	n+3	Status Signal	n+3

(Note) Be careful of using duplicated node addresses.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of four input words (channels) and four output words (channels) 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: 0.01 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 such as PC software.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	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+2	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+3	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

n+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (upper word)																

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

n+2	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 + 3	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 -999999 to 999999. (Example) 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.	4.9 (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 such as PC. 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.	4.9 (1)
	Control signal	b15	BKRL	Forced brake release: The brake is released when the signal turns ON.	4.7.11 (18)
		b14	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	4.7.11 (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.	4.7.11 (20)
		b10	-	Cannot be used.	-
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	4.7.11 (32)
		b8	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	4.7.11 (13)
		b7	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	4.7.11 (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.	4.7.11 (14)
		b5	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	4.7.11 (15)
		b4	SON	Servo ON command: The servo is ON when the signal is ON.	4.7.11 (5)
		b3	RES	Reset: A reset is performed when the signal turns ON.	4.7.11 (4)
		b2	STP	Pause: A pause command is issued when the signal turns ON.	4.7.11 (11)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	4.7.11 (6)
		b0	CSTR	Positioning start: A move command is issued when the signal turns ON.	4.7.11 (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. The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	4.9 (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.	4.9 (1)
	Status code	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.7.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	CEND	Load cell calibration complete: This signal turns ON when the load cell calibration is complete.	4.7.11 (32)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.7.11 (12)
		b11	PZONE/ ZONE2	PZONE and ZONE2 can be switched in Parameter No.149. No.149 = 0 Position zone : This signal turns ON when the current position is inside the specified position zone. No.149 = 1 Zone2 : This signal turns ON when the current position is inside the specified zone.	4.7.11 (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 operation manual for your controller.)	4.7.11 (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 operation manual for your controller.)	4.7.11 (27)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.7.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.7.11 (28)
		b6	PUSHS	Push-motion operation in progress: The signal is ON when the Push-motion operation in progress.	4.7.11 (25)
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	4.7.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.7.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.7.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.7.11 (10)

4.7.8 Half Direct Value Mode (Number of occupied channels 8CH)

(Note) This mode is applicable only for SCON-CA/CB.
In this mode, the actuator is operated by means of force control (push-motion operation based on feedback of load cell values) and also by specifying the target position, positioning band, speed, acceleration/deceleration and push 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	○	
Operation at different acceleration and deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

Parameter No.84	SCON-CA/CB input register	PLC output CH	SCON-CA/CB output register	PLC input CH
6	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Current load	n+2
		n+3		n+3
	Velocity	n+4	Current Speed	n+4
	Acceleration/Deceleration	n+5		n+5
	Pressing Current Limit Value	n+6	Alarm Code	n+6
	Control signal	n+7	Status Signal	n+7

(Note) Be careful of using duplicated node addresses.

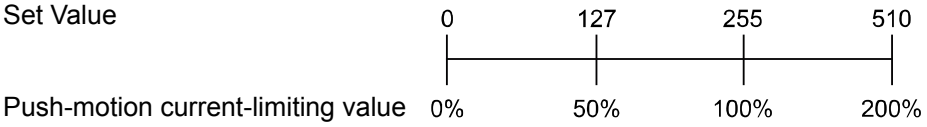
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of eight input words (channels) and eight output words (channels) 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: 0.01 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 +999999 (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/sec or 0.1 mm/sec) 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/sec
1	0.1 mm/sec

- 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 limit 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 limit 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Target Position (lower word)																
n+1 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+2 Positioning band (upper word)	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+3 Positioning band (lower word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+4 Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+5 Acceleration/ deceleration	—	—	—	—	—	**1,024**	**512**	256	128	64	32	16	8	4	2	1
n+6 Push-current limiting value	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+7 Control signal	BKRL	RMOD	DIR	PUSH	—	—	CLBR	JOG+	JOG−	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

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

If the current position is a negative value, it is expressed by a 2’s complement.

1 word (1CH) = 16 bits

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

If the current load is a negative value, it is expressed by a 2’s complement.

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

If the current speed is a negative value, it is expressed by a 2’s complement.

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+6																
Alarm code																
n+7	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 -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.	4.9 (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 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.	4.9 (2)
	Velocity	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/sec or 0.1mm/sec. 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/sec: To set 254.0 mm/sec, specify "254." If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.9 (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.	4.9 (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 Limit Value	16-bit data	-	16-bit integer Specify the current-limiting value to be used during push-motion 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 push-motion current, an alarm will occur.	4.9 (2)
	Control Signal	b15	BKRL	Forced brake release: When it is turned ON, the brake is released.	4.7.11 (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.	4.7.11 (19)
		b13	DIR	Push 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	4.7.11 (22)
		b12	PUSH	Push-motion specification: Positioning operation is performed when this signal is OFF, and push-motion operation is performed when the signal is ON.	4.7.11 (21)
		b11	-	Unavailable	-
		b10			
		b9	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	4.7.11 (32)
		b8	JOG+	+ Jog: “ON” for Movement in the Opposite Direction of Home	4.7.11 (13)
		b7	JOG-	-Jog: “ON” for Movement to the Home Direction	4.7.11 (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.	4.7.11 (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.	4.7.11 (15)
		b4	SON	Servo ON Command: The servo turns ON when this signal turns ON.	4.7.11 (5)
		b3	RES	Reset: A reset is performed when this signal turns ON.	4.7.11 (4)
		b2	STP	Pause: A pause command is issued when this signal turns ON.	4.7.11 (11)
		b1	HOME	Home return: A home-return command is issued when this signal turns ON.	4.7.11 (6)
		b0	DSTR	Positioning Command: A move command is issued when this signal turns ON.	4.7.11 (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 The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	4.9 (2)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	4.9 (2)
	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.9 (2)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0$_H$”. Refer to the Operation Manual for the controller main body for the details of the alarms.	4.9 (2)
	Status Signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.7.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.7.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.7.11 (12)
		b11	-	Unavailable	-
		b10			
		b9	CEND	Load cell calibration is complete: This signal turns ON when calibration is complete.	4.7.11 (32)
		b8	RMDS	Operation Mode Status: This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	4.7.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops	4.7.11 (28)
		b6	PUSHS	Push-motion operation in progress: The signal is ON when the Push-motion operation in progress.	4.7.11 (25)
		b5	PSEL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	4.7.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.7.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.7.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.7.11 (10)

4.7.9 Remote I/O Mode 2 (Number of occupied channels 6CH)

(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 the teaching tools such as RC PC software.
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.
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 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: 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)	○	○	○	○	○	○	○	○
Push-motion operation	○	○	○	○	○	x	○	○
Speed change during movement	○	○	○	○	x	○	○	x
Operation at different acceleration and 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 channel configuration (* “n” shows the node address of each axis.)

Parameter No. 84	SCON-CA/CB DI and input register	PLC output address	SCON-CA/CB DO and output register	PLC input address
7	Port number 0 to 15	n+0	Port number 0 to 15	n+0
	Occupied area	n+1	Occupied area	n+1
		n+2	Current position	n+2
		n+3		n+3
		n+4	Current load	n+4
		n+5		n+5

(Note) The areas denoted by Occupied area cannot be used for any other purpose.
Also, exercise caution to avoid node 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 (channels) 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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

n+0	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
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+0																
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+1																
Cannot be used																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+2																
Current Position (lower word)																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
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																
Current load (lower word)																

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+5																
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 4.7.2 (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 The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	-
	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.	-

4.7.10 Half Direct Value Mode 3 (Number of occupied channels 8CH)

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 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	○	
Operation at different acceleration and deceleration	x	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	x	

(1) PLC channel configuration (* “n” shows the node address of each axis.)

ParameterNo.84	SCON-CA/CB/CAL input register	PLC output CH	SCON-CA/CB/CAL output register	PLC input CH
8	Target Position	n+0	Current Position	n+0
		n+1		n+1
	Positioning Band	n+2	Command Current	n+2
		n+3		n+3
	Velocity	n+4	Current Speed	n+4
	Acceleration/Deceleration	n+5		n+5
	Pressing Current Limit Value	n+6	Alarm Code	n+6
	Control signal	n+7	Status Signal	n+7

(Note) Be careful of using duplicated node addresses.

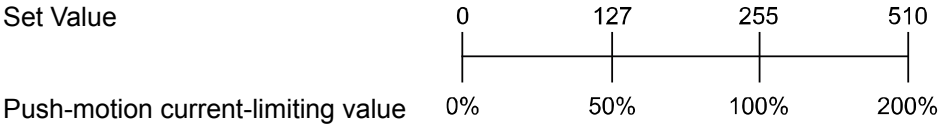
(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of eight input words (channels) and eight output words (channels) 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: 0.01 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 +999999 (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/sec or 0.1 mm/sec) 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/sec
1	0.1 mm/sec

- 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 limit 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 limit 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/sec).
- The alarm code is expressed using 1-word (16 bits) binary data.

PLC output
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Target Position (lower word)																
n+1 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+2 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+3 Positioning band (upper word)	—	—	—	—	—	—	—	—	—	—	—	—	524,288	262,144	131,072	65,536
n+4 Speed	32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+5 Acceleration/ deceleration	—	—	—	—	—	**1,024**	**512**	256	128	64	32	16	8	4	2	1
n+6 Push-current limiting value	—	—	—	—	—	—	—	256	128	64	32	16	8	4	2	1
n+7 Control signal	BKRL	RMOD	DIR	PUSH	GSL1	GSL0	NTC1	NTC0	**MOD1**	**MOD0**	—	SON	RES	STP	HOME	DSTR

PLC input
Channel (* “n” shows the node address of each axis.)

1 word (1CH) = 16 bits

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Current Position (lower word)																
n+1 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+2 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+3 Command Current (upper word)													524,288	262,144	131,072	65,536
n+4 Current Speed (lower word)																
n+5 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+6 Alarm code																
n+7 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 -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.	4.9 (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 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.	4.9 (2)
	Velocity	16-bit data	-	16-bit integer. Specify the speed at which to move the actuator. Designate the unit of 1.0mm/sec or 0.1mm/sec. 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/sec: To set 254.0 mm/sec, specify "254." If a move command is issued by specifying a value exceeding the maximum speed, an alarm will occur.	4.9 (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.	4.9 (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="18">PLC output</td><td>Push-current limiting value</td><td>16-bit data</td><td>-</td><td>16-bit integer.
Specify the current-limiting value during push-motion operation.
The specified range is 0 (0%) to 255 (100%).
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 push current value, an alarm will occur.</td><td>4.9 (2)</td></tr>
<tr><td rowspan="17">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>4.7.11 (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>4.7.11 (19)</td></tr>
<tr><td>b13</td><td>DIR</td><td colspan="2">Push 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>4.7.11 (22)</td></tr>
<tr><td>b12</td><td>PUSH</td><td colspan="2">Push specification: Positioning operation when the signal is OFF, or push-motion operation when the signal is ON.</td><td>4.7.11 (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">4.7.11 (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>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">4.7.11 (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:
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">4.7.11 (30)</td></tr>
<tr><td>b6</td><td>MOD0</td></tr>
<tr><td>b5</td><td>-</td><td colspan="2">Not available</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>4.7.11 (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>4.7.11 (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>4.7.11 (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>4.7.11 (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>4.7.11 (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 The unit is 0.01 mm (other than DD motor) and 0.001° (DD motor). (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.	4.9 (2)
	Command Current	32-bit data	-	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. (Example) Reading:000003FF$_H$=1023 (decimal) =1023mA	4.9 (2)
	Current Speed	32-bit data	-	32-bit signed integer indicating the current position The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The setting unit is 0.01mm/sec. (Example) Reading:000003FF$_H$=1023 (decimal) =10.23mm/sec * When the value is read in hexadecimal notation, the negative figure is expressed as a complement of 2.	4.9 (2)
	Alarm Code	16-bit data	-	16-bit integer When an alarm is issued, the alarm code is output. When any alarm is not issued, it is “0$_H$”. Refer to the Operation Manual for the controller main body for the details of the alarms.	4.9 (2)
	Status Signal	b15	EMGS	Emergency stop: An emergency stop is actuated when this signal turns ON.	4.7.11 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	4.7.11 (1)
		b13	ZONE2	Zone 2:“ON” for the current position within the zone set range	4.7.11 (12)
		b12	ZONE1	Zone 1:“ON” for the current position within the zone set range	4.7.11 (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.	4.7.11 (19)
		b7	BALM	Absolute battery voltage low warning: This signal turns ON when the voltage drops.	4.7.11 (28)
		b6	-	Unavailable	-
		b5	PSFL	Pressing and a Miss: This signal turns ON when the actuator missed the load in push-motion operation.	4.7.11 (23)
		b4	SV	Operation preparation end: This signal turns ON when the servo turns ON.	4.7.11 (5)
		b3	ALM	Alarm: This signal turns ON when an alarm occurs.	4.7.11 (3)
		b2	MOVE	Moving Signal: This signal remains ON while the actuator is moving.	4.7.11 (9)
		b1	HEND	Home return completion: This signal turns ON when home return is completed.	4.7.11 (6)
		b0	PEND	Positioning completion signal: This signal turns ON when positioning is completed.	4.7.11 (10)

4.7.11 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 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”.

(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 4.4, "CompoNet Interface”) on the front surface of the controller illuminates in red.

(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

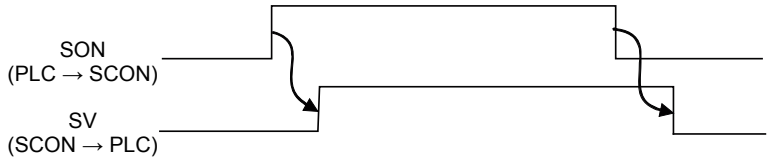
[1] When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset.(In the case of the alarm with the cold start level, re-injection of the power is required)
[2] When this signal is turned ON from OFF condition during 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 4.4, "CompoNet Interface”) on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

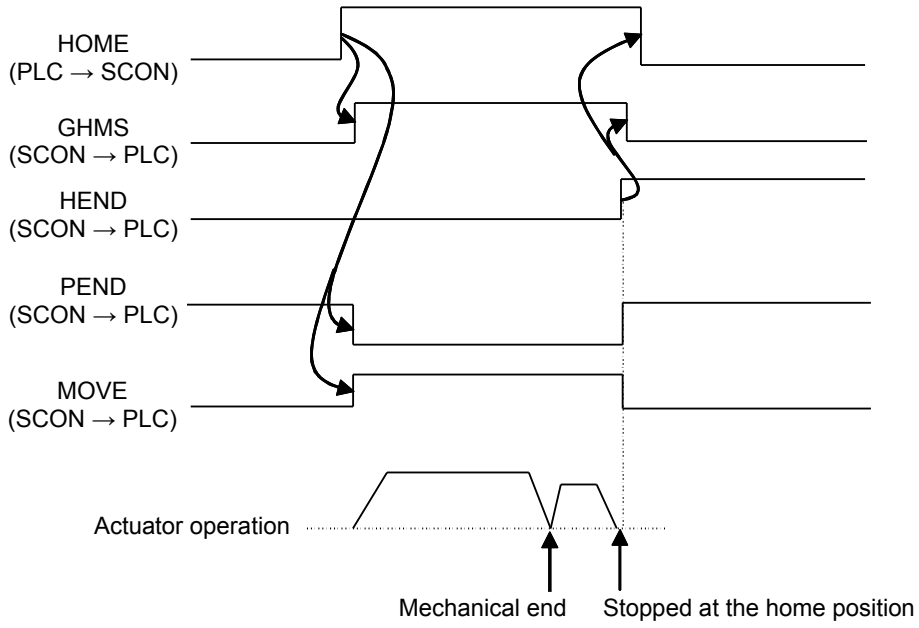
■Function

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.



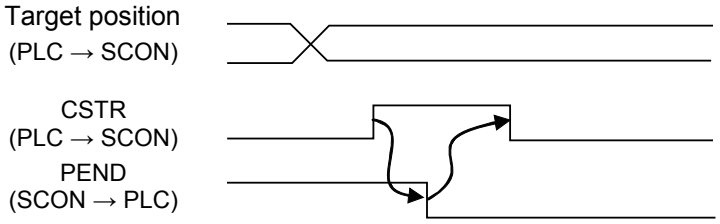
⚠ Caution: In the Remote I/O Modes 1 to 3 and Position/Simplified Direct Value Modes 1 and 2, when the positioning command is issued without performing the home return operation after the power injection, the positioning is performed after the automatic home return operation. Exercise caution that in 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”.

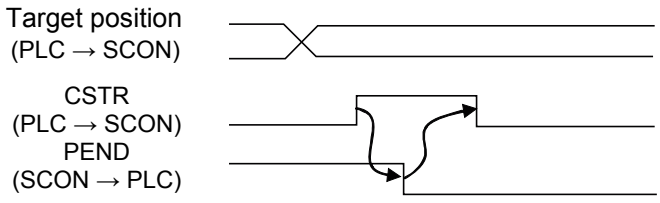
- PMOD＝OFF: Target position data for the specified position No. is used.
- PMOD＝ON :Value for the target position set using the PLC's target position register is used.

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 (HEND) 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”.

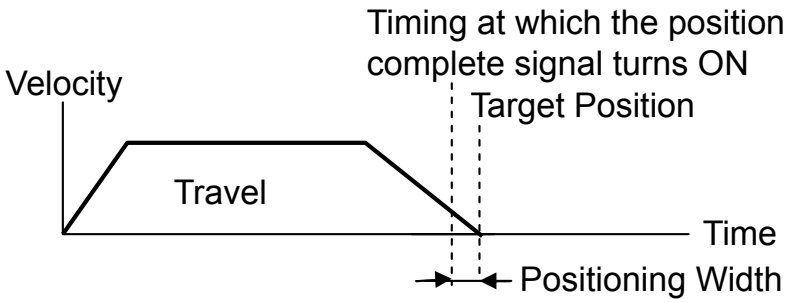


(9) Moving Signal (MOVE) PLC input signal

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 “ON”.

(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.



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” and the actuator is within the positioning band, the PEND signal is turned “ON” again.
When the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.

(11) Pause (STP) PLC output signal

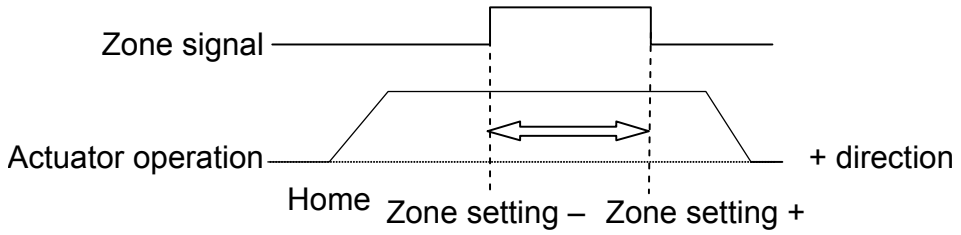
When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position 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.

(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 velocity is based on the parameter value specified using the Jog Speed/Inching Distance Change-Over (IVEL) 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.
The relationship is as follows.

Controller ready	Jog operation: JISL=OFF	Inch operation: JISL=ON
OFF	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed” Parameter No. 48, “Inch distance”
ON	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2” Parameter No. 49, “Inch distance 2”

(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.
The table below summarizes the relationship of the ON/OFF statuses of the JISL signal and jog speed/inch-distance switching (JVEL) signal.

		Jog operation	Inch operation
JISL		OFF	ON
JVEL=OFF	Velocity	Parameter No. 26, “Jog speed”	Parameter No. 26, “Jog speed”
	Travel	–	Parameter No. 48, “Inch distance”
	Accelera-tion/Dece-leration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
JVEL=ON	Velocity	Parameter No. 47, “Jog speed 2”	Parameter No. 47, “Jog speed 2”
	Travel	–	Parameter No. 48, “Inch distance”
	Accelera-tion/Dece-leration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
Operation		When the JOG +/JOG – signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG – signal.

(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.

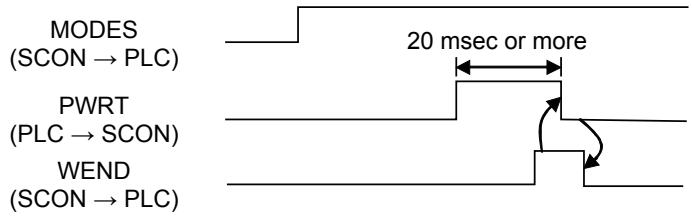
- The actuator operation (motor) is stopped.
- The + JOG (JOG+) signal and – JOG (JOG-) signal are turned “OFF”.
- The Position Data Import Command (PWRT) Signal and Positioning Start (CSTR) Signal are turned “OFF”.

(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 20msec or more. If the time is shorter than 20msec, 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

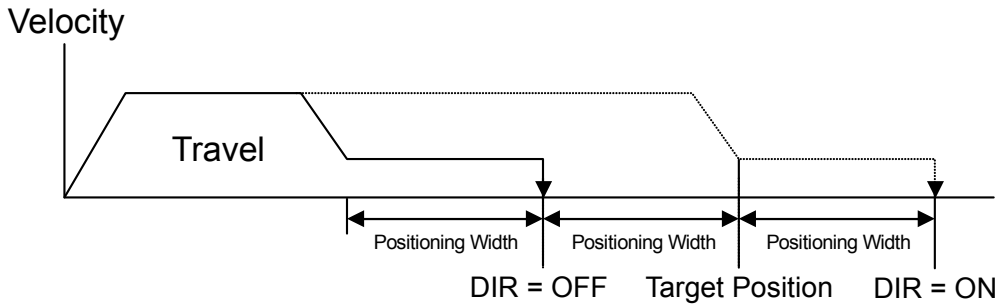
This signal changes over the use of the value registered in the controller position table for the target position in the movement and the use of the value specified in the PLC's target position register.
PMOD=OFF: Use the position table
PMOD=ON :Use the value of the target position resister

(21) Push-motion 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) Operation in Half Direct Value Mode in “4.9 Operation” for the setting timing for this signal)

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

This signal specifies the pressing direction.
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.
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.
In the case of the normal pressing operation, this signal is disabled.
Refer to Item (2) Operation in Half Direct Value Modes 1 to 3 in 4.9, "Operation” for the setting timing for this signal)



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

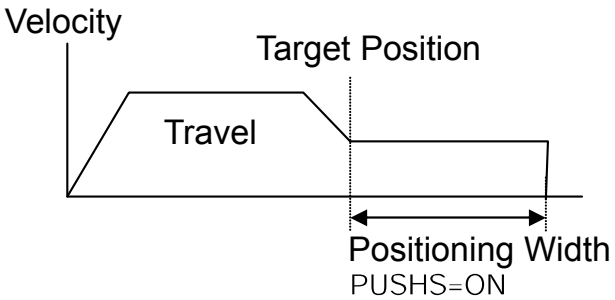
In the case that the pressing operation was performed, and the actuator moved the travel distance set in the controller position table positioning band or set using the PLC's positioning band register, but it was not pushed against the work part, this signal is turned “ON”.
Refer to Item (2) Operation in Half Direct Value Modes 1 to 3 in 4.9, "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) Push motion in progress (PUSHS) PLC input signal

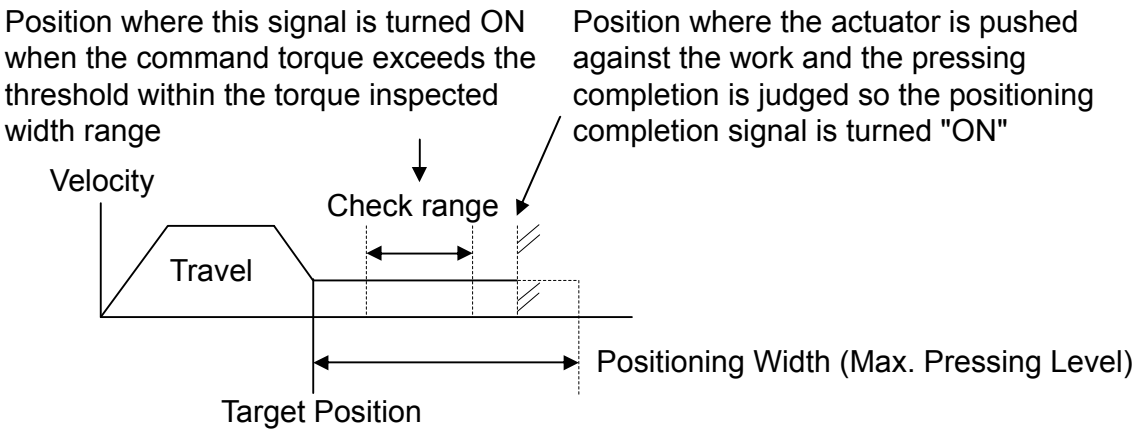
This signal is turned “ON” during the pressing operation.



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) Operation in Half Direct Value Modes 1 to 3 in 4.9, "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 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.

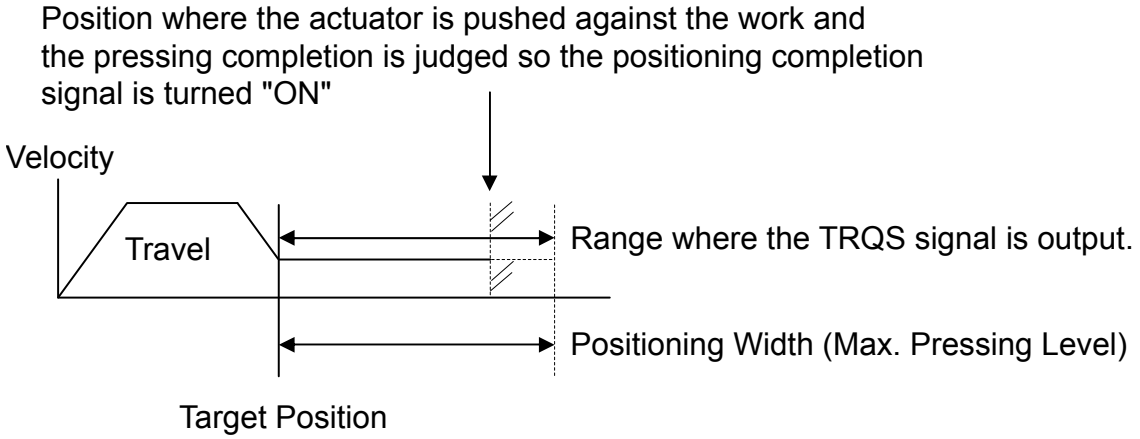


- Set the pressing speed using the parameter No. 34 “Pressing Speed”.
  When the machine is delivered, it has been individually set depending on the actuator characteristics. Set an appropriate velocity considering the work part material and shape.
- Set the parameter No. 50 “Load Output Judgment Time 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 for more information.

⚠ Caution: The actuator continues to push the work with the pressing current at the stop time decided with the current limit 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”.
The velocity available for the pressing varies depends on the motor and leads, it is required to adjust the parameters.



- Set the pressing velocity 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 for more information.

⚠ Caution: The actuator continues to push the work with the pressing current at the stop time decided with the current limit value.
It is not the stop condition, so take the greatest care to deal with it.

(28) Absolute Battery Voltage Low Warning (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.)

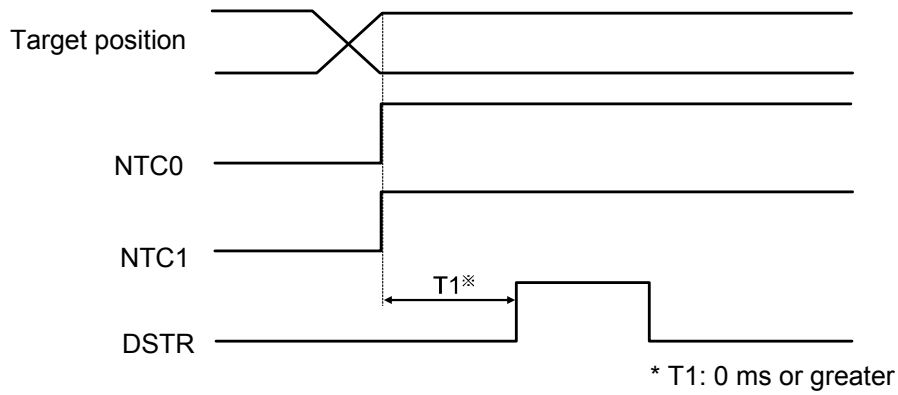
(29) Vibration Damping Mode Selection 0, 1 (NTC0, NTC1) PLC Output Signals

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.
For details, refer to the operation manual for your controller.

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: 0 ms or greater

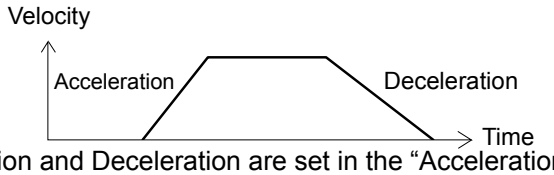
⚠ Caution: Since the statuses of NTC0/NTC1 signals are loaded when a movement command (DSTR) is recognized, nothing happens when the NTC0/NTC1 signals are turned ON/OFF while the actuator is moving.

(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	

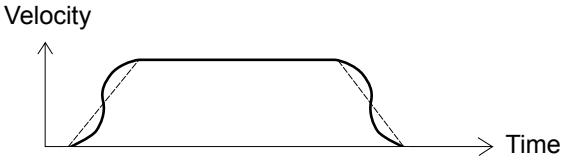
Trapezoid Pattern



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

S-shaped Motion

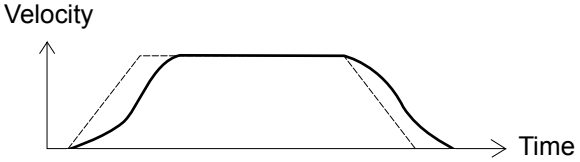
The S-shaped curve is described where at first in the acceleration, the line is gentle, but along the way, it suddenly becomes steep.
Use it in such application that setting the acceleration/deceleration rate high is desired because high tact time is required, but in the movement start or immediately before stop, low acceleration/deceleration rate is favorable.



* The S-shaped motion degree is set using the parameter No. 56 “S-Shaped Motion Ratio Setting”. The setting unit is % and setting range is from “0” to “100”.
(The above figure shows the image graph with the Parameter No. 56 set to “100”.)
When it is set to “0”, the S-shaped motion is disabled.
However, the setting is not reflected on the jog operation or inching operation performed using the teaching tools such as PC.

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.

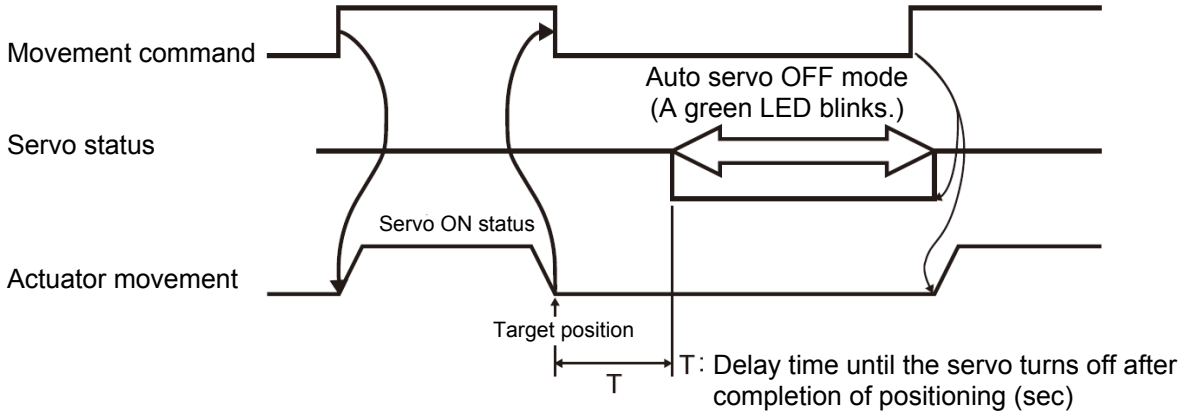


* The first-order lag degree set using the parameter No. 55 “Position Command Primary Filter Time Constant”. The minimum input unit is 0.1msec and setting range is from “0.0” to “100.0”.
When it is set to “0”, the first-order lag filter is disabled.
However, the setting is not reflected on the jog operation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

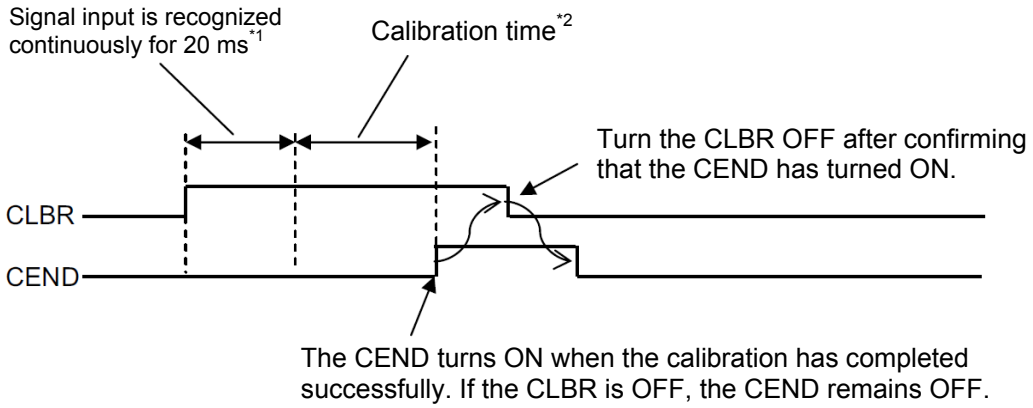


(32) Load Cell Calibration Command (CLBR) PLC Output Signal
Load Cell Calibration Complete (CEND) PLC Input Signal

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).
For details, refer to the operation manual for your controller.

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	

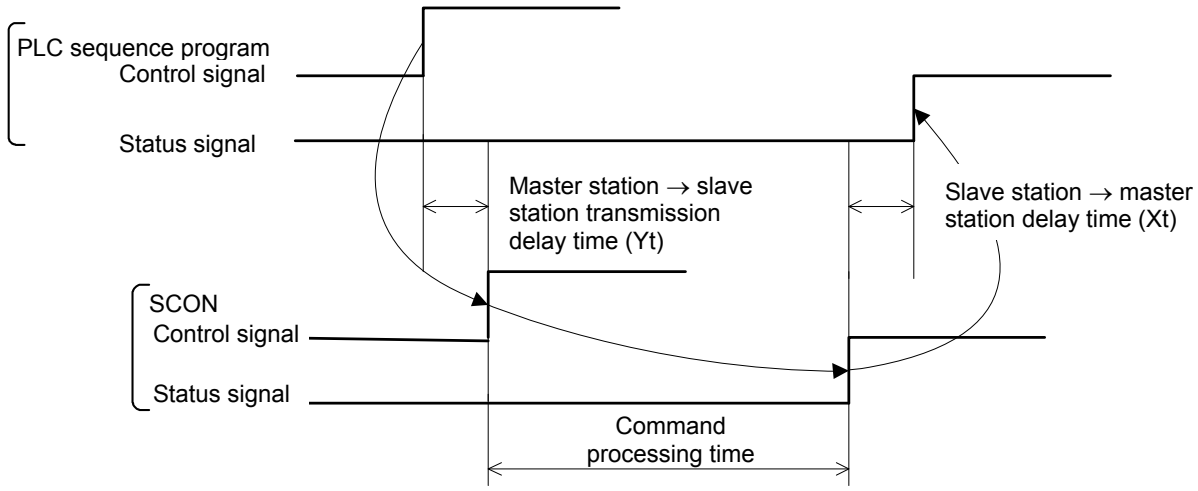
4.8 I/O Signal Timings

When any of the control signal is turned ON to perform the operation of the actuator using the PLC's sequence program, the response (status) is returned to the PLC. The maximum response time is expressed using the following formula.

Maximum response time (msec)＝Yt+Xt+3+ command processing time (operation time, etc.)

Yt: Master Station→slave transmission delay time
Xt: Slave→Master Station Transmission Delay Time
} Filed Network Transmission Delay Time

Master Station→ For the master station -> slave transmission delay (Yt) and slave → master station transmission delay (Xt), refer to the Operation Manuals for the CompoNet master unit and PLC installed in the master unit.



4.9 Operation

The timings for the basic operation examples in the Position/Simplified Direct Value Mode 1 and 2 , Half Direct Value Mode 1 to 3 and Full Direct Value Mode, are described.
For the Remote I/O Mode 1 to 3, refer to the Operation Manual for the controller main body.
(In remote I/O mode 2 and 3, read the current position and current speed from the respective byte of the PLC, as deemed appropriate.)

(1) Operation in the position/simple-direct mode 1 and 2

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

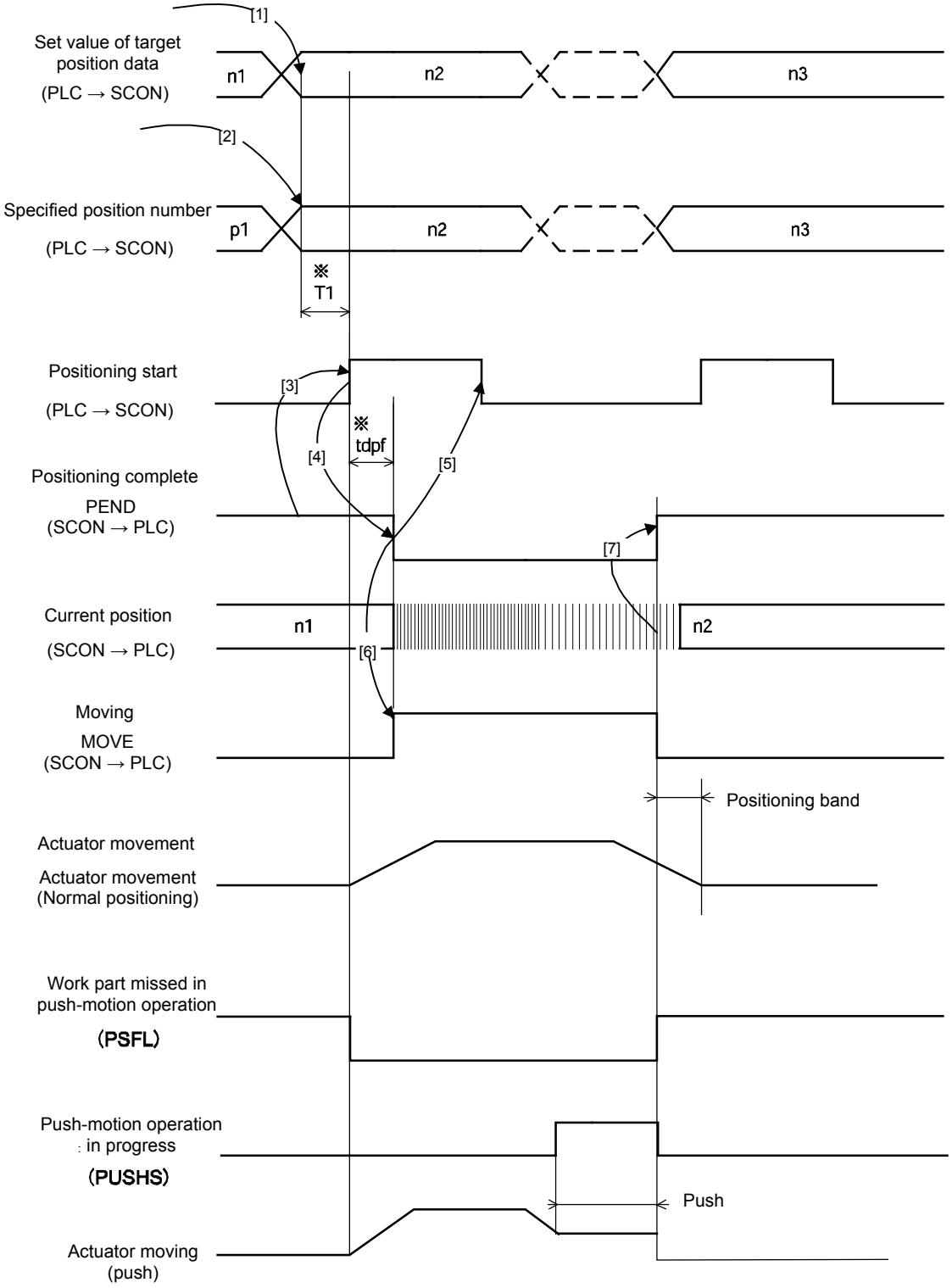
● Example of operation (normal positioning operation)

(Preparation) Set the position data items (speed, acceleration/deceleration, positioning band, 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] In the condition where the positioning completion (PEND) signal is turned “ON” or, Under Movement (MOVE) signal is turned “OFF”, turn “ON” the Positioning Start (CSTR) signal. The data items set in Steps 1) and 2) are read in the controller at the startup (ON edge) of the CSTR signal.
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 CST signal is turned “ON”, the PEND signal is turned OFF after tdpf.
[5] After confirming that the PEND signal is turned “OFF” or MOVE signal is turned “ON”, turn “OFF” the CSTR signal. 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”.
[7] The current position data is continuously updated. When the remaining travel distance becomes within the range of the positioning band set in the position data, and the CSTR signal is turned “OFF”, the PEND signal is turned “ON”. Then, the completed position No. is output to the completed position No. register.
Accordingly, for the read of the completed position No. register when the positioning is completed, confirm it some time (Remaining Travel Distance Movement Time) after the PEND signal is turned “ON”.
The current position data might be changed slightly even when the system is stopped.
[8] 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.

● Example of operation (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.



*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(2) Operation in the half direction mode 1 to 3

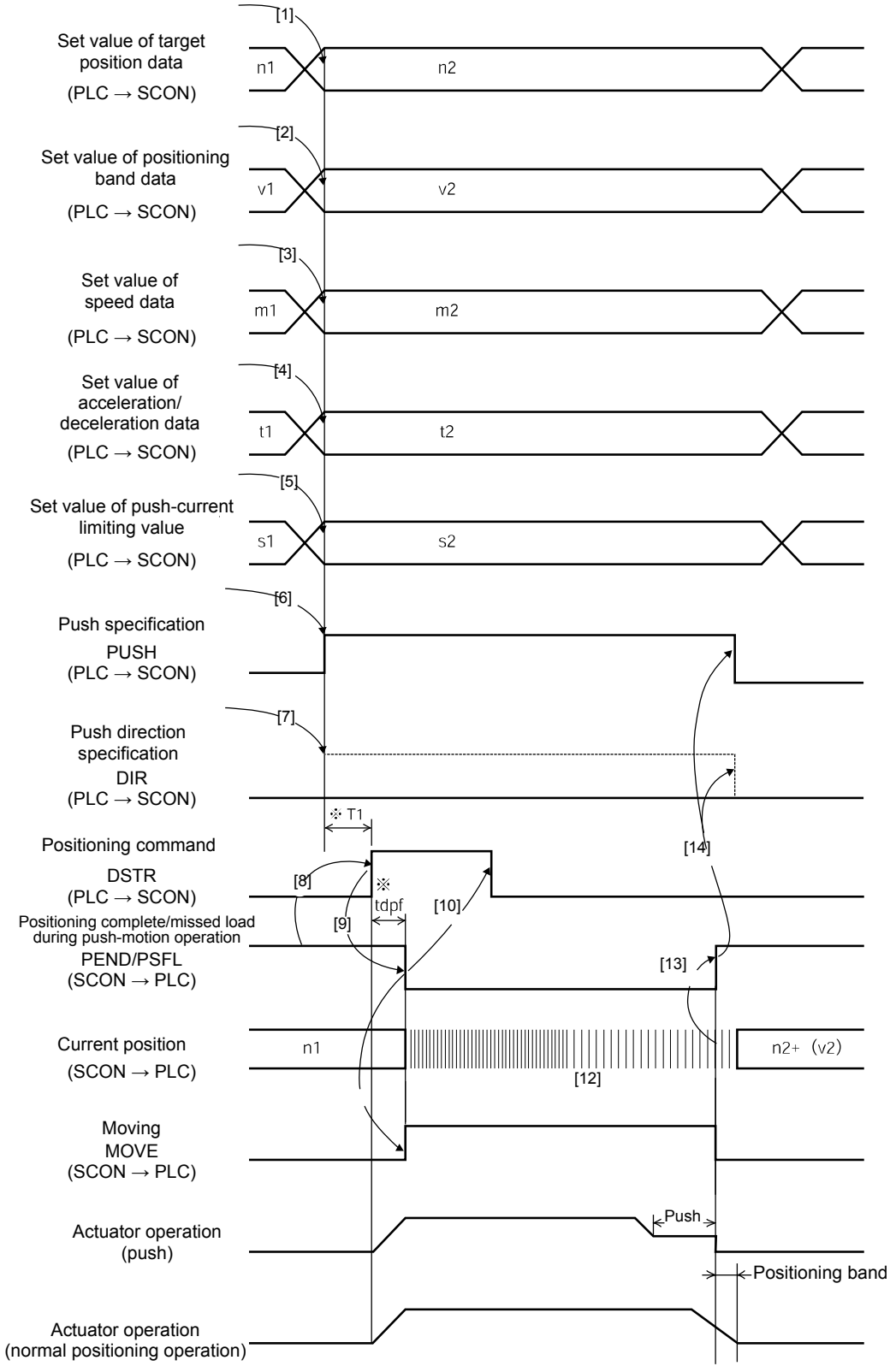
It is operated with the data set in the PLC's target position register, positioning band register, setup speed register, acceleration/deceleration register and pressing current limit setup register.

● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the acceleration/deceleration data to the acceleration/deceleration resister.
[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 4.7.11 (22))
[8] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 5) 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] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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”. (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[14] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 6 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.



*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(3) Operation in the full direct mode

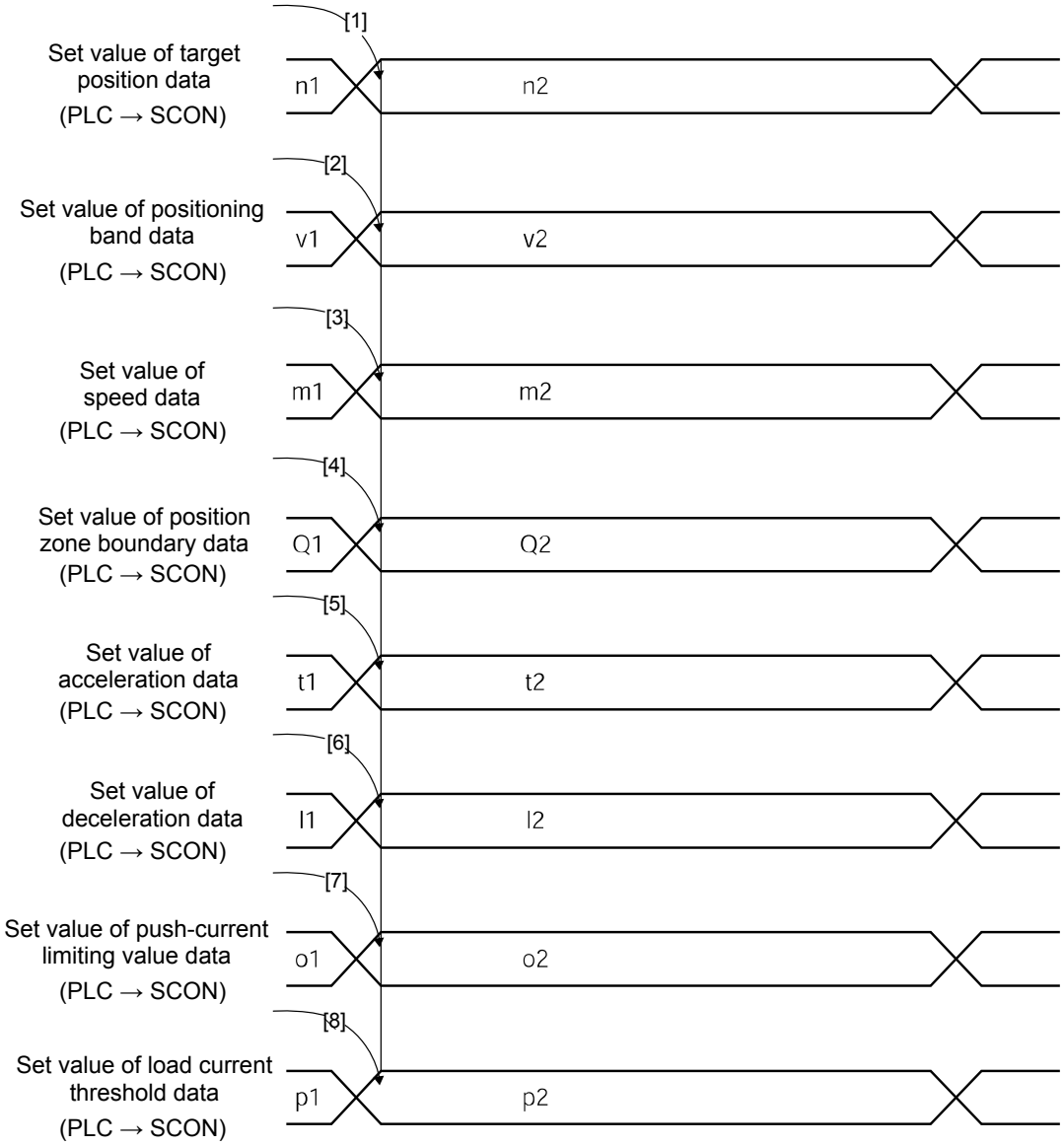
The actuator is operated by specifying all conditions required for positioning such as the target position resister and positioning band resister of the PLC.

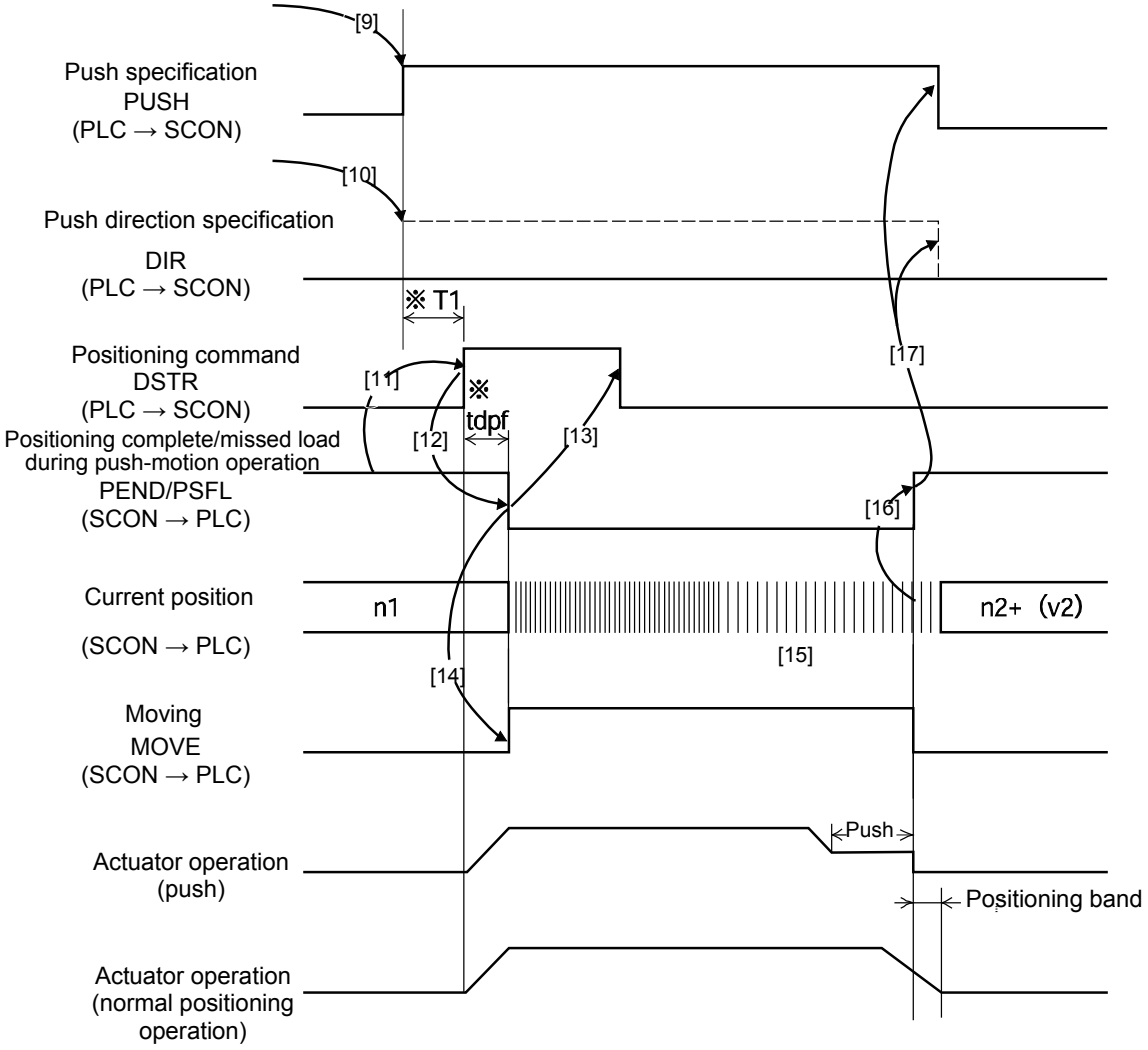
● Example of operation (Pressing Operation)

[1] Set the target position data in the target position register.
[2] Set the positioning band data in the positioning band register.
[3] Set the speed data to the speed resister.
[4] Set the position zone output boundary data in the zone boundary + register or zone boundary - 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 4.7.11 (22))
[11] In the condition where the positioning completion (PEND) signal is turned “ON” or under movement signal (MOVE) is turned “OFF”, turn “ON” the positioning command (DSTR) signal.
The data items set in Steps 1) through 8) 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 tpdf.
[13] After confirming that the PEND signal is turned “OFF” or the MOVE signal is turned “ON”, turn “OFF” the DSTR signal. Do not change any value in each register 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”.
[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” (Completion of push-motion operation)
Even when the positioning band 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 (PSEL) signal is turned“ON”. In this case, the PEND signal is not turned “ON” (Pressing and a Miss).
[17] After the PEND signal or PSEL signal is turned “ON”, turn “OFF” the PUSH signal.

● Example of operation (normal positioning operation)

For the general positioning operation, set the signal in Step 9 to “OFF”.
When the remaining travel distance becomes within the range of the positioning band set in the position data, and the DSTR signal is turned “OFF”, the PEND signal is turned “ON”.


[1]
Set value of target position data (PLC → SCON)
n1
n2
[2]
Set value of positioning band data (PLC → SCON)
v1
v2
[3]
Set value of speed data (PLC → SCON)
m1
m2
[4]
Set value of position zone boundary data (PLC → SCON)
Q1
Q2
[5]
Set value of acceleration data (PLC → SCON)
t1
t2
[6]
Set value of deceleration data (PLC → SCON)
l1
l2
[7]
Set value of push-current limiting value data (PLC → SCON)
o1
o2
[8]
Set value of load current threshold data (PLC → SCON)
p1
p2

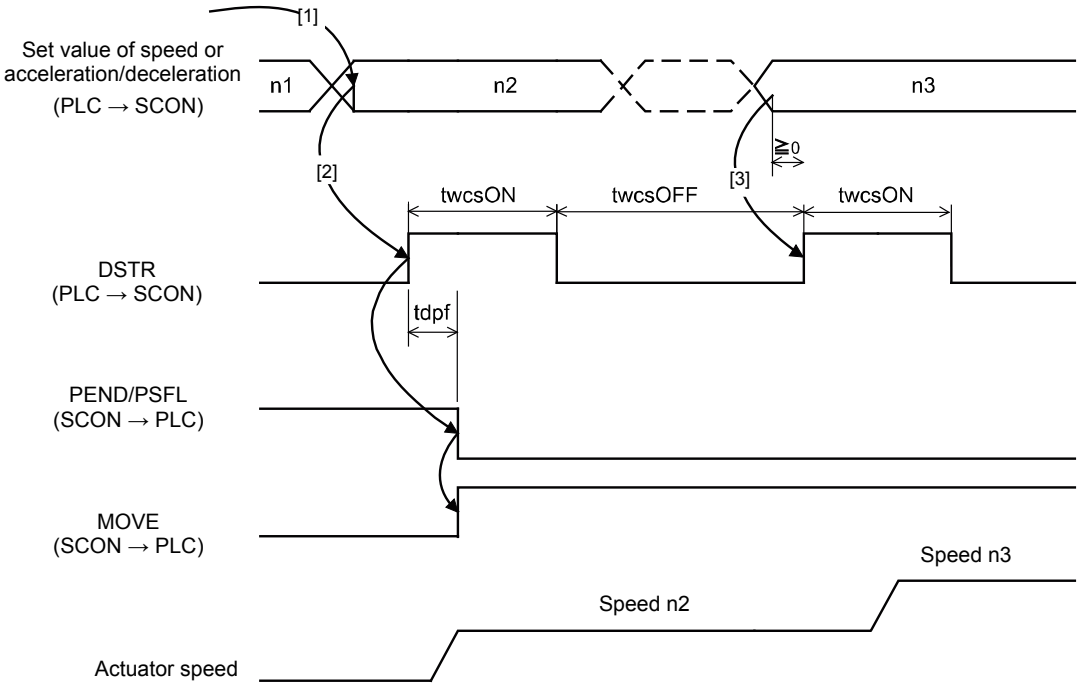


*T1: Considering the scanning time of the host controller, set it so that " T1 ≥ 0ms" .

*Yt+xt ≤ tdpf ≤ Yt+xt+3(msec)

(4) Data change during movement

In the half direct mode or full direct mode 1 to 3, the value currently set to a given resister among the resisters for target position data, acceleration/deceleration data, speed data, positioning band and push-motion current-limiting value, can be changed while the actuator is moving.
After changing the data, turn “ON” the positioning command (DSTR) for more than tdpf.
Also, after turning “OFF” the DSTR, set aside some time for “twcsON + twcsOFF” or more, until the next DSTR is turned “ON”.
The example is shows as follows, where the speed and acceleration/deceleration data items have been changed.



twcsON ≥ Yt＋xt＋3 (msec)
twcsOFF ≥ Yt＋xt＋3 (msec)
*Yt＋xt ≤ tpdf ≤ Yt＋xt＋3 (msec)

⚠ 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.

4.10 CompoNet related parameters

Parameters relating to CompoNet are No. 84 to No. 85, No. 90 and No.159.

Category:C:External interface parameter

No.	Category	Symbol	Name	Default Value set in the Factory before Delivery
1			Refer to Operation Manual for the controller for the parameters No. 1 through No. 83.	
~				
83				
84	C	FMOD	Field bus operation mode	0
85	C	NADR	Field bus node address	0
86	C	FBRS	Field bus baud rate	0
87	C	NTYP	Network type	4
90	C	FMIO	Field I/O format	3
159	C	FBVS	FB Half Direct Mode Speed Unit	0

● Field bus operation mode (No.84 FMOD)
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 CompoNet.
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.

(Note) SCON-CAL is not applicable for the operation modes 5 to 7.

● Field bus node address (No.85 NADR)
Specify the node address number in parameter No. 85.

Setting Range 0 to 63 (It is set to “0” when the machine is delivered from the factory.)

● Field bus baud rate (No.86 FBRS)
The baud rate is automatically set to the same value as the baud rate set in the master. Accordingly, you do not need to set the baud rate.

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

● Field I/O format (No.90 FMIO)
Addresses in the PLC are assigned in units of 16 points (2 bytes) based on the node address set in the controller and the occupied bytes in each operation mode.
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 “Example i”.)
1	The host bytes are exchanged with slave bytes in the host words and slave words. (Refer to “Example ii”.)
2	In the case of word register, the host words are exchanged with the slave words. (Refer to “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 “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			

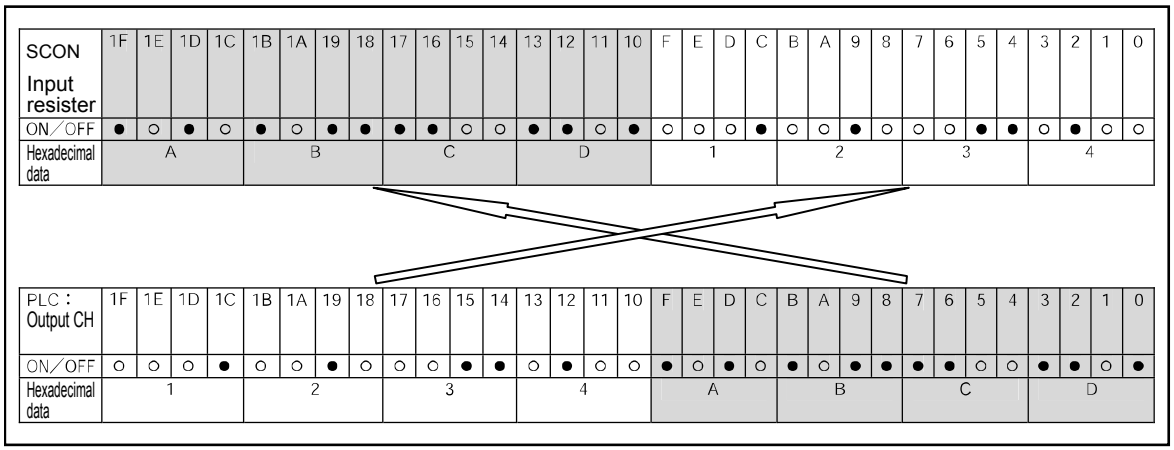
PLC： Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

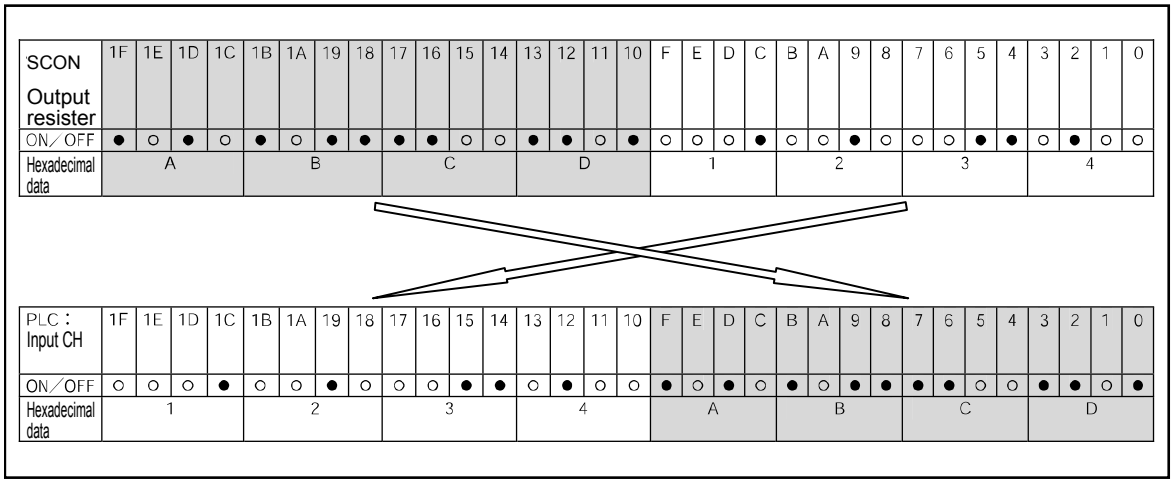
SCON Output resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	●	●	○	●	○	○	○	○	○	●	○	○	●	○	●	●	○	○	●	●	○	●	●	○	●	○	●	○	●	●
Hexadecimal data	3				4				1				2				C				D				A				B			

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			

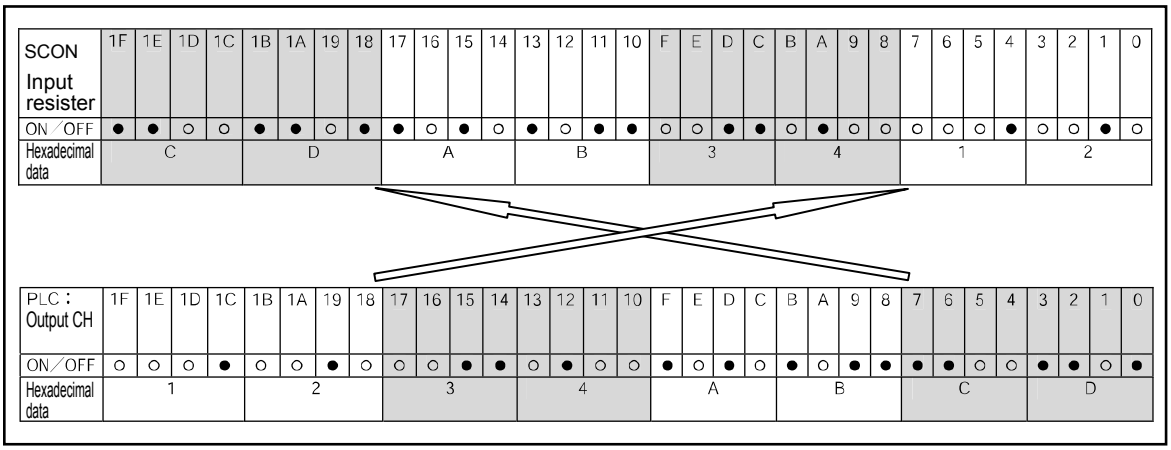
(Example iii) Set value = “2”

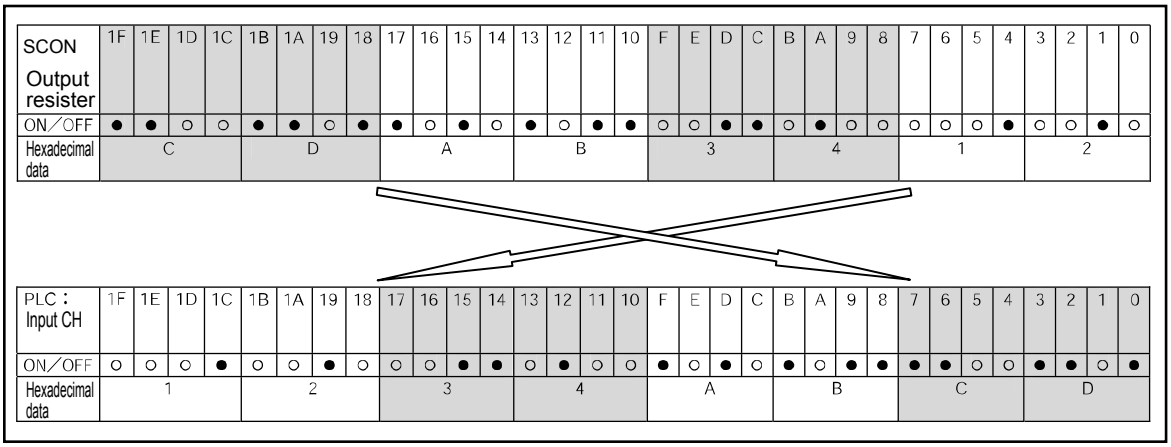
● indicates ON, while ○ indicates OFF.





(Example iv) Set value = “3”　　● indicates ON, while ○ indicates OFF.





● FB Half Direct Mode Speed Unit (No.159 FBVS)
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/sec
1	0.1 mm/sec

4.11 Troubleshooting

● Alarm Description and Cause/Treatment

[1] **When an alarm is issued, the completed position No. (4 bits for PM1to PM8) shows the simplified alarm code in the Remote I/O Mode 1 to 3.**

In the position/simple direct mode 1 and 2, this simple alarm code is output to the (n+4, n+5) bytes.
In the half direct mode 1 to 3 and full direct mode, this simple alarm code is output to the (n+12, n+13) bytes.

1) Confirm the alarm code using the PLC's monitor function, etc., or using the status monitor, connecting the teaching tools such as RC PC software.
2) Based on the read alarm code, search the alarm description list in the operation manual for the controller.
3) Deal with it based on the description for the alarm code in question.
For the following alarm code, deal with it according to the following table.

Code	Error name	ID (*1)	RES (*2)	Cause/Treatment
0F2	Field bus module error	05	x	Cause: The filed bus module error is detected Treatment: Confirm the parameter.
0F3	Field bus module not detected	04	x	Cause: The module can not be detected. Treatment: Turn ON the power again. If the error is not removed, contact our company.

(*1) ID→Simple alarm code

(*2) RES→ Whether or not the alarm can be reset ○: Alarm can be reset / x: Alarm cannot be reset

[2] If the alarm is occurred, checking the network status on the display of monitor LEDs is possible.

○: Illuminating, x: OFF, ☆: Flashing

MS	NS	Item	Cause of error occurrence	Unit operation after error detection	Measure
x	-	No power supply input	Specified power voltage is not supplied.	SCON stop the operation.	Remove the cause of no power supply input and input the power supply again.
○ GN	☆ RD	Communication Error	Remote I/O communication that the connection was set up with the master unit has stopped by timeout.	SCON continue the operation.	The following cases are considered to be the possible causes of communication error. Find the most suitable case and remove the cause. 1) A stop was cased by an error on the PLC system including the master unit. → Check the PLC system condition and cancel the error. SCON need not be restarted. 2) Communication with the master unit is disabled by broken connector, repeater, etc. → Check the conditions of cables, terminals and repeater. Supply the communication power again after an error cause is removed. 3) Master unit stopped the communication due to the communication retries with the applicable SCON continuously exceeded the specified value caused by noise. → Check the noise condition around the applicable SCON For the items above excluding 1) restart of master unit is not necessary.
○ GN	○ RD	Address duplication error	There are SCON with the same node existing on the network.	SCON stop the operation.	Confirm the node number of SCON, correct the duplicated number, then conduct operations in the following procedure. 1) Turn OFF the communication power supply between the master unit and SCON. 2) Turn ON the communication power supply between the master unit and SCON again.
○ RD	-	Unit error	An error has occurred to SCON due to the following causes.	SCON stop the operation.	Check the set value for the SCON node address to remove the possibility of the error cause for 1). Then, restart (turn on the communication power supply again) SCON. If the error occurs again, replace SCON.

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

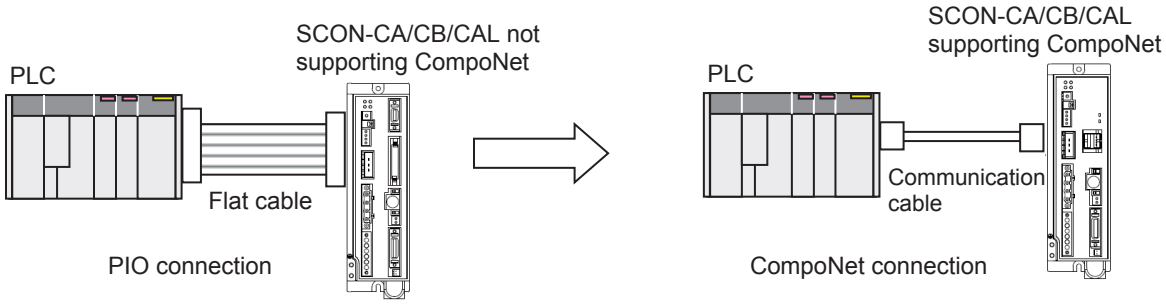
The operation modes described in the table below for SCON-CB Type applicable for CopoNet are available to choose from for operation.

Operation modes and key functions

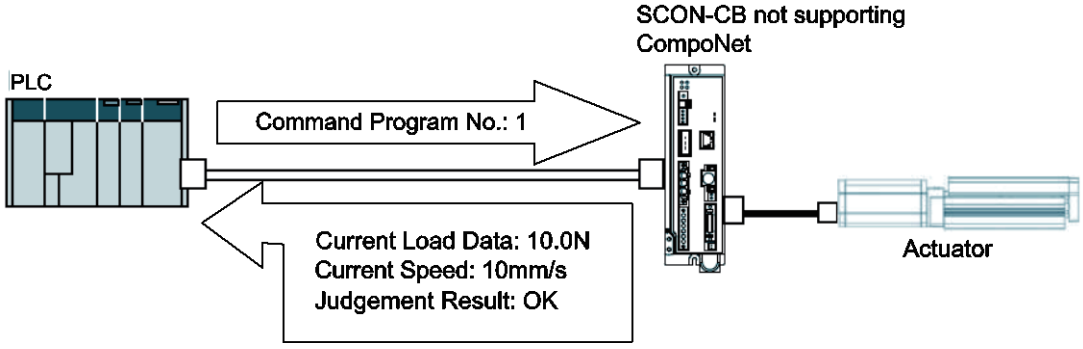
Key function	Remote I/O mode	Full function mode
Number of occupied bytes	2	32
Operation by position data specification	×	○
Direct speed/acceleration specification	×	○
Current position reading	×	○
Current speed reading	×	○
Program number command operation	○	○
Judgement result reading	○	○
Current load data reading	×	○
Overload level monitor	×	○
Servo gain switching	○(*1)	○(*1)

(*1) One servo gain can be registered to one press program.

[1] Remote I/O mode: In this mode, the actuator is operated by PIOs (24 V I/Os) via CompoNet 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

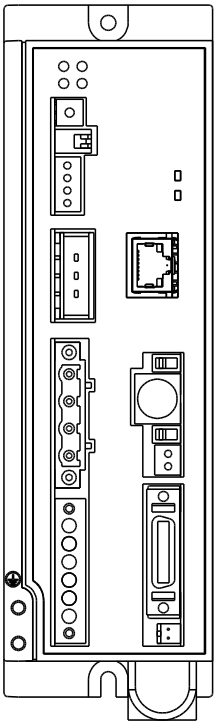


5.2 Model Numbers

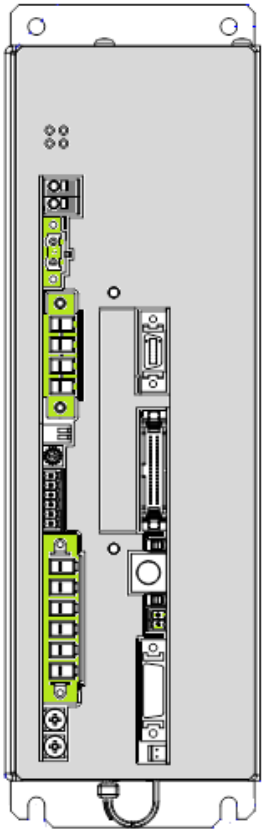
The model numbers of SCON-CB controller supporting CompoNet are indicated as follows, respectively:

● SCON-CB-☐F-CN-☐

For ~ 750W motor
(The figure below 400W or less type)



For 3000 ~ 3300W motor



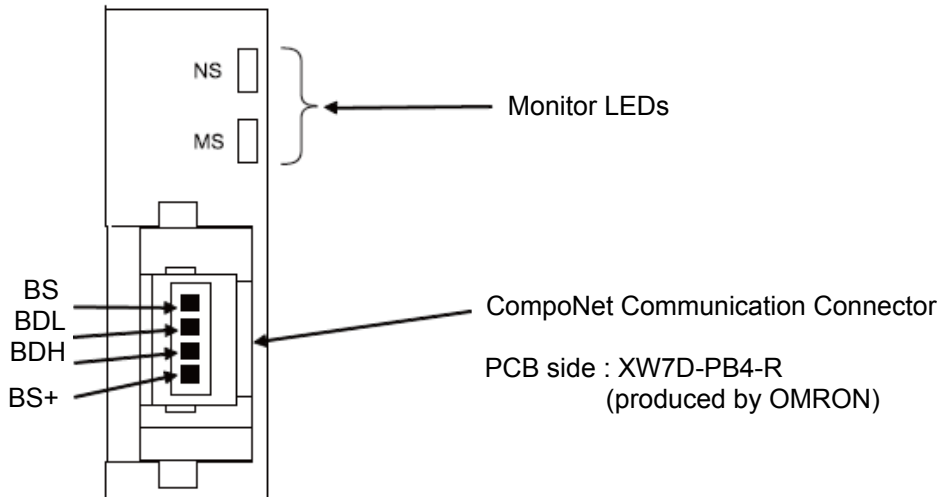
5.3 Interface Specifications

Item	Specification
Communication protocol	CompoNet specialized protocol
Communication type	Remote I/O communication
Baud rate	Automatically set to the same value as the baud rate set in the master
Communication Cable Length	Refer to CompoNet specifications
Slave type	Word mixed slave
Applicable note address	0 to 63 (set by controller parameter)
Communications cable	Round-type cable (JIS C3306,VCTF2 conductors) Flat cable 1 (not sheathed) Flat cable 2 (sheathed)
Connector	Connector recommended by OMRON is to be used. Controller-end connector:xW7D-PB4-R (OMRON)

5.4 CompoNet Interface

5.4.1 Name of the Parts

The names of each section related to CompoNet are described as follows.



5.4.2 Monitor LED indications

The node conditions of 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.
LEDs are 2-colored illumination type (orange / green), and the colors show the status as listed below.

MS (ModuleStatus) LED · · · · · · · · · Condition of the node (each controller)
NS (NetworkStatus) LED · · · · · · · · Condition of network

○: Illuminating, x: OFF, ☆: Flashing

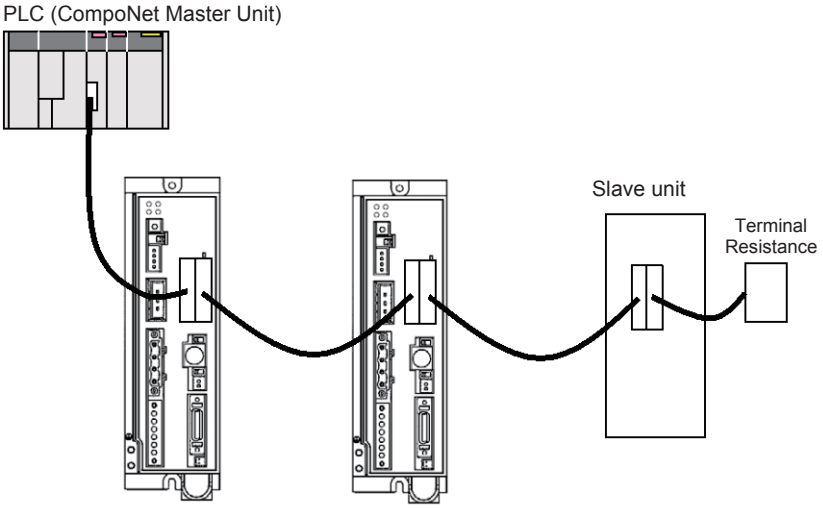
LED	Color	Indication Status	Description
MS	GN	○	In the normal operation
	RD	○	A hardware error. The replacement of the board is required.
		☆	It is a minor error such as a user setting error or configuration error. It can be recovered by re-setting, etc.
	-	x	The CompoNet is being initialized, or the power is not supplied.
NS	GN	○	The connection has been established and the communication is being performed normally.
		☆	The machine is on-line, but the connection has not been established. Communication Stop. (Network is normal)
	RD	○	Node address duplication.
		☆	Communication Error. (Communication timeout has been detected)
	-	x	The machine is not on-line. The power to the CompoNet is not supplied.

5.5 Wiring

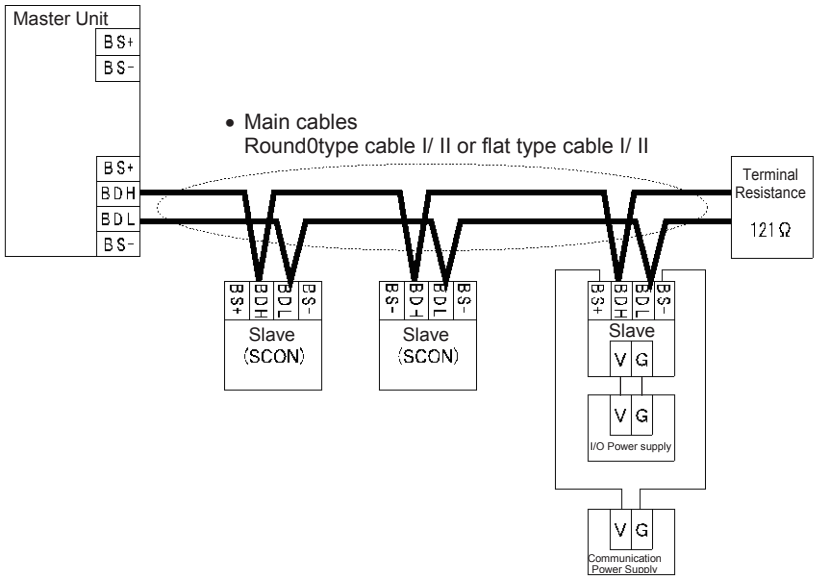
5.5.1 Connection Diagram

An example for wiring is as shown below.

- Wiring Example



- Connecting Example



*1: SCON for CompoNet specifications does not require the communication power supply. However, when multiple power supply is conducted, connection of the communication power of SCON to BS+ and BS- terminals is required.
*2: Make sure to read the Operation Manual for the master unit for the details of CompoNet wiring, precautions, etc.

5.6 Setting

Using the 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 CompoNet.

5.6.1 Operation Mode Selecting

Set parameter No. 84 “FMOD: Field bus operation mode.”
[Refer to 5.10 CompoNet Related Parameters.]

Set value	Operation mode	Number of occupied bytes
0 (Factory setting)	Remote I/O mode	1
1	Full function mode	16

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

5.6.2 Node Address Setting

The node address is set by the parameters.
Set the parameter No. 85 “NADR: Field Bus Node Address” using the RC PC software.
(Refer to 5.10, "CompoNet Related Parameters”.)

Settable Range:0 to 63 (It is set to “0” when the machine is delivered from the factory.)

(Note) Exercise caution to avoid node address duplication.
The nodes (controllers) are assigned in the order of their node address in the remote I/O address areas of the PLC.
For details, refer to the Operation Manuals of the master unit and PLC in which in the master unit is installed.

(Note) The setting for the communication speed is not required because it automatically follows the master’s communication speed.

(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.

5.7 Communicating with the Master Station

5.7.1 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 byte 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
	Number of occupied channel: 1 CH	Number of occupied channel: 16 CH
n+0	Port No. 0 to 15	Target position
n+1		
n+2		Positoning band
n+3		
n+4		Command speed
n+5		
n+6		Occupied area
n+7		
n+8		
n+9		
n+10		Acceleration
n+11		Deceleration
n+12		Occupied area
n+13		Load current threshold
n+14		Control signal 1
n+15		Control signal 2

• SCON-CB input → PLC output (* “n” indicates the byte 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
	Number of occupied channel: 1 CH	Number of occupied channel: 16 CH
n+0	Port No. 0 to 15	Current position
n+1		
n+2		Feedback current
n+3		
n+4		Current speed
n+5		
n+6		Current load
n+7		
n+8		Occupied area
n+9		
n+10		Program alarm code
n+11		Alarm code
n+12		Overload level monitor
n+13		Execution program
n+14		Status signal 1
n+15		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 node address duplication.

5.7.2 Remote I/O Mode (Number of Occupied Channels: 1CH)

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 a PC software for RC.
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	×
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 node 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	0 to 15	n+0

(2) I/O Signal Allocation for each Axis
The I/O signals of each axis consist of one input (1 channnel=1CH) and one output word in the I/O areas.
- Each address is controlled by ON/OFF bit signals.

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

1 word = (1CH) =16 bit

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+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 node address of each axis.)

1 word = (1H) =16 bit

	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
n+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.

5.7.3 Full Function Mode (Number of Occupied Channels: 16)

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	○
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 node 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	Current position	n+0
		n+1		n+1
	Positioning band	n+2	Feedback current	n+2
		n+3		n+3
	Speed	n+4	Current speed	n+4
		n+5		n+5
	Occupied area	n+6	Current load data	n+6
		n+7		n+7
	Occupied area	n+8	Occupied area	n+8
		n+9		n+9
	Acceleration	n+10	Program alarm code	n+10
	Deceleration	n+11	Alarm code	n+11
	Occupied area	n+12	Overload level monitor	n+12
	Command program No.	n+13	Execution program No.	n+13
	Status signal 1	n+14	Status signal 1	n+14
	Status signal 2	n+15	Status signal 2	n+15

(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 node address duplication.

(2) I/O Signal Allocation for each Axis

The I/O signals of each axis consist of sixteen input words (4 channel = 4 CH) 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 –999999 to +999999 (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 +999999 (Unit: 0.001 mm/sec) 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/sec) 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/sec).
- 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 node address of each axis.)

1 word = (1CH)= 16 bit

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Target position (Lower word)																
n+2 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+2 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+3 Positioning band (Upper word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536
n+4 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+5 Speed (Upper word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536
n+6 Can not be used																
n+7 Can not be used																

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

1 word = (1CH)= 16 bit

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8 Can not be used																
n+9 Can not be used																
n+10 Acceleration	-	-	-	-	-	1,024	512	256	128	64	32	16	8	4	2	1
n+11 Deceleration	-	-	-	-	-	1,024	512	256	128	64	32	16	8	4	2	1
n+12 Can not be used																
n+13 Command program No.	-	-	-	-	-	-	-	-	-	-	PC32	PC16	PC8	PC4	PC2	PC1
n+14 Status signal 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
n+15 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 node address of each axis.)

1 word = (1CH)= 16 bit

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+0 Current position (Lower word)																
n+1 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+2 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+3 Feedback current (Upper word)	-	-	-	-	-	-	-	-	-	-	-	-	524,288	262,144	131,072	65,536
n+4 Current speed (Lower word)																
n+5 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+6 Current load (Lower word)																
n+7 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 node address of each axis.)]

1 word = (1CH)= 16 bit

	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
n+8 Can not be used																
n+9 Can not be used																
n+10 Program alarm code																
n+11 Alarm code																
n+12 Overload lebel monitor	-	-	-	-	-	-	-	-	-	PC64	PC32	PC16	PC8	PC4	PC2	PC1
n+13 Execution program No.	-	-	-	-	-	-	-	-	-	-	PC32	PC16	PC8	PC4	PC2	PC1
n+14 Status signal 1	JDNG	JDOK	LJNG	LJOK	PJNG	PJOK	-	-	-	WAIT	RTRN	DCMP	PSTP	PRSS	SERC	APRC
n+15 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”.)

Adress		Bit	Symbol	Function	Details
PLC output	Target position	32-bit data	-	32-bit signed integer. Set the target position on the absolute coordinates. The unit is 0.001 mm, while the specifiable range is -999999 to 999999. (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.	5.9 (2)
	Positioning band	32-bit data	-	32-bit integer. The unit is 0.001 mm, while the specifiable range is 1 to 999999. (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.	5.9 (2)
	Velocity	32-bit data	-	32-bit integer. Specify the speed at which to move the actuator. The unit is 0.01 mm/sec, 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”, set it as “2540”. When the movement command is set with the value bigger than the max. speed, an alarm is issued.	5.9 (2)
	Acceleration	16-bit data	-	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 0.30G, 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.	5.9 (2)
	Deceleration	16-bit data	-		
	Command program No.	16-bit data	-	16-bit integer. 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).	5.9 (2)

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

Adress		Bit	Symbol	Function	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	5.7.4 (15)
		b14	JOG-	-Jog: The actuator moves in the direction of home when the signal is ON.	5.7.4 (14)
		b13	JOG+	+Jog: The actuator moves in the direction opposite home when the signal is ON.	5.7.4 (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.	5.7.4 (13)
		b11	JISL	Jog/inching switching: Jog operation when the signal is OFF, or inching operation when the signal is ON.	5.7.4 (12)
		b10	SSTP	Probing stage: When this bit is ON at the time when probing stage completes, stops at probing stage complete position	5.7.4 (11)
		b9	FPST	Program compulsory stop: Executed press program stopped when it turns ON.	5.7.4 (10)
		b8	ENMV	Axis operation permission: Axis operation permitted when it turns ON.	5.7.4 (9)
		b7	PHOM	Program home return movement	5.7.4 (8)
		b6	PSTR	Program start	5.7.4 (7)
		b5	BKRL	Forced brake release: The brake is released when the signal turns ON.	5.7.4 (6)
		b4	RMOD	Operation mode: AUTO mode when the signal is OFF, or MANU mode when the signal is ON.	5.7.4 (5)
		b3	CLBR	Load cell calibration command: Calibration is performed when this signal turns ON.	5.7.4 (4)
		b2	RES	Reset: A reset is performed when the signal turns ON.	5.7.4 (3)
		b1	HOME	Home return: A home return command is issued when the signal turns ON.	5.7.4 (2)
		b0	SON	Servo ON command: The servo is ON when the signal is ON.	5.7.4 (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. The unit is 0.01 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.	5.9 (2)
	Feedback current	32-bit data	-	32-bit integer. It shows the feedback current value. The unit is 0.1 %. (Example) Reading: 00000FF$_H$ = 255 (decimal) = 25.5 %	5.9 (2)
	Current speed	32-bit data	-	32-bit signed integer. The current speed is indicated. Positive value: The actuator is moving in the direction opposite home. Negative value: The actuator is moving in the direction of home. The unit is 0.01 mm/sec. (Example) Reading: 000003FF$_H$ = 1023 (decimal) = 10.23 mm/sec * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.9 (2)
	Current load data	32-bit data	-	32-bit signed integer. The unit is 0.01N. * If this data is read as a hexadecimal value, a negative value is indicated by a compliment of 2.	5.9 (2)
	Program alarm code	16-bit data	-	16-bit integer. The alarm code currently generated output. 0 is output when no alarm is present. For details on alarms, refer to the instruction manual for the controller.	5.9 (2)
	Alarm code	16-bit data	-	16-bit integer. The signal turns ON when an alarm occurs. 0 is output when no alarm is present. For details on alarms, refer to the instruction manual for the controller.	5.9 (2)
	Overload level monitor	16-bit data	-	16-bit integer. Motor temperature estimated from feedback current value, and output in ratio with allowable upper limit as 100%. The unit is %. Overload alarm (E0) will be generated when this value gets to 100%.	5.9 (2)
	Execution program No.	16-bit data	-	16-bit integer. The press program number currently executed is output. This value is retained unless the next program number gets indicated or the servo gets turned OFF. This value is retained until alarm reset when an alarm is generated while a program is executed.	5.9 (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.	5.7.4 (31)
		b14	JDOK	Overall Judgment OK: Turns ON when Overall judgment was made for load and position (distance) as a OK.	5.7.4 (31)
		b13	LJNG	Load judgement NG: Turns ON when load for pressing operation judged NG.	5.7.4 (30)
		b12	LJOK	Load judgement OK: Turns ON when load for pressing operation judged OK.	5.7.4 (30)
		b11	PJNG	Position (distance) judgement OK: Turns ON when load for pressing operation position (distance) judged NG.	5.7.4 (30)
		b10	PJOK	Position (distance) judgement NG: Turns ON when load for pressing operation position (distance) judged OK.	5.7.4 (30)
		b9	-	Can not be used.	-
		b8	-		
		b7	-		
		b6	WAIT	Press program standby: Turns ON in standby status after press program finished in normal condition.	5.7.4 (29)
		b5	RTRN	Returned during the operation: Turns ON during returning stage.	5.7.4 (28)
		b4	DCMP	While in decompressing operation: Turns ON during decompressing stage.	5.7.4 (27)
		b3	PSTP	Pressurize during the stop: Turns on during stop in pressurizing stage.	5.7.4 (26)
		b2	PRSS	While in pressurizing operation: Turns ON while pressurizing operation executed in pressurizing stage.	5.7.4 (25)
		b1	SERC	While in probing operation: Turns ON when probing stage executed.	5.7.4 (24)
		b0	APRC	While in approaching the operation: Turns ON when approaching stage executed.	5.7.4 (23)
	Status signal 2	b15	EMGS	Emergency stop: An emergency stop is being executed when the signal is ON.	5.7.4 (22)
		b14	ALM	Alarm: The signal turns ON when an alarm occurs.	5.7.4 (21)
		b13	ALML	Light failure alarm: The signal turns ON when an light failure alarm occurs.	5.7.4 (20)
		b12	PALM	Program alarm: The signal turns ON when an program alarm occurs.	5.7.4 (19)
		b11	MPHM	Program home return during the movement: Turns ON while in movement to home position set to each press program.	5.7.4 (8)
		b10	PORG	Program home position: Turns ON while in achieve to reach to home position set to each press program.	5.7.4 (8)
		b9	PRUN	Press program excecuted: Turns ON when press program executed.	5.7.4 (7)

(* “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	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.	5.7.4 (7)
		b7	ZONE2	Zone 2: The signal is ON when the current position is inside the specified zone.	5.7.4 (18)
		b6	ZONE1	Zone 1: The signal is ON when the current position is inside the specified zone.	5.7.4 (18)
		b5	-	Can not be used.	-
		b4	PEND	Positioning complete signal: The signal turns ON when the positioning is completed.	5.7.4 (16)
		b3	RMDS	Operation mode: The signal is OFF when the current mode AUTO, or ON when the current mode is MANU.	5.7.4 (5)
		b2	CEND	Loadcell calibration completion: ON when the calibration completion.	5.7.4 (4)
		b1	HEND	Home return completion: ON when the home return completion	5.7.4 (2)
		b0	SV	Operation ready: ON when the Servo ON	5.7.4 (1)

5.7.4 I/O Signal Controls and Function

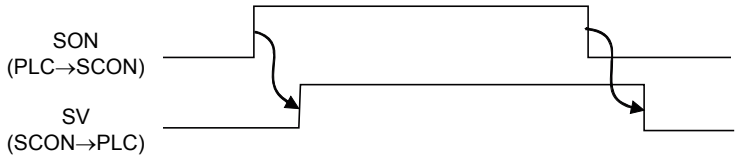
* ON indicates that the applicable bit signal is “1”, while OFF indicates that the bit signal is “0”.
The I/O control and functions used in the full function mode are described as follows. For the I/O signals for the Remote I/O Modes, refer to the instruction manual for the controller main body for servo 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, " CompoNet Interface”) on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

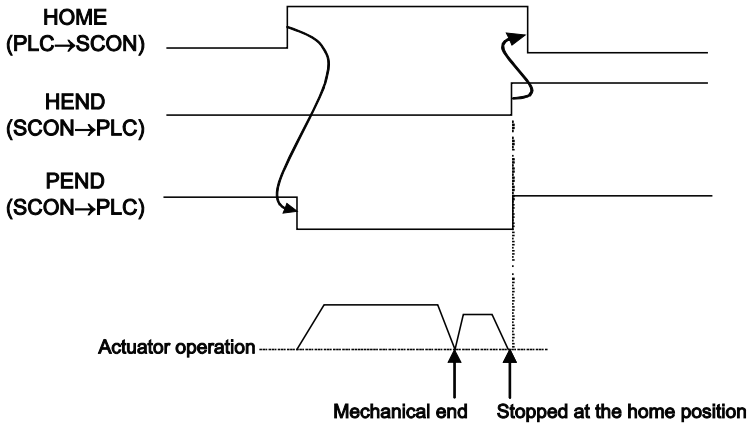
■Function

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

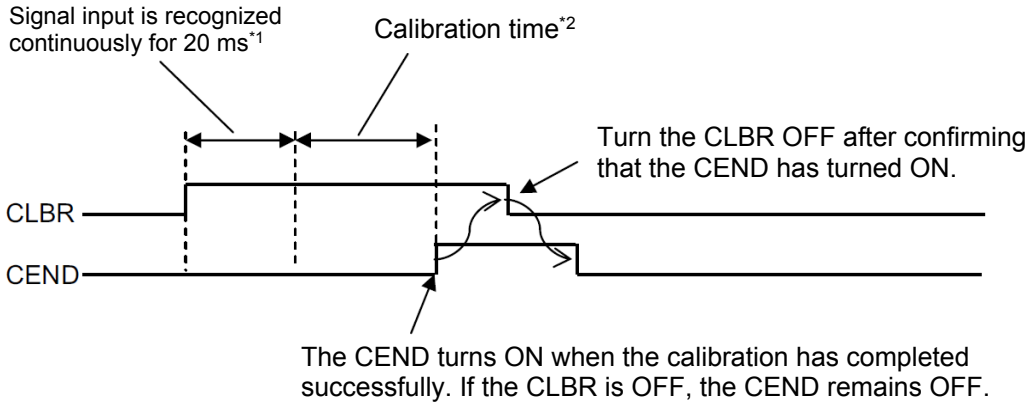
The factory setting for the load cell is 0N when no load is applied. If you want to use the loaded condition as the reference (0 N), perform the following calibration. Also perform this calibration in other conditions as necessary (such as during readjustment, inspection, etc.).

[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.

(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)

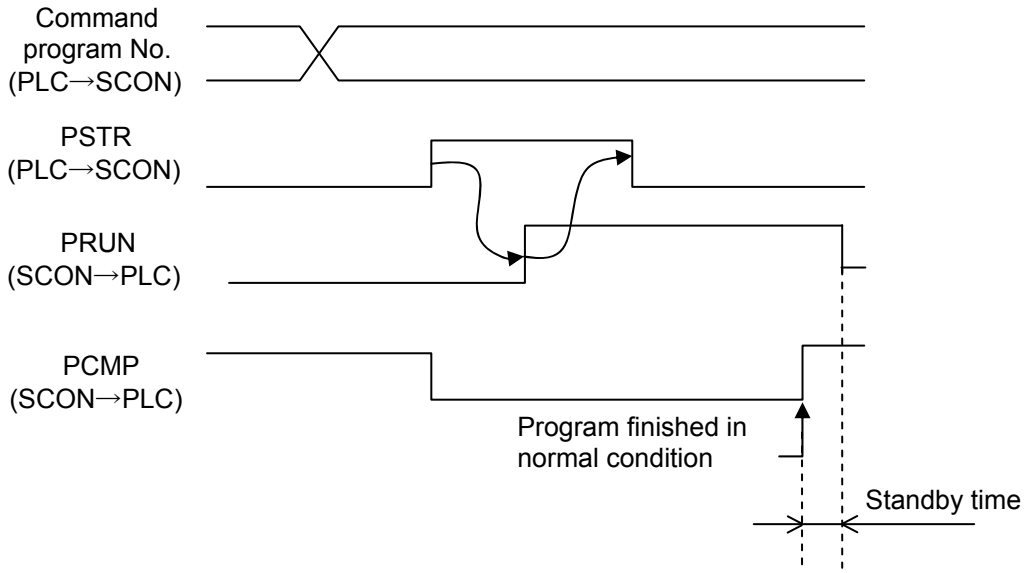
(Note) In MANU mode, the startup of the operation from PLC is not available.

(6) Brake release (BKRL) PLC output signal

Turning this signal "ON" can release the brake forcibly.

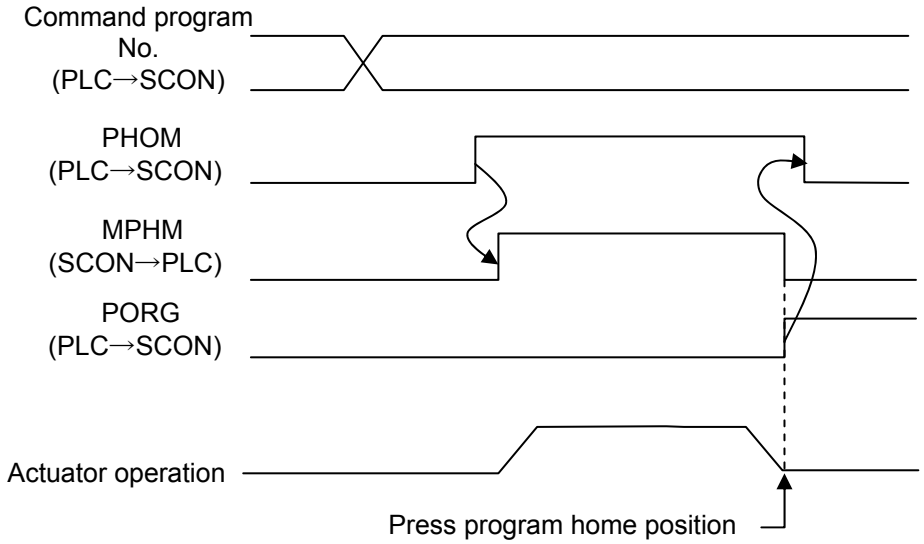
(7) Press program start (PSTR) PLC output signal
Press program executed (PRUN) PLC input signal
Press program finished in normal condition (PCMP) PLC input signal

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. PORG signal turns ON once completes to move to the home position. Turn PHOM Signal OFF once PORG Signal turns ON.
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 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.
The table below summarizes the relationship of the ON/OFF statuses of the JISL signal and jog speed/inch-distance switching (JVEL) signal.

		Jog operation	Inching operation
JISL		OFF	ON
JVEL =OFF	Speed	Parameter No. 26, "Jog speed"	Parameter No. 26, "Jog speed"
	Travel	-	Parameter No. 48, "Inching 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 "Inching distance 2"
	Acceleration/ Deceleration	Rated value (The specific value varies depending on the actuator.)	Rated value (The specific value varies depending on the actuator.)
Operation		When the JOG +/JOG – signal is ON.	Upon detection of the leading (ON) edge of the JOG +/JOG – signal.

(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.
The relationship is as follows.

JVEL signal	Jog operation: JISL=OFF	Inching operation: JISL=ON
OFF	Parameter No. 26, "Jog speed"	Parameter No. 26, "Jog speed" Parameter No. 48, "Inching distance"
ON	Parameter No. 47, "Jog speed 2"	Parameter No. 47, "Jog speed 2" Parameter No. 49, "Inching distance 2"

(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.

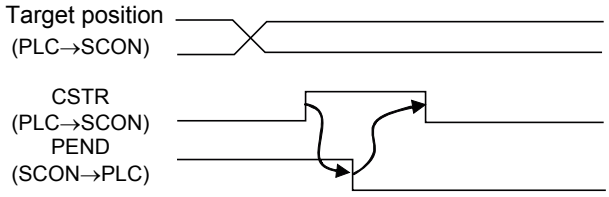
- The speed conforms to the value of the parameter specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No. 26, "PIO jog speed".
  If the JVEL signal is ON, the actuator operates according to parameter No. 47, "PIO jog speed 2".
- The travel conforms 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.

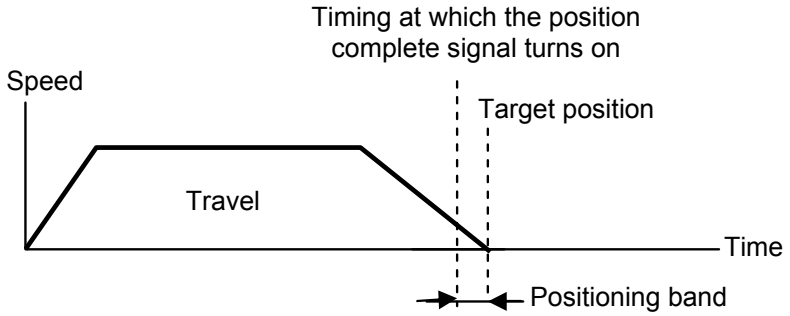
(15) Positioning command (DSTR) PLC output signal

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.



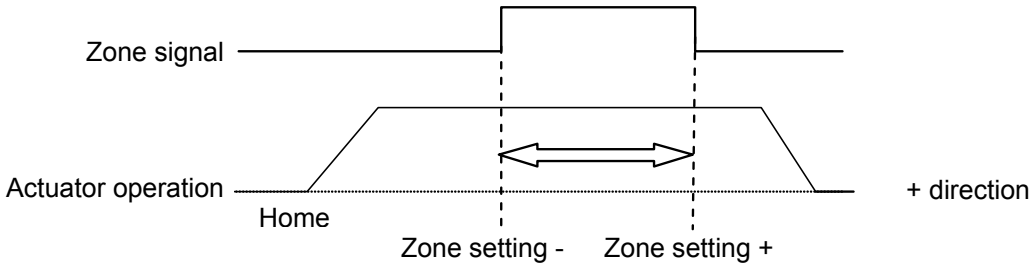
When the servo-motor is turned ON from OFF condition, the positioning is performed with the position set as the target position. Accordingly, this signal is turned “ON” and after that, when the positioning operation is started with the home return (HOME) signal, positioning start (CSTR) signal and positioning 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” and the actuator is within the positioning band, the PEND signal is turned “ON” again.
When the positioning is completed with the CSTR signal or DSTR signal turned “ON”, the PEND signal is not turned “ON”.

(17) Zone 1 (ZONE1) PLC input signal
Zone 2 (ZONE2) 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.

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.



(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 generated.
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]

(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.

(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

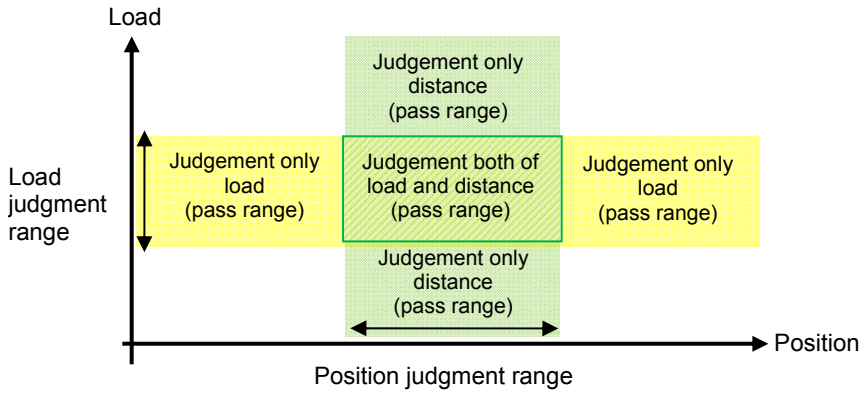
It turns ON at the stop after pressurizing in the pressurizing stage in press program.

(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.



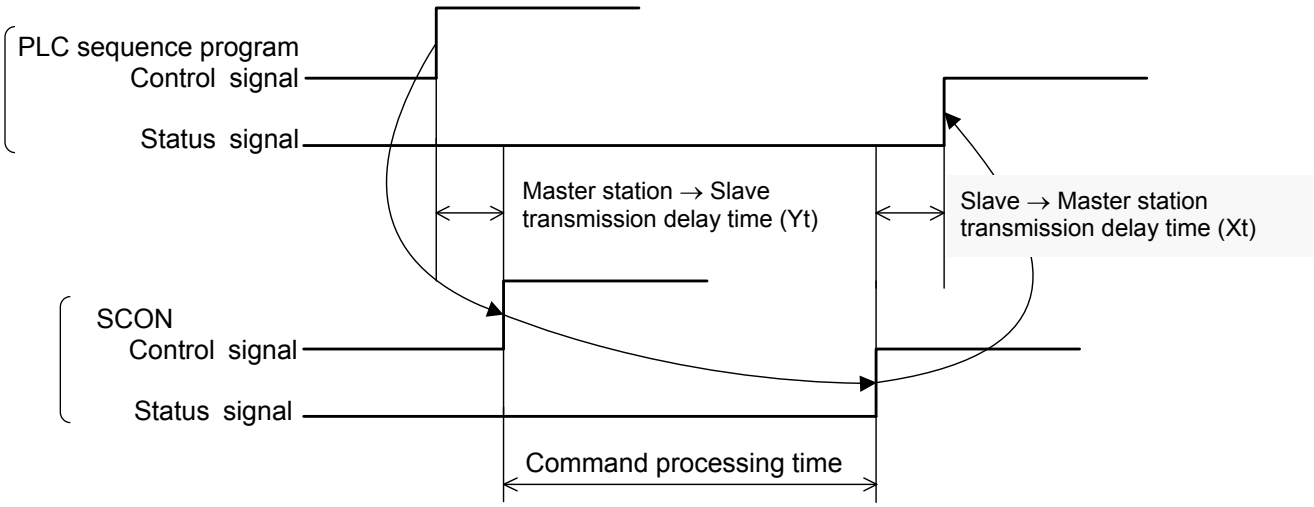
(30) Overall Judgment OK (JDOK) PLC input signal
Overall Judgment NG (JDNG) PLC input signal
Overall judgment is made from the position (distance) judgment and the load judgment, and JDOK signal turns ON when it passes and JDNG signal is turned ON when it fails.

5.8 I/O Signal Timings

When any of the control signal is turned ON to perform the operation of the actuator using the PLC's sequence program, the response (status) is returned to the PLC. The maximum response time is expressed using the following formula.

Maximum response time (msec)=Yt+Xt+3+command processing time (operation time, etc.)
Yt: Master Station→slave transmission delay time
Xt: Slave→Master Station Transmission Delay Time
} Filed Network Transmission Delay Time

Master Station→ For the master station → slave transmission delay (Yt) and slave → master station transmission delay (Xt), refer to the instruction manuals for the CompoNet master unit and PLC installed in the master unit.



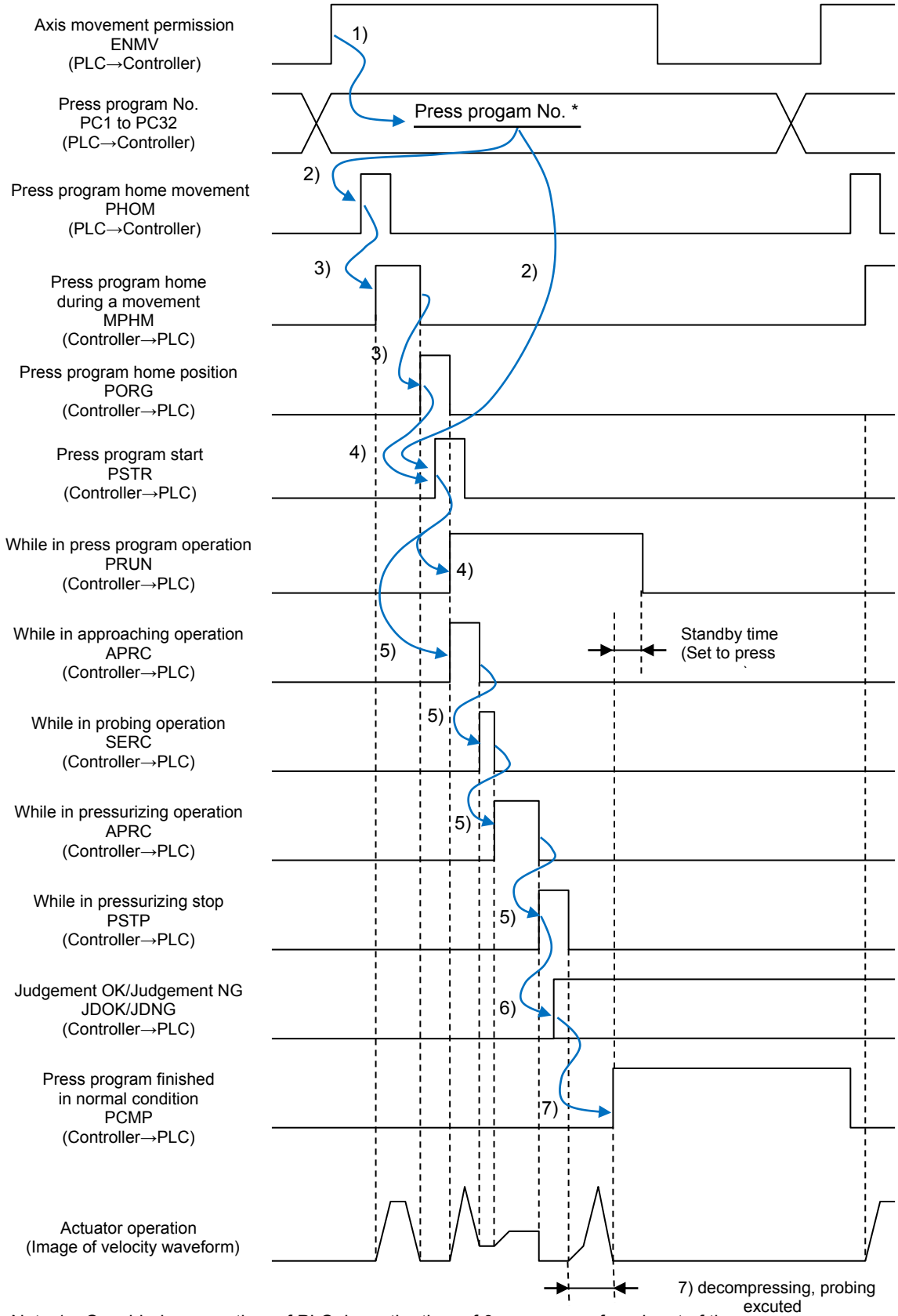
5.9 Operation

The timings for the basic operation examples.

(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 (APRC)
     - 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 Considering scan time of PLC, have the time of 0 ms or more from input of the press program number to PSTR to turn ON.

(2) Operation in the full function mode

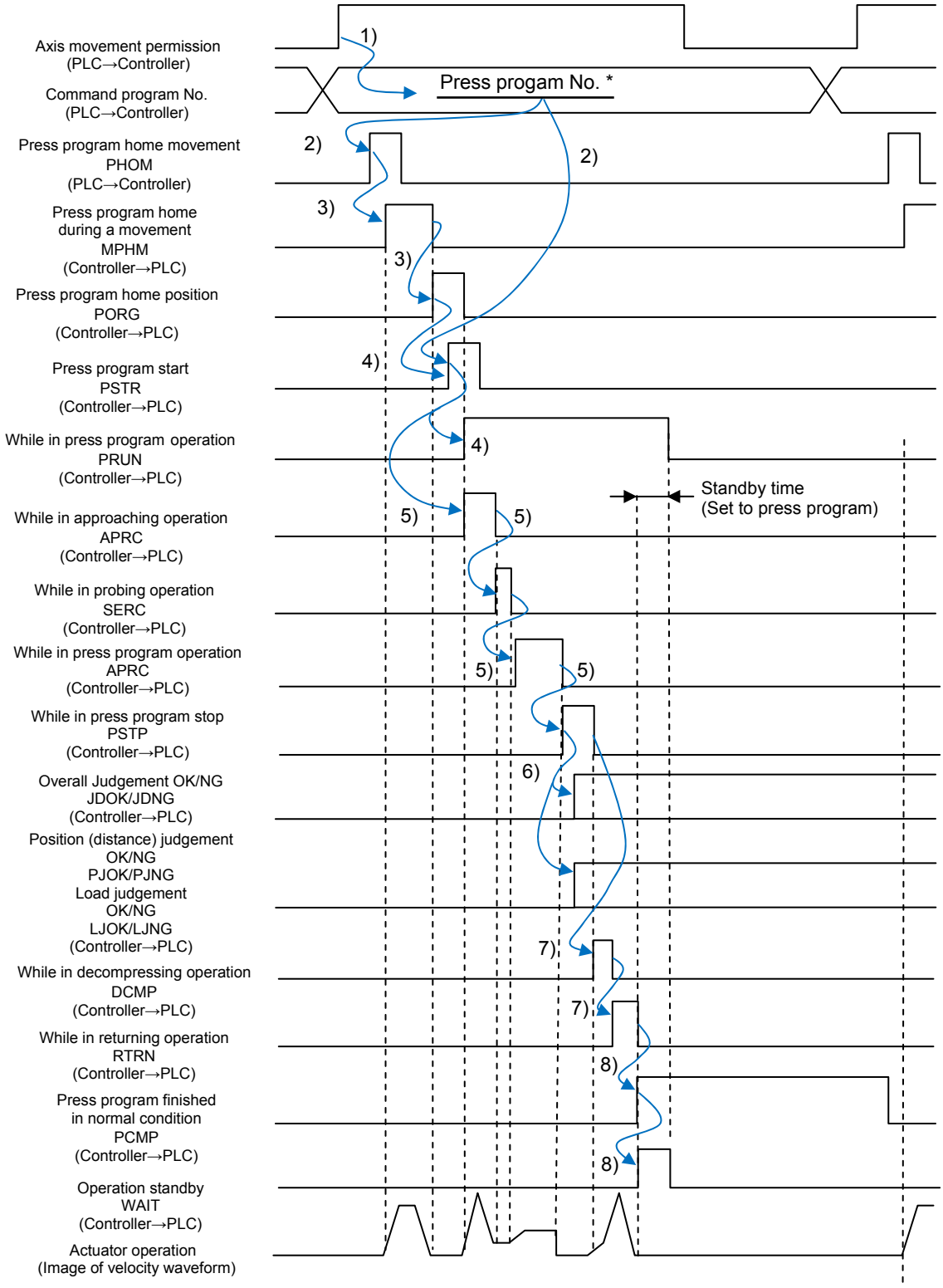
Here, it shows examples for [1] when executing one press program and [2] when performing direct indication movement to the target position after completing to turn the servo ON, return to home position and having loadcell calibration.

[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 (PSTP)

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) Executing signal for each stage turns on during operation of each stage in press program.
- While decompressing stage executed = While decompressing operation signal (DCMP)
- While returning stage executed = While returning operation signal (RTRN)

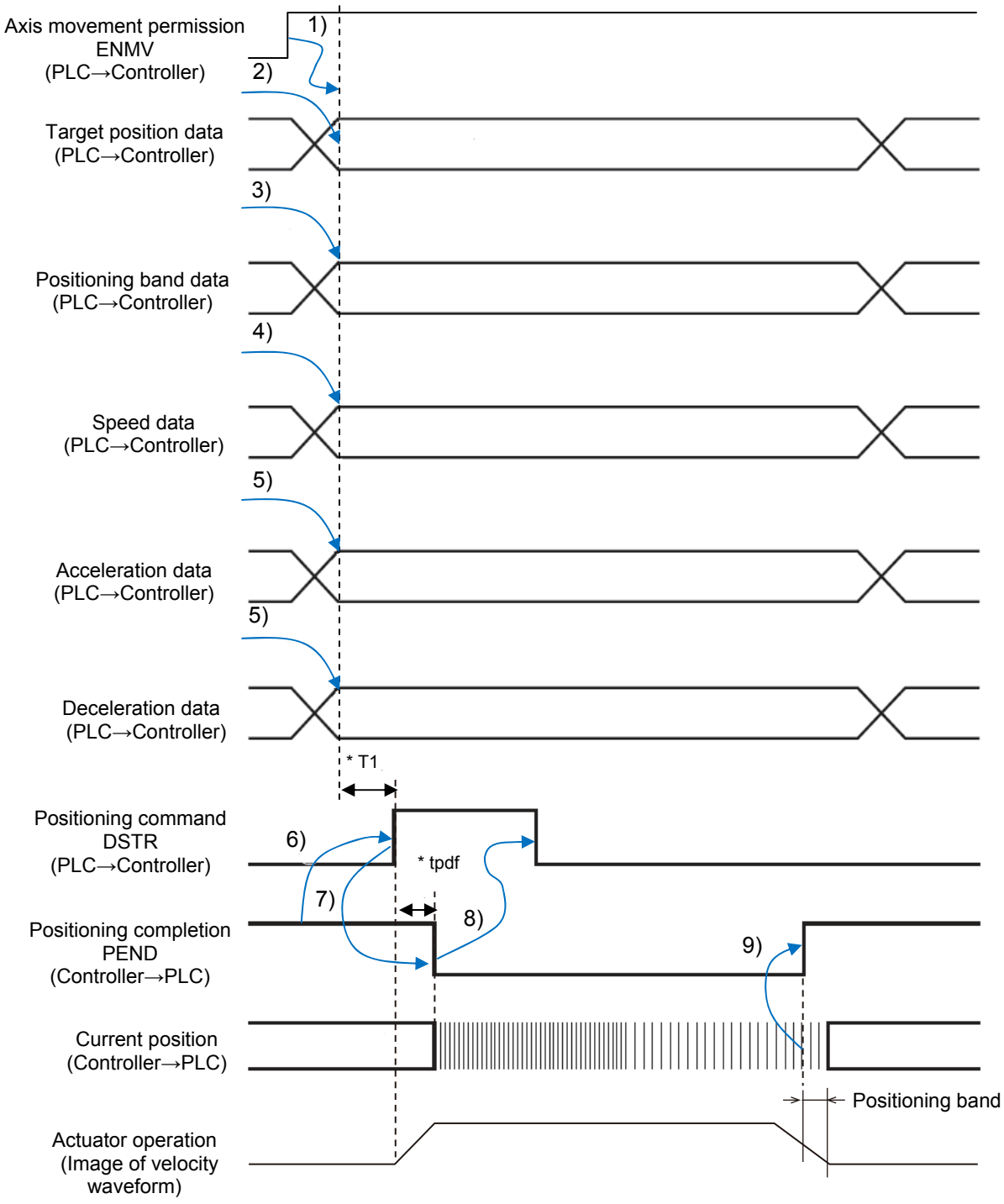
8) Once each of decompressing and return stage is finished, the press program normal complete signal (PCMP) turns ON, stops operation for the duration of standby time set in the press program, and turns ON the press program standby signal (WAIT). Wait for the standby time before making a command when the next press program is to be executed.



Note 1 Considering scan time of PLC, have the time of 0 ms or more from input of the press program number to PSTR to turn ON.

[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 tpdf.
8) After confirming that the PEND signal is turned “OFF”, turn “OFF” the DSTR signal. Do not change any value in each register 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” .



* T1 Establish setting to have T1 ≥ 0ms.
* Yt+Xt ≤ tdpf ≤ Yt+Xt+3 (msec)
Refer to 5.8 I/O Signal Timings

5.10 CompoNet Related Parameters

Parameters relating to CompoNet are No. 84 to No. 87, No. 90 and No. 159.

Category: C: External interface parameter

No.	Category	Symbol	Name	Default Value set in the Factory before Delivery
1			Refer to Operation Manual for the controller for the parameters No. 1 through No. 83.	
~				
83				
84	C	FMOD	Field bus operation mode	0
85	C	NADR	Field bus node address	0
86	C	FBRS	Field bus baud rate	0
87	C	NTYP	Network type	4
90	C	FMIO	Field I/O format	3
159	C	FBVS	FB half direct mode speed unit	0

- Field bus operation mode (No. 84 FMOD)
  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 CompoNet.
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.

- Field bus node address (No.85 NADR)

Specify the node address number in parameter No. 85.

Setting Range 0 to 63 (It is set to “0” when the machine is delivered from the factory.)

- Field bus baud rate (No.86 FBRS)

The baud rate is automatically set to the same value as the baud rate set in the master. Accordingly, you do not need to set the baud rate.

- Network type (No.87 NTYP)

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

- Field bus I/O format (No. 90 FMIO)
  Addresses in the PLC are assigned in units of 16 points (1 CH) based on the node address set in the controller and the occupied bytes in each operation mode.
  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 “Example i”.)
1	The host bytes are exchanged with slave bytes in the host words and slave words. (Refer to “Example ii”.)
2	In the case of word register, the host words are exchanged with the slave words. (Refer to “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 “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

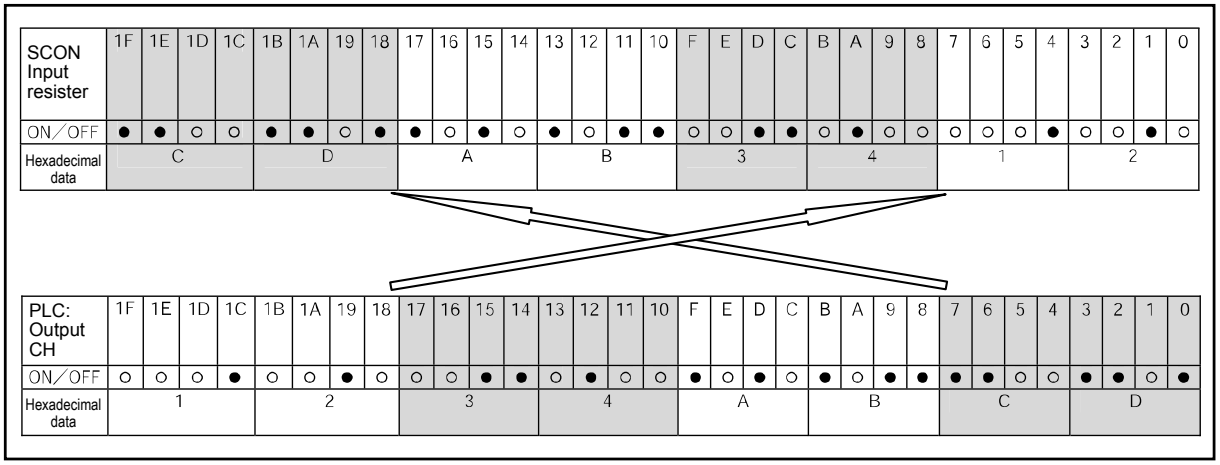
SCON Input resister	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

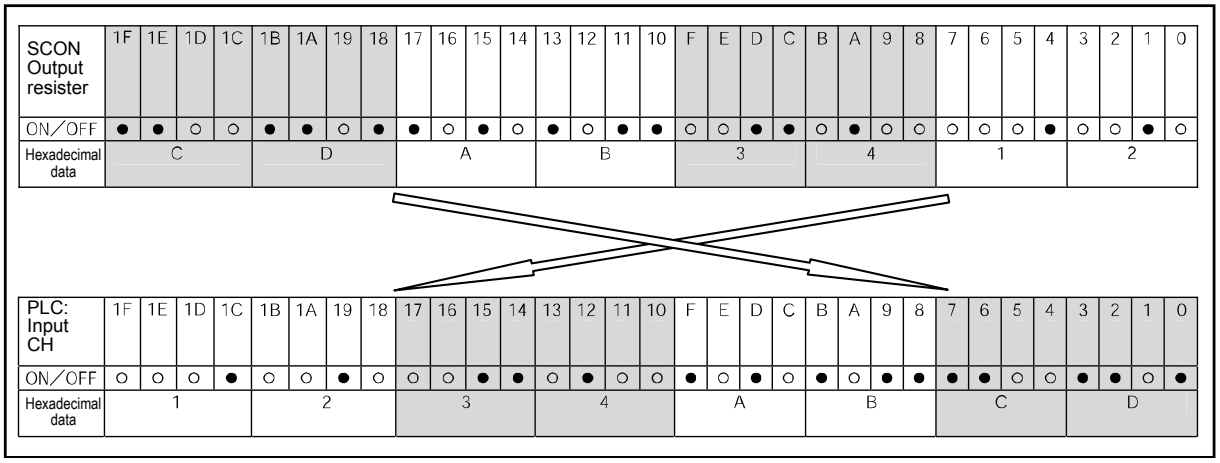
PLC: Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON／OFF	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●
Hexadecimal data	1				2				3				4				A				B				C				D			

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	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





- FB Half Direct Mode Speed Unit (No. 159 FBVS)
  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/sec
1	0.1 mm/sec

5.11 Troubleshooting

- 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 RC PC software or other 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)	RES (*2)	Cause/action
094	Press program alarm detection	02	○	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. [Refer to Program Alarm in Controller Instruction Manual]
0AD	Press program data error	06	○	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	×	Cause: A fieldbus module error has been detected. Action: Check the applicable parameters.
0F3	Fieldbus module non-detection error	04	×	Cause: The module could not be detected. Action: Reconnect the power. If the problem persists, please contact IAI.
0FD	Extension device error	05	×	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) RES → Alarm can/cannot be reset ○: Alarm can be reset / ×: Alarm cannot be reset

6. Change History

Revision Date	Description of Revision
May 2009	First edition
November 2011	Third edition Contents changed in Safety Guide Caution notes added for when working with two or more persons Added Chapter 3, “SCON-CA.”
June 2012	Fourth edition Contents added and changed in Safety Guide PCON-CA/CFA added
November 2012	Fifth 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 informati on added to the SCON-CA full direct mode
August 2013	Sixth edition Positioning unit changed to 0.001° when DD motor is connected
October 2013	Seventh edition ACON-CA, DCON-CA added
August 2014	Eighth edition SCON-CAL added
March 2015	Ninth edition ACON-CB, DCON-CB, PCON-CB, SCON-CB added
August 2015	Tenth edition Servo press type SCON-CB/CGB added
December 2015	Eleventh edition PCON-CB series added
February 2016	11C edition SCON for servo press (3000 ~ 3300W) added
January 2017	11D edition Servo Press Type SCON-CB/CGB correction made

Manual No.: ME0220-11D (January 2017)

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