OMRON

Machine Automation Controller NJ/NX-series

EtherCAT®
Connection Guide

Mitutoyo Corporation

LINEAR GAGE COUNTER(Display Unit)
(EJ-102N)

Network
Connection
Guide

SYSMAC
always in control

P755-E1-01

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1. Related Manuals

To ensure system safety, make sure you always read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the manuals for each device used in the system.
The table below lists the manuals provided by Mitutoyo Corporation (hereinafter referred to as "Mitutoyo") and OMRON Corporation (hereinafter referred to as "OMRON"), which pertain to this guide.

Manufacturer	Cat. No.	Model	Manual name
OMRON	W500	NJ501-☐☐☐☐ NJ301-☐☐☐☐ NJ101-☐☐☐☐	NJ-series CPU Unit Hardware User's Manual
OMRON	W535	NX701-☐☐☐☐	NX-series CPU Unit Hardware User's Manual
OMRON	W593	NX102-☐☐☐☐	NX-series NX102 CPU Unit Hardware User's Manual
OMRON	W578	NX1P2-☐☐☐☐	NX-series NX1P2 CPU Unit Hardware User's Manual
OMRON	W501	NX701-☐☐☐☐ NX102-☐☐☐☐ NX1P2-☐☐☐☐	NJ/NX-series CPU Unit Software User's Manual
OMRON	W505	NJ501-☐☐☐☐ NJ301-☐☐☐☐ NJ101-☐☐☐☐	NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual
OMRON	W504	SYSMAC-SE2☐☐☐	Sysmac Studio Version 1 Operation Manual
Mitutoyo	99MBC139A	EJ-102N	Compact Display Unit for Linear Gage EJ Counter User's Manual
Mitutoyo	99MBC158A	21HZA264	Interface Unit EtherCAT for EJ Counter User's Manual

2. Terms and Definitions

The terms and definitions used in this guide are given below.

Term	Explanation and Definition
PDO communications (Process Data Objects communications)	PDO communications is used for constant data exchange between a master and slaves. PDO data (i.e., I/O data that is mapped to PDOs) that is allocated in advance is input and output each EtherCAT process data communications cycle (i.e., the task period of primary periodic task). The NJ/NX-series Machine Automation Controllers use PDO communications for commands to refresh I/O data in a fixed control period, including I/O data for slave units and the position control data for servomotors. It is accessed from NJ/NX-series Machine Automation Controllers in the following ways. ・With device variables for EtherCAT slave I/O ・With axis variables for a servo drive and encoder input slaves to which an axis is assigned
SDO communications (Service Data Objects communications)	SDO communications is used to read and write specified slave data from a master when required. The NJ/NX-series Machine Automation Controllers use SDO communications for commands to read and write data, such as for parameter transfers, at specified times. The NJ/NX-series Machine Automation Controllers can read/write the specified slave data, such as parameters and error information, with the EC_CoESDORead (Read CoE SDO) instruction or the EC_CoESDOWrite (Write CoE SDO) instruction.
slave unit	A generic name for a device that performs EtherCAT communications with an EtherCAT master. There are various types of slave units such as servo drives that handle position data and I/O terminals that handle bit signals.
node address	An address to identify a slave unit connected to EtherCAT.
ESI file (EtherCAT slave information file)	It contains information unique to EtherCAT slave units in XML format. The ESI file can be loaded into Sysmac Studio, to allocate EtherCAT 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 a safety circuit, in order to ensure safety and minimize the risk of abnormal occurrence.

(2) To ensure system safety, make sure you always read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the manuals for each device 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 guide without the permission of OMRON Corporation.

(5) The information contained in this guide is current as of May 2022. It is subject to change for improvement without notice.

The following notations are used in this guide.

⚠ WARNING	Indicates a potentially hazardous situation which, if not avoided, may 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.

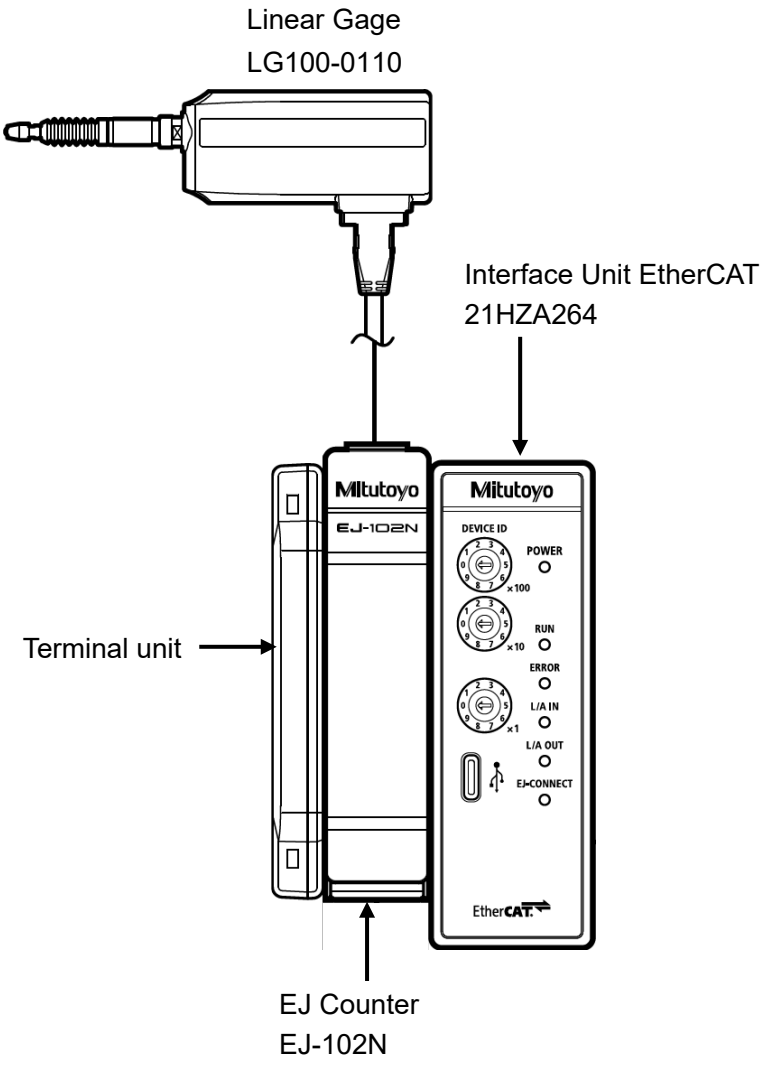
Symbol

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

4. Overview

This guide describes procedures for connecting a Mitutoyo Linear Gage Counter (Display Unit) EJ-102N (hereinafter referred to as the "EJ Counter"), an Interface Unit EtherCAT for EJ Counter 21HZA264 and an OMRON NJ/NX-series Machine Automation Controller (hereinafter referred to as the "Controller") via EtherCAT and for checking their communication status.
Refer to *Section 6. EtherCAT Settings* and *Section 7. EtherCAT Connection Procedure* to understand setting methods and key points to perform PDO communications via EtherCAT.
In this guide, the system composed of an EJ Counter, an Interface Unit for EJ Counter, and a Linear Gage is called the "Linear Gage".

<System configuration of the Linear Gage used in this guide>



Additional Information

Even we only explain Linear Gage 1-axis connection in this guide, 1 Interface Unit for EJ Counter can connect up to 8 EJ Counters and input a total of 16 Linear Gage data to the Controller.

5. Applicable Devices and Device Configuration

5.1. Applicable Devices

The applicable devices are as follows.

Manufacturer	Name	Model
OMRON	NJ/NX-series CPU Unit	NX701-☐☐☐☐ NX102-☐☐☐☐ NX1P2-☐☐☐☐ NJ501-☐☐☐☐ NJ301-☐☐☐☐ NJ101-☐☐☐☐
Mitutoyo	EJ Counter	EJ-102N
Mitutoyo	Interface Unit EtherCAT for EJ Counter	21HZA264
Mitutoyo	Linear Gage	LG100-series LG200-series LGB-series

Precautions for Correct Use

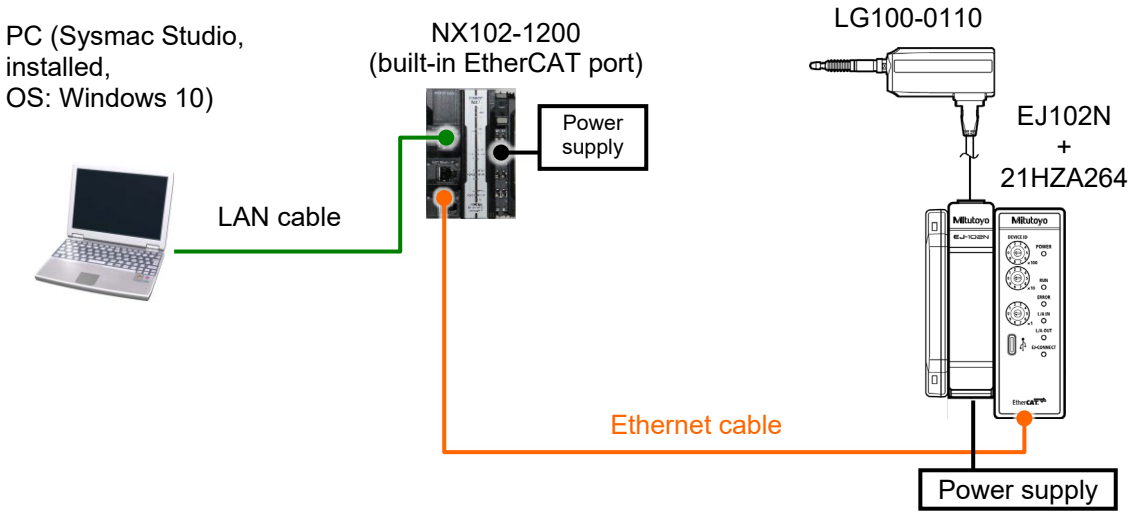
In this guide, the devices with models and versions listed in *5.2. Device Configuration* are used as examples of applicable devices to describe the procedures for connecting the devices and checking their connection.
You cannot use devices with versions lower than those listed in *5.2.*
To use the above 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 guide describes the procedures for establishing the network connection.
It does not provide information on operation, installation, wiring method, device functionality, or device operation, which is not related to the connection procedures.
Refer to the manuals or contact the manufacturers of the applicable devices for other information.

5.2. Device Configuration

The hardware components to replicate the connection procedures in this guide are as follows.



Manufacturer	Name	Model	Version
OMRON	NX-series CPU Unit (built-in EtherCAT port)	NX102-1200	Ver.1.43
—	Power supply (24 VDC for Controller)	—	
OMRON	Sysmac Studio	SYSMAC-SE2□□□	Ver.1.45
—	PC (OS: Windows 10)	—	
—	LAN cable (STP (shielded, twisted-pair) cable of Ethernet category 5 or higher)	—	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-□M□-K	
Mitutoyo	EJ Counter	EJ-102N	
Mitutoyo	Interface Unit EtherCAT for EJ Counter	21HZA264	Rev.0x0001 0001
Mitutoyo	Linear Gage	LG100-0110	
Mitutoyo	ESI file	MITUTOYO 21HZA264 ECAT 20220330.xml	
—	Power supply (24 VDC for Linear Gage)	—	

Precautions for Correct Use

Download the ESI file specified above from Mitutoyo Corporation website before proceeding.

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 an Ethernet switch.
Use an Ethernet cable (double shielding with aluminum tape and braiding) of Category 5 or higher, and use a 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

Update Sysmac Studio to the version 1.45 or to a higher version.
If you use a version higher than the one specified, the procedures and related screenshots described in *Section 7* and the subsequent sections may not be applicable. In that case, use the equivalent procedures described in this guide by referring to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

Additional Information

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

Additional Information

For more information on the power supply specifications of the Controller, refer to the *NX-series NX102 CPU Unit Hardware User's Manual* (Cat. No. W593).

Additional Information

For more information on the power supply specifications of the Linear Gage, refer to the *Compact Display Unit for Linear Gage EJ Counter User's Manual* (99MBC139A).

6. EtherCAT Settings

This section describes the parameters and device variables that are all defined in this guide.
The Linear Gage is referred to as the "slave unit" in some descriptions.

6.1. Parameter

The following parameter is required to connect the Linear Gage and the Controller via EtherCAT.

Name	Setting item	Setting value	Remarks
Interface Unit EtherCAT for EJ Counter	Node address (rotary switch for Device ID)	1	—

6.2. Device Variable

The process data to communicate with the Linear Gage is assigned to the Controller's device variables. The device variable names and data types are shown below.

■Output area(Controller to Linear Gage)

Device variable name	Data type	Description
E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00	USINT	Current value data internal HOLD 1: Internal HOLD set 0: Internal HOLD cleared

■Input area(Linear Gage to Controller)

Device variable name	Data type	Description
E001_Transmit_PDO_Mapping_ALL_GO_2003_00	USINT	ALL_GO : Tolerance judgment for all axes 0: if any result fails 1: if tolerance judgement is OK for all axes
E001_Transmit_PDO_Mapping_HOLD_COMPLETE_2004_00	USINT	HOLD_COMPLETE 0: HOLD clear state 1: HOLD data update complete
		C1A(Counter_1A)
E001_Transmit_PDO_Mapping_C1A_CONNECT_2006_01	USINT	CONNECT
E001_Transmit_PDO_Mapping_C1A_RANGE_CHECK_2006_02	USINT	Not used
E001_Transmit_PDO_Mapping_C1A_RANGE_L_2006_03	USINT	RANGE_L
E001_Transmit_PDO_Mapping_C1A_RANGE_LT_2006_04	USINT	RANGE_LT
E001_Transmit_PDO_Mapping_C1A_SENSOR_ERROR_2006_05	USINT	SENSOR_ERROR
E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06	DINT	CURRENT_DATA
		C1B(Counter_1B)
E001_Transmit_PDO_Mapping_C1B_CONNECT_2007_01	USINT	CONNECT
E001_Transmit_PDO_Mapping_C1B_RANGE_CHECK_2007_02	USINT	Not used
E001_Transmit_PDO_Mapping_C1B_RANGE_L_2007_03	USINT	RANGE_L
E001_Transmit_PDO_Mapping_C1B_RANGE_LT_2007_04	USINT	RANGE_LT
E001_Transmit_PDO_Mapping_C1B_SENSOR_ERROR_2007_05	USINT	SENSOR_ERROR
E001_Transmit_PDO_Mapping_C1B_CURRENT_DATA_2007_06	DINT	CURRENT_DATA
		C2A(Counter_2A)
E001_Transmit_PDO_Mapping_C2A_CONNECT_2008_01	USINT	CONNECT
E001_Transmit_PDO_Mapping_C2A_RANGE_CHECK_2008_02	USINT	Not used
E001_Transmit_PDO_Mapping_C2A_RANGE_L_2008_03	USINT	RANGE_L
E001_Transmit_PDO_Mapping_C2A_RANGE_LT_2008_04	USINT	RANGE_LT
E001_Transmit_PDO_Mapping_C2A_SENSOR_ERROR_2008_05	USINT	SENSOR_ERROR
E001_Transmit_PDO_Mapping_C2A_CURRENT_DATA_2008_06	DINT	CURRENT_DATA

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			C8A(Counter_8A)
E001_Transmit_PDO_Mapping_C8A_CONNECT_2014_01	USINT		CONNECT
E001_Transmit_PDO_Mapping_C8A_RANGE_CHECK_2014_02	USINT		Not used
E001_Transmit_PDO_Mapping_C8A_RANGE_L_2014_03	USINT		RANGE_L
E001_Transmit_PDO_Mapping_C8A_RANGE_LT_2014_04	USINT		RANGE_LT
E001_Transmit_PDO_Mapping_C8A_SENSOR_ERROR_2014_05	USINT		SENSOR_ERROR
E001_Transmit_PDO_Mapping_C8A_CURRENT_DATA_2014_06	DINT		CURRENT_DATA
			C8B(Counter_8B)
E001_Transmit_PDO_Mapping_C8B_CONNECT_2015_01	USINT		CONNECT
E001_Transmit_PDO_Mapping_C8B_RANGE_CHECK_2015_02	USINT		Not used
E001_Transmit_PDO_Mapping_C8B_RANGE_L_2015_03	USINT		RANGE_L
E001_Transmit_PDO_Mapping_C8B_RANGE_LT_2015_04	USINT		RANGE_LT
E001_Transmit_PDO_Mapping_C8B_SENSOR_ERROR_2015_05	USINT		SENSOR_ERROR
E001_Transmit_PDO_Mapping_C8B_CURRENT_DATA_2015_06	DINT		CURRENT_DATA

The above are bit assignments of CONNECT, RANGE_L, RANGE_LT and SNSOR_ERROR.

Bit	7	6	5	4	3	2	1	0
CONNECT	–	–	–	–	–	–	–	Connection status flag
RANGE_L	–	–	–	L5	L4	L3	L2	L1
RANGE_LT	–	–	–	–	–	LT3	LT2	LT1
SENSOR_ERROR	–	–	–	–	–	–	–	Tolerance judgement / current value output flag

Additional Information

For more information on the assignments in the input and output areas, refer to *4.4.2 EtherCAT Cyclic Communication* in *4. EtherCAT Communication* of the *Interface Unit EtherCAT for EJ Counter User Manual* (99MBC158A).

Additional Information

In default settings, PDO entries are prepared for maximum of 8 EJ Counters which allow 16 Linear Gage connections.
While keeping the maximum PDO entries, we only explain 1-axis connection in this guide, and you can delete PDO entries for the unused axes.
For more information on how to delete PDO entry, refer to *A-3-4 Editing PDO Entry Tables* in *A-3 Multi-vendor Environments* of the *NX/NJ-series CPU Unit Built-in EtherCAT® Port User's Manual.* (Cat. No. W505).

7. EtherCAT Connection Procedure

This section describes the procedures for connecting the Controller and the Linear Gage via EtherCAT. The procedures for setting up the Controller and the Linear Gage in this guide are based on the factory default settings.
Refer to *Section 8. Initialization Method* for information on how to initialize them.

7.1. Work Flow

Take the following steps to connect the Controller and the Linear Gage via EtherCAT and perform PDO communications.

7.2. Mitutoyo Linear Gage Setup	Set up the Mitutoyo Linear Gage.
↓	
7.2.1. Hardware Settings	Set up the hard switch of the Linear Gage and connect the cables to the Linear Gage.
↓	
7.3 Controller Setup	Set up the Controller.
↓	
7.3.1. Starting Sysmac Studio and Installing the ESI File	Start Sysmac Studio and install the ESI file of the EJ Counter.
↓	
7.3.2. Setting the EtherCAT Network Configuration	Set the EtherCAT network configuration.
↓	
7.3.3. Setting Device Variables	Set device variables used for PDO communications with the slave unit.
↓	
7.3.4. Transferring the Project Data	Transfer the project data created in Sysmac Studio to the Controller.
↓	
7.4. EtherCAT Communication Status Check	Confirm that PDO communications via EtherCAT is performed normally.
↓	
7.4.1. Checking the Connection Status	Check the EtherCAT connection status.
↓	
7.4.2. Checking Sent and Received Data	Check that correct data is sent and received.

7.2. Mitutoyo Linear Gage Setup

Set up the Mitutoyo Linear Gage.

7.2.1. Hardware Settings

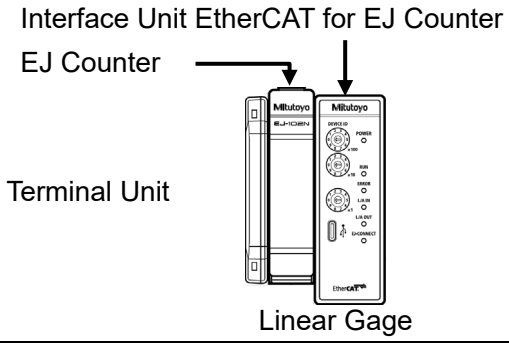
Set up the hard switch of the Linear Gage and connect the cables to the Linear Gage.

Precautions for Correct Use

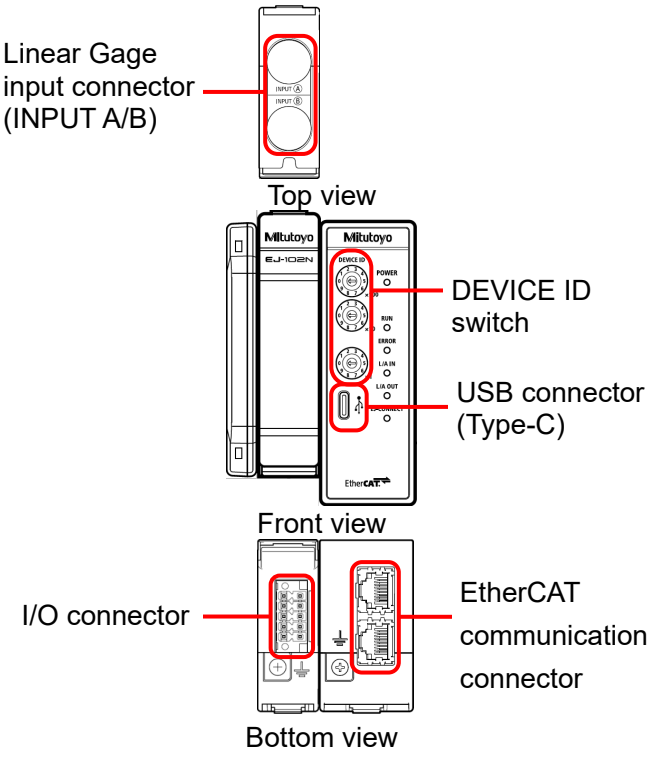
Make sure the power supply is OFF before setting up.
If it is ON, the settings described in the following steps and subsequent procedures may not be applicable.

1 Make sure power supply for the Linear Gage is OFF.

2 Attach the Interface Unit EtherCAT for EJ Counter and the terminal unit to the EJ Counter.



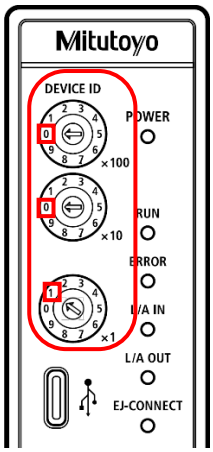
Check the positions of the switches and the connectors on the Linear Gage by referring to the figure on the right.



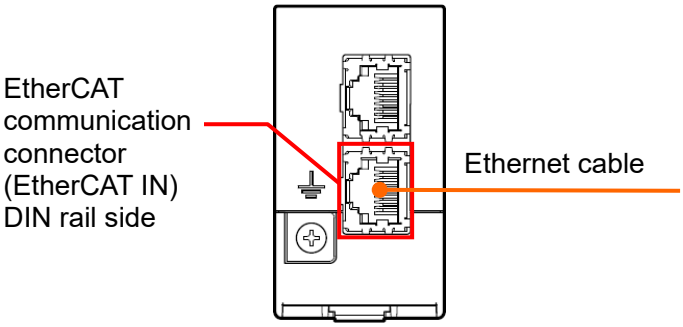
3 Set the Device ID switches (Dev ID) as follows.

x100 : 0
x10 : 0
x1 : 1

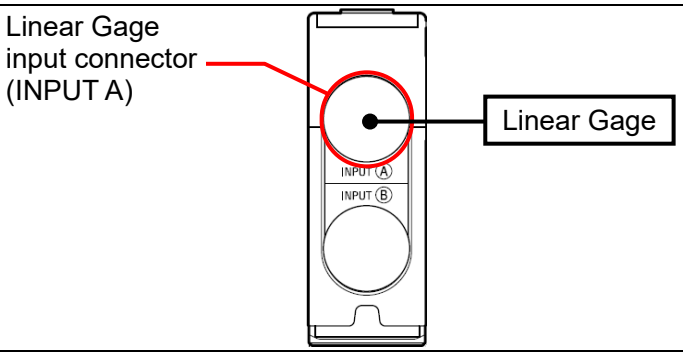
*Set the node address to "1".



4 Connect an Ethernet cable to the EtherCAT communication connector (EtherCAT IN) on the bottom side of the Interface Unit EtherCAT for EJ Counter.

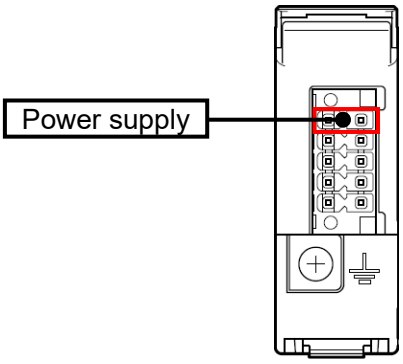


5 Plug the connector on the Linear Gage into the Linear Gage input connector (INPUT A) on the upper side of the EJ Counter.



6 Connect the power supply of the Linear Gage to the I/O connector on the bottom of the EJ Counter.

*For more information on the power supply connection, refer to *2.3.2 DC Power Supply Connection* of the *Compact Display Unit for Linear Gage EJ Counter User's Manual* (99MBC139A).

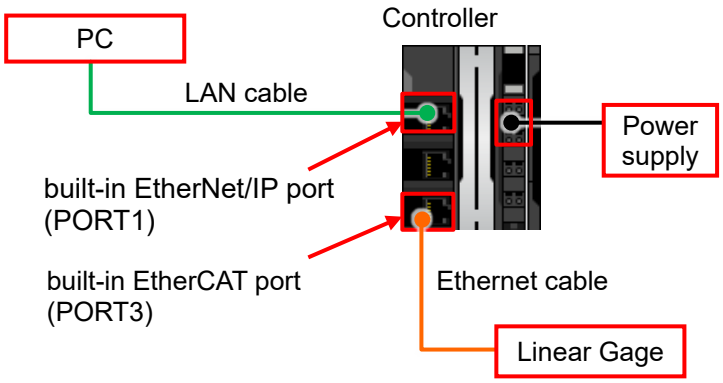


7.3. Controller Setup

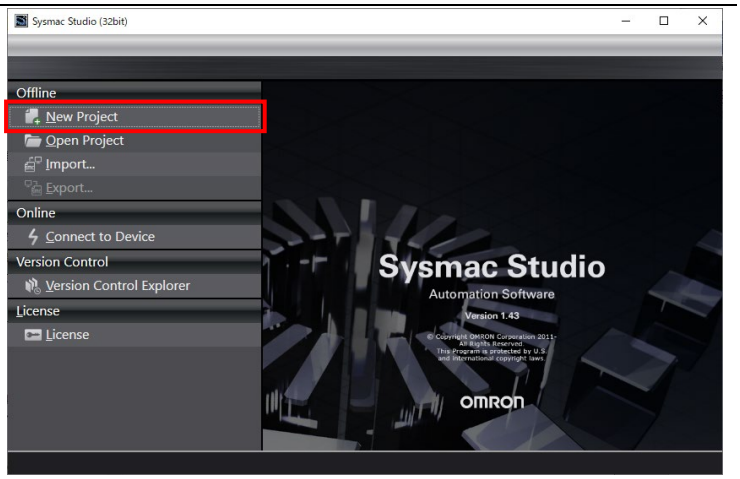
Set up the Controller.

7.3.1. Starting Sysmac Studio and Installing the ESI File

Start Sysmac Studio and install the ESI file of the EJ Counter.

1	Make sure the power supplies for the Controller and the Linear Gage are all OFF.	
2	Connect PC and built-in EtherNet/IP port (PORT1) on Controller with a LAN cable. Connect the other end of the Ethernet cable (which at one end has been connected to Linear Gage) to built-in EtherCAT port (PORT3) on the Controller. Connect the power supply to the Controller. *For more information on the power supply connection to Controller, refer to *5-4-1 Wiring the Unit Power Supply* of the *NX-series NX102 CPU Unit Hardware User's Manual* (Cat. No. W593).	
3	Start Sysmac Studio. *If the User Account Control Dialog Box appears at start, make a selection to start Sysmac Studio.	

4 Sysmac Studio starts up.
Click **New Project.**

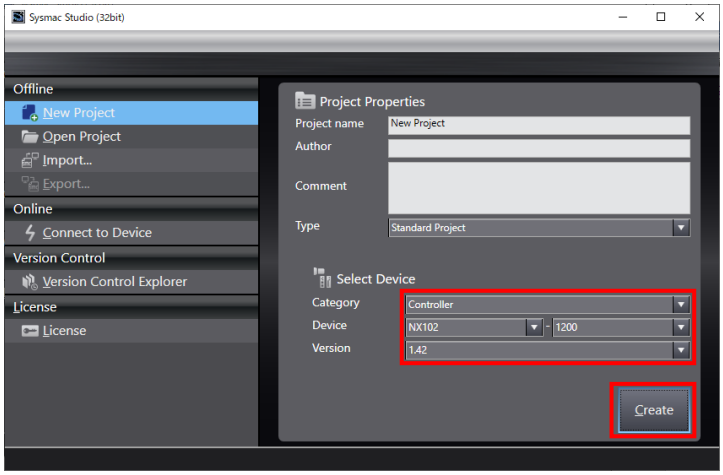


5 The Project Properties Screen appears.
Select items appropriate for your Controller from the pull-down list in each field of Select Device. Click **Create.**

In this guide, the following Controller is used.

- Category: Controller
- Device: NX102-1200
- Version: 1.43

*In this guide, "New Project" is used as the project name.



6 The New Project Window appears.

The following panes are displayed in the window.

Left: Multiview Explorer

Upper right: Toolbox

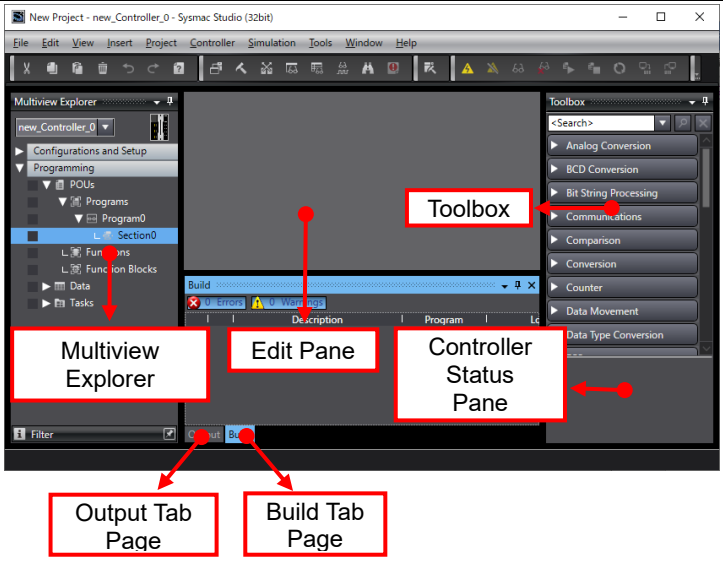
Lower right: Controller Status Pane

Upper middle: Edit Pane

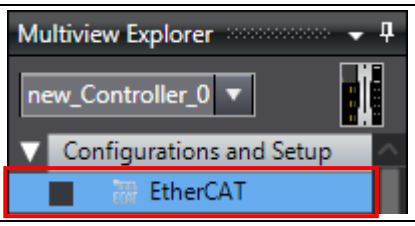
The following tabs are displayed in the lower middle of the window.

Output Tab Page

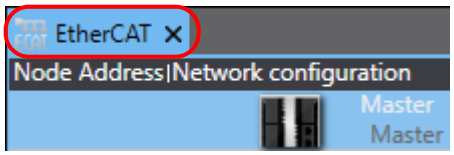
Build Tab Page



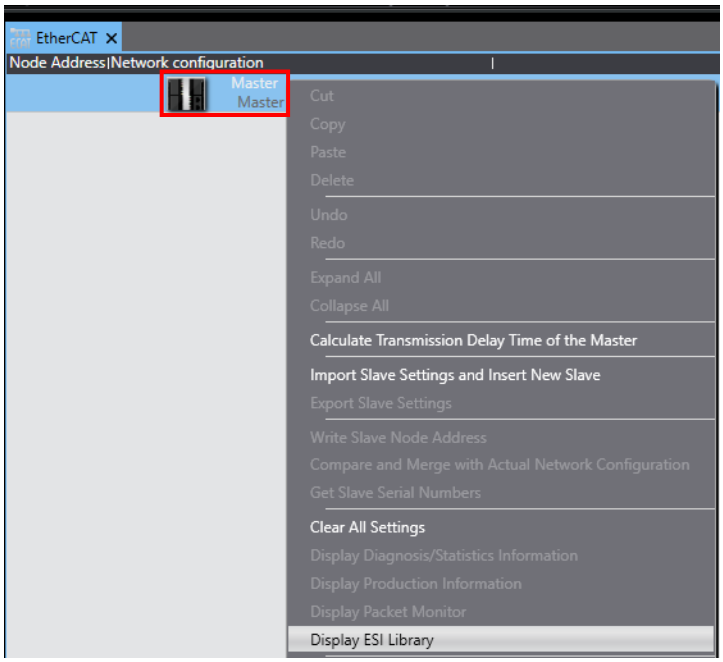
7 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.



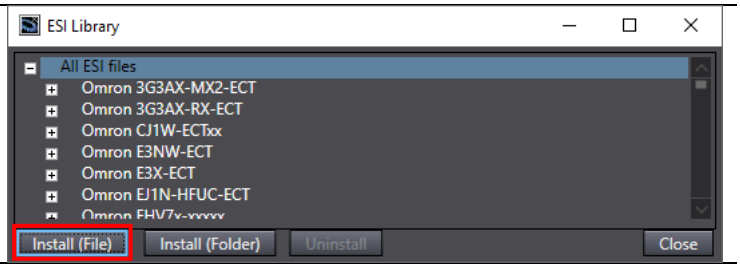
8 The EtherCAT Tab Page appears in the Edit Pane.



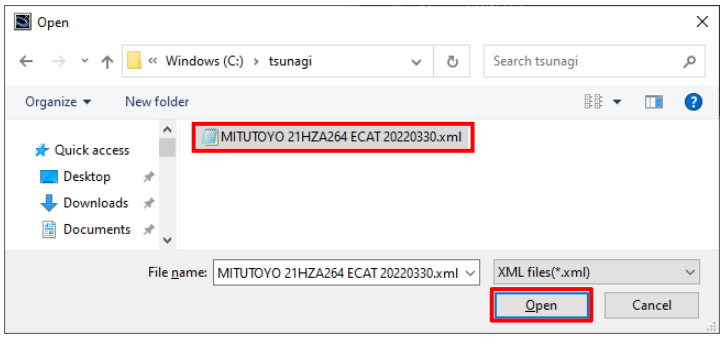
9 Right-click **Master** and select ***Display ESI Library*** from the menu.



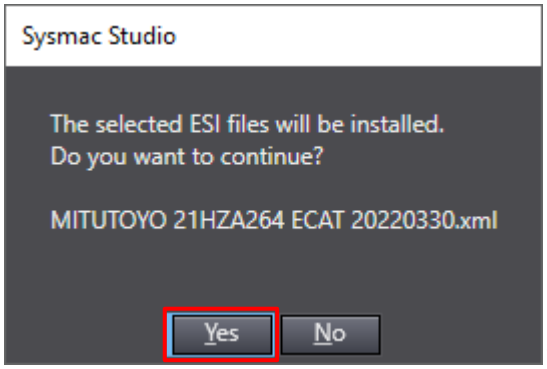
10 The ESI Library Dialog Box appears. Click **Install (File).**



11 The Open Dialog Box appears. Select the prepared ESI file *MITUTOYO 21HZA264 ECAT 20220330.xml* and click **Open.**

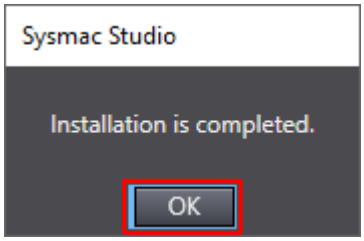


12 The dialog box on the right appears. Check the message and click **Yes.**



1

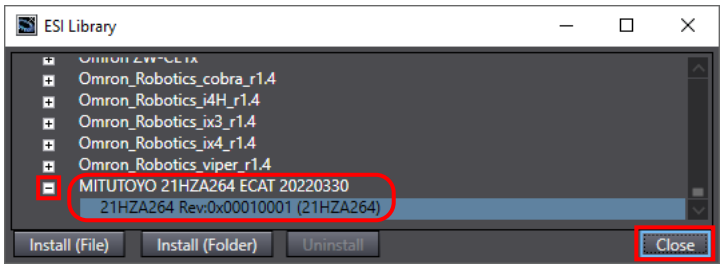
13 The dialog box on the right appears when the ESI file installation is completed. Check the message and click **OK.**



14 Click the **+** sign on the left of MITUTOYO 21HZA264 ECAT 20220330 in the ESI Library Dialog Box, and check that 21HZA264 Rev.0x00010001(21HZA264) is displayed.

Check that there are no exclamation marks (errors).

Click **Close.**



Precautions for Correct Use

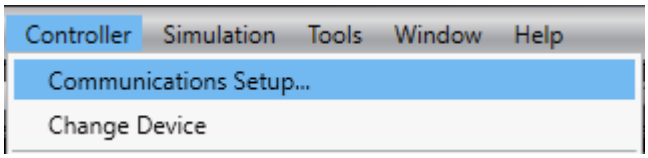
If an exclamation mark (error) appears to the left of the ESI file, check the name of the ESI file, and then obtain the ESI file with a correct name. If an exclamation mark (error) still appears even when the name of the ESI file is correct, the file may be corrupted.
In that case, contact Mitutoyo Corporation.

7.3.2. Setting the EtherCAT Network Configuration

Set the EtherCAT network configuration.

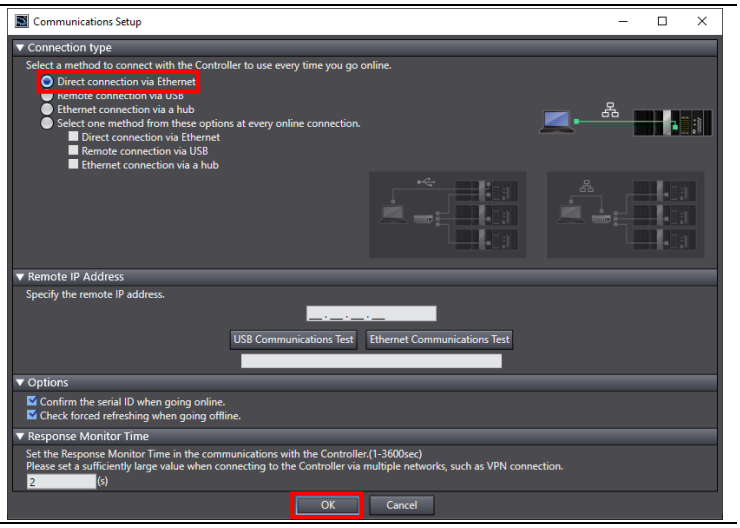
1 Turn ON the power supplies of the Controller and the Linear Gage.

2 Select ***Communications Setup*** from the Controller Menu.

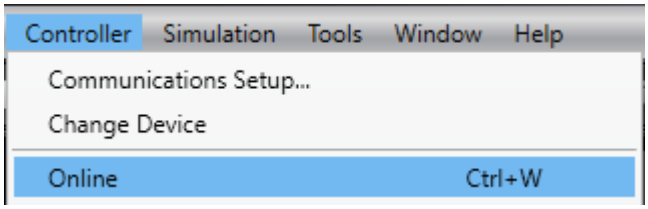


3 The Communications Setup Dialog Box appears.
Check that *Direct connection via Ethernet* is selected in the *Connection type* Field.

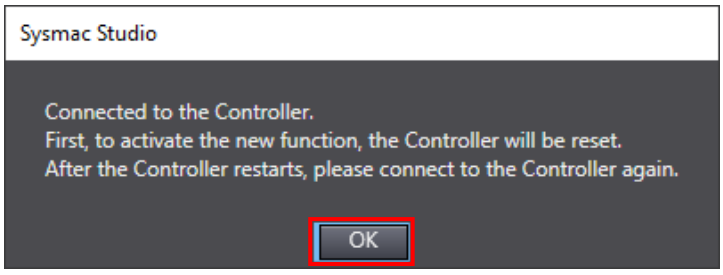
Click **OK.**



4 Select ***Online*** from the Controller Menu.

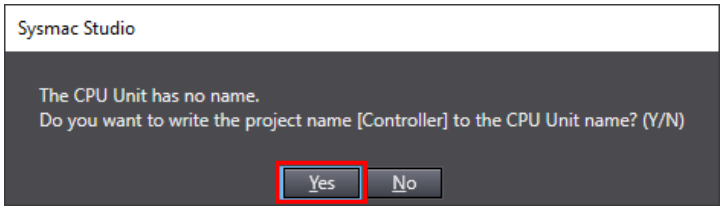


*If the dialog box on the right appears, check the message and click **OK**. Then select ***Online*** again.

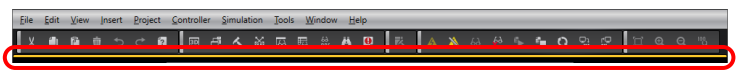


*If a dialog box on the right appears, check the message and click **Yes**.

*The message of the dialog box varies with the Controller status. Check the message and click on an appropriate button to proceed with the processing.



5 When an online connection is established, a yellow line appears under the toolbar.

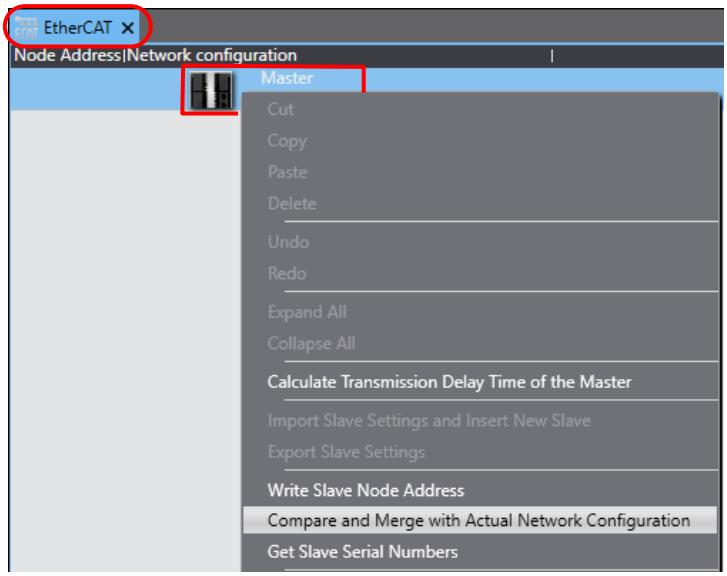


Additional Information

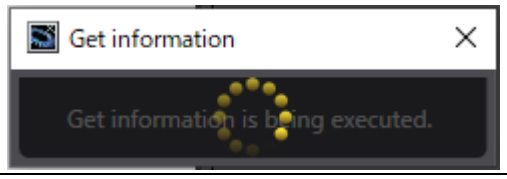
For more information on online connections, refer to *Section 6. Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

6 Right-click **Master** on the EtherCAT Tab Page displayed in the Edit Pane and select **Compare and Merge with Actual Network Configuration** from the menu.

*If the EtherCAT Tab Page is not displayed in the Edit Pane, follow step 7 of *7.3.1. Starting Sysmac Studio and Installing the ESI File* to display the tab page.

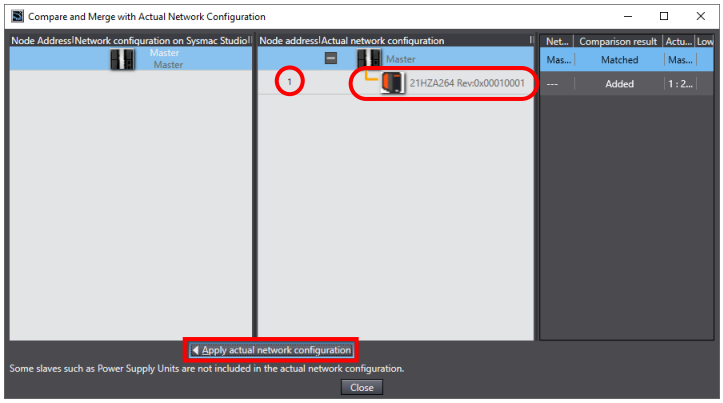


A message appears stating "Get information is being executed"



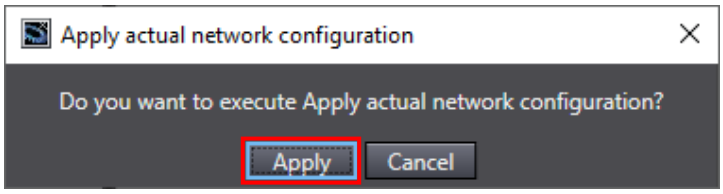
7 The Compare and Merge with Actual Network Configuration Dialog Box appears.
After the comparison with the settings on Sysmac Studio, 21HZA264 Rev:0x00010001 is addressed as node 1 and is added to the Actual network configuration.

Click **Apply actual network configuration.**

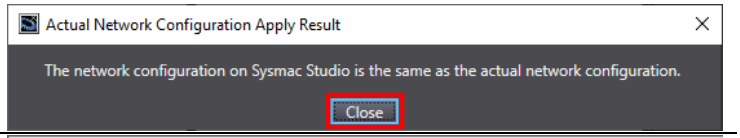


8 A confirmation dialog box appears. Check the message and click **Apply.**

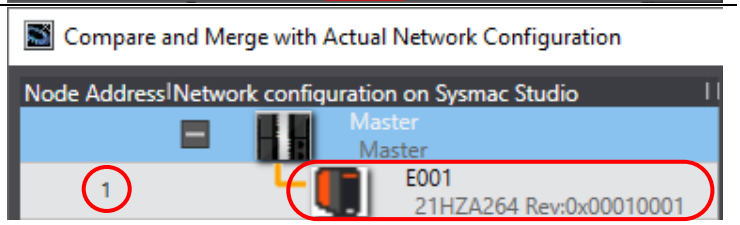
z



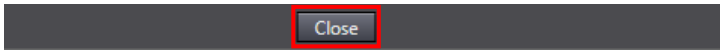
A result dialog box appears. Check the message and click **Close.**



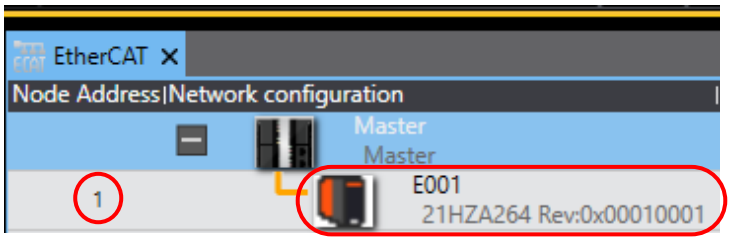
9 E001 21HZA264 Rev:0x00010001 is addressed as node 1 and is added to the Network configuration on Sysmac Studio.



Check that the slave unit is added. Click **Close.**



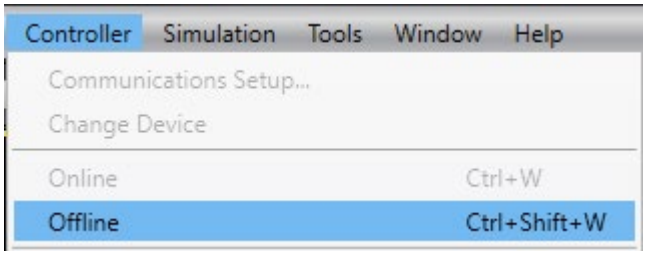
10 E001 21HZA264 Rev:0x00010001 is addressed as node 1 and is added to the EtherCAT Tab Page displayed in the Edit Pane.



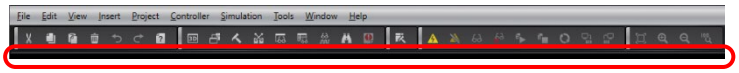
7.3.3. Setting Device Variables

Set device variables used for PDO communications with the slave unit.

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

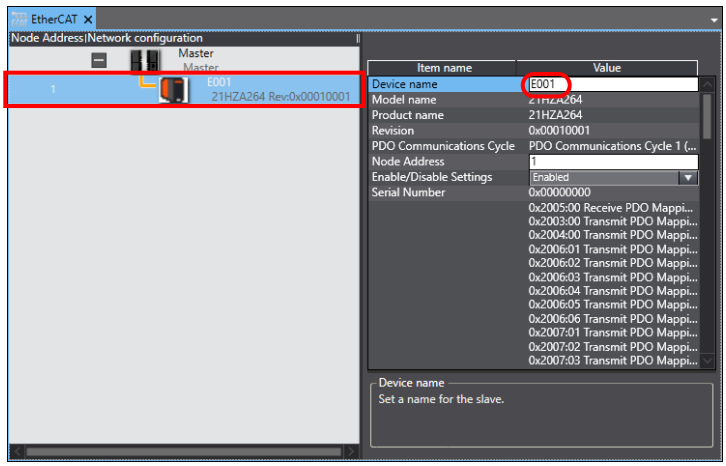


The yellow line under the toolbar disappears.

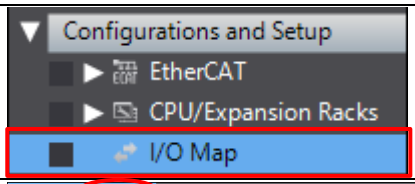


2 Select the slave unit with node address 1 added to the EtherCAT Tab Page in the previous procedure *7.3.2.* Check that the device name is E001.

*The device name can be changed as desired.

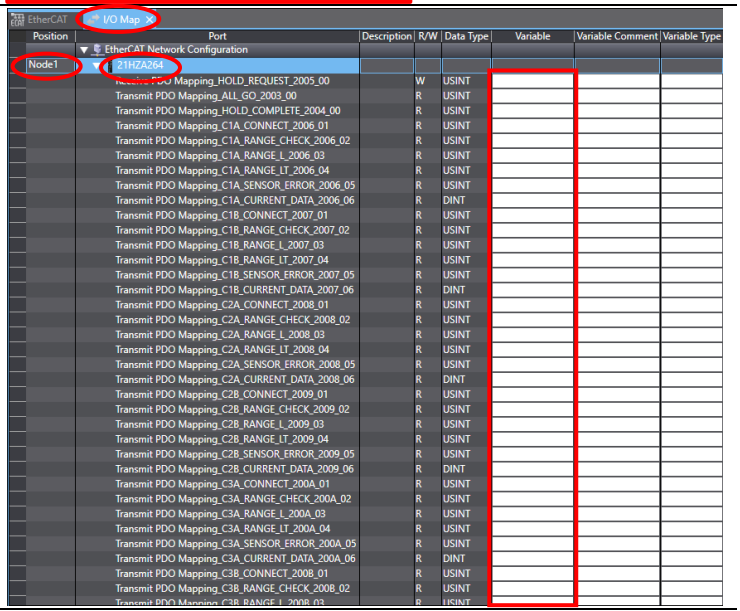


3 Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.

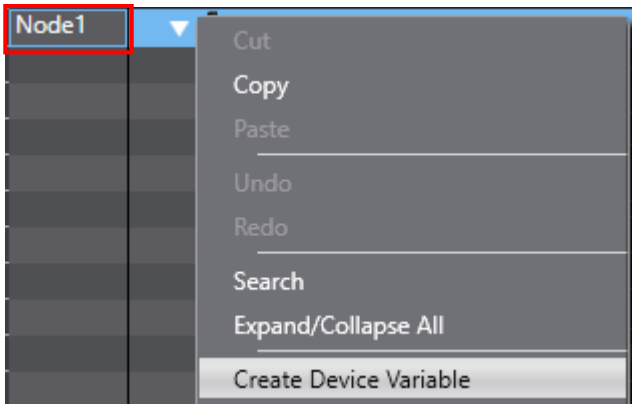


4 The I/O Map Tab Page appears in the Edit Pane.
Check that Node1 is displayed in the *Position* Column and that the added slave unit is displayed in the *Port* Column.

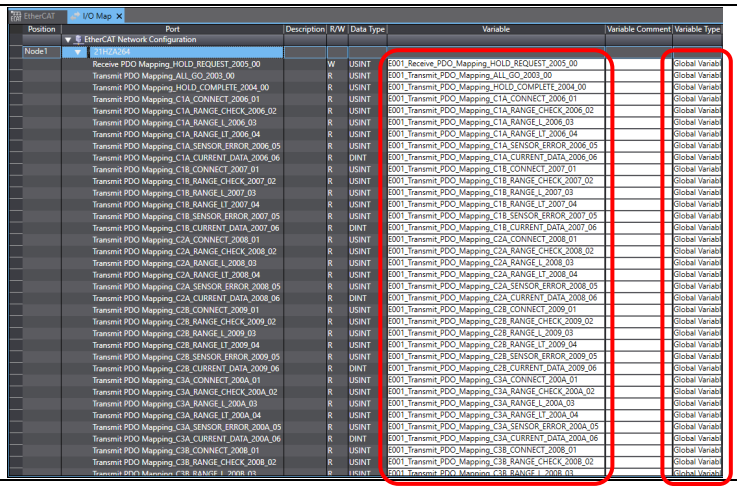
*To manually set a variable name for the slave unit, click a cell in the *Variable* Column and enter a name.



5 Right-click **Node1** and select ***Create Device Variable*** from the menu.



6 The variable names and types are set.



Additional Information

The device variables are automatically created by combining the device name and the port name.
The default device names are "E" followed by a serial number starting from "001"

Additional Information

In this guide, device variables are automatically named for each slave unit.
They can also be manually named for each port.

7.3.4. Transferring the Project Data

Transfer the project data created in Sysmac Studio to the Controller.

⚠ WARNING

Regardless of the operating mode of the CPU Unit, devices or machines may perform unexpected operation when you transfer any of the following data from Sysmac Studio: a user program, configuration data, setup data or device variables. Always ensure safety at the destination node before you transfer the project data.

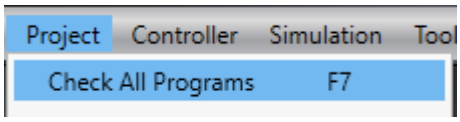
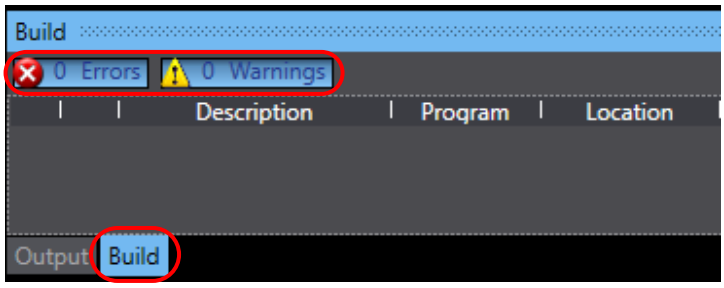
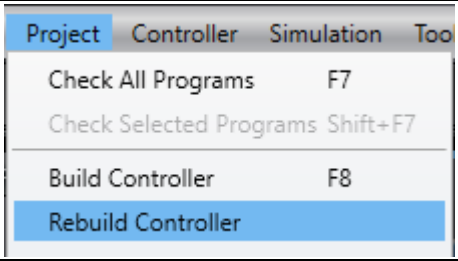
⚠ WARNING

Before you transfer the parameters, check the specifications of the EtherCAT slave unit in manuals or other documentation and confirm that the system will not be adversely affected.

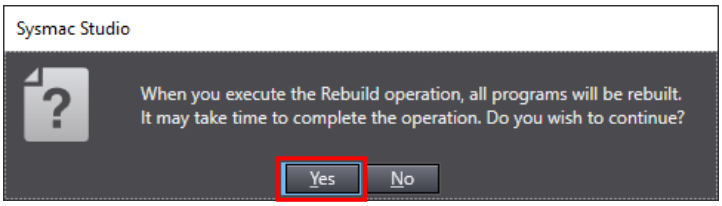
⚠ Caution

After you transfer the project data, the CPU Unit will restart, and communications with the slave unit will be cut off. During the period, the outputs of the slave unit behave according to the slave unit settings.

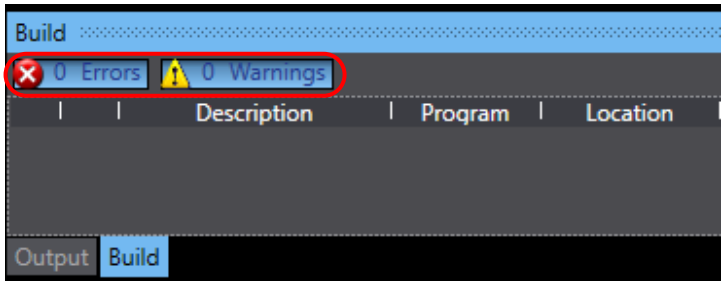
The time that communications is cut off depends on the EtherCAT network configuration. Before you transfer the project data, confirm that the slave unit settings will not adversely affect the system.

1	Select ***Check All Programs*** from the Project Menu.	
2	The Build Tab Page appears. Check that the tab page shows the results "0 Errors" and "0 Warnings"	
3	Select ***Rebuild Controller*** from the Project Menu.	

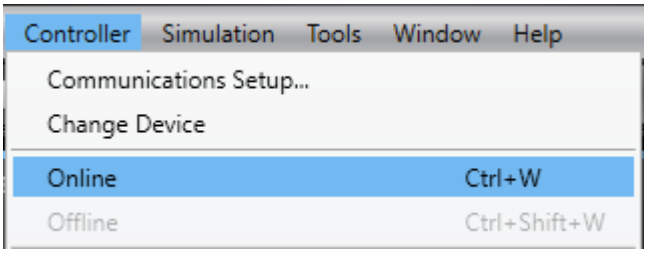
4 The dialog box on the right appears. Confirm that there is no problem and click **Yes.**



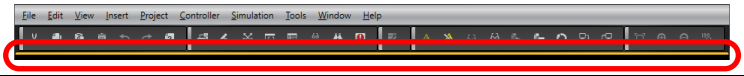
5 Check that the Build Tab Page shows the results "0 Errors" and "0 Warnings".



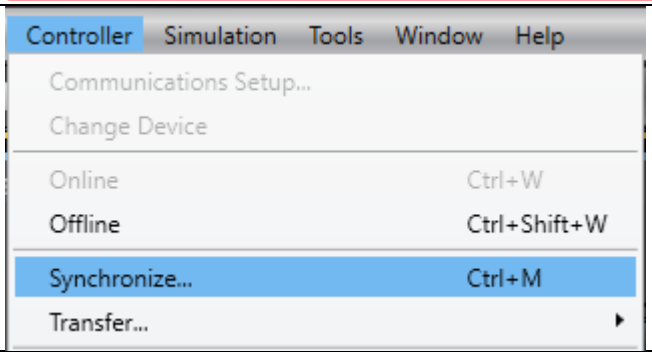
6 Select ***Online*** from the Controller Menu.



When an online connection is established, a yellow line appears under the toolbar.

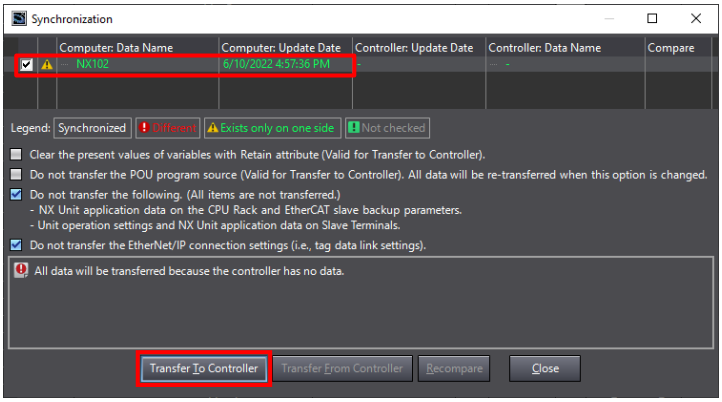


7 Select ***Synchronize*** from the Controller Menu.

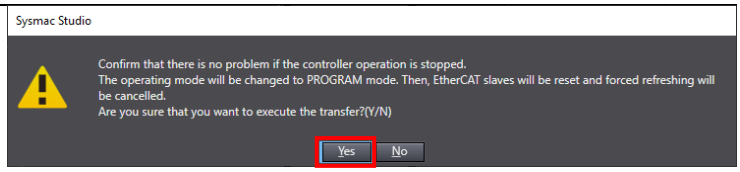


8 The Synchronization Dialog Box appears.
Check that the data to be transferred (e.g., NX102) is selected.
Click **Transfer to Controller.**

*After you click on the button, the Sysmac Studio data is transferred to Controller, and the data is synchronized.



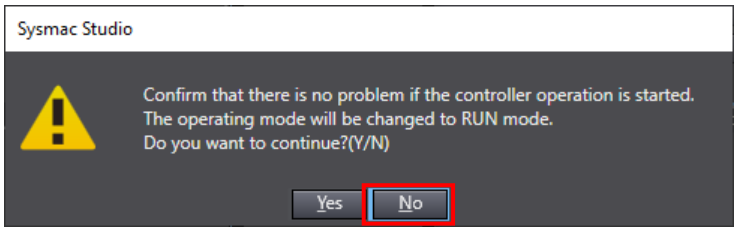
9 The dialog box on the right appears. Confirm that there is no problem and click **Yes.**



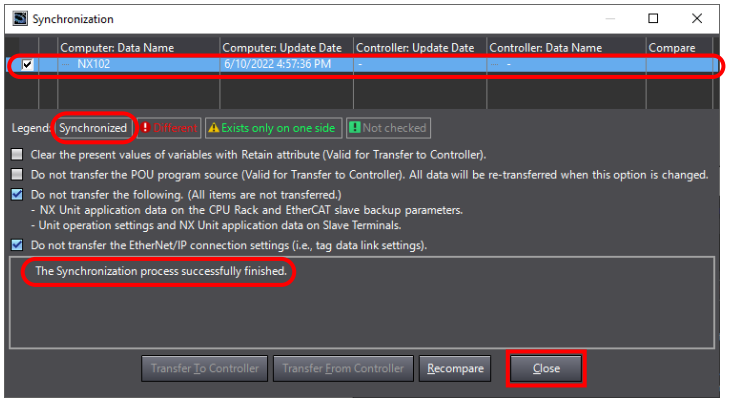
A message appears stating "Synchronizing"

The dialog box on the right appears. Confirm that there is no problem, and click **No.**

*Do not return to RUN mode.



10 As shown in the figure on the right, the font color used to display the synchronized data changes to white which is the color used to specify "Synchronized". Check that a message appears stating "The Synchronization process successfully finished"
Confirm that there is no problem and click **Close.**



*When the project data created in Sysmac Studio matches the Controller data, a message appears stating "The Synchronization process successfully finished"

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

7.4. EtherCAT Communication Status Check

Confirm that PDO communications via EtherCAT is performed normally.

7.4.1. Checking the Connection Status

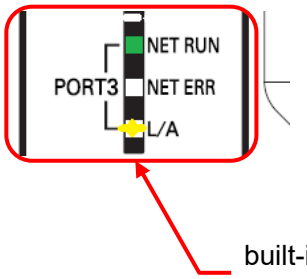
Check the EtherCAT connection status.

1 Check with the LED indicators on Controller that PDO communications via EtherCAT is performed normally.

The LEDs in normal status are as follows:

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

*The NJ-series Controllers also have the same LED status.

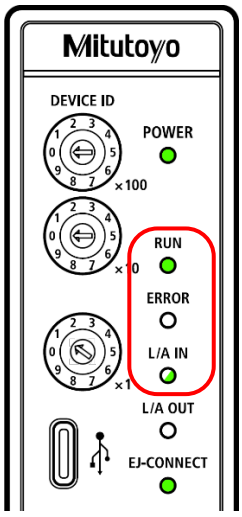


built-in EtherCAT port (PORT3)
Status indicators

2 Check the LEDs on the EJ Counter.

The LEDs in normal status are as follows:

RUN : Green lit
ERROR : Not lit
L/A IN : flashing



7.4.2. Checking Sent and Received Data

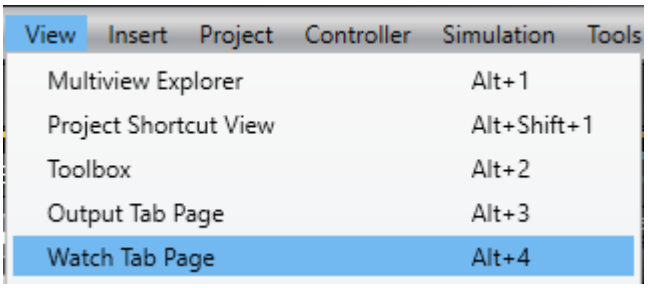
Check that correct data is sent and received.

⚠ Caution

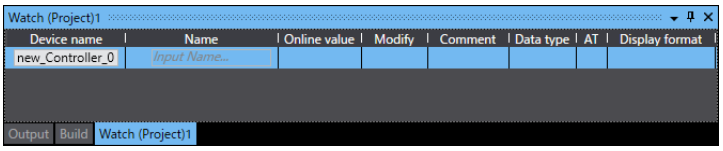
If you change the variable values on a Watch Tab Page when Sysmac Studio is online with the CPU Unit, the devices connected to the Controller may operate regardless of the operating mode of the CPU Unit.

Always ensure safety before you change the variable values on a Watch Tab Page when Sysmac Studio is online with the CPU Unit.

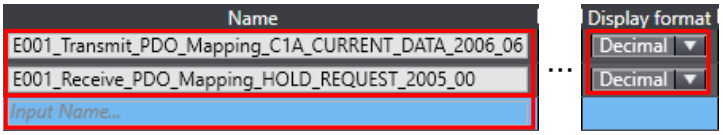
1 With Sysmac Studio, select ***Watch Tab Page*** from the View Menu.



2 The Watch (Project)1 appears.



3 Click Input Name in the *Name* Column and enter the following variable names for monitoring. Select the display format for each variable as shown below.

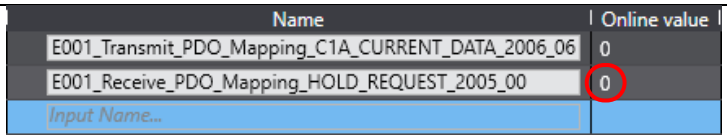


Name:
E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06
Display format: ***Decimal***

Name:
E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00
Display format: ***Decimal***

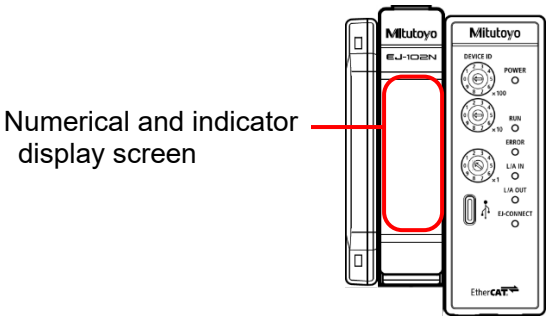
4 Check that the Online value of *E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00* is 0.

**E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00* indicates "current value data internal HOLD". The example on the right shows that the internal HOLD is cleared since the Online value is 0. This means that the measurement value of the Linear Gage is reflected to the current value data.



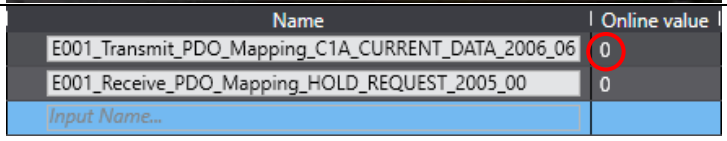
5 Check the numerical value (current value) on the "Numerical and indicator display screen" of the Linear Gage.

*The numerical value display varies with the status of the Linear Gage.
The example on the right shows 0.000mm.



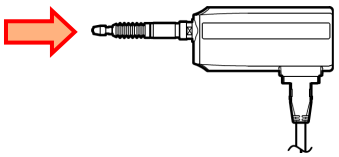
6 Check the Online value for *E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06.*

*It displays "0" on the right figure and you can see that it is the same value as checked in step 5.



7 Push and secure the gage head of the Linear Gage. Check that the numerical value (current value) on the "Numerical and indicator display screen" of the Linear Gage is changed.

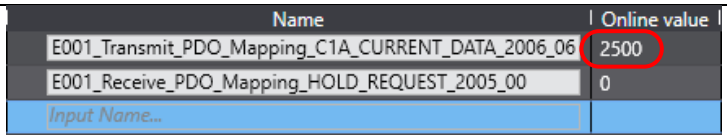
*The example on the right shows 0.025mm.



8 Check that the Online value of *E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06* is changed in the Watch (Project)1.

*The example on the right shows 2500. Since the minimum resolution of the current value data for EtherCAT communication is fixed as 0.00001mm, it displays as 0.02500mm. You can see that it is the same value as checked in step 7.

*You can see that the Controller correctly receives data from the Linear Gage.



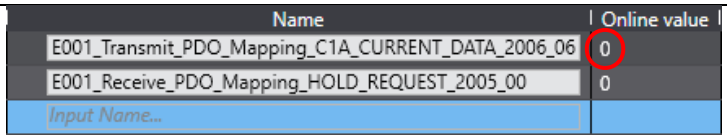
Name	Online value
E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06	2500
E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00	0
Input Name...	

9 Release the push-secured gage head of the Linear Gage.

10 Check the numerical value (current value) on the "Numerical and indicator display screen" of the Linear Gage.

11 Check the Online value for *[E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06.*

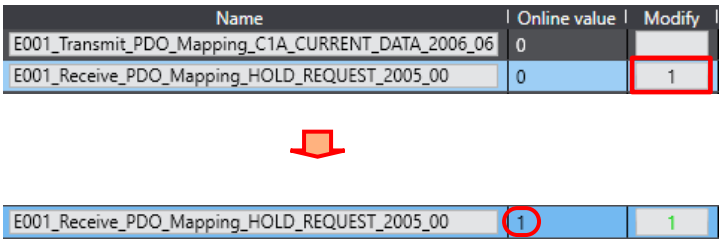
*It displays "0" on the right figure and you can see that it is the same value as checked in step 10.



12 Enter *1* in the *Modify* Column for *E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00.*

The Online value becomes 1.

*This means that the measurement value of the Linear Gage is not reflected to the current value data.

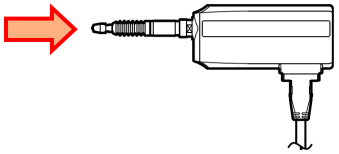


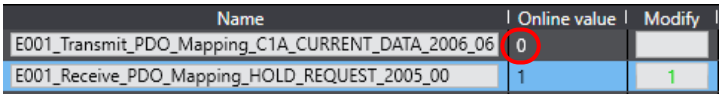
13 Change the push amount for the gage head of the Linear Gage.

Check that the numerical value (current value) on the "Numerical and indicator display screen" of the Linear Gage and the Online value for *E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06* are not changed.

You can see that the current value data is in HOLD state.

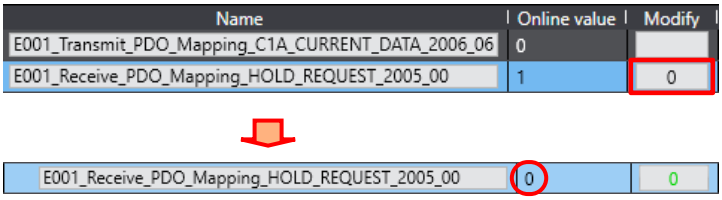
*You can see that the Controller correctly sends data to the Linear Gage.





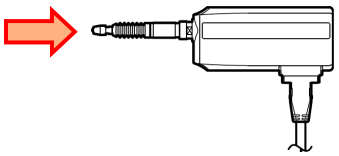
14 Enter *0* in the *Modify* Column for *E001_Receive_PDO_Mapping_HOLD_REQUEST_2005_00.*

The Online value becomes 0.



15 Change the push amount for the gage head of the Linear Gage.

Due to the changes on numerical value (current value) on the "Numerical and indicator display screen" of the Linear Gage and the changes on Online value for *E001_Transmit_PDO_Mapping_C1A_CURRENT_DATA_2006_06*, you can check that the HOLD state is released.

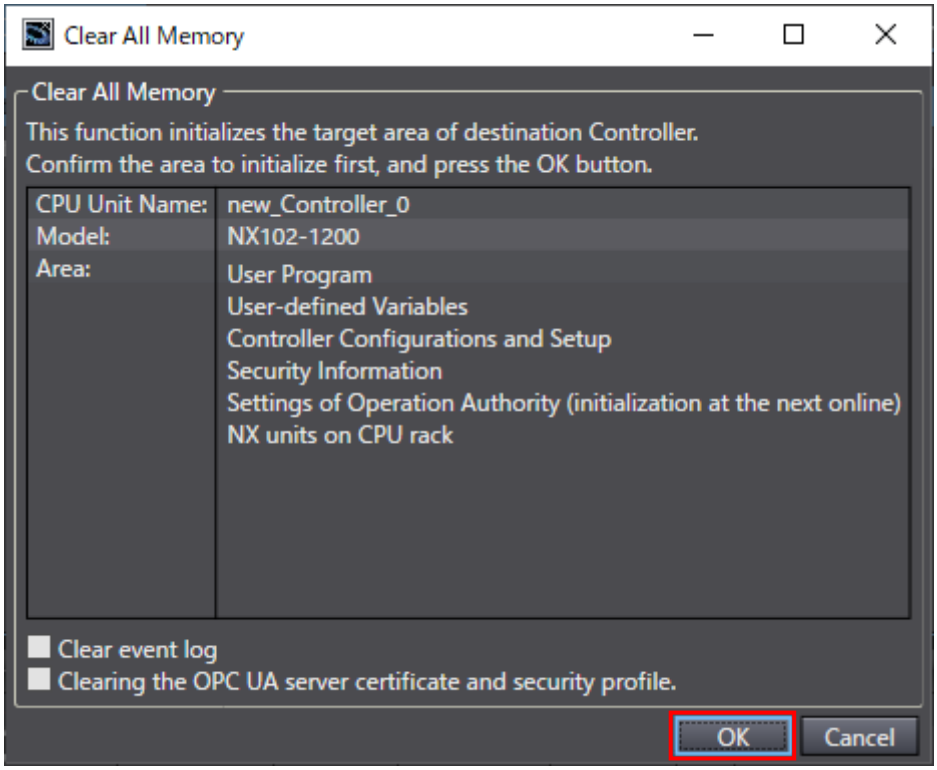


8. Initialization Method

The setting procedures in this guide are based on the factory default settings.
Some procedures may not be applicable unless you use the devices with the factory default settings.

8.1. Initializing a Controller

To initialize a Controller, clear all memory of a CPU Unit.
With Sysmac Studio, change the operating mode of Controller to PROGRAM mode and select ***Clear All Memory*** from the Controller Menu. The Clear All Memory Dialog Box appears.
Check the message and click **OK.**



9. Revision History

Revision code	Date of revision	Description of revision
01	July, 2022	New entry

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