OMRON

Machine Automation Controller NJ/NX-series

IO-Link Connection Guide (EtherCAT® Host Communications)

PATLITE Corporation

IO-Link Signal Tower

(LR6-IL)

Network Connection Guide

[IO-Link Master Unit]

OMRON Corporation

NX-series IO-Link Master Unit

(NX-ILM□□□)

SYSMAC always in control

P733-E1-01

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1. Related Manuals

To ensure system safety, make sure to always read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the manuals for each device which is used in the system.
The table below lists the manuals provided by PATLITE Corporation (hereinafter referred to as "PATLITE") 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
OMRON	W519	NX-ECC20□	NX-series EtherCAT® Coupler Unit User's Manual
OMRON	W567	NX-ILM□□□	NX-series IO-Link Master Unit User's Manual
OMRON	W570	NX-ILM□□□ GX-ILM□□□	IO-Link System User's Manual
PATLITE	GA0001002	LR6-□IL□□□-□	IO-Link Signal Tower TYPE LR6-IL Complete Operation Manual

2. Terms and Definitions

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

Term	Explanation and Definition
IO-Link device	A device with a sensor or an actuator that can perform IO-Link communications with an IO-Link master.
IO-Link master	A device that performs IO-Link communications with IO-Link devices in an IO-Link System and that simultaneously functions as a slave for host communications. The term “IO-Link Master Unit" is used to refer to a specific unit in this guide.
IO-Link Mode	A communication mode of an IO-Link master to perform IO-Link communications with IO-Link devices.
cyclic communications	Communications that exchanges data in a fixed period with no need for programming.
I/O data	All target data in cyclic communications with a host. IO-Link Systems contain the following two types of I/O data. ・Target data in cyclic communications with a host in an IO-Link master ・Target data in IO-Link devices for cyclic communications with an IO-Link master
process data	I/O data in IO-Link devices. You can allocate a maximum of 32 bytes of process data in a master.
IODD file	A definition file for an IO-Link device. The parameter settings of an IO-Link device can be made by installing this file in CX-ConfiguratorFDT.
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.

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 to always read and follow the information provided in all Safety Precautions and Precautions for Safe Use in the 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 guide without the permission of OMRON Corporation.

(5) The information contained in this guide is current as of July 2019. 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.

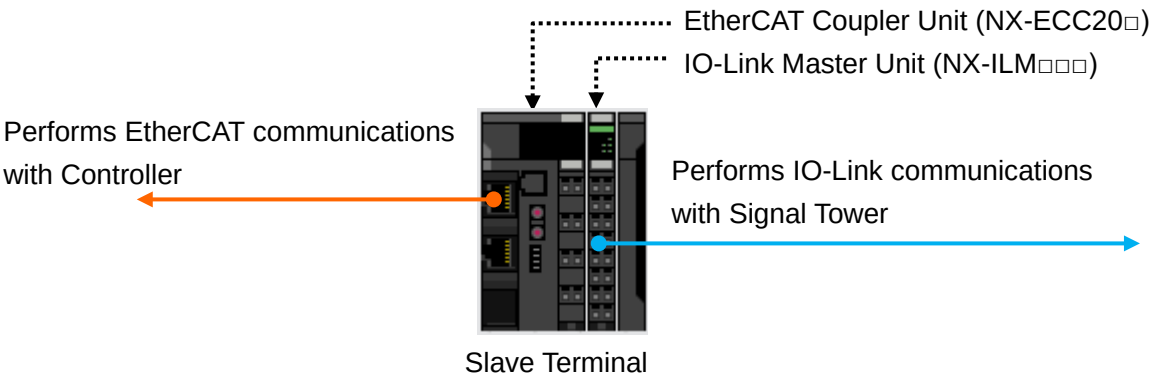
Symbol

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 PATLITE IO-Link Signal Tower LR6-IL (hereinafter referred to as the "Signal Tower") via IO-Link to an OMRON NX-series IO-Link Master Unit (NX-ILM□□□); connecting an OMRON NJ/NX-series Machine Automation Controller (hereinafter referred to as the "Controller") via EtherCAT through an OMRON EtherCAT Coupler Unit (NX-ECC20□) to which the IO-Link Master Unit is connected; and checking their communication status.
Refer to *Section 6. Communications Settings* and *Section 7. IO-Link Connection Procedure* to understand setting methods and key points to perform cyclic communications in the IO-Link System.
In this guide, the generic EtherCAT slave for EtherCAT communications is called the "slave unit", and the specific EtherCAT slave made up of the EtherCAT Coupler Unit and the IO-Link Master Unit is called the "Slave Terminal".

Slave Terminal Configuration



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-□□□□
OMRON	NX-series EtherCAT Coupler Unit	NX-ECC20□
OMRON	NX-series IO-Link Master Unit	NX-ILM□□□
PATLITE	Signal Tower LR6-IL	LR6-□IL□□□-□

Precautions for Correct Use

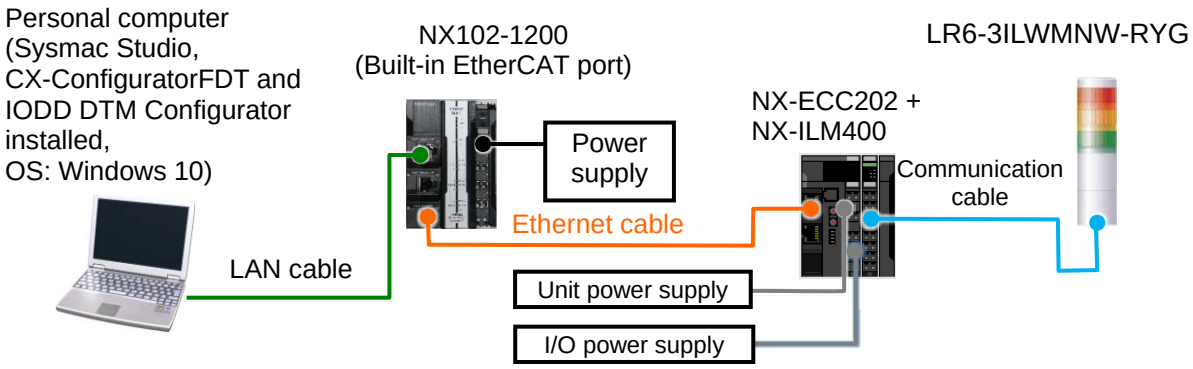
In this guide, the devices with models and versions listed in *5.2. Device Configuration* are used as examples of applicable devices to describe the procedures for connecting the devices and checking their connection.
You cannot use devices with versions lower than those listed in *5.2*.
To use the above 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.

5.2. Device Configuration

The hardware components to reproduce 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.1.31
—	Power supply (24 VDC for Controller)	—	
OMRON	Sysmac Studio	SYSMAC-SE2□□□	Ver.1.25
OMRON	CX-ConfiguratorFDT	(Provided in Sysmac Studio package)	Ver.2.5
—	IODD DTM Configurator	(Provided in Sysmac Studio package)	Ver.3.5
—	Personal computer (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	
OMRON	NX-series EtherCAT Coupler Unit	NX-ECC202	Ver.1.2
OMRON	NX-series IO-Link Master Unit	NX-ILM400	Ver.1.1
—	Unit power supply (24 VDC)	—	
—	I/O power supply (24 VDC)	—	
—	Communication cable (with a connector on one end (M12 / 5 pins))	—	
PATLITE	Signal Tower	LR6-3ILWMNW-RYG	Ver.1.00
PATLITE	IODD file	Patlite-LR6-IL-20190110-IODD1.1.xml (Patlite-LR6-IL-20190110-IODD1.1.zip)	

Precautions for Correct Use

Contact PATLITE Corporation to obtain the IODD file specified above 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, CX-ConfiguratorFDT and IODD DTM Configurator to the versions specified on the previous page or to higher versions. 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) and the *CX-ConfiguratorFDT Online Help*.

Precautions for Correct Use

To connect the Signal Tower to the NX-series IO-Link Master Unit, you need a communication cable with a connector on one end. For information on the connector specifications of the Signal Tower, refer to the *IO-Link Signal Tower TYPE LR6-IL Complete Operation Manual* (GA0001002).

Additional Information

For information on the specifications of Ethernet cables and 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 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

Refer to the *NX-series EtherCAT® Coupler Unit User's Manual* (Cat. No. W519) for information on the unit power supply specifications of the Slave Terminal and the power supply specifications for I/O.

6. Communications Settings

This section describes the parameters and device variables that are all defined in this guide.

6.1. EtherCAT Connection Parameter

The following parameter is required to connect the Controller and the Slave Terminal via EtherCAT.

Slave Terminal setting

Item	Setting value	Remarks
Node address	1	The address is set using the hardware switches on the Slave Terminal.

6.2. IO-Link Connection Parameters

The following parameters are required to connect the IO-Link Master Unit and the Signal Tower via IO-Link.
In this guide, the Signal Tower is connected to Port 1 on the IO-Link Master Unit.

IO-Link Master Unit setting

Item	Setting value
Port1 IO-Link Device Configuration Data / Process data in length	2 (Byte) (default)*1
Port1 IO-Link Device Configuration Data / Process data out length	6 (Byte)
Port1 IO-Link Device Configuration Data / Master Control	IO-Link Mode (default)

*1 The process data length of the Signal Tower is "6 byte / 0 byte (input from master / output to master)"; however, in this guide, the default value (2 bytes) is used for the process data in length for Port 1 on the IO-Link Master Unit, which is related to the process data length "0 byte (output to master)" of the Signal Tower.

6.3. Slave Terminal Configuration and Device Names

The Slave Terminal configuration and device names are shown below.
The default values are used for the device names. For slave units, the default device names are "E" followed by a serial number starting from "001". For NX Units, the default device names are "N" followed by a serial number starting from "1".

Slave Terminal configuration and device names

NX Unit number	Name	Model	Device name
0	EtherCAT Coupler Unit	NX-ECC202	E001
1	IO-Link Master Unit	NX-ILM400	N1

0 1

6.4. Device Variables

The process data of the Signal Tower (as PDOs in the Slave Terminal) is assigned to the Controller's device variables. The device variables are automatically named from a combination of the device names and the port names.
The following show the device variables and data types to which the process data of the Signal Tower is assigned.
In this guide, the operating mode of the Signal Tower is set to Simple Mode (default) for the process data assignment of the Signal Tower.

Additional Information

With Sysmac Studio, two methods can be used to specify an array for a data type.
After specifying, (1) is converted to (2), and the data type is always displayed as (2).
(1) BOOL[16] / (2) ARRAY[0..15] OF BOOL
In this guide, the data type is simplified by displaying BOOL[16].
(The example above means a BOOL data type with sixteen array elements.)

Process data output area (Controller to Slave Terminal)

Device name	Device variable	Data type	Process data of Signal Tower		
			Byte No.	Bit	Description
N1	N1_Port1_Output_Data01[0]	BYTE	5	0	Buzzer ON / OFF
				1 to 7	Not used
	N1_Port1_Output_Data01[1]	BYTE	4	0	LED Unit (White) ON/OFF
				1 to 7	Not used
	N1_Port1_Output_Data02[0]	BYTE	3	0	LED Unit (Blue) ON / OFF
				1 to 7	Not used
	N1_Port1_Output_Data02[1]	BYTE	2	0	LED Unit (Green) ON / OFF
				1 to 7	Not used
	N1_Port1_Output_Data03[0]	BYTE	1	0	LED Unit (Amber) ON / OFF
				1 to 7	Not used
	N1_Port1_Output_Data03[1]	BYTE	0	0	LED Unit (Red) ON / OFF
				1 to 7	Not used

Additional Information

For more information on the process data of the Signal Tower, refer to *6 How to Use* of the *IO-Link Signal Tower TYPE LR6-IL Complete Operation Manual* (GA0001002).

7. IO-Link Connection Procedure

This section describes the procedures for connecting the Signal Tower via IO-Link to the IO-Link Master Unit and for connecting the Controller via EtherCAT to the Slave Terminal made up of the IO-Link Master Unit. The procedures for setting up the Controller and Slave Terminal in this guide are based on the factory default settings.
For information on initialization, refer to *Section 8. Initialization Method*.

7.1. Work Flow

Take the following steps to connect the Signal Tower via IO-Link to the IO-Link Master Unit and to connect the Controller via EtherCAT to the Slave Terminal made up of the IO-Link Master Unit.

7.2. Slave Terminal Setup	Set up the Slave Terminal.
↓	
7.2.1. Hardware Settings	Build the Slave Terminal, set hardware switches and connect the Signal Tower.
↓	
7.3. Network Configuration for Host Communications	Set up the network configuration for host communications.
↓	
7.3.1. Starting Sysmac Studio	Start Sysmac Studio and go online with the Controller.
↓	
7.3.2. Setting the EtherCAT Network Configuration	Set the EtherCAT network configuration.
↓	
7.4. IO-Link Master Unit Setup	Set up the IO-Link Master Unit.
↓	
7.4.1 Parameter Settings	Set parameters for the IO-Link Master Unit.
↓	
7.4.2. I/O Allocation Settings	Set I/O allocations for the IO-Link Master Unit.
↓	
7.5. Controller Setup	Set up the Controller.
↓	
7.5.1. Setting Device Variables	Set device variables to use for the Slave Terminal.
↓	
7.5.2. Transferring the Project Data	Place Sysmac Studio online and transfer the project data to the Controller.
↓	

7.6. IO-Link Communication Status Check

Confirm that cyclic communications in the IO-Link System is performed normally.

↓

7.6.1. Checking the Connection Status

Check the connection status of each device.

↓

7.6.2. Installing the IODD File

Install the IODD file of the Signal Tower.

↓

7.6.3. Checking Sent Data

Check that correct data is sent.

7.2. Slave Terminal Setup

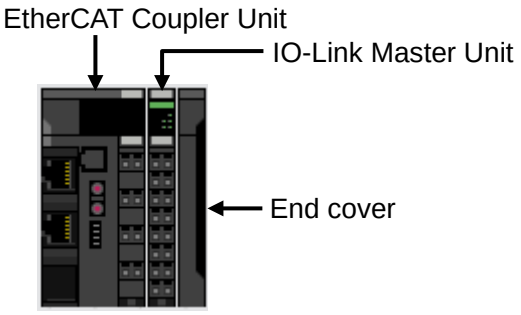
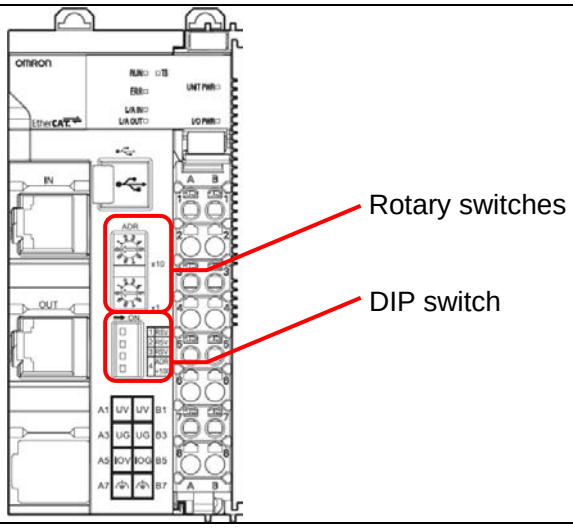
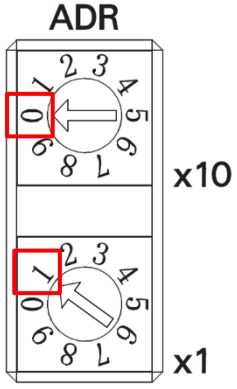
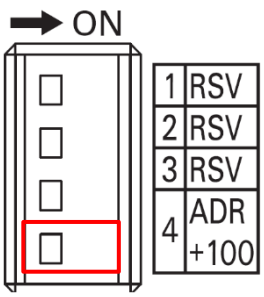
Set up the Slave Terminal.

7.2.1. Hardware Settings

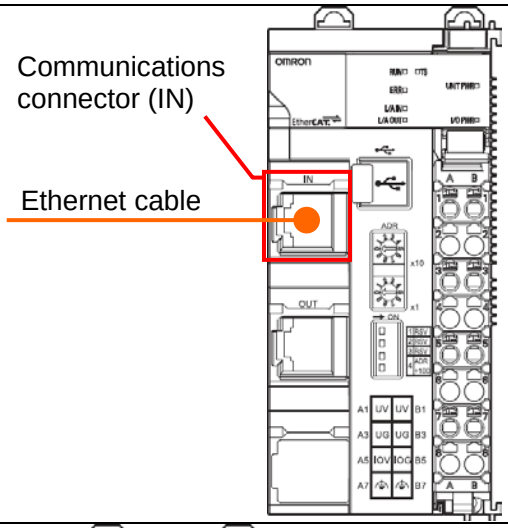
Build the Slave Terminal, set hardware switches and connect the Signal Tower.

Precautions for Correct Use

Make sure the power supplies are OFF before setting up.
If either of them is ON, the settings described in the following steps and subsequent procedures may not be applicable.

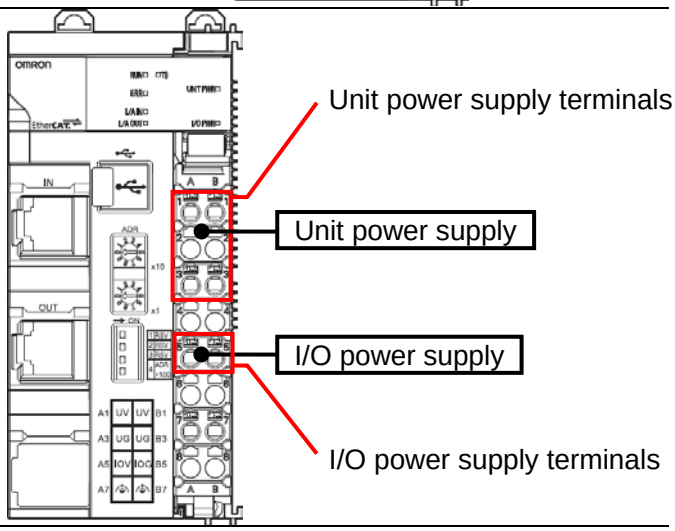
1	Make sure Unit power supply and I/O power supply are OFF.	
2	Connect IO-Link Master Unit to EtherCAT Coupler Unit.	
3	Check the position of the hardware switches on EtherCAT Coupler Unit by referring to the figure on the right.	
4	Set Rotary switches and DIP switch as follows: ・Rotary switches x10: *0* x1: *1* ・DIP switch 4 (ADR+100): *OFF* *The node address is set to 1.	 Rotary switches  DIP switch

5 Connect an Ethernet cable to Communications connector (IN) on EtherCAT Coupler Unit.



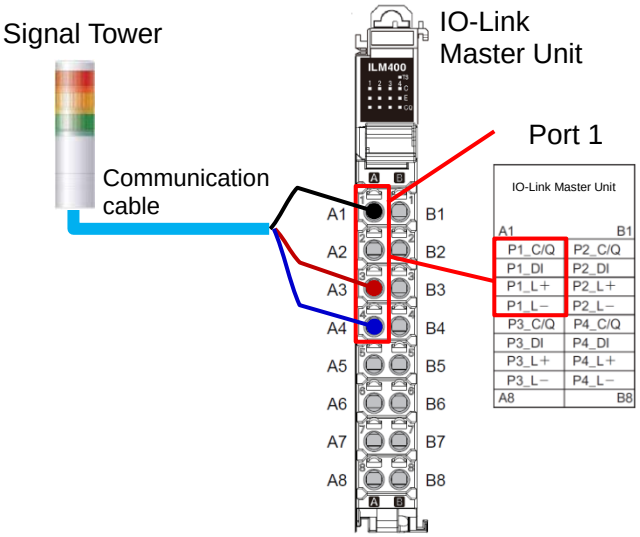
6 Connect Unit power supply and I/O power supply to Unit power supply terminals and I/O power supply terminals on EtherCAT Coupler Unit, respectively.

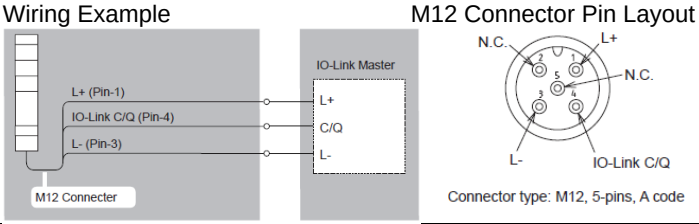
*Refer to the *NX-series EtherCAT® Coupler Unit User's Manual* (Cat. No. W519) for information on wiring the power supplies to NX-series Slave Terminal.



7 Connect Signal Tower and Port 1 on IO-Link Master Unit with a Communication cable.

*For information on the connector specifications of Signal Tower, refer to the *IO-Link Signal Tower TYPE LR6-IL Complete Operation Manual* (GA0001002).





7.3. Network Configuration for Host Communications

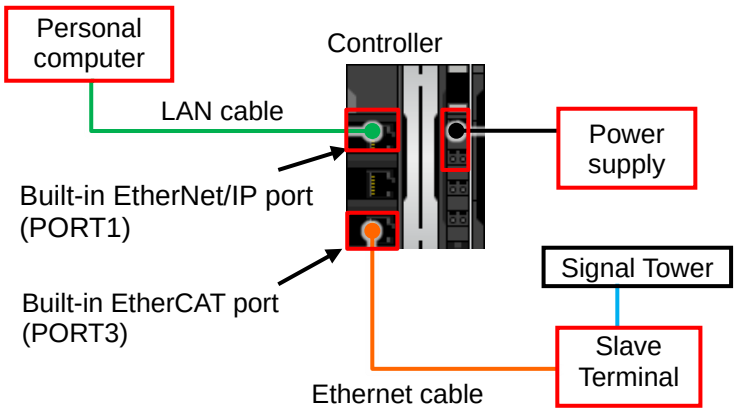
Set up the network configuration for host communications.

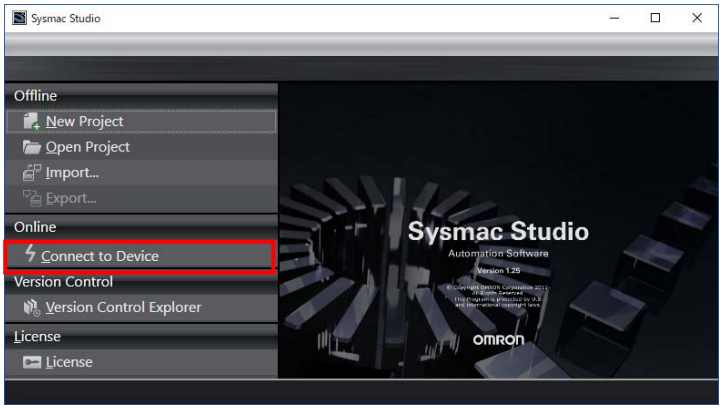
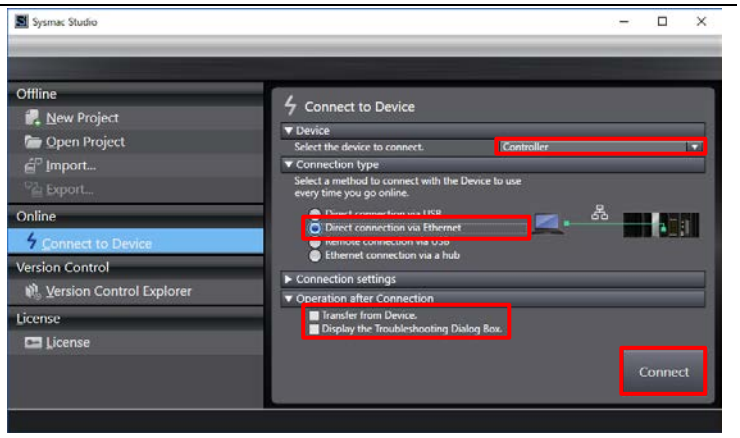
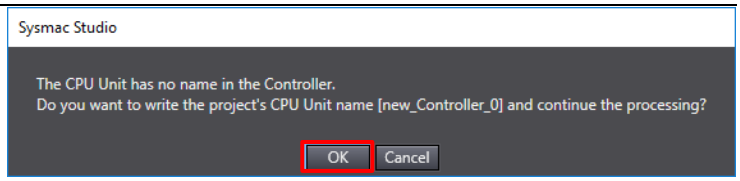
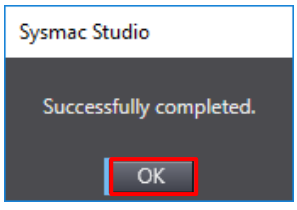
7.3.1. Starting Sysmac Studio

Start Sysmac Studio and go online with the Controller.

Additional Information

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

1	Make sure the power supplies for Controller and Slave Terminal are OFF.	
2	Connect Personal computer 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 Slave Terminal) to Built-in EtherCAT port (PORT3) on Controller. Connect Power supply to Controller. *For 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	Turn ON Controller and Unit power supply to Slave Terminal. *The I/O power supply to Slave Terminal remains OFF.	
4	Start Sysmac Studio. *If the User Account Control Dialog Box is displayed at start, make a selection to start Sysmac Studio.	

5	Sysmac Studio starts up. Click **Connect to Device**.	
6	The Connect to Device Screen is displayed. Select ***Controller*** from the pull-down list in the *Device* Field and *Direct connection via Ethernet* in the *Connection type* Field. Uncheck the boxes for both *Transfer from Device* and *Display the Troubleshooting Dialog Box* in the *Operation after Connection* Field. Click **Connect**.	
7	A confirmation dialog box is displayed. Check the contents and click **OK**. *The contents of the dialog box vary depending on the status of Controller. Check the contents and click on an appropriate button to proceed with the processing.	
8	The dialog box on the right is displayed when the connection to the device is successfully completed. Check the contents and click **OK**.	

9 The Auto Connect Project Dialog Box is displayed online. When an online connection is established, a yellow line is displayed under the toolbar.

The following panes are displayed in the window.

Left: Multiview Explorer

Top right: Toolbox

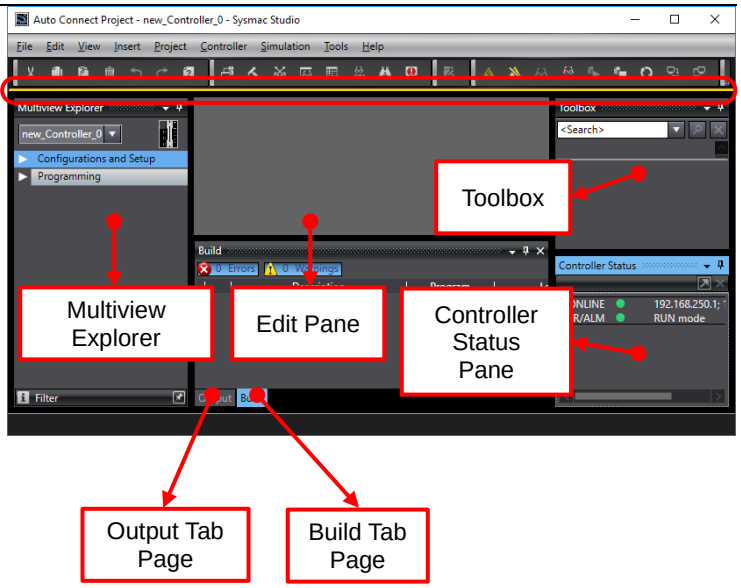
Bottom right: Controller Status Pane

Top middle: Edit Pane

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

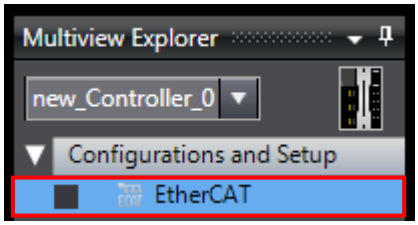
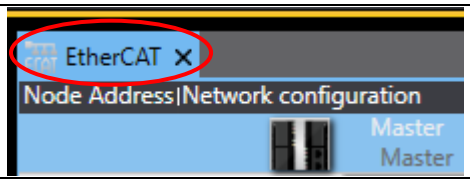
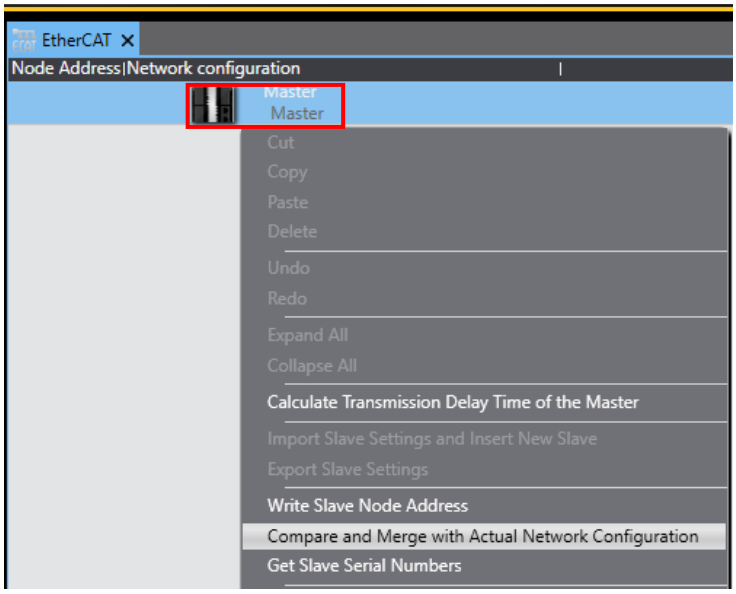
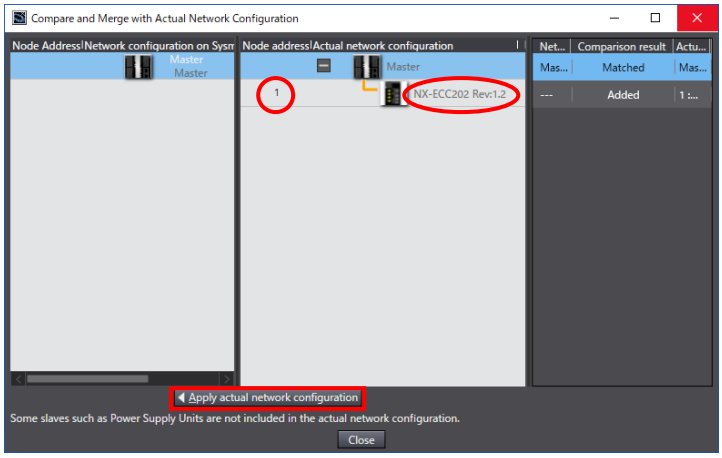
Output Tab Page

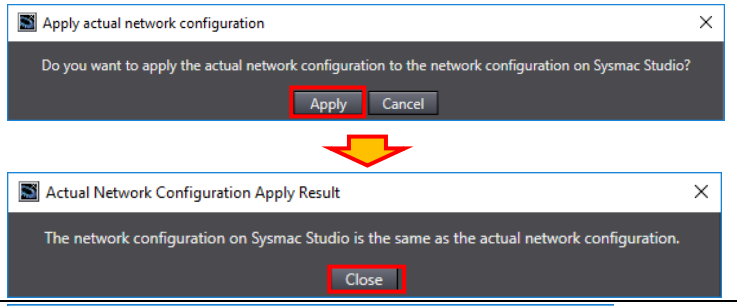
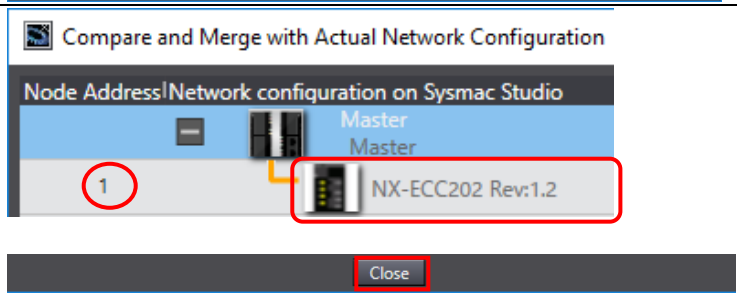
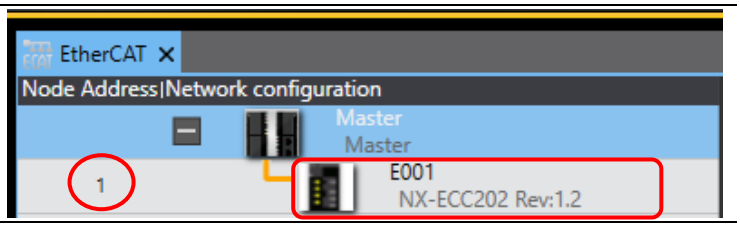
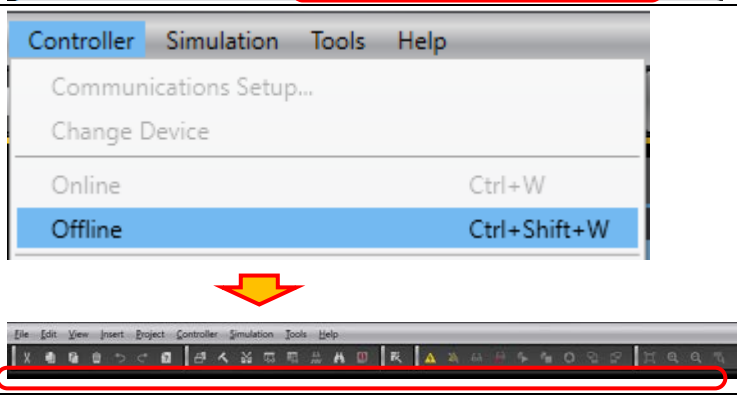
Build Tab Page



7.3.2. Setting the EtherCAT Network Configuration

Set the EtherCAT network configuration.

1	Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.	
2	The EtherCAT Tab Page is displayed in the Edit Pane.	
3	Right-click **Master** on the EtherCAT Tab Page of the Edit Pane, and select ***Compare and Merge with Actual Network Configuration***. A screen is displayed stating "Get information is being executed".	
4	The Compare and Merge with Actual Network Configuration Dialog Box is displayed. As a node address 1 slave, NX-ECC202 Rev:1.2 is added to the Actual network configuration, after the comparison. Click **Apply actual network configuration**.	

5	A confirmation dialog box is displayed. Check the contents and click **Apply**. A result dialog box is displayed. Check the contents and click **Close**.	
6	As a node address 1 slave, E001 NX-ECC202 Rev:1.2 is added to the Network configuration on Sysmac Studio. Check that the data is added. Click **Close**.	
7	The node address 1 and E001 NX-ECC202 Rev:1.2 are added to the EtherCAT Tab Page of the Edit Pane.	
8	Select ***Offline*** from the Controller Menu. The yellow line under the toolbar disappears.	

7.4. IO-Link Master Unit Setup

Set up the IO-Link Master Unit.

7.4.1. Parameter Settings

Set parameters for the IO-Link Master Unit.

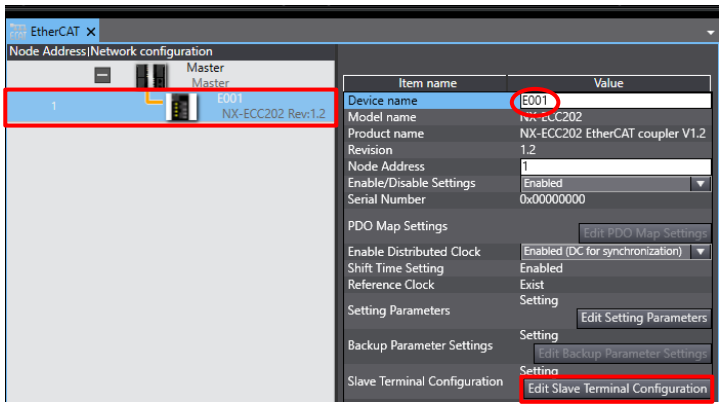
Additional Information

If you use the functions such as "connected device verification" and "backup and restoration of parameter settings in IO-Link devices", refer to the *NX-series IO-Link Master Unit User's Manual* (Cat. No. W567) and the *IO-Link System User's Manual* (Cat. No. W570).

1 Select NX-ECC202 Rev:1.2 on the EtherCAT Tab Page of the Edit Pane.
Check that the device name is E001.

*The device name can be changed as desired.
The device name you set is used at the beginning of a device variable name.

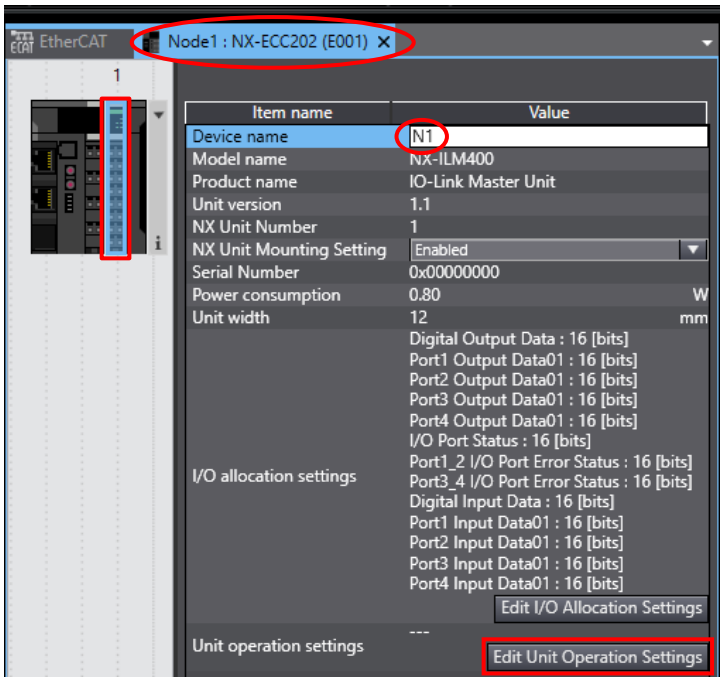
Click **Edit Slave Terminal Configuration**.

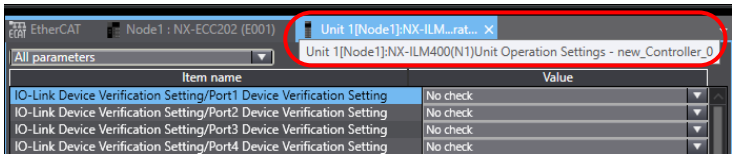
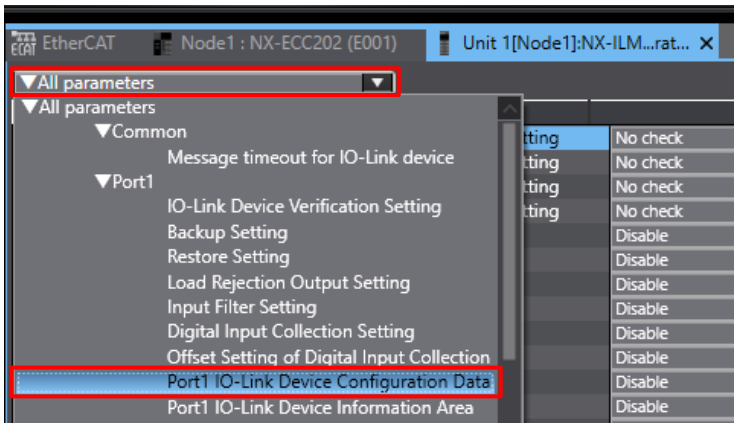
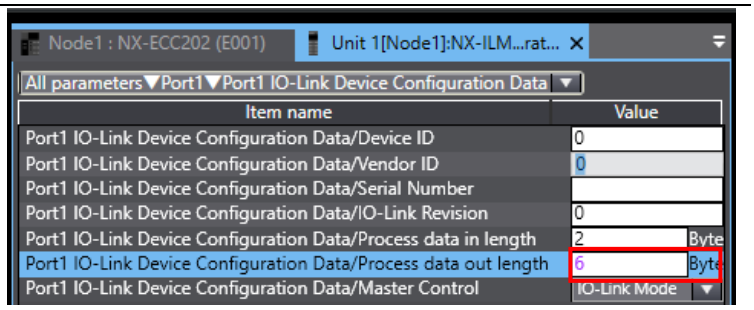


2 The Node1:NX-ECC202(E001) Tab Page is displayed.
Select IO-Link Master Unit (NX Unit number 1).
The configuration settings are displayed on the right side of the tab page.
Check that the device name is N1.

*The device name can be changed as desired.
The device name you set is used at the beginning of a device variable name.

Click **Edit Unit Operation Settings**.



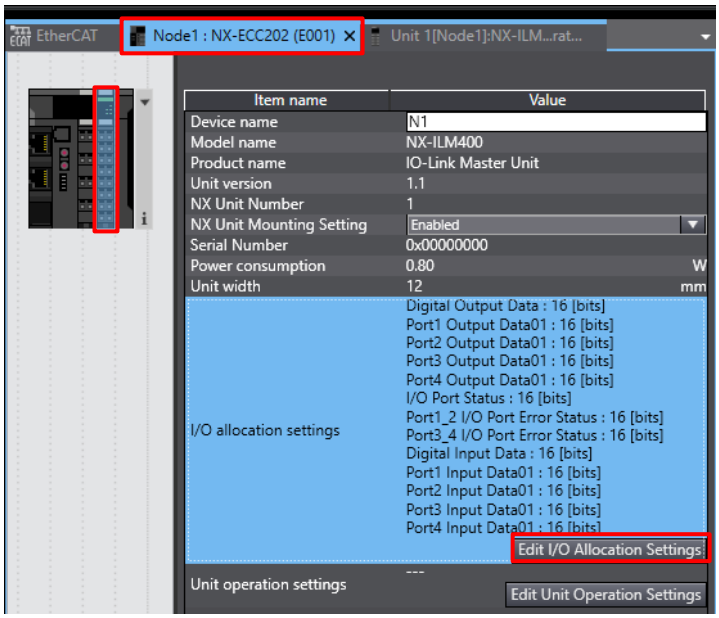
3	The Unit 1[Node1]:NX-ILM400 (N1)Unit Operation Settings Tab Page is displayed.	
4	Select ▼ ***Port1*** – ***Port1 IO-Link Device Configuration Data*** from the pull-down list (just above the column header "Item name") to narrow down the parameters.	
5	The items of Port1 IO-Link Device Configuration Data are displayed. Set the following items. ・Process data out length: *6* (Byte) ・Master Control: ***IO-Link Mode*** (default) *The process data length of Signal Tower is "6 byte / 0 byte (input from master / output to master)"; however, in this guide, the default value (2 bytes) is used for the process data out length for Port 1 on IO-Link Master Unit, which is related to the process data length "0 byte (output to master)" of Signal Tower.	

7.4.2. I/O Allocation Settings

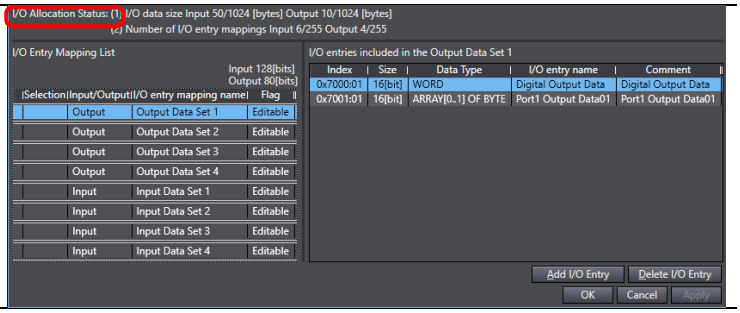
Set I/O allocations for the IO-Link Master Unit.

In this guide, the data size of the output data area for Port 1 is set to 6 bytes.

1 Click the **Node1 : NX-ECC202 (E001)** Tab.
Select IO-Link Master Unit (NX Unit number 1) and click **Edit I/O Allocation Settings**.



2 The IO allocation status is displayed.

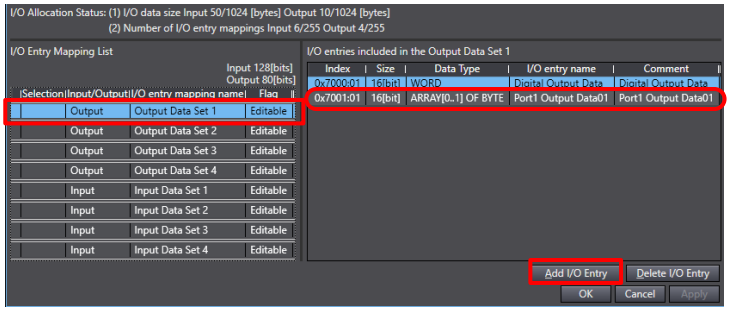


3 Select *Output Data Set 1* from I/O Entry Mapping List displayed on the left side of the dialog box. The table of "I/O entries included in the Output Data Set 1" is displayed on the right side of the dialog box. Check that the following I/O entry is set.

- 0x7001:01 16[bit]
  ARRAY[0..1] OF BYTE
  Port1 Output Data01

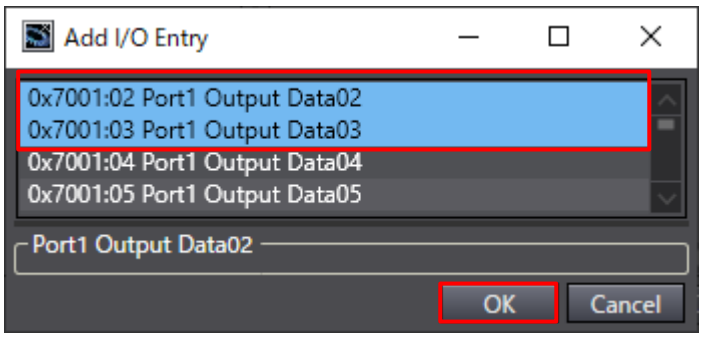
Click **Add I/O Entry**.

*The data size of the output data area for Port 1 is set to 2 bytes.



4 The Add I/O Entry Dialog Box is displayed.
Select from *0x7001:02 Port1 Output Data02* to *0x7001:03 Port1 Input Data03* by holding the shift key down.

Click **OK**.

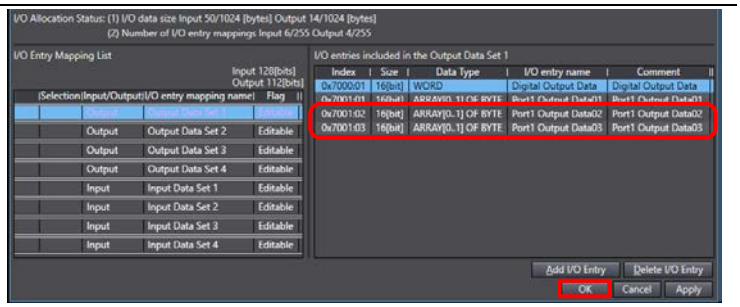


5 Add the following I/O entries to the table of "I/O entries included in the Output Data Set 1".

- 0x7001:02 Port1 Output Data02
- 0x7001:03 Port1 Output Data03

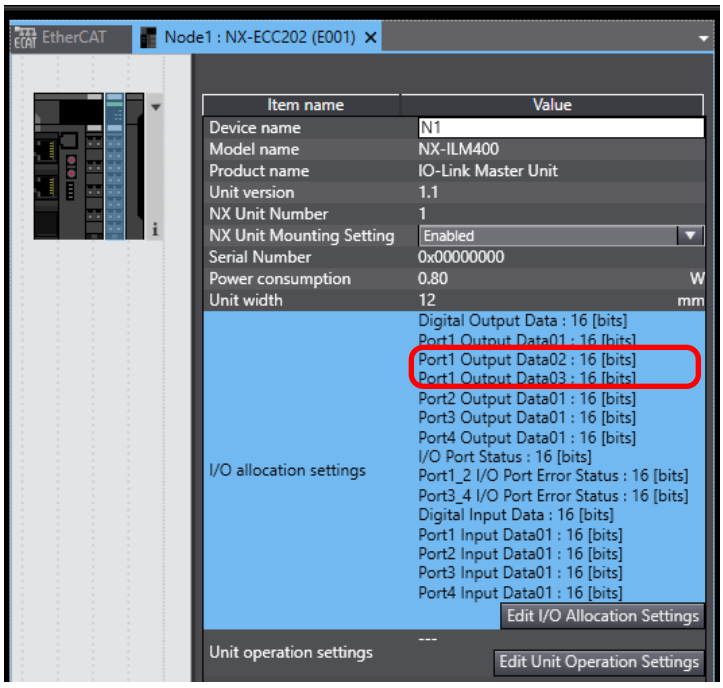
Click **OK**.

*The data size of the output data area for Port 1 is set to 6 bytes in total.



6 Check that the following I/O entries are added to the *I/O allocation settings* Field.

- Port1 Output Data02:16[bit]
- Port1 Output Data03:16[bit]

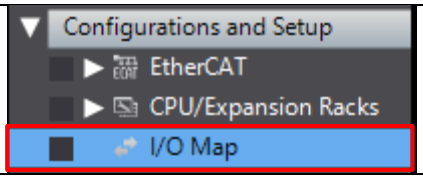
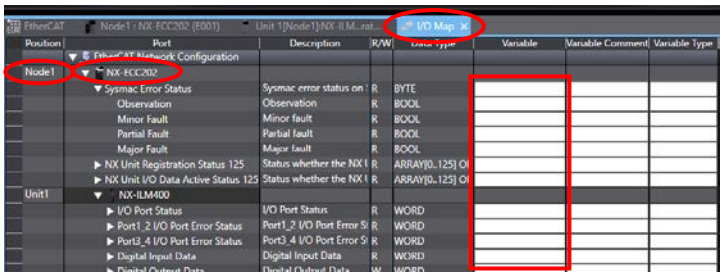
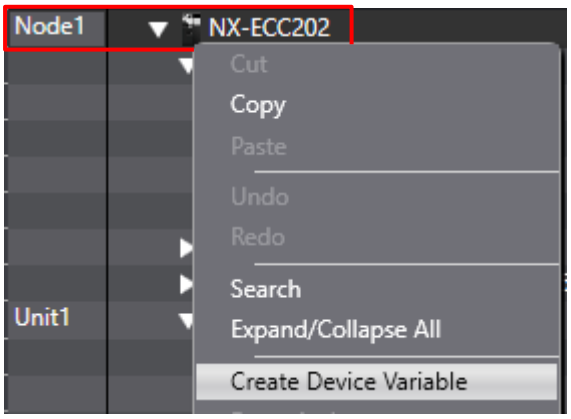
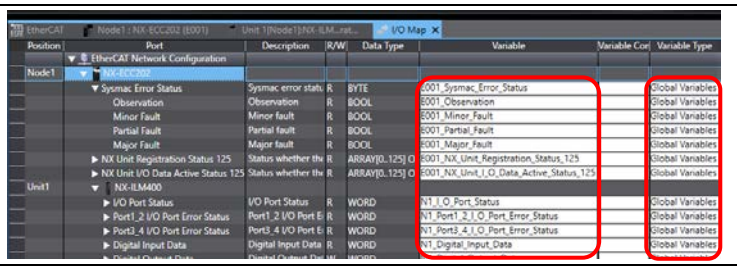


7.5. Controller Setup

Set up the Controller.

7.5.1. Setting Device Variables

Set device variables to use for the Slave Terminal.

1	Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.	
2	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 Terminal is displayed in the *Port* Column. *To manually set a variable name for Slave Terminal, click a cell in the *Variable* Column and enter a name.	
3	Right-click **Node1** and select ***Create Device Variable***.	
4	The variable names and types are set.	

Additional Information

The device variables are automatically named from a combination of the device names and the port names.
For slave units, the default device names are "E" followed by a serial number starting from "001". For NX Units, the default device names are "N" followed by a serial number starting from "1".

Additional Information

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

7.5.2. Transferring the Project Data

Place Sysmac Studio online and transfer the project data to the Controller.

⚠ WARNING

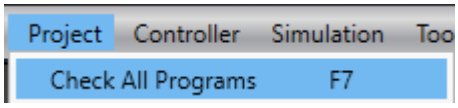
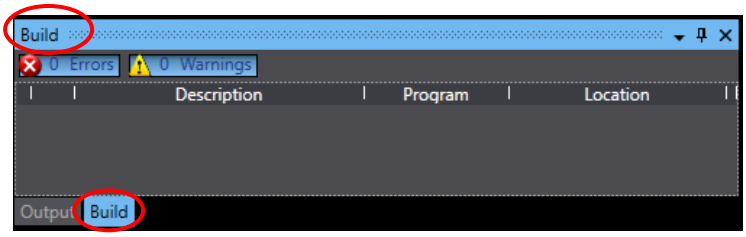
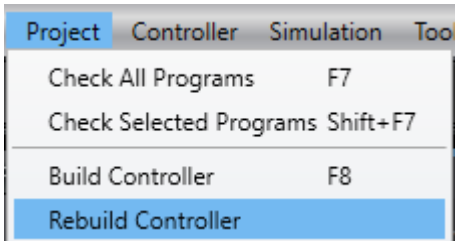
Regardless of the operating mode of the CPU Unit, devices or machines may perform unexpected operation when you transfer any of the following data from Sysmac Studio: a user program, configuration data, setup data or device variables.
Always confirm safety at the destination node before you transfer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

⚠ WARNING

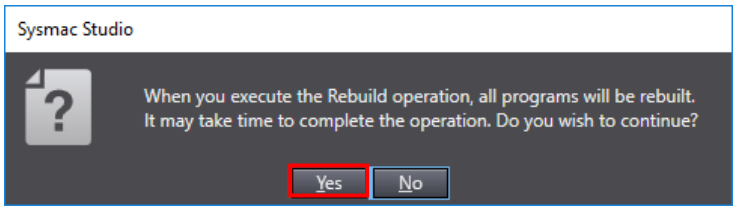
Before you transfer the parameters, check the specifications of the EtherCAT slave unit in manuals or other documentation and confirm that the system will not be adversely affected.

⚠ Caution

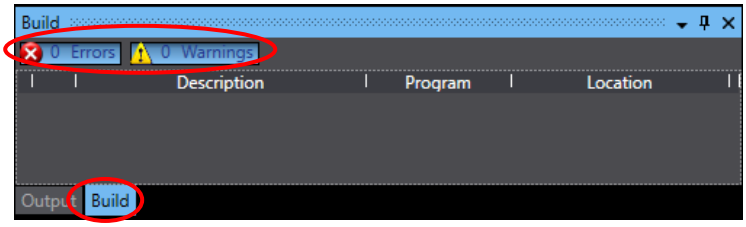
After you transfer the project data, the CPU Unit is restarted, and communications with the slave unit is cut off. During the period, the outputs of the slave unit behave according to the slave unit settings. The time that communications is cut off depends on the EtherCAT network configuration.
Before 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 is displayed. Check that "0 Errors" and "0 Warnings" are displayed.	
3	Select ***Rebuild Controller*** from the Project Menu.	

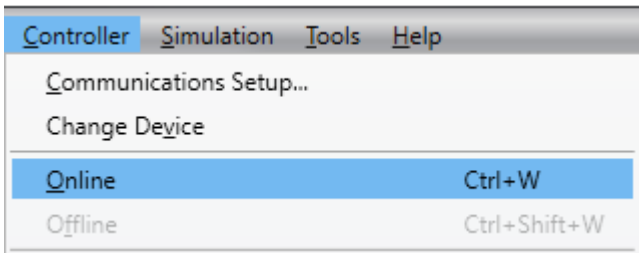
4 The dialog box on the right is displayed. Confirm that there is no problem, and click **Yes**.



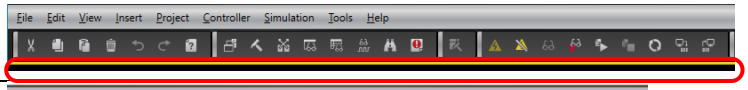
5 Check that "0 Errors" and "0 Warnings" are displayed on the Build Tab Page.



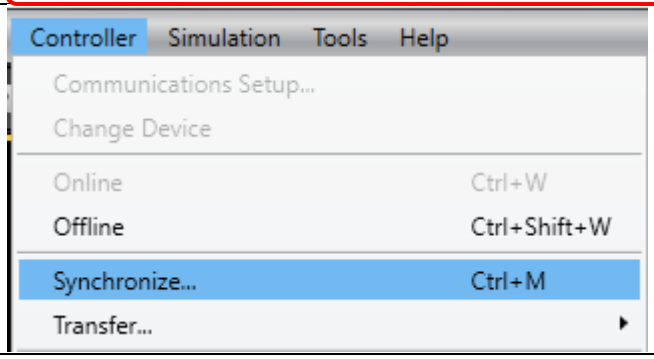
6 Select ***Online*** from the Controller Menu.



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

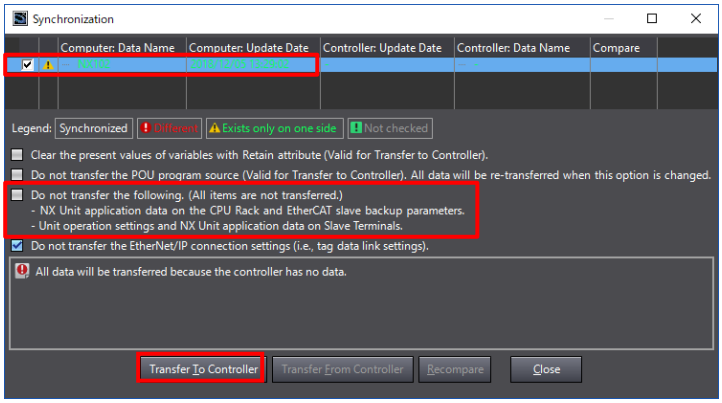


7 Select ***Synchronize*** from the Controller Menu.



8 The Synchronization Dialog Box is displayed.
Check that the data to transfer (e.g. NX102) is selected.
Uncheck the box for *Do not transfer the following. (All items are not transferred.)* to make the unit operation settings on Slave Terminal transferable.
Click **Transfer To Controller**.

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

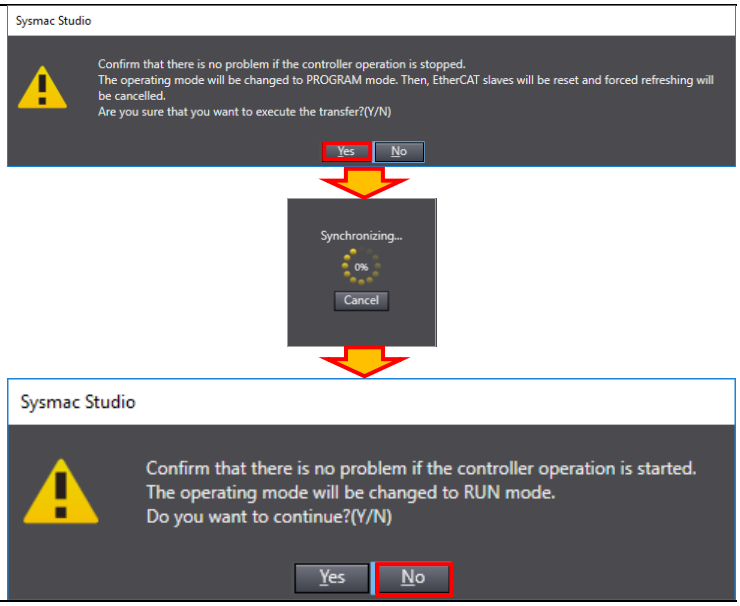


9 The dialog box on the right is displayed. Confirm that there is no problem, and click **Yes**.

A screen is displayed stating "Synchronizing".

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

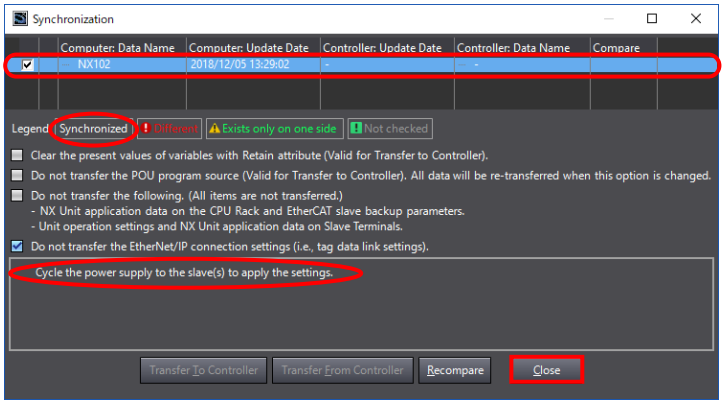
*Do not return to RUN mode.



10 As shown in the figure on the right, the font color that is used to display the synchronized data changes to the same color as the one used to specify "Synchronized". Check that a message is displayed stating "Cycle the power supply to the slave(s) to apply the settings". Click **Close**.

*When the Sysmac Studio project data matches the Controller data, the synchronized data will have the same font color as the one used to specify "Synchronized".

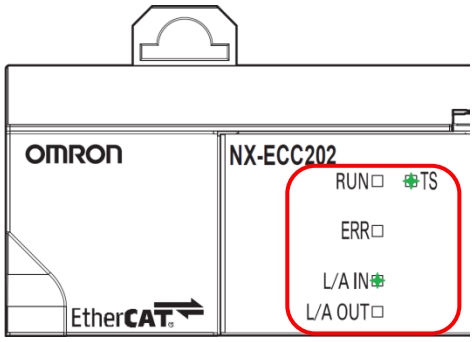
*If the synchronization fails, check the wiring and repeat from step 1.



11 To reflect the settings, turn OFF Unit power supply to Slave Terminal, then turn it back ON.

12 Check that the following LED indicators on Slave Terminal show the communication ready status.

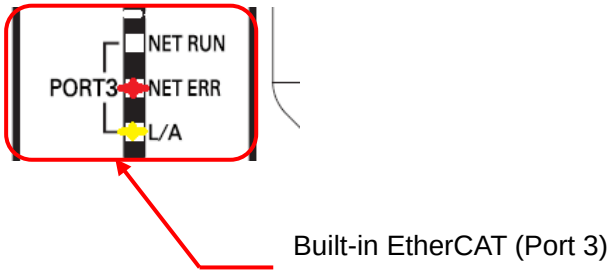
RUN: Not lit
ERR: Not lit
TS: Green flashing
L/A IN: Green flickering
L/A OUT: Not lit



13 The LED indicators on Controller are as shown below when an error occurs in EtherCAT communications due to the temporary interruption of Unit power supply to Slave Terminal.

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

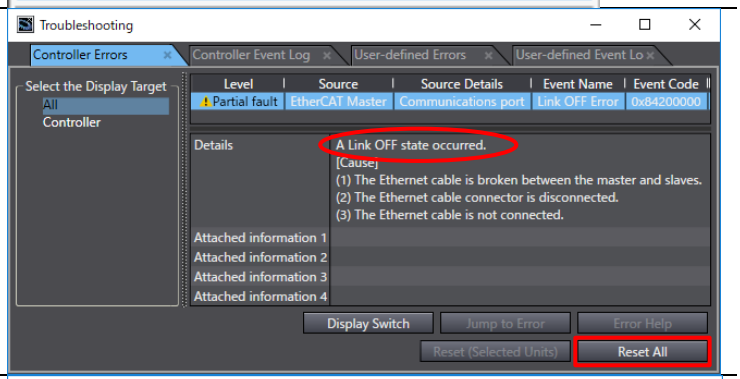
*The NJ-series Controllers also have the same LED indicator status.



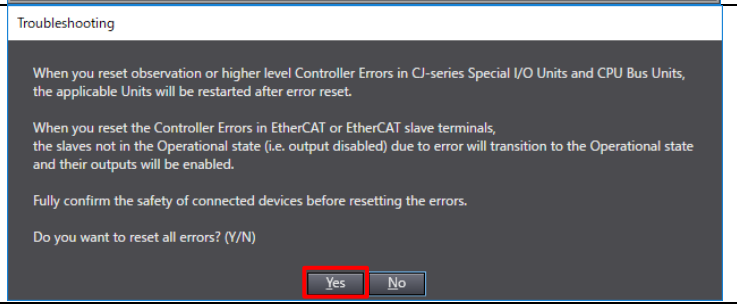
14 Select ***Troubleshooting*** from the Tools Menu.

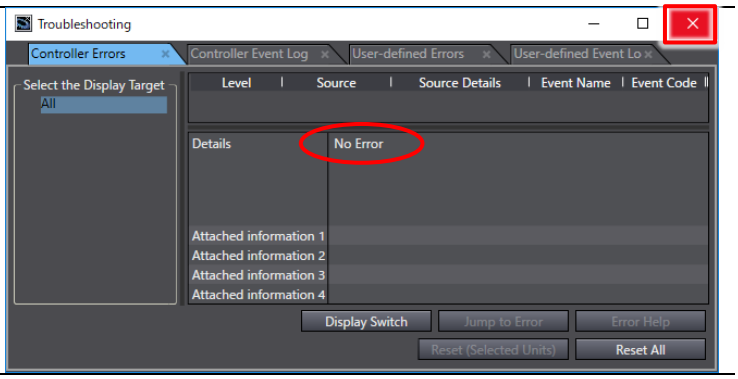
15 The Troubleshooting Dialog Box is displayed. Check that a Link OFF Error occurs as shown in the figure on the right.

Click **Reset All**.



16 The dialog box on the right is displayed. Check the contents and click **Yes**.



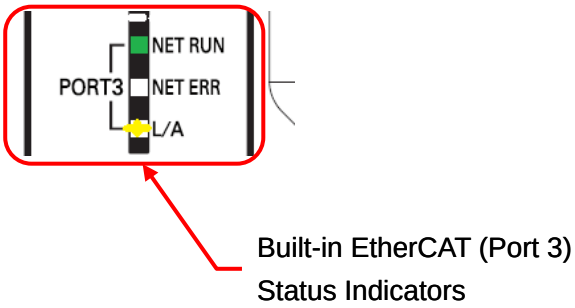
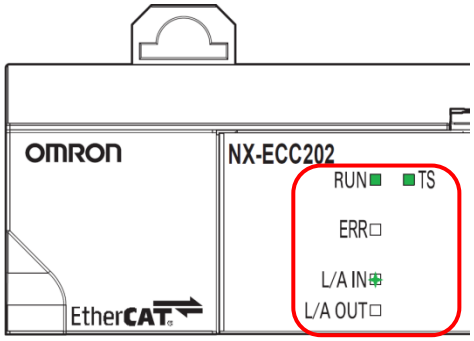
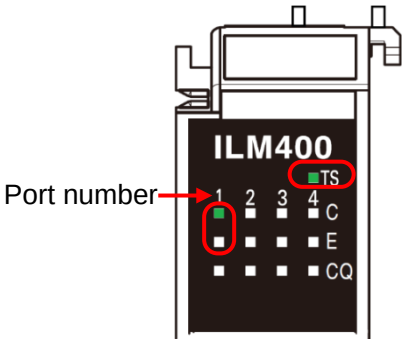
17	Check that the error is not displayed. Click **X** at the top right of the Troubleshooting Dialog Box to close.	
18	Turn ON I/O power supply to Slave Terminal.	

7.6. IO-Link Communication Status Check

Confirm that cyclic communications in the IO-Link System is performed normally.

7.6.1. Checking the Connection Status

Check the connection status of each device.

1	Check with the LED indicators on Controller that PDO communications via EtherCAT is performed normally. The LED indicators 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 indicator status.	
2	Check the LED indicators on EtherCAT Coupler Unit. The LED indicators in normal status are as follows: RUN: Green lit TS: Green lit ERR: Not lit L/A IN: Green flickering L/A OUT: Not lit	
3	Check the LED indicators on IO-Link Master Unit. The LED indicators in normal status are as follows: TS: Green lit Port 1 – C: Green lit Port 1 – E: Not lit	

7.6.2. Installing the IODD File

Install the IODD file of the Signal Tower.

When you use IO-Link devices other than those produced by OMRON, you need to first install the IODD file relevant to your IO-Link device in order to use with CX-ConfiguratorFDT.

The IODD DTM Configurator that is provided in the Sysmac Studio package is used to install the file.

Ensure that IODD DTM Configurator is installed on your personal computer.

Precautions for Correct Use

Obtain the IODD file specified in *5.2. Device Configuration*.

IODD files are usually provided in a compressed folder or in their respective compressed folders; hence, you need to extract it. Some image files (png) may be stored along with the IODD file(s) (xml) in the extracted folder. Leave those image files in the same folder with the IODD file(s) (xml).

1	Start IODD DTM Configurator.	The startup icon is displayed under "IO-Link" in the All Apps list in Windows Start Menu.
2	IODD DTM Configurator starts up. Click **Add IODD**.	The **Add IODD** Button is at the top right of the screen of IODD DTM Configurator.
3	Select the IODD file *Patlite-LR6-IL-20190110-IODD1.1.xml* to install, and click **Open**.	A dialog box to select the file is opened.
4	The message (dialog box) on the right is displayed. Confirm that there is no problem, and click **OK**.	"Please close any running FDT frame application."
5	Check that the IODD "PATLITE Corporation LR6-IL" is installed. Click **Close**.	Check the installed file on the screen of IODD DTM Configurator. The **Close** Button is at the bottom right of the screen of IODD DTM Configurator.
6	The message (dialog box) on the right is displayed. Check the contents and click **OK**.	"Please ensure that at next startup of the FDT frame application the device catalogue becomes updated."

7.6.3. Checking Sent Data

Check that correct data is sent.

Ensure that CX-ConfiguratorFDT is installed on your personal computer, which is provided in the Sysmac Studio package.

⚠ Caution

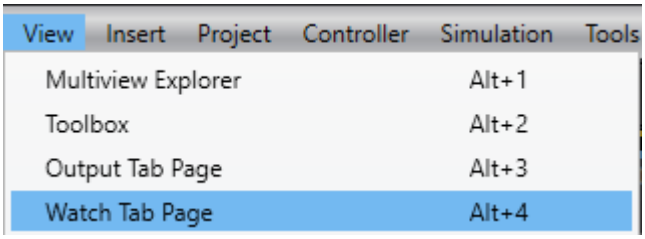
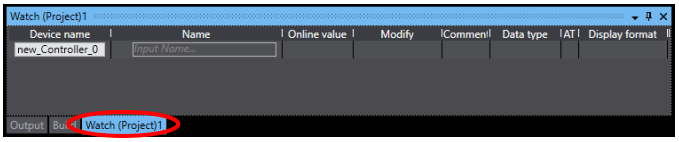
In this procedure, the output of the Signal Tower is performed, which may have a risk of unexpected operation of the devices connected to the Signal Tower.
Ensure safety before you proceed with this operation check described here.
If you cannot ensure safety, do not proceed. When you perform this operation check, make sure you complete all the steps and make the output of the Signal Tower safe.

⚠ Caution

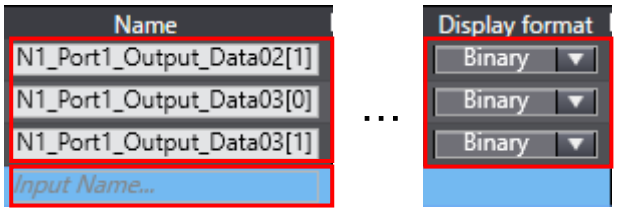
If you wire I/O in a state where the devices are powered ON, it may cause damage to the devices.
Always read and follow the information provided in all safety precautions in the manuals for each device before wiring.

⚠ 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. .

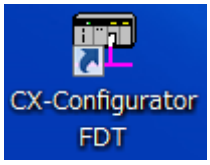
1	Select ***Watch Tab Page*** from the View Menu.	
2	The Watch (Project)1 Tab Page is displayed.	

3 Click *Input Name* and enter the following variable names for monitoring.
Select the following display formats for the variables.

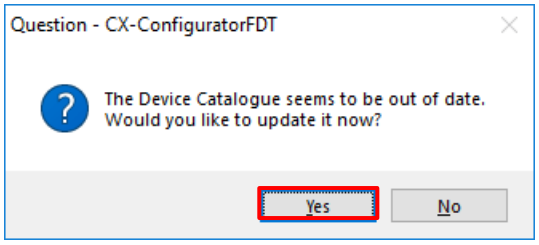


Name:
N1_Port1_Output_Data02[1]
Display format: ***Binary***
Name:
N1_Port1_Output_Data03[0]
Display format: ***Binary***
Name:
N1_Port1_Output_Data03[1]
Display format: ***Binary***

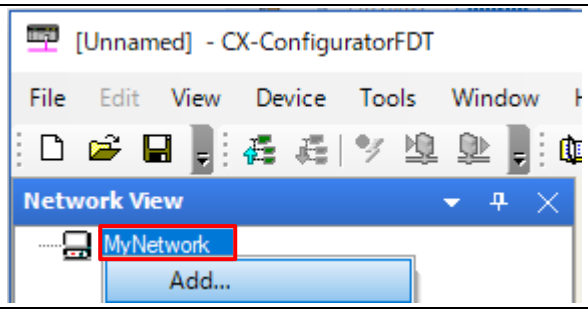
4 Start CX-ConfiguratorFDT.



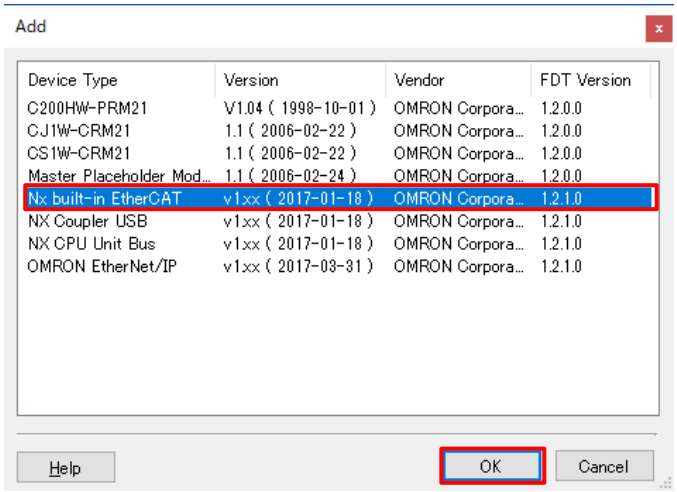
*When you start CX-ConfiguratorFDT, the dialog box on the right is displayed asking you whether you wish to update the device catalog. Click **Yes**.



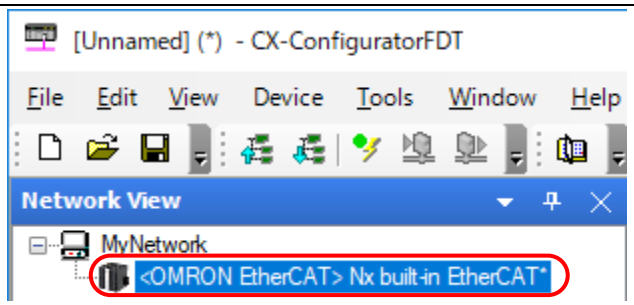
5 CX-ConfiguratorFDT starts up.
Right-click **MyNetwork** in the Network View and select ***Add*** from the menu.



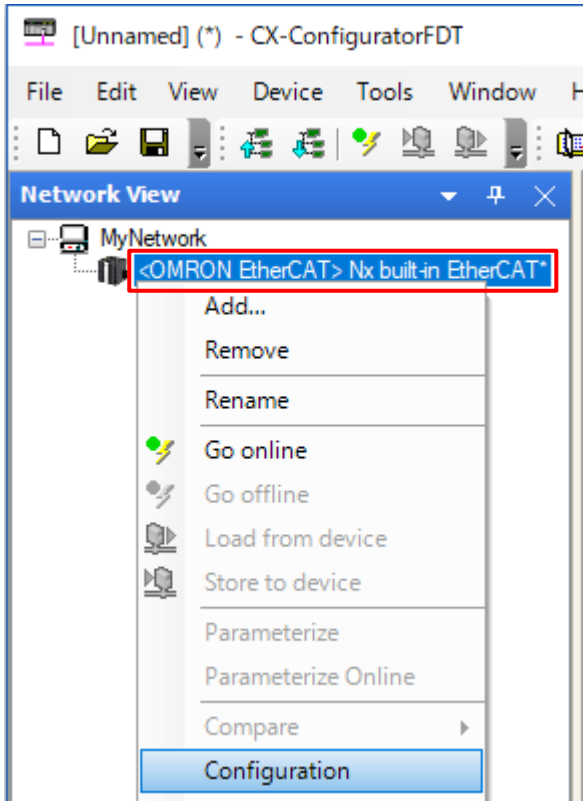
6 The Add Dialog Box is displayed.
Select *Nx built-in EtherCAT*.
Click **OK**.



7 Check that <OMRON EtherCAT> Nx built-in EtherCAT is added under MyNetwork in the Network View.

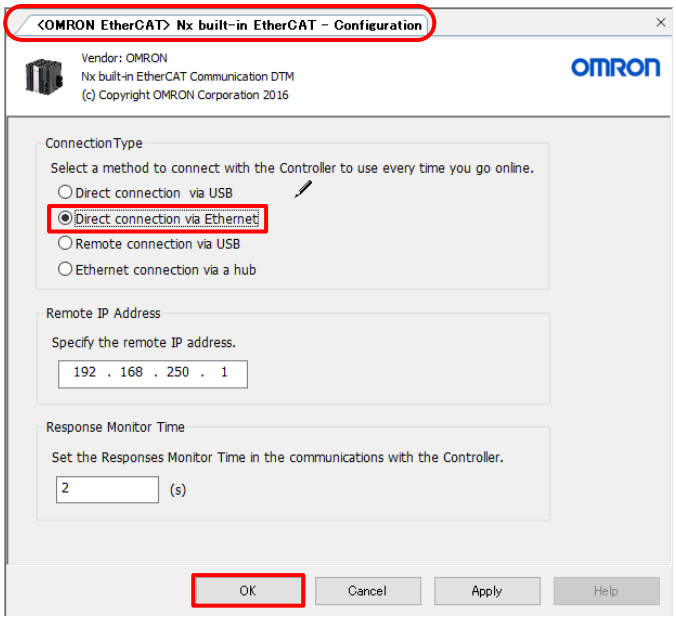


8 Right-click **<OMRON EtherCAT> Nx built-in EtherCAT** and select ***Configuration*** from the menu.

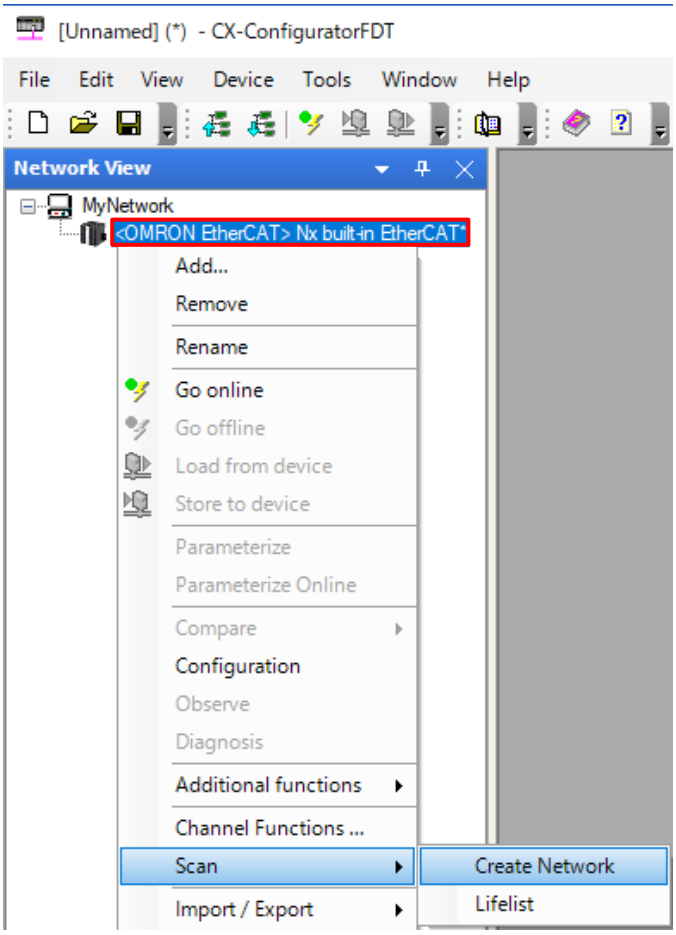


9 The <OMRON EtherCAT> Nx built-in EtherCAT - Configuration Tab Page is displayed.
Select *Direct connection via Ethernet* and click **OK**.

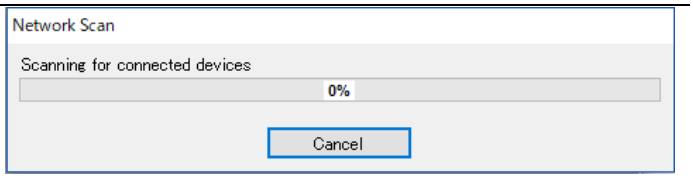
The <OMRON EtherCAT> Nx built-in EtherCAT - Configuration Tab Page is closed.



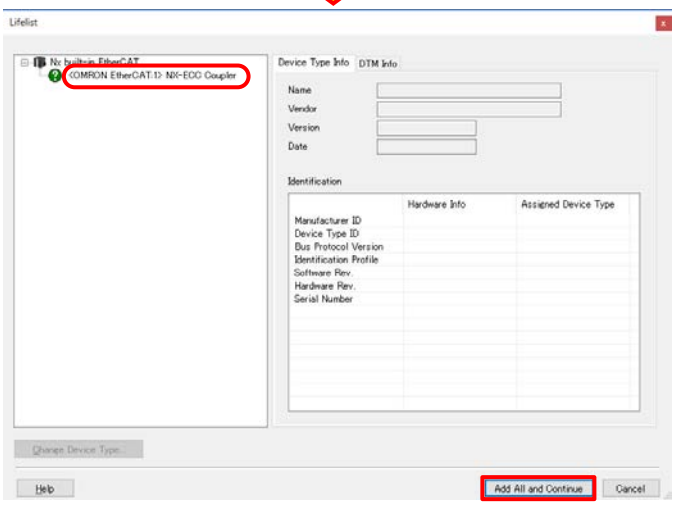
10 Right-click **<OMRON EtherCAT> Nx built-in EtherCAT** and select ***Scan*** – ***Create Network*** from the menu.



11 The Lifelist Dialog Box is displayed after the network scan is completed.

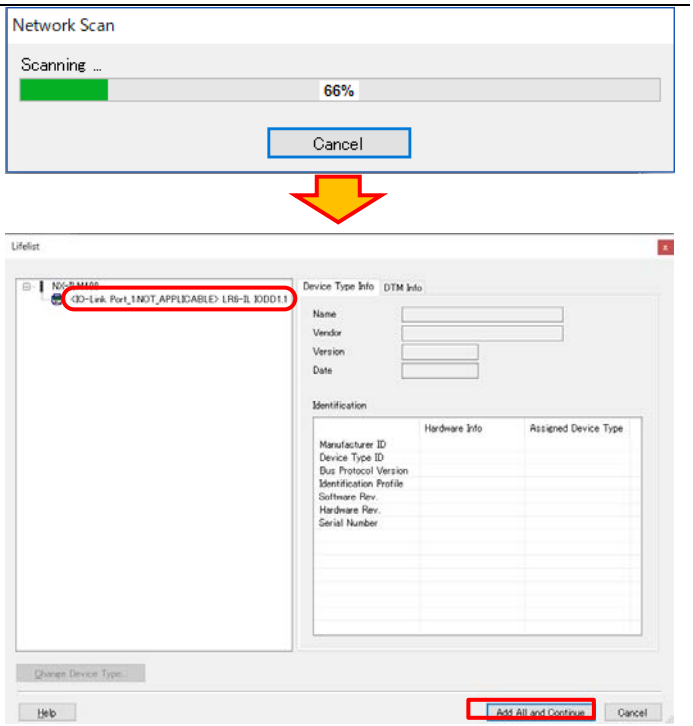


Check that <OMRON EtherCAT:1> NX-ECC Coupler is added under Nx built-in EtherCAT.
Click **Add All and Continue**.

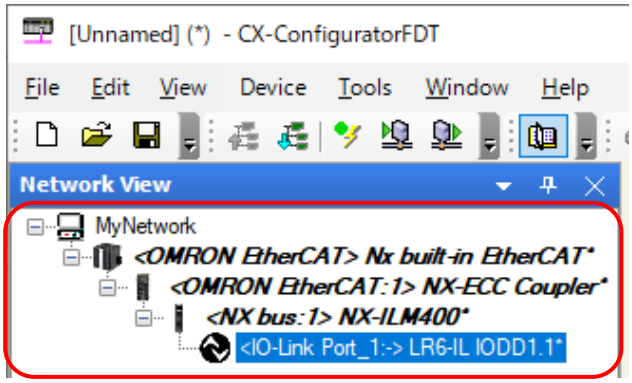


12 The Lifelist Dialog Box is displayed again after the network scan is completed.

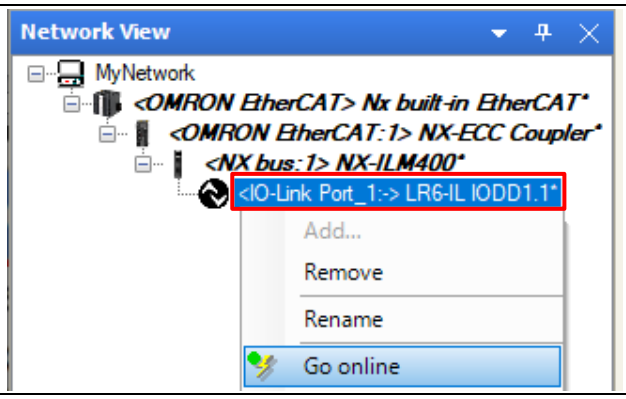
Check that <IO-Link Port_1:NOT_APPLICABLE> LR6-IL IODD1.1 is added under NX-ILM400.
Click **Add All and Continue**.



13 Check that the network configuration (as shown on the right) is created in the Network View.

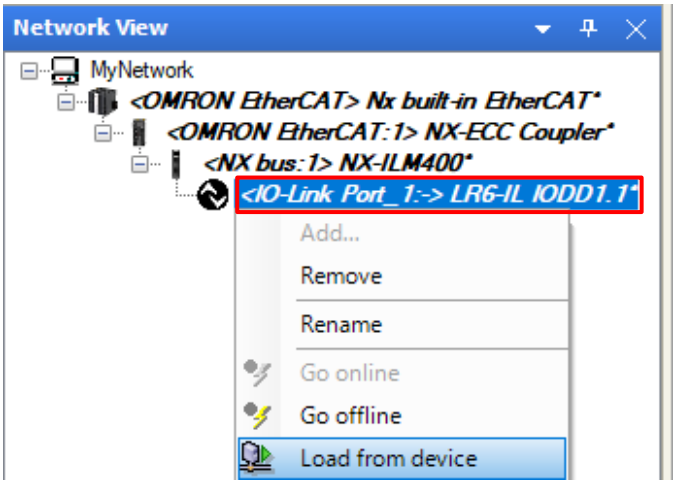


14 Right-click **<IO-Link Port_1:-> LR6-IL IODD1.1** and select ***Go online*** from the menu.



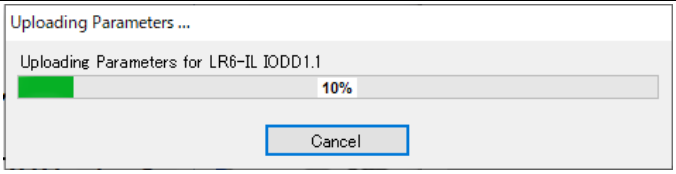
15 Check that Signal Tower is online. Right-click **<IO-Link Port_1:-> LR6-IL IODD1.1** and select ***Load from device*** from the menu.

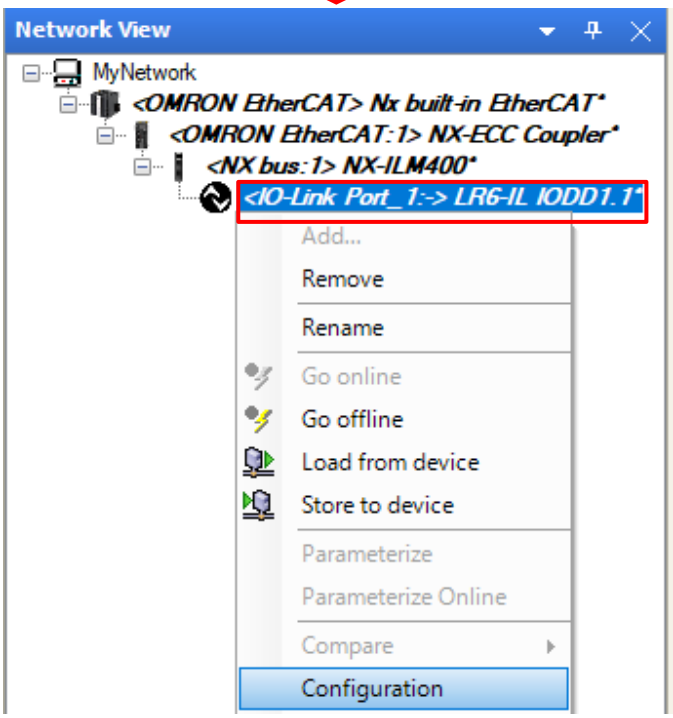
*Signal Tower is online when <IO-Link Port_1:-> LR6-IL IODD1.1 is displayed in bold italic font.



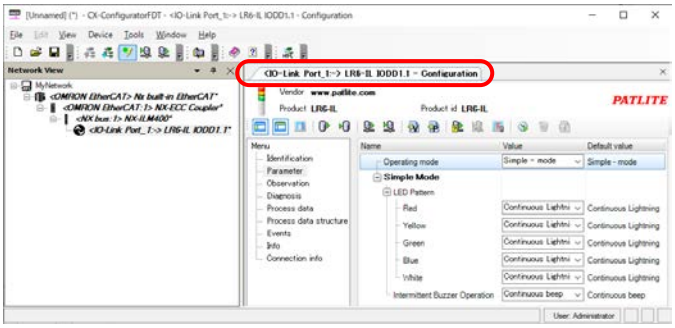
16 The parameters of Signal Tower are uploaded. The dialog box on the right is displayed during the parameter upload.

The dialog box is closed after the upload is completed.
Right-click **<IO-Link Port_1:-> LR6-IL IODD1.1** and select ***Configuration*** from the menu.

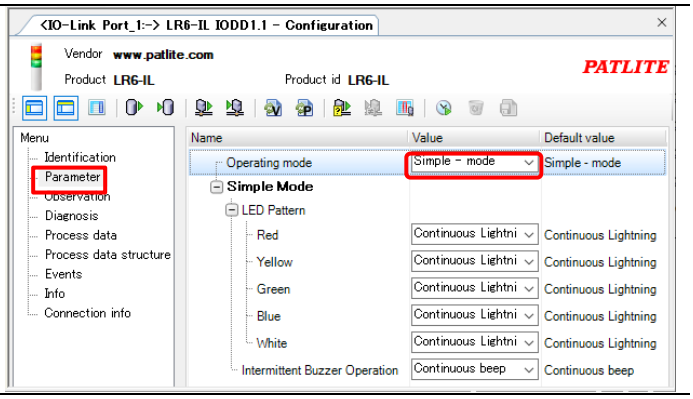




17 The <IO-Link Port_1:-> LR6-IL IODD1.1 - Configuration Tab Page is displayed.

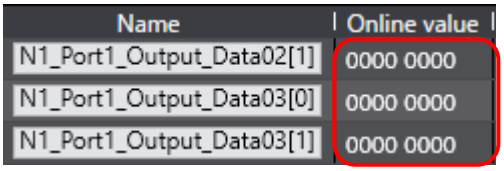


18 Select *Parameter* listed under Menu on the <IO-Link Port_1:-> LR6-IL IODD1.1 - Configuration Tab Page. Check that Operating mode displayed on the right side of the tab page is set to Simple - mode (default).



19 With Sysmac Studio, check that the following online values are displayed on the Watch Tab Page.

- *N1_Port1_Output_Data02[1]*: 0000 0000
- *N1_Port1_Output_Data03[0]*: 0000 0000
- *N1_Port1_Output_Data03[1]*: 0000 0000



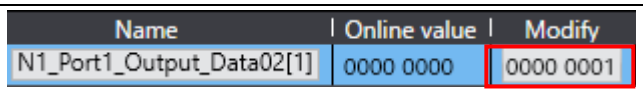
*The bit 0 value of *N1_Port1_Output_Data02[1]* is 0, which indicates that Controller turns OFF the green light of the LED unit on Signal Tower.

*Refer to *6.4. Device Variables* for details on each of the variables.

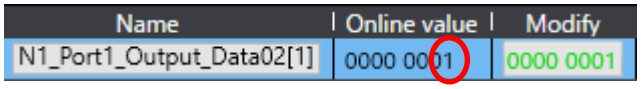
20 Check that Signal Tower is not lit.

*As shown in the figure on the right, Signal Tower is not lit. It is the same as the online values displayed in step 19.

21 On the Watch Tab Page of Sysmac Studio, enter *0000 0001* in the *Modify* Column for *N1_Port1_Output_Data02[1]* .



The bit 0 value of *N1_Port1_Output_Data02[1]* (LED unit (Green) ON/OFF) changes to 1.



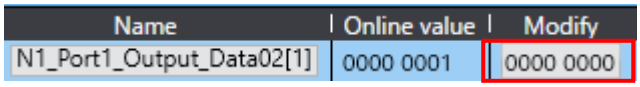
*Controller turns ON the green light of the LED unit on Signal Tower.

*Refer to *6.4. Device Variables* for details on each of the variables.

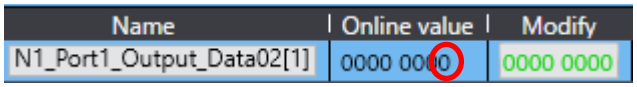
22 Check that the green light of the LED unit on Signal Tower is ON.

*As shown in the figure on the right, the green light of the LED unit on Signal Tower is ON.
It is the same as the online value displayed in step 21.

23 On the Watch Tab Page of Sysmac Studio, enter *0000 0000* in the *Modify* Column for *N1_Port1_Output_Data02[1]*.



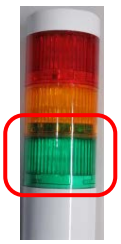
The bit 0 value of *N1_Port1_Output_Data02[1]* (LED unit (Green) ON/OFF) changes to 0.



*Controller turns OFF the green light of the LED unit on Signal Tower.

*Refer to *6.4. Device Variables* for details on each of the variables.

24 Check that Signal Tower is not lit.



*As shown in the figure on the right, Signal Tower is not lit.
It is the same as the online value displayed in step 23.

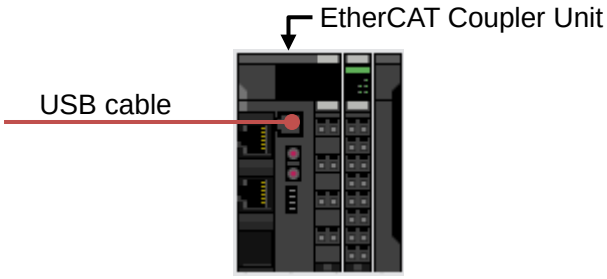
8. Initialization Method

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

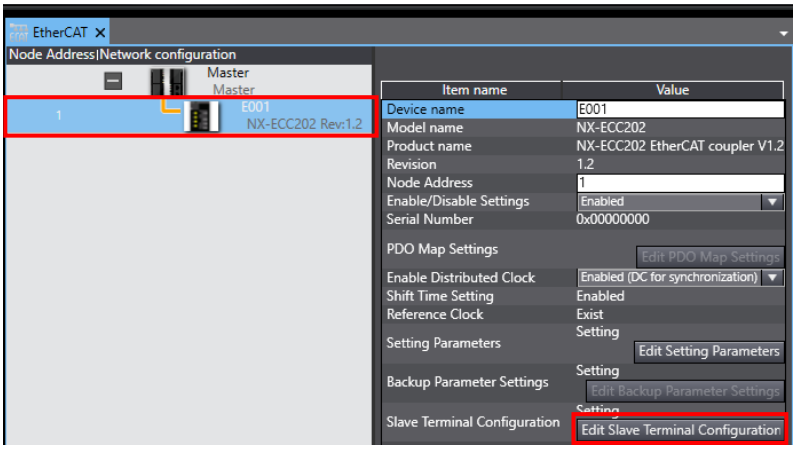
8.1. Initializing a Slave Terminal

To initialize a Slave Terminal, connect the Slave Terminal directly to your personal computer on which Sysmac Studio runs.

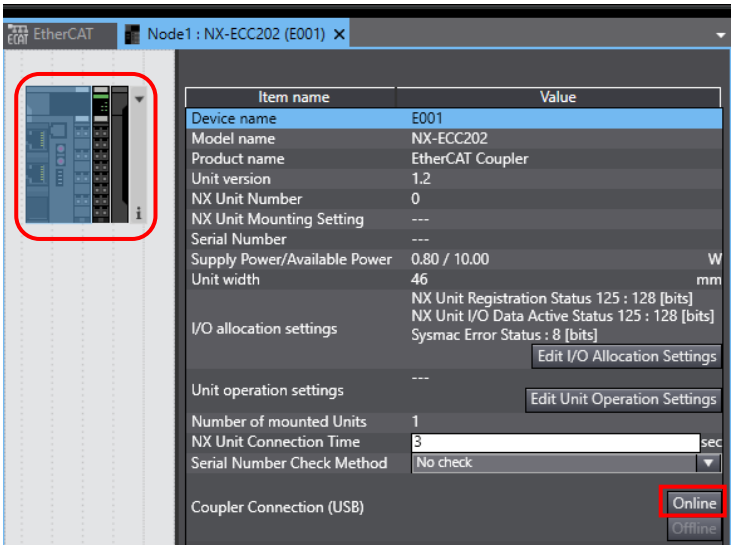
1) Connect a USB cable (USB 2.0-compliant, B-type connector) to the peripheral USB port on EtherCAT Coupler Unit.



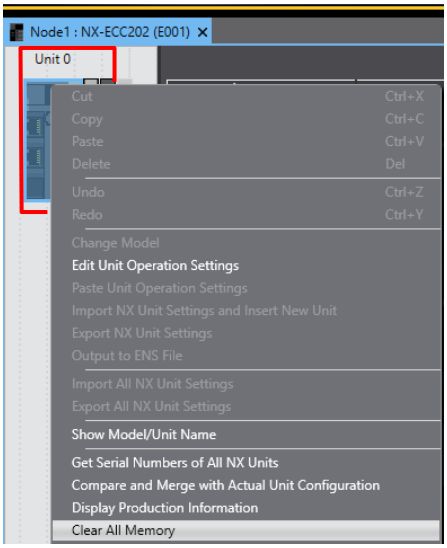
2) Select NX-ECC202 on the EtherCAT Tab Page of the Edit Pane.
Click **Edit Slave Terminal Configuration** in the *Slave Terminal Configuration* Field.



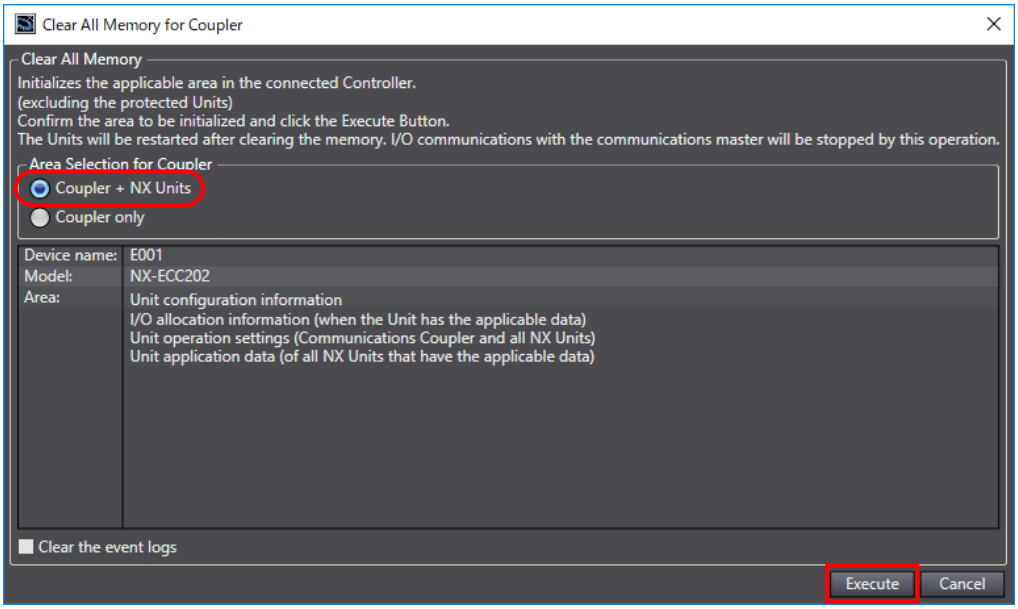
3) The configuration of the connected Slave Terminal is displayed. Click **Online**.



4) Right-click EtherCAT Coupler Unit (Unit 0) after checking the online connection. Select ***Clear All Memory*** from the menu.



5) The Clear All Memory for Coupler Dialog Box is displayed. Check that Coupler + NX Units is selected. Click **Execute**.



Precautions for Correct Use

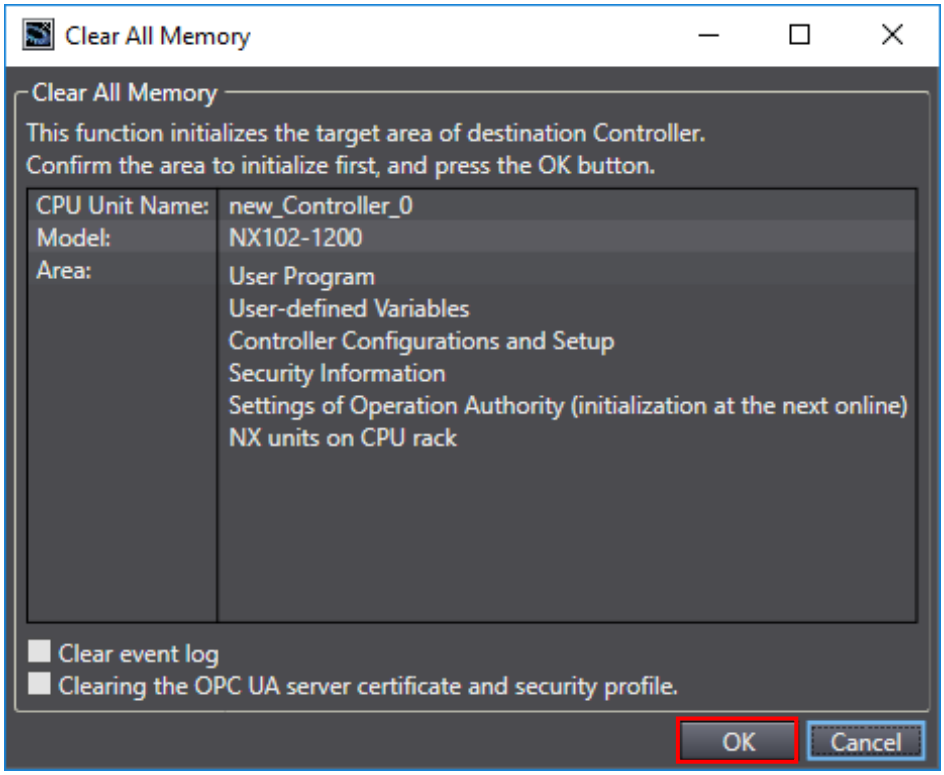
In the initialization of a Slave Terminal, the backup data of IO-Link devices that is stored in an IO-Link Master Unit is not cleared. If you wish to clear the backup data stored in the IO-Link Master Unit, refer to *7-6-5 Clearing Backup Data* of the *IO-Link System User's Manual* (Cat. No. W570).

8.2. 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 is displayed.

Check the contents and click **OK**.



9. Revision History

Revision code	Date of revision	Description of revision
01	November 2019	First edition

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