

Machine Automation Controller NJ-series

EtherCAT(R) Connection Guide

ORIENTAL MOTOR CO., LTD.

Network Converter NETC01-ECT

-Closed Loop Stepping Motor and Driver Package

αSTEP High-Efficiency AR Series FLEX DC/AC

power input Built-in Controller Type

-5-Phase Stepping Motor and Driver Package

CRK Series FLEX Built-in Controller Type

-New 5-Phase Stepping Motor and Driver

Package RKII Series FLEX Built-in Controller

Type

-Closed Loop Stepping Motor and Driver Package

αSTEP AZ Series FLEX DC/AC power input

Built-in Controller Type

-Brushless Motor and Driver Package BLE Series

FLEX RS-485 Communication Type

Network
Connection
Guide

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1. Related Manuals

To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions and Precautions for Safe Use of manuals for each device which is used in the system.

The table below lists the manuals of ORIENTAL MOTOR CO., LTD. (hereinafter referred to as Oriental Motor) and OMRON Corporation (hereinafter referred to as OMRON) related to this document.

Manufacturer	Cat. No.	Model	Manual name
OMRON	W500	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	NJ-series CPU Unit Hardware User's Manual
OMRON	W501	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	NJ/NX-series CPU Unit Software User's Manual
OMRON	W505	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	NJ/NX-series CPU Unit Built-in EtherCAT(R) Port User's Manual
OMRON	W504	SYSMAC-SE2□□□□	Sysmac Studio Version 1 Operation Manual
Oriental Motor	HM-60301	NETC01-ECT	Network Converter EtherCAT Compatible NETC01-ECT USER MANUAL
Oriental Motor	HM-60190	AR Series	Closed Loop Stepping Motor and Driver Package αSTEP High-efficiency AR Series FLEX DC power input Built-in Controller Type USER MANUAL
Oriental Motor	HM-60065	AR Series	Closed Loop Stepping Motor and Driver Package αSTEP High-efficiency AR Series FLEX AC power input Built-in Controller Type USER MANUAL
Oriental Motor	HM-60219	OPX-2A	Data Setter OPX-2A AR Series FLEX Built-in Controller Type OPERATING MANUAL
Oriental Motor	HM-40112	CRK Series	5-phase stepping motor and driver package CRK Series FLEX Built-in Controller type USER MANUAL
Oriental Motor	HM-40114	OPX-2A	Data Setter OPX-2A CRK Series FLEX Built-in Controller Type OPERATING MANUAL

Manufacturer	Cat. No.	Model	Manual name
Oriental Motor	HM-60085	RK II Series	New 5-Phase Stepping Motor and Driver Package RK II Series FLEX Built-in controller type USER MANUAL
Oriental Motor	HM-60088	OPX-2A	Data setter OPX-2A RK II Series FLEX Built-in Controller Type OPERATING MANUAL
Oriental Motor	HM-60250	AZ Series	Closed Loop Stepping Motor and Driver Package αSTEP AZ Series FLEX DC power input Built-in controller type OPERATING MANUAL Driver
Oriental Motor	HM-60243	AZ Series	Closed Loop Stepping Motor and Driver Package αSTEP AZ Series FLEX AC power input Built-in controller type OPERATING MANUAL Driver
Oriental Motor	HM-60244	AZ Series	OPERATING MANUAL Closed Loop Stepping Motor and Driver Package αSTEP AZ Series Motor
Oriental Motor	HM-60262	AZ Series	Closed Loop Stepping Motor and Driver Package αSTEP AZ Series Function Edition
Oriental Motor	HM-5140	BLE Series	Brushless Motor and Driver Package BLE Series FLEX RS-485 communication type USER MANUAL
Oriental Motor	HM-40107	MEXE02	Data setting software MEXE02 INSTALLATION MANUAL
Oriental Motor	HM-60131	MEXE02	Data setting software MEXE02 OPERATING MANUAL

2. Terms and Definitions

Term	Explanation and Definition
PDO communications (Communications using Process Data Objects)	<p>This method is used for cyclic data exchange between a master unit and slave units.</p> <p>PDO data (i.e., I/O data that is mapped to PDOs) that is allocated in advance is refreshed periodically each EtherCAT process data communications cycle (i.e., the period of primary periodic task).</p> <p>The NJ-series Machine Automation Controller uses the PDO communications for commands to refresh I/O data in a fixed control period, including I/O data for slaves, and the position control data for servomotors.</p> <p>It is accessed from NJ-series Machine Automation Controller in the following ways.</p> <ul style="list-style-type: none"> • With device variables for a slave I/O • With axis variables for a servo drive and an encoder input slave to which assigned as an axis
SDO Communications (Communications using Service Data Objects)	<p>This method is used to read and write the specified slave unit data from a master unit when required.</p> <p>The NJ-series Machine Automation Controller uses SDO communications for commands to read and write data, such as for parameter transfers, at specified times.</p> <p>The NJ-series Machine Automation Controller can read or write the specified slave data (parameters and error information, etc.) with the EC_CoESDORed (Read CoE SDO) instruction or the EC_CoESDOWrite (Write CoE SDO) instruction.</p>
Slave unit	<p>There are various types of slaves such as servo drives that handle position data and I/O terminals that handle bit signals.</p> <p>A slave unit receives output data sent from a master, and sends input data to a master.</p>
Node address	A node address is an address to identify a unit connected to EtherCAT.
ESI file (EtherCAT Slave Information file)	An ESI file contains information unique to the EtherCAT slaves in XML format. You can load an ESI file into Sysmac Studio, to allocate slave process data and make other settings.

3. Precautions

- (1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing safety circuit, in order to ensure safety and minimize risks of abnormal occurrence.
- (2) To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions and Precautions for Safe Use of manuals for each device which is used in the system.
- (3) The user is encouraged to confirm the standards and regulations that the system must conform to.
- (4) It is prohibited to copy, to reproduce, and to distribute a part or the whole of this document without the permission of OMRON Corporation.
- (5) The information contained in this document is current as of October 2015. It is subject to change without notice for improvement.

The following notations are used in this document.



WARNING

Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.



Caution

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.



Precautions for Correct Use

Precautions on what to do and what not to do to ensure proper operation and performance.



Additional Information

Additional information to read as required.

This information is provided to increase understanding or make operation easier.

Symbol



The filled circle symbol indicates operations that you must do.
The specific operation is shown in the circle and explained in text.
This example shows a general precaution for something that must do.

4. Overview

This document describes the procedures for connecting Network Converter (NETC01-ECT) of Oriental Motor to NJ-series Machine Automation Controller (hereinafter referred to as Controller) of OMRON via EtherCAT as well as the procedures for checking their connections. Refer to *Section 6. EtherCAT Settings* and *Section 7. EtherCAT Connection Procedure* to understand the setting methods and key points to operate PDO Communications via EtherCAT.

5. Applicable Devices and Device Configuration

5.1. Applicable Devices

The applicable devices are as follows:

Manufacturer	Name	Model
OMRON	NJ-series CPU Unit	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□
Oriental Motor	Network Converter	NETC01-ECT
Oriental Motor	Closed Loop Stepping Motor and Driver Package αSTEP High-Efficiency AR Series FLEX DC power input Built-in Controller Type Driver	ARD-KD
Oriental Motor	Closed Loop Stepping Motor and Driver Package αSTEP High-Efficiency AR Series FLEX AC power input Built-in Controller Type Driver	ARD-AD ARD-CD
Oriental Motor	5-phase Stepping Motor and Driver Package CRK Series FLEX Built-in Controller Type Driver	CRD5[□]□-KD CRD507H-KD
Oriental Motor	New 5-Phase Stepping Motor and Driver Package RK II Series FLEX Built-in Controller Type Driver	RKSD503-[□]D RKSD507-[□]D
Oriental Motor	Closed Loop Stepping Motor and Driver Package αSTEP AZ Series FLEX DC power input Built-in Controller Type Driver	AZD-KD
Oriental Motor	Closed Loop Stepping Motor and Driver Package αSTEP AZ series FLEX AC power input Built-in Controller Type Driver	AZD-AD AZD-CD
Oriental Motor	Brushless Motor and Driver Package BLE Series FLEX RS-485 Communication Type Driver	BLED3[□]M-R BLED6[□]M-R BLED12[□]M-R



Precautions for Correct Use

As applicable devices above, the devices with the models and versions listed in 5.2. *Device Configuration* are actually used in this document to describe the procedure for connecting devices and checking the connection.

You cannot use devices with versions lower than the versions listed in 5.2.

To use the above devices with models not listed in 5.2. or versions higher than those listed in 5.2., check the differences in the specifications by referring to the manuals before operating the devices.



Additional Information

This document describes the procedures to establish the network connection.

It does not provide information on operation, installation or wiring method which is not related to the connection procedures. It also does not describe the functionality or operation of the devices. Refer to the manuals or contact the device manufacturer.



Additional Information

Contact ORIENTAL MOTOR CO., LTD. for applicable stepping motors to connect.

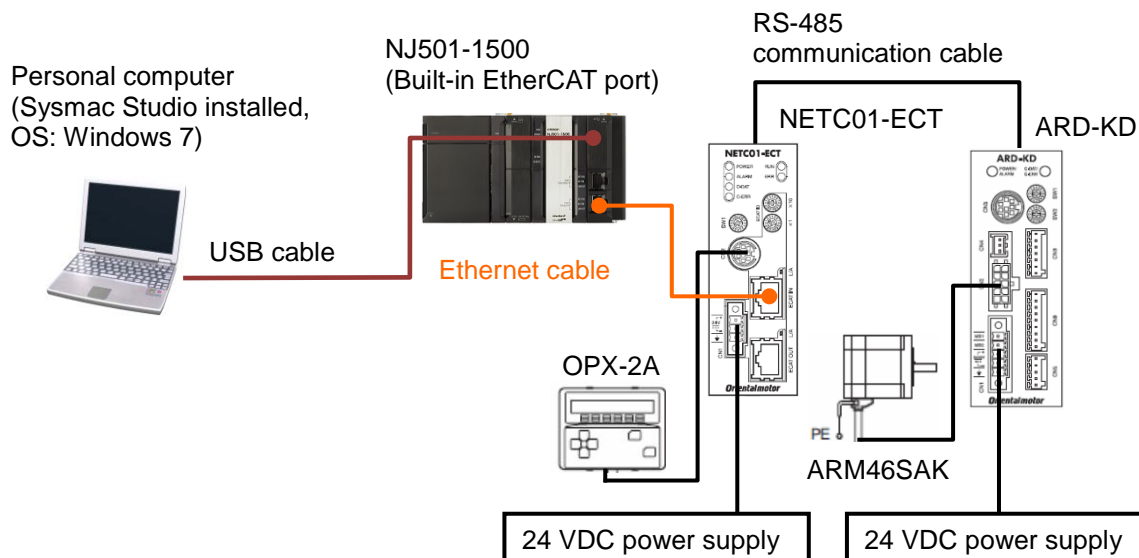


Additional Information

Contact ORIENTAL MOTOR CO., LTD. for applicable brushless motors to connect.

5.2. Device Configuration

The hardware components to reproduce the connection procedures of this document are as follows:



Manufacturer	Name	Model	Version
OMRON	CPU Unit (Built-in EtherCAT port)	NJ501-1500	Ver.1.08
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Sysmac Studio	SYSMAC-SE2[] [] [] []	Ver.1.09
-	Personal computer (OS: Windows 7)	-	
-	USB cable (USB 2.0 type B connector)	-	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-[]M[]-K	
Oriental Motor	Network Converter	NETC01-ECT	
Oriental Motor	AR Series Driver DC power input Built-in Controller Type	ARD-KD	
Oriental Motor	Stepping Motor	ARM46SAK	
Oriental Motor	Data Setter	OPX-2A	
Oriental Motor	RS-485 communication cable	CC001-RS4	
Oriental Motor	ESI file	ORIENTALMOTOR NETC01-ECT.xml	
-	24 VDC power supply (for Network Converter)	-	
-	24 VDC power supply (for AR Series Driver)	-	



Precautions for Correct Use

Prepare the ESI file listed in this clause beforehand. To obtain the ESI file, contact ORIENTAL MOTOR CO., LTD.



Precautions for Correct Use

The connection line of EtherCAT communications cannot be shared with other Ethernet networks.

Do not use devices for Ethernet such as a switching hub.

Use the Ethernet cable (double shielding with aluminum tape and braiding) of Category 5 or higher, and use the shielded connector of Category 5 or higher.

Connect the cable shield to the connector hood at both ends of the cable.



Precautions for Correct Use

The Driver has a built-in termination resistor (120Ω). Enable the built-in termination resistor of Driver that is installed at the end.



Precautions for Correct Use

Update Sysmac Studio to the version specified in this clause or higher version.

If you use a version lower than the one specified in this clause, procedures described in *Section 7.* and subsequent sections may not be applicable. In that case, use the equivalent procedures described in this document by referring to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).



Additional Information

For specifications of Ethernet cables and network wirings, refer to *Section 4. EtherCAT Network Wiring* of the *NJ/NX-series CPU Unit Built-in EtherCAT(R) Port User's Manual* (Cat. No. W505).



Additional Information

The system configuration in this document uses USB for the connection to Controller.

For information on how to install a USB driver, refer to *A-1 Driver Installation for Direct USB Cable Connection* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

6. EtherCAT Settings

This section describes the specifications of parameters and device variables that are set in this document.

Hereinafter, Network Converter is referred to as "Slave Unit" in some descriptions.

6.1. Parameter Settings

The parameters required for connecting Controller and Network Converter via EtherCAT are given below.

Name	Item	Set value	Remarks
Network Converter	Node address (Node address setting switches)	1	
	Termination resistor	Enabled	Fixed
	Transmission rate (Baud rate)	625,000 bps	Set SW1 to 7.
Driver	Address number (Slave address)	0	For details, refer to 7.2. <i>Setting up Oriental Motor Driver.</i>
	Termination resistor	Enabled	
	Transmission rate (Baud rate)	625,000 bps	
	RS-485 Communication protocol	Network Converter	



Precautions for Correct Use

The Network Converter does not support "Write Slave Node Address" of Sysmac Studio. Set the node address by the node address setting switches as described in this document.

6.2. Device Variables

The PDO communications data for Network Converter are allocated to the Controller's device variables. Some of device variables and data types are shown below.

The following describes the settings when using AR Series DC/AC power input Built-in Controller Type Driver.



Additional Information

For details on assignments of input and output areas, contact ORIENTAL MOTOR CO., LTD.

■Output area (Controller to Network Converter)

Device variable name	Data type	Meaning
E001_1st_receive_PDO_Mapping _NET_IN_Lower_2600_01	BYTE	Digital output value (in units of 1 byte)
E001_NET_IN0_AXIS_0_0	BOOL	Operation data No. selection (M0)
E001_NET_IN1_AXIS_0_0	BOOL	Operation data No. selection (M1)
E001_NET_IN2_AXIS_0_0	BOOL	Operation data No. selection (M2)
E001_NET_IN3_AXIS_0_0	BOOL	Positioning operation (START)
E001_NET_IN4_AXIS_0_0	BOOL	Return-to-home operation (HOME)
E001_NET_IN5_AXIS_0_0	BOOL	Stop the motor (STOP)
E001_NET_IN6_AXIS_0_0	BOOL	Motor excitation stop and electromagnetic brake release (FREE)
E001_NET_IN7_AXIS_0_0	BOOL	Not used.
E001_1st_receive_PDO_Mapping _NET_IN_Upper_2600_02	BYTE	Digital output value (in units of 1 byte)
E001_NET_IN8_AXIS_0_0	BOOL	Direct positioning operation (MS0)
E001_NET_IN9_AXIS_0_0	BOOL	Direct positioning operation (MS1)
E001_NET_IN10_AXIS_0_0	BOOL	Direct positioning operation (MS2)
E001_NET_IN11_AXIS_0_0	BOOL	Sequential positioning operation (SSTART)
E001_NET_IN12_AXIS_0_0	BOOL	JOG operation in the positive direction (+JOG)
E001_NET_IN13_AXIS_0_0	BOOL	JOG operation in the negative direction (-JOG)
E001_NET_IN14_AXIS_0_0	BOOL	Continuous operation in the positive direction (FWD)
E001_NET_IN15_AXIS_0_0	BOOL	Continuous operation in the negative direction (RVS)
E001_1st_receive_PDO_Mapping _Remote_Register_Command_2800_02	UINT	Command code
E001_1st_receive_PDO_Mapping _Remote_Register_Data_2800_03	DINT	Data

Device variable name	Data type	Meaning
E001_1st_receive_PDO_Mapping _Remote_Register_TRIG_2800_04	BYTE	Command code execution trigger (in units of 1 byte)
E001_Remote_Register_TRIG_AXIS _0_0	BOOL	Command code execution trigger
.	.	.
.	.	.
.	.	.

■Input area (Network Converter to Controller)

Device variable name	Data type	Meaning
E001_1st_transmit_PDO_Mapping _NET_OUT_Lower_2400_01	BYTE	Digital input value (in units of 1 byte)
E001_NET_OUT0_AXIS_0_0	BOOL	Output in response to operation data No. input (M0_R)
E001_NET_OUT 1_AXIS_0_0	BOOL	Output in response to operation data No. input (M1_R)
E001_NET_OUT 2_AXIS_0_0	BOOL	Output in response to operation data No. input (M2_R)
E001_NET_OUT 3_AXIS_0_0	BOOL	Output in response to positioning operation input (START_R)
E001_NET_OUT 4_AXIS_0_0	BOOL	Motor in home position (HOME-P)
E001_NET_OUT 5_AXIS_0_0	BOOL	Driver ready (READY)
E001_NET_OUT 6_AXIS_0_0	BOOL	Warning status of the driver (WNG)
E001_NET_OUT 7_AXIS_0_0	BOOL	Alarm status of the driver (ALM)
E001_1st_transmit_PDO_Mapping _NET_OUT_Upper_2400_02	BYTE	Digital input value (in units of 1 byte)
E001_NET_OUT 8_AXIS_0_0	BOOL	Internal processing state (S-BSY)
E001_NET_OUT 9_AXIS_0_0	BOOL	Motor area range (AREA1)
E001_NET_OUT 10_AXIS_0_0	BOOL	Motor area range (AREA 2)
E001_NET_OUT 11_AXIS_0_0	BOOL	Motor area range (AREA 3)
E001_NET_OUT 12_AXIS_0_0	BOOL	Monitor output shaft rotation (TIM)
E001_NET_OUT 13_AXIS_0_0	BOOL	Motor operating status (MOVE)
E001_NET_OUT 14_AXIS_0_0	BOOL	Positioning operation complete (END)
E001_NET_OUT 15_AXIS_0_0	BOOL	Motor torque outside range (TLC)
E001_1st_transmit_PDO_Mapping _Remote_Register_Command_R_2900_02	UINT	Command code response
E001_1st_transmit_PDO_Mapping _Remote_Register_Data_R_2900_03	DINT	Data response

Device variable name	Data type	Meaning
E001_1st_transmit_PDO_Mapping _Remote_Register_Status_2900_04	BYTE	Status response (in units of 1 byte)
E001_Remote_Register_TRIG_R_AXIS_0_0	BOOL	Command code execution trigger response
E001_Remote_Register_STATUS_AXIS_0_0	BOOL	Transmission error response
E001_Remote_Register_ADR_ERR_AXIS_0_0	BOOL	Address number error response
.	.	.
.	.	.
.	.	.



Additional Information

Contact ORIENTAL MOTOR CO., LTD. for details on assignments of input and output areas when using Drivers for CRK Series Built-in Controller Type, RK II Series Built-in Controller Type, AZ Series DC/AC power input Built-in Controller Type, or BLE Series RS-485 Communication Type.



Additional Information

The device variables are named automatically from a combination of the device names and the port names.

The default device names are "E" followed by a serial number that starts from 001.

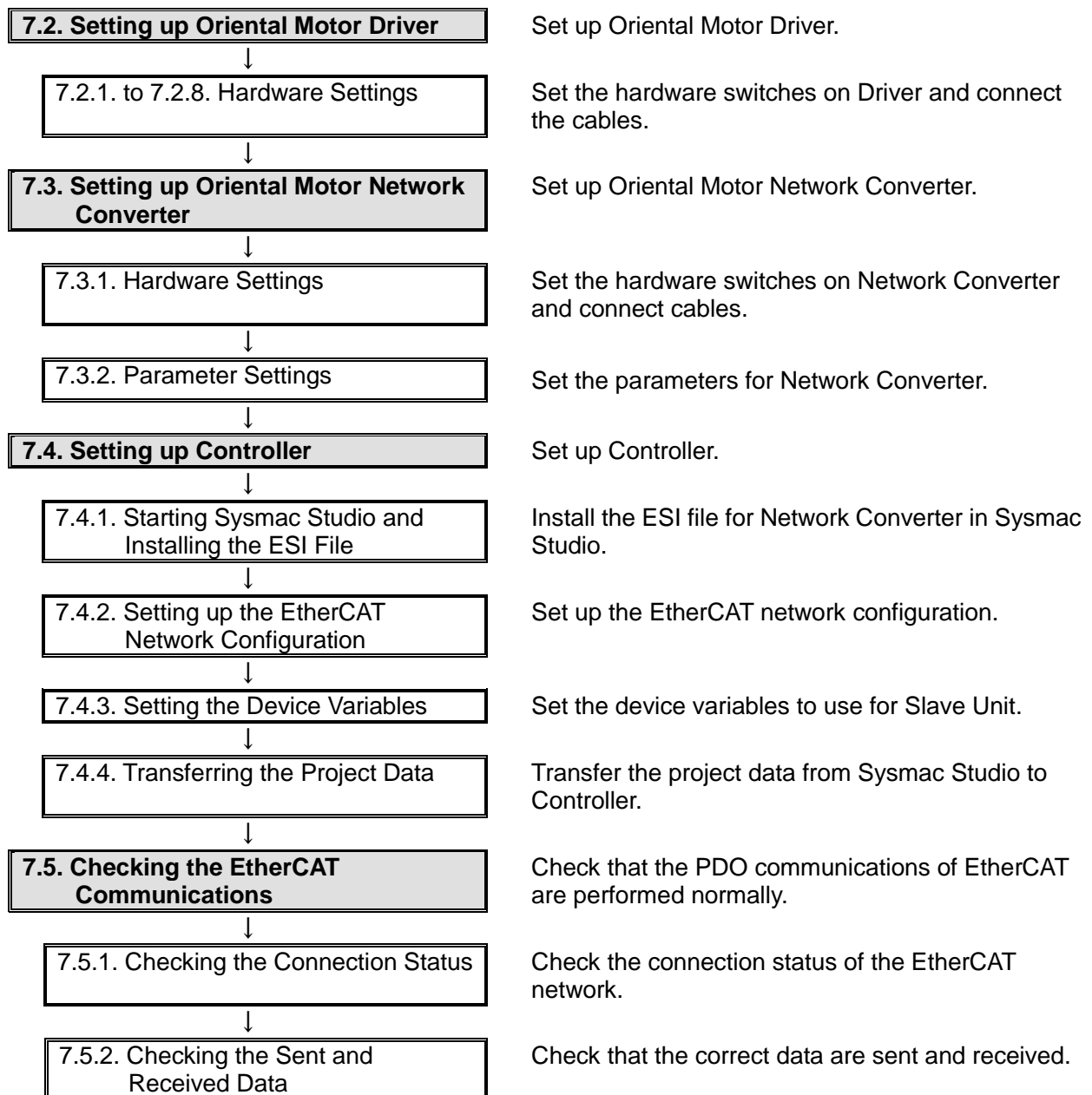
7. EtherCAT Connection Procedure

This section describes the procedures for connecting Controller to Network Converter via EtherCAT.

In this document, the explanations of procedures for setting up Controller, Network Converter, and Driver are based on the factory default settings. For the initialization, refer to *Section 8. Initialization Method*.

7.1. Work Flow

Take the following steps to perform PDO Communications of EtherCAT.



7.2. Setting up Oriental Motor Driver

Set up Oriental Motor Driver.

7.2.1. Hardware Settings

Set the hardware switches on Driver and connect the cables.

Since the hardware settings vary depending on the Driver type, refer to the applicable procedures below that describe details of settings.

Driver type	Procedure to refer
AR Series DC power input Built-in Controller Type	7.2.2. Hardware Settings of AR Series DC power input Built-in Controller Type
AR Series AC power input Built-in Controller Type	7.2.3. Hardware Settings of AR Series AC power input Built-in Controller Type
CRK Series Built-in Controller Type	7.2.4. Hardware Settings of CRK Series Built-in Controller Type
RK II Series Built-in Controller Type	7.2.5. Hardware Settings of RK II Series Built-in Controller Type
AZ Series DC power input Built-in Controller Type	7.2.6. Hardware Settings of AZ Series DC power input built-in controller type
AZ Series AC power input Built-in Controller Type	7.2.7. Hardware Settings of AZ Series AC power input built-in controller type
BLE Series RS-485 communication type	7.2.8. Hardware Settings of BLE Series RS-485 Communication Type

7.2.2. Hardware Settings of AR Series DC Power Input Built-in Controller Type

Set the hardware switches on Driver for AR Series DC power input Built-in Controller Type and connect the cables.



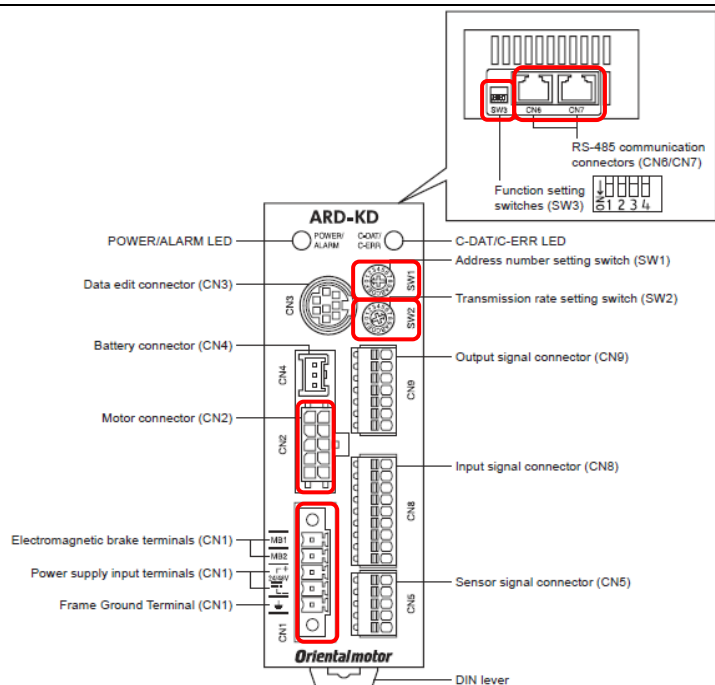
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Driver is OFF.

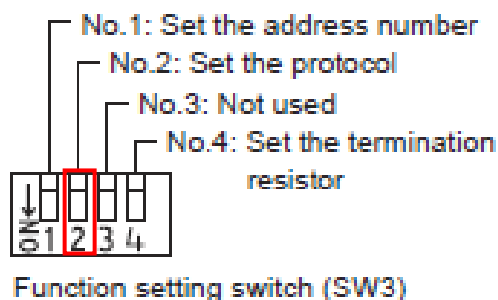
*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

- 2 Check the positions of hardware switches and connectors on Driver by referring to the right figure.



- 3 Set Function setting switch (SW3)-No.2 to OFF.

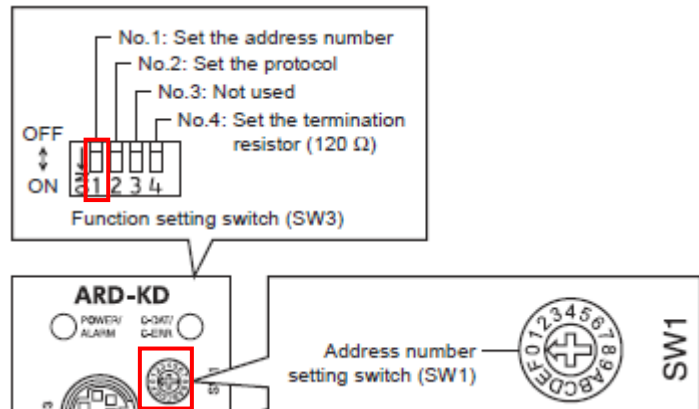
*The RS-485 communication protocol is set to Network Converter.



- 4 Make the following settings for the address number (slave address).

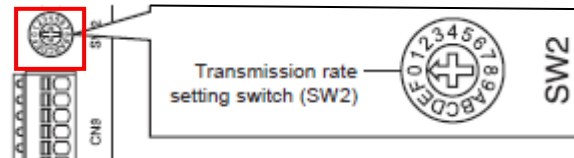
- Set Function setting switch (SW3)-No.1 to *OFF*.
- Set Address number setting switch (SW1) to 0.

*The address number (slave address) is set to 0.



- 5 Set Transmission rate setting switch (SW2) to 7.

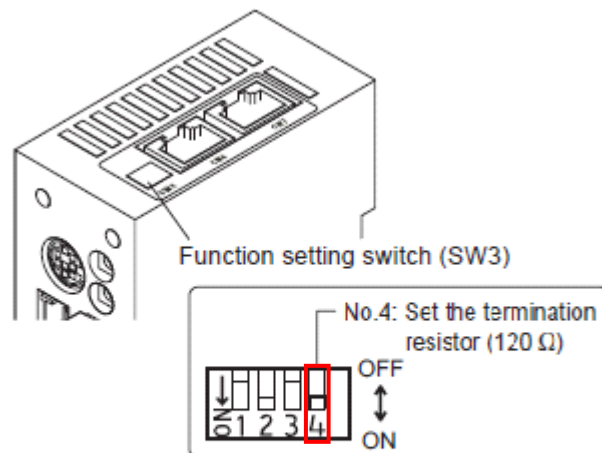
*Transmission rate (Baud rate) is set to 625,000 bps.



- 6 Set Function setting switch (SW3)-No.4 to *ON*.

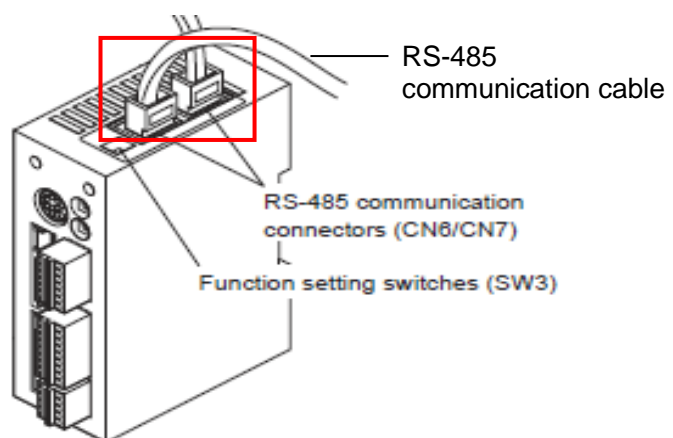
*The termination resistor (120Ω) is enabled.

Factory setting *OFF* (termination resistor disabled)

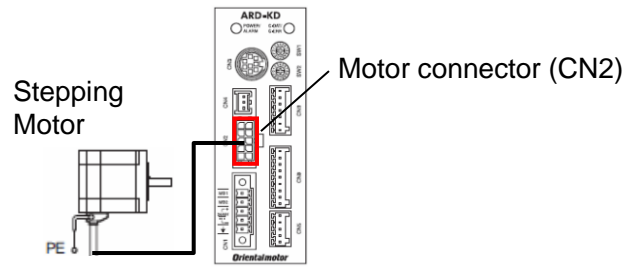


SW3-No.4	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

- 7 Connect a RS-485 communication cable to RS-485 communication connector (CN6) or RS-485 communication connector (CN7).



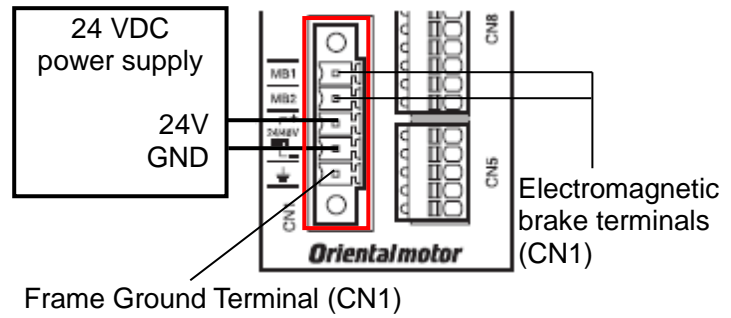
- 8 Connect Stepping Motor to Motor connector (CN2).



- 9 Connect 24 VDC power supply to Power supply input terminals (CN1).

*Connect an electromagnetic brake cable to Electromagnetic brake terminals (CN1) as required.

*Connect Frame Ground Terminal (CN1) as required.



7.2.3. Hardware Settings of AR Series AC Power Input Built-in Controller Type

Set the hardware switches on Driver for AR Series AC power input Built-in Controller Type and connect the cables.



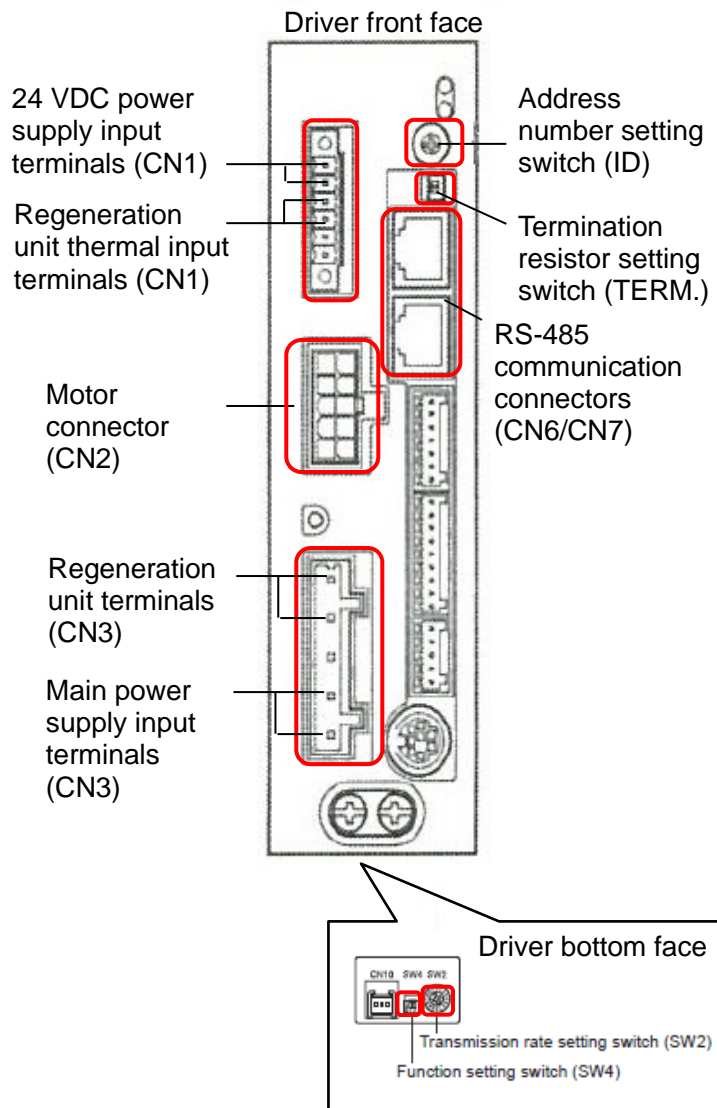
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Driver is OFF.

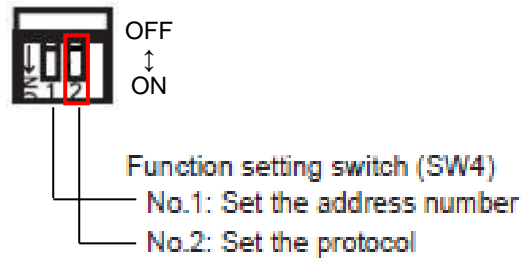
*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

- 2 Check the positions of hardware switches and connectors on Driver by referring to the right figure.



- 3 Set Function setting switch (SW4)-No.2 to *OFF*.

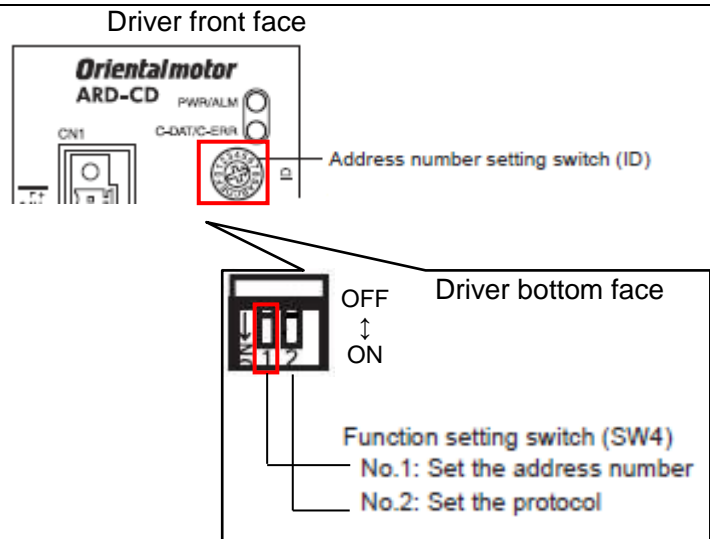
*The RS-485 communication protocol is set to Network Converter.



- 4 Make the following settings for the address number (slave address).

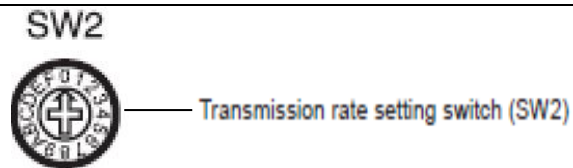
- Set Address number setting switch (ID) to 0.
- Set Function setting switch (SW4)-No.1 to *OFF*.

*The address number (slave address) is set to 0.



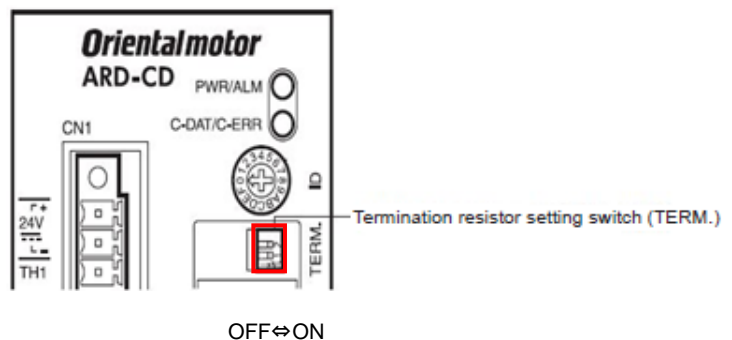
- 5 Set Transmission rate setting switch (SW2) to 7.

*The Transmission rate (Baud rate) is set to 625,000 bps.



- 6 Set the both No.1 and No.2 of Termination resistor setting switch (TERM.) to *ON*.

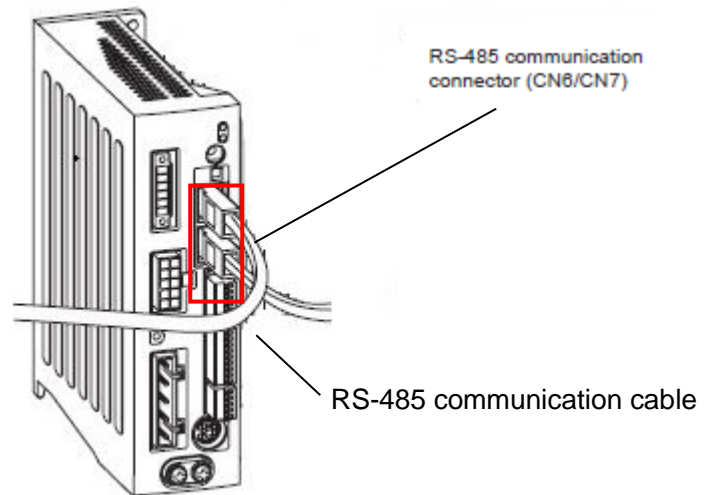
*The termination resistor (120Ω) is enabled.



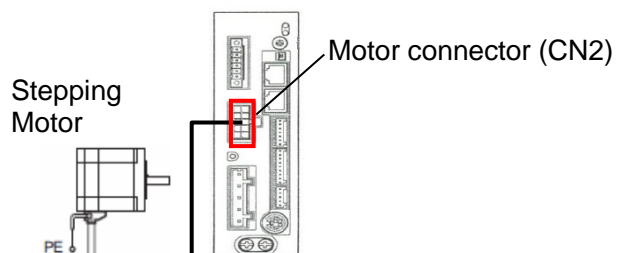
Factory setting No.1 and No.2: Both OFF (termination resistor disabled)

TERM.-No.1 and No.2	Termination resistor (120 Ω)
Both are OFF	Disabled
Both are ON	Enabled

- 7 Connect a RS-485 communication cable to RS-485 communication connector (CN6) or RS-485 communication connector (CN7).

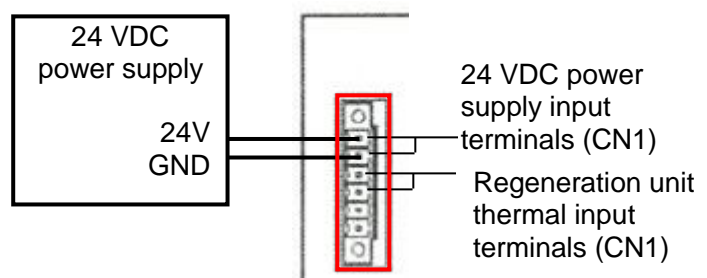


- 8 Connect Stepping Motor to Motor connector (CN2).



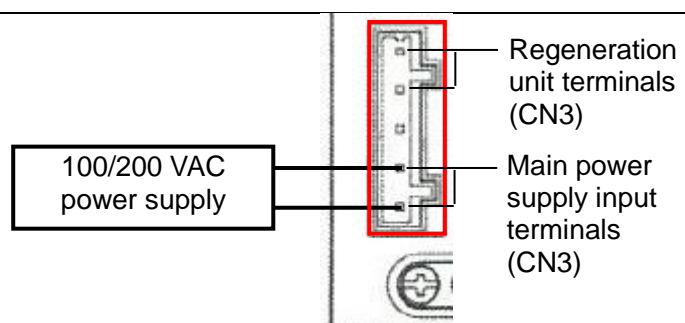
- 9 Connect 24 VDC power supply to 24 VDC power supply input terminals (CN1).

*If no Regeneration unit thermal input terminals (CN1) are connected, short the TH1 and TH2 terminals. The CN1 connector (6 pins) is shipped with a jumper wire pre-assembled, so you can short the terminals.



- 10 Connect 100 VAC or 200 VAC power supply to Main power supply input terminals (CN3).

*Connect the regeneration unit to Regeneration unit terminals (CN3) as required.



7.2.4. Hardware Settings of CRK Series Built-in Controller Type

Set the hardware switches on Driver for CRK Series Built-in Controller Type and connect the cables.



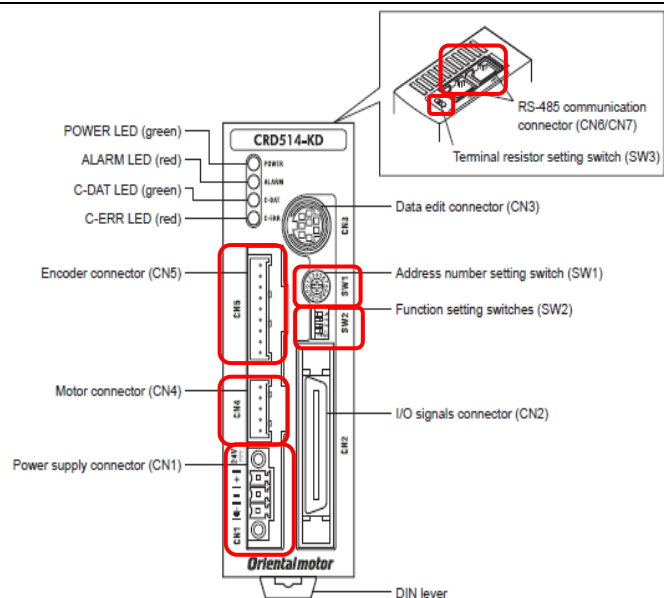
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Driver is OFF.

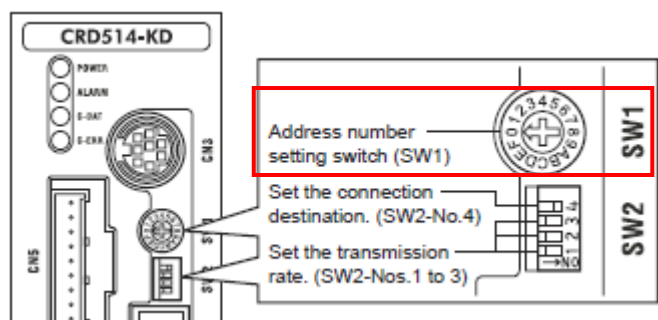
*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

- 2 Check the positions of hardware switches and connectors on Driver by referring to the right figure.



- 3 Set Address number setting switch (SW1) to 0.

*The address number (slave address) is set to 0.

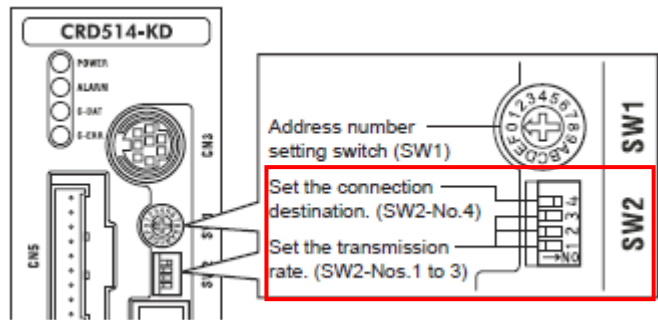


4 Set Function setting switches (SW2) as follows:

No.4: OFF Connection destination setting

No.3: ON
No.2: ON
No.1: ON } Baud rate setting

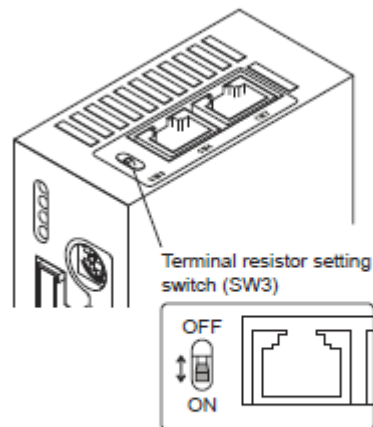
*The RS-485 communication protocol is set to Network Converter, and the transmission rate (Baud rate) is set to 625,000 bps.



5 Set Terminal resistor setting switch (SW3) to ON.

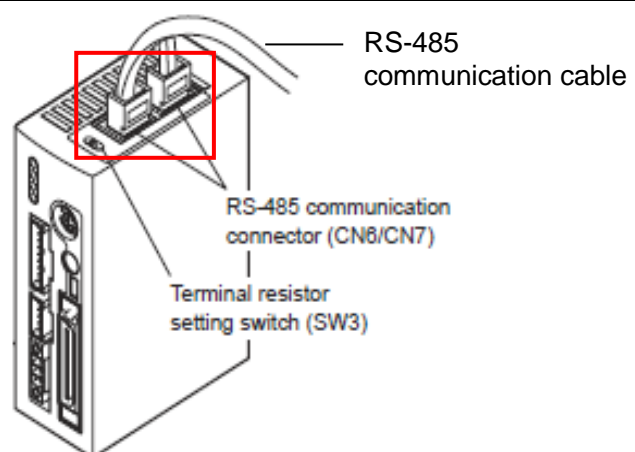
*The termination resistor (120Ω) is enabled.

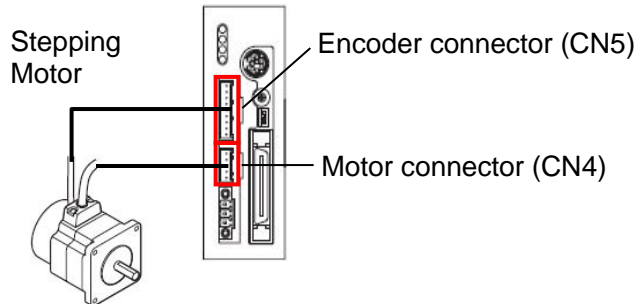
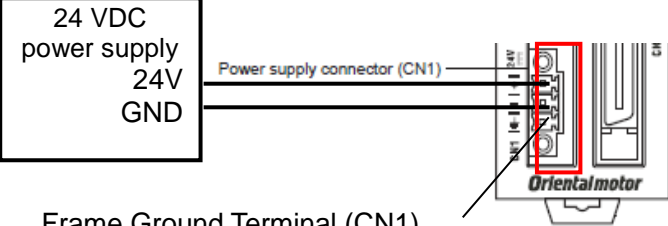
Factory setting OFF (termination resistor disabled)



SW3	Termination resistor (120 Ω)
OFF	Disabled
ON	Enabled

6 Connect a RS-485 communication cable to RS-485 communication connector (CN6) or RS-485 communication connector (CN7).



7	<p>Connect Stepping Motor to Motor connector (CN4) and Encoder connector (CN5).</p>	 <p>The diagram shows a stepping motor connected to a control unit. The motor's wires are plugged into the Motor connector (CN4) and the Encoder connector (CN5) on the control unit. The connectors are highlighted with red boxes.</p>
8	<p>Connect 24 VDC power supply to Power supply connector (CN1).</p> <p>*Connect Frame Ground Terminal (CN1) as required.</p>	 <p>The diagram shows a 24 VDC power supply connected to a control unit. The power supply's 24V and GND terminals are connected to the Power supply connector (CN1) and the Frame Ground Terminal (CN1) on the control unit. The connectors are highlighted with red boxes. The control unit is labeled 'Orientalmotor'.</p>



Additional Information

If the product is controlled by Network Converter, the following parameters have settings controlled by I/O as defaults. Therefore, their values need to be changed to the settings controlled by RS-485 communications. Change the settings if necessary.

- START input mode
- HOME/FWD/RVS input mode
- Data No. input mode
- Motor excitation mode
- I/O STOP input

Especially because the logic for I/O STOP input is Break (Normally Closed) (default value), set the I/O STOP input to be disabled if no use it.

For details, refer to *I/O parameter* of the *5-phase stepping motor and driver package CRK Series FLEX Built-in Controller type USER MANUAL* (HM-40112).

7.2.5. Hardware Settings of RK II Series Built-in Controller Type

Set the hardware switches on Driver for RK II Series Built-in Controller Type and connect the cables.



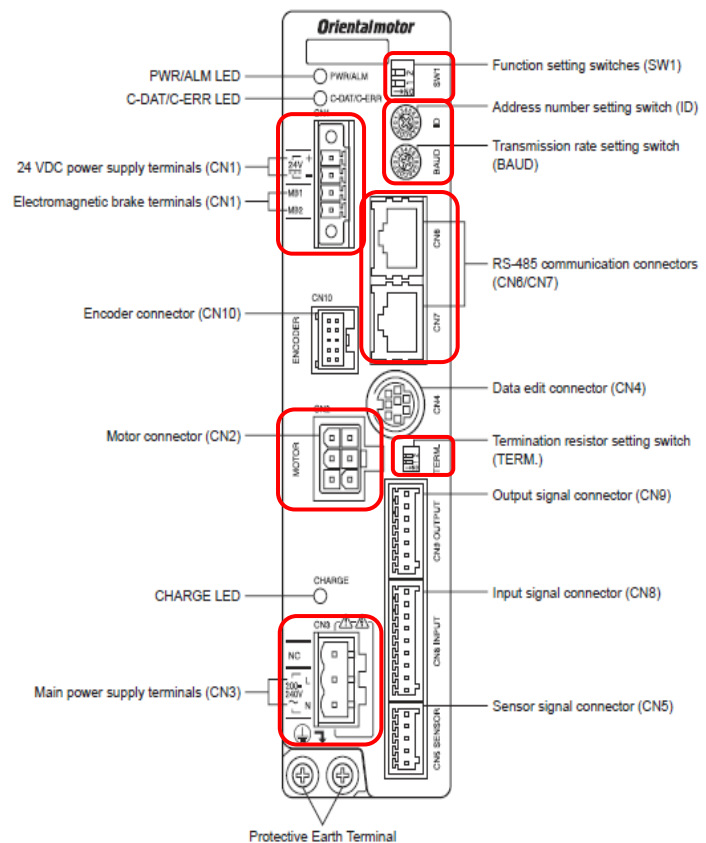
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Driver is OFF.

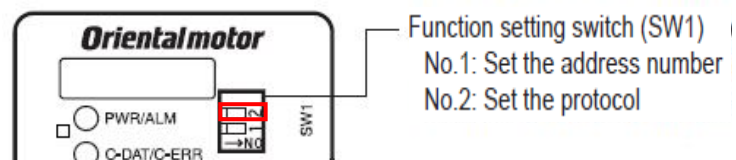
*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

- 2 Check the positions of hardware switches and connectors on Driver by referring to the right figure.



- 3 Set Function setting switch (SW1)-No.2 to OFF.

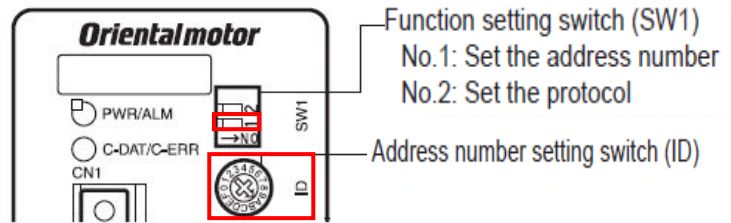
*The RS-485 communication protocol is set to Network Converter.



- 4 Make the following settings for the address number (slave address).

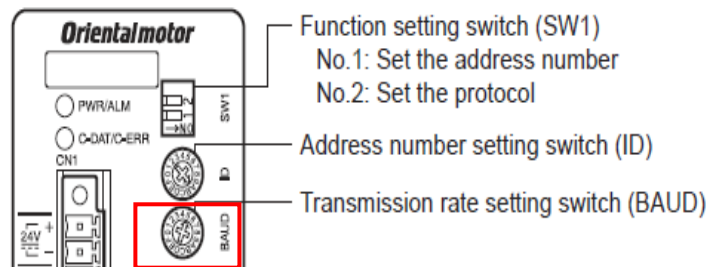
- Set Function setting switch (SW1)-No.1 to *OFF*.
- Set Address number setting switch (ID) to 0.

*The address number (slave address) is set to 0.



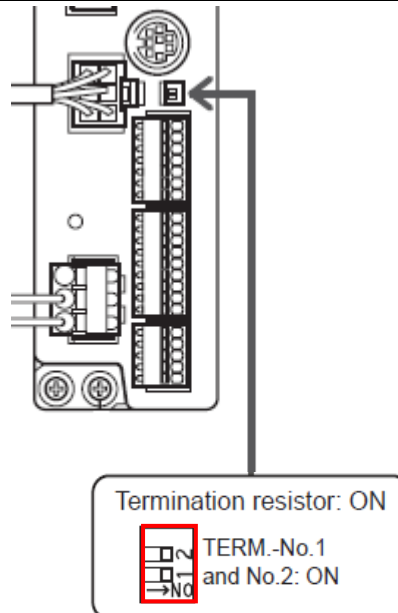
- 5 Set Transmission rate setting switch (BAUD) to 7.

*The Transmission rate (Baud rate) is set to 625,000 bps.

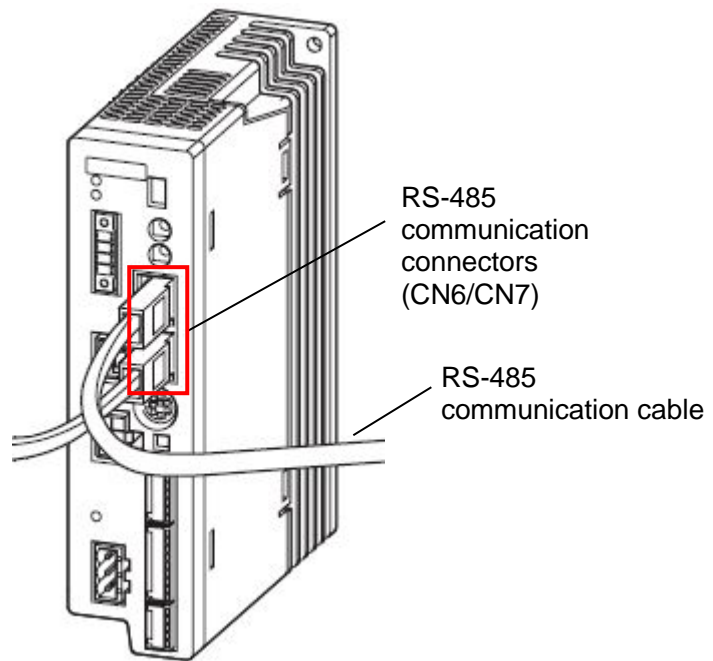


- 6 Set the both No.1 and No.2 of Termination resistor setting switch (TERM.) to *ON*.

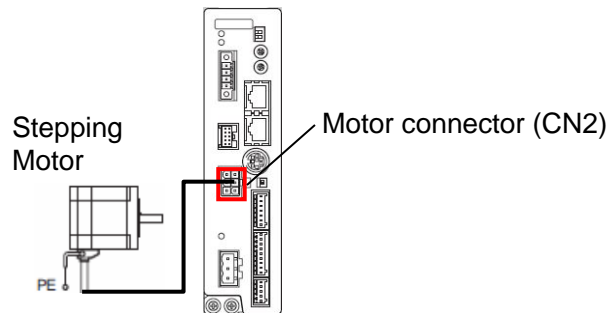
*The termination resistor (120Ω) is enabled.



- 7 Connect a RS-485 communication cable to RS-485 communication connector (CN6) or RS-485 communication connector (CN7).

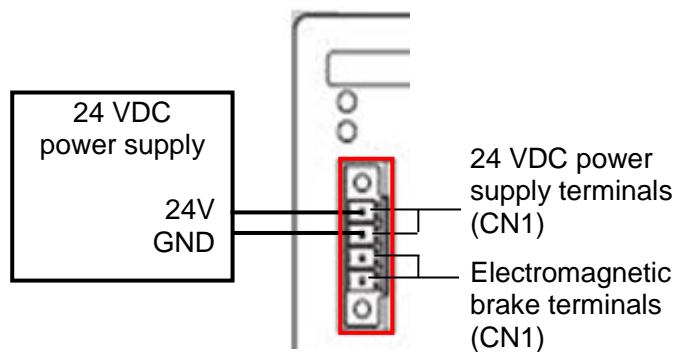


- 8 Connect Stepping Motor to Motor connector (CN2).

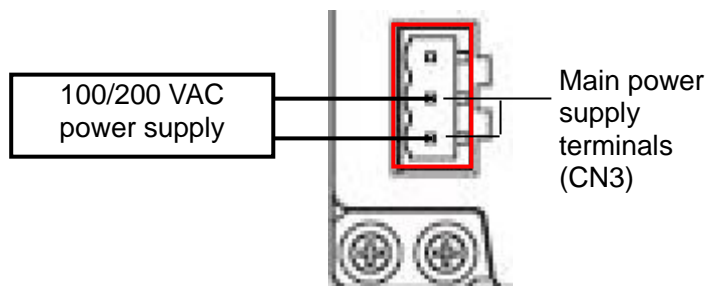


- 9 Connect 24 VDC power supply to 24 VDC power supply terminals (CN1).

*Connect an electromagnetic brake cable to Electromagnetic brake terminals (CN1) as required.



- 10 Connect 100 VAC or 200 VAC power supply to Main power supply terminals (CN3).



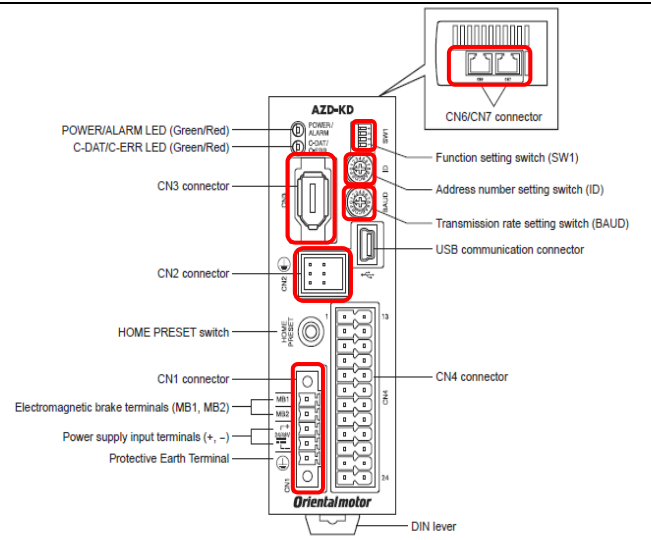
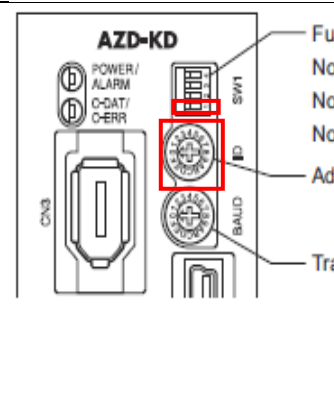
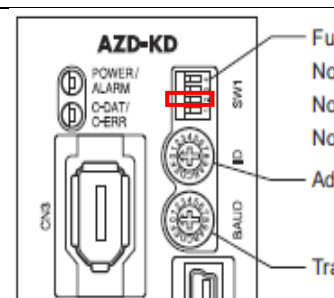
7.2.6. Hardware Settings of AZ Series DC Power Input Built-in Controller Type

Set the hardware switches on Driver for AZ Series DC power input Built-in Controller Type and connect the cables.



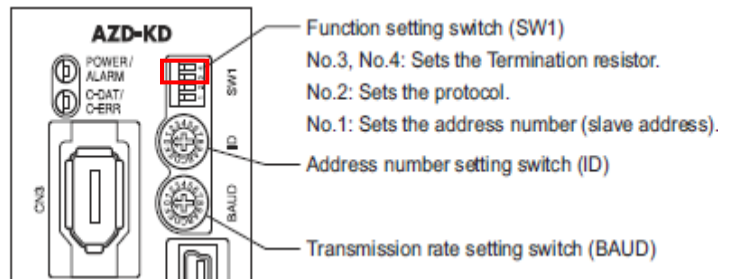
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

<p>1</p>	<p>Make sure that the power supply to Driver is OFF.</p> <p>*If the power supply is turned ON, settings may not be applicable as described in the following procedure.</p>
<p>2</p>	<p>Check the positions of hardware switches and connectors on Driver by referring to the right figure.</p> 
<p>3</p>	<p>Make the following settings for the address number (slave address).</p> <ul style="list-style-type: none"> Set Function setting switch (SW1)-No.1 to OFF. Set Address number setting switch (ID) to 0. <p>*The address number (slave address) is set to 0.</p> 
<p>4</p>	<p>Set Function setting switch (SW1)-No.2 to OFF.</p> <p>*The RS-485 communication protocol is set to Network Converter.</p> 

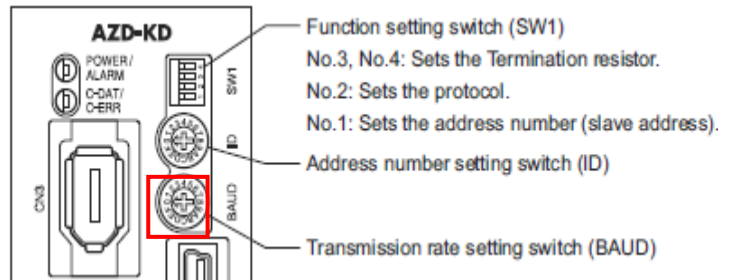
- 5 Set the both No.3 and No.4 of Function setting switch (SW1) to ON.

*The termination resistor (120Ω) is enabled.



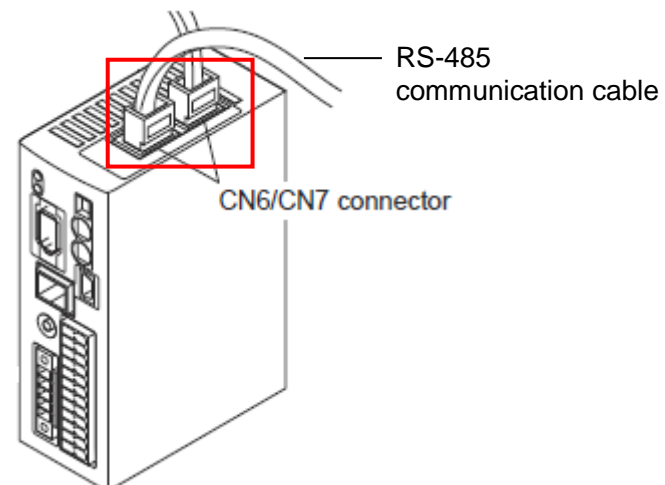
SW1-No.3, No.4	Termination resistor (120 Ω)
Both are OFF	Disabled
Both are ON	Enabled

- 6 Set Transmission rate setting switch (BAUD) to 7.

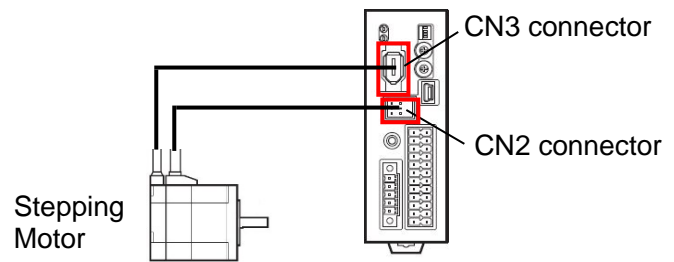


BAUD	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600
4	115,200
5	230,400
6	Not used.
7	Network converter
8 to F	Not used.

- 7 Connect a RS-485 communication cable to CN6 of connector or CN7 connector.



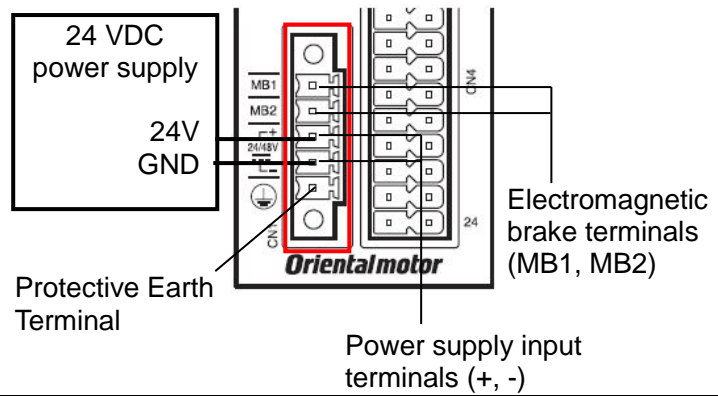
- 8 Connect Stepping Motor to CN2 connector and CN3 connector.



- 9 Connect 24 VDC power supply to Power supply input terminals (+, -).

*Connect an electromagnetic brake cable to Electromagnetic brake terminals (MB1, MB2) as required.

*Connect Protective Earth Terminal as required.



7.2.7. Hardware Settings of AZ Series AC Power Input Built-in Controller Type

Set the hardware switches on Driver for AZ Series AC power input Built-in Controller Type and connect the cables.

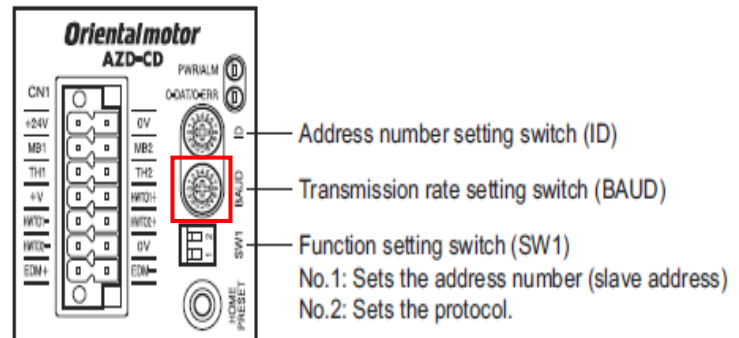


Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

<p>1</p>	<p>Make sure that the power supply to Driver is OFF.</p> <p>*If the power supply is turned ON, settings may not be applicable as described in the following procedure.</p>	
<p>2</p>	<p>Check the positions of hardware switches and connectors on Driver by referring to the right figure.</p>	<p>Diagram labels for Figure 7-27:</p> <ul style="list-style-type: none"> CN1 connector DC24 V power supply input terminal (+24V, 0V) Electromagnetic brake terminals (MB1, MB2) Regeneration resistor thermal input terminals (TH1, TH2) Power removal signal input terminal (-HWT01+, HWT01-, HWT02+, HWT02-) Power removal monitor output terminal (EDM+, EDM-) CN2 connector (ENCODER) CN3 connector (MOTOR) CHARGE LED (Red) CN4 connector Regeneration resistor terminals (RG1, RG2) Main power supply input terminals (L, N or L1, L2, L3) Protective Earth Terminal PWR/ALM LED (Green/Red) C-DAT/C-ERR LED (Green/Red) Address number setting switch (ID) Transmission rate setting switch (BAUD) Function setting switch (SW1) HOME PRESET switch USB communication connector CN6/CN7 connector (RS-485) Termination resistor setting switch (TERM.) CN5 connector (I/O)
<p>3</p>	<p>Make the following settings for the address number (slave address).</p> <ul style="list-style-type: none"> Set Function setting switch (SW1)-No.1 to OFF. Set Address number setting switch (ID) to 0. <p>*The address number (slave address) is set to 0.</p>	<p>Diagram labels for Figure 7-28:</p> <ul style="list-style-type: none"> Address number setting switch (ID) Transmission rate setting switch (BAUD) Function setting switch (SW1) No.1: Sets the address number (slave address) No.2: Sets the protocol.
<p>4</p>	<p>Set Function setting switch (SW1)-No.2 to OFF.</p> <p>*The RS-485 communication protocol is set to Network Converter.</p>	<p>Diagram labels for Figure 7-29:</p> <ul style="list-style-type: none"> Address number setting switch (ID) Transmission rate setting switch (BAUD) Function setting switch (SW1) No.1: Sets the address number (slave address) No.2: Sets the protocol.

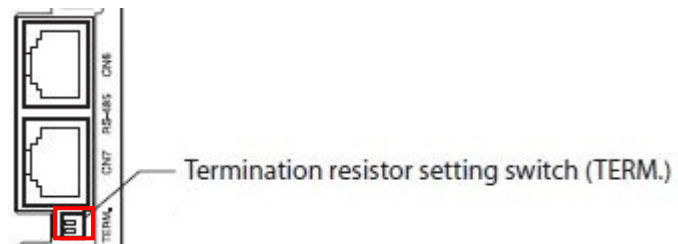
- 5 Set Transmission rate setting switch (BAUD) to 7.



BAUD	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600
4	115,200
5	230,400
6	Not used.
7	Network converter
8 to F	Not used.

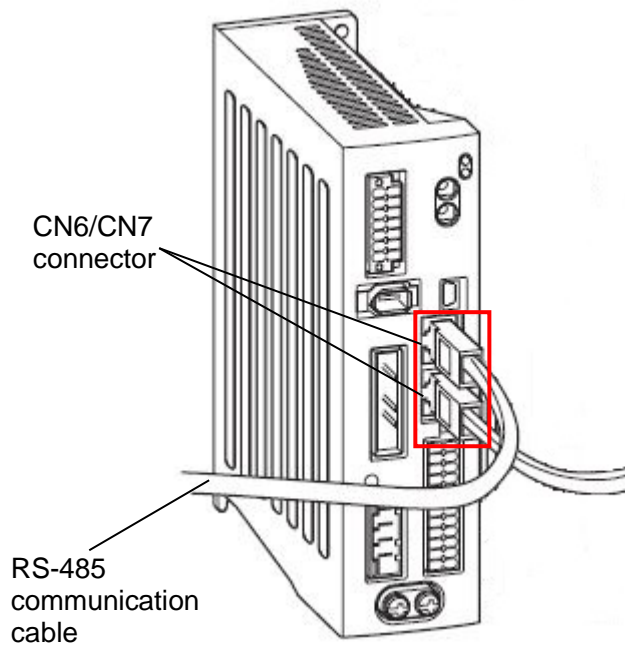
- 6 Set the both No.1 and No.2 of Termination resistor setting switch (TERM.) to ON.

*The termination resistor (120Ω) is enabled.

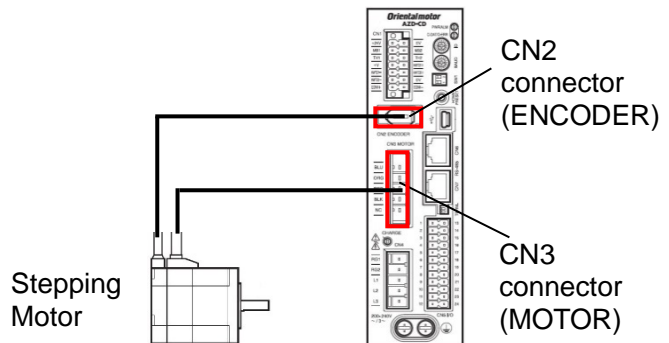


TERM.-No.1, No.2	Termination resistor (120 Ω)
Both are OFF	Disabled
Both are ON	Enabled

- 7 Connect a RS-485 communication cable to CN6 connector or CN7 connector.



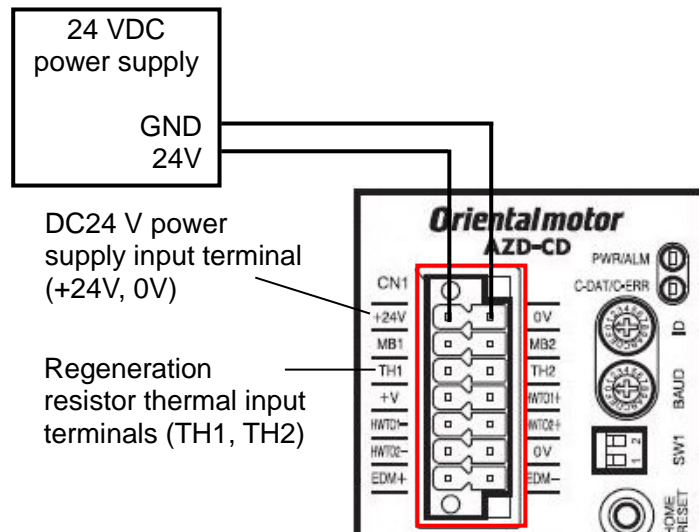
- 8 Connect Stepping Motor to CN2 connector (ENCODER) and CN3 connector (MOTOR).



- 9 Connect 24 VDC power supply to DC24 V power supply input terminal (+24V, 0V).

*If no Regeneration resistor thermal input terminals (TH1, TH2) are connected, short the TH1 and TH2 terminals.

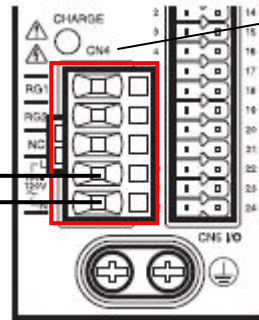
*If you do not use the power removal function, short the +V and HWT01+ terminals, the HWT01- and HWT02+ terminals, and the HWT02- and 0V terminals.



10 Connect 100 VAC or 200 VAC power supply to Main power supply input terminals (L, N or L1, L2, L3).

- Single-phase 100 VAC power supply

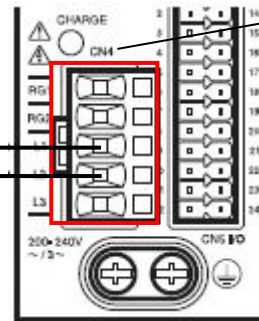
Single-phase
100 VAC
power supply



Main power
supply input
terminals (L
and N)

- Single-phase 200 VAC power supply

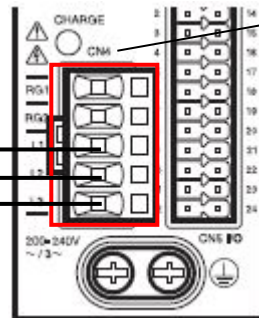
Single-phase
200 VAC
power supply



Main power
supply input
terminals
(L1 and L2)

- Three-phase 200 VAC power supply

Three-phase
200 VAC
power supply



Main power
supply input
terminals
(L1, L2 and
L3)

7.2.8. Hardware Settings of BLE Series RS-485 Communication Type

Set the hardware switches on Driver for BLE Series RS-485 Communication Type and connect the cables.



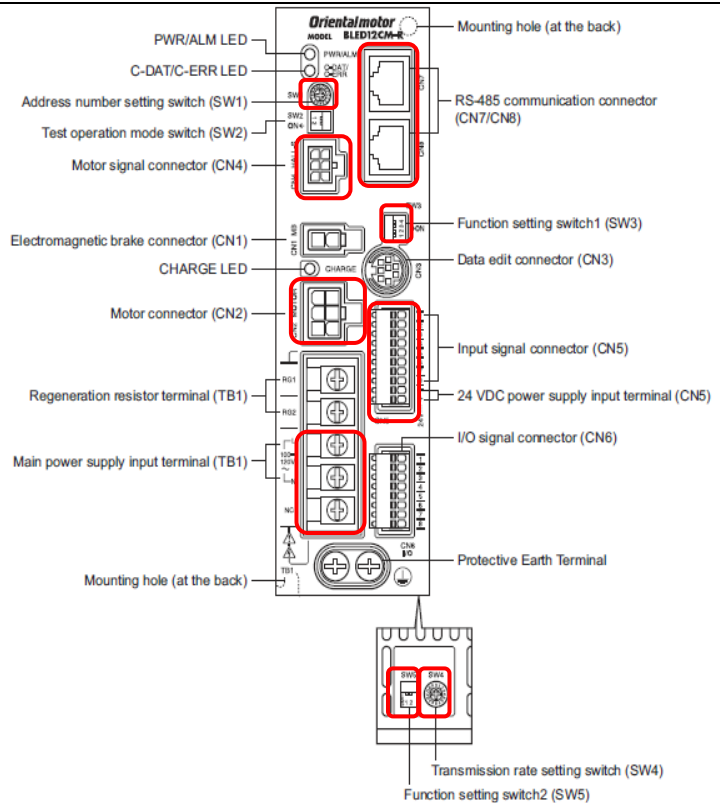
Precautions for Correct Use

Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Driver is OFF.

*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

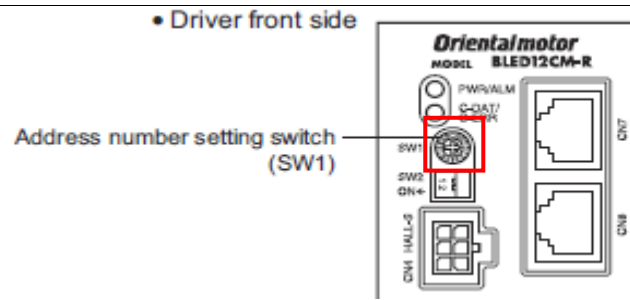
- 2 Check the positions of hardware switches and connectors on Driver by referring to the right figure.



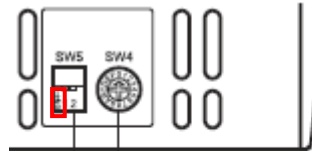
3 Make the following settings for the address number (slave address).

- Set Address number setting switch (SW1) to 0.
- Set Function setting switch2 (SW5)-No.1 to OFF.

*The address number (slave address) is set to 0.



• Driver bottom side



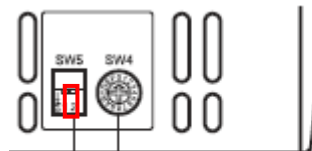
Transmission rate setting switch (SW4)

Function setting switch2 (SW5)
No.1: Set the address number
No.2: Set the protocol

4 Set Function setting switch2 (SW5)-No.2 to OFF.

*The RS-485 communication protocol is set to Network Converter.

• Driver bottom side

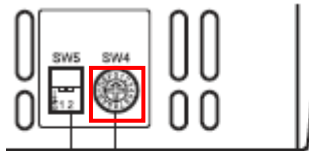


Transmission rate setting switch (SW4)

Function setting switch2 (SW5)
No.1: Set the address number
No.2: Set the protocol

- 5 Set Transmission rate setting switch (SW4) to 7.

• Driver bottom side



Transmission rate setting switch (SW4)

Function setting switch2 (SW5)

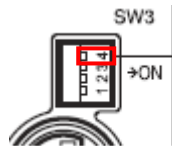
No.1: Set the address number

No.2: Set the protocol

SW4	Transmission rate (bps)
0	9600
1	19200
2	38400
3	57600
4	115200
5	Not used
6	Not used
7	Network Converter
8 to F	Not used

- 6 Set Function setting switch1 (SW3)-No.4 to ON.

*The termination resistor (120Ω) is enabled.



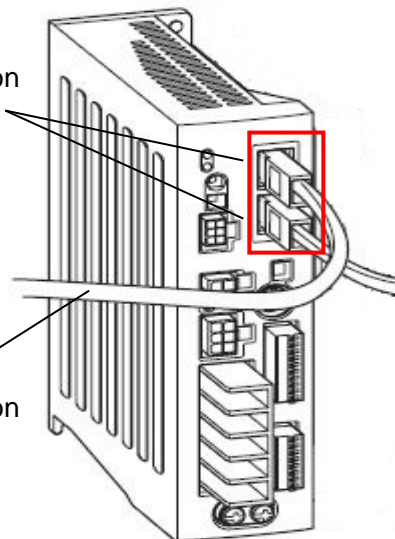
Function setting switch1 (SW3)
No.4: Set the termination resistor

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

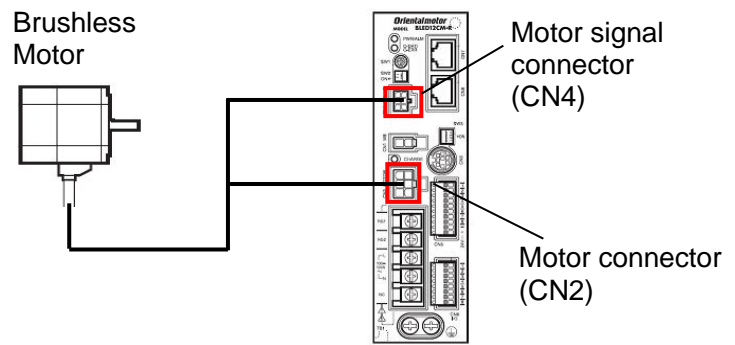
- 7 Connect a RS-485 communication cable to RS-485 communication connector (CN7) or RS-485 communication connector (CN8).

RS-485 Communication connector (CN7/CN8)

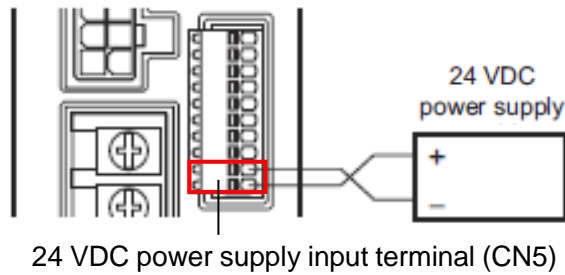
RS-485 Communication cable



- 8 Connect Brushless Motor to Motor signal connector (CN4) and Motor connector (CN2).

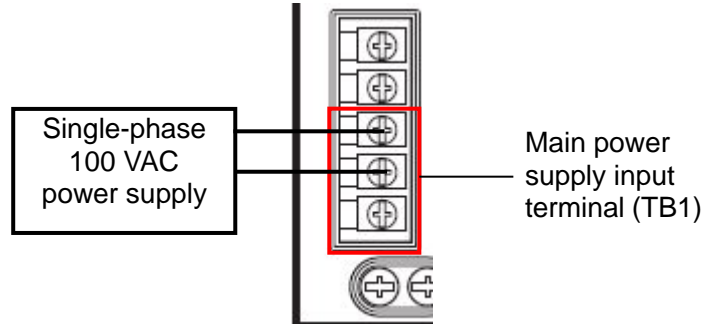


- 9 Connect 24 VDC power supply to 24 VDC power supply input terminal (CN5).

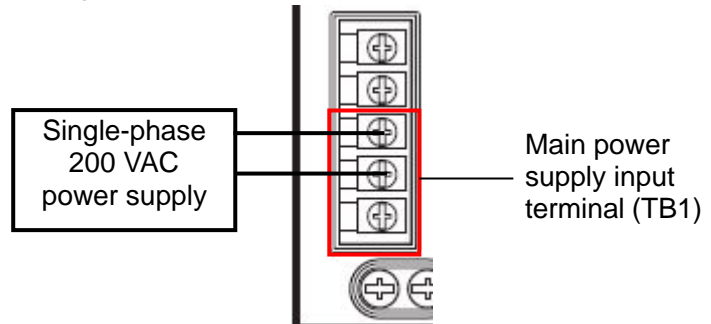


- 10 Connect 100 VAC or 200 VAC power supply to Main power supply input terminal (TB1).

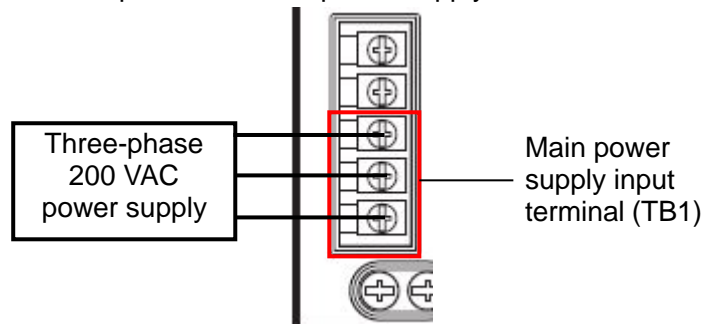
- Single-phase 100 VAC power supply



- Single-phase 200 VAC power supply



- Three-phase 200 VAC power supply



7.3. Setting up Oriental Motor Network Converter

Set up the Oriental Motor Network Converter.

7.3.1. Hardware Settings

Set the hardware switches on Network Converter and connect cables.



Precautions for Correct Use

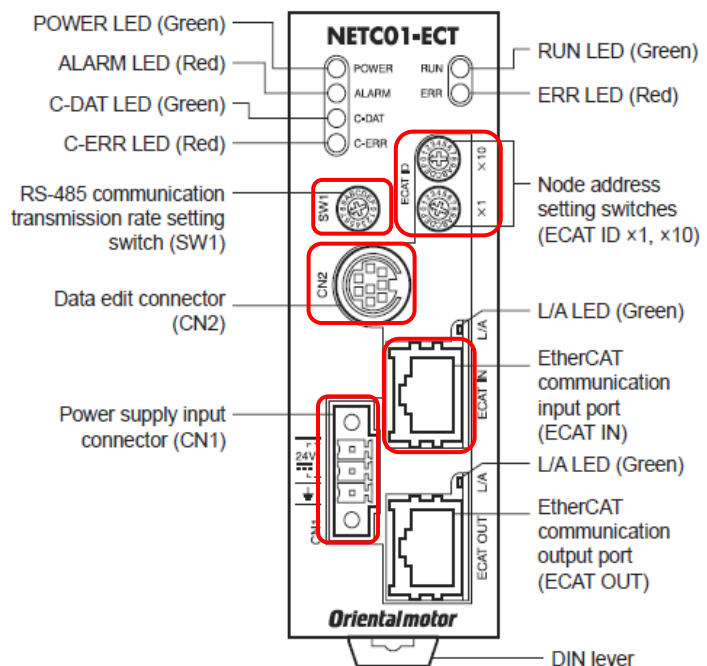
Make sure that the power supply is OFF when you perform the setting up.

- 1 Make sure that the power supply to Network Converter is OFF.

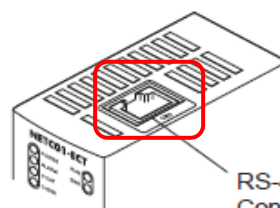
*If the power supply is turned ON, settings may not be applicable as described in the following procedure.

- 2 Check the positions of the hardware switches and the connectors on Network Converter by referring to the right figure.

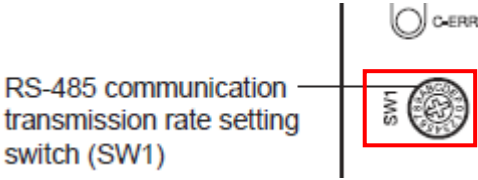
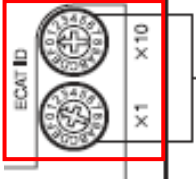
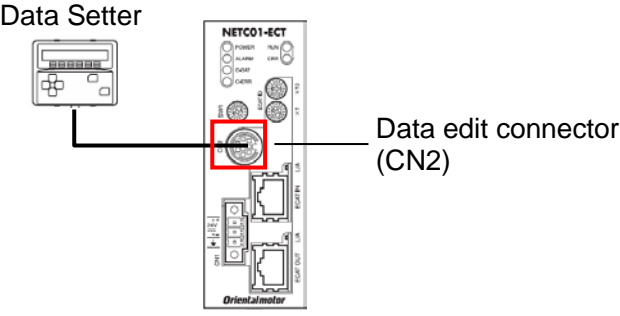
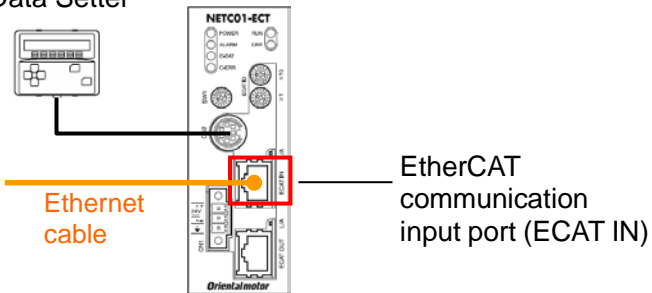
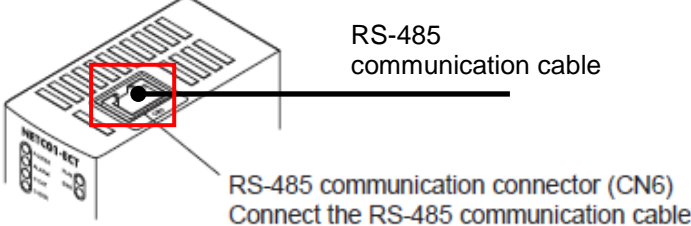
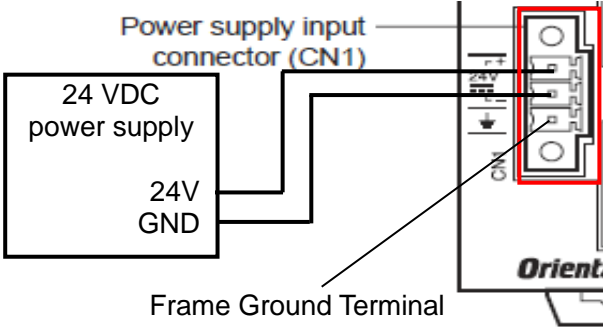
Network Converter front face



Network Converter top face



RS-485 communication connector (CN6)
Connect the RS-485 communication cable

<p>3</p>	<p>Set RS-485 communication transmission rate setting switch (SW1) to 7.</p> <p>*The Transmission rate (Baud rate) is set to 625,000 bps.</p>	 <p>RS-485 communication transmission rate setting switch (SW1)</p>
<p>4</p>	<p>Set Node address setting switches (ECAT ID x1, x10) as follows: x10: 0 x1: 1</p> <p>*The node address is set to 1.</p>	 <p>Node address setting switches (ECAT ID x1, x10)</p>
<p>5</p>	<p>Connect Data setter to Data edit connector (CN2).</p>	 <p>Data Setter</p> <p>Data edit connector (CN2)</p>
<p>6</p>	<p>Connect an Ethernet cable to EtherCAT communication input port (ECAT IN).</p>	 <p>Data Setter</p> <p>Ethernet cable</p> <p>EtherCAT communication input port (ECAT IN)</p>
<p>7</p>	<p>Connect a RS-485 communication cable to RS-485 communication connector (CN6).</p>	 <p>RS-485 communication cable</p> <p>RS-485 communication connector (CN6) Connect the RS-485 communication cable</p>
<p>8</p>	<p>Connect 24 VDC power supply to Power supply input connector (CN1).</p> <p>*Connect Frame Ground Terminal as required.</p>	 <p>Power supply input connector (CN1)</p> <p>24 VDC power supply</p> <p>24V GND</p> <p>Frame Ground Terminal</p>
<p>9</p>	<p>Turn ON the power supplies to Network Converter and Driver.</p>	

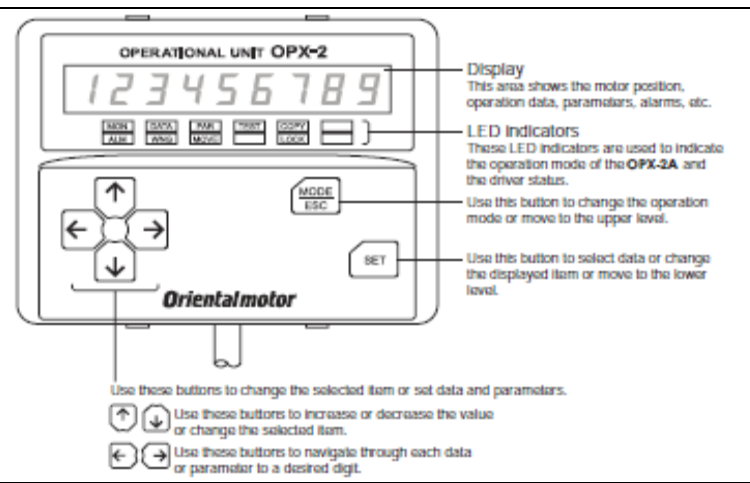

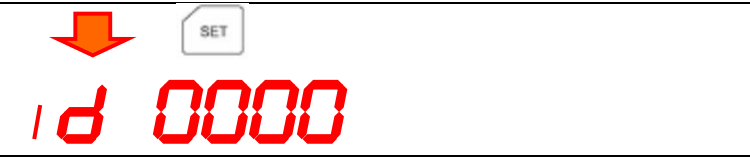

7.3.2. Parameter Settings



Set the parameters for Network Converter.



Additional Information

The following procedure is unnecessary if Network Converter is in the factory default settings, and if Driver only with address number 0 is used.

1	<p>Check the parameter settings by using the Data Setter keys as shown in the right figure.</p>	
2	<p>Press MODE/ESC to display the parameter mode.</p> <p>*The initial display may differ depending on the status of the device.</p>	
3	<p>Press SET to display "id 0000".</p>	
4	<p>Use the arrow keys to display "id 3456".</p> <p>3456: Connection (Address number 0)</p> <p>Press SET.</p> <p>Check that the displayed value is the default value 1.</p> <p>*If the setting is different, change the set value.</p> <p>Press SET and return to "id 3456".</p>	

<p>5</p>	<p>Use the up arrow key to display "id 3457".</p> <p>3457: Connection (Address number 1)</p> <p>Press SET.</p> <p>Check that the displayed value is the default value 0.</p> <p>*If the setting is different, change the set value.</p> <p>Press SET and return to "id 3457".</p>	
<p>6</p>	<p>In the same way as Step 5, check that the set values from "id 3458" to "id 3471" are 0.</p> <p>3458: Connection (Address number 2)</p> <p>.</p> <p>.</p> <p>.</p> <p>3471: Connection (Address number 15)</p>	
<p>7</p>	<p>Turn OFF the power supplies to Network Converter and Driver.</p>	

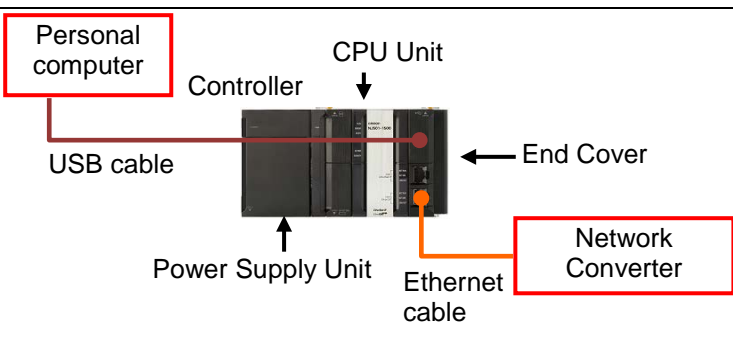

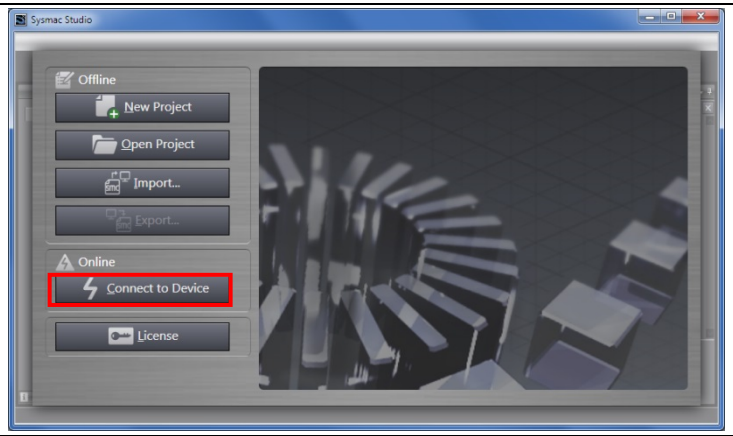
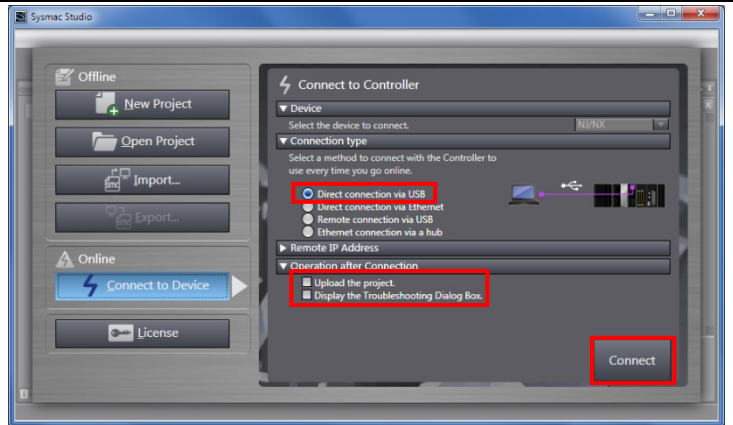
7.4. Setting up Controller

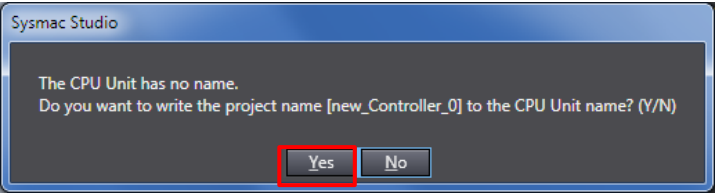
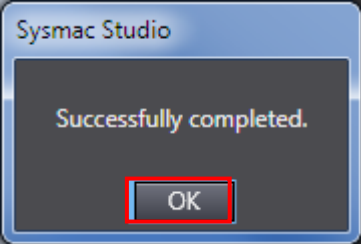
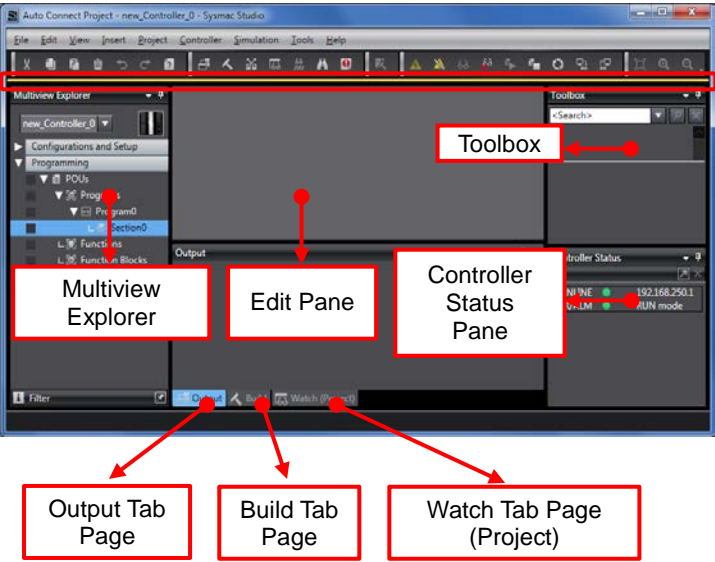
Set up Controller.

7.4.1. Starting Sysmac Studio and Installing the ESI File

Install the ESI file for Network Converter in Sysmac Studio.

Install Sysmac Studio and a USB driver on Personal computer beforehand.

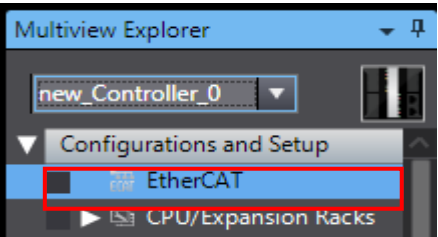
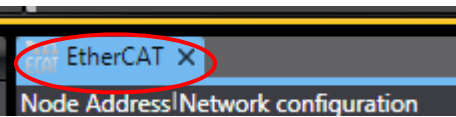
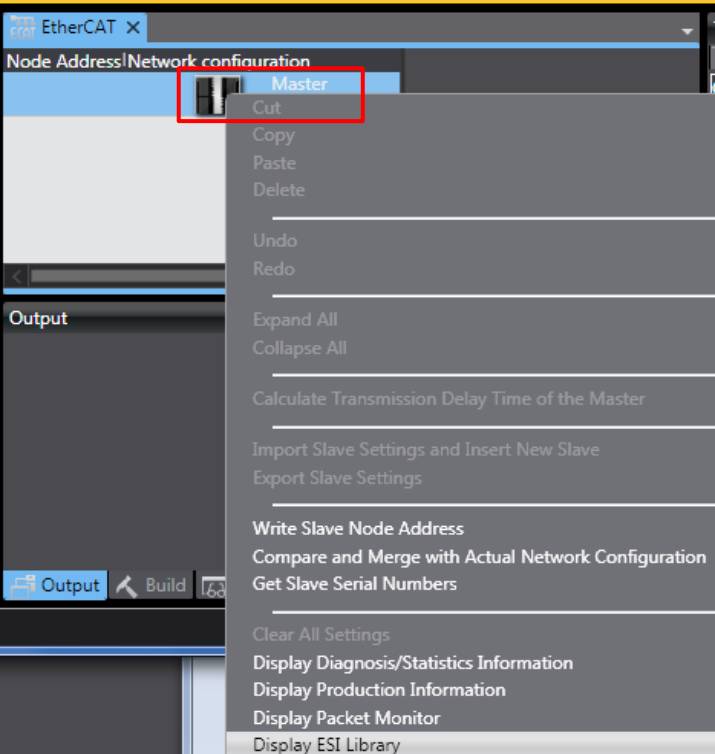
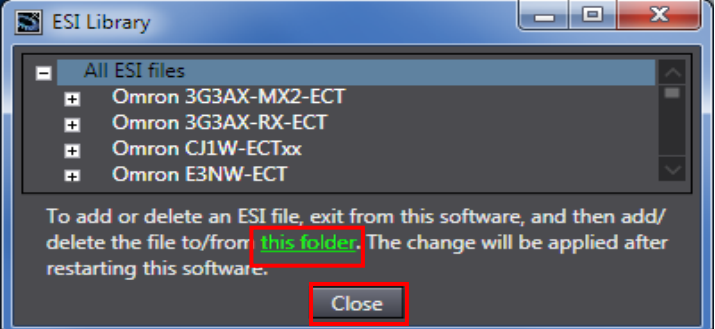
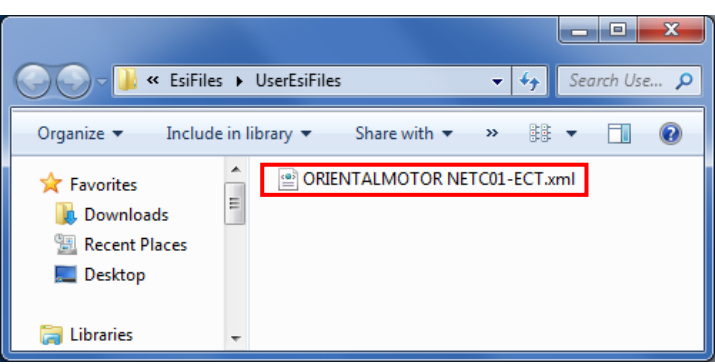
<p>1 Connect an Ethernet cable to the Built-in EtherCAT port (PORT2) on Controller, and connect a USB cable to the peripheral (USB) port. As shown in 5.2. <i>Device Configuration</i>, connect Personal computer and Network Converter to Controller.</p>	 <p>Personal computer</p> <p>Controller</p> <p>CPU Unit</p> <p>End Cover</p> <p>Power Supply Unit</p> <p>Network Converter</p> <p>USB cable</p> <p>Ethernet cable</p>
<p>2 Turn ON the power supplies to Controller, Network Converter, and Driver.</p>	
<p>3 Start Sysmac Studio.</p> <p>*If a confirmation dialog for an access right is displayed at start, execute a selection to start.</p>	
<p>4 Sysmac Studio starts.</p> <p>Click Connect to Device.</p>	
<p>5 The Connect to Controller Dialog Box is displayed. Select <i>Direct connection via USB</i> for Connection type. Uncheck <i>Upload the project</i> and <i>Display the Troubleshooting Dialog Box</i> for Operation after Connection.</p> <p>Click Connect.</p>	

<p>6</p>	<p>A confirmation dialog box is displayed. Check the contents and click Yes.</p> <p>*The displayed dialog depends on the status of Controller. Check the contents and click OK or Yes to proceed with the processing.</p>	
<p>7</p>	<p>A dialog box on the right is displayed. Check the contents and click OK.</p>	
<p>8</p>	<p>The Auto Connect Project Dialog Box is displayed online. When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.</p> <p>The following panes are displayed in this window.</p> <p>Left: Multiview Explorer</p> <p>Top right: Toolbox</p> <p>Bottom right: Controller Status Pane</p> <p>Middle top: Edit Pane</p> <p>The following tab pages are displayed at the middle bottom of the window.</p> <p>Output Tab Page</p> <p>Build Tab Page</p> <p>Watch Tab Page (Project)</p>	



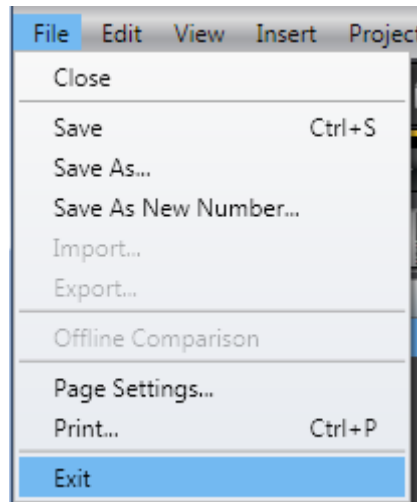
Additional Information

For details on online connections to Controller, refer to *Section 6. Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

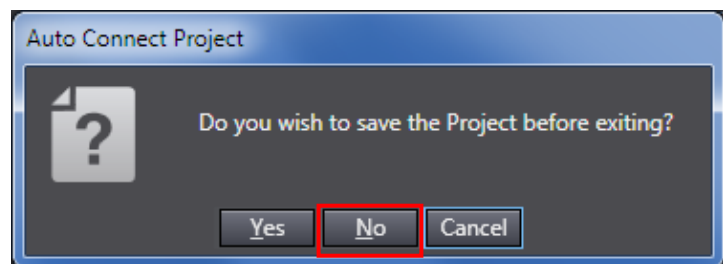
9	<p>Double-click EtherCAT under Configurations and Setup in the Multiview Explorer.</p>	
10	<p>The EtherCAT Tab Page is displayed in the Edit Pane.</p>	
11	<p>Right-click Master and select Display ESI Library.</p>	
12	<p>The ESI Library Dialog Box is displayed.</p> <p>Click the this folder link.</p> <p>When the Explorer starts, Click Close to close the dialog box.</p>	
13	<p>The Explorer starts, and a folder is opened, allowing you to install the ESI file. Copy the prepared ORIENTALMOTOR NETC01-ECT.xml to this folder.</p>	

- 14 Select **Exit** from the File Menu to exit Sysmac Studio.

*You need to restart Sysmac Studio after installing the ESI file.



A dialog box is displayed confirming whether to save the project. If you do not need to save it, click **No**.

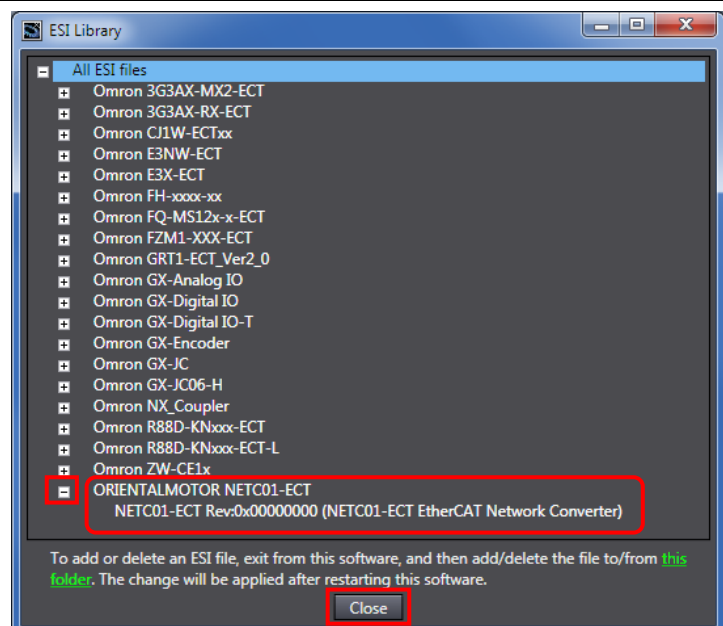


- 15 In the same way as steps 3 to 11, restart Sysmac Studio and display the ESI Library Dialog Box.

Click the **+** Button of ORIENTALMOTOR NETC01-ECT to check that NETC01-ECT Rev:0x00000000 is displayed.

Check that an exclamation mark (warning) is not displayed.

Click **Close**.



Precautions for Correct Use

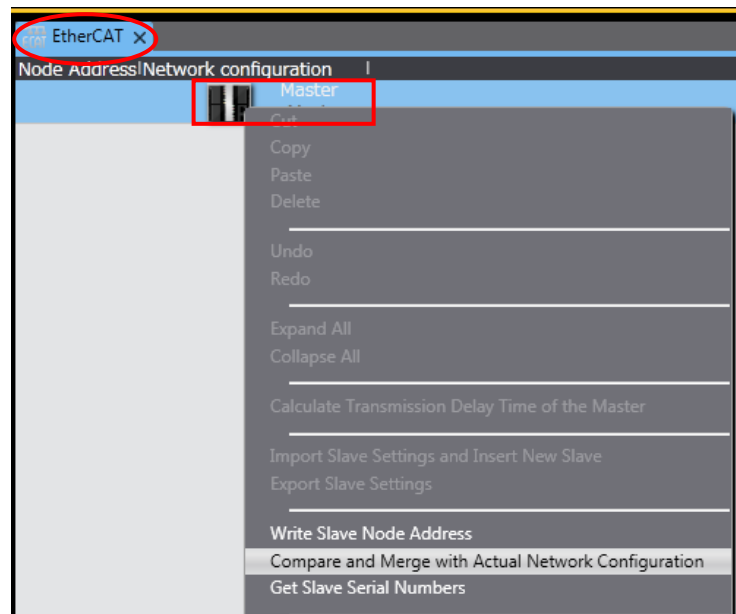
If an exclamation mark (warning) is displayed for the ESI file, check the name of the ESI file, and obtain an ESI file with a correct name. If an exclamation mark (warning) is displayed even when the name of the ESI file is correct, the file may be corrupted. Contact the device manufacturer.

7.4.2. Setting up the EtherCAT Network Configuration

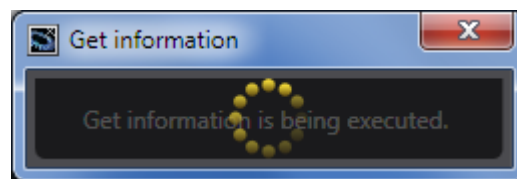
Set up the EtherCAT network configuration.

- 1 Right-click **Master** on the EtherCAT Tab Page and select **Compare and Merge with Actual Network Configuration**.

*If the EtherCAT Tab Page is not displayed in the Edit Pane, take step 9 in 7.4.1. *Starting Sysmac Studio and Installing the ESI File* to display.

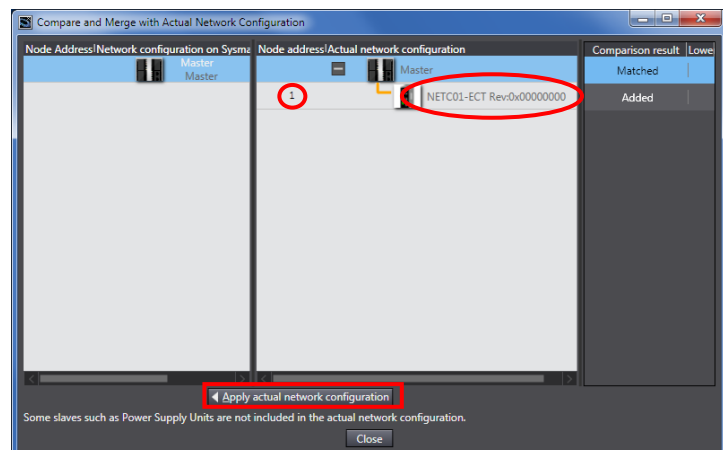


A screen is displayed stating "Get information is being executed".

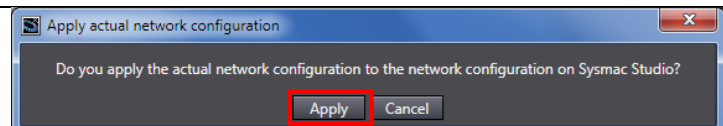


- 2 The Compare and Merge with Actual Network Configuration Dialog Box is displayed. Node address 1 and NETC01-ECT Rev:0x00000000 are added to the Actual network configuration after the comparison.

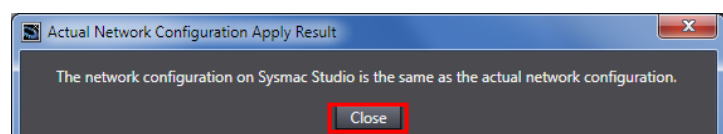
Click **Apply actual network configuration**.



- 3 A confirmation dialog box is displayed. Check the contents and click **Apply**.

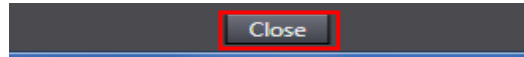
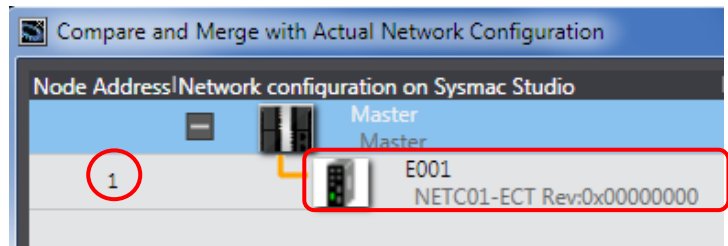


The dialog box on the right is displayed. Click **Close**.

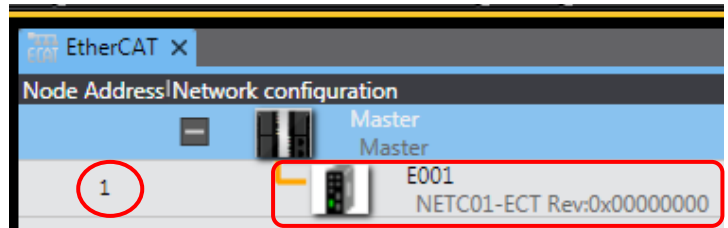


- 4 E001 NETC01-ECT
Rev:0x00000000 is added as a
node address 1 to the Network
configuration on Sysmac Studio.

Check that the data above is
added. Click **Close**.



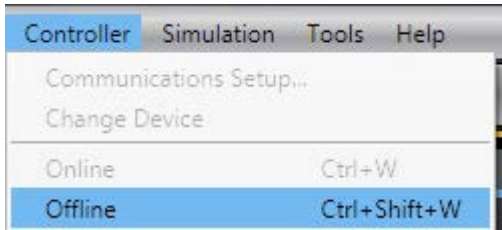
- 5 Node address 1 and E001
NETC01-ECT Rev:0x00000000
are added to the EtherCAT Tab
Page in the Edit Pane.



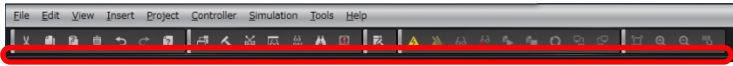
7.4.3. Setting the Device Variables

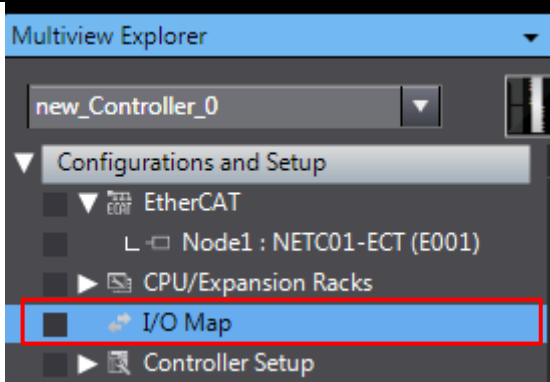
Set the device variables to use for Slave Unit.

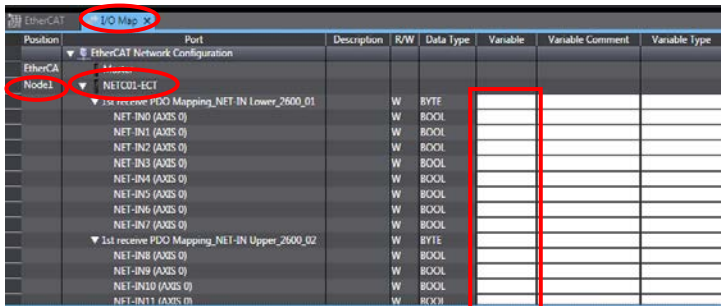
- 1 Select **Offline** from the Controller Menu.



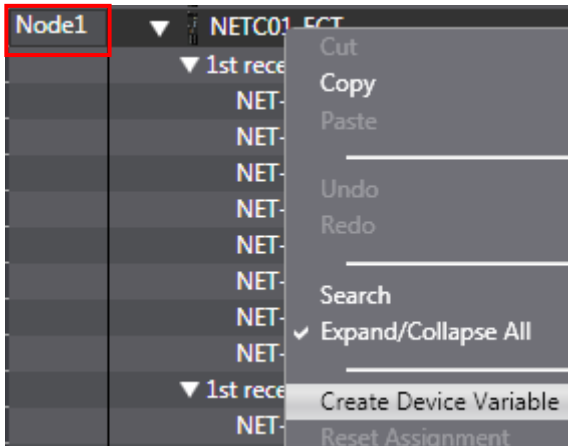
The yellow bar under the toolbar disappears.


- 2 Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.


- 3 The I/O Map Tab Page is displayed in the Edit Pane. Check that Node1 is displayed in the *Position* Column, and that the added Slave Unit is displayed in the *Port* Column.



*To manually set a variable name for Slave Unit, click a column under the *Variable* Column and enter a name.
- 4 Right-click **Node1** and select **Create Device Variable**.



- 5 The variable names and variable types are set.

Position	Port	Desc	R/W	Data Type	Variable	Variable Type
etherCA	Master					
Node1	NET-IO1-ECT					
	▼ 1st receive PDO Mapping_NET-IN Lower_2600_01		W	BYTE	E001_1st_receive_PDO_Mapping_NET-IN_Lower_2600_01	Global Variables
	NET-IN0 (AXIS 0)		W	BOOL	E001_NET_IN0_AXIS_0_0	Global Variables
	NET-IN1 (AXIS 0)		W	BOOL	E001_NET_IN1_AXIS_0_0	Global Variables
	NET-IN2 (AXIS 0)		W	BOOL	E001_NET_IN2_AXIS_0_0	Global Variables
	NET-IN3 (AXIS 0)		W	BOOL	E001_NET_IN3_AXIS_0_0	Global Variables
	NET-IN4 (AXIS 0)		W	BOOL	E001_NET_IN4_AXIS_0_0	Global Variables
	NET-IN5 (AXIS 0)		W	BOOL	E001_NET_IN5_AXIS_0_0	Global Variables
	NET-IN6 (AXIS 0)		W	BOOL	E001_NET_IN6_AXIS_0_0	Global Variables
	NET-IN7 (AXIS 0)		W	BOOL	E001_NET_IN7_AXIS_0_0	Global Variables
	▼ 1st receive PDO Mapping_NET-IN Upper_2600_02		W	BYTE	E001_1st_receive_PDO_Mapping_NET-IN_Upper_2600_02	Global Variables
	NET-IN8 (AXIS 0)		W	BOOL	E001_NET_IN8_AXIS_0_0	Global Variables
	NET-IN9 (AXIS 0)		W	BOOL	E001_NET_IN9_AXIS_0_0	Global Variables
	NET-IN10 (AXIS 0)		W	BOOL	E001_NET_IN10_AXIS_0_0	Global Variables
	NET-IN11 (AXIS 0)		W	BOOL	E001_NET_IN11_AXIS_0_0	Global Variables



Additional Information

The device variables are named automatically from a combination of the device names and the port names.

The default device names are "E" followed by a serial number that starts from 001.



Additional Information

In this document, device variables are automatically named for a unit (a slave).

Device variables can also be manually named for ports.

7.4.4. Transferring the Project Data

Transfer the project data from Sysmac Studio to Controller.

WARNING

When you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from Sysmac Studio, the devices or machines may perform unexpected operation regardless of the operating mode of CPU Unit.

Always confirm safety at the destination node before you transfer the project data.



Caution

After transferring the project data, CPU Unit restarts and communications with slaves are cut off. During the period, the outputs of slaves behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration.

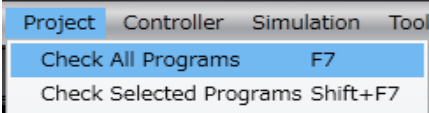
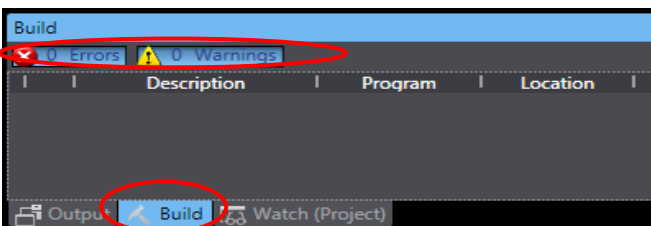
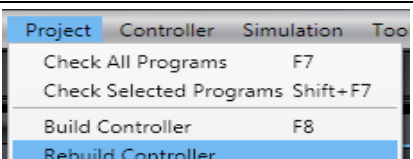
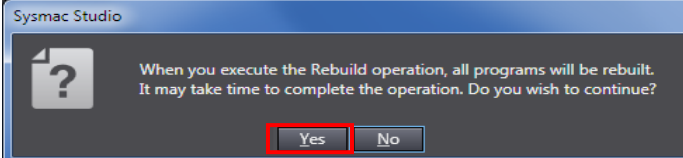
Before you transfer the project data, confirm that the slave settings will not adversely affect the device.

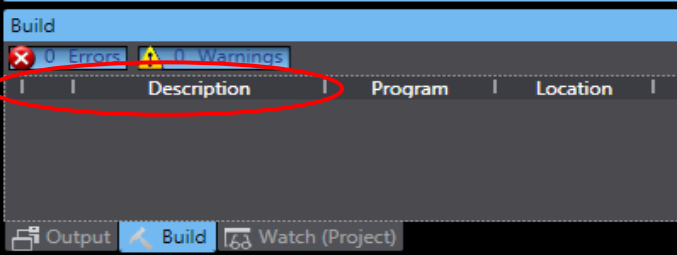
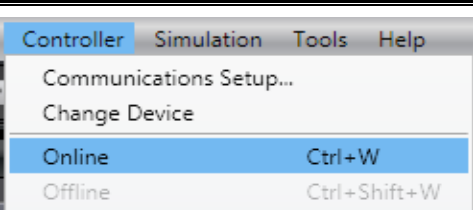
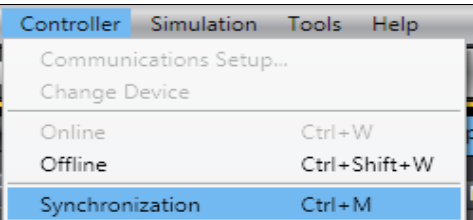
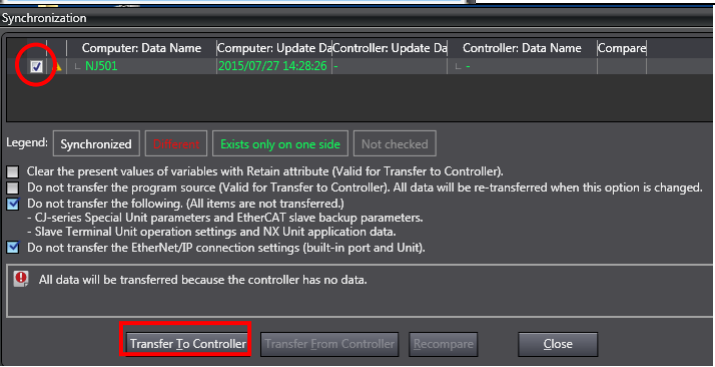
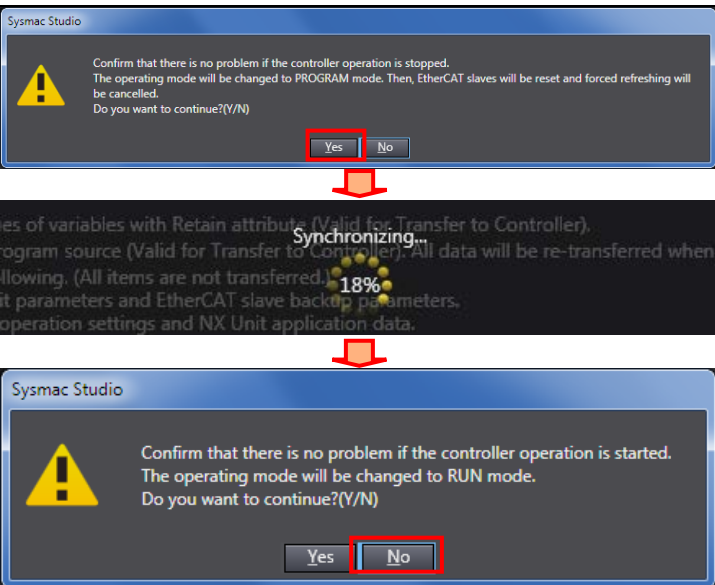


Caution

A slave will be reset after performing the synchronization in step 7 and subsequent steps, and the device may perform unexpected operations. Always confirm safety before performing the synchronization.



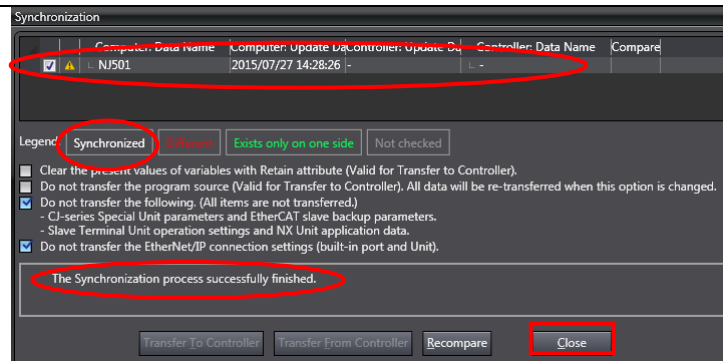
1	Select Check All Programs from the Project Menu.	
2	The Build Tab Page is displayed. Check that "0 Errors" and "0 Warnings" are displayed.	
3	Select Rebuild Controller from the Project Menu.	
4	A confirmation dialog box is displayed. Check that there is no problem and click Yes .	

5	<p>Check that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.</p>	
6	<p>Select Online from the Controller Menu.</p>	
7	<p>Select Synchronization from the Controller Menu.</p>	
8	<p>The Synchronization Dialog Box is displayed.</p> <p>Check that the data to transfer (NJ501 in the right dialog box) is selected. Then, click Transfer To Controller.</p> <p>*After executing Transfer To Controller, the Sysmac Studio data is transferred to Controller, and the data is compared.</p>	
9	<p>A confirmation dialog box is displayed. Check that there is no problem and click Yes.</p> <p>A screen stating "Synchronizing" is displayed.</p> <p>A confirmation dialog box is displayed. Check that there is no problem and click No.</p> <p>*Do not return to RUN mode.</p>	

- 10 Check that the synchronized data is displayed with the color specified by "Synchronized", and that a message is displayed stating "The synchronization process successfully finished". If there is no problem, click **Close**.

*A message stating "The synchronization process successfully finished" is displayed if the Sysmac Studio project data coincides with the Controller data.

*If the synchronization fails, check the wiring and repeat from step 1.



7.5. Checking the EtherCAT Communications

Check that the PDO communications of EtherCAT are performed normally.

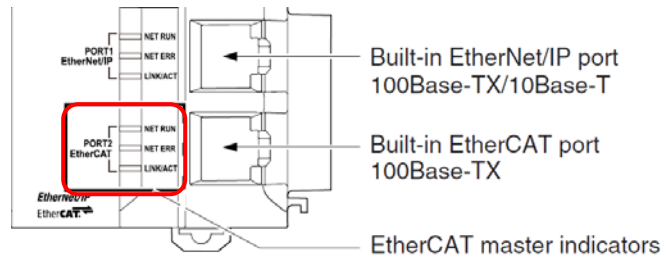
7.5.1. Checking the Connection Status

Check the connection status of the EtherCAT network.

- 1 Check with LED indicators on Controller that PDO communications via EtherCAT are performed normally.

The LED indicators in normal status are as follows:

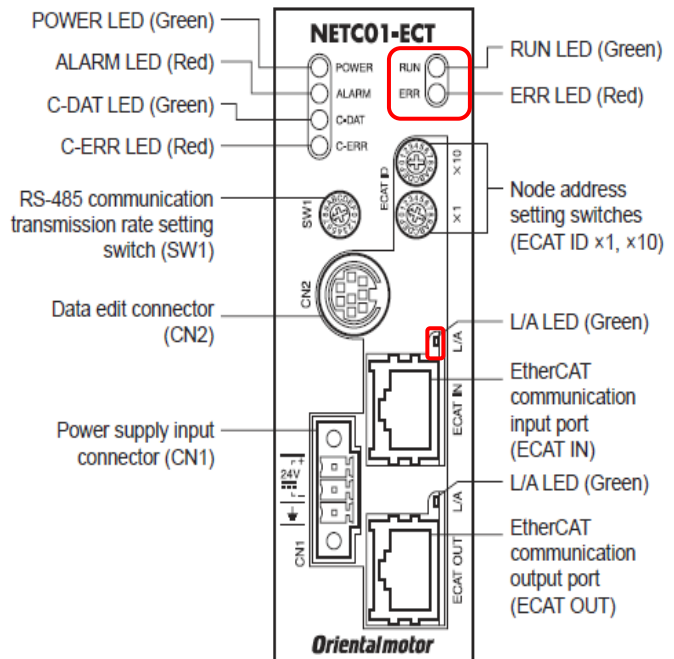
NET RUN: Green lit
NET ERR: Not lit
LINK/ACT: Yellow flashing



- 2 Check the LED indicators on the Network Converter.

The LED indicators in normal status are as follows:

RUN: Green lit
ERR: Not lit
L/A: Green flickering



7.5.2. Checking the Sent and Received Data

Check that the correct data are sent and received.

Caution

If you change the values of variables on a Watch Tab Page in the online state, the devices connected to the output unit may operate regardless of the operating mode of CPU Unit.

Sufficiently confirm safety before you change the values of variables on a Watch Tab Page when Sysmac Studio is online with CPU Unit.

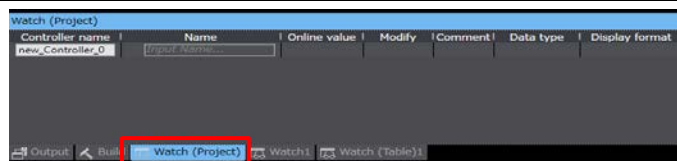


Caution

In this procedure, Network Converter is output, which may perform unexpected operations. Take sufficient safety precautions and proceed with this operation check. If you cannot confirm safety, do not proceed with this procedure after completing until 7.5.1. *Checking the Connection Status*. If you proceed with this operation check, make sure to complete all the steps and place Network Converter in the safe state.



1 Select the **Watch (Project)** Tab.



2 As shown below, enter the following names of the variables for monitoring.

Click *Input Name* in the *Name* Column to enter a new name.

E001_NET_IN14_AXIS_0_0
(Continuous operation in the positive direction (FWD))

E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02
(Command code)

E001_Remote_Register_TRIG_AXIS_0_0
(Command code execution trigger)

E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02
(Command code response)

E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03
(Data Response)

E001_Remote_Register_TRIG_R_AXIS_0_0
(Command code execution trigger response)

Name
E001_NET_IN14_AXIS_0_0
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02
E001_Remote_Register_TRIG_AXIS_0_0
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03
E001_Remote_Register_TRIG_R_AXIS_0_0
Input Name...

- 3 Select **Hexadecimal** from the pull-down menu of Display format for *E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02*.

Name	Online value	Modify	Display format
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	0	TRUE FALSE	Decimal
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0	TRUE FALSE	Decimal
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0	TRUE FALSE	Decimal
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE	Boolean



Name	Online value	Modify	Display format
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	0000	TRUE FALSE	Hexadecimal
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0	TRUE FALSE	Decimal
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0	TRUE FALSE	Decimal
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE	Boolean

Check that the online value is displayed in hexadecimal.

- 4 In the same way as step 3, change the display format of the following variables to Hexadecimal.

E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02
(Command code response)

E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03
(Data Response)

Name	Online value	Modify	Display format
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	0000	TRUE FALSE	Hexadecimal
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0	TRUE FALSE	Decimal
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0	TRUE FALSE	Decimal
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE	Boolean



Name	Online value	Modify	Display format
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	0000	TRUE FALSE	Hexadecimal
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE	Boolean
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0000	TRUE FALSE	Hexadecimal
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0000 0000	TRUE FALSE	Hexadecimal
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE	Boolean

Check that the online value of each variable is displayed in hexadecimal.

- 5 Enter 206A (display Direct I/O and electromagnetic brake status) in the **Modify** Column of *E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02*.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	0000	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0000	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0000 0000	TRUE FALSE
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE



Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0000	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0000 0000	TRUE FALSE
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE

Press **Enter** and check that the online value changes to 206A.


- 6 Check that the online value of *E001_Remote_Register_TRIG_AXIS_0_0* is False. Click **TRUE** in the **Modify** Column.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	0000	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	0000 0000	TRUE FALSE
E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE



Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	True	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	206A	TRUE FALSE
E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	012E 0000	TRUE FALSE
E001_Remote_Register_TRIG_R_AXIS_0_0	True	TRUE FALSE

Check that the online value changes to True.

<p>7</p>	<p>Check that the online values of variables are as follows:</p> <p><i>E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02</i> (Command code response): 206A</p> <p><i>E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03</i> (Data Response): Desired value (depending on Driver)</p> <p><i>E001_Remote_Register_TRIG_R_AXIS_0_0</i> (Command code execution trigger response): True</p>	<table border="1"> <thead> <tr> <th>Name</th><th>Online value</th><th>Modify</th></tr> </thead> <tbody> <tr> <td>E001_NET_IN14_AXIS_0_0</td><td>False</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02</td><td>206A</td><td>206A</td></tr> <tr> <td>E001_Remote_Register_TRIG_AXIS_0_0</td><td>True</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02</td><td>206A</td><td></td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03</td><td>012E 0000</td><td></td></tr> <tr> <td>E001_Remote_Register_TRIG_R_AXIS_0_0</td><td>True</td><td>TRUE FALSE</td></tr> </tbody> </table>	Name	Online value	Modify	E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A	E001_Remote_Register_TRIG_AXIS_0_0	True	TRUE FALSE	E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	206A		E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	012E 0000		E001_Remote_Register_TRIG_R_AXIS_0_0	True	TRUE FALSE																					
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<p>8</p>	<p>Click FALSE in the <i>Modify</i> Column of <i>E001_Remote_Register_TRIG_AXIS_0_0</i>.</p> <p>Check that the online value changes to False.</p>	<table border="1"> <thead> <tr> <th>Name</th><th>Online value</th><th>Modify</th></tr> </thead> <tbody> <tr> <td>E001_NET_IN14_AXIS_0_0</td><td>False</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02</td><td>206A</td><td>206A</td></tr> <tr> <td>E001_Remote_Register_TRIG_AXIS_0_0</td><td>True</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02</td><td>206A</td><td></td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03</td><td>012E 0000</td><td></td></tr> <tr> <td>E001_Remote_Register_TRIG_R_AXIS_0_0</td><td>True</td><td>TRUE FALSE</td></tr> </tbody> </table>  <table border="1"> <thead> <tr> <th>Name</th><th>Online value</th><th>Modify</th></tr> </thead> <tbody> <tr> <td>E001_NET_IN14_AXIS_0_0</td><td>False</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02</td><td>206A</td><td>206A</td></tr> <tr> <td>E001_Remote_Register_TRIG_AXIS_0_0</td><td>False</td><td>TRUE FALSE</td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02</td><td>206A</td><td></td></tr> <tr> <td>E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03</td><td>012E 0000</td><td></td></tr> <tr> <td>E001_Remote_Register_TRIG_R_AXIS_0_0</td><td>False</td><td>TRUE FALSE</td></tr> </tbody> </table>	Name	Online value	Modify	E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A	E001_Remote_Register_TRIG_AXIS_0_0	True	TRUE FALSE	E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	206A		E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	012E 0000		E001_Remote_Register_TRIG_R_AXIS_0_0	True	TRUE FALSE	Name	Online value	Modify	E001_NET_IN14_AXIS_0_0	False	TRUE FALSE	E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A	E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE FALSE	E001_1st_transmit_PDO_Mapping_Remote_Register_Command_R_2900_02	206A		E001_1st_transmit_PDO_Mapping_Remote_Register_Data_R_2900_03	012E 0000		E001_Remote_Register_TRIG_R_AXIS_0_0	False	TRUE FALSE
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Additional Information

For RK II Series Built-in Controller Type Driver, you can monitor "direct I/O and electromagnetic brake status" by performing steps 2 to 9 as with the case of AR Series DC/AC power input Built-in Controller Type Driver.

For CRK Series Built-in Controller Type Driver, you can monitor "Driver status" in steps 6 to 9 by setting 2E30 (Driver status) in the *Modify* Column of *E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02* (Command code) in step 5.

For AZ Series DC/AC power input Built-in Controller Type Driver, you can monitor "direct I/O" by performing steps 2 to 9 as with the case of AR Series DC/AC power input Built-in Controller Type Driver.

For BLE Series RS-485 Communication Type Driver, you can monitor "direct I/O and electromagnetic brake status" by performing steps 2 to 9 as with the case of AR Series DC/AC power input Built-in Controller Type Driver.

⚠ Caution

In the following procedures, Stepping Motor is output.

Once the output is ON (TRUE), continuously operating until it turns OFF (FALSE). Confirm safety before operation. If you cannot confirm safety, do not proceed with step 10 and the further procedure after you complete step 9.

After confirming, place Stepping Motor in the safe state.



- 10** Click **TRUE** in the *Modify* Column of *E001_NET_IN14_AXIS_0_0*.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE TRUE



The online value changes to True, and Stepping Motor rotates.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	True	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE TRUE

- 11** Click **FALSE** in the *Modify* Column of *E001_NET_IN14_AXIS_0_0*.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	True	TRUE FALSE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE TRUE



The online value changes to False, and Stepping Motor stops.

Name	Online value	Modify
E001_NET_IN14_AXIS_0_0	False	TRUE TRUE
E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02	206A	206A
E001_Remote_Register_TRIG_AXIS_0_0	False	TRUE TRUE



Additional Information

For RK II Series Built-in Controller Type Driver, Stepping Motor can continuously operate by performing steps 2 to 11 as with the case of AR Series DC/AC power input Built-in Controller Type Driver.

For CRK Series Built-in Controller Type Driver, Stepping Motor can continuously operate by using the following device variables.

- *E001_NET_IN0_AXIS_0_0* (Operation data No.)
- *E001_NET_IN9_AXIS_0_0* (Continuous operation in the positive direction)
- *E001_NET_IN13_AXIS_0_0* (Motor excitation and non-excitation)

Take the following steps to operate Stepping Motor continuously.

- 1) Click **TRUE** in the *Modify* Column of *E001_NET_IN13_AXIS_0_0*. The Stepping Motor is excited. (When the motor excitation mode is set to RS-485 communication)
- 2) Click **TRUE** in the *Modify* Column of *E001_NET_IN0_AXIS_0_0*.
- 3) Click **TRUE** in the *Modify* Column of *E001_NET_IN9_AXIS_0_0*. The online value changes to True, and Stepping Motor rotates.
- 4) Click **FALSE** in the *Modify* Column of *E001_NET_IN9_AXIS_0_0*. The online value changes to False, and Stepping Motor stops.

For AZ Series DC/AC power input Built-in Controller Type Driver, Stepping Motor can continuously operate by performing steps 2 to 11 as with the case of AR Series DC/AC power input Built-in Controller Type Driver.

For BLE Series RS-485 Communication Type Driver, Brushless Motor can continuously operate by using the following device variables.

- *E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02* (Command code)
- *E001_1st_receive_PDO_Mapping_Remote_Register_Data_2800_03* (Data)
- *E001_Remote_Register_TRIG_AXIS_0_0* (Command code execution trigger)
- *E001_NET_IN0_AXIS_0_0* (Operation data No.)
- *E001_NET_IN3_AXIS_0_0* (Continuous operation in the positive direction)

Take the following steps to operate Brushless Motor continuously with the rotation speed 100 r/min.

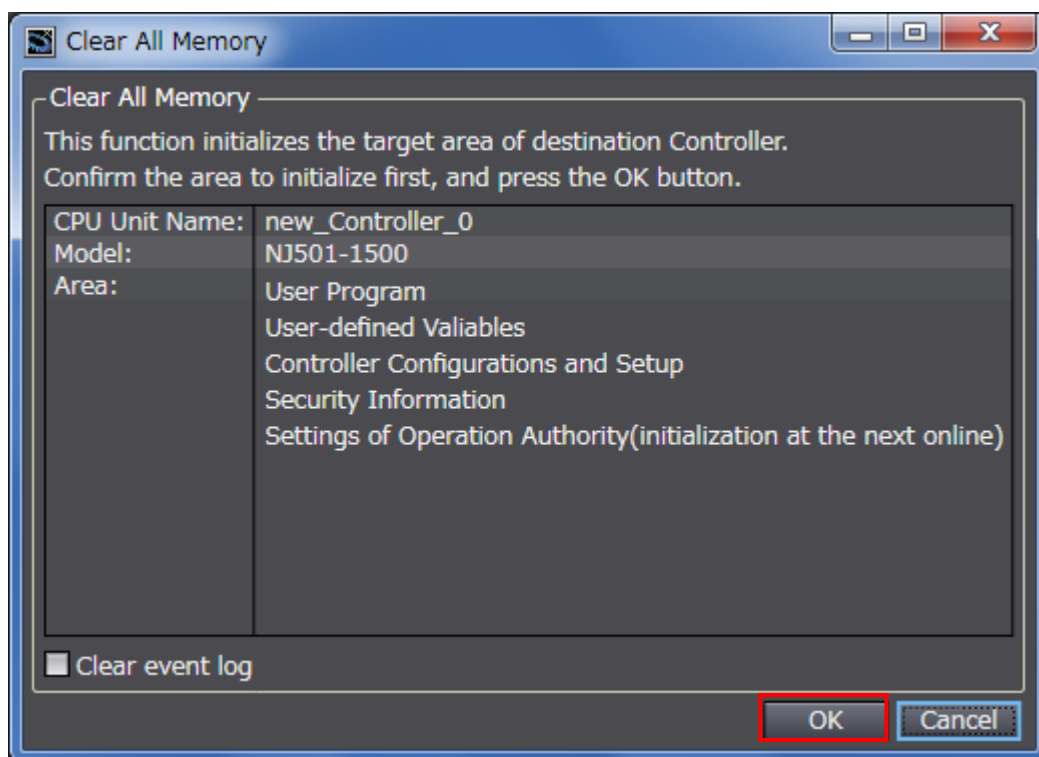
- 1) Enter 1241 (hexadecimal data) (write the rotation speed No.1) in the *Modify* Column of *E001_1st_receive_PDO_Mapping_Remote_Register_Command_2800_02*.
- 2) Enter 100 (decimal data) (100 r/min) in the *Modify* Column of *E001_1st_receive_PDO_Mapping_Remote_Register_Data_2800_03*.
- 3) Click **TRUE** in the *Modify* Column of *E001_Remote_Register_TRIG_AXIS_0_0*. Check that the online value changes to True.
- 4) Click **TRUE** in the *Modify* Column of *E001_NET_IN0_AXIS_0_0*. Check that the online value changes to True.
- 5) Click **TRUE** in the *Modify* Column of *E001_NET_IN3_AXIS_0_0*. The online value changes to True, and Brushless Motor rotates.
- 6) Click **FALSE** in the *Modify* Column of *E001_NET_IN3_AXIS_0_0*. The online value changes to False, and Brushless Motor stops.

8. Initialization Method

This document provides explanations of procedures based on the factory default settings. Some settings may not be applicable as described in this document unless you use the devices with the factory default settings.

8.1. Initializing the Controller

To initialize the settings of Controller, select **Clear All Memory** from the Controller Menu in Sysmac Studio. The Clear All Memory Dialog Box is displayed. Check the contents and click **OK**.



8.2. Initializing the Oriental Motor Network Converter

For initialization of Oriental Motor Network Converter, execute "Initialize all parameters" by referring to *Screen transitions* of the *Network Converter EtherCAT Compatible NETC01-ECT USER MANUAL* (HM-60301).

8.3. Initializing Oriental Motor Driver

For initialization of Oriental Motor Driver, refer to the following manuals for each Driver.

Driver type	Reference manual (Cat. No.)	Referred procedure
AR Series DC/AC power input Built-in Controller Type	Data Setter OPX-2A AR Series FLEX Built-in Controller Type OPERATING MANUAL (HM-60219)	Initializing driver data
CRK Series Built-in Controller Type	Data Setter OPX-2A CRK Series FLEX Built-in Controller Type OPERATING MANUAL (HM-40114)	Initializing driver data
RK II Series Built-in Controller Type	Data setter OPX-2A RK II Series FLEX Built-in Controller Type OPERATING MANUAL (HM-60088)	Initializing driver data
AZ Series DC/AC power input Built-in Controller Type	Data setting software MEXE02 OPERATING MANUAL (HM-60131)	Resetting data of applicable product to factory default settings
BLE Series RS-485 Communication Type	Data setting software MEXE02 OPERATING MANUAL (HM-60131)	Resetting data of applicable product to factory default settings

9. Revision History

Revision code	Date of revision	Revision reason and revision page
01	April 25, 2013	First edition
02	July 25, 2014	Revisions due to upgraded versions of Controller and Sysmac Studio.
03	October 26, 2015	Models added.

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specifications are subject to change without notice.

Cat. No. P552-E1-03

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