Oriental motor

Integrated Robot Controller & Drivers
MRCU Series
Operating Manual

WM-0006E

Thank you for purchasing an Oriental Motor product. This manual describes product handling procedures and safety precautions. Please read the manual thoroughly to ensure safe operation.

- Use the product correctly after thoroughly reading the section “Safety Precautions.” In addition, be sure to observe the contents described in warning, caution, and note in this manual.
- This manual mainly describes the hardware of the product. For the control method, parameters, I/O signals, etc., refer to the “MRC01 User Manual.”

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 into the configuration tool of the scanner, settings of EtherNet/IP can be made before the controller is in your hand.
For details, contact your nearest Oriental Motor sales office.

Safety Precautions

The precautions described below are intended to ensure the safe and proper 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 the robot (i.e., to operate the device in accordance with the specified purpose) when the machine in which the controller is incorporated does not meet the 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.

Tip

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 areas subjected to splashing water, or near combustible materials. 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.
- Conduct a risk assessment in a state where all parts and components including the product have been installed in the equipment. Failure to do so may result in injury or damage to equipment.
- Provide a safety cage that meets the safety distance specified in ISO 13857 so that an operator or other personnel does not enter the movable range of the product while the equipment is operating. Failure to do so may result in injury.
- When teaching, adjusting, or inspecting the product inside the safety cage, take appropriate safety measures according to the results of the risk assessment of the entire equipment. 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.
- Provide an emergency stop function for the equipment. Failure to do so may result in injury.
- The function and performance of the safety-related control system are appropriately determined according to the results of the risk assessment of the entire equipment. This may result in injury.
- Do not disassemble or modify the product. Doing 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.
- Perform the teaching operation outside the safety cage. Failure to do so may result in injury.
- Do not touch the controller while the power is on. 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 cause the controller to malfunction, resulting in injury or damage to equipment.

Installation and Wiring

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

- Before operating a robot, check the condition of the surrounding area to ensure safety. This may cause injury or damage to equipment.

- Take appropriate safety measures when placing the motor in a non-excitation state. Failure to do so may result in injury or damage to equipment.
- Do not turn off the power or input a signal to place the motor in a non-excitation state during operation. The robot may move unexpectedly, causing 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.
- Before operating a robot, check the setting value of the parameters. 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.
- 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.

Caution

- Do not use the product beyond its specifications. Doing so may result in injury or damage to equipment.
- Keep the area around the product free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the product that would obstruct ventilation. Doing so may result in 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.
- 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.
- Do not touch the terminals while conducting the insulation resistance measurement or the dielectric strength test. Accidental contact may result in electric shock.
- When installing and wiring, take measures against EMC. Without effective measures to suppress Electromagnetic Interference (EMI) caused by the product in the surrounding control system equipment or Electromagnetic Susceptibility (EMS) generated by the product, the function of your equipment may be seriously affected. Verify EMC compliance with the completed equipment. Failure to do so may result in injury or damage to equipment.

Precautions for Use

Saving data to non-volatile memory

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

Note when connecting a power supply whose positive terminal is grounded

The USB 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.

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 controller.

Preparation

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
- CN5 connector (20 pins)... 1 piece

How to Identify the Product Model

Verify the model name of the purchased product against the model shown on the nameplate of the product.

MRCU 6 A K

1 2 3

1	Series	MRCU Series
2	Number of Axes	3A: 3 Axes 4A: 4 Axes 5A: 5 Axes 6A: 6 Axes 7A: 7 Axes 8A: 8 Axes
3	power Supply Specification	K: 24/48 VDC

Products that Can Be Combined

Product Type	Series	Example of Product Model
Small Robot	OVR	OVR5035K1-V
Stepping Motor	AZ Series	AZM46AK

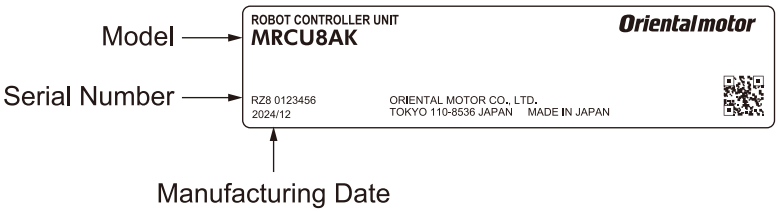
Product Type	Series	Example of Product Model
Motorized Actuator	EAC Series	EACM2E05AZAK
	EAS Series	EASM4NXD005AZAK
	EZS Series	EZSM6D005AZAK
	DR Series	DR28G2.5B03-AZAKU
	DRS2 Series	DRSM60-05A4AZAK
	DGII Series	DGM85R-AZAK DGB85R12-AZAKR
	EH Series	EH4-AZAKH
	L Series	LM4F150AZAK-1

Information About Nameplate

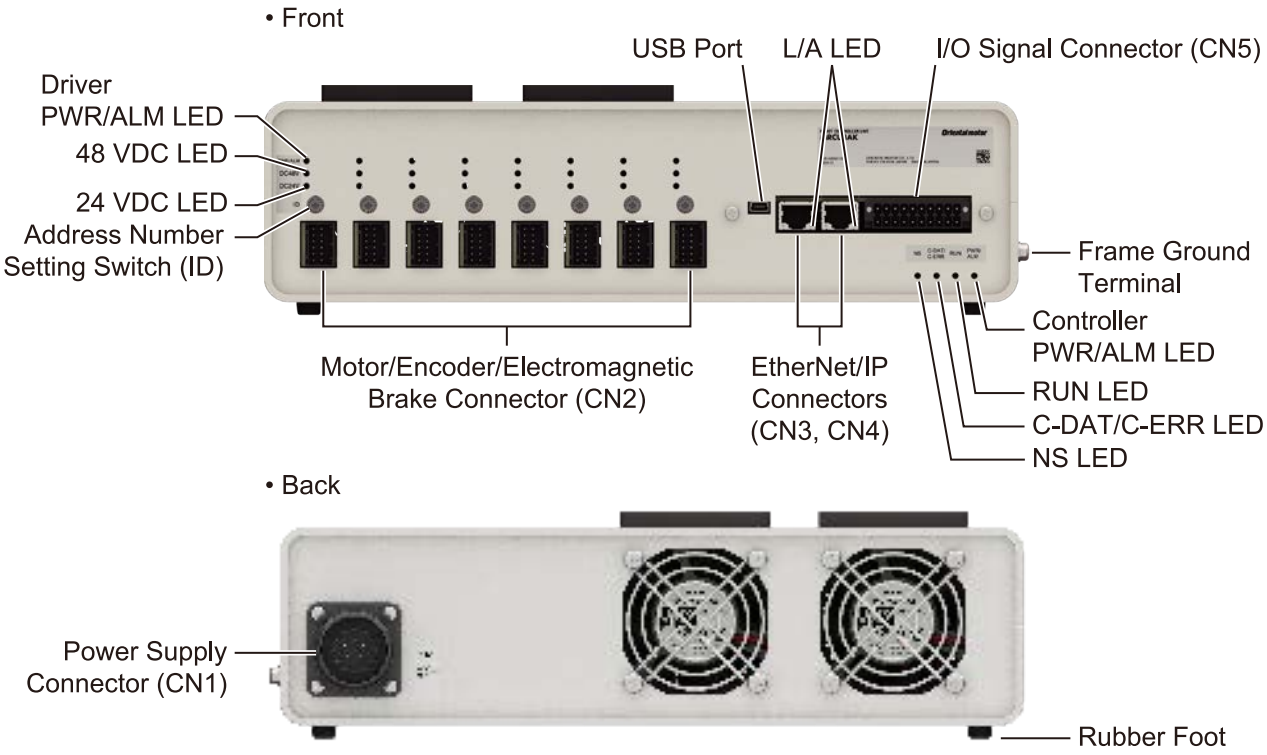
The figure shows an example.

Tip

The position describing the information may vary depending on the product.



Names of Parts


• Front
USB Port
L/A LED
I/O Signal Connector (CN5)
Driver
PWR/ALM LED
48 VDC LED
24 VDC LED
Address Number
Setting Switch (ID)
Frame Ground
Terminal
Controller
PWR/ALM LED
RUN LED
C-DAT/C-ERR LED
NS LED
Motor/Encoder/Electromagnetic
Brake Connector (CN2)
EtherNet/IP
Connectors
(CN3, CN4)
• Back
Power Supply
Connector (CN1)
Rubber Foot

Position	Type	Name	Description
Front	Connector	Motor/Encoder/Electromagnetic Brake Connector (CN2)	Connects the motor, the encoder, and the electromagnetic brake.
		EtherNet/IP Connectors (CN3, CN4)	Connects the EtherNet/IP cable.
		I/O Signal Connector (CN5)	Connect when using direct I/O or sensors.
		USB Port	Connects a PC in which the MRC Studio software has been installed. (USB2.0 mini-B port)
	LED Indicators	Controller PWR/ALM LED	This LED indicates the status of the controller.
		RUN LED (Green)	This LED is lit while the operation of the program set with the operation program of the MRC Studio software is being executed.
		C-DAT/C-ERR LED (Green/Red)	This LED indicates the communication status inside the controller.
		NS LED (Green/Red)	This LED indicates the communication status of EtherNet/IP.
		L/A LED (Green)	This LED indicates the LINK/ACT status of EtherNet/IP.
		Driver PWR/ALM LED (Green/Red/Blue)	This LED indicates the status of the driver.
		24 VDC LED, 48 VDC LED (Green)	This LED indicates the voltage of the main power supply that is being supplied to each axis.
	Switch	Address Number Setting Switch (ID)	Sets the address number (server address) of each axis.
	Terminal	Frame Ground Terminal	Ground if necessary.
Back	Connector	Power Supply Connector (CN1)	Connects a power supply.

Indication of LEDs

Controller PWR/ALM 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 on.
No Light	Blinking	An alarm is being generated. The alarm item 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.

*Green and red colors may overlap and may be visible as 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 inside the controller.

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 inside the controller is being performed properly.
Blinking	No Light	Communication inside the controller is established.
No Light	Light	An error in communication inside the controller has occurred.

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	The connection to the scanner has timed out.
No Light	Light	The setting of an IP address is duplicated in the same system.
Blinking Alternately		Self-diagnosis when the power is turned on is being executed.

Driver PWR/ALM LED

This LED indicates the status of the driver.

LED Status	Description
No Light	The main power supply and the control power supply are not turned on.
Green Light	The main power supply and/or the control power supply are turned on.
Blinking Red	An alarm is being generated. The alarm item 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 Blue	Information is being generated. The LED is lit in green when the information is cleared.

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.

LED status	Description
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.

Installation and Connection

Installation Location

The product described in this manual is designed and manufactured to be incorporated into general industrial 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 installed indoors (provide ventilation 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 equipment, etc.)
- Area free of radioactive materials, magnetic fields, or vacuum
- Up to 1,000 m (3,300 ft.) above sea level

Installation Method

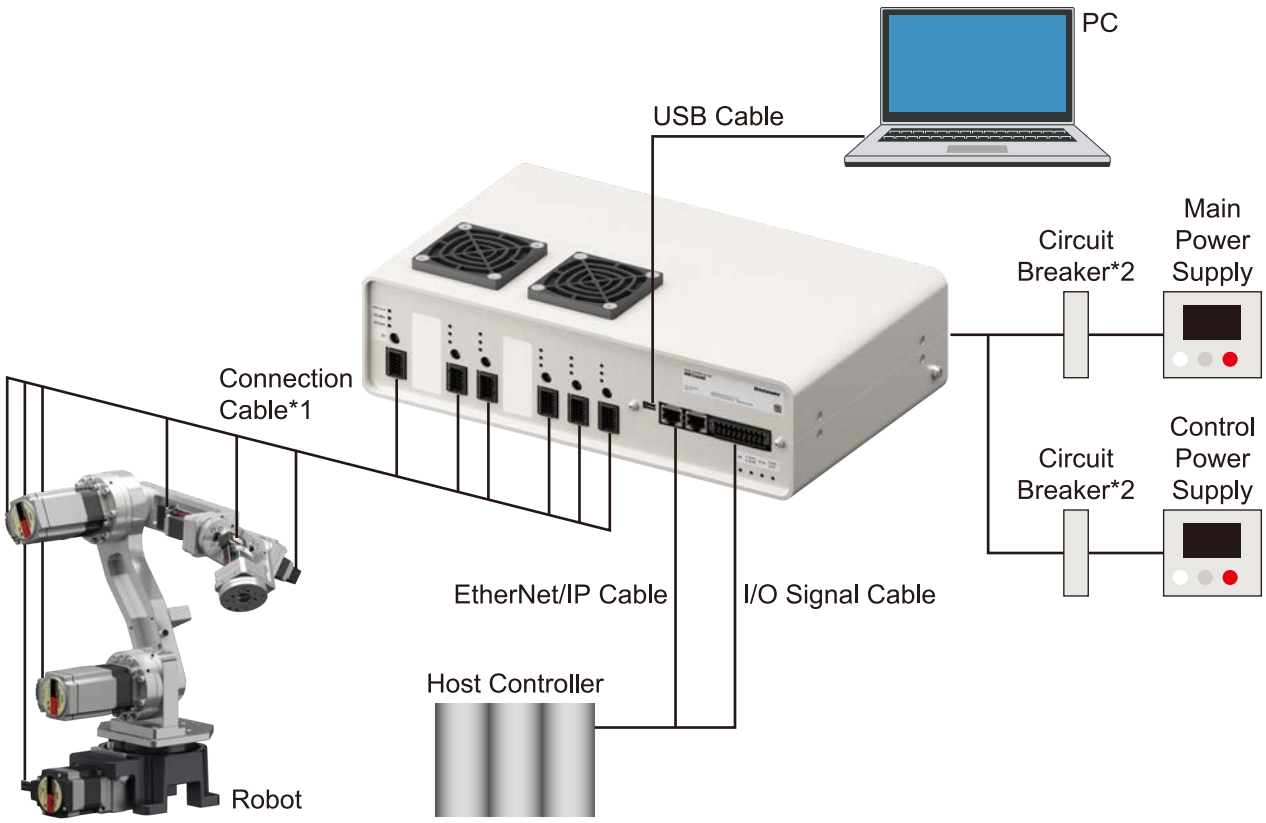
Install the controller vertically on a flat metal plate with the rubber feet facing down.

Note

- Do not install any equipment that generates a large amount of heat or noise near the controller.
- Do not install the controller under a host controller or other heat-sensitive equipment.
- If the ambient temperature of the controller exceeds 40 °C (104 °F), reconsider the ventilation conditions, such as using fans for forced cooling or providing space between the controller and other products.

Connection Example

Maintain 10 m (32.8 ft.) or less for wiring distance between a motor and driver.



*1 These are Oriental motor cables. Purchase is required 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 connector securely. Insecure connector connection may cause malfunction or damage to the motor or controller.
- When connecting the cable, secure it so that no load is applied to the connector. Applying a load to the connector may result in a connection failure, causing the controller to malfunction.

Tip

Before connecting or disconnecting a connector, turn off the power supply and check that the PWR/ALM LED on the controller and the PWR/ALM LED on the driver have been turned off.

Connecting a Power Supply

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

Note

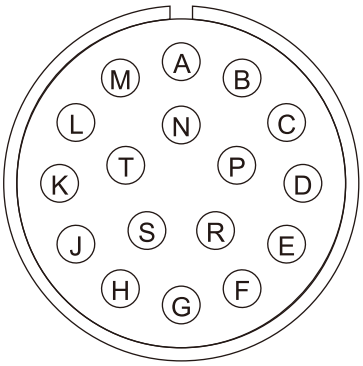
Make sure the polarity of the power supply before connecting. Connecting the power supply with reversed polarity may damage the controller.

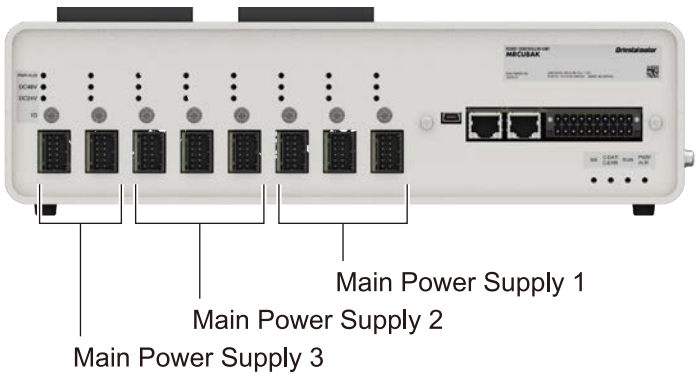
Recommended Connectors

Type	Part number	Manufacturer
Straight Plug	N/MS3106B20-29S	Japan Aviation Electronics Industry, Ltd.
Right Angle Plug	N/MS3108B20-29S	Japan Aviation Electronics Industry, Ltd.

Pin assignment

The figure shows the view from the insert side of the contacts. Wire all terminals according to the pin assignments in the table.





Number	Name
A	Main Power Supply 1
B	Ground (For main power supply 1)
C	Main Power Supply 2
D	Ground (For main power supply 2)
E	Main Power Supply 3
F	Ground (For main power supply 3)
G	Frame ground
H	Control power supply
J	Ground (For control power supply)
K to T	Reserved

Tip

Since the main power supplies 1 through 3 are internally independent, wire the power to all of them.

Voltage specifications

The power supply input voltage specifications include the rated voltage and the allowable operating voltage.

	Rated Voltage	Allowable Operating Voltage
Main Power Supply	24 VDC±5 % 48 VDC±5 %	24 VDC input: 20 to 32 VDC (22.8 to 32 VDC) 48 VDC input: 40 to 55 VDC
Control Power Supply	24 VDC±5 %	20 to 27.6 VDC(22.8 to 27.6 VDC)

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

Note

Do not apply 48 VDC to the control power supply. Doing so may result in damage to the controller.

Current Capacity for Main Power Supply

The current capacity for the main power supply varies depending on the product combined. Refer to the table below.

Product Type	Series	Model	Power Supply Current Capacity
Small Robot	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

Product Type	Series	Model	Power Supply Current Capacity
Stepping Motor	AZ 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
Motorized Actuator	EAC Series* EAS Series* EZS Series*	AZM24	1.4 A or more
		AZM46	1.6 A or more
		AZM66	3.7 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
	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

* Check it by referring to the model of the equipped motor.

Current Capacity for Control Power Supply

Number of Axes	Power Supply Current Capacity	
	Without electromagnetic brake	With electromagnetic brake
3 Axes	0.75 A or more	1.5 A or more
4 Axes	0.9 A or more	1.9 A or more

Number of Axes	Power Supply Current Capacity	
	Without electromagnetic brake	With electromagnetic brake
5 Axes	1.05 A or more	2.3 A or more
6 Axes	1.2 A or more	2.7 A or more
7 Axes	1.35 A or more	3.1 A or more
8 Axes	1.5 A or more	3.5 A or more

Grounding

Ground the controller if necessary. Do not share the grounding wire with a welder or any other power equipment.
Applicable lead wire: AWG 16 to 14 (1.25 to 2.0 mm^2)

Connecting the EtherNet/IP Cable

Connect the EtherNet/IP cable to the EtherNet/IP connector (CN3, CN4).

Connecting the USB Cable

Using a USB cable with the following specifications, connect a PC on which the MRC Studio software has been installed to the USB port.

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

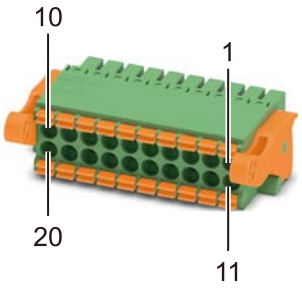
Tip

- Use a USB cable to connect directly to a PC.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core on the USB cable.

Connecting the I/O Signals

Connect when using direct I/O or sensors.
Use the CN5 connector (20 pins) to connect the I/O signal cable to the I/O signal connector (CN5).

Pin Assignment

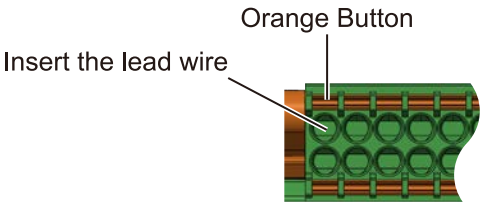


Pin Number	Signal Name	Description	Initial Value
1	IN-COM	Common for IN0 to IN7 inputs	–
2	IN0	Control input 0	STOP
3	IN2	Control input 2	ETO-CLR-DRV
4	IN4	Control input 4	PAUSE
5	IN6	Control input 6	PRG-DIN0
6	OUT-COM	Common for OUT0 to OUT7 outputs	–
7	OUT0	Control output 0	READY
8	OUT2	Control output 2	ETO-MON-DRV
9	OUT4	Control output 4	PAUSE-BSY
10	OUT6	Control output 6	PRG-DOUT0
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

Connector Wiring Method

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

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



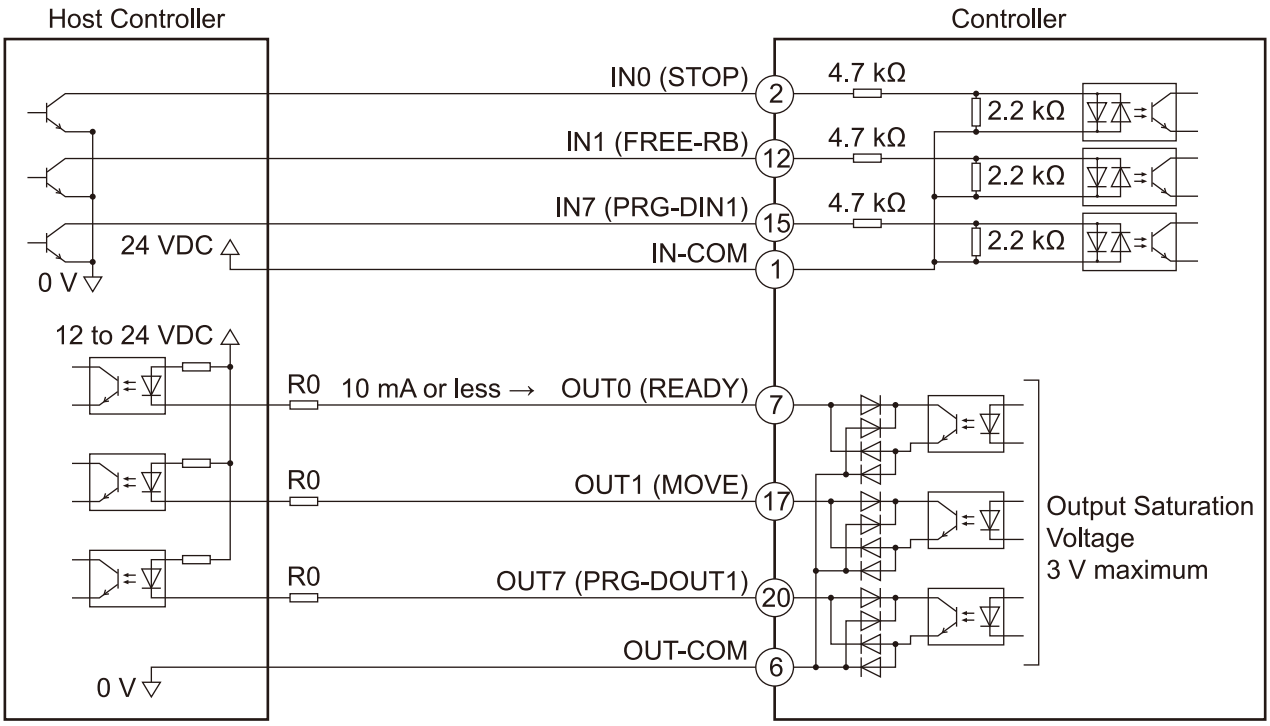
Connection Example

Values in parentheses ( ) are initial values.

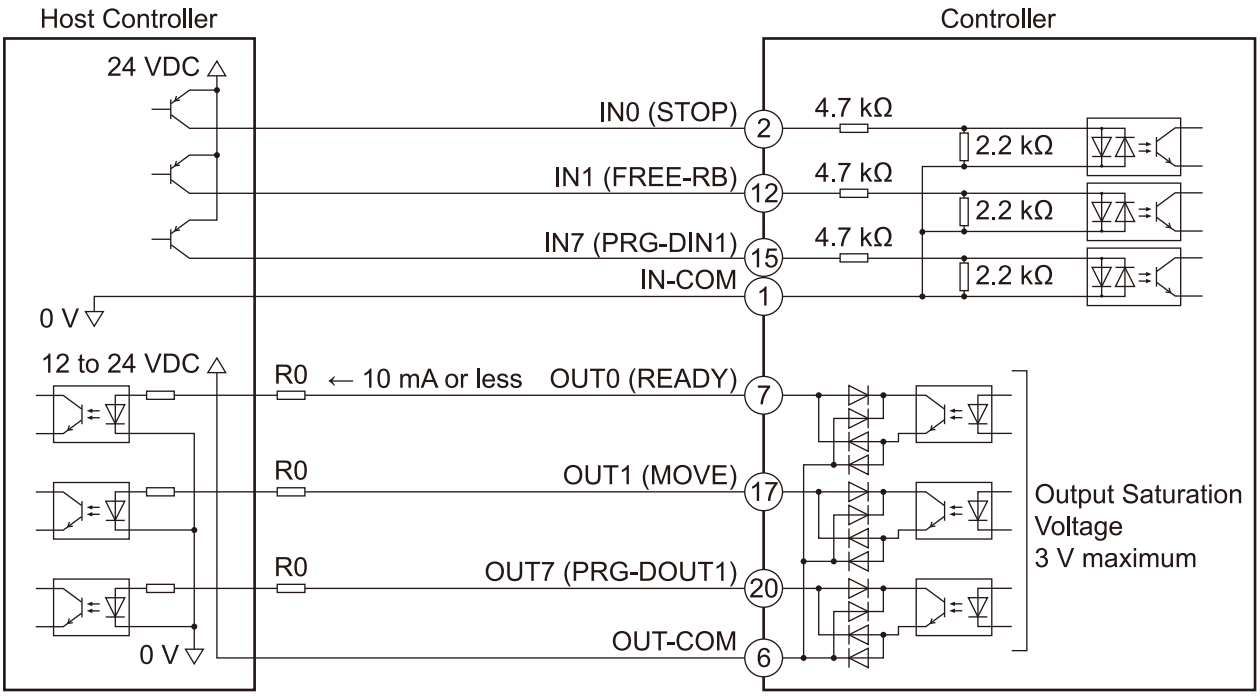
Note

- 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 the current to 10 mA or less.

Connection Example with a Current Sink Output Circuit



Connection Example with a Current Source Output Circuit



Noise Elimination Measures

There are two types of electrical noise: One is noise that enters the controller from the outside and causes the controller to malfunction, and the other is noise that is emitted from the controller and causes peripheral equipment to malfunction.
For noise entering the controller from the outside, take measures to prevent the controller from malfunctioning. It is necessary to take appropriate measures because the signal lines are very likely to be affected by the noise.
For noise emitted from the controller, take measures to suppress the noise.

Measures to Eliminate Electrical Noise

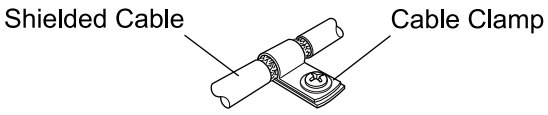
There are the following three main methods to take measures against electrical noise.

Noise Suppression

- When relays or electromagnetic switches are used, use a noise filter or CR circuit to suppress the surge generated by these devices.
- Cover the controller by a metal plate such as aluminum. This effectively shields the electrical noise emitted by the controller.

Prevention of Noise Propagation

- Connect a noise filter to the AC input side of the DC power supply.
- Keep power lines, such as motor and power supply cables, at least 200 mm (3.94 in.) away from signal lines, and do not bundle or parallel them. If a power cable and a signal cable must cross, cross them at right angles.
- 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 the effectiveness of blocking electrical noise because the impedance at the grounding points will be reduced. However, ground them so that a potential difference does not occur among the grounding points. I/O signal cables that include a ground wire are available in Oriental Motor products.
- 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 close to the product as possible.



Suppression of the Effect of Noise Propagation

Wrap the noise propagating cable around a ferrite core. This will prevent the propagated noise from entering the controller or from being emitted 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. To increase the noise attenuation effect of the ferrite core, wrap the cable several more times.

Noise Suppression Products

Noise Filter

- Connect a noise filter (or equivalent) as shown in the table below to the AC input side of the DC power supply. Install the noise filter as close to the driver as possible. When using a power transformer, be sure to connect a noise filter to the AC input side of the power transformer. This will prevent noise from propagating through the power supply line.

Manufacturer	Model
Soshin Electric Co., Ltd.	HF2010A-UPF
Schaffner EMC	FN2070-10-06

- Use the AWG 18 (0.75 mm^2) or thicker wire for the input and output cables of the noise filter, and secure them firmly using a cable clamp or other means to prevent the cable from coming loose from the enclosure.
- Place the input cable as far away from the output cable as possible and do not wire the cables in parallel. If the input and output cables are placed at a close distance or wired in parallel, the noise in the enclosure will affect the power cable through stray capacitance, and the noise suppression effect will be reduced.
- Connect the ground terminal of the noise filter to the grounding point using a wire that is as thick and short as possible.
- When connecting a noise filter in an enclosure, wire the input cable of the noise filter as short as possible. Wiring over a long distance may reduce the noise suppressing effect.

Oriental Motor Noise Suppression Products

I/O Signal Cables

These are shielded cables for good noise immunity to connect the controller and a host controller. The ground wires useful for grounding come out of both ends of the cable.
Select the cable suitable for the number of I/O signals connected.

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

Surge Suppressors

This product is effective in suppressing the surge that occurs in a contact part of the relay. Connect when using a relay or electromagnetic switch. A CR circuit for surge suppression and a CR circuit module are provided.

CR Circuit for Surge Suppression

This product is effective in suppressing the surge that occurs in a contact part of the relay. Use it to protect the contacts of the relay or switch.
Model: EPCR1201-2

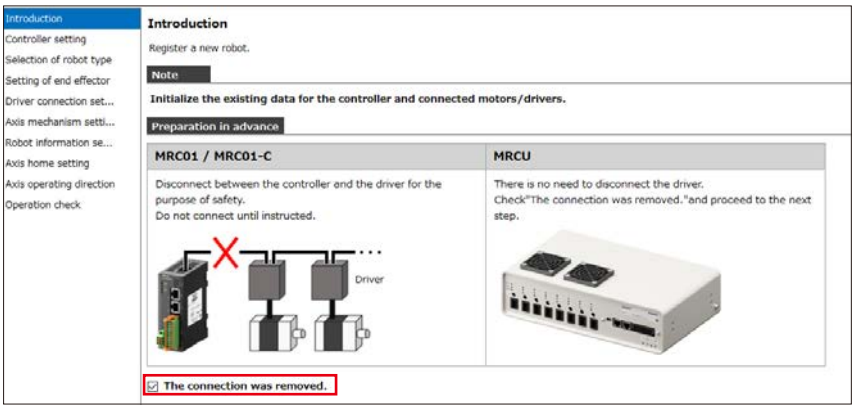
CR Circuit Module

This product is effective in suppressing the surge that occurs in a contact part of the relay. Use it to protect the contacts of the relay or switch. Four pieces of CR circuit for surge suppression are mounted on the compact circuit, and this product can be installed to a DIN rail. This product can make the wiring easy and reliable as it also allows terminal block connection.
Model: VCS02

Setup

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

1. Start the MRC Studio software.
2. Click [Communication port] to select [MRCU].
3. Click [Setup] on the start screen.
4. On the “Introduction” screen, check “The connection was removed.” and proceed to the next screen.



5. Then follow the on-screen instructions to set up.

> **Tip**
>
> To change the robot type, perform the setup again from the start screen. Except for the robot type, using [Re-setup] in the [Maintenance] menu can change even after the setup is completed.

Maintenance

It is recommended that the following items be inspected periodically after each operation of the robot. If any abnormality occurs, stop using the product and contact your nearest Oriental Motor sales office.

Inspection

Inspection Items

- Check to see if the openings in the controller are clogged.
- Check to see if there is no dust adhering to the controller.
- Check to see if the connection part to the controller is loose.
- Check to see if there is any unusual smell or appearance to the controller.

> **Note**
>
> The controller uses semiconductor components. Since static electricity may damage semiconductor components, be extremely careful when handling it.

Warranty

Check on the Oriental Motor Website.

Disposal

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

Troubleshooting

Alarms

This controller has an alarm function to protect against temperature rise, poor connection, operating error, 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. At this time, the motors remain in an excitation state.
At the same time, the ALM LED blinks in red.
The alarm that is being generated can be checked via communication, using the MRC Studio software, or by counting the number of blinks of the ALM LED.
Refer to the USER MANUAL of the MRC01 controller for the alarm list or timing chart.

Alarm Reset

Before resetting an alarm, always correct the cause of the alarm and ensure safety, and perform any of the reset operations listed below.

> **Note**
>
> Some alarms can only be reset by turning the power off and on again.

- Turn the ALM-RST input from OFF to ON. (It is enabled at the ON edge.)
- Execute the alarm reset by the maintenance command via communication.
- Execute the alarm reset using the MRC Studio software.
- Turn the power off and on again.

Alarm History

Up to 10 generated alarm items are stored in non-volatile memory in order from most recent to oldest. The stored alarm history can be read or cleared if any of the following operations is performed.

- Read the alarm history with the monitor command via communication.
- Clear the alarm history with the maintenance command via communication.
- Read or clear the alarm history using the MRC Studio software.

Information

The controller is equipped with a function to generate information output before an alarm is generated. This function can be used for periodic maintenance of equipment by setting an appropriate value in the parameter of each information.
Refer to the USER MANUAL for details on the related parameters and information list.

Status When Information is Generated

Information Bit Output

If information is generated, a bit output (INFO-** output) of the corresponding information is turned ON. A desired output signal can be assigned to the INFO-USRIO output among the 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 to operate even while information is being 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 be automatically cleared if the condition for clearing the information is met.

When the “Information auto clear” parameter is set to “0: Disable”

Even if the condition for clearing the information is met, the information remains generated. The information can be cleared if any of the following is performed in a state where the condition for the clearing information is met.

- Execute the clear information with the maintenance command via communication.
- Execute the clear information on the information monitor of the MRC Studio software.
- Turn the INFO-CLR input ON.
- Turn the power off and on again.

Information History

Up to 16 generated information items are stored in RAM in order from most recent to oldest. The information stored as the information history is the information code, the time of generation, and the information content.
The stored information history can be read or cleared if any of the following operations is performed.

- Read the information history with the monitor command via communication.
- Clear the information history with the maintenance command via communication.
- Read or clear the information history using the MRC Studio software.

> **Tip**
>
> The information history is cleared when the power supply of the controller is turned off, as it is stored in RAM.

Cable

Connection Cables / Flexible Connection Cables (For cable type)

These cables are used to connect the motor and controller.
Use a flexible cable if the cable is bent, as in the case of a robot arm.

For AZM14, AZM15, AZM24, AZM26

Length [m (ft.)]	Connection Cable Model	Flexible Connection Cable Model
0.5 (1.6)	CCM005Z2AAF	CCM005Z2AAR
1 (3.3)	CCM010Z2AAF	CCM010Z2AAR
3 (9.8)	CCM030Z2AAF	CCM030Z2AAR
5 (16.4)	CCM050Z2AAF	CCM050Z2AAR
10 (32.8)	CCM100Z2AAF	CCM100Z2AAR

For AZM46, AZM48, AZM66, AZM69

For motor/encoder connection

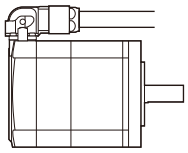
Length [m (ft.)]	Connection Cable Model	Flexible Connection Cable Model
0.5 (1.6)	CCM005Z2ABF	CCM005Z2ABR
1 (3.3)	CCM010Z2ABF	CCM010Z2ABR
3 (9.8)	CCM030Z2ABF	CCM030Z2ABR
5 (16.4)	CCM050Z2ABF	CCM050Z2ABR
10 (32.8)	CCM100Z2ABF	CCM100Z2ABR

For motor/encoder/electromagnetic brake connection

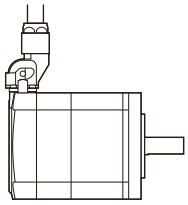
Length [m (ft.)]	Connection Cable Model	Flexible Connection Cable Model
0.5 (1.6)	CCM005Z2ACF	CCM005Z2ACR
1 (3.3)	CCM010Z2ACF	CCM010Z2ACR
3 (9.8)	CCM030Z2ACF	CCM030Z2ACR
5 (16.4)	CCM050Z2ACF	CCM050Z2ACR
10 (32.8)	CCM100Z2ACF	CCM100Z2ACR

Connection Cables / Flexible Connection Cables (For connector type)

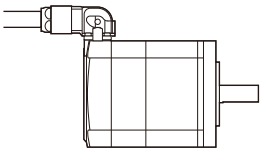
These cables are used to connect the motor and controller.
Use a flexible cable if the cable is bent, as in the case of a robot arm.
The connection cable model varies depending on the direction of the cable outlet from the motor.
Refer to the figures below.



Cable Outlet Direction
Output Shaft Side



Cable Outlet Direction
Vertical Side



Cable Outlet Direction
Opposite to Output Shaft Side

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

Length [m (ft.)]	Cable Outlet Direction		
	Output shaft direction	Vertical direction	Opposite to output shaft direction
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 to add between the controller and the connection cable to extend the wiring distance. They are common to the cable type motor and the connector type motor.
Use a flexible cable if the cable is bent, as in the case of a robot arm.
When extending the wiring distance by connecting an extension cable to the connection cable, make the total cable length 10 m (32.8 ft.) or less.

Length [m (ft.)]	Extension Cable Model	Flexible Extension Cable Model
1 (3.3)	CCM010Z2ADFT	CCM010Z2ADRT
3 (9.8)	CCM030Z2ADFT	CCM030Z2ADRT
5 (16.4)	CCM050Z2ADFT	CCM050Z2ADRT

Power Supply Cable

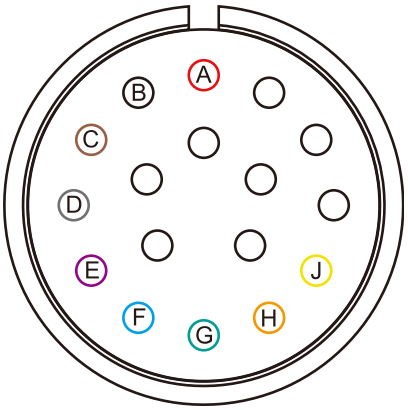
This cable is used when connecting a controller to power supplies.

Model

CC09MRCU030 [3 m (9.8 ft.)]

Pin Assignment

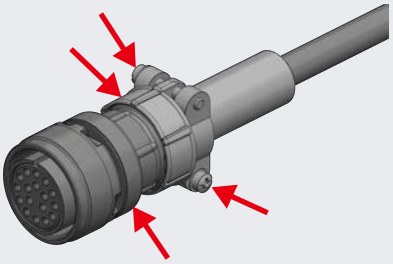
The figure shows the view from the insert side of the contacts. Wire all terminals according to the pin assignments in the table.



No.	Lead Wire Color	Name
A	Red	Main Power Supply 1
B	Black	Ground (For main power supply 1)
C	Brown	Main Power Supply 2
D	Gray	Ground (For main power supply 2)
E	Purple	Main Power Supply 3
F	Blue	Ground (For main power supply 3)
G	Green	Frame Ground
H	Orange	Control Power Supply
J	Yellow	Ground (For control power supply)

Tip

The plug of the cable is assembled with several screws. Check that these screws are not loose before use. Tighten the screws again if they are loose.



Specifications

Product Specifications

For product specifications, contact your nearest Oriental Motor sales office.

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
Atmosphere: No corrosive gas or dust. No exposure to water or oil.

Storage Environment and 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
Atmosphere: No corrosive gas or dust. No exposure to water or oil.

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• Please contact your nearest Oriental Motor office for further information.

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