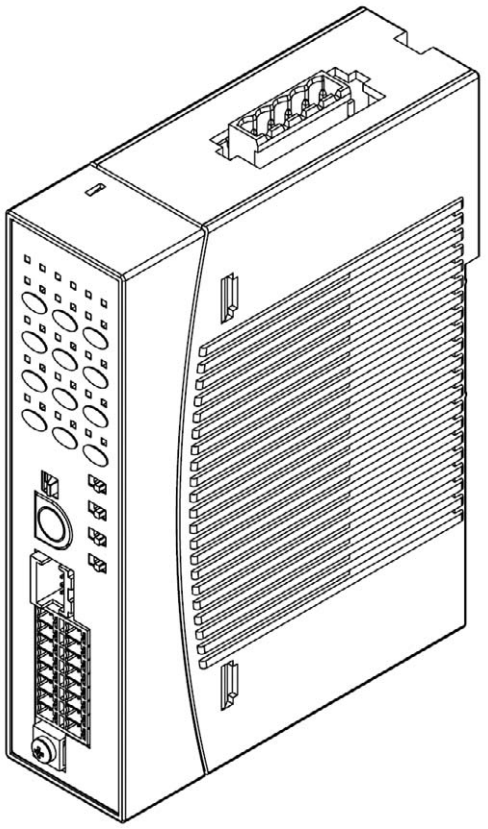
ERC3

ERC3 Gateway Unit
Instruction Manual Forth Edition



IAI Corporation

Please Read Before Use

Thank you for purchasing our product.

This Instruction Manual describes all necessary information items to operate this product safely such as the operation procedure, structure and maintenance procedure.

To ensure the safe operation of this product, please read and fully understand this manual.
The enclosed CD or DVD in this product package includes the Instruction Manual for this product. For the operation of this product, print out the necessary sections in the Instruction Manual or display them using the personal computer.

After reading through this manual, keep this Instruction Manual at hand so that the operator of this product can read it whenever necessary.

[Important]

- This Instruction Manual is original.
- The product cannot be operated in any way unless expressly specified in this Instruction Manual. IAI shall assume no responsibility for the outcome of any operation not specified herein.
- Information contained in this Instruction Manual is subject to change without notice for the purpose of product improvement.
- If you have any question or comment regarding the content of this manual, please contact the IAI sales office near you.
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Safety Guide

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

Safety Precautions for Our Products

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

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

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

No.	Operation Description	Description
4	Installation and Start	(2) Cable Wiring ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire.
		(3) Grounding ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm^2 (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

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

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

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

Alert Indication

The safety precautions are divided into “Danger”, “Warning”, “Caution” and “Notice” according to the warning level, as follows, and described in the Instruction 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

Precautions in Operation

1. Make sure to follow the usage condition, environment and specification range of the product.
   In case it is not secured, it may cause a drop in performance or malfunction of the product.

2. This can be used by connecting to ERC3 Serial Communication Type (CON Mode Type or MEC Mode Type).
   It is not applicable for any others but the serial communication type.
   It cannot be connected with CON Mode and MEC Mode together.

3. Use an appropriate teaching tool.
   Use the PC Software for an appropriate teaching pendant to interface with this controller.
   [Refer to 1.1.2 Teaching Tool]

4. Set the operation patterns.
   This unit is applicable for various types of Fieldbus and possesses multiple operation patterns. Set an appropriate operation pattern considering the control method to be used. [Refer to Chapter 3. Operation and Chapter 4 I/O Parameters.]

⚠ Warning : Please note it is very risky when the control sequence and operation pattern setting do not match each other. The normal operation might not occur. There may be no movement, or there may be unexpected movement.

5. Operation cannot be performed unless there is an input of Servo-ON Signal.
   The servo-ON signal (SON) is available to select whether to enable or disable in the initial setting process “Servo Control”.
   If it is set to “Enable”, the ERC3 would not operate unless turning this signal ON.
   If parameter No.21 is set to “Not to use”, SON is disabled. If it is set to “Disable”, the servo turns ON and the actuator operation becomes enabled as soon as the power supply to the controller is turned ON and the emergency stop signal is cancelled.
   Have the setting that suits to the desirable control logic.

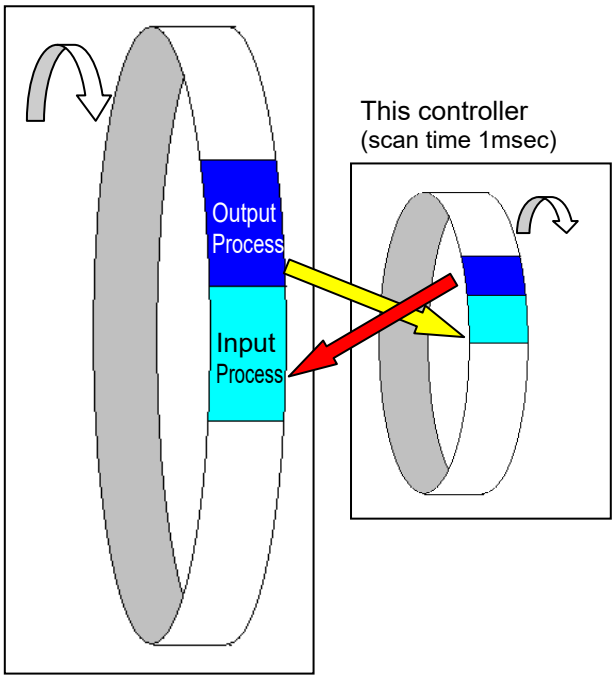
6. Clock Setting in Calendar Function
   There may be a case in the first time to supply the power after delivery that Gateway Error Code 4A “Real Time Clock Vibration Stop Detected” is generated. In the case this happens, set the current time with a teaching tool.
   If the battery is fully charged, the clock data is retained for approximately 10 days after the power is turned OFF.
   Even though the time setting is conducted before the product is shipped, the battery is not fully charged. Therefore, there may be a case that the clock data is lost even if the days described above have not passed.

7. According to Sequence Program Creation

Please note the following things when creating a sequence program.
When data transfer is necessary between two devices that have a different scan time from each other, duration more than the longer scan time is required to certainly read the signal. (It is recommended to have a timer setting of at least twice as long as the scan time in order for the PLC to adequately perform the reading process.)

● Operation Image

PLC
(e.g. scan time is 20msec)



As shown in the diagram, the input and output timings of two devices that have different scan time do not match, when transferring a signal.
There is no guarantee that PLC would read the signal as soon as this controller signal turns ON. In such a case, make the setting to read the signal after a certain time that is longer than the longer scan time to ensure the reading process succeeds on the PLC side.
It is the same in the case this controller side reads the signal.
In such a case, it is recommended to ensure 2 to 4 times of the scan time for the timer setting margin.
It is risky to have the setting below the scan time since the timer is also processed in the scan process.
In the diagram, PLC can only read the input once in 20msec even though this controller output once in 1msec.
Because PLC only conducts output process once in 20msec, this controller identifies the same output status for that entire time period.

Also, if one tries to read the signal that is being re-written by the other, the signal may be read wrong. Make sure to read the signal after the rewriting is complete. (It is recommended to have more than 2 scan periods to wait.) Make sure not to have the output side to change the output until the other side completes the reading. Also, a setting is made on the input area not to receive the signal less than a certain time to prevent a wrong reading of noise. This duration also needs to be considered.

8. PLC Timer Setting

Do not have the PLC timer setting to be done with the minimum setting.
Setting to “1” for 100msec timer turns ON at the timing from 0 to 100msec while 10msec timer from 0 to 10msec for some PLC.
Therefore, the same process as when the timer is not set is held and may cause a failure such as the actuator cannot get positioned to the indicated position number in Positioner Mode.
Set “2” as the minimum value for the setting of 10msec timer and when setting to 100msec, use 10msec timer and set to “10”.

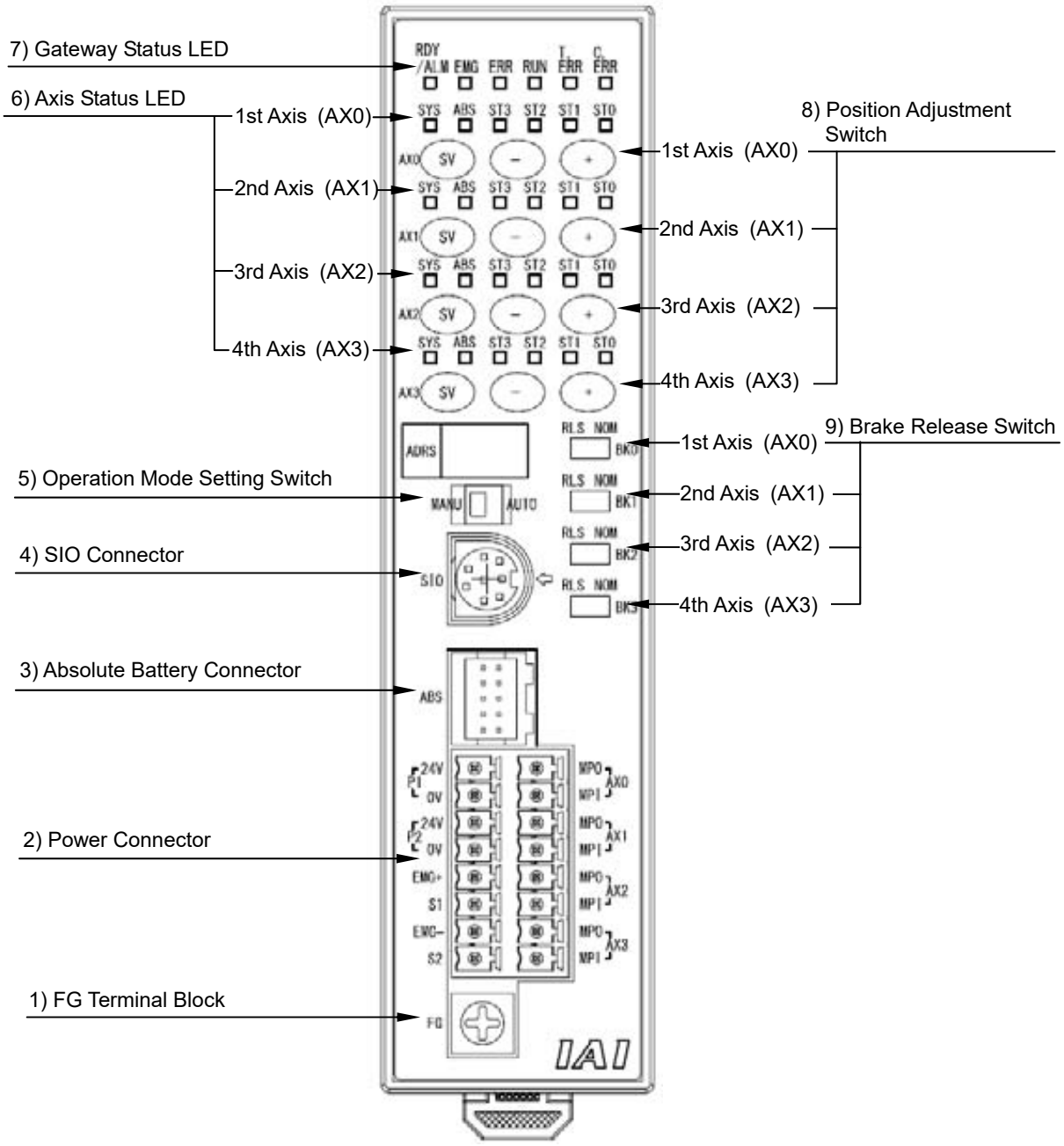
International Standards Compliances

ERC3 Gateway Unit with the following overseas standard.

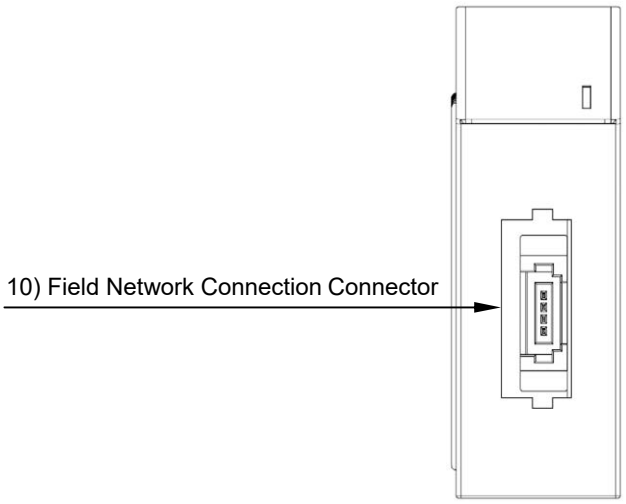
RoHS Directive	CE Marking	UL
○	To be scheduled	To be scheduled

Name for Each Parts and Their Functions

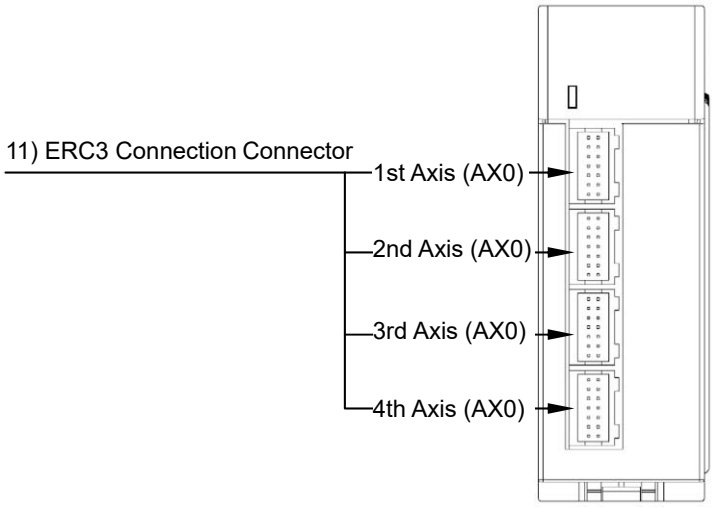
O Front



O Upper surfaces



O Bottom surfaces



1) FG Terminal Block
This is the terminal block for frame grounding. Since this controller is made of plastic, it is necessary to ground from this terminal block. Ground Type should be Class D (formally Class 3 grounding = ground resistance 100Ω or less).

2) Power Connector
This is a connector to supply the 24V DC power (control power, actuator power and brake control power supplies) and to input the emergency stop condition signals to this unit.

3) Absolute Battery Connector
This is a connector for future extension.

4) SIO Connector
It is the connector dedicated for the connection of a teaching tool such as PC software and teaching pendant

5) Operation Mode Setting Switch
This is a switch to change the operation mode between Automatic Operation (AUTO) and Manual Operation (MANU). The operation modes are provided to avoid the duplication of the SIO (Serial) communication operation using PC software or a teaching pendant (described as teaching tool from now on) and the operation with Fieldbus or PIO (Parallel I/O)
The output from PLC is ignored at MANU and the data when switched to MANU is maintained for the input to PLC.

Status	Information
MANU	Manual Operation : An operation is available from a teaching pendant or PC
AUTO	Automatic Operation : It can control the controller with Fieldbus communication.

⚠ Caution : (1) If “Accept PIO Startup” is selected on the teaching tool, the AUTO operation becomes available no matter the condition of the front panel or external switchover signal input, thus attention may have to be paid. In such a condition, the actuator may get activated by following the signal from the host.
(2) The information of “Accept PIO Startup” or “Prohibit PIO Startup” is remained when the teaching tool is removed from the controller. Do not fail to select “Prohibit PIO Startup” when removing the teaching tool after finishing the teaching operation or debugging.

6) Axis Status LED

The condition (status) of each axis is displayed with the patterns of lighting.

○ Illuminating, × OFF, ☆ Flashing

Name	Color	Lamp condition	Information
SYS	GN	○	Servo ON
		☆	In automatic servo OFF mode
		×	Servo OFF
	RD	○	Alarm generated, Emergency stop
		×	Normal
ABS	GN	-	Not used
	RD		
ST3	GN	Status display (i) The current command current ratio (percentage to the rating) is displayed when servo is ON. (ii) Simple alarm code is displayed when an alarm is issued. [Refer to Chapter 6. Troubleshooting for the details of the alarms.] ○ Illuminating, × OFF	
ST2	GN		
ST1	GN		
ST0	GN		

ST				Command Current Ratio
3	2	1	0	
ALM8	ALM4	ALM2	ALM1	Simple alarm code
×	×	×	×	0.00% to 6.24%
×	×	×	○	6.25% to 24.99%
×	×	○	○	25.00% to 49.99%
×	○	○	○	50.00% to 74.99%
○	○	○	○	75.00% to 100.00% or more

7) Gateway Status LED
Gateway condition (status) is displayed with the lighting patterns.

○ Illuminating, × OFF

Name	Color	Lamp condition	Information
RDY /ALM	GN	○	Turned ON when system is ready (after power is turned ON and CPU operating in normal condition)
	OR	○	Alarm generated
EMG	RD	○	Emergency stop
STATUS0 /NS/ERR	GN	–	Condition differs depending on field network [Refer to "3.8 Field Network LED Indication" for more details]
	OR	–	
STATUS1 /MS/RUN	GN	–	
	OR	–	
T.ERR	OR	×	Internal bus communication with controller in normal condition
	OR	○	Internal bus communication with controller in error
C.ERR	OR	×	Field network communication in normal condition
	OR	○	Field network communication in condition in error

8) Position Adjustment Switch
It consists of 3 push button switches and is used when performing JOG operation for each axis.
These switches are valid when 5) Operation Mode Setting Switch is on MANU side and a teaching tool is not connected to 4) SIO Connector. They do not activate in other cases.

Name	Information
SV	Servo ON/OFF
+	Movement made to positive direction while it is pressed If the time to press is less than 1sec, the movement is in 1mm pitch (Inching Operation). It is a continuous movement (JOG Operation) if pressed for 1sec or more. (Note) The JOG speed accelerates gradually if the time to press is long. (1→10→30→50→100mm/sec (Max))
–	Movement made to negative direction while it is pressed (details are the same as +)
Pressing + and – buttons together	Start/Stop home-return operation

9) Brake Release Switch
This is a switch to compulsorily release the brake of the actuator equipped with a brake.
RLS · · Brake release
NOM · · Normal operation (Brake available)

> ⚠ Warning : In normal operation, make sure to set this switch to NOM side.
> (Keep the switch to RLS side only as needed, and make sure to set it on NOM side in ordinary use.)
> The brake would not work even with the servo OFF condition if the switch is on the RLS side. In the vertical oriented mount, the work may drop and cause an injury or the work to be damaged.

10) Field Network Connection Connector
This is a connector to connect each field network.

11) ERC3 Connection Connector
Up to 4 units ERC3 can be connected.

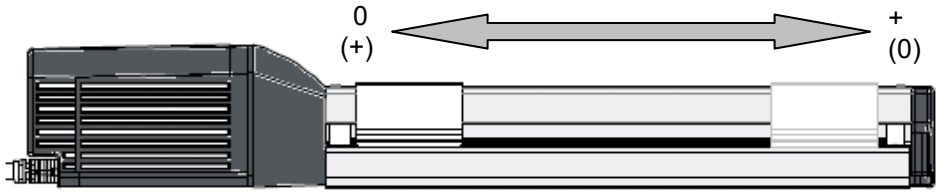
ERC3 Axes

The coordinate system is as shown in the figure below.
0 defines the home position, and items in ( ) are for the home-reversed type (option).

> ⚠ Caution : There are some actuators that are not applicable to the origin reversed type. Check further on the catalog or the Instruction Manual of the actuator.

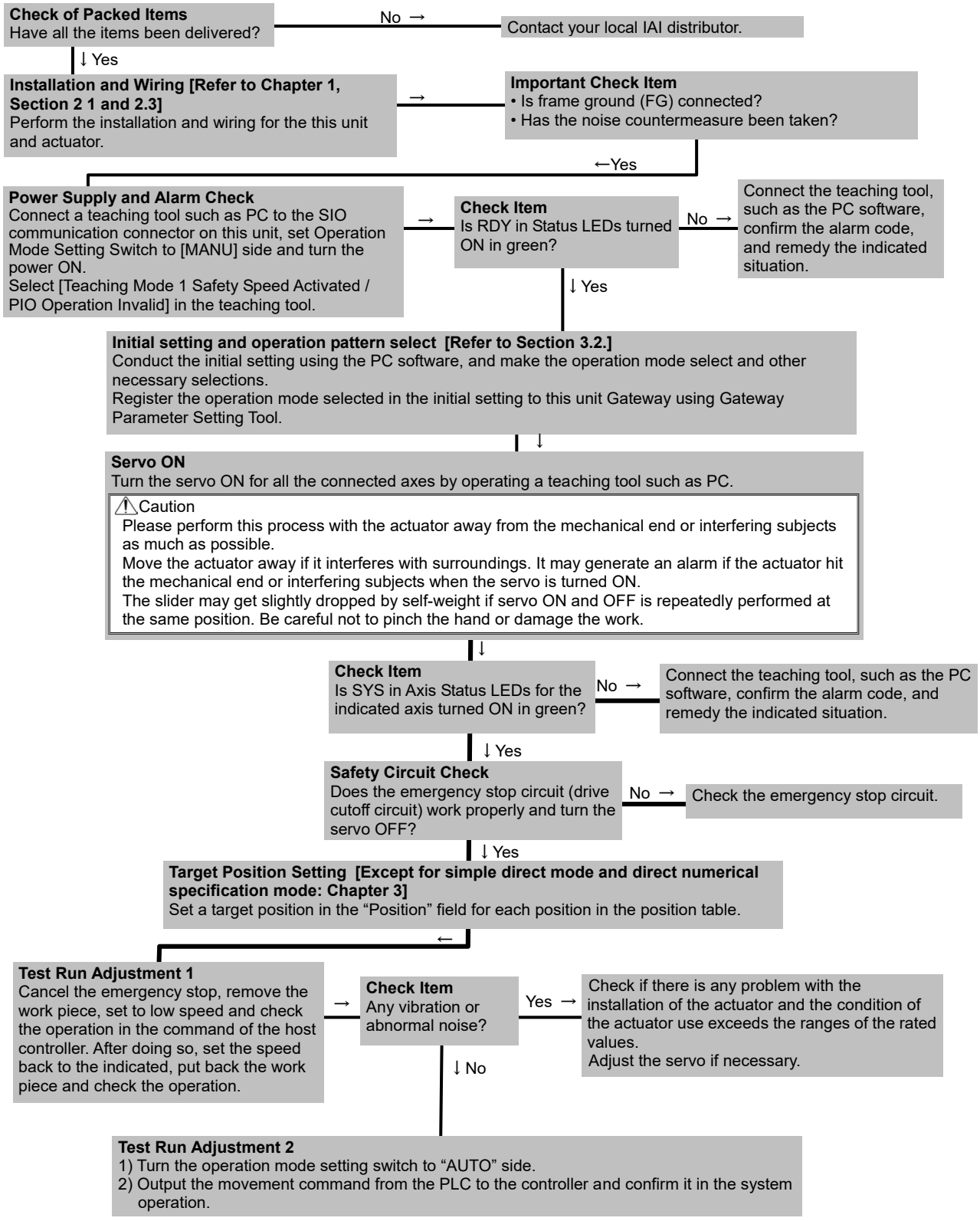
(1) Rod Type

(2) Slider Type



Starting Procedures

When using this product for the first time, work while making sure to avoid omission and incorrect wiring by referring to the procedure below. “PC” stated in this section means “PC software”.



Chapter 1 Specifications Check

1.1 Product Check

1.1.1 Parts

The standard configuration of this product is comprised of the following parts.
If you find any faulty or missing parts, contact your local IAI distributor.

No.	Part Name	Model	Remarks
1	Gateway Unit Main Body	Refer to “How to read the model plate”, “How to read the model”.	
Accessories			
2	Power Connector	FMCD1.5/8-ST-3.5 (Supplier : PHOENIX CONTACT)	
3	CC-Link Connector (For CC-Link Type)	MSTB2.5/5-STF-5.08 AU (Supplier : PHOENIX CONTACT)	
4	DeviceNet Connector (For DeviceNet Type)	SMSTB2.5/5-ST-5.08AU (Supplier : PHOENIX CONTACT)	
5	First Step Guide	ME0301	
6	Instruction Manual (DVD)		
7	Safety Guide	M0194	

1.1.2 Teaching Tool

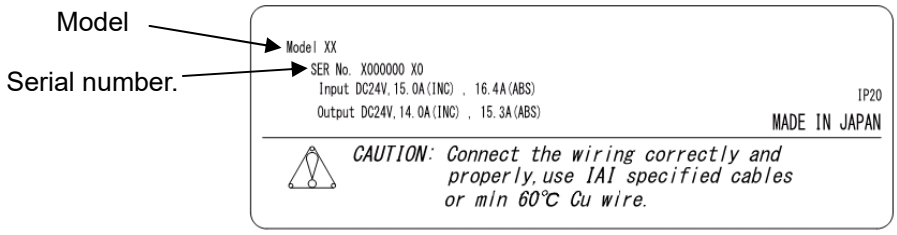
A teaching tool such as PC software is necessary when performing the setup for position setting, parameter setting, etc. that can only be done on the teaching tool.
Please prepare either of the following teaching tools.

No.	Part Name	Model
1	PC Software (Includes RS232C Exchange Adapter + Peripheral Communication Cable)	RCM-101-MW
2	PC Software (Includes USB Exchange Adapter + USB Cable + Peripheral Communication Cable)	RCM-101-USB
3	Touch Panel Teaching Pendant (Standard type) Touch Panel Teaching Pendant (With dead-man switch type) Touch Panel Teaching Pendant (Applicable for Safety Category type)	CON-PTA CON-PDA CON-PGA
4	Touch Panel Teaching Pendant	TB-01 TB-02 TB-03

1.1.3 Instruction Manuals Related to This Product, Which are Contained in the Instruction Manual (DVD).

No.	Name	Manual No.
1	ERC3 Gateway Unit Instruction Manual	ME0302
2	ERC3 Actuator with Integrated Controller Instruction Manual	ME0297
3	PC Software RCM-101-MW/RCM-101-USB Instruction Manual	ME0155
4	Touch Panel Teaching Pendant CON-PTA/CON-PDA/CON-PGA Instruction Manual	ME0295
5	Touch Panel Teaching Pendant TB-01/01D/01DR Applicable for Position Controller Instruction Manual	ME0324
6	Touch Panel Teaching Pendant TB-02/02D Applicable for Position Controller/ELECYLINDER Instruction Manual	ME0355
7	Touch Panel Teaching Pendant TB-03 Applicable for Position Controller/ELECYLINDER Wired Link Instruction Manual	ME0376

1.1.4 How to Read the Model Plate



1.1.5 How to Read the Model

- Gateway unit model

RCM – EGW – DV

<Series>

<Type>
EGW : Drive cutoff relay mounted
EGWG : Drive cutoff relay not mounted

<Type of connected field network>
DV : DeviceNet Type
CC : CC-Link Type
PR : PROFIBUS-DP Type
CN : CompoNet Type
ML : MECHATROLINK Type
EP : EtherNet/IP Type
EC : EtherCAT Type

1.2 Basic Specifications

Specification Item		Specification Contents
Number of Controlled Axes		MAX. 4 axis
Control/Motor Power Supply Voltage		24V DC ±10%
Control Power Capacity		MAX. 1A
Load current (per axis)	High output setting valid (Note1)	Rated 3.5A/ MAX. 4.2A
	High output setting invalid (Note1)	Rated 1.2A/ MAX. 2.0A
Capacity of Brake Release Power Source (per axis)		MAX. 0.15A
Heat Generation	High output setting valid (Note1)	2.5W
	High output setting invalid (Note1)	1.9W
Load Current (Note2)		MAX. 60A
Transient Power Cutoff Durability		20ms
Motor Control System		Refer to the Instruction Manual for the ERC3 Actuator with Integrated Controller
Corresponding Encoder		
Cable length between actuator and gateway		MAX. 10m (Apply the dedicated cable for the connection.)
Serial Communication (dedicated for SIO Port Teaching)		RS485 1ch (complying with Modbus Protocol) Speed : 9.6 to 230.4kbps
External Interface		DeviceNet, CC-Link, PROFIBUS-DP, CompoNet, MECHATROLINK-I/II, EtherNet/IP, EtherCAT
Data Setting and Input		PC software, Touch panel teaching, Gateway parameter create tool
Data Retention Memory		Position data and parameters saved in the non-volatile memory of actuator via Gateway Unit (There is no limitation in number of writing)
Number of positioning points		Maximum 512 points (There is no limit for simple direct and direct indication modes) (Note) The number of positioning points differs depending on the operation pattern select by the parameter setting.
LED Indication (Mounted on Front Panel)		1) Gateway status LEDs 6 points 2) Each axis status LEDs 6 points
Forcibly releasing of electromagnetic brake		Can be released with the brake compulsory release switch installed in the front panel for each axis
Protective Functions		Overcurrent Protection
Protection Function against Electric Shock		Class I basic insulation
Insulation Resistance		DC500V 10M Ω
Cooling Method		Natural air-cooling
External Dimensions		35W×140H×105D
Mass		Approx. 220g (DeviceNet type, CC-Link type, PROFIBUS type, CompoNet type, EtherNet/IP type) Approx. 230g (MECHATROLINK type) Approx. 240g (EtherCAT type)
Environment	Ambient storage temperature	0 to 40°C
	Ambient storage humidity	85%RH or less (non-condensing)
	Ambient environment	[Refer to Installation Environment]
	Ambient storage temperature	-20 to 70°C
	Ambient storage humidity	85%RH or less (non-condensing)
	Usable altitude	1000m or lower above sea level
	Vibration durability	Frequency 10 to 57Hz / Swing width: 0.075mm Frequency 57 to 150Hz / Acceleration: 9.8m/s^2 XYZ Each direction Sweep time: 10 min. Number of sweep: 10 times
	Shock resistance	150mm/s^2 11ms Semi-sine wave pulse three times to each of the directions X, Y and Z
	Protection class	IP20

Note1 Refer to the separate booklet Controller Integrated Actuator for the details of the connected actuator (ERC3).
Note2 Rush current passes for about 50μs after the power is injected.

1.3 Calculation for Power Capacity

For the calculation of 24V DC power capacity, figure out the numbers for (1) to (5) below, and then follow Step (6).

(1) Control Power Current Consumption : 1A ·····1)

(2) Current Consumption of Motor Power Supply:
Sum total of load current + (Number of actuator axes equipped with brake × 0.15A) ·····2)

(3) Current Consumption at Excitation Phase Detection :
Add the inrush current for all connected axes·····3)

(4) Load Current : 60A ·····4)

(5) Selection of Power Supply :
The power source with 1.3 times higher than the rated current should be selected ordinary considering approximately 30% of margin to the load current of 1) + 2) above. However, the current of 3) to 4) flows, even though it is only a short time, select a power source of a type with “peak load application” or with enough capacity considering this high current. The current of 3) to 4) can be avoided from being generated at the same time by changing the timing of cancelling the emergency stop (turning on the motor power) or turning the servo on. There may be a risk of transient voltage drop with the selection with no enough capacity. Be careful especially when selecting a power source equipped with remote sensing.
(Note) When having power sources separately on the control power and the motor power, make sure to short-circuit on the 0V side.

(Reference) Selection of Power Supply Protection Circuit Breaker

It is recommended that the power supply protection is conducted on the primary side (AC power side) of the 24V DC power supply unit.
When selecting the protection breaker, consider the rated cutoff current of the circuit breaker so a cutoff is surely performed even in the case of inrush current of 24V DC power supply unit or a short-circuit of the power supply.

- Rated Breaking Current > Short-circuit Current = Primary Power Supply Capacity / Power Voltage
- (Reference) In-rush Current of IAI Power Supply Unit PS241 = 50 to 60A, 3msec

1.4 Specifications for each Fieldbus

1.4.1 Specifications of DeviceNet Interface

Item	Specification			
Communication Protocol	DeviceNet2.0			
	Group 2 Dedicated Server			
	Network-Powered Insulation Node			
Baud Rate	Automatically follows the master			
Communication System	Master-Slave System (Polling)			
Number of Occupied Channels	Refer to “3.4.1 PLC Address Construction by each Operation Mode”			
Number of Occupied Nodes	1 Node			
Communication Cable Length (Note 2)	Baud Rate	Max. Network Length	Total Branch Line Length	Max. Branch Line Length
	500kbps	100m	39m	6m
	250kbps	250m	78m	
	125kbps	500m	156m	
Communications Cable	Use the dedicated cable.			
Connector (Note 1)	MSTBA2.5/5-G-5.08AU (Manufactured by PHOENIX CONTACT or equivalent)			
Consumption Current of Communication Power Supply	60mA			
Communication Power Supply	24V DC (Supplied from DeviceNet)			

(Note 1) The cable-side connector is a standard accessory. (PHOENIX CONTACT SMSTB2.5/5-ST-5.08AU)
(Note 2) For T branch communication, refer to the Instruction Manuals for the master unit and programmable controller (PLC) to be mounted.

1.4.2 Specifications of CC-Link Interface

Item	Specification					
Communication Protocol	CC-Link ver1.1 or ver2					
Station Type	Remote Device Station (MAX. four stations occupied)					
Baud Rate	10M/5M/2.5M/625k/156kbps					
Communication System	Broadcast Polling System					
Number of Connectable Stations	Refer to “3.4.1 PLC Address Construction by each Operation Mode”					
Communication Cable Length (Note 2)	Baud Rate [bps]	10M	5M	2.5M	625k	156k
	Total Cable Length [m]	100	160	400	900	1200
Communications Cable	Apply the dedicated cable					
Connector (Note 1)	MSTB2.5/5-GF-5.08AU (Manufactured by PHOENIX CONTACT or equivalent)					

(Note 1) The cable-side connector is a standard accessory. (PHOENIX CONTACT MSTB2.5/5-STF-5.08AU)
(Note 2) For T branch communication, refer to the Instruction Manuals for the master unit and PLC to be mounted.

1.4.3 Specifications of PROFIBUS-DP Interface

Item	Specification		
Communication Protocol	PROFIBUS-DP		
Baud Rate	Automatically follows the master		
Communication System	Hybrid System (Master-Slave System or Token Passing System)		
Number of Occupied Stations	Refer to 3.4.1 “PLC Address Construction by each Operation Mode”		
Communication Cable Length	MAX. Total Network	Baud Rate	Cable Type
	100m	12,000/6,000/3,000kbps	Type A Cable
	200m	1,500kbps	
	400m	500kbps	
	1000m	187.5kbps	
	1200m	9.6/19.2/93.75kbps	
Communications Cable	STP cable AWG18		
Connector (Note 1)	9-pin female D-sub Connector		
Transmission Path Format	Bus/Tree/Star		

(Note 1) Please prepare a 9-pin male D-sub connector for the cable-end connector.

1.4.4 Specifications of CompoNet Interface

Item	Specification
Communication System	CompoNet Special Protocol
Communication Type	Remote I/O communication
Baud Rate	Automatically follows the master
Communication Cable Length	Follows CompoNet specifications
Slave Type	Word mixed slave
Available Node Addresses for Setting	0 to 63 (Setting conducted on controller parameter)
Number of Occupied Channels	Refer to “3.4.1 PLC Address Construction by each Operation Mode”
Communications Cable (Note 1)	Round Cable (JIS C3306, VCTF2-core) Flat cable I (with no sheathed) Flat cable II (sheathed)
Connector (Controller side)	XW7D-PB4-R (Manufactured by OMRON or equivalent)

(Note 1) Prepare the communication cable separately.

1.4.5 Specifications of MECHATROLINK-I/II Interface

Item		Specification
Slave Type		Intelligent I/O
Baud Rate	MECHATROLINK I	4Mbps
	MECHATROLINK II	10Mbps
Max. Transmittable Distance		50m
Min. Distance between Stations		0.5m
Number of Occupied Bytes		Refer to “3.4.1 PLC Address Construction by each Operation Mode”
Number of Connectable Slaves	MECHATROLINK I	15 Stations
	MECHATROLINK II	30 Stations (repeater is required for connections of more than 17 stations)
Transmission Frequency		1 to 8ms
Data Length	MECHATROLINK I	17 bytes
	MECHATROLINK II	17/32 bytes
Settable Node Address Range		61 to 7F [hex.]
Communications Cable (Note 1)		STP cable (characteristic impedance 130Ω)
Controller	Controller side	DUSB-ARB82-T11A-FA (Manufactured by DDK or equivalent)

(Note 1) Prepare the communication cable separately.

1.4.6 Specifications of EtherNet/IP Interface

Item	Specification
Communication Protocol	IEC61158 (IEEE802.3)
Baud Rate	10BASE-T/100BASE-T (Autonegotiation setting is recommended)
Communication Cable Length	Follows EtherNet/IP specifications (Distance between hub and each node: 100m max.)
Number of Connection	Master Unit
Available Node Addresses for Setting	0.0.0.0 to 255.255.255.255
Communications Cable (Note 1)	Category 5 or more (Double shielded cable braided with aluminum foil recommended)
Connector	RJ45 Connector × 1pc

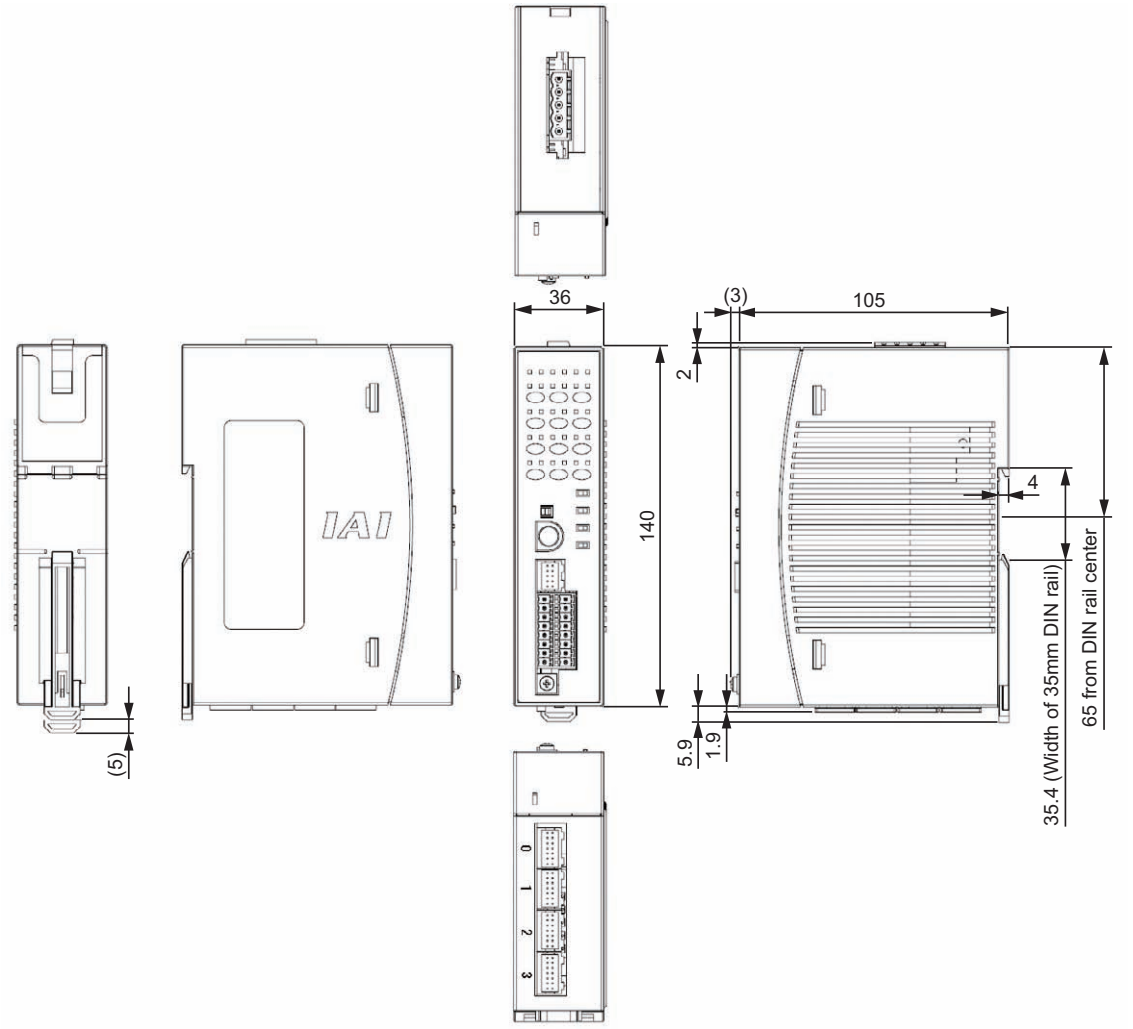
(Note 1) Prepare a LAN cable separately for the connection cable.

1.4.7 Specifications of EtherCAT Interface

Item	Specification
Communication Protocol	IEC61158 type 12
Physical Layer	100Base-TX (IEEE802.3)
Baud Rate	Automatically follows the master
Communication Cable Length	Follows EtherCAT® specifications (Distance between each node: 100m max.)
Slave Type	I/O slave
Applicable Node Address	0 to 127 (17 to 80: When connected to the master (CJ1W-NC*82) manufactured by OMRON)
Communications Cable (Note1)	Category 5 or more (Double shielded cable braided with aluminum foil recommended)
Connector	RJ45 Connector × 2pcs (Input × 1, Output × 1)
Connection	Daisy chain only

(Note 1) Prepare a LAN cable separately for the connection cable.

1.5 External Dimensions



1.6 Option

1.7 Installation and Storage Environment

This product is capable for use in the environment of pollution degree 2[*1] or equivalent.
*1 Pollution Degree 2 : Environment that may cause non-conductive pollution or transient conductive pollution by frost (IEC60664-1)

[1] Installation Environment

Do not use this product in the following environment.

- Location where the surrounding air temperature exceeds the range of 0 to 40°C
- Location where condensation occurs due to abrupt temperature changes
- Location where relative humidity exceeds 85%RH
- Location exposed to corrosive gases or combustible gases
- Location exposed to significant amount of dust, salt or iron powder
- Location subject to direct vibration or impact
- Location exposed to direct sunlight
- Location where the product may come in contact with water, oil or chemical droplets
- Environment that blocks the air vent [Refer to 1.8 Noise Elimination and Mounting Method]

When using the product in any of the locations specified below, provide a sufficient shield.

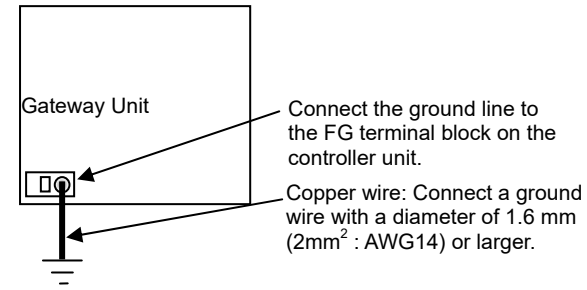
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

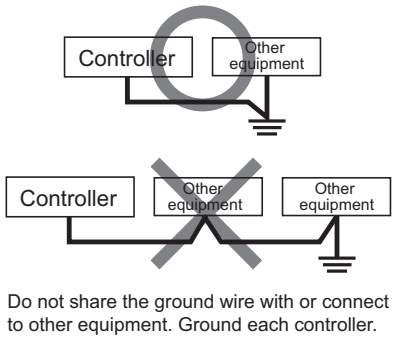
[2] Storage and Preservation Environment

- Storage and preservation environment follows the installation environment. Especially, when the product is to be left for a long time, pay special attention to condensed water.
  Unless specially specified, moisture absorbency protection is not included in the package when the machine is delivered. In the case that the machine is to be stored in an environment where dew condensation is anticipated, take the condensation preventive measures from outside of the entire package, or directly after opening the package.

1.8 Noise Elimination and Mounting Method

(1) Noise Elimination Grounding (Frame Ground)



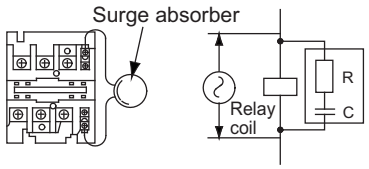


Do not share the ground wire with or connect to other equipment. Ground each controller.

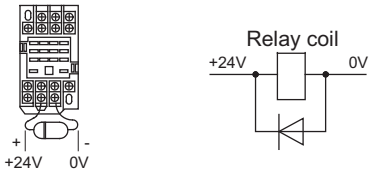
(2) Precautions regarding wiring method
1) Wire is to be twisted for the power supply.
2) Separate the signal and encoder lines from the power supply and power lines.

(3) Noise Sources and Elimination
Carry out noise elimination measures for electrical devices on the same power path and in the same equipment.
The following are examples of measures to eliminate noise sources.

1) AC solenoid valves, magnet switches and relays
[Measure] Install a Surge absorber parallel with the coil.

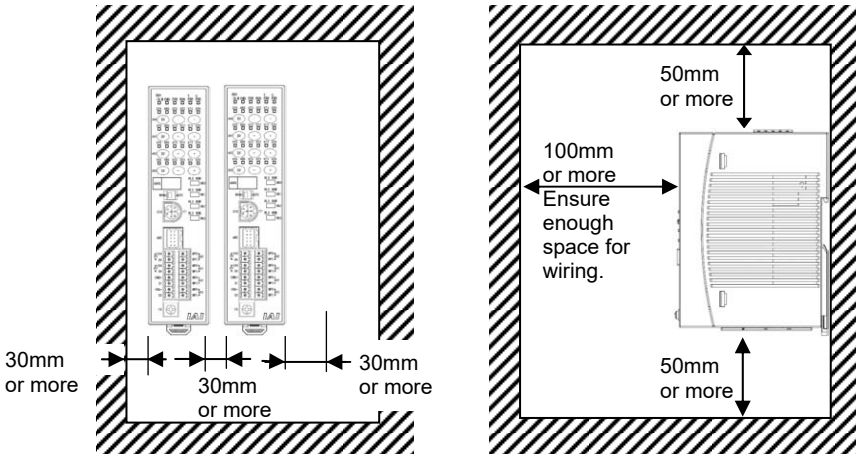


2) DC solenoid valves, magnet switches and relays
[Measure] Mount the windings and diodes in parallel.
Select a diode built-in type for the DC relay.

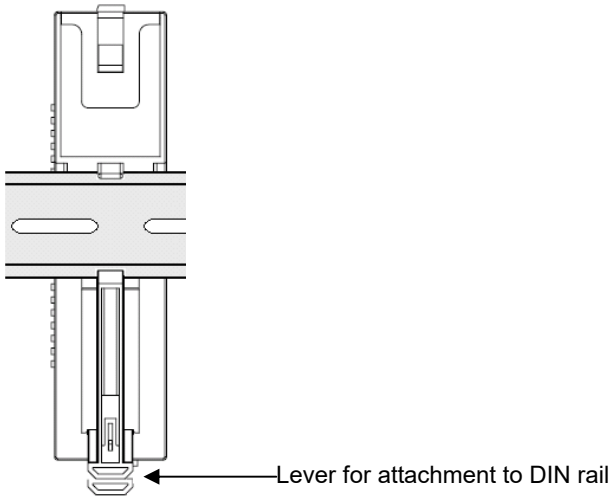


(4) Cooling Factors and Installation

Design and Build the system considering the size of the controller box, location of the controller and cooling factors to keep the ambient temperature around the controller below 40°C.

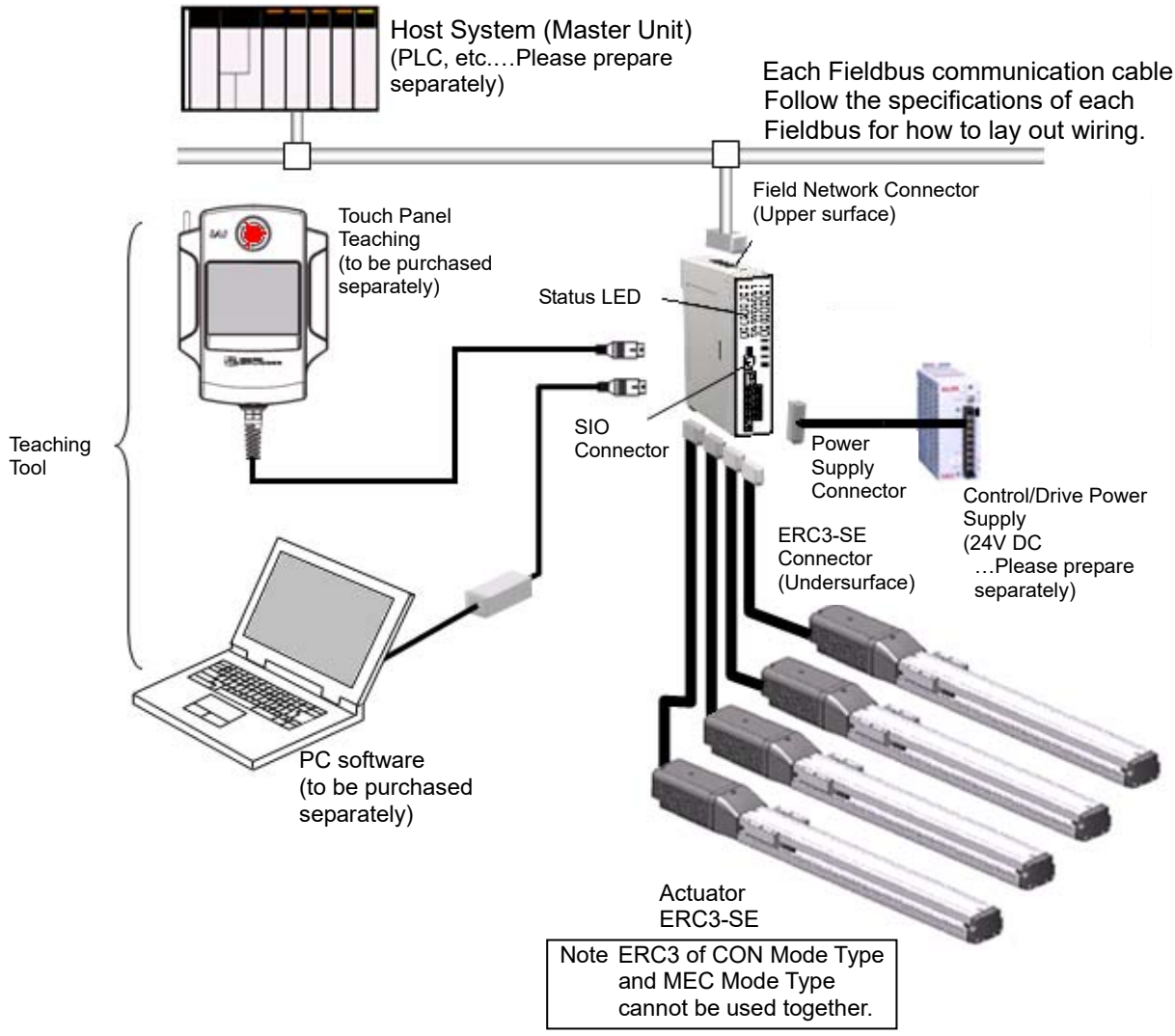


For the Gateway attachment, affix it on the DIN rail.



Chapter 2 Wiring

2.1 Wiring Diagram (Connection of Construction Devices)



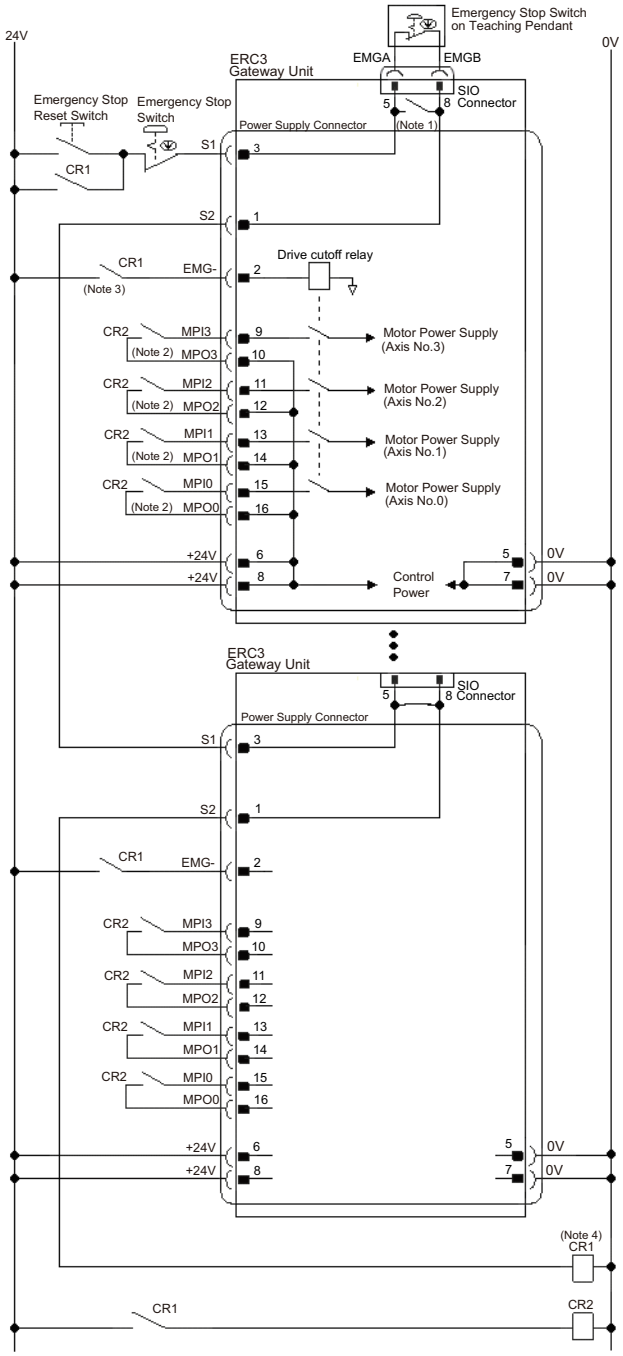
Note ERC3 of CON Mode Type and MEC Mode Type cannot be used together.

⚠ Caution: Make sure to turn the power to the controller OFF when inserting or removing the connector that connects the PC software or teaching pendant to the controller. (For touch panel teaching, insertion and removal of the active line is available.) Inserting or removing the connector while the power is turned ON causes a controller failure.

2.2 Circuit Diagram

Sample circuit diagrams are shown below.

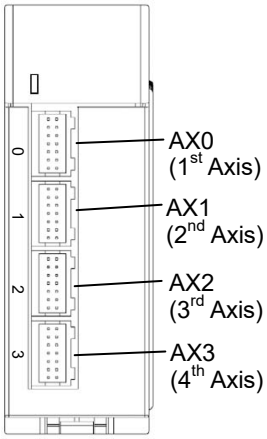
[1] Power Supply and Emergency Stop (when drive cutoff is conducted to all the axes at the same time)

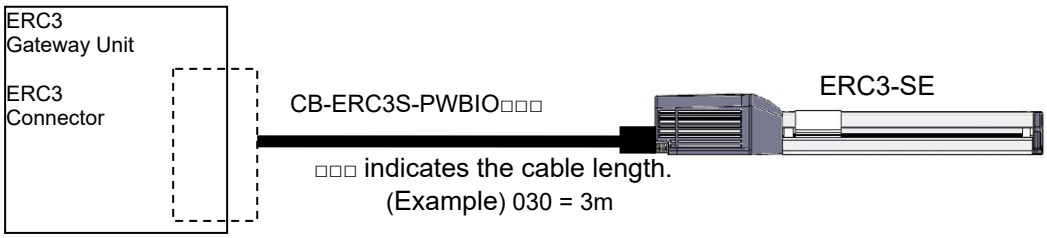


Note 1 When the teaching pendant is not connected, S1 and S2 become short-circuited inside the controller.
Note 2 When the motor power must be disconnected externally for safety category compliance, apply a safety rated contactor between MPI* and MPO*.
Note 3 The rating for the emergency stop signal (EMG-) to turn ON/OFF at contact CR1 is 24V DC and 10mA.
Note 4 For CR1, select the one with coil current 0.1A or less.
Note 5 It is recommended to have a switch on the primary (AC) side of 24V DC power supply unit to turn ON/OFF the control power supply. If the power is to be turned on/off on the secondary (24V DC) side, keep the 0V being connected and connect/disconnect the +24V.

[2] Motor • Encoder Circuit

⚠ Caution : Refer to the figure below to plug the actuators correctly.
Check in the instruction manual of each actuator for the details (connection layout diagram) of each cable.



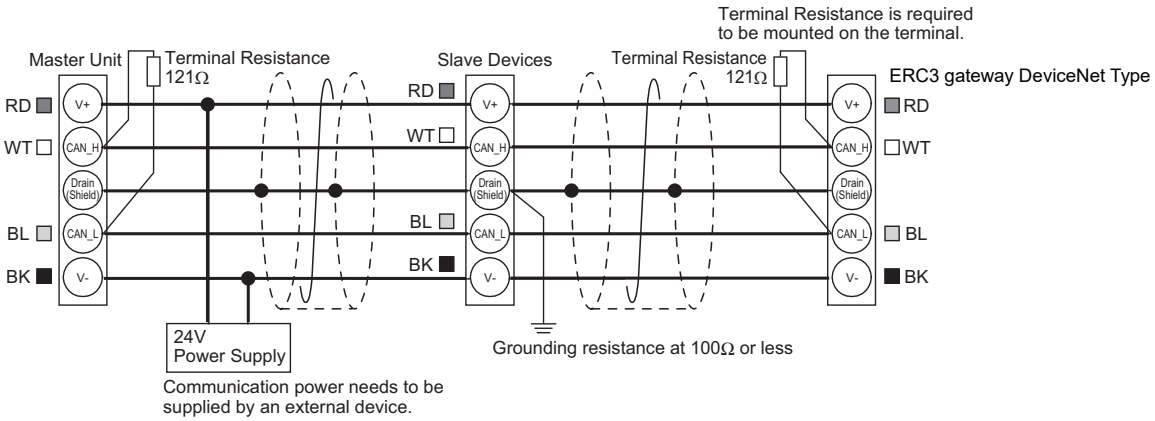


(Note) ERC3 of CON Mode Type and MEC Mode Type cannot be used together.

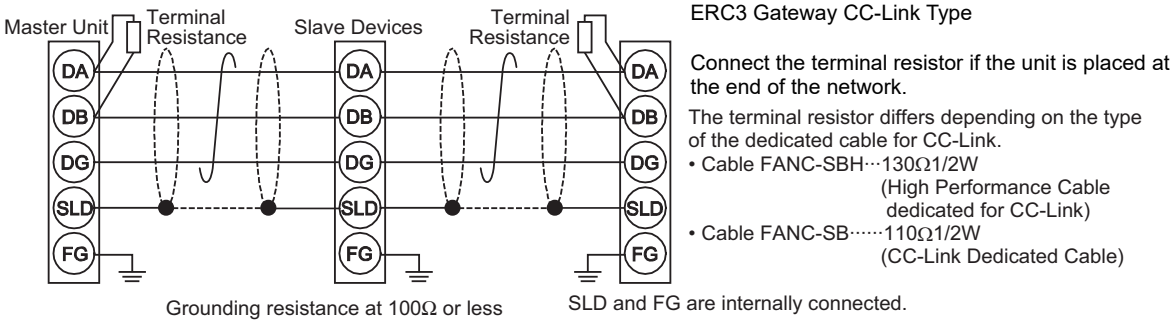
[3] Wiring Layout for Field Network

Follow the instruction manual of the master unit for each field network and the constructing PLC for the details of how to connect the cables.

1) DeviceNet Type



2) CC-Link Type



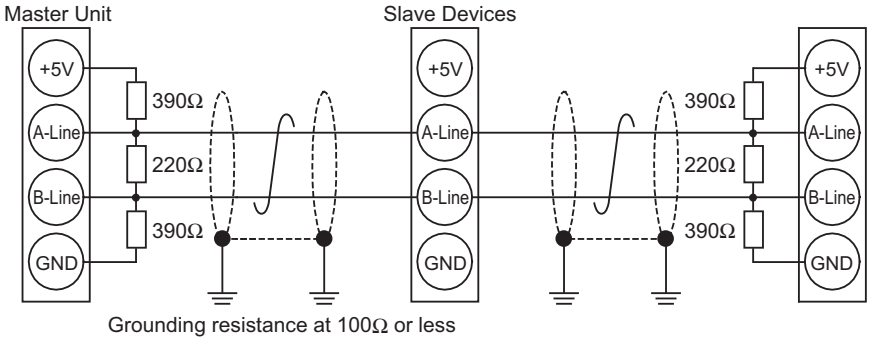
ERC3 Gateway CC-Link Type

Connect the terminal resistor if the unit is placed at the end of the network.

The terminal resistor differs depending on the type of the dedicated cable for CC-Link.

- Cable FANC-SBH···130Ω1/2W (High Performance Cable dedicated for CC-Link)
- Cable FANC-SB·····110Ω1/2W (CC-Link Dedicated Cable)

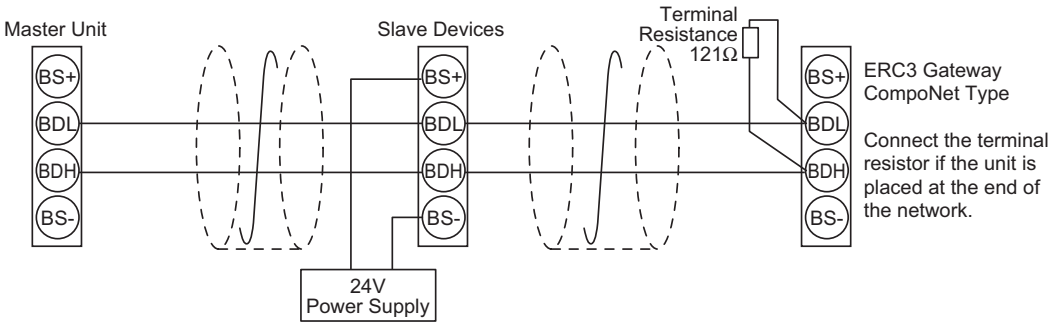
3) PROFIBUS-DP Type



ERC3 Gateway PROFIBUS Type

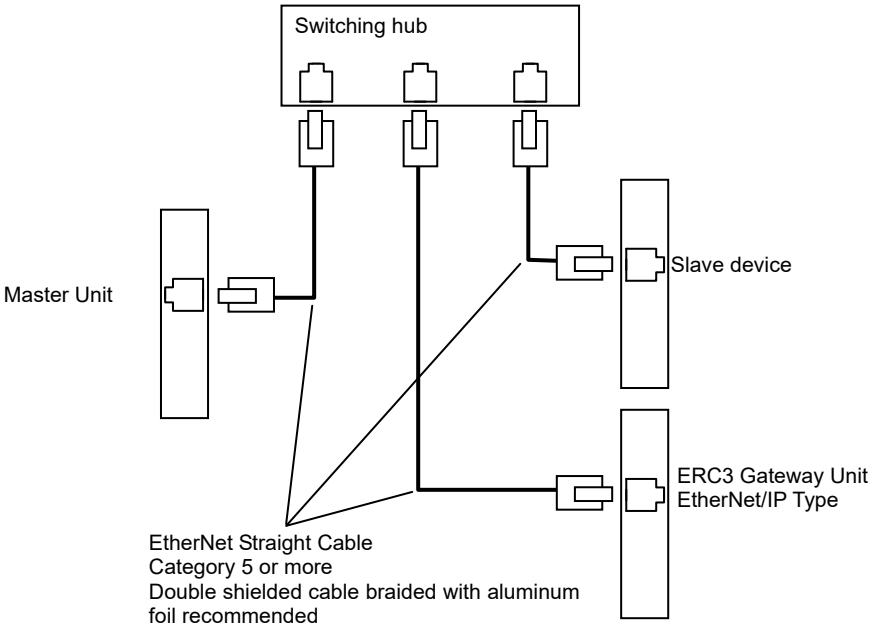
Connect the terminal resistor if the unit is placed at the end of the network.

4) CompoNet Type

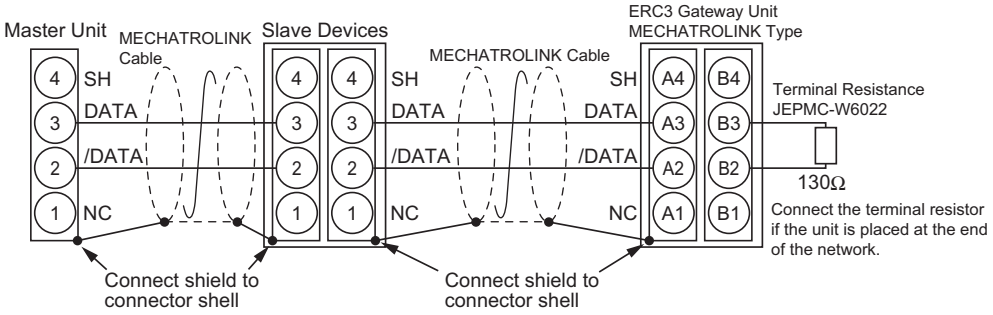


Supply power separately to the slave devices that requires the communication power supply.
It is not necessary to supply communication power to ERC3 Gateway Unit, however, there is no problem even if communication power is supplied.

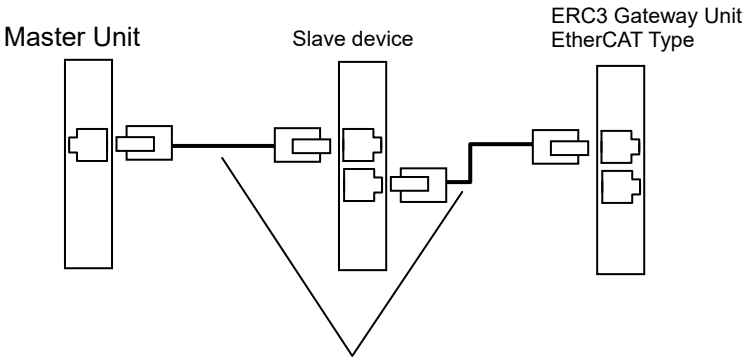
5) EtherNet/IP Type



6) MECHATROLINK Type



7) EtherCAT Type



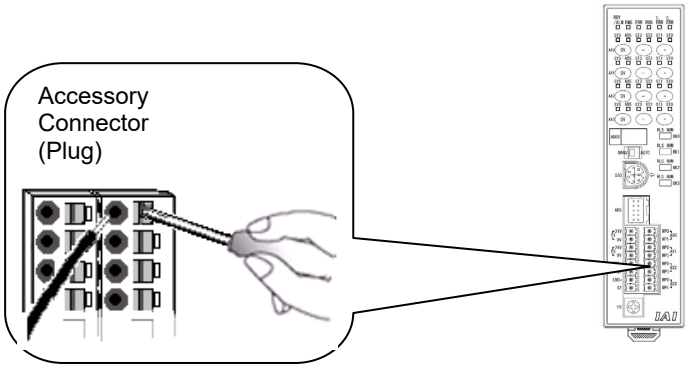
EtherNet Straight Cable
Category 5 or more
Double shielded cable braided with aluminum foil recommended

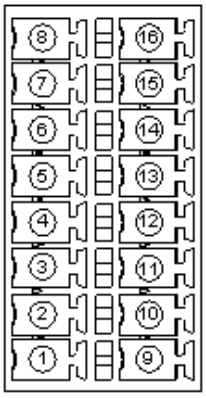
(Note) Terminal resistor is not required.

2.3 Wiring Method

2.3.1 Connection to Power Input Connector

The wire of the power supply is to be connected to the enclosed connector (plug).
Strip the sheath of the applicable wires for 10mm and insert them to the connector. Push a protrusion beside the cable inlet with a small slotted screwdriver to open the inlet. Once the cable is inserted, take the slotted screwdriver OFF the protrusion to fix the cable to the terminal.





Front view of connector on controller side

Connector Name	Power Connector	
Cable Side	FMCD1.5/8-ST-3.5	Enclosed in standard package Manufactured by PHOENIX CONTACT
Controller Side	MCDN1,5/8-G1-3,5P26THR	

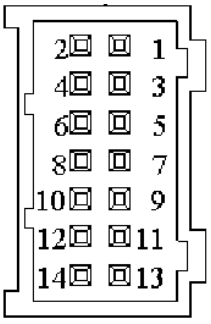
Pin No.	Signal Name	Description	Applicable cable diameter
1	S2	Provide a contact output for the emergency-stop switch on the teaching pendant	KIV0.5mm^2 (AWG20)
2	EMG-	Emergency stop signal input	
3	S1	Provide a contact output for the emergency-stop switch on the teaching pendant	
4	EMG+	For emergency stop power output	
5	0V(P2)	Power input for gateway and actuator	KIV1.25 to 0.5mm^2 (AWG16 to 20) Select the cable thickness allowable for the current figured out in the power capacity.
6	24V(P2)		
7	0V(P1)		
8	24V(P1)		
9	MPI3	Motor power external input for 4th axis	
10	MPO3	Motor power external output for 4th axis	
11	MPI2	Motor power external input for 3rd axis	
12	MPO2	Motor power external output for 3rd axis	
13	MPI1	Motor power external input for 2nd axis	
14	MPO1	Motor power external output for 2nd axis	
15	MPI0	Motor power external input for 1st axis	
16	MPO0	Motor power external output for 1st axis	

(Note) It is recommended to have a switch on the primary (AC) side of 24V DC power supply unit to turn ON/OFF the control power supply. If the power is to be turned ON/OFF on the secondary (24V DC) side, keep the 0V being connected and connect/disconnect the +24V.

2.3.2 Connection with ERC3 Actuators

Connection to ERC3 actuators should be made with the dedicated cables.
See the instruction manual for ERC3 Controller Integrated Actuator for the details of the connection cable.

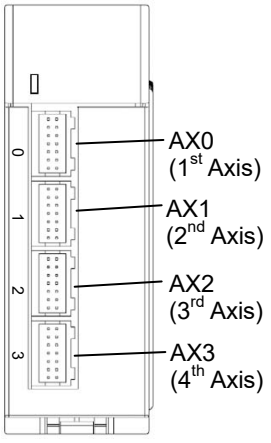
Connector Name	ERC3 Connector
Cable Side	PADP-14V-1-S
Controller Side	S14B-PADSS-1(LF)(SN)



Front view of connector on controller side

Pin No.	Signal Name	Description	Applicable cable diameter
1	SGB	RS485 differential negative side	Cable dedicated for IAI products
2	SGA	RS485 differential positive side	
3	EMG	Emergency stop output	
4	BKR	Brake release 24V power supply	
5	BAT	Battery power supply	
6	GND		
7	CP	Actuator control power supply	
8	GND		
9	MP	Motor drive power supply	
10	GND		
11	N.C.	Not used	
12	N.C.	Not used	
13	N.C.	Not used	
14	FG	Frame ground	

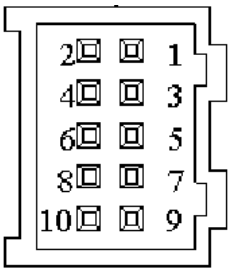
⚠ Caution : Refer to the figure below to plug the actuators correctly.
Check in the instruction manual of each actuator for the details (connection layout diagram) of each cable.



2.3.3 Connection to Battery Connector

This is a connector for future extension.

Connector Name	Absolute Battery Connector
Cable Side	PADP-10V-1-S
Controller Side	S10B-PADSS-1(LF)(SN)

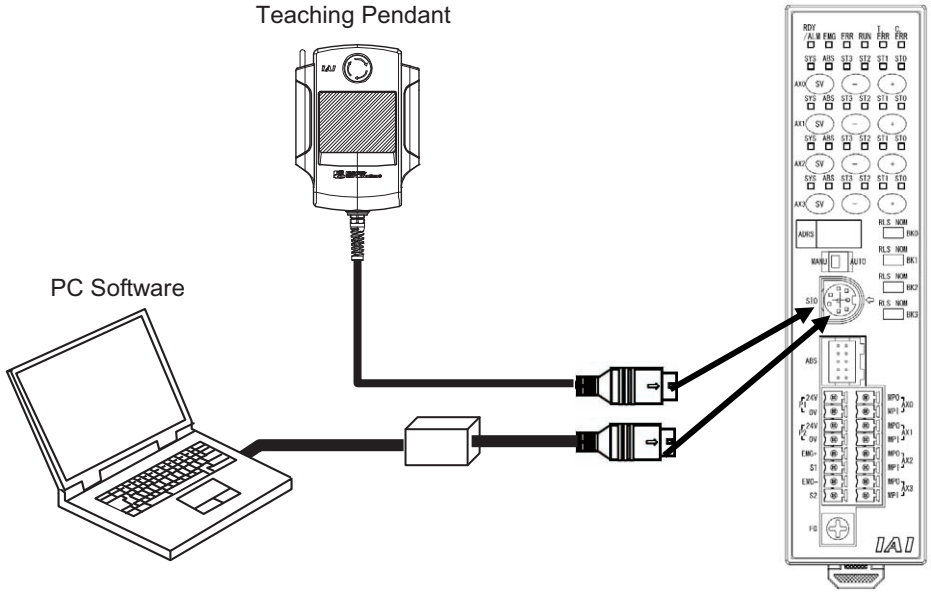


Front view of connector on controller side

Pin No.	Signal Name	Description	Applicable cable diameter
1	CP24V	Battery box control power output	Cable dedicated for IAI products
2	GND		
3	BAT0	Absolute battery power supply for 1st axis	
4	BAT1	Absolute battery power supply for 2nd axis	
5	BAT2	Absolute battery power supply for 3rd axis	
6	BAT3	Absolute battery power supply for 4th axis	
7	GND	0V	
8	SGB	RS485 differential negative side	
9	SGA	RS485 differential positive side	
10	GND	0V	

2.3.4 Connection of SIO Connector

Connect an teaching tool such as the PC software.



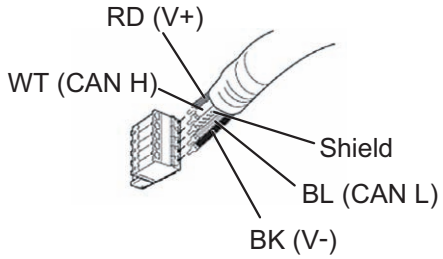
Connector Name	SIO Connector	
Cable Side	miniDIN 8 pin	
Controller Side	TCS7587-0121077	

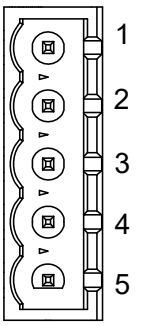
Pin No.	Signal Name	Description	Applicable cable diameter
1	SGA	Teaching tool signal +	Cable dedicated for IAI products
2	SGB	Teaching tool signal -	
3	5V	Power supply for teaching tool	
4	ENB	Enable signal input	
5	EMGA	Emergency stop signal A	
6	24V	Power supply for teaching tool	
7	0V	0V	
8	EMGB	Emergency stop signal B	
Shell	0V	0V	

2.3.5 Wiring Layout of Fieldbus Connector

Check the instruction manuals for each Field network master unit and mounted PLC for the details.

1) DeviceNet Type





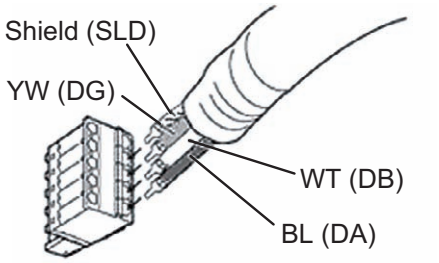
Front view of connector on controller side

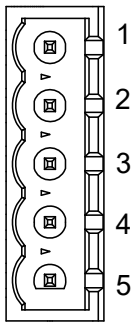
Connector Name	DeviceNet Connector	
Cable Side	SMSTB2.5/5-ST-5.08AU	Enclosed in standard package Manufactured by PHOENIX CONTACT
Controller Side	MSTBA2.5/5-G-5.08AU	

Pin No.	Signal Name (Color)	Description	Applicable cable diameter
1	V- (BK)	Power supply cable negative side	Dedicated cable for DeviceNet
2	CAN L (BL)	Communication data Low side	
3	Shield (None)	Shield	
4	CAN H (WT)	Communication data High side	
5	V+ (RD)	Power supply cable positive side	

Note Connect a terminal resistor (121Ω) between CAN L and CAN H if the unit comes to the end of the network. [Refer to 2.2 [4] Wiring Layout of Field Network]

2) CC-Link Type





Front view of connector on controller side

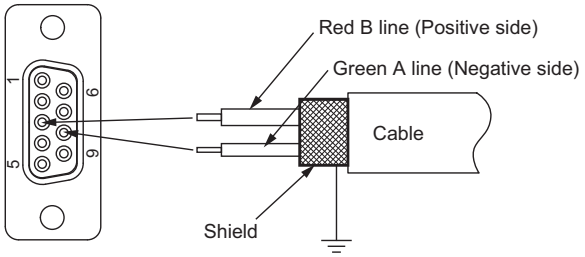
Connector Name	CC-Link Connector	
Cable Side	MSTB2.5/5-STF-5.08 AU	Enclosed in standard package Manufactured by PHOENIX CONTACT
Controller Side	MSTB2.5/5-GF-5.08 AU	

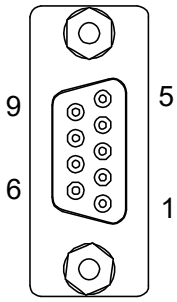
Pin No.	Signal Name (Color)	Description	Applicable cable diameter
1	DA (BL)	Communication line A	Dedicated cable for CC-Link
2	DB (WT)	Communication line B	
3	DG (YW)	Digital GND	
4	SLD	Connect the shield of the shielded cable (Connect the FG of the 5 pins and controller FG internally)	
5	FG	Frame Ground (Connect the SLD of the 4 pins and controller FG internally)	

Note Connect a terminal resistor between DA and DB if the unit comes to the end of the network. [Refer to 2.2 [4] Wiring Layout of Field Network]

3) PROFIBUS-DP Type

Use the type A cable for PROFIBUS-DP (EN5017).





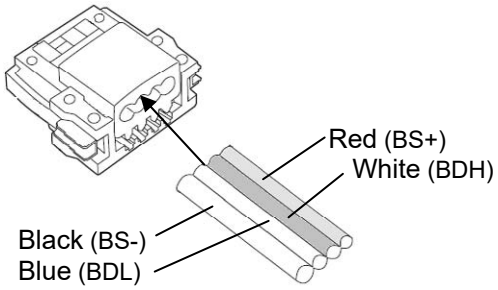
Front view of connector on controller side

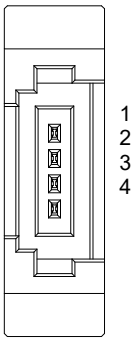
Connector Name	PROFIBUS-DP Connector	
Cable Side	9-pin D-sub Connector (Male)	Please prepare separately
Controller Side	9-pin D-sub Connector (Female)	

Pin No.	Signal Name	Description	Applicable cable diameter
1	NC	Disconnected	PROFIBUS-DP Dedicated Cable
2	NC	Disconnected	
3	B-Line	Communication line B (RS485)	
4	RTS	Request for sending	
5	GND	Signal GND (Insulation)	
6	+5V	+5V output (Insulation)	
7	NC	Disconnected	
8	A-Line	Communication line A (RS485)	
9	NC	Disconnected	

Note Connect a terminal resistor (220Ω) between A-line and B-line if the unit comes to the end of the network. [Refer to 2.2 [4] Wiring Layout of Field Network]

4) CompoNet Type





Front view of connector on controller side

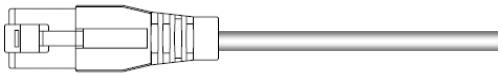
Connector Name	CompoNet Connector	
Cable Side	Prepare a connector complied with CompoNet standards.	
Controller Side	XW7D-PB4-R	Manufactured by OMRON

Pin No.	Signal Name	Description	Applicable cable diameter
1	BS+(RD)	Communication power supply+ (Note1)	CompoNet Dedicated Cable
2	BDH(WT)	Signal line H side	
3	BDL(BL)	Signal line L side	
4	BS- (BK)	Communication power supply- (Note1)	

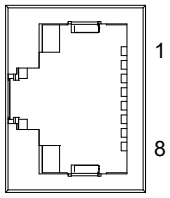
Note 1 It is not necessary to supply the communication power. (Internal power source is used.)
If conducting multi power supply to other slave devices via communication cables, there is no problem with connecting the power supply to BS+ and BS- terminals.

Note 2 Connect a terminal resistor (121Ω) between BDH and BDL if the unit comes to the end of the network. [Refer to 2.2 [4] Wiring Layout of Field Network]

5) EtherNet/IP Type



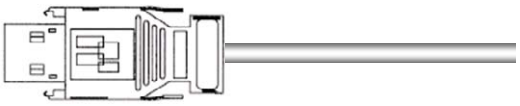
Connector Name	EtherNet/IP Connector	
Cable Side	8P8C Modular Plug	
Controller Side	8P8C Modular Jack	



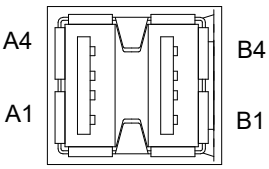
Front view of connector on controller side

Pin No.	Signal Name (Color)	Description	Applicable cable diameter
1	TD+	Sent data +	For EtherNet cable, use a straight STP cable that possesses the performance of Category 5 or more.
2	TD-	Sent data -	
3	RD+	Received data +	
4	–	Not used	
5	–	Not used	
6	RD-	Received data -	
7	–	Not used	
8	–	Not used	

6) MECHATROLINK Type



Connector Name	MECHATROLINK Connector	
Cable Side	Prepare a connector complied with MECHATROLINK standards.	
Controller Side	DUSB-ARB82-T11A-FA	Manufactured by DDK

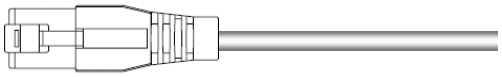


Front view of connector on controller side

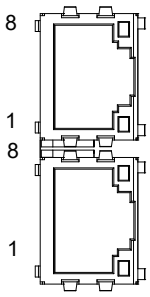
Pin No.	Signal Name (Color)	Description	Applicable cable diameter
A1/B1	NC	Disconnected	MECHATROLINK Dedicated Cable
A2/B2	/DATA	Signal line - side	
A3/B3	DATA	Signal line + side	
A4/B4	SH	Shield	

Note Connect a terminal resistor (JEPMC-W6022) between DATA and /DATA if the unit comes to the end of the network. [Refer to 2.2 [4] Wiring Layout of Field Network]

7) EtherCAT Type



Connector Name	EtherCAT Connector	
Cable Side	8P8C Modular Plug	
Controller Side	8P8C Modular Jack	



Front view of connector on controller side

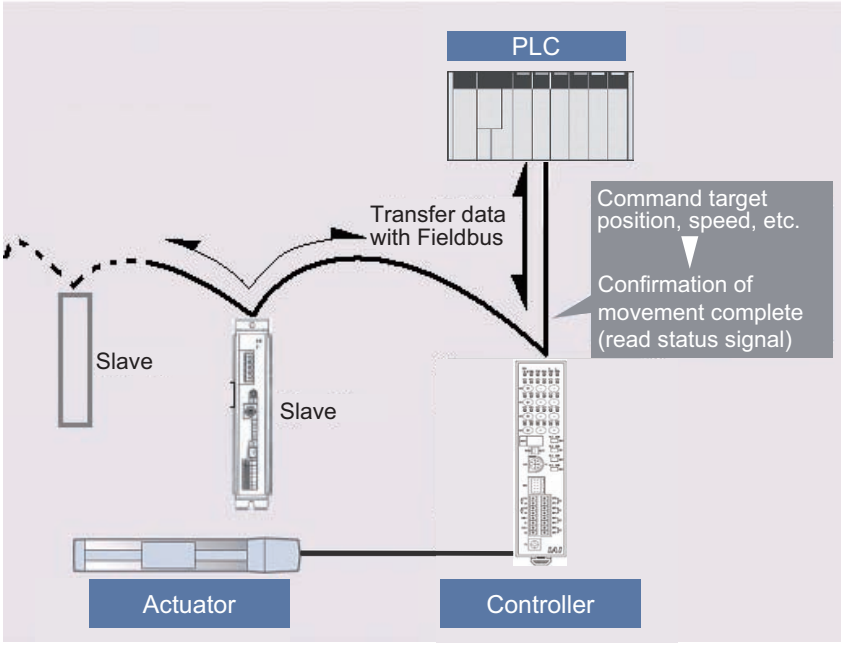
Pin No.	Signal Name (Color)	Description	Applicable cable diameter
1	TD+	Sent data +	For EtherNet cable, use a straight STP cable that possesses the performance of Category 5 or more.
2	TD-	Sent data -	
3	RD+	Received data +	
4	–	Not used	
5	–	Not used	
6	RD-	Received data -	
7	–	Not used	
8	–	Not used	

Chapter 3 Operation

3.1 Basic Operation

3.1.1 Basic Operation Methods

There are slider type and rod type in ERC3, however, unless otherwise specified in this manual, the operational control methods should be the same.

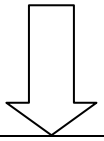


[Basic Operation Procedures]

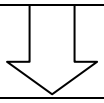
[1] Set the ERC3 parameters with using a teaching tool such as PC software.
1) Set Parameter No.25 PIO Patterns if using Remote I/O Mode in the operation modes [Refer to next page].
2) Set the zone (Parameters No.1 and 2) and soft limit (Parameter No.3 and 4) that suit to the system.
[Refer to ERC3 Actuator with Integrated Controller Instruction Manual for more information]

[2] Initial Setting [Refer to Section 3.2 and 3.7]
Establish the settings for those such as the slave addresses in the field network using Gateway Parameter Setting Tool. Also set the operation modes to use for each of the connected ERC3.
1) Establish the setting following the procedure described in Section 3.2.
2) Set the gateway parameters to suit the system to be used.
Establish such settings as the calendar function (clock setting) use or the speed unit change in Direct Indication Mode.

[3] Setting of Position Data [Refer to Section 3.3]
(Note) Setting of Direct Indication Mode is not necessary.
Set the data for those to be used such as target position, speed, etc. to the position data.
Position data differs for CON Mode type and MEC Mode type. Have the suitable setting.



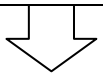
[4] Field Network Setting [Refer to Section 3.4.1 and 3.4.2]
Assign ERC3 Gateway to PLC (master unit).
[Refer to the instruction manuals for the master unit and PLC]



[5] Link to Network
1) Set the operation mode setting switch in the front of Gateway to AUTO side and reboot the ERC3 Gateway power supply. (By putting to AUTO, field network line activates.)
2) Once the link to PLC (master unit) is established (Note 1), turn ON MON Signal of the gateway control signals (Note 2). Control from the field network is available while MON Signal is ON.

Note 1 By referring to the field network LED display shown in the section of the names for each part and the function in the top of this manual, confirm that the communication is established in the normal condition.

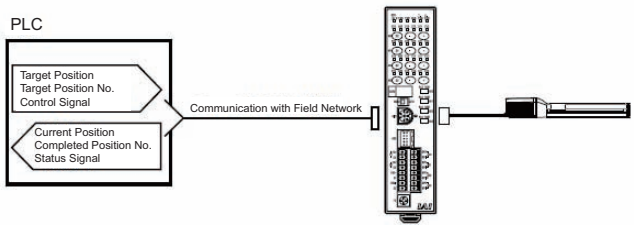
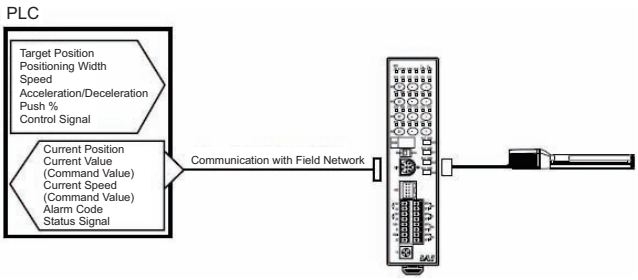
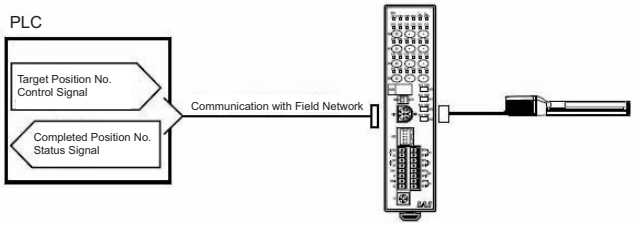
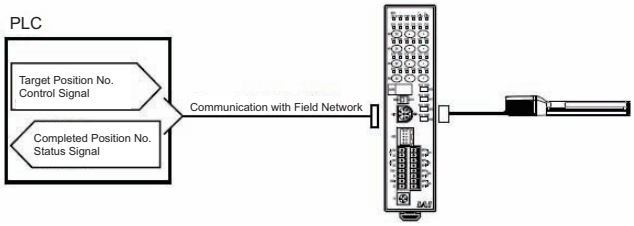
Note 2 Refer to Section 3.4.3 Control Signals of Gateway.



[6] Operation Control in Each Operation Mode [Refer to Section 3.4.4 to 3.6.]
1) Send the information of the target position, speed, acceleration/deceleration, etc. from PLC (master unit) to the controller.
2) The actuator follows the received information of the target position, speed, acceleration/deceleration, etc. to perform a positioning at the specific coordinates.
3) Confirm the status of positioning complete.

This is the end of the basic way of operation.

● Operation Mode Available
5 types of operation modes are available to select from.
Explained below is the outline.

Operation Pattern	Description	Overview
Positioner 1	In Positioner 1 Mode, 512 points of position data can be registered at the maximum and is able to stop at the registered positions. Monitoring of the current position is also available.	
Simple Direct Mode	In Simple Direct Mode, the target position can be indicated directly by inputting a value. Monitoring of the current position is also available.	
Direct Numeric Specification Mode	The target position, speed acceleration/deceleration and pressing current limit can be indicated with inputting a number. Monitoring of not only the current position, but also the current speed and indicated current are available.	
Positioner 2 Mode	This is the operation mode of the position data of 512 points at maximum set in the position table. The monitoring of the current position is not available This mode is that the transferred data is reduced from Positioner 1 Mode.	
Positioner 3 Mode	This is the operation mode of the position data of 256 points at maximum set in the position table. The monitoring of the current position is not available. This is the mode to control with the minimized number of signals to perform the positioning operation by reducing the amount of sent and received data from Positioner 2 Mode.	
I/O	6 types (Note) of control same as for PIO (CON Mode) are available. Note They can be switched around in PIO patterns on ERC3 unit 2 types (Note) of control same as for PIO (MEC Mode) are available. Note They can be switched around in operation patterns on ERC3 unit	Refer to ERC3 Actuator with Integrated Controller Instruction Manual

3.1.2 Parameter Settings

Parameter data should be set appropriately according to the applicaiton requirements. Parameters are variables to be set to meet the use of the controller in the similar way as settings of the ringtone and silent mode of a cell phone and settings of clocks and calendars.

(Example)

Software Stroke Limit : Set a proper operation range for definition of the stroke end, prevention of interferences with peripherals and safety.

Zone Output : Set to require signal outputs in an arbitrary position zone within the operation zone.

Parameters should be set to meet the use of the controller prior to operation. Once set, they may not set every operation.

Check the Chapter 4 for the parameter types and the details.

3.2 Initial Setting

The settings are to be conducted with RC PC Software (Note) or Touch Panel Teaching (Note). Also the setting for the operation mode is to be conducted with Gateway Parameter Setting Tool (Ver. 1.2.0.0 or later).

(Note) Connectable teaching tools should be checked in 1.1.2 Teaching Tool.
Also, for the applicable version of each teaching tool, refer to the instruction manual of each. [Refer to 1.1.3 Instruction Manuals Related to This Product, Which are Contained in the Instruction Manual (DVD)]

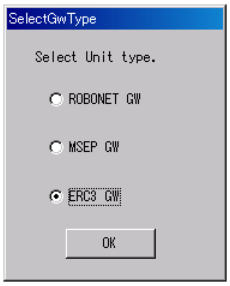
Shown below is the process for the setup. Follow the instruction to conduct the setting properly.

[Preparation] Install RC PC Software and Gateway Parameter Setting Tool. For Gateway Parameter Setting Tool, install the file stored in the CD-ROM for PC software, or download from our homepage.
[Refer to the instruction manual of the PC software for the details of the PC software.]

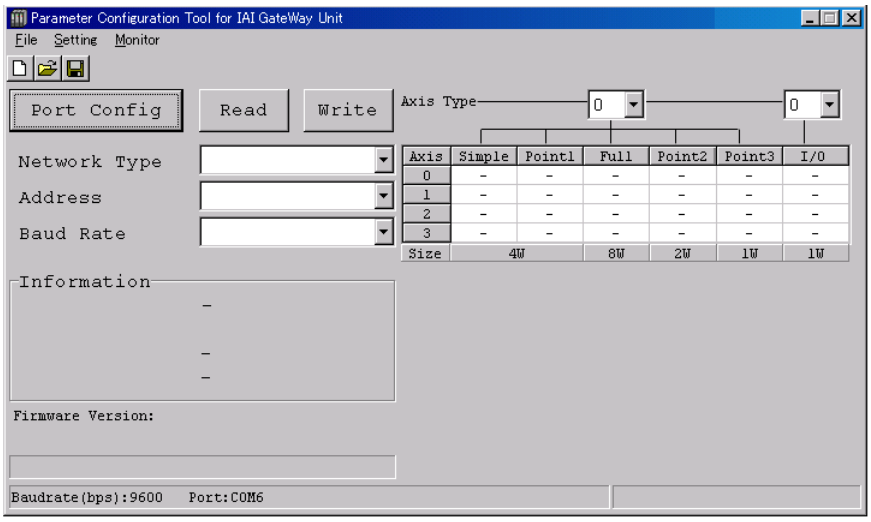
Make sure the power, system I/O connector wires and operation mode setting switch are in MANU condition when having the setting done.

[Step 1] Connect the PC to SIO connector on ERC3 Gateway Unit with using the cable enclosed in RC PC software, and start up Gateway Parameter Setting Tool.

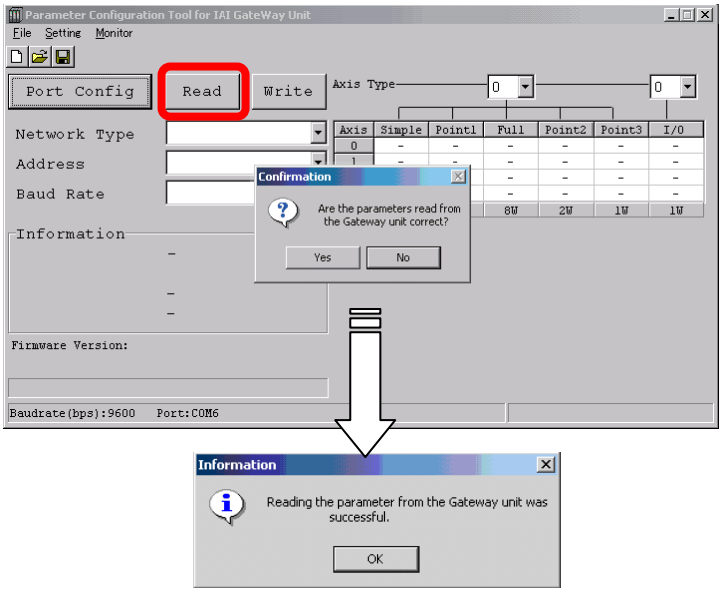
[Step 2] Controller Select window shows up. Select ERC3 GW and press OK.



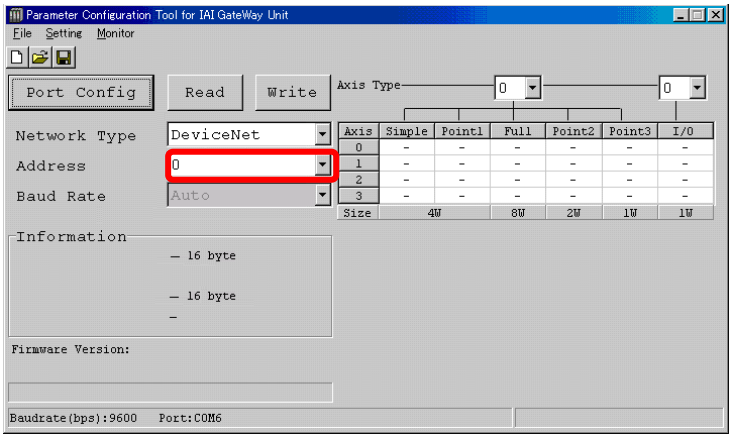
[Step 3] The main window opens.



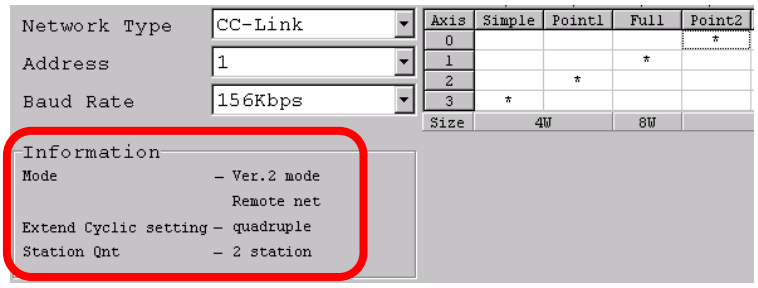
[Step 4] Reading is started from ERC3 gateway unit to PC. Click on the “Read” button and a confirmation window appears. Click on the “Yes” button.
Once the parameter reading is completed in normal condition, the reading complete window opens. Click OK.



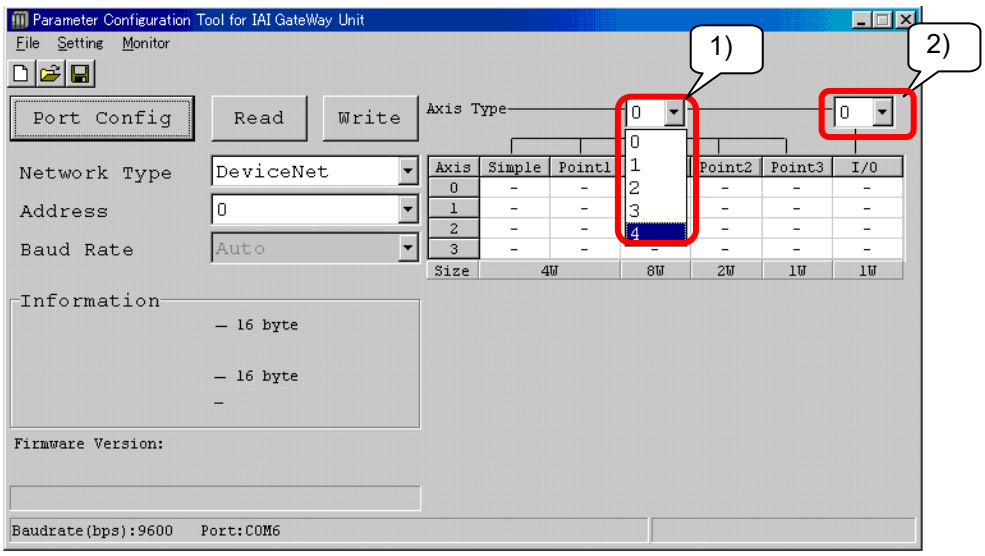
[Step 5] The parameters input to ERC3 gateway unit are listed as shown below. Indicate the node address (station) of ERC3 gateway unit on field network in Address.



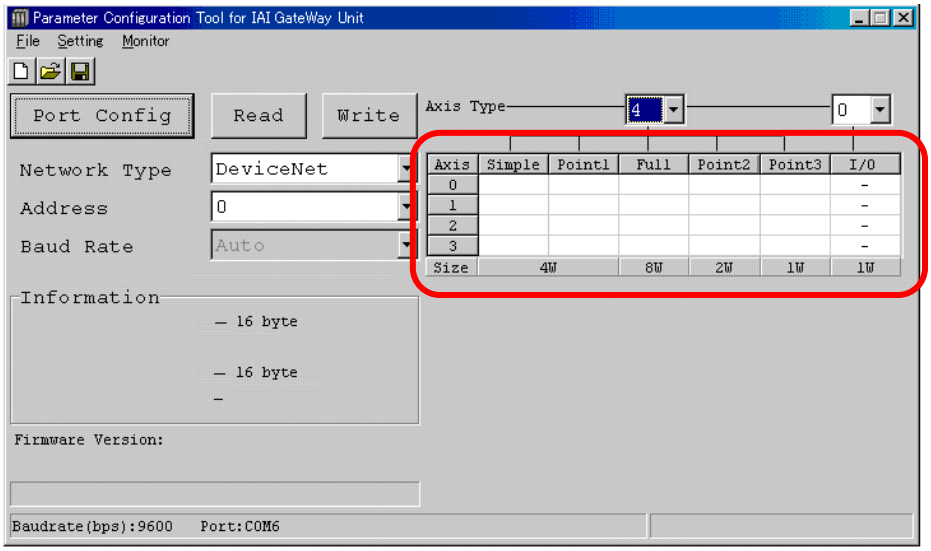
⚠ Caution : Caution for CC-Link Type station setting
In the following slave, set the value the number of occupied station is added to the current station number.



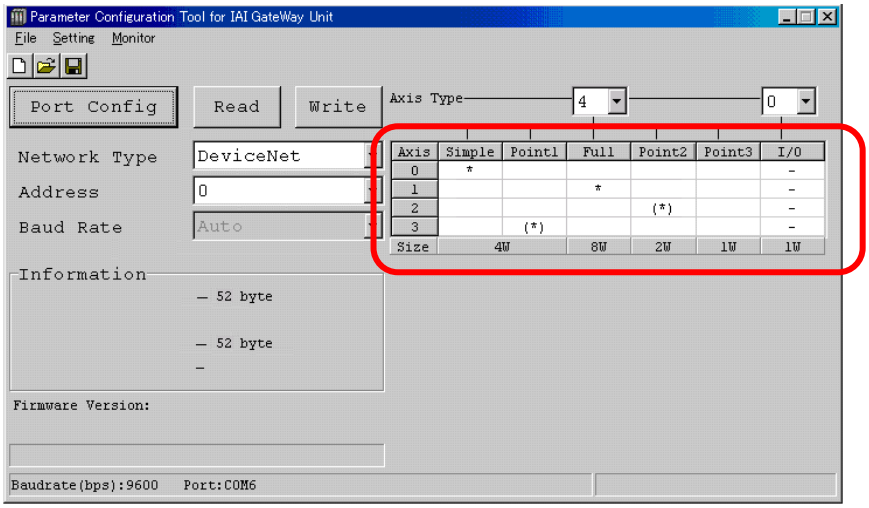
[Step 6] Set the number of axes used in each operation mode. If the system is used in Positioner Modes 1 to 3, Simple Direct Mode or Positioning Mode, input the total number of the axes in 1) in the figure below. Input the total number of axes in 2) if using in Remote I/O Mode. Note that 1) and 2) cannot be used at the same time.



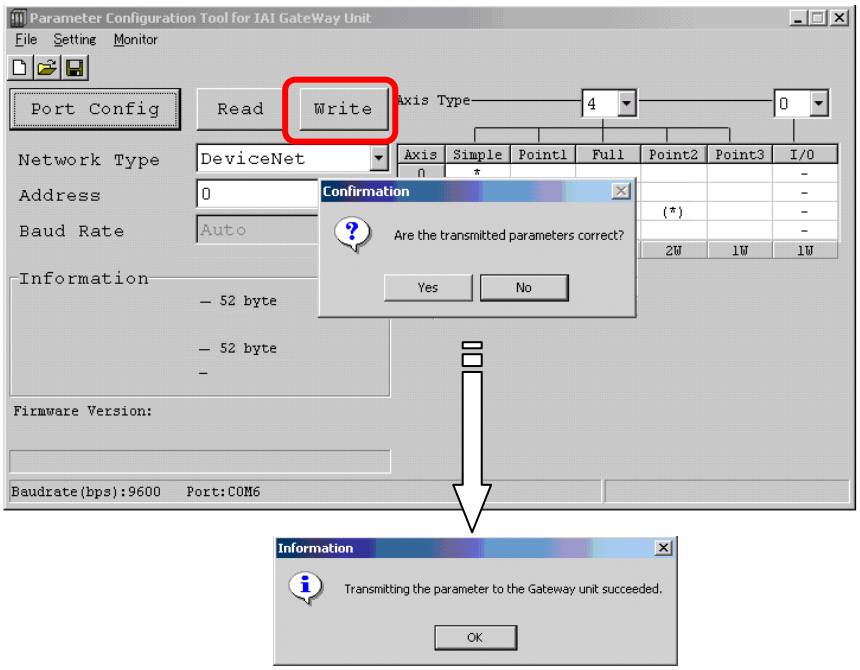
[Step 7] Once the setting of the number of axes is done, the cells for the operation mode settable to each axis turn to blank in response. For Remote I/O Mode, "*" is displayed for a number equals to the number of set axis.



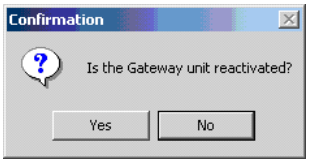
[Step 8] Click on a blank cell and "*" shows up. "*" mark means that an operation mode is selected for each axis.
If clicking a cell showing "*", the mark turns to "(*)". "(*)" means it is a reserved axis, which is to be set when not using even though the actuator is connected.
If clicking on a cell with "(*)" mark for the reserved axes shown, the cell turns back to blank.
(Note) Even if the total number of the used axes is an odd number, make the last axis in reservation to get an even number.



[Step 9] Write the edited operation mode setting parameters to ERC3 gateway unit.
Click on the "Write" button shown below and a confirmation window pops up. Click on the "Yes" button.
If the writing is finished in normal condition, writing complete window appears. Click OK.



[Step 10] A confirmation window for gateway unit reboot opens. Click “Yes” to accept the reboot.



[Step 11] After rebooting, a confirmation window for parameter reading appears for confirmation of the written contents. Click “Yes” to accept the reading.
Once the reading process is complete, confirm that the written contents are reflected.
If not written properly, do the process again from Step 1.

> Reference : Dealing to the communication error and a change to the speed unit at Direct Indication Mode are to be conducted in the special parameters.Refer to 3.7. About Gateway Parameter Setting Tool for the details.

3.3 Setting of Position Data

For ERC3 actuator, two types of operation types (CON Mode / MEC Mode) can be selected when purchased. Since the position data differs for each type, have the settings established considering the purchased ERC3 type.

3.3.1 CON Mode Type Setting

Positioner and Remote I/O Mode makes an operation based on the position data (position, velocity, etc.) set in advance in the position table. Set the target position first.
The values in the position table can be set as shown below. In the case that only positioning is necessary, all you have to do is to input the position data, and nothing else is required as long as the indication of acceleration and deceleration is needed. For the velocity and acceleration/deceleration, the data set to the parameters is automatically reflected to the setting. Therefore, the work can be simple if you put the speed and acceleration/deceleration data to the parameter setting.

1) No.	2) Position [mm]	3) Velocity [mm/s]	4) Accele-ration [G]	5) Decele-ration [G]	6) Pressing [%]	7) Thresh-old [%]	8) Positioning width [mm]	9) Zone+ [mm]	10) Zone- [mm]	11) Acceleration/ Deceleration mode	12) Incre-mental	13) Transported load	14) Stop mode	15) Vibration suppress No.	Comment
0	0.00	100.00	0.30	0.30	0.00	0.00	0.10	0.00	0.00	0	0	0	0	0	
1	100.00	100.00	0.30	0.30	0.00	0.00	0.10	0.00	0.00	0	0	0	0	0	
2	150.00	200.00	0.30	0.30	50.00	0.00	30.00	0.00	0.00	0	0	0	0	0	
3	300.00	400.00	1.00	1.00	0.00	0.00	0.10	0.00	0.00	0	0	0	0	1	
4	200.00	200.00	0.30	0.30	0.00	0.00	0.10	250.00	230.00	0	0	0	0	2	
5	500.00	50.00	0.10	0.10	0.00	0.00	0.10	0.00	0.00	0	0	0	0	0	
6															
7															

1) Position number····· It is the number to be indicated by PLC at startup.

> ⚠ Caution : Do not use Position No.0 if there is margin to the positions.
> Even if the actuator is not at the position of Position No.0 in the first servo-ON after the power is turned ON, the output of complete position number is 0, thus it is the same condition as positioning at the point of Position No.0. And, the output of the complete position number while the actuator is moving is also 0 In case a use of Position No.0 is desired, take a note of the history of the commands in the sequence program and check Position No.0 matching with the history.

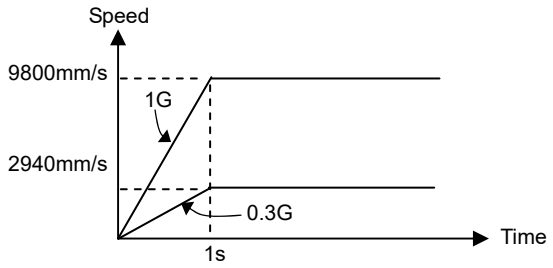
2) Position [mm] ····· It is the coordinate value for positioning. Input the position from the home position.
Input the pitch width for the pitch feed (relative movement = incremental feed).
A movement toward the home position is made if – is added, and toward the opposite side if not added.

3) Velocity [mm/s] ····· Set the velocity in the operation.
Do not attempt to input a value more than the maximum velocity or minimum velocity (Note 1).
Note 1 Refer to the values stated in the Chapter 7 Appendix or the following for the calculation
Minimum speed [mm/s] = Lead length [mm] / No. of Encoder Pluses / 0.001 [s]

4) Acceleration [G] ····· Set the acceleration at start.

5) Deceleration [G] ····· Set the deceleration at stop.

(Reference) How to set the acceleration is described below. The same idea can be applied to the deceleration.
1G=9800mm/s^2: Acceleration capable to accelerate up to 9800mm/s per second
0.3G :Acceleration capable to accelerate up to 9800mm/s × 0.3 = 2940mm/s per second



⚠ Caution : (1) Set the speed, acceleration and deceleration so that they do not exceed the rating values described in the brochure or the catalog or instruction manual of the actuator. The setting that exceeds the rated acceleration/deceleration speed may shorten the actuator life remarkably.
(2) Consider to lower the acceleration/deceleration speed when a shock or vibration is applied to the actuator or work. In such cases, do not continue the use of the actuator, otherwise the product life may be shortened extremely fast.
(3) If the payload is extremely lighter than the rated payload, increase acceleration/deceleration to larger than their rated values to shorten the takt time. Contact our company. At that time, inform us of the work piece weight, profile, way to attach and the installation condition of the actuator.

6) Pressing [%] ····· Set a value here and the pressing operation is available. Set a pressing torque (limit current value) in %. If the value is set to 0, the normal positioning operation is performed.
The speed for the pressing operation is set in Parameter No.34. If the setting of 3) is lower than the pressing velocity, the pressing process will be conducted with the velocity of 3).

⚠ Caution : If the pressing velocity is changed, the pressing force may differ from that specified in 6.1 Appendix Specifications of Actuator.
When the pressing velocity is changed, make sure to measure the actual pressing force before start using

7) Threshold [%]····· Set the pressing torque in % for the pressing.
The detection signal is output when the torque (load current) has exceeded the value of this setting during the pressing operation.
This function is used when judge the movement whether it is good or not by monitoring the load current in the process of press-fitting with the pressing operation.

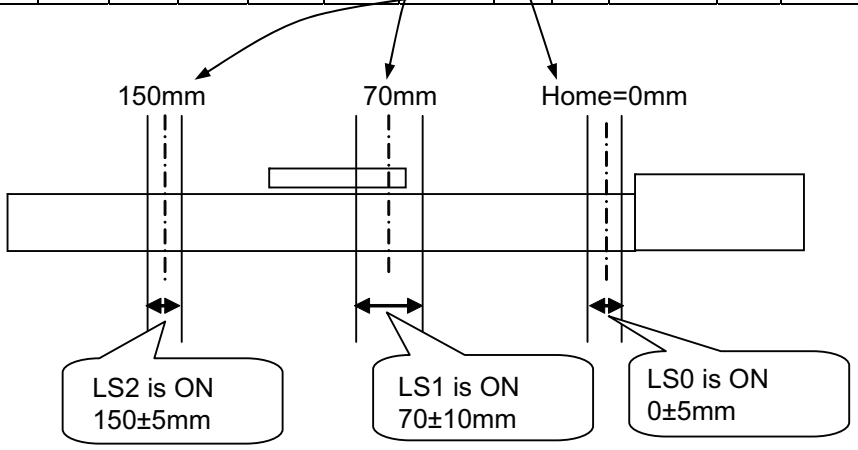
8) Positioning width [mm] ··· The positioning complete signal is output when the remaining movement amount gets into the area that is set here if positioning is executed with a pattern **other than PIO Pattern 5** of ERC3 in Remote I/O Mode. [*1]
In pressing operation, an operation is made with the established speed and acceleration/deceleration like the normal positioning up to the position set in 2), and pressing operation movement is made for the data set in here.
For the positioning width, make its width at least 4 times larger than the minimum unit of the movement (movement amount of 1 pulse of the encoder) of the used actuator.
There is not output range of completion signal to the positioning command for PIO Pattern 5 of ERC3 in Remote I/O Mode. No matter what position number is commanded, the applicable output signal (LS*) turns on if getting into the setting range as if a detection is conducted with using sensors. Also, the pressing operation cannot be performed in PIO Pattern 5.

*1 PIO Pattern: It is operation patterns provided in Remote I/O Mode.
[Refer to 3.4.8 Control Signals for Remote I/O Mode in the instruction manual for ERC3 Actuator Integrated Controller]

[Example for PIO Pattern 5]

Shown below is the position table and the figure expressing the positions that LS signal turns ON. It turns ON every time the actuator is moved manually or is in that range when the actuator passes in an operation of another position number or while the servo is OFF.

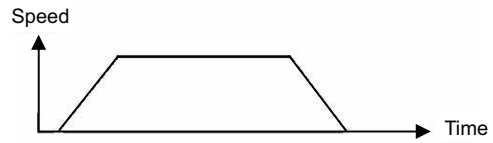
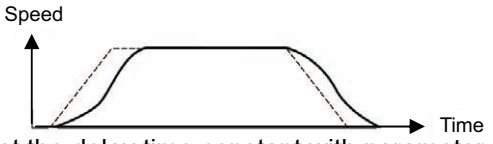
No.	Position [mm]	Velocity [mm/s]	Accele-ration [G]	Decele-ration [G]	Pressing [%]	Thresh-old [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/ Deceleration mode	Incre-mental	Transported load	Stop mode
0	0.00	250.00	0.20	0.20	0	0	5.00	0.00	0.00	0	0	0	0
1	70.00	250.00	0.20	0.20	0	0	10.00	0.00	0.00	0	0	0	0
2	150.00	250.00	0.20	0.20	0	0	5.00	0.00	0.00	0	0	0	0



9) Zone+ [mm] ····· Set the positive side coordinates to turn the output signal of the position zone, PZONE, ON. PZONE turns ON when in the range between here and the negative coordinates set in 10).
It is a function accompanying the indicated position number, and is valid only when that position is indicated, but not valid when in an operation to other positions.

10) Zone- [mm] ····· Set the negative side coordinates to turn the output signal of the position zone, PZONE, ON.

11) Acceleration/deceleration mode …Select the acceleration/deceleration pattern. Establish the setting considering the load.

Set Value	Acceleration/Deceleration Pattern	Operation
0	Trapezoid	
1	S-shaped Motion (Refer to Caution at S-shaped Motion)	 Set the S-motion rate with parameter No.56.
2	First-Order Lag Filter	 Set the delay time constant with parameter No.55.

⚠ Caution at S-shaped Motion :
1) Since it requires a speed change during the operation, even if having the position command or direct command that S-shaped motion is set while the actuator is moving, S-shaped motion control cannot be performed and will be the trapezoid control.
   Make sure to make a command while the actuator is stopped.
2) Do not use S-shaped acceleration/deceleration control if the setting of the acceleration time or the deceleration time exceeds 2 seconds. It will not provide the right operation.
3) Do not pause on the move during acceleration or deceleration. It will change the speed (acceleration) and may cause a danger.

12) Incremental…… Set to 1 when performing the pitch feeding (Relative movement = incremental feeding). The value set in 1) is the amount for the pitch feeding.
If the setting is 0, the movement is positioning to the position of 1) in absolute coordinate system.

⚠ Caution : In the pitch feed, do not perform a command with a pitch smaller than the minimum encoder resolution (lead/encoder pulse number) or that less than positioning accuracy repeatability.
There would be no deviation to occur even with the command because it is an operation command to the same position as the positioning complete condition, but the positioning control cannot be performed properly.

13) Transported load ····· Register 4 types of load weights with using the teaching tool, and choose the number from the registered numbers (0 to 3) that is to be used.
From the numbers (load weights) registered in this section, the shortest takt time function calculates the optimum speed and acceleration/deceleration.

[Refer to the instruction manual of each teaching tool for how to register the load weights and shortest takt time.]

Setting	Name
0	Transported Load No.0)
1	Transported Load No.1)
2	Transported Load No.2)
3	Transported Load No.3)

14) Stop mode ····· The servo can be turned OFF automatically in a certain time after positioning is complete for power saving.
The time setting can be set in parameters, and three types of time can be selected.

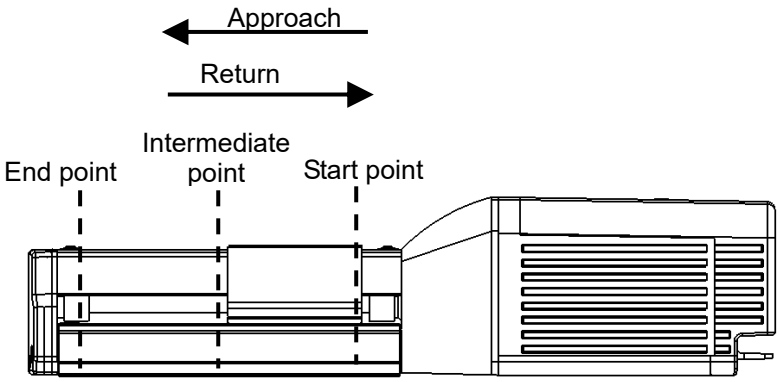
Setting	Operation after Positioning Complete	Parameter No.
0	Keep the servo ON	–
1	Automatic servo-OFF in a certain time	36
2	Automatic servo-OFF in a certain time	37
3	Automatic servo-OFF in a certain time	38
4	Servo control	–
5	Full-servo control for a certain time and then automatically turning servo OFF	36
6	Full-servo control for a certain time and then automatically turning servo OFF	37
7	Full-servo control for a certain time and then automatically turning servo OFF	38

⚠ Caution :
- No retaining torque is provided in automatic servo OFF. Pay sufficient attention to the setting because the actuator may be moved by external force applied to it.
- Do not use the automatic servo OFF if the next moving command is relative distance specification (pitch feed). It may create misalignment in position.
- Do not use the automatic servo OFF in pressing. If used, the pressing force is lost.
- Automatic Servo OFF would not function in the operation with teaching mode of PC software.

15) Vibration Control No.··· Do not set up.

3.3.2 Settings for MEC Mode Type

In MEC Mode, an operation is made by the data in the following operation condition table. Setting is to be conducted on the operation panel of Quick Teach and a teaching tool such as MEC PC software.



Positioning Information

Used PIO (input and output) Signal		Stop position*2	1)	2)	3)	4)	5)	6)	7)
2-point stop	3-Point Stops		Position [mm]	Speed [mm/s]	Acceleration [G]	Deceleration [G]	Pressing Force [%]	Pressing Width [mm]	Energy-Saving Setting
ST0 *1	ST0	Start Point (forward)	10.00	50.00	0.1	0.1	0	0	Enabled
–	ST0, ST1	Intermediate point (intermediate)	50.00	50.00	0.1	0.1	70	1.00	Enabled
ST0*1	ST1	End point (backward)	100.00	50.00	0.1	0.1	0	0	Enabled

*1 ST0 for 2-point stop is end point move when it is ON, and start point move when OFF.

*2 The start point of SEP-PT is expressed as “Backward End Position”, end point as “Forward End Position” and intermediate point as “Intermediate Position”.

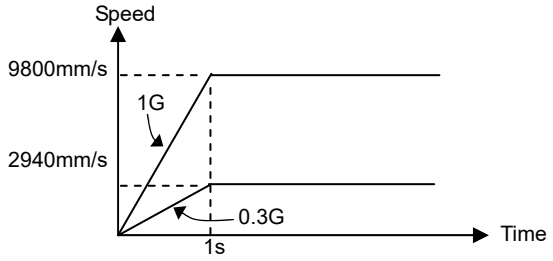
1) Position [mm] ····· It is the positioning stop point. The position from the origin is to be set. The position is in the relation described below:
Start point < Intermediate point < End point

2) Speed [mm/s] ····· Set the speed in the operation.
The maximum speed differs depending on the actuator.
Refer to the catalog or instruction manual for the actuator.

3) Acceleration [G] ····· Set the acceleration at startup.

4) Deceleration [G]…… Set the deceleration at stop.

(Reference) How to set the acceleration is described below. The same idea can be applied to the deceleration.
1G=9800mm/s^2 : Acceleration capable to accelerate up to 9800mm/s per second
0.3G : Acceleration capable to accelerate up to 9800mm/s × 0.3 = 2940mm/s per second



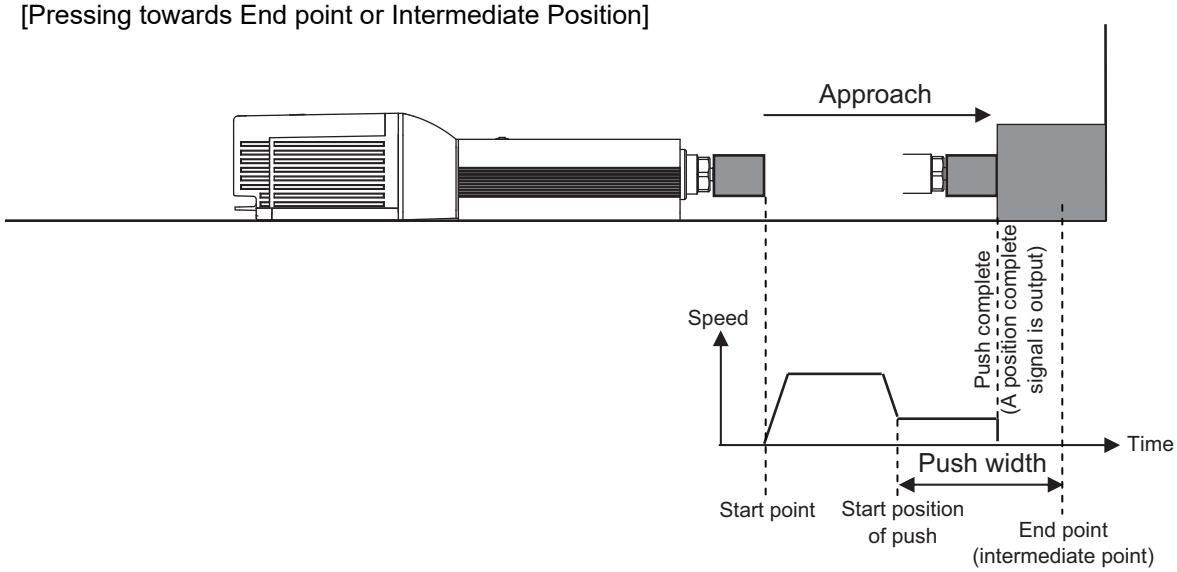
⚠ Caution : Regarding to Acceleration/Deceleration Speed Setting
(1) Do not have the setting to exceed the rated acceleration/deceleration speed that is specified in the catalog or this Instruction Manual. The setting that exceeds the rated acceleration/deceleration speed may shorten the actuator life remarkably.
(2) Consider to lower the acceleration/deceleration speed when a shock or vibration is applied to the actuator or work. In such a case, keeping the use under such a condition may shorten the actuator life remarkably.
(3) If the load is extremely lighter than the rated load, there may be a possibility that acceleration/deceleration can be made greater than the rated values to shorten the takt time. Contact our company. At that time, inform us of the work piece weight, profile, way to attach and the installation condition of the actuator.

5) Pressing Force [%] ····· Set the pressing torque (current limit value) in % for the pressing operation.
Having a bigger power limit value gives bigger pressing force.
It is set to the positioning operation when setting to 0.

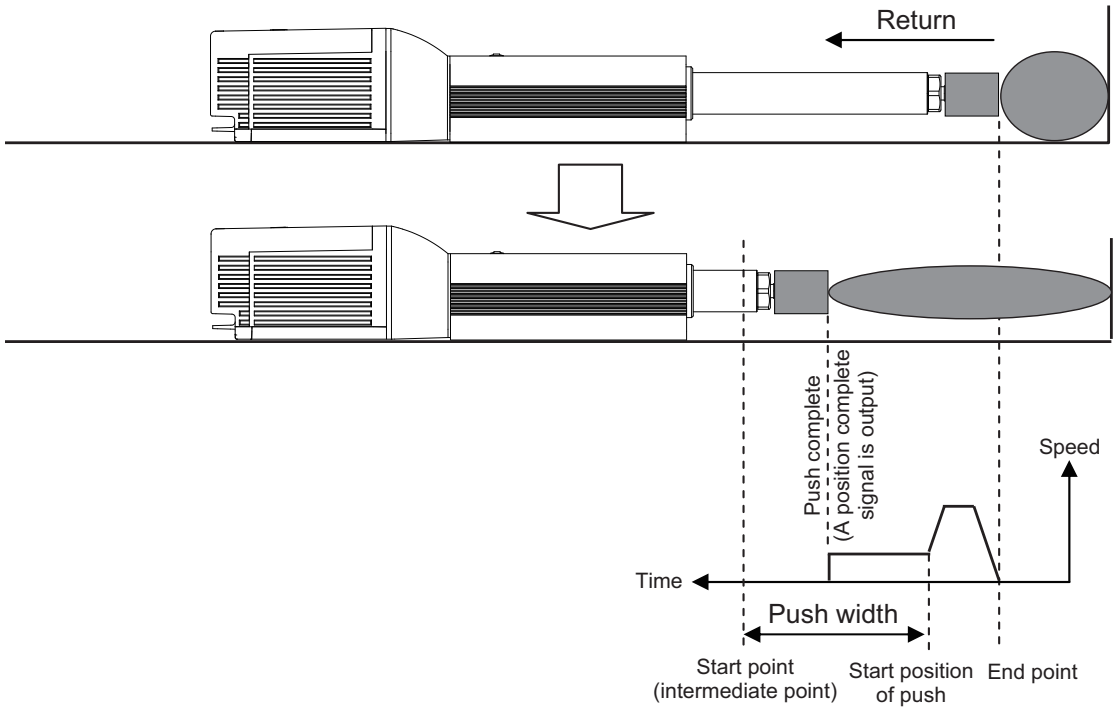
⚠ Caution : Changing the pressing speed may make the pressing force different from that described in 6.1 Appendix Actuator Specifications of Actuator.
When the pressing velocity is changed, make sure to measure the actual pressing force before start using

6) Pressing Width [mm] · Set the movement amount for pressing operation.
When the push operation is conducted, the actuator moves with the speed and rated torque set in the positioning information, as it does in the positioning operation, until the remained movement amount reaches to the set area, and once it gets in the area, it starts push & hold operation towards the points listed in 1).
The speed for the pressing operation is set in Parameter No.7. Do not have the speed setting exceeding this.
If the setting done in 2) is less than the pressing speed setting value, the pressing operation is performed at this setting value.
Shown in the figure below is how the actuator moves when pressing is performed against the end, start and intermediate points.

[Pressing towards End point or Intermediate Position]



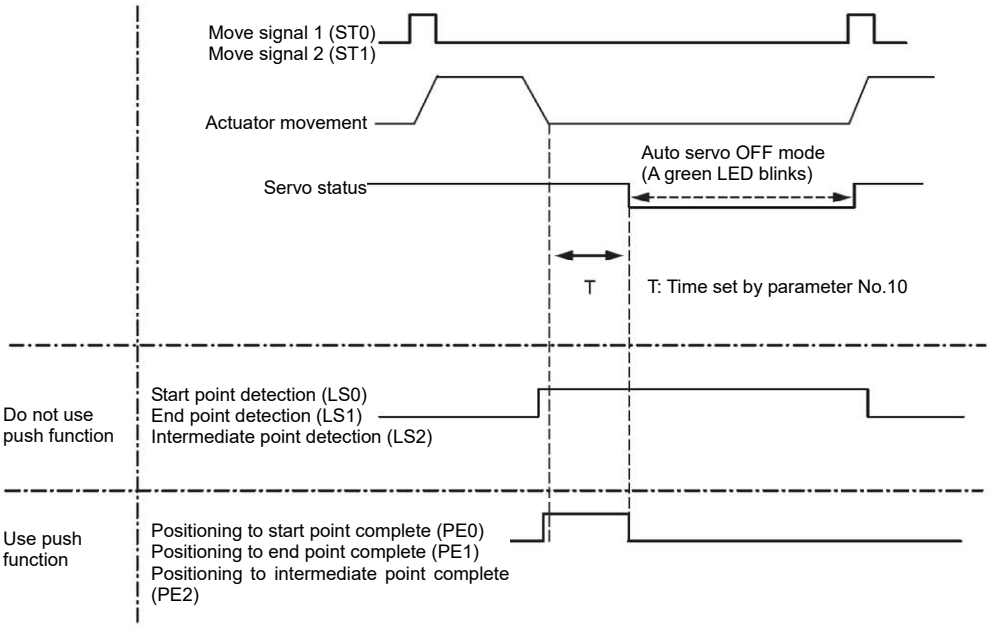
[Pressing towards End point or Intermediate Position = Pulling Action]



7) Power Saving Function··· By activating Power Saving Function, the motor power supply (servo) automatically turns OFF in a certain time after positioning is complete for power saving.
Set the time in advance in the parameter.

Parameter No.	Parameter name	Default	Setting Range
10	Auto Servo-motor OFF Delay Time [sec]	1	0 to 9999

[Automatic Motor Power Supply (Servo) OFF]
The motor power supply (servo) automatically turns OFF in a certain time after positioning is complete. If the next positioning command is issued, the motor power supply (servo) automatically turns back ON and executes the positioning operation. Because the holding current does not pass in the stop mode, the power consumption can be saved.



[Condition of Position Detecting Output Signal when Pressing Function Not Used]
Even if the motor power supply (servo) is turned OFF, when the actuator's position is in the positioning band (Parameter No. 1) range, the start point position detecting signal (LS0), end point position detecting signal(LS1) and intermediate point position detecting signal (LS2) correspond to each position will turn ON as if a detection is conducted with using sensors. Therefore, if the actuator does not move after positioning is complete, position detecting signal will remain ON.

[Condition of Positioning Complete Signal when Pressing Function Used]
In pressing operation, the motor power supply (servo) does not automatically turn OFF in pressing condition.
The motor power supply (servo) automatically turns OFF in the condition of pressing failure.
The motor power supply (servo) being OFF makes the condition of positioning not complete.
Therefore, all of Pressing Complete Signal 0 (PE0), Pressing Complete Signal 1 (PE1) and Pressing Complete Signal 2 (PE2) are turned OFF no matter what position the actuator is stopped.

⚠ Caution : No retaining torque is provided in automatic power supply (servo) OFF. Pay sufficient attention to the setting because the actuator may be moved by external force applied to it.

3.4 Field Network Address Map

3.4.1 PLC Address Construction by each Operation Mode

The PLC address domain to be occupied differs depending on the operation mode.
Refer to the example in Section 3.4.2 for the assignment.

• PLC Output → ERC3 Input (n is PLC output top word address to ERC3) (Note 1)

PLC Output Area		Simple Direct Mode	Positioner 1 Mode	Direct Indication (Full) Mode	Positioner 2 Mode	Positioner 3 Mode	Remote I/O Mode (Note 2)	Details
ERC3 Gateway Control Area	n	Gateway Control 0						3.4.3
	n+1	Gateway Control 1						
	n+2	Command						3.4.9
	n+3	Data 0						
	n+4	Data 1						
	n+5	Data 2						
	n+6	Data 3						
	n+7	Occupied Area (Note 3)						
Connected Axes Control Area	n+8	Target Position (Axis No.0)	Occupied Area (Note 3)	Target Position (Axis No.0)	Specified Position No. (Axis No.0)	Control Signal/ Position No. (Axis No.0)	Assignment Area for Axis No.0	3.4.4 to 3.4.8
	n+9				Control Signal (Axis No.0)	Assignment Area for Axis No.1	Assignment Area for Axis No.1	
	n+10	Specified Position No. (Axis No.0)	Specified Position No. (Axis No.0)	Positioning Width (Axis No.0)	Assignment Area for Axis No.1	Assignment Area for Axis No.2	Assignment Area for Axis No.2	
	n+11	Control Signal (Axis No.0)	Control Signal (Axis No.0)			Assignment Area for Axis No.3	Assignment Area for Axis No.3	
	n+12	Assignment Area for Axis No.1	Occupied Area (Note 3)	Speed (Axis No.0)	Assignment Area for Axis No.2 and later			
	n+13			Acceleration/ Deceleration (Axis No.0)				
	n+14		Assignment Area for Axis No.1	Pressing Current Limit (Axis No.0)				
	n+15			Control Signal (Axis No.0)				
	n+16 to n+23	Assignment Area for Axis No.2 and later	Assignment Area for Axis No.2 and later	Assignment Area for Axis No.1				
	n+24 to n+71			Assignment Area for Axis No.2 and later				

(Note 1) For CC-Link, n and n+1 are for input and output bit addresses, and n+8 is for the top address of data register.
(Note 2) Remote I/O Mode occupies 12 words no matter how many axes are connected.
(Note 3) This is the area occupied unconditionally. Therefore, this area cannot be used for any other purpose.

⚠ Caution : 1) Remote I/O Mode cannot be used together with other modes.
2) Only Remote I/O Mode can be selected in MEC Mode Type.
3) Only Positioner 3 Mode and Remote I/O Mode can be selected in MECHATROLINK and CompoNet. (CompoNet occupies 32 bytes no matter of the number of axes.)

• ERC3 Output → PLC Input (n is PLC input top word address from ERC3) (Note 1)

PLC Intput Area		Simple Direct Mode	Positioner 1 Mode	Direct Indication (Full) Mode	Positioner 2 Mode	Positioner 3 Mode	Remote I/O Mode (Note 2)	Details
ERC3 Gateway Response Area	n	Gateway Status 0						3.4.3
	n+1	Gateway Status 1						
	n+2	Response Command						3.4.9
	n+3	Data 0						
	n+4	Data 1						
	n+5	Data 2						
	n+6	Data 3						
	n+7	Occupied Area (Note 3)						
Connected Axes Response Area	n+8	Current Position (Axis No.0)		Current Position (Axis No.0)	Completed Position No./ Simple Alarm ID (Axis No.0)	Status Signal/ Completed Position No. (Axis No.0)	Assignment Area for Axis No.0	3.4.4 to 3.4.8
	n+9				Status Signal (Axis No.0)	Assignment Area for Axis No.1	Assignment Area for Axis No.1	
	n+10	Completed Position No./ Simple Alarm ID (Axis No.0)		Command Current (Axis No.0)	Assignment Area for Axis No.1	Assignment Area for Axis No.2	Assignment Area for Axis No.2	
	n+11	Status Signal (Axis No.0)				Assignment Area for Axis No.3	Assignment Area for Axis No.3	
	n+12	Assignment Area for Axis No.1		Current Speed (Axis No.0)	Assignment Area for Axis No.2 and later			
	n+13			Occupied Area (Axis No.0)				
	n+14			Alarm Code (Axis No.0)				
	n+15			Status Signal (Axis No.0)				
	n+16 to n+23	Assignment Area for Axis No.2 and later		Assignment Area for Axis No.1				
	n+24 to n+71			Assignment Area for Axis No.2 and later				

(Note 1) For CC-Link, n and n+1 are for input and output bit addresses, and n+8 is for the top address of data register.
(Note 2) Remote I/O Mode occupies 12 words no matter how many axes are connected.
(Note 3) This is the area occupied unconditionally. Therefore, this area cannot be used for any other purpose.

⚠ Caution : 1) Remote I/O Mode cannot be used together with other modes.
2) Only Remote I/O Mode can be selected in MEC Mode Type.
3) Only Positioner 3 Mode and Remote I/O Mode can be selected in MECHATROLINK and CompoNet. (CompoNet occupies 32 bytes no matter of the number of axes.)

3.4.2 Example for each Field Network Address Map

Shown below is an example for the address map by the combination of operation modes for each field network.
Refer to it for the address assignment.
The example for the address map shown below is provided for each field network, however is described together (Note) for the networks of the same address assignment.
Note In the order of each field network address map description
1) DeviceNet and CompoNet
2) CC-Link
3) PROFIBUS, EtherNet/IP, MECHATROLINK, EtherCAT

◎ In the case of CC-Link
Station Type : Ver.2 Remote device station
Extended Cyclic Setting/Occupied Station Number Setting :
Calculate the necessary data domain from the operation mode and number of axes and set it.

⚠ Caution : 1) If Remote I/O Mode is selected, all the axes connected to ERC3 are involved in Remote I/O Mode.
2) Only Remote I/O Mode can be selected in MEC Mode Type.
3) Only Positioner 3 Mode and Remote I/O Mode can be selected in MECHATROLINK and CompoNet. (CompoNet occupies 32 bytes no matter of the number of axes.)

[1] Address Map with Combination of Positioner 1/Simple Direct Modes and Direct Indication Mode

In the table below, shows the address map when four axes of ERC3 are operated with a combination of Simple Direct Mode and Direct Indication Mode in 3 types of construction for each field network as an example.

Combination Example	Number of Simple Direct Mode Axes	Number of Direct Indication (Full) Mode Axes
1	4	0
2	2	2
3	0	4

1) DeviceNet (CompoNet is not applicable for this mode)

[Combination Example 1] When number of Simple Direct Mode axes is 4 and number of Direct Indication (Full) Mode 0
(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+1	Gateway Control	n to n+1	Gateway Control
n+2 to n+7	Command	n+2 to n+7	Response Command
n+8 to n+11	Axis No.0 Control Information	n+8 to n+11	Axis No.0 Control Information
n+12 to n+15	Axis No.1 Control Information	n+12 to n+15	Axis No.1 Control Information
n+16 to n+19	Axis No.2 Control Information	n+16 to n+19	Axis No.2 Control Information
n+20 to n+23	Axis No.3 Control Information	n+20 to n+23	Axis No.3 Control Information

[Combination Example 2] When number of Simple Direct Mode axes is 2 (axis No.0, No.1) and number of Direct Indication (Full) Mode is 2 (axis No.2, No.3) (n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+1	Gateway Control	n to n+1	Gateway Control
n+2 to n+7	Command	n+2 to n+7	Response Command
n+8 to n+11	Axis No.0 Control Information	n+8 to n+11	Axis No.0 Control Information
n+12 to n+15	Axis No.1 Control Information	n+12 to n+15	Axis No.1 Control Information
n+16 to n+19	Axis No.2 Control Information	n+16 to n+19	Axis No.2 Control Information
n+20 to n+23		n+20 to n+23	
n+24 to n+27	Axis No.3 Control Information	n+24 to n+27	Axis No.3 Control Information
n+28 to n+31		n+28 to n+31	

[Combination Example 3] When number of Simple Direct Mode axes is 0 and number of Direct Indication (Full) Mode is 4 (n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+1	Gateway Control	n to n+1	Gateway Control
n+2 to n+7	Command	n+2 to n+7	Response Command
n+8 to n+11	Axis No.0 Control Information	n+8 to n+11	Axis No.0 Control Information
n+12 to n+15		n+12 to n+15	
n+16 to n+19	Axis No.1 Control Information	n+16 to n+19	Axis No.1 Control Information
n+20 to n+23		n+20 to n+23	
n+24 to n+27	Axis No.2 Control Information	n+24 to n+27	Axis No.2 Control Information
n+28 to n+31		n+28 to n+31	
n+32 to n+35	Axis No.3 Control Information	n+32 to n+35	Axis No.3 Control Information
n+36 to n+39		n+36 to n+39	

2) CC-Link

[Combination Example 1] When number of Simple Direct Mode axes is 4 and number of Direct Indication (Full) Mode is 0
(Extended Cyclic Setting/Number of Occupied Stations
1 times/4 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 00 to 1F	Gateway Control	RX 00 to 1F	Gateway Status
RY 20 to 6F	Command	RX 20 to 6F	Response Command
RY 70 to 7F	Cannot be used.	RX 70 to 7F	Cannot be used.
RWw 00 to 03	Axis No.0 Control Information	RWr 00 to 03	Axis No.0 Status Information
RWw 04 to 07	Axis No.1 Control Information	RWr 04 to 07	Axis No.1 Status Information
RWw 08 to 0B	Axis No.2 Control Information	RWr 08 to 0B	Axis No.2 Status Information
RWw 0C to 0F	Axis No.3 Control Information	RWr 0C to 0F	Axis No.3 Status Information

[Combination Example 2] When number of Simple Direct Mode axes is 2 (axis No.0, No.1) and number of Direct Indication (Full) Mode is 2 (axis No.0, No.3) (Extended Cyclic Setting/Number of Occupied Stations: 4 times/2 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 000 to 01F	Gateway Control	RX 000 to 01F	Gateway Status
RY 020 to 06F	Command	RX 020 to 06F	Response Command
RY 070 to 07F	Cannot be used.	RX 070 to 07F	Cannot be used.
RY 080 to 0BF	Cannot be used.	RX 080 to 0BF	Cannot be used.
RWw 00 to 03	Axis No.0 Control Information	RWr 00 to 03	Axis No.0 Status Information
RWw 04 to 07	Axis No.1 Control Information	RWr 04 to 07	Axis No.1 Status Information
RWw 08 to 0B	Axis No.2 Control Information	RWr 08 to 0B	Axis No.2 Status Information
RWw 0C to 0F		RWr 0C to 0F	
RWw 10 to 13	Axis No.3 Control Information	RWr 10 to 13	Axis No.3 Status Information
RWw 14 to 17		RWr 14 to 17	
RWw 18 to 1B	Cannot be used.	RWr 18 to 1B	Cannot be used.
RWw 1C to 1F	Cannot be used.	RWw 1C to 1F	Cannot be used.

[Combination Example 3] When number of Simple Direct Mode axes is 0 and number of Direct Indication (Full) Mode is 4 (Extended Cyclic Setting/Number of Occupied Stations: 4 times/2 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 000 to 01F	Gateway Control	RX 000 to 01F	Gateway Status
RY 020 to 06F	Command	RX 020 to 06F	Response Command
RY 070 to 07F	Cannot be used.	RX 070 to 07F	Cannot be used.
RY 080 to 0BF	Cannot be used.	RX 080 to 0BF	Cannot be used.
RWw 00 to 03	Axis No.0 Control Information	RWr 00 to 03	Axis No.0 Status Information
RWw 04 to 07		RWr 04 to 07	
RWw 08 to 0B	Axis No.1 Control Information	RWr 08 to 0B	Axis No.1 Status Information
RWw 0C to 0F		RWr 0C to 0F	
RWw 10 to 13	Axis No.2 Control Information	RWr 10 to 13	Axis No.2 Status Information
RWw 14 to 17		RWr 14 to 17	
RWw 18 to 1B	Axis No.3 Control Information	RWr 18 to 1B	Axis No.3 Status Information
RWw 1C to 1F		RWw 1C to 1F	

3) PROFIBUS-DP, EtherNet/IP, EtherCAT
(MECHATROLINK is not applicable for this mode)

[Combination Example 1] When number of Simple Direct Mode axes is 4 and number of Direct Indication (Full) Mode is 0
(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16 to n+23	Axis No.0 Control Information	n+16 to n+23	Axis No.0 Status Information
n+24 to n+31	Axis No.1 Control Information	n+24 to n+31	Axis No.1 Status Information
n+32 to n+39	Axis No.2 Control Information	n+32 to n+39	Axis No.2 Status Information
n+40 to n+47	Axis No.3 Control Information	n+40 to n+47	Axis No.3 Status Information

[Combination Example 2] When number of Simple Direct Mode axes is 2 (axis No.0, No.1) and number of Direct Indication (Full) Mode is 2 (axis No.2, No.3)
(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16 to n+23	Axis No.0 Control Information	n+16 to n+23	Axis No.0 Status Information
n+24 to n+31	Axis No.1 Control Information	n+24 to n+31	Axis No.1 Status Information
n+32 to n+39	Axis No.2 Control Information	n+32 to n+39	Axis No.2 Status Information
n+40 to n+47		n+40 to n+47	
n+48 to n+55	Axis No.3 Control Information	n+48 to n+55	Axis No.3 Status Information
n+56 to n+63		n+56 to n+63	

[Combination Example 3] When number of Simple Direct Mode axes is 0 and number of Direct Indication (Full) Mode is 4
(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16 to n+23	Axis No.0 Control Information	n+16 to n+23	Axis No.0 Status Information
n+24 to n+31		n+24 to n+31	
n+32 to n+39	Axis No.1 Control Information	n+32 to n+39	Axis No.1 Status Information
n+40 to n+47		n+40 to n+47	
n+48 to n+55	Axis No.2 Control Information	n+48 to n+55	Axis No.2 Status Information
n+56 to n+63		n+56 to n+63	
n+64 to n+71	Axis No.3 Control Information	n+64 to n+71	Axis No.3 Status Information
n+72 to n+79		n+72 to n+79	

[2] Address Map for Positioner 2 Mode

Shown below is the address map for each Fieldbus when four axes of ERC3 are operated in Positioner 2 Mode.

1) DeviceNet (CompoNet is not applicable for this mode)

(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16 to n+19	Axis No.0 Control Information	n+16 to n+19	Axis No.0 Status Information
n+20 to n+23	Axis No.1 Control Information	n+20 to n+23	Axis No.1 Status Information
n+24 to n+27	Axis No.2 Control Information	n+24 to n+27	Axis No.2 Status Information
n+28 to n+31	Axis No.3 Control Information	n+28 to n+31	Axis No.3 Status Information

2) CC-Link

(Extended Cyclic Setting/Number of Occupied Stations: 1 times/4 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 00 to 1F	Gateway Control	RX 00 to 1F	Gateway Status
RY 20 to 6F	Command	RX 20 to 6F	Response Command
RY 70 to 7F	Cannot be used.	RX 70 to 7F	Cannot be used.
RWw 00 to 01	Axis No.0 Control Information	RWr 00 to 01	Axis No.0 Status Information
RWw 02 to 03	Axis No.1 Control Information	RWr 02 to 03	Axis No.1 Status Information
RWw 04 to 05	Axis No.2 Control Information	RWr 04 to 05	Axis No.2 Status Information
RWw 06 to 07	Axis No.3 Control Information	RWr 06 to 07	Axis No.3 Status Information

3) PROFIBUS-DP, EtherNet/IP, EtherCAT
(MECHATROLINK is not applicable for this mode)

(n is the top node address for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16 to n+19	Axis No.0 Control Information	n+16 to n+19	Axis No.0 Status Information
n+20 to n+23	Axis No.1 Control Information	n+20 to n+23	Axis No.1 Status Information
n+24 to n+27	Axis No.2 Control Information	n+24 to n+27	Axis No.2 Status Information
n+28 to n+31	Axis No.3 Control Information	n+28 to n+31	Axis No.3 Status Information

[3] Address Map for Positioner 3 Mode

Shown below is the address map for each field network when four axes of ERC3 are operated in Positioner 3 Mode.

1) DeviceNet, CompoNet (CompoNet occupies 32 bytes no matter of the number of axes.)

(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+1	Gateway Control	n to n+1	Gateway Status
n+2 to n+7	Command	n+2 to n+7	Response Command
n+8	Axis No.0 Control Information	n+8	Axis No.0 Status Information
n+9	Axis No.1 Control Information	n+9	Axis No.1 Status Information
n+10	Axis No.2 Control Information	n+10	Axis No.2 Status Information
n+11	Axis No.3 Control Information	n+11	Axis No.3 Status Information

2) CC-Link

(Extended Cyclic Setting/Number of Occupied Stations: 1 times/4 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 00 to 1F	Gateway Control	RX 00 to 1F	Gateway Status
RY 20 to 6F	Command	RX 20 to 6F	Response Command
RY 70 to 7F	Cannot be used.	RX 70 to 7F	Cannot be used.
RWw 0	Axis No.0 Control Information	RWr 00	Axis No.0 Status Information
RWw 01	Axis No.1 Control Information	RWr 01	Axis No.1 Status Information
RWw 02	Axis No.2 Control Information	RWr 02	Axis No.2 Status Information
RWw 03	Axis No.3 Control Information	RW 03	Axis No.3 Status Information

3) PROFIBUS-DP, EtherNet/IP, MECHATROLINK, EtherCAT

(n is the top node address for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16, n+17	Axis No.0 Control Information	n+16, n+17	Axis No.0 Status Information
n+18, n+19	Axis No.1 Control Information	n+18, n+19	Axis No.1 Status Information
n+20, n+21	Axis No.2 Control Information	n+20, n+21	Axis No.2 Status Information
n+22, n+23	Axis No.3 Control Information	n+22, n+23	Axis No.3 Status Information

[4] Address Map for Remote I/O Mode

Shown below is the address map for when four axes of ERC3 are operated in Remote I/O Mode.

1) DeviceNet, CompoNet (CompoNet occupies 32 bytes no matter of the number of axes.)

(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
CH No.	Description	CH No.	Description
n to n+1	Gateway Control	n to n+1	Gateway Status
n+2 to n+7	Command	n+2 to n+7	Response Command
n+8	Axis No.0 Control Information	n+8	Axis No.0 Status Information
n+9	Axis No.1 Control Information	n+9	Axis No.1 Status Information
n+10	Axis No.2 Control Information	n+10	Axis No.2 Status Information
n+11	Axis No.3 Control Information	n+11	Axis No.3 Status Information

2) CC-Link

(Extended Cyclic Setting/Number of Occupied Stations: 1 times/4 stations)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Address	Description	Address	Description
RY 00 to 1F	Gateway Control	RX 00 to 1F	Gateway Status
RY 20 to 6F	Command	RX 20 to 6F	Response Command
RY 70 to 7F	Cannot be used.	RX 70 to 7F	Cannot be used.
RWw 00	Axis No.0 Control Information	RWw 00	Axis No.0 Control Information
RWw 01	Axis No.1 Control Information	RWw 01	Axis No.1 Control Information
RWw 02	Axis No.2 Control Information	RWw 02	Axis No.2 Control Information
RWw 03	Axis No.3 Control Information	RWw 03	Axis No.3 Control Information

3) PROFIBUS-DP, EtherNet/IP, MECHATROLINK, EtherCAT

(n is the top channel number for each PLC input and output between ERC3 and PLC)

PLC → ERC3 Gateway		ERC3 Gateway → PLC	
Node Address (Byte Address)	Description	Node Address (Byte Address)	Description
n to n+3	Gateway Control	n to n+3	Gateway Status
n+4 to n+15	Command	n+4 to n+15	Response Command
n+16, n+17	Axis No.0 Control Information	n+16, n+17	Axis No.0 Control Information
n+18, n+19	Axis No.1 Control Information	n+18, n+19	Axis No.1 Control Information
n+20, n+21	Axis No.2 Control Information	n+20, n+21	Axis No.2 Control Information
n+22, n+23	Axis No.3 Control Information	n+22, n+23	Axis No.3 Control Information

3.4.3 Gateway Control Signals (in common for all operation modes)

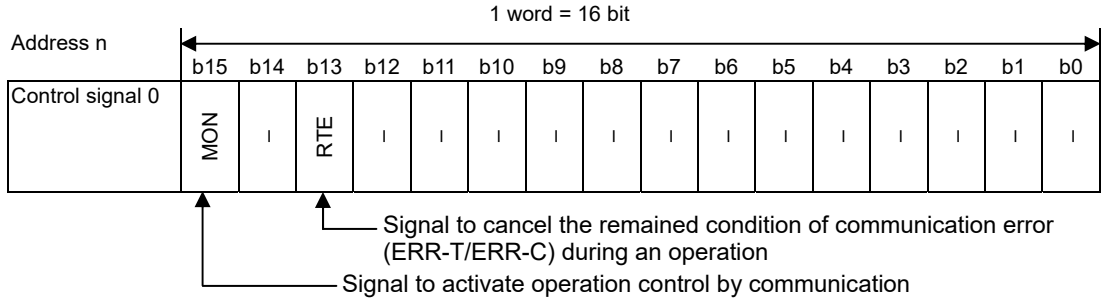
When operating the system with Fieldbus, the axes are controlled via Gateway of ERC3. The top 2 words of input and output in each operation mode are the signals Gateway control and status monitoring.

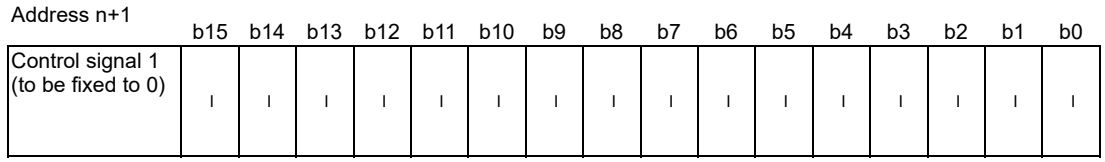
(n is the top word address for each PLC input and output between ERC3 Gateway and PLC)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Control Signal 0	n	Control Signal 0	n
Control Signal 1	n+1	Control Signal 1	n+1

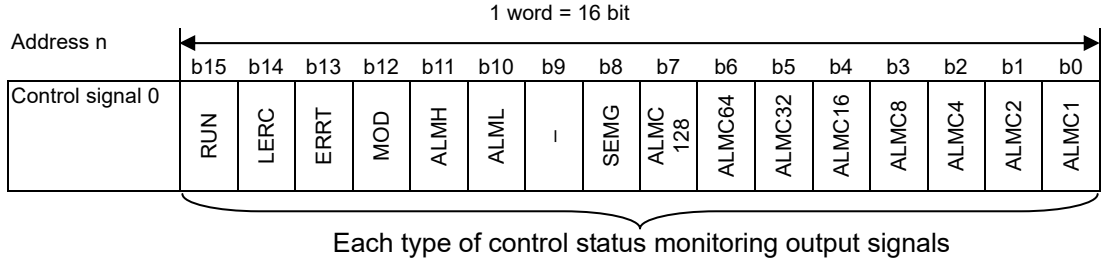
(1) PLC I/O Signal

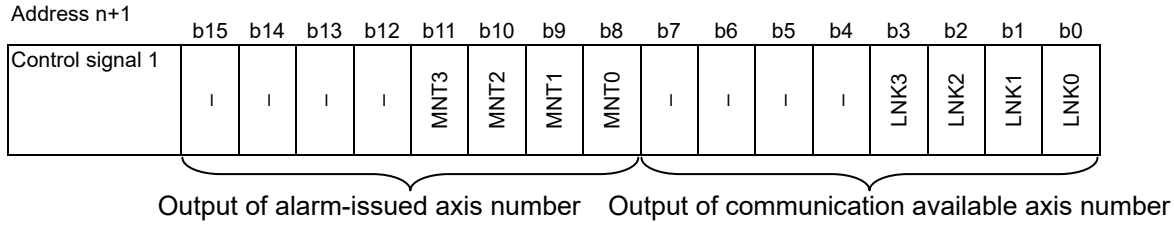
PLC Output





PLC Input





(2) List for Input and Output Signal

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Control signal 0	b15	MON	Operation control with communication is available while it is ON	–
		b14	–	Cannot be used.	–
		b13	RTE	Retained condition of ERR-T or ERR-C during an operation is cancelled if it is ON It is the cancel signal when ERR-T or ERR-C occurrence is set to latch in Gateway Parameter Setting Tool	–
		b12	–	Cannot be used.	–
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1			
		b0			
	Control signal 1	b15	–	Cannot be used. (Make it to all 0.)	–
		b14			
		b13			
		b12			
		b11			
		b10			
		b9			
		b8			
		b7			
		b6			
		b5			
		b4			
		b3			
		b2			
		b1			
		b0			

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Input	Control signal 0	b15	RUN	This signal turns ON when Gateway is in normal operation.	–
		b14	LERC	This signal turns ON if the ERR-T or ERR-C occurred during an operation is retained and turns OFF if cancel signal RTE is turn ON. It is effective when ERR-T or ERR-C occurrence is set to latch in Gateway Parameter Setting Tool.	–
		b13	ERRT	This signal turns ON when a communication error is detected between the Gateway and each axis.	–
		b12	MOD	This signal turns ON if the operation mode switch on the front of the unit is selected to be on MANU side, and turns OFF if on AUTO side.	–
		b11	ALMH	This signal turns ON when an error caused by the Gateway that requires a reboot is occurred. (A wrong setting in the parameters can be considered. Check the parameters settings.)	–
		b10	ALML	This signal turns ON when a light error caused by the Gateway is occurred. (It is considered that there shall be a loss of the calendar data. Check the parameters settings.)	–
		b9	–	Cannot be used.	–
		b8	SEMG	This signal turns ON when EMGIN input of the system I/O connector is OFF (emergency stop). When this bit is turned ON, all the connected axes get in the emergency stop.	–
		b7	ALMC1 to 128	It is an output of an alarm code caused by the Gateway. [Refer to Gateway alarm codes in Chapter 5. Troubleshooting for details.]	–
		b6			
		b5			
		b4			
		b3			
		b2			
		b1			
		b0			
	Control signal 1	b15	–	The bit of an axis number that a light error alarm is generated turns ON. Axis No.0 = MNT0 to Axis No.3 = MNT3	–
		b14	–		
		b13	–		
		b12	–		
		b11	MNT3		
		b10	MNT2		
		b9	MNT1		
		b8	MNT0		
		b7	–	The bit of the axis number identified as effective by the Gateway turns ON. Axis No.0 = LNK0 to Axis No.3 = LNK3	–
		b6	–		
		b5	–		
		b4	–		
		b3	LNK3		
		b2	LNK2		
		b1	LNK1		
		b0	LNK0		

3.4.4 Control Signals for Positioner 1/Simple Direct Mode

> ⚠ Caution : This mode is not applicable for CompoNet, MECHATROLINK and MEC Mode specifications.

To select the mode, use Gateway Parameter Setting Tool. All the modes can be used only by indicating a position number.

Positioner 1 Mode : Operation is performed by indicating a position number from the operation modes of the position data set in the position table.
Simple Direct Mode : This is a mode to operate with inputting the target position for positioning directly. Except for the target position, the operation follows the position data set in the indicated position number.

The settable No. of position data items is max 512 points.
The main functions of ERC3 capable to control in this mode are as described in the following table.

ROBO cylinder function	○: Direct control △: Indirect control × : Disabled		Remarks
	Positioner 1 Mode	Simple Direct Mode	
Home-return operation	○		
Positioning operation	△	○	Positioner 1 Mode : These items must be set in the position data table. Simple Direct Mode : For those other than the target position, it is necessary to set the position data.
Speed and acceleration/ deceleration setting	△		These items must be set in the position data table.
Pitch feed (inching)	△		
Pressing operation	△		
Speed change during movement	△		
Operation at different acceleration and deceleration	△		
Pause	○		
Zone signal output	○		
PIO pattern selection	×		

(1) PLC Address Composition
(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Target Position (Note 1)	m to m+1	Current Position	m to m+1
Specified Position No.	m+2	Completed Position No. (Simple Alarm Code)	m+2
Control Signal	m+3	Status Signal	m+3

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

Note 1 For Positioner 1 Mode, it is unnecessary to indicate the target position with a value. It will be disregarded even if written in.

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 4-word for each I/O data register.

- The control signals and status signals are ON/OFF signals in units of bit.
- For the target position and current position, 2-word (32-bit) binary data is available and values from -999999 to +999999 (unit: 0.01mm) can be used. Negative numbers are to be dealt with two's complement.

> ⚠ Caution : • Set the position data in the range of the soft stroke (0 to effective stroke length) of the actuator.
> • It is not necessary to have this setting done for Positioner 1 Mode.

- For the indicated position number and complete position number, 1-word (16-bit) binary data is available and values from 0 to 512 can be used.

> ⚠ Caution : Set the operational condition in advance with using a teaching tool such as PC software in the position number to be used. Selecting a position number with no setting conducted will generate the alarm code 0A2 "Position Data Error".

PLC Output (m is PLC output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Lower word)																

Address m+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Upper word)																

(Note) If the target position is a negative value, it is indicated by a two's complement.

Address m+2	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified Position No.	–	–	–	–	–	–	–	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

Address m+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal	BKRL	–	–	–	–	MODE	PWRT	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC Input (m is PLC input top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (Lower word)																

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

(Note) If the target position is a negative value, it is indicated by a two's complement.

Address m+2	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Completed Position No.	–	–	–	–	–	–	–	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

Address m+3	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal	EMGS	CRDY	ZONE1	ZONE2	PZONE	MODES	WEND	–	–	–	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Target Position	32 bits Data	–	32-bit signed integer indicating the current position Unit: 0.01mm Available range for Setting: -999999 to 999999 Set the target position with the value from the home position. (Example) If +25.40mm, input 000009EC$_H$ (2540 in decimal system). (Note) Input the negative value using a complement of 2.	3.6 (21)
	Specified Position No.	16 bits Data	PC1 to PC256	16-bit integer Available range for Setting: 0 to 511 To operate, it is necessary to have the position data that the operation conditions are already set in advance with a teaching tool such as the PC software. In this register, indicate the position number the data is input with a binary number. Indicating a value out of the range or operating with a position number with no setting conducted will generate the alarm code 0A2 “Position Data Error”.	3.6 (21)
	Control Signal	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.6 (17)
		b14	–	Cannot be used.	–
		b13			
		b12			
		b11			
		b10	MODE	Teaching Mode Command (Invalid in Simple Direct Mode) OFF: Standard mode, ON : Teaching mode	3.6 (15)
		b9	PWRT	Position Import Command (Invalid in Simple Direct Mode) ON: Position Data Import	3.6 (16)
		b8	JOG+	+Jog ON: Movement against home position, OFF: Stop	3.6 (12)
		b7	JOG-	-Jog ON: Movement toward home position, OFF: Stop	
		b6	JVEL	Jog-speed/inch-distance switching OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in ERC3 ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in ERC3	3.6 (13)
		b5	JISL	Jog/inching switching ON: Inching, OFF: Jog	3.6 (14)
		b4	SON	Servo ON Command ON: Servo ON, OFF: Servo OFF	3.6 (5)
		b3	RES	Reset A reset is performed when this signal turns ON.	3.6 (4)
		b2	STP	Pause ON: Pause, OFF: Pause Release	3.6 (10)
		b1	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (6)
		b0	CSTR	Positioning Start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (7)

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Input	Current Position	32 bits	–	32-bit signed integer indicating the current position Unit: 0.01mm (Example) If +10.23mm, input 000003FF$_H$ (1023mm in decimal system). (Note) Negative numbers are two’s complement.	3.6 (21)
	Completed Position No. (Simple Alarm Code)	16 bits	PM1 to PM256	16-bit integer The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, “0” is output. Read it by turning PEND Signal ON after movement. The simple alarm code (refer to Chapter 5. Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON).	3.6 (21)
	Control Signal	b15	EMGS	This signal turns ON during an emergency stop	3.6 (2)
		b14	CRDY	This signal turns ON when the controller is standing by.	3.6 (1)
		b13	ZONE2	“ON” for the current position within the zone 2 set range The zone range setting is necessary for the parameter.	3.6 (11)
		b12	ZONE1	“ON” for the current position within the zone 1 set range The zone range setting is necessary for the parameter.	
		b11	PZONE	Position zone (Invalid in Simple Direct Mode) This signal turns ON when the current position is inside the specified position zone.	3.6 (11)
		b10	MODES	Teaching mode Signal (Invalid in Simple Direct Mode) This signal is ON while the teaching mode is selected.	3.6 (15)
		b9	WEND	Position data import complete (Invalid in Simple Direct Mode) This signal turns ON when writing is complete.	3.6 (16)
		b8	–	Cannot be used.	–
		b7			
		b6			
		b5	PSFL	“ON” for pressing and a miss	3.6 (20)
		b4	SV	This signal turns ON when operation standby is complete (Servo is ON).	3.6 (5)
		b3	ALM	This signal is ON while an alarm is generated.	3.6 (3)
		b2	MOVE	This signal is ON while in movement.	3.6 (8)
		b1	HEND	This signal turns ON at home return complete and is kept unless the home position is lost due to a factor such as an alarm.	3.6 (6)
		b0	PEND	This signal turns ON at positioning complete and is kept ON during a stop with the servo ON, but does not turn ON when pressing operation is failed.	3.6 (9)

3.4.5 Control Signals for Direct Indication Mode

> ⚠ Caution : This mode is not applicable for CompoNet, MECHATROLINK and MEC Mode specifications.

This is an operation mode to indicate directly with values for the target position, positioning width, speed, acceleration/deceleration and pressing current.
Set a value to each input and output data register. Set to the parameters when using the zone signals.
The main functions of ERC3 capable to control in this mode are as described in the following table.

ROBO cylinder function	○: Direct control △: Indirect control × : Disabled	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration/ deceleration setting	○	
Pitch feed (inching)	○	
Pressing operation	○	
Speed change during movement	○	
Operation at different acceleration and deceleration	×	
Pause	○	
Zone signal output	△	Parameters must be set.
PIO pattern selection	×	

(1) PLC Address Composition

(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Target Position	m to m+1	Current Position	m to m+1
Positioning Width	m+2 to m+3	Command Current	m+2 to m+3
Command Speed	m+4	Current Speed	m+4
Acceleration/ Deceleration	m+5	Cannot be used.	m+5
Pressing Current Limit	m+6	Alarm Code	m+6
Control Signal	m+7	Status Signal	m+7

[Refer to Section 3.4.2 for the address maps for each Fieldbus.

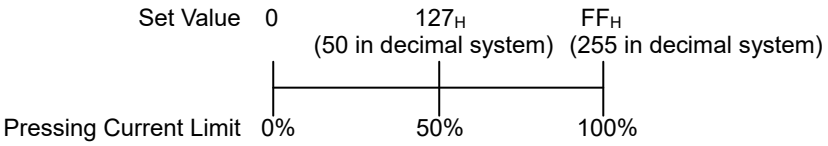
(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 8-word for each I/O data register.

- The control signals and status signals are ON/OFF signals in units of bit.
- For the target position and current position, 2-word (32-bit) binary data is available and values from -999999 to +999999 (unit: 0.01mm) can be used. Negative numbers are to be dealt with two's complement.

⚠ Caution : • Set the position data in the range of the soft stroke (0 to effective stroke length) of the actuator.

- Set the positioning width. The positioning width is expressed using 2-word (32-bit) binary data. The figures from 0 to +999999 (unit: 0.01mm) can be set in PLC.
- The command speed is expressed using 1-word (16-bit) binary data. The figures from 1 to +65535 (unit: 1.0mm/sec or 0.1mm/sec) can be set in PLC. A change of the unit is to be conducted on Gateway Parameter Setting Tool.
- The Acceleration/Deceleration is expressed using 1-word (16-bit) binary data. The figures from 1 to 300 (unit: 0.01G) can be set in PLC.
- The pressing current limit value is expressed using 1-word (16-bit) binary data. The figures from 0 to 100% (0 to FF_H) can be set in PLC.



⚠ Caution : Have the setting with values available in the range of for speed, acceleration/deceleration and pressing current of the actuator. (Refer to the catalog or instruction manual of the actuator.) Otherwise, it may cause an abnormal condition of the servo or a malfunction of the actuator such as the alarm codes 0A3 "Position Command Information Data Error", 0C0 "Excess Actual Speed", 0C8 "Overcurrent", 0CA "Overheated" or 0E0 "Overloaded".

- The command current is expressed using 2-word (32-bit) binary data (unit: 1mA).
- The current speed is expressed using 1-word (16-bit) binary data (unit: 1.0mm/sec or 0.1mm/sec).
  The unit is the one set in the command speed. A positive number is output when the revolution of the driving motor is in CCW, while a negative number when CW. Negative numbers are output with two's complement.
  A negative number is output when a movement is made towards the motor side, while a positive number when against the motor side.
- The alarm code is expressed using 1-word (16-bit) binary data.

PLC Output (m is PLC output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Lower word)																

Address m+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Upper word)																

(Note) If the target position is a negative value, it is indicated by a two's complement.

Address m+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

Address m+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

Address m+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

Address m+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

Address m+6	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Pressing Current Limit	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1

Address m+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal	BKRL	–	DIR	PUSH	–	–	–	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR

PLC Input (m is PLC input top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Position (Lower word)																

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

(Note) If the target position is a negative value, it is indicated by a two's complement.

Address m+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

Address m+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

Address m+4	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Current Speed																

(Note) If a negative value, it is indicated by a two's complement.

Address m+5	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Cannot be used.																

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

Address m+7	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal	EMGS	CRDY	ZONE2	ZONE1	–	–	–	–	–	–	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Target Position	32 bits Data	–	32-bit signed integer indicating the current position Unit: 0.01mm Available range for Setting: -999999 to 999999 Set the target position with the value from the home position. (Example) If +25.40mm, input 000009EC$_H$ (2540 in decimal system). (Note) Input the negative value using a complement of 2.	3.6 (22)
	Positioning Width	32 bits Data	–	32-bit integer Unit: 0.01mm Available range for Setting: 0 to 999999 (Example) If 25.40mm, input 000009EC$_H$ (2540 in decimal system). This register value has two meanings depending on the operation type. 1) Positioning operation ⇒ Range for positioning complete against the target position 2) Pressing operation ⇒ Pressing width (Pressing operation distance) A pressing operation is performed when PUSH Signal in the control signals is ON.	3.6 (22)
	Command Speed	16 bits Data	–	16-bit integer Unit: 1.0mm/sec or 0.1mm/sec (It is set to 1.0mm/sec in the initial setting.) A change of the unit is to be conducted on Gateway Parameter Setting Tool. Available range for Setting: 1 to 65535 Specify the speed at which to move the actuator. (Example) If 254.0mm/sec (0.1mm/sec unit), input 09EC$_H$ (2540 in decimal system). It may cause an alarm or a malfunction if executing a movement command with 0 or a value more than the maximum speed of the actuator.	3.6 (22)
	Acceleration/ Deceleration	16 bits Data	–	16-bit integer Unit: 0.01G Available range for Setting: 1 to 300 Specify the acceleration/deceleration at which to move the actuator. The acceleration and deceleration will be the same value. (Example) If 0.30G, input 001E$_H$ (30 in decimal system). It may cause an alarm or a malfunction if executing a movement command with 0 or a value exceeding the maximum acceleration/deceleration of the actuator.	3.6 (22)
	Pressing Current Limit	16 bits Data	–	16-bit integer Unit: % Available range for Setting: 0 to 100 Indicate the current limit value for pressing operation. (Example) If “50%”, input “007F$_H$”. The pressing range available for indication differs depending on the actuator (Refer to the catalog or instruction manual for the actuator). It may cause an alarm or a malfunction if executing a movement command with a value more than the maximum pressing current.	3.6 (22)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Control Signal	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.6 (17)
		b14	–	Cannot be used.	–
		b13	DIR	Push direction specification ON: Movement against home position, OFF: Movement toward home position	3.6 (19)
		b12	PUSH	Push-motion specification ON: Pressing operation, OFF: Positioning operation	3.6 (18)
		b11	–	Cannot be used.	–
		b10			
		b9			
		b8	JOG+	+Jog ON: Movement against home position, OFF: Stop	3.6 (12)
		b7	JOG-	-Jog ON: Movement toward home position, OFF: Stop	3.6 (12)
		b6	JVEL	Jog-speed/inch-distance switching OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in ERC3 ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance 2 in ERC3	3.6 (13)
		b5	JISL	Jog/inching switching ON: Inching, OFF: Jog	3.6 (14)
		b4	SON	Servo ON Command ON: Servo ON, OFF: Servo OFF	3.6 (5)
		b3	RES	Reset A reset is performed when this signal turns ON.	3.6 (4)
		b2	STP	Pause ON: Pause, OFF: Pause Release	3.6 (10)
		b1	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (6)
		b0	CSTR	Positioning Start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (7)

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Input	Current Position	32 bits Data	–	32-bit signed integer indicating the current position Unit: 0.01mm (Example) If 10.23mm, input 000003FF$_H$ (1023mm in decimal system). (Note) Negative numbers are two’s complement.	3.6 (22)
	Command Current	32 bits Data	–	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. This resistor makes an output in hexadecimal numbers. (Example) Reading: 000003FF$_H$ = 1023 (Decimal number) = 1023mA	3.6 (22)
	Current Speed	16 bits Data	–	16-bit integer The current speed is indicated. Unit: 1.0mm/sec or 0.1mm/sec. A change of the unit is to be conducted on Gateway Parameter Setting Tool. (Example) Reading: 03FF$_H$ = 1023 (Decimal number) = 1023mm/sec (1mm/sec unit) (Note) Negative numbers are two’s complement.	3.6 (22)
	Alarm Code	16 bits Data	–	16-bit integer The simple alarm code (refer to Chapter 5. Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON).	3.6 (22)
	Status Signal	b15	EMGS	This signal turns ON during an emergency stop	3.6 (2)
		b14	CRDY	This signal turns ON when the controller is standing by.	3.6 (1)
		b13	ZONE2	“ON” for the current position within the zone 2 set range The zone range setting is necessary for the parameter.	3.6 (11)
		b12	ZONE1	“ON” for the current position within the zone 1 set range The zone range setting is necessary for the parameter.	
		b11	–	Cannot be used.	–
		b10			
		b9			
		b8			
		b7			
		b6			
		b5	PSFL	This signal turns ON when the actuator missed the load in push-motion operation.	3.6 (20)
		b4	SV	This signal turns ON when operation standby is complete (Servo is ON).	3.6 (5)
		b3	ALM	This signal is ON while an alarm is generated.	3.6 (3)
		b2	MOVE	This signal is ON while in movement.	3.6 (8)
		b1	HEND	This signal turns ON at home return complete and is kept unless the home position is lost due to a factor such as an alarm.	3.6 (6)
		b0	PEND	This signal turns ON at positioning complete and is kept ON during a stop with the servo ON, but does not turn ON when pressing operation is failed.	3.6 (9)

3.4.6 Control Signals for Positioner 2 Mode

> ⚠ Caution : This mode is not applicable for CompoNet, MECHATROLINK and MEC Mode specifications.

It is an operation mode to operate with indicating a position number. The operation is to be made with the position data set in the position table. This is a mode that the indication of the target position and the monitoring of the current value are removed from Positioner 1.
The settable No. of position data items is max 512 points.
The main functions of ERC3 capable to control in this mode are as described in the following table.

ROBO cylinder function	○: Direct control △: Indirect control ×: Disabled	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 movement	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	○	
PIO pattern selection	×	

(1) PLC Address Composition

(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Specified Position No.	m	Completion Position No. (Simple Alarm Code)	m
Control Signal	m+1	Status Signal	m+1

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 2-word for each I/O data register.

- The control signals and status signals are ON/OFF signals in units of bit.
- For the indicated position number and complete position number, 1-word (16-bit) binary data is available and values from 0 to 511 can be used.

> ⚠ Caution:
> Set the operational condition in advance with using a teaching tool such as PC software in the position number to be used. Selecting a position number with no setting conducted will generate the alarm code 0A2 “Position Data Error”.

PLC Output (m is PLC output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Specified Position No.	–	–	–	–	–	–	–	PC256	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1

Address m+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal	BKRL	–	–	–	–	–	–	JOG+	JOG-	–	JISL	SON	RES	STP	HOME	CSTR

PLC Input (m is PLC input top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Completed Position No.	–	–	–	–	–	–	–	PM256	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1

Address m+1	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal	EMGS	CRDY	ZONE2	ZONE1	PZONE	MODES	WEND	–	–	–	PSFL	SV	ALM	MOVE	HEND	PEND

(3) I/O signal assignment

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Specified Position No.	16 bits Data	PC1 to PC256	16-bit integer Available range for Setting: 0 to 511 To operate, it is necessary to have the position data that the operation conditions are already set in advance with a teaching tool such as the PC software. In this register, indicate the position number the data is input with a binary number. Indicating a value out of the range or operating with a position number with no setting conducted will generate the alarm code 0A2 “Position Data Error”.	3.6 (23)
	Control Signal	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.6 (17)
		b14	–	Cannot be used.	–
		b13			
		b12			
		b11			
		b10	MODE	Teaching Mode Command (Unavailable in Simple Direct Mode) OFF: Normal mode, ON: Teaching mode	3.6 (15)
		b9	PWRT	Position Writing Command (Unavailable in Simple Direct Mode) ON: Position Data Import	3.6 (16)
		b8	JOG+	+Jog ON: Movement against home position, OFF: Stop	3.6 (12)
		b7	JOG-	-Jog ON: Movement toward home position, OFF: Stop	
		b6	JVEL	Jog-speed/inch-distance switching OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in ERC3 ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance 2 in ERC3	3.6 (13)
		b5	JISL	Jog/inching switching ON: Inching, OFF: Jog	3.6 (14)
		b4	SON	Servo ON command ON: Servo ON, OFF: Servo OFF	3.6 (5)
		b3	RES	Reset A reset is performed when this signal turns ON.	3.6 (4)
		b2	STP	Pause ON: Pause, OFF: Pause release	3.6 (10)
		b1	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (6)
		b0	CSTR	Positioning start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (7)

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Output	Completed position No. (Simple alarm code)	16 bits	PM1 to PM256	16-bit integer The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, “0” is output. Read it by turning PEND Signal ON after movement. The simple alarm code (refer to Chapter 5. Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON).	3.6 (23)
	Status Signal	b15	EMGS	This signal turns ON during an emergency stop	3.6 (2)
		b14	CRDY	This signal turns ON when the controller is standing by.	3.6 (1)
		b13	ZONE2	“ON” for the current position within the zone 2 set range The zone range setting is necessary for the parameter.	3.6 (11)
		b12	ZONE1	“ON” for the current position within the zone 1 set range The zone range setting is necessary for the parameter.	
		b11	PZONE	Position zone (Invalid in Simple Direct Mode) This signal turns ON when the current position is inside the specified position zone.	3.6 (11)
		b10	MODES	Teaching mode Signal (Invalid in Simple Direct Mode) This signal is ON while the teaching mode is selected.	3.6 (15)
		b9	WEND	Position data import complete (Invalid in Simple Direct Mode) This signal turns ON when writing is complete.	3.6 (16)
		b8	–	Cannot be used.	–
		b7			
		b6			
		b5	PSFL	This signal turns ON when the actuator missed the load in push-motion operation.	3.6 (20)
		b4	SV	This signal turns ON when operation standby is complete (Servo is ON).	3.6 (5)
		b3	ALM	This signal is ON while an alarm is generated.	3.6 (3)
		b2	MOVE	This signal is ON while in movement.	3.6 (8)
		b1	HEND	This signal turns ON at home return complete and is kept unless the home position is lost due to a factor such as an alarm.	3.6 (6)
		b0	PEND	This signal turns ON at positioning complete and is kept ON during a stop with the servo ON, but does not turn ON when pressing operation is failed.	3.6 (9)

3.4.7 Control Signals for Positioner 3 Mode

This is the operation mode with the position No. set up. The operation is to be made with the position data set in the position table. This is the mode with the minimum amount of input and output signals and the sent and received data in 1-word.
The settable No. of position data items is max 256 points.
The main functions of ROBO Cylinder capable to control in this mode are as described in the following table.

ROBO cylinder function	○: Direct control △: Indirect control × : Disabled	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 movement	△	
Operation at different acceleration and deceleration	△	
Pause	○	
Zone signal output	△	Zones are set using parameters.

(1) PLC Address Composition

(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Control Signal/ Specified Position No.	m	Status Signal/ Completion Position No.	m

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 1-word for each I/O data register.

- The control signals and status signals are ON/OFF signals in units of bit.
- Binary data of 8 bits for the specified position number and complete position number and values from 0 to 255 can be used.

⚠ Caution : Set the operational condition in advance with using a teaching tool such as PC software in the position number to be used. Selecting a position number with no setting conducted will generate the alarm code 0A2 “Position Data Error”.

PLC Output (m is PLC output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal/ Specified Position No.	BKRL	–	–	SON	RES	STP	HOME	CSTR	PC128	PC64	PC32	PC16	PC8	PC4	PC2	PC1
	Control Signal								Specified Position No.							

PLC Input (m is PLC input top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Status Signal/ Completed Position No.	EMGS	ZONE1	PSFL	SV	ALM	MOVE	HEND	PEND	PM128	PM64	PM32	PM16	PM8	PM4	PM2	PM1
	Status Signal								Completed Position No.							

(3) I/O signal assignment

(ON = Applicable bit is “1”, OFF = Applicable bit is “0”)

Signal Type		Bit	Symbol	Description	Details
PLC Input	Control Signal/ Specified Position No.	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.6 (17)
		b14	–	Cannot be used.	–
		b13			
		b12	SON	Servo ON command ON: Servo ON, OFF: Servo OFF	3.6 (5)
		b11	RES	Reset A reset is performed when this signal turns ON.	3.6 (4)
		b10	STP	Pause ON: Pause, OFF: Pause release	3.6 (10)
		b9	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (6)
		b8	CSTR	Positioning start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.6 (7)
		b7	PC128	8 bits binary data Available range for Setting: 0 to 255 To operate, it is necessary to have the position data that the operation conditions are already set in advance with a teaching tool such as the PC software. In this register, indicate the position number the data is input with a binary number. Indicating a value out of the range or operating with a position number with no setting conducted will generate the alarm code 0A2 “Position Data Error”.	3.6 (23)
		b6	PC64		
		b5	PC32		
		b4	PC16		
		b3	PC8		
		b2	PC4		
		b1	PC2		
		b0	PC1		
PLC Output	Status Signal/ Completed Position No.	b15	EMGS	This signal turns ON during an emergency stop	3.6 (2)
		b14	ZONE1	“ON” for the current position within the zone 1 set range The zone range setting is necessary for the parameter.	3.6 (11)
		b13	PSFL	This signal turns ON when the actuator missed the load in push-motion operation.	3.6 (20)
		b12	SV	This signal turns ON when operation standby is complete (Servo is ON).	3.6 (5)
		b11	ALM	This signal is ON while an alarm is generated.	3.6 (3)
		b10	MOVE	This signal is ON while in movement.	3.6 (8)
		b9	HEND	This signal turns ON at home return complete and is kept unless the home position is lost due to a factor such as an alarm.	3.6 (6)
		b8	PEND	This signal turns ON at positioning complete and is kept ON during a stop with the servo ON, but does not turn ON when pressing operation is failed.	3.6 (9)
		b7	PM128	8 bits binary data The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, “0” is output. Read it by turning PEND Signal ON after movement.	3.6 (23)
		b6	PM64		
		b5	PM32		
		b4	PM16		
		b3	PM8		
		b2	PM4		
		b1	PM2		
		b0	PM1		

3.4.8 Control Signals for Remote I/O Mode

(1) CON Mode Type

This is an operation mode same as when using PIO (24V input and output).
Set the position data from a teaching tool such as the RC PC software.
The number of positioning points depends on the operation pattern (PIO pattern) set in the parameters of ERC3 unit.
The I/O specifications for the operation pattern are described as follows. [Refer to Instruction Manual for the ERC3 actuator with integrated controller for more information]

PIO Pattern	Operation Mode	I/O Type
0	Positioning mode	Positioning points: 64 points Zone signal output 1 point (Note1) Position zone signal output (Note 2)1 point
1	Teaching mode	Positioning points: 64 points Zone signal output (Note 2)1 point Jog operation is available The current position can be written to a specified position.
2	256-point mode	Positioning points: 256 points Zone signal output (Note 2)1 point
3	512-point mode	Positioning points: 512 points There are no zone signal outputs.
4	Solenoid valve mode 1	Positioning points: 7 points Zone signal output 1 point (Note 1) Position zone signal output (Note 2)1 point Operation command available only with position number indication
5	Solenoid valve mode 2	Positioning points: 3 points Zone signal output 1 point (Note 1) Position zone signal output (Note 2)1 point The actuator is operated by specifying forward, backward and intermediate position commands. Complete signal is able to output a signal equivalent to the limit switch

Note 1 Set the range of the zone in ERC3 parameter. It becomes constantly valid once the home-return operation is complete.

Note 2 The range of the zone is to be set in the position table, and is activated only when that position number is indicated. It is invalid in other position number commands. The position zone signal can be switched over to the zone signal with the setting of Parameter No.149 of ERC3.

The ERC3 functions capable to control in this mode are as described in the table below.
○: Operation available ×: Operation not available

ROBO cylinder function	Operation Pattern (PIO Pattern)					
	0	0	0	0	0	0
	Positioning mode	Teaching mode	256-point mode	512-point mode	Solenoid valve mode 1	Solenoid valve mode 2
Home-return operation	○	○	○	○	○	×(Note 1)
Positioning operation	○	○	○	○	○	○
Speed and acceleration/deceleration setting	○	○	○	○	○	○
Pitch feed (inching)	○	○	○	○	○	○
Pressing operation	○	○	○	○	○	×
Speed change during movement	○	○	○	○	○	○
Operation at different acceleration and deceleration	○	○	○	○	○	○
Pause	○	○	○	○	○	○(Note 2)
Zone signal output	○	○	○	×	○	○
Selecting the PIO pattern	○	○	○	○	○	○

Note 1 Home-return operation is performed in the first movement command.
Note 2 It is available when the parameter No. 27 of ERC3 “Movement Command Type” is set to “0”.

(1) PLC Address Composition

(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Port No. 0 to 15	m	Port No. 0 to 15	m

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 1-word for each I/O bit register.

- The I/O bit register is controlled using the ON/OFF signal in units of bit. (ON = Applicable bit is “1”, OFF = Applicable bit is “0”)
- The content of the signal for each bit changes depending what is selected in the PIO patterns.
  [Refer to next section I/O signal assignment]

PLC Output (m is PLC input and output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Controller Input Port No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

PLC Output (m is PLC input and output top word address for each axis number)

1 word = 16 bit

Address m	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller Output Port No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

(3) I/O signal assignment

The controller's I/O port signal varies depending on the parameter No. 25 setting.
[Refer to Instruction Manual for the ERC3 actuator with integrated contoroller for more information]

		Set the parameter No.25 of ERC3					
		Positioning mode		Teaching mode		256-point mode	
		0		1		2	
Category	Port No.	Symbol	Signal Name	Symbol	Signal Name	Symbol	Signal Name
PLC output→ ERC3 input	0	PC1	Specified Position Number	PC1	Specified Position Number	PC1	Specified Position Number
	1	PC2		PC2		PC2	
	2	PC4		PC4		PC4	
	3	PC8		PC8		PC8	
	4	PC16		PC16		PC16	
	5	PC32		PC32		PC32	
	6	–	Cannot be used.	MODE	Teaching Mode Command	PC64	
	7	–		JISL	Jog/Inching Switching	PC128	
	8	–		JOG+	+Jog	–	Cannot be used.
	9	BKRL	Brake release	JOG-	-Jog	BKRL	Brake release
	10	–	Cannot be used.	–	Cannot be used.	–	Cannot be used.
	11	HOME	Home return	HOME	Home return	HOME	Home return
	12	*STP	Pause	*STP	Pause	*STP	Pause
	13	CSTR	Positioning Start	CSTR/ PWRT	Positioning Start/ Position Data Import Command	CSTR	Positioning Start
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON Command	SON	Servo ON Command	SON	Servo ON Command
ERC3 output →PLC input	0	PM1	Completed Position No.	PM1	Completed Position No.	PM1	Completed Position No.
	1	PM2		PM2		PM2	
	2	PM4		PM4		PM4	
	3	PM8		PM8		PM8	
	4	PM16		PM16		PM16	
	5	PM32		PM32		PM32	
	6	MOVE	Moving Signal	MOVE	Moving Signal	PM64	
	7	ZONE1	ZONE1	MODES	Teaching mode Signal	PM128	
	8	PZONE/ Z0NE2	Position Zone/ Zone 2	PZONE/ ZONE1	Position Zone/ Zone 1	PZONE/ ZONE1	Position Zone
	9	–	Cannot be used.	–	Cannot be used.	–	Cannot be used.
	10	HEND	Home Return Completion	HEND	Home Return Completion	HEND	Home Return Completion
	11	PEND	Positioning Completion Signal	PEND/ WEND	Positioning Completion Signal/Position Data Import Complete	PEND	Positioning Completion Signal
	12	SV	Operation Preparation Completion	SV	Operation Preparation Completion	SV	Operation Preparation Completion
	13	*EMGS	Emergency Stop	*EMGS	Emergency Stop	*EMGS	Emergency Stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	LOAD /TRQS /*ALML	Load Output Judgment/ Torque Level/ Light Error Alarm	*ALML	Light Error Alarm	LOAD /TRQS /*ALML	Load Output Judgment/ Torque Level/ Light Error Alarm

(Note) "*" in codes above shows the signal of the active low.

(Reference) Signal of Active Low
A signal of active low is a signal that the input signal is processed when it is turned OFF, output signal is ordinarily on while the power is ON, and turns OFF when the signal is output.

		Set the parameter No.25 of ERC3					
		256-point mode		Solenoid valve mode 1		Solenoid valve mode 2	
		3		4		5	
Category	Port No.	Symbol	Signal Name	Symbol	Signal Name	Symbol	Signal Name
PLC output→ ERC3 input	0	PC1	Specified Position Number	ST0	Start Position 0	ST0	Start Position 0
	1	PC2		ST1	Start Position 1	ST1	Start Position 1
	2	PC4		ST2	Start Position 2	ST2	Start Position 2
	3	PC8		ST3	Start Position 3	–	Cannot be used.
	4	PC16		ST4	Start Position 4	–	
	5	PC32		ST5	Start Position 5	–	
	6	PC64		ST6	Start Position 6	–	
	7	PC128		–	Cannot be used.	–	
	8	PC256		–		–	
	9	BKRL	Brake Release	BKRL	Brake Release	BKRL	Brake Release
	10	–	Cannot be used.	–	Cannot be used.	–	Cannot be used.
	11	HOME	Home Return	HOME	Home Return	–	Cannot be used.
	12	*STP	Pause	*STP	Pause	–	
	13	CSTR	Positioning Start	–	Cannot be used.	–	
	14	RES	Reset	RES	Reset	RES	Reset
	15	SON	Servo ON Command	SON	Servo ON Command	SON	Servo ON Command
ERC3 output →PLC input	0	PM1	Completed Position No.	PE0	Position 0 complete	LS0	Backword End Move Command 0
	1	PM2		PE1	Position 1 complete	LS1	Backword End Move Command 1
	2	PM4		PE2	Position 2 complete	LS2	Backword End Move Command 2
	3	PM8		PE3	Position 3 complete	–	Cannot be used.
	4	PM16		PE4	Position 4 complete	–	
	5	PM32		PE5	Position 5 complete	–	
	6	PM64		PE6	Position 6 complete	–	
	7	PM128		ZONE1	ZONE 1	ZONE1	ZONE 1
	8	PM256		PZONE/ ZONE2	Position Zone/ ZONE 2	PZONE/ ZONE2	Position Zone/ ZONE 2
	9	–	Cannot be used.	–	Cannot be used.	–	Cannot be used.
	10	HEND	Home Return Completion	HEND	Home Return Completion	HEND	Home Return Completion
	11	PEND	Positioning Completion Signal	PEND	Positioning Completion Signal	–	Cannot be used.
	12	SV	Operation Preparation Completion	SV	Operation Preparation Completion	SV	Operation Preparation Completion
	13	*EMGS	Emergency Stop	*EMGS	Emergency Stop	*EMGS	Emergency Stop
	14	*ALM	Alarm	*ALM	Alarm	*ALM	Alarm
	15	LOAD /TRQS /*ALML	Load Output Judgment/ Torque Level/ Light Error Alarm	LOAD /TRQS /*ALML	Load Output Judgment/ Torque Level/ Light Error Alarm	*ALML	Light Error Alarm

(Note) "*" in codes above shows the signal of the active low.

[2] MEC Mode Type

This is an operation mode same as when using PIO (24V input and output).
Set the position data using a teaching tool such as the PC software.
The I/O specifications for the operation pattern are described as follows. [Refer to Operation Manual for the ERC3 actuator with integrated controller for more information]

Operation Mode	I/O Type
1-Input, 2-Point Movement	2 positioning points 1 point of positioning movement command (move to start point if it is ON and to end point if OFF) 2 points of position detection output
2-Input, 3-Point Movement	3 positioning points 2 point of positioning movement command (Move to start point with ST0 ON, to end point with ST1 ON, and to intermediate point when ST0 and 1 are either ON or OFF, which depends on how the setting is established.) 3 points of position detection output

The ERC3 functions capable to control in this mode are as described in the table below.
○: Operation available ×: Operation not available

ROBO cylinder function	Operation Pattern	
	1-Input, 2-Point Movement	2-Input, 3-Point Movement
Home-return operation	×(Note1)	×(Note1)
Positioning operation	○	○
Speed and acceleration/deceleration setting	○	○
Pitch feed (inching)	×	×
Pressing operation	○	○
Speed change during movement	×	×
Operation at different acceleration and deceleration	○	○
Pause	×	○
Zone signal output	×	×

Note 1 Home-return operation is performed in the first movement command.

(1) PLC Address Composition

(m is PLC input and output top word address for each axis number)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Port No.0 to 15	m	Port No.0 to 15	m

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 1-word for each I/O bit register.

- The I/O bit register is controlled using the ON/OFF signal in units of bit. (ON = Applicable bit is “1”, OFF = Applicable bit is “0”)
- The content of the signal for each bit changes depending what is selected in the PIO patterns. [Refer to (3) I/O signal assignment]

PLC output (m is PLC input and output top word address for each axis number)

1 word = 16 bit

Address m	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Controller input port number	I	I	I	I	I	I	I	I	I	I	I	I	3	2	1	0

PLC input (m is PLC input and output top word address for each axis number)

1 word = 16 bit

Address m	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
Controller output port number	I	I	I	I	I	I	I	I	I	I	I	I	3	2	1	0

(3) I/O signal assignment

The content of I/O port signal changes depending on the operation pattern.
The contents of the signals for the input and output ports vary depending of the operation pattern.
[Refer to Instruction Manual for the ERC3 actuator with integrated controller for more information]

		1-Input, 2-Point Movement		2-Input, 3-Point Movement	
Category	Port No.	Symbol	Signal Name	Symbol	Signal Name
PLC output→ ERC3 input	0	ST0	Movement Signal 1	ST0	Movement Signal 1
	1	*STP	Pause	ST1	Pause
	2	RES	Alarm Reset	RES	Alarm Reset
	3	SON(Note1)	Servo ON	SON(Note1)	Servo ON
ERC3 output →PLC input	0	LS0	Start Point Detection	LS0	Start Point Detection
		PE0	Start Point Position complete	PE0	Start Point Position complete
	1	LS1	End Point Detection	LS1	End Point Detection
		PE1	End Point Position Complete	PE1	End Point Position Complete
	2	HEND	Home Return Completion	LS2	Intermediate Point Detection
		SV	Servo ON	PE2	Intermediate Point Positioning Completion
	3	*ALM	Alarm Output	*ALM	Alarm Output
		SV	Servo ON	SV	Servo ON

Note “*” in codes above shows the signal of the active low.
Note 1 It is invalid before home-return operation. Home-return operation is performed at the first movement after the power is turned ON.

(Reference) Signal of Active Low

A signal of active low is a signal that the input signal is processed when it is turned OFF, output signal is ordinarily on while the power is ON, and turns OFF when the signal is output.

3.4.9 About Commands (Position Data Read/Write and Alarm Axis Read)

By sending a specific code to a specific address, the position data reading and writing, and the reading of the axis number that an alarm was issued and the alarm code can be performed.
(Note) It is not necessary to use commands in Simple Direct Mode because no position data is to be used in it.

> ⚠ Caution :• The command cannot be used in MECHATROLINK type.
> • Is not necessary to use commands in Simple Direct Mode because no position data is to be used in it.

Shown below is the table to indicate the assignment of each signal.

(1) PLC Address Composition

(n is PLC input and output top address.)

PLC → ERC3 (PLC Output)		ERC3 → PLC (PLC Input)	
Command	n+2	Response Command	n+2
Data 0	n+3	Data 0	n+3
Data 1	n+4	Data 1	n+4
Data 2	n+5	Data 2	n+5
Data 3	n+6	Data 3	n+6

[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Command List

Class	Code	Description
Handshaking	0000_H	Command cleared
Write Position Data	1000_H	Writing of target position
	1001_H	Writing of pressing width
	1002_H	Writing of speed
	1003_H	Cannot be used.
	1004_H	
	1005_H	Writing of acceleration
	1006_H	Writing of deceleration
	1007_H	Writing current limit at pressing
	1008_H	Cannot be used.
Read Position Data	1040_H	Reading of target position
	1041_H	Reading of pressing width
	1042_H	Reading of speed
	1043_H	Cannot be used.
	1044_H	
	1045_H	Reading of acceleration
	1046_H	Reading of deceleration
	1047_H	Reading of current limit at pressing
	1048_H	Cannot be used.
Error Information Monitoring	4000_H	Acquiring alarm-issued axis
	4001_H	Acquiring alarm code

(3) Details of Commands

The I/O signals are consist of 5-word for each I/O data register.

- The target position and current position are expressed using 2-word (32-bit) binary data. The figures from -999999 to +999999 (unit: 0.01mm) can be set in PLC. Negative numbers are to be dealt with two's complement.
- Binary data of 2-word (32-bit) for the pressing band and values from 1 to +999999 (unit: 0.01mm) in PLC can be used.

⚠ Caution :• Set the position data of the actuator, such as the target position and positioning width, in the range of the soft stroke (0 to effective stroke length).

- Binary data of 2-word (32-bit) for the speed and values from 1 to +999999 (unit: 0.1mm/s) in PLC can be used. A change of the unit is to be conducted on Gateway Parameter Setting Tool.
- The Acceleration and Deceleration are expressed using 1-word (16-bit) binary data. The figures from 1 to 300 (unit: 0.01G) can be set in PLC.
- The pressing current limit value is expressed using 1-word (16-bit) binary data. The figures from 0 (0%) to 255 (100%) can be set in PLC.
- Binary data of 1-word (16-bit) for the axis numbers and values from 0 (1st Axis) to 3 (4th Axis) in PLC can be used.
- Binary data of 1-word (16-bit) for the position numbers and values from 0 (No.0) to 511 (No.511) in PLC can be used.
- The alarm code is expressed using 1-word (16-bit) binary data.

⚠ Caution : Be sure to set the values for speed, acceleration/deceleration, and pressing current within the applicable range of the actuator. (Refer to the catalog or instruction manual of the actuator.) Otherwise, it may cause an abnormal condition of the servo or a malfunction of the actuator such as the alarm codes 0A3 "Position Command Information Data Error", 0C0 "Excess Actual Speed", 0C8 "Overcurrent", 0CA "Overheated" or 0E0 "Overloaded".

1) Command Cleared
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
(Note) Response command does not return.

1 word = 16 bit

	Bit / Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Demand Command Cleared	n+2 Command [0000h]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+3 Data 0 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

2) Writing of Target Position
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command.
If an error is generated, an error response is returned. [Refer to this Section 15).]

1 word = 16 bit

	Bit / Address	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Target Position	n+2 Command [1000h]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Target Position (Lower word)]																
	n+5 Data 2 [Target Position (Upper word)]																
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

3) Writing of Positioning Width

PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command. If an error is generated, an error response is returned. [Refer to this Section 15).]

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Pressing Width	n+2 Command [1001h]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Pressing Width (Lower word)]																
	n+5 Data 2 [Pressing Width (Upper word)]																
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

4) Writing of Speed

PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command. If an error is generated, an error response is returned. [Refer to this Section 15).]

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Speed	n+2 Command [1002h]	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Speed (Lower word)]	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [Speed (Upper word)]	–	–	–	–	–	–	–	–	–	–	–	–	524288	262144	131072	65536
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

5) Writing of Acceleration
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command. If an error is generated, an error response is returned. [Refer to this Section 16).]

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Acceleration	n+2 Command [1005h]	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Acceleration]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

6) Writing of Deceleration
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command. If an error is generated, an error response is returned. [Refer to this Section 16).]

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Deceleration	n+2 Command [1006h]	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Deceleration]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

7) Writing of Pressing Current Limit
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
(Note) If the writing is finished in normal condition, the same content as the command is returned to the response command. If an error is generated, an error response is returned. [Refer to this Section 16).]

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Writing of Pressing Current Limit	n+2 Command [1007h]	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Pressing Current Limit]	–	–	–	–	–	–	–	–	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

8) Reading of Target Position
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Target Position	n+2 Command [1040h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Target Position	n+2 Response Command [1040h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Target Position (Lower word)]																
	n+5 Data 2 [Target Position (Upper word)]																
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

9) Reading of Pressing Width
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Pressing Width	n+2 Command [1041h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Pressing Width	n+2 Response Command [1041h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Pressing Width (Lower word)]																
	n+5 Data 2 [Pressing Width (Upper word)]																
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

10) Reading of Speed
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Speed	n+2 Command [1042h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Speed	n+2 Response Command [1042h]	0	0	0	1	0	0	0	0	0	1	0	0	0	0	1	0
	n+3 Data 0 [Position No.]	–	–	–	–	–	–	–	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Speed (Lower word)]	32768	16384	8192	4096	2048	1024	512	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [Speed (Upper word)]	–	–	–	–	–	–	–	–	–	–	–	–	524288	262144	131072	65536
	n+6 Data 3 [Axis No.]	–	–	–	–	–	–	–	–	–	–	–	–	–	4	2	1

11) Reading of Acceleration
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Acceleration	n+2 Command [1045h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Acceleration	n+2 Response Command [1045h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Acceleration]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

12) Reading of Deceleration
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Deceleration	n+2 Command [1046h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Deceleration	n+2 Response Command [1046h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	0
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Deceleration]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

13) Reading of Pressing Current Limit
PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Pressing Current Limit	n+2 Command [1047h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Pressing Current Limit	n+2 Response Command [1047h]	0	0	0	1	0	0	0	0	0	1	0	0	0	1	1	1
	n+3 Data 0 [Position No.]	-	-	-	-	-	-	-	256	128	64	32	16	8	4	2	1
	n+4 Data 1 [Pressing Current Limit]	-	-	-	-	-	-	-	-	128	64	32	16	8	4	2	1
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

14) Reading of Alarm-issued Axis Number

PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

(Note) If this command is sent, the response command updates with the latest information until the command clear is sent.

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Alarm-issued Axis Number	n+2 Command [4000h]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+3 Data 0 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Alarm-issued Axis Number	n+2 Response Command [4000h]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+3 Data 0 [0]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	n+4 Data 1 [Alarm-issued Axis Number] 1: Alarm 2: Normal	–	–	–	–	–	–	–	–	–	–	–	–	Status of 3rd Axis	Status of 2nd Axis	Status of 1st Axis	Status of 0th Axis
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

15) Reading of Alarm Code

PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)

(Note) If this command is sent, the response command updates with the latest information until the command clear is sent.

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Alarm Code	n+2 Command [4001h]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	n+3 Data 0 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+4 Data 1 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

PLC Input (Address n is the input and output top address for ERC3 Gateway Unit.)

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Reading of Alarm Code	n+2 Response Command [4001h]	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	n+3 Data 0 [0]	-	-	-	-	-	-	-	-	128	64	32	16	8	4	2	1
	n+4 Data 1 [Alarm Code]																
	n+5 Data 2 [0]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	n+6 Data 3 [Axis No.]	-	-	-	-	-	-	-	-	-	-	-	-	-	4	2	1

16) Error Response Command

PLC Output (Address n is the input and output top address for ERC3 Gateway Unit.)
In the case that the command did not complete in normal condition, this error response command is returned.

1 word = 16 bit

	Address \ Bit	b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Error Response Command	n+2 Command	1	The values are those with the bit 15 of the command code being 1.														
	n+3 Data 0 [Undefined]	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	n+4 Data 1 [Error Detail]	0101_H: Incorrect Axis Number 0102_H: Incorrect Position Number 0103_H: Incorrect Command 0104_H: Communication error 0105_H: Controller Execution Impossible															
	n+5 Data 2 [Undefined]	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
	n+6 Data 3 [Undefined]	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

3.5 Input and Output Signal Process for Field Network

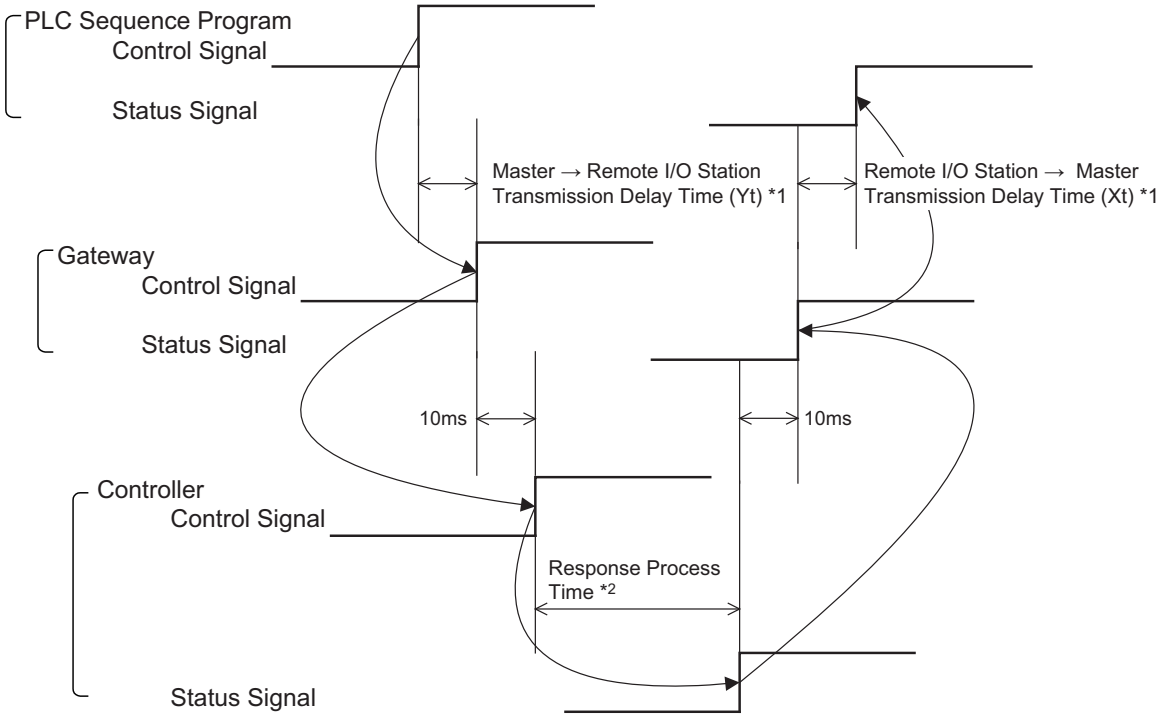
(1) I/O Signal Timings

When any of the control signal is turned ON to perform the operation of the ERC3 using the PLC's sequence program, the response (status) is returned to the PLC. The maximum response time is expressed using the following formula.
The value is constant regardless the number of composition axes.

Max. response time (msec) = Yt + Xt + 20 + Response process time (operation time, etc.)

Yt : Master Station → Slave Transmission Delay Time
Xt : Slave → Master Station Transmission Delay Time
} Field Network Transmission Delay Time

Refer to the instruction manual of the mounted PLC for the master station → slave transfer delay time (Yt) and the slave → master station transfer delay time (Xt).



*1 Refer to PLC Manual
*2 Varies depending on the content of control

(2) Command Sending and Receiving Timing (Reading and Writing of Position Data and Reading of Alarm Axis)

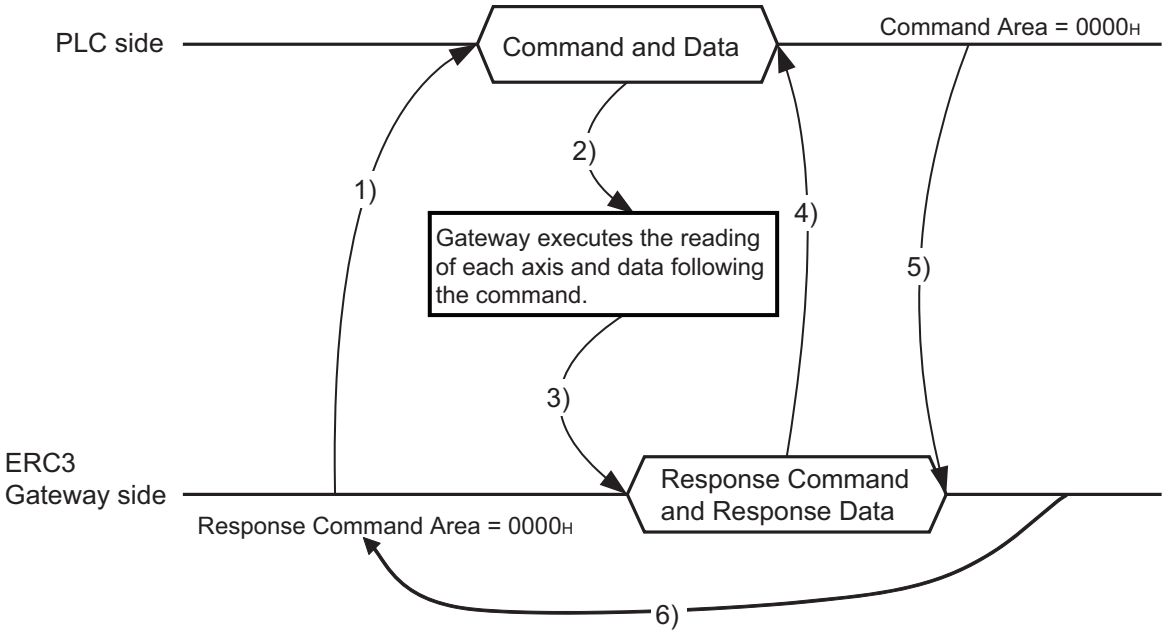
By writing and reading the specified commands to the area of 5-word next to Gateway control/status area, reading and writing of the position data and reading of alarm axis can be conducted.

Gateway executes the command every time the control/status data exchange finishes for all the axes. [Refer to Section 3.4.9 About Command.]

● Step

1) PLC confirms the area of response command is 0.
2) PLC sets the necessary commands and data to the indicated area and send them.
3) Gateway detects that the area of the command has become other than 0, and rewrites the appropriate axis data if it is the writing command, and reads the requirement data from the appropriate axis if reading command.
4) Gateway output the response result to PLC once the command is executed.
5) Once PLC has confirmed the response result, clear the area for the command to 0.
6) Gateway clears the response command area to 0 and waits for the next command after it detects the command is cleared.

The procedures from 1) to 6) are repeated when continuously used.



3.6 I/O Signal Controls and Function

This section explains the signals used in modes other than Remote I/O Mode. For the I/O signals for the Remote I/O Mode refer to the instruction manual for the ERC3 actuator with integrated contoroller.
The applicable bit is “1” when the signal is ON and “0” when it is OFF.

(1) Controller ready (CRDY) PLC Input Signal

When the ERC3 can control the system after the power is supplied, it is turned “ON”.
■ Function
Regardless of the alarm or servo conditions, when the ERC3 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 ERC3 can control the system, it is turned “ON”.

(2) Emergency stop (EMGS) PLC Input Signal

When the ERC3 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 (RES) signal is turned “ON”, the alarm is turned “OFF” in the case that it is the alarm with the operation cancellation level. (In the case of the alarm with the cold start level, cycling the power is required.)

(4) Reset (RES) PLC Output Signal

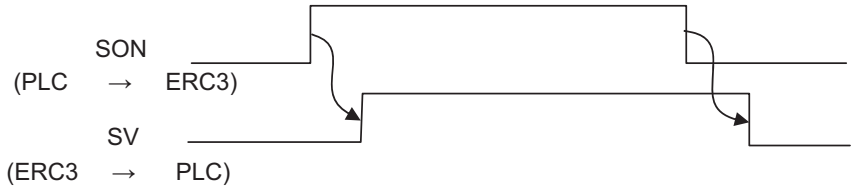
This signal has two functions. It can reset the ERC3 alarm and cancel the reminder for planned movements during pause conditions.
■ Function
1) When this signal is turned ON from OFF condition after eliminating the cause of the alarm during the alarm output, the alarm (ALM) signal can be reset. (In the case of the alarm with the cold start level, cycling 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 ready (SV) PLC Input Signal

When the SON signal is turned ON, the servo will turn ON.
When the servo-motor is turned ON, the Status Indicator LED (SYS*) on the front surface of the controller illuminates in green.
The “SV” signal is synchronized with this LED.

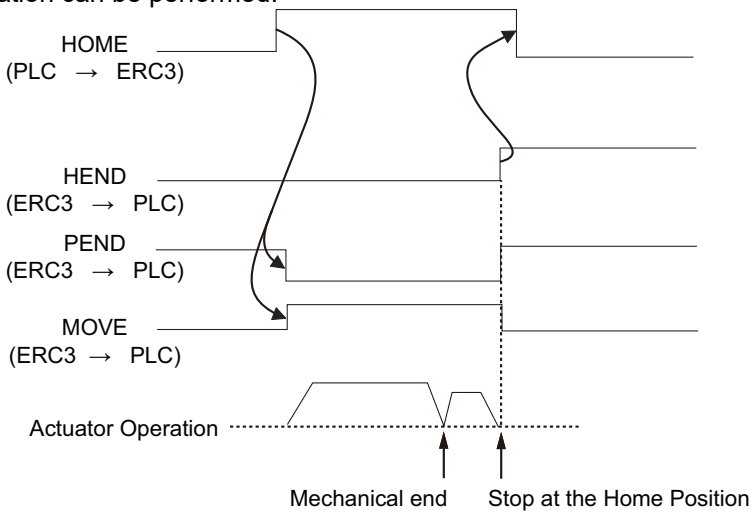
■ Function

Using the “SON” signal, the turning ON/OFF of the ERC3 is available.
While the “SV” signal is ON, the ERC3'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

When the “HOME” signal is turned “ON”, this command is processed at the startup (ON edge), and the homing operation is performed automatically.
When the home return is completed, the HEND signal is turned “ON”.
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.

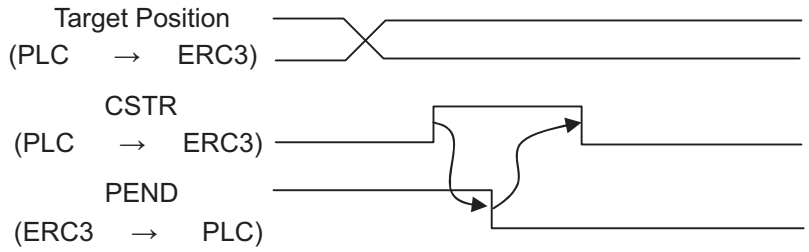


⚠ Caution: In the Position 1/Simplified Direct Value Mode, when the positioning command is issued without performing the homing operation after the power is supplied, the positioning is performed after the automatic homing operation.
Exercise caution that in the direct numeric specification mode, issuing 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) 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.

If a movement command is issued when the first home return is not yet completed after the power is turned ON (HEND signal OFF), home return will be performed automatically to establish the coordinates first, after which the actuator will move to the target position.
Turn "OFF" this signal after confirming that the Positioning Completion Signal (PEND) signal has been turned "OFF".

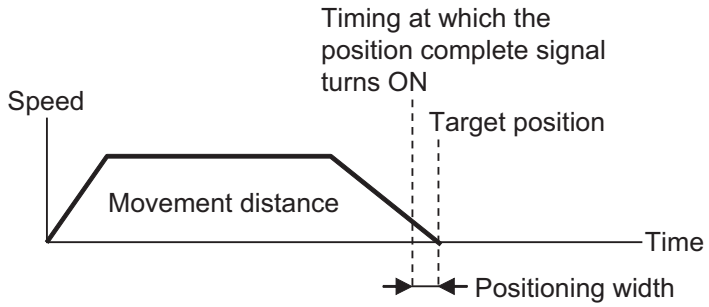


(8) Moving signal (MOVE) PLC Input Signal

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 "OFF".

(9) 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 home return (HOME) signal and positioning start (CSTR) 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 turned "ON", the PEND signal is not turned "ON".

(10) Pause (STP) PLC Output Signal

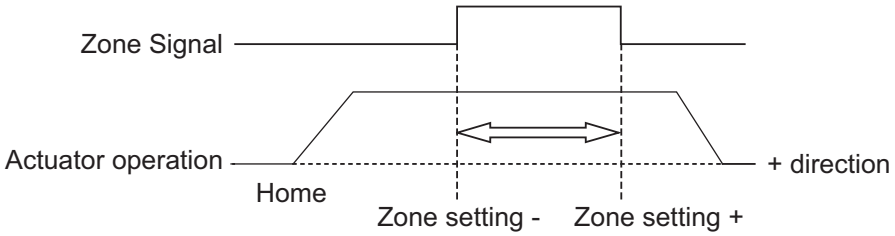
When this signal is turned “ON”, the actuator movement is decelerated and stopped. When it is turned “OFF”, the actuator movement is restarted.
The acceleration in the operation restart or the deceleration in stopping operation, is expressed as the value for the acceleration/deceleration for the position No. set using the specified position No. resister in the Position 1/Simplified Direct Value Mode, and as the value set in the acceleration/deceleration register in the Direct Numeric Specification Mode.

(11) Zone 1 (ZONE1) PLC Input Signal
Zone 2 (ZONE2) PLC Input Signal
Position Zone 2 (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
Settings are to be established in the parameters of ERC3.
The ZONE 1 Signal is set using the parameter No. 1 “Zone Border 1 “+” Side” and No. 2 “Zone Border 1 “–” Side” of ERC3.
The ZONE 1 Signal is set using the parameter No.23 “Zone Positive Boundary 2 “+” Side” and No.24 “Zone Negative boundary 2 “–” Side” of ERC3.
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
It can be used in Positioner 1 and Positioner 2 Modes, and is to be set in the position table.
Position Zone Signal becomes valid at the movement of the position number that the position zone is set after home-return complete.



(12) + 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.

- The speed is based on the parameter value ON/OFF 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” of ERC3.
  If the JVEL signal is ON, the actuator operates according to parameter No.47, “PIO jog speed 2” of ERC3.
- The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
- When both the JOG+ and JOG- signals are turned “ON”, the actuator is decelerated and stopped.

2) Inching (movement for certain amount) operation

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

- The speed conforms to the value of the parameter ON/OFF specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No.26, “PIO jog speed” of ERC3.
  If the JVEL signal is ON, the actuator operates according to parameter No.47, “PIO jog speed 2” of ERC3.
- The travel conforms to the value of the parameter ON/OFF specified by the JVEL signal.
  If the JVEL signal is OFF, the actuator operates according to parameter No.48, “PIO inch distance” of ERC3.
  If the JVEL signal is ON, the actuator operates according to parameter No.49, “PIO inch distance 2” of ERC3.
- The acceleration/deceleration conforms to the rated acceleration/deceleration (the specific value varies 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.

(13) Jog/inch-distance switching (JVEL) PLC Output Signal

It is a signal to switch the parameters to indicate the speed or inching distance when in JOG operation and inching operation. Table below shows the relations.

JVEL signal	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”

(14) Jog/inching switching (JISL) PLC Output Signal

This signal changes over the jog operation and the inching operation.
JISL = OFF : Jog operation
JISL = ON : Inching operation
When the JISL signal is turned “ON” (for inching operation) during the jog operation, the actuator is decelerated and performs the inching operation.
When the JISL signal is turned “OFF” (jog) while the actuator is moving by inching, the actuator will complete the movement and then switch to the jog function.

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

(15) Teaching mode command (MODE) PLC Output Signal

Teaching mode signal (MODES) PLC Input Signal

When the MODE signal is turned “ON”, the normal operation mode is changed to the teaching mode.
When the mode for the ERC3 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.

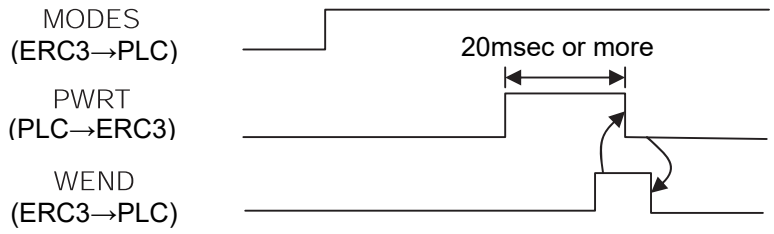
- The actuator operation (motor) is stopped.
- The + JOG (JOG+) signal and – JOG (JOG-) signal are turned “OFF”.
- The Position Data Import Command (PWRT) Signal and Positioning Start (CSTR) Signal are turned “OFF”.

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

(16) Position data import command (PWRT) PLC Output Signal
Position data import complete (WEND) PLC Input Signal

The PWRT signal is available when the teaching mode signal (MODES) is turned “ON”.
Turn ON the PWRT signal (Note1), Then, the current position data will be written in the position data box for the position No. set using the PLC's specified Position No. channel. (Note2)
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”.

Note1 Turn it ON for 20msec or more. If the time is shorter than 20msec, the writing is not completed.
Note 2 When the data items except for the position have not been defined, the parameter initial values are written. [Refer to the instruction manual for the ERC3 actuator with integrated contoroller]



(17) Brake release (BKRL) PLC Output Signal

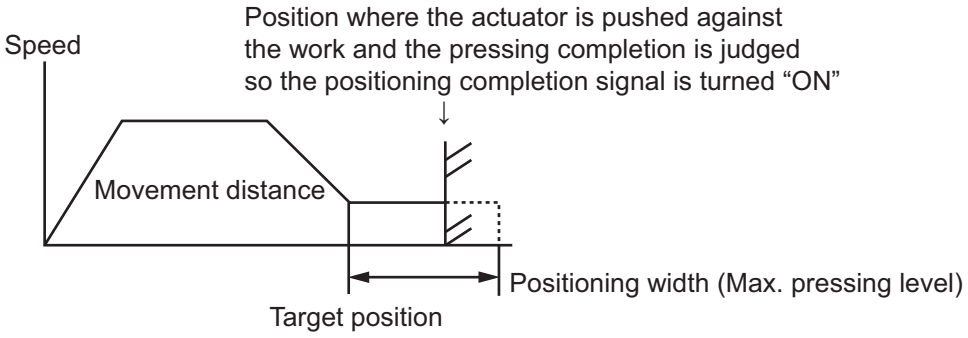
Turning this signal “ON” can release the brake forcibly.

(18) 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.

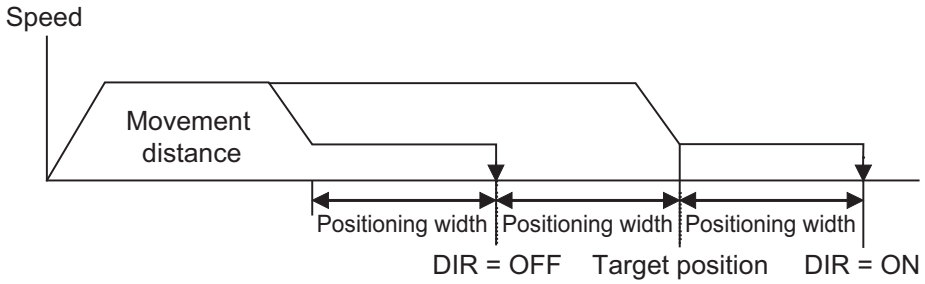
After reaching the target position (Note 1) from the current position, the actuator moves at the pressing speed for only the distance set in the positioning width (Direct Indication Mode) or pressing width (Simple Direct/Positioner 1 Mode).
The positioning complete signal (PEND) turns ON if the work piece hits and pressing is judged as completed while in the pressing operation.

(Note 1) The value is that set as the position in the position data for Positioner 1 Mode, and that input in the target position register for Simple Direct and Direct Indication Modes.



(19) 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 direction of the value determined by adding the positioning width to the target position.
Pressing operation starts towards the position where the positioning width is added to the target position if this signal is turned ON.
When the normal positioning operation or SEP method pressing operation is selected, this signal is ineffective.



(20) 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”.

(21) Operation for Positioner 1/Simple Direct Modes

If the position data is written to the target position register (for Simple Direct Mode) or the target position is set in the position data of ERC3 (for Positioner 1 Mode), the operation shall be made with other information, such as the speed, acceleration/deceleration, pressing width, pressing force, etc., set to the position data.

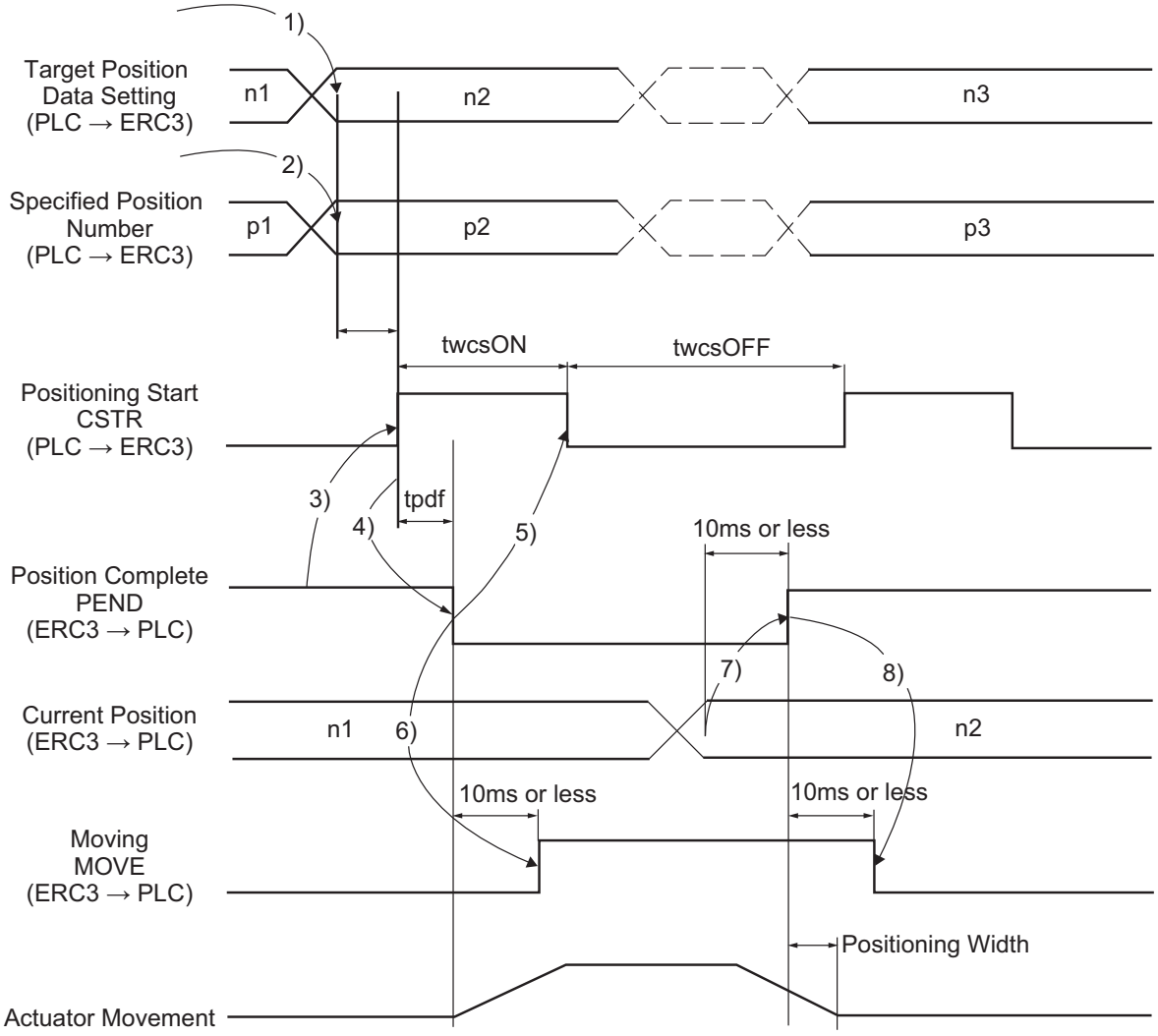
● Example of operation (Normal Positioning Operation with Simple Direct Mode)

(Preparation) Set the axis numbers to be used in Simple Direct Mode with Gateway Parameter Setting Tool. [Refer to 3.2. Initial Setting.]
Set the position data items (speed, acceleration/deceleration, pressing width, etc) except for the target position item, in the position table.

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 signal (MOVE) is turned “OFF”, turn “ON” the positioning command (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 CSTR 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) MOVE signal turns OFF at the same time as or within 10ms after PEND signal turns ON.
9) The target position data can be changed during the actuator movement.
   In order to change the target position, change the target position 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, set the current limit to the pressing force box and pressing width to the pressing width box in the position data at the stage of (preparation). By conducting a positioning operation towards the set position number, the actuator performs a pressing operation.



To turn ON TwcsON, have an interval of time more than 10ms.
To turn OFF TwcsOFF, have an interval of time more than 10ms.
Tdpf = Yt+10+Xt (minimum value) to Yt+10+Xt+7 (maximum value)

(22) Operation for Direct Indication 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.

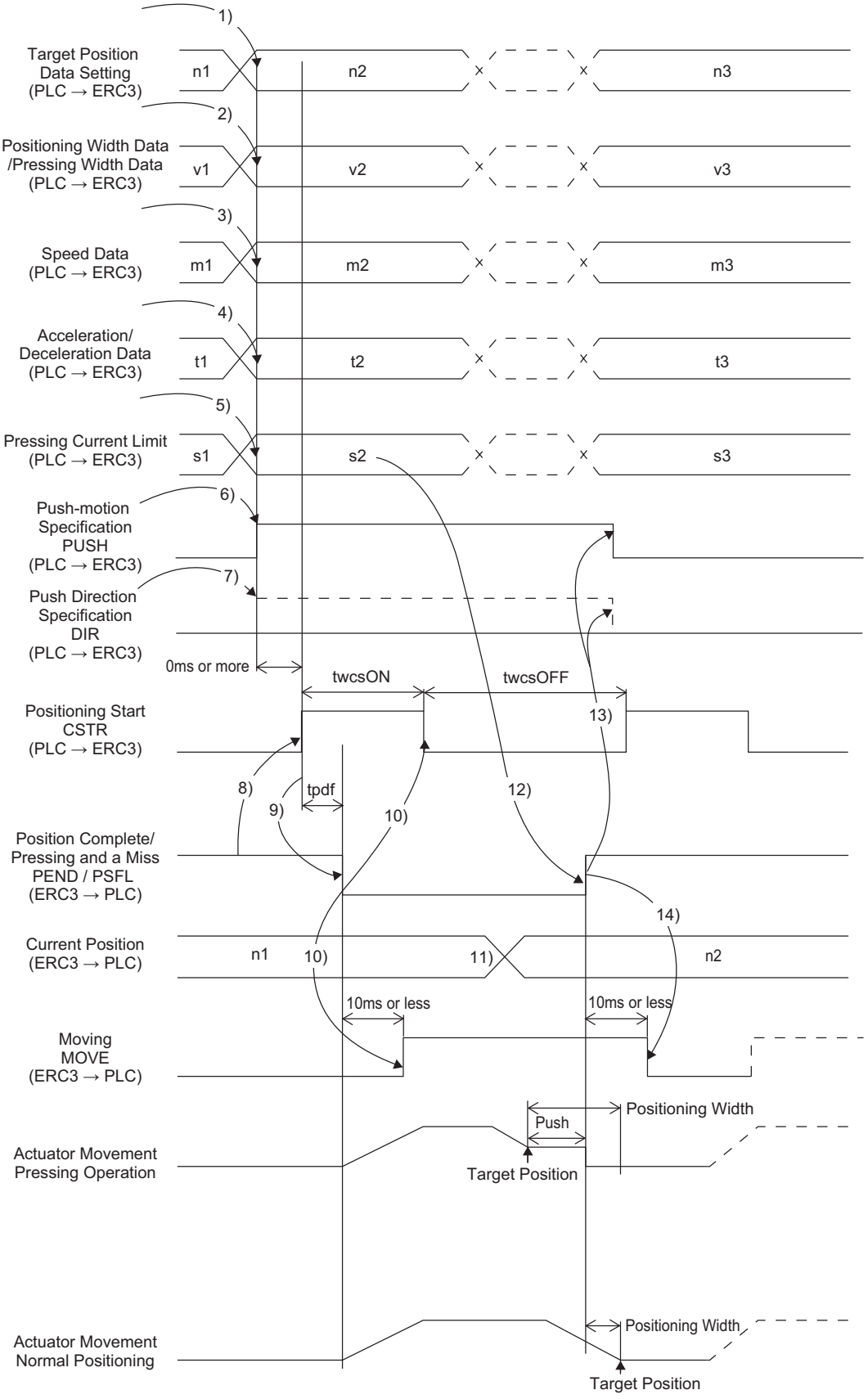
● Example of operation (Pressing operation)

(Preparation) Set the axis numbers to be used in Direct Indication Mode with Gateway Parameter Setting Tool.

1) Set the target position data in the target position register.
2) Set the positioning width (pressing 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.
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 start (CSTR) signal. The data items set in Steps 1) through 5) are read in the controller at the startup (ON edge) of the CSTR signal.
9) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
10) After confirming that the PEND signal is turned “OFF” or MOVE signal is turned “ON”, turn “OFF” the CSTR signal. Do not change any value in each register until the CSTR signal has been turned “OFF”.
11) The current position data is continuously updated.
12) When the CSTR signal is turned “OFF” and the motor current reaches the current limit value set in Step 5), the PEND signal is turned “ON”. (Pressing complete)
Even when the positioning width (pressing width) set in Step 2) is reached, in the case that the current does not reach the motor current limit value set in Step 5), the pressing and a miss (PSFL) signal is turned “ON”. In this case, the PEND signal is not turned “ON”. (Pressing and a miss)
13) After the PEND signal or PSFL signal is turned “ON”, turn “OFF” the PUSH signal.
14) MOVE signal turns OFF at the same time as or within 10ms after PEND signal turns ON.

● 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 CSTR signal is turned “OFF”, the PEND signal is turned “ON”.



To turn ON TwcsON, have an interval of time more than 10ms.
To turn OFF TwcsOFF, have an interval of time more than 10ms.
Tdpf = Yt+10+Xt (minimum value) to Yt+10+Xt+7 (maximum value)

(23) Operation for Positioner 2 and Positioner 3 Modes

The operation is to be made with the target position, speed, acceleration/deceleration, positioning width and pressing force set in the position data of ERC3.

● Example of operation (Positioning operation)

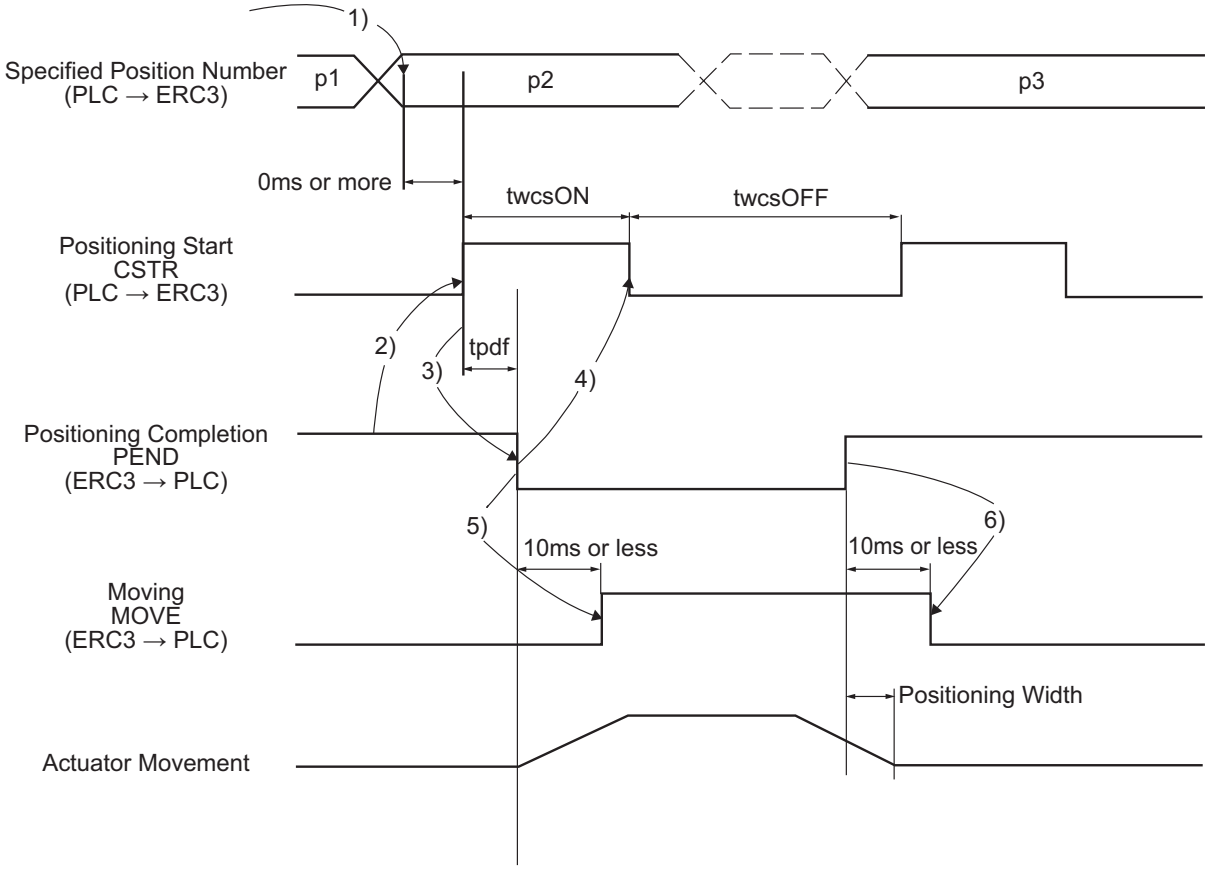
(Preparation) Set the axis numbers to be used in Positioner 2 or Positioner 3 Mode with Gateway Parameter Setting Tool. [Refer to 3.2. Initial Setting.]
Set the position data (target position, speed, acceleration/deceleration, etc.) to the position table.

(Note) If Positioner 3 Mode, have 1) and 2) at the same time.

1) Set the position No. where the speed and acceleration/deceleration, etc., have been set, in the setup position No. register.
2) In the condition where the positioning completion (PEND) signal is turned “ON” or under moving signal (MOVE) is turned “OFF”, turn “ON” the positioning start (CSTR) signal.
   The data items set in Step 1) is read in the controller at the startup (ON edge) of the CSTR signal.
3) After the CSTR signal is turned “ON”, the PEND signal is turned OFF after tdpf.
4) 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 CSTR signal is turned “OFF”.
5) At the same time when the PEND signal is turned “OFF”, the MOVE signal is turned “ON”.
6) Once the remaining movement amount of the actuator gets into the range of the positioning width set in the parameter, PEND signal turns ON if CSTR signal is OFF, and the complete position number is output to the complete position number 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”.
   MOVE signal turns OFF at the same time as or within 10ms after PEND signal turns ON.

● Example of operation (Pressing operation)

For the pressing operation, set the current limit to the pressing box and pressing width to the pressing width box in the position data at the stage of (preparation). By conducting a positioning operation towards the set position number, the actuator performs a pressing operation.



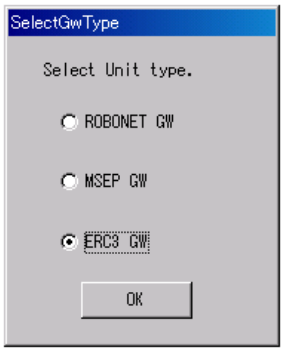
To turn ON TwcsON, have an interval of time more than 10ms.
To turn OFF TwcsOFF, have an interval of time more than 10ms.
Tdpf = Yt+10+Xt (minimum value) to Yt+10+Xt+7 (maximum value)

3.7 About Gateway Parameter Setting Tool

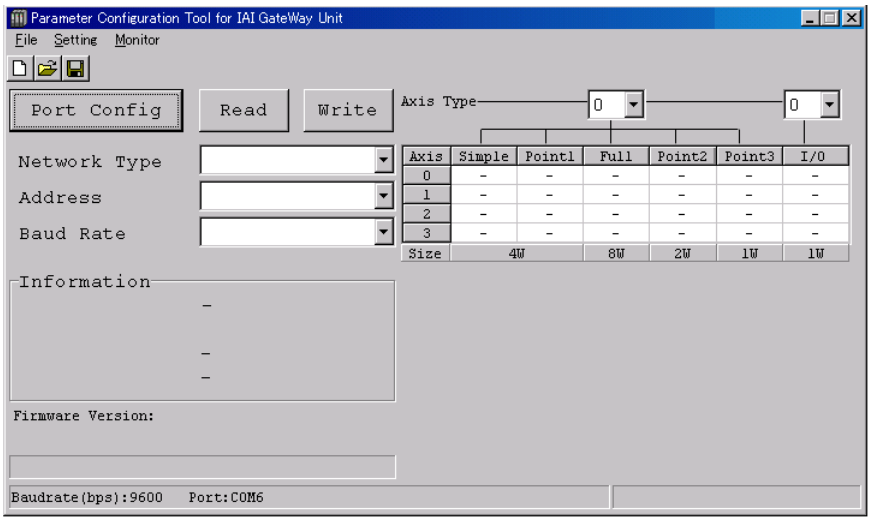
This tool is necessary for the initial setting process such as ERC3 operation mode select. Shown below is how to use the tool.

3.7.1 Startup of Tool

1) Boot the Gateway Parameter Setting Tool after the power to ERC3 is turned ON, and the window shown below appears. Select “ERC3 GW” if ERC3 is connected and click OK.



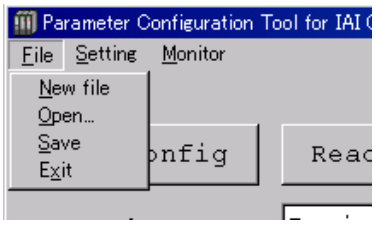
2) The main window opens. The main window opens even when ERC3 could not be detected. Click on the “Read” button in this window and the parameters start to be read from ERC3. Parameter transfer starts if the “Write” button is clicked. However, note that the transfer cannot be made if there is a blank like Address and Baud Rate in the figure below.



Main Window (Initial condition)

3.7.2 Explanation of each Menu

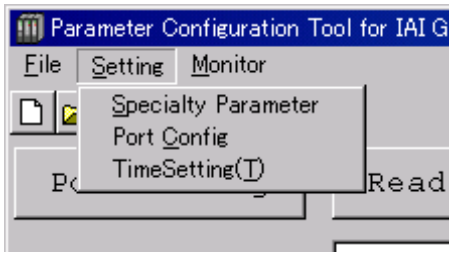
1) File Menu



In the main window, click on the file menu on the top left corner and the menu list pops up as shown in the figure above.

- New file : Create new network parameters and operation mode parameters.
- Open… : Open the saved parameter files to show on the main window.
- Save : Save the parameter remained in the tool as a file.
- Exit : Close the tool.

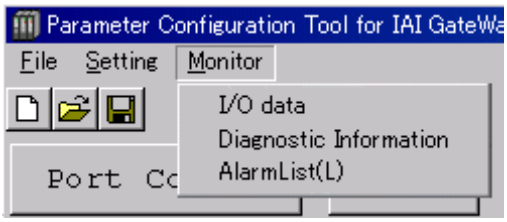
2) Setting Menu



Click on the “Setting” menu on the top left corner in the main window and the setting menu list pops up.

- Specialty Parameter : Set the parameters related to the process in ERC3 Gateway. [Refer to 3.7.3 1), 2) and 3) GW Parameter */GW Mode Select.]
- Port Config : Set the communication speed between the tool and PC and COM port number.
- TimeSetting(T) : Set the clock retained in ERC3. [Refer to 3.7.3 4) Time Setting.]

3) Monitor Menu

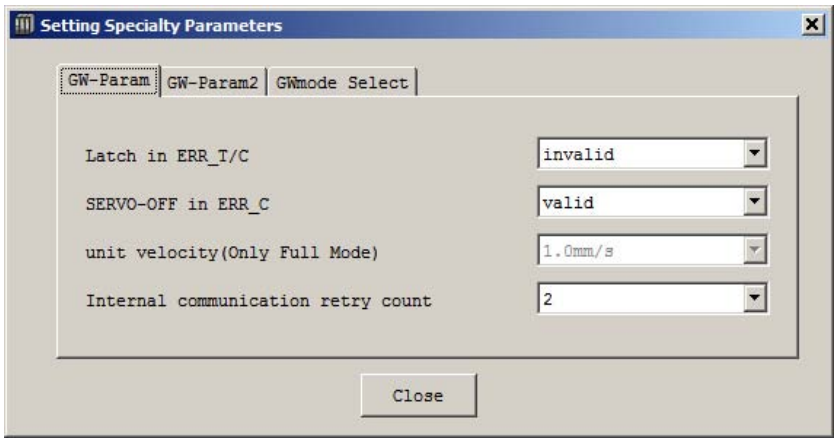


Click on the “Monitor” menu on the top left corner in the main window and the monitor menu list pops up.
(Note) “Monitor” cannot be selected before reading a parameter.

- I/O data : Show the details of the host PLC and ERC3 data. [Refer to 3.7.3 5) I/O Data]
- Diagnostic Information : Show the number of ERRT and ERRC occurrence, emergency stops and scan time. [Refer to 3.7.3 6) Diagnostic Information]
- AlarmList(L) : Read and show the alarm list retained in ERC3. [Refer to 3.7.3 7) Alarm List]

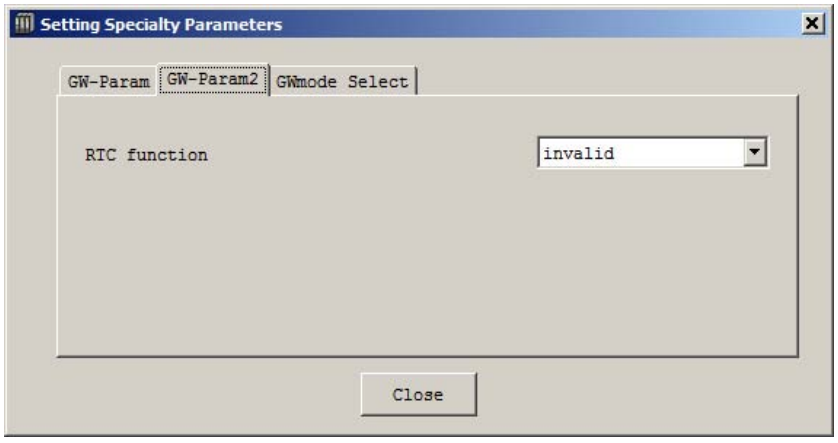
3.7.3 Description of Functions

1) GW-Param



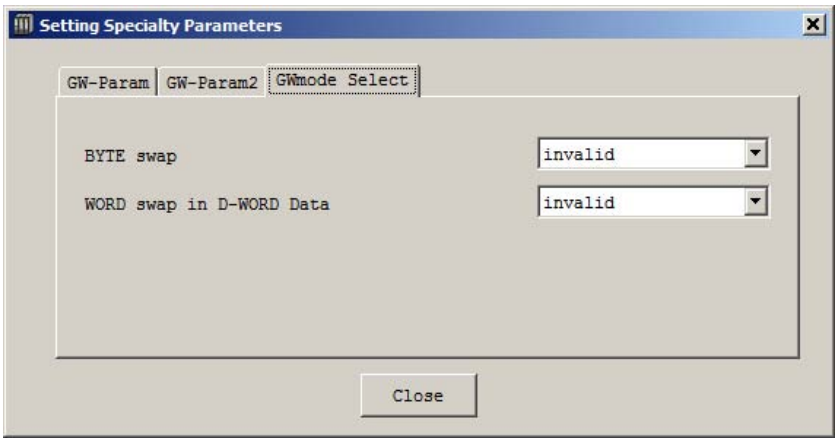
- Latch in ERR_T/C : Select whether to continue the error even in recoverable condition after ERRT and ERRC are issued.
- SERVO-OFF in ERR_C : Select whether to turn the servo OFF on the connected axes when ERRC is occurred.
- unit velocity (Only Full Mode) : Select the unit for speed from 1.0mm/s and 0.1mm/s.
- Internal communication retry count : Set the number of communication retries with the connected axes in AUTO mode.

2) GW-Param2



- RTC function : Activate this setting if the calendar function is to be used

3) GWmode Select



- BYTE swap : Set the byte swap. [Refer to 3)-1 in this section.]
- WORD swap in D-WORD Data : Set whether to swap the W-word sized data with word size [Refer to 3)-2 in this section.]

3)-1 BYTE swap : Swap the upper and lower in the sent and received data in byte unit. Set this considering the connected host system if necessary.

●= ON, ○= OFF

MSEP Input register	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: RWwnn	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			

MSEP Output register	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: RWrnn	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			

3)-2 WORD swap in D-WORD Data

: Swap the upper and lower in the W-word sized sent and received data in word unit.
Set this considering the connected host system if necessary.

●= ON, ○= OFF

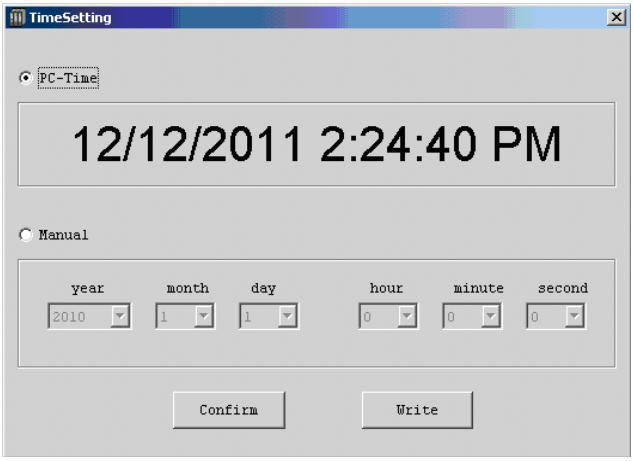
MSEP Input register	1F	1E	1D	1C	1B	1A	19	18	17	16	15	14	13	12	11	10	F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0
ON/OFF	●	○	●	○	●	○	●	●	●	●	○	○	●	●	○	●	○	○	○	●	○	○	●	○	○	○	●	●	○	●	○	○
Hexadecimal data	A				B				C				D				1				2				3				4			

PLC: RWwnn	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			

MSEP Output register	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: RWrnn	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			

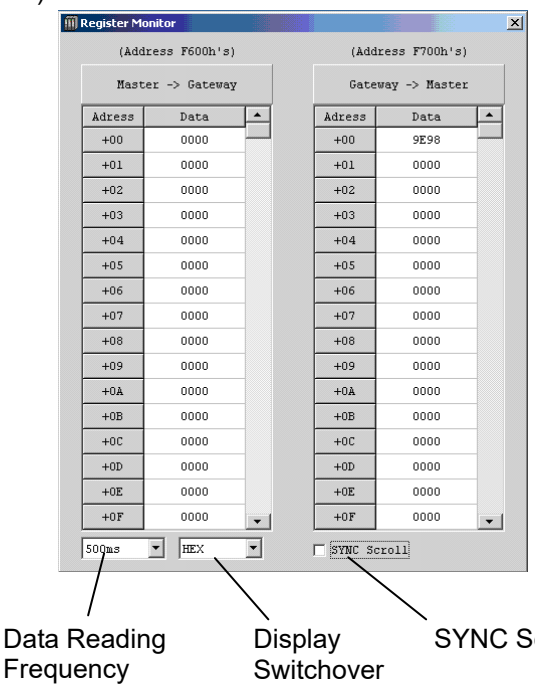
4) TimeSetting



By selecting Time on PC, the current time on the PC is acquired and set to ERC3 gateway unit.
If Set Manually is selected, desired time set in the clock edit in the window can be set in ERC3 gateway unit.
Click “Write”, and the time setting is transferred to ERC3 gateway unit and the data is written in.
Clicking on the Confirm button and the clock data currently retained in ERC3 gateway unit can be read and displayed.

> ⚠ Caution: The clock (calendar) function in ERC3 Gateway Unit can be retained for approximately 10 days (reference) after the power to ERC3 is turned OFF. Once the clock data is lost, the time passed since the power is turned back ON as 2000/1/1 0:00:00 is displayed as the current time.

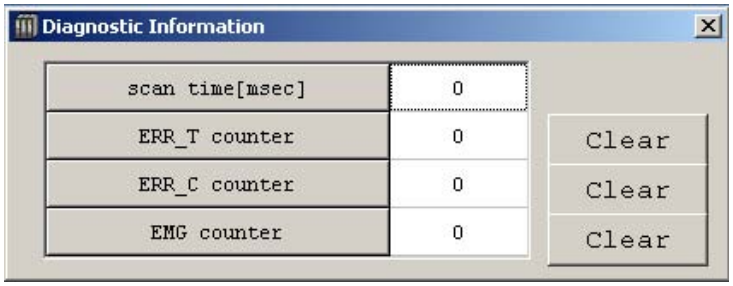
5) I/O Monitor



In this register monitor window, shows the data that Gateway Unit has received from the host (master) and the data sent back to the host (master).

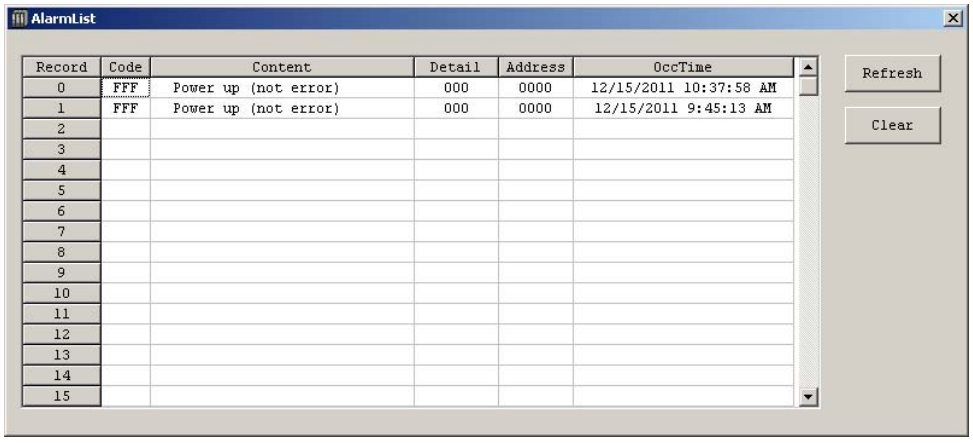
- Data Reading Frequency : Select the frequency of displayed data update from 100 to 500ms
- Display Switchover : Select from binary and hexadecimal for the display
- SYNC Scroll : Check in the box to make the list of the sent and received data scrolled together

6) Diagnostic Information



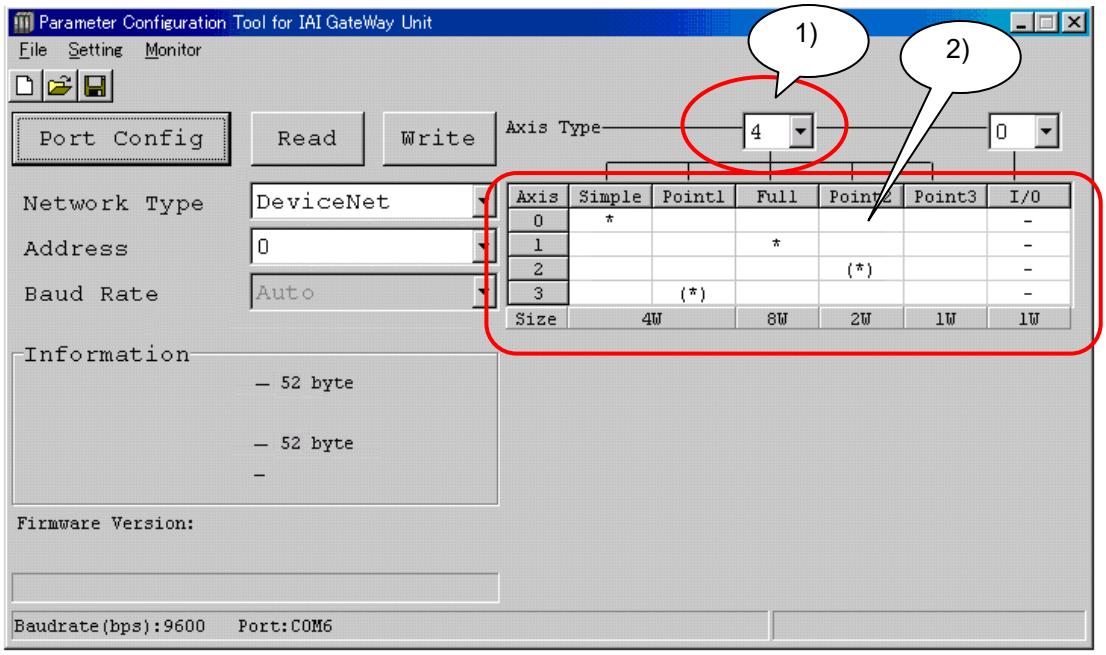
The number of the communication error (ERRC and ERRT) occurrence and number of the emergency stop (EMG) detection can be counted.

7) Alarm List



Click on the “Refresh” button and the alarm list is read again from ERC3 gateway unit.
Click on the “Clear” button and the alarm list retained in ERC3 gateway unit are all deleted.
Refer to Chapter 5. Troubleshooting for the details of the alarms.

3.7.4 Operation Mode Setting

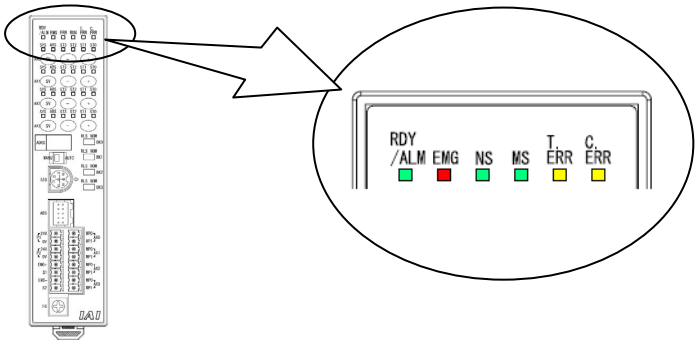


When selecting the operation mode, select (Note 1) the axis number in the pull down menu circled as 1). By selecting the number, the cells in 2) become blank in response. Click the cell for the mode to be set in each axis.
If clicking on a blank cell, "*" will appear. "*" indicates that the mode is selected.
Click on a cell with "*"shown in, the mark is changed to "(*)". "(*)" mark means the axis is treated as a reserved axis, and even if an error is generated on the actuator, it is available to have other actuators operated.

(Note 1) Remote I/O Mode cannot be set together with other modes.

3.8 Field Network LED Indication

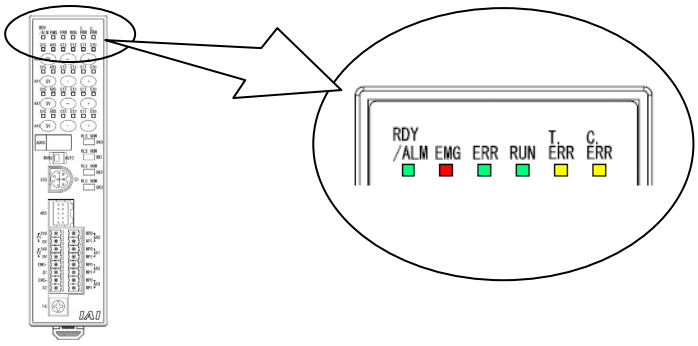
1) In the case of DeviceNet



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
NS	GN	○	Online (normal)
	GN	☆	Online (Even though the network is established normally, the master does not identify)
	OR	○	An error occurs
	OR	☆	No response returned from another slave device
	GN/OR	☆(Blink by turn)	In self-checking process
MS	GN	○	Communication in normal condition
	GN	☆	Parameter setting error
	OR	○	Hardware failure
	OR	☆	Light malfunction
	GN/OR	☆(Blink by turn)	In self-checking process

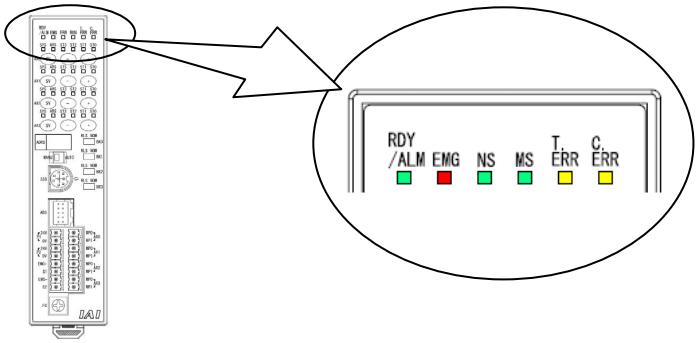
2) In the case of CC-Link



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
ERR	OR	○	An error occurs (CRC error, station No. setting error or baud rate setting error)
	OR	☆	The station number setting or the baud rate setting is changed while power is ON.
	–	×	Normal
RUN	GN	○	Communication in normal condition

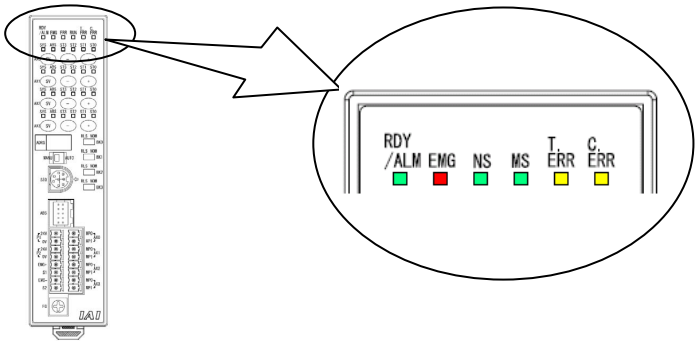
3) In the case of PROFIBUS-DP



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
NS	GN	○	Online (normal)
	GN	☆	Online (Even though the network is established normally, the master does not identify)
	OR	○	An error occurs (parameter error, Initializing failed
MS	GN	○	initializing completed
	GN	☆	Initializing completed and in self-checking process
	OR	○	An error occurs (exceptional error)

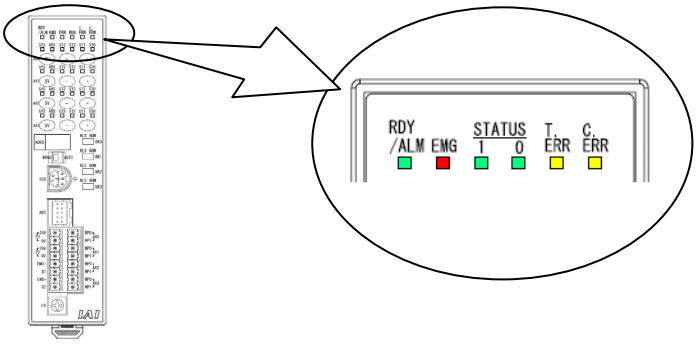
4) In the case of CompoNet



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
NS	GN	○	Online (normal)
	GN	☆	Online (Even though the network is established normally, the master does not identify)
	OR	○	Node address duplication error, Wrong slave address setting
	OR	☆	No response returned from another slave device
	–	×	Power OFF, Under reset operation, In initializing process
MS	GN	○	Communication in normal condition
	OR	○	Hardware failure
	OR	☆	EEPROM reading failed in initial setting
	–	×	Power is not turned on. under reset operation

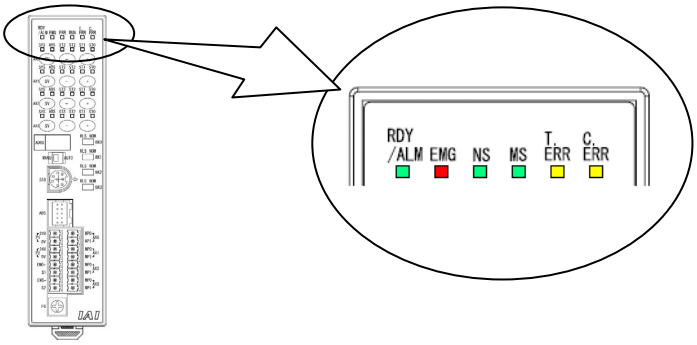
5) In the case of MECHATROLINK



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
STATUS1	GN	○	Receiving CONNECT, in communication process
	OR	○	Communication error detection (Self-station status error, synchronizing frame status error)
	–	×	In initializing process, receiving DISCONNECT
STATUS0	GN	○	Initializing succeeded
	OR	○	Initializing failed (RAM check error)
	–	×	Initializing started

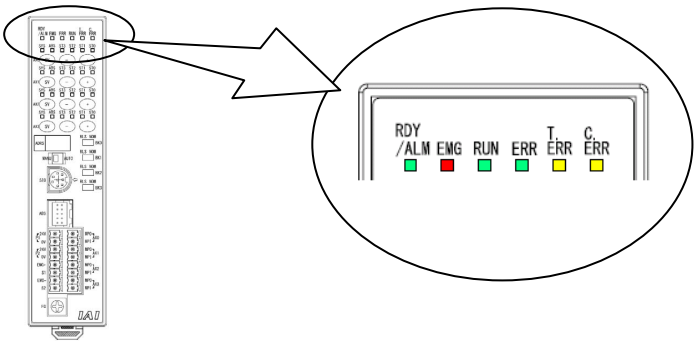
6) In the case of EtherNet/IP



○ Illuminating, × OFF, ☆ Flashing

Symbol	Color	Lamp condition	Description
NS	GN	○	Online (Communication in normal condition)
	GN	☆	Online (Even though the network is established normally, the master does not identify)
	OR	○	Communication error (IP address duplication, etc.)
	OR	☆	Communication error (Communication timeout has been detected)
	–	×	Power is OFF or IP address not established
MS	GN	○	Communication in normal condition
	GN	☆	Construction information setting is not completed or the scanner (master) is in idling condition
	OR	○	Hardware failure (The replacement of the board is required.)
	OR	☆	Light error such as initializing error and setting violation Can be recovered by re-establishing
	–	×	Power OFF

7) In the case of EtherCAT

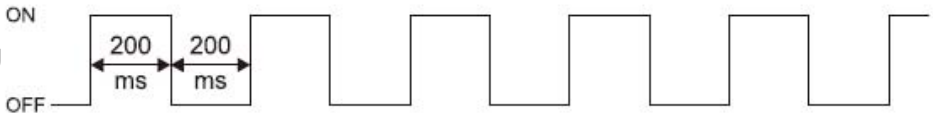


○ Illuminating, × OFF, ☆ Flashing

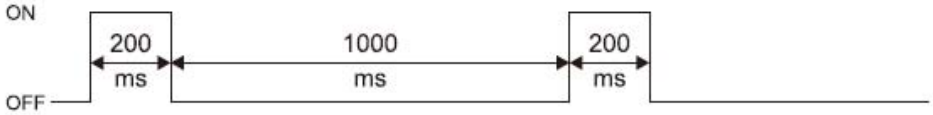
Symbol	Color	Lamp condition	Description
RUN	GN	○	Communication in normal condition (OPERATION)
	GN(Note1)	☆	PRE-OPERATION
	GN(Note2)	☆	SAFE-OPERATION
	OR	○	Communication component (module) error
	–	×	Initial condition (INIT) or the power is OFF
ERR	OR	○	Communication component (module) error
	OR(Note1)	☆ (ON:200ms/ OFF:200ms)	Construction information (settings) error (Information received from the master cannot be set)
	OR(Note3)	☆	Communication section circuit error (Watchdog Timer/Timeout)
	–	×	No abnormality or the power is OFF

• Timing of LED Flashing

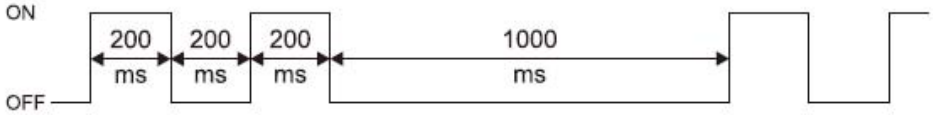
(Note1) blinking



(Note2) single flash



(Note3) double flash



Chapter 4 I/O Parameter

Parameters are the data to set up considering the system and application.
The ERC3 Gateway Unit setting is to be conducted using Gateway Parameter Setting Tool.
[Refer to 3.7. About Gateway Parameter Setting Tool for the details]

Note The ERC3 actuator for Parameter is to be done with using a teaching tool such as the RC PC software. [Refer to Instruction Manual for the ERC3 actuator with integrated controller for more information]

⚠ Warning: Parameter setting has great influences on operations of the controller.
Incorrect parameter setting may not only cause malfunction or failure of the controller to occur but also people and assets to be exposed to risk.
The controller is configured to be applicable to normal operation at shipment.
Understand very well about the control logic of controller if making a change or performing a setting suitable to the system.
Please contact us if you have anything unclear.
Do not attempt to turn OFF the power to the controller while writing the parameters.

Chapter 5 Troubleshooting

5.1 Action to Be Taken upon Occurrence of Problem

Upon occurrence of a problem, take an appropriate action according to the procedure below in order to ensure quick recovery and prevent recurrence of the problem.

1) Check the condition of the illumination of Gateway Status LEDs and Axes Status LEDs on the front panel of ERC3 Gateway Unit [Refer to Name for Each Parts and Their Functions]
2) Check whether an alarm occurs on the host controller (PLC, etc.).
3) Check the voltage of the main power supply (24V DC).
4) Voltage check of PIO power supply (24V DC) or field network power supply
5) Check the voltage (24V DC) of the power supply for brake (for the actuator with the brake).
6) Alarm Check(Note1)
   Check the alarm code on the teaching tool such as PC software.
7) Check the connectors for disconnection or connection error.
8) Check the cables for connection error, disconnection or pinching.
   Make sure to turn OFF the main power (to avoid electric shock) and disconnect the cables at the measured points before having a conductivity check.
9) Check the I/O signals.
   Using the host controller (PLC, etc.) or a teaching tool such as PC software, check the presence of inconsistency in I/O signal conditions.
10) Check the noise elimination measures (grounding, installation of noise killer, etc.).
11) Check the events leading to the occurrence of problem (Note 1), as well as the operating condition at the time of occurrence.
12) Analyze the cause.
13) Treatment

Note 1 The time of alarm generated can be recorded if the clock is set to the current time on Gateway Parameter Setting Tool.
If the current time is set, the data is remained for approximately 10 days under the condition that the power to the controller is OFF. If the setting is not conducted or the time data is lost, it will be the time passed since 2000/1/1, 00:00:00 when the power is turned ON. Even if the date and time data is lost, the generated error code is retained. Alarms subject to this function only include those in 5.4 Alarm List but do not include errors in the teaching tool such as PC software.

> ⓘ Notice : In troubleshooting, exclude normal portions from suspicious targets to narrow down the causes. Check 1) to 11) described above before contacting us.

5.2 Fault Diagnosis

This section describes faults largely divided into four types as follows:
(1) Impossible operation of controller
(2) Positioning and speed of poor precision (incorrect operation)
(3) Generation of noise and/or vibration
(4) Communication not established

5.2.1 Impossible Operation of Controller

Situation	Possible cause	Check/Treatment
Either of ALM LED in Gateway Status LEDs or SYS LED in Axis Status LEDs turns ON in red when the power is turned ON.	Occurrence of alarm.	Check the error code with the teaching tool being connected and remove the cause by referring the alarm list. [Refer to 5.4 Alarm List.]
EMG in Gateway Status LEDs turns ON in red	During emergency-stop. 1) Was the emergency-stop switch released? 2) EMG- on the power supply connector is not connected.	1) Release the emergency stop switch. 2) Check the connection of the power connector (EMG-). [Refer to 2.3 [1] Power Supply and Emergency Stop]
Both position No. and start signal are input to the controller, but the actuator does not move.	1) Servo OFF condition 2) The pause signal is OFF 3) Positioning command is issued to a stop position. 4) There is no positioning data set to the commanded position number. 5) Writing the information in a wrong area for Direct Indication Mode.	1) Is SYS LED in Axis Status LEDs for the connected axis that is to be operated turned ON in green? [Refer to Name for Each Parts and Their Functions] Turn ON the servo-on signal SON. 2) Operation is available when pause signal *STP (Remote I/O Mode) is ON and pause when it is OFF. Turn it ON. 3) Check the sequence or the settings of the position table. 4) It will generate Alarm Code 0A2 “Position Data Error”. Conduct the position table setting.
Connected the teaching tool and supplied the motor and control power to controller, but operation would not start. (the emergency stop switch is released on the teaching tool)	Cable treatment or mode selection. 1) Emergency stop condition 2) Servo OFF condition 3) In pause	1) Supply 24V DC to EMG- terminal of the power connector. ⚠ Warning If the process of 1) is conducted, put back the setting as soon as the adjustment work is finished. Starting the operation without putting it back may cause a serious accident since the emergency stop is set invalid. 2) 3) Put the operation mode switch on the front panel of the controller to “MANU” side, and select the teach mode on the teaching tool.

5.2.2 Positioning and Speed of Poor Precision (Incorrect Operation)

Situation	Possible cause	Check/Treatment
Completion of operation on the way to home return	In the home return of our standard specification, the actuator is first pressed to the mechanical end, moved oppositely, and subject to positioning stop at the home position. Therefore, the product may judge as the mechanical end even though it is still on the way when the load is large and interfere with surrounding object. 1) A load exceeding its rating weight is installed on the actuator. 2) It is touched to interference in the way of the run. 3) Torsion stress is applied to guide due to improper fixing method of the actuator or uneven fastening of bolts. 4) The sliding resistance of the actuator itself is large.	1) Reduce the load. 2) Remove the interference. 3) Loosen the fixing bolts once and check whether the slider can move smoothly. If the slider can move smoothly, check if there is a deformation on the attached surface, and install the actuator again following the instructions stated in Instruction Manual. 4) Please contact IAI.
Shocks at start and/or stop	Acceleration/deceleration is set too high.	Decrease the settings of acceleration/deceleration.
Overshoot during deceleration to stop.	The load inertia is large.	Decrease the setting of deceleration.
Positioning of poor precision Uneven speed during movement Acceleration/deceleration not smooth (bad speed response)	[Refer to Instruction Manual for the ERC3 actuator with integrated controller of Servo Adjustment]	
Positioning at a position different from that of commanded position No.	1) For PIO Type, the start signal CSTR after the position number command is too early, or input at the same timing. (Note) Inputting at the same timing is available for Fieldbus Type. 2) The correct position No. is not specified due to PIO signal disconnection or poor connector contact.	1) The stop position may be set for another purpose. Make sure to complete the reading of the position numbers to this controller before inputting the start signal. 2) Check the input signal on I/O monitor on the teaching tool.
Complete signal PEND is not output even though positioning process is completed.	Start signal CSTR is not turned OFF.	Make the start signal CSTR turned OFF before completing the positioning process by the turn-off of positioning complete signal PEND after starting operation, and so on.

5.2.3 Generation of Noise and/or Vibration

Situation	Possible cause	Check/Treatment
Generation of noise and/or vibration from actuator itself	Noise and vibration are generated by many causes including the status of load, the installation of the actuator, and the rigidity of the unit on which the actuator is installed.	Servo adjustment may improve the situation. [Refer to Instruction Manual for the ERC3 actuator with integrated controller of Servo Adjustment]
Vibrations of load	1) Acceleration/deceleration is set too high. 2) The installation structure and/or the installed load are easily affected by acceleration/deceleration.	1) Decrease the settings of acceleration/deceleration.

5.2.4 Communication Not Established

Situation	Possible cause	Check/Treatment
Not connectable with host unit	1) Communication rates do not match. 2) The machine number (station number) is set to be duplicate with that of another unit or out of the range. 3) Poor wiring or disconnection of communication cable	1) Set the communication rate to match that of the host machine. [Refer to the Instruction Manual of the host unit.] 2) Correct the unit number (station number) setting. Machine numbers (station numbers) vary depending on communication modes. Refer to 3.4 Field Network Address Map and the instruction manuals for the host devices for the details. 3) Review the wiring again. Check if termination resistances are connected to network terminals with correct values. Check if the communication power supply is established properly for DeviceNet Type. [Refer to the Instruction Manual of the host unit.]

5.3 Alarm Level

The alarms are classified to 3 types of levels by the content of the error.

Alarm level	ALM lamp	*ALM signal	Status when an error occurred	Cancellation method
Message	OFF	No output	No stop	Alarm of maintenance output such as battery voltage drop or the teaching tool such as PC software [Refer to Instruction Manual of each tool for details.]
Operation release	ON	Output	Servo OFF after deceleration to stop	Reset the alarm by the PIO or teaching tool.
Cold start	ON	Output	Servo OFF after deceleration to stop	Software reset or power reconnection by teaching tool. Home return is required for any actuators of other than simple absolute specification.

⚠ Caution: Reset each alarm after identifying and removing the cause.
If the cause of the alarm cannot be removed or when the alarm cannot be reset after removing the cause, please contact IAI.
If the same error occurs again after resetting the alarm, it means that the cause of the alarm has not been removed.

5.4 Alarm List

5.4.1 Gateway Alarm Codes

The alarm codes are read into b7 to b0 in Gateway Status Signal 0.

(Note) The alarm code shown on Gateway Parameter Setting Tool is applied with “8” on the top of the alarm codes listed below. (Example) If the alarm code is 43, it will be shown as 843.

Alarm Code	Alarm Name	Cause/Treatment
43	Absolute Battery Charge Voltage Drop	Cause : The voltage of the absolute battery charger has dropped. Treatment : Check the voltage of the 24V DC power supply. Check the wiring (especially connectors) between Absolute Battery Box and ERC3 Gateway Unit.
49	Time Notification Error	Cause : It is an error of between the ERC3 Gateway Unit and ERC3 actuator. The clock data transfer from Gateway unit to the actuator has failed. Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
4A	Real Time Clock Operation Stop Detection	Cause : Clock data has lost. The clock data can be remained for approximately 10 days after the power to the controller is turned OFF. Treatment : Have the clock setting done from the Gateway Parameter Setting Tool again.
4B	Real Time Clock Access Error	Cause : It is an internal error of ERC3 Gateway Unit. The clock data failed to be acquired internally. Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
50	Fieldbus Communication Error (ERR-C)	Cause : It is a field network link error. If the flip-flop is set in Gateway Parameter Setting Tool during this error, the actuator is stopped in the condition of the error and any command is ignored until it receives a release signal. Treatment : Check the settings for field network (node addresses, communication speed, etc.) and wiring layout.
60	Master-Slave Axes Communication Error (ERR-T)	Cause : It is an internal error of ERC3. Communication failed between Gateway Unit and actuators. Treatment : It is considered that the driver board is not inserted or there is a failure in the connection (connector is not inserted deep enough).
61	Master-Slave Axes Communication Internal Error (Sending)	Cause : It is an internal error of ERC3. Communication failed between Gateway Unit and actuators. Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
62	Master-Slave Axes Communication Internal Error (Receiving)	Cause : It is an internal error of ERC3. Communication failed between Gateway Unit and actuators. Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
6A	Driver Board Operation Pattern Error	Cause : Operation modes which cannot be used together are indicated. Treatment : Set the operation modes again on Gateway Parameter Setting Tool.
80	GW Parameter Error	Cause : There is an error in Gateway parameters. Treatment : Check the settings such as the number of connected axes and operation mode on Gateway Parameter Setting Tool.
81	Parameter Check Sum Error	Cause : There is a possibility that the memory data inside ERC3 Gateway has destroyed. Treatment : Establish all the settings again on Gateway Parameter Setting Tool or write the backup data if it exists.

Alarm Code	Alarm Name	Cause/Treatment
90	Driver Board Mount Error	Cause : The number of axes (number of driver boards) set in Gateway Parameter Setting Tool does not match with the number of the actually connected axes. Treatment : Match the numbers of the axes.
9C	Fieldbus Module Not Detected	Cause : Communication board for field network was not detected. 1) Communication board is not inserted. 2) Malfunction of communication board Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
A0	Control Power Overvoltage	Cause : Control power voltage reached beyond the overvoltage threshold (120% of 24V DC = 28.8V). 1) The voltage of 24V DC power supply is high. 2) A faulty part inside the controller 3) Turning the servo ON at acceleration/deceleration spends a huge current consumption transiently. Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change. Treatment : 1) 2) Check the voltage of the input power supply. 3) Think to use a power supply with enough current capacity or not to use the remote sensing function. If the voltage is normal, please contact IAI.
A1	Control Power Voltage Drop	Cause : The control power voltage dropped less than the voltage drop threshold (70% of 24V DC = 16.8V). 1) The voltage of 24V DC power is low 2) A faulty part inside the controller Treatment : Check the power voltage. If the voltage is normal, please contact IAI.
A2	Motor Power Voltage Error	Cause : 1) Motor power input voltage (input to MPI terminal) is too large (38V or more) Turning the servo ON at acceleration/deceleration spends a huge current consumption transiently. Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change. 2) Overcurrent is generated on the motor power supply line Treatment : 1) Check the power voltage input to MPI terminal. Think to use a power supply with enough current capacity or not to use the remote sensing function. 2) Check the wire layout between the actuator and controller.
A6	Encoder Voltage Drop	Cause : The power voltage for the encoder has dropped below the allowable range. Treatment : Check the connection between the actuator and Gateway Unit.
AA	Regenerative Electric Discharge Circuit Error	Cause : There is an error in the regenerative discharge circuit inside the controller. Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.
FF	Power-on Log	It is the log at the power being on (it is not an error).

5.4.2 Simple Alarm Code

Simple alarm codes are read into the complete position register (PM8 to PM1) in Position 1/ Simple Direct Modes when an alarm is generated.

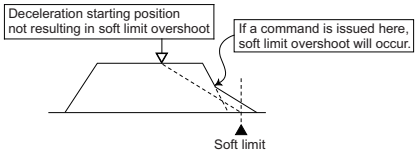
○: ON ●: OFF

*ALM	ALM8 (PM8)	ALM4 (PM4)	ALM2 (PM2)	ALM1 (PM1)	Binary Code	Description: Alarm code is shown in ( ).
○	●	●	●	●	–	Normal
●	●	●	○	●	2	Software reset during servo ON (090) Position number error during teaching (091) PWRT signal detected during a movement (092) PWRT signal detected with home return incomplete (093)
●	●	●	○	○	3	Move command during servo OFF (080) Position command in incomplete home return (082) Absolute position move command when home return is not yet completed (083) Movement command during home return operation (084) Position No. error during movement (085) Command deceleration error (0A7)
●	●	○	○	●	6	Parameter data error (0A1) Position data error (0A2) Position command data error (0A3) Unsupported motor/encoder type (0A8)
●	●	○	○	○	7	Excitement detection error (0B8) Home return timeout (0BE)
●	○	●	●	●	8	Actual Speed Excessive (0C0)
●	○	●	●	○	9	Overcurrent (0C8) Overvoltage (0C9) Overheat (0CA) Control power source voltage error (0CC) Control power voltage drop (0CE) Drive source error (0D4)
●	○	●	○	○	11	Differential counter overflow with home return incomplete (0D5) Deviation overflow (0D8) Software stroke limit over error (0D9) Pressing motion range over error (0DC)
●	○	○	●	●	12	Servo error (0C1) Overload (0E0)
●	○	○	●	○	13	Encoder receipt error (0E5) Absolute encoder error detection 1 (0ED) Absolute encoder error detection 2 (0EE) Absolute encoder error detection 3 (0EF)
●	○	○	○	●	14	CPU error (0FA) Logic error (0FC)
●	○	○	○	○	15	Nonvolatile memory write verify error (0F5) Nonvolatile memory write timeout (0F6) Nonvolatile memory data destroyed (0F8)

(Note) *ALM Signal is an active low signal. It is ON when the power is applied to the controller, and turns OFF when the signal is output.

5.4.3 Alarm Codes for ERC3 (Each Axis)

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
048	Message	Driver overload alarm	Cause : There is a risk of overload with the current operation condition. This alarm keeps its status until a reset is conducted. Treatment : Lower the setting of acceleration/deceleration. Also, increase the frequency of pause.
04E		Exceeded movement count threshold	Cause : The total number of the operation times exceeded the value set in Parameter No.26 “Total Movement Count Threshold”.
04F		Exceeded operated distance threshold	Cause : The total number of the operation distance exceeded the value set in Parameter No.27 “Total Operated Distance Threshold”.
06B		Maintenance information data error	Cause : The maintenance information (total movement count, total operated distance) is lost. Treatment : Please contact IAI.
080	Operation release	Move command in servo OFF	Cause : A move command was issued when the servo is OFF. Treatment : Issue a movement command after confirming the servo is ON (servo ON signal (SV) or position complete signal (PEND) is ON).
082		Position command in incomplete home return	Cause : A position move command was issued before home return was completed. Treatment : Issue a command after confirming that home return has been completed (HEND) is ON.
083		Numerical command in incomplete home return	Cause : An absolute position command was issued by numerical specification before home return was completed (direct command from Field Network). Treatment : Issue a numeric specification after performing home return operation and confirming the complete signal (HEND).
084		Movement command during home return operation	Cause : A move command was issued when home return was still in progress. Treatment : Issue a movement command after performing home return operation and confirming the complete signal (HEND).
085		Position No. error during movement	Cause : A non-existing (invalid) position number was specified in the positioner mode. Treatment : Check the position table again and indicate an effective position number.
090		Software reset during servo ON	Cause : A software reset command was issued when the servo was ON. Treatment : Issue a software reset command after confirming that the servo is OFF (SV signal is 0).
091		Position No. error in teaching	Cause : The position number out of the available range was selected in the teaching. Treatment : Select the position number from 63 or smaller.
092		PWRT signal detected during a movement	Cause : Input was made while the current position writing signal (PWRT) is in the JOG operation in Teaching Mode. Treatment : Input the signal after confirming that JOG button is not pressed and the actuator is in a stop (in the condition MOVE output signal is OFF).
093		PWRT signal detected with home return incomplete	Cause : Input was made while the current position writing signal (PWRT) is in home-return incomplete in Teaching Mode Treatment : Input HOME signal first to perform a home return, and then input the signal after confirming the home return is complete (HEND output signal is ON).

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0A1	Cold start	Parameter data error	Cause : The data input range in the parameter area is not appropriate. Treatment : Change the value to the appropriate one.
0A2	Operation release	Position data error	Cause : 1) A move command was input when no target position was set in the “Position” field of a position No. in the position table. 2) The value of the target value in the “Position” field exceeded the ERC3 Parameter No.3, 4 “Soft limit set value”. Treatment : 1) Set the target position. 2) Change the target position value to the one within the soft limit set value.
0A3		Position command data error	Cause : 1) The speed or acceleration/deceleration value during direct numeric specification exceeded the maximum set value. Treatment : 1) Table to input a proper value.
0A7		Command deceleration error	Cause : Because there is not enough deceleration distance when the deceleration is changed to a lower setting during the operation, the actuator exceeded the soft limit when deceleration was made from the current position with the deceleration after the change.  The cause is that the timing to make the next movement command when the speed was changed during the operation was late. Treatment : Make the timing earlier for the movement command for the deceleration speed change.
0A8	Cold start	Unsupported motor/encoder types	Cause : A motor or encoder not applicable for is connected. Treatment : Contact us in case this alarm is issued with the applicable actuator or occurs again even after the power is rebooted.

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0B8	Cold start	Excitement detection error	Cause : In ERC3, the excitation detection starts when the servo is turned ON for the first time after the power is supplied. The detection is not finished after a certain time being passed. 1) Connection error or wire breakage on an actuator cable. 2) Brake is not released (when equipped with a brake). 3) Load to the motor is high due to external force. 4) Power was turned ON while touching to the mechanical end. 5) The resistance in the actuator sliding operation is large. Treatment : 1) Check the wiring condition of the actuator cables. 2) There is a concern of a malfunction of the controller internal components. Please contact us. 3) Confirm that there is no error in the mechanical part assembly condition. 4) Move the slider or the rod to a point where it would not hit the mechanical end and reboot the system. 5) If the loaded weight is within the allowable range, turn the power OFF and check the resistance in sliding operation by moving the slider with hand.
0BE	Operation release	Home return timeout	Cause : Home return does not complete after elapse of a certain period after the start of home return. Treatment : This error does not occur in normal operation. Please contact IAI.
0C0		Actual speed excessive	Cause : This indicates the number of motor rotation exceeded the number of allowable rotation. 1) The slide resistance of the actuator is locally high. 2) The load is increased too much due to a external force. With the reasons above, it can be considered a sudden speed increase has occurred before detecting the servo error. Treatment : Even though this would not occur in normal operation, check if there is any abnormality in the parts assembly condition. Also check if there is a possibility that an external force may be applied in the direction of the actuator movement.

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0C1	Operation release	Servo error	Cause : It indicates 2 seconds has passed without making a move since a move command was received. 1) Connection error or wire breakage on an actuator cable 2) Brake is not released (when equipped with a brake). 3) Load to the motor is high due to external force. 4) The resistance in the actuator sliding operation is large. Treatment : 1) Check the wiring condition of the actuator cables. 2) There is a concern of a malfunction of the controller internal components. Please contact IAI. 3) Confirm that there is no error in the mechanical part assembly condition. 4) If the loaded weight is within the allowable range, turn the power OFF and check the resistance in sliding operation by moving the slider with hand.
0C8	Cold start	Overcurrent	Cause : The output current in the power circuit section is increased abnormally. Treatment : This alarm will not be generated in normal operation. Degradation in insulation of motor coil or malfunction ERC3 controller can be considered. Please contact IAI.
0C9		Overvoltage	Cause : The power voltage reached the overvoltage. Treatment : Malfunction of a component in ERC3 controller can be considered. Please contact IAI.
0CA		Overheat	Cause : This indicates overheat (90□C or more) of the components inside the ERC3 controller. 1) Operation is performed with the load condition exceeding the specified range. 2) High temperature around the controller. 3) Load to the motor is high due to external force. 4) A faulty part inside the controller. Treatment : 1) Revise the operation condition such as decreasing the acceleration/deceleration speed. 2) Lower the ambient temperature of the ERC3. 3) Confirm that there is no error in the mechanical part assembly condition. (Note) This error would not normally occur. If it occurs, confirm there is not 1) to 3) above. In case the same problem occurs again even after these treatments, ERC3 may be considered broken. Please contact us.

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0CC	Cold start	Control power source voltage error	Cause : The control power voltage dropped less than the voltage drop threshold (120% of 24V DC = 28.8V). 1) The voltage of 24V DC power supply is high. 2) Component malfunction in ERC3 controller 3) During acceleration/deceleration and servo-ON that use the remote sensing function of 24V DC power supply, the current consumption rises transiently. Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change. Treatment : 1) 2) Check the voltage of the power supply. 3) Think to use a power supply with enough current capacity or not to use the remote sensing function. In the case that the voltage is normal, please contact IAI.
0CE	Operation release	Drop in control supply voltage	Cause : The control power voltage dropped less than the voltage drop threshold (80% of 24V DC = 19.2V). 1) The voltage of 24V DC power supply is low. 2) Component malfunction in ERC3 controller Treatment : Check the voltage of the power supply. In the case that the voltage is normal, please contact IAI.
0D4	Cold start	Drive Source Error	Cause : 1) Motor power input voltage (input to MPI terminal) is too large During acceleration/deceleration and servo-ON, the current consumption rises transiently. Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change. 2) Overcurrent is generated on the motor power supply line Treatment : 1) Check the power voltage input to MPI terminal. Think to use a power supply with enough current capacity or not to use the remote sensing function. 2) Check the wire layout between the actuator and controller.
0D5		Differential Counter Overflow with Home Return Incomplete	Cause : This alarm indicates that the position deviation counter has overflowed. 1) The speed dropped or stopped during JOG move due to an impact of external force, hit to the mechanical end or overload. 2) The excited-phase detection operation following the power-on is unstable. Treatment : 1) This error occurs when the actuator cannot be operated as it is commanded. Check the load conditions such as if the work is touching to the surrounding object, or brake is properly released, and remove the cause. 2) Overload is concerned. Revise the transportable weight.

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0D8	Cold start	Deviation overflow	Cause : This alarm indicates that the position deviation counter has overflowed. 1) The speed dropped or the actuator stopped due to the effect of external force or overload. 2) The excited-phase detection operation following the power-on is unstable. Treatment : 1) This error occurs when the actuator cannot be operated as it is commanded. Check the load conditions such as if the work is touching to the surrounding object, or brake is properly released, and remove the cause. 2) Overload can be concerned. Revise the transportable weight and redo the home-return operation.
0D9		Software stroke limit over error	Cause : The current position of the actuator exceeds the software stroke limit. Treatment : Return the actuator to be within the range of the software stroke limit.
0DC		Pressing motion range over error	Cause : 1) After the pressing operation has complete, the force to push back is too large and the pushed back to the pressing start position (“Position” in the position table). 2) The actuator touched the work during the approach movement before the pressing movement. Treatment : 1) Revise the setting and adjust it so the force to push back gets smaller. 2) Set the “Position” setting in front in the position table to shorten the approach distance.
0E0		Overload	Cause : 1) The work weight exceeds the rated weight, or an external force is applied and the load increased. 2) Brake is not released (when equipped with a brake). 3) The slide resistance of the actuator is locally high. Treatment : 1) Check the work and its surrounding area to remove the cause. 2) There is a concern of a malfunction of the controller internal components. Please contact IAI. 3) In the case that the work can be moved by hand, move it. Then, check that there is no location where a sliding resistant is too large. Check if the installation face is distorted. When the error occurs in operation of the actuator only, Please contact IAI. ⚠ Caution Restart the operation after making sure to remove the cause. If you cannot determine that the cause is removed completely, wait for at least 30 minutes before turning on the power to prevent the motor coil from burning.

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0E5	Cold start	Encoder receipt error	Cause : This indicates that the data was not received to the ERC3 controller in the normal condition from the simple absolute area. 1) Connector connection error (If the detail code in the error list of the teaching tool is 0002H.) 2) Effect of noise (If the detail code in the error list of the teaching tool is 0001H.) 3) Malfunction of component (communication part) inside the ERC3 controller. Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections. 2) Interrupt the power to the peripheral equipment and ERC3 only the this actuator and actuator. If any error does not occur, it might be caused by noise. Take proper measures against noise. If the cause is due to 3), it is necessary to replace the ERC3 (motor part) or controller. If the cause cannot be specified, please contact IAI.
0F5	Operation release	Nonvolatile memory write verify error	It is verified at the data writing process to the non-volatile memory that the data inside the memory and the data to be written are matched. There was a mismatch detected in this process. Cause : Faulty nonvolatile memory. Treatment : When the error is caused even when the power is re-input, please contact IAI.
0F6	Cold start	Nonvolatile memory write timeout	There is no response in the specified time duration during the data writing to the non-volatile memory. Cause : Faulty nonvolatile memory. Treatment : When the error is caused even when the power is re-input, please contact IAI.
0F8		Nonvolatile memory data destroyed	Abnormal data was detected during the nonvolatile memory check after starting. Cause : Faulty nonvolatile memory. Treatment : When the error is caused even when the power is re-input, please contact IAI.
0FA		CPU error	The CPU operation is not normal. Cause : 1) Faulty CPU. 2) Malfunction due to noise. Treatment : When the error is caused even when the power is re-input, please contact IAI.
0FC		Logic error (Component error in ERC3 controller)	The controller is not operating properly. Cause : 1) Malfunction due to the effect of noise, etc. 2) Malfunction of peripheral circuit components. Treatment : Turn the power OFF and reboot. If the error occurs again, check for presence of noise. Also, if you have another ERC3, replace it and try. A recurring error with the spare controller suggests presence of noise. If the cause cannot be identified, please contact IAI.
100 to 1FF	Message	Alarm on teaching tool	[Refer to the Instruction Manual of teaching tool.]
200 to 2FF	Operation release	Alarm on teaching tool	[Refer to the Instruction Manual of teaching tool.]
300 to 3FF	Cold start	Alarm on teaching tool	[Refer to the Instruction Manual of teaching tool.]

Chapter 6 Appendix

6.1 Specifications of Actuator

> ⚠ Caution: Transportable weight differs depending on the velocity and acceleration/deceleration. Refer to Instruction Manual of ERC3 (ME0297) for the details.

6.1.1 In the case of high output setting valid for Slider Type (Screw Cover Type)

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Slider Type	SA5C	Ball screw	800	3	Horizontal	3.75	225(at 50 to 450st) 200(at 500st) 165(at 550st) 140(at 600st) 115(at 650st) 100(at 700st) 85(at 750st) 75(at 800st)	1.0	106	370	20
					Vertical			0.5			
				6	Horizontal	7.5	450(at 50 to 450st) 400(at 500st) 330(at 550st) 280(at 600st) 235(at 650st) 200(at 700st) 175(at 750st) 150(at 800st)	1.0	53	185	
					Vertical			0.5			
				12	Horizontal	15	900(at 50 to 450st) 805(at 500st) 665(at 550st) 560(at 600st) 475(at 650st) 405(at 700st) 350(at 750st) 300(at 800st)	1.0	26	93	
					Vertical			0.5			
				20	Horizontal	25	1120(at 50 to 500st) 1115(at 550st) 935(at 600st) 795(at 650st) 680(at 700st) 585(at 750st) 510(at 800st)	1.0	16	56	
					Vertical			0.5			
	SA7C	Ball screw	800	4	Horizontal	5	210(at 50 to 600st) 185(at 650st) 160(at 700st) 140(at 750st) 120(at 800st)	1.0	192	673	20
					Vertical			0.5			
				8	Horizontal	10	490(at 50 to 550st) 440(at 600st) 375(at 650st) 320(at 700st) 280(at 750st) 245(at 800st)	1.0	96	336	
					Vertical			0.5			
				16	Horizontal	20	980(at 50 to 550st) 880(at 600st) 750(at 650st) 645(at 700st) 585(at 750st) 495(at 800st)	1.0	48	168	
					Vertical		840(at 50 to 600st) 750(at 650st) 645(at 700st) 565(at 750st) 495(at 800st)	0.5			

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Slider Type	SA7C	Ball screw	800	24	Horizontal	30	1200(at 50 to 600st) 1130(at 650st) 975(at 700st) 850(at 750st) 745(at 800st)	1.0	32	112	20
					Vertical			0.5			

6.1.2 In the case of high output setting invalid for Slider Type (Screw Cover Type)

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Slider Type	SA5C	Ball screw	800	3	Horizontal/ Vertical	3.75	150(at 50 to 550st) 140(at 600st) 115(at 650st) 100(at 700st) 85(at 750st) 75(at 800st)	0.2	106	370	20
				6	Horizontal	7.5	300(at 50 to 550st) 280(at 600st) 235(at 650st) 200(at 700st) 175(at 750st) 150(at 800st)	0.3	53	185	
					Vertical			0.2			
				12	Horizontal	15	600(at 50 to 550st) 560(at 600st) 475(at 650st) 405(at 700st) 350(at 750st) 300(at 800st)	0.3	26	93	
					Vertical			0.2			
				20	Horizontal	25	1000(at 50 to 550st) 935(at 600st) 795(at 650st) 680(at 700st) 585(at 750st) 510(at 800st)	0.3	16	56	
					Vertical			0.2			
	SA7C	Ball screw	800	4	Horizontal/ Vertical	5	125(at 50 to 750st) 120(at 800st)	0.2	192	673	20
				8	Horizontal	10	250(at 50 to 750st) 245(at 800st)	0.3	96	336	
					Vertical			0.2			
				16	Horizontal	20	450	0.3	48	168	
					Vertical		400	0.2			
				24	Horizontal	30	675	0.3	32	112	
					Vertical		600	0.2			

6.1.3 In the case of high output setting valid for Slider Type (Stainless Steel Sheet Type / Cleanroom Type)

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Slider Type	SA5C	Ball screw	800	3	Horizontal	3.75	225(at 50 to 450st) 195(at 500st) 165(at 550st) 140(at 600st) 120(at 650st) 105(at 700st) 90(at 750st) 80(at 800st)	1.0	106	370	20
					Vertical			0.5			
				6	Horizontal	7.5	450(at 50 to 450st) 395(at 500st) 335(at 550st) 285(at 600st) 245(at 650st) 215(at 700st) 185(at 750st) 165(at 800st)	1.0	53	185	
					Vertical			0.5			
				12	Horizontal	15	900(at 50 to 450st) 795(at 500st) 665(at 550st) 570(at 600st) 490(at 650st) 425(at 700st) 375(at 750st) 330(at 800st)	1.0	26	93	
					Vertical			0.5			
				20	Horizontal	25	1120(at 50 to 550st) 1045(at 600st) 900(at 650st) 785(at 700st) 690(at 750st) 610(at 800st)	1.0	16	56	
					Vertical			0.5			
	SA7C	Ball screw	800	4	Horizontal	5	210(at 50 to 600st) 185(at 650st) 160(at 700st) 145(at 750st) 125(at 800st)	1.0	192	673	20
					Vertical			0.5			
				8	Horizontal	10	490(at 50 to 550st) 430(at 600st) 375(at 650st) 325(at 700st) 290(at 750st) 255(at 800st)	1.0	96	336	
					Vertical			0.5			
				16	Horizontal	20	980(at 50 to 550st) 865(at 600st) 750(at 650st) 655(at 700st) 580(at 750st) 515(at 800st)	1.0	48	168	
					Vertical		840(at 50 to 600st) 750(at 650st) 655(at 700st) 580(at 750st) 515(at 800st)	0.5			
				24	Horizontal	30	1200(at 50 to 600st) 1155(at 650st) 1010(at 700st) 890(at 750st) 790(at 800st)	1.0	32	112	
					Vertical			0.5			

6.1.4 In the case of high output setting invalid for Slider Type (Stainless Steel Sheet Type / Cleanroom Type)

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Slider Type	SA5C	Ball screw	800	3	Horizontal/ Vertical	3.75	150(at 50 to 550st) 140(at 600st) 120(at 650st) 105(at 700st) 90(at 750st) 80(at 800st)	0.2	106	370	20
				6	Horizontal	7.5	300(at 50 to 550st) 285(at 600st) 245(at 650st) 215(at 700st) 185(at 750st) 165(at 800st)	0.3	53	185	
					Vertical			0.2			
				12	Horizontal	15	600(at 50 to 550st) 570(at 600st) 490(at 650st) 425(at 700st) 375(at 750st) 330(at 800st)	0.3	26	93	
					Vertical			0.2			
				20	Horizontal	25	1000(at 50 to 600st) 900(at 650st) 785(at 700st) 690(at 750st) 610(at 800st)	0.3	16	56	
					Vertical			0.2			
	SA7C	Ball screw	800	4	Horizontal/ Vertical	5	125	0.2	192	673	20
				8	Horizontal	10	250	0.3	96	336	
					Vertical			0.2			
				16	Horizontal	20	450	0.3	48	168	
					Vertical		400	0.2			
				24	Horizontal	30	675	0.3	32	112	
					Vertical		600	0.2			

6.1.5 In the case of high output setting valid for Rod Type

Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Rod Type	RA4C	Ball screw	800	3	Horizontal	3.75	225(at 50 to 200st) 170(at 250st) 120(at 300st)	1.0	106	370	20
					Vertical			0.5			
				6	Horizontal	7.5	450(at 50 to 200st) 345(at 250st) 240(at 300st)	1.0	53	185	
					Vertical			0.5			
				12	Horizontal	15	700(at 50 to 200st) 695(at 250st) 485(at 300st)	1.0	26	93	
					Vertical			0.5			
				20	Horizontal	25	800	1.0	16	56	
					Vertical			0.5			
	RA6C	Ball screw	800	4	Horizontal	5	210(at 50 to 250st) 200(at 300st)	1.0	312	1094	20
					Vertical		175	0.5			
				8	Horizontal/ Vertical	10	420(at 50 to 250st) 400(at 300st)	1.0	156	547	
								0.5			
				16	Horizontal	20	700	1.0	78	273	
					Vertical		560	0.5			
				24	Horizontal	30	800	1.0	52	182	
					Vertical		600	0.5			

6.1.6 In the case of high output setting invalid for Rod Type

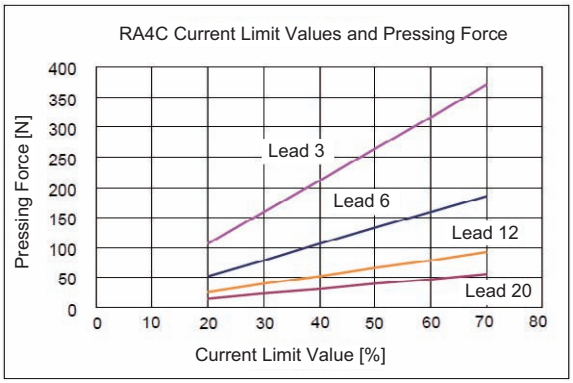
Actuator series	Type	Feed screw	No. of encoder pulses	Lead [mm]	Mounting direction	Minimum speed [mm/s]	Maximum speed [mm/s]	Maximum acceleration/ deceleration [G]	Minimum push force [N]	Maximum push force [N]	Rated push speed [mm/s]
Rod Type	RA4C	Ball screw	800	3	Horizontal/ Vertical	3.75	150(at 50 to 250st) 120(at 300st)	0.2	106	370	20
				6	Horizontal	7.5	300(at 50 to 250st) 240(at 300st)	0.3	53	185	
					Vertical			0.2			
				12	Horizontal	15	600(at 50 to 250st) 485(at 300st)	0.3	26	93	
					Vertical			0.2			
				20	Horizontal	25	667	0.3	16	56	
					Vertical			0.2			
	RA6C	Ball screw	800	4	Horizontal/ Vertical	5	125	0.2	312	1094	20
				8	Horizontal	10	250	0.3	156	547	
					Vertical		200	0.2			
				16	Horizontal	20	450	0.3	78	273	
					Vertical		400	0.2			
				24	Horizontal	30	675	0.3	52	182	
					Vertical		600	0.2			

6.1.7 Pressing Force and Current Limit Value

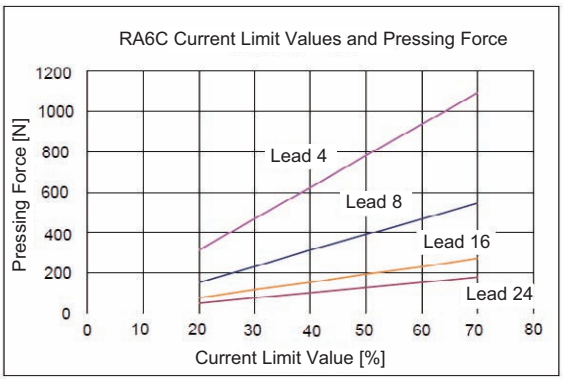
> Caution : • The correlation of the pressing force and the current limit value is the rated pressing speed (20mm/s) and is a reference value.
> • Use the actuator with the setting above the minimum pressing force value. The pressing force will be unstable if it is below the minimum pressing force value.
> • If the positioning speed setting in the operation condition is made lower than the pressing speed, the pressing speed will follow that speed, thuscannot perform the expected pressing force.

Rod Type

RA4C Type

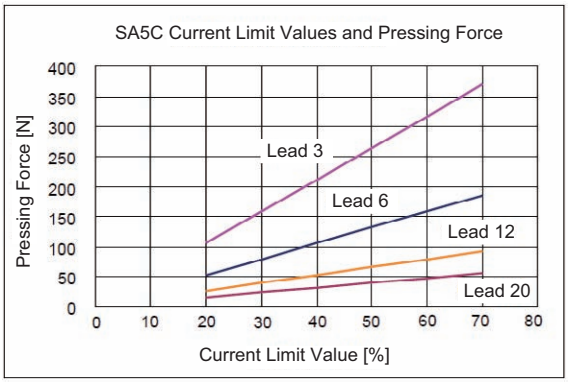


RA6C Type

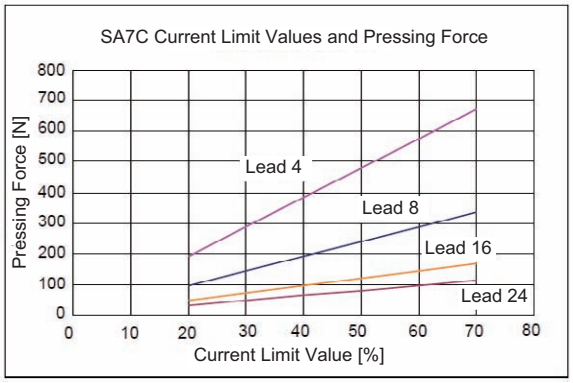


Slider Type

SA5C Type



SA7C Type



Chapter 7 Warranty

7.1 Warranty Period

One of the following periods, whichever is shorter:
- 18 months after shipment from our company
- 12 months after delivery to the specified location

7.2 Scope of Warranty

Our products are covered by warranty when all of the following conditions are met. Faulty products covered by warranty will be replaced or repaired free of charge:

(1) The breakdown or problem in question pertains to our product as delivered by us or our authorized dealer.

(2) The breakdown or problem in question occurred during the warranty period.

(3) The breakdown or problem in question occurred while the product was in use for an appropriate purpose under the conditions and environment of use specified in the operation manual and catalog.

(4) The breakdown of problem in question was caused by a specification defect or problem, or by a quality issue with our product.

Note that breakdowns due to any of the following reasons are excluded from the scope of warranty:

[1] Anything other than our product
[2] Modification or repair performed by a party other than us (unless we have approved such modification or repair)
[3] Anything that could not be easily predicted with the level of science and technology available at the time of shipment from our company
[4] A natural disaster, man-made disaster, incident or accident for which we are not liable
[5] Natural fading of paint or other symptoms of aging
[6] Wear, depletion or other expected result of use
[7] Operation noise, vibration or other subjective sensation not affecting function or maintenance

Note that the warranty only covers our product as delivered and that any secondary loss arising from a breakdown of our product is excluded from the scope of warranty.

7.3 Honoring the Warranty

As a rule, the product must be brought to us for repair under warranty.

7.4 Limited Liability

(1) We shall assume no liability for any special damage, consequential loss or passive loss such as a loss of expected profit arising from or in connection with our product.
(2) We shall not be liable for any program or control method created by the customer to operate our product or for the result of such program or control method.

7.5 Conditions of Conformance with Applicable Standards/Regulations, Etc., and Applications

(1) If our product is combined with another product or any system, device, etc., used by the customer, the customer must first check the applicable standards, regulations and/or rules. The customer is also responsible for confirming that such combination with our product conforms to the applicable standards, etc. In such a case we will not be liable for the conformance of our product with the applicable standards, etc.

(2) Our product is for general industrial use. It is not intended or designed for the applications specified below, which require a high level of safety. Accordingly, as a rule our product cannot be used in these applications. Contact us if you must use our product for any of these applications:

[1] Medical equipment pertaining to maintenance or management of human life or health
[2] A mechanism or mechanical equipment intended to move or transport people (such as a vehicle, railway facility or aviation facility)
[3] Important safety parts of mechanical equipment (such as safety devices)
[4] Equipment used to handle cultural assets, art or other irreplaceable items

(3) Contact us at the earliest opportunity if our product is to be used in any condition or environment that differs from what is specified in the catalog or operation manual.

7.6 Other Items Excluded from Warranty

The price of the product delivered to you does not include expenses associated with programming, the dispatch of engineers, etc. Accordingly, a separate fee will be charged in the following cases even during the warranty period:

[1] Guidance for installation/adjustment and witnessing of test operation
[2] Maintenance and inspection
[3] Technical guidance and education on operating/wiring methods, etc.
[4] Technical guidance and education on programming and other items related to programs

Change History

Revision Date	Revision Description
2012.12	First Edition
2013.01	Second Edition ● 2-Input, 2-Point Movement deleted. ● Changed from I/O Mode to Remote I/O Mode.
2013.08	Third Edition ● Battery Box and Simple Absolute board deleted.
2019.04	Forth Edition ● Connectable teaching tools added ● Correction made in 2.2 Circuit Diagram ● Correction made to compliable cables for EtherNet/IP and EtherCAT

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IAI
Quality and Innovation

IAI Corporation

Head Office: 577-1 Obane Shimizu-KU Shizuoka City Shizuoka 424-0103, Japan
TEL +81-54-364-5105 FAX +81-54-364-2589
website: www.iai-robot.co.jp/

Technical Support available in USA, Europe and China

IAI America, Inc.

Head Office: 2690 W. 237th Street, Torrance, CA 90505
TEL (310) 891-6015 FAX (310) 891-0815
Chicago Office: 110 East State Parkway, Schaumburg, IL 60173
TEL (847) 908-1400 FAX (847) 908-1399
Atlanta Office: 1220 Kennestone Circle, Suite 108, Marietta, GA 30066
TEL (678) 354-9470 FAX (678) 354-9471
website: www.intelligentactuator.com

IAI Industrieroboter GmbH

Ober der Röth 4, D-65824 Schwalbach am Taunus, Germany
TEL 06196-88950 FAX 06196-889524
website:www.iai-gmbh.de

IAI (Shanghai) Co., Ltd.

SHANGHAI JIAHUA BUSINESS CENTER A8-303, 808, Hongqiao Rd. Shanghai 200030, China
TEL 021-6448-4753 FAX 021-6448-3992
website: www.iai-robot.com

IAI Robot (Thailand) Co., Ltd.

825, PhairojKijja Tower 7th Floor, Bangna-Trad RD., Bangna, Bangna, Bangkok 10260, Thailand
TEL +66-2-361-4458 FAX +66-2-361-4456
website:www.iai-robot.co.th

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