Oriental motor

HM-60091-3

Network converter

MECHATROLINK-Ⅱ compatible

NETC01-M2

USER MANUAL

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.

Table of contents

1 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.

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. Doing so may result in fire 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, injury or damage to equipment.

Connection

- Keep the power supply input voltage of the **NETC01-M2** within the specified range. Failure to do so may result in fire.
- For the power supply of the **NETC01-M2**, 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. Failure to do so may result in fire.
- Do not forcibly bend, pull or pinch the cable. Doing so may cause fire. Applying stress to the connection area of the connectors may cause damage to the product.

Operation

- Turn off the **NETC01-M2** power in the event of a power failure. Or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.
- When an alarm of the **NETC01-M2** is generated, stop the motor. Failure to do so may result in fire, injury or damage to equipment.

Repair, disassembly and modification

- Do not disassemble or modify the **NETC01-M2**. Doing so may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

⚠ Caution

Handling the product without observing the instructions that accompany a "Caution" symbol may result in injury or property damage.

General

- Do not use the **NETC01-M2** beyond its specifications. Doing so may result in injury or damage to equipment.
- Keep your fingers and objects out of the openings in the **NETC01-M2**. Failure to do so may result in fire or injury.

Installation

- Install the **NETC01-M2** in the enclosure in order to prevent injury.
- Keep the area around the **NETC01-M2** free of combustible materials in order to prevent fire or a skin burn(s).
- Do not leave anything around the **NETC01-M2** that would obstruct ventilation. Doing so may result in damage to equipment.

Connection

- The power supply connector (CN1), MECHATROLINK-Ⅱ communication connector (CN2), data edit connector (CN3) and RS-485 communication connector (CN6) of the **NETC01-M2** 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 **NETC01-M2** and these equipment to short, damaging both.

Operation

- Use the **NETC01-M2** in combination with the designated applicable product. Failure to do so may result in fire.
- When operating the product, do so after making preparations that an emergency stop can be performed at any time. Failure to do may result in injury.
- Set a suitable operation speed and acceleration/deceleration rate. Improper setting may cause loss of the motor synchronism and moving the load to an unexpected direction, which may result in injury or damage to equipment.
- Immediately when trouble has occurred, stop running and turn off the **NETC01-M2** power. Failure to do so may result in fire or injury.
- Always use an insulated screwdriver to adjust the switches of the **NETC01-M2**.

Disposal

- To dispose of the **NETC01-M2**, disassemble it into parts and components as much as possible and dispose of individual parts/components as industrial waste. Contact your nearest Oriental Motor office if you have any questions.

2 Introduction

■ Before use

Only qualified personnel should work with the product.
Use the product correctly after thoroughly reading the section "1 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. For the power supply of the **NETC01-M2**, use a DC power supply with reinforced insulation on its primary and secondary sides. Oriental Motor Co., Ltd. is not responsible for any damage caused through failure to observe this warning.

■ Operating Manuals for the NETC01-M2

Operating manuals for the **NETC01-M2** are listed below.
After reading the following manuals, keep them in a convenient place so that you can reference them at any time.

- **Network converter MECHATROLINK-Ⅱ compatible NETC01-M2 USER MANUAL**

  This manual explains the function, installation and connection of the **NETC01-M2** as well as operating method.
  The USER MANUAL does not come with the product. For details, contact your nearest Oriental Motor sales office or download from Oriental Motor Website Download Page.

  For the command code or remote I/O of the RS-485 communication compatible product that can be connected to the **NETC01-M2**, refer to the USER MANUAL of the corresponding RS-485 communication compatible product or **AZ** Series Function Edition.

- **Network converter MECHATROLINK-Ⅱ compatible NETC01-M2 OPERATING MANUAL**

  This manual explains safety precautions, connector pin assignments and others.

- **Data setting software MEXE02 OPERATING MANUAL**

  This manual explains the parameter setting method or monitor function using the **MEXE02**.

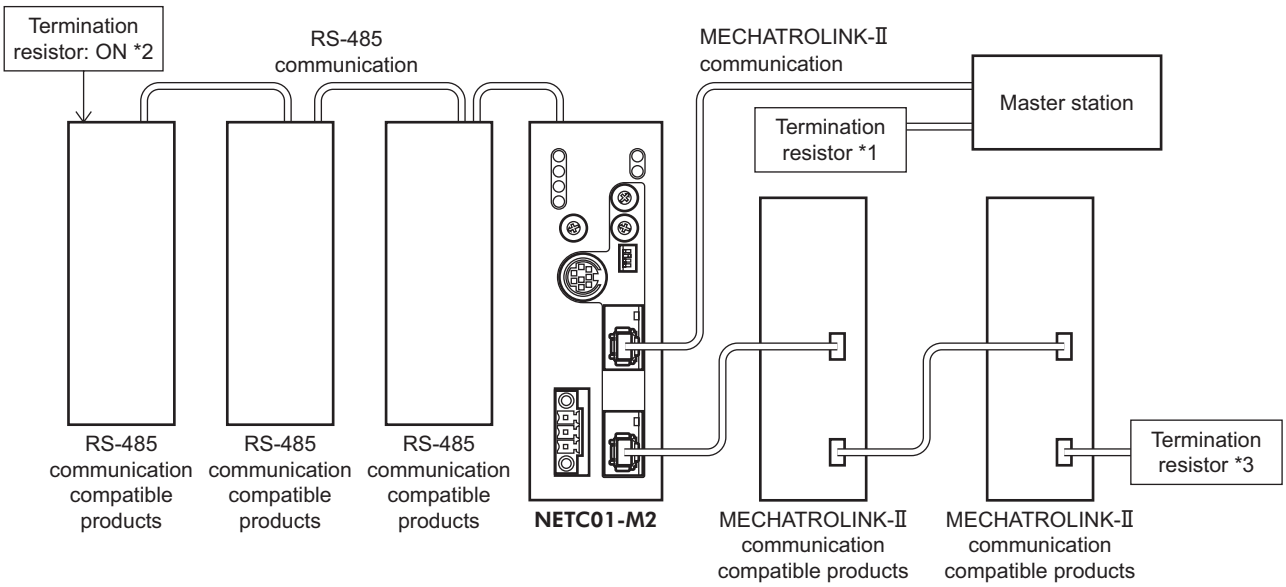
■ Overview of the product

The **NETC01-M2** is a communication converter between MECHATROLINK-Ⅱ and RS-485 communication. By converting the MECHATROLINK-Ⅱ communication protocol of the upper level to the RS-485 communication protocol of the lower level, Oriental Motor RS-485 communication compatible products can be operated via MECHATROLINK-Ⅱ communication.
The RS-485 communication protocol of the lower level is Oriental Motor's own RS-485 communication protocol.

Parameters of the NETC01-M2 cannot be set with the master station.
When setting the parameters of the NETC01-M2, use a MEXE02 or accessory OPX-2A.

When the **MEXE02** is used, a communication cable for data setting software **CC05IF-USB** (accessory) is needed to connect a PC and **NETC01-M2**. Be sure to purchase it.

■ System configuration



*1 The master device may have a built-in internal termination resistor which functions as the termination resistor on the master side. For details, refer to the operating manual for the master device.

*2 The termination resistor for RS-485 communication is built into the product.

*3 For the termination resistor on slave side, use a dedicated termination resistor for MECHATROLINK communication, manufactured by YASKAWA Electric Corporation.

■ CE Marking

Because the input power supply voltage of this product is 24 VDC, it is not subject to the Low Voltage Directive but install and connect this product as follows.

- This product is designed and manufactured for use as a component to be installed inside equipment.
- For the power supply of the **NETC01-M2**, use a DC power supply with reinforced insulation on its primary and secondary sides.
- Overvoltage category: Ⅰ
- Pollution degree: 2
- Degree of protection: IP20

- **EMC Directive**

This product has received EMC compliance under the conditions specified in "Example of **NETC01-M2** installation and wiring" on p.10.

The conformance of your mechanical equipment with the EMC Directive will vary depending on such factors as the configuration, wiring, and layout for other control system devices and electrical parts used with the **NETC01-M2**. It therefore must be verified through conducting EMC measures in a state where all parts including the **NETC01-M2** have been installed in the equipment.

Applicable standards

- EMI: EN 61000-6-4, EN 55011 group 1 class A
- EMS: EN 61000-6-2

■ Hazardous substances

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

3 Preparation

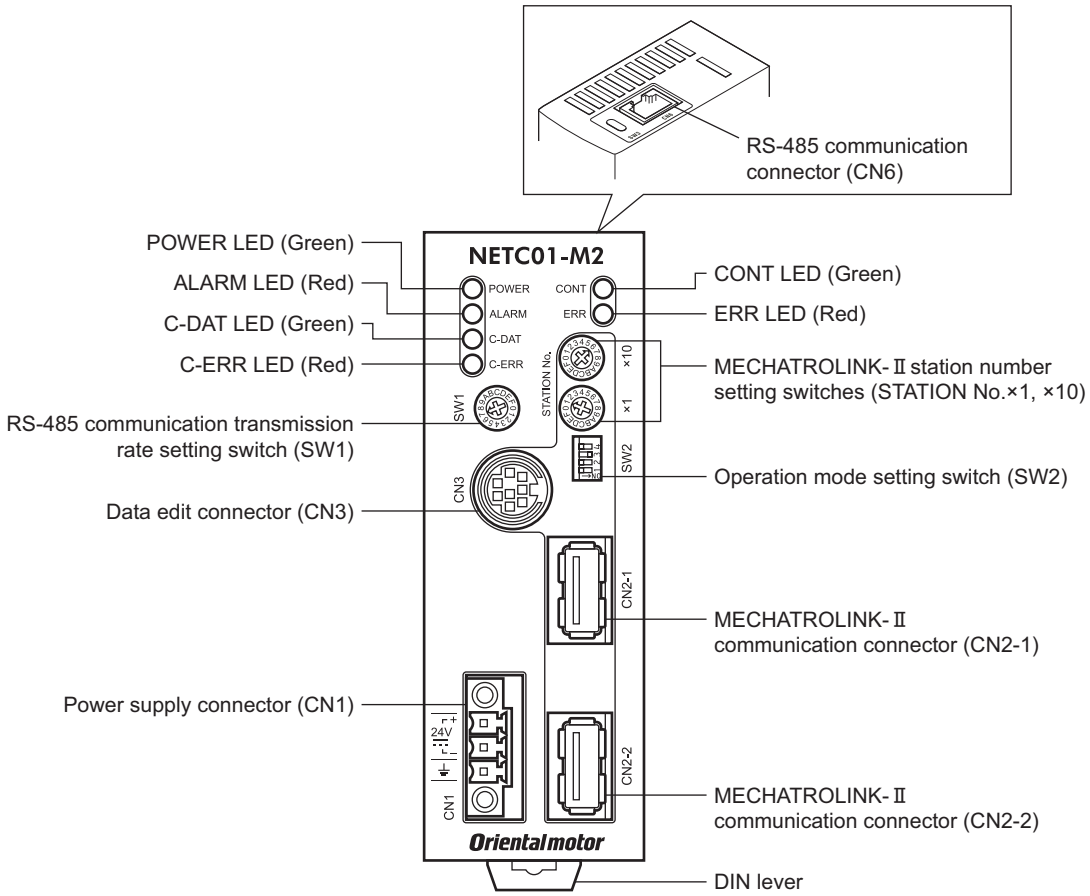
This chapter explains the items you should check, as well as the name and function of each part.

3.1 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.

- **NETC01-M2**.....1 unit
- CN1 connector (3 pins) .....1 pc.
- RS-485 communication cable .....2 pcs. [0.1 m (3.94 in.), 0.25 m (9.84 in.) each 1 pc.]
- OPERATING MANUAL.....1 copy

3.2 Names and functions of parts



Name	Description	Ref.
POWER LED (Green)	This LED is lit while the power is input.	–
ALARM LED (Red)	This LED will blink when an alarm generates.	p.39
C-DAT LED (Green)	This LED is lit while transmitting and receiving data via RS-485 communication.	–
C-ERR LED (Red)	This LED is lit when an error has occurred via RS-485 communication.	–
CONT LED (Green)	This LED is lit while a connection is established.	–
ERR LED (Red)	This LED is lit when the MECHATROLINK-Ⅱ communication error has occurred.	p.39
RS-485 communication transmission rate setting switch (SW1)	Sets the transmission rate of RS-485 communication. Factory setting: 7 (625 kbps)	p.17
Data edit connector (CN3)	Connects a PC in which the **MEXE02** has been installed, or an accessory **OPX-2A** (sold separately).	p.13
Power supply connector (CN1)	Connects a 24 VDC power supply.	p.11
MECHATROLINK-Ⅱ station address setting switches (STATION No.×1, ×10)	Sets the station address in the 60h to 7Fh range. Factory setting: 61h (×10=6, ×1=1) ×10: Sets the upper of the station address ×1: Sets the lower of the station address	p.18
Operation mode setting switch (SW2-Nos.1 to 3)	Sets the operation mode. • SW2-No.1: Sets the remote I/O occupied size. Factory setting: OFF (16 bit mode) • SW2-No.2, No.3: Sets the number of transmission bytes. Factory setting: No.2=OFF, No.3=ON (32 bytes)	p.17
MECHATROLINK-Ⅱ communication connector (CN2-1, CN2-2)	Connects the MECHATROLINK-Ⅱ communication cable.	p.13
RS-485 communication connector (CN6)	Connects the RS-485 communication cable.	p.12

4 Installation

This chapter explains the installation location and installation methods of the **NETC01-M2**.
The installation and wiring methods in compliance with the EMC Directive are also explained.

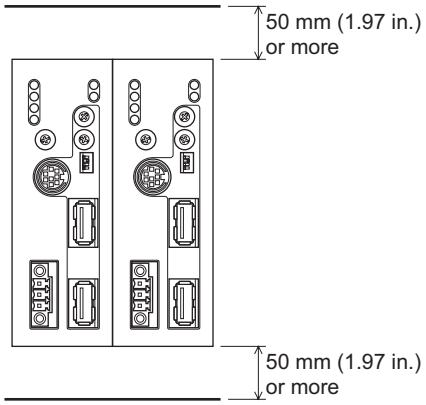
4.1 Location for installation

The **NETC01-M2** has been designed and manufactured for use as a component to be installed inside equipment.
Install it in a well-ventilated location that provides easy access for inspection. The location must also satisfy the following conditions:

- Inside an enclosure that is installed indoors (provide vent holes)
- Operating ambient temperature 0 to +40 °C (+32 to +104 °F) (non-freezing)
- Operating ambient humidity 85% or less (non-condensing)
- Area that is free of explosive atmosphere or toxic gas (such as sulfuric gas) or liquid
- Area not exposed to direct sun
- Area free of excessive amount of dust, iron particles or the like
- Area not subject to splashing water (rain, water droplets), oil (oil droplets) or other liquids
- Area free of excessive salt
- Area not subject to continuous vibration or excessive shocks
- Area free of excessive electromagnetic noise (from welders, power machinery, etc.)
- Area free of radioactive materials, magnetic fields or vacuum

4.2 Installation method

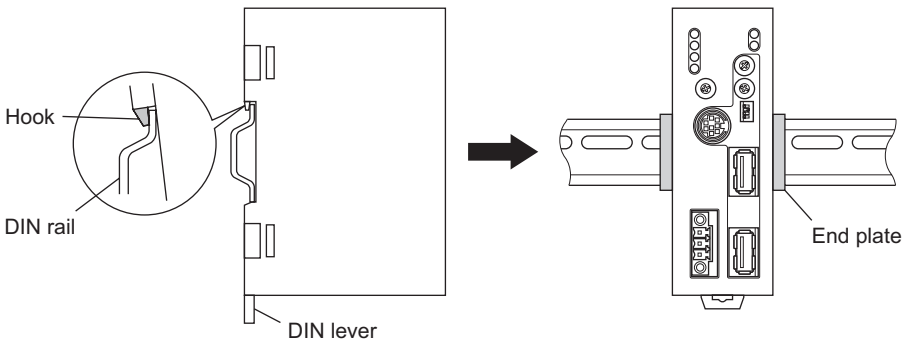
Install the **NETC01-M2** to a 35 mm (1.38 in.) width DIN rail.
There must be a clearance of at least 50 mm (1.97 in.) in the horizontal and vertical directions, between the **NETC01-M2** and enclosure or other equipment within the enclosure.
When installing two or more **NETC01-M2** in parallel, it is possible to install them closely in the horizontal direction. Provide a minimum clearance of 50 mm (1.97 in.) in the vertical direction.



Note Be sure to install the **NETC01-M2** vertically (vertical position). If the **NETC01-M2** is installed in the direction other than vertical position, its heat radiation effect will deteriorate.

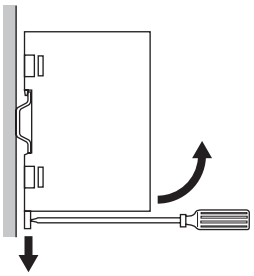
■ Mounting to DIN rail

Pull down the DIN lever of the **NETC01-M2** and lock it. Hang the hook at the rear to the DIN rail, and push in the **NETC01-M2**. After installation, secure the both sides of the **NETC01-M2** with the end plate.



Removing from DIN rail

Pull the DIN lever down until it locks using a flat tip screwdriver, and lift the bottom of the **NETC01-M2** 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.



4.3 Installing and wiring in compliance with EMC Directive

Effective measures must be taken against the EMI that the **NETC01-M2** may give to adjacent control-system equipment, as well as the EMS of the **NETC01-M2** itself, in order to prevent a serious functional impediment in the machinery. The use of the following installation and wiring methods will enable the **NETC01-M2** to be compliant with the EMC directive. Refer to "CE Marking" on p.5 for the applicable standards.
Oriental Motor conducts EMC measurements on its **NETC01-M2** in accordance with "Example of **NETC01-M2** installation and wiring" on p.10. The user is responsible for ensuring the machine's compliance with the EMC Directive, based on the installation and wiring explained below.

■ Power supply

This network converter is a product of DC power supply input.
Use a DC power supply (switching power supply etc.) that conforms to the EMC Directive.

■ Noise filter

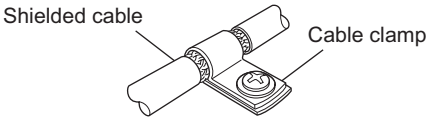
- Connect a noise filter in the DC power supply input to prevent the noise generated in the **NETC01-M2** from propagating externally through the power supply line.
- When using a power supply transformer, be sure to connect a noise filter to the AC input side of the power supply transformer.
- For a noise filter, use HF2010A-UPF (SOSHIN ELECTRIC CO.,LTD), FN2070-10-06 (Schaffner EMC) or equivalent product.
- Install the noise filter as close to the AC input terminal of DC power supply as possible. Use cable clamps and other means to secure the AC input cables (AWG18: 0.75 mm^2 or more) and output cables (AWG18: 0.75 mm^2 or more) firmly to the surface of the enclosure.
- Connect the ground terminal of the noise filter to the grounding point, using as thick and short a wire as possible.
- Do not place the AC input cable parallel with the noise filter output cable. Parallel placement will reduce noise filter effectiveness if the enclosure's internal noise is directly coupled to the power supply cable by means of stray capacitance.

■ How to ground

The cable used to ground the **NETC01-M2** and mains filter must be as thick and short as possible so that no potential difference is generated. Choose a large, thick and uniformly conductive surface for the grounding point.

■ Wiring the power supply cable and I/O signal cable

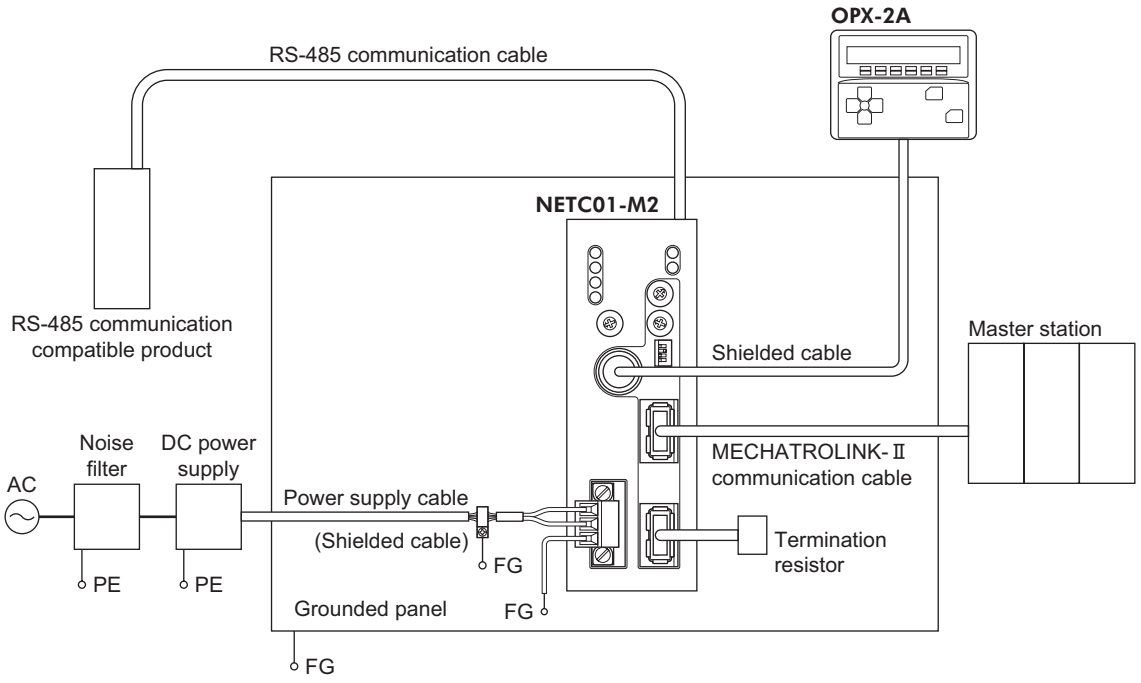
- Use a shielded cable of AWG22 (0.3 mm^2) or more for the power supply cable of the **NETC01-M2**, and keep it as short as possible.
- For the MECHATROLINK-Ⅱ communication cable, use a dedicated cable with connector.
- To ground the power supply cable , use a metal cable clamp or similar device that will maintain contact with the entire circumference of the cable. Attach a cable clamp as close to the end of the cable as possible, and connect it as shown in the figure.



■ Notes about installation and wiring

- Connect the **NETC01-M2** 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 noise filters and CR circuits to suppress surges generated by them.
- Keep cables as short as possible without coiling and bundling extra lengths.
- Place the power cables such as the motor and power supply cables as far as 100 mm (3.94 in.) from the signal cables. If the power cables and signal cables have to cross, cross them at a right angle. Place the AC input cable and output cable of a noise filter separately from each other.

■ Example of NETC01-M2 installation and wiring



■ Precautions about static electricity

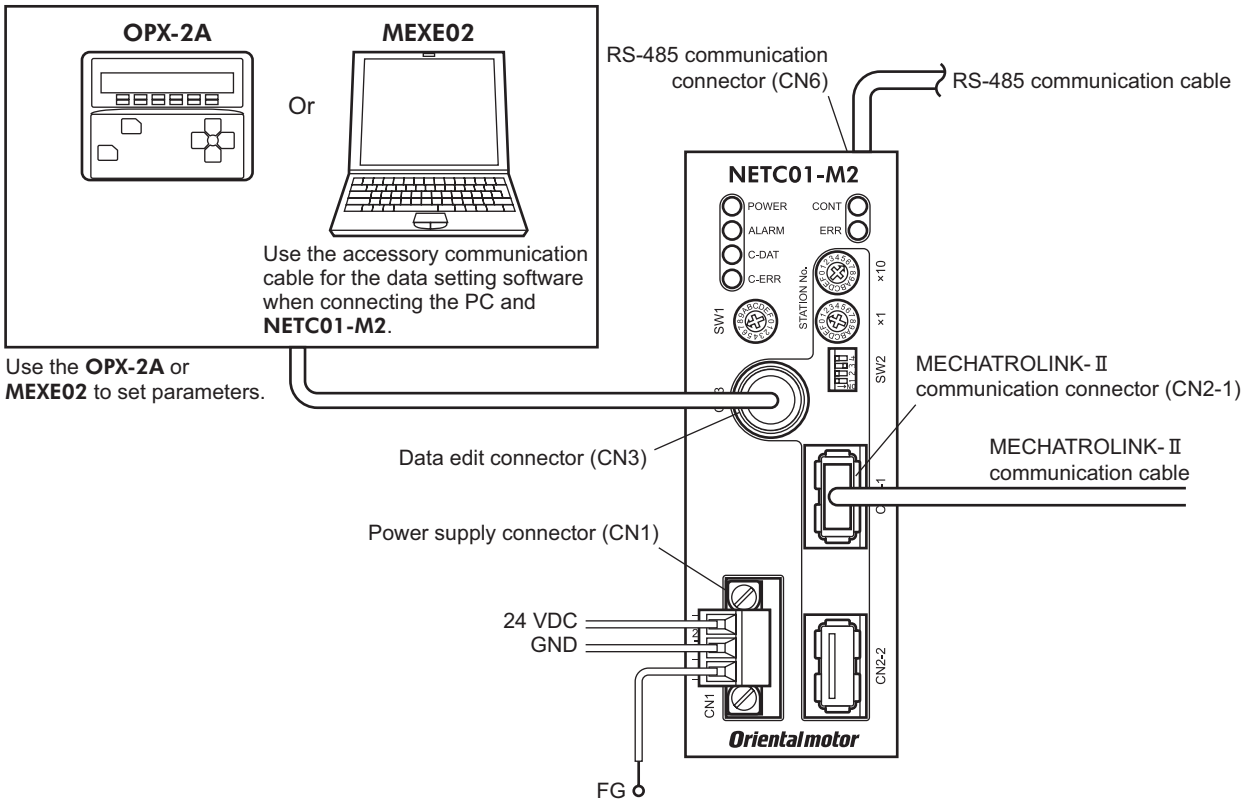
Static electricity may cause the **NETC01-M2** to malfunction or suffer damage. While the **NETC01-M2** is receiving power, handle the **NETC01-M2** with care and do not come near or touch the **NETC01-M2**. Always use an insulated screwdriver to change the switches of the **NETC01-M2**.

Note The **NETC01-M2** uses parts that are sensitive to electrostatic charge. Before touching the **NETC01-M2**, turn off the power to prevent electrostatic charge from generating. If an electrostatic charge is impressed on the **NETC01-M2**, the **NETC01-M2** may be damaged.

5 Connection

This chapter explains the connection method of the **NETC01-M2** and power supply/communication cable, as well as the grounding method.

5.1 Connection example



5.2 Connecting the power supply and grounding the NETC01-M2

■ Connecting the power supply

Connect the power supply cable (AWG22: 0.3 mm^2) to the power supply connector (CN1) of the **NETC01-M2** using the supplied CN1 connector (3 pins).

■ Grounding the NETC01-M2

Ground the Frame Ground terminal (FG) of the **NETC01-M2** as necessary.
Ground using a wire of AWG24 to 16 (0.2 to 1.25 mm^2), and do not share the protective earth terminal with a welder or any other power equipment.

■ CN1 connector pin assignments

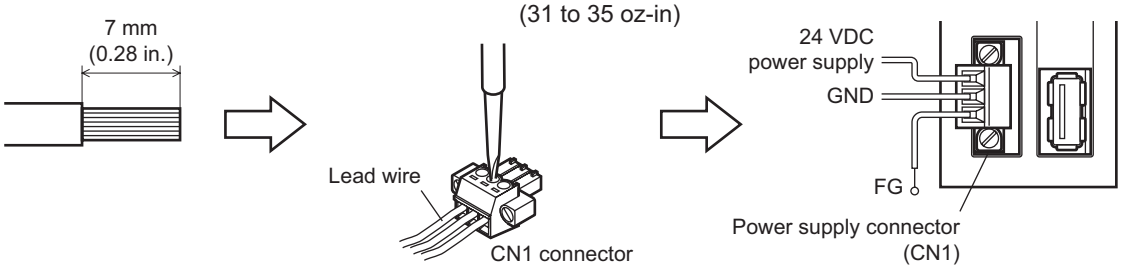
Pin No.	Signal name	Description
1	+24 VDC	+24 VDC 0.2 A or more
2	GND	Power supply GND
3	FG	Frame Ground

Note

- When connecting, pay attention to the polarity of the power supply. Reverse-polarity connection may cause damage to the **NETC01-M2**.
- Do not wire the power supply cable of the **NETC01-M2** in the same cable duct with other power lines. Doing so may cause malfunction due to noise.

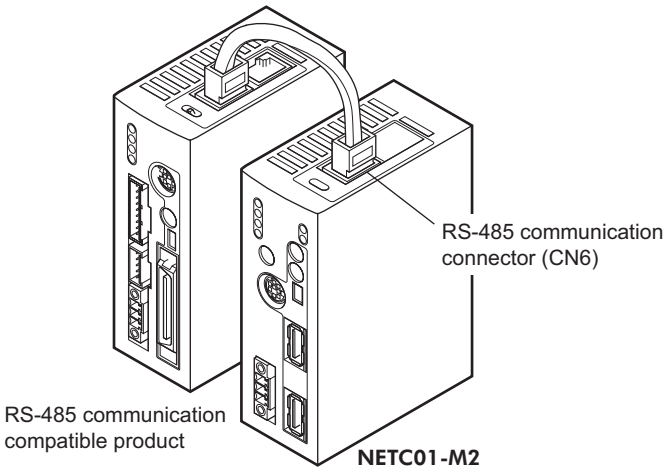
■ Connecting method

1. Strip the insulation cover of the lead wire by 7 mm (0.28 in.)
2. Insert each lead wire into the CN1 connector and tighten the screw using a screwdriver.
   Connector screw size: M2
   Tightening torque: 0.22 to 0.25 N·m (31 to 35 oz-in)
3. Insert the CN1 connector into the CN1 and tighten the screws using a screwdriver.
   Connector screw size: M2.5
   Tightening torque: 0.4 N·m (56 oz-in)



5.3 Connecting the RS-485 communication cable

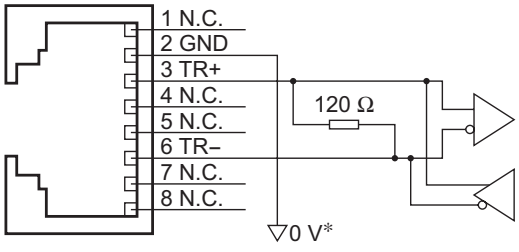
Connect the **NETC01-M2** and RS-485 communication compatible product using the supplied RS-485 communication cable.
Connect the RS-485 communication cable to RS-485 communication connector (CN6). Since RS-485 communication cables of two lengths are supplied, use either one of the two.
You can also use a commercial LAN cable to link drivers.



■ CN6 connector pin assignments

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

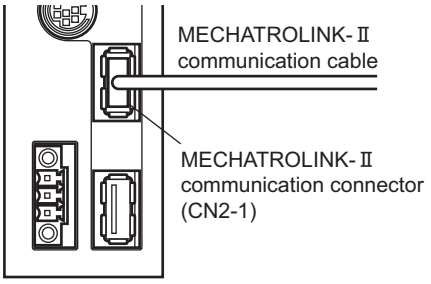
• **NETC01-M2** internal circuit and termination resistor



* The GND line is used in common with CN1 (not insulated)

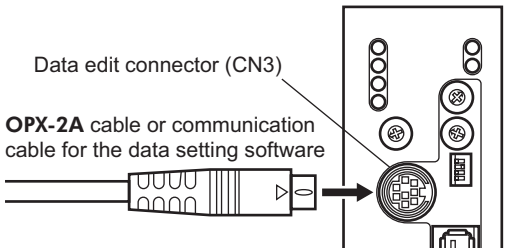
5.4 Connecting the MECHATROLINK-Ⅱ communication

Connect the MECHATROLINK-Ⅱ communication cable to the MECHATROLINK-Ⅱ communication connector (CN2-1 or CN2-2) of the **NETC01-M2**. For the MECHATROLINK-Ⅱ communication cable, use a dedicated cable with connector. Other MECHATROLINK-Ⅱ communication compatible products can be connected to the vacant connector.
Connect a termination resistor to the **NETC01-M2** that is positioned at the end from the master device.



5.5 Connecting the data setter

Connect the **OPX-2A** cable or communication cable for the data setting software to the data edit connector (CN3) on the **NETC01-M2**.



⚠ Caution

The power supply connector (CN1), MECHATROLINK-Ⅱ communication connector (CN2-1, CN2-2), data edit connector (CN3) and RS-485 communication connector (CN6) of the **NETC01-M2** 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 **NETC01-M2** and these equipment to short, damaging both.

6 Guidance

If you are new to the **NETC01-M2**, read this section to understand the operating methods along with the operation flow.
As an example, this chapter explains how to perform positioning operation for the "**CRK** Series FLEX Built-in controller type [described as the **CRD-KD** in this manual]," using the **NETC01-M2** via MECHATROLINK-Ⅱ communication.

Note
- Before operating the motor, check the condition of the surrounding area to ensure safety.
- Refer to "13.4 Parameter mode" on p.51 for how to set parameters.

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

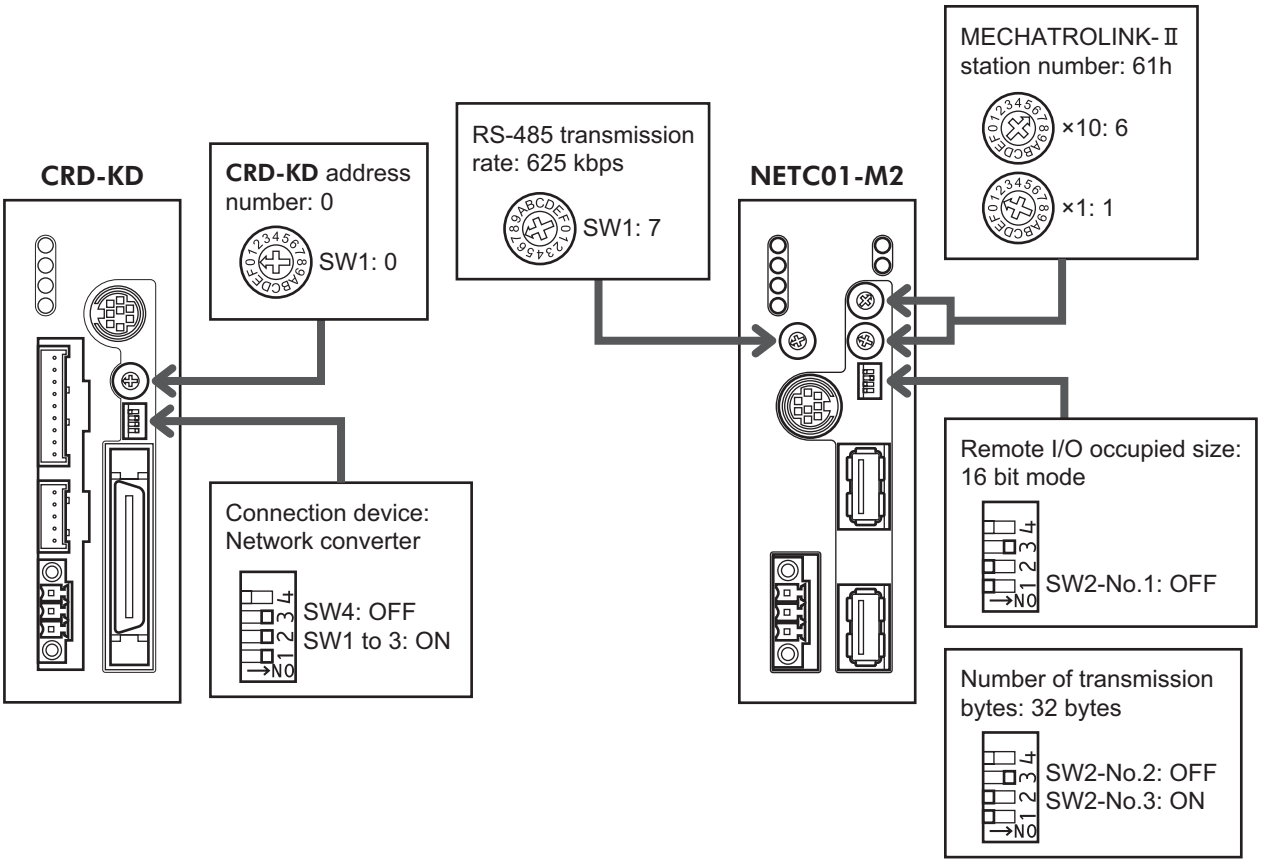
■ Using the parameter

1. Set the "connection (address number 0)" parameter of the **NETC01-M2** to "1: Enable."
2. Cycle the **NETC01-M2** power.

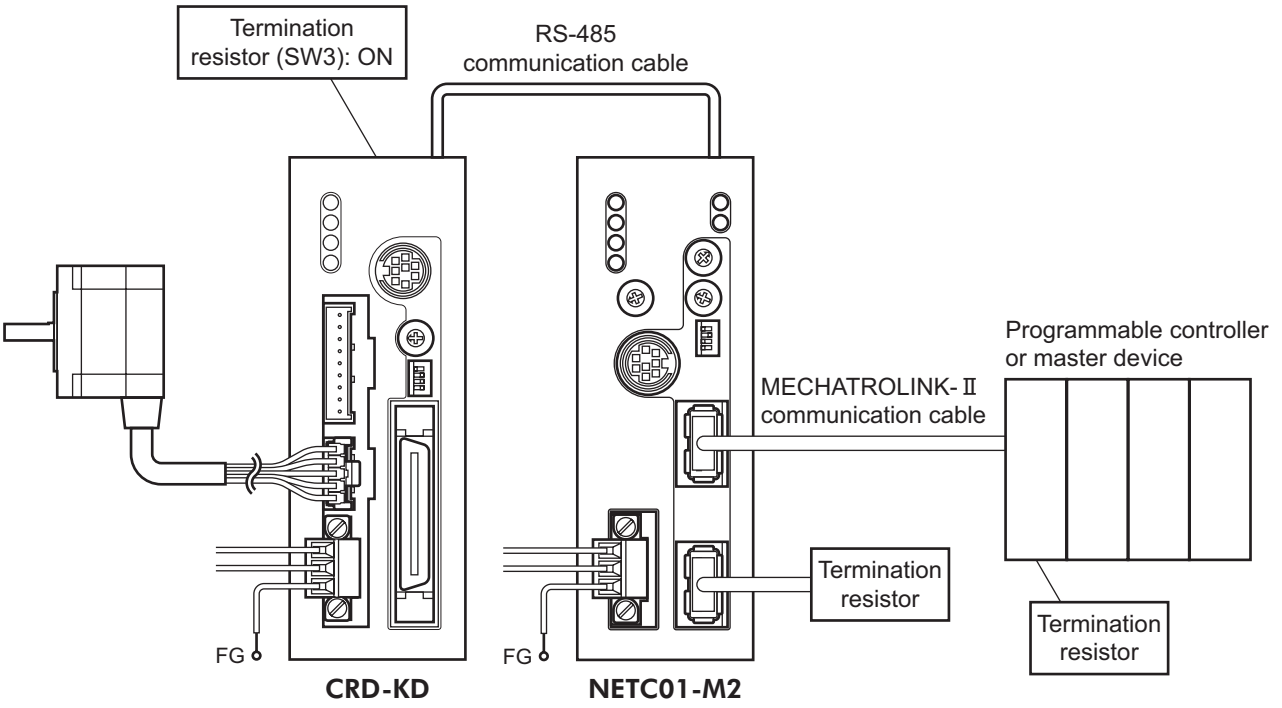
Note
- "Connection" parameters will be enabled after the power is cycled.
- When setting the parameters of the **NETC01-M2**, use the **OPX-2A** or **MEXE02**.

■ Using the switches

- **Setting condition of CRD-KD**
  - Address number of **CRD-KD**: 0
  - Connection device of **CRD-KD**: Network converter
- **Setting condition of NETC01-M2**
  - MECHATROLINK-Ⅱ station address: 61h
  - RS-485 transmission rate: 625 kbps
  - Remote I/O occupied size: 16 bit mode
  - Number of transmission bytes: 32 bytes

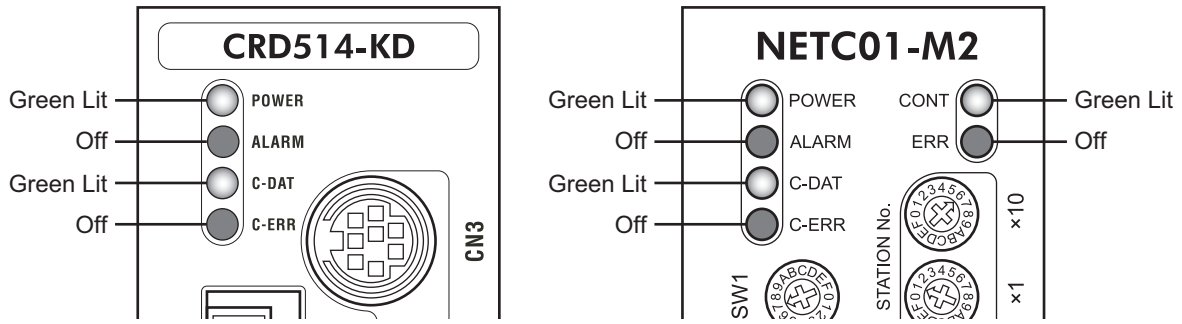


STEP 2 Check the connection and set the termination resistor



STEP 3 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 **CRD-KD** 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 type of the MECHATROLINK-Ⅱ communication error.

STEP 4 Set the parameters of CRD-KD

Set the parameters of the **CRD-KD** using any of the **OPX-2A**, **MEXE02**, RS-485 communication or MECHATROLINK-Ⅱ communication.

1. Set the "START input mode (1C00h)" parameter of the **CRD-KD** to "0: RS-485 communication." (Initial setting: I/O)
2. Set the position (travel amount: 1001h) and operating speed (1101h) to the operation data No.1 of the **CRK-KD**.
3. Set the "Data No. input mode (1C0Dh)" parameter of the **CRD-KD** to "0: RS-485 communication." (Initial setting: I/O)
4. Set the "STOP contact configuration (1C03h)" parameter of the **CRD-KD** to "0: Normally open." (Initial setting: Normally closed)

Note

- Operation data or parameters set via RS-485 communication or MECHATROLINK-Ⅱ communication will be written to the RAM of the **CRD-KD**. The data stored in the RAM will be erased when turning off the power supply of the **CRD-KD**. When saving the data to the non-volatile memory, execute the "batch NV memory write" command of the maintenance command.
- The operation data or parameters set by the **OPX-2A** or **MEXE02** will be saved to the non-volatile memory of the **CRD-KD**.
- The non-volatile memory can be rewritten approx. 100,000 times.

STEP 5 Execute positioning operation

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

1. Select the data No.1 by turning the M0 of the address number 0 to ON.
2. Execute positioning operation by turning the START of the address number 0 to ON.

STEP 6 Were you able to operate the motor properly?

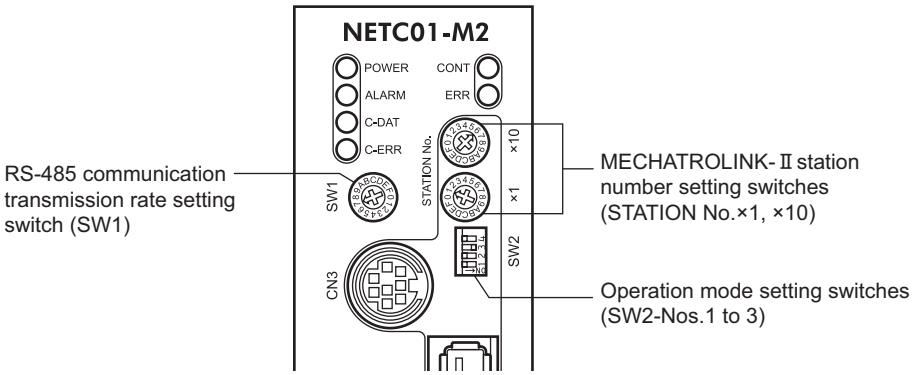
How did it go? Were you able to operate the motor properly? If the motor does not function, check the following points:

- Is any alarm present in the **NETC01-M2** or **CRD-KD**?
- Are the address number, transmission rate and termination resistor set correctly?
- Are the "connection" parameters of the **NETC01-M2** set correctly?
- Is the C-ERR LED lit? (RS-485 communication error)
- Is the ERR LED lit? (MECHATROLINK-Ⅱ communication error)
- Is the operation data set correctly?
- Is the motor for the **CRD-KD** excited? Or is the excitation setting correct?
- Are the **CRD-KD** parameters set correctly?
- Is the STOP input of the **CRD-KD** I/O turned ON?

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

7 Setting

This chapter explains how to set the functions of the **NETC01-M2**.



Note Be sure to turn off the **NETC01-M2** 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 **NETC01-M2** power is cycled.

7.1 Transmission rate of RS-485 communication

Set the transmission rate using the transmission rate setting switch (SW1).

Factory setting **7 (625 kbps)**

Note
- For the SW1, always set to "7." If the switch is set to the dial of "8" or higher, the communication switch setting error alarm will be generated when turning on the power. And do not set the switch to the dial of "0" to "6" because they cannot be used. (An alarm will not be generated.)
- For the transmission rate of the RS-485 communication compatible product, set to 625 kbps.

7.2 Operation mode

Set the remote I/O occupied size and number of transmission bytes for the RS-485 communication compatible product connecting to a **NETC01-M2**. Set the remote I/O occupied size using the operation mode setting switch SW2-No.1, and set the number of transmission bytes using the SW2-No.2 and No.3. If the operation mode is changed, cycle the power.

Factory setting **No.1: OFF (Remote I/O occupied size: 16 bit mode)**
No.2: OFF, No.3: ON (Number of transmission bytes: 32 bytes)

SW2	Description	Factory setting
No.1	Sets the remote I/O occupied size. OFF: 16 bit mode (Up to 8 units can be connected) ON: 8 bit mode (Up to 16 units can be connected)	OFF
No.2 No.3	Sets the number of transmission bytes. No.2=OFF, No.3=OFF: 17 bytes No.2=OFF, No.3=ON: 32 bytes	No.2: OFF No.3: ON

Note The SW2-No.4 is not used.

7.3 Station address

Set the station address using the two MECHATROLINK-Ⅱ station address setting switches (STATION No.×1 and ×10). When connecting two or more MECHATROLINK-Ⅱ compatible products, do not set duplicate station address.
Set the tens place with the "STATION No.×10" switch and the ones place with the "STATION No.×1" switch.

Setting range **60h to 7Fh**
Factory setting **61h (×10: 6, ×1: 1)**

Note 00h to 5Fh and 80h to FFh cannot be used.

8 MECHATROLINK-Ⅱ communication format

This chapter explains the MECHATROLINK-Ⅱ communication format that the **NETC01-M2** supports.

8.1 Data format

The outline of the data format for MECHATROLINK-Ⅱ communication is shown below. The **NETC01-M2** is compatible with the cyclic communication mode.

The cyclic communication mode of MECHATROLINK-Ⅱ communication specifies that the header fields are 1 byte to 4 bytes and the data fields are 5 bytes and later.

	Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
Header field	1	DATA_RWA (50h)	DATA_RWA (50h)
	2	OPTION	ALARM
	3		STATUS
	4		
Data field	5 to 31	Command data field	Response data field

8.2 Phase

The communication phases of MECHATROLINK-Ⅱ communication are classified as follows.

Phase	Description
0	This is a state at power-on. When turning on the power for the master station and slave station, operation switches to phase 1.
1	This is a state waiting for the connection establishment between the master station and slave station.
2	Asynchronous communication between the master station and slave station is enabled. Only asynchronous command can be used.
3	Synchronous communication between the master station and slave station is enabled. Both asynchronous command and synchronous command can be used.
4	This is a state that the communication between the master station and slave station is stopped and the connection is disconnected.
5	This is a state turning off the power for the master station and slave station.

9 Details of command

This chapter explains the common commands and I/O command that the **NETC01-M2** supports.

Profile	Command code (Hex)	Command	Description	Ref.
Common command	00	NOP	This command is used as "no operation command."	p.20
	03	ID_RD	This command is used to read the product information as ID data.	p.22
	05	ALM_RD	This command is used to read the alarm code, warning code or MECHATROLINK-Ⅱ communication error code that is currently occurred.	p.24
	06	ALM_CLR	This command is used to reset the alarm, warning or MECHATROLINK-Ⅱ communication error that is currently occurred.	p.24
	0E	CONNECT	This command is used to establish a connection of MECHATROLINK-Ⅱ communication.	p.25
	0F	DISCONNECT	This command is used to release a connection of MECHATROLINK-Ⅱ communication.	p.26
I/O command	50	DATA_RWA	Operation commands to the RS-485 communication compatible product, reading and writing parameters, and monitoring can be executed via remote I/O or remote register.	p.27

9.1 No operation command (NOP: 00H)

This command is used as "no operation command." A response returns the present status.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	NOP (00h)	NOP (00h)
2	Reserved (0h)	ALARM
3		STATUS
4		
5 to 15		Reserved (0h)
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Network command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=NOP (=00h) and STATUS.CMDRDY=1.
Note	ALARM: Error code occurred in communication STATUS: Communication status

■ ALARM

Code	Name	Description	Phase at error	Transition phase after error	ALARM/ WARNING	ALM-CLR
01h	Invalid Command	Unsupported command • Executed the command that was not implemented.	P1 to P4	Phase not changed	WARNING	Possible
02h	Command Not Allowed	Command execution condition error • The command that has been sent is inconsistency with the communication phase. • The command execution conditions are not met.	P2, P3			
03h	Invalid Data	Outside the range of command data • The data in the command is not correct.	P2, P3			

■ STATUS bit allocations

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Vendor-specific					CMDRDY	WARNG	ALARM

bit 15	bit 14	bit 13	bit 12	bit 11	bit 10	bit 9	bit 8
Vendor-specific							

Explanation of bit field

Item	Definition	Description
ALARM	0: No alarm 1: Alarm status	If the MECHATROLINK-Ⅱ communication error has occurred between the master station and **NETC01-M2**, the STATUS bit 0 becomes "1" (ALARM=1). Even if an alarm generates in the **NETC01-M2** or RS-485 communication compatible product, it will not become "1." Refer to p.39 for the **NETC01-M2** alarm.
WARNG	0: No warning 1: Warning status	If "unsupported command," "command execution condition error" or "outside the range of command data" has occurred between the master station and **NETC01-M2**, the STATUS bit 1 becomes "1" (WARNING=1). Refer to p.42 for details. Even if a warning generates in the **NETC01-M2** or RS-485 communication compatible product, it will not become "1." Refer to p.42 for the **NETC01-M2** warning.
CMDRDY	0: Command cannot be accepted. 1: Command can be accepted.	CMDRDY=0 (the STATUS bit 2 is equal to "0") represents that the **NETC01-M2** is executing command processing. When the STATUS bit 2 becomes "1" (CMDRDY=1), a new command can be accepted.

■ WDT/RWDT

When synchronization has been established, the watchdog timer (WDT) executes checking. Updating the WDT can be refreshed even if synchronization has not been established.

- **WDT**

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
SN: Copy of RSN in RWDT				MN: Incremented by 1 each communication cycle (Master station WDT count)			

- **RWDT**

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
RSN: Incremented by 1 each communication cycle (Slave station WDT count)				RMN: Copy of MN in WDT			

9.2 Read ID command (ID_RD: 03h)

This command is used to read the product information as ID data. Select ID data by specifying the DEVICE_CODE.
Refer to the "DEVICE_CODE list" for details.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	ID_RD (03h)	ID_RD (03h)
2	Reserved (0h)	ALARM
3		STATUS
4		
5	DEVICE_CODE	DEVICE_CODE
6	OFFSET	OFFSET
7	SIZE	SIZE
8 to 15	Reserved (0h)	ID
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Data communication command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=ID_RD (=03h), STATUS.CMDRDY=1, DEVICE_CODE, OFFSET and SIZE.
Note	DEVICE_CODE: Device code OFFSET: Read offset Size: Read data size (byte)

■ DEVICE_CODE list

<table>
<tr><th>DEVICE_
CODE</th><th>Description</th><th>Data size</th><th>Data type</th></tr>
<tr><td rowspan="2">00h</td><td>Product model</td><td>32 char</td><td>ASCII</td></tr>
<tr><td colspan="3">This is a code to specify the product model.
<table>
<tr><td>00</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td>09</td><td>0A</td><td>0B</td><td>0C</td><td>0D</td><td>0E</td><td>0F</td></tr>
<tr><td>N</td><td>E</td><td>T</td><td>C</td><td>0</td><td>1</td><td>-</td><td>M</td><td>2</td><td>00</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>1A</td><td>1B</td><td>1C</td><td>1D</td><td>1E</td><td>1F</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
* Data end delimiter: Null code (00) is added at the end of each character string.</td></tr>
<tr><td rowspan="2">01h</td><td>Manufacture serial</td><td>32 char</td><td>ASCII</td></tr>
<tr><td colspan="3">This is a manufacture serial number.
<table>
<tr><td>00</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td>09</td><td>0A</td><td>0B</td><td>0C</td><td>0D</td><td>0E</td><td>0F</td></tr>
<tr><td>00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>1A</td><td>1B</td><td>1C</td><td>1D</td><td>1E</td><td>1F</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
* Data end delimiter: Null code (00) is added at the end of each character string.</td></tr>
<tr><td rowspan="2">02h</td><td>Device version</td><td>32 char</td><td>ASCII</td></tr>
<tr><td colspan="3">This is a code to specify the device version.
<table>
<tr><td>00</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td>09</td><td>0A</td><td>0B</td><td>0C</td><td>0D</td><td>0E</td><td>0F</td></tr>
<tr><td>0</td><td>1</td><td>.</td><td>0</td><td>0</td><td>00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>1A</td><td>1B</td><td>1C</td><td>1D</td><td>1E</td><td>1F</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
* Data end delimiter: Null code (00) is added at the end of each character string.</td></tr>
<tr><td rowspan="2">0Fh</td><td>Vendor code</td><td>48 byte</td><td>BIN/ASCII</td></tr>
<tr><td colspan="3">This is a code to specify the vendor.
<table>
<tr><td>00</td><td>01</td><td>02</td><td>03</td><td>04</td><td>05</td><td>06</td><td>07</td><td>08</td><td>09</td><td>0A</td><td>0B</td><td>0C</td><td>0D</td><td>0E</td><td>0F</td></tr>
<tr><td>05</td><td>00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>1A</td><td>1B</td><td>1C</td><td>1D</td><td>1E</td><td>1F</td></tr>
<tr><td>O</td><td>R</td><td>I</td><td>E</td><td>N</td><td>T</td><td>A</td><td>L</td><td></td><td>M</td><td>O</td><td>T</td><td>O</td><td>R</td><td></td><td>C</td></tr>
<tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>1A</td><td>1B</td><td>1C</td><td>1D</td><td>1E</td><td>1F</td></tr>
<tr><td>o</td><td>.</td><td>,</td><td>L</td><td>T</td><td>D</td><td>.</td><td>00</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
* Data end delimiter: Null code (00) is added at the end of each character string.</td></tr>
</table>

9.3 Read alarm or warning command (ALM_RD: 05h)

This command is used to read the alarm code, warning code or MECHATROLINK-Ⅱ communication error code that is currently occurred.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	ALM_RD (05h)	ALM_RD (05h)
2	Reserved (0h)	ALARM
3		STATUS
4		
5	ALM_RD_MODE	ALM_RD_MODE
6 to 15	Reserved (0h)	ALM_DATA
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Control command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=ALM_RD (=05h) and STATUS. CMDRDY=1.
Note	ALM_RD_MODE 0: Reads the present alarm or warning status.

9.4 Clear alarm or warning command (ALM_CLR: 06h)

This command is used to reset the MECHATROLINK-Ⅱ communication error that is currently occurred.

Note Only the MECHATROLINK-Ⅱ communication error can be reset by the "clear alarm or warning command." To reset the alarm and warning of the **NETC01-M2**, cycle the power.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	ALM_CLR (06h)	ALM_CLR (06h)
2	Reserved (0h)	ALARM
3		STATUS
4		
5	ALM_CLR_MODE	ALM_CLR_MODE
6 to 15	Reserved (0h)	Reserved (0h)
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Control command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=ALM_CLR (=06h) and STATUS.CMDRDY=1.
Note	ALM_CLR_MODE 0: Resets the MECHATROLINK-Ⅱ communication error that is currently occurred.

9.5 Establish connection command (CONNECT: 0Eh)

This command is used to establish the MECHATROLINK-Ⅱ communication connection.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	CONNECT (0Eh)	CONNECT (0Eh)
2	Reserved (0h)	ALARM
3		STATUS
4		Reserved (0h)
5	VER (21h)	VER (21h)
6	COM_MODE	COM_MODE
7	COM_TIME	COM_TIME
8 to 15	Reserved (0h)	Reserved (0h)
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Network command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=CONNECT (=0Eh), STATUS.CMDRDY=1, VER, COM_MODE and COM_TIME.
Note	• VER: Version number in the application layer • COM_MODE: Communication mode

■ COM_MODE bit allocations

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
DATA_EXP	0	0	0	DTMOD		SYNCMOD	0

Explanation of bit field

Item	Description
DATA_EXP	Data area extension 0: Padded with zero (0) for the byte 17 to byte 31 1: The byte 17 to byte 31 are extended areas (effective with 32-byte mode)
DTMODE	Communication mode 00: Single transmission 01: Consecutive transmission (Not used in the **NETC01-M2**) 10, 11: Reserved
SYNCMODE	Synchronous setting 0: Asynchronous communication (Detecting the watchdog data error is disabled and synchronous command cannot be used.) 1: Synchronous command (Not used in the **NETC01-M2**)

9.6 Release connection command (DISCONNECT: 0Fh)

This command is used to release a connection of MECHATROLINK-Ⅱ communication.
This command is given priority over other commands. When the DISCONNECT command is received while processing the other command, the current command is stopped processing and the connection is released.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	DISCONNECT (0Fh)	DISCONNECT (0Fh)
2	Reserved (0h)	ALARM
3		STATUS
4		
5 to 15		Reserved (0h)
16	WDT	RWDT
17 to 31	Reserved (0h)	Reserved (0h)

■ Explanation of command

Device group	Common command group
Function group	Network command group
Communication type	Asynchronous command
Completion of command operation	Controls the command transmitting time of the mater station as at least two communication cycles.

9.7 Data READ/WRITE_A command (DATA_RWA: 50h)

Operation commands to the RS-485 communication compatible product, reading and writing parameters, and monitoring can be executed via remote I/O or remote register.

- **Remote I/O**

  Remote I/O is one of the data used in communication between the master station and RS-485 communication compatible product. The control like the ON-OFF switching of I/O signals can be executed using serial communication.
  When remote I/O of the **NETC01-M2** is assigned to the register of the master station, it is possible to control using remote I/O via the **NETC01-M2**. The following functions can be executed using remote I/O.
  - Controls the ON-OFF status of the input signal to the RS-485 communication compatible product.
  - Checks the output signal from the RS-485 communication compatible product.

- **Remote register**

  Remote register is one of the data used in communication between the master station and RS-485 communication compatible product. Reading and writing the numerical number can be executed using serial communication.
  When remote register of the **NETC01-M2** is assigned to the register of the master station, it is possible to control using remote register via the **NETC01-M2**. The following functions can be executed using remote register.
  - Reads the parameters from the RS-485 communication compatible product.
  - Writes the parameters to the RS-485 communication compatible product.
  - Monitors the status of the RS-485 communication compatible product.

■ Data format

Byte	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	DATA_RWA (50h)	DATA_RWA (50h)
2	OPTION	ALARM
3		STATUS
4		
5 to 16	OUTPUT	INPUT
17 to 31	OUTPUT	INPUT

■ Explanation of command

Device group	I/O command group
Function group	Data communication command group
Communication type	Asynchronous command
Completion of command operation	Confirms by the response byte 1=DATA_RWA (=50h) and STATUS. CMDRDY=1.
Note	• This command can be used in the phase 2 and 3. • OUTPUT: Output data • INPUT: Input data • Refer to the "I/O data."

■ Connection status

The connection status with the RS-485 communication compatible product can be monitored by the response of the DATA_RWA command. For the connection status shown in the next section "I/O data," when the master station properly communicates with the RS-485 communication compatible product, the bit corresponding to the address number shown in the table below becomes "1." If the connection setting is disabled or if the communication error has occurred, the bit becomes "0."

bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
Address number 7	Address number 6	Address number 5	Address number 4	Address number 3	Address number 2	Address number 1	Address number 0
Address number 15	Address number 14	Address number 13	Address number 12	Address number 11	Address number 10	Address number 9	Address number 8

■ I/O data

The OUTPUT and INPUT respectively correspond to the command and response of the data field as shown below.

Controlling the I/O signal of the RS-485 communication compatible product, reading and writing operation data or parameters, and monitoring can be executed.

In the following cases, the most significant bit of the register address number response becomes "1."

- When "communication (address number)" parameter specifies the address number of "0: Disabled"
- When the power supply of the RS-485 communication compatible product is not turned on

- **Remote I/O occupied size: 16-bit mode**
  Number of transmission bytes: 17-byte mode

Byte	Part	Type	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
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				
9			Address number "1" remote I/O input	Address number "1" remote I/O output
10				
11			Address number "2" remote I/O input	Address number "2" remote I/O output
12				
13			Address number "3" remote I/O input	Address number "3" remote I/O output
14				
15		–	Reserved	Reserved
16				

- **Remote I/O occupied size: 16-bit mode**
  Number of transmission bytes: 32-byte mode

Byte	Part	Type	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	Header field	–	DATA_RWA (50h)	DATA_RWA (50h)
2			OPTION	ALARM
3				STATUS
4				
5	Data field	–	Reserved	Connection status
6				
7		RemoteI/O	Address number "0" remote I/O input	Address number "0" remote I/O output
8				
9			Address number "1" remote I/O input	Address number "1" remote I/O output
10				
11			Address number "2" remote I/O input	Address number "2" remote I/O output
12				
13			Address number "3" remote I/O input	Address number "3" remote I/O output
14				
15			Address number "4" remote I/O input	Address number "4" remote I/O output
16				
17			Address number "5" remote I/O input	Address number "5" remote I/O output
18				
19			Address number "6" remote I/O input	Address number "6" remote I/O output
20				
21			Address number "7" remote I/O input	Address number "7" remote I/O output
22				
23		Remote register	Register address number	Register address number response
24				
25			Command code + TRIG	Command code response + TRIG response + STATUS
26				
27 to 30			DATA	DATA response
31		–	Reserved	Reserved

- **Remote I/O occupied size: 8-bit mode**
  Number of transmission bytes: 17-byte mode

Byte	Part	Type	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
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		–	Reserved	Reserved

- **Remote I/O occupied size: 8-bit mode**
  Number of transmission bytes: 32-byte mode

Byte	Part	Type	Command (Master to **NETC01-M2**)	Response (**NETC01-M2** to master)
1	Header field	–	DATA_RWA (50h)	DATA_RWA (50h)
2			OPTION	ALARM
3				STATUS
4				
5	Data field	–	Reserved	Connection status
6				
7		RemoteI/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			Address number "8" remote I/O input	Address number "8" remote I/O output
16			Address number "9" remote I/O input	Address number "9" remote I/O output
17			Address number "10" remote I/O input	Address number "10" remote I/O output
18			Address number "11" remote I/O input	Address number "11" remote I/O output
19			Address number "12" remote I/O input	Address number "12" remote I/O output
20			Address number "13" remote I/O input	Address number "13" remote I/O output
21			Address number "14" remote I/O input	Address number "14" remote I/O output
22			Address number "15" remote I/O input	Address number "15" remote I/O output
23		Remote register	Register address number	Register address number response
24				
25			Command code + TRIG	Command code response + TRIG_R + STATUS
26				
27 to 30			DATA	DATA response
31		–	Reserved	Reserved

9.8 Timing chart of the data READ/WRITE_A command

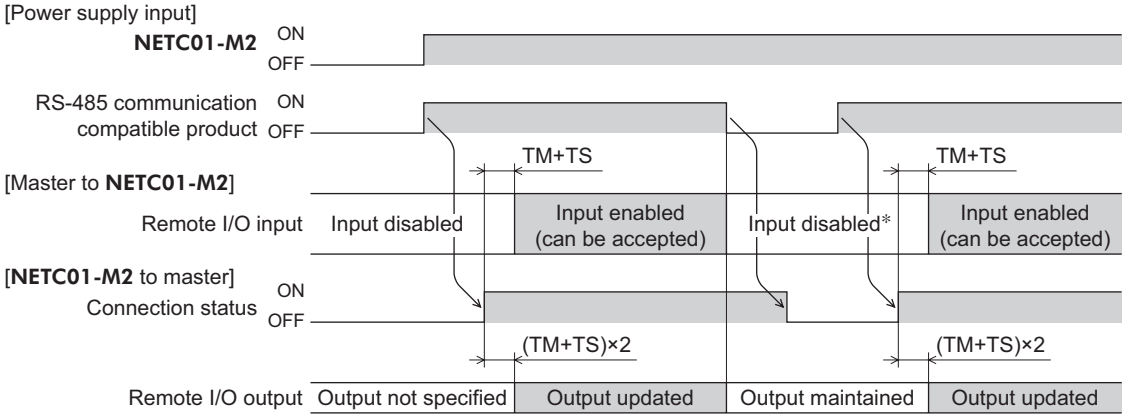
The command codes in the following timing charts are examples of the **AR** Series FLEX DC power input Built-in controller type.

TM: Communication cycle between the master station and **NETC01-M2**

TS: Communication cycle between the **NETC01-M2** and RS-485 communication compatible product.

■ When the power supply is turned on (remote I/O)

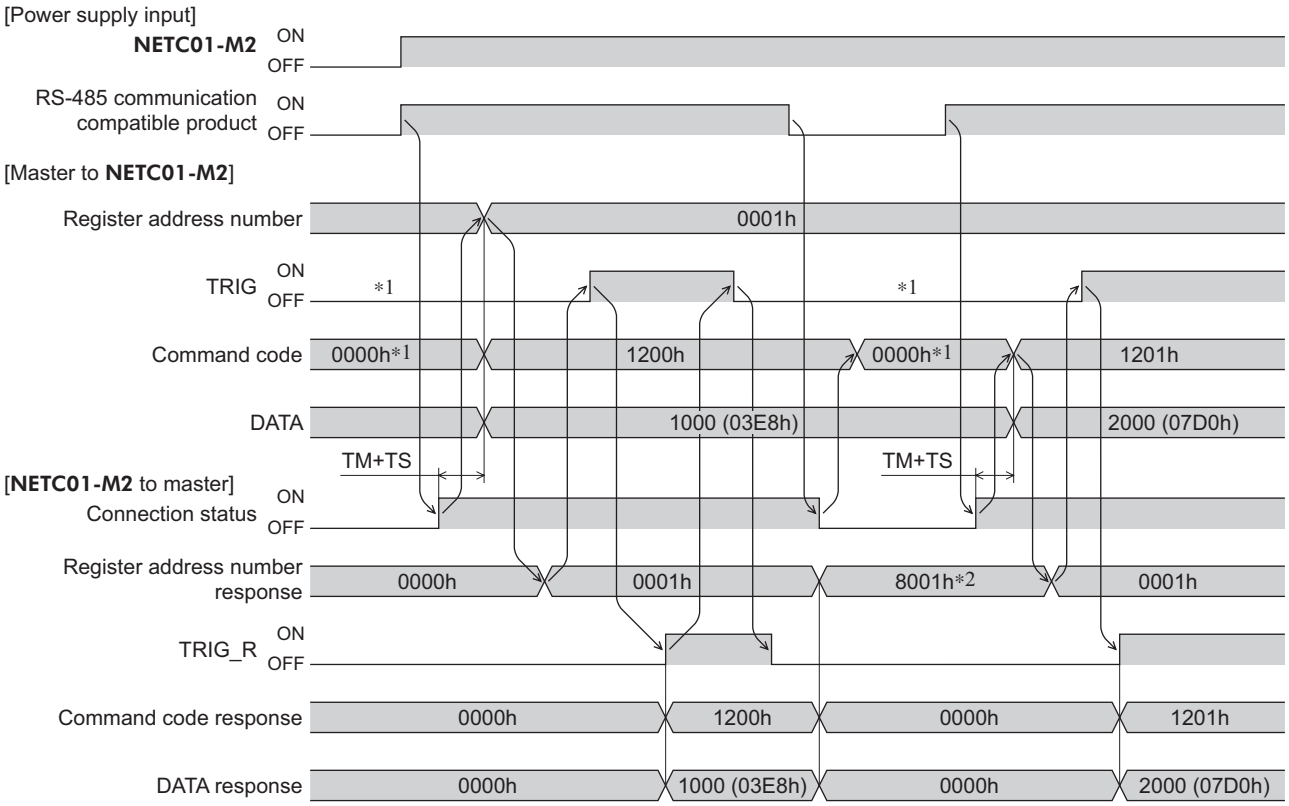
1) Turn on the power supply of the **NETC01-M2**.
2) Turn on the power supply of the RS-485 communication compatible product.
3) Check the connection status is turned from OFF to ON.



* When the connection status is OFF, turn the signals to start operation (START, HOME etc.) to OFF.

■ When the power supply is turned on (remote register)

1) Turn on the power supply of the **NETC01-M2**.
2) Turn on the power supply of the RS-485 communication compatible product.
3) Check the connection status is turned from OFF to ON. For the next step, refer to the next section "read parameter and operation data (remote register)."

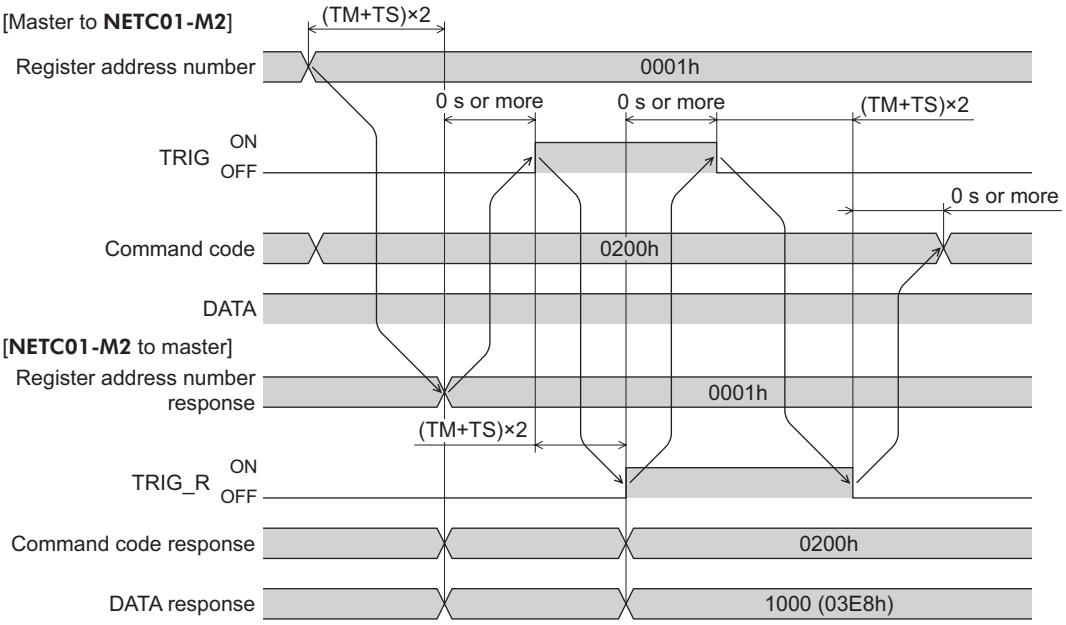


*1 When the connection status is OFF, set the command code to "0000h" and turn the TRIG to OFF.
*2 When the power supply of the RS-485 communication compatible product is OFF, the most significant bit of the register address number response becomes "1."

■ Read parameters and operation data (remote register)

1) Specify the register address number.
2) Check the register address number response.
3) Turn the TRIG from OFF to ON. The selected parameter or operation data is started reading.
4) After checking the TRIG_R was turned from OFF to ON, check the command code response and DATA response.
5) Turn the TRIG from ON to OFF, and check that the TRIG_R was turned from ON to OFF.

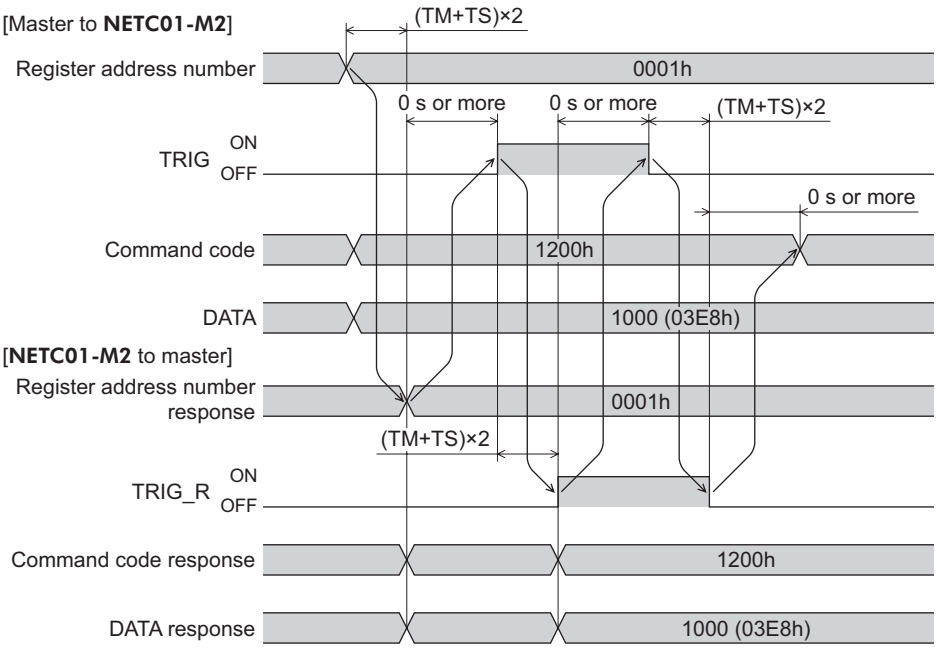
When reading the "position (1000)" of the operation data No.0



■ Write parameters and operation data (remote register)

1) Specify the register address number.
2) Check the register address number response.
3) Turn the TRIG from OFF to ON. The selected parameter or operation data is started writing.
4) After checking the TRIG_R was turned from OFF to ON, check the command code response and DATA response.
5) Turn the TRIG from ON to OFF, and check that the TRIG_R was turned from ON to OFF.

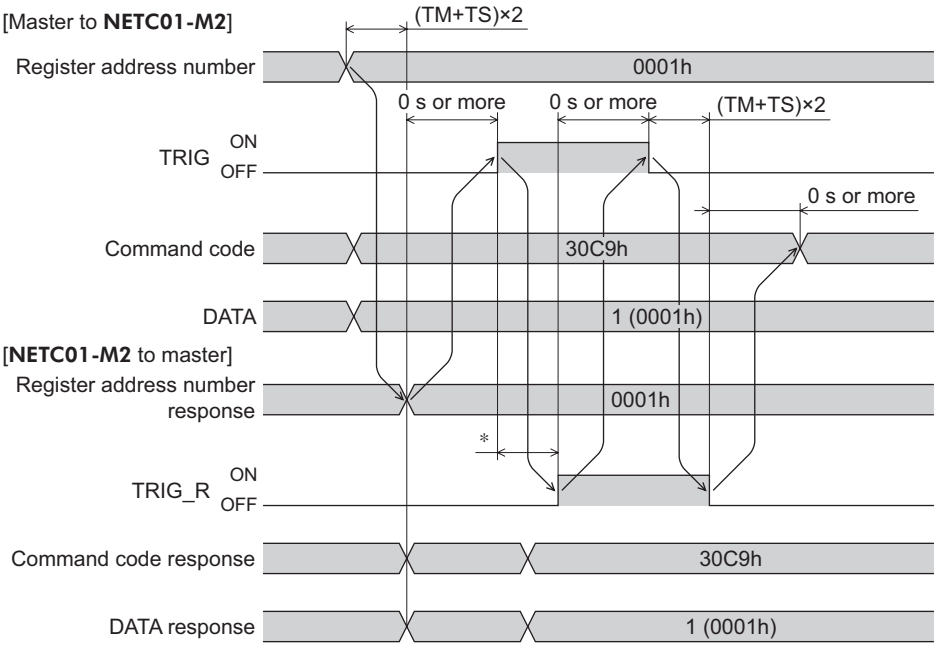
When writing 1000 to the "position" of the operation data No.0



■ Maintenance (remote register)

1) Specify the register address number.
2) Check the register address number response.
3) Turn the TRIG from OFF to ON. The selected maintenance command is executed.
4) After checking the TRIG_R was turned from OFF to ON, check the command code response and DATA response.
5) Turn the TRIG from ON to OFF, and check that the TRIG_R was turned from ON to OFF.

When executing "batch NV memory write"

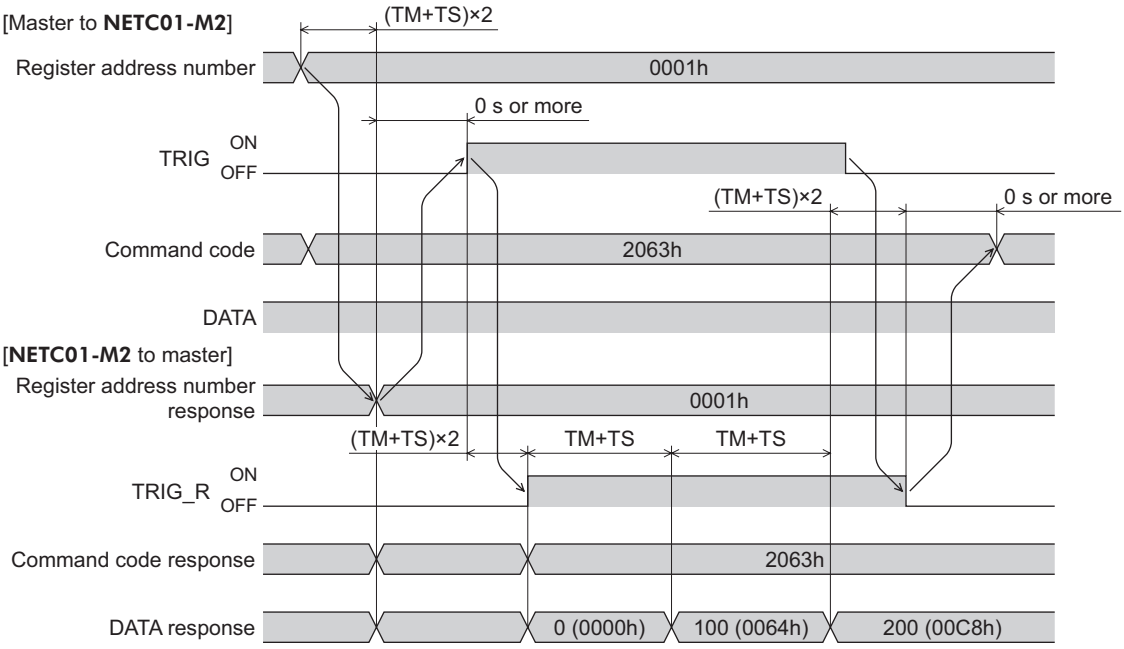


* It varies depending on the type of the RS-485 communication compatible products or commands.

■ Monitor (remote register)

1) Specify the register address number.
2) Check the register address number response.
3) Turn the TRIG from OFF to ON. The selected monitor command is executed.
4) After checking the TRIG_R was turned from OFF to ON, check the command code response and DATA response.
   The DATA response value is updated while the TRIG is ON.
5) Turn the TRIG from ON to OFF, and check that the TRIG_R was turned from ON to OFF.

When monitoring the "command position"

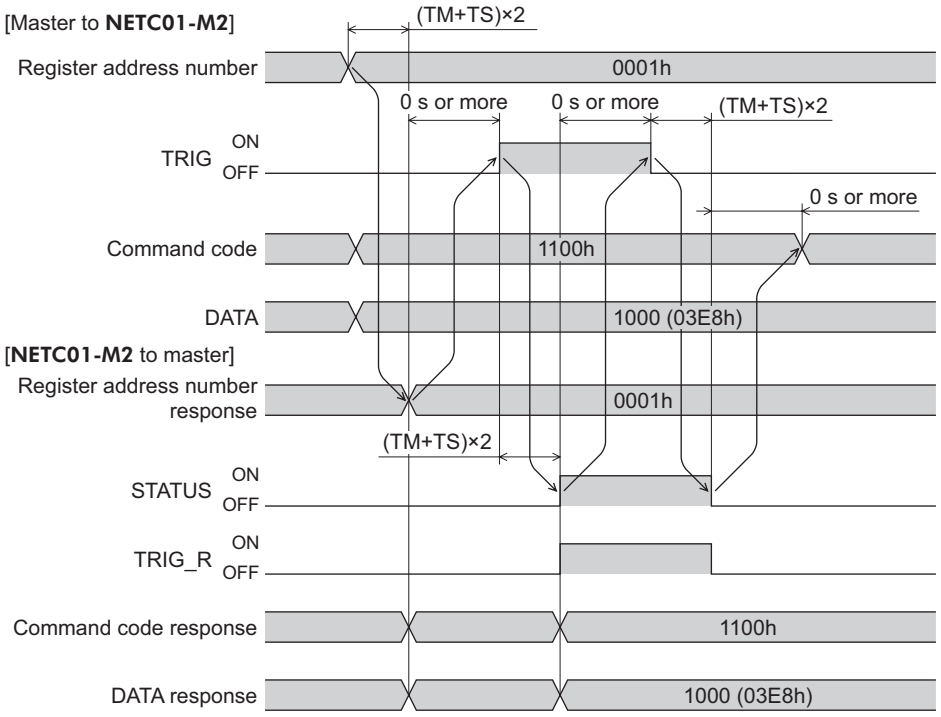


■ When an error has occurred (remote register)

1) Specify the register address number.
2) Check the register address number response.
3) Turn the TRIG from OFF to ON. The selected parameter or operation data is started writing.
4) When the written value is an error, the STATUS is turned from OFF to ON. Check the command code and DATA.
5) Turn the TRIG from ON to OFF, and reset the error status.

Note If an error has occurred in data transfer, the STATUS is turned ON.

When specifying data that is outside the setting range (write 1000 to the "STOP input action" parameter)

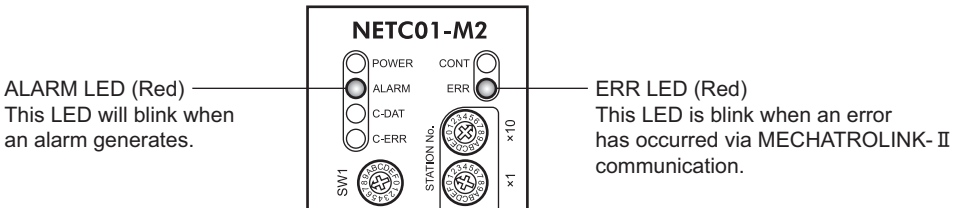


10 Troubleshooting and remedial actions

The **NETC01-M2** provides alarms that are designed to protect the **NETC01-M2** from poor connection, error in operation, etc. (protective functions), as well as warnings that are output before the corresponding alarms generate (warning functions).

10.1 Alarms and MECHATROLINK-Ⅱ communication error

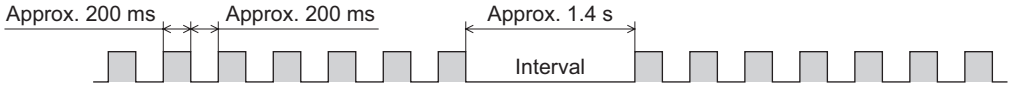
If an alarm has generated, the ALARM LED of the **NETC01-M2** blinks.
When the MECHATROLINK-Ⅱ communication error has occurred, the ERR LED blinks.



■ When an alarm in the NETC01-M2 unit was generated

If an alarm in the **NETC01-M2** unit has generated, RS-485 communication is stopped and the ALARM LED blinks.
The present alarm can be checked by counting the number of times the ALARM LED blinks. The present alarm can be also checked using the **OPX-2A** or **MEXE02**.
You can check the records of up to ten most recent alarms starting from the latest one, or clear the alarm records.

- **ALARM LED status (Example: RS-485 communication error)**



Note If an alarm is generated, the communication between the **NETC01-M2** and RS-485 communication compatible product is stopped. When RS-485 communication is stopped, the parameter command, maintenance command and monitor command of the RS-485 communication compatible product cannot be used.

- **Alarm reset**

Before resetting an alarm to cycle the power, always remove the cause of the alarm and ensure safety.

Note The alarm in the **NETC01-M2** unit cannot be reset by the **OPX-2A**, **MEXE02** or via MECHATROLINK-Ⅱ communication.

■ When the MECHATROLINK-Ⅱ communication error has occurred

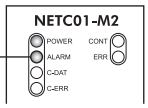
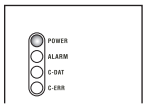
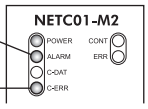
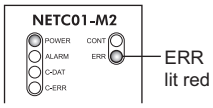
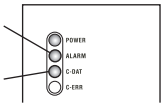
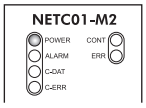
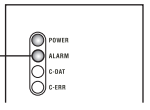
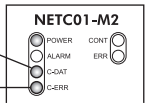
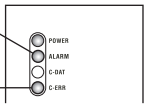
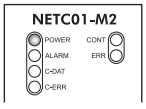
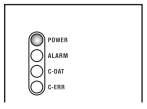
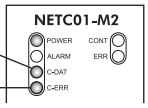
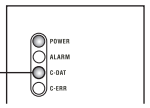
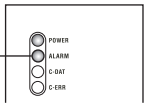
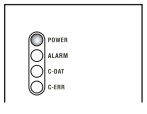
If the MECHATROLINK-Ⅱ communication error has occurred, the ERR LED blinks.
The motor operation is stopped but RS-485 communication is continued.

How to reset the MECHATROLINK-Ⅱ communication error

Perform one of the reset operations specified below. Before resetting the MECHATROLINK-Ⅱ communication error to cycle the power, always remove the cause of the error and ensure safety.

- Execute the alarm reset for the **NETC01-M2** or RS-485 communication compatible product using the **OPX-2A** or **MEXE02**.
- Cycle the power of the **NETC01-M2** or master device.
- Execute the clear alarm or warning command (ALM_CLR: 06h) of MECHATROLINK-Ⅱ communication.

■ List of alarm and MECHATROLINK-Ⅱ communication error

<table>
<tr><th rowspan="2">Product</th><th rowspan="2">Type</th><th colspan="2">LED status</th><th rowspan="2">Alarm code</th></tr>
<tr><th>NETC01-M2</th><th>RS-485 communication compatible product</th></tr>
<tr><td rowspan="4">NETC01-M2 unit</td><td rowspan="4">Alarm</td><td>ALARM blinking 9 times
  </td><td rowspan="4">POWER only lit
  </td><td>A1h</td></tr>
<tr><td rowspan="2">ALARM blinking 7 times
C-ERR lit red
  </td><td>E3h</td></tr>
<tr><td>E4h</td></tr>
<tr><td>E6h</td></tr>
<tr><td rowspan="3">Between master and NETC01-M2</td><td rowspan="3">MECHATROLINK-Ⅱ communication error</td><td rowspan="3">NETC01-M2
ERR lit red
  </td><td rowspan="3">ALARM blinking 7 times
C-DAT lit green
  </td><td>01h</td></tr>
<tr><td>02h</td></tr>
<tr><td>03h</td></tr>
<tr><td rowspan="5">Between NETC01-M2 and RS-485 communication compatible product</td><td rowspan="5">MECHATROLINK-Ⅱ communication error</td><td>POWER only lit
  </td><td>ALARM blinking 7 times
  </td><td rowspan="5">–</td></tr>
<tr><td>C-DAT lit green
C-ERR lit red
  </td><td>ALARM blinking 7 times
C-ERR lit red
  </td></tr>
<tr><td>POWER only lit
  </td><td>POWER only lit
  </td></tr>
<tr><td rowspan="3">C-DAT lit green
C-ERR lit red
  </td><td>C-DAT lit green
  </td></tr>
<tr><td>ALARM blinking 7 times
  </td></tr>
<tr><td>POWER only lit
  </td></tr>
</table>

Alarm type	System status	Cause	Remedial action
EEPROM error	Communication between the **NETC01-M2** and RS-485 communication compatible product cannot be performed.	The stored data of the **NETC01-M2** was damaged.	Initialize data using any of the maintenance command, **OPX-2A** or **MEXE02**.
Communication switch setting error		The transmission rate setting switch (SW1) of RS-485 communication was set outside the range (8 and above).	Set the transmission rate setting switch (SW1) to "7".
RS-485 communication error		The RS-485 communication error has been detected three times consecutively.	• Check the transmission rate of RS-485 communication. • Check the connector or cable of RS-485 communication.
Network connection product error		The "communication (address number)" parameter is outside the setting range.	Set either of "0: Disable" or "1: Enable."
Unsupported command	Communication between the **NETC01-M2** and master station cannot be performed.	The command that was not implemented was executed.	Re-examine the command sending sequence of the master station.
Command execution condition error		• The order (sequence) of the command that has been sent is not correct. • The command not being permitted in the current phase was executed.	
Outside the range of command data		The data in the command was not correct.	Re-examine the command data content that the master station sends.
–	Communication between the **NETC01-M2** and RS-485 communication compatible product cannot be performed.	The power supply of the **NETC01-M2** was shut off while communicating via RS-485 communication.	Check the power supply of the **NETC01-M2**.
		The setting of the SW1 of the **NETC01-M2** is not the same as that of the transmission rate of RS-485 communication compatible product.	Check the setting of the switch.
		The "communication (address number)" parameter is set to "0: Disable."	Set the "communication (address number)" parameter to "1: Enable."
	Communication between the **NETC01-M2** and RS-485 communication compatible product cannot be performed.	The RS-485 communication compatible product corresponding to the "communication (address number)" parameter does not exist.	Check the address number of the RS-485 communication compatible product.
		The communication of the RS-485 communication compatible product was shut off while communicating.	• Check the RS-485 communication cable. • Check the power supply of the RS-485 communication compatible product.
		When the RS-485 communication cable was connected incompletely or it was not connected, the power supply was turned on.	Check the RS-485 communication cable.

10.2 Warning

The present warning can be checked using the **OPX-2A** or **MEXE02**. You can also check the records of up to ten most recent warnings starting from the latest one, or clear the warning records.
If a warning is generated, the motor will continue to operate. Once the cause of the warning is removed, the warning will be reset automatically.

Note The warning records can be cleared by turning off the **NETC01-M2** power.

Warning code	Warning type	Cause	Remedial action
E4h	RS-485 communication error	The RS-485 communication error was detected.	• Check the transmission rate of RS-485 communication. • Check the connector or cable of RS-485 communication.
E5h	RS-485 communication timeout	Even though the receiving cycle of RS-485 communication has passed, the response frame was not completed receiving.	• Check the connector or cable of RS-485 communication. • Check the power supply of the RS-485 communication compatible product.

11 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.

- Are any of the **NETC01-M2** DIN rail mounting parts loose?
- Are any of the connection parts of the **NETC01-M2** loose?
- Is there attachment of dust, etc., on the **NETC01-M2**?
- Are there any strange smells or appearances within the **NETC01-M2**?

Note The **NETC01-M2** uses semiconductor elements. Handle the **NETC01-M2** with care since static electricity may damage semiconductor elements. Static electricity may damage the **NETC01-M2**.

12 General specifications

■ Environment specification

	Operation environment	Storage environment Shipping environment
Ambient temperature	0 to +40 °C (+32 to +104 °F) (non-freezing)	−25 to +70 °C (−13 to +158 °F) (non-freezing)
Humidity	85% or less (non-condensing)	
Altitude	Up to 1000 m (3300 ft.) above sea level	Up to 3000 m (10000 ft.) above sea level
Surrounding atmosphere	No corrosive gas, dust, water or oil	

■ Insulation specification

Insulation resistance	Between FG terminal and power supply terminals	100 MΩ or more when 500 VDC megger is applied
Dielectric strength		Sufficient to withstand 500 VAC at 50/60 Hz applied for 1 minute, leak current 10 mA or less.

■ RS-485 communication specification

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.
Communication mode	Half duplex, Asynchronous mode (data: 8 bits, stop bit: 1 bit, parity: none)
Transmission rate	625 kbps
Protocol	Frame size: 10 bytes (fix), binary transmission
Maximum number of connected units	8 units or 16 units (it varies depending on the operation mode.)

■ MECHATROLINK-Ⅱ communication specification

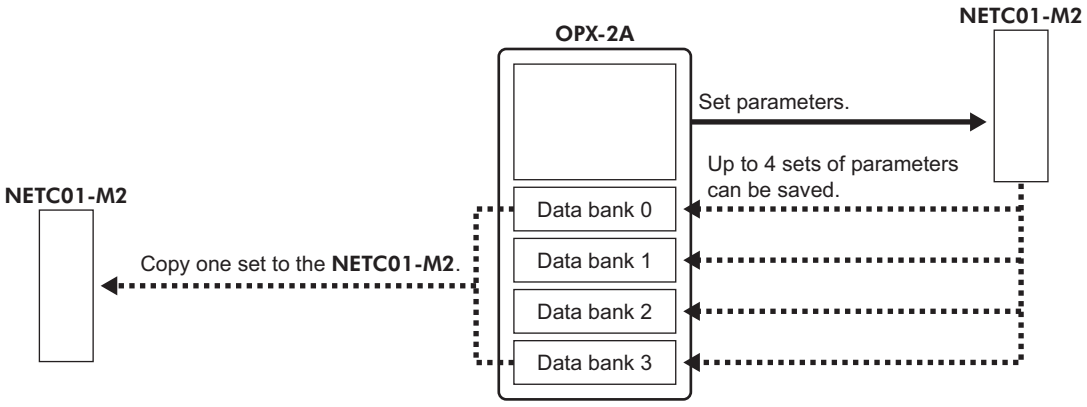
Type of Connection	Bus topology
Transmission cable	MECHATROLINK-Ⅱ dedicated cable (STP cable, impedance 130 Ω) To connect the **NETC01-M2**, the dedicated cable with connector is recommended.
Transmission distance	50 m (164 ft.) maximum
Distance between stations	500 mm (19.69 in.) minimum
Baud rate	10 Mbps
Data encoding method	Manchester encoding
Access control method	Master - Slave
Electrical insulation between devices and transmission lines	Transformer
Number of stations connected	Up to 30 stations
Station address	60h to 7Fh (Factory setting: 61h)
Communication mode	Cyclic communication mode (Asynchronous command)
Transmission cycle	0.5/1.0/1.5/2.0/2.5/3.0/3.5/4.0/8.0 ms
Data size	17 bytes or 32 bytes (Factory setting: 32 bytes)
Implemented commands	Intelligent I/O command

13 Operation using the OPX-2A

This chapter explains the overview and operation using the **OPX-2A**.

13.1 Overview of the OPX-2A

The **OPX-2A** is a data setter that lets you set parameters and monitor the communication time.
In addition, the **OPX-2A** can be used to save the data of **NETC01-M2**. There are four destinations (data banks) to save data.



The **OPX-2A** can be used for the following purposes:

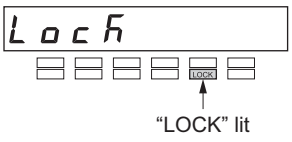
- The parameters for the **NETC01-M2** can be set.
- The communication time and status can be monitored.
- The alarm records can be checked and cleared.
- The parameters set in the **NETC01-M2** can be saved to the **OPX-2A**.
- The parameters saved in the **OPX-2A** can be copied to another **NETC01-M2** connected to the **OPX-2A**.

■ Edit lock function

Enable the edit lock function if you want to prevent parameters from being edited or cleared. Parameters cannot be changed or deleted while the edit lock function is enabled.

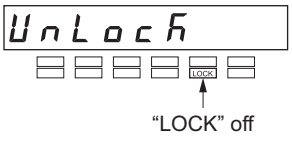
- **Setting the edit lock function**

In the top screen of each operation mode, press the【MODE/ESC】key for at least 5 seconds.
The display will show “LocK” and the edit lock function will be enabled.
The “LOCK” LED in the LED indicator area will also be lit.

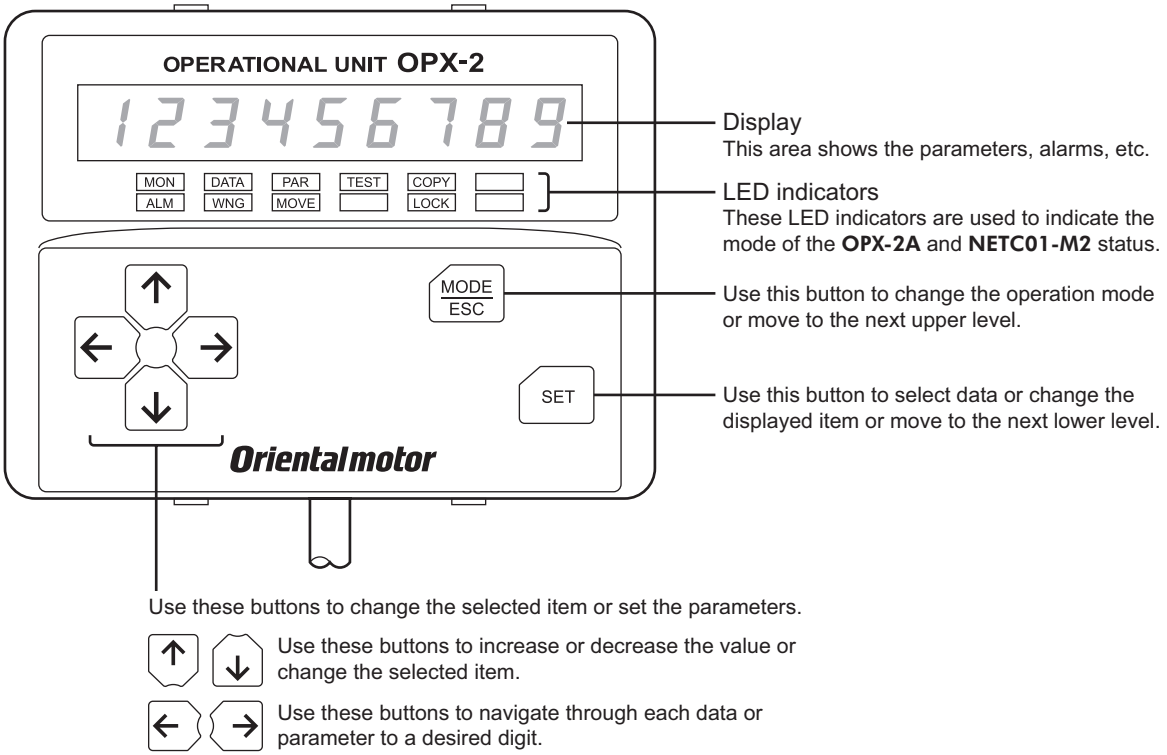


- **Canceling the edit lock function**

Again in the top screen of each operation mode, press the【MODE/ESC】key for at least 5 seconds.
The display will show “UnLocK” and the edit lock function will be cancelled. The “LOCK” LED in the LED indicator area will turn off.

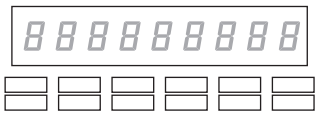


13.2 Names and functions of parts



13.3 Notation

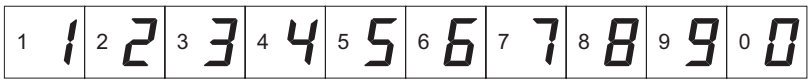
In this manual, keys are denoted by symbols, such as [MODE/ESC][SET][↑][↓][←][→].
In figures, a simplified illustration of the display and LED indicators is used, as shown below.



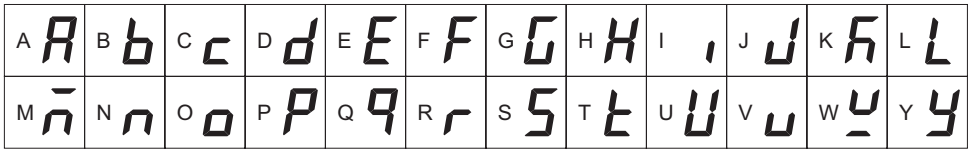
13.4 How to read the display

The display consists of 7-segment LEDs. (The number “5” and alphabet “S” are the same.)

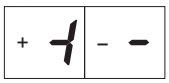
- Numbers



- Alphabets

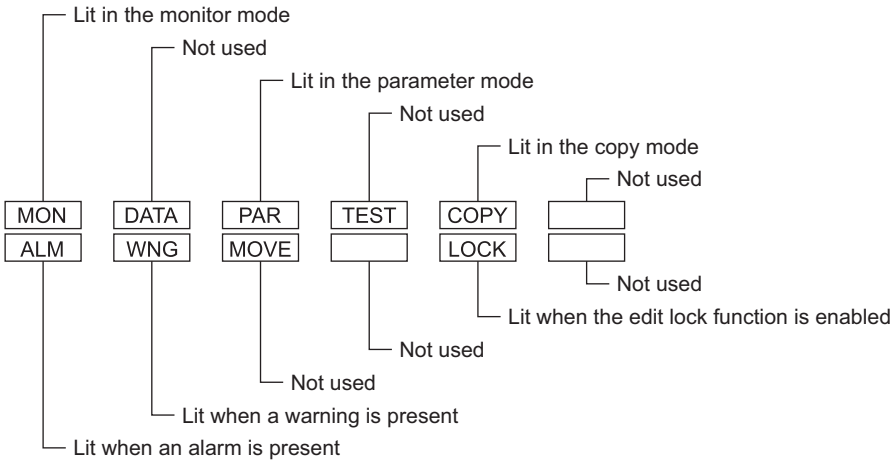


- Signs



■ How to read the LED indicators

When the operation mode is changed or an alarm or warning generates, a corresponding LED will be lit. While the edit lock function is enabled, the condition is also indicated by the illumination of a corresponding LED.

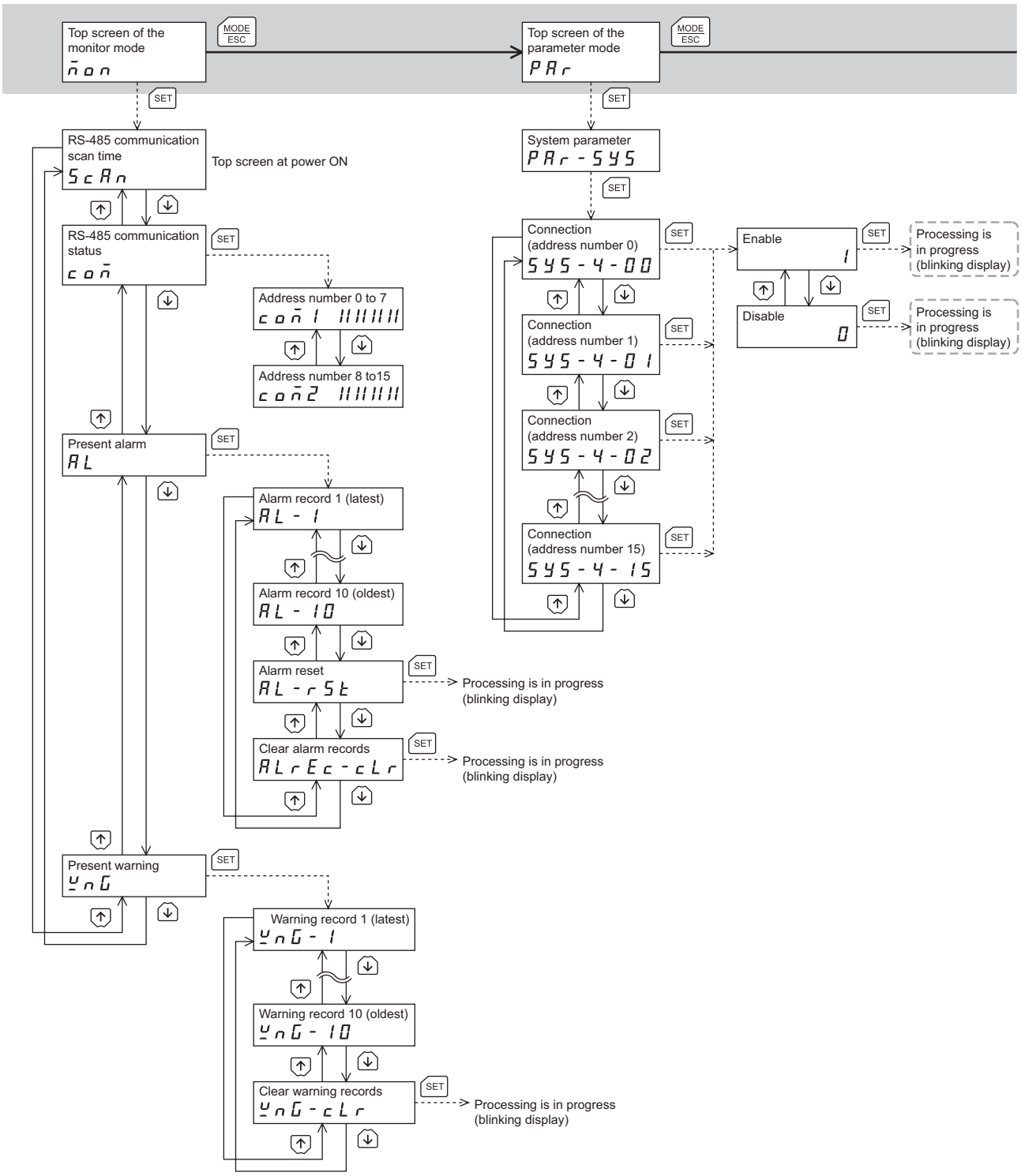


13.5 OPX-2A error display

Errors displayed on the **OPX-2A** are explained.

Error display	Meaning	Action
t inEoUt 1.1	A communication error occurred between the **OPX-2A** and **NETC01-M2**.	• Check if the **OPX-2A** is connected securely. • Check if the **OPX-2A** cable is disconnected or damaged. • The **OPX-2A** or the communication part of the **NETC01-M2** may have damaged. Contact your nearest Oriental Motor sales office.

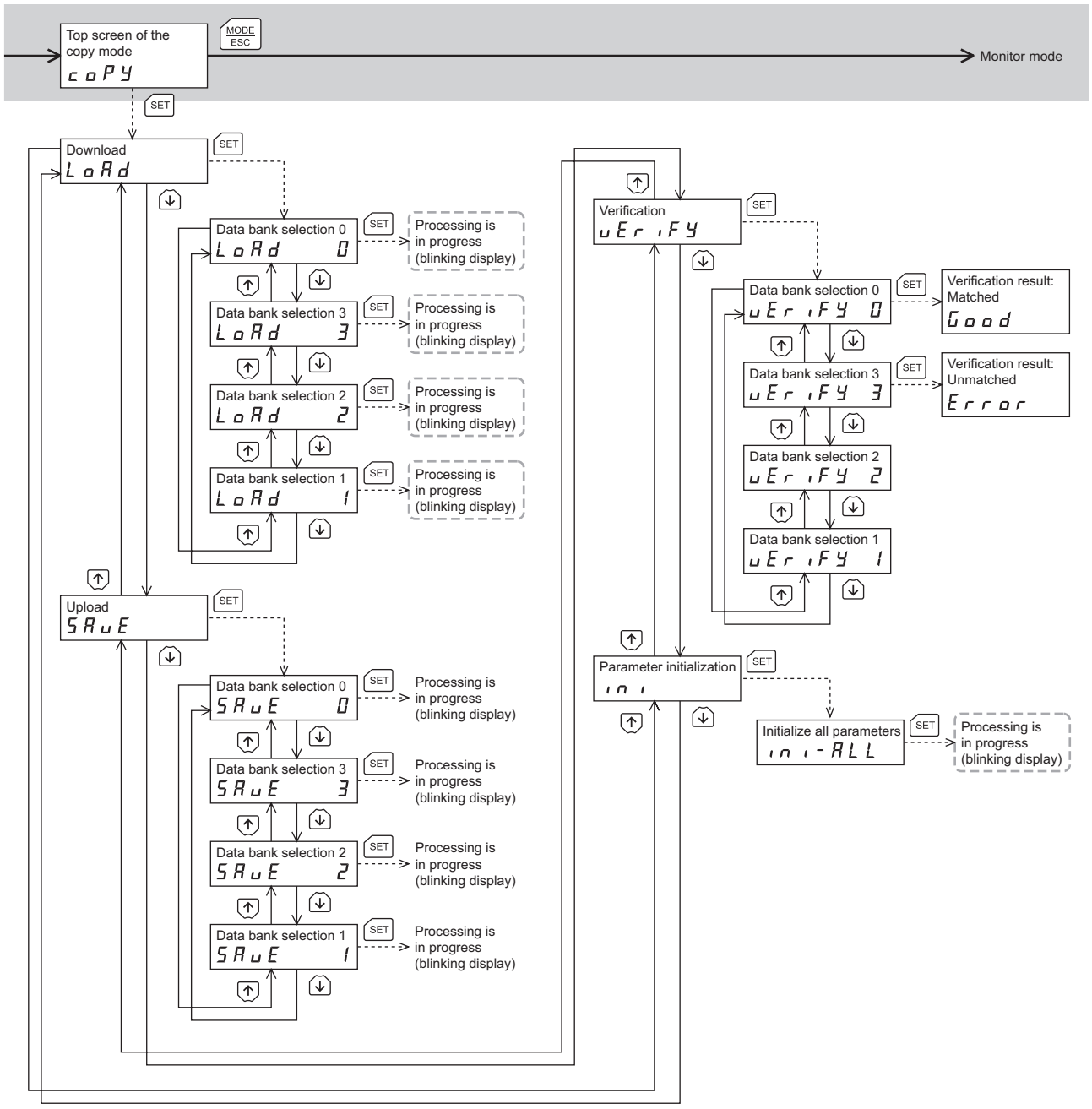
13.6 Screen transitions



In the lower level except the top screen, press the MODE ESC key to return to the previous level.

Note

- For the parameter mode and copy mode, if the【SET】key is pressed while processing the memory of the **NETC01-M2** via MECHATROLINK-Ⅱ communication, the screen cannot move to the lower level from the top screen and "mEm-busy" is displayed. Be sure to wait until the memory processing is completed, before pressing the【SET】key.
- The following limitations are present while the edit lock function is enabled.
  − Parameter mode, copy mode: Although they are displayed on the screen, they are unable to operate.
  − Clearing the alarm and warning records: They are not displayed on the screen.



- - - Broken line indicates that data writing cannot be executed when internal processing is in progress via MECHATROLINK-Ⅱ communication.
“mEm-bUSy" is displayed even when the SET key is pressed.

13.7 Monitor mode

■ Overview of the monitor mode

- **Monitoring the communication status**

  The communication scan time and communication status can be monitored.

- **Checking alarms/warnings, clearing alarm/warning records, and resetting alarms**
  - If an alarm or warning generates, a corresponding alarm code or warning code will be displayed. You can check the code to identify the details of the alarm/warning.
  - Up to ten most recent alarms/warnings can be displayed, starting from the latest one.
  - The present alarm can be reset.
  - Alarm/warning records can be cleared.

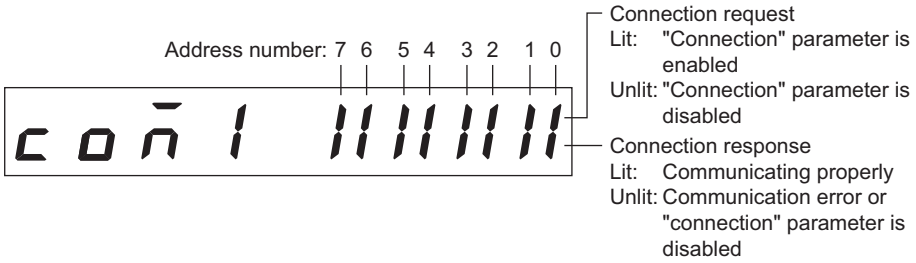
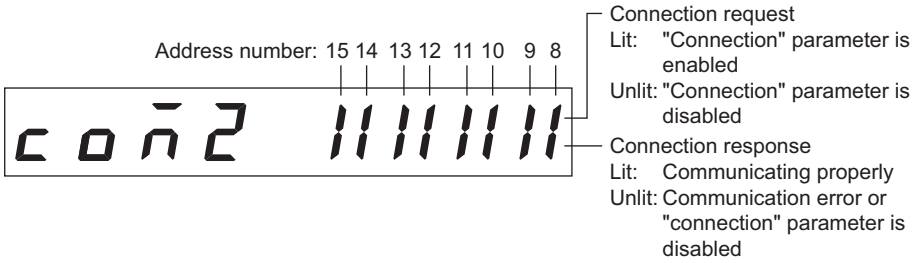
■ Monitor items

- **RS-485 communication scan time**

  The communication time between the **NETC01-M2** and connected product can be monitored in real time (unit: msec).

- **RS-485 communication status**

  The communication status of the connected product can be checked.

Address number 0 to 7	
Address number 8 to 15	

- **Present alarm**

  When an alarm generates, a corresponding alarm code will be displayed.
  Also, alarm records can be checked and cleared.

  Alarm code list

No. of ALARM LED blinks	Alarm code	Alarm type
9	A1h	EEPROM error
7	E3h	Communication switch setting error
	E4h	RS-485 communication error
	E6h	Network connection product error

Note

- Do not turn off the **NETC01-M2** power while alarm records are being cleared (=while the display is blinking). Doing so may damage the data.
- If an alarm generates, communication between the **NETC01-M2** and RS-485 communication compatible product is stopped. The remote I/O, parameter command, maintenance command and monitor command of the RS-485 communication compatible product cannot be used.
- To reset the alarms, cycle the **NETC01-M2** power.

- **Present warning**

  When a warning generates, a corresponding warning code will be displayed. Warning records can be checked and cleared.

  Warning code list

Warning code	Warning type
E4h	RS-485 communication error
E5h	RS-485 communication timeout

Note

- Do not turn off the **NETC01-M2** power while a warning records are being cleared (=while the display is blinking). Doing so may damage the data.
- Warning records can be cleared automatically by turning off the **NETC01-M2** power.

13.8 Parameter mode

When a parameter has been changed, the new parameter will become effective after the **NETC01-M2** power is cycled.

■ Application parameter

Parameter name	Description	Setting range	Initial value	**OPX-2A** screen display
Data setter edit	Sets whether it is possible to edit using the **OPX-2A**.	0: Disable 1: Enable	1: Enable	−*

* It can be changed by setting/canceling the edit lock function on the **OPX-2A**.

■ System parameter

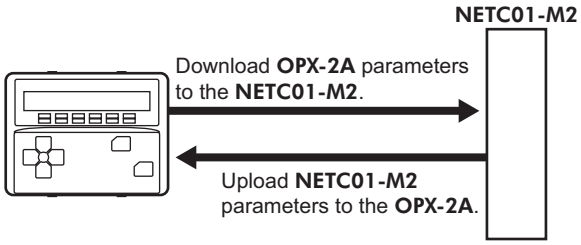
Parameter name	Description	Setting range	Initial value	**OPX-2A** screen display
Connection (address number 0)	Sets whether to enable or disable the communication with the connected product.	0: Disable 1: Enable	0: Disable	SYS-4-00
Connection (address number 1)				SYS-4-01
Connection (address number 2)				SYS-4-02
Connection (address number 3)				SYS-4-03
Connection (address number 4)				SYS-4-04
Connection (address number 5)				SYS-4-05
Connection (address number 6)				SYS-4-06
Connection (address number 7)				SYS-4-07
Connection (address number 8)				SYS-4-08
Connection (address number 9)				SYS-4-09
Connection (address number 10)				SYS-4-10
Connection (address number 11)				SYS-4-11
Connection (address number 12)				SYS-4-12
Connection (address number 13)				SYS-4-13
Connection (address number 14)				SYS-4-14
Connection (address number 15)				SYS-4-15

Note
- If operations are limited by the edit lock function (p.45), parameters cannot be edited.
- The non-volatile memory can be rewritten approx. 100,000 times.

13.9 Copy mode

■ Download

Parameters saved in the **OPX-2A** can be copied to the **NETC01-M2**.
If a download error occurs, a code indicating the description of the error will blink on the display. Download will not be performed and the display will return to the top screen of download.
Refer to "Error of the copy mode" for the error display.



■ Upload

Parameters saved in the **NETC01-M2** can be copied to the **OPX-2A**.

■ Verification

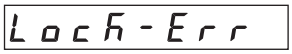
Parameters in the **OPX-2A** can be verified against the corresponding parameters in the **NETC01-M2**.
If the verification finds that the two sets of parameter match, “Good” will be shown. If the two do not match, “Error” will be shown.
If a verification error occurs, a code indicating the description of the error will blink on the display. Verification will not be performed and the display will return to the top screen of verification.
Refer to "Error of the copy mode" for the error display.

■ Initializing parameters

Parameters saved in the **NETC01-M2** can be restored to the initial values.

■ What happens when the【SET】key is pressed while the edit lock function is enabled

While the edit lock function is enabled, you cannot move to any lower level from the top screen of the copy mode. Pressing the【SET】key will generate an error, and “LocK-Err” will be shown.



Be sure to cancel the edit lock function before pressing the【SET】key. Refer to p.45 for the procedure to cancel the edit lock function.

Note

- If the【SET】key is pressed while processing the memory of the **NETC01-M2** via MECHATROLINK-Ⅱ communication, the screen cannot move to the lower level from the top screen and "mEm-busy" is displayed. Be sure to wait until the memory processing is completed, before pressing the【SET】key.
- When a system parameter has been changed, the new parameter will become effective after the power is cycled. When system parameters were changed by downloading, cycle the **NETC01-M2** power.
- Do not turn off the **NETC01-M2** power while the download is still in progress (=while the display is blinking). Doing so may damage the data.

■ Error of the copy mode

If an error occurs in download or verification, the error code will blink on the display.
At this time, the processing will not be executed and the display will return to the top screen.

Blinking display	Description	Action
Prod-Err	There is a discrepancy between the selected product series and the data being processed.	• Check the product series. • Check the data bank number on the **OPX-2A**.
HEAd-Err bcc-Err	An error occurred while processing.	Execute the processing again. If the same error occurs, the parameters saved in the **OPX-2A** may have damaged. Upload and set the parameters of the **OPX-2A** again.
no-dAtA	The specified data bank number does not contain data.	Check the data bank number.
dAtA-Err	An error occurred while parameter was being downloaded.	Perform download again.

14 Accessories (sold separately)

■ Data setter

The data setter lets you set parameters for your **NETC01-M2** with ease and monitor the communication time.

Model: **OPX-2A**

■ Communication cable for the data setting software

Be sure to purchase the communication cable for the data setting software when connecting the **NETC01-M2** to the PC in which the data setting software **MEXE02** has been installed.
This is a set of a PC interface cable and USB cable. The cable is connected to the USB port on the PC.

Model: **CC05IF-USB** [5 m (16.4 ft.)]

The **MEXE02** can be downloaded from Oriental Motor Website Download Page. Also, the **MEXE02** is provided in the form of a storage medium. For details, check out our Website or contact your nearest Oriental Motor sales office.

■ RS-485 communication cable

The RS-485 communication compatible product can be connected.
Model: **CC001-RS4** [0.1 m (0.3 ft.)]
CC002-RS4 [0.25 m (0.8 ft.)]

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