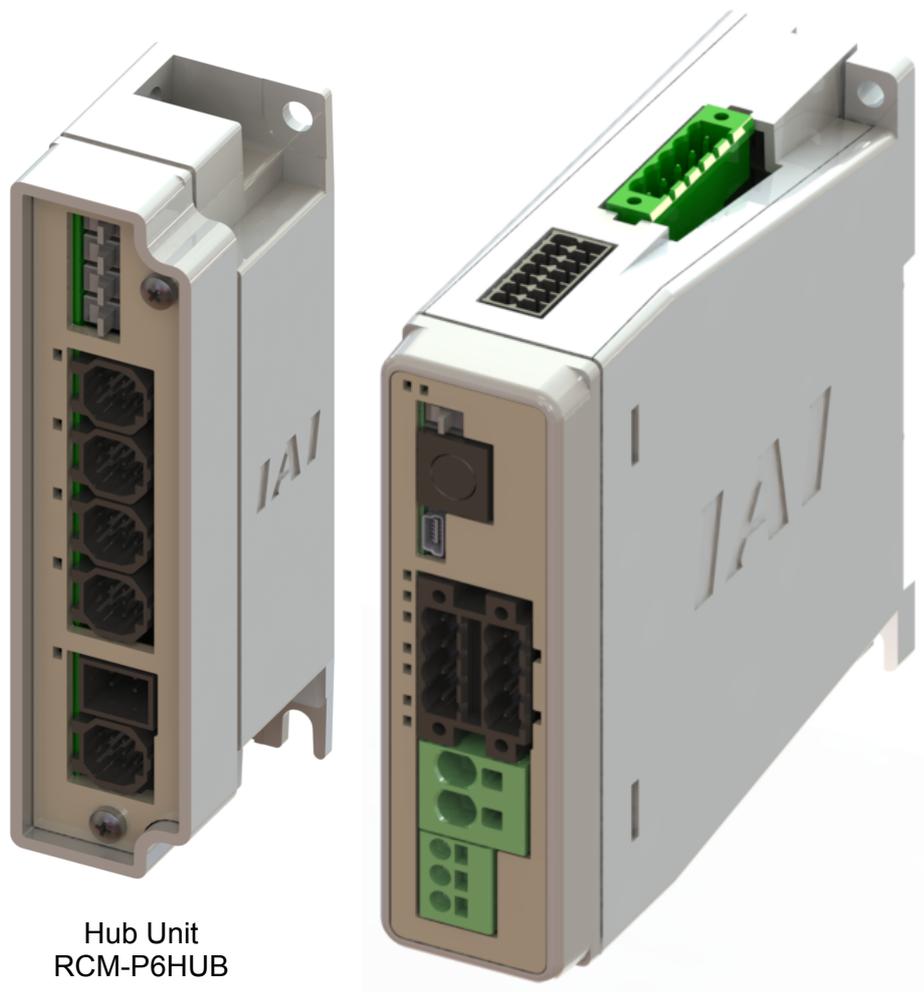


RCP6S

Fieldbus Communication Instruction Manual Third Edition



Hub Unit
RCM-P6HUB

Gateway Unit
RCM-P6GW (G)

IAI America, Inc.

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.

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Construction of Instruction Manual for Each Controller Model and This Manual

This is an instruction manual for RCP6S gateway unit, fieldbus communication using hub unit. For installation and how to attach conveyance objects, refer to instruction manual for each actuator type.

RCP6S



● Basic Specifications (Actuator type)

• Fieldbus Communication	<input type="checkbox"/>	RCP6S fieldbus communication (This manual)	<u>ME0349</u>
• Serial Communication	<input type="checkbox"/>	Serial communication [Modbus]	<u>ME0162</u>
Slider type	<input type="checkbox"/>	RCP6 (S)-SA	<u>ME3749</u>
Wide slider type	<input type="checkbox"/>	RCP6 (S)-WSA	<u>ME3750</u>
Rod type	<input type="checkbox"/>	RCP6 (S)-RA	<u>ME3751</u>
Wide rod type	<input type="checkbox"/>	RCP6 (S)-WRA	<u>ME3752</u>
Radial cylinder type	<input type="checkbox"/>	RCP6 (S)-RRA	<u>ME3753</u>
Table type	<input type="checkbox"/>	RCP6 (S)-TA	<u>ME3754</u>

★ Extention Device

• Gateway unit	<input type="checkbox"/>	RCP6S fieldbus communication (This manual)	<u>ME0349</u>
• Hub unit	<input type="checkbox"/>	RCP6S fieldbus communication (This manual)	<u>ME0349</u>
• PLC connecting unit	<input type="checkbox"/>	Serial communication [Modbus]	<u>ME0162</u>

■ Teaching Tool

• PC software	<input type="checkbox"/>	PC software	<u>ME0155</u>
• Teaching Pendant			
TB-02 (Applicable for position controller)	<input type="checkbox"/>	Touch panel teaching	<u>ME0355</u>
TB-01 (Applicable for position controller)	<input type="checkbox"/>	Touch panel teaching	<u>ME0324</u>
CON-PTA	<input type="checkbox"/>	Touch panel teaching	<u>ME0295</u>

⚠ 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”.

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★ Starting Procedures ★

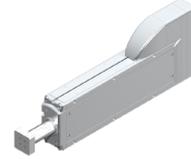
Step 1 Confirm All The Necessary Things are Prepared (Contact us or our sales agency in case of any missing)

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



★ 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 Instruction Manual for Each Type
- 5) Serial Communication [Modbus] Instruction Manual (ME0162)



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

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

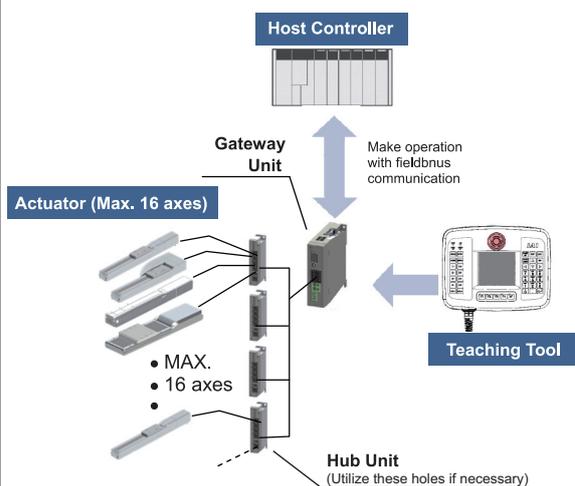


Step 2 Check How to Operate

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

★ Operation by Fieldbus Connection

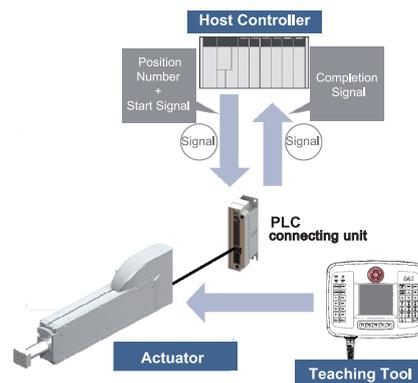
The host controller drives the actuator by the fieldbus communication through the gateway unit



⚠ 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)



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

RCP6S Fieldbus Communication

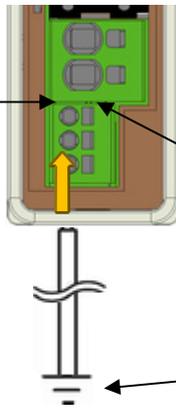
Step 3 Installation "Refer to "1.6 Installation and Storage Environment" and "1.7 Noise Prevention and Installation"

· 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 (2mm²) or more.



Push hard in the square hole with a slotted screwdriver to open the ground wire inlet.



Earth Terminal
(Grounding resistance at 100Ω or less)

· Heat Radiation and Installation

Keep the ambient temperature of the controller at 40°C or less.

Step 4 Wiring

Refer to Chapter 2 "Wiring"

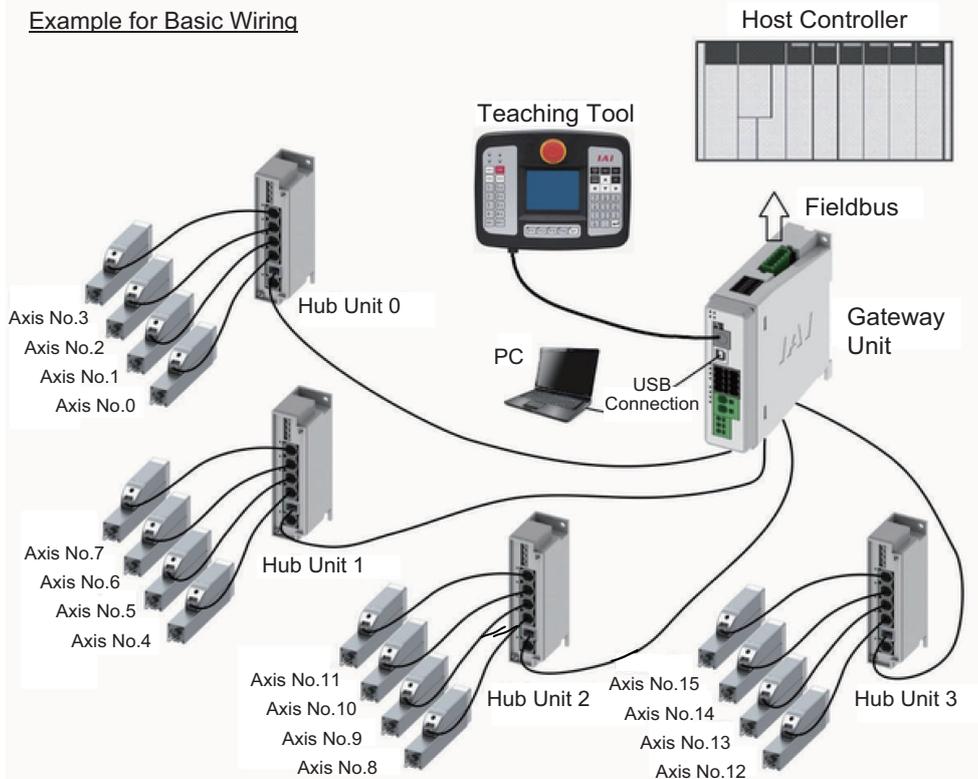
[Fieldbus Control]

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



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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.

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Safety Guide

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

Safety Precautions for Our Products

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

No.	Operation Description	Description
1	Model Selection	<ul style="list-style-type: none">● This product has not been planned and designed for the application where high level of safety is required, so the guarantee of the protection of human life is impossible. Accordingly, do not use it in any of the following applications.<ol style="list-style-type: none">1) Medical equipment used to maintain, control or otherwise affect human life or physical health.2) Mechanisms and machinery designed for the purpose of moving or transporting people (For vehicle, railway facility or air navigation facility)3) Important safety parts of machinery (Safety device, etc.)● Do not use the product outside the specifications. Failure to do so may considerably shorten the life of the product.● Do not use it in any of the following environments.<ol style="list-style-type: none">1) Location where there is any inflammable gas, inflammable object or explosive2) Place with potential exposure to radiation3) Location with the ambient temperature or relative humidity exceeding the specification range4) Location where radiant heat is added from direct sunlight or other large heat source5) Location where condensation occurs due to abrupt temperature changes6) Location where there is any corrosive gas (sulfuric acid or hydrochloric acid)7) Location exposed to significant amount of dust, salt or iron powder8) Location subject to direct vibration or impact● For an actuator used in vertical orientation, select a model which is equipped with a brake. If selecting a model with no brake, the moving part may drop when the power is turned OFF and may cause an accident such as an injury or damage on the work piece.

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No.	Operation Description	Description
2	Transportation	<ul style="list-style-type: none"> ● When carrying a heavy object, do the work with two or more persons or utilize equipment such as crane. ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When in transportation, consider well about the positions to hold, weight and weight balance and pay special attention to the carried object so it would not get hit or dropped. ● Transport it using an appropriate transportation measure. The actuators available for transportation with a crane have eyebolts attached or there are tapped holes to attach bolts. Follow the instructions in the instruction manual for each model. ● Do not step or sit on the package. ● Do not put any heavy thing that can deform the package, on it. ● When using a crane capable of 1t or more of weight, have an operator who has qualifications for crane operation and sling work. ● When using a crane or equivalent equipments, make sure not to hang a load that weighs more than the equipment's capability limit. ● Use a hook that is suitable for the load. Consider the safety factor of the hook in such factors as shear strength. ● Do not get on the load that is hung on a crane. ● Do not leave a load hung up with a crane. ● Do not stand under the load that is hung up with a crane.
3	Storage and Preservation	<ul style="list-style-type: none"> ● The storage and preservation environment conforms to the installation environment. However, especially give consideration to the prevention of condensation. ● Store the products with a consideration not to fall them over or drop due to an act of God such as earthquake.
4	Installation and Start	<p>(1) Installation of Robot Main Body and Controller, etc.</p> <ul style="list-style-type: none"> ● Make sure to securely hold and fix the product (including the work part). A fall, drop or abnormal motion of the product may cause a damage or injury. Also, be equipped for a fall-over or drop due to an act of God such as earthquake. ● Do not get on or put anything on the product. Failure to do so may cause an accidental fall, injury or damage to the product due to a drop of anything, malfunction of the product, performance degradation, or shortening of its life. ● When using the product in any of the places specified below, provide a sufficient shield. <ol style="list-style-type: none"> 1) Location where electric noise is generated 2) Location where high electrical or magnetic field is present 3) Location with the mains or power lines passing nearby 4) Location where the product may come in contact with water, oil or chemical droplets

RCP6S Fieldbus Communication

No.	Operation Description	Description
4	Installation and Start	<p>(2) Cable Wiring</p> <ul style="list-style-type: none"> ● Use our company's genuine cables for connecting between the actuator and controller, and for the teaching tool. ● Do not scratch on the cable. Do not bend it forcibly. Do not pull it. Do not coil it around. Do not insert it. Do not put any heavy thing on it. Failure to do so may cause a fire, electric shock or malfunction due to leakage or continuity error. ● Perform the wiring for the product, after turning OFF the power to the unit, so that there is no wiring error. ● When the direct current power (+24V) is connected, take the great care of the directions of positive and negative poles. If the connection direction is not correct, it might cause a fire, product breakdown or malfunction. ● Connect the cable connector securely so that there is no disconnection or looseness. Failure to do so may cause a fire, electric shock or malfunction of the product. ● Never cut and/or reconnect the cables supplied with the product for the purpose of extending or shortening the cable length. Failure to do so may cause the product to malfunction or cause fire. <p>(3) Grounding</p> <ul style="list-style-type: none"> ● The grounding operation should be performed to prevent an electric shock or electrostatic charge, enhance the noise-resistance ability and control the unnecessary electromagnetic radiation. ● For the ground terminal on the AC power cable of the controller and the grounding plate in the control panel, make sure to use a twisted pair cable with wire thickness 0.5mm² (AWG20 or equivalent) or more for grounding work. For security grounding, it is necessary to select an appropriate wire thickness suitable for the load. Perform wiring that satisfies the specifications (electrical equipment technical standards). ● Perform Class D Grounding (former Class 3 Grounding with ground resistance 100Ω or below).

RCP6S *Fieldbus Communication*

No.	Operation Description	Description
4	Installation and Start	<p>(4) Safety Measures</p> <ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● When the product is under operation or in the ready mode, take the safety measures (such as the installation of safety and protection fence) so that nobody can enter the area within the robot's movable range. When the robot under operation is touched, it may result in death or serious injury. ● Make sure to install the emergency stop circuit so that the unit can be stopped immediately in an emergency during the unit operation. ● Take the safety measure not to start up the unit only with the power turning ON. Failure to do so may start up the machine suddenly and cause an injury or damage to the product. ● Take the safety measure not to start up the machine only with the emergency stop cancellation or recovery after the power failure. Failure to do so may result in an electric shock or injury due to unexpected power input. ● When the installation or adjustment operation is to be performed, give clear warnings such as "Under Operation; Do not turn ON the power!" etc. Sudden power input may cause an electric shock or injury. ● Take the measure so that the work part is not dropped in power failure or emergency stop. ● Wear protection gloves, goggle or safety shoes, as necessary, to secure safety. ● Do not insert a finger or object in the openings in the product. Failure to do so may cause an injury, electric shock, damage to the product or fire. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity.
5	Teaching	<ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the teaching operation from outside the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the "Stipulations for the Operation" and make sure that all the workers acknowledge and understand them well. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign "Under Operation" at the position easy to see. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>

RCP6S *Fieldbus Communication*

No.	Operation Description	Description
6	Trial Operation	<ul style="list-style-type: none">• When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers.• After the teaching or programming operation, perform the check operation one step by one step and then shift to the automatic operation.• When the check operation is to be performed inside the safety protection fence, perform the check operation using the previously specified work procedure like the teaching operation.• Make sure to perform the programmed operation check at the safety speed. Failure to do so may result in an accident due to unexpected motion caused by a program error, etc.• Do not touch the terminal block or any of the various setting switches in the power ON mode. Failure to do so may result in an electric shock or malfunction.
7	Automatic Operation	<ul style="list-style-type: none">• Check before starting the automatic operation or rebooting after operation stop that there is nobody in the safety protection fence.• Before starting automatic operation, make sure that all peripheral equipment is in an automatic-operation-ready state and there is no alarm indication.• Make sure to operate automatic operation start from outside of the safety protection fence.• In the case that there is any abnormal heating, smoke, offensive smell, or abnormal noise in the product, immediately stop the machine and turn OFF the power switch. Failure to do so may result in a fire or damage to the product.• When a power failure occurs, turn OFF the power switch. Failure to do so may cause an injury or damage to the product, due to a sudden motion of the product in the recovery operation from the power failure.

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No.	Operation Description	Description
8	Maintenance and Inspection	<ul style="list-style-type: none"> ● When the work is carried out with 2 or more persons, make it clear who is to be the leader and who to be the follower(s) and communicate well with each other to ensure the safety of the workers. ● Perform the work out of the safety protection fence, if possible. In the case that the operation is to be performed unavoidably inside the safety protection fence, prepare the “Stipulations for the Operation” and make sure that all the workers acknowledge and understand them well. ● When the work is to be performed inside the safety protection fence, basically turn OFF the power switch. ● When the operation is to be performed inside the safety protection fence, the worker should have an emergency stop switch at hand with him so that the unit can be stopped any time in an emergency. ● When the operation is to be performed inside the safety protection fence, in addition to the workers, arrange a watchman so that the machine can be stopped any time in an emergency. Also, keep watch on the operation so that any third person can not operate the switches carelessly. ● Place a sign “Under Operation” at the position easy to see. ● For the grease for the guide or ball screw, use appropriate grease according to the Instruction Manual for each model. ● Do not perform the dielectric strength test. Failure to do so may result in a damage to the product. ● When releasing the brake on a vertically oriented actuator, exercise precaution not to pinch your hand or damage the work parts with the actuator dropped by gravity. ● The slider or rod may get misaligned OFF the stop position if the servo is turned OFF. Be careful not to get injured or damaged due to an unnecessary operation. ● Pay attention not to lose the cover or untightened screws, and make sure to put the product back to the original condition after maintenance and inspection works. Use in incomplete condition may cause damage to the product or an injury. <p>* Safety protection Fence : In the case that there is no safety protection fence, the movable range should be indicated.</p>
9	Modification and Dismantle	<ul style="list-style-type: none"> ● Do not modify, disassemble, assemble or use of maintenance parts not specified based at your own discretion.
10	Disposal	<ul style="list-style-type: none"> ● When the product becomes no longer usable or necessary, dispose of it properly as an industrial waste. ● When removing the actuator for disposal, pay attention to drop of components when detaching screws. ● Do not put the product in a fire when disposing of it. The product may burst or generate toxic gases.
11	Other	<ul style="list-style-type: none"> ● Do not come close to the product or the harnesses if you are a person who requires a support of medical devices such as a pacemaker. Doing so may affect the performance of your medical device. ● See Overseas Specifications Compliance Manual to check whether complies if necessary. ● For the handling of actuators and controllers, follow the dedicated instruction manual of each unit to ensure the safety.

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 7 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. Transference of signal between controllers

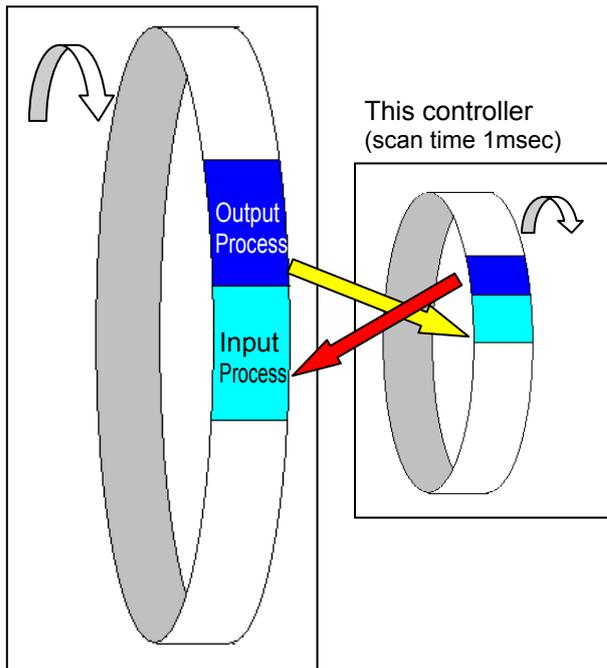
Please note the following when conducting transference signal between controllers.

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)



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.

7. 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.

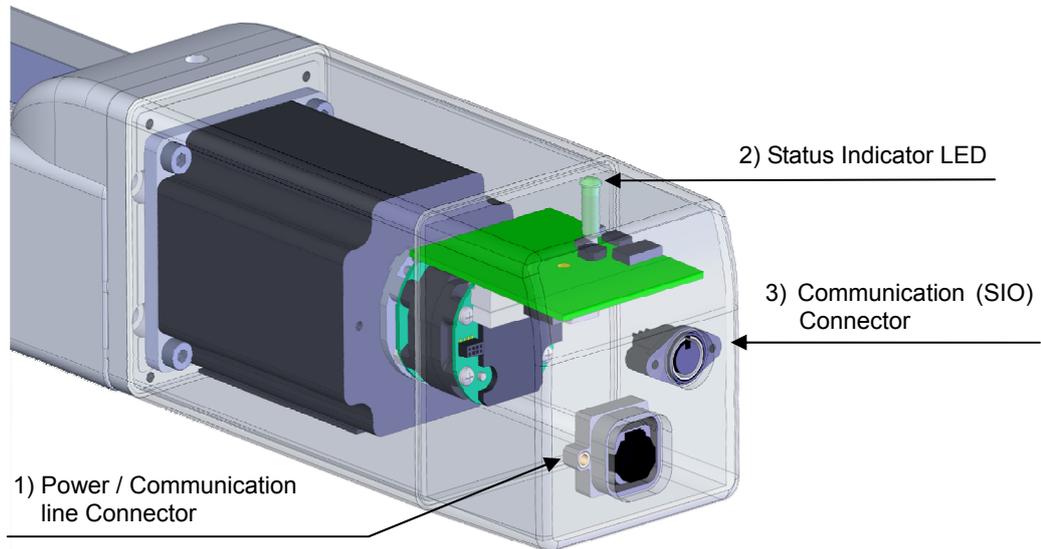
Therefore, the same process as when the timer is not set is held and may cause a failure such as the actuator cannot get positioned to the indicated position number in positioner mode.

Set "2" as the minimum value for the setting of 10msec timer and when setting to 100msec, use 10msec timer and set to "10".

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

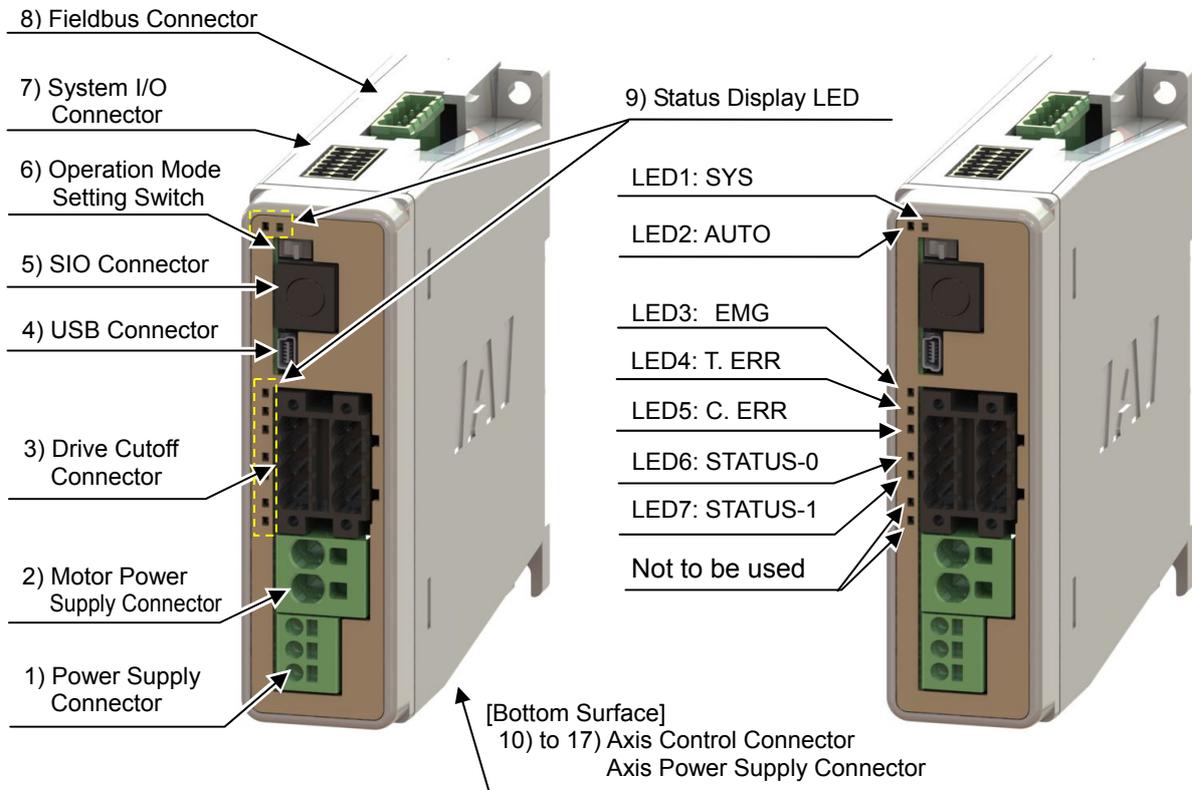
LED	Color	Operation Status
×	-	Operation status
		Servo OFF
●	RD	Alarm (Operation cancellation level or more)
		In the emergency stop
★	RD	During crash detection
●	GR	Servo ON
★	GR	Motor driving power supply OFF (Note 1)
●	OR	In initializing process when the power is turned on

Note 1 Signal during automatic servo-off : [Refer to Chapter 5]

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.

RCP6S Fieldbus Communication

2. RCP6S Gateway Unit



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.

RCP6S Fieldbus Communication

9) Status Display LED

It shows the status of gateway unit.

□ : Illuminating

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

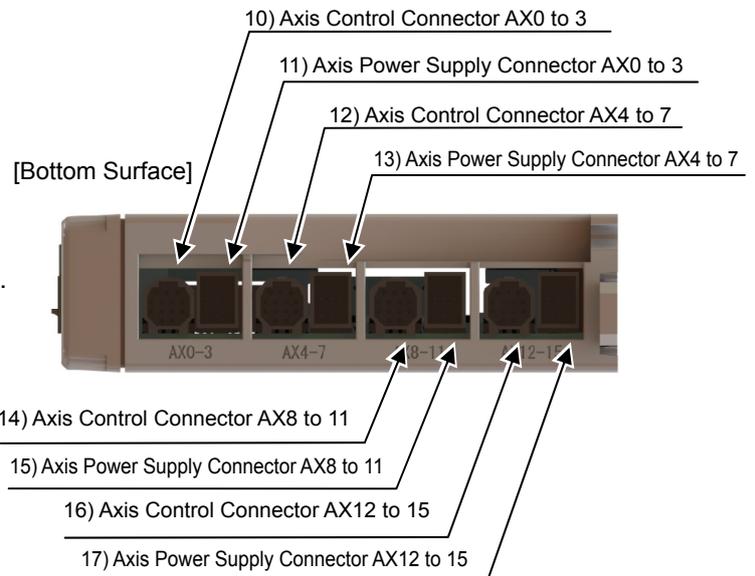
It is a connector to supply power and control signals (24V DC control power supply, 24V DC motor power supply, communication line, brake release signal and emergency stop status) from the gateway to a hub unit or actuator.

- 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.

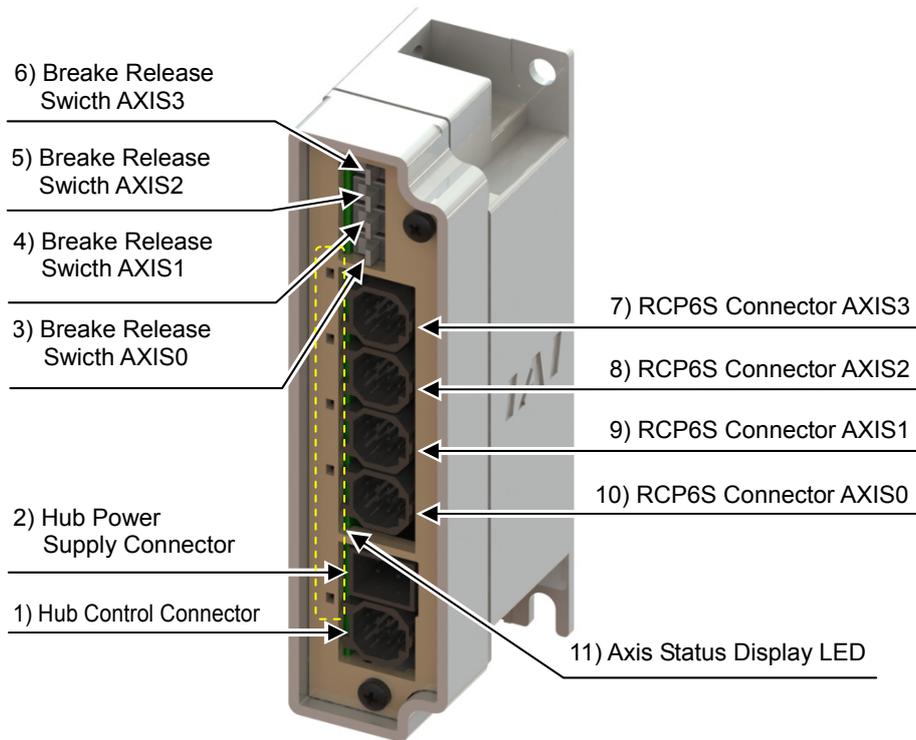
* Refer to Chapter 2 Wiring for details for such as connector codes and pin assignments etc.

[Top Surface]



RCP6S Fieldbus Communication

3. RCP6S Hub Unit



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 switth. 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.

RCP6S Fieldbus Communication

11) Axis Status Display LED

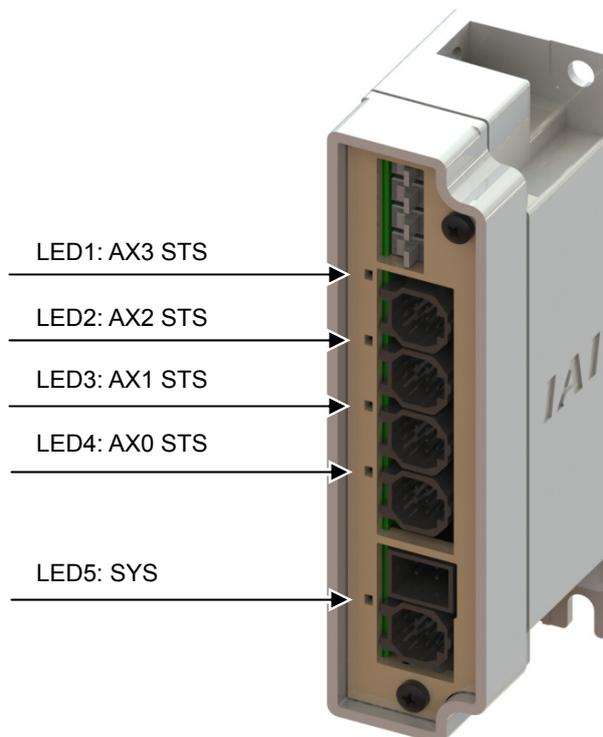
It shows the status of hub unit and connected actuator.

□ : Illuminating ×: OFF ☆: Flashing

Symbol	LED	Display Color and Operation Status
LED1	AX3 STS	<u>Axis No.0 to 3 Status</u> Servo OFF (× OFF) Servo ON (■ Green Illuminating) Automatic Servo OFF (★ Green Flashing) ^(Note 1) Alarm, Emergency Stop (■ Red Illuminating) Communication Error (★ Red Flashing)
LED2	AX2 STS	
LED3	AX1 STS	
LED4	AX0 STS	
LED5	SYS	<u>Hub Unit System Status</u> 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.

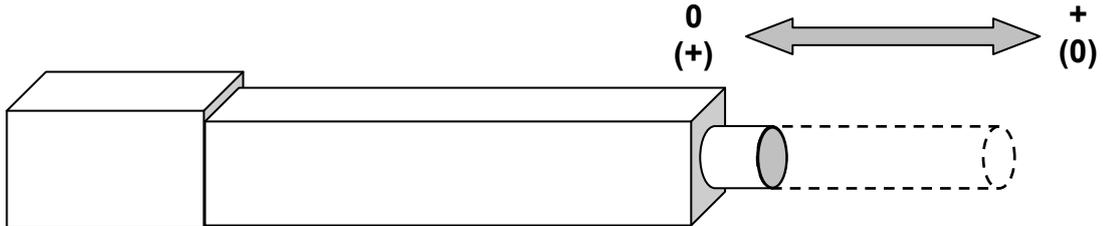


■ Actuator Axes ■

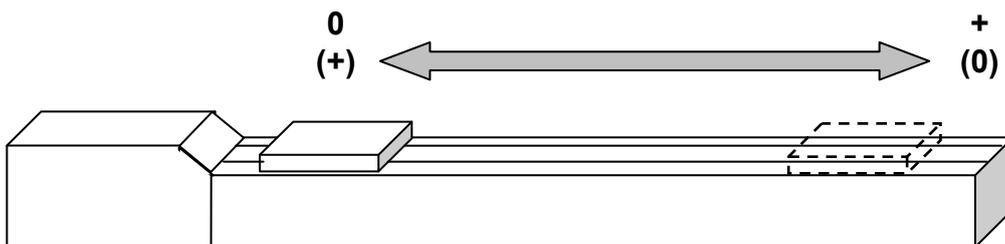
Refer to the pictures below for the actuator axes that can be controlled.
0 defines the home position, and items in () are for the home-reversed type (option).

⚠ 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.

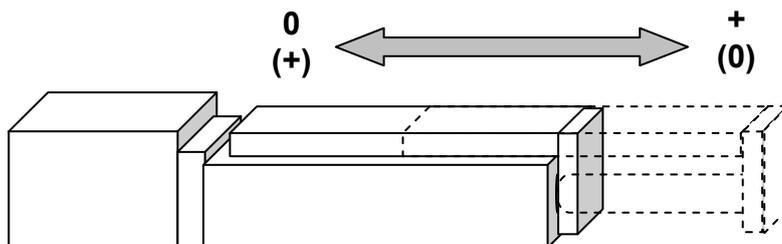
(1) Rod/Wide Rod/Radial Cylinder Type



(2) Slider/Wide Slider Type



(3) Table Type

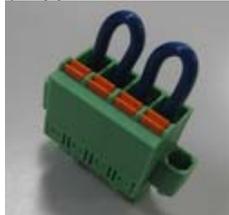
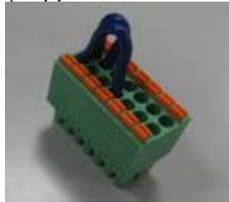


Chapter 1 Specifications Check

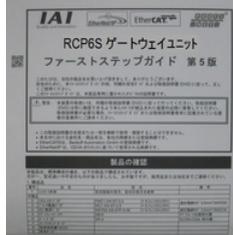
1.1 Product Check

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	
Accessories				
3	Hub Unit (Option)	Refer to "1.1.4 How to read the model plate", "1.1.5 How to read the model".	-	
4	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)
5	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)
6	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)
7	Dummy Plug (For Safety Category Complied Type RCM-P6GWG)	DP-5 	1	

RCP6S Fieldbus Communication

No.	Part Name	Model and Picture	Number	Remarks
8	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.
9	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
10	Safety Guide		1	The picture shows an image.
11	First Step Guide		1	The picture shows an image.
12	Instruction Manual (DVD)		1	The picture shows an image.

RCP6S *Fieldbus Communication*

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).

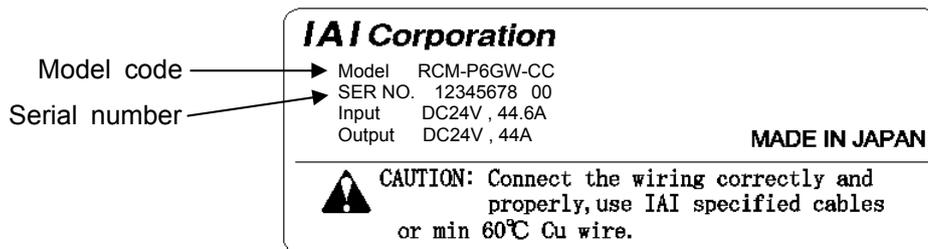
No.	Part Name	Model
1	Instruction Manual for the RCP6S Fieldbus Communication (This manual)	ME0349
2	Instruction Manual for the Serial Communication [for Modbus]	ME0162
3	Instruction Manual for the RCP6S Slider Type	ME3749
4	Instruction Manual for the RCP6S Wide Slider Type	ME3750
5	Instruction Manual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

RCP6S Fieldbus Communication

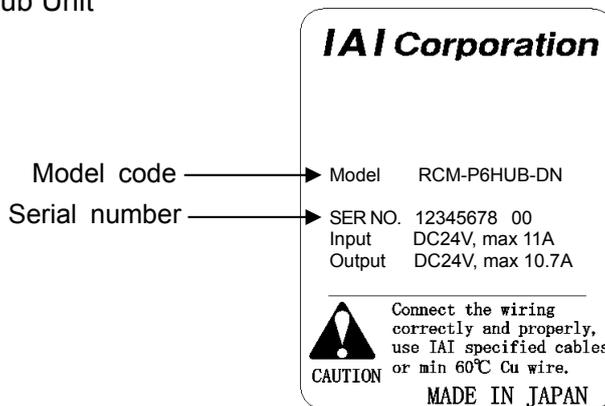
1.1.4 How to Read the Model Nameplate

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

[1] Gateway Unit



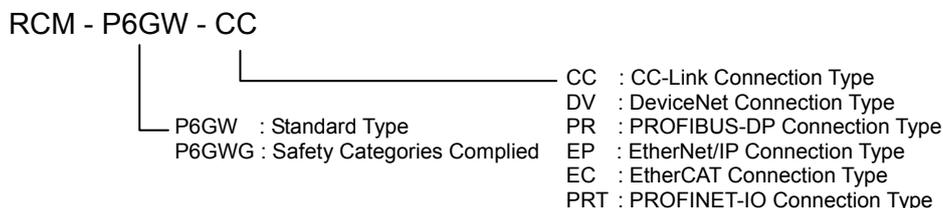
[2] Hub Unit



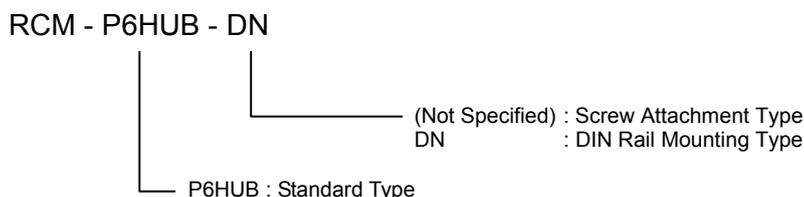
1.1.5 How to Read the Model

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

[1] Gateway Unit



[2] Hub Unit



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	3.2A max.
	56SP, 60P		5.7A max.
Power Supply for Electromagnetic Brake (for actuator equipped with brake)		24V DC±10% 0.15A <i>(Note) 0.7A is required for 0.2sec at brake release.</i>	
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 <i>(Note) Connection of gateway unit is necessary separately.</i> 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°C).
The value of inrush current differs depending on the impedance of the power supply line.

RCP6S Fieldbus Communication

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 $\pm 10\%$
Control Power Capacity	0.6A (Gateway unit itself 0.3A+Fieldbus module 0.3A)
Motor Power Capacity	Current consumption 56.6A (Effective value 40A) ^(Note 2)
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 $\times 1$ (RUN/ALM), EMG LED $\times 1$, MODE LED $\times 1$ (AUTO/MANU), T.ERR LED $\times 1$, C.ERR LED $\times 1$ Status LED lamp for each fieldbus module LED $\times 2$
Tool Connection	T/P connector : RS485 1ch (based on Modbus protocol) USB connector : USB 1ch
Electromagnetic Brake Compulsory Release Feature	System I/O connector: External brake release signal input (24V DC) * 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 10M Ω
Mass	250g
External Dimensions	35W \times 115H \times 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).

Note 2 The effective value should be 410A due to the connector rated current and the circuit width on the printed circuit board. ($40 \times \sqrt{2} = 56.6A$)

1.2.3 Specification of Hub Unit

Specification Item	Details of Specifications
Number of Controlled Axes	4-axes max.
Power-supply Voltage	24V DC $\pm 10\%$
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 $\times 1$ (RUN/ALM), Axis status LED $\times 4$ (RUN/ALM)
Tool Connection	None
Electromagnetic Brake Compulsory Release Feature	Brake release switch $\times 4$
Protection Function against Electric Shock	Class I basic insulation
Insulation Strength	500V DC 10M Ω
Mass	80g
External Dimensions	30W \times 115H \times 45D

RCP6S *Fieldbus Communication*

1.2.4 Specification of Environment (Built-in Controller/Gateway Unit/Hub Unit 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 Frequency 57 to 150Hz / Acceleration: 9.8m/s ² 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) ≤ 12.8A1)
- 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 unit3)

(3) Rush Current: 8.3A (Motor type 28P, 35P, 42P and 56P)

10A (Motor type 56SP and 60P)4)

(4) Current Consumption of Brake Release Power: Number of actuators with brake × 0.7A5)

* 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]

RCP6S Fieldbus Communication

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 (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 (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 (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.

RCP6S Fieldbus Communication

1.4.6 Specifications of PROFINET-IO Interface

Item	Specification
Communication Protocol	IEC61158 (IEEE802.3), IEC61784
Baud Rate	100Mbps
Number of Occupied Bytes	3.4.1 PLC Address Construction by each Operation Mode
Communication Cable Length	Distance between each segment: 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 (Double shielded cable braided with aluminum foil recommended)
Connector	RJ45 connector × 1pc
GSDML File Version	Ver 2.3

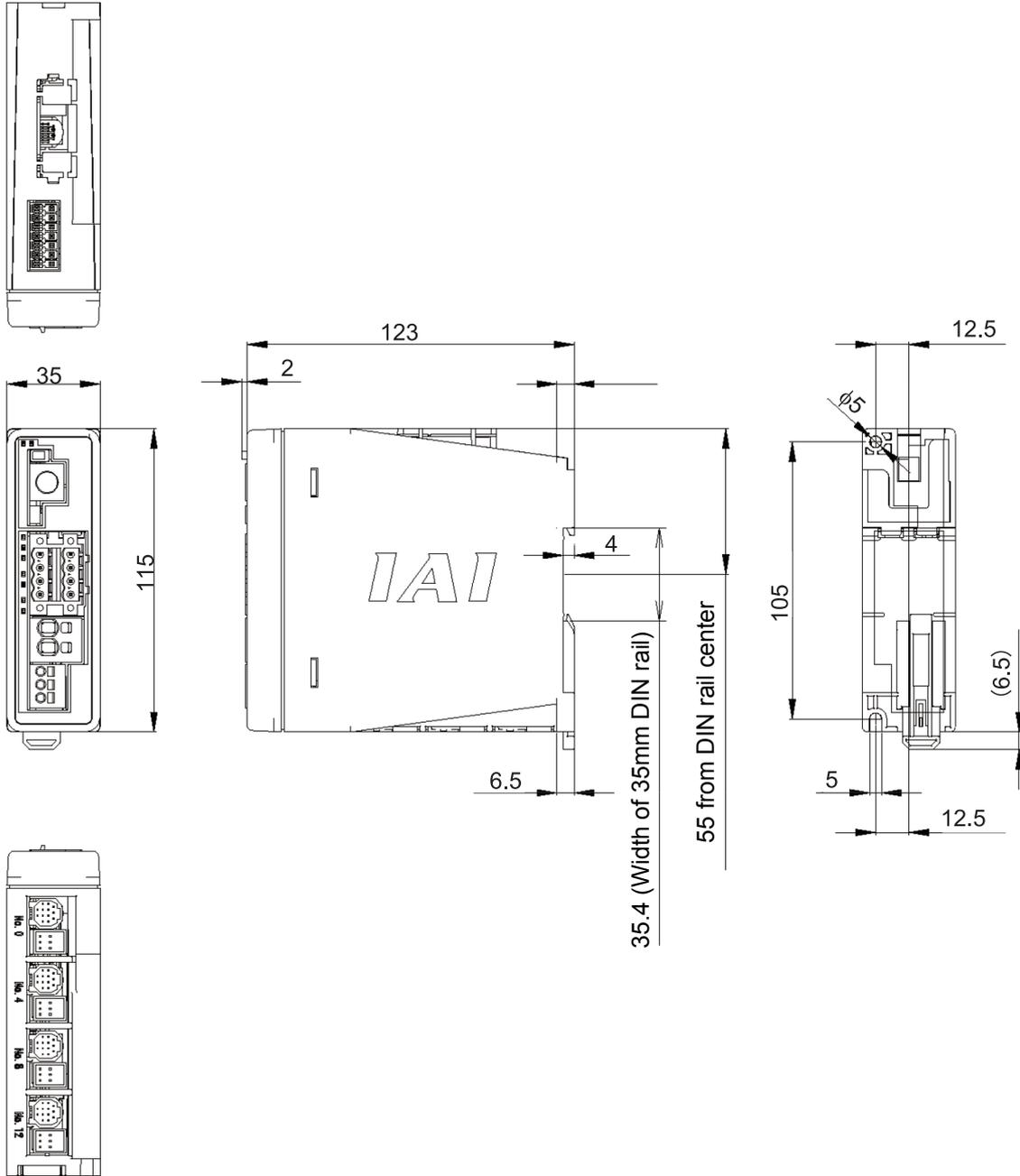
Note 1 Prepare separately for the communication cable.

RCP6S Fieldbus Communication

1.5 External Dimensions

1.5.1 Gateway Unit

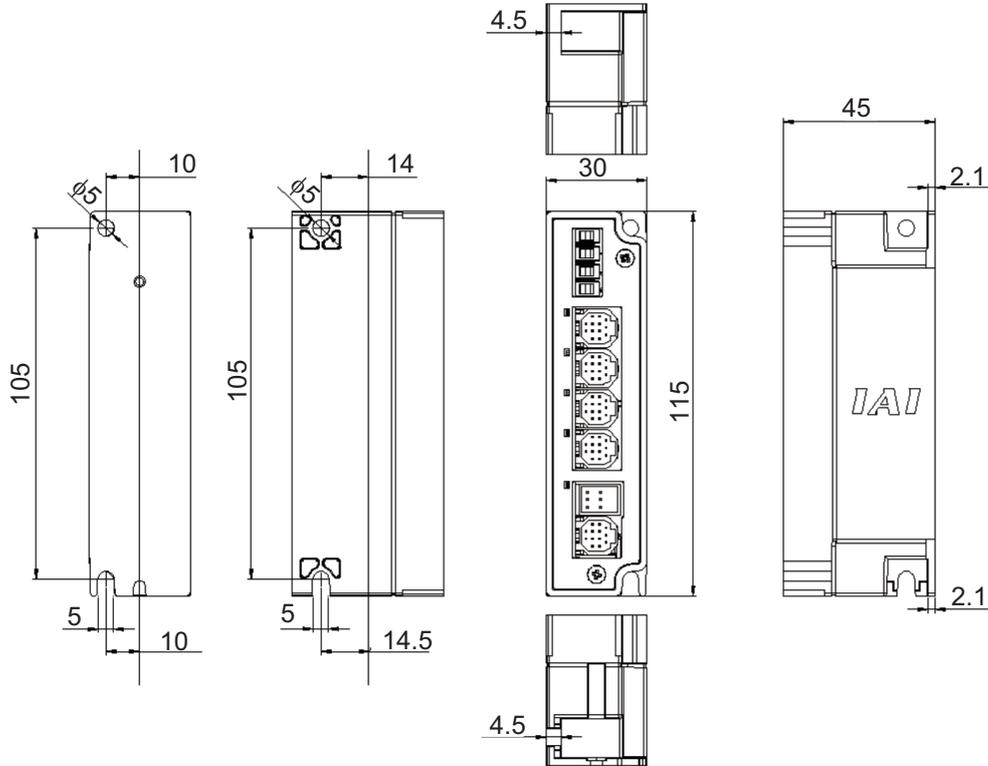
Attachment Screws and Attachment DIN Rail Type



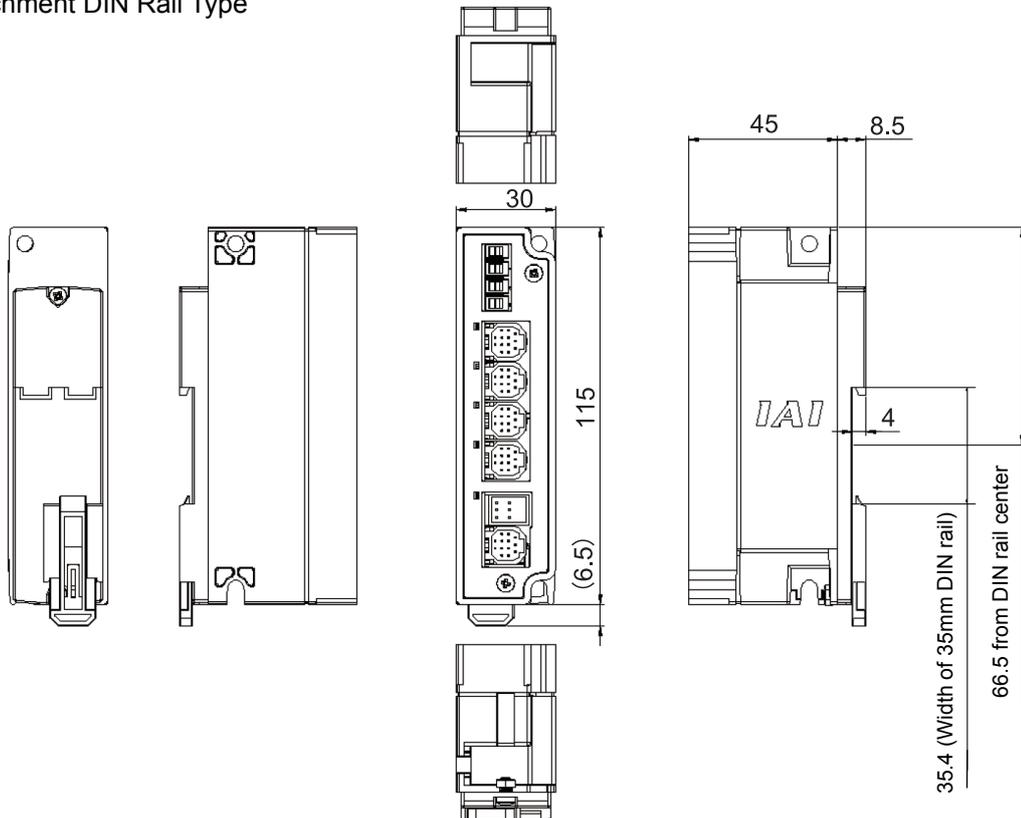
RCP6S Fieldbus Communication

1.5.2 Hub Unit

[1] Attachment 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.

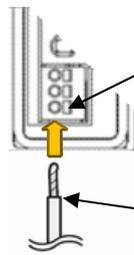
- Location subject to electrostatic noise
- Location where high electrical or magnetic field is present
- Location with the mains or power lines passing nearby

[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.

1.7 Noise Elimination and Mounting Method

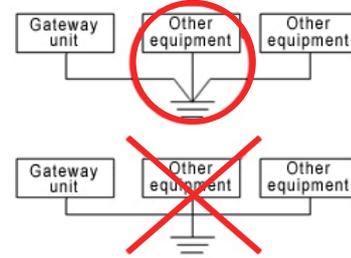
(1) Noise Elimination Grounding (Frame Ground)



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 (2mm²: 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 each unit.

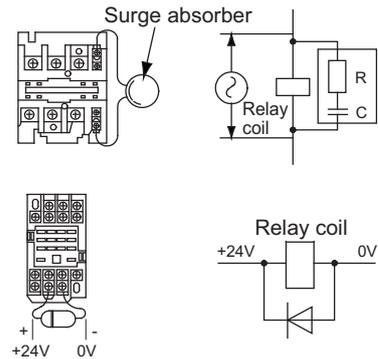
(2) Precautions regarding wiring method

- 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.
- 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.



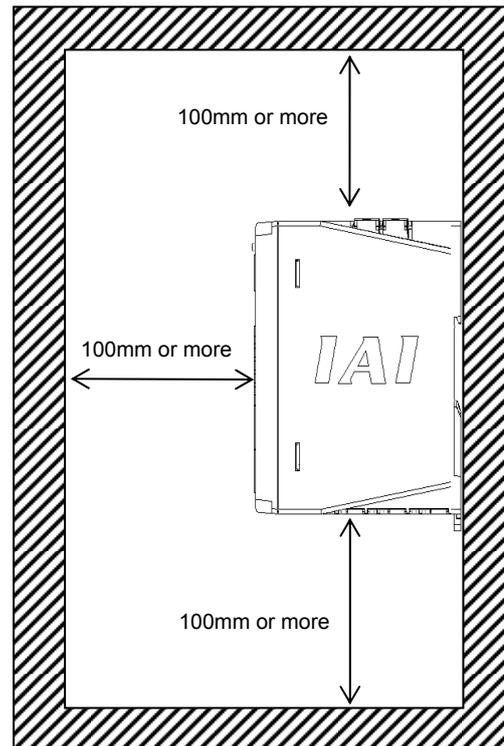
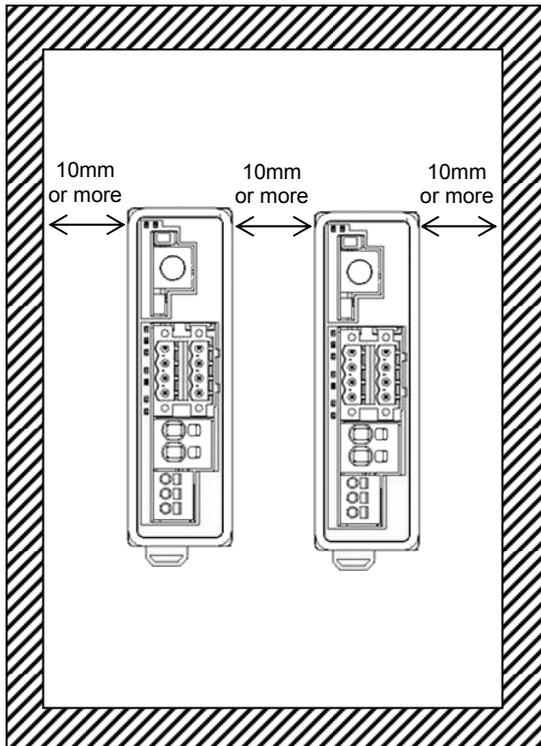
RCP6S Fieldbus Communication

(4) Heat Radiation and Installation

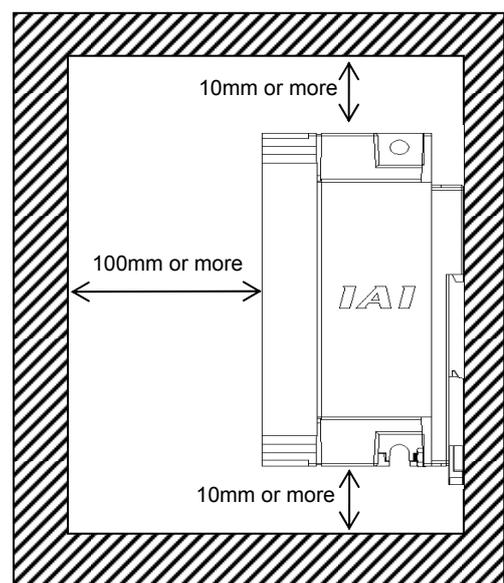
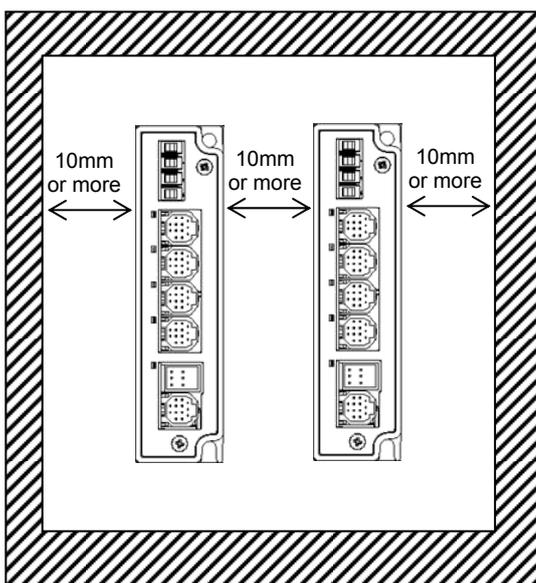
Design and Build the system considering the size of the controller box, location of the controller and cooling factors to keep the surrounding temperature around the controller below 40°C.

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



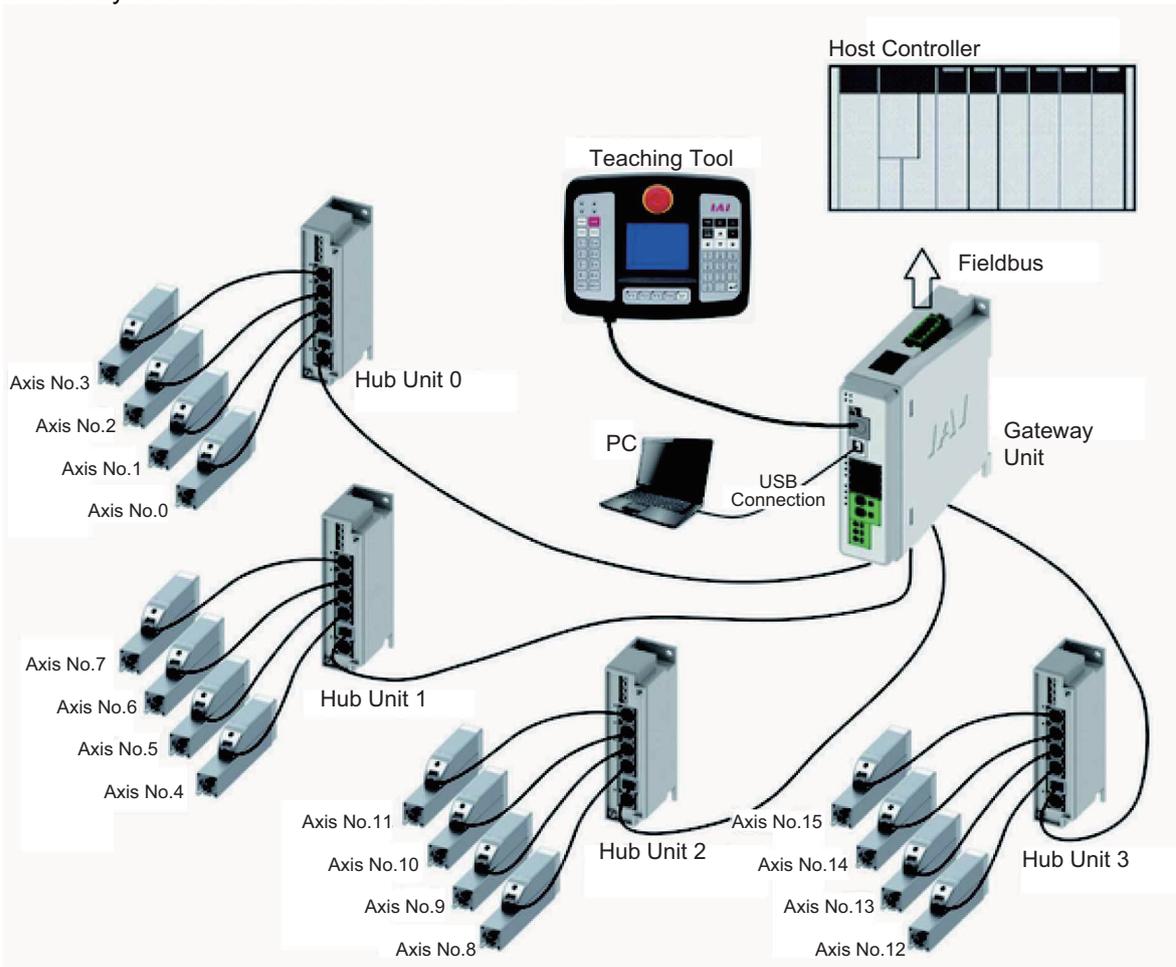
RCP6S Fieldbus Communication

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.

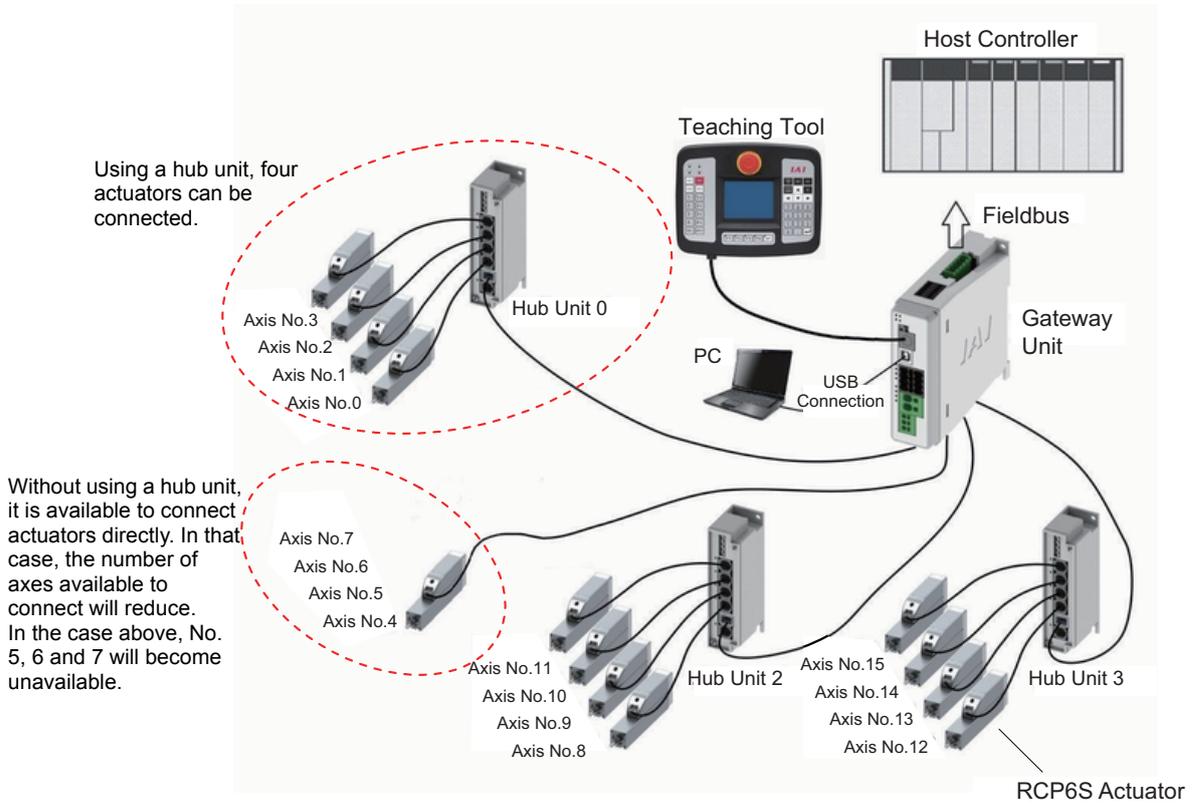


There is a switch equipped to a hub unit for brake release so brake release work can be conducted near the actuator. Also, assuming that actuators could be connected to the gateway unit directly, there are external power input type brake release input terminal blocks equipped to each channel.

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.

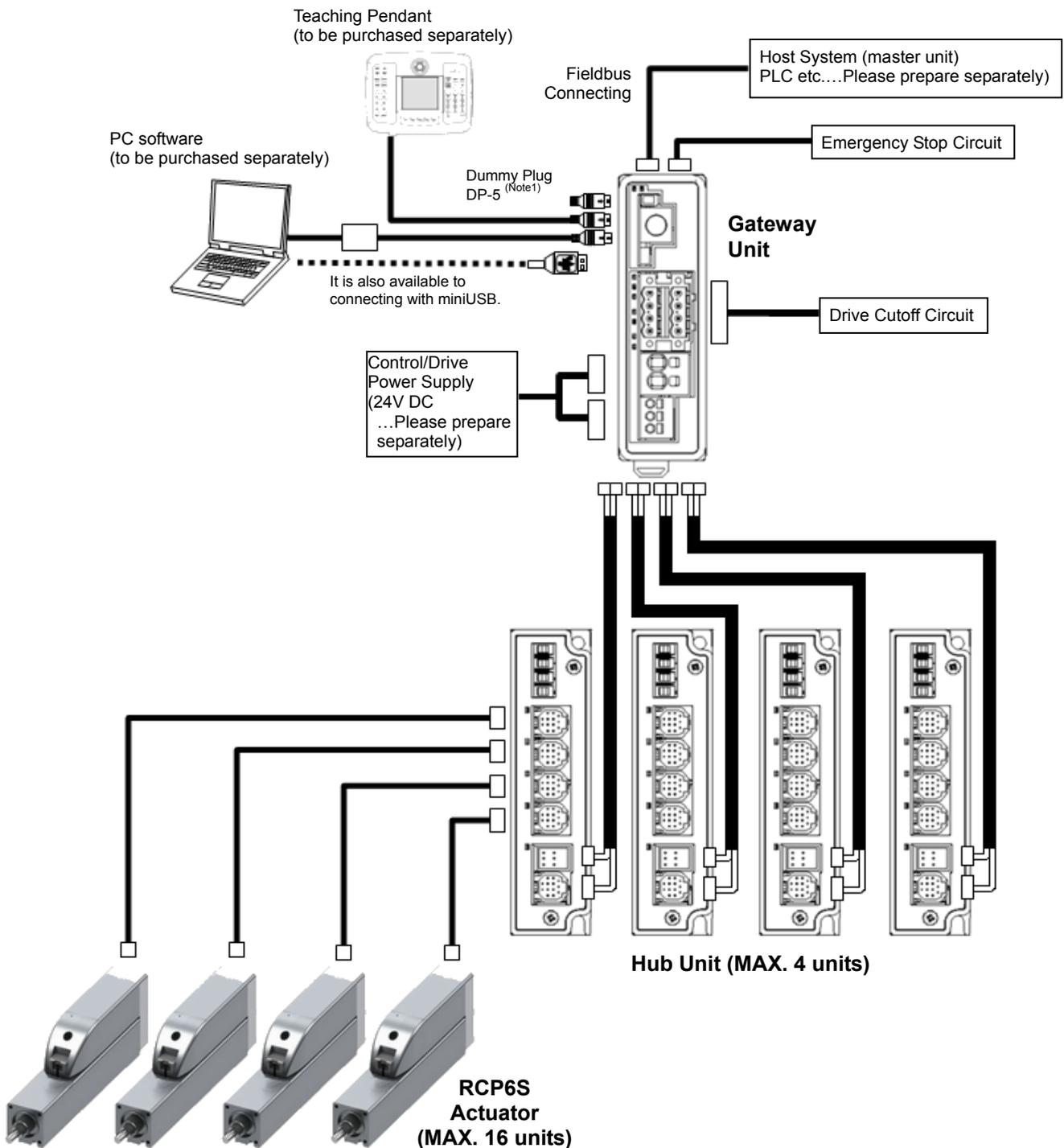
RCP6S Fieldbus Communication

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.



RCP6S Fieldbus Communication

2.1 Wiring Diagram (Connection of Construction Devices)



Caution: Make sure to turn the power to the gateway unit OFF when inserting or removing the connector that connects the PC software or gateway unit to the controller. Inserting or removing the connector while the power is turned ON causes a gateway unit failure.

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.

RCP6S Fieldbus Communication

2.2 Circuit Diagram

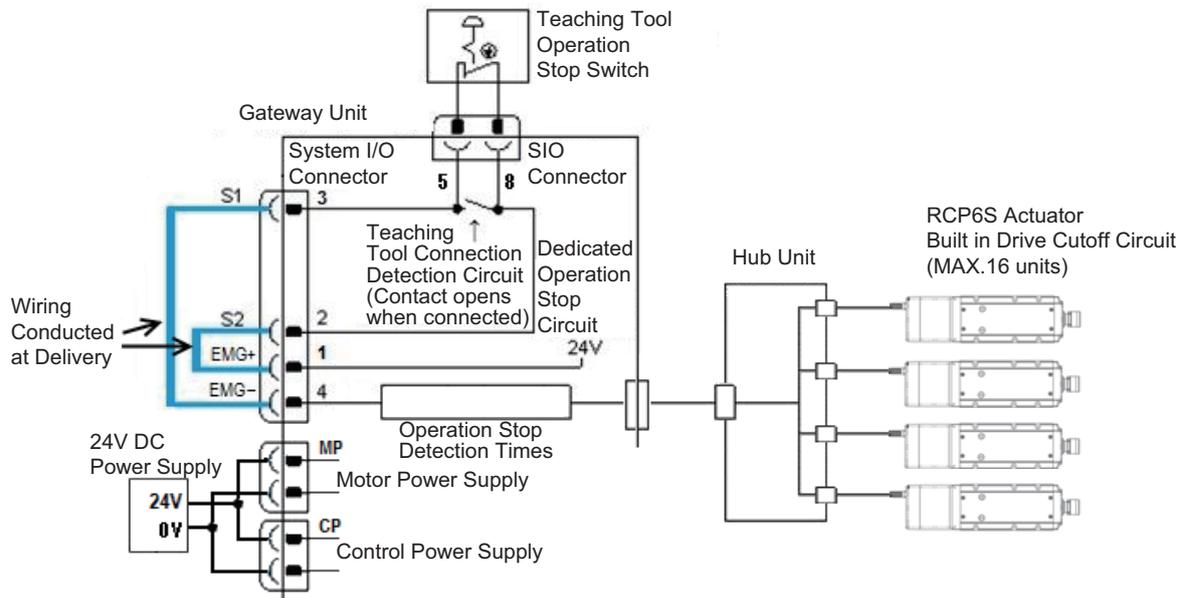
[1] Power Supply and Emergency Stop

As an example of a circuit, cases of 4 conditions are shown.

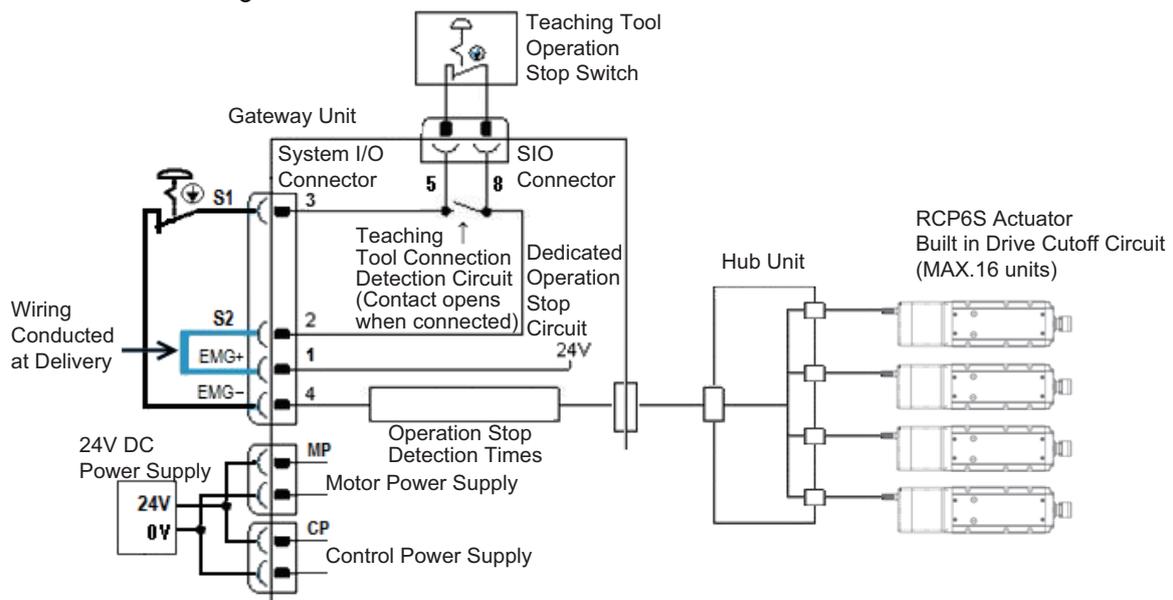
Select from 3) or 4) for RCM-P6GWG type.

- 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

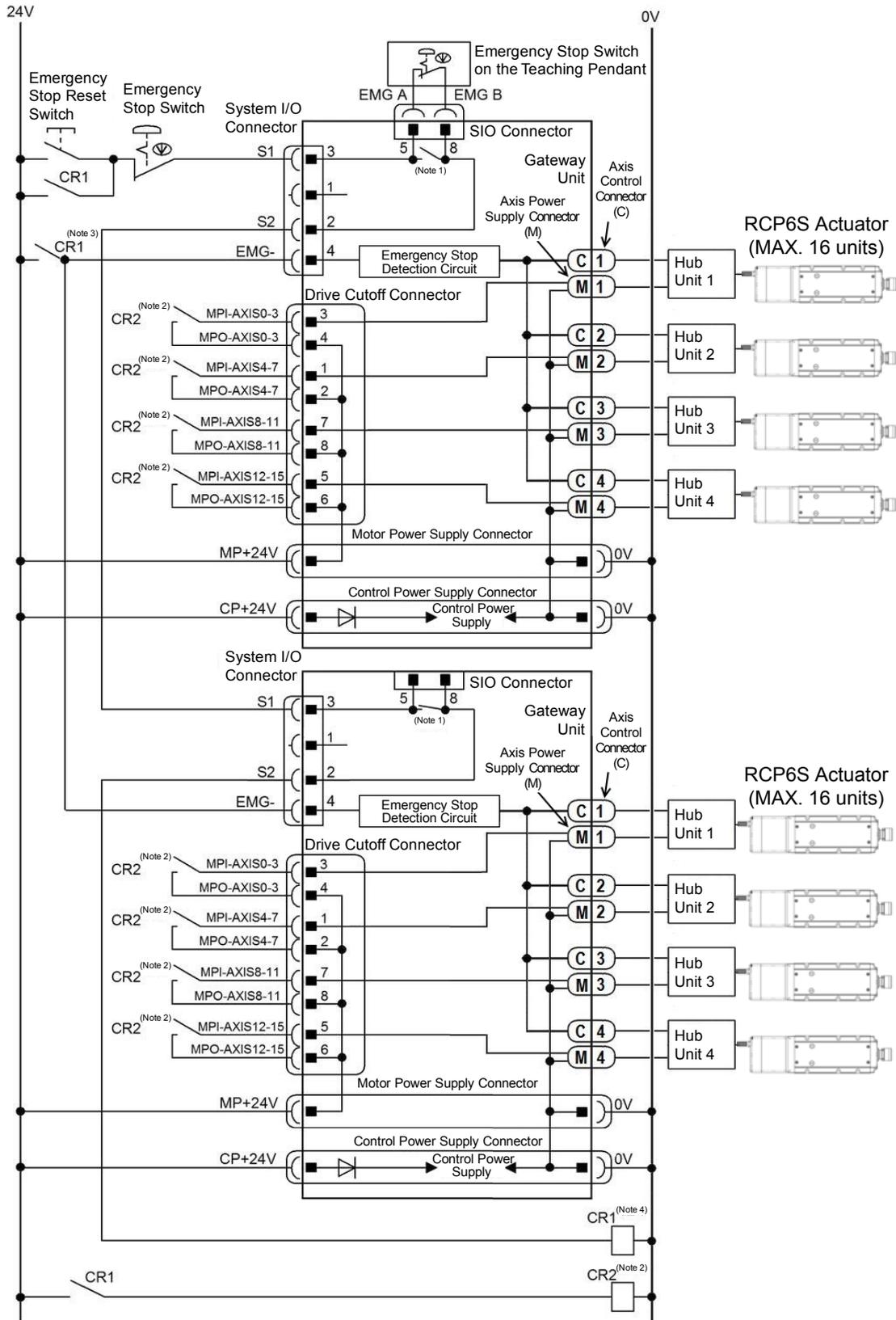


2) Example of wiring to drive an actuator by activating devices and emergency stop input (EMG-) from a teaching tool



RCP6S Fieldbus Communication

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



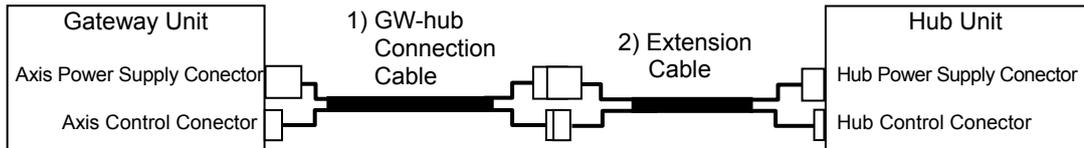
Check in the previous page for Note 1 to 4.

RCP6S Fieldbus Communication

[2] Connection Cable

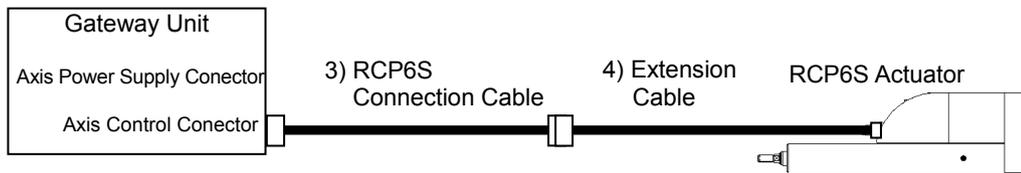
In order to operate the RCP6S actuator with each fieldbus, it is necessary to connect it to the gateway unit or the hub unit. Use RCP6S connection cable in case of connecting to either unit. Also, use the gateway – hub connection cable to connect the hub unit to the gateway unit. There is an extension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

1) Connection to RCP6S Gateway Unit and Hub Unit



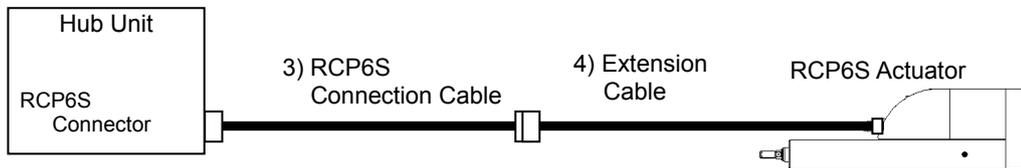
* Extension Cable is utilize these holes if necessary.

2) Connection to RCP6S Gateway Unit and RCP6S



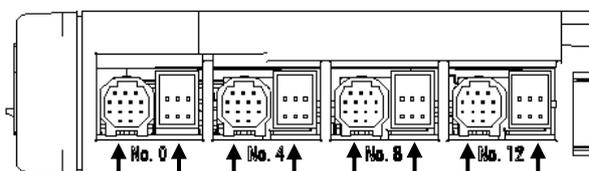
* Extension Cable is utilize these holes if necessary.

3) Connection to RCP6S Hub unit and RCP6S



* Extension Cable is utilize these holes if necessary.

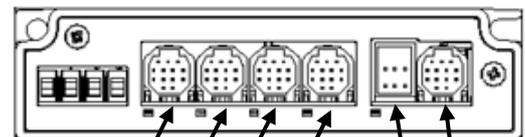
Gateway Unit (Bottom surface)



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)
<p>Hub Unit Side Hub Unit Connector: J11DF-06V-KX Connector: DF62C-13S-2.2C</p> <p>Wire Diameter of Motor Cable: AWG18 Cable Diameter: $\phi 9$ 1m, 3m, 5m and 10m are prepared in standard</p> <p>GW Unit Side Connector: J11DF-06V-KX Connector: DF62C-13S-2.2C</p>			

2)	Gateway-Hub Connection Cable	CB-RCP6S-RLY□□□-JY1	Max. 10m (Note 1)
<p>Hub Unit Side Hub Unit Connector: J11DF-06V-KX Connector: DF62C-13S-2.2C</p> <p>Wire Diameter of Motor Cable: AWG18 Cable Diameter: $\phi 9$ 1m, 3m and 5m are prepared in standard</p> <p>GW Unit Side Connector: J11DFW-06V-KX Connector: DF62B-13EP-2.2C</p>			

3)	RCP6S Connection Cable	CB-RCP6S-PWBIO□□□	Max. 20m (Note 2)
<p>Actuator Side Connector: DF62C-13S-2.2C</p> <p>Wire Diameter of Motor Cable: AWG22 (when below 5m), AWG18 (when 5m and above) Cable Diameter: $\phi 7$ (when below 5m), $\phi 8$ (when 5m and above)</p> <p>Connector Unit Side GW Unit, Hub Unit Connector: DF62C-13S-2.2C</p>			

4)	RCP6S Extension Cable	CB-RCP6S-PWBIO□□□-JY1	Max. 20m (Note 2)
<p>Actuator Side Connector: DF62B-13EP-2.2C</p> <p>Wire Diameter of Motor Cable: AWG18 Cable Diameter: $\phi 8$ 1m, 3m and 5m are prepared in standard</p> <p>Connector Unit Side GW Unit, Hub Unit Connector: DF62C-13S-2.2C</p>			

Note 1 The maximum length should be 10m between the gateway and hub unit.

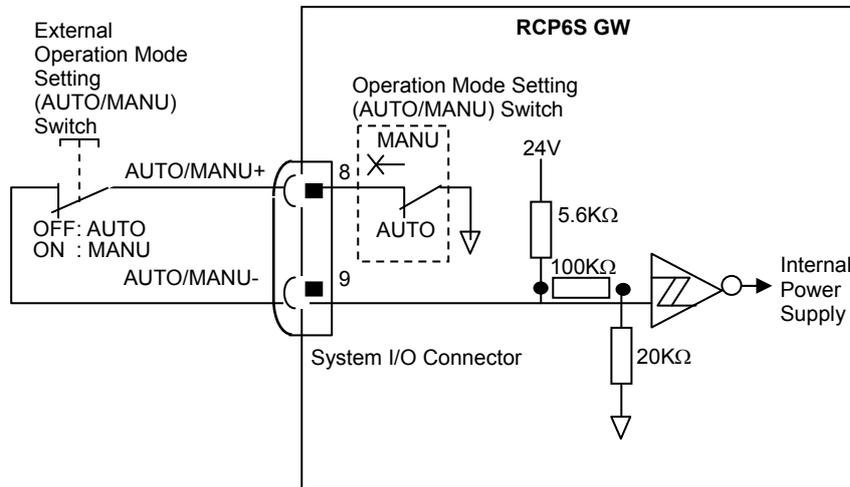
Note 2 The maximum length should be 20m from the gateway unit to RCP6S regardless of a hub unit is used or not used.

RCP6S Fieldbus Communication

[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.

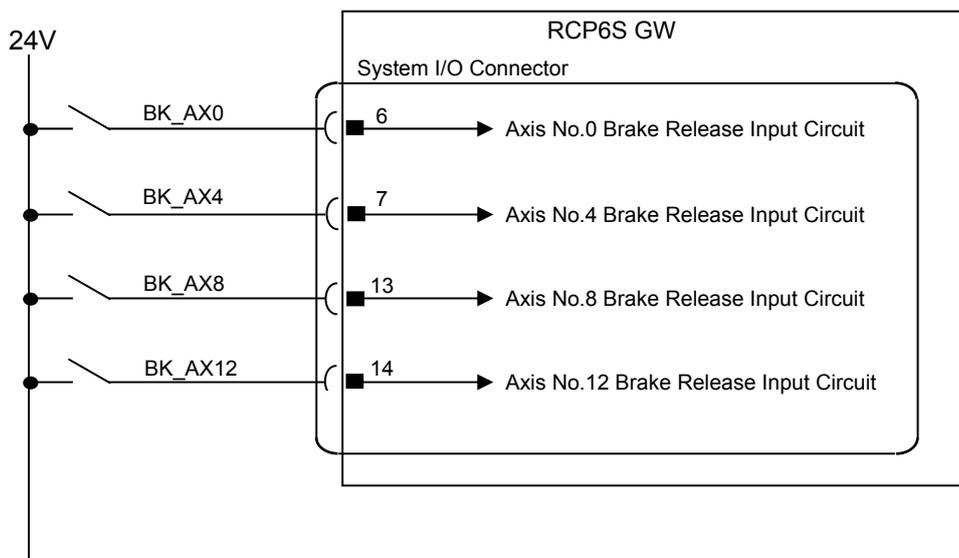
If not switching externally, apply a jumper on AUTO/MANU + terminal and AUTO/MANU – terminal.



[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.

It is the brake release of the RCP6S actuator 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.

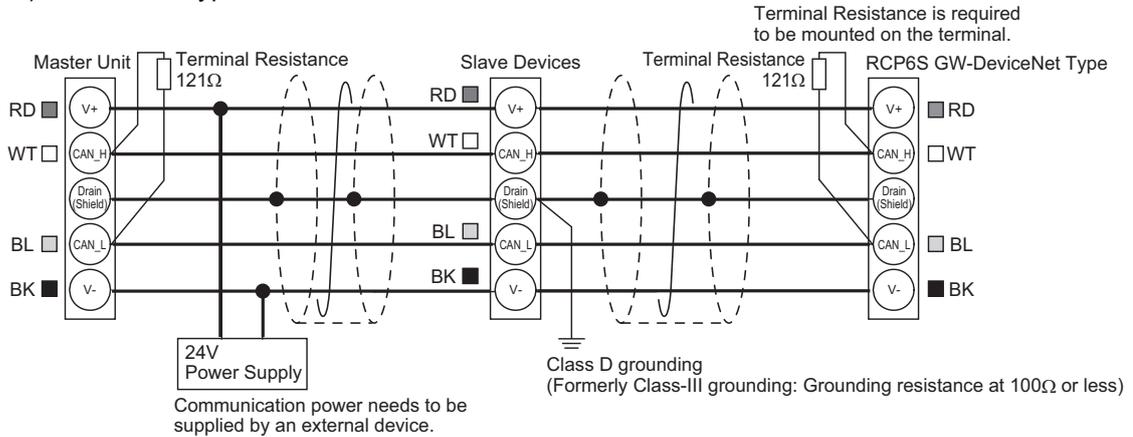
Even if the main power supply on the controller is not turned on, brake release is available if the control power on the RCP6S gateway unit is supplied.

RCP6S Fieldbus Communication

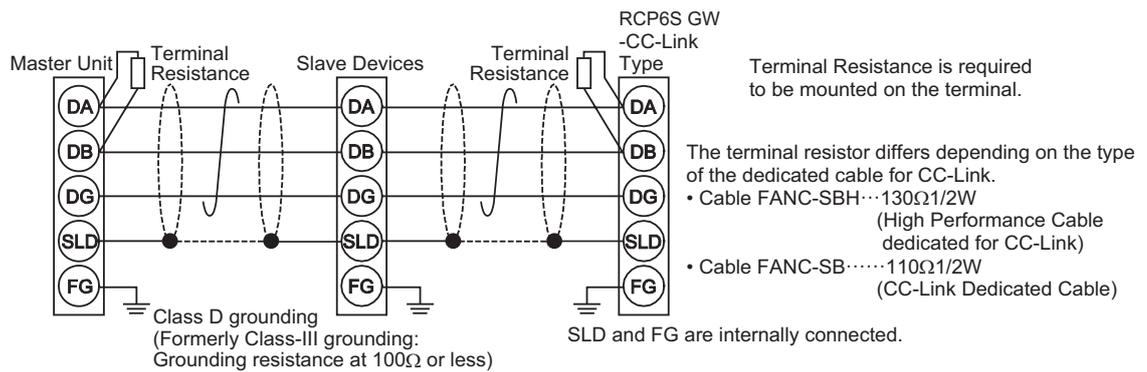
[5] Wiring Layout for Fieldbus

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

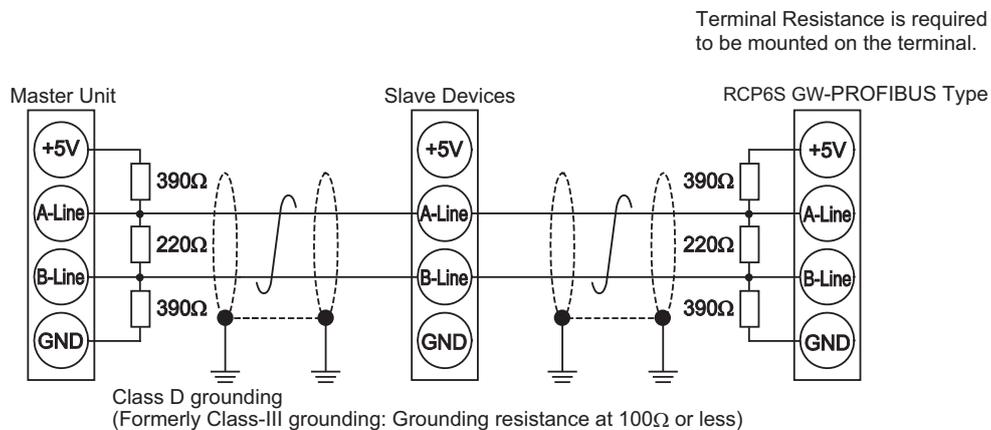
1) DeviceNet Type



2) CC-Link Type

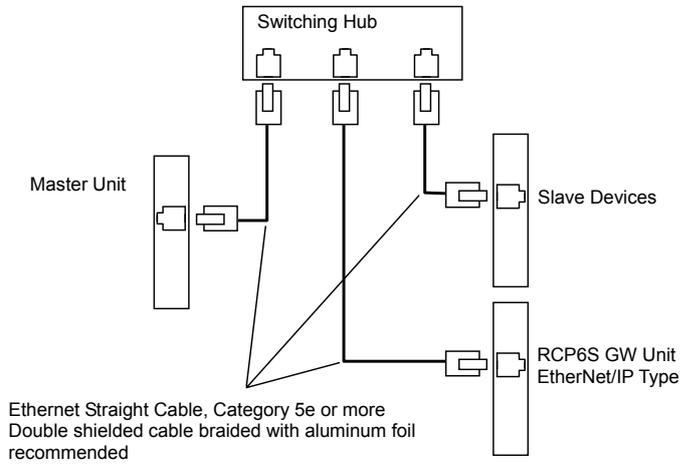


3) PROFIBUS-DP Type

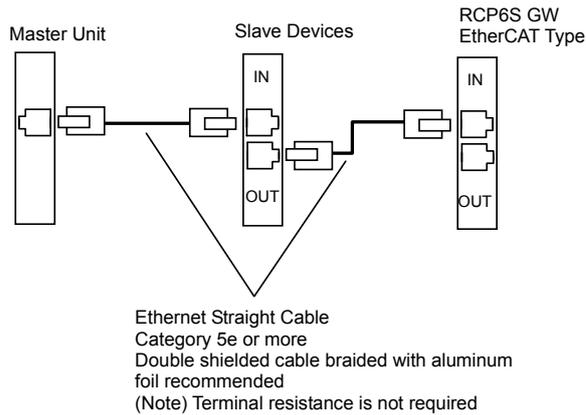


RCP6S Fieldbus Communication

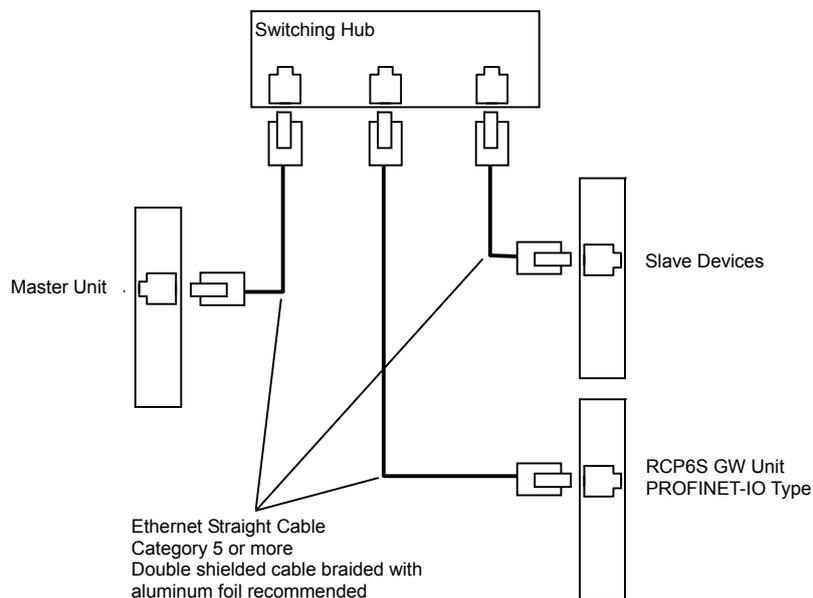
4) EtherNet/IP Type



5) EtherCAT Type



6) PROFINET-IO Type



RCP6S Fieldbus Communication

2.3 Wiring Method (Gateway Unit)

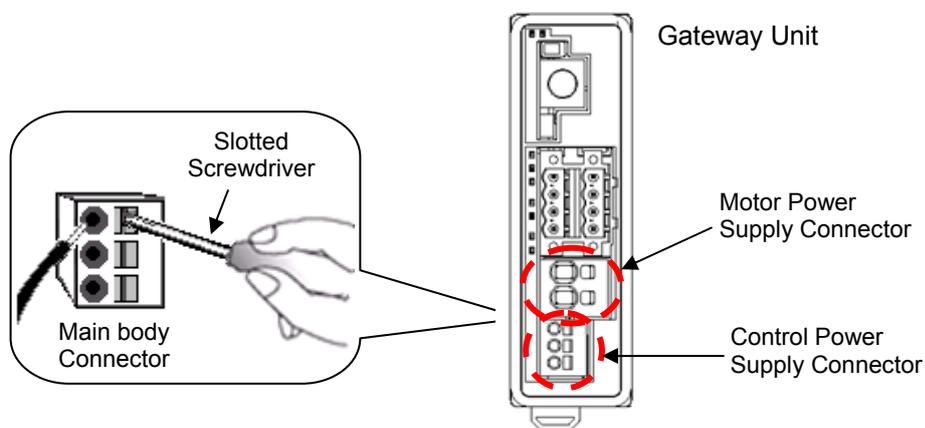
2.3.1 Connection to Power Input Connector

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.

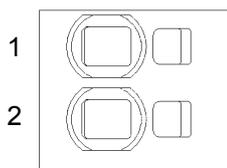
[How to Insert]

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



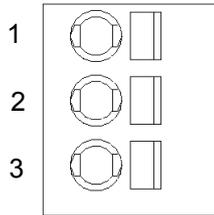
Connector model: SPT5/2-H-7.5-ZB (Manufactured by PHOENIX CONTACT)

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" (*). * It is no problem to calculate the current consumption using the rated value.
2	GND	0V Input	

(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] Control Power Supply Connector



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)

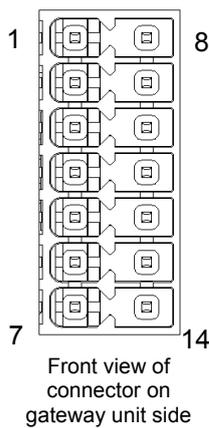
(Note) If supplying power with using a 24V DC, having it turned ON/OFF, keep the 0V connected and have the +24V supplied/cut (cut one side only).

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.



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	

RCP6S *Fieldbus Communication*

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.

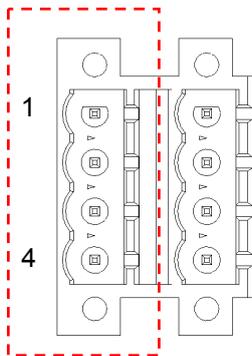
Output 24V DC externally from MPO, and put it back from MPI to GW unit via the relay contact. The motor power which was in common for all the axes will be spread at this connector to each channel (AXIS0 to 3, 4 to 7, 8 to 11 and 12 to 15). It is also available to input the motor power directly to each 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.

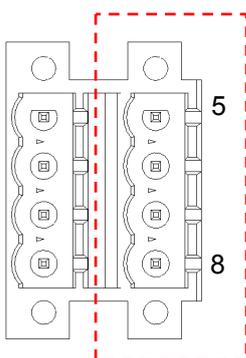
Once the cable is inserted, take the slotted screwdriver OFF the protrusion to fix the cable to the terminal.



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	

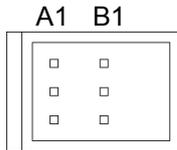
RCP6S Fieldbus Communication

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.



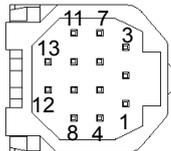
Front view of connector on gateway unit side

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.



Front view of connector on gateway unit side

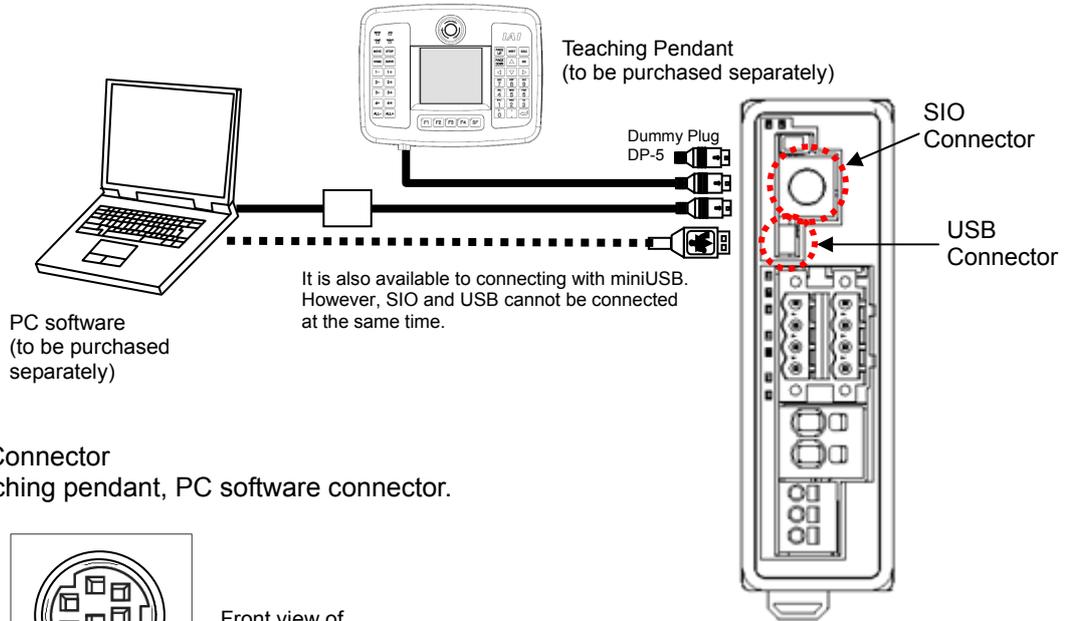
Connector Name	Axis Control Connector	
Cable Side	DF62C-13S-2.2C	Manufactured by Hirose Electric Co., Ltd.
Gateway Unit Side	DF62-13P-2.2DS	Manufactured by Hirose Electric Co., Ltd.

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	

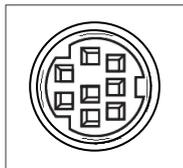
RCP6S Fieldbus Communication

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).



[1] SIO Connector
 Teaching pendant, PC software connector.



Front view of connector on gateway unit side

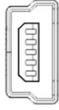
Connector Name	SIO Connector	Remarks
Cable Side	miniDIN 8Pin	
Gateway Unit Side	TCS7587-0121077	

Pin No.	Signal Name	Description	Applicable Cable Diameter
1	SGA	Teaching Tool Signal +	Cable dedicated for IAI products
2	SGB	Teaching Tool Signal -	
3	5V	For Teaching Tool Power Supply	
4	ENB	Enable Signal Input	
5	EMGA	Emergency Stop Signal A	
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	USB Cable
2	D-	Communication Data -	
3	D+	Communication Data +	
4	NC	Disconnected	
5	GND	0V	
Shell	GND	0V	



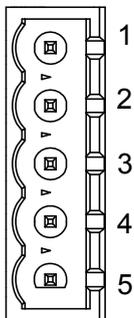
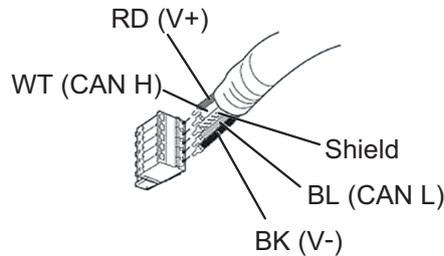
- Caution:**
- 1) Set "Operation Mode Setting Switch" to "MANU" side when a teaching device is connected.
 - 2) Turn the power off before disconnecting a teaching pendant.
 - 3) SIO and USB cannot be connected at the same time. USB connector is prioritized.
 - 4) When using the USB connector for the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

RCP6S *Fieldbus Communication*

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



Front view of connector on gateway unit side

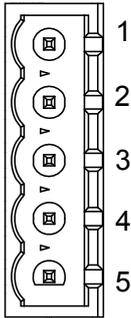
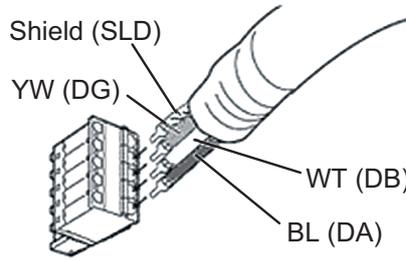
Connector Name	DeviceNet Connector	
Cable Side	MSTB2.5/5-STF-5.08 AU M	Enclosed in standard package Manufactured by PHOENIX CONTACT
Gateway Unit Side	MSTB2.5/5-GF-5.08 AU	

Pin No.	Signal Name (Color)	Description	Applicable Cable Diameter
1	V- (Black)	Power Supply Cable - Side	Dedicated cable for DeviceNet
2	CAN L (Blue)	Communication Data Low Side	
3	Shield (None)	Shield	
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.]

RCP6S Fieldbus Communication

2) CC-Link Type



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	

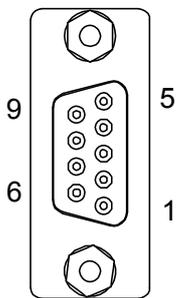
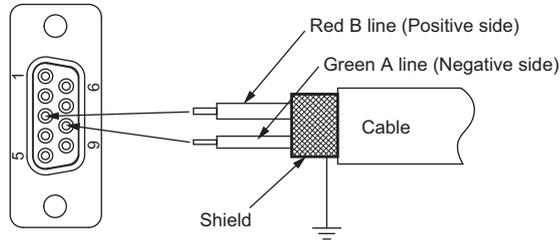
Pin No.	Signal Name (Color)	Description	Applicable Cable Diameter
1	DA (Blue)	Communication Line A	Dedicated cable for CC-Link
2	DB (White)	Communication Line B	
3	DG (Yellow)	Digital GND	
4	SLD	Connect the shield of the shielded cable (Connect the FG of the 5 pins and controller FG internally)	
5	FG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

RCP6S Fieldbus Communication

3) PROFIBUS-DP Type

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



Front view of connector on gateway unit side

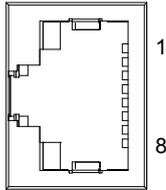
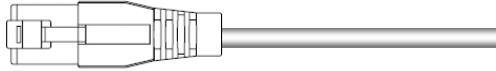
Connector Name	PROFIBUS-DP Connector	
Cable Side	9-Pin D Sub Connector (Male)	Please prepare separately
Gateway Unit Side	9-Pin D Sub Connector (Female)	

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.]

RCP6S Fieldbus Communication

4) EtherNet/IP Type

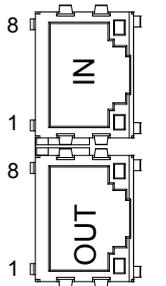
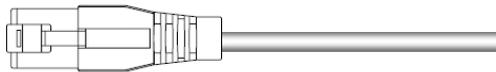


Front view of connector on gateway unit side

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	

5) EtherCAT Type



Front view of connector on gateway unit side

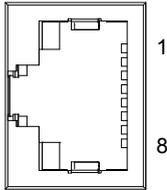
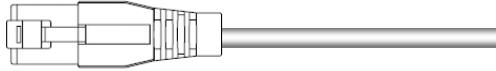
Connector Name	EtherCAT Connector	
Cable Side	8P8C Modular Plug	Please prepare separately
Gateway Unit Side	8P8C Modular Jack	

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	

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

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6) PROFINET-IO Type



Front view of connector on gateway unit side

Connector Name	PROFINET 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 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	

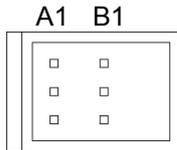
RCP6S Fieldbus Communication

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.



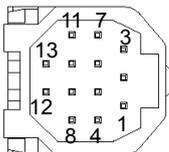
Front view of connector on hub unit side

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	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) 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.



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.

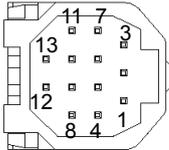
Pin No.	Signal Name	Description	Applicable Cable Diameter
1	CP	Control Power Supply DC24V	Cable dedicated for IAI products
2	AM_SD-	Serial Communication Line For Automonitor -	
3	CT_SD-	Control Serial Communication Line -	
4	BK	Brake Release	
5	EMGS	Emergency Stop Status	
6	AM_SD+	Serial Communication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

RCP6S Fieldbus Communication

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.



Front view of connector on hub unit side

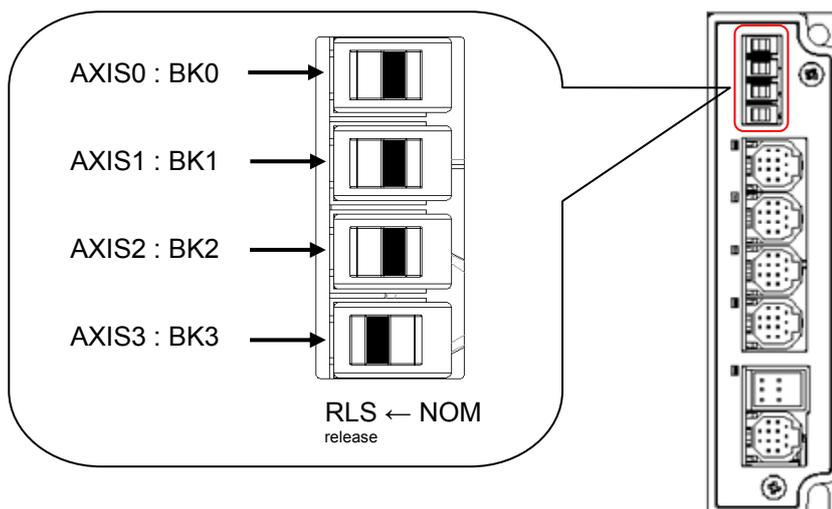
Connector Name	Axis Control Connector	
Cable Side	DF62C-13S-2.2C	Manufactured by Hirose Electric Co., Ltd.
Hub Unit Side	DF62-13P-2.2DS	Manufactured by Hirose Electric Co., Ltd.

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



RCP6S *Fieldbus Communication* --- ---

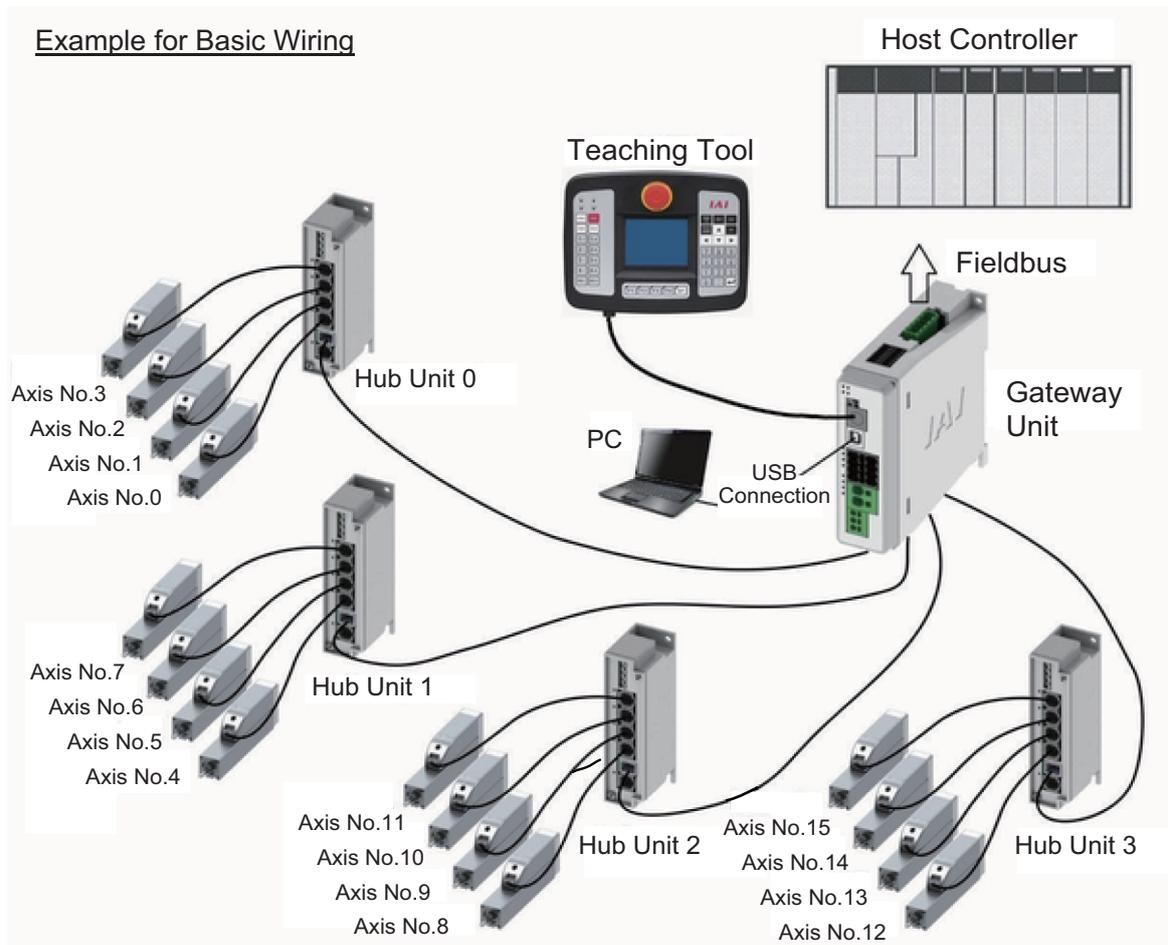
RCP6S Fieldbus Communication

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.



RCP6S Fieldbus Communication

[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 7 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.

RCP6S Fieldbus Communication

- 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.	

RCP6S Fieldbus Communication

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

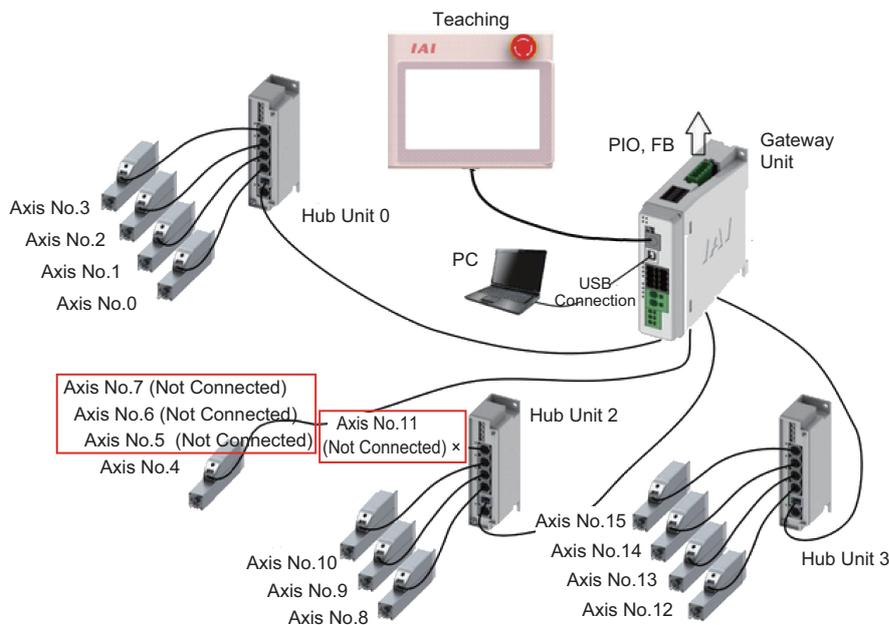
There are axis numbers allocated in advance on the gateway unit slot and the hub unit slot. The relation between the axis number and the PLC address domain differs as stated below depending on the fieldbus I/O domain left-justification setting feature (hereafter stated as the left-justification setting 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
Axis No.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		PLC Address Area Gateway Unit + Command Area	
Axis No.0	Invalid	Axis No.0 area	Connection
Axis No.1	Invalid	Axis No.1 area	Connection
Axis No.2	Invalid	Axis No.2 area	Connection
Axis No.3	Invalid	AxisNo.3 area	Connection
Axis No.4	Invalid	Axis No.4 area	Connection
Axis No.5	Valid	Axis No.8 area	Connection
Axis No.6	Valid	Axis No.9 area	Connection
Axis No.7	Valid	Axis No.10 area	Connection
Axis No.8	Invalid	Axis No.12 area	Connection
Axis No.9	Invalid	Axis No.13 area	Connection
Axis No.10	Invalid	Axis No.14 area	Connection
Axis No.11	Valid	Axis No.15 area	Connection
AxisNo.12	Invalid	-	Unoccupied
Axis No.13	Invalid	-	Unoccupied
Axis No.14	Invalid	-	Unoccupied
Axis No.15	Invalid	-	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		PLC Address Area Gateway Unit + Command Area	
Axis No.0	Invalid	Axis No.0 area	Connection
Axis No.1	Invalid	Axis No.1 area	Connection
Axis No.2	Invalid	Axis No.2 area	Connection
Axis No.3	Invalid	AxisNo.3 area	Connection
Axis No.4	Invalid	Axis No.4 area	Connection
Axis No.5	Valid	Axis No.8 area	Connection
Axis No.6	Valid	Axis No.9 area	Connection
Axis No.7	Valid	Axis No.10 area	Connection
Axis No.8	Invalid	Axis No.11 area	Unoccupied
Axis No.9	Invalid	Axis No.12 area	Connection
Axis No.10	Invalid	Axis No.13 area	Connection
Axis No.11	Invalid	Axis No.14 area	Connection
AxisNo.12	Invalid	Axis No.15 area	Connection
Axis No.13	Invalid	-	Unoccupied
Axis No.14	Invalid	-	Unoccupied
Axis No.15	Invalid	-	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)”.

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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.

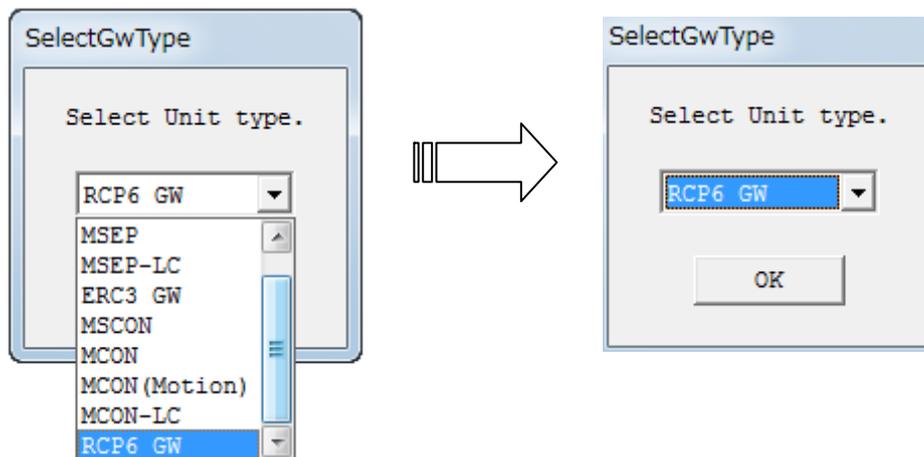
Shown below is the process for the setup. Follow the instruction to conduct the setting properly. Refer to [3.8 About Gateway Parameter Setting Tool] for details.

(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 1. 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".



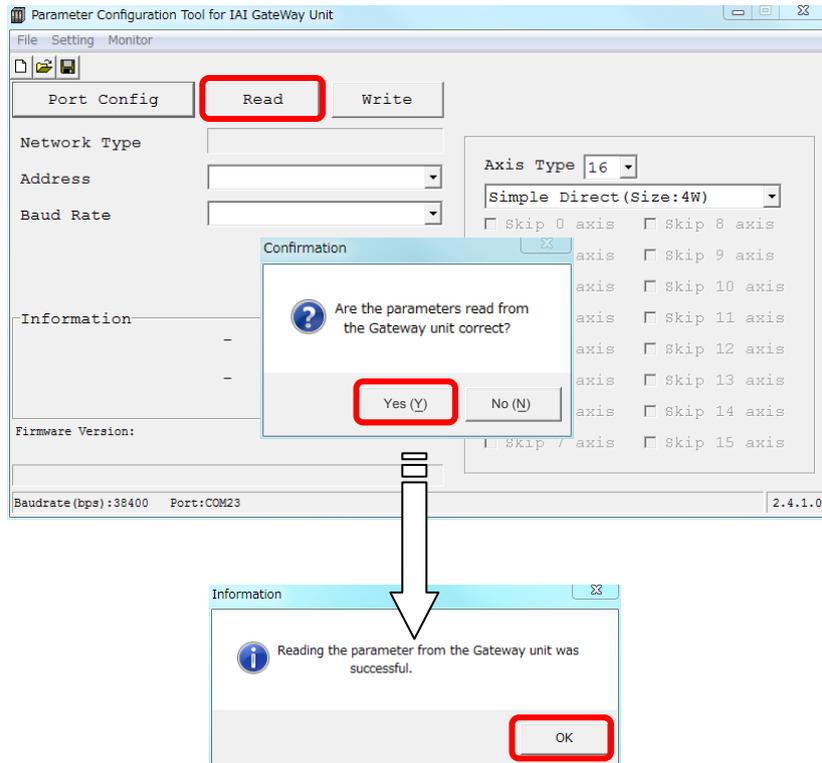
RCP6S Fieldbus Communication

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



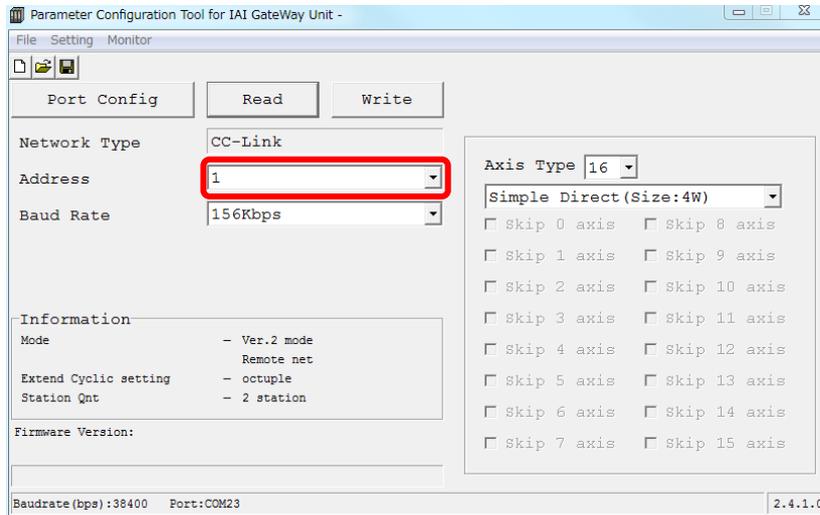
Main windows (Initial condition)

[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”.



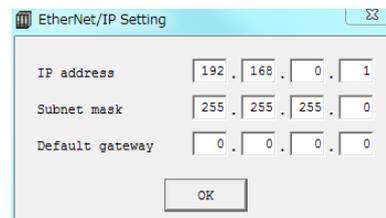
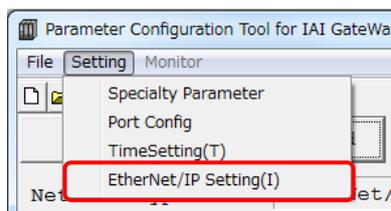
RCP6S Fieldbus Communication

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



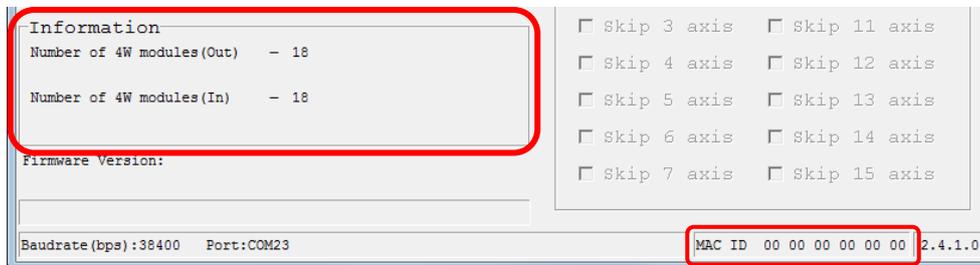
Caution:
In the following slave, set the value the number of occupied station is added to the current station number.

[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.

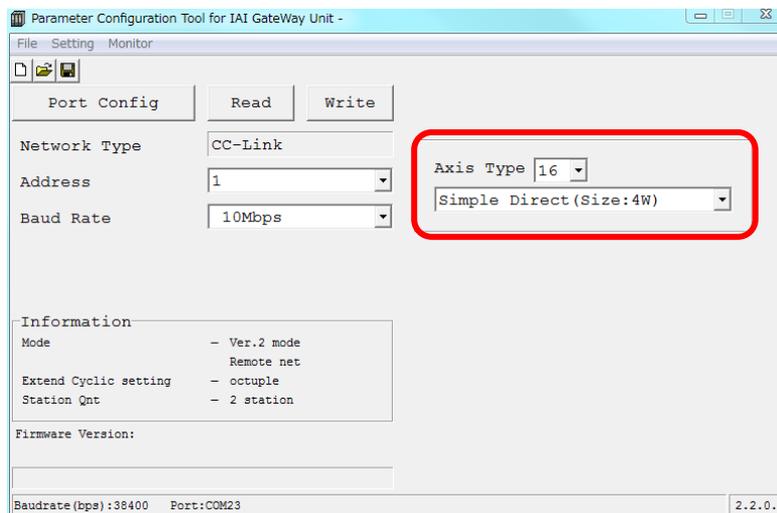


RCP6S Fieldbus Communication

[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.



[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.



Maximum Connectable Axes

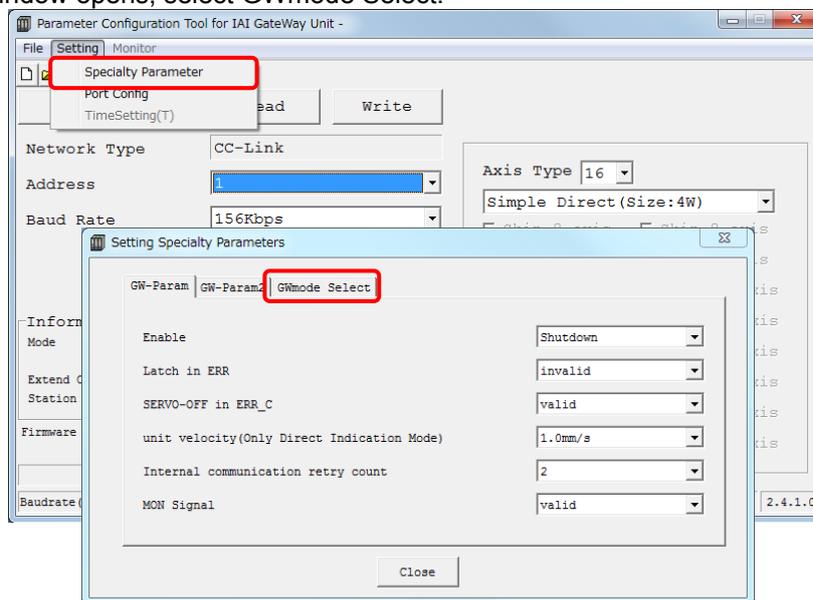
Fieldbus \ Mode	Direct Number Indication Mode	Simple Direct Mode	Positiner 1 Mode	Positiner 2 Mode	Positiner 3 Mode	Positiner 5 Mode
CC-Link	16 axes	16 axes	16 axes	16 axes	16 axes	16 axes
DeviceNet	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
PROFIBUS-DP	8 axes	16 axes	16 axes	16 axes	16 axes	16 axes
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

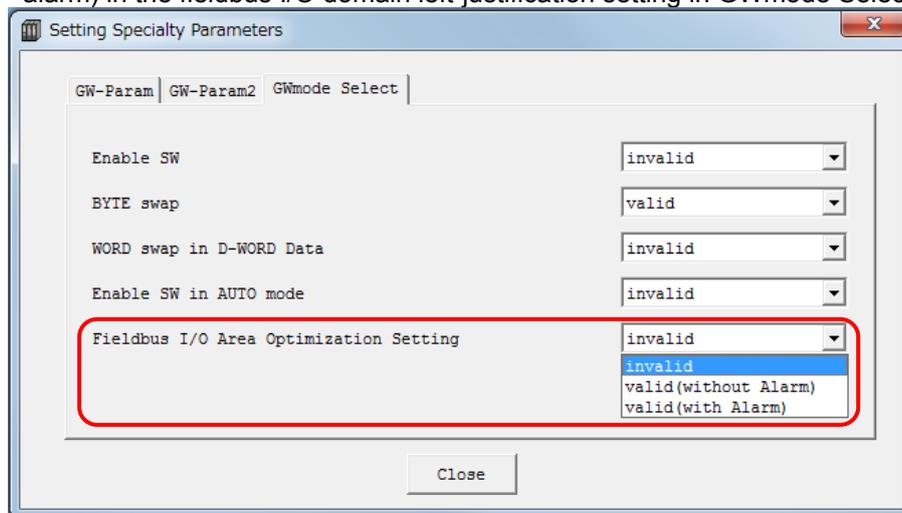
- When Left-Justification Setting Feature Used
 The maximum connectable number of axes should be eight (PLC address: Axis No. 0 Domain to Axis No. 7 Domain).
- When Left-Justification Setting Feature Not To Be Used
 The maximum connectable number of axes should be eight when two units of hub unit are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

RCP6S Fieldbus Communication

[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

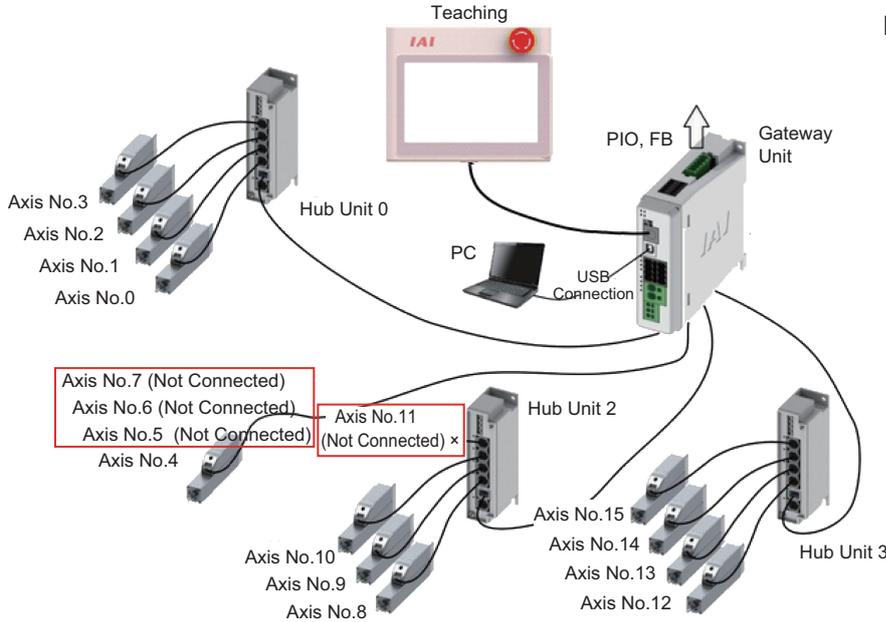
livalid	Left-justification setting feature is not to be used.
Valid (without Alarm)	Left-justification setting feature is to be used. An alarm will not be output when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status.
Valid (with 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.

RCP6S Fieldbus Communication

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

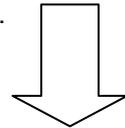
(Example for Connection) When Axis No. 5, 6, 7 and 11 are not connected;



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

Axis Type [16]

Simple Direct (Size:4W)

Skip 0 axis Skip 8 axis
 Skip 1 axis Skip 9 axis
 Skip 2 axis Skip 10 axis
 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

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

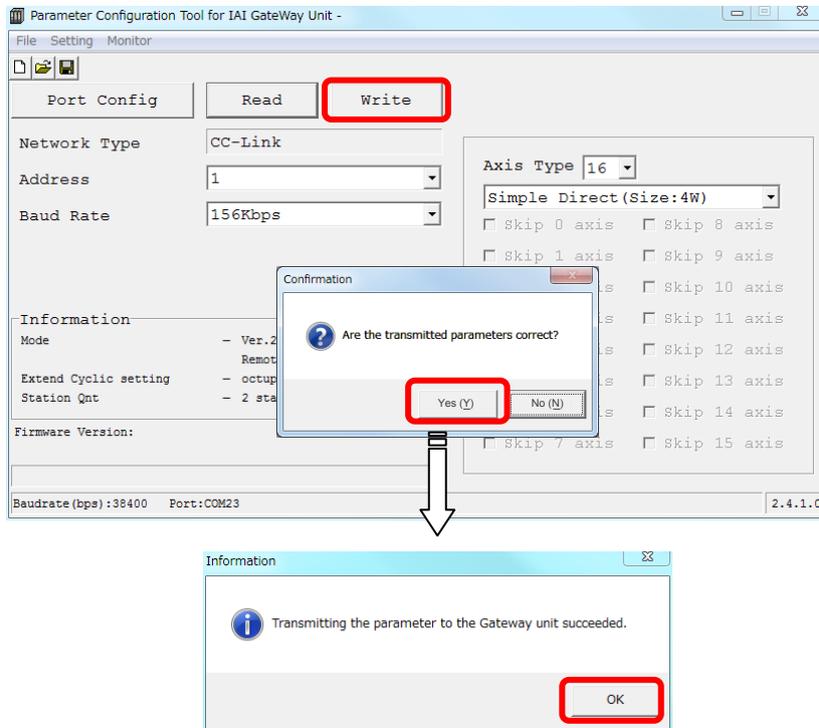
After Left-Justification Setting

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

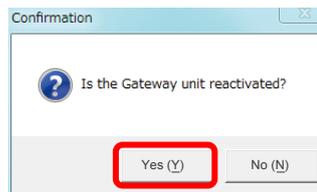
Caution: It is available to put a check mark to axes which are connected. In that case, the PLC address domain for the axis with a check mark will be removed, and the next axis and behind are to be left-justified. Be careful not to put an unexpected check mark accidentally.

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- [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 application 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 teaching 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 7 Parameter for the parameter types and the details.

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)	2)	3)	4)	5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	
No.	Position [mm]	Velocity [mm/s]	Acceleration [G]	Deceleration [G]	Pressing [%]	Threshold [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/Deceleration mode	Incremental	transported load	Stop mode	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															

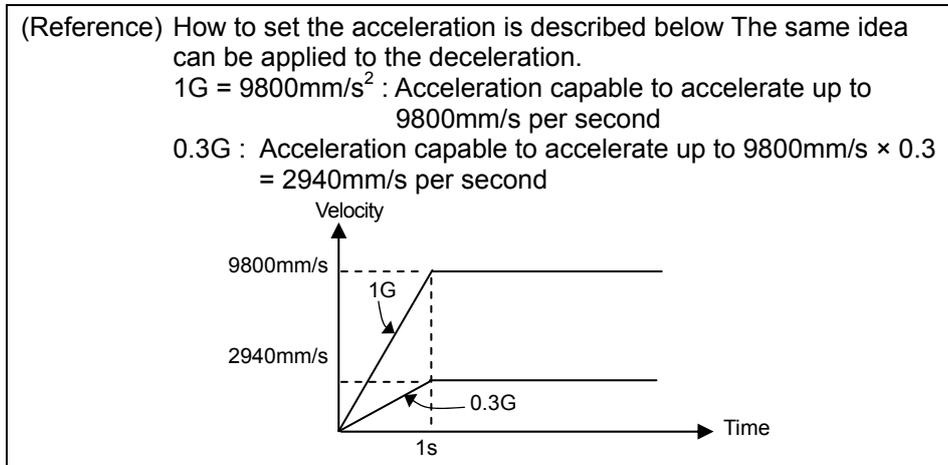
- 1) Position No. It is the number commanded by PLC in operation command.

 **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.
- 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.

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



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.

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.

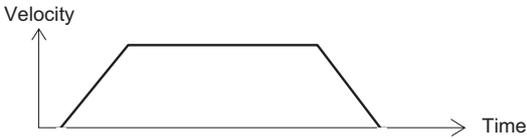
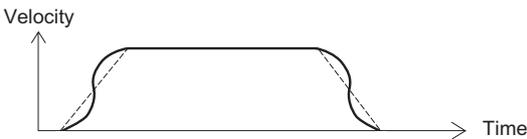
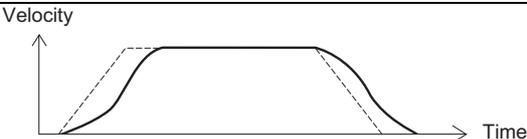
7) Threshold [%] ····· Set the threshold value of the pressing torque in %. If the torque (load current) becomes larger than this setting value during pressing, the detection signal is output. This feature is used to monitor the load current and judge whether the operation is good or not in such an operation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

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- 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	
1	S-shaped Motion (Refer to Caution at S-shaped Motion)	 <p>Set the S-motion rate with parameter No.56.</p>
2	First-Order Delay Filter (Refer to Caution at First-order Delay Filter)	 <p>Set the delay time constant with parameter No.55.</p>

 **Caution at S-shaped Motion:**

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

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.

- 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) 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.
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

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- 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.

Set Value	Operation after Positioning Complete
0	Keep the servo ON
1	Automatic servo OFF in a certain time (Parameter No. 36 set values)
2	Automatic servo OFF in a certain time (Parameter No. 37 set values)
3	Automatic servo OFF in a certain time (Parameter No. 38 set values)

 **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. Not for Use. Do not attempt to establish setting.

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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)
	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			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.

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• 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	Assignment Area for Axis 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.

RCP6S Fieldbus Communication

3.4.2 Gateway Control Signals (Common for All Operation Modes)

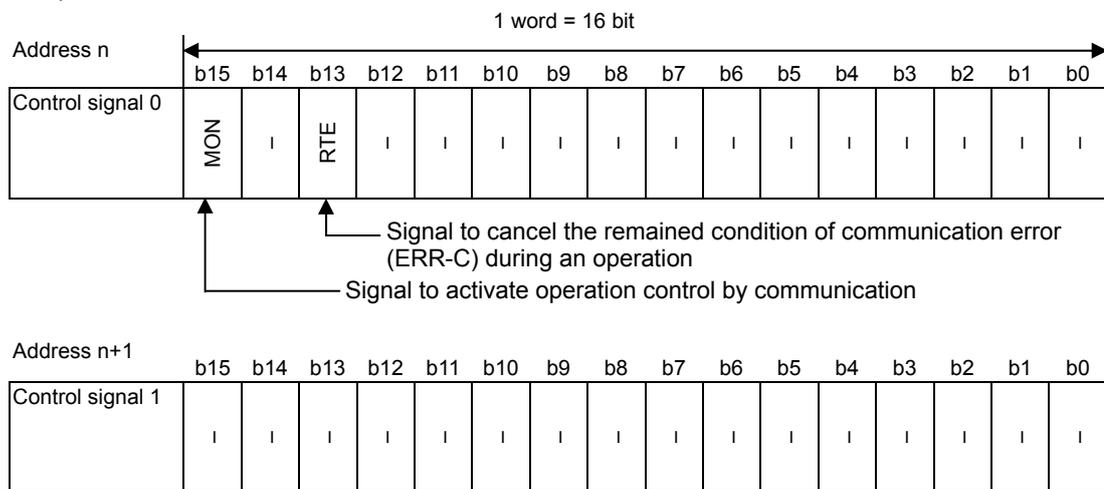
When operating the system with Fieldbus, the axes are controlled via Gateway of RCP6S. The top 2 words of input and output in each operation mode are the signals gateway control and status monitoring.

(n is the top word address for each PLC input and output between RCP6S GW and PLC)

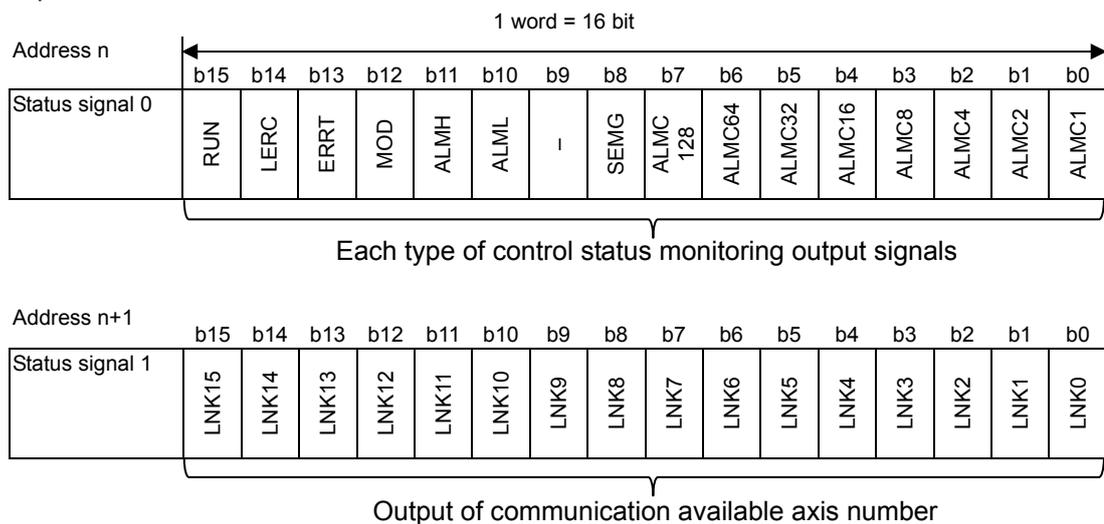
PLC → RCP6S GW (PLC Output)		RCP6S GW → PLC (PLC Input)	
Control Signal 0	n	Status Signal 0	n
Control Signal 1	n+1	Status Signal 1	n+1

(1) PLC I/O Signal

PLC Output



PLC Input



RCP6S Fieldbus Communication

(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 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. 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. (A wrong setting in the parameters can be considered. Check the parameters settings.)	-				
		b10	ALML	This signal turns ON when a light error caused by the Gateway is occurred. (It is considered that there shall be a loss of the calendar data. Check the parameters settings.)	-				
		b9	-	Cannot be used.	-				
		b8	SEMG	This signal turns ON when EMGIN input of the system I/O connector is OFF (emergency stop). When this bit is turned ON, all the connected axes get in the emergency stop.	-				
		b7	ALMC 1 to 128	It is an output of an alarm code caused by the Gateway. [Refer to Gateway alarm codes in Chapter 8 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. 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								

RCP6S Fieldbus Communication

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	○: Direct control △: Indirect control ×: Disabled	Remarks
Home-return operation	○	
Positioning operation	○	For those other than the target position, it is necessary to set the position data.
Speed and acceleration/ deceleration setting	△	These items must be set in the position data table.
Separate settings for acceleration and deceleration	△	
Pitch feed (incremental)	△	
Pressing operation	△	
Speed change during movement	△	
Pause	○	
Zone signal output	△	These items must be set in the parameters.
Position zone signal	△	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.]

RCP6S Fieldbus Communication

(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 the range of the soft stroke (0 to effective stroke length) 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: Set the operational condition in advance with using a teaching tool such as PC software in the position number to be used. Selecting a position number with no setting conducted will generate the alarm code 0A2 "Position Data Error".

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

		1 word = 16 bit															
Address m		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Lower word)																	
Address m+1		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Target Position (Upper word)																	
Address m+2		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+3		b15	b14	b13	b12	b11	b10	b9	b8	b7	b6	b5	b4	b3	b2	b1	b0
Control Signal		BKRL							JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR

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

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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

Signal Type	Bit	Symbol	Description	Details	
PLC Input	Current Position	32 bits	–	32-bit signed integer indicating the current position Unit: 0.01mm (Example) If +10.23mm, input 000003FF _H (1023 in decimal system). <i>(Note) Negative numbers are two's implement.</i>	3.7.2
	Completed Position No. (Simple Alarm Code)	16 bits	PM1 to PM512	16-bit integer The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, "0" is output. Read it by turning PEND Signal ON after movement. The simple alarm code (refer to Chapter 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 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	PZONE	Position zone 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. It is OFF when the servo is OFF.	3.7.1 [19]
		b7	ALML	Light error alarm output It turns ON when an overload warning or message level error is issued.	3.7.1 [21]
		b6	LOAD	Load Output Judgment: 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]		

RCP6S Fieldbus Communication

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	○: Direct control △: Indirect control ×: Disabled	Remarks
Home-return operation	○	
Positioning operation	△	These items must be set in the position data table.
Speed and acceleration/ deceleration setting	△	
Separate settings for acceleration and deceleration	△	
Pitch feed (incremental)	△	
Pressing operation	△	
Speed change during movement	△	
Pause	○	
Zone signal output	△	These items must be set in the parameters.
Position zone signal	△	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.]

RCP6S Fieldbus Communication

(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.		-	-	-	-	-	-	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	-	-	-	-	MODE	PWRT	JOG+	JOG-	JVEL	JISL	SON	RES	STP	HOME	CSTR

RCP6S Fieldbus Communication

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	MODES	WEND	MEND	ALML	LOAD	PSFL	SV	ALM	MOVE	HEND	PEND

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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

Signal Type	Bit	Symbol	Description	Details	
PLC Input	Current Position	32 bits	– 32-bit signed integer indicating the current position Unit: 0.01mm (Example) If +10.23mm, input 000003FF _H (1023 in decimal system). <i>(Note) Negative numbers are two's implement.</i>	3.7.2	
	Completed Position No. (Simple Alarm Code)	16 bits	PM1 to PM512 16-bit integer The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, "0" is output. Read it by turning PEND Signal ON after movement. The simple alarm code (refer to Chapter 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 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	PZONE	Position zone 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. It is OFF when the servo is OFF.	3.7.1 [19]
		b7	ALML	Light error alarm output It turns ON when an overload warning or message level error is issued.	3.7.1 [21]
		b6	LOAD	Load Output Judgment: 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]		

RCP6S Fieldbus Communication

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	○ : Direct control △ : Indirect control × : Disabled	Remarks
Home-return operation	○	
Positioning operation	○	
Speed and acceleration/ deceleration setting	○	
Separate settings for acceleration and deceleration	×	Values for acceleration and deceleration should be the same.
Pitch feed (Incremental)	○	
Pressing operation	○	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	○	
Pause	○	
Zone signal output	△	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.]

RCP6S Fieldbus Communication

(2) Input and Output Signal Assignment for each Axis

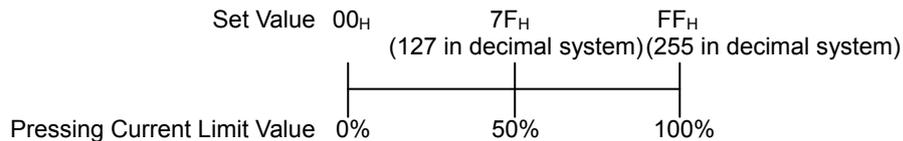
The I/O signals for each axis consists of 8-word for each I/O bit register.

- 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.



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

- Set the positioning width. The positioning width is expressed using 2-word (32 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.



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

- The command current is expressed using 2-word (32 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.

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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)	-	-	-	-	-	-	-	-	-	-	-	-	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	-	-	-	MEND	ALML	-	PSFL	SV	ALM	MOVE	HEND	PEND

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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

RCP6S Fieldbus Communication

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

Signal Type	Bit	Symbol	Description	Details	
PLC Input	Current Position	32 bits	–	32-bit signed integer indicating the current position Unit: 0.01mm (Example) If 10.23mm, input 000003FF _H (1023 in decimal system). <i>(Note) Negative numbers are two's implement.</i>	3.7.3
	Command Current	32 bits	–	32-bit integer The electrical current presently specified by a command is indicated. The setting unit is mA. This resistor makes an output in hexadecimal numbers. (Example) Reading: 000003FF _H = 1023 (Decimal number) = 1023mA	3.7.3
	Current Speed	16 bits	–	16-bit integer The current speed is indicated. Unit: 1.0mm/s or 0.1mm/s. A change of the unit is to be conducted on Gateway Parameter Setting Tool. (Example) Reading: 03FF _H = 1023 (Decimal number) = 1023mm/s <i>(Note) Negative numbers are two's implement.</i>	3.7.3
	Alarm Code	16 bits	–	16-bit integer The alarm code (refer to Chapter 8 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. It is OFF when the servo is OFF.	3.7.1 [19]
		b7	ALML	Light error alarm output 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]		

RCP6S *Fieldbus Communication*

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	○: Direct control △: Indirect control ×: Disabled	Remarks
Home-return operation	○	
Positioning operation	△	
Speed and acceleration/ deceleration setting	△	These items must be set in the position data table.
Separate settings for acceleration and deceleration	△	
Pitch feed (incremental)	△	
Pressing operation	△	
Speed change during movement	△	
Pause	○	
Zone signal output	△	These items must be set in the parameters.
Position zone signal	△	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.]

RCP6S Fieldbus Communication

(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:
 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	← 1 word = 16 bit →															
	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	← 1 word = 16 bit →															
	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	← 1 word = 16 bit →															
	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	← 1 word = 16 bit →															
	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

RCP6S Fieldbus Communication

(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 Available range for Setting: 0 to 767 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
	Control Signal	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.7.1 [15]
		b14	-	Cannot be used.	-
		b13			
		b12			
		b11			
		b10	MODE	Teaching mode command OFF: Standard mode, ON : Teaching mode	3.7.1 [13]
		b9	PWRT	Position import command ON: Position Data Import	3.7.1 [14]
		b8	JOG+	+Jog ON: Movement against home position, OFF: Stop	3.8.1 [10]
		b7	JOG-	-Jog ON: Movement toward home position, OFF: Stop	
		b6	JVEL	Jog-speed/inch-distance switching OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S 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 ON: Inching, OFF: Jog	3.7.1 [12]
		b4	SON	Servo ON command ON: Servo ON, OFF: Servo OFF	3.7.1 [5]
		b3	RES	Reset A reset is performed when this signal turns ON.	3.7.1 [4]
		b2	STP	Pause ON: Pause, OFF: Pause release	3.7.1 [8]
b1	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.7.1 [6]		
b0	CSTR	Positioning start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.7.1 [1]		

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 The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, "0" is output. Read it by turning PEND Signal on after movement. The simple alarm code (refer to Chapter 8 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 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	PZONE	Position zone 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. It is OFF when the servo is OFF.	3.7.1 [19]
		b7	ALML	Light error alarm output It turns ON when an overload warning or message level error is issued.	3.7.1 [21]
		b6	LOAD	Load Output Judgment: 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]		

RCP6S Fieldbus Communication

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	○: Direct control △: Indirect control ×: Disabled	Remarks
Home-return operation	○	
Positioning operation	△	These items must be set in the position data table.
Speed and acceleration/ deceleration setting	△	
Separate settings for acceleration and deceleration	△	
Pitch feed (incremental)	×	
Pressing operation	△	These items must be set in the position data table.
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)	
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.]

RCP6S Fieldbus Communication

(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.

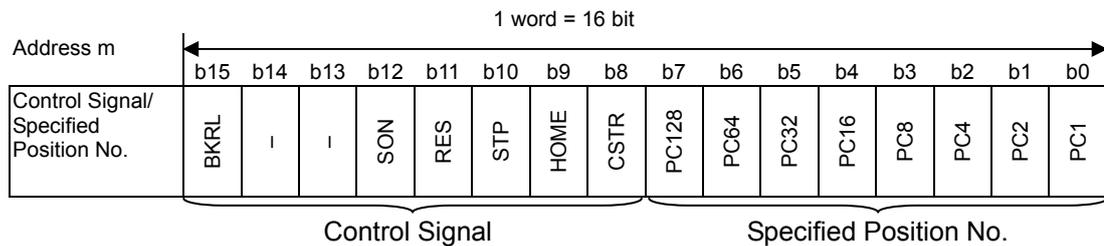
- The control signals and status signals are ON/OFF signals in units of bit.
- Binary data of 8 bits for the specified position number and complete position number and values from 0 to 255 can be used.



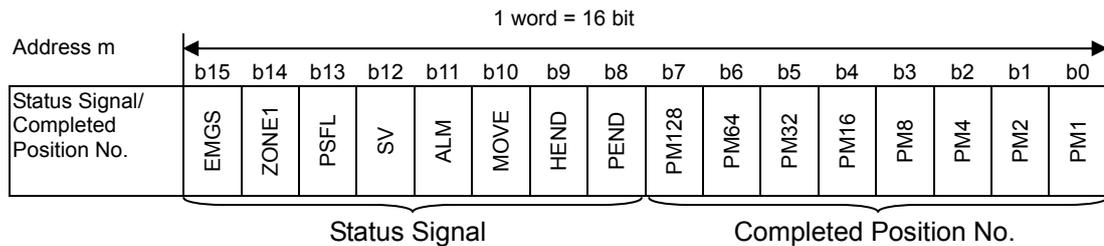
Caution:

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)



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



RCP6S Fieldbus Communication

(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					

RCP6S Fieldbus Communication

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 △: Indirect control ×: Disabled	Remarks
Home-return operation	○	These items must be set in the position data table.
Positioning operation	△	
Speed and acceleration/ deceleration setting	△	
Separate settings for acceleration and deceleration	△	
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.]

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(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) Available range for Setting: 0 to 15 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	
	Control Signal	b15	BKRL	Brake release ON: Brake release, OFF: Brake activated	3.7.1 [15]
		b14	-	Cannot be used.	-
		b13			
		b12			
		b11			
		b10			
		b9			
		b8	JOG+	+Jog ON: Movement against home position, OFF: Stop	3.7.1 [10]
		b7	JOG-	-Jog ON: Movement toward home position, OFF: Stop	
		b6	JVEL	Jog-speed/inch-distance switching OFF : Use the setting values of Parameter No.26 JOG Speed and No.48 Inching Distance in RCP6S 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 ON: Inching, OFF: Jog	3.7.1 [12]
		b4	SON	Servo ON command ON: Servo ON, OFF: Servo OFF	3.7.1 [5]
		b3	RES	Reset A reset is performed when this signal turns ON.	3.7.1 [4]
		b2	STP	Pause ON: Pause, OFF: Pause release	3.7.1 [8]
b1	HOME	Home return Home-return command with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.7.1 [6]		
b0	CSTR	Positioning start Movement command executed with this signal ON, command carried on till complete even if the signal is turned OFF on the way	3.7.1 [1]		

RCP6S Fieldbus Communication

(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 Unit: 0.01mm (Example) If +102.3mm, input 000003FF _H (1023 in decimal system). <i>(Note) Negative numbers are two's implement.</i>	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 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	PM1 to PM8	16-bit integer, Available range for output: 0 to 15 The positioning complete position number is output in a binary number once getting into the positioning width after moving to the target position. In the case that the position movement has not been performed at all, or during the movement, "0" is output. Read it by turning PEND Signal on after movement. The simple alarm code (refer to Chapter 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. It is OFF when the servo is OFF.	3.7.1 [19]
		b6	ALML	Light error alarm output 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]		

RCP6S Fieldbus Communication

3.5 Input and Output Signal Process for Fieldbus

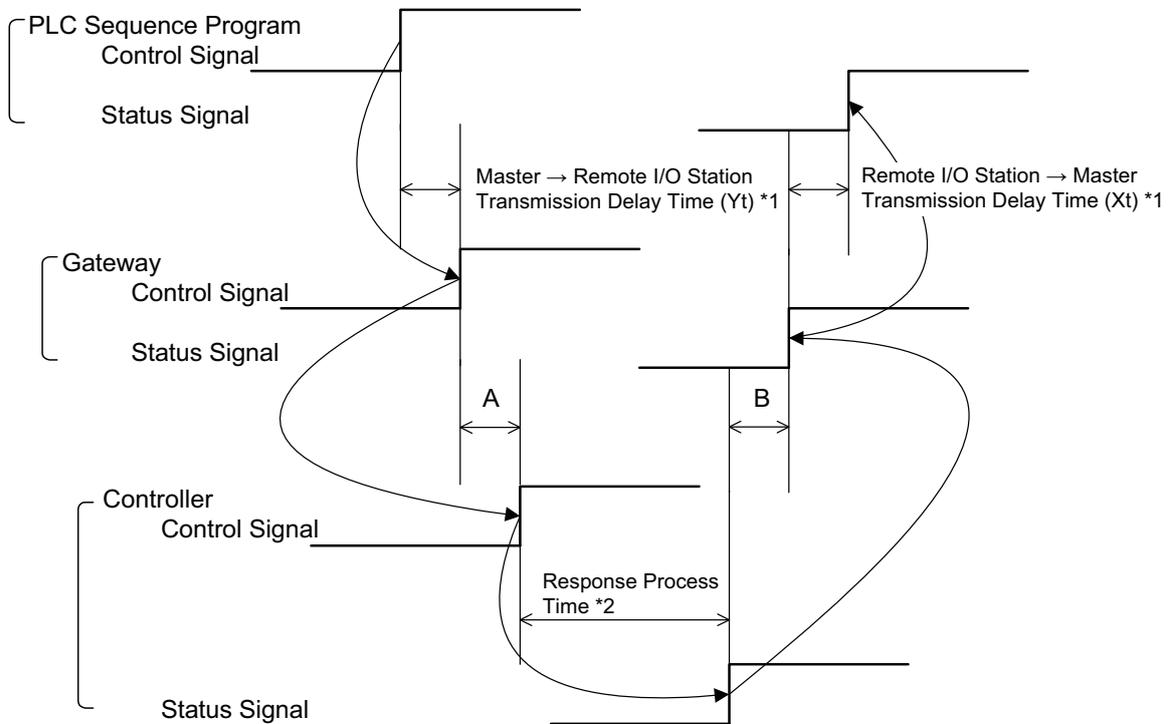
I/O Signal Timings

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 } Fieldbus Transmission Delay Time
 Xt : Slave → Master Station Transmission Delay Time }

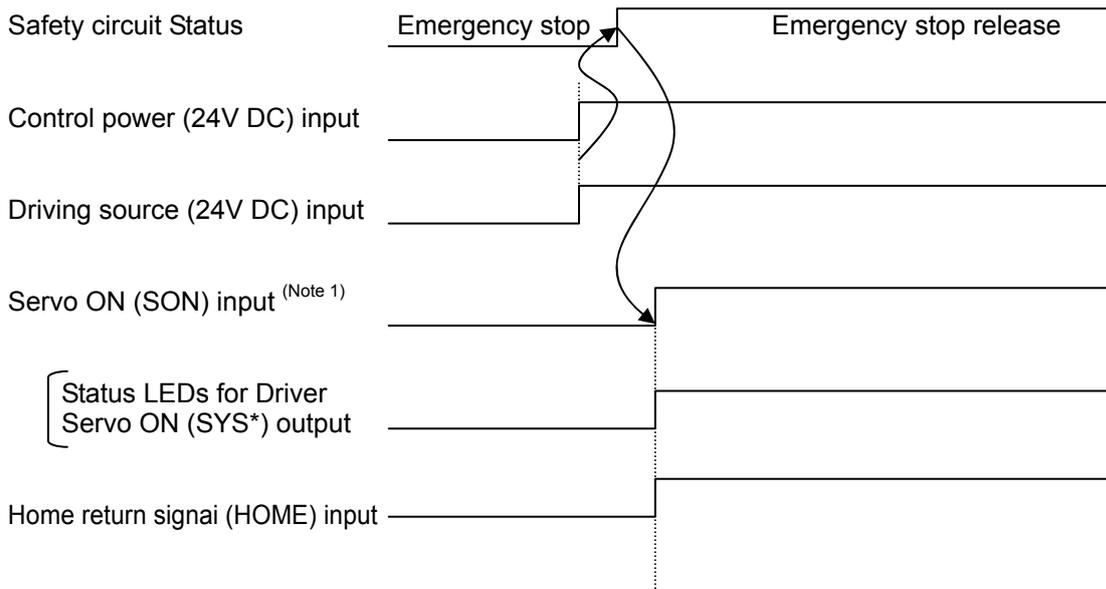
Refer to the instruction manual of the mounted PLC for the master station → slave transfer delay time (Yt) and the slave → master station transfer delay time (Xt).

RCP6S Fieldbus Communication

3.6 Power Supply

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 signal (HOME) from the host side.



Note 1 If the servo control is set activated in the initial setting, the servo turns on when SON Signal is input.

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 ON 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.

RCP6S Fieldbus Communication

(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 remainder of the planned movement left can be cancelled and the remained operation can be deleted.

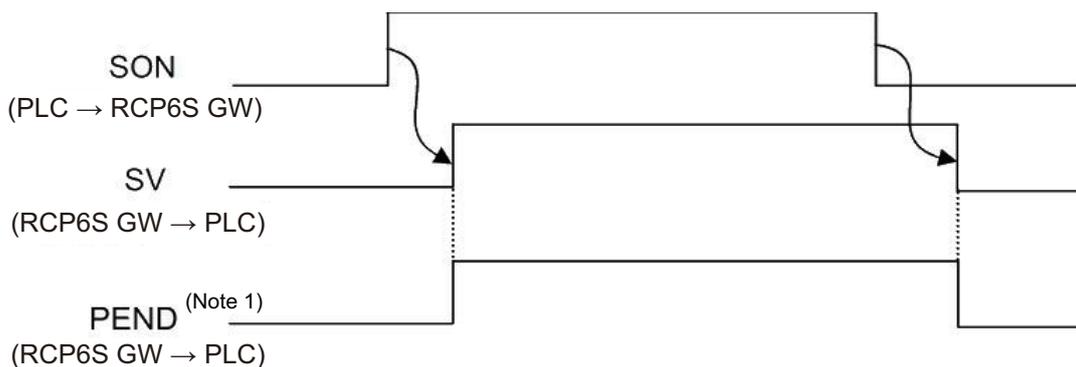
(5) Servo ON command (SON) PLC Output Signal

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.



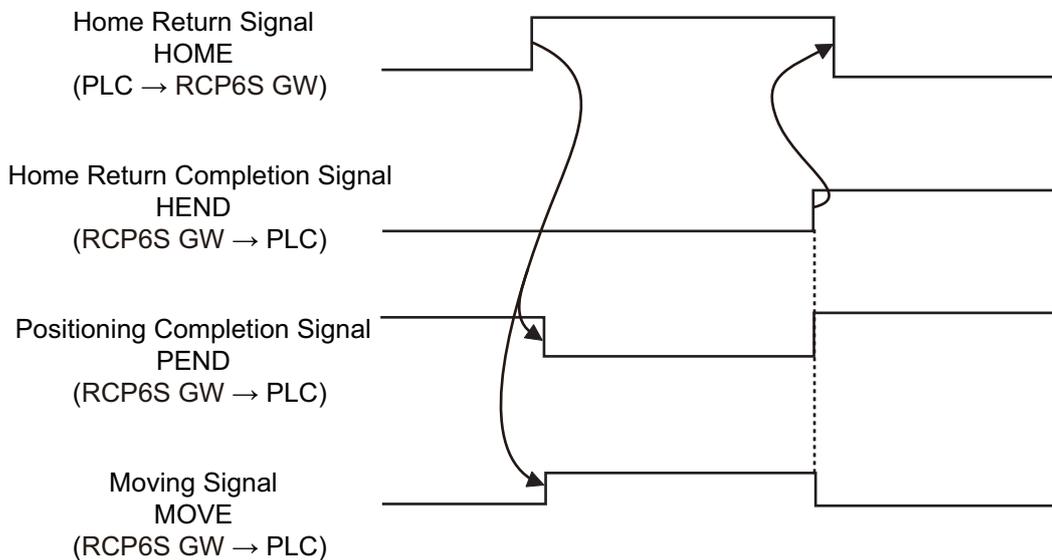
Note 1 PEND would not turn ON in the pause condition.

RCP6S Fieldbus Communication

- (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

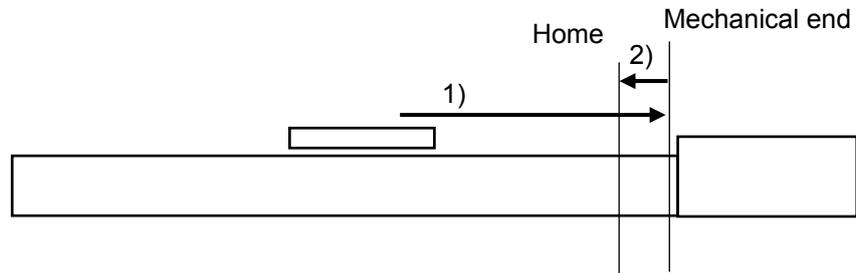
Operation Mode	Positioner 1	Simple Direct	Direct numeric specification	Positioner 2	Positioner 3	Positioner 5
○ : Equipped × : Not equipped	○	○	○	○	○	○

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.



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[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 Section 7.2 [14] when a change to Parameter No.22 "Home Return Offset Level" is required.*

RCP6S Fieldbus Communication

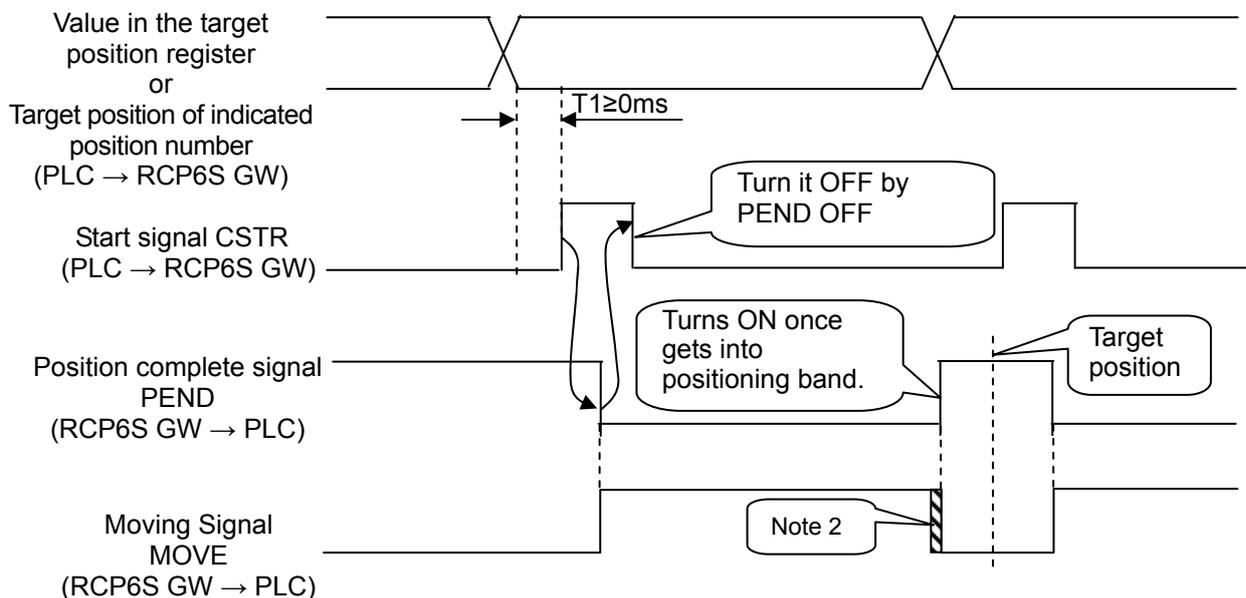
- (7) Positioning start (CSTR) PLC Output Signal
 Moving (MOVE) PLC Input Signal
 Positioning complete (PEND) PLC Input Signal

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.



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.

RCP6S Fieldbus Communication

(8) Pause (STP) PLC Output Signal

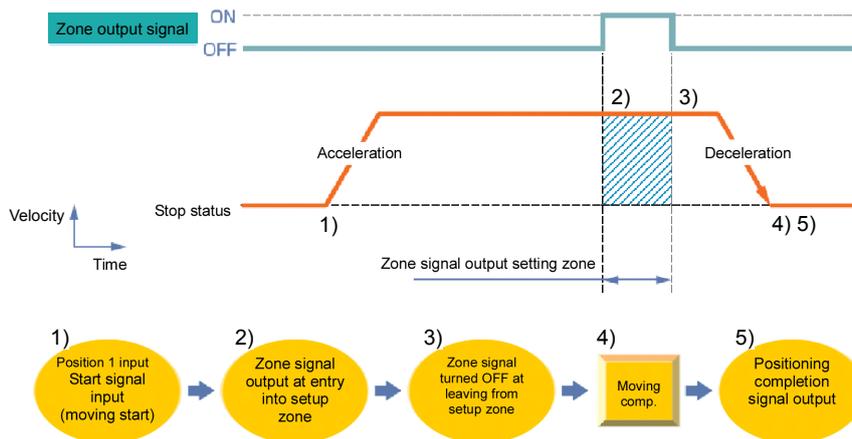
Operation Mode	Positioner 1	Simple Direct	Direct numeric specification	Positioner 2	Positioner 3	Positioner 5
○ : Equipped × : Not equipped	○	○	○	○	○	○

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

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(2) Position zone signal (PZONE)

No.	Position [mm]	Velocity [mm/s]	Acceleration [G]	Deceleration [G]	Pressing [%]	Threshold [%]	Positioning width [mm]	Zone+ [mm]	Zone- [mm]	Acceleration/Deceleration mode	Incremental	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.

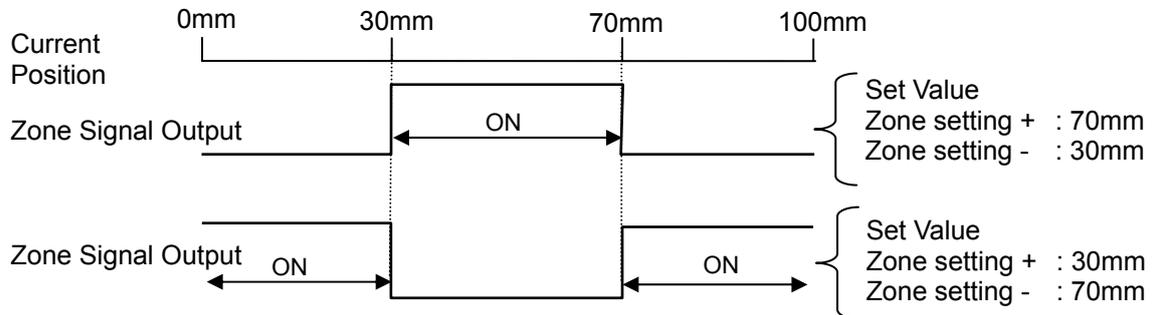
This set value becomes valid while the position number set in the zone range is executed. It is kept effective also during the emergency stop unless the actuator is operated or the memory of the origin is lost due to alarm.

(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]



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(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
○ : Equipped × : Not equipped	○	○	○	○	×	○

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 (JVCL) signal.
If the JVCL signal is OFF, the actuator operates according to parameter No.26, "PIO jog speed".
If the JVCL 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 JVCL signal.
If the JVCL signal is OFF, the actuator operates according to parameter No.26, "PIO jog speed".
If the JVCL 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 JVCL signal.
If the JVCL signal is OFF, the actuator operates according to parameter No.48, "PIO inch distance".
If the JVCL 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.

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(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.

RCP6S Fieldbus Communication

(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.

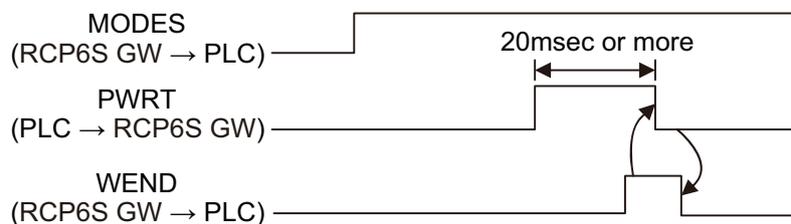
After the WEND signal is turned ON, turn OFF the PWRT signal in the host machine.

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 7 Parameter]



RCP6S Fieldbus Communication

(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 gateway 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.

RCP6S Fieldbus Communication

(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.

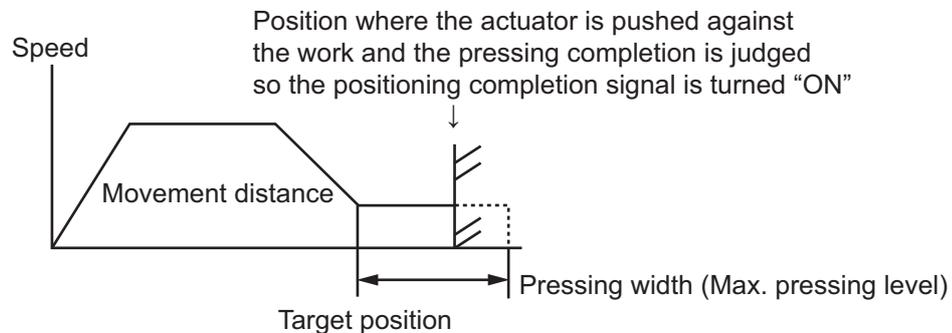
When this signal is set to "OFF", the normal positioning operation is performed.

[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.



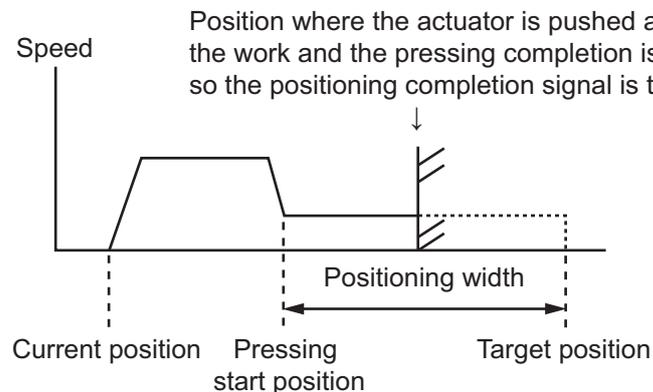
[Pressing Operation SEP Method]

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.



RCP6S Fieldbus Communication

(17) Push direction specification (DIR) PLC Output Signal

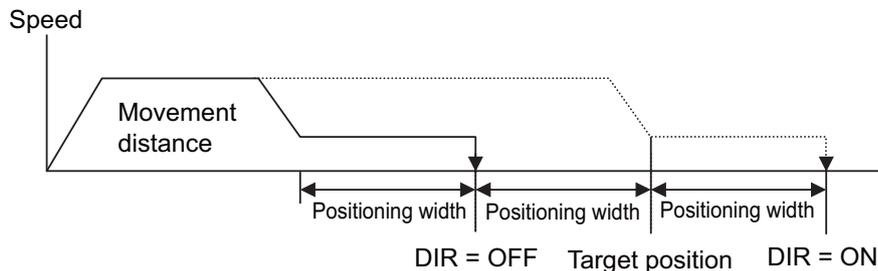
Operation Mode	Positioner 1	Simple Direct	Direct numeric specification	Positioner 2	Positioner 3	Positioner 5
○ : Equipped × : Not equipped	×	×	○	×	×	×

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 × : 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 × : 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 × : 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. (relative 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 7.2 [52] Light Malfunction Alarm Output Select]

For the message level alarm, refer to the section for the Chapter 8 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.

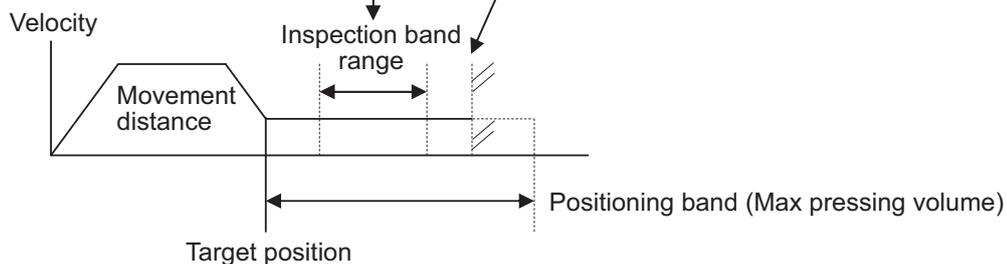
This signal makes a judgment by checking if the command torque exceeds the threshold for a certain time in total.

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.



- 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 Operation 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 Operation 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 Operation 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.

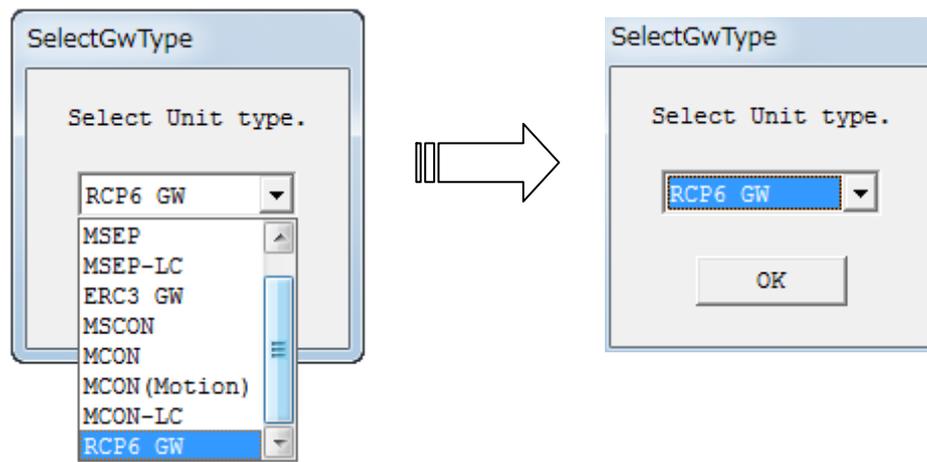
3.8 About Gateway Parameter Setting Tool

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.



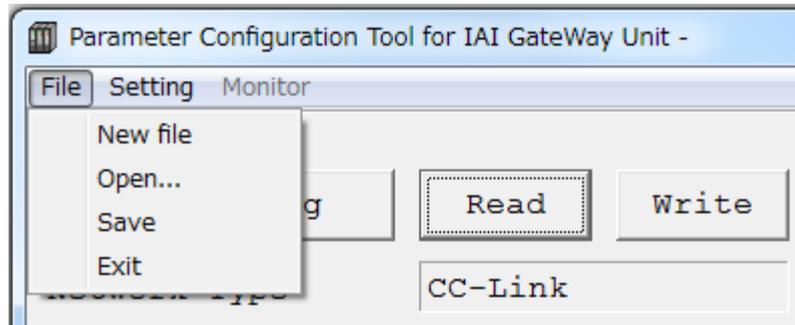
Main windows (Initial condition)

RCP6S Fieldbus Communication

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.

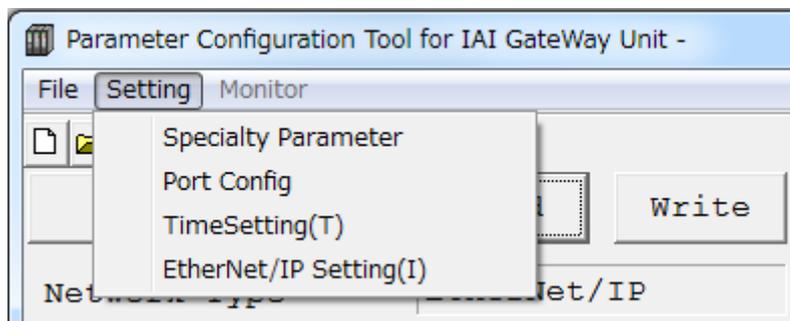
1) File Menu



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

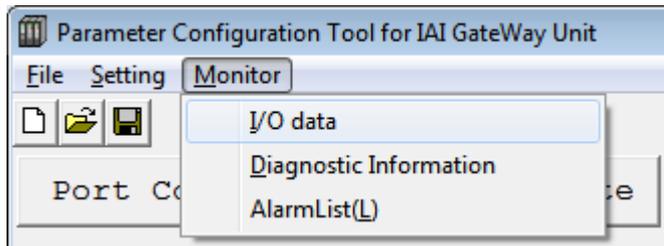


Click on the "Setting" menu on the top left corner in the main window and the setting menu list pops up.

- 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]

RCP6S Fieldbus Communication

3) Monitor menu



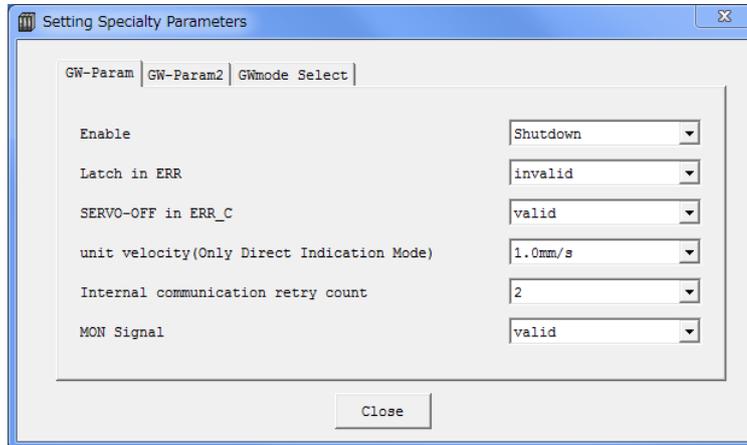
Click on the [Monitor] menu on the top left corner in the main window and the monitor menu list pops up.

(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

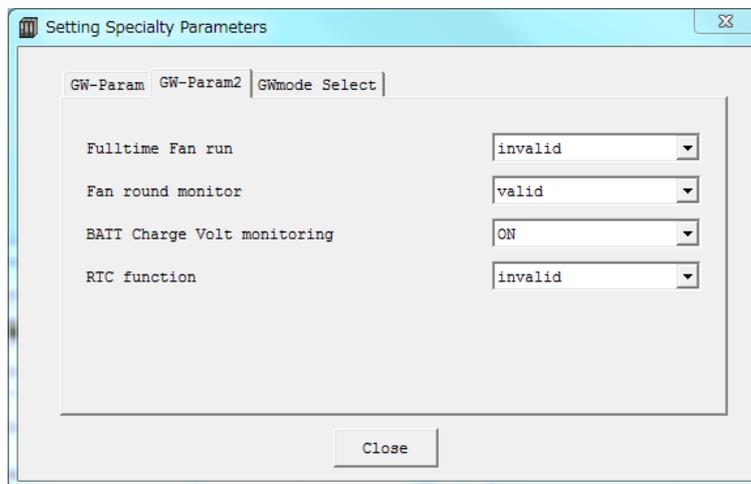


- Enable operation : Select the operation when enable input is detected.
Select whether to shut down or turn the servo OFF.
- Latch in ERR : Select the operation at recovery after ERR_T or ERR_C occurred.

	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.

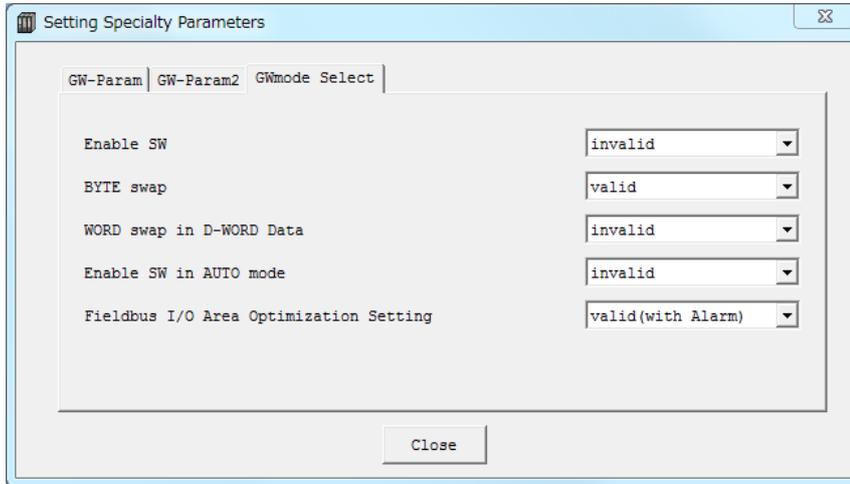
- SERVO-OFF in ERR_C : Select whether to turn the servo OFF on the connected axes when ERR_C is occurred.
- Unit velocity (Only direct indication mode) : Select the unit for speed from 1.0mm/s and 0.1mm/s.
- Internal communication retry count : Set the number of communication retries with the connected 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

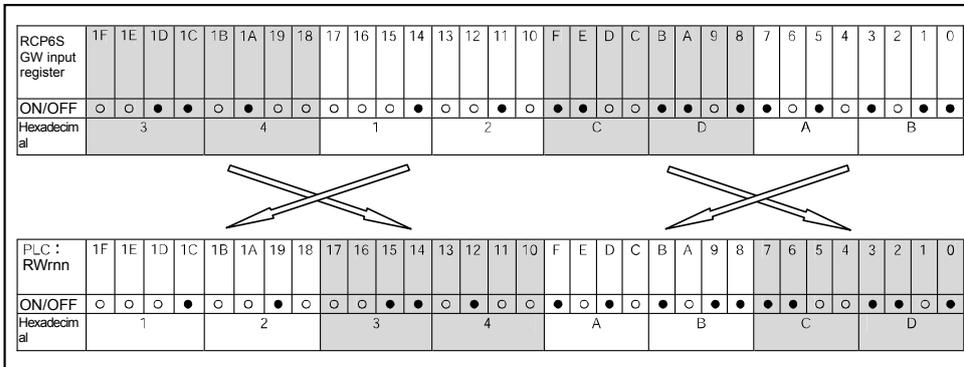
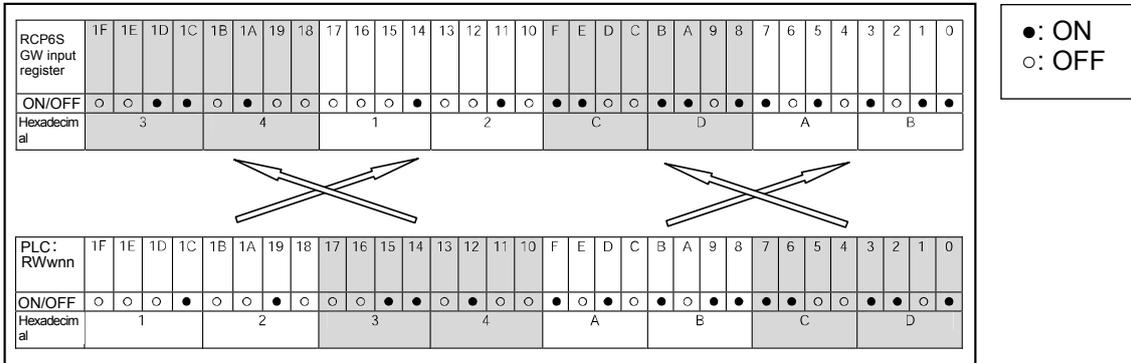


- Enable SW : Select whether to activate/inactivate the enable switch in teaching pendant.
- BYTE swap : Set the byte swap. [Refer to 3)-1 in this section.]
- WORD swap in D-WORD data : Set whether to swap the W-word sized data with word size. [Refer to 3)-2 in this section.]
- Enable SW in AUTO mode : 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.

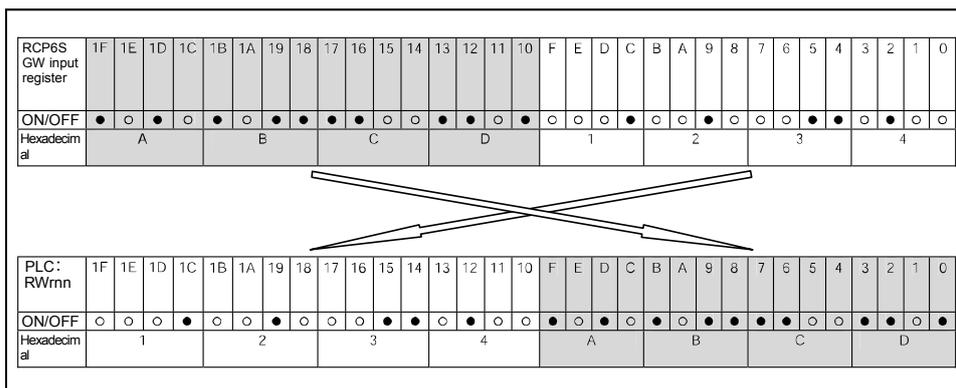
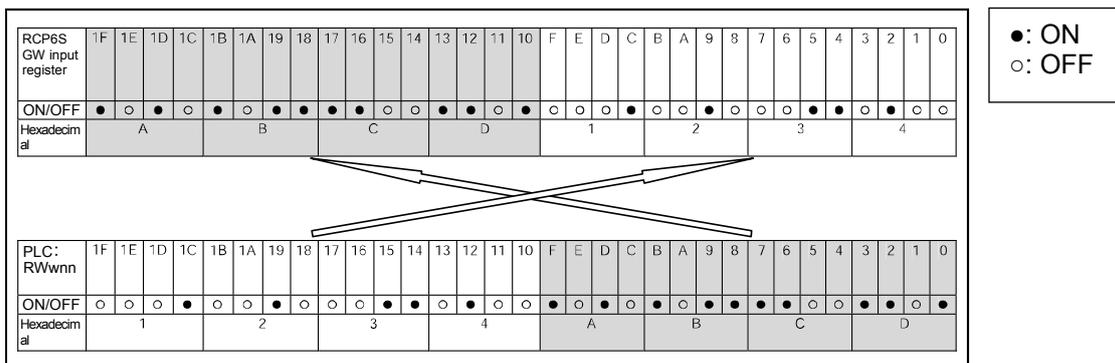
Invalid	Left-justification setting feature is not to be used. Select it when all the axes are connected or not to have all the unconnected axes left-justified.
Valid (without Alarm)	Left-justification setting feature is to be used. An alarm will not be output when there is a mismatch between the left-justification setting in the gateway setting tool and the current axis connection status. Select it when having partially the unconnected axes not to be left-justified.
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. Select it when having all the axes left-justified.

RCP6S Fieldbus Communication

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.

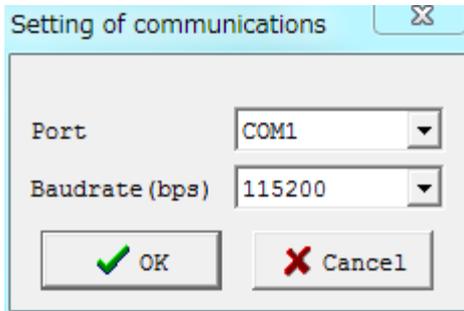


3)-2 WORD Swap in D-WORD Data: Swap the upper and lower in the W-word sized sent and received data in word unit.
Set this considering the connected host system if necessary.



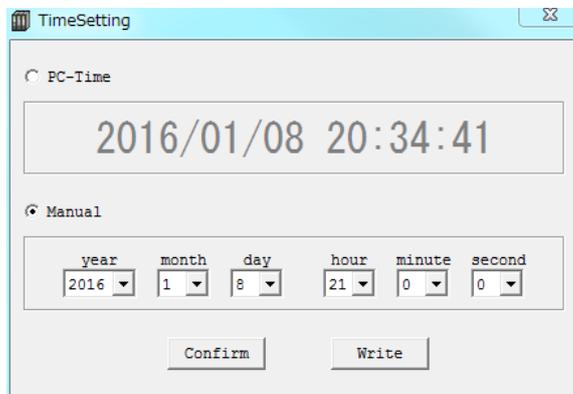
RCP6S Fieldbus Communication

4) Tool Communication Setting



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

5) Time Setting

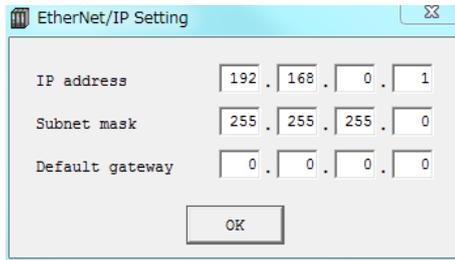


By selecting Time on PC, the current time on the PC is acquired and set to RCP6S GW. If Set Manually is selected, desired time set in the clock edit in the window can be set in RCP6S GW. Click "Write", and the time setting is transferred to RCP6S GW and the data is written in. Clicking on the Confirm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

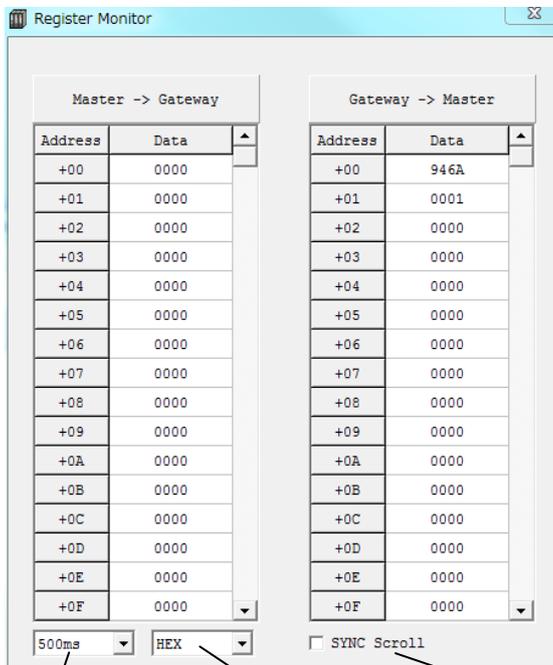
RCP6S Fieldbus Communication

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



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

7) I/O Data (Register Monitor)



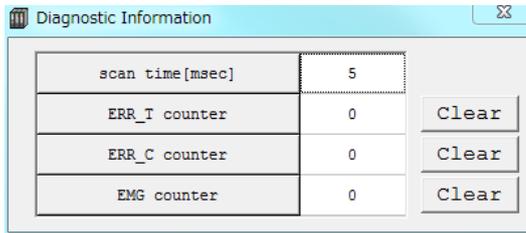
Data Reading Frequency Display Switchover SYNC Scroll

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

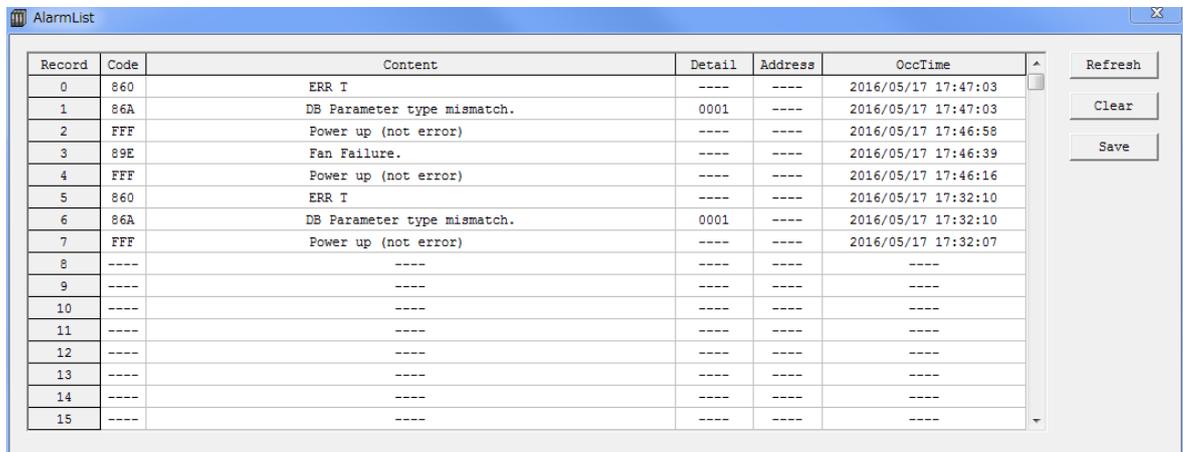


The screenshot shows a window titled "Diagnostic Information" with a close button (X). It contains a table with the following data:

Parameter	Value	Action
scan time[msec]	5	
ERR_T counter	0	Clear
ERR_C counter	0	Clear
EMG counter	0	Clear

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



The screenshot shows a window titled "AlarmList" with a close button (X). It contains a table with the following data:

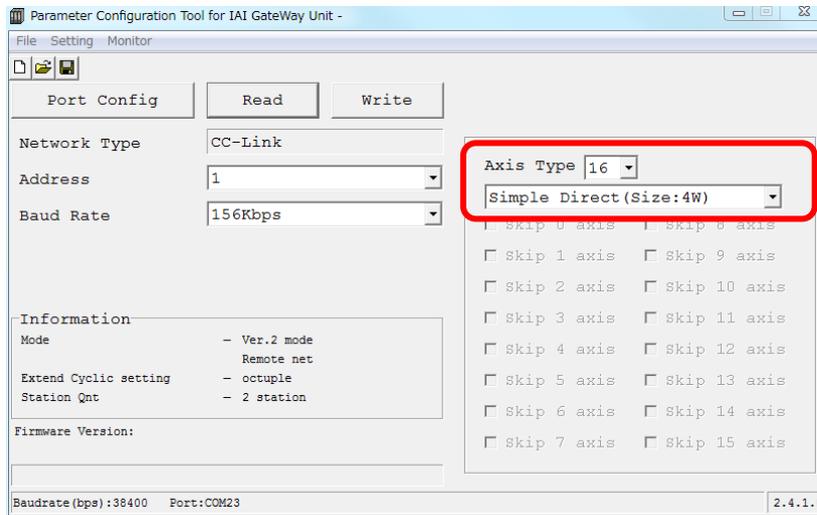
Record	Code	Content	Detail	Address	OccTime	Buttons
0	860	ERR T	----	----	2016/05/17 17:47:03	Refresh Clear Save
1	86A	DB Parameter type mismatch.	0001	----	2016/05/17 17:47:03	
2	FFF	Power up (not error)	----	----	2016/05/17 17:46:58	
3	89E	Fan Failure.	----	----	2016/05/17 17:46:39	
4	FFF	Power up (not 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 8 Troubleshooting for the details of the alarms.

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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

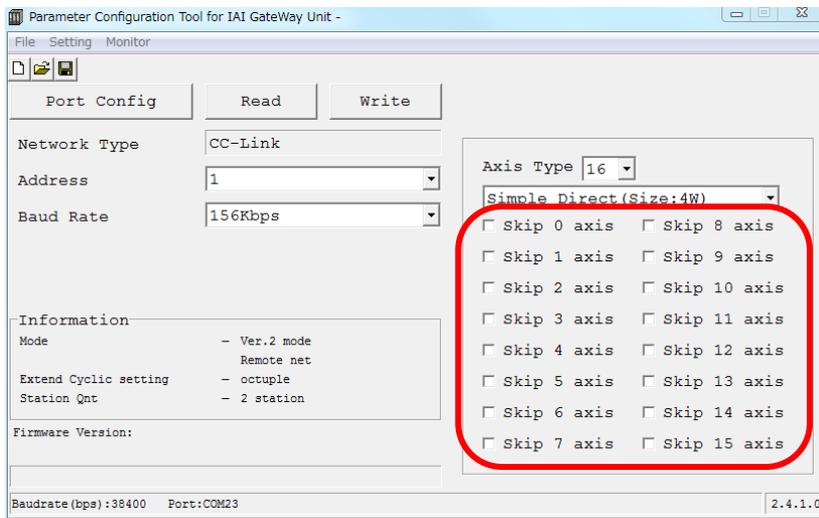


Caution: Max. Connectable Axis Number when Using Direct Indication Mode in those other than CC-Link

- 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.

RCP6S Fieldbus Communication

3.8.5 Fieldbus I/O Domain Left-Justification Setting

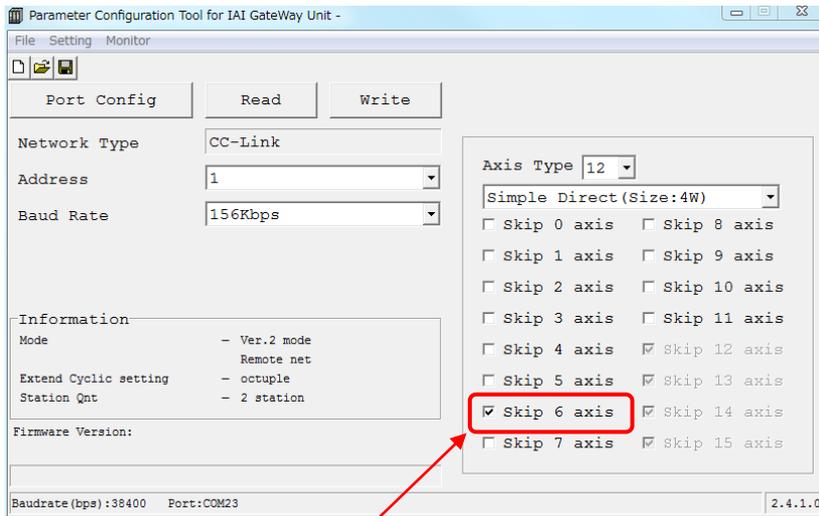


Setting whether to have left-justification conducted or not conducted to each axis can be selected to Axis 0 to Axis 15 when Valid (without Alarm) or Valid (with Alarm) is selected in the fieldbus I/O domain left-justification setting.

[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	<input type="checkbox"/> : Remove Check Mark
Left-justification to be conducted	<input checked="" type="checkbox"/> : Put Check Mark

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



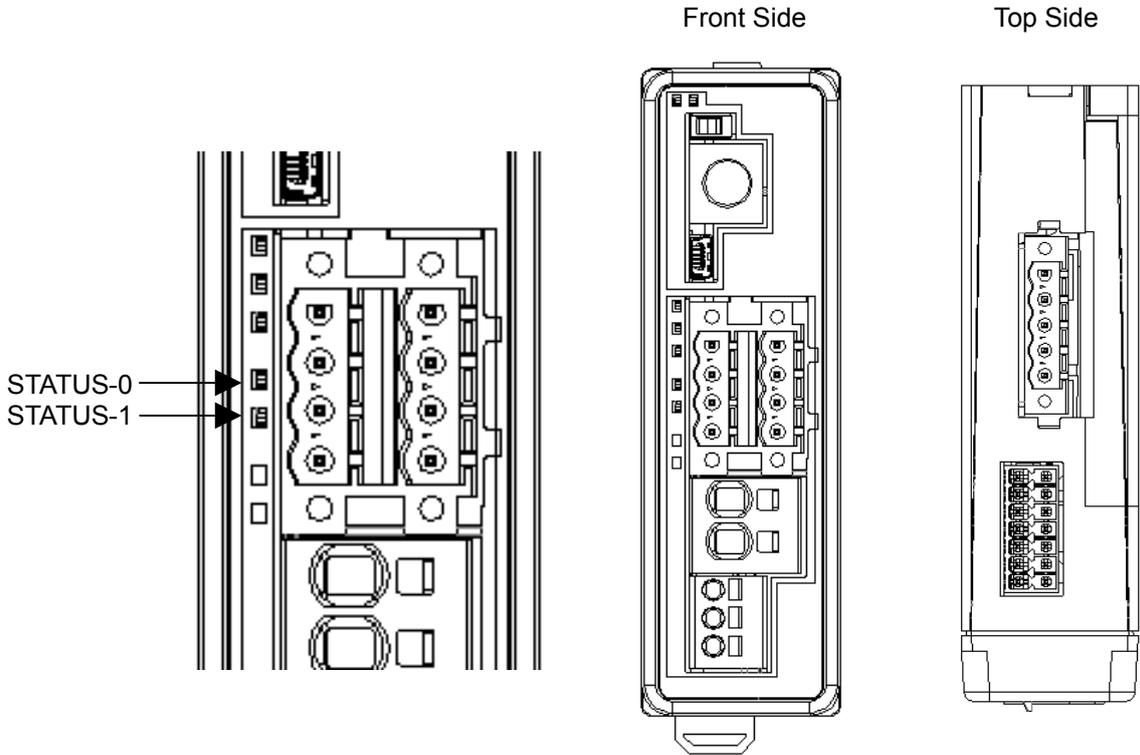
Put a check mark to select an axis to be left-justified.
Remove a check mark to for those not to be left-justified.

RCP6S *Fieldbus Communication*

3.9 Fieldbus Status LEDs

The communication status of the fieldbus can be checked.

3.9.1 DeviceNet

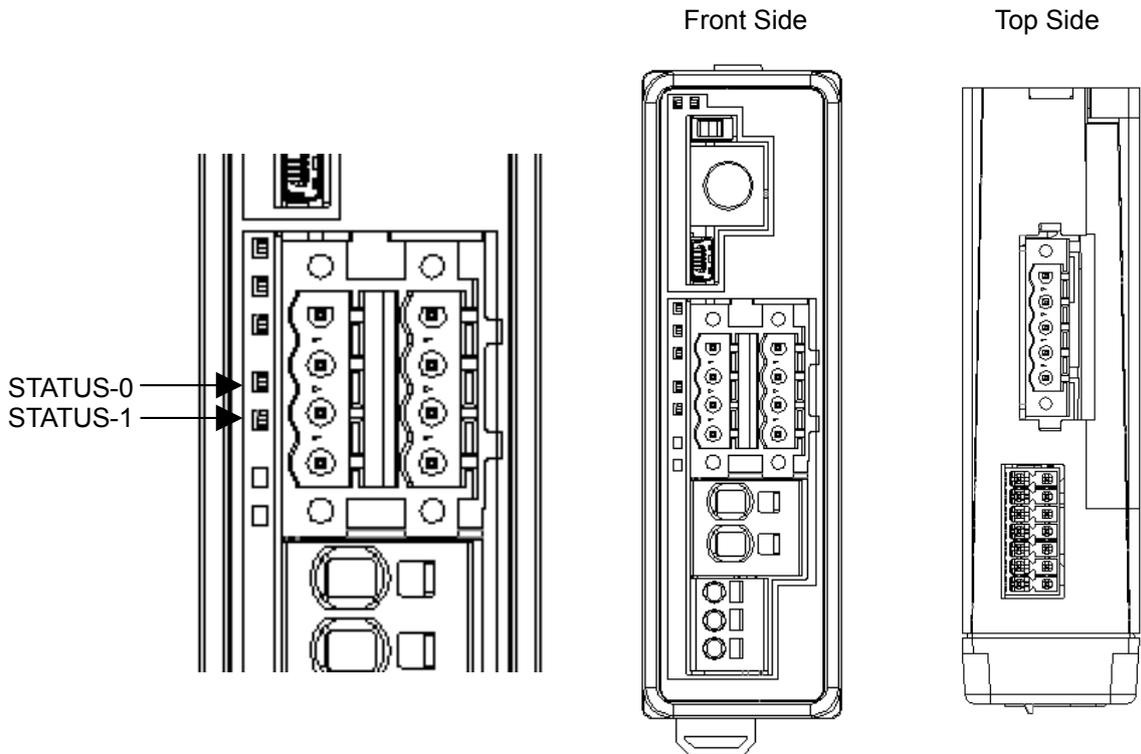


○: Illuminating, ×: OFF, ☆: Flashing

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.

RCP6S Fieldbus Communication

3.9.2 CC-Link

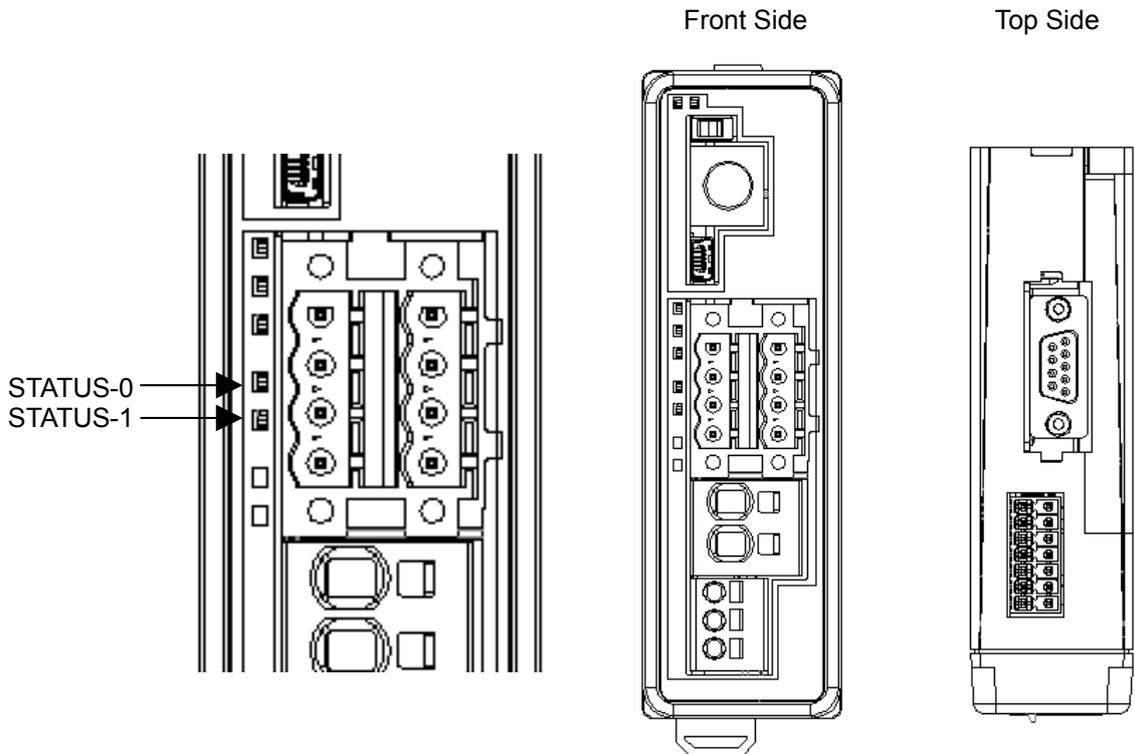


○: Illuminating, ×: OFF, ☆: Flashing

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

RCP6S Fieldbus Communication

3.9.3 PROFIBUS-DP

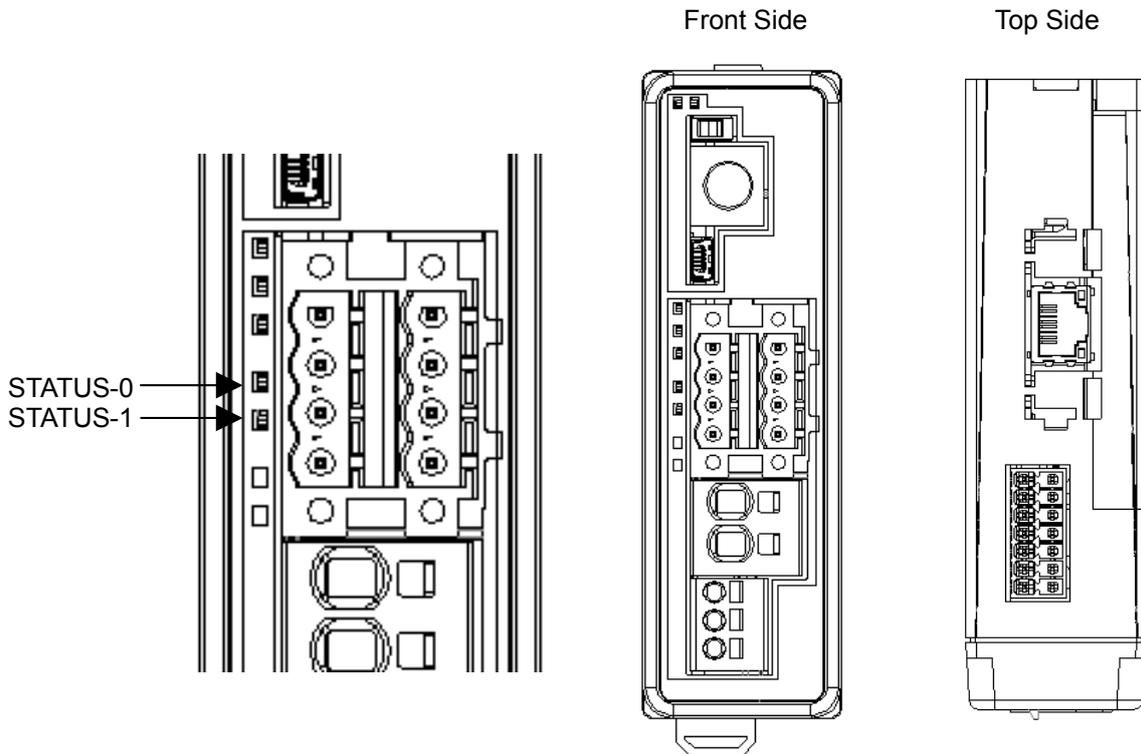


○: Illuminating, ×: OFF, ☆: Flashing

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)

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3.9.4 EtherNet/IP

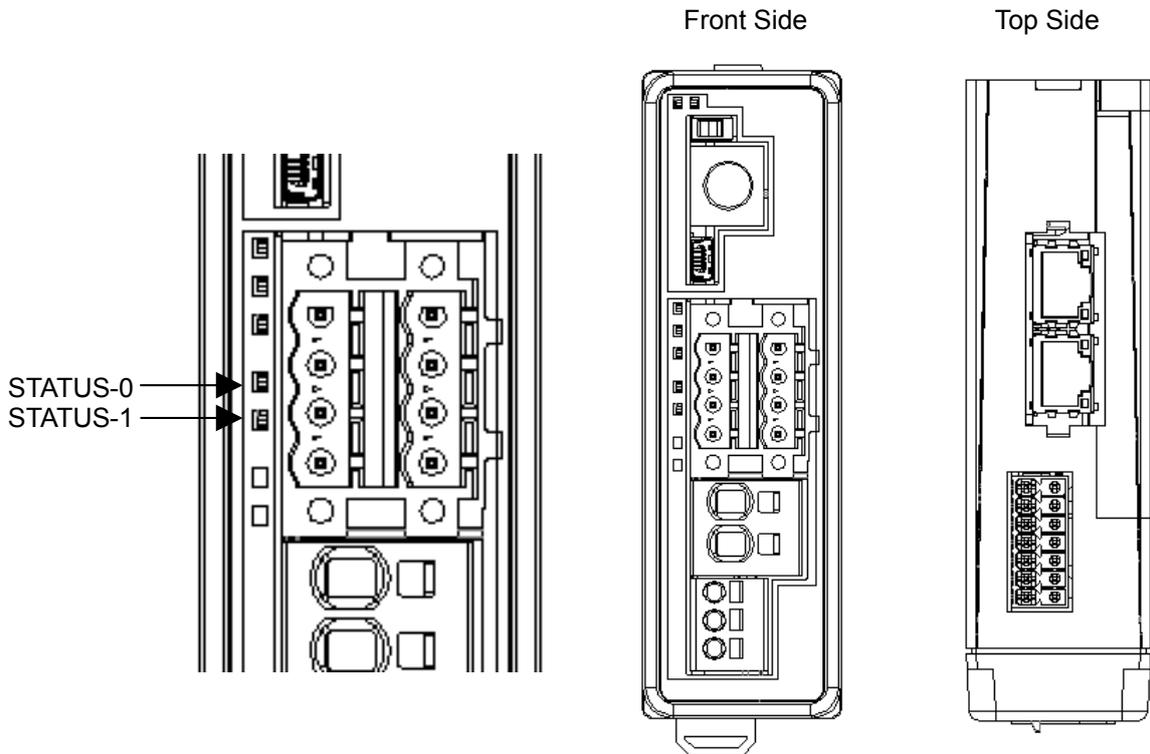


○: Illuminating, ×: OFF, ☆: Flashing

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

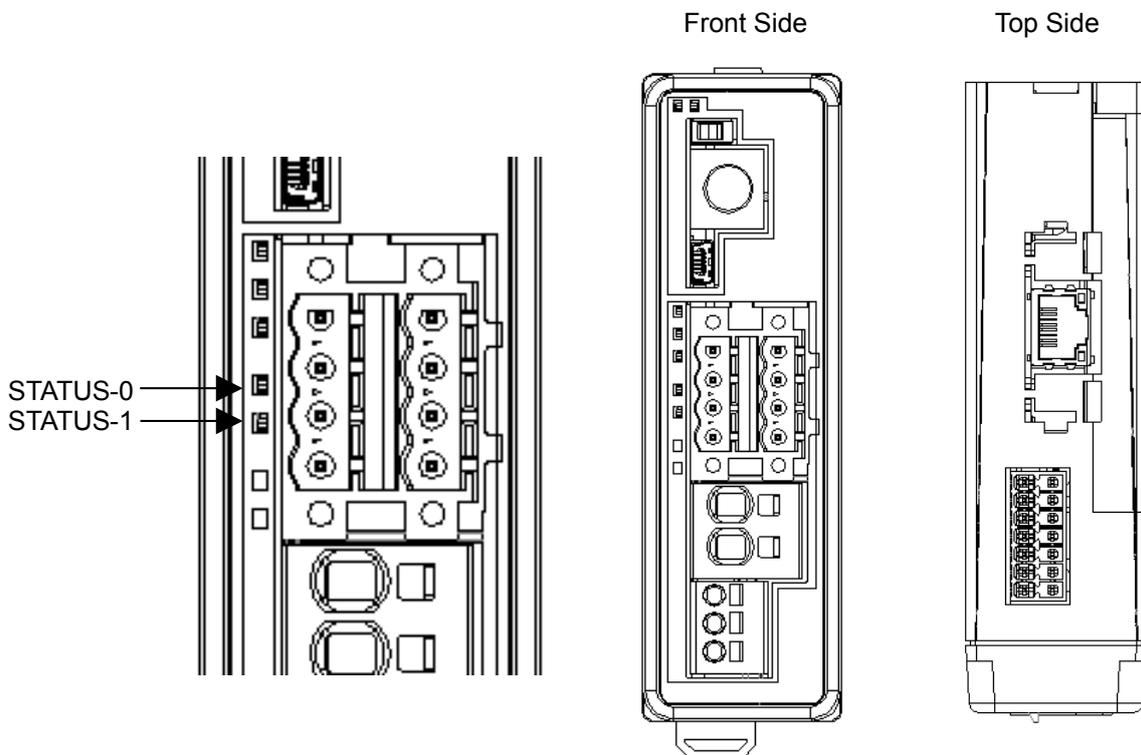


○: Illuminating, ×: OFF, ☆: Flashing

Name	Panel State	Display Color	Remarks
STATUS-1	RUN	● Green (Illuminating)	Operation Status (EtherCAT communication "OPERATION" status)
		☆ Green (Flashing) ON : 200ms OFF : 200ms	EtherCAT communication "PRE-OPERATION" status
		☆ Green (Flashing) ON : 200ms 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) ON : 200ms OFF : 200ms	Construction information (settings) error (Information received from the master cannot be set)
		☆ Orange (Flashing) ON : 200ms×2 times OFF : 1000ms	Watchdog timer / timeout
		× (OFF)	No error, Power is OFF

RCP6S Fieldbus Communication

3.9.6 PROFINET-IO



○: 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 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 supportive feature 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.

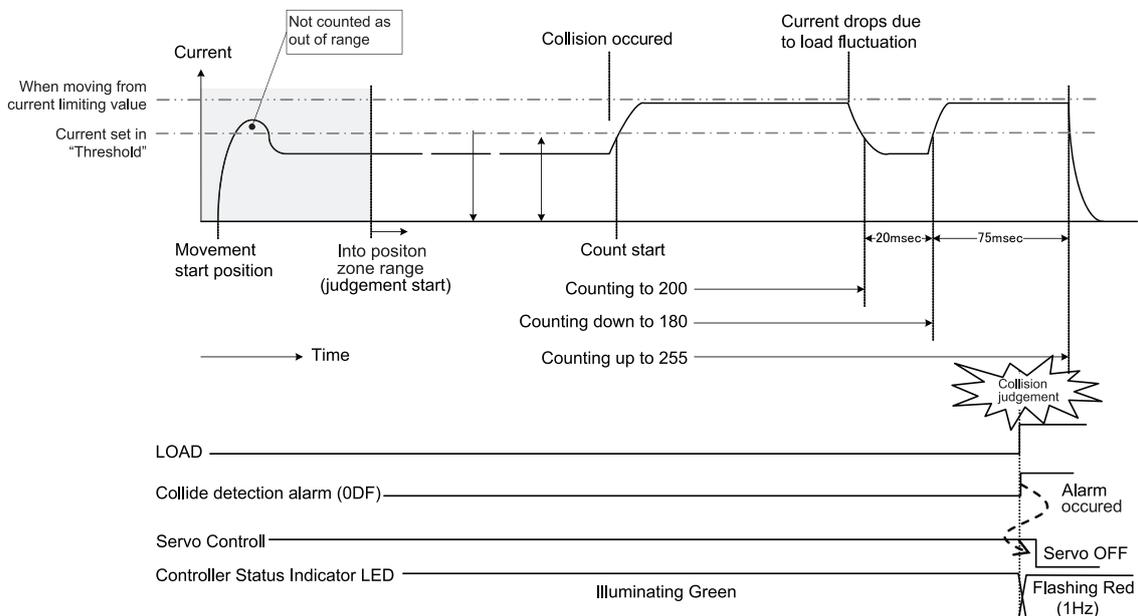
4.1 Collision Detection Judgement

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)



RCP6S Fieldbus Communication

4.2 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 level
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 level
3	Detection is conducted in position zone setting range, but is not conducted in the following conditions. <ul style="list-style-type: none"> The first movement after releasing from a pause Movement from a stop in the position zone range 	
5	Detection is conducted in position zone setting range.	Message level
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. <ul style="list-style-type: none"> The first movement after releasing from a pause Movement from a stop in the position 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)

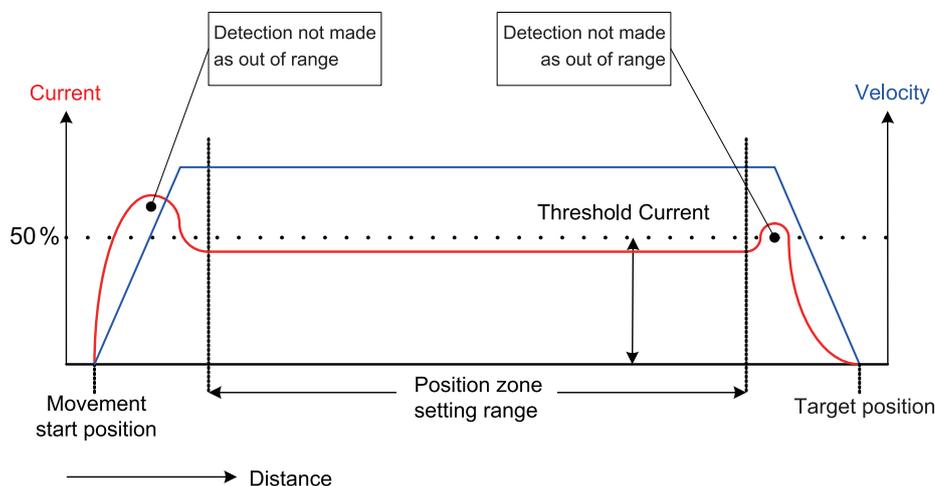
Set the range in "Zone +" and "Zone -" in the position table. Set a small value in "Zone +" and "Zone -".

Position zone : 0.00 to Actuator Stroke Length [mm]

4.3 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 5 Power-saving Function (Automatic Servo OFF)

This controller possesses Automatic Servo OFF 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.

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.

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.

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(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
36	Automatic servo OFF delay time 1 (Unit: sec)
37	Automatic servo OFF delay time 2 (Unit: sec)
38	Automatic servo OFF delay time 3 (Unit: sec)

(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.

Setting value	Operation after completion of positioning
0	Servo ON not changed
1	Automatic servo OFF in a certain time] (set in Parameter No.36)
2	Automatic servo OFF in a certain time (set in Parameter No.37)
3	Automatic servo OFF in a certain time (set in Parameter No.38)

(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.

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) The status display LED lamps for the RCP6S built-in controller and hub unit turn on in green during the automatic servo-off.

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[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

[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

RCP6S *Fieldbus Communication* --- ---

Chapter 6 Absolute Reset

6.1 Absolute Reset

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

- 1) Select position data on the main screen and click the **Alarm** button.



- 2) Select position data on the main screen and click the **Home** button.

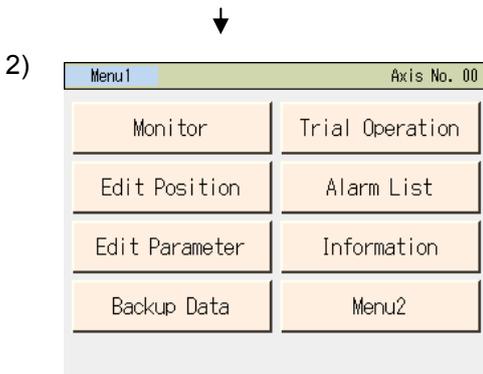


RCP6S Fieldbus Communication

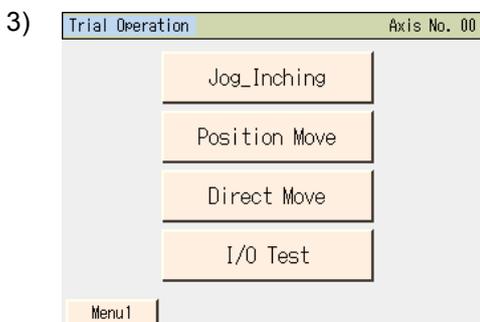
(2) For Teaching Pendant



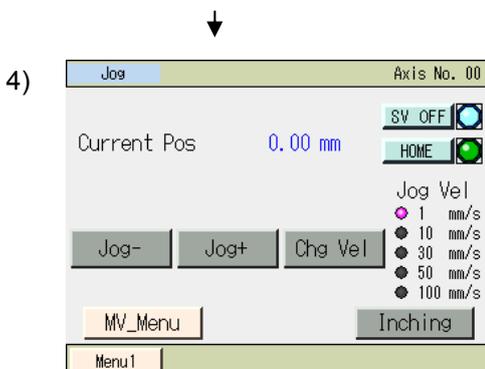
Press **Reset Alm**.



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



Press **Jog_Inching** on Trial screen.



Press **Home** on Job/Inching screen.

Chapter 7 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.*

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7.1 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

(1/3)

No.	Category	Name	Symbol	Unit (Note 1)	Input Range	Default factory setting	Relevant sections
1	B	Zone 1 Positive Side	ZONM	mm	-9999.99 to 9999.99	Actual stroke on positive side	7.2 [1] 7.2 [55]
2	B	Zone 1 Negative Side	ZONL	mm	-9999.99 to 9999.99	Actual stroke on negative side	
3	A	Soft Limit Positive Side	LIMM	mm	-9999.99 to 9999.99	Actual stroke on positive side	7.2 [2]
4	A	Soft Limit Negative Side	LIML	mm	-9999.99 to 9999.99	Actual stroke on negative side	
5	D	Home Return Direction	ORG	-	0: Reverse 1: Normal	In accordance with actuator	7.2 [3]
6	C	Push & Hold Stop Judgment Period	PSWT	msec	0 to 9999	255	7.2 [4]
7	C	Servo Gain Number	PLGO	-	0 to 31	6	7.2 [5] 7.3
8	B	Default Velocity	VCMD	mm/s	1 to Actuator's max. speed	Rated actuator speed	7.2 [6]
9	B	Default Acceleration/Deceleration	ACMD	G	0.01 to Actuator's max. acceleration/ deceleration	Rated actuator's acceleration/ deceleration	7.2 [7]
10	B	Default Positioning Width	INP	mm	0.01 to In accordance with actuator	In accordance with actuator	7.2 [8]
12	B	Current limitation at positioning stop	SPOW	%	0 to 70	35	7.2 [9]
13	C	Current-Limiting Value During Home Return	ODPW	%	0 to 100	In accordance with actuator	7.2 [10]
16	B	SIO Communication Speed Selection	BRSL	dps	9600 to 230400	38400	7.2 [11]
17	B	Minimum Delay Time for Slave Transmitter Activation	RTIM	msec	0 to 255	5	7.2 [12]
18	E	Home Position Check Sensor Input Polarity	LS	-	0 to 2	In accordance with actuator	7.2 [13]
22	C	Home Return Offset Level	OFST	mm	0.00 to 9999.99	In accordance with actuator	7.2 [14]
23	B	Zone 2 Positive Side	ZNM2	mm	-9999.99 to 9999.99	Actual stroke on positive side	7.2 [15] 7.2 [1]
24	B	Zone 2 Negative Side	ZNL2	mm	-9999.99 to 9999.99	Actual stroke on negative side	
26	B	PIO Jog Velocity	JOGV	mm/sec	1 to Actuator's max. speed	In accordance with actuator	7.2 [16]

RCP6S Fieldbus Communication

Parameter List

(2/3)

No.	Category	Name	Symbol	Unit ^(Note 1)	Input Range	Default factory setting	Relevant sections
31	B	Velocity Loop Proportional Gain	VLPG	-	1 to 27661	In accordance with actuator	7.2 [17] 7.3
32	B	Velocity Loop Integral Gain	VLPT	-	1 to 217270	In accordance with actuator	7.2 [18] 7.3
33	C	Torque Filter Time Constant	TRQF	-	0 to 2500	In accordance with actuator	7.2 [19] 7.3
34	C	Push Velocity	PSHV	mm/sec	1 to actuator's max. pressing speed	In accordance with actuator ^(Note 2)	7.2 [20]
35	C	Safety Velocity	SAFV	mm/sec	1 to 250 (maximum speed for the actuators with 250 or less)	100	7.2 [21]
36	C	Auto Servo-motor OFF Delay Time 1	ASO1	sec	0 to 9999	0	7.2 [22] Section 5 (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	PEND	-	0: PEND 1: INP	0	7.2 [23] Section 5 (3)
42	C	Enable Function	ENBL	-	0: Enabled 1: Disabled	1	7.2 [24]
43	B	Home Position Check Sensor Input Polarity	HMC	-	0: Sensor not used 1: a contact 2: b contact	In accordance with actuator	7.2 [25]
45	B	Silent Interval Magnification	SIVM	-	0 to 10	0	7.2 [26]
46	B	Velocity Override	OVRD	%	0 to 100	100	7.2 [27]
47	B	PIO Jog Velocity 2	IOV2	mm/sec	1 to 250 (maximum speed for the actuators with 250 or less)	In accordance with actuator	7.2 [28]
48	B	PIO Inching Distance	IOID	mm	0.01 to 1.00	1.00	7.2 [29]
49	B	PIO Inching Distance 2	IOD2	mm	0.01 to 1.00	0.10	
50	C	Load Output Judgment Time Period	LDWT	msec	0 to 9999	255	7.2 [30]
52	B	Default Acceleration/Deceleration Mode	MOD	-	0: Trapezoid pattern 1: S-motion 2: Primary delay filter	0	7.2 [31]
53	B	Default Stop Mode	HSTP	-	0 to 3	0	7.2 [32] Section 5 (2)
55	B	Position Command Primary Filter Time Constant	PLPF	msec	0.0 to 100.0	0.0	7.2 [33] 7.3
56	B	S-motion Rate	SCRV	%	0 to 100	0	7.2 [34]
71	B	Position Feed Forward Gain	PLFG	-	0 to 100	0	7.2 [35] 7.3
77	D	Ball Screw Lead Length	LEAD	mm	0.01 to 999.99	In accordance with actuator	7.2 [36]
78	D	Axis Operation Type	ATYP	-	0: Linear axis 1: Rotary axis	In accordance with actuator	7.2 [37]
79	B	Rotary Axis Mode Selection	ATYP	-	0: Normal mode 1: Index mode	In accordance with actuator	7.2 [38]
80	B	Rotational Axis Shortcut Selection	ATYP	-	0: Disabled 1: Enabled	In accordance with actuator	7.2 [39]
83	B	Absolute unit	ETYP	-	0: Not used 1: Used	0	7.2 [40]

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Parameter List

(3/3)

No.	Category	Name	Symbol	Unit ^(Note 1)	Input Range	Default factory setting	Relevant sections
88	D	Software Limit Margin	SLMA	mm	0 to 9999.99	0	7.2 [41]
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	7.2 [42]
110	B	Stop Method at Servo OFF	PSOF	-	0: Rapid stop 1: Deceleration to stop	0	7.2 [43]
112	B	Monitoring Mode Selection Monitoring Period	FMNT	-	0 to 3	1	7.2 [44]
113	B	Monitoring Period	FMNT	msec	1 to 60000	1	7.2 [45]
143	B	Overload Level Ratio	OLWL	%	50 to 100	100	7.2 [46]
144	B	Gain Scheduling Upper Limit Multiplying Ratio	GSUL	%	0 to 1023	0	7.2 [47]
145	C	GS Velocity Loop Proportional Gain	GSPC	-	1 to 50000	In accordance with actuator	7.2 [48] 7.2 [17]
146	C	GS Velocity Loop Integral Gain	GSIC	-	1 to 500000	In accordance with actuator	7.2 [49] 7.2 [18]
147	B	Total Movement Count Threshold	TMCT	Times	0 to 999999999	0	7.2 [50]
148	B	Total Operated Distance Threshold	ODOT	m	0 to 999999999	0	7.2 [51]
151	B	Light Malfunction Alarm Output Select	FSTP	-	0: Overload warning output 1: Message label alarm output	0	7.2 [52]
152	B	High Output Setting	BUEN	-	0: Disabling 1: Enabling	1	7.2 [53]
153	B	BU Velocity Loop Proportional Gain	BUPC	-	1 to 27661	In accordance with actuator	7.2 [54] 7.2 [17]
154	B	BU Velocity Loop Integral Gain	BUIC	-	1 to 217270	In accordance with actuator	7.2 [55] 7.2 [18]
165	B	Delay Time after Shutdown Release	SDDT	msec	0 to 1000	0	7.2 [57]
166	B	Startup Current Limit Extension Feature	DCET	-	0: Disabling 1: Enabling	0	7.2 [58]
168	B	Collision Detection Feature	CODT	-	0 to 7	0	7.2 [59] 4.2
169	B	SIO2 Baud Rate Select	BRS2	bps	9600 to 230400	38400	7.2 [60]
170	B	SIO2 Slave Station Transmitter Activating Minimum Delay Time	RTM2	msec	0 to 255	5	7.2 [61]
171	B	SIO2 Silent Interval Multiplying Factor	SIM2	-	0 to 10	0	7.2 [62]
172	B	SIO2 Slave Address	MSA2	-	1 to 16	1	7.2 [63]
181	B	Pressing Method	SPOS	-	0: CON type 1: SEP type	0	7.2 [64]

7.2 Detail Explanation of Parameters

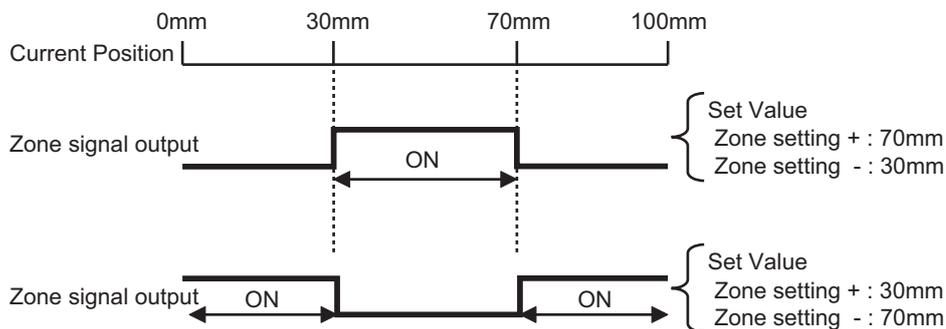
⚠ Caution: *If parameters are changed (writing), provide software reset or reconnect the power to reflect the setting values.*

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

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

These parameters are used set the zone in which zone signal (ZONE1 or ZONE2) turns ON. The minimum setting unit is 0.01mm (deg).
 If a specific value is set to both zone setting + and zone setting -, the zone signal is not output. A setting sample is shown below.

[Example of when line axis]



⚠ Caution: *The signal cannot be output unless of the zone detection is set to a value greater than that of the minimum resolution (actuator lead length/encoder pulse value).*

[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	-9999.99 to 9999.99	Actual stroke on + side
4	Soft limit Negative Side	LIML	mm	-9999.99 to 9999.99	Actual stroke on - 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.

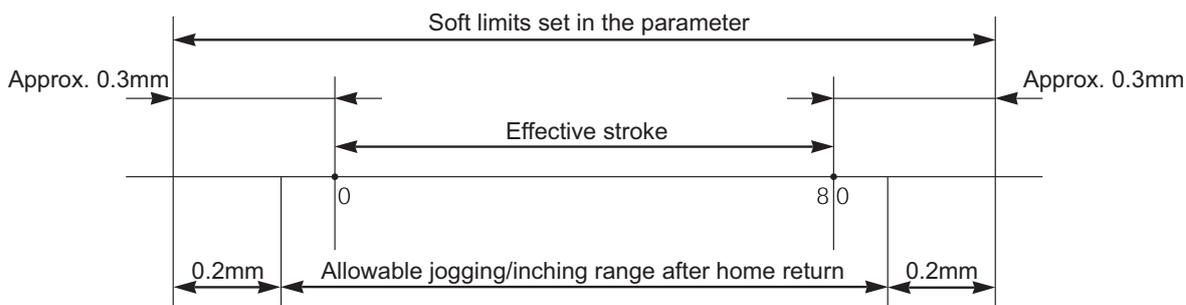
The minimum setting unit is 0.01mm.

(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 and 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. [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: The home direction cannot be changed for the rod type actuators.

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

No.	Name	Symbol	Unit	Input Range	Default factory setting
6	Press & hold stop judgment period	PSWT	msec	0 to 9999	255

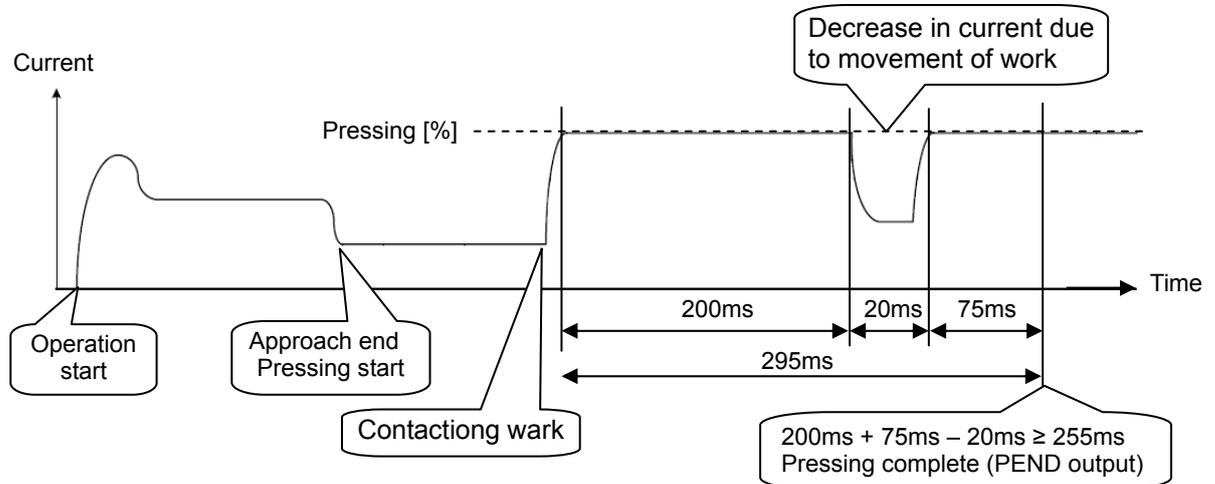
Judging completion of pressing operation

(1) For Standard type (PIO pattern 0 to 3)

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 [%])
 $\geq 255 \text{ ms (Parameter No.6)}$

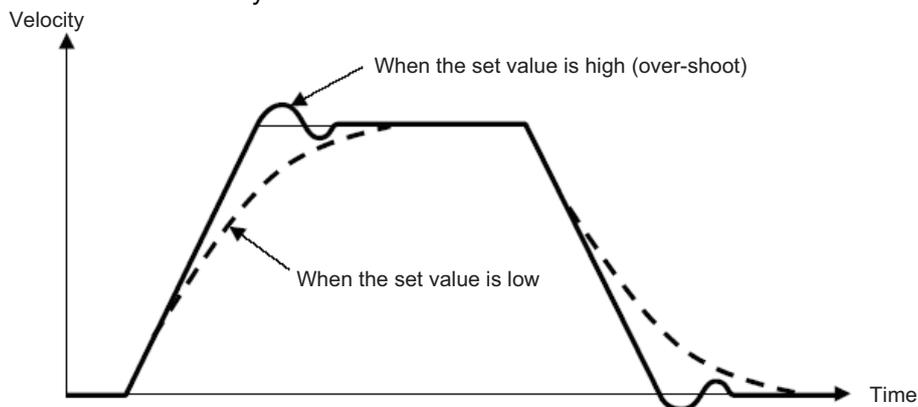


[5] Servo gain number (Parameter No.7)

No.	Name	Symbol	Unit	Input Range	Default factory setting
7	Servo gain number	PLGO	-	0 to 31	6

The servo gain is also called position loop gain or position control system proportional 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 chances 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.



[6] Default velocity (Parameter No.8)

No.	Name	Symbol	Unit	Input Range	Default factory setting
8	Default velocity	VCMD	mm/s	1 to Actuator's max. verocity	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 (Parameter No.10)

No.	Name	Symbol	Unit	Input Range	Default factory setting
10	Default positioning width	INP	mm	0.00 to In accordance with actuator	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.

[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	%	1 to 70	35

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.

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

No.	Name	Symbol	Unit	Input Range	Default factory setting
13	Current-limiting value during home return	ODPW	%	0 to 100	In accordance with actuator

The factory setting conforms to the standard specification of the actuator. 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.

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[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)

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) 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. Do not set a smaller value than the initial setting value for Home Return Offset. Normal excitation detection cannot be performed, and there may be a risk of generating the excitation detection error or causing abnormal noise. In case there is a necessity of setting a value less than the initial setting, contact IAI.

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[15] Zone 2 positive side, Zone 2 negative side (Parameter No.23, No.24)
 [Refer to 7.2 [1].]

[16] PIO jog velocity (Parameter No.26)

No.	Name	Symbol	Unit	Input Range	Default factory setting
26	PIO jog velocity	JOGV	mm/s	1 to Actuator's max. speed ^(note1)	In accordance with actuator

It is the setting of JOG operation velocity when the JOG velocity / inching distance switchover signal JVEL is off.

Set an appropriate value in Parameter No.26 in accordance with the purpose of use.

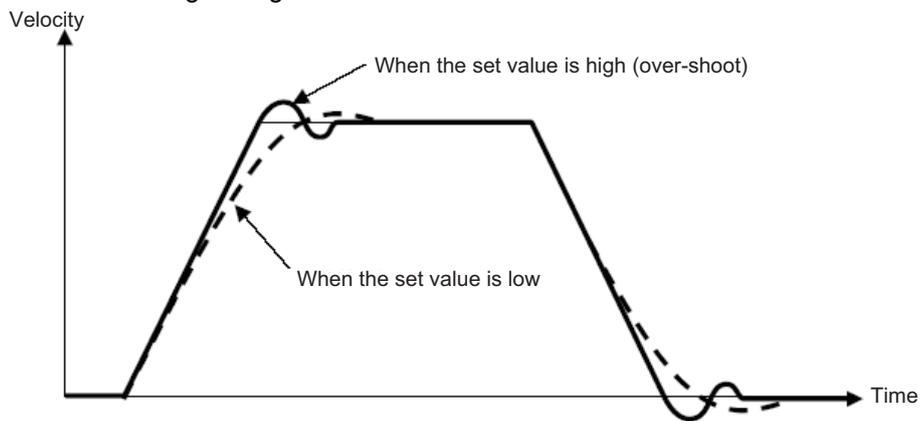
Note 1 The maximum speed is limited to 250mm/s.

[17] 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 may induce vibrations in the mechanical system.

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.



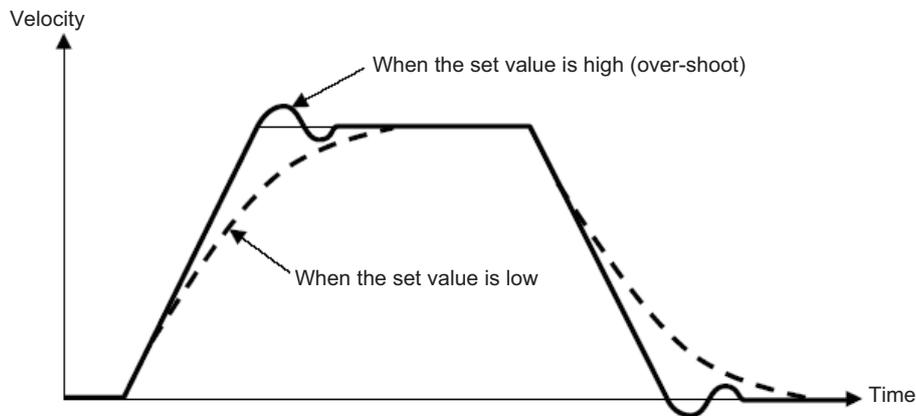
[18] Velocity loop integral gain (Parameter No.32)

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 friction. This parameter is intended to cope with deviation generated by external causes including friction. 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 causes the machine system to be vibrated due to overshoot or shaking.

Tune it to obtain the optimum setting by watching the velocity response.

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.



[19] 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.

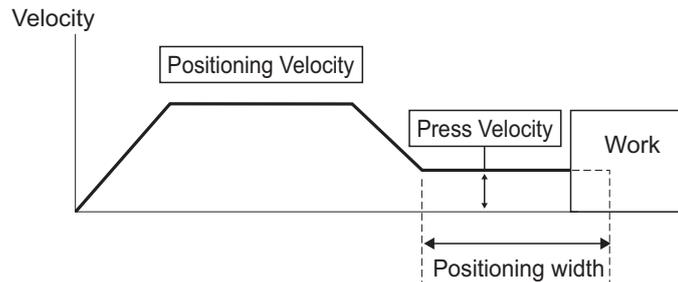
When vibration and/or noises occur due to mechanical resonance during operation, this parameter may be able to suppress the mechanical resonance. This function is effective for torsion resonance of ball screws (several hundreds Hz).

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[20] Press velocity (Parameter No.34)

No.	Name	Symbol	Unit	Input Range	Default factory setting
34	Press velocity	PSHV	mm/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.
 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 disrupt to obtain the specified pressing force. Also when setting at a low velocity, take 5mm/s as the minimum.



⚠ Caution: If the velocity of the positioning of the position table is set below this parameter, the pressing speed will become the same as the positioning speed.

[21] Safety velocity (Parameter No.35)

No.	Name	Symbol	Unit	Input Range	Default factory setting
35	Safety velocity	SAFV	mm/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.

[22] 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 Chapter 5 Power-saving Function.]

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[23] 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 1: INP	0

This is the parameter to select the type of the positioning complete signals to be used. 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.

Setting	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.

[24] Enable function (Parameter No.42)

No.	Name	Symbol	Unit	Input Range	Default factory setting
42	Enable function	ENBL	–	0 : Enabling 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)

[25] 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 1: a contact 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 home position sensor non-detected 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

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[26] 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.

[27] Velocity override (Parameter No.46)

No.	Name	Symbol	Unit	Input Range	Default factory setting
46	Velocity override	OVRD	%	0 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 is 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.

[28] 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 maximum speed for the actuators ^(Note 1)	In accordance with actuator

It is the setting of JOG operation velocity when the JOG velocity / inching distance switchover signal JVEL is on.

Set the appropriate value considering how the system is to be used.

Note 1 The maximum speed is limited to 250mm/s.

[29] PIO inch distance, PIO inch distance 2 (Parameter No.48, No.49)

No.	Name	Symbol	Unit	Input Range	Default factory setting
48	PIO inch distance	IOID	mm	0.01 to 1.00 ^(Note 2)	1.00
49	PIO inch distance 2	IOD2	mm	0.01 to 1.00 ^(Note 2)	0.1

Parameter No. 48 is the setting of inching distance when the JOG velocity / inching distance switchover signal JVEL is off, and Parameter No. 49 is the that when the JOG velocity / inching distance switchover signal JVEL is on.

Note 2 The maximum allowable value is 1 mm.

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[30] Load output judgment time period (Parameter No.50)

No.	Name	Symbol	Unit	Input Range	Default factory setting
50	Load output judgment time period	LDWT	msec	0 to 9999	255

The load output (LOAD) turns on when the current has exceeded the rate (%) set as the threshold in the position table in the range set with Zone + / Zone – (Inspection Range) in the position table during the pressing operation.

(Note) It is not output of the torque level status signal (TRQS) for fieldbus control.

[31] 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 pattern)

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.

Set Value	Description
0	Trapezoid
1	S-motion
2	Primary delay filter

[32] Default stop mode (Parameter No.53)

No.	Name	Symbol	Unit	Input Range	Default factory setting
53	Default stop mode	HSTP	–	0 to 3	0 (Does not use)

This parameter defines the power-saving function.

[Refer to Chapter 5 Power-saving Function.]

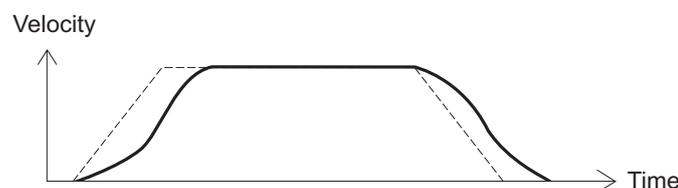
[33] Position-command primary filter time constant (Parameter No.55)

No.	Name	Symbol	Unit	Input Range	Default factory setting
55	Position-command primary filter time constant	PLPF	msec	0.0 to 100.0	0

Use this in the case to set the value in “Acceleration/Deceleration” box in the position table to 2 “1-step delay filter”, or in the case that there is no acceleration/deceleration function the host controller in Pulse Train Control Mode.

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 takt time will become longer.

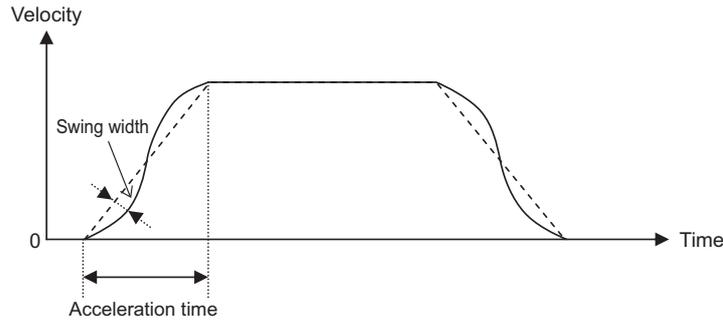


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[34] S-motion rate (Parameter No.56)

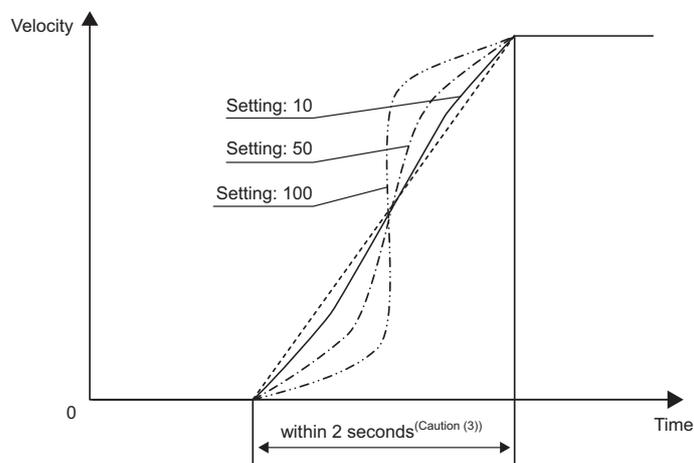
No.	Name	Symbol	Unit	Input Range	Default factory setting
56	S-motion rate	SCRV	%	0 to 100	0

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 takt 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 of Parameter No.56 [%]	Level of swing width
0 [Set in delivery]	No S-motion (Dotted line shown in the image below)
100	Sine curve swing width $\times 1$ (Double-dot dashed line shown in the image below)
50	Sine curve swing width $\times 0.5$ (Dashed line shown in the image below)
10	Sine curve swing width $\times 0.1$ (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) If acceleration time or deceleration time exceeds 2 seconds, do not specify S-motion control. The actuator will fail to operate normally.

(3) Do not perform temporary stop during acceleration or deceleration. The speed change (acceleration) may cause the dangerous situation.

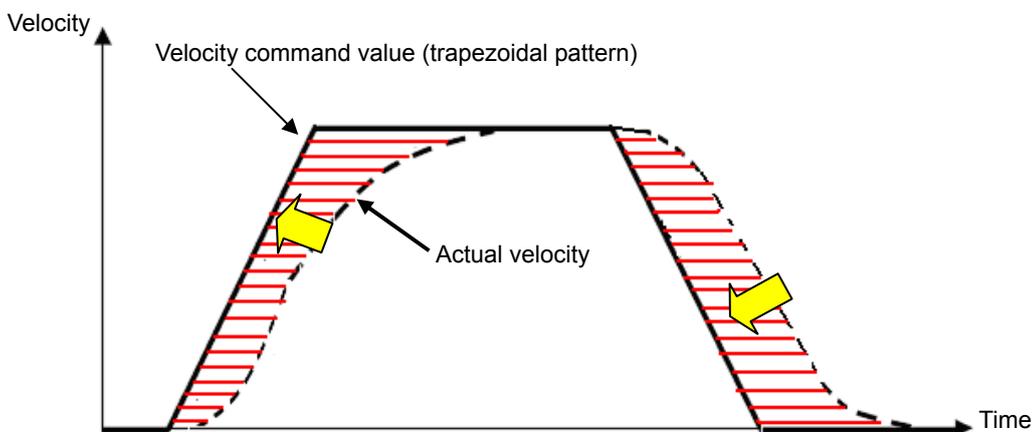
[35] Position feed forward gain (Parameter No.71)

No.	Name	Symbol	Unit	Input Range	Default factory setting
71	Feed forward gain	PLFG	–	0 to 100	0

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.



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[36] 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.*

[37] Axis operation type (Parameter No.78)

No.	Name	Symbol	Unit	Input Range	Default factory setting
78	Axis operation type	ATYP	-	0: Linear Axis 1: Rotary Axis	0

This parameter defines the type of the actuator used.

Connected Actuator	Set Value	Reference
Linear Axis	0	Actuator other than rotational axis
Rotary Axis	1	Rotary Axis (cannot be selected in RCP6S)

⚠ Caution: *Do not change the setting of this parameter. Failure to follow this may cause an alarm or fault to occur.*

[38] 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 1: Index Mode	In accordance with actuator

This parameter defines the mode of the rotational axis.
When the axis operation type (Parameter No.78) is set to "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 shortcut control is enabled.

Set Value	Description
0	Normal Mode
1	Index Mode

⚠ 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.*

⚠ Caution: *Not to be used in this setting for RCP6S. Do not change the setting from the setting value.*

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[39] Rotational axis shortcut selection (Parameter No.80)

No.	Name	Symbol	Unit	Input Range	Default factory setting
80	Rotational axis shortcut selection	ATYP	–	0: Disabling 1: Enabling	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	Disable
1	Enable

⚠ Caution: Not to be used in this setting for RCP6S. Do not change the setting from the setting value.

[40] Absolute unit (Parameter No.83)

No.	Name	Symbol	Unit	Input Range	Default factory setting
83	Absolute unit	ETYP	–	0: Not used 1: Used	1

Set to 1 for battery-less absolute type.

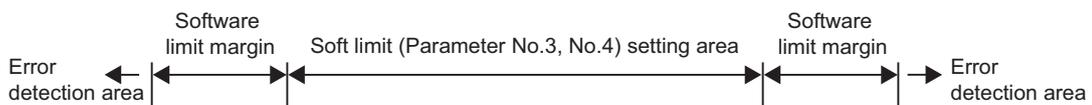
Set to 0 when battery-less absolute is used in incremental.

[41] 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 software limit errors set in Parameters No. 3 and No. 4.

It is not necessary to change the setting in normal use.



[42] 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	PSFC	–	0: Current limiting value at stop 1: Current limit value during pressing	0

This parameter defines the restricted current value at stopping due to miss-pressing. This restricted current value locks the servo till the next moving command.

Parameter No.91	Description
0	Current limitation value while in operation stop (setting value in the current limiting value at positioning stop (Parameter No.12))
1	Press-motion current-limiting value

[43] 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: Rapid stop 1: Deceleration to stop	0

Select the stop mode for when the servo is turned OFF while in operation. It is stopped with the rated deceleration speed if 1 is selected. If 1 is selected, the actuator decelerates with position data in execution and stops.

[44] Monitoring mode (Parameter No.112)

No.	Name	Symbol	Unit	Input Range	Default factory setting
112	Monitoring mode	FMNT	–	0: Does not use 1: Monitor function 1 2: Monitor function 2 3: Monitor function 3	0

The controller can be connected with PC software to monitor the servo. This parameter allows you to select a monitoring mode function (servo monitor). 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.

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[45] 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 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 1ms in the initial setting. Up to 60s can be set.

Record mode	1ms frequency setting	100ms frequency setting
2CH	Max. Obtainable Time 8.19sec	Max. Obtainable Time 819sec
4CH	Max. Obtainable Time 4.095sec	Max. Obtainable Time 409.5sec
8CH	Max. Obtainable Time 2.047sec	Max. Obtainable Time 204.7sec

[46] Overload level ratio (Parameter No.143)

No.	Name	Symbol	Unit	Input Range	Default factory setting
143	Overload level ratio	OLWL	%	50 to 100	100

Do not change the default value.

[47] 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 (Disabling)

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)

[48] 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 7.2 [17] Velocity loop proportional gain for the details]

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.

[49] 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 7.2 [18] Velocity loop integral gain for the details]

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.

[50] Total movement count threshold (Parameter No.147)

No.	Name	Symbol	Unit	Input Range	Default factory setting
147	Total movement count threshold	TMCT	Times	0 to 999999999	0 (Disabling)

A light error alarm 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.

[51] Total operated distance threshold (Parameter No.148)

No.	Name	Symbol	Unit	Input Range	Default factory setting
148	Total operated distance threshold	ODOT	m	0 to 999999999	0 (Disabling)

A light error alarm 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.

[52] 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 level alarm output	0

It can be selected whether outputting ALML Signal when a message level alarm is generated in addition to when overload warning.

[53] High output setting (Parameter No.152)

No.	Name	Symbol	Unit	Input Range	Default factory setting
152	High output setting	BUEN	–	0: Disable 1: Enable	1 (Enable)

Set whether use the high output function.

[54] BU velocity loop proportional gain (Parameter No.153)

No.	Name	Symbol	Unit	Input Range	Default factory setting
153	BU velocity loop proportional gain	BUPC	–	1 to 27661	In accordance with actuator

When the High output setting (Parameter No.152) is set effective, this parameter setting becomes effective for Velocity Loop Proportional Gain.

[Refer to the 7.2 [17] Velocity loop proportional gain for the details]

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.

[55] BU velocity loop integral gain (Parameter No.154)

No.	Name	Symbol	Unit	Input Range	Default factory setting
154	BU velocity loop integral gain	BUIC	–	1 to 217270	In accordance with actuator

When the high-thrust setting (Parameter No.152) is set effective, this parameter setting becomes effective for Velocity Loop Integrated Gain.

[Refer to the 7.2 [18] Velocity loop integral gain for the details]

[Reference Item] 7.2 [56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.

[56] Selecting the Use of velocity loop proportional gain and velocity loop integrated gain.

Even though Velocity Loop Proportional Gain 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)	
		1 (Enable)	0 (Disable)
Gain Scheduling (Parameter No.144)	101 to (Enable)	Parameter No.145, 146	Parameter No.145, 146
	to 100 (Disable)	Parameter No.153, 154	Parameter No.31, 32

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[57] Delay time after shutdown release (Parameter No.165)

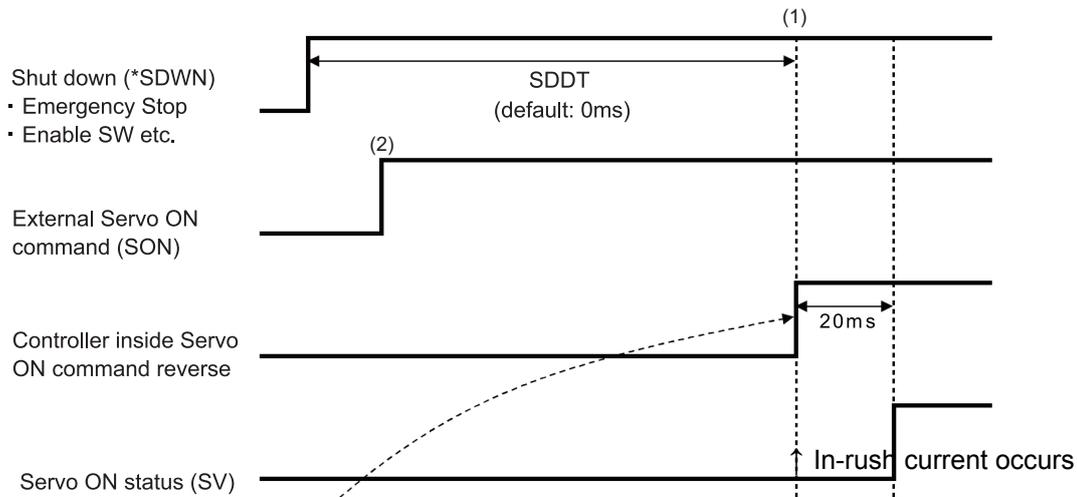
No.	Name	Symbol	Unit	Input Range	Default factory setting
165	Delay time after shutdown release	SDDT	msec	0 to 1000	0

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.

Example of use) When drive cutoff is constructed externally



If the ON-edge (2) of the external servo ON command is later than the time past the SDDT time (1), the status becomes to stand by to receive the controller internal servo ON command at the time of (2).

[58] Startup Current Limit Extension Feature (Parameter No.166)

No.	Name	Symbol	Unit	Input Range	Default factory setting
166	Startup current limit extension feature	DCET	-	0: Disable 1: Enable	0 (Disable)

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

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[59] Collision detection feature (Parameter No.168)

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 4 Collision Detection Feature]

Setting value	Operation status	Alarm level
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 level
3	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. <ul style="list-style-type: none"> • The first movement after releasing from a pause • Movement from a stop in the position zone range 	
5	Detection is conducted in position zone setting range.	Message level
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. <ul style="list-style-type: none"> • The first movement after releasing from a pause • Movement from a stop in the position zone range 	

[60] 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.

[61] 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.

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[62] 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.

[63] 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 address 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.**

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[64] Pressing type (Parameter No.181)

No.	Name	Symbol	Unit	Input Range	Default factory setting
181	Pressing type	SPOS	-	0: Type CON 1: Type SEP	0

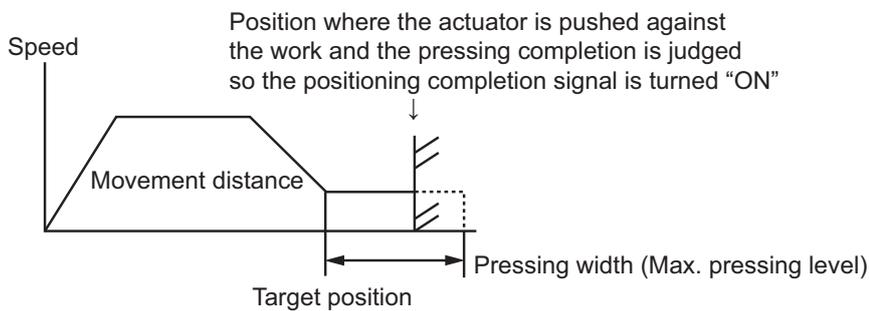
The pressing type can be selected from CON type and SEP type.

[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.



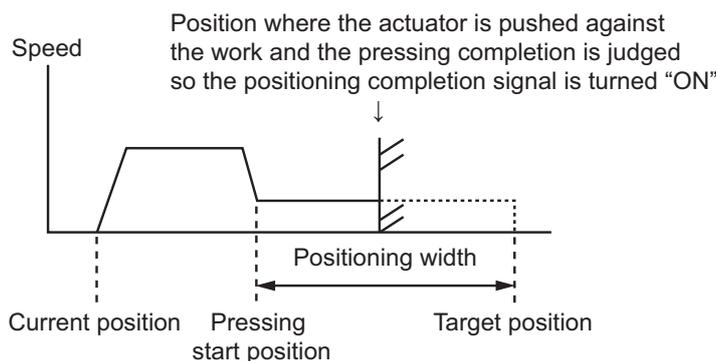
[Pressing Operation SEP Method]

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.



7.3 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 cause 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.*

No.	Situation that requires adjustment	How to Adjust
1	<p>Takes time to finish positioning</p> <p>Positioning accuracy is not appropriate</p> <p>Shorter takt time is desired</p>	<ul style="list-style-type: none"> • Set "parameter No.55 "Position command primary filter time constant"" to "0" if it is set. • Increase the value of "parameter No.7 "Servo gain number"". By setting a larger value, the following 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. <u>If the value of "parameter No.7 "Servo gain number"" is increased, also adjust the "parameter No.31 "Velocity loop proportional gain"" in increasing direction to ensure the stability in the control system.</u> To increase the value of "parameter No.31 "Velocity loop proportional gain"" <u>by about approximately 20% of the default.</u> Prior to the setting, adjust "parameter No.7 "Servo gain number"".
2	Vibration is generated at acceleration/deceleration	<ul style="list-style-type: none"> • 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. • Decrease the values of "acceleration/deceleration setting". • Decrease the number of "parameter No.7 "Servo gain number"". If the "parameter No.7 "Servo gain number"" is too low, it takes long time to finish the positioning.
3	<p>Speed is uneven during the movement</p> <p>Speed accuracy is not appropriate</p>	<ul style="list-style-type: none"> • Increase the value of parameter No.31 "Velocity loop proportional gain". By setting a larger value, the follow-up ability to the speed command becomes better. Setting too large value makes the mechanical components easy to vibrate. As a reference for the setting, <u>increase the value little by little by about approximately 20% from the initial setting.</u>

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No.	Situation that requires adjustment	How to Adjust
4	<p>Abnormal noise is generated. Especially, when stopped state and operation in low speed (less than 50mm/sec), comparatively high noise is generated.</p>	<ul style="list-style-type: none"> Input the "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. <p>[Important] Prior to Adjustment: 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:</p> <ol style="list-style-type: none"> The value for "parameter No.7 "Servo gain number"", "parameter No.31 "Velocity loop proportional gain"", or "parameter No.32 "Velocity loop integral gain"" are excessive. The stiffness of the load is sufficient as much as possible, or the attachments are not loosened. The actuator unit is mounted securely with a proper torque. There is no waviness on the actuator mounting surface.
5	<p>Trace precision is desired to be improved. Equi-speed performance is desired to be improved. Response is desired to be improved.</p>	<ul style="list-style-type: none"> 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. <p>[Reference] 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. Therefore, to improve the precisions of the trace, position, speed and response of the actuator, the load inertia ratio must be made small. 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. The best method is to calculate the load inertia to select the proper actuator.</p>
6	<p>Large static friction of load makes actuator start slowly. Large load inertia makes response of actuator low at start and stop. Takt time is desired to be shortened.</p>	<ul style="list-style-type: none"> Set parameter No.71 "Feed forward gain". 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. Setting a large value may cause vibrations and/or noises to occur. 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 "Velocity loop proportional gain".

Chapter 8 Troubleshooting

8.1 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 the controller.

○: Illuminating, ×: OFF, ☆: Flashing

LED	Color	Operation Status
×	-	Power is OFF
		Servo OFF
●	Red	Alarm (operation available level 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 chapter 5]

- 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 8.3 Gateway Alarm or 8.4 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.*

8.2 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.

8.2.1 Impossible Operation of Controller

Situation	Possible cause	Check/Treatment
At power-on, SV on the status indicator LEDs does not go ON.	<ol style="list-style-type: none"> (1) Proper power is not supplied. (2) Servo-on command is not input to IAI controller. The operation mode setting switch on the front panel is on "MANU" side. (3) Occurrence of alarm. (4) During emergency-stop. <ol style="list-style-type: none"> 1) Was the emergency-stop switch. 2) EMG- on the power supply connector is not connected. 	<ol style="list-style-type: none"> (1) Ensure that appropriate voltage is supplied and the wiring is in the right condition. [Refer to 2.3.1 Wiring Layout of Power Supply Connector.] (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. [Refer to Name for Each Parts and Their Functions.] (3) Check the error code with the teaching tool being connected and remove the cause by referring the alarm list. [Refer to 8.4 Alarm List.] (4) <ol style="list-style-type: none"> 1) Release the emergency stop switch. 2) Check the connection of the power connector (EMG-). [Refer to 2.3.1 Connection to Power Input Connector.]
ALM in the status display LEDs turns on when the power is supplied.	<ol style="list-style-type: none"> (1) Occurrence of alarm (2) During emergency-stop. <ol style="list-style-type: none"> 1) Was the emergency-stop switch. 2) EMG- on the power supply connector is not connected. 	<ol style="list-style-type: none"> (1) Check the error code with the teaching tool being connected and remove the cause by referring the alarm list. [Refer to 9.4 Alarm List.] (2) <ol style="list-style-type: none"> 1) Release the emergency stop switch. 2) Check the connection of the power connector (EMG-). [Refer to 2.3.1 Connection to Power Input Connector.]

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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. 1) Servo OFF condition 2) The pause signal is OFF. 3) Positioning command is issued to a stop position. 4) There is no positioning data set to the commanded position number. 5) 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. 2) Operation is available pause signal *STP is ON and pause when it is OFF. Turn it ON. 3) Check the sequence or the settings of the position table. 4) It will generate Alarm Code 0A2 "Position Data Error". Conduct the position table setting. 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. (the emergency stop switch is released on the teaching tool)	Cable treatment or mode selection. 1) Emergency stop condition 2) Servo OFF condition 3) In pause	1) Supply 24V DC to EMG-terminal of the power connector. <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p> Warning If the process of 1) is conducted, put back the setting as soon as the adjustment work is finished. Starting the operation without putting it back may cause a serious accident since the emergency stop is set invalid.</p> </div> 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.

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8.2.2 Positioning and Speed of Poor Precision (incorrect operation)

Situation	Possible cause	Check/Treatment
Completion of operation on the way to home return	In the home return of our standard specification, the actuator is first pressed to the mechanical end, moved oppositely, and subject to positioning stop at the home position. Therefore, the product may judge as the mechanical end even though it is still on the way when the load is large and interfere with surrounding object. 1) A load exceeding its rating weight is installed on the actuator. 2) It is touched to interference in the way of the run. 3) Torsion stress is applied to guide due to improper fixing method of the actuator or uneven fastening of bolts. 4) The sliding resistance of the actuator itself is large.	1) Reduce the load. 2) Remove the interference. 3) Loosen the fixing bolts once and check whether the slider can move smoothly. If the slider can move smoothly, check if there is a deformation on the attached surface, and install the actuator again following the instructions stated in Instruction Manual. 4) Please contact IAI.
Shocks at start and/or stop.	Acceleration/deceleration is set too high.	Decrease the settings of acceleration/deceleration.
Overshoot during deceleration to stop.	The load inertia is large.	Decrease the setting of deceleration.
Positioning of poor precision ----- Uneven speed during movement ----- Acceleration/deceleration not smooth (bad speed response) ----- Trace of poor precision	[Refer to 7.3 Servo Adjustment.]	

(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. 1) Start signal CSTR is input too early after position No. command. Or position No. command and start signal are input concurrently. 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.] 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. 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.

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8.2.3 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 7.3 Servo Adjustment.] It may be improved with setting to Full Servo Mode if the case occurs during deceleration and stop. [Refer to Chapter 5 Power-saving Function]

Situation	Possible cause	Check/Treatment
Vibrations of load	<ol style="list-style-type: none"> 1) Acceleration/deceleration is set too high. 2) The installation structure and/or the installed load are easily affected by acceleration/deceleration. 	<ol style="list-style-type: none"> 1) Decrease the settings of acceleration/deceleration.

8.2.4 Impossible Communication

Situation	Possible cause	Check/Treatment
Not connectable with host machine	<ol style="list-style-type: none"> 1) Communication rates do not match. 2) The machine number (station number) is set to be duplicate out of the range. 3) Parameter No.17 "Minimum delay time for slave transmitter activation" is set incorrectly. 4) Poor wiring or disconnection of communication cable 	<ol style="list-style-type: none"> 1) Set the communication rate to match that of the host machine. [Refer to the Instruction Manual of the host unit.] 2) Confirm the maximum number of axes available to connect. 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.) 4) Review the wiring again. Check if termination resistances are connected to network terminals with correct values.

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8.3 Gateway Alarm

8.3.1 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.

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Alarm Code	Alarm Name	Cause/Treatment
96 (896)	Connected Unit Construction Error	<p>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.</p> <p>Treatment : 1) Adjust the left-justification setting in the gateway setting tool and the current axis connection status to be matched. 2) Set the left-justification setting feature setting valid (with out alarm).</p>
9D (89D)	Fieldbus Module Initialization Timeout	<p>Cause : Initialization of the fieldbus module did not finish even after a certain while has passed.</p> <p>Treatment : Turn the power OFF and reboot. If the same error occurs again, please contact IAI.</p>
A0 (8A0)	Control Power Overvoltage	<p>Cause : Control power voltage reached beyond the overvoltage threshold (120% of 24V DC = 28.8V). 1) The voltage of 24V DC power supply is high. 2) A faulty part inside the controller 3) Turning the servo ON at acceleration/deceleration spends a huge current consumption transiently. Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change.</p> <p>Treatment : 1) 2) Check the voltage of the input power supply. 3) Think to use a power supply with enough current capacity or not to use the remote sensing function. If the voltage is normal, please contact IAI.</p>
A1 (8A1)	Control Power Voltage Drop	<p>Cause : The control power voltage dropped less than the voltage drop threshold (70% of 24V DC = 16.8V). 1) The voltage of 24V DC power is low 2) A faulty part inside the controller</p> <p>Treatment : Check the power voltage. If the voltage is normal, please contact IAI.</p>
A7 (8A7)	Power Voltage Drop in External Wiring	<p>Cause : Power voltage to be used for external wiring has dropped.</p> <p>Treatment : Reboot the power supply. In case the error occurs even after power reboot, contact IAI.</p>
B0 (8B0)	Connection Unit Control Power Voltage Drop	<p>Cause : The control power voltage of the hab unit has dropped.</p> <p>Treatment : Check the wiring on the hub unit. The detected point can be clarified with the detail code. Detail Code "----" : Hub Unit 1 "0001" : Hub Unit 2 "0002" : Hub Unit 3 "0003" : Hub Unit 4</p> <p>(Note) It may not be displayed depending on the version of the gateway unit and the hub unit. [Refer to 8.3.2 Connection Unit Control Power Voltage Drop Alarm.]</p>
FFF	Power-on Log	It is the log at the power being on (it is not an error).

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8.3.2 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.

Hub Unit SYS LED Display

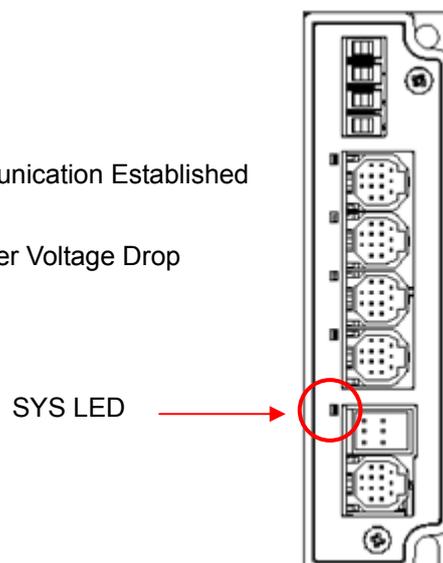
The display status of SYS LED lamp when the voltage has recovered to the normal condition from control power voltage drop differs depending on the version of the hub unit.

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.

Hub Unit

- Green Illuminating : Ready Status
- ★ Green Flashing : Standby with Communication Established
- Red Illuminating : Control / Motor Power Voltage Drop



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8.4 Driver Alarm

8.4.1 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 PIO 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.

8.4.2 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.

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*ALM	ALM8 (PM8)	ALM4 (PM4)	ALM2 (PM2)	ALM1 (PM1)	Binary Code	Description: Alarm code is shown in ().
●	●	○	○	●	6	Parameter data error (0A1) Position data error (0A2) Unsupported motor/encoder type (0A8)
●	●	○	○	○	7	Excitement detection error (0B8) Home sensor non-detection (0BA) Home return timeout (0BE)
●	○	●	●	●	8	Actual speed excessive (0C0)
●	○	●	●	○	9	Overcurrent (0C8) Overvoltage (0C9) Overheat (0CA) Current sensor offset adjustment error (0CB) Control power supply voltage error (0CC) Control power supply voltage drop (0CE) Drive source error (0D4)
●	○	●	○	○	11	Command counter overflow in Incomplete home return (0D5) Deviation overflow (0D8) Software stroke limit exceeded (0D9) Pressing motion range over error (0DC)
●	○	○	●	●	12	Servo error (0C1) Overload (0E0)
●	○	○	●	○	13	Encoder send error (0E4) Encoder receipt error (0E5) Encoder Counter Error (0E6) A and B-phase wire breaking (0E8) Battery-less ABS error (0EB) PS-phase wire breaking (0EC) Absolute encoder error detection 1 (0ED) Absolute encoder error detection 2 (0EE)
●	○	○	○	●	14	CPU error (0FA) Logic error (0FC)
●	○	○	○	○	15	Nonvolatile memory write verify error (0F5) Nonvolatile memory write timeout (0F6) Nonvolatile memory data destroyed (0F8)

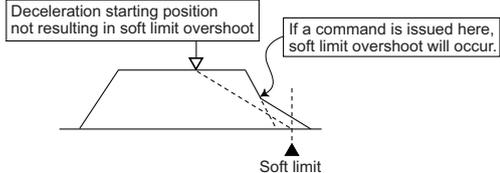
(Note) *ALM Signal is an active low signal. It is ON when the power is applied to the controller, and turns OFF when the signal is output.

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8.4.3 Alarm Codes for Driver Board

Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
048	Message	Driver overload alarm	Cause : There is a risk of overload with the current operation condition. Treatment : Lower the setting of acceleration/deceleration. Also, increase the frequency of pause.
049			Cause : Motor current has reached the detection current set in the 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".
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.
090		Software reset command in servo-ON condition	Cause : A software reset command was issued when the servo was ON. Treatment : Issue a software reset command after confirming that the servo is OFF (SV signal is 0).

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
091	Operation release	Position No. error in teaching	Cause : The position number out of the available range was selected. 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. 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. 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. 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. 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 7.2 [2] Soft limit +, Soft limit -] Treatment : Change the value to the appropriate one.
0A2	Operation release	Position data error	Cause : 1) A move command was input when no target position was set in the "Position" field of a position No. in the position table. 2) The value of the target value in the "Position" field exceeded the Parameter No.3 and 4 "Soft limit set value". Treatment : 1) Set the target position. 2) Change the target position value to the one within the soft limit set value.
0A3		Position command data error	Cause : The speed or acceleration/deceleration value during direct numeric specification exceeded the maximum set value. Treatment : Input an appropriate value.
0A7		Command deceleration error	Cause : Because there is not enough deceleration distance when the deceleration is changed to a lower setting during the operation, the actuator exceeded the soft limit when deceleration was made from the current position with the deceleration after the change.  The cause is that the timing to make the next movement command when the speed was changed during the operation was late. Treatment : Make the timing earlier for the movement command for the deceleration speed change.

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0A8	Cold start	Unsupported motor/encoder types	<p>Cause : A motor or encoder not applicable for this controller is connected, and the motor or encoder cannot be classified.</p> <p>Treatment : Contact us in case this alarm is issued with the applicable actuator or occurs again even after the power is rebooted.</p>
0B8		Excitement detection error	<p>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.</p> <ol style="list-style-type: none"> 1) Connection error or wire breakage of motor/encoder cables. 2) Brake is not released (when equipped with a brake). 3) Load to the motor is high due to external force. 4) Power was turned on while touching to the mechanical end. 5) The resistance in the actuator sliding operation is large. 6) Parameter No.22 Home Return Offset was set smaller than the initial value. <p>Treatment : 1) Check for the motor/encoder cable wiring condition. 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. 3) Confirm that there is no error in the mechanical part assembly condition. 4) Move the slider or the rod to a point where it would not hit the mechanical end and reboot the system. 5) If the loaded weight is within the allowable range, turn the power OFF and check the resistance in sliding operation by moving the slider with hand. 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.</p>
0BA	Operation release	Home sensor non-detection	<p>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.</p> <ol style="list-style-type: none"> 1) The work piece has interfered with the peripherals during the home-return operation. 2) The resistance in the actuator sliding operation is large. 3) Attachment error, malfunction or wire breakage of origin sensor. <p>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.</p>
0BE		Home return timeout	<p>Cause : Home return does not complete after elapse of a certain period after the start of home return.</p> <p>Treatment : This error does not occur in normal operation. The combination of the controller and actuator may be incorrect. Please contact IAI.</p>

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0C0	Operation release	Actual speed excessive	<p>Cause : This indicates the number of motor rotation exceeded the number of allowable rotation.</p> <ol style="list-style-type: none"> 1) The slide resistance of the actuator is locally high. 2) The load is increased too much due to an external force. <p>With the reasons above, it can be considered a sudden speed increase has occurred before detecting the servo error.</p> <p>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.</p>
0C1		Servo error	<p>Cause : It indicates 2 seconds has passed without making a move since a move command was received.</p> <ol style="list-style-type: none"> 1) Connection error or wire breakage of motor/encoder cables. 2) Brake is not released (when equipped with a brake). 3) Load to the motor is high due to external force. 4) The resistance in the actuator sliding operation is large. <p>Treatment :</p> <ol style="list-style-type: none"> 1) Check for the motor/encoder cable wiring condition. 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. 3) Confirm that there is no error in the mechanical part assembly condition. 4) If the loaded weight is within the allowable range, turn the power OFF and check the resistance in sliding operation by moving the slider with hand.

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0C8	Cold start	Overcurrent	<p>Cause : The output current in the power circuit section is increased abnormally.</p> <p>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.</p>
0C9		Overvoltage	<p>Cause : The voltage on the power regenerative circuit exceeded the threshold.</p> <p>Treatment : Malfunction of the controller can be concerned. Please contact IAI.</p>
0CA		Overheat	<p>Cause : This indicates overheat (90°C or more) of the components inside the controller.</p> <ol style="list-style-type: none"> 1) Operation is performed with the load condition exceeding the specified range. 2) High temperature around the controller. 3) Load to the motor is high due to external force. 4) A faulty part inside the controller. <p>Treatment : 1) Revise the operation condition such as decreasing the acceleration/deceleration speed. 2) Lower the ambient temperature of the controller. 3) Confirm that there is no error in the mechanical part assembly condition.</p> <p><i>(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.</i></p>
0CB		Current sensor offset adjustment error	<p>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. The current detection sensor or any of its surrounding parts is faulty.</p> <p>Treatment : It is necessary to replace the PC board or adjust the offset. Please contact IAI.</p>
0CC		Control power source voltage error	<p>Cause : The control power voltage dropped less than the voltage drop threshold (120% of 24V DC = 28.8V).</p> <ol style="list-style-type: none"> 1) The voltage of 24V DC power supply is high. 2) A faulty part inside the controller. 3) During acceleration/deceleration and servo-on that use the remote sensing function of 24V DC power supply, the current consumption rises transiently. <p>Using the remote sensing function with a power supply with no enough current capacity may cause overvoltage responding to the current change.</p> <p>Treatment : 1) 2) Check the voltage of the power supply. 3) Think to use a power supply with enough current capacity or not to use the remote sensing function.</p> <p>In the case that the voltage is normal, please contact IAI.</p>
0CE		Operation release	Drop in control supply voltage

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0D4	Cold start	Drive Source error	Cause : Overcurrent is generated on the motor power supply line. Treatment : Check the wire layout between the actuator and controller.
0D5		Differential Counter Overflow with Home Return Incomplete	Cause : This alarm indicates that the position deviation counter has overflowed. 1) The speed dropped or stopped during JOG move due to an impact of external force, hit to the mechanical end or overload. 2) The excited-phase detection operation following the power-on is unstable. Treatment : 1) This error occurs when the actuator cannot be operated as it is commanded. Check the load conditions such as if the work is touching to the surrounding object, or brake is properly released, and remove the cause. 2) Overload is concerned. Revise the transportable weight.
0D8	Operation release	Deviation overflow	Cause : This alarm indicates that the position deviation counter has overflowed. 1) The speed dropped or the actuator stopped due to the effect of external force or overload. 2) The excited-phase detection operation following the power-on is unstable. Treatment : 1) This error occurs when the actuator cannot be operated as it is commanded. Check the load conditions such as if the work is touching to the surrounding object, or brake is properly released, and remove the cause. 2) Overload can be concerned. Revise the transportable weight and redo the home-return operation.
0D9		Software stroke limit exceeded	Cause : The current position of the actuator exceeds the software stroke limit. Treatment : Return the actuator to be within the range of the software stroke limit.
0DC		Pressing motion range over error	Cause : 1) After the pressing operation has complete, the force to push back is too large and the pushed back to the pressing start position ("Position" in the position table). 2) The actuator touched the work during the approach movement before the pressing movement. Treatment : 1) Revise the setting and adjust it so the force to push back gets smaller. 2) Set the "Position" setting in front in the position table to shorten the approach distance.
0DF		Collision detection	Cause : Collision of actuator was detected. Treatment : Remove the cause of collision. If it is an unexpected detection, re-adjust the collision detection feature. [Refer to Chapter 4 Collision Detection Feature]

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0E0	Cold start	Overload	<p>Cause : 1) The work piece weight exceeds the rating, or load has increased due to external force. 2) Brake is not released in case of actuator (equipped with brake). 3) The slide resistance of the actuator is locally high.</p> <p>Treatment : 1) Revise the work piece and peripherals, and remove the cause. 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. 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.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p> Caution: <i>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.</i></p> </div>
0E4		Encoder send error	<p>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.</p> <p>1) Encoder cable is about to break or connector is not plugged properly 2) Effect of noise 3) One or more communication ICs installed on the encoder board are faulty. 4) One or more communication ICs installed on the controller board are faulty.</p> <p>Treatment : 1) Check on the cables and the connector joints to see if any abnormality. 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. If 3) or 4) is the case, the encoder or controller must be replaced. If the cause cannot be specified, please contact IAI.</p>

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0E5	Cold start	Encoder receipt error	<p>Cause : This shows the data was not received in normal condition from the encoder side to the controller</p> <ol style="list-style-type: none"> 1) Cable breakage of encoder cable or connector connection failure (If the detail code in the error list of the teaching tool is 0002_H.) 2) Effect of noise (If the detail code in the error list of the teaching tool is 0001_H.) 3) Malfunction of component (communication part) inside the actuator 4) A faulty part inside the controller (communication part). 5) Initialization of battery-less absolute encoder is incomplete (Detail Code 0003_H) <p>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections. 2) Interrupt the power to the peripheral equipment and activate only the actuator. If any error does not occur, it might be caused by noise. Take proper measures against noise. If the cause is due to 3), 4) or 5), it is necessary to replace the actuator (motor part) or controller. If the cause cannot be specified, please contact IAI.</p>
0E6		Encoder count error	<p>Cause : Error status was received in initial communication with battery-less absolute encoder</p> <p>Treatment : Reboot the power and conduct an absolute reset (home-return operation). Contact IAI in case the condition would not recover.</p>
0E8		A- and B-phase wire breaking	<p>Cause : Encoder signals cannot be detected correctly.</p> <ol style="list-style-type: none"> 1) The actuator cable is disconnected or its connector is not plugged in correctly. 2) The encoder itself is faulty. <p>Treatment : 1) Check if any wire breakage on a connector and the condition of wire connections. If the cables are normal, faulty encoder is suspected. Please contact IAI.</p>
0EB		Battery-less ABS error	<p>Cause : It is a condition that the battery-less absolute encoder has not detected the position information properly.</p> <p>Treatment : Check if there is any breakage on the connectors and the condition of connections. Malfunction of the encoder can be considered if the cables are in the normal condition. Please contact IAI.</p>
0ED		Operation release	Absolute encoder error detection 1

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Alarm Code	Alarm Level	Alarm Name	Cause/Treatment
0EE	Operation release	Absolute encoder error detection 2	<p>Cause : The position data cannot be detected properly in the encoder.</p> <p>1) Changed the parameters of controller</p> <p>2) Position data loss in absolute reset (If the detail code in the error list of the teaching tool is 0006_H or 0022_H.)</p> <p>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)</p> <p>Treatment : Conduct an absolute reset. [Refer to Chapter 6 Absolute Reset]</p>
0F4	Cold start	Mismatched PCB	<p>The PCB is not applicable for the connected motor in the startup check.</p> <p>Cause : The parameter may not match. Check the model.</p> <p>Treatment : Should this error occur, please contact IAI.</p>
0F5	Operation release	Nonvolatile memory write verify error	<p>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.</p> <p>Cause : Faulty nonvolatile memory.</p> <p>Treatment : When the error is caused even when the power is re-input, please contact IAI.</p>
0F6	Cold start	Nonvolatile memory write timeout	<p>There is no response in the specified time duration during the data writing to the non-volatile memory.</p> <p>Cause : Faulty nonvolatile memory.</p> <p>Treatment : When the error is caused even when the power is re-input, please contact IAI.</p>
0F8		Nonvolatile memory data destroyed	<p>Abnormal data was detected during the nonvolatile memory check after starting.</p> <p>Cause : Faulty nonvolatile memory.</p> <p>Treatment : When the error is caused even when the power is re-input, please contact IAI.</p>
0FA		CPU error	<p>The CPU operation is not normal.</p> <p>Cause : 1) Faulty CPU. 2) Malfunction due to noise.</p> <p>Treatment : When the error is caused even when the power is re-input, please contact IAI.</p>
0FC		Logic error (Faulty component)	<p>The controller is not operating properly.</p> <p>Cause : 1) Malfunction due to the effect of noise, etc. 2) Malfunction of peripheral circuit components.</p> <p>Treatment : Turn the power OFF and reboot. If the error occurs again, check for presence of noise. 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. If the cause cannot be identified, please contact IAI.</p>

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Chapter 9 Appendix

9.1 Conformity to Safety Category

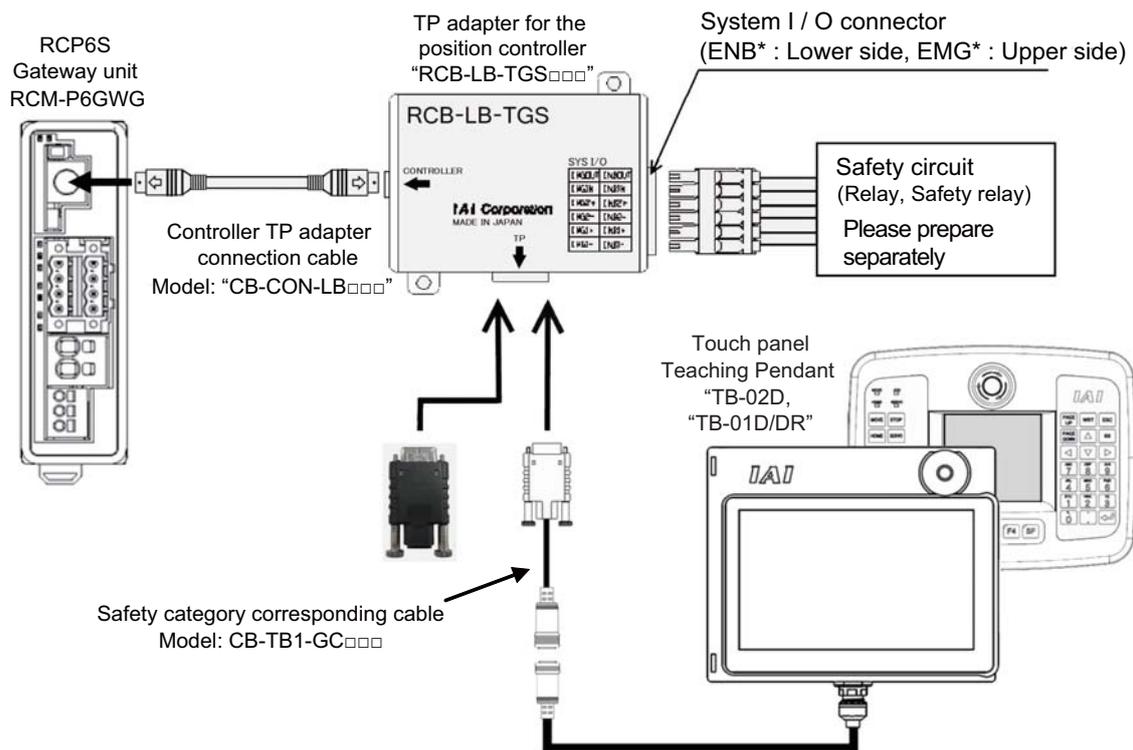
In this chapter, shows an example for a circuit using the dedicated teaching pendant. However, it is not possible for us to confirm the conformity of it in the environment of your use.

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.



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[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
Lower side (ENB side)	6	EMGOUT	24V power supply output for emergency stop detection input
	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	

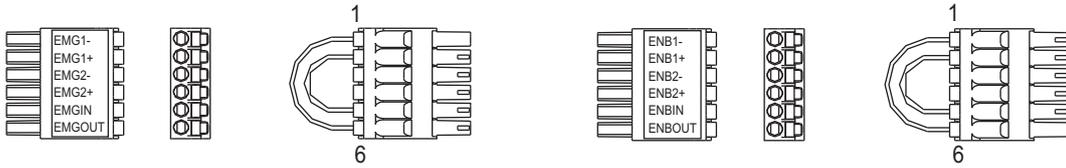
Note 1 Connectors on the cable side are attached under conditions where initial wiring has been conducted.

In order to support each category, remove the initial wiring and wire your safety circuit.

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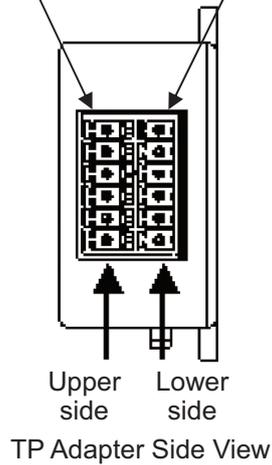
• Upper side (EMG) connector

• Lower side (ENB) connector



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-	1
	YW	ENB1+	2
	—	ENB2-	3
	—	ENB2+	4
	YW	ENBIN	5
	YW	ENBOUT	6

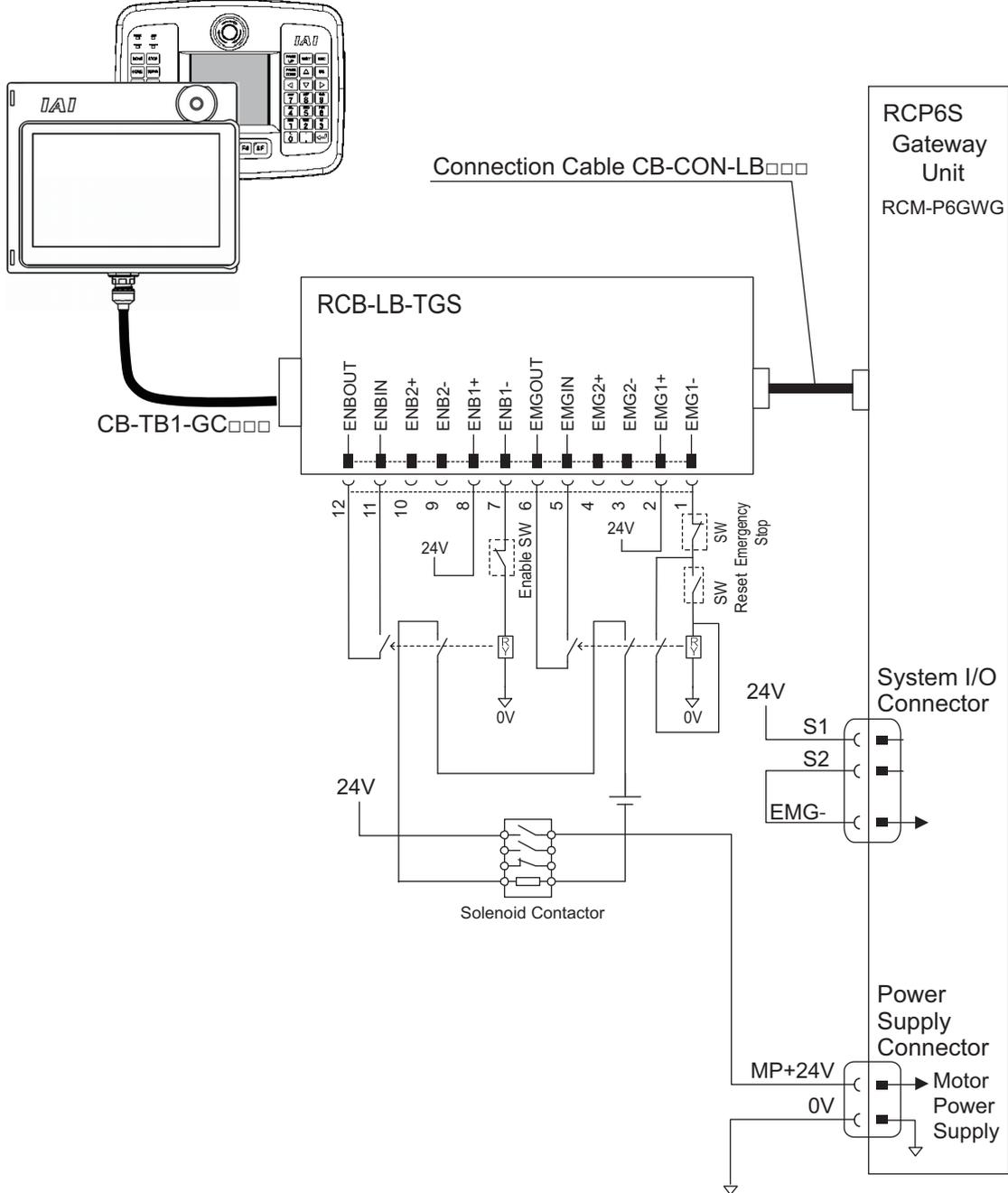


- (3) Connection of dummy plug of TP adapter
 When operating the controller with AUTO Mode, make sure to connect the enclosed dummy plug (DP-4S) to TP Connector.

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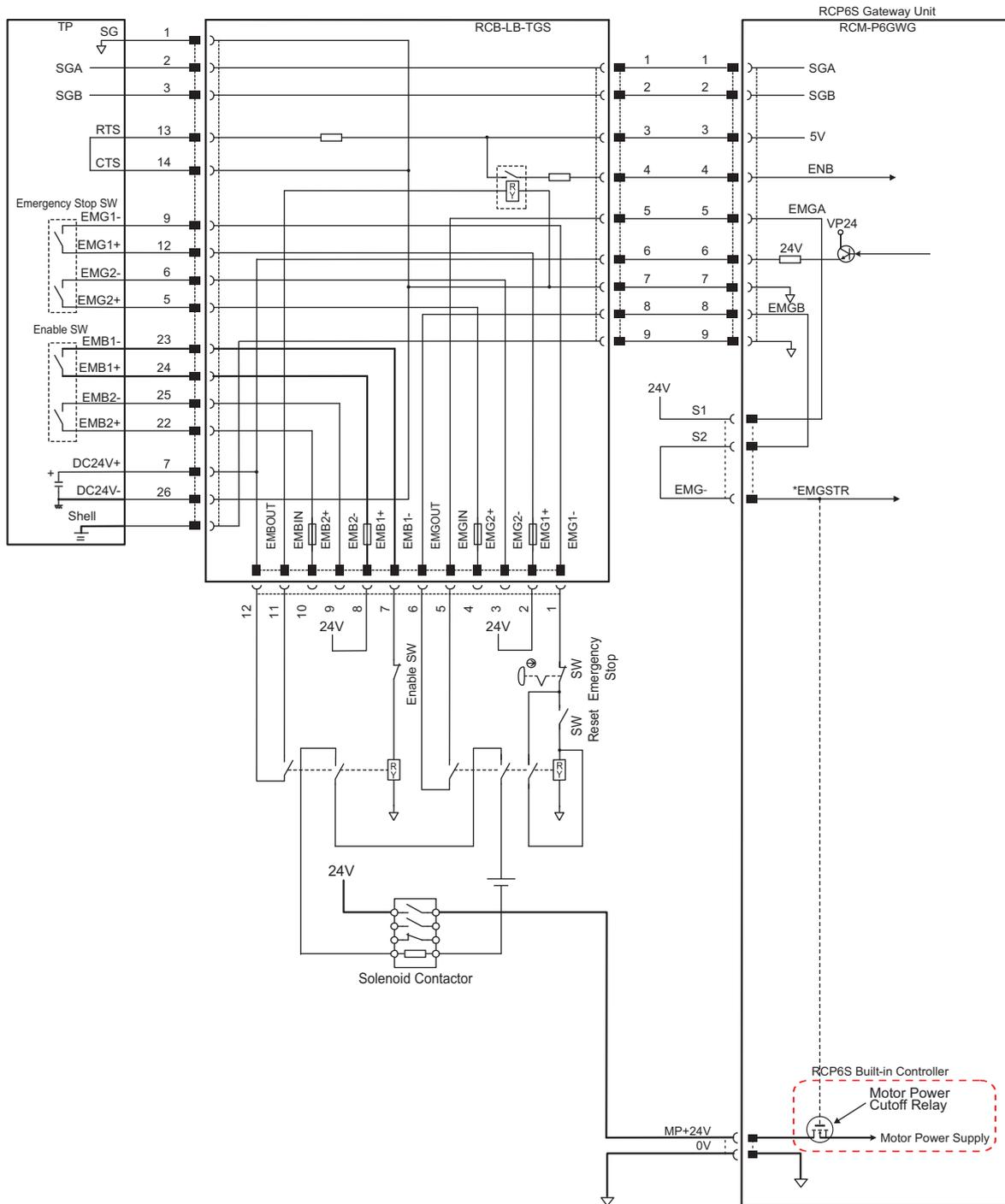
- [3] Examples of safety circuits
 1) In case of category 1

TB-02D or TB-01D/TB-01DR
 (or Dummy plug : DP-4S)



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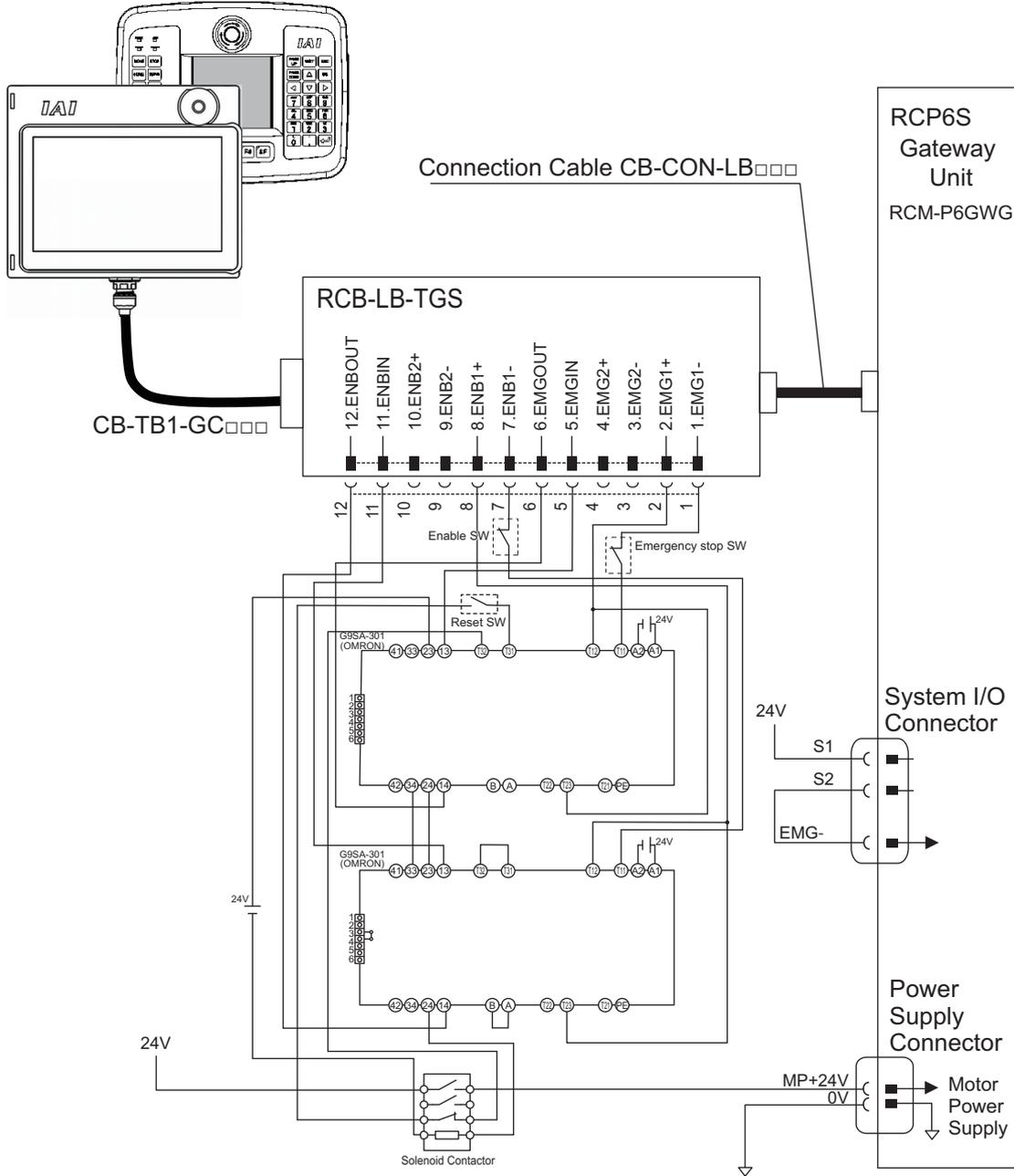
- Detailed category 1 circuit example



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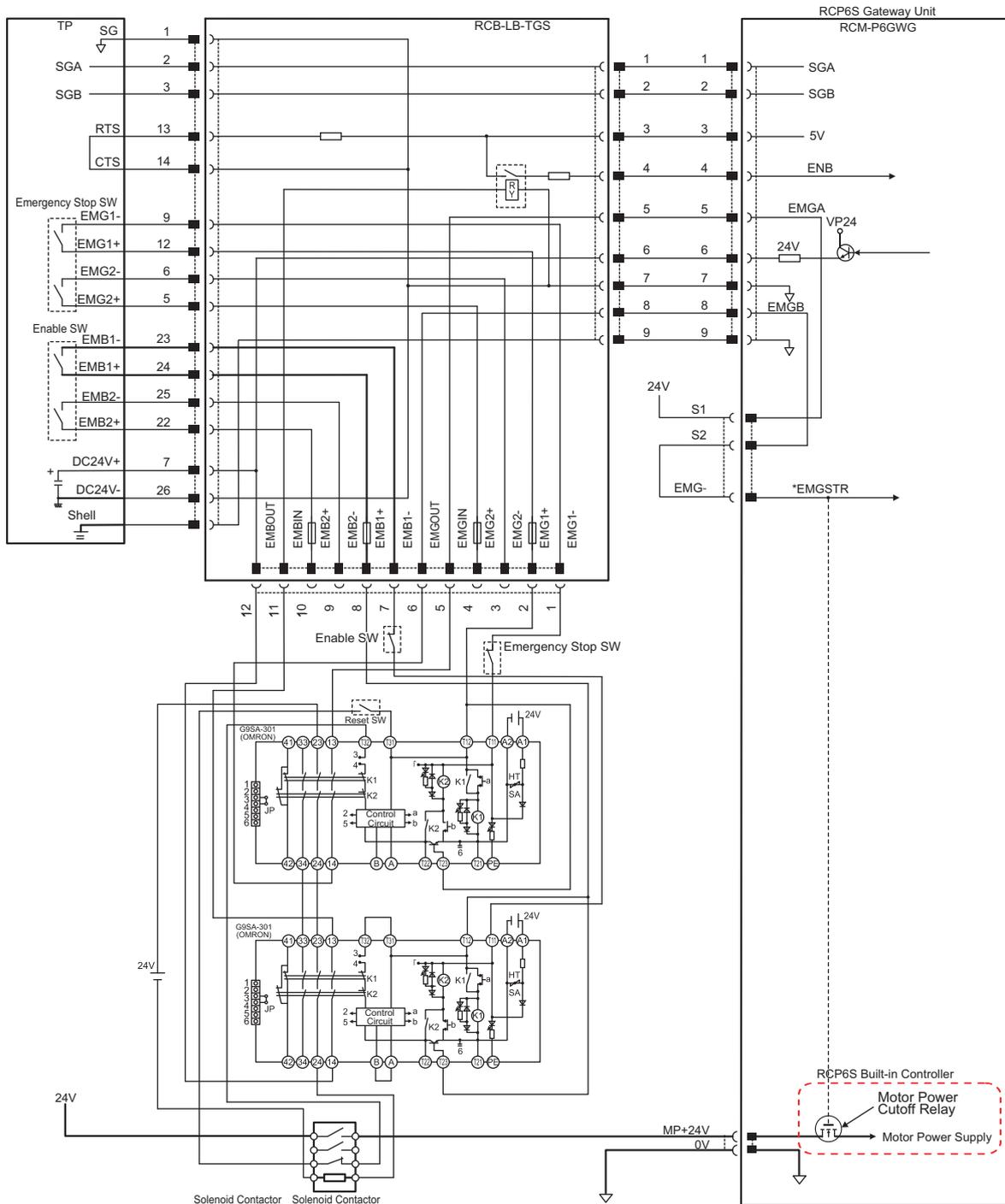
2) In case of category 2

TB-02D or TB-01D/TB-01DR
(or Dummy plug : DP-4S)



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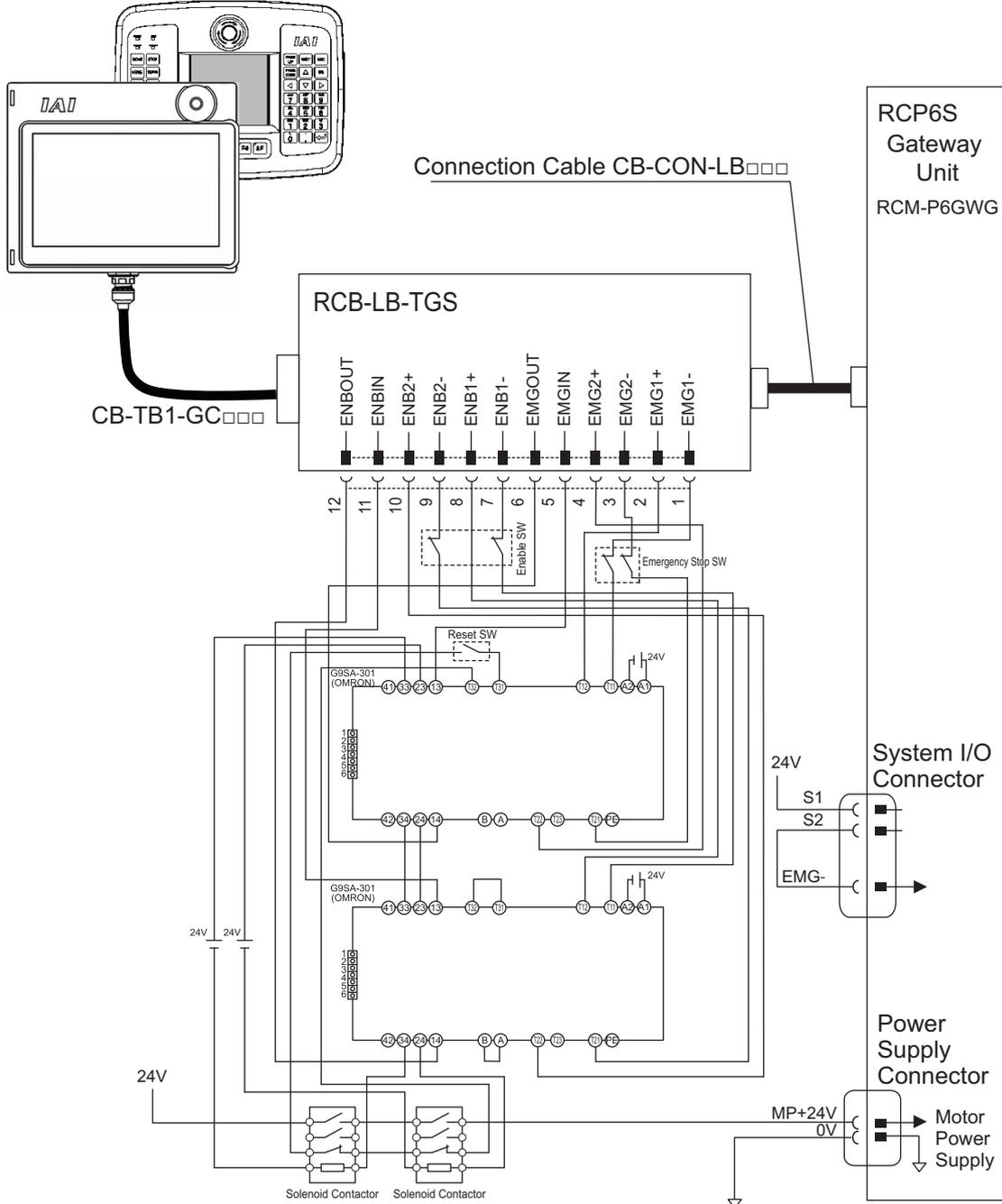
- Detailed category 2 circuit example



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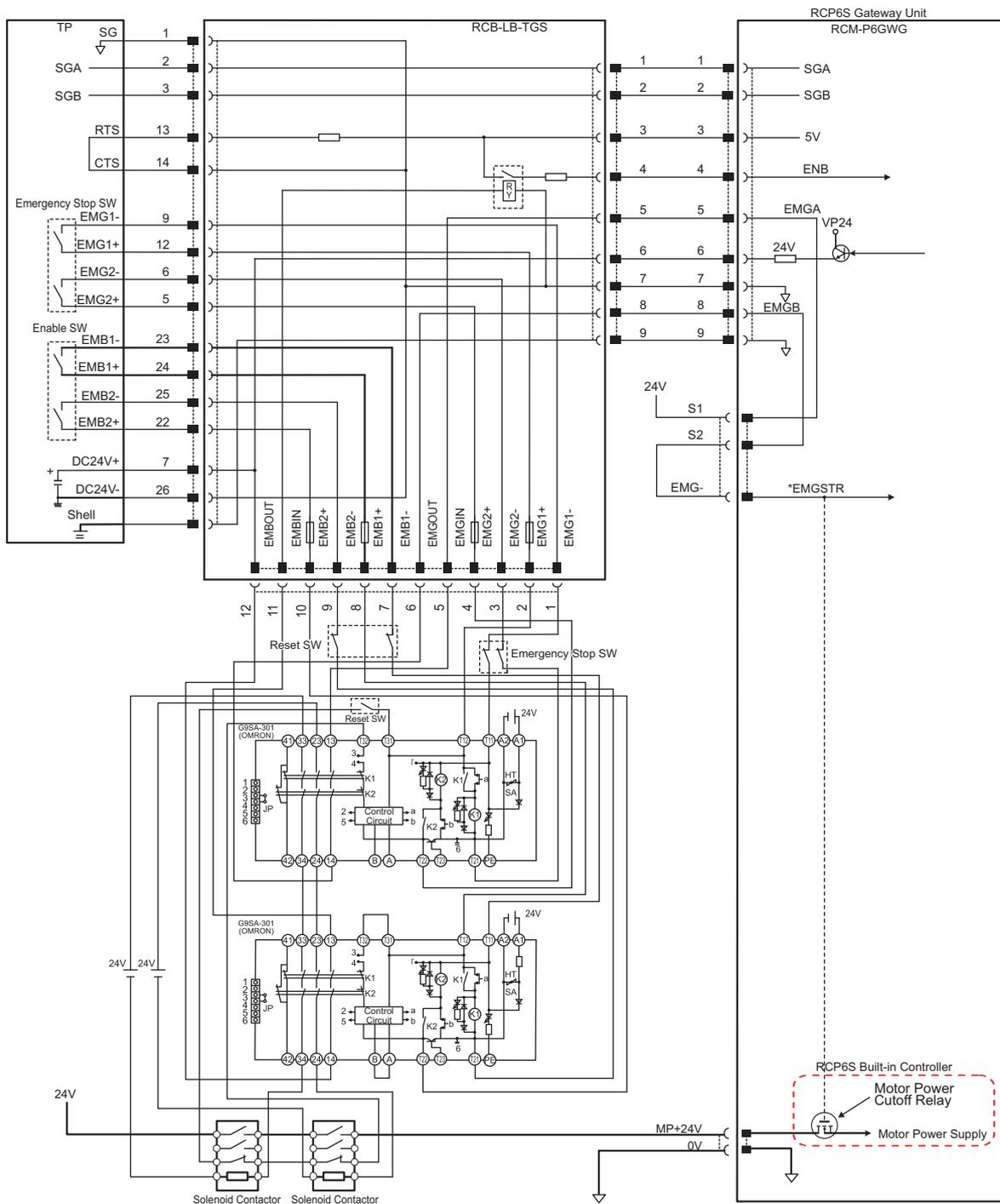
3) In case of category 3

TB-02D or TB-01D/TB-01DR
(or Dummy plug : DP-4S)



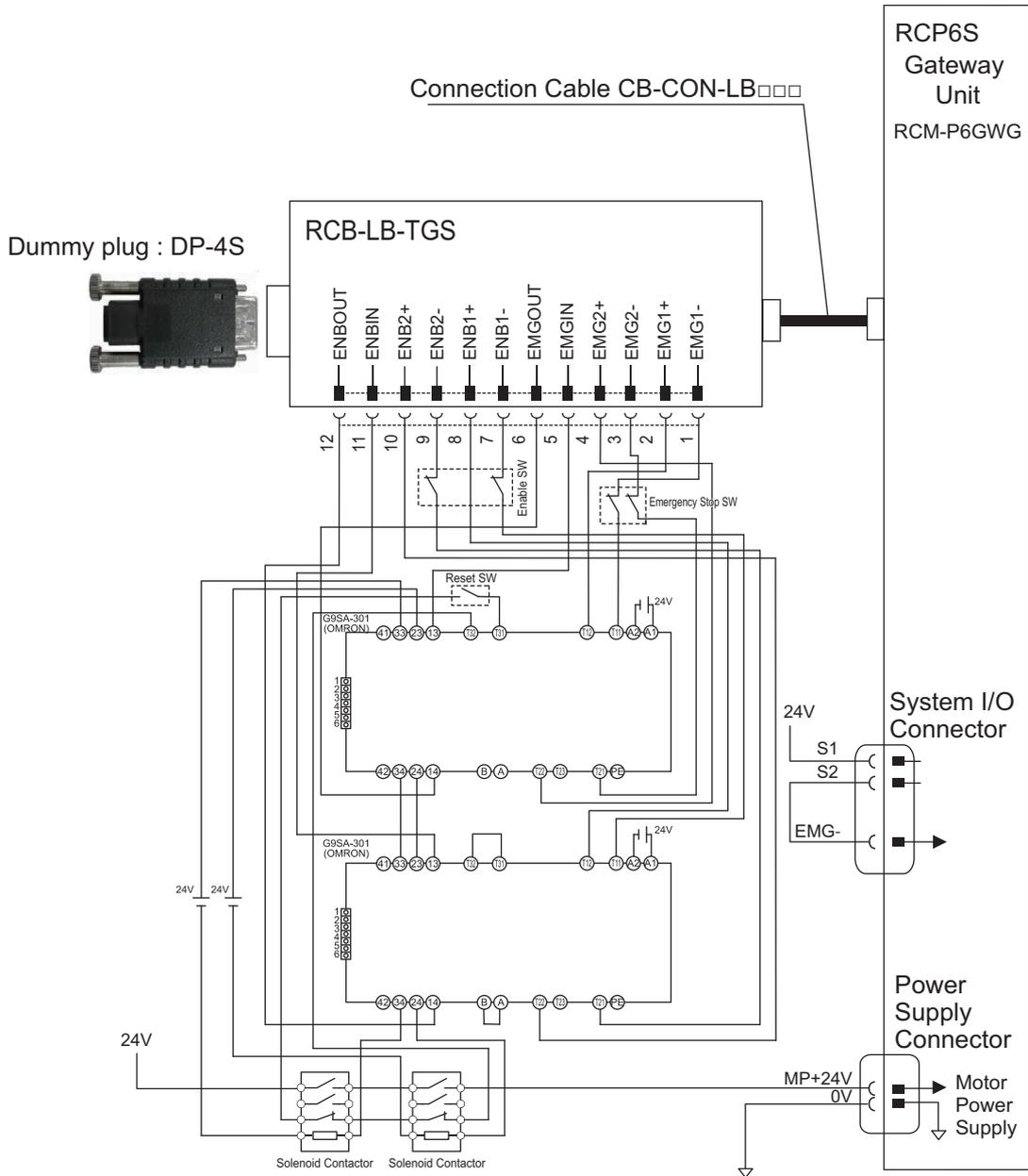
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- Detailed category 3 circuit example



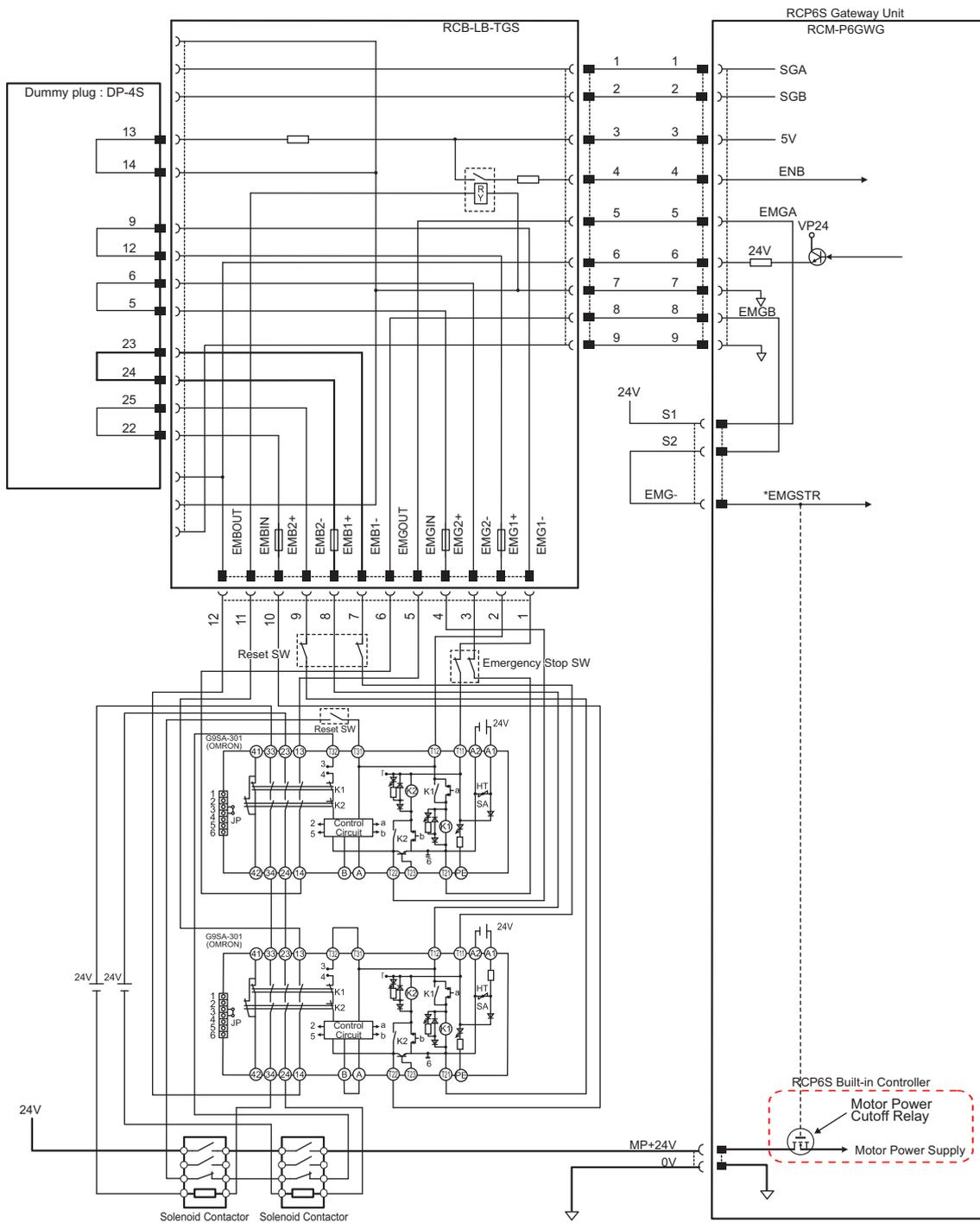
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4) In case of category 4



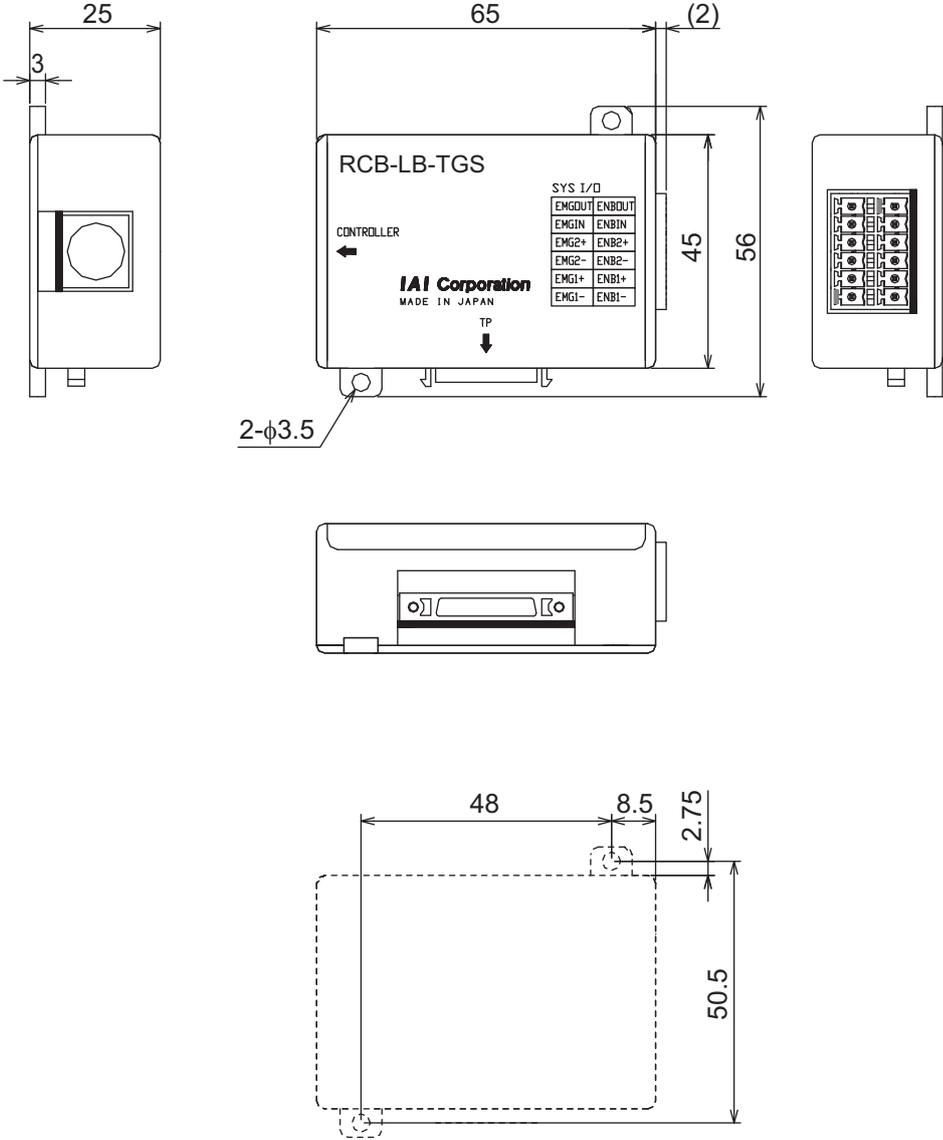
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- Detailed category 4 circuit example



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- [4] TP adapter and accessories
 - 1) TP adapter external dimensions



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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

9.2 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.

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9.3 Maintenance

9.3.1 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

9.3.2 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 be 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".

Note 3 The message level alarms "04E Times of Movement Target Exceeded" and "04F Drive Distance Target Exceeded" are output. [Refer to 8.4.3 Alarm Codes on Driver Board (Each Axis)]

Chapter 10 Warranty

10.1 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

10.2 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.

10.3 Honoring the Warranty

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

10.4 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.

10.5 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.

10.6 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

RCP6S *Fieldbus Communication*

Change History

Revision Date	Revision Description
2016.01	First Edition
2016.06	Second Edition <ul style="list-style-type: none">• Applicable for high-output setting invalid actuator• Note corrected
2016.07	Third Edition <ul style="list-style-type: none">• Chapter 2 2.3 Wiring (Gateway Unit) revised• Chapter 2 2.4 Wiring (Hub Unit) added• Applied to Chapter 3 Left-Justification Setting Feature• Chapter 8 896 Alarm, 8B0 Alarm added• Chapter8 8.3.2 Connection Unit Control Power Voltage Drop Alarm added• Chapter 9 Appendix added• Correction made in TB-02 Application





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