Oriental motor

TN-MRCUE-2

Robot Controller Unit
MRCU Series
Technical Reference

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

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

1 Introduction

1-1 Before use

Only qualified personnel of electrical and mechanical engineering should work with the product.
Use the product correctly after thoroughly reading the "2 Safety precautions" on p.3. In addition, be sure to observe the contents described in warning, caution, and note in this document.
The product described in this document 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.

1-2 Related operating manuals

For operating manuals and technical reference, contact your nearest Oriental Motor sales office.

- Robot Controller Unit **MRCU** Series technical reference (this document)
- Robot Controller **MRC01** USER MANUAL

This document mainly describes the hardware contents. For information not included in this document, such as control methods, parameters, and input/output signals, please refer to the Robot Controller **MRC01** USER MANUAL.

1-3 Overview of the product

This product is a controller unit that controls a robot configured with the **AZ** Series/Motorized actuator equipped with **AZ** Series. The **AZ** series mini driver RS-485 communication type and robot controller **MRC01** are built-in, reducing the wiring work between the drivers and controller.

■ Applicable robot type

This product can control robots consisting of up to 7 axes (including end effectors). For the robot type supported by the controller, refer to the setup screen of the **MRC Studio** software.

■ Two types of control methods

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

■ 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.

2 Safety precautions

The precautions described below are intended to ensure the safe and correct use of the product, and to prevent the customer and others 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 the robot (i.e., to operate the device in accordance with the specified purpose) when the machine in which the robot 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 are familiar with the operation of electronic equipment, and thereby prevent injury or damage to the equipment.
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, regulations, accident-prevention rules and inspection conditions; 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 death or serious bodily injury.
⚠CAUTION	Handling the product without observing the instructions that accompany a "CAUTION" symbol may result in bodily injury or property damage.
Note	The items under this heading contain important handling instructions that the user should observe to ensure the 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 document.

⚠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

- 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.

3 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**

  For noise elimination measures, refer to the Robot Controller **MRC01** USER MANUAL.

4 Preparation

4-1 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

4-2 How to identify the product model

Check the model against the model shown on the nameplate.

MRCU **6A** **1D** **1**

1 2 3 4

1	Series	**MRCU**: **MRCU** series
2	Number of robot axes	**2A**: 2 axes **3A**: 3 axes **4A**: 4 axes **5A**: 5 axes **6A**: 6 axes
3	Included drivers	**1D**: **AZD-KR2D**
4	Number of peripheral axes	Blank: 0 axis **1**: 1 axis **2**: 2 axes

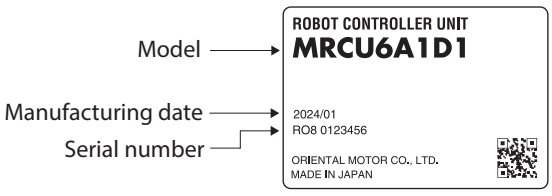
4-3 Products possible to combine

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

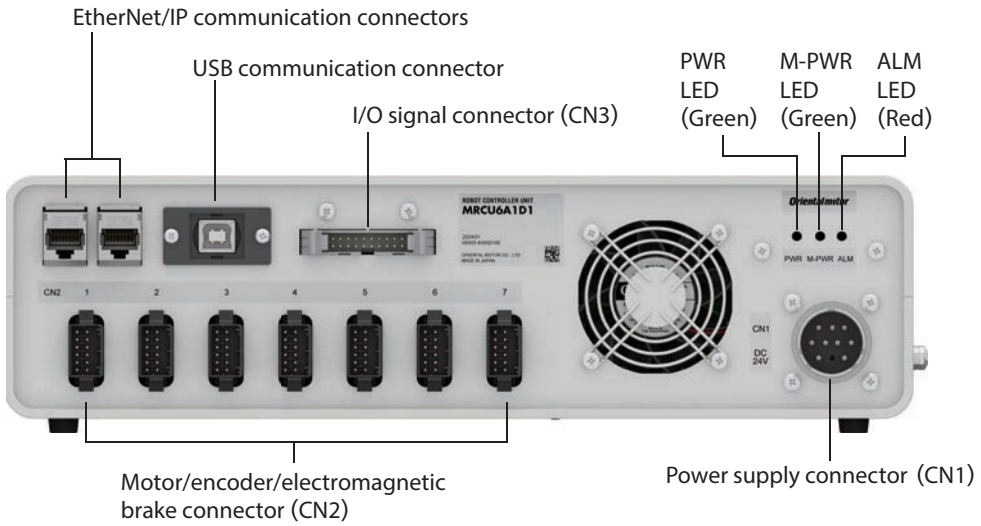
Power supply type	Product type	Applicable Series	Example of model name
DC power input	Small Robots	**OVR**	**OVR5035K1-V**
	Stepping motor	**AZ** Series	**AZM46AK**
	Motorized actuator	**EAC** Series	**EACM2E05AZAK**
		EAS Series	**EASM4NXD005AZAK**
		EZS Series	**EZSM6D005AZAK**
		DR Series	**DR28G2.5B03-AZAKU**
		DRS2 Series	**DRSM60-05A4AZAK**
		DGII Series	**DGM85R-AZAK** **DGB85R12-AZAKR**
		EH Series	**EH4-AZAKH**
		L Series	**LM4F150AZAK-1**

4-4 Information about nameplate

The figure shows an example.



4-5 Names and functions of parts



Type	Name	Description
Connector	EtherNet/IP communication connectors	Connects a scanner with the EtherNet/IP cable.
	USB communication connector	Connects a PC in which the **MRC Studio** software has been installed. (USB type-B)
	Power supply connector (CN1)	Connects a main power supply and a control power supply.
	Motor/encoder/electromagnetic brake connector (CN2)	Connects the motor, the encoder, and the electromagnetic brake.
	I/O signal connector (CN3)	Connects when using direct I/O or sensors.
LED	PWR LED (Green)	This LED indicates the status of a control power supply.
	M-PWR LED (Green)	This LED indicates the status of a main power supply.
	ALM LED (Red)	This LED indicates the status of an alarm.

5 Installation

5-1 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 +40 °C [+32 to +104 °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

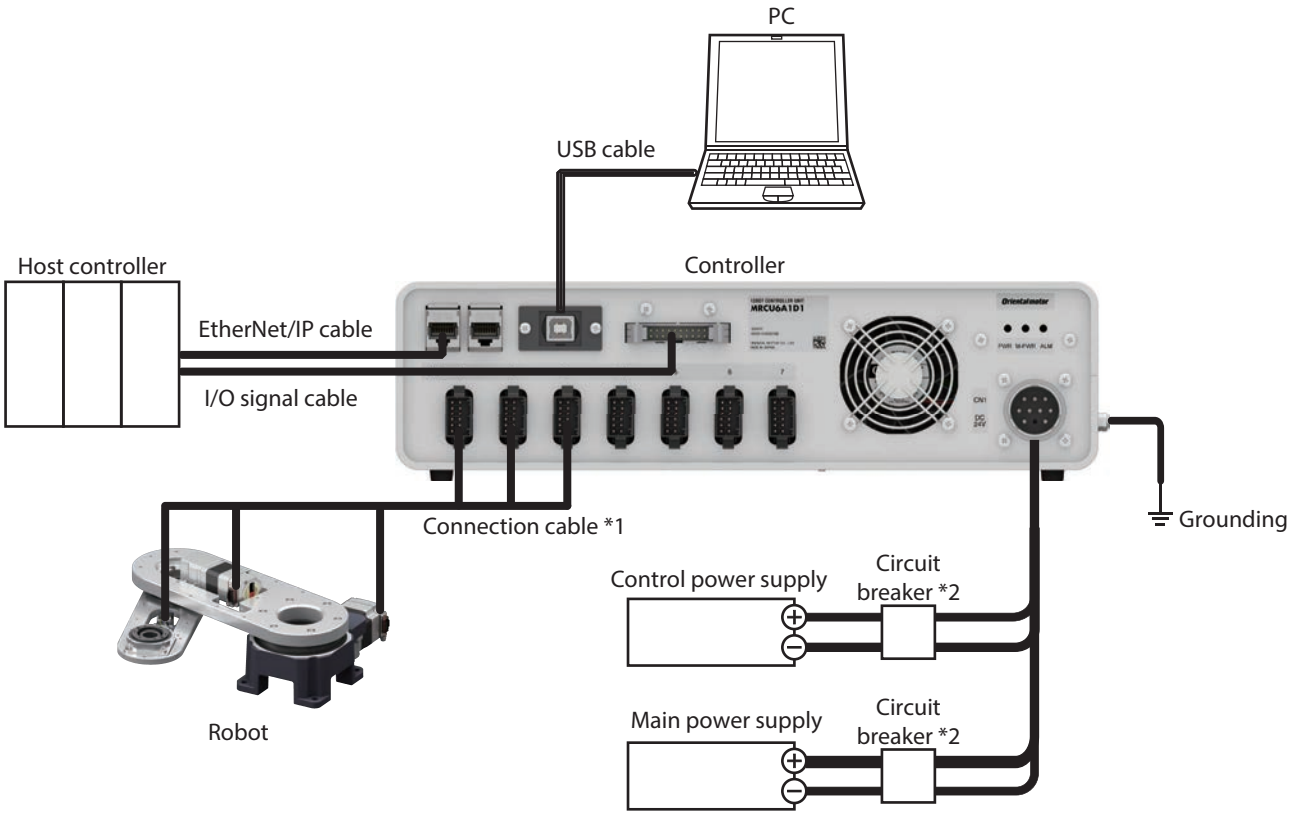
5-2 Installation method

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 40 °C (104 °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 horizontally with the rubber feet facing down.
- Install the controller on a flat metal plate or similar surface.

6 Connection

6-1 Connection example



*1 This is Oriental motor cable. Please purchase separately.

*2 It is recommended that a circuit breaker or a circuit protector is connected because incorrect wiring may cause the internal input circuit to short-circuit.

Note

- Connect the connectors securely. Insecure connections may cause malfunction or damage to the motor or the driver.
- When connecting the cables, secure them so that no load is applied to the connectors. Applying a load to the connector may result in a connection failure, causing the driver to malfunction.
- Keep 10 m (32.8 ft.) or less for the wiring distance between a motor and a driver. Exceeding 10 m (32.8 ft.) in the wiring distance may result in increase of the electrical noise emitted from the driver.
- Keep 2 m (6.6 ft.) or less for the cable length of the main power supply and control power supply cables.

memo

Before connecting or disconnecting a connector, turn off the power supply, and check the PWR LED and M-PWR LED have been turned off.

6-2 Connecting the power supply (CN1)

Connect a power supply to the CN1 connector.
Connecting the control power supply allows you to continue monitoring even if the main power supply is shut off. Connect it as necessary.

Note

Make sure the polarity of the power supply before connecting. Reverse-polarity connection may cause damage to the driver.

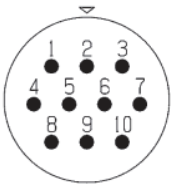
■ Recommended Connectors

Part number: NR-2410-PF, NR-2410CPS-PF (Nanaboshi Electric Mfg.Co.,Ltd.)

■ Pin assignment

The figure shows the view from the insertion side of contacts.
Please wire all No.1 to 8 and 10 according to the instructions.

No.	Name
1	Main power supply 1
2	Main power supply 2
3	Main power supply 3
4	GND (Main power supply 1)
5	GND (Main power supply 2)
6	GND (Main power supply 3)
7	Control power supply
8	GND (Control power supply)
9	-
10	Frame ground



memo No.1 to No.2 are electrically insulated.

■ Voltage specifications

The voltage specifications of power supply input include the rated voltage and the allowable operating voltage.
The voltage specifications are common for the main power supply and the control power supply.

Rated voltage	24 VDC±5 %
Allowable operating voltage	20 to 32 VDC (22.8 to 32 VDC) *

* The value in parentheses ( ) is the one when the electromagnetic brake motor is connected.

memo Set the "Main power mode" parameter to "0: 24 VDC" or "1: 48 VDC" when the main power supply starts up slowly or the voltage of the main power supply is unstable.

■ Power supply current capacity

● Current capacity for main power supply

The current capacity for the main power supply varies depending on the product combined.
Check the current capacity in reference to the equipped motor model when using the **EAC** Series, **EAS** Series, or **EZS** Series.

Series	Model	Power supply current capacity
AZ Series **EAC** Series **EAS** Series **EZS** Series	**AZM14**	0.4 A or more
	AZM15	0.5 A or more
	AZM24, **AZM26**	1.4 A or more
	AZM46	1.6 A or more
	AZM48	2.1 A or more
	AZM66	3.7 A or more
	AZM69	3.5 A or more
DGII Series	**DGM60**	1.4 A or more
	DGB85	1.6 A or more
	DGB130	3.7 A or more
	DGM85	1.6 A or more
	DGM130	3.7 A or more

Series	Model	Power supply current capacity
DR Series	**DR20**	0.4 A or more
	DR28	1.3 A or more
DRS2 Series	**DRSM42**	1.5 A or more
	DRSM60	2.6 A or more
EH Series	**EH3**	0.4 A or more
	EH4	1.4 A or more
L Series	**LM2**, **LM4**	3.7 A or more
Small Robots **OVR**	**OVR3041K3-H**	6.7 A or more
	OVR3AL030030Z10K-C, **OVR3AR030030Z10K-C**	6.9 A or more
	OVR4048K5-V, **OVR4068K5-V**, **OVR4088K5-V**	12.5 A or more
	OVR5035K1-V	14.3 A or more
	OVR6048K1-V	15.3 A or more

memo In addition to the motor's input current, the control unit consumes 0.2 A of current. Prepare a power supply taking into consideration the current capacity of the connected products and the control unit.

- **Current capacity for control power supply**

Number of axes	Power supply current capacity	
	Without electromagnetic brake	With electromagnetic brake
3 axes	0.65 A or more	1.4 A or more
4 axes	0.8 A or more	1.8 A or more
5 axes	0.95 A or more	2.2 A or more
6 axes	1.1 A or more	2.6 A or more
7 axes	1.25 A or more	3 A or more

■ Grounding the controller

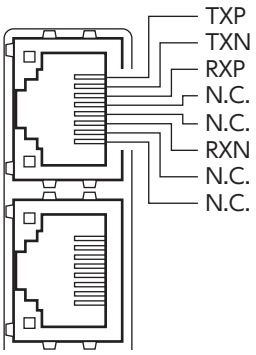
Ground the controller as necessary. Do not share the grounding wire with a welder or any other power equipment.

6-3 Connecting the EtherNet/IP cable

Connect the EtherNet/IP cable to the EtherNet/IP communication connector.

■ 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.	–



6-4 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 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.

6-5 Connecting the I/O signals (CN3)

Connect when using direct I/O or sensors.
Using a connector with the following specifications, connect a I/O signal cable to the I/O signal connector (CN3).

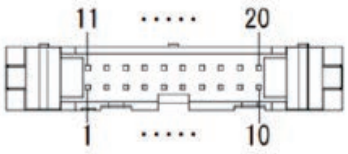
Specification	MIL connector (MIL-C-83503)
Number of pins	20 pins

■ Pin assignment

Pin No.	Signal name	Description *1
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 *2	Common for OUT0 to OUT7 outputs (GND)
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 *1
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	Reserved	–
19	OUT5	Control output 5 (PRG-RUN)
20	OUT7	Control output 7 (PRG-DOUT1)

*1 Values in parentheses ( ) are initial values.
*2 Since pin No. 16 is used to light the LED, OUT-COM is fixed to GND.



Note To ensure that the ALM LED functions properly, be sure to carry out the following steps.
- Be sure to connect GND (0V) to pin No. 6 (OUT-COM). If you connect the +24V side, the ALM LED will not function properly.
- In **MRC Studio**, set the "DOUT3 (Normal) Output function" parameter to "ALM-A." If you use the default value (ALM-B), the ALM LED will remain lit all the time. No other signals can be assigned to pin No. 18.

6-6 Noise elimination measures

For noise elimination measures, refer to the Robot Controller **MRC01** USER MANUAL.

7 Operation

This part explains contents to be performed before starting operation.

7-1 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. (Details ⇨ "7-2 Setting of robot")

↓

Setting of origin*

↓

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

↓

Operation check*

↓

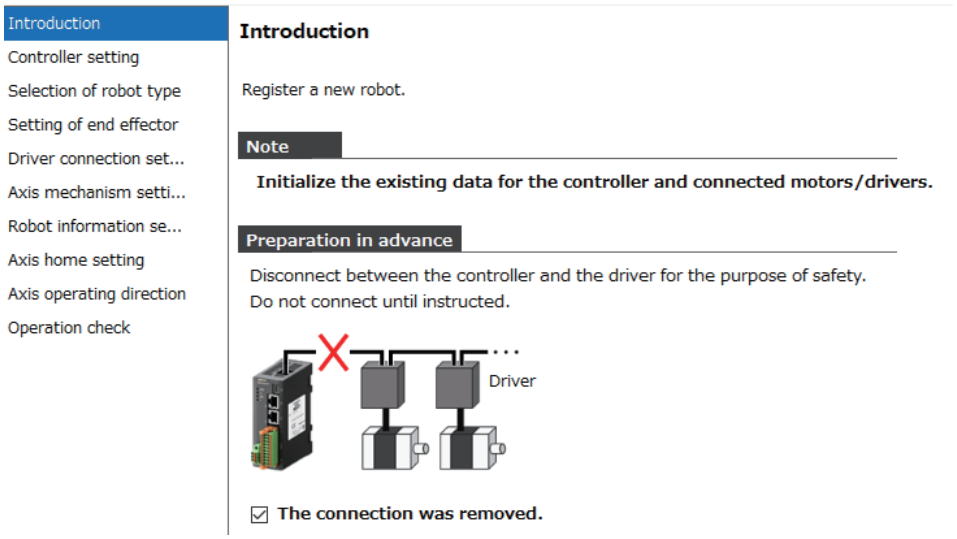
Backup of data* — Save the data having set in the **MRC Studio** software to a PC.

* Refer to the Robot Controller **MRC01** USER MANUAL. Please also take a look at the details of the robots that can be controlled by the controller, how to create the operation program, and commands.

7-2 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. In the "Introduction", you will be prompted to "Disconnect between the controller and the driver for the purpose of safety." However, with this product, there is no need to disconnect the driver inside the case. Check "The connection was removed" and proceed to the next step.



5. Follow the on-screen instructions to set "Controller setting", "Selection of robot type," and "Setting of end effector."
6. In "Driver connection setting", perform STEP 1 and then proceed to STEP 3. Since the switches on the driver body have already been set for this product, there is no need to perform STEP 2.
7. Follow the instructions on the screen for the settings after "Axis mechanism setting".

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.

8 Inspection and maintenance

8-1 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 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.

8-2 Warranty

Check on the Oriental Motor Website for the product warranty.

8-3 Disposal

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

9 Troubleshooting

This part explains alarm and information functions.

9-1 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 ALM 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 ALM LED blinks, or using EtherNet/IP or the **MRC Studio** software.
For alarm list and timing chart, refer to the Robot Controller **MRC01** USER MANUAL.

■ 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. For details, refer to the alarm list of Robot Controller **MRC01** USER MANUAL.

■ 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.

9-2 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.
For related parameters and information list, refer to the Robot Controller **MRC01** USER MANUAL.

■ Status when information is generated

- **Information bit output**

  If information is generated, a bit output of the corresponding information is turned ON.
  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.

- **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.

■ 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.

■ 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.

Information history is cleared when the power supply of the controller is turned off since it is stored in the RAM.

10 Cable and accessories

10-1 Connection cables (For cable type)

■ Connection cables/Flexible connection cables (For AZM14, AZM15, AZM24, AZM26)

These cables are used when connecting a motor and a controller.

memo If the cable needs to bend, such as in a robot arm, use a flexible cable.

- **Connection cables**
  For motor/encoder

Model	Length [m (ft.)]
CCM005Z2AAF	0.5 (1.6)
CCM010Z2AAF	1 (3.3)
CCM030Z2AAF	3 (9.8)
CCM050Z2AAF	5 (16.4)
CCM100Z2AAF	10 (32.8)

- **Flexible connection cables**
  For motor/encoder

Model	Length [m (ft.)]
CCM005Z2AAR	0.5 (1.6)
CCM010Z2AAR	1 (3.3)
CCM030Z2AAR	3 (9.8)
CCM050Z2AAR	5 (16.4)
CCM100Z2AAR	10 (32.8)

■ Connection cables/Flexible connection cables (For AZM46, AZM48, AZM66, AZM69)

These cables are used when connecting a motor and a controller.

memo If the cable needs to bend, such as in a robot arm, use a flexible cable.

- **Connection cables**

For motor/encoder

Model	Length [m (ft.)]
CCM005Z2ABF	0.5 (1.6)
CCM010Z2ABF	1 (3.3)
CCM030Z2ABF	3 (9.8)
CCM050Z2ABF	5 (16.4)
CCM100Z2ABF	10 (32.8)

For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CCM005Z2ACF	0.5 (1.6)
CCM010Z2ACF	1 (3.3)
CCM030Z2ACF	3 (9.8)
CCM050Z2ACF	5 (16.4)
CCM100Z2ACF	10 (32.8)

- **Flexible connection cables**

For motor/encoder

Model	Length [m (ft.)]
CCM005Z2ABR	0.5 (1.6)
CCM010Z2ABR	1 (3.3)
CCM030Z2ABR	3 (9.8)
CCM050Z2ABR	5 (16.4)
CCM100Z2ABR	10 (32.8)

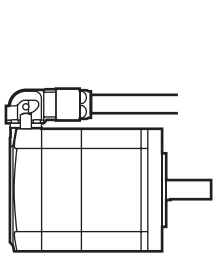
For motor/encoder/electromagnetic brake

Model	Length [m (ft.)]
CCM005Z2ACR	0.5 (1.6)
CCM010Z2ACR	1 (3.3)
CCM030Z2ACR	3 (9.8)
CCM050Z2ACR	5 (16.4)
CCM100Z2ACR	10 (32.8)

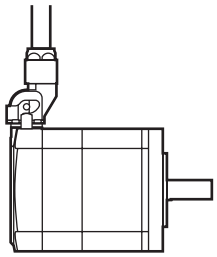
10-2 Connection cables (For connector type)

■ Connection cables/Flexible connection cables

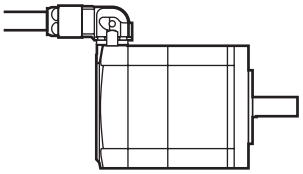
These cables are used when connecting a motor and a controller.
The model name of the connection cable varies depending on the outlet direction from the motor. Refer to the figures below.



Cable outlet direction
Output shaft direction



Cable outlet direction
Vertical direction



Cable outlet direction
Opposite to output shaft direction

memo If the cable needs to bend, such as in a robot arm, use a flexible cable.

- **Connection cables**

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
0.2 (0.7)	**CCM002Z1EFF**	**CCM002Z1EVF**	**CCM002Z1EBF**
0.5 (1.6)	**CCM005Z1EFF**	**CCM005Z1EVF**	**CCM005Z1EBF**
1 (3.3)	**CCM010Z1EFF**	**CCM010Z1EVF**	**CCM010Z1EBF**
2 (6.6)	**CCM020Z1EFF**	**CCM020Z1EVF**	**CCM020Z1EBF**
3 (9.8)	**CCM030Z1EFF**	**CCM030Z1EVF**	**CCM030Z1EBF**
5 (16.4)	**CCM050Z1EFF**	**CCM050Z1EVF**	**CCM050Z1EBF**
7 (23.0)	**CCM070Z1EFF**	**CCM070Z1EVF**	**CCM070Z1EBF**
10 (32.8)	**CCM100Z1EFF**	**CCM100Z1EVF**	**CCM100Z1EBF**

- **Flexible connection cables**

Length [m (ft.)]	Cable outlet direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
0.5 (1.6)	**CCM005Z1EFR**	**CCM005Z1EVR**	**CCM005Z1EBR**
1 (3.3)	**CCM010Z1EFR**	**CCM010Z1EVR**	**CCM010Z1EBR**
2 (6.6)	**CCM020Z1EFR**	**CCM020Z1EVR**	**CCM020Z1EBR**
3 (9.8)	**CCM030Z1EFR**	**CCM030Z1EVR**	**CCM030Z1EBR**
5 (16.4)	**CCM050Z1EFR**	**CCM050Z1EVR**	**CCM050Z1EBR**
7 (23.0)	**CCM070Z1EFR**	**CCM070Z1EVR**	**CCM070Z1EBR**
10 (32.8)	**CCM100Z1EFR**	**CCM100Z1EVR**	**CCM100Z1EBR**

■ Extension cables/Flexible extension cables

These cables are used when extending a connection cable (add between the driver and connection cable).
Use if the length of the connection cable used is not enough when extending the distance between a motor and a driver.

memo
- If the cable needs to bend, such as in a robot arm, use a flexible cable.
- When extending the wiring length by connecting an extension cable to the connection cable, make the total cable length 10 m (32.8 ft.) or less.

- **Extension cables**

Model	Length [m (ft.)]
CCM010Z2ADFT	1 (3.3)
CCM030Z2ADFT	3 (9.8)
CCM050Z2ADFT	5 (16.4)

- **Flexible extension cables**

Model	Length [m (ft.)]
CCM010Z2ADRT	1 (3.3)
CCM030Z2ADRT	3 (9.8)
CCM050Z2ADRT	5 (16.4)

10-3 Accessories

■ 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**

11 Specifications

11-1 Product specifications

Power supply	Input voltage	24 VDC±5 %
	Input current	3 axes: 11.3A (Maximum) 4 axes: 15A (Maximum) 5 axes: 18.7A (Maximum) 6 axes: 22.4A (Maximum) 7 axes: 26.1A (Maximum)
Interface	Field network	EtherNet/IP
	Control input	• Number of input points: 8, photocoupler • Voltage: 24 VDC±10 %
	Control output	• Number of output points: 7, photocoupler/open collector • Voltage: 30 VDC or less • Output saturated voltage: 3 VDC maximum • Current: 10 mA or less
Number of control axes		• 3 to 7 axes*

* It is the number of axes including an end effector. This controller can be used to control a single unit of the robot.

11-2 General specifications

Operating environment	Ambient temperature	0 to +40 °C [+32 to +104 °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

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