

Brushless Motor and Driver Package

BLV Series

Standard Type, Electromagnetic Brake Type

USER MANUAL (RS-485 Communication Mode)

CE

Thank you for purchasing an Oriental Motor product.

This manual describes product handling procedures and safety precautions.

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

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1 Introduction

■ Before use

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the section "2 Safety precautions" on p.3.

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.

■ Operating Manuals for the BLV Series

Operating manuals for the **BLV** Series are listed below. Read the manuals carefully before using your **BLV** Series unit.

- **BLV Series** OPERATING MANUAL (Supplied with the product.)

This manual explains the motor and driver functions as well as installation method, and others.

- **BLV Series** USER MANUAL Basic Function

This manual explains the motor and driver functions, how to install/connect and troubleshooting, among others.

Also, it explains operations using an accessory data setter **OPX-2A**.

- **BLV Series** USER MANUAL RS-485 Communication Mode (This document)



This manual explains how to control the motor via RS-485 communication using a programmable controller.

■ Hazardous substances

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

2 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 safe use of the product.

Warning

General

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Failure to do so may result in fire, electric shock or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire, electric shock, injury or damage to equipment.
- Do not use a non-electromagnetic brake type motor in a vertical application. If the driver 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 motor with electromagnetic brake as a safety brake. It is intended to hold the movable parts and motor position. This caution is to avoid personal injury or damage to the equipment.
- When the driver's protection function is triggered, first remove the cause and then clear the protection function. Continuing the operation without removing the cause of the problem may cause malfunction of the motor and driver, leading to injury or damage to equipment.

Installation

- Install the motor (gearhead) and driver in an enclosure in order to prevent injury.

Connection

- Keep the driver's input-power voltage within the specified range to avoid fire.
- For the power supply, use a DC power supply with reinforced insulation on its primary and secondary sides. Failure to do so may cause electric shock.
- Connect the cables securely according to the wiring diagram in order to prevent fire.
- Do not forcibly bend, pull or pinch the cable. Doing so may cause fire.
- Do not machine or modify the motor cable or extension 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 connector. Failure to do so may result in fire or equipment damage.

Operation

- Use a specified motor (gearhead) and driver combination. Failure to do so may result in fire or equipment damage.

Maintenance/inspection

- Always turn off the power before performing maintenance/inspection. Failure to do so may result in injury.
- Do not touch the motor or driver when measuring insulation resistance or performing a dielectric strength test. Accidental contact may result in electric shock.
- Regularly check the openings in the driver for accumulated dust. Accumulated dust may cause fire.

Repair, disassembly and modification

- Do not disassemble or modify the motor (gearhead) and driver. This may cause electric shock or injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.



General

- Do not use the motor (gearhead) and driver beyond its specifications, or injury or damage to equipment may result.
- Keep your fingers and objects out of the openings in the driver, or fire or injury may result.
- Do not touch the motor (gearhead) and driver during operation or immediately after stopping. The surface is hot and may cause a skin burn(s).

Installation

- To prevent the risk of damage to equipment, leave nothing around the motor and driver that would obstruct ventilation.
- Do not hold the motor (gearhead) output shaft or cable. This may cause injury.
- Do not touch the motor output shaft (key groove or pinion) with bare hands. Doing so may result in injury.
- When assembling the motor 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 affix 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 over the rotating parts (output shaft) of the motor (gearhead) to prevent 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 (gearhead) output shaft. Inappropriate installation may result in injury.

Operation

- Do not shut off the negative side of the power supply during operation. Also, make sure that the wiring for the power supply does not disconnect. Doing so may cause damage to equipment.
- Provide an emergency stop device or emergency stop circuit external to the equipment so that the entire equipment will operate safely in the event of a system failure or malfunction. Failure to do so may result in injury.
- Immediately when trouble has occurred, stop operation and turn off the driver power. Failure to do so may result in fire, electrical shock or injury.
- Do not touch the rotating part (output shaft) during operation. This may cause injury.
- The motor surface temperature may exceed 70 °C even under normal operating conditions. If the operator is allowed to approach the running motor, attach a warning label as shown below in a conspicuous position. Failure to do so may result in skin burn(s).



Warning label

Disposal

- To dispose of the motor (gearhead) and driver, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste.

3 Precautions for use

This section covers limitations and requirements the user should consider when using the product.

- **Regeneration energy**

When using the motor in operation such as vertical drive (gravitational operation) or sudden starting/stopping of a inertial load, regeneration energy may generate. Since the driver has no function to consume regeneration energy, if the output capacity or overvoltage allowance of the DC power supply is small, the protective function for the power supply or driver may activate and the motor may stop. When performing these operations, use a DC power supply or battery that has a large output capacity or overvoltage allowance.

Also, use an electromagnetic brake motor not to drop the moving part in vertical drive (gravitational operation).

If protective function for the power supply or driver is activated, contact your nearest Oriental Motor sales office.

- **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 withstand voltage test separately on the motor and the driver.**

Conducting the insulation resistance measurement or withstand voltage test with the motor and driver connected may result in injury or damage to equipment.

- **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 customer's equipment or products.

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

If you are 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 electrical noise**

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 [USER MANUAL Basic Function](#) for the noise elimination measures.

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

The driver's main power supply input terminal (CN1), I/O signal connector (CN3), communication connector (CN5/CN6/CN7) and control power supply input terminal (TB1) are not electrically insulated.

When grounding the positive terminal of the power supply, do not connect any equipment (PC, etc.) whose negative terminal is grounded. Doing so may cause the driver and these equipment to short, damaging both.

- **The driver uses semiconductor elements. Handle the driver with care.**

The driver uses parts that are sensitive to electrostatic charge. Before touching the driver, turn off the power to prevent electrostatic charge from generating. If an electrostatic charge is impressed on the driver, the driver may be damaged.

- **Use an extension cable (supplied) when extending the wiring distance between the motor and driver**

4 Method of control via Modbus protocol

The following explains how to implement control from a programmable controller using the Modbus protocol via RS-485 communication.

The Modbus protocol is simple and its specification is open to public, so this protocol is used widely in industrial applications.

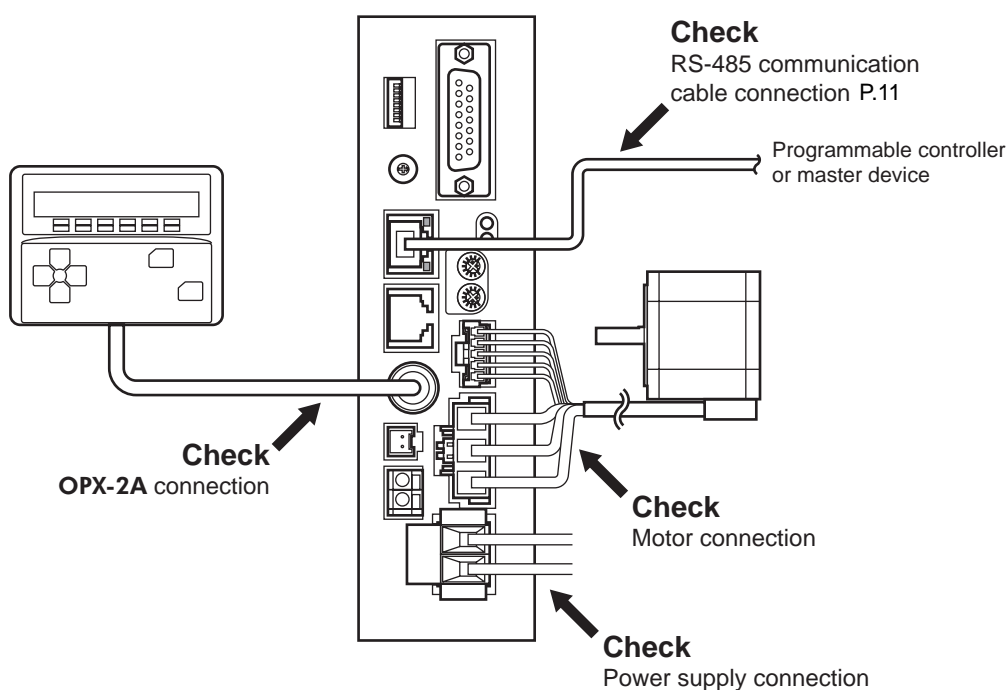
Modbus communication is based on the single-master/multiple-slave method. Only the master can issue a query. Each slave executes the requested process and returns a response message.

4.1 Guidance

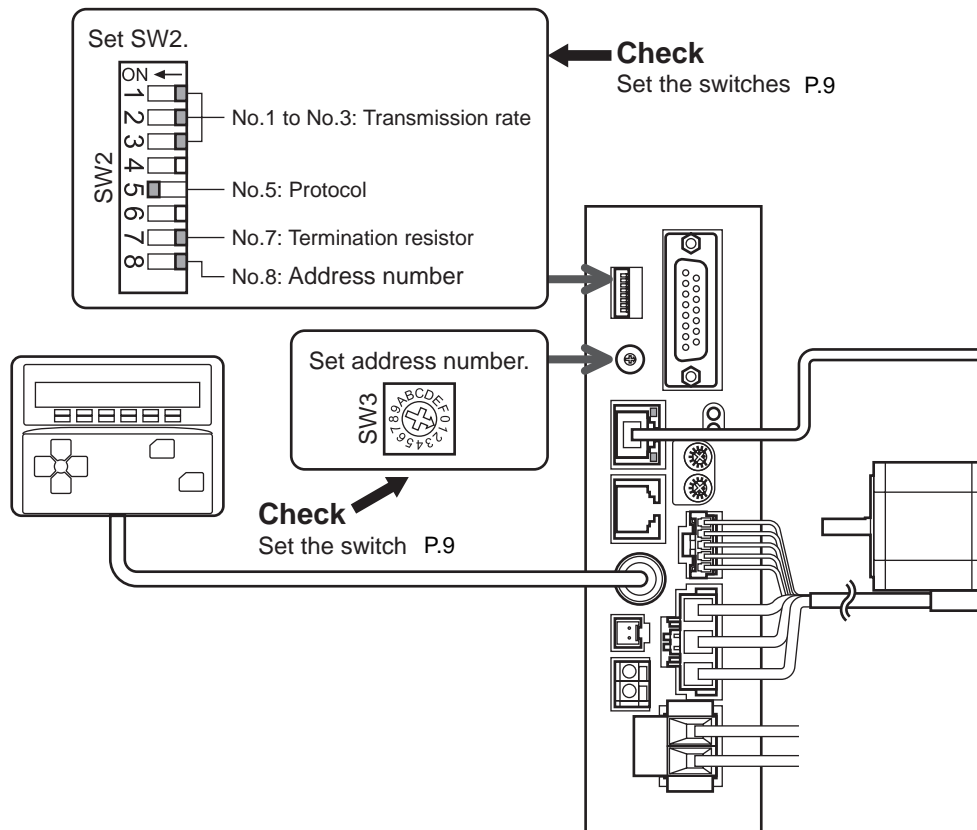
If you are new to the **BLV** Series driver, read this section to understand the operating methods along with the operation flow.

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

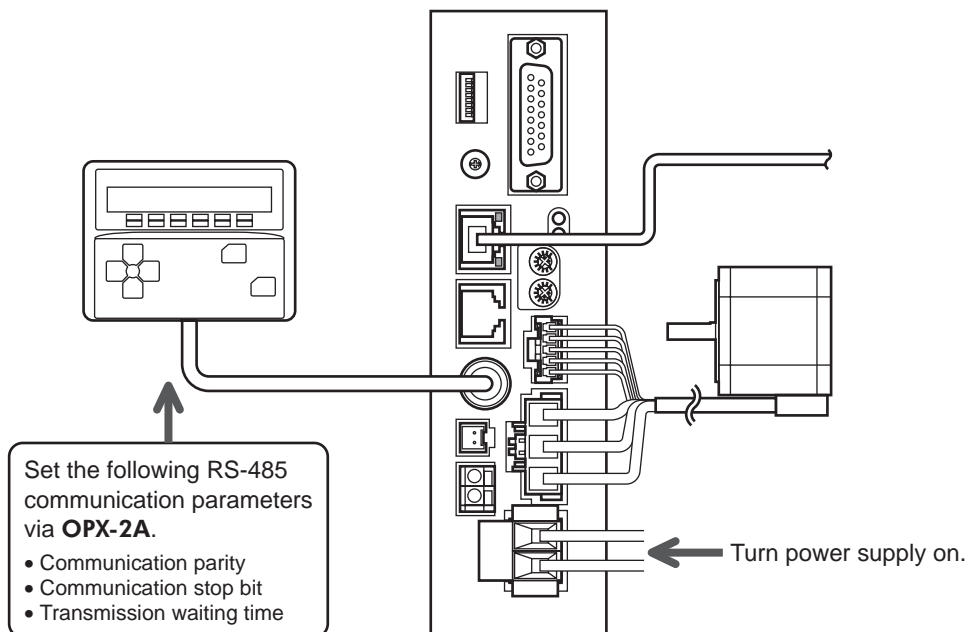
STEP 1 Check the installation and connection



STEP 2 Set the switches



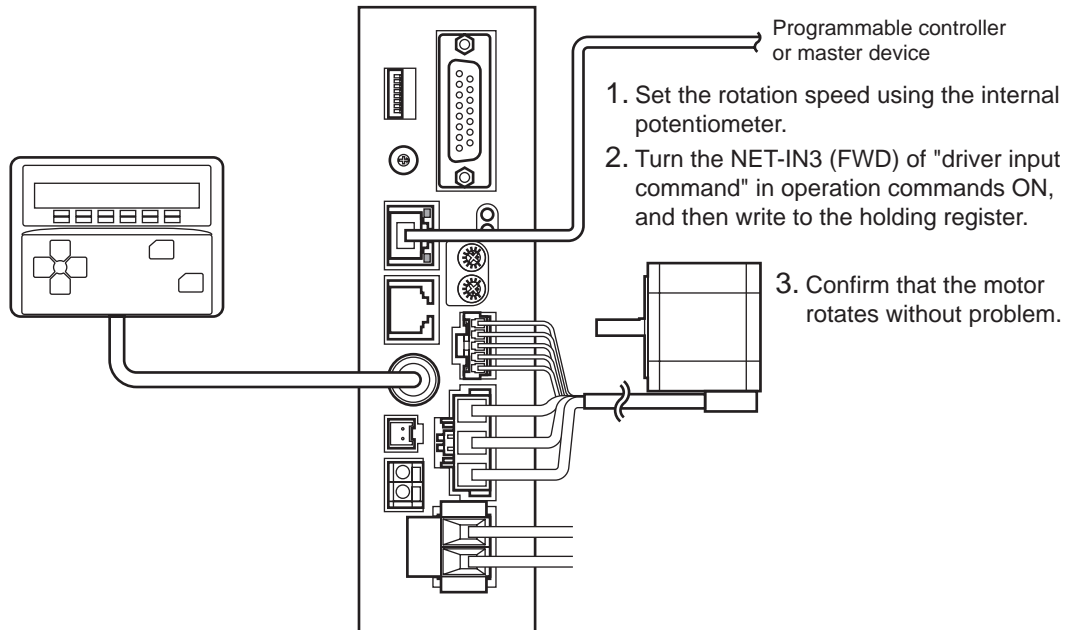
STEP 3 Turn on the power and set the parameters



STEP 4 Cycle the power

Parameters for "communication parity", "communication stop bit" and "transmission waiting time" will be enabled after the power is cycled.

STEP 5 Operate the motor



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?

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

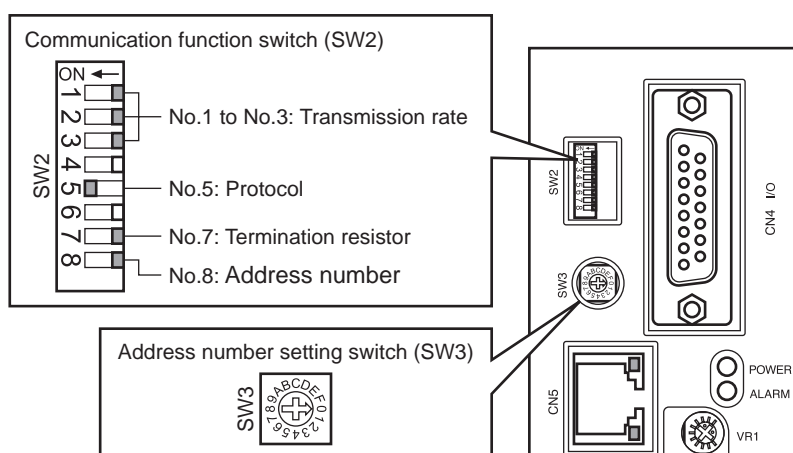
4.2 Communication specifications

Electrical characteristics	In conformance with EIA-485 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 programmable controller (master device).

4.3 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.
- Do not set No.4 and No.6 of the communication function switch (SW2) to ON.



■ Protocol

Set the No.5 of the communication function switch (SW2) to ON. The Modbus protocol is selected.

Factory setting OFF

■ Address number (Slave address)

Set the address number (slave address) using the address setting switch (SW3) and No.8 of communication function switch (SW2). 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 SW3: 0, SW2-No.8: OFF

Address number (Slave address) list

SW3	SW2-No.8: OFF	SW3	SW2-No.8: OFF	SW3	SW2-No.8: ON	SW3	SW2-No.8: ON
0	Broadcast	8	8	0	16	8	24
1	1	9	9	1	17	9	25
2	2	A	10	2	18	A	26
3	3	B	11	3	19	B	27
4	4	C	12	4	20	C	28
5	5	D	13	5	21	D	29
6	6	E	14	6	22	E	30
7	7	F	15	7	23	F	31

■ Transmission rate

Set the transmission rate using Nos. 1 to 3 of the communication function switch (SW2) to.

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

Factory setting All OFF (9600 bps)

SW2-No.3	SW2-No.2	SW2-No.1	Transmission rate (bps)
OFF	OFF	OFF	9600
OFF	OFF	ON	19200
OFF	ON	OFF	38400
OFF	ON	ON	57600
ON	OFF	OFF	115,200

Note Do not set other combinations except the above table.

■ Termination resistor

Use a termination resistor for the driver located farthest away (positioned at the end) from the programmable controller (master device). Turn No.7 of communication function switch (SW2) ON to set the termination resistor for RS-485 communication (120 Ω).

Factory setting OFF (Termination resistor disabled)

SW2-No.7	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

4.4 Connecting the control power supply

If the driver is connected to the control power supply, it can communicate with the master device without connecting to the main power supply. Using the communication function only, the operation data and parameters can be set, and also the alarm records can be checked.

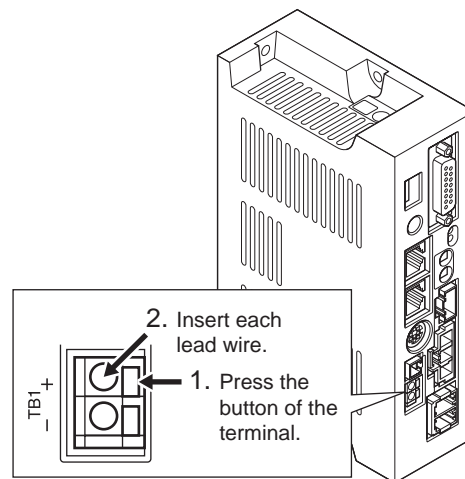
Note When the driver is connected to the control power supply while it is not connected to the main power supply, the undervoltage alarm will generate but the communication operation can still be performed.

■ Control power supply specification

Model	Input power supply voltage	Current capacity
BLV620	24 VDC \pm 10%	300 mA or more
BLV640	48 VDC \pm 10%	

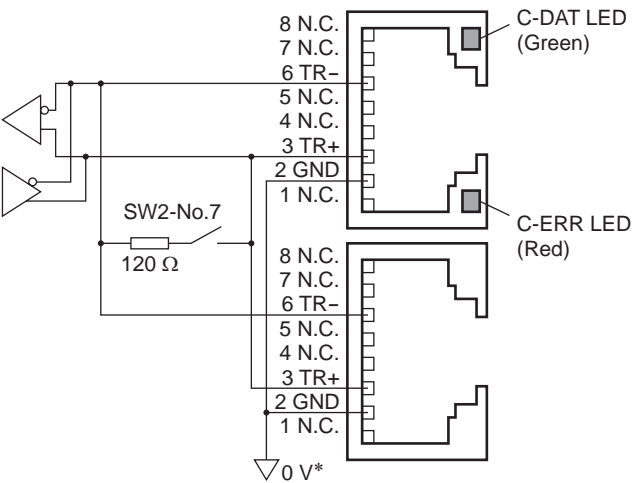
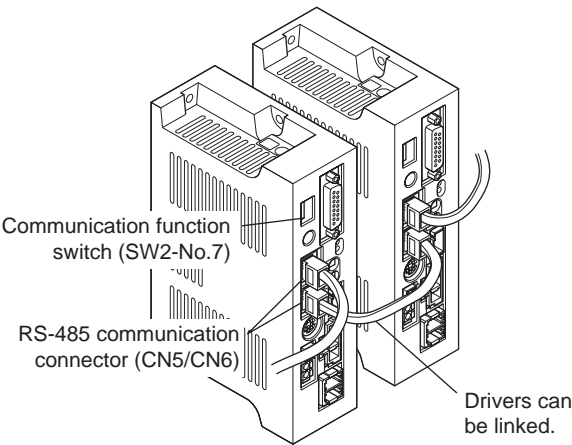
■ Applicable lead wire

- Length of the lead wire which can be peeled:
11 mm (0.43 in.)
- Applicable lead wire: AWG24 to 16 (0.2 to 1.25 mm²)



4.5 Connecting the RS-485 communication cable

Connect RS-485 communication cable to CN5 or CN6 on the driver.
You can use the vacant connector to connect a different driver. Use a commercial LAN cable to link drivers.



* The GND line is used in common with main power supply input terminal (CN1) and control power supply input terminal (TB1) [not insulated].

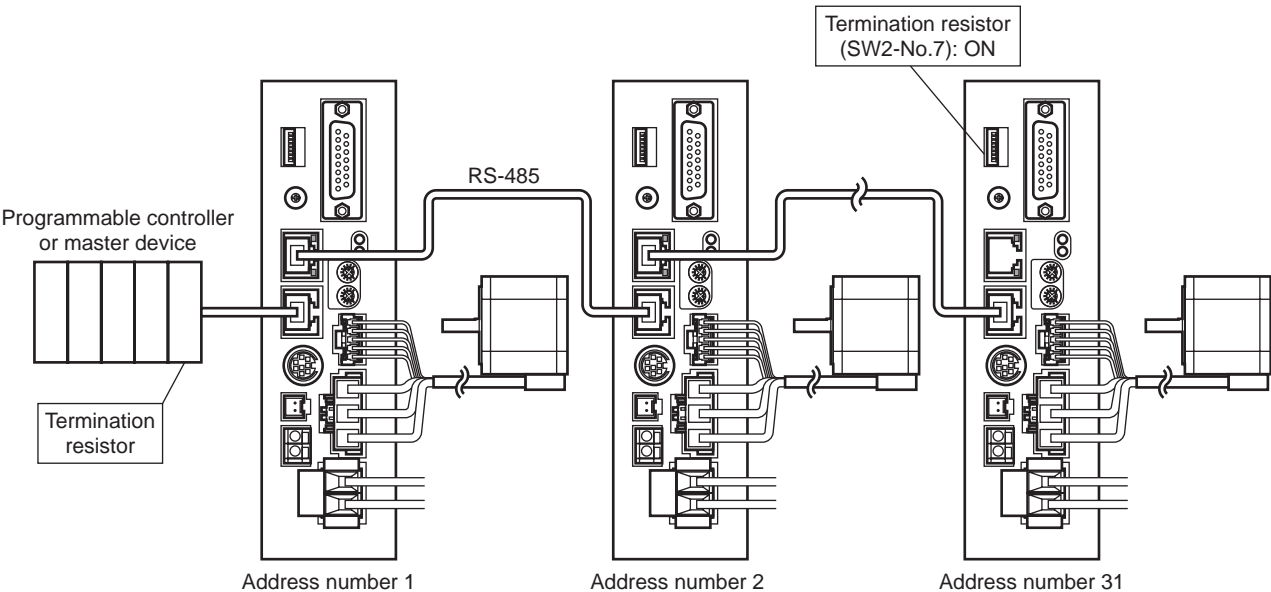
• CN5/CN6 pin assignments

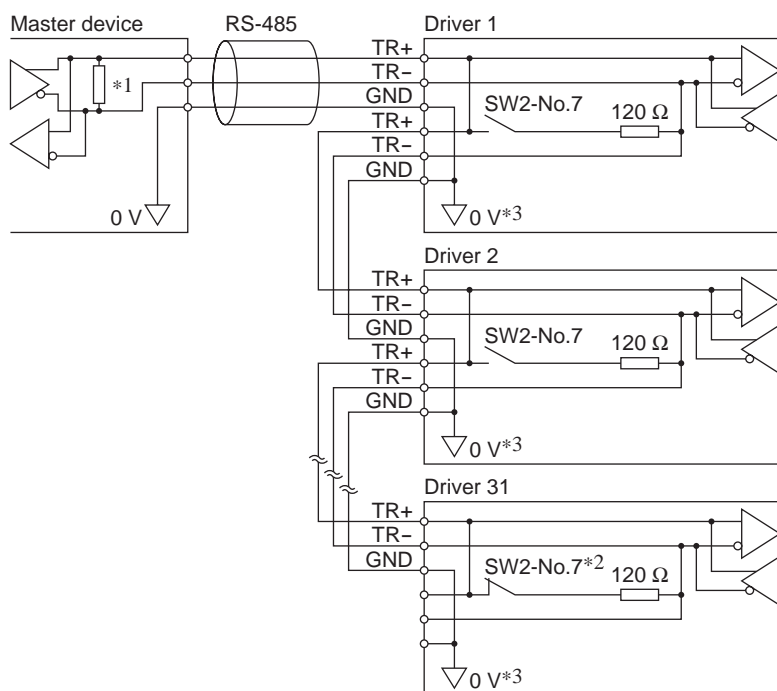
Pin No.	Signal name	Description
1	N.C.	Not used
2	GND	GND
3	TR+	RS-485 communication signal (+)
4	N.C.	Not used
5	N.C.	Not used
6	TR-	RS-485 communication signal (-)
7	N.C.	Not used
8	N.C.	Not used

• LED

Name	Description
C-DAT LED (Green)	This LED will lit steadily when the driver is communicating with the master station properly via RS-485 communication.
C-ERR LED (Red)	This LED will lit when a RS-485 communication error occurs with the master station.

■ Connection example





- *1 Termination resistor 120 Ω
- *2 Turn the termination resistor (SW2-No.7) to ON.
- *3 The GND line is used in common with main power supply input terminal (CN1) and control power supply input terminal (TB1) [not insulated].

4.6 Setting the RS-485 communication

Set parameters required for RS-485 communication first.

- Parameters set with the **OPX-2A**

Set the following parameters using the **OPX-2A** since they cannot be set via RS-485 communication.

Parameter name	Setting range	Initial value	Description
Communication parity	0: None 1: Even number 2: Odd number	1	Sets the parity for RS-485 communication.
Communication stop bit	0: 1 bit 1: 2 bits	0	Sets the stop bit for RS-485 communication.
Transmission waiting time	0 to 10000 ($\times 0.1$ ms)	100	Sets the transmission waiting time for RS-485 communication.

- Parameters set with the **OPX-2A** or via RS-485 communication

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

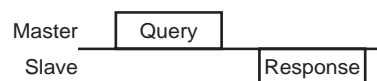
Parameter name	Setting range	Initial value	Description
Communication timeout	0: Not monitored 0 to 10000 ms	0	Sets the condition in which a communication timeout occurs in RS-485 communication.
Communication error alarm	1 to 10 times	3	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.

4.7 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.

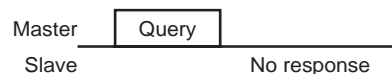
- Unicast mode

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

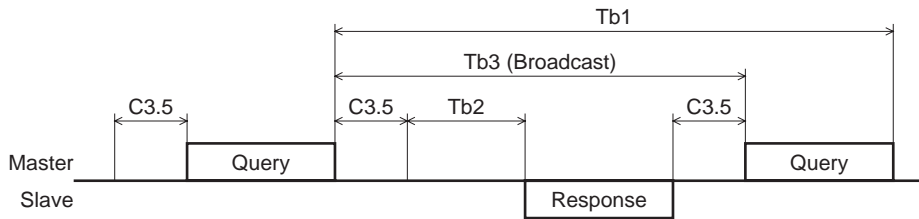


- Broadcast mode

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



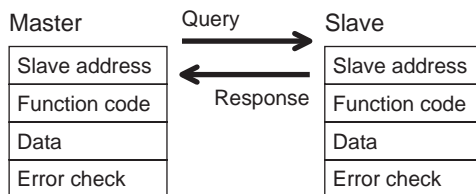
4.8 Communication timing



Character	Name	Description
Tb1	Communication timeout	The interval of the received query is monitored. If no query could be received after the time set in the "communication timeout" parameter, a communication timeout alarm generates. Initial setting: Not monitored
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. The transmission waiting time is set by the "transmission waiting time" parameter. Initial setting: 10 ms 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. If this waiting time is less than 3.5 characters long, the driver cannot respond. The silent interval should be 1.75 ms when the transmission rate is 19200 bps or more.

4.9 Message

The message format is shown below.



■ Query

The query message structure is shown below.

Slave address	Function code	Data	Error check
8 bits	8 bits	Nx8 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 **BLV** Series driver are as follows.

Function code	Description	Broadcast
03h	Read from a holding register(s).	Impossible
06h	Write to a holding register.	Possible
08h	Perform diagnosis.	Impossible
10h	Write to multiple holding registers.	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.

■ 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 query message structure.

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

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 interface communication in progress (89h) Downloading, initialization or teaching operation is in progress using the OPX-2A • NV memory processing in progress (8Ah) • Internal processing is in progress. (S-BSY is ON.) • An EEPROM error alarm was present. • Outside the parameter setting range (8Ch) The written value is outside the setting range • Command execute disable (8Dh)

Example of exception response

Master		Slave	
Query		Response	
Slave address	01h	Slave address	01h
Function code	06h	Function code	86h
Data	Register address (upper)	Data	Exception code
	02h		04h
	Register address (lower)	Error check (lower)	02h
	1Eh	Error check (upper)	61h
	Value written (upper)		
	FFh		
	Value written (lower)		
	FFh		
Error check (lower)	E9h		
Error check (upper)	C4h		

4.10 Function code

■ Reading from a holding register(s) (03h)

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 to start reading from
	Register address (lower)	80h	
	Number of registers (upper)	00h	Number of registers to be read from the starting register address (4 registers=0004h)
	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	Same as query
Data	Number of data bytes	08h	Twice the number of registers in the query
	Value read from register address (upper)	00h	Value read from register address 0480h
	Value read from register address (lower)	00h	
	Value read from register address+1 (upper)	00h	Value read from register address 0481h
	Value read from register address+1 (lower)	64h	
	Value read from register address+2 (upper)	00h	Value read from register address 0482h
	Value read from register address+2 (lower)	00h	
	Value read from register address+3 (upper)	0Fh	Value read from register address 0483h
	Value read from register address+3 (lower)	A0h	
Error check (lower)		E1h	Calculation result of CRC-16
Error check (upper)		97h	

■ Writing to a holding register (06h)

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	Written value	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	
	Written value (upper)	00h	Written value for the register address
	Written value (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	Same as query
Data	Register address (upper)	10h	Same as query
	Register address (lower)	ABh	
	Written value (upper)	00h	Same as query
	Written value (lower)	32h	
Error check (lower)		7Dh	Calculation result of CRC-16
Error check (upper)		0Ch	

■ Diagnosis (08h)

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 address 3.

• 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	Same as query
Data	Sub-function code (upper)	00h	Same as query
	Sub-function code (lower)	00h	
	Data value (upper)	12h	Same as query
	Data value (lower)	34h	
Error check (lower)		ECh	Same as query
Error check (upper)		9Eh	

■ Writing to multiple holding registers (10h)

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 Nos.0 to 2 as part of operation data at slave address 4.

Description	Register address	Written value	Corresponding decimal
Acceleration time No.0 (upper)	0600h	0000h	2
Acceleration time No.0 (lower)	0601h	0002h	
Acceleration time No.1 (upper)	0602h	0000h	50
Acceleration time No.1 (lower)	0603h	0032h	
Acceleration time No.2 (upper)	0604h	0000h	150
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 to start writing from
	Register address (lower)	00h	
	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 query (6 registers × 2 = 12 registers: 0Ch)
	Written value for register address (upper)	00h	Written value for register address 0600h
	Written value for register address (lower)	00h	
	Written value for register address+1 (upper)	00h	Written value for register address 0601h
	Written value for register address+1 (lower)	02h	
	Written value for register address+2 (upper)	00h	Written value for register address 0602h
	Written value for register address+2 (lower)	00h	
	Written value for register address+3 (upper)	00h	Written value for register address 0603h
	Written value for register address+3 (lower)	32h	
	Written value for register address+4 (upper)	00h	Written value for register address 0604h
	Written value for register address+4 (lower)	00h	
	Written value for register address+5 (upper)	00h	Written value for register address 0605h
	Written value for 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	Same as query
Data	Register address (upper)	06h	Same as query
	Register address (lower)	00h	
	Number of registers (upper)	00h	Same as query
	Number of registers (lower)	06h	
Error check (lower)		40h	Calculation result of CRC-16
Error check (upper)		D6h	

4.11 Register address list

All data used by the driver is 32-bit wide. Since the register for the Modbus protocol is 16-bit wide, 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.

■ Operation commands

Commands related to motor operation. Operation commands are not saved in the NV memory.

Register address		READ/WRITE	Name	Description
Dec	Hex			
48	0030h	R/W	Group (upper)	Sets the address number for the group send.
49	0031h		Group (lower)	
124	007Ch	R/W	Driver input command (upper)	Sets the input command to the driver.
125	007Dh		Driver input command (lower)	
126	007Eh	R	Driver output command (upper)	Sets the output status of the driver.
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 p.33 for group details.

- Driver input command (007Ch, 007Dh)

These are the driver input signals that can be accessed via RS-485 communication.
Assignments of the remote I/O (NET-IN0 to 15) are as follows.

(): Initial value (2-wire input mode)

Address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
007Ch	Upper	–	–	–	–	–	–	–	–
	Lower	–	–	–	–	–	–	–	–
007Dh	Upper	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)
	Lower	NET-IN7 (MB-FREE)	NET-IN6 (Not used)	NET-IN5 (STOP-MODE)*	NET-IN4 (REV)*	NET-IN3 (FWD)*	NET-IN2 (M2)	NET-IN1 (M1)	NET-IN0 (M0)

* When the "3-wire input mode" is set by the "operation input mode selection" parameter, the following signals are applied.
FWD → START/STOP, REV → RUN/BRAKE, STOP-MODE → FWD/REV

Input signals shown below can be assigned to the NET-IN0 to NET-IN15 of the remote I/O by setting parameters.
For details on parameter, refer to "Parameter R/W commands [I/O function (Remote I/O)]" on p.31.

Signal name	Function	Setting range
Not used	Set when the input terminal is not used.	–
FWD	[2-wire input mode] The motor rotates in the FWD direction when setting the bit of the FWD input to "1." The motor stops when setting to "0." The motor rotates in the REV direction when setting the bit of the REV input to "1." The motor stops when setting to "0." Select how the motor should stop with the bit of the STOP-MODE input.	0: Stop 1: Rotate to FWD direction
REV		0: Stop 1: Rotate to REV direction
STOP-MODE		0: Instantaneous stop 1: Deceleration stop
START/STOP	[3-wire input mode] The motor rotates when setting the bit of the START/STOP input and RUN/BRAKE input to "1." The motor decelerates and stops when setting the bit of the START/STOP input to "0," while the motor will stop instantaneously when setting the bit of the RUN/BRAKE input to "0." Select the motor rotation direction with the bit of the FWD/REV input.	0: Deceleration stop 1: Operation
RUN/BRAKE		0: Instantaneous stop 1: Operation
FWD/REV		0: FWD direction 1: REV direction
MB-FREE	Select how the electromagnetic brake would operate when the motor stops.	0: Lock when it stops 1: Release when it stops
HMI	Release the function limitation of the OPX-2A .	0: Function limitation 1: Function limitation release
M0 to M2	Select the operation data No. using these three bits.	0 to 7: Operation data No.

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 same input signal is assigned to both remote I/O and direct I/O (X0 to X5), the function will be executed if any of the terminals becomes active.
- If the HMI input is not assigned to the input terminal, the HMI input will always become "1" (function limitation release). If the HMI input is assigned to both remote I/O and direct I/O (X0 to X5), the function limitation will be released when both of them become "1."

Driver output command (007Eh, 007Fh)

These are the driver output signals that can be received via RS-485 communication.
Assignments of the remote I/O (NET-OUT0 to 15) are as follows.

(): Initial value (2-wire input mode)

Address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
007Eh	Upper	–	–	–	–	–	–	–	–
	Lower	–	–	–	–	–	–	–	–
007Fh	Upper	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)
	Lower	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)

* When the "3-wire input mode" is set by the "operation input mode selection" parameter, the following signals are applied.
FWD → START/STOP, REV → RUN/BRAKE, STOP-MODE → FWD/REV

Output signals shown below can be assigned to the output terminals NET-OUT0 to NET-OUT15 of the remote I/O by setting parameters. For details on parameter, refer to “Parameter R/W commands [I/O function (Remote I/O)]” on p.31.

Signal name	Function		Setting range
Not used	Set when the output terminal is not used.		—
FWD_R	2-wire input mode	Output in response to the FWD.	0: FWD=OFF 1: FWD=ON
REV_R		Output in response to the REV.	0: REV=OFF 1: REV=ON
STOP-MODE_R		Output in response to the STOP-MODE.	0: STOP-MODE=OFF 1: STOP-MODE=ON
START/STOP_R	3-wire input mode	Output in response to the START/STOP.	0: START/STOP=OFF 1: START/STOP=ON
RUN/BRAKE_R		Output in response to the RUN/BRAKE.	0: RUN/BRAKE=OFF 1: RUN/BRAKE=ON
FWD/REV_R		Output in response to the FWD/REV.	0: FWD/REV=OFF 1: FWD/REV=ON
MB-FREE_R	Output in response to the MB-FREE.		0: MB-FREE=OFF 1: MB-FREE=ON
M0_R	Output in response to the M0.		0: M0=OFF 1: M0=ON
M1_R	Output in response to the M1.		0: M1=OFF 1: M1=ON
M2_R	Output in response to the M2.		0: M2=OFF 1: M2=ON
ALARM-OUT1	Output the alarm of the BLV .		0: Normal operation 1: Alarm present
WNG	Output the warning of the BLV .		0: Normal operation 1: Warning present
MOVE	Output when the motor operates.		0: Motor standstill 1: Motor in operation
TLC	Output when the motor output torque reaches the limit value.		0: Within the torque limiting value 1: Outside the torque limiting value
VA	Output when the speed difference between the set rotation speed and actual motor rotation speed becomes equal to or less than the value set by the rotation speed attainment band parameter.		0: Within the speed attainment band 1: Outside the speed attainment band
S-BSY	Output when the BLV is in internal processing status.		0: Internal processing not in progress 1: Internal processing in progress
ALARM-OUT2	Output when the overload warning detection level is exceeded.		0: Normal operation 1: In overload operation
MPS	Output the power-on status of the main power supply.		0: Main power-OFF 1: Main power-ON

■ Maintenance commands

These commands are used to reset alarms and warnings. They are also used to execute the batch processing for the NV memory. All commands can be read and written (READ/WRITE). Executes 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 NV memory, to their defaults.	
399	018Fh	All data initialization (lower) *		
400	0190h	Batch NV memory read (upper)	Reads the parameters saved in the NV 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 NV memory. The NV memory can be rewritten approx. 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**.

Note

Before executing all data initialization, be sure to turn the X0/X1 terminals of the direct I/O and NET-IN3/NET-IN4 of the remote I/O to OFF. The motor may suddenly rotate after initialization unless these signals are turned OFF.

• Configuration (018Ch)

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 not the test mode or copy mode.

Shows the driver status before and after executing the configuration.

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

Note

The correct monitor value may not return even when the monitor is executed via **OPX-2A** or RS-485 communication while executing the configuration.

■ Monitor commands

Monitor the operation speed, alarm and warning records, etc. All commands can be read (READ).

Register address		Name	Description	Setting 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 1 to 10.	
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.	00h to FFh
151	0097h	Present warning (lower)		
152	0098h	Warning record 1 (upper)	Monitors the warning records 1 to 10.	
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)		
160	00A0h	Warning record 5 (upper)		
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)		

Register address		Name	Description	Setting range
Dec	Hex			
174	00AEh	Communication error code record 1 (upper)	Monitors the communication error records 1 to 10 that have occurred in the past.	00h to FFh
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)		
196	00C4h	Present selected data No. (upper)	Monitors the operation data No. currently selected.	0 to 7
197	00C5h	Present selected data No. (lower)		
200	00C8h	Command speed (upper)	Monitors the current 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
207	00CFh	Feedback speed (lower)		
212	00D4h	Direct I/O and electromagnetic brake status (upper)	Monitors the each direct I/O signal (X0 to X5, Y0, Y1) and electromagnetic brake status.	See next table.
213	00D5h	Direct I/O and electromagnetic brake status (lower)		

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

Register address (Hex)		bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
00D4h	Upper	-	-	-	-	-	-	-	MB
	Lower	-	-	-	-	-	-	Y1	Y0
00D5h	Upper	-	-	-	-	-	-	-	-
	Lower	-	-	X5	X4	X3	X2	X1	X0

■ Parameter R/W commands [Operation data]

Write or read parameters. All commands can be read and written (READ/WRITE).

For details on parameter, refer to USER MANUAL Basic Function.

Register address		Name	Setting range	Setting unit	Initial value	Effective *
Dec	Hex					
1152	0480h	Rotation speed No.0 (upper)	0 r/min, and 80 to 4000 r/min	1	0	
1153	0481h	Rotation speed No.0 (lower)				
1154	0482h	Rotation speed No.1 (upper)				
1155	0483h	Rotation speed No.1 (lower)				
1156	0484h	Rotation speed No.2 (upper)				
1157	0485h	Rotation speed No.2 (lower)				
1158	0486h	Rotation speed No.3 (upper)				
1159	0487h	Rotation speed No.3 (lower)				
1160	0488h	Rotation speed No.4 (upper)				
1161	0489h	Rotation speed No.4 (lower)				
1162	048Ah	Rotation speed No.5 (upper)				
1163	048Bh	Rotation speed No.5 (lower)				
1164	048Ch	Rotation speed No.6 (upper)				
1165	048Dh	Rotation speed No.6 (lower)				
1166	048Eh	Rotation speed No.7 (upper)				
1167	048Fh	Rotation speed No.7 (lower)				
1536	0600h	Acceleration time No.0 (upper)	2 to 150 (1=0.1 s)	0.1	5	A
1537	0601h	Acceleration time No.0 (lower)				
1538	0602h	Acceleration time No.1 (upper)				
1539	0603h	Acceleration time No.1 (lower)				
1540	0604h	Acceleration time No.2 (upper)				
1541	0605h	Acceleration time No.2 (lower)				
1542	0606h	Acceleration time No.3 (upper)				
1543	0607h	Acceleration time No.3 (lower)				
1544	0608h	Acceleration time No.4 (upper)				
1545	0609h	Acceleration time No.4 (lower)				
1546	060Ah	Acceleration time No.5 (upper)				
1547	060Bh	Acceleration time No.5 (lower)				
1548	060Ch	Acceleration time No.6 (upper)				
1549	060Dh	Acceleration time No.6 (lower)				
1550	060Eh	Acceleration time No.7 (upper)				
1551	060Fh	Acceleration time No.7 (lower)				
1664	0680h	Deceleration time No.0 (upper)	2 to 150 (1=0.1 s)	0.1	5	
1665	0681h	Deceleration time No.0 (lower)				
1666	0682h	Deceleration time No.1 (upper)				
1667	0683h	Deceleration time No.1 (lower)				
1668	0684h	Deceleration time No.2 (upper)				
1669	0685h	Deceleration time No.2 (lower)				
1670	0686h	Deceleration time No.3 (upper)				
1671	0687h	Deceleration time No.3 (lower)				
1672	0688h	Deceleration time No.4 (upper)				
1673	0689h	Deceleration time No.4 (lower)				
1674	068Ah	Deceleration time No.5 (upper)				
1675	068Bh	Deceleration time No.5 (lower)				
1676	068Ch	Deceleration time No.6 (upper)				
1677	068Dh	Deceleration time No.6 (lower)				
1678	068Eh	Deceleration time No.7 (upper)				
1679	068Fh	Deceleration time No.7 (lower)				

* Indicates the timing for the data to become effective

A: Effective immediately

Register address		Name	Setting range	Setting unit	Initial value	Effective *
Dec	Hex					
1792	0700h	Torque limiting No.0 (upper)	0 to 200%	1	200	A
1793	0701h	Torque limiting No.0 (lower)				
1794	0702h	Torque limiting No.1 (upper)				
1795	0703h	Torque limiting No.1 (lower)				
1796	0704h	Torque limiting No.2 (upper)				
1797	0705h	Torque limiting No.2 (lower)				
1798	0706h	Torque limiting No.3 (upper)				
1799	0707h	Torque limiting No.3 (lower)				
1800	0708h	Torque limiting No.4 (upper)				
1801	0709h	Torque limiting No.4 (lower)				
1802	070Ah	Torque limiting No.5 (upper)				
1803	070Bh	Torque limiting No.5 (lower)				
1804	070Ch	Torque limiting No.6 (upper)				
1805	070Dh	Torque limiting No.6 (lower)				
1806	070Eh	Torque limiting No.7 (upper)				
1807	070Fh	Torque limiting No.7 (lower)				

* Indicates the timing for the data to become effective

A: Effective immediately

■ Parameter R/W commands [User parameters]

Register address		Name	Description	Setting range	Setting unit	Initial value	Effective *
Dec	Hex						
646	0286h	JOG operation speed (upper)	Set the rotation speed of JOG operation.	0 r/min, and 80 to 1000 r/min	1	300	A
647	0287h	JOG operation speed (lower)					
900	0384h	Motor direction selection (upper)	Set the motor direction to be applied when the FWD input is turned ON.	0: + side=CCW 1: + side=CW	—	1	C
901	0385h	Motor direction selection (lower)					
4160	1040h	Operation input mode selection (upper)	Operation signals of external input can be switched between 2-wire input mode and 3-wire input mode.	0: 2-wire input mode 1: 3-wire input mode	—	0	
4161	1041h	Operation input mode selection (lower)					
4162	1042h	JOG operation torque (upper)	Set the torque limiting value of JOG operation.	0 to 200%	1	200	A
4163	1043h	JOG operation torque (lower)					
4170	104Ah	Speed reduction ratio (upper)	When entering the gear ratio of the gearhead, the rotation speed of the gearhead output shaft can be displayed. Set the decimal point position for the setting value of the gear ratio by the parameter for speed reduction ratio decimal digit specification.	100 to 9999	1	100	
4171	104Bh	Speed reduction ratio (lower)					
4172	104Ch	Speed reduction ratio decimal digit setting (upper)		0: 1 digit 1: 2 digit 2: 3 digit	—	2	
4173	104Dh	Speed reduction ratio decimal digit setting (lower)					

* Indicates the timing for the data to become effective

A: Effective immediately, C: Effective after executing the configuration

Register address		Name	Description	Setting range	Setting unit	Initial value	Effective [*]
Dec	Hex						
4174	104Eh	Speed increasing ratio (upper)	Set the speed increasing ratio relative to the rotation speed of the motor output shaft. The displays vary depending on the setting value. 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	A
4175	104Fh	Speed increasing ratio (lower)					
4176	1050h	Conveyor speed reduction ratio (upper)	When setting the conveyor speed reduction ratio, the transfer speed of the conveyor can be displayed.	100 to 9999	1	100	
4177	1051h	Conveyor speed reduction ratio (lower)					
4178	1052h	Conveyor speed reduction ratio decimal digit setting (upper)		0: 1 digit 1: 2 digit 2: 3 digit	—	2	
4179	1053h	Conveyor speed reduction ratio decimal digit setting (lower)					
4180	1054h	Conveyor speed increasing ratio (upper)	Set the conveyor speed-increasing ratio relative to the rotation speed of the motor output shaft.	1 to 5	—	1	
4181	1055h	Conveyor speed increasing ratio (lower)					
4322	10E2h	Analog input signal selection (upper)	Setting method of operation data can be changed. Refer to p.28 for details.	0: Mode 0 1: Mode 1 2: Mode 2 3: Mode 3 4: Mode 4 5: Mode 5	—	0	C
4323	10E3h	Analog input signal selection (lower)					
4430	114Eh	Rotation speed attainment band (upper)	Set the band within which the rotation speed of the motor is deemed to have reached the set value.	0 to 400 r/min	1	200	A
4431	114Fh	Rotation speed attainment band (lower)					

* Indicates the timing for the data to become effective

A: Effective immediately, C: Effective after executing the configuration

- Operation data setting using analog input signal selection

Setting method of operation data can be changed using the analog input signal selection parameter.

See a combination of the mode No. and analog setting/digital setting as shown below.

Others except the following combinations are not available to be set.

Mode No.	Operation data No.	VR1	VR2	VR3	External potentiometer	Digital setting
Mode 0 (Initial setting)	0	Rotation speed	Acceleration/ Deceleration time	Torque limiting value	–	–
	1	–	Acceleration/ Deceleration time	Torque limiting value	Rotation speed	–
	2 to 7	–	–	–	–	Rotation speed Acceleration time Deceleration time Torque limiting value
Mode 1	0 to 7	–	–	–	–	Rotation speed Acceleration time Deceleration time Torque limiting value
Mode 2	0 to 7	–	–	–	Torque limiting value	Rotation speed Acceleration time Deceleration time
Mode 3	0	Acceleration time	Deceleration time	Rotation speed	–	Torque limiting value
	1	Acceleration time	Deceleration time	–	Rotation speed	Torque limiting value
	2 to 7	–	–	–	–	Rotation speed Acceleration time Deceleration time Torque limiting value
Mode 4	0	Rotation speed	Torque limiting value	Acceleration/ Deceleration time	–	–
	1	–	Torque limiting value	Acceleration/ Deceleration time	Rotation speed	–
	2 to 7	–	–	–	–	Rotation speed Acceleration time Deceleration time Torque limiting value
Mode 5	0	Torque limiting value	Acceleration/ Deceleration time	Rotation speed	–	–
	1	Torque limiting value	Acceleration/ Deceleration time	–	Rotation speed	–
	2 to 7	–	–	–	–	Rotation speed Acceleration time Deceleration time Torque limiting value

Note

The factory setting of the torque limiting potentiometer (VR3) is set to the maximum value. When selecting modes No.3, No.4 or No.5, check the setting value before operating a motor because the rotation speed and acceleration/deceleration value are set to the maximum value initially.

■ Parameter R/W commands [Alarm, warning]

Register address		Name	Description	Setting range	Setting unit	Initial value	Effective *
Dec	Hex						
840	0348h	Undervoltage warning level (upper)	Set the warning level for the undervoltage of the main power.	0 to 480 (=0.1 V)	0.1	24 VDC type: 216 48 VDC type: 432	A
841	0349h	Undervoltage warning level (lower)					
4224	1080h	Electromagnetic brake action at alarm (upper)	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 coasting to a stop 1: Lock immediately	-	1	C
4225	1081h	Electromagnetic brake action at alarm (lower)					
4226	1082h	Operation error during initialization alarm function (upper)	Switch enable/disable of the operation error during initialization alarm.	0: Disable 1: Enable	-	0	
4227	1083h	Operation error during initialization alarm function (lower)					
4228	1084h	Undervoltage alarm latch (upper)	Set whether the current to the motor is cut off or not when releasing the undervoltage alarm. When setting to "0", the motor will rotate automatically. When setting to "1", the motor will remain at a standstill.	0: Disable 1: Enable	-	0	
4229	1085h	Undervoltage alarm latch (lower)					
4258	10A2h	Overload warning function (upper)	Enable/disable the overload warning function.	0: Disable 1: Enable	-	1	A
4259	10A3h	Overload warning function (lower)					
4264	10A8h	Undervoltage warning function (upper)	Enable/disable the undervoltage warning function.	0: Disable 1: Enable	-	1	
4265	10A9h	Undervoltage warning function (lower)					
4266	10AAh	Overload warning level (upper)	Set the warning level for the load torque of the motor.	50 to 100%	1	100	
4267	10ABh	Overload warning level (lower)					
4608	1200h	Communication timeout (upper)	Sets the condition in which a communication timeout occurs in RS-485 communication.	0: Not monitored 0 to 10000 ms	1	0	
4609	1201h	Communication timeout (lower)					
4610	1202h	Communication error alarm (upper)	Sets the condition in which a RS-485 communication error alarm generates. A communication error alarm generates after a RS-485 communication error has occurred by the number of times set here.	1 to 10 times	-	3	
4611	1203h	Communication error alarm (lower)					

* Indicates the timing for the data to become effective

A: Effective immediately, C: Effective after executing the configuration

■ Parameter R/W commands [Data setter]

Register address		Name	Description	Setting range	Initial value	Effective *
Dec	Hex					
960	03C0h	Data setter speed display (upper)	Sets the display method of operation speed in the monitor mode. If "0" is set, "-" will be displayed when rotating in REV input direction.	0: Signed 1: Absolute value	0	A
961	03C1h	Data setter speed display (lower)				
962	03C2h	Data setter edit lock (upper)	Editing and clearing the operation data/parameters can be prohibited by locking operation of the OPX-2A .	0: Disable 1: Enable	1	D
963	03C3h	Data setter edit lock (lower)				
4320	10E0h	Data setter initial display (upper)	Select the initial screen when the driver power is turned on.	0: Operation speed 1: Conveyor transfer speed 2: Load factor 3: Operation data number 4: Top screen of monitor mode	0	
4321	10E1h	Data setter initial display (lower)				

* Indicates the timing for the data to become effective

A: Effective immediately, D: Effective after turning the power ON again

■ Parameter R/W commands [I/O function (Direct I/O)]

Register address		Name	Setting range	Initial value	Effective *1
Dec	Hex				
4352	1100h	X0 input function selection (upper)	0: Not used 1: FWD (START/STOP)*2 2: REV (RUN/BRAKE)*2 19: STOP-MODE (FWD/REV)*2 20: MB-FREE 21: EXT-ERROR 24: ALARM-RESET 27: HMI 48: M0 49: M1 50: M2	1	B
4353	1101h	X0 input function selection (lower)		2	
4354	1102h	X1 input function selection (upper)			
4355	1103h	X1 input function selection (lower)		19	
4356	1104h	X2 input function selection (upper)			
4357	1105h	X2 input function selection (lower)		48	
4358	1106h	X3 input function selection (upper)			
4359	1107h	X3 input function selection (lower)		24	
4360	1108h	X4 input function selection (upper)			
4361	1109h	X4 input function selection (lower)		20	
4362	110Ah	X5 input function selection (upper)			
4363	110Bh	X5 input function selection (lower)			
4416	1140h	Y0 output function selection (upper)	0: Not used 65: ALARM-OUT1 66: WNG 68: MOVE 71: TLC 77: VA 81: ALARM-OUT2	65	A
4417	1141h	Y0 output function selection (lower)		66	
4418	1142h	Y1 output function selection (upper)			
4419	1143h	Y1 output function selection (lower)			

*1 Indicates the timing for the data to become effective

A: Effective immediately, B: Effective after stopping the operation

*2 The parentheses () will be applied when selecting "3-wire input mode" with the "operation input mode selection" parameter.

■ Parameter R/W commands [I/O function (Remote I/O)]

Register address		Name	Setting range	Initial value	Effective *1
Dec	Hex				
4448	1160h	NET-IN0 input function selection (upper)	0: Not used 1: FWD (START/STOP) ^{*2} 2: REV (RUN/BRAKE) ^{*2} 19: STOP-MODE (FWD/REV) ^{*2} 20: MB-FREE 27: HMI 48: M0 49: M1 50: M2	48	C
4449	1161h	NET-IN0 input function selection (lower)			
4450	1162h	NET-IN1 input function selection (upper)		49	
4451	1163h	NET-IN1 input function selection (lower)			
4452	1164h	NET-IN2 input function selection (upper)		50	
4453	1165h	NET-IN2 input function selection (lower)			
4454	1166h	NET-IN3 input function selection (upper)		1	
4455	1167h	NET-IN3 input function selection (lower)			
4456	1168h	NET-IN4 input function selection (upper)		2	
4457	1169h	NET-IN4 input function selection (lower)			
4458	116Ah	NET-IN5 input function selection (upper)		19	
4459	116Bh	NET-IN5 input function selection (lower)			
4460	116Ch	NET-IN6 input function selection (upper)		0	
4461	116Dh	NET-IN6 input function selection (lower)			
4462	116Eh	NET-IN7 input function selection (upper)		20	
4463	116Fh	NET-IN7 input function selection (lower)			
4464	1170h	NET-IN8 input function selection (upper)		0	
4465	1171h	NET-IN8 input function selection (lower)			
4466	1172h	NET-IN9 input function selection (upper)		0	
4467	1173h	NET-IN9 input function selection (lower)			
4468	1174h	NET-IN10 input function selection (upper)		0	
4469	1175h	NET-IN10 input function selection (lower)			
4470	1176h	NET-IN11 input function selection (upper)		0	
4471	1177h	NET-IN11 input function selection (lower)			
4472	1178h	NET-IN12 input function selection (upper)		0	
4473	1179h	NET-IN12 input function selection (lower)			
4474	117Ah	NET-IN13 input function selection (upper)		0	
4475	117Bh	NET-IN13 input function selection (lower)			
4476	117Ch	NET-IN14 input function selection (upper)		0	
4477	117Dh	NET-IN14 input function selection (lower)			
4478	117Eh	NET-IN15 input function selection (upper)		0	
4479	117Fh	NET-IN15 input function selection (lower)			

*1 Indicates the timing for the data to become effective

C: Reflects after executing the configuration

*2 The parentheses () will be applied when selecting "3-wire input mode" with the "operation input mode selection" parameter.

Register address		Name	Setting range	Initial value	Effective *1
Dec	Hex				
4480	1180h	NET-OUT0 output function selection (upper)	0: Not used 1: FWD_R (START/STOP_R)*2 2: REV_R (RUN/BRAKE_R)*2 19: STOP-MODE_R (FWD/REV_R)*2 20: MB-FREE_R 27: HMI_R 48: M0_R 49: M1_R 50: M2_R 65: ALARM-OUT1 66: WNG 68: MOVE 71: TLC 77: VA 80: S-BSY 81: ALARM-OUT2 82: MPS	48	C
4481	1181h	NET-OUT0 output function selection (lower)			
4482	1182h	NET-OUT1 output function selection (upper)		49	
4483	1183h	NET-OUT1 output function selection (lower)			
4484	1184h	NET-OUT2 output function selection (upper)		50	
4485	1185h	NET-OUT2 output function selection (lower)			
4486	1186h	NET-OUT3 output function selection (upper)		1	
4487	1187h	NET-OUT3 output function selection (lower)			
4488	1188h	NET-OUT4 output function selection (upper)		2	
4489	1189h	NET-OUT4 output function selection (lower)			
4490	118Ah	NET-OUT5 output function selection (upper)		19	
4491	118Bh	NET-OUT5 output function selection (lower)			
4492	118Ch	NET-OUT6 output function selection (upper)		66	
4493	118Dh	NET-OUT6 output function selection (lower)			
4494	118Eh	NET-OUT7 output function selection (upper)		65	
4495	118Fh	NET-OUT7 output function selection (lower)			
4496	1190h	NET-OUT8 output function selection (upper)		80	
4497	1191h	NET-OUT8 output function selection (lower)			
4498	1192h	NET-OUT9 output function selection (upper)		0	
4499	1193h	NET-OUT9 output function selection (lower)			
4500	1194h	NET-OUT10 output function selection (upper)		0	
4501	1195h	NET-OUT10 output function selection (lower)			
4502	1196h	NET-OUT11 output function selection (upper)		0	
4503	1197h	NET-OUT11 output function selection (lower)			
4504	1198h	NET-OUT12 output function selection (upper)		81	
4505	1199h	NET-OUT12 output function selection (lower)			
4506	119Ah	NET-OUT13 output function selection (upper)		68	
4507	119Bh	NET-OUT13 output function selection (lower)			
4508	119Ch	NET-OUT14 output function selection (upper)		77	
4509	119Dh	NET-OUT14 output function selection (lower)			
4510	119Eh	NET-OUT15 output function selection (upper)		71	
4511	119Fh	NET-OUT15 output function selection (lower)			

*1 Indicates the timing for the data to become effective

C: Reflects after executing the configuration

*2 The parentheses () will be applied when selecting "3-wire input mode" with the "operation input mode selection" parameter.

4.12 Group send

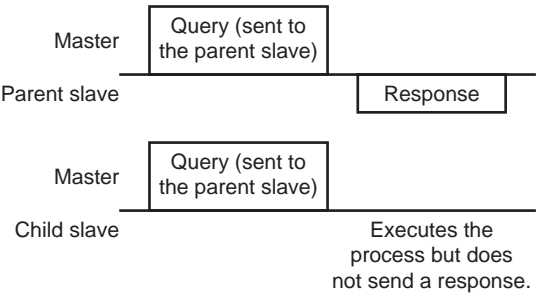
Multiple slaves are made into a group and a query is sent to all slaves in the group at once.

• 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

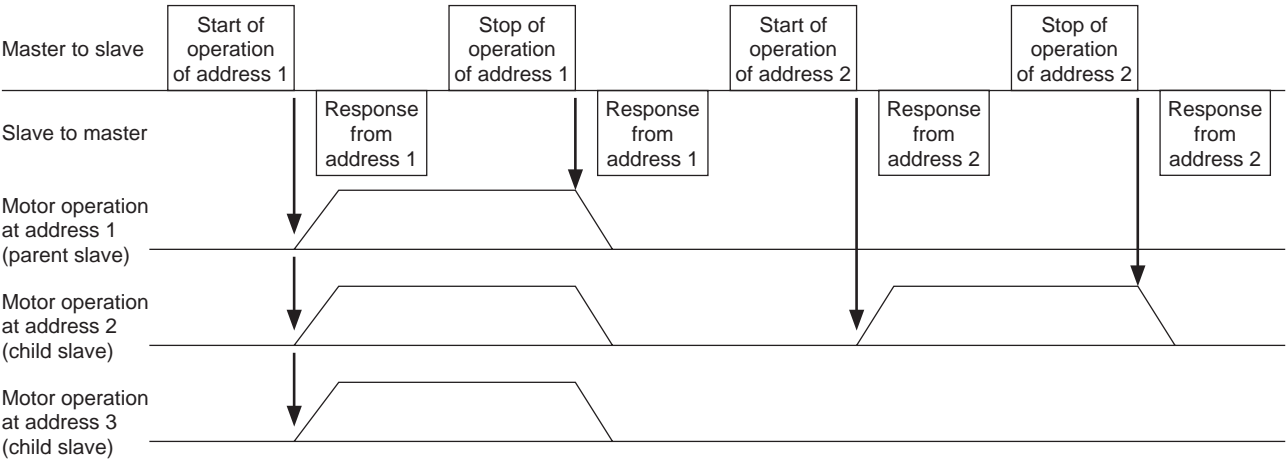
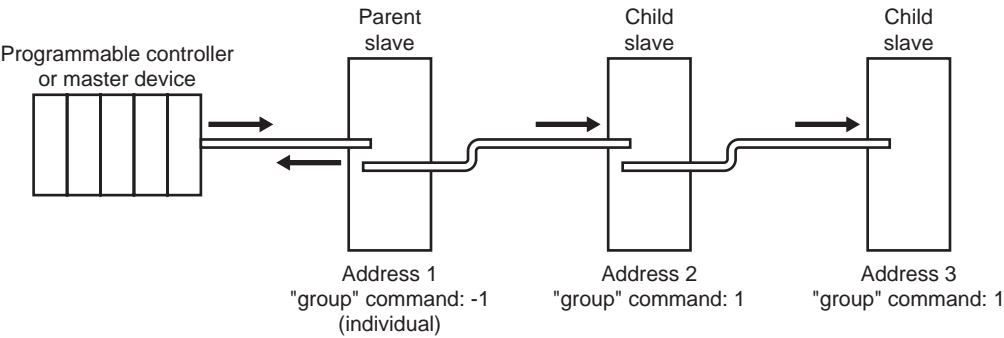
Use a "group" command to set a group address to each child slave.
Change the group in the unicast mode.

Address	Setting range	Initial value
0030h	-1: No group specification (Group send is not performed) 1 to 31: Sets a group address.	-1

Note Since the group setting is not saved in the NV memory even when the "batch NV memory write" executes, the group setting will be cleared when turning the driver power OFF. Reset the group setting whenever the power is turned on.

• Function code to execute in a group send

Function code	Function
10h	Writing to multiple holding registers



4.13 Detection of communication errors

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

■ 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 | You can also clear the communication error records by turning off the driver power.

Type of communication error	Error code	Cause
RS-485 communication error	84h	A transmission error was detected. See “No response” on p.14.
Command not yet defined	88h	An exception response (exception code 01h, 02h) was detected. See p.15.
User I/F communication in progress	89h	An exception response (exception code 04h) was detected. See p.15.
NV memory processing in progress	8Ah	An exception response (exception code 03h, 04h) was detected. See p.15.
Outside setting range	8Ch	An exception response (exception code 03h, 04h) was detected. See p.15.
Command execute disable	8Dh	An exception response (exception code 04h) was detected. See p.15.

■ Alarms and warnings

When an alarm generates, the ALARM-OUT output will turn OFF and the motor will stop. At the same time, the ALARM 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 | You can also clear the warning records by turning off the driver power.

- Communication switch setting error

When setting the No.4 of communication function switch (SW2) to ON, 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.

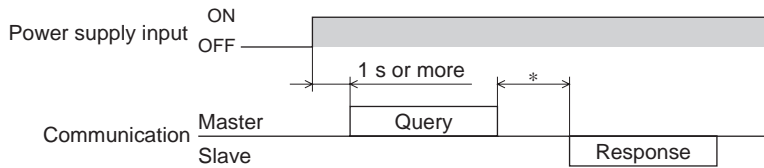
Description of error	Description
Warning	A warning generates when one RS-485 communication error (84h) has been detected. If normal reception occurs while the warning is present, the warning will be reset automatically.
Alarm	An alarm generates when a RS-485 communication error (84h) has been detected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

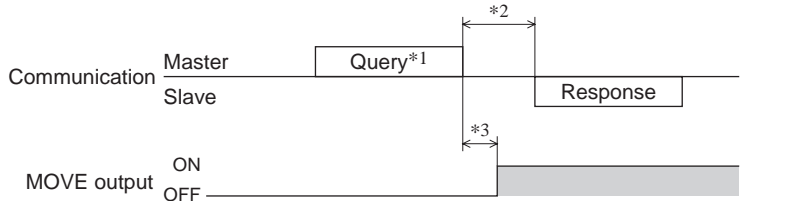
4.14 Timing charts

■ Communication start



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

■ Operation start

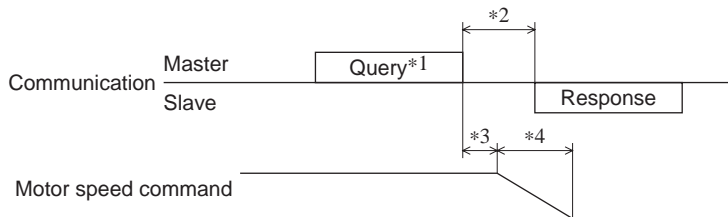


*1 A message including a query to start operation via RS-485 communication.

*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



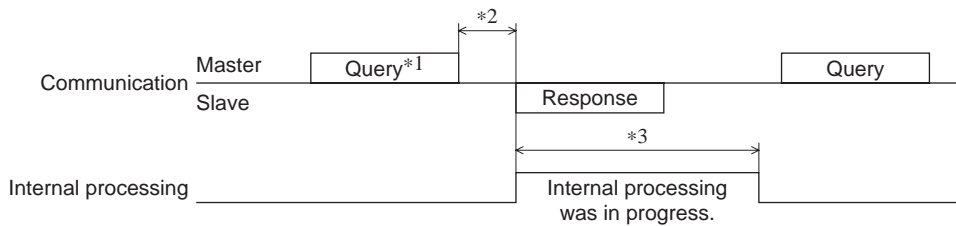
*1 A message including a query to stop operation via RS-485 communication and another to change the speed.

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

*3 C3.5 (silent interval) + command processing time

*4 The specific time varies depending on the driver input command or the parameter setting.

■ 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 C3.5 (silent interval) + 1 s or less

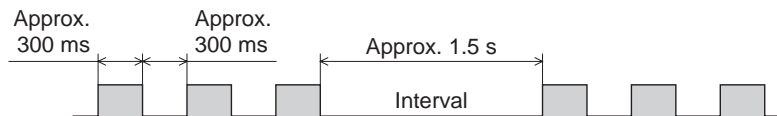
5 Alarms, warnings and communication errors

The driver provides alarms that are designed to protect the driver from overheating, poor connection, misoperation, 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.

5.1 Alarms

When an alarm generates, the ALARM-OUT output will turn OFF and the motor will stop. At the same time, the ALARM LED will start blinking. The cause of the alarm can be checked by counting the number of times the ALARM LED blinks or using **OPX-2A** or RS-485 communication.

Example: Sensor error alarm (number of blinks: 3)



■ Alarm list

Alarm code	No. of ALARM 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 such as acceleration/deceleration time.	Possible
28h	3	Sensor error	The motor sensor signal line experienced an open circuit during operation, or the motor signal connector came off.	Check the connection between the driver and motor.	
42h		Initial sensor error	The motor sensor signal line broke or motor 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 exceeded the overvoltage detection level. [Detection level] BLV620: approx. 40 VDC BLV640: approx. 72 VDC• Sudden starting/stopping of a large inertia load was 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 time or deceleration time.• When generating the alarm in acceleration, set the speed response to low-response.• When generating the alarm at stopping the motor, set the STOP-MODE to instantaneous stop.	
25h	5	Undervoltage	The main power supply voltage dropped the undervoltage detection level. [Detection level] BLV620 : approx. 10 VDC BLV640 : approx. 20 VDC	<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 such as acceleration/ deceleration time.	

Alarm code	No. of ALARM LED blinks	Alarm type	Cause	Remedial action	Reset using the ALARM-RESET input
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 cycle 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 using the OPX-2A , and cycle the power.	
21h	9	Main circuit overheat	The temperature inside the driver exceeded the main circuit overheat level.	Review the ventilation condition in the enclosure.	Possible
6Eh	10	External stop*1	The EXT-ERROR input turned OFF.	Check the EXT-ERROR input.	
46h	11	Initial operation error*2	The main 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 main power supply.	
81h	12	Network bus error	The bus of host network of the network converter turned off while the motor was operating.	Check the connector and cable of the host network.	Not possible
83h		Communication switch setting error	The communication function switch (SW2-No.4) was turned ON.	Check the communication function switch (SW2-No.4).	
84h		RS-485 communication error	The number of consecutive RS-485 communication errors reached the value set in the "communication error alarm" parameter.	<ul style="list-style-type: none"> • Check the connection with the host system. • Check the setting of the RS-485 communication. 	Possible
85h		RS-485 communication timeout	The time set in the "communication timeout" parameter has elapsed, and yet the communication could not be established with the host system.	Check the connection with the host system.	
8Eh		Network converter error	The network converter generated an alarm.	Check the alarm code of the network converter.	
2Dh	14	Main circuit output error*3	The motor drive wire broke or motor drive connector came off.	Check the connection between the driver and motor.	

*1 This alarm generates when the EXT-ERROR is assigned to the X0 to X5 inputs.

*2 This alarm generates when the "Initial operation error" function has been enabled.

*3 This alarm does not generate when the torque limiting value is set to less than 200% .

■ Alarm reset

When resetting an alarm, be sure to remove the cause of the alarm and check the safety after turning the input signal for operation OFF, and then perform one of the reset operations specified below. Refer to **BLV Series USER MANUAL Basic Function** for the timing chart.

- Turn the ALARM-RESET input to ON and then OFF. (The alarm will be reset at the OFF edge of the input.)
- Perform an alarm reset using RS-485 communication.
- Perform an alarm reset using the **OPX-2A**.
- Cycle the power.

Note

- Some alarms cannot be reset with the ALARM-RESET input, **OPX-2A** or RS-485 communication. Check the alarm list table to identify which alarms meet this condition. To reset these alarms, you must cycle the power. If the unit does not operate properly after the power is cycled, internal circuit damage is suspected. Please contact your nearest office.
- If an alarm is reset via RS-485 communication, when performing the alarm reset while any of the input signals for operation is ON, the motor will start rotating after the alarm reset, which may cause some dangerous situation. Be sure to turn the input signal for operation OFF before resetting the alarm.

■ Alarm records

Up to 10 generated alarms are saved in the NV memory in order of the latest to oldest.
Alarm records saved in the NV memory can be read and cleared when performing any of the following.

- Get the alarm records by the monitor command via RS-485 communication.
- Clear the alarm records by the maintenance command via RS-485 communication.
- Get and clear the alarm records using the **OPX-2A**.

5.2 Warnings

This signal is output when a warning generates. However, the operation will continue.
The WNG output will turn OFF automatically once the cause of the warning is removed.

■ Warning list

Code	Warning type	Cause	Remedial action
21h	Main circuit overheat	The temperature inside the driver exceeded the overheat warning level.	Review the ventilation condition in the enclosure.
25h	Undervoltage*	The main power supply voltage dropped by approx. 10% or more from the rated voltage.	<ul style="list-style-type: none"> • Check the input voltage of the power supply. • Check the power supply cable wiring.
30h	Overload*	The load torque of the motor exceeded the overload warning level.	<ul style="list-style-type: none"> • Reduce the load. • Change the operation pattern including the acceleration/ deceleration time.
6Ch	Operation error	<ul style="list-style-type: none"> • When performing test operation using the OPX-2A, any of the input signal for operation was ON. • When changing the assignment of the input terminal using the OPX-2A, the assigned terminal was ON. 	Turn the input signals OFF.
84h	RS-485 communication error	A RS-485 communication error was detected.	<ul style="list-style-type: none"> • Check the connection between the driver and programmable controller. • Check the setting of RS-485 communication.

* The detection level can be changed using the **OPX-2A**.

■ Warning records

Up to 10 generated warning are saved in the NV memory in order of the latest to oldest.
Warning records saved in the NV memory can be read and cleared when performing any of the following.

- Get the warning records by the monitor command via RS-485 communication.
- Clear the warning records by the maintenance command via RS-485 communication.
- Get and clear the warning records using the **OPX-2A**.

Note | You can also clear the warning records by turning off the driver power.

5.3 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 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 driver and programmable controller. • 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	User I/F communication in progress	The command requested by the master could not be executed since the OPX-2A was communicating with the driver.	Wait until the processing for the OPX-2A will be completed.
8Ah	NV memory processing in progress	The command could not be executed because the driver was processing the NV memory. · 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 complete. • When the EEPROM error was generated, initialize the parameter using OPX-2A 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 could not be executed, it tried to do it.	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.

- Get 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.

Note | You can also clear the communication error records by turning off the driver power.

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