Oriental motor

HP-5169-2

Brushless Motors

BLS Series Driver

DC power supply input

RS-485 Communication Type

OPERATING MANUAL

Installation and Connection Edition

Thank you for purchasing an Oriental Motor product.

This operating manual describes product handling procedures and safety precautions.

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

1 Introduction

■ Before using the product

Only qualified personnel of electrical and mechanical engineering should work with the product.
Use the product properly after thoroughly reading the section "Safety precautions". 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 into general industrial equipment. Do not use it for any other purpose. For the power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Operating manuals for the product

For operating manuals, download from Oriental Motor Website Download Page or contact your nearest Oriental Motor sales office.
Also read the operating manual of the motor used in combination with a driver.

- **BLS** Series Driver DC power supply input RS-485 Communication Type OPERATING MANUAL Installation and Connection Edition (this document)
- **BLS** Series Driver RS-485 Communication Type OPERATING MANUAL Function Edition
- **BLS** Series Motor DC power supply input OPERATING MANUAL

2 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.

⚠ 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

- Assign qualified personnel 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 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.
- Do not transport, install, connect, or inspect the product while the power is supplied. Always turn off the power before carrying out these operations.
  This may result in damage to equipment.
- If the alarm function (protective function) of the driver is activated, remove the cause before resetting the alarm function.
  Continuing the operation without removing the cause of the problem may cause the motor to malfunction, resulting in injury or damage to equipment.
- Do not use a motor in a vertical drive such as elevating equipment. If the alarm function (protective function) of the driver is activated, the motor will stop and the moving part may fall, causing injury or damage to equipment.
- Do not use a motor in a vertical drive such as elevating equipment. Since the output of the deceleration torque is limited so that the regenerative power is not fed to the power supply, the moving part will fall when the operation is performed in the downward direction. This may cause injury or damage to equipment.

Installation

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

Connection

- Always keep the input voltage of the power supply to the driver within the specified range. Failure to do so may result in fire.
- Be sure to observe the specified cable sizes. Failure to do so may result in fire or damage to equipment.
- Make connections securely according to the connection example. Failure to do so may result in fire or damage to equipment.

Operation

- Use a motor and driver only in the specified combination. An incorrect combination may cause fire or damage to equipment.
- If the motor is operated by turning the power supply on and off, turn off the driver power in the event of a power failure.
  Otherwise, the motor may start suddenly when the power is restored, causing injury or damage to equipment.
- For the driver power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.

Maintenance and inspection

- Do not touch the motor and driver when conducting the insulation resistance measurement or dielectric strength test. Accidental contact may result in electric shock.
- Always turn off the power before performing maintenance or inspection. Failure to do so may result in electric shock.

Repair, disassembly, and modification

- Do not disassemble or modify the driver. Doing so may result in injury or damage to equipment.
  Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠ CAUTION

General

- Do not use the driver beyond its specifications. Doing so may result in fire, injury, or damage to equipment.
- Do not touch the driver while operating or immediately after stopping. The driver surface is hot and this may cause a skin burn(s).

Installation

- Install the driver securely to the mounting plate. Incorrect installation may cause the driver to come off and fall, resulting in injury or damage to equipment.
- Keep the area around the driver free of combustible materials. Failure to do so may result in fire or a skin burn(s).
- Do not leave anything around the driver that would obstruct ventilation. Doing so may result in damage to equipment.

Connection

- Do not shut off the negative side of the power supply. Also, make sure that the wiring of the power supply is not disconnected.
  This may result in damage to equipment.
- Be sure to ground the motor and the driver to prevent damage from static electricity. Failure to do so may result in fire or damage to equipment.

Operation

- Pay enough attention to safe operation when starting and stopping the motor by switching the power supply on and off.
  This may cause injury or damage to equipment.
- Provide an emergency stop device or emergency stop circuit external to the equipment 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.
- If a problem occurs, immediately stop operation and turn off the driver power. Failure to do so may result in fire, electrical shock, or injury.

3 Precautions for use

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

- **Connecting a motor and a driver**

  Use the dedicated connection cable (sold separately) when extending the wiring distance between the motor and the driver.
  Refer to p.7 for connection cable.

- **Do not conduct the insulation resistance measurement or the dielectric strength test with the motor and driver connected.**

  Conducting the insulation resistance measurement or the dielectric strength test with the motor and driver connected may result in damage to the product.

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

  The USB port on the driver 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 driver and this equipment to short, damaging both.
  When connecting, do not ground equipment.

- **Note when using a mechanical contact to turn the power supply on and off**

  When a mechanical contact (breaker, electromagnetic switch, relay, etc.) is used to turn the power supply on and off, turn only the positive (+) side of the power supply on and off using the mechanical contact.
  If the positive (+) and negative (-) sides of the power supply are turned on and off simultaneously using a mechanical contact, the control circuit or peripheral equipment may be damaged.
  Refer to p.13 for details.

- **Notes when saving the data to non-volatile memory**

  Do not turn off the power supply while writing the data to non-volatile memory, and also do not turn off for five seconds after writing is 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.

- **Noise elimination measures**

  Refer to p.18 for noise elimination measures.

4 Preparation

This chapter explains the items you should check and the name and function of each part.

4-1 Checking the product

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

☐ Driver ..... 1 unit
☐ Instructions and Precautions for Safe Use ..... 1 copy

Note When taking out the driver from the electrostatic discharge (ESD) protection bag, make sure your hands are not charged with static electricity. Static electricity may cause damage to the driver.

4-2 How to identify the product model

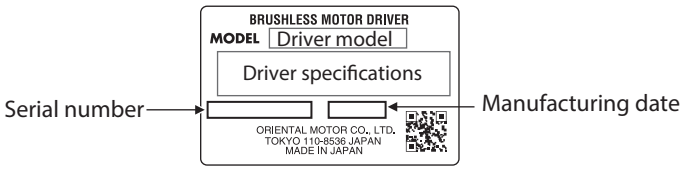
Check the model name of the product against that shown on the nameplate.

BLSD - K R
1 2 3

1	Driver type	**BLSD**: **BLS** Series driver
2	Power supply voltage	**K**: 24 VDC
3	Product type	R: RS-485 Communication Type

4-3 Information about nameplate

The figure shows an example.



4-4 Products that can be combined

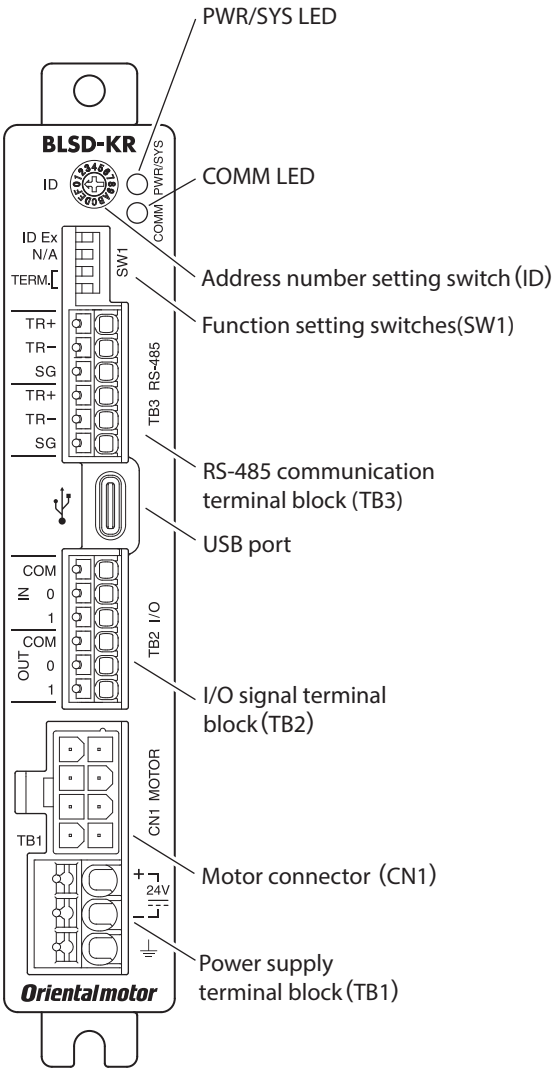
Products with which the driver can be combined are listed below. Check the model name of the product against that shown on the nameplate. For details on the combination of a motor and a gearhead, refer to the operating manual of the motor. Use the dedicated connection cable or flexible connection cable (sold separately) when extending the wiring distance between the motor and the driver.

Output power	Motor model	Gearhead model (**GN**, **GE**)	Driver model	Connection cable	Flexible connection cable
25 W	**BL2M425KC-GN**	**4GN□K**	**BLSD-KR**	**CC010B2F** **CC020B2F** **CC030B2F** **CC050B2F** **CC070B2F** **CC100B2F**	**CC010B2R** **CC020B2R** **CC030B2R** **CC050B2R** **CC070B2R** **CC100B2R**
40 W	**BL2M540KC-GN**	**5GN□K**			
90 W	**BL2M590KC-GE**	**5GE□S**			

Output power	Motor model	Gearhead model (**GF**)	Driver model	Connection cable	Flexible connection cable
30 W	**BL2M230KCP-GF**	**GFV2G□**, **GFS2G□FR**	**BLSD-KR**	**CC010B2F** **CC020B2F** **CC030B2F** **CC050B2F** **CC070B2F** **CC100B2F**	**CC010B2R** **CC020B2R** **CC030B2R** **CC050B2R** **CC070B2R** **CC100B2R**
	BL2M230KCP-A	–			
60 W	**BL2M460KCP-GF**	**GFV4G□**, **GFS4G□FR**			
	BL2M460KCP-A	–			
120 W	**BL2M5120KCP-GF**	**GFV5G□**, **GFS5G□FR**			
	BL2M5120KCP-A	–			

4-5 Names and functions of parts

This section explains the name and function for each part of the driver.



Name	Sign	Description
LED indicators	PWR/SYS	Refer to "4-6 Indication of LED".
	COMM	
Address number setting switch	ID	Sets the address number when used via RS-485 communication. Factory setting: 1
Function setting switches	SW1	Sets the address number or termination resistor when used via RS-485 communication. Factory setting: All are set to OFF
RS-485 communication terminal block	TB3	Connects the RS-485 communication signals.
USB port	⇽●⇾	Connects a PC in which the support software has been installed.
I/O signal terminal block	TB2	Connects the I/O signals.
Motor connector	CN1	Connects the motor cable.
Power supply terminal block	TB1	Connects a power supply and frame ground.

4-6 Indication of LED

■ PWR/SYS LED

This LED indicates the status of the driver.

LED status	Description
No light	The power supply is not turned on.
White light	The power supply is 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 will be lit in white when the alarm is reset.
Blinking blue	Information is being generated. The LED will be lit in white when the information is cleared.

■ COMM LED

This LED indicates the status of RS-485 communication.

LED status	Description
White light or blinking white	The driver communicates properly with the host controller via RS-485 communication. (C-DAT)
Red light	An error occurs while communicating with the host controller via RS-485 communication. The LED will be lit or blink in white when the communication status returns to the normal state. (C-ERR)

5 Installation

5-1 Installation location

The driver is designed and manufactured to be incorporated into 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 +50 °C [+32 to 122 °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 free of excessive salt
- Area not subject to splashing water (rain, water droplets), oil (oil droplets), or other liquids
- 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
- Altitude: Up to 1000 m (3300 ft.) above sea level

5-2 Installation method

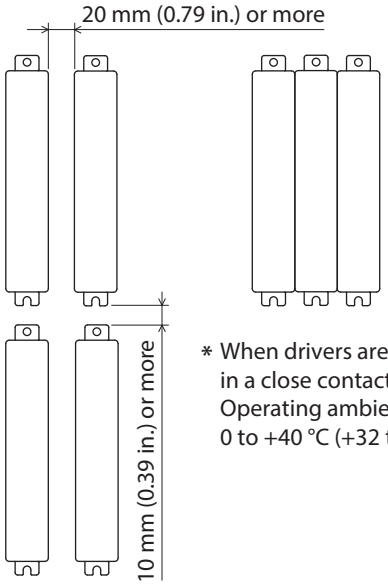
The driver is designed based on heat radiation by air convection and heat conduction to an enclosure.
When installing the driver in an enclosure, install it in a vertical direction or horizontal direction.

Note

- Do not install any equipment that generates a large amount of heat or noise near the driver.
- Do not install the driver under a host controller or other heat-sensitive equipment.
- If the ambient temperature of the driver exceeds the upper limit of the operating ambient temperature, reconsider the ventilation conditions or forcibly cool the area around the driver with a fan to maintain the operating ambient temperature.

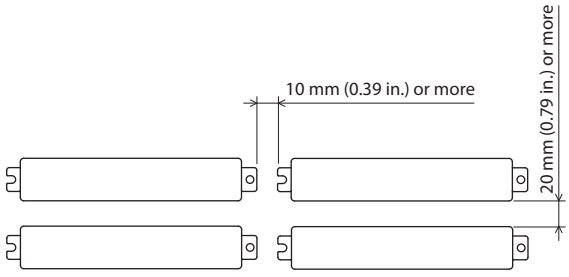
■ Installation direction

● **Vertical installation***



* When drivers are installed in a close contact state
Operating ambient temperature: 0 to +40 °C (+32 to +104 °F)

● **Horizontal installation**

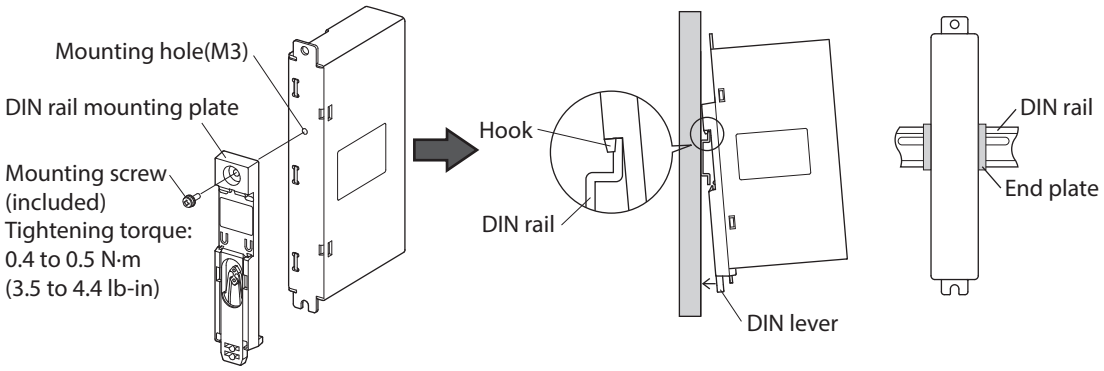


■ When a driver is installed with screws

Install the driver on an appropriate flat metal plate with excellent vibration resistance and heat conductivity.
Using the mounting holes or notches on the driver, secure it with two screws (M4: not included) so that there is no gap between the driver and the metal plate.

■ When a driver is installed on a DIN rail

Use the DIN rail mounting plate **PADP04** (sold separately) to install on a 35 mm (1.38 in.) wide DIN rail.
After installing on the DIN rail, secure both sides of the driver with end plates provided by the customer.

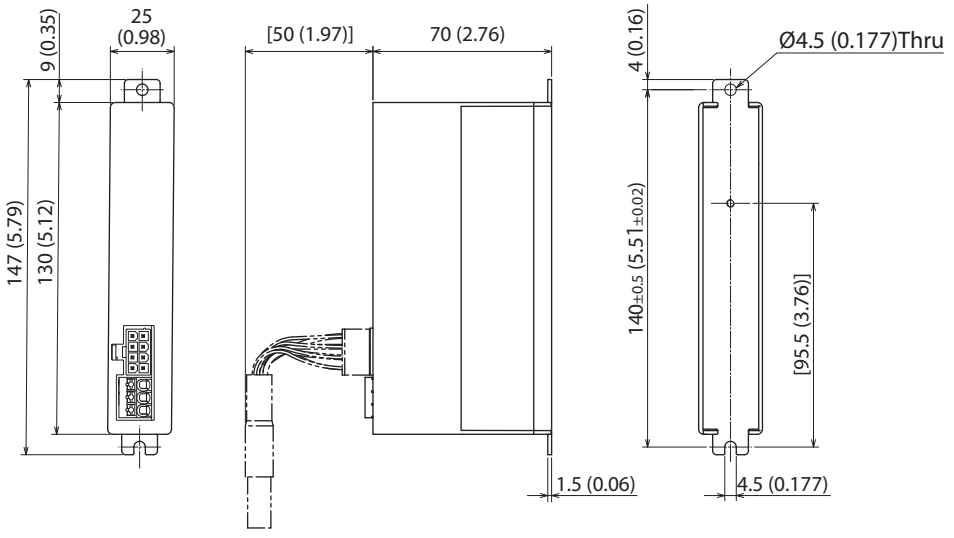


Note Be sure to use the included screws when securing the DIN rail mounting plate.

5-3 Dimensions

Mass: 0.13 kg (0.29 lb.)

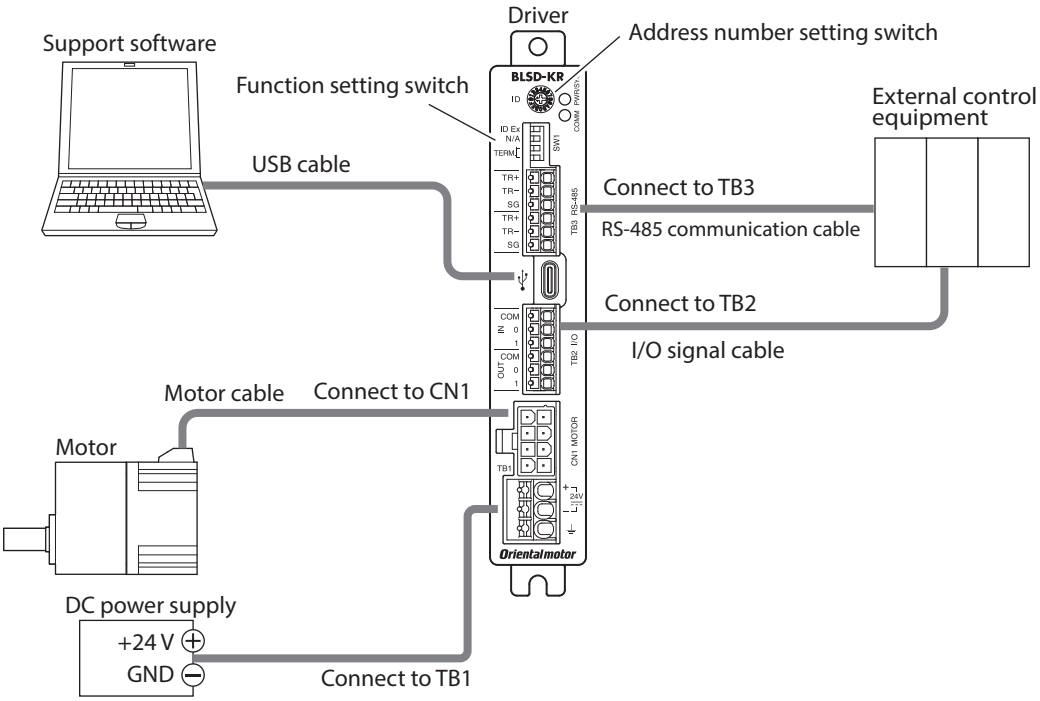
[Unit: mm (in.)]



6 Connection

This chapter explains how to connect the driver to the motor, power supply, and I/O signals.
Noise suppression measures and installation and wiring methods to comply with the EMC Directive/Regulations are also explained.

6-1 Connection example



Note

- When connecting, pay attention to the polarity of the power supply. Connection with incorrect polarity may cause damage to the driver.
- Connect the connectors securely. Insecure connector connection may cause malfunction or damage to the driver.

memo

- When disconnecting the connector, pull out while pressing the latches on the connector with fingers.
- When turning the power off and on again or connecting/disconnecting the connector, turn off the power supply and wait for the PWR/SYS LED to turn off.

6-2 Connecting the power supply (TB1)

The current capacity of the power supply varies depending on the motor connected.
Connect a power supply cable to the power supply terminal block (TB1).
Applicable lead wire size: AWG24 (0.2 mm^2) to AWG12 (3.5 mm^2)
Stripping length of wire insulation: 10 mm (0.39 in.)

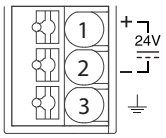
Output power	Power supply current capacity
25 W	2.2 A
40 W	4.0 A
90 W	7.1 A

Output power	Power supply current capacity
30 W	3.1 A
60 W	6.2 A
120 W	13 A

Note

- When connecting, pay attention to the polarity of the power supply. Connection with incorrect polarity may cause damage to the driver.
- The input current varies depending on the power supply voltage or the motor output power. Select a wire diameter suitable for the input current.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cable.
- When connecting the power supply, use the thickest cable possible and keep the distance as short as possible. If a thin cable is used or the wiring distance is long, the voltage drop will increase.

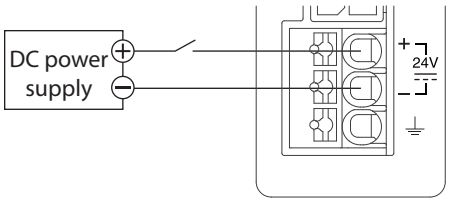
TB1 pin assignments



Pin number	Description
1	Power supply input (24 VDC)
2	Power supply ground
3	Frame ground

Note on power supply ON-OFF control using a mechanical contact

- When a mechanical contact (breaker, electromagnetic switch, relay, etc.) is used to turn the power supply on and off, turn only the positive (+) side of the power supply on and off using the mechanical contact.



Do not turn on or off the positive side (+) and the negative side (−) of the power supply simultaneously or shut off only the negative side (−) of the power supply.
The main circuit and the control circuit (USB port) in the driver are connected to the same ground. Therefore, when the power supply is turned on or off, the input current of the main circuit will flow into the control circuit, causing damage to the control circuit or peripheral equipment.

6-3 Connecting the motor and driver (CN1)

Connect the motor cable connector to the motor connector (CN1) on the driver.

When extending the motor cable, use a connection cable (sold separately).
The maximum extension distance including the cable length of the motor itself should be 10.5 m (34.4 ft.).

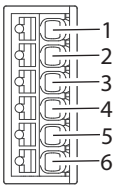
Note

- Connect the connectors securely. Insecure connector connection may cause malfunction or damage to the driver.
- Be sure to connect and disconnect the connector while holding the connector part. Do not apply force in any direction other than the connecting/disconnecting direction. Applying improper force may damage the connector and driver.

6-4 Connecting the I/O signals (TB2)

Connect the I/O signal cable to the I/O signal terminal block (TB2).
Lead wire size: AWG24 (0.2 mm^2) to AWG16 (1.25 mm^2)
Stripping length of wire insulation: 8 mm (0.31 in.)

TB2 pin assignments



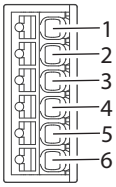
Pin number	Terminal name	Description
1	IN-COM	Common for IN0 and IN1 inputs
2	IN0	Control input 0 (FW-SPD)
3	IN1	Control input 1 (RV-SPD)
4	OUT-COM	Common for OUT0 and OUT1 outputs
5	OUT0	Control output 0 (ALM-B)
6	OUT1	Control output 1 (MOVE)

Values in parentheses ( ) are initial values.

6-5 Connecting the RS-485 communication signals (TB3)

Connect the RS-485 communication cable to the TB3 connector on the driver. Another driver can be connected using the unconnected terminals.
A cable to connect to the host controller and a cable to connect between drivers are required to be provided by the customer.
Lead wire size: AWG24 (0.2 mm^2) to AWG16 (1.25 mm^2)
Stripping length of wire insulation: 8 mm (0.31 in.)

TB3 pin assignments

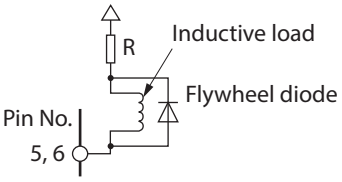


Pin number	Terminal name	Description
1	TR+	RS-485 communication signal positive side
2	TR−	RS-485 communication signal negative side
3	SG	Ground for RS-485 communication
4	TR+	RS-485 communication signal positive side
5	TR−	RS-485 communication signal negative side
6	SG	Ground for RS-485 communication

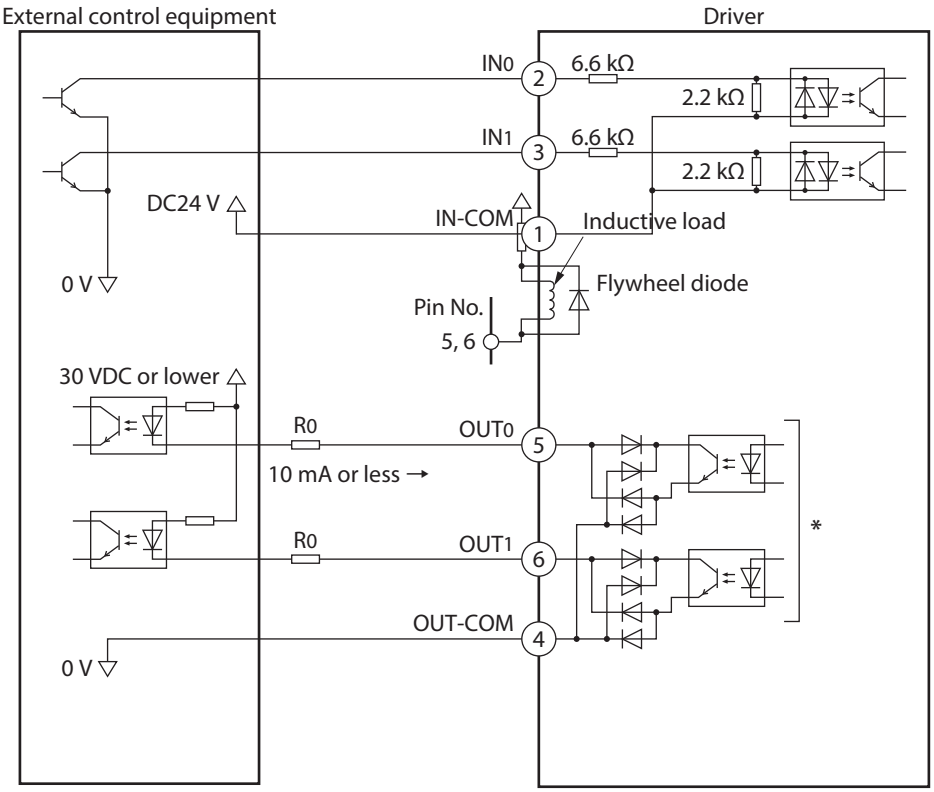
6-6 Driver I/O circuit

Note

- Use input signals at 24 VDC (−15 to +20%).
- Use output signals at 4.5 to 30 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.
- When a relay (inductive load) is connected, it is necessary to take a control measure for the fly-back voltage against the relay by connecting a diode. Or use a relay with built-in flywheel diode.

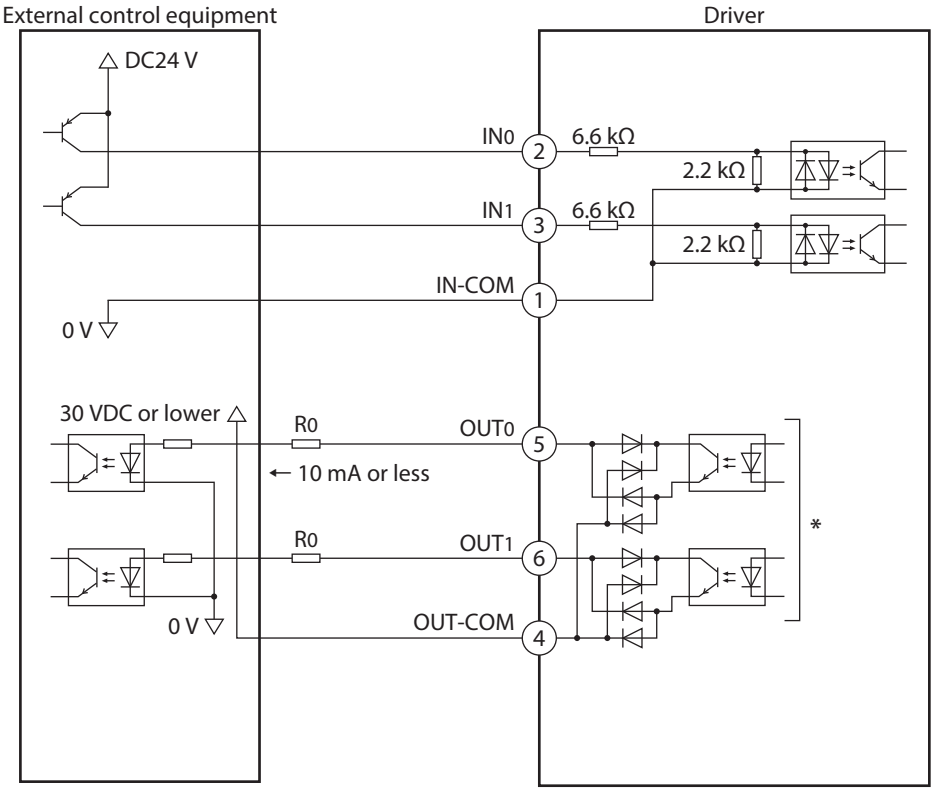


■ Connection example with a current sink output circuit



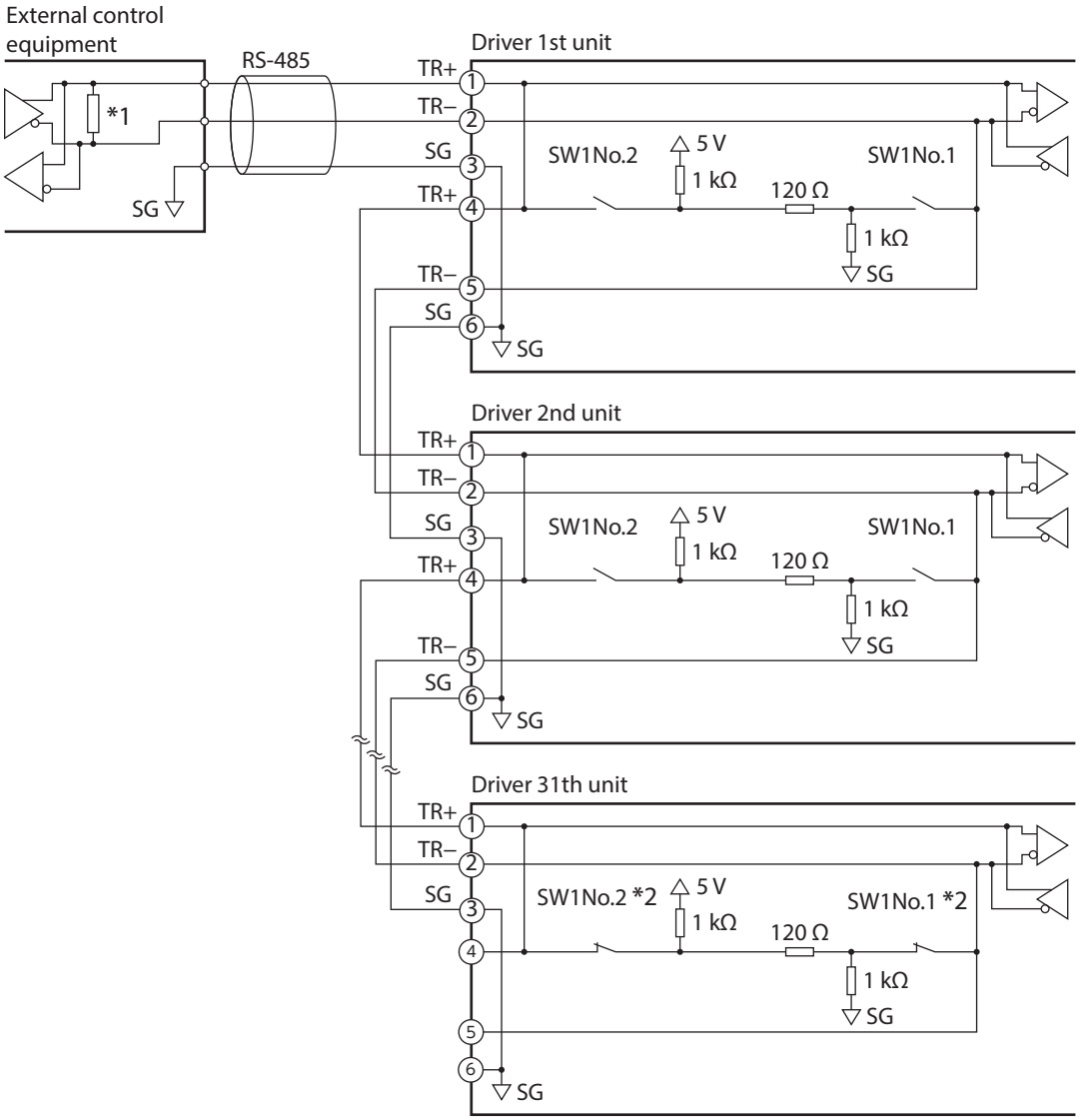
*Output saturation voltage: 1.2 VDC maximum

■ Connection example with a current source output circuit



*Output saturation voltage: 1.2 VDC maximum

■ Connection example with a host controller (RS-485 communication)



*1 Termination resistor 120 Ω

*2 Turn the termination resistor ON.

Note

- Use twisted-pair wires for the communication cable and keep the total extension distance to 50 m (164 ft.) or less.
- Keep 31 units or less for the number of drivers connected.
- The signal ground (SG) is insulated from the ground (GND) for power supply.

memo Refer to p.27 for the communication specifications.

6-7 Connecting the USB cable

When the **MEXE02** software is used, connect the USB cable to the USB port.

Specifications of USB cable

Specifications	USB 2.0 (Full speed)
Cable	Length: 3 m (9.8 ft.) or less Shape: Type-C

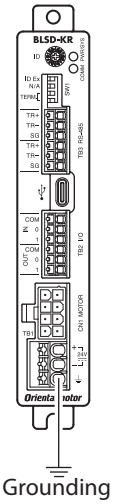
Note

- Connect the driver and PC directly with the USB cable without using a hub or an extension cable.
- In large electrically noisy environments, use the USB cable with a ferrite core or install a ferrite core on the USB cable.
- The USB port on the driver 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 driver and these equipment to short, damaging both.

6-8 Grounding

Ground the frame ground of the power supply terminal block (TB1).

Use the thickest possible wire and the shortest distance to ground the driver to the grounding point.



Note Static electricity may damage the product if it is not grounded.

6-9 Noise elimination measures

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

■ Measures against electrical noise

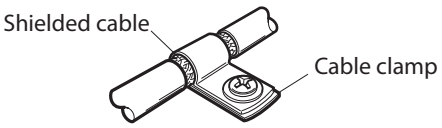
There are the following three methods mainly to take measures against the electrical noise.

● Noise suppression

- When relays or electromagnetic switches are used, use noise filters or CR circuits to suppress surge generated by them.
- Cover the driver by a metal plate such as aluminum. This effectively shields the electrical noise emitted by the driver.

● Prevention of noise propagation

- Place the power lines such as the motor and power supply cables, keeping a distance of 100 mm (3.94 in.) or more from the signal lines such as I/O signal cable and RS-485 communication cable, and also do not bundle them or wire them in parallel. If power and signal cables must cross, cross them at right angles.
- To effectively eliminate noise, use shielded cables for power and signal lines, or install ferrite cores if unshielded cables are used.
- Keep cables as short as possible without coiling and bundling extra lengths.
- 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.



- 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.

● Suppression of effect by noise propagation

- Wrap the noise propagating cable around a ferrite core. This will prevent the propagated noise from entering into the driver or from being emitted from the driver. The frequency band in which an effect of 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.

6-10 Compliance with EMC Directive/Regulations

Effective measures must be taken against the EMI that the motor and driver may give to adjacent control system equipment, as well as the EMS of the motor and driver itself, to prevent the occurrence of serious malfunctions in the functions of the mechanical device. The use of the following installation and wiring methods will enable the motor and driver to be compliant with the EMC directive.
Oriental Motor conducts EMC testing on its motors and drivers in accordance with "Example of installation and wiring" shown on the next page. "Example of installation and wiring"
The user is responsible for ensuring that the machine complies with EMC based on the installation and wiring described 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.

■ About power supply

The driver is a product of the DC power input. Use a DC power supply (switched-mode power supply, etc.) that complies with the EMC Directive/Regulations.

■ Connecting the motor cable

Use an Oriental Motor connection cable when extending the wiring distance between a motor and a driver.

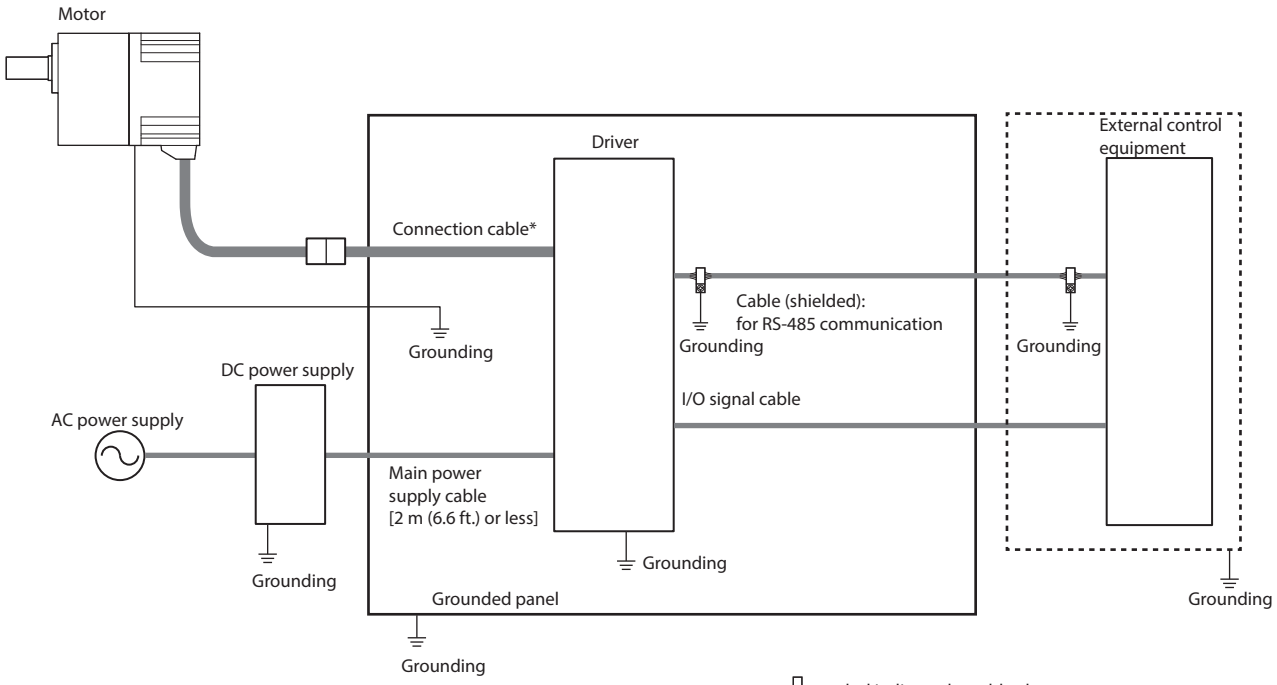
■ Connecting the signal cable

Refer to "Prevention of noise propagation" on p.18.

■ Grounding method

- Use the thickest possible wires and the shortest distance to ground the motor and driver so that there is no potential difference between the grounding points.
- Install the motor to a grounded metal plate.

■ Example of installation and wiring



■ Precautions about static electricity

Note

- Do not approach or touch the driver while the power is on.
- Always use an insulated screwdriver to set the address number setting switch on the driver.

7 Guidance

If you are new to this product, read this chapter to understand the operating methods and procedures.
This is an example how to set operation data and parameters to the driver and operate the motor using a host controller.
Refer to the **BLS** Series OPERATING MANUAL Function Edition for details.

Note Before operating the motor, check the surrounding conditions to ensure safety.

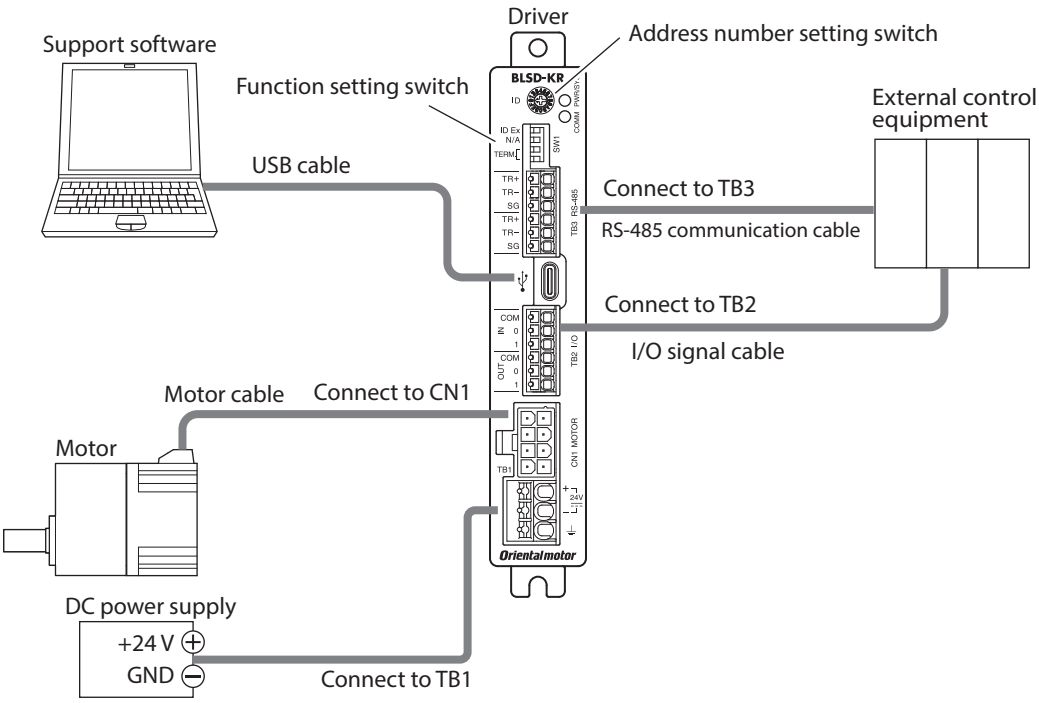
STEP 1	Installation and connection
↓	
STEP 2	Setting the switches
↓	
STEP 3	Turning on the power and setting the communication parameters
↓	
STEP 4	Turning the power off and on
↓	
STEP 5	Operating the motor
↓	
STEP 6	Checking the operation

After a parameter has been changed, it may be necessary to perform Configuration or turn on the driver power again to update the new setting.
Refer to the OPERATING MANUAL Function Edition for details about the update timing.

● Operating conditions

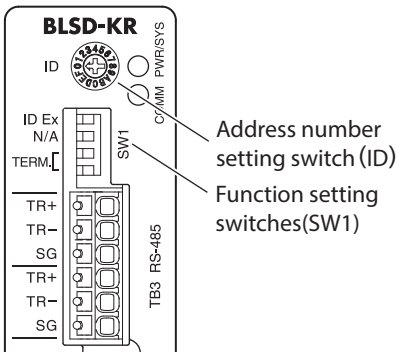
- Connected drivers: 1 unit
- Address number: 1 (set by the switch)
- Transmission rate: 115,200 bps
- Termination resistor: Set to ON

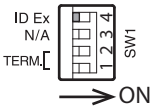
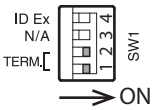
STEP 1 Installation and connection



STEP 2 Setting the switches

The address number (communication ID) and termination resistor of RS-485 communication can be set using the address number setting switch (ID) and the function setting switches (SW1).
Refer to the **BLS** Series OPERATING MANUAL Function Edition for details.



Setting item	Function setting switches (SW1)	Address number setting switch (ID)
Set the address number to 1	 ID Ex: OFF (Factory setting: OFF)	 1 (Factory setting: 1)
Set the termination resistor to ON	 TERM.: ON (Factory setting: OFF)	–

STEP 3 Turning on the power and setting the communication parameters

Turn on the driver power supply and check the communication parameters listed below using the support software.
If communication cannot be established, reconsider the communication parameters of the driver.

Parameter name	Factory setting
Communication ID	–1: Follow switch settings
Baudrate	4: 115,200 bps
Communication order	0: Even Address-High Word & Big-Endian
Communication parity	1: Even parity
Communication stop bit	0: 1 bit
Transmission waiting time	3.0 ms
Silent interval	0.0: Set automatically

STEP 4 Turning the power off and on

The switches and communication parameters of the driver will be updated after the power supply is turned on again.

STEP 5 Operating the motor

Send a message to operate the motor. As an example, this section explains how to operate the motor at 3000 r/min.

1. Set the speed of operation data No. 0 (address: 1802h) to 3000 r/min.

Message	Communication data (HEX)
Query	01 10 18 02 00 02 04 00 00 0B B8 DF 34
Response	01 10 18 02 00 02 E6 A8

2. Set bit 0 of the driver input command (reference) [address: 007Ch] of the remote I/O command to ON to start operation.

Message	Communication data (HEX)
Query	01 10 00 7C 00 02 04 00 00 00 01 35 1E
Response	01 10 00 7C 00 02 80 10

3. Set bit 0 of the driver input command (reference) [address: 007Ch] of the remote I/O command to OFF to decelerate to a stop.

Message	Communication data (HEX)
Query	01 10 00 7C 00 02 04 00 00 00 00 F4 DE
Response	01 10 00 7C 00 02 80 10

STEP 6 Checking the operation

If the motor does not operate, check the following points.

- Is any alarm present?
- Are the power supply, the motor, and the RS-485 communication cable securely connected?
- Are the switches and the communication parameters set correctly?
- Is the COMM LED unlit? Or is it lit in red? (A communication error has occurred.)

8 Inspection and maintenance

8-1 Inspection

Check the following items regularly.
If any abnormality occurs, stop using the product and contact your nearest Oriental Motor sales office.

Note

- Do not conduct the insulation resistance measurement or dielectric strength test with the motor and driver connected. Doing so may result in damage to the product.
- The driver uses semiconductor elements, so be extremely careful when handling them. Static electricity may damage the driver.

■ Inspection items

- Check to see if any of the mounting screws secured the driver are loose.
- Check to see if the connection of the terminal block and the connection of the connector are loose.
- Check to see if there is no dust on the driver.
- Check to see if the driver has an abnormal odor or has defects in its appearance.

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

The motor or driver may not operate properly if the rotation speed is wrongly set or the connection is wrong.
If the motor cannot operate properly, refer to the contents of this chapter and take appropriate action.
If the problem persists, contact your nearest Oriental Motor sales office.

Note If an alarm or information is generated, refer to the **BLS** Series OPERATING MANUAL Function Edition.

The motor does not rotate.	● The power supply is not connected correctly or the connection is poor. ▷ Check the connection of the power supply.
	● The operation input signal is not turned ON. ▷ Check the connection.
	● An alarm is present. ▷ Check to see if an alarm is generated. The PWR/SYS LED blinks in red while an alarm is generated. For details of alarms, refer to the **BLS** Series OPERATING MANUAL Function Edition.
	● Information of Start operation error is generated. ▷ Check to see if information is generated. The PWR/SYS LED blinks in blue when information is generated. Refer to the **BLS** Series OPERATING MANUAL Function Edition.

The rotation speed cannot be increased.	● The power supply voltage is dropping. ▷ Check the power supply voltage.

● **The time to stop the motor is long.** ● **The time to stop the motor is wrong.**	● Load inertia is too large. ▷ Check it by increasing the friction load or reducing the load inertia.

Torque limiting value is not increased.	● The ATL function is activated. ▷ Refer to the **BLS** Series OPERATING MANUAL Function Edition.

The PWR/SYS LED blinks in blue.	● Information is generated. ▷ Refer to the **BLS** Series OPERATING MANUAL Function Edition.

The motor rotates in the opposite direction to the specified one.	● The setting is wrong. ▷ Check the setting of the "Motor rotation direction" parameter.
	● The gearhead with a gear ratio in which the rotation direction is opposite to that of the motor output shaft is used. ▷ Check the operating manual of the motor for the rotation direction of the gearhead output shaft.
	● A hollow shaft flat gearhead is used. ▷ The hollow shaft flat gearhead rotates in the opposite direction to the motor when viewed from the front of the gearhead and in the same direction as the motor when viewed from the rear (motor mounting side).

● **The motor movement is not stable.** ● **Motor vibration is too large.**	● The motor and gearhead output shaft and a load shaft are out of alignment. ▷ Check the coupling condition of the motor and gearhead output shaft and the load shaft.
	● The product is affected by electrical noise. ▷ Check operation only with the motor, driver, and minimum external equipment required for operation. If a noise effect has been confirmed, take the following countermeasures: [Keep away from the noise sources.] [Reconsider the wiring.]

10 Specifications

10-1 Specifications

The values for the rated torque, peak torque, rated speed, and speed control range are those when the gearhead is not combined.
Check on the Oriental Motor Website for the product specifications.

■ Applicable motor: 25 W, 40 W, 90 W

Model name	Driver	BLSD-KR		
	Motor	BL2M425KC-GN	BL2M540KC-GN	BL2M590KC-GE
Rated output power (Continuous)		25 W	40 W	90 W
Power supply input	Rated voltage	24 VDC		
	Permissible voltage range	−10 to +10%		
	Rated input current	1.6 A	2.4 A	5.3 A
	Maximum input current*	1.8 A (2.2 A)	3.2 A (4.0 A)	6.1 A (7.1 A)
Rated torque		0.199 N·m [28 oz-in]	0.319 N·m [45 oz-in]	0.717 N·m [101 oz-in]
Rated speed		1200 r/min		
Speed control range		100 to 2000 r/min		

* The values in parentheses ( ) are when the distance between the motor and the driver is 10.5 m (34.4 ft.).

■ Applicable motor: 30 W, 60 W, 120 W

Model name	Driver	BLSD-KR		
	Motor	BL2M230KCP-GF BL2M230KCP-A	BL2M460KCP-GF BL2M460KCP-A	BL2M5120KCP-GF BL2M5120KCP-A
Rated output power (Continuous)		30 W	60 W	120 W
Power supply input	Rated voltage	24 VDC		
	Permissible voltage range	−10 to +10%		
	Rated input current	1.9 A	3.3 A	6.3 A
	Maximum input current*	2.8 A (3.1 A)	5.0 A (6.2 A)	9.8 A (13.0 A)
Rated torque		0.096 N·m [13.6 oz-in]	0.191 N·m [27 oz-in]	0.382 N·m [54 oz-in]
Peak torque		0.191 N·m [27 oz-in]	0.382 N·m [54 oz-in]	0.764 N·m [108 oz-in]
Rated speed		3000 r/min		
Speed control range		100 to 4000 r/min		

* The values in parentheses ( ) are when the distance between the motor and the driver is 10.5 m (34.4 ft.).

10-2 General specifications

Operating environment	Ambient temperature	Driver: 0 to +50 °C (+32 to +122 °F) (non-freezing)
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 1000 m (3300 ft.) above sea level
	Surrounding atmosphere	No corrosive gas or dust. No water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environments. (For details on installation locations, refer to p.10.)
	Vibration	Not subject to continuous vibration or excessive impact. In conformance with JIS C 60068-2-6 "Sine-wave vibration test method" Frequency range: 10 to 55 Hz Pulsating amplitude: 0.15 mm (0.006 in.) Sweep direction: 3 directions (X, Y, Z) Number of sweeps: 20 times
Storage environment Shipping environment	Ambient temperature	Driver: −25 to +70 °C (−13 to +158 °F) (non-freezing)
	Ambient humidity	85% or less (non-condensing)
	Altitude	Up to 3000 m (10000 ft.) above sea level
	Surrounding atmosphere	No corrosive gas or dust. No water or oil. Cannot be used in radioactive materials, magnetic field, vacuum or other special environments.
Degree of protection		IP20

10-3 Communication specifications

Electrical characteristics	In conformance with EIA-485 The twisted-pair wires and keep the total wiring distance to 50 m (164 ft.) or less.*
Communication mode	Half duplex Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number)
Transmission rate	Selects from 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps, 115,200 bps (initial value), and 230,400 bps.
Protocol	Modbus RTU mode
Type of Connection	Up to 31 drivers can be connected to a single host controller.

* 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.

11 Regulations and standards

11-1 UL Standards, CSA Standards

This product is recognized by UL under the UL and CSA Standards.
The driver is not provided with the motor overtemperature protection specified in UL Standards and CSA Standards.

11-2 CE Marking / UKCA Marking

This product is affixed with the marks under the following directives/regulations.

■ EU EMC Directive / UK EMC Regulations

Refer to "6-10 Compliance with EMC Directive/Regulations" on p.19 for details on compliance.

■ EU RoHS Directive / UK RoHS Regulations

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

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