Oriental motor

HM-60461-3

Robot Controller

MRC01

USER MANUAL

Thank you for purchasing an Oriental Motor product.
This Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

1 Introduction

2 Hardware

3 Operation

4 Control via EtherNet/IP

5 Parameter

6 I/O signals

7 Other functions

8 Troubleshooting

1 Introduction

This part explains the product overview and safety precautions in addition to the types and descriptions about operating manuals.

◆Table of contents

1 Before using the product

Only qualified personnel of electrical and mechanical engineering should work with the product.
Use the product correctly after thoroughly reading the section "4 Safety precautions" on p.14. In addition, be sure to observe the contents described in warning, caution, and note in this manual.
The product described in this manual is designed and manufactured to be incorporated in general industrial equipment. Do not use for any other purpose.
Oriental Motor Co., Ltd. is not responsible for any compensation for damage caused through failure to observe this warning.

2 Overview of the product

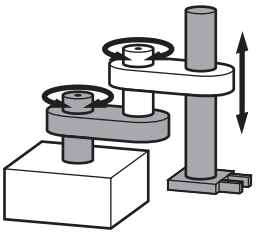
MRC01 is a controller that controls a robot consisting of motors of the **AZ** Series and/or motorized actuators equipped with the **AZ** Series.
Using **MRC01** together with the programming software **MRC Studio** allows you to control a robot easily.

■ Applicable robot type

This controller can be used to control the following robot types. Refer to p.40 for details about each robot.
- **MRC01**: All types of robots are supported.
- **MRC01-C**: Only a Cartesian robot and a Cartesian robot (planar surface gantry) are supported.

● SCARA robot

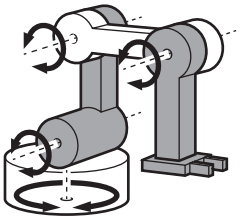
The figure shows the "2-link tip up-down" type.



- 2-link tip up-down
- 2-link base up-down
- 2-link tip up-down + Rz
- 2-link base up-down + Rz
- 2-link + Rz without up-down
- 2-link without up-down
- 2-llink base linear motion tip up-down
- 2-llink base linear motion base up-down
- 2-llink base linear motion without up-down
- 3-llink tip up-down
- 3-link base up-down
- 3-llink without up-down

● Vertically articulated robot

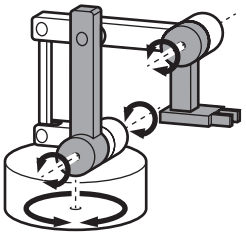
The figure shows the "3-link base rotation" type.



- 3-link base rotation
- 3-link base linear motion
- 3-link base rotation + Rz
- 3-link base linear motion + Rz
- 3-link without base axis
- 6-axis vertically articulated Model 1
- 6-axis vertically articulated Model 2

● Vertically articulated robot (Palletizer)

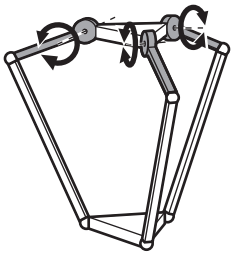
The figure shows the "1 parallel-linkage base rotation" type.



- 1 parallel-linkage base rotation
- 1 parallel-linkage base linear motion
- 1 parallel-linkage base rotation + Rz
- 1 parallel-linkage base linear motion + Rz
- 1 parallel-linkage without base axis
- 2 parallel-linkage base rotation
- 2 parallel-linkage base linear motion
- 2 parallel-linkage base rotation + Rz
- 2 parallel-linkage base linear motion + Rz
- 2 parallel-linkage without base axis

● Delta robot

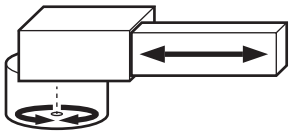
The figure shows the Delta robot.



- Delta robot
- Delta robot + Rz

- **Polar/Cylindrical robot**

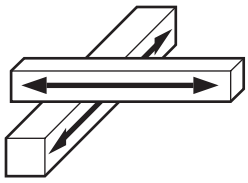
  The figure shows the polar robot.



  - Polar
  - Polar + Rz
  - Cylindrical
  - Cylindrical + Rz

- **Cartesian robot**

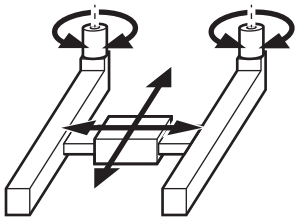
  The figure shows the "2-axis (XY)" type.



  - 2-axis (XY)
  - 2-axis (XZ)
  - 2-axis (YZ)
  - X Y + Rz
  - X Z + Rz
  - Y Z + Rz
  - 3-axis (XYZ)
  - X Y Z + Rz

- **Cartesian robot (Planar surface gantry)**

  The figure shows the planar surface gantry 2-axis (XY) type.



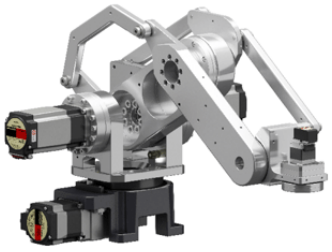
  - Planar surface gantry 2-axis (XY)
  - Planar surface gantry 2-axis (XZ)
  - Planar surface gantry 2-axis (YZ)
  - Planar surface gantry 2-axis (XY) + Rz
  - Planar surface gantry 2-axis (XZ) + Rz
  - Planar surface gantry 2-axis (YZ) + Rz
  - Planar surface gantry 3-axis (XYZ)
  - Planar surface gantry 3-axis (XYZ) + Rz

- **Small Robots OVR**

4-axis vertically articulated

Model: **OVR4048K5-V**, **OVR4068K5-V**, **OVR4088K5-V**

The figure shows the model **OVR4048K5-V**.



5-axis vertically articulated

Model: **OVR5035K1-V**

6-axis vertically articulated

Model: **OVR6048K1-V**

3-axis SCARA

Model: **OVR3041K3-H**

■ Two types of control methods

- Operation by Implicit communication (periodic communication) of EtherNet/IP.
- Operation by using I/O signals.

■ Setting methods of operation programs and parameters

Operation programs are set using the **MRC Studio** software.
Parameters can be set using the **MRC Studio** software or via EtherNet/IP.

■ Equipped with direct data operation function

The direct data operation is a function to execute operation at the same time as rewriting of the data.
It is suitable to frequently change operation data such as the position (travel amount) or the speed, or to applications to adjust the position finely.
Direct data operation is performed via EtherNet/IP.

■ Providing the EDS File

The EDS file (Electronic Data Sheets file) is a file that describes the specific information of the EtherNet/IP compatible products. By importing the EDS file to the setting tool of the scanner, settings of EtherNet/IP can be performed before you receive the controller.
For details, contact your nearest Oriental Motor sales office.

3 About MRC Studio

MRC Studio is software dedicated to the **MRC01** robot controller. Creating operation programs, setting and editing of parameters, teaching, and various monitor functions can be performed.
For details, contact your nearest Oriental Motor sales office.

License Agreement for Programming Software (MRC Studio)

Please read the following terms and conditions carefully before using the Programming Software (**MRC Studio**) ("Software"). The user of the Software ("User") shall be deemed to agree to those terms and conditions when the User makes the Software available for the use (including, but not limited to, download, installation and any similar action), and this license agreement shall be deemed to be entered into between ORIENTAL MOTOR CO., LTD. ("ORIENTAL MOTOR") and the User.

1. The ownership right, copyright and other intellectual property right, and all other rights with regard to the Software shall belong to either ORIENTAL MOTOR or its licensor, depending on the nature of each specific right.
2. ORIENTAL MOTOR shall grant to the User a non-exclusive right to use the Software only for the purpose of using an ORIENTAL MOTOR product or products supported by the Software.
3. The User may not reproduce, distribute, lend or transfer the Software to any third party or otherwise allow any third party to use the Software in any form or by any means. Furthermore, the User may not upload the Software to an electric bulletin board or website which is accessible by public.
4. The User may not modify, alter, reverse-engineer, decompile, disassemble or otherwise manipulate all or part of the Software.
5. The User shall observe the Foreign Exchange and Foreign Trade Law and other applicable laws and regulations related to export and import in Japan in using the Software. The User shall not export the Software to any country which is subject to the export control regulations by the government of Japan or USA.
6. Neither ORIENTAL MOTOR nor its licensor shall make any warranty as to the Software, including, but not limited to, whether the Software is appropriate or useful in serving a specific purpose of the User, whether the Software is trouble-free in linking with any other software or hardware used by the User, whether the Software is free from defects, or any other condition relating to the Software.
7. Neither ORIENTAL MOTOR nor its licensor shall be held liable whatsoever for any loss or damage arising directly or indirectly in association with, or in relation to, a use of the Software or a link with other software or hardware used by the User (including, but not limited to, loss or damage arising from damage or corruption of hardware using the Software, or other software or hardware used by the User, loss of benefit, disruption of business, loss of any data).
8. Neither ORIENTAL MOTOR nor its licensor shall be held liable whatsoever for any claim or demand made by a third party regarding the Software.
9. ORIENTAL MOTOR shall reserve the right to change the specifications of the Software without prior notice for the purpose of improvement. The User is recommended always to use the latest version.
10. This Agreement shall be terminated immediately upon the User's violation of this Agreement. The User may not use the Software once this Agreement is terminated.
11. This Agreement shall be drawn up in the Japanese, English and Chinese (Traditional/Simplified) languages, but in the event of any conflict, the Japanese language version shall prevail.
12. This Agreement shall be governed by and interpreted in accordance with the Laws of Japan.
13. If any dispute arises out of this Agreement, the Tokyo District Court shall have exclusive jurisdiction to settle such dispute for the first instance.

■ Operating environment

Operating system	32-bit (x86) and 64-bit (x64) versions are supported. • Microsoft Windows 10 version 1607 or later • Microsoft Windows 11
CPU	Intel® Core i3™ processor 2 GHz or more
Graphics	DirectX 10 or later, VRAM 128 MB or more
Display resolution	HD (1280 × 720) or more
Memory *1	2 GB or more
Hard disk *2	Free space of 1 GB or more
USB Port	USB2.0, 1 port

*1 It is required to satisfy the operating conditions of the operating system.

*2 Microsoft. NET Framework 4.8 is required to use the **MRC Studio** software. If it is not installed, the following free space may additionally be needed since it will be installed automatically.
32-bit (x86) version: 4.5 GB
64-bit (x64) version: 4.5 GB

4 Safety precautions

The precautions described below are intended to ensure the safe and correct use of the product, and to prevent the user and other personnel from exposure to the risk of injury. Use the product only after carefully reading and fully understanding these instructions.
In regard to a controller, it is prohibited to start operating a motor and a motorized actuator (i.e., to operate the device in accordance with the specified purpose) when the machine in which the controller is incorporated does not satisfy any relevant safety standards. The factory safety manager or safety personnel in charge of the applicable machine must ensure that the machine is operated only by qualified personnel who has expert knowledge on safety, and thereby prevent injury or damage to the machine.
The term "qualified personnel" refers to persons who have received the necessary training or education and have pertinent experience; who are familiar with the relevant standards and regulations; who are authorized by the factory safety manager to engage in the necessary activities; and who have the ability to discern and prevent potential dangers.

⚠WARNING	Handling the product without observing the instructions that accompany a "WARNING" symbol may result in serious injury or death.
⚠CAUTION	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in injury or property damage.
Note	The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.
memo	The items under this heading contain related information and contents to gain a further understanding of the text in this manual.

⚠WARNING

General

- Never use the product for equipment in connection with the maintenance or management of human life or health.
- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, in places subjected to splashing water, or near combustibles. Doing so may result in fire or injury.
- Assign qualified personnel having expert knowledge on electrical and mechanical engineering as well as safety to the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Handling by unqualified personnel may result in fire, injury, or damage to equipment.
- Do not touch the controller while the power is supplied. Doing so may result in fire.
- When an alarm of the controller is generated (any of the controller's protective functions is triggered), remove the cause before resetting the alarm (protective function). Continuing the operation without removing the cause of the problem may result in malfunction of the controller, leading to injury or damage to equipment.
- Conduct a risk assessment in a state where all parts and components including the controller have been installed in the equipment. Failure to do so may result in injury or damage to equipment.
- Use the product in a condition where the entire equipment complies with relevant international standards such as ISO 12100, ISO 10218-1, ISO 10218-2, national standards, and legal regulations such as occupational health and safety required in each country. Failure to do so may result in injury or damage to equipment.
- Provide a safety cage that satisfies the safety distance specified in ISO 13857 so that an operator or other personnel does not enter the movable range of the robot during operation of the equipment. Failure to do so may result in injury.
- Perform the teaching operation outside the safety cage. Failure to do so may result in injury.
- Provide appropriate safety measures in accordance with the results of the risk assessment of entire equipment when adjusting or inspecting the robot inside the safety cage. Failure to do so may result in injury.
- Provide appropriate safety measures so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.

Installation

- Install the controller inside an enclosure. Failure to do so may result in injury.

Connection

- Keep the input power voltage of the controller within the specified range. Failure to do so may result in fire.
- Connect the product securely according to the connection diagram. Failure to do so may result in fire.
- Do not forcibly bend, pull, or pinch the cable. Doing so may result in fire or damage to equipment.

Operation

- Turn off the power supply of the controller in the event of a power failure. Failure to do so may result in injury or damage to equipment.
- Turn all input signals to the controller OFF before turning on the power supply. Failure to do so may result in injury or damage to equipment.
- Turn all output signals OFF before Implicit communication of EtherNet/IP is started. Failure to do so may result in injury or damage to equipment.
- Do not remove the motor excitation during operation. Doing so may cause the motor to stop and lose the holding force, resulting in injury or damage to equipment.

Repair, disassembly, and modification

- Do not disassemble or modify the controller. Doing so may result in injury or damage to equipment.

⚠CAUTION

General

- Do not use the controller beyond its specifications. Doing so may result in injury or damage to equipment.
- Keep your fingers and objects out of the openings in the controller. Failure to do so may result in fire or injury.
- Do not forcibly bend or pull the cable that is connected to the controller. Doing so may cause damage to the product.

Installation

- Do not place combustibles around the controller. Doing so may result in fire or a skin burn(s).
- Do not leave anything around the controller that would obstruct ventilation. Doing so may result in damage to equipment.

Operation

- Use a controller and a driver only in the specified combination. An incorrect combination may cause a fire.
- If any abnormality is observed, stop the operation immediately to turn off the power supply. Failure to do so may result in fire or injury.
- Use a DC power supply with reinforced insulation on its primary and secondary sides for a power supply. Failure to do so may result in electric shock.

Maintenance and inspection

- Do not touch the terminals while conducting the insulation resistance measurement or the dielectric strength test. Doing so may result in electric shock.

5 Precautions for use

This chapter explains restrictions and requirements the user should consider when using the product.

- **When conducting the insulation resistance measurement or the dielectric strength test, be sure to disconnect the controller from other products.**

  Conducting the insulation resistance measurement or the dielectric strength test with the controller and other products connected may result in damage to the product.

- **Note when connecting a power supply whose positive terminal is grounded**

  The USB communication connector on the controller is not electrically insulated. When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the controller and these equipment to short, damaging both. When connecting, do not ground equipment.

- **Saving data to the non-volatile memory**

  Do not turn off the power supply while writing the data to the non-volatile memory, and also do not turn off for five seconds after the completion of writing the data. Doing so may abort writing the data and cause an alarm of EEPROM error to generate. The non-volatile memory can be rewritten approximately 100,000 times.

- **Noise elimination measures**

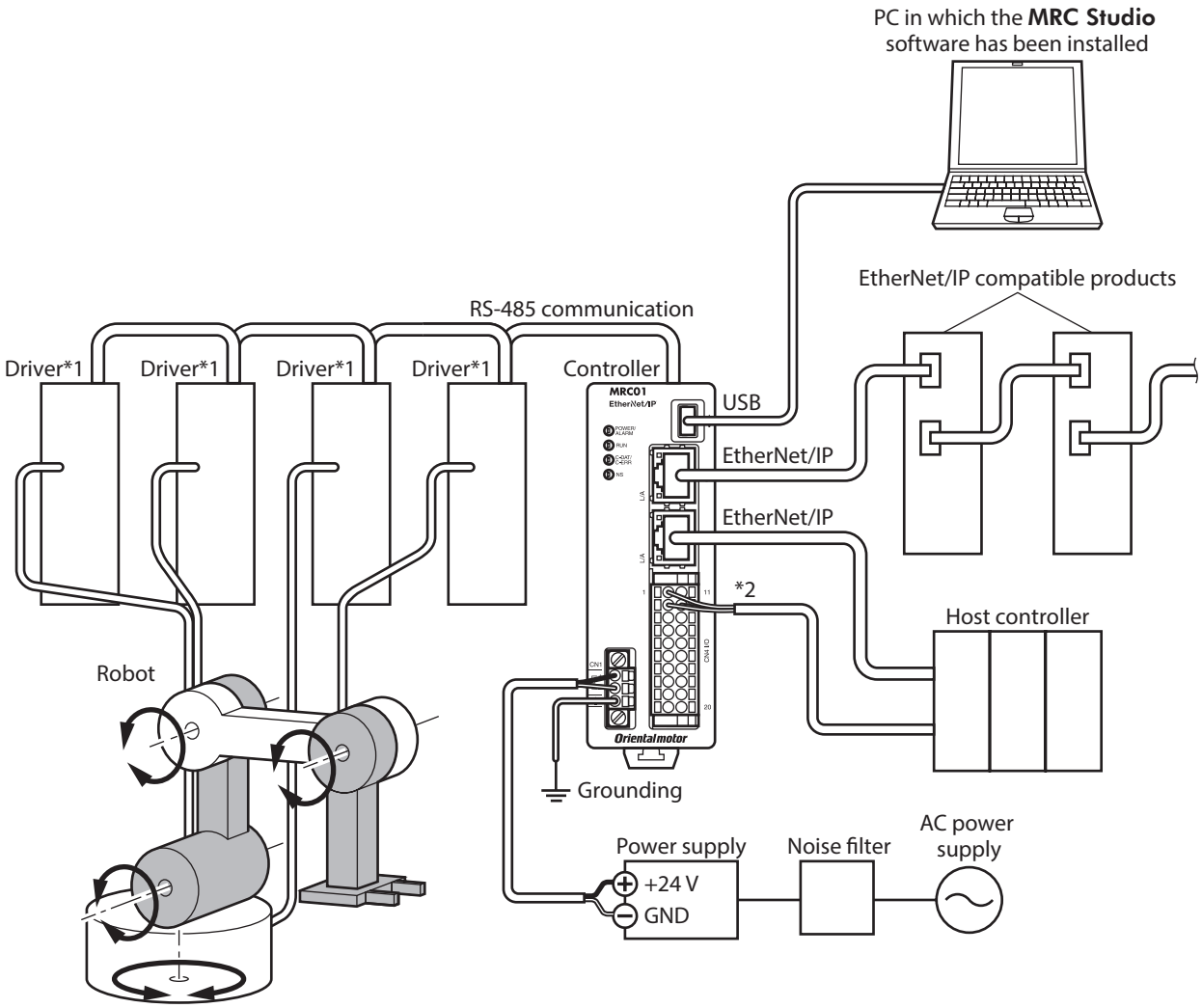
  Refer to p.30 for noise elimination measures.

2 Hardware

This part explains names and functions of each part of the controller, installation and connection methods, and so on.

◆Table of contents

1 System configuration



*1 Connect a power supply to each driver.
*2 Connect when using direct I/O or sensors.

2 Preparation

This chapter explains the items you should check, as well as names and functions of each part.

2-1 Checking the product

Verify that the items listed below are included. Report any missing or damaged items to the Oriental Motor sales office from which you purchased the product.

- Controller..... 1 unit
- CN1 connector (3 pins)..... 1 piece
- CN4 connector (20 pins) ..... 1 piece
- Instructions and Precautions for Safe Use..... 1 copy

Included connector model

Type	Part number	Manufacturer
CN1 connector	FMC1,5/3-STF3,5	PHOENIX CONTACT GmbH & Co. KG
CN4 connector	DFMC1,5/10-ST-3,5-LR	

2-2 Model list

Model	Applicable robot type
MRC01	All
MRC01-C	• Cartesian robot • Cartesian robot (Planar surface gantry)

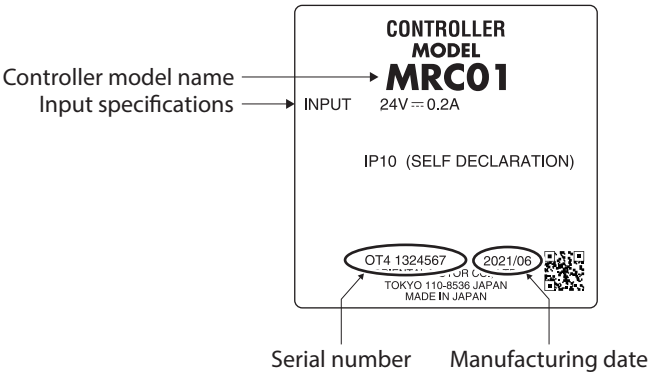
2-3 Drivers possible to combine

Drivers with which this controller can be combined are listed below. Check the driver model with the nameplate.

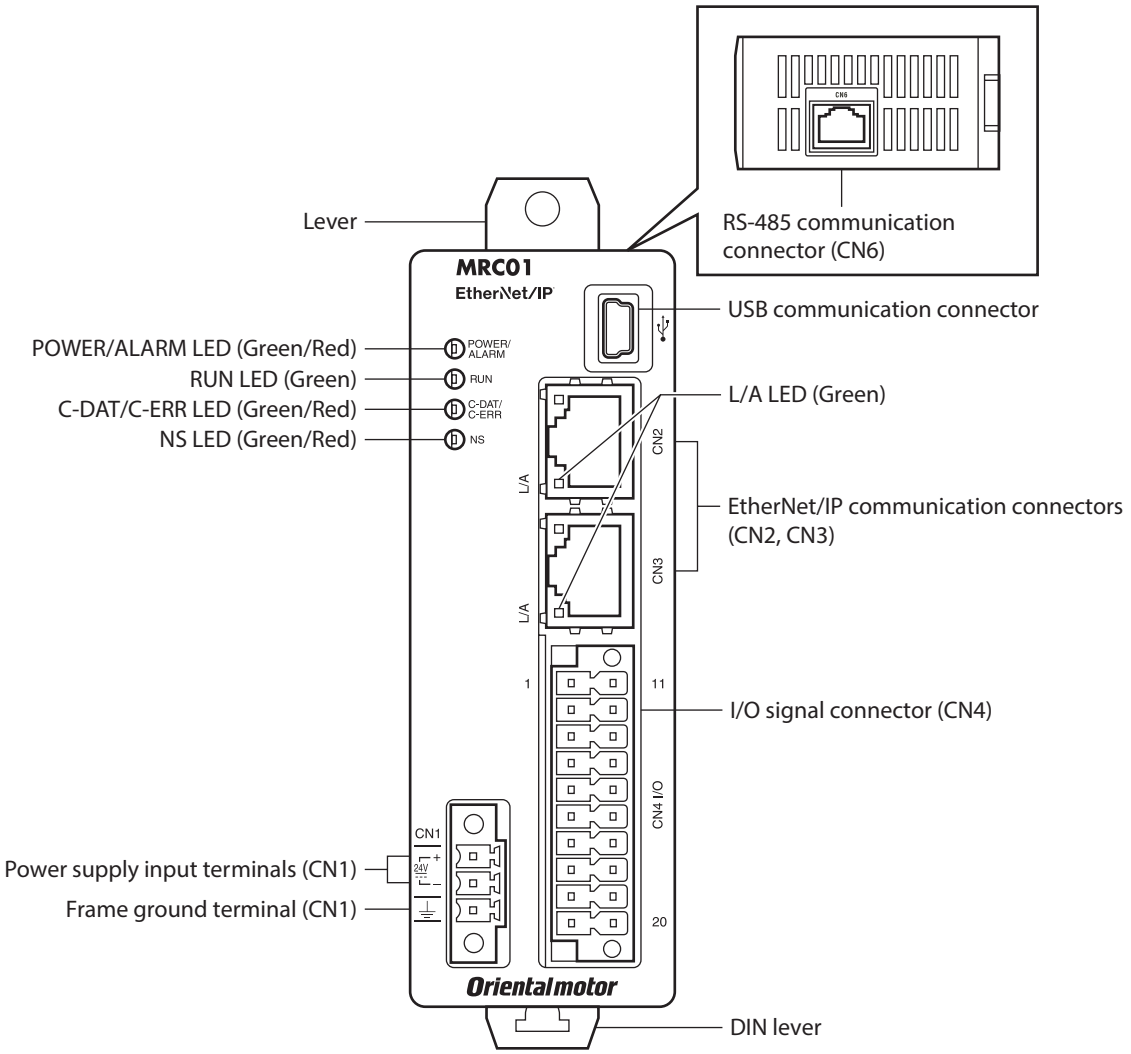
Series	Driver type	Model	Driver version
AZ Series	Built-in controller type	**AZD-AD** **AZD-CD** **AZD-KD**	Version 4.20 or later
	mini Driver RS-485 communication type	**AZD-KR2D**	All

2-4 Information about nameplate

The figure shows an example.



2-5 Names and functions of parts



Type	Name	Sign	Description
LED	POWER/ALARM LED (Green/Red)	POWER/ALARM	This LED indicates the status of the controller.
	RUN LED (Green)	RUN	This LED is lit in green while program operation (*) is being executed.
	C-DAT/C-ERR LED (Green/Red)	C-DAT/C-ERR	This LED indicates the status of RS-485 communication.
	NS LED (Green/Red)	NS	This LED indicates the communication status of EtherNet/IP.
	L/A LED (Green)	L/A	This LED indicates the LINK/ACT status of EtherNet/IP.
Connector	USB communication connector		Connects a PC in which the **MRC Studio** software has been installed. (USB2.0 mini-B port)
	EtherNet/IP communication connectors (CN2, CN3)	–	Connects a scanner with the EtherNet/IP cable.
	I/O signal connector (CN4)	I/O	Connects when using direct I/O or sensors.
	RS-485 communication connector (CN6)	–	Connects a driver with the RS-485 communication cable.
Terminal	Power supply input terminals (CN1)	+, –	Connects a power supply.
	Frame ground terminal (CN1)		Ground using a grounding wire of AWG 16 to 14 (1.25 to 2.0 mm^2) as necessary.

Type	Name	Sign	Description
Others	DIN lever	–	This is used to install the controller to a DIN rail.
	Levers	–	This is used together with the mounting hole of the DIN lever when the controller is installed with screws.

* It is operation of the program that was set with the operation program of the **MRC Studio** software.

2-6 Indication of LEDs

■ POWER/ALARM LED

This LED indicates the status of the controller.

LED status		Description
Green	Red	
No light	No light	The power supply is not turned on.
Light	No light	The power supply is turned on.
No light	Blinking	An alarm is being generated. The alarm message generated can be checked by counting the number of times the LED blinks. The LED is lit in green when the alarm is reset.
Blinking twice at the same time *		• Information is being generated. The LED is lit in green when the information is cleared. • The teaching screen is open on the **MRC Studio** software. The LED is lit in green when the teaching screen is closed.
Repeating "Green → Red → Simultaneously lit * → No light"		This is the simulation mode. Refer to p.239 for the simulation mode.

* Green and red colors may overlap and it may be visible to orange.

■ RUN LED

This LED indicates the status of program operation.

LED status	Description
No light	Program operation has not been executed.
Light	Program operation is being executed.

■ C-DAT/C-ERR LED

This LED indicates the communication status with the driver via RS-485 communication.

LED status		Description
Green	Red	
No light	No light	• Information of the robot has not been written to the controller. • The power supply of the controller is not turned on.
Light	No light	This is in an online state. Communication is performed with the driver properly.
Blinking	No light	RS-485 communication is being established with the driver.
No light	Light	An error occurs in communication with the driver.

■ NS LED

This LED indicates the communication status with the scanner via EtherNet/IP.

LED status		Description
Green	Red	
No light	No light	• This is in an offline state. • The power supply of the controller is not turned on.
Blinking	No light	This is in an online state. Connection has not been established with the scanner.
Light	No light	This is in an online state. Connection is being established with the scanner.
No light	Blinking	Connection timed out with the scanner.
No light	Light	The setting of an IP address is duplicated in the same system.
Blinking alternately		Self-diagnosis when turning on the power is executing.

■ L/A LED

This LED indicates the LINK/ACT status of EtherNet/IP.

LED status	Description
No light	• This is in an offline state. • The frame of EtherNet/IP is not sent and received.
Blinking	• This is in an online state. • The frame of EtherNet/IP is sent and received.
Light	• This is in an online state. • The frame of EtherNet/IP is not sent and received.

3 Installation

This chapter explains the installation location and installation method of the controller.

3-1 Installation location

The controller is designed and manufactured to be incorporated in equipment. Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature: 0 to +55 °C [+32 to +131 °F] (non-freezing)
- Operating ambient humidity: 85 % or less (non-condensing)
- Area free of explosive atmosphere, toxic gas (such as sulfuric gas), or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum
- Up to 1,000 m (3,300 ft.) above sea level

3-2 Installation method

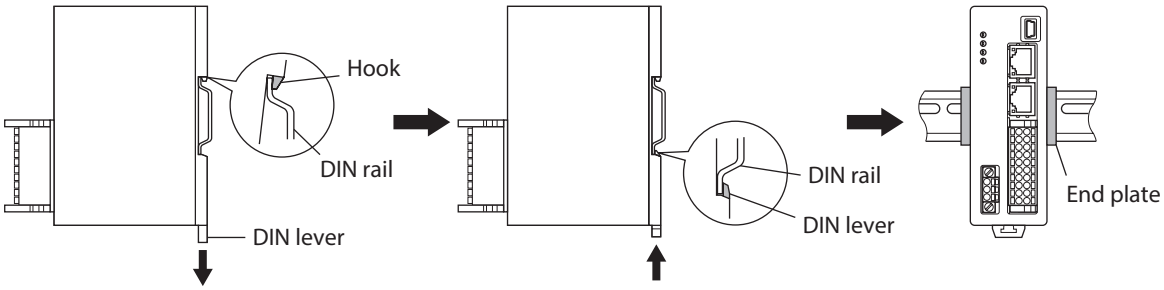
To install the controller, there are two methods. One is a method installing to a DIN rail and the other is that installing with screws.
When installing the controller and drivers side by side, observe the installation conditions of the drivers.

Note

- Do not install any equipment that generates a large amount of heat or noise near the controller.
- Do not install the controller underneath a host controller or other equipment vulnerable to heat.
- If the ambient temperature of the controller exceeds 55 °C (131 °F), reconsider the ventilation condition such as providing forced cooling by using fans or creating spaces between the controller and other products.
- Be sure to install the controller vertically (in a vertical position). If the controller is installed in a direction other than a vertical position, its heat radiation effect will deteriorate.

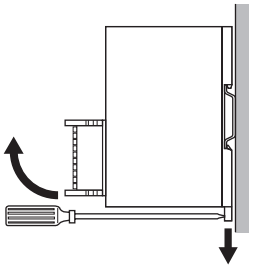
■ Installing to DIN rail

1. Pull down the DIN lever of the controller and lock it. Hang the hook at the rear to the DIN rail.
2. Hold the controller to the DIN rail, and push up the DIN lever to secure.
3. Secure both sides using end plates.



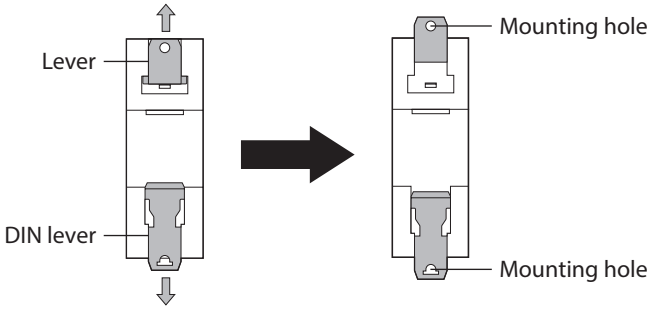
Removing from DIN rail

Pull the DIN lever down until it locks using a flat tip screwdriver, and lift the bottom of the controller to remove it from the rail. Apply a force of about 10 to 20 N (2.2 to 4.5 lb.) to pull the DIN lever down to lock it. Excessive force may damage the DIN lever.



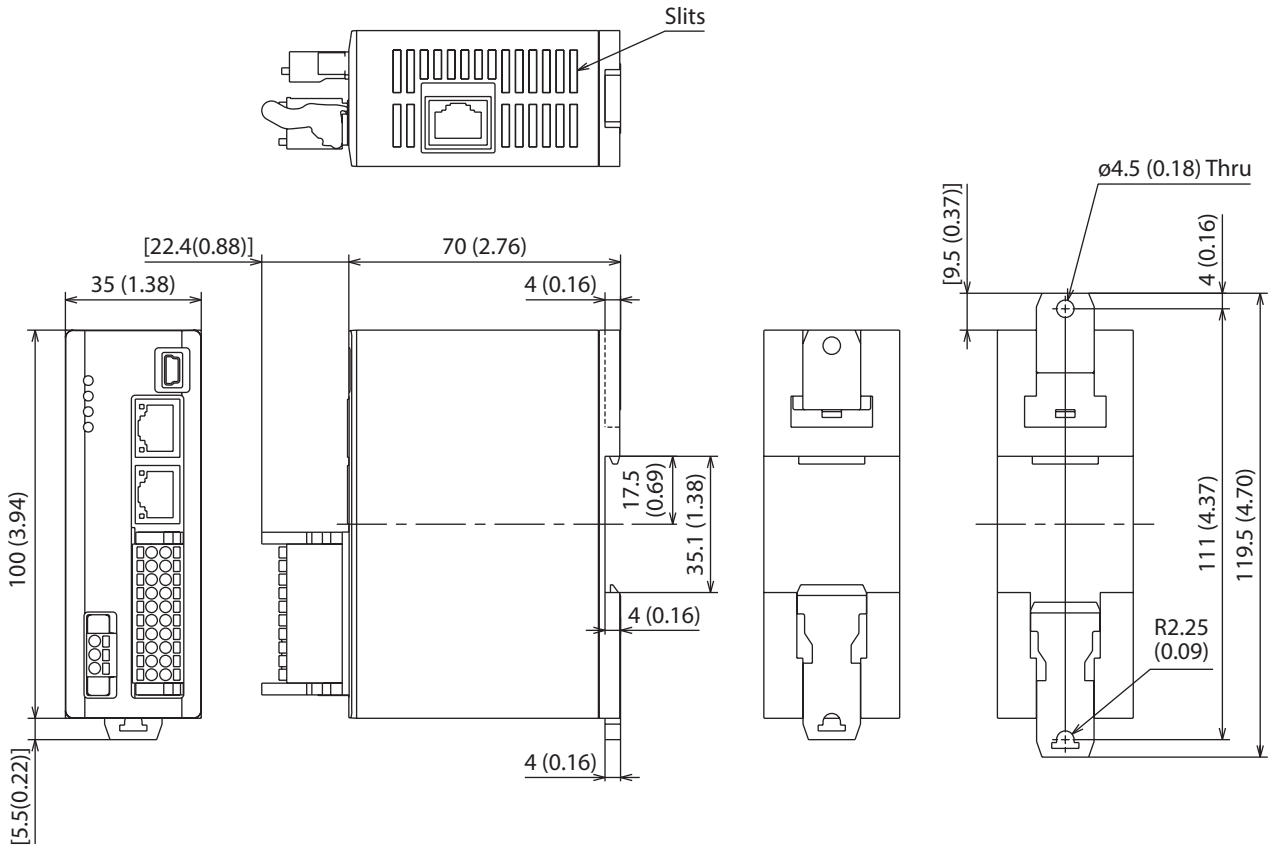
■ Installing with screws

1. Pull up and down the upper and lower levers on the rear side of the controller respectively until each lever clicks.
2. Secure the controller using screws (not included) through the two mounting holes.
   Use screws and washers which sizes are ø10 mm (ø0.39 in.) or less.
   • Screw size: M4
   • Tightening torque: 0.7 N·m (99 oz-in)



■ Dimensions [Unit: mm (in.)]

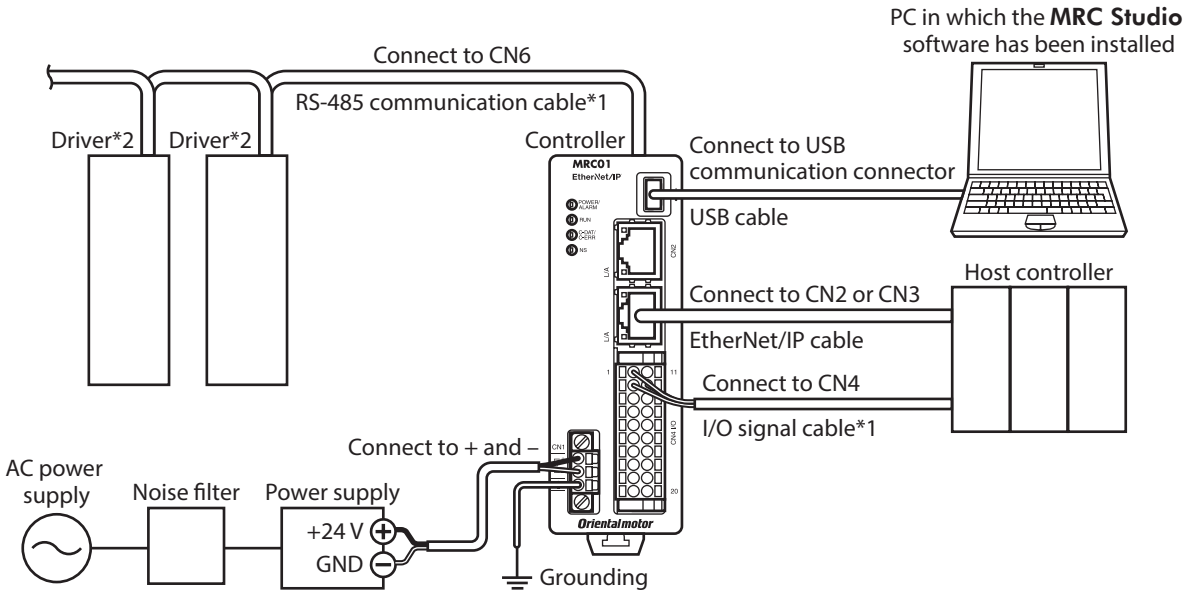
Mass: 0.12 kg (0.26 lb.)



4 Connection

This chapter explains a connection example of the controller, a connection method of a power supply, a grounding method, and others.
It also explains installation and wiring methods to comply with the EMC Directive, as well as measures against electrical noise.

4-1 Connection example



*1 Theses cables are provided in Oriental Motor products.
*2 Connect a power supply to each driver.

Note

- Connect the connectors securely. Insecure connector connections may cause malfunction or damage to the controller.
- Do not wire the power supply cable of the controller in the same cable duct with other power lines or motor cables. Doing so may cause malfunction due to noise.
- Keep 50 m (164 ft.) or less for the wiring distance between the controller and a driver located at the end. Exceeding 50 m (164 ft.) may cause malfunction.

memo

Before connecting or disconnecting a connector, turn off the power supply, and check the POWER/ALARM LED has been turned off.

■ Electrical wire size

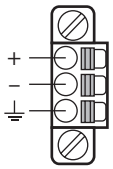
Connector	Terminal symbol	Recommended wire size	Screw size	Tightening torque
CN1	+, –, ⏚	AWG24 to 16 (0.2 to 1.25 mm^2)	M2.5	0.2 to 0.3 N·m (28 to 42 oz-in)
CN4	–	AWG24 to 16 (0.2 to 1.25 mm^2)	–	–

4-2 Connecting the power supply and grounding (CN1)

Use the CN1 connector (3 pins) to connect the power supply.

■ Pin assignment

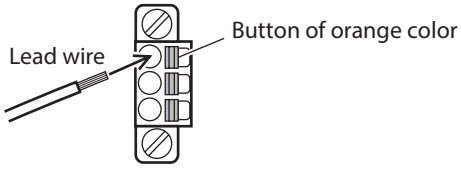
Sign	Description
+	Power supply input (24 VDC)
–	Power supply ground
⏚	Frame ground



■ Wiring method of CN1 connector

- Applicable lead wire: AWG 24 to 16 (0.2 to 1.25 mm^2)
- Lead wire strip length: 10 mm (0.39 in.)

1. Strip the insulation of the lead wires.
2. Insert the lead wire while pushing the button of the orange color with a screwdriver.
3. After having inserted, release the button to secure the lead wire.
4. Insert the CN1 connector into CN1 to tighten the screws.
   • Screw size: M2.5
   • Tightening torque: 0.2 to 0.3 N·m (28 to 42 oz-in)



■ Power supply current capacity

Input power supply voltage	Power supply current capacity
24 VDC±10 %	0.2 A or more

■ Grounding the controller

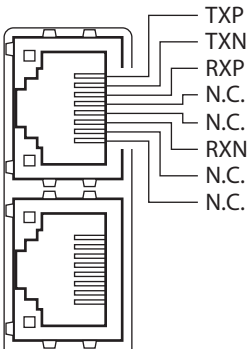
Ground the controller as necessary.
Do not share the grounding wire with a welder or any other power equipment.

4-3 Connecting the EtherNet/IP cable (CN2, CN3)

Connect the EtherNet/IP cable to the EtherNet/IP communication connector (CN2, CN3).

■ Pin assignment

Signal name	Description
TXP	Transmitted data +
TXN	Transmitted data –
RXP	Received data +
N.C.	–
N.C.	–
RXN	Received data –
N.C.	–
N.C.	–

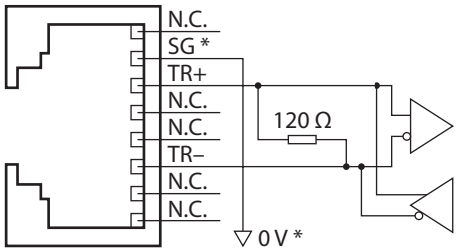


4-4 Connecting the RS-485 communication cable (CN6)

Connect the RS-485 communication cable to the RS-485 communication connector (CN6).
The RS-485 communication cables are provided in Oriental Motor products. Refer to p.34 for the model name.
Commercially available LAN cables (straight cables) can also be connected.

■ Pin assignment

Signal name	Description
N.C.	–
SG	Signal ground
TR+	RS-485 communication signal (+)
N.C.	–
N.C.	–
TR–	RS-485 communication signal (–)
N.C.	–
N.C.	–



* SG is electrically isolated from the power ground of the CN1 connector.

4-5 Connecting the USB cable

Using a USB cable with the following specifications, connect a PC in which the **MRC Studio** software has been installed to the USB communication connector.

Specification	USB2.0 (Full speed)
Cable	Length: 3 m (9.8 ft.) or less Shape: A to mini B

memo

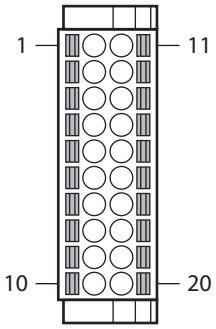
- Connect the controller and a PC directly using a USB cable.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core to the USB cable.

4-6 Connecting the I/O signals (CN4)

Connect when using direct I/O or sensors.
Connect the I/O signal cable to the I/O signal connector (CN4) using the CN4 connector (20 pins).

■ Pin assignment

Pin No.	Signal name	Description *
1	IN-COM	Common for IN0 to IN7 inputs
2	IN0	Control input 0 (STOP)
3	IN2	Control Input 2 (ETO-CLR-DRV)
4	IN4	Control input 4 (PAUSE)
5	IN6	Control input 6 (PRG-DIN0)
6	OUT-COM	Common for OUT0 to OUT7 outputs
7	OUT0	Control output 0 (READY)
8	OUT2	Control Input 2 (ETO-MON-DRV)
9	OUT4	Control output 4 (PAUSE-BSY)
10	OUT6	Control output 6 (PRG-DOUT0)



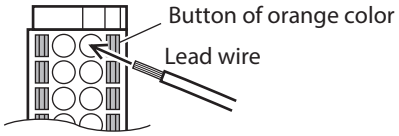
Pin No.	Signal name	Description *
11	N.C.	–
12	IN1	Control input 1 (FREE-RB)
13	IN3	Control input 3 (ALM-RST)
14	IN5	Control input 5 (not used)
15	IN7	Control input 7 (PRG-DIN1)
16	N.C.	–
17	OUT1	Control output 1 (MOVE)
18	OUT3	Control output 3 (ALM-B)
19	OUT5	Control output 5 (PRG-RUN)
20	OUT7	Control output 7 (PRG-DOUT1)

* Values in parentheses ( ) are initial values.

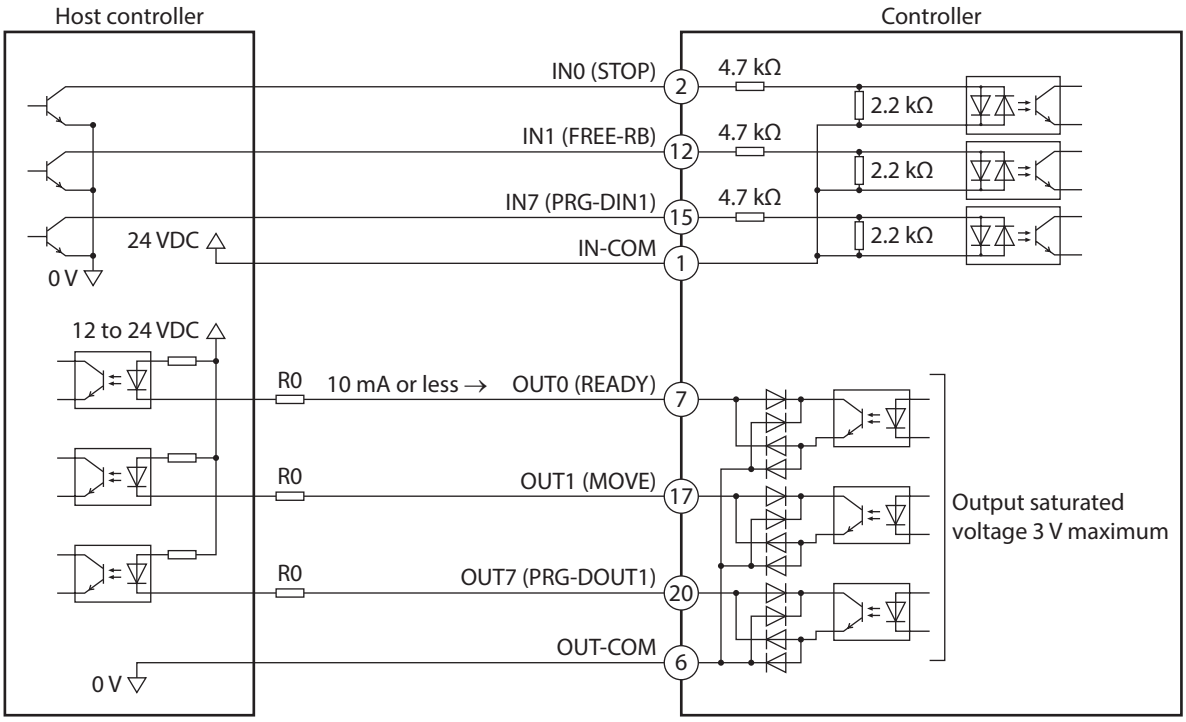
■ Wiring method of CN4 connector

- Applicable lead wire: AWG 24 to 16 (0.2 to 1.25 mm^2)
- Lead wire strip length: 10 mm (0.39 in.)

1. Strip the insulation of the lead wires.
2. Insert the lead wire while pushing the button of the orange color with a screwdriver.
3. After having inserted, release the button to secure the lead wire.



■ Connection example with a current sink output circuit



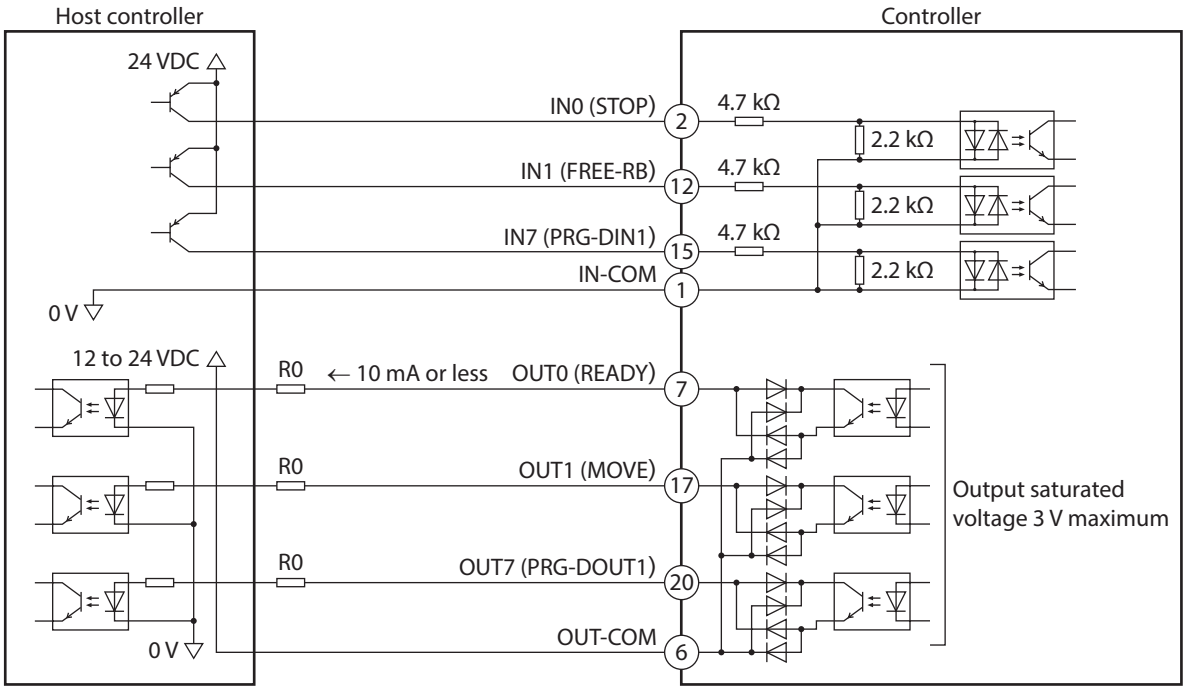
* Values in parentheses ( ) are initial values.

Note

- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC, 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 to keep 10 mA or less.

memo The saturated voltage of the output signal is 3 VDC maximum.

■ Connection example with a current source output circuit



* Values in parentheses ( ) are initial values.

Note

- Use input signals at 24 VDC.
- Use output signals at 12 to 24 VDC, 10 mA or less. If the current exceeds 10 mA, connect an external resistor R0 to keep 10 mA or less.

memo The saturated voltage of the output signal is 3 VDC maximum.

4-7 Noise elimination measures

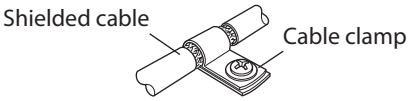
There are two types of electrical noises: One is a noise to invade into the controller from the outside and cause the controller to malfunction, and the other is a noise to emit from the controller and cause peripheral equipment to malfunction.
For the noise that is invaded from the outside, take measures to prevent a malfunction of the controller. It is needed to take adequate measures because signal lines are very likely to be affected by the noise.
For the noise that is emitted from the controller, take measures to suppress it.

■ Measures against electrical noise

There are the following three methods mainly to take measures against the electrical noise.

- **Noise suppression**
  - When relays or electromagnetic switches are used, use noise filters or CR circuits to suppress surge generated by them.
  - Cover the controller by a metal plate such as aluminum. This is effective in shielding the electrical noise emitted from the controller.
- **Prevention of noise propagation**
  - Connect a noise filter on the AC input side of the DC power supply.
  - Place the power lines, such as the motor and power supply cables, keeping a distance of 200 mm (7.87 in.) or more from the signal lines, and also do not bundle them or wire them in parallel. If a power cable and a signal cable have to cross, cross them at a right angle.
  - Use shielded twisted pair cables for power lines and signal lines.
  - Keep cables as short as possible without coiling and bundling extra lengths.

- Grounding multiple points will increase effect to block electrical noise because impedance on the grounding points is decreased. However, ground them so that a potential difference does not occur among the grounding points. I/O signal cables that include a grounding wire are provided in Oriental Motor products. Refer to p.34 for the model name.
- To ground a shielded cable, use a metal cable clamp that can maintain contact with the entire circumference of the shielded cable, and ground as near the product as possible.



● Suppression of effect by noise propagation

Loop the noise propagated cable around a ferrite core. Doing so will prevent the propagated noise invades into the controller or emits from the controller. The frequency band in which an effect by the ferrite core can be seen is generally 1 MHz or more. Check the frequency characteristics of the ferrite core used. When increasing the effect of noise attenuation by the ferrite core, loop the cable a lot.

■ Noise suppression product

● Noise filter

- Connect a noise filter (or equivalent) in the table below on the AC input side of the DC power supply. When a power supply transformer is used, be sure to connect a noise filter on the AC input side of the power supply transformer. Doing so will prevent the propagated noise through the power line. Install the noise filter as close to the input terminals of DC power supply as possible.

Manufacturer	Part number
SOSHIN ELECTRIC CO., LTD.	HF2010A-UPF
Schaffner EMC	FN2070-10-06

- Use the AWG18 (0.75 mm^2) or thicker wire for the input and output cables of the noise filter, and secure firmly using a cable clamp or others so that the cable does not come off the enclosure.
- Place the input cable as far apart as possible from the output cable, and do not wire the cables in parallel. If the input and output cables are placed at a close distance or if they are wired in parallel, the noise in the enclosure affects the power cable through stray capacitance, and the noise suppressing effect will reduce.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- When connecting a noise filter in an enclosure, wire the input cable of the noise filter as short as possible. Wiring in long distance may reduce the noise suppressing effect.

■ Oriental Motor's noise suppression products

● I/O signal cables

These are shielded cables for good noise immunity to connect the controller and a host controller. Both ends of the cable are equipped with grounding wires useful to grounding. Refer to p.34 for the model name.
The EMC testing is conducted using Oriental Motor I/O signal cable.

● Surge suppressors

These are effective to suppress the surge which occurs in a relay contact part. Connect when using a relay or electromagnetic switch. A CR circuit for surge suppression and a CR circuit module are provided. Refer to p.35 for the model name.

4-8 Compliance with the EMC Directive

Effective measures must be taken against EMI that the controller may give to adjacent control-system equipment, as well as EMS of the controller itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the controller to comply with the EMC Directive.
Oriental Motor conducts EMC testing on the controller in accordance with "Example of installation and wiring."
The user is responsible for ensuring the machine's compliance with EMC, based on the installation and wiring explained below.

⚠CAUTION This equipment is not intended for use in residential environments nor for use on a low-voltage public network supplied in residential premises, and it may not provide adequate protection to radio reception interference in such environments.

- **Connecting the noise filter**

  In large electrically noisy environments, connect a noise filter. Refer to "Noise filter" on p.31 for details.

- **Connecting the power supply**

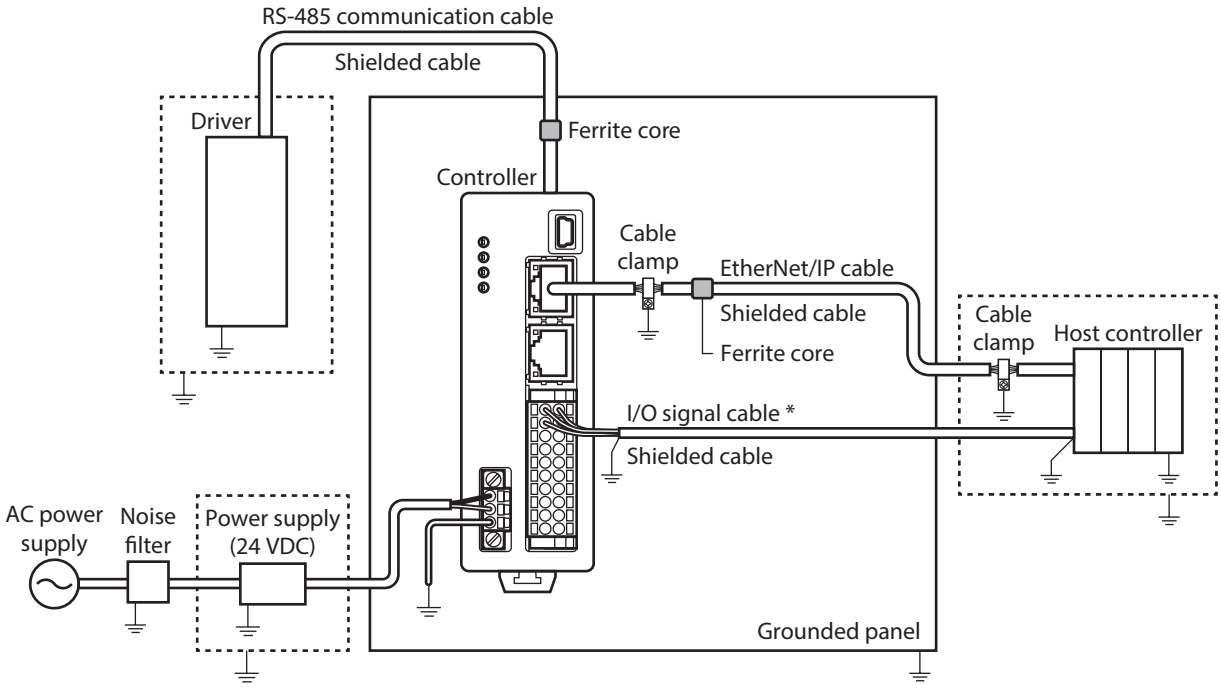
  For the power supply, use a DC power supply that complies with the EMC Directive.
  Use shielded cables to wire and ground as short as possible. Refer to "Prevention of noise propagation" on p.30 for grounding the shielded cable.

- **Connecting the signal cable**

  Refer to "Prevention of noise propagation" on p.30.

- **Grounding method**
  - The cable used to ground the controller and a noise filter must be as thick and short as possible so that no potential difference is generated.
  - Choose a large, thick and uniformly conductive surface for the grounding point.
  - Ground the frame ground terminal of the controller. Refer to p.26 for the grounding method.

- **Example of installation and wiring**



⏚ represents grounding.
⋯ is a shielding box.
* This is Oriental motor cable.

Note The controller uses components that are sensitive to static electricity. Take measures against static electricity since it may cause the controller to malfunction or suffer damage.

5 Inspection and maintenance

5-1 Inspection

It is recommended that periodic inspections are conducted for the items listed below after each operation of the robot. If an abnormality is found, discontinue any use and contact your nearest Oriental Motor sales office.

■ Inspection item

- Check if the openings on the controller are clogged.
- Check if dust is deposited on the controller.
- Check if the installation place secured the controller is loose.
- Check if the connection part with the controller is loose.
- Check if there is any abnormality or unusual smell on the controller.

Note The controller uses semiconductor components. Static electricity may damage the semiconductor components of the controller, so be extremely careful when handling them.

5-2 Warranty

Check on the Oriental Motor Website for the product warranty.

5-3 Disposal

Dispose the product correctly in accordance with laws and regulations, or instructions of local governments.

6 Cable

6-1 RS-485 communication cables

These cables are used when connecting the controller and a driver.

Model	Length [m (ft.)]	Applicable driver
CC001-RS4	0.1 (0.3)	**AZD-KD**
CC002-RS4	0.25 (0.8)	**AZD-AD** **AZD-CD** **AZD-KD**
CC02FLT6	2 (6.6)	**AZD-KR2D**
CC05FLT6	5 (16.4)	

6-2 I/O signal cables

These cables are shielded cables for control I/O of the controller offering excellent noise resistance. Both ends of the cable are equipped with grounding wires useful to grounding.
Select the cable suitable for the number of I/O signals connected.

Model list

Length [m (ft.)]	Number of lead wires			
	6 pieces	10 pieces	12 pieces	16 pieces
0.5 (1.6)	**CC06D005B-1**	**CC10D005B-1**	**CC12D005B-1**	**CC16D005B-1**
1 (3.3)	**CC06D010B-1**	**CC10D010B-1**	**CC12D010B-1**	**CC16D010B-1**
1.5 (4.9)	**CC06D015B-1**	**CC10D015B-1**	**CC12D015B-1**	**CC16D015B-1**
2 (6.6)	**CC06D020B-1**	**CC10D020B-1**	**CC12D020B-1**	**CC16D020B-1**

7 Accessories

7-1 Relay contact protection parts/circuits

- **CR circuit for surge suppression**

  This product is effective to suppress the surge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.

  Model: **EPCR1201-2**

- **CR circuit module**

  This product is effective to suppress the surge which occurs in a relay contact part. Use it to protect the contacts of the relay or switch.
  4 pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to the DIN rail. This product can make the wiring easily and securely since it also supports terminal block connection.

  Model: **VCS02**

8 Specifications

8-1 Product specifications

Power supply	Input voltage	24 VDC±10 %
	Input current	0.2 A
Interface	Field network	EtherNet/IP
	Control input	• Number of input points: 8, photocoupler • Voltage: 24 VDC±10 %
	Control output	• Number of output points: 8, photocoupler/open collector • Voltage: 30 VDC or less • Output saturated voltage: 3 VDC maximum • Current: 10 mA or less
RS-485 communication specifications		Modbus RTU In conformance with EIA-485 Use a straight cable with twisted-pair wires (TIA/EIA-568B CAT5e or higher is recommended) and keep the total wiring distance to 50 m (164 ft.) or less. *1
Number of control axes		• **MRC01**: Maximum 8 axes*2 • **MRC01-C**: Maximum 6 axes*2

*1 If the motor cable or the power supply cable generates an undesirable amount of noise depending on the wiring or configuration, shield the cable or install a ferrite core.

*2 It is the number of axes including an end effector.
This controller can be used to control a single unit of the robot. For example, if an end effector (single axis) is also controlled when a 2-axis type Cartesian robot (XY) is used, the number of control axes will be three.

8-2 General specifications

Degree of protection		IP10
Operating environment	Ambient temperature	0 to +55 °C [+32 to +131 °F] (non-freezing)
	Humidity	85 % or less (non-condensing)
	Altitude	Up to 1,000 m (3,300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Storage environment Shipping environment	Ambient temperature	−25 to +70 °C [−13 to 158 °F] (non-freezing)
	Humidity	85 % or less (non-condensing)
	Altitude	Up to 3,000 m (10,000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas, dust, water or oil
Insulation resistance		100 MΩ or more when 500 VDC megger is applied between the following places: • Frame ground terminal - Power supply input terminal

9 Regulations and standards

9-1 CE Marking

This product is affixed with the mark under the following directive.

■ EU EMC Directive

Refer to "4-8 Compliance with the EMC Directive" on p.32 for details about conformity.

■ EU RoHS Directive

This product does not contain the substances exceeding the restriction values.

3 Operation

This part explains contents to be performed before starting operation as well as commands.

◆Table of contents

1 Robots that can be controlled by the controller

1-1 Robot type

For the robot type supported by the controller, refer to Oriental Motor Website or the setup screen of the **MRC Studio** software.

1-2 Details of robots

■ Degrees of freedom and number of axes for robots

The directions that can be operated and the number of motor axes that constitutes a robot vary depending on the robot type. For all robot types, up to two motor axes can be added for end effectors.

Robot type		Direction that can operate						Number of axes *
SCARA	2-link tip up-down	X	Y	Z	–	–	–	3 (5)
	2-link base up-down	X	Y	Z	–	–	–	3 (5)
	2-link tip up-down + Rz	X	Y	Z	–	–	Rz	4 (6)
	2-link base up-down + Rz	X	Y	Z	–	–	Rz	4 (6)
	2-link + Rz without up-down	X	Y	–	–	–	Rz	3 (5)
	2-link without up-down	X	Y	–	–	–	–	2 (4)
	2-llink base linear motion tip up-down	X	Y	Z	–	–	Rz	4 (6)
	2-llink base linear motion base up-down	X	Y	Z	–	–	Rz	4 (6)
	2-llink base linear motion without up-down	X	Y	–	–	–	Rz	3 (5)
	3-link tip up-down	X	Y	Z	–	–	Rz	4 (6)
	3-link base up-down	X	Y	Z	–	–	Rz	4 (6)
	3-link without up-down	X	Y	–	–	–	Rz	3 (5)
Vertically articulated	3-link base rotation	X	Y	Z	Rx	–	–	4 (6)
	3-link base linear motion	X	Y	Z	Rx	–	–	4 (6)
	3-link base rotation + Rz	X	Y	Z	Rx	–	Rz	5 (7)
	3-link base linear motion + Rz	X	Y	Z	Rx	–	Rz	5 (7)
	3-link without base axis	–	Y	Z	Rx	–	–	3 (5)
	6-axis vertically articulated Model 1	X	Y	Z	Rx	Ry	Rz	6 (8)
	6-axis vertically articulated Model 2	X	Y	Z	Rx	Ry	Rz	6 (8)

Robot type		Direction that can operate						Number of axes *
Vertically articulated (Palletizer)	1 parallel-linkage base rotation	X	Y	Z	Rx	–	–	4 (6)
	1 parallel-linkage base linear motion	X	Y	Z	Rx	–	–	4 (6)
	1 parallel-linkage base rotation + Rz	X	Y	Z	Rx	–	Rz	5 (7)
	1 parallel-linkage base linear motion + Rz	X	Y	Z	Rx	–	Rz	5 (7)
	1 parallel-linkage without base axis	–	Y	Z	Rx	–	–	3 (5)
	2 parallel-linkage base rotation	X	Y	Z	–	–	–	3 (5)
	2 parallel-linkage base linear motion	X	Y	Z	–	–	–	3 (5)
	2 parallel-linkage base rotation + Rz	X	Y	Z	–	–	Rz	4 (6)
	2 parallel-linkage base linear motion + Rz	X	Y	Z	–	–	Rz	4 (6)
	2 parallel-linkage without base axis	–	Y	Z	–	–	–	2 (4)
Delta robot	Delta robot	X	Y	Z	–	–	–	3 (5)
	Delta robot + Rz	X	Y	Z	–	–	Rz	4 (6)
Polar/Cylindrical robot	Polar	X	Y	–	–	–	–	2 (4)
	Polar + Rz	X	Y	–	–	–	Rz	3 (5)
	Cylindrical	X	Y	Z	–	–	–	3 (5)
	Cylindrical + Rz	X	Y	Z	–	–	Rz	4 (6)
Cartesian	2-axis (XY)	X	Y	–	–	–	–	2 (4)
	2-axis (XZ)	X	–	Z	–	–	–	2 (4)
	2-axis (YZ)	–	Y	Z	–	–	–	2 (4)
	XY + Rz	X	Y	–	–	–	Rz	3 (5)
	XZ + Rz	X	–	Z	–	–	Rz	3 (5)
	YZ + Rz	–	Y	Z	–	–	Rz	3 (5)
	3-axis (XYZ)	X	Y	Z	–	–	–	3 (5)
	XYZ + Rz	X	Y	Z	–	–	Rz	4 (6)
Cartesian (Planar surface gantry)	Planar surface gantry 2-axis (XY)	X	Y	–	–	–	–	2 (4)
	Planar surface gantry 2-axis (XZ)	X	–	Z	–	–	–	2 (4)
	Planar surface gantry 2-axis (YZ)	–	Y	Z	–	–	–	2 (4)
	Planar surface gantry 2-axis (XY) + Rz	X	Y	–	–	–	Rz	3 (5)
	Planar surface gantry 2-axis (XZ) + Rz	X	–	Z	–	–	Rz	3 (5)
	Planar surface gantry 2-axis (YZ) + Rz	–	Y	Z	–	–	Rz	3 (5)
	Planar surface gantry 3-axis (XYZ)	X	Y	Z	–	–	–	3 (5)
	Planar surface gantry 3-axis (XYZ) + Rz	X	Y	Z	–	–	Rz	4 (6)
Small Robots **OVR**	4-axis vertically articulated: **OVR4048K5-V** **OVR4068K5-V** **OVR4088K5-V**	X	Y	Z	–	–	Rz	4 (6)
	5-axis vertically articulated: **OVR5035K1-V**	X	Y	Z	Rx	–	Rz	5 (7)
	6-axis vertically articulated: **OVR6048K1-V**	X	Y	Z	Rx	Ry	Rz	6 (8)
	3-axis SCARA: **OVR3041K3-H**	X	Y	–	–	–	Rz	3 (5)

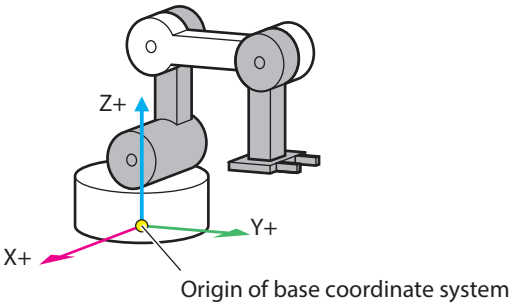
* The value in parentheses ( ) indicates the number of axes when two axes of end effectors are used.

■ Coordinate system

The controller controls a robot in the following coordinate systems.

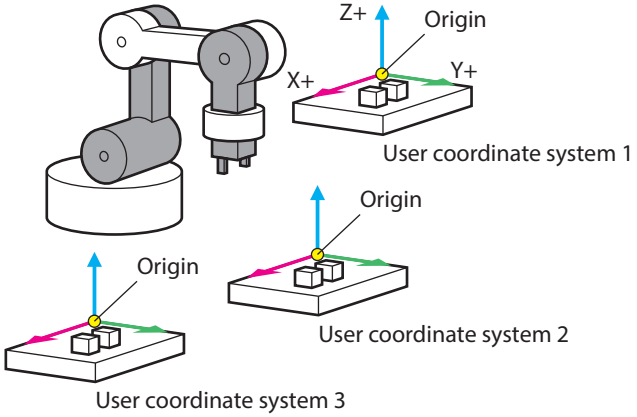
● Base coordinate system

This is Cartesian coordinates with the base (installation surface) of a robot as a reference. Based on the origin of the base, the tool coordinate system and the TCP (Tool Center Point *) are calculated in accordance with information about the link length and the axis position.
The origin of the base coordinate system cannot be changed.
* The center point when controlling a tool at the tip of a robot



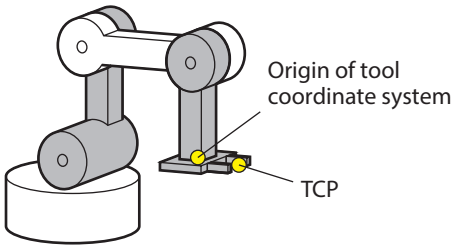
● User coordinate system (World coordinate system)

This is Cartesian coordinates to operate the TCP to set a desired position as the origin. When executing return-to-origin operation after setting the origin, the TCP moves to the origin of the user coordinate system.
Three user coordinate systems (user coordinate system 1 to user coordinate system 3) can be set to the **MRC01** controller and switched according to the operation.
When the setup of the robot is completed, the user coordinate system 1 is applied.
The origin is the same as the origin of the base coordinate system at this time.

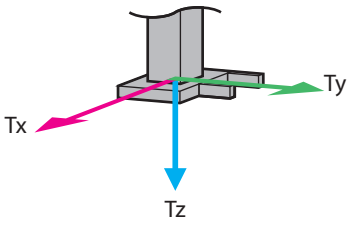


● Tool coordinate system

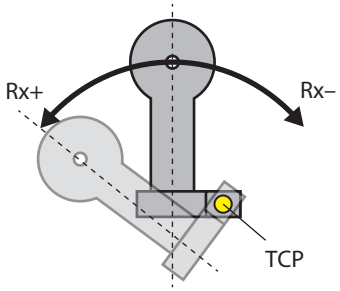
This is Cartesian coordinates with a tool attached to the tip of a robot as the origin. The position having offset by the tool offset from the origin is the TCP.
The coordinates in the tool coordinate system include Tx, Ty, and Tz, which represent the direction the tool moves. If Rx, Ry and Rz are set, the tool rotates around the TCP. Rx represents the rotation angle around the Tx axis, Ry around the Ty axis, and Rz around the Tz axis. Rx and Ry can only be set for a vertically articulated robot.



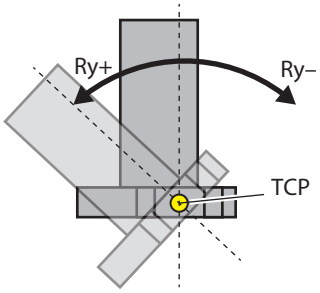
• Tx, Ty, Tz



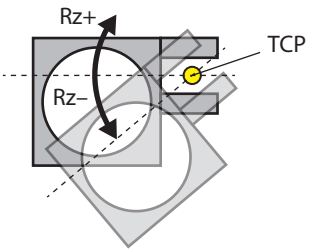
• Rx+, Rx–
(Vertically articulated robot only)



• Ry+, Ry–
(Vertically articulated robot only)



• Rz+, Rz–



■ Definition of right-handed system / left-handed system

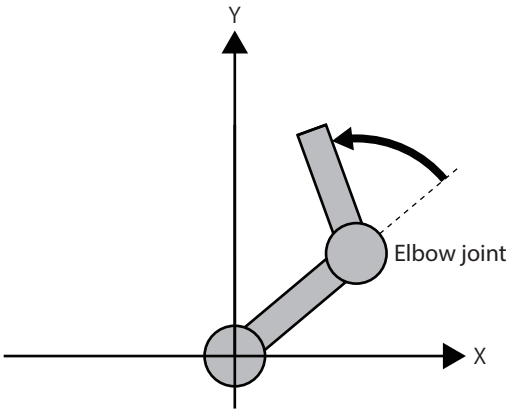
For a SCARA robot and a 6-axis vertically articulated robot, the posture of the robot is controlled by the right-handed system or the left-handed system.

- **SCARA robot**

The right-handed system and the left-handed system used in a SCARA robot are defined as shown in the figures. Since the direction in which the elbow joint is bent changes depending on the selected handed system, select the handed system so that the robot arm does not interfere with the peripheral equipment.

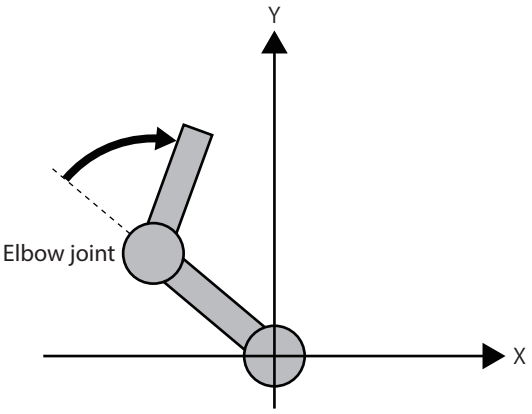
Right-handed system

This refers to a state where the axis of the elbow joint is bent to the left.



Left-handed system

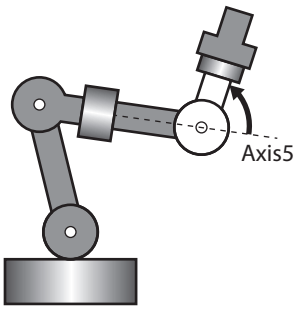
This refers to a state where the axis of the elbow joint is bent to the right.



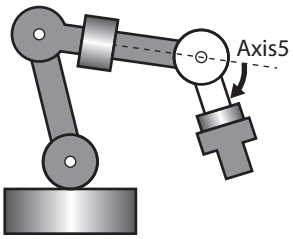
- **6-Axis vertically articulated robot**

The right-handed system and the left-handed system used in a 6-axis vertically articulated robot are defined as shown in the figures.
Since the direction in which the joint of the fifth axis is bent changes depending on the posture of the robot, select the handed system according to the posture of the robot. If the handed system is not selected properly, the robot may cause unexpected movement.

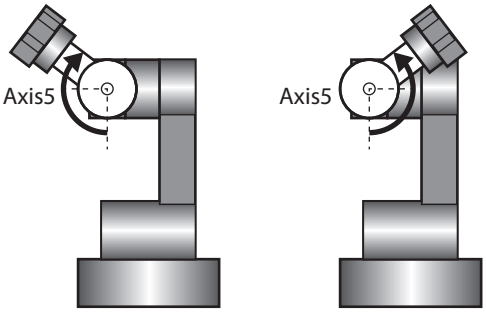
Right-handed system of model 1



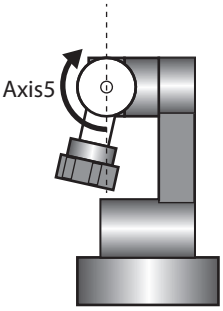
Left-handed system of model 1



Right-handed system of model 2



Left-handed system of model 2



2 Before starting operation

2-1 Operation preparation flow

Use the **MRC Studio** software to prepare for operation.

Setting of robot — Set the information of the robot with the **MRC Studio** software.

↓

Setting of origin

↓

Setting of position limit — Set the position limit to restrict the movable area of a robot.

↓

Operation check

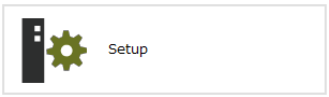
↓

Backup of data — Save the data having set in the **MRC Studio** software to a PC.

2-2 Setting of robot

Set the information of the robot with the **MRC Studio** software.

1. Start the **MRC Studio** software.
2. Click [COM port] to select "**MRC01**."
3. Click [Setup] on the start screen.



4. Set the robot type and the mechanism information according to the instructions on the screen.

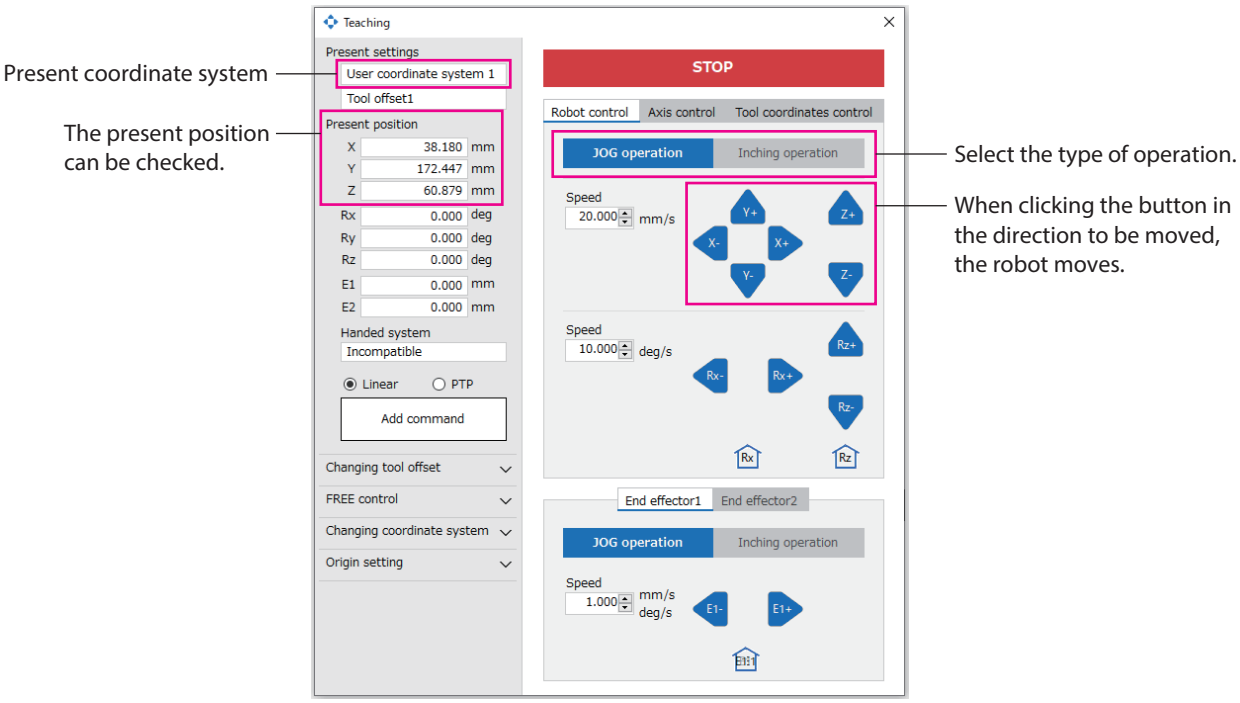
memo To change the robot type, perform the setup again from the start screen. Except for the robot type, you can change using [Re-setup] under the [Maintenance] menu even after the setup is completed.

2-3 Origin setting

When the setup of the robot is completed, the origin of the user coordinate system 1 is applied. If the origin of the user coordinate system is set, the origin of the robot can be changed to a desired position. When high-speed return-to-origin operation is performed with a robot other than a Cartesian robot, set the origin of the user coordinate system. Otherwise, high-speed return-to-origin operation cannot be executed.
Up to three user coordinate systems can be set. When using multiple user coordinate systems, set the origin for each.

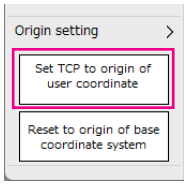
Note Before operating a robot, check the condition of the surrounding area to ensure safety.

1. Click the [Communication] icon on the toolbar to set communication to an ON state (online state).
   Communication is started with the controller.
2. Click the [Teaching] icon on the toolbar.
   The teaching screen appears.
3. Using JOG operation or inching operation, operate the robot until the TCP reaches a position where the origin is desired to set.



Note Just in case the origin is changed by mistake or the controller is replaced due to maintenance, keep the information of the present position that is desired to set as the origin.

4. Check that the present coordinate system is one of user coordinate system 1 to user coordinate system 3.
   The present coordinate system can be changed by "Changing coordinate system."
5. Click [Origin setting], and then click [Set TCP to origin].
   The origin is set and the values of X, Y, and Z at the present position change to zero.



memo
- The origin is written to the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.
- The origin having set can be checked using the origin offsets of the robot information monitor.
- The origin can be set only when the present coordinate system is the user coordinate system.

2-4 Setting of position limit

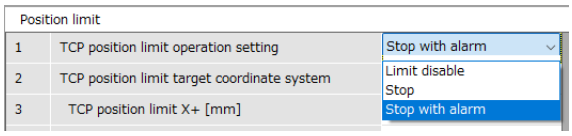
It is recommended to set the position limit in order to prevent danger such as collision. The position limit can be set for the TCP or each axis.
This section explains how to set the position limit of the TCP.

Note This is not a safety function that can apply to protection measures.

■ Setting of stop mode

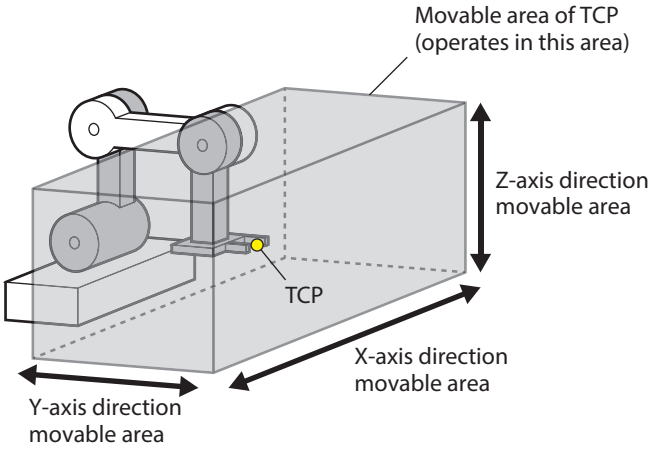
The stop mode when the TCP reaches the position limit is set here.

1. Click [Parameter setting] on the menu.
2. Click [Protective function setting] > [Position limit] on the parameter group.
3. Set the stop mode of the robot with the “TCP position limit operation setting” parameter.
   In this case, set "Stop with alarm."



■ Setting of movable area

Set the movable area of the TCP.



1. Click the [Teaching] icon on the toolbar.
   The teaching screen appears.
2. Using JOG operation or inching operation, move the TCP to the maximum position in the X-axis direction.
3. Check the value of the present position X, and set to the "TCP position limit X+" parameter.
4. Using JOG operation or inching operation, move the TCP to the minimum position in the X-axis direction.
5. Check the value of the present position X, and set to the "TCP position limit X–" parameter.
6. As in Steps 2 through 5, set the movable area of Y axis to the “TCP position limit Y” parameter and that of Z axis to the “TCP position limit Z” parameter.
7. Click the [Writing] icon on the toolbar.
   The parameters having set are written to the controller.

memo The position limit can also be set for each axis and an end effector. Set the “Axis position limit” parameter as necessary.

2-5 Operation check

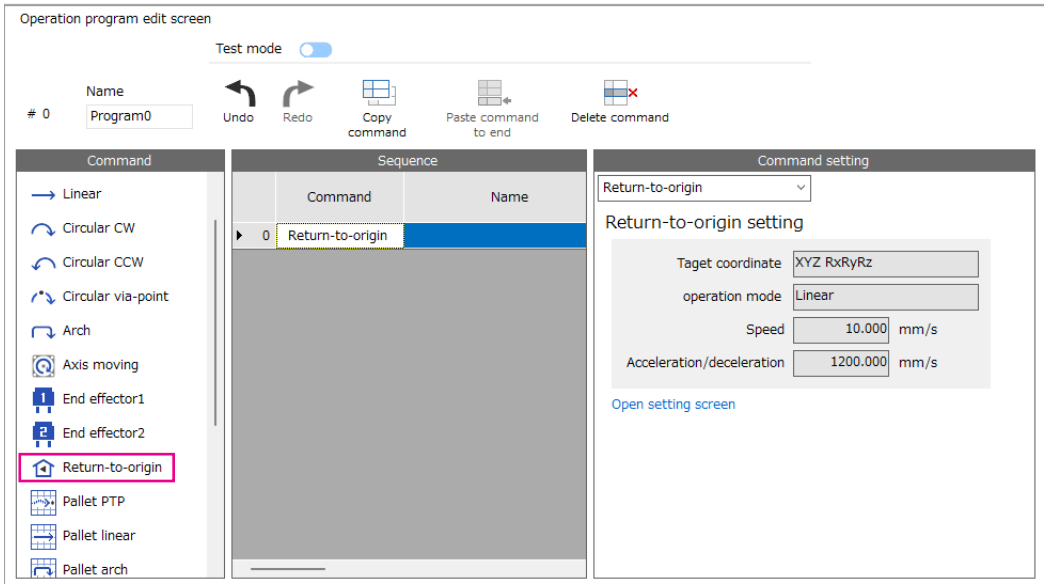
Check if the items having set so far can operate properly.

Note Before operating a robot, check the condition of the surrounding area to ensure safety.

■ Check of origin

Use the return-to-origin command to check that operation until the origin of the user coordinate system having set is performed.

1. Click [Operation program] on the menu.
2. Click [New] for the program number used.
   The operation program edit screen appears.
3. Click [Return-to-origin] of the move command.
   The return-to-origin command is added to the sequence.

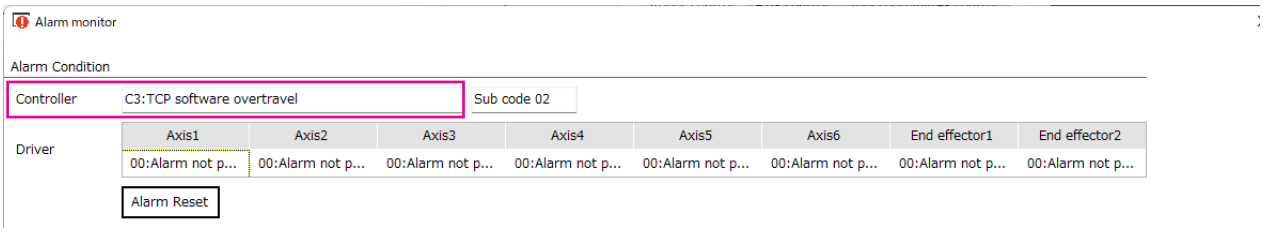


4. Set the test mode to ON.
5. Click [Step execution] of the test mode.
   High-speed return-to-origin operation is started.
6. When the robot stops, make sure that the values of X, Y, and Z of the present position have changed to 0.
   The present position can be checked on the teaching screen.

■ Check of TCP position limit

Operate to the TCP position limit and check that an alarm is generated.

1. Click the [Teaching] icon on the toolbar.
   The teaching screen appears.
2. Operate using JOG operation or inching operation.
   If the TCP position limit having set is detected, an alarm will be generated.
3. Click [Monitor] > [Alarm monitor] on the menu.
   The alarm monitor screen appears.
4. Check "C3: TCP software overtravel" is shown on the controller of the present alarm.



5. Click [Alarm reset].
   After the alarm is reset, escape from the position limit using JOG operation or inching operation.

2-6 Backup of data

Save the data having set in the **MRC Studio** software to a PC.
Backing up the data is recommended in case the controller is replaced for maintenance or the controller is damaged.

1. Click [Save As] under the [File] menu.
2. Input a file name and click [Save].
   A desired file name and storage destination can be used. The saving format is ".mrcx."

2-7 Maintenance

When the controller, driver, or motor is replaced, the data stored as backup can be applied to use.

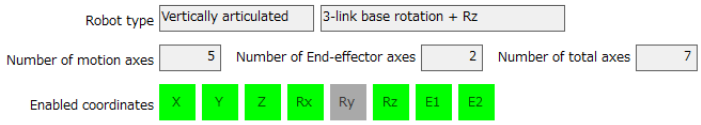
■ When the controller is replaced

1. Replace the controller.
2. Turn on the power supply of the controller.
3. Open the backup data using the **MRC Studio** software.
   1) Click [Open] on the start screen.
   2) Select the mrcx file stored, and click [Open].
4. Click [Writing all data (including robot & origin of user coordinate system)] under the [Maintenance] menu.
   The backup data is written to the controller.

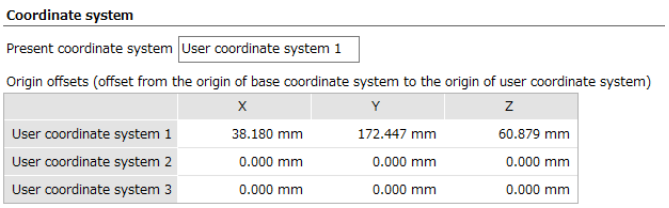
   memo When the message "Turn on the power again" appears, turn off the power supply of the controller and then turn on it again.

5. Click [Monitor] > [Robot information monitor] on the menu.
   The robot information monitor screen appears.

6. Check the robot information.
   1) Set the [Communication] icon to ON.
   2) Check that the robot type, the number of axes, and enabled coordinates match the robot being connected.



   3) Click [Monitor] > [Status monitor] on the menu.
      The status monitor screen appears.
   4) Check that the origin offsets are the coordinates set in "2-3 Origin setting" on p.45.
      If the origin offsets are not correct, refer to "When the origin information is not stored in the mrcx file" in the next section to set the origin.



	X	Y	Z
User coordinate system 1	38.180 mm	172.447 mm	60.879 mm
User coordinate system 2	0.000 mm	0.000 mm	0.000 mm
User coordinate system 3	0.000 mm	0.000 mm	0.000 mm

● When the origin information is not stored in the mrcx file

1. Click [Origin setting of user coordinate system] under the [Maintenance] menu.
2. Input the position of the origin kept in "2-3 Origin setting" on p.45.
3. Click [Set to the controller].
4. Turn on the power supply of the controller again.

■ When a motor or a driver is replaced

1. Replace a motor or a driver.
2. Turn on the power supplies of the controller and the driver.
3. Open the backup data in the **MRC Studio** software.
   1) Click [Open] on the start screen.
   2) Select the mrcx file stored, and click [Open].
4. Click [Re-setup] under the [Maintenance] menu.
   When the setup wizard appears, perform the "Axis home setting."

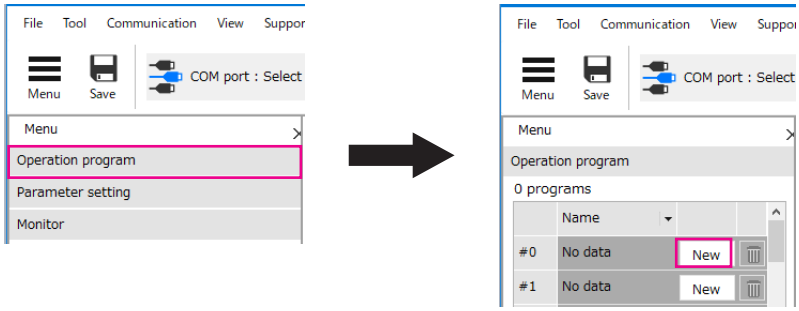
3 Creation of operation program

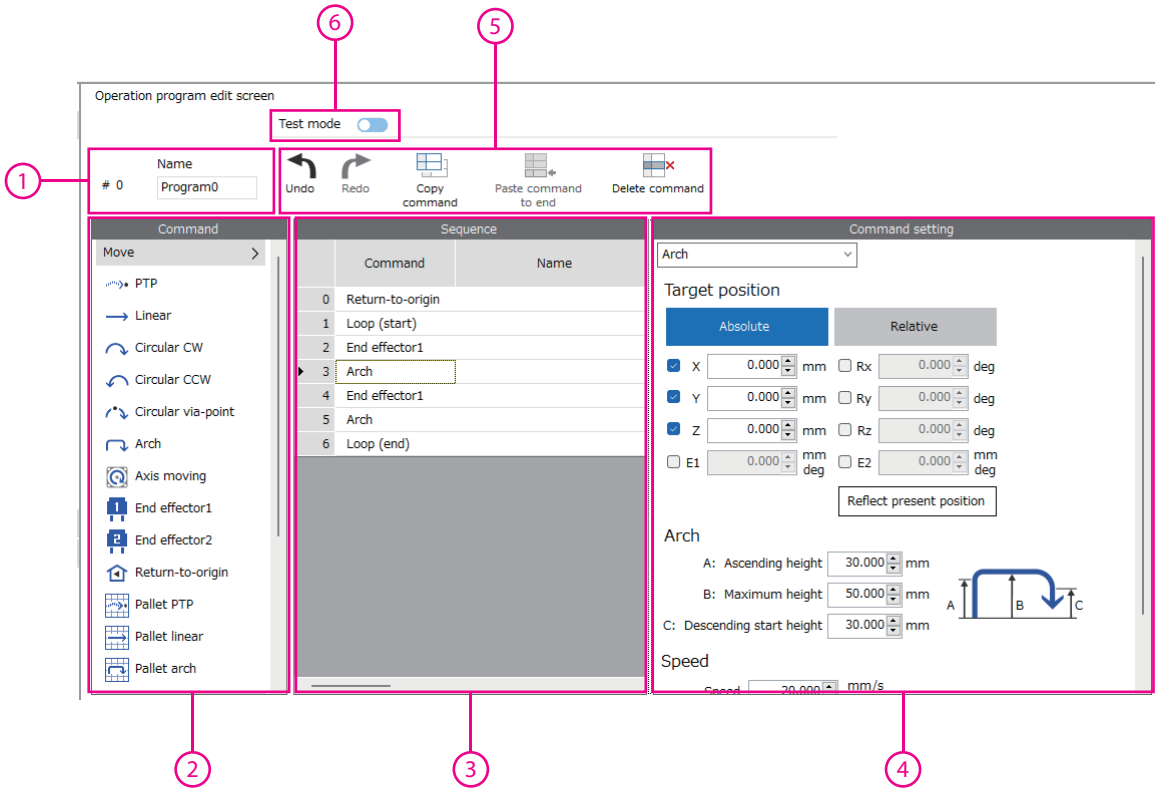
Create operation programs in the **MRC Studio** software.
Up to 64 operation programs can be created. A single operation program can array up to 128 commands.
The created operation program is executed using input signals or via EtherNet/IP.

memo The more operating programs and commands are, the longer it takes for the data in the **MRC Studio** software to read and write.

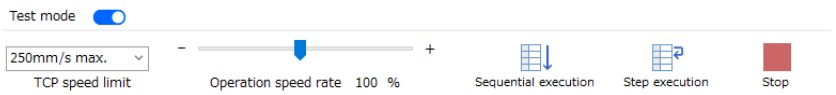
■ Operation program edit screen

Clicking [Operation program] on the menu appears operation programs. Clicking [New] on the operation program appears the operation program edit screen.





1	This indicates the program number and the program name being edited.
2	These are commands to control a robot. Commands include the move command and the control command. Clicking a command adds it to the sequence.
3	Arrays the commands in the order in which they will be executed. The commands are executed in order starting from 0. Dragging and dropping the number of the command can change the order of the commands. Up to 128 commands can be arrayed in a single program.
4	Sets relevant parameters such as the target position and the target speed for each command.

5	These are icons used to edit the operation programs.
6	The operation programs having set can be checked. Using the graphic monitor can check the movement on the 3D simulator. Setting the test mode to ON switches the icons used to edit the operation programs to the following. 

Operation speed rate	Sets the operating speed rate when the command is executed in the test mode. Set the ratio to the speed on the command setting. The setting range is 10 to 200 %.
Sequential execution	Executes sequentially from the selected command to the last command. If sequential execution is started from a command after the loop (start), the loop is not executed.
Step execution	Executes only the selected commands.
Stop	Stops the command being executed.

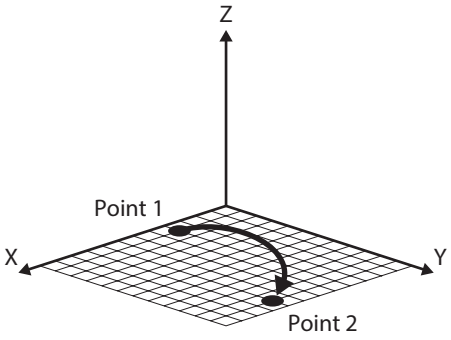
4 Commands

4-1 Move commands

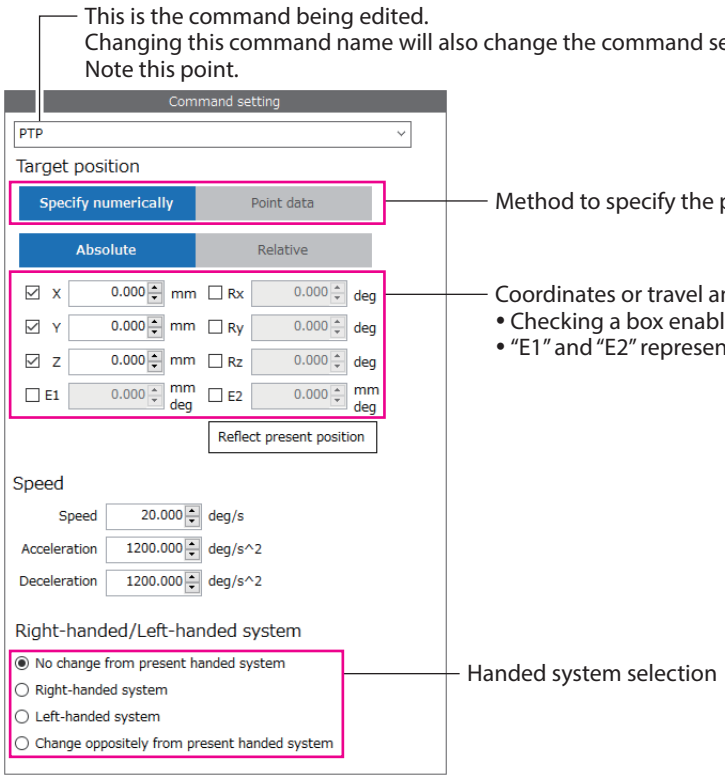
■ PTP

This is a command for PTP operation. Using PTP operation, the robot can move faster than linear interpolation operation since positioning of each motor is performed at the shortest distance from the present position to the target position. For a SCARA robot and a 6-axis vertically articulated robot, the handed system can be switched between the right-handed system and the left-handed system.

- **Example of trajectory**



- **Command setting**



MRC Studio Command setting	Screen indication	Setting range	Initial value
Target position	Method to specify the position	• Specify numerically • Point data	Specify numerically
	Point data number*1	0 to 15	0
	X	–2,000.000 to 2,000.000 mm	0
	Y	–2,000.000 to 2,000.000 mm	0
	Z	–2,000.000 to 2,000.000 mm	0
	E1	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	E2	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	Rx	–270.000 to 270.000 deg	0
	Ry	–90.000 to 90.000 deg	0
	Rz	–270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 deg/s^2	1,200.000
Right-handed/ Left-handed system*2	Handed system selection	• No change from present handed system • Right-handed system • Left-handed system • Change oppositely from present handed system	No change from present handed system

*1 It is displayed only when "Point data" is selected in the method to specify the position.
*2 It is enabled for a SCARA robot and a 6-axis vertically articulated robot. Set if the handed system is desired to change for each command when repeating the PTP commands in a single operation program.

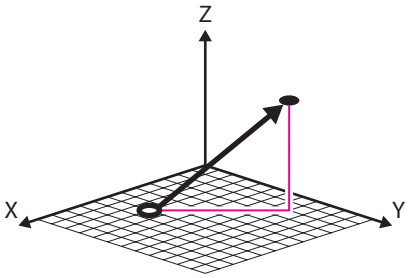
memo

- For "Speed" in PTP operation, set the speed of the axis that has the largest travel amount among the axes of the entire robot. In PTP operation, each axis operates according to the speed of the axis that has the largest travel amount in the entire robot. Therefore, the robot may operate faster in PTP operation than in linear interpolation operation or circular interpolation operation, where the speed of the TCP is set.
- If the same target position is set multiple times, selecting "Point data" in the method to specify the position can easily set the target position.
- When setting the target position using "Point data," set the "Point data" parameter in advance. Note that the position information other than the end effector (E1, E2) can be set in the "Point data" parameter.

■ Linear

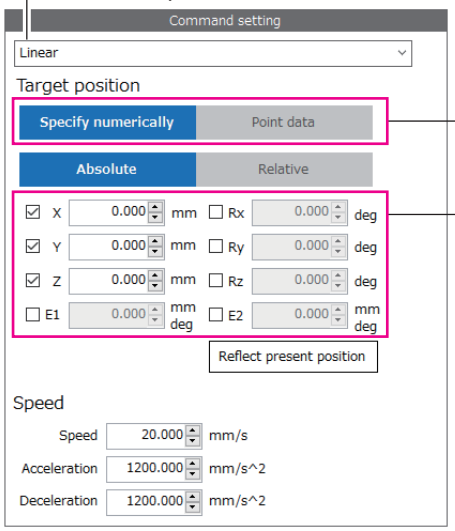
This is a command for linear interpolation operation. Linear interpolation operation is performed from the present position to the target position.

● Example of trajectory



● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Method to specify the position

Coordinates or travel amount
- Checking a box enables a value.
- "E1" and "E2" represent an end effector.

MRC Studio Command setting	Screen indication	Setting range	Initial value
Target position	Method to specify the position	• Specify numerically • Point data	Specify numerically
	Point data number*	0 to 15	0
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

* It is displayed only when "Point data" is selected in the method to specify the position.

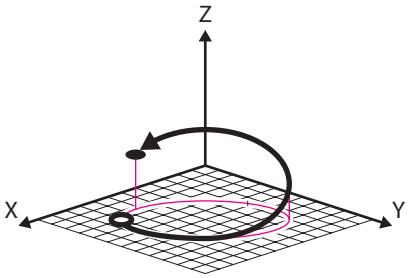
memo

- If multiple coordinates are set at the target position, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.
- If the same target position is set multiple times, selecting "Point data" in the method to specify the position can easily set the target position.
- When setting the target position using "Point data," set the "Point data" parameter in advance. Note that the position information other than the end effector (E1, E2) can be set in the "Point data" parameter.

■ Circular CW, circular CCW, circular via-point

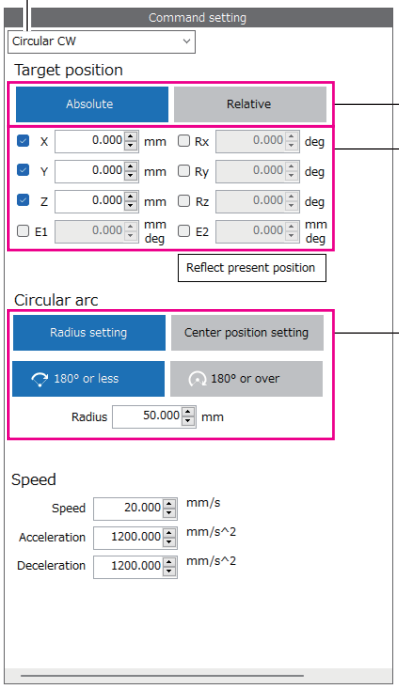
These are commands for circular interpolation operation. When the X and Y coordinates are set, circular interpolation operation is performed from the present position to the target position. When the X, Y and Z coordinates are set, helical interpolation operation is performed from the present position to the target position. The operation of one revolution (360 degrees) can be performed only when "Center position setting" is selected in the setting method of the circular arc. Operation exceeding one revolution (360°) is not available.

● Example of trajectory



● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.

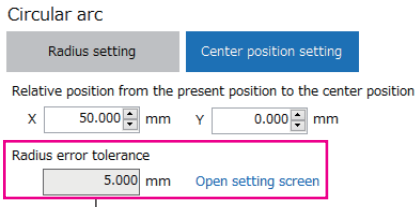


Method to specify the position

Coordinates or travel amount
- Checking a box enables a value.
- "E1" and "E2" represent an end effector.

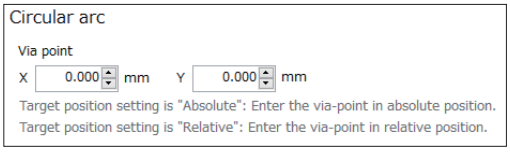
Circular arc setting method
The screen on the left is when "Radius setting" is selected.
The following screen is shown when "Center position setting" is selected or when using the circular via-point command.

- Center position setting



You cannot input on this screen. Click "Open setting screen" and set the "Circular center position radius error tolerance" parameter.

- Circular via-point command



MRC Studio Command setting	Screen indication	Setting range	Initial value
Target position	Method to specify the position	• Absolute • Relative	Absolute
	X	–2,000.000 to 2,000.000 mm	0
	Y	–2,000.000 to 2,000.000 mm	0
	Z	–2,000.000 to 2,000.000 mm	0
	E1	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	E2	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	Rx	–270.000 to 270.000 deg	0
	Ry	–90.000 to 90.000 deg	0
	Rz	–270.000 to 270.000 deg	0
Circular arc	Circular arc setting method	• Radius setting (180° or less) • Radius setting (180° or more) • Center position setting	Radius setting (180° or less)
	Radius	1.000 to 2,000.000 mm	50.000
	X	–2,000.000 to 2,000.000 mm	50.000
	Y	–2,000.000 to 2,000.000 mm	50.000
	Radius error tolerance	0 to 500.000 mm	5.000
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

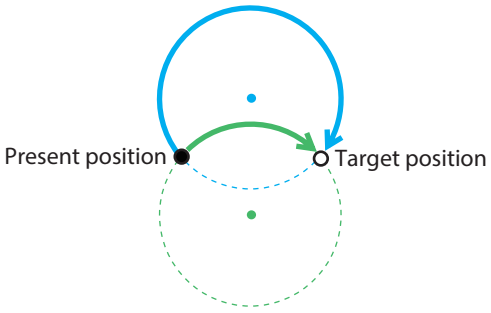
memo If multiple coordinates are set at the target position, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

● Circular arc setting method

"Radius setting"

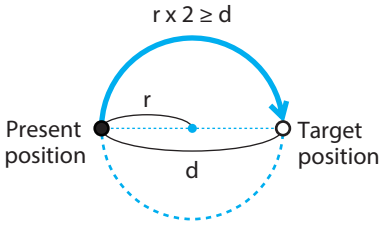
There are two types of circles with the same radius passing through the present position and the target position.

- When setting to 180° or less for radius setting: Passes through the trajectory of the green arrow.
- When setting to 180° or more for radius setting: Passes through the trajectory of the blue arrow.

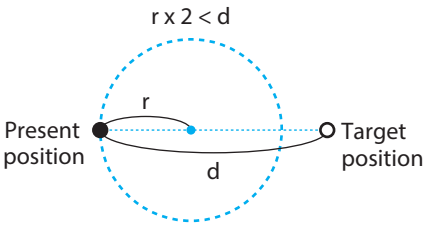


Set a value to "Radius" so that a value of twice the radius is equal to or greater than the linear distance between the present position and the target position. If this condition is not satisfied, or if the present position is equal to the target position, operation will not start and information of Operation start error will be generated.

• Operation can be started

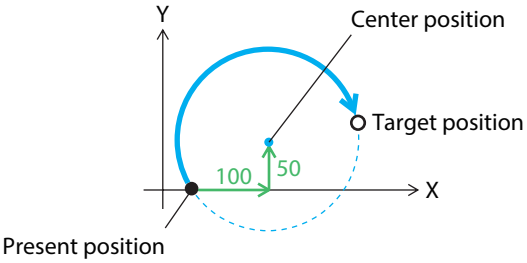


• Operation cannot be started

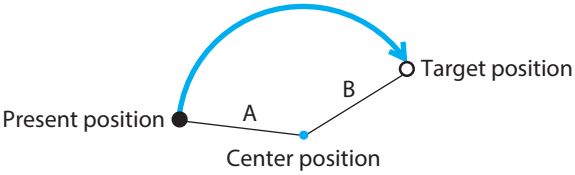


"Center position setting"

Set relative coordinates from the present position to the target position to "X" and "Y."
In the figure, X is 100 and Y is 50.



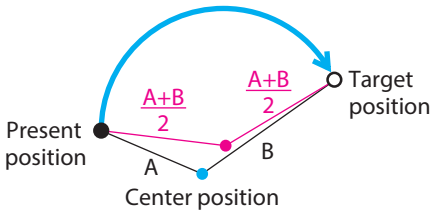
The radius of the circular arc is calculated from the distance A between the center position and the present position, and the distance B between the center position and the target position.
If A and B are equal, operation is performed in a circular arc trajectory with the specified circular arc as a center.



If A and B are different, operation is performed in a circular arc trajectory with the radius that is the average value of A and B.
If the absolute value of the difference between A and B exceeds the "Radius error tolerance," operation will not be started and information of Operation start error will be generated.

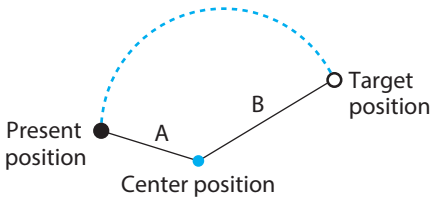
• Operation can be started

|A–B| ≤ Radius error tolerance



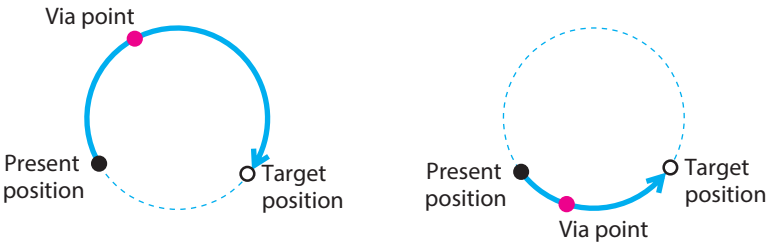
• Operation cannot be started

|A–B| > Radius error tolerance



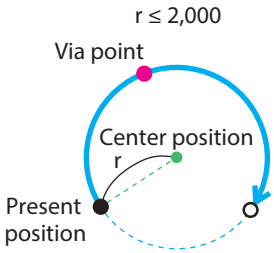
Circular via-point command

Operation is performed following a circular arc trajectory passing through the via point.
When the target position is specified to "Absolute," input the absolute position of the via point to "X" and "Y." When it is specified to "Relative," input the relative position of the via point to "X" and "Y." The operating direction is determined depending on the position of the via point.

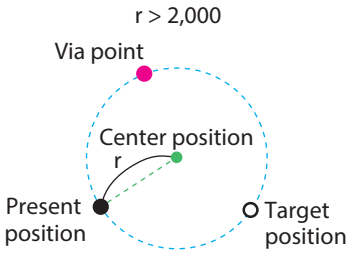


When the radius of the circular arc connecting the present position, via point, and target position is larger than the upper limit value (2,000 mm), or when the present position, via point, and target position are on the same straight line, operation is not started and information of Operation start error is generated.

• Operation can be started



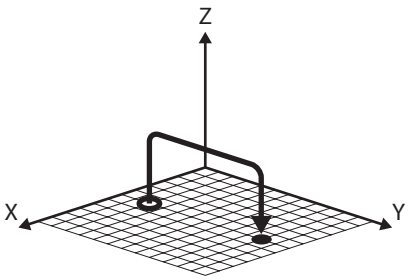
• Operation cannot be started



■ Arch

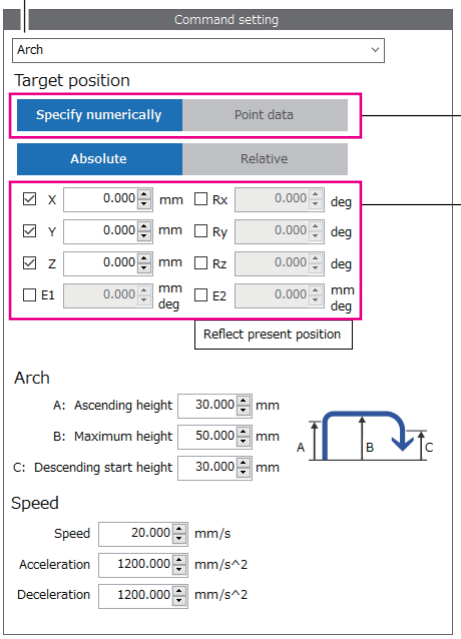
This is a command for arch interpolation operation. Pick & place operation can be performed using only the arch command since a series of motion, which is starting from ascending, moving in horizontal, and to descending, can be performed without slowing the speed down.

● Example of trajectory



● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Method to specify the position

Coordinates or travel amount
• Checking a box enables a value.
• "E1" and "E2" represent an end effector.

MRC Studio Command setting	Screen indication	Setting range	Initial value
Target position	Method to specify the position	• Specify numerically • Point data	Specify numerically
	Point data number*	0 to 15	0
	X	–2,000.000 to 2,000.000 mm	0
	Y	–2,000.000 to 2,000.000 mm	0
	Z	–2,000.000 to 2,000.000 mm	0
	E1	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	E2	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	Rx	–270.000 to 270.000 deg	0
	Ry	–90.000 to 90.000 deg	0
	Rz	–270.000 to 270.000 deg	0
Arch	A: Ascending height	–2,000.000 to 2,000.000 mm	30.000
	B: Maximum height	–2,000.000 to 2,000.000 mm	50.000
	C: Descending start height	–2,000.000 to 2,000.000 mm	30.000
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

* It is displayed only when "Point data" is selected in the method to specify the position.

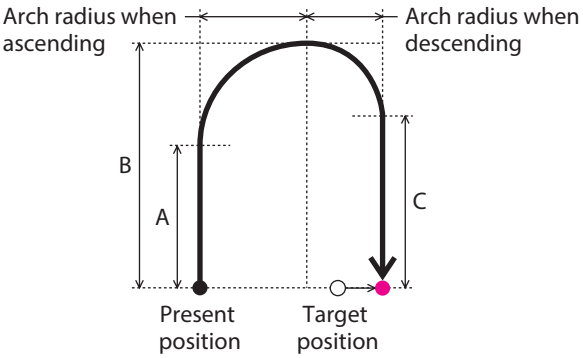
memo

- If multiple coordinates are set at the target position, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.
- If the same target position is set multiple times, selecting "Point data" in the method to specify the position can easily set the target position.
- When setting the target position using "Point data," set the "Point data" parameter in advance. Note that the position information other than the end effector (E1, E2) can be set in the "Point data" parameter.

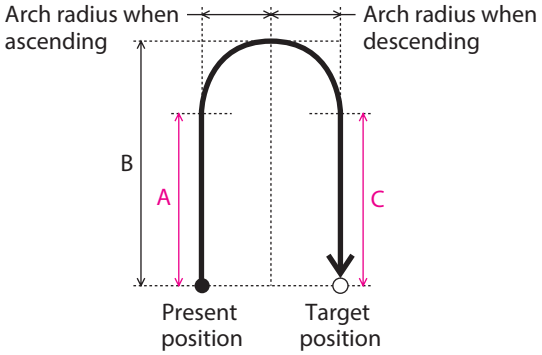
● Setting of arch

Set values with reference to the present position to "A: Ascending height," "B: Maximum height," and "C: Descending start height" of the arch. Setting these items will determine the trajectory of the arch based on the distance between the present position and the target position.
If the distance between the present position and the target position is less than the sum of the arch radius at ascending and that at descending, the target position will be exceeded. Therefore, "A: Ascending height" and "C: Descending start height" are automatically corrected so that the arch radius at ascending and that at descending are half of the distance between the present position and the target position.

- Before correction
  Distance between present position and target position < Arch radius when ascending + Arch radius when descending



- After correction
  Distance between present position and target position = Arch radius when ascending + Arch radius when descending



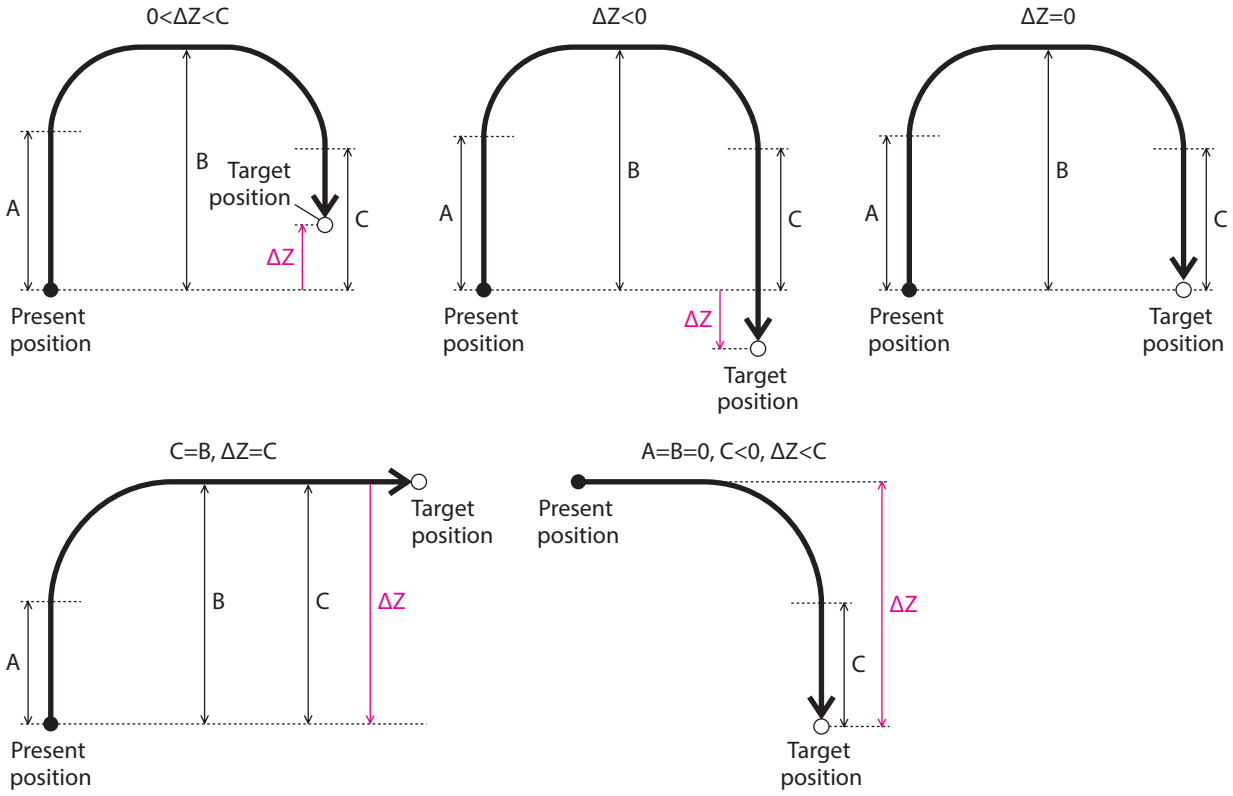
When making the arch trajectory upward

If the arch is set to one of the following, the arch trajectory is upward.

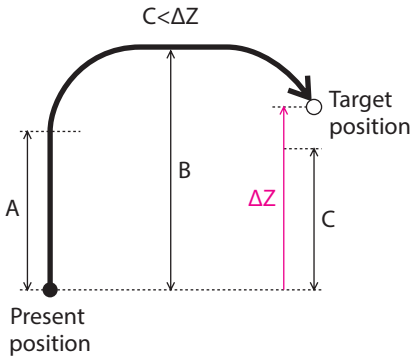
- "A: Ascending height" is larger than 0
- "A: Ascending height" is 0 and "B: Maximum height" is larger than 0

Set a value larger than the difference between the present position height and the target position height (Z coordinate) to "C: Descending start height." If this condition is not satisfied, operation is not started and information of Operation start error will be generated.

• Operation can be started



• Operation cannot be started



When making the arch trajectory downward

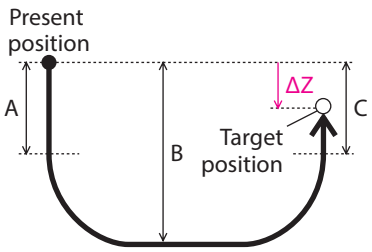
If the arch is set to one of the following, the arch trajectory is downward.

- "A: Ascending height" is smaller than 0
- "A: Ascending height" is 0 and "B: Maximum height" is smaller than 0

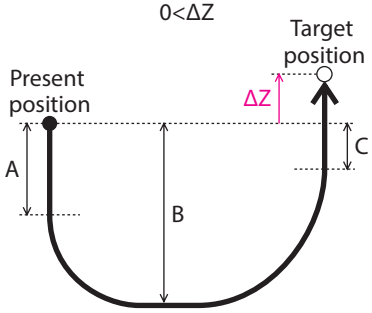
Set a value smaller than the difference between the present position height and the target position height (Z coordinate) to "C: Descending start height." If this condition is not satisfied, operation is not started and information of Operation start error will be generated.

• Operation can be started

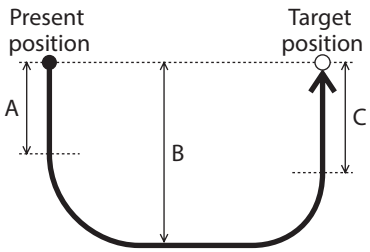
C<ΔZ<0



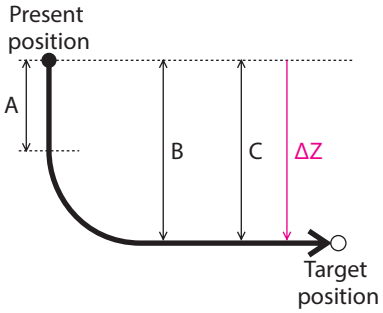
0<ΔZ



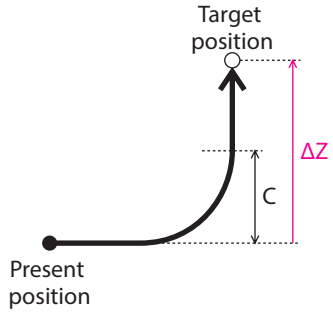
ΔZ=0



C=B, ΔZ=C

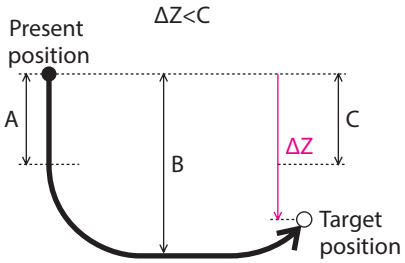


A=B=0, 0<C, C<ΔZ



• Operation cannot be started

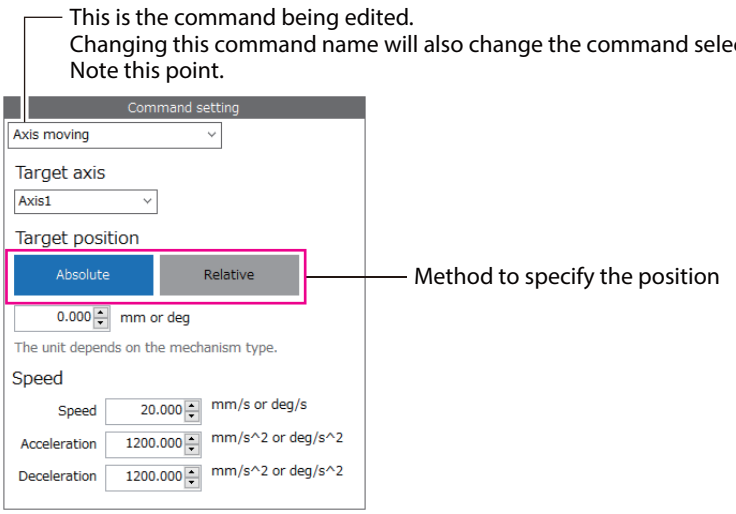
ΔZ<C



■ Axis moving

This is a command to move the selected axis.

● Command setting



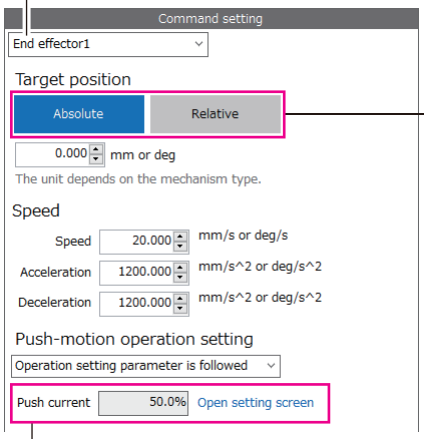
MRC Studio Command setting	Screen indication	Setting range	Initial value
Target axis	Target axis	Axis1 to Axis6	Axis1
Target position	Method to specify the position	• Absolute • Relative	Absolute
	Position	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s or 0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000

■ End effector 1, End effector 2

This is a command for end-effector operation. This command is used to operate an end effector only.
Only an end effector can execute push-motion operation.

● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Method to specify the position

- When "Push-motion enable" is selected on the Push-motion operation setting
  You can input on this screen.
- When "Operation setting parameter is followed" is selected in the Push-motion operation setting
  You cannot input on this screen. Click "Open setting screen" and set the "Push current" parameter.

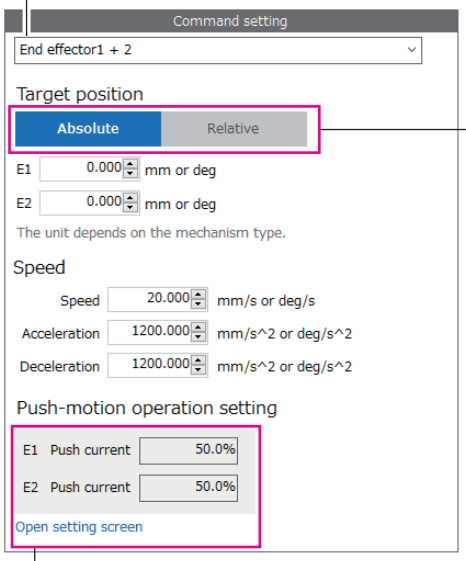
MRC Studio Command setting	Screen indication	Setting range	Initial value
Target position	Method to specify the position	• Absolute • Relative	Absolute
	Position	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s or 0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000
Push-motion operation setting	Push-motion operation setting	• Operation setting parameter is followed • Push-motion disable • Push-motion enable	Operation setting parameter is followed
	Push current	0 to 100.0 %	50.0

■ End-effector 1 + 2

This is a command for end-effector operation. This command is used to operate both end-effector 1 and end-effector 2 simultaneously.
Use this command when performing push-motion operation of the end effectors in two axes simultaneously.

● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Method to specify the position

When "Operation setting parameter is followed" is selected in the Push-motion operation setting, this screen cannot be used to input data. Click "Open setting screen" to set the "Push current" parameter.

MRC Studio command setting	Screen view	Setting range	Initial value
Target position	Method to specify the position	• Absolute • Relative	Absolute
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s or 0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2 or 0.001 to 30,000.000 deg/s^2	1,200.000
Push-motion operation setting	E1 Push current	0 to 100.0 %	50.0
	E2 Push current	0 to 100.0 %	50.0

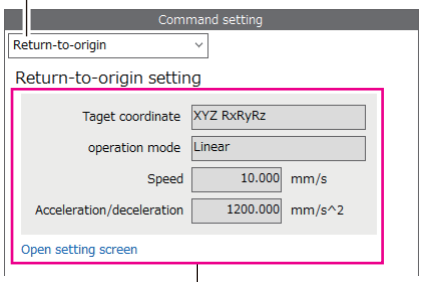
■ Return-to-origin

This is a command for high-speed return-to-origin operation. High-speed return-to-origin operation of the coordinates set in "Target coordinates" is performed.

memo When high-speed return-to-origin operation is performed with a robot other than a Cartesian robot, set the origin of the user coordinate system in advance. Refer to "2-3 Origin setting" on p.45 for how to set.

● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



You cannot input on this screen.
Click "Open setting screen" and set the applicable parameter.

MRC Studio Command setting	Screen indication	Setting range	Initial value
Return-to-origin setting	Target coordinates	• XYZ RxRyRz E1E2 • XYZ RxRyRz • XYZ RxRyRz E1 • XYZ RxRyRz E2 • XYZ E1E2 • XYZ E1 • XYZ E2 • XYZ	XYZ RxRyRz
	Operation mode*1	• PTP • Linear	Linear
	Speed	1 to 250.000 mm/s*2	10.000
	Acceleration/deceleration	1 to 3,000.000 mm/s^2*3	1,200.000

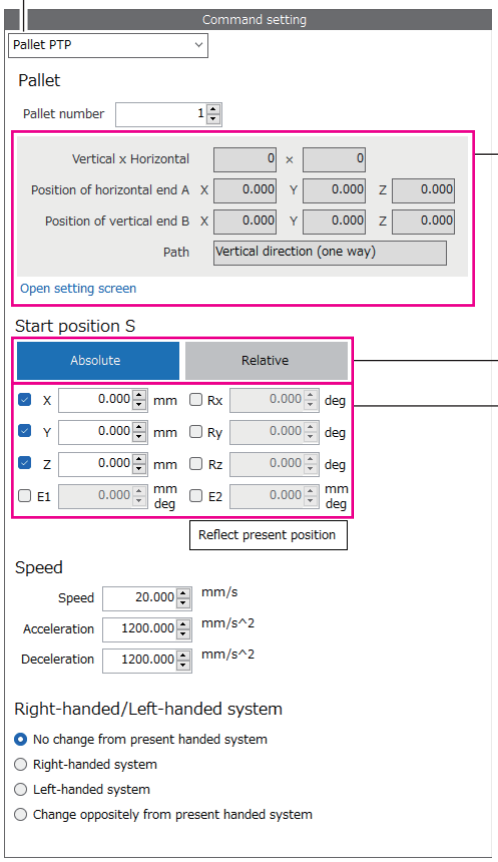
*1 It is the operation mode for high-speed return-to-origin operation. Select "Linear" to avoid obstacles and return to the origin.
*2 If the operation mode is PTP, the unit is "deg/s." Note that "mm/s" is still displayed on the screen.
*3 If the operation mode is PTP, the unit is "deg/s^2." Note that "mm/s^2" is still displayed on the screen.

■ Pallet PTP

This is a command for pallet operation. PTP operation is performed by calculating the next cell from the pallet number and the start position S.

● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



You cannot input on this screen.
Click "Open setting screen" and set the parameter.

Method to specify the position

Coordinates or travel amount
• Checking a box enables a value.
• "E1" and "E2" represent an end effector.

MRC Studio Command setting	Screen indication	Setting range	Initial value
Pallet	Pallet number	1 to 6	1
Start position S	Method to specify the position	• Absolute • Relative	Absolute
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 deg/s^2	1,200.000

MRC Studio Command setting	Screen indication	Setting range	Initial value
Right-handed/ Left-handed system *	Handed system selection	• No change from present handed system • Right-handed system • Left-handed system • Change oppositely from present handed system	No change from present handed system

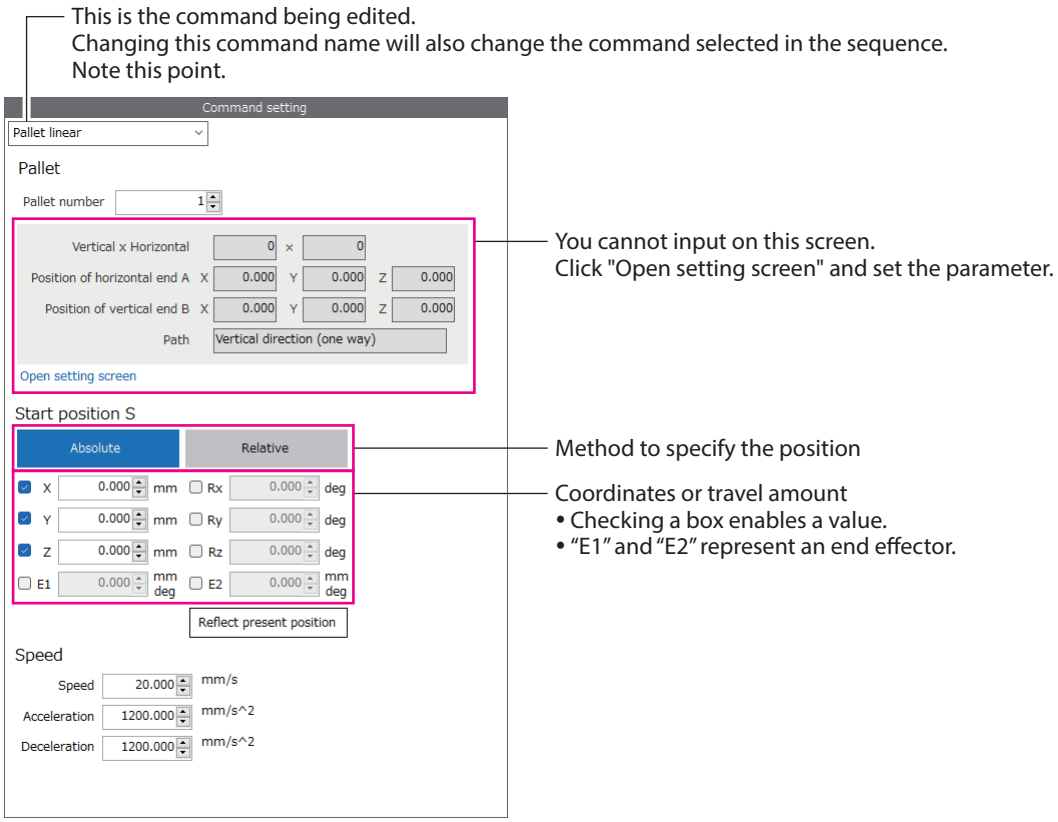
* It is enabled for a SCARA robot and a 6-axis vertically articulated robot. Set if the handed system is desired to change for each command when repeating the PTP commands in a single operation program.

memo If multiple coordinates are set at the start position S, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

■ Pallet linear

This is a command for pallet operation. Linear interpolation operation is performed by calculating the next cell from the pallet number and the start position S.

● Command setting



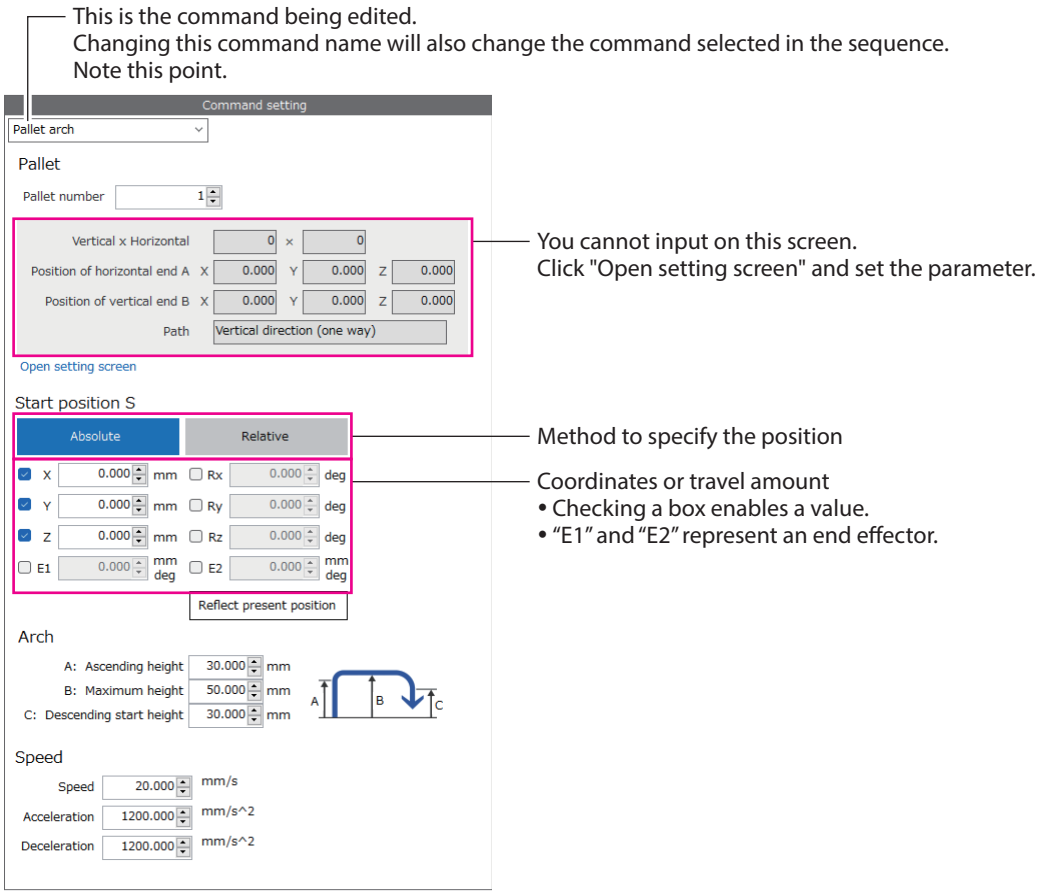
MRC Studio Command setting	Screen indication	Setting range	Initial value
Pallet	Pallet number	1 to 6	1
Start position S	Method to specify the position	• Absolute • Relative	Absolute
	X	–2,000.000 to 2,000.000 mm	0
	Y	–2,000.000 to 2,000.000 mm	0
	Z	–2,000.000 to 2,000.000 mm	0
	E1	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	E2	–2,000.000 to 2,000.000 mm or –2,000.000 to 2,000.000 deg	0
	Rx	–270.000 to 270.000 deg	0
	Ry	–90.000 to 90.000 deg	0
	Rz	–270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

memo If multiple coordinates are set at the start position S, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

■ Pallet arch

This is a command for pallet operation. Arch interpolation operation is performed by calculating the next cell from the pallet number and the start position S.

● Command setting



MRC Studio Command setting	Screen indication	Setting range	Initial value
Pallet	Pallet number	1 to 6	1
Start position S	Method to specify the position	• Absolute • Relative	Absolute
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Arch *	A: Ascending height	−2,000.000 to 2,000.000 mm	30.000
	B: Maximum height	−2,000.000 to 2,000.000 mm	50.000
	C: Descending start height	−2,000.000 to 2,000.000 mm	30.000
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

* Refer to p.60 for setting of the arch.

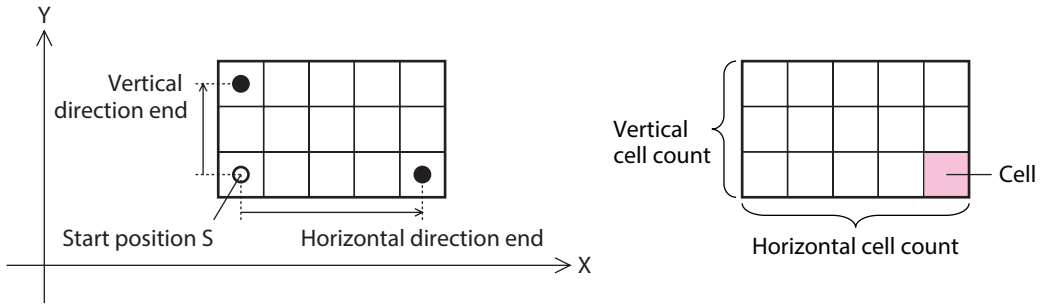
memo If multiple coordinates are set at the start position S, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

■ Parameters related to pallet operation commands

Name		Setting range
Pallets 1 to 6	Horizontal direction end X coordinate	−2,000.000 to 2,000.000 mm
	Horizontal direction end Y coordinate	−2,000.000 to 2,000.000 mm
	Horizontal direction end Z coordinate	−2,000.000 to 2,000.000 mm
	Horizontal cell count	0 to 256
	Vertical direction end X coordinate	−2,000.000 to 2,000.000 mm
	Vertical direction end Y coordinate	−2,000.000 to 2,000.000 mm
	Vertical direction end Z coordinate	−2,000.000 to 2,000.000 mm
	Vertical cell count	0 to 256
	Path	• Vertical direction (one way) • Vertical direction (back and forth) • Horizontal direction (one way) • Horizontal direction (back and forth)
	Number of cells	0 to 65,536

● Operating range of pallet

The operating range of the pallet is determined by the coordinates of the start position S, the horizontal direction end of the pallet, and the vertical direction end of the pallet. The horizontal direction end represents the end cell in the X-axis direction from the start position S, and the vertical direction end represents the end cell in the Y-axis direction from the start position S. Set the relative coordinates from the start position S in the horizontal direction end and the vertical direction end.



● Number of cells of pallet

The maximum number of cells of the pallet is determined by the number of cells set in the "Horizontal cell count" and "vertical cell count" parameters.
If the "Number of cells" parameter is set, the number of cells used can be limited.

When using all cells

Set "0 (initial value)" to the "Number of cells" parameter.

- Setting of parameters

Name	Setting value
Horizontal cell count	5
Vertical cell count	3
Path	Horizontal direction (one way)
Number of cells	0 (Initial value)

- Range to be used

11	12	13	14	15
6	7	8	9	10
①	2	3	4	5

Start position S

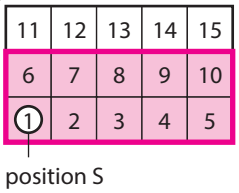
When using some parts of cells

Set the number of cells used to the "Number of cells" parameter.

- Setting of parameters

Name	Setting value
Horizontal cell count	5
Vertical cell count	3
Path	Horizontal direction (one way)
Number of cells	10

- Range to be used

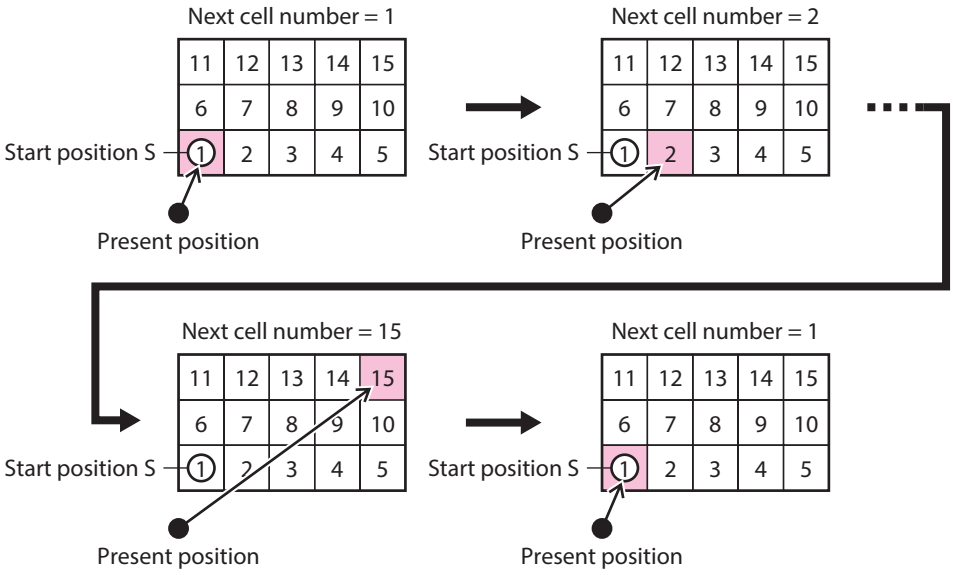


● Pallet counters

Commands of pallet operation have a counter indicating the next cell (next cell number) for each pallet number. The next cell number is counted up each time the pallet operation command is completed with reference to the start position S. (It is not counted up when stopped in the middle of operation.) When the next cell number reaches the number of cells set in the "Number of cells" parameter, it returns to 1.

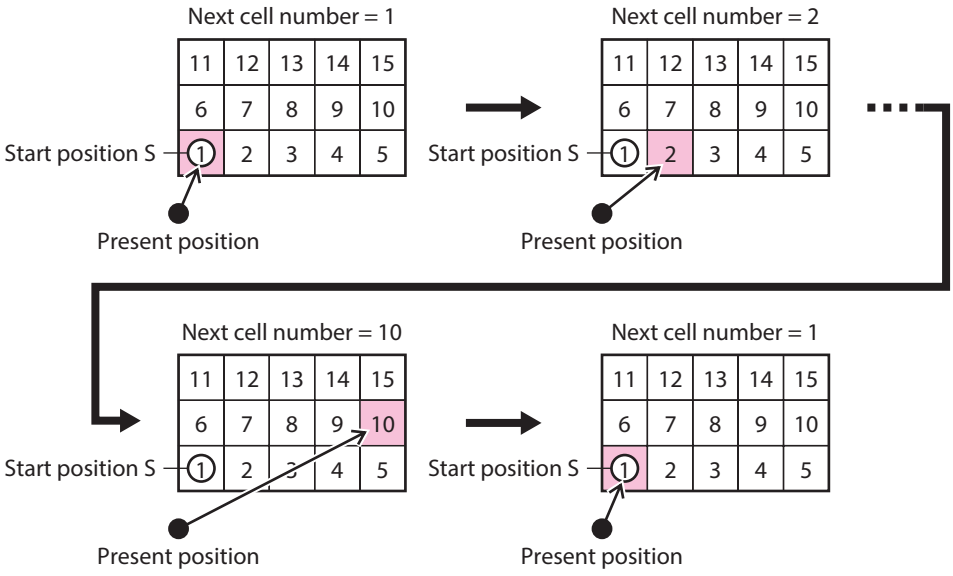
When the "Number of cells" parameter is "0 (initial value)"

When the next cell number reaches the maximum number of cells (horizontal cell count × vertical cell count), it returns to 1.



When the "Number of cells" parameter is "10"

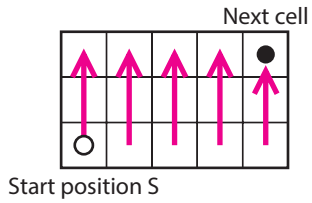
When the next cell number reaches 10, it returns to 1.



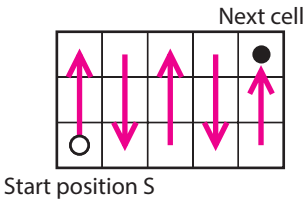
- **"Path" parameter**

For the "Path" parameter, set the direction of traveling to the next cell.

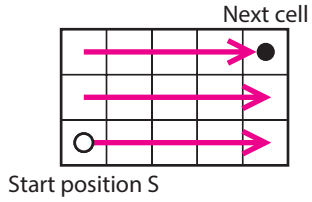
Path: Vertical direction (one way)



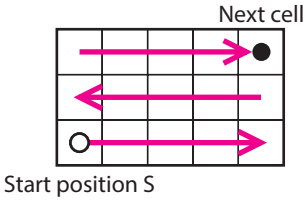
Path: Vertical direction (back and forth)



Path: Horizontal direction (one way)

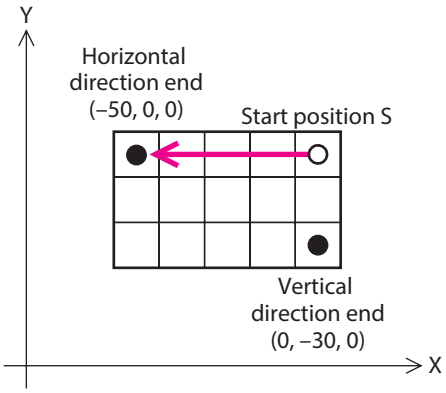


Path: Horizontal direction (back and forth)

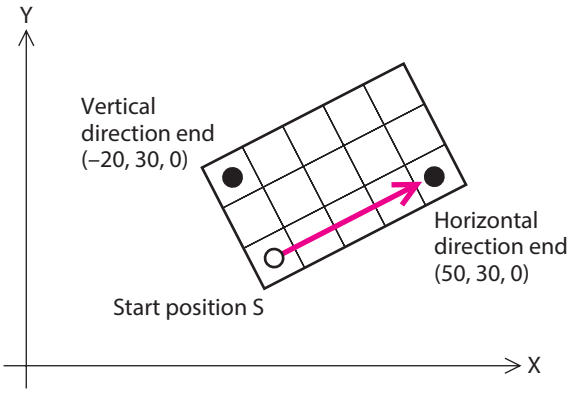


The path for the negative direction or the oblique direction can also be set depending on the setting for the horizontal direction end and the vertical direction end.

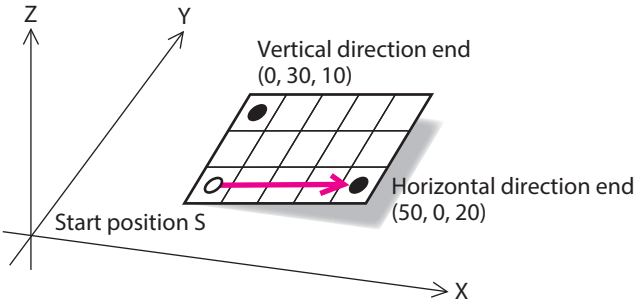
• Example: Negative direction



• Example: Oblique direction



If the Z coordinate for the horizontal direction end and/or the vertical direction end, the path inclined in the Z direction can also be specified. It is the coordinates on a plane that includes the horizontal direction end and the vertical direction end having set.



4-2 Control commands

■ Wait (time)

The next command is executed after the specified wait time has elapsed.

MRC Studio Command setting	Setting range	Initial value
Waiting time	0.1 to 65.5 s	0.1

■ Wait (signal)

The next command is executed after the specified signal satisfies the waiting end condition (ON or OFF).

MRC Studio Command setting	Setting range	Initial value
Signal	PRG-DIN0 to PRG-DIN15 or PRG-RIN0 to PRG-RIN31	PRG-DIN0
Waiting end condition	OFF/ON	ON

■ Loop start / Loop end

The command from the loop (start) to the loop (end) is repeated a specified number of loop times.

MRC Studio Command setting	Setting range	Initial value
Number of loop times	2 to 254 or infinite	2

■ Signal output

This command is used to change the output status of a single signal or the output status of all signals at simultaneously. Use this command when operating a robot in combination with an external device.

MRC Studio Command setting	Setting range	Initial value
Signal	• All (PRG-DOUT & PRG-ROUT) • All remote outputs (PRG-ROUT) • All direct outputs (PRG-DOUT) • PRG-DOUT0 to PRG-DOUT15, PRG-ROUT0 to PRG-ROUT31	PRG-DOUT0
Output status	• OFF • ON	ON

memo If the "Signal output" command is executed after the move command, the output status of the signal is updated more than 200 ms before the robot stops operating. If the output status of the signal is desired to update after the robot has completely stopped, set the "Wait (time)" command before the "Signal output" command and set a waiting time of 200 ms or more.

■ Signal output (Multiple selection)

The output status of multiple signals can be changed as desired. Use this command when operating a robot in combination with an external device.

MRC Studio command setting	Setting range	Initial value
Signal	• Remote output (PRG-ROUT) • Direct output (PRG-DOUT) • All (PRG-DOUT & PRG-ROUT)	Remote output (PRG-ROUT)
Output status (PRG-ROUT)	Selects ON/OFF of PRG-ROUT0 to PRG-ROUT31	All signals are ON.
Output status (PRG-DOUT)	Selects ON/OFF of PRG-DOUT0 to PRG-DOUT15	All signals are ON.

memo If the "Signal output (Multiple selection)" command is executed after the move command, the output status of the signal is updated more than 200 ms before the robot stops operating. If the output status of the signal is desired to update after the robot has completely stopped, set the "Wait (time)" command before the "Signal output (Multiple selection)" command and set a waiting time of 200 ms or more.

■ Changing tool offset

This is a command to switch the tool offset.
Two offset values of TCP can be set to the controller according to the shape of the tool being used. When using two tools with different shapes, TCP can be switched according to the tool being controlled.

MRC Studio Command setting	Setting range	Initial value
Changing tool offset	• Tool offset1 • Tool offset2 • Change from the present tool offset	Tool offset1

memo The present TCP also changes when the tool offset is switched. Even if the operation is the same, the movement of the robot also changes when the tool offsets are different.

Related parameters

Parameter ID		Parameter name	Description	Setting range	Initial value
Dec	Hex				
601	0259h	Tool offset1 Tx [mm]	Sets the offset value of the Tx direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0
602	025Ah	Tool offset1 Ty [mm]	Sets the offset value of the Ty direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0
603	025Bh	Tool offset1 Tz [mm]	Sets the offset value of the Tz direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0
4294	10C6h	Tool offset2 Tx [mm]	Sets the offset value of the Tx direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0
4295	10C7h	Tool offset2 Ty [mm]	Sets the offset value of the Ty direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0
4296	10C8h	Tool offset2 Tz [mm]	Sets the offset value of the Tz direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0
4556	11CCh	Tool offset selection when power is turned on	Sets the tool offset number that is used when the power is turned on.	0: Tool offset1 1: Tool offset2	0

■ Changing coordinate system

This is a command to switch the coordinate system.
Select the coordinate system to be used for operation.

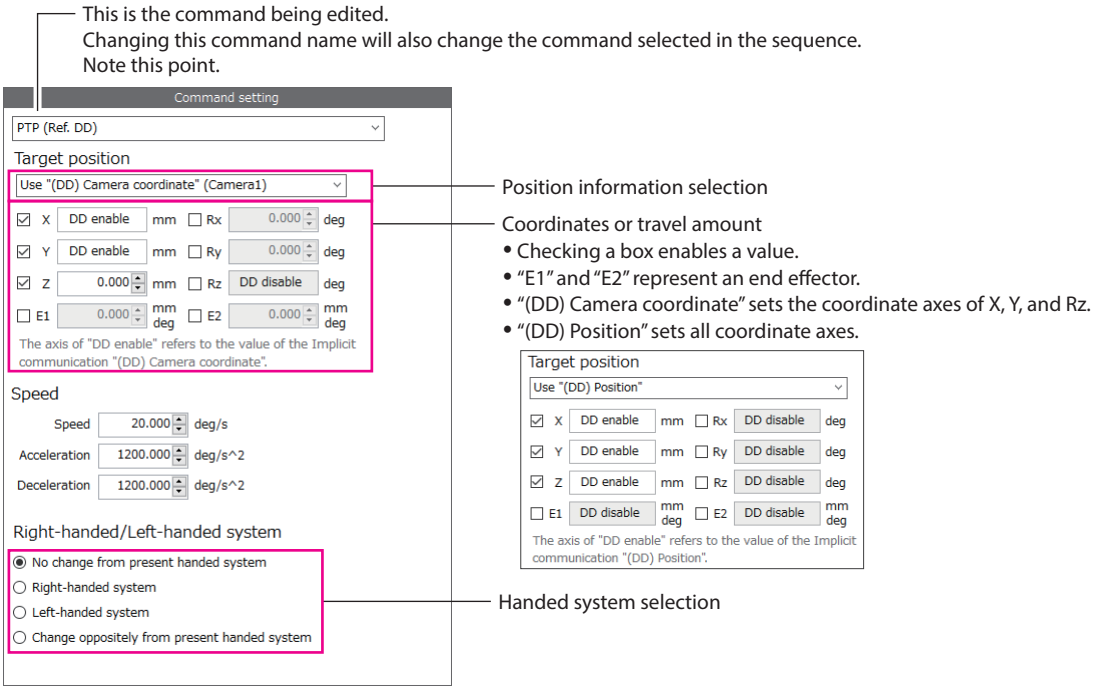
MRC Studio command setting	Setting range	Initial value
Changing coordinate system	• User coordinate system 1 • User coordinate system 2 • User coordinate system 3 • Base coordinate system	User coordinate system 1

4-3 EtherNet/IP commands

These are commands used to set the target position via EtherNet/IP. The target position can be selected using "(DD) Camera coordinate" or "(DD) Position" of the Implicit message. Executing the command will start operation to the target position specified in the position information selection.
For details of operation of each command, refer to "4-1 Move commands" on p.52.

■ PTP (Ref. DD)

● Command setting



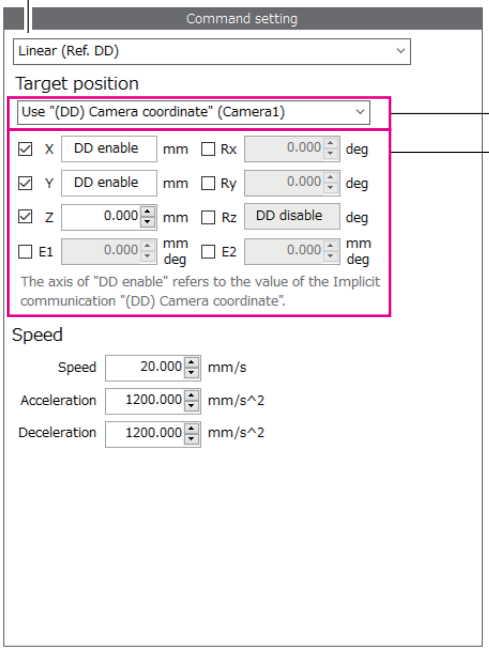
MRC Studio command setting	Screen view	Setting range	Initial value
Target position	Position information selection	• Use "(DD) Camera coordinate" (Camera 1) • Use "(DD) Camera coordinate" (Camera 2) • Use "(DD) Position"	Use "(DD) Camera coordinate" (Camera 1)
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 deg/s	20.000
	Acceleration	0.001 to 30,000.000 deg/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 deg/s^2	1,200.000
Right-handed/ Left-handed system*	Handed system selection	• No change from present handed system • Right-handed system • Left-handed system • Change oppositely from present handed system	No change from present handed system

* It is enabled for a SCARA robot and a 6-axis vertically articulated robot. Set if the handed system is desired to change for each command when repeating the PTP commands in a single operation program.

■ Linear (Ref. DD)

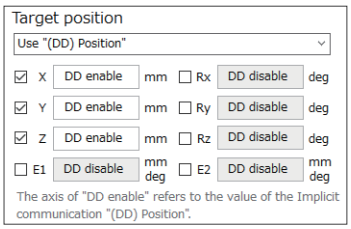
● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Position information selection

Coordinates or travel amount
- Checking a box enables a value.
- "E1" and "E2" represent an end effector.
- "(DD) Camera coordinate" sets the coordinate axes of X, Y, and Rz.
- "(DD) Position" sets all coordinate axes.

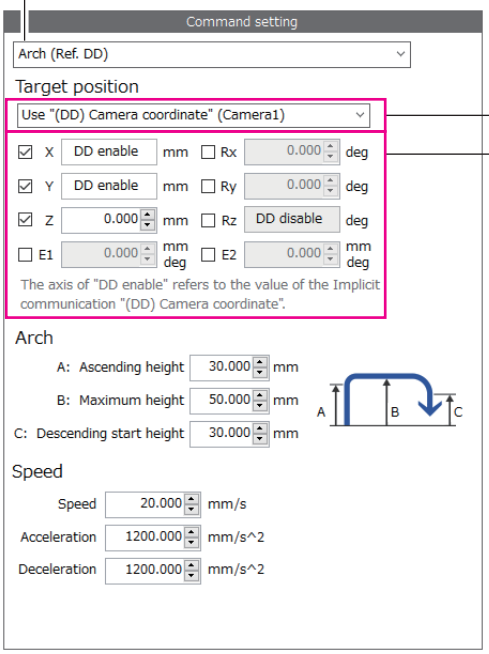


MRC Studio command setting	Screen view	Setting range	Initial value
Target position	Position information selection	• Use "(DD) Camera coordinate" (Camera 1) • Use "(DD) Camera coordinate" (Camera 2) • Use "(DD) Position"	Use "(DD) Camera coordinate" (Camera 1)
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

■ Arch (Ref. DD)

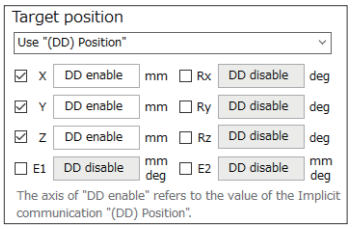
● Command setting

This is the command being edited.
Changing this command name will also change the command selected in the sequence.
Note this point.



Position information selection

Coordinates or travel amount
- Checking a box enables a value.
- "E1" and "E2" represent an end effector.
- "(DD) Camera coordinate" sets the coordinate axes of X, Y, and Rz.
- "(DD) Position" sets all coordinate axes.



MRC Studio command setting	Screen view	Setting range	Initial value
Target position	Position information selection	• Use "(DD) Camera coordinate" (Camera 1) • Use "(DD) Camera coordinate" (Camera 2) • Use "(DD) Position"	Use "(DD) Camera coordinate" (Camera 1)
	X	−2,000.000 to 2,000.000 mm	0
	Y	−2,000.000 to 2,000.000 mm	0
	Z	−2,000.000 to 2,000.000 mm	0
	E1	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	E2	−2,000.000 to 2,000.000 mm or −2,000.000 to 2,000.000 deg	0
	Rx	−270.000 to 270.000 deg	0
	Ry	−90.000 to 90.000 deg	0
	Rz	−270.000 to 270.000 deg	0
Arch	A: Ascending height	−2,000.000 to 2,000.000 mm	30.000
	B: Maximum height	−2,000.000 to 2,000.000 mm	50.000
	C: Descending start height	−2,000.000 to 2,000.000 mm	30.000
Speed	Speed	0.010 to 2,000.000 mm/s	20.000
	Acceleration	0.001 to 30,000.000 mm/s^2	1,200.000
	Deceleration	0.001 to 30,000.000 mm/s^2	1,200.000

4 Control via EtherNet/IP

This part explains how to control via EtherNet/IP.

◆Table of contents

1 Guidance

If you are new to this product, read this section to understand the operation flow.
This example is a method that operation programs and parameters are set using the **MRC Studio** software to operate a robot via EtherNet/IP.

STEP 1	Installation and connection
↓	
STEP 2	Before starting operation
↓	
STEP 3	Setting of IP address
↓	
STEP 4	Creation of operation program
↓	
STEP 5	Data writing
↓	
STEP 6	Operation of robot

- **Operating conditions**

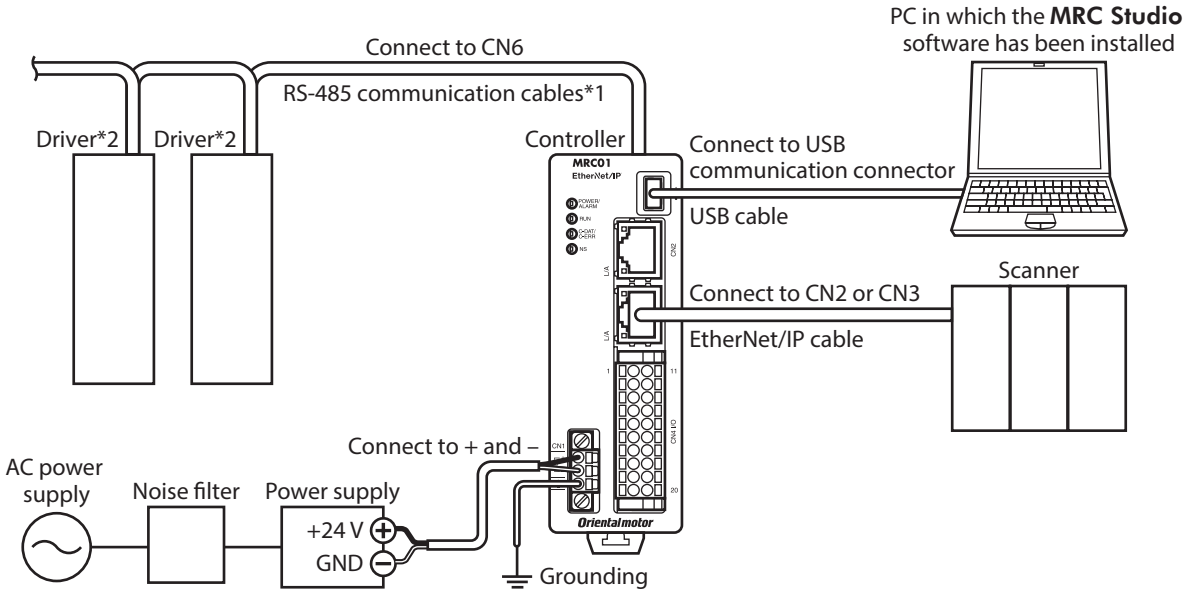
This operation is performed under the following conditions.

- Setting of controller
  IP address: 192.168.1.2
- Setting of robot
  Robot type : SCARA robot 2-link base up-down
  End effector: Not used
- Setting of driver
  Driver connected: **AZD-KD** 3 units
  Address number setting: Set in order of communication ID=1, 2, and 3 from near the robot.
  Transmission rate: 230,400 bps
  Communication protocol: Modbus RTU
  Termination resistor: Set only for driver of communication ID=3

Note

- Before operating a robot, check the condition of the surrounding area to ensure safety.
- Before starting based on the guidance, import the EDS file to the setting tool of the scanner and register the system configuration in advance. For details, contact your nearest Oriental Motor sales office.

STEP 1 Check the installation and the connection.



*1 Theses cables are provided in Oriental Motor products.
*2 Connect a power supply to each driver.

Note For details on connecting the driver power supply and the motor, refer to the operating manuals for products used and connect them properly according to the connection diagram.

STEP 2 Make preparations for operation.

Refer to "2 Before starting operation" on p.44.

STEP 3 Set an IP address.

In this example, an IP address of the controller is set using the **MRC Studio** software.

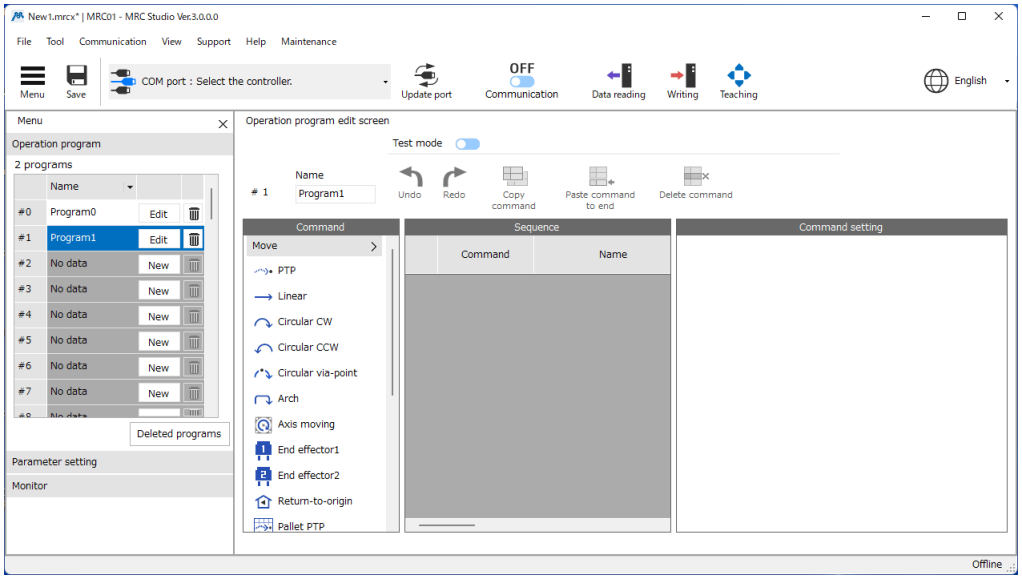
1. Click [Parameter setting] on the menu.
2. Click [Communication IF] > [EtherNet/IP] on the parameter group.
3. Set the "Configuration Control (attr. 3)" parameter to "Parameter" and the "IP Address 4" parameter to "2."

STEP 4 Create an operation program.

As an example, this section explains how to execute the following operation.

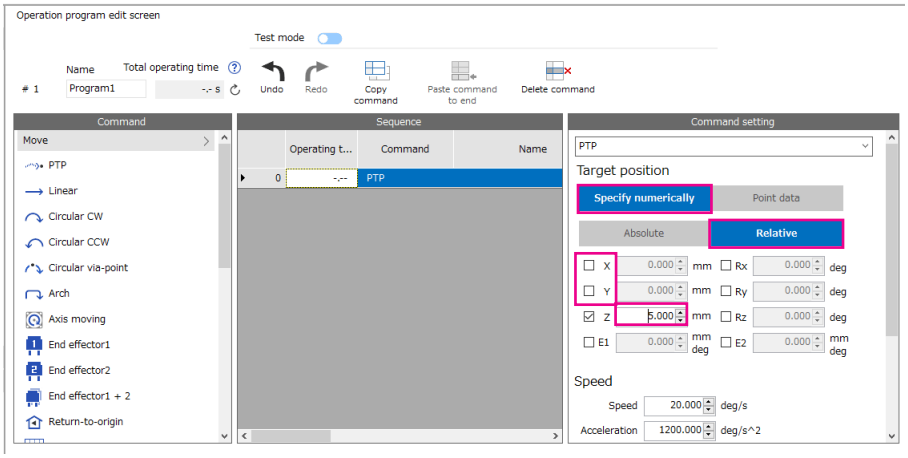
- **Setting example**
  - Program number: 1
  - Setting method of target position: Relative
  - Travel amount: +5 mm in Z direction
- **Flow of operation**

1. Click [Operation program] on the menu.
2. Click [New] of No. 1.
   The operation program edit screen appears.



3. Click [PTP] of the move command.
   The PTP command is added to the sequence.

4. Edit the target position on the command setting.
   1) Click [Relative] on the target position.
   2) Uncheck the X and Y axes.
   3) Set the Z axis to 5.000 mm.



STEP 5 Write the data and turn on the power supply again.

Write the IP address and the operation program to the controller.

1. Click the [Writing] icon.
2. Click [OK].
3. Turn on the power supply of the controller again.

STEP 6 Execute operation of the robot.

Descriptions are given using the scanner as the subject.

1. Check the READY output has been turned ON.
2. Select the program No. 1 to turn the START input ON.
   The robot operates 5 mm in the Z direction.
3. Check the READY output has been turned OFF and turn the START input OFF.

memo The travel amount of the robot can be checked on the status monitor of the **MRC Studio** software.

STEP 7 Were you able to operate?

How did it go? Were you able to operate properly? If the robot does not operate properly, check the following points.

- Is the POWER/ALARM LED blinking in red?
  An alarm is being generated. Refer to "2 Alarms" on p.245 for details.
- Is the C-DAT/C-ERR LED unlit?
  – Information of the robot has not been written to the controller.
  – The power supply of the controller is not turned on.
- Was the setup wizard of the **MRC Studio** software completed successfully?
  If the ROBOT-EN output is in an OFF state, the setting of the robot has not been completed successfully. Set from STEP 2 again.
- Are the power supply, the motor, the driver, the EtherNet/IP cable, and the RS-485 communication cable connected securely?
- Is the C-DAT/C-ERR LED lit in red?
  A communication error of RS-485 communication is being detected. Refer to p.246 for details.
- Is the NS LED lit in red or blinking in red?
  A communication error of EtherNet/IP is being detected. Refer to p.244 for details.
- Is the IP address set correctly?

2 Communication specifications

Communication standards	EtherNet/IP (conforms to CT17)	
Vendor ID	187: Oriental Motor Company	
Device type	43: Generic Device	
Transmission rate	10/100 Mbps (autonegotiation)	
Communication mode	Full duplex/Half duplex (autonegotiation)	
Cable specifications	Shielded twisted pair (STP) cable straight-through/crossover cable, category 5e or higher is recommended (cable length: 50 m (164 ft.) or less)	
Number of occupied bytes	Output (scanner → controller)	2 to 228 bytes (Initial value: 172)*
	Input (controller → scanner)	2 to 228 bytes (Initial value: 172)*
Implicit communication	Number of connections	2
	Connection type	Exclusive Owner, Input Only
	Communication cycle (RPI)	10 to 3,200 ms
	Connection type (scanner → controller)	Point–to–Point
	Connection type (controller → scanner)	Point–to–Point, Multicast
	Data trigger	Cyclic
IP address setting method	Parameter, DHCP	
Network topology	Star, Linear bus, Ring (Device Level Ring)	

* The number of bytes can be set with the **MRC Studio** software.

3 Implicit message

3-1 Implicit message format

This section shows transfer contents of implicit message. The order of data is in little-endian format.
Contents of implicit message cannot be changed since they are fixed.
Refer to p.91 for details about Input data and p.105 for details about Output data.

Operation example	Byte	Input (controller → scanner)	Output (scanner → controller)
Remote I/O operation	0, 1	Remote I/O (R-OUT)	Remote I/O (R-IN)
	2, 3	Program number selection_R	Program number selection
	4 to 7	Controller control (monitor)	Controller control input
	8, 9	JOG operation response (user coordinate system)	JOG operation input
	10, 11	Inching operation response (user coordinate system)	Inching operation input
	12, 13	JOG operation response (axis)	JOG operation input (axis)
	14, 15	Inching operation response (axis)	Inching operation input (axis)
JOG/inching operation	16, 17	Operation error code	JOG operating speed (X, Y, Z, Tx, Ty, Tz)
	18, 19	Present alarm of controller	
	20 to 23	Information of controller	JOG operating speed (Rx, Ry, Rz)
	24 to 27	Present alarm code of axis (axis 1 to axis 4)	JOG operating speed (End effector 1, 2)
	28 to 31	Present alarm code of axis (axis 5 to axis 8) *	JOG operating speed (axis)
	32, 33	Operation mode display	JOG operation travel amount (X, Y, Z)
	34	Present robot type	
	35	Number of axes	
	36 to 39	Controller assignable monitor 0	JOG operation travel amount (Rx, Ry, Rz)
	40 to 43	Controller assignable monitor 1	JOG operation travel amount (End effector 1, 2)
	44 to 47	Controller assignable monitor 2	JOG operation travel amount (axis)
	48 to 51	Controller assignable monitor 3	Reserved
Direct data operation	52, 53	(DD) TRIG_R	(DD) TRIG
	54, 55	(DD) Status	Reserved
	56, 57	(DD) Operation mode_R	(DD) Operation mode
	58	(DD) Axis selection_R	(DD) Axis selection
	59	(DD) TCP operation target coordinates selection_R	(DD) TCP operation target coordinates selection
	60 to 63	Feedback position X coordinate	(DD) Position X coordinate
	64 to 67	Feedback position Y coordinate	(DD) Position Y coordinate
	68 to 71	Feedback position Z coordinate	(DD) Position Z coordinate
	72 to 75	Feedback position Rx coordinate	(DD) Position Rx coordinate
	76 to 79	Feedback position Ry coordinate	(DD) Position Ry coordinate
	80 to 83	Feedback position Rz coordinate	(DD) Position Rz coordinate
	84 to 87	Feedback position E1 coordinate	(DD) Position E1 coordinate
	88 to 91	Feedback position E2 coordinate	(DD) Position E2 coordinate
	92 to 95	TCP feedback speed (X, Y, Z)	(DD) Speed

Operation example	Byte	Input (controller → scanner)	Output (scanner → controller)
Direct data operation	96, 97	Present handed system	(DD) Acceleration
	98, 99	Present tool offset	
	100 to 103	Axis 1 assignable monitor 0	(DD) Deceleration
	104 to 107	Axis 1 assignable monitor 1	(DD) Position (axis)
	108, 109	Axis 1 assignable monitor 2	(DD) End-effector 1, 2 operation mode
	110, 111		(DD) End-effector 1, 2 push current
	112, 113	Axis 2 assignable monitor 0	(DD) PTP operation handed system selection
	114, 115		(DD) Circular interpolation operation setting method
	116 to 119	Axis 2 assignable monitor 1	(DD) Circular interpolation operation radius
	120 to 123	Axis 2 assignable monitor 2	(DD) Circular interpolation operation center coordinate / via-point X
	124 to 127	Axis 3 assignable monitor 0	(DD) Circular interpolation operation center coordinate / via-point Y
	128 to 131	Axis 3 assignable monitor 1	(DD) Arch interpolation operation ascending height
	132 to 135	Axis 3 assignable monitor 2	(DD) Arch interpolation operation maximum height
	136 to 139	Axis 4 assignable monitor 0	(DD) Arch interpolation operation descending start height
	140, 141	Axis 4 assignable monitor 1	(DD) Pallet number selection
	142, 143		(DD) Tool offset selection
	144, 145	Axis 4 assignable monitor 2	(DD) Coordinate system selection
	146, 147		(DD) Camera number selection
	148 to 151	Axis 5 assignable monitor 0	(DD) Camera coordinate X coordinate
	152 to 155	Axis 5 assignable monitor 1	(DD) Camera coordinate Y coordinate
	156 to 159	Axis 5 assignable monitor 2	(DD) Camera coordinate Rz coordinate
	160 to 163	Axis 6 assignable monitor 0	Reserved
	164 to 167	Axis 6 assignable monitor 1	
	168 to 171	Axis 6 assignable monitor 2	
Read/write command	172, 173	Read parameter target selection_R	Read parameter target selection
	174, 175	Read parameter ID_R	Read parameter ID
	176, 177	Reserved	Reserved
	178, 179	Read/write status	Write request
	180, 181	Write parameter target selection_R	Write parameter target selection
	182, 183	Write parameter ID_R	Write parameter ID
	184 to 187	Read data	Write data
	188 to 191	Axis 7 assignable monitor 0*	Reserved
	192 to 195	Axis 7 assignable monitor 1*	
	196 to 199	Axis 7 assignable monitor 2*	
	200 to 203	Axis 8 assignable monitor 0*	
	204 to 207	Axis 8 assignable monitor 1*	
	208 to 211	Axis 8 assignable monitor 2*	
	212 to 227	Reserved	

* The axis 7 is the end effector 1 and the axis 8 is the end effector 2.

■ Implicit communication format size

Refer to the operation example of "3-1 Implicit message format" on p.87, and set the format size of Implicit communication with the **MRC Studio** software. Choosing an appropriate format size can eliminate sending and receiving of unnecessary information to reduce communication tasks.

Operation example	Format size
Remote I/O operation	16 bytes
JOG/inching operation	52 bytes
Direct data operation	172 bytes
Read/write command	228 bytes

● Related parameters

These items can be set with the **MRC Studio** software only. There is no parameter ID.

Name	Description	Setting range	Initial value
Implicit communication format size (Input)	Sets the format size of the Input data.	2 to 228 bytes	172
Implicit communication format size (Output)	Sets the format size of the Output data.	2 to 228 bytes	172

3-2 Input data

Data transferred from the controller to a scanner is called Input data.

■ Input data format

Contents of the Input data are as follows. Refer to p.91 for details. The order of data is in little-endian format.

Assembly Instance	Attribute	Byte	Size (Byte)	Description
100	3	0, 1	2	Remote I/O (R-OUT)
		2, 3	2	Program number selection_R
		4 to 7	4	Controller control (monitor)
		8, 9	2	JOG operation response (user coordinate system)
		10, 11	2	Inching operation response (user coordinate system)
		12, 13	2	JOG operation response (axis)
		14, 15	2	Inching operation response (axis)
		16, 17	2	Operation error code
		18, 19	2	Present alarm of controller
		20 to 23	4	Information of controller
		24 to 31	8	Present alarm code of axis*
		32, 33	2	Operation mode display
		34	1	Present robot type
		35	1	Number of axes
		36 to 39	4	Controller assignable monitor 0
		40 to 43	4	Controller assignable monitor 1
		44 to 47	4	Controller assignable monitor 2
		48 to 51	4	Controller assignable monitor 3
		52, 53	2	(DD) TRIG_R
		54, 55	2	(DD) Status
		56, 57	2	(DD) Operation mode_R
		58	1	(DD) Axis selection_R

Assembly Instance	Attribute	Byte	Size (Byte)	Description
100	3	59	1	(DD) TCP operation target coordinates selection_R
		60 to 63	4	Feedback position X coordinate
		64 to 67	4	Feedback position Y coordinate
		68 to 71	4	Feedback position Z coordinate
		72 to 75	4	Feedback position Rx coordinate
		76 to 79	4	Feedback position Ry coordinate
		80 to 83	4	Feedback position Rz coordinate
		84 to 87	4	Feedback position E1 coordinate
		88 to 91	4	Feedback position E2 coordinate
		92 to 95	4	TCP feedback speed (X, Y, Z)
		96, 97	2	Present handed system
		98, 99	2	Present tool offset
		100 to 103	4	Axis 1 assignable monitor 0
		104 to 107	4	Axis 1 assignable monitor 1
		108 to 111	4	Axis 1 assignable monitor 2
		112 to 115	4	Axis 2 assignable monitor 0
		116 to 119	4	Axis 2 assignable monitor 1
		120 to 123	4	Axis 2 assignable monitor 2
		124 to 127	4	Axis 3 assignable monitor 0
		128 to 131	4	Axis 3 assignable monitor 1
		132 to 135	4	Axis 3 assignable monitor 2
		136 to 139	4	Axis 4 assignable monitor 0
		140 to 143	4	Axis 4 assignable monitor 1
		144 to 147	4	Axis 4 assignable monitor 2
		148 to 151	4	Axis 5 assignable monitor 0
		152 to 155	4	Axis 5 assignable monitor 1
		156 to 159	4	Axis 5 assignable monitor 2
		160 to 163	4	Axis 6 assignable monitor 0
		164 to 167	4	Axis 6 assignable monitor 1
		168 to 171	4	Axis 6 assignable monitor 2
		172, 173	2	Read parameter target selection_R
		174, 175	2	Read parameter ID_R
		176, 177	2	Reserved
		178, 179	2	Read/write status
		180, 181	2	Write parameter target selection_R
		182, 183	2	Write parameter ID_R
		184 to 187	4	Read data
		188 to 191	4	Axis 7 assignable monitor 0*
		192 to 195	4	Axis 7 assignable monitor 1*
		196 to 199	4	Axis 7 assignable monitor 2*
		200 to 203	4	Axis 8 assignable monitor 0*
		204 to 207	4	Axis 8 assignable monitor 1*
		208 to 211	4	Axis 8 assignable monitor 2*
		212 to 227	16	Reserved

* The axis 7 is the end-effector 1 and the axis 8 is the end-effector 2.

■ Details of Input data

● Remote I/O (R-OUT)

These are output signals accessed via EtherNet/IP.
The assignments of signals can be changed using the "R-OUT output function" parameters.

Bit	Name	Description	Initial assignment
0	R-OUT0	Output in response to the signal assigned with the "R-OUT output function" parameter.	416: PRG-ROUT0
1	R-OUT1		417: PRG-ROUT1
2	R-OUT2		418: PRG-ROUT2
3	R-OUT3		419: PRG-ROUT3
4	R-OUT4		420: PRG-ROUT4
5	R-OUT5		421: PRG-ROUT5
6	R-OUT6		422: PRG-ROUT6
7	R-OUT7		423: PRG-ROUT7
8	R-OUT8		424: PRG-ROUT8
9	R-OUT9		425: PRG-ROUT9
10	R-OUT10		426: PRG-ROUT10
11	R-OUT11		427: PRG-ROUT11
12	R-OUT12		428: PRG-ROUT12
13	R-OUT13		429: PRG-ROUT13
14	R-OUT14		430: PRG-ROUT14
15	R-OUT15		431: PRG-ROUT15

● Program number selection_R

Bit	Name	Description
0	M0_R	Output in response to an input signal.
1	M1_R	
2	M2_R	
3	M3_R	
4	M4_R	
5	M5_R	
6 to 15	Reserved	0 is returned.

- **Controller control (monitor)**

Bit	Name	Description
0	STOP_R	Output in response to an input signal.
1	PAUSE-BSY	Output during a pause.
2	START_R	Output in response to an input signal.
3	SSTART_R	
4	READY	Output when the controller and all drivers are ready to operate.
5	Reserved	0 is returned.
6	PRG-RUN	Output when program operation is being executed.
7	ALM-A-CNT	Output the alarm status of the controller (normally open).
8	ALM-A-DRV	Output the alarm status of the driver (normally open).
9	INFO-CNT	Output the Information status of the controller.
10	INFO-DRV	Output the Information status of the driver.
11	Reserved	0 is returned.
12	ETO-MON-DRV	Output when there is a driver in the power removal status.
13	CRNT-LMTD1	Output when the current limit is performed by the CRNT-LMT1 input.
14	SPD-LMTD1	Output when the speed limit is performed by the SPD-LMTD1 input.
15	Reserved	0 is returned.
16	HOME-END	Output when high-speed return-to-origin operation is completed or when the origin of the user coordinate system is rewritten to the present TCP by turning the P-PRESET-RB input ON.
17	CMD-END-CNT	Output when program operation or direct data operation is completed.
18	MOVE-CNT	Output while the robot operates.
19	CMD-END	Output when all motors stopped after program operation or direct data operation was completed.
20	MOVE	Output while the robot operates.
21	CRNT-RB	Output when all motion axes (motors driving the robot) are in an excitation state.
22	CRNT-E1	Output when the end-effector axis 1 (a motor driving the end effector 1) is in an excitation state.
23	CRNT-E2	Output when the end-effector axis 2 (a motor driving the end effector 2) is in an excitation state.
24	Reserved	0 is returned.
25	ROBOT-EN	Output while the setup of the robot is properly completed.
26	SGL-LMT	Output when the robot is near the singularity.
27	PST-ERR	Output while the elbow joint (*) of a vertically articulated robot is at a negative angle.
28	Reserved	0 is returned.
29	TLC-RB	Output when the output torque of any of the motion axes (motors driving the robot) reaches the upper limit value.
30	TLC-E1	Output when the output torque of the end-effector axis 1 (a motor driving the end effector 1) reaches the upper limit value.
31	TLC-E2	Output when the output torque of the end-effector axis 2 (a motor driving the end effector 2) reaches the upper limit value.

* With base axis: Axis 3,
  Without base axis: Axis 2

- **JOG operation response (user coordinate system)**

Bit	Name	Description
0	JOG-X+_R	Output in response to an input signal.
1	JOG-X−_R	
2	JOG-Y+_R	
3	JOG-Y−_R	
4	JOG-Z+_R	
5	JOG-Z−_R	
6	JOG-RX+_R	
7	JOG-RX−_R	
8	JOG-RY+_R	
9	JOG-RY−_R	
10	JOG-RZ+_R	
11	JOG-RZ−_R	
12	JOG-E1+_R	
13	JOG-E1−_R	
14	JOG-E2+_R	
15	JOG-E2−_R	

- **Inching operation response (user coordinate system)**

Bit	Name	Description
0	JOG-P-X+_R	Output in response to an input signal.
1	JOG-P-X−_R	
2	JOG-P-Y+_R	
3	JOG-P-Y−_R	
4	JOG-P-Z+_R	
5	JOG-P-Z−_R	
6	JOG-P-RX+_R	
7	JOG-P-RX−_R	
8	JOG-P-RY+_R	
9	JOG-P-RY−_R	
10	JOG-P-RZ+_R	
11	JOG-P-RZ−_R	
12	JOG-P-E1+_R	
13	JOG-P-E1−_R	
14	JOG-P-E2+_R	
15	JOG-P-E2−_R	

- **JOG operation response (axis)**

Bit	Name	Description
0	JOG-A1+_R	Output in response to an input signal.
1	JOG-A1−_R	
2	JOG-A2+_R	
3	JOG-A2−_R	
4	JOG-A3+_R	
5	JOG-A3−_R	
6	JOG-A4+_R	
7	JOG-A4−_R	
8	JOG-A5+_R	
9	JOG-A5−_R	
10	JOG-A6+_R	
11	JOG-A6−_R	
12	JOG-A7+_R	
13	JOG-A7−_R	
14	JOG-A8+_R	
15	JOG-A8−_R	

- **Inching operation response (axis)**

Bit	Name	Description
0	JOG-P-A1+_R	Output in response to an input signal.
1	JOG-P-A1−_R	
2	JOG-P-A2+_R	
3	JOG-P-A2−_R	
4	JOG-P-A3+_R	
5	JOG-P-A3−_R	
6	JOG-P-A4+_R	
7	JOG-P-A4−_R	
8	JOG-P-A5+_R	
9	JOG-P-A5−_R	
10	JOG-P-A6+_R	
11	JOG-P-A6−_R	
12	JOG-P-A7+_R	
13	JOG-P-A7−_R	
14	JOG-P-A8+_R	
15	JOG-P-A8−_R	

● **Operation error code**

Bit	Name	Code	Description
0 to 15	Operation error code	0	No error is detected.
		1	The robot exceeded the operable range.
		2	The robot approached the singularity during interpolation operation. Or interpolation operation was started from near singularity.
		3	The command position of the TCP exceeded the TCP position limit.
		4	The command speed of the TCP exceeded the maximum TCP speed.
		5 to 9	When the "User-defined area operation setting" parameter was set to "2: AREA output, no entry with alarm", the command position of the TCP entered the no entry area (user-defined area). 5: User-defined area 0 6: User-defined area 1 7: User-defined area 2 8: User-defined area 3 9: User-defined area 4
		10 to 13	The setting of circular interpolation operation is wrong. 10: When the circular arc setting method is "0: Radius setting (180° or less)" or "1: Radius setting (180° or more)," the radius was too short. Refer to p.56 for details about the radius setting. 11: When the circular arc setting method is "0: Radius setting (180° or less)" or "1: Radius setting (180° or more)," the X and Y coordinates of the target position were the same as the present position. 12: When the circular arc setting method is "2: Center position setting," the wrong target position was set. Refer to p.57 for details about the center position setting. 13: Circular interpolation operation could not be executed because the operation distance was too short.
		14 to 16	The setting of arch interpolation operation is wrong. 14: The X and Y coordinates of the target position were the same as the present position. 15: The arch trajectory could not be generated because the Z coordinate of the target position was too high. 16: The signs of the values set to "A: Ascending height" and "B: Maximum height" were different.
		17	Operation was executed in a state where there was an axis which home was not set.
		18	The base coordinate system is selected with a robot other than a Cartesian robot. Or high-speed return-to-origin operation was executed in a state where the origin offsets of X, Y, and Z of the selected user coordinate system were all set to zero.
		20 to 27	There is an axis that exceeded the axis position limit. 20 (axis 1) to 27 (axis 8)*
		30 to 37	There is an axis that exceeded the maximum speed. Or the operation where the wrist joint part of a SCARA robot or a vertical articulated robot passes through the negative side of the Y-axis was executed. 30 (axis 1) to 37 (axis 8)*
		39	Interpolation operation was executed while a vertically articulated robot was in an incorrect posture. Or the Delta robot was executed the operation from an incorrect posture.
		40 to 47	There is an axis that a load exceeded 100 % during operation. 40 (axis 1) to 47 (axis 8)*
		50 to 57	There is an axis that has put into a non-excitation state during operation. 50 (axis 1) to 57 (axis 8)*
		60 to 67	There is an axis that an alarm was generated during operation. 60 (axis 1) to 67 (axis 8)*

Bit	Name	Code	Description
0 to 15	Operation error code	70 to 77	• During operation, there is an axis that the angle of the axis was out of the range of –170° to 170°, or there is an axis that exceeded the wrap range of the driver. 70 (axis 1) to 77 (axis 8)* • With a SCARA robot or a vertically articulated robot that the base axis rotates, operation that causes the TCP position or the wrist joint to move beyond the negative side of the Y-axis of the base coordinate system (directly behind the robot) was executed.
		80 to 87	There is an axis that communication with the controller was failed. 80 (axis 1) to 87 (axis 8)*
		97	The setting of arch interpolation operation is wrong. The arch trajectory could not be generated because the Z coordinate of the target position was too small.
		100, 101	The maximum value of the rotation axis limit was exceeded. 100: The maximum speed set in the rotation axis limit was exceeded. 101: The maximum acceleration/deceleration set in the rotation axis limit was exceeded.
		110	The imaging position of the camera was failed to transform to the base coordinate system of the robot.
		111, 112	Operation using the imaging position of the camera was executed in a state where calibration was not performed. Refer to p.132 for the calibration. 111: Camera No.1 112: Camera No.2
		113	Operation referring to "Direct data operation position" was executed in a state where an out-of-range value was set in "Direct data operation position" of Implicit communication. The commands to be in use are the following. • PTP (Ref. DD) command • Linear (Ref. DD) command • Arch (Ref. DD) command
		114	Operation referring to "Direct data operation camera coordinate" was executed in a state where an out-of-range value was set in "Direct data operation camera coordinate" of Implicit communication. The commands to be in use are the following. • PTP (Ref. DD) command • Linear (Ref. DD) command • Arch (Ref. DD) command

* The axis 7 is the end-effector 1 and the axis 8 is the end-effector 2.

- **Present alarm of controller**

Bit	Name	Description
0 to 15	Present alarm of controller	This indicates the alarm code being generated in the controller.

- **Information of controller**

Bit	Name	Description
0 to 31	Information of controller	This indicates the information code being generated in the controller.

- **Present alarm code of axis**

Bit	Name	Description
0 to 7	Present alarm code of axis 1	This indicates the alarm code being generated in the axis 1.
8 to 15	Present alarm code of axis 2	This indicates the alarm code being generated in the axis 2.
16 to 23	Present alarm code of axis 3	This indicates the alarm code being generated in the axis 3.
24 to 31	Present alarm code of axis 4	This indicates the alarm code being generated in the axis 4.
32 to 39	Present alarm code of axis 5	This indicates the alarm code being generated in the axis 5.
40 to 47	Present alarm code of axis 6	This indicates the alarm code being generated in the axis 6.
48 to 55	Present alarm code of axis 7	This indicates the alarm code being generated in the axis 7 (end-effector 1).
56 to 63	Present alarm code of axis 8	This indicates the alarm code being generated in the axis 8 (end-effector 2).

- **Operation mode display**

Bit	Name	Description
0 to 15	Operation mode display	This indicates the operation mode. 0: Automatic mode 1: Operation prohibition mode

- **Present robot type**

Bit	Name	Description
0 to 7	Present robot type	This indicates the robot type having set. 0: Not set 1: Cartesian robot 2: SCARA 3: Vertically articulated 4: Delta robot 5: Polar/Cylindrical

- **Number of axes**

Bit	Name	Description
8 to 15	Number of axes	This is the number of axes having set. An end effector is also included.

- **Controller assignable monitor 0**

Bit	Name	Description
0 to 31	Controller assignable monitor 0	This indicates the monitor value of the "Controller assignable monitor address 0" parameter.

- **Controller assignable monitor 1**

Bit	Name	Description
0 to 31	Controller assignable monitor 1	This indicates the monitor value of the "Controller assignable monitor address 1" parameter.

- **Controller assignable monitor 2**

Bit	Name	Description
0 to 31	Controller assignable monitor 2	This indicates the monitor value of the "Controller assignable monitor address 2" parameter.

- **Controller assignable monitor 3**

Bit	Name	Description
0 to 31	Controller assignable monitor 3	This indicates the monitor value of the "Controller assignable monitor address 3" parameter.

- **(DD) TRIG_R**

Bit	Name	Description
0 to 15	Direct data operation TRIG_R	Output in response to an input signal.

- **(DD) Status**

Bit	Name	Description
0	Direct data operation SET-ERR	Output when the parameter beginning with (DD) is out of the setting range among "3-1 Implicit message format" on p.87.
1	Direct data operation EXE-ERR	Output when direct data operation is failed to execute.
2 to 7	Reserved	0 is returned.
8	Direct data operation SET-C-ERR	Output when "(DD) Camera number selection" in"3-1 Implicit message format" on p.87 is out of range or a camera number that has not been calibrated is selected.
9 to 15	Reserved	0 is returned.

- **(DD) Operation mode_R**

Bit	Name	Description
0 to 15	Direct data operation operation mode response	Output in response to the direct data operation operation mode.

- **(DD) Axis selection_R**

Bit	Name	Description
0 to 7	Direct data operation axis selection (number) response	Output in response to the axis number performing direct data operation.

- **(DD) TCP operation target coordinates selection_R**

Bit	Name	Description
0	Direct data operation TCP operation target coordinates selection response X	This indicates the coordinate performing direct data operation in bits. 0: Disable, 1: Enable
1	Direct data operation TCP operation target coordinates selection response Y	
2	Direct data operation TCP operation target coordinates selection response Z	
3	Direct data operation TCP operation target coordinates selection response Rx	
4	Direct data operation TCP operation target coordinates selection response Ry	
5	Direct data operation TCP operation target coordinates selection response Rz	
6	Direct data operation TCP operation target coordinates selection response E1	
7	Direct data operation TCP operation target coordinates selection response E2	

- **Feedback position X coordinate**

Bit	Name	Description
0 to 31	Feedback position X coordinate	This indicates the feedback position of the X coordinate.

- **Feedback position Y coordinate**

Bit	Name	Description
0 to 31	Feedback position Y coordinate	This indicates the feedback position of the Y coordinate.

- **Feedback position Z coordinate**

Bit	Name	Description
0 to 31	Feedback position Z coordinate	This indicates the feedback position of the Z coordinate.

- **Feedback position Rx coordinate**

Bit	Name	Description
0 to 31	Feedback position Rx coordinate	This indicates the feedback position of the Rx coordinate.

- **Feedback position Ry coordinate**

Bit	Name	Description
0 to 31	Feedback position Ry coordinate	This indicates the feedback position of the Ry coordinate.

- **Feedback position Rz coordinate**

Bit	Name	Description
0 to 31	Feedback position Rz coordinate	This indicates the feedback position of the Rz coordinate.

- **Feedback position E1 coordinate**

Bit	Name	Description
0 to 31	Feedback position E1 coordinate	This indicates the feedback position of the E1 coordinate.

- **Feedback position E2 coordinate**

Bit	Name	Description
0 to 31	Feedback position E2 coordinate	This indicates the feedback position of the E2 coordinate.

- **TCP feedback speed (X, Y, Z)**

Bit	Name	Description
0 to 31	TCP feedback speed X, Y, Z	This indicates the feedback speed of the TCP. This is the feedback speed on the Cartesian coordinates of XYZ.

- **Present handed system**

Bit	Name	Description
0 to 15	Present handed system	This indicates the present handed system. 0: Not supported, 1: Right-handed system, 2: Left-handed system

- **Present tool offset**

Bit	Name	Description
0 to 15	Present tool offset	This indicates the present tool offset number. 1: Tool offset 1, 2: Tool offset 2

- **Axis 1 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 1 assignable monitor 0	This indicates the monitor value of the “Driver assignable monitor address 0” parameter for the axis 1.

- **Axis 1 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 1 assignable monitor 1	This indicates the monitor value of the “Driver assignable monitor address 1” parameter for the axis 1.

- **Axis 1 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 1 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 1.

- **Axis 2 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 2 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 2.

- **Axis 2 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 2 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 2.

- **Axis 2 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 2 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 2.

- **Axis 3 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 3 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 3.

- **Axis 3 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 3 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 3.

- **Axis 3 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 3 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 3.

- **Axis 4 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 4 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 4.

- **Axis 4 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 4 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 4.

- **Axis 4 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 4 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 4.

- **Axis 5 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 5 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 5.

- **Axis 5 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 5 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 5.

- **Axis 5 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 5 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 5.

- **Axis 6 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 6 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 6.

- **Axis 6 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 6 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 6.

- **Axis 6 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 6 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 6.

- **Read parameter target selection_R**

Bit	Name	Description
0 to 15	Read parameter target selection_R	This indicates a response of the read parameter target selection. 0: Controller 1 to 8: Axis number

- **Read parameter ID_R**

Bit	Name	Description
0 to 15	Read parameter ID_R	This indicates a response of the read parameter ID.

- **Read/write status**

Bit	Name	Description
0 to 6	Reserved	0 is returned.
7	RD-ERR	Output when an error occurred in reading. If reading is performed properly, the RD-ERR is turned OFF
8	WR-END	Output in response to the WR-REQ. The WR-END is also turned ON while the WR-REQ is ON. OFF: Write request waiting ON: Write completed
9	SYS-BSY	Output when the controller is in an internal processing state.
10	Reserved	0 is returned.
11	WR-SET-ERR	Output when the write parameter ID or write data is out of the setting range.
12	WR-IF-ERR	Output when writing cannot be executed while user I/F is being communicated.
13	WR-NV-ERR	Output when writing cannot be executed while the non-volatile memory is processed.
14	WR-EXE-ERR	Output when a command cannot be executed.
15	WR-ERR	Output when an error occurred in writing. If the WR-REQ is turned OFF or writing is performed properly, the WR-ERR is turned OFF.

- **Write parameter target selection_R**

Bit	Name	Description
0 to 15	Write parameter target selection_R	This indicates a response of the write parameter target selection. 0: Controller

- **Write parameter ID_R**

Bit	Name	Description
0 to 15	Write parameter ID_R	This indicates a response of the write parameter ID.

- **Read data**

Bit	Name	Description
0 to 31	Read data	This indicates the setting value of the parameter shown in the read parameter ID_R.

- **Axis 7 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 7 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 7 (end-effector 1).

- **Axis 7 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 7 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 7 (end-effector 1).

- **Axis 7 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 7 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 7 (end-effector 1).

- **Axis 8 assignable monitor 0**

Bit	Name	Description
0 to 31	Axis 8 assignable monitor 0	This indicates the monitor value of the "Driver assignable monitor address 0" parameter for the axis 8 (end-effector 2).

- **Axis 8 assignable monitor 1**

Bit	Name	Description
0 to 31	Axis 8 assignable monitor 1	This indicates the monitor value of the "Driver assignable monitor address 1" parameter for the axis 8 (end-effector 2).

- **Axis 8 assignable monitor 2**

Bit	Name	Description
0 to 31	Axis 8 assignable monitor 2	This indicates the monitor value of the "Driver assignable monitor address 2" parameter for the axis 8 (end-effector 2).

3-3 Output data

Data transferred from a scanner to the controller is called Output data.

■ Output data format

Contents of the Output data are as follows. Refer to p.105 for details. The order of data is in little-endian format.

Assembly Instance	Attribute	Byte	Size (Byte)	Description
101	3	0, 1	2	Remote I/O (R-IN)
		2, 3	2	Program number selection
		4 to 7	4	Controller control input
		8, 9	2	JOG operation input
		10, 11	2	Inching operation input
		12, 13	2	JOG operation input (axis)
		14, 15	2	Inching operation input (axis)
		16 to 19	4	JOG operating speed (X, Y, Z, Tx, Ty, Tz)
		20 to 23	4	JOG operating speed (Rx, Ry, Rz)
		24 to 27	4	JOG operating speed (End effector 1, 2)
		28 to 31	4	JOG operating speed (axis)
		32 to 35	4	JOG operation travel amount (X, Y, Z)
		36 to 39	4	JOG operation travel amount (Rx, Ry, Rz)
		40 to 43	4	JOG operation travel amount (End effector 1, 2)
		44 to 47	4	JOG operation travel amount (axis)
		48 to 51	4	Input signal for program operation
		52, 53	2	(DD) TRIG
		54, 55	2	Reserved
		56, 57	2	(DD) Operation mode
		58	1	(DD) Axis selection
		59	1	(DD) TCP operation target coordinates selection
		60 to 63	4	(DD) Position X coordinate
		64 to 67	4	(DD) Position Y coordinate
		68 to 71	4	(DD) Position Z coordinate
		72 to 75	4	(DD) Position Rx coordinate
		76 to 79	4	(DD) Position Ry coordinate
		80 to 83	4	(DD) Position Rz coordinate
		84 to 87	4	(DD) Position E1 coordinate
		88 to 91	4	(DD) Position E2 coordinate
		92 to 95	4	(DD) Speed
		96 to 99	4	(DD) Acceleration

Assembly Instance	Attribute	Byte	Size (Byte)	Description
101	3	100 to 103	4	(DD) Deceleration
		104 to 107	4	(DD) Position (axis)
		108, 109	2	(DD) End-effector 1, 2 operation mode
		110, 111	2	(DD) End-effector 1, 2 push current
		112, 113	2	(DD) PTP operation handed system selection
		114, 115	2	(DD) Circular interpolation operation setting method
		116 to 119	4	(DD) Circular interpolation operation radius
		120 to 123	4	(DD) Circular interpolation operation center coordinate / via-point X
		124 to 127	4	(DD) Circular interpolation operation center coordinate / via-point Y
		128 to 131	4	(DD) Arch interpolation operation ascending height
		132 to 135	4	(DD) Arch interpolation operation maximum height
		136 to 139	4	(DD) Arch interpolation operation descending start height
		140, 141	2	(DD) Pallet number selection
		142, 143	2	(DD) Tool offset selection
		144, 145	2	(DD) Coordinate system selection
		146, 147	2	(DD) Camera number selection
		148 to 151	4	(DD) Camera coordinate X coordinate
		152 to 155	4	(DD) Camera coordinate Y coordinate
		156 to 159	4	(DD) Camera coordinate Rz coordinate
		160 to 171	12	Reserved
		172, 173	2	Read parameter target selection
		174, 175	2	Read parameter ID
		176, 177	2	Reserved
		178, 179	2	Write request
		180, 181	2	Write parameter target selection
		182, 183	2	Write parameter ID
		184 to 187	4	Write data
		188 to 227	40	Reserved

■ Details of Output data

● Remote I/O (R-IN)

These are input signals accessed via EtherNet/IP.
The assignments of signals can be changed using the "R-IN input function" parameters.

Bit	Name	Description	Initial assignment
0	R-IN0	Execute the signal assigned with the "R-IN input function" parameter.	192: PRG-RIN0
1	R-IN1		193: PRG-RIN1
2	R-IN2		194: PRG-RIN2
3	R-IN3		195: PRG-RIN3
4	R-IN4		196: PRG-RIN4
5	R-IN5		197: PRG-RIN5
6	R-IN6		198: PRG-RIN6
7	R-IN7		199: PRG-RIN7
8	R-IN8		200: PRG-RIN8
9	R-IN9		201: PRG-RIN9
10	R-IN10		202: PRG-RIN10
11	R-IN11		203: PRG-RIN11
12	R-IN12		204: PRG-RIN12
13	R-IN13		205: PRG-RIN13
14	R-IN14		206: PRG-RIN14
15	R-IN15		207: PRG-RIN15

● Program number selection

Bit	Name	Description	Initial value
0	M0	The program number is selected using six bits.	0
1	M1		
2	M2		
3	M3		
4	M4		
5	M5		
6 to 15	Reserved	A value is disregarded.	0

- **Controller control input**

Bit	Name	Description
0	STOP	This is used to stop the operation of the robot.
1	PAUSE	This is used to stop the operation of the robot temporarily.
2	START	This is used to execute the operation of the program number being selected. After operation is started, the command having set is executed automatically.
3	SSTART	This is used to execute the operation of the program number being selected. After operation is started and the command having set is completed, the next command is executed when turning the SSTART input OFF and then ON again.
4	Reserved	A value is disregarded.
5	Reserved	A value is disregarded.
6	Reserved	A value is disregarded.
7	ALM-RST	This is used to reset the alarm being generated presently.
8	Reserved	A value is disregarded.
9	INFO-CLR	This is used to clear the information status.
10	PRG-DOUT-CLR	This is used to turn the output status OFF for all of PRG-DOUT0 to PRG-DOUT15.
11	PRG-ROUT-CLR	This is used to turn the output status OFF for all of PRG-ROUT0 to PRG-ROUT31.
12	ETO-CLR-DRV	This is used to turn the ETO-CLR input ON for all drivers except **AZD-KR2D**.
13	CRNT-LMT1	This is used to execute the current limit.
14	SPD-LMT1	This is used to execute the speed limit.
15	Reserved	A value is disregarded.
16	ZHOME-ALL	This is used to execute high-speed return-to-origin operation. All coordinates (X, Y, Z, Rx, Ry, Rz, E1, E2) are returned to the origin, respectively.
17	ZHOME-RB	This is used to execute high-speed return-to-origin operation. Coordinates other than the end effector (X, Y, Z, Rx, Ry, Rz) are returned to the origin, respectively.
18	ZHOME-E1	This is used to execute high-speed return-to-origin operation. The coordinates of the end effector 1 are returned to the origin.
19	ZHOME-E2	This is used to execute high-speed return-to-origin operation. The coordinates of the end effector 2 are returned to the origin.
20	Reserved	A value is disregarded.
21	FREE-RB	This is used to shut off the current of all motion axes (motors driving the robot) to put all motors into a non-excitation state.
22	FREE-E1	This is used to shut off the current of the end-effector axis 1 (a motor driving the end effector 1) to put the motor into a non-excitation state.
23	FREE-E2	This is used to shut off the current of the end-effector axis 2 (a motor driving the end effector 2) to put the motor into a non-excitation state.
24 to 31	Reserved	A value is disregarded.

- **JOG operation input**

Bit	Name	Description
0	JOG-X+	This is used to execute JOG operation in the positive direction of X.
1	JOG-X–	This is used to execute JOG operation in the negative direction of X.
2	JOG-Y+	This is used to execute JOG operation in the positive direction of Y.
3	JOG-Y–	This is used to execute JOG operation in the negative direction of Y.
4	JOG-Z+	This is used to execute JOG operation in the positive direction of Z.
5	JOG-Z–	This is used to execute JOG operation in the negative direction of Z.
6	JOG-RX+	This is used to execute JOG operation in the positive direction of Rx.
7	JOG-RX–	This is used to execute JOG operation in the negative direction of Rx.
8	JOG-RY+	This is used to execute JOG operation in the positive direction of Ry.
9	JOG-RY–	This is used to execute JOG operation in the negative direction of Ry.
10	JOG-RZ+	This is used to execute JOG operation in the positive direction of Rz.
11	JOG-RZ–	This is used to execute JOG operation in the negative direction of Rz.
12	JOG-E1+	This is used to execute JOG operation in the positive direction of E1.
13	JOG-E1–	This is used to execute JOG operation in the negative direction of E1.
14	JOG-E2+	This is used to execute JOG operation in the positive direction of E2.
15	JOG-E2–	This is used to execute JOG operation in the negative direction of E2.

- **Inching operation input**

Bit	Name	Description
0	JOG-P-X+	This is used to execute inching operation in the positive direction of X.
1	JOG-P-X–	This is used to execute inching operation in the negative direction of X.
2	JOG-P-Y+	This is used to execute inching operation in the positive direction of Y.
3	JOG-P-Y–	This is used to execute inching operation in the negative direction of Y.
4	JOG-P-Z+	This is used to execute inching operation in the positive direction of Z.
5	JOG-P-Z–	This is used to execute inching operation in the negative direction of Z.
6	JOG-P-RX+	This is used to execute inching operation in the positive direction of Rx.
7	JOG-P-RX–	This is used to execute inching operation in the negative direction of Rx.
8	JOG-P-RY+	This is used to execute inching operation in the positive direction of Ry.
9	JOG-P-RY–	This is used to execute inching operation in the negative direction of Ry.
10	JOG-P-RZ+	This is used to execute inching operation in the positive direction of Rz.
11	JOG-P-RZ–	This is used to execute inching operation in the negative direction of Rz.
12	JOG-P-E1+	This is used to execute inching operation in the positive direction of E1.
13	JOG-P-E1–	This is used to execute inching operation in the negative direction of E1.
14	JOG-P-E2+	This is used to execute inching operation in the positive direction of E2.
15	JOG-P-E2–	This is used to execute inching operation in the negative direction of E2.

- **JOG operation input (axis)**

Bit	Name	Description
0	JOG-A1+	This is used to execute JOG operation in the forward direction of the axis 1.
1	JOG-A1–	This is used to execute JOG operation in the reverse direction of the axis 1.
2	JOG-A2+	This is used to execute JOG operation in the forward direction of the axis 2.
3	JOG-A2–	This is used to execute JOG operation in the reverse direction of the axis 2.
4	JOG-A3+	This is used to execute JOG operation in the forward direction of the axis 3.
5	JOG-A3–	This is used to execute JOG operation in the reverse direction of the axis 3.
6	JOG-A4+	This is used to execute JOG operation in the forward direction of the axis 4.
7	JOG-A4–	This is used to execute JOG operation in the reverse direction of the axis 4.
8	JOG-A5+	This is used to execute JOG operation in the forward direction of the axis 5.
9	JOG-A5–	This is used to execute JOG operation in the reverse direction of the axis 5.
10	JOG-A6+	This is used to execute JOG operation in the forward direction of the axis 6.
11	JOG-A6–	This is used to execute JOG operation in the reverse direction of the axis 6.
12	JOG-A7+	This is used to execute JOG operation in the forward direction of the axis 7 (end-effector 1).
13	JOG-A7–	This is used to execute JOG operation in the reverse direction of the axis 7 (end-effector 1).
14	JOG-A8+	This is used to execute JOG operation in the forward direction of the axis 8 (end-effector 2).
15	JOG-A8–	This is used to execute JOG operation in the reverse direction of the axis 8 (end-effector 2).

- **Inching operation input (axis)**

Bit	Name	Description
0	JOG-P-A1+	This is used to execute inching operation in the forward direction of the axis 1.
1	JOG-P-A1–	This is used to execute inching operation in the reverse direction of the axis 1.
2	JOG-P-A2+	This is used to execute inching operation in the forward direction of the axis 2.
3	JOG-P-A2–	This is used to execute inching operation in the reverse direction of the axis 2.
4	JOG-P-A3+	This is used to execute inching operation in the forward direction of the axis 3.
5	JOG-P-A3–	This is used to execute inching operation in the reverse direction of the axis 3.
6	JOG-P-A4+	This is used to execute inching operation in the forward direction of the axis 4.
7	JOG-P-A4–	This is used to execute inching operation in the reverse direction of the axis 4.
8	JOG-P-A5+	This is used to execute inching operation in the forward direction of the axis 5.
9	JOG-P-A5–	This is used to execute inching operation in the reverse direction of the axis 5.
10	JOG-P-A6+	This is used to execute inching operation in the forward direction of the axis 6.
11	JOG-P-A6–	This is used to execute inching operation in the reverse direction of the axis 6.
12	JOG-P-A7+	This is used to execute inching operation in the forward direction of the axis 7 (end-effector 1).
13	JOG-P-A7–	This is used to execute inching operation in the reverse direction of the axis 7 (end-effector 1).
14	JOG-P-A8+	This is used to execute inching operation in the forward direction of the axis 8 (end-effector 2).
15	JOG-P-A8–	This is used to execute inching operation in the reverse direction of the axis 8 (end-effector 2).

- **JOG operating speed (X, Y, Z, Tx, Ty, Tz)**

Bit	Name	Description	Initial value
0 to 31	JOG operating speed (X, Y, Z, Tx, Ty, Tz)	This is used to set the operating speed for JOG operation and inching operation on the X, Y, and Z coordinates, and that for JOG operation on the Tx, Ty, and Tz coordinates. **[Setting range]** 1 to 250,000 (1=0.001 mm/s)	20,000

- **JOG operating speed (Rx, Ry, Rz)**

Bit	Name	Description	Initial value
0 to 31	JOG operating speed (Rx, Ry, Rz)	This is used to set the operating speed for JOG operation and inching operation on the Rx, Ry, and Rz coordinates. **[Setting range]** 1 to 250,000 (1=0.001 deg/s)	10,000

- **JOG operating speed (End effector 1, 2)**

Bit	Name	Description	Initial value
0 to 31	JOG operating speed (End effector 1, 2)	This is used to set the operating speed of the end effector 1 and end effector 2 for JOG operation and inching operation. **[Setting range]** 1 to 250,000 (1=0.001 mm/s or 1=0.001 deg/s)	1,000

- **JOG operating speed (Axis)**

Bit	Name	Description	Initial value
0 to 31	JOG operating speed (Axis)	This is used to set the operating speed for JOG operation and inching operation of the axis. **[Setting range]** 1 to 250,000 (1=0.001 mm/s or 1=0.001 deg/s)	10,000

- **JOG operation travel amount (X, Y, Z)**

Bit	Name	Description	Initial value
0 to 31	JOG operation travel amount (X, Y, Z)	This is used to set the travel amount for inching operation on the X, Y, and Z coordinates. **[Setting range]** 1 to 200,000 (1=0.001 mm)	10,000

- **JOG operation travel amount (Rx, Ry, Rz)**

Bit	Name	Description	Initial value
0 to 31	JOG operation travel amount (Rx, Ry, Rz)	This is used to set the travel amount for inching operation on the Rx, Ry, and Rz coordinates. **[Setting range]** 1 to 200,000 (1=0.001 deg)	5,000

- **JOG operation travel amount (End effector 1, 2)**

Bit	Name	Description	Initial value
0 to 31	JOG operation travel amount (End effector 1, 2)	This is used to set the travel amount of the end effector 1 and end effector 2 for inching operation. **[Setting range]** 10 to 100,000 (1=0.001 mm or 1=0.001 deg)	1,000

- **JOG operation travel amount (Axis)**

Bit	Name	Description	Initial value
0 to 31	JOG operation travel amount (Axis)	This is used to set the travel amount for inching operation of the axis. **[Setting range]** 10 to 100,000 (1=0.001 mm or 1=0.001 deg)	5,000

- **Input for program operation**

Bit	Name	Description
0	PRG-RIN0	These are general-purpose input signals exclusively for remote input that can be set to "Wait (signal)" of the control command for program operation.
1	PRG-RIN1	
2	PRG-RIN2	
3	PRG-RIN3	
4	PRG-RIN4	
5	PRG-RIN5	
6	PRG-RIN6	
7	PRG-RIN7	
8	PRG-RIN8	
9	PRG-RIN9	
10	PRG-RIN10	
11	PRG-RIN11	
12	PRG-RIN12	
13	PRG-RIN13	
14	PRG-RIN14	
15	PRG-RIN15	
16	PRG-RIN16	
17	PRG-RIN17	
18	PRG-RIN18	
19	PRG-RIN19	
20	PRG-RIN20	
21	PRG-RIN21	
22	PRG-RIN22	
23	PRG-RIN23	
24	PRG-RIN24	
25	PRG-RIN25	
26	PRG-RIN26	
27	PRG-RIN27	
28	PRG-RIN28	
29	PRG-RIN29	
30	PRG-RIN30	
31	PRG-RIN31	

● **(DD) TRIG**

Bit	Name	Description	Initial value
0 to 15	Direct data operation TRIG	This is used to set the trigger for direct data operation. (About TRIG ⇨p.127) **[Setting range]** –6: Operation command –5: Position (one of the following items: X, Y, Z, Rx, Ry, Rz, E1, E2, and axis) –4: Operating speed –3: Acceleration –2: Deceleration 0: Disable 1: All data updated	0

● **(DD) Operation mode**

Bit	Name	Description	Initial value
0 to 15	Direct data operation operation mode	This is used to set the operation mode or control command for direct data operation. **[Setting range]** 0: Disable 1: PTP operation (absolute positioning) 2: PTP operation (relative positioning) 3: Linear interpolation operation (absolute positioning) 4: Linear interpolation operation (relative positioning) 5: Circular (CW) interpolation operation (absolute positioning) 6: Circular (CW) interpolation operation (relative positioning) 7: Circular (CCW) interpolation operation (absolute positioning) 8: Circular (CCW) interpolation operation (relative positioning) 9: Arch interpolation operation (absolute positioning) 10: Arch interpolation operation (relative positioning) 11: End-effector 1 operation (absolute positioning) 12: End-effector 1 operation (relative positioning) 13: Axis operation (absolute positioning) 14: Axis operation (relative positioning) 15: Circular interpolation_via-point (absolute positioning) 16: Circular interpolation_via-point (relative positioning) 17: Pallet_PTP operation (absolute positioning) 18: Pallet_PTP operation (relative positioning) 19: Pallet_Linear interpolation operation (absolute positioning) 20: Pallet_Linear interpolation operation (relative positioning) 21: Pallet_Arch interpolation operation (absolute positioning) 22: Pallet_Arch interpolation operation (relative positioning) 23: End-effector 2 operation (absolute positioning) 24: End-effector 2 operation (relative positioning) 25: Changing tool offset 26: Changing coordinate system 27: End-effector 1 + 2 operation (absolute position) 28: End-effector 1 + 2 operation (relative position) 29: PTP operation (camera imaging position) 30: Linear interpolation operation (camera imaging position) 31: Arch interpolation operation (camera imaging position)	0

● **(DD) Axis selection**

Bit	Name	Description	Initial value
0 to 7	Direct data operation axis selection	This is used to select the axis number performing direct data operation. **[Setting range]** 0: Disable 1 to 8: Axis number	0

- **(DD) TCP operation target coordinates selection**

Bit	Name	Description	Initial value
0	Direct data operation TCP operation target coordinates selection X	These are used to select the coordinates performing direct data operation in bits. **[Setting range]** 0: Disable 1: Enable	0
1	Direct data operation TCP operation target coordinates selection Y		
2	Direct data operation TCP operation target coordinates selection Z		
3	Direct data operation TCP operation target coordinates selection Rx		
4	Direct data operation TCP operation target coordinates selection Ry		
5	Direct data operation TCP operation target coordinates selection Rz		
6	Direct data operation TCP operation target coordinates selection E1		
7	Direct data operation TCP operation target coordinates selection E2		

- **(DD) Position X coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position X coordinate	This is used to set the target position of the X coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0

- **(DD) Position Y coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position Y coordinate	This is used to set the target position of the Y coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0

- **(DD) Position Z coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position Z coordinate	This is used to set the target position of the Z coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0

- **(DD) Position Rx coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position Rx coordinate	This is used to set the target position of the Rx coordinate for direct data operation. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0

- **(DD) Position Ry coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position Ry coordinate	This is used to set the target position of the Ry coordinate for direct data operation. **[Setting range]** −90,000 to 90,000 (1=0.001 deg)	0

- **(DD) Position Rz coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position Rz coordinate	This is used to set the target position of the Rz coordinate for direct data operation. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0

- **(DD) Position E1 coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position E1 coordinate	This is used to set the target position of the end effector 1 for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0

- **(DD) Position E2 coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position E2 coordinate	This is used to set the target position of the end effector 2 for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0

- **(DD) Speed**

Bit	Name	Description	Initial value
0 to 31	Direct data operation operating speed	This is used to set the target speed for direct data operation. **[Setting range]** 10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	20,000

memo If multiple coordinates are set at the target position or the start position S, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

- **(DD) Acceleration**

Bit	Name	Description	Initial value
0 to 31	Direct data operation acceleration	This is used to set the acceleration for direct data operation. **[Setting range]** 10 to 30,000,000 (1=0.001 mm/s^2 or 1=0.001 deg/s^2)	1,200,000

- **(DD) Deceleration**

Bit	Name	Description	Initial value
0 to 31	Direct data operation deceleration	This is used to set the deceleration for direct data operation. [Setting range] 10 to 30,000,000 (1=0.001 mm/s^2 or 1=0.001 deg/s^2)	1,200,000

- **(DD) Position (axis)**

Bit	Name	Description	Initial value
0 to 31	Direct data operation position (axis)	This is used to set the target position of axis operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0

- **(DD) End-effector 1, 2 operation mode**

Bit	Name	Description	Initial value
0 to 15	Direct data operation end-effector 1, 2 operation mode	This is used to select the operation mode of the end effector 1 and end effector 2 for direct data operation. **[Setting range]** 0: Parameter setting is followed 1: Positioning operation 2: Push-motion positioning operation	0

- **(DD) End-effector 1, 2 push current**

Bit	Name	Description	Initial value
0 to 15	Direct data operation end-effector 1, 2 push current	This is used to set the push operating current of the end effector 1 and end effector 2 for direct data operation. This is enabled when the end-effector operation mode is set to "2: Push-motion positioning operation." **[Setting range]** 1 to 1,000 (1=0.1 %)	500

- **(DD) PTP operation handed system selection**

Bit	Name	Description	Initial value
0 to 15	Direct data operation PTP operation handed system selection	This is used to set the handed system of PTP operation for direct data operation. It is enabled for a SCARA robot and a 6-axis vertically articulated robot. **[Setting range]** 0 : No change from present handed system 1 : Right-handed system 2 : Left-handed system 3 : Change oppositely from present handed system	0

- **(DD) Circular interpolation operation setting method**

Bit	Name	Description	Initial value
0 to 15	Direct data operation Circular interpolation operation setting method	This is used to set how to specify the center coordinate of circular interpolation operation for direct data operation. This is enabled when the operation mode is "Circular (CW) interpolation operation" or "Circular (CCW) interpolation operation." **[Setting range]** 0: Radius setting (180° or less) 1: Radius setting (180° or more) 2: Center position setting	0

- **(DD) Circular interpolation operation radius**

Bit	Name	Description	Initial value
0 to 31	Direct data operation Circular interpolation operation radius	This is used to set the radius of circular interpolation operation for direct data operation. This is enabled when the setting method of circular interpolation operation is "0: Radius setting (180° or less)" or "1: Radius setting (180° or more)." **[Setting range]** 1,000 to 2,000,000 (1=0.001 mm)	50,000

● **(DD) Circular interpolation operation center coordinate / via-point X**

Bit	Name	Description	Initial value
0 to 31	Direct data operation circular interpolation operation center coordinate / via-point X	This is used to set the center coordinate (X) or the via-point coordinate (X) of circular interpolation operation for direct data operation. The setting methods are shown below. • When the setting method of circular interpolation operation is "2: Center position setting," input the X coordinate of the center of the circular arc in a relative position. • When the operation mode is "15: Circular interpolation_via-point (absolute positioning)," input the X coordinate of the via point in an absolute position. • When the operating mode is "16: Circular interpolation_via-point (relative positioning)," input the X coordinate of the via point in a relative position. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0

● **(DD) Circular interpolation operation center coordinate / via-point Y**

Bit	Name	Description	Initial value
0 to 31	Direct data operation circular interpolation operation center coordinate / via-point Y	This is used to set the center coordinate (Y) or the via-point coordinate (Y) of circular interpolation operation for direct data operation. The setting methods are shown below. • When the setting method of circular interpolation operation is "2: Center position setting," input the Y coordinate of the center of the circular arc in a relative position. • When the operation mode is "15: Circular interpolation_via-point (absolute positioning)," input the Y coordinate of the via point in an absolute position. • When the operating mode is "16: Circular interpolation_via-point (relative positioning)," input the Y coordinate of the via point in a relative position. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0

● **(DD) Arch interpolation operation ascending height**

Bit	Name	Description	Initial value
0 to 31	Direct data operation arch interpolation operation ascending height	This is used to set the ascending height of arch interpolation operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	30,000

● **(DD) Arch interpolation operation maximum height**

Bit	Name	Description	Initial value
0 to 31	Direct data operation arch interpolation operation maximum height	This is used to set the maximum height of arch interpolation operation for direct data operation. Set a value larger than the ascending height or the descending start height. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	50,000

● **(DD) Arch interpolation operation descending start height**

Bit	Name	Description	Initial value
0 to 31	Direct data operation arch interpolation operation descending start height	This is used to set the descending start height of arch interpolation operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	30,000

- **(DD) Pallet number selection**

Bit	Name	Description	Initial value
0 to 15	Direct data operation pallet number selection	This is used to set the pallet number of pallet operation for direct data operation. **[Setting range]** 0: Disable 1 to 6: Pallet number	0

- **(DD) Tool offset**

Bit	Name	Description	Initial value
0 to 15	Direct data operation tool offset	This is used to set the tool offset of the changing tool offset for direct data operation. **[Setting range]** 0: Disable 1, 2: Tool offset number 3: Change from the present tool offset	0

- **(DD) Coordinate system selection**

Bit	Name	Description	Initial value
0 to 15	Direct data operation coordinate system selection	This is used to set the coordinate system of changing coordinate system for direct data operation. **[Setting range]** −1: Base coordinate system 0: Disable 1: User coordinate system 1 2: User coordinate system 2 3: User coordinate system 3	0

- **(DD) Camera number selection**

Bit	Name	Description	Initial value
0 to 15	Direct data operation camera number selection	This is used to set the camera number when operation is performed with the values of the coordinates of the load captured by the camera. **[Setting range]** 0: Disable 1: Camera 1 2: Camera 2	0

- **(DD) Camera coordinate X coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation camera coordinate X coordinate	This is used to set the X coordinate of the load captured by the camera. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 px)	0

- **(DD) Camera coordinate Y coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation camera coordinate Y coordinate	This is used to set the Y coordinate of the load captured by the camera. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 px)	0

- **(DD) Camera coordinate Rz coordinate**

Bit	Name	Description	Initial value
0 to 31	Direct data operation camera coordinate Rz coordinate	This is used to set the Rz coordinate (angle) of the load captured by the camera. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0

- **Read parameter target selection**

Bit	Name	Description	Initial value
0 to 15	Read parameter target selection	This is used to set the target to be read from. **[Setting range]** 0: Controller 1 to 8: Axis number	0

- **Read parameter ID**

Bit	Name	Description	Initial value
0 to 15	Read parameter ID	This is used to set the parameter ID to be read from.	0

- **Write request**

Bit	Name	Description	Initial value
0 to 7	Reserved	A value is disregarded.	0
8	WR-REQ	This is used to set the write request. **[Setting range]** 0: Disable 1: Write request (ON edge)	0
9 to 15	Reserved	A value is disregarded.	0

- **Write parameter target selection**

Bit	Name	Description	Initial value
0 to 15	Write parameter target selection	This is used to select the device to be written to. Any value other than 0 is disabled. **[Setting range]** 0: Controller	0

- **Write parameter ID**

Bit	Name	Description	Initial value
0 to 15	Write parameter ID	This is used to set the parameter ID to be written to.	0

- **Write data**

Bit	Name	Description	Initial value
0 to 31	Write data	This is used to set a value to be written to the parameter specified by the write parameter ID.	0

3-4 Processing order of Implicit communication

The processing order of Implicit communication is shown below.

Data writing

↓

Setting of operation command

↓

Data reading

memo

- If multiple operation commands are set in the Implicit message format, the operation command of direct data operation is prioritized.
- If the operation commands for remote I/O (R-IN) and the controller control input are set at the same time, operation is as follows.
  · If the same operation command is set: The robot will start.
  · If different operation commands are set: The robot will not start, and information of operation start error will be generated.

3-5 Data writing

This section explains the flow that data is written from the scanner to the controller via Implicit communication.

■ Area of Implicit message format used

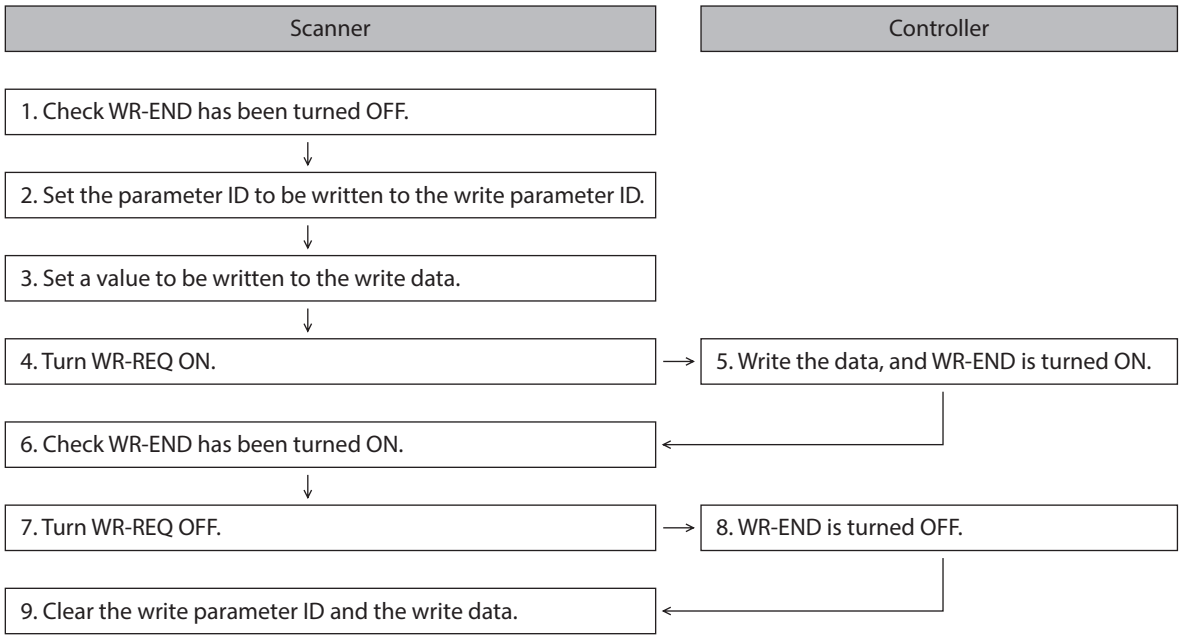
Input (transfer from controller to scanner)

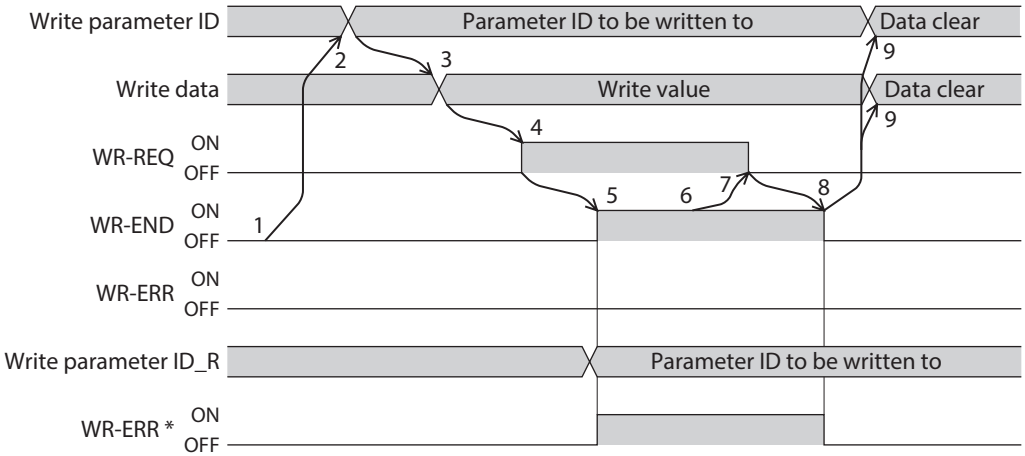
Byte	Description
178, 179	Read/write status
180, 181	Write parameter target selection_R
182, 183	Write parameter ID_R

Output (transfer from scanner to controller)

Byte	Description
178, 179	Write request
180, 181	Write parameter target selection
182, 183	Write parameter ID
184 to 187	Write data

■ Flow that data is written to





* If an error occurs while data is being written, the WR-END and WR-ERR are simultaneously turned ON.

3-6 Data reading

This section explains the flow that data is read from the controller to the scanner via Implicit communication.
There are the following two methods to read data.

- Method to use an area of "Read data"
- Method to use an area of "Assignable monitor"

■ When an area of read data is used

● Area of Implicit message format used

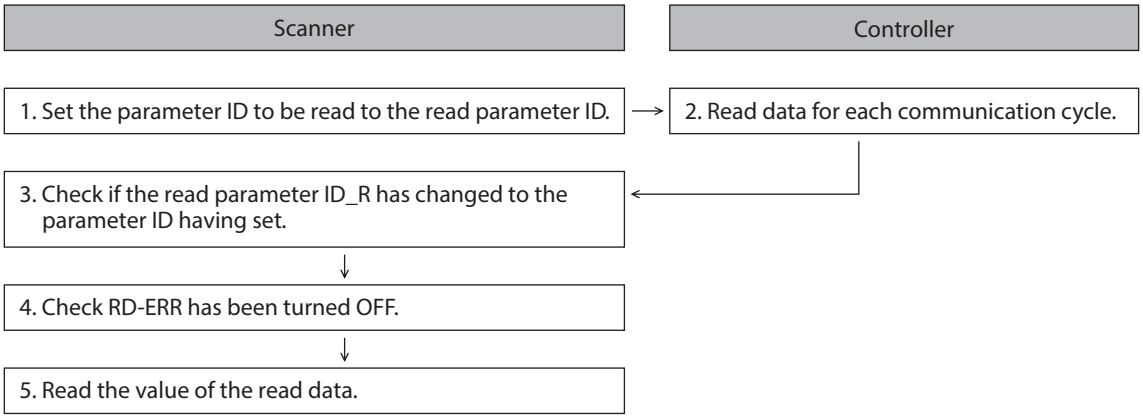
Input (transfer from controller to scanner)

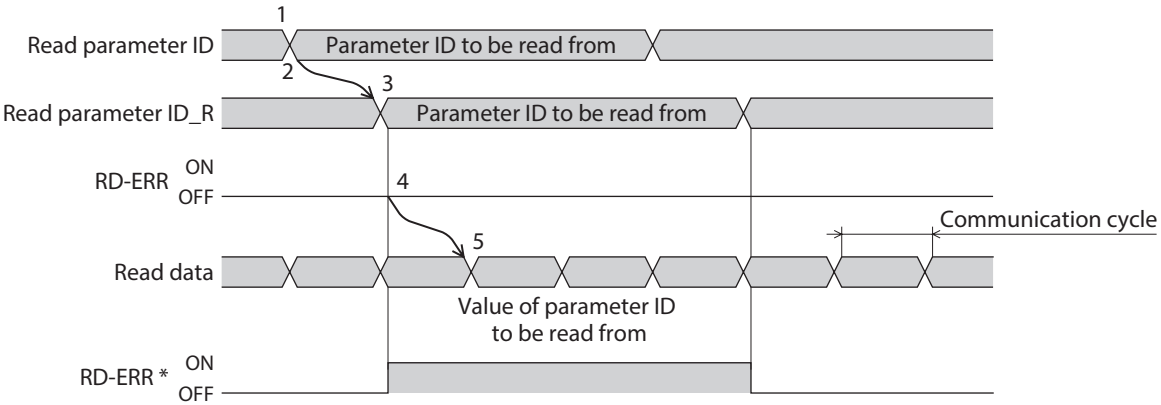
Byte	Description
172, 173	Read parameter target selection_R
174, 175	Read parameter ID_R
178, 179	Read/write status
184 to 187	Read data

Output (transfer from scanner to controller)

Byte	Description
172, 173	Read parameter target selection
174, 175	Read parameter ID

● Flow that data is read from





* If the parameter ID out of the setting range is set to the read parameter ID, the RD-ERR is turned ON at the same time when the read parameter ID_R is updated.

■ When an area of assignable monitor is used

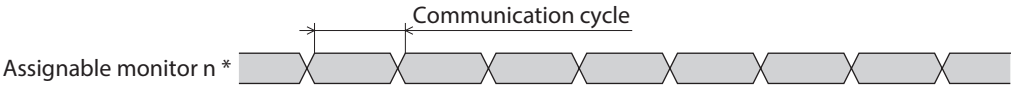
● Area of Implicit message format used

Input (transfer from controller to scanner)

Byte	Description
36 to 39	Controller assignable monitor 0
40 to 43	Controller assignable monitor 1
44 to 47	Controller assignable monitor 2
48 to 51	Controller assignable monitor 3
100 to 111	Axis 1 assignable monitor 0 to 2
112 to 123	Axis 2 assignable monitor 0 to 2
124 to 135	Axis 3 assignable monitor 0 to 2
136 to 147	Axis 4 assignable monitor 0 to 2
148 to 159	Axis 5 assignable monitor 0 to 2
160 to 171	Axis 6 assignable monitor 0 to 2
188 to 199	Axis 7 assignable monitor 0 to 2*
200 to 211	Axis 8 assignable monitor 0 to 2*

* The axis 7 is the end-effector 1 and the axis 8 is the end-effector 2.

Scanner	Driver
Set the "Assignable monitor address" parameter →	Read the monitor value of the "Assignable monitor address" parameter for each communication cycle.



* n: 0 to 3

● Related parameters

Parameter ID		Name	Description	Setting range	Initial value
Dec	Hex				
3746	0EA2h	Driver assignable monitor address 0	Sets the parameter ID of the item to be monitored.	Driver assignable monitor address ⇨p.191	107: Torque monitor
3747	0EA3h	Driver assignable monitor address 1			124: Driver temperature
3748	0EA4h	Driver assignable monitor address 2			125: Motor temperature
25600	6400h	Controller assignable monitor address 0	Sets the parameter ID of the item to be monitored.	Monitor command ⇨p.142	1448: Driver communication status
25601	6401h	Controller assignable monitor address 1			1247: TCP feedback speed RxRyRz
25602	6402h	Controller assignable monitor address 2			653: Enabled coordinates
25603	6403h	Controller assignable monitor address 3			124: Controller temperature

4 Direct data operation

4-1 Overview of direct data operation

Direct data operation is a mode that allows execution of operation at the same time as rewriting of data.
It is suitable to frequently change operation data such as the position (travel amount) or the speed, or to applications to adjust the position finely.
There are the following six types of triggers to execute operation at the same time as rewriting of data.

- One of the following items: Operation command, position, speed, acceleration, and deceleration
- The above five items are collectively rewritten

4-2 Output data related to direct data operation

Output data related to direct data operation is shown in table. Operation can be executed without setting all Output data. Refer to p.128 for details.

Byte	Name	Description	Initial value
52, 53	Direct data operation TRIG	This is used to set the trigger for direct data operation. (About TRIG ⇨ p.127) **[Setting range]** –6: Operation command –5: Position (one of the following items: X, Y, Z, Rx, Ry, Rz, E1, E2, and axis) –4: Speed –3: Acceleration –2: Deceleration 0: Disable 1: All data updated	0
56, 57	Direct data operation operation mode	This is used to set the operation mode or control command for direct data operation. **[Setting range]** 0: Disable 1: PTP operation (absolute positioning) 2: PTP operation (relative positioning) 3: Linear interpolation operation (absolute positioning) 4: Linear interpolation operation (relative positioning) 5: Circular (CW) interpolation operation (absolute positioning) 6: Circular (CW) interpolation operation (relative positioning) 7: Circular (CCW) interpolation operation (absolute positioning) 8: Circular (CCW) interpolation operation (relative positioning) 9: Arch interpolation operation (absolute positioning) 10: Arch interpolation operation (relative positioning) 11: End-effector 1 operation (absolute positioning) 12: End-effector 1 operation (relative positioning) 13: Axis operation (absolute positioning) 14: Axis operation (relative positioning) 15: Circular interpolation_via-point (absolute positioning) 16: Circular interpolation_via-point (relative positioning) 17: Pallet_PTP operation (absolute positioning) 18: Pallet_PTP operation (relative positioning) 19: Pallet_Linear interpolation operation (absolute positioning) 20: Pallet_Linear interpolation operation (relative positioning) 21: Pallet_Arch interpolation operation (absolute positioning) 22: Pallet_Arch interpolation operation (relative positioning) 23: End-effector 2 operation (absolute positioning) 24: End-effector 2 operation (relative positioning) 25: Changing tool offset 26: Changing coordinate system 27: End-effector 1 + 2 operation (absolute position) 28: End-effector 1 + 2 operation (relative position) 29: PTP operation (camera imaging position) 30: Linear interpolation operation (camera imaging position) 31: Arch interpolation operation (camera imaging position)	0
58	Direct data operation axis selection	This is used to select the number of the axis to be the target for direct data operation. **[Setting range]** 0: Disable 1 to 8: Axis number	0

Byte	Name	Description	Initial value
59	Direct data operation TCP operation target coordinates selection X Direct data operation TCP operation target coordinates selection Y Direct data operation TCP operation target coordinates selection Z Direct data operation TCP operation target coordinates selection Rx Direct data operation TCP operation target coordinates selection Ry Direct data operation TCP operation target coordinates selection Rz Direct data operation TCP operation target coordinates selection E1 Direct data operation TCP operation target coordinates selection E2	These are used to select the coordinate to be the target for direct data operation in bits. **[Setting range]** 0: Disable 1: Enable	0
60 to 63	Direct data operation position X coordinate	This is used to set the target position of the X coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0
64 to 67	Direct data operation position Y coordinate	This is used to set the target position of the Y coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0
68 to 71	Direct data operation position Z coordinate	This is used to set the target position of the Z coordinate for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0
72 to 75	Direct data operation position Rx coordinate	This is used to set the target position of the Rx coordinate for direct data operation. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0
76 to 79	Direct data operation position Ry coordinate	This is used to set the target position of the Ry coordinate for direct data operation. **[Setting range]** −90,000 to 90,000 (1=0.001 deg)	0
80 to 83	Direct data operation position Rz coordinate	This is used to set the target position of the Rz coordinate for direct data operation. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0
84 to 87	Direct data operation position E1 coordinate	This is used to set the target position of the end effector 1 for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0

Byte	Name	Description	Initial value
88 to 91	Direct data operation position E2 coordinate	This is used to set the target position of the end effector 2 for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0
92 to 95	Direct data operation operating speed	This is used to set the target speed for direct data operation. **[Setting range]** 10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	20,000
96 to 99	Direct data operation acceleration	This is used to set the acceleration for direct data operation. **[Setting range]** 10 to 30,000,000 (1=0.001 mm/s^2 or 1=0.001 deg/s^2)	1,200,000
100 to 103	Direct data operation deceleration	This is used to set the deceleration for direct data operation. **[Setting range]** 10 to 30,000,000 (1=0.001 mm/s^2 or 1=0.001 deg/s^2)	1,200,000
104 to 107	Direct data operation position (axis)	This is used to set the target position of axis operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0
108, 109	Direct data operation end-effector 1, 2 operation mode	This is used to select the operation mode of the end effector 1 and end effector 2 for direct data operation. **[Setting range]** 0: Parameter setting is followed 1 : Positioning operation 2 : Push-motion positioning operation	0
110, 111	Direct data operation end-effector 1, 2 push current	This is used to set the push operating current of the end effector 1 and end effector 2 for direct data operation. This is enabled when the end-effector operation mode is set to "2: Push-motion positioning operation." **[Setting range]** 1 to 1,000 (1=0.1 %)	500
112, 113	Direct data operation PTP operation handed system selection	This is used to set the handed system of PTP operation for direct data operation. This is enabled for a SCARA robot and a 6-axis vertically articulated robot. **[Setting range]** 0 : No change from present handed system 1 : Right-handed system 2 : Left-handed system 3 : Change oppositely from present handed system	0
114, 115	Direct data operation circular interpolation operation setting method	This is used to set how to specify the center coordinate of circular interpolation operation for direct data operation. This is enabled when the operation mode is "Circular (CW) interpolation operation" or "Circular (CCW) interpolation operation." **[Setting range]** 0: Radius setting (180° or less) 1: Radius setting (180° or more) 2: Center position setting	0
116 to 119	Direct data operation circular interpolation operation radius	This is used to set the radius of circular interpolation operation for direct data operation. This is enabled when the setting method of circular interpolation operation is "0: Radius setting (180° or less)" or "1: Radius setting (180° or more)." **[Setting range]** 1,000 to 2,000,000 (1=0.001 mm)	50,000

Byte	Name	Description	Initial value
120 to 123	Direct data operation circular interpolation operation center coordinate / via-point X	This is used to set the center coordinate (X) or the via-point coordinate (X) of circular interpolation operation for direct data operation. The setting methods are shown below. • When the setting method of circular interpolation operation is "2: Center position setting," input the X coordinate of the center of the circular arc in a relative position. • When the operation mode is "15: Circular interpolation_via-point (absolute positioning)," input the X coordinate of the via point in an absolute position. • When the operating mode is "16: Circular interpolation_via-point (relative positioning)," input the X coordinate of the via point in a relative position. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0
124 to 127	Direct data operation circular interpolation operation center coordinate / via-point Y	This is used to set the center coordinate (Y) or the via-point coordinate (Y) of circular interpolation operation for direct data operation. The setting methods are shown below. • When the setting method of circular interpolation operation is "2: Center position setting," input the Y coordinate of the center of the circular arc in a relative position. • When the operation mode is "15: Circular interpolation_via-point (absolute positioning)," input the Y coordinate of the via point in an absolute position. • When the operating mode is "16: Circular interpolation_via-point (relative positioning)," input the Y coordinate of the via point in a relative position. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	0
128 to 131	Direct data operation arch interpolation operation ascending height	This is used to set the ascending height of arch interpolation operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	30,000
132 to 135	Direct data operation arch interpolation operation maximum height	This is used to set the maximum height of arch interpolation operation for direct data operation. Set a value larger than the ascending height or the descending start height. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	50,000
136 to 139	Direct data operation arch interpolation operation descending start height	This is used to set the descending start height of arch interpolation operation for direct data operation. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 mm)	30,000
140, 141	Direct data operation pallet number selection	This is used to set the pallet number of pallet operation for direct data operation. **[Setting range]** 0: Disable 1 to 6: Pallet number	0
142, 143	Direct data operation tool offset	This is used to set the tool offset of the changing tool offset for direct data operation. **[Setting range]** 0: Disable 1, 2: Tool offset number 3: Change from the present tool offset	0

Byte	Name	Description	Initial value
144, 145	Direct data operation coordinate system selection	This is used to set the coordinate system of changing coordinate system for direct data operation. **[Setting range]** −1: Base coordinate system 0: Disable 1: User coordinate system 1 2: User coordinate system 2 3: User coordinate system 3	0
146, 147	Direct data operation camera number selection	This is used to set the camera number when operation is performed with the values of the coordinates of the load captured by the camera. **[Setting range]** 0: Disable 1: Camera 1 2: Camera 1	0
148 to 151	Direct data operation camera coordinate X coordinate	This is used to set the X coordinate of the load captured by the camera. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 px)	0
152 to 155	Direct data operation camera coordinate Y coordinate	This is used to set the Y coordinate of the load captured by the camera. **[Setting range]** −2,000,000 to 2,000,000 (1=0.001 px)	0
156 to 159	Direct data operation camera coordinate Rz coordinate	This is used to set the Rz coordinate (angle) of the load captured by the camera. **[Setting range]** −270,000 to 270,000 (1=0.001 deg)	0

memo For "direct data operation operating speed," if multiple coordinates are set at the target position or the start position S, the set speed may differ from the actual speed because the speed is automatically adjusted to the axis that takes the longest time to move.

■ TRIG

This is a trigger to execute operation at the same time as rewriting of data in direct data operation.

- **When TRIG is "0"**

  Direct data operation is disabled.

- **When TRIG is "1"**

  All data is applied to execute direct data operation. To execute the next direct data operation, set "Direct data operation TRIG" to "0" once. After that, operation is executed when setting "Direct data operation TRIG" to "1" again.

- **When TRIG is "−6 to −2"**

  Direct data operation is executed only when the target data is changed.
  Operation cannot be executed when the target data has not been changed.

Setting range	TRIG
−6	Operation command
−5	Position (one of the following items: X, Y, Z, Rx, Ry, Rz, E1, E2, and axis)
−4	Speed
−3	Acceleration
−2	Deceleration

4-3 Output data required to execute direct data operation

The Output data required to execute direct data operation varies depending on the operation mode.

Operation mode	Output data
1: PTP operation (absolute positioning) 2: PTP operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • PTP operation handed system selection
3: Linear interpolation operation (absolute positioning) 4: Linear interpolation operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration
5: Circular (CW) interpolation operation (absolute positioning) 6: Circular (CW) interpolation operation (relative positioning) 7: Circular (CCW) interpolation operation (absolute positioning) 8: Circular (CCW) interpolation operation (relative positioning) 15: Circular interpolation_via-point (absolute positioning) 16: Circular interpolation_via-point (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Circular interpolation operation setting method • Circular interpolation operation radius • Circular interpolation operation center coordinate / via-point X • Circular interpolation operation center coordinate / via-point Y
9: Arch interpolation operation (absolute positioning) 10: Arch interpolation operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Arch interpolation operation ascending height • Arch interpolation operation maximum height • Arch interpolation operation descending start height
11: End-effector 1 operation (absolute positioning) 12: End-effector 1 operation (relative positioning) 23: End-effector 2 operation (absolute positioning) 24: End-effector 2 operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • End-effector 1, 2 operation mode • End-effector 1, 2 push current
13: Axis operation (absolute positioning) 14: Axis operation (relative positioning)	• Axis selection • Speed • Acceleration • Deceleration • Position (Axis)

Operation mode	Output data
17: Pallet_PTP operation (absolute positioning) 18: Pallet_PTP operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • PTP operation handed system selection • Pallet number selection
19: Pallet_Linear interpolation operation (absolute positioning) 20: Pallet_Linear interpolation operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Pallet number selection
21: Pallet_Arch interpolation operation (absolute positioning) 22: Pallet_Arch interpolation operation (relative positioning)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Arch interpolation operation ascending height • Arch interpolation operation maximum height • Arch interpolation operation descending start height • Pallet number selection
25: Changing tool offset	• Tool offset
26: Changing coordinate system	Coordinate system selection
27: End-effector 1 + 2 operation (absolute position) 28: End-effector 1 + 2 operation (relative position)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • End-effector 1, 2 operation mode* • End-effector 1, 2 push current*
29: PTP operation (camera imaging position)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • PTP operation handed system selection • Camera number selection • Camera coordinate X coordinate • Camera coordinate Y coordinate • Camera coordinate Rz coordinate
30: Linear interpolation operation (camera imaging position)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Camera number selection • Camera coordinate X coordinate • Camera coordinate Y coordinate • Camera coordinate Rz coordinate

Operation mode	Output data
31: Arch interpolation operation (camera imaging position)	• TCP operation target coordinates selection • Position (Coordinates other than the axis) • Speed • Acceleration • Deceleration • Arch interpolation operation ascending height • Arch interpolation operation maximum height • Arch interpolation operation descending start height • Camera number selection • Camera coordinate X coordinate • Camera coordinate Y coordinate • Camera coordinate Rz coordinate

* Although these are not used in operation, set the values within the setting range. Operation cannot be performed if the values are set outside the range.

4-4 Operation example

The condition to execute direct data operation can be selected one of the follo wing: operation command, position, speed, acceleration, deceleration, or all data updated.

Note Before operating a robot, check the condition of the surrounding area to ensure safety.

■ When setting TRIG to "1: All data updated" to execute operation

As an example, this section explains how to perform the following direct data operation.

● Setting example

- Robot type: SCARA robot 2-link base up-down
- End effector: Not used
- Position (travel amount): +5 mm in Z direction
- TRIG: All data updated
- Operating mode: Linear interpolation operation (relative positioning)

● Operation processing flow

Descriptions are given using the scanner as the subject.

1. Check the READY has been turned ON.
2. Set the following data.
   Only the Output data required to execute the operation is set here. Refer to p.123 for other Output data.

- Output (scanner → controller)

Byte	Name	Setting value	Note
56, 57	Direct data operation operation mode	4	Linear interpolation operation (relative positioning)
59	Direct data operation TCP operation target coordinates selection X	0	Z Coordinate: Enable
	Direct data operation TCP operation target coordinates selection Y	0	
	Direct data operation TCP operation target coordinates selection Z	1	
	Direct data operation TCP operation target coordinates selection Rx	0	
	Direct data operation TCP operation target coordinates selection Ry	0	
	Direct data operation TCP operation target coordinates selection Rz	0	
	Direct data operation TCP operation target coordinates selection E1	0	
	Direct data operation TCP operation target coordinates selection E2	0	
60 to 63	Direct data operation position X coordinate	0	Z Coordinate: 5 mm (1=0.001 mm)
64 to 67	Direct data operation position Y coordinate	0	
68 to 71	Direct data operation position Z coordinate	5,000	
72 to 75	Direct data operation position Rx coordinate	0	
76 to 79	Direct data operation position Ry coordinate	0	
80 to 83	Direct data operation position Rz coordinate	0	
84 to 87	Direct data operation position E1 coordinate	0	
88 to 91	Direct data operation position E2 coordinate	0	
92 to 95	Direct data operation operating speed	20,000	Initial value
96 to 99	Direct data operation acceleration	1,200,000	
100 to 103	Direct data operation deceleration	1,200,000	

3. Set "Direct data operation TRIG" to "1."
   Direct data operation is started.

• Output (scanner → controller)

Byte	Name	Setting value	Note
52, 53	Direct data operation TRIG	1	All data updated

4. Check that "Direct data operation TRIG_R" has been "1" and set "Direct data operation TRIG" to "0."

• Output (scanner → controller)

Byte	Name	Setting value	Note
52, 53	Direct data operation TRIG	0	Disable

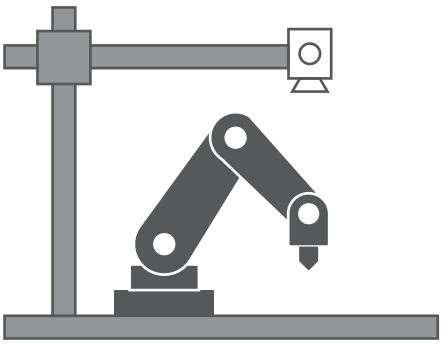
4-5 Operation where MRC01 controller and camera are used in combination

The **MRC01** is equipped with the calibration function (*) that supports a two-dimensional vision system. Therefore, even if an image processing device does not have the calibration function, the robot can be operated by using the **MRC01** and the camera in combination.
Because calibration can be performed semi-automatically using the **MRC Studio** software, it is possible to eliminate operator variation in correction accuracy and perform a highly accurate adjustment in a short time. The calibration function can also be used to readjust the position when the robot or camera is displaced.
* This is an adjustment function that converts the position and angle information of the load captured by the camera to the coordinate system of the robot. Calibration is necessary when using the vision system as a robot eye.

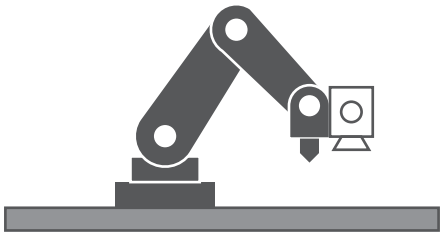
memo

- The **MRC01** can be calibrated with two cameras.
- The calibration methods supported by the **MRC01** are the "hand-eye method," where the camera is installed to the tip of the robot, and the "fixed camera method," where the camera is installed to a device or location other than the robot.

• Fixed camera method



• Hand-eye method

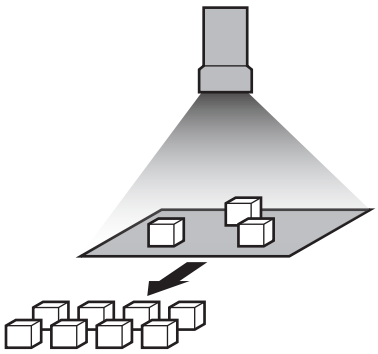


■ Example of use

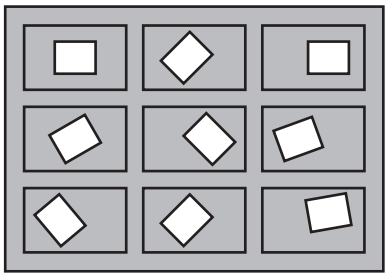
By using the **MRC01** and the camera in combination, the robot can be used for a variety of applications that were difficult to achieve on the robot itself.

- Align loads that have been placed in a random position.
- Pick up loads that have been placed in a random position on the pallet.
- A single robot handles multiple loads without changing the operation program or jigs.

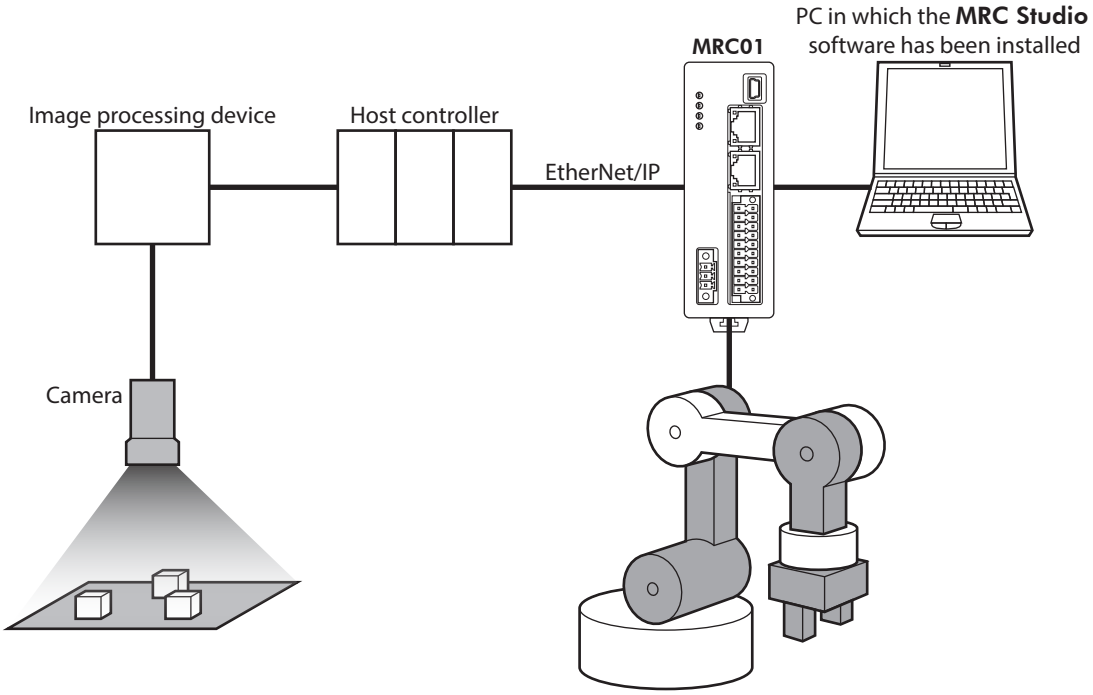
Alignment of loads that have been placed in a random position



Pickup of loads that have been placed in a random position on the pallet



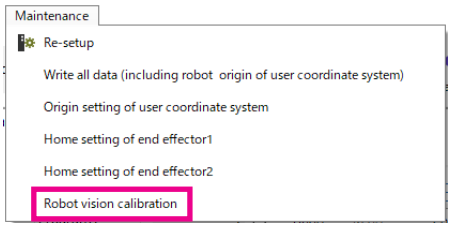
■ System configuration



■ Calibration method

This section is described under the assumption that the setup of the robot has been completed.
A single camera is used for calibration.

1. Install the camera.
2. Set the inspection program so that the image processing device can acquire the imaging position and angle of the load. (The angle setting is optional.)
   For details on the setting of the inspection program, refer to the instruction manual of the image processing device.
3. Connect the **MRC01** to a PC in which the **MRC Studio** software has been installed.
4. Click [Robot vision calibration] from the [Maintenance] menu of the **MRC Studio** software.



5. Follow the on-screen instructions to perform the calibration.

memo

- If the positional relationship between the robot and the camera is changed, perform the calibration again.
- The manufacturer of the image processing device or camera is not specified. Use products that can acquire and send the imaging position and angle of the load to the host controller.
- Even if no host controller is connected, calibration can be performed as long as the camera and robot are installed.

■ Operation flow

Execute direct data operation or program operation after performing calibration.
This section explains how to execute direct data operation using the **MRC01** and the camera in combination. For program operation, refer to the description of each command.

● Operation example: When setting "1: All data updated" to TRIG to execute operation

Setting example

- Robot type: Vertically articulated 3-link base rotation + Rz
- End effector: Not used
- Target position: Directly above the load (position of Z=10 mm)
- Operation mode: Linear interpolation operation (camera imaging position)
- Camera number: Camera 1

Operation processing flow

Descriptions are given using the scanner as the subject.

1. Check the READY has been turned ON.
2. The imaging position and angle of the load are acquired using the image processing device.
3. Set the following data.
   Only the Output data required to execute the operation is set here. Refer to p.123 for other Output data.

• Output (scanner → controller)

Byte	Name	Setting value	Note
56, 57	Direct data operation operation mode	30	Linear interpolation operation (camera imaging position)
59	Direct data operation TCP operation target coordinates selection X	1	X Y Z Rz coordinates: Enable
	Direct data operation TCP operation target coordinates selection Y	1	
	Direct data operation TCP operation target coordinates selection Z	1	
	Direct data operation TCP operation target coordinates selection Rx	0	
	Direct data operation TCP operation target coordinates selection Ry	0	
	Direct data operation TCP operation target coordinates selection Rz	1	
	Direct data operation TCP operation target coordinates selection E1	0	
	Direct data operation TCP operation target coordinates selection E2	0	
68 to 71	Direct data operation position Z coordinate	10,000	
72 to 75	Direct data operation position Rx coordinate	0	
76 to 79	Direct data operation position Ry coordinate	0	
84 to 87	Direct data operation position E1 coordinate	0	
88 to 91	Direct data operation position E2 coordinate	0	
92 to 95	Direct data operation speed	20,000	Initial value
96 to 99	Direct data operation acceleration	1,200,000	
100 to 103	Direct data operation deceleration	1,200,000	
146, 147	Direct data operation camera number selection	1	Camera 1

• Output (scanner → controller)

Byte	Name	Setting value	Note
148 to 151	Direct data operation camera coordinate X coordinate	*1	These are used to set the position and angle captured by the camera.
152 to 155	Direct data operation camera coordinate Y coordinate	*1	
156 to 159	Direct data operation camera coordinate Rz coordinate	*2	

*1 Input the X and Y coordinates of the load captured by the camera. (1=0.001 px)
*2 Input the Rz coordinate (angle) of the load captured by the camera. (1=0.001 deg)

memo When operating by acquiring the position captured by the camera, the **MRC01** automatically converts the X, Y, and Rz coordinates from the values set in the "Direct data operation camera coordinate" to the values that match the coordinate system of the robot. The setting values of X, Y, and Rz coordinates of the "Direct data operation position" are not used.

4. Set the "Direct data operation TRIG" to "1."
   Direct data operation is started.

• Output (scanner → controller)

Byte	Name	Setting value	Note
52, 53	Direct data operation TRIG	1	Apply all data

5. Check that the "Direct data operation TRIG_R" has been "1" and set the "Direct data operation TRIG" to "0."

• Output (scanner → controller)

Byte	Name	Setting value	Note
52, 53	Direct data operation TRIG	0	Disable

5 Parameter

This part describes the parameter lists to be used in the MRC Studio software and via EtherNet/IP.

◆Table of contents

1 Timing for parameter to update

All data used in the **MRC01** controller is 32 bits wide.
Parameters are stored in the RAM or the non-volatile memory. The parameters stored in the RAM are erased once the power supply is shut off, however, those stored in the non-volatile memory are retained even if the power supply is shut off.
When the power supply of the controller is turned on, the parameters stored in the non-volatile memory are sent to the RAM, and the recalculation and setup for the parameters are executed in the RAM.

Parameters set with the **MRC Studio** software are stored in the non-volatile memory if [Writing] is performed.
Parameters set via Implicit communication are saved in the RAM. To save the parameters stored in the RAM to the non-volatile memory, execute the "Write batch NV memory" of the maintenance command.
When a parameter is changed, the timing to update the new value varies depending on the parameter. Refer to "Notation rules" for the update timing.

memo
- Parameters set via Implicit communication are saved in the RAM. For parameters which update timing is "D: after turning on the power again," be sure to save in the non-volatile memory before turning off the power supply.
- The non-volatile memory can be rewritten approximately 100,000 times.

■ Notation rules

● Timing to update

In this part, each update timing is represented in an alphabet.

Notation	Timing to update	Description
A	Immediately	Recalculation and setup are immediately executed when the parameter is written.
B	After operation stop	Recalculation and setup are executed when the operation is stopped.
C	After executing Configuration	Recalculation and setup are executed after Configuration is executed or the power supply is turned on again.
D	After turning on the power again	Recalculation and setup are executed after the power supply is turned on again.

2 Protect release command

Parameter ID		Name	Description	Initial value	Key code
Dec	Hex				
34	0022h	HMI release key	Input a key code to release a state of limiting the functions of the **MRC Studio** software.	0	864617234 (33890312h)

memo A state of limiting the functions of the **MRC Studio** software can also be released with the HMI input.

3 Maintenance commands

Maintenance commands are used to execute resetting alarms, batch processing of the non-volatile memory or the like.

Note The maintenance commands include processing in which the memory is operated, such as batch processing of the non-volatile memory and P-PRESET-RB execution. Exercise caution not to execute them unnecessarily in succession.

memo For commands other than "Alarm history details," setting the write data is not required.

Parameter ID		Name	Description
Dec	Hex		
192	00C0h	Alarm reset	Resets the alarm being generated. Some alarms cannot be reset.
194	00C2h	Clear alarm history	Clears the alarm history.
197	00C5h	P-PRESET-RB execution	Rewrites the origin of the user coordinate system to the present TCP.
198	00C6h	Configuration	Executes recalculation and setup of the parameter. Refer to the next section for details about Configuration.
199	00C7h	Batch data initialization (excluding parameters for mechanism and communication)	Restores the parameters stored in the non-volatile memory to their initial values. (Parameters related to the mechanism and communication settings are excluded.)
200	00C8h	Read batch NV memory	Reads the parameters stored in the non-volatile memory to the RAM. All parameters stored in the RAM are overwritten.
201	00C9h	Write batch NV memory	Writes the parameters stored in the RAM to the non-volatile memory. All parameters stored in the non-volatile memory are overwritten. The non-volatile memory can be rewritten approximately 100,000 times.
202	00CAh	Batch data initialization (excluding mechanism parameters)	Restores the parameters stored in the non-volatile memory to their initial values. (Parameters related to the mechanism setting are excluded.)
206	00CEh	Clear command history	Clears the command history.
208	00D0h	Execution of ETO-CLR input for all drivers	Turn the ETO-CLR input ON for all drivers except **AZD-KR2D**.
211	00D3h	Clear information	Clears the information being generated.
212	00D4h	Clear information history	Clears the information history.
213	00D5h	Alarm history details	When writing the number of history (1 to 10) to this command and executing the "Alarm history details" of the monitor command, the detailed items of the specified alarm history can be checked.

■ Configuration

Configuration can be executed when all of the following conditions are satisfied.

- An alarm is not present.
- The robot is not operated.
- Neither teaching nor writing data is being performed using the **MRC Studio** software.

The table below shows the status of the controller before and after Configuration is executed.

Item	Configuration is ready to execute	Configuration is being executed	After configuration is executed
POWER/ALARM LED	Green light	Red and green colors blink simultaneously (Green and red colors may overlap and it may be visible to orange.)	It depends on the status of the controller.
Output signal	Enable	Disable	Enable
Input signals	Enable	Disable	Enable

memo Even if monitor is executed while Configuration is being executed, the correct monitor value may not return.

4 Monitor commands

These commands are used to monitor the command position, the command speed, the alarm history, and the information history, etc. All commands are for READ.

Parameter ID		Name	Description
Dec	Hex		
64	0040h	Present alarm	Indicates the alarm code presently being generated.
65	0041h	Alarm history 1	Indicates the latest alarm history. When an alarm is present, the code is also indicated in the alarm history 1 simultaneously.
66	0042h	Alarm history 2	Indicates the alarm history.
67	0043h	Alarm history 3	
68	0044h	Alarm history 4	
69	0045h	Alarm history 5	
70	0046h	Alarm history 6	
71	0047h	Alarm history 7	
72	0048h	Alarm history 8	
73	0049h	Alarm history 9	
74	004Ah	Alarm history 10	Indicates the oldest alarm history.
97	0061h	Program number presently selected	Indicates the program number being selected. The priority is in order of the direct selection (D-SEL), and the M0 to M5 inputs.
106	006Ah	Direct I/O	Indicates the status of direct I/O. (Arrangement of bits ⇨p.152)
123	007Bh	Information	Indicates the information code being generated. (Details of Information code ⇨p.151)
124	007Ch	Controller temperature	Indicates the present temperature of the controller. (1=0.1 °C)
150	0096h	Starting number of loop	Indicates the command number that is the starting point of loop operation being executed. It is held until the next program operation is executed.
151	0097h	Number of loop times	Indicates the number of times that loop operation being executed is repeated. It is held until the next program operation is executed.
152	0098h	Present program number	Indicates the program number being executed. It is held until the next program operation is executed.
153	0099h	Present command number	Indicates the command number of program operation being executed. It is held until the next program operation is executed.
162	00A2h	Number of power-on times	Indicates the number of times the power supply was turned on.
169	00A9h	Elapsed time from BOOT	Indicates a time period having elapsed since the power supply was turned on.
176	00B0h	I/O status 1	Indicates the ON-OFF status of the internal I/O. (Arrangement of bits ⇨p.152)
177	00B1h	I/O status 2	
178	00B2h	I/O status 3	
179	00B3h	I/O status 4	
180	00B4h	I/O status 5	
181	00B5h	I/O status 6	
182	00B6h	I/O status 7	
183	00B7h	I/O status 8	
184	00B8h	I/O status 9	

Parameter ID		Name	Description
Dec	Hex		
185	00B9h	I/O status 10	Indicates the ON-OFF status of the internal I/O. (Arrangement of bits ⇨p.152)
186	00BAh	I/O status 11	
187	00BBh	I/O status 12	
188	00BCh	I/O status 13	
189	00BDh	I/O status 14	
190	00BEh	I/O status 15	
191	00BFh	I/O status 16	
653	028Dh	Enabled coordinates	Indicates the coordinates where the robot can operate in bits. 0000 0001: X 0000 0010: Y 0000 0100: Z 0000 1000: Rx 0001 0000: Ry 0010 0000: Rz 0100 0000: E1 1000 0000: E2
697	02B9h	Present coordinate system	Indicates the present coordinate system. 0: Base coordinate system 1: User coordinate system 1 2: User coordinate system 2 3: User coordinate system 3
1053	041Dh	Command position (user coordinate system) X	Indicates the command position in the user coordinate system. (1=0.001 mm)
1054	041Eh	Command position (user coordinate system) Y	
1055	041Fh	Command position (user coordinate system) Z	
1069	042Dh	Feedback position (user coordinate system) X	Indicates the feedback position in the user coordinate system. (1=0.001 mm)
1070	042Eh	Feedback position (user coordinate system) Y	
1071	042Fh	Feedback position (user coordinate system) Z	
1101	044Dh	Command position (base coordinate system) X	Indicates the command position in the base coordinate system. (1=0.001 mm)
1102	044Eh	Command position (base coordinate system) Y	
1103	044Fh	Command position (base coordinate system) Z	
1105	0451h	Command position Rx	Indicates the command position of each coordinate. (1=0.001 deg)
1106	0452h	Command position Ry	
1107	0453h	Command position Rz	
1117	045Dh	Feedback position (base coordinate system) X	Indicates the feedback position in the base coordinate system. (1=0.001 mm)
1118	045Eh	Feedback position (base coordinate system) Y	
1119	045Fh	Feedback position (base coordinate system) Z	
1121	0461h	Feedback position Rx	Indicates the feedback position of each coordinate. (1=0.001 deg)
1122	0462h	Feedback position Ry	
1123	0463h	Feedback position Rz	

Parameter ID		Name	Description
Dec	Hex		
1125	0465h	Command speed X	Indicates the command speed of each coordinate. (1=0.001 mm/s)
1126	0466h	Command speed Y	
1127	0467h	Command speed Z	
1129	0469h	Command speed Rx	Indicates the command speed of each coordinate. (1=0.001 deg/s)
1130	046Ah	Command speed Ry	
1131	046Bh	Command speed Rz	
1141	0475h	Feedback speed X	Indicates the feedback speed of each coordinate. (1=0.001 mm/s)
1142	0476h	Feedback speed Y	
1143	0477h	Feedback speed Z	
1145	0479h	Feedback speed Rx	Indicates the feedback speed of each coordinate. (1=0.001 deg/s)
1146	047Ah	Feedback speed Ry	
1147	047Bh	Feedback speed Rz	
1149	047Dh	Command position Axis 1	Indicates the command position of each axis. (1=0.001 mm or 1=0.001 deg)
1150	047Eh	Command position Axis 2	
1151	047Fh	Command position Axis 3	
1152	0480h	Command position Axis 4	
1153	0481h	Command position Axis 5	
1154	0482h	Command position Axis 6	
1155	0483h	Command position end-effector 1	
1156	0484h	Command position end-effector 2	
1165	048Dh	Feedback position Axis 1	Indicates the feedback position of each axis. (1=0.001 mm or 1=0.001 deg)
1166	048Eh	Feedback position Axis 2	
1167	048Fh	Feedback position Axis 3	
1168	0490h	Feedback position Axis 4	
1169	0491h	Feedback position Axis 5	
1170	0492h	Feedback position Axis 6	
1171	0493h	Feedback position end-effector 1	
1172	0494h	Feedback position end-effector 2	
1173	0495h	Command speed Axis 1	Indicates the command speed of each axis. (1=0.001 mm/s or 1=0.001 deg/s)
1174	0496h	Command speed Axis 2	
1175	0497h	Command speed Axis 3	
1176	0498h	Command speed Axis 4	
1177	0499h	Command speed Axis 5	
1178	049Ah	Command speed Axis 6	
1179	049Bh	Command speed end-effector 1	
1180	049Ch	Command speed end-effector 2	
1189	04A5h	Feedback speed Axis 1	Indicates the feedback speed of each axis. (1=0.001 mm/s or 1=0.001 deg/s)
1190	04A6h	Feedback speed Axis 2	
1191	04A7h	Feedback speed Axis 3	
1192	04A8h	Feedback speed Axis 4	
1193	04A9h	Feedback speed Axis 5	
1194	04AAh	Feedback speed Axis 6	
1195	04ABh	Feedback speed end-effector 1	
1196	04ACh	Feedback speed end-effector 2	

Parameter ID		Name	Description
Dec	Hex		
1197	04ADh	Command position Axis 1	Indicates the command position of each axis. (step)
1198	04AEh	Command position Axis 2	
1199	04AFh	Command position Axis 3	
1200	04B0h	Command position Axis 4	
1201	04B1h	Command position Axis 5	
1202	04B2h	Command position Axis 6	
1203	04B3h	Command position end-effector 1	
1204	04B4h	Command position end-effector 2	
1213	04BDh	Feedback position Axis 1	Indicates the feedback position of each axis. (step)
1214	04BEh	Feedback position Axis 2	
1215	04BFh	Feedback position Axis 3	
1216	04C0h	Feedback position Axis 4	
1217	04C1h	Feedback position Axis 5	
1218	04C2h	Feedback position Axis 6	
1219	04C3h	Feedback position end-effector 1	
1220	04C4h	Feedback position end-effector 2	
1221	04C5h	Command speed Axis 1	Indicates the command speed of each axis. (Hz)
1222	04C6h	Command speed Axis 2	
1223	04C7h	Command speed Axis 3	
1224	04C8h	Command speed Axis 4	
1225	04C9h	Command speed Axis 5	
1226	04CAh	Command speed Axis 6	
1227	04CBh	Command speed end-effector 1	
1228	04CCh	Command speed end-effector 2	
1237	04D5h	Feedback speed Axis 1	Indicates the feedback speed of each axis. (Hz)
1238	04D6h	Feedback speed Axis 2	
1239	04D7h	Feedback speed Axis 3	
1240	04D8h	Feedback speed Axis 4	
1241	04D9h	Feedback speed Axis 5	
1242	04DAh	Feedback speed Axis 6	
1243	04DBh	Feedback speed end-effector 1	
1244	04DCh	Feedback speed end-effector 2	
1246	04DEh	Feedback speed XYZ	Indicates the feedback speed of X, Y, and Z. The feedback speed is the composite rate of X, Y, and Z. (1=0.001 mm/s)
1247	04DFh	Feedback speed RxRyRz	Indicates the feedback speed of Rx, Ry, and Rz. The feedback speed is the composite rate of Rx, Ry, and Rz. (1=0.001 deg/s)
1250	04E2h	Command speed XYZ	Indicates the command speed of X, Y, and Z. The command speed is the composite rate of X, Y, and Z. (1=0.001 mm/s)
1251	04E3h	Command speed RxRyRz	Indicates the command speed of Rx, Ry, and Rz. The command speed is the composite rate of Rx, Ry, and Rz. (1=0.001 deg/s)

Parameter ID		Name	Description
Dec	Hex		
1254	04E6h	Operating current Axis 1	Indicates the operating current of each axis. (1=0.1 %)
1255	04E7h	Operating current Axis 2	
1256	04E8h	Operating current Axis 3	
1257	04E9h	Operating current Axis 4	
1258	04EAh	Operating current Axis 5	
1259	04EBh	Operating current Axis 6	
1260	04ECh	Operating current end-effector 1	
1261	04EDh	Operating current end-effector 2	
1275	04FBh	Alarm history details (Alarm code)	Indicates the description of the alarm history specified by the "Alarm history details" of the maintenance command.
1276	04FCh	Alarm history details (Sub code)	
1277	04FDh	Alarm history details (Controller temperature)	
1278	04FEh	Alarm history details (Physical I/O input)	
1279	04FFh	Alarm history details (R-I/O output)	
1280	0500h	Alarm history details (Program number)	
1281	0501h	Alarm history details (Command number)	
1282	0502h	Alarm history details (Operation type)	
1283	0503h	Alarm history details (Feedback position X)	
1284	0504h	Alarm history details (Feedback position Y)	
1285	0505h	Alarm history details (Feedback position Z)	
1286	0506h	Alarm history details (Feedback position Rx)	
1287	0507h	Alarm history details (Feedback position Ry)	
1288	0508h	Alarm history details (Feedback position Rz)	
1289	0509h	Alarm history details (Feedback position end-effector 1)	
1290	050Ah	Alarm history details (Feedback position end-effector 2)	
1291	050Bh	Alarm history details (Elapsed time from Boot)	
1292	050Ch	Alarm history details (Elapsed time from starting operation)	
1296	0510h	Information history 1	Indicates the latest information history. When information is being generated, its code is also indicated on the information history 1 simultaneously.

Parameter ID		Name	Description
Dec	Hex		
1297	0511h	Information history 2	Indicates the information history.
1298	0512h	Information history 3	
1299	0513h	Information history 4	
1300	0514h	Information history 5	
1301	0515h	Information history 6	
1302	0516h	Information history 7	
1303	0517h	Information history 8	
1304	0518h	Information history 9	
1305	0519h	Information history 10	
1306	051Ah	Information history 11	
1307	051Bh	Information history 12	
1308	051Ch	Information history 13	
1309	051Dh	Information history 14	
1310	051Eh	Information history 15	
1311	051Fh	Information history 16	Indicates the oldest information history.
1312	0520h	Information time history 1	Indicates the history of the time when the latest information was generated. When information is being generated, the time when the present information was generated is indicated.
1313	0521h	Information time history 2	Indicates the history of the time when information was generated.
1314	0522h	Information time history 3	
1315	0523h	Information time history 4	
1316	0524h	Information time history 5	
1317	0525h	Information time history 6	
1318	0526h	Information time history 7	
1319	0527h	Information time history 8	
1320	0528h	Information time history 9	
1321	0529h	Information time history 10	
1322	052Ah	Information time history 11	
1323	052Bh	Information time history 12	
1324	052Ch	Information time history 13	
1325	052Dh	Information time history 14	
1326	052Eh	Information time history 15	
1327	052Fh	Information time history 16	Indicates the history of the time when the oldest information was generated.
1408	0580h	Maximum command speed XYZ	Indicates the maximum command speed of X, Y, and Z after the power supply is turned on. The maximum command speed is the composite rate of X, Y, and Z. (1=0.001 mm/s)
1409	0581h	Maximum command speed RxRyRz	Indicates the maximum command speed of Rx, Ry, and Rz after the power supply is turned on. The maximum command speed is the composite rate of Rx, Ry, and Rz. (1=0.001 deg/s)

Parameter ID		Name	Description
Dec	Hex		
1412	0584h	Maximum command speed Axis 1	Indicates the maximum command speed of each axis after the power supply is turned on. (1=0.001 mm/s or 1=0.001 deg/s)
1413	0585h	Maximum command speed Axis 2	
1414	0586h	Maximum command speed Axis 3	
1415	0587h	Maximum command speed Axis 4	
1416	0588h	Maximum command speed Axis 5	
1417	0589h	Maximum command speed Axis 6	
1418	058Ah	Maximum command speed end-effector 1	
1419	058Bh	Maximum command speed end-effector 2	
1420	058Ch	Maximum command speed [Hz] Axis 1	Indicates the maximum command speed of each axis after the power supply is turned on.
1421	058Dh	Maximum command speed [Hz] Axis 2	
1422	058Eh	Maximum command speed [Hz] Axis 3	
1423	058Fh	Maximum command speed [Hz] Axis 4	
1424	0590h	Maximum command speed [Hz] Axis 5	
1425	0591h	Maximum command speed [Hz] Axis 6	
1426	0592h	Maximum command speed [Hz] end-effector 1	
1427	0593h	Maximum command speed [Hz] end-effector 2	
1428	0594h	Maximum load factor Axis 1	Indicates the maximum load factor of each axis after the power supply is turned on. (1=0.1 %)
1429	0595h	Maximum load factor Axis 2	
1430	0596h	Maximum load factor Axis 3	
1431	0597h	Maximum load factor Axis 4	
1432	0598h	Maximum load factor Axis 5	
1433	0599h	Maximum load factor Axis 6	
1434	059Ah	Maximum load factor end-effector 1	
1435	059Bh	Maximum load factor end-effector 2	
1448	05A8h	Driver communication status	Indicate the communication status of each axis in bits. 0000 0001: Axis 1 0000 0010: Axis 2 0000 0100: Axis 3 0000 1000: Axis 4 0001 0000: Axis 5 0010 0000: Axis 6 0100 0000: End effector 1 1000 0000: End effector 2
1632	0660h	Command history 1	Indicates the latest command number among the commands executed until now. During operation, the value same as the "Present command number" is also indicated in the command history 1.

Parameter ID		Name	Description
Dec	Hex		
1633	0661h	Command history 2	Indicates the history of command numbers executed until now.
1634	0662h	Command history 3	
1635	0663h	Command history 4	
1636	0664h	Command history 5	
1637	0665h	Command history 6	
1638	0666h	Command history 7	
1639	0667h	Command history 8	
1640	0668h	Command history 9	
1641	0669h	Command history 10	
1642	066Ah	Command history 11	
1643	066Bh	Command history 12	
1644	066Ch	Command history 13	
1645	066Dh	Command history 14	
1646	066Eh	Command history 15	
1647	066Fh	Command history 16	Indicates the oldest command number among the commands executed until now.
2688	0A80h	Camera coordinate transformation error	Indicates an error that occurred when converting the "(DD) Camera coordinate" to the base coordinate system with the camera selected in the "(DD) Camera number selection." 0: No error 1: Camera 1: Not calibrated 2: Camera 2: Not calibrated 3: Coordinate transformation failed 4: Unsupported camera number (a camera other than camera 1 or camera 2 is selected)
2689	0A81h	Present camera number	Indicates the camera number selected in the "(DD) Camera number selection."
2690	0A82h	Present camera calibration method	Indicates the calibration method of the camera selected in the "(DD) Camera number selection." 0: Not calibrated 1: Fixed camera method 2: Hand-eye method
2697	0A89h	Camera coordinate base transformation value X	Indicates the value that each coordinate value set in the "(DD) Camera coordinate" is converted to the base coordinate system using the camera selected in the "(DD) Camera number selection" of Implicit message.
2698	0A8Ah	Camera coordinate base transformation value Y	
2702	0A8Eh	Camera coordinate base transformation value Rz	
2703	0A8Fh	Camera 1 calibration method	Indicates the calibration method of the camera 1. 0: Not calibrated 1: Fixed camera method 2: Hand-eye method
2705	0A91h	Camera 2 calibration method	Indicates the calibration method of the camera 2. 0: Not calibrated 1: Fixed camera method 2: Hand-eye method
3989	0F95h	Pallet number being executed	Indicates the pallet number selected in pallet operation being executed. It is held until the next pallet operation is executed.
3990	0F96h	Pallet 1 next cell position (horizontal)	Indicates the next cell position of the pallet 1. Indicates to which cell is moved from the start position S.
3991	0F97h	Pallet 1 next cell position (vertical)	

Parameter ID		Name	Description
Dec	Hex		
3992	0F98h	Pallet 2 next cell position (horizontal)	Indicates the next cell position of the pallet 2. Indicates to which cell is moved from the start position S.
3993	0F99h	Pallet 2 next cell position (vertical)	
3994	0F9Ah	Pallet 3 next cell position (horizontal)	Indicates the next cell position of the pallet 3. Indicates to which cell is moved from the start position S.
3995	0F9Bh	Pallet 3 next cell position (vertical)	
3996	0F9Ch	Pallet 4 next cell position (horizontal)	Indicates the next cell position of the pallet 4. Indicates to which cell is moved from the start position S.
3997	0F9Dh	Pallet 4 next cell position (vertical)	
3998	0F9Eh	Pallet 5 next cell position (horizontal)	Indicates the next cell position of the pallet 5. Indicates to which cell is moved from the start position S.
3999	0F9Fh	Pallet 5 next cell position (vertical)	
4000	0FA0h	Pallet 6 next cell position (horizontal)	Indicates the next cell position of the pallet 6. Indicates to which cell is moved from the start position S.
4001	0FA1h	Pallet 6 next cell position (vertical)	
4012	0FACh	Pallet 1 next cell number	Indicates the next cell number of the pallet 1.
4013	0FADh	Pallet 2 next cell number	Indicates the next cell number of the pallet 2.
4014	0FAEh	Pallet 3 next cell number	Indicates the next cell number of the pallet 3.
4015	0FAFh	Pallet 4 next cell number	Indicates the next cell number of the pallet 4.
4016	0FB0h	Pallet 5 next cell number	Indicates the next cell number of the pallet 5.
4017	0FB1h	Pallet 6 next cell number	Indicates the next cell number of the pallet 6.

■ Information codes

Information codes are indicated in eight hexadecimal digits. They can also be read in 32 bits.
If multiple information items are generated, the logical sum (OR) of the information codes is indicated.

Example: When information of "TCP positive direction operation prohibition" and "Axis positive direction operation prohibition" is generated

Information code of TCP positive direction operation prohibition: 0001 0000h
Information code of Axis positive direction operation prohibition: 0004 0000h
Logical sum (OR) of two information codes: 0005 0000h

Information code	32 bits indication	Information item
00000001h	0000 0000 0000 0000 0000 0000 0000 0001	I/O (user setting)
00000004h	0000 0000 0000 0000 0000 0000 0000 0100	Controller temperature
00000080h	0000 0000 0000 0000 0000 0000 1000 0000	TCP speed
00000100h	0000 0000 0000 0000 0000 0001 0000 0000	Axis speed
00000200h	0000 0000 0000 0000 0000 0010 0000 0000	Operation start error
00000400h	0000 0000 0000 0000 0000 0100 0000 0000	ZHOME start error
00000800h	0000 0000 0000 0000 0000 1000 0000 0000	Preset request
00002000h	0000 0000 0000 0000 0010 0000 0000 0000	Mechanism information mismatch
00008000h	0000 0000 0000 0000 1000 0000 0000 0000	RS-485 communication error
00010000h	0000 0000 0000 0001 0000 0000 0000 0000	TCP positive direction operation prohibition
00020000h	0000 0000 0000 0010 0000 0000 0000 0000	TCP negative direction operation prohibition
00040000h	0000 0000 0000 0100 0000 0000 0000 0000	Axis positive direction operation prohibition
00080000h	0000 0000 0000 1000 0000 0000 0000 0000	Axis negative direction operation prohibition
00100000h	0000 0000 0001 0000 0000 0000 0000 0000	Approach TCP inhibition area
00200000h	0000 0000 0010 0000 0000 0000 0000 0000	Near singularity
00400000h	0000 0000 0100 0000 0000 0000 0000 0000	Robot posture error
00800000h	0000 0000 1000 0000 0000 0000 0000 0000	Slip mode
04000000h	0000 0100 0000 0000 0000 0000 0000 0000	Driver connection setting incomplete
08000000h	0000 1000 0000 0000 0000 0000 0000 0000	Driver information detection
10000000h	0001 0000 0000 0000 0000 0000 0000 0000	Operation start restricted mode
20000000h	0010 0000 0000 0000 0000 0000 0000 0000	I/O test mode
40000000h	0100 0000 0000 0000 0000 0000 0000 0000	Configuration request
80000000h	1000 0000 0000 0000 0000 0000 0000 0000	Reboot request

■ Direct I/O

The arrangement of bits for direct I/O is indicated.

Parameter ID	Description							
106 (006Ah)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	DOUT7	DOUT6	DOUT5	DOUT4	DOUT3	DOUT2	DOUT1	DOUT0
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	DIN7	DIN6	DIN5	DIN4	DIN3	DIN2	DIN1	DIN0

■ I/O status

The arrangement of bits for internal I/O is indicated.

● Input signals

Parameter ID	Description							
176 (00B0h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	HMI	INFO-CLR-DRV	INFO-CLR-CNT	INFO-CLR	–	ETO-CLR-DRV	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	ALM-RST-DRV	ALM-RST-CNT	ALM-RST	E-STOP	–	PAUSE	STOP
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	FREE-E2	FREE-E1	FREE-RB	FREE	–
177 (00B1h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	PRG-ROUT-CLR	PRG-DOUT-CLR	P-PRESET-RB	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	SPD-LMT3	SPD-LMT2	SPD-LMT1	CRNT-LMT3	CRNT-LMT2	CRNT-LMT1
178 (00B2h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	SSTART	START
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	D-SEL7	D-SEL6	D-SEL5	D-SEL4	D-SEL3	D-SEL2	D-SEL1	D-SEL0
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	ZHOME-E2	ZHOME-E1	ZHOME-RB	ZHOME-ALL	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	M5	M4	M3	M2	M1	M0

Parameter ID	Description							
179 (00B3h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	JOG-A8–	JOG-A8+	JOG-A7–	JOG-A7+	JOG-A6–	JOG-A6+	JOG-A5–	JOG-A5+
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	JOG-A4–	JOG-A4+	JOG-A3–	JOG-A3+	JOG-A2–	JOG-A2+	JOG-A1–	JOG-A1+
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	JOG-E2–	JOG-E2+	JOG-E1–	JOG-E1+	JOG-RZ–	JOG-RZ+	JOG-RY–	JOG-RY+
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	JOG-RX–	JOG-RX+	JOG-Z–	JOG-Z+	JOG-Y–	JOG-Y+	JOG-X–	JOG-X+
180 (00B4h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	JOG-P-A8–	JOG-P-A8+	JOG-P-A7–	JOG-P-A7+	JOG-P-A6–	JOG-P-A6+	JOG-P-A5–	JOG-P-A5+
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	JOG-P-A4–	JOG-P-A4+	JOG-P-A3–	JOG-P-A3+	JOG-P-A2–	JOG-P-A2+	JOG-P-A1–	JOG-P-A1+
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	JOG-P-E2–	JOG-P-E2+	JOG-P-E1–	JOG-P-E1+	JOG-P-RZ–	JOG-P-RZ+	JOG-P-RY–	JOG-P-RY+
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	JOG-P-RX–	JOG-P-RX+	JOG-P-Z–	JOG-P-Z+	JOG-P-Y–	JOG-P-Y+	JOG-P-X–	JOG-P-X+
181 (00B5h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	PLT6-CLR	PLT5-CLR	PLT4-CLR	PLT3-CLR	PLT2-CLR	PLT1-CLR
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	PRG-DIN15	PRG-DIN14	PRG-DIN13	PRG-DIN12	PRG-DIN11	PRG-DIN10	PRG-DIN9	PRG-DIN8
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	PRG-DIN7	PRG-DIN6	PRG-DIN5	PRG-DIN4	PRG-DIN3	PRG-DIN2	PRG-DIN1	PRG-DIN0
182 (00B6h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	PRG-RIN31	PRG-RIN30	PRG-RIN29	PRG-RIN28	PRG-RIN27	PRG-RIN26	PRG-RIN25	PRG-RIN24
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	PRG-RIN23	PRG-RIN22	PRG-RIN21	PRG-RIN20	PRG-RIN19	PRG-RIN18	PRG-RIN17	PRG-RIN16
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	PRG-RIN15	PRG-RIN14	PRG-RIN13	PRG-RIN12	PRG-RIN11	PRG-RIN10	PRG-RIN9	PRG-RIN8
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	PRG-RIN7	PRG-RIN6	PRG-RIN5	PRG-RIN4	PRG-RIN3	PRG-RIN2	PRG-RIN1	PRG-RIN0
183 (00B7h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	R15	R14	R13	R12	R11	R10	R9	R8
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	R7	R6	R5	R4	R3	R2	R1	R0

● **Output signals**

Parameter ID	Description							
184 (00B8h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	CRNT-E2	CRNT-E1	CRNT-RB	CRNT	TLC-E2	TLC-E1	TLC-RB	TLC
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	ETO-MON-DRV	–	SYS-BSY	INFO-DRV	INFO-CNT	INFO
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	MOVE-CNT	CMD-END-CNT	–	CMD-END	WAIT	PRG-RUN	MOVE	READY
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	SYS-RDY	ALM-B-DRV	ALM-B-CNT	ALM-B	ALM-A-DRV	ALM-A-CNT	ALM-A	CONST-OFF
185 (00B9h)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	SLS-A4–	SLS-A4+	SLS-A3–	SLS-A3+	SLS-A2–	SLS-A2+	SLS-A1–	SLS-A1+
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	SLS-Z–	SLS-Z+	SLS-Y–	SLS-Y+	SLS-X–	SLS-X+
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	PRST-STLD-RB	–	–	ABSPEN	HOME-END	VA
186 (00BAh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	USR-OUT1	USR-OUT0
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	AREA2-AX	AREA1-AX	AREA0-AX	AREA4	AREA3	AREA2	AREA1	AREA0
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	SLS-A8–	SLS-A8+	SLS-A7–	SLS-A7+	SLS-A6–	SLS-A6+	SLS-A5–	SLS-A5+
187 (00BBh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	D-END7	D-END6	D-END5	D-END4	D-END3	D-END2	D-END1	D-END0
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	SPD-LMTD3	SPD-LMTD2	SPD-LMTD1	CRNT-LMTD3	CRNT-LMTD2	CRNT-LMTD1	PAUSE-BSY
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	SLIP	PST-ERR	SGL-LMT	HANDSYS-EN	ROBOT-EN
188 (00BCh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	PRG-DOUT15	PRG-DOUT14	PRG-DOUT13	PRG-DOUT12	PRG-DOUT11	PRG-DOUT10	PRG-DOUT9	PRG-DOUT8
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	PRG-DOUT7	PRG-DOUT6	PRG-DOUT5	PRG-DOUT4	PRG-DOUT3	PRG-DOUT2	PRG-DOUT1	PRG-DOUT0

Parameter ID	Description							
189 (00BDh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	PRG-ROUT31	PRG-ROUT30	PRG-ROUT29	PRG-ROUT28	PRG-ROUT27	PRG-ROUT26	PRG-ROUT25	PRG-ROUT24
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	PRG-ROUT23	PRG-ROUT22	PRG-ROUT21	PRG-ROUT20	PRG-ROUT19	PRG-ROUT18	PRG-ROUT17	PRG-ROUT16
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	PRG-ROUT15	PRG-ROUT14	PRG-ROUT13	PRG-ROUT12	PRG-ROUT11	PRG-ROUT10	PRG-ROUT9	PRG-ROUT8
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	PRG-ROUT7	PRG-ROUT6	PRG-ROUT5	PRG-ROUT4	PRG-ROUT3	PRG-ROUT2	PRG-ROUT1	PRG-ROUT0
190 (00BEh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	–	–	–	–	–	–	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	–	–	–	–	–	–	–	–
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	–	–	–	–	–	–	–	–
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	–	–	–	–	–	–	–	–
191 (00BFh)	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	Bit 25	Bit 24
	INFO-RBT	INFO-CFG	INFO-IOTEST	INFO-DSLMTD	INFO-DRVINFO	INFO-DRVDIS	–	–
	Bit 23	Bit 22	Bit 21	Bit 20	Bit 19	Bit 18	Bit 17	Bit 16
	INFO-SLIP	INFO-PST-ERR	INFO-SGL-LMT	INFO-PHBAREA	INFO-OT-AX–	INFO-OT-AX+	INFO-OT-RB–	INFO-OT-RB+
	Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
	INFO-NET-E	–	INFO-MECHMIS	–	INFO-PR-REQ	INFO-ZHOME	INFO-START	INFO-AXISSPD
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	INFO-RBSPD	–	–	–	–	INFO-CNTTMP	–	INFO-USRIO

5 Parameters: Basic setting

5-1 Basic setting

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
485	01E5h	Stop current Axis 1	Sets the stop current for the axis 1.	1 to 1,000 (1=0.1 %)	500	A
486	01E6h	Stop current Axis 2	Sets the stop current for the axis 2.	1 to 1,000 (1=0.1 %)	500	A
487	01E7h	Stop current Axis 3	Sets the stop current for the axis 3.	1 to 1,000 (1=0.1 %)	500	A
488	01E8h	Stop current Axis 4	Sets the stop current for the axis 4.	1 to 1,000 (1=0.1 %)	500	A
489	01E9h	Stop current Axis 5	Sets the stop current for the axis 5.	1 to 1,000 (1=0.1 %)	500	A
490	01EAh	Stop current Axis 6	Sets the stop current for the axis 6.	1 to 1,000 (1=0.1 %)	500	A
491	01EBh	Stop current end-effector 1	Sets the stop current for the end effector 1.	1 to 1,000 (1=0.1 %)	500	A
492	01ECh	Stop current end-effector 2	Sets the stop current for the end effector 2.	1 to 1,000 (1=0.1 %)	500	A
509	01FDh	Simulation mode	Coordinates and the operating state of operation programs can be checked without operating a robot.	0: Disable 1: Enable	0	D
791	0317h	Coordinate system selection when power is turned on	Sets the coordinate system when the power supply is turned on.	0: Base coordinate system 1: User coordinate system 1 2: User coordinate system 2 3: User coordinate system 3	1	D
3754	0EAAh	Automatic current cutback function Axis 1	Enables the automatic current cutback function for the axis 1.	0: Disable 1: Enable	1	A
3755	0EABh	Automatic current cutback function Axis 2	Enables the automatic current cutback function for the axis 2.	0: Disable 1: Enable	1	A
3756	0EACh	Automatic current cutback function Axis 3	Enables the automatic current cutback function for the axis 3.	0: Disable 1: Enable	1	A
3757	0EADh	Automatic current cutback function Axis 4	Enables the automatic current cutback function for the axis 4.	0: Disable 1: Enable	1	A
3758	0EAEh	Automatic current cutback function Axis 5	Enables the automatic current cutback function for the axis 5.	0: Disable 1: Enable	1	A
3759	0EAFh	Automatic current cutback function Axis 6	Enables the automatic current cutback function for the axis 6.	0: Disable 1: Enable	1	A
3760	0EB0h	Automatic current cutback function end-effector 1	Enables the automatic current cutback function for the end effector 1.	0: Disable 1: Enable	1	A
3761	0EB1h	Automatic current cutback function end-effector 2	Enables the automatic current cutback function for the end effector 2.	0: Disable 1: Enable	1	A
3762	0EB2h	Automatic current cutback switching time Axis 1	Sets a time period from when the motor of the axis 1 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3763	0EB3h	Automatic current cutback switching time Axis 2	Sets a time period from when the motor of the axis 2 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3764	0EB4h	Automatic current cutback switching time Axis 3	Sets a time period from when the motor of the axis 3 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3765	0EB5h	Automatic current cutback switching time Axis 4	Sets a time period from when the motor of the axis 4 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3766	0EB6h	Automatic current cutback switching time Axis 5	Sets a time period from when the motor of the axis 5 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3767	0EB7h	Automatic current cutback switching time Axis 6	Sets a time period from when the motor of the axis 6 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3768	0EB8h	Automatic current cutback switching time end-effector 1	Sets a time period from when the end effector 1 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
3769	0EB9h	Automatic current cutback switching time end-effector 2	Sets a time period from when the end effector 2 stops until when the automatic current cutback function is activated.	110 to 1,000 ms	110	A
4542	11BEh	Stop axis current setting at operating	While executing operation, sets the current of the axis being stopped to the stop current or the operating current.	0: Stop current 1: Operating current	0	A

6 Parameters: Operation setting

6-1 Program/direct data operation

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
465	01D1h	Operating current Axis 1	Sets the operating current of program operation and direct data operation for the axis 1.	1 to 1,000 (1=0.1 %)	1,000	A
466	01D2h	Operating current Axis 2	Sets the operating current of program operation and direct data operation for the axis 2.	1 to 1,000 (1=0.1 %)	1,000	A
467	01D3h	Operating current Axis 3	Sets the operating current of program operation and direct data operation for the axis 3.	1 to 1,000 (1=0.1 %)	1,000	A
468	01D4h	Operating current Axis 4	Sets the operating current of program operation and direct data operation for the axis 4.	1 to 1,000 (1=0.1 %)	1,000	A
469	01D5h	Operating current Axis 5	Sets the operating current of program operation and direct data operation for the axis 5.	1 to 1,000 (1=0.1 %)	1,000	A
470	01D6h	Operating current Axis 6	Sets the operating current of program operation and direct data operation for the axis 6.	1 to 1,000 (1=0.1 %)	1,000	A
471	01D7h	Operating current end-effector 1	Set the operating current when end-effector operation is executed.	1 to 1,000 (1=0.1 %)	1,000	A
472	01D8h	Operating current end-effector 2				
473	01D9h	End-effector 1 push operating current	Sets the operating current when push-motion operation is executed in end-effector operation.	1 to 1,000 (1=0.1 %)	500	A
474	01DAh	End-effector 2 push operating current				
475	01DBh	End-effector 1 push-motion operation setting	Sets whether or not to enable push-motion operation is executed in end-effector operation. (This is exclusive for end-effector operation.)	1: Disable 2: Enable	2	A
476	01DCh	End-effector 2 push-motion operation setting				
1025	0401h	Circular center position radius tolerance	When selecting "2: Center position setting" in the setting method of the circular arc of circular interpolation operation, sets the permissible value of an error between the distance from the present position to the center position and that from the target position to the center position.	0 to 500,000 (1=0.001 mm)	5,000	A
3852	0F0Ch	Return-to-origin operation target coordinates selection	Selects the target coordinates for high-speed return-to-origin operation.	0: XYZ RxRyRz E1E2 1: XYZ RxRyRz 2: XYZ RxRyRz E1 3: XYZ RxRyRz E2 4: XYZ E1E2 5: XYZ E1 6: XYZ E2 7: XYZ	1	B

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3853	0F0Dh	Return-to-origin operation operation mode	Selects the operation mode for high-speed return-to-origin operation. Select "1: Linear" when returning to the origin while avoiding obstacles.	0: PTP 1: Linear	1	B
3854	0F0Eh	Return-to-origin operation speed	Sets the speed for high-speed return-to-origin operation.	1 to 250,000 (1=0.001 mm/s)*1	10,000	B
3855	0F0Fh	Return-to-origin operation acceleration/ deceleration	Sets the acceleration/deceleration for high-speed return-to-origin operation.	1 to 3,000,000 (1=0.001 mm/s^2)*2	1,200,000	B

*1 When the "Return-to-origin operation operation mode" parameter is set to "0: PTP," the unit is "deg/s."
*2 When the "Return-to-origin operation operation mode" parameter is set to "0: PTP," the unit is "deg/s^2."

6-2 Point data (for program operation)

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4190	105Eh	Point data 0 X	Set each coordinate for the point data 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4191	105Fh	Point data 0 Y				
4192	1060h	Point data 0 Z				
4193	1061h	Point data 0 Rx		−270,000 to 270,000 (1=0.001 deg)		
4194	1062h	Point data 0 Ry		−90,000 to 90,000 (1=0.001 deg)		
4195	1063h	Point data 0 Rz		−270,000 to 270,000 (1=0.001 deg)		
4198	1066h	Point data 1 X	Set each coordinate for the point data 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4199	1067h	Point data 1 Y				
4200	1068h	Point data 1 Z				
4201	1069h	Point data 1 Rx		−270,000 to 270,000 (1=0.001 deg)		
4202	106Ah	Point data 1 Ry		−90,000 to 90,000 (1=0.001 deg)		
4203	106Bh	Point data 1 Rz		−270,000 to 270,000 (1=0.001 deg)		
4206	106Eh	Point data 2 X	Set each coordinate for the point data 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4207	106Fh	Point data 2 Y				
4208	1070h	Point data 2 Z				
4209	1071h	Point data 2 Rx		−270,000 to 270,000 (1=0.001 deg)		
4210	1072h	Point data 2 Ry		−90,000 to 90,000 (1=0.001 deg)		
4211	1073h	Point data 2 Rz		−270,000 to 270,000 (1=0.001 deg)		

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4214	1076h	Point data 3 X	Set each coordinate for the point data 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4215	1077h	Point data 3 Y				
4216	1078h	Point data 3 Z				
4217	1079h	Point data 3 Rx		−270,000 to 270,000 (1=0.001 deg)		
4218	107Ah	Point data 3 Ry		−90,000 to 90,000 (1=0.001 deg)		
4219	107Bh	Point data 3 Rz		−270,000 to 270,000 (1=0.001 deg)		
4222	107Eh	Point data 4 X	Set each coordinate for the point data 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4223	107Fh	Point data 4 Y				
4224	1080h	Point data 4 Z				
4225	1081h	Point data 4 Rx		−270,000 to 270,000 (1=0.001 deg)		
4226	1082h	Point data 4 Ry		−90,000 to 90,000 (1=0.001 deg)		
4227	1083h	Point data 4 Rz		−270,000 to 270,000 (1=0.001 deg)		
4230	1086h	Point data 5 X	Set each coordinate for the point data 5.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4231	1087h	Point data 5 Y				
4232	1088h	Point data 5 Z				
4233	1089h	Point data 5 Rx		−270,000 to 270,000 (1=0.001 deg)		
4234	108Ah	Point data 5 Ry		−90,000 to 90,000 (1=0.001 deg)		
4235	108Bh	Point data 5 Rz		−270,000 to 270,000 (1=0.001 deg)		
4238	108Eh	Point data 6 X	Set each coordinate for the point data 6.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4239	108Fh	Point data 6 Y				
4240	1090h	Point data 6 Z				
4241	1091h	Point data 6 Rx		−270,000 to 270,000 (1=0.001 deg)		
4242	1092h	Point data 6 Ry		−90,000 to 90,000 (1=0.001 deg)		
4243	1093h	Point data 6 Rz		−270,000 to 270,000 (1=0.001 deg)		
4246	1096h	Point data 7 X	Set each coordinate for the point data 7.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4247	1097h	Point data 7 Y				
4248	1098h	Point data 7 Z				
4249	1099h	Point data 7 Rx		−270,000 to 270,000 (1=0.001 deg)		
4250	109Ah	Point data 7 Ry		−90,000 to 90,000 (1=0.001 deg)		
4251	109Bh	Point data 7 Rz		−270,000 to 270,000 (1=0.001 deg)		

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4382	111Eh	Point data 8 X	Set each coordinate for the point data 8.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4383	111Fh	Point data 8 Y				
4384	1120h	Point data 8 Z				
4385	1121h	Point data 8 Rx		−270,000 to 270,000 (1=0.001 deg)		
4386	1122h	Point data 8 Ry		−90,000 to 90,000 (1=0.001 deg)		
4387	1123h	Point data 8 Rz		−270,000 to 270,000 (1=0.001 deg)		
4390	1126h	Point data 9 X	Set each coordinate for the point data 9.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4391	1127h	Point data 9 Y				
4392	1128h	Point data 9 Z				
4393	1129h	Point data 9 Rx		−270,000 to 270,000 (1=0.001 deg)		
4394	112Ah	Point data 9 Ry		−90,000 to 90,000 (1=0.001 deg)		
4395	112Bh	Point data 9 Rz		−270,000 to 270,000 (1=0.001 deg)		
4398	112Eh	Point data 10 X	Set each coordinate for the point data 10.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4399	112Fh	Point data 10 Y				
4400	1130h	Point data 10 Z				
4401	1131h	Point data 10 Rx		−270,000 to 270,000 (1=0.001 deg)		
4402	1132h	Point data 10 Ry		−90,000 to 90,000 (1=0.001 deg)		
4403	1133h	Point data 10 Rz		−270,000 to 270,000 (1=0.001 deg)		
4406	1136h	Point data 11 X	Set each coordinate for the point data 11.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4407	1137h	Point data 11 Y				
4408	1138h	Point data 11 Z				
4409	1139h	Point data 11 Rx		−270,000 to 270,000 (1=0.001 deg)		
4410	113Ah	Point data 11 Ry		−90,000 to 90,000 (1=0.001 deg)		
4411	113Bh	Point data 11 Rz		−270,000 to 270,000 (1=0.001 deg)		
4414	113Eh	Point data 12 X	Set each coordinate for the point data 12.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4415	113Fh	Point data 12 Y				
4416	1140h	Point data 12 Z				
4417	1141h	Point data 12 Rx		−270,000 to 270,000 (1=0.001 deg)		
4418	1142h	Point data 12 Ry		−90,000 to 90,000 (1=0.001 deg)		
4419	1143h	Point data 12 Rz		−270,000 to 270,000 (1=0.001 deg)		

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4422	1146h	Point data 13 X	Set each coordinate for the point data 13.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4423	1147h	Point data 13 Y				
4424	1148h	Point data 13 Z				
4425	1149h	Point data 13 Rx		−270,000 to 270,000 (1=0.001 deg)		
4426	114Ah	Point data 13 Ry		−90,000 to 90,000 (1=0.001 deg)		
4427	114Bh	Point data 13 Rz		−270,000 to 270,000 (1=0.001 deg)		
4430	114Eh	Point data 14 X	Set each coordinate for the point data 14.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4431	114Fh	Point data 14 Y				
4432	1150h	Point data 14 Z				
4433	1151h	Point data 14 Rx		−270,000 to 270,000 (1=0.001 deg)		
4434	1152h	Point data 14 Ry		−90,000 to 90,000 (1=0.001 deg)		
4435	1153h	Point data 14 Rz		−270,000 to 270,000 (1=0.001 deg)		
4438	1156h	Point data 15 X	Set each coordinate for the point data 15.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4439	1157h	Point data 15 Y				
4440	1158h	Point data 15 Z				
4441	1159h	Point data 15 Rx		−270,000 to 270,000 (1=0.001 deg)		
4442	115Ah	Point data 15 Ry		−90,000 to 90,000 (1=0.001 deg)		
4443	115Bh	Point data 15 Rz		−270,000 to 270,000 (1=0.001 deg)		

6-3 JOG/ZHOME operation

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3857	0F11h	JOG travel amount XYZ	Sets the travel amount for inching operation on the X, Y, and Z coordinates.	1 to 200,000 (1=0.001 mm)	10,000	B
3858	0F12h	JOG travel amount RxRyRz	Sets the travel amount for inching operation on the Rx, Ry, and Rz coordinates.	1 to 100,000 (1=0.001 deg)	5,000	B
3859	0F13h	JOG travel amount end-effector 1, 2	Sets the travel amount for inching operation of the end effector 1 and the end effector 2.	1 to 100,000 (1=0.001 mm or 1=0.001 deg)	1,000	B
3860	0F14h	JOG travel amount Axis	Sets the travel amount for inching operation of the axis.	1 to 100,000 (1=0.001 deg)	5,000	B
3861	0F15h	JOG operating speed XYZ TxTyTz	Sets the operating speed for JOG operation and inching operation on the X, Y, and Z coordinates, and that for JOG operation on the Tx, Ty, and Tz coordinates.	1 to 250,000 (1=0.001 mm/s)	20,000	B
3862	0F16h	JOG operating speed RxRyRz	Sets the operating speed for JOG operation and inching operation on the Rx, Ry, and Rz coordinates.	1 to 250,000 (1=0.001 deg/s)	10,000	B

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3863	0F17h	JOG operating speed end-effector 1, 2	Sets the operating speed for JOG operation and inching operation of the end effector 1 and the end effector 2.	1 to 250,000 (1=0.001 mm/s or 1=0.001 deg/s)	1,000	B
3864	0F18h	JOG operating speed Axis	Sets the operating speed for JOG operation and inching operation of the axis.	1 to 250,000 (1=0.001 deg/s)	10,000	B
3865	0F19h	JOG acceleration/ deceleration XYZ TxTyTz	Sets the acceleration/deceleration for JOG operation and inching operation on the X, Y, and Z coordinates, and that for JOG operation on the Tx, Ty, and Tz coordinates.	10 to 30,000,000 (1=0.001 mm/s^2)	1,200,000	B
3866	0F1Ah	JOG acceleration/ deceleration RxRyRz	Sets the acceleration/deceleration for JOG operation and inching operation on the Rx, Ry, and Rz coordinates.	10 to 30,000,000 (1=0.001 mm/s^2)	1,200,000	B
3867	0F1Bh	JOG acceleration/ deceleration end-effector 1, 2	Sets the acceleration/deceleration for JOG operation and inching operation of the end effector 1 and the end effector 2.	1 to 3,000,000 (1=0.001 mm/s^2 or 1=0.001 deg/s^2)	1,200,000	B
3868	0F1Ch	JOG acceleration/ deceleration Axis	Sets the acceleration/deceleration for JOG operation and inching operation of the axis.	1 to 3,000,000 (1=0.001 deg/s^2)	1,200,000	B
3869	0F1Dh	JOG push-motion operation mode end-effector 1	Sets the push-motion operation mode for JOG operation and inching operation of the end effector 1.	0: Disable 1: Enable	1	B
3870	0F1Eh	JOG push-motion operation mode end-effector 2	Sets the push-motion operation mode for JOG operation and inching operation of the end effector 2.	0: Disable 1: Enable	1	B
3874	0F22h	JOG/ZHOME operating current Axis 1	Sets the operating current for JOG operation and inching operation of the axis 1.	1 to 1,000 (1=0.1 %)	1,000	B
3875	0F23h	JOG/ZHOME operating current Axis 2	Sets the operating current for JOG operation and inching operation of the axis 2.	1 to 1,000 (1=0.1 %)	1,000	B
3876	0F24h	JOG/ZHOME operating current Axis 3	Sets the operating current for JOG operation and inching operation of the axis 3.	1 to 1,000 (1=0.1 %)	1.000	B
3877	0F25h	JOG/ZHOME operating current Axis 4	Sets the operating current for JOG operation and inching operation of the axis 4.	1 to 1,000 (1=0.1 %)	1.000	B
3878	0F26h	JOG/ZHOME operating current Axis 5	Sets the operating current for JOG operation and inching operation of the axis 5.	1 to 1,000 (1=0.1 %)	1.000	B
3879	0F27h	JOG/ZHOME operating current Axis 6	Sets the operating current for JOG operation and inching operation of the axis 6.	1 to 1,000 (1=0.1 %)	1.000	B
3880	0F28h	JOG/ZHOME operating current end-effector 1	Sets the operating current for JOG operation and inching operation of the end effector 1.	1 to 1,000 (1=0.1 %)	1.000	B
3881	0F29h	JOG/ZHOME operating current end-effector 2	Sets the operating current for JOG operation and inching operation of the end effector 2.	1 to 1,000 (1=0.1 %)	1.000	B
3882	0F2Ah	JOG push current end-effector 1	Sets the push current for JOG operation and inching operation of the end effector 1.	1 to 1,000 (1=0.1 %)	500	B
3883	0F2Bh	JOG push current end-effector 2	Sets the push current for JOG operation and inching operation of the end effector 2.	1 to 1,000 (1=0.1 %)	500	B

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3888	0F30h	ZHOME operation mode	Sets the operation mode for high-speed return-to-origin operation. Select "1: Linear" when returning to the origin while avoiding obstacles.	0: PTP 1: Linear	1	B
3889	0F31h	ZHOME-ALL operating speed	Sets the operating speed for high-speed return-to-origin operation.	1 to 250,000 (1=0.001 mm/s)	20,000	B
3890	0F32h	ZHOME-RB operating speed	Sets the operating speed for high-speed return-to-origin operation on the X, Y, and Z coordinates.	1 to 250,000 (1=0.001 mm/s)	10,000	B
3891	0F33h	ZHOME-E1 operating speed	Sets the operating speed for high-speed return-to-origin operation of the end effector 1.	1 to 250,000 (1=0.001 mm/s or 1=0.001 deg/s)	1,000	B
3892	0F34h	ZHOME-E2 operating speed	Sets the operating speed for high-speed return-to-origin operation of the end effector 2.	1 to 250,000 (1=0.001 mm/s or 1=0.001 deg/s)	1,000	B
3893	0F35h	ZHOME acceleration	Sets the acceleration/deceleration for high-speed return-to-origin operation.	1 to 3,000,000 (1=0.001 mm/s^2)	1,200,000	B

7 Parameters: Pallet setting

7-1 Pallets 1 to 6

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4042	0FCAh	Pallet 1 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 1 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4043	0FCBh	Pallet 1 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 1 in relative coordinates.		0	C
4044	0FCCh	Pallet 1 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 1 in relative coordinates.		0	C
4045	0FCDh	Pallet 1 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 1.	0 to 256	0	C
4046	0FCEh	Pallet 1 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 1 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4047	0FCFh	Pallet 1 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 1 in relative coordinates.		0	C
4048	0FD0h	Pallet 1 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 1 in relative coordinates.		0	C
4049	0FD1h	Pallet 1 vertical cell count	Sets the number of cells in the vertical direction of the pallet 1.	0 to 256	0	C
4051	0FD3h	Pallet 1 path	Sets the path of the pallet 1.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4052	0FD4h	Pallet 1 number of cells	Sets the number of cells of the pallet 1. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C
4066	0FE2h	Pallet 2 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 2 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4067	0FE3h	Pallet 2 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 2 in relative coordinates.		0	C
4068	0FE4h	Pallet 2 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 2 in relative coordinates.		0	C
4069	0FE5h	Pallet 2 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 2.	0 to 256	0	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4070	0FE6h	Pallet 2 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 2 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4071	0FE7h	Pallet 2 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 2 in relative coordinates.		0	C
4072	0FE8h	Pallet 2 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 2 in relative coordinates.		0	C
4073	0FE9h	Pallet 2 vertical cell count	Sets the number of cells in the vertical direction of the pallet 2.	0 to 256	0	C
4075	0FEBh	Pallet 2 path	Sets the path of the pallet 2.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4076	0FECh	Pallet 2 number of cells	Sets the number of cells of the pallet 2. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C
4090	0FFAh	Pallet 3 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 3 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4091	0FFBh	Pallet 3 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 3 in relative coordinates.		0	C
4092	0FFCh	Pallet 3 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 3 in relative coordinates.		0	C
4093	0FFDh	Pallet 3 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 3.	0 to 256	0	C
4094	0FFEh	Pallet 3 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 3 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4095	0FFFh	Pallet 3 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 3 in relative coordinates.		0	C
4096	1000h	Pallet 3 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 3 in relative coordinates.		0	C
4097	1001h	Pallet 3 vertical cell count	Sets the number of cells in the vertical direction of the pallet 3.	0 to 256	0	C
4099	1003h	Pallet 3 path	Sets the path of the pallet 3.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4100	1004h	Pallet 3 number of cells	Sets the number of cells of the pallet 3. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4114	1012h	Pallet 4 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 4 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4115	1013h	Pallet 4 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 4 in relative coordinates.		0	C
4116	1014h	Pallet 4 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 4 in relative coordinates.		0	C
4117	1015h	Pallet 4 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 4.	0 to 256	0	C
4118	1016h	Pallet 4 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 4 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4119	1017h	Pallet 4 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 4 in relative coordinates.		0	C
4120	1018h	Pallet 4 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 4 in relative coordinates.		0	C
4121	1019h	Pallet 4 vertical cell count	Sets the number of cells in the vertical direction of the pallet 4.	0 to 256	0	C
4123	101Bh	Pallet 4 path	Sets the path of the pallet 4.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4124	101Ch	Pallet 4 number of cells	Sets the number of cells of the pallet 4. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C
4138	102Ah	Pallet 5 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 5 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4139	102Bh	Pallet 5 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 5 in relative coordinates.		0	C
4140	102Ch	Pallet 5 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 5 in relative coordinates.		0	C
4141	102Dh	Pallet 5 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 5.	0 to 256	0	C
4142	102Eh	Pallet 5 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 5 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4143	102Fh	Pallet 5 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 5 in relative coordinates.		0	C
4144	1030h	Pallet 5 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 5 in relative coordinates.		0	C
4145	1031h	Pallet 5 vertical cell count	Sets the number of cells in the vertical direction of the pallet 5.	0 to 256	0	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4147	1033h	Pallet 5 path	Sets the path of the pallet 5.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4148	1034h	Pallet 5 number of cells	Sets the number of cells of the pallet 5. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C
4162	1042h	Pallet 6 horizontal direction end X coordinate	Sets the X coordinate of the horizontal direction end of the pallet 6 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4163	1043h	Pallet 6 horizontal direction end Y coordinate	Sets the Y coordinate of the horizontal direction end of the pallet 6 in relative coordinates.		0	C
4164	1044h	Pallet 6 horizontal direction end Z coordinate	Sets the Z coordinate of the horizontal direction end of the pallet 6 in relative coordinates.		0	C
4165	1045h	Pallet 6 horizontal cell count	Sets the number of cells in the horizontal direction of the pallet 6.	0 to 256	0	C
4166	1046h	Pallet 6 vertical direction end X coordinate	Sets the X coordinate of the vertical direction end of the pallet 6 in relative coordinates.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	C
4167	1047h	Pallet 6 vertical direction end Y coordinate	Sets the Y coordinate of the vertical direction end of the pallet 6 in relative coordinates.		0	C
4168	1048h	Pallet 6 vertical direction end Z coordinate	Sets the Z coordinate of the vertical direction end of the pallet 6 in relative coordinates.		0	C
4169	1049h	Pallet 6 vertical cell count	Sets the number of cells in the vertical direction of the pallet 6.	0 to 256	0	C
4171	104Bh	Pallet 6 path	Sets the path of the pallet 6.	0: Vertical direction (one way) 1: Vertical direction (back and forth) 2: Horizontal direction (one way) 3: Horizontal direction (back and forth)	0	C
4172	104Ch	Pallet 6 number of cells	Sets the number of cells of the pallet 6. The maximum number of cells is applied if 0 is set.	0 to 65,536	0	C

7-2 Pallet next cell number

The pallet next cell number is changed using the write parameter ID and the write data in the Implicit message. It cannot be changed by other methods. Refer to p.119 for data writing.

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
1026	0402h	Pallet 1 next cell number	Sets the next cell number of the pallet 1.	1 to 65,536	0	B
1027	0403h	Pallet 2 next cell number	Sets the next cell number of the pallet 2.			
1028	0404h	Pallet 3 next cell number	Sets the next cell number of the pallet 3.			
1029	0405h	Pallet 4 next cell number	Sets the next cell number of the pallet 4.			
1030	0406h	Pallet 5 next cell number	Sets the next cell number of the pallet 5.			
1031	0407h	Pallet 6 next cell number	Sets the next cell number of the pallet 6.			

8 Parameters: I/O setting

8-1 I/O operation and function

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
1790	06FEh	PAUSE input action	Selects how to stop the robot when the PAUSE input is turned ON.	0: Immediate stop 1: Deceleration stop	1	A
1791	06FFh	STOP input action	Selects how to stop the robot when the STOP input is turned ON.	0: Immediate stop 1: Deceleration stop	1	A
1802	070Ah	MOVE minimum ON time	Sets the minimum time during which the MOVE output remains ON.	0 to 255 ms	0	A
1803	070Bh	PAUSE standby condition selection	Selects a standby state when the PAUSE input is turned ON.	0: Standstill mode 1: Operation mode	0	A
1888	0760h	D-SEL0 operation number selection	Sets a program number to be started when the D-SEL0 input is turned ON.	0 to 63	0	A
1889	0761h	D-SEL1 operation number selection	Sets a program number to be started when the D-SEL1 input is turned ON.	0 to 63	1	A
1890	0762h	D-SEL2 operation number selection	Sets a program number to be started when the D-SEL2 input is turned ON.	0 to 63	2	A
1891	0763h	D-SEL3 operation number selection	Sets a program number to be started when the D-SEL3 input is turned ON.	0 to 63	3	A
1892	0764h	D-SEL4 operation number selection	Sets a program number to be started when the D-SEL4 input is turned ON.	0 to 63	4	A
1893	0765h	D-SEL5 operation number selection	Sets a program number to be started when the D-SEL5 input is turned ON.	0 to 63	5	A
1894	0766h	D-SEL6 operation number selection	Sets a program number to be started when the D-SEL6 input is turned ON.	0 to 63	6	A
1895	0767h	D-SEL7 operation number selection	Sets a program number to be started when the D-SEL7 input is turned ON.	0 to 63	7	A
1896	0768h	D-END0 operation number selection	Sets a program number corresponding to the D-END0 output.	0 to 63	0	A
1897	0769h	D-END1 operation number selection	Sets a program number corresponding to the D-END1 output.	0 to 63	1	A
1898	076Ah	D-END2 operation number selection	Sets a program number corresponding to the D-END2 output.	0 to 63	2	A
1899	076Bh	D-END3 operation number selection	Sets a program number corresponding to the D-END3 output.	0 to 63	3	A
1900	076Ch	D-END4 operation number selection	Sets a program number corresponding to the D-END4 output.	0 to 63	4	A
1901	076Dh	D-END5 operation number selection	Sets a program number corresponding to the D-END5 output.	0 to 63	5	A
1902	076Eh	D-END6 operation number selection	Sets a program number corresponding to the D-END6 output.	0 to 63	6	A
1903	076Fh	D-END7 operation number selection	Sets a program number corresponding to the D-END7 output.	0 to 63	7	A
3778	0EC2h	CRNT-LMT1 operating current limit value Axis 1	Sets the operating current of the axis 1 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3779	0EC3h	CRNT-LMT1 operating current limit value Axis 2	Sets the operating current of the axis 2 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3780	0EC4h	CRNT-LMT1 operating current limit value Axis 3	Sets the operating current of the axis 3 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3781	0EC5h	CRNT-LMT1 operating current limit value Axis 4	Sets the operating current of the axis 4 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3782	0EC6h	CRNT-LMT1 operating current limit value Axis 5	Sets the operating current of the axis 5 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3783	0EC7h	CRNT-LMT1 operating current limit value Axis 6	Sets the operating current of the axis 6 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3784	0EC8h	CRNT-LMT1 operating current limit value end-effector 1	Sets the operating current of the end effector 1 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3785	0EC9h	CRNT-LMT1 operating current limit value end-effector 2	Sets the operating current of the end effector 2 that is limited by the CRNT-LMT1 input.	1 to 1,000 (1=0.1 %)	500	A
3786	0ECAh	CRNT-LMT2 operating current limit value Axis 1	Sets the operating current of the axis 1 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3787	0ECBh	CRNT-LMT2 operating current limit value Axis 2	Sets the operating current of the axis 2 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3788	0ECCh	CRNT-LMT2 operating current limit value Axis 3	Sets the operating current of the axis 3 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3789	0ECDh	CRNT-LMT2 operating current limit value Axis 4	Sets the operating current of the axis 4 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3790	0ECEh	CRNT-LMT2 operating current limit value Axis 5	Sets the operating current of the axis 5 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3791	0ECFh	CRNT-LMT2 operating current limit value Axis 6	Sets the operating current of the axis 6 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3792	0ED0h	CRNT-LMT2 operating current limit value end-effector 1	Sets the operating current of the end effector 1 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3793	0ED1h	CRNT-LMT2 operating current limit value end-effector 2	Sets the operating current of the end effector 2 that is limited by the CRNT-LMT2 input.	1 to 1,000 (1=0.1 %)	500	A
3794	0ED2h	CRNT-LMT3 operating current limit value Axis 1	Sets the operating current of the axis 1 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3795	0ED3h	CRNT-LMT3 operating current limit value Axis 2	Sets the operating current of the axis 2 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3796	0ED4h	CRNT-LMT3 operating current limit value Axis 3	Sets the operating current of the axis 3 that is limiteds by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3797	0ED5h	CRNT-LMT3 operating current limit value Axis 4	Sets the operating current of the axis 4 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3798	0ED6h	CRNT-LMT3 operating current limit value Axis 5	Sets the operating current of the axis 5 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3799	0ED7h	CRNT-LMT3 operating current limit value Axis 6	Sets the operating current of the axis 6 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3800	0ED8h	CRNT-LMT3 operating current limit value end-effector 1	Sets the operating current of the end effector 1 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3801	0ED9h	CRNT-LMT3 operating current limit value end-effector 2	Sets the operating current of the end effector 2 that is limited by the CRNT-LMT3 input.	1 to 1,000 (1=0.1 %)	500	A
3802	0EDAh	SPD-LMT1 speed limit type selection	Selects the setting method of the speed limit value that is limited by the SPD-LMT1 input.	0: Ratio 1: Value	0	A
3803	0EDBh	SPD-LMT2 speed limit type selection	Selects the setting method of the speed limit value that is limited by the SPD-LMT2 input.	0: Ratio 1: Value	0	A
3804	0EDCh	SPD-LMT3 speed limit type selection	Selects the setting method of the speed limit value that is limited by the SPD-LMT3 input.	0: Ratio 1: Value	0	A
3805	0EDDh	SPD-LMT1 speed limit ratio	Sets the percentage of the speed limit based on the "Speed" of the command being 100 %. This is enabled when the "SPD-LMT1 speed limit type selection" parameter is set to "0: Ratio."	1 to 100 %	50	A
3806	0EDEh	SPD-LMT2 speed limit ratio	Sets the percentage of the speed limit based on the "Speed" of the command being 100 %. This is enabled when the "SPD-LMT2 speed limit type selection" parameter is set to "0: Ratio."	1 to 100 %	50	A
3807	0EDFh	SPD-LMT3 speed limit ratio	Sets the percentage of the speed limit based on the "Speed" of the command being 100 %. This is enabled when the "SPD-LMT3 speed limit type selection" parameter is set to "0: Ratio."	1 to 100 %	50	A
3808	0EE0h	SPD-LMT1 speed limit value	Sets the upper limit value of the speed. This is enabled when the "SPD-LMT1 speed limit type selection" parameter is set to "1: Value."	1 to 2,000,000 (1=0.001 mm/s)	10,000	A
3809	0EE1h	SPD-LMT2 speed limit value	Sets the upper limit value of the speed. This is enabled when the "SPD-LMT2 speed limit type selection" parameter is set to "1: Value."	1 to 2,000,000 (1=0.001 mm/s)	10,000	A
3810	0EE2h	SPD-LMT3 speed limit value	Sets the upper limit value of the speed. This is enabled when the "SPD-LMT3 speed limit type selection" parameter is set to "1: Value."	1 to 2,000,000 (1=0.001 mm/s)	10,000	A

8-2 Direct-IN (DIN)

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2112	0840h	DIN0 input function	Selects an input signal to be assigned to DIN0.	Input signals list ⇨p.203	16: STOP	C
2113	0841h	DIN1 input function	Selects an input signal to be assigned to DIN1.		2: FREE-RB	C
2114	0842h	DIN2 input function	Selects an input signal to be assigned to DIN2.		25: ETO-CLR-DRV	C
2115	0843h	DIN3 input function	Selects an input signal to be assigned to DIN3.		20: ALM-RST	C
2116	0844h	DIN4 input function	Selects an input signal to be assigned to DIN4.		17: PAUSE	C
2117	0845h	DIN5 input function	Selects an input signal to be assigned to DIN5.		0: Not used	C
2118	0846h	DIN6 input function	Selects an input signal to be assigned to DIN6.		160: PRG-IN0	C
2119	0847h	DIN7 input function	Selects an input signal to be assigned to DIN7.		161: PRG-IN1	C
2128	0850h	DIN0 inverting mode	Changes the ON-OFF status of DIN0.	0: Not invert 1: Invert	0	C
2129	0851h	DIN1 inverting mode	Changes the ON-OFF status of DIN1.	0: Not invert 1: Invert	0	C
2130	0852h	DIN2 inverting mode	Changes the ON-OFF status of DIN2.	0: Not invert 1: Invert	0	C
2131	0853h	DIN3 inverting mode	Changes the ON-OFF status of DIN3.	0: Not invert 1: Invert	0	C
2132	0854h	DIN4 inverting mode	Changes the ON-OFF status of DIN4.	0: Not invert 1: Invert	0	C
2133	0855h	DIN5 inverting mode	Changes the ON-OFF status of DIN5.	0: Not invert 1: Invert	0	C
2134	0856h	DIN6 inverting mode	Changes the ON-OFF status of DIN6.	0: Not invert 1: Invert	0	C
2135	0857h	DIN7 inverting mode	Changes the ON-OFF status of DIN7.	0: Not invert 1: Invert	0	C
2240	08C0h	DIN0 ON signal dead-time	Sets the ON signal dead-time of DIN0.	0 to 250 ms	0	C
2241	08C1h	DIN1 ON signal dead-time	Sets the ON signal dead-time of DIN1.	0 to 250 ms	0	C
2242	08C2h	DIN2 ON signal dead-time	Sets the ON signal dead-time of DIN2.	0 to 250 ms	0	C
2243	08C3h	DIN3 ON signal dead-time	Sets the ON signal dead-time of DIN3.	0 to 250 ms	0	C
2244	08C4h	DIN4 ON signal dead-time	Sets the ON signal dead-time of DIN4.	0 to 250 ms	0	C
2245	08C5h	DIN5 ON signal dead-time	Sets the ON signal dead-time of DIN5.	0 to 250 ms	0	C
2246	08C6h	DIN6 ON signal dead-time	Sets the ON signal dead-time of DIN6.	0 to 250 ms	0	C
2247	08C7h	DIN7 ON signal dead-time	Sets the ON signal dead-time of DIN7.	0 to 250 ms	0	C
2256	08D0h	DIN0 1-shot signal	Sets the 1-shot signal function of DIN0.	0: Disable 1: Enable	0	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2257	08D1h	DIN1 1-shot signal	Sets the 1-shot signal function of DIN1.	0: Disable 1: Enable	0	C
2258	08D2h	DIN2 1-shot signal	Sets the 1-shot signal function of DIN2.	0: Disable 1: Enable	0	C
2259	08D3h	DIN3 1-shot signal	Sets the 1-shot signal function of DIN3.	0: Disable 1: Enable	0	C
2260	08D4h	DIN4 1-shot signal	Sets the 1-shot signal function of DIN4.	0: Disable 1: Enable	0	C
2261	08D5h	DIN5 1-shot signal	Sets the 1-shot signal function of DIN5.	0: Disable 1: Enable	0	C
2262	08D6h	DIN6 1-shot signal	Sets the 1-shot signal function of DIN6.	0: Disable 1: Enable	0	C
2263	08D7h	DIN7 1-shot signal	Sets the 1-shot signal function of DIN7.	0: Disable 1: Enable	0	C
2176	0880h	DIN0 composite input function	Selects an input signal to be assigned to DIN0 as the composite input function.	Input signals list ⇨p.203	0: Not used	C
2177	0881h	DIN1 composite input function	Selects an input signal to be assigned to DIN1 as the composite input function.		0: Not used	C
2178	0882h	DIN2 composite input function	Selects an input signal to be assigned to DIN2 as the composite input function.		0: Not used	C
2179	0883h	DIN3 composite input function	Selects an input signal to be assigned to DIN3 as the composite input function.		0: Not used	C
2180	0884h	DIN4 composite input function	Selects an input signal to be assigned to DIN4 as the composite input function.		0: Not used	C
2181	0885h	DIN5 composite input function	Selects an input signal to be assigned to DIN5 as the composite input function.		0: Not used	C
2182	0886h	DIN6 composite input function	Selects an input signal to be assigned to DIN6 as the composite input function.		0: Not used	C
2183	0887h	DIN7 composite input function	Selects an input signal to be assigned to DIN7 as the composite input function.		0: Not used	C

8-3 Direct-OUT (DOUT)

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2144	0860h	DOUT0 (Normal) Output function	Selects an output signal to be assigned to DOUT0.	Output signals list ⇨p.207	264: READY	C
2145	0861h	DOUT1 (Normal) Output function	Selects an output signal to be assigned to DOUT1.		265: MOVE	C
2146	0862h	DOUT2 (Normal) Output function	Selects an output signal to be assigned to DOUT2.		277: ETO-MON-DRV	C
2147	0863h	DOUT3 (Normal) Output function	Selects an output signal to be assigned to DOUT3.		260: ALM-B	C
2148	0864h	DOUT4 (Normal) Output function	Selects an output signal to be assigned to DOUT4.		360: PAUSE-BSY	C
2149	0865h	DOUT5 (Normal) Output function	Selects an output signal to be assigned to DOUT5.		266: PRG-RUN	C
2150	0866h	DOUT6 (Normal) Output function	Selects an output signal to be assigned to DOUT6.		384: PRG-OUT0	C
2151	0867h	DOUT7 (Normal) Output function	Selects an output signal to be assigned to DOUT7.		385: PRG-OUT1	C
2160	0870h	DOUT0 inverting mode	Changes the ON-OFF status of DOUT0.	0: Not invert 1: Invert	0	C
2161	0871h	DOUT1 inverting mode	Changes the ON-OFF status of DOUT1.	0: Not invert 1: Invert	0	C
2162	0872h	DOUT2 inverting mode	Changes the ON-OFF status of DOUT2.	0: Not invert 1: Invert	0	C
2163	0873h	DOUT3 inverting mode	Changes the ON-OFF status of DOUT3.	0: Not invert 1: Invert	0	C
2164	0874h	DOUT4 inverting mode	Changes the ON-OFF status of DOUT4.	0: Not invert 1: Invert	0	C
2165	0875h	DOUT5 inverting mode	Changes the ON-OFF status of DOUT5.	0: Not invert 1: Invert	0	C
2166	0876h	DOUT6 inverting mode	Changes the ON-OFF status of DOUT6.	0: Not invert 1: Invert	0	C
2167	0877h	DOUT7 inverting mode	Changes the ON-OFF status of DOUT7.	0: Not invert 1: Invert	0	C
2272	08E0h	DOUT0 OFF delay time	Sets the OFF delay time of DOUT0.	0 to 250 ms	0	C
2273	08E1h	DOUT1 OFF delay time	Sets the OFF delay time of DOUT1.	0 to 250 ms	0	C
2274	08E2h	DOUT2 OFF delay time	Sets the OFF delay time of DOUT2.	0 to 250 ms	0	C
2275	08E3h	DOUT3 OFF delay time	Sets the OFF delay time of DOUT3.	0 to 250 ms	0	C
2276	08E4h	DOUT4 OFF delay time	Sets the OFF delay time of DOUT4.	0 to 250 ms	0	C
2277	08E5h	DOUT5 OFF delay time	Sets the OFF delay time of DOUT5.	0 to 250 ms	0	C
2278	08E6h	DOUT6 OFF delay time	Sets the OFF delay time of DOUT6.	0 to 250 ms	0	C
2279	08E7h	DOUT7 OFF delay time	Sets the OFF delay time of DOUT7.	0 to 250 ms	0	C
2224	08B0h	DOUT0 composite logical combination	Sets the composite logical combination of DOUT0.	0: AND 1: OR	1	C
2225	08B1h	DOUT1 composite logical combination	Sets the composite logical combination of DOUT1.	0: AND 1: OR	1	C
2226	08B2h	DOUT2 composite logical combination	Sets the composite logical combination of DOUT2.	0: AND 1: OR	1	C
2227	08B3h	DOUT3 composite logical combination	Sets the composite logical combination of DOUT3.	0: AND 1: OR	1	C
2228	08B4h	DOUT4 composite logical combination	Sets the composite logical combination of DOUT4.	0: AND 1: OR	1	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2229	08B5h	DOUT5 composite logical combination	Sets the composite logical combination of DOUT5.	0: AND 1: OR	1	C
2230	08B6h	DOUT6 composite logical combination	Sets the composite logical combination of DOUT6.	0: AND 1: OR	1	C
2231	08B7h	DOUT7 composite logical combination	Sets the composite logical combination of DOUT7.	0: AND 1: OR	1	C
2192	0890h	DOUT0 composite output function	Selects an output signal for logical operation with the signal of DOUT0.	Output signals list ⇨ p.207	256: CONST-OFF	C
2193	0891h	DOUT1 composite output function	Selects an output signal for logical operation with the signal of DOUT1.		256: CONST-OFF	C
2194	0892h	DOUT2 composite output function	Selects an output signal for logical operation with the signal of DOUT2.		256: CONST-OFF	C
2195	0893h	DOUT3 composite output function	Selects an output signal for logical operation with the signal of DOUT3.		256: CONST-OFF	C
2196	0894h	DOUT4 composite output function	Selects an output signal for logical operation with the signal of DOUT4.		256: CONST-OFF	C
2197	0895h	DOUT5 composite output function	Selects an output signal for logical operation with the signal of DOUT5.		256: CONST-OFF	C
2198	0896h	DOUT6 composite output function	Selects an output signal for logical operation with the signal of DOUT6.		256: CONST-OFF	C
2199	0897h	DOUT7 composite output function	Selects an output signal for logical operation with the signal of DOUT7.		256: CONST-OFF	C
2208	08A0h	DOUT0 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT0.	0: Not invert 1: Invert	0	C
2209	08A1h	DOUT1 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT1.	0: Not invert 1: Invert	0	C
2210	08A2h	DOUT2 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT2.	0: Not invert 1: Invert	0	C
2211	08A3h	DOUT3 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT3.	0: Not invert 1: Invert	0	C
2212	08A4h	DOUT4 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT4.	0: Not invert 1: Invert	0	C
2213	08A5h	DOUT5 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT5.	0: Not invert 1: Invert	0	C
2214	08A6h	DOUT6 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT6.	0: Not invert 1: Invert	0	C
2215	08A7h	DOUT7 composite inverting mode	Changes the ON-OFF status of the composite output function of DOUT7.	0: Not invert 1: Invert	0	C

8-4 Remote-I/O (R-I/O)

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2304	0900h	R-IN0 input function	Selects an input signal to be assigned to R-IN0.	Input signals list ⇨p.203	192: PRG-RIN0	C
2305	0901h	R-IN1 input function	Selects an input signal to be assigned to R-IN1.		193: PRG-RIN1	C
2306	0902h	R-IN2 input function	Selects an input signal to be assigned to R-IN2.		194: PRG-RIN2	C
2307	0903h	R-IN3 input function	Selects an input signal to be assigned to R-IN3.		195: PRG-RIN3	C
2308	0904h	R-IN4 input function	Selects an input signal to be assigned to R-IN4.		196: PRG-RIN4	C
2309	0905h	R-IN5 input function	Selects an input signal to be assigned to R-IN5.		197: PRG-RIN5	C
2310	0906h	R-IN6 input function	Selects an input signal to be assigned to R-IN6.		198: PRG-RIN6	C
2311	0907h	R-IN7 input function	Selects an input signal to be assigned to R-IN7.		199: PRG-RIN7	C
2312	0908h	R-IN8 input function	Selects an input signal to be assigned to R-IN8.		200: PRG-RIN8	C
2313	0909h	R-IN9 input function	Selects an input signal to be assigned to R-IN9.		201: PRG-RIN9	C
2314	090Ah	R-IN10 input function	Selects an input signal to be assigned to R-IN10.		202: PRG-RIN10	C
2315	090Bh	R-IN11 input function	Selects an input signal to be assigned to R-IN11.		203: PRG-RIN11	C
2316	090Ch	R-IN12 input function	Selects an input signal to be assigned to R-IN12.		204: PRG-RIN12	C
2317	090Dh	R-IN13 input function	Selects an input signal to be assigned to R-IN13.		205: PRG-RIN13	C
2318	090Eh	R-IN14 input function	Selects an input signal to be assigned to R-IN14.		206: PRG-RIN14	C
2319	090Fh	R-IN15 input function	Selects an input signal to be assigned to R-IN15.		207: PRG-RIN15	C
2320	0910h	R-OUT0 output function	Selects an output signal to be assigned to R-OUT0.	Output signals list ⇨p.207	416: PRG-ROUT0	C
2321	0911h	R-OUT1 output function	Selects an output signal to be assigned to R-OUT1.		417: PRG-ROUT1	C
2322	0912h	R-OUT2 output function	Selects an output signal to be assigned to R-OUT2.		418: PRG-ROUT2	C
2323	0913h	R-OUT3 output function	Selects an output signal to be assigned to R-OUT3.		419: PRG-ROUT3	C
2324	0914h	R-OUT4 output function	Selects an output signal to be assigned to R-OUT4.		420: PRG-ROUT4	C
2325	0915h	R-OUT5 output function	Selects an output signal to be assigned to R-OUT5.		421: PRG-ROUT5	C
2326	0916h	R-OUT6 output function	Selects an output signal to be assigned to R-OUT6.		422: PRG-ROUT6	C
2327	0917h	R-OUT7 output function	Selects an output signal to be assigned to R-OUT7.		423: PRG-ROUT7	C
2328	0918h	R-OUT8 output function	Selects an output signal to be assigned to R-OUT8.		424: PRG-ROUT8	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2329	0919h	R-OUT9 output function	Selects an output signal to be assigned to R-OUT9.	Output signals list ⇨p.207	425: PRG-ROUT9	C
2330	091Ah	R-OUT10 output function	Selects an output signal to be assigned to R-OUT10.		426: PRG-ROUT10	C
2331	091Bh	R-OUT11 output function	Selects an output signal to be assigned to R-OUT11.		427: PRG-ROUT11	C
2332	091Ch	R-OUT12 output function	Selects an output signal to be assigned to R-OUT12.		428: PRG-ROUT12	C
2333	091Dh	R-OUT13 output function	Selects an output signal to be assigned to R-OUT13.		429: PRG-ROUT13	C
2334	091Eh	R-OUT14 output function	Selects an output signal to be assigned to R-OUT14.		430: PRG-ROUT14	C
2335	091Fh	R-OUT15 output function	Selects an output signal to be assigned to R-OUT15.		431: PRG-ROUT15	C
2352	0930h	R-OUT0 OFF delay time	Sets the OFF delay time of R-OUT0.	0 to 250 ms	0	C
2353	0931h	R-OUT1 OFF delay time	Sets the OFF delay time of R-OUT1.	0 to 250 ms	0	C
2354	0932h	R-OUT2 OFF delay time	Sets the OFF delay time of R-OUT2.	0 to 250 ms	0	C
2355	0933h	R-OUT3 OFF delay time	Sets the OFF delay time of R-OUT3.	0 to 250 ms	0	C
2356	0934h	R-OUT4 OFF delay time	Sets the OFF delay time of R-OUT4.	0 to 250 ms	0	C
2357	0935h	R-OUT5 OFF delay time	Sets the OFF delay time of R-OUT5.	0 to 250 ms	0	C
2358	0936h	R-OUT6 OFF delay time	Sets the OFF delay time of R-OUT6.	0 to 250 ms	0	C
2359	0937h	R-OUT7 OFF delay time	Sets the OFF delay time of R-OUT7.	0 to 250 ms	0	C
2360	0938h	R-OUT8 OFF delay time	Sets the OFF delay time of R-OUT8.	0 to 250 ms	0	C
2361	0939h	R-OUT9 OFF delay time	Sets the OFF delay time of R-OUT9.	0 to 250 ms	0	C
2362	093Ah	R-OUT10 OFF delay time	Sets the OFF delay time of R-OUT10.	0 to 250 ms	0	C
2363	093Bh	R-OUT11 OFF delay time	Sets the OFF delay time of R-OUT11.	0 to 250 ms	0	C
2364	093Ch	R-OUT12 OFF delay time	Sets the OFF delay time of R-OUT12.	0 to 250 ms	0	C
2365	093Dh	R-OUT13 OFF delay time	Sets the OFF delay time of R-OUT13.	0 to 250 ms	0	C
2366	093Eh	R-OUT14 OFF delay time	Sets the OFF delay time of R-OUT14.	0 to 250 ms	0	C
2367	093Fh	R-OUT15 OFF delay time	Sets the OFF delay time of R-OUT15.	0 to 250 ms	0	C

8-5 Virtual input parameters

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2368	0940h	Virtual input (VIR-IN0) function	Selects the input signal to be assigned to VIR-IN0.	Input signals list ⇨p.203	0: Not used	C
2369	0941h	Virtual input (VIR-IN1) function	Selects the input signal to be assigned to VIR-IN1.		0: Not used	C
2370	0942h	Virtual input (VIR-IN2) function	Selects the input signal to be assigned to VIR-IN2.		0: Not used	C
2371	0943h	Virtual input (VIR-IN3) function	Selects the input signal to be assigned to VIR-IN3.		0: Not used	C
2372	0944h	Virtual input (VIR-IN0) source selection	Selects the output signal to be the trigger of VIR-IN0.	Output signals list ⇨p.207	256: CONST-OFF	C
2373	0945h	Virtual input (VIR-IN1) source selection	Selects the output signal to be the trigger of VIR-IN1.		256: CONST-OFF	C
2374	0946h	Virtual input (VIR-IN2) source selection	Selects the output signal to be the trigger of VIR-IN2.		256: CONST-OFF	C
2375	0947h	Virtual input (VIR-IN3) source selection	Selects the output signal to be the trigger of VIR-IN3.		256: CONST-OFF	C
2376	0948h	Virtual input (VIR-IN0) inverting mode	Changes ON/OFF setting of VIR-IN0.	0: Not invert 1: Invert	0	C
2377	0949h	Virtual input (VIR-IN1) inverting mode	Changes ON/OFF setting of VIR-IN1.		0	C
2378	094Ah	Virtual input (VIR-IN2) inverting mode	Changes ON/OFF setting of VIR-IN2.		0	C
2379	094Bh	Virtual input (VIR-IN3) inverting mode	Changes ON/OFF setting of VIR-IN3.		0	C
2380	094Ch	Virtual input (VIR-IN0) ON signal dead time	Sets the ON signal dead time of VIR-IN0.	0 to 250 ms	0	C
2381	094Dh	Virtual input (VIR-IN1) ON signal dead time	Sets the ON signal dead time of VIR-IN1.		0	C
2382	094Eh	Virtual input (VIR-IN2) ON signal dead time	Sets the ON signal dead time of VIR-IN2.		0	C
2383	094Fh	Virtual input (VIR-IN3) ON signal dead time	Sets the ON signal dead time of VIR-IN3.		0	C
2384	0950h	Virtual input (VIR-IN0) 1 shot signal mode	Enables the 1 shot signal function of VIR-IN0.	0: Disable 1: Enable	0	C
2385	0951h	Virtual input (VIR-IN1) 1 shot signal mode	Enables the 1 shot signal function of VIR-IN1.		0	C
2386	0952h	Virtual input (VIR-IN2) 1 shot signal mode	Enables the 1 shot signal function of VIR-IN2.		0	C
2387	0953h	Virtual input (VIR-IN3) 1 shot signal mode	Enables the 1 shot signal function of VIR-IN3.		0	C

8-6 User output setting parameters

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
2400	0960h	User output (USR-OUT0) source A function	Sets the output source A of USR-OUT0.	Output signals list ⇨ p.207	256: CONST-OFF	C
2401	0961h	User output (USR-OUT1) source A function	Sets the output source A of USR-OUT1.		256: CONST-OFF	C
2402	0962h	User output (USR-OUT0) source A inverting mode	Changes ON/OFF of the output source A of USR-OUT0.	0: Not invert 1: Invert	0	C
2403	0963h	User output (USR-OUT1) source A inverting mode	Changes ON/OFF of the output source A of USR-OUT1.		0	C
2404	0964h	User output (USR-OUT0) source B function	Sets the output source B of USR-OUT0.	Output signals list ⇨ p.207	256: CONST-OFF	C
2405	0965h	User output (USR-OUT1) source B function	Sets the output source B of USR-OUT1.		256: CONST-OFF	C
2406	0966h	User output (USR-OUT0) source B inverting mode	Changes ON/OFF of the output source B of USR-OUT0.	0: Not invert 1: Invert	0	C
2407	0967h	User output (USR-OUT1) source B inverting mode	Changes ON/OFF of the output source B of USR-OUT1.		0	C
2408	0968h	User output (USR-OUT0) logical operation	Sets the logical combination of the user output sources A and B of USR-OUT0.	0: AND 1: OR	1	C
2409	0969h	User output (USR-OUT1) logical operation	Sets the logical combination of the user output sources A and B of USR-OUT1.		1	C

9 Parameters: Protective function setting

9-1 Alarm/Information

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
386	0182h	Driver alarm detection	Sets whether or not to generate an alarm of "Driver alarm detection" in the controller when an alarm was generated in the driver.	0: Disable 1: Enable	0	A
390	0186h	Axis speed information (INFO-AXISSPD) Axis 1	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 1 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
391	0187h	Axis speed information (INFO-AXISSPD) Axis 2	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 2 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
392	0188h	Axis speed information (INFO-AXISSPD) Axis 3	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 3 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
393	0189h	Axis speed information (INFO-AXISSPD) Axis 4	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 4 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
394	018Ah	Axis speed information (INFO-AXISSPD) Axis 5	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 5 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
395	018Bh	Axis speed information (INFO-AXISSPD) Axis 6	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 6 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
396	018Ch	Axial speed information (INFO-AXISSPD) end-effector 1	Sets the condition in which the axis speed information (INFO-AXISSPD) of the end effector 1 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
397	018Dh	Axial speed information (INFO-AXISSPD) end-effector 2	Sets the condition in which the axis speed information (INFO-AXISSPD) of the end effector 2 is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0	A
416	01A0h	Controller temperature information (INFO-CNTTMP)	Sets the condition in which the controller temperature information (INFO-CNTTMP) is generated.	40 to 85 °C	85	A
418	01A2h	TCP speed information (INFO-RBSPD)	Sets the condition in which the TCP speed information (INFO-RBSPD) is generated.	0: Disable 1 to 2,000,000 (1=0.001 mm/s)	0	A
422	01A6h	Mechanism information mismatch information (INFO-MECHMIS)	Sets the Mechanism information mismatch information (INFO-MECHMIS).	0: Disable 1: Enable	1	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
423	01A7h	Driver information detection (INFO-DRVINFO)	Sets whether or not to generate the Driver information detection (INFO-DRVINFO) in the controller when information was generated in the driver.	0: Disable 1: Enable	0	A
441	01B9h	Robot posture error information (INFO-PST-ERR)	Sets the Robot posture error information (INFO-PST-ERR).	0: Disable 1: Enable	1	A
442	01BAh	Slip information (INFO-SLIP)	Sets the Slip information (INFO-SLIP).	0: Disable 1: Enable	1	A
444	01BCh	INFO-USRIO output selection	Selects the I/O status to be checked in the INFO-USRIO output.	Output signals list ⇨p.207	256: CONST-OFF	A
445	01BDh	INFO-USRIO output inversion	Sets the output logic of the INFO-USRIO output.	0: Not invert 1: Invert	0	A
446	01BEh	Information LED condition	Sets whether or not to blink the LED when information was generated.	0: Disable 1: Enable	1	A
447	01BFh	Information auto clear	When the cause of information is eliminated, the INFO output and the bit output of the corresponding information are turned OFF automatically.	0: Disable 1: Enable	1	A
3901	0F3Dh	Near singularity alarm setting	Sets an alarm of Near singularity.	0: Alarm not generated 1: Alarm generated	1	A
4545	11C1h	Rotation error at power on alarm setting	Sets an alarm of Rotation error at power on.	0: Alarm not generated 1: Alarm generated	0	A

9-2 Position limit

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
816	0330h	TCP position limit operation setting	Sets how the robot operates when the TCP position limit is detected.	−1: Limit disable 0: Stop 1: Stop with alarm	1	A
817	0331h	TCP position limit X+	Sets the position limit in the X-axis positive direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	1,000,000	A
818	0332h	TCP position limit Y+	Sets the position limit in the Y-axis positive direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	1,000,000	A
819	0333h	TCP position limit Z+	Sets the position limit in the Z-axis positive direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	1,000,000	A
825	0339h	TCP position limit X−	Sets the position limit in the X-axis negative direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	−1,000,000	A
826	033Ah	TCP position limit Y−	Sets the position limit in the Y-axis negative direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	−1,000,000	A
827	033Bh	TCP position limit Z−	Sets the position limit in the Z-axis negative direction of TCP.	−2,000,000 to 2,000,000 (1=0.001 mm)	−1,000,000	A
897	0381h	Axis position limit operation setting	Sets how the robot operates when the axis position limit is detected.	−1: Limit disable 0: Stop 1: Stop with alarm	1	A
898	0382h	Axis position limit Axis 1+	Sets the position limit in the positive direction of the axis 1.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
899	0383h	Axis position limit Axis 2+	Sets the position limit in the positive direction of the axis 2.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
900	0384h	Axis position limit Axis 3+	Sets the position limit in the positive direction of the axis 3.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
901	0385h	Axis position limit Axis 4+	Sets the position limit in the positive direction of the axis 4.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
902	0386h	Axis position limit Axis 5+	Sets the position limit in the positive direction of the axis 5.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
903	0387h	Axis position limit Axis 6+	Sets the position limit in the positive direction of the axis 6.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
904	0388h	Axis position limit end-effector 1+	Sets the position limit in the positive direction of the end effector 1.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
905	0389h	Axis position limit end-effector 2+	Sets the position limit in the positive direction of the end effector 2.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	1,000,000	A
906	038Ah	Axis position limit Axis 1−	Sets the position limit in the negative direction of the axis 1.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
907	038Bh	Axis position limit Axis 2−	Sets the position limit in the negative direction of the axis 2.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
908	038Ch	Axis position limit Axis 3−	Sets the position limit in the negative direction of the axis 3.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
909	038Dh	Axis position limit Axis 4−	Sets the position limit in the negative direction of the axis 4.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
910	038Eh	Axis position limit Axis 5−	Sets the position limit in the negative direction of the axis 5.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
911	038Fh	Axis position limit Axis 6−	Sets the position limit in the negative direction of the axis 6.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
912	0390h	Axis position limit end-effector 1−	Sets the position limit in the negative direction of the end effector 1.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
913	0391h	Axis position limit end-effector 2−	Sets the position limit in the negative direction of the end effector 2.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	−1,000,000	A
4546	11C2h	TCP position limit target coordinate system selection	Sets the coordinate system for the TCP position limit. If the coordinate system is changed, the position of the limit is also changed. When the coordinate system is changed, set the TCP position limit again.	0: User coordinate system 1: Base coordinate system	0	A

9-3 AREA signal output / no entry area

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
833	0341h	User-defined area 0 operation setting	Sets how the controller operates when the command position of the TCP enters the user-defined area. Setting to "0" will continue the operation even in the user-defined area. If it is set to "1" or "2," the user-defined area will be a no-entry area. Operation will be stopped when the the command position of the TCP enters the no-entry area.	0: AREA0 output 1: AREA0 output, no entry 2: AREA0 output, no entry with alarm	0	A
834	0342h	User-defined area 1 operation setting		0: AREA1 output 1: AREA1 output, no entry 2: AREA1 output, no entry with alarm	0	A
835	0343h	User-defined area 2 operation setting		0: AREA2 output 1: AREA2 output, no entry 2: AREA2 output, no entry with alarm	0	A
836	0344h	User-defined area 3 operation setting		0: AREA3 output 1: AREA3 output, no entry 2: AREA3 output, no entry with alarm	0	A
837	0345h	User-defined area 4 operation setting		0: AREA4 output 1: AREA4 output, no entry 2: AREA4 output, no entry with alarm	0	A
841	0349h	User-defined area 0 target coordinates	Selects the coordinates corresponding to the AREA0 output.	1: X 2: Y 3: XY 4: Z 5: XZ 6: YZ 7: XYZ	7	A
842	034Ah	User-defined area 1 target coordinates	Selects the coordinates corresponding to the AREA1 output.	1: X 2: Y 3: XY 4: Z 5: XZ 6: YZ 7: XYZ	7	A
843	034Bh	User-defined area 2 target coordinates	Selects the coordinates corresponding to the AREA2 output.	1: X 2: Y 3: XY 4: Z 5: XZ 6: YZ 7: XYZ	7	A
844	034Ch	User-defined area 3 target coordinates	Selects the coordinates corresponding to the AREA3 output.	1: X 2: Y 3: XY 4: Z 5: XZ 6: YZ 7: XYZ	7	A
845	034Dh	User-defined area 4 target coordinates	Selects the coordinates corresponding to the AREA4 output.	1: X 2: Y 3: XY 4: Z 5: XZ 6: YZ 7: XYZ	7	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
849	0351h	User-defined area 0 X+	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
850	0352h	User-defined area 1 X+	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
851	0353h	User-defined area 2 X+	Sets the position of the user-defined area 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
852	0354h	User-defined area 3 X+	Sets the position of the user-defined area 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
853	0355h	User-defined area 4 X+	Sets the position of the user-defined area 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
857	0359h	User-defined area 0 X–	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
858	035Ah	User-defined area 1 X–	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
859	035Bh	User-defined area 2 X–	Sets the position of the user-defined area 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
860	035Ch	User-defined area 3 X–	Sets the position of the user-defined area 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
861	035Dh	User-defined area 4 X–	Sets the position of the user-defined area 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
865	0361h	User-defined area 0 Y+	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
866	0362h	User-defined area 1 Y+	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
867	0363h	User-defined area 2 Y+	Sets the position of the user-defined area 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
868	0364h	User-defined area 3 Y+	Sets the position of the user-defined area 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
869	0365h	User-defined area 4 Y+	Sets the position of the user-defined area 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
873	0369h	User-defined area 0 Y–	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
874	036Ah	User-defined area 1 Y–	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
875	036Bh	User-defined area 2 Y–	Sets the position of the user-defined area 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
876	036Ch	User-defined area 3 Y–	Sets the position of the user-defined area 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
877	036Dh	User-defined area 4 Y–	Sets the position of the user-defined area 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
881	0371h	User-defined area 0 Z+	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
882	0372h	User-defined area 1 Z+	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
883	0373h	User-defined area 2 Z+	Sets the position of the user-defined area 2.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
884	0374h	User-defined area 3 Z+	Sets the position of the user-defined area 3.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
885	0375h	User-defined area 4 Z+	Sets the position of the user-defined area 4.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
889	0379h	User-defined area 0 Z–	Sets the position of the user-defined area 0.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A
890	037Ah	User-defined area 1 Z–	Sets the position of the user-defined area 1.	−2,000,000 to 2,000,000 (1=0.001 mm)	0	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
891	037Bh	User-defined area 2 Z–	Sets the position of the user-defined area 2.	–2,000,000 to 2,000,000 (1=0.001 mm)	0	A
892	037Ch	User-defined area 3 Z–	Sets the position of the user-defined area 3.	–2,000,000 to 2,000,000 (1=0.001 mm)	0	A
893	037Dh	User-defined area 4 Z–	Sets the position of the user-defined area 4.	–2,000,000 to 2,000,000 (1=0.001 mm)	0	A
4547	11C3h	User-defined area0 target coordinate system	Sets the coordinate system for the AREA0 output. If the coordinate system is changed, the position of the user-defined area is also changed. When the coordinate system is changed, set the user-defined area again.	0: User coordinate system 1: Base coordinate system	0	A
4548	11C4h	User-defined area1 target coordinate system	Sets the coordinate system for the AREA1 output. If the coordinate system is changed, the position of the user-defined area is also changed. When the coordinate system is changed, set the user-defined area again.	0: User coordinate system 1: Base coordinate system	0	A
4549	11C5h	User-defined area2 target coordinate system	Sets the coordinate system for the AREA2 output. If the coordinate system is changed, the position of the user-defined area is also changed. When the coordinate system is changed, set the user-defined area again.	0: User coordinate system 1: Base coordinate system	0	A
4550	11C6h	User-defined area3 target coordinate system	Sets the coordinate system for the AREA3 output. If the coordinate system is changed, the position of the user-defined area is also changed. When the coordinate system is changed, set the user-defined area again.	0: User coordinate system 1: Base coordinate system	0	A
4551	11C7h	User-defined area4 target coordinate system	Sets the coordinate system for the AREA4 output. If the coordinate system is changed, the position of the user-defined area is also changed. When the coordinate system is changed, set the user-defined area again.	0: User coordinate system 1: Base coordinate system	0	A
4530	11B2h	AREA0-AX target axis selection	Sets the axis ID for the AREA0-AX output.	0: Disable 1 to 8: Axis ID	0	A
4531	11B3h	AREA0-AX positioning standard	Sets the judgment criterion of the position for the AREA0-AX output.	0: Based on feedback position 1: Based on command position	0	A
4532	11B4h	AREA0-AX positive direction position	Sets the positive direction position of the AREA0-AX output.	–2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A
4533	11B5h	AREA0-AX negative direction position	Sets the negative direction position of the AREA0-AX output.	–2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A
4534	11B6h	AREA1-AX target axis selection	Sets the axis ID for the AREA1-AX output.	0: Disable 1 to 8: Axis ID	0	A

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4535	11B7h	AREA1-AX positioning standard	Sets the judgment criterion of the position for the AREA1-AX output.	0: Based on feedback position 1: Based on command position	0	A
4536	11B8h	AREA1-AX positive direction position	Sets the positive direction position of the AREA1-AX output.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A
4537	11B9h	AREA1-AX negative direction position	Sets the negative direction position of the AREA1-AX output.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A
4538	11BAh	AREA2-AX target axis selection	Sets the axis ID for the AREA2-AX output.	0: Disable 1 to 8: Axis ID	0	A
4539	11BBh	AREA2-AX positioning standard	Sets the judgment criterion of the position for the AREA2-AX output.	0: Based on feedback position 1: Based on command position	0	A
4540	11BCh	AREA2-AX positive direction position	Sets the positive direction position of the AREA2-AX output.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A
4541	11BDh	AREA2-AX negative direction position	Sets the negative direction position of the AREA2-AX output.	−2,000,000 to 2,000,000 (1=0.001 mm or 1=0.001 deg)	0	A

9-4 Speed limit

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
954	03BAh	TCP speed limit setting	Sets how the robot operates when the maximum speed of the TCP is detected.	−1: Limit disable (operation is not stopped) 0: Stop 1: Stop with alarm	1	B
955	03BBh	Maximum TCP speed	Sets the maximum speed of the TCP.	10 to 2,000,000 (1=0.001 mm/s)	500,000	B
963	03C3h	Axis speed limit setting	Sets how the robot operates when the maximum speed of each axis is detected.	−1: Limit disable (operation is not stopped) 0: Stop 1: Stop with alarm	1	B
964	03C4h	Maximum speed Axis 1	Sets the maximum speed of the axis 1.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
965	03C5h	Maximum speed Axis 2	Sets the maximum speed of the axis 2.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
966	03C6h	Maximum speed Axis 3	Sets the maximum speed of the axis 3.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
967	03C7h	Maximum speed Axis 4	Sets the maximum speed of the axis 4.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
968	03C8h	Maximum speed Axis 5	Sets the maximum speed of the axis 5.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
969	03C9h	Maximum speed Axis 6	Sets the maximum speed of the axis 6.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
970	03CAh	Maximum speed end-effector 1	Sets the maximum speed of the end effector 1.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
971	03CBh	Maximum speed end-effector 2	Sets the maximum speed of the end effector 2.	10 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	500,000	B
4520	11A8h	Rotation axis limit setting	Sets the limit for the speed and acceleration/deceleration according to the distance between the base rotation axis and the TCP. Refer to p.241 for details on the limit function.	0: Limit disable 1: Speed limit enable 2: Acceleration/ deceleration limit enable 3: Speed and acceleration/ deceleration limit enable	0	A
4521	11A9h	Rotation axis limit inside distance	Sets the position of the inside of the rotation axis limit with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0	A
4522	11AAh	Rotation axis limit inside maximum speed	Sets the maximum speed at the inside of the rotation axis limit.	0 to 2,000,000 (1=0.001 deg/s)	0	A
4523	11ABh	Rotation axis limit inside maximum acceleration/ deceleration	Sets the maximum acceleration/ deceleration at the inside of the rotation axis limit.	0 to 30,000,000 (1=0.001 deg/s^2)	0	A
4524	11ACh	Rotation axis limit middle distance	Sets a desired position between the rotation axis limits with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0	A
4525	11ADh	Rotation axis limit middle maximum speed	Sets the maximum speed at a desired position between the rotation axis limits.	0 to 2,000,000 (1=0.001 deg/s)	0	A
4526	11AEh	Rotation axis limit middle maximum acceleration/ deceleration	Sets the maximum acceleration/ deceleration at a desired position between the rotation axis limits.	0 to 30,000,000 (1=0.001 deg/s^2)	0	A
4527	11AFh	Rotation axis limit outside distance	Sets the position of the outside of the rotation axis limit with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0	A
4528	11B0h	Rotation axis limit outside maximum speed	Sets the maximum speed at the outside of the rotation axis limit.	0 to 2,000,000 (1=0.001 deg/s)	0	A
4529	11B1h	Rotation axis limit outside maximum acceleration/ deceleration	Sets the maximum acceleration/ deceleration at the outside of the rotation axis limit.	0 to 30,000,000 (1=0.001 deg/s^2)	0	A

9-5 Protection operation

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3904	0F40h	Slip function setting	Sets the "slip mode" that makes the motor slip when a load on the robot axis is increased while the robot is stopped. In the slip mode, the feedback position is the same value as the command position. Also, in the slip mode, if the robot axis is moved by an external force, it does not return to its former position.	0: Disable 1: Enable	0	A
3905	0F41h	Slip mode decision load factor	Sets the load factor for deciding to switch to the slip mode.	1 to 1,000 (1=0.1 %)	1,000	A
3906	0F42h	Slip mode decision time	Sets the time for deciding to switch to the slip mode.	0 to 50 (1=0.1 s)	1	A
3908	0F44h	Current in slip mode Axis 1	Sets the current in the slip mode. Sets the percentage of the current in the slip mode based on a value in the "Stop current" parameter being 100 %. (Example: If the “Stop current” parameter is set to 50 % and the “Current in slip mode” parameter is set to 50 %, the current in the slip mode will be 25 %).	1 to 1,000 (1=0.1 %)	1,000	A
3909	0F45h	Current in slip mode Axis 2		1 to 1,000 (1=0.1 %)	1,000	A
3910	0F46h	Current in slip mode Axis 3		1 to 1,000 (1=0.1 %)	1,000	A
3911	0F47h	Current in slip mode Axis 4		1 to 1,000 (1=0.1 %)	1,000	A
3912	0F48h	Current in slip mode Axis 5		1 to 1,000 (1=0.1 %)	1,000	A
3913	0F49h	Current in slip mode Axis 6		1 to 1,000 (1=0.1 %)	1,000	A
3916	0F4Ch	Slip mode release time	Sets the time for deciding to release the slip mode.	5 to 50 (1=0.1 s)	10	A
3920	0F50h	Overload stop setting	Sets the "Overload stop function" to stop the operation when a load on the robot axis is increased during operation.	0: Disable 1: Enable (alarm of Axis error during operation is generated)	1	A
3921	0F51h	Overload stop setting decision load factor	Sets the load factor for deciding to activate the overload stop function.	1 to 1,000 (1=0.1 %)	1,000	A
3922	0F52h	Overload stop setting decision time	Sets the time for deciding to activate the overload stop function.	0 to 50 (1=0.1 s)	1	A
3923	0F53h	Overload stop setting stop mode	Sets how to stop when the overload stop function is activated.	0: Immediate stop 1: Deceleration stop	0	A

10 Parameters: Communication and I/F setting

10-1 EtherNet/IP

● IP address setting parameters

These items can be set with the **MRC Studio** software only. There is no parameter ID.

Name	Description	Setting range	Initial value	Update
Implicit communication format size (Input)	Sets the format size of the Input data.	2 to 228 bytes	172	D
Implicit communication format size (Output)	Sets the format size of the Output data.	2 to 228 bytes	172	D
Configuration Control (attr.3)	Selects how to obtain the IP address.	0: Parameter 1: DHCP server	2	D
IP Address 1	Sets the IP address.	0 to 255	192	D
IP Address 2		0 to 255	168	D
IP Address 3		0 to 255	1	D
IP Address 4		0 to 255	1	D
Network Mask 1	Sets the subnet mask.	0 to 255	255	D
Network Mask 2		0 to 255	255	D
Network Mask 3		0 to 255	255	D
Network Mask 4		0 to 255	0	D
Gateway Address 1	Sets the default gateway.	0 to 255	0	D
Gateway Address 2		0 to 255	0	D
Gateway Address 3		0 to 255	0	D
Gateway Address 4		0 to 255	0	D

● Assignable monitor setting parameters

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
3746	0EA2h	Driver assignable monitor address 0	Sets the parameter ID of the item to be monitored.	Driver assignable monitor address ⇨p.191	107: Torque monitor	A
3747	0EA3h	Driver assignable monitor address 1			124: Driver temperature	A
3748	0EA4h	Driver assignable monitor address 2			125: Motor temperature	A
25600	6400h	Controller assignable monitor address 0	Sets the parameter ID of the item to be monitored.	Monitor command ⇨p.142	1448: Driver communication status	A
25601	6401h	Controller assignable monitor address 1			1247: Feedback speed RxRyRz	A
25602	6402h	Controller assignable monitor address 2			653: Enabled coordinates	A
25603	6403h	Controller assignable monitor address 3			124: Controller temperature	A

Driver assignable monitor address

Refer to the **AZ** Series OPERATING MANUAL Function Edition for details about monitor items. When checking the **AZ** Series OPERATING MANUAL Function Edition, refer to the parameter name instead of the parameter ID.

Parameter ID		Name
Dex	Hex	
99	0063h	Command position
100	0064h	Command speed (r/min)
101	0065h	Command speed (Hz)
102	0066h	Feedback position
103	0067h	Feedback speed (r/min)
104	0068h	Feedback speed (Hz)
106	006Ah	Direct I/O
107	006Bh	Torque monitor
109	006Dh	Cumulative load monitor
124	007Ch	Driver temperature
125	007Dh	Motor temperature
126	007Eh	Odometer
127	007Fh	Tripmeter
146	0092h	CST operating current

Parameter ID		Name
Dex	Hex	
160	00A0h	Main power supply count
161	00A1h	Main power supply time
162	00A2h	Control power supply count
163	00A3h	Inverter voltage
164	00A4h	Main power supply voltage
169	00A9h	Elapsed time from BOOT
184	00B8h	I/O status 1
185	00B9h	I/O status 2
186	00BAh	I/O status 3
187	00BBh	I/O status 4
188	00BCh	I/O status 5
189	00BDh	I/O status 6
190	00BEh	I/O status 7
191	00BFh	I/O status 8

10-2 USB communication

These items can be set with the **MRC Studio** software only. There is no parameter ID.

Name	Description	Setting range	Initial value	Update
USB-ID enable	The COM port can be fixed.	• Disable • Enable	Enable	D
USB-ID	Sets the ID to the COM port. This can be set when the "USB-ID enable" parameter is set to "Enable."	0 to 999,999,999	0	D
USB-PID	Sets the product ID to be displayed in the COM port.	0 to 31	0	D

10-3 Driver internal communication

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4543	11BFh	Reconnection setting at communication timeout	Sets how to recover from the timeout if RS-485 communication between the controller and the driver is timed out due to poor connection of the RS-485 communication cable or a power shutoff of the driver.	0: Automatic return 1: Return by INFO-CLR input	0	A

11 Parameters: Robot setting

11-1 End effector / Tool offsets

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
601	0259h	Tool offset 1 Tx [mm]	Sets the offset value of the Tx direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0	C
602	025Ah	Tool offset 1 Ty [mm]	Sets the offset value of the Ty direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0	C
603	025Bh	Tool offset 1 Tz [mm]	Sets the offset value of the Tz direction of the tool offset 1.	0 to 100,000 (1=0.01 mm)	0	C
624	0270h	(For cartesian robots only) Tool offset action	Sets whether to enable or disable the tool offsets when using a Cartesian robot.	0: Disable 1: Enable	1	C
2819	0B03h	Number of end-effector axes	Sets the number of end effectors used.	0 to 2	0	C
2820	0B04h	End-effector 1 type	Sets the mechanism of the end effector 1.	2: Linear motion / gripper [mm] 3: Rotation [deg]	2	C
2821	0B05h	End-effector 2 type	Sets the mechanism of the end effector 2.	2: Linear motion / gripper [mm] 3: Rotation [deg]	2	C
2822	0B06h	End-effector 1 Lead [mm]	Sets the lead of the end effector 1. This is enabled when the "End-effector 1 type" parameter is set to "2: Linear-motion / gripper."	1 to 2,147,483,647 (1=0.001 mm)	1,000	C
2823	0B07h	End-effector 2 Lead [mm]	Sets the lead of the end effector 2. This is enabled when the "End-effector 2 type" parameter is set to "2: Linear-motion / gripper."	1 to 2,147,483,647 (1=0.001 mm)	1,000	C
2824	0B08h	End-effector 1 Stroke [mm]	Sets the stroke of the end effector 1. This is enabled when the "End-effector 1 type" parameter is set to "2: Linear-motion / gripper."	1 to 2,147,483,647 (1=0.001 mm)	1,000	C
2825	0B09h	End-effector 2 Stroke [mm]	Sets the stroke of the end effector 2. This is enabled when the "End-effector 2 type" parameter is set to "2: Linear-motion / gripper."	1 to 2,147,483,647 (1=0.001 mm)	1,000	C
2828	0B0Ch	End-effector 1 Gear ratio	Sets the gear ratio of the end effector 1. This is enabled when the "End-effector 1 type" parameter is set to "3: Rotation."	1 to 32,767 (1=0.01)	100	C
2829	0B0Dh	End-effector 2 Gear ratio	Sets the gear ratio of the end effector 2. This is enabled when the "End-effector 2 type" parameter is set to "3: Rotation."	1 to 32,767 (1=0.01)	100	C
2830	0B0Eh	End-effector 1 Motor rotation direction	Sets the rotation direction of the end effector 1.	−1: Invert 1: Not invert	1	C
2831	0B0Fh	End-effector 2 Motor rotation direction	Sets the rotation direction of the end effector 2.	−1: Invert 1: Not invert	1	C

Parameter ID		Name	Description	Setting range	Initial value	Update
Dec	Hex					
4294	10C6h	Tool offset2 Tx [mm]	Sets the offset value of the Tx direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0	C
4295	10C7h	Tool offset2 Ty [mm]	Sets the offset value of the Ty direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0	C
4296	10C8h	Tool offset2 Tz [mm]	Sets the offset value of the Tz direction of the tool offset 2.	0 to 100,000 (1=0.01 mm)	0	C
4556	11CCh	Tool offset selection when power is turned on	Sets the tool offsets used when the power is turned on.	0: Tool offsets 1 1: Tool offsets 2	0	C

6 I/O signals

This part explains input signals and output signals.

◆Table of contents

1 Overview of I/O signals

1-1 Overview of input signals

■ Direct input

Direct input (DIN) is a method that the I/O signal cable is connected to the CN4 connector to directly input signals.
If the composite input function is used, a single input can turn two signals ON simultaneously, achieving saving of wiring.

Parameter name	Description
Input function	Selects an input signal to be assigned to DIN.
Inverting mode	The ON-OFF status of the signal can be changed.
ON signal dead-time	The input signal is turned ON when the time having set is exceeded. This can be used for taking measures to eliminate noise or for adjusting the timing between devices.
1-shot signal	The input signal having been turned ON is automatically turned OFF after 250 µs.
Composite input function	When DIN is turned ON, the signal selected here is also turned ON.

Setting example of MRC Studio software:
If operation of the program No. 1 is performed when the START input is turned ON

It can be executed if "START" is assigned to the input function and "M0" is assigned to the composite input function.

Direct-IN (DIN)

	Input function	Inverting mode	ON signal dead-time [ms]	1 shot signal	Composite input function
DIN0	START	Not invert	0	Disable	M0

■ Virtual input

Virtual input (VIR-IN) is a method in which a signal set in virtual input is input by using output of a signal set in the virtual input source.
Since it is an input method using internal I/O, it does not require wiring and can be used with direct I/O. Up to four virtual inputs can be set.

Parameter name	Description
Virtual input function	Selects the signal to be assigned to VIR-IN. When a signal of the virtual input source is output, VIR-IN is also turned ON.
Virtual input source selection	Selects the output signal to be a trigger of VIR-IN.
Virtual input inverting mode	ON/OFF of the input signal can be changed.
Virtual input ON signal dead time	When the set time is exceeded, the input signal is turned ON. You can use this value for prevention of noise and adjustment of the timing between devices.
Virtual input 1 shot signal mode	The input signal that has been turned ON is automatically turned OFF after 250 µs.

Setting example of MRC Studio software:
When the TLC output is turned ON, stop the robot operation by turning the STOP input ON

1	Virtual input (VIR-IN0) function	STOP
2	Virtual input (VIR-IN0) source selection	TLC
3	Virtual input (VIR-IN0) inverting mode	Not invert
4	Virtual input (VIR-IN0) ON signal dead time[ms]	0
5	Virtual input (VIR-IN0) 1 shot signal mode	Disable

1-2 Overview of output signals

■ Direct output

Direct output (DOUT) is a method that the I/O signal cable is connected to the CN4 connector to directly output signals.
If the composite output function is used, the logical combination result of two output signals can be output in a single signal.

Parameter name	Description
(Normal) Output function	Selects an output signal to be assigned to DOUT.
Inverting mode	The ON-OFF status of the signal can be changed.
OFF delay time	The output signal is turned OFF when the time having set is exceeded. This can be used for taking measures to eliminate noise or for adjusting the timing between devices.
Composite logical combination	Sets the logical combination [AND (logical product) or OR (logical sum)] of the composite output function.
Composite output function	Selects an output signal for logical operation with the signal of DOUT. When logical combination of the two signals has been established, DOUT is turned ON.
Composite inverting mode	Changes the ON-OFF status of the signal selected in the composite output function.

Setting example of MRC Studio software:
If the AREA0 output (DOUT0) is turned ON when the TLC output is turned ON within the range of AREA0

If "AREA0" is set to the "(Normal) Output function," "AND" is set to the "Composite logical combination," and "TLC" is set to the "Composite output function," you can check that the TLC output has been turned ON within the AREA0 by a single signal (DOUT0).

Direct-OUT (DOUT)

	(Normal) Output function	Inverting mode	OFF delay time [ms]	Composite logical combination	Composite output function	Composite inverting mode
DOUT0	AREA0	Not invert	0	AND	TLC	Not invert

■ User output

User output (USR-OUT) is a method in which a signal is output by using the internal I/O.
Two types of signals (A and B) are assigned to one user output. When logical combination of A and B has been established, USR-OUT is output.
This method does not require wiring and can be used with direct I/O. Up to two user outputs can be set.

Parameter name	Description
User output source A function	Selects output function A.
User output source A inverting mode	Changes ON/OFF of output function A.
User output source B function	Selects output function B.
User output source B inverting mode	Changes ON/OFF of output function B.
User output logical operation	Sets the logical combination [AND (logical product) or OR (logical sum)] of output function sources A and B.

Setting example of MRC Studio software:
When the CMD-END output and the READY output have been turned ON, USR-OUT is output

21	User output (USR-OUT0) source A function	CMD-END
22	User output (USR-OUT0) source A inverting mode	Not invert
23	User output (USR-OUT0) source B function	READY
24	User output (USR-OUT0) source B inverting mode	Not invert
25	User output (USR-OUT0) logical operation	AND

1-3 Setting contents of input signals and output signals

■ Direct input

● Input function

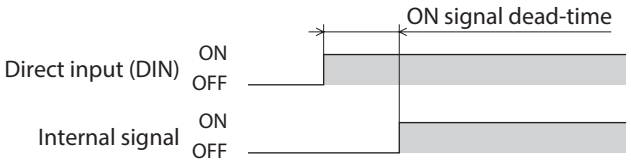
MRC Studio Parameter group	Name	Description	Initial value
Direct-IN (DIN)	DIN0 input function	Selects the input signals to be assigned to DIN0 to DIN7. **[Setting range]** Input signals list ⇨p.203	STOP
	DIN1 input function		FREE-RB
	DIN2 input function		ETO-CLR-DRV
	DIN3 input function		ALM-RST
	DIN4 input function		PAUSE
	DIN5 input function		Not used
	DIN6 input function		PRG-DIN0
	DIN7 input function		PRG-DIN1

● Change of ON-OFF setting of input signals

MRC Studio Parameter group	Name	Description	Initial value
Direct-IN (DIN)	Inverting mode	Changes the ON-OFF status of DIN0 to DIN7. **[Setting range]** • Not invert • Invert	Not invert

● ON signal dead-time

MRC Studio Parameter group	Name	Description	Initial value
Direct-IN (DIN)	ON signal dead-time	Sets the ON signal dead-time for DIN0 to DIN7. **[Setting range]** 0 to 250 ms	0



● 1-shot signal

MRC Studio Parameter group	Name	Description	Initial value
Direct-IN (DIN)	1-shot signal	The signal having input to DIN0 to DIN7 is automatically turned OFF (or ON) 250 µs after input. **[Setting range]** • Disable • Enable	Disable

Note The HMI input is a signal that is recommended to use as normally closed (always ON). When the HMI input is assigned to DIN, do not set "1-shot signal" to "Enable."

● **Composite input function**

MRC Studio Parameter group	Name	Description	Initial value
Direct-IN (DIN)	Composite input function	Selects the input signals to be assigned to DIN0 to DIN7 as the composite input function. **[Setting range]** Input signals list ⇨p.203	Not used

■ Virtual input

● **Virtual input function**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function (Extend)	Virtual input function	Selects the input signals to be assigned to VIR-IN0 to VIR-IN3. **[Setting range]** Input signals list ⇨p.203	Not used

● **Virtual input source selection**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function (Extend)	Virtual input source selection	Selects the output signals to be trigger of VIR-IN0 to VIR-IN3. **[Setting range]** Output signals list ⇨p.207	CONST-OFF

● **Virtual input inverting mode**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function (Extend)	Virtual input inverting mode	Changes ON/OFF setting of VIR-IN0 to VIR-IN3. **[Setting range]** • Not invert • Invert	Not invert

● **Virtual input ON signal dead time**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function (Extend)	Virtual input ON signal dead time	Sets the ON signal dead time of VIR-IN0 to VIR-IN3. **[Setting range]** 0 to 250 ms	0

● **Virtual input 1 shot signal mode**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function (Extend)	Virtual input 1 shot signal mode	Enables the 1 shot signal function of VIR-IN0 to VIR-IN3. **[Setting range]** • Disable • Enable	Disable

■ Direct output

● (Normal) Output function

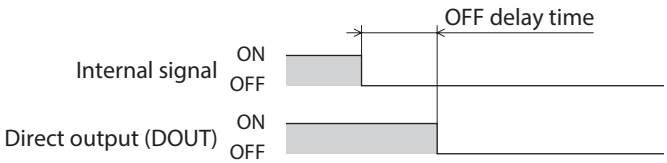
MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	DOUT0 (Normal) Output function	Selects the output signals to be assigned to DOUT0 to DOUT7. **[Setting range]** Output signals list ⇨ p.207	READY
	DOUT1 (Normal) Output function		MOVE
	DOUT2 (Normal) Output function		ETO-MON-DRV
	DOUT3 (Normal) Output function		ALM-B
	DOUT4 (Normal) Output function		PAUSE-BSY
	DOUT5 (Normal) Output function		PRG-RUN
	DOUT6 (Normal) Output function		PRG-DOUT0
	DOUT7 (Normal) Output function		PRG-DOUT1

● Inverting mode

MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	Inverting mode	Changes the ON-OFF status of DOUT0 to DOUT7. **[Setting range]** • Not invert • Invert	Not invert

● OFF delay time

MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	OFF delay time	Sets the OFF delay time for DOUT0 to DOUT7. **[Setting range]** 0 to 250 ms	0



● Composite logical combination

MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	Composite logical combination	Sets the composite logical combination of DOUT0 to DOUT7. **[Setting range]** • AND • OR	OR

● **Composite output function**

MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	Composite output function	Selects the output signals for logical operation with the signals of DOUT0 to DOUT7. **[Setting range]** Output signals list ⇨p.207	CONST-OFF

● **Composite inverting mode**

MRC Studio Parameter group	Name	Description	Initial value
Direct-OUT (DOUT)	Composite inverting mode	Changes the ON-OFF status of the composite output function. **[Setting range]** • Not invert • Invert	Not invert

■ User output

● **User output source A function**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function(Extend)	User output source A function	Sets output source A of USR-OUT0 and USR-OUT1. **[Setting range]** Output signals list ⇨p.207	CONST-OFF

● **User output source A inverting mode**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function(Extend)	User output source A inverting mode	Changes ON/OFF of user output source A. **[Setting range]** • Not invert • Invert	Not invert

● **User output source B function**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function(Extend)	User output source B function	Sets output source B of USR-OUT0 and USR-OUT1. **[Setting range]** Output signals list ⇨p.207	CONST-OFF

● **User output source B inverting mode**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function(Extend)	User output source B inverting mode	Changes ON/OFF of user output source B. **[Setting range]** • Not invert • Invert	Not invert

- **User output logical operation**

MRC Studio Parameter group	Name	Description	Initial value
VIR-IN & USR-OUT function(Extend)	User output logical operation	Sets the logical combination of user output sources A and B. **[Setting range]** • AND • OR	OR

2 Signals list

2-1 Input signals list

Use "Signal name" when assigning signals using the **MRC Studio** software.
To assign signals via EtherNet/IP, use "Assignment number."
Refer to "4 Input signals" on p.217 for details about each signal.

Assignment number	Signal name	Functions
0	Not used	Set when the input terminal is not used.
1	FREE	These are used to shut off the motor current to put the motor into a non-excitation state. In the case of an electromagnetic brake motor, the electromagnetic brake is released.
2	FREE-RB	
3	FREE-E1	
4	FREE-E2	
16	STOP	This is used to stop the operation.
17	PAUSE	This is used to stop the operation temporarily.
19	E-STOP	This is used to stop the command and the operation program that are being executed. (Normally closed)
20	ALM-RST	These are used to reset the alarm generated presently.
21	ALM-RST-CNT	
22	ALM-RST-DRV	
25	ETO-CLR-DRV	This is used to turn the ETO-CLR input ON for all drivers except **AZD-KR2D**.
27	INFO-CLR	These are used to clear the information status.
28	INFO-CLR-CNT	
29	INFO-CLR-DRV	
30	HMI	This is used to release a state of limiting the functions of the **MRC Studio** software.
32	CRNT-LMT1	These are used to limit the current.
33	CRNT-LMT2	
34	CRNT-LMT3	
35	SPD-LMT1	These are used to limit the speed.
36	SPD-LMT2	
37	SPD-LMT3	
53	P-PRESET-RB	This is used to rewrite the origin of the user coordinate system to the present TCP.
62	PRG-DOUT-CLR	This is used to turn the output status OFF for all of PRG-DOUT1 to PRG-DOUT15.
63	PRG-ROUT-CLR	This is used to turn the output status OFF for all of PRG-ROUT1 to PRG-ROUT31.
64	M0	A program number is selected using these six bits.
65	M1	
66	M2	
67	M3	
68	M4	
69	M5	
76	ZHOME-ALL	These are used to execute high-speed return-to-origin operation.
77	ZHOME-RB	
78	ZHOME-E1	
79	ZHOME-E2	

Assignment number	Signal name	Functions
80	D-SEL0	These are used to execute the operation of the program number having set.
81	D-SEL1	
82	D-SEL2	
83	D-SEL3	
84	D-SEL4	
85	D-SEL5	
86	D-SEL6	
87	D-SEL7	
88	START	This is used to execute program operation.
89	SSTART	This is used to execute program operation by one command only.
90	JOG-TX+	These are used to execute JOG operation in the tool coordinate system.
91	JOG-TX–	
92	JOG-TY+	
93	JOG-TY–	
94	JOG-TZ+	
95	JOG-TZ–	
96	JOG-X+	These are used to execute JOG operation of X, Y, and Z.
97	JOG-X–	
98	JOG-Y+	
99	JOG-Y–	
100	JOG-Z+	
101	JOG-Z–	
102	JOG-RX+	These are used to execute JOG operation of Rx, Ry, and Rz.
103	JOG-RX–	
104	JOG-RY+	
105	JOG-RY–	
106	JOG-RZ+	
107	JOG-RZ–	
108	JOG-E1+	These are used to execute JOG operation of the end effector 1 and end effector 2.
109	JOG-E1–	
110	JOG-E2+	
111	JOG-E2–	
112	JOG-A1+	These are used to execute JOG operation for each axis.
113	JOG-A1–	
114	JOG-A2+	
115	JOG-A2–	
116	JOG-A3+	
117	JOG-A3–	
118	JOG-A4+	
119	JOG-A4–	
120	JOG-A5+	
121	JOG-A5–	
122	JOG-A6+	
123	JOG-A6–	
124	JOG-A7+	
125	JOG-A7–	

Assignment number	Signal name	Functions
126	JOG-A8+	These are used to execute JOG operation for each axis.
127	JOG-A8–	
128	JOG-P-X+	These are used to execute inching operation of X, Y, and Z.
129	JOG-P-X–	
130	JOG-P-Y+	
131	JOG-P-Y–	
132	JOG-P-Z+	
133	JOG-P-Z–	
134	JOG-P-RX+	These are used to execute inching operation of Rx, Ry, and Rz.
135	JOG-P-RX–	
136	JOG-P-RY+	
137	JOG-P-RY–	
138	JOG-P-RZ+	
139	JOG-P-RZ–	
140	JOG-P-E1+	These are used to execute inching operation of the end effector 1 and end effector 2.
141	JOG-P-E1–	
142	JOG-P-E2+	
143	JOG-P-E2–	
144	JOG-P-A1+	These are used to execute inching operation for each axis.
145	JOG-P-A1–	
146	JOG-P-A2+	
147	JOG-P-A2–	
148	JOG-P-A3+	
149	JOG-P-A3–	
150	JOG-P-A4+	
151	JOG-P-A4–	
152	JOG-P-A5+	
153	JOG-P-A5–	
154	JOG-P-A6+	
155	JOG-P-A6–	
156	JOG-P-A7+	
157	JOG-P-A7–	
158	JOG-P-A8+	
159	JOG-P-A8–	
160	PRG-DIN0	These are general-purpose input signals exclusively for direct input that can be set to "Wait (signal)" of the control command of program operation.
161	PRG-DIN1	
162	PRG-DIN2	
163	PRG-DIN3	
164	PRG-DIN4	
165	PRG-DIN5	
166	PRG-DIN6	
167	PRG-DIN7	
168	PRG-DIN8	
169	PRG-DIN9	
170	PRG-DIN10	
171	PRG-DIN11	
172	PRG-DIN12	

Assignment number	Signal name	Functions
173	PRG-DIN13	These are general-purpose input signals exclusively for direct input that can be set to "Wait (signal)" of the control command of program operation.
174	PRG-DIN14	
175	PRG-DIN15	
176	PLT1-CLR	These are used to clear the counter of the pallet.
177	PLT2-CLR	
178	PLT3-CLR	
179	PLT4-CLR	
180	PLT5-CLR	
181	PLT6-CLR	
192	PRG-RIN0	These are general-purpose input signals exclusively for remote input that can be set to "Wait (signal)" of the control command for program operation.
193	PRG-RIN1	
194	PRG-RIN2	
195	PRG-RIN3	
196	PRG-RIN4	
197	PRG-RIN5	
198	PRG-RIN6	
199	PRG-RIN7	
200	PRG-RIN8	
201	PRG-RIN9	
202	PRG-RIN10	
203	PRG-RIN11	
204	PRG-RIN12	
205	PRG-RIN13	
206	PRG-RIN14	
207	PRG-RIN15	
208	PRG-RIN16	
209	PRG-RIN17	
210	PRG-RIN18	
211	PRG-RIN19	
212	PRG-RIN20	
213	PRG-RIN21	
214	PRG-RIN22	
215	PRG-RIN23	
216	PRG-RIN24	
217	PRG-RIN25	
218	PRG-RIN26	
219	PRG-RIN27	
220	PRG-RIN28	
221	PRG-RIN29	
222	PRG-RIN30	
223	PRG-RIN31	
224	R0	These are general signals.
225	R1	
226	R2	
227	R3	
228	R4	
229	R5	

Assignment number	Signal name	Functions
230	R6	These are general signals.
231	R7	
232	R8	
233	R9	
234	R10	
235	R11	
236	R12	
237	R13	
238	R14	
239	R15	

2-2 Output signals list

Use "Signal name" when assigning signals using the **MRC Studio** software.
To assign signals via EtherNet/IP, use "Assignment number."
Refer to "5 Output signals" on p.223 for details about each signal.

Assignment number	Signal name	Functions
0	Not used	Set when the output terminal is not used.
1	FREE_R	Output in response to an input signal.
2	FREE-RB_R	
3	FREE-E1_R	
4	FREE-E2_R	
16	STOP_R	
17	PAUSE_R	
19	E-STOP_R	
20	ALM-RST_R	
21	ALM-RST-CNT_R	
22	ALM-RST-DRV_R	
25	ETO-CLR-DRV_R	
27	INFO-CLR_R	
28	INFO-CLR-CNT_R	
29	INFO-CLR-DRV_R	
30	HMI_R	
32	CRNT-LMT1_R	
33	CRNT-LMT2_R	
34	CRNT-LMT3_R	
35	SPD-LMT1_R	
36	SPD-LMT2_R	
37	SPD-LMT3_R	
53	P-PRESET-RB_R	
62	PRG-DOUT-CLR_R	
63	PRG-ROUT-CLR_R	
64	M0_R	
65	M1_R	
66	M2_R	
67	M3_R	
68	M4_R	

Assignment number	Signal name	Functions
69	M5_R	Output in response to an input signal.
76	ZHOME-ALL_R	
77	ZHOME-RB_R	
78	ZHOME-E1_R	
79	ZHOME-E2_R	
80	D-SEL0_R	
81	D-SEL1_R	
82	D-SEL2_R	
83	D-SEL3_R	
84	D-SEL4_R	
85	D-SEL5_R	
86	D-SEL6_R	
87	D-SEL7_R	
88	START_R	
89	SSTART_R	
90	JOG-TX+_R	
91	JOG-TX−_R	
92	JOG-TY+_R	
93	JOG-TY−_R	
94	JOG-TZ+_R	
95	JOG-TZ−_R	
96	JOG-X+_R	
97	JOG-X−_R	
98	JOG-Y+_R	
99	JOG-Y−_R	
100	JOG-Z+_R	
101	JOG-Z−_R	
102	JOG-RX+_R	
103	JOG-RX−_R	
104	JOG-RY+_R	
105	JOG-RY−_R	
106	JOG-RZ+_R	
107	JOG-RZ−_R	
108	JOG-E1+_R	
109	JOG-E1−_R	
110	JOG-E2+_R	
111	JOG-E2−_R	
112	JOG-A1+_R	
113	JOG-A1−_R	
114	JOG-A2+_R	
115	JOG-A2−_R	
116	JOG-A3+_R	
117	JOG-A3−_R	
118	JOG-A4+_R	
119	JOG-A4−_R	
120	JOG-A5+_R	
121	JOG-A5−_R	

Assignment number	Signal name	Functions
122	JOG-A6+_R	
123	JOG-A6−_R	
124	JOG-A7+_R	
125	JOG-A7−_R	
126	JOG-A8+_R	
127	JOG-A8−_R	
128	JOG-P-X+_R	
129	JOG-P-X−_R	
130	JOG-P-Y+_R	
131	JOG-P-Y−_R	
132	JOG-P-Z+_R	
133	JOG-P-Z−_R	
134	JOG-P-RX+_R	
135	JOG-P-RX−_R	
136	JOG-P-RY+_R	
137	JOG-P-RY−_R	
138	JOG-P-RZ+_R	
139	JOG-P-RZ−_R	
140	JOG-P-E1+_R	
141	JOG-P-E1−_R	
142	JOG-P-E2+_R	
143	JOG-P-E2−_R	
144	JOG-P-A1+_R	
145	JOG-P-A1−_R	Output in response to an input signal.
146	JOG-P-A2+_R	
147	JOG-P-A2−_R	
148	JOG-P-A3+_R	
149	JOG-P-A3−_R	
150	JOG-P-A4+_R	
151	JOG-P-A4−_R	
152	JOG-P-A5+_R	
153	JOG-P-A5−_R	
154	JOG-P-A6+_R	
155	JOG-P-A6−_R	
156	JOG-P-A7+_R	
157	JOG-P-A7−_R	
158	JOG-P-A8+_R	
159	JOG-P-A8−_R	
160	PRG-DIN0_R	
161	PRG-DIN1_R	
162	PRG-DIN2_R	
163	PRG-DIN3_R	
164	PRG-DIN4_R	
165	PRG-DIN5_R	
166	PRG-DIN6_R	
167	PRG-DIN7_R	
168	PRG-DIN8_R	

Assignment number	Signal name	Functions
169	PRG-DIN9_R	
170	PRG-DIN10_R	
171	PRG-DIN11_R	
172	PRG-DIN12_R	
173	PRG-DIN13_R	
174	PRG-DIN14_R	
175	PRG-DIN15_R	
176	PLT1-CLR_R	
177	PLT2-CLR_R	
178	PLT3-CLR_R	
179	PLT4-CLR_R	
180	PLT5-CLR_R	
181	PLT6-CLR_R	
192	PRG-RIN0_R	
193	PRG-RIN1_R	
194	PRG-RIN2_R	
195	PRG-RIN3_R	
196	PRG-RIN4_R	
197	PRG-RIN5_R	
198	PRG-RIN6_R	
199	PRG-RIN7_R	
200	PRG-RIN8_R	
201	PRG-RIN9_R	
202	PRG-RIN10_R	Output in response to an input signal.
203	PRG-RIN11_R	
204	PRG-RIN12_R	
205	PRG-RIN13_R	
206	PRG-RIN14_R	
207	PRG-RIN15_R	
208	PRG-RIN16_R	
209	PRG-RIN17_R	
210	PRG-RIN18_R	
211	PRG-RIN19_R	
212	PRG-RIN20_R	
213	PRG-RIN21_R	
214	PRG-RIN22_R	
215	PRG-RIN23_R	
216	PRG-RIN24_R	
217	PRG-RIN25_R	
218	PRG-RIN26_R	
219	PRG-RIN27_R	
220	PRG-RIN28_R	
221	PRG-RIN29_R	
222	PRG-RIN30_R	
223	PRG-RIN31_R	
224	R0_R	
225	R1_R	

Assignment number	Signal name	Functions
226	R2_R	Output in response to an input signal.
227	R3_R	
228	R4_R	
229	R5_R	
230	R6_R	
231	R7_R	
232	R8_R	
233	R9_R	
234	R10_R	
235	R11_R	
236	R12_R	
237	R13_R	
238	R14_R	
239	R15_R	
256	CONST-OFF	Output an OFF state all the time.
257	ALM-A	Output the alarm status. (Normally open)
258	ALM-A-CNT	
259	ALM-A-DRV	
260	ALM-B	Output the alarm status. (Normally closed)
261	ALM-B-CNT	
262	ALM-B-DRV	
263	SYS-RDY	Output when the power supply of the controller is turned on.
264	READY	Output when the robot is ready to operate.
265	MOVE	Output while the robot operates.
266	PRG-RUN	Output while program operation is executed.
267	WAIT	Output when a command is in a standby state.
268	CMD-END	Output when program operation or direct data operation is completed.
270	CMD-END-CNT	
271	MOVE-CNT	Output while the robot operates.
272	INFO	Output the Information status.
273	INFO-CNT	
274	INFO-DRV	
275	SYS-BSY	Output when the controller is in an internal processing state.
277	ETO-MON-DRV	Output when the driver is in the power removal status.
280	TLC	Output when the output torque reaches the upper limit value.
281	TLC-RB	
282	TLC-E1	
283	TLC-E2	
284	CRNT	Output when the motor is in an excitation state.
285	CRNT-RB	
286	CRNT-E1	
287	CRNT-E2	
288	VA	Output when the command speed reaches the target speed.
289	HOME-END	Output when high-speed return-to-origin operation is completed or when the origin of the user coordinate system is rewritten to the present TCP by turning the P-PRESET input ON.
290	ABSPEN	Output when coordinates have been set.
293	PRST-STLD-RB	Output when the origin of the user coordinate system has been set.

Assignment number	Signal name	Functions
296	SLS-X+	Output when the TCP position limit of X, Y, and Z is reached.
297	SLS-X–	
298	SLS-Y+	
299	SLS-Y–	
300	SLS-Z+	
301	SLS-Z–	
312	SLS-A1+	Output when the axis position limit of each axis is reached.
313	SLS-A1–	
314	SLS-A2+	
315	SLS-A2–	
316	SLS-A3+	
317	SLS-A3–	
318	SLS-A4+	
319	SLS-A4–	
320	SLS-A5+	
321	SLS-A5–	
322	SLS-A6+	
323	SLS-A6–	
324	SLS-A7+	
325	SLS-A7–	
326	SLS-A8+	
327	SLS-A8–	
328	AREA0	Output when the command position of the TCP is within the range of the user-defined area.
329	AREA1	
330	AREA2	
331	AREA3	
332	AREA4	
333	AREA0-AX	Output when the axis position is within the range set in the parameter.
334	AREA1-AX	
335	AREA2-AX	
344	USR-OUT1	Output a logical product (AND) or a logical sum (OR) for two types of output signals.
345	USR-OUT2	
352	ROBOT-EN	Output while the setup of the robot is properly completed.
353	HANDSYS-EN	Output when the robot type corresponds to the handed system selection.
354	SGL-LMT	Output when the robot is near the singularity.
355	PST-ERR	Output when the posture of the robot is in an abnormal state.
356	SLIP	Output during the slip mode.
360	PAUSE-BSY	Output during a pause state.
361	CRNT-LMTD1	Output while the controller limits the operating current for all motors.
362	CRNT-LMTD2	
363	CRNT-LMTD3	
364	SPD-LMTD1	Output while the controller limits the operating speed for all motors.
365	SPD-LMTD2	
366	SPD-LMTD3	

Assignment number	Signal name	Functions
368	D-END0	Output when the operation of the specified program number is completed.
369	D-END1	
370	D-END2	
371	D-END3	
372	D-END4	
373	D-END5	
374	D-END6	
375	D-END7	
384	PRG-DOUT0	These are general-purpose output signals exclusively for direct output that can be set to "Signal output" of the control command of program operation.
385	PRG-DOUT1	
386	PRG-DOUT2	
387	PRG-DOUT3	
388	PRG-DOUT4	
389	PRG-DOUT5	
390	PRG-DOUT6	
391	PRG-DOUT7	
392	PRG-DOUT8	
393	PRG-DOUT9	
394	PRG-DOUT10	
395	PRG-DOUT11	
396	PRG-DOUT12	
397	PRG-DOUT13	
398	PRG-DOUT14	
399	PRG-DOUT15	
416	PRG-ROUT0	These are general-purpose output signals exclusively for remote output that can be set to "Signal output" of the control command of program operation.
417	PRG-ROUT1	
418	PRG-ROUT2	
419	PRG-ROUT3	
420	PRG-ROUT4	
421	PRG-ROUT5	
422	PRG-ROUT6	
423	PRG-ROUT7	
424	PRG-ROUT8	
425	PRG-ROUT9	
426	PRG-ROUT10	
427	PRG-ROUT11	
428	PRG-ROUT12	
429	PRG-ROUT13	
430	PRG-ROUT14	
431	PRG-ROUT15	
432	PRG-ROUT16	
433	PRG-ROUT17	
434	PRG-ROUT18	
435	PRG-ROUT19	
436	PRG-ROUT20	
437	PRG-ROUT21	
438	PRG-ROUT22	

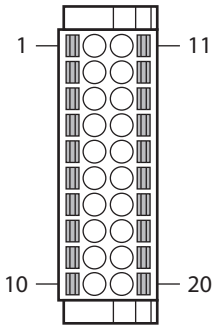
Assignment number	Signal name	Functions
439	PRG-ROUT23	These are general-purpose output signals exclusively for remote output that can be set to "Signal output" of the control command of program operation.
440	PRG-ROUT24	
441	PRG-ROUT25	
442	PRG-ROUT26	
443	PRG-ROUT27	
444	PRG-ROUT28	
445	PRG-ROUT29	
446	PRG-ROUT30	
447	PRG-ROUT31	
480	INFO-USRIO	Output when the corresponding information is generated.
482	INFO-CNTTMP	
487	INFO-RBSPD	
488	INFO-AXISSPD	
489	INFO-START	
490	INFO-ZHOME	
491	INFO-PR-REQ	
493	INFO-MECHMIS	
495	INFO-NET-E	
496	INFO-OT-RB+	
497	INFO-OT-RB–	
498	INFO-OT-AX+	
499	INFO-OT-AX–	
500	INFO-PHBAREA	
501	INFO-SGL-LMT	
502	INFO-PST-ERR	
503	INFO-SLIP	
506	INFO-DRVDIS	
507	INFO-DRVINFO	
508	INFO-DSLMTD	
509	INFO-IOTEST	
510	INFO-CFG	
511	INFO-RBT	

3 Signal type

3-1 Direct I/O

Direct I/O is I/O to be accessed via the I/O signal connector. Use parameters to assign the signals to the I/O terminals of the I/O signal connector. Refer to "2 Signals list" on p.203 for signals that can be assigned.

Pin No.	Signal name	Initial value
2	DIN0	STOP
3	DIN2	ETO-CLR-DRV
4	DIN4	PAUSE
5	DIN6	PRG-DIN0
7	DOUT0	READY
8	DOUT2	ETO-MON-DRV
9	DOUT4	PAUSE-BSY
10	DOUT6	PRG-DOUT0



Pin No.	Signal name	Initial value
12	DIN1	FREE-RB
13	DIN3	ALM-RST
14	DIN5	Not used
15	DIN7	PRG-DIN1
17	DOUT1	MOVE
18	DOUT3	ALM-B
19	DOUT5	PRG-RUN
20	DOUT7	PRG-DOUT1

Related parameter

MRC Studio Parameter group	Signal name	Input function
Direct-IN (DIN)	DIN0	STOP
	DIN1	FREE-RB
	DIN2	ETO-CLR-DRV
	DIN3	ALM-RST
	DIN4	PAUSE
	DIN5	Not used
	DIN6	PRG-DIN0
	DIN7	PRG-DIN1

MRC Studio Parameter group	Signal name	Output function
Direct-OUT (DOUT)	DOUT0	READY
	DOUT1	MOVE
	DOUT2	ETO-MON-DRV
	DOUT3	ALM-B
	DOUT4	PAUSE-BSY
	DOUT5	PRG-RUN
	DOUT6	PRG-DOUT0
	DOUT7	PRG-DOUT1

Note

- When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The E-STOP input and the HMI input are always in an ON state if they are not assigned to input terminals. If these inputs are assigned to both direct I/O and remote I/O, the function will be executed only when both I/Os are turned ON.

3-2 Remote I/O

Remote I/O is I/O to be accessed via EtherNet/IP.

■ Assignment to input signals

Use parameters to assign the input signals to R-IN0 to R-IN15 of remote I/O.
Refer to "2-1 Input signals list" on p.203 for input signals that can be assigned.

Related parameter

MRC Studio Parameter group	Signal name	Initial value
Remote-I/O (R-I/O)	R-IN0	PRG-RIN0
	R-IN1	PRG-RIN1
	R-IN2	PRG-RIN2
	R-IN3	PRG-RIN3
	R-IN4	PRG-RIN4
	R-IN5	PRG-RIN5
	R-IN6	PRG-RIN6
	R-IN7	PRG-RIN7

MRC Studio Parameter group	Signal name	Initial value
Remote-I/O (R-I/O)	R-IN8	PRG-RIN8
	R-IN9	PRG-RIN9
	R-IN10	PRG-RIN10
	R-IN11	PRG-RIN11
	R-IN12	PRG-RIN12
	R-IN13	PRG-RIN13
	R-IN14	PRG-RIN14
	R-IN15	PRG-RIN15

Note

- When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The E-STOP input and the HMI input are always in an ON state if they are not assigned to input terminals. If these inputs are assigned to both direct I/O and remote I/O, the function will be executed only when both I/Os are turned ON.

■ Assignment to output signals

Use parameters to assign the output signals to R-OUT0 to R-OUT15 of remote I/O.
Refer to "2-2 Output signals list" on p.207 for the output signals that can be assigned.

Related parameter

MRC Studio Parameter group	Signal name	Initial value
Remote-I/O (R-I/O)	R-OUT0	PRG-ROUT0
	R-OUT1	PRG-ROUT1
	R-OUT2	PRG-ROUT2
	R-OUT3	PRG-ROUT3
	R-OUT4	PRG-ROUT4
	R-OUT5	PRG-ROUT5
	R-OUT6	PRG-ROUT6
	R-OUT7	PRG-ROUT7

MRC Studio Parameter group	Signal name	Initial value
Remote-I/O (R-I/O)	R-OUT8	PRG-ROUT8
	R-OUT9	PRG-ROUT9
	R-OUT10	PRG-ROUT10
	R-OUT11	PRG-ROUT11
	R-OUT12	PRG-ROUT12
	R-OUT13	PRG-ROUT13
	R-OUT14	PRG-ROUT14
	R-OUT15	PRG-ROUT15

4 Input signals

4-1 Operation control

■ Excitation switching signals

- **FREE input, FREE-RB input, FREE-E1 input, FREE-E2 input**

These signals are used to switch the motor excitation state between excitation and non-excitation. In the case of an electromagnetic brake motor, turning these signals ON make the electromagnetic brake be in a state of releasing the motor shaft.
The state of the robot when each signal is turned ON is as follows.

- FREE input: The current flowing to all motors is shut off to put the motors into a non-excitation state.
- FREE-RB input: The current flowing to all motion axes (motors driving the robot) is shut off to put the motors into a non-excitation state.
- FREE-E1 input: The current flowing to the end-effector axis 1 (a motor driving the end effector 1) is shut off to put the motor into a non-excitation state.
- FREE-E2 input: The current flowing to the end-effector axis 2 (a motor driving the end effector 2) is shut off to put the motor into a non-excitation state.

Note When these input signals are turned ON, the robot may lose its posture or a load may fall since motors lose the holding force.

memo This is not a power removal function that can apply to protection measures.

■ Operation stop signals

These signals are used to stop the operation of the robot.
The CMD-END output is not turned ON even if the operation stop signal is turned ON.

- **STOP input**

When the STOP input is turned ON, the command and operation program being executed is stopped. (All motors will stop.)

- **E-STOP input**

The E-STOP input is a signal that is normally closed.
When the E-STOP input is turned OFF, the command and operation program being executed is stopped. (All motors will stop.)
When it is turned ON, the controller is come into a state that can be operated.
The E-STOP input can be assigned only to direct input. When it is not assigned, it will always be set to ON.

- **PAUSE input**

When the PAUSE input is turned ON, the command and operation program being executed is stopped temporarily. (All motors will stop temporarily.)
When the PAUSE input is turned OFF, the command and operation program having paused is resumed.

memo This is not a stop function that can apply to protection measures.

■ Signals used for program operation

- **START input**

When the START input is turned ON, operation of the program number having selected is executed.
After starting operation, all the commands having set are automatically executed.

- **SSTART input**

When the SSTART input is turned ON, operation of the program number having selected is executed.
After starting operation, the commands having set are executed one by one. If the SSTART input is turned from OFF to ON each time when a command is completed, the next command is executed.

- **D-SEL0 to D-SEL7 inputs**

  When one of the D-SEL0 to D-SEL7 inputs is turned ON, operation of the program number having set is executed. Since operation can be performed by only turning a single signal ON, the steps of selecting the program number can be saved.

- **PRG-DOUT-CLR input, PRG-ROUT-CLR input**

  These signals are used to turn OFF all of the general-purpose output signals that are used for the control commands of program operation.
  - PRG-DOUT-CLR input: This is used to turn the output status OFF for all of PRG-DOUT0 to PRG-DOUT15.
  - PRG-ROUT-CLR input: This is used to turn the output status OFF for all of PRG-ROUT0 to PRG-ROUT31.

- **M0 to M5 inputs**

  Select a desired program number to be executed by combining the ON-OFF status of the M0 to M5 inputs.

Program number	M5	M4	M3	M2	M1	M0
0	OFF	OFF	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	OFF	OFF	**ON**
• • •	• • •	• • •	• • •	• • •	• • •	• • •
63	**ON**	**ON**	**ON**	**ON**	**ON**	**ON**

- **ZHOME-ALL input, ZHOME-RB input, ZHOME-E1 input, ZHOME-E2 input**

  These signals are used to execute high-speed return-to-origin operation. The state of the robot when each signal is turned ON is as follows.
  - ZHOME-ALL input: All coordinates (X, Y, Z, Rx, Ry, Rz, E1, E2), including the end effector, are returned to the origin.
  - ZHOME-RB input: All coordinates (X, Y, Z, Rx, Ry, Rz) except the end effector are returned to the origin.
  - ZHOME-E1 input: Coordinates of the end effector 1 are returned to the origin.
  - ZHOME-E2 input: Coordinates of the end effector 2 are returned to the origin.

  memo In the case of a robot other than a Cartesian robot, high-speed return-to-origin operation cannot be executed without setting the origin of the user coordinate system.

■ General purpose inputs for control commands

- **PRG-DIN0 input to PRG-DIN15 input**

  These are general-purpose input signals exclusive for direct input that can be set to "Wait (signal)" of the control command.

  memo They cannot be assigned to the R-IN input function.

- **PRG-RIN0 input to PRG-RIN31 input**

  These are general-purpose input signals exclusive for remote input that can be set to "Wait (signal)" of the control command.

  memo They cannot be assigned to the DIN input function.

- **R0 input to R15 input**

  The R0 to R15 inputs are general-purpose signals. Using the R0 to R15 inputs, I/O signals from the host controller to the external equipment can be controlled by the **MRC01** controller. Direct I/O of the **MRC01** controller can be used as an I/O module.

  Example of use: When signals are output from the host controller to the external equipment

  Assign the R0 input to R-IN0 and the R0_R output to DOUT0.
  DOUT0 is turned ON when R-IN0 is set to 1 by the host controller, and DOUT0 is turned OFF when R-IN0 is set to 0.

  Example of use: When signals output from the external equipment are input to the host controller

  Assign the R1 input to DIN1 and the R1_R output to R-OUT1.
  R-OUT1 is set to 1 when DIN1 is turned ON by the external equipment, and R-OUT1 is set to 0 when DIN1 is turned OFF. The ON-OFF status of DIN1 can be set using the "DIN1 inverting mode" parameter.

■ Signals used for operation limitation

● HMI input

When the HMI input is turned ON, a state of limiting the functions of the **MRC Studio** software is released. When it is turned OFF, the functions are limited.
The functions to be limited are shown below.

- Setup
- Teaching operation
- Writing data and restoring parameters to the factory setting

Note

- When the HMI input is not assigned to direct I/O or remote I/O, this input will always be set to ON. Also, when this input is assigned to both direct I/O and remote I/O, the function will be executed only when both of them are turned ON.
- When the HMI input is assigned to the DIN input function, do not set the "1-shot signal" parameter to "Enable."

memo A state of limiting the functions can also be released using the "HMI release key" parameter.

● CRNT-LMT1 to CRNT-LMT3 inputs

If the CRNT-LMT input is turned ON, the operating current for all motors is limited.
The limited value can be set using the "CRNT-LMT operating current limit value" parameter.

● SPD-LMT1 to SPD-LMT3 inputs

If the SPD-LMT input is turned ON, the operating speed for all motors is limited.
The limited value can be set using the "SPD-LMT speed limit type selection," "SPD-LMT speed limit ratio," and "SPD-LMT speed limit value" parameters.

memo This is not a function for limitation that can apply to protection measures.

■ Signals used for macro operation

● Signals related to inching operation

The state of the robot when each signal related to inching operation is turned ON is as follows.

Input signals	Description
JOG-P-X+ (–) input	Inching operation is performed in the positive direction or negative direction of X axis.
JOG-P-Y+ (–) input	Inching operation is performed in the positive direction or negative direction of Y axis.
JOG-P-Z+ (–) input	Inching operation is performed in the positive direction or negative direction of Z axis.
JOG-P-E1+ (–) input	Inching operation is performed in the positive direction or negative direction of the end effector 1.
JOG-P-E2+ (–) input	Inching operation is performed in the positive direction or negative direction of the end effector 2.
JOG-P-RX+ (–) input	Inching operation is performed in the positive direction or negative direction of Rx axis.
JOG-P-RY+ (–) input	Inching operation is performed in the positive direction or negative direction of Ry axis.
JOG-P-RZ+ (–) input	Inching operation is performed in the positive direction or negative direction of Rz axis.
JOG-P-A1+ (–) input to JOG-P-A8+ (–) input	Inching operation is performed in the positive direction or negative direction of an axis corresponding to the input signal.

- **Signals related to JOG operation**

The state of the robot when each signal related to JOG operation is turned ON is as follows.

Input signals	Description
JOG-X+ (–) input	JOG operation is performed in the positive direction or negative direction of X axis.
JOG-Y+ (–) input	JOG operation is performed in the positive direction or negative direction of Y axis.
JOG-Z+ (–) input	JOG operation is performed in the positive direction or negative direction of Z axis.
JOG-E1+ (–) input	JOG operation is performed in the positive direction or negative direction of the end effector 1.
JOG-E2+ (–) input	JOG operation is performed in the positive direction or negative direction of the end effector 2.
JOG-RX+ (–) input	JOG operation is performed in the positive direction or negative direction of Rx axis.
JOG-RY+ (–) input	JOG operation is performed in the positive direction or negative direction of Ry axis.
JOG-RZ+ (–) input	JOG operation is performed in the positive direction or negative direction of Rz axis.
JOG-A1+ (–) input to JOG-A8+ (–) input	JOG operation is performed in the positive direction or negative direction of an axis corresponding to the input signal.
JOG-TX+ (–) input *	JOG operation is performed in the positive direction or negative direction of Tx axis.
JOG-TY+ (–) input *	JOG operation is performed in the positive direction or negative direction of Ty axis.
JOG-TZ+ (–) input *	JOG operation is performed in the positive direction or negative direction of Tz axis.

* The corresponding JOG-TX, JOG-TY, or JOG-TZ varies depending on the robot type.

Robot type		JOG-TX	JOG-TY	JOG-TZ
SCARA	2-link tip up-down	–	–	○
	2-link base up-down	–	–	○
	2-link tip up-down + Rz	○	○	○
	2-link base up-down + Rz	○	○	○
	2-link + Rz without up-down	○	○	–
	2-link without up-down	–	–	–
	2-link base linear motion tip up-down	○	○	○
	2-link base linear motion base up-down	○	○	○
	2-link base linear motion without up-down	○	○	–
	3-link tip up-down	○	○	○
	3-link base up-down	○	○	○
	3-link without up-down	○	○	–
Vertically articulated	3-link base rotation	–	○	○
	3-link base linear motion	○	○	○
	3-link base rotation + Rz	○	○	○
	3-link base linear motion + Rz	○	○	○
	3-link without base axis	–	○	○
	6-axis vertically articulated Model 1	○	○	○
	6-axis vertically articulated Model 2	○	○	○
Vertically articulated (Palletizer)	1 parallel-linkage base rotation	–	○	○
	1 parallel-linkage base linear motion	○	○	○
	1 parallel-linkage base rotation + Rz	○	○	○
	1 parallel-linkage base linear motion + Rz	○	○	○
	1 parallel-linkage without base axis	–	○	○
	2 parallel-linkage base rotation	–	○	○
	2 parallel-linkage base linear motion	○	○	○
	2 parallel-linkage base rotation + Rz	○	○	○
	2 parallel-linkage base linear motion + Rz	○	○	○
	2 parallel-linkage without base axis	–	○	○

Robot type		JOG-TX	JOG-TY	JOG-TZ
Delta robot	Delta robot	○	○	○
	Delta robot + Rz	○	○	○
Polar/Cylindrical robot	Polar	–	○	–
	Polar + Rz	○	○	–
	Cylindrical	–	○	○
	Cylindrical + Rz	○	○	○
Cartesian	2-axis (XY)	○	○	–
	2-axis (XZ)	○	–	○
	2-axis (YZ)	–	○	○
	X Y + Rz	○	○	–
	X Z + Rz	○	–	○
	Y Z + Rz	–	○	○
	3-axis (XYZ)	○	○	○
	X Y Z + Rz	○	○	○
Cartesian (Planar surface gantry)	Planar surface gantry 2-axis (XY)	○	○	–
	Planar surface gantry 2-axis (XZ)	○	–	○
	Planar surface gantry 2-axis (YZ)	–	○	○
	Planar surface gantry 2-axis (XY) + Rz	○	○	–
	Planar surface gantry 2-axis (XZ) + Rz	○	–	○
	Planar surface gantry 2-axis (YZ) + Rz	–	○	○
	Planar surface gantry 3-axis (XYZ)	○	○	○
	Planar surface gantry 3-axis (XYZ) + Rz	○	○	○
Small Robots **OVR**	4-axis vertically articulated: **OVR4048K5-V** **OVR4068K5-V** **OVR4088K5-V**	○	○	○
	5-axis vertically articulated: **OVR5035K1-V**	○	○	○
	6-axis vertically articulated: **OVR6048K1-V**	○	○	○
	3-axis SCARA: **OVR3041K3-H**	○	○	–

4-2 Coordinates management

- **P-PRESET-RB input**

  When the P-PRESET-RB input is turned ON, the origin of the user coordinate system is rewritten to the present TCP. At the same time, the value of the rewritten origin is written to the non-volatile memory.

  memo The P-PRESET-RB input cannot be turned ON while the robot is operated or is temporarily stopped by the PAUSE input.

- **PLT1-CLR to PLT6-CLR inputs**

  When the PLT1-CLR to PLT6-CLR inputs are turned ON, the next cell number of the corresponding pallet is set to 1.

4-3 Controller management

■ Status releasing signals

These signals are used to release the signal or status that is not released automatically.

● ALM-RST input, ALM-RST-CNT input, ALM-RST-DRV input

These signals are used to reset an alarm.
If an alarm is generated, the robot will stop. Be sure to remove the cause of the alarm and ensure safety before resetting the alarm. Note that some alarms cannot be reset with these signals. Refer to "2-3 Alarm list" on p.246 for alarms.
The state of the robot when each signal is turned from OFF to ON is as follows (they are enabled at the ON edge).

- ALM-RST input: Alarms generated in the controller and all drivers are reset.
- ALM-RST-CNT input: Alarms generated in the controller are reset.
- ALM-RST-DRV input: Alarms generated in all driver are reset.

● ETO-CLR-DRV input

When the ETO-CLR-DRV input is turned ON, the ETO-CLR input for all drivers except **AZD-KR2D** is turned ON. Refer to the **AZ** Series OPERATING MANUAL Function Edition for the ETO-CLR input.

Note The ETO-CLR-DRV input is not a safety-related part of a control system.

● INFO-CLR input, INFO-CLR-CNT input, INFO-CLR-DRV input

These signals are used to clear the information status. The state of the robot when each signal is turned ON is as follows.

- INFO-CLR input: The information status for the controller and all drivers is cleared.
- INFO-CLR-CNT input: The information status for the controller is cleared.
- INFO-CLR-DRV input: The information status for all drivers is cleared.

5 Output signals

5-1 Controller management

■ Status indication of controller

- **ALM-A output, ALM-A-CNT output, ALM-A-DRV output**
  ALM-B output, ALM-B-CNT output, ALM-B-DRV output

  These signals are output when an alarm is generated. The "ALM-A- output" is normally open and the "ALM-B- output" is normally closed.
  The state of signals when an alarm is generated is as follows. If an alarm is generated, the POWER/ALARM LED of the controller will blink in red to stop the robot.

Product that an alarm is generated	ALM-A	ALM-B	ALM-A-CNT	ALM-B-CNT	ALM-A-DRV	ALM-B-DRV
Controller and driver	**ON**	OFF	**ON**	OFF	**ON**	OFF
Controller	**ON**	OFF	**ON**	OFF	OFF	**ON**
Driver	**ON**	OFF	OFF	**ON**	**ON**	OFF

- **SYS-RDY output**

  After the power supply is turned on, when output signals are ready to operate ON-OFF and signals are enabled to input, the SYS-RDY output is turned ON.

- **SYS-BSY output**

  The SYS-BSY output is turned ON while the controller performs the following internal processing.
  - Teaching is being executed using the **MRC Studio** software.
  - Data writing is being executed using the **MRC Studio** software.
  - "Restoring parameters to the factory setting" is being executed using the **MRC Studio** software.
  - The maintenance command is being executed.

- **INFO output, INFO-CNT output, INFO-DRV output**

  These signals are output when information is generated.
  The state of signals when information is generated is as follows.

Product that information is generated	INFO	INFO-CNT	INFO-DRV
Controller and driver	**ON**	**ON**	**ON**
Controller	**ON**	**ON**	OFF
Driver	**ON**	OFF	**ON**

- **Output of signals for information**

  If corresponding information is generated, each output signal is turned ON.

- **SLIP output**

  This signal is output in the slip mode. The slip mode is a function to slip the motor when a load on the robot axis is increased while the robot stops. In the slip mode, the feedback position is the same value as the command position. If the robot axis is moved by an external force during the slip mode, it will not return to its former position. The slip mode is canceled after the time period set in the "Slip mode release time" parameter is elapsed.
  The SLIP output is turned ON when all of the following conditions are satisfied to move to the slip mode.
  - While the robot stops.
  - The "Slip function setting" parameter is set to "1: Enable."
  - Among the motion axes (motors driving the robot), there is an axis that the time period set in the "Slip mode decision time" parameter has elapsed while the load factor of the "Slip mode decision load factor" parameter is exceeded.

■ Status indication of motor

- **CRNT output, CRNT-RB output, CRNT-E1 output, CRNT-E2 output**

These signals are output when the motor is in an excitation state.

- CRNT output: The CRNT output is turned ON when all motors are in an excitation state.
- CRNT-RB output: The CRNT-RB output is turned ON when all motion axes (motors driving the robot) is in an excitation state.
- CRNT-E1 output: The CRNT-EE output is turned ON when the end-effector axis 1 (a motor driving the end effector 1) is in an excitation state.
- CRNT-E2 output: The CRNT-EE output is turned ON when the end-effector axis 2 (a motor driving the end effector 2) is in an excitation state.

5-2 Management of operation

■ Status indication of operation

- **READY output**

The READY output is turned ON when the controller and all drivers are ready to operate. Input the operation start command to the controller after the READY output is turned ON.
The READY output is turned ON when all of the following conditions are satisfied.

- The READY output is in an ON state for all drivers.
- The SYS-BSY output is in an OFF state.
- Not during initialization.
- Not during operation.
- The STOP input is in an OFF state.
- The CRNT output is in an ON state.
- The TLC-RB output is in an OFF state.
- Not in an alarm status.
- Communication with the driver is normal.
- Not in the slip mode.

- **MOVE output, MOVE-CNT output**

- MOVE output: The MOVE output is turned ON while the robot operates. When the command from the controller to the driver is stopped and all motors stop the operation, this signal is turned OFF.
- MOVE-CNT output: The MOVE-CNT output is turned ON while the robot operates. When the command from the controller to the driver is stopped, this signal is turned OFF. (It will be turned OFF even if there is a motor in operation.)

- **CMD-END output, CMD-END-CNT output**

These signals are output when program operation or direct data operation is completed.

- CMD-END output: The CMD-END output is turned ON when all motors stop after program operation or direct data operation is completed.
- CMD-END-CNT output: The CMD-END-CNT output is turned ON when program operation or direct data operation is completed.

memo When operation is interrupted by the STOP input or other operation stop signals, the CMD-END output and the CMD-END-CNT output are not turned ON.

- **PRG-RUN output**

The PRG-RUN output is turned ON while program operation is executed.

- **WAIT output**

The WAIT output is turned ON while "Wait (time)" or "Wait (signal)" of the control command is being executed.

- **TLC output, TLC-RB output, TLC-E1 output, TLC-E2 output**

  These signals are output when the motor output torque reached the upper limit value.
  - TLC output: The TLC output is turned ON when the output torque of any of the motors reaches the upper limit value.
  - TLC-RB output: The TLC-RB output is turned ON when the output torque of any of the motion axes (motors driving the robot) reaches the upper limit value.
  - TLC-E1 output: The TLC-E1 output is turned ON when the output torque of the end-effector axis 1 (a motor driving the end effector 1) reaches the upper limit value.
  - TLC-E2 output: The TLC-E2 output is turned ON when the output torque of the end-effector axis 2 (a motor driving the end effector 2) reaches the upper limit value.

- **VA output**

  The VA output is turned ON when the command speed reaches the target speed.

- **CRNT-LMTD1 to CRNT-LMTD3 outputs**

  These signals are enabled when the current limit is performed by the current limit input. If the operating current increases equal to or higher than the value set in the "CRNT-LMT operating current limit value" parameter, the operating speed is limited to turn the CRNT-LMTD1 to CRNT-LMTD3 outputs ON.

- **SPD-LMTD1 to SPD-LMTD3 outputs**

  These signals are enabled when the speed limit is performed by the speed limit input. If the operating speed increases equal to or higher than the value set in the "SPD-LMT speed limit ratio" parameter or the "SPD-LMT speed limit value" parameter, the operating speed is limited to turn the SPD-LMTD1 to SPD-LMTD3 outputs ON.

- **HOME-END output**

  When high-speed return-to-origin operation is completed or when the P-PRESET-RB input is turned ON to rewrite the origin of the user coordinate system to the present TCP, the HOME-END output is turned ON.

- **D-END0 to D-END7 outputs**

  These signals are enabled in program operation.
  They are turned OFF when operation of the specified program number is executed, and ON when it is completed.

- **PAUSE-BSY output**

  If the PAUSE input is turned ON while a command or operation program is being executed, the operation is temporarily stopped and the PAUSE-BSY output is turned ON.

■ Power removal function

- **ETO-MON-DRV output**

  The ETO-MON-DRV output is turned ON when there is a driver in the power removal status.

  Note The ETO-MON-DRV output is not a safety-related part of a control system.

■ Position indication of robot and axes

These signals are output according to the motor position.

- **AREA0 to AREA4 outputs**

  The AREA output is turned ON when the command position of the TCP is within the range set in the "User-defined area" parameter.
  It is turned ON when the command position of the TCP is within the range of the user-defined area even while the robot stops.

- **AREA0-AX to AREA2-AX outputs**

  When the axis position selected with the "AREA-AX target axis selection" parameter is within the range set with the "AREA-AX positive direction position" parameter or "AREA-AX negative direction position" parameter, the output signal of the corresponding axis is turned ON. It is turned ON even if operation is stopped.

- **SLS-X+ output, SLS-Y+ output, SLS-Z+ output**

  If the command position of the TCP exceeds the position set in the "TCP position limit X+" parameter, "TCP position limit Y+" parameter, or "TCP position limit Z+" parameter, the output signal of the corresponding axis is turned ON.

- **SLS-X– output, SLS-Y– output, SLS-Z– output**

  If the command position of the TCP falls below the position set in the "TCP position limit X–" parameter, "TCP position limit Y–" parameter, or "TCP position limit Z–" parameter, the output signal of the corresponding axis is turned ON.

- **SLS-A1+ to SLS-A8+ outputs**

  If a motion axis (a motor driving the robot) exceeds the position set in the corresponding parameter among the "Axis position limit Axis 1+" to "Axis position limit Axis 6+" parameters, the corresponding output among the SLS-A1+ to SLS-A6+ outputs is turned ON.
  If the end effector 1 exceeds the position set in the "Axis position limit end-effector 1+" parameter, the SLS-A7+ output is turned ON.
  If the end effector 2 exceeds the position set in the "Axis position limit end-effector 2+" parameter, the SLS-A8+ output is turned ON.

- **SLS-A1– to SLS-A8– outputs**

  If a motion axis (a motor driving the robot) falls below the position set in the corresponding parameter among the "Axis position limit Axis 1–" to "Axis position limit Axis 6–" parameters, the corresponding output among the SLS-A1– to SLS-A6– outputs is turned ON.
  If the end effector 1 falls below the position set in the "Axis position limit end-effector 1–" parameter, the SLS-A7– output is turned ON.
  If the end effector 2 falls below the position set in the "Axis position limit end-effector 2–" parameter, the SLS-A8– output is turned ON.

- **SGL-LMT output**

  The SGL-LMT output is turned ON while the robot is in near the singularity. If the SGL-LMT output is turned ON, operation is stopped. While this signal is output, linear interpolation operation, circular interpolation operation, and arch interpolation operation cannot be executed.

- **PST-ERR output**

  - Vertically articulated robot
    The PST-ERR output is turned ON when the elbow joint (*) is at a negative angle. While this signal is output, interpolation operation cannot be executed.

    * With base axis: Axis 3, without base axis: Axis 2

  - Delta robot
    The PST-ERR output is turned ON when the TCP position is in an abnormal posture that cannot be calculated. While this signal is output, operation cannot be executed.

■ General purpose outputs for control commands

- **PRG-DOUT0 to PRG-DOUT15 outputs**

  These are general-purpose output signals exclusive for direct output that can be set to "Signal output" of the control command.

  memo They cannot be assigned to the R-OUT output function.

- **PRG-ROUT0 to PRG-ROUT31 outputs**

  These are general-purpose output signals exclusive for remote output that can be set to "Signal output" of the control command.

  memo They cannot be assigned to the DOUT output function.

■ Coordinate status indication

- **ABSPEN output**

  The ABSPEN output is turned ON while the home is set for all axes.

- **PRST-STLD-RB output**

  The PRST-STLD-RB output is turned ON while the origin of the user coordinate system is set.

- **ROBOT-EN output**

  The ROBOT-EN output is turned ON while the setup of the robot using the **MRC Studio** software is properly completed.

- **HANDSYS-EN output**

  The HANDSYS-EN output is turned ON when the robot type is a SCARA robot or a 6-axis vertically articulated robot.

5-3 Response outputs

The response output is a signal to output the ON-OFF status of the corresponding input signal.
The table below shows the correspondences between input signals and output signals.

Input signal	Output signal
FREE	FREE_R
FREE-RB	FREE-RB_R
FREE-E1	FREE-E1_R
FREE-E2	FREE-E2_R
STOP	STOP_R
PAUSE	PAUSE_R
E-STOP	E-STOP_R
ALM-RST	ALM-RST_R
ALM-RST-CNT	ALM-RST-CNT_R
ALM-RST-DRV	ALM-RST-DRV_R
INFO-CLR	INFO-CLR_R
INFO-CLR-CNT	INFO-CLR-CNT_R
INFO-CLR-DRV	INFO-CLR-DRV_R
HMI	HMI_R
CRNT-LMT1	CRNT-LMT1_R
CRNT-LMT2	CRNT-LMT2_R
CRNT-LMT3	CRNT-LMT3_R
SPD-LMT1	SPD-LMT1_R
SPD-LMT2	SPD-LMT2_R
SPD-LMT3	SPD-LMT3_R
P-PRESET-RB	P-PRESET-RB_R
PRG-DOUT-CLR	PRG-DOUT-CLR_R
PRG-ROUT-CLR	PRG-DOUT-CLR_R
M0	M0_R
M1	M1_R
M2	M2_R
M3	M3_R
M4	M4_R
M5	M5_R
ZHOME-ALL	ZHOME-ALL_R
ZHOME-RB	ZHOME-RB_R
ZHOME-E1	ZHOME-E1_R
ZHOME-E2	ZHOME-E2_R
D-SEL0	D-SEL0_R
D-SEL1	D-SEL1_R
D-SEL2	D-SEL2_R
D-SEL3	D-SEL3_R
D-SEL4	D-SEL4_R
D-SEL5	D-SEL5_R
D-SEL6	D-SEL6_R
D-SEL7	D-SEL7_R
START	START_R
SSTART	SSTART_R

Input signal	Output signal
JOG-TX+	JOG-TX+_R
JOG-TX–	JOG-TX–_R
JOG-TY+	JOG-TY+_R
JOG-TY–	JOG-TY–_R
JOG-TZ+	JOG-TZ+_R
JOG-TZ–	JOG-TZ–_R
JOG-X+	JOG-X+_R
JOG-X–	JOG-X–_R
JOG-Y+	JOG-Y+_R
JOG-Y–	JOG-Y–_R
JOG-Z+	JOG-Z+_R
JOG-Z–	JOG-Z–_R
JOG-RX+	JOG-RX+_R
JOG-RX–	JOG-RX–_R
JOG-RY+	JOG-RY+_R
JOG-RY–	JOG-RY–_R
JOG-RZ+	JOG-RZ+_R
JOG-RZ–	JOG-RZ–_R
JOG-E1+	JOG-E1+_R
JOG-E1–	JOG-E1–_R
JOG-E2+	JOG-E2+_R
JOG-E2–	JOG-E2–_R
JOG-A1+	JOG-A1+_R
JOG-A1–	JOG-A1–_R
JOG-A2+	JOG-A2+_R
JOG-A2–	JOG-A2–_R
JOG-A3+	JOG-A3+_R
JOG-A3–	JOG-A3–_R
JOG-A4+	JOG-A4+_R
JOG-A4–	JOG-A4–_R
JOG-A5+	JOG-A5+_R
JOG-A5–	JOG-A5–_R
JOG-A6+	JOG-A6+_R
JOG-A6–	JOG-A6–_R
JOG-A7+	JOG-A7+_R
JOG-A7–	JOG-A7–_R
JOG-A8+	JOG-A8+_R
JOG-A8–	JOG-A8–_R
JOG-P-X+	JOG-P-X+_R
JOG-P-X–	JOG-P-X–_R
JOG-P-Y+	JOG-P-Y+_R
JOG-P-Y–	JOG-P-Y–_R
JOG-P-Z+	JOG-P-Z+_R

Input signal	Output signal
JOG-P-Z–	JOG-P-Z–_R
JOG-P-RX+	JOG-P-RX+_R
JOG-P-RX–	JOG-P-RX–_R
JOG-P-RY+	JOG-P-RY+_R
JOG-P-RY–	JOG-P-RY–_R
JOG-P-RZ+	JOG-P-RZ+_R
JOG-P-RZ–	JOG-P-RZ–_R
JOG-P-E1+	JOG-P-E1+_R
JOG-P-E1–	JOG-P-E1–_R
JOG-P-E2+	JOG-P-E2+_R
JOG-P-E2–	JOG-P-E2–_R
JOG-P-A1+	JOG-P-A1+_R
JOG-P-A1–	JOG-P-A1–_R
JOG-P-A2+	JOG-P-A2+_R
JOG-P-A2–	JOG-P-A2–_R
JOG-P-A3+	JOG-P-A3+_R
JOG-P-A3–	JOG-P-A3–_R
JOG-P-A4+	JOG-P-A4+_R
JOG-P-A4–	JOG-P-A4–_R
JOG-P-A5+	JOG-P-A5+_R
JOG-P-A5–	JOG-P-A5–_R
JOG-P-A6+	JOG-P-A6+_R
JOG-P-A6–	JOG-P-A6–_R
JOG-P-A7+	JOG-P-A7+_R
JOG-P-A7–	JOG-P-A7–_R
JOG-P-A8+	JOG-P-A8+_R
JOG-P-A8–	JOG-P-A8–_R
PRG-DIN0	PRG-DIN0_R
PRG-DIN1	PRG-DIN1_R
PRG-DIN2	PRG-DIN2_R
PRG-DIN3	PRG-DIN3_R
PRG-DIN4	PRG-DIN4_R
PRG-DIN5	PRG-DIN5_R
PRG-DIN6	PRG-DIN6_R
PRG-DIN7	PRG-DIN7_R
PRG-DIN8	PRG-DIN8_R
PRG-DIN9	PRG-DIN9_R
PRG-DIN10	PRG-DIN10_R
PRG-DIN11	PRG-DIN11_R
PRG-DIN12	PRG-DIN12_R
PRG-DIN13	PRG-DIN13_R
PRG-DIN14	PRG-DIN14_R
PRG-DIN15	PRG-DIN15_R

Input signal	Output signal
PLT1-CLR	PLT1-CLR_R
PLT2-CLR	PLT2-CLR_R
PLT3-CLR	PLT3-CLR_R
PLT4-CLR	PLT4-CLR_R
PLT5-CLR	PLT5-CLR_R
PLT6-CLR	PLT6-CLR_R
PRG-RIN0	PRG-RIN0_R
PRG-RIN1	PRG-RIN1_R
PRG-RIN2	PRG-RIN2_R
PRG-RIN3	PRG-RIN3_R
PRG-RIN4	PRG-RIN4_R
PRG-RIN5	PRG-RIN5_R
PRG-RIN6	PRG-RIN6_R
PRG-RIN7	PRG-RIN7_R
PRG-RIN8	PRG-RIN8_R
PRG-RIN9	PRG-RIN9_R
PRG-RIN10	PRG-RIN10_R
PRG-RIN11	PRG-RIN11_R
PRG-RIN12	PRG-RIN12_R
PRG-RIN13	PRG-RIN13_R
PRG-RIN14	PRG-RIN14_R
PRG-RIN15	PRG-RIN15_R
PRG-RIN16	PRG-RIN16_R
PRG-RIN17	PRG-RIN17_R
PRG-RIN18	PRG-RIN18_R
PRG-RIN19	PRG-RIN19_R
PRG-RIN20	PRG-RIN20_R
PRG-RIN21	PRG-RIN21_R
PRG-RIN22	PRG-RIN22_R
PRG-RIN23	PRG-RIN23_R
PRG-RIN24	PRG-RIN24_R
PRG-RIN25	PRG-RIN25_R
PRG-RIN26	PRG-RIN26_R
PRG-RIN27	PRG-RIN27_R
PRG-RIN28	PRG-RIN28_R
PRG-RIN29	PRG-RIN29_R
PRG-RIN30	PRG-RIN30_R
PRG-RIN31	PRG-RIN31_R

Input signal	Output signal
R0	R0_R
R1	R1_R
R2	R2_R
R3	R3_R
R4	R4_R
R5	R5_R
R6	R6_R
R7	R7_R
R8	R8_R
R9	R9_R
R10	R10_R
R11	R11_R
R12	R12_R
R13	R13_R
R14	R14_R
R15	R15_R

6 Control by direct I/O

If you are new to this product, read this chapter to understand the operating methods along with the operation flow. This example is a method that operation programs and parameters are set using the **MRC Studio** software to operate a robot via direct I/O.

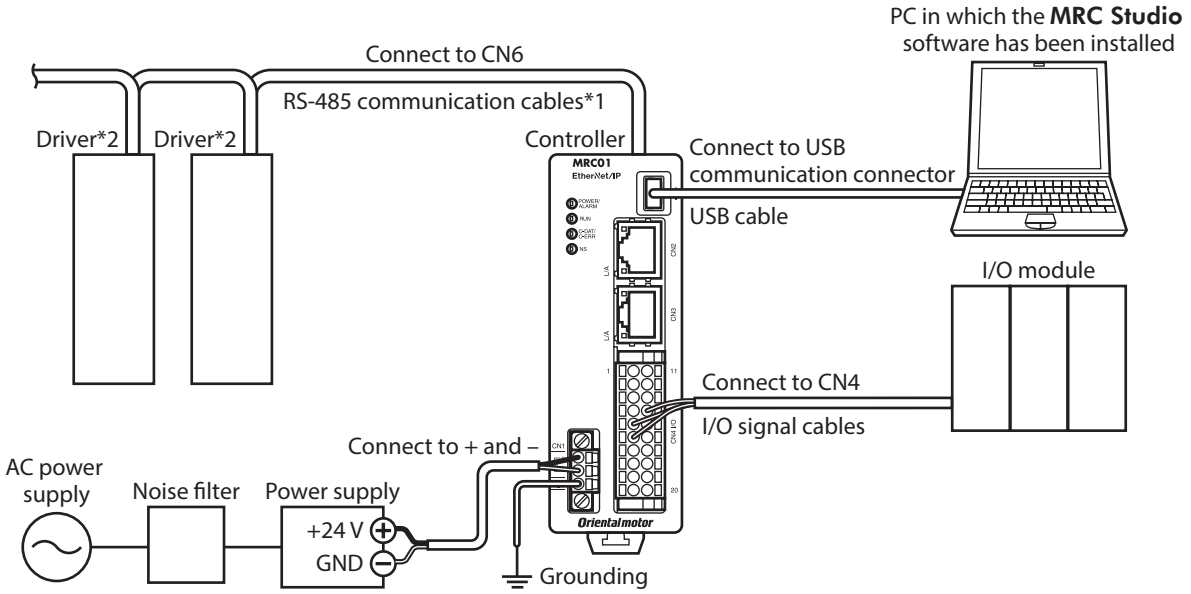
STEP 1	Installation and connection
↓	
STEP 2	Before starting operation
↓	
STEP 3	Assignment of direct I/O
↓	
STEP 4	Creation of operation program
↓	
STEP 5	Data writing
↓	
STEP 6	Operation of robot

- **Operating conditions**

  This operation is performed under the following conditions.
  - Setting of robot
    Robot type : SCARA robot 2-link base up-down
    End effector: Not used
  - Setting of driver
    Driver connected: **AZD-KD** 3 units
    Address number setting: Set in order of communication ID=1, 2, and 3 from near the robot.
    Transmission rate: 230,400 bps
    Termination resistor: Set only for driver of communication ID=3.

Note Before operating a robot, check the condition of the surrounding area to ensure safety.

STEP 1 Check the installation and the connection.



*1 Theses cables are provided in Oriental Motor products.
*2 Connect a power supply to each driver.

Note For details on connecting the driver power supply and the motor, refer to the operating manuals for products used and connect them correctly according to the connection diagram.

STEP 2 Make preparations for operation.

Refer to "2 Before starting operation" on p.44.

STEP 3 Assign direct I/O.

In this example, direct I/O is assigned using the **MRC Studio** software.

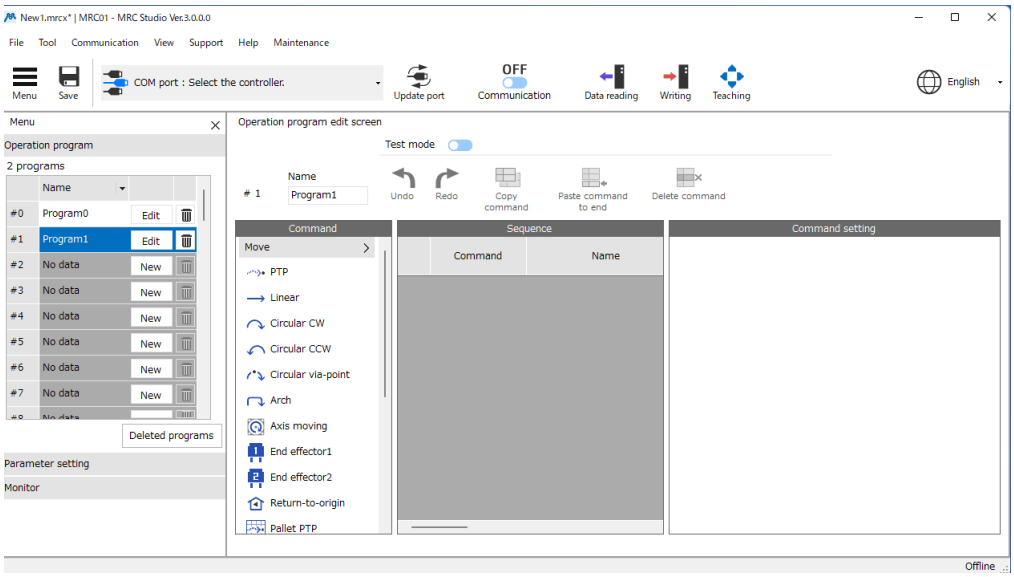
1. Click [Parameter setting] on the menu.
2. Click [I/O setting] > [Direct-IN (DIN)] on the parameter group.
3. Set the "DIN5 input function" parameter to "START" and the "DIN6 input function" parameter to "M0."

STEP 4 Create an operation program.

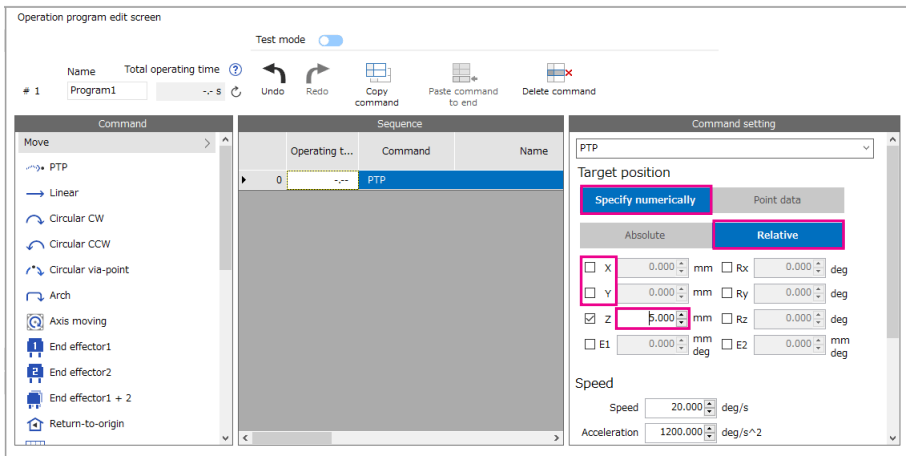
As an example, this section explains how to execute the following operation.

- **Setting example**
  - Program number: 1
  - Setting method of target position: Relative
  - Travel amount: +5 mm in Z direction
- **Flow of operation**

1. Click [Operation program] on the menu.
2. Click [New] of No. 1.
   The operation program edit screen appears.



3. Click [PTP] of the move command.
   The PTP command is added to the sequence.
4. Edit the target position on the command setting.
   1) Click [Relative] on the target position.
   2) Uncheck the X and Y axes.
   3) Set the Z axis to 5.000 mm.



STEP 5 Write the data and turn on the power supply again.

Write the setting of I/O and the operation program to the controller.

1. Click the [Writing] icon.
2. Click [OK].
3. Turn on the power supply of the controller again.

STEP 6 Execute operation of the robot.

1. Check the READY output has been turned ON.
2. Turn DIN6 having assigned the M0 input ON.
3. Turn DIN5 having assigned the START input ON.
   The robot operates 5 mm in the Z direction.
4. Check the READY output has been turned OFF, and turn DIN5 OFF.

memo The travel amount of the robot can be checked on the status monitor of the **MRC Studio** software.

STEP 7 Were you able to operate?

How did it go? Were you able to operate properly? If the robot does not operate properly, check the following points.

- Is the POWER/ALARM LED blinking in red?
  An alarm is being generated. Refer to "2 Alarms" on p.245 for details.
- Is the C-DAT/C-ERR LED unlit?
  – Information of the robot has not been written to the controller.
  – The power supply of the controller is not turned on.
- Was the setup wizard of the **MRC Studio** software completed successfully?
  If the ROBOT-EN output is in an OFF state, the setting of the robot has not been completed successfully. Set from STEP 2 again.
- Are the power supply, the motor, the driver, and the RS-485 communication cable connected securely?
- Is the C-DAT/C-ERR LED lit in red?
  A communication error of RS-485 communication is being detected. Refer to p.246 for details.

7 Other functions

◆Table of contents

1 To monitor using the MRC Studio software

1-1 Monitor types and examples of use

This chapter explains monitor types and examples of use using the **MRC Studio** software.

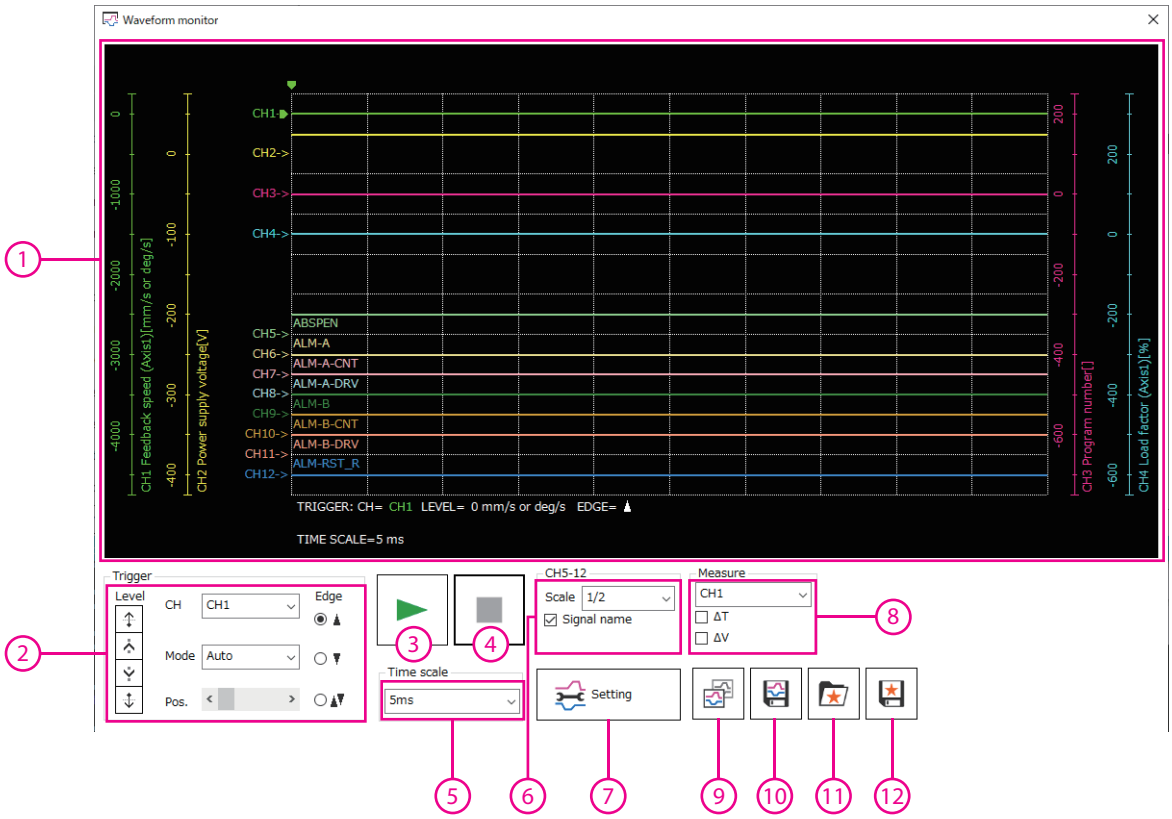
Name	Example of use
Status monitor	• To check the feedback position and the feedback speed for the robot or each axis. • To check the program number being executed. • To check the load factor of each axis.
Pallet monitor	To check the status of the pallet command.
Information monitor	To check the details of the information.
Alarm monitor	• To check the details of the alarm. • To reset an alarm.
Axis information monitor	To check the setting of each axis.
Graphic monitor	To check the trajectory of the robot.
Internal I/O monitor	To check the status of I/O signals.
D-I/O, R-I/O monitor	To check the status of signals assigned to direct I/O or remote I/O.
EtherNet/IP monitor	To check the communication setting of EtherNet/IP.
EtherNet/IP Implicit monitor	To check the contents of Implicit communication.
Controller information monitor	To check the version of the controller.
Robot information monitor	To check the offset amount from the origin of the base coordinate system to that of the user coordinate system
Waveform monitor	To check the speed of the TCP and the status of I/O signals as waveforms. Refer to p.235 for how to use the waveform monitor.

2 To utilize the waveform monitor

The waveform monitor is a function that can output the speed of the TCP and the status of I/O signals as a waveform. Output signals such as READY and MOVE can be monitored at the same time according to the operating state of the robot.
This chapter explains how to use the waveform monitor screen.

2-1 How to read the screen

Click [Waveform monitor] under the monitor.

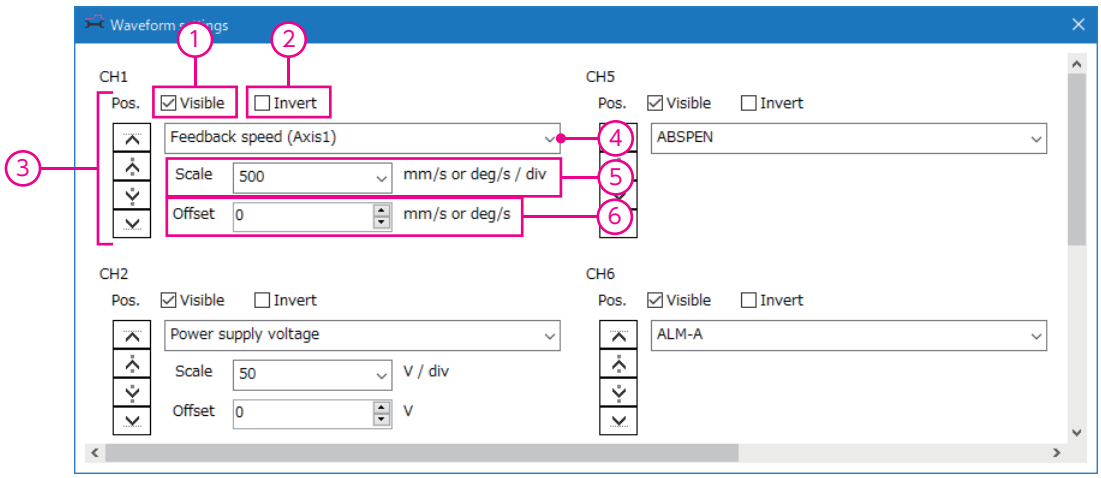


1	Measurement results are drawn in this area. CH1 to CH4: Used to measure the state of the target product CH5 to CH12: Used to measure I/O signals
2	Sets the trigger.
3	Starts measurement.
4	Stop the measurement.
5	Sets the measurement time range (width).
6	Sets the display method for CH5 to CH12. • Scale: Display size • Signal name: Shows or hides the signal name.
7	Sets the measurement conditions for each CH.
8	Switches to show or hide the measurement line. Also, selects CH to be measured.
9	Copies the presently displayed waveform to the clipboard.
10	Saves the presently displayed waveform to an external file. *
11	Reads the stored setting from "Favorites."
12	The setting for measurement can be saved as "Favorites."

* When saving the data, turn the [Communication] icon OFF to stop measurement.

■ Setting of measurement conditions

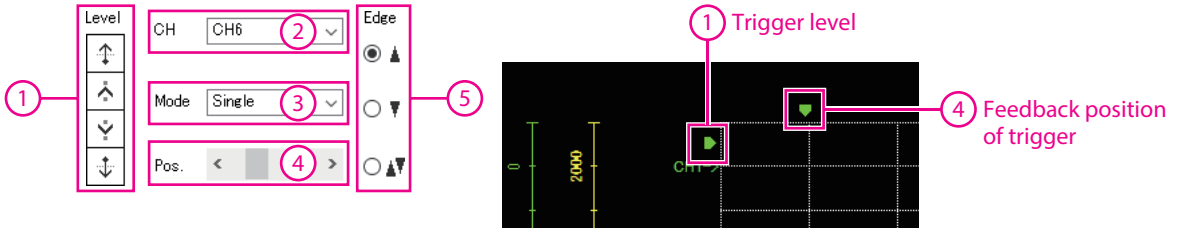
The measurement condition for each CH can be set on the screen appeared by clicking Setting.



1	Shows or hides each CH.
2	Inversely displays the waveform of the signal having measured.
3	Moves the display position of the waveform up and down.
4	Selects the item to be measured.
5	Selects a display scale of CH1 to CH4. The display size can be enlarged in combination with ⑥ .
6	Sets the offset value to be added to the display scale of CH1 to CH4. The display size can be enlarged in combination with ⑤ .

■ Setting of trigger

Setting a trigger to CH can check a waveform when a certain condition such as the motor speed or the ON-OFF status of a signal is satisfied.



1	Trigger level of CH1 to CH4 The condition to detect a trigger can be set in combination with ⑤ .
2	CH to set a trigger (this is available for only CH being displayed.)
3	Trigger types Refer to "Trigger types" on p.237 for details.
4	Feedback position of trigger
5	Detection conditions of trigger • ▲: CH1 to CH4 are used as a trigger - when the measurement value changes from a value less than Level to that equal to or more than Level. CH5 to CH12 are used as a trigger - when the signal changes from OFF to ON. • ▼: CH1 to CH4 are used as a trigger - when the measurement value changes from a value equal to or more than LEVEL to that less than Level. CH5 to CH12 are used as a trigger - when the signal changes from ON to OFF. • ▲▼: Both ▲ and ▼ are used as a condition.

Trigger types

Auto	Updates the waveform until the measurement is stopped.
Normal	Updates the waveform each time a trigger is detected. The trigger can be detected immediately after the waveform measurement is started.
Single	Updates the waveform when a trigger is first detected, and then stops the measurement. The trigger can be detected immediately after the waveform measurement is started.
Normal (Pre)	Updates the waveform each time a trigger is detected. The waveform before the trigger is detected (the left side of the trigger feedback position) can also be checked. However, the trigger is not detected until a certain period of time (*) has elapsed after the measurement was started.
Single (Pre)	Updates the waveform when a trigger is first detected, and then stops the measurement. The waveform before the trigger is detected (the left side of the trigger feedback position) can also be checked. However, the trigger is not detected until a certain period of time (*) has elapsed after the measurement was started.

* Time set in Timescale × 10

memo

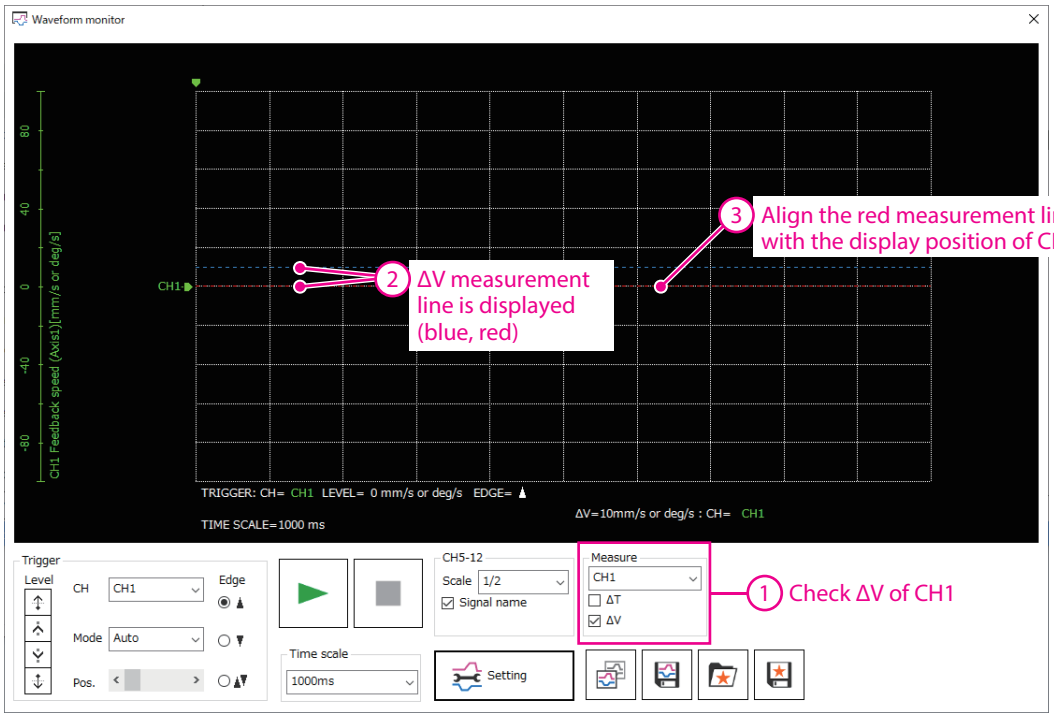
- Select Normal (Pre) or Single (Pre) when checking the waveforms before and after the trigger is detected.
- Select Normal or Single when checking only the waveform after the trigger is detected. Although the waveform before the trigger is detected is displayed even in Normal or Single, the old waveform before the measurement is started may be mixed if the time period from when the measurement is started until when the trigger is detected is less than a certain period of time (*).

* Time set in Timescale x Number of scales to the trigger feedback position

2-2 Enlarged view of waveform

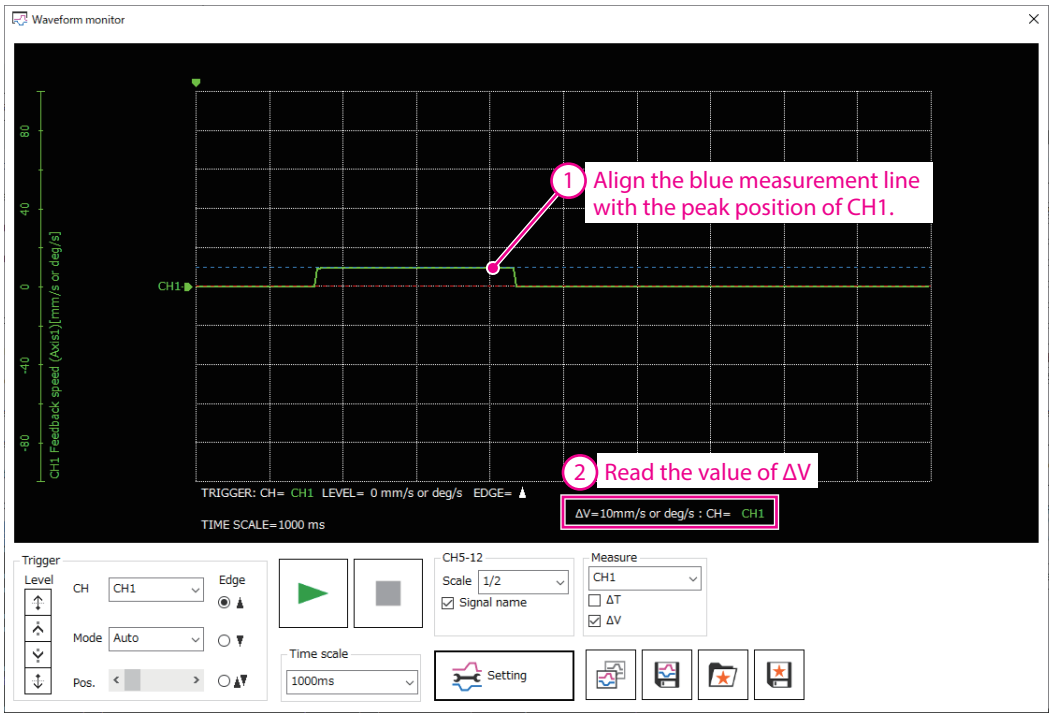
A portion of the measured waveform data can be enlarged to display.
As an example, this section introduces how to enlarge and display near the peak value when the feedback speed (Axis 1) is measured by CH1.

1. Select [CH1] with "Measure" and check ΔV.
   Two lines (blue and red) are displayed to measure ΔV.
2. Align the red measurement line with the display position of CH1.



3. Click ► to start measurement.

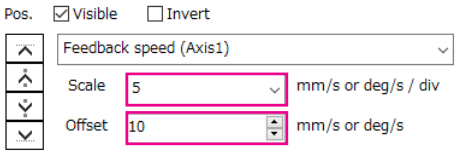
4. Align the blue measurement line with the peak value of CH1 and read the value of ΔV.
As a result of the measurement, it was found that the peak value of CH1 was around 10 mm/s or deg/s.

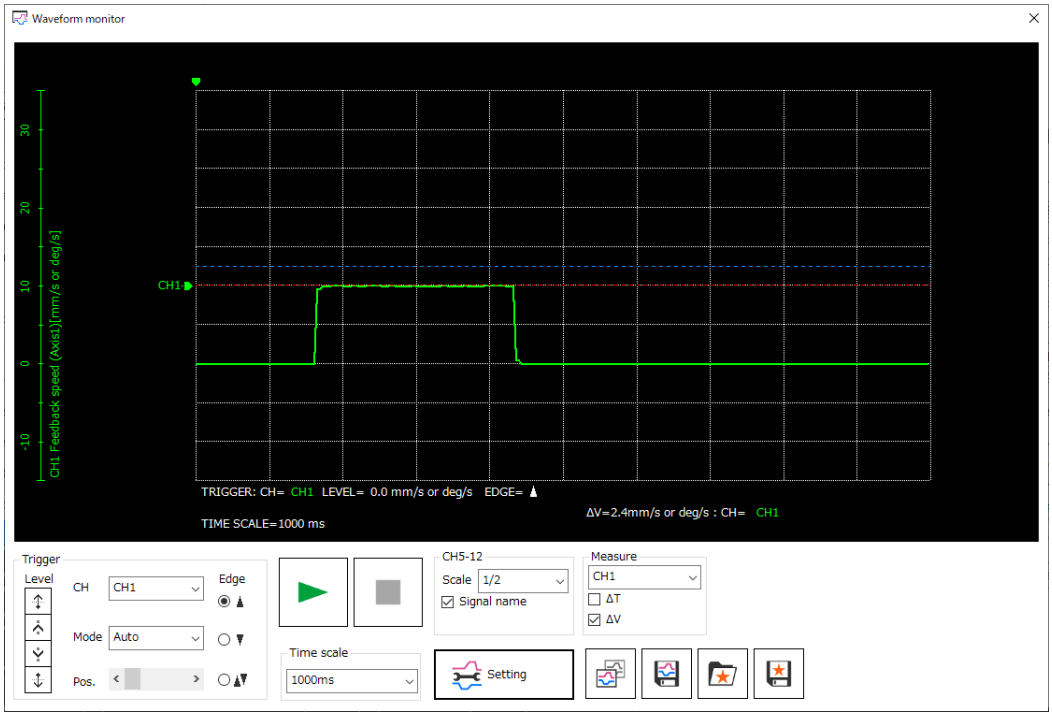


5. Click Setting.

6. Input the center value of the position to be enlarged to "Offset" of CH1.
To enlarge near the peak value, input 10 (mm/s or deg/s) that is the measurement result of the Step 4.

7. Set the speed per one scale in the vertical axis with "Scale" of CH1.
As an example, input 5 (mm/s or deg/s/div) this time.
The waveform is enlarged to display as the center on the value having input to the offset value.





3 To simulate the operation of the controller

The **MRC Studio** software has the simulation mode that can check the status of coordinates and I/O signals without operating a robot.
All drivers and motors must be connected when simulating.

Note
- Motors are excited even in the simulation mode.
- In the simulation mode, functions and I/O signals of the controller may differ from those in the normal state.

Related parameter

Parameter ID		Parameter name	Description	Setting range	Initial value	Update
Dec	Hex					
509	01FDh	Simulation mode	Coordinates and the operating state of operation programs can be checked without operating a robot.	0: Disable 1: Enable	0	D

■ Use this function for the following.

- To check the coordinates.
- To check the wiring.
- To check how the program operates.
- To check the status of I/O signals
- To check the trajectory of a robot.
- To verify the program since an error occurs in the system.

3-1 Operating procedure

This assumes that preparation for operation and setting of operation programs are completed.

1. Click [Parameter setting] on the menu.
2. Click [Basic setting] on the parameter group.
3. Set the "Simulation mode" parameter to "1: Enable."
4. Click the [Writing] icon.
5. Click [OK].
6. Turn on the power supply of the controller again.
7. Check if the "Simulation mode" parameter is applied.
   Check that the POWER/ALARM LED on the controller repeats as follows: Green light → Red light → Green and red are lit at the same time → No light
8. Operate the robot using either of the following methods.
   • Click the [Teaching] icon to perform JOG operation or inching operation.
   • Execute the operation program in the test mode.

memo Using the monitor can check the status of the position, speed, and I/O signals.
- Status monitor: The position and the speed can be checked.
- Monitors related to I/O: The status of I/O signals can be checked.
- Graphic Monitor: The operation or the trajectory of a robot can be checked.

9. End the simulation mode.
   Refer to the Steps 1 through 5 and set the "Simulation mode" parameter to "0: Disable."
10. Turn off the power supply of the controller.

3-2 Coordinates

■ Origin

The origin of the user coordinate system cannot be set in the simulation mode.
If the origin of the user coordinate system is used, set it before the simulation mode is performed.

■ Initial coordinates

The initial coordinates of the robot are calculated from the angle of the motor connected when the power supply is turned on.

3-3 Monitor

The following describes the items displayed during simulation that are different from those at the normal time.

Name	Item	Simulation mode
Status monitor	TCP feedback speed	Follows the commands regardless of the status of the robot.
	Feedback position	
Graphic monitor	Position	

3-4 Operation

All operations can be performed during simulation.
The protective function is also enabled.

3-5 I/O signals

The following describes I/O signals which specifications and operations in the simulation mode are different from those at the normal time.

■ Input signal

Signal name	Simulation mode	Normal time
P-PRESET-RB	Disable	Rewrite the origin of the user coordinate system to the present TCP.

■ Output signals

Signal name	Simulation mode	Normal time
MOVE	This signal is turned OFF at the same time as the MOVE-CNT output.	When all motors are stopped after the MOVE-CNT output is turned OFF, this signal is turned OFF.
CMD-END	This signal is turned ON at the same time as the CMD-END-CNT output.	When all motors are stopped after the CMD-END-CNT output is turned ON, this signal is turned ON.

4 Setting the advanced speed limit (Polar/Cylindrical robot only)

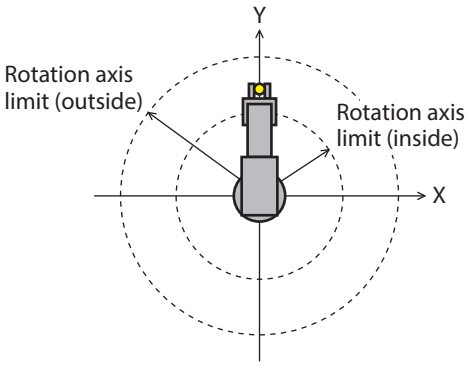
The speed and acceleration/deceleration of the rotation axis can be limited according to the distance between the TCP and the base rotation axis (Z axis of the base coordinate system) of the polar/cylindrical robot. If the maximum values of the speed or acceleration/deceleration of the rotation axis are different depending on the arm extension distance, use the rotation axis limit function instead of the normal axis speed limit function.

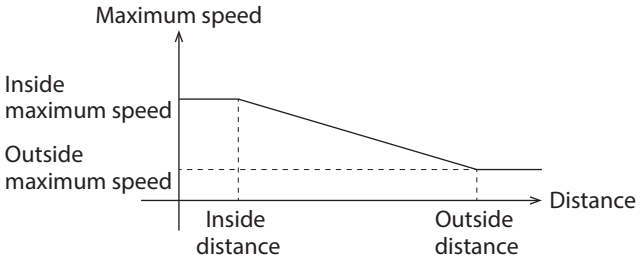
Related parameters

Parameter ID		Name	Description	Setting range	Initial value
Dec	Hex				
4520	11A8h	Rotation axis limit setting	Sets the limit for the speed and acceleration/deceleration according to the distance between the base rotation axis and the TCP. Refer to p.242 for details on the limit function.	0: Limit disable 1: Speed limit enable 2: Acceleration/ deceleration limit enable 3: Speed and acceleration/ deceleration limit enable	0
4521	11A9h	Rotation axis limit inside distance	Sets the position of the inside of the rotation axis limit with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0
4522	11AAh	Rotation axis limit inside maximum speed	Sets the maximum speed at the inside of the rotation axis limit.	0 to 2,000,000 (1=0.001 deg/s)	0
4523	11ABh	Rotation axis limit inside maximum acceleration/ deceleration	Sets the maximum acceleration/deceleration at the inside of the rotation axis limit.	0 to 30,000,000 (1=0.001 deg/s^2)	0
4524	11ACh	Rotation axis limit middle distance	Sets a desired position between the rotation axis limits with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0
4525	11ADh	Rotation axis limit middle maximum speed	Sets the maximum speed at a desired position between the rotation axis limits.	0 to 2,000,000 (1=0.001 deg/s)	0
4526	11AEh	Rotation axis limit middle maximum acceleration/ deceleration	Sets the maximum acceleration/deceleration at a desired position between the rotation axis limits.	0 to 30,000,000 (1=0.001 deg/s^2)	0
4527	11AFh	Rotation axis limit outside distance	Sets the position of the outside of the rotation axis limit with the TCP distance (radius) from the rotation axis.	10 to 2,000,000 (1=0.001 mm)	0
4528	11B0h	Rotation axis limit outside maximum speed	Sets the maximum speed at the outside of the rotation axis limit.	0 to 2,000,000 (1=0.001 deg/s)	0
4529	11B1h	Rotation axis limit outside maximum acceleration/ deceleration	Sets the maximum acceleration/deceleration at the outside of the rotation axis limit.	0 to 30,000,000 (1=0.001 deg/s^2)	0

■ To set the "inside" and "outside" parameters of the rotation axis limit and apply the speed limit at two points

Set the inside distance and the outside distance when applying the speed limit in the distance from the base rotation axis (Z coordinate of the base coordinate system) to the TCP. The maximum speed limit value is determined by interpolating the values set in the maximum speeds of the inside and outside with a straight line. When the base rotation axis exceeds this limit, the operation stops and an alarm of Axis overspeed is generated.





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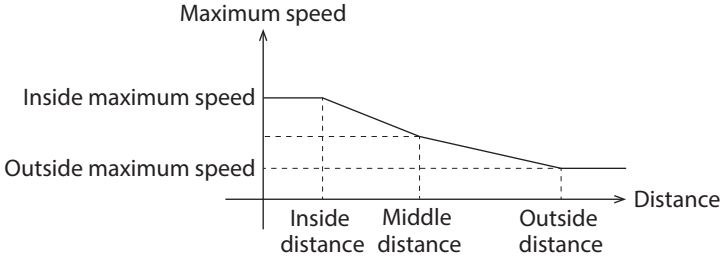
- Set a value greater than the "Rotation axis limit inside distance" parameter to the "Rotation axis limit outside distance" parameter. If the value set in the "Rotation axis limit inside distance" parameter is greater, the limit function is disabled.
- For an inner side than the value set in the "Rotation axis limit inside distance" parameter, the value set in the "Rotation axis limit inside maximum speed" parameter will be the limit value. Similarly, for an outer side than the value set in the "Rotation axis limit outside distance" parameter, the value set in the "Rotation axis limit outside maximum speed" parameter will be the limit value.

■ When setting the "middle" parameters of the rotation axis limit to apply the speed limit at three points

Using the "middle" parameters of the rotation axis limit allows the speed limit to be applied at three points. When the slope of the speed limits is desired to change between the inside and the outside, set the "middle" parameters of the rotation axis limit. The speed limit between the inside and middle positions of the rotation axis limit is determined by interpolating the setting values for each maximum speed with a straight line. Similarly, the speed limit between the middle and outside positions are determined by interpolating the setting values for each maximum speed with a straight line.



memo

When applying the speed limit at three points using the "middle" parameters of the rotation axis limit, set the parameters so that the following two conditions are satisfied. If the conditions are not satisfied, the speed limit is determined by two points of the inside and outside of the rotation axis limit.

- The value set in the "Rotation axis limit middle distance" is greater than the value set in the "Rotation axis limit inside distance" parameter.
- The value set in the "Rotation axis limit outside distance" parameter is greater than the value set in the "Rotation axis limit middle distance" parameter.

8 Troubleshooting

This part explains alarm and information functions.

◆Table of contents

1 Detection of communication errors

This chapter explains a function to detect that an error occurred in EtherNet/IP.

1-1 Communication timeout

If Implicit communication is interrupted due to disconnection of the EtherNet/IP cable or other reasons, the communication timeout is detected.
When the communication timeout is detected, the NS LED on the controller blinks in red.
When connection with the scanner is established again, the communication timeout is automatically cleared, and the NS LED on the controller returns to be lit in green.
If the communication timeout is detected, check the following points.

- Is the EtherNet/IP cable disconnected?
- Is the power supply for the scanner is turned on?

1-2 IP address conflict

If an IP address of the EtherNet/IP compatible products is duplicated in the same system, the IP address conflict is detected.
When the IP address conflict is detected, the NS LED on the controller is lit in red.
If the IP address conflict is detected, change the setting so that an IP address of the EtherNet/IP compatible products is not duplicated.
Check the IP address is not duplicated, and then turn on the control power supply again.

2 Alarms

This controller has the alarm function to protect from temperature rise, poor connection, error in operation, and the like.
If an alarm is generated, the ALM-A output is turned ON and the ALM-B output is turned OFF to stop the robot. The POWER/ALARM LED blinks in red simultaneously. At this time, the motors remain in an excitation state.
Details of the alarm being generated can be checked by counting the number of times the POWER/ALARM LED blinks, or using EtherNet/IP or the **MRC Studio** software.

2-1 Alarm reset

Before resetting an alarm, be sure to remove the cause of the alarm and ensure safety, and perform one of the reset operations specified below.

- Turn the ALM-RST input from OFF to ON. (It is enabled at the ON edge of the input.)
- Execute the alarm reset with the maintenance command via EtherNet/IP.
- Execute the alarm reset using the **MRC Studio** software.
- Turn off the power supply and on it again.

Note Some alarms cannot be reset by other methods than turning on the power supply again. Refer to "2-3 Alarm list" on p.246.

2-2 Alarm history

Up to 10 generated alarm items are stored in the non-volatile memory in order of the latest to the oldest. The alarm history stored in the non-volatile memory can be read or cleared if one of the following reset operations is performed.

- Read the alarm history by the monitor command via EtherNet/IP.
- Clear the alarm history by the maintenance command via EtherNet/IP.
- Read or clear the alarm history using the **MRC Studio** software.

2-3 Alarm list

Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
21h	2	Main circuit overheat	The internal temperature of the controller reached the upper limit of the specification value [85 °C (185 °F)].	Reconsider the ventilation condition in the enclosure.	Any of reset operations
32h	2	Out of position range	• The maximum operating range of the robot was exceeded during interpolation operation. • PTP operation was executed in a state where the target position is set to outside the maximum operating range of the robot.	• Reconsider the setting of the trajectory. • Reconsider the target position.	Any of reset operations
33h	7	Absolute position error	The origin information of the user coordinate system of the robot was damaged.	Execute "Reset to origin of base coordinate system" on the teaching screen of the **MRC Studio** software, and turn on the power supply again. After that, set the origin of the user coordinate system again.	Turn on the power supply again
41h	9	EEPROM error	The data stored in the controller was damaged.	Execute [Restoring parameters to the factory settings (except for robot information)] under the [Communication] menu of the **MRC Studio** software.	Turn on the power supply again
43h	8	Rotation error at power on	When the "Rotation error at power on alarm setting" parameter was set to "1: Alarm generated," the joint angle when the power supply was turned on was outside the range of −170° to 170°. (The communication ID of the target driver is indicated in the sub code.)	Reset the alarm first, and then use the axis move command or JOG operation (axis) to set the joint angle in the range of −170° to 170°.	Any of reset operations
4Ah	7	Return-to-home incomplete	Operation was executed in a state where there was an axis which home was not set.	Check the "Motor home setting" for all axes on the axis information monitor of the **MRC Studio** software. After that, perform the following. • If the home of the end effector has not set: Execute [Home setting of end effector] under the [Maintenance] menu of the **MRC Studio** software. • If the home other than the end effector has not set: Use [Re-setup] under the [Maintenance] menu of the **MRC Studio** software to perform "Axis home setting."	Turn on the power supply again

Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
70h	7	Operation data error	Operation was executed in a state where the setting of the radius or the center coordinate / via-point coordinate of circular interpolation operation was wrong. (Sub code: 0)	Reconsider the setting.	Any of reset operations
			Operation was executed in a state where the setting of the ascending height, the maximum height, the descending start height, or the target position of arch interpolation operation was wrong. (Sub code: 1)	Reconsider the setting.	
			Operation using the imaging position of the camera was executed in a state where calibration was not performed. (Sub code: 2)	Calibrate the camera number to be used with the **MRC Studio** software.	
			The imaging position of the camera was failed to transform to the base coordinate system of the robot. (Sub code: 3)	Reconsider the load position.	
			When an alarm is generated in the driver, operation was executed at the operating speed or operating current exceeding the value set in the "Mechanism protection" parameter.	Use the axis information monitor of the **MRC Studio** software and check whether the operation exceeding the value set in the "Mechanism protection" parameter is performed in the driver that generates the alarm.	
			The damaged operation program was executed. (Sub code: F0)	Write the data again.	
			An unsupported command was executed. (Sub code: F1)	Execute [Updating controller firmware] under the [Support] menu of the **MRC Studio** software.	
72h	7	Wrap setting error	The power supply of the controller was turned on in a state where the wrap setting range of the driver was invalid. (The communication ID of the target driver is indicated in the sub code.)	Use [Re-setup] under the [Maintenance] menu of the **MRC Studio** software to perform "Driver connection setting."	Turn on the power supply again
81h	7	Network bus error	Implicit communication of Exclusive Owner connection was cut off during operation.	Check the connection with the scanner and the condition of the power supply of the scanner.	Any of reset operations
82h	7	Network module error	An error was detected in the network module.	Turn on the power again.	Turn on the power supply again

Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
84h	7	RS-485 communication error	• An error was detected in communication with the driver. • The driver was operated or set using the **MEXE02** software in a state where the controller and the driver were connected. The communication ID of the target driver is indicated in the sub code.	• Check the connection with the driver. • Check the settings of the driver such as the transmission rate of RS-485 communication, the address number, and the transmission delay time. • Finish the setting and operation of the driver having performed with the **MEXE02** software, and turn off the power supplies of the driver and controller and on again. • When writing the data to the driver or restoring to the factory setting with the **MEXE02** software, use [Re-setup] under the [Maintenance] menu of the **MRC Studio** software to perform "Driver connection setting."	Any of reset operations
86h	7	Network product mismatch	• A driver other than possible combinations was connected. • A driver of an unsupported version of the **AZ** Series was connected. The following information is indicated in the sub code. • Lower 4 bits Communication ID of the target driver • Upper 4 bits 0: Driver other than **AZ** Series 1: Unsupported version of **AZ** Series driver	• Connect a driver that can be combined. (⇨p.19) • Update the driver firmware with the **MEXE02** software.	Turn on the power supply again
C3h	3	TCP software overtravel	When the "TCP position limit operation setting" parameter was set to "1: Stop with alarm," the command position of the TCP exceeded the position limit. The target coordinates (1: X, 2: Y, 3: Z) are indicated in the sub code.	Reconsider the target position.	Any of reset operations

Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
C4h	4	Approach TCP inhibition area	When the "User-defined area operation setting" parameter was set to "2: AREA output, no entry area with alarm," the command position of the TCP tried to enter the no entry area (user-defined area). (The target user-defined area number (0 to 4) is indicated in the sub code.)	Reconsider the operation program so that the TCP command position does not enter the no entry area (user-defined area).	Any of reset operations
			When the "User-defined area operation setting" parameter is set to "2: AREA output, no entry area with alarm," the command position of the TCP has entered the no entry area (user-defined area) at the time of operation start. (The target user-defined area number (0 to 4) is indicated in the sub code.)	Perform one of the following to escape from the no entry area. Then, return the changed parameter to the setting before the change. • Change the X, Y, and Z coordinate settings of the "User-defined area" parameter so that the TCP command position is outside the no entry area (user-defined area). • Change the "User-defined area operation setting" parameter to "0: AREA output."	
C5h	5	TCP overspeed	• When the "TCP speed limit setting" parameter was set to "1: Stop with alarm," the maximum TCP speed was exceeded. • The TCP speed exceeded 250 mm/s while teaching operation was being performed using the **MRC Studio** software.	Decrease the operating speed.	Any of reset operations
C6h	6	Axis software overtravel	When the "Axis position limit operation setting" parameter was set to "1: Stop with alarm," there was an axis having exceeded the position limit. (The communication ID of the target driver is indicated in the sub code.)	Reconsider the target position.	Any of reset operations

Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
C7h	7	Axis overspeed	• When the "Axis speed limit setting" parameter was set to "1: Stop with alarm," there was an axis having exceeded the maximum speed. • There was an axis which speed exceeded 250 mm/s or 250 deg/s while teaching operation was being performed using the **MRC Studio** software. • The speed or acceleration/ deceleration of the rotation axis exceeded the maximum value of the rotation axis limit. The communication ID of the target driver is indicated in the sub code.	Decrease the operating speed.	Any of reset operations
C9h	5	Driver alarm detection	When the "Driver alarm detection" parameter was set to "1: Enable," there was an axis that an alarm was generated. (The communication ID of the target driver is indicated in the sub code.)	Check an alarm of the driver, and remove the cause before resetting the alarm.	Any of reset operations
CAh	8	Near singularity	• When the "Near singularity alarm setting" parameter was set to "1: Alarm generated," the robot approached the singularity during interpolation operation. • When the "Near singularity alarm setting" parameter was set to "1: Alarm generated," interpolation operation was executed from near singularity.	• Reconsider the target position. • Move away from near singularity using the axis move command, JOG operation (axis), or PTP operation.	Any of reset operations
CCh	4	Robot posture error	• Interpolation operation was executed in a state where the angle of the elbow joint (*) of the vertical articulated robot was negative. * With base axis: Axis 3 Without base axis: Axis 2 • With a Delta robot, operation was executed from an abnormal posture where the TCP coordinates could not be calculated.	• Reset the alarm, and then use operation other than interpolation operation to set the angle of the elbow joint to a positive posture. • Reset the alarm, and then return to a normal posture (posture where PST-ERR is turned OFF).	Any of reset operations

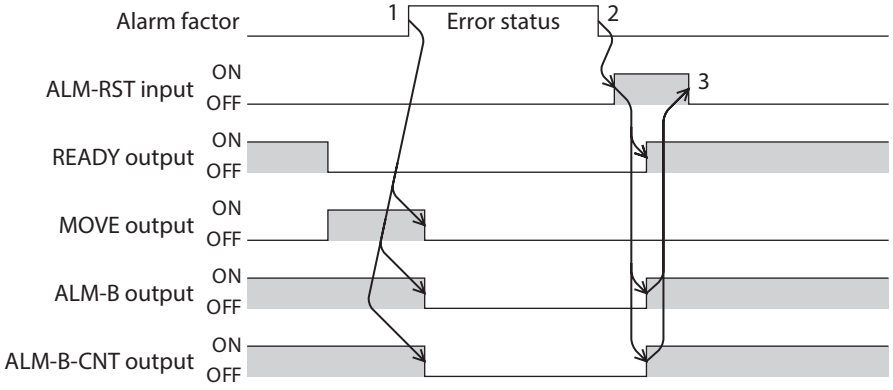
Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
CDh	2	Joint angle range error	• The joint angle was outside the range of –170° to 170°. • With a SCARA robot or a vertically articulated robot that the base axis rotates, operation that causes the TCP position or the wrist joint to move beyond the negative side of the Y-axis of the base coordinate system (directly behind the robot) was executed. • Operation exceeding the wrap range of the driver was executed. The following information is indicated in the sub code. • Lower 4 bits Communication ID of the target driver • Upper 4 bits 0: The joint angle was outside the range of –170° and 170° 1: The wrap range of the driver was exceeded	• Reconsider the joint angle. • With a SCARA robot or a vertically articulated robot that the base axis rotates, operate it so that the TCP position or the wrist joint does not move beyond the negative side of the Y-axis of the base coordinate system (directly behind the robot). • Reset the alarm first, and then use the axis move command or JOG operation (axis) to set the joint angle in the range of –170° to 170°. • Reconsider the target position.	Any of reset operations
CEh	7	Robot mechanism setting error	The power supply was turned on in a state where the mechanism information of the robot was invalid.	Set so that the total value of the following is larger than 0. After that, turn on the power again. • Link 2 length and "Tool offset 1 Ty" parameter • Link 2 length and "Tool offset 2 Ty" parameter The Link 2 length can be checked on the robot information monitor of the **MRC Studio** software.	Turn on the power supply again

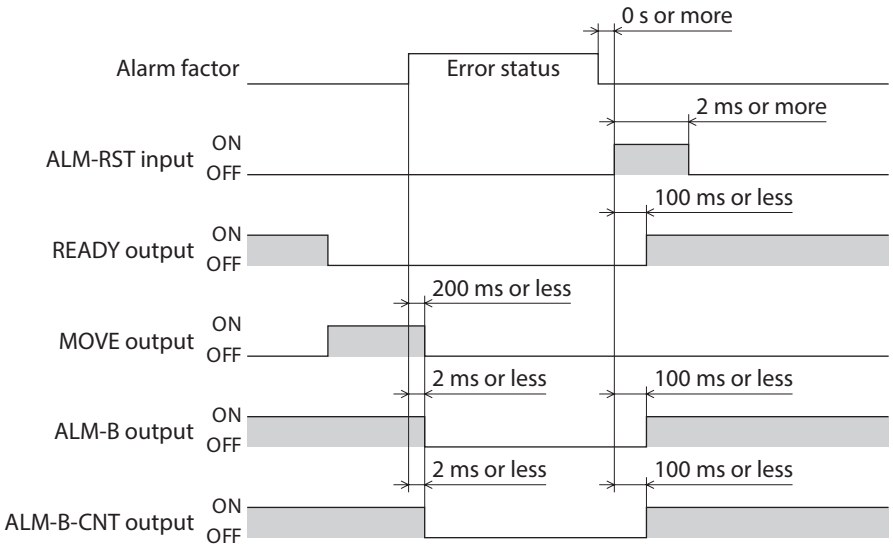
Alarm code	Number of POWER/ ALARM LED blinks	Alarm type	Cause	Remedial action	How to reset
CFh	4	Axis error during operation	The following error was detected during operation. • An error was detected in communication between the controller and the driver. • The motor was put into a non-excitation state. • An alarm was generated in the driver. • An overload of the motor was detected. (If the "Overload stop setting" parameter is set to "1: Enable") The following information is indicated in the sub code. • Lower 4 bits Communication ID of the target driver • Upper 4 bits The error content is indicated. 0: Communication error between controller and driver 1: The motor is in a non-excitation state 2: An alarm is generated in the driver 3: An overload of the motor is detected	• Check the connection between the controller and the driver. • Check the status of the driver and the motor. • When an alarm of Operation data error is generated in the driver, use the axis information monitor of the **MRC Studio** software and check whether the operation exceeding the value set in the "Mechanism protection" parameter is performed in the driver that generates the alarm. • Reconsider the operating condition.	Any of reset operations
F0h	Light	CPU error	CPU malfunctioned.	Turn on the power again.	Turn on the power supply again

2-4 Timing chart

■ When an alarm is generated in the controller

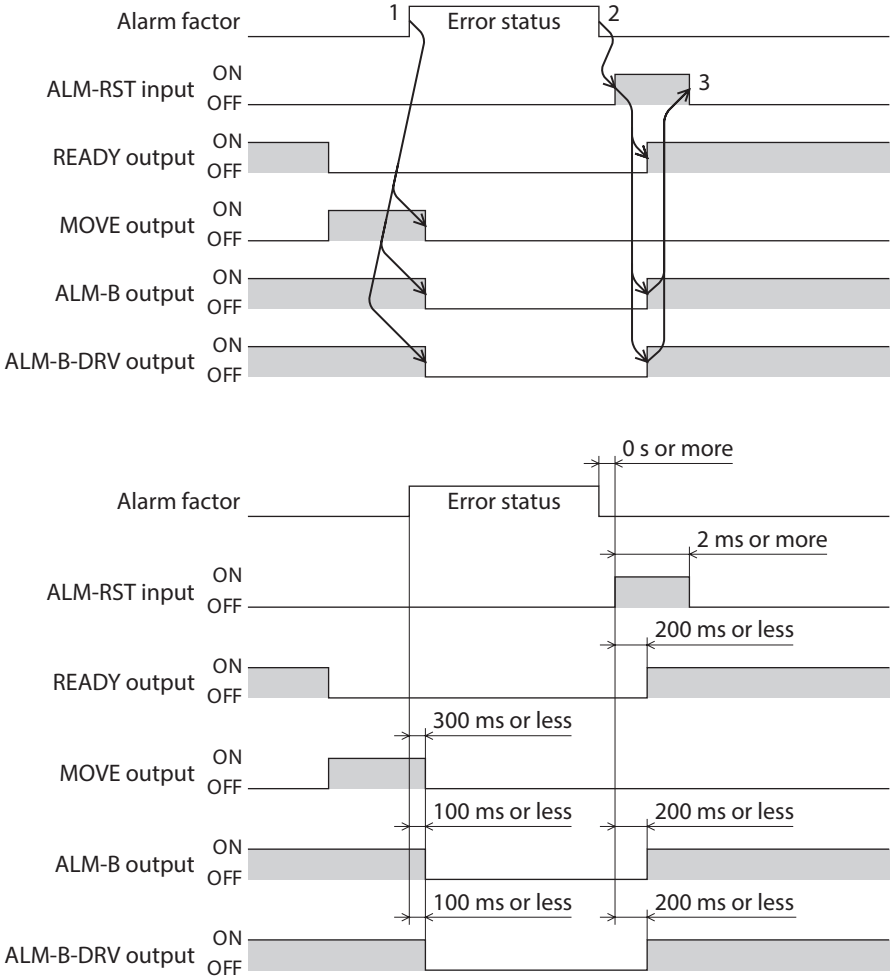
1. If an error occurs, the ALM-B output, the ALM-B-CNT output, and the MOVE output are turned OFF.
   At the same time, all motors stop instantaneously.
2. Remove the cause of the alarm before turning the ALM-RST input ON.
   The alarm is reset, and the ALM-B output, the ALM-B-CNT output, and the READY output are turned ON.
3. Check the ALM-B output and the ALM-B-CNT output have been turned ON before turning the ALM-RST input OFF.





■ When an alarm is generated in the driver

1. If an error occurs, the ALM-B output, the ALM-B-DRV output, and the MOVE output are turned OFF.
   At the same time, all motors stop instantaneously.
2. Remove the cause of the alarm before turning the ALM-RST input ON.
   The alarm is reset, and the ALM-B output, the ALM-B-DRV output, and the READY output are turned ON.
3. Check the ALM-B output and the ALM-B-DRV output have been turned ON before turning the ALM-RST input OFF.



3 Information

The controller is equipped with a function to generate information output before an alarm is generated.
This function can be utilized for periodic maintenance of equipment by setting a suitable value in the parameter of each information.

■ Status when information is generated

- **Information bit output**

  If information is generated, a bit output of the corresponding information is turned ON. (Details of bit output ⇨ p.258)
  A desired output signal can be assigned to the INFO-USRIO output among bit outputs and used. If the assigned output signal is turned ON, the INFO-USRIO output is also turned ON.

- **INFO output**

  If information is generated, the INFO output is turned ON.

- **LED indicator**

  If information is generated, the POWER/ALARM LED will simultaneously blink in green and red twice. (Green and red colors may overlap and it may be visible to orange.)

- **Operation of robot**

  The robot continues operating even while information is generated unlike in the case of an alarm. However, in some information, the robot may stop operating when information is generated.

- **Related parameters**

Parameter ID		Name	Description	Initial value
Dec	Hex			
390	0186h	Axis speed information (INFO-AXISSPD) Axis 1	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 1 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
391	0187h	Axis speed information (INFO-AXISSPD) Axis 2	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 2 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
392	0188h	Axis speed information (INFO-AXISSPD) Axis 3	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 3 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
393	0189h	Axis speed information (INFO-AXISSPD) Axis 4	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 4 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
394	018Ah	Axis speed information (INFO-AXISSPD) Axis 5	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 5 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0

Parameter ID		Name	Description	Initial value
Dec	Hex			
395	018Bh	Axis speed information (INFO-AXISSPD) Axis 6	Sets the condition in which the axis speed information (INFO-AXISSPD) of the axis 6 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
396	018Ch	Axial speed information (INFO-AXISSPD) end-effector 1	Sets the condition in which the axis speed information (INFO-AXISSPD) of the end effector 1 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
397	018Dh	Axial speed information (INFO-AXISSPD) end-effector 2	Sets the condition in which the axis speed information (INFO-AXISSPD) of the end effector 2 is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s or 1=0.001 deg/s)	0
416	01A0h	Controller temperature information (INFO-CNTTMP)	Sets the condition in which the controller temperature information (INFO-CNTTMP) is generated. **[Setting range]** 40 to 85 °C	85
418	01A2h	TCP speed information (INFO-RBSPD)	Sets the condition in which the TCP speed information (INFO-RBSPD) is generated. **[Setting range]** 0: Disable 1 to 2,000,000 (1=0.001 mm/s)	0
422	01A6h	Mechanism information mismatch information (INFO-MECHMIS)	Sets the Mechanism information mismatch information (INFO-MECHMIS). **[Setting range]** 0: Disable 1: Enable	1
423	01A7h	Driver information detection (INFO-DRVINFO)	Sets whether or not to generate the Driver information detection in the controller when information was generated in the driver. **[Setting range]** 0: Disable 1: Enable	0
441	01B9h	Robot posture error information (INFO-PST-ERR)	Sets the Robot posture error information (INFO-PST-ERR). **[Setting range]** 0: Disable 1: Enable	1
442	01BAh	Slip information (INFO-SLIP)	Sets the Slip information (INFO-SLIP). **[Setting range]** 0: Disable 1: Enable	1
444	01BCh	INFO-USRIO output selection	Selects the I/O status to be checked in the INFO-USRIO output. **[Setting range]** Output signal⇨p.207	256: CONST-OFF
445	01BDh	INFO-USRIO output inversion	Sets the output logic of the INFO-USRIO output. **[Setting range]** 0: Not invert 1: Invert	0

Parameter ID		Name	Description	Initial value
Dec	Hex			
446	01BEh	Information LED condition	Sets whether or not to blink the LED when information was generated. **[Setting range]** 0: Disable 1: Enable	1
447	01BFh	Information auto clear	When the cause of information is eliminated, the INFO output and the bit output of the corresponding information are turned OFF automatically. **[Setting range]** 0: Disable 1: Enable	1

3-1 Clearing information

How to clear the information can be set with the "Information auto clear" parameter.

- **When the "Information auto clear" parameter is set to "1: Enable" (initial value)**

  The generated information will automatically be cleared if the condition to clear information is satisfied.

- **When the "Information auto clear" parameter is set to "0: Disable"**

  Even if the condition to clear information is satisfied, the information is kept generated. The information can be cleared if one of the following methods is performed in a state where the condition to clear information is satisfied.
  - Execute the Clear information with the maintenance command via EtherNet/IP.
  - Execute the Clear information on the information monitor of the **MRC Studio** software.
  - Turn the INFO-CLR input ON.
  - Turn off the power supply and on it again.

3-2 Information history

Up to 16 generated information items are stored in the RAM in order of the latest to the oldest. Information items stored as the information history are the information code, generation time, and information item. The information history can be read or cleared when one of the following methods is performed.
- Read the information history by the monitor command via EtherNet/IP.
- Clear the information history by the maintenance command via EtherNet/IP.
- Read or clear the information history using the **MRC Studio** software.

memo Information history is cleared when the power supply of the controller is turned off since it is stored in the RAM.

3-3 Information list

Information item	Information bit output signal	Cause	Condition to clear
I/O (user setting)	INFO-USRIO	The output signal set in the "INFO-USRIO output selection" parameter was turned ON.	The output signal set in the "INFO-USRIO output selection" parameter was turned OFF.
Controller temperature	INFO-CNTTMP	The internal temperature of the controller exceeded the value set in the "Controller temperature information" parameter.	The internal temperature of the controller fell below the value set in the "Controller temperature information" parameter.
TCP speed	INFO-RBSPD	The feedback speed of the TCP exceeded the value set in the "TCP speed information" parameter.	The feedback speed of the TCP fell below the value set in the "TCP speed information" parameter.
Axis speed	INFO-AXISSPD	The feedback speed exceeded the value set in the "Axis speed information" parameter.	The feedback speeds of all axes fell below the value set in the "Axis speed information" parameter.
Operation start error	INFO-START	• The operation start signal in the direction having been stopped by the position limit was turned ON. • When operation could not be executed (e.g., the READY output was OFF), the operation start signal was turned ON.	Operation was started properly.
ZHOME start error	INFO-ZHOME	When the coordinates of the user coordinate system was not set (the PRST-STLD-RB output was OFF), the ZHOME-ALL input or the ZHOME-RB input was turned ON.	Operation was started properly.
Preset request	INFO-PR-REQ	Turn the P-PRESET-RB input ON.	The origin of the user coordinate system have been rewritten to the present TCP.
Mechanism information mismatch	INFO-MECHMIS	When the "Mechanism information mismatch information" parameter is set to "1: Enable," either of the following conditions is satisfied. • The mechanism type of the axis does not match the setting of the controller. • The lead and gear ratio of the actuator product do not match the setting of the controller.	• The mechanism type matched the setting of the controller. • The lead and gear ratio of the actuator product matched the setting of the controller.
RS-485 communication error	INFO-NET-E	An RS-485 communication error was detected.	RS-485 communication was performed properly.
TCP positive direction operation prohibition	INFO-OT-RB+	One of the X, Y, or Z coordinate of the TCP exceeded the position limit in the positive direction.	All of the X, Y, and Z coordinates of the TCP fell within the range of the position limit in the positive direction.
TCP negative direction operation prohibition	INFO-OT-RB–	One of the X, Y, or Z coordinate of the TCP exceeded the position limit in the negative direction.	All of the X, Y, and Z coordinates of the TCP fell within the range of the position limit in the negative direction.
Axis positive direction operation prohibition	INFO-OT-AX+	There was an axis that exceeded the position limit in the positive direction.	Positions of all axes fell within the range of the position limit in the positive direction.
Axis negative direction operation prohibition	INFO-OT-AX–	There was an axis that exceeded the position limit in the negative direction.	Positions of all axes fell within the range of the position limit in the negative direction.

Information item	Information bit output signal	Cause	Condition to clear
Approach TCP inhibition area	INFO-PHBAREA	When the "User-defined area operation setting" parameter was set to "1: AREA output, no entry area," the command position of the TCP entered the no entry area (user-defined area).	The command position of the TCP was out of the range of the no entry area (user-defined area).
Near singularity	INFO-SGL-LMT	The robot approached the singularity.	The robot moved away from the singularity.
Robot posture error	INFO-PST-ERR	When the "Robot posture error information" parameter is set to "1 : Enable," the angle of the elbow joint (*) of the vertical articulated robot became negative. * With base axis: Axis 3 Without base axis: Axis 2	The angle of the elbow joint of the robot became positive.
Slip mode	INFO-SLIP	When the "Slip information" parameter is set to "1: Enable," the robot switched to the slip mode.	The slip mode was released.
Driver connection setting incomplete	INFO-DRVDIS	There was an axis (or some axes) that the connection setting of the driver was not completed in the setup of the **MRC Studio** software.	The setup wizard of the **MRC Studio** software was completed.
Driver information detection	INFO-DRVINFO	When the "Driver information detection" parameter is set to "1: Enable," information was generated in the driver.	The information status for all drivers was cleared.
Operation start restricted mode	INFO-DSLMTD	• "Teaching operation" was executed using the **MRC Studio** software. • Configuration was executed. • Data was written to the controller from the **MRC Studio** software. • "Restoring parameters to the factory settings" was executed with the **MRC Studio** software.	• Teaching operation was canceled. • Configuration was completed. • Writing data was completed. • Data was restored to the factory setting.
I/O test mode	INFO-IOTEST	Configuration was executed.	Configuration was completed.
Configuration request	INFO-CFG	The parameter that required executing the configuration was changed.	Configuration was executed.
Reboot request	INFO-RBT	The parameter that required rebooting the controller was changed.	The controller was rebooted.

memo If the "Preset request" information was generated for 100 ms or more in a state where the "Information auto clear" parameter was set to "0: Disable," the origin of the user coordinate system may have been failed to rewritten.

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Published in June 2024

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