

CompoNet

Operation Manual

First Edition

ACON
PCON

IAI America Inc.

Introduction

Thank you for purchasing our product.

This Operation Manual explains how to operate, the configuration of, how to maintain, etc. this product, and specifies the necessary information for the safe use of the product.

Before using this product, be sure to read and understand the Operation Manual to ensure your safety in the use of the product. In the CD included with the product, there are Operation Manuals of our products.

For a use of the products, print out or display on your personal computer the necessary pages of the applicable Operation Manuals.

After reading the Operation Manuals, be sure to keep them in a convenient place easily accessible to the personnel using this product.

【Important】

- This product is not to be used for any other purpose from what is noted in this Operation Manual. IAI shall not be liable whatsoever for any loss or damage arising from the result of using the product for any other purpose from what is noted in the manual.
- The information contained in this Operation Manual is subject to change without notice for the purpose of production improvement.
- If you have any question or finding regarding the information contained in this Operation Manual, contact our customer center or our sales office near you.

- Using or copying all or a part of this Operation Manual without permission is prohibited.

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CompoNet

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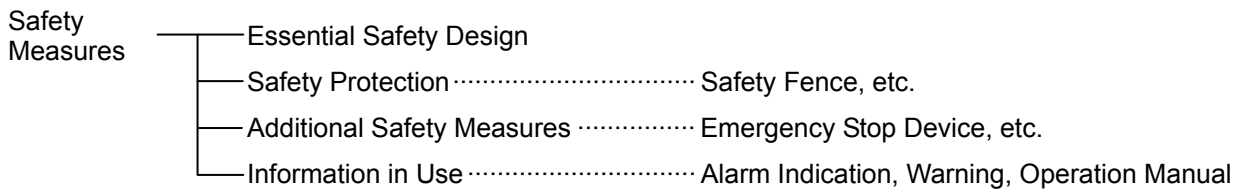
CompoNet

Safety Guide

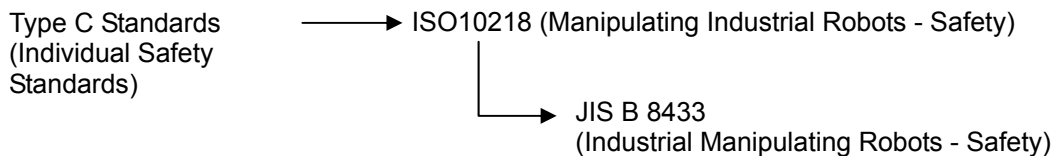
In order to secure the safety in the system design and manufacturing using the robot, take necessary measures according to the safety precautions.

Laws and Standards for the Industrial Robots

For the safety measures for the mechanical system, generally the following four measures are specified based on the International Industrial Standards ISO/DIS12100 "Safety for Machinery".



Based on the above, various standards are specified for each level in the International Standards ISO/IEC. The safety standards for the industrial robots are as follows.



The domestic laws for the safety of the industrial robots are established as follows.

Article 59 in the Industrial Safety and Health Law

The practice of special training is obliged for the labors who are engaged in dangerous or harmful jobs.

Ordinance on Industrial Safety and Hygiene

Article 36 Jobs that require the special training

- | | | |
|----|---------------------------------|---|
| └─ | No. 31 (Teaching, etc.) | For the teaching operation, etc., for the industrial robots (with some exceptions) |
| └─ | No. 32 (Inspection, etc.) | For the inspection, repair or adjustment operation, etc., for the industrial robots (with some exceptions). |

Article 150 For the measures to be taken by the user of the industrial robot

Requirements for the Industrial Robots set forth in the Ordinance on Industrial Safety and Hygiene

Operation Area	Operation Condition	Interruption of Driving Source	Treatment	Specified in
Out of Moving Range	In Automatic Operation	Disable	Signal for operation startup	Article 104
			Fence or enclosure installation, etc.	Item 4 in Article 150
Within the Moving Range	In Operation such as Teaching	Enable (Including Operation Stop)	Indication showing "Under Operation"	Item 3 in Article 150
		Disable	Preparation of Stipulations for the Operation	Item 3 in Article 150
			Treatment to stop the operation immediately	Item 3 in Article 150
			Indication showing "Under Operation"	Item 3 in Article 150
			Practice of special training	No. 31 in Article 36
			Checks, etc., before operation startup	Article 151
	In Operation such as Inspection	Enable	Performing it with the machine stopped.	Item 5 in Article 150
		Disable (In the case that it is performed unavoidably during the machine operation)	Indication showing "Under Operation"	Item 5 in Article 150
			Preparation of Stipulations for the Operation	Item 5 in Article 150
			Treatment to stop the operation immediately	Item 5 in Article 150
			Indication showing "Under Operation"	Item 5 in Article 150
			Practice of special training (Excluding the cleaning and oiling operations)	No. 32 in Article 36

Our Models regarded as Industrial Robots

The products which come under the following conditions, are excluded from the Industrial Robot category according to the notice from the Ministry of Labor and the notification issued by the director general of the Labor Standards Bureau in the Ministry of Labor (No. 340).

- (1) Single-axis robot product with the motor wattage of 80W or less
- (2) Multi-combined shaft robot product with the length of X, Y, and Z-axis of 300 mm or less and, if there is any rotary section, the maximum movable range is 300 cubic mm or less including the end section of the rotary section.
- (3) Articulated robot product with both the movable radius and the length of Z-axis of 300 mm or less.

Our models regarded as the industrial robots among the products in our catalogue are as follows.

1. Single Axis ROBO CYLINDER
RCS2/RXS2CR-SS8□ with the stroke exceeding 300 mm
2. Single Axis Robot
Following models with the stroke exceeding 300 mm and motor capacity exceeding 80W
ISA/ISPA, ISDA/ISPDA, ISWA/ISPWA, IF, FS, NS
3. Linear Servo-Actuator
All the models with the stroke exceeding 300 mm
4. Cartesian-Type Robot
Any of the models in Item 1 through Item 3, which can be used on a single axis
5. IX SCARA Robot
IX-NNN (NNW, NNC) 3515
IX-NNN (NNW, NNC) 50□□/60□□/70□□/80□□
IX-NSN5016/6016
IX-TNN (UNN) 3015/3515
IX-HNN (INN) 50□□/60□□/70□□/80□□

Safety Precautions for Our Products

The common safety precautions for the use of any of our robots in each operation, are described as follows.

No.	Operation Description	Precautions
1	Model Selection	<ul style="list-style-type: none"> ● 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. <ol style="list-style-type: none"> (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 it in any of the following environments. <ol style="list-style-type: none"> (1) Location where there is any flammable gas, flammable 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 ● Do not use the product outside the specifications. Failure to do so may considerably shorten its life and cause a product breakdown or facility operation stop.
2	Transportation	<ul style="list-style-type: none"> ● Consider well so that it is not bumped against anything or dropped during the transportation. ● Transport it using an appropriate transportation measure. ● Do not get on the package. ● Do not put any heavy thing that can deform the package, on it.
3	Storage	<ul style="list-style-type: none"> ● The standards for the installation environment are applied also to the storage environment. Avoid storing the product in damp or humid locations.





No.	Operation Description	Precautions
4	Installation and Startup	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> ● Make sure to securely hold and fix the product (including the work). A fall, drop or abnormal motion of the product may cause a damage or injury. ● 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. <ol style="list-style-type: none"> (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 <p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● 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. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● Make sure to perform the grounding of type D (Former Type 3) for the controller. 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.

No.	Operation Description	Precautions
4	Installation and Startup	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protective 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 is not dropped in power failure or emergency stop. ● Wear protective 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 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 is not dropped in power failure or emergency stop. ● Wear protective 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.
5	Teach	<ul style="list-style-type: none"> ● Perform the teaching operation from outside the safety protective fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protective 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 protective 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 protective 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. <p>*Safety Protective Fence : In the case that there is no safety protective fence, the movable range should be indicated.</p>

No.	Operation Description	Precautions
6	Check Operation	<ul style="list-style-type: none"> ● 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 protective 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	<ul style="list-style-type: none"> ● Before the automatic operation is started up, make sure that there is nobody inside the safety protective fence. ● Before the automatic operation is started up, make sure that all the related peripheral machines are ready for the automatic operation and there is no error indication. ● Make sure to perform the startup operation for the automatic operation, out of the safety protective 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.
8	Maintenance/ Inspection	<ul style="list-style-type: none"> ● Perform the work out of the safety protective fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protective 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 protective fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protective 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 protective 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. <p>*Safety Protective Fence : In the case that there is no safety protective fence, the movable range should be indicated.</p>
9	Modification	<ul style="list-style-type: none"> ● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion. ● In such case, the warranty is not applied.
10	Disposal	<ul style="list-style-type: none"> ● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.

Alert Indication

The safety precautions are divided into “DANGER”, “WARNING”, “CAUTION” “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

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 and PCON controllers (hereinafter referred to collectively as “controllers” or individually as a “controller”) can be used to configure a system based on minimal wiring.

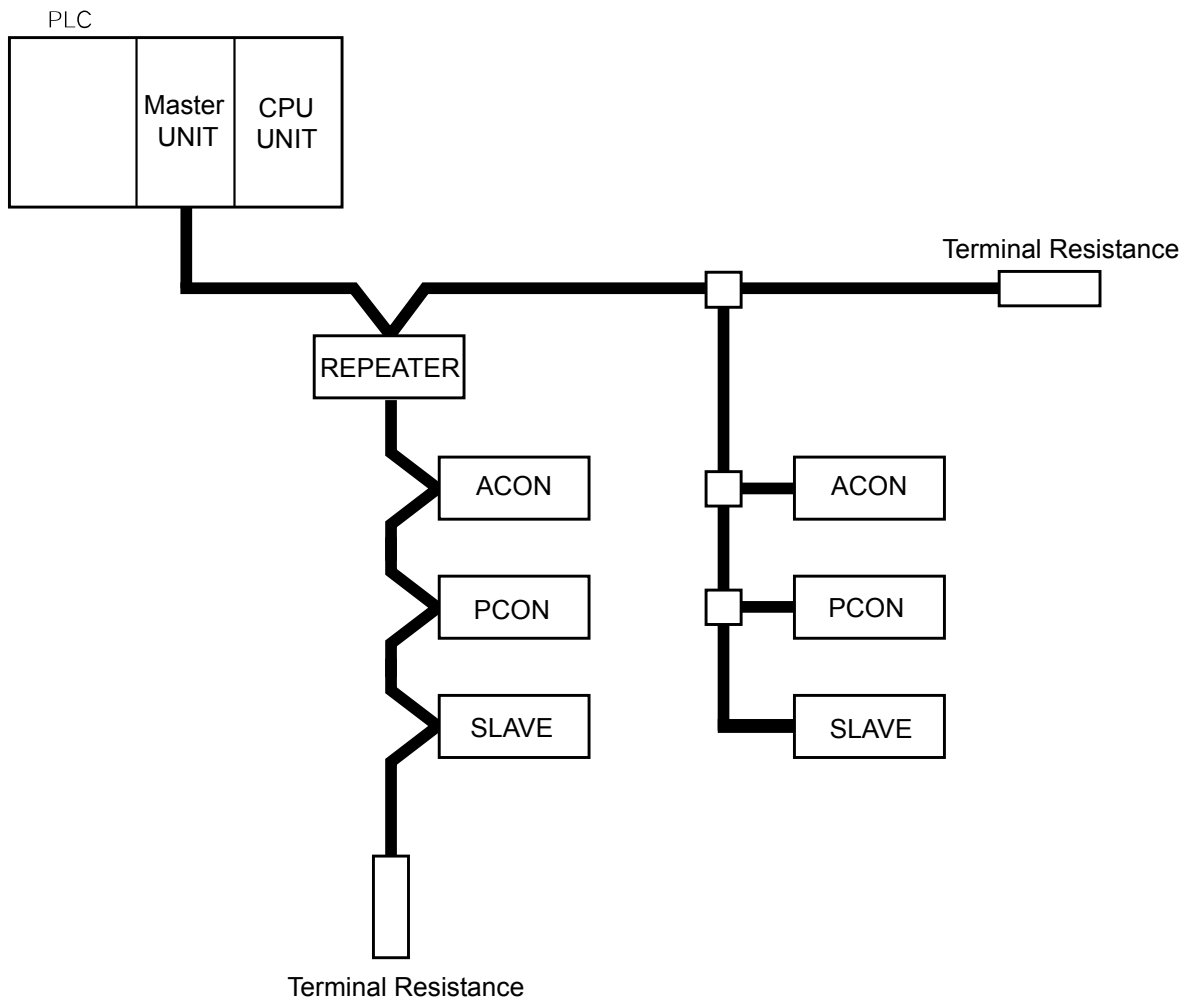
Each controller is treated as a word mixed slave on CompoNet.

*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



1.1 Operation Modes and Functions

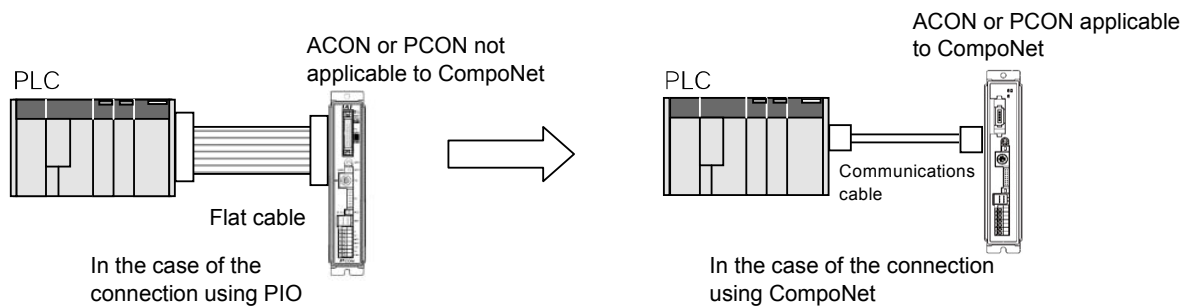
ACON or PCON applicable to CompoNet can be operated by means of selecting one mode out of the following five operation modes.

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	×	○(*1)	○	○	×
Speed and Acceleration Direct Setup	×	×	○	○	×
Pressing Operation	○	○	○	○	○
Current Position Read	×	○	○	○	○
Current Speed Read	×	×	○	○	○
Operation with the Position No. Specified	○	○	×	×	○
Completion Position No. Read	○	○	×	×	○
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

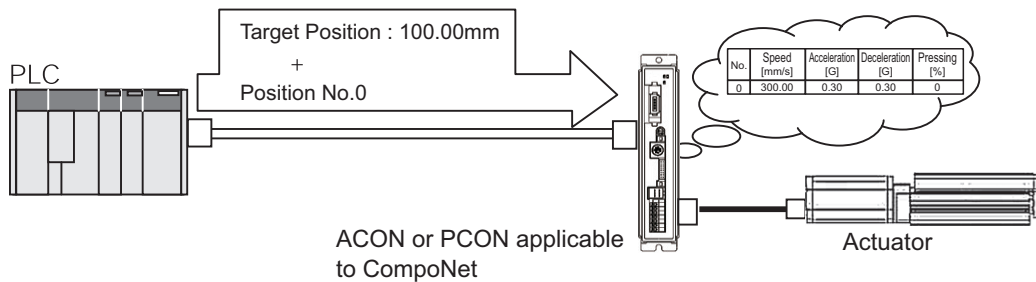


2) Position / Simplified Direct Value Mode : This is the operation mode with the position No. set up.

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.

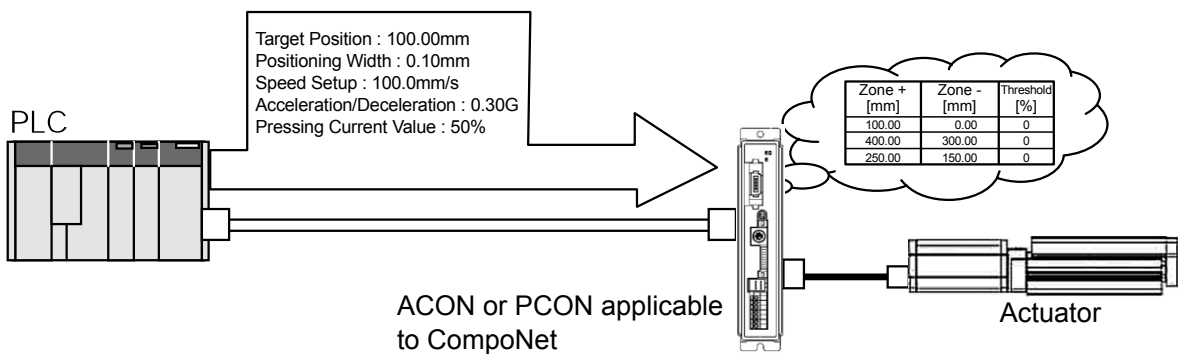
For “Speed”, “Acceleration/Deceleration” and “Positioning Width”, use the values already registered on the position data. The settable No. of position data items is max 768 points.

Number of occupied bytes: 8 bytes

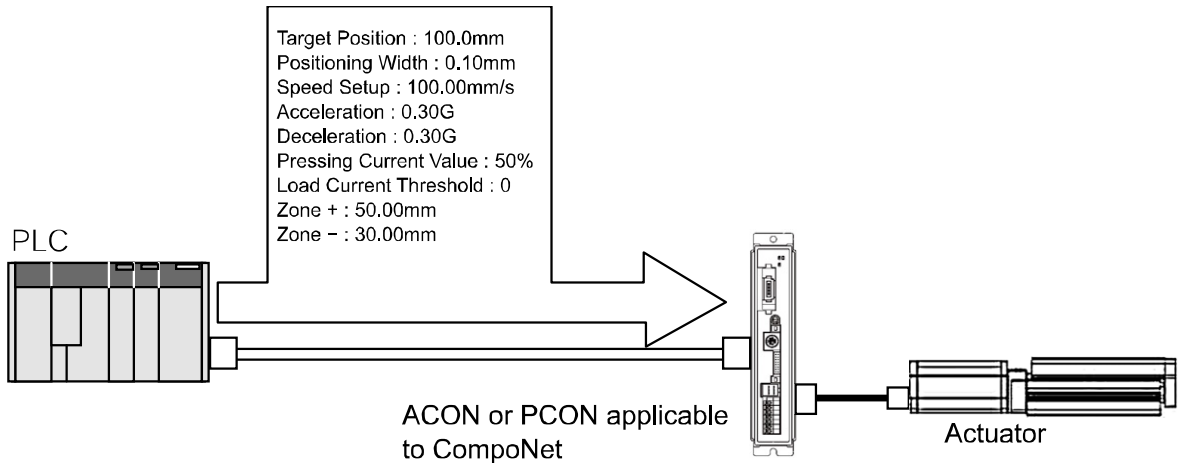


3) Half Direct Value Mode : This is the operation method with the “Speed”, “Acceleration/Deceleration”, “Pressing Current Value” set up directly using the numerical values, in addition to the “Target Position”.

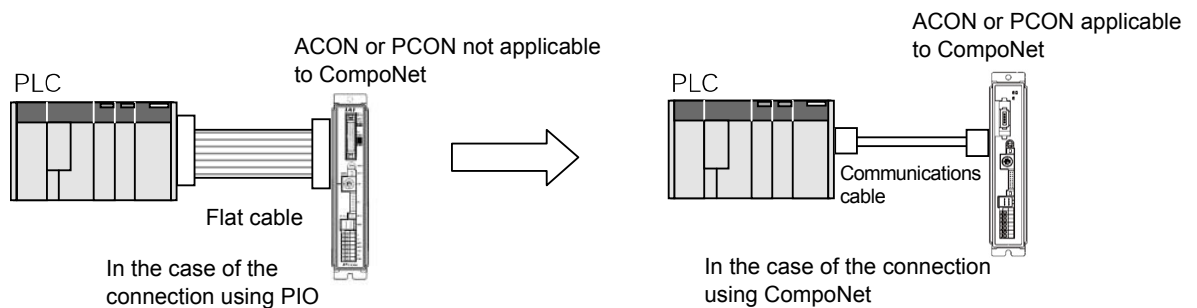
Number of occupied bytes: 16 bytes



- 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



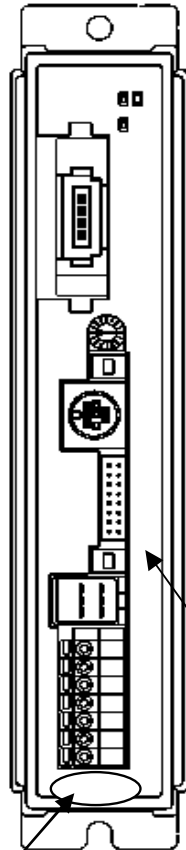
- 5) Remote I/O Mode 2 : This is the operation method using CompoNet, instead of PIO (24V I/O). The current position and command current value reading functions are added to the functions of (1).
 Number of occupied bytes: 12 bytes



2. Model No.

The Model Nos. 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

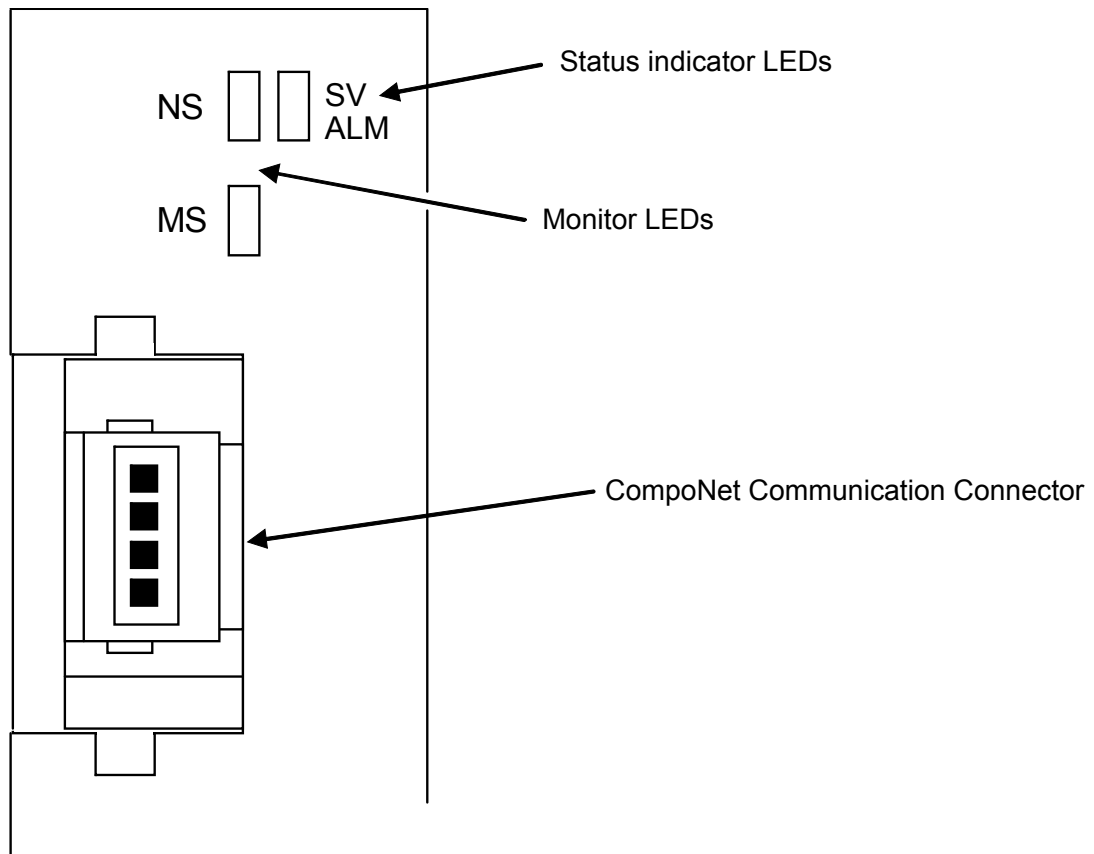
3. Interface Specifications

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 node 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. CompoNet Interface

4.1 Names of the Parts

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



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 (red / 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

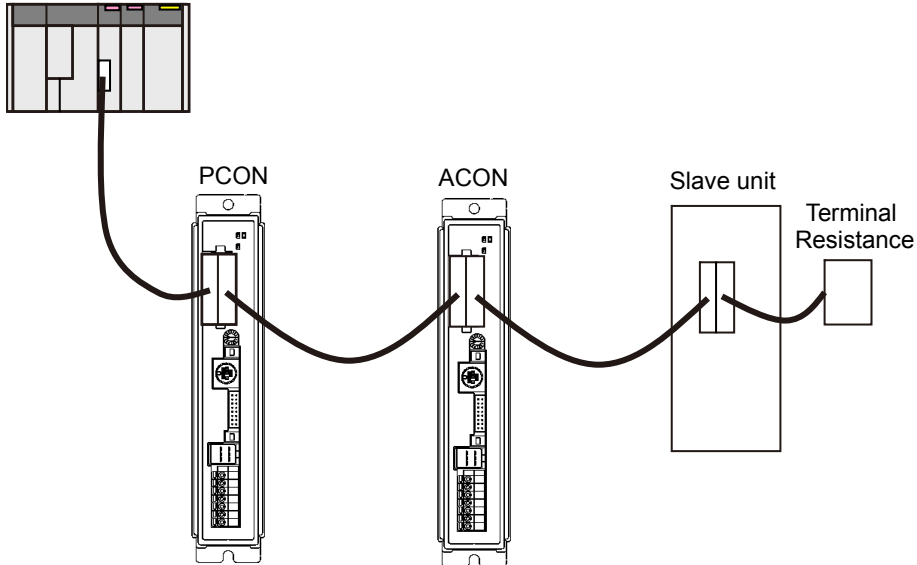
LED	Color	Indication Status	Description
MS	GN	Illuminating	In the normal operation
	RD	Illuminating	A hardware error. The replacement of the board is required.
		Flashing	It is a minor error such as a user setting error or configuration error. It can be recovered by re-setting, etc.
	—	OFF	The CompoNet 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.

5. Wiring Example

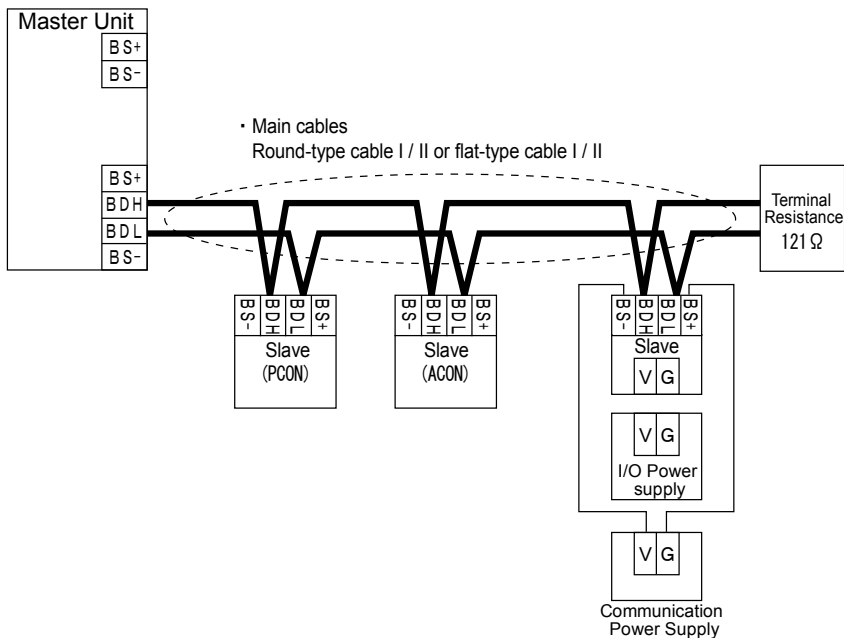
5.1 Connection Diagram

An example for wiring is as shown below.

- Wiring Example
PLC (CompoNet Master Unit)



- 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.

6. Setting

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 "FMODE: Field Bus Operation Mode" using the RC personal computer application software (V6.00.08.00 or later). (Refer to "10.Parameters".)

Set Value	Operation Mode	Number of occupied bytes
0 (Set in delivery)	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".

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 personal computer application software.

(Refer to "10.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 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.

7. Communicating with the Master Station

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.)

PLC output area (CH)	DI on the ACON or PCON side and Input Data Register				
	Remote I/O Mode	Position / Simplified Direct Value Mode	Half Direct Value Mode	Full Direct Value Mode	Remote I/O Mode 2
	Number of occupied 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		Specified position number	Positioning Width	Positioning Width	
n+2					
n+3					
n+4		Speed	Speed Setup		
n+5				Acceleration/Deceleration	
n+6		Pressing Current Limit Value	Zone boundary+		
n+7				Control Signal	
n+8		Zone boundary-			
n+9			Acceleration		
n+10			Deceleration		
n+11			Pressing Current Limit Value		
n+13		ACON	Occupied Domain		
		PCON	Load current threshold		
n+14		Control Signal 1			
n+15	Control Signal 2				

(Note) The **Occupied Domain** shows the domain to be occupied with the operation mode setting. Therefore, this domain 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 Domain		
n+2		Completed Position No. (simple alarm ID)	Command Current	Command Current	Target Position
n+3		Status Signal			
n+4		Occupied Domain	Current Speed	Current Speed	Command Current
n+5				Current Speed	
n+6				Alarm Code	
n+7			Status Signal	Occupied Domain	
n+8			Occupied Domain		
n+9					
n+10					
n+11					
n+12					
n+13					
n+14		Status Signal			
n+15			Status Signal		

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

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 RC personal computer application software or teaching pendant. 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	○	○	○	○	○	×
Positioning operation	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○
Pressing Operation	○	○	○	○	○	×
Speed change during the movement	○	○	○	○	○	○
Operation at different acceleration and deceleration	○	○	○	○	○	○

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
Pause	○	○	○	○	○	○(*1)
Zone signal output	○	○	○	×	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○

○ : Supported, × : 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.

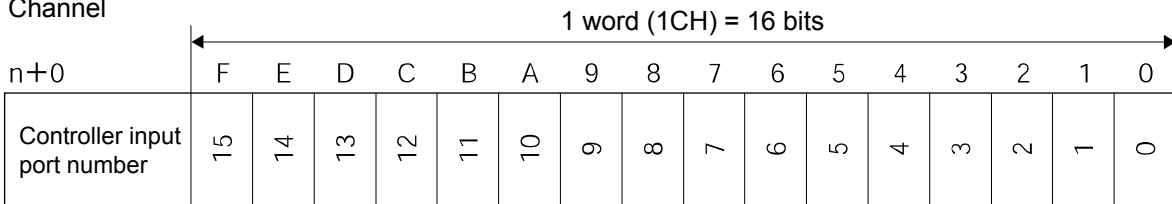
(2) I/O Signal Allocation for each Axis

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.

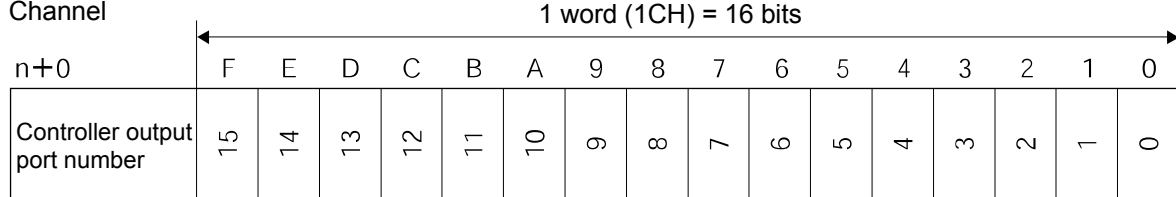
PLC output (* “n” shows the node address of each axis.)

Channel



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

Channel



(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.	Signal Name	Symbol	Signal Name	Symbol	Signal Name	Symbol
PLC Output → ACON Input	0	Command position No.	PC1	Command position No.	PC1	Command position No.	PC1
	1		PC2		PC2		PC2
	2		PC4		PC4		PC4
	3		PC8		PC8		PC8
	4		PC16		PC16		PC16
	5	PC32	PC32	PC32			
	6	Unavailable	—	Teaching Mode Command	MODE	Unavailable	PC64
	7		—	Jog/inching selector	JISL		PC128
	8		—	+Jog	JOG+		—
	9	Forced brake release	BKRL	-Jog	JOG-	Forced brake release	BKRL
	10	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD
	11	Home return	HOME	Home return	HOME	Home return	HOME
	12	Pause	* STP	Pause	* STP	Pause	* STP
	13	Positioning Start	CSTR	Positioning Start/ Position Data Import Command	CSTR/ PWRT	Positioning Start	CSTR
	14	Reset	RES	Reset	RES	Reset	RES
15	Servo ON Command	SON	Servo ON Command	SON	Servo ON Command	SON	
ACON Output → PLC Input	0	Completed Position No.	PM1	Completed Position No.	PM1	Completed Position No.	PM1
	1		PM2		PM2		PM2
	2		PM4		PM4		PM4
	3		PM8		PM8		PM8
	4		PM16		PM16		PM16
	5	PM32	PM32	PM32			
	6	Moving Signal	MOVE	Moving Signal	MOVE	—	PM64
	7	Zone 1	ZONE1	Teaching mode Signal	MODES	—	PM128
	8	Position zone	PZONE	Position zone	PZONE	Position zone	PZONE
	9	Operation Mode Status	RMDS	Operation Mode Status	RMDS	Operation Mode Status	RMDS
	10	Home return completion	HEND	Home return completion	HEND	Home return completion	HEND
	11	Positioning completion signal	PEND	Positioning completion signal/ position-data read complete	PEND/ WEND	Positioning completion signal	PEND
	12	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end	SV
	13	Emergency stop	* EMGS	Emergency stop	* EMGS	Emergency stop	* EMGS
	14	Alarm	* ALM	Alarm	* ALM	Alarm	* ALM
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.	Signal Name	Symbol	Signal Name	Symbol	Signal Name	Symbol
PLC Output → ACON Input	0	Command position No.	PC1	Start position 0	ST0	Start position 0	ST0
	1		PC2	Start position 1	ST1	Start position 1	ST1
	2		PC4	Start position 2	ST2	Start position 2	ST2
	3		PC8	Start position 3	ST3	Unavailable	—
	4		PC16	Start position 4	ST4		—
	5		PC32	Start position 5	ST5		—
	6		PC64	Start position 6	ST6		—
	7		PC128	Unavailable	—	—	—
	8	PC256	—		—	—	
	9	Forced brake release	BKRL	Forced brake release	BKRL	Forced brake release	BKRL
	10	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD
	11	Home return	HOME	Home return	HOME	Unavailable	—
	12	Pause	* STP	Pause	* STP		—
	13	Positioning Start	CSTR	Unavailable	—		—
	14	Reset	RES	Reset	RES	Reset	RES
15	Servo ON Command	SON	Servo ON Command	SON	Servo ON Command	SON	
ACON Output → PLC Input	0	Completed Position No.	PM1	Position 0 complete	PE0	Retracting end movement command 0	LS0
	1		PM2	Position 1 complete	PE1	Retracting end movement command 1	LS1
	2		PM4	Position 2 complete	PE2	Retracting end movement command 2	LS2
	3		PM8	Position 3 complete	PE3	Unavailable	—
	4		PM16	Position 4 complete	PE4		—
	5		PM32	Position 5 complete	PE5		—
	6		PM64	Position 6 complete	PE6		—
	7		PM128	Zone 1	ZONE1	Zone 1	ZONE1
	8	PM256	Position zone	PZONE	Position zone	PZONE	
	9	Operation Mode Status	RMDS	Operation Mode Status	RMDS	Operation Mode Status	RMDS
	10	Home return completion	HEND	Home return completion	HEND	Home return completion	HEND
	11	Positioning completion signal	PEND	Positioning completion signal	PEND	Unavailable	—
	12	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end	SV
	13	Emergency stop	* EMGS	Emergency stop	* EMGS	Emergency stop	* EMGS
	14	Alarm	* ALM	Alarm	* ALM	Alarm	* ALM
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.	Signal Name	Symbol	Signal Name	Symbol	Signal Name	Symbol
PLC Output → PCON Input	0	Command position No.	PC1	Command position No.	PC1	Command position No.	PC1
	1		PC2		PC2		PC2
	2		PC4		PC4		PC4
	3		PC8		PC8		PC8
	4		PC16		PC16		PC16
	5	PC32	PC32	PC32			
	6	Unavailable	—	Teaching Mode Command	MODE	Unavailable	PC64
	7		—	Jog/inching selector	JISL		PC128
	8		—	+Jog	JOG+		—
	9	Forced brake release	BKRL	-Jog	JOG-	Forced brake release	BKRL
	10	Operating mode selector	RMOD	Operating mode selector	RMOD	Operating mode selector	RMOD
	11	Home return	HOME	Home return	HOME	Home return	HOME
	12	Pause	* STP	Pause	* STP	Pause	* STP
	13	Positioning Start	CSTR	Positioning Start/ Position Data Import Command	CSTR/ PWRT	Positioning Start	CSTR
	14	Reset	RES	Reset	RES	Reset	RES
15	Servo ON Command	SON	Servo ON Command	SON	Servo ON Command	SON	
PCON Output → PLC Input	0	Completed Position No.	PM1	Completed Position No.	PM1	Completed Position No.	PM1
	1		PM2		PM2		PM2
	2		PM4		PM4		PM4
	3		PM8		PM8		PM8
	4		PM16		PM16		PM16
	5		PM32		PM32		PM32
	6	Moving Signal	MOVE	Moving Signal	MOVE	—	PM64
	7	Zone 1	ZONE1	Teaching mode Signal	MODES	—	PM128
	8	Position zone	PZONE	Position zone	PZONE	Position zone	PZONE
	9	Operation Mode Status	RMDS	Operation Mode Status	RMDS	Operation Mode Status	RMDS
	10	Home return completion	HEND	Home return completion	HEND	Home return completion	HEND
	11	Positioning completion signal	PEND	Positioning completion signal/ position-data read complete	PEND/ WEND	Positioning completion signal	PEND
	12	Operation preparation end	SV	Operation preparation end	SV	Operation preparation end	SV
	13	Emergency stop	* EMGS	Emergency stop	* EMGS	Emergency stop	* EMGS
	14	Alarm	* ALM	Alarm	* ALM	Alarm	* ALM
15	Load output judgment/ torque level	LOAD/ TRQS	Unavailable	—	Load output judgment/ torque level	LOAD/ TRQS	

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

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 width, 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 × : 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	×	

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

Parameter No.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.

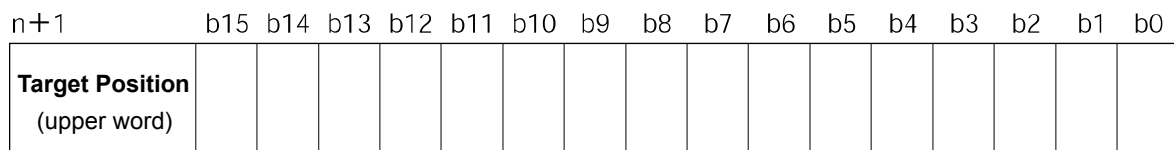
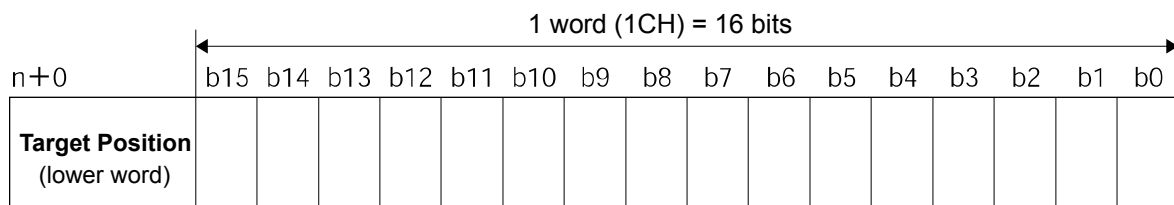
(2) I/O Signal Allocation for each Axis

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

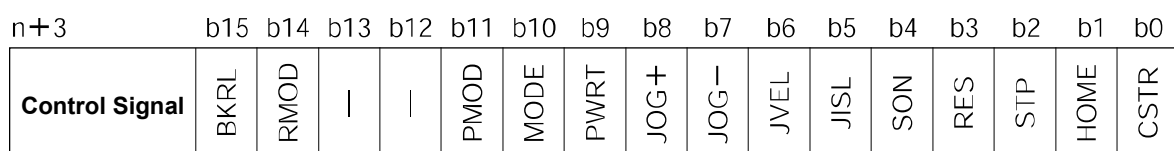
- The control signals and status signals are ON/OFF signals in units of bit.
- The target position and current position are expressed using 2-word (32 bits) binary data. The figures from -999999 to +999999 (Unit: 0.01mm) can be set in PLC. However, set the position data within the soft stroke range (0 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 personal computer software or teaching pendant.

PLC output

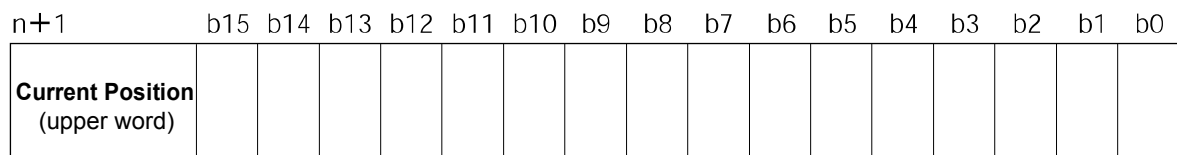
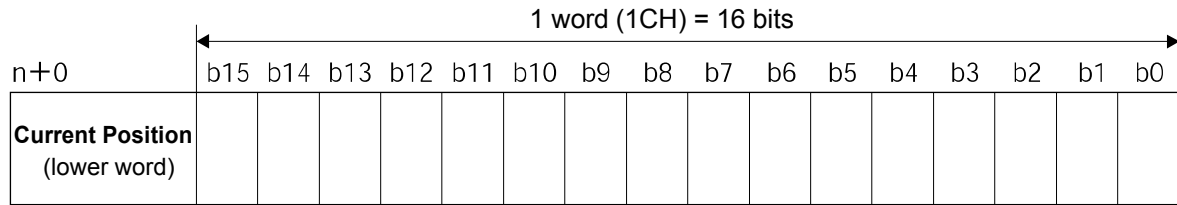
Channel (* "n" shows the node address of each axis.)



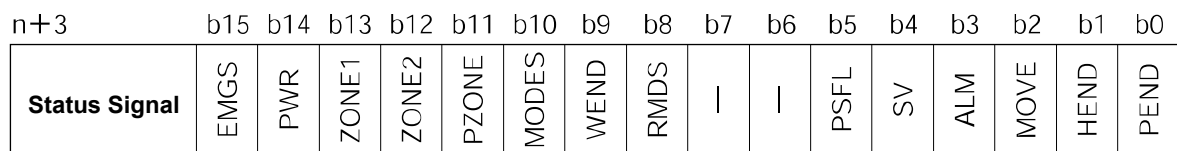
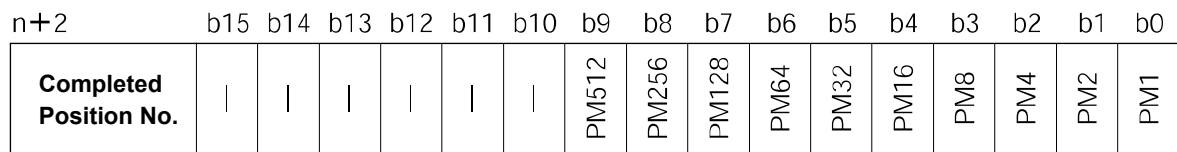
When the target position is shown using the negative figure, it is expressed using the complement of 2.



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



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



(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.	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 personal computer software or teaching pendant. 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.	9 (1)
	Control signal	b15	BKRL	Forced brake release : When it is turned ON, the brake is released.	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.	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.	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.	7.7 (16)
		b9	PWRT	Position Data Import Command : Position data is read when this signal is ON.	7.7 (17)
		b8	JOG+	+Jog : "ON" for Movement in the Opposite Direction of Home	7.7 (13)
b7		JOG-	-Jog : "ON" for Movement to the Home Direction	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.	7.7 (14)		

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

Signal Type		Bit	Symbol	Contents	Details
PLC Output	Control signal	b5	JISL	Jog/inching selector : Jog operation is performed when this signal is OFF, and inch operation is performed when the signal is ON.	7.7 (15)
		b4	SON	Servo ON Command : The servo turns ON when this signal turns ON.	7.7 (5)
		b3	RES	Reset : A reset is performed when this signal turns ON.	7.7 (4)
		b2	STP	Pause : A pause command is issued when this signal turns ON.	7.7 (11)
		b1	HOME	Home return : A home-return command is issued when this signal turns ON.	7.7 (6)
		b0	CSTR	Positioning Start : A move command is issued when this signal turns ON.	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.	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 width 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.	9 (1)
	Status code	b15	EMGS	Emergency stop : An emergency stop is actuated when this signal turns ON.	7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	7.7 (1)
		b13	ZONE2	Zone 2 : "ON" for the current position within the zone set range	7.7 (12)
		b12	ZONE1	Zone 1 : "ON" for the current position within the zone set range	7.7 (12)
		b11	PZONE	Position zone : This signal turns ON when the current position is inside the specified position zone.	7.7 (12)
		b10	MODES	Teaching mode Signal : This signal is ON while the teaching mode is selected.	7.7 (16)
		b9	WEND	Position-data read complete : This signal turns ON when reading is complete.	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.	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.	7.7 (23)
		b4	SV	Operation preparation end : This signal turns ON when the servo turns ON.	7.7 (5)
		b3	ALM	Alarm : This signal turns ON when an alarm occurs.	7.7 (3)
b2	MOVE	Moving Signal : This signal remains ON while the actuator is moving.	7.7 (9)		
b1	HEND	Home return completion : This signal turns ON when home return is completed.	7.7 (6)		
b0	PEND	Positioning completion signal : This signal turns ON when positioning is completed.	7.7 (10)		

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

This is the operation mode with the target position, positioning width, 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 × : 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	×	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	×	

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

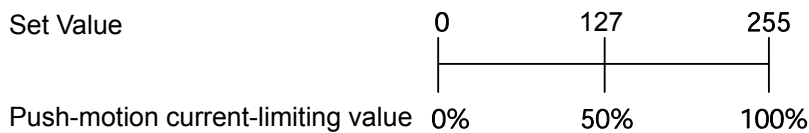
Parameter No.84	ACON/PCON input register	PLC output CH	ACON/PCON output register	PLC input CH
2	Target Position	N+0	Current Position	N+0
		N+1		N+1
	Positioning Width	N+2	Command Current	N+2
		N+3		N+3
	Speed	N+4	Current Speed	N+4
	Acceleration/Deceleration	N+5		N+5
	Pressing Current Limit Value	N+6	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 width. The positioning width 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) 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

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
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
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	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Acceleration/ Deceleration								256	128	64	32	16	8	4	2	1

n+6	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing Current Limit Value									128	64	32	16	8	4	2	1

n+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal	BKRL	RMOD	DIR	PUSH	—	—	—	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	DSTR

PLC input
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		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal		EMGS	PWR	ZONE2	ZONE1				RMDS			PSFL	SV	ALM	MOVE	HEND	PEND

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

Signal Type	Bit	Symbol	Contents	Details	
PLC Output	Target Position	32-bit data	—	<p>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.</p>	9 (2)
	Positioning Width	32-bit data	—	<p>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.</p>	9 (2)
	Speed	16-bit data	—	<p>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. (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.</p>	9 (2)
	Acceleration/Deceleration	16-bit data	—	<p>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.</p>	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.	9 (2)
	Control Signal	b15	BKRL	Forced brake release : When it is turned ON, the brake is released.	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.	7.7 (19)
		b13	DIR	Push direction specification : "OFF" for the direction reducing the positioning width from the target position, "ON" for the direction adding the positioning width to the target position	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.	7.7 (21)
		b11	—	Unavailable	—
		b10			
		b9			
		b8	JOG+	+ Jog : "ON" for Movement in the Opposite Direction of Home	7.7 (13)
		b7	JOG-	-Jog : "ON" for Movement to the Home Direction	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.	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.	7.7 (15)
		b4	SON	Servo ON Command : The servo turns ON when this signal turns ON.	7.7 (5)
		b3	RES	Reset : A reset is performed when this signal turns ON.	7.7 (4)
		b2	STP	Pause : A pause command is issued when this signal turns ON.	7.7 (11)
b1	HOME	Home return : A home-return command is issued when this signal turns ON.	7.7 (6)		
b0	DSTR	Positioning Command : A move command is issued when this signal turns ON.	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.	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	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.	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.	9 (2)	
	Status Signal	b15	EMGS	Emergency stop : An emergency stop is actuated when this signal turns ON.	7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	7.7 (1)
		b13	ZONE2	Zone 2 : "ON" for the current position within the zone set range	7.7 (12)
b12		ZONE1	Zone 1 : "ON" for the current position within the zone set range	7.7 (12)	
b11 b10 b9		—	Unavailable	—	
b8	RMDS	Operation Mode Status : This signal is OFF when the current mode is AUTO, or ON when the current mode is MANU.	7.7 (19)		

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

Signal Type		Bit	Symbol	Contents	Details
PLC Input	Status Signal	b7	—	Unavailable	—
		b6			
		b5	PSEL	Pressing and a Miss : This signal turns ON when the actuator missed the load in push-motion operation.	7.7 (23)
		b4	SV	Operation preparation end : This signal turns ON when the servo turns ON.	7.7 (5)
		b3	ALM	Alarm : This signal turns ON when an alarm occurs.	7.7 (3)
		b2	MOVE	Moving Signal : This signal remains ON while the actuator is moving.	7.7 (9)
		b1	HEND	Home return completion : This signal turns ON when home return is completed.	7.7 (6)
		b0	PEND	Positioning completion signal : This signal turns ON when positioning is completed.	7.7 (10)

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 × : 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	×

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

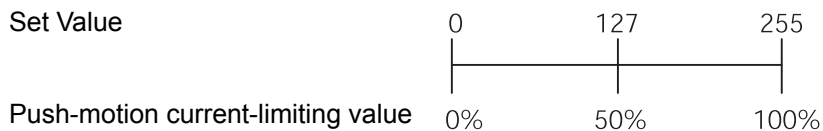
Parameter No.84	ACON/PCON input register		PLC output CH	ACON/PCON output register	PLC input CH
3	Target Position		n+0	Current Position	n+0
			n+1		n+1
	Positioning Width		n+2	Command Current	n+2
			n+3		n+3
	Speed		n+4	Current Speed	n+4
			n+5		n+5
	Zone boundary +		n+6	Alarm Code	n+6
			n+7		n+7
	Zone boundary -		n+8	Occupied Domain	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 Domain	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 Domain 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 width. The positioning width 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.

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

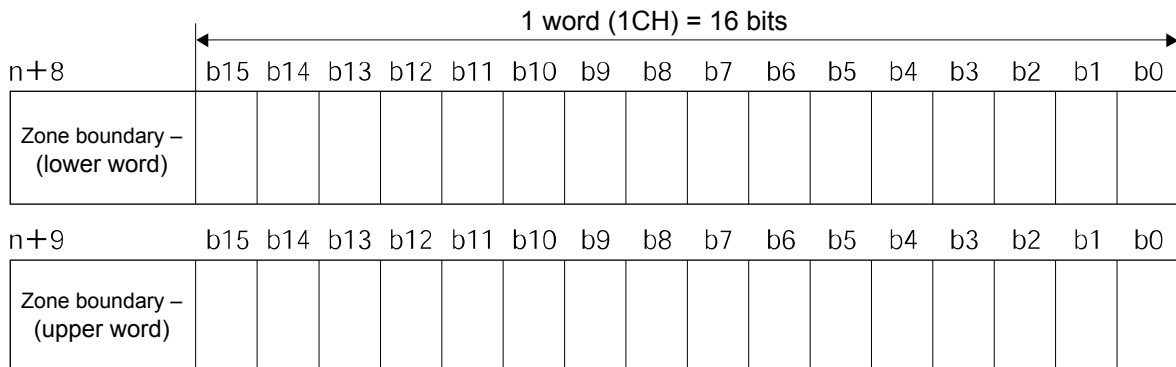
		1 word (1CH) = 16 bits															
n+0		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (lower word)																	
n+1		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (upper word)																	

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

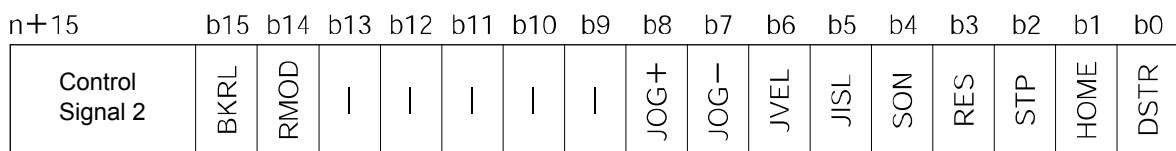
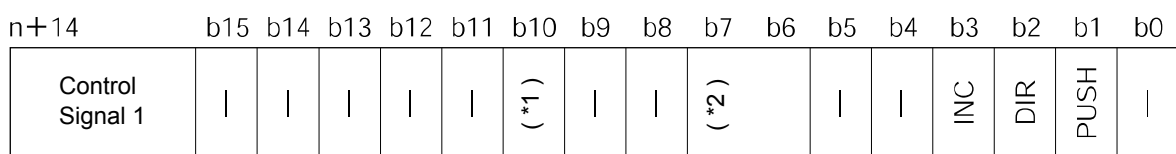
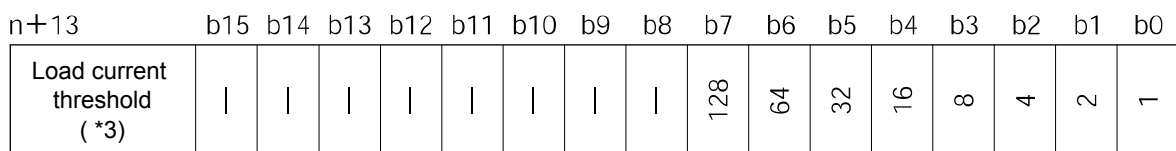
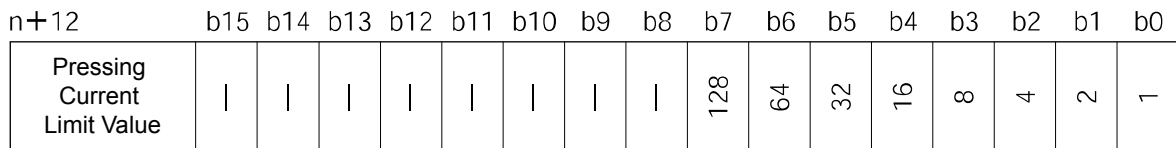
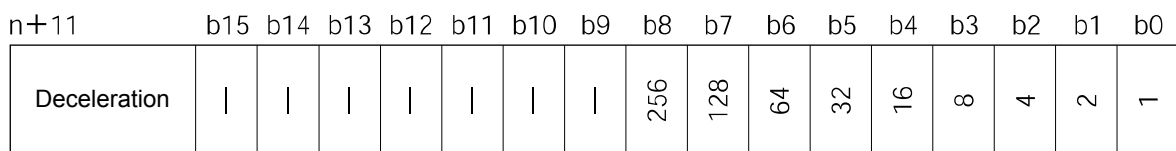
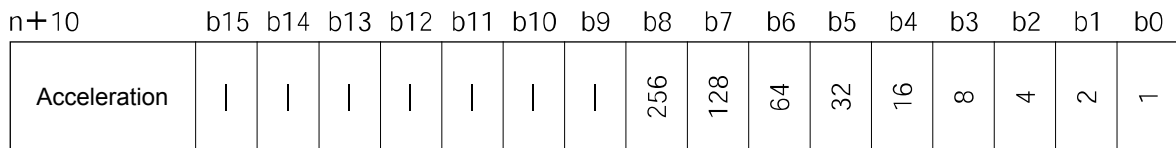
n+2		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning Width (lower word)		32,768	16,384	8,192	4,096	2,048	1,024	512	256	128	64	32	16	8	4	2	1
n+3		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Positioning Width (upper word)														524,288	262,144	131,072	65,536
n+4		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
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		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Speed (upper word)														524,288	262,144	131,072	65,536
n+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)																	

If the zone boundary is a negative value, it is indicated by a 2's complement.

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



If the zone boundary is a negative value, it is indicated by a 2's complement.



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

Controller	Symbol	
	b10	ACON
	—	SMOD

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

Controller	Symbol	
	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

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)																

If the current position is a negative value, it is indicated by a 2's complement.

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)																

If the current speed is a negative value, it is indicated by a 2's complement.

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
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	—	<p>32-bit signed integer indicating the current position Set the target position on the absolute coordinates. The unit is 0.01mm and settable range is -999999 to +999999. (Example) When it is "+25.41mm", set it as "2541". If the value larger than the value (0.2mm) inside the soft limit for the parameter, the movement would be limited to the inside the soft limit (0.2mm). * When the input is performed in hexadecimal notation, input the negative value using a complement of 2.</p>	9 (3)
	Positioning Width	32-bit data	—	<p>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.</p>	9 (3)
	Speed	32-bit data	—	<p>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. (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.</p>	9 (3)
	Zone boundary+ /Zone boundary-	32-bit data	—	<p>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.</p>	9 (3)

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

Address	Bit	Symbol	Function	Details	
Acceleration	16-bit data	—	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.	9 (3)	
	Deceleration	16-bit data			—
Pressing Current Limit Value	16-bit data	—	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.	9 (3)	
Load current threshold	16-bit data	—	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".	9 (3)	
PLC Output	b15	—	Unavailable	—	
	b14				
	b13				
	b12				
	b11				
	b10	A C C O N	—	Unavailable	—
		P C C O N	SMOD	Stopping control mode: When this signal is ON, servo control is performed during stopping.	7.7 (28)
	b9	—	Unavailable	—	
	b8				
	b7	A C C O N	MOD1	Acceleration / deceleration mode: When both signals are OFF, the trapezoid pattern mode is selected. When one signal is OFF and the other signal is ON, the S-motion mode is selected. When one signal is ON and the other signal is OFF, the primary delay filter mode is selected.	7.7 (29)
	b6		MOD0		
	b7	P C C O N	—	Unavailable	—
	b6		—	Unavailable	—
	b5		—	Unavailable	—
	b4	—	Unavailable	—	—
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.	7.7 (24)	

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

Address	Bit	Symbol	Function	Details
Control Signal 1	b2	DIR	Push direction specification: "OFF" for the direction reducing the positioning width from the target position "ON" for the direction adding the positioning width to the target position	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.	7.7 (21)
	b0	—	Unavailable	—
Control Signal 2	b15	BKRL	Forced brake release : When it is turned ON, the brake is released	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.	7.7 (19)
	b13	—	Unavailable	—
	b12			
	b11			
	b10			
	b9			
	b8	JOG+	+Jog : "ON" for Movement in the Opposite Direction of Home	7.7 (13)
	b7	JOG-	-Jog : "ON" for Movement to the Home Direction	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.	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.	7.7 (15)
	b4	SON	Servo ON Command : The servo turns ON when this signal turns ON.	7.7 (5)
	b3	RES	Reset : A reset is performed when this signal turns ON.	7.7 (4)
	b2	STP	Pause : A pause command is issued when this signal turns ON.	7.7 (11)
b1	HOME	Home return : A home-return command is issued when this signal turns ON.	7.7 (6)	
b0	DSTR	Positioning Start : A move command is issued when this signal turns ON.	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.	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	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.	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.	9 (3)	
	Status Signal	b15	EMGS	Emergency stop : An emergency stop is actuated when this signal turns ON.	7.7 (2)
		b14	PWR	Controller ready : This signal turns ON when the controller becomes ready.	7.7 (1)
		b13	ZONE2	Zone 2 : "ON" for the current position within the zone set range	7.7 (12)
b12		ZONE1	Zone 1 : "ON" for the current position within the zone set range	7.7 (12)	
b11		PZONE	Position zone : This signal turns ON when the current position is inside the specified position zone.	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)	7.7 (26)	

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

Signal Type	Bit	Symbol	Contents	Details	
PLC Input	Status Signal	ACON	—	Unavailable (ON/OFF is undefined)	—
		b9	PCON TROS	Torque level : When this signal is ON, the specified load has been reached. When the signal is OFF, the load has not been reached yet. (Refer to Operation Manual for the controller main body for more information)	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.	7.7 (19)
		b7	GHMS	Under Homing Operation : This signal remains ON while home return is in progress.	7.7 (6)
		b6	PUSHS	Push motion in progress : This signal remains ON while push-motion operation is in progress.	7.7 (25)
		b5	PSEL	Pressing and a Miss : This signal turns ON when the actuator missed the load in push-motion operation.	7.7 (23)
		b4	SV	Operation preparation end : This signal turns ON when the servo turns ON.	7.7 (5)
		b3	ALM	Alarm : This signal turns ON when an alarm occurs.	7.7 (3)
		b2	MOVE	Moving Signal : This signal remains ON while the actuator is moving.	7.7 (9)
		b1	HEND	Home return completion : This signal turns ON when home return is completed.	7.7 (6)
b0	PEND	Positioning completion signal : This signal turns ON when positioning is completed.	7.7 (10)		

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 RC personal computer application software or teaching pendant.

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	○	○	○	○	○	×
Positioning operation	○	○	○	○	○	○
Speed and acceleration/ deceleration setting	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○
Pressing Operation	○	○	○	○	○	×
Speed change during the movement	○	○	○	○	○	○
Operation at different acceleration and deceleration	○	○	○	○	○	○
Pause	○	○	○	○	○	○(*1)
Zone signal output	○	○	○	×	○	○
PIO pattern selection (set by a parameter)	○	○	○	○	○	○

○ : Supported, × : 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 Domain	n+1	Occupied Domain	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 Domain** cannot be used for any other purpose. Also, exercise caution to avoid node address duplication.

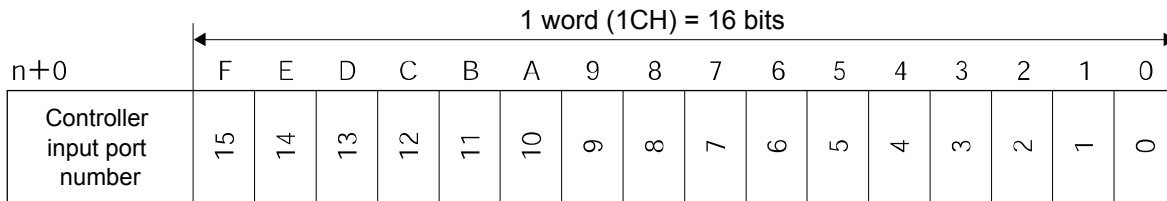
(2) I/O Signal Allocation for each Axis

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.)



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)																

If the current position is a negative value, it is indicated by a 2's complement.

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 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	—

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 is supplied, it is turned "ON".

■Function

Regardless of the alarm or servo conditions, when the controller initialization is completed normally after the power is supplied 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, resupplying the power is required)

When the alarm is detected, the Status Indicator LED (Refer to "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, resupplying 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 CompoNet Interface") on the front surface of the controller illuminates in green.

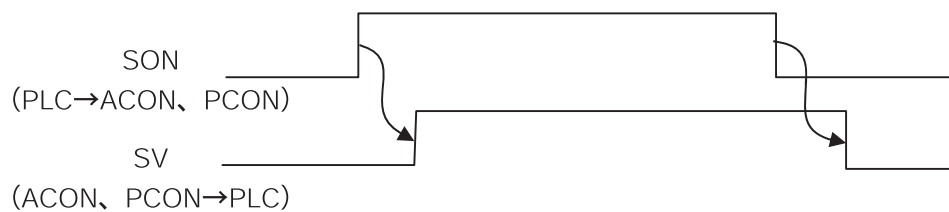
The "SV" signal is synchronized with this LED.

■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.



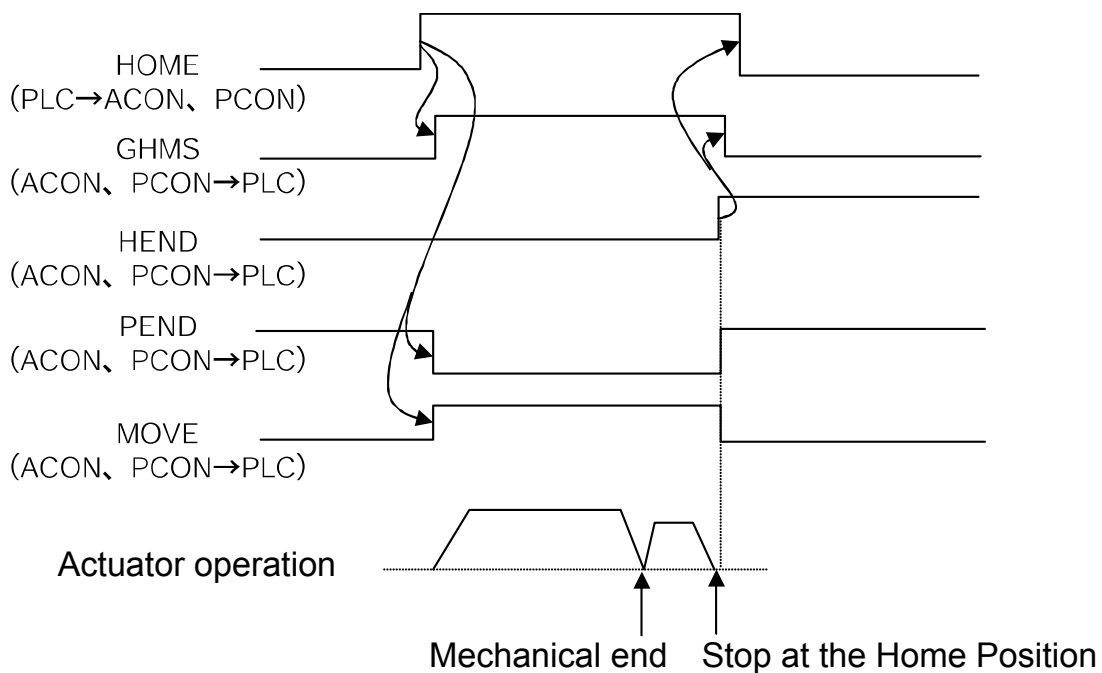
- (6) Home return (HOME) PLC output signal
- Home return completion (HEND) PLC input signal
- Under Homing Operation (GHMS) PLC input signal

When the "HOME" signal is turned "ON", this command is processed at the startup (ON edge), and the homing operation is performed automatically. During the homing 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.

Even after the completion of the homing operation, when the "HOME" signal is turned "ON", the homing 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 homing operation after the power is supplied, the positioning is performed after the automatic homing 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

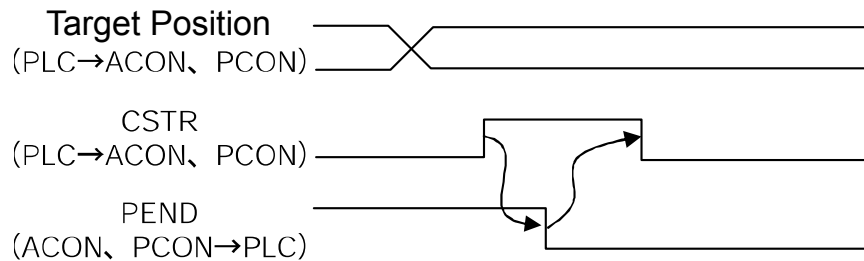
This signal is processed at the startup (ON edge) and the positioning is performed to the target position with the specified position No. or set using the PLC's target position register.

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 homing operation has not performed at all after the power is supplied (HEND signal OFF), the positioning to the target position is performed after the homing operation is performed automatically.

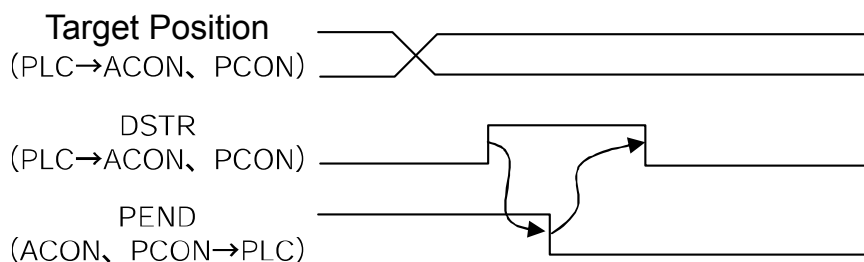
Turn "OFF" this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned "OFF".



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

This signal is processed at the startup (ON edge) and the positioning to the target position input in the PLC's target position register is performed. When this signal is issued in the condition where the homing 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".



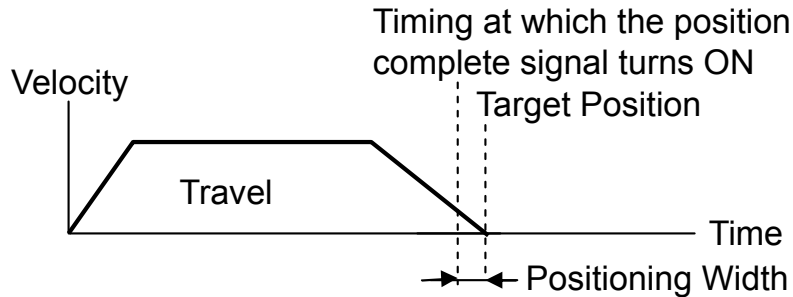
(9) Moving Signal (MOVE) PLC input signal

This signal is turned ON while the actuator's slider or rod is moving.(Including the pressing or jog operation after the homing operation)

After the completion of the positioning, homing 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 width 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 homing (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 width, 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. register 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 domain and turned OFF when the current position is out of the set domain.

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 homing operation is completed. After that, even during the servo OFF, it is effective.

2) Position zone

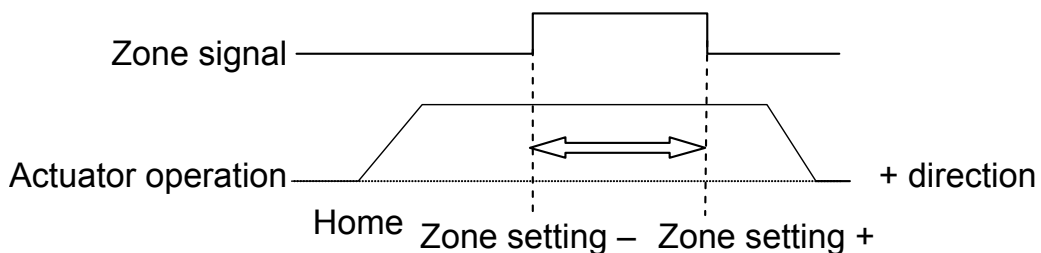
Each zone is set in the position table or using the zone boundary register.

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

2) Inch operation

The inching operation is available while the 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 homing 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) Jog/inch switching (JISL) PLC output signal

This signal changes over the jog operation and the inching operation.

JISL=OFF : Jog operation

JISL=ON : Inch operation

When the JISL signal is turned "ON" (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.

When the JISL signal is turned OFF (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.

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

JISL		Jog operation	Inch operation
		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 signalTeaching 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 signalPosition 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 register of the PLC (*2).

When the data writing is completed, the WEND signal is turned "ON".

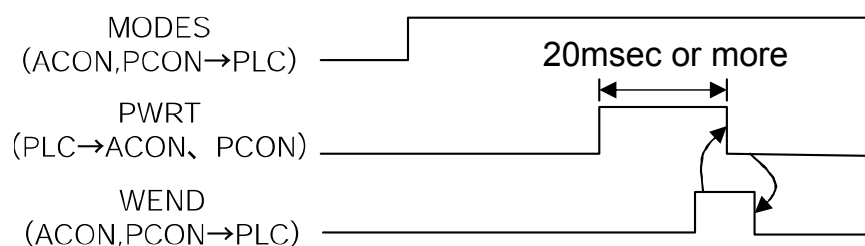
After the WEND signal is turned ON, turn OFF the PWRT signal in the host machine.

When the PWRT signal is turned OFF 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 register

(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 "9 Operation" for the setting timing for this signal)

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

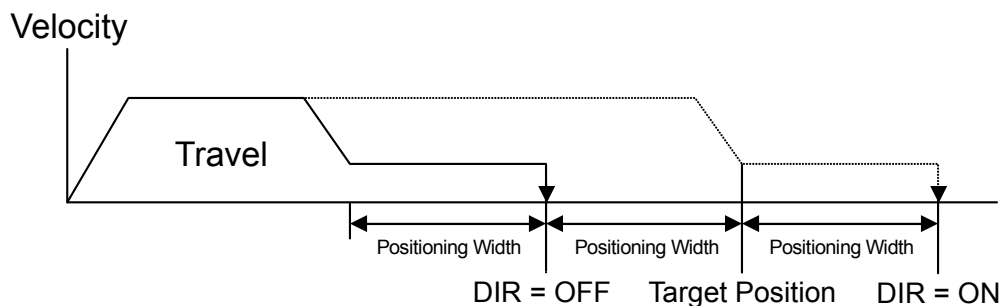
This signal specifies the pressing direction.

When this signal is turned "OFF", the pressing operation is performed to the position expressed using the value reducing the positioning width 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 "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 width or set using the PLC's positioning width register, but it was not pushed against the work, this signal is turned "ON".

(Refer to Item (2) Operation in Half Direct Value Mode in "9 Operation" for the setting timing for this signal)

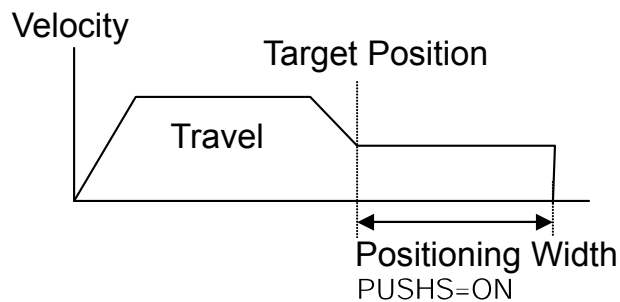
(24) Incremental Command (INC) [PLC output signal]

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 "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.

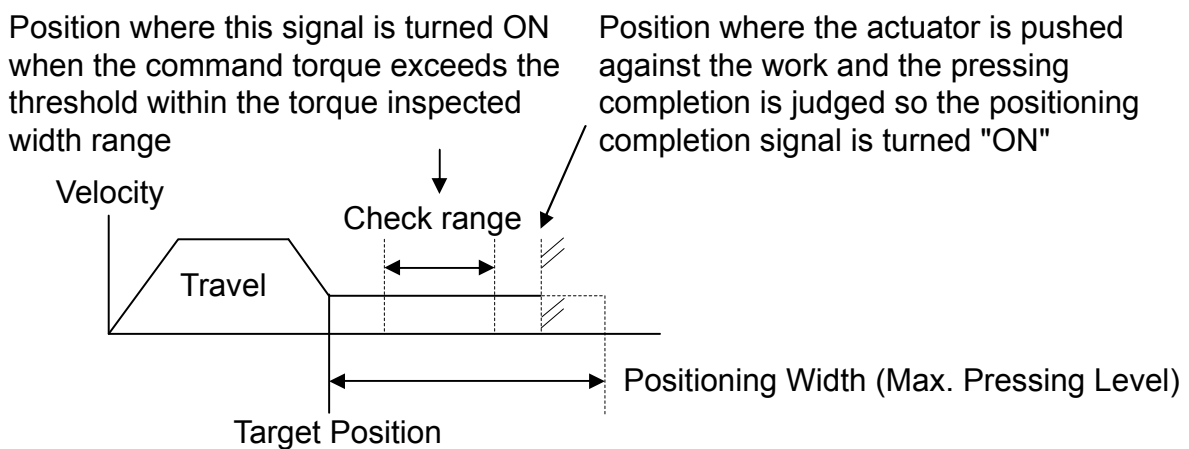
When this signal is used for pressing-in purpose, it provides feedback of whether or not the set load threshold is reached during the pressing operation.

The load threshold and check range are set by the PLC and the LOAD signal will turn ON when the command torque (motor current) exceeds the threshold inside the check range.

This signal judges the load output based on the fact that the command torque exceeds the threshold for the specified time period.

This processing procedure is the same as for the pressing judgment. The judgment time period can be changed freely using the parameter No. 50 "Load Output Judgment Time Period".

This signal is continued until the next movement command is received.



- Set the pressing speed using the parameter No. 34 "Pressing Speed".
When the machine is delivered, it has been individually set depending on the actuator characteristics.
Set an appropriate velocity considering the work 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 width using the PLC's Positioning Width Register.
Set it a bit longer from the backmost position considering the mechanical dispersion of the work.
- 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

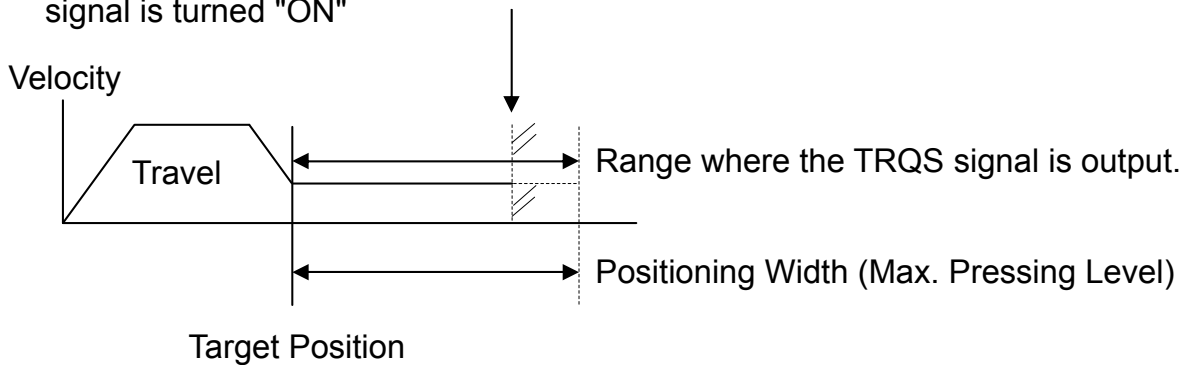
This signal is available only in the pressing operation.

When the motor current reaches the load threshold during the pressing operation (moving up to the positioning width), 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.

Position where the actuator is pushed against the work and the pressing completion is judged so the positioning completion signal is turned "ON"



- 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 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 width using the PLC's Positioning Width Register.
Set it a bit longer from the backmost position considering the mechanical dispersion of the work.
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.

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

One of the pulse motor general characteristics is 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 personal computer application 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.

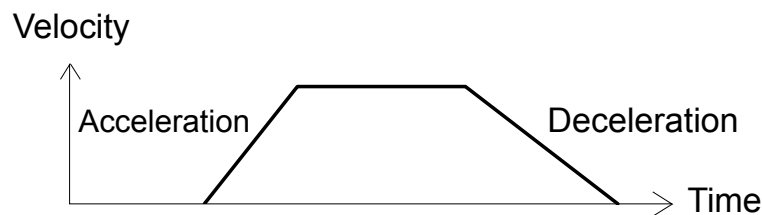
(29)Acceleration/deceleration mode (MOD1、MOD0) PLC output signal

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	Set in delivery
OFF	ON	S-shaped Motion	
ON	OFF	First-Order Lag Filter	
ON	ON	Unavailable	

Trapezoid Pattern

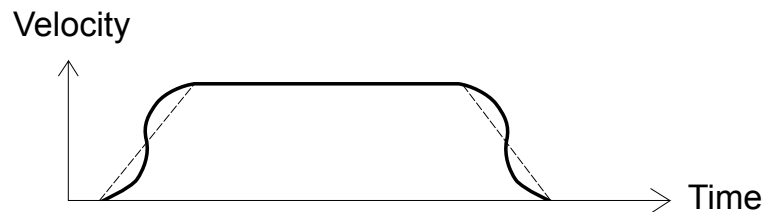


*The Acceleration and Deceleration are set in the “Acceleration” and “Deceleration” data boxes on the position data.

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.

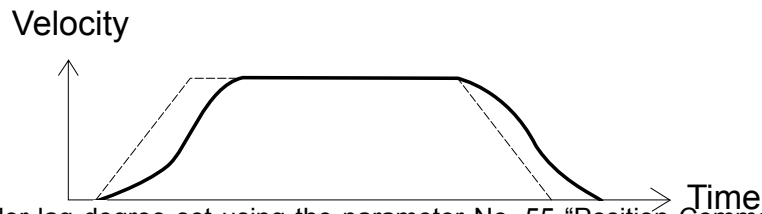


* The S-shaped motion degree is set using the parameter No. 56 “S-Shaped Motion Ratio Setting”. The setting unit is % and setting range is from “0” to “100”.
 (The above figure shows the image graph with the Parameter No. 56 set to “100”.)
 When it is set to “0”, the S-shaped motion is disabled.
 However,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

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 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 personal computer or teaching pendant.

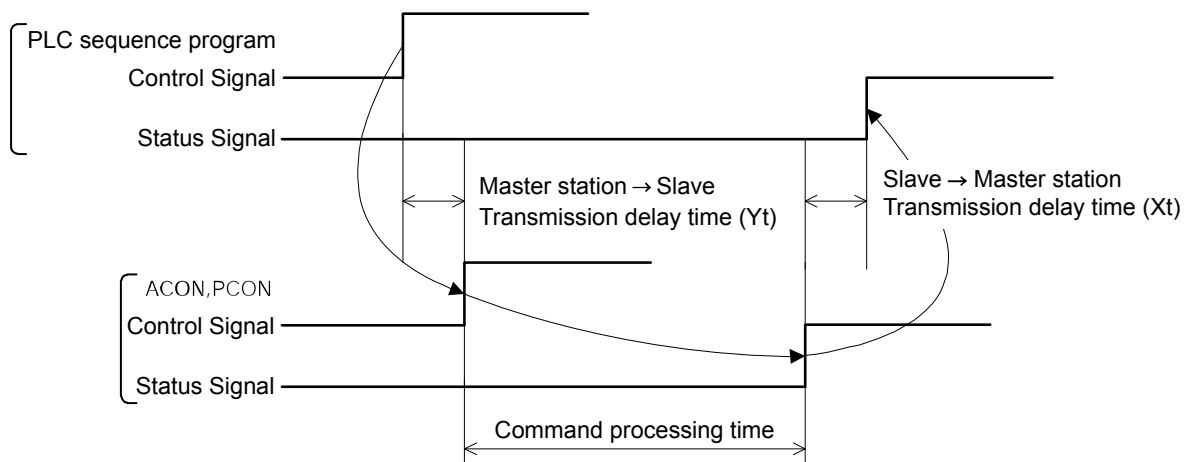
8. I/O Signal Timings

When any of the control signals are 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 } Filed Network Transmission
 Xt : Slave → Master Station Transmission Delay Time } 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.



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 width 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 width, etc) except for the target position item, in the position table.

Turn on the Position/Simplified Direct Value Change-Over Signal (PMOD).

- 1) Set the target position data in the target position register.
- 2) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
- 3) 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.
- 4) After the CSTR 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 width 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".

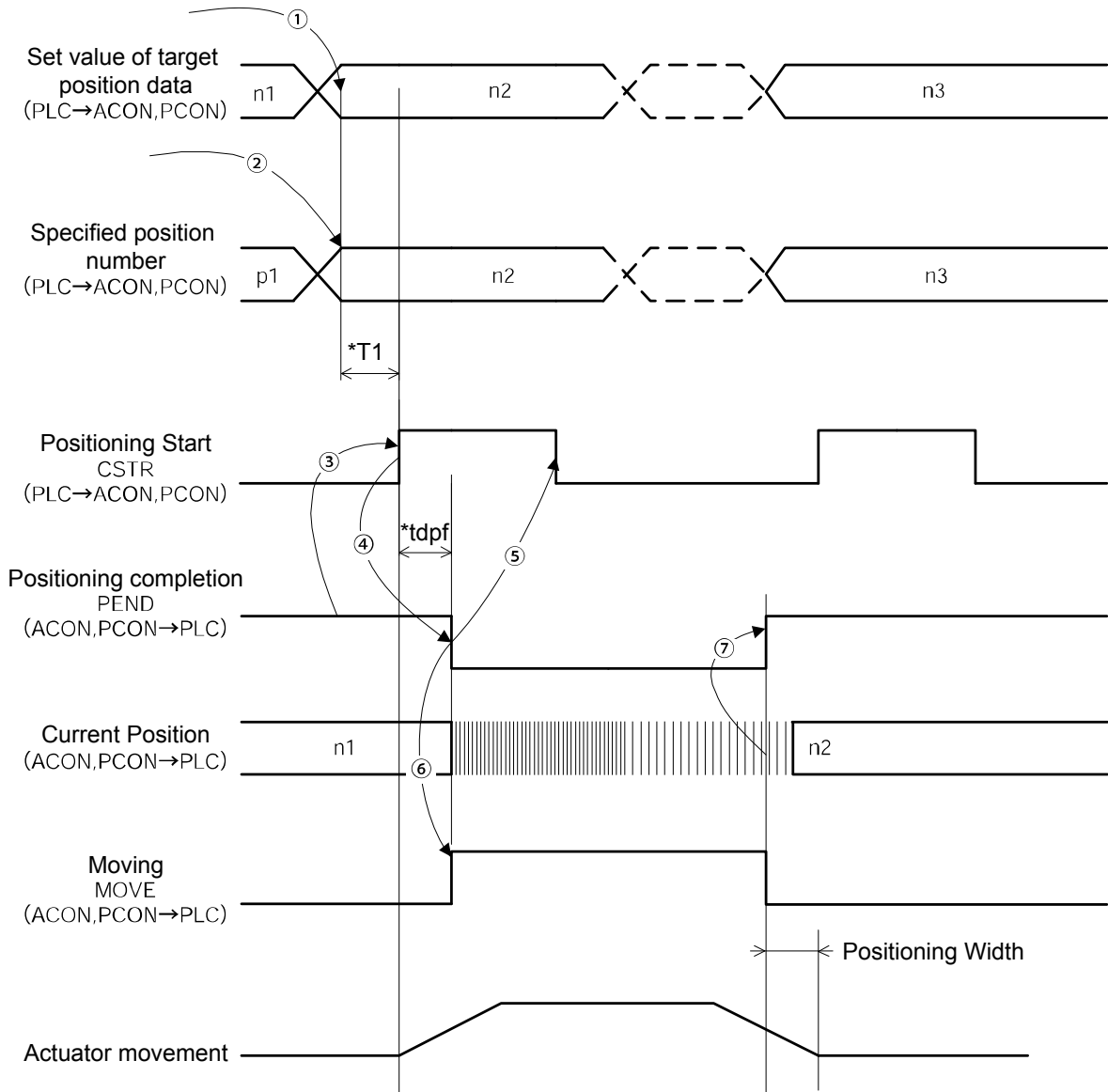
The current position data might be changed slightly even when the system is stopped.

- 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 width register, setup speed register, acceleration/deceleration register and pressing current limit setup register.

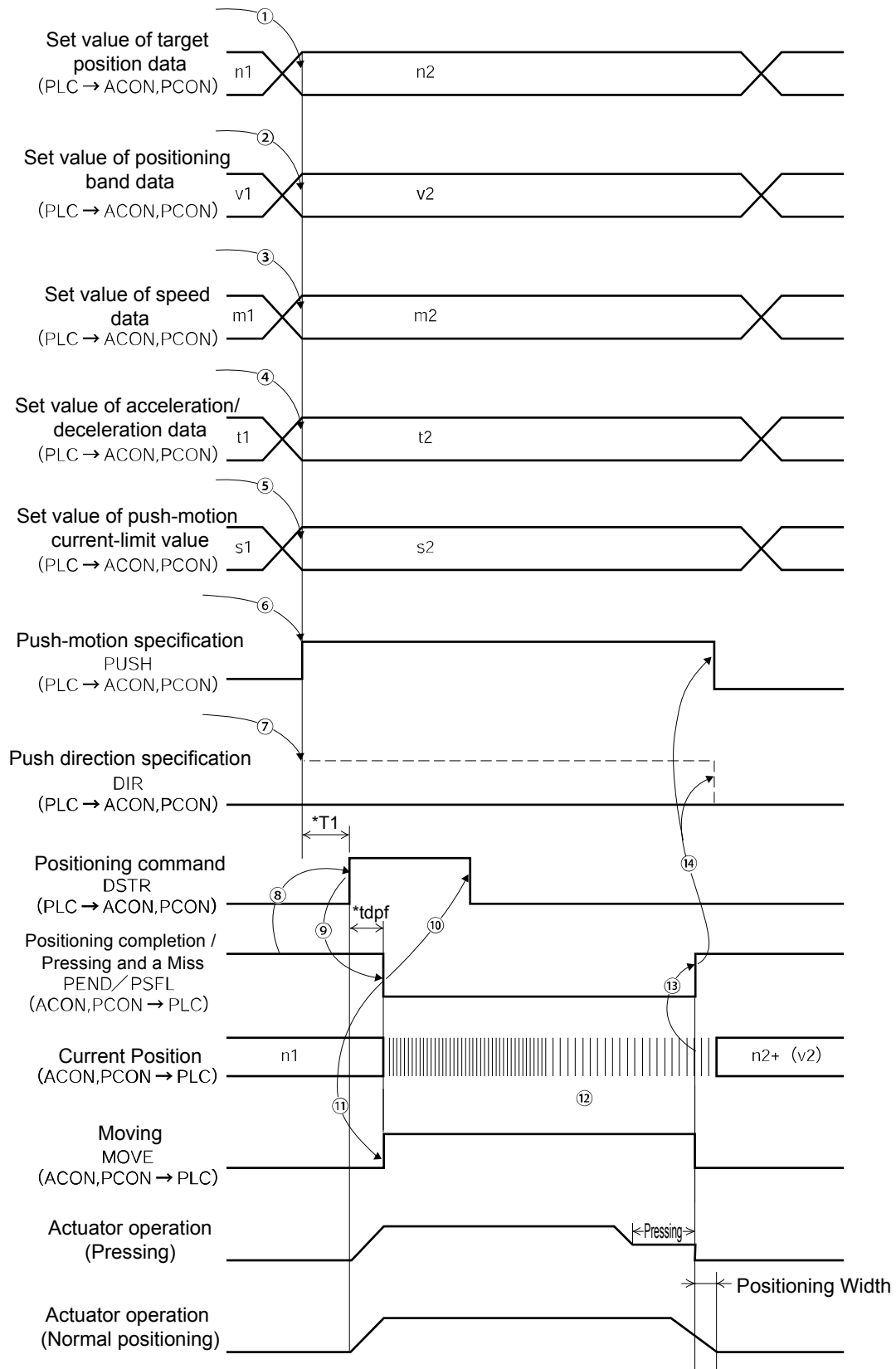
● Example of operation (Pressing Operation)

- 1) Set the target position data in the target position register.
- 2) Set the positioning width data in the positioning width register.
- 3) Set the speed data to the speed register.
- 4) Set the acceleration/deceleration data to the acceleration/deceleration register.
- 5) Set the pressing current limit data in the pressing current limit value register.
- 6) Turn "ON" the pressing setup (PUSH) signal.
- 7) Specify the pressing direction using the pressing direction setup (DIR) signal. (Refer to 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 width set in Step 2 is reached, in the case that the current does not reach the motor current limit value set in Step 5, the pressing and a miss (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 width 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 register and positioning band register of the PLC.

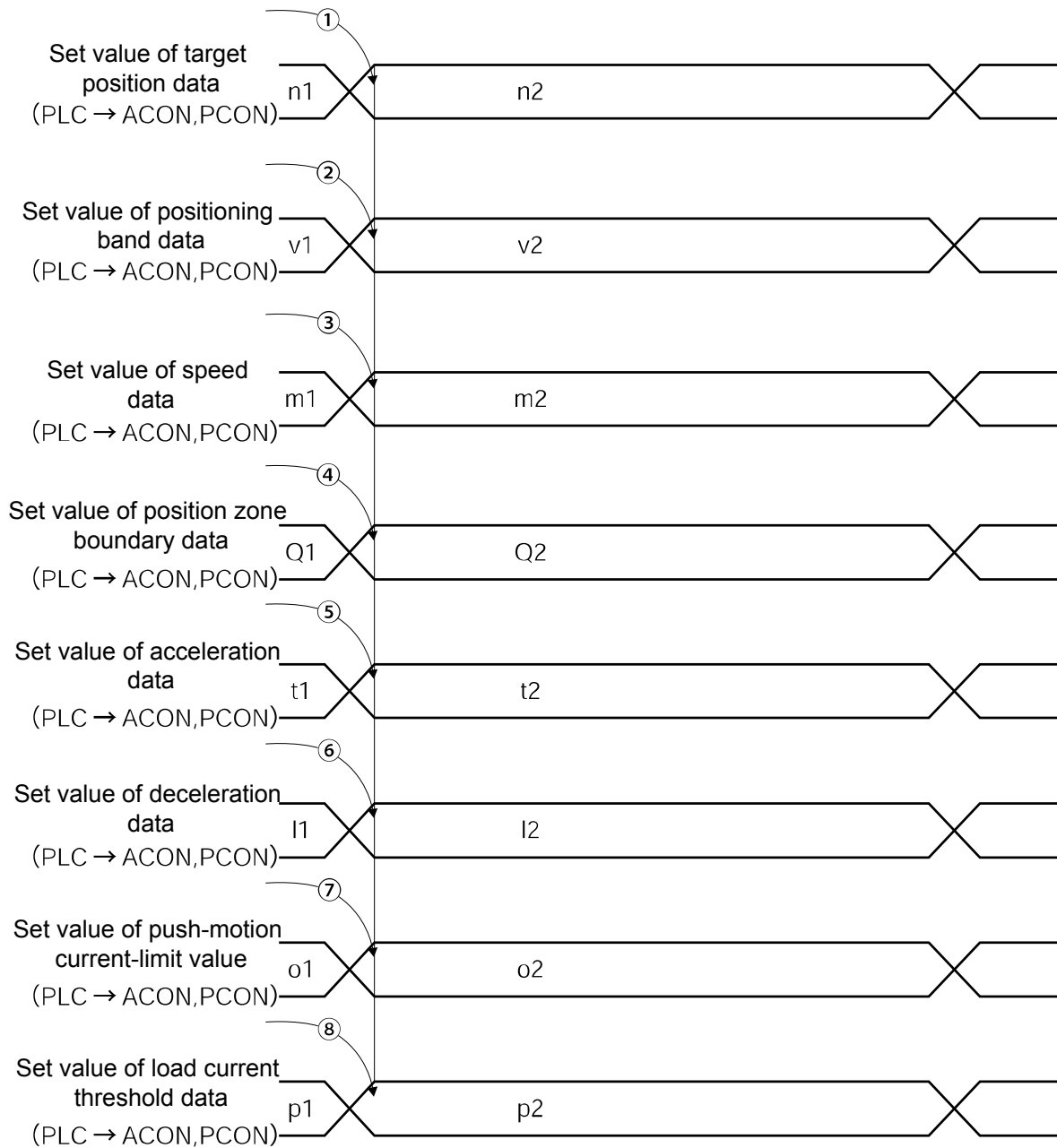
● Example of operation (Pressing Operation)

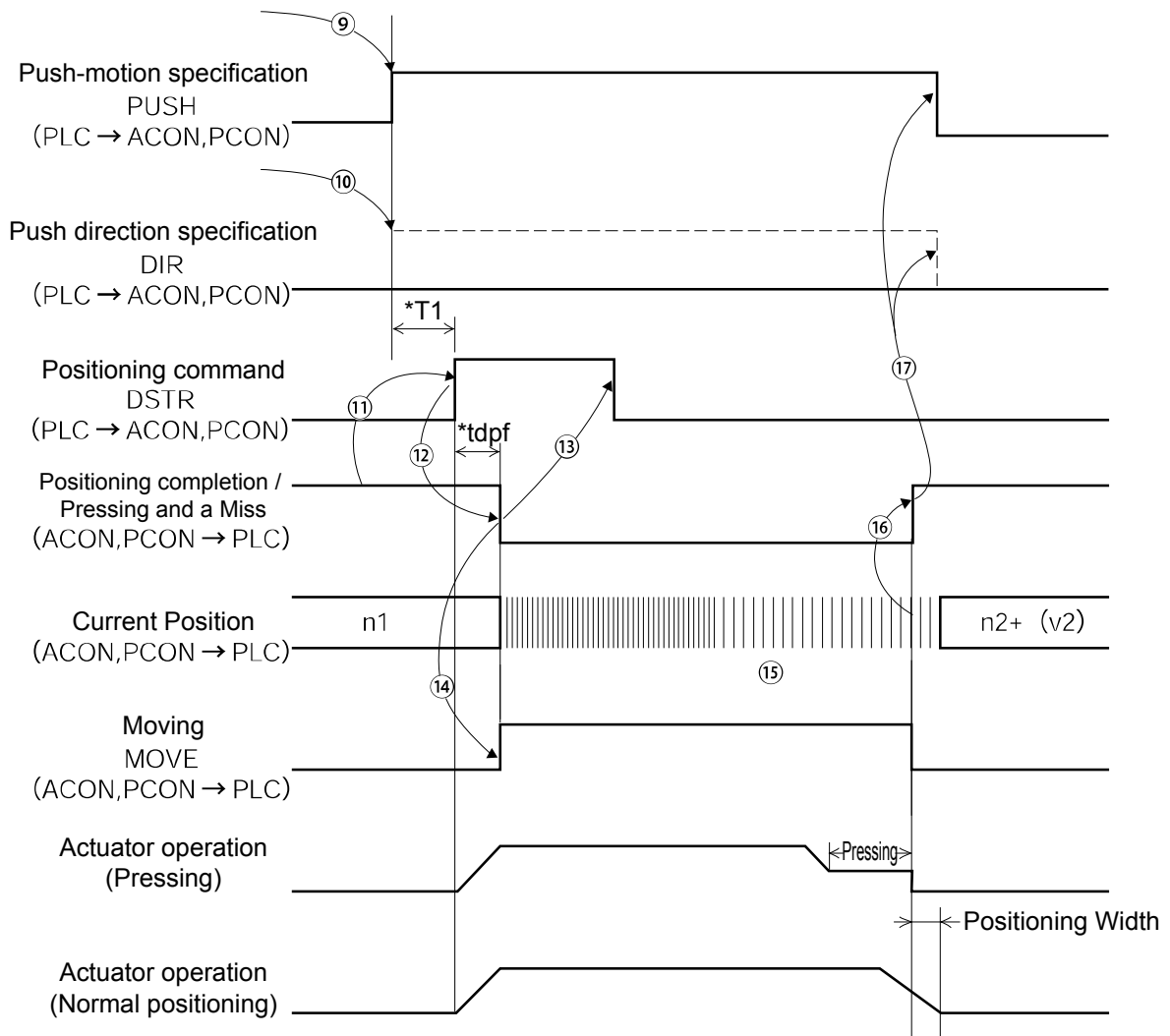
- 1) Set the target position data in the target position register.
- 2) Set the positioning width data in the positioning width register.
- 3) Set the speed data to the speed register.
- 4) Set the position zone output boundary data in the zone boundary + register or zone boundary - register.
- 5) Set 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 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 width set in Step 2 is reached, in the case that the current does not reach the motor current limit value set in Step 7, the pressing and a miss (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 width 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)

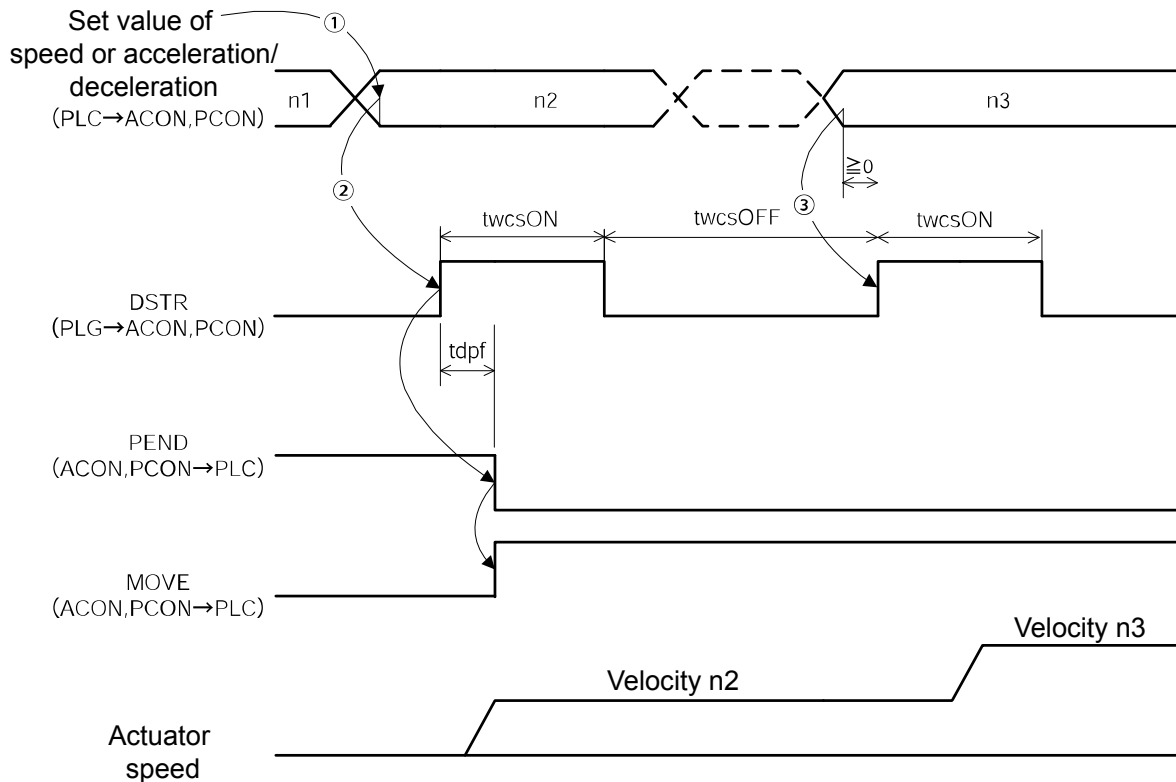
(4) Data change during movement

In the half direct mode or full direct mode, the value currently set to a given register among the registers 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 t_{dpf} .

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 shown as follows, where the speed and acceleration/deceleration data items have been changed.



$$twcsON \geq Yt + Xt + 3(\text{msec})$$

$$twcsOFF \geq Yt + Xt + 3(\text{msec})$$

$$*Yt + Xt \leq t_{pdf} \leq Yt + Xt + 3(\text{msec})$$

⚠ 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.

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.	
2				
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(Set in delivery)	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)

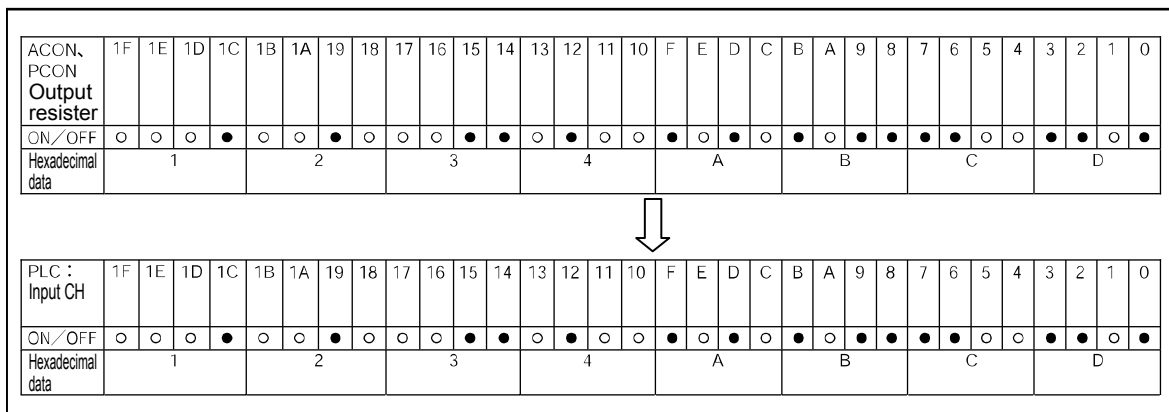
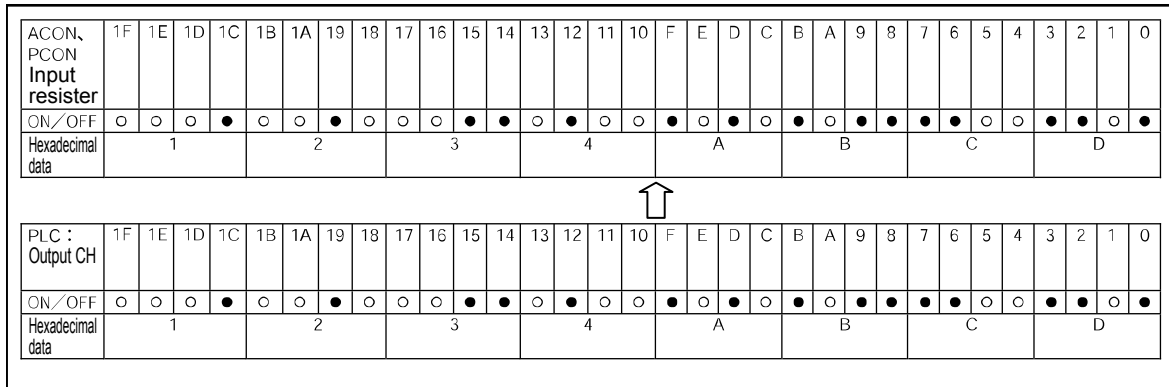
Addresses in the PLC are assigned in units of 16 points (2 bytes) based on the node address set in the controller and the occupied bytes in each operation mode.

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 (Set in delivery)	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	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 registers. (Refer to "Example iv".)

(Example i) Set value = "0"

● indicates ON, while ○ indicates OFF.



(Example ii) Set value = "1"

● 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	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							

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	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.

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			

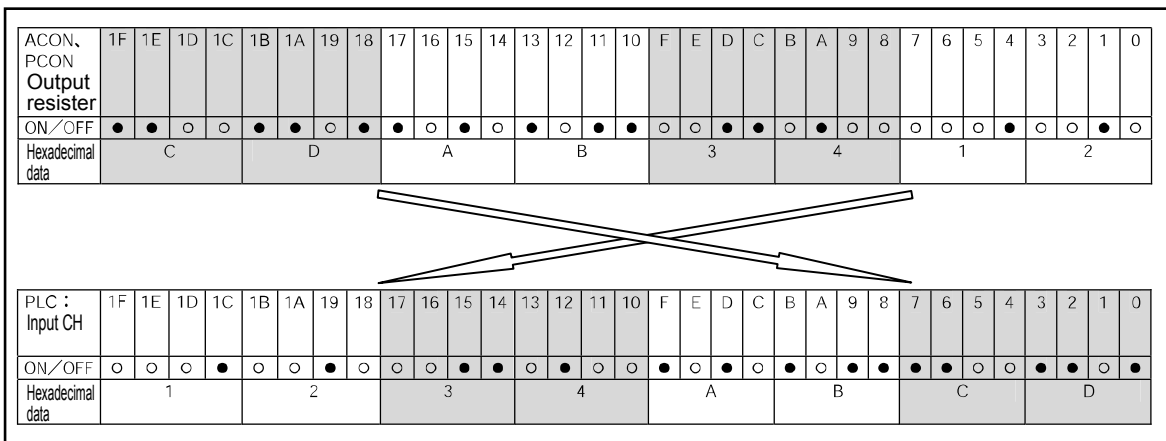
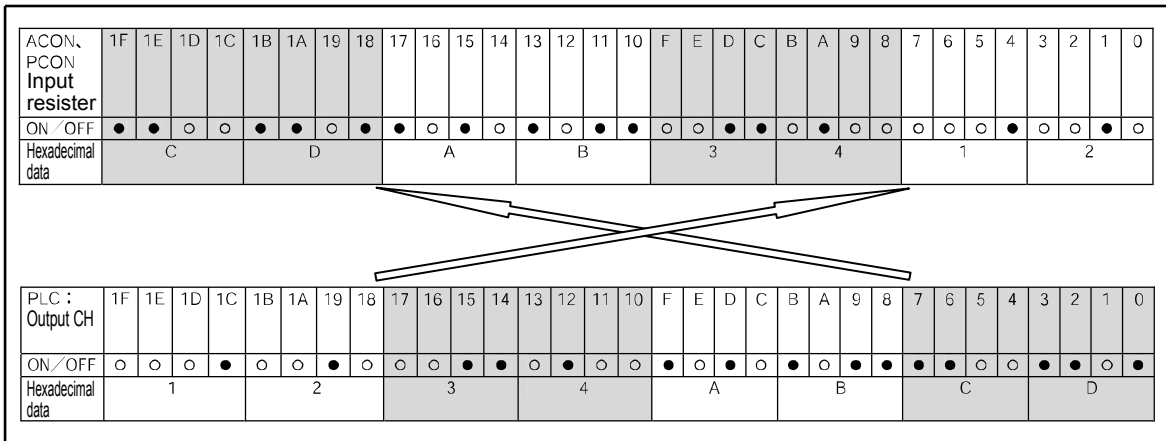
PLC : Output CH	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
Hexadecimal data	1				2				3				4				A				B				C				D			

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.



11. Troubleshooting

● Alarm Description and Cause/Treatment

- 1) When an alarm is issued, the completed position No. (4 bits for PM 1 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 RC personal computer application software or teaching pendant.
- 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	×	Cause: The field bus module error is detected Treatment: Confirm the parameter.
0F3	Field bus module not detected	04	×	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 / × : Alarm cannot be reset

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

MS	NS	Item	Cause of error occurrence	Unit operation after error detection	Measure
●	—	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.	<p>The following cases are considered to be the possible causes of communication error. Find the most suitable case and remove the cause.</p> <p>1) A stop was caused by an error on the PLC system including the master unit. → Check the PLC system condition and cancel the error.</p> <p>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.</p> <p>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</p> <p>For the items above excluding 1) restart of master unit is not necessary.</p>
○ GN	○ RD	Address duplication error	There are ACON / PCON with the same node existing on the network.	ACON / PCON stop the operation.	<p>Confirm the node number of ACON / PCON, correct the duplicated number, then conduct operations in the following procedure.</p> <p>1) Turn OFF the communication power supply between the master unit and ACON / PCON.</p> <p>2) Turn ON the communication power supply between the master unit and ACON / PCON again.</p>
○ RD	—	Unit error	An error has occurred to ACON / PCON due to the following causes.	ACON / PCON stop the operation.	<p>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.</p> <p>If the error occurs again, replace ACON / PCON</p>

LED indication ○ : Illuminating ◎ : Flashing ● : OFF — : Not applicable

12. CE Mark

12.1 EC Directives

The EC Directives are a new set of directives issued by the European Commission that are intended to protect the health and safety of users and consumers of products distributed within the EU (European Union) zone, while ensuring free movements of these products within the EU zone. Companies exporting to Europe or having a production facility in Europe must comply with the following directives in order to receive a CE Mark certification for their products.

(1) Low Voltage Directive

ACON and PCON controllers are designed to comply with the Low Voltage Directive by themselves.

(2) EMC Directive

The EMC Directives cover the entire equipment including IAI's controllers and other control devices and electrical components used in the equipment. IAI determines representative connection/installation modes (conditions) for controllers, actuators and peripherals and use these models to ensure compliance with the related EMC Directive standards.

12.2 Compliance Standards

<Low Voltage Directive>

EN50178(Electronic Equipment used in Electrical Facility)

<EMC Directive>

EN55011(Industrial, Scientific and Medical (ISM) radio-frequency Equipment
Electromagnetic Disturbance Characteristics)

EN61000-6-2(Industrial, Scientific and Medical (ISM) radio-frequency Equipment
Electromagnetic Disturbance Characteristics)

EN61000-4-2(Electrostatic Discharge Immunity)

EN61000-4-3(Radiated, Radio-Frequency, Electromagnetic Field Immunity)

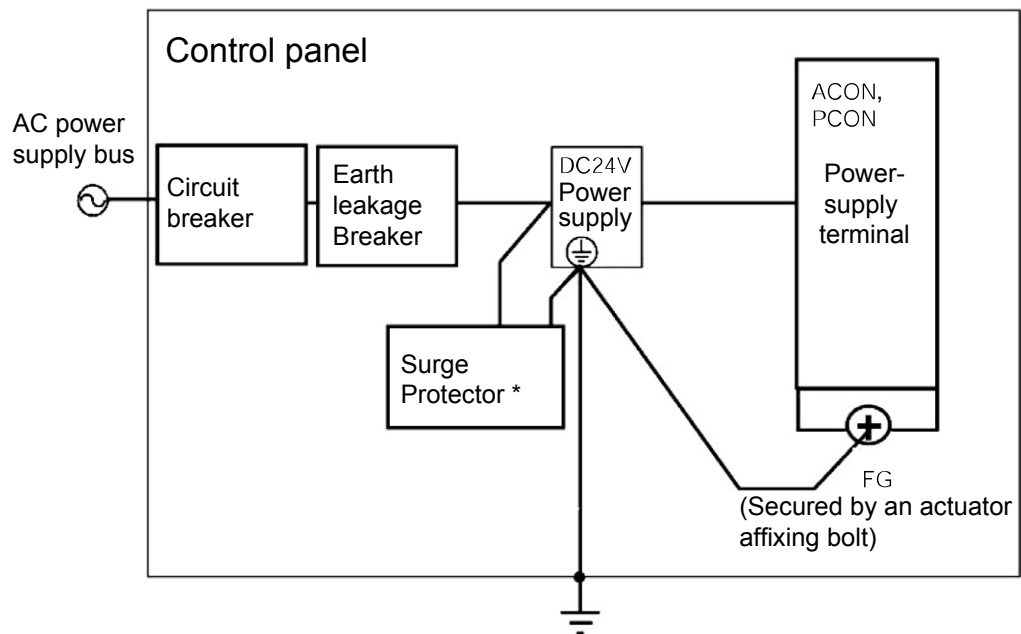
EN61000-4-4(Electric Fast Transient/Burst Immunity Test)

EN61000-4-5(Surge Immunity Test)

EN61000-4-6(Immunity Test for Conducted Disturbances,
induced by Radio-Frequency Fields)

EN61000-4-8(Power Frequency Magnetic Field Immunity Test)

12.3 Configuration of Peripherals



* R • A • V-781BWZ-4 (Maker : OKAYA Electric Industries Co., Ltd.)

(1) Environment

Use ACON and PCON controllers in an environment of pollution degree 2 or 1 as specified in IEC 60664-1.

Example) Install the controller in a control panel constructed to shut off ingress of water, oil, carbon, dust, etc. (IP54).

(2) Power supply

A) Use these controllers in an environment of overvoltage category II as specified in IEC 60664-1. Accordingly, be sure to install a circuit breaker between the power distribution board and 24-VDC power supply.

B) Use a 24-VDC power supply bearing the CE Mark.

(3) Grounding

To prevent electric shock, be sure to connect the FG grounding terminal on the ACON or PCON to the protective earth (earth plate) of the control panel.

(4) Earth leakage breaker

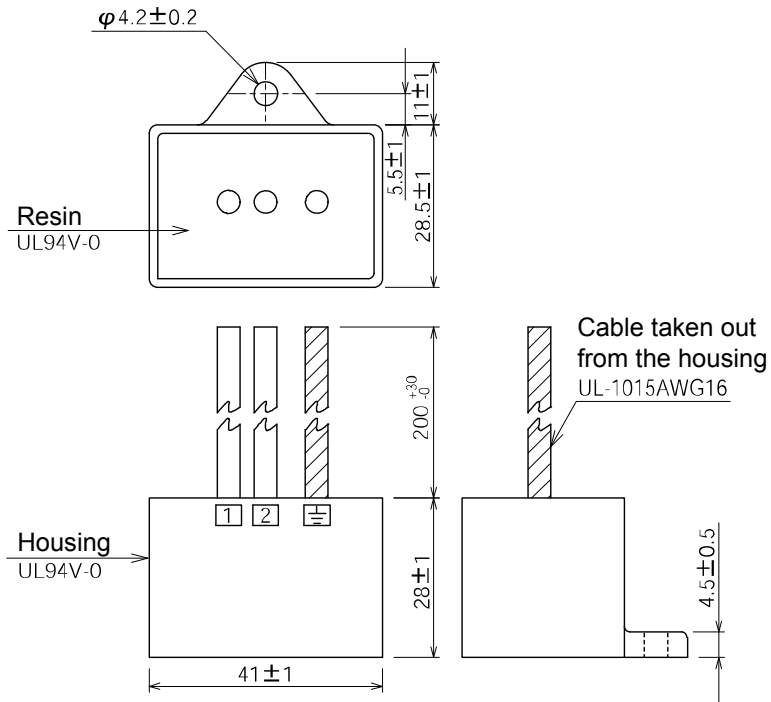
Install an earth leakage breaker (RCD) between the power distribution board and 24-VDC power supply.

(5) Surge Protector

Install a surge protector on the primary side of the 24-VDC power supply.

Maker : OKAYA Electric Industries Co., Ltd.

Model No. : R·A·V-781BWZ-4



External View of Surge Protector

(6) Cable

Keep the lengths of all cables connected to the ACON or PCON, such as the motor cable, encoder cable and various network cables, to less than 30m.

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