



Brushless Motor and Driver Package

BLE Series

RS-485 communication type

USER MANUAL



Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

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

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1 Entry

This part explains the composition of the operating manuals, the product overview, specifications and safety standards as well as the name and function of each part and others.

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1 Operating Manuals for the BLE Series

Operating manuals for the **BLE** Series FLEX RS-485 communication type are listed below.
 After reading the following manuals, keep them in a convenient place so that you can reference them at any time.

Applicable product	Type of operating manual	Model	Description of operating manual
BLE Series FLEX RS-485 communication type	OPERATING MANUAL (supplied with the product)	HM-5143	This manual explains the functions as well as the installation method and others for the motor and driver.
	USER MANUAL (this manual)	HM-5140	This manual explains the function, installation and connection of the motor and driver as well as operating method. It also explains how to use the MEXE02 .
Data setter OPX-2A	OPERATING MANUAL	HP-5056	This manual explains the functions and installation/connection method as well as data setting method and others for the accessory OPX-2A (sold separately).
Network converter	CC-Link compatible NETC01-CC USER MANUAL	HM-60089	This manual explains the functions, installation/connection method as well as the operating method and others for the network converter.
	MECHATROLINK- II compatible NETC01-M2 USER MANUAL	HM-60091	
	MECHATROLINK-III compatible NETC01-M3 USER MANUAL	HM-60093	

2 Introduction

2.1 Before use

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the section "3 Safety precautions" on p.9.

The product described in this manual has been designed and manufactured for use in general industrial equipment.

Do not use for any other purpose. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Product overview

This is a motor and driver package product consisting of a compact, high-torque brushless motor and driver compatible with I/O control and RS-485 communication.

The operation data and parameters can be set using an accessory data setter **OPX-2A** or data setting software **MEXE02** (sold separately), or via RS-485 communication.

■ Accessories

The operation data and parameters can be set using an accessory data setter **OPX-2A** or data setting software **MEXE02**, or via RS-485 communication. Provide the **OPX-2A** or **MEXE02** as necessary.

■ Related products

The **BLE** Series FLEX RS-485 communication type can be used via various network when connecting to a network converter.

Network converter	Supported network
NETC01-CC	CC-Link communication
NETC01-M2	MECHATROLINK- II communication
NETC01-M3	MECHATROLINK- III communication

■ Notation rules

The following term is used in explanation of this manual.

Term	Description
Master controller	This is a generic name for a programmable controller, master module and so on.

■ Hazardous substances

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

2.2 Standards and CE Marking

This product is affixed the CE Marking based on the EN Standard (Low Voltage Directive and EMC Directive).

- **Applicable Standards**

	Applicable Standards	Standards File No.	CE Marking
Motor *	EN 60034-1, EN 60034-5, EN 60664-1, EN 60950-1	Conform to EN Standards	Low Voltage Directive EMC Directives
Driver	EN 60950-1, EN 61800-5-1		

* Thermal class EN Standards: 120(E)

- **Installation conditions**

The motor and driver are designed and manufactured for use as a component to be installed inside equipment.

Item	Motor	Driver
Overvoltage category	III *	II
Pollution degree	3	2
Protection against electric shock	Class I	

* Overvoltage category II when EN 60950-1 is applicable.

- **Low Voltage Directive**

This product is designed and manufactured for use as a component to be installed inside equipment.

- Install the product within an enclosure in order to avoid contact with hands.
- Be sure to maintain a Protective Earth in case hands should make contact with the product. Securely ground the Protective Earth Terminals of the motor and driver.

- **EMC Directives**

This product has received EMC compliance under the conditions specified in "Example of motor and driver installation and wiring" on p.34.

Be sure to conduct EMC measures with the product assembled in your equipment by referring to "1.12 Installing and wiring in compliance with EMC Directive" on p.33.

3 Safety precautions

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. 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 the safe use of the product.

Warning

- Do not use the product in a place exposed to explosive, flammable or corrosive gases or water splashes or near combustible materials. Doing so may result in fire, electric shock or injury.
- Only qualified personnel should be allowed to perform installation, connection, operation and inspection/troubleshooting of the product. Handling by unqualified personnel may result in fire, electric shock, injury or equipment damage.
- Do not move, install, connect or inspect the product while the power is supplied. Perform these operations after turning off the power. Failure to observe these instructions may result in electric shock.
- The terminals on the driver's front panel marked with   symbol indicate the presence of high voltage. Do not touch these terminals while the power is on to avoid the risk of fire or electric shock.
- Do not use a non-electromagnetic brake type motor in a vertical application. If the driver's protection function is activated, the motor will stop and the moving part of the equipment will drop, thereby causing injury or equipment damage.
- Do not use the brake mechanism of the electromagnetic brake motor as a safety brake. It is intended to hold the moving parts and motor position. Doing so may result in injury or damage to equipment.
- If the driver protective function has been activated, remove the cause and reset the protective function. Continuing to operate the equipment without removing the cause of problem will lead to a motor or driver malfunction, resulting in injury or equipment damage.
- Use a specified motor (gearhead) and driver combination. Failure to do so may result in fire, electric shock or equipment damage.
- Use the motor and driver only in class I equipment. Installing them in equipment of other classes may result in electric shock.
- Install the motor and driver in an enclosure. Failure to do so may result in electric shock or injury.
- When installing the motor and driver, connect their Protective Earth Terminals. Failure to do so may result in electric shock.
- Securely connect the cables in accordance with the connection examples. Failure to do so may result in fire or electric shock.
- Do not forcibly bend, pull or pinch the cables. Doing so may result in fire or electric shock.
- Do not machine or modify the motor cable or connection cable. Doing so may result in electric shock or fire.
- Be sure to observe the specified cable sizes. Use of unspecified cable sizes may result in fire.
- Observe the specified screw tightening torque when connecting terminals to the terminal block. Failure to do so may result in electric shock or equipment damage.
- Always keep the power supply voltage of the driver within the specified range. Failure to do so may result in fire or electric shock.
- When using the electromagnetic brake motor, do not turn the MB-FREE input ON while a load is held in vertical direction. Otherwise, the holding power of the motor and electromagnetic brake will be lost, causing personal injury or damage to equipment.
- When using the electromagnetic brake motor in vertical drive (gravitational operation), be sure to operate after checking the load condition. If a load in excess of the rated torque is applied or the small torque limiting value is set using a **OPX-2A**, **MEXE02** or RS-485 communication, the load may fall. This may result in injury or damage to equipment.
- Always turn off the power before performing maintenance/inspection. Failure to do so may result in electric shock.
- Do not touch the motor or driver when measuring insulation resistance or performing a dielectric strength test. Accidental contact may result in electric shock.
- Do not touch the connection terminals on the driver immediately (until the CHARGE LED turns off) after the power is turned off. Residual voltage may cause electric shock.
- Regularly check the openings in the driver for accumulated dust. Accumulated dust may cause fire.
- Do not disassemble or modify the motor (gearhead) and driver. Doing so may result in electric shock, injury or equipment damage. Should you require inspection or repair of internal parts, please contact the Oriental Motor branch or sales office from which you purchased the product.

⚠ Caution

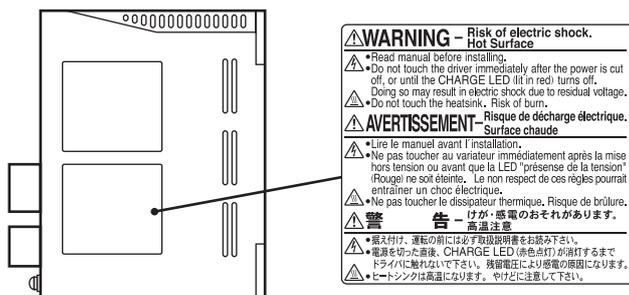
- Do not use the product in conditions exceeding the motor (gearhead) or driver specifications. Doing so may result in electric shock, fire, injury or equipment damage.
- Do not insert an object into the openings in the driver. Doing so may result in fire, electric shock or injury.
- Do not touch the motor (gearhead) or driver while operating or immediately after stopping. The surface of the motor (gearhead) or driver may be hot and cause a skin burn(s).
- Do not carry the product by holding the motor (gearhead) output shaft or any of the cables. Doing so may result in injury.
- Do not place around the motor and driver any object blocking the air flow. Doing so may result in equipment damage.
- Do not touch the motor output shaft (key groove or pinion) with bare hands. Doing so may result in injury.
- When assembling the motor (pinion shaft) with the gearhead, exercise caution not to pinch your fingers or other parts of your body between the motor and gearhead. Injury may result.
- Securely install the motor (gearhead) and driver to their respective mounting plates. Inappropriate installation may cause the motor/driver to detach and fall, resulting in injury or equipment damage.
- Provide a cover on the rotating part (output shaft) of the motor (gearhead). Failure to do so may result in injury.
- When installing the motor (gearhead) in the equipment, exercise caution not to pinch your fingers or other parts of your body between the equipment and motor or gearhead. Injury may result.
- Securely install the load on the motor output shaft. Inappropriate installation may result in injury.
- Use a 24 VDC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may result in electric shock.
- 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.
- Immediately when trouble has occurred, stop running and turn off the driver power. Failure to do so may result in fire, electric shock or injury.
- Do not touch the rotating part (output shaft) during operation. Doing so may result in injury.
- The motor surface temperature may exceed 70 °C (158 °F) even under normal operating conditions. If the operator is allowed to approach a running motor, attach a warning label as shown to the right in a conspicuous position. Failure to do so may result in skin burn(s).
- Use an insulated screwdriver to adjust the switches in the driver. Failure to do so may result in electric shock.
- To dispose of the motor (gearhead) or driver, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.



Warning label

■ Warning information

A warning label with handling instructions is attached on the driver. Be sure to observe the instructions on the label when handling the driver.



4 Precautions for use

This chapter explains the restrictions and other items you should take heed of when using the **BLE** Series FLEX RS-485 communication type.

- **Connect protective devices to the power line**

Connect a circuit breaker or earth leakage breaker to the driver's power line to protect the primary circuit. If an earth leakage breaker is to be installed, use one incorporating high-frequency noise elimination measures. Refer to "Preventing leakage current" below for the selection of protective devices.

- **Use an electromagnetic brake type for an application involving vertical travel**

When the motor is used in an application involving vertical travel, use an electromagnetic brake type to hold the load in position.

- **Do not use a solid-state relay (SSR) to turn on/off the power**

A circuit that turns on/off the power via a solid-state relay (SSR) may damage the motor and driver.

- **Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver**

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

- **Grease measures**

On rare occasions, a small amount of grease may ooze out from the gearhead. If there is concern over possible environmental damage resulting from the leakage of grease, check for grease stains during regular inspections. Alternatively, install an oil pan or other device to prevent leakage from causing further damage. Oil leakage may lead to problems in the user's equipment or products.

- **Apply grease to the hollow output shaft of a hollow shaft flat gearhead**

When using a hollow shaft flat gearhead, apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.

- **Preventing leakage current**

Stray capacitance exists between the driver's current-carrying line and other current-carrying lines, the earth and the motor, respectively. A high-frequency current may leak out through such capacitance, having a detrimental effect on the surrounding equipment. The actual leakage current depends on the driver's switching frequency, the length of wiring between the driver and motor, and so on.

When connecting an earth leakage breaker, use one of the following products offering resistance against high frequency current:

Mitsubishi Electric Corporation: NV series

Fuji Electric FA Components & Systems Co., Ltd.: EG and SG series

- **Noise elimination measures**

Provide noise elimination measures to prevent a motor or driver malfunction caused by external noise.

For more effective elimination of noise, use a shielded I/O signal cable or attach ferrite cores if a non-shielded cable is used. Refer to "1.12 Installing and wiring in compliance with EMC Directive" on p.33 for the noise elimination measures.

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

The data edit connector (CN3), I/O signal connectors (CN5/CN6) and RS-485 communication connectors (CN7/CN8) are not 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 these equipment and driver to short, damaging both.

- **Use a connection cable (supplied or accessory) when extending the wiring distance between the motor and driver**

- **When using the motor in operation such as vertical drive (gravitational operation) or a large inertial load drive, use an accessory regeneration unit **EPRC-400P** (sold separately).**

The driver may be damaged if the regeneration energy generated during vertical drive (gravitational operation) or sudden starting/stopping of a large inertial load exceeds the allowable limit that can be absorbed by the driver.

The accessory regeneration unit **EPRC-400P** is designed to discharge the regenerated energy, thereby protecting the driver.

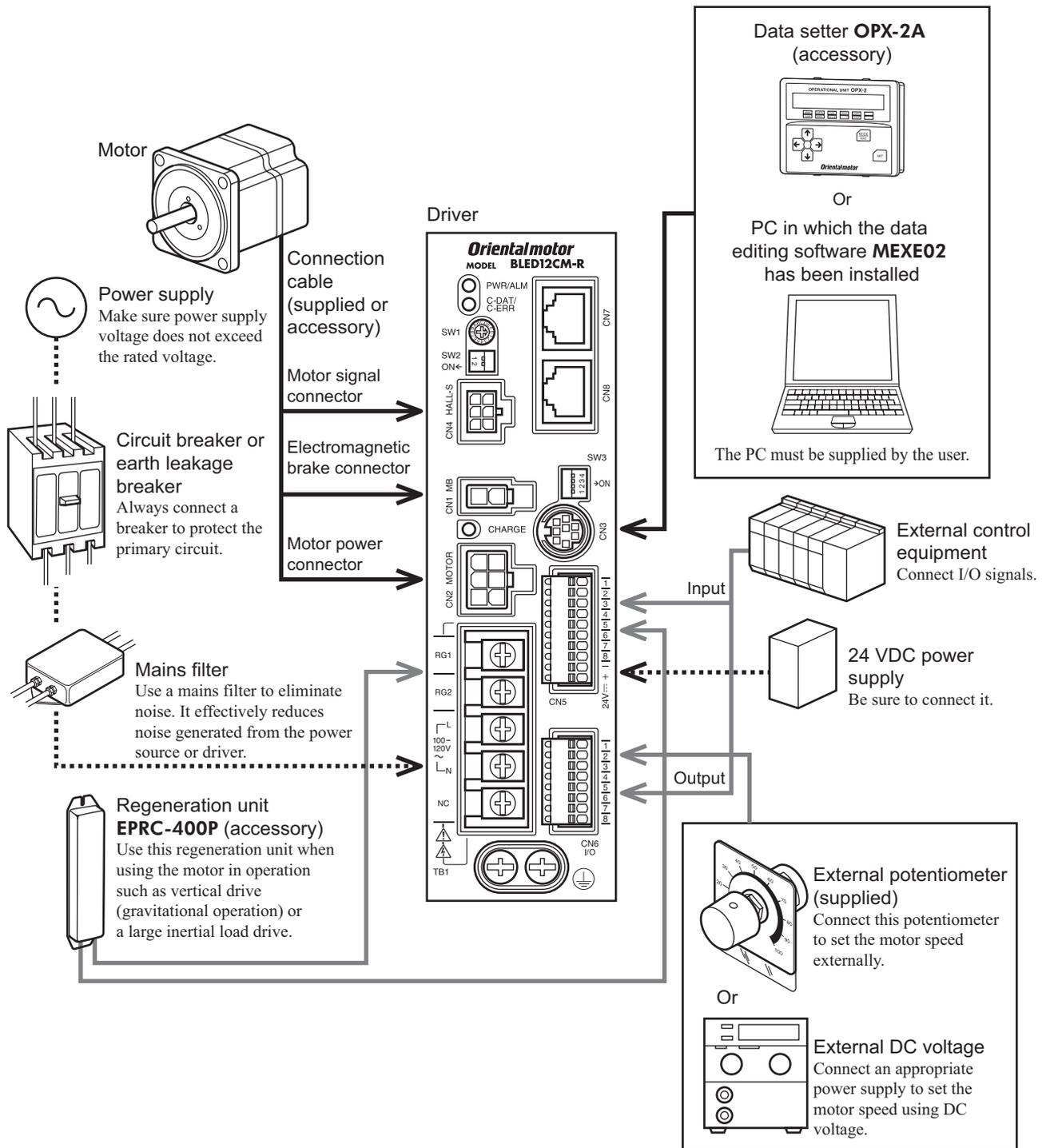
- Saving data to the non-volatile memory

Do not turn off the 24 VDC power supply while writing the data to the non-volatile memory, and also do not turn off within 5 seconds after the completion of writing the data. Doing so may abort writing the data and cause a EEPROM error alarm to generate.

The non-volatile memory can be rewritten approximately 100,000 times.

5 System configuration

An example of system configuration using the **BLE** Series FLEX RS-485 communication type is shown below. Illustration shows the electromagnetic brake type.



6 Preparation

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

6.1 Checking the product

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

Verify the model number of the purchased product against the number shown on the package label.

Check the model number of the motor and driver against the number shown on the nameplate. Model names for motor and driver combinations are shown on page 15.

- Motor..... 1 unit (with a gearhead, only for combination type)
- Driver 1 unit
- Connection cable..... 1 pc. (Only models with a supplied connection cable)
- CN5 connector (10 pins)..... 1 pc.
- CN6 connector (8 pins)..... 1 pc.
- **OPERATING MANUAL**..... 1 copy
- External potentiometer..... 1 pc.
- Signal cable for external potentiometer 1 pc. [1 m (3.3 ft.)]

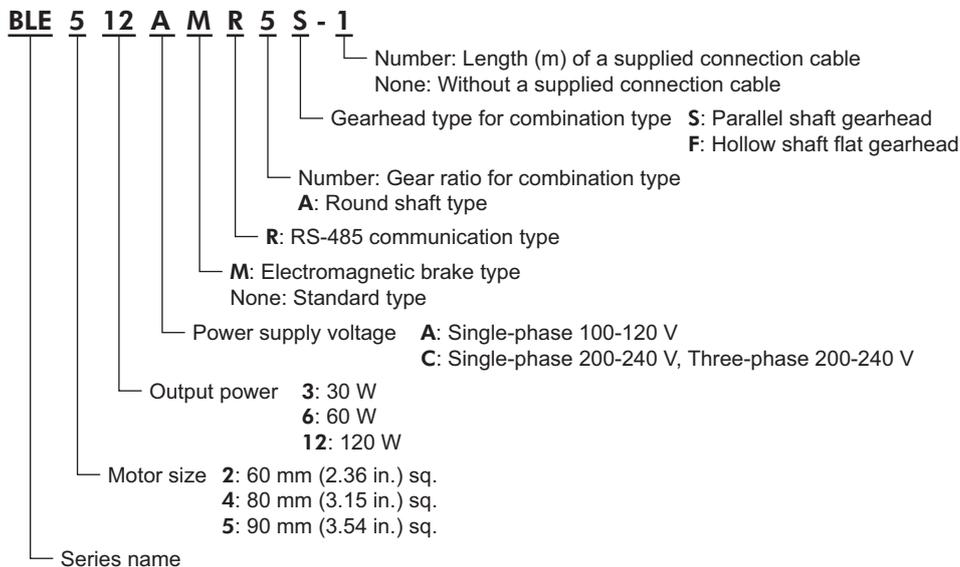
Accessories for combination type parallel shaft gearhead

- Hexagonal socket head screw set..... 1 set
(Hexagonal socket head screw, flat washer, spring washer and nut, 4 pcs. each)
- Parallel key..... 1 pc.

Accessories for combination type hollow shaft flat gearhead

- Hexagonal socket head screw set..... 1 set
(Hexagonal socket head screw, flat washer, spring washer and nut, 4 pcs. each)
- Safety cover..... 1 pc.
- Safety cover mounting screw..... 2 pcs.
- Parallel key..... 1 pc.

6.2 How to identify the product model



6.3 Combination tables

- in the model names indicates a number representing the gear ratio.
- indicates a number representing the length of a connection cable.
- The combination types come with the motor and gearhead pre-assembled.

■ Standard type

Motor type	Model	Motor model	Gearhead model	Driver model
Combination type parallel shaft gearhead	BLE23AR□S-■	BLEM23-GFS	GFS2G□	BLED3AM-R
	BLE23CR□S-■			BLED3CM-R
	BLE46AR□S-■	BLEM46-GFS	GFS4G□	BLED6AM-R
	BLE46CR□S-■			BLED6CM-R
	BLE512AR□S-■	BLEM512-GFS	GFS5G□	BLED12AM-R
	BLE512CR□S-■			BLED12CM-R
Combination type hollow shaft flat gearhead	BLE23AR□F-■	BLEM23-GFS	GFS2G□FR	BLED3AM-R
	BLE23CR□F-■			BLED3CM-R
	BLE46AR□F-■	BLEM46-GFS	GFS4G□FR	BLED6AM-R
	BLE46CR□F-■			BLED6CM-R
	BLE512AR□F-■	BLEM512-GFS	GFS5G□FR	BLED12AM-R
	BLE512CR□F-■			BLED12CM-R
Round shaft type	BLE23ARA-■	BLEM23-A	-	BLED3AM-R
	BLE23CRA-■			BLED3CM-R
	BLE46ARA-■	BLEM46-A		BLED6AM-R
	BLE46CRA-■			BLED6CM-R
	BLE512ARA-■	BLEM512-A		BLED12AM-R
	BLE512CRA-■			BLED12CM-R

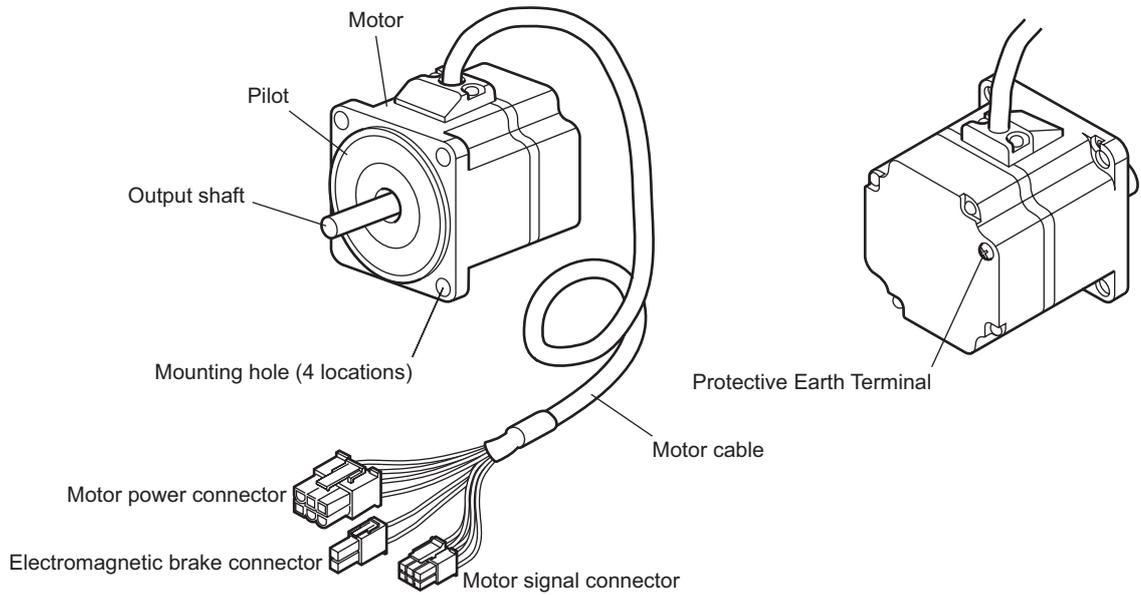
■ Electromagnetic brake type

Motor type	Model	Motor model	Gearhead model	Driver model
Combination type parallel shaft gearhead	BLE23AMR□S-■	BLEM23M2-GFS	GFS2G□	BLED3AM-R
	BLE23CMR□S-■			BLED3CM-R
	BLE46AMR□S-■	BLEM46M2-GFS	GFS4G□	BLED6AM-R
	BLE46CMR□S-■			BLED6CM-R
	BLE512AMR□S-■	BLEM512M2-GFS	GFS5G□	BLED12AM-R
	BLE512CMR□S-■			BLED12CM-R
Combination type hollow shaft flat gearhead	BLE23AMR□F-■	BLEM23M2-GFS	GFS2G□FR	BLED3AM-R
	BLE23CMR□F-■			BLED3CM-R
	BLE46AMR□F-■	BLEM46M2-GFS	GFS4G□FR	BLED6AM-R
	BLE46CMR□F-■			BLED6CM-R
	BLE512AMR□F-■	BLEM512M2-GFS	GFS5G□FR	BLED12AM-R
	BLE512CMR□F-■			BLED12CM-R
Round shaft type	BLE23AMRA-□	BLEM23M2-A	-	BLED3AM-R
	BLE23CMRA-□			BLED3CM-R
	BLE46AMRA-□	BLEM46M2-A		BLED6AM-R
	BLE46CMRA-□			BLED6CM-R
	BLE512AMRA-□	BLEM512M2-A		BLED12AM-R
	BLE512CMRA-□			BLED12CM-R

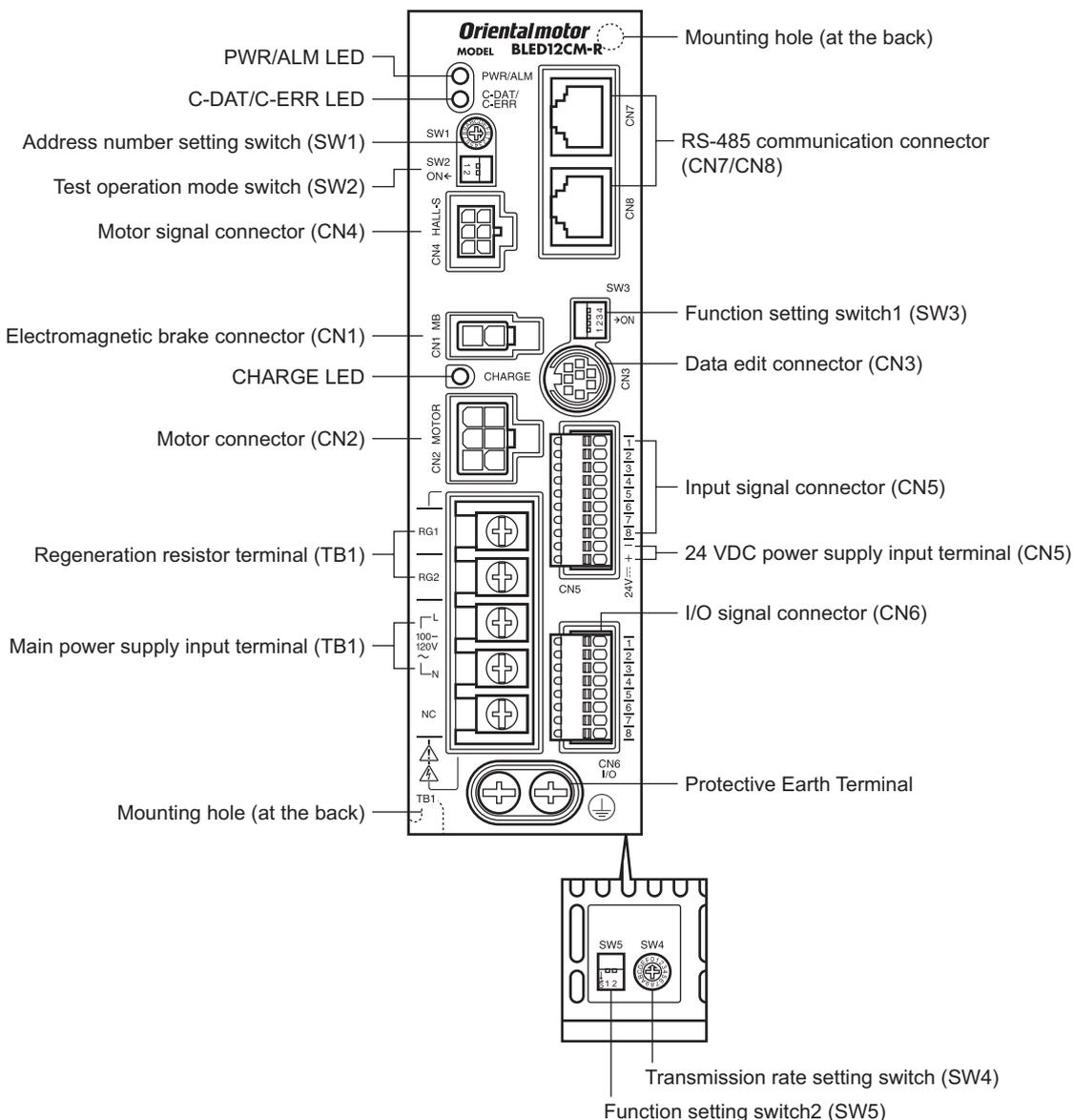
6.4 Names and functions of parts

■ Motor

Illustration shows the electromagnetic brake type.



■ Driver



Name	Description	Ref.
PWR/ALM LED	PWR (Green): This LED is lit while the 24 VDC power is input.	-
	ALM (Red): This LED will blink when an alarm generates. It is possible to check the generated alarm by counting the number of times the LED blinks.	p.177
C-DAT/C-ERR LED	C-DAT (Green): This LED will blink or illuminate steadily when the driver is communicating with the master station properly via RS-485 communication.	-
	C-ERR (Red): This LED will illuminate when the RS-485 communication error occurs with the master station.	
CHARGE LED (Red)	This LED is lit while the main power is input. After the main power has been turned off, the LED will turn off once the residual voltage in the driver drops to a safe level.	
Address number setting switch (SW1)	Use this switch when controlling the system via RS-485 communication. Using this switch in combination with the SW5-No.1 of the function setting switch2, the address number of RS-485 communication can be set. Factory setting: 0	p.85 p.117 p.129
Test operation mode switch (SW2)	SW2-No.1: This switch is used to check the connection between the motor and driver before establishing a communication. When having connected properly, setting the SW2-No.1 to the ON side causes the motor to rotate at low speed in the forward direction. Factory setting: OFF	p.43
	SW2-No.2: Not used. (Keep this switch OFF.)	
Function setting switch1 (SW3)	<ul style="list-style-type: none"> • SW3-No.1: Not used. (Keep this switch OFF.) • SW3-No.2: Not used. (Keep this switch OFF.) 	-
	<ul style="list-style-type: none"> • SW3-No.3: This switch is used to select the power supply for I/O signals (use the built-in power supply or external power supply). To control the operation using relays and switches, set the SW3-No.3 to the ON side to select the built-in power supply. Factory setting: OFF 	p.38
	<ul style="list-style-type: none"> • SW3-No.4: Use this switch when controlling the system via RS-485 communication. The termination resistor (120 Ω) of RS-485 communication can be set. Factory setting: OFF 	
Transmission rate setting switch (SW4)	Use this switch when controlling the system via RS-485 communication. The transmission rate of RS-485 communication can be set. Factory setting: 7	p.85 p.117 p.129
Function setting switch2 (SW5)	Use this switch when controlling the system via RS-485 communication. <ul style="list-style-type: none"> • SW5-No.1: Using this switch in combination with the address number setting switch (SW1), the address number of RS-485 communication can be set. Factory setting: OFF • SW5-No.2: The protocol of RS-485 communication can be set. Factory setting: OFF 	
Electromagnetic brake connector (CN1)	Connects the electromagnetic brake connector. (Electromagnetic brake type only)	p.37
Motor connector (CN2)	Connects the motor power connector.	
Data edit connector (CN3)	Connects a PC in which the MEXE02 has been installed, or the OPX-2A .	p.42
Motor signal connector (CN4)	Connects the motor signal connector.	p.37
Input signal connector (CN5)	Connects the input signals.	p.38
24 VCD power input terminals (CN5)	Connects the control power supply of the driver. +: +24 VDC power supply input -: Power supply GND [This is shared with the common wire of input signals (0 V)]	p.38
I/O signal connector (CN6)	<ul style="list-style-type: none"> • Connects the external potentiometer (supplied) or external DC power supply. • Connects the output signals. 	p.38
RS-485 communication connectors (CN7/CN8)	Connects the RS-485 communication cable.	p.42
Regeneration resistor terminal (TB1)	Connects an accessory regeneration unit EPRC-400P (sold separately).	p.43

Name	Description	Ref.
Main power supply input terminal (TB1)	Connects to the main power supply. <ul style="list-style-type: none"> • Single-phase 100-120 VAC L, N: Connects a single-phase 100-120 VAC power supply NC: Not used. • Single-phase 200-240 VAC L1, L2: Connects a single-phase 200-240 VAC power supply L3: Not used. • Three-phase 200-240 VAC L1, L2, L3: Connects a three-phase 200-240 VAC power supply 	p.36
Protective Earth Terminal	Ground this terminal using a grounding wire of AWG18 to 14 (0.75 to 2.0 mm ²).	
Mounting holes (two locations at the back)	These mounting holes are used to install the driver with screws (M4).	p.31

2 Installation and connection

This part explains the installation method of the product, the mounting method of a load and the connection method as well as I/O signals.

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1 Installation

This chapter explains the installation location and installation methods of the motor and driver, as well as how to install a load and external potentiometer. Also covered in this section are the installation and wiring methods that are in compliance with the relevant EMC Directive.

1.1 Installation location

The motor and driver are designed and manufactured for use as a component to be installed inside equipment. Install them 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)
- Ambient temperature: 0 to +50 °C (+32 to +122 °F) (non-freezing)
- Ambient humidity: 85% or less (non-condensing)
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area free of excessive salt
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- 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

1.2 Installation overview

This section explains an overview of how to install the motor and driver. Refer to each applicable section for details.

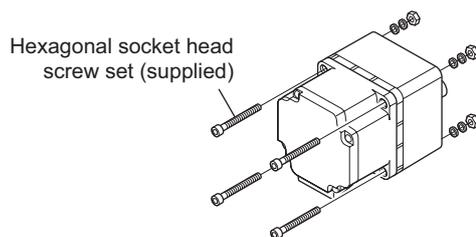
■ Installing the combination type parallel shaft gearhead and round shaft type

Secure the motor using the hexagonal socket head screws through the four mounting holes. Tighten the nuts until no gaps remain between the motor and mounting plate.

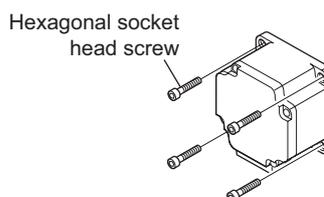
The combination type parallel shaft gearheads come with a set of hexagonal socket head screws. Round shaft types do not come with hexagonal socket head screws. Hexagonal socket head screws must be provided by the user if round shaft types are used.

For machining dimension of the mounting plate or installing/removing method of the gearhead, see page 24 for the combination type parallel shaft gearhead and page 25 for the round shaft type.

- Combination type parallel shaft gearhead



- Round shaft type



Hexagonal socket head screw set (supplied with the combination type parallel shaft gearhead)

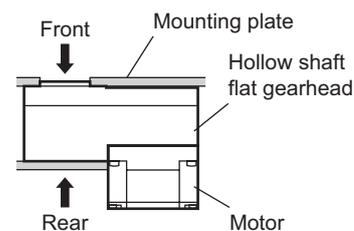
Model	Nominal thread size	Tightening torque	Maximum applicable plate thickness *
BLE23	M4	1.8 N·m (15.9 lb-in)	5 mm (0.20 in.)
BLE46	M6	6.4 N·m (56 lb-in)	8 mm (0.31 in.)
BLE512	M8	15.5 N·m (137 lb-in)	12 mm (0.47 in.)

* When the supplied hexagonal socket head screw set is used.

■ Installing the combination type hollow shaft flat gearhead

A combination type hollow shaft flat gearhead can be installed by using either its front or rear side as the mounting surface. Install the supplied hexagonal socket head screw set in the four mounting holes you drilled and tighten the nuts until no gaps remain between the motor and mounting plate. Also, attach the supplied safety cover to the hollow output shaft on the end opposite from the one where the load shaft is installed.

Refer to page 25 for the installation method and how to install/remove the gearhead.



Hexagonal socket head screw set (supplied)

Model	Nominal thread size	Tightening torque	Maximum applicable plate thickness *
BLE23	M5	3.8 N·m (33 lb-in)	5 mm (0.20 in.)
BLE46	M6	6.4 N·m (56 lb-in)	8 mm (0.31 in.)
BLE512	M8	15.5 N·m (137 lb-in)	12 mm (0.47 in.)

* When the supplied hexagonal socket head screw set is used.

■ Installing the driver

The driver can be installed in two different ways. Refer to page 31 for the specific installation methods.

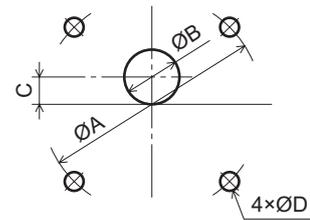
- Use screws (M4: not supplied) to secure the driver through the mounting holes (two locations) provided at the back of the driver.
- Secure the driver on a DIN rail using the accessory DIN-rail mounting plate (sold separately).

1.3 Installing the combination type parallel shaft gearhead

■ Mounting hole dimensions [unit: mm (in.)]

Model	ØA	ØB	C	ØD
BLE23	70 (2.76)	24 (0.94)	10 (0.39)	4.5 (0.177)
BLE46	94 (3.70)	34 (1.34)	13 (0.51)	6.5 (0.256)
BLE512	104 (4.09)	40 (1.57)	18 (0.71)	8.5 (0.335)

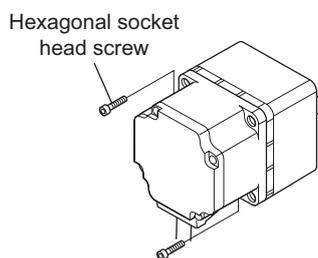
ØB indicates the external dimensions of the product.
 Drill holes with a minimum diameter of ØB +1 mm (0.04 in.).



■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead. The gearhead can be removed and the motor cable position changed to a desired 90° direction.

1. Remove the hexagonal socket head screws (2 pcs.) assembling the motor and gearhead and detach the motor from the gearhead.

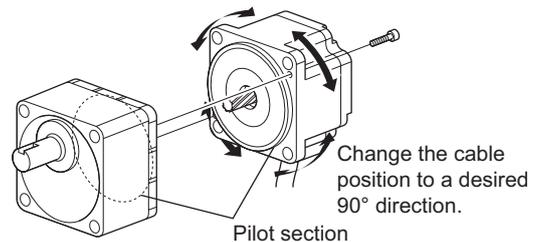


Assembly screws

Model	Nominal thread size	Tightening torque
BLE23 BLE46	M2.6	0.4 N·m (3.5 lb-in)
BLE512	M3	0.6 N·m (5.3 lb-in)

2. Using the pilot sections of the motor and gearhead as guides, install the gearhead to the motor and tighten the hexagonal socket head screws.

At this time, the motor cable position can be changed to a desired 90° direction. When installing the gearhead, slowly rotate it clockwise/counterclockwise to prevent the pinion of the motor output shaft from contacting the side panel or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matters enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor and gearhead carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is crushed or severed, grease may leak from the gearhead.
- The hexagonal socket head screws assembling the motor and gearhead are used to attach the motor and gearhead temporarily. When installing the product, be sure to use the supplied hexagonal socket head screws (4 pcs.).

1.4 Installing the round shaft type

■ Mounting plate size

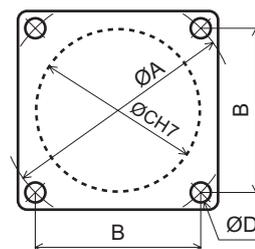
Install the motor to a mounting plate of the following size or larger, so that the motor case temperature will not exceed 90 °C (194 °F).

Model	Size of mounting plate	Thickness	Material
BLE23	115×115 mm (4.53×4.53 in.) *	5 mm (0.20 in.)	Aluminum
BLE46	135×135 mm (5.31×5.31 in.)		
BLE512	165×165 mm (6.50×6.50 in.)		

* Electromagnetic brake type: 135×135 mm (5.31×5.31 in.)

■ Mounting hole dimensions [unit: mm (in.)]

Model	ØA	B	ØCH7	ØD
BLE23	70 (2.76)	49.5 (1.949)	54 ^{+0.030} ₀ (2.1260 ^{+0.0012})	4.5 (0.177)
BLE46	94 (3.70)	66.47 (2.616)	73 ^{+0.030} ₀ (2.8740 ^{+0.0012})	6.5 (0.256)
BLE512	104 (4.09)	73.54 (2.895)	83 ^{+0.035} ₀ (3.2677 ^{+0.0014})	8.5 (0.335)



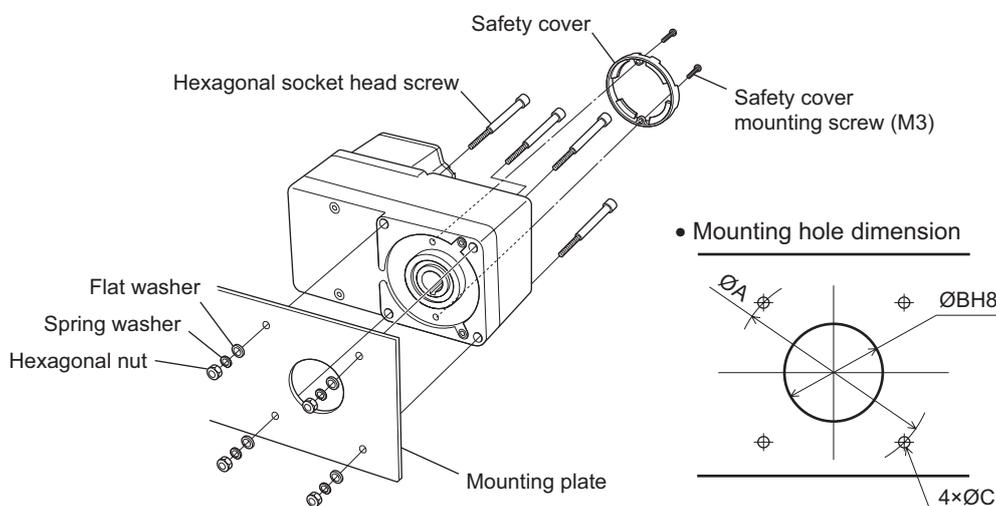
ØC indicates the pilot diameter on the flange.

Note Fit the boss on the gearhead mounting surface into a pilot receiving hole.

1.5 Installing the combination type hollow shaft flat gearhead

■ Using the front side as the mounting surface

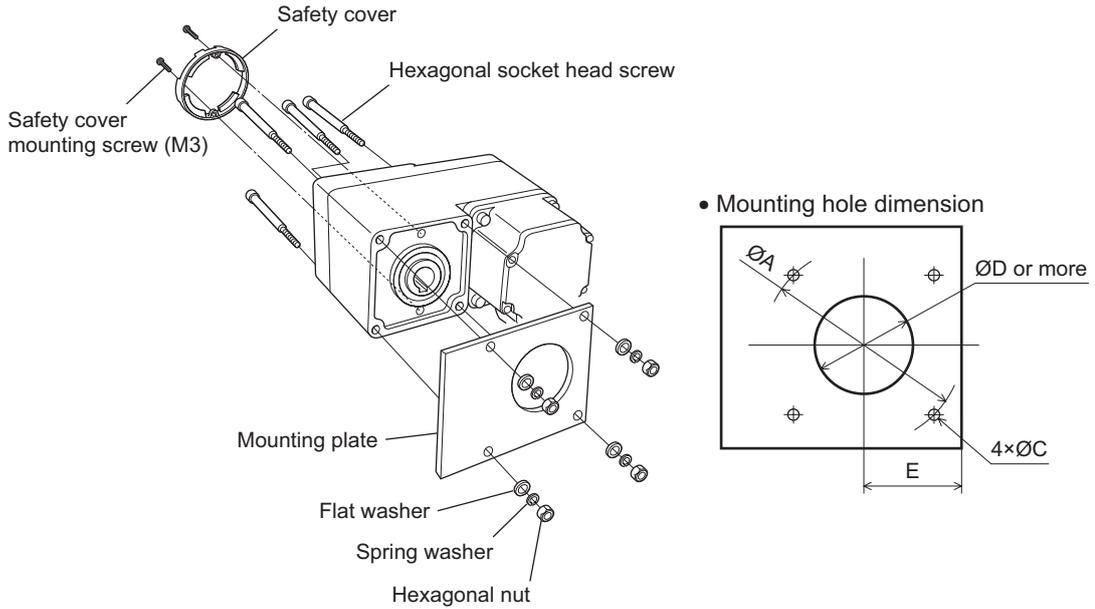
When the gearhead is installed by using its front side as the mounting surface, use the boss of the output shaft to align the center.



Mounting hole dimensions [unit: mm (in.)]

Model	ØA	ØBH8	ØC
BLE23	70 (2.76)	34 ^{+0.039} ₀ (1.34 ^{+0.0015})	5.5 (0.22)
BLE46	94 (3.70)	38 ^{+0.039} ₀ (1.50 ^{+0.0015})	6.5 (0.26)
BLE512	104 (4.09)	50 ^{+0.039} ₀ (1.97 ^{+0.0015})	8.5 (0.33)

■ Using the rear side as the mounting surface



Mounting hole dimensions [unit: mm (in.)]

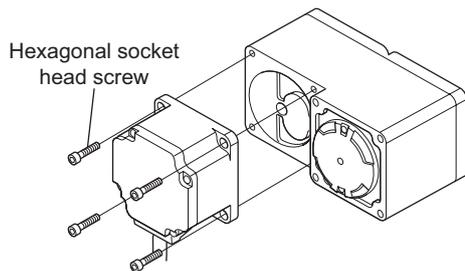
Model	ØA	ØC	ØD	E
BLE23	70 (2.76)	5.5 (0.22)	25 (0.98)	29 (1.14)
BLE46	94 (3.70)	6.5 (0.26)	30 (1.18)	39 (1.54)
BLE512	104 (4.09)	8.5 (0.33)	35 (1.38)	44 (1.73)

Note When installing the gearhead by using its rear side as the mounting surface, prevent contact between the mounting plate and motor by keeping dimension E below the specified value.

■ Removing/Installing the gearhead

To replace the gearhead or change the cable outlet direction, remove the screws assembling the gearhead. The gearhead can be removed and the motor cable position changed to one of three 90° directions. Note that the motor cable cannot be positioned in the direction where the cable faces the gearhead output shaft.

1. Remove the hexagonal socket head screws (4 pcs.) attaching the gearhead and motor and detach the motor from the gearhead.

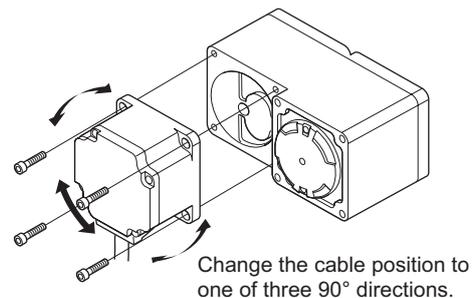


Assembly screws

Model	Nominal thread size	Tightening torque
BLE23	M4	1.8 N·m (15.9 lb-in)
BLE46	M6	6.4 N·m (56 lb-in)
BLE512	M8	15.5 N·m (137 lb-in)

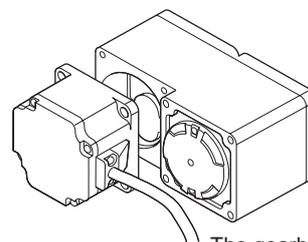
2. Using the pilot sections of the motor and gearhead as guides, install the motor to the gearhead and tighten the hexagonal socket head screws.

At this time, the motor cable position can be changed to one of three 90° directions. Install the motor carefully to prevent the pinion of the motor output shaft from contacting the casing or gear of the gearhead. Also confirm that no gaps remain between the motor flange surface and the end face of the gearhead's pilot section.



Note

- Do not forcibly assemble the motor and gearhead. Also, do not let metal objects or other foreign matters enter the gearhead. The pinion of the motor output shaft or gear may be damaged, resulting in noise or shorter service life.
- Do not allow dust to attach to the pilot sections of the motor and gearhead. Also, assemble the motor carefully by not pinching the O-ring at the motor's pilot section. If the O-ring is pinched, the coupling strength will drop and grease may leak from the gearhead.
- The motor cable position cannot be changed to the direction where the cable faces the gearhead output shaft, because the gearhead case will obstruct the cable.



The gearhead case will obstruct the cable.

1.6 Installing a load to the combination type parallel gearhead or round shaft type

When installing a load on the motor (gearhead), align the center of the motor output shaft (gearhead output shaft) with the center of the load shaft.

Note

- When coupling the motor (gearhead) with a load, pay attention to centering, belt tension, parallelism of pulleys, etc. Also, firmly secure the tightening screws of the coupling or pulleys.
- When installing a load, do not damage the motor output shaft (gearhead output shaft) or bearing. Forcing in the load by driving it with a hammer, etc., may break the bearing. Do not apply any excessive force to the output shaft.
- Do not modify or machine the motor (gearhead) output shaft. The bearing may be damaged or motor (gearhead) may break.

■ Output shaft shape

- Combination type parallel shaft gearhead

A key slot is provided on the output shaft of each combination type parallel shaft gearhead. Form a key slot on the load side and secure the load using the supplied parallel key.

- Round shaft type

A flat section is provided on the motor output shaft of each round shaft type. Apply a double-point screw, etc., at the flat section to firmly secure the load and prevent it from spinning.

■ How to install a load

- Using a coupling

Align the centerline of the motor (gearhead) output shaft with the centerline of the load shaft.

- Using a belt

Adjust the motor (gearhead) output shaft to lie parallel with the load shaft and form right angles between the output shaft/load shaft and the line connecting the centers of both pulleys.

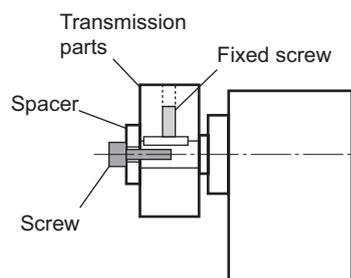
- Using a gear

Adjust the motor (gearhead) output shaft to lie parallel with the gear shaft and allow the output shaft to mesh correctly with the centers of the gear teeth.

- When using the output axis tip screw hole of a gearhead

Use a screw hole provided at the tip of the output shaft as an auxiliary means for preventing the transfer mechanism from disengaging. (GFS2G type have no output shaft tip screw hole.)

Gearhead model name	Output shaft tip screw hole
GFS4G	M5, Effective depth 10 mm (0.39 in.)
GFS5G	M6, Effective depth 12 mm (0.47 in.)



1.7 Installing a load to the combination type hollow shaft flat gearhead

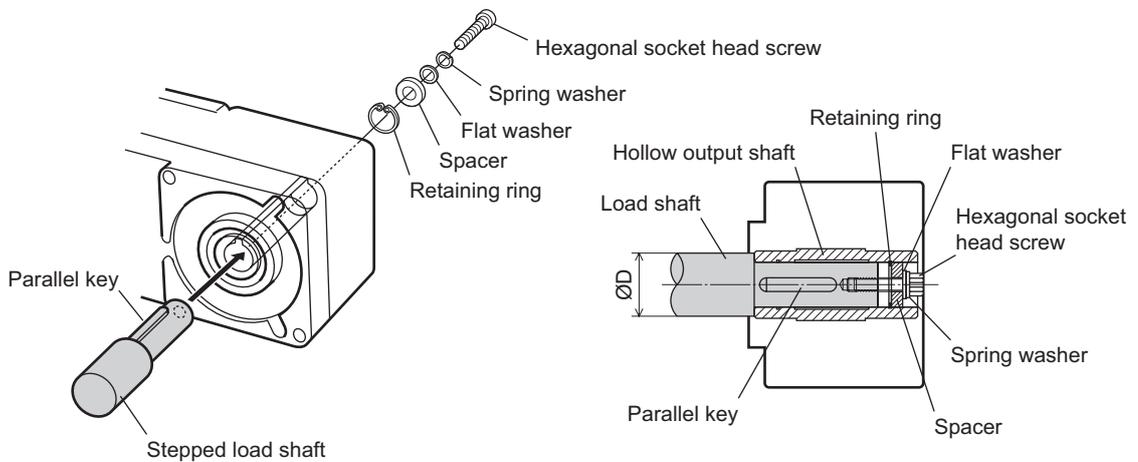
If the motor is subject to a strong impact upon instantaneous stop or receives a large overhung load, use a stepped load shaft.

- Note**
- Apply grease (molybdenum disulfide grease, etc.) on the surface of the load shaft and inner walls of the hollow output shaft to prevent seizure.
 - When installing a load, do not damage the hollow output shaft or bearing of the gearhead. Forcing in the load by driving it with a hammer, etc. may break the bearing. Do not apply any excessive force to the hollow output shaft.
 - Do not modify or machine the hollow output shaft of the gearhead. Doing so may damage the bearings and destroy the gearhead.

■ Stepped load shaft

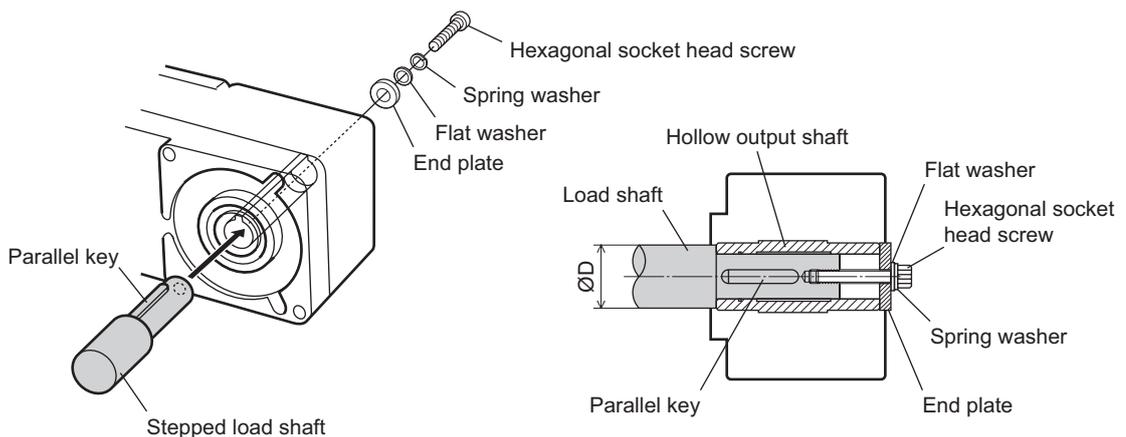
- Mounting method using retaining ring

Secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



- Mounting method using end plate

Secure the end plate to the load shaft by tightening the hexagonal socket head screw over a flat washer and spring washer.



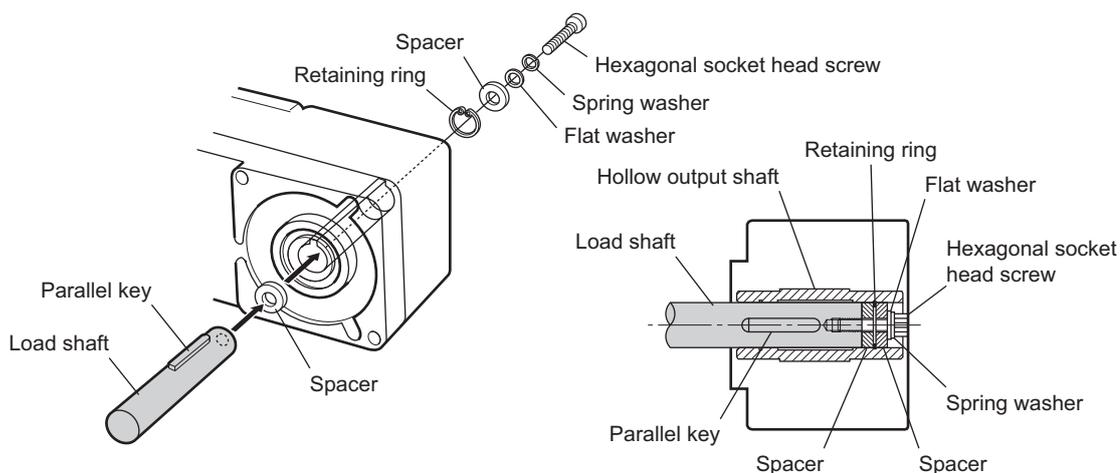
- Note** The safety cover (supplied) cannot be attached due to contact between the safety cover and hexagonal socket head screw. Take safety measures against rotating part.

• Recommended load shaft installation dimensions [Unit: mm (in.)]

Model	Inner diameter of hollow shaft (H8)	Recommended diameter of load shaft (h7)	Nominal diameter of retaining ring	Applicable screw	Spacer thickness	Outer diameter of stepped shaft (ØD)
BLE23	$\begin{matrix} \text{Ø}12 & +0.027 \\ & 0 \\ (\text{Ø}0.4724 & +0.0011 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}12 & 0 \\ & -0.018 \\ (\text{Ø}0.4724 & 0 \\ & -0.0007) \end{matrix}$	Ø12 (Ø0.47)	M4	3 (0.12)	20 (0.79)
BLE46	$\begin{matrix} \text{Ø}15 & +0.027 \\ & 0 \\ (\text{Ø}0.5906 & +0.0011 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}15 & 0 \\ & -0.018 \\ (\text{Ø}0.5906 & 0 \\ & -0.0007) \end{matrix}$	Ø15 (Ø0.59)	M5	4 (0.16)	25 (0.98)
BLE512	$\begin{matrix} \text{Ø}20 & +0.033 \\ & 0 \\ (\text{Ø}0.7874 & +0.0013 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}20 & 0 \\ & -0.021 \\ (\text{Ø}0.7874 & 0 \\ & -0.0008) \end{matrix}$	Ø20 (Ø0.79)	M6	5 (0.20)	30 (1.18)

■ Non-stepped load shaft

Install a spacer on the load shaft side and secure the retaining ring to the load shaft by tightening the hexagonal socket head screw over a spacer, flat washer and spring washer.



Recommended load shaft installation dimensions [Unit: mm (in.)]

Model	Inner diameter of hollow shaft (H8)	Recommended diameter of load shaft (h7)	Nominal diameter of retaining ring	Applicable screw	Spacer thickness
BLE23	$\begin{matrix} \text{Ø}12 & +0.027 \\ & 0 \\ (\text{Ø}0.4724 & +0.0011 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}12 & 0 \\ & -0.018 \\ (\text{Ø}0.4724 & 0 \\ & -0.0007) \end{matrix}$	Ø12 (Ø0.47)	M4	3 (0.12)
BLE46	$\begin{matrix} \text{Ø}15 & +0.027 \\ & 0 \\ (\text{Ø}0.5906 & +0.0011 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}15 & 0 \\ & -0.018 \\ (\text{Ø}0.5906 & 0 \\ & -0.0007) \end{matrix}$	Ø15 (Ø0.59)	M5	4 (0.16)
BLE512	$\begin{matrix} \text{Ø}20 & +0.033 \\ & 0 \\ (\text{Ø}0.7874 & +0.0013 \\ & 0) \end{matrix}$	$\begin{matrix} \text{Ø}20 & 0 \\ & -0.021 \\ (\text{Ø}0.7874 & 0 \\ & -0.0008) \end{matrix}$	Ø20 (Ø0.79)	M6	5 (0.20)

1.8 Permissible radial load and permissible axial load

Make sure the radial load and axial load received by the motor (gearhead) output shaft will not exceed the allowable values shown in the table below.

Note If the radial load or axial load exceeds the specified allowable value, repeated load applications may cause the bearing or output shaft of the motor (gearhead) to undergo a fatigue failure.

■ Combination type parallel shaft gearhead

Model	Gear ratio	Distance from tip of gearhead output shaft and permissible radial load [N (lb.)] *		Permissible axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
BLE23	5	100 (22) [90 (20)]	150 (33) [110 (24)]	40 (9)
	10 to 20	150 (33) [130 (29)]	200 (45) [170 (38)]	
	30 to 200	200 (45) [180 (40)]	300 (67) [230 (51)]	
BLE46	5	200 (45) [180 (40)]	250 (56) [220 (49)]	100 (22)
	10 to 20	300 (67) [270 (60)]	350 (78) [330 (74)]	
	30 to 200	450 (101) [420 (94)]	550 (123) [500 (112)]	
BLE512	5	300 (67) [230 (51)]	400 (90) [300 (67)]	150 (33)
	10 to 20	400 (90) [370 (83)]	500 (112) [430 (96)]	
	30 to 200	500 (112) [450 (101)]	650 (146) [550 (123)]	

* The values assume a rated speed of 3000 r/min or below. The values in [] are based on a rated speed of 4000 r/min.

■ Combination type hollow shaft flat gearhead

Model	Gear ratio	Distance from gearhead mounting surface and permissible radial load [N (lb.)] *		Permissible axial load [N (lb.)]
		10 mm (0.39 in.)	20 mm (0.79 in.)	
BLE23	5, 10	450 (101) [410 (92)]	370 (83) [330 (74)]	200 (45)
	15 to 200	500 (112) [460 (103)]	400 (90) [370 (83)]	
BLE46	5, 10	800 (180) [730 (164)]	660 (148) [600 (135)]	400 (90)
	15 to 200	1200 (270) [1100 (240)]	1000 (220) [910 (200)]	
BLE512	5, 10	900 (200) [820 (184)]	770 (173) [700 (157)]	500 (112)
	15, 20	1300 (290) [1200 (270)]	1110 (240) [1020 (220)]	
	30 to 200	1500 (330) [1400 (310)]	1280 (280) [1200 (270)]	

* The values assume a rated speed of 3000 r/min or below. The values in [] are based on a rated speed of 4000 r/min.

■ Round shaft type

Model	Distance from tip of motor output shaft and permissible radial load [N (lb.)]		Permissible axial load [N (lb.)]
	10 mm (0.39 in.)	20 mm (0.79 in.)	
BLE23	80 (18)	100 (22)	Not to exceed one-half the motor's dead weight *
BLE46	110 (24)	130 (29)	
BLE512	150 (33)	170 (38)	

* Minimize the axial load. If a thrust load must be applied, do not let it exceed one-half the motor's mass.

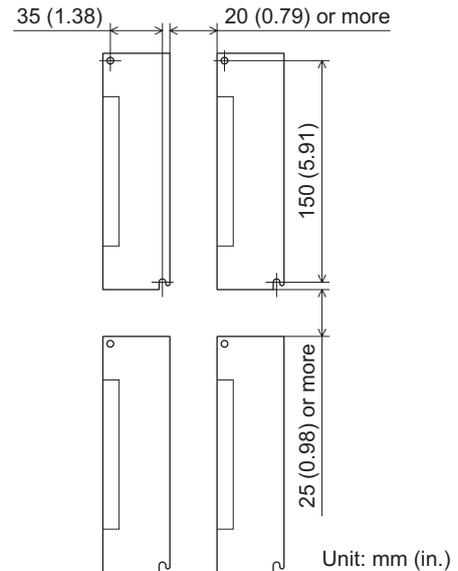
1.9 Installing the driver

The driver is designed so that heat is dissipated via air convection and conduction through the enclosure. Install the driver to a flat metal plate offering excellent vibration resistance.

When two or more drivers are to be installed side by side, provide 20 mm (0.79 in.) and 25 mm (0.98 in.) clearances in the horizontal and vertical directions, respectively.

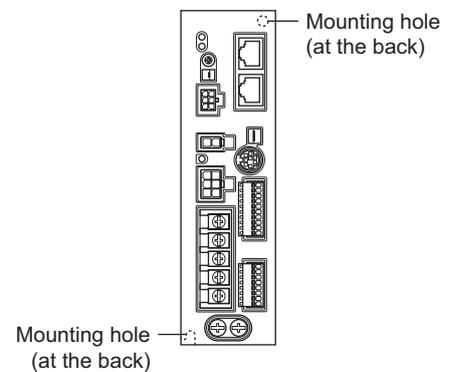
Note

- Install the driver in an enclosure whose pollution degree is 2 or above or protection class is IP54 or better.
- Be sure to install the driver vertically (in vertical position) shown in the figure. Do not block the radiation openings.
- Do not install any equipment that generates a large amount of heat or noise near the driver.
- If the ambient temperature of the driver exceeds 50 °C (122 °F), revise the ventilation condition or force-cool the area around the driver using a fan.



■ Installing with screws

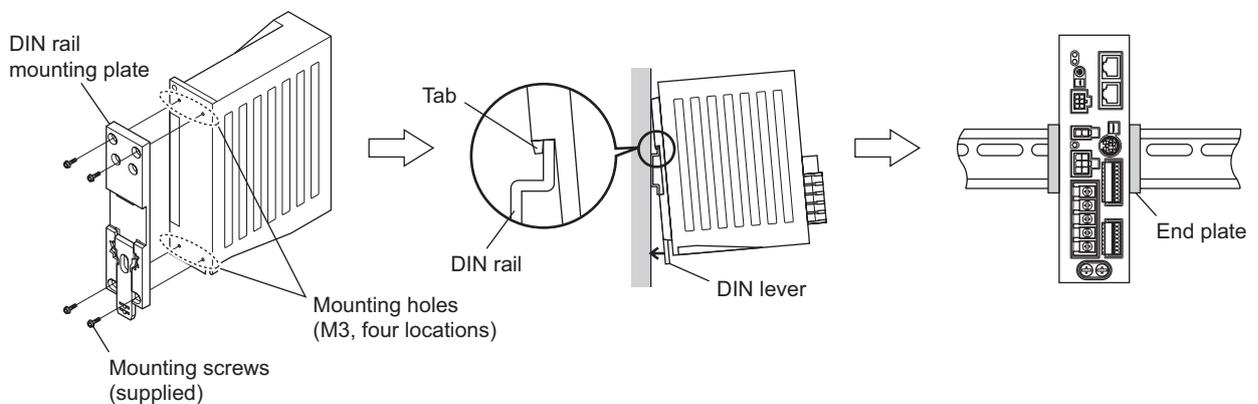
Install the driver vertically (in vertical position) and secure the driver through the mounting holes using two screws (M4: not supplied).



■ Mounting to DIN rail

When mounting the driver to a DIN rail, use a separately sold DIN rail mounting plate (model number: **PADP03**) and attach it to a 35 mm (1.38 in.) wide DIN rail.

1. Attach the DIN rail mounting plate to the back of the driver using the screws supplied with the plate.
Tightening torque: 0.3 to 0.4 N·m (2.6 to 3.5 lb-in)
2. Pull the DIN lever down, engage the upper tab of the DIN rail mounting plate over the DIN rail, and push the DIN lever until it locks in place.
3. Fix the driver with the end plate (not supplied).

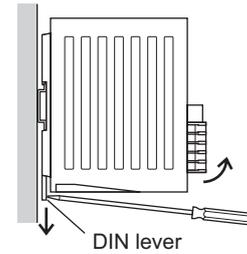


Note

- Do not use the mounting holes for the DIN rail mounting plate for any purpose other than securing the DIN rail mounting plate.
- Be sure to use the supplied screws when securing the DIN rail mounting plate. The use of screws that would penetrate 3 mm (0.12 in.) or more through the surface of the driver may cause damage to the driver.

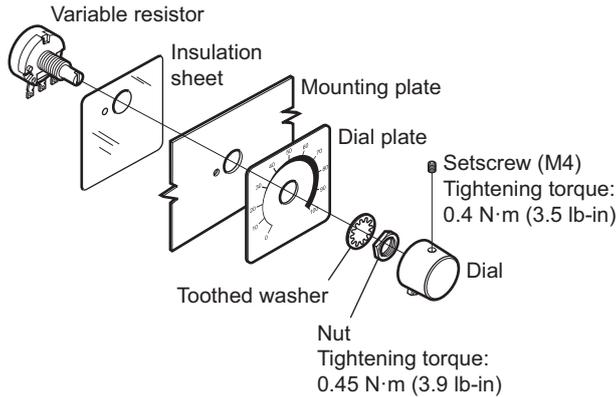
■ Removing from DIN rail

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

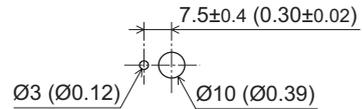


1.10 Installing the external potentiometer (supplied)

Install the external potentiometer as shown below.

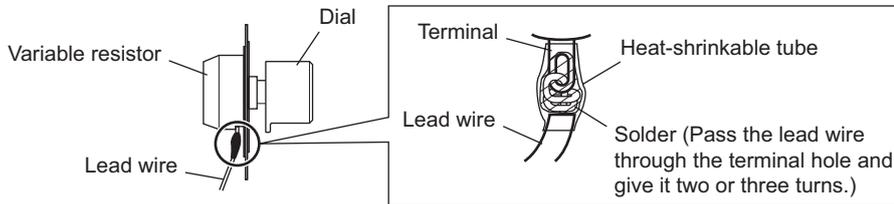


• Reference mounting hole dimensions
[Unit: mm (in.)]



Soldering the variable resistor terminal and the lead wires

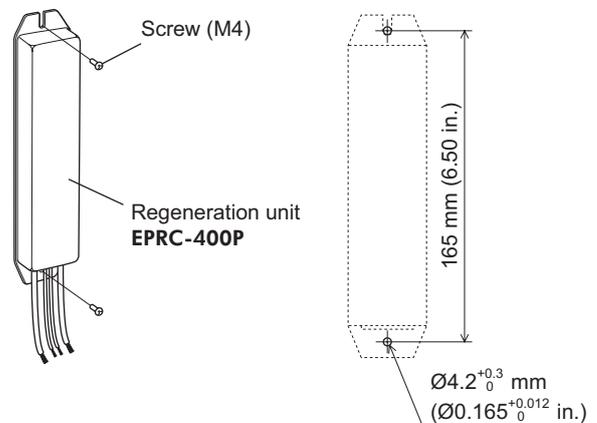
Cover a heat-shrinkable tube over the soldered part to insulate.
Soldering condition: 235 °C (455 °F), less than 5 sec.



1.11 Installing the regeneration unit (accessory)

Install the regeneration unit **EPRC-400P** in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured. Secure it on a smooth metal plate offering high heat conductivity, using two screws (M4, not supplied).

• Mounting hole dimension



1.12 Installing and wiring in compliance with EMC Directive

The **BLE** Series is designed and manufactured for use as a component to be installed inside equipment. The EMC Directives require that your mechanical equipment in which the **BLE** Series is installed satisfy the applicable requirements.

The installation/wiring methods of the motor and driver explained here represent the basic methods that are effective in helping your mechanical equipment conform to the EMC Directives.

The final level of conformance of your mechanical equipment to the EMC Directives will vary depending on the control system equipment used with the motor/driver, configuration of electrical parts, wiring, layout, hazard level, and the like. Therefore, you must conduct the EMC tests on your mechanical equipment to confirm compliance.

Applicable Standards

EMI	Emission Tests	EN 61000-6-4, EN 61800-3 C3
	Harmonics Current Test	EN 61000-3-2
	Voltage Fluctuations Test	EN 61000-3-3
EMS	Immunity Tests	EN 61000-6-2, EN 61800-3 C3

Without effective measures to suppress the electromagnetic interference (EMI) caused by the **BLE** Series in the surrounding control system equipment or the electromagnetic spectrum (EMS) generated by the **BLE** Series, the function of your mechanical equipment may be seriously affected.

The **BLE** Series will conform to the EMC Directives if installed/wired using the methods specified below.

■ Connecting a mains filter

Install a mains filter in the power line in order to prevent the noise generated within the driver from propagating outside via the AC input line. For mains filters, use the product as shown below, or an equivalent.

Manufacturer	Single-phase 100-120 V Single-phase 200-240 V	Three-phase 200-240 V
SOSHIN ELECTRIC CO.,LTD	HF2010A-UPF	HF3010C-SZA

- Overvoltage category II applies to the mains filter.
- Install the mains filter as close to the driver as possible.
- Use cable clamps and other means to secure the input and output cables firmly to the surface of the enclosure.
- Connect the ground terminal of the mains filter to the grounding point, using as thick and short a wire as possible.
- Do not place the AC input cable (AWG18 to 14: 0.75 to 2.0 mm²) parallel with the mains-filter output cable (AWG18 to 14: 0.75 to 2.0 mm²). Parallel placement will reduce mains filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ Connecting the AC power line reactor

When inputting single-phase 200-240 V, insert a reactor (5 A, 5 mH) in the AC power line to ensure compliance with EN 61000-3-2.

■ Connecting the external power supply

Use an external power supply conforming to the EMC Directive. Use a shielded cable for wiring and wire/ground the external power supply over the shortest possible distance. Refer to "Wiring the power supply cable" for how to ground the shielded cable.

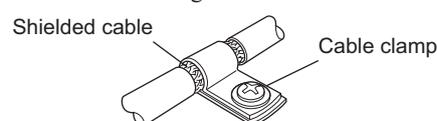
■ Grounding procedure

The cable used to ground the motor, driver, mains filter and power supply cable (shielded cable) must be as thick and short to the grounding point as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point. Refer to the page 36 for the recommended grounding method.

■ Wiring the power supply cable

Use a shielded cable of AWG18 to 14 (0.75 to 2.0 mm²) in diameter for the driver power supply cable and keep it as short as possible. Strip a part of the shielded cable and ground the stripped part using a metal cable clamp that contacts the stripped cable around its entire circumference, or use a drain wire to make the ground connection.

When grounding the shielded cable, connect both ends (mains filter side and power supply side) to earth to prevent a potential difference from generating in the shielded cable.

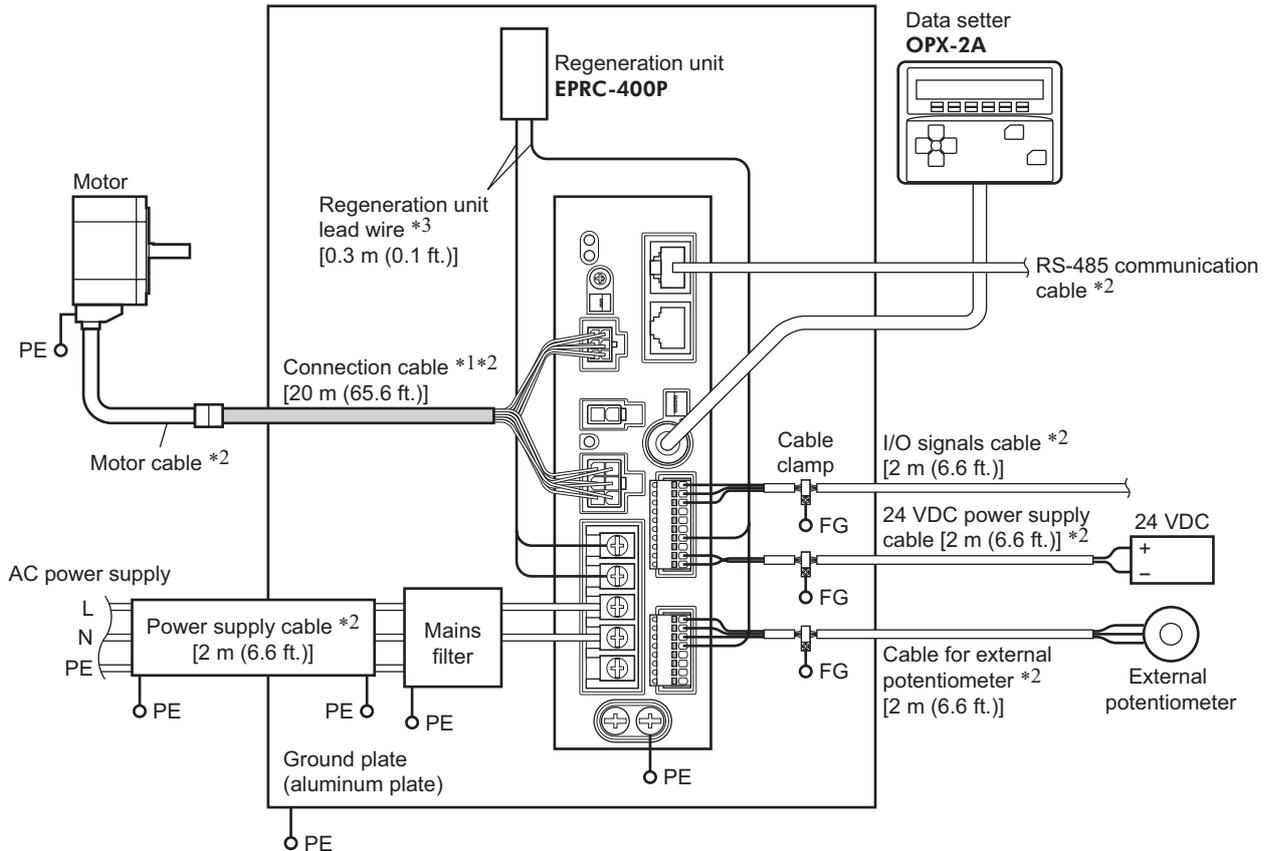


■ Notes about installation and wiring

- Connect the motor/driver and other peripheral control equipment directly to the grounding point so as to prevent a potential difference from developing between grounds.
- When relays or electromagnetic switches are used together with the system, use mains filters and CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Wire the power lines such as the motor cable and power cable away from the signal cables by providing a minimum clearance of 100 mm (3.94 in.) between them. If they must cross, do so at a right angle. Place the AC input cable and output cable of a mains filter separately from each other.
- Use a connection cable (supplied or accessory) when extending the wiring distance between the motor and driver. The EMC measures are conducted using the Oriental Motor connection cable.

■ Example of motor and driver installation and wiring

Illustration shows the standard type.



*1 Performance has been evaluated based on connection cable lengths of up to 20 m (65.6 ft.). You can connect up to three connection cables.

*2 Shielded cable

*3 Unshielded cable

■ Precautions about static electricity

Static electricity may cause the driver to malfunction or become damaged. Do not come close to or touch the driver while the power is on except when operating the switch of the front of driver.

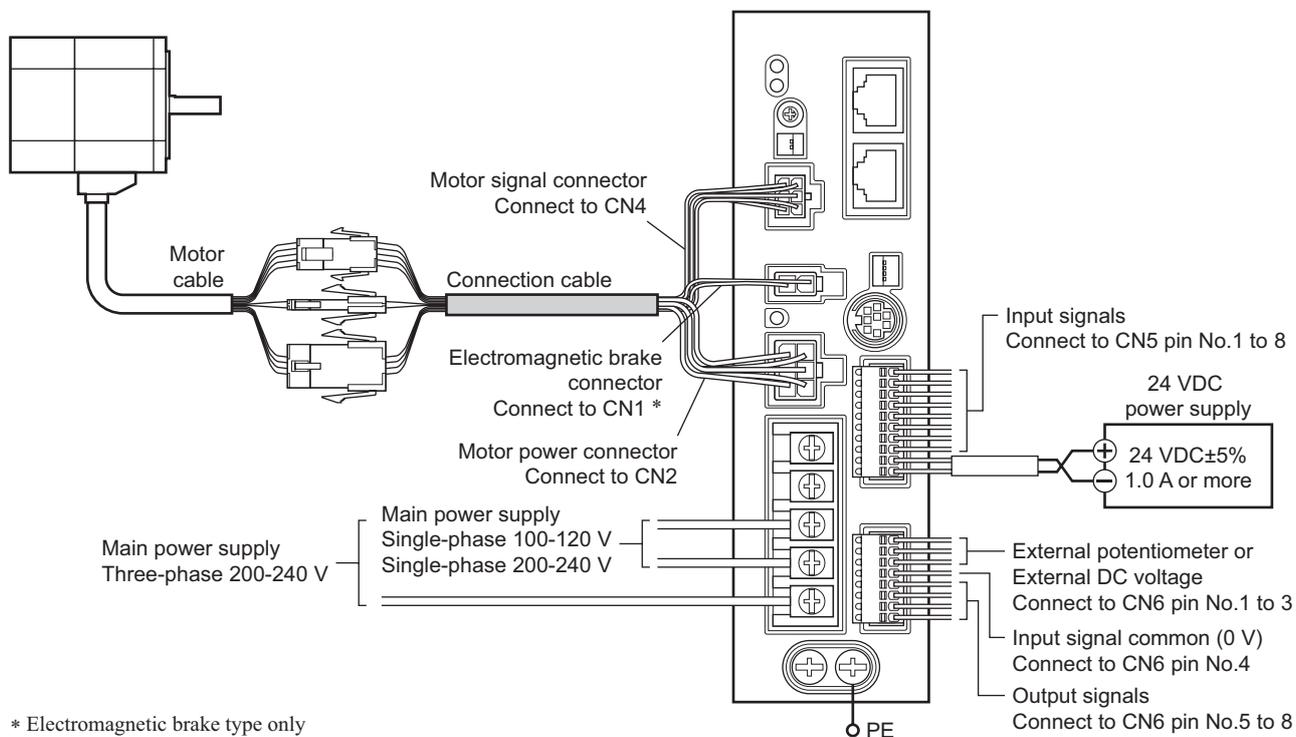
To change the settings of driver switches, be sure to use an insulated screwdriver.

2 Connection

This chapter explains how to connect the driver and motor, I/O signals, and power supply, as well as the grounding method.

2.1 Connection example

The following figure is a connection example when an electromagnetic brake motor is used.



* Electromagnetic brake type only

Note

- Have the connector plugged in securely. Insecure connections may cause malfunction or damage to the motor or driver.
- When unplugging the connector, do so while pressing the latches on the connector.
- When cycle the power or plugging/unplugging the connector, turn off the power and wait for the CHARGE LED to turn off before doing so. Residual voltage may cause electric shock.
- Do not wire the power supply cable of the driver in the same cable duct with other power lines or motor cables. Doing so may cause malfunction due to noise.
- When installing the motor to a moving part, use an accessory flexible cable offering excellent flexibility. For the flexible motor cable, refer to page 184.

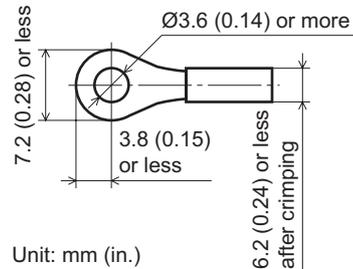
2.2 Connecting the power supply

Connect the power cable to the main power supply input terminals (TB1) on the driver.
The product does not come with a power cable. It must be supplied by the user.

Power supply input	Connecting method
Single-phase 100-120 V	Connect the live side to terminal L, and the neutral side to terminal N.
Single-phase 200-240 V	Connect the live side to terminal L1, and the neutral side to terminal L2.
Three-phase 200-240 V	Connect the R, S and T phase lines to the L1, L2 and L3 terminals, respectively.

Power connection terminal and cable

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M3.5
- Tightening torque: 1.0 N·m (8.8 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)
- Temperature rating of lead wire: 60 °C, 60 or 75 °C, or 75 °C (140 °F, 140 or 167 °F, or 167 °F)
- Conductive material: Use only copper wire.



■ Circuit breaker

Be sure to connect a circuit breaker to the power line of the driver to protect the primary circuit.

- Rated current of protective device: Single-phase input 10 A, three-phase input 5 A
- Circuit breaker: Mitsubishi Electric Corporation NF30

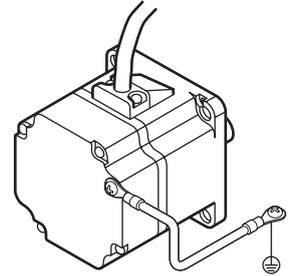
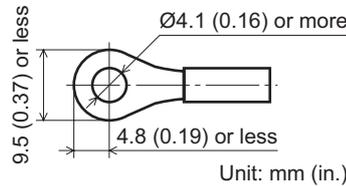
2.3 Grounding

■ Grounding the motor

Connect the Protective Earth Terminal on the motor to the ground near the motor.
Minimize the wiring length of the ground cable.

Ground terminal and cable

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Thread size of terminal: M4
- Tightening torque: 0.8 to 1.0 N·m (7.0 to 8.8 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)



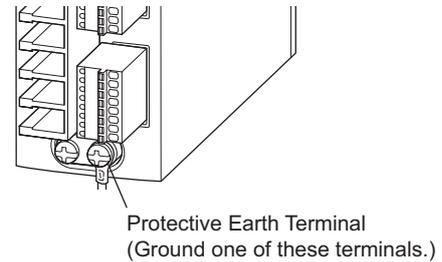
■ Grounding the driver

Be sure to ground the Protective Earth Terminal (screw size: M4) of the driver.

- Applicable crimp terminal: Round crimp terminal with insulation cover
- Tightening torque: 1.2 N·m (10.6 lb-in)
- Applicable lead wire: AWG18 to 14 (0.75 to 2.0 mm²)

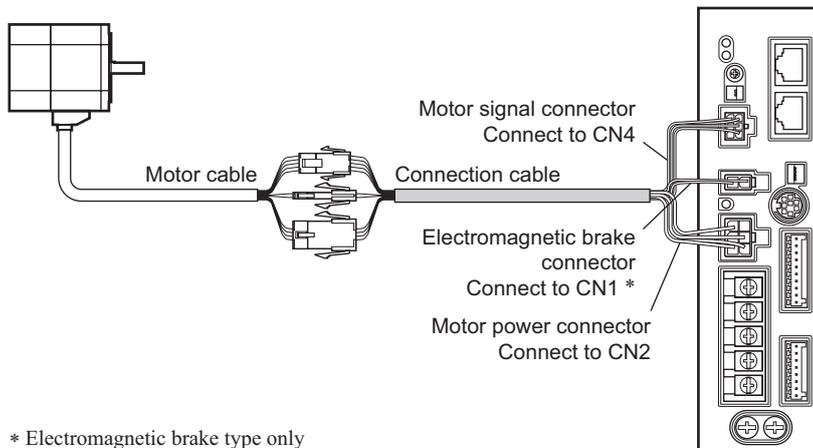
Either of the two Protective Earth Terminals can be used for grounding the driver. The terminal that is not grounded can be used as a spare terminal. Use the spare terminal according to your specific need, such as connecting it to the motor in order to ground the motor.

Do not share the Protective Earth Terminal with a welder or any other power equipment. When grounding the Protective Earth Terminal, secure the grounding point near the driver.



2.4 Connecting the motor and driver

Connect the motor power connector to the CN2, and the motor signal connector to the CN4 on the driver. When using an electromagnetic brake type motor, also connect the electromagnetic brake connector to the CN1. When extending the connection distance between the motor and driver, use the connection cable (supplied or accessory).

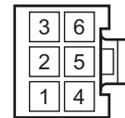


* Electromagnetic brake type only

Note Have the connector plugged in securely. Insecure connector connection may cause malfunction or damage to the motor or driver.

- Pin assignment of motor power connector

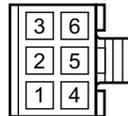
Pin No.	Color	Lead size
1	Blue	AWG18
2	-	-
3	-	Drain (AWG24 or equivalent)
4	Purple	AWG18
5	Gray	-
6	-	-



Housing: 5557-06R-210 (Molex)
Terminal: 5556T (Molex)

- Pin assignment of motor signal connector

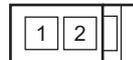
Pin No.	Color	Lead size
1	-	-
2	Green	AWG26
3	Yellow	
4	Brown	
5	Red	
6	Orange	



Housing: 43025-0600 (Molex)
Terminal: 43030-0004 (Molex)

- Pin assignment of electromagnetic brake connector

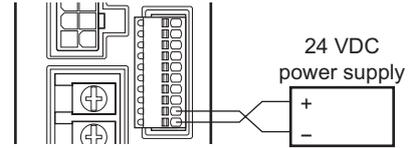
Pin No.	Color	Lead size
1	Black	AWG24
2	White	



Housing: 5557-02R-210 (Molex)
Terminal: 5556T (Molex)

2.5 Connecting the 24 VDC power supply

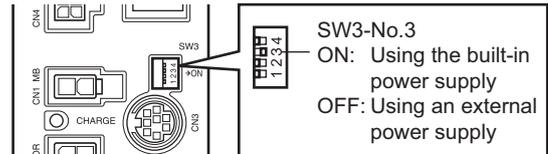
The 24 VDC power supply is for the control circuit of the driver. Be sure to connect a power supply which voltage is 24 VDC -15% to $+20\%$ and current is 1 A or more, to the CN5.



- Note**
- When connecting the 24 VDC power supply, check the indication of the driver case and pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the driver.
 - When cycling the 24 VDC power, turn off the power and wait for the PWR/ALM LED to turn off.

2.6 Selecting the input signal power supply

Select the input signal power supply (built-in power supply or external power supply) to be used. The driver comes with a built-in power supply. To control the operation using relays and switches, set the SW3-No.3 of the function setting switch1 to the ON side to select the built-in power supply.



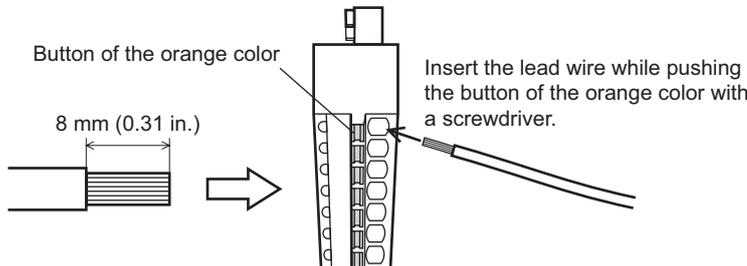
Factory setting: OFF (an external power supply is used)

- Note**
- The built-in power supply cannot be used with the source logic. If the source logic is used, do not turn the external voltage selector switch to the ON side.

2.7 Connecting the I/O signals

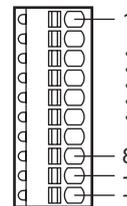
Connect the input signals to the CN5, and connect the analog external speed setting input signals and output signals to the CN6.

- Applicable lead wire: AWG26 to 20 (0.14 to 0.5 mm²)
- Length of the insulation cover which can be peeled: 8 mm (0.31 in.)



■ CN5 pin assignment

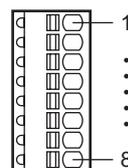
Pin No	Name	Description *
1	IN0	Input terminal 0 [FWD]
2	IN1	Input terminal 1 [REV]
3	IN2	Input terminal 2 [STOP-MODE]
4	IN3	Input terminal 3 [M0]
5	IN4	Input terminal 4 [ALARM-RESET]
6	IN5	Input terminal 5 [MB-FREE]
7	IN6	Input terminal 6 [TH]
8	IN-COM0	Input signal common
-	-	Power supply GND/ Input signal common (0 V)
+	-	24 VDC power supply



* The signal in brackets [] is a function that is assigned at the time of shipment. The assignments can be changed using the **OPX-2A** or **MEXE02**, or via RS-485 communication.

■ CN6 pin assignment

Pin No	Name	Description *2
1	VH	Analog external speed setting input
2	VM	
3	VL *1	
4	IN-COM1	Input signal common (0 V)
5	OUT0+	Output terminal 0 (+) [SPEED-OUT]
6	OUT0-	Output terminal 0 (-) [SPEED-OUT]
7	OUT1+	Output terminal 1 (+) [ALARM-OUT1]
8	OUT1-	Output terminal 1 (-) [ALARM-OUT1]

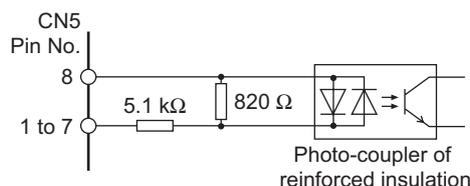


*1 The VL input is connected to IN-COM1 inside the driver.

*2 The signal in brackets [] is a function that is assigned at the time of shipment. The assignments can be changed using the **OPX-2A** or **MEXE02**, or via RS-485 communication.

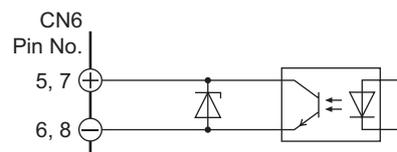
■ Input signal circuit

All input signals of the driver are photocoupler inputs.
When an external power supply is used: 24 VDC -15 to $+20\%$,
100 mA or more



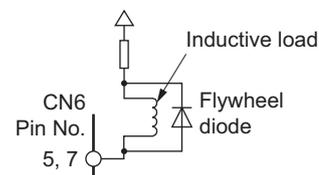
■ Output signal circuit

All output signals of the driver are photocoupler/open-collector outputs. The ON voltage of the output circuit is 1.6 VDC maximum.
When driving each element using the output signal circuit, give consideration to this ON voltage.
4.5 to 30 VDC, 40 mA or less (For the SPEED-OUT output, supply at least 5 mA of current.)



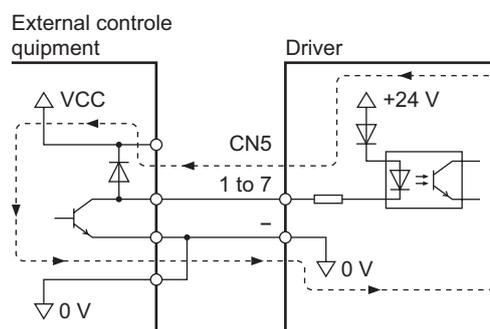
Note

- Always connect a current-limiting resistor. If the power supply voltage is connected to the output circuit directly without connecting a current-limiting resistor in between, the driver will be damaged.
- When connecting a relay (inductive load), etc., to detect alarm outputs, use a relay with built-in flywheel diode, or provide a fly-back voltage control measure based on diode, etc., for the inductive load.



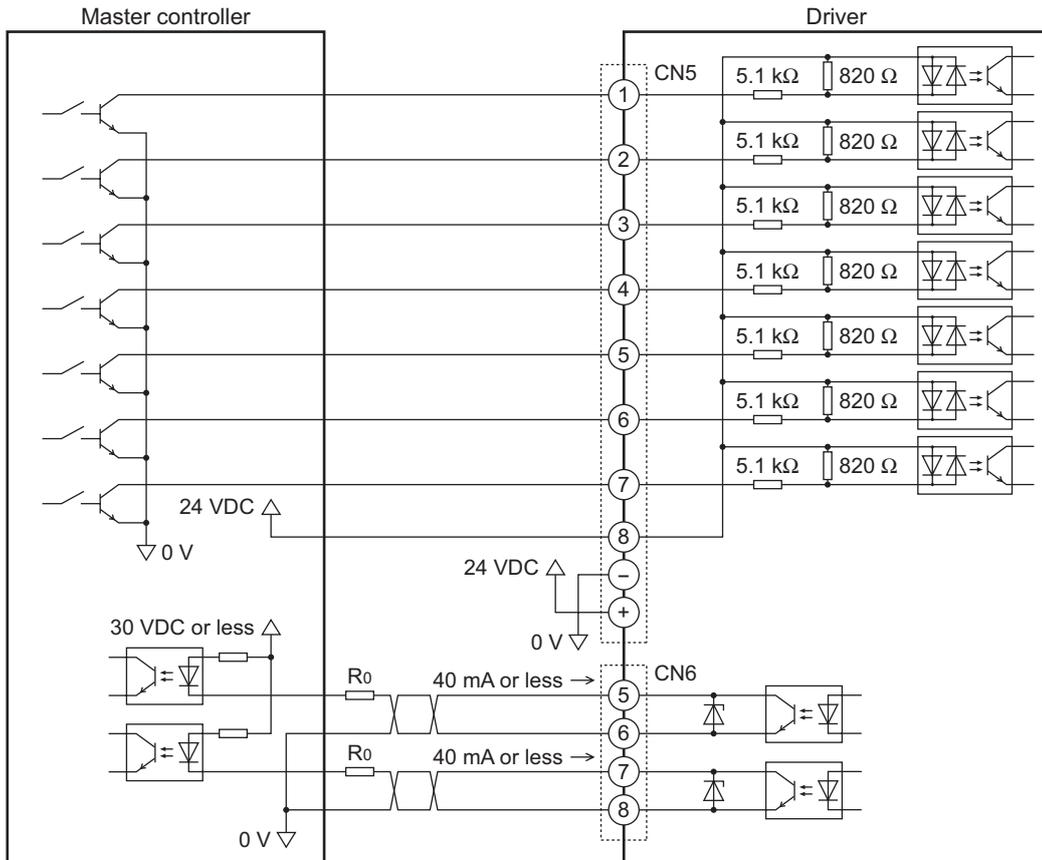
■ Using a controller with a built-in clamp diode

If a controller with a built-in clamp diode is used, a leakage path may form and cause the motor to operate even when the controller power is off, as long as the driver power is on. Since the power capacity of the controller is different from that of the driver, the motor may operate when the controller and driver powers are turned on or off simultaneously.
When powering down, turn off the driver power first, followed by the controller power. When powering up, turn on the controller power first, followed by the driver power.



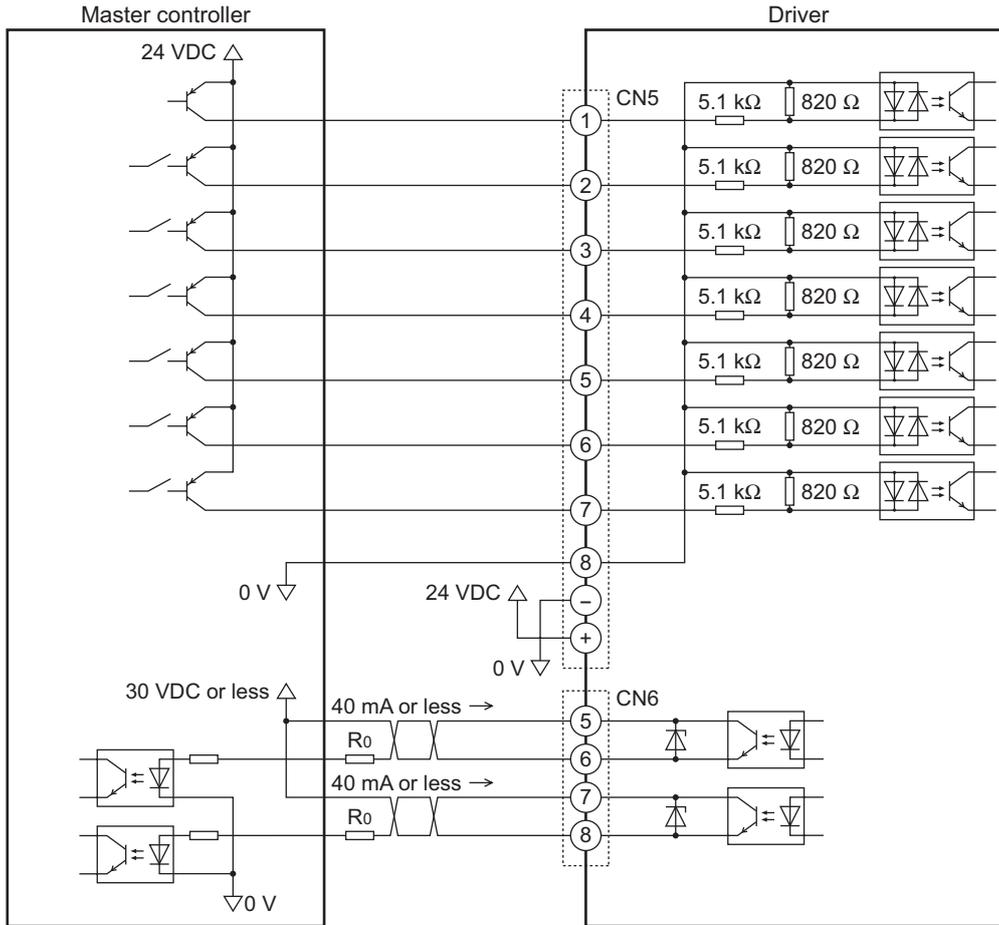
■ Connection example with I/O signal circuit

- Sink logic circuit



- Note**
- Keep the output signal to 30 VDC or less.
 - Be sure to connect the current-limiting resistor R0 and keep the current to 40 mA or less.

• Source logic circuit



- Note**
- Keep the output signal to 30 VDC or less.
 - Be sure to connect the current-limiting resistor R0 and keep the current to 40 mA or less.

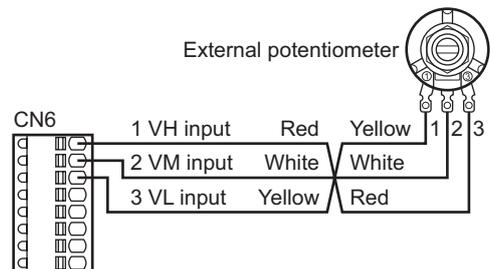
2.8 Connecting an external speed setter

The rotation speed can be set using an external potentiometer (supplied) or external DC voltage. Refer to page 70 for setting method.

• Using an external potentiometer

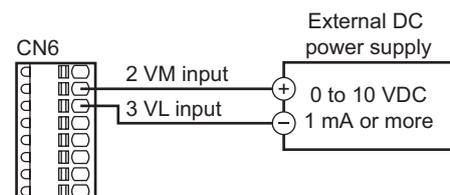
Connect the supplied external potentiometer to the pin Nos. 1 to 3 of CN6 of the driver. Use the supplied signal wire for this connection.

Connect the shield wire of the signal wire to the VL input terminal. Make sure the shield wire does not contact other terminals.



• Using an external DC voltage

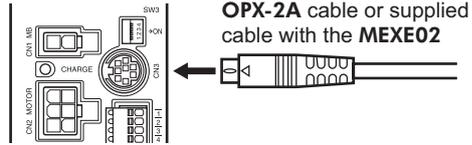
For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver. The input impedance between the VM input and VL input is approximately 30 kΩ. The VL input is connected to IN-COM1 inside the driver.



- Note**
- Be sure to set the external DC voltage to 10 VDC or less. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

2.9 Connecting the data setter

Connect **OPX-2A** cable or supplied cable with the **MEXE02** to CN3 on the driver.



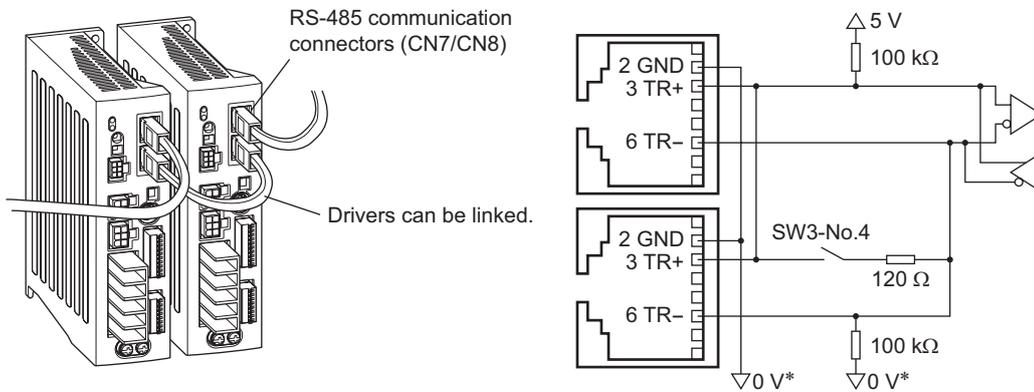
⚠ Caution

The data edit connector (CN3), I/O signal connectors (CN5/CN6) and RS-485 communication connectors (CN7/CN8) are not 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 these equipment and driver to short, damaging both.

2.10 Connecting the RS-485 communication cable

Connect this cable when controlling the product via RS-485 communication. Connect the RS-485 communication cable to the CN7 or CN8 on the driver.

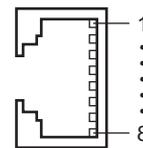
The vacant connector can be used to connect a different driver. A driver link cable is available as an accessory (sold separately). See page 184. A commercial LAN cable can be also used to link drivers.



* The GND line is used in common with 24 VDC power supply input terminal (CN5).

CN7/CN8 pin assignment

Pin No	Name	Description
1	N.C.	Not used
2	GND	GND
3	TR+	RS-485 communication signal (+)
4	N.C.	Not used
5	N.C.	
6	TR-	RS-485 communication signal (-)
7	N.C.	Not used
8	N.C.	



2.11 Test operation

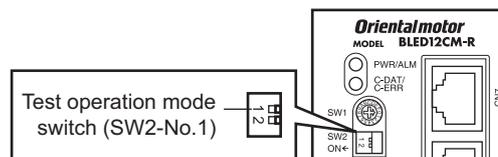
Once a main power supply and 24 VDC power supply are connected, the connection status can be checked by driving the motor tentatively without setting the data.

1. Turn on the main power supply and 24 VDC power supply after completing the wiring.
2. Turn the test operation mode switch (SW2-No.1) ON.
3. Check that the motor rotates at low speed (100 r/min) in the forward direction.

If the motor did not rotate or malfunction could be seen, check the wiring after turning off the power.

(If the rotation direction has been changed by the **OPX-2A** or **MEXE02**, or via RS-485 communication, the motor rotates according to the setting.)

4. Turn the test operation mode switch OFF.
The motor stops.



Note If the FWD input or REV input is turned ON while the motor rotates in test operation, the motor will stop. (A warning or alarm signal is not output.) To reset this condition, turn all of test operation mode switch, FWD input and REV input OFF. The motor will be able to operate after turning all of them OFF.

2.12 Connecting the regeneration unit

If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect the regeneration unit **EPRC-400P**.

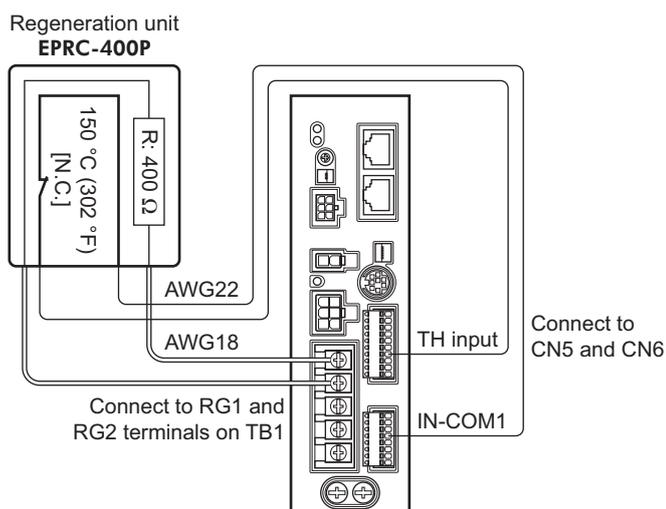
Install the regeneration unit in a location where heat dissipation capacity equivalent to a level achieved with a heat sink [made of aluminum, 350×350×3 mm (13.78×13.78×0.12 in.)] is ensured.

■ Connecting method

The wiring of the regeneration unit to the driver I/O terminals varies depending on the connecting methods. Refer to page 45 for connecting method.

Connect the regeneration unit before turning on the main power and 24 VDC power. The regeneration unit does not perform its control function if connected after the main power and 24 VDC power has been turned on.

- Regenerative current flows through the two thick lead wires (AWG18: 0.75 mm²) of the regeneration unit. Connect them to the RG1 and RG2 terminals of the TB1. The applicable crimp terminal is the same as the one used to connect the power supply. Refer to page 36.
- The two thin lead wires (AWG22: 0.3 mm²) of the regeneration unit are thermostat outputs. Connect them to CN5 and CN6. Refer to page 38 for connecting method.



Note If the current consumption of the regeneration unit exceeds the allowable level, the thermostat will be triggered and a regeneration unit overheat alarm will generate. If a regeneration unit overheat alarm generates, turn off the power and check the content of the error.

■ Regeneration unit specifications

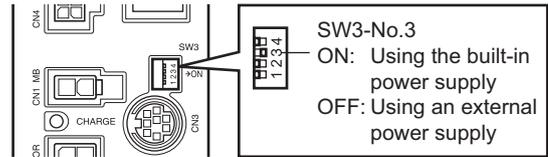
Model	EPRC-400P
Continuous regenerative power	100 W
Resistance	400 Ω
Operating temperature of thermostat	Operation: Opens at 150 ± 7 °C (302 ± 45 °F) Reset: Closes at 145 ± 12 °C (293 ± 54 °F) (normally closed)
Electrical rating of thermostat	120 VAC 4 A, 30 VDC 4 A (minimum current: 5 mA)

2.13 Connection diagram (example)

Each connection diagram (example) is for the electromagnetic brake type. In the case of the standard type, there are no connection for the electromagnetic brake and no connection/input for the MB-FREE input signal.

To use the built-in power supply, set the SW3-No.3 of the function setting switch switch1 to the ON side.

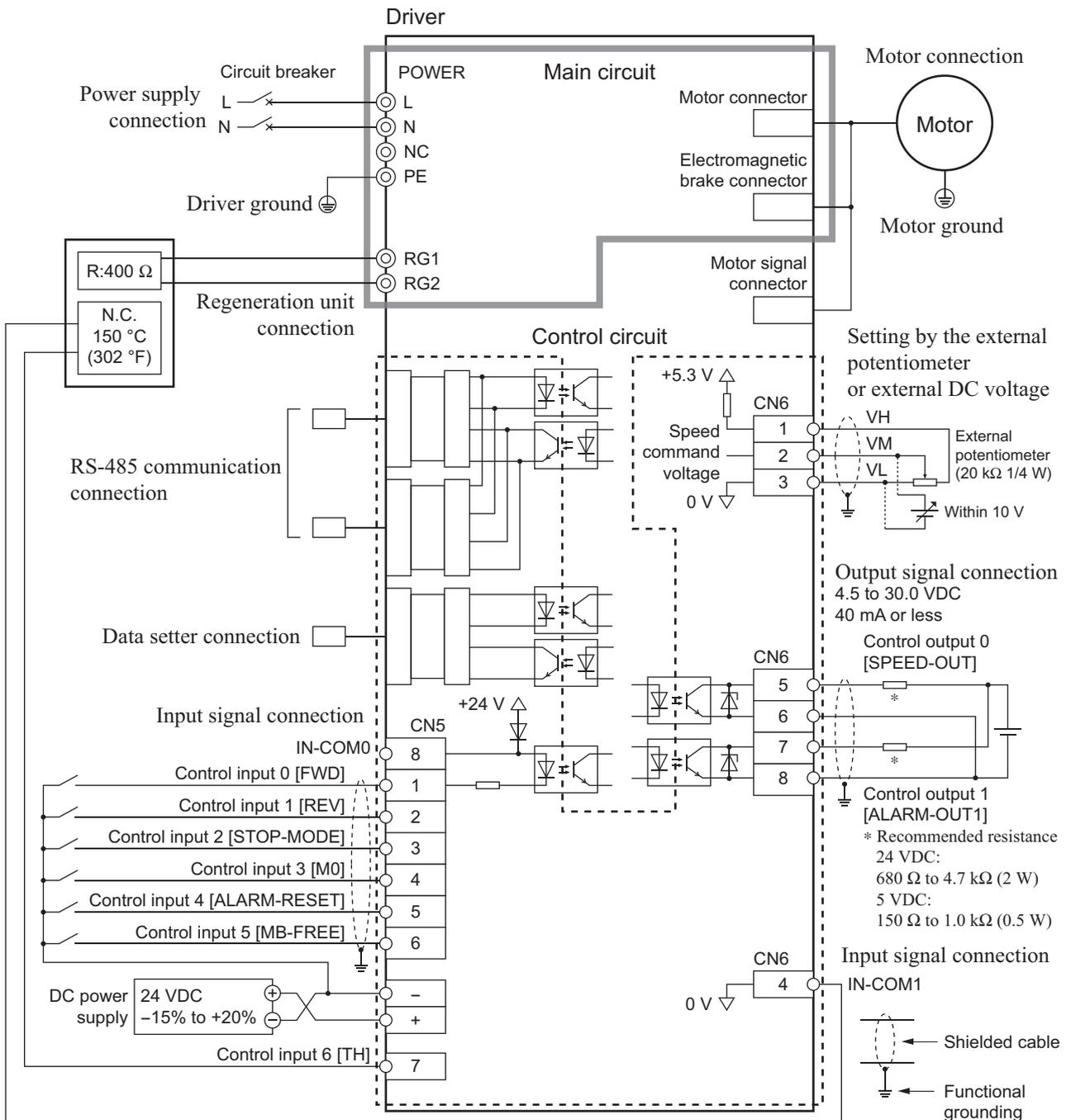
The factory setting is OFF (an external power supply is used). To use an external power supply, the factory setting need not be changed.



■ Sink logic

- Using the built-in power supply

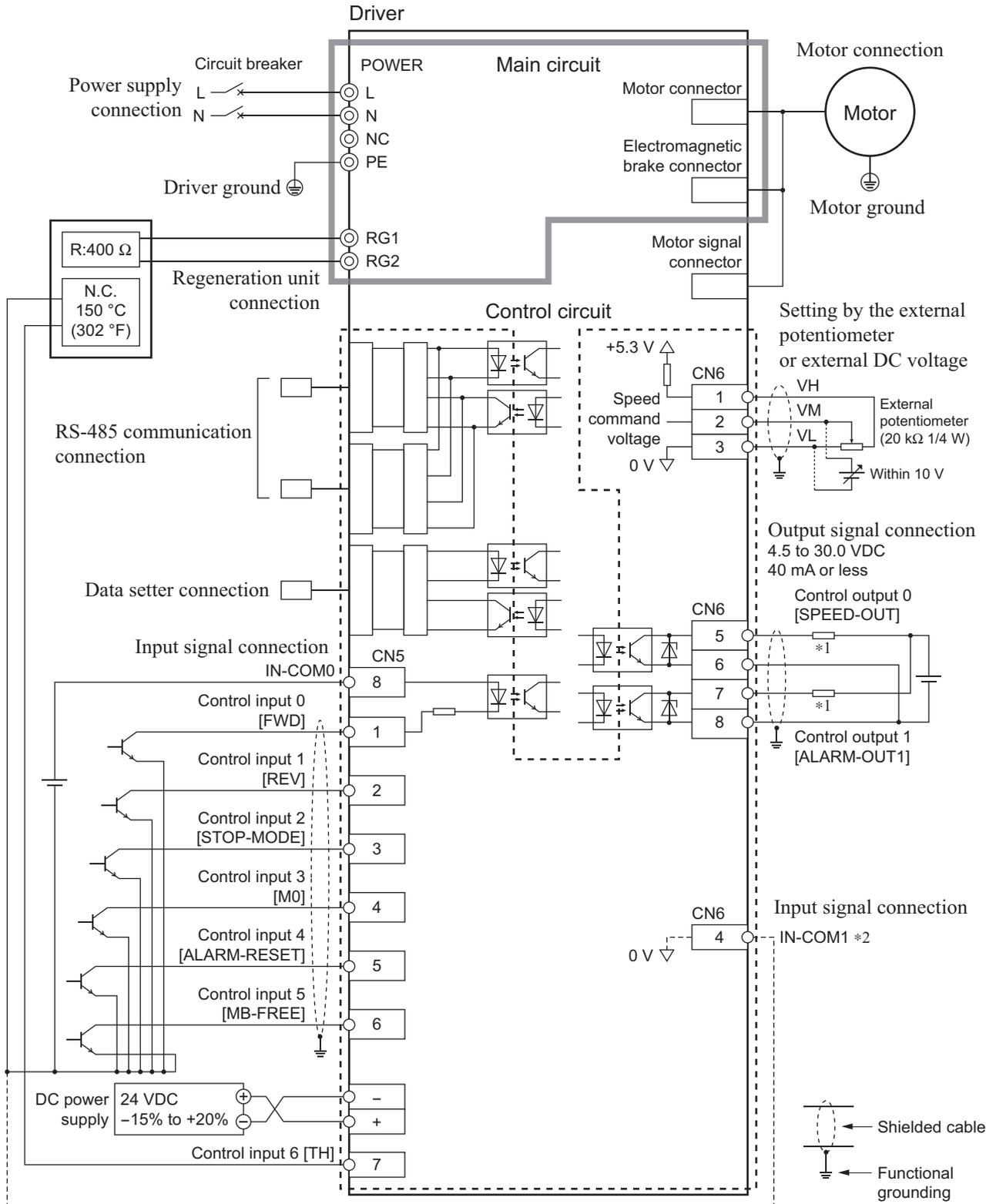
This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with relays, switches and other contact switches. For the SPEED-OUT output, supply at least 5 mA of current.



* Recommended resistance 24 VDC: 680 Ω to 4.7 kΩ (2 W)
5 VDC: 150 Ω to 1.0 kΩ (0.5 W)

• Using an external power supply

This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with sequence connection of transistor type. For the SPEED-OUT output, supply at least 5 mA of current.

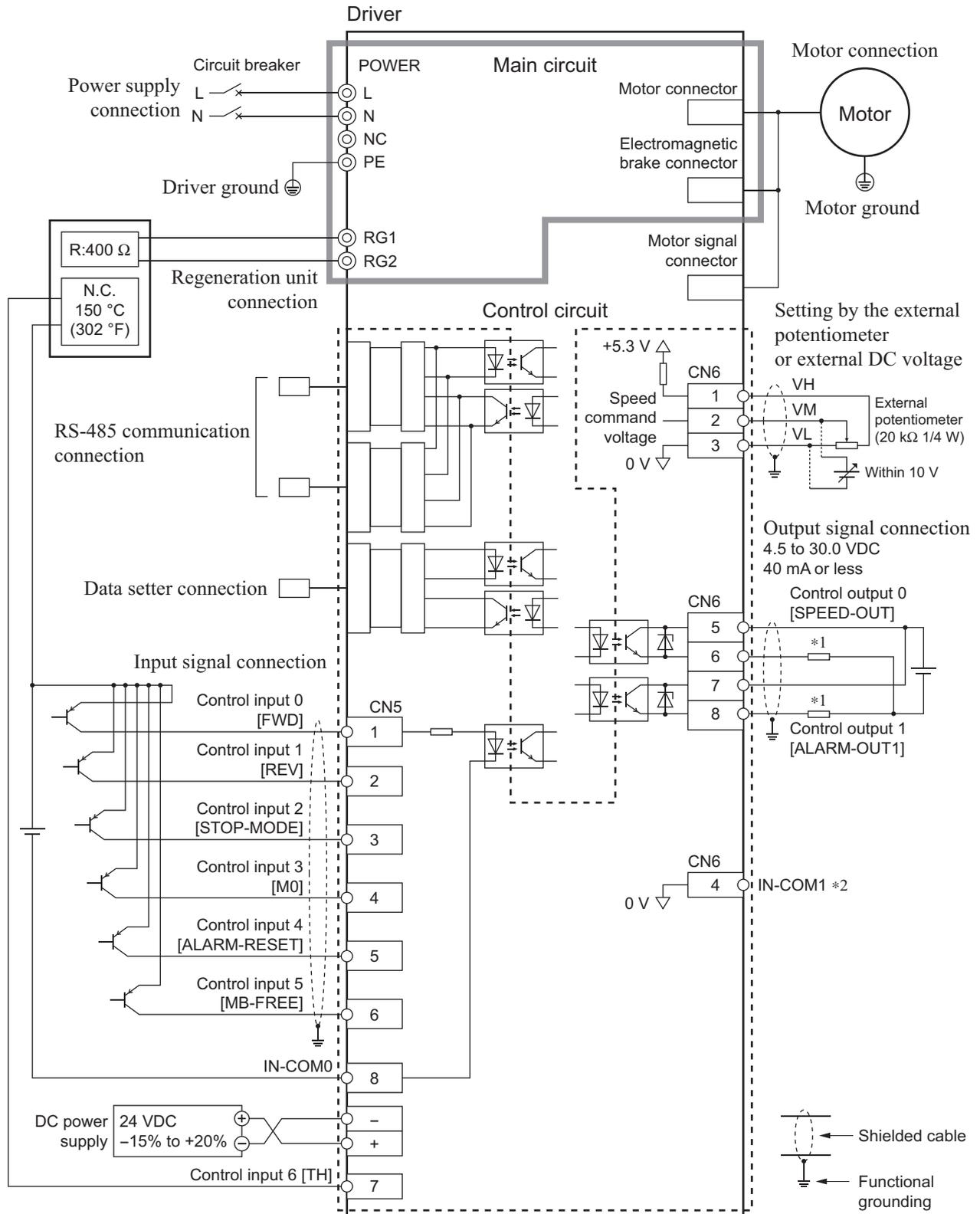


*1 Recommended resistance 24 VDC: 680 Ω to 4.7 kΩ (2 W)
5 VDC: 150 Ω to 1.0 kΩ (0.5 W)

*2 When connecting one of the lead wires of the thermostat output to the IN-COM1, connect it in common with a GND of the external power supply.

■ Source logic

This is a connection example that the power supply is single-phase 100-120 VAC, the rotation speed is set using an external potentiometer or external DC voltage, and the motor is operated with sequence connection of transistor type. For the SPEED-OUT output, supply at least 5 mA of current.



- *1 Recommended resistance 24 VDC: 680 Ω to 4.7 kΩ (2 W)
5 VDC: 150 Ω to 1.0 kΩ (0.5 W)
- *2 No connection for source logic

3 Explanation of I/O signals

In this manual, I/O signals are described as follows.

- Direct I/O: I/O signals accessed via input signal connector (CN5) and I/O signal connector (CN6)
- Network I/O: I/O signals accessed via RS-485 communication

Set the following parameters using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

3.1 Assignment of direct I/O

■ Assignment to the input terminals

The input signals shown below can be assigned to the input terminals IN0 to IN6 of CN5 by setting parameters. For details on input signals, refer to page 54.

Input terminal	Initial value	Input terminal	Initial value
IN0	1: FWD	IN4	24: ALARM-RESET
IN1	2: REV	IN5	20: MB-FREE
IN2	19: STOP-MODE	IN6	22: TH
IN3	48: M0		

Assignment No.	Signal name	Function
0	Not used	Set when the input terminal is not used.
1	FWD	Rotate the motor in the forward direction.
2	REV	Rotate the motor in the reverse direction.
19	STOP-MODE	Select instantaneous stop or deceleration stop.
20	MB-FREE	Release the electromagnetic brake.
21	EXT-ERROR	Stop the motor (normally closed).
22	TH	
24	ALARM-RESET	Reset of the present alarm.
27	HMI	Release of the function limitation of the OPX-2A or MEXE02 (normally closed).
32	R0	General signals Use these signals when controlling the system via RS-485 communication.
33	R1	
34	R2	
35	R3	
36	R4	
37	R5	
38	R6	
39	R7	
40	R8	
41	R9	
42	R10	
43	R11	
44	R12	
45	R13	
46	R14	
47	R15	
48	M0	Select the operation data No. using these four bits.
49	M1	
50	M2	
51	M3	
54	TL	Disable the torque limiting. (normally closed).

Related parameters

Parameter name	Description	Initial value
IN0 function select	Assigns the input signals to the input terminal IN0 to IN6. See the table on the previous page for the assignment number and corresponding signal.	1: FWD
IN1 function select		2: REV
IN2 function select		19: STOP-MODE
IN3 function select		48: M0
IN4 function select		24: ALARM-RESET
IN5 function select		20: MB-FREE
IN6 function select		22: TH

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- The ALARM-RESET input will be executed when turning from ON to OFF.
- When the HMI input and TL input are not assigned to the input terminals, these inputs will be always set to ON. When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

■ Changing the logic level setting of input signals

You can change the logic level setting for input terminals IN0 to IN6 using the parameter.

Related parameters

Parameter name	Description	Initial value
IN0 contact configuration	Changes the logic level setting for the input terminal IN0 to IN6. 0: Normally open 1: Normally closed	0
IN1 contact configuration		
IN2 contact configuration		
IN3 contact configuration		
IN4 contact configuration		
IN5 contact configuration		
IN6 contact configuration		

■ Assignment to the output terminals

The output signals shown below can be assigned to the output terminals OUT0 and OUT1 of CN6 by setting parameters. For details on output signals, refer to page 56.

Output terminal	Initial value
OUT0	85: SPEED-OUT
OUT1	65: ALARM-OUT1

Assignment No.	Signal name	Function
0	Not used	Set when the output terminal is not used.
1	FWD_R	Output in response to the FWD input.
2	REV_R	Output in response to the RVS input.
19	STOP-MODE_R	Output in response to the STOP-MODE input.
20	MB-FREE_R	Output in response to the MB-FREE input.
27	HMI_R	Output in response to the HMI input.
32	R0	Output the status of the general signals R0 to R15.
33	R1	
34	R2	
35	R3	
36	R4	
37	R5	
38	R6	
39	R7	
40	R8	
41	R9	
42	R10	
43	R11	
44	R12	
45	R13	
46	R14	
47	R15	
48	M0_R	Output in response to the M0 to M3 inputs.
49	M1_R	
50	M2_R	
51	M3_R	
54	TL_R	Output in response to the TL input.
65	ALARM_OUT1	Output the alarm status of the driver (normally closed).
66	WNG	Output the warning status of the driver.
68	MOVE	Output while the motor operates.
71	TLC	Output when the motor torque reaches the torque limiting value.
77	VA	Output when the motor speed reaches the setting value.
80	S-BSY	Output when the driver is in internal processing state.
81	ALARM-OUT2	Output when the overload warning detection level is exceeded. Output when the overload alarm generates. (normally closed)
82	MPS	Output the ON-OFF state of the main power supply.
84	DIR	Output the rotation direction of motor shaft.
85	SPEED-OUT	30 pulses are output with each revolution of the motor output shaft.

Related parameters

Parameter name	Description	Initial value
OUT0 function select	Assigns the output signals to the output terminals OUT0 and OUT1. See the table above for the assignment number and corresponding signal.	85: SPEED-OUT
OUT1 function select		65: ALARM-OUT1

3.2 Assignment of network I/O

Assign the I/O function via RS-485 communication.

■ Assignment of input signals

The input signals shown below can be assigned to the NET-IN0 to NET-IN15 of network I/O by setting parameters. See each command description for the assignments of the NET-IN0 to NET-IN15.

Assignment No.	Signal name	Function	Setting range
0	Not used	Set when the input terminal is not used.	–
1	FWD	Rotate the motor to FWD direction.	0: Stop
2	REV	Rotate the motor to REV direction.	1: Operation
19	STOP-MODE	Select instantaneous stop or deceleration stop.	0: Instantaneous stop 1: Deceleration stop
20	MB-FREE	Release the electromagnetic brake.	0: Electromagnetic brake hold 1: Electromagnetic brake release
27	HMI	Release of the function limitation of the OPX-2A or MEXE02 (normally closed).	0: Function limitation 1: Function limitation release
32	R0	General signals Use these signals when controlling the system via RS-485 communication.	0: OFF 1: ON
33	R1		
34	R2		
35	R3		
36	R4		
37	R5		
38	R6		
39	R7		
40	R8		
41	R9		
42	R10		
43	R11		
44	R12		
45	R13		
46	R14		
47	R15		
48	M0	Select the operation data No. using these four bits.	0: OFF 1: ON (Operation data No.0 to 15 can be selected.)
49	M1		
50	M2		
51	M3		
54	TL	Disable the torque limiting. (normally closed).	0: Torque limiting disable 1: Torque limiting enable

Related parameters

Parameter name	Description	Initial value
NET-IN0 function select	Assigns the input signals to the NET-IN0 to NET-IN15. See the table on the previous page for the assignment number and corresponding signal.	48: M0
NET-IN1 function select		49: M1
NET-IN2 function select		50: M2
NET-IN3 function select		1: FWD
NET-IN4 function select		2: REV
NET-IN5 function select		19: STOP-MODE
NET-IN6 function select		20: MB-FREE
NET-IN7 function select		0: Not used
NET-IN8 function select		
NET-IN9 function select		
NET-IN10 function select		
NET-IN11 function select		
NET-IN12 function select		
NET-IN13 function select		
NET-IN14 function select		
NET-IN15 function select		

- Note**
- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
 - When the HMI input and TL input are not assigned to the input terminals, these inputs will be always set to ON. When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

■ Assignment to the output terminals

The output signals shown below can be assigned to the NET-OUT0 to NET-OUT15 of network I/O by setting parameters. See each command description for the assignments of the NET-OUT0 to NET-OUT15.

Assignment No.	Signal name	Function	Data read
0	Not used	Set when the output terminal is not used.	
1	FWD_R	Output in response to the FWD input.	
2	RVS_R	Output in response to the RVS input.	
19	STOP-MODE_R	Output in response to the STOP-MODE input.	
20	MB-FREE_R	Output in response to the MB-FREE input.	
27	HMI_R	Output in response to the HMI input.	
32	R0	Output the status of the general signals R0 to R15.	0: OFF 1: ON
33	R1		
34	R2		
35	R3		
36	R4		
37	R5		
38	R6		
39	R7		
40	R8		
41	R9		
42	R10		
43	R11		
44	R12		
45	R13		
46	R14		
47	R15		
48	M0_R	Output in response to the M0 to M3 inputs.	
49	M1_R		
50	M2_R		
51	M3_R		
54	TL_R	Output in response to the TL input.	
65	ALARM-OUT1	Output the alarm status of the driver (normally closed).	0: Alarm not present 1: Alarm present
66	WNG	Output the warning status of the driver.	0: Warning not present 1: Warning present
68	MOVE	Output while the motor operates.	0: Motor stopped 1: Motor operating
71	TLC	Output when the motor torque reaches the torque limiting value.	0: No torque limiting 1: In torque limiting operation
77	VA	Output when the motor speed reaches the setting value.	0: Speed not attained 1: Speed attainment
80	S-BSY	Output when the driver is in internal processing state.	0: OFF 1: ON
81	ALARM-OUT2	Output when the overload warning detection level is exceeded. Output when the overload alarm generates. (normally closed)	0: Normal operation 1: In overload operation
82	MPS	Output the ON-OFF state of the main power supply.	0: OFF 1: ON
84	DIR	Output the rotation direction of motor shaft.	0: REV direction 1: FWD direction

Related parameters

Parameter name	Description	Initial value
NET-OUT0 function select	Assigns the output signal to the NET-OUT0 to NET-OUT15. See the table on the previous page for the assignment number and corresponding signal.	48: M0_R
NET-OUT1 function select		49: M1_R
NET-OUT2 function select		50: M2_R
NET-OUT3 function select		1: FWD_R
NET-OUT4 function select		2: REV_R
NET-OUT5 function select		19: STOP-MODE_R
NET-OUT6 function select		66: WNG
NET-OUT7 function select		65: ALARM-OUT1
NET-OUT8 function select		80: S-BSY
NET-OUT9 function select		0: Not used
NET-OUT10 function select		
NET-OUT11 function select		
NET-OUT12 function select		81: ALARM-OUT2
NET-OUT13 function select		68: MOVE
NET-OUT14 function select		77: VA
NET-OUT15 function select		71: TLC

3.3 Input signals

The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ FWD input and REV input

When the FWD input is turned ON, the motor rotates in the clockwise direction. When the FWD input is turned OFF, the motor stops.

When the REV input is turned ON, the motor rotates in the counterclockwise direction. When the REV input is turned OFF, the motor stops.

If both the FWD input and REV input are turned ON, the motor stops instantaneously.

■ STOP-MODE input

Select how the motor should stop when the FWD input or REV input is turned OFF.

When the STOP-MODE input is ON, the motor decelerates to a stop. When the STOP-MODE input is OFF, the motor stops instantaneously.

■ MB-FREE input

This input signal is used with electromagnetic brake types. Select how the electromagnetic brake would operate when the motor stops.

When the MB-FREE input is ON, the electromagnetic brake will be released.

When the MB-FREE input is OFF, the electromagnetic brake will actuate and hold the shaft in position.

Note | The MB-FREE input is disabled while an alarm is present.

■ EXT-ERROR input

The EXT-ERROR input is normally closed.

Connect an error signal detected externally. When the error signal is input, the EXT-ERROR input will be turned OFF and the motor will be stopped.

When operating the motor, turn the EXT-ERROR input ON.

■ TH input

The TH input is normally closed.

When using the regeneration unit, connect the thermostat output of the regeneration unit.

■ ALARM-RESET input

When an alarm generates, the motor will stop. When the ALARM-RESET input is turned from ON to OFF, the alarm will be reset (The alarm will be reset at the OFF edge of the ALARM-RESET input). Always reset an alarm after removing the cause of the alarm and ensuring safety.

Note that some alarms cannot be reset with the ALARM-RESET input. See page 177 for alarm descriptions.

■ HMI input

The HMI input is normally closed.

When the HMI input is turned ON, the function limitation of the **OPX-2A** or **MEXE02** will be released.

When the HMI input is turned OFF, the function limitation will be imposed.

The following functions will be limited to execute.

- I/O test
- Test operation
- Teaching
- Writing, downloading and initializing parameters

Note When the HMI input is not assigned to the input terminal, this input will be always set to ON.
When assigning it to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

■ M0 to M3 inputs

Select a desired operation data number for multi-speed operation based on the combination of ON/OFF states of the M0 to M3 inputs.

Refer to page 77 for multi-speed operation.

Operation data No.	M3	M2	M1	M0	Speed setting method
0	OFF	OFF	OFF	OFF	Analog setting/digital setting
1	OFF	OFF	OFF	ON	
2	OFF	OFF	ON	OFF	
3	OFF	OFF	ON	ON	
4	OFF	ON	OFF	OFF	
5	OFF	ON	OFF	ON	
6	OFF	ON	ON	OFF	
7	OFF	ON	ON	ON	Digital setting
8	ON	OFF	OFF	OFF	
9	ON	OFF	OFF	ON	
10	ON	OFF	ON	OFF	
11	ON	OFF	ON	ON	
12	ON	ON	OFF	OFF	
13	ON	ON	OFF	ON	
14	ON	ON	ON	OFF	
15	ON	ON	ON	ON	

■ TL input

The TL input is normally closed.

When the TL input is turned ON, the torque limiting is enabled.

When the TL input is turned OFF, the torque limiting becomes invalid.

Note When the TL input is not assigned to the input terminal, this input will be always set to ON.
When assigning it to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON.

3.4 Output signals

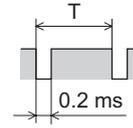
The signal state represents the "ON: Carrying current" or "OFF: Not carrying current" state of the internal photocoupler rather than the voltage level of the signal.

■ SPEED-OUT output

30 pulses are output with each revolution of the motor output shaft synchronously with the motor operation. The pulse width of output pulse signals is 0.2 ms. The rotation speed of the motor output shaft can be calculated using the SPEED-OUT output.

$$\text{SPEED-OUT output frequency (Hz)} = \frac{1}{T}$$

$$\text{Motor shaft speed (r/min)} = \frac{\text{SPEED-OUT output frequency}}{30} \times 60$$



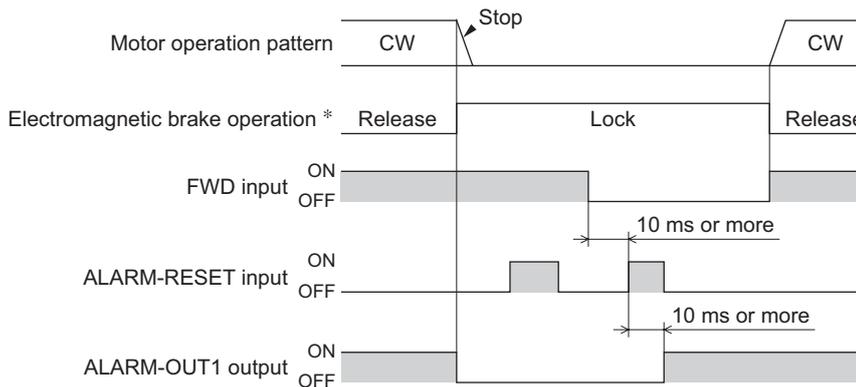
■ ALARM-OUT1 output

The ALARM-OUT1 input is normally closed.

When the driver's protective function actuates, the ALARM-OUT1 output turns OFF and the ALM LED blinks.

In the case of a standard type, the motor coasts to a stop. In the case of an electromagnetic brake type, on the other hand, the motor stops instantaneously, upon which the electromagnetic brake actuates and holds the shaft in position. To reset an alarm, turn both the FWD input and REV input OFF, and remove the cause of the alarm before turning the ALARM-RESET input ON (keep it ON for 10 ms or more). The ALARM-RESET input is disabled while the FWD input or REV input is ON.

If the alarm cannot be reset with the ALARM-RESET input, once turn off the power, wait for at least 30 sec, and turn on the power again.



* When the motor is an electromagnetic brake type, the electromagnetic brake is actuated to hold the shaft in position at the same time that an alarm generates. The setting, which the electromagnetic brake will actuate and hold the position after the motor coasts to a stop, can be selected using the **OPX-2A, MEXE02** or RS-485 communication.

■ MOVE output

The MOVE output turns ON while the motor is operating (while any of the input signal for operation is ON).

■ VA output

The VA output turns ON when the motor speed reaches the setting value.

■ ALARM-OUT2 output

The ALARM-OUT2 output is normally closed.

When the "overload warning enable" is set to enable, this signal will be turned OFF if the motor load torque exceeds the overload warning level.

Even if the "overload warning enable" is set to disable, this signal will be turned OFF if the overload alarm generates.

■ WNG output

When a warning generates, the WNG output will turn ON. The motor will continue to operate.

Once the cause of the warning is removed, the WNG output will turn OFF automatically.

■ TLC output

The TLC output turns ON when the motor output torque reaches the limit value.

■ S-BSY output

The S-BSY output turns ON while internal processing of the driver is being executed. In the following condition, the driver will be in an internal processing status.

- Issuing maintenance commands via RS-485 communication

■ MPS output

The MPS output turns ON when the driver main power is ON.

■ DIR output

The DIR output is the output signal that shows the rotation direction of motor output shaft.

The rotation direction shows the forward direction if this signal is ON, and the rotation direction shows the reverse direction if this signal is OFF.

■ Response output

The response output is the output signal that shows the ON/OFF status corresponding to the input signals.

The following tables show the correspondence between the input signals and output signals.

Input signal	Output signal	Input signal	Output signal
FWD	FWD_R	M0	M0_R
REV	REV_R	M1	M1_R
STOP-MODE	STOP-MODE_R	M2	M2_R
MB-FREE	MB-FREE_R	M3	M3_R
HMI	HMI_R	TL	TL_R

3.5 General signals (R0 to R15)

The R0 to R15 are general signals that enable control via RS-485 communication.

Using the R0 to R15 signals, I/O signals for the external device can be controlled by the master device via the driver.

The direct I/O of the driver can be used as an I/O unit.

See the following example for setting of the general signals.

- When outputting the signals from the master device to the external device

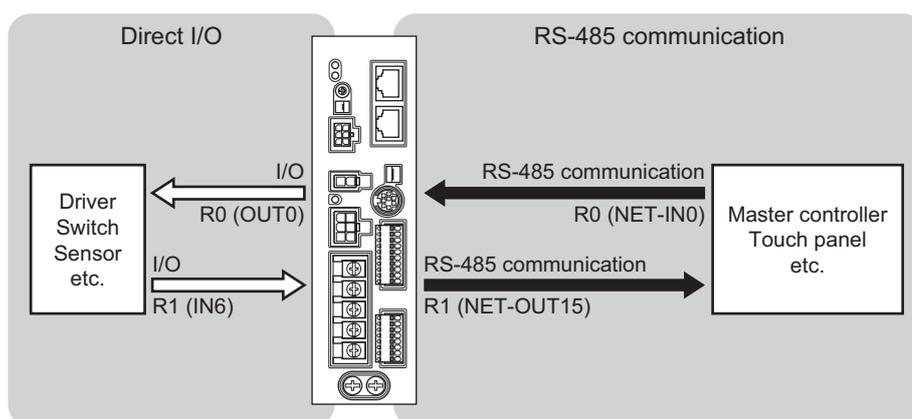
Assign the general signal R0 to the OUT0 output and NET-IN0.

When setting the NET-IN0 to 1, the OUT0 output turns ON. When setting the NET-IN0 to 0, the OUT0 output turns OFF.

- When inputting the output of the external device to the master device

Assign the general signal R1 to the IN6 input and NET-OUT15.

When turning the IN6 input ON by the external device, the NET-OUT15 becomes 1. When turning the IN6 input OFF, the NET-OUT15 becomes 0. The logic level of the IN6 input can be set using "IN6 contact configuration" parameter.



3 Method of control via I/O

This part explains when the operation is controlled via I/O after setting the operation data and parameters by the **OPX-2A** or **MEXE02**.

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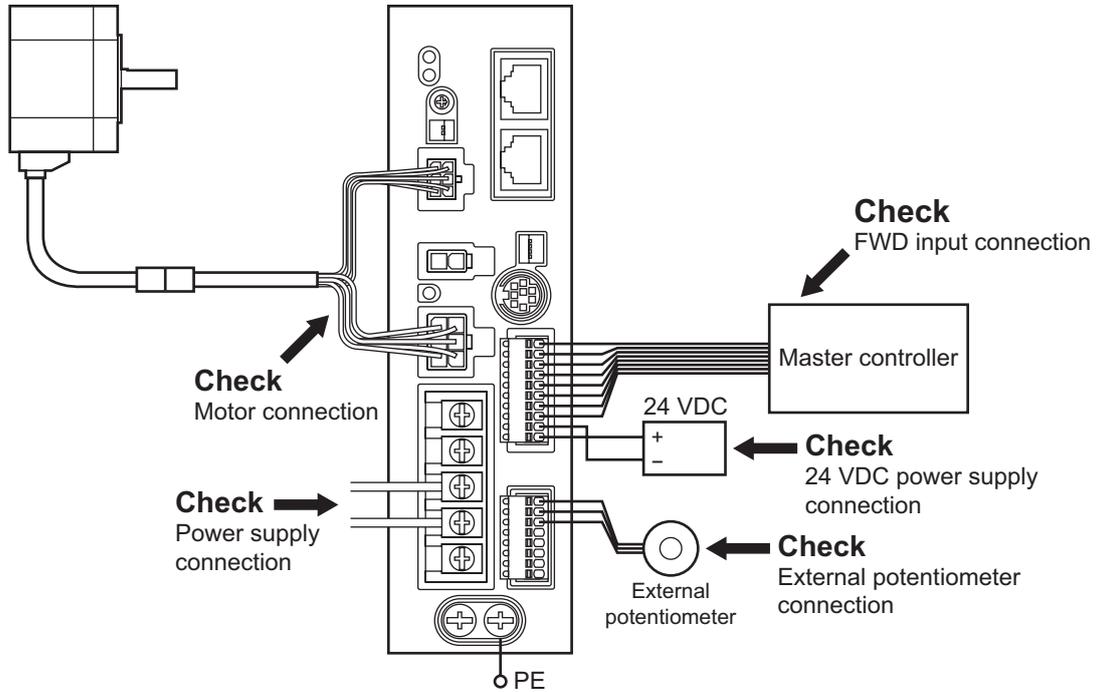
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1 Guidance

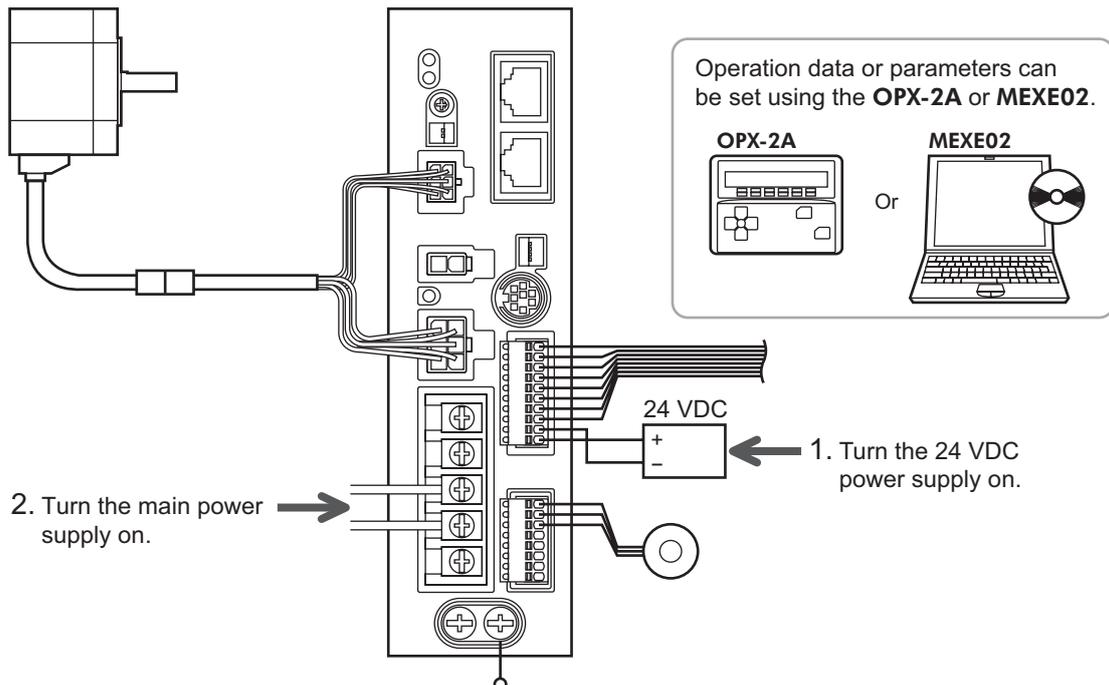
If you are new to the **BLE Series FLEX RS-485** communication type, read this section to understand the operating methods along with the operation flow.

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

STEP 1 Check the installation and connection

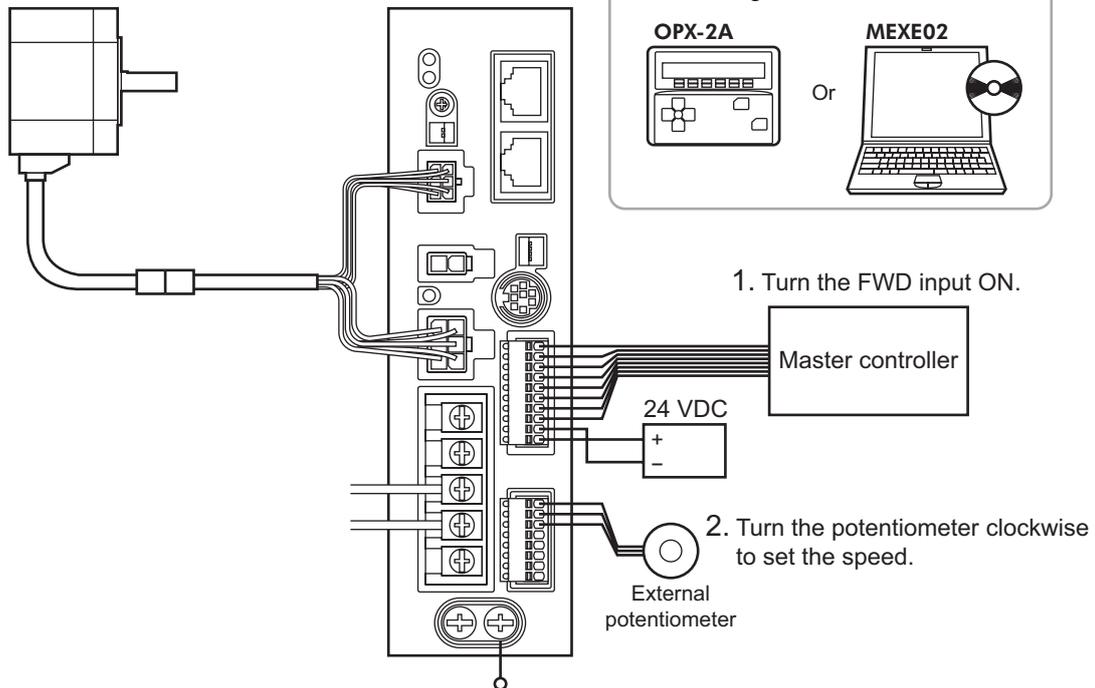


STEP 2 Turn on the power



STEP 3 Operate the motor

3. Confirm that the motor rotates without any problem.



STEP 4 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present?
- Are the power supply and motor connected securely?
- Is the external potentiometer connected securely?

For more detailed settings and functions, refer to the following pages.

2 Operation data and parameter

The parameters required for motor operation are available in the following two types.

- Operation data
- User parameters

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the 24 VDC power supply is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the 24 VDC power supply is turned off.

When turning on the driver 24 VDC power supply, the parameters saved in the non-volatile memory will be sent to the RAM. Then, the recalculation and setup for the parameters are executed in the RAM.

When a parameter is changed, the timing to enable the new value varies depending on the parameter. See the following four types.

- Effective immediately Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration ... Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again .. Executes the recalculation and setup after turning the 24 VDC power ON again.

Note

- The parameters are written in the RAM when writing via RS-485 communication.
- The non-volatile memory can be rewritten approximately 100,000 times.

2.1 Operation data

The following data is required to operate a motor. Total 16 operation data (No.0 to No.15) can be set in this product. There are the following two setting methods.

- Analog setting for rotation speed: This is a method to set the rotation speed using the external potentiometer or external DC voltage.
- Digital setting for rotation speed: This is a method to set the rotation speed using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

Item	Description	Setting range	Initial value	Effective *1
Rotational speed No.0 to Rotational speed No.15	Sets the rotation speed.	Analog setting: 100 to 4000 r/min Digital setting: 80 to 4000 r/min	0	A
Acceleration No.0 to Acceleration No.15	Sets the time needed for the motor to reach the rotation speed. *2	0.2 to 15 s	0.5	
Deceleration No.0 to Deceleration No.15	Sets the time needed for the motor to stop from the rotation speed. *3			
Torque limit No.0 to Torque limit No.15	Sets the motor torque. Sets the maximum torque based on the rated torque being 100%.	0 to 200%	200	

*1 Indicates the timing for the data to become effective. (A: Effective immediately)

*2 The acceleration time when using the digital setting for rotation speed refers to the time needed for the motor to reach the set rotation speed.

The acceleration time when using the analog setting for rotation speed refers to the time needed for the motor to reach the rated rotation speed (3000 r/min).

*3 The deceleration time when using the digital setting for rotation speed refers to the time needed for the motor to stop from the set rotation speed.

The deceleration time when using the analog setting for rotation speed refers to the time needed for the motor to stop from the rated rotation speed (3000 r/min).

2.2 Parameter

■ Parameter list

Function parameter (page 64)	<ul style="list-style-type: none"> • Reduction gear rate • Decimal place for reduction gear rate • Amplification speed rate • Conveyor reduction gear rate • Decimal place for conveyor reduction gear rate • Conveyor amplification speed rate • Velocity attainment width • Motor rotation direction
I/O function parameter (page 65)	<ul style="list-style-type: none"> • IN0 to IN6 function select • IN0 to IN6 contact configuration • OUT0 and OUT1 function select
I/O function parameter (RS-485) (page 66)	<ul style="list-style-type: none"> • NET-IN0 to NET-IN15 function select • NET-OUT0 to NET-OUT15 function select
Analog adjust parameter (page 67)	<ul style="list-style-type: none"> • Analog operating speed command gain • Analog operating speed command offset • Analog torque limit gain • Analog torque limit offset • Analog operating speed maximum value for external input • Analog torque limit maximum value external input
Alarm/warning parameter (page 67)	<ul style="list-style-type: none"> • Over load warning level • Over load warning enable
Utilities parameter (page 67)	<ul style="list-style-type: none"> • JOG operating speed • JOG operating torque • Display mode of the data setter speed • The data setter editing mode
Operation parameter (page 68)	<ul style="list-style-type: none"> • Data setter initial display • Analog input signal select • No operation at initial alarm enable • Magnetic brake function at alarm • Initial thermal input detection • Run mode select
Communication parameter (page 69)	<ul style="list-style-type: none"> • Communication time out • Communication error alarm • Communication parity • Communication stop bit • Communication transfer wait time

■ Function parameter

Name	Description	Setting range	Initial value	Effective *
Reduction gear rate	When entering the gear ratio of the gearhead, the rotation speed of the gearhead output shaft can be displayed. Set the decimal position for the setting value of the gear ratio by the "decimal place for reduction gear rate" parameter.	100 to 9999	100	A
Decimal place for reduction gear rate		0: 1 digit 1: 2 digit 2: 3 digit	2	
Amplification speed rate	Set the speed increasing ratio relative to the rotation speed of the motor output shaft. When setting the speed increasing ratio to 1, the speed reduction ratio will be effective. When setting the speed increasing ratio to other than 1, the speed increasing ratio will be effective.	1 to 5	1	
Conveyor reduction gear rate	When setting the conveyor speed reduction ratio, the transfer speed of the conveyor can be displayed. Set the decimal position for the setting value of the speed reduction ratio by the "decimal place for conveyor reduction gear rate" parameter.	100 to 9999	100	
Decimal place for conveyor reduction gear rate		0: 1 digit 1: 2 digit 2: 3 digit	2	
Conveyor amplification speed rate	Sets the conveyor speed-increasing ratio relative to the rotation speed of the motor output shaft.	1 to 5	1	
Velocity attainment width	Sets the band within which the rotation speed of the motor is deemed to have reached the set value.	0 to 400 r/min	200	
Motor rotation direction	Sets the motor direction to be applied when the FWD input is turned ON.	0: + direction=CCW 1: + direction=CW	1	C

* Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

● How to set the speed reduction ratio

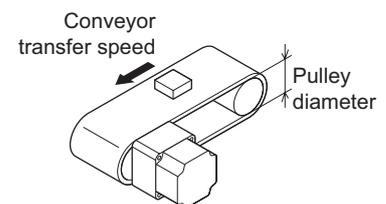
Set the speed reduction ratio as a combination of the "reduction gear rate" parameter and "decimal place for reduction gear rate" parameter. The relationships of speed reduction ratio and decimal position are explained by the combinations shown below.

Actual speed reduction ratio	"Reduction gear rate" parameter	"Decimal place for reduction gear rate" parameter
1.00 to 9.99	100 to 999	2
10.0 to 99.9		1
100 to 999		0
10.00 to 99.99	1000 to 9999	2
100.0 to 999.9		1
1000 to 9999		0

● Display the conveyor transfer speed

To display the conveyor transfer speed, set the conveyor speed reduction ratio by using the formula below:

$$\text{Conveyor gear ratio} = \frac{1}{\text{Feed rate per motor revolution}} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi}$$



When the calculated conveyor speed reduction ratio is used, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{\text{Motor output shaft rotating speed [r/min]}}{\text{Conveyor gear ratio}}$$

Example: The pulley diameter is 0.1 m and gear ratio of the gear head is 20

$$\text{Conveyor gear ratio} = \frac{\text{Gearhead gear ratio}}{\text{Pulley diameter [m]} \times \pi} = \frac{20}{0.1[\text{m}] \times \pi} \doteq 63.7$$

From the conversion formula, the conveyor speed reduction ratio is calculated as 63.7 in this example. This means that the conveyor speed reduction ratio parameter is 637, while the conveyor speed reduction ratio decimal digit setting parameter is 1.

If the speed reduction decimal ratio is 63.7 and rotation speed of the motor is 1300 r/min, the conveyor transfer speed is converted as follows:

$$\text{Conveyor transfer speed [m/min]} = \frac{1300}{63.7} \doteq 20.4$$

Accordingly, “20.4” is shown.

■ I/O function parameter

Name	Description	Setting range	Initial value	Effective *
IN0 function select	Assigns the input signals to the input terminals IN0 to IN6.	See table next.	1: FWD	B
IN1 function select			2: REV	
IN2 function select			19: STOP-MODE	
IN3 function select			48: M0	
IN4 function select			24: ALARM-RESET	
IN5 function select			20: MB-FREE	
IN6 function select			22: TH	
IN0 contact configuration	Changes the logic level setting for the input terminals IN0 to IN6.	0: Make (N.O.) 1: Brake (N.C.)	0	C
IN1 contact configuration				
IN2 contact configuration				
IN3 contact configuration				
IN4 contact configuration				
IN5 contact configuration				
IN6 contact configuration				
OUT0 function select	Assigns the output signals to the output terminals OUT0 and OUT1.	See table next.	85: SPEED-OUT	A
OUT1 function select			65: ALARM-OUT1	

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

• Setting range for IN input function selection

0: No function	22: TH	35: R3	41: R9	47: R15
1: FWD	24: ALARM-RESET	36: R4	42: R10	48: M0
2: REV	27: HMI	37: R5	43: R11	49: M1
19: STOP-MODE	32: R0	38: R6	44: R12	50: M2
20: MB-FREE	33: R1	39: R7	45: R13	51: M3
21: EXT-ERROR	34: R2	40: R8	46: R14	54: TL

• Setting range for OUT output function selection

0: No function	34: R2	42: R10	50: M2_R	80: S-BSY
1: FWD_R	35: R3	43: R11	51: M3_R	81: ALARM-OUT2
2: REV_R	36: R4	44: R12	54: TL_R	82: MPS
19: STOP-MODE_R	37: R5	45: R13	65: ALARM_OUT1	84: DIR
20: MB-FREE_R	38: R6	46: R14	66: WNG	85: SPEED-OUT
27: HMI_R	39: R7	47: R15	68: MOVE	
32: R0	40: R8	48: M0_R	71: TLC	
33: R1	41: R9	49: M1_R	77: VA	

■ I/O function parameter (RS-485)

Name	Description	Setting range	Initial value	Effective *
NET-IN0 function select	Assigns the input signals to the NET-IN0 to NET-IN15.	See table next.	48: M0	C
NET-IN1 function select			49: M1	
NET-IN2 function select			50: M2	
NET-IN3 function select			1: FWD	
NET-IN4 function select			2: REV	
NET-IN5 function select			19: STOP-MODE	
NET-IN6 function select			20: MB-FREE	
NET-IN7 function select			0: No function	
NET-IN8 function select				
NET-IN9 function select				
NET-IN10 function select				
NET-IN11 function select				
NET-IN12 function select				
NET-IN13 function select				
NET-IN14 function select				
NET-IN15 function select				
NET-OUT0 function select	Assigns the output signals to the NET-OUT0 to NET-OUT15.	See table next.	48: M0_R	C
NET-OUT1 function select			49: M1_R	
NET-OUT2 function select			50: M2_R	
NET-OUT3 function select			1: FWD_R	
NET-OUT4 function select			2: REV_R	
NET-OUT5 function select			19: STOP-MODE_R	
NET-OUT6 function select			66: WNG	
NET-OUT7 function select			65: ALARM-OUT1	
NET-OUT8 function select			80: S-BSY	
NET-OUT9 function select			0: No function	
NET-OUT10 function select				
NET-OUT11 function select				
NET-OUT12 function select			81: ALARM-OUT2	
NET-OUT13 function select			68: MOVE	
NET-OUT14 function select			77: VA	
NET-OUT15 function select			71: TLC	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

• Setting range for NET-IN input function selection

0: No function	32: R0	38: R6	44: R12	50: M2
1: FWD	33: R1	39: R7	45: R13	51: M3
2: REV	34: R2	40: R8	46: R14	54: TL
19: STOP-MODE	35: R3	41: R9	47: R15	
20: MB-FREE	36: R4	42: R10	48: M0	
27: HMI	37: R5	43: R11	49: M1	

• Setting range for NET-OUT output function selection

0: No function	34: R2	42: R10	50: M2_R	80: S-BSY
1: FWD_R	35: R3	43: R11	51: M3_R	81: ALARM-OUT2
2: REV_R	36: R4	44: R12	54: TL_R	82: MPS
19: STOP-MODE_R	37: R5	45: R13	65: ALARM_OUT1	84: DIR
20: MB-FREE_R	38: R6	46: R14	66: WNG	
27: HMI_R	39: R7	47: R15	68: MOVE	
32: R0	40: R8	48: M0_R	71: TLC	
33: R1	41: R9	49: M1_R	77: VA	

■ Analog adjust parameter

Name	Description	Setting range	Initial value	Effective *
Analog operating speed command gain	Sets the speed command per 1 VDC of input voltage.	0 to 4000 r/min	800	A
Analog operating speed command offset	Sets the offset for speed command input.	-2000 to 2000 r/min	0	
Analog torque limit gain	Sets the torque limit per 1 VDC of input voltage.	0 to 200%	40	
Analog torque limit offset	Sets the offset for torque limit input.	-50 to 50%	0	
Analog operating speed maximum value for external input	Sets the maximum value of rotation speed.	0 to 4000 r/min	4000	
Analog torque limit maximum value external input	Sets the maximum value of torque limiting.	0 to 200%	200	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Alarm/warning parameter

Name	Description	Setting range	Initial value	Effective *
Over load warning level	Sets the percentage to generate the overload warning against the motor load torque.	50 to 100%	100	A
Over load warning enable	Sets whether to enable or disable overload warning function.	0: Disable 1: Enable	0	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Utilities parameter

Name	Description	Setting range	Initial value	Effective *
JOG operating speed	Sets the rotation speed at JOG operation.	0, or 80 to 1000 r/min	300	A
JOG operating torque	The torque in JOG operation can be limited. Sets the maximum torque based on the rated torque being 100%.	0 to 200%	200	
Display mode of the data setter speed	Sets the display method of rotation speed in the monitor mode. If "0: Signed" is set, "-" will be displayed when rotating in the reverse direction.	0: Signed 1: Absolute	0	
The data setter editing mode	Editing and clearing the operation data/ parameters can be prohibited by locking operation of the OPX-2A .	0: Disable 1: Enable	1	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Operation parameter

Name	Description	Setting range	Initial value	Effective *
Data setter initial display	Sets the initial screen to display on the OPX-2A when the driver power is turned on.	0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view	0	C
Analog input signal select	Sets the setting method of operation data. See table next.	0: Analog invalid 1: Analog speed 2: Analog torque	1	
No operation at initial alarm enable	Sets whether to enable or disable the "no operation at initial alarm enable."	0: Disable 1: Enable	0	
Magnetic brake function at alarm	Set the actuated timing of the electromagnetic brake when an alarm is generated. When setting to 0, the electromagnetic brake will actuate and hold the position after the motor coasts to a stop.	0: Lock after free stop 1: Lock immediately	1	
Initial thermal input detection	Switches whether to enable or disable the initial thermal input detection. When setting to "1: Enable," the regeneration unit overheat alarm will be generated if the 24 VDC power supply is input while the TH input is not assigned.	0: Disable 1: Enable	0	
Run mode select	The motor excitation can be shut off so that the overvoltage alarm is not generated immediately when driving a large inertia. The time until the motor stops will be longer.	0: PWM shut off mode enable 1: PWM shut off mode disable	1	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

Note When the electromagnetic brake motor is operated in vertical direction, do not set the "run mode select" parameter to "0."

• Analog input signal selection parameter

Setting method of operation data can be changed using the "analog input signal select" parameter. Others except the following combinations are not available to set.

Analog input signal selection parameter	Operation data No.	Rotational speed	Acceleration Deceleration	Torque limit
0	0 to 15	Digital setting		
1 (Initial value)	0	Analog setting	Digital setting	
	1 to 15	Digital setting		
2	0 to 15	Digital setting		Analog setting

Setting example

- When setting all operation data with digital setting: Set the analog input signal selection parameter to 0.
- When setting the only rotation speed of the operation data No.0 with analog setting: Set the analog input signal selection parameter to 1.

■ Communication parameter

Name	Description	Setting range	Initial value	Effective *
Communication time out	Sets the condition in which the communication timeout occurs in RS-485 communication. When setting to zero (0), the driver does not monitor the condition in which the communication timeout occurs.	0 to 10000 ms	0	A
Communication error alarm	Sets the condition in which the RS-485 communication error alarm generates. The communication error alarm generates after the RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3	
Communication parity	Sets the parity for RS-485 communication.	0: No parity 1: Even 2: Odd	1	D
Communication stop bit	Sets the stop bit for RS-485 communication.	0: 1 bit 1: 2 bit	0	
Communication transfer wait time	Sets the transmission waiting time for RS-485 communication.	0 to 10000 (1=0.1 ms)	100	

* Indicates the timing for the data to become effective. (A: Effective immediately, D: Effective after turning the power ON again)

3 Method of control via I/O

This chapter explains the operations that can be performed with the **BLE** Series FLEX RS-485 communication type.

3.1 Operation data

The following data is required to operate a motor. Total 16 operation data (No.0 to No.15) can be set in this product. There are the following two setting methods.

- Analog setting for rotation speed: This is a method to set the rotation speed using the external potentiometer or external DC voltage.
- Digital setting for rotation speed: This is a method to set the rotation speed using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

Item	Description	Setting method	Setting range	Initial value
Rotational speed	Sets the rotation speed.	Analog setting	100 to 4000 r/min	0 r/min
		Digital setting	80 to 4000 r/min	
Acceleration	Sets the time needed for the motor to reach the rotation speed.	Digital setting	0.2 to 15 s	0.5 s
Deceleration	Sets the time needed for the motor to stop from the rotation speed.			
Torque limit	Sets the motor torque. Sets the maximum torque based on the rated torque being 100%.	Digital setting Analog setting	0 to 200%	200%

When using the digital setting for the rotation speed or torque limiting, enable the digital setting by setting the setting range of the following parameter to "0: Analog invalid."

Parameter name	Description	Setting range	Initial value
Analog input signal select	Sets the setting method of operation data. Refer to page 68 for details.	0: Analog invalid 1: Analog speed 2: Analog torque	1

3.2 Setting the rotation speed

■ Analog setting

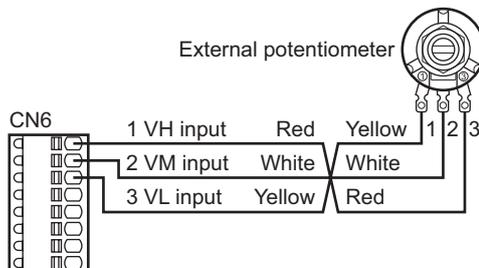
Set the rotation speed by the external potentiometer (supplied) or external DC voltage.

- Setting by the external potentiometer

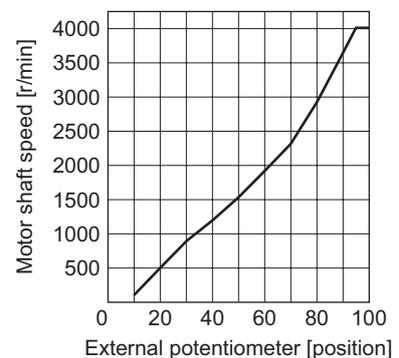
Connect the supplied external potentiometer to the pin Nos.1 to 3 of CN6 of the driver. Use the supplied signal wire for this connection. Use the supplied signal wire for this connection.

Connect the shield wire of the signal wire to the VL input terminal. Make sure the shield wire does not contact other terminals.

Turning the external potentiometer in the clockwise direction makes the motor to rotate faster. Turning it in the counterclockwise direction makes the motor to rotate slower.

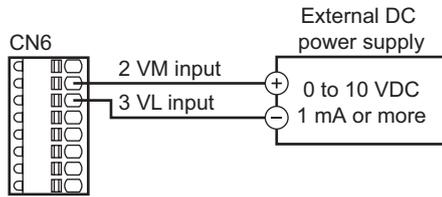


- Speed characteristics (representative values)

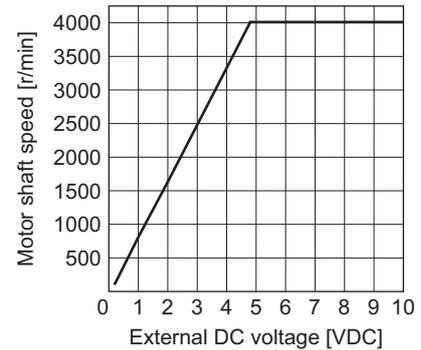


• Setting by the external DC voltage

For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver.
The input impedance between the VM input and VL input is approx. 30 kΩ. The VL input is connected to IN-COM1 inside the driver.



• Speed characteristics (representative values)

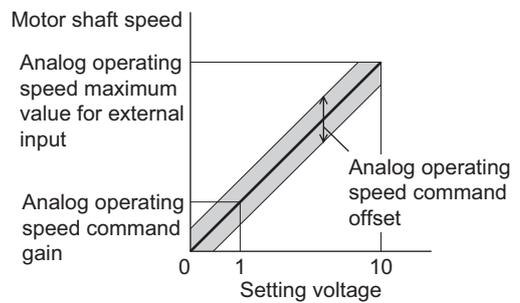


Note Be sure to set the external DC voltage to 10 VDC or lower. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

Gain adjustment and offset adjustment for external DC voltage

When setting the rotation speed using the external DC voltage, the relationship between the voltage value and rotation speed can be changed by adjusting the gain or offset.
Set the following parameters using any of the **OPX-2A**, **MEXE02** or via RS-485 communication.

Note The rotation speed corresponding to the voltage value varies depending on the products.

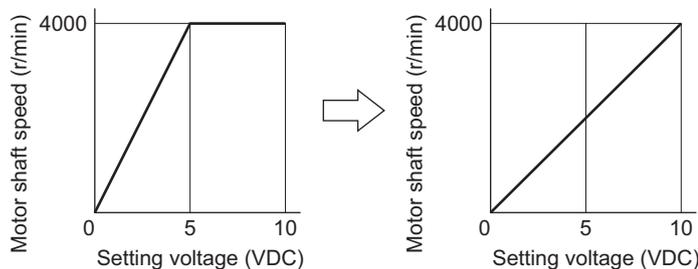


Parameter name	Description	Setting range	Initial value
Analog operating speed command gain	Sets the speed command per 1 VDC of input voltage.	0 to 4000 r/min	800
Analog operating speed maximum value for external input	Sets the maximum value of rotation speed.		4000
Analog operating speed command offset	Sets the offset for speed command input.	-2000 to 2000 r/min	0

Setting example1:

When setting the rotation speed of the motor output shaft up to 4000 r/min (maximum rotation speed) using 0 to 10 VDC of the external DC voltage

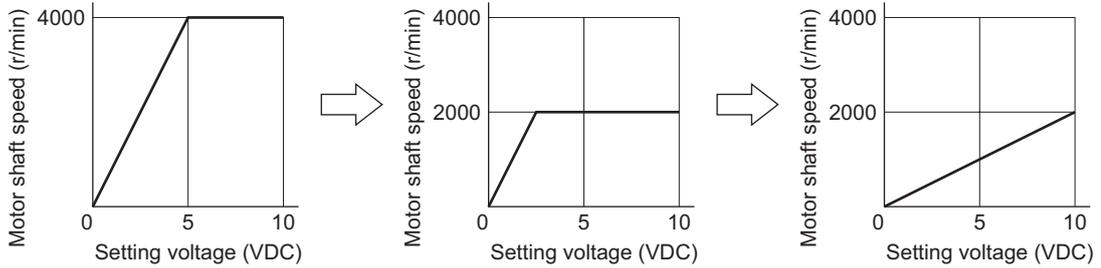
Set the "analog operating speed command gain" to 400.



Setting example2:

When setting the rotation speed of the motor output shaft up to 2000 r/min (maximum rotation speed) using 0 to 10 VDC of the external DC voltage

Set the "analog operating speed maximum value for external input" to 2000, and then set the "analog operating speed command gain" to 200.



■ **Digital setting**

- Using the **OPX-2A**: Refer to the **OPX-2A OPERATING MANUAL** (HP-5056).
- Using the **MEXE02**: Refer to "6 Method to use the **MEXE02**"
- Via RS-485 communication: Refer to "4 Method of control via Modbus RTU (RS-485 communication)" or "5 Method of control via industrial network"

3.3 Setting the acceleration time and deceleration time

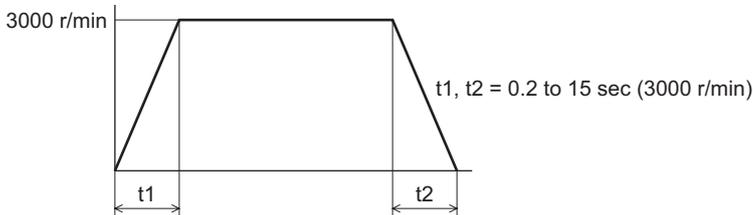
The meaning of the acceleration time/deceleration time varies depending on the setting method of the rotation speed.

■ **When setting the rotation speed with analog setting**

When using the analog setting, the motor is operated at the acceleration time and deceleration time set in the operating data No.0.

Acceleration time (t1) refers to the time needed for the motor to reach the rated speed (3000 r/min) from the standstill status.

Deceleration time (t2) refers to the time needed for the motor to stop from the rated speed (3000 r/min).



■ **When setting the rotation speed with digital setting**

When using the digital setting, the desired value for the acceleration time and deceleration time can be set to the operating data No.0 to No.15 respectively.

Acceleration time refers to the time needed for the motor to reach the setting speed from the standstill status.

Deceleration time refers to the time needed for the motor to stop from the setting speed.

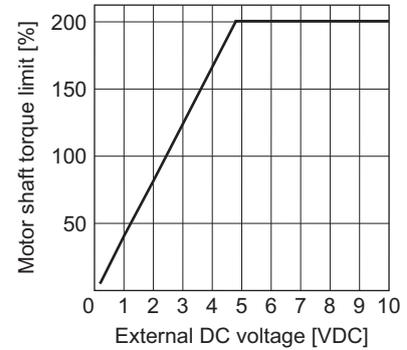
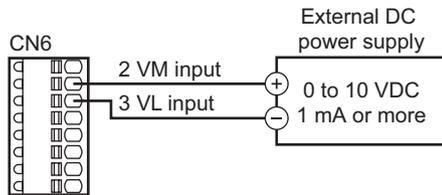
3.4 Setting the torque limiting

Set the torque limiting when restricting the motor output torque. The torque limiting can be set using either of the analog setting or digital setting. This section explains the analog setting by the external DC voltage.

■ Setting by the external DC voltage

For the external voltage, use a DC power supply (0 to 10 VDC) with reinforced insulation on both the primary side and secondary side, and connect it to the pin Nos. 2 and 3 of CN6 of the driver. The input impedance between the VM input and VL input is approx. 30 kΩ. The VL input is connected to IN-COM1 inside the driver.

- Torque limiting characteristics (representative values)

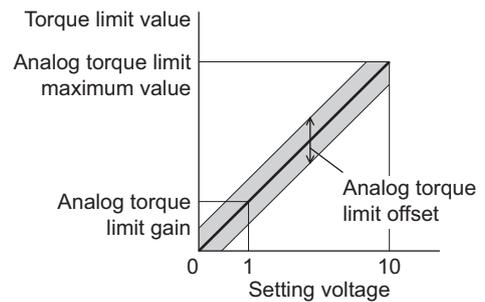


Note Be sure to set the external DC voltage to 10 VDC or lower. When connecting the external DC power supply, make sure the polarities are correct. If the polarities are reversed, the driver may be damaged.

Gain adjustment and offset adjustment for external DC voltage

When setting the torque limiting using the analog setting, the relationship between the voltage value and torque limiting value can be changed by adjusting the gain or offset.

Set the following parameters using any of the **OPX-2A, MEXE02** or via RS-485 communication.

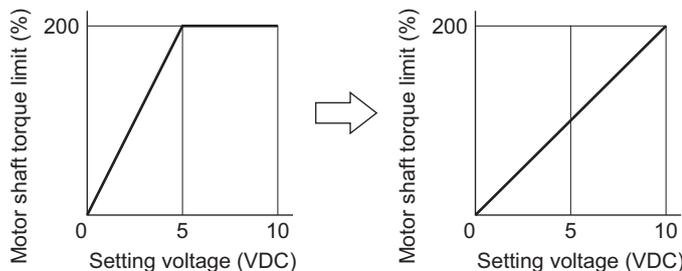


Parameter name	Description	Setting range	Initial value
Analog torque limit gain	Sets the torque limit per 1 VDC of input voltage.	0 to 200%	40
Analog torque limit maximum value	Sets the maximum value of torque limit.		200
Analog torque limit offset	Sets the offset for torque limit input.	-50 to 50%	0

Setting example

When adjusting the torque limiting value up to 200% using 0 to 10 VDC of the external DC voltage

Set the "analog torque limit gain" to 20.



3.5 Running/stopping the motor

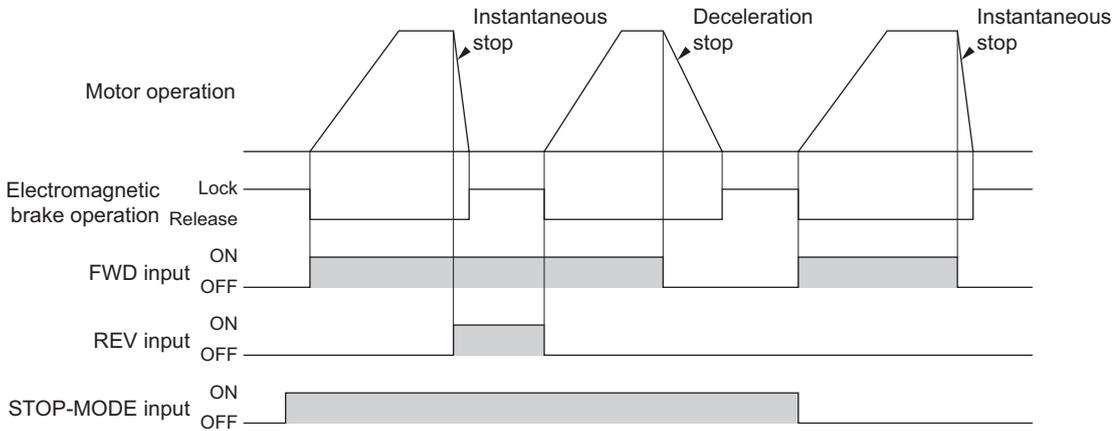
Run/stop the motor by inputting operation control signals.

■ Operation

When the FWD input is turned ON, the motor rotates in the clockwise direction. When the FWD input is turned OFF, the motor stops.

When the REV input is turned ON, the motor rotates in the counterclockwise direction. When the REV input is turned OFF, the motor stops.

If both the FWD input and REV input are turned ON, the motor stops instantaneously.



Note When using the motor in vertical drive (gravitational operation), although it depends on the load condition, if operation is performed with the setting below, the motor shaft may momentarily rotate in the reverse direction (about one-fourth revolution of the motor output shaft) at the time of starting/stopping the motor.

- When the set rotation speed is low
- When the acceleration time and deceleration time is long

■ Stop

If the STOP-MODE input is ON, the motor decelerates and stops. If the STOP-MODE input is OFF, the motor stops instantaneously.

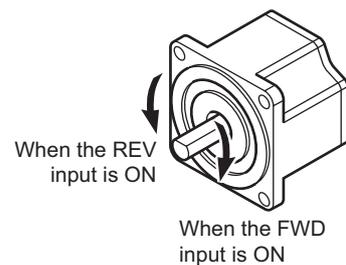
■ Rotation direction

The rotation direction of the motor output shaft represents the direction when viewed from the motor output shaft side.

• Combination type parallel shaft gearhead

The rotation direction of the motor output shaft may vary from that of the gearhead output shaft depending on the gear ratio of the gearhead.

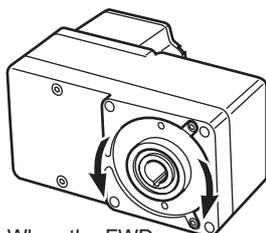
Gear ratio	Rotating direction of gearhead output shaft
5, 10, 15, 20, 200	Same as the motor output shaft
30, 50, 100	Opposite to the motor output shaft



• Combination type hollow shaft flat gearhead

For all gear ratios, the output shaft of the gearhead rotates in the opposite direction to that of the motor. The direction is different depending on whether the pre-assembled motor/gearhead is viewed from the front side or rear side.

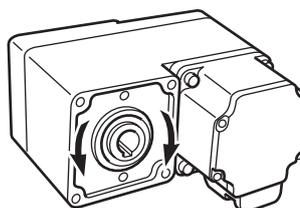
Viewed from Front



When the FWD input is ON

When the REV input is ON

Viewed from Rear

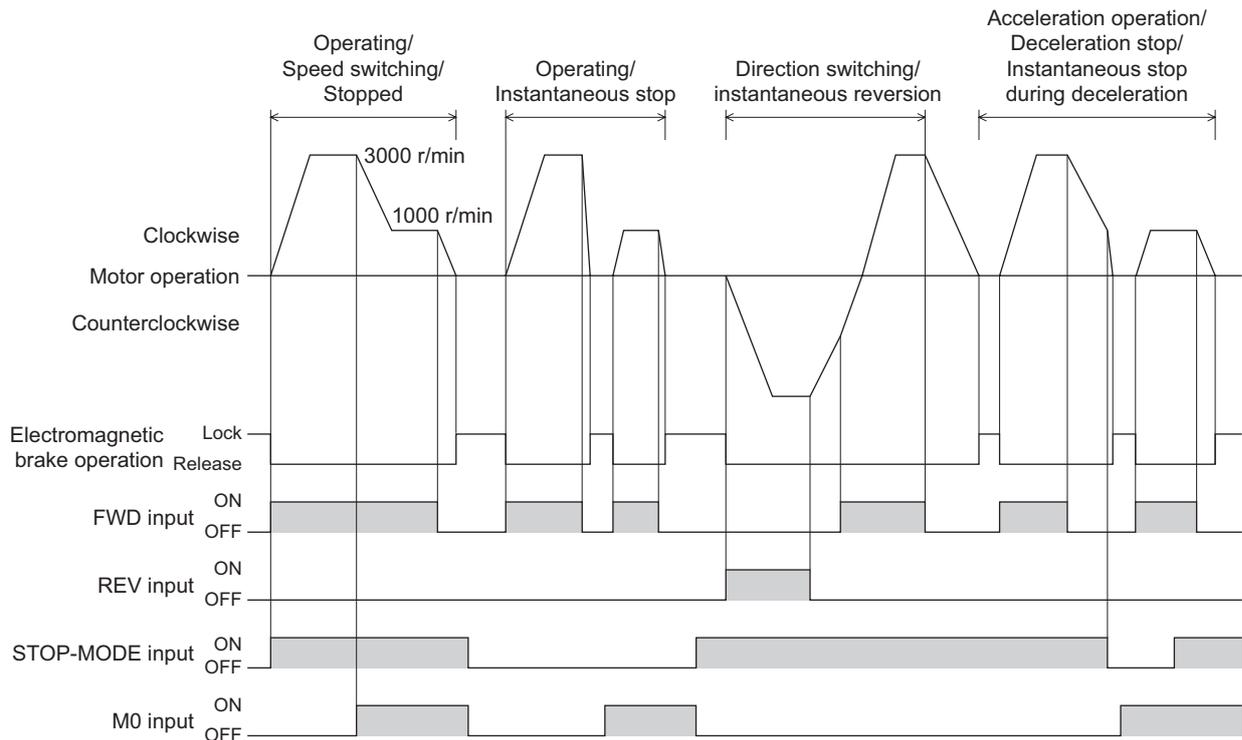


When the REV input is ON

When the FWD input is ON

3.6 Example of operation pattern

The charts below are an example of setting the external potentiometer to 3000 r/min and the rotation speed of the operation data No.1 to 1000 r/min, and switching the speed between these two levels.



- Note**
- Make sure each signal remains ON for at least 10 ms.
 - When switching the FWD input and REV input, provide an interval of at least 10 ms.

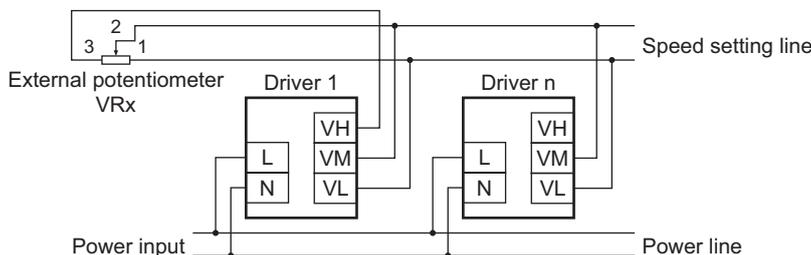
3.7 Multi-motor control

A single external potentiometer (external DC voltage) can be used to operate the same speed for multiple motors.

- The connection examples explained here assume a single-phase specification. In the case of a three-phase specification, connect the power line to a three-phase power supply.
- Connection of a motor and I/O signals is omitted in the figure.

■ Using an external potentiometer

Connect the drivers as shown below. When performing multi-motor control using the external potentiometer, the number of drivers should not exceed 20 units.



Resistance (VRx) when the number of drivers is n:

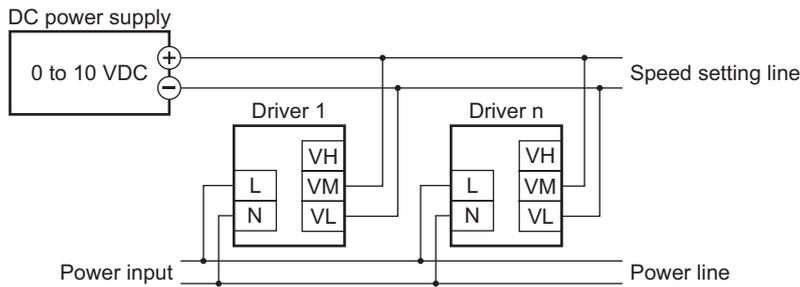
$$\text{Resistance (VRx)} = 20/n \text{ (k}\Omega\text{)}, n/4 \text{ (W)}$$

Example: If two drivers are used

$$\text{Resistance (VRx)} = 20/2 \text{ (k}\Omega\text{)}, 2/4 \text{ (W)}, \text{ resistance (VRx) is calculated as } 10 \text{ k}\Omega, 1/2 \text{ W.}$$

■ Using external DC voltage

Connect the drivers as shown below.



Current capacity (I) of external DC power supply when the number of drivers is n:

$$\text{Current capacity (I)} = 1 \times n \text{ (mA)}$$

Example: If two drivers are used

Current capacity (I) = 1×2 (mA), current capacity (I) is calculated as 2 mA or more.

■ How to adjust the speed difference

To adjust the speed difference among the first motor and the second and subsequent motors, change the parameter or connect a resistor to adjust.

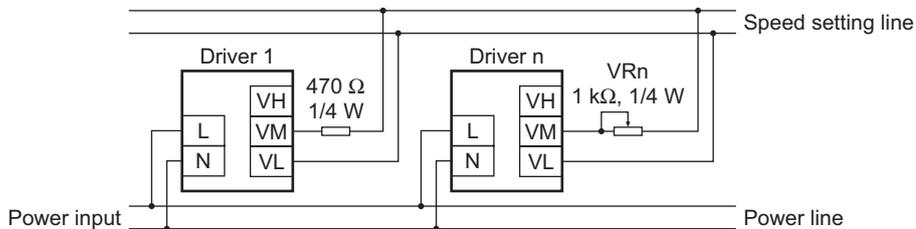
• Adjusting by the parameter

The speed difference can be adjusted by changing the "analog operating speed command gain" parameter and "analog operating speed command offset" parameter for the second and subsequent drivers. This section explains how to adjust by the "analog operating speed command offset" parameter. See page 71 for details.

- When the speed of the second motor is slower than that of the first motor:
Set the offset value to rotate faster (positive side) by the "analog operating speed command offset" parameter.
- When the speed of the second motor is faster than that of the first motor:
Set the offset value to rotate slower (negative side) by the "analog operating speed command offset" parameter.

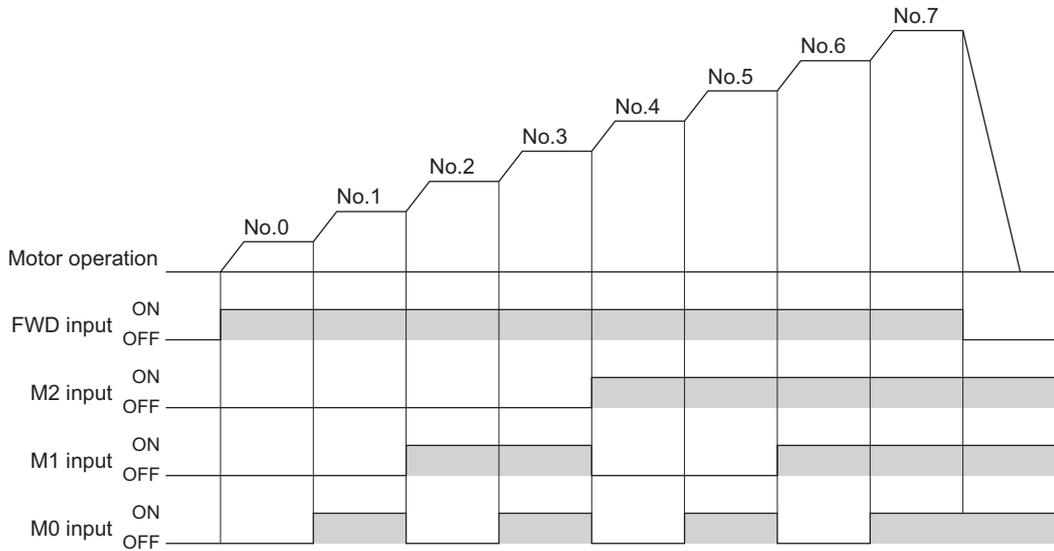
• Adjustment by a resistor

Connect a resistor of 470Ω , $1/4 \text{ W}$ to the terminal VM on the driver 1 and connect a variable resistor VRn of $1 \text{ k}\Omega$, $1/4 \text{ W}$ to the driver 2 and subsequent drivers.



3.8 Multi-speed operation

When assigning the M0 to M3 inputs to the CN5 input terminals, the variable-speed driving of the motor is possible using maximum 16 operation data. This section shows an example assigning the M0 to M2 inputs and performing multi-speed operation by using 8 operating data. See page 55 for the combination of the M0 to M3 inputs and how to select the operating data.



4 Method of control via Modbus RTU (RS-485 communication)

This part explains how to control from the master controller via RS-485 communication. The protocol for the RS-485 communication is the Modbus protocol.

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5 Communication mode and communication timing	88	8.4 Parameter R/W commands	102
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1 Guidance

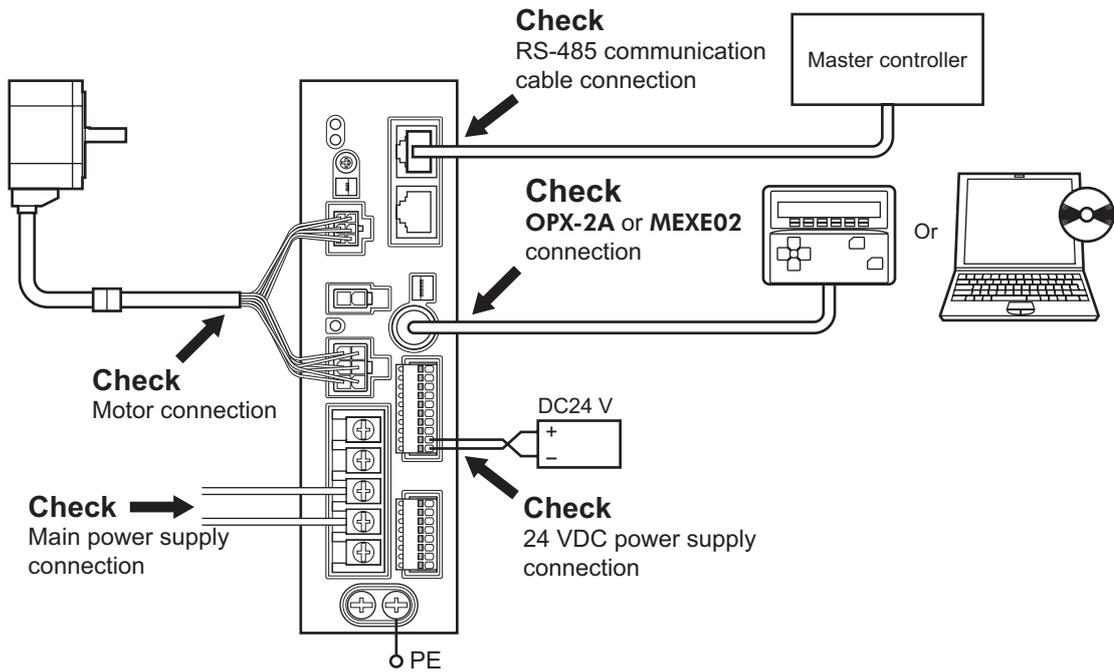
The Modbus protocol is simple and its specification is open to the public, so this protocol is used widely in industrial applications. Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query (command). Each slave executes the requested process and returns a response message.

If you are new to the **BLE** Series FLEX RS-485 communication type, read this section to understand the operating methods along with the operation flow.

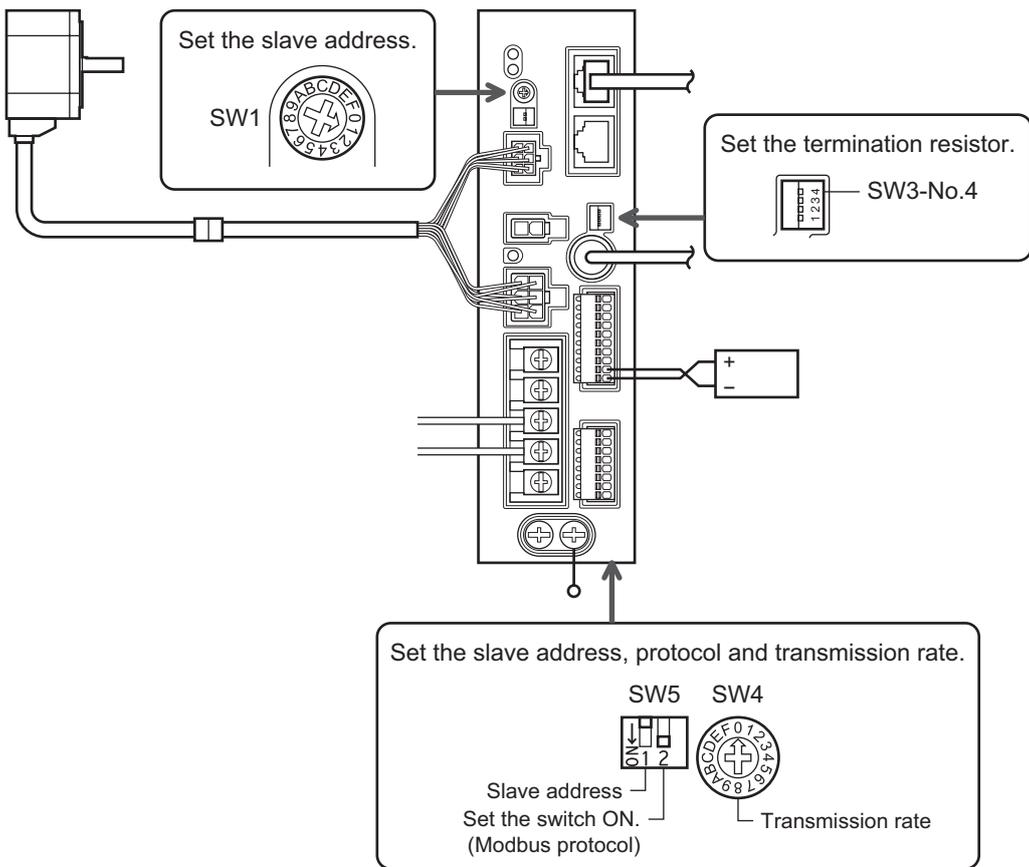
This is an example how to operate the motor based on the operation data and parameters set to the driver by the master controller.

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

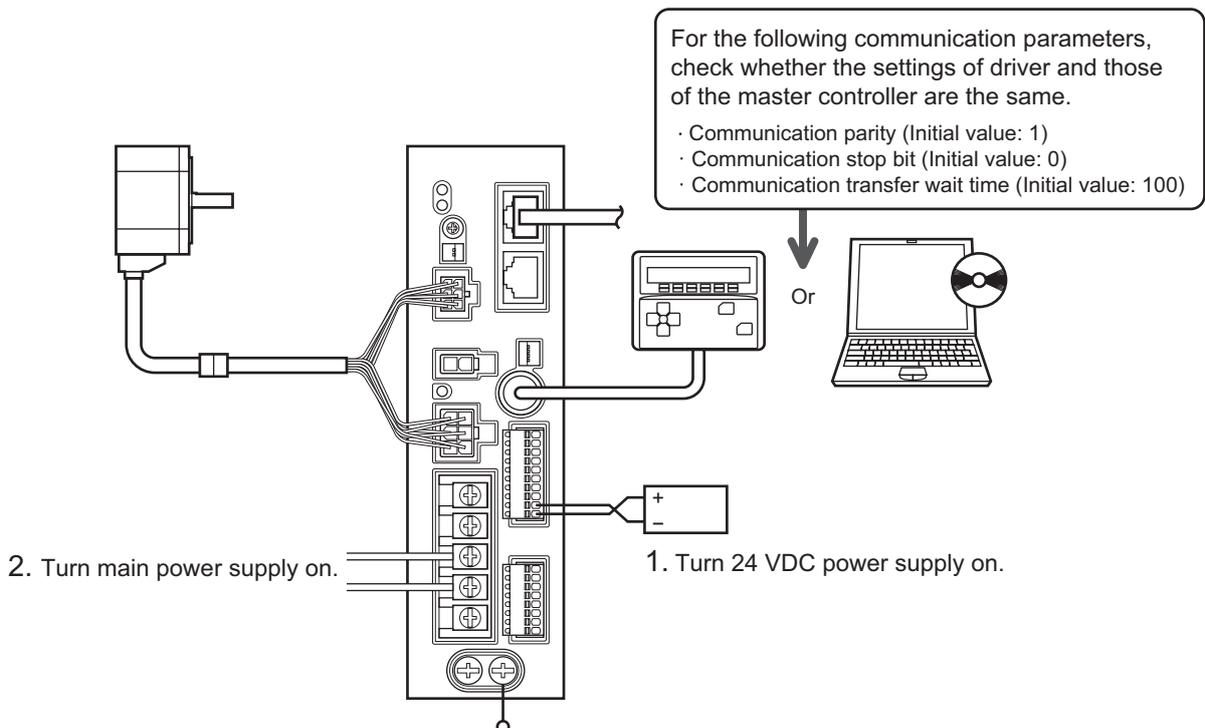
STEP 1 Check the installation and connection



STEP 2 Set the switches



STEP 3 Turn on the power and check the parameters



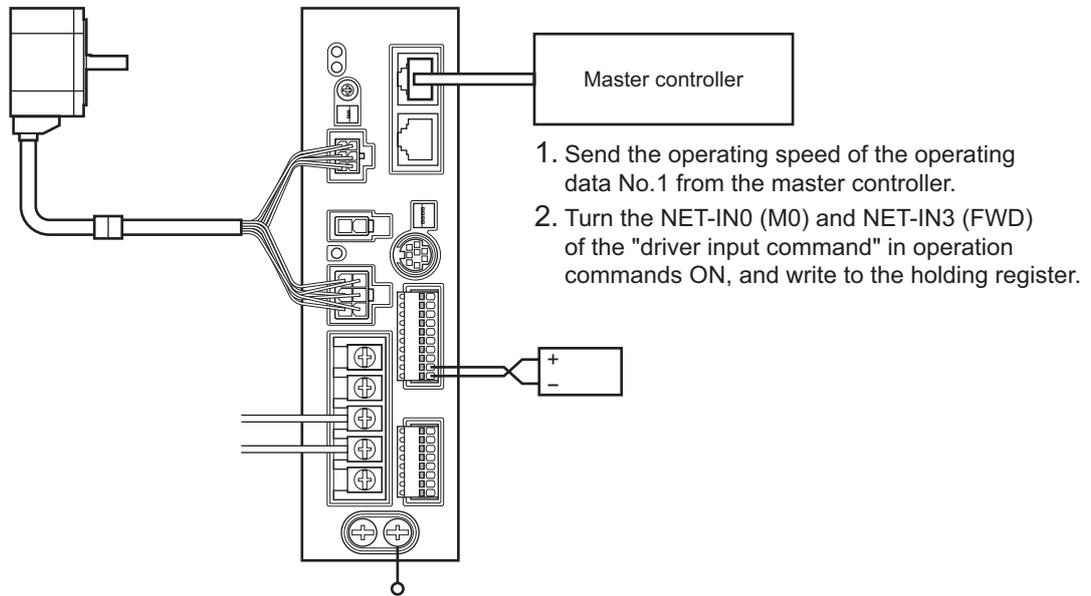
Check that the parameters of the driver and those of the master controller are the same. Use the **OPX-2A** or **MEXE02** when changing the driver parameters.

STEP 4 Cycle the power

Communication parameters will be enabled after the power is cycled. If you have changed any of the communication parameters, be sure to cycle the power.

STEP 5 Operate the motor

3. Confirm that the motor rotates without any problem.



STEP 6 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

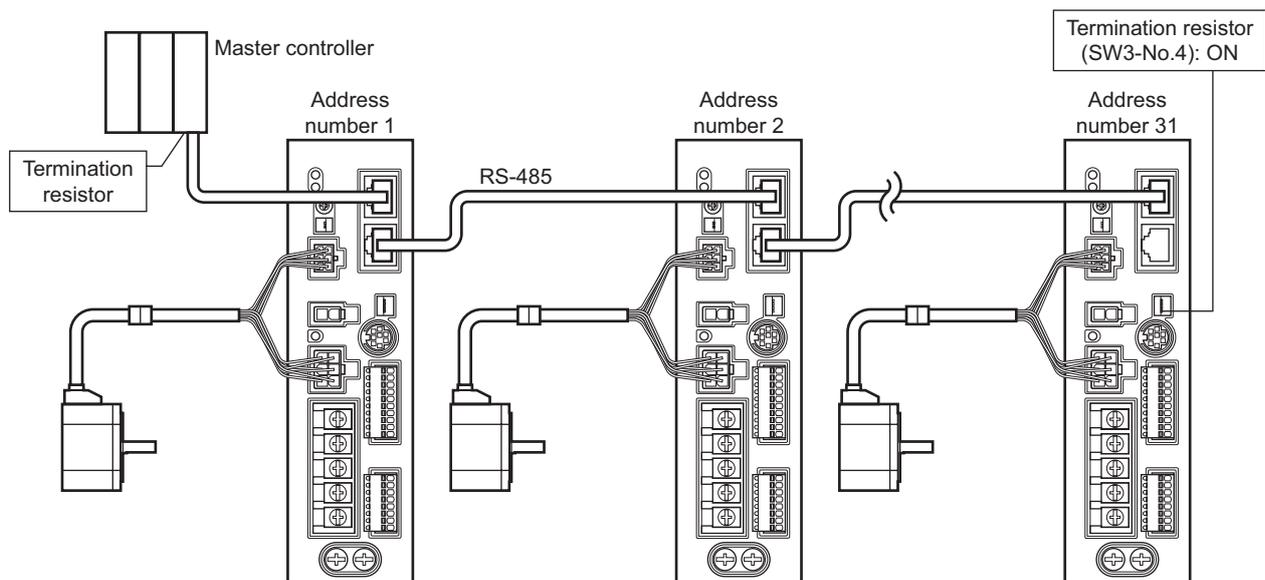
- Is any alarm present?
- Are the power supply, motor and RS-485 communication cable connected securely?
- Are the slave address, transmission rate and termination resistor set correctly?
- Is the C-ERR LED lit?
- Is the C-DAT LED lit or blinking?

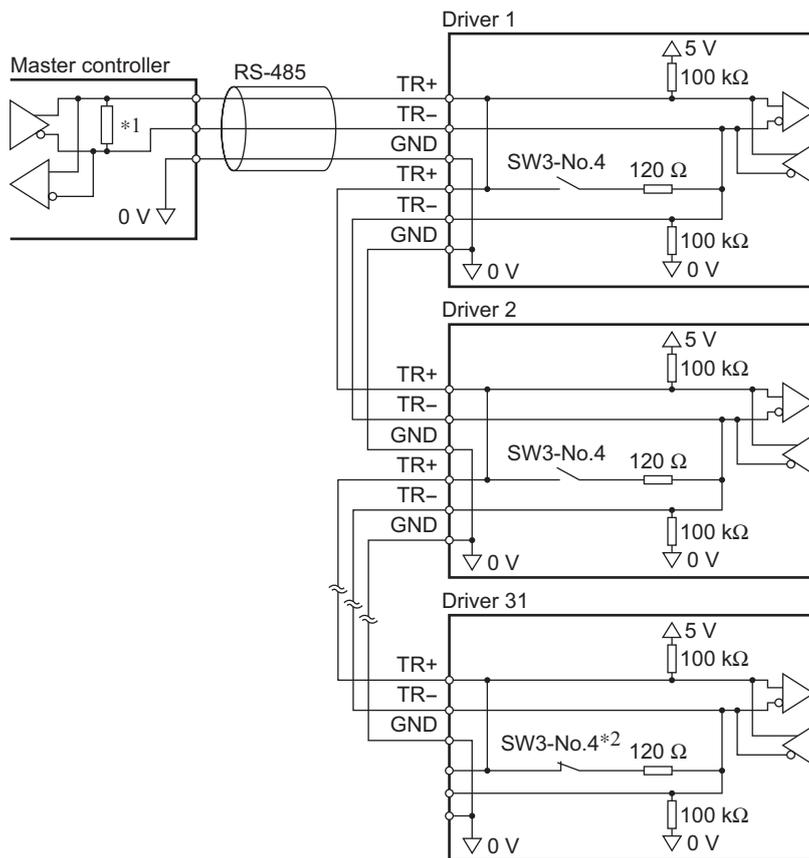
For more detailed settings and functions, refer to following pages.

2 Communication specifications

Electrical characteristics	In conformance with EIA-485, straight cable Use a twisted pair cable (TIA/EIA-568B CAT5e or higher is recommended) and keep the total wiring distance including extension to 50 m (164 ft.) or less.
Transmission mode	Half duplex
Transmission rate	Selectable from 9600 bps, 19200 bps, 38400 bps, 57600 bps and 115,200 bps.
Physical layer	Asynchronous mode (data: 8 bits, stop bit: 1 bit/2 bits, parity: none/even number/odd number)
Protocol	Modbus RTU mode
Connection pattern	Up to 31 drivers can be connected to one master controller.

■ Connection example

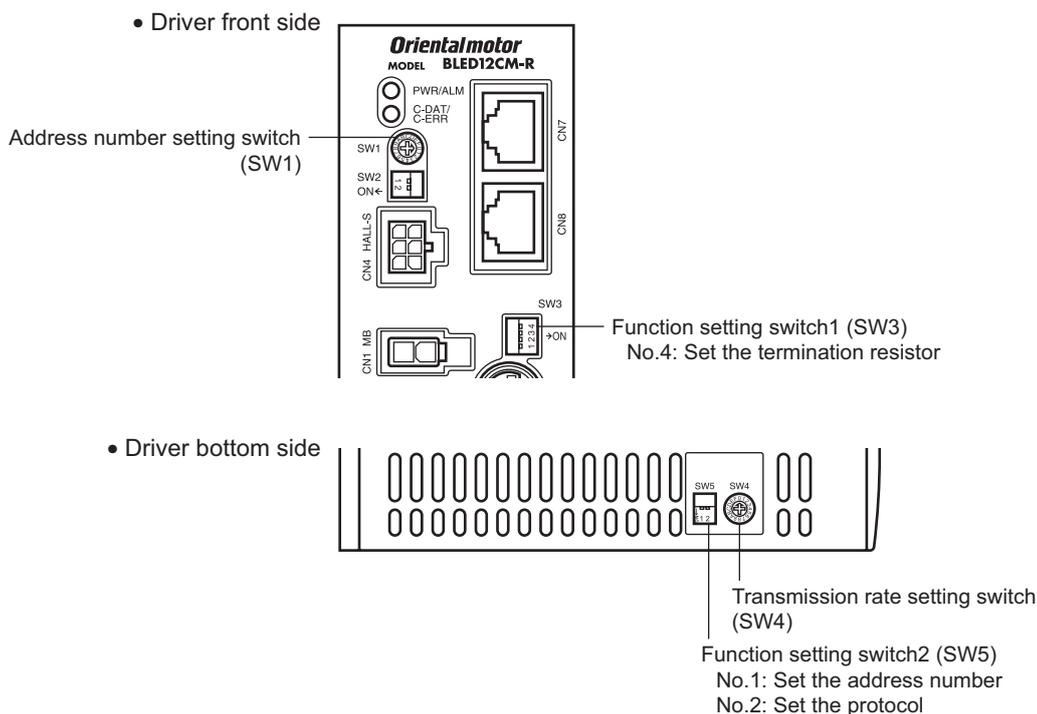




*1 Termination resistor 120 Ω

*2 Turn the termination resistor (SW3-No.4) to ON.

3 Setting the switches



Note Be sure to turn off the driver power before setting the switches. If the switches are set while the power is still on, the new switch settings will not become effective until the driver power is cycled.

■ Protocol

Set the SW5-No.2 of the function setting switch2 to ON. The Modbus protocol is selected.

Factory setting OFF

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique.

Address number (slave address) 0 is reserved for broadcasting, so do not use this address.

Factory setting SW1: 0, SW5-No.1: OFF (Address number 0)

SW1	SW5-No.1	Address number (slave address)	SW1	SW5-No.1	Address number (slave address)
0	OFF	Not used	0	ON	16
1		1	1		17
2		2	2		18
3		3	3		19
4		4	4		20
5		5	5		21
6		6	6		22
7		7	7		23
8		8	8		24
9		9	9		25
A		10	A		26
B		11	B		27
C		12	C		28
D		13	D		29
E		14	E		30
F		15	F		31

■ Transmission rate

Set the transmission rate using transmission rate setting switch (SW4).

The transmission rate to be set should be the same as the transmission rate of the master controller.

Factory setting 7

SW4	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600
4	115,200
5 to F	Not used

Note | Do not set the SW4 to positions 5 to F.

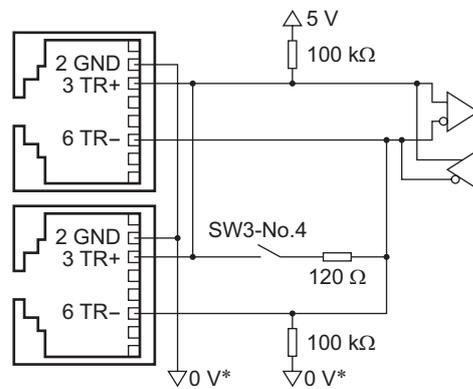
■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the master controller.

Turn the SW3-No.4 of the function setting switch1 to ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

SW3-No.4	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled



* The GND line is used in common with 24 VDC power supply input terminal (CN5).

4 Setting the RS-485 communication

Set parameters required to use via RS-485 communication beforehand.

■ Parameters set with the OPX-2A or MEXE02

The following parameters cannot be set via RS-485 communication. Set these parameters using the **OPX-2A** or **MEXE02**

Parameter name	Description	Setting range	Initial value
Communication parity	Sets the parity for RS-485 communication.	0: No parity 1: Even 2: Odd	1
Communication stop bit	Sets the stop bit for RS-485 communication.	0: 1 bit 1: 2 bit	0
Communication transfer wait time	Sets the transmission waiting time for RS-485 communication.	0 to 10000 (1=0.1 ms)	100

■ Parameters set with the OPX-2A, MEXE02 or via RS-485 communication

Set the following parameters using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

Parameter name	Description	Setting range	Initial value
Communication time out	Sets the condition in which the communication timeout occurs in RS-485 communication. When setting to zero (0), the driver does not monitor the condition in which the communication timeout occurs.	0 to 10000 ms	0
Communication error alarm	Sets the condition in which the RS-485 communication error alarm generates. The communication error alarm generates after the RS-485 communication error has occurred by the number of times set here.	1 to 10 times	3

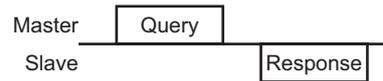
5 Communication mode and communication timing

5.1 Communication mode

Modbus protocol communication is based on the single-master/multiple-slave method. Under this protocol, messages are sent in one of two methods.

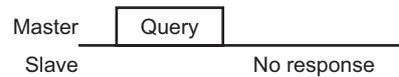
- **Unicast mode**

The master sends a command to only one slave. The slave executes the process and returns a response.

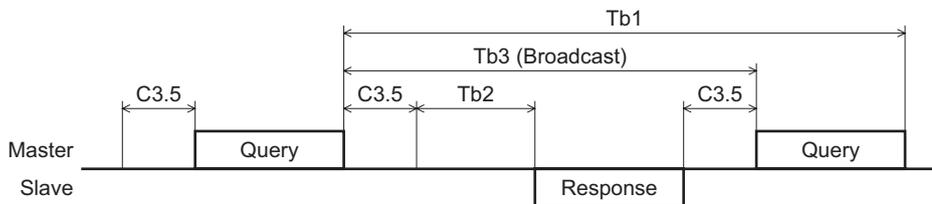


- **Broadcast mode**

If slave address 0 is specified on the master, the master can send a command to all slaves. Each slave executes the process, but does not return a response.



5.2 Communication timing



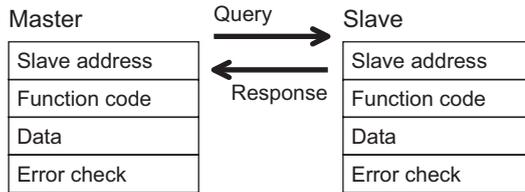
Character	Name	Description
Tb1	Communication timeout	Intervals between received messages are monitored. If no message could be received after the time set in the "communication time out" parameter, the RS-485 communication timeout alarm generates.
Tb2	Transmission waiting time	The time after the slave switches its communication line to the transmission mode upon receiving a query from the master, until it starts sending a response. Sets using the "communication transfer wait time" parameter. The actual transmission waiting time corresponds to the silent interval (C3.5) + processing time + transmission waiting time (Tb2).
Tb3	Broadcasting interval	The time until the next query is sent in broadcasting. A time equivalent to or longer than the silent interval (C3.5) plus 5 ms is required.
C3.5	Silent interval	Be sure to provide a waiting time of 3.5 characters or more. If this waiting time is less than 3.5 characters long, the driver cannot respond. See the following table for transmission waiting time.

Transmission waiting time of the "silent interval"

Transmission rate (bps)	Transmission waiting time
9600	4 ms or more
19200	2 ms or more
38400 57600 115,200	1.75 ms or more

6 Message

The message format is shown below.



6.1 Query

The query message structure is shown below.

Slave address	Function code	Data	Error check
8 bits	8 bits	N×8 bits	16 bits

■ Slave address

Specify the slave address (unicast mode).

If the slave address is set to 0, the master can send a query to all slaves (broadcast mode).

■ Function code

The function codes and message lengths supported by the **BLE** Series FLEX RS-485 communication type are as follows.

Function code	Description	Message length		Broadcast
		Query	Response	
03h	Read from a holding register(s).	8	7 to 37	Impossible
06h	Write to a holding register.	8	8	Possible
08h	Perform diagnosis.	8	8	Impossible
10h	Write to multiple holding registers.	11 to 41	8	Possible

■ Data

Set data associated with the selected function code. The specific data length varies depending on the function code.

■ Error check

In the Modbus RTU mode, error checks are based on the CRC-16 method. The slave calculates a CRC-16 of each received message and compares the result against the error check value included in the message. If the calculated CRC-16 value matches the error check value, the slave determines that the message is normal.

• CRC-16 calculation method

1. Calculate an exclusive-OR (XOR) value of the default value of FFFFh and slave address (8 bits).
2. Shift the result of step 1 to the right by 1 bit. Repeat this shift until the overflow bit becomes "1."
3. Upon obtaining "1" as the overflow bit, calculate an XOR of the result of step 2 and A001h.
4. Repeat steps 2 and 3 until a shift is performed eight times.
5. Calculate an XOR of the result of step 4 and function code (8 bits).
Repeat steps 2 to 4 for all bytes.
The final result gives the result of CRC-16 calculation.

- Example of CRC-16 calculation (slave address: 02h, function code: 07h)

The following table is a calculation example when setting the slave address of the first byte to 02h and setting the function code of the second byte to 07h.

The result of actual CRC-16 calculation is calculated including the data on and after the third byte.

Description	Result	Overflow digit
Default value in CRC register FFFFh	1111 1111 1111 1111	-
First byte 02h	0000 0000 0000 0010	-
XOR with default value FFFFh	1111 1111 1111 1101	-
First shift to right	0111 1111 1111 1110	1
XOR with A001h	1010 0000 0000 0001 1101 1111 1111 1111	-
Second shift to right	0110 1111 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1100 1111 1111 1110	-
Third shift to right	0110 0111 1111 1111	0
Fourth shift to right	0011 0011 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1001 0011 1111 1110	-
Fifth shift to right	0100 1001 1111 1111	0
Sixth shift to right	0010 0100 1111 1111	1
XOR with A001h	1010 0000 0000 0001 1000 0100 1111 1110	-
Seventh shift to right	0100 0010 0111 1111	0
Eighth shift to right	0010 0001 0011 1111	1
XOR with A001h	1010 0000 0000 0001 1000 0001 0011 1110	-
XOR with next byte 07h	0000 0000 0000 0111 1000 0001 0011 1001	-
First shift to right	0100 0000 1001 1100	1
XOR with A001h	1010 0000 0000 0001 1110 0000 1001 1101	-
Second shift to right	0111 0000 0100 1110	1
XOR with A001h	1010 0000 0000 0001 1101 0000 0100 1111	-
Third shift to right	0110 1000 0010 0111	1
XOR with A001h	1010 0000 0000 0001 1100 1000 0010 0110	-
Fourth shift to right	0110 0100 0001 0011	0
Fifth shift to right	0011 0010 0000 1001	1
XOR with A001h	1010 0000 0000 0001 1001 0010 0000 1000	-
Sixth shift to right	0100 1001 0000 0100	0
Seventh shift to right	0010 0100 1000 0010	0
Eighth shift to right	0001 0010 0100 0001	0
Result of CRC-16	0001 0010 0100 0001	-

6.2 Response

Slave-returned responses are classified into three types: normal response, no response, and exception response. The response message structure is the same as the command message structure.

Slave address	Function code	Data	Error check
8 bits	8 bits	$N \times 8$ bits	16 bits

■ Normal response

Upon receiving a query from the master, the slave executes the requested process and returns a response.

■ No response

The slave may not return a response to a query sent by the master. This condition is referred to as "No response." The causes of no response are explained below.

• Transmission error

The slave discards the query and does not return a response if any of the following transmission errors is detected.

Cause of transmission error	Description
Framing error	Stop bit 0 was detected.
Parity error	A mismatch with the specified parity was detected.
Mismatched CRC	The calculated value of CRC-16 was found not matching the error check value.
Invalid message length	The message length exceeded 256 bytes.

• Other than transmission error

A response may not be returned without any transmission error being detected.

Cause	Description
Broadcast	If the query was broadcast, the slave executes the requested process but does not return a response.
Mismatched slave address	The slave address in the query was found not matching the slave address of the driver.

■ Exception response

An exception response is returned if the slave cannot execute the process requested by the query. Appended to this response is an exception code indicating why the process cannot be executed. The message structure of exception response is as follows.

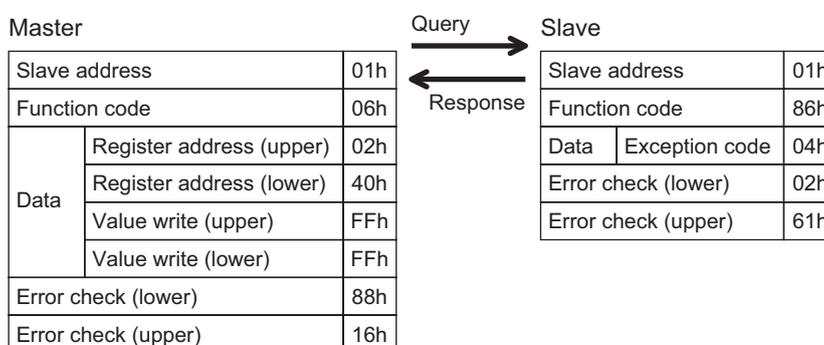
Slave address	Function code	Exception code	Error check
8 bits	8 bits	8 bits	16 bits

• Function code

The function code in the exception response is a sum of the function code in the query and 80h.

Example) query: 03h → Exception response: 83h

• Example of exception response



• Exception code

This code indicates why the process cannot be executed.

Exception code	Communication error code	Cause	Description
01h	88h	Invalid function	The process could not be executed because the function code was invalid. · The function code is not supported. · The sub-function code for diagnosis (08h) is other than 00h.
02h		Invalid data address	The process could not be executed because the data address was invalid. · The address is not supported (other than 0000h to 1FFFh). · Register address and number of registers are 2000h or more in total.
03h	8Ch	Invalid data	The process could not be executed because the data was invalid. · The number of registers is 0 or more than 17. · The number of bytes is other than twice the number of registers. · The data length is outside the specified range.
04h	89h 8Ah 8Ch 8Dh	Slave error	The process could not be executed because an error occurred at the slave. • User I/F communication in progress (89h) · Downloading, initializing or teaching function is in progress using the OPX-2A · Downloading or initialization is in progress using the MEXE02 • Non-volatile memory processing in progress (8Ah) · Internal processing is in progress. (S-BSY is ON.) · An EEPROM error alarm is present. • Outside the parameter setting range (8Ch) · The value write is outside the setting range. • Command execute disable (8Dh)

7 Function code

7.1 Reading from a holding register(s)

This function code is used to read a register (16 bits). Up to 16 successive registers (16×16 bits) can be read. Read the upper and lower data at the same time. If they are not read at the same time, the value may be invalid. If multiple holding registers are read, they are read in order of register addresses.

Example of read

Read operation data for rotation speed Nos.0 and 1 of slave address 1.

Description	Register address	Value read	Corresponding decimal
Rotation speed No.0 (upper)	0480h	0000h	100
Rotation speed No.0 (lower)	0481h	0064h	
Rotation speed No.1 (upper)	0482h	0000h	4000
Rotation speed No.1 (lower)	0483h	0FA0h	

• Query

Field name	Data	Description
Slave address	01h	Slave address 1
Function code	03h	Reading from holding registers
Data	Register address (upper)	04h
	Register address (lower)	80h
	Number of registers (upper)	00h
	Number of registers (lower)	04h
Error check (lower)	44h	Calculation result of CRC-16
Error check (upper)	D1h	

• Response

Field name	Data	Description
Slave address	01h	Same as query
Function code	03h	
Data	Number of data bytes	08h
	Value read from register address (upper)	00h
	Value read from register address (lower)	00h
	Value read from register address+1 (upper)	00h
	Value read from register address+1 (lower)	64h
	Value read from register address+2 (upper)	00h
	Value read from register address+2 (lower)	00h
	Value read from register address+3 (upper)	0Fh
	Value read from register address+3 (lower)	A0h
Error check (lower)	E1h	Calculation result of CRC-16
Error check (upper)	97h	

7.2 Writing to a holding register

This function code is used to write data to a specified register address.

However, since the result combining the upper and lower may be outside the data range, write the upper and lower at the same time using the "multiple holding registers (10h)."

Example of write

Write 50 (32h) as overload warning level (lower) to slave address 2.

Description	Register address	Value write	Corresponding decimal
Overload warning level (lower)	10ABh	32h	50

- Query

Field name		Data	Description
Slave address		02h	Slave address 2
Function code		06h	Writing to a holding register
Data	Register address (upper)	10h	Register address to be written
	Register address (lower)	ABh	
	Value write (upper)	00h	Value written to the register address
	Value write (lower)	32h	
Error check (lower)		7Dh	Calculation result of CRC-16
Error check (upper)		0Ch	

- Response

Field name		Data	Description
Slave address		02h	Same as query
Function code		06h	
Data	Register address (upper)	10h	
	Register address (lower)	ABh	
	Value write (upper)	00h	
	Value write (lower)	32h	
Error check (lower)		7Dh	Calculation result of CRC-16
Error check (upper)		0Ch	

7.3 Diagnosis

This function code is used to diagnose the communication between the master and slave. Arbitrary data is sent and the returned data is used to determine whether the communication is normal. 00h (reply to query) is the only sub-function supported by this function code.

Example of diagnosis

Send arbitrary data (1234h) to the slave.

- Query

Field name		Data	Description
Slave address		03h	Slave address 3
Function code		08h	Diagnosis
Data	Sub-function code (upper)	00h	Return the query data
	Sub-function code (lower)	00h	
	Data value (upper)	12h	Arbitrary data (1234h)
	Data value (lower)	34h	
Error check (lower)		ECh	Calculation result of CRC-16
Error check (upper)		9Eh	

- Response

Field name		Data	Description
Slave address		03h	Same as query
Function code		08h	
Data	Sub-function code (upper)	00h	
	Sub-function code (lower)	00h	
	Data value (upper)	12h	
	Data value (lower)	34h	
Error check (lower)		ECh	
Error check (upper)		9Eh	

7.4 Writing to multiple holding registers

This function code is used to write data to multiple successive registers. Up to 16 registers can be written.

Write the data to the upper and lower at the same time. If not, an invalid value may be written.

Registers are written in order of register addresses. Note that even when an exception response is returned because some data is invalid as being outside the specified range, etc., other data may have been written properly.

Example of write

Set the following data as acceleration time Nos.0 to 2 as part of operation data at slave address 4.

Description	Register address	Value written	Corresponding decimal
Operation data acceleration time No.0 (upper)	0600h	0000h	2
Operation data acceleration time No.0 (lower)	0601h	0002h	
Operation data acceleration time No.1 (upper)	0602h	0000h	50
Operation data acceleration time No.1 (lower)	0603h	0032h	
Operation data acceleration time No.2 (upper)	0604h	0000h	150
Operation data acceleration time No.2 (lower)	0605h	0096h	

• Query

Field name	Data	Description	
Slave address	04h	Slave address 4	
Function code	10h	Writing to multiple holding registers	
Data	Register address (upper)	06h	
	Register address (lower)	00h	Register address to start writing from
	Number of registers (upper)	00h	Number of registers to be written from the starting register address (6 registers=0006h)
	Number of registers (lower)	06h	
	Number of data bytes	0Ch	Twice the number of registers in the command (6 registers × 2 = 12 registers: 0Ch)
	Value written to register address (upper)	00h	Value written to register address 0600h
	Value written to register address (lower)	00h	
	Value written to register address+1 (upper)	00h	Value written to register address 0601h
	Value written to register address+1 (lower)	02h	
	Value written to register address+2 (upper)	00h	Value written to register address 0602h
	Value written to register address+2 (lower)	00h	
	Value written to register address+3 (upper)	00h	Value written to register address 0603h
	Value written to register address+3 (lower)	32h	
	Value written to register address+4 (upper)	00h	Value written to register address 0604h
	Value written to register address+4 (lower)	00h	
	Value written to register address+5 (upper)	00h	Value written to register address 0605h
Value written to register address+5 (lower)	96h		
Error check (lower)	85h	Calculation result of CRC-16	
Error check (upper)	70h		

• Response

Field name	Data	Description	
Slave address	04h	Same as query	
Function code	10h		
Data	Register address (upper)		06h
	Register address (lower)		00h
	Number of registers (upper)		00h
	Number of registers (lower)	06h	
Error check (lower)	40h	Calculation result of CRC-16	
Error check (upper)	D6h		

8 Register address list

All data used by the driver is 32-bit wide. The register for the Modbus protocol is 16-bit wide, and one data is described by two registers. Since the address assignment is big endian, the even number addresses become the upper and the odd number addresses become the lower.

8.1 Operation commands

These are commands related to motor operation. Operation commands are not saved in the non-volatile memory.

Register address		Name	Description	READ/ WRITE	Setting range
Dec	Hex				
48	0030h	Group (upper)	Sets the group address.	R/W	-1: No group specification (Group send is not performed) 1 to 31: Group address (Address number of parent slave)
49	0031h	Group (lower)			
124	007Ch	Driver input command (upper)	Sets the input command to the driver.	R/W	See the following explanation.
125	007Dh	Driver input command (lower)			
126	007Eh	Driver output command (upper)	Reads the output status of the driver.	R	See next page.
127	007Fh	Driver output command (lower)			

- Group (0030h, 0031h)

Multiple slaves are made into a group and a query is sent to all slaves in the group at once. See page 108 for group details.

The initial value is -1. When performing read or write for setting a group, set the upper and lower simultaneously.

Address (Hex)	Description of address *							
0030h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	[FFFFh]							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	[FFFFh]							

* []: Initial value

Address (Hex)	Description of address *							
0031h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	1 to 31: Sets the address number for the group send. [FFFFh]							
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	1 to 31: Sets the address number for the group send. [FFFFh]							

* []: Initial value

- Driver input command (007Ch, 007Dh)

These are the driver input signals that can be accessed via RS-485 communication. See page 54 for each input signal.

Address (Hex)	Description of address							
007Ch	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	-	-	-	-	-	-	-	-
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	-	-	-	-	-	-	-

Address (Hex)	Description of address *							
007Dh	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	NET-IN15 [Not used]	NET-IN14 [Not used]	NET-IN13 [Not used]	NET-IN12 [Not used]	NET-IN11 [Not used]	NET-IN10 [Not used]	NET-IN9 [Not used]	NET-IN8 [Not used]
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	NET-IN7 [Not used]	NET-IN6 [MB-FREE]	NET-IN5 [STOP-MODE]	NET-IN4 [REV]	NET-IN3 [FWD]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* []: Initial value

- Driver output command (007Eh, 007Fh)

These are the driver output signals that can be received via RS-485 communication. See page 56 for each output signal.

Address (Hex)	Description of address							
	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
007Eh	-	-	-	-	-	-	-	-
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	-	-	-	-	-	-	-

Address (Hex)	Description of address *							
	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
007Fh	NET-OUT15 [TLC]	NET-OUT14 [VA]	NET-OUT13 [MOVE]	NET-OUT12 [ALARM-OUT2]	NET-OUT11 [Not used]	NET-OUT10 [Not used]	NET-OUT9 [Not used]	NET-OUT8 [S-BSY]
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	NET-OUT7 [ALARM-OUT1]	NET-OUT6 [WNG]	NET-OUT5 [STOP-MODE_R]	NET-OUT4 [REV_R]	NET-OUT3 [FWD_R]	NET-OUT2 [M2_R]	NET-OUT1 [M1_R]	NET-OUT0 [M0_R]

* []: Initial value

8.2 Maintenance commands

These commands are used to reset alarms and warnings, and they are also used to execute the batch processing for the non-volatile memory. All commands can be written (WRITE). They are executed when writing from 0 to 1.

Register address		Name	Description	Setting range
Dec	Hex			
384	0180h	Reset alarm (upper)	Resets the alarms that are present. Some alarms cannot be reset with the "reset alarm."	0, 1
385	0181h	Reset alarm (lower)		
388	0184h	Clear alarm records (upper)	Clears alarm records.	
389	0185h	Clear alarm records (lower)		
390	0186h	Clear warning records (upper)	Clears warning records.	
391	0187h	Clear warning records (lower)		
392	0188h	Clear communication error records (upper)	Clears the communication error records.	
393	0189h	Clear communication error records (lower)		
396	018Ch	Configuration (upper)	Executes the parameter recalculation and the setup.	
397	018Dh	Configuration (lower)		
398	018Eh	All data initialization (upper) *	Resets the operation data and parameters saved in the non-volatile memory, to their defaults.	
399	018Fh	All data initialization (lower) *		
400	0190h	Batch NV memory read (upper)	Reads the parameters saved in the non-volatile memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten.	
401	0191h	Batch NV memory read (lower)		
402	0192h	Batch NV memory write (upper)	Writes the parameters saved in the RAM to the non-volatile memory. The non-volatile memory can be rewritten approximately 100,000 times.	
403	0193h	Batch NV memory write (lower)		

* Communication parity, communication stop bit and transmission waiting time are not initialized. Initialize them using the **OPX-2A** or **MEXE02**.

Note | The non-volatile memory can be rewritten approx. 100,000 times.

Configuration (018Ch, 018Dh)

Configuration will be executed when all of the following conditions are satisfied:

- An alarm is not present.
- The motor is not operated.
- The **OPX-2A** is in other modes than the test mode or copy mode.
- The **MEXE02** is in other status than downloading, I/O test, test operation or teaching function.

Shows the driver status before and after executing the configuration.

Item	Configuration is ready to execute	Configuration is executing	Configuration is completed
PWR LED	Lit	Lit	Based on the driver condition.
ALM LED	OFF	OFF	
Electromagnetic brake	Hold/release	Hold	
Output signals	Allowed	Indeterminable	Allowed
Input signals		Not allowed	

Note The correct monitor value may not return even when the monitor is executed while executing the configuration.

8.3 Monitor commands

These commands are used to monitor the command position, command speed, alarm and warning records, etc. All commands can be read (READ).

Register address		Name	Description	Range
Dec	Hex			
128	0080h	Present alarm (upper)	Monitors the present alarm code.	00h to FFh
129	0081h	Present alarm (lower)		
130	0082h	Alarm record 1 (upper)	Monitors the alarm records.	
131	0083h	Alarm record 1 (lower)		
132	0084h	Alarm record 2 (upper)		
133	0085h	Alarm record 2 (lower)		
134	0086h	Alarm record 3 (upper)		
135	0087h	Alarm record 3 (lower)		
136	0088h	Alarm record 4 (upper)		
137	0089h	Alarm record 4 (lower)		
138	008Ah	Alarm record 5 (upper)		
139	008Bh	Alarm record 5 (lower)		
140	008Ch	Alarm record 6 (upper)		
141	008Dh	Alarm record 6 (lower)		
142	008Eh	Alarm record 7 (upper)		
143	008Fh	Alarm record 7 (lower)		
144	0090h	Alarm record 8 (upper)		
145	0091h	Alarm record 8 (lower)		
146	0092h	Alarm record 9 (upper)		
147	0093h	Alarm record 9 (lower)		
148	0094h	Alarm record 10 (upper)		
149	0095h	Alarm record 10 (lower)		
150	0096h	Present warning (upper)	Monitors the present warning code.	
151	0097h	Present warning (lower)		
152	0098h	Warning record 1 (upper)	Monitors the warning records.	
153	0099h	Warning record 1 (lower)		
154	009Ah	Warning record 2 (upper)		
155	009Bh	Warning record 2 (lower)		
156	009Ch	Warning record 3 (upper)		
157	009Dh	Warning record 3 (lower)		
158	009Eh	Warning record 4 (upper)		
159	009Fh	Warning record 4 (lower)		

Register address list

Register address		Name	Description	Range
Dec	Hex			
160	00A0h	Warning record 5 (upper)	Monitors the warning records.	00h to FFh
161	00A1h	Warning record 5 (lower)		
162	00A2h	Warning record 6 (upper)		
163	00A3h	Warning record 6 (lower)		
164	00A4h	Warning record 7 (upper)		
165	00A5h	Warning record 7 (lower)		
166	00A6h	Warning record 8 (upper)		
167	00A7h	Warning record 8 (lower)		
168	00A8h	Warning record 9 (upper)		
169	00A9h	Warning record 9 (lower)		
170	00AAh	Warning record 10 (upper)		
171	00ABh	Warning record 10 (lower)		
172	00ACh	Communication error code (upper)	Monitors the last received communication error code.	
173	00ADh	Communication error code (lower)		
174	00AEh	Communication error code record 1 (upper)	Monitors the communication error records that have occurred in the past.	
175	00AFh	Communication error code record 1 (lower)		
176	00B0h	Communication error code record 2 (upper)		
177	00B1h	Communication error code record 2 (lower)		
178	00B2h	Communication error code record 3 (upper)		
179	00B3h	Communication error code record 3 (lower)		
180	00B4h	Communication error code record 4 (upper)		
181	00B5h	Communication error code record 4 (lower)		
182	00B6h	Communication error code record 5 (upper)		
183	00B7h	Communication error code record 5 (lower)		
184	00B8h	Communication error code record 6 (upper)		
185	00B9h	Communication error code record 6 (lower)		
186	00BAh	Communication error code record 7 (upper)		
187	00BBh	Communication error code record 7 (lower)		
188	00BCh	Communication error code record 8 (upper)		
189	00BDh	Communication error code record 8 (lower)		
190	00BEh	Communication error code record 9 (upper)		
191	00BFh	Communication error code record 9 (lower)		
192	00C0h	Communication error code record 10 (upper)		
193	00C1h	Communication error code record 10 (lower)		

Register address		Name	Description	Range
Dec	Hex			
196	00C4h	Present operation data No. (upper)	Monitors the operation data No. corresponding to the data used in the current operation.	0 to 15
197	00C5h	Present operation data No. (lower)		
200	00C8h	Command speed (upper)	Monitors the command speed.	-4010 to +4010 r/min +: Forward -: Reverse 0: Stop
201	00C9h	Command speed (lower)		
206	00CEh	Feedback speed (upper)	Monitors the feedback speed.	-5200 to +5200 r/min +: Forward -: Reverse 0: Stop
207	00CFh	Feedback speed (lower)		
212	00D4h	Direct I/O and electromagnetic brake status (upper)	Monitors the each direct I/O signal and electromagnetic brake status.	See next table.
213	00D5h	Direct I/O and electromagnetic brake status (lower)		
256	0100h	Operation speed (upper)	Monitors the feedback speed calculated by the "reduction gear rate" parameter or "amplification speed rate" parameter.	-20050 to +20050 r/min +: Forward -: Reverse 0: Stop
257	0101h	Operation speed (lower)		
258	0102h	Operation speed decimal position (upper)	Monitors the decimal position in the operation speed. *2	0: No decimal point 1: 1 digit 2: 2 digit 3: 3 digit
259	0103h	Operation speed decimal position (lower)		
260	0104h	Conveyor transfer speed (upper)	Monitors the feedback speed calculated by the "conveyor reduction gear rate" parameter or "conveyor amplification speed rate" parameter.	-20050 to +20050 r/min +: Forward -: Reverse 0: Stop
261	0105h	Conveyor transfer speed (lower)		
262	0106h	Conveyor transfer speed decimal position (upper)	Monitors the decimal position in the conveyor transfer speed. *1	0: No decimal point 1: 1 digit 2: 2 digit 3: 3 digit
263	0107h	Conveyor transfer speed decimal position (lower)		
264	0108h	Load factor (upper)	Monitors the torque that is output by the motor based on the rated torque being 100%.	0 to 200%
265	0109h	Load factor (lower)		
268	010Ch	External analog speed setting (upper)	Monitors the value of the analog speed setting. *2	0 to 4000 r/min
269	010Dh	External analog speed setting (lower)		
272	0110h	External analog torque limit setting (upper)	Monitors the value of the analog torque limiting. *2	0 to 200%
273	0111h	External analog torque limit setting (lower)		
278	0116h	External analog voltage setting (upper)	Monitors the value of the analog voltage setting.	0 to 100 (1=0.1 V)
279	0117h	External analog voltage setting (lower)		

*1 The decimal position is automatically changed based on the setting of the "conveyor reduction gear rate" parameter or "decimal place for conveyor reduction gear rate" parameter.

*2 FFFFh is displayed when not selecting by the "analog input signal select" parameter.

■ Direct I/O and electromagnetic brake status (00D4h, 00D5h)

Address (Hex)	Description of address							
00D4h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	-	-	-	-	-	-	MB	-
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	-	-	-	-	-	OUT1	OUT2

Address (Hex)	Description of address							
00D5h	bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
	-	-	-	-	-	-	-	-
	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
	-	IN6	IN5	IN4	IN3	IN2	IN1	IN0

8.4 Parameter R/W commands

These commands are used to write or read parameters. All commands can be read and written (READ/WRITE). When the operation data is changed, a recalculation and setup will be performed immediately and the changed value will be set. For details on parameters, see page 63 and later.

■ Operation data

Register address		Name	Setting range	Initial value
Dec	Hex			
1152	0480h	Rotational speed No.0 (upper)	0, or 80 to 4000 r/min	0
1153	0481h	Rotational speed No.0 (lower)		
to	to	to		
1182	049Eh	Rotational speed No.15 (upper)		
1183	049Fh	Rotational speed No.15 (lower)		
1536	0600h	Acceleration No.0 (upper)	2 to 150 (1=0.1 s)	5
1537	0601h	Acceleration No.0 (lower)		
to	to	to		
1566	061Eh	Acceleration No.15 (upper)		
1567	061Fh	Acceleration No.15 (lower)		
1664	0680h	Deceleration No.0 (upper)	2 to 150 (1=0.1 s)	5
1665	0681h	Deceleration No.0 (lower)		
to	to	to		
1694	069Eh	Deceleration No.15 (upper)		
1695	069Fh	Deceleration No.15 (lower)		
1792	0700h	Torque limit No.0 (upper)	0 to 200%	200
1793	0701h	Torque limit No.0 (lower)		
to	to	to		
1822	071Eh	Torque limit No.15 (upper)		
1823	071Fh	Torque limit No.15 (lower)		

■ User parameters

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
646	0286h	JOG operating speed (upper)	0, or 80 to 1000 r/min	300	A
647	0287h	JOG operating speed (lower)			
900	0384h	Motor rotation direction (upper)	0: + direction=CCW 1: + direction=CW	1	C
901	0385h	Motor rotation direction (lower)			
960	03C0h	Display mode of the data setter speed (upper)	0: Signed 1: Absolute	0	A
961	03C1h	Display mode of the data setter speed (lower)			
962	03C2h	The data setter editing mode (upper)	0: Disable 1: Enable	1	
963	03C3h	The data setter editing mode (lower)			
4140	102Ch	Run mode select (upper)	0: PWM shut off mode enable 1: PWM shut off mode disable	1	C
4141	102Dh	Run mode select (lower)			
4162	1042h	JOG operation torque (upper)	0 to 200%	200	A
4163	1043h	JOG operation torque (lower)			
4170	104Ah	Reduction gear rate (upper)	100 to 9999	100	
4171	104Bh	Reduction gear rate (lower)			
4172	104Ch	Decimal place for reduction gear rate (upper)	0: 1 digit 1: 2 digit 2: 3 digit	2	
4173	104Dh	Decimal place for reduction gear rate (lower)			
4174	104Eh	Amplification speed rate (upper)	1 to 5	1	
4175	104Fh	Amplification speed rate (lower)			
4176	1050h	Conveyor reduction gear rate (upper)	100 to 9999	100	
4177	1051h	Conveyor reduction gear rate (lower)			
4178	1052h	Decimal place for conveyor reduction gear rate (upper)	0: 1 digit 1: 2 digit 2: 3 digit	2	
4179	1053h	Decimal place for conveyor reduction gear rate (lower)			
4180	1054h	Conveyor amplification speed rate (upper)	1 to 5	1	
4181	1055h	Conveyor amplification speed rate (lower)			
4224	1080h	Magnetic brake function at alarm (upper)	0: Lock after free stop 1: Lock immediately	1	C
4225	1081h	Magnetic brake function at alarm (lower)			
4226	1082h	No operation at initial alarm enable (upper)	0: Disable 1: Enable	0	
4227	1083h	No operation at initial alarm enable (lower)			
4230	1086h	Initial thermal input detection (upper)	0: Disable 1: Enable	0	
4231	1087h	Initial thermal input detection (lower)			
4258	10A2h	Over load warning enable (upper)	0: Disable 1: Enable	0	
4259	10A3h	Over load warning enable (lower)			
4266	10AAh	Over load warning level (upper)	50 to 100%	100	A
4267	10ABh	Over load warning level (lower)			
4320	10E0h	Data setter initial display (upper)	0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view	0	C
4321	10E1h	Data setter initial display (lower)			

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address list

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
4322	10E2h	Analog input signal select (upper)	0: Analog invalid 1: Analog speed 2: Analog torque (See page 106 for details)	1	C
4323	10E3h	Analog input signal select (lower)			
4430	114Eh	Velocity attainment width (upper)	0 to 400 r/min	200	A
4431	114Fh	Velocity attainment width (lower)			
4352	1100h	IN0 function select (upper)	See table on page 106.	1: FWD	B
4353	1101h	IN0 function select (lower)		2: REV	
4354	1102h	IN1 function select (upper)		19: STOP-MODE	
4355	1103h	IN1 function select (lower)		48: M0	
4356	1104h	IN2 function select (upper)		24: ALARM-RESET	
4357	1105h	IN2 function select (lower)		20: MB-FREE	
4358	1106h	IN3 function select (upper)		22: TH	
4359	1107h	IN3 function select (lower)			
4360	1108h	IN4 function select (upper)			
4361	1109h	IN4 function select (lower)			
4362	110Ah	IN5 function select (upper)			
4363	110Bh	IN5 function select (lower)			
4364	110Ch	IN6 function select (upper)			
4365	110Dh	IN6 function select (lower)			
4384	1120h	IN0 contact configuration (upper)	0: Make (N.O.) 1: Brake (N.C.)	0	C
4385	1121h	IN0 contact configuration (lower)			
4386	1122h	IN1 contact configuration (upper)			
4387	1123h	IN1 contact configuration (lower)			
4388	1124h	IN2 contact configuration (upper)			
4389	1125h	IN2 contact configuration (lower)			
4390	1126h	IN3 contact configuration (upper)			
4391	1127h	IN3 contact configuration (lower)			
4392	1128h	IN4 contact configuration (upper)			
4393	1129h	IN4 contact configuration (lower)			
4394	112Ah	IN5 contact configuration (upper)			
4395	112Bh	IN5 contact configuration (lower)			
4396	112Ch	IN6 contact configuration (upper)			
4397	112Dh	IN6 contact configuration (lower)			
4416	1140h	OUT0 function select (upper)	See table on page 106.	85: SPEED-OUT	A
4417	1141h	OUT0 function select (lower)		65: ALARM-OUT1	
4418	1142h	OUT1 function select (upper)			
4419	1143h	OUT1 function select (lower)			
4448	1160h	NET-IN0 function select (upper)	See table on page 106.	48: M0	C
4449	1161h	NET-IN0 function select (lower)		49: M1	
4450	1162h	NET-IN1 function select (upper)		50: M2	
4451	1163h	NET-IN1 function select (lower)		1: FWD	
4452	1164h	NET-IN2 function select (upper)		2: REV	
4453	1165h	NET-IN2 function select (lower)		19: STOP-MODE	
4454	1166h	NET-IN3 function select (upper)		20: MB-FREE	
4455	1167h	NET-IN3 function select (lower)			
4456	1168h	NET-IN4 function select (upper)			
4457	1169h	NET-IN4 function select (lower)			
4458	116Ah	NET-IN5 function select (upper)			
4459	116Bh	NET-IN5 function select (lower)			
4460	116Ch	NET-IN6 function select (upper)			
4461	116Dh	NET-IN6 function select (lower)			

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address		Name	Setting range	Initial value	Effective *			
Dec	Hex							
4462	116Eh	NET-IN7 function select (upper)	See table on page 106.	0: No function				
4463	116Fh	NET-IN7 function select (lower)						
4464	1170h	NET-IN8 function select (upper)						
4465	1171h	NET-IN8 function select (lower)						
4466	1172h	NET-IN9 function select (upper)						
4467	1173h	NET-IN9 function select (lower)						
4468	1174h	NET-IN10 function select (upper)						
4469	1175h	NET-IN10 function select (lower)						
4470	1176h	NET-IN11 function select (upper)						
4471	1177h	NET-IN11 function select (lower)						
4472	1178h	NET-IN12 function select (upper)						
4473	1179h	NET-IN12 function select (lower)						
4474	117Ah	NET-IN13 function select (upper)						
4475	117Bh	NET-IN13 function select (lower)						
4476	117Ch	NET-IN14 function select (upper)						
4477	117Dh	NET-IN14 function select (lower)						
4478	117Eh	NET-IN15 function select (upper)						
4479	117Fh	NET-IN15 function select (lower)						
4480	1180h	NET-OUT0 function select (upper)				See table on page 106.	48: M0_R	C
4481	1181h	NET-OUT0 function select (lower)					49: M1_R	
4482	1182h	NET-OUT1 function select (upper)	50: M2_R					
4483	1183h	NET-OUT1 function select (lower)	1: FWD_R					
4484	1184h	NET-OUT2 function select (upper)	2: REV_R					
4485	1185h	NET-OUT2 function select (lower)	19: STOP-MODE_R					
4486	1186h	NET-OUT3 function select (upper)	66: WNG					
4487	1187h	NET-OUT3 function select (lower)	65: ALARM-OUT1					
4488	1188h	NET-OUT4 function select (upper)	80: S-BSY					
4489	1189h	NET-OUT4 function select (lower)	0: No function					
4490	118Ah	NET-OUT5 function select (upper)	81: ALARM-OUT2					
4491	118Bh	NET-OUT5 function select (lower)	68: MOVE					
4492	118Ch	NET-OUT6 function select (upper)	77: VA					
4493	118Dh	NET-OUT6 function select (lower)	71: TLC					
4494	118Eh	NET-OUT7 function select (upper)						
4495	118Fh	NET-OUT7 function select (lower)						
4496	1190h	NET-OUT8 function select (upper)						
4497	1191h	NET-OUT8 function select (lower)						
4498	1192h	NET-OUT9 function select (upper)						
4499	1193h	NET-OUT9 function select (lower)						
4500	1194h	NET-OUT10 function select (upper)						
4501	1195h	NET-OUT10 function select (lower)						
4502	1196h	NET-OUT11 function select (upper)						
4503	1197h	NET-OUT11 function select (lower)						
4504	1198h	NET-OUT12 function select (upper)						
4505	1199h	NET-OUT12 function select (lower)						
4506	119Ah	NET-OUT13 function select (upper)						
4507	119Bh	NET-OUT13 function select (lower)						
4508	119Ch	NET-OUT14 function select (upper)						
4509	119Dh	NET-OUT14 function select (lower)						
4510	119Eh	NET-OUT15 function select (upper)						
4511	119Fh	NET-OUT15 function select (lower)						

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

Register address		Name	Setting range	Initial value	Effective *
Dec	Hex				
4512	11A0h	Analog operating speed command gain (upper)	0 to 4000 r/min	800	A
4513	11A1h	Analog operating speed command gain (lower)			
4514	11A2h	Analog operating speed command offset (upper)	-2000 to 2000 r/min	0	
4515	11A3h	Analog operating speed command offset (lower)			
4516	11A4h	Analog torque limit gain (upper)	0 to 200%	40	
4517	11A5h	Analog torque limit gain (lower)			
4518	11A6h	Analog torque limit offset (upper)	-50 to 50%	0	
4519	11A7h	Analog torque limit offset (lower)			
4522	11AAh	Analog operating speed maximum value for external input (upper)	0 to 4000 r/min	4000	
4523	11ABh	Analog operating speed maximum value for external input (lower)			
4526	11AEh	Analog torque limit maximum value external input (upper)	0 to 200%	200	
4527	11AFh	Analog torque limit maximum value external input (lower)			
4608	1200h	Communication time out (upper)	0: Not monitored 1 to 10000 ms	0	
4609	1201h	Communication time out (lower)			
4610	1202h	Communication error alarm (upper)	1 to 10 times	3	
4611	1203h	Communication error alarm (lower)			

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

• "Analog input signal select" parameter

Setting method of operation data can be changed using the "analog input signal select" parameter. Others except the following combinations are not available to set.

"Analog input signal select" parameter	Operation data No.	Rotational speed	Acceleration Deceleration	Torque limit
0	0 to 15	Digital setting		
1 (Initial value)	0	Analog setting	Digital setting	
	1 to 15	Digital setting		
2	0 to 15	Digital setting		Analog setting

Setting example

- When setting all operation data with digital setting: Set the "analog input signal select" parameter to "0."
- When setting only the rotation speed in the operation data No.0 using the analog setting: Set the "analog input signal select" parameter to "1."

• Setting items for I/O signal assignment

IN function select parameter

0: No function	22: TH	35: R3	41: R9	47: R15
1: FWD	24: ALARM-RESET	36: R4	42: R10	48: M0
2: REV	27: HMI	37: R5	43: R11	49: M1
19: STOP-MODE	32: R0	38: R6	44: R12	50: M2
20: MB-FREE	33: R1	39: R7	45: R13	51: M3
21: EXT-ERROR	34: R2	40: R8	46: R14	54: TL

OUT function select parameter

0: No function	32: R0	38: R6	44: R12	50: M2_R	71: TLC
1: FWD_R	33: R1	39: R7	45: R13	51: M3_R	77: VA
2: REV_R	34: R2	40: R8	46: R14	54: TL_R	80: S-BSY
19: STOP-MODE_R	35: R3	41: R9	47: R15	65: ALARM-OUT1	81: ALARM-OUT2
20: MB-FREE_R	36: R4	42: R10	48: M0_R	66: WNG	82: MPS
27: HMI_R	37: R5	43: R11	49: M1_R	68: MOVE	84: DIR
					85: SPEED-OUT

NET-IN function select parameter

0: No function	32: R0	38: R6	44: R12	50: M2
1: FWD	33: R1	39: R7	45: R13	51: M3
2: REV	34: R2	40: R8	46: R14	54: TL
19: STOP-MODE	35: R3	41: R9	47: R15	
20: MB-FREE	36: R4	42: R10	48: M0	
27: HMI	37: R5	43: R11	49: M1	

NET-OUT function select parameter

0: No function	32: R0	38: R6	44: R12	50: M2_R	71: TLC
1: FWD_R	33: R1	39: R7	45: R13	51: M3_R	77: VA
2: REV_R	34: R2	40: R8	46: R14	54: TL_R	80: S-BSY
19: STOP-MODE_R	35: R3	41: R9	47: R15	65: ALARM-OUT1	81: ALARM-OUT2
20: MB-FREE_R	36: R4	42: R10	48: M0_R	66: WNG	82: MPS
27: HMI_R	37: R5	43: R11	49: M1_R	68: MOVE	84: DIR

9 Group send

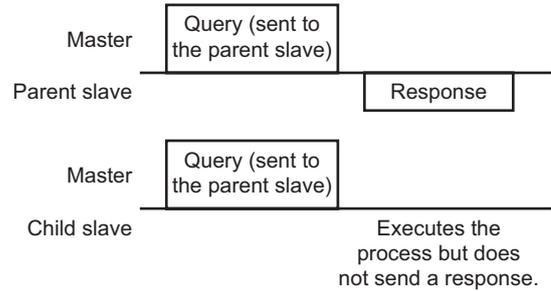
Multiple slaves are made into a group and a query is sent to all slaves in the group at once.

■ Group composition

A group consists of one parent slave and child slaves and only the parent slave returns a response.

■ Group address

To perform a group send, set a group address to the child slaves to be included in the group.
The child slaves to which the group address has been set can receive a query sent to the parent slave.



■ Parent slave

No special setting is required on the parent slave to perform a group send. The address of the parent slave becomes the group address. When a query is sent to the parent slave from the master, the parent slave executes the requested process and then returns a response (same as with the unicast mode).

■ Child slave

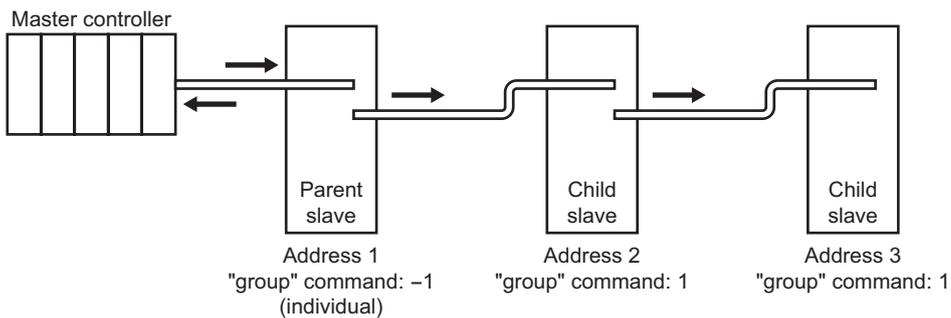
Use a "group" command to set a group address to each child slave. Change the group in the unicast mode.
When performing read or write for setting a group, set the upper and lower simultaneously.

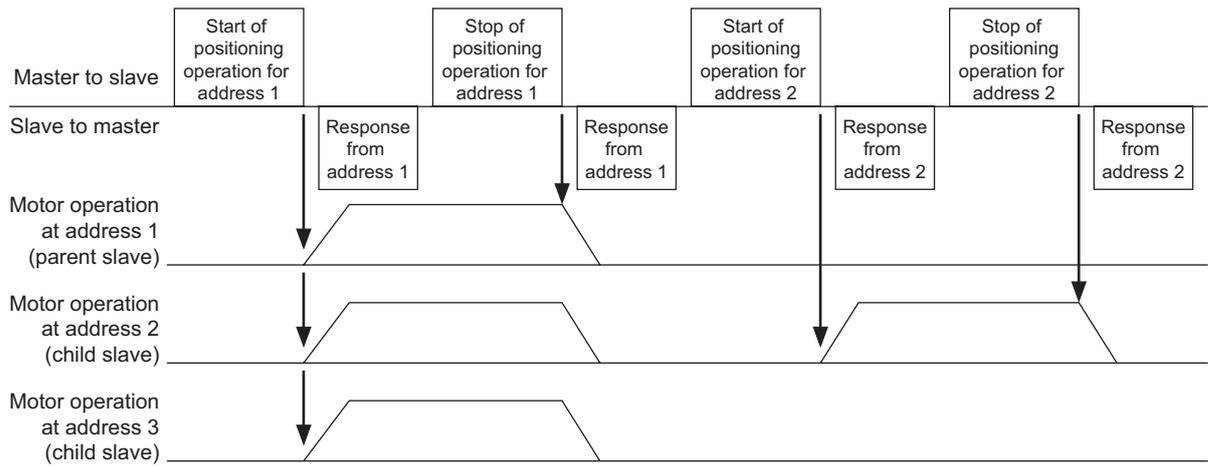
Register address		Name	Description	READ/ WRITE	Setting range
Dec	Hex				
48	0030h	Group (upper)	Sets the group address.	R/W	-1: No group specification (Group send is not performed) 1 to 31: Group address (Address number of parent slave)
49	0031h	Group (lower)			

Note Since the group setting is not saved in the non-volatile memory even when the "batch NV memory write" executes, the group setting will be cleared when turning the driver power OFF.

■ Function code to execute in a group send

Function code	Function
10h	Writing to multiple holding registers





10 Detection of communication errors

This function detects abnormalities that may occur during RS-485 communication. The abnormalities that can be detected include alarms, warnings and communication errors.

10.1 Communication errors

A communication error record will be saved in the RAM. You can check the communication errors using the “communication error record” command via RS-485 communication.

Note | The communication error record will be cleared once the driver power is turned off.

Type of communication error	Error code	Cause	Ref.
RS-485 communication error	84h	A transmission error was detected.	page 91
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected.	
Execution disable due to user I/F communication in progress	89h	An exception response (exception code 04h) was detected.	
Non-volatile memory processing in progress	8Ah		
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected.	
Command execute disable	8Dh	An exception response (exception code 04h) was detected.	

10.2 Alarms and warnings

When an alarm generates, the ALARM-OUT1 output will turn OFF and the motor will stop. At the same time, the ALM LED will start blinking.

When a warning generates, the WNG output will turn ON. The motor will continue to operate. Once the cause of the warning is removed, the WNG output will turn OFF automatically.

Note | The warning records will be cleared by turning off the driver power.

■ Communication switch setting error (83h)

When setting the transmission rate setting switch (SW4) to positions 8 to F, the transmission rate setting switch error will occur.

■ RS-485 communication error (84h)

The table below shows the relationship between alarms and warnings when an RS-485 communication error occurs.

Description of error	Description
Warning	A warning generates when one RS-485 communication error (84h) has been detected. If normal reception occurs while the warning is present, the warning will be reset automatically.
Alarm	An alarm generates when a RS-485 communication error (84h) has been detected consecutively by the number of times set in the “communication error alarm” parameter.

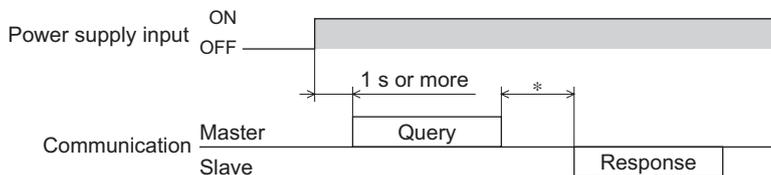
■ RS-485 communication timeout (85h)

If communication is not established with the master after an elapse of the time set by the “communication time out” parameter, the RS-485 communication timeout alarm will generate.

11 Timing charts

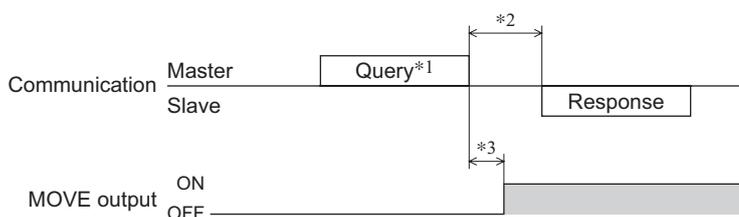
See "5.2 Communication timing" on p.88 for codes in the timing chart.

■ Communication start



* $Tb2$ (transmission waiting time) + $C3.5$ (silent interval) + command processing time

■ Operation start

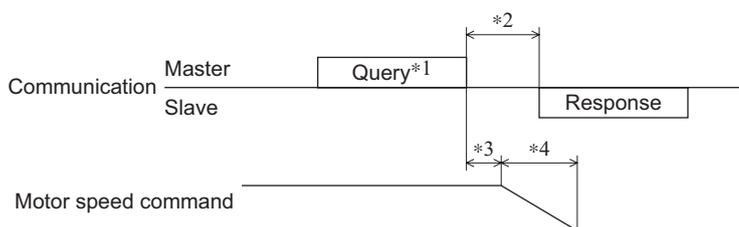


*1 A message including a query to start operation via RS-485 communication.

*2 $Tb2$ (transmission waiting time) + $C3.5$ (silent interval) + command processing time

*3 $C3.5$ (silent interval) + 4 ms or less

■ Operation stop, speed change



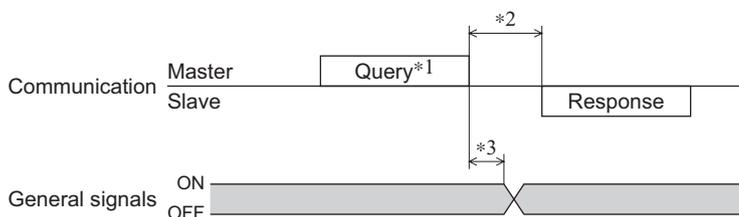
*1 A message including a query to stop operation and another to change the speed via RS-485 communication.

*2 $Tb2$ (transmission waiting time) + $C3.5$ (silent interval) + command processing time

*3 The specific time varies depending on the command speed.

*4 It varies based on the stopping method selected by the STOP-MODE input.

■ General signals

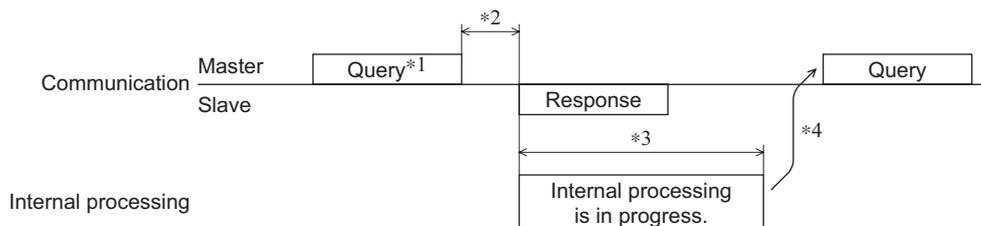


*1 A message including a query for remote output via RS-485 communication.

*2 $Tb2$ (transmission waiting time) + $C3.5$ (silent interval) + command processing time

*3 $C3.5$ (silent interval) + 4 ms or less

■ Configuration



*1 A message including a query for configuration via RS-485 communication.

*2 $Tb2$ (transmission waiting time) + $C3.5$ (silent interval) + command processing time

*3 Internal processing time + 1 s or less

*4 Execute a query after the driver internal processing has been completed.

5 Method of control via industrial network

This part explains how to control via industrial network. This product can be controlled via CC-Link communication or MECHATROLINK communication in combination with a network converter (sold separately).

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1 Method of control via CC-Link communication

See the following explanation when using the **BLE** Series FLEX RS-485 communication type in combination with the network converter **NETC01-CC** via CC-Link communication. Refer to "3 Details of remote I/O" on p.134 and "4 Command code list" on p.136 for remote I/O and command code.

1.1 Guidance

If you are new to the **BLE** Series FLEX RS-485 communication type, read this section to understand the operating methods along with the operation flow.

- Note**
- Before operating the motor, check the condition of the surrounding area to ensure safety.
 - See the network converter **NETC01-CC USER MANUAL** for how to set the parameter.

STEP 1 Set the transmission rate, station address and address number.

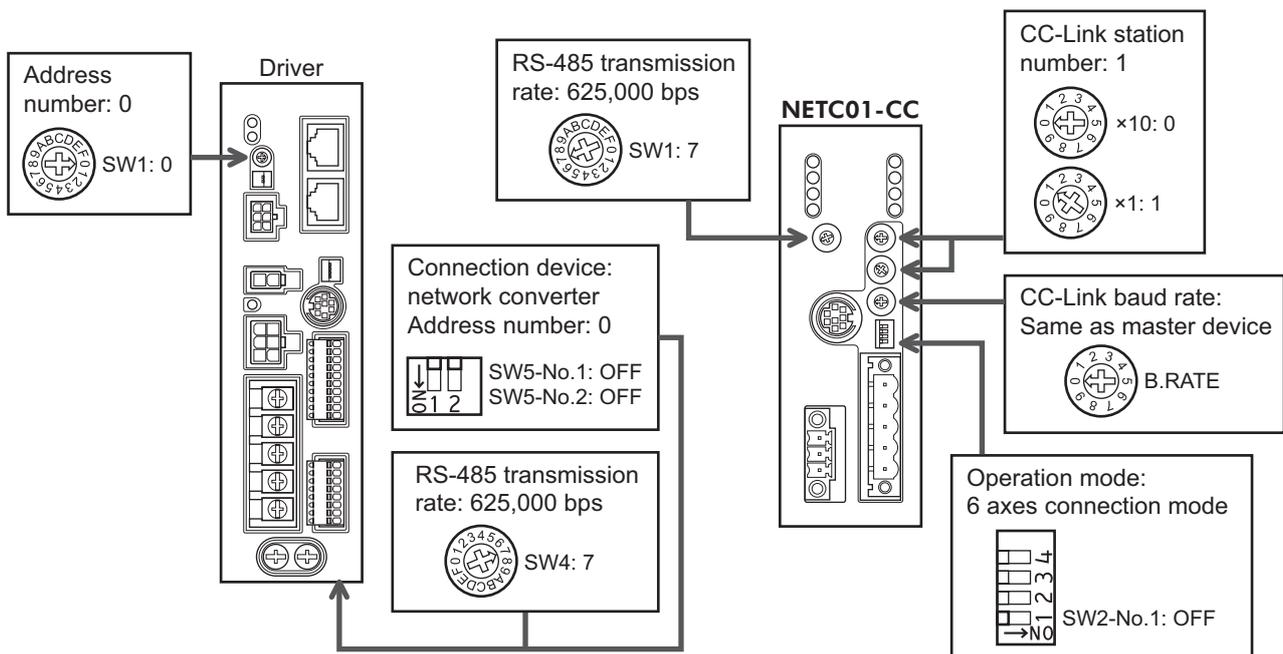
■ Using the switches

Setting condition of driver

- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW5-No.2 of the function setting switch2: OFF

Setting condition of **NETC01-CC**

- CC-Link station number: 1
- RS-485 transmission rate: 625,000 bps
- CC-Link baud rate: Same as the master station
- Operation mode: 6 axes connection mode

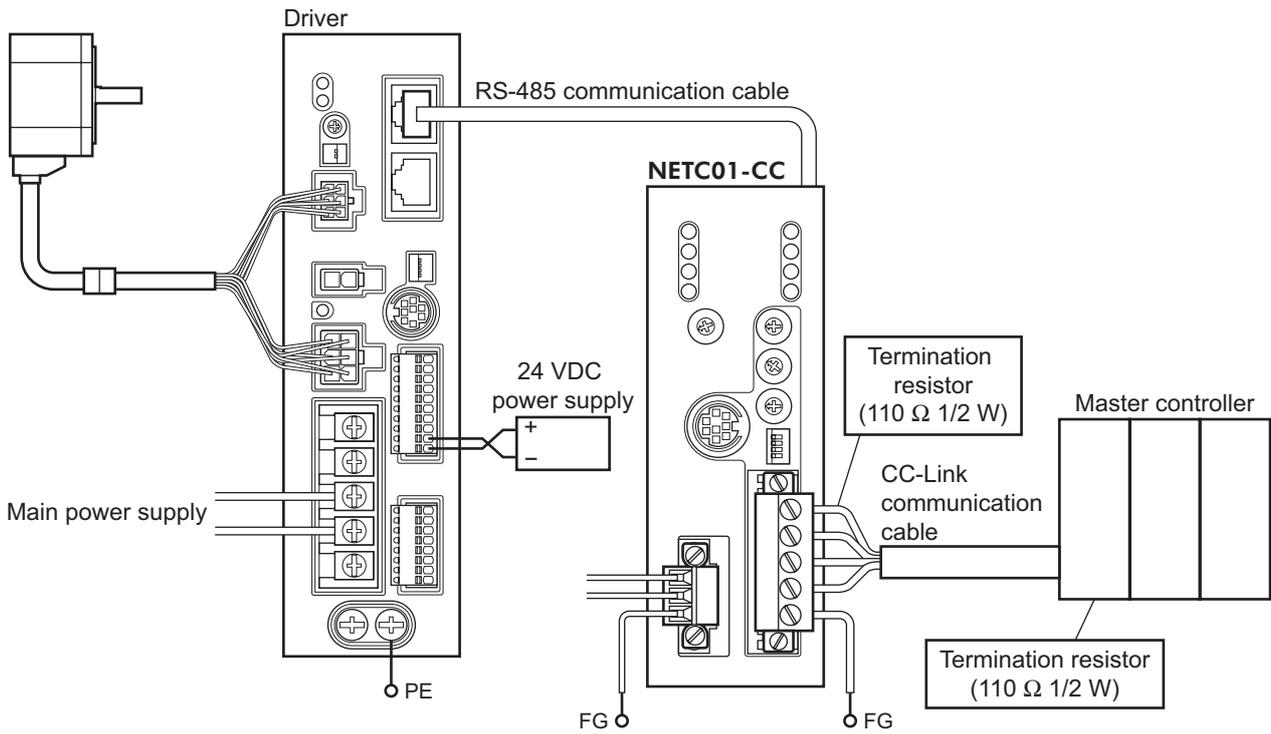


■ Using the parameter

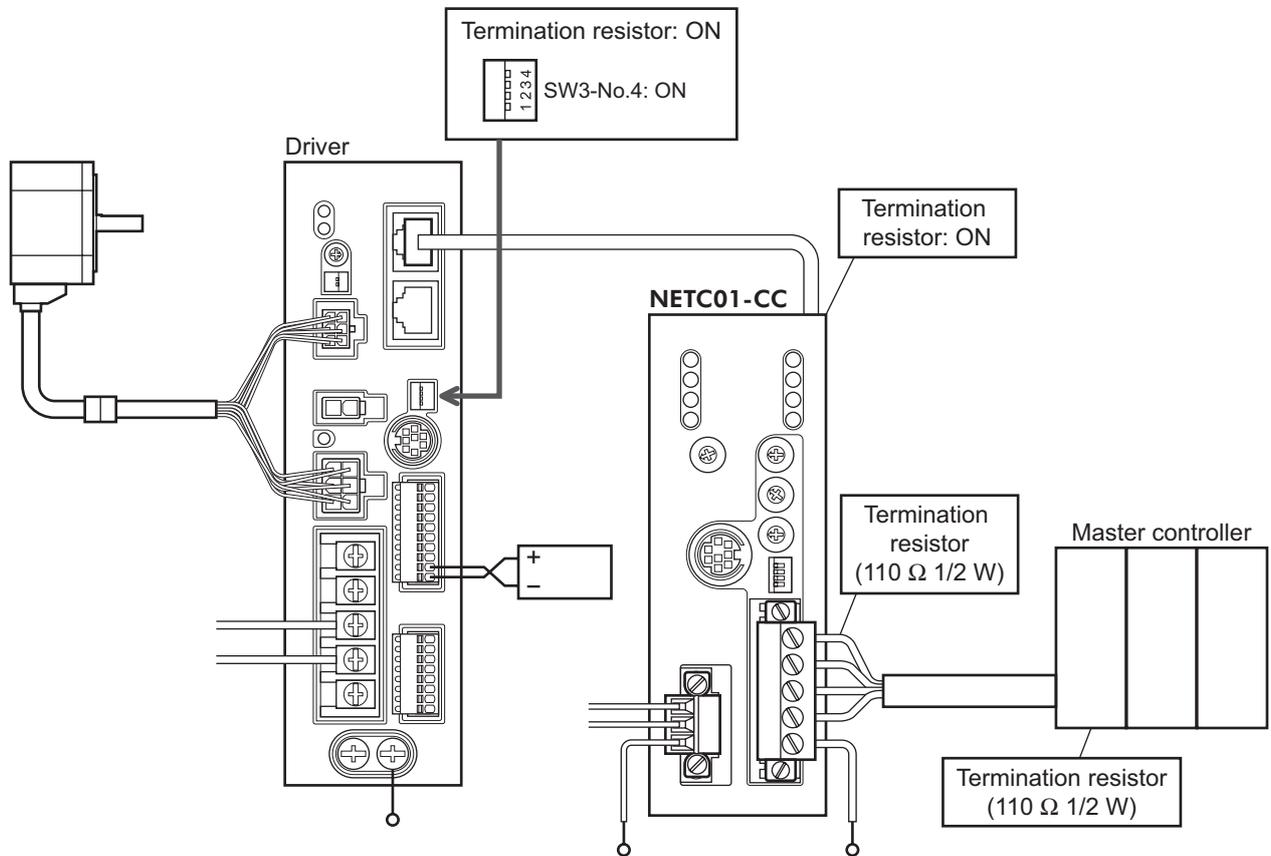
1. Set the "connection (address number 0) (1D80h)" parameter of the **NETC01-CC** to "Enable."
2. Execute the "batch NV memory write (3E85h)" of the **NETC01-CC**.
3. Cycle the **NETC01-CC** power.

Note "Connection" parameters will be enabled after the power is cycled.

STEP 2 Check the connection

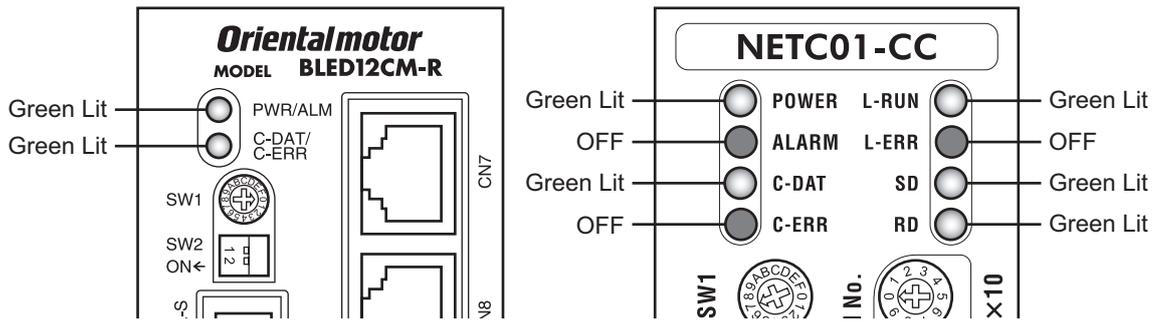


STEP 3 Check the termination resistor



STEP 4 Turn on the power and check the setting

Check that the LED condition has become as shown in the figures.



- When C-ERR (red) of the driver or **NETC01-CC** is lit:
Check the transmission rate or address number of RS-485 communication.
- When L-ERR (red) of the **NETC01-CC** is lit:
Check the type of the CC-Link communication error.

STEP 5 Execute continuous operation via remote I/O of CC-Link communication.

1. Set the rotation speed (1241h) for the operation data No.1 of the driver.
2. Perform continuous operation by turning ON the M0 and FWD of the address number 0 for remote I/O of CC-Link communication.

RY (Master to NETC01-CC)			RY (Master to NETC01-CC)		
Device No.	Signal name	Initial value	Device No.	Signal name	Initial value
RY0	NET-IN0	M0	RY8	NET-IN8	Not used
RY1	NET-IN1	M1	RY9	NET-IN9	
RY2	NET-IN2	M2	RYA	NET-IN10	
RY3	NET-IN3	FWD	RYB	NET-IN11	
RY4	NET-IN4	REV	RYC	NET-IN12	
RY5	NET-IN5	STOP-MODE	RYD	NET-IN13	
RY6	NET-IN6	MB-FREE	RYE	NET-IN14	
RY7	NET-IN7	Not used	RYF	NET-IN15	

STEP 6 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

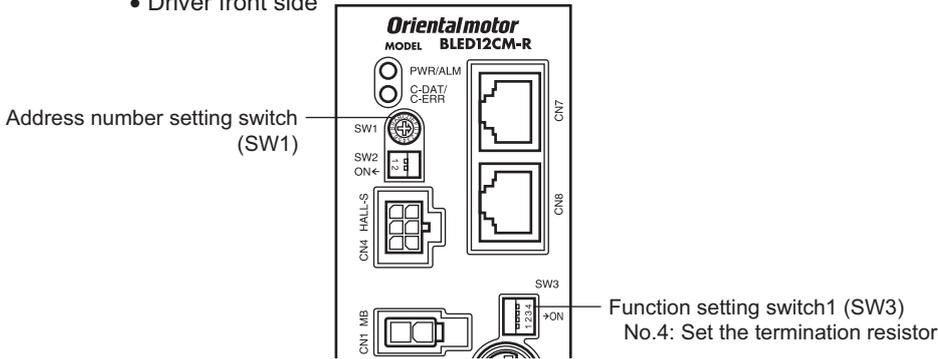
- Is any alarm present in the driver or **NETC01-CC**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-CC** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the L-ERR LED lit? (CC-Link communication error)
- Is the operation data (rotation speed) set correctly?
- Are the driver parameters set correctly?

For more detailed settings and functions, refer to next page and later, and the **NETC01-CC USER MANUAL**.

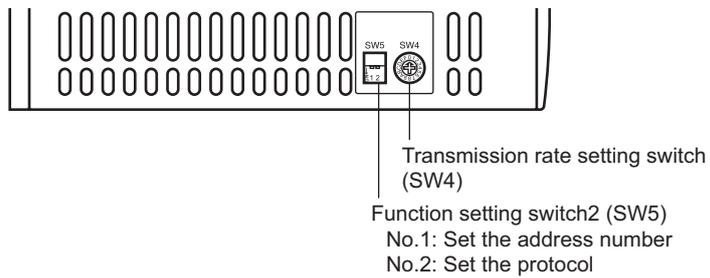
1.2 Setting the switches

When using the driver in combination with the network converter, set the switches before use.

• Driver front side



• Driver bottom side



Note Be sure to turn off the driver power before setting the switches. If the switches are set while the power is still on, the new switch settings will not become effective until the driver power is cycled.

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch2 SW5-No.2. Turn this switch OFF when controlling via the network converter.
 Factory setting OFF (Network converter)

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique.
 Factory setting SW1: 0, SW5-No.1: OFF (Address number 0)

Address number (slave address)	0	1	2	3	4	5	6	7	8	9	10	11
SW1	0	1	2	3	4	5	6	7	8	9	A	B
SW5-No.1	OFF											
Connection mode	6 axes connection mode						12 axes connection mode					

■ Transmission rate

Set the transmission rate to 625,000 bps using the transmission rate setting switch (SW4).
 Factory setting 7 (625,000 bps)

■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the network converter. Turn the SW3-No.4 of the function setting switch1 ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

SW3-No.4	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

1.3 Remote register list

Remote register is common to 6-axes connection mode and 12-axes connection mode.

"Monitor", "read and write of parameters" and "maintenance command" for the driver or **NETC01-CC** are executed using remote register.

"n" is an address assigned to the master station by the CC-Link station number setting.

RWw (Master to NETC01-CC)		RWr (NETC01-CC to master)	
Address No.	Description	Address No.	Description
RWwn0	Command code of monitor 0	RWrn0	Data of monitor 0 (lower 16 bit)
RWwn1	Address number of monitor 0	RWrn1	Data of monitor 0 (upper 16 bit)
RWwn2	Command code of monitor 1	RWrn2	Data of monitor 1 (lower 16 bit)
RWwn3	Address number of monitor 1	RWrn3	Data of monitor 1 (upper 16 bit)
RWwn4	Command code of monitor 2	RWrn4	Data of monitor 2 (lower 16 bit)
RWwn5	Address number of monitor 2	RWrn5	Data of monitor 2 (upper 16 bit)
RWwn6	Command code of monitor 3	RWrn6	Data of monitor 3 (lower 16 bit)
RWwn7	Address number of monitor 3	RWrn7	Data of monitor 3 (upper 16 bit)
RWwn8	Command code of monitor 4	RWrn8	Data of monitor 4 (lower 16 bit)
RWwn9	Address number of monitor 4	RWrn9	Data of monitor 4 (upper 16 bit)
RWwnA	Command code of monitor 5	RWrnA	Data of monitor 5 (lower 16 bit)
RWwnB	Address number of monitor 5	RWrnB	Data of monitor 5 (upper 16 bit)
RWwnC	Command code	RWrnC	Command code response
RWwnD	Address number	RWrnD	Address number response
RWwnE	Data (lower)	RWrnE	Data (lower)
RWwnF	Data (upper)	RWrnF	Data (upper)

1.4 Assignment for remote I/O of 6 axes connection mode

Remote I/O assignments of the driver are as follows. "n" is an address assigned to the master station by the CC-Link station number setting. See the network converter **NETC01-CC** [USER MANUAL](#) for 6-axes.

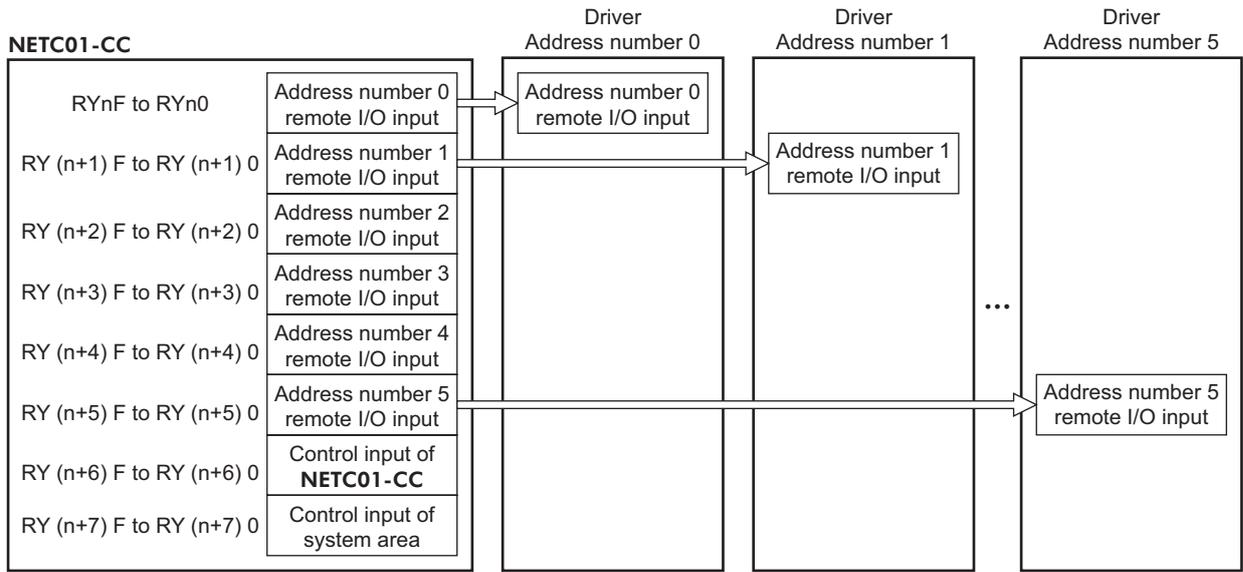
■ Assignment list of remote I/O

Command RY (Master to NETC01-CC)		Response RX (NETC01-CC to master)	
Device No.	Description	Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input	RXn7 to RXn0	Address number "0" remote I/O output
RYnF to RYn8		RXnF to RXn8	
RY (n+1) 7 to RY (n+1) 0	Address number "1" remote I/O input	RX (n+1) 7 to RX (n+1) 0	Address number "1" remote I/O output
RY (n+1) F to RY (n+1) 8		RX (n+1) F to RX (n+1) 8	
RY (n+2) 7 to RY (n+2) 0	Address number "2" remote I/O input	RX (n+2) 7 to RX (n+2) 0	Address number "2" remote I/O output
RY (n+2) F to RY (n+2) 8		RX (n+2) F to RX (n+2) 8	
RY (n+3) 7 to RY (n+3) 0	Address number "3" remote I/O input	RX (n+3) 7 to RX (n+3) 0	Address number "3" remote I/O output
RY (n+3) F to RY (n+3) 8		RX (n+3) F to RX (n+3) 8	
RY (n+4) 7 to RY (n+4) 0	Address number "4" remote I/O input	RX (n+4) 7 to RX (n+4) 0	Address number "4" remote I/O output
RY (n+4) F to RY (n+4) 8		RX (n+4) F to RX (n+4) 8	
RY (n+5) 7 to RY (n+5) 0	Address number "5" remote I/O input	RX (n+5) 7 to RX (n+5) 0	Address number "5" remote I/O output
RY (n+5) F to RY (n+5) 8		RX (n+5) F to RX (n+5) 8	
RY (n+6) 7 to RY (n+6) 0	Control input of NETC01-CC *	RX (n+6) 7 to RX (n+6) 0	Status output of NETC01-CC *
RY (n+6) F to RY (n+6) 8		RX (n+6) F to RX (n+6) 8	
RY (n+7) 7 to RY (n+7) 0	Control input of system area *	RX (n+7) 7 to RX (n+7) 0	Status output of system area *
RY (n+7) F to RY (n+7) 8		RX (n+7) F to RX (n+7) 8	

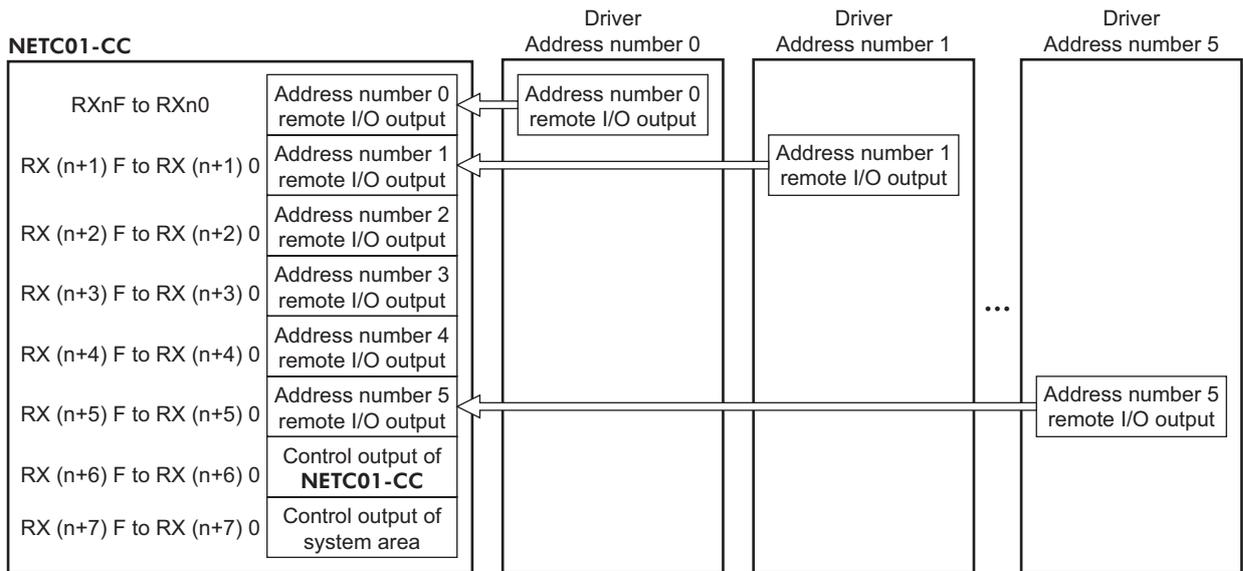
* See the network converter **NETC01-CC** [USER MANUAL](#) for details.

■ Input/output of remote I/O

• Remote I/O input



• Remote I/O output



■ Details of remote I/O assignment

* []: Initial value

	Command RY (Master to NETC01-CC)			Response RX (NETC01-CC to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
Address number "0"	RY(n)0	NET-IN0	[M0] *	RX(n)0	NET-OUT0	[M0_R] *
	RY(n)1	NET-IN1	[M1] *	RX(n)1	NET-OUT1	[M1_R] *
	RY(n)2	NET-IN2	[M2] *	RX(n)2	NET-OUT2	[M2_R] *
	RY(n)3	NET-IN3	[FWD] *	RX(n)3	NET-OUT3	[FWD_R] *
	RY(n)4	NET-IN4	[REV] *	RX(n)4	NET-OUT4	[REV_R] *
	RY(n)5	NET-IN5	[STOP-MODE] *	RX(n)5	NET-OUT5	[STOP-MODE_R] *
	RY(n)6	NET-IN6	[MB-FREE] *	RX(n)6	NET-OUT6	[WNG] *
	RY(n)7	NET-IN7	[Not used] *	RX(n)7	NET-OUT7	[ALARM-OUT1] *
	RY(n)8	NET-IN8		RX(n)8	NET-OUT8	[S-BSY] *
	RY(n)9	NET-IN9		RX(n)9	NET-OUT9	[Not used] *
	RY(n)A	NET-IN10		RX(n)A	NET-OUT10	
	RY(n)B	NET-IN11		RX(n)B	NET-OUT11	[ALARM-OUT2] *
	RY(n)C	NET-IN12		RX(n)C	NET-OUT12	
	RY(n)D	NET-IN13		RX(n)D	NET-OUT13	
RY(n)E	NET-IN14	RX(n)E		NET-OUT14	[VA] *	
RY(n)F	NET-IN15	RX(n)F	NET-OUT15	[TLC] *		
Address number "1"	RY(n+1)0 to RY(n+1)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+1)0 to RX(n+1)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "2"	RY(n+2)0 to RY(n+2)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+2)0 to RX(n+2)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "3"	RY(n+3)0 to RY(n+3)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+3)0 to RX(n+3)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "4"	RY(n+4)0 to RY(n+4)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+4)0 to RX(n+4)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "5"	RY(n+5)0 to RY(n+5)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+5)0 to RX(n+5)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
NETC01-CC control input/ status output	RY(n+6)0	M-REQ0	Monitor request 0	RX(n+6)0	M-DAT0	During execution of monitor 0
	RY(n+6)1	M-REQ1	Monitor request 1	RX(n+6)1	M-DAT1	During execution of monitor 1
	RY(n+6)2	M-REQ2	Monitor request 2	RX(n+6)2	M-DAT2	During execution of monitor 2
	RY(n+6)3	M-REQ3	Monitor request 3	RX(n+6)3	M-DAT3	During execution of monitor 3
	RY(n+6)4	M-REQ4	Monitor request 4	RX(n+6)4	M-DAT4	During execution of monitor 4
	RY(n+6)5	M-REQ5	Monitor request 5	RX(n+6)5	M-DAT5	During execution of monitor 5
	RY(n+6)6	-	-	RX(n+6)6	WNG	Warning
	RY(n+6)7	ARM-RST	Reset alarm	RX(n+6)7	ALM	Alarm
	RY(n+6)8	-	-	RX(n+6)8	C-SUC	During execution of RS-485 communication
	RY(n+6)9			RX(n+6)9	-	-
	RY(n+6)A			RX(n+6)A		
	RY(n+6)B			RX(n+6)B		
RY(n+6)C	D-REQ	Command execution request	RX(n+6)C	D-END	Command processing completion	

	Command RY (Master to NETC01-CC)			Response RX (NETC01-CC to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
NETC01-CC control input/ status output	RY(n+6)D	-	-	RX(n+6)D	R-ERR	Register error
	RY(n+6)E			RX(n+6)E	S-BSY	During system processing
	RY(n+6)F			RX(n+6)F	-	-
System area control input/ status output	RY(n+7)0 to RY(n+7)F	-	Cannot be used	RX(n+7)0 to RX(n+7)A	-	Cannot be used
				RX(n+7)B	CRD	Remote station communication ready
				RX(n+7)C to RX(n+7)F	-	Cannot be used

1.5 Assignment for remote I/O of 12 axes connection mode

Remote I/O assignments of the driver are as follows. "n" is an address assigned to the master station by the CC-Link station number setting. See the network converter **NETC01-CC** [USER MANUAL](#) for 12-axes.

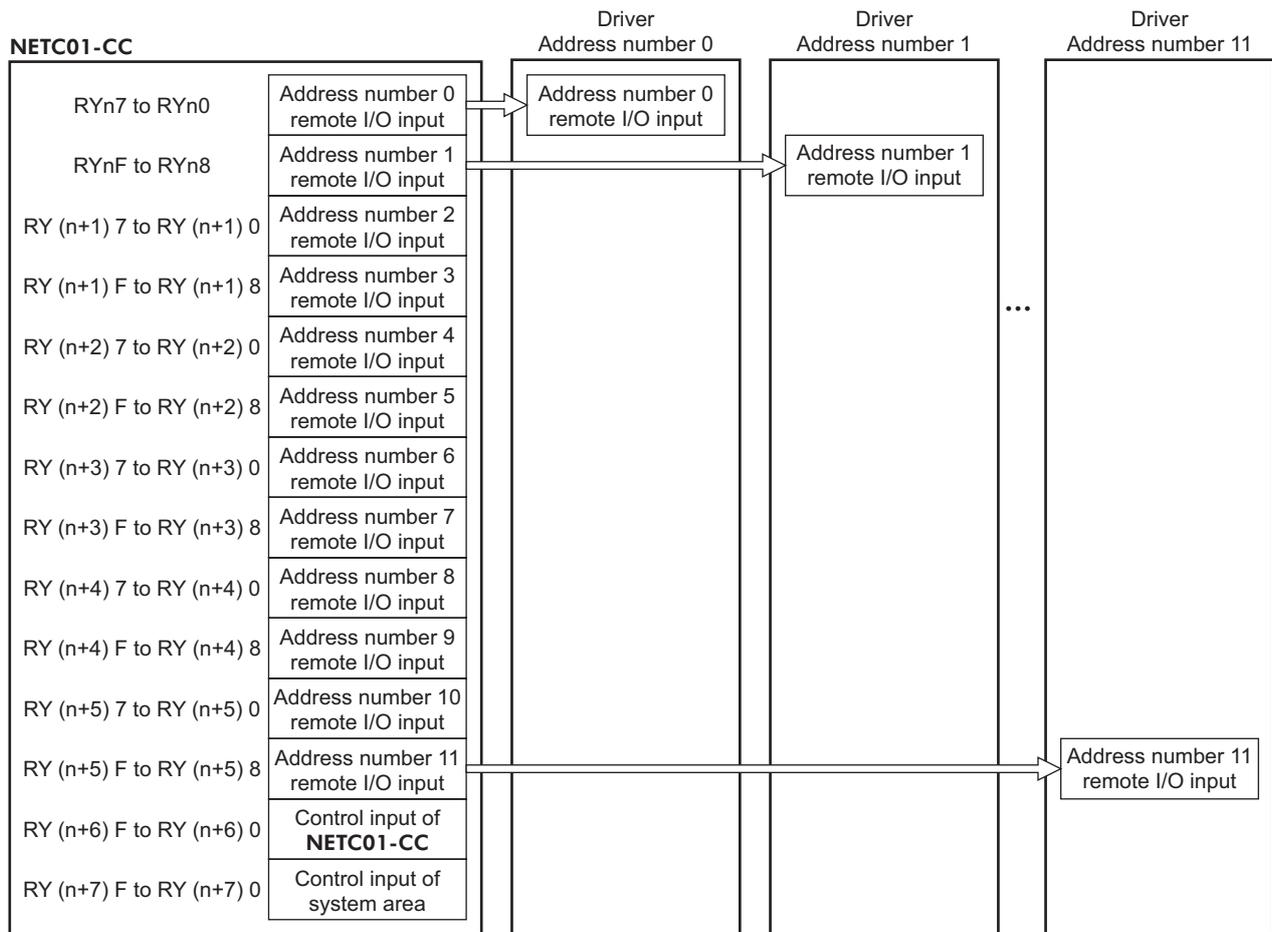
■ Assignment list of remote I/O

Command RY (Master to NETC01-CC)		Response RX (NETC01-CC to master)	
Device No.	Description	Device No.	Description
RYn7 to RYn0	Address number "0" remote I/O input	RXn7 to RXn0	Address number "0" remote I/O output
RYnF to RYn8	Address number "1" remote I/O input	RXnF to RXn8	Address number "1" remote I/O output
RY (n+1) 7 to RY (n+1) 0	Address number "2" remote I/O input	RX (n+1) 7 to RX (n+1) 0	Address number "2" remote I/O output
RY (n+1) F to RY (n+1) 8	Address number "3" remote I/O input	RX (n+1) F to RX (n+1) 8	Address number "3" remote I/O output
RY (n+2) 7 to RY (n+2) 0	Address number "4" remote I/O input	RX (n+2) 7 to RX (n+2) 0	Address number "4" remote I/O output
RY (n+2) F to RY (n+2) 8	Address number "5" remote I/O input	RX (n+2) F to RX (n+2) 8	Address number "5" remote I/O output
RY (n+3) 7 to RY (n+3) 0	Address number "6" remote I/O input	RX (n+3) 7 to RX (n+3) 0	Address number "6" remote I/O output
RY (n+3) F to RY (n+3) 8	Address number "7" remote I/O input	RX (n+3) F to RX (n+3) 8	Address number "7" remote I/O output
RY (n+4) 7 to RY (n+4) 0	Address number "8" remote I/O input	RX (n+4) 7 to RX (n+4) 0	Address number "8" remote I/O output
RY (n+4) F to RY (n+4) 8	Address number "9" remote I/O input	RX (n+4) F to RX (n+4) 8	Address number "9" remote I/O output
RY (n+5) 7 to RY (n+5) 0	Address number "10" remote I/O input	RX (n+5) 7 to RX (n+5) 0	Address number "10" remote I/O output
RY (n+5) F to RY (n+5) 8	Address number "11" remote I/O input	RX (n+5) F to RX (n+5) 8	Address number "11" remote I/O output
RY (n+6) 7 to RY (n+6) 0	Control input of NETC01-CC *	RX (n+6) 7 to RX (n+6) 0	Status output of NETC01-CC *
RY (n+6) F to RY (n+6) 8		RX (n+6) F to RX (n+6) 8	
RY (n+7) 7 to RY (n+7) 0	Control input of system area *	RX (n+7) 7 to RX (n+7) 0	Status output of system area *
RY (n+7) F to RY (n+7) 8		RX (n+7) F to RX (n+7) 8	

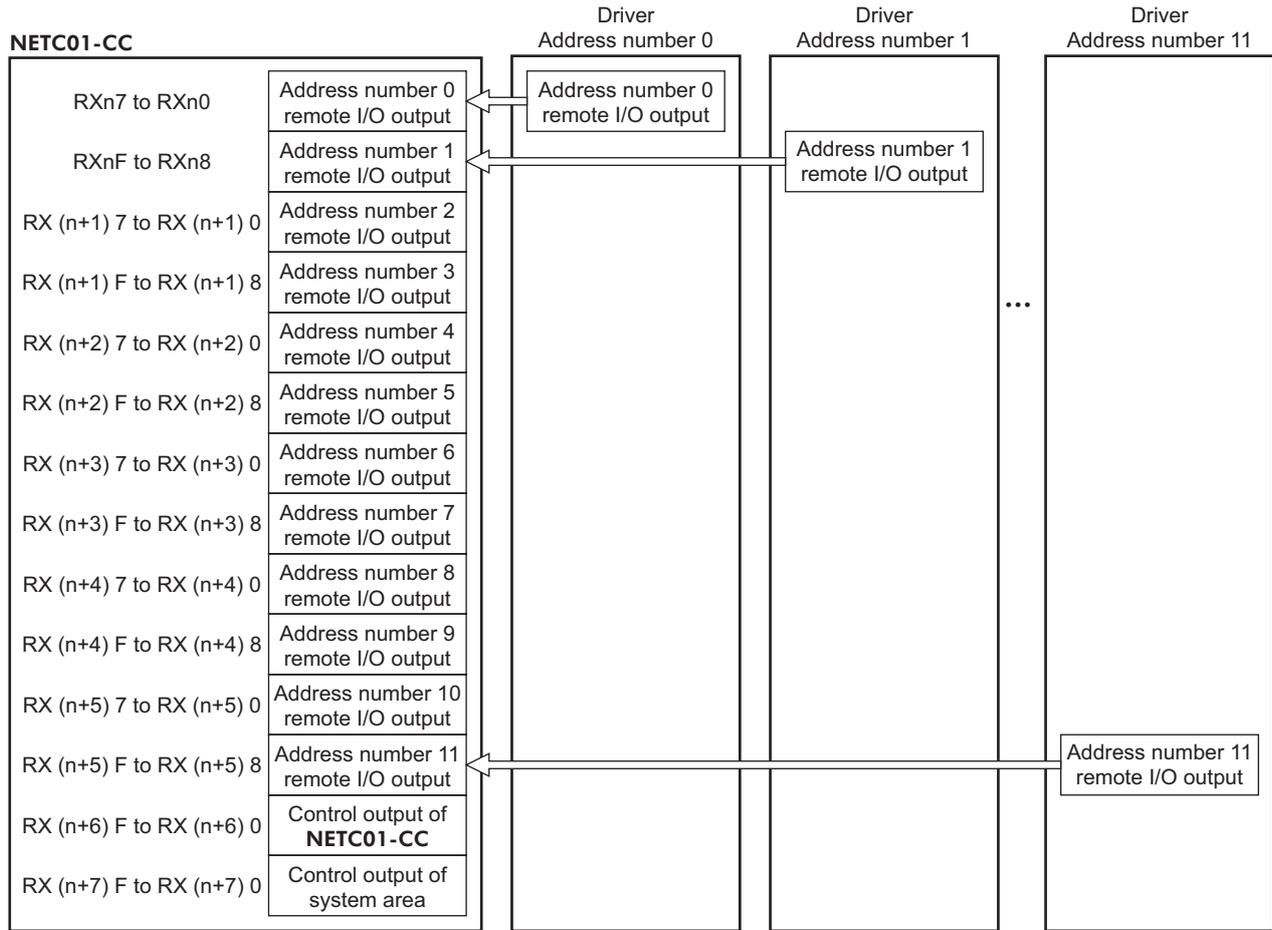
* See the network converter **NETC01-CC** [USER MANUAL](#) for details.

■ Input/output of remote I/O

- Remote I/O input



• Remote I/O output



■ Details of remote I/O assignment

* []: Initial value

	Command RY (Master to NETC01-CC)			Response RX (NETC01-CC to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
Address number "0"	RY(n)0	NET-IN0	[M0] *	RX(n)0	NET-OUT0	[M0_R] *
	RY(n)1	NET-IN1	[M1] *	RX(n)1	NET-OUT1	[M1_R] *
	RY(n)2	NET-IN2	[M2] *	RX(n)2	NET-OUT2	[M2_R] *
	RY(n)3	NET-IN3	[FWD] *	RX(n)3	NET-OUT3	[FWD_R] *
	RY(n)4	NET-IN4	[REV] *	RX(n)4	NET-OUT4	[REV_R] *
	RY(n)5	NET-IN5	[STOP-MODE] *	RX(n)5	NET-OUT5	[STOP-MODE_R] *
	RY(n)6	NET-IN6	[MB-FREE] *	RX(n)6	NET-OUT6	[WNG] *
	RY(n)7	NET-IN7	[Not used] *	RX(n)7	NET-OUT7	[ALARM-OUT1] *
	RY(n)8	NET-IN0		RX(n)8	NET-OUT8	[S-BSY] *
	RY(n)9	NET-IN1		RX(n)9	NET-OUT9	[Not used] *
	RY(n)A	NET-IN2		RX(n)A	NET-OUT10	
	RY(n)B	NET-IN3		RX(n)B	NET-OUT11	[ALARM-OUT2] *
	RY(n)C	NET-IN4		RX(n)C	NET-OUT12	
	RY(n)D	NET-IN5		RX(n)D	NET-OUT13	
RY(n)E	NET-IN6	RX(n)E		NET-OUT14	[VA] *	
RY(n)F	NET-IN7	RX(n)F	NET-OUT15	[TLC] *		
Address number "1"	RY(n+1)0 to RY(n+1)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+1)0 to RX(n+1)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "2"	RY(n+2)0 to RY(n+2)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+2)0 to RX(n+2)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "3"	RY(n+3)0 to RY(n+3)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+3)0 to RX(n+3)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "4"	RY(n+4)0 to RY(n+4)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+4)0 to RX(n+4)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
Address number "5"	RY(n+5)0 to RY(n+5)F	NET-IN0 to NET-IN15	Same as Address number "0"	RX(n+5)0 to RX(n+5)F	NET-OUT0 to NET-OUT15	Same as Address number "0"
NETC01-CC control input/ status output	RY(n+6)0	M-REQ0	Monitor request 0	RX(n+6)0	M-DAT0	During execution of monitor 0
	RY(n+6)1	M-REQ1	Monitor request 1	RX(n+6)1	M-DAT1	During execution of monitor 1
	RY(n+6)2	M-REQ2	Monitor request 2	RX(n+6)2	M-DAT2	During execution of monitor 2
	RY(n+6)3	M-REQ3	Monitor request 3	RX(n+6)3	M-DAT3	During execution of monitor 3
	RY(n+6)4	M-REQ4	Monitor request 4	RX(n+6)4	M-DAT4	During execution of monitor 4
	RY(n+6)5	M-REQ5	Monitor request 5	RX(n+6)5	M-DAT5	During execution of monitor 5
	RY(n+6)6	-	-	RX(n+6)6	WNG	Warning
	RY(n+6)7	ARM-RST	Reset alarm	RX(n+6)7	ALM	Alarm
	RY(n+6)8	-	-	RX(n+6)8	C-SUC	During execution of RS-485 communication
	RY(n+6)9			RX(n+6)9	-	-
	RY(n+6)A			RX(n+6)A		
	RY(n+6)B			RX(n+6)B		
	RY(n+6)C	D-REQ	Command execution request	RX(n+6)C	D-END	Command processing completion

	Command RY (Master to NETC01-CC)			Response RX (NETC01-CC to master)		
	Device No.	Signal name	Description	Device No.	Signal name	Description
NETC01-CC control input/ status output	RY(n+6)D	-	-	RX(n+6)D	R-ERR	Register error
	RY(n+6)E			RX(n+6)E	S-BSY	During system processing
	RY(n+6)F			RX(n+6)F	-	-
System area control input/ status output	RY(n+7)0 to RY(n+7)F	-	Cannot be used	RX(n+7)0 to RX(n+7)A	-	Cannot be used
				RX(n+7)B	CRD	Remote station communication ready
				RX(n+7)C to RX(n+7)F	-	Cannot be used

2 Method of control via MECHATROLINK communication

See the following explanation when using the **BLE** Series FLEX RS-485 communication type in combination with the network converter **NETC01-M2** or **NETC01-M3**, via MECHATROLINK communication.

Refer to "3 Details of remote I/O" on p.134 and "4 Command code list" on p.136 for remote I/O and command code.

2.1 Guidance

If you are new to the **BLE** Series FLEX RS-485 communication type, read this section to understand the operating methods along with the operation flow.

This section explains the operation method in combination with the **NETC01-M2** as an example.

- Note**
- Before operating the motor, check the condition of the surrounding area to ensure safety.
 - See the network converter **NETC01-M2/NETC01-M3 USER MANUAL** for how to set the parameter.

STEP 1 Set the transmission rate, station address and address number.

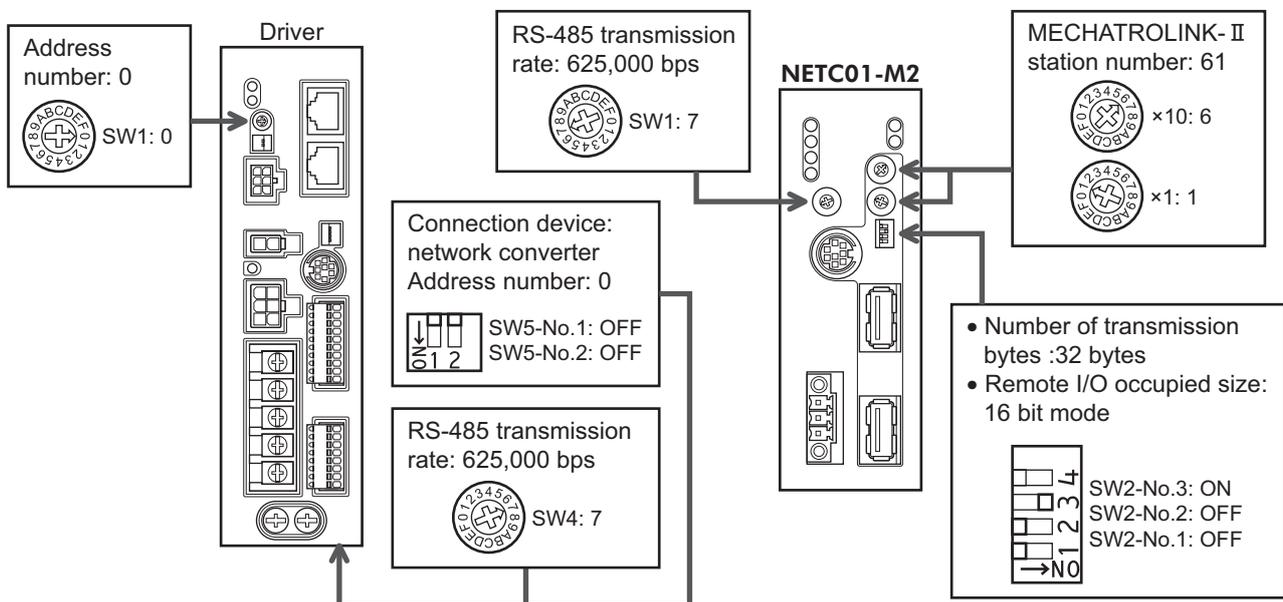
■ Using the switches

Setting condition of driver

- Address number of the driver: 0
- RS-485 transmission rate: 625,000 bps
- SW5-No.2 of the function setting switches: OFF

Setting condition of **NETC01-M2**

- MECHATROLINK-II station address: 61
- RS-485 transmission rate: 625,000 bps
- Remote I/O occupied size: 16 bit mode
- Number of transmission bytes: 32 bytes

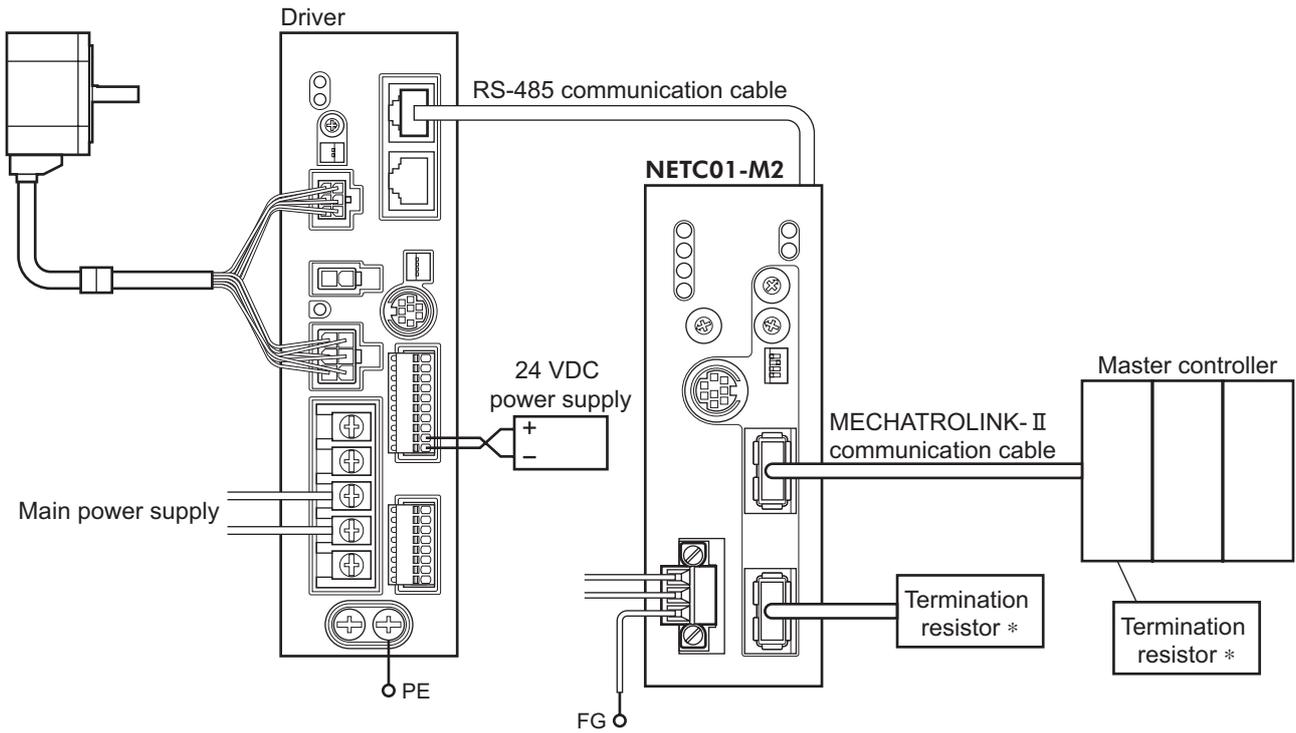


■ Using the parameter

1. Set the "communication (address number 0)" parameter of the **NETC01-M2** to "Enable" using the **OPX-2A** or **MEXE02**.
2. Cycle the **NETC01-M2** power.

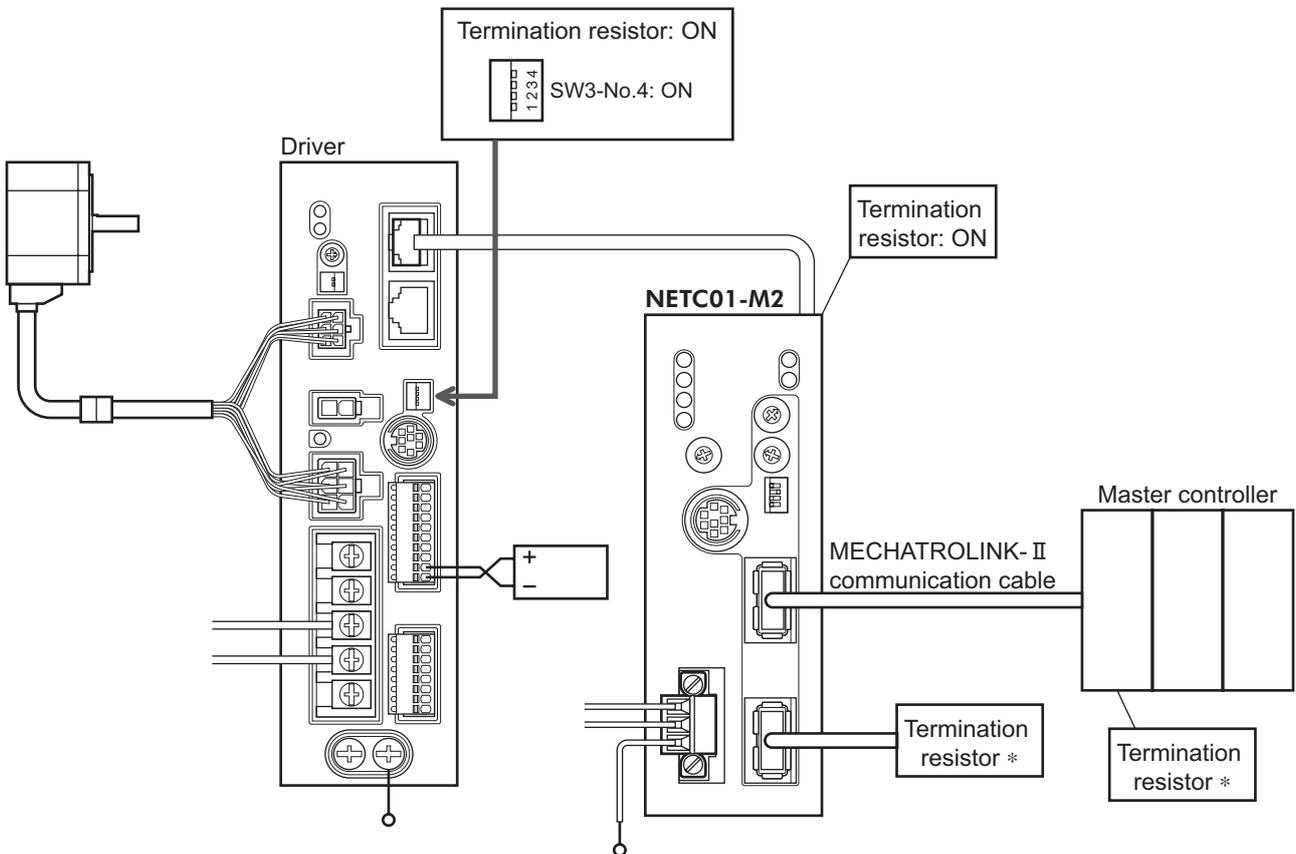
- Note**
- "Communication" parameter will be enabled after the power is cycled.
 - When setting the parameters of the **NETC01-M2**, use the **OPX-2A** or **MEXE02**.

STEP 2 Check the connection



* It is not necessary for the **NETC01-M3**.

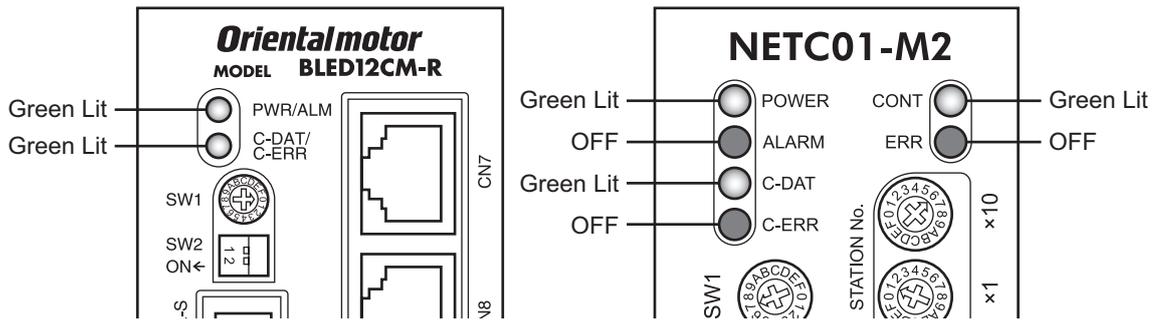
STEP 3 Check the termination resistor



* It is not necessary for the **NETC01-M3**.

STEP 4 Turn on the power and check the setting

Check that the LED condition has become as shown in the figures.



- When C-ERR (red) of the driver or **NETC01-M2** is lit:
Check the transmission rate or address number of RS-485 communication.
- When ERR (red) of the **NETC01-M2** is lit: Check the MECHATROLINK-II communication error.

STEP 5 Continuous operation

Control the I/O signal of the driver using the I/O command (DATA_RWA: 50h) of MECHATROLINK-II communication.

1. Set the rotation speed (1241h) for the operation data No.1 of the driver.
2. Perform continuous operation by turning ON the M0 and FWD of the address number 0.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [Not used]	NET-IN14 [Not used]	NET-IN13 [Not used]	NET-IN12 [Not used]	NET-IN11 [Not used]	NET-IN10 [Not used]	NET-IN9 [Not used]	NET-IN8 [Not used]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [Not used]	NET-IN6 [MB-FREE]	NET-IN5 [STOP-MODE]	NET-IN4 [REV]	NET-IN3 [FWD]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* []: Initial value

STEP 6 Were you able to operate the motor properly?

How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

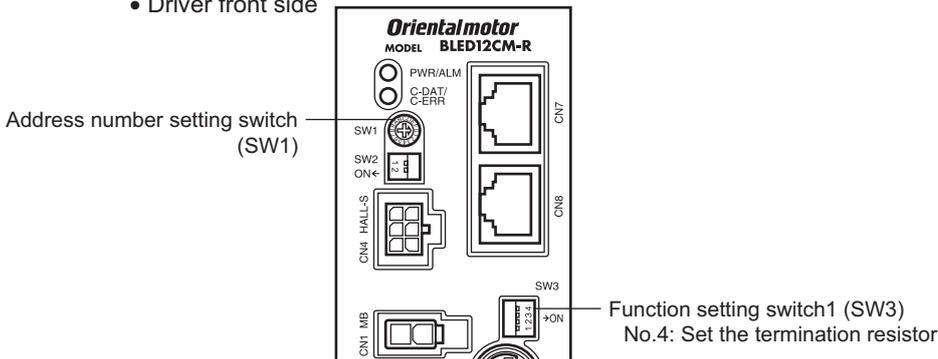
- Is any alarm present in the driver or **NETC01-M2**?
- Are the address number, transmission rate and termination resistor set correctly?
- Is the "connection" parameter of the **NETC01-M2** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the ERR LED of the **NETC01-M2** lit? (MECHATROLINK-II/III communication error)
- Is the operation data (rotation speed) set correctly?
- Are the driver parameters set correctly?

For more detailed settings and functions, refer to next page and later, and the **NETC01-M2 USER MANUAL**.

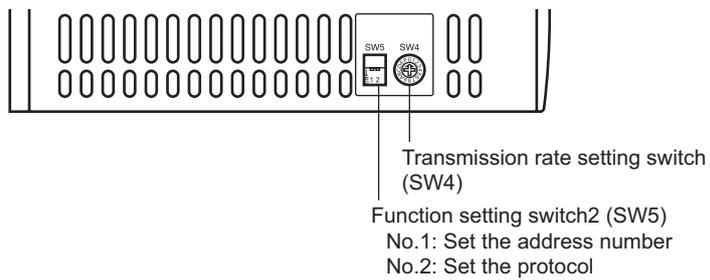
2.2 Setting the switches

When using the driver in combination with the network converter, set the switches before use.

• Driver front side



• Driver bottom side



Note Be sure to turn off the driver power before setting the switches. If the switches are set while the power is still on, the new switch settings will not become effective until the driver power is cycled.

■ Setting the connection device

Set the connection device of RS-485 communication using the function setting switch2 SW5-No.2. Turn this switch OFF when controlling via the network converter.
Factory setting OFF (Network converter)

■ Address number (slave address)

Set the address number (slave address) using the address number setting switch (SW1) and SW5-No.1 of the function setting switch2. Make sure each address number (slave address) you set for each driver is unique.
Factory setting SW1: 0, SW5-No.1: OFF (Address number 0)

Address number (slave address)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
SW1	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
SW5-No.1	OFF															
Connection mode	8 axes connection mode								16 axes connection mode							

■ Transmission rate

Set the transmission rate to 625,000 bps using the transmission rate setting switch (SW4).
Factory setting 7 (625,000 bps)

■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the network converter. Turn the SW3-No.4 of the function setting switch1 ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (termination resistor disabled)

SW3-No.4	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

2.3 I/O field map for the NETC01-M2

Update of remote I/O data (asynchronous) is executed by the "DATA_RWA" Command (50h). When the remote I/O occupied size is 16-bit mode and the number of transmission bytes is 32 bytes (initial value), I/O field map will be as follows. See the network converter **NETC01-M2 USER MANUAL** for other I/O field map.

Byte	Part	Type	Command	Response			
1	Header field	-	DATA_RWA (50h)	DATA_RWA (50h)			
2			OPTION	ALARM			
3				STATUS			
4							
5	Data field	-	Reserved	Connection status			
6							
7		Remote I/O		Address number "0" remote I/O input	Address number "0" remote I/O output		
8				Address number "1" remote I/O input	Address number "1" remote I/O output		
9				Address number "2" remote I/O input	Address number "2" remote I/O output		
10				Address number "3" remote I/O input	Address number "3" remote I/O output		
11				Address number "4" remote I/O input	Address number "4" remote I/O output		
12				Address number "5" remote I/O input	Address number "5" remote I/O output		
13				Address number "6" remote I/O input	Address number "6" remote I/O output		
14				Address number "7" remote I/O input	Address number "7" remote I/O output		
15				Remote resistor		Register address number	Register address number response
16						Command code + TRIG	Command code response + TRIG response + STATUS
17						DATA	DATA response
18							
19							
20							
21		-	Reserved	Reserved			
22							
23							
24							
25							
26							
27							
28							
29							
30							
31							

2.4 I/O field map for the NETC01-M3

Update of remote I/O data (asynchronous) is executed by "DATA_RWA" Command (20h). When the remote I/O occupied size is 16-bit mode and the number of transmission bytes is 32 bytes (initial value), I/O field map will be as follows. See the network converter **NETC01-M3 USER MANUAL** for other I/O field map.

Byte	Type	Command	Response	
0	-	DATA_RWA (20h)	DATA_RWA (20h)	
1	-	WDT	RWDT	
2	-	CMD_CTRL	CMD_STAT	
3				
4	-	Reserved	Connection status	
5				
6	Remote I/O	Address number "0" remote I/O input	Address number "0" remote I/O output	
7		Address number "1" remote I/O input	Address number "1" remote I/O output	
8		Address number "2" remote I/O input	Address number "2" remote I/O output	
9		Address number "3" remote I/O input	Address number "3" remote I/O output	
10		Address number "4" remote I/O input	Address number "4" remote I/O output	
11		Address number "5" remote I/O input	Address number "5" remote I/O output	
12		Address number "6" remote I/O input	Address number "6" remote I/O output	
13		Address number "7" remote I/O input	Address number "7" remote I/O output	
14		Register address number	Register address number response	
15		Command code + TRIG	Command code response + TRIG response + STATUS	
16		Remote resistor	DATA	DATA response
17				
18				
19				
20	-	Reserved	Reserved	
21	-	Reserved	Reserved	

2.5 Communication format

Communication formats to the driver and **NETC01-M2 (NETC01-M3)** are as follows.

■ Remote I/O input

For details on remote I/O, refer to page 134.

• 8 axes connection mode [16 bit mode]

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [Not used]	NET-IN14 [Not used]	NET-IN13 [Not used]	NET-IN12 [Not used]	NET-IN11 [Not used]	NET-IN10 [Not used]	NET-IN9 [Not used]	NET-IN8 [Not used]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [Not used]	NET-IN6 [MB-FREE]	NET-IN5 [STOP-MODE]	NET-IN4 [REV]	NET-IN3 [FWD]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* []: Initial value

• 16 axes connection mode [8 bit mode]

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [Not used]	NET-IN6 [MB-FREE]	NET-IN5 [STOP-MODE]	NET-IN4 [REV]	NET-IN3 [FWD]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* []: Initial value

■ Remote I/O output

• 8 axes connection mode [16 bit mode]

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-OUT15 [TLC]	NET-OUT14 [VA]	NET-OUT13 [MOVE]	NET-OUT12 [ALARM- OUT2]	NET-OUT11 [Not used]	NET-OUT10 [Not used]	NET-OUT9 [Not used]	NET-OUT8 [S-BSY]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 [ALARM- OUT1]	NET-OUT6 [WNG]	NET-OUT5 [STOP- MODE_R]	NET-OUT4 [REV_R]	NET-OUT3 [FWD_R]	NET-OUT2 [M2_R]	NET-OUT1 [M1_R]	NET-OUT0 [M0_R]

* []: Initial value

• 16 axes connection mode [8 bit mode]

bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 [ALARM- OUT1]	NET-OUT6 [WNG]	NET-OUT5 [STOP- MODE_R]	NET-OUT4 [REV_R]	NET-OUT3 [FWD_R]	NET-OUT2 [M2_R]	NET-OUT1 [M1_R]	NET-OUT0 [M0_R]

* []: Initial value

■ Remote register input

• Command [NETC01-M2 (NETC01-M3) to driver]

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
-	TRIG	Command code					
DATA							

• Explanation of command

Name	Description	Setting range
Command code	The command sets the command code for "write and read of parameters," "monitor" and "maintenance."	-
TRIG	This is the trigger for handshake to execute the command code. When turning the TRIG from 0 to 1, the command code and DATA will be executed.	0: No motion 1: Execution
DATA	This is the data writing to the driver (little endian).	-

■ Remote register output

- Response [Driver to **NETC01-M2 (NETC01-M3)**]

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Command code							
STATUS	TRIG_R						
DATA_R							

- Explanation of command

Name	Description	Setting range
Command code	The response returns the command code of the command.	-
TRIG_R	This is the trigger for handshake indicating the completion of the command code. When the command code is completed, the TRIG_R will be turned from 0 to 1.	0: Not processing 1: Execution completion
STATUS	This indicates the result that executed the command code.	0: Normal operation 1: Error
DATA_R	This is the data reading from the driver (little endian).	-

3 Details of remote I/O

This is common to **NETC01-CC**, **NETC01-M2** and **NETC01-M3**.

3.1 Input signals to the driver

The following input signals can be assigned to the NET-IN0 to NET-IN15 of remote I/O using the parameter.

See the following table for the assignments of the NET-IN0 to NET-IN15.

For details on parameter, refer to "I/O function parameter (RS-485)" on p.141.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-IN15 [Not used]	NET-IN14 [Not used]	NET-IN13 [Not used]	NET-IN12 [Not used]	NET-IN11 [Not used]	NET-IN10 [Not used]	NET-IN9 [Not used]	NET-IN8 [Not used]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-IN7 [Not used]	NET-IN6 [MB-FREE]	NET-IN5 [STOP-MODE]	NET-IN4 [REV]	NET-IN3 [FWD]	NET-IN2 [M2]	NET-IN1 [M1]	NET-IN0 [M0]

* []: Initial value

Signal name	Function	Setting range
Not used	Set when the input terminal is not used.	-
FWD	Rotate the motor in the forward direction.	0: Stop 1: Operation
REV	Rotate the motor in the reverse direction.	
STOP-MODE	Select instantaneous stop or deceleration stop.	0: Instantaneous stop 1: Deceleration stop
MB-FREE	Release the electromagnetic brake.	0: Electromagnetic brake hold 1: Electromagnetic brake release
HMI	Release of the function limitation of the OPX-2A or MEXE02 (normally closed)	0: Function limitation 1: Function limitation release
R0 to R15	General signals. Use these signals when controlling the system via RS-485 communication.	0: OFF 1: ON
M0 to M3	Select the operation data No. using these four bits.	0: OFF 1: ON (Operation data No.0 to 15 can be selected.)
TL	Disable the torque limiting. (normally closed).	0: Torque limiting disabled 1: Torque limiting enabled

Note

- Do not assign the same input signal to multiple input terminals. When the same input signal is assigned to multiple input terminals, the function will be executed if any of the terminals becomes active.
- When the HMI input and TL input are not assigned to the input terminals, these inputs will be always set to ON (1). When assigning them to multiple terminals (including direct I/O and network I/O), the function will be executed when all terminals are set to ON (1).

3.2 Output signals from the driver

The following output signals can be assigned to the NET-OUT0 to NET-OUT15 of remote I/O using the parameter.

See the following table for the assignments of the NET-OUT0 to NET-OUT15.

For details on parameter, refer to "I/O function parameter (RS-485)" on p.141.

bit15	bit14	bit13	bit12	bit11	bit10	bit9	bit8
NET-OUT15 [TLC]	NET-OUT14 [VA]	NET-OUT13 [MOVE]	NET-OUT12 [ALARM- OUT2]	NET-OUT11 [Not used]	NET-OUT10 [Not used]	NET-OUT9 [Not used]	NET-OUT8 [S-BSY]
bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
NET-OUT7 [ALARM- OUT1]	NET-OUT6 [WNG]	NET-OUT5 [STOP- MODE_R]	NET-OUT4 [REV_R]	NET-OUT3 [FWD_R]	NET-OUT2 [M2_R]	NET-OUT1 [M1_R]	NET-OUT0 [M0_R]

* []: Initial value

Signal name	Function	Data read
Not used	Set when the output terminal is not used.	-
FWD_R	Output in response to the FWD input.	0: OFF 1: ON
REV_R	Output in response to the RVS input.	
STOP-MODE_R	Output in response to the STOP-MODE input.	
MB-FREE_R	Output in response to the MB-FREE input.	
HMI_R	Output in response to the HMI input.	
R0 to R15	Output the status of the general signals R0 to R15.	
M0_R to M3_R	Output in response to the M0 to M3 inputs.	
TL_R	Output in response to the TL input	
ALARM_OUT1	Output the alarm status (normally open).	0: Alarm not present 1: Alarm present
WNG	Output the warning status.	0: Warning not present 1: Warning present
MOVE	Output when the motor operates.	0: Motor stopped 1: Motor operating
TLC	Output when the motor torque reaches the limit value.	0: No torque limiting 1: In torque limiting operation
VA	Output when the motor speed reaches the setting value.	0: Speed not attained 1: Speed attainment
S-BSY	Output when the motor is in internal processing state.	0: No internal processing 1: During internal processing
ALARM-OUT2	Output when the overload warning detection level is exceeded. Output when an overload alarm generates. (normally closed)	0: Normal operation 1: In overload operation
MPS	Output the ON-OFF state of the main power supply.	0: Main power-OFF 1: Main power-ON
DIR	Output the motor rotation direction.	0: REV direction 1: FWD direction

4 Command code list

This is common to **NETC01-CC**, **NETC01-M2** and **NETC01-M3**.

4.1 Group function

The driver has a group function. Multiple slaves are made into a group and a operation command is sent to all slaves in the group at once.

■ Group composition

A group consists of one parent slave and child slaves.

- Group address

To perform a group send, set a group address to the child slaves to be included in the group.

The child slaves to which the group address has been set can receive a command sent to the parent slave.

The operation command will be sent to the child slaves in the same group by sending it to the parent slave.

- Parent slave

No special setting is required on the parent slave to perform a group send. The address of the parent slave becomes the group address.

- Child slave

Use a "group" (1018h) to set a group address to each child slave.

Note Only remote I/O input can execute the group function. Read from commands and parameters or write to commands and parameters cannot be executed.

■ Group setting

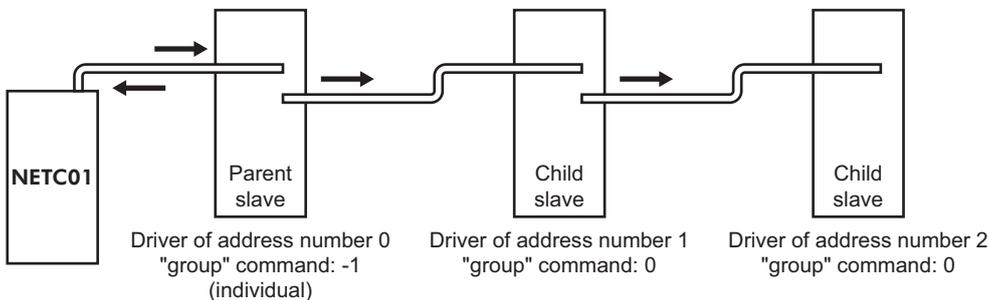
The group setting is not saved in the non-volatile memory even when the maintenance command "batch NV memory write" executes.

Command code		Description	Setting range	Initial value
Read	Write			
0018h	1018h	Group	Set the group. -1: Individual (No group setting) 0 to 15: Set the group address. (Address number of parent slave) *	-1: Individual

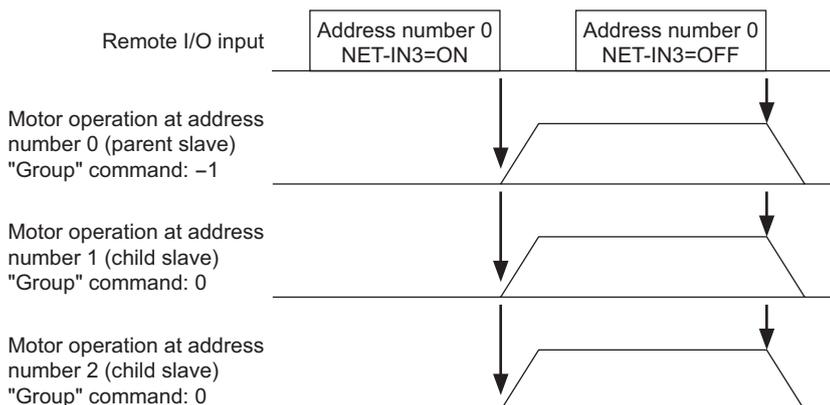
* Set in the 0 to 11 range when using the **NETC01-CC**, and set in the 0 to 15 range when using the **NETC01-M2** or **NETC01-M3**.

■ Example for setting of the group function

Set as follows when making a group by setting the driver of address number 0 to the parent slave and by setting the driver of address number 1 and 2 to the child slaves.



This is a timing chart for when assigning the FWD signal to NET-IN3 (remote I/O) of the driver in the group.



Note When inputting a command to the parent slave with remote I/O, the motors of the parent slave and child slaves will operate. The motors will not operate if the command is input to the child slaves.

4.2 Maintenance command

These commands are used to clear the alarm records and warning records. They are also used to execute the batch processing for the non-volatile memory.

Command code	Name	Description	Setting range
30C0h	Reset alarm	Resets the alarms that are present. Some alarms cannot be reset with the "reset alarm."	1: Execute
30C2h	Clear alarm records	Clears alarm records.	
30C3h	Clear warning records	Clears warning records.	
30C4h	Clear communication error records	Clears the communication error records.	
30C6h	Configuration	Executes the parameter recalculation and the setup.	
30C7h	All data initialization *	Resets the parameters saved in the non-volatile memory to the initial value.	
30C8h	Batch NV memory read	Reads the parameters saved in the non-volatile memory, to the RAM. All operation data and parameters previously saved in the RAM are overwritten.	
30C9h	Batch NV memory write	Writes the parameters saved in the RAM to the non-volatile memory.	

* Communication parity, communication stop bit and transmission waiting time are not initialized. Initialize them using the **OPX-2A** or **MEXE02**.

Note The non-volatile memory can be rewritten approximately 100,000 times.

4.3 Monitor command

These commands are used to monitor the driver condition.

Command code	Name	Description
2040h	Present alarm	Monitors the present alarm code.
2041h	Alarm record 1	Monitors the alarm records.
2042h	Alarm record 2	
2043h	Alarm record 3	
2044h	Alarm record 4	
2045h	Alarm record 5	
2046h	Alarm record 6	
2047h	Alarm record 7	
2048h	Alarm record 8	
2049h	Alarm record 9	
204Ah	Alarm record 10	
204Bh	Present warning	Monitors the present warning code.
204Ch	Warning record 1	Monitors the warning records.
204Dh	Warning record 2	
204Eh	Warning record 3	
204Fh	Warning record 4	
2050h	Warning record 5	
2051h	Warning record 6	
2052h	Warning record 7	
2053h	Warning record 8	
2054h	Warning record 9	
2055h	Warning record 10	
2056h	Present communication error code	Monitors the last received communication error code.
2057h	Communication error code record 1	Monitors the communication error records that have occurred in the past.
2058h	Communication error code record 2	
2059h	Communication error code record 3	
205Ah	Communication error code record 4	
205Bh	Communication error code record 5	
205Ch	Communication error code record 6	
205Dh	Communication error code record 7	
205Eh	Communication error code record 8	
205Fh	Communication error code record 9	
2060h	Communication error code record 10	
2062h	Present operation data No.	Monitors the operation data No. corresponding to the data used in the current operation. While the motor is stopped, the last used operation data number is indicated.
2064h	Command speed	Monitors the command speed.
2067h	Feedback speed	Monitors the feedback speed.
206Ah	Direct I/O and electromagnetic brake status	Monitors the each direct I/O signal and electromagnetic brake status. See the following table for the assignments.
2080h	Operation speed	Monitors the feedback speed calculated by the "reduction gear rate" parameter or "amplification speed rate" parameter. (unit: r/min)
2081h	Operation speed decimal position	Monitors the decimal position in the operation speed. *1
2082h	Conveyor transfer speed	Monitors the feedback speed calculated by the "conveyor reduction gear rate" parameter or "conveyor amplification speed rate" parameter. (unit: m/min)
2083h	Conveyor transfer speed decimal position	Monitors the decimal position in the conveyor transfer speed. *2
2084h	Load factor	Monitors the torque that is output by the motor based on the rated torque being 100%. (unit: %)
2086h	External analog speed setting	Monitors the speed setting value by the external potentiometer. (unit: r/min) *3

Command code	Name	Description
2088h	External analog torque limit setting	Monitors the torque limiting value by the external potentiometer. (unit: %) *3
208Bh	External analog voltage setting	Monitors the setting voltage by external voltage. (unit: 0.1 V)

*1 The decimal position is automatically changed based on the setting of the "reduction gear rate" parameter or "decimal place for reduction gear rate" parameter.

*2 The decimal position is automatically changed based on the setting of the "conveyor reduction gear rate" parameter or "decimal place for conveyor reduction gear rate" parameter.

*3 FFFFh is displayed when not selecting by the "analog input signal select" parameter.

- Direct I/O and electromagnetic brake status (206Ah)

Byte	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
0	-	IN6	IN5	IN4	IN3	IN2	IN1	IN0
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	OUT1	OUT2
3	-	-	-	-	-	-	MB	-

4.4 Operation data

Up to 16 operation data can be set (data Nos.0 to 15).

When the operation data is changed, a recalculation and setup will be performed after the operation is stopped and the changed value will be set.

Command code		Description	Setting range	Initial value
Read	Write			
0240h to 024Fh	1240h to 124Fh	Rotational speed No.0 to Rotational speed No.15	0, or 80 to 4000 r/min	0
0300h to 030Fh	1300h to 130Fh	Acceleration No.0 to Acceleration No.15	2 to 150 (1=0.1 s)	5
0340h to 034Fh	1340h to 134Fh	Deceleration No.0 to Deceleration No.15		
0380h to 038Fh	1380h to 138Fh	Torque limit No.0 to Torque limit No.15	0 to 200%	200

4.5 User parameters

The parameters are saved in the RAM or non-volatile memory. The data saved in the RAM will be erased once the power is turned off. On the other hand, the parameters saved in the non-volatile memory will be retained even after the power supply is turned off.

When turning on the driver power, the parameters saved in the non-volatile memory will be sent to the RAM, and the recalculation and setup for the parameters will be executed in the RAM.

When a parameter is changed, the timing to enable the new value varies depending on the parameter. See the following four types.

- Effective immediately Executes the recalculation and setup immediately when writing the parameter.
- Effective after stopping the operation Executes the recalculation and setup after stopping the operation.
- Effective after executing the configuration ... Executes the recalculation and setup after executing the configuration.
- Effective after turning the power ON again .. Executes the recalculation and setup after turning the power ON again.

Note

- The parameters are written in the RAM area when writing via the **NETC01-CC**, **NETC01-M2** or **NETC01-M3**.
- When saving data to the non-volatile memory, execute "batch NV memory write" of the maintenance command.
- The non-volatile memory can be rewritten approximately 100,000 times.

■ Function parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
01C2h	11C2h	Motor rotation direction	0: + direction=CCW 1: + direction=CW	1	C
0825h	1825h	Reduction gear rate	100 to 9999	100	A
0826h	1826h	Decimal place for reduction gear rate	0: 1 digit 1: 2 digit 2: 3 digit	2	
0827h	1827h	Amplification speed rate	1 to 5	1	
0828h	1828h	Conveyor reduction gear rate	100 to 9999	100	
0829h	1829h	Decimal place for conveyor reduction gear rate	0: 1 digit 1: 2 digit 2: 3 digit	2	
082Ah	182Ah	Conveyor amplification speed rate	1 to 5	1	
08A7h	18A7h	Velocity attainment width	0 to 400 r/min	200	

* Indicates the timing for the data to become effective. (A: Effective immediately, C: Effective after executing the configuration)

■ I/O function parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0880h	1880h	IN0 function select	See table next.	1: FWD	B
0881h	1881h	IN1 function select		2: REV	
0882h	1882h	IN2 function select		19: STOP-MODE	
0883h	1883h	IN3 function select		48: M0	
0884h	1884h	IN4 function select		24: ALARM-RESET	
0885h	1885h	IN5 function select		20: MB-FREE	
0886h	1886h	IN6 function select		22: TH	
0890h	1890h	IN0 contact configuration	0: Make (N.O.) 1: Brake (N.C.)	0	C
0891h	1891h	IN1 contact configuration			
0892h	1892h	IN2 contact configuration			
0893h	1893h	IN3 contact configuration			
0894h	1894h	IN4 contact configuration			
0895h	1895h	IN5 contact configuration			
0896h	1896h	IN6 contact configuration			
08A0h	18A0h	OUT0 function select	See table next.	85: SPEED-OUT	A
08A1h	18A1h	OUT1 function select		65: ALARM-OUT1	

* Indicates the timing for the data to become effective. (A: Effective immediately, B: Effective after stopping the operation, C: Effective after executing the configuration)

● Setting range for IN input function selection

0: No function	22: TH	35: R3	41: R9	47: R15
1: FWD	24: ALARM-RESET	36: R4	42: R10	48: M0
2: REV	27: HMI	37: R5	43: R11	49: M1
19: STOP-MODE	32: R0	38: R6	44: R12	50: M2
20: MB-FREE	33: R1	39: R7	45: R13	51: M3
21: EXT-ERROR	34: R2	40: R8	46: R14	54: TL

● Setting range for OUT output function selection

0: No function	34: R2	42: R10	50: M2_R	80: S-BSY
1: FWD_R	35: R3	43: R11	51: M3_R	81: ALARM-OUT2
2: REV_R	36: R4	44: R12	54: TL_R	82: MPS
19: STOP-MODE_R	37: R5	45: R13	65: ALARM-OUT1	84: DIR
20: MB-FREE_R	38: R6	46: R14	66: WNG	85: SPEED-OUT
27: HMI_R	39: R7	47: R15	68: MOVE	
32: R0	40: R8	48: M0_R	71: TLC	
33: R1	41: R9	49: M1_R	77: VA	

■ I/O function parameter (RS-485)

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
08B0h	18B0h	NET-IN0 function select	See table next.	48: M0	C
08B1h	18B1h	NET-IN1 function select		49: M1	
08B2h	18B2h	NET-IN2 function select		50: M2	
08B3h	18B3h	NET-IN3 function select		1: FWD	
08B4h	18B4h	NET-IN4 function select		2: REV	
08B5h	18B5h	NET-IN5 function select		19: STOP-MODE	
08B6h	18B6h	NET-IN6 function select		20: MB-FREE	
08B7h	18B7h	NET-IN7 function select		0: No function	
08B8h	18B8h	NET-IN8 function select			
08B9h	18B9h	NET-IN9 function select			
08BAh	18BAh	NET-IN10 function select			
08BBh	18BBh	NET-IN11 function select			
08BCh	18BCh	NET-IN12 function select			
08BDh	18BDh	NET-IN13 function select			
08BEh	18BEh	NET-IN14 function select			
08BFh	18BFh	NET-IN15 function select			
08C0h	18C0h	NET-OUT0 function select	See table next.	48: M0_R	
08C1h	18C1h	NET-OUT1 function select		49: M1_R	
08C2h	18C2h	NET-OUT2 function select		50: M2_R	
08C3h	18C3h	NET-OUT3 function select		1: FWD_R	
08C4h	18C4h	NET-OUT4 function select		2: REV_R	
08C5h	18C5h	NET-OUT5 function select		19: STOP-MODE_R	
08C6h	18C6h	NET-OUT6 function select		66: WNG	
08C7h	18C7h	NET-OUT7 function select		65: ALARM-OUT1	
08C8h	18C8h	NET-OUT8 function select		80: S-BSY	
08C9h	18C9h	NET-OUT9 function select		0: No function	
08CAh	18CAh	NET-OUT10 function select			
08CBh	18CBh	NET-OUT11 function select		81: ALARM-OUT2	
08CCh	18CCh	NET-OUT12 function select			
08CDh	18CDh	NET-OUT13 function select			
08CEh	18CEh	NET-OUT14 function select			
08CFh	18CFh	NET-OUT15 function select	77: VA		
				71: TLC	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

● Setting range for NET-IN input function selection

0: No function	32: R0	38: R6	44: R12	50: M2
1: FWD	33: R1	39: R7	45: R13	51: M3
2: REV	34: R2	40: R8	46: R14	54: TL
19: STOP-MODE	35: R3	41: R9	47: R15	
20: MB-FREE	36: R4	42: R10	48: M0	
27: HMI	37: R5	43: R11	49: M1	

● Setting range for NET-OUT output function selection

0: No function	33: R1	40: R8	47: R15	66: WNG
1: FWD_R	34: R2	41: R9	48: M0_R	68: MOVE
2: REV_R	35: R3	42: R10	49: M1_R	71: TLC
19: STOP-MODE_R	36: R4	43: R11	50: M2_R	77: VA
20: MB-FREE_R	37: R5	44: R12	51: M3_R	80: S-BSY
27: HMI_R	38: R6	45: R13	54: TL_R	81: ALARM-OUT2
32: R0	39: R7	46: R14	65: ALARM_OUT1	82: MPS
				84: DIR

■ Analog adjust parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
08D0h	18D0h	Analog operating speed command gain	0 to 4000 r/min	800	A
08D1h	18D1h	Analog operating speed command offset	-2000 to 2000 r/min	0	
08D2h	18D2h	Analog torque limit gain	0 to 200%	40	
08D3h	18D3h	Analog torque limit offset	-50 to 50%	0	
08D5h	18D5h	Analog operating speed maximum value for external input	0 to 4000 r/min	4000	
08D7h	18D7h	Analog torque limit maximum value external input	0 to 200%	200	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Alarm/warning parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0851h	1851h	Over load warning enable	0: Disable 1: Enable	0	A
0855h	1855h	Over load warning level	50 to 100%	100	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Utilities parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0143h	1143h	JOG operating speed	0, or 80 to 1000 r/min	300	A
01E0h	11E0h	Display mode of the data setter speed	0: Signed 1: Absolute	0	
01E1h	11E1h	The data setter editing mode	0: Disable 1: Enable	1	
0821h	1821h	JOG operating torque	0 to 200%	200	

* Indicates the timing for the data to become effective. (A: Effective immediately)

■ Operation parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0816h	1816h	Run mode select	0: PWM shut off mode enable 1: PWM shut off mode disable	1	C
0840h	1840h	Magnetic brake function at alarm	0: Lock after free stop 1: Lock immediately	1	
0841h	1841h	No operation at initial alarm enable	0: Disable 1: Enable	0	
0843h	1843h	Initial thermal input detection		0	
0870h	1870h	Data setter initial display	0: Operating speed 1: Conveyor speed 2: Load factor 3: Operating number 4: Mon top view	0	
0871h	1871h	Analog input signal select	0: Analog invalid 1: Analog speed 2: Analog torque (See next page for details.)	1	

* Indicates the timing for the data to become effective. (C: Effective after executing the configuration)

- "Analog input signal select" parameter

Setting method of operation data can be changed using the "analog input signal select" parameter. Others except the following combinations are not available to set.

"Analog input signal select" parameter	Operation data No.	Rotational speed	Acceleration Deceleration	Torque limit
0	0 to 15	Digital setting		
1 (Initial value)	0	Analog setting	Digital setting	
	1 to 15	Digital setting		
2	0 to 15	Digital setting		Analog setting

Setting example

- When setting all operation data with digital setting: Set the "analog input signal select" parameter to "0."
- When setting only the rotation speed in the operation data No.0 using the analog setting: Set the "analog input signal select" parameter to "1."

■ Communication parameter

Command code		Description	Setting range	Initial value	Effective *
Read	Write				
0900h	1900h	Communication time out	0: Not monitored 1 to 10000 ms	0	A
0901h	1901h	Communication error alarm	1 to 10 times	3	

* Indicates the timing for the data to become effective. (A: Effective immediately)

6 Method to use the MEXE02

This part explains the setting method of the data and parameters as well as the editing method, using the data setting software **MEXE02**.

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1 Overview of the MEXE02

This chapter explains the overview and operating method for the data setting software **MEXE02**.

Perform any editing operations for the **MEXE02** using an account with Administrator privileges.

The **MEXE02** is designed with the assumption that the user has an understanding of basic operations such as starting up and exiting applications and how to use a mouse in Windows 2000, Windows XP, Windows Vista and Windows 7. Use the product only after carefully reading and fully understanding these instructions.

■ Functions of the MEXE02

The **MEXE02** is a software program that lets you set data required for motor operation from a PC.

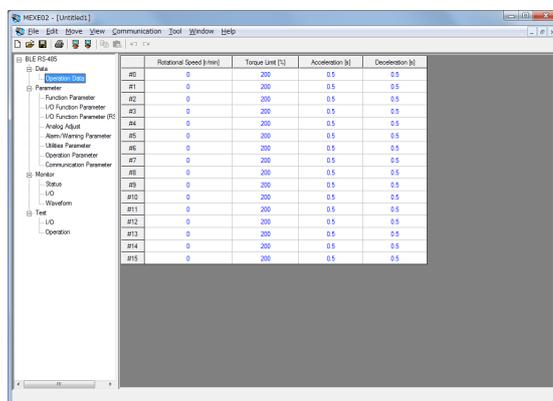
Data can be edited in various PC screens, or data set in the driver can be checked from a PC.

The key functions of the **MEXE02** are explained below.

● Editing and saving the data

Operating data and parameters can be created and edited. Data edited in the **MEXE02** can be written to the driver (download), or data stored in driver can be read into the **MEXE02** (upload).

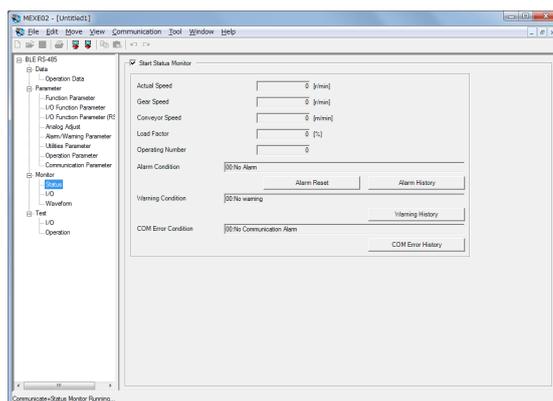
You can save data files created in the **MEXE02** in either the **MEXE02**'s dedicated file format or CSV format.



● Monitor function

The ON-OFF status of I/O signals can be monitored.

The waveform measurement feature lets you check I/O signals, motor speeds and other settings based on measured waveforms.



● Test function

I/O test can be performed to monitor input signals and cause output signals to be output forcibly.

Test operation can be also performed using the **MEXE02**.

■ Hazardous substances

The products do not contain the substances exceeding the restriction values of RoHS Directive (2011/65/EU).

■ Items required

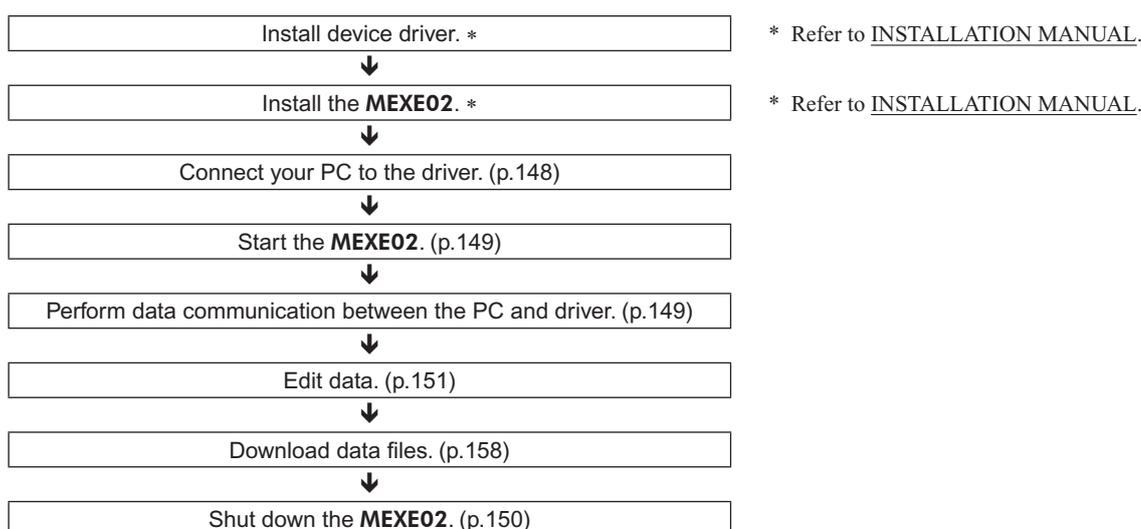
- Data setting software **MEXE02**
- Communication cable for the data setting software **CC05IF-USB** (a set of a PC interface cable and USB cable)
- [INSTALLATION MANUAL](#)

■ General specifications of the communication cable for the data setting software

Interface	USB Specification 1.1 (Full Speed 12 Mbps)
Connector shapes	RS-485 (Mini DIN 8 Pin: male), USB (Type Mini B: female) USB Type A connection via included USB cable to connect to a PC
Communication system	Half duplex
Communication speed	9600 bps
Indicator	The LED is lit (green) when recognized by PC and ready to use.
Power supply	5.0 VDC (bus power)
Current consumption	25 mA (100 mA max.)
Dimension	25×58.6×16 mm (0.98×2.31×0.63 in.) [excluding cable section]
Mass	PC interface cable: App. 0.2 kg (7.1 oz) USB cable: App. 0.03 kg (1.06 oz)
Operation environment	Ambient temperature: 0 to +40 °C (+32 to +104 °F) (non-freezing) Ambient humidity: 85% or less (non-condensing) Surrounding atmosphere: No corrosive gas, dust, water or oil
Insulation system	Non-isolated

■ General flow

Steps to set operating data and parameters using the **MEXE02** are shown below.



Note

- You can also connect the PC and applicable product after editing data. In this case, after saving the edited data to the PC, turn off both the PC power and applicable product power, connect the PC and applicable product, and then start them again.
- It is recommended to back up the application program to a suitable storage device or a medium since data loss is a possibility when using software.
- Do not unplug the USB cable while the **MEXE02** communicates with the applicable product.

■ Notation rules

The description of text in this manual follows the notation rules specified as shown at the right. The screens shown in this manual are those displayed in Windows 7.

[]	Menus and submenus shown in/from the title bar, buttons, and other controls that can be clicked with the mouse, are enclosed in square brackets.
“ ”	Dialog box messages, etc., are enclosed in double quotations marks.
{Enter}	Keyboard keys are shown in a box.

2 Connection, startup and shutdown

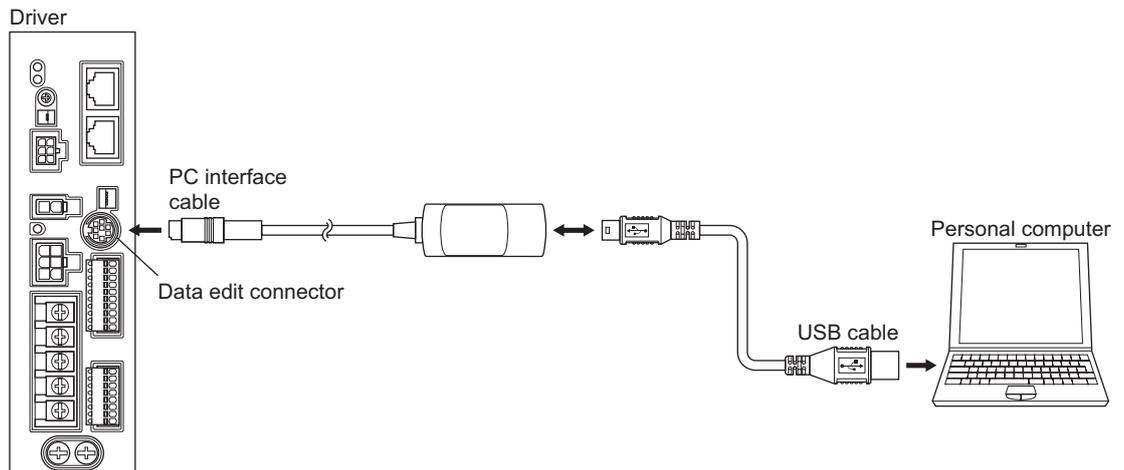
This chapter explains how to connect your PC to the driver and start/shut down the **MEXE02**.

2.1 Connection method

Caution ⚠ 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 PC to short, damaging both.

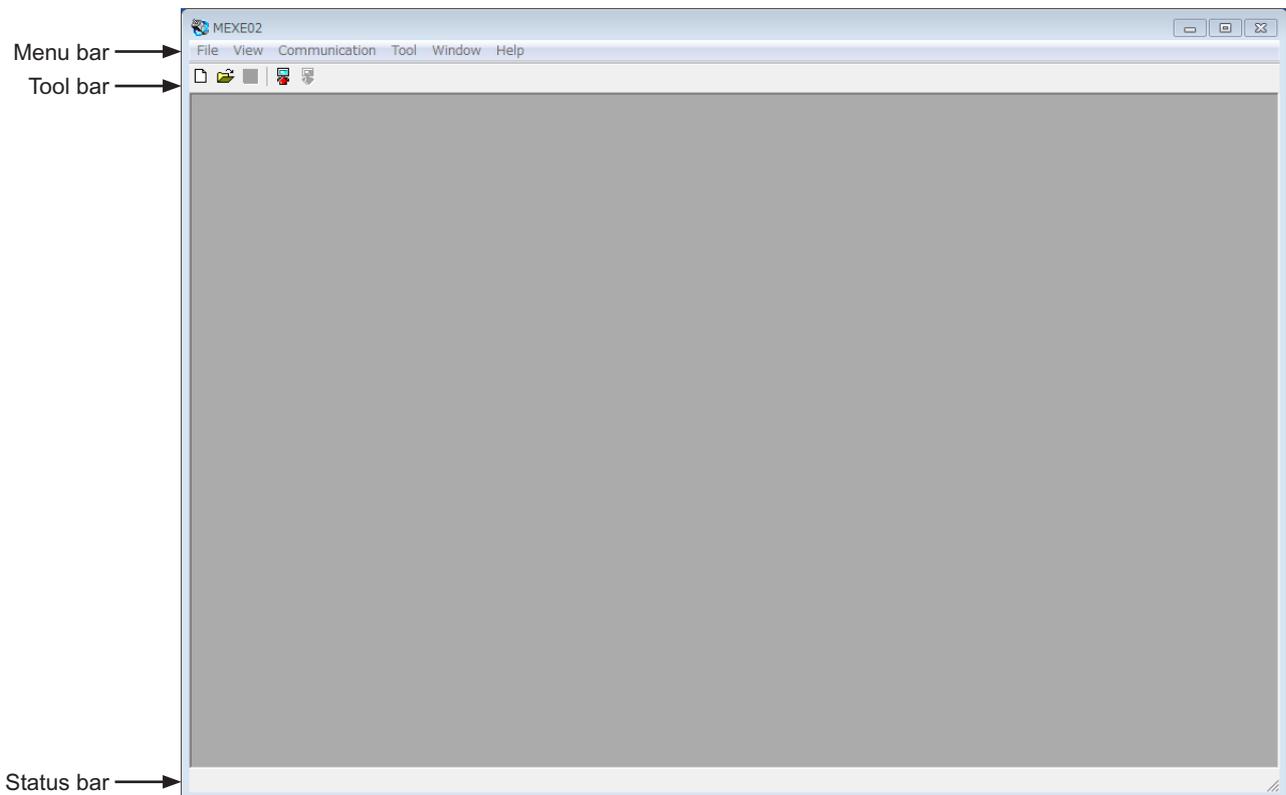
Note | Use the communication cable for the data setting software when connecting a PC and driver.

1. Turn off the PC and driver.
2. Insert the PC interface cable of the communication cable for the data setting software to the data edit connector on the driver.
Insert the USB cable of the communication cable for the data setting software to the USB port on the PC.
3. Connect the PC interface cable and USB cable.
4. Turn on the power to the PC and driver, and start the PC.



2.2 Starting the MEXE02

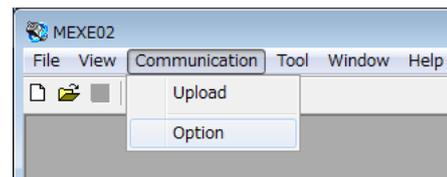
Double-click the **MEXE02** icon on the desktop to start the **MEXE02**.
Once the **MEXE02** has started, the following window appears.



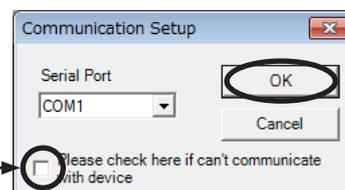
2.3 Setting up the communication line

If you have connected the PC and the driver for the first time, set up the communication line.

1. Click [Option] from the [Communication] menu.



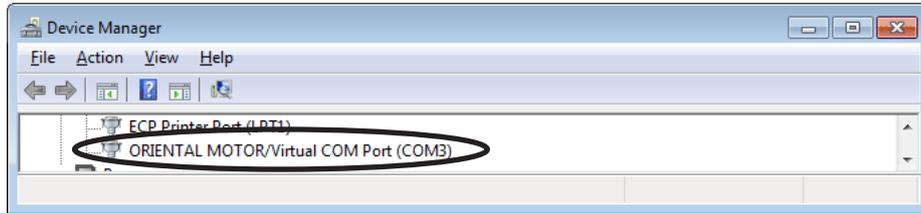
2. Select the communication port number connected the communication cable for the data setting software, and click [OK].



- * If communication cannot be established even though the driver power is input and the correct communication port is selected, select this check box and then set up the communication line again.

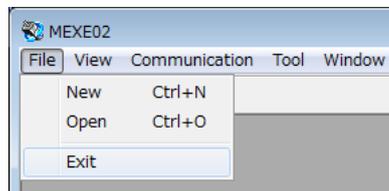
■ Confirming the communication port number

1. Right-click the “My Computer” icon on the Desktop and click “Properties”.
The system properties will be displayed.
2. Click the “Hardware” tab and then click [Device Manager].
3. Double-click “Port (COM & LPT)”.
Confirm the port number labeled as “ORIENTAL MOTOR/Virtual COM Port”. In the example below, it is COM3.



2.4 Shutting down

Click [Exit] from the [File] menu.
The **MEXE02** shuts down.



3 Data edit

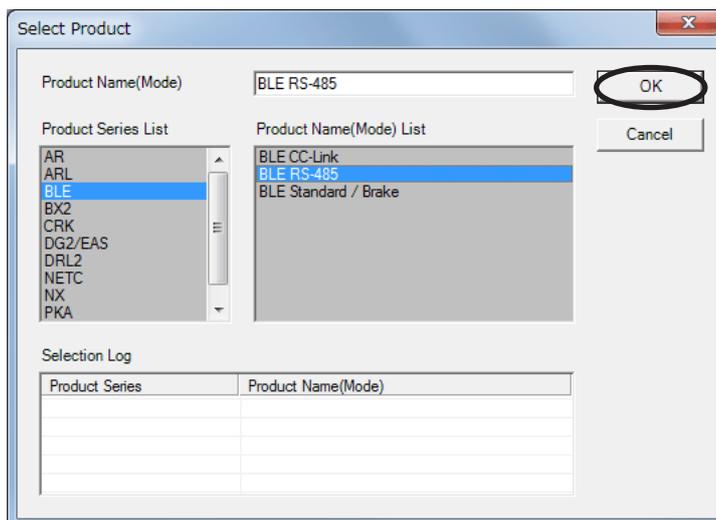
This chapter explains how to create data files, edit operating data and parameters, and store edited data. Data can be created from scratch or by editing existing data. Both require different procedures, so read the section corresponding to each method.

3.1 Creating new data

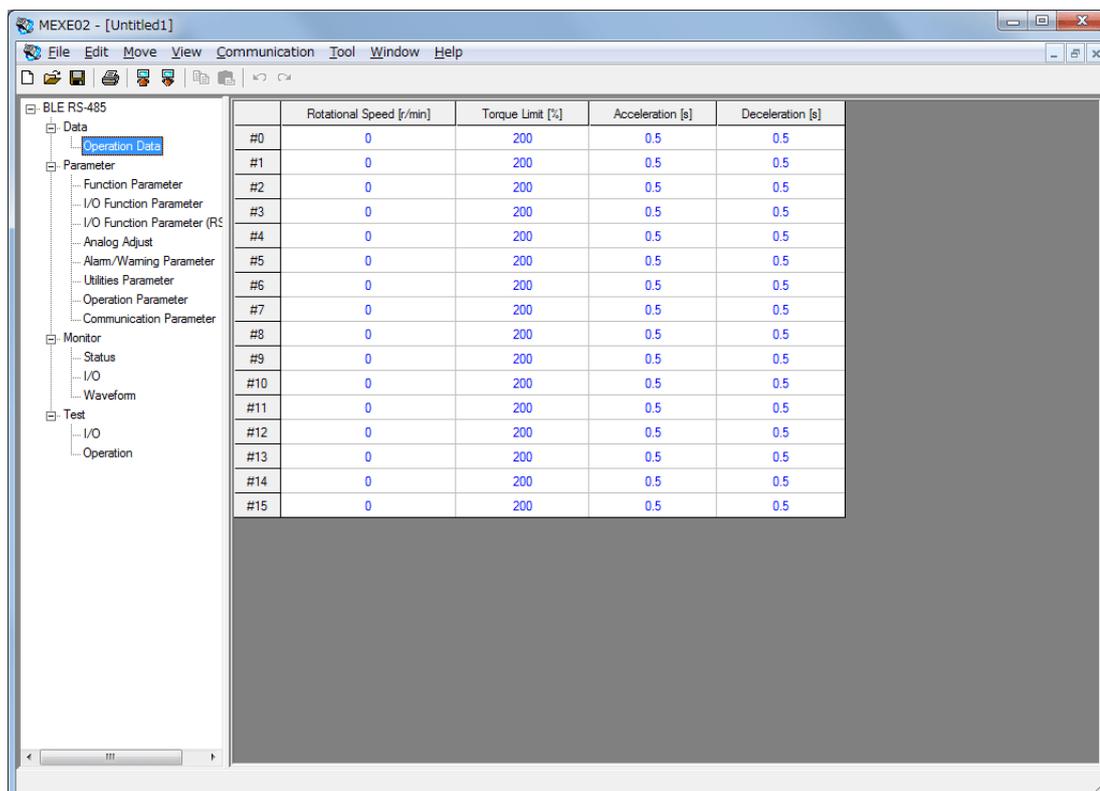
1. Click the “New” icon in the toolbar.



2. Select the product series and product name (mode), and click [OK].

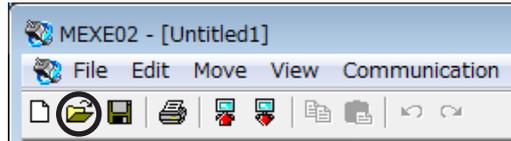


The data edit window appears.

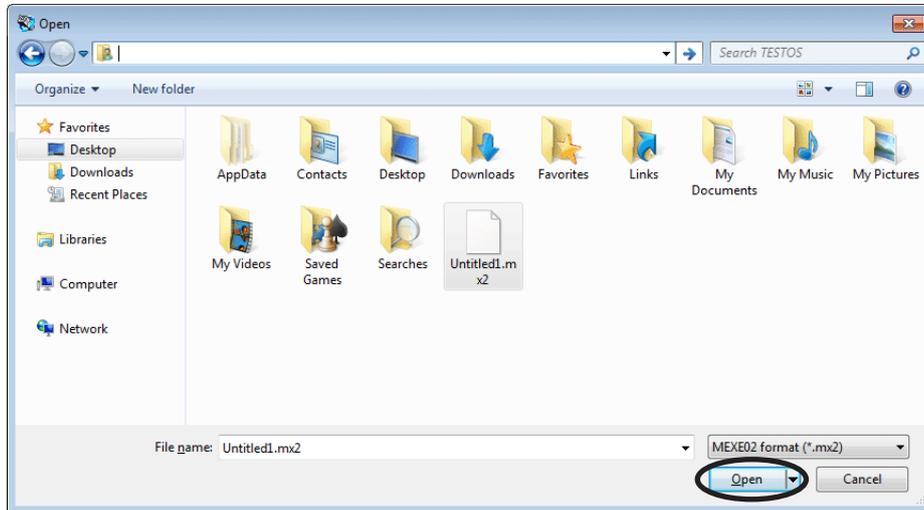


3.2 Opening an existing data file

1. Click the “Open” icon in the toolbar.



2. Select the file you want to edit, and click [Open].



The data edit window appears, just like when you are creating a new data file.

3.3 Setting data in the data edit window

Note Changing the data in the MEXE02 will not change the data in the driver. In order to change the data in the driver, a download must be performed. See page 158 for procedures on downloading.

■ Data entry

When the value in a cell is changed, the cell changes to yellow.

The characters in the cell will be black if the value in the cell is different from the default value. Resetting the cell back to the default value changes the text color to blue.

- Entering a numeric value

Click a desired cell, enter a numeric value using the keyboard, and then press the {Enter} key.

- Selecting a value from a pull-down menu

Double-clicking a desired cell displays a pull-down menu. Select a desired value from the pull-down menu.

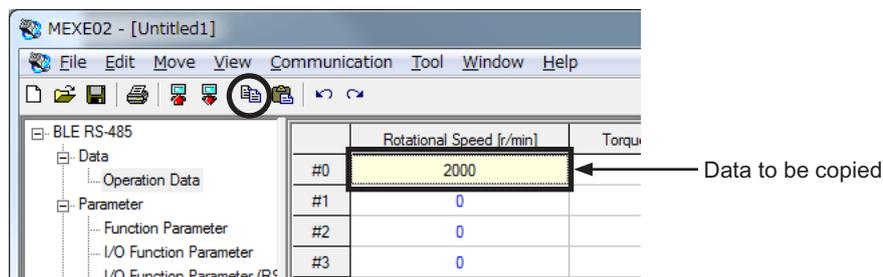
Rotational Speed [r/min]	Torque Limit [%]
0	200
0	200

Over Load Warning Level [%]	100
Over Load Warning Enable	Disable ▾
	Disable
	Enable

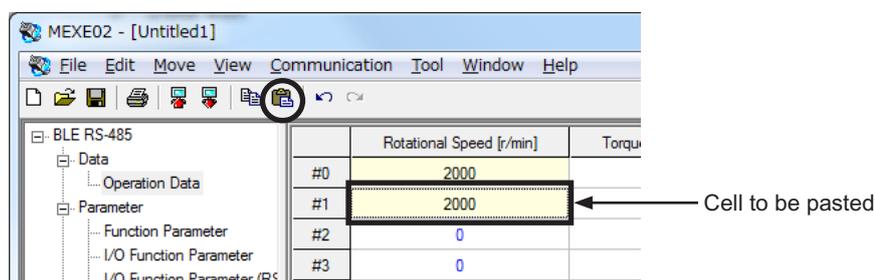
■ Copying and pasting data

You can copy an entered value and paste it into a different cell. Copying and pasting lets you quickly populate multiple cells with the same value.

1. Select the data you want to copy, and then click the “Copy” icon in the toolbar.
You can select a single value or multiple values.



2. Click the cell you want to paste the data into, and then click the “Paste” icon in the toolbar.

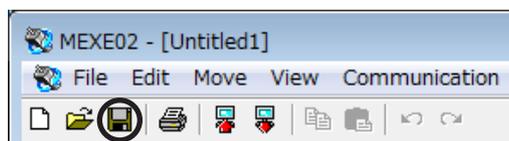


3.4 Saving a data file

The data edited within the **MEXE02** or data read by the driver will be saved as a file. Data files can be saved in the **MEXE02**'s dedicated file format (.mx2) or CSV format (.csv).

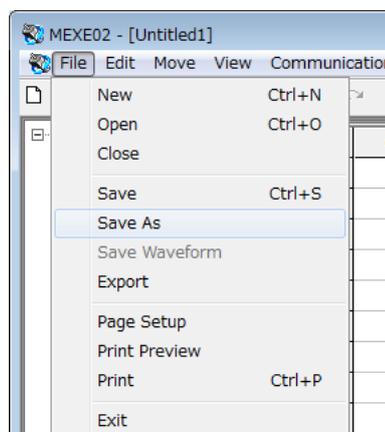
■ Saving data by overwriting

Click the “Save” icon in the toolbar. The current data is saved over the existing data.

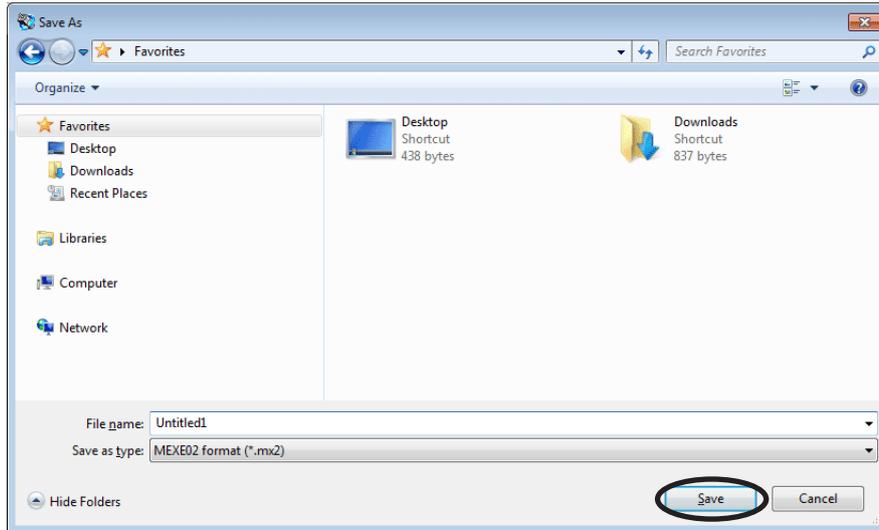


■ Saving data under a different name

1. Click [Save As] from the [File] menu.



2. Enter a new file name, and click [Save].
The data is saved under the specified name.



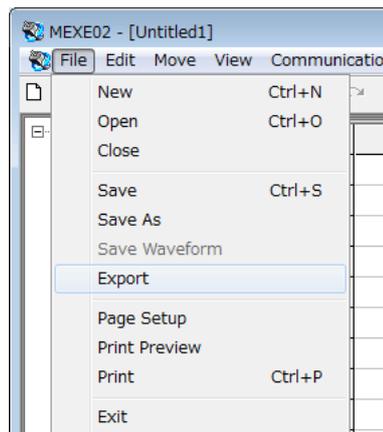
■ Saving data in CSV format

Data saved in the CSV format can be edited in applications other than the **MEXE02**.

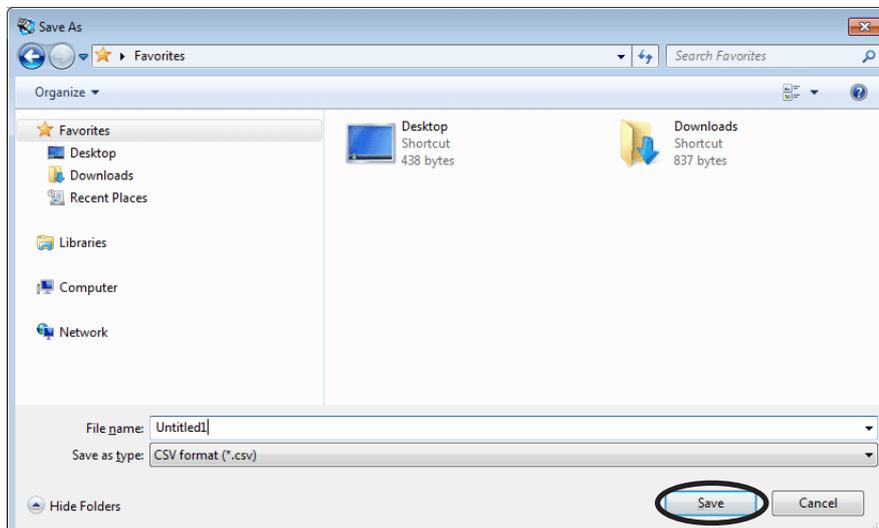
Note that once saved in the CSV format, files can no longer be opened or edited in the **MEXE02**.

To edit a CSV file in the **MEXE02**, open the file in an application other than the **MEXE02** and then paste the data to the **MEXE02**.

1. Click [Export] from the [File] menu.



2. Select the CSV format from "Save as type," then enter a file name and click [Save].
All operating data and parameters are saved in CSV format.

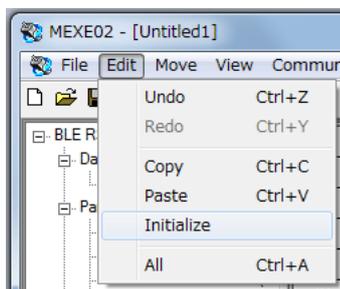


3.5 Restore default data

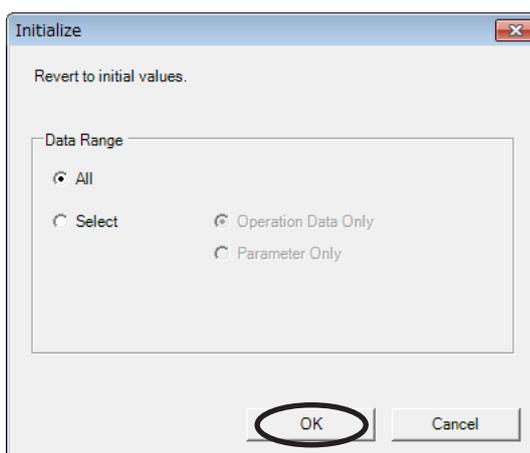
■ Restoring edited data

You can initialize the data you have edited in the data edit window.

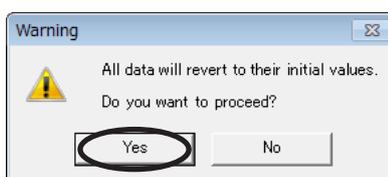
1. Click [Initialize] from the [Edit] menu.



2. Select the data you want to initialize, and click [OK].



3. Click [Yes].
The data is initialized.



■ Restoring default data in selected cells

1. In the data edit window, select the cell you want to restore.

	Rotational Speed [r/min]
#0	2000
#1	0
#2	0

← Cell to be initialize

2. Click the right mouse button, and click [Initialize].
The value in the selected cell returns to the default.

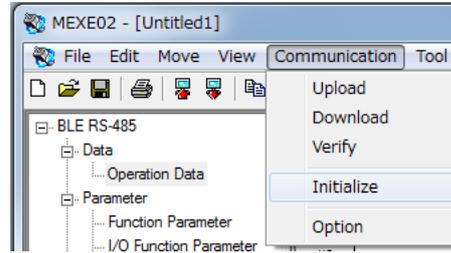
	Rotational Speed [r/min]	Torque Limit [%]	Accel
#0	2000	200	
#1	0		
#2	0		
#3	0		
#4	0		
#5	0	200	

Restoring the driver to default settings

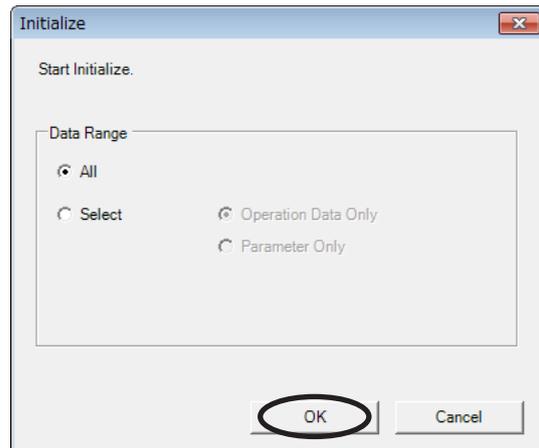
You can restore data stored in the driver's non-volatile memory.

- Note**
- The driver's non-volatile memory can be rewritten approximately 100,000 times.
 - Do not turn off the driver power while the initialization is still in progress. Doing so may damage the data.

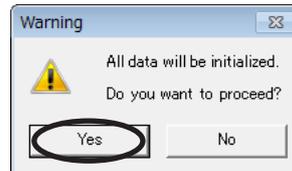
- Click [Initialize] from the [Communication] menu.



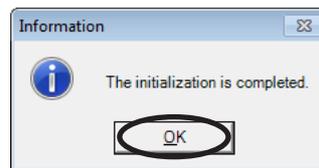
- Select the data you want to restore, and then click [OK].



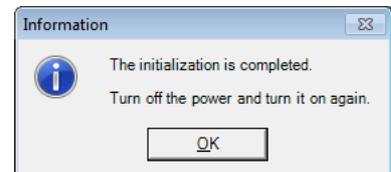
- Click [Yes].
The specified data in the driver's non-volatile memory is restored.



- When the restore is complete, click [OK].

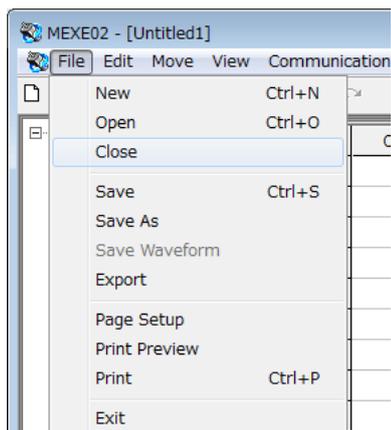


- Note** When changing the parameters that are necessary to cycle the power or execute the configuration by initializing the data, the following message is displayed. Since these parameters become effective after the power is cycled, turn on the power again.



3.6 Ending data edit

To close the data edit window, click [Close] from the [File] menu.



4 Data upload/download and verification

This chapter explains how to write the **MEXE02** data to the driver (download), read data from the driver into the **MEXE02** (upload), and verify the **MEXE02** data against driver data.

4.1 Download data to the driver (writing)

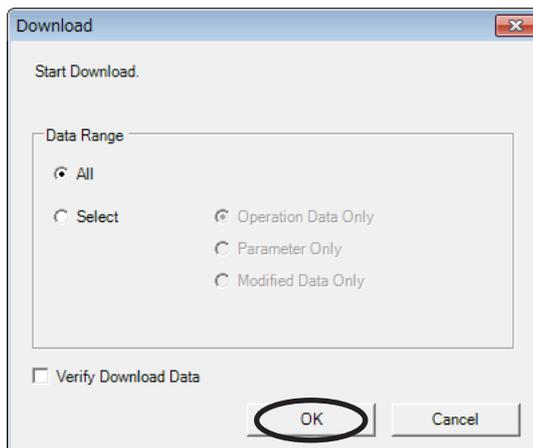
You can write data created in the **MEXE02** to the driver.

- Note**
- The driver's non-volatile memory can be rewritten approximately 100,000 times.
 - Do not turn off the driver power while the download is still in progress. Doing so may damage the data.

1. Click the "Download" icon in the toolbar.

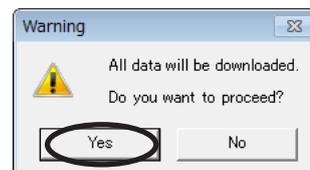


2. Select the data to be downloaded, and then click [OK].



- Note** The **MEXE02** data and the driver data must be synchronized prior to performing the "Modified Data Only" download. For the synchronization method, refer to page 167.

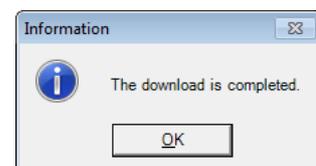
3. Click [Yes].
The data is downloaded.



4. After the data has been downloaded, click [OK].



- Note** When changing the parameters that are necessary to cycle the power or execute the configuration by downloading the data, the following message is displayed. Since these parameters become effective after the power is cycled, turn on the power again.



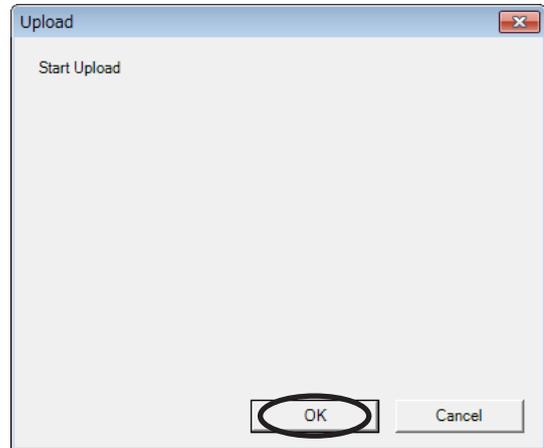
4.2 Upload from the driver (reading)

You can read data stored in the driver into the **MEXE02**.

1. Click the “Upload” icon in the toolbar.



2. Click [OK].
The data is uploaded.



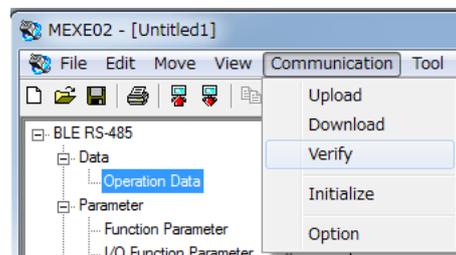
3. After the data has been uploaded, click [OK].
The data that has been read is displayed.



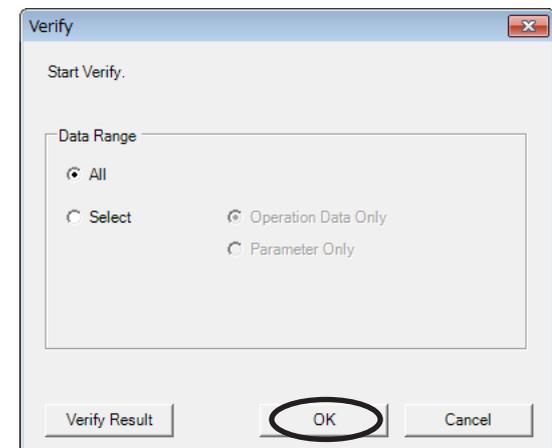
4.3 Verifying data

You can verify the data stored in the driver against the data displayed in the **MEXE02**.

1. Click [Verify] from the [Communication] menu.



2. Select the data to be verified, and then click [OK].
Data is verified.



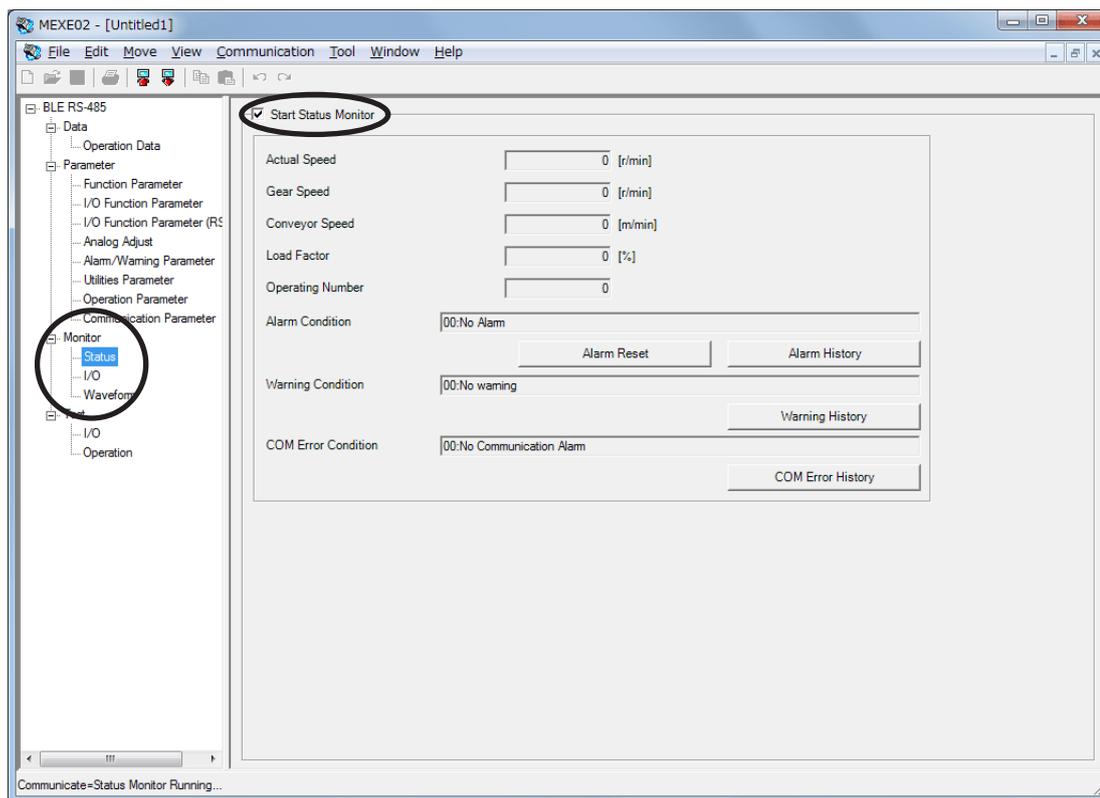
5 Monitor function

You can monitor the motor operating status, alarm condition and I/O signals. In the waveform monitor, the motor operating speeds and I/O signal switching status can be checked in a waveform format.

5.1 Status monitor

You can monitor the operation status and alarm condition.

1. In the window selection area, click [Status] under [Monitor].
The status monitor window appears.
2. Select “Start Status Monitor”.
Status monitor starts.

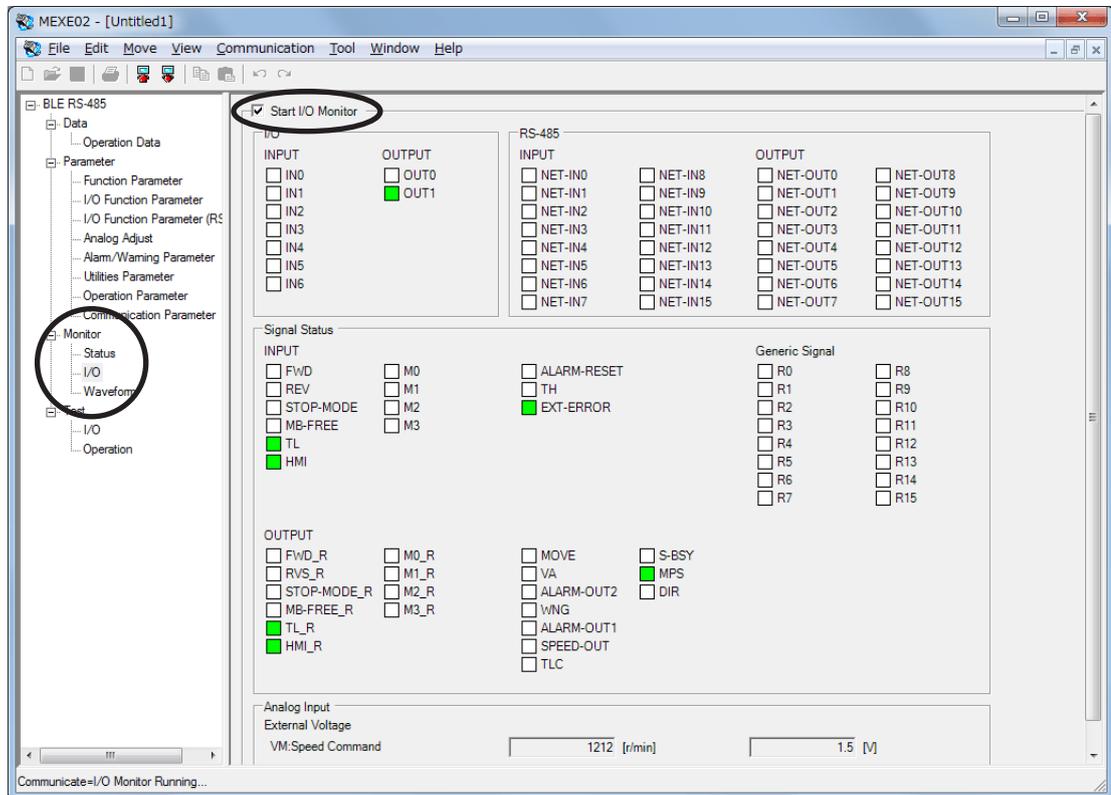


3. To end status monitor, unselect “Start Status Monitor”.

5.2 I/O monitor

You can monitor the I/O status of the driver.

1. In the window selection area, click [I/O] under [Monitor].
The I/O monitor window appears.
2. Select "Start I/O Monitor".
The I/O monitor starts.



Each signal is shown in green if ON, and in white if OFF.

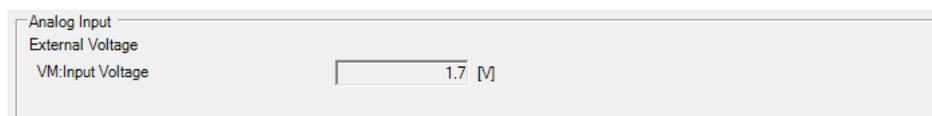
Display	Driver terminals status	I/O signals status
ON (green)	The driver photocoupler is in conduction state.	Status for the signals detected inside the driver is active.
OFF (white)	The driver photocoupler is in non-conduction state.	Status for the signals detected inside the driver is non-active.

3. To end I/O monitor, unselect "Start I/O Monitor".

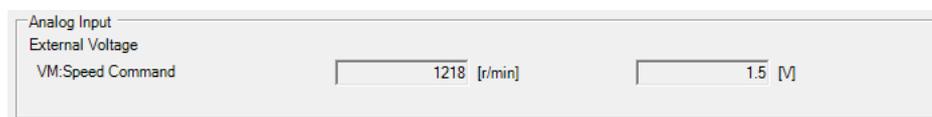
■ Analog input monitor

The monitor items of the analog input vary depending on the setting of the "analog input signal select" parameter.

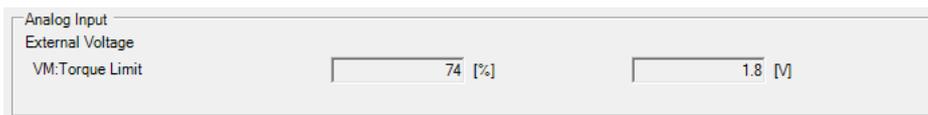
- When the parameter is set to "Analog invalid": Monitors the voltage (V)



- When the parameter is set to "Analog speed": Monitors the speed command (r/mim) and voltage (V)



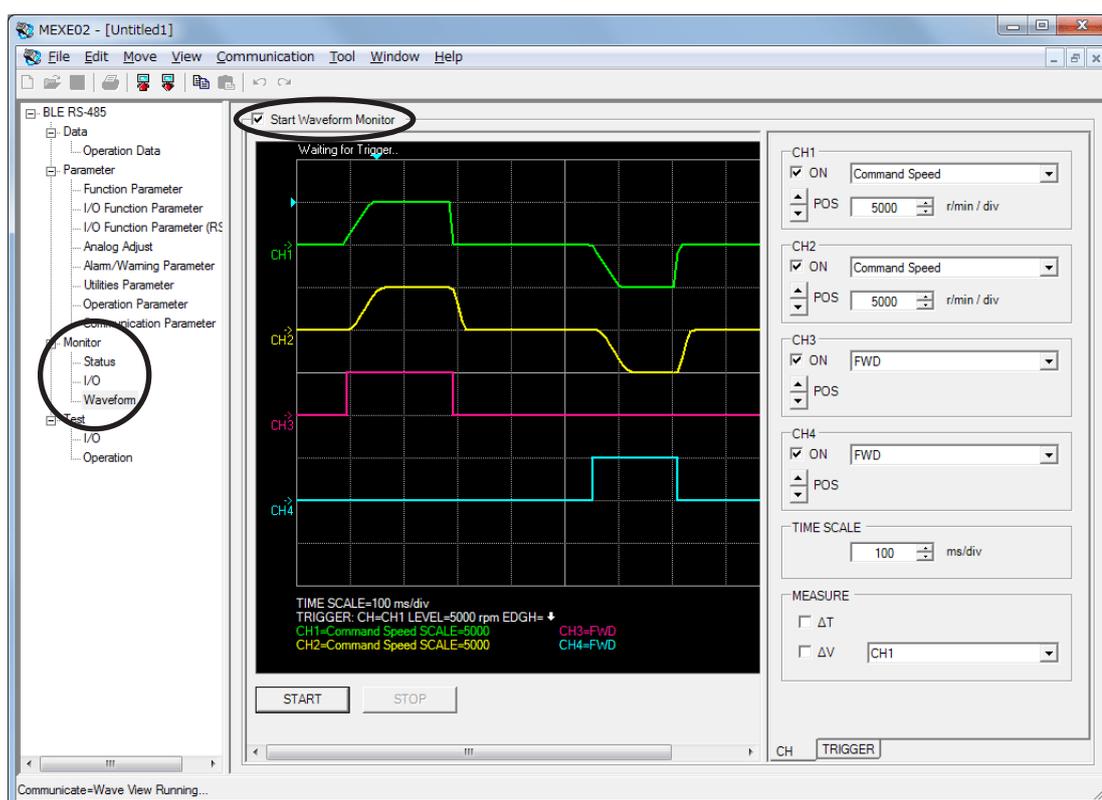
- When the parameter is set to "Analog torque": Monitors the torque limiting (%) and voltage (V)



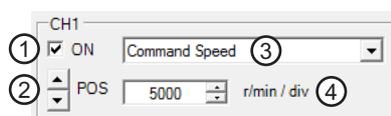
5.3 Waveform monitor

The motor operating speeds and I/O signal switching status can be checked in a waveform format. Four sets of waveforms (four channels) can be shown in the window simultaneously.

1. In the window selection area, click [Waveform] under [Monitor].
The waveform monitor window appears.
2. Select "Start Waveform Monitor".
Waveform monitor starts.



3. Set the required items for each channel.

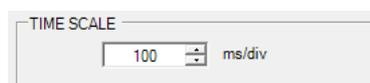


No.	Item	Description
1	ON	Selecting this check box specifies that the applicable channel will be displayed.
2	POS	Set the position in the window where you want to show the channel. ▲ : Move the channel position up ▼ : Move the channel position down.
3	Measurement item	Select the speed or signal you want to measure.
4	Measurement range	Set the scale for each tick mark on the vertical axis. (This item can be set only for CH1 and CH2.)

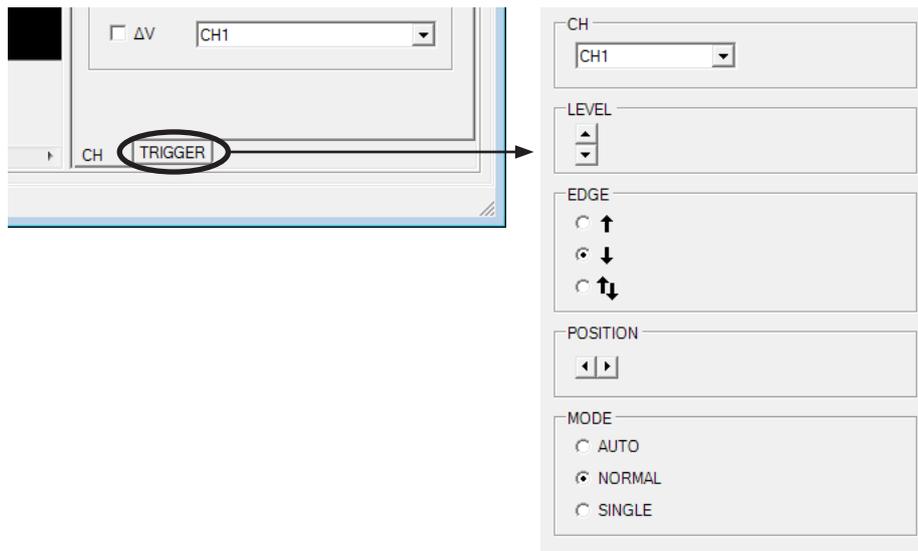
4. Set the time scale.

The time for each tick mark on the horizontal axis will be set.

- ▲ : Time will become longer.
- ▼ : Time will become shorter.

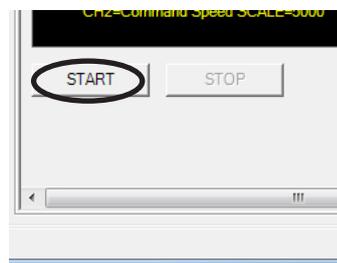


- Click [TRIGGER] on the lower right of the screen, and set the trigger.
Trigger is a function for automatically measuring waveform when the motor speed or I/O signal ON/OFF status satisfies a specific condition.



CH	Select the channel you want to set a trigger for.
LEVEL	This item is shown when you have selected CH1 or CH2 under “CH.” Click the up/down arrows to set the trigger level of speed.
EDGE	Set the trigger detection condition. ↑ : For CH1 and CH2, when the value changes from a value below what is set for “LEVEL” to a value at or above what is set for “LEVEL.” For CH3 and CH4, measurement will be triggered when the I/O signal status changes from OFF to ON. ↓ : For CH1 or CH2, when the value changes from a value at or above what is set for “LEVEL” to a value below what is set for “LEVEL.” For CH3 and CH4, measurement will be triggered when the I/O signal status changes from ON to OFF. ↑ ↓ : This item sets both ↑ and ↓ as conditions.
POSITION	Set the trigger position in the screen. ◀ : Move the trigger position to left. ▶ : Move the trigger position to right.
MODE	Select when to display waveforms. AUTO: Waveforms are constantly updated until the waveform measurement is stopped. NORMAL: Waveforms are updated every time a trigger is detected. SINGLE: Waveforms are updated when a trigger is detected, after which waveform monitor will end automatically.

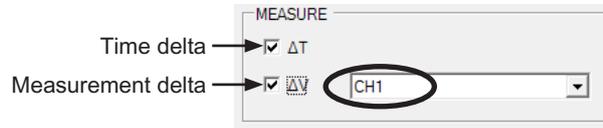
- Click [START].
Waveform measurement starts.
- Click [STOP] to stop the measurement.



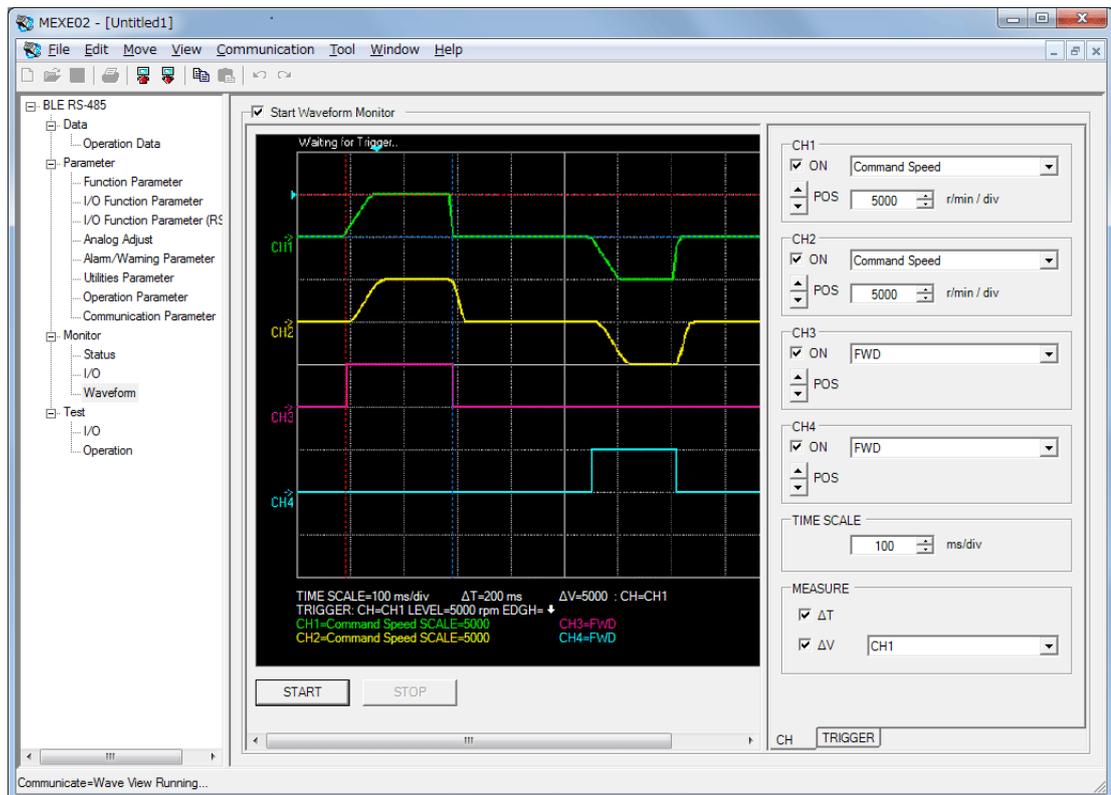
■ Measurement function

You can measure the time delta and measurement delta in the window based on measurement results. The time delta indicates the difference between T1 and T2, while the measurement delta indicates the difference between V1 and V2. This function is useful to verify the time that the measured waveform is in ON state or to verify the interval between the signals. It is also useful to verify the difference between the measured value of the items selected for CH1 and CH2.

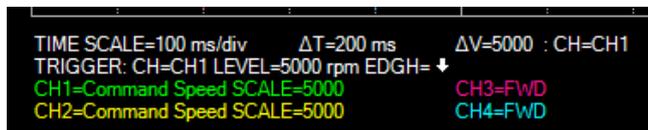
1. Under “MEASURE” on the right side of the window, select the channel you want to measure.



2. To measure the time delta, select “ΔT.” To measure the measurement delta, select “ΔV”.
If ΔT has been selected, two vertical lines appear. If ΔV has been selected, two horizontal lines appear.
The red line shows the T1 time or V1 measurement. The blue line shows the T2 time or V2 measurement.



3. Drag the vertical or horizontal lines with the mouse to desired measurement positions.
The time delta and measurement delta are shown below the graph.

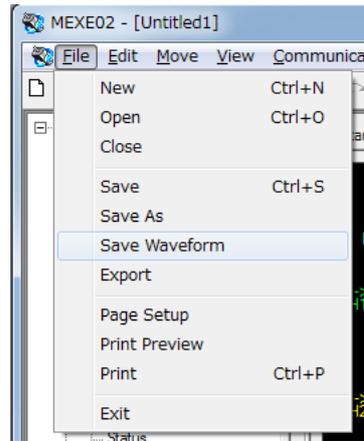


← Display the time delta and measurement delta

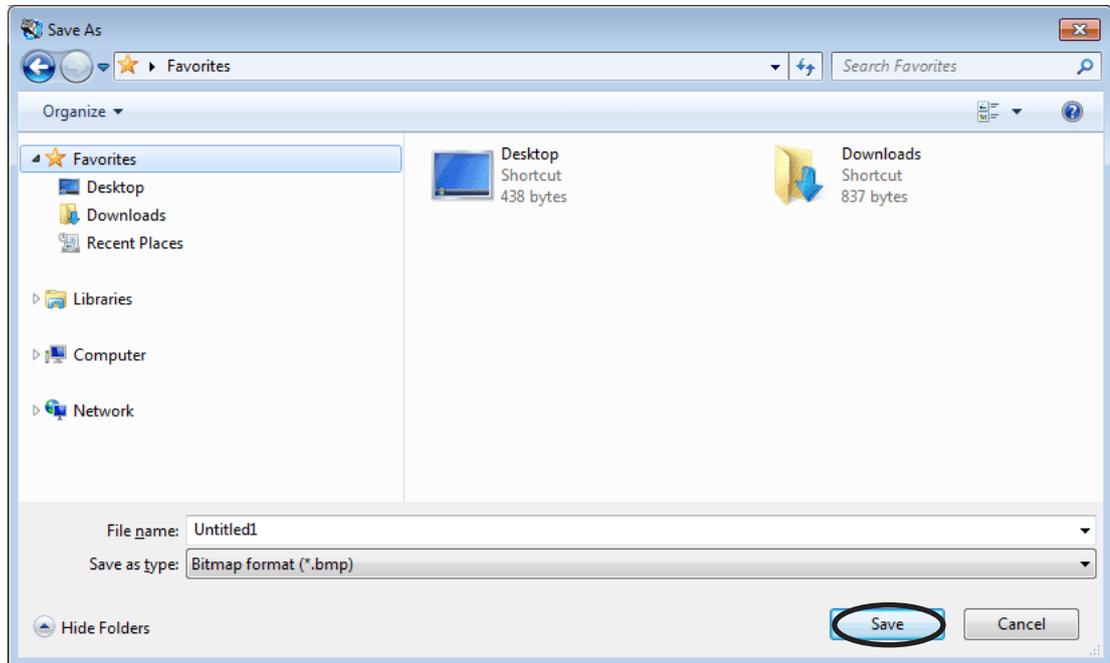
■ Saving a waveform

The waveform on the waveform monitor screen can be saved as a BMP file.

1. Unselect “Start Waveform Monitor.”
2. Click [Save Waveform] from the [File] menu.



3. Enter a file name, and click [Save].



6 Test function

You can perform I/O signal test and test operation.

6.1 Synchronization with the driver

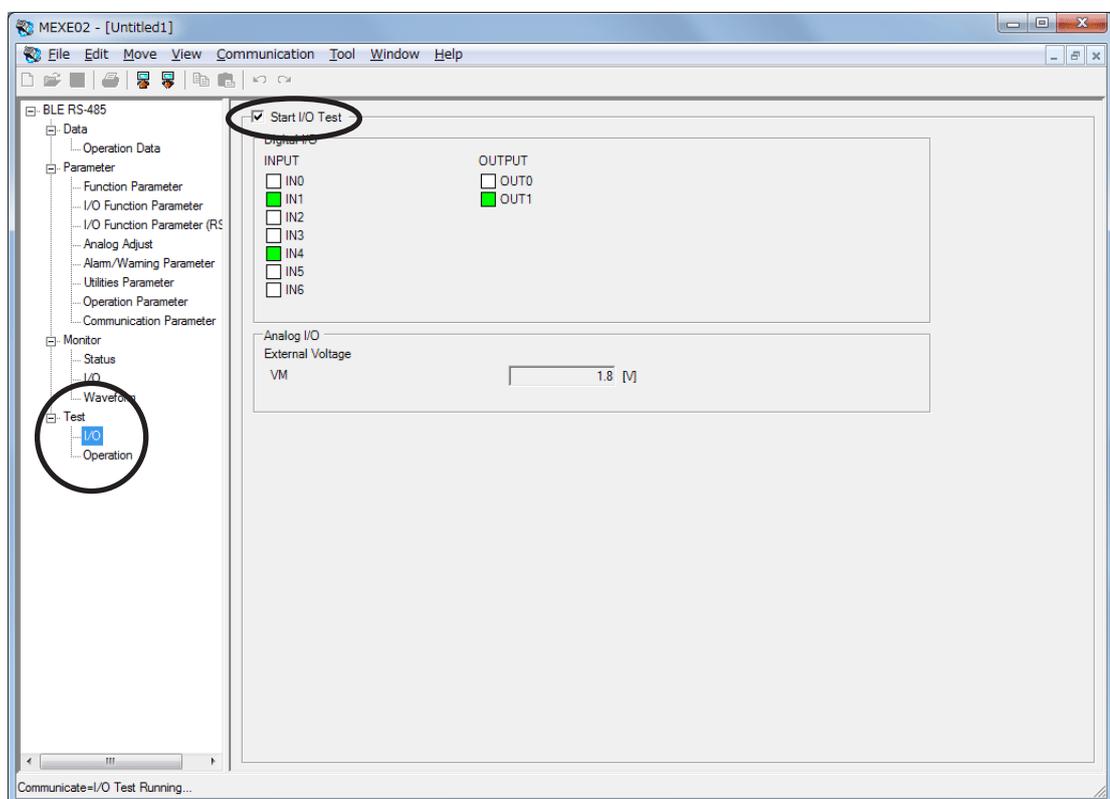
In order to verify the status of the driver using the test function, the **MEXE02** data and driver data must be synchronized. A window to select a synchronization method will be displayed when the test function is selected without synchronizing the data.

Once synchronization is complete, the synchronization will be valid until communication with the **MEXE02** is interrupted or the **MEXE02** data is changed.

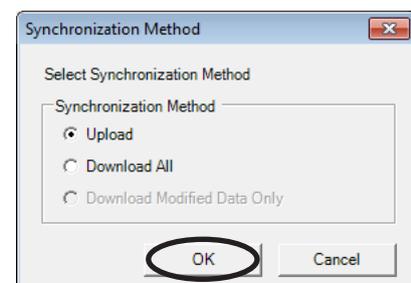
Also, when the **MEXE02** data is edited after synchronization, "Download Modified Data Only" is enabled to be selected, which allows downloading only the data that has been edited to the driver.

Note Once synchronization is complete, the **MEXE02** data or driver data will be changed. Which data is changed depends on the synchronization method.

1. In the window selection area, select test function by clicking [I/O] or [Operation] under [Test].
2. Select the check box of "Start I/O Test" or "Start Test Operation" near the center of the screen.
The following screen is an example that the I/O test has been selected. Select "Start I/O Test" in this case.



3. Select the synchronization method.
4. Click [OK].
The **MEXE02** data and driver data will be synchronized.
5. Once synchronization is complete, clear the check box in Step 2 if you wish to proceed to another function.

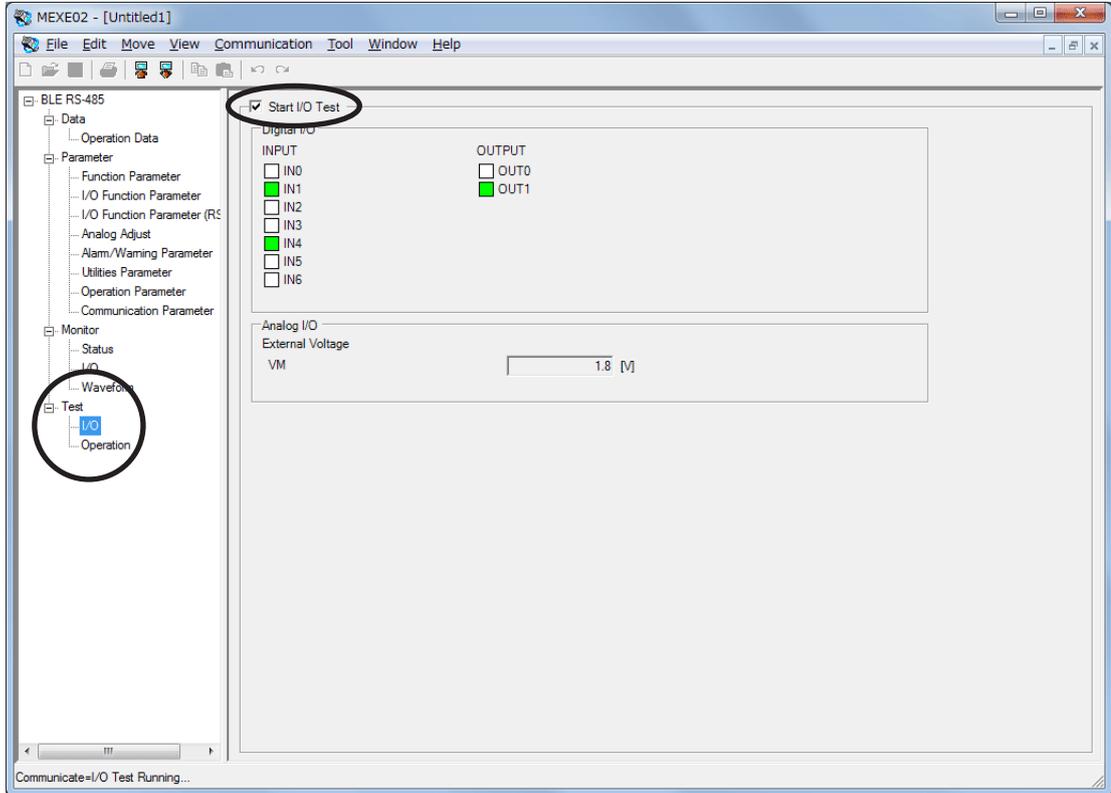


6.2 I/O test

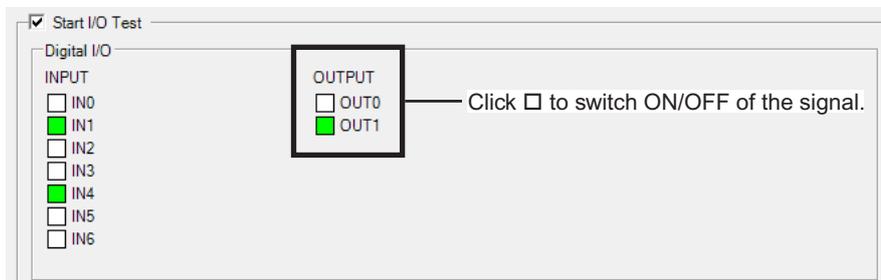
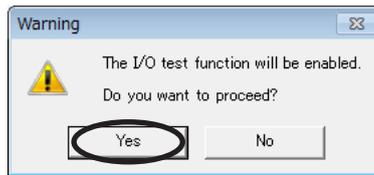
You can monitor input signals and cause output signals to forcibly output. This function is convenient if you want to check the wiring condition.

Note I/O signals are kept in the same status which was before the I/O test was performed. If a signal is input externally while the I/O test is performed, the signal becomes invalid.

1. In the window selection area, click [I/O] under [Test].
The I/O test window appears.
2. Select "Start I/O Test".



3. Click [Yes].
You can now perform I/O test.



You can monitor the ON/OFF status of the signals under "INPUT."

For the signals under "OUTPUT", the ON/OFF status switches every time is clicked.

Each signal is shown in green if ON, and in white if OFF.

The voltage value that is input by the external speed potentiometer or external DC voltage will be shown in the "External voltage."

Display	Driver terminals status
ON (green)	The driver photocoupler is in conduction state.
OFF (white)	The driver photocoupler is in non-conduction state.

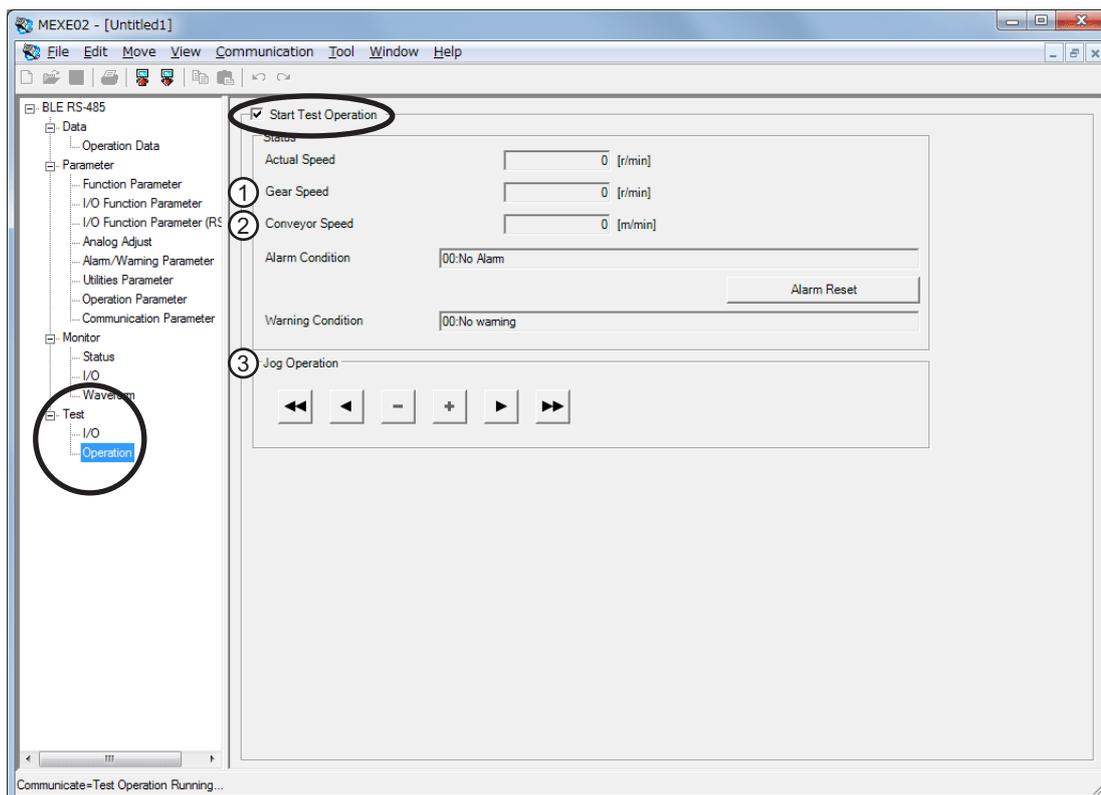
- To end the I/O test, unselect “Start I/O Test.”
The signals under “OUTPUT” (output signals) return to the status they had before the I/O test.

6.3 Test operation

You can operate a motor using the **MEXE02**. The motor operation can be checked by test operation before connecting to a master controller.

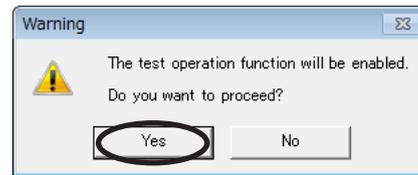
Note During test operation, the motor rotates at the set speed while each operation button is pressed. Perform test operation after confirming thoroughly that the motor rotation will not cause any dangerous situation.

- In the window selection area, click [Operation] under [Test].
The test operation window appears.
- Select “Start Test Operation”.



No.	Item	Description
1	Gear speed	Using the "reduction gear rate" parameter or "amplification speed rate" parameter, the operating speed that is calculated based on the actual speed of the motor will be displayed.
2	Conveyor speed	Using the "conveyor reduction gear rate" parameter or "conveyor amplification speed rate" parameter, the conveyor transfer speed that is calculated based on the actual speed of the motor will be displayed.
3	JOG operation button	Operates a motor. The torque at the JOG operation is the value set by the "Jog operating torque" parameter. ◀◀ : Operates continuously in the negative direction at the JOG operation speed. ◀ : Operates continuously in the negative direction at the lowest speed (80 r/min at the motor shaft speed). - + : Not used. ▶ : Operates continuously in the positive direction at the lowest speed (80 r/min at the motor shaft speed) ▶▶ : Operates continuously in positive direction at the JOG operation speed.

3. Click [Yes].
You can now perform test operation.
4. To end the test operation, unselect “Start Test Operation”.



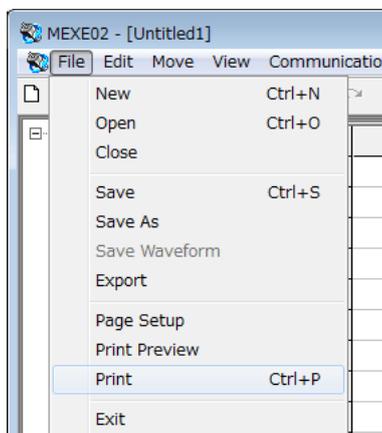
7 Other functions

You can print the **MEXE02** data or check the version of the **MEXE02**.

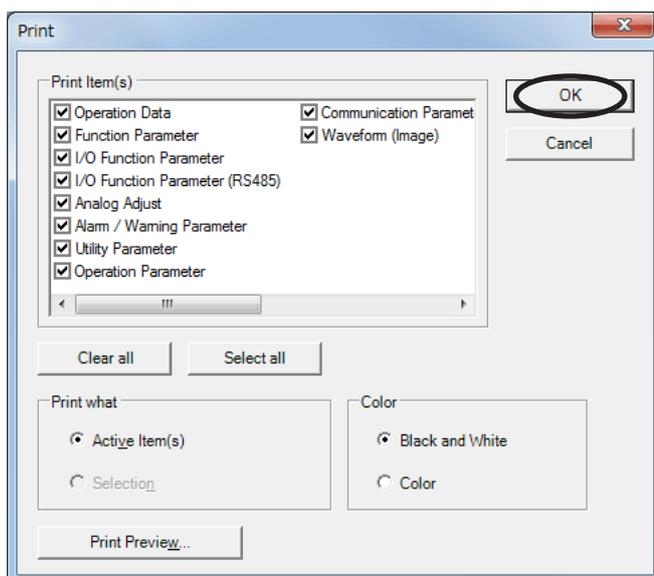
7.1 Printing data

You can print data and waveform measurement results.

1. Click [Print] from the [File] menu.



2. Set the items you want to print, print object, and color, and then click [OK].



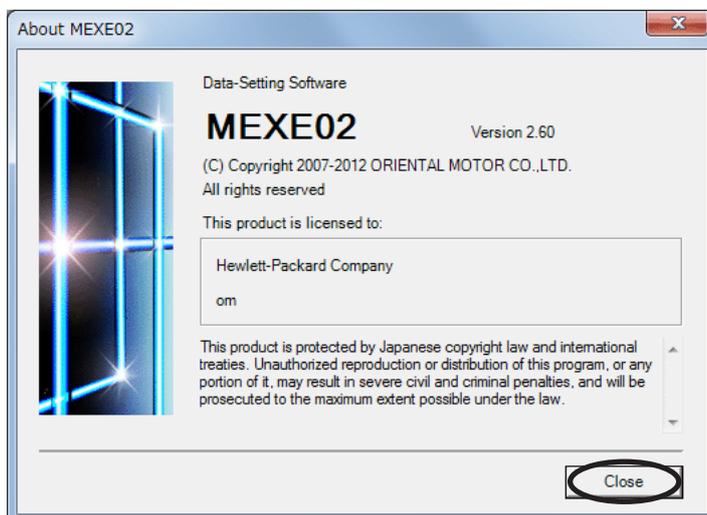
7.3 Checking version information

You can check the version of the **MEXE02** software you are using.

1. Click [About **MEXE02**] from the [Help] menu.



2. After you have checked the software version, click [Close].



The software version is also found on the **MEXE02** CD-ROM.

7.4 Checking error message

If the **MEXE02** has encountered a problem while running, a corresponding error message is shown in the window. "Measures" may be displayed depending on the contents of the error message. Check the screen and appropriately deal with the issue.

7 Inspection, troubleshooting and remedial actions

This part explains the periodical inspection methods as well as confirmation items and remedial actions when problems have happened.

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1 Inspection

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

Note

- Conduct the insulation resistance measurement or dielectric strength test separately on the motor and the driver. Conducting the insulation resistance measurement or dielectric strength test with the motor and driver connected may result in damage to the product.
- The driver uses semiconductor elements. Handle the driver with care since static electricity may damage semiconductor elements. Static electricity may damage the driver.

■ During inspection

- The motor/gearhead mounting screws are not loose.
- Check for any unusual noises in the motor bearings (ball bearings) or other moving parts.
- The bearing (ball bearing) and gear meshing parts of the gearhead are not generating noise.
- The motor/gearhead output shaft is not misaligned with the load shaft.
- Are there any scratches, signs of stress or loose driver connections in the cable?
- Are the openings in the driver blocked?
- The driver mounting screws and power connection terminal screws are not loose.
- Are there any strange smells or appearances within the driver?

2 Alarms, warnings and communication errors

The driver provides alarms that are designed to protect the driver from overheating, poor connection, error in operation, etc. (protective functions), as well as warnings that are output before the corresponding alarms generate (warning functions).

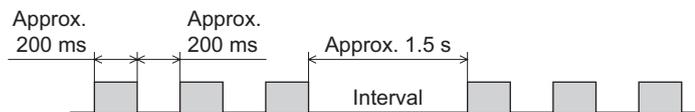
Communication error will generate when the process requested by the master could not be executed.

2.1 Alarms

When an alarm generates, the ALARM-OUT1 output will turn OFF and the motor will stop. At the same time, the PWR/ALM LED will start blinking.

The present alarm can be checked by counting the number of times the PWR/ALM LED blinks. The alarm can be also checked using any of the **OPX-2A**, **MEXE02** or RS-485 communication.

Example: Sensor error alarm (number of blinks: 3)



■ Alarm reset

Before resetting an alarm, always remove the cause of the alarm and ensure safety, and perform one of the reset operations specified below. Refer to page 56 for the timing chart.

- Turn the ALARM-RESET input to ON and then OFF. (This signal will become effective when turning from ON to OFF.)
- Perform an alarm reset using RS-485 communication.
- Perform an alarm reset using the **OPX-2A** or **MEXE02**.
- Cycle the power.

Note Some alarms cannot be reset with the ALARM-RESET input, **OPX-2A**, **MEXE02** or RS-485 communication. Check the following table to identify which alarms meet this condition. To reset these alarms, cycle the power.

■ Alarm records

Up to 10 generated alarms are saved in the non-volatile memory in order of the latest to oldest.

Alarm records saved in the non-volatile memory can be read and cleared when performing any of the following.

- Read the alarm records by the monitor command via RS-485 communication.
- Clear the alarm records by the maintenance command via RS-485 communication.
- Read and clear the alarm records using the **OPX-2A** or **MEXE02**.

■ Alarm list

Code	No. of LED blinks	Alarm type	Cause	Remedial action	Reset using the ALARM-RESET input
30h	2	Overload	A load exceeding the rated torque was applied to the motor for 5 seconds or more.	<ul style="list-style-type: none"> • Decrease the load. • Review the operation pattern settings such as the acceleration/ deceleration time. 	Possible
28h	3	Sensor error	The motor sensor signal line experienced an open circuit during operation, or the signal connector came off.	Check the connection between the driver and motor.	
42h		Initial sensor error	The motor sensor signal line broke or signal connector came off before the main power supply was turned on.		
22h	4	Overvoltage	<ul style="list-style-type: none"> • The main power-supply voltage became higher than the rated voltage by approx. 20%. • A load exceeding the allowable gravitational capacity of the motor is driven or sudden starting/stopping of a large inertial load is performed. 	<ul style="list-style-type: none"> • Check the main power supply voltage. • If this alarm occurs during operation, reduce the load or increase the acceleration/ deceleration time. • Use a regeneration unit. 	
25h	5	Undervoltage	The main power-supply voltage became lower than the rated voltage by approx. 40%	<ul style="list-style-type: none"> • Check the main power supply voltage. • Check the wiring of the power supply cable. 	
31h	6	Overspeed	The rotation speed of the motor output shaft exceeded approx. 4800 r/min	<ul style="list-style-type: none"> • Decrease the load. • Review the operation pattern settings such as the acceleration/ deceleration time. 	
20h	7	Overcurrent	Excessive current has flown through the driver due to ground fault, etc.	Check the wiring between the driver and motor for damage, and then cycled the power.	Not possible
41h	8	EEPROM error	<ul style="list-style-type: none"> • Stored data was damaged. • Data became no longer writable or readable. 	Initialize the parameters if the OPX-2A or MEXE02 is used. If the alarm does not reset even after the power has been cycled, contact your nearest office.	
51h	9	Overheated regeneration unit	<ul style="list-style-type: none"> • Overheating of the regeneration unit was detected. • Lead wires of the thermostat output of the regeneration unit broke during operation. 	<ul style="list-style-type: none"> • The power consumption of the regeneration unit exceeds the permissible level. Review the load condition and operating conditions. • Check the connection of the regeneration unit. 	Possible
6Eh	10	External stop *1	The EXT-ERROR input turned OFF.	Check the EXT-ERROR input.	
46h	11	Initial operation inhibition *2	The 24 VDC power supply was cycled when the FWD input or REV input was ON.	Turn the FWD input and REV input OFF, and then cycle the 24 VDC power supply.	
81h	12	Network bus error	When the motor operates, the master controller for the network converter shows a disconnection status.	Check the connector or cable of the master controller.	Not possible
83h		Communication switch setting error	Transmission rate setting switch (SW4) was out-of-specification.	Check the transmission rate setting switch (SW4).	
84h		RS-485 communication error	The number of consecutive RS-485 communication errors reached the set value of the "communication error alarm" parameter.	<ul style="list-style-type: none"> • Check the connection between the master controller and driver. • Check the setting of RS-485 communication. 	Possible

*1 It generates when assigning the EXT-ERROR to the IN0 to IN6 inputs.

*2 It generates when setting the "no operation at initial alarm enable" parameter to "Enable."

Code	No. of LED blinks	Alarm type	Cause	Remedial action	Reset using the ALARM-RESET input
85h	12	RS-485 communication timeout	The time set in the "communication time out" parameter has elapsed, and yet the communication could not be established with the master controller.	Check the connection between the master controller and driver.	Possible
8Eh		Network converter error	An alarm was generated in the network converter.	Check the alarm code of the network converter.	
23h	13	Main power off	<ul style="list-style-type: none"> The main power supply was shut off while operating. Although the 24 VDC power supply has been turned on, the operation command was input while the main power supply was shut off. 	<ul style="list-style-type: none"> Check the connections between the driver and power supply. Check the power supply cable wiring. 	
2Dh	14	Main circuit output error *	The motor drive wire broke or motor power connector came off.	Check the connection between the driver and motor.	

* This alarm does not generate when the torque limiting value is set to less than 200% .

2.2 Warnings

When a warning generates, the WNG output will turn ON. The motor will continue to operate. Once the cause of the warning is removed, the WNG output will turn OFF automatically.

■ Warning list

Code	Warning type	Cause	Remedial action
30h	Overload *	The load torque of the motor exceeded the overload warning level.	<ul style="list-style-type: none"> Decrease the load. Review the operation pattern settings such as the acceleration/ deceleration time.
6Ch	Operation error	<ul style="list-style-type: none"> When moving from the test mode to other mode using the OPX-2A or MEXE02, the FWD input or REV input was turned ON. When changing the assignment of the input terminal using any of the OPX-2A, MEXE02 or RS-485 communication, the assigned terminal was ON. 	Turn the input signals OFF.
84h	RS-485 communication error	The RS-485 communication error was detected.	<ul style="list-style-type: none"> Check the connection between the master controller and driver. Check the setting of RS-485 communication.

* The detection level can be changed using the **OPX-2A**.

■ Warning records

Up to 10 generated warnings are saved in the RAM in order of the latest to oldest. Warning records saved in the RAM can be read or cleared when performing any of the following.

- Read the warning records by the monitor command via RS-485 communication.
- Clear the warning records by the maintenance command via RS-485 communication.
- Read and reset the warning records using the **OPX-2A** or **MEXE02**.

Note | You can also clear the warning records by turning off the driver power.

2.3 Communication errors

Up to 10 communication errors are saved in the RAM in order of the latest to the oldest and you can check using the **MEXE02** or via RS-485 communication.

■ Communication error list

Code	Communication error type	Cause	Remedial action
84h	RS-485 communication error	One of the following errors was detected. · Framing error · BCC error	<ul style="list-style-type: none"> • Check the connection between the master controller and driver. • Check the setting of RS-485 communication.
88h	Command not yet defined	The command requested by the master could not be executed because of being undefined.	<ul style="list-style-type: none"> • Check the setting value for the command. • Check the flame configuration.
89h	Execution disable due to user I/F communication in progress	The command requested by the master could not be executed because the OPX-2A or MEXE02 was communicating with the driver.	Wait until the processing for the OPX-2A or MEXE02 will be completed.
8Ah	Non-volatile memory processing in progress	The command could not be executed because the driver was performing the non-volatile memory processing. · Internal processing was in progress. (S-BSY is ON.) · An EEPROM error alarm was present.	<ul style="list-style-type: none"> • Wait until the internal processing will be completed. • When the EEPROM error was generated, initialize all parameters using any of the OPX-2A, MEXE02 or RS-485 communication.
8Ch	Outside setting range	The setting data requested by the master could not be executed due to outside the range.	Check the setting data.
8Dh	Command execute disable	When the command is unable to execute, it was tried to execute.	Check the driver status.

■ Communication error records

Up to 10 communication errors are saved in the RAM in order of the latest to oldest.

Communication error records saved in the RAM can be read or cleared when performing any of the following.

- Read the communication error records by the monitor command via RS-485 communication.
- Clear the communication error records by the maintenance command via RS-485 communication.
- Clear the communication error records by the status monitor of the **MEXE02**.

Note | You can also clear the communication records by turning off the driver power.

3 Troubleshooting and remedial actions

During motor operation, the motor or driver may fail to function properly due to an improper speed setting or wiring. When the motor cannot be operated correctly, refer to the contents provided in this section and take appropriate action. If the problem persists, contact your nearest Oriental Motor sales office.

Phenomenon	Possible cause	Remedial action
The motor does not operate.	The power supply is not connected correctly.	Check the connection of the power supply.
	Both the FWD input and REV input are OFF.	Turn ON either the FWD input or REV input one at a time.
	Both the FWD input and REV input are ON.	
	The ALM LED (red) is blinking.	An alarm generated due to a protective function being triggered. Refer to page 177 to reset the alarm.
	Electromagnetic brake is not released. (electromagnetic brake motor only).	Turn ON the MB-FREE input.
The motor rotates in the direction opposite to the specified direction.	The FWD input and REV input are connected wrongly or otherwise not connected correctly.	Check the connection of the FWD input and REV input. The motor rotates in the clockwise direction when the FWD input is ON, and in the counterclockwise direction when the REV input is ON.
	The combination type parallel shaft gearhead is using a gear with a gear ratio of 30, 50 or 100.	When the gear ratio of the combination type parallel shaft gearhead is 30, 50 or 100, the rotation direction of the gear output shaft is opposite the rotation direction of the motor output shaft. Accordingly, reverse the FWD input and REV input operations.
	A combination type hollow shaft flat gearhead is used.	<ul style="list-style-type: none"> With a combination type hollow shaft flat gearhead, the rotation direction of the gear output shaft is opposite the rotation direction of the motor output shaft. Accordingly, reverse the FWD input and REV input operations. Is the gearhead viewed in the correct direction? With a combination type hollow shaft flat gearhead, the rotation direction of the gearhead changes according to the direction in which the gearhead is viewed.
<ul style="list-style-type: none"> Motor operation is unstable. Motor vibration is too great. 	The motor (gearhead) output shaft is not misaligned with the load shaft.	Check the coupling condition of the motor (gearhead) output shaft and load shaft.
	Effect of noise.	Check the operation only with the motor, driver and other external equipment required for operation. If an effect of noise has been confirmed, implement the following countermeasures: <ul style="list-style-type: none"> Move the motor and driver farther away from noise generation sources. Review the wiring. Change the signal cables to a shielded type. Install ferrite cores.
The motor doesn't stop instantaneously.	The STOP-MODE input is ON.	To cause the motor to stop instantaneously, turn OFF the STOP-MODE input.
	The inertial load is large.	Reduce the load inertia or connect the accessory regeneration unit (sold separately).
The electromagnetic brake does not hold.	The MB-FREE input is ON.	Turn OFF the MB-FREE input.

Note

- Check the alarm message when the alarm generates.
- I/O signals can be monitored using the **OPX-2A**, **MEXE02** or RS-485 communication. Use to check the wiring condition of the I/O signals.

8 Appendix

This part explains accessories (sold separately) that are used in combination with the products.

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1 Accessories (sold separately)

■ Connection cable

This cable is used to extend the wiring distance between the driver and motor. Connection can be extended to a maximum of 20.4 m (66.9 ft.). Flexible connection cables are also available. You can connect up to three connection cables.

• Standard type

• Connection cable

Length [m (ft.)]	Model
1 (3.3)	CC01BLE
2 (6.6)	CC02BLE
3 (9.8)	CC03BLE
5 (16.4)	CC05BLE
7 (23.0)	CC07BLE
10 (32.8)	CC10BLE
15 (49.2)	CC15BLE
20 (65.6)	CC20BLE

• Flexible connection cable

Length [m (ft.)]	Model
1 (3.3)	CC01BLER
2 (6.6)	CC02BLER
3 (9.8)	CC03BLER
5 (16.4)	CC05BLER
7 (23.0)	CC07BLER
10 (32.8)	CC10BLER
15 (49.2)	CC15BLER
20 (65.6)	CC20BLER

• Electromagnetic brake type

• Connection cable

Length [m (ft.)]	Model
1 (3.3)	CC01BLEM
2 (6.6)	CC02BLEM
3 (9.8)	CC03BLEM
5 (16.4)	CC05BLEM
7 (23.0)	CC07BLEM
10 (32.8)	CC10BLEM
15 (49.2)	CC15BLEM
20 (65.6)	CC20BLEM

• Flexible connection cable

Length [m (ft.)]	Model
1 (3.3)	CC01BLEM
2 (6.6)	CC02BLEM
3 (9.8)	CC03BLEM
5 (16.4)	CC05BLEM
7 (23.0)	CC07BLEM
10 (32.8)	CC10BLEM
15 (49.2)	CC15BLEM
20 (65.6)	CC20BLEM

■ Data setter

The data setter lets you set data and parameters for your **BLE** Series FLEX RS-485 communication type with ease and also functions as a monitor.

Model: **OPX-2A**

■ Data setting software

The data setting software lets you set parameters for your **BLE** Series FLEX RS-485 communication type and monitor its operating condition using a PC.

The software comes with a PC interface cable [5 m (16.4 ft.)]. The cable is connected to the USB port on the PC.

Model: **MEXE02**

■ RS-485 communication cable

You can link drivers using this cable connected to the RS-485 communication connectors (CN7, CN8).

Model: **CC002-RS4** [0.25 m (0.8 ft.)]

■ DIN rail mounting plate

When mounting the driver to a DIN rail, use a DIN rail mounting plate.

Use a DIN rail 35 mm (1.38 in.) wide.

Model: **PADP03**

■ Regeneration unit

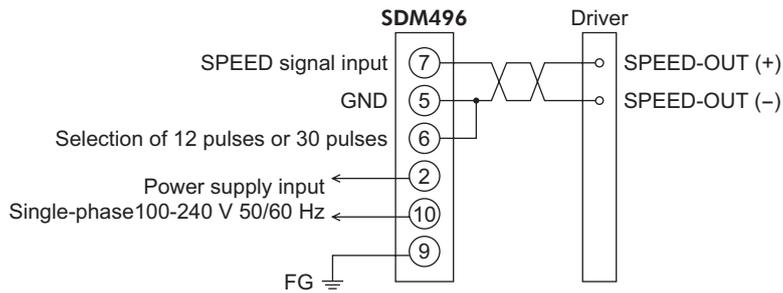
If vertical drive (gravitational operation) such as elevator applications is performed or if sudden start-stop operation of a large inertial load is repeated frequently, connect the regeneration unit **EPRC-400P**.

Model: **EPRC-400P**

■ Digital speed indicator

This device displays the speed of the motor output shaft and reduced speed of the gearhead output shaft.

Model: **SDM496**



- Note**
- The **SDM496** does not conform to safety standards. If the **SDM496** is combined with a **BLE** Series product, the **BLE** Series product does not conform to safety standards, either.
 - The **SDM496** cannot be used with the source logic.

2 Related products (sold separately)

■ Network converter

NETC01-CC; supporting CC-Link communication

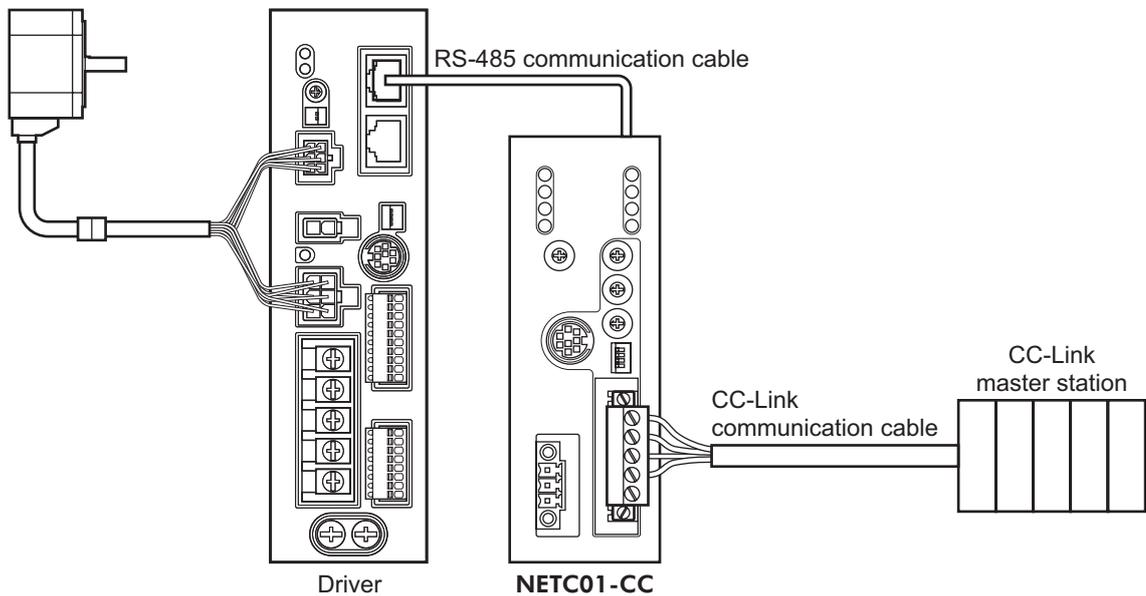
NETC01-M2; supporting MECHATROLINK-Ⅱ communication

NETC01-M3; supporting MECHATROLINK-Ⅲ communication

When the **BLE** Series FLEX RS-485 communication type is used in a CC-Link system or MECHATROLINK system while connecting the driver via the network converter, the converted data from the each communication protocol to the RS-485 communication protocol can be sent to the driver.

Alarms and other data output from the driver, which normally conform to the RS-485 communication protocol, can also be converted to each communication protocol and sent to the master station accordingly.

Example: Connecting to the network converter **NETC01-CC**



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ORIENTAL MOTOR U.S.A. CORP.
Technical Support Tel:(800)468-3982
8:30 A.M. to 5:00 P.M., P.S.T. (M-F)
7:30 A.M. to 5:00 P.M., C.S.T. (M-F)
E-mail: techsupport@orientalmotor.com
www.orientalmotor.com

ORIENTAL MOTOR (EUROPA) GmbH
Headquarters and Düsseldorf Office
Tel:0211-52067-00 Fax:0211-52067-099
Munich Office
Tel:089-3181225-00 Fax:089-3181225-25
Hamburg Office
Tel:040-76910443 Fax:040-76910445

ORIENTAL MOTOR (UK) LTD.
Tel:01256-347090 Fax:01256-347099

ORIENTAL MOTOR (FRANCE) SARL
Tel:01 47 86 97 50 Fax:01 47 82 45 16

ORIENTAL MOTOR ITALIA s.r.l.
Tel:02-93906346 Fax:02-93906348

SHANGHAI ORIENTAL MOTOR CO.,LTD.
Tel:400-820-6516 Fax:021-6278-0269

TAIWAN ORIENTAL MOTOR CO.,LTD.
Tel:(02)8228-0707 Fax:(02)8228-0708

SINGAPORE ORIENTAL MOTOR PTE LTD
Tel:+65-6745-7344 Fax:+65-6745-9405

ORIENTAL MOTOR (MALAYSIA) SDN. BHD.
Tel:(03)22875778 Fax:(03)22875528

ORIENTAL MOTOR (THAILAND) CO.,LTD.
Tel:+66-2-251-1871 Fax:+66-2-251-1872

INA ORIENTAL MOTOR CO.,LTD.
KOREA
Tel:080-777-2042 Fax:02-2026-5495

ORIENTAL MOTOR CO.,LTD.
Headquarters Tokyo, Japan
Tel:03-6744-0361 Fax:03-5826-2576