# RCP6S

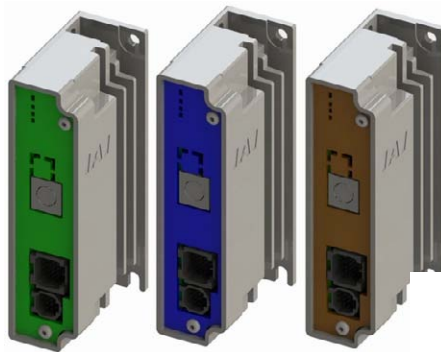## Fieldbus Communication
## Instruction Manual Fouth Edition



RCP6S Gateway Controllers
RCM-P6PC   RCM-P6AC   RCM-P6DC



Hub Unit
RCM-P6HUB

Gateway Unit
RCM-P6GW (G)

**IAI Corporation**

# *RCP6S* *Fieldbus Communication*

## 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.
Before the operation, read this manual carefully and fully understand it to operate this product safely.
The enclosed 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.
- Using or copying all or part of this Instruction Manual without permission is prohibited.
- The company names, names of products and trademarks of each company shown in the sentences are registered trademarks.

# RCP6S Fieldbus Communication

## Construction of Instruction Manual for Each Controller Model and This Manual

This instruction manual is for the fields communication using RCP6S Gateway Unit, Hub Unit and controllers for RCP6S Gateway.
For installation and how to attach conveyance objects, refer to instruction manual for each actuator type.

### RCP6S(W)

### RCP6S Gateway Controllers

● Basic Specifications (Actuator type)

| | | |
|---|---|---|
| ・ Fieldbus Communication | □ RCP6S fieldbus communication (This manual) | ME0349 |
| ・ Serial Communication | □ Serial communication [Modbus] | ME0162 |
| Slider type | □ RCP6S(CR)-SA | ME3749 |
| Wide slider type | □ RCP6S(CR)-WSA | ME3750 |
| Rod type | □ RCP6S-RA | ME3751 |
| Wide rod type | □ RCP6S-WRA | ME3752 |
| Radial cylinder type | □ RCP6S-RRA | ME3753 |
| Table type | □ RCP6S-TA | ME3754 |
| Dust proof/Splush proof Rod type | □ RCP6SW-RA | ME3759 |
| Dust proof/Splush proof Wide rod type | □ RCP6SW-WRA | ME3760 |
| Dust proof/Splush proof Radial cylinder type | □ RCP6SW-RRA | ME3761 |

★ Extention Device

| | | |
|---|---|---|
| ・ Gateway unit | ■ RCP6S fieldbus communication (This manual) | ME0349 |
| ・ Hub unit | ■ RCP6S fieldbus communication (This manual) | ME0349 |
| ・ RCP6S Gateway Controllers | ■ RCP6S fieldbus communication (This manual) | ME0349 |
| ・ PLC connecting unit | ■ Serial communication [Modbus] | ME0162 |

■ Teaching Tool

| | | |
|---|---|---|
| ・ PC software | ■ PC software | ME0155 |
| ・ Teaching Pendant | | |
| TB-02 (Applicable for position controller) | ■ Touch panal teaching | ME0355 |
| TB-01 (Applicable for position controller) | ■ Touch panal teaching | ME0324 |
| CON-PTA | ■ Touch panal teaching | ME0295 |

⚠ Caution:  In this manual shows the explanation of how to operate for when using the Fieldbus communication.
Refer to provided separately for Serial Communication [Modbus] for operation in serial communication.

* In this manual explanations "RCP6S GW" shows the "RCP6S Gateway".

# RCP6S *Fieldbus Communication*

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## ★Starting Procedures★

**Step 1**  Confirm All The Necessary Things are Prepared (Contact us or our sales agency in case of any missing)

Refer to the section "1.1 Product Check" in this manual for more detail.
☆Actuator (RCP6S-**) and Connection Cable
 * To operate this actuator, it is necessary gateway unit or
   PLC connecting unit.
   Check also enclosed parts in parallel. [Refer to Section 1.1.1]

☆CD-ROM (Enclosed in RCM-101-□□)
   (The following software is included)
   ・RC PC software
   ・Gateway parameter
     setting tool

☆For Gateway Unit (extension):
   Field Network Setting File
   File (e.g. EDS File)

      Download it in homepage
   (http://www.iai-robot.co.jp/)

☆DVD Instruction Manual
   (includes the following instruction manuals)
  [Refer to Instruction Manuals related to this product, which are
    provided on the 1.1.3 DVD.]
   1) RCP6S Instruction Manual (This manual)
   2) RC PC Software Instruction Manual (ME0155)
   3) Touch Panel Teaching Instruction Manual (ME0324)
   4) RCP6S(CR), RCP6SW Instruction Manual for Each Type
   5) Serial Communication [Modbus] Instruction Manual (ME0162)
   6) Instruction manual of each actuator

**Step 2**  Check How to Operate

The operation modes and control methods will defer depending on the type you have purchased.

☆ Operation by Fieldbus Connection

The host controller drives the actuator by the fieldbus communication through the gateway unit

Host Controller

Gateway Unit

Make operation with fieldbnus communication

Actuator (Max. 16 axes)

● MAX.
● 16 axes
●

Hub Unit
(Utilize these holes if necessary)

Teaching Tool
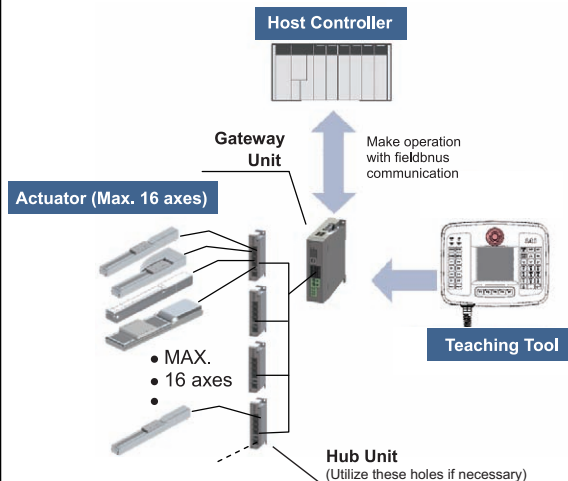
⚠ *In the direct numerical mode except for when connection with CC-Link, the maximum connectable number of axes should be eight axes.*

☆ Operation by Serial Communication

Make operation with serial communication (Modbus)

Host Controller

Position Number + Start Signal

Completion Signal

Signal    Signal

PLC connecting unit

Actuator

Teaching Tool
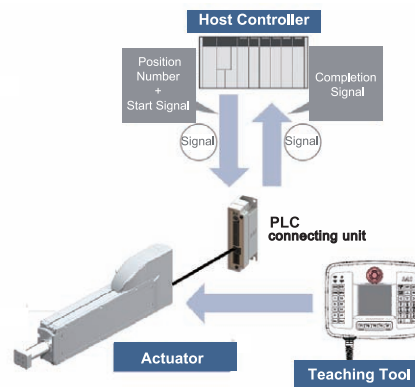
When conducting the serial communication control, refer to Serial Communication [for Modbus] Instruction Manual provided separately.

# RCP6S *Fieldbus Communication*

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**Step 3** Installation  "Refer to "1.6 Installation and Storage Environment" and "1.7 Noise Prevention and Installation""

· External Dimensions * As they differ for each specifications and type. Refer to the each instruction manual.

· Noise Elimination Grounding
  (Frame Ground)

Connect the ground line together to the main unit using the FG terminal.

Copper Wire :
  Connect to an ground cable with diameter 1.6mm ($2mm^2$) or more.
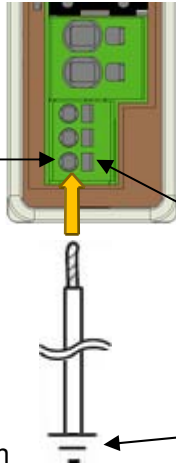
Push hard in the square hole with a slotted screwdriver to open the ground wire inlet.
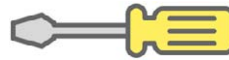
Earth Terminal
(Grounding resistance at $100\Omega$ or less)

· Heat Radiation and Installation
  Keep the ambient temperature of the controller at 40°C or less.

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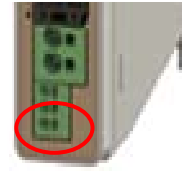
**Step 4** Wiring      Refer to Chapter 2 "Wiring"

[Fieldbus Control]        Refer to Sections 2.1
[Serial Communication Control]   When conducting the serial communication control with using the PLC connection unit, refer to Serial Communication [for Modbus] Instruction Manual provided separately.

Example for Basic Wiring
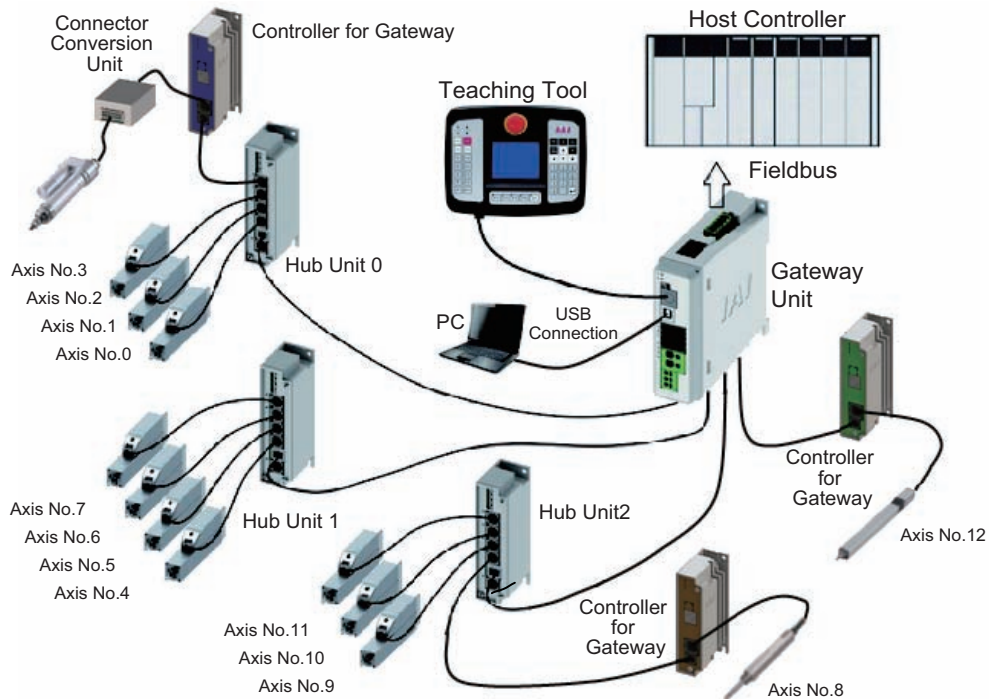
Connector Conversion Unit

Controller for Gateway

Teaching Tool

Host Controller

Fieldbus

Axis No.3
Axis No.2
Axis No.1
Axis No.0

Hub Unit 0

PC   USB Connection

Gateway Unit

Controller for Gateway

Axis No.7
Axis No.6
Axis No.5
Axis No.4

Hub Unit 1

Hub Unit2

Axis No.12

Axis No.11
Axis No.10
Axis No.9

Controller for Gateway

Axis No.8

*Note   When an actuator is to connected to the controller for RCP6S Gateway, make sure to connect an actuator of the model code stated on the controller front panel. Operation will not be performed correctly if an actuator not indicated is connected.*

**Step 5** Operate Unit

How you should look in the instruction manuals will differ depending on the operation modes and control methods you choose.
Establish the settings for your control format needs.

● For Fieldbus Communication Control ⟶ 3.1. Basic Operation ⇒ 3.2 Initial Setting ⇒ 3.3 Setting of Position Data

● For Serial Communication Control ⟶ Provided Separately [Modbus] Instruction Manual

Caution Set it away from the mechanical end or peripherals as much as possible when turning the servo ON. Move it apart when it interferes with peripherals. It may generate an alarm if it hits to the mechanical end or peripherals when the servo is turned on. Also, in case the actuator is installed in vertical orientation, turning ON and OFF the servo at the same spot may cause a slight drop by the self-gravity. Pay attention not to pinch your finger or damage a work piece.

Caution There is a brake release switch mounted on the front panel of the hub unit. Also, there is the brake release input in the system connector of the gateway unit.
When the actuator is to be installed in the vertical mount, it may drop with its self-weight when the brake gets compulsorily released. Pay attention not to pinch your finger or damage the workpiece.

Caution The controller is equipped with a safety velocity function to make the operation in low speed compulsorily. It is recommended to have this function activated in the first operation.

# *RCP6S* *Fieldbus Communication*

## 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.<br>  1) Medical equipment used to maintain, control or otherwise affect human life or physical health.<br>  2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)<br>  3) Important safety parts of machinery (Safety device, etc.)<br>● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.<br>● Do not use it in any of the following environments.<br>  1) Location where there is any inflammable gas, inflammable object or explosive<br>  2) Place with potential exposure to radiation<br>  3) Location with the ambient temperature or relative humidity exceeding the specification range<br>  4) Location where radiant heat is added from direct sunlight or other large heat source<br>  5) Location where condensation occurs due to abrupt temperature changes<br>  6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)<br>  7) Location exposed to significant amount of dust, salt or iron powder<br>  8) Location subject to direct vibration or impact<br>● 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.<br>• 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.<br>• 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.<br>• Transport it using an appropriate transportation measure.<br>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.<br>• Do not step or sit on the package.<br>• Do not put any heavy thing that can deform the package, on it.<br>• When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work.<br>• When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit.<br>• Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength.<br>• Do not get on the load that is hung on a crane.<br>• Do not leave a load hung up with a crane.<br>• 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.<br>• 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.<br>• 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.<br>Also, be equipped for a fall-over or drop due to an act of God such as earthquake.<br>• 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.<br>• When using the product in any of the places specified below, provide a sufficient shield.<br>1) Location where electric noise is generated<br>2) Location where high electrical or magnetic field is present<br>3) Location with the mains or power lines passing nearby<br>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<br>● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool.<br>● 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.<br>● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error.<br>● 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.<br>● 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.<br>● 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<br>● 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.<br>● 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).<br>● 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<br>● 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.<br>● 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.<br>● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation.<br>● 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.<br>● 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.<br>● 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.<br>● Take the measure so that the work part is not dropped in power failure or emergency stop.<br>● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety.<br>● 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.<br>● 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.<br>● 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.<br>● 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.<br>● 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.<br>● Place a sign "Under Operation" at the position easy to see.<br>● 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.<br>* 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.<br>● After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.<br>● 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.<br>● 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.<br>● 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.<br>● Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.<br>● Make sure to operate automatic operation start from outside of the safety protection fence.<br>● 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.<br>● 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.<br>● 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.<br>● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch.<br>● 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.<br>● 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.<br>● Place a sign "Under Operation" at the position easy to see.<br>● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model.<br>● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product.<br>● 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.<br>● 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.<br>● 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.<br>　Use in incomplete condition may cause damage to the product or an injury.<br>＊ 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.<br>● When removing the actuator for disposal, pay attention to drop of components when detaching screws.<br>● Do not put the product in a fire when disposing of it.<br>　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.<br>● See Overseas Specifications Compliance Manual to check whether complies if necessary.<br>● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety. |

# RCP6S *Fieldbus Communication*

## 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.
   Not doing so may cause a drop of performance or malfunction of the product.

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

3. Backup the data to secure for breakdown.
   A non-volatile memory is used as the backup memory for this controller. All the registered position data and parameters are written into this memory and backed-up at the same time. Therefore, you will not usually lose the data even if the power is shut down. However, make sure to save the latest data so a quick recovery action can be taken in case when the controller is broken and needs to be replaced with another one.

   How to Save Data
   (1) Save the data to non-volatile memory with using the PC software
   (2) Hard-copy the information of position tables and parameters on paper

4. Initial setting the operation
   To make this controller flexibly applied in various situations, it is made applicable for six types of communication standards, possesses six types of fieldbus operation modes for control method.
   The setup can be performed in the initial setting. [Refer to Chapter 3.2 Initial Setting and Chapter 8 Parameter]
   Set the operation mode and operation pattern setting to the logic that suits your use after the power is turned ON.

5. Clock setting in calendar function
   There may be a case in the first time to supply the power after delivery that Gateway Alarm Code 84A "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.

6. Note that there are some frictions and/or torsions in through-hole of rotary actuator when it is used
   When using rotary actuator with a through hole in the center of the revolution and using the hole to put cables through, have a treatment to prevent wear from rubbing or wire break due to the cables getting twisted.
   Take particular note on actuators of 360° rotation specification because they can be rotated infinitely in a single direction.

7. Limitations on operation of rotary actuator in index mode

Rotary actuators of 360° specification can select the normal mode for finite rotations or the index mode enabling multi-rotation control by using parameter No.79 "Rotational axis mode selection".

[Refer to Chapter 8 Parameter.]

The following limitations are applied to the index mode:

1) In the JOG or Inching Operation using a teaching tool such as PC software or using PIO signal, the range of 1 time of command is 360° at maximum for JOG while 1° at maximum for Inching.
2) Pressing is unavailable. The pressing torque can only be set to 0.
3) Do not issue positioning command around 0° repeatedly during movement near 0°. Failure to follow this may cause the actuator to rotate in the direction reverse to the specified rotation direction or operate indefinitely.
4) Software stroke limit is invalid in the index mode.

8. Transference of signal between controllers

Please note the following when conducting transference signal between controllers.
To certainly transfer the signal between controllers with different scan time, it is necessary to have longer scan time than the one longer than the other controller. To ensure to end the process safely, it is recommended to have the timer setting more than twice as long as the longer scan time at least.

● Operation Image

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



This controller
(scan time 1msec)

Output Process

Input Process
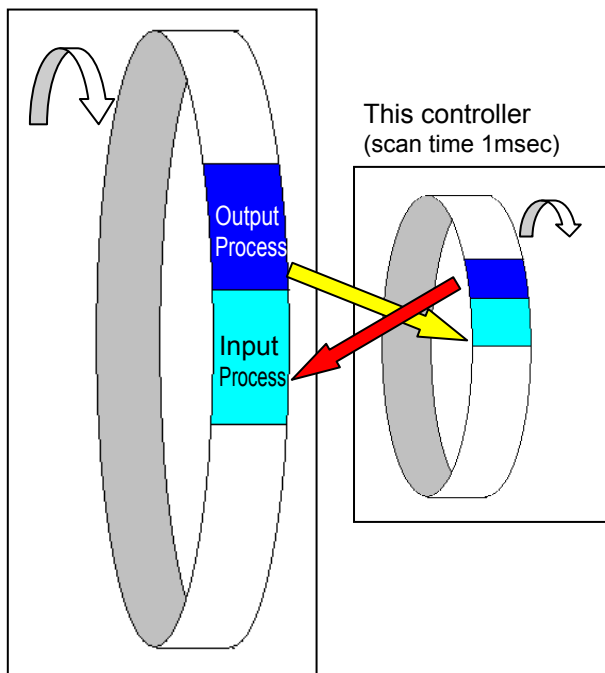
As shown in the diagram, the input and output timings of two devices that have different scan time do not match, of course, when transferring a signal.

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 to succeed 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 while.

Also, if one tries to read the signal that is being re-written by the other, the signal may be read wrongly. 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.

9. 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".

10. Regarding Battery-less Absolute Type Actuator
   1) For the pulse motor type, the setting switched over between the absolute type and incremental type with the parameters.
      • Parameter No.83　Absorber unit
        0 : not used = (Incremental Type),　　1 : Use = (Absolute Type)
   2) For actuator of RCP5 series, for the first time to turn the servo on after turning on the power, it will have slight position adjustment due to the characteristics of the stepping motor.
      The maximum movement amount at position adjustment operation is the distance of 0.025 × lead length [mm].
      Also, the current position displayed on the teaching tool before turning the servo on is the coordinates before adjustment operation.
   3) After the first time the servo is tuned on after the power has been supplied, the home-return complete signal [HEND] and the limit switch output signal (LS) are output.
   4) When the first servo-on is conducted out of the soft limit range, an error would not be output. Soft limit monitoring starts after it is moved into the range.
   5) Make sure to have a home-return operation (absolute reset) after detaching the motor unit from the actuator for motor replacement purpose and so on.

11. Caution when RCP6S Gateway Controller is Connected
When RCM-P6DC or RCM-P6DC which is a controller for RCP6S Gateway is to be connected, the version of the gateway unit and the hub unit needs to be V0004 or later for both units.

12. Motor Features in AUTO Mode
Status (condition) display and servomotor are available in AUTO Mode.

# *RCP6S* *Fieldbus Communication*

## ■International Standards Compliances■

This product comply with the following international standards:
Refer to Overseas Standard Compliance Manual (ME0287) for more detailed information.

| Device | RoHS Directive | CE Marking | cUL |
|---|---|---|---|
| Gateway Unit | ○ | ○ | ○ |
| Hub Unit | ○ | ○ | ○ |
| RCP6S Gateway Controllers | ○ | ○ | ○ |

# $RCP6S$ *Fieldbus Communication*

## ■Name for Each Parts and Their Functions■

1. Controller Unit in RCP6S (Built-in Controller Type)
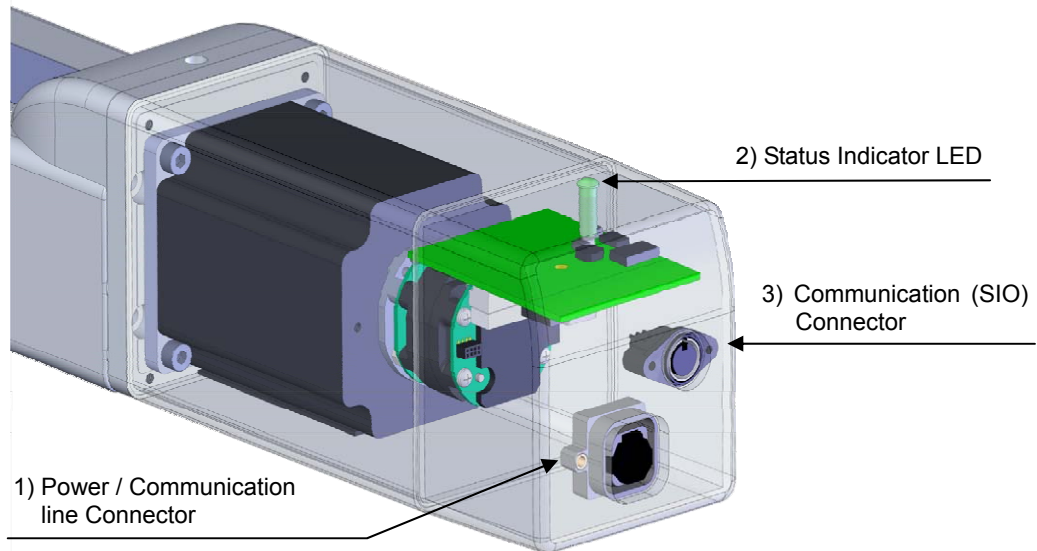


1) Power / Communication line Connector [Refer to Chapter 2]
   It is a connector that the gateway unit, hub unit or PLC unit etc. is to be connected.

2) Status Indicator LED
   Following show the controller operation status:
   ○ : Illuminating   × : OFF   ☆ : Flashing

| LED | Color | Operation Status |
|---|---|---|
| × | - | Operation status |
| | | Servo OFF |
| 🔴 | RD | Alarm (Operation cancellation level or more) |
| | | In the emergency stop |
| ★ | RD | During crash detection |
| 🟢 | GR | Servo ON |
| ☆ | GR | Motor driving power supply OFF (Note 1) |
| 🟠 | OR | In initializing process when the power is turned on |

*Note 1   Signal during automatic servo-off : [Refer to Chapter 6]*

3) Communication (SIO) Connector [Refer to 2.3.5 SIO Connector Connection]
   The SIO connector is used to connect the controller with a teaching tool through a proper communication cable.
*  There is no SIO connector equipped on the dust and drip proof type (RCP6SW).
   A teaching tool should be connected to the gateway unit for operation.

# *RCP6S* *Fieldbus Communication*

2. RCP6S Gateway Unit



8) Fieldbus Connector

7) System I/O Connector

6) Operation Mode Setting Switch

5) SIO Connector

4) USB Connector

3) Drive Cutoff Connector

2) Motor Power Supply Connector

1) Power Supply Connector

9) Status Display LED

LED1: SYS

LED2: AUTO

LED3: EMG

LED4: T. ERR

LED5: C. ERR

LED6: STATUS-0

LED7: STATUS-1

Not to be used

[Bottom Surface]
10) to 17) Axis Control Connector
Axis Power Supply Connector
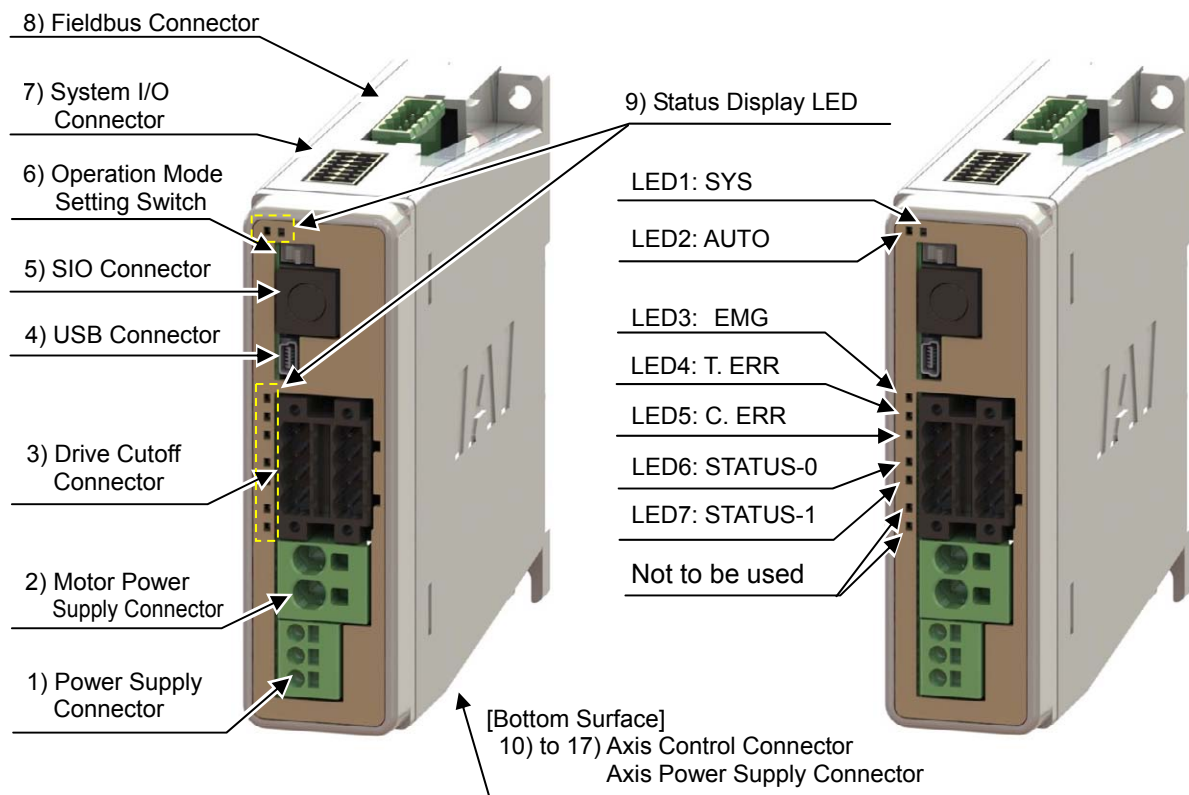
1) Power Supply Connector
It is a connector for the 24V DC gateway control power supply and frame grounding (FG).

2) Motor Power Supply Connector
It is a connector for the 24V DC motor power supply to the gateway.

3) Drive Cutoff Connector
It is a connector to connect the external drive cutoff relay to 24V DC input from the motor power supply connector.

4) USB Connector
It is a connector to connect such as a PC. Mini USB Connector is adopted.

5) SIO Connector
It is a connector to connect such as a teaching pendant or PC.

6) Operation Mode Setting Switch
This is a switch to change the operation mode between Automatic Operation (AUTO) and Manual Operation (MANU).

7) System I/O Connector
It is a connector for the brake release input in case of connecting the actuator directly to the emergency stop input, external AUTO/MANU switchover input or the gateway unit.

8) Fieldbus Connector
It is a connector for the fieldbus.

9) Status Display LED

    It shows the status of gateway unit.

□ : Illuminating

| Symbol | LED | Display Color and Operation Status |
|--------|-----|-----------------------------------|
| LED1 | SYS | **System Status** <br> Ready (🟩Green), Alarm (🟥Red) |
| LED2 | AUTO | **Operation Mode (AUTO/MANU) Status** <br> Automatic Operation (AUTO) Mode (🟩Green) |
| LED3 | EMG | **Emergency Stop (EMG) Status** <br> Emergency Stop (EMG) (🟥Red) |
| LED4 | T. ERR | **Bus Communication Error inside Controller** <br> T. ERR (🟧Orange) |
| LED5 | C. ERR | **Fieldbus Network Communication Error** <br> C. ERR (🟧Orange) |

*(Note) LED6: STATUS-0, LED7: For STATUS-1, because the display differs depending on the type of the fieldbus, refer to 3.9 Fieldbus Status LED.*

10) Axis Control Connector AX0 to 3
12) Axis Control Connector AX4 to 7
14) Axis Control Connector AX8 to 11
16) Axis Control Connector AX12 to 15

    It is a connector to supply power and control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from the gateway to a hub unit or actuator.

11) Axis Power Supply Connector AX0 to 3
13) Axis Power Supply Connector AX4 to 7
15) Axis Power Supply Connector AX8 to 11
17) Axis Power Supply Connector AX12 to 15

    It is a connector to supply 24V DC motor power from the gateway to a hub unit.

  * Refer to Chapter 2 Wiring for details for such as connector codes and pin assignments etc.

[Bottom Surface]

10) Axis Control Connector AX0 to 3
11) Axis Power Supply Connector AX0 to 3
12) Axis Control Conector AX4 to 7
13) Axis Power Supply Connector AX4 to 7

14) Axis Control Connector AX8 to 11
15) Axis Power Supply Connector AX8 to 11
16) Axis Control Connector AX12 to 15
17) Axis Power Supply Connector AX12 to 15

[Top Surface]
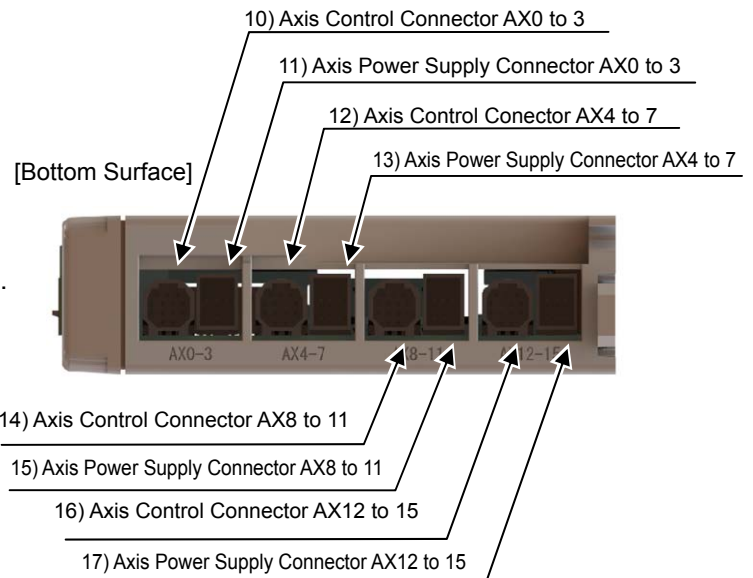
# *RCP6S* *Fieldbus Communication*

3. RCP6S Hub Unit
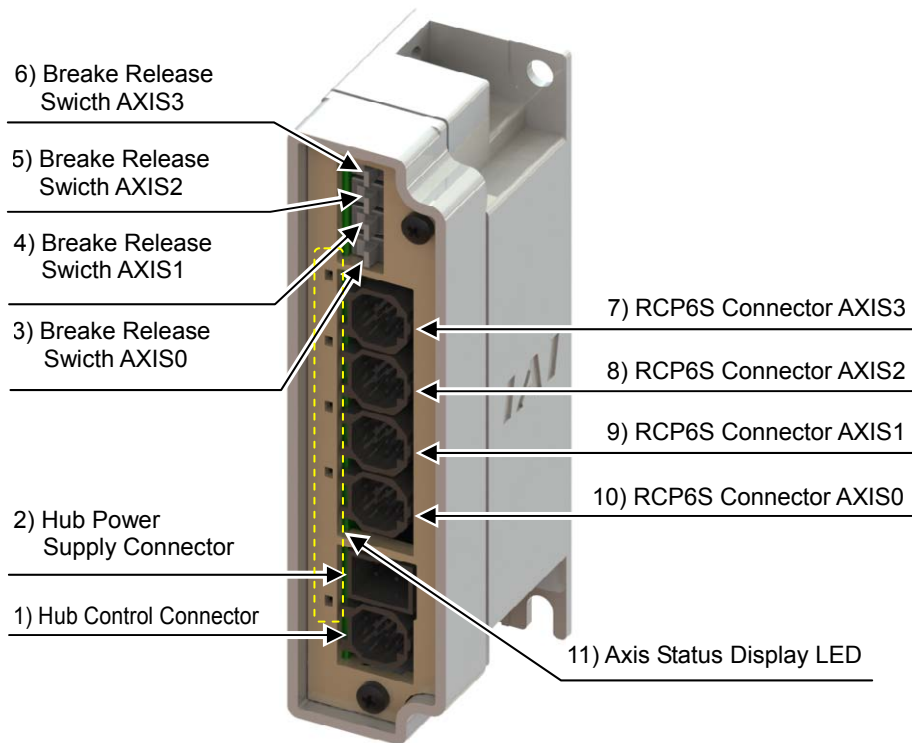
6) Breake Release Swicth AXIS3

5) Breake Release Swicth AXIS2

4) Breake Release Swicth AXIS1

3) Breake Release Swicth AXIS0

2) Hub Power Supply Connector

1) Hub Control Connector

7) RCP6S Connector AXIS3

8) RCP6S Connector AXIS2

9) RCP6S Connector AXIS1

10) RCP6S Connector AXIS0

11) Axis Status Display LED

1) Hub Control Connector
It is a connector to supply power and control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from the gateway to a hub.

2) Hub Power Supply Connector
It is a connector to supply 24V DC motor power from the gateway to a hub unit.

3) Breake Release Switch AXIS0
4) Breake Release Switch AXIS1
5) Breake Release Switch AXIS2
6) Breake Release Switch AXIS3
It is a switch to breake release swich. Four switches are equipped for AXIS 0 to 4.

7) RCP6S Connector AXIS3
8) RCP6S Connector AXIS2
9) RCP6S Connector AXIS1
10) RCP6S Connector AXIS0
It is a connector to supply the power and the control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from a hub to connected axes.

* Refer to Chapter 2 Wiring for details for such as connector codes and pin assignments etc.

11) Axis Status Display LED
It shows the status of hub unit and connected actuator.

□ : Illuminating   × : OFF   ☆ : Flashing

| Symbol | LED | Display Color and Operation Status |
|---|---|---|
| LED1 | AX3 STS | **Axis No.0 to 3 Status** |
| LED2 | AX2 STS | Servo OFF (× OFF) |
| LED3 | AX1 STS | Servo ON ( ■Green Illuminating) |
| LED4 | AX0 STS | Automatic Servo OFF ( ★Green Flashing) [Note 1] |
| | | Alarm, Emergency Stop ( ■Red Illuminating) |
| | | Communication Error ( ★Red Flashing) [Note 2] |
| LED5 | SYS | **Hub Unit System Status** |
| | | Ready ( ■Green Illuminating) |
| | | Standby for communication establishment ( ★Green Flashing) [Note 2] |
| | | Control/ Motor power voltage drop |
| | | Alarm, Emergency Stop ( ■Red Illuminating) |

Note 1   The lamp turns on and off in every 1sec.
Note 2   The lamp turns on and off in every 0.25sec.



LED1: AX3 STS

LED2: AX2 STS

LED3: AX1 STS

LED4: AX0 STS

LED5: SYS

16
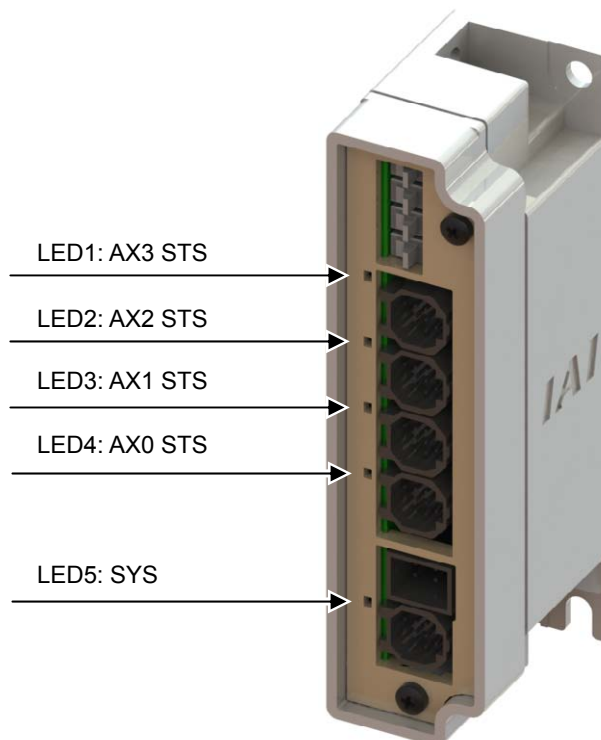
## 4. RCP6S Gateway Controllers

| Model | Type | Panel Color | Applicable Actuator |
|---|---|---|---|
| RCM-P6PC | Pulse Motor Type | 🟩 | RCP2 to 6 |
| RCM-P6AC | Servo Motor Type | 🟦 | RCA and RCA2 |
| RCM-P6DC | Brushless DC Electric Motor | 🟥 | RCD |

4) Status Display LED

3) SIO Connector

2) Axis Control Connector

1) Power Connector

RCM-P6PC   RCM-P6AC   RCM-P6DC
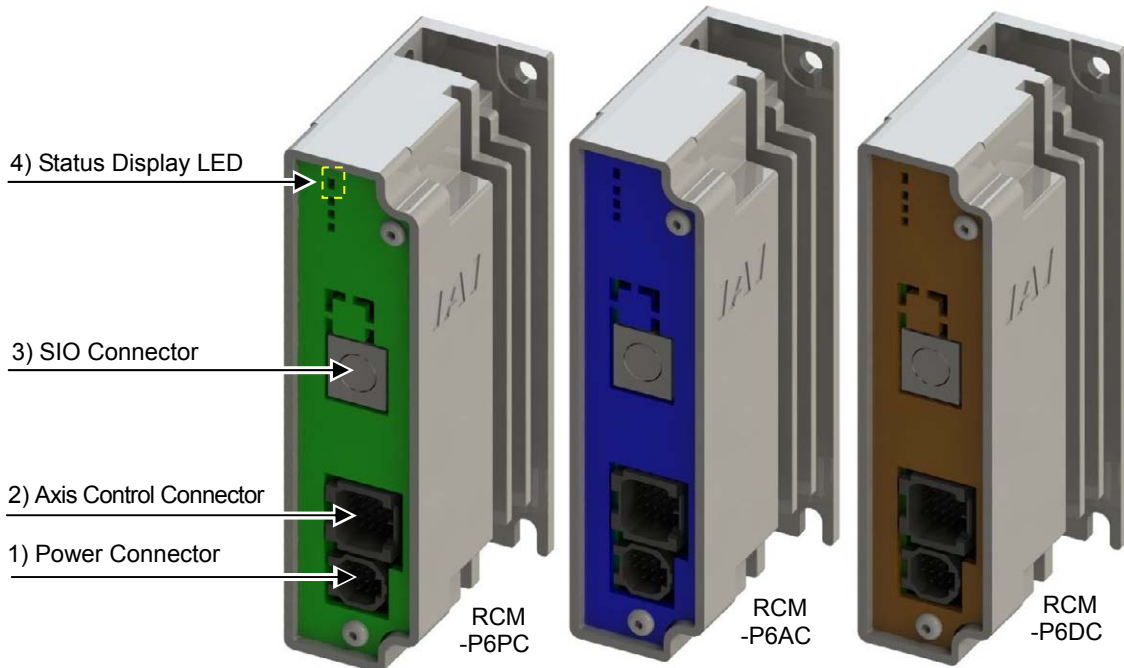
1) Power Connector
It is a connector to supply power and send control signals (control power 24V DC, motor power 24DC, communication line, brake release signal and emergency stop status) from the hub unit or gateway unit to controllers for RCP6S Gateway.

2) Axis Control Connector
It is a connector to supply power and send control signals (control power 24V DC, motor power 24DC, communication line, brake release signal and emergency stop status) from a controller for RCP6S Gateway to actuators.

3) SIO Connector
It is a connector to connect such as a teaching pendant or PC.

*   Refer to Chapter 2 Wiring for details for such as connector codes and pin assignments etc.

4) Status Display LED
It shows the status of the RCP6S Gateway controllers.

☐: Illuminating   ×: OFF

| Symbol | LED | Display Color and Operation Status |
|---|---|---|
| LED1 | SV/ALM | <u>Servo ON/Alarm</u><br>Servo OFF ( × OFF)<br>Servo ON ( 🟩 Green Illuminating)<br>Alarm, Emergency Stop ( 🟥 Red Illuminating) |

# ■Actuator Axes■

Refer to the pictures below for the actuator axes that can be controlled.
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/Wide Rod/Radial Cylinder Type
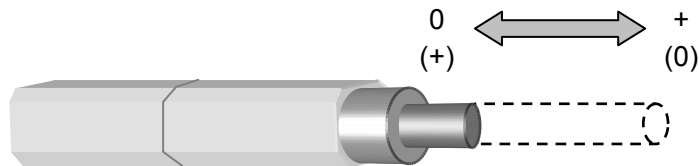
(2) Slider Type/Wide Slider Type
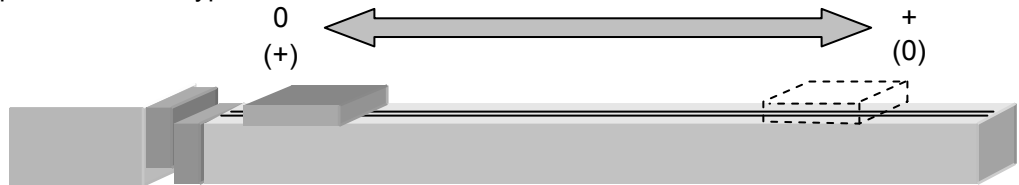
(3) Table Type
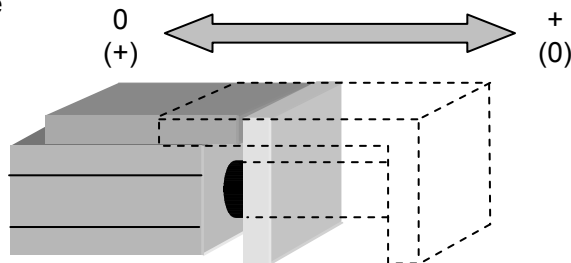
(4) Arm Type
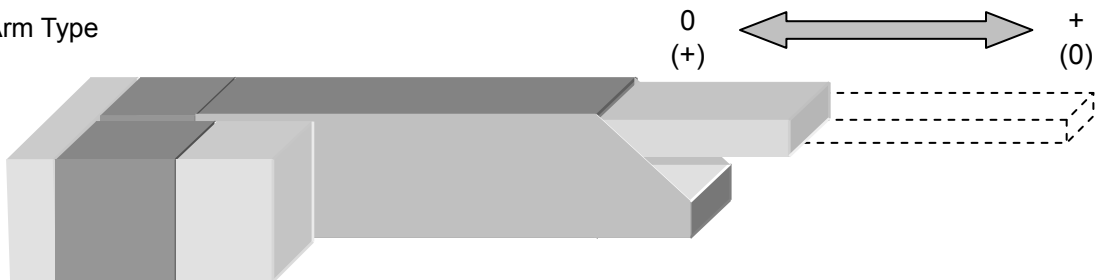
(5) Gripper Type
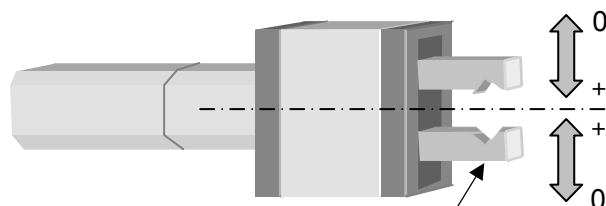
Finger Attachment
(Please prepare separately)

(6) Rotary type
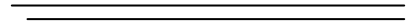


(330 ° Rotation Specification)　　　　　(Multi-rotation Specification)
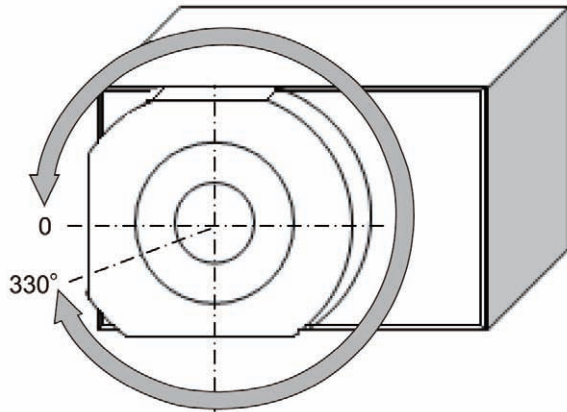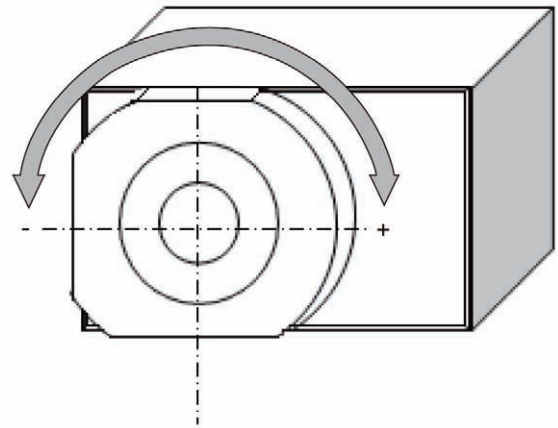
The directions of positive and negative will be opposite for the home-reversed type in the multi-rotation type.

# *RCP6S* *Fieldbus Communication*

## 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 and Picture | Number | Remarks |
|---|---|---|---|---|
| 1 | Actuator Main Body | Refer to each instruction manual of an actuator. | - | |
| 2 | Gateway Unit | Refer to "1.1.4 How to read the model plate", "1.1.5 How to read the model". | 1 | RCM-P6GW(G) |
| Accessories | | | | |
| 3 | Drive Cutoff Connector (1) | FKCN2.5/4-STF-5.0 (Ax0-7) (Supplier : PHOENIX CONTACT) | 1 | Recommended cable size 1.25 to 0.5mm$^2$ (AWG16 to 20) |
| 4 | Drive Cutoff Connector (2) | FKCN2.5/4-STF-5.0 (Ax8-15) (Supplier : PHOENIX CONTACT) | 1 | Recommended cable size 1.25 to 0.5mm$^2$ (AWG16 to 20) |
| 5 | System I/O Connector | DFMC1.5/7-ST-3.5 (Supplier : PHOENIX CONTACT) | 1 | Recommended cable size • Brake Release Input 1.25 to 0.5mm$^2$ (AWG16 to 20) • Other than above 1.25 to 0.3mm$^2$ (AWG16 to 22) |
| 6 | Dummy Plug (For Safety Category Complied Type RCM-P6GWG) | DP-5 | 1 | |

1. Specifications Check

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| No. | Part Name | Model and Picture | Number | Remarks |
|---|---|---|---|---|
| 7 | DeviceNet Connector (For DeviceNet Type) | MSTB2.5/5-STF-5.08 AU M (Supplier : PHOENIX CONTACT) | 1 | Prepare a terminal resistance separately if this controller is to be allocated at the terminal. |
| 8 | CC-Link Connector (For CC-Link Type) | MSTB2.5/5-STF-5.08 AU (Supplier : PHOENIX CONTACT) | 1 | Terminal Resistance (130Ω1/2W, 110Ω1/2W) enclosed one unit each |
| 9 | Safety Guide | 安全ガイド 第5版 Safety Guide Fifth Edition | 1 | The picture shows an image. |
| 10 | First Step Guide | RCP6S ゲートウェイユニット ファーストステップガイド 第5版 | 1 | The picture shows an image. |
| 11 | Instruction Manual (DVD) | 取扱説明書 INSTRUCTION MANUAL No.CDM20081001 | 1 | The picture shows an image. |

## Option

Prepare the following options if necessary.

| No. | Part Name | Model and Picture | Number | Remarks |
|---|---|---|---|---|
| 1 | Hub Unit | Refer to "1.1.4 How to read the model plate", "1.1.5 How to read the model". | - | RCM-P6HUB |
| 2 | RCP6S Gateway Controllers | Refer to "1.1.4 How to read the model plate", "1.1.5 How to read the model". | - | RCM-P6PC RCM-P6AC RCM-P6DC |
| 3 | Connector Conversion Unit | | - | RCM-CV-APCS |

## 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 | Teaching Pendant (Touch Panel Teaching) | TB-02 |
| 4 | Teaching Pendant (Touch Panel Teaching with deadman switch) | TB-02D |
| 5 | Teaching Pendant (Touch Panel Teaching) | TB-01 |
| 6 | Teaching Pendant (Touch Panel Teaching with deadman switch) | TB-01D |
| 7 | Teaching Pendant (Dead man's switch right mounted touch panel teaching) | TB-01DR |
| 8 | Teaching Pendant (Touch Panel Teaching) | CON-PTA |
| 9 | Teaching Pendant (Touch Panel Teaching with deadman switch) | CON-PDA |
| 10 | Teaching Pendant (Touch Panel Teaching with deadman switch + TP Adapter (RCB-LB-TG)) | CON-PGA(S) |

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

| No. | Part Name | Model |
|-----|-----------|-------|
| 1 | Instruction Manual for the RCP6S Fieldbus Communication (This manual) | ME0349 |
| 2 | Instruction Manual for the Serial Communication [for Modbus] | ME0162 |
| 3 | Instruction Manual for the RCP6(S)(CR) Slider Type | ME3749 |
| 4 | Instruction Manual for the RCP6(S)(CR) Wide Slider Type | ME3750 |
| 5 | Instruction Manual for the RCP6(S) Rod Type | ME3751 |
| 6 | Instruction Manual for the RCP6(S) Wide Rod Type | ME3752 |
| 7 | Instruction Manual for the RCP6(S) Radial Cylinder Type | ME3753 |
| 8 | Instruction Manual for the RCP6(S) Table Type | ME3754 |
| 9 | Instruction Manual for the RCP6(S)W Rod Dust proof/Splush proof Type | ME3759 |
| 10 | Instruction Manual for the RCP6(S)W Wide Rod Dust proof/Splush proof Type | ME3760 |
| 11 | Instruction Manual for the RCP6(S)W Radial Cylinder Dust proof/Splush proof Type | ME3761 |
| 12 | PC Software   RCM-101-MW/RCM-101-USB Instruction Manual | ME0155 |
| 13 | Touch Panel Teaching TB-02/TB-02D Applicable for Position Controller Instruction Manual | ME0355 |
| 14 | Touch Panel Teaching TB-01/TB-01D/TB-01DR Applicable for Position Controller Instruction Manual | ME0324 |
| 15 | Touch Panel Teaching CON-PTA/PDA/PGA (S) Instruction Manual | ME0295 |

## 1.1.4  How to Read the Model Nameplate

* Refer to the each instruction manual of the label of RCP6S built-in controller gateway unit.

[1] Gateway Unit

Model code → Model    RCM-P6GW-CC
Serial number → SER NO.   12345678  00
Input       DC24V , 44.6A
Output      DC24V , 44A        **MADE IN JAPAN**

⚠ CAUTION: Connect the wiring correctly and properly, use IAI specified cables or min 60℃ Cu wire.

[2] Hub Unit

**IAI Corporation**

Model code → Model      RCM-P6HUB-DN

Serial number → SER NO.  12345678  00
Input     DC24V, max 11A
Output    DC24V, max 10.7A

⚠ CAUTION  Connect the wiring correctly and properly, use IAI specified cables or min 60℃ Cu wire.
**MADE IN JAPAN**

[3] RCP6S Gateway Controllers

Attached on Side

Attached on Panel

Model code → SN: 10027501
Serial number → RCM-P6AC-301-SE-0-0-DN

RCP6 SA4C
L=16, ST=500

Model Code of
Actuator to be Connected

**IAI Corporation**

c ⓊⓁ us C E

Model    RCM-P6AC-30I-SE-0-0-DN → Model code
SER NO.   X000000 X0 → Serial number
Input     DC24V, 2.67A
Output    0-24Vac, 3ph,
0-333Hz, 1.6A

⚠ Connect the wiring correctly and properly, use IAI specified cables or min 60℃ Cu wire.
QR   **MADE IN JAPAN**

# RCP6S *Fieldbus Communication*

## 1.1.5  How to Read the Model

* Refer to the each instruction manual of the label of RCP6S built-in controller gateway unit.

[1] Gateway Unit

RCM − P6GW − CC

P6GW   : Standard Type
P6GWG : Safety Categories Complied

CC   : CC-Link Connection Type
DV   : DeviceNet Connection Type
PR   : PROFIBUS-DP Connection Type
EP   : EtherNet/IP Connection Type
EC   : EtherCAT Connection Type
PRT : PROFINET-IO Connection Type

[2] Hub Unit

RCM − P6HUB − DN

P6HUB : Standard Type

(Not Specified) : Fixed Screws Type
DN                   : Attachment DIN Rail Type

[3] RCP6S Gateway Controllers

RCM − P6□C − 30 WAI HA − SE − 0 − 0 − DN

<Type>
P6PC: Pulse Motor Type
P6AC: Servo Motor Type
P6DC: Brushless DC Electric
         Motor Type

<Motor type>
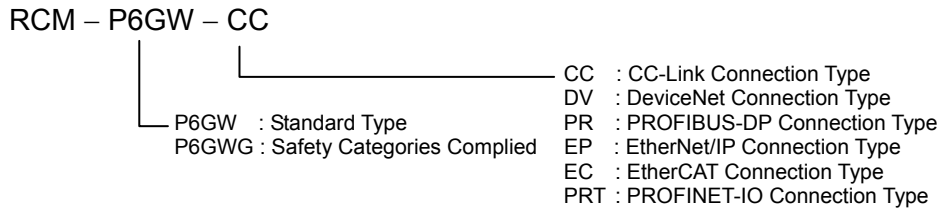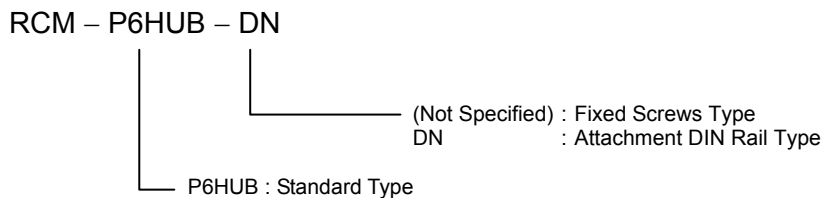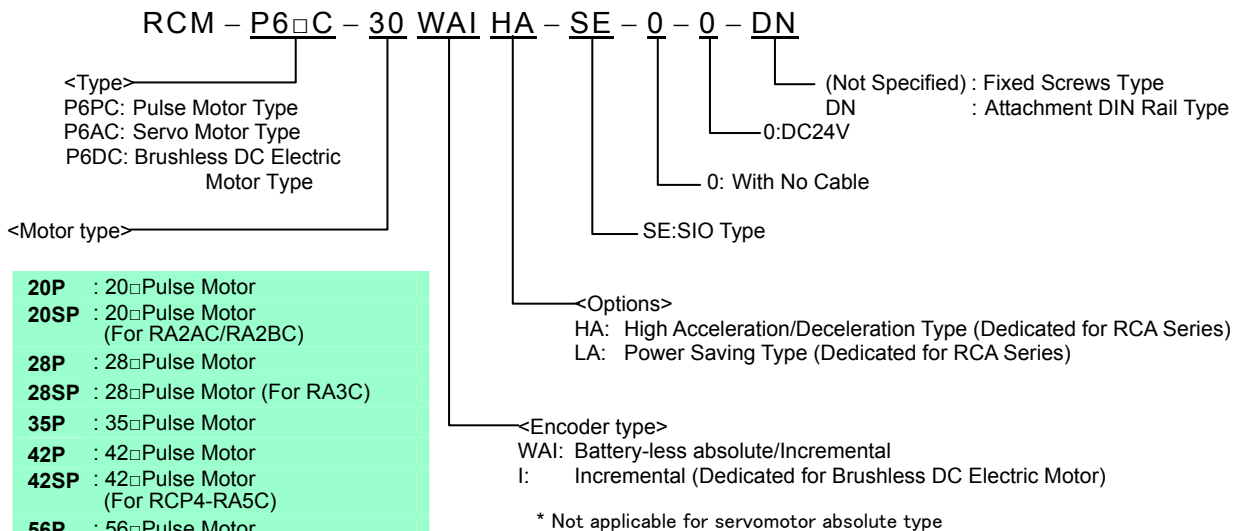
| | |
|---|---|
| **20P** | : 20□Pulse Motor |
| **20SP** | : 20□Pulse Motor (For RA2AC/RA2BC) |
| **28P** | : 28□Pulse Motor |
| **28SP** | : 28□Pulse Motor (For RA3C) |
| **35P** | : 35□Pulse Motor |
| **42P** | : 42□Pulse Motor |
| **42SP** | : 42□Pulse Motor (For RCP4-RA5C) |
| **56P** | : 56□Pulse Motor |
| **2** | : 2W Servo Motor |
| **5** | : 5W Servo Motor |
| **5S** | : 5W Servo Motor (For SA2A/RA2A) |
| **10** | : 10W Servo Motor |
| **20** | : 20W Servo Motor |
| **20S** | : 20W Servo Motor (For RCA2-SA4/RCA-RA3) |
| **30** | : 30W  Servo Motor |
| **3D** | : 3W Brushless DC Electric Motor |

<Encoder type>
WAI: Battery-less absolute/Incremental
I:     Incremental (Dedicated for Brushless DC Electric Motor)

  * Not applicable for servomotor absolute type

<Options>
HA:  High Acceleration/Deceleration Type (Dedicated for RCA Series)
LA:  Power Saving Type (Dedicated for RCA Series)

SE:SIO Type

0: With No Cable

0:DC24V

(Not Specified) : Fixed Screws Type
DN                   : Attachment DIN Rail Type

# *RCP6S* *Fieldbus Communication*

## 1.2   List of Basic Specifications

### 1.2.1   Specification of Built-in Controller

| Specification Item | | | Details of Specifications | |
|---|---|---|---|---|
| Number of Controlled Axes | | | 1-axis | |
| Power-supply Voltage | | | 24V DC±10% | |
| Control Power Capacity | | | 0.3A (Built-in Controller only) | |
| Load Current (Including current consumption for control) | Motor Type | 28P, 35P, 42P, 56P | High-thrust function is disabled | 1.7A max. |
| | | | High-thrust function is enabled | Rated at 3.2A, 4.2A max. |
| | | 56SP, 60P | | 5.7A max. |
| Power Supply for Electromagnetic Brake (for actuator equipped with brake) | | | 24V DC±10%   0.15A *(Note) 0.7A is required for 0.2sec at brake release.* | |
| Heat Generation | | | 5W (Motor type 28P, 35P, 42P, 56P) 19.2W (Motor type 56SP, 60P) | |
| Rush Current [Note 1] | | | 8.3A with in-rush current protection circuit (Motor type 28P, 35P, 42P, 56P) 10A with in-rush current protection circuit (Motor type 56SP, 60P) | |
| Motor Control System | | | Weak field-magnet vector control | |
| Corresponding Encoder | | | Battery-less absolute encoder   Resolution 8192pulse/rev | |
| Cable Length | | | Between gateway unit and hub: 10m max. Between gateway unit and RCP6S actuator: 20m max. | |
| Serial Communication Interface (SIO Port) | | | RS485: 2CH (based on Modbus protocol RTU/ASCII) Only 1CH is in conformity with ASCII   Speed: 9.6 to 230.4Kbps | |
| External Interface | | | Fieldbus connection *(Note) Connection of gateway unit is necessary separately.* DeviceNet, CC-Link, PROFIBUS-DP, EtherCAT, EtherNet/IP, PROFINET-IO | |
| Data Setting and Input | | | PC software, Touch panel teaching | |
| Data Retention Memory | | | Saves position data and parameters to non-volatile memory (There is no limitation in number of writing.) | |
| LED Display | | | SV (GR) / ALM (RD): Servo ON / Alarm generated and emergency stop | |
| Insulation Resistance | | | 500V DC 10MΩ or more | |
| Protection Function against Electric Shock | | | Class I basic insulation | |
| Cooling Method | | | Natural air-cooling | |

*Note 1   In-rush current will flow for approximately 1 to 5msec after the power is turned on (at 40℃).*
*The value of inrush current differs depending on the impedance of the power supply line.*

## 1.2.2　Specification of Gateway Unit

| Specification Item | Details of Specifications |
|---|---|
| Number of Controlled Axes | 16-axes max. (Four axes for gateway unit itself) [(Note 1)] |
| Power-supply Voltage | 24V DC ±10% |
| Control Power Capacity | 0.6A (Gateway unit itself 0.3A+Fieldbus module 0.3A) |
| Motor Power Capacity | Current consumption 51.6A |
| Cooling Method | Natural air-cooling |
| Emergency-stop Input | B contact input |
| Enable Input | None |
| T.P. Enable Input | Equipped |
| Enable Operation | Servo OFF or shutdown (Select the parameter) |
| Backup Memory | FRAM (256kbit), No limitation in number of writing |
| Calendar Function | Equipped (Data retained for ten days after power cutoff) |
| Gateway Board LED Display | SYS LED×1 (RUN/ALM), EMG LED×1, MODE LED×1 (AUTO/MANU), T.ERR LED×1, C.ERR LED×1 <br> Status LED lamp for each fieldbus module LED×2 |
| Tool Connection | T/P connector　: RS485 1ch (based on Modbus protocol) <br> USB connector : USB　1ch |
| Electromagnetic Brake Compulsory Release Feature | System I/O connector: External brake release signal input (24V DC) <br> * Used only when RCP6S connected directly to gateway unit. Invalid when hub connected. |
| Protection Function against Electric Shock | Class I basic insulation |
| Insulation Strength | 500V DC 10MΩ |
| Mass | 250g |
| External Dimensions | 35W×115H×123D |

Note 1　For those except for CC-Link which are used in the direct indication mode, the maximum number of the axes should be eight (and two axes with the gateway unit itself).

## 1.2.3　Specification of Hub Unit

| Specification Item | Details of Specifications |
|---|---|
| Number of Controlled Axes | 4-axes max. |
| Power-supply Voltage | 24V DC ±10% |
| Control Power Capacity | 0.3A (Hub unit itself) |
| Motor Power Capacity | Total connected axes 12.8A max. |
| Cooling Method | Natural air-cooling |
| Emergency-stop Input | None |
| Enable Input | None |
| T.P. Enable Input | None |
| Enable Operation | None |
| Backup Memory | None |
| Calendar Function | None |
| LED Display | System status LED×1 (RUN/ALM), Axis status LED×4 (RUN/ALM) |
| Tool Connection | None |
| Electromagnetic Brake Compulsory Release Feature | Brake release switch×4 |
| Protection Function against Electric Shock | Class I basic insulation |
| Insulation Strength | 500V DC 10MΩ |
| Mass | 80g (95g) Mass described in brackets is for DIN rail type |
| External Dimensions | 30W×115H×45D (53.5D) Dimension described in brackets is for DIN rail type |

# RCP6S *Fieldbus Communication*

## 1.2.4　Specification of RCP6S Gateway Controllers

### [1] Pulse Motor Type RCM-P6PC

| Specification Item | | | Details of Specifications | |
|---|---|---|---|---|
| Number of Controlled Axes | | | 1-axis | |
| Controller Power-supply | | | DC24V ± 10% | |
| Applicable Motor Rated Current | | | Rated at 1.2A, Rated at 0.4A | |
| Control Power Capacity | | | 0.3A (It is necessary to have 0.7A for 0.2s at brake release when RCP6 actuator is equipped with a brake.) | |
| Motor Power Capacity | Motor Type | 20P, 20SP, 28P | Not applicable for high-output setting | 1.0A max. |
| | | 28SP, 35P, 42P, 42SP, 56P | High-thrust function is disabled | 1.7A max. |
| | | | High-thrust function is enabled | Rated at 3.2A, 4.2A max. |
| Controller Heat Generation | | | 5W (8W when PC in use) | |
| Controller Power-supply Rush Current | | | 8.3A (with in-rush current control circuit) | |
| Cooling Method | | | Natural air-cooling | |
| Drive Cutoff System | | | Drive cutoff by semiconductor | |
| Emergency-stop Input | | | B contact input | |
| Emergency Stop Operation | | | Servo OFF + Drive Cutoff | |
| Enable Input | | | None | |
| T.P. Enable Input | | | Equipped | |
| Enable Operation | | | Servo OFF | |
| Motor Control System | | | Field Weakening Vector Control | |
| Motor Noise Reduction | | | Equipped | |
| Tuning | | | Smart Tuning | |
| PowerCON | | | Equipped | |
| Encoder | | | Incremental/Battery-less absolute encoder: Resolution 800 pulse/rev High-resolution battery-less absolute encoder: Resolution 8192 pulse/rev (13bit) | |
| Appliance to Absolute | | | Battery-less absolute, Applicable for high-resolution battery-less absolute | |
| Backup Memory | | | FRAM (256kbit) No limit in number of overwriting | |
| Calendar Function | | | None (Available when gateway unit is connected) | |
| LED Display | | | SV/ALM LED × 1 | |
| Serial communication | | | RS485 2ch (Based on Modbus protocol) | |
| Electromagnetic Brake Compulsory Release Feature | | | Brake release input (inside I/F connector) | |
| Protection Function against Electric Shock | | | Class I basic insulation | |
| Insulation Strength | | | DC500V 10MΩ | |
| Mass | | | 200g (215g)　Mass described in brackets is for DIN rail type | |
| External Dimensions | | | 30W × 115H × 58D (66.5D)　Dimension described in brackets is for DIN rail type | |

## [2] Servo Motor Type RCM-P6AC

| Specification Item | | | Details of Specifications |
|---|---|---|---|
| Number of Controlled Axes | | | 1-axis |
| Controller Power-supply | | | DC24V ± 10% |
| Control Power Capacity | | | 0.3A |
| Motor Power Capacity | RCL | 2W | Rated at 0.8A, 4.6A max. |
| | | 5W | Rated at 1.0A, 6.4A max. |
| | | 10W | Rated at 1.3A, 6.4A max. |
| | RCA RCA2 | 10W | Rated at 1.3A, 2.5A max. for power saving, 4.4A max. |
| | | 20W | Rated at 1.3A, 2.5A max. for power saving, 4.4A max. |
| | | 20W (20S) | Rated at 1.7A, 3.4A max. for power saving, 5.1A max. |
| | | 30W | Rated at 1.3A, 2.2A max. for power saving, 4.0A max. |
| Controller Heat Generation | | | 8.4W |
| Controller Power-supply Rush Current | | | 10A（with in-rush current control circuit） |
| Cooling Method | | | Natural air-cooling |
| Drive Cutoff System | | | Drive cutoff by semiconductor |
| Emergency-stop Input | | | B contact input |
| Emergency Stop Operation | | | Servo OFF + Drive Cutoff |
| Enable Input | | | None |
| T.P. Enable Input | | | Equipped |
| Enable Operation | | | Servo OFF |
| Motor Control System | | | Sine Wave (AC) Drive |
| Additional Functions | | | Anti-Vibration Control |
| Tuning | | | Off-board Tuning, Smart Tuning |
| Encoder | Equipped with Battery-less Absolute Encoder | | 16384 pulse/rev |
| | RCA | Incremental | 800 pulse/rev |
| | RCA2 | RCA2-***N | 1048 pulse/rev |
| | | Other than RCA2-***N | 800 pulse/rev |
| | RCL | RA1L, SA1L, SA4L, SM4L | 715 pulse/rev |
| | | RA2L, SA2L, SA5L, SM5L | 855 pulse/rev |
| | | RA3L, SA3L, SA6L, SM6L | 1145 pulse/rev |
| Appliance to Absolute | | | Battery-less absolute, Applicable for high-resolution battery-less absolute |
| Backup Memory | | | FRAM (256kbit) No limit in number of overwriting |
| Calendar Function | | | None (Available when gateway unit is connected) |
| LED Display | | | SV/ALM LED × 1 |
| Serial communication | | | RS485 2ch (based on Modbus protocol) |
| Electromagnetic Brake Compulsory Release Feature | | | Brake release input (inside I/F connector) |
| Protection Function against Electric Shock | | | Class I basic insulation |
| Insulation Strength | | | DC500V 10MΩ |
| Mass | | | 200g (215g)   Mass described in brackets is for DIN rail type |
| External Dimensions | | | 30W × 115H × 58D (66.5D)   Dimension described in brackets is for DIN rail type |

## [3] Brushless DC Electric Motor RCM-P6DC

| Specification Item | Details of Specifications |
|---|---|
| Number of Controlled Axes | 1-axis |
| Controller Power-supply | DC24V ± 10% |
| Control Power Capacity | 0.3A |
| Motor Power Capacity | Rated at 0.7A, 1.5A max. |
| Controller Heat Generation | 4W |
| Controller Power-supply Rush Current | 10A（with in-rush current control circuit） |
| Cooling Method | Natural air-cooling |
| Drive Cutoff System | Drive cutoff by semiconductor |
| Emergency-stop Input | B contact input |
| Emergency Stop Operation | Servo OFF + Drive Cutoff |
| Enable Input | None |
| T.P. Enable Input | Equipped |
| Enable Operation | Servo OFF |
| Motor Control System | Rectangular Wave (DC) Drive |
| Encoder | Incremental Encoder AB Phase Differential Output: Resolution 400 pulse / rev |
| Appliance to Absolute | None |
| Backup Memory | FRAM (256kbit) No limit in number of overwriting |
| Calendar Function | None (Available when gateway unit is connected) |
| LED Display | SV/ALM LED × 1 |
| Serial communication | RS485 2ch (based on Modbus protocol) |
| Electromagnetic Brake Compulsory Release Feature | Brake release input (inside I/F connector) |
| Protection Function against Electric Shock | Class I basic insulation |
| Insulation Strength | DC500V 10MΩ |
| Mass | 200g (215g)   Mass described in brackets is for DIN rail type |
| External Dimensions | 30W × 115H × 58D ( 66.5D)   Dimension described in brackets is for DIN rail type |

## 1.2.5   Specification of Environment (Built-in Controller/Gateway Unit/Hub Unit/ RCP6S Gateway Controller in Common)

| | Specification Item | Details of Specifications |
|---|---|---|
| Environment | Surrounding Air Temperature | 0 to 40°C |
| | Surrounding Humidity | 85%RH or less (non-condensing) |
| | Surrounding Environment | Refer to 1.6 [1] Installation Environment |
| | Surrounding Storage Temperature | -20 to 70°C |
| | Usage Altitude | 85%RH or less (non-condensing) |
| | Protection Class | 1,000m or lower above sea level |
| | Vibration Durability | Frequency 10 to 57Hz / Swing width: 0.075mm<br>Frequency 57 to 150Hz / Acceleration: 9.8m/s$^2$<br>XYZ Each direction   Sweep time: 10 min.   Number of sweep: 10 times |
| | Shock Resistance | Dropping height 800mm   1 corner, 3 edges and 6 surfaces |
| | Pollution Degree | Pollution degree 2 |
| | Protection Class | IP20 |

  
## 1.3    The Calculation of Number of Connectable Axes and Power Capacity

To calculate the number of axes connectable to one unit of the gateway unit and the current amperage of 24V DC, figure out (1) to (4) below and follow (5).

(1) The Calculation of Number of Connectable Axes, and Motor Current Consumption
  Condition 1: Sum total of motor current consumption connectable to one unit of hub unit: 12.8A
  Condition 2: Number of controlled axes connectable to corresponding 1 unit: 4-axes or less
   * By adjusting the number of connected axes or motor type, select the connected axes so each hub unit satisfies the formulas below.
● Sum total of motor current consumption for hub unit= Motor current consumption of 1st axis
                + Motor current consumption of 2nd axes (if connected)
                + Motor current consumption of 3rd axes (if connected)
                + Motor current consumption of 4th axes (if connected) ≤ 12.8A ··········1)
● Sum total of motor current consumption = Motor current consumption of hub unit 1st unit
                + Motor current consumption of hub unit 2nd units (if connected)
                + Motor current consumption of hub unit 3rd units (if connected)
                + Motor current consumption of hub unit 4th units (if connected) ··········2)

(2) Control Power Current Consumption:
  0.3A × Number of actuator + 0.6A (GW) + 0.3A × Number of hub unit  ·····································3)

(3) Rush Current: 8.3A (RCP6S Motor type 28P, 35P, 42P, 56P and RCM-P6PC)
           10A (RCP6S Motor type 56SP, 60P, RCM-P6AC and RCM-P6DC)  ···················4)

(4) (For RCP6S only) Current Consumption of Brake Release Power:
                    Number of actuators with brake × 0.7A  ······················5)
   * When servo is on, it should be 0.5sec or less, after that retaining of released status should be 0.1A / axis.
    When using the control power source and the motor power source in common, calculate with the number of brake-equipped actuators × 0.1A.

(5) Selection of Power Supply:
   Usually, the rated current is to be approximately 1.2 times higher than the total of Control Power 2) + 3) + 5) above considering approximately 30% of margin to the load current.
   However, considering the inrush currents of 4), even though it is a short time, select a power supply with "sufficient peak load capacity.
   Avoid current of 4) from occurring at the same time by having the timing of emergency stop release (turning the motor power on) and timing to turn the servo on shifted [Note 1] from each other and so on. Huge current flow of the same time may cause a transient voltage drop.
   Be careful especially when selecting a power source equipped with remote sensing.

   *Note 1   The timing to turn the servo on can be tuned in Parameter No. 165 [Latency after Shutdown Release].*

   *(Note)   Ensure motor and control power supplies reference the same potential when using multiple power supplies.*

   (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

# *RCP6S* *Fieldbus Communication*

## 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 1] | 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 2] | MSTB2.5/5-GF-5.08 AU (Manufactured by PHOENIX CONTACT or equivalent) | | | |
| Consumption Current of Communication Power Supply | 60mA | | | |
| Communication Power Supply | 24V DC (Supplied from DeviceNet) | | | |

Note 1  For T branch communication, refer to the Instruction Manuals for the master unit and programmable logic controller (PLC) to be mounted.

Note 2  The cable-side connector is a standard accessory. [Refer to 1.1.1 Parts]

### 1.4.2 Specifications of CC-Link Interface

| Item | Specification | | | | |
|------|------|------|------|------|------|
| Communication Protocol | CC-Link ver1.10 or ver2.00 | | | | |
| Station Type | Remote device station (MAX. four stations occupied) | | | | |
| Baud Rate | 10M/5M/2.5M/625k/156kbps | | | | |
| Communication System | Broadcast polling system | | | | |
| Number of Occupied Stations | Refer to 3.4.1 PLC Address Construction by each Operation Mode | | | | |
| Communication Cable Length [Note 1] | 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 2] | MSTB2.5/5-GF-5.08 AU (Manufactured by PHOENIX CONTACT or equivalent) | | | | |

Note 1  For T branch communication, refer to the Instruction Manuals for the master unit and PLC to be mounted.

Note 2  The cable-side connector is a standard accessory. [Refer to 1.1.1 Parts]

## 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 | 3,000/6,000/12,000kbps | Type A cable |
| | 200m | 1,500kbps | |
| | 400m | 500kbps | |
| | 1000m | 187.5kbps | |
| | 1200m | 9.6/19.2/93.75kbps | |
| Communications Cable | Equipped with shield twist pair 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 EtherNet/IP Interface

| Item | Specification |
|---|---|
| Communication Protocol | IEC61158 (IEEE802.3) |
| Baud Rate | 10BASE-T/100BASE-T (Autonegotiation setting is recommended) |
| Number of Occupied Bytes | 3.4.1 PLC Address Construction by each Operation Mode |
| Communication Cable Length | Follows EtherNet/IP specifications<br>(Distance between hub and each node: 100m max.) |
| Number of Connection | Follows master unit |
| Available Node Addresses for Setting | 0.0.0.0 to 255.255.255.255 |
| Communications Cable (Note 1) | Category 5 or more<br>(Double shielded cable braided with aluminum foil recommended) |
| Connector | RJ45 connector × 1pc |

*Note 1    Prepare separately for the communication cable.*

## 1.4.5    Specifications of EtherCAT Interface

| Item | Specification |
|---|---|
| Communication Protocol | IEC61158 type 12 |
| Physical Layer | 100Base-TX (IEEE802.3) |
| Baud Rate | Automatically follows the master |
| Number of Occupied Bytes | 3.4.1 PLC Address Construction by each Operation Mode |
| Communication Cable Length | Follows EtherCAT® specifications (Distance between each node: 100m max.) |
| Slave Type | I/O slave |
| Available Node Addresses for Setting | 0 to 65535 |
| Communications Cable (Note 1) | Category 5e or more<br>(Double shielded cable braided with aluminum foil recommended) |
| Connector | RJ45 connector × 2pcs (Input × 1, Output × 1) |
| Connect | Daisy chain only |

*Note 1    Prepare separately for the communication cable.*

* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 090 | Operation release | Software reset command in servo-ON condition | Cause : A software reset command was issued when the servo was ON.<br>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.<br>Treatment : Select the position number from 63 or smaller. |
| 092 | | PWRT signal detection during movement | Cause : The current position write signal PWRT was input while the actuator was jogging.<br>Treatment : Check that JOG+/- signal is not on and stopped (MOVE output signal is off) before inputting. |
| 093 | | PWRT signal detection in incomplete home return | Cause : The current position write signal PWRT was input when home return was not yet completed.<br>Treatment : Input the HOME signal first to perform home return, and then input the PWRT signal after confirming that the home return has completed (HEND output signal is ON). |
| 0A1 | Cold start | Parameter data error | Cause : The data input range in the parameter area is not appropriate.<br>Example 1) This error occurs when the magnitude relationship is apparently inappropriate such as when 300mm was incorrectly input as the value of the soft limit negative side while the value of the soft limit positive side was 200.3mm.<br>Example 2) In rotary axis, when the index mode is changed to the normal mode and the soft limit negative side is 0, this error is issued. Set the soft limit negative side to a value -0.3mm is added to the outer side of the effective stroke. [Refer to 8.2 [2] Soft limit positive side, Soft limit negative side]<br>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.<br>2) The value of the target value in the "Position" field exceeded the Parameter No.3 and 4 "Soft limit set value".<br>3) Pressing operation was specified while the vibration suppress control function remained effective.<br>Treatment : 1) Set the target position.<br>2) Change the target position value to the one within the soft limit set value.<br>3) The vibration suppress control function and pressing operation cannot be used concurrently. Provide setting so that either of the functions is effective. |

1. Specifications Check

## 1.5 External Dimensions

### 1.5.1 Gateway Unit

Fixed Screws Type and Attachment DIN Rail Type
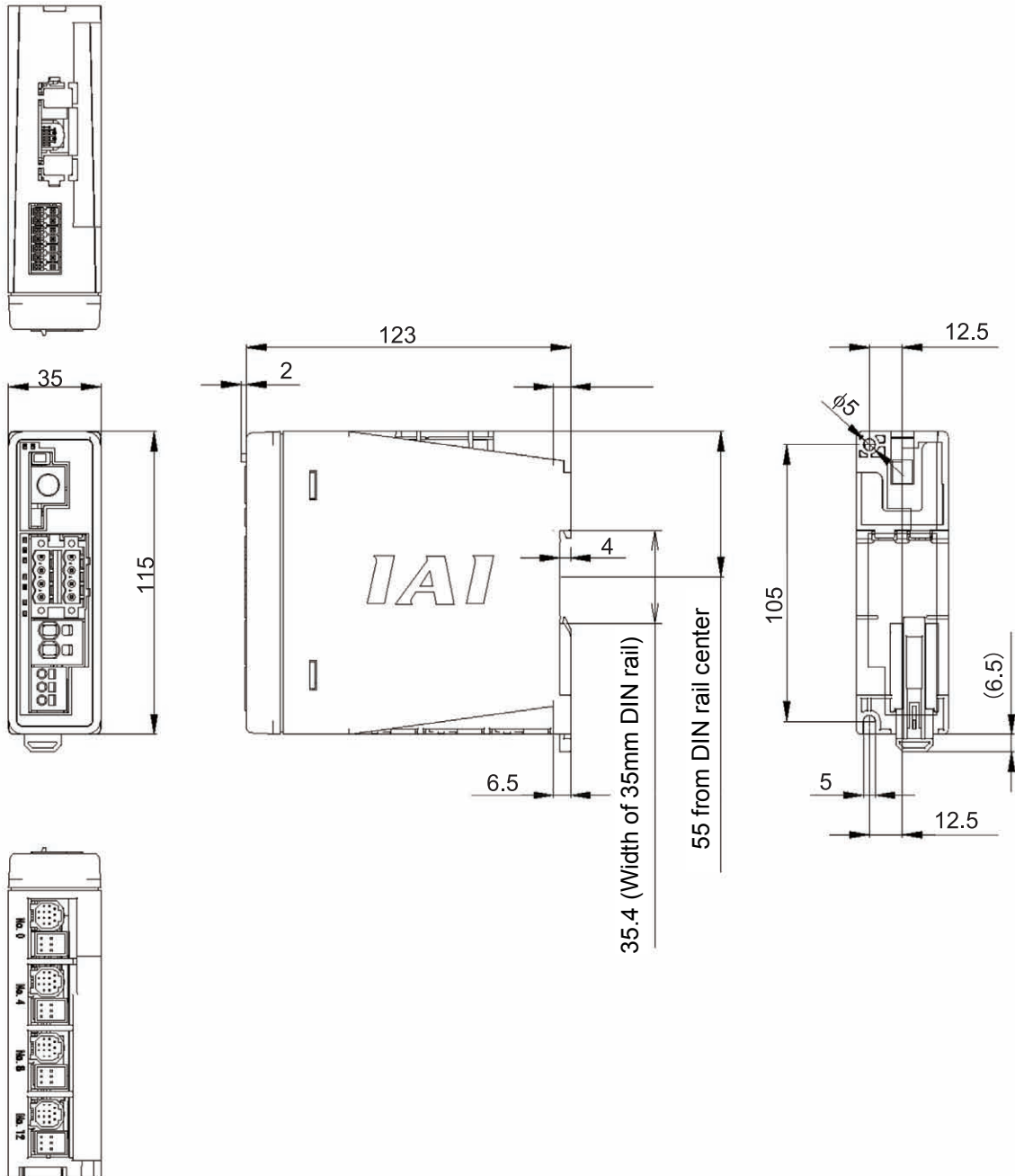
# *RCP6S* *Fieldbus Communication*

## 1.5.2 Hub Unit

[1] Fixed Screws Type
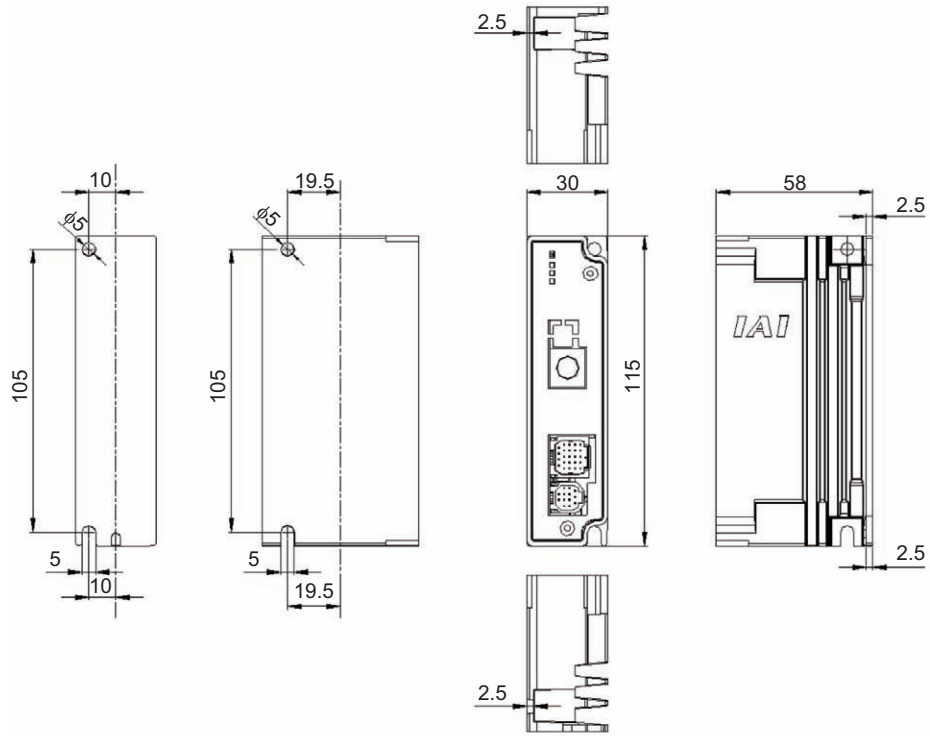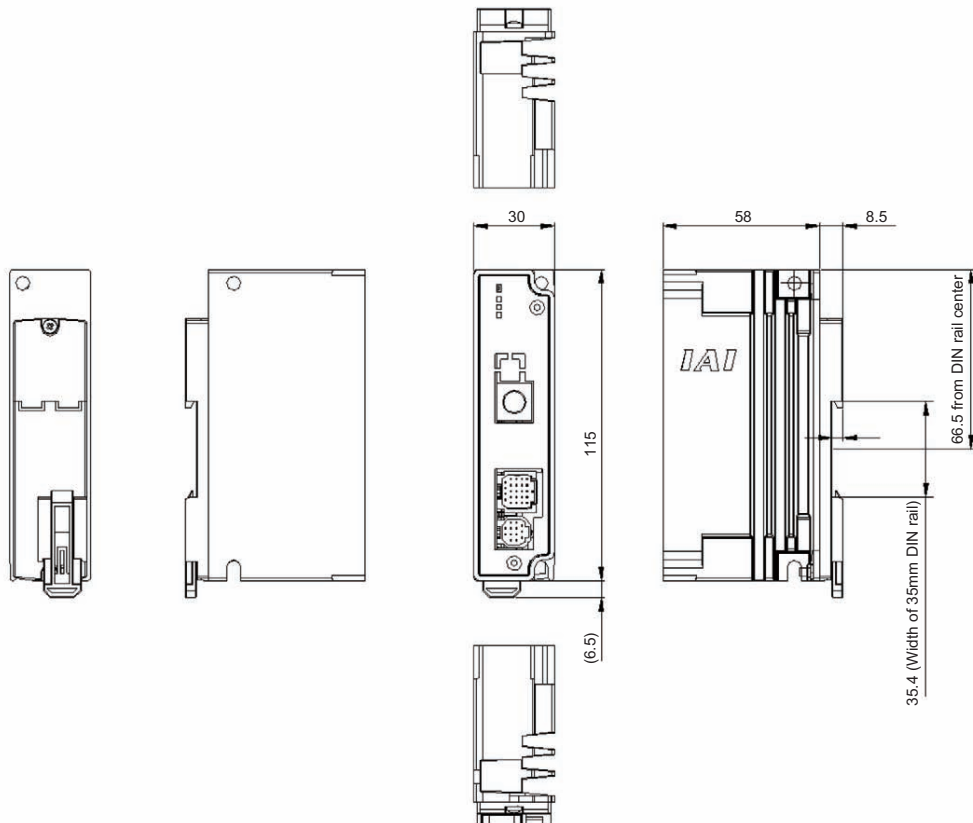


[2] Attachment DIN Rail Type

## 1.5.3 RCP6S Gateway Controller

Dimensions for RCM-P6PC, RCM-P6AC and RCM-P6DC should be the same.

[1] Fixed Screws Type
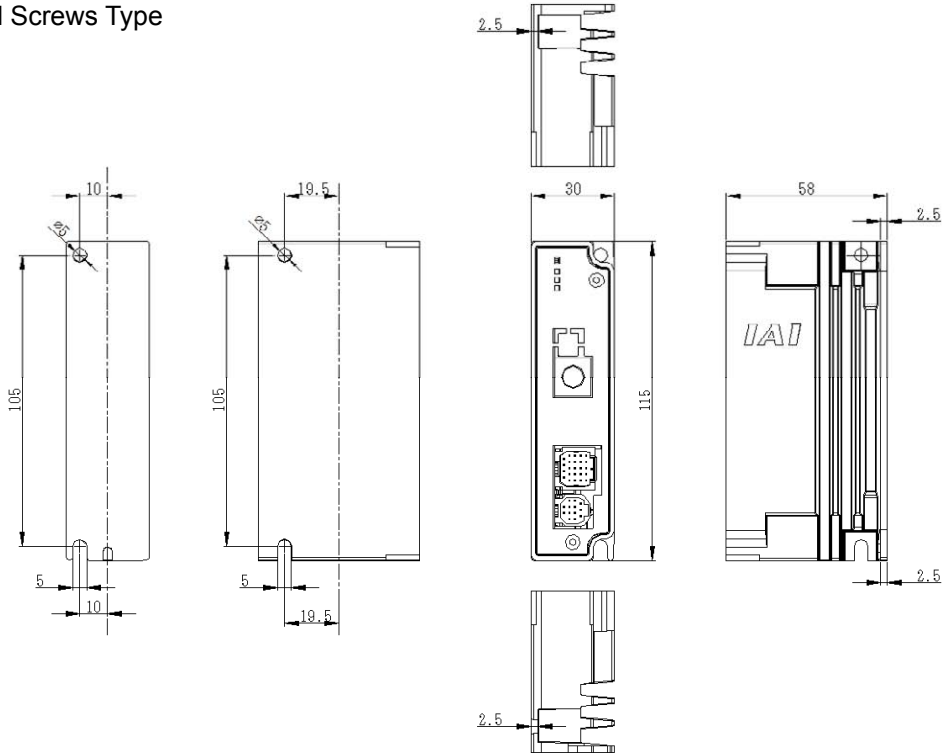
[2] Attachment DIN Rail Type
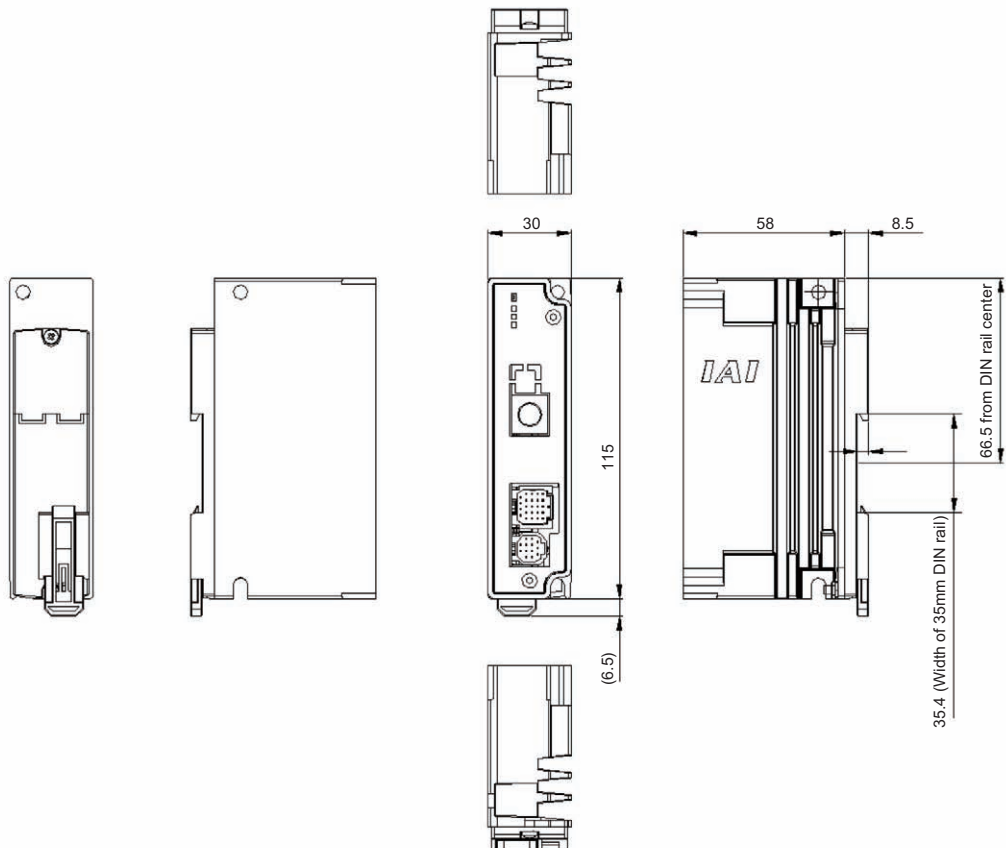
## 1.6 Installation and Storage Environment

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 1.7 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. Specifications Check

## 1.7    Noise Elimination and Mounting Method

### (1)  Noise Elimination Grounding (Frame Ground)

Gateway Unit

Connect the ground line to the FG terminal block on the controller unit.
Put a tool such as a screwdriver into the square slot to open the opening to connect the line.

Copper wire: Connect a ground wire with a diameter of 1.6 mm ($2mm^2$: AWG14).
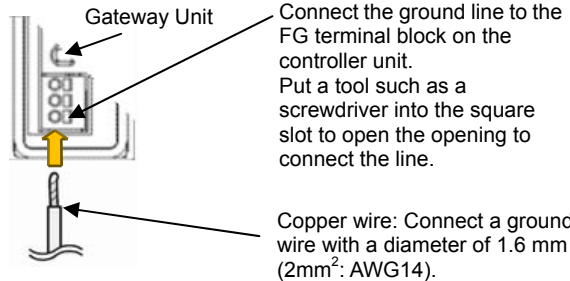
Earth Terminal
Grounding resistance at 100Ω or less
(Formerly Class-III grounding)
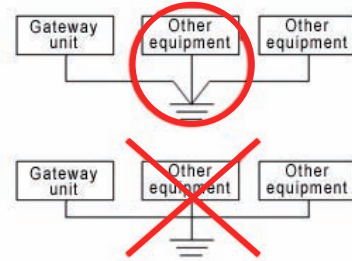
Do not share the ground wire with or connect to other equipment. Ground wach unit.

### (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.

Surge absorber

R
Relay coil
C

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.

+24V    0V

Relay coil
+24V        0V
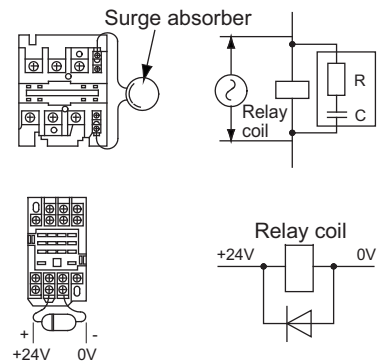
(4)   Heat Radiation and Installation

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

To fix the units in the control box, use the attachment holes on top and bottom of the unit for the screw fixed type, and use the DIN rails for the DIN rail fixed type.

Gateway Unit
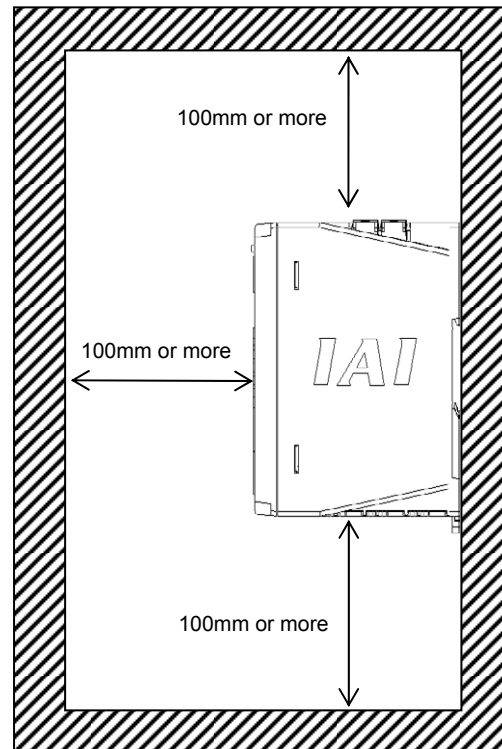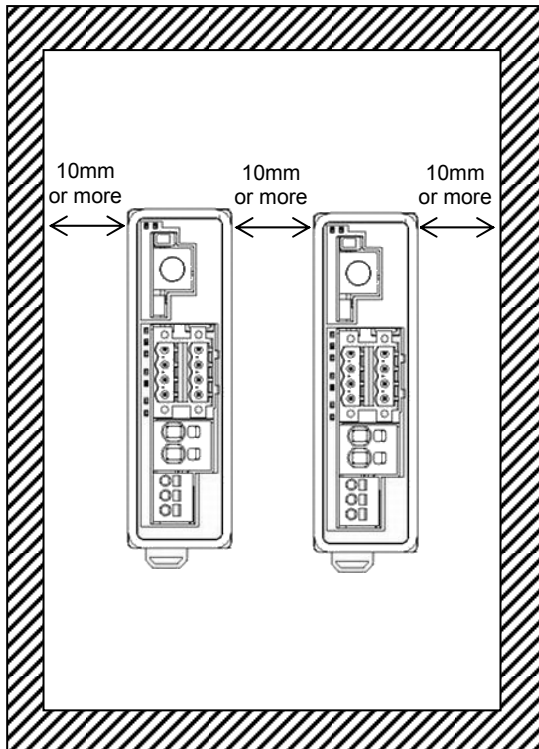


Hub Unit
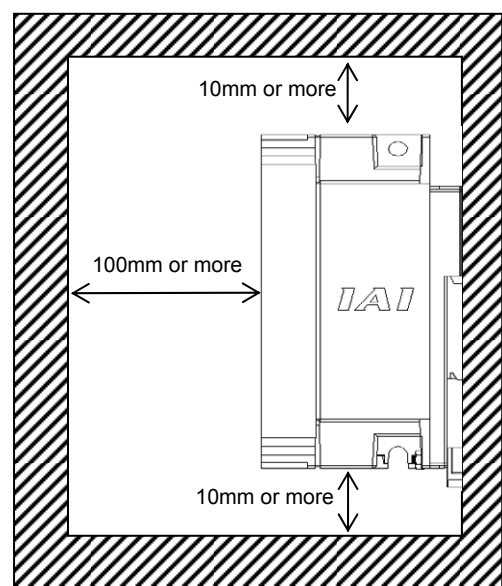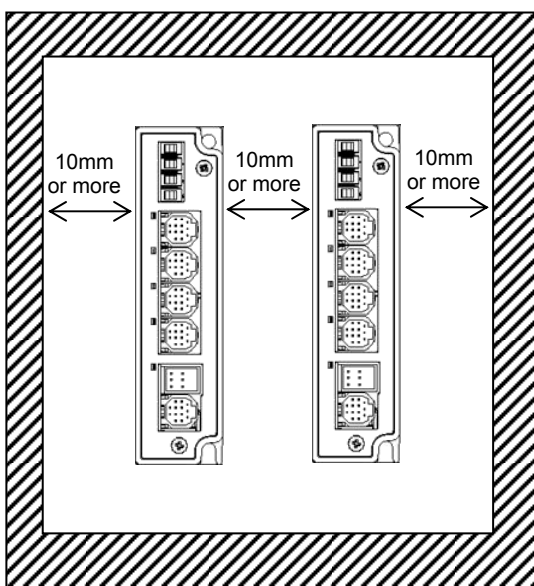
RCP6S Gateway Controllers (RCM-P6PC/RCM-P6AC/RCM-P6DC)
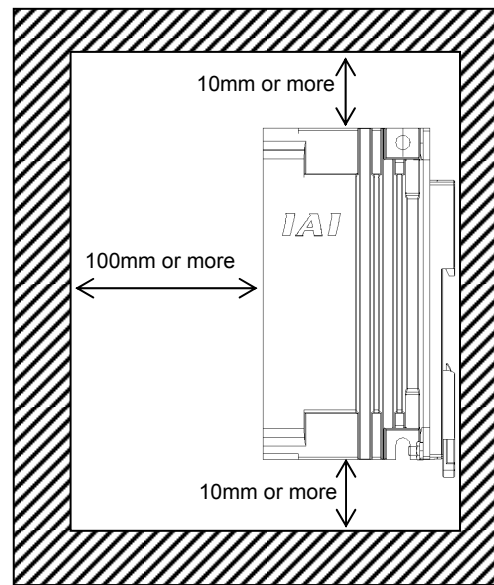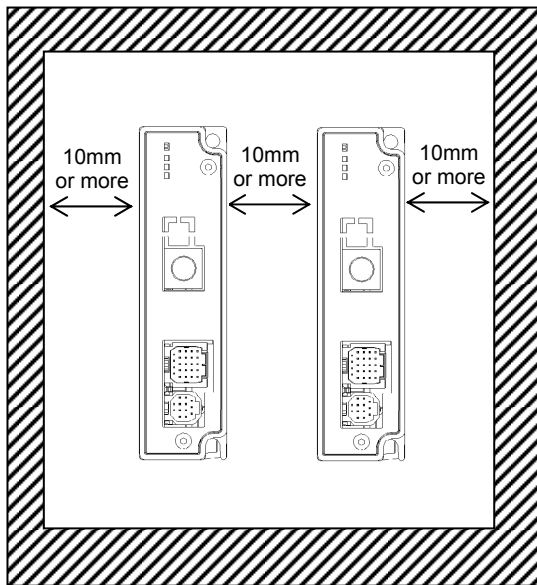
# RCP6S *Fieldbus Communication*

## Chapter 2    Wiring

To connect the RCP6S actuator to each fieldbus, it is necessary to use the gateway unit.
Gateway unit is equipped with communication lines for 4 channels, which are available for connection to the RCP6S actuator or hub unit.
A hub unit is capable for four axes of RCP6S actuators connected to one unit, and by connecting hub units to all of four channels of the gateway unit, 16 axes of the RCP6S actuators can be connected at the maximum.

The axis numbers on the gateway unit slots and the hub unit slots are fixed in advance, and it is not necessary to set the axis address for each actuator.
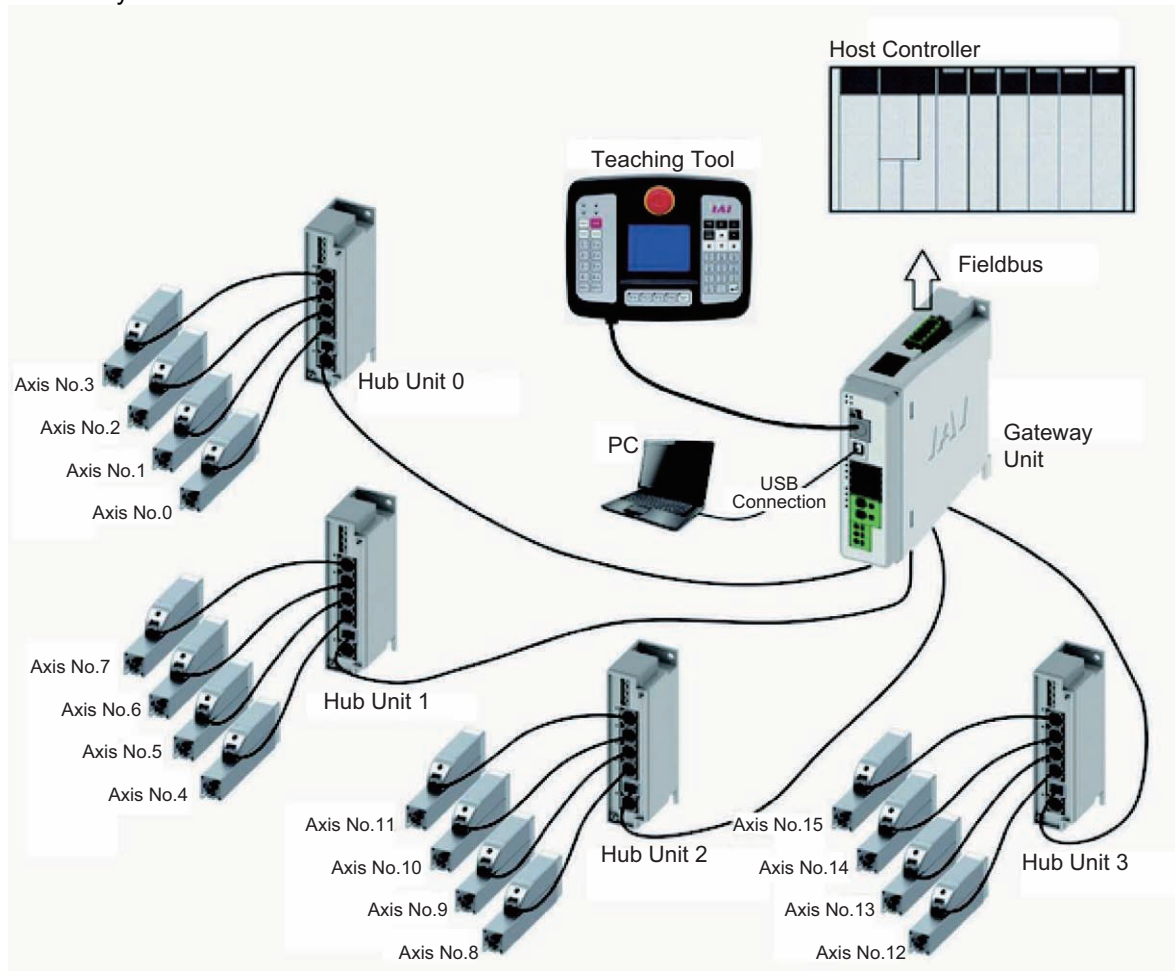


There is a switch equipped to a hub unit for brake release so brake release work can be conducted near the actuator. Also, assuming that actuators could be connected to the gateway unit directly, there are external power input type brake release input terminal blocks equipped to each channel.

> ⚠ *Caution: When the direct numerical mode is used in in fieldbus except for CC-Link, the maximum connectable number of axes should be eight axes.*

# RCP6S *Fieldbus Communication*

It is also available to use Gateway Unit by connecting RCP6S actuator directly.
In the figure below shows that case. The axis address of RCP6S connected directly without using a hub unit should be No. 4, and No. 5, 6 and 7 will become unavailable.



Using a hub unit, four actuators can be connected.

Axis No.3
Axis No.2
Axis No.1
Axis No.0

Hub Unit 0

Teaching Tool

Host Controller

PC

USB Connection

Fieldbus

Gateway Unit

Without using a hub unit, it is available to connect actuators directly. In that case, the number of axes available to connect will reduce.
In the case above, No. 5, 6 and 7 will become unavailable.

Axis No.7
Axis No.6
Axis No.5
Axis No.4

Axis No.11
Axis No.10
Axis No.9
Axis No.8

Hub Unit 2

Axis No.15
Axis No.14
Axis No.13
Axis No.12

Hub Unit 3

RCP6S Actuator

Also, it is available that RCP6S Gateway controller is connected instead of connecting a RCP6S actuator and connect an actuator of RCP2 ~ 6, RCA2 or RCD (partly not applicable). Some actuators require a connector conversion unit.
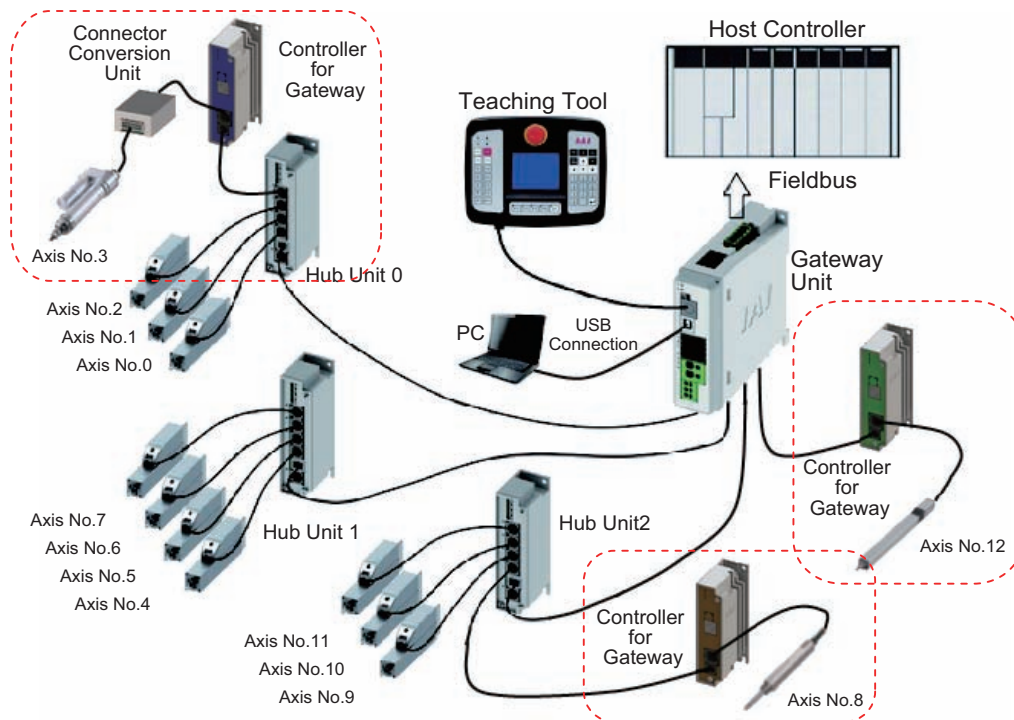


Connector Conversion Unit

Controller for Gateway

Host Controller

Teaching Tool

Fieldbus

Gateway Unit

Axis No.3

Hub Unit 0

Axis No.2
Axis No.1
Axis No.0

PC

USB Connection

Controller for Gateway

Axis No.12

Axis No.7
Axis No.6
Axis No.5
Axis No.4

Hub Unit 1

Hub Unit2

Controller for Gateway

Axis No.11
Axis No.10
Axis No.9

Axis No.8

*Note  When an actuator is to connected to the controller for RCP6S Gateway, make sure to connect an actuator of the model code stated on the controller front panel. Operation will not be performed correctly if an actuator not indicated is connected.*

# RCP6S *Fieldbus Communication*

## 2.1 Wiring Diagram (Connection of Construction Devices)



Teaching Pendant
(to be purchased separately)

PC software
(to be purchased separately)

Fieldbus Connecting

Host System (master unit)
(PLC etc....Please prepare separately)

Emergency Stop Circuit

Dummy Plug DP-5 (Note1)

Gateway Unit

It is also available to connecting with miniUSB.

Drive Cutoff Circuit

Control/Drive Power Supply
(24V DC …Please prepare separately)

RCP6S Gateway Controllers

RCP5

RCP6S

RCP6S Gateway Controllers

Hub Unit (MAX. 4 units)

Actuator (MAX. 16 units)

RCP6S

RCM-P6AC

Connector Conversion Unit RCM-CV-APCS

RCA2

⚠ *Caution: Turn the power off at the gateway unit before putting in or taking out a connector on PC software or a teaching pendant from the gateway unit, RCP6S built-in controller or RCP6S Gateway controller.*
*Putting in or taking out a connect while the power is kept on may cause malfunction.*

*Note 1 For RCM-P6GWG, in case a teaching tool is not connected to SIO connector, have the enclosed dummy plug plugged (DP-5) in the connector.*

## 2.2 Circuit Diagram

[1] Power Supply and Emergency Stop
As an example of a circuit, cases of 4 conditions are shown.
Select from 3) or 4) for RCM-P6GWG type.
1) Wiring to drive an actuator using only emergency stop input from a teaching tool.
2) Wiring to drive an actuator by activating devices and emergency stop input (EMG-) from a teaching tool.
3) Stop supplying external motor power at emergency stop input.
4) Shut off the motor power externally by inputting the emergency stop with using two units of controllers or more.

1) Example of wiring to drive an actuator using only emergency stop input from a teaching tool
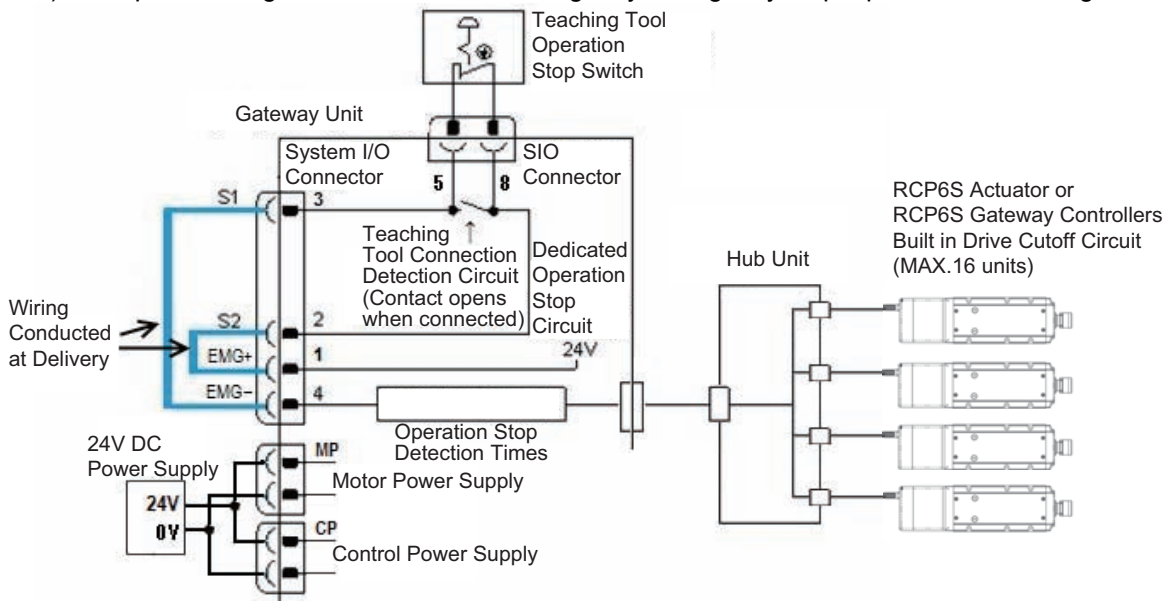


2) Example of wiring to drive an actuator by activating devices and emergency stop input (EMG-) from a teaching tool
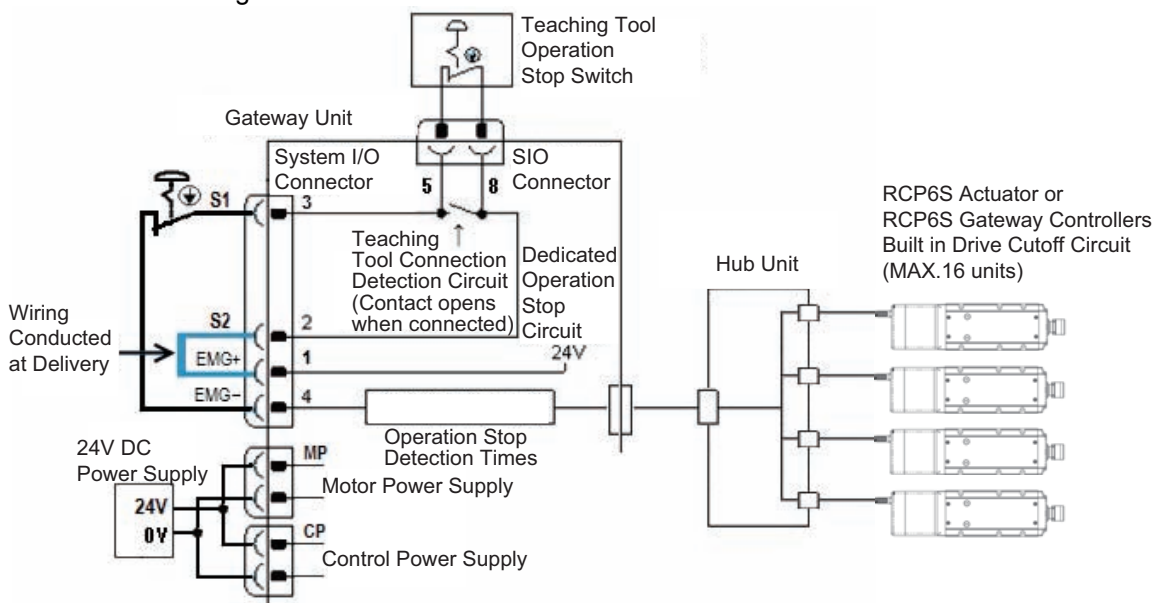
# RCP6S *Fieldbus Communication*

3) Example of stop supplying external motor power at emergency stop input.
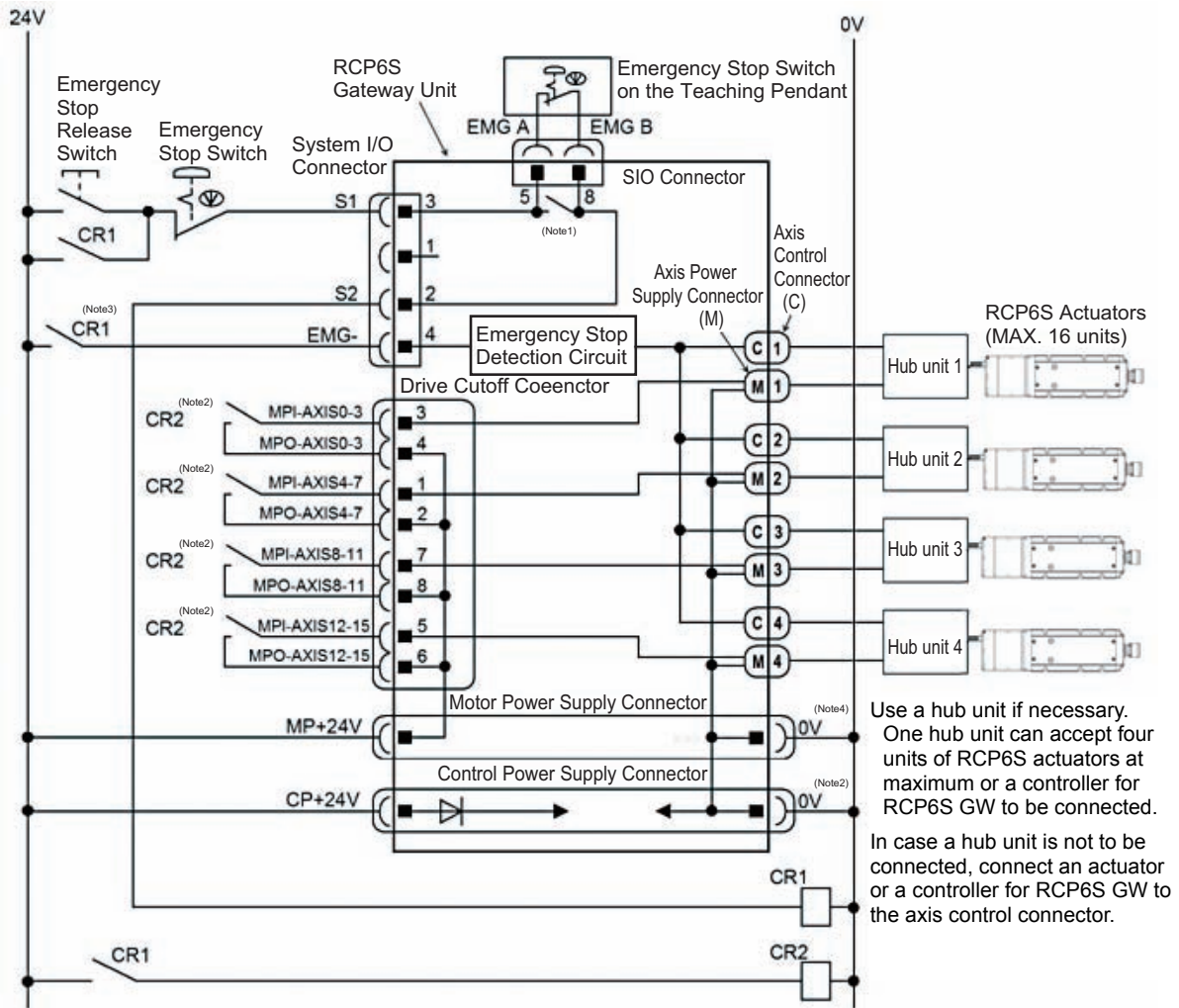


*Note 1* RCM-P6GW : When there is nothing plugged in the SIO connector, S1 and S2 are short-circuited inside the controller.
RCM-P6GWG : When there is nothing plugged in the SIO connector, S1 and S2 are not short-circuited.
To make them short-circuited, have the enclosed dummy plug DP-5 plugged in the SIO connector. [Refer to 2.3.6]
*Note 2* When the motor power must be disconnected externally for safety category compliance, apply a safety rated relay between MPI-AXIS✳ and MPO-AXIS✳. Choose one that is capable to open and close with the motor current consumption of the connected actuator [Refer to 1.2 List of Basic Specifications.]. (✳: Slot Number)
*Note 3* The rating for the emergency stop signal (EMG-) to turn ON/OFF at contact CR1 is 24V DC and 10mA or less.
*Note 4* For CR1, select the one with coil current 0.1A or less.

⚠ *Caution: When supplying the power by turning ON/OFF the 24V DC, keep the 0V being connected and have the +24V supplied/disconnected (cut one side only).*

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4) Example of shut off the motor power externally by inputting the emergency stop with using two units of controllers or more.
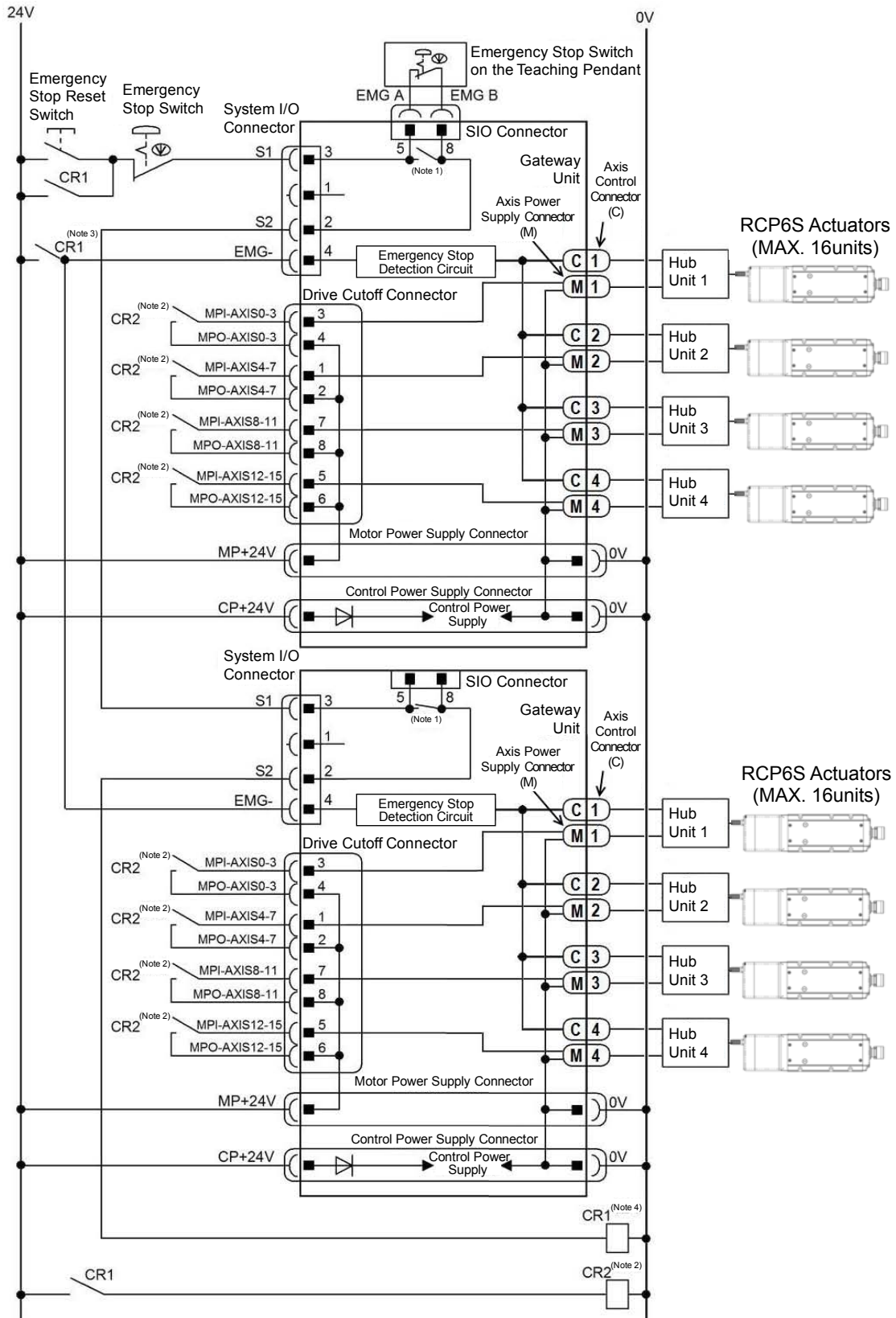


Check in the previous page for Note 1 to 4.

# *RCP6S* *Fieldbus Communication*

[2] Connection Cable

■ Connection among Gateway Unit, Hub Unit and RCP6S

In order to operate the RCP6S actuator with each fieldbus, it is necessary to connect it to the gateway unit or the hub unit. Use RCP6S connection cable in case of connecting to either unit. Also, use the gateway – hub connection cable to connect the hub unit to the gateway unit. There is an extension cable prepared for both cables
In below, shows the model codes of and the figures of the cables.

[A] Connection to RCP6S Gateway Unit and Hub Unit

| Gateway Unit | 1) GW-hub Connection Cable | 2) Extension Cable | Hub Unit |
|---|---|---|---|
| Axis Power Supply Conector | | | Hub Power Supply Conector |
| Axis Control Conector | | | Hub Control Conector |
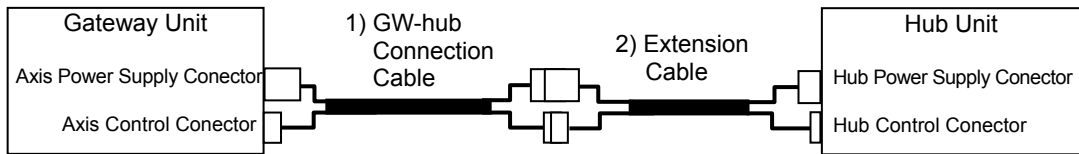
\* Extension Cable is utilize these holes if necessary.

[B] Connection to RCP6S Gateway Unit and RCP6S

| Gateway Unit | 3) RCP6S Connection Cable | 4) Extension Cable | RCP6S Actuator |
|---|---|---|---|
| Axis Power Supply Conector | | | |
| Axis Control Conector | | | |
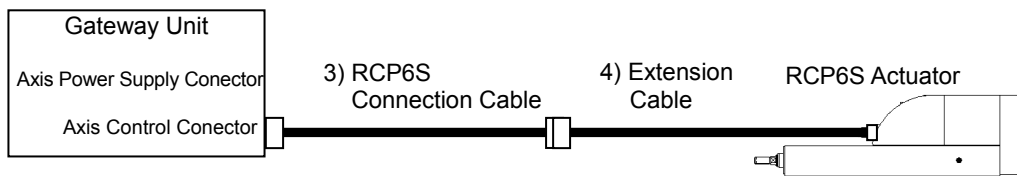
\* Extension Cable is utilize these holes if necessary.

[C] Connection to RCP6S Hub unit and RCP6S

| Hub Unit | 3) RCP6S Connection Cable | 4) Extension Cable | RCP6S Actuator |
|---|---|---|---|
| RCP6S Connector | | | |

\* Extension Cable is utilize these holes if necessary.

Gateway Unit (Bottom surface)

No. 0    No. 4    No. 8    No. 12

Axis Control Connector
Connected unit: Hub unit (Hub unit used)
Connected unit: RCP6S actuator (Hub unit not used)

Axis Power Supply Connector
Connected unit: Hub unit

Hub Unit (Front surface)

RCP6S Connector
Connected unit: RCP6S actuator

Hub Power Supply Connector
Connected unit: Gateway unit

Hub Control Connector
Connected unit: Gateway unit

# RCP6S *Fieldbus Communication*
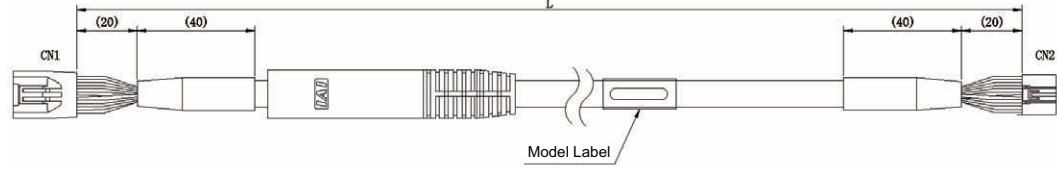
Applicable Connection Cable Model Codes

□□□: Cable length   Example) 030 = 3m   For the robot cable -RB

| Symbol | Cable Name | Cable Model | Remarks |
|---|---|---|---|
| 1) | Gateway-Hub Connection Cable | CB-RCP6S-RLY□□□ | Max. 10m (Note 1) |



Hub Unit Side
Hub Unit
Connector: J11DF-06V-KX
Connector: DF62C-13S-2.2C

Wire Diameter of Motor Cable: AWG18
Cable Diameter: φ9
1m, 3m, 5m and 10m are prepared in standard

GW Unit Side
Connector: J11DF-06V-KX
Connector: DF62C-13S-2.2C

| 2) | Gateway-Hub Connection Cable | CB-RCP6S-RLY□□□-JY1 | Max. 10m (Note 1) |
|---|---|---|---|



Hub Unit Side
Hub Unit
Connector: J11DF-06V-KX
Connector: DF62C-13S-2.2C

Wire Diameter of Motor Cable: AWG18
Cable Diameter: φ9
1m, 3m and 5m are prepared in standard

GW Unit Side
Connector: J11DFW-06V-KX
Connector: DF62B-13EP-2.2C

| 3) | RCP6S Connection Cable | CB-RCP6S-PWBIO□□□ | Max. 20m (Note 2) |
|---|---|---|---|



Actuator Side
Connector: DF62C-13S-2.2C

Wire Diameter of Motor Cable: AWG22 (when below 5m),
                              AWG18 (when 5m and above)
Cable Diameter: φ7 (when below 5m), φ8 (when 5m and above)

Connector Unit Side
GW Unit, Hub Unit
Connector: DF62C-13S-2.2C

| 4) | RCP6S Extension Cable | CB-RCP6S-PWBIO□□□-JY1 | Max. 20m (Note 2) |
|---|---|---|---|



Actuator Side
Connector: DF62B-13EP-2.2C

Wire Diameter of Motor Cable: AWG18
Cable Diameter: φ8
1m, 3m and 5m are prepared in standard

Connector Unit Side
GW Unit, Hub Unit
Connector: DF62C-13S-2.2C

Note 1   The maximum length should be 10m between the gateway and hub unit.
Not e2   The maximum length should be 20m from the gateway unit to RCP6S regardless of a hub unit is used or not used.

# RCP6S *Fieldbus Communication*

■ Connection among Hub Unit, RCP6S Gateway Controller and Actuators

Gateway Unit (Bottom Surface)

No. 0    No. 4    No. 8    No. 12

Axes Control Connector
Connected unit: RCP6S Gateway Controllers
(Hub unit not used)

RCP6S Gateway Controllers
(Front Surface)

Hub Unit (Front Surface)

RCP6S Connector
Connected unit: RCP6S Gateway Controllers

Axes Control Connector
Connected unit:
Each Actuator or Connector Conversion Unit
Power Supply Connector
Connected unit: Hub Unit or Gateway Unit

Shown below is a cable layout diagram and model numbers when a controller for RCP6S Gateway is to be connected to a hub unit.
It is available that a controller for RCP6 Gateway is connected directly to the gateway unit without using a hub unit. In this case, the controller should be connected to the axis control connector.

[D]   When connection is established with a pulse motor type actuator (RCP5 or 6)

| Hub Unit | 3) RCP6S | RCP6S | 5) RCP6S | RCP5 and 6 |
|---|---|---|---|---|
| RCP6S Connector | Connector | Gateway Controller | Gateway Connector | Actuator |
| | | Power Supply Connector   axis Control Connector | | |
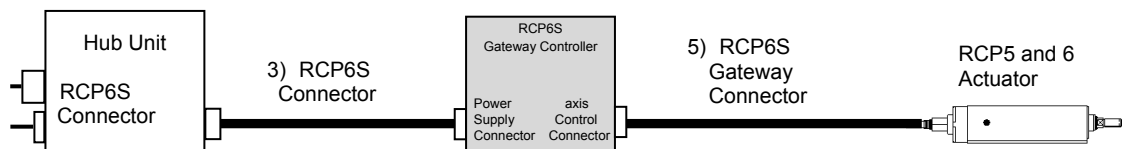
Connect a controller for RCP6S Gateway to the hub unit (or a gateway unit) and connect a RCP5 or 6 actuator on the further end.

[E]   When connection is established with a pulse motor type actuator (RCP2 to 4)

| Hub Unit | 3) RCP6S | RCP6S | 5) RCP6S | Connector | Each Actuator Connector |
|---|---|---|---|---|---|
| RCP6S Connector | Connector | Gateway Controller | Gateway Connector | Conversion Unit RCM-CV-APCS | RCP2 to 4 Actuator |
| | | Power Supply Connector   axis Control Connector | | | |
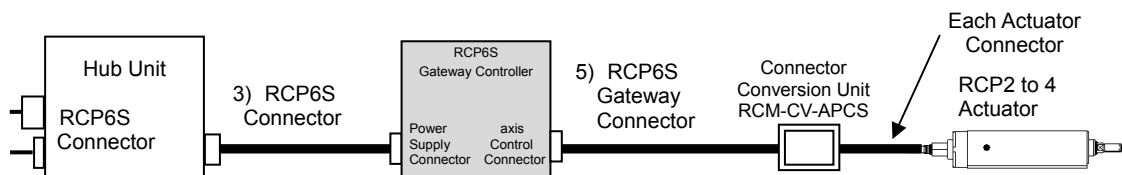
Connect a controller for RCP6S Gateway (RCM-P6PC) to the hub unit (or a gateway unit) and connect a RCP2 to 4 actuator on the further end via a connector conversion unit.

**2. Wiring**

[F]    When connection is established with a servo motor type actuator (RCA or RCA2)
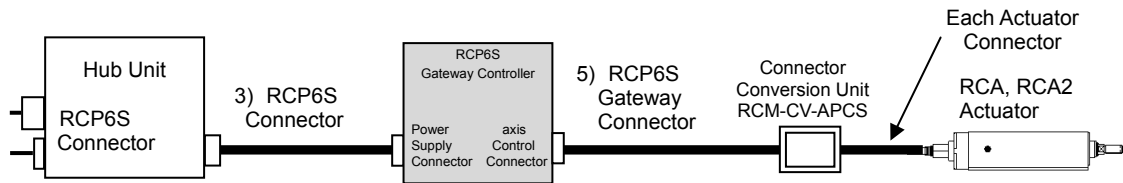


Connect a controller for RCP6S Gateway (RCM-P6AC) to the hub unit (or a gateway unit) and connect a RCA or RCA2 actuator on the further end via a connector conversion unit.

[G]   When connection is established with a brushless DC electric motor type actuator (RCD)
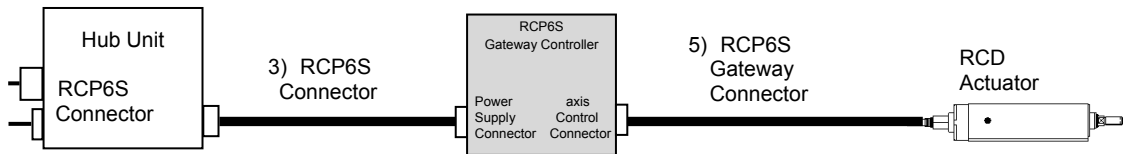


Connect a controller for RCP6S Gateway (RCM-P6DC) to the hub unit (or a gateway unit) and connect a RCD actuator on the further end.

Applicable Connection Cable Model Codes

□□□: Cable length    Example) 030 = 3m    For the robot cable -RB

| Symbol | Cable Name | Cable Model | Remarks |
|---|---|---|---|
| 3) | RCP6S Connection Cable | CB-RCP6S-PWBIO□□□ | Max. 20m (Note 3) |



Actuator Side
Connector: DF62C-13S-2.2C

Wire Diameter of Motor Cable: AWG22 (when below 5m),
AWG18 (when 5m and above)
Cable Diameter: φ7 (when below 5m), φ8 (when 5m and above)

Connector Unit Side
GW Unit, Hub Unit
Connector: DF62C-13S-2.2C

| 5) | RCP6S Gateway Connection Cable | CB-ADPC-MPA□□□ | Max.20m (Note 3)  Max.10m (RCM-P6DC used) |
|---|---|---|---|



Actuator Side
Connector: DF62C-24S-2.2C

Wire Diameter of Motor Cable: AWG22 (when below 5m),
AWG18 (when 5m and above)
Cable Diameter: φ8.5 (when below 5m), φ9.1 (when 5m and above)

Controller Unit Side
Connector: DF62C-13S-2.2C

*Note3   The maximum length from the gateway unit to each actuator should be 20m regardless of a hub unit or connector conversion unit being used or not used. However, the maximum length should be 10m from the gateway unit to RCD actuator when RCM-P6DC is used.*

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# RCP6S *Fieldbus Communication*

■ Connector Conversion Unit

Use this connector conversion unit in case of actuators not being able to connect to the connection cable for RCP6S Gateway in 5) in the previous page in order to convert it to the existing controller connector (PADP-24V-1-S) and connect the connection cables to each actuator.

Connector Conversion Unit (RCM-CV-APCS)

RCP6S Gateway
Controllers

65

25

45

Actuator Side

Example for Connection

| RCP6S Gateway Controllers | | 5) RCP6S Gateway Connector | Connector Conversion Unit RCM-CV-APCS | Each Actuator Connector | Actuator |

Power Supply Connector    axis Control Connector
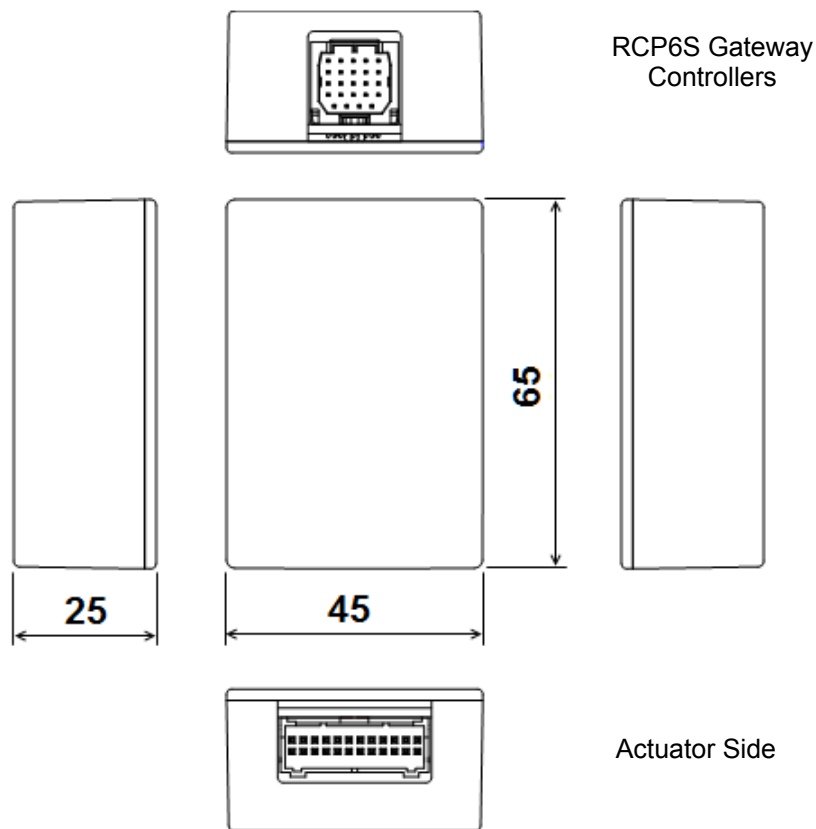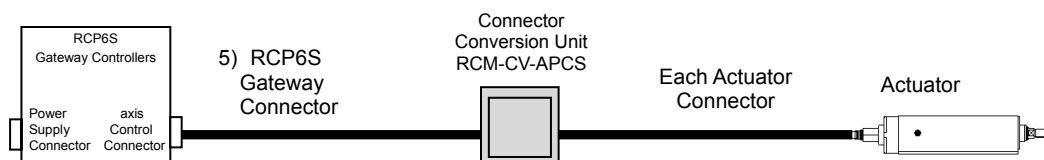
\* Refer to an instruction manual of each actuator for the model code of the connection cables for each actuator.

[3] Layout for Mode Switchover Circuit
When a switchover of the operation modes (AUTO/MANU) is required with an external input, connect a device such as a switch between AUTO/MANU + terminal and AUTO/MANU – terminal.
If not switching externally, apply a jumper on AUTO/MANU + terminal and AUTO/MANU – terminal.
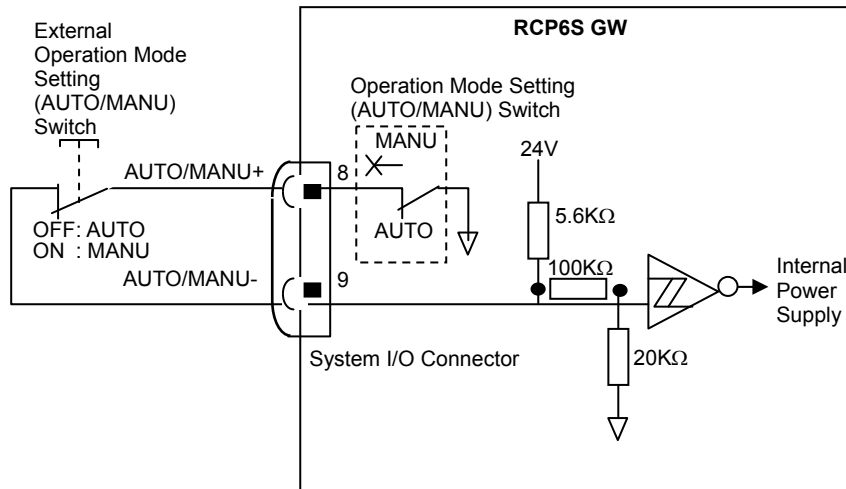


[4] Layout for External Brake Input Circuit
Lay out the circuit when an external compulsory brake release with using an actuator equipped with a brake is desired. It is not necessary if an external release is not required.

This is how to lay out the brake release when connected directly to the gateway unit.
This input will be invalid in case that a hub is connected. In such a case, release the brake on the brake release switch on a hub unit.
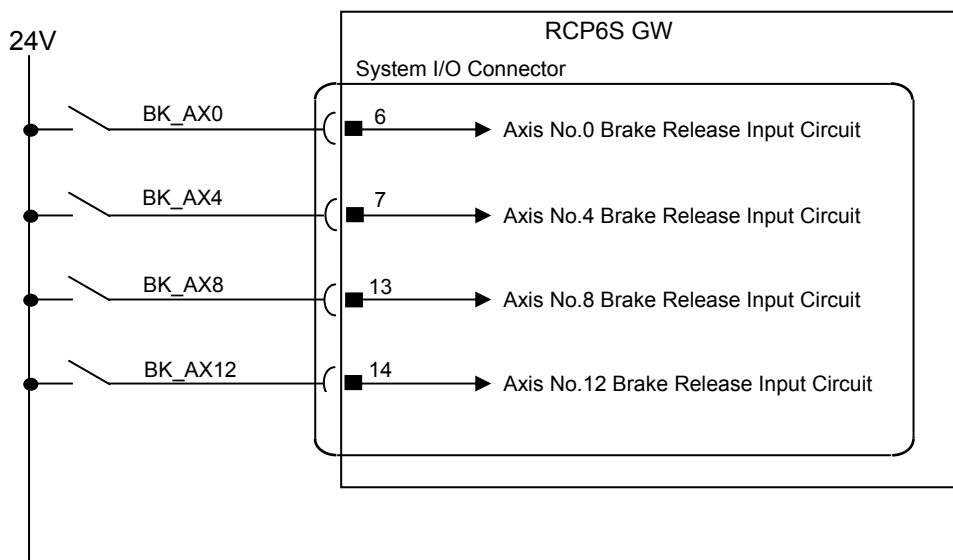


0V is in common with the control power supply.
Brakes should be available for release if the control power is supplied to RCP6S Gateway Unit.

# *RCP6S* *Fieldbus Communication*

[5]  Wiring Layout for Fieldbus
  Follow the instruction manual of the master unit for each Fieldbus and the constructing PLC for the details of how to connect the cables.

1) DeviceNet Type

Terminal Resistance is required to be mounted on the terminal.



Master Unit
Terminal Resistance 121Ω
Slave Devices
Terminal Resistance 121Ω
RCP6S GW-DeviceNet Type

RD ☐    V+
WT ☐    CAN_H
         Drain (Shield)
BL ☐    CAN_L
BK ■    V-

RD ☐    V+
WT ☐    CAN_H
         Drain (Shield)
BL ☐    CAN_L
BK ■    V-

V+    ☐ RD
CAN_H ☐ WT
Drain (Shield)
CAN_L ☐ BL
V-    ■ BK

24V Power Supply
Communication power needs to be supplied by an external device.

Class D grounding
(Formerly Class-III grounding: Grounding resistance at 100Ω or less)

2) CC-Link Type

RCP6S GW -CC-Link Type

Master Unit
Terminal Resistance
Slave Devices
Terminal Resistance

DA    DA    DA
DB    DB    DB
DG    DG    DG
SLD   SLD   SLD
FG    FG    FG

Terminal Resistance is required to be mounted on the terminal.

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)

SLD and FG are internally connected.

Class D grounding
(Formerly Class-III grounding: Grounding resistance at 100Ω or less)

3) PROFIBUS-DP Type

Terminal Resistance is required to be mounted on the terminal.

Master Unit
Slave Devices
RCP6S GW-PROFIBUS Type

+5V           +5V           +5V
      390Ω              390Ω
A-Line        A-Line        A-Line
      220Ω              220Ω
B-Line        B-Line        B-Line
      390Ω              390Ω
GND           GND           GND

Class D grounding
(Formerly Class-III grounding: Grounding resistance at 100Ω or less)

## 4) EtherNet/IP Type

Switching Hub

Master Unit

Slave Devices

RCP6S GW Unit
EtherNet/IP Type

Ethernet Straight Cable, Category 5e or more
Double shielded cable braided with aluminum foil
recommended

## 5) EtherCAT Type

Master Unit

Slave Devices

RCP6S GW
EtherCAT Type

IN

OUT

IN

OUT

Ethernet Straight Cable
Category 5e or more
Double shielded cable braided with aluminum
foil recommended
(Note) Terminal resistance is not required

## 6) PROFINET-IO Type

Switching Hub

Master Unit

Slave Devices

RCP6S GW Unit
PROFINET-IO Type

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

# RCP6S *Fieldbus Communication*

## 2.3    Wiring Method (Gateway Unit)

### 2.3.1    Wiring to Power Input Connector

The power cables of the gateway unit are to be connected to the motor power supply connector and the control power supply connector on the main body.
Strip the sheath of the applicable wires for 10mm and insert them to the connector.

[How to Insert]
1. Put a small slotted screwdriver in the opening on the right of the inlet deeply till it hits the end.
2. Open the inlet completely and put in the stripped end of the electric wires.
3. Pull out the slotted screwdriver to hold the wires.
4. Pull back the fixed wires to make sure that they are held tightly.

*Note    Put in a slotted screwdriver till it hits the end, otherwise it could be difficult to hold the electric wires or the wires could be easy to pull out. Pay attention to this difference.*
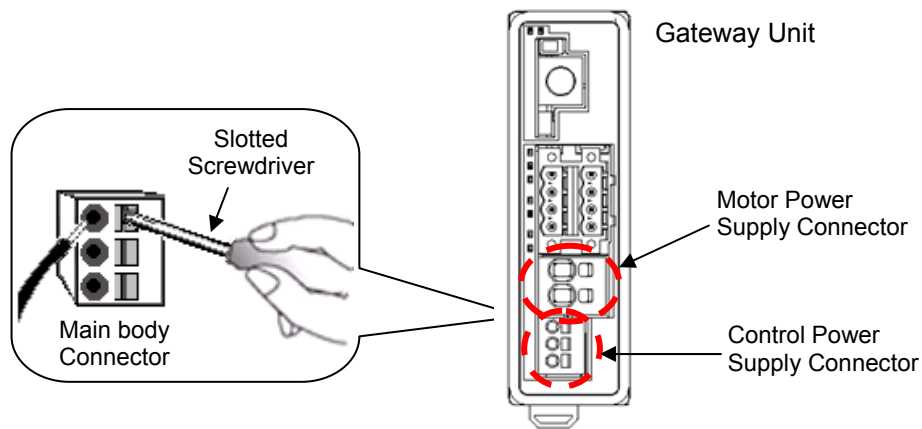


[1] Motor Power Supply Connector
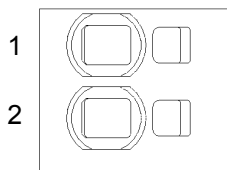


Connector model: SPT5/2-H-7.5-ZB (Manufactured by PHOENIX CONTACT)

| Pin No. | Signal Name | Description | Applicable cable diameter |
|---------|-------------|-------------|---------------------------|
| 1 | MP | Motor Power Supply 24V Input | KIV8 to $0.5mm^2$ (AWG8 to 20) Select the cable thickness allowable for the current figured out in the "1.3 Calculation for Power Capacity" [*]. |
| 2 | GND | 0V Input | * It is no problem to calculate the current consumption using the rated value. |

*(Note) If supplying power with using a 24V DC, having it turned ON/OFF, keep the 0V connected and have the +24V supplied/cut (cut one side only).*

[2] Control Power Supply Connector

1
2
3

Connector model: SPT2.5/3-H-5.0 (Manufactured by PHOENIX CONTACT)

| Pin No. | Signal Name | Description | Applicable cable diameter |
|---------|-------------|-------------|---------------------------|
| 1 | 24V | Control Power Supply 24V Input | KIV3.5 to 0.5mm$^2$ (AWG12 to 20) |
| 2 | GND | 0V Input | |
| 3 | FG | Frame Ground | KIV3.5 to 2.0mm$^2$ (AWG12 to 14) |

(Note) If supplying power with using a 24V DC, having it turned ON/OFF, keep the 0V connected and have the +24V supplied/cut (cut one side only).

# *RCP6S* *Fieldbus Communication*

## 2.3.2  Wiring Layout of System I/O Connector

The connector consists of the emergency stop input for the whole controller, changeover of the operation modes (AUTO/MANU) externally and the external brake release input (used only when actuator connected directly to gateway unit).

Insert the wires 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 gateway unit side
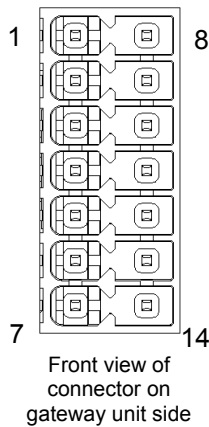
| Connector Name | System I/O Connector | |
|---|---|---|
| Cable Side | DFMC1.5/7-ST-3.5 | Enclosed in standard package Manufactured by PHOENIX CONTACT |
| Gateway Unit Side | DMC1.5/7-G1-3.5P20THR | Manufactured by PHOENIX CONTACT |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | EMG+ | +24V power output for emergency stop | KIV1.25 to 0.3mm$^2$ (AWG16 to 22) |
| 2 | S2 | Emergency stop switch contact input for teaching pendant | |
| 3 | S1 | Emergency stop switch contact output for teaching pendant | |
| 4 | EMG- | Emergency stop input | |
| 5 | NC | Disconnected | - |
| 6 | BK_AX0 | Axis No.0 external brake release input | KIV1.25 to 0.5mm$^2$ (AWG16 to 20) |
| 7 | BK_AX4 | Axis No.4 external brake release input | |
| 8 | AUTO /MANU+ | +24V power output for AUTO/MANU | KIV1.25 to 0.3mm$^2$ (AWG16 to 22) |
| 9 | AUTO /MANU- | AUTO/MANU signal input | |
| 10 | RSV | Spare | - |
| 11 | RSV | Spare | |
| 12 | RSV | Spare | |
| 13 | BK_AX8 | Axis No.8 external brake release input | KIV1.25 to 0.5mm$^2$ (AWG16 to 20) |
| 14 | BK_AX12 | Axis No.12 external brake release input | |

### 2.3.3 Wiring of Drive-source Cutoff Connector

It is a connector to connect the external drive cutoff relay to 24V DC input from the motor power supply connector.
Output 24V DC externally from MPO, and put it back from MPI to GW unit via the relay contact.
The motor power which was in common for all the axes will be spread at this connector to each channel (AXIS0 to 3, 4 to 7, 8 to 11 and 12 to 15). It is also available to input the motor power directly to each MPI on the drive cutoff connector without inputting 24V DC to the motor power supply connector.

Perform wiring when it is required to have the drive sources cut off for each axis power connector. Unless it is desired, the controller can be used in the condition that the enclosed short-circuit line is connected.
The wire 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 gateway unit side
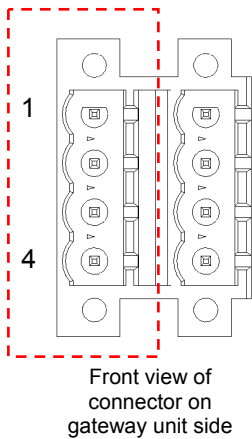
| Connector Name | Drive-source Cutoff Connector | |
|---|---|---|
| Cable Side | FKCN2.5/4-STF-5.0 (AX0-7) | Enclosed in standard package Manufactured by PHOENIX CONTACT |
| Gateway Unit Side | CCDN2.5/4-G1FP26THR | Manufactured by PHOENIX CONTACT |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | MPI_AXIS4-7 | Motor Power Input_AXIS4-7 | KIV1.25 to 0.75mm$^2$ (AWG16 to 18) |
| 2 | MPO_AXIS4-7 | Motor Power Output_AXIS4-7 | |
| 3 | MPI_ AXIS0-3 | Motor Power Input_AXIS0-3 | |
| 4 | MPO_ AXIS0-3 | Motor Power Output_AXIS0-3 | |

Front view of connector on gateway unit side
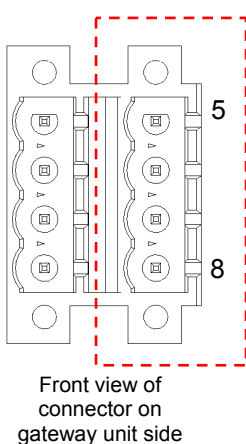
| Connector Name | Drive-source Cutoff Connector | |
|---|---|---|
| Cable Side | FKCN2.5/4-STF-5.0 (AX8-15) | Enclosed in standard package Manufactured by PHOENIX CONTACT |
| Gateway Unit Side | CCDN2.5/4-G1FP26THR | Manufactured by PHOENIX CONTACT |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 5 | MPI_ AXIS12-15 | Motor Power Input_AXIS12-15 | KIV1.25 to 0.75mm$^2$ (AWG16 to 18) |
| 6 | MPO_ AXIS12-15 | Motor Power Output_AXIS12-15 | |
| 7 | MPI_ AXIS8-11 | Motor Power Input_AXIS8-11 | |
| 8 | MPO_ AXIS8-11 | Motor Power Output_AXIS8-11 | |

# RCP6S *Fieldbus Communication*

### 2.3.4 Connection with the Actuator/Hub

Connect the relay cables to the actuator connectors.

**(1) Axis Power Supply Connector**

It is a connector to supply 24V DC motor power from the gateway to a hub unit or actuator.

A1  B1

A3  B3
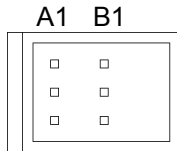
Front view of
connector on
gateway unit side

| Connector Name | Axis Power Supply Connector | |
|---|---|---|
| Cable Side | J11DF-06V-KX | (JST Mfg. Co., Ltd.) |
| Gateway Unit Side | S06B-J11DK-TXR | (JST Mfg. Co., Ltd.) |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| A1 | GND | 0V | Cable dedicated for IAI products |
| A2 | GND | 0V | |
| A3 | GND | 0V | |
| B1 | MP | Motor Power Supply 24V DC | |
| B2 | MP | Motor Power Supply 24V DC | |
| B3 | MP | Motor Power Supply 24V DC | |

**(2) Axis Control Connector**

It is a connector to supply power and control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from the gateway to hub unit or actuator.
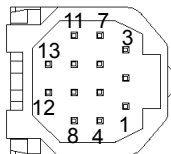
11  7
13    3
12    1
8  4

Front view of
connector on
gateway unit side

| Connector Name | Axis Control Connector | |
|---|---|---|
| Cable Side | DF62C-13S-2.2C | Manufactured by Hirose Electric Co., Ltd. |
| Gateway Unit Side | DF62-13P-2.2DS | Manufactured by Hirose Electric Co., Ltd. |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | CP | Control Power Supply DC24V | Cable dedicated for IAI products |
| 2 | AM_SD- | Serial Communication Line For Automonitor - | |
| 3 | CT_SD- | Control Serial Communication Line - | |
| 4 | BK | Brake Release | |
| 5 | EMGS | Emergency Stop Status | |
| 6 | AM_SD+ | Serial Communication Line For Automonitor + | |
| 7 | CT_SD+ | Control Serial Communication Line + | |
| 8 | MP | Motor Power Supply 24V DC | |
| 9 | MP | Motor Power Supply 24V DC | |
| 10 | GND | 0V | |
| 11 | GND | 0V | |
| 12 | FG | Frame Ground | |
| 13 | NC | Disconnected | |

## 2.3.5  Connection of Teaching Tool (SIO Connector, USB Connector)

Connect an teaching tool such as the PC software.
Connection of either RS485 or USB is available.
Apply the enclosed dummy plug (DP-5) to the teaching connector when Operation Mode Setting Switch is set to AUTO in safety categories complied type (RCM-P6GWG).

Teaching Pendant
(to be purchased separately)

Dummy Plug DP-5

SIO Connector

USB Connector

It is also available to connecting with miniUSB.
However, SIO and USB cannot be connected at the same time.

PC software
(to be purchased separately)
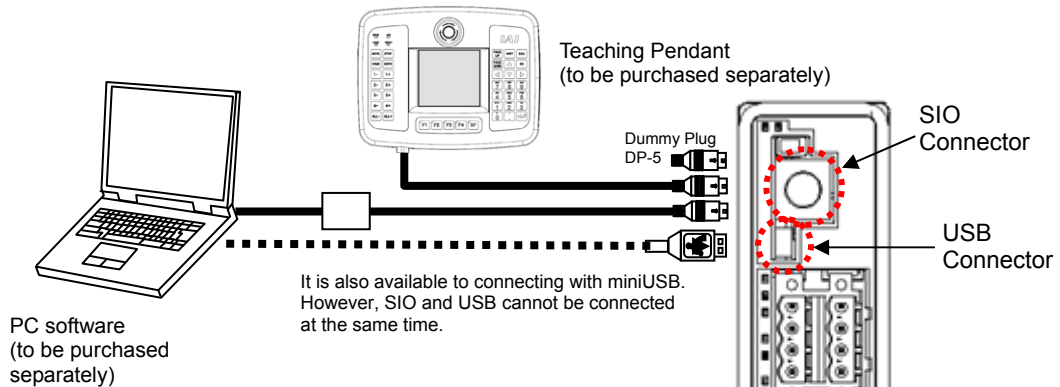
[1] SIO Connector
    Teaching pendant, PC software connector.
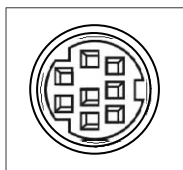
Front view of connector on gateway unit side

| Connector Name | SIO Connector | Remarks |
|---|---|---|
| Cable Side | miniDIN　8Pin | |
| Gateway Unit Side | TCS7587-0121077 | Manufactured by Hosiden Corporation |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | SGA | Teaching Tool Signal + | |
| 2 | SGB | Teaching Tool Signal - | |
| 3 | 5V | For Teaching Tool Power Supply | |
| 4 | ENB | Enable Signal Input | |
| 5 | EMGA | Emergency Stop Signal A | Cable dedicated for IAI products |
| 6 | 24V | For Teaching Tool Power Supply | |
| 7 | 0V | 0V | |
| 8 | EMGB | Emergency Stop Signal B | |
| Shell | 0V | 0V | |

⚠ *Caution: Do not attempt connect the device to the same SIO network as the SEP related controllers such as MSEP.*

# RCP6S *Fieldbus Communication*

[2] USB Connector
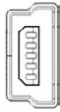
Front view of
connector on
gateway unit side

| USB Connector | Model | Remarks |
|---|---|---|
| Gateway Unit Side | 51387-0530 | Manufactured by MOLEX |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | $V_{BUS}$ | 5V | |
| 2 | D- | Communication Data - | |
| 3 | D+ | Communication Data + | |
| 4 | NC | Disconnected | USB Cable |
| 5 | GND | 0V | |
| Shell | GND | 0V | |

⚠ *Caution:* 1) *Set "Operation Mode Setting Switch" to "MANU" side when a teaching device is connected.*
2) *Turn the power off before disconnecting a teaching pendant.*
3) *SIO and USB cannot be connected at the same time. USB connector is prioritized.*
4) *When using the USB connector for the safety categories complied type (RCM-P6GWG), connect a dummy plug (DP-5) to the SIO connector otherwise the enable signal detection will work.*

## 2.3.6 Wiring of Fieldbus Connector

Refer to the instruction manuals of the each fieldbus master unit and mounted PLC for details.

1) DeviceNet Type



RD (V+)
WT (CAN H)
Shield
BL (CAN L)
BK (V-)
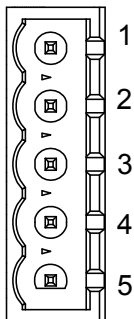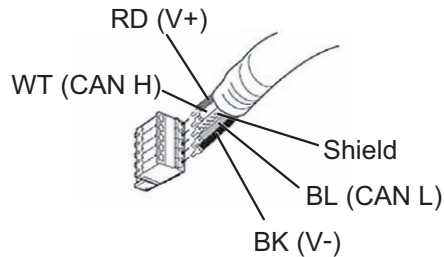
Front view of
connector on
gateway unit side

| Connector Name | DeviceNet Connector | |
|---|---|---|
| Cable Side | MSTB2.5/5-STF-5.08 AU M | Enclosed in standard package Manufactured by PHOENIX CONTACT |
| Gateway Unit Side | MSTB2.5/5-GF-5.08 AU | |

| Pin No. | Signal Name (Color) | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | V- (Black) | Power Supply Cable - Side | |
| 2 | CAN L (Blue) | Communication Data Low Side | |
| 3 | Shield (None) | Shield | Dedicated cable for DeviceNet |
| 4 | CAN H (White) | Communication Data High Side | |
| 5 | V+ (Red) | Power Supply Cable + 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 [5] Wiring Layout for Fieldbus.]*

2. Wiring

# *RCP6S* *Fieldbus Communication*

2) CC-Link Type



Shield (SLD)
YW (DG)
WT (DB)
BL (DA)
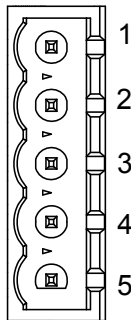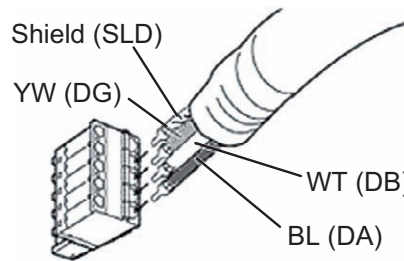


Front view of
connector on
gateway unit side

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

| Pin No. | Signal Name (Color) | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | DA (Blue) | Communication Line A | |
| 2 | DB (White) | Communication Line B | |
| 3 | DG (Yellow) | Digital GND | |
| 4 | SLD | Connect the shield of the shielded cable (Connect the FG of the 5 pins and controller FG internally) | Dedicated cable for CC-Link |
| 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 [5] Wiring Layout for Fieldbus.]*

3)  PROFIBUS-DP Type

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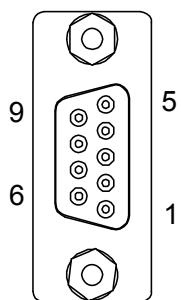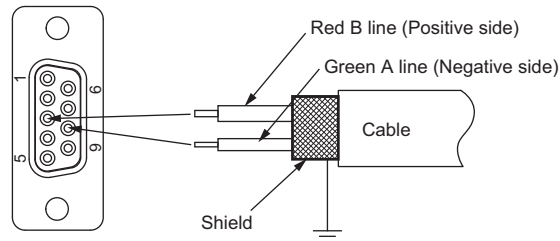




Front view of
connector on
gateway unit side

| Connector Name | PROFIBUS-DP Connector | |
|---|---|---|
| Cable Side | 9-Pin D Sub Connector (Male) | Please prepare separately |
| Gateway Unit Side | 9-Pin D Sub Connector (Female) | |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | NC | Disconnected | Dedicated cable for PROFIBUS-DP |
| 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 between A-line and B-line if the unit comes to the end of the network. [Refer to 2.2 [5] Wiring Layout for Fieldbus.]*

4) EtherNet/IP Type
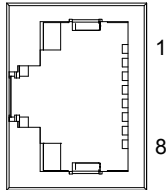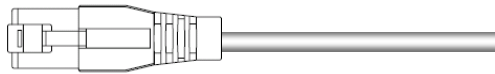
| Connector Name | EtherNet/IP Connector | |
|---|---|---|
| Cable Side | 8P8C Modular Plug | Please prepare separately |
| Gateway Unit Side | 8P8C Modular Jack | |

| Pin No. | Signal Name (Color) | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | TD+ | Data Sending + | For EtherNet cable, use a straight STP cable that possesses the performance of Category 5e or more. |
| 2 | TD- | Data Sending - | |
| 3 | RD+ | Data Receiving + | |
| 4 | - | Not to be used | |
| 5 | - | Not to be used | |
| 6 | RD- | Data Receiving - | |
| 7 | - | Not to be used | |
| 8 | - | Not to be used | |

Front view of connector on gateway unit side

5) EtherCAT Type

| Connector Name | EtherCAT Connector | |
|---|---|---|
| Cable Side | 8P8C Modular Plug | Please prepare separately |
| Gateway Unit Side | 8P8C Modular Jack | |

| Pin No. | Signal Name (Color) | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | TD+ | Data Sending + | For EtherCAT cable, use a straight STP cable that possesses the performance of Category 5e or more. |
| 2 | TD- | Data Sending - | |
| 3 | RD+ | Data Receiving + | |
| 4 | - | Not to be used | |
| 5 | - | Not to be used | |
| 6 | RD- | Data Receiving - | |
| 7 | - | Not to be used | |
| 8 | - | Not to be used | |

Front view of connector on gateway unit side

In and out are determined on the communication port. Be careful not to plug in the communication cable in the wrong way.

# RCP6S *Fieldbus Communication*

6) PROFINET-IO Type
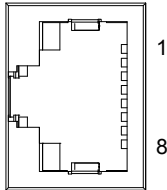


| Connector Name | PROFINET Connector | |
|---|---|---|
| Cable Side | 8P8C Modular Plug | Please prepare separately |
| Gateway Unit Side | 8P8C Modular Jack | |

Front view of connector on gateway unit side

| Pin No. | Signal Name (Color) | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | TD+ | Data Sending + | For EtherNet cable, use a straight STP cable that possesses the performance of Category 5 or more. |
| 2 | TD- | Data Sending - | |
| 3 | RD+ | Data Receiving + | |
| 4 | - | Not to be used | |
| 5 | - | Not to be used | |
| 6 | RD- | Data Receiving - | |
| 7 | - | Not to be used | |
| 8 | - | Not to be used | |

# RCP6S *Fieldbus Communication*

## 2.4  Wiring Method (Hub Unit)

### 2.4.1  Connection with the Gateway Unit

(1) Hub Power Supply Connector
It is a connector to supply 24V DC motor power from the gateway to a hub unit.

A1  B1

A3  B3
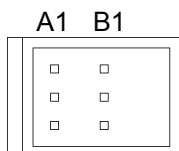
Front view of
connector on
hub unit side

| Connector Name | Hub Power Supply Connector | |
|---|---|---|
| Cable Side | J11DF-06V-KX | (JST Mfg. Co., Ltd.) |
| Hub Unit Side | S06B-J11DK-TXR | (JST Mfg. Co., Ltd.) |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| A1 | GND | 0V | |
| A2 | GND | 0V | |
| A3 | GND | 0V | Cable dedicated for IAI products |
| B1 | MP | Motor Power Supply 24V DC | |
| B2 | MP | Motor Power Supply 24V DC | |
| B3 | MP | Motor Power Supply 24V DC | |

(2) Hub Control Connector
It is a connector to supply power and control signals (24V DC control power supply, communication line, brake release signal and emergency stop status) from the gateway to hub unit.

11 7
13    3
12
8 4

Front view of
connector on
hub unit side

| Connector Name | Hub Control Connector | |
|---|---|---|
| Cable Side | DF62C-13S-2.2C | Manufactured by Hirose Electric Co., Ltd. |
| Hub Unit Side | DF62-13P-2.2DS | Manufactured by Hirose Electric Co., Ltd. |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | CP | Control Power Supply DC24V | |
| 2 | AM_SD- | Serial Communication Line For Automonitor - | |
| 3 | CT_SD- | Control Serial Communication Line - | |
| 4 | BK | Brake Release | |
| 5 | EMGS | Emergency Stop Status | |
| 6 | AM_SD+ | Serial Communication Line For Automonitor + | |
| 7 | CT_SD+ | Control Serial Communication Line + | Cable dedicated for IAI products |
| 8 | NC | Disconnected | |
| 9 | NC | Disconnected | |
| 10 | GND | 0V | |
| 11 | GND | 0V | |
| 12 | FG | Frame Ground | |
| 13 | NC | Disconnected | |

## 2.4.2 Connection with the Actuator

Axis Control Connector

It is a connector to supply power and control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from the hub unit to actuator.

| Connector Name | Axis Control Connector | |
|---|---|---|
| Cable Side | DF62C-13S-2.2C | Manufactured by Hirose Electric Co., Ltd. |
| Hub Unit Side | DF62-13P-2.2DS | Manufactured by Hirose Electric Co., Ltd. |

Front view of connector on hub unit side

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | CP | Control Power Supply DC24V | Cable dedicated for IAI products |
| 2 | AM_SD- | Serial Communication Line For Automonitor - | |
| 3 | CT_SD- | Control Serial Communication Line - | |
| 4 | BK | Brake Release | |
| 5 | EMGS | Emergency Stop Status | |
| 6 | AM_SD+ | Serial Communication Line For Automonitor + | |
| 7 | CT_SD+ | Control Serial Communication Line + | |
| 8 | MP | Motor Power Supply 24V DC | |
| 9 | MP | Motor Power Supply 24V DC | |
| 10 | GND | 0V | |
| 11 | GND | 0V | |
| 12 | FG | Frame Ground | |
| 13 | NC | Disconnected | |

## 2.4.3 Brake Release Switch

Four units of compulsory brake release switch are equipped, which can be operated at hand.

| Symbol | Switch Model | Remarks |
|---|---|---|
| RLS | CF-LD-1DC6-AG2W (Manufactured by Fujisoku) | At compulsory brake release |
| NOM | | In normal condition |



AXIS0 : BK0

AXIS1 : BK1

AXIS2 : BK2

AXIS3 : BK3

RLS ← NOM
release

# **RCP6S** *Fieldbus Communication*
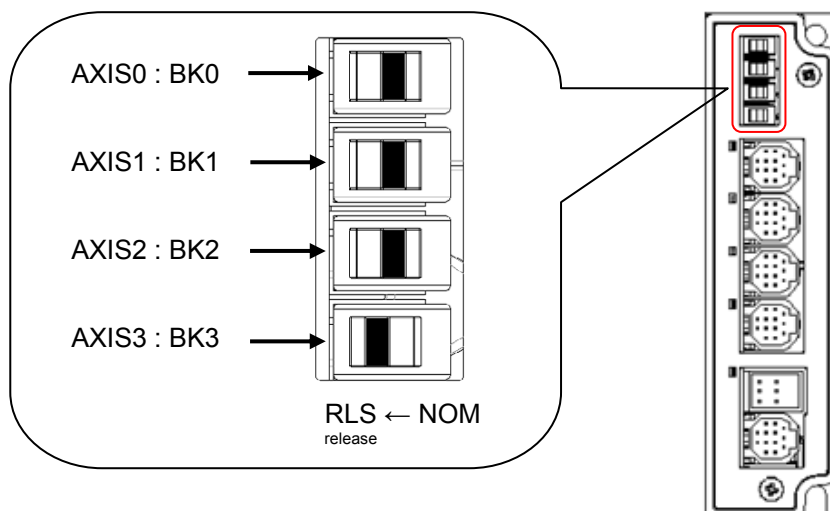
## 2.5   Wiring Method (RCP6S Gateway Controllers)

### 2.5.1   Connection with the Gateway Unit/Hub Unit

Power Supply Connector
It is a connector to supply power and send control signals (control power 24V DC, motor power 24DC, communication line, brake release signal and emergency stop status) from the gateway unit or hub unit to controllers for RCP6S Gateway.
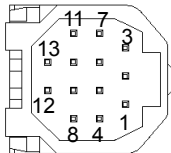
| Connector Name | Power Supply Connector | |
|---|---|---|
| Cable Side | DF62C-13S-2.2C | Manufactured by Hirose Electric Co., Ltd. |
| Controller Side | DF62-13P-2.2DS | Manufactured by Hirose Electric Co., Ltd. |

Front view of connector on RCP6S gateway controller side

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | CP | Control Power Supply DC24V | |
| 2 | AM_SD- | Serial Communication Line For Automonitor - | |
| 3 | CT_SD- | Control Serial Communication Line - | |
| 4 | BK | Brake Release | |
| 5 | EMGS | Emergency Stop Status | |
| 6 | AM_SD+ | Serial Communication Line For Automonitor + | Cable dedicated for IAI products |
| 7 | CT_SD+ | Control Serial Communication Line + | |
| 8 | MP | Motor Power Supply 24V DC | |
| 9 | MP | Motor Power Supply 24V DC | |
| 10 | GND | 0V | |
| 11 | GND | 0V | |
| 12 | FG | Frame Ground | |
| 13 | NC | Disconnected | |

## 2.5.2 Connection with the Actuator/ Connector Conversion Unit

Axis Control Connector

It is a connector to supply power and send control signals (control power 24V DC, motor power 24V DC, communication line, brake release signal and emergency stop status) from the controllers for RCP6S Gateway to actuators or connector conversion units.
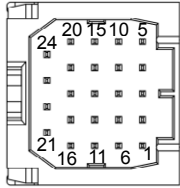
Front view of connector on RCP6S gateway controller side

| Connector Name | Axis Control Connector | |
|---|---|---|
| Cable Side | DF62C-24S-2.2C | Manufactured by Hirose Electric Co., Ltd. |
| Controller Side | DF62-24P-2.2DS | Manufactured by Hirose Electric Co., Ltd. |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | A+ | Encoder + A-Phase Input | |
| 2 | BK- | Brake Release - Side | |
| 3 | φA | Motor Drive Line A-Phase | |
| 4 | φ/A | Motor Drive Line /A-Phase | |
| 5 | VMM | Motor Power Supply Line | |
| 6 | A- | Encoder - A-Phase Input | |
| 7 | GND | Ground | |
| 8 | LS+ | Limit Switch + Side | |
| 9 | VMM | Motor Power Supply Line | |
| 10 | φB | Motor Drive Line B-Phase | |
| 11 | B+ | Encoder + B-Phase Input | |
| 12 | SD+ | Battery-less Absolute Communication Line + | Cable dedicated for IAI products |
| 13 | LSGND | Grounding for Limit Switch Negative | |
| 14 | LS- | Limit Switch - Side | |
| 15 | φ/B | Motor Drive Line /B-Phase | |
| 16 | B- | Encoder - B-Phase Input | |
| 17 | SD- | Battery-less Absolute Communication Line - | |
| 18 | VPS | Encoder Line Driver Enable Output | |
| 19 | NC | Disconnected | |
| 20 | BK+ | Brake Release + Side | |
| 21 | VCC | Encoder Power Supply 5V | |
| 22 | NC | Disconnected | |
| 23 | NC | Disconnected | |
| 24 | FG | Frame Ground | |

## 2.5.3   Connection of Teaching Tool

Connect an teaching tool such as the PC software.

SIO Connector
  Teaching pendant, PC software connector.

Front view of
connector on
RCP6S gateway
controller side

| Connector Name | SIO Connector | Remarks |
|---|---|---|
| Cable Side | miniDIN   8pin |  |
| Controller Side | TCS7587-0121077 | Manufactured by Hosiden Corporation |

| Pin No. | Signal Name | Description | Applicable Cable Diameter |
|---|---|---|---|
| 1 | SGA | Teaching Tool Signal + | |
| 2 | SGB | Teaching Tool Signal - | |
| 3 | 5V | For Teaching Tool Power Supply | |
| 4 | ENB | Enable Signal Input | |
| 5 | EMGA | Emergency Stop Signal A | Cable dedicated for IAI products |
| 6 | 24V | For Teaching Tool Power Supply | |
| 7 | 0V | 0V | |
| 8 | EMGB | Emergency Stop Signal B | |
| Shell | 0V | 0V | |

⚠ *Caution: Do not attempt connect the device to the same SIO network as the SEP related controllers such as MSEP.*

# Chapter 3    Operation

## 3.1    Basic Operation

### 3.1.1    Basic Operation Methods

RCP6S actuator is to be controlled with the fieldbus by using the gateway unit and hub units. There are various types of actuators including slider type, wide slider type, rod type, wide rod type, radial cylinder type and table type. The same operation control method is applicable unless particular descriptions are contained in this manual.

Example for Basic Wiring
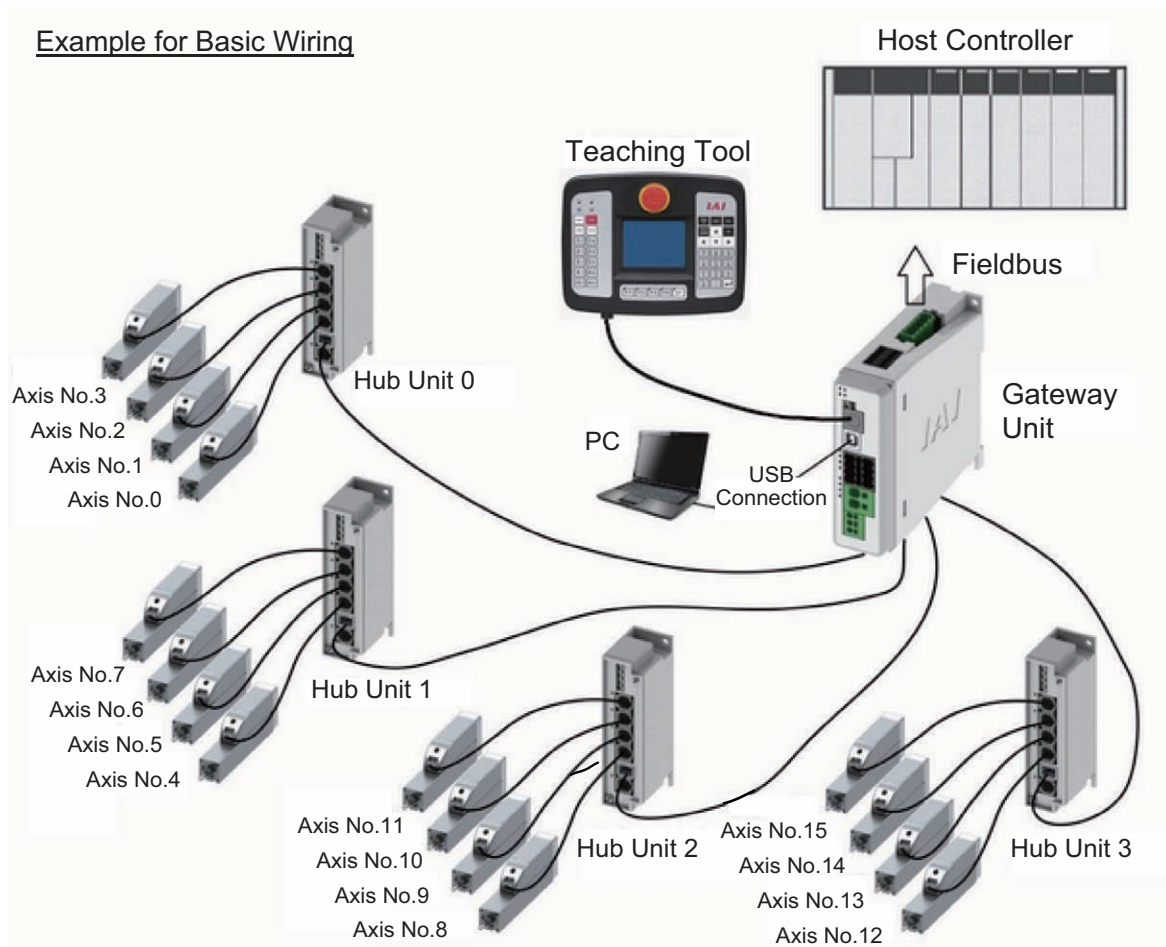


It is available to have a controller for RCP6S Gateway (RCM-P6PC, RCM-P6AC or RCM-P6DC) instead of RCP6S actuator connected to a hub unit or a gateway unit and connect an actuator of RCP2 to 6, RCA/RCA2 and RCD. In this case, the way to control the operation should be the same unless otherwise specified.

[Basic Operation Procedures]

| Initial Setting |

[1]  Operation Mode Setting [Refer to Sections 3.2.1 and 3.8]
Establish the settings for those such as the slave addresses in the Fieldbus using Gateway Parameter Setting Tool. Establish the settings of the operation mode for all the axes.
1)  Establish the setting following the procedure described in Section 3.2.1.
All the connected axes will be in the same operation mode.
2)  Setting the gateway parameters to suit the system to be used.
Establish such conducting as the calendar function (clock setting) use or the speed unit change in Direct Indication Mode.

[2]  Parameter Settings [Refer to Sections 3.2.2]
Establish the parameter settings on all the connected axes by using a teaching tool such as the PC software.
Set the zone (Parameters No.1 and 2) and soft limit (Parameter No.3 and 4) that suit to the system.
[Refer to Chapter 8 Parameter]

[3]  Setting of Position Data [Refer to Sections 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.*

[4]  Fieldbus Settings [Refer to Sections 3.4.1 and 3.4.2]
Assign RCP6S gateway to PLC (master unit).
[Refer to the instruction manuals for the master unit and PLC]

[5]  Link to Network
1)  Put the operation mode setting switch on the front panel of RCP6S gateway unit to AUTO side and reboot the power. (By putting to AUTO, Fieldbus 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]. While MON Signal is ON, control from fieldbus is available.
*Note 1: By referring to 3.9 Fieldbus status LEDs display, confirm that the communication is established in the normal condition.*
*Note 2: Refer to 3.4.2 Control Signals of Gateway.*

[6]  Operation Control in Each Operation Mode [Refer to Sections 3.4.3 to 3.4.8]
1)  Send the information of the target position, speed, acceleration/deceleration, etc. from PLC (master unit) to the RCP6S gateway.
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.

● Operation Mode Available

6 types of operation modes are available to select from. The settings are to be established with Gateway Parameter Setting Tool. Shown below are the outline.

| Operation Mode | Contents | Overview |
|---|---|---|
| Simple Direct Mode | The target position can be indicated directly by inputting a value. Also, monitoring of the current position is available in 0.01mm unit. Those other than the target position are to be indicated in the position table, and the setting can be done for 768 points at maximum. |  |
| Positioner 1 Mode | The 768 points of position data can be registered at the maximum and is able to stop at the registered positions. Also, monitoring of the current position is available in 0.01mm unit. | |
| Direct Indication Mode | The target position, speed acceleration/deceleration and pressing current limit can be indicated with inputting a number. As well as monitoring of the current position in 0.01mm unit, monitoring of current speed and command current is also available |  |
| Positioner 2 Mode | This is the operation mode of the position data of 768 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. |  |
| Positioner 5 Mode | This is the operation mode of the position data of 16 points at maximum set in the position table. It is a mode that enabled to monitor the current position in 0.1mm unit by number of position table from Positioner 2 Mode. |  |

### 3.1.2 Relation between Axis Number and PLC Address Domain (Left-Justification Feature)

There are axis numbers allocated in advance on the gateway unit slot and the hub unit slot. The relation between the axis number and the PLC address domain differs as stated below depending on the fieldbus I/O domain left-justification setting feature (hereafter stated as the left-justification setting feature).

(Note)    The left-justification setting is to be established in Gateway Parameter Setting Tool (Ver. 2.4.1.0 or later).
Refer to [3.2.1 Operation Mode Setting] and [3.8 Gateway Parameter setting Tool]

(1) When Left-Justification Setting Feature is set "Invalid"
    The PLC address domain of the axis not connected is to be an unoccupied domain.

(Example for Connection) When Axis No. 5, 6, 7 and 11 are not connected;
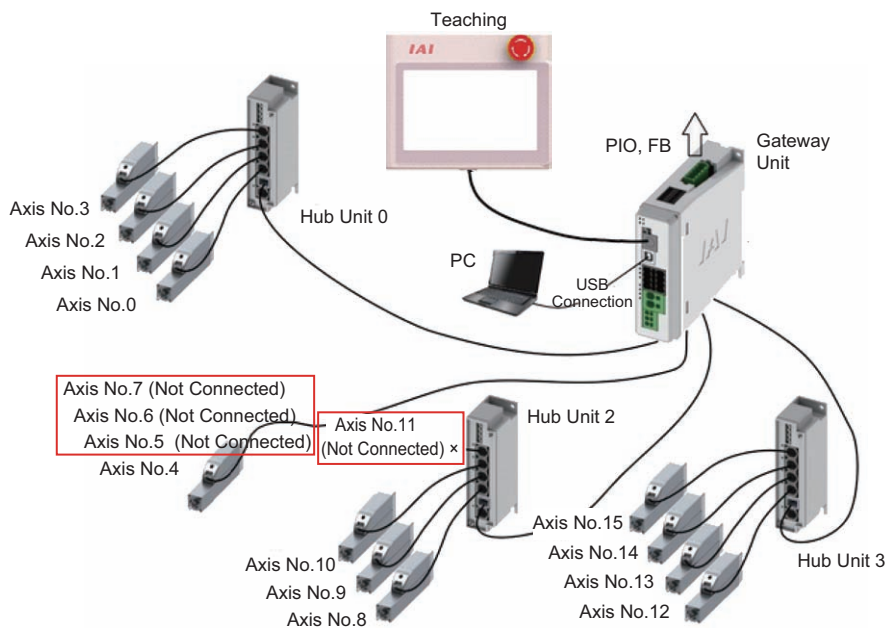


| Left-Justification Feature |
|---|
| Invalid |

| PLC Address Area | |
|---|---|
| Gateway Unit + Command Area | |
| Axis No.0 area | Connection |
| Axis No.1 area | Connection |
| Axis No.2 area | Connection |
| AxisNo.3 area | Connection |
| Axis No.4 area | Connection |
| Axis No.5 area | Unoccupied |
| Axis No.6 area | Unoccupied |
| Axis No.7 area | Unoccupied |
| Axis No.8 area | Connection |
| Axis No.9 area | Connection |
| Axis No.10 area | Connection |
| Axis No.11 area | Unoccupied |
| Axis No.12 area | Connection |
| Axis No.13 area | Connection |
| Axis No.14 area | Connection |
| Axis No.15 area | Connection |

(Note)    Refer to [3.4.1 PLC Address Construction by Each Operation Mode] for details of the PLC address domain.

# RCP6S *Fieldbus Communication*

(2) When Left-Justification Setting Feature is set "Valid (without Alarm)" or "Valid (with Alarm)
The PLC address domain of the axes set for left-justification should be justified to the left.

(Example for Connection 1) When Axis No. 5, 6, 7 and 11 are set to be left-justified as Axis
No. 5, 6, 7 and 11 are not connected

| Left-Justification | |
|---|---|
| Axis No.0 | Invalid |
| Axis No.1 | Invalid |
| Axis No.2 | Invalid |
| Axis No.3 | Invalid |
| Axis No.4 | Invalid |
| Axis No.5 | Valid |
| Axis No.6 | Valid |
| Axis No.7 | Valid |
| Axis No.8 | Invalid |
| Axis No.9 | Invalid |
| Axis No.10 | Invalid |
| Axis No.11 | Valid |
| AxisNo.12 | Invalid |
| Axis No.13 | Invalid |
| Axis No.14 | Invalid |
| Axis No.15 | Invalid |

| PLC Address Area | |
|---|---|
| Gateway Unit + Command Area | |
| Axis No.0 area | Connection |
| Axis No.1 area | Connection |
| Axis No.2 area | Connection |
| AxisNo.3 area | Connection |
| Axis No.4 area | Connection |
| Axis No.8 area | Connection |
| Axis No.9 area | Connection |
| Axis No.10 area | Connection |
| Axis No.12 area | Connection |
| Axis No.13 area | Connection |
| Axis No.14 area | Connection |
| Axis No.15 area | Connection |
| - | Unoccupied |
| - | Unoccupied |
| - | Unoccupied |
| - | Unoccupied |

(Example for Connection 2) When Axis No. 5, 6 and 7 are set to be left-justified as Axis No. 5,
6 and 7 are not connected, but Axis No. 11 is not to be set
left-justified (in such case as to connect Axis No. 11 later)

| Left-Justification | |
|---|---|
| Axis No.0 | Invalid |
| Axis No.1 | Invalid |
| Axis No.2 | Invalid |
| Axis No.3 | Invalid |
| Axis No.4 | Invalid |
| Axis No.5 | Valid |
| Axis No.6 | Valid |
| Axis No.7 | Valid |
| Axis No.8 | Invalid |
| Axis No.9 | Invalid |
| Axis No.10 | Invalid |
| Axis No.11 | Invalid |
| AxisNo.12 | Invalid |
| Axis No.13 | Invalid |
| Axis No.14 | Invalid |
| Axis No.15 | Invalid |

| PLC Address Area | |
|---|---|
| Gateway Unit + Command Area | |
| Axis No.0 area | Connection |
| Axis No.1 area | Connection |
| Axis No.2 area | Connection |
| AxisNo.3 area | Connection |
| Axis No.4 area | Connection |
| Axis No.8 area | Connection |
| Axis No.9 area | Connection |
| Axis No.10 area | Connection |
| Axis No.11 area | Unoccupied |
| Axis No.12 area | Connection |
| Axis No.13 area | Connection |
| Axis No.14 area | Connection |
| Axis No.15 area | Connection |
| - | Unoccupied |
| - | Unoccupied |
| - | Unoccupied |

(Note) As Example for Connection 2 shows, when unconnected axes are partially turned invalid,
set the left-justification setting feature "Valid (without Alarm)".
Operation will not be performed with 896 Connected Unit Construction Error Alarm
generated if set to "Valid (with Alarm)".

## 3.2 Initial Setting

Use Gateway Parameter Setting Tool (Ver. 2.4.1.0 or later) in order to perform the setting for Operation Mode.

⚠ *Caution:* *Although the parameter settings of RCP6S Gateway Unit can be conducted on Gateway Parameter Setting Tool (Ver. 2.2.0.0 or later), as the setting and cancellation of the left-justification setting feature can only be conducted in Ver. 2.4.1.0 or later, setting conducted on the tool with Ver. 2.2.0.0 to Ver. 2.4.1.0 may cause unexpected operation.*

Shown below is the process for the setup. Follow the instruction to conduct the setting properly. Refer to [3.8 About Gateway Parameter Setting Tool] for details.

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

Make sure the system I/O connector wires and operation mode setting switch are in MANU condition when having the setting done. [Refer to 2. RCP6S Gateway Unit 6), 7)]

### 3.2.1 Operation Mode Setting (Setting in Gateway Parameter Setting Tool)

[Step 1]    Connect between the PC and SIO connector on RCP6S Gateway Unit with the cable enclosed in the RC PC Software, or connect the USB connector by USB cable connection and start the gateway parameter setting tool.
The following window appears. Select "RCP6 GW" and click "OK".

# RCP6S Fieldbus Communication
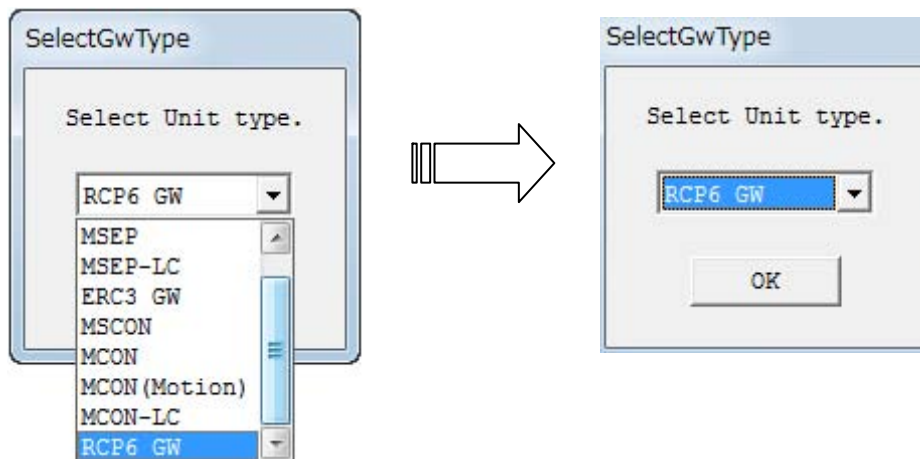
[Step 2]    RCP6S GW is detected, it may cause the main window opens.



Main windows (Initial condition)

[Step 3]    Reading is started from RCP6S GW to PC. Click on the "Read" button and a confirmation window appears. Click on the "Yes (Y)" button.
If the writing is finished in normal condition, writing complete window appears. Click "OK".

3. Operation
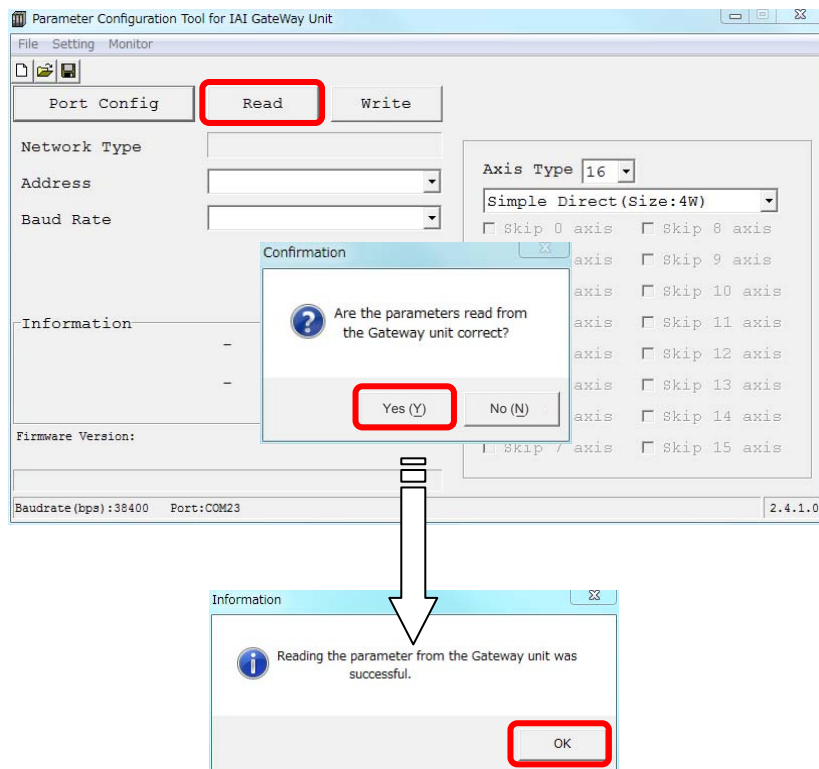
[Step 4]    The parameters input to RCP6S GW are listed as shown below. Indicate the Fieldbus node addresses (station) in RCP6S GW in Address.
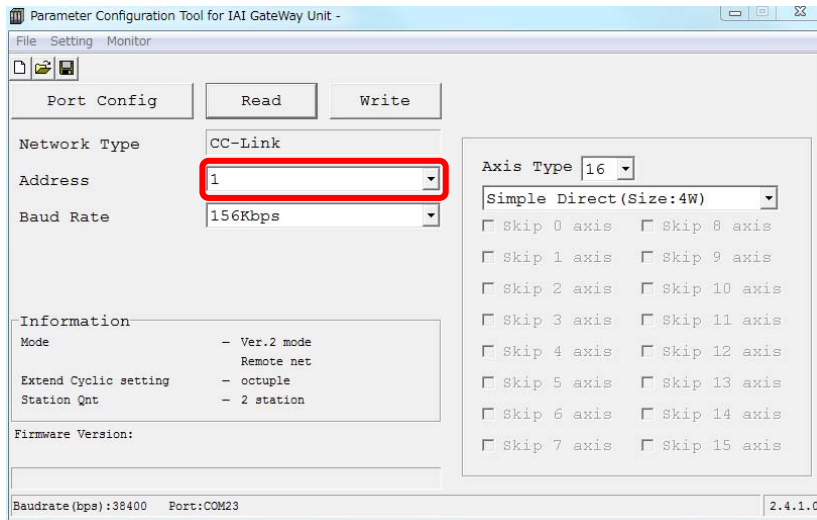


> ⚠ *Caution:*
>    *In the following slave, set the value the number of occupied station is added to the current station number.*
>
> 

[Step 5]    To be conducted for EtherNet/IP type (If not applied, go to Step 6)
Click on Setting in the menu and select EtherNet/IP Setting, and the setting window of the IP addresses, subnet mask and default gateway. Establish the setting that suits to your use.
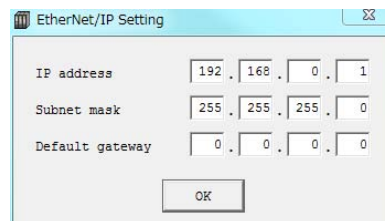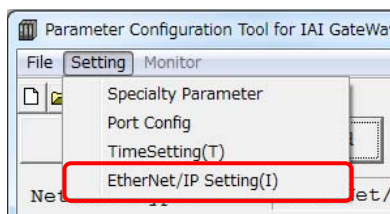
[Step 6] To be conducted for PROFINET-IO type (If not applied, go to Step 7)
If parameters are read (Step 3) from MCON to the PC in PROFINET-IO Type, the occupation information will be displayed on the center left of the main screen and MAC address on the right bottom. Establish the setting in the host master with these numbers.

```
┌Information────────────────────┐
 Number of 4W modules(Out)   - 18

 Number of 4W modules(In)    - 18

Firmware Version:

Baudrate(bps):38400   Port:COM23          MAC ID  00 00 00 00 00 00  2.4.1.0
```

☐ Skip 3 axis   ☐ Skip 11 axis
☐ Skip 4 axis   ☐ Skip 12 axis
☐ Skip 5 axis   ☐ Skip 13 axis
☐ Skip 6 axis   ☐ Skip 14 axis
☐ Skip 7 axis   ☐ Skip 15 axis
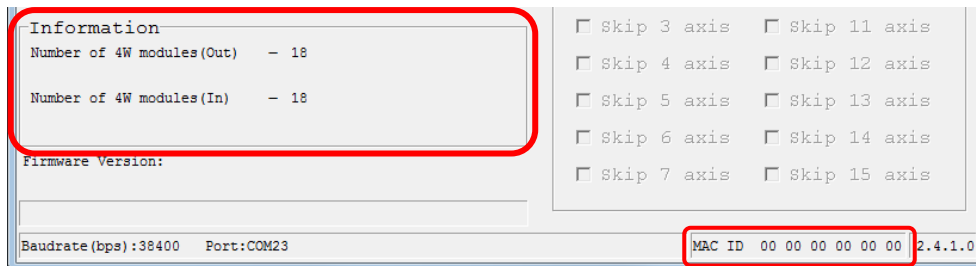
[Step 7] Select an operation mode for number of connected axes (a value of final axis number + 1) and drive unit.
The operation mode selected in this section will be applied to all the connected axes.

```
Parameter Configuration Tool for IAI GateWay Unit -
File  Setting  Monitor

  Port Config      Read      Write

Network Type    CC-Link
                                       Axis Type 16 ▼
Address         1          ▼           Simple Direct(Size:4W) ▼
Baud Rate       10Mbps     ▼

┌Information─────────────────┐
Mode                   - Ver.2 mode
                         Remote net
Extend Cyclic setting  - octuple
Station Qnt            - 2 station

Firmware Version:

Baudrate(bps):38400   Port:COM23            2.2.0.0
```

## Maximum Connectable Axes

| Fieldbus \ Mode | Direct Number Indication Mode | Simple Direct Mode | Positiner 1 Mode | Positiner 2 Mode | Positiner 3 Mode | Positiner 5 Mode |
|---|---|---|---|---|---|---|
| CC-Link | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| DeviceNet | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| PROFIBUS-DP | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| EtherNet/IP | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| EtherCAT | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| PROFINET-IO | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |

⚠ Caution: Max. Connectable Axis Number when Using Direct Indication Mode in those other than CC-Link

• When Left-Justification Setting Feature Used
The maximum connectable number of axes should be eight (PLC address: Axis No. 0 Domain to Axis No. 7 Domain).
• When Left-Justification Setting Feature Not To Be Used
The maximum connectable number of axes should be eight when two units of hub unit are used and two when hub unit not used.

[Step 8]   Click on Setting in Menu and select Specialty Parameter. As GW Parameter Setting window opens, select GWmode Select.
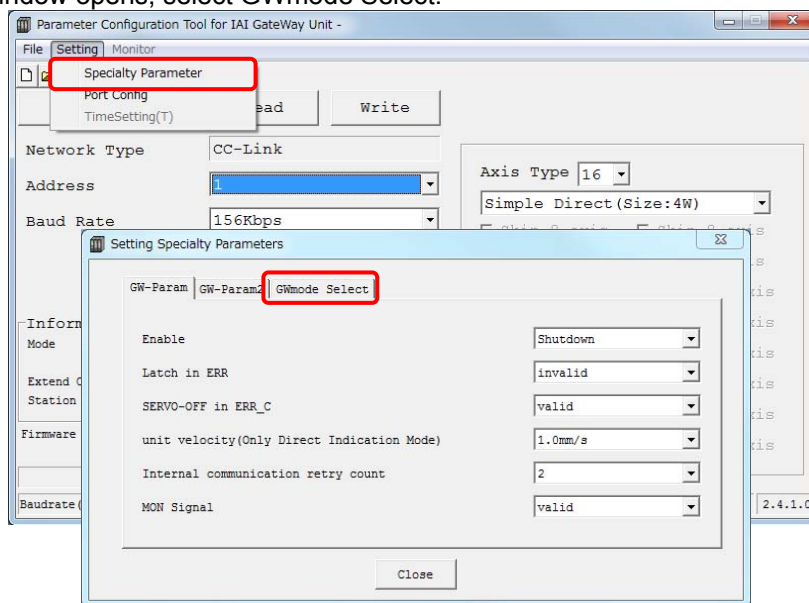


[Step 9]   Select invalid when the left-justification setting is not to be used.
When the left-justification setting is to be used, select valid (without alarm) or valid (with alarm) in the fieldbus I/O domain left-justification setting in GWmode Select.
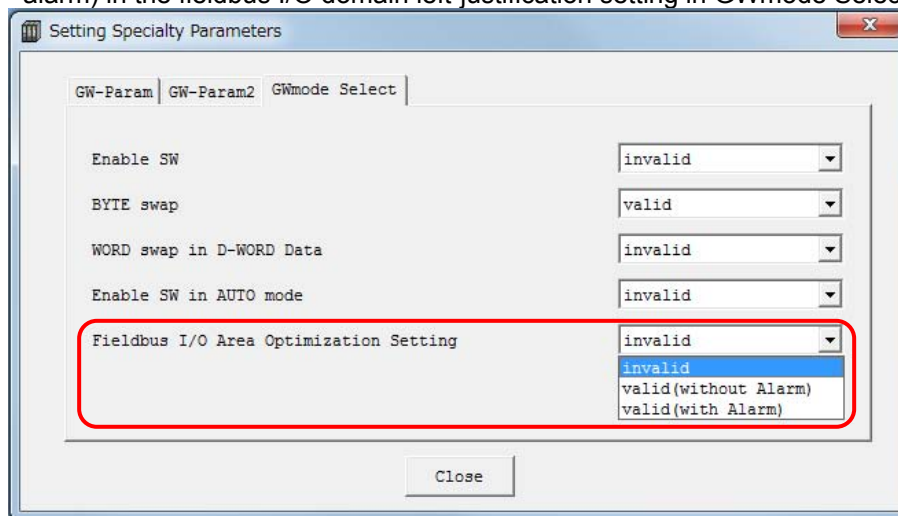


Fieldbus I/O Area Optimization Setting Function

| Iivalid | Left-justification setting feature is not to be used. |
|---|---|
| Valid (without Alarm) | Left-justification setting feature is to be used. An alarm will not be output when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status. |
| Valid (with Alarm) | Left-justification setting feature is to be used. "896 Connected Unit Construction Error" is occurred when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status. |

(Note)   Select "Valid (with Alarm)" when unconnected axes should partially not to be left-justified. Operation will not be performed with "896 Connected Unit Construction Error" alarm generated.

[Step 10]  When Using Left-Justification Setting Feature (Go to Step 11 when not to be used)

(Example for Connection) When Axis No. 5, 6, 7 and 11 are not connected;



**Before Left-Justification Setting**

| PLC Address Area | |
|---|---|
| Gateway Unit + Command Area | |
| Axis No.0 area | Connection |
| Axis No.1 area | Connection |
| Axis No.2 area | Connection |
| AxisNo.3 area | Connection |
| Axis No.4 area | Connection |
| Axis No.5 area | Unoccupied |
| Axis No.6 area | Unoccupied |
| Axis No.7 area | Unoccupied |
| Axis No.8 area | Connection |
| Axis No.9 area | Connection |
| Axis No.10 area | Connection |
| Axis No.11 area | Unoccupied |
| Axis No.12 area | Connection |
| Axis No.13 area | Connection |
| Axis No.14 area | Connection |
| Axis No.15 area | Connection |

Put a check mark ☑ to the axis to be left-justified, and remove a check mark if not.
In this example for connection, check marks are put on Axis No. 5, Axis No. 6,
Axis No. 7 and Axis No. 11, which are not to be connected.

## Left-Justification Setting



| Left-Justification Setting | |
|---|---|
| Axis No.0 area | Invalid |
| Axis No.1 area | Invalid |
| Axis No.2 area | Invalid |
| AxisNo.3 area | Invalid |
| Axis No.4 area | Invalid |
| Axis No.5 area | Valid |
| Axis No.6 area | Valid |
| Axis No.7 area | Valid |
| Axis No.8 area | Invalid |
| Axis No.9 area | Invalid |
| Axis No.10 area | Invalid |
| Axis No.11 area | Valid |
| Axis No.12 area | Invalid |
| Axis No.13 area | Invalid |
| Axis No.14 area | Invalid |
| Axis No.15 area | Invalid |

**After Left-Justification Setting**

| PLC Address Area | |
|---|---|
| Gateway Unit + Command Area | |
| Axis No.0 area | Connection |
| Axis No.1 area | Connection |
| Axis No.2 area | Connection |
| AxisNo.3 area | Connection |
| Axis No.4 area | Connection |
| Axis No.8 area | Connection |
| Axis No.9 area | Connection |
| Axis No.10 area | Connection |
| Axis No.11 area | Unoccupied |
| Axis No.12 area | Connection |
| Axis No.13 area | Connection |
| Axis No.14 area | Connection |
| - | Unoccupied |
| - | Unoccupied |
| - | Unoccupied |
| - | Unoccupied |

⚠ *Caution:  It is available to put a check mark ☑ to axes which are connected.
In that case, the PLC address domain for the axis with a check mark will be
removed, and the next axis and behind are to be left-justified. Be careful not to put
an unexpected check mark accidently.*

[Step 11]　Write the edited operation mode setting parameters to RCP6S GW. Once "Write" button in the figure below is pressed, the confirmation message window appears. Click on "Yes (Y)" button.
If the writing is finished in normal condition, writing complete window appears. Click "OK".
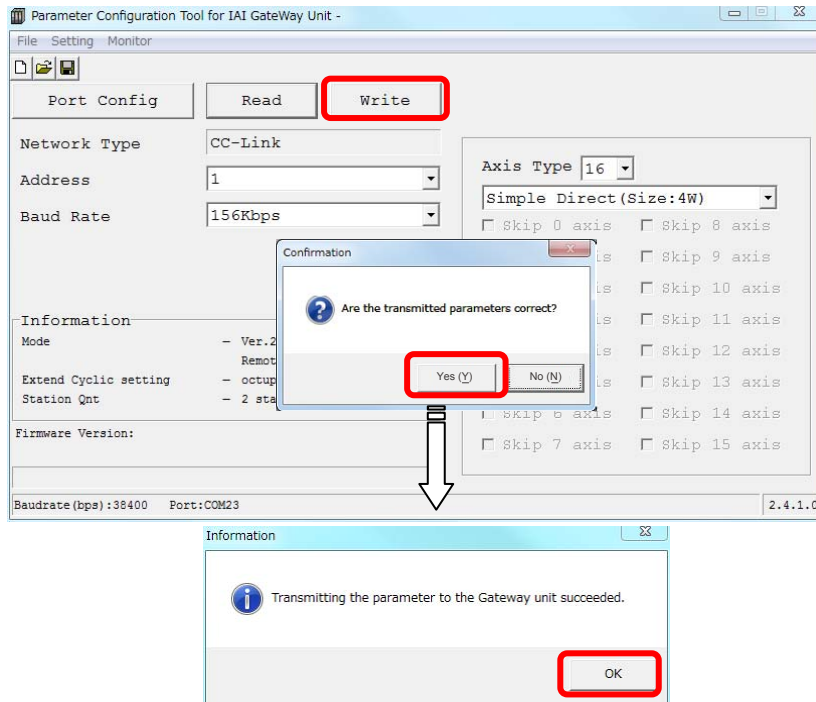


[Step 12]　A confirmation window for Gateway Unit reboot opens. Click "Yes (Y)" to accept the reboot.
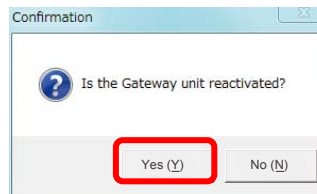


[Step 13]　After rebooting, a confirmation window for parameter reading appears for confirmation of the written contents. Click "Yes (Y)" to accept the reading.
Once the reading process is complete, confirm that the written contents are reflected. If not written properly, do the process again from Step 1.

*Reference:*　*The settings are conducted in the special parameters for the process of communication error, change in setting for enable, speed unit change for Direct Indication Mode. Refer to 3.8 About Gateway Parameter Setting Tool for the details.*

### 3.2.2 Parameter Settings (Setting on RC PC Software)

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.

Parameter settings are to be established with RC PC software (Ver.10.2.0.0 or later) or teching box TB-02/TB-02D (Ver. 1.00 or later) TB-01/TB-01D/TB-01DR/CON-PTA/CON-PDA/ CON-PGA (S) (Ver.2.60 or later).

Parameters should be set to meet the use of the controller prior to operation. Once set, they may not set every operation.
Refer to Chapter 8 Parameter for the parameter types and the details.

3. Operation

## 3.3 Setting of Position Data

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 speed 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) Acceleration [G] | 5) Deceleration [G] | 6) Pressing [%] | 7) Threshold [%] | 8) Positioning width [mm] | 9) Zone+ [mm] | 10) Zone- [mm] | 11) Acceleration/ Deceleration mode | 12) Incremental | 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 | 200.00 | 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 | | | | | | | | | | | | | | | |

> ⚠ Caution: The input value is treated as the angle for the rotary actuator.
> Therefore;
> [mm]→[deg] ·········· 1.2=1.2deg
> [mm/s]→[deg/s]······· 100=100deg/s
> They are treated as above.
> Please note that the display on the screen of a teaching tool such as the PC software is in [mm].

1) Position No.·········· It is the number commanded by PLC in operation command.

> ⚠ Caution: Do not use position No.0 if available positions remains enough.
> At the first servo ON after power ON, the completed position No. output is 0 even if the actuator is not located at position No.0. The actuator enters into the same state as that at positioning to position No.0. The completed position No. output is 0 during movement of the actuator. To use position No.0, get the command history by using the sequence program to check completed position No.0 based on the history.

2) Position [mm] ······ Positioning coordinate value. Enter it as the distance from the home position.
For pitch feed (relative movement = incremental feed), enter the pitch width.
A value with – indicates that the actuator moves toward the home position. A value without – indicates that the actuator moves to be away from the home position.

> ⚠ Caution: (1) In the case of a Gripper Type:
> Set the coordinate value on the single finger basis. Set the value for the movement of one finger from the home position. Stroke information in the specification is shown in the total value of movement distance of the two fingers.
> Therefore, the stroke is 1/2 of what is described in the specifications.
> (2) In the case of a Rotary Type
> Set the coordinate value by an angle from the home.

3) Velocity [mm/s]······ Set the velocity in the operation.
Do not attempt to input a value more than the maximum velocity or less than the minimum velocity [1].
*1    Minimum velocity [mm/s] =
Lead length [mm] / Number of encoder pulse (8192) / 0.001 [sec]

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



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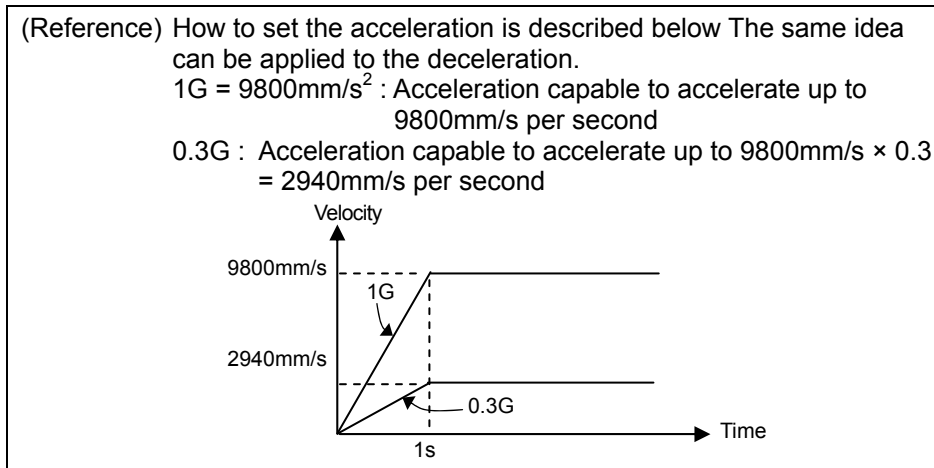
⚠ Caution: (1) Set the velocity, acceleration and deceleration so that they do not exceed the rating values described in the brochure or the catalog or instruction manual of the actuator. The setting that exceeds the rated acceleration/deceleration speed may shorten the actuator life remarkably.
(2) 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 tact time. Contact our company. Inform us of the weight, shape and mounting method of the work and the installation conditions of the actuator.
(4) For the gripper type, have the setting done for the speed and acceleration/deceleration in the basis of one finger. Therefore, note that the relative speed and acceleration/deceleration speed become twice as it is set for the two fingers.

---

6) Pressing [%] ······· Set a value other than 0 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 done in 3) is less than the pressing speed setting value, the pressing operation is performed at this setting value.

---

⚠ Caution: If the pressing speed is changed, the rated pressing force may differ from that specified.
When the pressing speed is changed, make sure to measure the actual pressing force before start using.

7) Threshold [%] ····· Set the threshold value of the pressing torque in %.
If the torque (load current) becomes larger than this setting value during pressing, the detection signal is output. This feature is used to monitor the load current and judge whether the operation is good or not in such an operation as press fitting in pressing.
This feature is limited only to the pulse motor type actuators.
Set to 0 for the servo motor type and brushless DC motor type actuators.

> For RCP6S and RCM-P6PC only
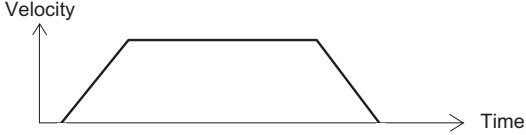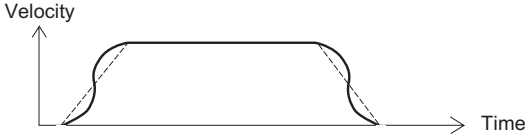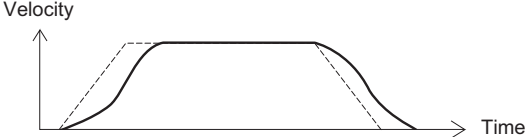
8) Positioning width [mm] ·· In Positioner * Mode, Simple Direct Mode positioning complete signal is output if the remaining moving distance is entered within the zone set here when positioning is performed.
For pressing, the actuator is moved at the setup velocity and acceleration/deceleration in the same way as normal positioning to the position of the coordinate value set in 2) and then performs pressing movement by the data set here.
Set the positioning band more than the minimum unit of the movement amount (movement amount for one pulse of an encoder) of the used actuator.

9) Zone + [mm] [(Note 2)] ········ Set the coordinate value on the positive side at which position zone output signal PZONE is turned ON. PZONE is set to ON in the zone between this value and the coordinate value on the negative side set in 10).
The feature follows the specified position number. It is valid only when the position is specified but invalid in another position operation.

10) Zone - [mm] [(Note 2)] ········· Set the coordinate value on the negative side at which position zone output signal PZONE is turned ON.

*Note 2:  If set to Zone + < Zone -, PZONE Signal turns ON out of the ranges of Zone + and Zone -.*

11) Acceleration/deceleration mode ········ Select a proper acceleration/deceleration pattern depending on the load.

| Set value | Acceleration/Deceleration Pattern | Operation |
|---|---|---|
| 0 | Trapezoid | Velocity / Time |
| 1 | S-shaped Motion (Refer to Caution at S-shaped Motion) | Velocity / Time<br>Set the S-motion rate with parameter No.56. |
| 2 | First-Order Delay Filter (Refer to Caution at First-order Delay Filter) | Velocity / Time<br>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) *S-shaped motion control is invalid in the index mode of the rotary actuator. It will be the trapezoid control even if S-shaped acceleration/deceleration control is indicated.*
3) *Do not use S-shaped acceleration/deceleration control if the setting of the acceleration time or the deceleration time exceeds 2 seconds. It will be the trapezoid control.*
4) *Do not pause on the move during acceleration or deceleration. It will change the speed (acceleration) and may cause a danger.*

⚠ *Caution at First-order Delay Filter:*
1) *Since it requires a speed change during the operation, even if having the position command or direct command that first-order delay filter is set while the actuator is moving, first-order delay filter control cannot be performed and will be the trapezoid control.*
   *Make sure to make a command while the actuator is stopped.*
2) *First-order delay filter control is invalid in the index mode of the rotary actuator. It will be the trapezoid control even if first-order delay filter control is indicated*

12) Incremental·········· Set to 1 for pitch feed (relative movement = incremental feed).
The value set for the position in 1) indicates the pitch feed distance.
With the value set to 0, positioning is defined to the position in 1) based on the 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.*
*When solenoid valve mode 2 is selected, set this to 0. Setting this to 1 causes the position data error to occur.*

13)-1 Transported Load······ Register 4 types of load weights with using the smart tuning, and choose the number from the registered numbers (0 to 3) that is to be used.

┌─────────────────┐
│ For RCP6S and   │
│ RCM-P6PC only   │
└─────────────────┘

From the numbers (load weights) registered in this section, the shortest tact time function calculates the optimum speed and acceleration/deceleration.

[Refer to the instruction manual of smart tuning tool for how to register the load weights and shortest tact time.]

| Set Value | Name |
|-----------|------|
| 0 | Transported Load Pattern No.0 |
| 1 | Transported Load Pattern No.1 |
| 2 | Transported Load Pattern No.2 |
| 3 | Transported Load Pattern No.3 |

13)-2 Gain Set ··············· Six parameters required for servo gain adjustment are collected to be a single set. 4 types of settings are able to be registered and the servo gains can be switched over for each positioning operation. By utilizing Smart Tuning Function [Note 1] in the PC software, the setting close to the optimum can be obtained.

┌─────────────────┐
│ For RCM-P6AC    │
│ only            │
└─────────────────┘

*Note 1 Refer to Chapter 10.4 List of Specifications of Connectable Actuators for the applicable models.*
*It may require the setting of the gain set dedicated for the home-return operation in the case this function is used to have the high-speed setting or the setting to apply a transported weight more than the ratings.*
*For how to set up and the caution items, refer to the instruction manual for RC PC Software.*

[Parameters constructed in 1 set]
• Servo Gain Number (Position Gain)
• Position Feed Forward Gain
• Speed Loop Proportional Gain
• Speed Loop Integral Gain
• Torque Filter Time Constant
• Current Control Band Number

It is able to establish the gain set that corresponds to the position number to be operated to the indicated gain set.

[Refer to "Servo Adjustment" in Section 8.3 for each gain parameter details.]

| Setting | Parameter Set Select | Parameter No. |
|---------|----------------------|---------------|
| 0 | Gain Set 0 | 7, 71, 31 to 33, 54 |
| 1 | Gain Set 1 | 120 to 125 |
| 2 | Gain Set 2 | 126 to 131 |
| 3 | Gain Set 3 | 132 to 137 |

3. Operation

14) Stop mode ········ Automatic servo OFF is enabled after a certain period from the completion of positioning for power saving.
Time setting is to be conducted in Parameter No. 36 to 38 Automatic Servo-off Delay Time 1 to 3, and three types of time are available to select.
Selection is available from 0 to 3 for the RCP6S, RCM-P6AC and RCM-P6DC.
Selection is available from 0 to 7 for RCM-P6PC. However, selection should be made from 0 to 3 in case an actuator equipped with the high-resolution battery-less absolute encoder is connected.
[Refer to 6.1 Automatic Servo-off and Full Servo Functions]

| Setting | Operation after Positioning Complete | Selectable Model |
|---|---|---|
| 0 | Keep the servo ON | All mdels |
| 1 | Automatic servo-off in a certain time (Parameter No. 36 set values) | All mdels |
| 2 | Automatic servo-off in a certain time (Parameter No. 37 set values) | All mdels |
| 3 | Automatic servo-off in a certain time (Parameter No. 38 set values) | All mdels |
| 4 | Full servo control | RCM-P6PC |
| 5 | Full-servo control for a certain time (Parameter No. 36 set values) and then automatically turning servo OFF | RCM-P6PC |
| 6 | Full-servo control for a certain time (Parameter No. 37 set values) and then automatically turning servo OFF | RCM-P6PC |
| 7 | Full-servo control for a certain time (Parameter No. 38 set values) and then automatically turning servo OFF | RCM-P6PC |

⚠ 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). Failure to follow it may cause position shift to occur.
- 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 Suppress No. ⋯⋯⋯ Suppresses vibration (sympathetic vibration) of the load installed on the actuator.
It possesses a capacity to deal with 3 types of vibration.
There are 4 parameters corresponds to 1 type of vibration and they are compiled in 1 set.
Set the parameter set corresponds to the position number necessary for the vibration control in the position table.
[Refer to Chapter 4 Vibration Suppress Control Function.

For RCM-P6AC only

Cannot be used in direct indication mode

| Setting | Vibration Control Frequency (Specific Frequency) | Parameter No. |
|---------|--------------------------------------------------|---------------|
| 0 | Vibration suppress frequency (Natural frequency) | — |
| 1 | Vibration Control Parameter Set 1 | 97 to 100 |
| 2 | Vibration Control Parameter Set 2 | 101 to 104 |
| 3 | Vibration Control Parameter Set 3 | 105 to 108 |

⚠ *Caution:* (1) *The vibration frequency that can be controlled (applicable specific frequency) is from 0.5 to 30Hz.*
(2) *The vibration control is applicable only for the vibration generated by the load of the actuator connected to this controller.*
*Other vibrations cannot be controlled.*
(3) *The vibration control is applicable only for the vibration in the direction of the actuator operation. Vibration in other directions cannot be controlled.*
(4) *The vibration control is not applicable for home-return and pressing operations.*
(5) *If the vibration frequency setting is low, the takt time may become long. The value below approximately 6Hz makes the positioning finishing to take more than 150ms.*

This feature is limited only to RCM-P6PC.
Set to 0 for RCP6S, RCM-P6AC and RCM-P6DC.

## 3.4 Fieldbus Type Address Map

### 3.4.1 PLC Address Construction by Each Operation Mode

The address domain to be occupied differs depending on the operation mode.

• PLC Output → RCP6S GW Input (n is PLC output top word address to RCP6S GW) [Note 1]

| PLC output Area | | Simple Direct Mode | Positioner 1 Mode | Direct Indication Mode | Positioner 2 Mode | Positioner 3 Mode | Positioner 5 Mode | Details |
|---|---|---|---|---|---|---|---|---|
| RCP6S Gateway Control Area | n | Gateway Control 0 | | | | | | 3.4.2 |
| | n+1 | Gateway Control 1 | | | | | | |
| | n+2 to n+7 | Occupied Areas [Note 2] | | | | | | - |
| Connected Axes Control Area | n+8 | Target Position (Axis No.0) | Occupied Area [Note 2] | Target Position (Axis No.0) | Specified Position No. (Axis No.0) | Control Signal/ Position No. (Axis No.0) | Specified Position No. (Axis No.0) | 3.4.3 to 3.4.8 |
| | n+9 | | | | Control Signal (Axis No.0) | Assignment Area for Axis No.1 | Control Signal (Axis No.0) | |
| | 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.1 | |
| | n+11 | Control Signal (Axis No.0) | Control Signal (Axis No.0) | | | Assignment Area for Axis No.3 | | |
| | n+12 | Assignment Area for Axis No.1 | Occupied Area [Note 2] | Speed (Axis No.0) | Assignment Area for Axis No.2 to No.15 (~n+39) | Assignment Area for Axis No.4 | Assignment Area for Axis No.2 to No.15 (~n+39) | |
| | n+13 | | | Acceleration/ Deceleration (Axis No.0) | | Assignment Area for Axis No.5 | | |
| | n+14 | | Assignment Area for Axis No.1 | Pressing Current Limitation Value (Axis No.0) | | Assignment Area for Axis No.6 | | |
| | n+15 | | | Control Signal (Axis No.0) | | Assignment Area for Axis No.7 | | |
| | n+16 to n+23 | Assignment Area for Axis No.2 to No.15 | Assignment Area for Axis No.2 to No.15 | Assignment Area for Axis No.1 | | Assignment Area for Axis No.8 to No.15 | | |
| | n+24 to n+71 | | | Assignment Area for Axis No.2 to No.7 [Note 3] | | | | |

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 This is the domain occupied unconditionally. Therefore, this domain cannot be used for any other purpose.

Note 3 For CC-Link, assignment is available up to Axis No. 15 (~n+135).

◎ In the case of CC-Link
Station Type: Ver.2.00 Remote device station
Extended Cyclic Setting/Occupied Station Number Setting:
Register the information of the occupations displayed on Gateway Parameter Setting Tool to the master unit. Connection cannot be established if information other than occupation is set.
[Refer to 3.2.1 Operation Mode Setting]

The domain of the axis not connected is to be an unoccupied domain when the left-justification setting feature is not to be used.
The domain of the axis number set for the left-justification will be justified to the left when the left-justification setting feature is to be used.

3. Operation

• RCP6S GW Output → PLC Input (n is PLC input top word address from RCP6S GW) (Note 1)

| PLC Input Area | | Simple Direct Mode | Positioner 1 Mode | Direct Indication Mode | Positioner 2 Mode | Positioner 3 Mode | Positioner 5 Mode | Details |
|---|---|---|---|---|---|---|---|---|
| RCP6S Gateway Response Area | n | Gateway Status 0 | | | | | | 3.4.2 |
| | n+1 | Gateway Status 1 | | | | | | |
| | n+2 to n+7 | Occupied Areas (Note 2) | | | | | | - |
| 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 (Axis No.0) | Completed Position No./ Simple Alarm ID (Axis No.0) | 3.4.3 to 3.4.8 |
| | n+9 | | | | Status Signal (Axis No.0) | Assignment Area for Axis No.1 | Status Signal (Axis No.0) | |
| | 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.1 | |
| | n+11 | Status Signal (Axis No.0) | | | | 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 to No.15 (~n+39) | Assignment Area for Axis No.4 | Assignment Area for Axis No.2 to No.15 (~n+39) | |
| | n+13 | | | Occupied Area (axis No.0) | | Assignment Area for Axis No.5 | | |
| | n+14 | | | Alarm Code (Axis No.0) | | Assignment Area for Axis No.6 | | |
| | n+15 | | | Status Signal (Axis No.0) | | Assignment Area for Axis No.7 | | |
| | n+16 to n+23 | Assignment Area for Axis No.2 to No.15 | | Assignment Area for Axis No.1 | | Assignment Area for Axis No.8 to No.15 | | |
| | n+24 to n+71 | | | Assignment Area for Axis No.2 to No.7 (Note 3) | | | | |

*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 This is the domain occupied unconditionally. Therefore, this domain cannot be used for any other purpose.*
*Note 3 For CC-Link, assignment is available up to Axis No. 15 (~n+135).*

◎ In the case of CC-Link
Station Type: Ver.2.00 Remote device station
Extended Cyclic Setting/Occupied Station Number Setting:
Register the information of the occupations displayed on Gateway Parameter Setting Tool to the master unit. Connection cannot be established if information other than occupation is set.
[3.2.1 Operation Mode Setting]

The domain of the axis not connected is to be an unoccupied domain when the left-justification setting feature is not to be used.
The domain of the axis number set for the left-justification will be justified to the left when the left-justification setting feature is to be used.

Refer to "3.1.2 Relation between Axis Number and PLC Address Domain (Left-Justification Feature)" for the left-justification setting feature.

## 3.4.2 Gateway Control Signals (Common for All Operation Modes)

When operating the system with Fieldbus, the axes are controlled via Gateway of RCP6S.
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 RCP6S GW and PLC)

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → PLC (PLC Input) | |
|---|---|---|---|
| Control Signal 0 | n | Status Signal 0 | n |
| Control Signal 1 | n+1 | Status Signal 1 | n+1 |

(1) PLC I/O Signal

PLC Output

1 word = 16 bit

Address n

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control signal 0 | MON | I | RTE | I | I | I | I | I | I | I | I | I | I | I | I | I |

Signal to cancel the remained condition of communication error (ERR-C) during an operation

Signal to activate operation control by communication

Address n+1

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Control signal 1 | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I | I |

PLC Input

1 word = 16 bit

Address n

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status signal 0 | RUN | LERC | ERRT | MOD | ALMH | ALML | I | SEMG | ALMC 128 | ALMC64 | ALMC32 | ALMC16 | ALMC8 | ALMC4 | ALMC2 | ALMC1 |

Each type of control status monitoring output signals

Address n+1

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status signal 1 | LNK15 | LNK14 | LNK13 | LNK12 | LNK11 | LNK10 | LNK9 | LNK8 | LNK7 | LNK6 | LNK5 | LNK4 | LNK3 | LNK2 | LNK1 | LNK0 |

Output of communication available axis number

(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-C during an operation is cancelled if it is ON<br>It is the cancel signal when 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. | – |
| | | | b14 | | | |
| | | | b13 | | | |
| | | | b12 | | | |
| | | | b11 | | | |
| | | | b10 | | | |
| | | | b9 | | | |
| | | | b8 | | | |
| | | | b7 | | | |
| | | | b6 | | | |
| | | | b5 | | | |
| | | | b4 | | | |
| | | | b3 | | | |
| | | | b2 | | | |
| | | | b1 | | | |
| | | | b0 | | | |

# *RCP6S* *Fieldbus Communication*

(ON = Applicable bit is "1", OFF = Applicable bit is "0")

| Signal Type | | Bit | Symbol | Description | Details |
|---|---|---|---|---|---|
| PLC Input | Status signal 0 | b15 | RUN | This signal turns ON when Gateway is in normal operation. | – |
| | | b14 | LERC | This signal turns ON if the ERR-C occurred during an operation is retained and turns OFF if cancel signal RTE is turn ON.<br>It is effective when 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.<br>(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.<br>(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).<br>When this bit is turned ON, all the connected axes get in the emergency stop. | – |
| | | b7 | ALMC 1 to 128 | It is an output of an alarm code caused by the Gateway.<br>[Refer to Gateway alarm codes in Chapter 9 Troubleshooting for details.] | – |
| | | b6 | | | |
| | | b5 | | | |
| | | b4 | | | |
| | | b3 | | | |
| | | b2 | | | |
| | | b1 | | | |
| | | b0 | | | |
| | Status signal 1 | b15 | LNK15 | The bit of the axis number identified as effective by the Gateway turns ON.<br>Axis No.0 = LNK0 to Axis No.15 = LNK15 | – |
| | | b14 | LNK14 | | |
| | | b13 | LNK13 | | |
| | | b12 | LNK12 | | |
| | | b11 | LNK11 | | |
| | | b10 | LNK10 | | |
| | | b9 | LNK9 | | |
| | | b8 | LNK8 | | |
| | | b7 | LNK7 | | |
| | | b6 | LNK6 | | |
| | | b5 | LNK5 | | – |
| | | b4 | LNK4 | | |
| | | b3 | LNK3 | | |
| | | b2 | LNK2 | | – |
| | | b1 | LNK1 | | |
| | | b0 | LNK0 | | |

3. Operation

### 3.4.3 Control Signals for 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 768 points.
The main functions of ROBO Cylinder capable to control in this mode are as described in the following table.

| ROBO cylinder function | O: Direct control<br>Δ : Indirect control<br>× : Disabled | Remarks |
|---|---|---|
| Home-return operation | O | |
| Positioning operation | O | For those other than the target position, it is necessary to set the position data. |
| Speed and acceleration/ deceleration setting | Δ | These items must be set in the position data table. |
| Separate settings for acceleration and deceleration | Δ | |
| Pitch feed (incremental) | Δ | |
| Pressing operation | Δ | |
| Speed change during movement | Δ | |
| Pause | O | |
| Zone signal output | Δ | These items must be set in the parameters. |
| Position zone signal | Δ | These items must be set in the position data table. |
| PIO pattern selection | × | |

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → PLC (PLC Input) | |
|---|---|---|---|
| Target Position | 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.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 4-word for each I/O bit 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 <u>the range of the soft stroke (0 to effective stroke length)</u> of the actuator.

- For the indicated position number and complete position number, 1-word (16-bit) binary data is available and values from 0 to 768 can be used.

> ⚠ Caution: <u>Set the operational condition in advance</u> 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. | I | I | I | I | I | I | PC512 | 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 | I | I | I | I | I | I | JOG+ | JOG- | JVEL | JISL | SON | RES | STP | HOME | CSTR |

3. Operation

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. | ‒ | ‒ | ‒ | ‒ | ‒ | ‒ | PC512 | PC256 | 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 | ZONE2 | ZONE1 | PZONE | ‒ | ‒ | MEND | ALML | LOAD | 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 | – | 32-bit signed integer indicating the current position<br>Unit: 0.01mm<br>Available range for Setting: -999999 to 999999<br>Set the target position with the value from the home position.<br>(Example) If +25.40mm, input 000009EC$_H$ (2540 in decimal system).<br>*(Note) Input the negative value using a compliment of 2.* | 3.7.2 |
| | Specified Position No. | 16 bits | PC1 to PC512 | 16-bit integer<br>Available range for Setting: 0 to 767<br>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.<br>In this register, indicate the position number the data is input with a binary number.<br>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". | 3.7.2 |
| | Control Signal | b15 | BKRL | Brake release<br>ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | – | Cannot be used. | – |
| | | b13 | | | |
| | | b12 | | | |
| | | b11 | | | |
| | | b10 | | | |
| | | b9 | | | |
| | | b8 | JOG+ | +Jog<br>ON: Movement against home position, OFF: Stop | 3.7.1 [10] |
| | | b7 | JOG- | -Jog<br>ON: Movement toward home position, OFF: Stop | |
| | | b6 | JVEL | Jog-speed/inch-distance switching<br>OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S<br>ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in RCP6S | 3.7.1 [11] |
| | | b5 | JISL | Jog/inching switching<br>ON: Inching, OFF: Jog | 3.7.1 [12] |
| | | b4 | SON | Servo ON command<br>ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b3 | RES | Reset<br>A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b2 | STP | Pause<br>ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | b1 | HOME | Home return<br>Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [6] |
| | | b0 | CSTR | Positioning start<br>Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [1] |

3. Operation

(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<br>Unit: 0.01mm<br>(Example) If +10.23mm, input 000003FF$_H$ (1023 in decimal system).<br>*(Note) Negative numbers are two's implement.* | 3.7.2 |
| | Completed Position No. (Simple Alarm Code) | 16 bits | PM1 to PM512 | 16-bit integer<br>The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position.<br>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.<br>The simple alarm code (refer to Chapter 9 Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON). | 3.7.2 |
| | Status Signal | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | CRDY | This signal turns ON when the controller is standing by. | 3.7.1 [1] |
| | | b13 | ZONE2 | "ON" for the current position within the zone 2 set range<br>The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | b12 | ZONE1 | "ON" for the current position within the zone 1 set range<br>The zone range setting is necessary for the parameter. | |
| | | b11 | PZONE | Position zone<br>This signal turns ON when the current position is inside the specified position zone. | 3.7.1 [9] |
| | | b10 | – | Cannot be used. | – |
| | | b9 | | | |
| | | b8 | MEND | This signal turns ON at either of positioning complete of after movement, home return complete or pressing complete or pressing failure, and turns OFF at movement start.<br>It is OFF when the servo is OFF. | 3.7.1 [19] |
| | | b7 | ALML | Light error alarm output<br>It turns ON when an overload warning or message level error is issued. | 3.7.1 [21] |
| | | b6 | LOAD | Load Output Judgment:<br>turns on when achieved and off when unachieved | 3.7.1 [22] |
| | | b5 | PSFL | "ON" for pressing and a miss | 3.7.1 [18] |
| | | b4 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b3 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b2 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b1 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |

### 3.4.4 Control Signals for Positioner 1 Mode

Operation is performed by indicating a position number from the operation modes of the position data set in the position table.

The settable No. of position data items is max 768 points.
The main functions of ROBO Cylinder capable to control in this mode are as described in the following table.

| ROBO cylinder function | O: Direct control<br>Δ : Indirect control<br>× : Disabled | Remarks |
|---|---|---|
| Home-return operation | O | |
| Positioning operation | Δ | |
| Speed and acceleration/ deceleration setting | Δ | |
| Separate settings for acceleration and deceleration | Δ | These items must be set in the position data table. |
| Pitch feed (incremental) | Δ | |
| Pressing operation | Δ | |
| Speed change during movement | Δ | |
| Pause | O | |
| Zone signal output | Δ | These items must be set in the parameters. |
| Position zone signal | Δ | These items must be set in the position data table. |
| PIO pattern selection | × | |

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → PLC (PLC Input) | |
|---|---|---|---|
| Cannot be used. | 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.]

(2) Input and Output Signal Assignment for each Axis

The I/O signals for each axis consists of 4-word for each I/O bit register.
- The control signals and status signals are ON/OFF signals in units of bit.
- For the 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.
- For the indicated position number and complete position number, 1-word (16-bit) binary data is available and values from 0 to 767 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cannot be used. | | | | | | | | | | | | | | | | |

Address m+1

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cannot be used. | | | | | | | | | | | | | | | | |

Address m+2

| | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Specified Position No. | I | I | I | I | I | I | PC512 | 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 | I | I | I | I | 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. | I | I | I | I | I | I | PC512 | PC256 | 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 | ZONE2 | ZONE1 | PZONE | MODES | WEND | MEND | ALML | LOAD | PSFL | SV | ALM | MOVE | HEND | PEND |

3. Operation

3. Operation

(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 | PC1 to PC512 | 16-bit integer<br>Available range for Setting: 0 to 767<br>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.<br>In this register, indicate the position number the data is input with a binary number.<br>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". | 3.7.2 |
| | Control Signal | b15 | BKRL | Brake release<br>ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | – | Cannot be used. | – |
| | | b13 | | | |
| | | b12 | | | |
| | | b11 | | | |
| | | b10 | MODE | Teaching mode command<br>OFF: Standard mode, ON : Teaching mode | 3.7.1 [13] |
| | | b9 | PWRT | Position import command<br>ON: Position Data Import | 3.7.1 [14] |
| | | b8 | JOG+ | +Jog<br>ON: Movement against home position, OFF: Stop | 3.7.1 [10] |
| | | b7 | JOG- | -Jog<br>ON: Movement toward home position, OFF: Stop | |
| | | b6 | JVEL | Jog-speed/inch-distance switching<br>OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S<br>ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in RCP6S | 3.7.1 [11] |
| | | b5 | JISL | Jog/inching switching<br>ON: Inching, OFF: Jog | 3.7.1 [12] |
| | | b4 | SON | Servo ON command<br>ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b3 | RES | Reset<br>A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b2 | STP | Pause<br>ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | b1 | HOME | Home return<br>Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [6] |
| | | b0 | CSTR | Positioning start<br>Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [1] |

(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<br>Unit: 0.01mm<br>(Example) If +10.23mm, input 000003FF$_H$ (1023 in decimal system).<br>*(Note) Negative numbers are two's implement.* | 3.7.2 |
| | Completed Position No. (Simple Alarm Code) | 16 bits | PM1 to PM512 | 16-bit integer<br>The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position.<br>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.<br>The simple alarm code (refer to Chapter 9 Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON). | 3.7.2 |
| | Status Signal | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | CRDY | This signal turns ON when the controller is standing by. | 3.7.1 [1] |
| | | b13 | ZONE2 | "ON" for the current position within the zone 2 set range<br>The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | b12 | ZONE1 | "ON" for the current position within the zone 1 set range<br>The zone range setting is necessary for the parameter. | |
| | | b11 | PZONE | Position zone<br>This signal turns ON when the current position is inside the specified position zone. | 3.7.1 [9] |
| | | b10 | MODES | This signal is ON while the teaching mode is selected. | 3.7.1 [13] |
| | | b9 | WEND | This signal turns ON when reading is complete. | 3.7.1 [14] |
| | | b8 | MEND | This signal turns ON at either of positioning complete of after movement, home return complete or pressing complete or pressing failure, and turns OFF at movement start.<br>It is OFF when the servo is OFF. | 3.7.1 [19] |
| | | b7 | ALML | Light error alarm output<br>It turns ON when an overload warning or message level error is issued. | 3.7.1 [21] |
| | | b6 | LOAD | Load Output Judgment:<br>turns on when achieved and off when unachieved | 3.7.1 [22] |
| | | b5 | PSFL | "ON" for pressing and a miss | 3.7.1 [18] |
| | | b4 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b3 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b2 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b1 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |

3. Operation

3. Operation

### 3.4.5 Control Signals for Direct Indication Mode

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 ROBO Cylinder capable to control in this mode are as described in the following table.

| ROBO cylinder function | O: Direct control<br>Δ : Indirect control<br>× : Disabled | Remarks |
|---|---|---|
| Home-return operation | O | |
| Positioning operation | O | |
| Speed and acceleration/deceleration setting | O | |
| Separate settings for acceleration and deceleration | × | Values for acceleration and deceleration should be the same. |
| Pitch feed (Incremental) | O | |
| Pressing operation | O | Selection can be made from the pressing method same as CON type such as PCON and that same as SEP type such as PSEP. |
| Speed change during movement | O | |
| Pause | O | |
| Zone signal output | Δ | Parameters must be set. |
| Position zone signal | × | |
| PIO pattern selection | × | |

(1) PLC Address Composition

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → 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 bit 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.

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⚠ *Caution: Set the position data in <u>the range of the soft stroke (0 to effective stroke length)</u> of the actuator.*

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● Set the positioning width. The positioning width is expressed using 2-word (32 bits) 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 bits) binary data. The figures from 1 to +65535 (Unit: 1.0mm/s or 0.1mm/s) 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 bits) 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 bits) binary data. The figures from 0 to 100% ($00_H$ to $FF_H$) can be set in PLC.

| Set Value | $00_H$ | $7F_H$ | $FF_H$ |
|---|---|---|---|
| | | (127 in decimal system) | (255 in decimal system) |
| Pressing Current Limit Value | 0% | 50% | 100% |

---
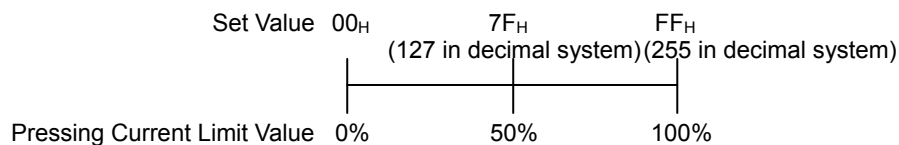
⚠ *Caution: Have the setting with values available <u>in the range of for speed, acceleration/deceleration and pressing current</u> of the actuator. (Refer to the catalog or instruction manual of the actuator.) Otherwise, it may cause an abnormal condition of the servo or a malfunction of the actuator 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 bits) binary data (Unit: 1mA).
● The current speed is expressed using 1-word (16 bits) binary data (Unit: 1.0mm/s or 0.1mm/s).
  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.
  For Slider and Rod Types of actuators, a negative number is output when a movement is made towards the motor side, while a positive number when against the motor side. For Reversed Motor Type, it is the other way around.
● The alarm code is expressed using 1-word (16 bits) 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 input 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Command 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 Value | – | – | – | – | – | – | – | 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 | INC | 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 output 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) | I | I | I | I | I | I | I | I | I | I | I | I | 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 the 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 | I | I | I | MEND | ALML | I | PSFL | SV | ALM | MOVE | HEND | PEND |

**3. Operation**

(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 | – | 32-bit signed integer indicating the current position<br>Unit: 0.01mm<br>Available range for Setting: -999999 to 999999<br>Set the target position with the value from the home position.<br>(Example) If +25.40mm, input 000009EC$_H$ (2540 in decimal system).<br>*(Note) Input the negative value using a compliment of 2.* | 3.7.3 |
| | Positioning Width | 32 bits | – | 32-bit integer<br>Unit: 0.01mm<br>Available range for Setting: 0 to 999999<br>(Example) If 25.40mm, input 000009EC$_H$ (2540 in decimal system).<br>This register value has two meanings depending on the operation type.<br>1) Positioning operation □<br>  Range for positioning complete against the target position<br>2) Pressing operation □<br>  Pressing width (Pressing operation distance)<br>A pressing operation is performed when PUSH Signal in the control signals is ON. | 3.7.3 |
| | Command Speed | 16 bits | – | 16-bit integer<br>Unit: 1.0mm/s or 0.1mm/s (It is set to 1.0mm/s in the initial setting.)<br>A change of the unit is to be conducted on Gateway Parameter Setting Tool.<br>Available range for Setting: 1 to 65535<br>Specify the speed at which to move the actuator.<br>(Example) If 254.0mm/s, input 09EC$_H$ (2540 in decimal system).<br>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. | 3.7.3 |
| | Acceleration/ Deceleration | 16 bits | – | 16-bit integer<br>Unit: 0.01G<br>Available range for Setting: 1 to 300<br>Specify the acceleration/deceleration at which to move the actuator. The acceleration and deceleration will be the same value.<br>(Example) If 0.30G, input 001E$_H$ (30 in decimal system).<br>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. | 3.7.3 |
| | Pressing Current Limit Value | 16 bits | – | 16-bit integer<br>Unit: %<br>Available range for Setting:  0 to FF$_H$<br>      7F$_H$=50%, FF$_H$=100%<br>Indicate the current value for pressing operation.<br>  (Example)   When setting to 50%, indicate FF$_H$ * 50%<br>      = 255 * 50% = 127 (Decimal Number)<br>      = 007F$_H$.<br>The pressing range available for indication differs depending on the actuator (Refer to the catalogue 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. | 3.7.3 |

3. Operation

| Signal Type | | Bit | Symbol | Description | Details |
|---|---|---|---|---|---|
| PLC Output | Control Signal | b15 | BKRL | Brake release<br>ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | INC | Absolute position commands are issued when this signal is OFF, and incremental position commands are issued when the signal is ON. | 3.7.1 [20] |
| | | b13 | DIR | Push direction specification<br>ON: Movement against home position, OFF: Movement toward home position<br>*(Note) This signal is effective when the pressing method of CON type is selected.* | 3.7.1 [17] |
| | | b12 | PUSH | Push-motion specification<br>ON: Pressing operation, OFF: Positioning operation | 3.7.1 [16] |
| | | b11<br>b10<br>b9 | – | Cannot be used. | – |
| | | b8 | JOG+ | +Jog<br>ON: Movement against home position, OFF: Stop | 3.7.1 [10] |
| | | b7 | JOG- | -Jog<br>ON: Movement toward home position, OFF: Stop | |
| | | b6 | JVEL | Jog-speed/inch-distance switching<br>OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S<br>ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in RCP6S | 3.7.1 [11] |
| | | b5 | JISL | Jog/inching switching<br>ON: Inching, OFF: Jog | 3.7.1 [12] |
| | | b4 | SON | Servo ON command<br>ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b3 | RES | Reset<br>A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b2 | STP | Pause<br>ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | b1 | HOME | Home return<br>Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [6] |
| | | b0 | CSTR | Positioning start<br>Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [1] |

(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<br>Unit: 0.01mm<br>(Example) If 10.23mm, input 000003FF$_H$ (1023 in decimal system).<br>*(Note) Negative numbers are two's implement.* | 3.7.3 |
| | Command Current | 32 bits | – | 32-bit integer<br>The electrical current presently specified by a command is indicated.<br>The setting unit is mA.<br>This resistor makes an output in hexadecimal numbers.<br>(Example) Reading: 000003FF$_H$ = 1023 (Decimal number) = 1023mA | 3.7.3 |
| | Current Speed | 16 bits | – | 16-bit integer<br>The current speed is indicated.<br>Unit: 1.0mm/s or 0.1mm/s.<br>A change of the unit is to be conducted on Gateway Parameter Setting Tool.<br>(Example) Reading: 03FF$_H$ = 1023 (Decimal number) = 1023mm/s<br>*(Note) Negative numbers are two's implement.* | 3.7.3 |
| | Alarm Code | 16 bits | – | 16-bit integer<br>The alarm code (refer to Chapter 9 Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON). | 3.7.3 |
| | Status Signal | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | CRDY | This signal turns ON when the controller is standing by. | 3.7.1 [1] |
| | | b13 | ZONE2 | "ON" for the current position within the zone 2 set range The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | 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 | MEND | This signal turns ON at either of positioning complete of after movement, home return complete or pressing complete or pressing failure, and turns OFF at movement start.<br>It is OFF when the servo is OFF. | 3.7.1 [19] |
| | | b7 | ALML | Light error alarm output<br>It turns ON when an overload warning or message level error is issued. | 3.7.1[21] |
| | | b6 | – | Cannot be used. | – |
| | | b5 | PSFL | This signal turns ON when the actuator missed the load in push-motion operation. | 3.7.1 [18] |
| | | b4 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b3 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b2 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b1 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |

3. Operation

### 3.4.6　Control Signals for Positioner 2 Mode

It is an operation mode to operate with indicating a position number.
The operation is to be made by using 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 Mode.
The settable No. of position data items is max 768 points.
The main functions of ROBO Cylinder capable to control in this mode are as described in the following table.

| ROBO cylinder function | O: Direct control<br>Δ: Indirect control<br>×: Disabled | Remarks |
|---|---|---|
| Home-return operation | O | |
| Positioning operation | Δ | |
| Speed and acceleration/ deceleration setting | Δ | These items must be set in the position data table. |
| Separate settings for acceleration and deceleration | Δ | |
| Pitch feed (incremental) | Δ | |
| Pressing operation | Δ | |
| Speed change during movement | Δ | |
| Pause | O | |
| Zone signal output | Δ | These items must be set in the parameters. |
| Position zone signal | Δ | These items must be set in the position data table. |
| PIO pattern selection | × | |

(1) PLC Address Composition

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → 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 bit 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 767 can be used.

> ⚠ *Caution:*
> <u>*Set the operational condition in advance*</u> *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. | - | - | - | - | - | - | PC512 | 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 | - | - | - | - | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Completed Position No. | - | - | - | - | - | - | PC512 | PC256 | 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 | MEND | ALML | LOAD | 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 | PC1 to PC512 | 16-bit integer<br>Available range for Setting: 0 to 767<br>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.<br>In this register, indicate the position number the data is input with a binary number.<br>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". | 3.7.4 |
| | Control Signal | b15 | BKRL | Brake release<br>ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | – | Cannot be used. | – |
| | | b13 | | | |
| | | b12 | | | |
| | | b11 | | | |
| | | b10 | MODE | Teaching mode command<br>OFF: Standard mode, ON : Teaching mode | 3.7.1 [13] |
| | | b9 | PWRT | Position import command<br>ON: Position Data Import | 3.7.1 [14] |
| | | b8 | JOG+ | +Jog<br>ON: Movement against home position, OFF: Stop | 3.8.1 [10] |
| | | b7 | JOG- | -Jog<br>ON: Movement toward home position, OFF: Stop | |
| | | b6 | JVEL | Jog-speed/inch-distance switching<br>OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S<br>ON   : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in RCP6S | 3.7.1 [11] |
| | | b5 | JISL | Jog/inching switching<br>ON: Inching, OFF: Jog | 3.7.1 [12] |
| | | b4 | SON | Servo ON command<br>ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b3 | RES | Reset<br>A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b2 | STP | Pause<br>ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | b1 | HOME | Home return<br>Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [6] |
| | | b0 | CSTR | Positioning start<br>Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [1] |

3. Operation

# RCP6S *Fieldbus Communication*

(ON = Applicable bit is "1", OFF = Applicable bit is "0")

| Signal Type | | Bit | Symbol | Description | Details |
|---|---|---|---|---|---|
| PLC Input | Completed Position No. (Simple Alarm Code) | 16 bits | PM1 to PM512 | 16-bit integer<br>The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position.<br>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.<br>The simple alarm code (refer to Chapter 9 Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON). | 3.7.4 |
| | Status Signal | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | CRDY | This signal turns ON when the controller is standing by. | 3.7.1 [1] |
| | | b13 | ZONE2 | "ON" for the current position within the zone 2 set range<br>The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | b12 | ZONE1 | "ON" for the current position within the zone 1 set range<br>The zone range setting is necessary for the parameter. | |
| | | b11 | PZONE | Position zone<br>This signal turns ON when the current position is inside the specified position zone. | 3.7.1 [9] |
| | | b10 | MODES | This signal is ON while the teaching mode is selected. | 3.7.1 [13] |
| | | b9 | WEND | This signal turns ON when reading is complete. | 3.7.1 [14] |
| | | b8 | MEND | This signal turns ON at either of positioning complete of after movement, home return complete or pressing complete or pressing failure, and turns OFF at movement start.<br>It is OFF when the servo is OFF. | 3.7.1 [19] |
| | | b7 | ALML | Light error alarm output<br>It turns ON when an overload warning or message level error is issued. | 3.7.1 [21] |
| | | b6 | LOAD | Load Output Judgment:<br>turns on when achieved and off when unachieved | 3.7.1 [22] |
| | | b5 | PSFL | This signal turns ON when the actuator missed the load in push-motion operation. | 3.7.1 [18] |
| | | b4 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b3 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b2 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b1 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |

### 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 by using 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 | O: Direct control<br>Δ : Indirect control<br>× : Disabled | Remarks |
|---|:---:|---|
| Home-return operation | O | |
| Positioning operation | Δ | These items must be set in the position data table. |
| Speed and acceleration/ deceleration setting | Δ | |
| Separate settings for acceleration and deceleration | Δ | |
| Pitch feed (incremental) | × | |
| Pressing operation | Δ | These items must be set in the position data table. |
| Speed change during movement | Δ | |
| Pause | O | |
| Zone signal output | Δ | These items must be set in the parameters. |
| Position zone signal | × | |
| PIO pattern selection | × | |

(1) PLC Address Composition

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → 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 bit 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 | I | I | 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 Output | Control Signal/ Specified Position No. | b15 | BKRL | Brake release ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | – | Cannot be used. | – |
| | | b13 | | | |
| | | b12 | SON | Servo ON command ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b11 | RES | Reset A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b10 | STP | Pause ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | 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 | 3.7.1 [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 | 3.7.1 [1] |
| | | b7 | PC1 to PC128 | Command position No. (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". | 3.7.4 |
| | | b6 | | | |
| | | b5 | | | |
| | | b4 | | | |
| | | b3 | | | |
| | | b2 | | | |
| | | b1 | | | |
| | | b0 | | | |
| PLC Input | Status Signal/ Completed Position No. | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | ZONE1 | "ON" for the current position within the zone 1 set range The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | b13 | PSFL | This signal turns ON when the actuator missed the load in push-motion operation. | 3.7.1 [18] |
| | | b12 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b11 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b10 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b9 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |
| | | b7 | PM1 to PM128 | Completed position No. (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. | 3.7.4 |
| | | b6 | | | |
| | | b5 | | | |
| | | b4 | | | |
| | | b3 | | | |
| | | b2 | | | |
| | | b1 | | | |
| | | b0 | | | |

3. Operation

### 3.4.8 Control Signals for Positioner 5 Mode

It is an operation mode to operate with indicating a position number.
The operation is to be made by using the position data set in the position table.
It is a mode that enabled to monitor the current position in 0.1mm unit by number of position table from Positioner 2 Mode.
The settable No. of position data items is max 16 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<br>△ : Indirect control<br>× : Disabled | Remarks |
|---|---|---|
| Home-return operation | ○ | |
| Positioning operation | △ | |
| Speed and acceleration/ deceleration setting | △ | |
| Separate settings for acceleration and deceleration | △ | These items must be set in the position data table. |
| Pitch feed (incremental) | △ | |
| Pressing operation | △ | |
| Speed change during movement | △ | |
| Pause | ○ | |
| Zone signal output | △ | These items must be set in the parameters. |
| Position zone signal | × | |
| PIO pattern selection | × | |

(1) PLC Address Composition

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

| PLC → RCP6S GW (PLC Output) | | RCP6S GW → PLC (PLC Input) | |
|---|---|---|---|
| Specified Position No. | m | Completion Position No. (0.1mm unit) | m |
| Control Signal | m+1 | Status Signal | m+1 |

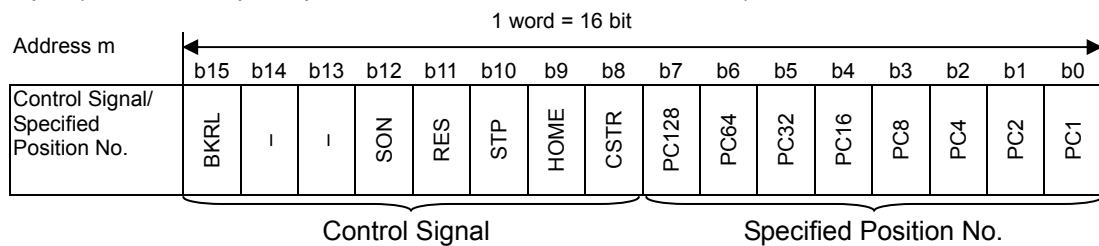[Refer to Section 3.4.2 for the address maps for each Fieldbus.]

(2) Input and Output Signal Assignment for each Axis

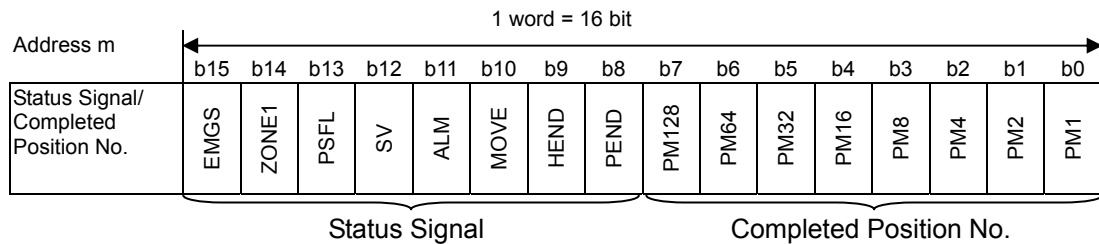The I/O signals for each axis consists of 2-word for each I/O bit register.
- The control signals and status signals are ON/OFF signals in units of bit.
- For the indicated position number and complete position number, 1-word (16-bit) binary data is available and values from 0 to 15 can be used.
- The current position is the binary data in 1 word (16 bits), and can deal with numbers from -32768 to +32767 (unit: 0.1mm) in PLC. Negative numbers are to be dealt with two's complement.

⚠ *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. | I | I | I | I | I | I | I | I | I | I | I | I | 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 | I | I | I | I | I | I | 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 | | | | | | | | | | | | | | | | |

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

| Address m+1 | b15 | b14 | b13 | b12 | b11 | b10 | b9 | b8 | b7 | b6 | b5 | b4 | b3 | b2 | b1 | b0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Status Signal/ Completed Position No. | EMGS | CRDY | ZONE2 | ZONE1 | PM8 | PM4 | PM2 | PM1 | MEND | ALML | 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 | PC1 to PC8 | 16-bit integer (4-bit use)<br>Available range for Setting: 0 to 15<br>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.<br>In this register, indicate the position number the data is input with a binary number.<br>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". | 3.7.4 |
| | Control Signal | b15 | BKRL | Brake release<br>ON: Brake release, OFF: Brake activated | 3.7.1 [15] |
| | | b14 | – | Cannot be used. | – |
| | | b13 | | | |
| | | b12 | | | |
| | | b11 | | | |
| | | b10 | | | |
| | | b9 | | | |
| | | b8 | JOG+ | +Jog<br>ON: Movement against home position, OFF: Stop | 3.7.1 [10] |
| | | b7 | JOG- | -Jog<br>ON: Movement toward home position, OFF: Stop | |
| | | b6 | JVEL | Jog-speed/inch-distance switching<br>OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S<br>ON : Use the setting values of Parameter No.47 JOG Speed 2 and No.49 Inching Distance in RCP6S | 3.7.1 [11] |
| | | b5 | JISL | Jog/inching switching<br>ON: Inching, OFF: Jog | 3.7.1 [12] |
| | | b4 | SON | Servo ON command<br>ON: Servo ON, OFF: Servo OFF | 3.7.1 [5] |
| | | b3 | RES | Reset<br>A reset is performed when this signal turns ON. | 3.7.1 [4] |
| | | b2 | STP | Pause<br>ON: Pause, OFF: Pause release | 3.7.1 [8] |
| | | b1 | HOME | Home return<br>Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [6] |
| | | b0 | CSTR | Positioning start<br>Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way | 3.7.1 [1] |

(ON = Applicable bit is "1", OFF = Applicable bit is "0")

| Signal Type | | Bit | Symbol | Description | Details |
|---|---|---|---|---|---|
| PLC Input | Current Position | 16 bits | – | 16-bit signed integer indicating the current position<br>Unit: 0.01mm<br>(Example) If +102.3mm, input 000003FF$_H$ (1023 in decimal system).<br>*(Note) Negative numbers are two's implement.* | 3.7.4 |
| | Status Signal /Completed Position No. | b15 | EMGS | This signal turns ON during an emergency stop | 3.7.1 [2] |
| | | b14 | CRDY | This signal turns ON when the controller is standing by. | 3.7.1 [1] |
| | | b13 | ZONE2 | "ON" for the current position within the zone 2 set range<br>The zone range setting is necessary for the parameter. | 3.7.1 [9] |
| | | b12 | ZONE1 | "ON" for the current position within the zone 1 set range<br>The zone range setting is necessary for the parameter. | |
| | | b11 | PM1 to PM8 | 16-bit integer, Available range for output: 0 to 15<br>The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position.<br>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.<br>The simple alarm code (refer to Chapter 9 Troubleshooting) is output while an alarm is issued (ALM of Status Signal is ON). | 3.7.4 |
| | | b10 | | | |
| | | b9 | | | |
| | | b8 | | | |
| | | b7 | MEND | This signal turns ON at either of positioning complete of after movement, home return complete or pressing complete or pressing failure, and turns OFF at movement start.<br>It is OFF when the servo is OFF. | 3.7.1 [19] |
| | | b6 | ALML | Light error alarm output<br>It turns ON when an overload warning or message level error is issued. | 3.7.1 [21] |
| | | b5 | PSFL | "ON" for pressing and a miss | 3.7.1 [18] |
| | | b4 | SV | This signal turns ON when operation standby is complete (Servo is ON). | 3.7.1 [5] |
| | | b3 | ALM | This signal is ON while an alarm is generated. | 3.7.1 [3] |
| | | b2 | MOVE | This signal is ON while in movement. | 3.7.1 [7] |
| | | b1 | HEND | This signal turns ON at home return complete and is kept unless the home position is lost due to a fact such as an alarm. | 3.7.1 [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. | 3.7.1 [7] |

3. Operation

## 3.5   Input and Output Signal Process for Fieldbus

I/O Signal Timings
   The time of each process until the response (status) is returned to the PLC after any of the control signals is turned on to perform the operation of ROBO Cylinder using the PLC's sequence program is as shown below.
   The process time between the gateway unit and the built-in controller of RCP6S is constant regardless of the number of constructing axes, but it varies depending on whether hub units are used or not.

|  | A (Control signla sending) | B (Status signla receiving) |
|---|---|---|
| Hub unit not used | 8 ms to 10 ms | 8 ms to 10 ms |
| Hub unit used | 20 ms to 40 ms | 20 ms to 40 ms |

   * Except for when monitoring is conducted with PC software connected.
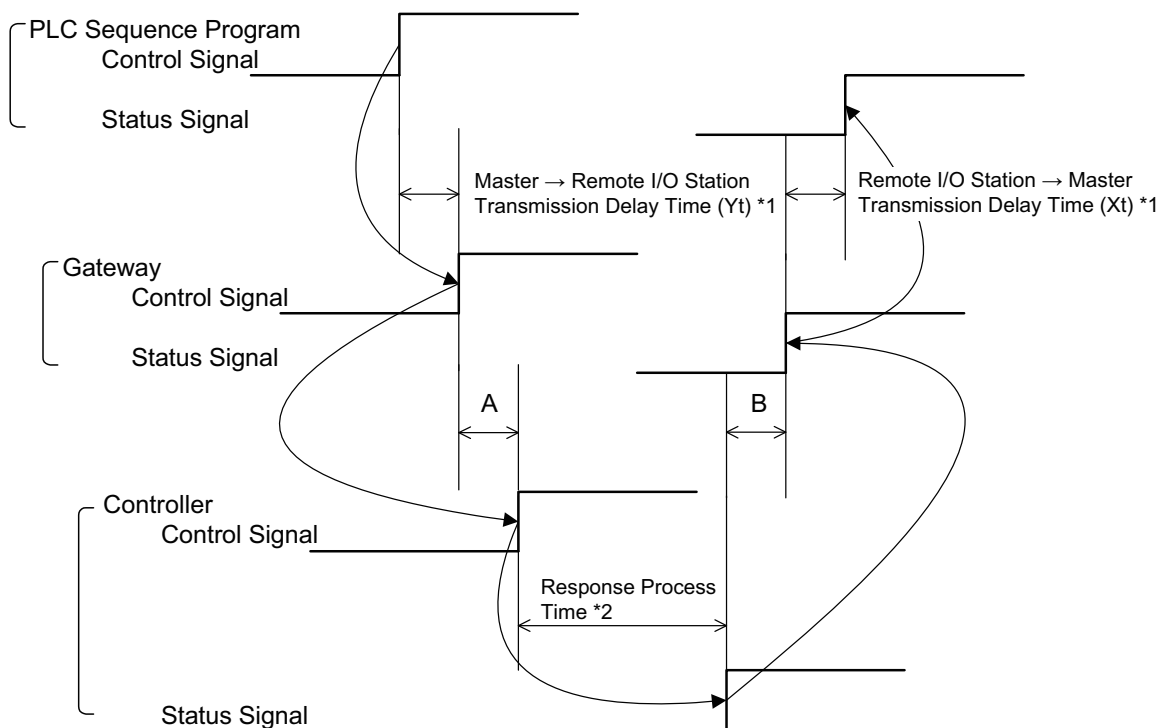


*1 Refer to PLC Manual
*2 Varies depending on the content of control

Yt : Master Station → Slave Transmission Delay Time
Xt : Slave → Master Station Transmission Delay Time } Fieldbus 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).

## 3.6   Power Supply

### 3.6.1   Battery-less absolute

Follow the steps below to turn ON the power to the controller.
1) Control power and the drive (24V DC).
2) Cancel the emergency stop condition or make the motor drive power supply available to turn ON.
3) If using the servo-on signal, input the signal from the host side.

| | |
|---|---|
| Safety circuit Status | Emergency stop    Emergency stop release |
| Control power (24V DC) input | |
| Driving source (24V DC) input | |
| Servo ON (SON) input | |
| Status LEDs for Driver Servo ON (SYS*) output | |
| Home return signai (HOME) input | |
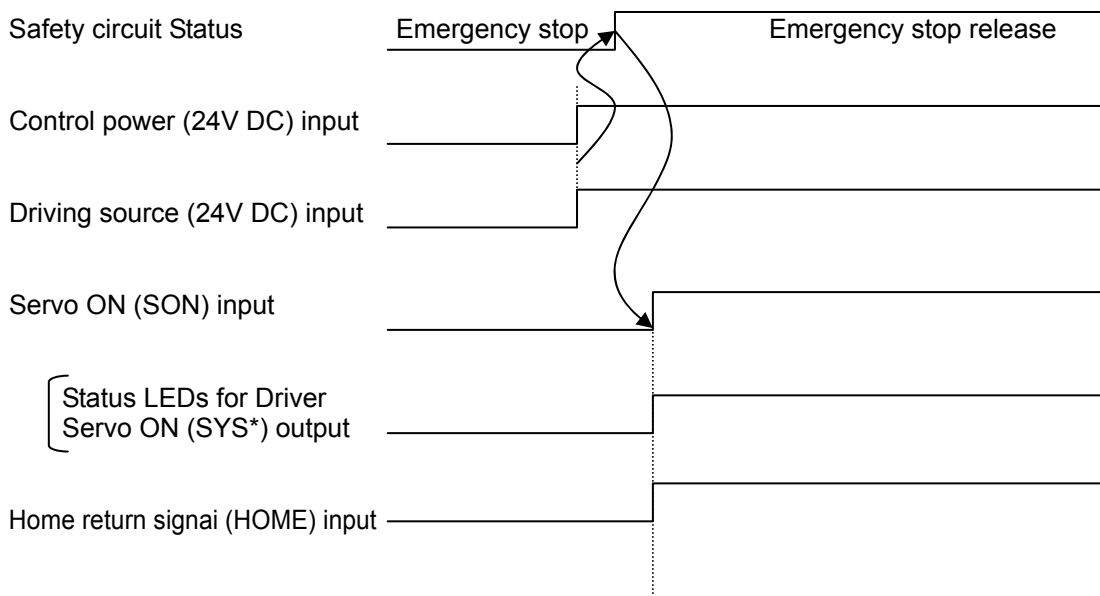
## 3.6.2  Incremental

Follow the steps below to turn ON the power to the controller.
1)  Control power and the drive (24V DC).
2)  Cancel the emergency stop condition or make the motor drive power supply available to turn ON.
3)  If using the servo-on signal, input the signal from the host side.
4)  Input the home return signai (HOME) from the host side.

| Safety Circuit Status | Emergency Stop | Emergency Stop Release |

Control power (24V DC) input

Driving source (24V DC) input

Servo ON (SON) input

Status LEDs for Driver
Servo ON (SYS*) output

1.6sec or less [(Note 1)]

Home return signai (HOME) input — Home return

Home return completion (HEND) output

20ms (TYP)

Actuator operation

Mechanical end    Home position
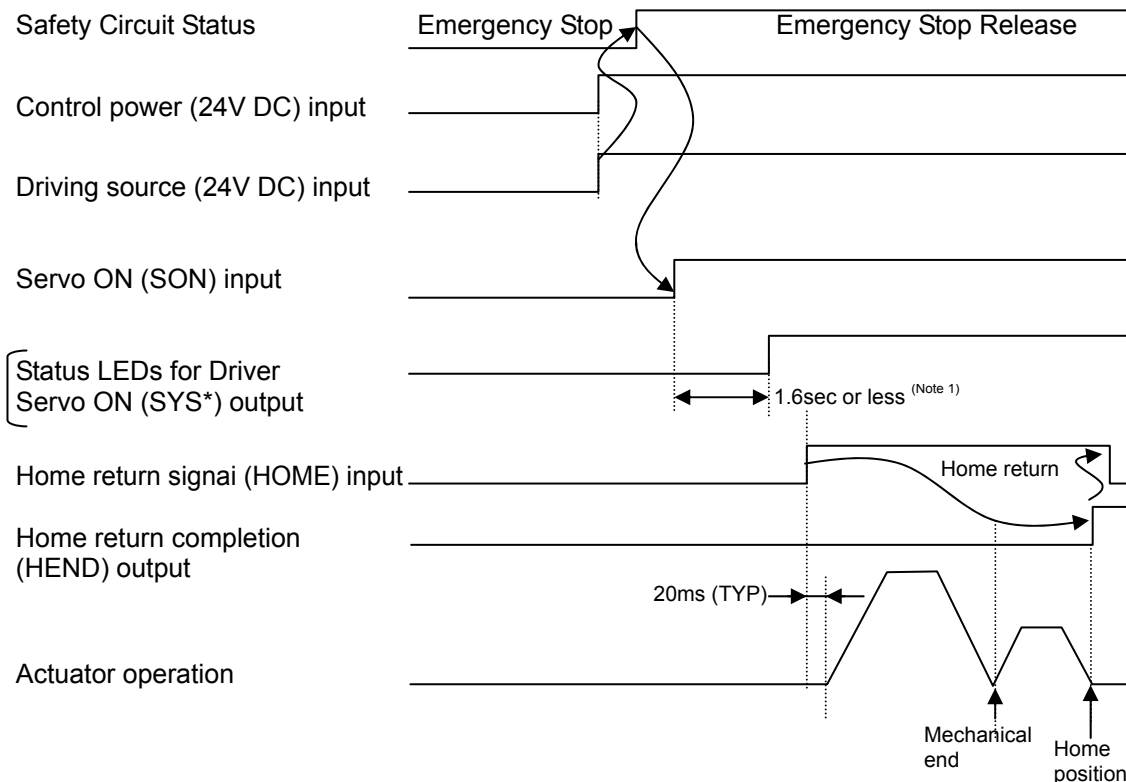
*Note 1    For RCM-P6AC, have a latency of 1.6sec or more before inputting a movement (home-return) command after the servo is turned on for the first time after the power is booted in order to detect the magnetic pole phase. In the second time or later, make the latency of 60ms or more.*

⚠ *Warning: Executing a servo ON when the actuator is position very close to a mechanical end may cause the magnetic pole phase detection operation to malfunction and reporting of the magnetic pole unconfirmed or excitation detection errors.*
*Always move the actuator physical position away from the mechanical end before executing the servo ON command.*

## 3.7　Control and Functions of Input and Output Signals of Modes

Input and output signals are prepared for each axis number.
The applicable bit is "1" when the signal is ON and "0" when it is OFF.

### 3.7.1　Input and Output Signal Functions

[1]　Controller ready (CRDY) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ○ | ○ | ○ | ✕ | ○ |

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

[2]　Emergency stop (EMGS) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

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.
Also, ALM* in the driver status LEDs flashes. [Refer to Name and Function of Each Part 7)]
Have an appropriate safety treatment such as interlock with this signal for the host controller.
*(Note)　It is not an emergency stop output due to an alarm generation of the controller.*

[3]　Alarm (ALM) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

This is a signal that is OFF in normal condition and turns ON when an alarm of operation cancelled level [(Note 1)] or higher is generated. This signal turns OFF once the reset (RES) signal is turned oON while an alarm of operation cancelled level is being generated. (In the case of the alarm with the cold start level, re-injection of the power is required.)
Also, ALM* in the driver status LEDs flashes. [Refer to Name and Function of Each Part 7)]
*Note 1　Check the 8.3 Gateway Alarm and 8.4 Driver Alarm for details of alarms.*

[4]  Reset (RES) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

The reset signal RES possesses two functions, one is an alarm reset while an alarm is being generated, and the other is to cancel the operation while in a pause.
1) Once this signal is turned ON while an alarm of operation cancelled level is being generated, the alarm is cancelled. (In the case of the alarm with the cold start level, re-injection of the power is required.) Confirm the cause of the alarm and remove it before conducting a reset of the alarm. Having the alarm reset repeatedly without removing the cause of the alarm to restart the operation may cause a critical malfunction such as motor burn-down.
2) When this signal is turned ON from OFF condition during the pause condition, the reminder of the planned movement left can be cancelled and the remained operation can be deleted.

[5]  Servo ON command (SON)      PLC Output Signal
     Servo ON status (SV)        PLC Input Signal
     Positioning complete (PEND)  PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

1) Servo ON command SON is the signal making the servo motor of the actuator operable.
2) Once the Servo ON is executed and the operation comes available, Servo ON status signal SV starts turned ON. The positioning complete signal PEND turns ON at the same time. Also, the axis driver status LEDs (SYS*) on the front panel corresponding for the axis No. turns ON in green. [Refer to Name and Function of Each Part 7) driver status LEDs]
3) With the power being supplied, then controller cannot be operated while the SV signal remains OFF. If SON Signal is turned OFF during the actuator operation, the actuator decelerates and stops with the emergency stop torque, servo turns OFF, and the motor goes into the free-run condition.
   For the actuators equipped with a brake, the brake gets activated.

SON
(PLC → RCP6S GW)

SV
(RCP6S GW → PLC)

PEND (Note 1)
(RCP6S GW → PLC)
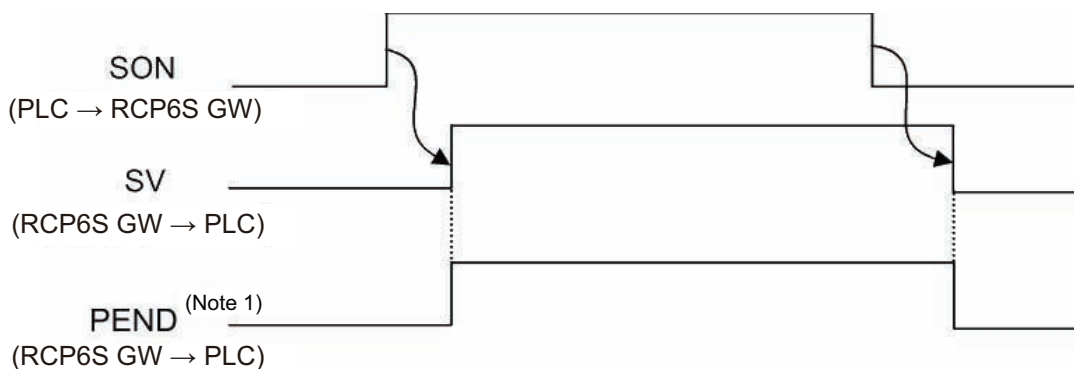
*Note 1   PEND would not turn ON in the pause condition.*

[6]   Home return (HOME)          PLC Output Signal
      Home return completion (HEND)  PLC Input Signal
      Moving (MOVE)              PLC Input Signal
      Positioning complete (PEND)    PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped<br>× : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

HOME Signal is a signal to conduct an automatic home-return operation.
Once HOME Signal is turned ON, this signal is processed as a rise (ON-edge), and the actuator starts home-return operation. Once the home-return operation is completed, the home-return operation complete signal HEND turns ON. The home return complete signal HEND is kept ON unless the home position is lost. The positioning complete signal PEND turns OFF and the moving signal MOVE turns ON during a home-return operation.
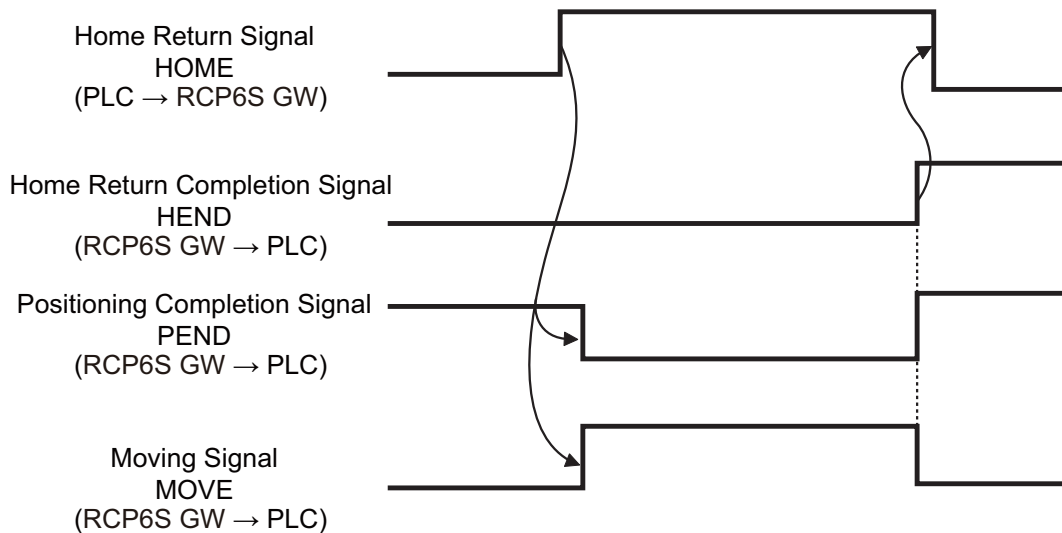
3. Operation

[Operation of Slider Type/Rod Type Actuator]
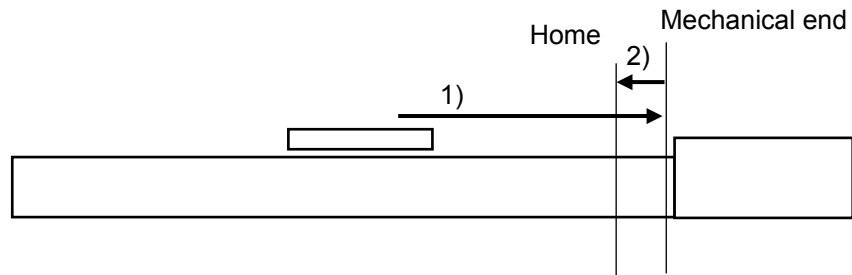


1) With the HOME signal being ON, the actuator moves toward the mechanical end at the home return speed.
   The speed for most of the actuators is 20mm/s, however, for some actuators it is less than 20mm/s.

2) The actuator is turned at the mechanical end and stopped at the home position.The movement amount in this process follows the setting in Parameter No. 22 "Home return offset level".

> ⚠ Caution:  In the home reverse specification, the actuator moves in the reverse direction.
> Make sure to refer to 8.2 [14] when a change to Parameter No.22 "Home Return Offset Level" is required.

[7] Positioning start (CSTR) — PLC Output Signal
Moving (MOVE) — PLC Input Signal
Positioning complete (PEND) — PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

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.

1) Once the start signal CSTR is turned ON, the actuator starts to accelerate following the data in the specified position table to perform positioning at the target position.
2) Once the operation starts, the positioning complete signal PEND turns OFF. Turn OFF CSTR Signal. If CSTR Signal is not turned OFF, output of complete position number cannot be performed and the positioning complete signal would not turn ON when the positioning is complete.
3) Once the positioning is complete, the number of positioning complete position is output in the binary data by Complete Position No. PM1 to PM**, and the positioning complete signal PEND is turned ON at the same time.
4) The moving signal MOVE turns ON at the same time as the operation starts, and turns OFF once the positioning complete signal PEND turns ON or the movement command output completes.
5) The positioning complete signal PEND turns ON once the remaining movement gets into the range of the positioning band. PEND Signal will be kept ON once it is turned ON unless the start signal CSTR is turned back ON, servo is turned OFF [Note 1] or the actuator is out of the positioning band width range [Note 1].
*Note 1   It can be switched over with Parameter No. 39.*

Value in the target position register
or
Target position of indicated position number
(PLC → RCP6S GW)

T1≥0ms

Start signal CSTR
(PLC → RCP6S GW)

Turn it OFF by PEND OFF

Position complete signal PEND
(RCP6S GW → PLC)

Turns ON once gets into positioning band.

Target position

Moving Signal MOVE
(RCP6S GW → PLC)
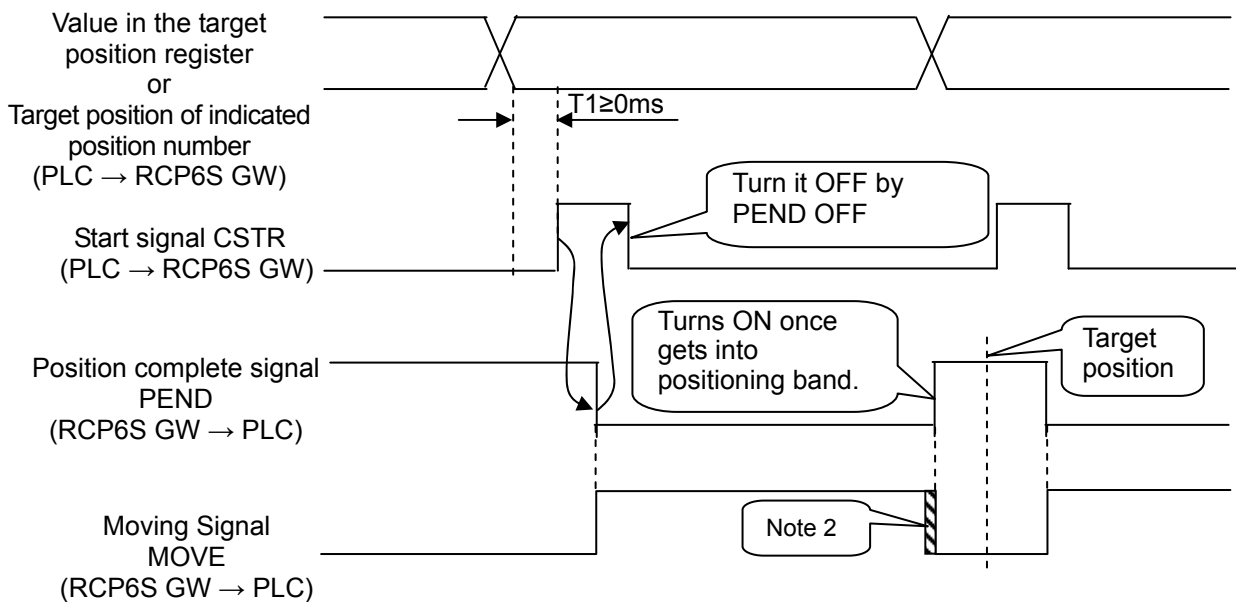
Note 2

*Note 2   MOVE turns ON at the same time as PEND turns OFF, and turns OFF once the command from a controller to the motor is finished. Therefore, when the positioning band setting is wide, the signal may turn OFF even in the actuator operation, and may turn OFF prior to PEND if the positioning band setting is narrow.*

⚠ *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.*

3. Operation

## [8]   Pause (STP) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

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* Mode and Simplified Direct Value Mode, and as the value set in the acceleration/deceleration register in the Derect indication mode.

## [9]   Zone 1 (ZONE1)        PLC Input Signal
   Zone 2 (ZONE2)        PLC Input Signal
   Position Zone (PZONE)   PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | △ (No PZONE) | ○ | △ (Only for ZONE1) | △ (No PZONE) |
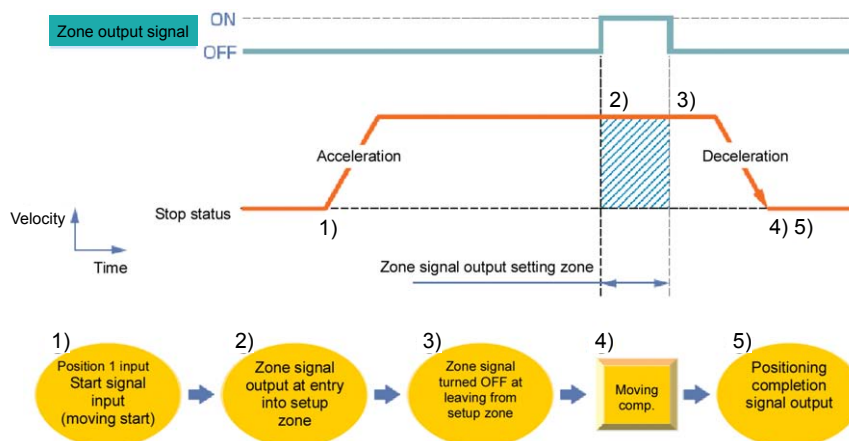


This is a function enables to turn a signal on while the actuator is passing a certain position (in the zone range) or during a stop, in which there are two types.

1) Zone signal (ZONE1, ZONE2)···· Turn the output on at a position set in the parameter.
2) Position zone signal (PZONE)···· Turn the output on at a position set in the position table.

The roles of a sensor, such as the judgment of complete position at pressing complete, continuous operation range setting for the pitch feed or operation interlock of other devices in the setting range, can be made available.

(1)   Zone signal (ZONE1, ZONE2)
   Set the zone range to the parameter.
   1) ZONE1:   Parameter No.1 (Zone boundary 1+), Parameter No.2 (Zone boundary 1-)
   2) ZONE2:   Parameter No.23 (Zone boundary 2+), Parameter No.24 (Zone boundary 2-)

   The zone signal is kept effective also during the emergency stop unless the memory of the origin is lost due to alarm.

(2) Position zone signal (PZONE)

| 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 | | | | | | | | | | | | | |
| 1 | 0.00 | 250.00 | 0.20 | 0.20 | 0 | 0 | 0.10 | 50.00 | 30.00 | 0 | 0 | 0 | 0 |
| 2 | 100.00 | 250.00 | 0.20 | 0.20 | 0 | 0 | 0.10 | 70.00 | 60.00 | 0 | 0 | 0 | 0 |
| 3 | 50.00 | 250.00 | 0.20 | 0.20 | 50 | 0 | 20.00 | 60.00 | 65.00 | 0 | 0 | 0 | 0 |

Setting of zone range

Set the zone range to the position table.
This set value becomes valid while the position number set in the zone range is executed. It is kept effective also during the emergency stop unless the actuator is operated or the memory of the origin is lost due to alarm.

(3) Output Ranges of Set Values and Signals
The zone output range differs depending on the difference of the values set in the zone positive side and negative side.

1) Value set for positive side > value set for negative side:
Output signal turn ON in the range from the value on negative side to that on positive side, and turns OFF out of the range
2) Value set for positive side < value set for negative side:
Output signal turn OFF in the range from the value on positive side to that on negative side, and turns ON out of the range

[Example of Line Axis]
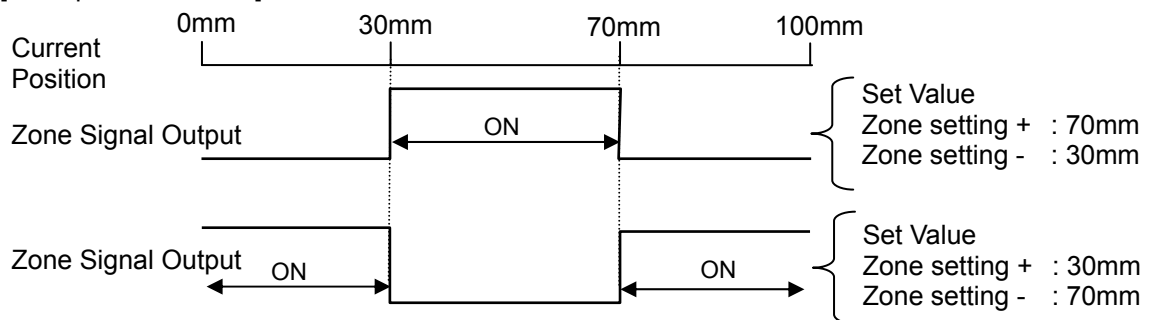
[10] + Jog (JOG+) PLC Output Signal
    - Jog (JOG-)   PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| O : Equipped<br>× : Not equipped | O | O | O | O | × | O |

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

1) Jog operation
   Jog operation can be performed when the jog/inch switching (JISL) signal is OFF.
   While the "JOG+" is turned ON, the movement direction is to the opposite of the home and when it is turned OFF, the actuator is decelerated and stopped.
   While the "JOG-" is ON, the actuator will operate in the direction of home and when it is turned OFF, it is decelerated to a stop.
   The operation is performed based on the set values of the following parameters.
   • The speed is based on the parameter value 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".
     If the JVEL signal is ON, the actuator operates according to parameter No.47, "PIO jog speed 2".
   • The acceleration/deceleration conforms to the rate acceleration/deceleration (the specific value varies depending on the actuator).
   • When both the JOG+ and JOG- signals are turned ON, the actuator is decelerated and stopped.

2) Inching (incremental) operation
The inching operation is available while the JISL signal is turned ON.
One time of ON input gives the actuator a constant amount of movement of the inching distance set in the parameter.
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".
     If the JVEL signal is ON, the actuator operates according to parameter No.47, "PIO jog speed 2".
   • The travel conforms to the value of the parameter ON/OFF specified by the JVEL signal.
     If the JVEL signal is OFF, the actuator operates according to parameter No.48, "PIO inch distance".
     If the JVEL signal is ON, the actuator operates according to parameter No.49, "PIO inch distance 2".
   • The acceleration/deceleration conforms to the rate 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.

[11] Jog-speed/inch-distance switching (JVEL) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | × | ○ |

It is a signal to switch the parameters to indicate the speed or inching (incremental) 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" |

[12] Jog/inching switching (JISL) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | × | ○ |

This signal changes over the jog operation and the inching (incremental) 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. |

[13] Teaching mode command (MODE) PLC Output Signal

Teaching mode signal (MODES) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ✕ | ✕ | ○ | ✕ | ✕ |

When the MODE signal is turned ON, the normal operation mode is changed to the teaching mode.
When the mode 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.*

[14] Position data import command (PWRT) PLC Output Signal

Position data import complete (WEND) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ○ | ✕ | ✕ | ○ | ✕ | ✕ |

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.*
*Note2 When the data items except for the position have not been defined, the parameter initial values are written. [Refer to Chapter 8 Parameter]*
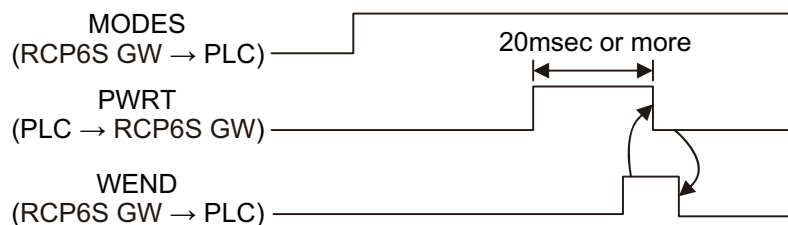
## [15] Brake release (BKRL) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped × : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

The brake can be released while BKRL signal is turned ON. For an actuator equipped with a brake, the brake can be controlled automatically with the ON/OFF of the servo, however, it may require to release the brake in such cases as when installing to the system or conducting Direct Teach [*1], when the slider or rod needs to be moved manually with hand.

This operation also can be performed with the brake release switch on the hub unit front panel, or by supplying 24V to the brake release input on the system I/O connector of gaetway unit.

*1 Direct Teaching:   It is an operation to move the slider or rod manually with hand to read the coordinate to the position table.

---

⚠ *Warning:  (1)  Release the brake with a special care. Doing so carelessly may cause an injury or a malfunction of actuator, work piece or other devices due to a drop of the slider or rod.*

*(2)  Make sure to put the setting back to activate the brake after releasing it. It is extremely dangerous to perform operation with the brake open. Drop of the slider or rod may cause injury or malfunction of actuator body, work piece or system.*

---

[16] Push-motion specification (PUSH) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped ✕ : Not equipped | ✕ | ✕ | ○ | ✕ | ✕ | ✕ |

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.

[Pressing Operation CON Method]
After reaching the target position [Note 1] from the current position, the actuator moves with the pressing speed for the distance set as the pressing band width.
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  In Direct Indication Mode, it is the value input in the target position register.*



[Pressing Operation SEP Method]
The pressing operation is performed with the start position set at the point in front of the target position [Note 1] for the width of the positioning width (for Direct Indication 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    In Direct Indication Mode, it is the value input in the target position register.*
*(Note)    Pulling operation cannot be performed.*
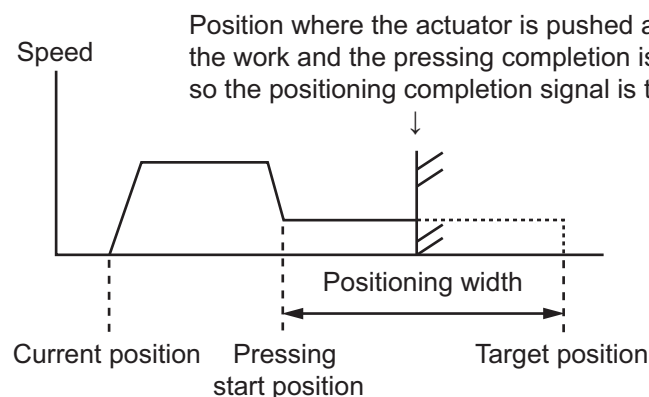
## [17] Push direction specification (DIR) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped<br>× : Not equipped | × | × | ○ | × | × | × |

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 and select the pressing as SEP type related models, this signal is ineffective.
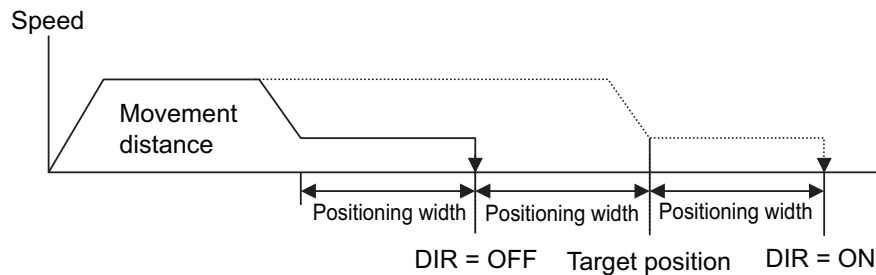


## [18] Pressing and a miss (PSFL) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped<br>× : Not equipped | ○ | ○ | ○ | ○ | ○ | ○ |

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.

## [19] Command complete signal (MEND) PLC Input Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped<br>× : Not equipped | ○ | ○ | ○ | ○ | × | ○ |

This signal turns ON when the movement to the target position indicated by the host system is complete.
Even though the control is about the same as PEND, this signal turns ON even if pressing is missed.
It is OFF when servo is OFF or emergency stop is OFF. Also, if CSTR Signal is ON, this signal would not turn ON.

## [20] Incremental command (INC) PLC Output Signal

| Operation Mode | Positioner 1 | Simple Direct | Direct numeric specification | Positioner 2 | Positioner 3 | Positioner 5 |
|---|---|---|---|---|---|---|
| ○ : Equipped<br>× : Not equipped | × | × | ○ | × | × | × |

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

### [21] Light error alarm (ALML) PLC Input Signal

This signal turns ON when an overload warning or message level alarm is generated.
[Refer to 8.2 [62] Light Malfunction Alarm Output Select]

For the message level alarm, refer to the section for the Chapter 9 Troubleshooting.

### [22] Outputs load output judgment (LOAD) PLC Input Signal

This signal is valid only in pressing operation.
In order to use it in press-fitting purpose, it is necessary to know if the load has reached the set load threshold during the pressing operation.
The load threshold and the inspection band range are to be set in the PLC, and this signal turns on when the command torque (motor current) exceeded the threshold in this inspection band range.
This signal makes a judgment by checking if the command torque exceeds the threshold for a certain time in total.
The process order is the same as that for pressing judgment. The judgment time for load output can be changed if necessary in Parameter No. 50 "Load Output Judgment Time".
This signal will be retained until the next movement command is received.

The position where this signal turns on if the command torque exceeded the threshold in the torque inspection range

The position where positioning complete signal turns ON if the work piece hits and pressing is judged as completed.

Velocity

Inspection band range

Movement distance

Positioning band (Max pressing volume)

Target position
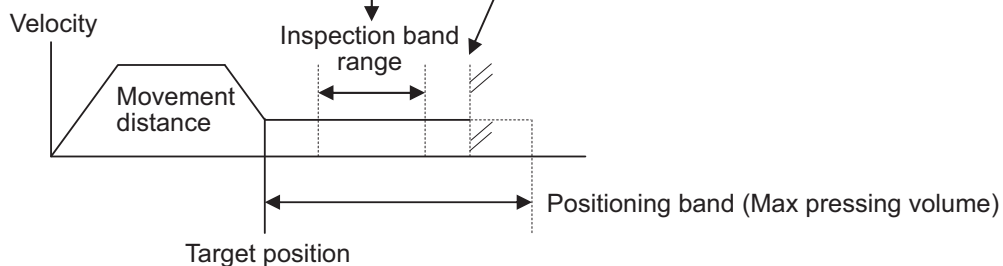
- The pressing velocity is set in Parameter No. 34.
  Setting is established individually considering the actuator characteristics at the delivery.
  Indicate appropriate velocity considering the material and profile of the work piece.
- Set the parameter No.50 [Outputs load output judgment time]
- The threshold inspection band is to be set in Zone Boundary + Register and Zone Boundary – Register in PLC.
- The threshold is to be set in Load Current Threshold Register in PLC.
- The positioning band is to be set in Positioning Band Register in PLC.
  Set it a little longer than the position of the end portion considering mechanical unevenness of a work piece.
  Refer to an instruction manual for main unit of controller for details

⚠ *Caution : • Servo error will occur if hitting to a work piece in front of the target position. Consider the relation between the target position and the work piece position.*
*• The actuator keeps pushing a work piece with the pressing current at stop determined by the current limit value.*
*Be careful in handling at this time as it is not the status of stop.*

## 3.7.2　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 RCP6S GW (for Positioner 1 Mode), the operation shall be made with other information, such as the speed, acceleration/deceleration, positioning width, pressing force, etc., set to the position data.

● Example of operation (Normal Positioning Operation with Simple Direct Mode)
(Preparation) Set the operation mode to Simple Direct Mode in Gateway Parameter Setting Tool.
　　　　　　　[Refer to 3.2.1 Oeration Mode 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.
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.

### 3.7.3 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 operation mode to Direct Indication Mode in Gateway Parameter Setting Tool. [Refer to 3.2.1 Oeration Mode Setting.]

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.
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 positioning band resistor, and the CSTR signal is turned OFF, the PEND signal is turned ON.

### 3.7.4    Operation for Positioner 2, Positioner 3 and Positioner 5 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 RCP6S GW.

● Example of operation (Positioning operation)
(Preparation) Set the operation mode to Positioner 2, Positioner 3 or Positioner 5 Mode in Gateway Parameter Setting Tool. [Refer to 3.2.1 Oeration Mode Setting.]
Set the position data (target position, speed, acceleration/deceleration, etc.) to the position table.

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.
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)  The current position data is continuously updated for Positioner 5 Modes.
6)  At the same time when the PEND signal is turned OFF, the MOVE signal is turned ON.
7)  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 positioning 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.

## 3.8 About Gateway Parameter Setting Tool

This tool is necessary for the process such as RCP6S gateway operation mode select.
Shown below is how to use the tool.
*(Note) The design of the screen may differ depending on the operation system of your PC.*

### 3.8.1 Startup of Tool

1) Boot the Gateway Parameter Setting Tool after the power to RCP6S gateway unit is turned ON, and the window shown below appears.
Select "RCP6 GW" and click on the "OK" button.
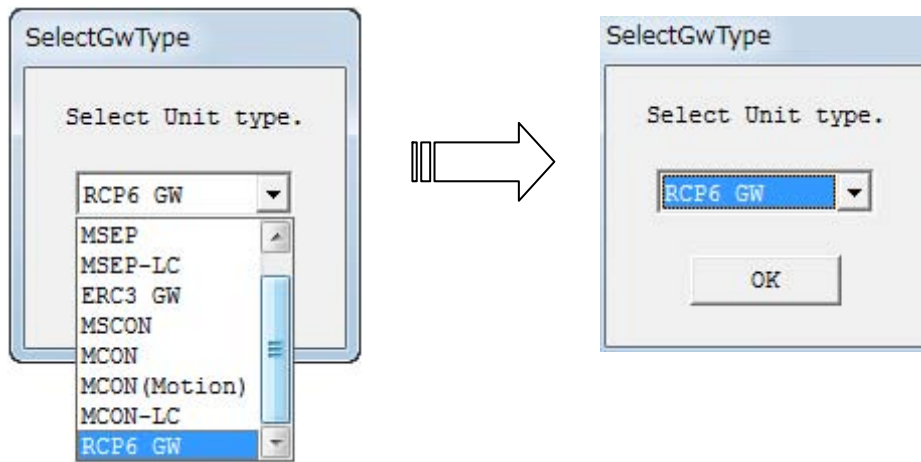


2) The main window opens. Click on the "Read" button in this window and the parameters start to be read from RCP6S GW.
Parameter transfer starts if the "Write" button is clicked. However, note that the transfer cannot be made if there is a blank like Address and Communication Speed in the figure below.



Main windows (Initial condition)

3. Operation

### 3.8.2 Explanation of Each Menu

(Note) *If RCP6S GW is not detected, there will be some items that cannot be displayed or selected.*

1) File Menu
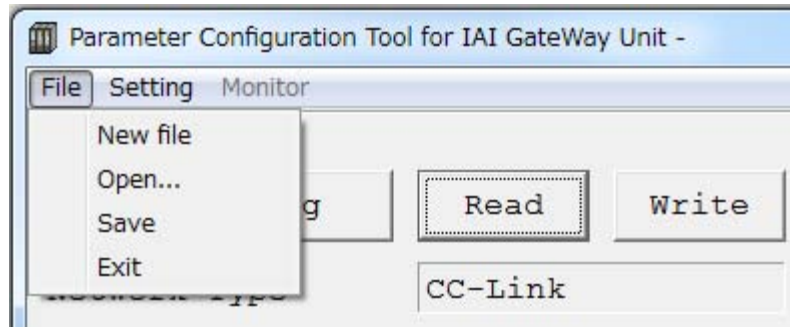


In the main window, click on the file menu on the top left corner and the menu list pops up as shown in the figure above.

- 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
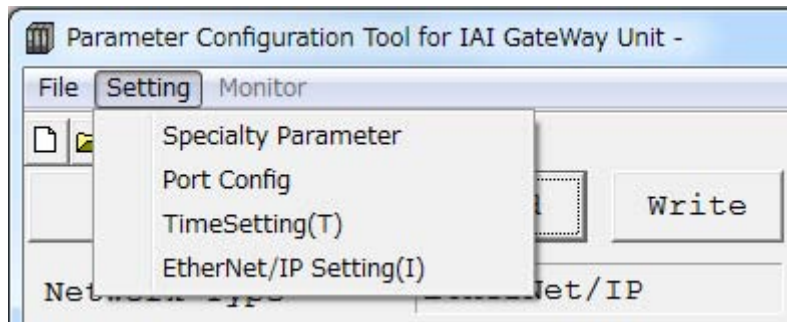


Click on the "Setting" menu on the top left corner in the main window and the setting menu list pops up.

- Specialty Parameter : Set the parameters related to the process of Gateway area in RCP6S GW.
  [Refer to 3.8.3 1) to 2) GW Parameter 1/2, 3) GW Mode Select.]
- Port Config : Set the communication speed between the tool and PC and COM port number.
- Time Setting (T) : Set the clock retained in RCP6S GW.
  [Refer to 3.8.3 5) Time Setting.]
- EtherNet/IP Setting (I) : For EtherNet/IP type, this menu is displayed. Set IP address etc.
  [Refer to 3.8.3 6) EtherNet/IP Setting]

3) Monitor menu
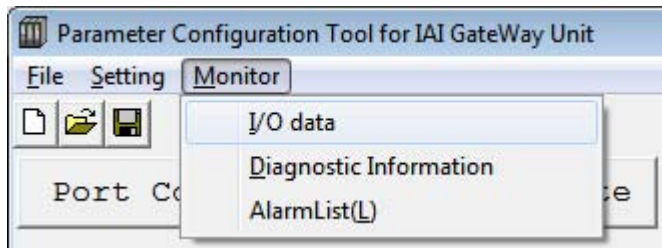


Click on the [Monitor] menu on the top left corner in the main window and the monitor menu list pops up.
*(Note)  "Monitor" cannot be selected before reading a parameter.*

- I/O data　　　　　　　　: Show the details of the host PLC and RCP6S GW data.
　　　　　　　　　　　　　[Refer to 3.8.3 7) I/O data.]
- Diagnosis Information: Show the number of ERR_T and ERR_C occurrence, emergency stops and scan time.
　　　　　　　　　　　　　[Refer to 3.8.3 8) Diagnosis information.]
- Alarm List (L)　　　　　: Read and show the alarm list retained in RCP6S GW.
　　　　　　　　　　　　　[Refer to 3.8.3 9) Alarm list.]

### 3.8.3 Description of Functions

1) GW-Param
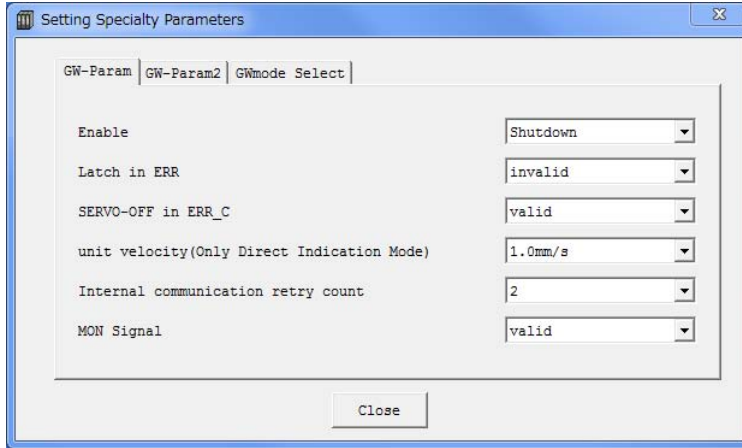


- Enable operation : Select the operation when enable input is detected.
  Select whether to shut down or turn the servo OFF.
- Latch in ERR : Select the operation at recovery after ERR_T or ERR_C occurred.

|  | At Recovery after ERR_T Occurrence | At Recovery after ERR_C Occurrence |
|---|---|---|
| Valid | Servo turns off. (Stops at position where ERR_T occurred) | The condition of ERR_C occurred does not get cancelled. |
| Invalid | Servo remains on. | The condition of ERR_C occurred get cancelled. |

- SERVO-OFF in ERR_C : Select whether to turn the servo OFF on the connected axes when ERR_C is occurred.
- Unit velocity (Only direct indication 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.
- MON signal : Select whether to have MON Signal output valid or invalid.

2) GW-Param 2
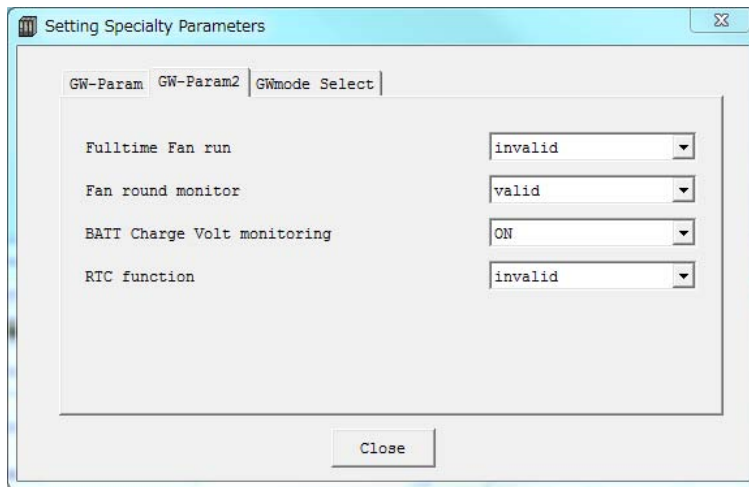


- Fulltime fan run : Select whether to always drive the fan even in AUTO mode.
- Fan round monitor : Select whether to/not to monitor the fan rotation speed with the monitor function.
- BATT charge volt monitoring : Select whether to/not to monitor the absolute battery charge voltage.
- RTC function : Select whether to use the calendar function.

3) GWmode Select
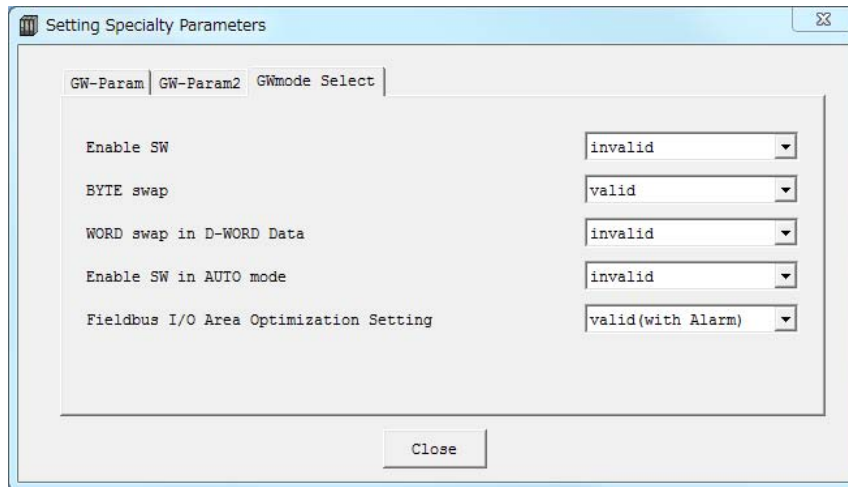


- Enable SW : Select whether to activate/inactivate the enable switch inteaching pendunt.
- BYTE swap : Set the byte swap. [Refer to 3)-1 in this section.]
- WORD swap in D-WORD data : Set whether to swap the W-word sized data with word size. [Refer to 3)-2 in this section.]
- Enable SW in AUTO mode : Select whether to activate/inactivate the enable switch in AUTO mode.
- Fieldbus I/O Area Optimization Setting : Select whether to valid or invalid the left-justification setting feature in the fieldbus I/O domain.

| Iivalid | Left-justification setting feature is not to be used.<br>Select it when all the axes are connected or not to have all the unconnected axes left-justified. |
|---|---|
| Valid (without Alarm) | Left-justification setting feature is to be used.<br>An alarm will not be output when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status.<br><br>Select it when having partially the unconnected axes not to be left-justified. |
| Valid (with Alarm) | Left-justification setting feature is to be used.<br>"896 Connected Unit Construction Error" is occurred when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status.<br><br>Select it when having all the axes left-justified. |

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.

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RCP6S GW input register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ● | ● | ○ | ○ | ● | ● | ○ | ● | ● | ○ | ● | ○ | ● | ● | ● | ● |
| Hexadecimal | | 3 | | | | 4 | | | | 1 | | | | 2 | | | | C | | | | D | | | | A | | | | B | | |

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLC: RWwnn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ● | ○ | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | ● |
| Hexadecimal | | 1 | | | | 2 | | | | 3 | | | | 4 | | | | A | | | | B | | | | C | | | | D | | |

●: ON
○: OFF

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RCP6S GW input register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ● | ● | ○ | ○ | ● | ● | ○ | ● | ● | ○ | ● | ○ | ● | ● | ● | ● |
| Hexadecimal | | 3 | | | | 4 | | | | 1 | | | | 2 | | | | C | | | | D | | | | A | | | | B | | |

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLC: RWrnn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ● | ○ | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | ● |
| Hexadecimal | | 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.

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RCP6S GW input register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ● | ○ | ● | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ |
| Hexadecimal | | A | | | | B | | | | C | | | | D | | | | 1 | | | | 2 | | | | 3 | | | | 4 | | |

●: ON
○: OFF

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLC: RWwnn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ● | ○ | ● | ○ | ● | ○ | ● | ● | ● | ○ | ○ | ● | ● | ○ | ○ | ○ |
| Hexadecimal | | 1 | | | | 2 | | | | 3 | | | | 4 | | | | A | | | | B | | | | C | | | | D | | |

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RCP6S GW input register | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ● | ○ | ● | ○ | ● | ○ | ● | ● | ● | ● | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ |
| Hexadecimal | | A | | | | B | | | | C | | | | D | | | | 1 | | | | 2 | | | | 3 | | | | 4 | | |

| | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PLC: RWrnn | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ON/OFF | ○ | ○ | ○ | ● | ○ | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ● | ○ | ○ | ● | ○ | ● | ○ | ● | ○ | ● | ● | ● | ○ | ○ | ● | ● | ○ | ○ | ● |
| Hexadecimal | | 1 | | | | 2 | | | | 3 | | | | 4 | | | | A | | | | B | | | | C | | | | D | | |

4) Tool Communication Setting
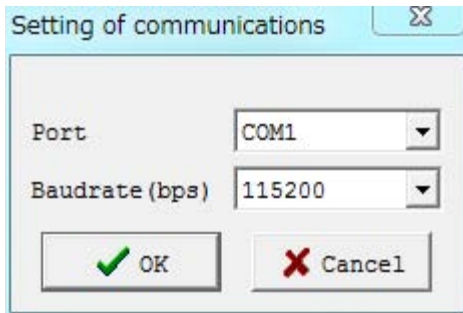


- Port            : Set the communication port number.
- Baudrate (bps) : Select the baud rate between RCP6S GW and PC from
                   9600/19200/38400/57600/115200/230400.

5) Time Setting
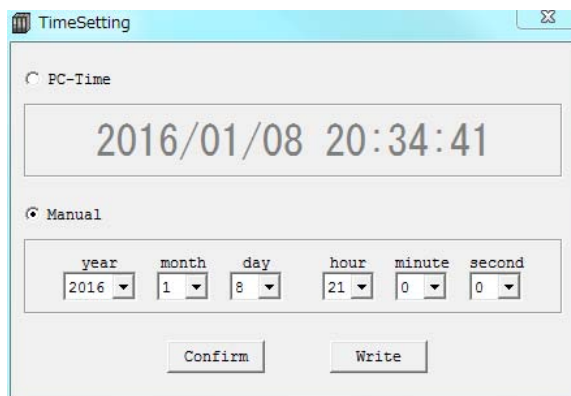


By selecting Time on PC, the current time on the PC is acquired and set to RCP6S GW.
If Set Manually is selected, desired time set in the clock edit in the window can be set in RCP6S GW. Click "Write", and the time setting is transferred to RCP6S GW and the data is written in. Clicking on the Confirm button and the clock data currently retained in RCP6S GW can be read and displayed.

⚠ Caution: The clock (calendar) function in RCP6S GW can be retained for approximately 10 days (reference) after the power to RCP6S GW 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.

6) EtherNet/IP Setting (Setting to be established for EtherNet/IP type)

| EtherNet/IP Setting | |
|---|---|
| IP address | 192 . 168 . 0 . 1 |
| Subnet mask | 255 . 255 . 255 . 0 |
| Default gateway | 0 . 0 . 0 . 0 |

OK
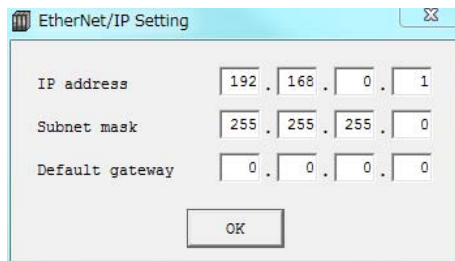
- IP address         : Set IP address for RCP6S GW.
- Subnet mask      : Set subnet mask.
- Default gateway : Set default gateway.

7) I/O Data (Register Monitor)

Register Monitor

| Master -> Gateway | | Gateway -> Master | |
|---|---|---|---|
| Address | Data | Address | Data |
| +00 | 0000 | +00 | 946A |
| +01 | 0000 | +01 | 0001 |
| +02 | 0000 | +02 | 0000 |
| +03 | 0000 | +03 | 0000 |
| +04 | 0000 | +04 | 0000 |
| +05 | 0000 | +05 | 0000 |
| +06 | 0000 | +06 | 0000 |
| +07 | 0000 | +07 | 0000 |
| +08 | 0000 | +08 | 0000 |
| +09 | 0000 | +09 | 0000 |
| +0A | 0000 | +0A | 0000 |
| +0B | 0000 | +0B | 0000 |
| +0C | 0000 | +0C | 0000 |
| +0D | 0000 | +0D | 0000 |
| +0E | 0000 | +0E | 0000 |
| +0F | 0000 | +0F | 0000 |

| 500ms | | HEX | | ☐ SYNC Scroll |
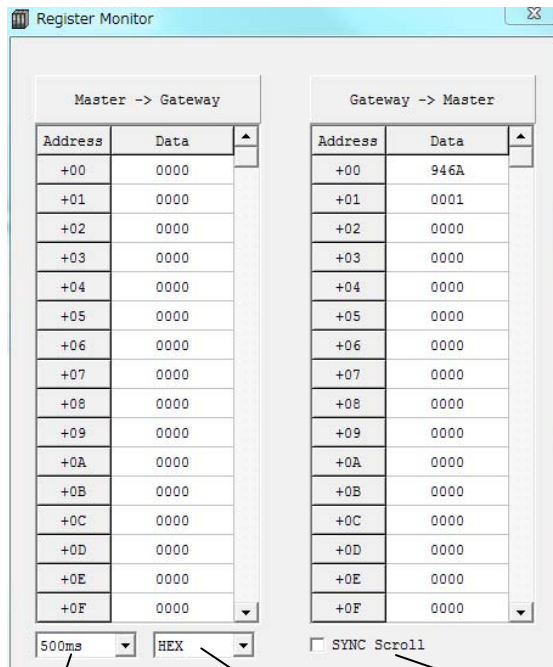
Data Reading Frequency      Display Switchover      SYNC Scroll

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                    : Tick in the box to make the list of the sent and received data scrolled together.

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8) Diagnosis Information
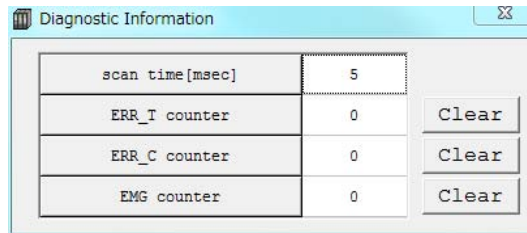


In this window, displays the scanning time of the gateway unit and the devices connected to it, times of communication error (ERR_C and ERR_T) occurrence and times of emergency stop (EMG) detection. Also, when the clear button is pressed each counter will be reset.

9) Alarm List



| Record | Code | Content | Detail | Address | OccTime |
|---|---|---|---|---|---|
| 0 | 860 | ERR T | ---- | ---- | 2016/05/17 17:47:03 |
| 1 | 86A | DB Parameter type mismatch. | 0001 | ---- | 2016/05/17 17:47:03 |
| 2 | FFF | Power up (not error) | ---- | ---- | 2016/05/17 17:46:58 |
| 3 | 89E | Fan Failure. | ---- | ---- | 2016/05/17 17:46:39 |
| 4 | FFF | Power up (not error) | ---- | ---- | 2016/05/17 17:46:16 |
| 5 | 860 | ERR T | ---- | ---- | 2016/05/17 17:32:10 |
| 6 | 86A | DB Parameter type mismatch. | 0001 | ---- | 2016/05/17 17:32:10 |
| 7 | FFF | Power up (not error) | ---- | ---- | 2016/05/17 17:32:07 |
| 8 | ---- | ---- | ---- | ---- | ---- |
| 9 | ---- | ---- | ---- | ---- | ---- |
| 10 | ---- | ---- | ---- | ---- | ---- |
| 11 | ---- | ---- | ---- | ---- | ---- |
| 12 | ---- | ---- | ---- | ---- | ---- |
| 13 | ---- | ---- | ---- | ---- | ---- |
| 14 | ---- | ---- | ---- | ---- | ---- |
| 15 | ---- | ---- | ---- | ---- | ---- |

Click on the "Refresh" button and the alarm list is read again from RCP6S GW.
Click on the "Clear" button and the alarm list retained in RCP6S GW are all deleted.
Press "Save" button and the alarm list retained in RCP6S GW will be saved in CSV format.

Refer to Chapter 9 Troubleshooting for the details of the alarms.
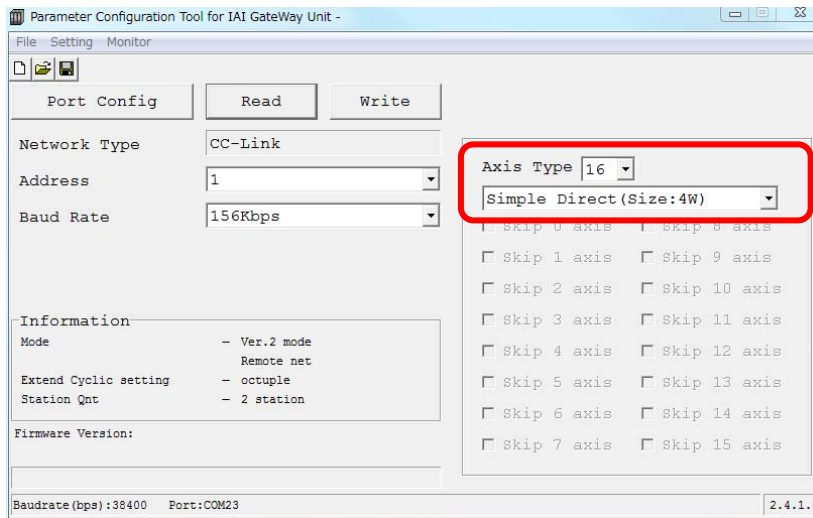
### 3.8.4 Operation Mode Setting

Select an operation mode for number of connected axes (a value of final axis number + 1) and drive unit.
The selected operation mode will be that for all the connected axes. (Same mode for all axes)

Maximum Connectable Axes

| Fieldbus \ Mode | Direct Number Indication Mode | Simple Direct Mode | Positiner 1 Mode | Positiner 2 Mode | Positiner 3 Mode | Positiner 5 Mode |
|---|---|---|---|---|---|---|
| CC-Link | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| DeviceNet | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| PROFIBUS-DP | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| EtherNet/IP | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| EtherCAT | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |
| PROFINET-IO | 8 axes | 16 axes | 16 axes | 16 axes | 16 axes | 16 axes |

⚠ Caution:   Max. Connectable Axis Number when Using Direct Indication Mode in those other than CC-Link

• When Left-Justification Setting Feature Used
The maximum connectable number of axes should be eight (PLC address: Axis No. 0 Domain to Axis No. 7 Domain).
• When Left-Justification Setting Feature Not To Be Used
The maximum connectable number of axes should be eight when two units of hub unit are used and two when hub unit not used.

### 3.8.5 Fieldbus I/O Domain Left-Justification Setting
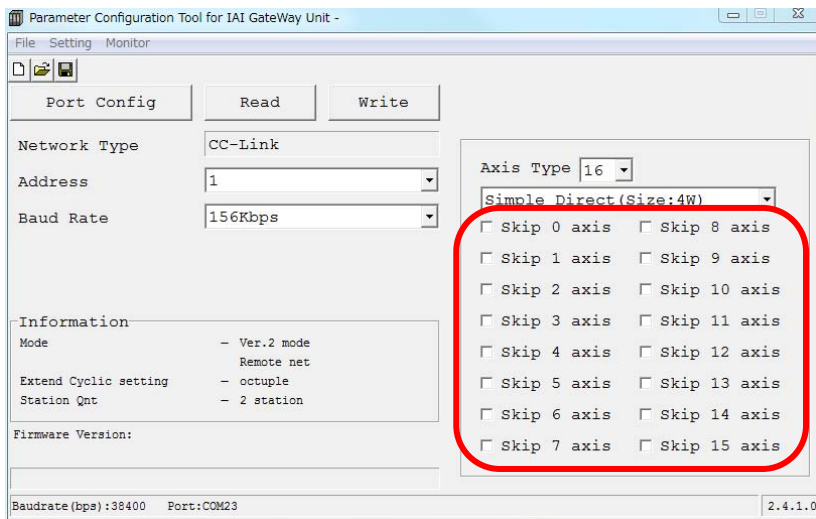


Setting whether to have left-justification conducted or not conducted to each axis can be selected to Axis 0 to Axis 15 when Valid (without Alarm) or Valid (with Alarm) is selected in the fieldbus I/O domain left-justification setting.
[Refer to 3.8.3 Explanation for Features (3) GW Mode Select for how to conduct the fieldbus I/O domain left-justification setting]

| Left-justification not to be conducted | □ : Remove Check Mark |
|---|---|
| Left-justification to be conducted | ☑ : Put Check Mark |

*(Note)  Putting a check mark ☑ will have also connected axes left-justified.*
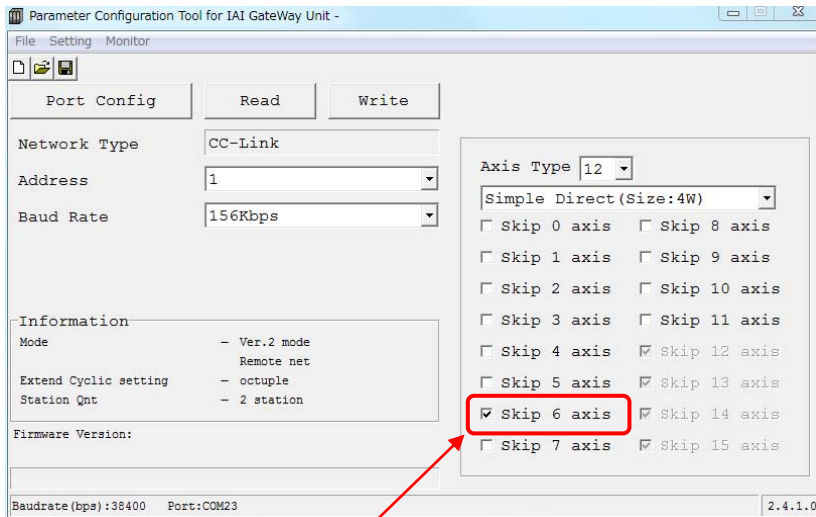


Put a check mark ☑ to select an axis to be left-justified.
Remove a check mark to for those not to be left-justified.

## 3.9 Fieldbus Status LEDs

The communication status of the fieldbus can be checked.

### 3.9.1 DeviceNet
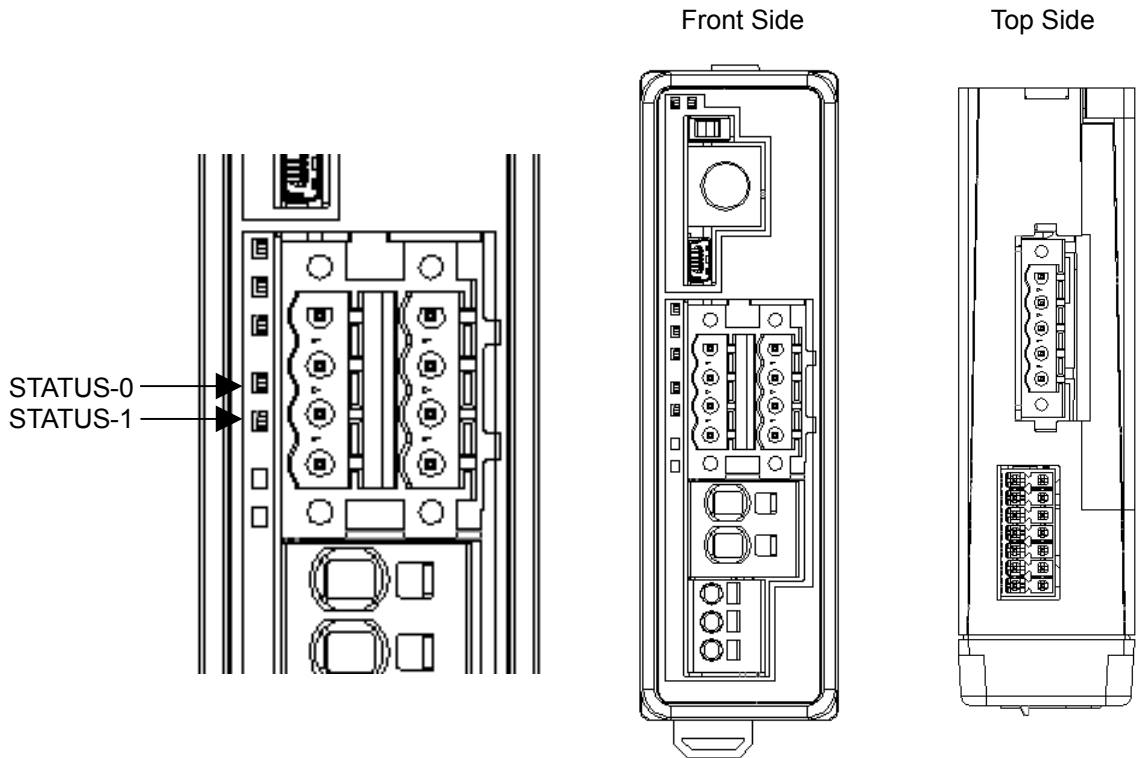
Front Side          Top Side



STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆: Flashing

| Name | Panel State | Display Color | Remarks |
|------|-------------|---------------|---------|
| STATUS-1 | NS | 🟢 Green (Illuminating) | Online |
| | | ⭐ Green (Flashing) | Online (Cnx unestablished) |
| | | 🟠 Orange (Illuminating) | An error occurs. |
| | | ⭐ Orange (Flashing) | One or more Cnx in timeout |
| | | ⭐⭐ Green/Orange (Flashing by turns) | In self-checking process. |
| STATUS-0 | MS | 🟢 Green (Illuminating) | In normal operation |
| | | ⭐ Green (Flashing) | Status of no configuration information or incomplete |
| | | 🟠 Orange (Illuminating) | Malfunction (recovery impossible) |
| | | ⭐ Orange (Flashing) | Malfunction (recovery possible) |
| | | ⭐⭐ Green/Orange (Flashing by turns) | In self-checking process. |

## 3.9.2 CC-Link

Front Side    Top Side
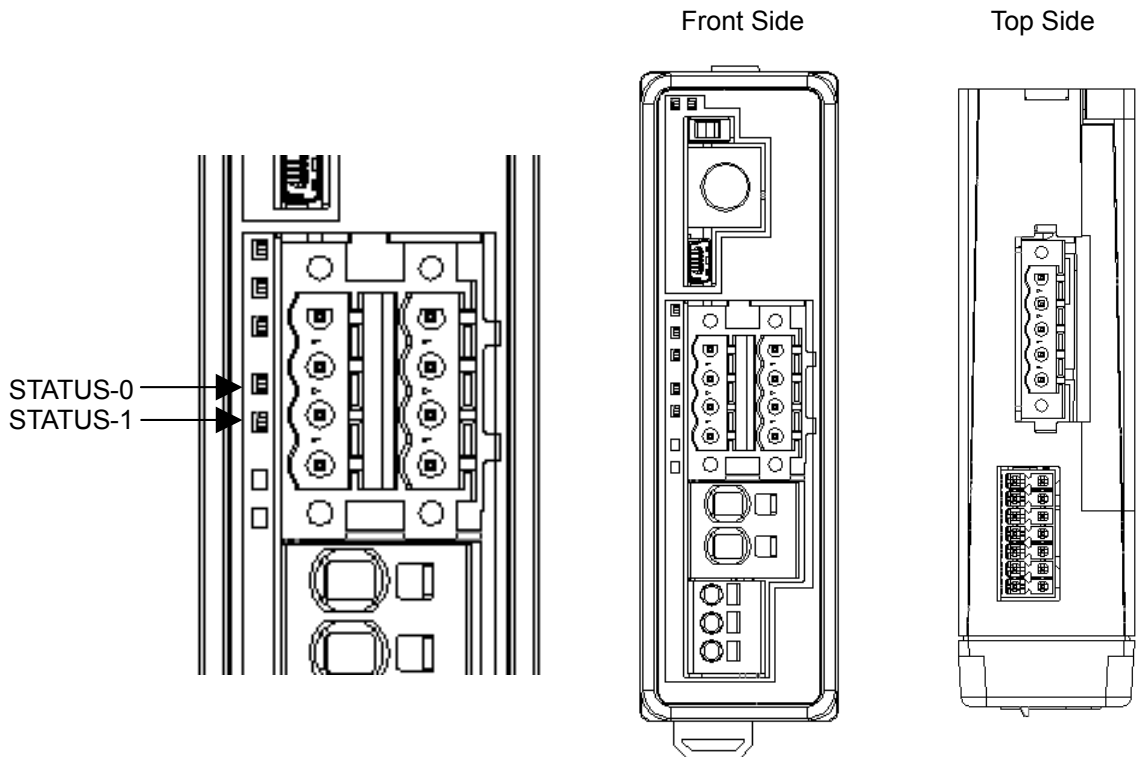


STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆: Flashing

| Name | Panel State | Display Color | | Remarks |
|---|---|---|---|---|
| STATUS-1 | ERR | 🟠 | Orange (Flashing) | An error occurs. (CRC error, station No. setting error or baud rate setting error) |
| | | ⭐ | Orange (Flashing) | Value has changed from those of station number and baud rate setting at reset release |
| STATUS-0 | RUN | 🟢 | Green (Illuminating) | Reception of refresh and polling in normal condition or reception of refresh in normal condition after joining to a network |
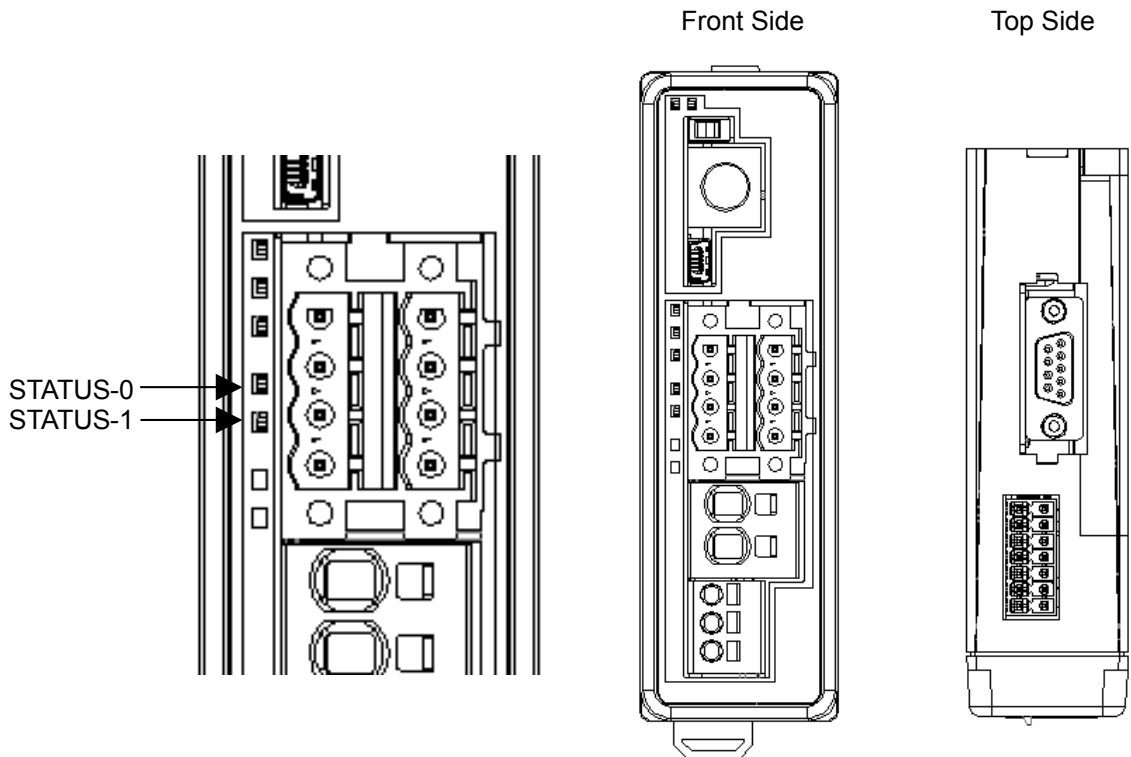
### 3.9.3 PROFIBUS-DP

Front Side     Top Side

STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆: Flashing

| Name | Panel State | Display Color | | Remarks |
|---|---|---|---|---|
| STATUS-1 | NS | 🟢 | Green (Illuminating) | Online |
| | | ⭐ | Green (Flashing) | Online (cleared) |
| | | 🟠 | Orange (Flashing) | An error occurs. (Parameterizing error or PROFIBUS configuration error) |
| STATUS-0 | MS | 🟢 | Green (Illuminating) | Initialization complete |
| | | ⭐ | Green (Flashing) | Initialization complete (with diagnosis event) |
| | | 🟠 | Orange (Flashing) | An error occurs. (exceptional error) |
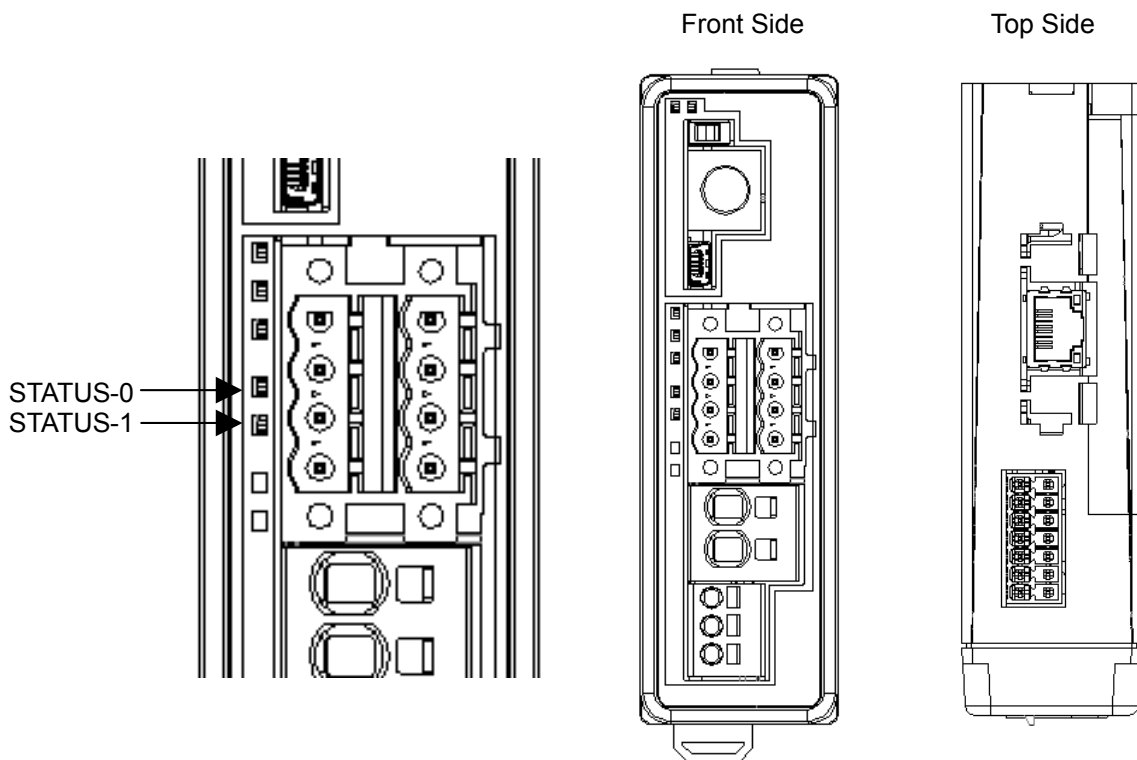
## 3.9.4 EtherNet/IP

Front Side

Top Side



STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆: Flashing

| Name | Panel State | Display Color | | Remarks |
|------|-------------|---------------|--|---------|
| STATUS-1 | NS | ● | Green (Illuminating) | Online (one or more connection(s) established) |
| | | ★ | Green (Flashing) | Online (connection unestablished) |
| | | ● | Orange (Flashing) | IP address duplicated, Critical error |
| | | ★ | Orange (Flashing) | One or more connection (s) in timeout |
| | | × (OFF) | | Power is OFF, IP address not established |
| STATUS-0 | MS | ● | Green (Illuminating) | In normal operation and under control of scanner (master) |
| | | ★ | Green (Flashing) | Construction information setting is incomplete, or scanner (master) is in idling condition |
| | | ● | Orange (Flashing) | Fatal malfunction (exception condition or critical error) |
| | | ★ | Orange (Flashing) | Light malfunction possible to recover |
| | | × (OFF) | | Power is OFF |

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### 3.9.5 EtherCAT

Front Side          Top Side
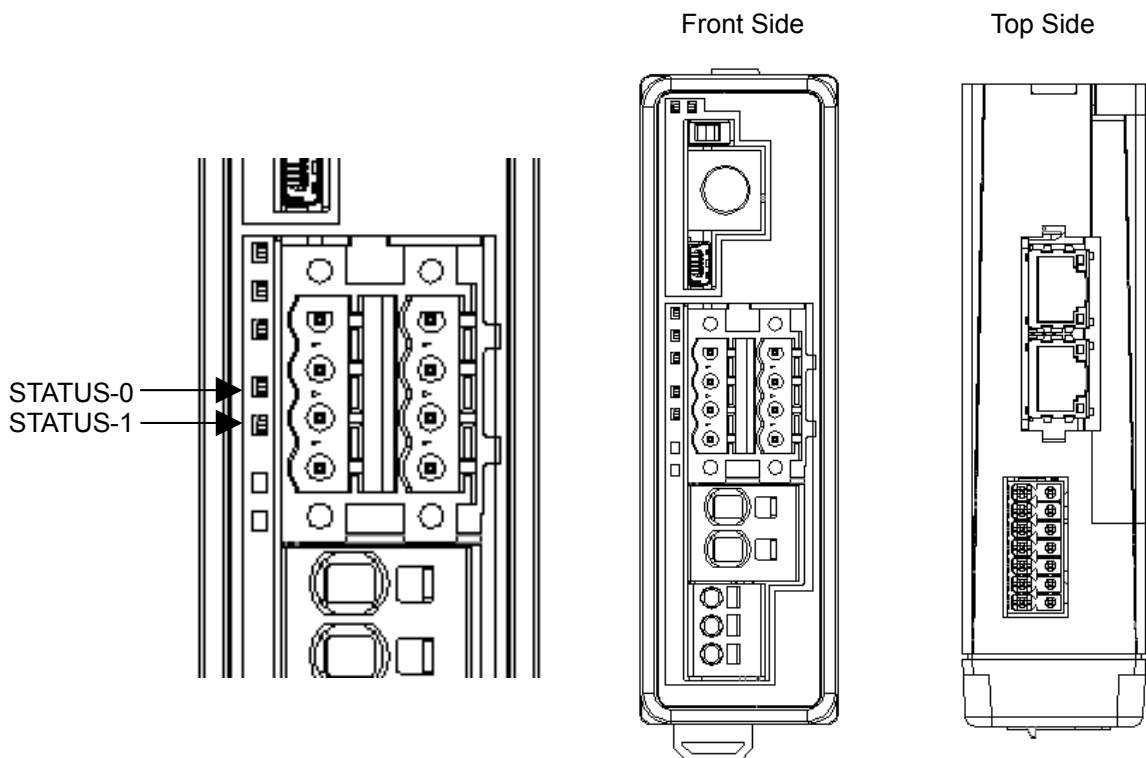


STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆: Flashing

| Name | Panel State | | Display Color | Remarks |
|---|---|---|---|---|
| STATUS-1 | RUN | ● | Green (Illuminating) | Operation Status (EtherCAT communication "OPERATION" status) |
| | | ★ | Green (Flashing)<br>ON : 200ms<br>OFF : 200ms | EtherCAT communication "PRE-OPERATION" status |
| | | ★ | Green (Flashing)<br>ON : 200ms<br>OFF : 1000ms | EtherCAT communication "SAFE-OPERATION" status |
| | | ● | Orange (Flashing) | Module error |
| | | × | (OFF) | Initializing status (EtherCAT communication "INIT" status) |
| STATUS-0 | ERR | ● | Orange (Flashing) | Module error |
| | | ★ | Orange (Flashing)<br>ON : 200ms<br>OFF : 200ms | Construction information (settings) error (Information received from the master cannot be set) |
| | | ★ | Orange (Flashing)<br>ON : 200ms×2 times<br>OFF : 1000ms | Watchdog timer / timeout |
| | | × | (OFF) | No error, Power is OFF |
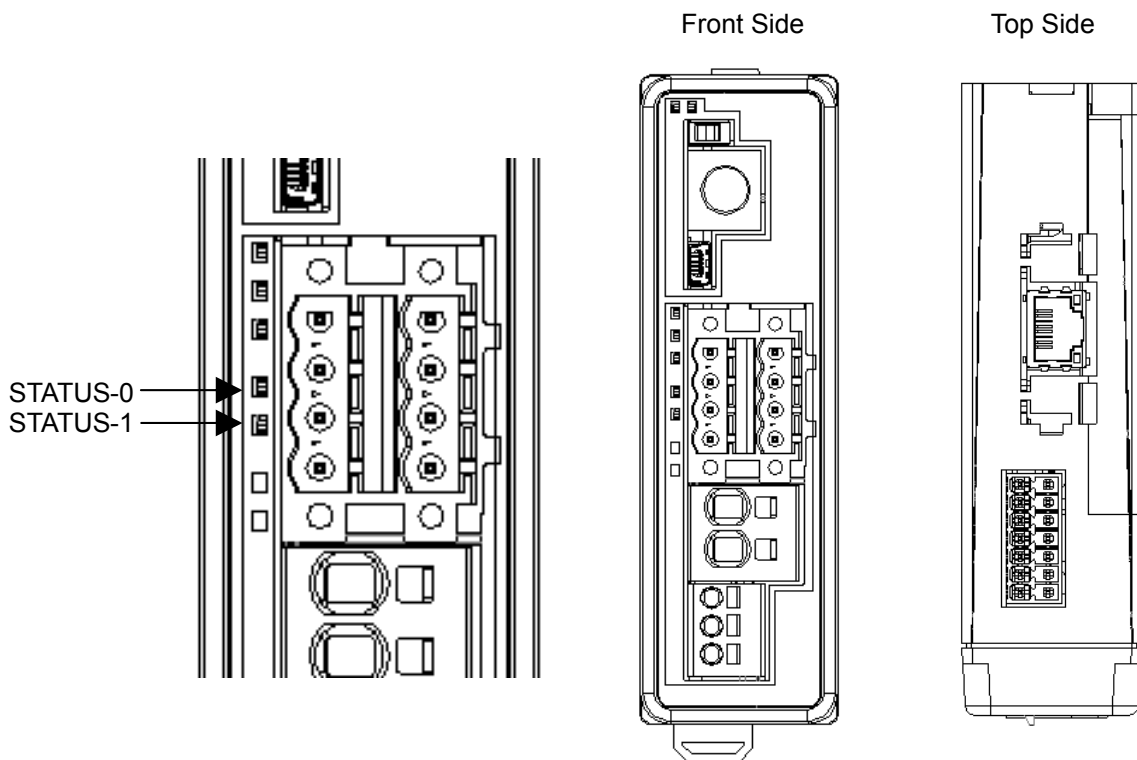
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## 3.9.6 PROFINET-IO

Front Side      Top Side

STATUS-0
STATUS-1

○: Illuminating, ×: OFF, ☆ : Flashing

| Name | Panel State | Display Color | | Remarks |
|---|---|---|---|---|
| STATUS-1 | NS | 🟢 | Green (Illuminating) | Communication established, in RUN status |
| | | ⭐ | Green (Flashing) | Communication established, in STOP status |
| | | × (OFF) | | Power is OFF, No connection |
| STATUS-0 | MS (Note1) | 🟢 | Green (Illuminating) | In the normal operation |
| | | ⭐1 | Green (Flashing 1) | Diagnosis even exists |
| | | ⭐2 | Green (Flashing 2) | Engineering tool identifying nodes |
| | | 🟠 | Orange (Flashing) | In serious malfunction (EXCEPTION) status |
| | | ⭐1 | Orange (Flashing 1) | Configuration error |
| | | ⭐2 | Orange (Flashing 2) | IP address error (IP address unset) |
| | | ⭐3 | Orange (Flashing 3) | Station name error (Station name not established) |
| | | ⭐4 | Orange (Flashing 4) | Internal critical malfunction error |
| | | × (OFF) | | Power turned OFF, module setup/initial status |

Note 1     The continues to flash for number of times stated beside the star mark (☆) in every 0.25sec.
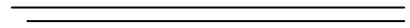
## Chapter 4 Vibration Suppress Control Function

The vibration suppress control function suppresses vibrations of loads induced by our actuators.

The function can suppress vibrations in the same direction as the movement of the actuator in the frequency range from 0.5Hz to 30Hz.

Measure the frequency of the generated vibration and set it to the parameter. Three frequencies can be defined as parameters. Specify the parameters in the position table to reflect them on suppression of vibrations generated by the operation. For a single moving command (position data), only a single parameter can be set.

*(Note) This feature is limited only to the servo motor type actuators.*
*Cannot be used in direct indication mode*
*Before this function can be used, you must read the cautions described on the next page.*

[Functional Operation Image]

The figure below shows an example in which two actuators are subject to 2-axis combination. Actuator A is moved to cause actuator B corresponding to a joint to be vibrated. Measure the vibrations of B in the direction in which A is moved and make proper vibration suppress control in the direction to suppress the vibrations of B. Vibrations of Actuator B caused by the movement of B cannot be suppressed by Actuator A.



★No setting of vibration suppress control     ☆Setting of vibration suppress control

Vibration in axis moving direction

B (Joint)

A

B (Joint)

A
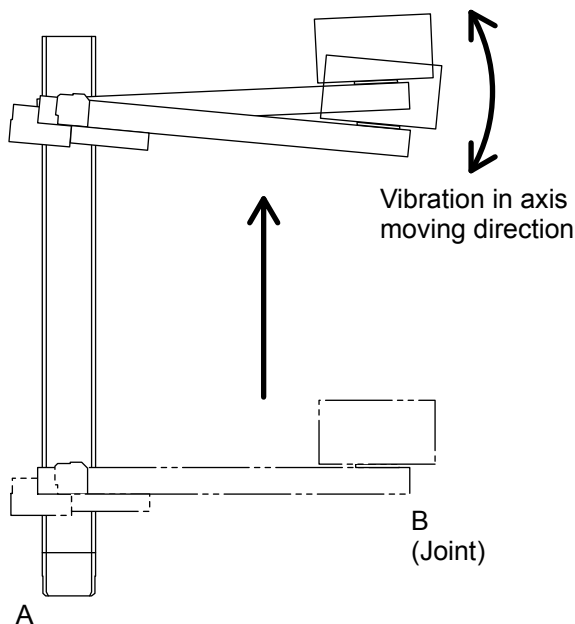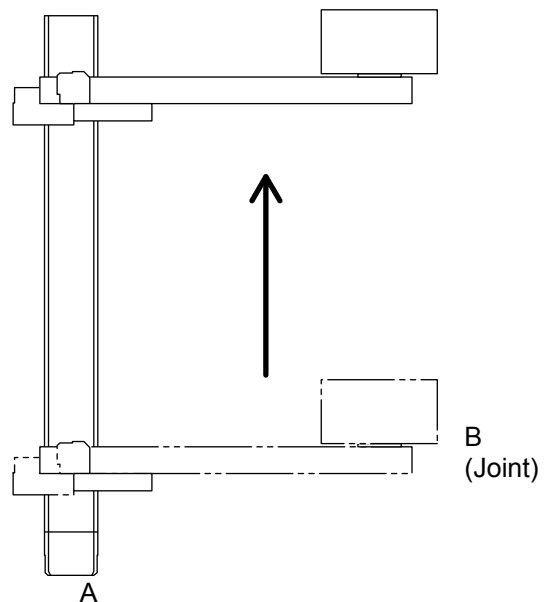
⚠ *Caution:*

- *Use of Frequency Analysis Tool for Anti-Vibration Control*
  *If using the frequency analysis tool for anti-vibration control installed in the PC software, it is necessary to get the key file (Fam.dll), copy and store it in the same folder as the executable file (RcPc.exe) of the PC software.*
  *Please contact IAI for the key file.*
  *Refer to "Chapter 14 Frequency Analysis Feature for Anti-Vibration Control" in the RC PC Software Instruction Manual for how to operate.*
- *Vibrations subject to vibration suppress control*
  *It is the vibration of the load generated by IAI actuator, and is in the same directions as the actuator movement.*
- *Vibrations not subject to vibration suppress control*
  1) *Vibration whose source is not the operation of the actuator*
  2) *Vibration in a direction different from the direction in which the actuator, or the vibration source, is moved.*
  3) *Vibration of vibrating object itself (This function moves objects easily vibrated without vibrations and cannot suppress vibrations already generated.)*
- *Conditions in which vibration suppress effect can hardly be obtained*
  1) *When the frequency to control is the same value as the mechanical angle of the motor (motor rotation) or the electrical angle of the motor*
     *Frequency of motor's mechanical angle (motor revolution):*
         *operation speed [mm/s]/lead length [mm]*
     *Frequency of motor's electric angle:*
         *4 times of frequency of mechanical angle for servo motor installation axis*
     *Example 1:  Servo motor installation axis*
         *For lead length 20mm and operation speed 100mm/s:*
             *Frequency of mechanical angle (motor revolution)                          : 5Hz*
             *Frequency of electric angle (four times of frequency of mechanical angle)  : 20Hz*
  2) *When a higher speed response is required for the vibration control than the set speed control response, the speed response is not able to catch up with the vibration control.*
  3) *In case of a system shown in the figure on the right, the vibration cannot be controlled directly by the actuator, thus the effect may be only small or even nothing.*
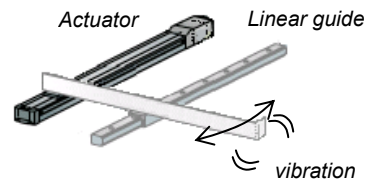


- *Vibration suppress control unavailable in home return and pressing operations*
  *Home return and pressing operations cannot suppress vibrations. Operating the vibration suppress control function in pressing causes 0A2 "position data error" to occur.*
- *Prohibition of simultaneous use of vibration suppress control with feed forward gain*
  *The vibration suppress control function cannot be used with feed forward gain simultaneously.*
- *Prohibition of switch to use vibration suppress control during moving operation.*
  *Switching between vibration suppress control and normal positioning is disabled during movement of the actuator. Any switching command causes 0C5 "Illegal control system transition command error" to occur.*
- *Response of vibration suppress control*
  *Vibration suppress control has time lag from speed command in the operation plan. This makes cycle time longer.*
  *Lower the setting frequency is, longer the time lag is.*
- *Consideration of servo gain*
  *If the servo gain setting is not conducted properly, the effect of the anti-vibration control may get dropped. First adjust the servo gain prior to setting of vibration suppress control.*

# RCP6S *Fieldbus Communication*

## 4.1   Setting Procedure

To use the vibration suppress control function, make proper measurements and settings depending on the procedure described below.

| | | |
|---|---|---|
| **Before setting vibration suppress control**<br>1) Are steps up to trial adjustment 2 in Starting Procedure completed? | →No | 1) Provide start setting according to Starting Procedure. |

↓ Yes

| | | |
|---|---|---|
| **Confirmation of vibration to be suppressed**<br>Check the root cause of vibration by having operation in AUTO Mode. Is vibration source our actuator? Is vibration direction the same as moving direction? | →No | This function cannot suppress the vibration. Take other measures. |

↓ Yes

**Measurement of Natural frequency**
Measure the Natural frequency by any of the following methods:
- Use the frequency analysis tool for anti-vibration control installed in the PC software.
  Make preparation by referring to "Use of Frequency Analysis Tool for Anti-Vibration Control" in the caution note in the previous page.
- Use of measuring instrument such as vibration meter or acceleration pickup.
- Calculation from video image data.

↓

**Setting of parameter for vibration suppress control**
**[See next page.]**
- Set the measured natural frequency in the parameter.
  *(Note) With the frequency analysis tool for anti-vibration control installed in the PC software, it is able to write parameters from the tool.*
- Set related parameters.

↓

**Setting of vibration suppress control parameter set No.**
Set the anti-vibration control parameter set number to be used to the position number that anti-vibration of the position table is required.

↓

| | |
|---|---|
| **Test run (check of vibration suppress effect)**<br>Operate the actuator.<br>Is sufficient vibration suppress effect obtained? | →No |

↓ Yes

Now the settings are completed.

4. Vibration Suppress Control Function

## 4.2 Settings of Parameters for Vibration Suppress Control

Set the parameters associated with vibration suppress control, which are listed in the table below.

| Parameter No. | Parameter Set No. | Parameter Name | Unit | Default | Input Range |
|---|---|---|---|---|---|
| 97 | 1 | Damping characteristic coefficient 1 | Rate | 10 | 0 to 1000 |
| 98 | | Damping characteristic coefficient 2 | Rate | 1000 | 0 to 1000 |
| 99 | | Natural frequency | 1/1000Hz | 10000 | 500 to 30000 |
| 100 | | Notch filter gain | Rate | 9990 | 1 to 20000 |
| 101 | 2 | Damping characteristic coefficient 1 | Rate | 10 | 0 to 1000 |
| 102 | | Damping characteristic coefficient 2 | Rate | 1000 | 0 to 1000 |
| 103 | | Natural frequency | 1/1000Hz | 10000 | 500 to 30000 |
| 104 | | Notch filter gain | Rate | 9990 | 1 to 20000 |
| 105 | 3 | Damping characteristic coefficient 1 | Rate | 10 | 0 to 1000 |
| 106 | | Damping characteristic coefficient 2 | Rate | 1000 | 0 to 1000 |
| 107 | | Natural frequency | 1/1000Hz | 10000 | 500 to 30000 |
| 108 | | Notch filter gain | Rate | 9990 | 1 to 20000 |
| 109 | | Default vibration suppress No. | | 0 | 0 to 3 |
| 110 | | Stop method at servo OFF | | 0 | 0, 1 |

[1] Damping characteristic coefficient 1, 2 (Parameter No.97, 98, 101, 102, 105, and 106)
In this section, do not change.

[2] Natural frequency [1/1000Hz] (Parameter No.99, 103 and 107)
Set the natural frequency of the load measured. It can be input directly to the parameter from the frequency analysis tool for anti-vibration control included in the PC software if the tool is already used. [Refer to the Instruction Manual of the RC PC software.]
Set the specific frequency of the loaded object close to the setting so a higher anti-vibration performance can be obtained.

> [Reference] Other vibration measuring methods
> - Use of measuring instrument such as vibration meter and acceleration pickup
> - Calculation from video image data

[3] Notch filter gain (Parameter No.100, 104 and 108)
Set the notch filter gain following the table below in response to the measured specific frequency of the loaded object. See the table below for reference. Provide fine adjustment if overshooting occurs.
If the notch filter gain setting is too high, overshooting would occur during the settling time.
If the notch filter gain setting is too low, undershooting would occur during the settling time.

| Measured Natural Frequency [Hz] | Setting Value of Notch Filter Gain |
|---|---|
| 0.5 | 9900 |
| 1 | 9980 |
| 2 to 30 | 9990 |

4. Vibration Suppress Control Function

[4] Default vibration suppress No. (Parameter No.109)
When a position is written into a position table not registered yet, the initial value set to this parameter is automatically entered in the "Vibration suppress No." field. To change the setting, edit the position table later.
0: Normal positioning control (default)
1: Use Anti-Vibration Control Parameter Set 1
2: Use Anti-Vibration Control Parameter Set 2
3: Use Anti-Vibration Control Parameter Set 3

[5] Stop method at servo OFF (Parameter No.110)
The table below shows the relationship between the values of Parameter No.110 and stop commands.

| Stop Command | Stop Method at Servo OFF Setting Value | | | |
| | 0 : Sudden Stop | | 1 : Deceleration and stop | |
| | Vibration suppress control | Normal positioning control | Vibration suppress control | Normal positioning control |
|---|---|---|---|---|
| Pause | Anti-vibration deceleration stop | Normal deceleration and stop | Anti-vibration deceleration stop | Normal deceleration and stop |
| Servo OFF | Sudden stop by emergency stop torque | | | |
| Emergency Stop | | | | |
| Error (Operation-cancellation level alarms) | | | | |
| Error (Cold start) | Sudden stop by emergency stop torque | | | |

## 4.3   Setting of Position Data

To make the anti-vibration control effective, set the parameter set number to be used in Anti-Vibration Number Column in Position Data.
*(Note)  The vibration suppress control function cannot be used in pressing operation.*

| 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 | Gain set | Stop mode | Vibration suppress No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | | | | | | | | | | | | | | |
| 1 | 0.00 | 50.00 | 0.01 | 0.01 | 0 | 0 | 0.10 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 0 |
| 2 | 50.00 | 50.00 | 0.01 | 0.01 | 0 | 0 | 0.10 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 1 |
| 3 | 50.00 | 50.00 | 0.01 | 0.01 | 50 | 0 | 0.10 | 0.00 | 0.00 | 0 | 0 | 0 | 0 | 3 |
| 4 | | | | | | | | | | | | | | |

Set natural frequency 1 (enabled)
Set natural frequency 3 (Alarm: It cannot be in common with Error. 0A2 Position Data Error Pressing Operation.)
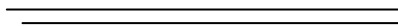
# Chapter 5    Collision Detection Feature

This controller is equipped with a feature to stop immediately when the actuator is hit on an object during operation.
Understand this chapter well to avoid any trouble in operation and safety.
Collision detection feature is a feature that stops the operation by generating an alarm and turning OFF the servo when the command current exceeds the set value. The range for detection also can be set.

> ⚠ *Warning:  This feature is a <u>supportive feature</u> to reduce the damage to a work piece in case of an emergency.*
> *It does not mean to compensate in any unexpected damage.*
> *The setup of this feature is necessary to be adjusted to an expected collision, and the optimum value differs depending on the system. Well confirm the status before use.*

## 5.1   Collision Detection Judgement

Judgment is made as a collision when the current position is in the range of the position zone, for longer than the time set in the parameter [*1] and the current has exceeded the threshold [*2], and it turns ON load output judgment (LOAD) signal [*3] and turns the servo OFF after generating the collision detection alarm.

*1 Parameter No.50 Load output judgment time
*2 "Threshold" in the positioner table.

◎Example of judgement (when judgment time is 255ms)
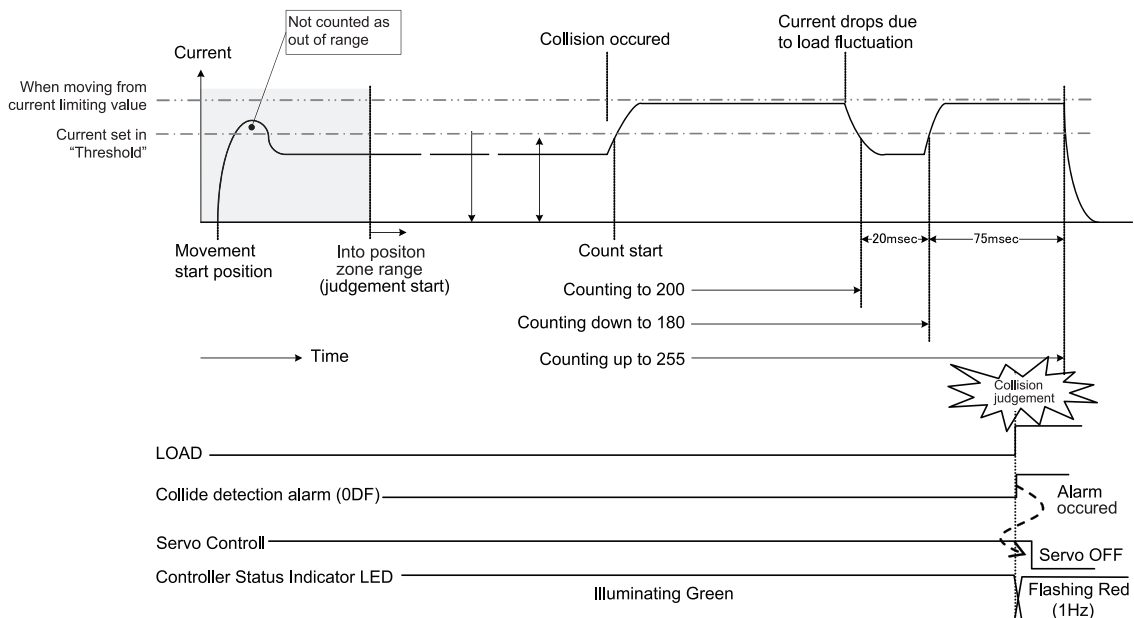
## 5.2   Settings

Have the following settings established when using following function.
1) Select to use feature
Setting can be established in the parameters. Setting of parameter "No.168 Collision Detection Feature"

| Setting value | Operation status | Alarm lebel |
|:---:|---|:---:|
| 0 | Detection not to be conducted (Same when 2, 4 or 6 is set) | - |
| 1 | Detection is conducted in position zone setting range. | Operation cancel lebel |
| 3 | Detection is conducted in position zone setting range, but is not conducted in the following conditions.<br>• The first movement after releasing from a pause<br>• Movement from a stop in the positon zone range | |
| 5 | Detection is conducted in position zone setting range. | Message lebel |
| 7 | Detection is conducted in position zone setting range, but is not conducted in the following conditions. In this setting, it can avoid a mistake to detect the current during acceleration.<br>• The first movement after releasing from a pause<br>• Movement from a stop in the positon zone range | |

2) Setting of Detection Current Value
Setting is made by inputting 0 (0%) to 100 (100%) in "Threshold" cell in the position table. Detection is not conducted if set to 0.

3) Setting of Adjustment time
Setting can be established in the parameters. Setting of parameter "No.50 Load Output Judgment Time"
Position zone  : 0 to 9999 [ms]    (Initial Value 255ms)

4) Setting of Adjustment Range (position zone)
Set the range in "Zone +" and "Zone –" in the position table. Set a small value in "Zone +" and "Zone –".
Position zone  : 0.00 to Actuator Stroke Length [mm]

## 5.3   Adjustment

Refer to the following when performing an adjustment.
1) Adjustment Range :        Avoid the acceleration range, which requires high current", and set the range with possibility that collision can occur.
2) Detection Current Value :   Considering the movement velocity and weight of a work piece, set a low value in the range that detection mistake would not occur.
(Set it slightly higher than the current necessary for constant velocity movement, and tune little by little.)
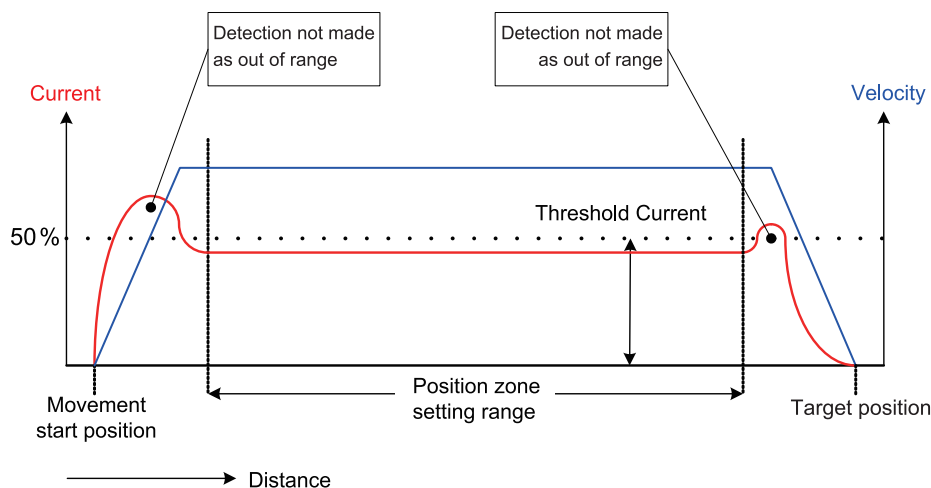
## Chapter 6   Power-saving Function

### 6.1   Automatic Servo-off and Full Servo Functions

This controller possesses Automatic Servo OFF (setting available on all model) and Full Servo functions (for RCP6S and RCM-P6PC only) to reduce the power consumption while the actuator is stopped. Read the description in this chapter carefully to save power so that the controller can be operated safely.

Automatic Servo-off function automatically turns the servo OFF in certain time after positioning process is finished. The next positioning command is issued to turn the servo ON automatically and achieve the positioning. No holding current flows in the stop state to allow the power consumption to be saved.

3 types of patterns can be set for the time since positioning complete until servo turned OFF, and either one can be selected.
In the Full Servo Function [(Note 1)], it is able to reduce the power consumption (Note) by controlling the pulse motor which consumes comparatively high current during a stop.

For the power saving function, which of Parameter No.53 or "Stop Mode" in the position table is to be used is determined by the actuator condition. The details are shown below.

*Note 1   Certain amount of stop current is applied to restrain small vibration during a stop to stop completely. Also, return to the target position will not be performed for the misalignment in the range of ±2 counts from the target position for the encoder value.*
*(Return operation will be performed even for misalignment of 1 count when the full servo feature is activated.)*

| Condition | Setting |
|---|---|
| Standby with the servo turned ON after the power is supplied (Positioning to the target point is not done) | Power saving function executed with the values set in Parameter No.53 (Stop Mode of the position number is invalid) |
| Standby after the positioning is complete to the target position set in the position table | Power saving function executed with the values set in "Stop Mode" in each position number (Setting of Parameter No.53 is invalid) |

⚠ *Warning:  Do not use this function if the automatic servo OFF is followed by pitch feed (relative movement).*
*Servo ON/OFF may cause slight position shift to occur. If position shift occurs due to external force during servo OFF, positioning to the correct position is disabled. It is because pitch feed is operated based on the position at start used as the base point.*

⚠ *Caution:  Automatic Servo-off Function is not effective while in pressing operation. Do not use. It becomes effective at completion of positioning. In pressing, the function becomes effective only when miss-pressing occurs (the status at the completion of operation without pressing is the same as that at the completion of positioning).*
*No retaining torque is provided in automatic servo-off. The actuator can move with an external force. Pay attention to the interference to the peripherals and the safety in the installation.*

⚠ *Caution:  When an operation is made with jog or inching while in operation with the full servo function, the full servo function will be inactivated. If a movement is made again on the position number that the full servo function is set valid, the full servo function will be activated.*

### 6.1.1　Setting of periods taken until automatic servo OFF

Three periods from completion of positioning to automatic servo OFF can be set in the following parameters in seconds [sec].

| Parameter No. | Name | Unit | Input range | Initial value |
|---|---|---|---|---|
| 36 | Automatic servo-off delay time 1 | sec | 0 to 9999 | 0 |
| 37 | Automatic servo-off delay time 2 | sec | 0 to 9999 | 0 |
| 38 | Automatic servo-off delay time 3 | sec | 0 to 9999 | 0 |

### 6.1.2　Set of power-saving mode

Select a proper power-saving mode from the conditions below. Set the corresponding value in the stop mode or parameter No.53 of the position table.
Selection is available from 0 to 3 for RCP6S, RCM-P6AC and RCM-P6DC.
Selection is available from 0 to 7 for RCM-P6PC.
However, selection should be made from 0 to 3 in case an actuator equipped with the high-resolution battery-less absolute encoder is connected.
[Refer to 14) Stop mode in 3.3 Set of Position Table.]

| Set value | Operation after completion of positioning | Selectable Model |
|---|---|---|
| 0 | Servo ON not changed | All Models |
| 1 | Automatic servo off in a certain time (set in Parameter No.36) | All Models |
| 2 | Automatic servo off in a certain time (set in Parameter No.37) | All Models |
| 3 | Automatic servo off in a certain time (set in Parameter No.38 | All Models |
| 4 | Full Servo Control | RCM-P6PC |
| 5 | Full-servo control for a certain time (value set in Parameter No.36) and then automatically turning servo OFF | RCM-P6PC |
| 6 | Full-servo control for a certain time (value set in Parameter No.37) and then automatically turning servo OFF | RCM-P6PC |
| 7 | Full-servo control for a certain time (value set in Parameter No.38) and then automatically turning servo OFF | RCM-P6PC |

> ⚠ *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). Failure to follow it may cause position shift to occur.*
> • *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.*

## 6.1.3 Status of positioning complete signal in selection of automatic servo OFF

Automatic servo OFF causes the actuator to be in other than the positioning complete state due to the servo OFF. Positioning complete signal (PEND) is turned OFF. Changing the PEND signal to the in-position signal judging whether the actuator is stopped within the positioning width zone instead of the positioning complete signal allows PEND not to be turned OFF during servo OFF.

This setting is reflected on complete position numbers PM1 to PM** in PIO patterns 0 to 2 confirming the positioning complete position No. or current position numbers PE* in PIO patterns 4.

Define the setting in Parameter No.39.

| Value set in Parameter No.39 | Content of PEND signal | Signal outputs during automatic servo OFF | | |
|---|---|---|---|---|
| | | PEND | PM1 to PM** | PE** |
| 0 | Positioning Completion Signal | OFF | OFF | OFF |
| 1 | In-position Signal | ON | ON | ON |

*(Note)* *SYS in the driver status LED lamps on the front panel blinks in green during the automatic servo OFF.*

[For Parameter No.39 = 0]

| Operation of actuator | Positioning operation | Automatic servo OFF standby | Servo OFF | Positioning operation |
|---|---|---|---|---|
| Servo Condition | ON | ON | OFF | ON |
| Completed Position No. Output (Current position number output) | PM1 to ** =0 (PE** = OFF) | PM1 to ** = Output (PE** = ON) | PM1 to ** = 0 (PE** = OFF) | PM1 to ** = 0 (PE** = OFF) |
| Positioning Completion Signal PEND | OFF | ON | OFF | OFF |

Servo OFF Delay Time (Parameter No.36 to 38)

[For Parameter No.39 = 1]

| Operation of actuator | Positioning operation | Automatic servo OFF standby | Servo OFF | Positioning operation |
|---|---|---|---|---|
| Servo Condition | ON | ON | OFF | ON |
| Completed Position No. Output (Current position number output) | PM1 to ** = 0 (PE** = OFF) | PM1 to ** = Output (PE** = ON) | PM1 to ** = 0 Output (PE** = ON) | PM1 to ** = 0 (PE** = OFF) |
| Positioning Completion Signal PEND | OFF | ON | ON | OFF |

Servo OFF Delay Time (Parameter No.36 to 38)

6. Power-saving Function

## 6.2   Selecting Automatic Current Reduction Feature

When performing a complete stop in the positioning, the current flows in constant amount [Note 1] regardless of the size of the external force in a normal condition (without using the automatic current reduction feature). Using the automatic current reduction feature enables to flow the current considering the influence of the external force, that will be able to save the power consumption when the transported load is small.
*Note 1   Parameter No. 12 "Current Limit Value at Positioning Stop"*

To enabled / disabled the automatic current reduction feature can be set in Parameter No. 182.

| Parameter No. | Name | Unit | Input range | Initial value |
|---|---|---|---|---|
| 182 | Auto Current Adj. Select | - | 0: Disabled<br>1: Enabled | 0 |

Shown below is a graph (example) of the current flow volume and velocity command in the positioning operation in comparison of when the automatic current reduction feature is inactive and when it is active.

- The automatic current reduction feature: Disabled



- The automatic current reduction feature: Enabled



Current flow volume at stop considering external force influence

6. Power-saving Function
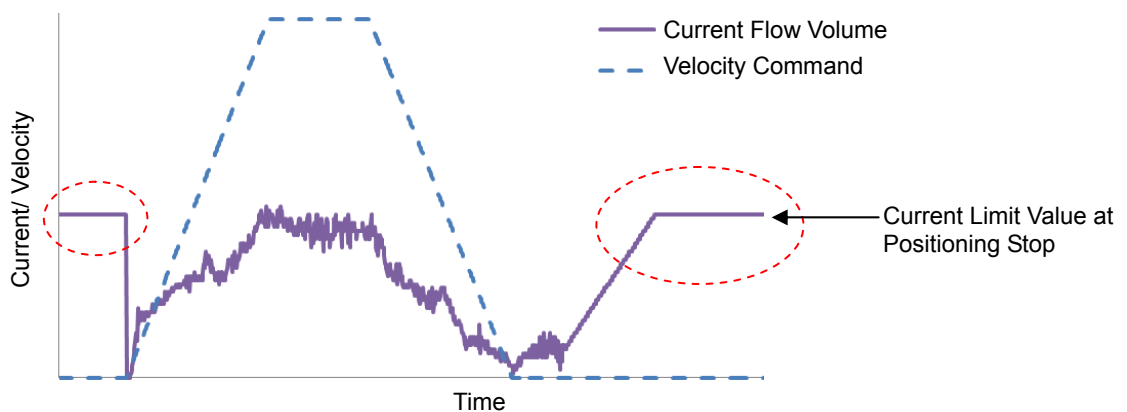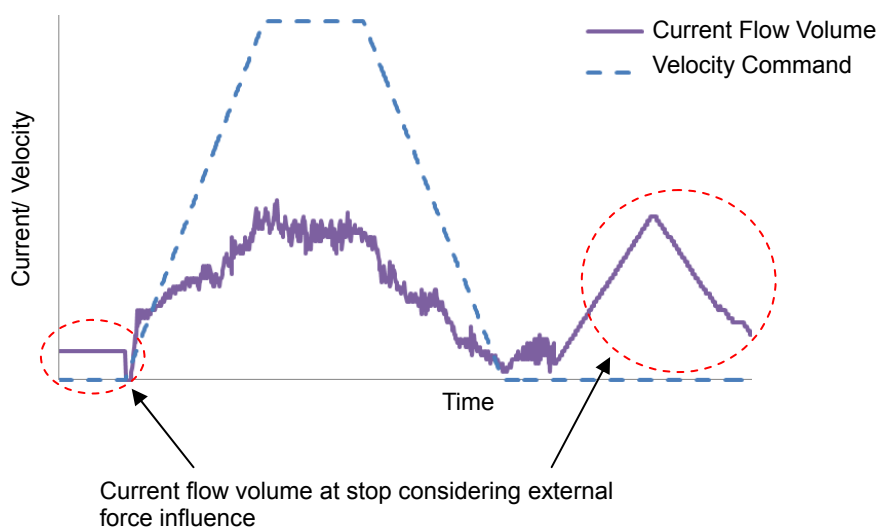
### 6.2.1 Process When Feature is Active

1) The same process as the existing complete stop feature will be performed until the current flow volume reaches the current limit value at the positioning stop (parameter).

2) The condition will be retained until the target position deviation becomes zero after finishing the stopping current flow.

3) Current flow volume will be controlled following the fact of target position deviation.
   - Current reduced gradually by certain amount when no target position deviation
   - Current increased gradually by certain amount when there is target position deviation

There are some restrictions as follows to the current flow control.
- When current flow transition of reduction to increasing process is held for more than certain times, only the increasing process will be held.
- The minimum current volume should be defined for every actuator, and the current flow volume will be reduced to a certain amount when there is no position deviation.
- The maximum current volume should be the current limit value at positioning stop (parameter), and the current flow volume will be increased to a certain amount.

### 6.2.2 Caution

(1) Deference in Target Position Deviation due to Encoder Resolution
   for Actuator with Lead Length 24 [mm/rev]

   1) When the encoder resolution is 800 [pulse/rev], the current flow volume will be decreased until the target position deviation of 24 / 800 = 0.0300 [mm] occurs.

   2) When the encoder resolution is 8192 [pulse/rev], the current flow volume will be increased until the target position deviation of 24 / 8192 = 0.029… [mm] occurs.

(2) Caution in High-Resolution Encoder
   In an actuator equipped with the high-resolution encoder, if the positioning complete status continues for a long while, the current flow volume rises to the current limit value at positioning stop (parameter) at last even if this feature is activated. Therefore, note that power consumption cannot be saved in such a situation.

6. Power-saving Function

## Chapter 7   Absolute Reset

### 7.1   Absolute Reset

For a battery-less absolute type actuator, RCP6S actuator does not require the home-return operation every time as it is the battery-less absolute type and the encoder position information is retained even when the power is off.

Absolute reset conduct in the cases of (1) and (2) stated below.
(1) At motor replacement
(2) When absolute error generated

The absolute reset is performed by using a teaching tool such as PC software etc.
Shown below is the reset procedures (outline).

1) Connect the teaching tool and turn ON the power of the controller.
2) The absolute encoder error appears on the teaching tool. Perform alarm reset.
3) Perform home-return operation. Once the home return is complete, the point of origin is memorized at the same time the origin point is established.

In below explains the procedure using each teaching tool:

[1]   For PC software

Select position data on the main screen and click the Alarm button.

*1*
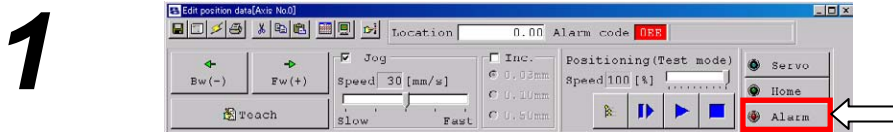


Turn the servo ON with Servo button, and press Home button.

*2*
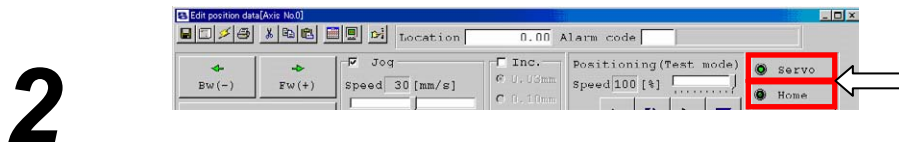
[2]   For Teaching Pendant (TB-02)

**1**   Press Reset Alm .
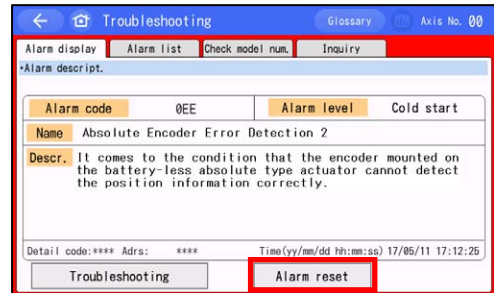


**2**   Press Trial Operation on the Menu 1 screen.
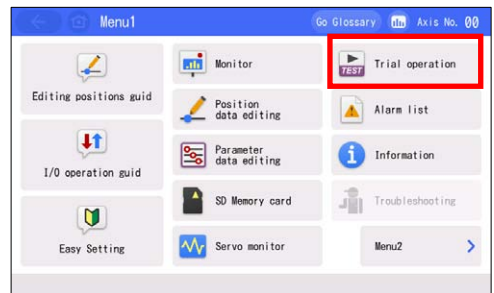


**3**   Press Jog_Inching on Trial screen.
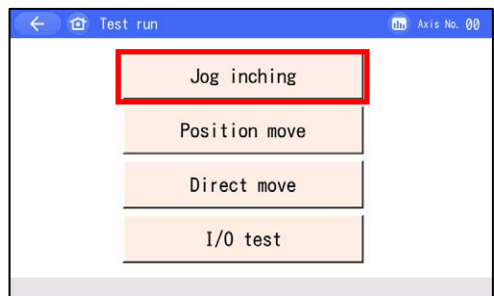


**4**   Touch Servo to turn the servo ON and touch Homing in Jog/Inching screen.

# RCP6S *Fieldbus Communication*

[3] For Teaching Pendant (TB-01)

**1**    Press Reset Alm.
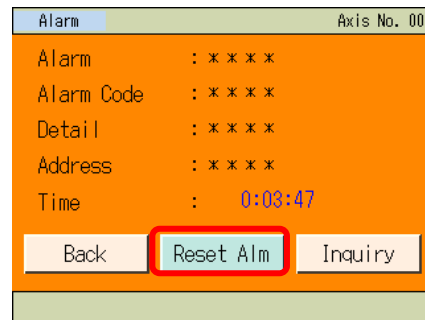


**2**    Press Trial Operation on the Menu 1 screen.
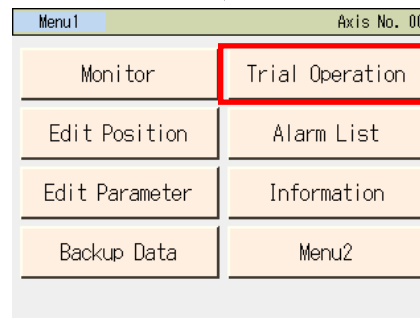


**3**    Press Jog_Inching on Trial screen.



**4**    Touch Servo to turn the servo ON and touch Homing in Jog/Inching screen.

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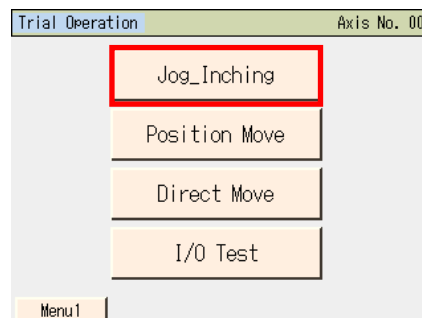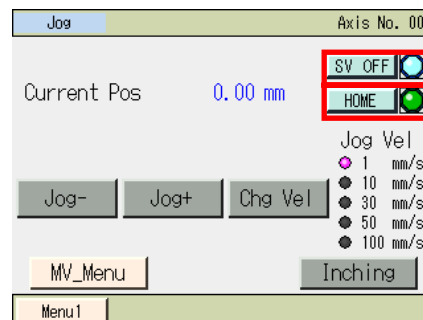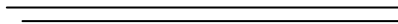
## Chapter 8    Parameter

Parameter data should be set appropriately according to the applicaiton requirements.
When a change is required to the parameters, make sure to back up the data before the change so the settings can be returned anytime.
With using PC software, it is able to store the backup to the PC. With using a teaching pendant, it is able to store the backup to the memory card. Write down on a memo when data backup is not available.
Also, for the purpose of rapid recovery after the investigation of failure unit or replacing the controller, keep data backup or memo also after the parameter change.
The change to the parameters will be activated after they are edited, written to the non-volatile controller built-in memory (FeRAM), then either software reset or reboot of the power. It will not become active only with setting on the teaching tool.

> ⚠ *Warning:* (1) *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. Before providing certain change or setting for the controller to be fit to your system, understand the control methods of the controller sufficiently. Please contact us if you have anything unclear.*
> (2) *Do not turn OFF the power to the controller during the parameter writing. Parameter cannot be written properly, which may cause an unexpected operation, and is extremely dangerous.*

Each axis number possesses parameters. Have the setting and checking on each axis number.

8. Parameter

## 8.1   Parameter List

The categories in the table below indicate whether parameters should be set or not. There are five categories as follows:

A :  Check the settings before use.
B :  Use parameters of this category depending on their uses.
C :  Use parameters of this category with the settings at shipments leaving unchanged as a rule. Normally they may not be set.
D :  Parameters of the category are set at shipment in accordance with the specification of the actuator. Normally they may not be set.
E :  Parameters of the category are exclusively used by us for convenience of production. Changing their settings may not only cause the actuator to operate improperly but also to be damaged. So, never change the setting of the parameters.

Category do not appear on the teaching tool.
Also, the unused parameter numbers are not mentioned in the list.

Parameter List                                                                                                     (1/5)

| No. | Category | Name | Symbol | Unit (Note 1) | Input Range | Default factory setting | Applicable Controller (Note 3) | | | Relevant sections |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | A | P | D | |
| 1 | B | Zone Boundary 1 Positive Side | ZONM | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side (Note 2) | ○ | ○ | ○ | 8.2 [1] |
| 2 | B | Zone Boundary 1 Negative Side | ZONL | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side (Note 2) | ○ | ○ | ○ | |
| 3 | A | Soft Limit Positive Side | LIMM | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side (Note 2) | ○ | ○ | ○ | 8.2 [2] |
| 4 | A | Soft Limit Negative Side | LIML | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side (Note 2) | ○ | ○ | ○ | |
| 5 | D | Home Return Direction | ORG | - | 0: Reverse 1: Normal | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [3] |
| 6 | C | Push & Hold Stop Judgment Period | PSWT | msec | 0 to 9999 | 255 | ○ | ○ | ○ | 8.2 [4] |
| 7 | C | Servo Gain Number | PLGO | - | 0 to 31 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [5] 8.3 |
| 8 | B | Default Velocity | VCMD | mm/s [deg/s] | 1 to Actuator's max. speed | Rated actuator speed (Note 2) | ○ | ○ | ○ | 8.2 [6] |
| 9 | B | Default Acceleration/Deceleration | ACMD | G | 0.01 to Actuator's max. acceleration/ deceleration | Rated actuator's acceleration/ Deceleration (Note 2) | ○ | ○ | ○ | 8.2 [7] |
| 10 | B | Default Positioning Width | INP | mm [deg] | Actuator's min. resolution to 999.99 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [8] |
| 12 | B | Current limitation at positioning stop | SPOW | % | 0 to 70 | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [9] |
| 13 | C | Current-Limiting Value During Home Return | ODPW | % | 0 to 100 / 0 to 300 | In accordance with actuator (Note 2) | - / ○ | ○ / - | - / ○ | 8.2 [10] |
| 16 | B | SIO Communication Speed Selection | BRSL | dps | 9600 to 230400 | 38400 | ○ | ○ | ○ | 8.2 [11] |
| 17 | B | Minimum Delay Time for Slave Transmitter Activation | RTIM | msec | 0 to 255 | 5 | ○ | ○ | ○ | 8.2 [12] |
| 18 | E | Home Position Check Sensor Input Polarity | LS | - | 0 to 2 | In accordance with actuator (Note 2) | ○ | ○ | - | 8.2 [13] |
| 22 | C | Home Return Offset Level | OFST | mm [deg] | 0.00 to 9999.99 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [14] |
| 23 | B | Zone Boundary 2 Positive Side | ZNM2 | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side (Note 2) | ○ | ○ | ○ | 8.2 [15] 8.2 [1] |
| 24 | B | Zone Boundary 2 Negative Side | ZNL2 | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side (Note 2) | ○ | ○ | ○ | |

Note 1   The unit [deg] is for rotary actuator and lever type gripper. It is displayed in [mm] in the teaching tools.
Note 2   The setting values vary in accordance with the specification of the actuator. At shipment, the parameters are set in accordance with the specification.
Note 3   A: RCM-P6AC, P: RCP6S and RCM-P6PC, D: RCM-P6DC

# *RCP6S* *Fieldbus Communication*

## Parameter List

| No. | Category | Name | Symbol | Unit (Note 1) | Input Range | Default factory setting | A | P | D | Relevant sections |
|---|---|---|---|---|---|---|---|---|---|---|
| 26 | B | PIO Jog Velocity | JOGV | mm/s [deg/s] | 1 to 250 (maximum speed for the actuators with 250 or less) | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [16] |
| 28 | B | Default movement direction for excitation-phase signal detecting movement | PHSP | - | 0: Reverse 1: Forward | In accordance with actuator (Note 2) | ○ | ○ | - | 8.2 [17] |
| 29 | B | Exicitation-phase signal detection time | PHSP | msec | 1 to 999 | 10 | - | ○ | - | 8.2 [18] |
| | | | | | 50 to 999 | 128 | ○ | - | - | |
| 30 | B | Excitation detection type | PHSP | - | 0: Conventional method 1: New method 1 2: New method 2 | 1 | - | ○ | - | 8.2 [19] |
| | B | Pole Sensing Type | PHSP | - | 0: Current Control 1: Distance Control 1 2: Distance Control 2 | 1 | ○ | - | - | 8.2 [20] |
| 31 | B | Velocity Loop Proportional Gain | VLPG | - | 1 to 27661 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [21] 8.3 |
| 32 | B | Velocity Loop Integral Gain | VLPT | - | 1 to 217270 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [22] 8.3 |
| 33 | C | Torque Filter Time Constant | TRQF | - | 0 to 2500 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [23] 8.3 |
| 34 | C | Push Velocity | PSHV | mm/s [deg/s] | 1 to actuator's max. pressing speed | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [24] |
| 35 | C | Safety Velocity | SAFV | mm/s [deg/s] | 1 to 250 (maximum speed for the actuators with 250 or less) | 100 | ○ | ○ | ○ | 8.2 [25] |
| 36 | C | Auto Servo-motor OFF Delay Time 1 | ASO1 | sec | 0 to 9999 | 0 | ○ | ○ | ○ | 8.2 [26] 6.1.1 |
| 37 | C | Auto Servo-motor OFF Delay Time 2 | ASO2 | sec | 0 to 9999 | 0 | ○ | ○ | ○ | |
| 38 | B | Auto Servo-motor OFF Delay Time 3 | ASO3 | sec | 0 to 9999 | 0 | ○ | ○ | - | |
| 39 | B | Position Complete Signal Output Method (Note 3) | PEND | - | 0: PEND 1: INP | 0 | ○ | ○ | ○ | 8.2 [27] 6.1.3 |
| 42 | C | Enable Function | ENBL | - | 0: Enabled 1: Disabled | 1 | ○ | ○ | ○ | 8.2 [28] |
| 43 | B | Home position check sensor input polarity | HMC | - | 0: Sensor not used 1: a contact 2: b contact | In accordance with actuator (Note 2) | ○ | ○ | - | 8.2 [29] |
| 45 | B | Silent Interval Magnification | SIVM | - | 0 to 10 | 0 | ○ | ○ | ○ | 8.2 [30] |
| 46 | B | Velocity override | OVRD | % | 0 to 100 | 100 | ○ | ○ | ○ | 8.2 [31] |
| 47 | B | PIO Jog Velocity 2 | IOV2 | mm/s [deg/s] | 1 to 250 (maximum speed for the actuators with 250 or less) | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [32] |
| 48 | B | PIO Inching Distance | IOID | mm [deg/s] | 0.01 to 1.00 | 1.00 | ○ | ○ | ○ | 8.2 [33] |
| 49 | B | PIO Inching Distance 2 | IOD2 | mm [deg/s] | 0.01 to 1.00 | 0.10 | ○ | ○ | ○ | |
| 50 | C | Load Output Judgment Time Period | LDWT | msec | 0 to 9999 | 255 | - | ○ | - | 8.2 [34] |
| 52 | B | Default Acceleration/ Deceleration Mode | MOD | - | 0: Trapezoid pattern 1: S-motion 2: Primary delay filter | 0 | ○ | ○ | ○ | 8.2 [35] |

*Note 1 The unit [deg] is for rotary actuator and lever type gripper. It is displayed in [mm] in the teaching tools.*
*Note 2 The setting values vary in accordance with the specification of the actuator. At shipment, the parameters are set in accordance with the specification.*
*Note 3 A: RCM-P6AC, P: RCP6S and RCM-P6PC, D: RCM-P6DC*

8. Parameter

## Parameter List (3/5)

| No. | Category | Name | | Symbol | Unit (Note 1) | Input Range | Default factory setting | Applicable Controller (Note 3) | | | Relevant sections |
|-----|----------|------|--|--------|------|-------------|-------------------------|---|---|---|-------------------|
| | | | | | | | | A | P | D | |
| 53 | B | Default Stop Mode | | HSTP | - | 0 to 3 | 0 (Not applicable) | ○ | △ (Note 4) | ○ | 8.2 [36] 6.1.2 |
| | | | | | | 0 to 7 | | - | △ (Note 4) | - | |
| 54 | C | Current Control Width Number | | CTLF | - | 0 to 15 | In accordance with actuator (Note 2) | ○ | - | ○ | 8.2 [37] |
| 55 | B | Position Command Primary Filter Time Constant | | PLPF | msec | 0.0 to 100.0 | 0.0 | ○ | ○ | ○ | 8.2 [38] 8.3 |
| 56 | B | S-motion Rate | | SCRV | % | 0 to 100 | 0 | ○ | ○ | ○ | 8.2 [39] |
| 71 | B | Position Feed Forward Gain | | PLFG | - | 0 to 100 | 0 | ○ | ○ | - | 8.2 [40] 8.3 |
| | | | | | | | 50 | - | - | ○ | |
| 77 | D | Ball Screw Lead Length | | LEAD | mm [deg] | 0.01 to 999.99 | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [41] |
| 78 | D | Axis Operation Type | | ATYP | - | 0: Linear axis 1: Rotary axis | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [42] |
| 79 | B | Rotary Axis Mode Selection | | ATYP | - | 0: Normal mode 1: Index mode | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [43] |
| 80 | B | Rotational Axis Shortcut Selection | | ATYP | - | 0: Disabled 1: Enabled | In accordance with actuator (Note 2) | ○ | ○ | ○ | 8.2 [44] |
| 83 | B | Absolute unit | | ETYP | - | 0: Not used 1: Used | In accordance with specification at order accepted | ○ | ○ | - | 8.2 [45] |
| 88 | D | Software Limit Margin | | SLMA | mm | 0 to 9999.99 | 0 | ○ | ○ | ○ | 8.2 [46] |
| 91 | C | Current Limit Value at Stopping Due to Miss-pressing | | PSFC | - | 0: Current limiting value at stop 1: Current limit value during pressing | 0 | ○ | ○ | ○ | 8.2 [47] |
| 97 | C | Vibration suppress parameter set 1 | Damping Characteristic Coefficient 1 | DC11 | - | 0 to 1000 | 10 | ○ | - | - | |
| 98 | C | | Damping Characteristic Coefficient 2 | DC21 | - | 0 to 1000 | 1000 | ○ | - | - | |
| 99 | B | | Natural Frequency | NP01 | 1/1000Hz | 500 to 30000 | 10000 | ○ | - | - | |
| 100 | C | | Notch Filter Gain | NFG1 | - | 1 to 20000 | 9990 | ○ | - | - | |
| 101 | C | Vibration suppress parameter set 2 | Damping Characteristic Coefficient 1 | DC12 | - | 0 to 1000 | 10 | ○ | - | - | |
| 102 | C | | Damping Characteristic Coefficient 2 | DC22 | - | 0 to 1000 | 1000 | ○ | - | - | 8.2 [48] 4.2 |
| 103 | B | | Natural Frequency | NP02 | 1/1000Hz | 500 to 30000 | 10000 | ○ | - | - | |
| 104 | C | | Notch Filter Gain | NFG2 | - | 1 to 20000 | 9990 | ○ | - | - | |
| 105 | C | Vibration suppress parameter set 3 | Damping Characteristic Coefficient 1 | DC11 | - | 0 to 1000 | 10 | ○ | - | - | |
| 106 | C | | Damping Characteristic Coefficient 2 | DC21 | - | 0 to 1000 | 1000 | ○ | - | - | |
| 107 | B | | Natural Frequency | NP03 | 1/1000Hz | 500 to 30000 | 10000 | ○ | - | - | |
| 108 | C | | Notch Filter Gain | NFG3 | - | 1 to 20000 | 9990 | ○ | - | - | |
| 109 | B | Default Vibration Suppress No. | | CTLF | - | 0 to 3 | 0 | ○ | - | - | 8.2 [49] |

Note 1   The unit [deg] is for rotary actuator and lever type gripper. It is displayed in [mm] in the teaching tools.
Note 2   The setting values vary in accordance with the specification of the actuator. At shipment, the parameters are set in accordance with the specification.
Note 3   A: RCM-P6AC, P: RCP6S and RCM-P6PC, D: RCM-P6DC
Note 4   Selection is available from 0 to 3 for RCP6S. Selection is available from 0 to 7 for RCM-P6PC. However, selection should be made from 0 to 3 in case an actuator equipped with the high-resolution battery-less absolute encoder is connected.

8. Parameter

# RCP6S *Fieldbus Communication*

## Parameter List

| No. | Category | Name | Symbol | Unit (Note 1) | Input Range | Default factory setting | Applicable Controller (Note 3) A | P | D | Relevant sections |
|---|---|---|---|---|---|---|---|---|---|---|
| 110 | B | Stop Method at Servo OFF | PSOF | - | 0: Rapid stop 1: Deceleration to stop | 0 | ○ | ○ | ○ | 8.2 [50] |
| 112 | B | Monitoring Mode Selection Monitoring Period | FMNT | - | 0: Unused 1: Monitor Function 1 2: Monitor Function 2 3: Monitor Function 3 | 1 | ○ | ○ | ○ | 8.2 [51] |
| 113 | B | Monitoring Period | FMNT | msec | 1 to 60000 | 1 | ○ | ○ | ○ | 8.2 [52] |
| 120 | C | Servo Gain Number 1 | PLG1 | - | 0 to 31 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [5] |
| 121 | C | Feed Forward Gain 1 | PLF1 | - | 0 to 100 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [40] |
| 122 | C | Velocity Loop Proportional Gain 1 | VLG1 | - | 1 to 27661 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [21] |
| 123 | C | Velocity Loop Integral Gain 1 | VLT1 | - | 1 to 217270 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [22] |
| 124 | C | Torque Filter Time Constant 1 | TRF1 | - | 0 to 2500 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [23] |
| 125 | C | Current Control Width Number 1 | CLP1 | - | 0 to 15 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [37] |
| 126 | C | Servo Gain Number 2 | PLG2 | - | 0 to 31 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [5] |
| 127 | C | Feed Forward Gain 2 | PLF2 | - | 0 to 100 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [40] |
| 128 | C | Speed Loop Proportional Gain 2 | VLG2 | - | 1 to 27661 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [21] |
| 129 | C | Speed Loop Integral Gain 2 | VLT2 | - | 1 to 217270 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [22] |
| 130 | C | Torque Filter Time Constant 2 | TRF2 | - | 0 to 2500 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [23] |
| 131 | C | Current Control Width Number 2 | CLP2 | | 0 to 15 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [37] |
| 132 | C | Servo Gain Number 3 | PLG3 | - | 0 to 31 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [5] |
| 133 | C | Feed Forward Gain 3 | PLF3 | - | 0 to 100 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [40] |
| 134 | C | Speed Loop Proportional Gain 3 | VLG3 | - | 1 to 27661 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [21] |
| 135 | C | Speed Loop Integral Gain 3 | VLT3 | - | 1 to 217270 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [22] |
| 136 | C | Torque Filter Time Constant 3 | TRF3 | - | 0 to 2500 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [23] |
| 137 | C | Current Control Width Number 3 | CLP3 | - | 0 to 15 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [53] 8.2 [37] |
| 138 | C | Servo Gain Switchover Time Constant | GCFT | ms | 10 to 2000 | 10 | ○ | - | - | 8.2 [54] |
| 139 | C | Home Preset Value | PRST | mm | -9999.99 to 9999.99 | In accordance with actuator (Note 2) | ○ | - | - | 8.2 [55] |
| 143 | B | Overload Level Ratio | OLWL | % | 50 to 100 | 100 | ○ | ○ | ○ | 8.2 [56] |
| 144 | B | Gain Scheduling Upper Limit Multiplying Ratio | GSUL | % | 0 to 1023 | 0 (Disabled) | - | ○ | - | 8.2 [57] |

Note 1    The unit [deg] is for rotary actuator and lever type gripper. It is displayed in [mm] in the teaching tools.
Note 2    The setting values vary in accordance with the specification of the actuator. At shipment, the parameters are set in accordance with the specification.
Note 3    A: RCM-P6AC, P: RCP6S and RCM-P6PC, D: RCM-P6DC

8. Parameter

Parameter List (5/5)

| No. | Category | Name | Symbol | Unit (Note 1) | Input Range | Default factory setting | Applicable Controller (Note 3) | | | Relevant sections |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | A | P | D | |
| 145 | C | GS Velocity Loop Proportional Gain | GSPC | - | 1 to 50000 | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [58] 8.2 [21] |
| 146 | C | GS Velocity Loop Integral Gain | GSIC | - | 1 to 500000 | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [59] 8.2 [22] |
| 147 | B | Total Movement Count Threshold | TMCT | Times | 0 to 999999999 | 0 (Disabled) | ○ | ○ | ○ | 8.2 [60] |
| 148 | B | Total Operated Distance Threshold | ODOT | m | 0 to 999999999 | 0 (Disabled) | ○ | ○ | ○ | 8.2 [61] |
| 151 | B | Light Malfunction Alarm Output Select | FSTP | - | 0: Overload warning output 1: Message lebel alarm output | 1 | ○ | ○ | ○ | 8.2 [62] |
| 152 | B | High Output Setting | BUEN | - | 0: Disabled 1: Enabled | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [63] |
| 153 | B | BU Velocity Loop Proportional Gain | BUPC | - | 1 to 27661 | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [64] 8.2 [21] |
| 154 | B | BU Velocity Loop Integral Gain | BUIC | - | 1 to 217270 | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [65] 8.2 [22] |
| 155 | A | Absolute Battery Retention Time | AIP | - | 0: 20 days 1: 15 days 2: 10 days 3: 5 days | 0 | ○ | (Note 4) △ | - | 8.2 [66] 7.2.2 |
| 165 | B | Delay Time after Shutdown Release | SDDT | msec | 0 to 1000 | 0 | ○ | ○ | ○ | 8.2 [67] |
| 166 | B | Startup Current Limit Extension Feature | DCET | - | 0: Disabled 1: Enabled | In accordance with actuator (Note 2) | - | ○ | - | 8.2 [68] |
| 168 | B | Collision Detection Feature | CODT | - | 0 to 7 | 0 | - | ○ | - | 8.2 [69] 5.2 |
| 169 | B | SIO2 Baud Rate Select | BRS2 | bps | 9600 to 230400 | 38400 | ○ | ○ | ○ | 8.2 [70] |
| 170 | B | SIO2 Slave Station Transmitter Activating Minimum Delay Time | RTM2 | msec | 0 to 255 | 5 | ○ | ○ | ○ | 8.2 [71] |
| 171 | B | SIO2 Silent Interval Multiplying Factor | SIM2 | - | 0 to 10 | 0 | ○ | ○ | ○ | 8.2 [72] |
| 172 | B | SIO2 Slave Address | MSA2 | - | 1 to 16 | 1 | ○ | ○ | ○ | 8.2 [73] |
| 181 | B | Pressing Method | SPOS | | 0: CON type 1: SEP type | 0 | ○ | ○ | ○ | 8.2 [74] |
| 182 | B | Auto Current Adj. Select | ACDS | | 0: Disabled 1: Enabled | 0 | - | ○ | - | 8.2 [75] 6.2 |

Note 1　The unit [deg] is for rotary actuator and lever type gripper. It is displayed in [mm] in the teaching tools.
Note 2　The setting values vary in accordance with the specification of the actuator. At shipment, the parameters are set in accordance with the specification.
Note 3　A: RCM-P6AC, P: RCP6S and RCM-P6PC, D: RCM-P6DC
Note 4　△: For RCM-P6PC only

## 8.2    Detail Explanation of Parameters

Establish settings for each axis number.

> ⚠ *Caution: • If parameters are changed (writing), provide software reset or reconnect*
> *the power to reflect the setting values.*
> *• The unit [deg] is for rotary actuator and lever type gripper. Pay attention*
> *that it is displayed in mm in the teaching tools.*

[1]   Zone boundary 1 positive side, zone boundary 1 negative side (Parameter No.1, No.2)
      Zone boundary 2 positive side, zone boundary 2 negative side (Parameter No.23, No.24)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 1 | Zone Boundary 1 Positive Side | ZONM | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side |
| 2 | Zone Boundary 1 Negative Side | ZONL | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side |
| 23 | Zone Boundary 2 Positive Side | ZNM2 | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side |
| 24 | Zone Boundary 2 Negative Side | ZNL2 | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side |

These parameters are used to set the zone in which zone signal (ZONE1 or ZONE2) turns ON.
The minimum setting unit is 0.01 mm [deg].
If a specific value is set to both zone boundary setting positive side and zone boundary setting negative side, the zone signal is not output.
A setting sample is shown below.
[Example of when line axis]
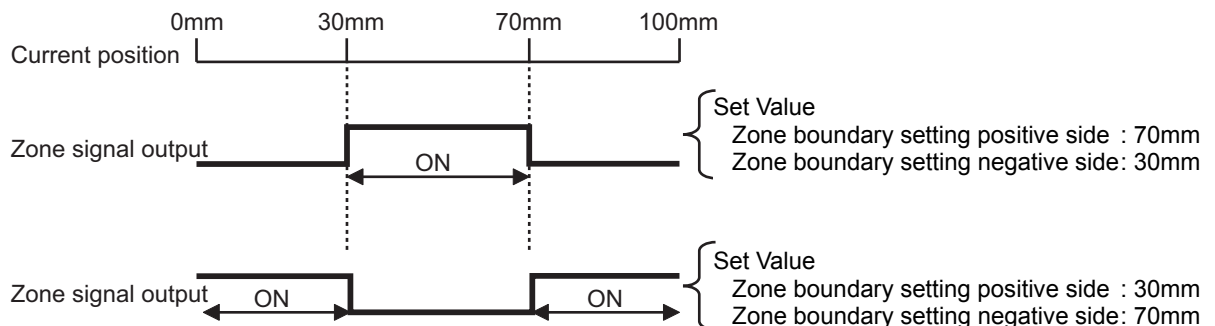


[Example of Rotary Actuator Index Mode]
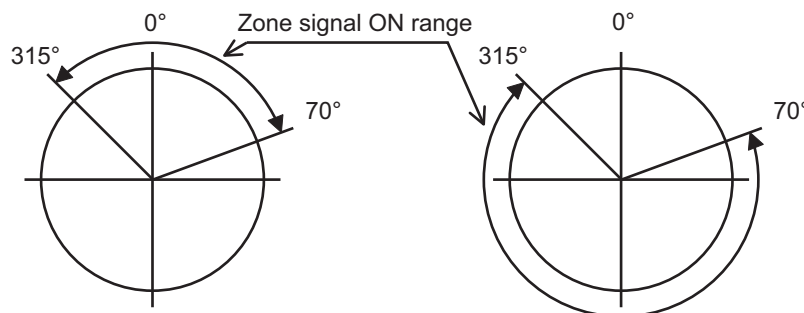


> ⚠ *Caution: The zone detection range would not output unless the value exceeds that of the*
> *minimum resolution (actuator lead length / No. of Encoder Pluses).*

[2]  Soft limit positive side, Soft limit negative side (Parameter No.3, No.4)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 3 | Soft Limit Positive Side | LIMM | mm [deg] | -9999.99 to 9999.99 | Actual stroke on positive side |
| 4 | Soft Limit Negative Side | LIML | mm [deg] | -9999.99 to 9999.99 | Actual stroke on negative side |

0.3mm [deg] is added to the outside of the effective actuator stroke for the setting at the delivery (since there would be an error at the end of effective stroke if set to 0). Change the setting if required for the cases such as when there is interference or to prevent a crash, or when using the actuator with slightly exceeding effective stroke in the operational range.
An incorrect soft limit setting will cause the actuator to collide into the mechanical end, so exercise sufficient caution.
The minimum setting unit is 0.01mm.
*Note: To change a soft limit, set a value corresponding to 0.3mm outside of the effective stroke.*
Example) Set the effective stroke to between 0mm to 80mm
Parameter No.3 (positive side) 80.3
Parameter No.4 (negative side) -0.3
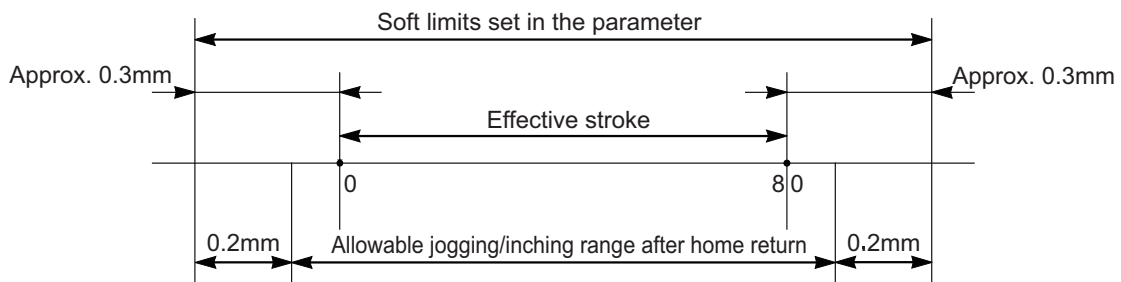


The operational range for jog and inching after the home return is 0.2mm [deg] less than the set value.
Alarm Code 0D9 "Soft Limit Over Error" will be generated when the set value exceeded the value (0 when shipped out) set in Parameter No.88 "Software Limit Margin". If the setting is not done in Parameter No.88, the value set in this parameter become the detection value for Alarm Code 0D9 "Soft Limit Over Error".

[3]  Home return direction (Parameter No.5)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 5 | Home Return Direction | ORG | - | 0: Reverse 1: Forward | In accordance with actuator |

Unless there is a request of Home Reversed Type (option), the home-return direction is on the motor side for the line axis, counterclockwise side for the rotary axis and outer (open) side for the gripper. [Refer to the coordinate system of the actuator.]
If it becomes necessary to reverse the home direction after the actuator is installed on the machine, change the setting.

⚠ *Caution:  For the actuator of rod or rotary type, the home direction cannot be changed.*

## [4]  Press & hold stop judgment period (Parameter No.6)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 6 | Push & Hold Stop Judgment Period | PSWT | msec | 0 to 9999 | 255 |

Judging completion of pressing operation
(1)  For Standard type (PIO pattern 0 to 2)
The operation monitors the torque (current limit value) in percent in "Pressing" of the position table and turns pressing complete signal PEND ON when the load current satisfies the condition shown below during pressing. PEND is turned ON at satisfaction of the condition if the work is not stopped.
(Accumulated time in which current reaches pressing value [%])
– (accumulated time in which current is less than pressing value [%])
$\geqq$ 255 ms (Parameter No.6)
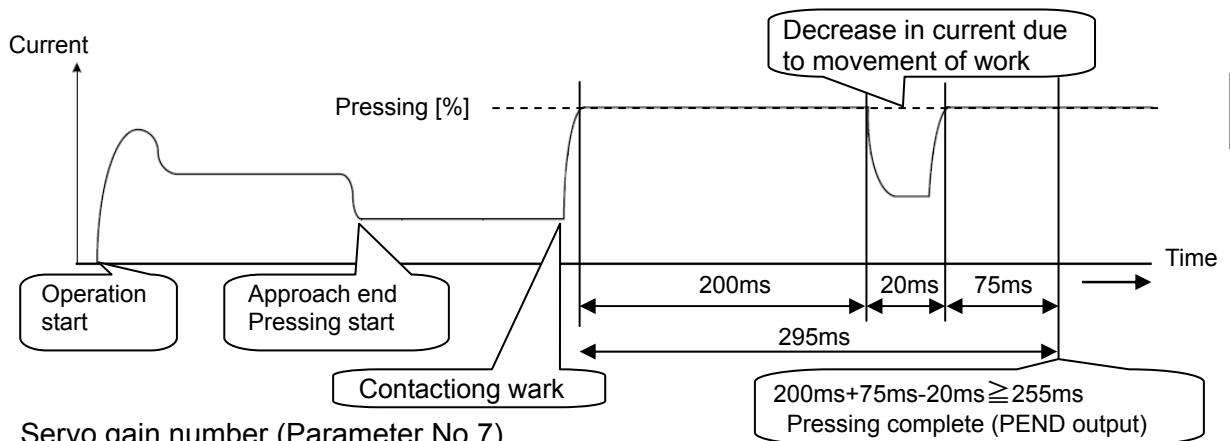


## [5]  Servo gain number (Parameter No.7)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 7 | Servo Gain Number | PLGO | - | 0 to 31 | In accordance with actuator |

The servo gain is also called position loop gain or position control system proportion gain. The parameter defines the response when a position control loop is used. Increasing the set value improves the tracking performance with respect to the position command. However, increasing the parameter value excessively increases the changes of overshooting.
When the set value is too low, the follow-up ability to the position command is degraded and it takes longer time to complete the positioning.
For a system of low mechanical rigidity or low natural frequency (every object has its own natural frequency), setting a large servo gain number may generate mechanical resonance, which then cause not only vibrations and/or noises but also overload error to occur.



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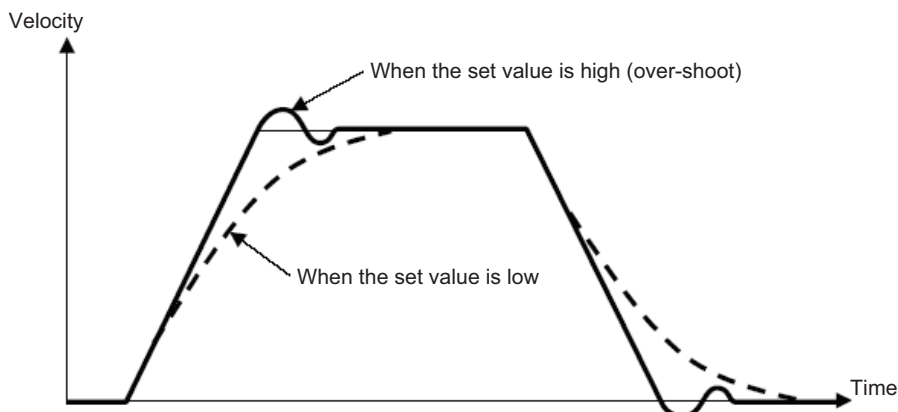
[6] Default velocity (Parameter No.8)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 8 | Default Velocity | VCMD | mm/s [deg/s] | 1 to Actuator's max. speed | Rated actuator speed |

The factory setting is the rated velocity of the actuator.
When a target position is set in an unregistered position table, the setting in this parameter is automatically written in the applicable position number.
It is convenient to set the velocity often used.

[7] Default acceleration/deceleration (Parameter No.9)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 9 | Default Acceleration/Deceleration | ACMD | G | 0.01 to Actuator's max. acceleration/ deceleration | Rated actuator's acceleration/ deceleration |

The factory setting is the rated acceleration/deceleration of the actuator.
When a target position is set in an unregistered position table, the setting in this parameter is automatically written in the applicable position number.
It is convenient to set the acceleration/deceleration often used.

[8] Default positioning width (in-position) (Parameter No.10)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 10 | Default Positioning Width | INP | mm [deg] | Actuator's min. resolution to 999.99 | In accordance with actuator |

When a target position is set in an unregistered position table, the setting in this parameter is automatically written in the applicable position number. When the remaining moving distance enters into this width, the positioning complete signal PEND/INP is output.
It is convenient to set the positioning width often used.

> For RCP6S and RCM-P6PC only

[9] Current-limiting value at standstill during positioning (Parameter No.12)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 12 | Current-limiting value at standstill during positioning | SPOW | % | 0 to 70 | In accordance with actuator |

When the value is increased, the stop holding torque is increased.
Even though it is generally unnecessary to change this setting, setting the value larger is necessary in the case a large external force is applied during stop. Please contact IAI.

8. Parameter

# RCP6S *Fieldbus Communication*

## [10] Current-limiting value during home return (Parameter No.13)

| No. | Name | Symbol | Unit | Input Range | Default factory setting | Type |
|-----|------|--------|------|-------------|------------------------|------|
| 13 | Current-Limiting Value During Home Return | ODPW | % | 0 to 100 | In accordance with actuator | RCP6S RCM-P6PC |
| | | | | 0 to 300 | | RCM-P6AC RCM-P6DC |

The setting is established for the current to suit for the standard type actuator at the delivery.
Increasing this setting will increase the home return torque.
Normally this parameter need not be changed. If the home return should be completed before the correct position depending on the affixing method, load condition or other factors when the actuator is used in a vertical application, the setting value must be increased. Please contact IAI.

## [11] SIO communication speed (Parameter No.16)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 16 | SIO communication speed selection | BRSL | bps | 9600 to 230400 | 38400 |

Set the SIO baud rate for the startup.
Set an appropriate value in accordance with the communication speed of the host.
One of 9600, 14400, 19200, 28800, 38400, 76800, 115200 and 230400 bps can be selected as the communication speed.

⚠ *Caution:  After the PC software is connected, the baud rate setting is changed to that of the PC software. To make effective the value set in the parameter, cycle controller power.*

## [12] Minimum delay time for slave transmitter activation (Parameter No.17)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 17 | Minimum delay time for slave transmitter activation | RTIM | msec | 0 to 255 | 5 |

In this setting, set the time from receiving the command (received data) during the SIO communication till the response (sent data) is returned to the host side.

## [13] Home position check sensor input polarity (Parameter No.18)

For RCP6S, RCM-P6PC and RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 18 | Home Position Check Sensor Input Polarity | LS | - | 0 to 2 | In accordance with actuator |

The home sensor is an option.

| Set Value | Description |
|-----------|-------------|
| 0 | Standard specification (sensor not used) |
| 1 | Input is a contact |
| 2 | Input is b contact |

[14] Home return offset level (Parameter No.22)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 22 | Home Return Offset Level | OFST | mm [deg] | 0.00 to 9999.99 | In accordance with actuator |

In this setting can set the distance from the mechanical end to the home position.
An adjustment is available for the following cases.
1) Want to match the actuator home position and the mechanical origin of the system.
2) Want to set a new home after reversing the factory-set home direction.
3) Want to eliminate a slight deviation from the previous home position generated after replacing the actuator.

[Adjustment Process]
1) Homing execution
2) Offset check
3) Parameter setting change
4) If setting a number close to a multiple of the lead length (including home-return offset value = 0) to the home offset value, there is a possibility to servo lock on Z-phase at absolute reset, thus the coordinates may get shifted for the lead length.
   For Absolute Type, do not attempt to set a value near a number that the lead length is multiplied by an integral number.
   Have enough margin.
   After the setting, repeat home return several times to confirm that the actuator always returns to the same home position.

⚠ Caution: If the home return offset has been changed, the soft limit parameters must also be adjusted accordingly.
In case the there is a necessity of setting a value more than the initial setting, contact IAI.

[15] Zone boundary 2 positive side, zone boundary 2 negative side (Parameter No.23, No.24)
   [Refer to 8.2 [1].]

[16] PIO jog velocity (Parameter No.26)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 26 | PIO Jog Velocity | JOGV | mm/s [deg/s] | 1 to 250 (250 or less of actuator maximum speed) | In accordance with actuator |

The setting of JOG operation velocity when the set in the JOG velocity / inching distance switchover signal JVEL is set to OFF.
Set an appropriate value in Parameter No.26 in accordance with the purpose of use.

[17] Default movement direction for excitation-phase signal detecting movement (Parameter No.28)

For RCP6S, RCM-P6PC and RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 28 | Default Movement Direction for Excitation-phase Signal Detection | PHSP | – | 0 : Reversed direction<br>1 : Forward direction | In accordance with actuator |

Excitation detection[Note] starts when the servo is turned ON for the first time after the power is supplied. Define the detection direction at this time.
Even though it is generally unnecessary to change this setting, set this to the direction which the motor is easy to move when the actuator interferes with the mechanical end or peripheral object at the time the power is supplied.
If the direction not interfering is the same direction as the home return direction, set the same values as set to Parameter No.5 Home Return Direction. If the direction is opposite, set the other values from Parameter No.5. (If No.5 is 0, set 1. If No.5 is 1, set 0.)
*Note 1  For Simple Absolute Type, the excitation detection is performed at the end of home return operation.*

[18] Excitation-phase signal detection time (Parameter No.29)

For RCP6S, RCM-P6PC and RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting | Specifications |
|-----|------|--------|------|-------------|-------------------------|----------------|
| 29 | Excitation-phase Signal Detection Time | PHSP | msec | 1 to 999 | 10 | RCP6S<br>RCM-P6PC |
|     |      |      |      | 50 to 999 | 128 | RCM-P6AC |

Excitation detection[Note] starts when the servo is turned ON for the first time after the power is supplied. Define the detection direction at this time.
Even though it is generally unnecessary to change this setting, changing the setting of this parameter may be effective when excitation error is generated or abnormal operation is confirmed.
Please contact us in the case a change is necessary to this parameter.
*Note 1   For Simple Absolute Type, the excitation detection is performed at the end of home return operation.*

8. Parameter

## [19] Excitation detection type (Parameter No.30)

For RCP6S and RCM-P6PC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 30 | Excitation Detection Type | PHSP | - | 0 : Conventional method<br>1 : New method 1 (For vertical mount installation)<br>2 : New method 2 (For horizontal mount installation) | 1 |

Excitation detection[Note 1] starts when the servo is turned ON for the first time after the power is supplied. In the new method, this operation was made smoother, thus quieter than ever (if compared with our existing products).
In the case the new method 2 (horizontal mount installation) is set and the actuator is mounted vertically, the slider or the rod may drop at the excitation operation. Follow the instructed orientation to install. If the slide or rod drops with the mentioned way of installation, set with the current setting.
*Note 1    For Simple Absolute Type, the excitation detection is performed at the end of home return operation.*

## [20] Pole sensing type (Parameter No.30)

For RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default Factory Setting |
|---|---|---|---|---|---|
| 30 | Pole Sensing Type | PHSP | - | 0 : Current Control<br>1 : Distance Control 1<br>2 : Distance Control 2 | 1 |

At the time the magnetic pole detection is performed at the serve-on after the power is turned on, the operation system is defined at the same time.
It is not necessary to make a change in normal use.

[21] Velocity loop proportional gain (Parameter No.31)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 31 | Velocity Loop Proportional Gain | VLPG | - | 1 to 27661 | In accordance with actuator |

This parameter determines the response of the speed control loop. When the set value is increased, the follow-up ability to the velocity command becomes better (the servo-motor rigidity is enhanced). The higher the load inertia becomes, the larger the value should be set. However, excessively increasing the setting will cause overshooting or oscillation, which facilitates producing the vibrations of the mechanical system.
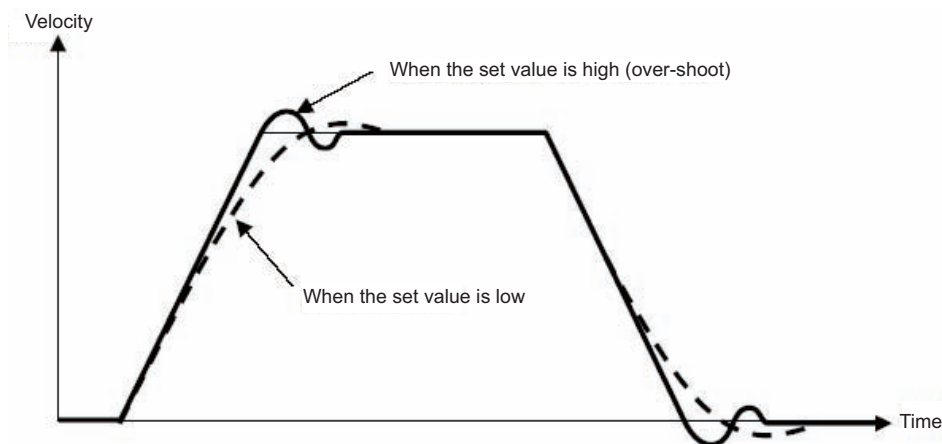
Velocity

When the set value is high (over-shoot)

When the set value is low

Time

Also, for the conditions to use this item in RCP6S and RCM-P6PC, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of the next page.

8. Parameter

[22] Velocity loop integral gain (Parameter No.32)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 32 | Velocity Loop Integral Gain | VLPT | - | 1 to 217270 | In accordance with actuator |

Any machine produces frictions. This parameter is intended to cope with deviation generated by external causes including frictions. Increasing the setting value improves the reactive force
against load change. That is, the servo rigidity increases. However, increasing the parameter value excessively may make the gain too high, which then cause the machine system to be vibrated due to overshoot or shaking.
Tune it to obtain the optimum setting by watching the velocity response.
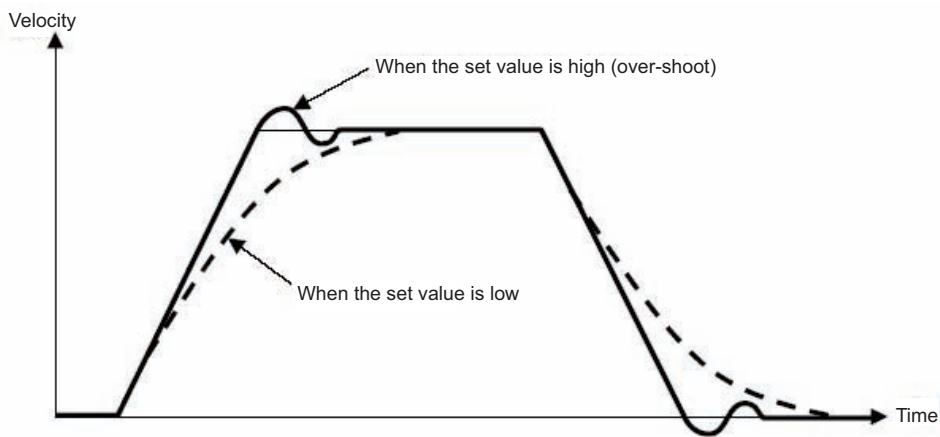


Also, for the conditions to use this item in RCP6S and RCM-P6PC, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of the next page.

【**Selecting the Use of velocity loop proportional gain and velocity loop integrated gain**】

Even though Velocity Loop Proportional Gain of RCP6S and RCM-P6PC can be set to Parameter No.31, 145 and 153, and Velocity Loop Integrated Gain to Parameter No.32, 146 and 154, the values to be effective during an operation is just one of them. The following table shows which parameter number becomes effective in each condition.

**Effective Parameter Number**

| | | High Output Setting (Parameter No.152) | |
|---|---|---|---|
| | | 0 (Disable) | 1 (Enable) |
| Gain Scheduling (Parameter No.144) | to 100 (Disable) | Parameter No.31, 32 | Parameter No.153, 154 |
| | 101 to (Enable) | Parameter No.145, 146 | Parameter No.145, 146 |

8. Parameter

[23] Torque filter time constant (Parameter No.33)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 33 | Torque Filter Time Constant | TRQF | - | 0 to 2500 | In accordance with actuator |

This parameter decides the filter time constant for the torque command. When vibrations and/or noises occur due to mechanical resonance during operation, this parameter may be able to suppress the mechanical resonance. This function is effective for torsion resonance of ball screws (several hundreds Hz).

[24] Pressing velocity (Parameter No.34)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 34 | Pressing velocity | PSHV | mm/s [deg/s] | 1 to actuator's max. pressing speed | In accordance with actuator |

This is the parameter to set the velocity in pressing operation.
The setting is done considering the actuator type when the product is delivered. [Refer Appendix to 10.4 List of Specifications of Connectable Actuators]
If a change to the setting is required, make sure to have the setting below the maximum pressing velocity of the actuator. Setting it fast may disable to obtain the specified pressing force. Also when setting at a low velocity, take 5mm/s as the minimum. Specified pressing force may not be obtained also when a low speed setting is set.
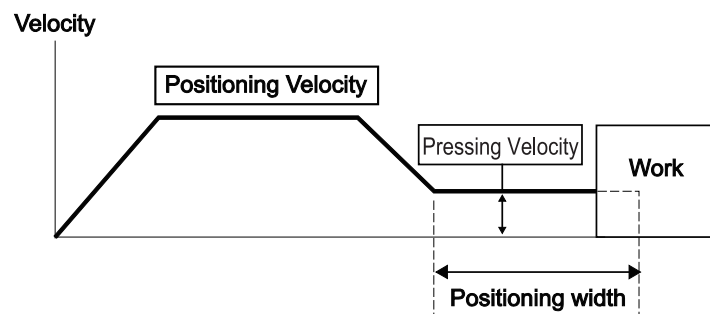


⚠ *Caution:* *If the velocity of the positioning of the position table is set below this parameter, the pressing velocity will become the same as the positioning speed.*

[25] Safety velocity (Parameter No.35)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 35 | Safety Velocity | SAFV | mm/s [deg/s] | 1 to 250 (maximum speed for the actuators with 250 or less) | 100 |

This is the parameter to set the maximum speed of manual operation while the safety velocity selected in the teaching tool. Do not have the setting more than necessary.

[26] Auto servo motor OFF delay time 1, 2, 3 (Parameter No.36, No.37, No.38)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 36 | Auto Servo-motor OFF Delay Time 1 | ASO1 | sec | 0 to 9999 | 0 |
| 37 | Auto Servo-motor OFF Delay Time 2 | ASO2 | sec | 0 to 9999 | 0 |
| 38 | Auto Servo-motor OFF Delay Time 3 | ASO3 | sec | 0 to 9999 | 0 |

Set the duration before the servo turns OFF after positioning process is complete when the power saving function is used.
[Refer to 6.1 Automatic Servo-off and Full Servo Functions.]

[27] Position complete signal output method (Parameter No.39)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 39 | Position Complete Signal Output Method | PEND | - | 0: PEND<br>1: INP | 0 |

This is the parameter to select the type of the positioning complete signals to be used.
It is available except for when PIO Pattern = 5 (Solenoid Valve Type 2 [3-point type]) is selected.
There are 2 types of positioning complete signals and the output condition would differ depending on whether the servo is ON after the positioning is complete or the servo is OFF.

| Set Value | Signal Type | During Servo ON (positioning complete) | During Servo OFF |
|-----------|-------------|----------------------------------------|------------------|
| 0 | PEND | It will not turn OFF even if the current position is out of the range of the positioning width. | Turns OFF in any case |
| 1 | INP | Turns ON when the current position is in the positioning width, and OFF when out of it. | |

Complete position No. outputs PM1 to PM** and current position No. outputs PE0 to PE6 are issued in the similar way.

[28] Enable function (Parameter No.42)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 42 | Enable function | ENBL | – | 0 : Enabling<br>1 : Disabling | 1 |

Set valid/invalid the deadman switch function if the teaching pendant is equipped with a deadman switch.

| Set Value | Description |
|-----------|-------------|
| 0 | Enable (Use the input signal) |
| 1 | Disable (Does not use the input signal) |

For RCP6S, RCM-P6PC
and RCM-P6AC only

[29] Home position check sensor input polarit
(Parameter No.43)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 43 | Home Position Check Sensor Input Polarity | HMC | - | 0: Sensor not used<br>1: a contact<br>2: b contact | In accordance with actuator |

Set the input signal polarity of the home position check sensor (option).
Since the home position check sensor is installed just below the mechanical end, if the actuator reverses without reaching the mechanical end because of a reason such as interference, an alarm will be generated because it will be identified as off the position and causes 0BA "Home sensor non-detection" error.
It is generally unnecessary to change the setting.

| Set Value | Description |
|---|---|
| 0 | Home position check sensor not used |
| 1 | Sensor polarity: Contact a |
| 2 | Sensor polarity: Contact b |

[30] Silent interval magnification (Parameter No.45)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 45 | Silent interval magnification | SIVM | times | 0 to 10 | 0 |

Use this parameter to set the silent interval (no communication) time by the time taken for communication of 3.5 characters or longer before command data transmission when the controller is operated via serial communication (RTU).
This parameter need not be changed when a teaching tool such as PC software is used.
If "0" is set, no multiplier is applied.

[31] Velocity override (Parameter No.46)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 46 | Velocity Override | OVRD | % | 1 to 100 | 100 |

When move commands are issued from the PLC, the moving speed set in the "Velocity" field of the position table can be overridden by the value set by this parameter.
Actual movement velocity = [Velocity set in the position table] × [setting value in Parameter No.46]
Example) Value in the "Velocity" field of the position table: 500mm/s
Setting in Parameter No.46 20%
In this case, the actual movement speed becomes 100mm/s.
The minimum setting unit is 1% and the input range is 1 to 100%.
*(Note) This parameter is ignored for move commands from a teaching tool such as PC software.*

## [32] PIO jog velocity 2 (Parameter No.47)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 47 | PIO Jog Velocity 2 | IOV2 | mm/s (deg/s) | 1 to 250 (250 or less of actuator maximum speed) | In accordance with actuator |

The setting of JOG operation velocity when the set in the JOG velocity / inching distance switchover signal JVEL is set to ON.
Set the appropriate value considering how the system is to be used.

However, it will operate at the value in this parameter only when JVEL Signal is on and Command Speed Setting = 0 at the same time in the direct indication mode.
(Operation will be made at the Command Speed setting value when JVEL Signal is on and Command Speed Setting ≠ 0.)

## [33] PIO inch distance, PIO inch distance 2 (Parameter No.48, No.49)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 48 | PIO Inching Distance | IOID | mm [deg/s] | 0.01 to 1.00 | 1.00 |
| 49 | PIO Inching Distance 2 | IOD2 | mm [deg/s] | 0.01 to 1.00 | 0.10 |

When the selected PIO pattern is "1" (teaching mode), this parameter defines the inching distance to be applied when inching input commands are received from the PLC.
Parameter No.49 defines the inching distance when 1 is set in the JOG speed / inching distance switchover signal JVEL for field network type.
The maximum allowable value is 1mm.

## [34] Load output judgment time period (Parameter No.50)

| For RCP6S and RCM-P6PC only |
|---|

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 50 | Load Output Judgment Ttime Period | LDWT | msec | 0 to 9999 | 255 |

This parameter defines the time taken to judging whether torque level status signal (TRQS) is ON.
If the command torque exceeds the value set in "Threshold" of position data for the time set by this parameter during pressing operation, torque level status signal (TRQS) is turned ON.
Refer to 3.8.2 [4] or 3.8.3 [3] Pressing Operation for the details of the pressing operation.

## [35] Default acceleration/deceleration mode (Parameter No.52)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 52 | Default Acceleration/ Deceleration Mode | MOD | - | 0 to 2 | 0 (Trapezoid) |

When a target position is written to an unregistered position table, this value is automatically set as the "Acceleration/deceleration mode" of the applicable position number.
Refer to [3.3 Position Data Setting 11) Acceleration/Deceleration Mode] for Acceleration/Deceleration Mode

| Set Value | Description |
|-----------|-------------|
| 0 | Trapezoid |
| 1 | S-motion |
| 2 | Primary delay filter |

## [36] Default stop mode (Parameter No.53)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 53 | Default Stop Mode | HSTP | - | 0 to 7 (RCM-P6PC) [Note1] <br> 0 to 3 (RCP6S, RCM-P6AC, RCM-P6DC) | 0 (Not applicable) |

This parameter defines the power-saving function.
[Refer to 6.1 Automatic Servo-off and Full Servo Functions.]
*Note1 Selection should be made from 0 to 3 in case an actuator equipped with the high-resolution battery-less absolute encoder is connected.*

## [37] Current control width number (Parameter No.54)

> For RCM-P6AC and RCM-P6DC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 54 | Current Control Width Number | CLPF | - | 0 to 15 | In accordance with actuator |

This parameter is for the manufacturer's use only to determine the response capability of thecurrent loop control. Therefore, do not change the settings in this parameter. If the parameter ischanged carelessly, control safety may be adversely affected and a very dangerous situationmay result.

## [38] Position command primary filter time constant (Parameter No.55)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 55 | Position Command Primary Filter Time Constant | PLPF | msec | 0.0 to 100.0 | 0.0 |

This is to be used when setting the value in "Acceleration/Deceleration Mode" box in the position table to 2 "Primary Delay Filter".
The primary delay filter is disabled if "0" is set.
The greater the setting value is, the longer the delay is and the slower the acceleration/deceleration is. The impact at the acceleration and deceleration will be eased, but the cycle time will become longer.
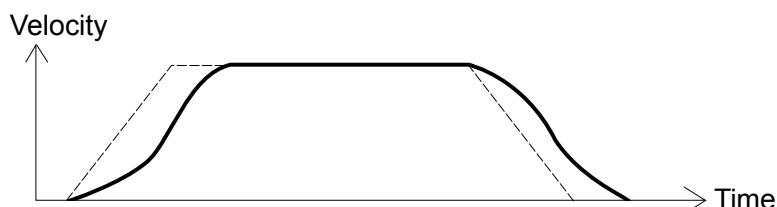
[39] S-motion rate (Parameter No.56)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 56 | S-motion Rate | SCRV | % | 0 to 100 | 0 |

This parameter is used when the value in the "Acceleration/deceleration mode" field of the position table is set to "1 (S-motion)".
This enables to ease the impact at acceleration and deceleration without making the cycle time longer.
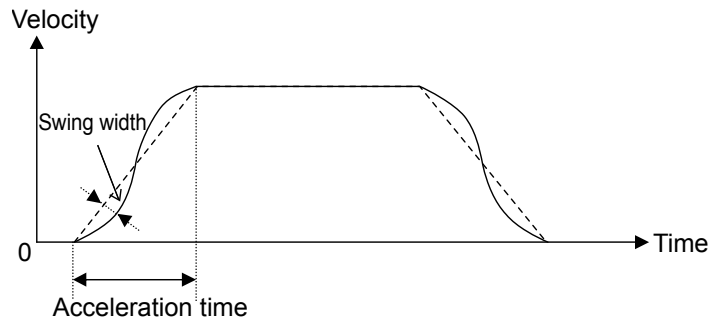


The S-motion is a sine curve that has the acceleration time as 1 cycle.
The level of its swing width can be set by this parameter.

| Setting [%] | Level of swing width |
|-------------|----------------------|
| 0 | No S-motion (Dotted line shown in the image below) |
| 100 | Sine curve swing width × 1 (Double-dashed line shown in the image below) |
| 50 | Sine curve swing width × 0.5 (Dashed line shown in the image below) |
| 10 | Sine curve swing width × 0.1 (Solid line shown in the image below) |
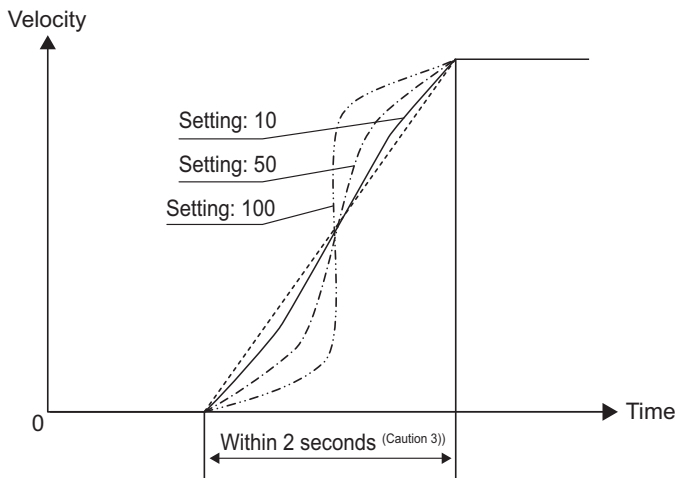


> ⚠ *Caution:*
> 1) *If the S-motion is specified in acceleration/deceleration mode, executing position command or direct value command while the actuator is moving causes an actuator to move along the trapezoid pattern.*
>    *To change a speed during operation, be sure to specify such a position command while the actuator is in pause state.*
> 2) *In the index mode of rotary actuator, the S-motion control is disabled. If S-motion acceleration/deceleration is specified, the trapezoid pattern is used in acceleration/deceleration mode.*
> 3) *If acceleration time or deceleration time exceeds 2 seconds, do not specify S-motion control. The actuator will be the trapezoid operation.*
> 4) *Do not perform temporary stop during acceleration or deceleration. The speed change (acceleration) may cause the dangerous situation.*

[40] Position Feed forward gain (Parameter No.71)

| No. | Name | Symbol | Unit | Input Range | Default factory setting | Model |
|-----|------|--------|------|-------------|------------------------|-------|
| 71 | Position Feed Forward Gain | PLFG | - | 0 to 100 | 0 | RCP6S<br>RCM-P6PC<br>RCM-P6AC |
| | | | | | 50 | RCM-P6DC |

This parameter defines the level of feed forward gain to be applied to position control.
Setting this parameter allows the servo gain to be increased and the response of the position control loop to be improved. This is the parameter to improve the takt time and traceability even more after fine-tuning the settings for "Servo Gain Number (Parameter No.7)", "Velocity Loop Proportional Gain (Parameter No.31)", etc.
This can result in shorter positioning time.
The gain adjustment of position, speed and current loop in feedback control can directly change the response of the servo control system. Thus, improper adjustment may cause the control system to be unstable and further vibrations and/or noises to occur. On the other hand, since this parameter only changes the speed command value and does not relate with the servo loop, it neither makes the control system unstable nor generate continuous vibrations and/or noises. However, excessive setting may generate vibrations and/or noises until the machine can follow command values in every operation.

In the trapezoidal pattern, adding the value resulting from multiplying the speed command by the feed forward gain to the speed command can reduce the delay of speed follow-up and the position deviation.

The feedback control providing control in accordance with the result causes control delay to occur. This conducts the supportive control independent from the control delay.
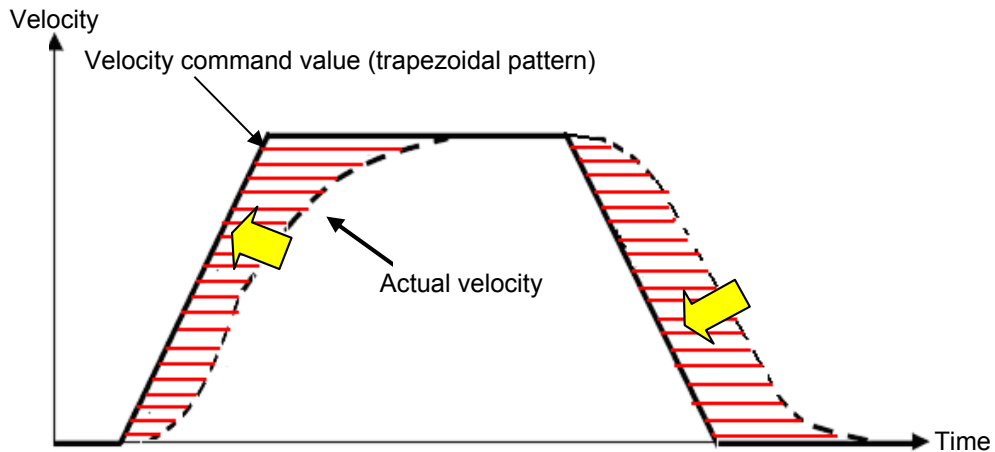


⚠ Caution: Anti-vibration control function is unavailable when the feed-forward gain is used (with the settings except for 0).

8. Parameter

207

[41] Ball screw lead length (Parameter No.77)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 77 | Ball Screw Lead Length | LEAD | mm | 0.01 to 999.99 | In accordance with actuator |

This parameter set the ball screw lead length.
The factory setting is the value in accordance with the actuator characteristics.

⚠ *Caution:* *If the setting is changed, not only the normal operation with indicated speed,*
*acceleration or amount to move is disabled, but also it may cause a*
*generation of alarm, or malfunction of the unit.*

[42] Axis operation type (Parameter No.78)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 78 | Axis Operation Type | ATYP | - | 0: Linear axis<br>1: Rotary axis | In accordance with actuator |

This parameter defines the type of the actuator used.

| Connected Actuator | Set Value | Reference |
|---|---|---|
| Linear Axis | 0 | Actuator other than rotary type |
| Rotary Axis | 1 | Actuator of rotary type |

⚠ *Caution:* *Do not change the setting of this parameter. Failure to follow this may cause*
*an alarm or fault to occur.*

[43] Rotary axis mode selection (Parameter No.79)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 79 | Rotary Axis Mode Selection | ATYP | - | 0: Normal mode<br>1: Index mode | In accordance with actuator |

This parameter defines the mode of the rotational axis.
When the Parameter No.78 (Axis Operation Type) is set to "1: Rotary Axis" and the index mode is selected, the current value indication is fixed to "0 to 359.99". When the index mode is selected, the short course control is enabled.

| Set Value | Description |
|---|---|
| 0 | Normal Mode |
| 1 | Index Mode |

• The index mode cannot be specified for actuators of absolute specification.

⚠ Caution: · When it is set to "Index Mode", the push & hold operation is not available. Even when data is entered in the "Push & Hold" data box in the Position Data, it becomes invalid and normal operation is performed. The positioning width becomes the parameter's default value for the positioning width.
· Change the value in the soft limit at the same time when changing the setting of Index Mode to Normal Mode. Parameter data error would be generated if the value in the soft limit is set to 0. Set a value that is -0.3mm out of the effective stroke.

[44] Rotational axis shortcut selection (Parameter No.80)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 80 | Rotational Axis Shortcut Selection | ATYP | - | 0: Disabled<br>1: Enabled | In accordance with actuator |

Select whether valid/invalid the shortcut when positioning is performed except for when having the relative position movement in the multiple rotation type rotary actuator.
The shortcut means that the actuator is rotated to the next position in the rotational direction of the smaller travel distance.

| Set Value | Description |
|---|---|
| 0 | Shortcut Invalid |
| 1 | Shortcut Valid |

8. Parameter

For RCP6S, RCM-P6PC
and RCM-P6AC only

## [45] Absolute unit (Parameter No.83)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 83 | Absolute Unit | ETYP | - | 0: Not used<br>1: Used | In accordance with specification at order accepted |

[For RCP6S and RCM-P6PC]
   Set to 1 if simple absolute type or battery-less absolute type and 0 if others.
   Set to 0 when using the battery-less absolute in incremental.
[For RCM-P6AC]
   Set to 1 for Simple Absolute, and set to 0 for other types.
   The battery-less absolute cannot be used in incremental.

## [46] Software limit margin (Parameter No.88)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 88 | Software Limit Margin | SLMA | mm (deg) | 0 to 9999.99 | 0 |

This is the parameter to set the position of over error detection against the soft limit errors set in Parameters No.3 and No.4.
It is not necessary to change the setting in normal use.
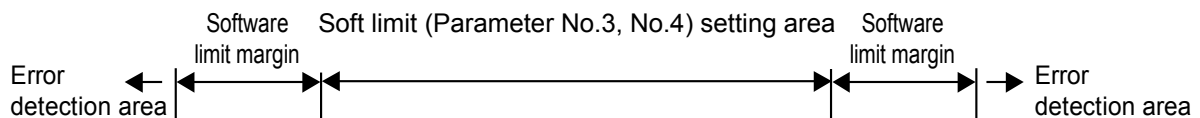


## [47] Current limit value at stopping due to miss-pressing (Parameter No.91)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 91 | Current Limit Value at Stopping Due to Miss-pressing | PSFT | - | 0: Current limiting value at stop<br>1: Current limit value during pressing | 0 |

This parameter select the restricted current value at stopping due to miss-pressing.
This restricted current value locks the servo till the next moving command.

| Set Value | Description |
|-----------|-------------|
| 0 | Use the current limit value (Parameter No. 12) at positioning stop. |
| 1 | Use the current limit value at pressing set in the position table. |

8. Parameter

[48] Damping characteristic coefficient 1, 2 / Natural frequency / Notch filter gain
(Parameter No.97 to No.108)

| | No. | Name | Symbol | Unit | Input range | Default factory setting |
|---|---|---|---|---|---|---|
| Parameter set 1 | 97 | Damping characteristic coefficient 1 | DC11 | - | 0 to 1000 | 10 |
| | 98 | Damping characteristic coefficient 2 | DC21 | - | 0 to 1000 | 1000 |
| | 99 | Natural frequency | NP01 | 1/1000Hz | 500 to 30000 | 10000 |
| | 100 | Notch filter gain | NFG1 | - | 1 to 20000 | 9990 |
| Parameter set 2 | 101 | Damping characteristic coefficient 1 | DC12 | - | 0 to 1000 | 10 |
| | 102 | Damping characteristic coefficient 2 | DC22 | - | 0 to 1000 | 1000 |
| | 103 | Natural frequency | NP02 | 1/1000Hz | 500 to 30000 | 10000 |
| | 104 | Notch filter gain | NFG2 | - | 1 to 20000 | 9990 |
| Parameter set 3 | 105 | Damping characteristic coefficient 1 | DC13 | - | 0 to 1000 | 10 |
| | 106 | Damping characteristic coefficient 2 | DC23 | - | 0 to 1000 | 1000 |
| | 107 | Natural frequency | NP03 | 1/1000Hz | 500 to 30000 | 10000 |
| | 108 | Notch filter gain | NFG3 | - | 1 to 20000 | 9990 |

This parameter is exclusively used for vibration suppress control. [Refer to Chapter 4 Vibration Suppress Control Function for details.]

[49] Default vibration suppress No. (Parameter No.109)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 109 | Default Vibration Suppress No. | CTLS | - | 0 to 3 | 0 |

This parameter is exclusively used for vibration suppress control.
[Refer to Chapter 4 Vibration Suppress Control Function for details.]

[50] Stop method at servo OFF (Parameter No.110)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 110 | Stop Method at Servo OFF | PSOF | - | 0: Sudden Stop 1: Deceleration to stop | 0 |

This parameter select how to stop the actuator at issue of servo OFF command, emergency stop or occurrence of an error (operation release level).

| Stop Command | Set Value | | | |
|---|---|---|---|---|
| | 0 : Sudden Stop | | 1 : Deceleration to stop | |
| | In Anti-Vibration Control Process | In Normal Positioning Control Process | In Anti-Vibration Control Process | In Normal Positioning Control Process |
| Pause | Vibration Control Deceleration and Stop | Normal Deceleration and Stop | Vibration Control Deceleration and Stop | Normal Deceleration and Stop |
| Servo OFF | Sudden stop due to emergency stop torque | | | |
| Emergency Stop | | | | |
| Error (Operation Cancellation Level) | | | | |
| Error (Cold Start) | Sudden stop due to emergency stop torque | | | |

[51] Monitoring mode selection (Parameter No.112)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 112 | Monitoring Mode Selection | FMNT | - | 0: Unused<br>1: Monitor Function 1<br>2: Monitor Function 2<br>3: Monitor Function 3 | 1 |

The controller can be connected with PC software to monitor the servo.
This parameter allows you to select a monitoring mode function (number of channels in the servomotor).
Check the Instruction Manual of the RC PC software for details.

| Set Value | Description |
|---|---|
| 0 | Unused |
| 1 | Sets the 4CH record mode. |
| 2 | Sets the 8CH record mode. |
| 3 | Sets the 2CH record mode. |

[52] Monitoring period (Parameter No.113)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 113 | Monitoring Period | FMNT | msec | 1 to 60000 | 1 |

This is the parameter to set up the frequency to the initial setting[Note 1] of time to obtain data (Sampling Frequency) when the monitoring mode is selected.
By setting the value in this parameter bigger, the frequency of data obtaining can be made longer.
It is set to 1msec in the initial setting. Up to 60000msec can be set.

| 1msec frequency setting | 60000msec frequency setting |
|---|---|
| Up to 2.048 seconds in 4CH record mode | Up to 34 hours 8 minutes in 4CH record mode |
| Up to 1.024 seconds in 8CH record mode | Up to 17 hours 4 minutes in 8CH record mode |
| Up to 4.096 seconds in 2CH record mode | Up to 68 hours 16 minutes in 2CH record mode |

*Note 1    The sampling period can be changed in the RC PC software.*

For RCM-P6AC only

[53] Servo gain number / Position Feed forward gain / Velocity loop proportional gain / Velosity loop integral gain / Torque filter time constant / Current control width number (Parameter No.120 to 137)

| | No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|---|
| Gain set 1 | 120 | Servo gain number 1 | PLG1 | - | 0 to 31 | In accordance with actuator |
| | 121 | Position Feed forward gain 1 | PLF1 | - | 0 to 100 | |
| | 122 | Velocity loop proportional gain 1 | VLG1 | - | 1 to 27661 | |
| | 123 | Velosity loop integral gain 1 | VLT1 | - | 1 to 217270 | |
| | 124 | Torque filter time constant 1 | TRF1 | - | 0 to 2500 | |
| | 125 | Current control width number 1 | CLP1 | - | 0 to 15 | |
| Gain set 2 | 126 | Servo gain number 2 | PLG2 | - | 0 to 31 | In accordance with actuator |
| | 127 | Position Feed forward gain 2 | PLF2 | - | 0 to 100 | |
| | 128 | Velocity loop proportional gain 2 | VLG2 | - | 1 to 27661 | |
| | 129 | Velosity loop integral gain 2 | VLT2 | - | 1 to 217270 | |
| | 130 | Torque filter time constant 2 | TRF2 | - | 0 to 2500 | |
| | 131 | Current control width number 2 | CLP2 | - | 0 to 15 | |
| Gain set 3 | 132 | Servo gain number 3 | PLG3 | - | 0 to 31 | In accordance with actuator |
| | 133 | Position Feed forward gain 3 | PLF3 | - | 0 to 100 | |
| | 134 | Velocity loop proportional gain 3 | VLG3 | - | 1 to 27661 | |
| | 135 | Velosity loop integral gain 3 | VLT3 | - | 1 to 217270 | |
| | 136 | Torque filter time constant 3 | TRF3 | - | 0 to 2500 | |
| | 137 | Current control width number 3 | CLP3 | - | 0 to 15 | |

・Servo gain number 1/2/3 (Parameter No. 120, 126, 132)
   This parameter determines the response of the position control loop.
   [Refer to 8.2 [5] Servo gain number.]

・Position Feed forward gain 1/2/3 (Parameter No. 121, 127, 133)
   This parameter defines the feed forward gain of the position control system.
   [Refer to 8.2 [40] Position Feed forward gain.]

・Velocity loop proportional gain 1/2/3 (Parameter No. 122, 128, 134)
   This parameter determines the response of the speed control loop.
   [Refer to 8.2 [21] Velocity loop proportional gain.]

・Velosity loop integral gain 1/2/3 (Parameter No. 123, 129, 135)
   This parameter determines the response of the speed control loop.
   [Refer to 8.2 [22] Velosity loop integral gain.]

・Torque filter time constant 1/2/3 (Parameter No. 124, 130, 136)
   This parameter decides the filter time constant for the torque command.
   [Refer to 8.2 [23] Torque filter time constant.]

・Current control width number 1/2/3 (Parameter No. 125, 131, 137)
   This parameter defines the control width of the current control system.
   [Refer to 8.2 [37] Current control width number.]

   [Reference Item] 3.3 Position Data Setting 13)-2 Gain Set

[54] Servo gain switchover time constant (Parameter No.138)

For RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 138 | Servo Gain Switchover Time Constant | GCFT | msec | 10 to 2000 | 10 |

When a switchover of the servo gain set is commanded in the position table, the switchover process is completed after time more than 3 times of the time spent in the setting of this parameter is passed since the operation of the commanded position number has started.

⚠ *Caution:  A time constant being rather short may cause the servo gain to change rapidly to have the operation of the actuator unstable.*

[55] Home Preset Value (Parameter No.139)

For RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 139 | Home preset value | PRST | mm | -9999.99 to 9999.99 | In accordance with actuator |

For the actuator of absolute specification, set this parameter so that (home return offset + value of this parameter) is within the range between 0 and the ball screw lead. (as it is necessary to register the Z-phase nearest to the mechanical end as the datum)
The value should be an integer multiple of ±ball screw lead length including 0.00.
(If the home return offset is within the range between 0 and ball screw lead length, the value of this parameter is 0.00.)
Also, when a value other than 0.00 is set in this parameter, home-return complete position cannot be 0.00, and it gets to the positon of home position + this parameter.

⚠ Caution:  If the above condition is not satisfied, the home position at restart after home return may shift by an integer multiple of the ball screw lead.

For the actuator of incremental specification, always set this parameter to 0.00.

&lt;Setting example 1&gt;
With ball screw lead length 4mm and home return offset level 10mm, set this parameter to -8mm.

Home Return Offset Level (10mm)

Ball Screw Lead Length (4mm) | Ball Screw Lead Length (4mm) | Ball Screw Lead Length (4mm)

Home position preset value (-8mm)

Home return completion position [-8mm]

Home Position [0mm]
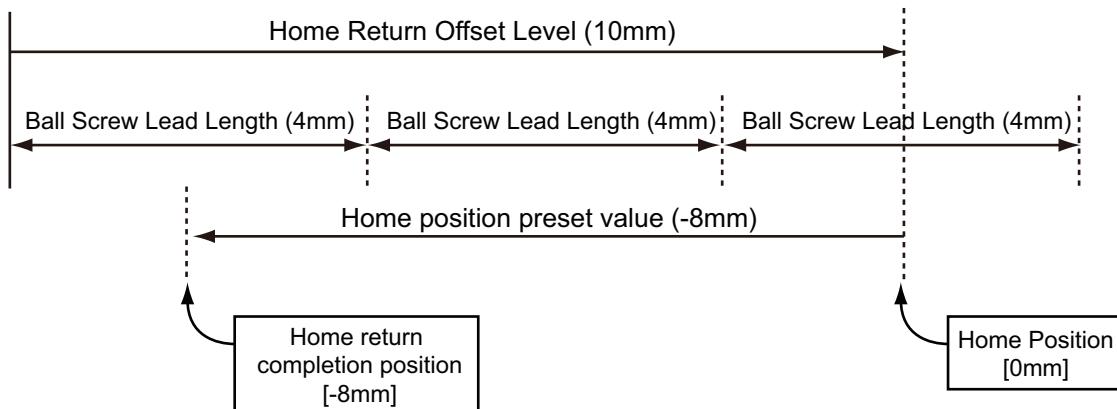
[56] Overload level ratio (Parameter No.143)

| No. | Name | Symbol | Unit | Input Range | Default Factory Setting |
|-----|------|--------|------|-------------|-------------------------|
| 143 | Overload level ratio | OLWL | % | 50 to 100 | 100 |

With the estimated risen temperature to generate overload alarm set as 100%, the 048 overload warning (message level) alarm is output when the motor temperature has exceeded the ratio set in this parameter. Judgment will not be executed if set to 100. (Refer to 8.2 [62] for the alarm output.)

[Applied: prevention function]
By setting this parameter, warning output notifies you before the equipment stops by error in case that the motor temperature rises due to load condition change caused by dry-up of grease or wear-out of components. Warning output (ALML Signal) can be conducted with PIO[*] or fieldbus.
* PIO output, parameter No.151 set to 0.



The current applied to the motor increases because of sliding resistance increase due to lack of maintenance of guide and ball screw or excess load applied on the motor. As a result, overload error occurs and the device stops the operation.

The current applied to the motor increases gradually as the sliding resistance gets higher without supplying grease on guide and ball screw. Warning will be generated if the current reaches the threshold that you set. At this time, the device will not stop, but have inspection and maintenance work held and remove the cause immediately.

Normal Operation Range

As RCP6S and RCM-P6PC are not applicable for this feature, do not attempt to make any change from the initial setting.

8. Parameter

**[57] Gain scheduling upper limit multiplying ratio (Parameter No.144)**

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 144 | Gain Scheduling Upper Limit Multiplying Ratio | GSUL | % | 0 to 1023 | 0 (Disabled) |

Gain scheduling is the function to change the gain in accordance with the operation speed.
This parameter shows the multiplying rate of the upper limit of the changeable gain.
With the set multiplying rate, the values for GS Velocity Loop Proportional Gain (Parameter No.145) and GS Velocity Loop Integrated Gain (Parameter No.146) are changed.

| Set Value | Description |
|-----------|-------------|
| 100 or less | Gain scheduling disabled |
| 101 to 1023 | Gain scheduling enabled (Recommended value 300) |

**[58] GS velocity loop proportional gain (Parameter No.145)**

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 145 | GS Velocity Loop Proportional gain | GSPC | - | 1 to 50000 | In accordance with actuator |

When the gain scheduling upper multiplying rate (Parameter No.144) is set to 101 or more, this parameter setting becomes effective for Velocity Loop Proportional Gain.
[Refer to the 8.2 [21] Velocity loop proportional gain for the details]
Also, for the conditions to use this item, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of 8.2 [22].

**[59] GS velocity loop integral gain (Parameter No.146)**

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 146 | GS Velocity Loop Integral Gain | GSIC | - | 1 to 500000 | In accordance with actuator |

When the gain scheduling upper multiplying rate (Parameter No.144) is set to 101 or more, this parameter setting becomes effective for Velocity Loop Integrated Gain.
[Refer to the 8.2 [22] Velocity loop integral gain for the details]
Also, for the conditions to use this item, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of 8.2 [22].

**[60] Total movement count target value (Parameter No.147)**

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 147 | Total movement count target value | TMCT | Times | 0 to 999999999 | 0 (Disabled) |

Alarm Code 04E "Exceeded Movement Count Threshold" is generated when the total movement count exceeds the value set to this parameter.
The judgment would not be made if the value is set to 0.

## [61] Total operated distance target value (Parameter No.148)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 148 | Total operated distance target value | ODOT | m | 0 to 999999999 | 0 (Disabled) |

Alarm Code 04F "Exceeded Operated Distance Threshold" is generated when the total operation distance exceeds the value set to this parameter.
The judgment would not be made if the value is set to 0.

## [62] Light Malfunction Alarm Output Select (Parameter No.151)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 151 | Light Malfunction Alarm Output Select | FSTP | - | 0: Overload warning output 1: Message lebel alarm output | 1 |

If set to 0, *ALML will be generated when overload level ratio (Parameter No. 143) has been exceeded.
If set to 1, *ALML will be generated when a message level alarm has been generated.

## [63] High output setting (Parameter No.152)

For RCP6S and RCM-P6PC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 152 | High Output Setting | BUEN | - | 0: Disabled 1: Enabled | 0 (Disabling) |

Set whether use the high output function. Note that it is necessary to indicate the high-output setting type (option) and have an actuator applicable for high-output [Note 1] connected.
*(Note 1) High-output applicable actuator : RCP4, RCP5 Series*

## [64] BU velocity loop proportional gain (Parameter No.153)

For RCP6S and RCM-P6PC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 153 | BU Velocity Loop Proportional Gain | BUPC | - | 1 to 27661 | In accordance with actuator |

The setting in this parameter gets effective for Velocity Loop Proportional Gain when Parameter No. 152 "High-Output Setting" is valid and No. 144 "Gain Scheduling Upper Magnification" is set to 100 or lower.
[Refer to the 8.2 [21] Velocity loop proportional gain for the details]
Also, for the conditions to use this item, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of 8.2 [22].

8. Parameter

[65] BU velocity loop integral gain (Parameter No.154)

> For RCP6S and
> RCM-P6PC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 154 | BU Velocity Loop Integral Gain | BUIC | - | 1 to 217270 | In accordance with actuator |

The setting in this parameter gets effective for Velocity Loop Proportional Gain when Parameter No. 152 "High-Output Setting" is valid and No. 144 "Gain Scheduling Upper Magnification" is set to 100 or lower.
[Refer to the 8.2 [22] Velocity loop integral gain for the details]
Also, for the conditions to use this item, refer to "Selecting to Use Velocity Loop Proportional Gain and Velocity Loop Integrated Gain" in the bottom of 8.2 [22].

[66] Absolute battery retention time (Parameter No.155)

> For RCM-P6PC and
> RCM-P6AC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 155 | Absolute Battery Retention Ttime | AIP | - | 0: 20 days<br>1: 15 days<br>2: 10 days<br>3:  5 days | 0 |

For simple absolute type, set how long the encoder position information is to be retained after the power to the controller is turned OFF. The setting can be selected from 4 phases and as the motor rotation speed gets slower, the time to retain the position information gets longer. In the case that there is a possibility that the slide or the rod of the actuator that transports the work may be moved by an external force, follow the table below and calculate [Note 1] the number of rotation from the moved speed and set this parameter to the value faster than this value. If the motor rotation setting value exceeds the set value, the position information will be lost.

*Note 1  Motor rotation [rpm] = Moved speed [mm/s] / Lead length [mm] × 60*

| Setting | Upper Limit of Motor Rotation Speed at Power being OFF [rpm] | | Position information retaining time (reference) |
|---------|-------------------------------------------|----------|--------------------------------------|
|         | Other than RCA2-***NA | RCA2-***NA |                                      |
| 0 | 100 | 75 | 20 days |
| 1 | 200 | 150 | 15 days |
| 2 | 400 | 300 | 10 days |
| 3 | 800 | 600 | 5 days |

[67] Delay time after shutdown release (Parameter No.165)

| No. | Name | Symbol | Unit | Input Range | Default Factory Setting |
|---|---|---|---|---|---|
| 165 | Delay time after shutdown release | SDDT | msec | 0 to 1000 | 0 |

It is used in purpose to scatter the in-rush current when the power is supplied to multiple controllers from one power source. It is used to set the delay time from the driving power supply (24V supplied to MPI) to shutdown cancellation. It is available to scatter the peak load by having the time setting separately on each controller.

*(Note 1)   An electric discharge inside the controller gets large if the setting is made large, and therefore, large amount of current gets necessary in order to charge the power when the servo gets turned on after that. Use a 24V power supply device with enough the power capacity.*

e.g.) When building up a drive cutoff relay externally



Shutdown (*SDWN)
• Emergency Stop
• Enable Switch etc.

SDDT (Default: 0ms)

External Servo-ON Command (SON)

Reception of Controller Internal Servo-ON Command

20ms

Servo-ON Status (SV)

If the ON-edge 2) of external servo-ON command came after the point of passing SDDT time 1), the condition becomes reception of controller internal servo-ON command at the point of 2).
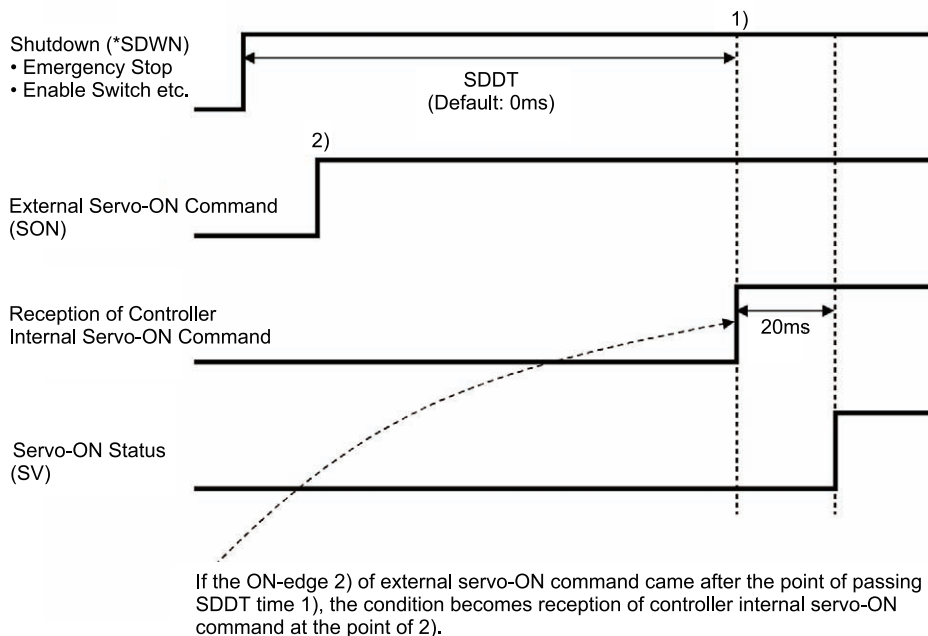
## [68] Startup Current Limit Extension Feature (Parameter No.166)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 166 | Startup Current Llimit Extension Feature | DCET | - | 0: Disabled<br>1: Enabled | 0 (Disabled) |

Drive control is made to the operation that causes an impact force at the start of movement when moving to the target position from the stop state.
Effect is expected on an actuator used in large equipment with static friction of load (such as gripper).
This feature would not work even if this parameter is activated in the following cases.
 1) Home return
 2) The first escape operation after pressing is finished
 3) First movement after pause is released
 4) When movement command is issued during operation

## [69] Collision Detection Feature (Parameter No.168)　For RCP6S and RCM-P6PC only

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 168 | Collision Detection Feature | CODT | - | 0 to 7 | 0 |

It is a feature to generate a collision detection alarm and stop the operation (turn the servo OFF) when the actuator is crashed.
Detection is conducted in the range set that the position zone is set. [Refer to the Chapter 5 Collision Detection Feature]

| Setting value | Operation status | Alarm level |
|---------------|------------------|-------------|
| 0 | Detection not to be conducted (same when set to 2, 4 or 6) | - |
| 1 | Detection is conducted in position zone setting range. | Operation cancellation level |
| 3 (Note 1) | Detection is conducted in position zone setting range, but is not conducted in the following conditions. In this setting, it can avoid a mistake to detect the current during acceleration.<br>• The first movement after releasing from a pause<br>• Movement from a stop in the positon zone range | Operation cancellation level |
| 5 | Detection is conducted in position zone setting range. | Message level |
| 7 (Note 1) | Detection is conducted in position zone setting range, but is not conducted in the following conditions. In this setting, it can avoid a mistake to detect the current during acceleration.<br>• The first movement after releasing from a pause<br>• Movement from a stop in the positon zone range | Message level |

*Note 1　In this setting, it can avoid a mistake to detect the current during acceleration.*

# $RCP6S$ *Fieldbus Communication*

[70] Selection of SIO2 Baud Rate (Parameter No.169)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 169 | Selection of baud rate SIO2 | BRSL | bps | 9600 to 230400 | 38400 |

Set the baud rate in the startup SIO2 baud rate.
Set an appropriate value in accordance with the communication speed of the host.
One of 9600, 14400, 19200, 28800, 38400, 76800, 115200 and 230400 bps can be selected as the communication speed.

⚠ *Caution: The baud rate after the PC software is connected will be the rate of PC software. To make effective the value set in the parameter, turn off the power once and on it again.*

[71] SIO2 Minimum Delay Time for Slave Transmitter Activation (Parameter No.170)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 170 | Minimum delay time for slave transmitter activation | RTM2 | msec | 0 to 255 | 5 |

In this setting, set the time from receiving the command (received data) during the SIO2 communication till the response (sent data) is returned to the host side.

[72] SIO2 Silent Interval Magnification (Parameter No.171)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 171 | SIO2 silent interval magnification | SIM2 | Time | 0 to 10 | 0 |

Use this parameter to set the silent interval (no communication) time by the time taken for communication of 3.5 characters or longer before command data transmission when the controller is operated via serial communication.
This parameter need not be changed when a teaching tool such as PC software is used.
If "0" is set, no multiplier is applied.

[73] SIO2 Slave Address (Parameter No.172)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|-------------------------|
| 172 | SIO2 slave address | MSA2 | - | 0 to 16 | 0 |

Set the slave addres when SIO2 communication.
*(Note) Make sure to establish the setting to avoid duplication of the unit number to a device connected to SIO2.*

⚠ *Caution: Not to be used in this setting for RCP6S. Do not change the setting from the setting value.*

[74] Pressing Type (Parameter No.181)

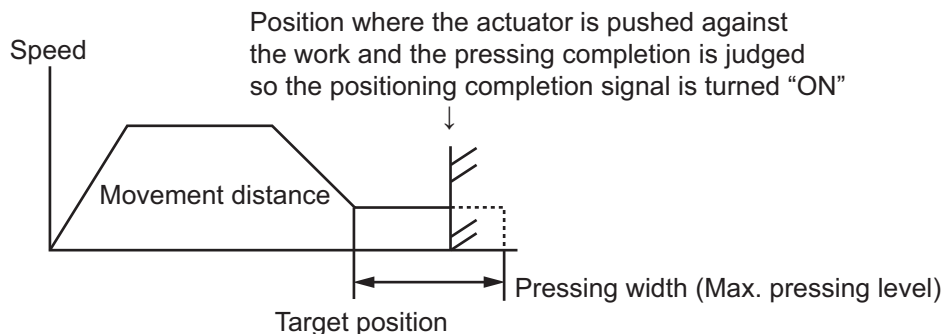| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|-----|------|--------|------|-------------|------------------------|
| 181 | Pressing type | SPOS | - | 0: Type CON<br>1: Type SEP | 0 |

The pressing method can be selected from CON type and SEP type.

[Pressing Operation CON Method]
After reaching the target position [Note 1] from the current position, the actuator moves with the pressing speed for the distance set as the pressing band width.
The positioning complete signal (PEND) turns ON if the work piece hits and pressing is judged as completed while in the pressing operation.
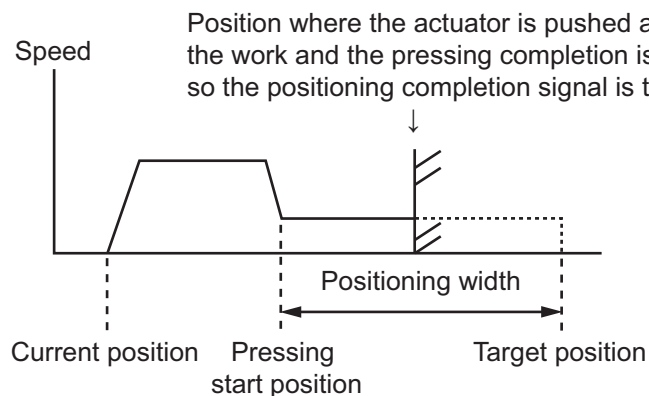*Note 1    In Direct Indication Mode, it is the value input in the target position register.*

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

Speed

Movement distance

Pressing width (Max. pressing level)

Target position

[Pressing Operation SEP Method]
The pressing operation is performed with the start position set at the point in front of the target position [Note 1] for the width of the positioning width (for Direct Indication 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    In Direct Indication Mode, it is the value input in the target position register.*
*(Note)    Pulling operation cannot be performed.*

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

Speed

Positioning width

Current position    Pressing start position    Target position

[75] Selecting Automatic Current Reduction Feature (Parameter No.182)

| No. | Name | Symbol | Unit | Input Range | Default factory setting |
|---|---|---|---|---|---|
| 182 | Auto Current Adj. Select | ACDS | - | 0: Disabled<br>1: Enabled | 0 |

It is a feature to make a stop by having the current flow considering the external force influence when performing the complete stop in positioning.
It will be able to save the power consumption when the transported load is small.
[Refer to 6.2 Selecting Automatic Current Reduction Feature]

8. Parameter

## 8.3 Servo Adjustment

The parameters are preset at the factory before shipment so that the actuator operates stably within the rated (maximum) transportable weight.
However, the preset setting cannot always be the optimum load condition in the actual use. In such cases, servo adjustment may be required.
This section describes the basic servo adjustment method.

> ⚠ *Caution:* *Rapid and excessive settings are dangerous. They may devices including the actuator to be damaged and/or people to be injured. Take sufficient note on the setting.*
> *Record settings during servo adjustment so that prior settings can always be recovered.*
> *When a problem arises and the solution cannot be found, please contact IAI.*

### 8.3.1 Adjustment of Pulse Motor and Servo Motor

| No. | Situation that requires adjustment | How to Adjust |
|---|---|---|
| 1 | Takes time to finish positioning<br><br>Positioning accuracy is not appropriate<br><br>Shorter takt time is desired | • Set Parameter No.55 "Position command primary filter time constant" to "0" if it is set.<br>• Increase the value of Parameter No.7 "Servo gain number". By setting a larger value, the follow-up ability to the position command becomes better. Set the value to any of 3 to 10 roughly or up to 15 at the maximum. If the value is too large, an overshoot is caused easily and may cause noise or vibration.<br><u>If the value of Parameter No.7 "Servo gain number" is increased, also adjust the Parameter No.31 "Speed loop proportional gain" in increasing direction to ensure the stability in the control system.</u><br>To increase the value of Parameter No.31 "Speed loop proportional gain" <u>by about 20% of the default</u>. Prior to the setting, adjust Parameter No.7 "Servo gain number". |
| 2 | Vibration is generated at acceleration/deceleration | • The cause of the problem is excessive "acceleration/deceleration setting" or vulnerable structure of the unit on which the actuator is installed. If possible, reinforce the unit itself, first.<br>• Decrease the values of "acceleration/deceleration setting".<br>• Decrease the number of Parameter No.7 "Servo gain number".<br>If the Parameter No.7 "Servo gain number" is too low, it takes long time to finish the positioning. |
| 3 | Speed is uneven during the movement<br><br>Speed accuracy is not appropriate | • Increase the value of Parameter No.31 "Speed loop proportional gain". By setting a larger value, the follow-up ability to the speed command becomes better.<br>Setting too large value makes the mechanical components easy to vibrate. As a reference for the setting, increase the value little <u>by little by 20% from the initial setting.</u> |

| No. | Situation that requires adjustment | How to Adjust |
|---|---|---|
| 4 | Abnormal noise is generated. Especially, when stopped state and operation in low speed (less than 50mm/sec), comparatively high noise is generated. | • Input the Parameter No.33 "Torque Filter Time Constant". Try to increase by 50 as a reference for the setting. If the setting is too large, it may cause a loss of control system stability and lead the generation of vibration.<br><br>[Important] Prior to Adjustment:<br>This phenomenon is likely to occur when the stiffness of the mechanical components is not sufficient. The actuator itself may also resonate if its stroke is over 600mm or it is belt-driven type. Before having an adjustment, check if:<br>1) The value for Parameter No.7 "Servo gain number", Parameter No.31 "Speed loop proportional gain", or Parameter No.32 "Speed loop integral gain" are excessive.<br>2) The stiffness of the load is sufficient as much as possible, or the attachments are not loosened.<br>3) The actuator unit is mounted securely with a proper torque.<br>4) There is no waviness on the actuator mounting surface. |
| 5 | Trace precision is desired to be improved.<br>Equi-speed performance is desired to be improved.<br>Response is desired to be improved. | • Make the condition optimized with Parameter No.7 "Servo gain number" and Parameter No.31 "Velocity loop proportional gain" adjusted by referring to the way to adjust stated in No.1 to 3 in the previous page.<br>[Reference]<br>The most important factor is to select the actuator (motor). The servo is extremely sensitive to the inertia of the load. If the inertia moment of the load is too large in comparison with the inertia moment of the servo motor itself, the motor is highly affected by the load. This may cause the actuator to be controlled unstably.<br>Therefore, to improve the precisions of the trace, position, speed and response of the actuator, the load inertia ratio must be made small.<br>For high trace precision, equi-speed performance, and response of the actuator in such a use as application, it is better to use ball screws with small leads in the actuator as much as possible and an actuator of motor capacity higher by at least one level.<br>The best method is to calculate the load inertia to select the proper actuator. |
| 6 | Large static friction of load makes actuator start slowly.<br>Large load inertia makes response of actuator low at start and stop.<br>Cycle time is desired to be shortened. | • Set parameter No.71 "Feed forward gain".<br>Select a value in the range from 10 to 50 roughly. The larger the setting value is, the smaller the deviation is. Then the response is improved.<br>Setting a large value may cause vibrations and/or noises to occur.<br>Set the feed forward gain in order to improve the response of the actuator further after adjusting Parameter No.7 "Servo gain number" and Parameter No.31 "Speed loop proportional gain". |
| 7 | There is an impact at the start or stop. | • Change the setting in Parameter No.55 "Position command primary filter time constant" to approximately 50ms. If there is no improvement in situation, try to increase the setting gradually. If there is an improvement, try to decrease the setting gradually to the boundary. Making a change to this setting will make the settling time longer thus the takt time also becomes longer. The accuracy for the positioning also becomes worse. It is recommended, to solve the problem from the root cause, to replace the host positioning unit with one that is equipped with acceleration/deceleration function. |

8. Parameter

## 8.3.2 Adjustment of Brushless DC Electric Motor

| No. | Situation that requires adjustment | How to Adjust |
|---|---|---|
| 1 | Hunching occurs at positioning stop | Set the parameter in the following steps, and check the operation. If an improvement is confirmed in operation, finish the adjustment. It is not necessary to proceed to the next step. |
| 2 | Fluctuation in speed occur during operation | |
| | Speed is inaccurate | |
| | | Procedure 1 : Change Parameter No. 32 "Velocity Loop Integrated Gain" Set the five types of values below in order, and check the operation. |

Procedure 1 : Change Parameter No. 32 "Velocity Loop Integrated Gain"
Set the five types of values below in order, and check the operation.

| Setting Order | Velocity Loop Integrated Gain Setting |
|---|---|
| 1 | 411 |
| 2 | 592 |
| 3 | 925 |
| 4 | 1645 |
| 5 | 3700 |

Go onto Procedure 2 if there is no improvement in operation.

Procedure 2 : Change Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integrated Gain"
Set the six types of values below in order, and check the operation.

| ●Load of 0.2kg or less | | |
|---|---|---|
| Setting Order | Velocity Loop Proportional Gain Setting | Velocity Loop Integrated Gain Setting |
| 1 | 42 | 382 |
| 2 | 42 | 520 |
| 3 | 42 | 749 |
| 4 | 42 | 1171 |
| 5 | 42 | 2081 |
| 6 | 42 | 4683 |

| ●Load over 0.2kg | | |
|---|---|---|
| Setting Order | Velocity Loop Proportional Gain Setting | Velocity Loop Integrated Gain Setting |
| 1 | 32 | 231 |
| 2 | 32 | 315 |
| 3 | 32 | 453 |
| 4 | 32 | 708 |
| 5 | 32 | 1259 |
| 6 | 32 | 2833 |

Contact IAI if there is no improvement in operation.

| No. | Situation that requires adjustment | How to Adjust |
|---|---|---|
| 3 | Abnormal noise is generated / Especially, when stop or operation in low speed (less than 20mm/sec), comparatively high noise is generated. | Change the values for Parameter No. 31 "Velocity Loop Proportional Gain" and Parameter No. 32 "Velocity Loop Integrated Gain" to the following. Speed loop proportional gain : 32 Speed loop integral gain : 231 |

# Chapter 9   Troubleshooting

## 9.1   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 status indicator LEDs on each controller.

○: Illuminating, ×: OFF, ☆: Flashing

| LED | Color | Operation Status |
|---|---|---|
| × | - | Power is OFF |
| | | Servo OFF |
| ● | Red | Alarm (operation available lebel or more) |
| | | Emergency stop |
| ★ | Red | During crash detection |
| ● | Green | Servo ON |
| ★ | Green | Automatic Servo is OFF (Note 1) |
| ● | Orange | In initializing process when the power is turned on |

*Note 1: Automatic servo-off signal: [Refer to 6.1 Automatic Servo-off and Full Servo 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) Check the voltage of power supply for the fieldbus.
5) Check the voltage of the power supply for brake (For the actuator with the brake).
6) Alarm Check (Note 2)
   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.
   Before performing a continuity check, turn off the power (to prevent electric shocks) and disconnect the cables of measuring instruments (to prevent accidental power connection due to sneak current path).
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 surge killer, etc.).
11) Check the events leading to the occurrence of problem (Note 3), as well as the operating condition at the time of occurrence.
12) Analyze the cause.
13) Treatment

*Note 2: The alarms applicable for this function are those stated in Section 9.3 Gateway Alarm or 9.4 Driver Alarm. Any error which may occur in a teaching tool such as the PC software is not included.*

*Note 3: If of gateway parameter setting tool set to current time, it is possible to know the date and time at which the alarm occurred. Refer to [3.8.3 (5) Clock Setting] for how to set up the date and time.*
*The date and time data set once is retained for about 10 days if the power supply of the controller is OFF. Unless the setting is conducted or the clock data is lost, the clock shows 00/01/01 00:00:00 when the power is turned ON.*
*Even if the date and time data is lost, the generated error code is retained.*

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

## 9.2 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) Impossible Communication.

### 9.2.1 Impossible Operation of Controller

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| At power-on, SV on the status indicator LEDs does not go ON. | (1) Proper power is not supplied.<br>(2) Servo-on command is not input to IAI controller.<br>The operation mode setting switch on the front panel is on "MANU" side.<br>(3) Occurrence of alarm.<br>(4) During emergency-stop.<br>　1) Was the emergency-stop switch.<br>　2) EMG- on the power supply connector is not connected. | (1) Ensure that appropriate voltage is supplied and the wiring is in the right condition.<br>[Refer to 2.3.1 Wiring Layout of Power Supply Connector.]<br>(2) Can such operation as jogging be performed from the teaching tool such as PC software? Set the operation mode setting switch on the front panel and restart the controller.<br>[Refer to Name for Each Parts and Their Functions.]<br>(3) Check the error code with the teaching tool being connected and remove the cause by referring the alarm list.<br>[Refer to 9.4 Alarm List.]<br>(4) 1) Release the emergency stop switch.<br>　2) Check the connection of the power connector (EMG-).<br>[Refer to 2.3.1 Connection to Power Input Connector.] |
| ALM in the status display LEDs turns on when the power is supplied. | (1) Occurrence of alarm<br>(2) During emergency-stop.<br>　1) Was the emergency-stop switch.<br>　2) EMG- on the power supply connector is not connected. | (1) Check the error code with the teaching tool being connected and remove the cause by referring the alarm list.<br>[Refer to 9.4 Alarm List.]<br>(2) 1) Release the emergency stop switch.<br>　2) Check the connection of the power connector (EMG-).<br>[Refer to 2.3.1 Connection to Power Input Connector.] |

9. Troubleshooting

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| Both position No. and start signal are input to the controller, but the actuator does not move. | There is a problem treatment, position table setting or operation mode selection.<br>1) Servo OFF condition<br>2) The pause signal is OFF.<br>3) Positioning command is issued to a stop position.<br>4) There is no positioning data set to the commanded position number.<br>5) Target position number and the start signal commanded at the same time | 1) Is the status display LED SV turned ON? [Refer to Name for Each Parts and Their Functions] Turn ON the servo-on signal SON.<br>2) Operation is available pause signal *STP is ON and pause when it is OFF. Turn it ON.<br>3) Check the sequence or the settings of the position table.<br>4) It will generate Alarm Code 0A2 "Position Data Error". Conduct the position table setting.<br>5) Have 6ms or more between the target position number command and start signal command. |

[Startup Adjustment with Teaching Tool when Control Circuit Incomplete]

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| Operation is not performed even though the teaching tool is connected, and power to the controller motor and control circuit is supplied.<br>(the emergency stop switch is released on the teaching tool) | Cable treatment or mode selection.<br>1) Emergency stop condition<br>2) Servo OFF condition<br>3) In pause | 1) Supply 24V DC to EMG- terminal of the power connector.<br><br>⚠ *Warning*<br>*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.*<br><br>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. |

9. Troubleshooting

## 9.2.2 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.<br>1) A load exceeding its rating weight is installed on the actuator.<br>2) It is touched to interference in the way of the run.<br>3) Torsion stress is applied to guide due to improper fixing method of the actuator or uneven fastening of bolts.<br>4) The sliding resistance of the actuator itself is large. | 1) Reduce the load.<br>2) Remove the interference.<br>3) Loosen the fixing bolts once and check whether the slider can move smoothly.<br>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.<br>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 | [Refer to 8.3 Servo Adjustment.] | |
| Uneven speed during movement | | |
| Acceleration/deceleration not smooth (bad speed response) | | |
| Trace of poor precision | | |

*(Note1) Since RCP6S actuator is equipped with the battery-less absolute encoder, it is not necessary to perform the home-return operation in ordinary situation.*

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| Positioning at a position different from that of commanded position No. | Signal processing is incorrect.<br>1) Start signal CSTR is input too early after position No. command. Or position No. command and start signal are input concurrently.<br>2) The correct position No. is not specified due. | 1) The stop position may be set for another purpose. Input the start signal after the controller fully reads the position number. [Refer to 3.7.2 to 3.7.4 Operation in each mode.]<br>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. | Signal processing is incorrect.<br>1) Start signal CSTR is not turned OFF. | 1) 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. |

### 9.2.3    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 8.3 Servo Adjustment.] It may be improved with setting to Full Servo Mode if the case occurs during deceleration and stop. [Refer to Chapter 6 Power-saving Function] |

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| Vibrations of load | 1) Acceleration/deceleration is set too high.<br>2) The installation structure and/or the installed load are easily affected by acceleration/deceleration. | 1) Decrease the settings of acceleration/deceleration. |

### 9.2.4    Impossible Communication

| Situation | Possible cause | Check/Treatment |
|---|---|---|
| Not connectable with host machine | 1) Communication rates do not match.<br>2) The machine number (station number) is set to be duplicate out of the range.<br>3) Parameter No.17 "Minimum delay time for slave transmitter activation" is set incorrectly.<br>4) 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.]<br>2) Confirm the maximum number of axes available to connect.<br>3) Set the value in Parameter No.17 smaller (2 as a reference) if the response timeout error is being issued in the host system. In any other cases, increase or decrease the value at will to change the send/receive timing. (If the operation is performed properly, the transmission cycle of the host is too fast. Always check the response of RCP6S GW before next transmission.)<br>4) Review the wiring again. Check if termination resistances are connected to network terminals with correct values. |

## 9.3 Gateway Alarm

### 9.3.1 Gateway Alarm Codes

The alarm codes are read into ALMC1 to128 (b7 to b0) in Gateway Status Signal 0.
[Refer to 3.4.2 Gateway Control Signals (Common for all operation modes).]

*(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 | |
|---|---|---|---|
| 4A (84A) | 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 (84B) | Real Time Clock Access Error | Cause | : It is an internal error of RCP6S GW. 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 (850) | Fieldbus Communication Error (ERR-C) | Cause | : It is a Fieldbus 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 Fieldbus (node addresses, communication speed, etc.) and wiring layout. |
| 60 (860) | Master-Slave Axes Communication Error (ERR-T) | Cause | : It is an error of RCP6S GW. The communication with the driver board to connect each axis of the actuators was not able to be established. |
| | | Treatment | : It is concerned that there is an error in the connector insertion (connector is not inserted till it hits the end) or line breakage on the cable. |
| 61 (861) | Master-Slave Axes Communication Internal Error (Sending) | Cause | : It is a communication error of RCP6S GW. It is concerned that there is an error in the connector insertion (connector is not inserted till it hits the end) or line breakage on the cable.. |
| | | Treatment | : It is concerned that there is an error in the connector insertion (connector is not inserted till it hits the end) or line breakage on the cable. |
| 62 (862) | Master-Slave Axes Communication Internal Error (Receiving) | Cause | : It is a communication error of RCP6S GW. The communication with the actuator built-in controller could not be established. |
| | | Treatment | : It is concerned that there is an error in the connector insertion (connector is not inserted till it hits the end) or line breakage on the cable. |
| 6A (86A) | 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 (880) | 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 (881) | Parameter Check Sum Error | Cause | : There is a possibility that the memory data inside RCP6S GW has destroyed. |
| | | Treatment | : Establish all the settings again on Gateway Parameter Setting Tool or write the backup data if it exists. |
| 9C (89C) | Fieldbus Module Not Detected | Cause | : Communication board for Fieldbus 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. |

| Alarm Code | Alarm Name | Cause/Treatment |
|---|---|---|
| 96 (896) | Connected Unit Construction Error | Cause : There is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status when valid (with alarm) has been selected in the fieldbus I/O domain left-justification setting.<br>Treatment : 1) Adjust the left-justification setting in the gateway setting tool and the current axis connection status to be matched.<br>2) Set the left-justification setting feature setting valid (with out alarm). |
| 9D (89D) | Fieldbus Module Initialization Timeout | Cause : Initialization of the fieldbus module did not finish even after a certain while has passed.<br>Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI. |
| A0 (8A0) | Control Power Overvoltage | Cause : Control power voltage reached beyond the overvoltage threshold (120% of 24V DC = 28.8V).<br>1) The voltage of 24V DC power supply is high.<br>2) A faulty part inside the controller<br>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.<br>Treatment : 1) 2) Check the voltage of the input power supply.<br>3) Think to use a power supply with enough current capacity or not to use the remote sensing function.<br>If the voltage is normal, please contact IAI. |
| A1 (8A1) | Control Power Voltage Drop | Cause : The control power voltage dropped less than the voltage drop threshold (70% of 24V DC = 16.8V).<br>1) The voltage of 24V DC power is low<br>2) A faulty part inside the controller<br>Treatment : Check the power voltage.<br>If the voltage is normal, please contact IAI. |
| A7 (8A7) | Power Voltage Drop in External Wiring | Cause : Power voltage to be used for external wiring has dropped.<br>Treatment : Reboot the power supply. In case the error occurs even after power reboot, contact IAI. |
| B0 (8B0) | Connection Unit Control Power Voltage Drop | Cause : The control power voltage of the hab unit has dropped.<br>Treatment : Check the wiring on the hub unit.<br>The detected point can be clarified with the detail code.<br>Detail Code "----" : Hub Unit 1<br>"0001" : Hub Unit 2<br>"0002" : Hub Unit 3<br>"0003" : Hub Unit 4<br>(Note) It may not be displayed depending on the version of the gateway unit and the hub unit.<br>[Refer to 9.3.2 Connection Unit Control Power Voltage Drop Alarm.] |
| FFF | Power-on Log | It is the log at the power being on (it is not an error). |

## 9.3.2 Connection Unit Control Power Voltage Drop Alarm

When Gateway Unit Version V0003 or later and also Hub Unit Version V0003 or later, the gateway unit monitors the control power voltage of the hub unit, and it displays "8B0 Connection Unit Control Power Voltage Drop" when the voltage has dropped.

| | | Gateway Unit Version | |
|---|---|---|---|
| | | V0002 and earlier | V0003 and later |
| Hub Unit Version | V0001 | No displayed | No displayed |
| | V0003 and later | No displayed | **8B0 displayed** |

There is no Hub Unit Version V0002.

<u>Hub Unit SYS LED Display</u>

The display status of SYS LED lamp when the voltage has recovered to the normal condition from control power voltage drop differs depending on the version of the hub unit.

| Hub Unit Version | Control Power Voltage (Monitor Power Voltage in Normal) | | |
|---|---|---|---|
| | In Normal | When Dropped | Recovered to Normal after Drop |
| V0001 | 🟩 Green Illuminating ⭐ Green Flashing | 🟥 Red Illuminating | 🟩 Green Illuminating ⭐ Green Flashing |
| V0003 and later | 🟩 Green Illuminating ⭐ Green Flashing | 🟥 Red Illuminating | 🟥 Red Illuminating |

There is no Hub Unit Version V0002.

<u>Hub Unit</u>

🟩 Green Illuminating : Ready Status
⭐ Green Flashing : Standby with Communication Established

🟥 Red Illuminating : Control / Motor Power Voltage Drop

SYS LED ⟶
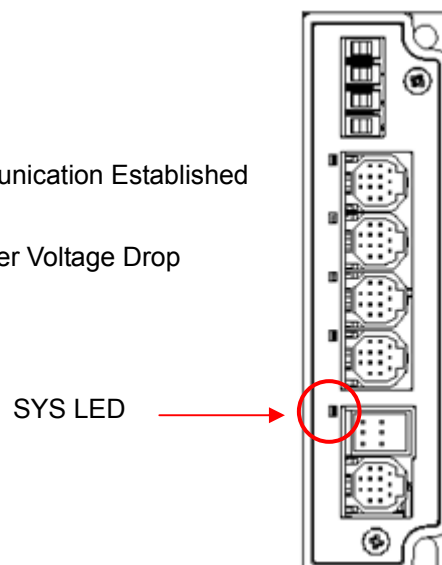
## 9.4 Driver Alarm

### 9.4.1 Alarm Level

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

| Alarm level | Actuator status display LED | *ALM signal | Status when an error occurred | Cancellation method |
|---|---|---|---|---|
| Message | Green Light is turned ON. | 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 | Red Light is turned ON. | Output | Servo OFF after deceleration to stop | Reset the alarm by the reset signal (RES) or teaching tool. |
| Cold start | Red Light is turned 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.*

### 9.4.2 Simple Alarm Code

Simple alarm codes are read into the complete position register (PM8 to PM1) of each mode in Simplified Direct Value, Positioner 1, Positioner 2, Positioner 3 and Positioner 5 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 |
| ● | ● | ● | ● | ○ | 1 | Collision Detection (0DF) |
| ● | ● | ● | ○ | ● | 2 | Software reset during servo ON (090) Position number error during teaching (091) PWRT signal detected during movement (092) PWRT signal detected before completion of home return (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) Position command information data error (0A3) Command deceleration error (0A7) |
| ● | ● | ○ | ● | ● | 4 | Mismatched PCB (0F4) |

*(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.*

| *ALM | ALM8 (PM8) | ALM4 (PM4) | ALM2 (PM2) | ALM1 (PM1) | Binary Code | Description: Alarm code is shown in ( ). |
|---|---|---|---|---|---|---|
| ● | ● | ○ | ○ | ● | 6 | Parameter data error (0A1)<br>Position data error (0A2)<br>Unsupported motor/encoder type (0A8) |
| ● | ● | ○ | ○ | ○ | 7 | Z-phase position error (0B5)<br>Z-phase detection time out (0B6)<br>Magnetic pole indeterminacy (0B7)<br>Excitement detection error (0B8)<br>Home sensor non-detection (0BA)<br>Home return timeout (0BE) |
| ● | ○ | ● | ● | ● | 8 | Actual speed excessive (0C0) |
| ● | ○ | ● | ● | ○ | 9 | Overcurrent (0C8)<br>Overvoltage (0C9)<br>Overheat (0CA)<br>Current sensor offset adjustment error (0CB)<br>Control power supply voltage error (0CC)<br>Control power supply voltage drop (0CE)<br>Drive source error (0D4)<br>External Output Power Source Error (0DE) |
| ● | ○ | ● | ○ | ○ | 11 | Command counter overflow in Incomplete home return (0D5)<br>Deviation overflow (0D8)<br>Software stroke limit exceeded (0D9)<br>Pressing motion range over error (0DC) |
| ● | ○ | ○ | ● | ● | 12 | Electric angling mismatching (0B4)<br>Servo error (0C1)<br>Illegal control system transition command (0C5)<br>Motor power source voltage excessive (0D2)<br>Overload (0E0) |
| ● | ○ | ○ | ● | ○ | 13 | Encoder send error (0E4)<br>Encoder receipt error (0E5)<br>Encoder Counter Error (0E6)<br>A-, B- and Z-phase wire breaking (0E7)<br>A and B-phase wire breaking (0E8)<br>Battery-less ABS error (0EB)<br>PS-phase wire breaking (0EC)<br>Absolute encoder error detection 1 (0ED)<br>Absolute encoder error detection 2 (0EE)<br>Absolute encoder error detection 3 (0EF)<br>Driver logic error (0F0) |
| ● | ○ | ○ | ○ | ● | 14 | CPU error (0FA)<br>Logic error (0FC) |
| ● | ○ | ○ | ○ | ○ | 15 | Nonvolatile memory write verify error (0F5)<br>Nonvolatile memory write timeout (0F6)<br>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.

## 9.4.3   Alarm Codes for Driver Board

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

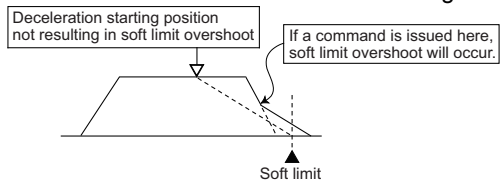| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment | |
|---|---|---|---|---|
| 047 | Message | Deviation Overflow Warning | Cause | : The current operational condition or the sliding resistance of the actuator is large, and there is a concern of the deviation overflow being occurred. |
| | | | Treatment | : Reduce the acceleration setting. Have a maintenance work conducted to supply grease and so on. |
| 048 | | Driver overload alarm | Cause | : The load current exceeded the value set in Parameter No.143 "Overload Level Ratio". This alarm should turn on when the overload current has risen from below exceeded the setting and the alarm will be kept on until reset is held. |
| | | | Treatment | : Lower the setting of acceleration/deceleration. Also, increase the frequency of pause. |
| 049 For RCP6S and P6PC only | | Collision alarm | Cause | : Motor current has reached the detection current set in the collision detection feature. |
| | | | Treatment | : Remove the cause of collision. If it is an unexpected detection, re-adjust the collision detection feature. [Refer to Chapter 5 Collision Detection Feature] |
| 04E | | Exceeded movement count threshold | Cause | : The total number of the operation times exceeded the value set in Parameter No.147 "Total Movement Count Threshold". |
| 04F | | Exceeded operated distance threshold | Cause | : The total number of the operation distance exceeded the value set in Parameter No.148 "Total Operated Distance Threshold". |
| 05C | | Receiving timeout | Cause | : Valid data was not detected even after 5 seconds has passed since the start (header) of Modbus communication was detected. |
| 05E | | Delimiter error packet receive | Cause | : Valid data cannot be detected with Modbus communication, or abnormal data was received. |
| 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 | | Absolute position move command when home return is not yet completed | 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. |

* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 090 | Operation release | Software reset command in servo-ON condition | Cause : A software reset command was issued when the servo was ON.<br>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.<br>Treatment : Select the position number from 63 or smaller. |
| 092 | | PWRT signal detection during movement | Cause : The current position write signal PWRT was input while the actuator was jogging.<br>Treatment : Check that JOG+/- signal is not on and stopped (MOVE output signal is off) before inputting. |
| 093 | | PWRT signal detection in incomplete home return | Cause : The current position write signal PWRT was input when home return was not yet completed.<br>Treatment : Input the HOME signal first to perform home return, and then input the PWRT signal after confirming that the home return has completed (HEND output signal is ON). |
| 0A1 | Cold start | Parameter data error | Cause : The data input range in the parameter area is not appropriate.<br>Example 1) This error occurs when the magnitude relationship is apparently inappropriate such as when 300mm was incorrectly input as the value of the soft limit negative side while the value of the soft limit positive side was 200.3mm.<br>Example 2) In rotary axis, when the index mode is changed to the normal mode and the soft limit negative side is 0, this error is issued. Set the soft limit negative side to a value -0.3mm is added to the outer side of the effective stroke. [Refer to 8.2 [2] Soft limit positive side, Soft limit negative side]<br>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.<br>2) The value of the target value in the "Position" field exceeded the Parameter No.3 and 4 "Soft limit set value".<br>3) Pressing operation was specified while the vibration suppress control function remained effective.<br>Treatment : 1) Set the target position.<br>2) Change the target position value to the one within the soft limit set value.<br>3) The vibration suppress control function and pressing operation cannot be used concurrently. Provide setting so that either of the functions is effective. |

* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0A3 | Operation release | Position command data error | Cause : 1) The command value during direct numeric specification exceeded the maximum set value.<br>2) Pressing operation was specified in the field bus specification while the vibration suppress function remained effective.<br>Treatment : 1) Exceeded command item code is displayed in the detailed address. Input an appropriate value by referring to these values.<br><br>

| Detailed Address (Command Item Code) | Command Item |
|---|---|
| 0 | Target Position |
| 2 | Command Speed |
| 4 | Acceleration |
| 6 | Deceleration |
| 8 | Positioning Width |
| C | Pressing Current Limit Value |
| D | Control Signal |

<br>2) The vibration suppress control function and pressing operation cannot be used concurrently. Provide setting so that either of the functions is effective. |
| 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.<br><br>Deceleration starting position not resulting in soft limit overshoot — If a command is issued here, soft limit overshoot will occur.<br><br>Soft limit<br><br>The cause is that the timing to make the next movement command when the speed was changed during the operation was late.<br>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 this controller is connected, and the motor or encoder cannot be classified.<br>Treatment : Contact us in case this alarm is issued with the applicable actuator or occurs again even after the power is rebooted. |
| 0B4<br><br>For P6AC Only | Operation release | Electric angling mismatching | Cause : 1) The position deviation counter is over-flown.<br>2) An error occurred in Z-axis detection. (When detail code in error list of teaching tool is $0001_H$)<br>Treatment : 1) This error occurs when an actuator cannot operate.<br>Confirm about the load conditions, that the work does not interfere with any object nearby or the brake has been released, etc.<br>If the error occurs even when the servo is ON, the cable breakage or disconnection is considered. Check the cable connection. Please contact IAI if there is no failure in the cable and connector connections.<br>2) Turn the power OFF and reboot. If the same error occurs again, please contact IAI. |

9. Troubleshooting

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0B5<br><br>For P6AC Only | | Z-Phase position error | Cause : The point where Z-phase was detected in home-return operation was out of the specified area. Encoder error<br>Treatment : Please contact IAI. |
| 0B6<br><br>For P6AC Only | Operation release | Z-phase detection timeout | Cause : This indicates the Z-phase could not be detected at the first servo-on or home-return operation after the power is turned ON in Simple Absolute type.<br>  1) Connector connection error or wire breakage on an actuator cable.<br>  2) Brake cannot be released on a controller equipped with a brake.<br>  3) Detection of the motor is not performed properly because an external force is applied.<br>  4) The slide resistance of the actuator itself is large.<br>Treatment : 1) Check for the actuator cable wiring condition.<br>  2) Check the wiring condition of the brake cable, and also turn on/off the brake release switch to see if the brake makes a "clicking" sound. If the brake is not making any noise, check if the power is supplied to the brake properly.<br>  3) Check if there is any abnormality in the parts assembly condition.<br>  4) It the transportation weight is in the acceptable range, cut off the power to check the slide resistance manually by moving with hand.<br>If the actuator itself is suspected to be the cause, please contact IAI. |
| 0B7<br><br>For P6AC Only | Cold start | Magnetic pole undefined | Cause : It shows the magnetic pole phase could not be detected after a certain time being passed even though the process for the magnetic pole phase detection was executed at the first servo-on after the power is turned ON.<br>  1) Connector connection error or wire breakage on an actuator cable.<br>  2) Brake cannot be released on a controller equipped with a brake.<br>  3) Detection of the motor is not performed properly because an external force is applied.<br>  4) The slide resistance of the actuator itself is large.<br>Treatment : 1) Check for the actuator cable wiring condition.<br>  2) Check the wiring condition of the brake cable, and also turn on/off the brake release switch to see if the brake makes a "clicking" sound. If the brake is not making any noise, check if the power is supplied to the brake properly.<br>  3) Check if there is any abnormality in the parts assembly condition.<br>  4) It the transportation weight is in the acceptable range, cut off the power to check the slide resistance manually by moving with hand.<br>If the actuator itself is suspected to be the cause, please contact IAI. |

9. Troubleshooting

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment | |
|---|---|---|---|---|
| 0B8<br><br>For RCP6S and P6PC only | Cold start | Excitement detection error | Cause | : In this controller, 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 (set to Parameter No.29) being passed.<br>1) Connection error or wire breakage of motor/encoder cables.<br>2) Brake is not released (when equipped with a brake).<br>3) Load to the motor is high due to external force.<br>4) Power was turned on while touching to the mechanical end.<br>5) The resistance in the actuator sliding operation is large.<br>6) Parameter No.22 Home Return Offset was set smaller than the initial value. |
| | | | Treatment : | 1) Check for the motor/encoder cable wiring condition.<br>2) Supply 24V DC 150mA to the BKRLS terminal on the power supply connector and if you can see an improvement, it is considered the controller failure. Please contact IAI.<br>3) Confirm that there is no error in the mechanical part assembly condition.<br>4) Move the slider or the rod to a point where it would not hit the mechanical end and reboot the system.<br>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.<br>6) If the Parameter No.22 Home Return Offset is set smaller than the initial setting, the actuator interferes with the mechanical end and excitation detection cannot be performed properly. |
| 0BA | Operation release | Home sensor non-detection | Cause | : This indicates that the home-return operation of the actuator equipped with origin sensor (option for those except for rotary actuator) is not completed in normal condition.<br>1) The work piece has interfered with the peripherals during the home-return operation.<br>2) The resistance in the actuator sliding operation is large.<br>3) Attachment error, malfunction or wire breakage of origin sensor. |
| | | | Treatment : | If there is no interference of the work piece confirmed with the peripherals, 2) or 3) can be considered as a cause. Please contact IAI. |
| 0BE | | Home return timeout | Cause | : Home return does not complete after elapse of a certain period after the start of home return. |

Detailed Code table (within 0BE Cause):

| Detailed Code | Applicable Action |
|---|---|
| 01 | Home Return Action Timeout |
| 02 | LS Evacuating Action Timeout |

Treatment : This error does not occur in normal operation. The combination of the controller and actuator may be incorrect. Please contact IAI.

9. Troubleshooting

* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment | |
|---|---|---|---|---|
| 0C0 | Operation release | Actual speed excessive | Cause | : This indicates the number of motor rotation exceeded the number of allowable rotation.<br>1) The slide resistance of the actuator is locally high.<br>2) The load is increased too much due to a external force.<br>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. |
| 0C1<br><br>For RCP6S and P6PC only | | Servo error | Cause | : It indicates 2 seconds has passed without making a move since a move command was received.<br>1) Connection error or wire breakage of motor/encoder cables.<br>2) Brake is not released (when equipped with a brake).<br>3) Load to the motor is high due to external force.<br>4) The resistance in the actuator sliding operation is large. |
| | | | Treatment | : 1) Check for the motor/encoder cable wiring condition.<br>2) Supply 24V DC 150mA to the BKRLS terminal on the power supply connector and if you can see an improvement, it is considered the controller failure. Please contact IAI.<br>3) Confirm that there is no error in the mechanical part assembly condition.<br>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. |
| 0C5<br><br>For P6AC and P6DC only | | Illegal transition command in control system | Cause | : 1) Change the operation from the vibration suppress control operation to the normal position control operation.<br>2) Change the operation from the normal position control operation to the vibration suppress control operation. |
| | | | Treatment | : Change the sequence so the next action is conducted after confirming the positioning complete signal (PEND) is turned ON for both cases 1) and 2). |
| 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. It can be considered as the insulation degradation of the motor winding or malfunction of the controller. Please contact IAI. |
| 0C9<br><br>For RCP6S and P6PC only | | Overvoltage | Cause | : The voltage on the power regenerative circuit exceeded the threshold. |
| | | | Treatment | : Malfunction of the controller can be concerned. Please contact IAI. |

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0CA | | Overheat | Cause : This indicates overheat (90°C or more) of the components inside the controller. <br> 1) Operation is performed with the load condition exceeding the specified range. <br> 2) High temperature around the controller. <br> 3) Load to the motor is high due to external force. <br> 4) A faulty part inside the controller. <br> Treatment : 1) Revise the operation condition such as decreasing the acceleration/deceleration speed. <br> 2) Lower the ambient temperature of the controller. <br> 3) Confirm that there is no error in the mechanical part assembly condition. <br> *(Note) This error would not normally occur. If it occurs, confirm there is not 1) to 3) above. If the same error is issued again even after confirming 1) to 3) is not in the condition, it is considered to be a malfunction. Please contact IAI.* |
| 0CB | Cold start | Current sensor offset adjustment error | Cause : An error was found to the sensor in the status check of the current detection sensor conducted at the initializing process in the startup. <br> 1) A breakdown of the current detection sensor or peripheral component is supposed. <br> 2) An error in the offset adjustment is supposed. <br> 3) The actuator has moved by an external force at the time the power was turned on. <br> Treatment : In case the same error occurs even after rebooting the power in a condition that the actuator does not move, it is necessary to replace the PC board or adjust the offset. <br> Please contact IAI. |
| 0CC | | Control power source voltage error | Cause : The control power voltage dropped less than the voltage drop threshold (120% of 24V DC = 28.8V). <br> 1) The voltage of 24V DC power supply is high. <br> 2) A faulty part inside the controller. <br> 3) During acceleration/deceleration and servo-on that use the remote sensing function of 24V DC power supply, the current consumption rises transiently. <br> Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change. <br> Treatment : 1) 2) Check the voltage of the power supply. <br> 3) Think to use a power supply with enough current capacity or not to use the remote sensing function. <br> 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). <br> 1) The voltage of 24V DC power supply is low. <br> 2) A faulty part inside the controller. <br> Treatment : Check the voltage of the power supply. <br> In the case that the voltage is normal, please contact IAI. |
| 0D2 <br><br> For P6AC and P6DC only | | Motor power source voltage excessive | Cause : A malfunction of a component inside the controller can be considered. <br> Treatment : If this error occurs often, there is a concern of a controller malfunction. Please contact IAI. |

9. Troubleshooting

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0D4 | | Drive Source error | Cause : Overcurrent is generated on the motor power supply line.<br>Treatment : Check the wire layout between the actuator and controller. |
| 0D5<br>For RCP6S and P6PC only | Cold start | Differential Counter Overflow with Home Return Incomplete | Cause : This alarm indicates that the position deviation counter has overflowed.<br>1) The speed dropped or stopped during JOG move due to an impact of external force, hit to the mechanical end or overload.<br>2) The excited-phase detection operation following the power-on is unstable.<br>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.<br>2) Overload is concerned. Revise the transportable weight. |
| 0D8 | Operation release | Deviation overflow | Cause : This alarm indicates that the position deviation counter has overflowed.<br>1) The speed dropped or the actuator stopped due to the effect of external force or overload.<br>2) The excited-phase detection operation following the power-on is unstable.<br>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.<br>2) Overload can be concerned. Revise the transportable weight and redo the home-return operation. |
| 0D9 | | Software stroke limit exceeded | Cause : The current position of the actuator exceeds the software stroke limit.<br>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).<br>2) The actuator touched the work during the approach movement before the pressing movement.<br>Treatment : 1) Revise the setting and adjust it so the force to push back gets smaller.<br>2) Set the "Position" setting in front in the position table to shorten the approach distance. |
| 0DE<br>For P6AC and P6DC only | Cold start | External output power source error | Cause : Error in external power supply to brake-release, LS and so on.<br>Treatment : Reboot the power. Please contact us if the problem is not solved with this action. |
| 0DF<br>For RCP6S and P6PC only | Operation release | Collision detection | Cause : Collision of actuator was detected.<br>Treatment : Remove the cause of collision.<br>If it is an unexpected detection, re-adjust the collision detection feature.<br>[Refer to Chapter 5 Collision Detection Feature] |

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0E0 | Cold start | Overload | Cause : 1) The work piece weight exceeds the rating, or load has increased due to external force.<br>2) Brake is not released in case of actuator (equipped with brake).<br>3) The slide resistance of the actuator is locally high.<br>Treatment : 1) Revise the work piece and peripherals, and remove the cause.<br>2) Turn on the brake release switch to confirm the brake gets released. In case that the brake does not get released, it can be considered a malfunction of the brake itself, breakage of the cable or malfunction of the controller. Please contact IAI.<br>3) If the work piece is in a condition that it can be moved manually with hand, try to move it to check if there is any spot that the sliding resistance is large. Check if there is any deformation on the attachment surface. Please contact IAI if this occurs with the actuator itself.<br><br>⚠ *Caution:*<br>*Make sure to remove the cause before resuming the operation. In case that confirmation cannot be made that the cause is completely removed, leave the unit for 30 minutes or more before rebooting the power to avoid motor coil burnout.* |
| 0E4<br><br>For P6PC and P6AC only | | Encoder send error | Cause : The data sending and receiving between the controller and encoder is conducted by the serial communication. This error indicates that the data sent from the controller was not received properly at the encoder side.<br>1) Encoder cable is about to break or connector is not plugged properly<br>2) Effect of noise<br>3) One or more communication ICs installed on the encoder board are faulty.<br>4) One or more communication ICs installed on the controller board are faulty.<br>Treatment : 1) Check on the cables and the connector joints to see if any abnormality.<br>2) Interrupt the power to the peripheral equipment and activate only the actuator. If any error does not occur, it might be caused by noise. Take proper measures against noise.<br>If 3) or 4) is the case, the encoder or controller must be replaced. If the cause cannot be specified, please contact IAI. |

9. Troubleshooting

\* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0E5<br><br>For P6PC and P6AC only | Cold start | Encoder receipt error | Cause : This shows the data was not received in normal condition from the encoder side to the controller<br>1) Cable breakage of encoder cable or connector connection failure<br>(If the detail code in the error list of the teaching tool is $0002_H$.)<br>2) Effect of noise<br>(If the detail code in the error list of the teaching tool is $0001_H$.)<br>3) Malfunction of component (communication part) inside the actuator<br>4) A faulty part inside the controller (communication part).<br>5) Initialization of battery-less absolute encoder is incomplete (Detail Code $0003_H$)<br>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections.<br>2) Interrupt the power to the peripheral equipment and activate only the actuator. If any error does not occur, it might be caused by noise. Take proper measures against noise.<br>If the cause is due to 3), 4) or 5), it is necessary to replace the actuator (motor part) or controller.<br>If the cause cannot be specified, please contact IAI. |
| 0E6<br><br>For P6PC and P6AC only | | Encoder count error | Cause : Error status was received in initial communication with battery-less absolute encoder<br>Treatment : Reboot the power and conduct an absolute reset (home-return operation).<br>Contact IAI in case the condition would not recover. |
| 0E7<br><br>For P6AC only | | A-, B- and Z-phase wire breaking | Cause : Encoder signals cannot be detected correctly.<br>1) Wire breakage or connector connection error on an actuator cable or cable enclosed in an actuator.<br>2) Malfunction of encoder itself.<br>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections.<br>If the cables are in the normal condition, the malfunction of the encoder can be considered. Please contact IAI. |
| 0E8 | | A- and B-phase wire breaking | Cause : Encoder signals cannot be detected correctly.<br>1) The actuator cable is disconnected or its connector is not plugged in correctly.<br>2) The encoder itself is faulty.<br>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections.<br>If the cables are normal, faulty encoder is suspected. Please contact IAI. |
| 0EB<br><br>For P6PC and P6AC only | | Battery-less ABS error | Cause : It is a condition that the battery-less absolute encoder has not detected the position information properly.<br>Treatment : Check if there is any breakage on the connectors and the condition of connections.<br>Malfunction of the encoder can be considered if the cables are in the normal condition. Please contact IAI. |

# RCP6S *Fieldbus Communication*

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0EC<br><br>For P6DC only | Cold start | PS-phase wire breaking | Cause : Encoder signals cannot be detected correctly.<br>　1) Wire breakage or connector connection error on an actuator cable or cable enclosed in an actuator.<br>　2) Malfunction of encoder itself.<br>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections.<br>If the cables are in the normal condition, the malfunction of the encoder can be considered. Please contact IAI. |
| 0ED<br><br>For P6PC and P6AC only | Operation release | Absolute encoder error detection 1 | Cause : The current position has changed while the controller is reading or saving the absolute data.<br>Treatment : Avoid a condition that gives vibration to the actuator. |
| 0EE<br><br>For P6PC and P6AC only | Operation release | Absolute encoder error detection 2 | Cause : The position data cannot be detected properly in the encoder.<br>　1) Changed the parameters of controller<br>　2) Position data loss in absolute reset<br>　　(If the detail code in the error list of the teaching tool is $0006_H$ or $0022_H$.)<br>　3) Motor has replaced in battery-less absolute type, and the pairing ID registered in the controller has changed. (When the detail code is 000BH or $0020_H$ in the error list on the teaching tool)<br>Treatment : Conduct an absolute reset.<br>[Refer to Chapter 7 Absolute Reset] |
| 0EF<br><br>For P6PC and P6AC only | | Absolute encoder error detection 3 | Cause : The encoder for the Simple absolute type cannot detect the position information properly. (Encoder over speed error)<br>The current position changed with a speed more than the rotation speed setting by an external cause during the power shutoff.<br>Treatment : Set the rotation speed to a higher speed than what currently is. If the same failure occurs again, it is necessary to have an absolute reset.<br>[Refer to Chapter 7. Absolute Reset] |
| 0F0<br><br>For P6AC and P6DC only | Cold start | Driver logic error | Cause : Exceeded load, parameter (motor type) mismatched, noise, malfunction of controller, etc.<br>Treatment : Please contact IAI. |
| 0F4<br><br>For P6PC and P6AC only | | Mismatched PCB | The PCB is not applicable for the connected motor in the startup check.<br>Cause : The parameter may not match. Check the model.<br>Treatment : Should this error occur, please contact IAI. |
| 0F5 | Operation release | Nonvolatile memory write verify error | Cause : 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. (Faulty nonvolatile memory.)<br>Treatment : When the error is caused even when the power is re-input, please contact IAI. |

9. Troubleshooting

* In the alarm code list, description of P6PC shows RCM-P6PC, P6AC shows RCM-P6AC and P6DC shows RCM-P6DC.

| Alarm Code | Alarm Level | Alarm Name | Cause/Treatment |
|---|---|---|---|
| 0F6 | Cold start | Nonvolatile memory write timeout | Cause : There is no response in the specified time duration during the data writing to the non-volatile memory. (Faulty nonvolatile memory.) <br> Treatment : When the error is caused even when the power is re-input, please contact IAI. |
| 0F8 | | Nonvolatile memory data destroyed | Cause : Abnormal data was detected during the nonvolatile memory check after starting. (Faulty nonvolatile memory.) <br> 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. <br> Cause : 1) Faulty CPU. <br> 2) Malfunction due to noise. <br> Treatment : When the error is caused even when the power is re-input, please contact IAI. |
| 0FC | | Logic error (Faulty component) | The controller is not operating properly. <br> Cause : 1) Malfunction due to the effect of noise, etc. <br> 2) Malfunction of peripheral circuit components. <br> Treatment : Turn the power OFF and reboot. <br> If the error occurs again, check for presence of noise. <br> If a spare controller is available, replace the problem controller with the spare controller. A recurring error with the spare controller suggests presence of noise. <br> 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.] |
| 800 to 8FF | - | Alarm on Gateway | [Refer to 9.3.1 Gateway Alarm Codes.] |

# Chapter 10  Appendix

## 10.1  Conformity to Safety Category

In this chapter, shows an example for a circuit using the dedicated teaching pendant. However, it is not possible for us to confirm the conformity of it in the environment of your use.

Therefore, it is necessary that you construct your own circuit layout considering the environment of your use and the category to be applied.

### [1]  System Configuration

When it is required to construct a system applicable for the Safety Category (ISO12100-1/ISO13849-1), use RCP6S Gateway Unit (Model Code: RCM-P6GWG) and TP Adapter (Model Code: RCB-LB-TGS) that are applicable for the Safety Category.
The system can conform to up to safety category B to 4 (ISO12100-1/ISO13849-1) by changing connections of system I/O connectors.
Also, to be complied with the Safety Categories from B to 3, it is recommended to use a teaching pendant equipped with a dead man's switch (Model Code: TB-02D or TB-01D/DR).
For the Safety Category 4, detach the teaching pendant and connect the dummy plug (Model Code: DP-4S) instead.
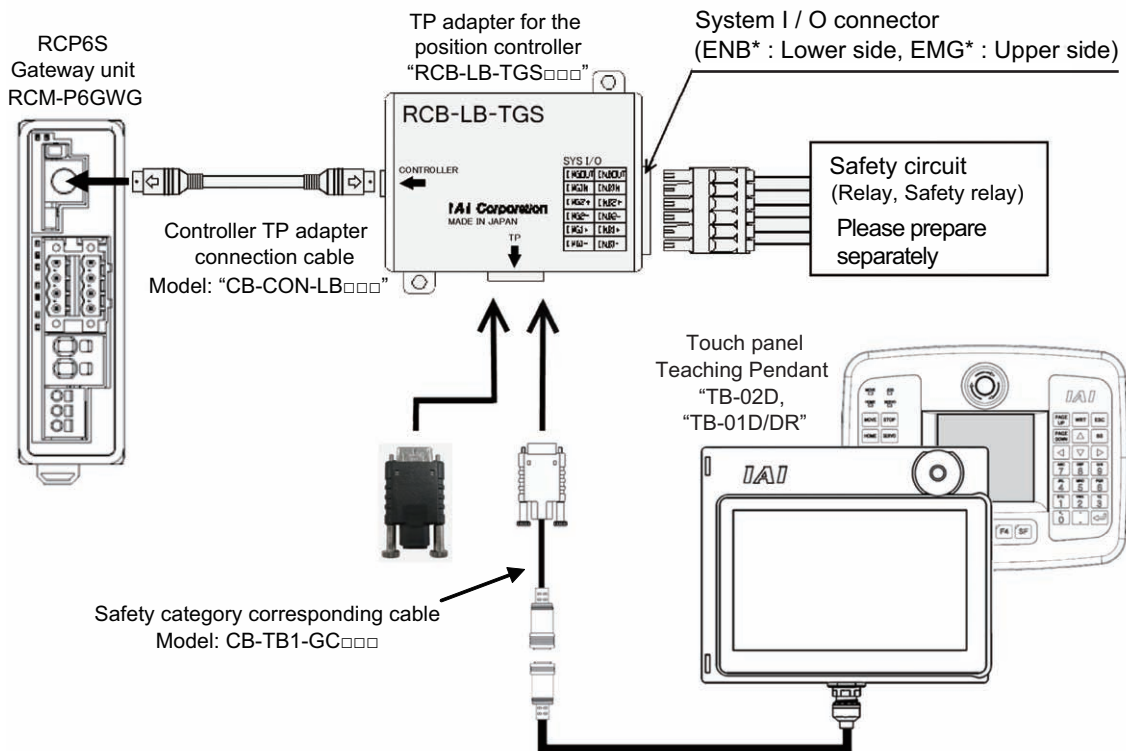
[2]  Wiring and Setting of Safety Circuit

(1)  Power supply
To use safety relays and/or contactors of 24V DC specification in the safety circuit, the control power supply should be used only for the circuit as much as possible. (Do not attempt to use the same power source as the driving power on this controller.) For example, to supply power to the safety circuit, do not use the power supply driving our robo-cylinder controller ACON or PCON.
It is the risk prevention treatment preparing for the cases such as the operation error of the safety circuit caused by not enough power capacity.

(2)  Specification of system I/O connector for TP adapter

| Connector Name | | System I/O Connector | | Applicable Wire |
|---|---|---|---|---|
| Upper side (EMG side) | Cable side | FMC1.5/6-ST-3.5[(Note 1)] | Phoenix Contact | AWG24 to 16 (0.2 to 1.25m$^2$) |
| | TP adapter side | MCDN1.5/6-G1-3.5P26THR | | |
| Lower side (ENB side) | Cable side | FMC1.5/6-ST-3.5[(Note 1)] | | |
| | TP adapter side | MCDN1.5/6-G1-3.5P26THR | | |

| | Pin No. | Signal name | Description |
|---|---|---|---|
| Upper side (EMG side) | 1 | EMG1- | Emergency stop contact 1 (30V DC or less, 100mA or less) |
| | 2 | EMG1+ | |
| | 3 | EMG2- | Emergency stop contact 2 (30V DC or less, 100mA or less) |
| | 4 | EMG2+ | |
| | 5 | EMGIN | Emergency stop detection input |
| | 6 | EMGOUT | 24V power supply output for emergency stop detection input |
| Lower side (ENB side) | 7 | ENB1- | Enable contact 1 (30V DC or less, 100mA or less) |
| | 8 | ENB1+ | |
| | 9 | ENB2- | Enable contact 2 (30V DC or less, 100mA or less) |
| | 10 | ENB2+ | |
| | 11 | ENBIN | Enable detection input |
| | 12 | ENBOUT | 24V power supply output for enable detection input |

*Note 1  Connectors on the cable side are attached under conditions where initial wiring has been conducted.*
*In order to support each category, remove the initial wiring and wire your safety circuit.*

# *RCP6S* *Fieldbus Communication*

● Upper side (EMG) connector



| | | | |
|---|---|---|---|
| EMG1- | | | 1 |
| EMG1+ | | | |
| EMG2- | | | |
| EMG2+ | | | |
| EMGIN | | | |
| EMGOUT | | | 6 |
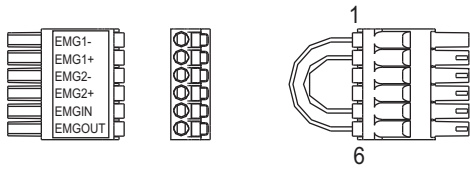
● Lower side (ENB) connector
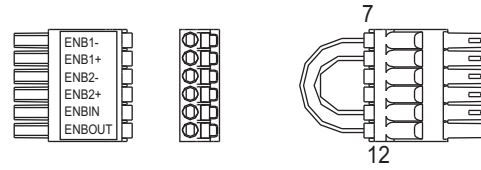


| | | | |
|---|---|---|---|
| ENB1- | | | 7 |
| ENB1+ | | | |
| ENB2- | | | |
| ENB2+ | | | |
| ENBIN | | | |
| ENBOUT | | | 12 |

| Wiring | Color | Signal | No. |
|---|---|---|---|
| AWG24 | YW | EMG1- | 1 |
| | YW | EMG1+ | 2 |
| | — | EMG2- | 3 |
| | — | EMG2+ | 4 |
| | YW | EMGIN | 5 |
| | YW | EMGOUT | 6 |

| Wiring | Color | Signal | No. |
|---|---|---|---|
| AWG24 | YW | ENB1- | 7 |
| | YW | ENB1+ | 8 |
| | — | ENB2- | 9 |
| | — | ENB2+ | 10 |
| | YW | ENBIN | 11 |
| | YW | ENBOUT | 12 |



Upper side        Lower side

TP Adapter Side View
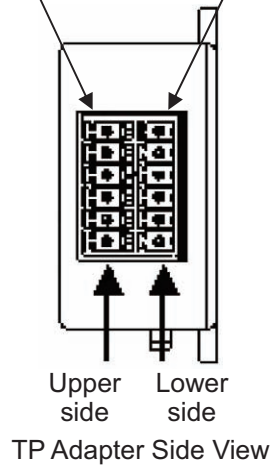
(3)  Connection of dummy plug of TP adapter
When operating the controller with AUTO Mode, make sure to connect the enclosed dummy plug (DP-4S) to TP Connector.

[3]  Examples of safety circuits
  1) In case of category 1

TB-02D or TB-01D/TB-01DR
(or Dummy plug : DP-4S)

Connection Cable CB-CON-LB□□□

RCP6S
Gateway
Unit

RCM-P6GWG

RCB-LB-TGS

CB-TB1-GC□□□

| ENBOUT | ENBIN | ENB2+ | ENB2- | ENB1+ | ENB1- | EMGOUT | EMGIN | EMG2+ | EMG2- | EMG1+ | EMG1- |

| 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

24V

Enable SW

24V

SW
Reset

SW
Emergency
Stop

0V

0V

System I/O
Connector

24V

S1

S2

EMG-

24V

Solenoid Contactor

Power
Supply
Connector

MP+24V → Motor
Power
0V    Supply
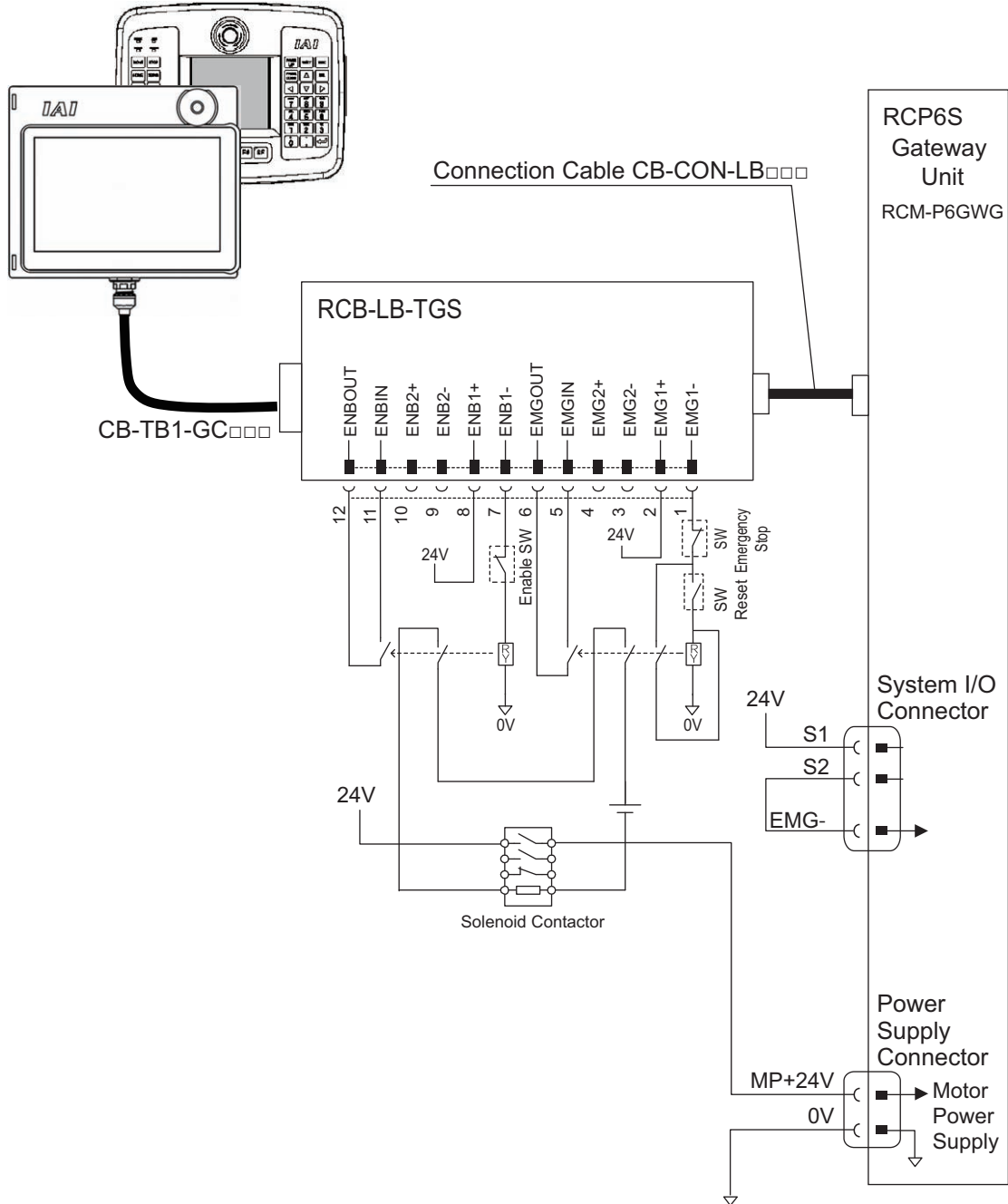
# RCP6S *Fieldbus Communication*

● Detailed category 1 circuit example
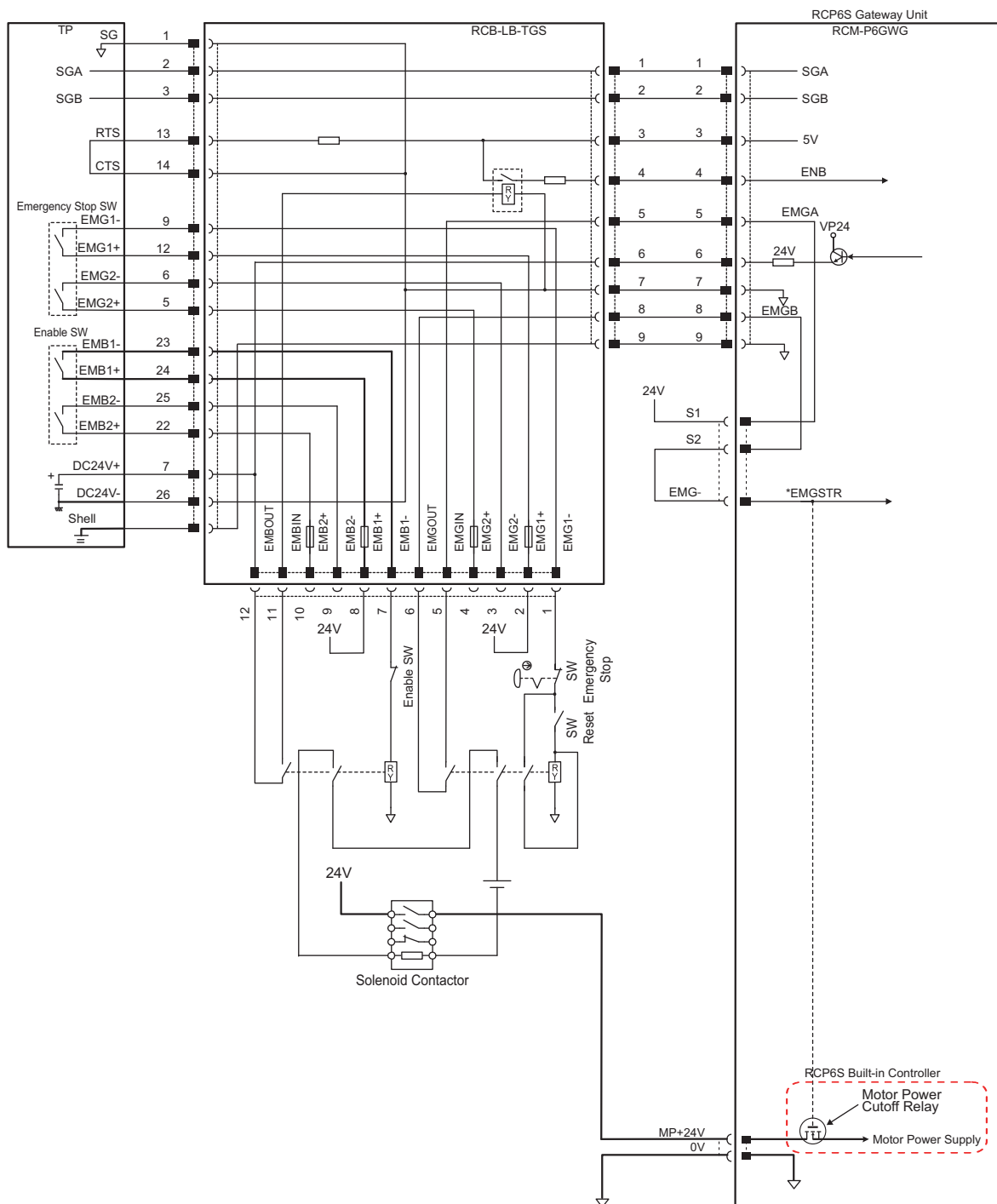
# RCP6S *Fieldbus Communication*

2) In case of category 2

TB-02D or TB-01D/TB-01DR
(or Dummy plug : DP-4S)

Connection Cable CB-CON-LB□□□

RCP6S
Gateway
Unit

RCM-P6GWG

RCB-LB-TGS

CB-TB1-GC□□□

| 12.ENBOUT | 11.ENBIN | 10.ENB2+ | 9.ENB2- | 8.ENB1+ | 7.ENB1- | 6.EMGOUT | 5.EMGIN | 4.EMG2+ | 3.EMG2- | 2.EMG1+ | 1.EMG1- |

Enable SW

Emergency stop SW

Reset SW

G9SA-301
(OMRON)

System I/O
Connector

24V

S1

S2

EMG-

G9SA-301
(OMRON)

24V

24V

Power
Supply
Connector

Solenoid Contactor

MP+24V
0V

Motor
Power
Supply

10. Appendix
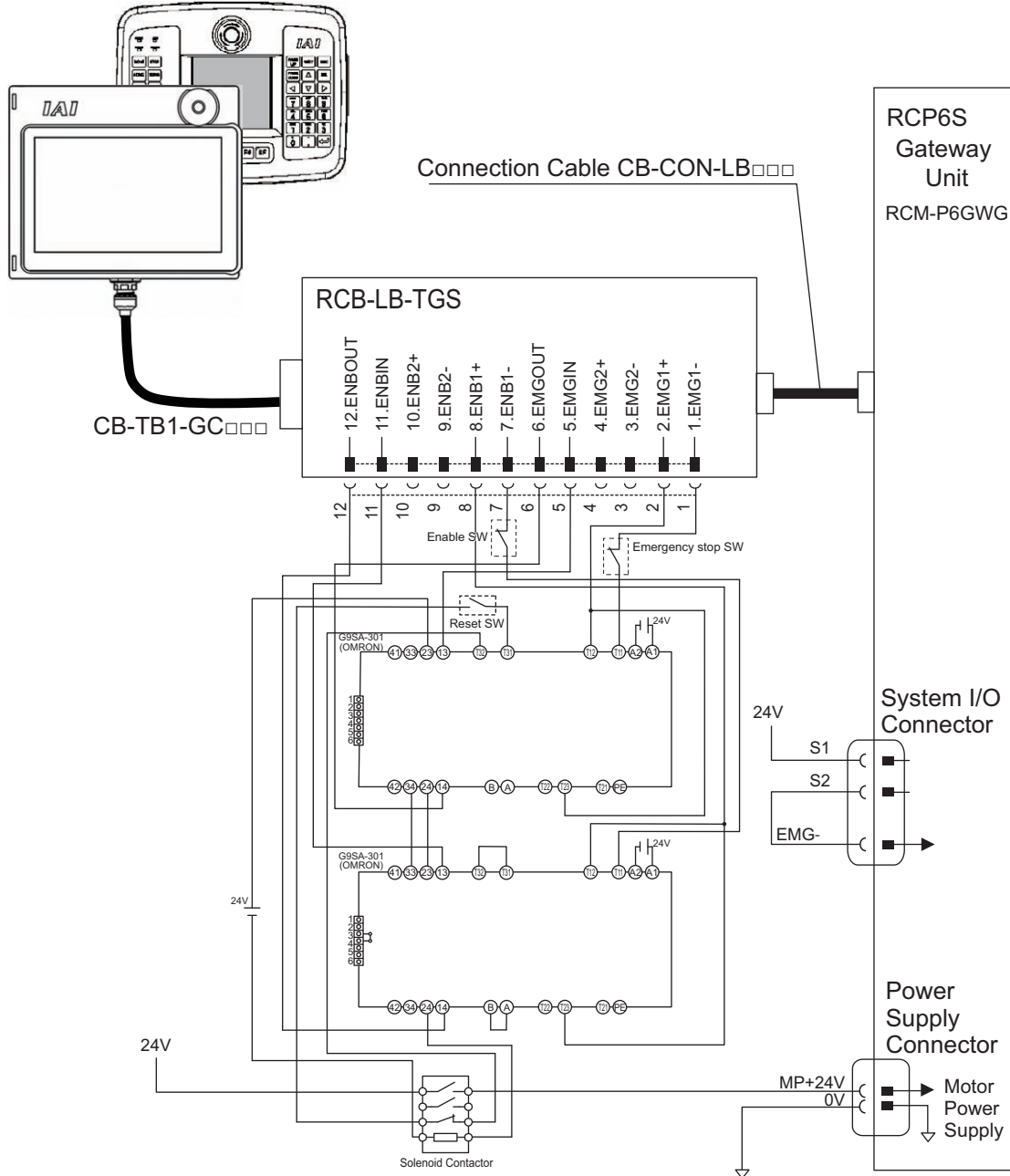
# RCP6S *Fieldbus Communication*

● Detailed category 2 circuit example
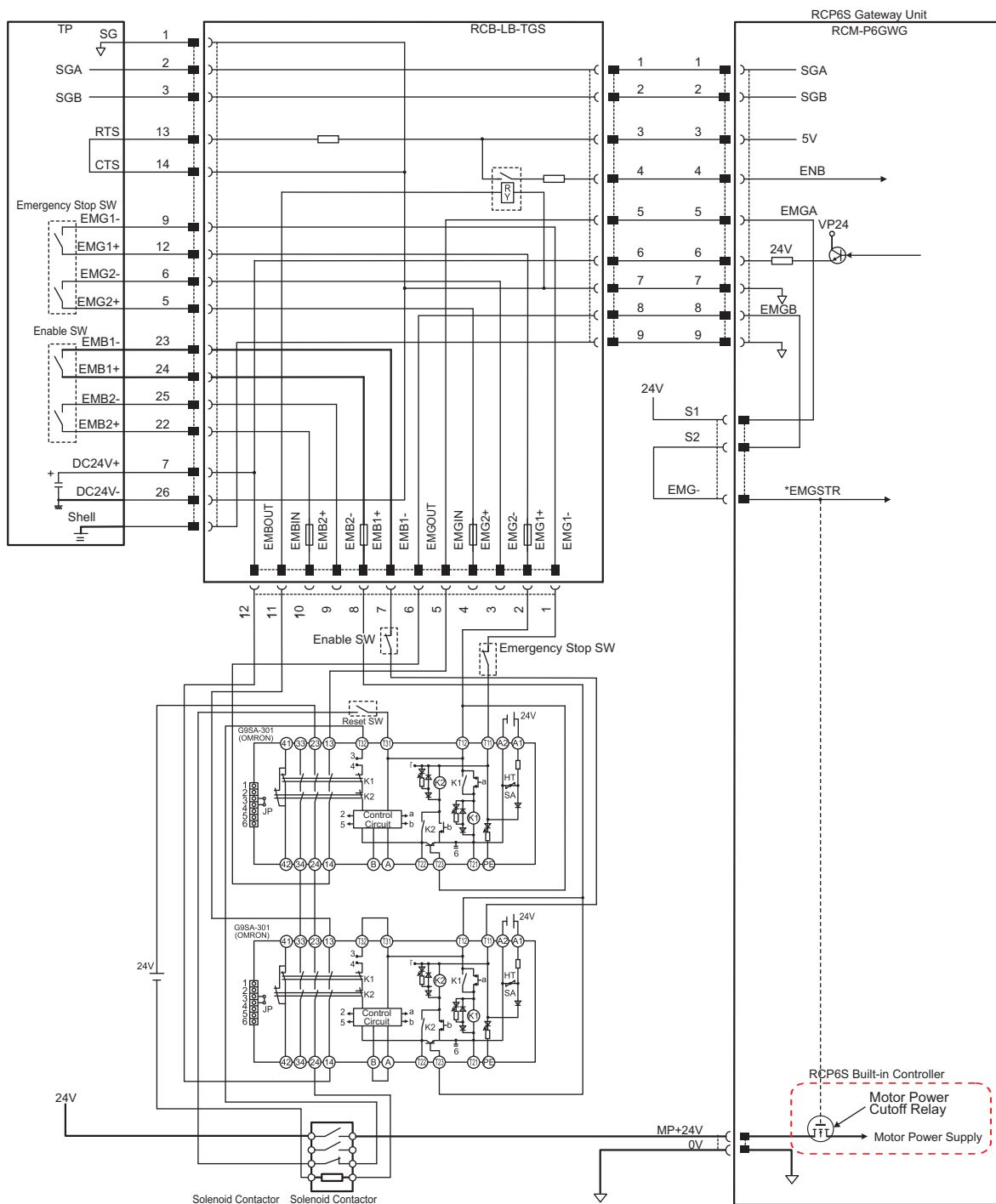
# RCP6S *Fieldbus Communication*

3) In case of category 3

TB-02D or TB-01D/TB-01DR
(or Dummy plug : DP-4S)

Connection Cable CB-CON-LB☐☐☐

RCP6S
Gateway
Unit

RCM-P6GWG

RCB-LB-TGS

CB-TB1-GC☐☐☐

| ENBOUT | ENBIN | ENB2+ | ENB2- | ENB1+ | ENB1- | EMGOUT | EMGIN | EMG2+ | EMG2- | EMG1+ | EMG1- |
|--------|-------|-------|-------|-------|-------|--------|-------|-------|-------|-------|-------|
| 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Enable SW

Emergency Stop SW

Reset SW

24V

G9SA-301
(OMRON)

41 33 23 13    T2 T31        T4 T1 A2 A1

1
2
3
4
5
6

42 34 24 14    B A    T22 T23    T21 PE

G9SA-301
(OMRON)

41 33 23 13    T2 T31        T4 T1 A2 A1    24V

1
2
3
4
5
6

42 34 24 14    B A    T22 T23    T21 PE

24V  24V

24V

Solenoid Contactor    Solenoid Contactor

24V

S1
S2

EMG-

System I/O
Connector

Power
Supply
Connector

MP+24V
0V

Motor
Power
Supply

# RCP6S *Fieldbus Communication*

● Detailed category 3 circuit example
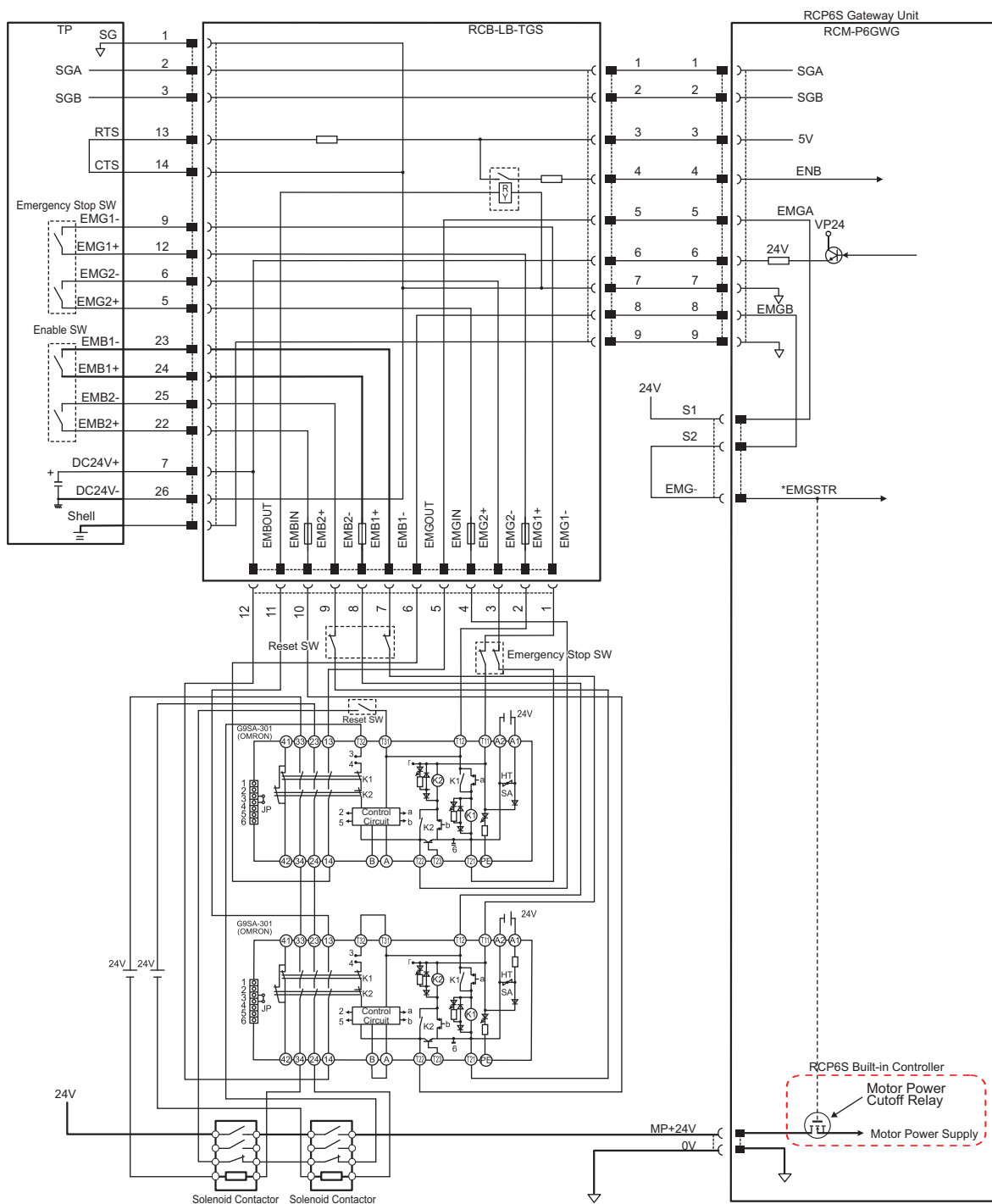
# RCP6S *Fieldbus Communication*

4) In case of category 4

Connection Cable CB-CON-LB□□□

Dummy plug : DP-4S

RCB-LB-TGS

RCP6S Gateway Unit
RCM-P6GWG

| ENBOUT | ENBIN | ENB2+ | ENB2- | ENB1+ | ENB1- | EMGOUT | EMGIN | EMG2+ | EMG2- | EMG1+ | EMG1- |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Enable SW

Emergency Stop SW

Reset SW

G9SA-301 (OMRON)

24V

G9SA-301 (OMRON)

24V

24V 24V

24V

Solenoid Contactor    Solenoid Contactor

System I/O Connector

24V

S1
S2

EMG-

Power Supply Connector

MP+24V
0V

Motor Power Supply
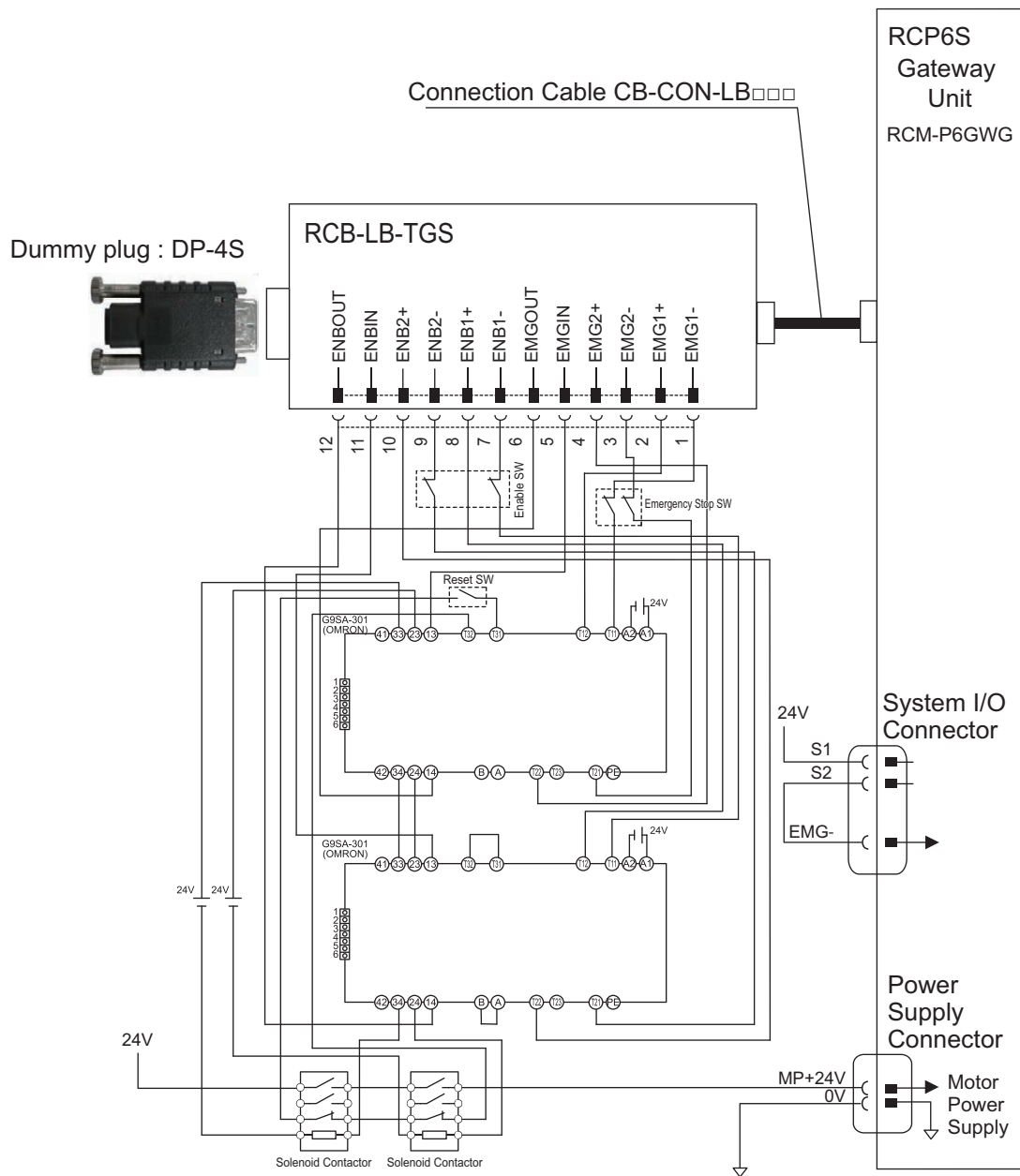
# RCP6S *Fieldbus Communication*

● Detailed category 4 circuit example
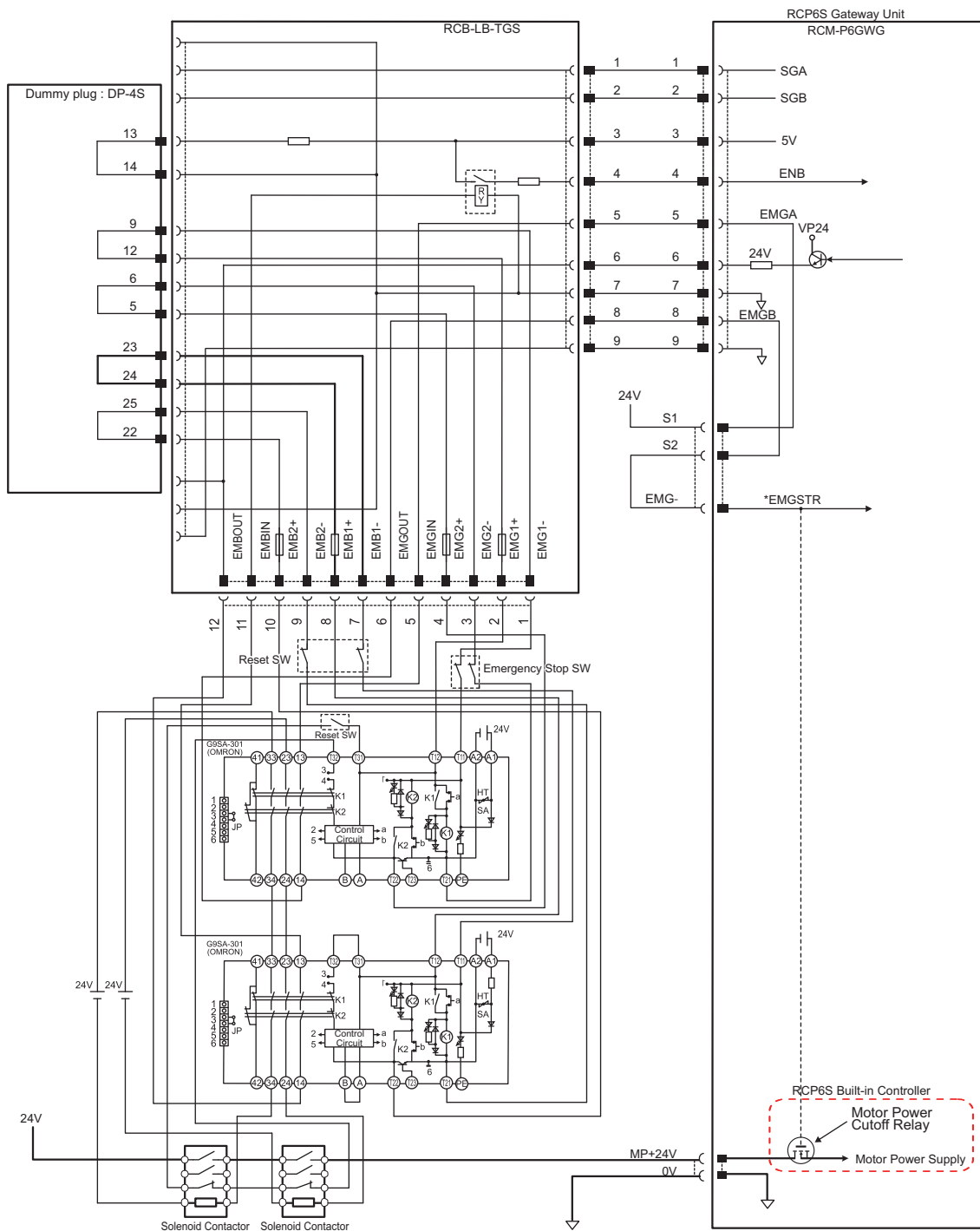
[4] TP adapter and accessories
　1) TP adapter external dimensions
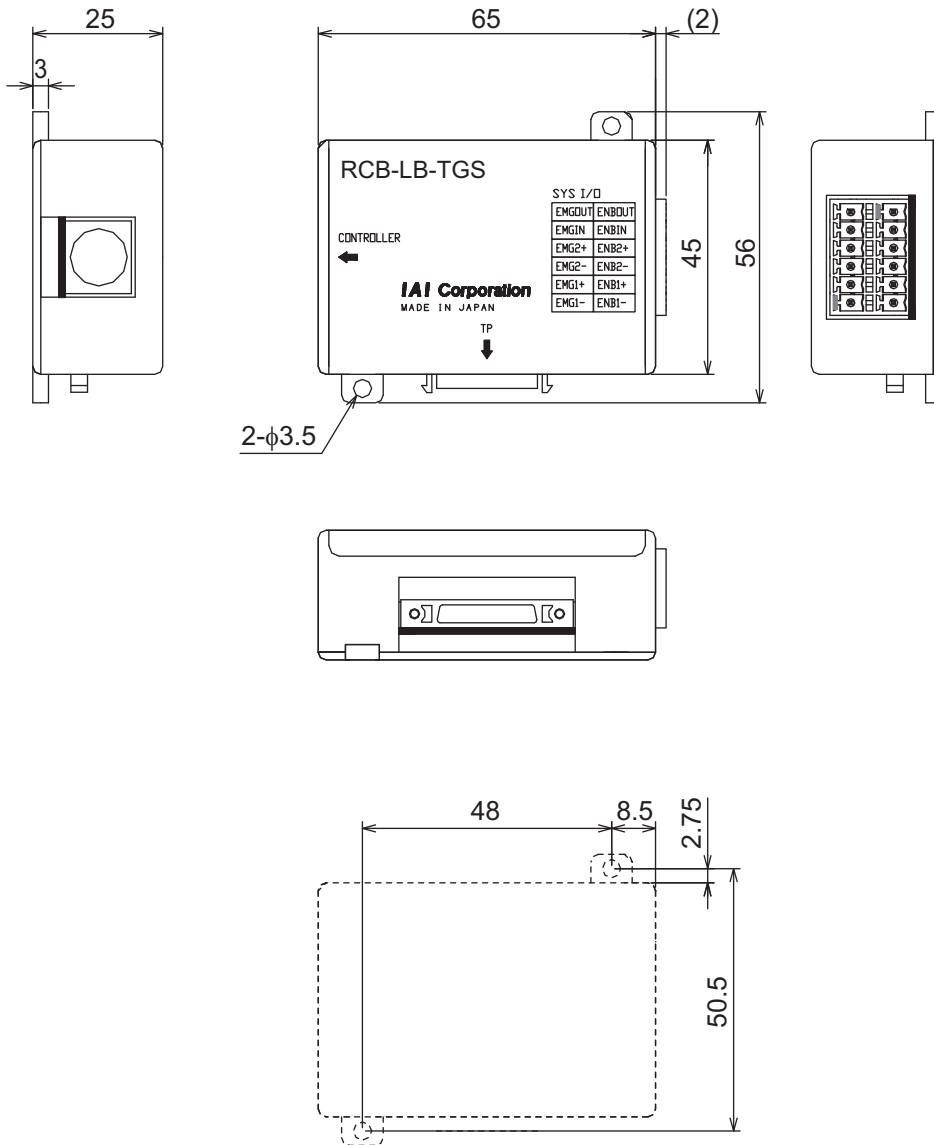
# *RCP6S* *Fieldbus Communication*

2) Connection Cable
- Gateway Unit/TP Adaptor Connection Cable
  Use this cable to connect the gateway unit and TP adapter.
  Model : CB-CON-LB005 (standard cable length : 0.5m)
  Maximum cable length : 2.0m

CN1                                                                    CN2



CB-CON-LB□□□

CN1

| Color | Signal | No. |
|-------|--------|-----|
| BR | SGA | 1 |
| YW | SGB | 2 |
| RD | 5V | 3 |
| OR | ENBL | 4 |
| BL | EMGA | 5 |
| GN | 24V | 6 |
| PL | GND | 7 |
| GY | EMGB | 8 |
| Shield | FG | |

8PIN MIN DIN Connector (overmolded)

CN2

| No. | Signal | Color |
|-----|--------|-------|
| 1 | SGA | BR |
| 2 | SGB | YW |
| 3 | 5V | RD |
| 4 | ENBL | OR |
| 5 | EMGA | BL |
| 6 | 24V | GN |
| 7 | GND | PL |
| 8 | EMGB | GY |
| | FG | Shield |

8PIN MIN DIN Connector (overmolded)
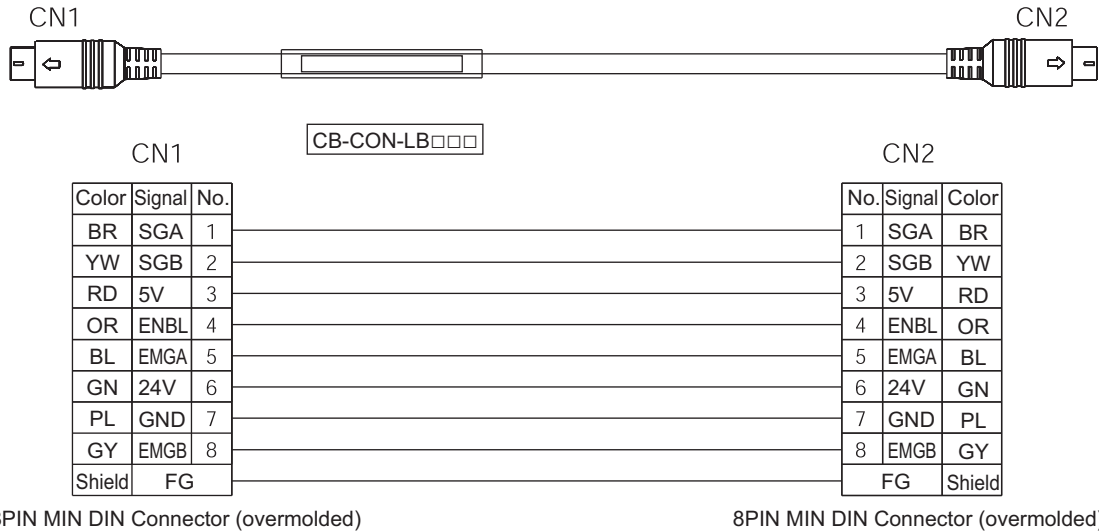
- Teaching Pendant /TP Adaptor Connection Cable
  Use this cable to connect the Teaching pendant and TP adapter.
  Model : CB-TB1-GC□□□
  Maximum cable length : 10.0m, Minimum cable length : 0.2m

Teaching side                                          TP Adaptor side



CB-TB1-GC□□□

| Cable color | | Signal name | Pin No. | | Pin No. | Signal name | Cable color | |
|---|---|---|---|---|---|---|---|---|
| | Yellow /Black 1 | SRD+ | 1 | | 2 | SRD+ | Yellow /Black 1 | AWG28 |
| | Pink/Black 1 | SRD- | 2 | | 3 | SRD- | Pink/Black 1 | |
| - | - | N.C | 3 | | 4 | N.C | - | - |
| AWG28 | Brown | ENB2+ | 4 | | 22 | ENB2+ | Brown | AWG28 |
| | Gray | T24V | 5 | | 7 | DC24V+ | Gray | |
| | Red | EMG1- | 6 | | 9 | EMG1- | Red | |
| | Black | EMG2+ | 7 | | 5 | EMG2+ | Black | |
| | Yellow | EMG2- | 8 | | 6 | ENG2- | Yellow | |
| | Pink | ENG1+ | 9 | | 24 | ENB1+ | Pink | |
| | Purple | T24G | 10 | | 26 | DC24V- | Purple | |
| | White | GND | 11 | | 1 | SG | White | |
| | Blue/Red 1 | ENB2- | 12 | | 25 | ENB2- | Blue/Red 1 | |
| | Pink /Red 1 | EMG1+ | 13 | | 12 | EMG1+ | Pink /Red 1 | |
| | Green /Red 1 | ENB1- | 14 | | 23 | ENB1- | Green /Red 1 | |
| - | - | N.C | 15 | | 8 | N.C | - | - |
| - | - | N.C | 16 | | 10 | N.C | - | - |
| - | - | N.C | 17 | | 11 | N.C | - | - |
| - | - | N.C | 18 | | 13 | RTS | UL1571 Applicable wire | AWG28 |
| - | - | N.C | 19 | | 14 | CTS | | |
| AWG28 | UL1571 Applicable wire | FG | 20 | | 15 | N.C | - | - |
| | | | | | 16 | N.C | - | - |
| | | | | | 17 | N.C | - | - |
| | | | | | 18 | N.C | - | - |
| | | | | | 19 | N.C | - | - |
| | | | | | 20 | N.C | - | - |
| | | | | | 21 | N.C | - | - |
| | | | | | | The shield is clamped to the hood | | |

Plug    : RP13A-12PH-20SC (71) (Hirose Electric Co., Ltd.) ×1
Contact : RP19-SC-222 (Hirose Electric Co., Ltd.) ×14

Plug    : HDR-E26MSG1 + (Honda Tsushin Kogyo Co., Ltd.)
Contact : HDR-E26LPH (Honda Tsushin Kogyo Co., Ltd.)

10. Appendix

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3) Dummy plug
   Connect a dummy plug to the teaching pendant connecting connector.
   Make sure to connect a dummy plug if the AUTO mode is specified.
   Without the connection, it will be the emergency stop condition.
   Model : DP-4S

| Signal | No. |
|---|---|
| GND | 1 |
| EMGS | 2 |
| VCC | 3 |
| DTR | 4 |
| EMGOUT2 | 5 |
| EMGIN2 | 6 |
| NC | 7 |
| RSVCC | 8 |
| EMGIN1 | 9 |
| NC | 10 |
| NC | 11 |
| EMGOUT1 | 12 |
| RTS | 13 |
| CTS (GND) | 14 |
| TXD | 15 |
| RXD | 16 |
| DSR | 17 |
| NC | 18 |
| NC | 19 |
| RSVTBX1 | 20 |
| RSVTBX2 | 21 |
| ENBVCC2 | 22 |
| ENBTBX1 | 23 |
| ENBVCC1 | 24 |
| ENBTBX2 | 25 |
| GND | 26 |

Short-circuit processing.

DP-4S



Plug : HDR-E26MSG1

10. Appendix

## 10.2  When Connecting Power with Plus Grounding

There is a risk that 24V DC may get short-circuited if a PC is connected when used with plus grounding. It is because many types of PC have communication ground (GND) and frame ground (FG) connected inside, and short-circuit occurs through the frame ground (FG). Also, when the connection is established with the serial communication between controllers using different 24V DC power, the communication line may get damaged as the communication line gets connected through the controller power line depending on the timing to turn the power on.

Troubleshooting and countermeasures are gathered in "ME0271 Caution when 24V Power Controller being Plug Grounded". Please refer to it for detail.

## 10.3 Maintenance

### 10.3.1 Consumed Parts

These parts below have production life. Shown below is the reference.

| Item | Life | Specification |
|---|---|---|
| Electrolytic capacitor | 5 years | 0 to 40□C |
| Backup capacitor for calendar feature | 5 years | When repeated to conduct for 12H in 40□C environment and cut for 12H in 20□C environment |
| Forced air-cooling FAN | Approx. 3 years | When repeated to conduct for 24H in 40□C |

### 10.3.2 Maintenance Information

The times of actuator run and distance of operation can be summed up and recorded [Note 1] in the controller.
Also, an alarm is output [Note 3] and signal can by output [Note 4] externally when the times and distance [Note 2] exceed the threshold. By this signal, notice can be available for the timing of grease supply or regular inspection.



Note 1 *The contents recorded in the teaching tool and Modbus communication can be checked.*
*To check in the teaching tool [Refer in each instruction manual for details]*
*・TB-01/TB-02　[Monitor] → [Maintenance]*
*・TB-02　　　　　[Information] → [Maintenance Information]*
*・RC PC software [Monitor (M)] → [Maintenance Information (I)] → Select axis*
Note 2 *Set in Parameter No. 147 "Total Times of Movement Target" and No. 148 "Total Drive Distance Target". [Refer to 8.2 [60] and [61].]*
Note 3 *The message level alarms "04E Times of Movement Target Exceeded" and "04F Drive Distance Target Exceeded" are output. [Refer to 9.4.3 Alarm Codes on Driver Board (Each Axis)]*
Note 4 *It outputs a light error alarm (ALML). [Refer to 3.71. [21] and 8.2 [62].]*

# RCP6S Fieldbus Communication

## 10.4 List of Connectable Actuators

Refer to instruction manual for each actuator type for the specifications of the actuator.

■How to Figure out Min. Velocity

The minimum velocity differs depending on the system.
Use the formula below to figure it out.

Minimum velocity [mm/s] =
Lead length [mm] / Number of encoder pulse / 0.001 [sec]

*Note) Calculate it with 800 for the number of encoder pulse for RCP6(S).*

### RCP6S Actuator

| RCP6S Slider type | | RCP6S Wide slider type | |
|---|---|---|---|
| RCP6S-SA4C | RCP6S-SA4R | RCP6S-WSA10C | RCP6S-WSA10R |
| RCP6S-SA6C | RCP6S-SA6R | RCP6S-WSA12C | RCP6S-WSA12R |
| RCP6S-SA7C | RCP6S-SA7R | RCP6S-WSA14C | RCP6S-WSA14R |
| RCP6S-SA8C | RCP6S-SA8R | RCP6S-WSA16C | RCP6S-WSA16R |
| RCP6S Rod type | | RCP6S Table type | |
| RCP6S-RA4C | RCP6S-RA4R | RCP6S-TA4C | RCP6S-TA4R |
| RCP6S-RA6C | RCP6S-RA6R | RCP6S-TA6C | RCP6S-TA6R |
| RCP6S-RA7C | RCP6S-RA7R | RCP6S-TA7C | RCP6S-TA7R |
| RCP6S-RA8C | RCP6S-RA8R | | |
| RCP6S Radial type | | RCP6S Wide radial type | |
| RCP6S-RRA4C | RCP6S-RRA4R | RCP6S-WRA10C | RCP6S-WRA10R |
| RCP6S-RRA6C | RCP6S-RRA6R | RCP6S-WRA12C | RCP6S-WRA12R |
| RCP6S-RRA7C | RCP6S-RRA7R | RCP6S-WRA14C | RCP6S-WRA14R |
| RCP6S-RRA8C | RCP6S-RRA8R | RCP6S-WRA16C | RCP6S-WRA16R |

### Clean Type

| RCP6S Slider type | RCP6S Wide slider type |
|---|---|
| RCP6SCR-SA4C | RCP6SCR-WSA10C |
| RCP6SCR-SA6C | RCP6SCR-WSA12C |
| RCP6SCR-SA7C | RCP6SCR-WSA14C |
| RCP6SCR-SA8C | RCP6SCR-WSA16C |

### Dust proof/Splush proof rod type

| RCP6S Rod type | | | |
|---|---|---|---|
| RCP6SW-RA4C | RCP6SW-RA4R | | |
| RCP6SW-RA6C | RCP6SW-RA6R | | |
| RCP6SW-RA7C | RCP6SW-RA7R | | |
| RCP6SW-RA8C | RCP6SW-RA8R | | |
| RCP6S Radial type | | RCP6S Wide radial type | |
| RCP6SW-RRA4C | RCP6SW-RRA4R | RCP6SW-WRA10C | RCP6SW-WRA10R |
| RCP6SW-RRA6C | RCP6SW-RRA6R | RCP6SW-WRA12C | RCP6SW-WRA12R |
| RCP6SW-RRA7C | RCP6SW-RRA7R | RCP6SW-WRA14C | RCP6SW-WRA14R |
| RCP6SW-RRA8C | RCP6SW-RRA8R | RCP6SW-WRA16C | RCP6SW-WRA16R |

# RCP6S Fieldbus Communication

## RCM-P6PC Connection Actuator (1/2)

| RCP6 Slider type | | RCP6 Wide slider type | |
|---|---|---|---|
| RCP6-SA4C | RCP6-SA4R | RCP6-WSA10C | RCP6-WSA10R |
| RCP6-SA6C | RCP6-SA6R | RCP6-WSA12C | RCP6-WSA12R |
| RCP6-SA7C | RCP6-SA7R | RCP6-WSA14C | RCP6-WSA14R |
| **RCP5 Slider type** | | **RCP5 Belt type** | |
| RCP5-SA4C | RCP5-SA4R | RCP5-BA4 | RCP5-BA4U |
| RCP5-SA6C | RCP5-SA6R | RCP5-BA6 | RCP5-BA6U |
| RCP5-SA7C | RCP5-SA7R | RCP5-BA7 | RCP5-BA7U |
| **RCP4 Slider type** | | **RCP3 Slider type** | |
| RCP4-SA3C | RCP4-SA3R | RCP3-SA2AC | RCP3-SA2AR |
| RCP4-SA5C | RCP4-SA5R | RCP3-SA2BC | RCP3-SA2BR |
| RCP4-SA6C | RCP4-SA6R | RCP3-SA3C | RCP3-SA3R |
| RCP4-SA7C | RCP4-SA7R | RCP3-SA4C | RCP3-SA4R |
| **RCP2 Slider type** | | RCP3-SA5C | RCP3-SA5R |
| RCP2-SA5C | RCP2-SA5R | RCP3-SA6C | RCP3-SA6R |
| RCP2-SA6C | RCP2-SA6R | | |
| RCP2-SA7C | RCP2-SA7R | | |
| RCP2-SS7C | RCP2-SS7R | | |
| RCP2-SS8C | RCP2-SS8R | | |
| **RCP6 Rod type** | | **RCP6 Table type** | |
| RCP6-RA4C | RCP6-RA4R | RCP6-TA4C | RCP6-TA4R |
| RCP6-RA6C | RCP6-RA6R | RCP6-TA6C | RCP6-TA6R |
| RCP6-RA7C | RCP6-RA7R | RCP6-TA7C | RCP6-TA7R |
| **RCP6 Radial type** | | **RCP6 Wide radial type** | |
| RCP6-RRA4C | RCP6-RRA4R | RCP6-WRA10C | RCP6-WRA10R |
| RCP6-RRA6C | RCP6-RRA6R | RCP6-WRA12C | RCP6-WRA12R |
| RCP6-RRA7C | RCP6-RRA7R | RCP6-WRA14C | RCP6-WRA14R |
| **RCP5 Rod type** | | **RCP4 Rod type** | |
| RCP5-RA4C | RCP5-RA4R | RCP4-RA3C | RCP4-RA3R |
| RCP5-RA6C | RCP5-RA6R | RCP4-RA5C | RCP4-RA5R |
| RCP5-RA7C | RCP5-RA7R | RCP4-RA6C | RCP4-RA6R |
| **RCP3 Rod type** | | ↑(except for 56SP Motor type) | |
| RCP3-RA2AC | RCP3-RA2AR | | |
| RCP3-RA2BC | RCP3-RA2BR | **RCP3 Table type** | |
| **RCP2 Rod type** | | RCP3-TA3C | RCP3-TA3R |
| RCP2-RA2C | RCP2-SRA4R | RCP3-TA4C | RCP3-TA4R |
| RCP2-RA3C | RCP2-SRGD4R | RCP3-TA5C | RCP3-TA5R |
| RCP2-RA4C | RCP2-SRGS4R | RCP3-TA6C | RCP3-TA6R |
| RCP2-RA6C | | RCP3-TA7C | RCP3-TA7R |
| **RCP4 Gripper type** | | | |
| RCP4-GRSML | RCP4-GRSLL | RCP4-GRSWL | |
| RCP4-GRLM | RCP4-GRLL | RCP4-GRLW | |
| **RCP2 Gripper type** | | | |
| RCP2-GRSS | RCP2-GRLS | RCP2-GRS | |
| RCP2-GRM | RCP2-GRHM | RCP2-GRHB | |
| RCP2-GR3LS | RCP2-GR3LM | RCP2-GR3SS | RCP2-GR3SM |
| **RCP2 Rotary type** | | | |
| RCP2-RTBS | RCP2-RTBSL | RCP2-RTCS | RCP2-RTCSL |
| RCP2-RTB | RCP2-RTBL | RCP2-RTC | RCP2-RTCL |
| RCP2-RTBB | RCP2-RTBBL | RCP2-RTCB | RCP2-RTCBL |
| **RCP4 Stopper cylinder** | | | |
| RCP4-ST68E | RCP4-ST615E | RCP4-ST4525E | |

10. Appendix

# *RCP6S* *Fieldbus Communication*

## RCM-P6PC Connection Actuator (2/2)

### Clean Type

| RCP6 Slider type | | RCP6 Wide slider type | |
|---|---|---|---|
| RCP6CR-SA4C | | RCP6CR-WSA10C | |
| RCP6CR-SA6C | | RCP6CR-WSA12C | |
| RCP6CR-SA7C | | RCP6CR-WSA14C | |

| RCP5 Slider type | | RCP4 Slider type | |
|---|---|---|---|
| RCP5CR-SA4C | | RCP4CR-SA3C | |
| RCP5CR-SA6C | | RCP4CR-SA5C | |
| RCP5CR-SA7C | | RCP4CR-SA6C | |

| RCP2 Slider type | | RCP4CR-SA7C | |
|---|---|---|---|
| RCP2CR-SS7C | RCP2CR-SS8C | | |

| RCP2 Gripper type | | | |
|---|---|---|---|
| RCP2CR-GRSS | RCP2CR-GRLS | RCP2CR-GRS | RCP2CR-GRM |
| RCP2CR-GR3SS | RCP2CR-GR3SM | | |

| RCP2 Rotary type | | | |
|---|---|---|---|
| RCP2CR-RTBS | RCP2CR-RTBSL | RCP3CR-RTCS | RCP3CR-RTCSL |
| RCP3CR-RTB | RCP3CR-RTBL | RCP3CR-RTC | RCP3CR-RTCL |
| RCP3CR-RTBB | RCP3CR-RTBBL | RCP3CR-RTCB | RCP3CR-RTCBL |

### Dust proof/Splush proof rod type

| RCP4 Slider type | | | |
|---|---|---|---|
| RCP4W-SA5C | | | |
| RCP4W-SA6C | | | |
| RCP4W-SA7C | | | |

| RCP6 Rod type | | RCP6 Radial type | |
|---|---|---|---|
| RCP6W-RA4C | RCP6W-RA4R | RCP6W-RRA4C | RCP6W-RRA4R |
| RCP6W-RA6C | RCP6W-RA6R | RCP6W-RRA6C | RCP6W-RRA6R |
| RCP6W-RA7C | RCP6W-RA7R | RCP6W-RRA7C | RCP6W-RRA7R |

| RCP6 Wide radial type | | RCP5 Rod type | |
|---|---|---|---|
| RCP6W-WRA10C | RCP6W-WRA10R | RCP5W-RA6C | |
| RCP6W-WRA12C | RCP6W-WRA12R | RCP5W-RA7C (except for 56SP Motor type) | |
| RCP6W-WRA14C | RCP6W-WRA14R | | |

| RCP4 Rod type | | RCP2 Rod type | |
|---|---|---|---|
| RCP4W-RA6C | | RCP2W-RA4C | |
| RCP4W-RA7C (except for 56SP Motor type) | | RCP2W-RA6C | |

| RCP2 Gripper type | | | |
|---|---|---|---|
| RCP2W-GRSS | RCP2W-GRLS | RCP2W-GRS | RCP2W-GRM |
| RCP2W-GR3SS | RCP2W-GR3SM | | |

| RCP2 Rotary type | | | |
|---|---|---|---|
| RCP2W-RTBS | RCP2W-RTBSL | RCP2W-RTCS | RCP2W-RTCSL |
| RCP2W-RTB | RCP2W-RTBL | RCP2W-RTC | RCP2W-RTCL |
| RCP2W-RTBB | RCP2W-RTBBL | RCP2W-RTCB | RCP2W-RTCBL |

## RCM-P6DC Connection Actuator

| Rod type | Gripper type |
|---|---|
| RCD-RA1DA | RCD-GRSNA |

10. Appendix

**10. Appendix**

## RCM-P6AC Connection Actuator

### RCA2 Slider type

| | |
|---|---|
| RCA2-SA2AC | RCA2-SA2AR |
| RCA2-SA3C | RCA2-SA3R |
| RCA2-SA4C | RCA2-SA4R |
| RCA2-SA5C | RCA2-SA5R |
| RCA2-SA6C | RCA2-SA6R |

### RCA Slider type

| | | |
|---|---|---|
| RCA-SA4C | RCA-SA4R | RCA-SA4D |
| RCA-SA5C | RCA-SA5R | RCA-SA5D |
| RCA-SA6C | RCA-SA6R | RCA-SA6D |

### RCA2 Slim small rod type

| | | |
|---|---|---|
| RCA2-RA2AC | RCA2-RA2AR | |
| RCA2-RN3NA | RCA2-GS3NA | RCA2-SD3NA |
| RCA2-RN4NA | RCA2-GS4NA | RCA2-SD4NA |
| RCA2-RP3NA | RCA2-GD3NA | |
| RCA2-RP4NA | RCA2-GD4NA | |

### RCA Rod type

| | | |
|---|---|---|
| RCA-RA3C | RCA-RA3R | RCA-RA3D |
| RCA-RA4C | RCA-RA4R | RCA-RA4D |
| RCA-SRA4R | RCA-SRGS4R | RCA-SGD4R |
| RCA-RGS3C | | RCA-RGS3D |
| RCA-RGS4C | | RCA-RGS4D |
| RCA-RGD3C | RCA-RGD3R | RCA-RGD3D |
| RCA-RGD4C | RCA-RGD4R | RCA-RGD4D |

### RCA2 Table type

| | | |
|---|---|---|
| RCA2-TCA3NA | RCA2-TWA3NA | RCA2-TFA3NA |
| RCA2-TCA4NA | RCA2-TWA4NA | RCA2-TFA4NA |
| RCA2-TA4C | RCA2-TA4R | |
| RCA2-TA5C | RCA2-TA5R | |
| RCA2-TA6C | RCA2-TA6R | |
| RCA2-TA7C | RCA2-TA7R | |

### RCA Arm type

| |
|---|
| RCA-A4R |
| RCA-A5R |
| RCA-A6R |

### RCL Linear servo type

| | | |
|---|---|---|
| RCL-SA1L | | RCL-RA1L |
| RCL-SA2L | | RCL-RA2L |
| RCL-SA3L | | RCL-RA3L |
| RCL-SA4L | RCL-SM4L | |
| RCL-SA5L | RCL-SM5L | |
| RCL-SA6L | RCL-SM6L | |

## Clean Type

### RCA Slider type

| | |
|---|---|
| RCACR-SA4C | |
| RCACR-SA5C | RCACR-SA5D |
| RCACR-SA6C | RCACR-SA6D |

## Dust proof/Splush proof rod type

### RCA2 Slim small rod type

| | | |
|---|---|---|
| RCA2W-RN3NA | RCA2W-GS3NA | RCA2W-SD3NA |
| RCA2W-RN4NA | RCA2W-GS4NA | RCA2W-SD4NA |
| RCA2W-RP3NA | RCA2W-GD3NA | |
| RCA2W-RP4NA | RCA2W-GD4NA | |

### RCA Rod type

| | | |
|---|---|---|
| RCAW-RA3C | RCAW-RA3R | RCAW-RA3D |
| RCAW-RA4C | RCAW-RA4R | RCAW-RA4D |

## Chapter 11   Warranty

### 11.1  Warranty Period

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

### 11.2  Scope of the 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 or problem in question was caused by a specification defect or problem, or by the poor quality of 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.

### 11.3  Honoring the Warranty

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

### 11.4  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.

## 11.5  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.

## 11.6  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

11. Warranty

## Change History

| Revision Date | Revision Description |
|---|---|
| 2016.01 | First Edition |
| 2016.06 | Second Edition<br>• Applicable for high-output setting invalid actuator<br>• Note corrected |
| 2016.07 | Third Edition<br>• Chapter 2 2.3 Wiring (Gateway Unit) revised<br>• Chapter 2 2.4 Wiring (Hub Unit) added<br>• Applied to Chapter 3 Left-Justification Setting Feature<br>• Chapter 8 896 Alarm, 8B0 Alarm added<br>• Chapter8 8.3.2 Connection Unit Control Power Voltage Drop Alarm added<br>• Chapter 9 Appendix added<br>• Correction made in TB-02 Application |
| 2017.06 | Fouth Edition<br>• RCP6S Gateway Controllers (RCM-P6PC, RCM-P6AC and RCM-P6DC) added<br>• Became applicable for dust and drip proof rod type, dust and drip proof wide rod type and dust and drip proof radial cylinder type<br>• Note corrected |

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