

Machine Automation Controller NJ/NX-series

EtherNet/IP™ Connection Guide

HMS Industrial Networks AB

Anybus Communicator for EtherNet/IP

Network
Connection
Guide

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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 used in the system.

The table below lists the manuals provided by HMS Industrial Networks (hereinafter referred to as "HMS") 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	W506	NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	NJ/NX-series CPU Unit Built-in EtherNet/IP™ Port User's Manual
OMRON	W504	SYSMAC-SE2□□□	Sysmac Studio Version 1 Operation Manual
OMRON	0969584-7	W4S1-05□ W4S1-03B	Switching Hub W4S1-series Users Manual
HMS	HMSI-27-316	AB7072	User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)
HMS	SP1708	AB7072	Anybus Communicator - EtherNet/IP Interface Installation Sheet

2. Terms and Definitions

Term	Explanation and Definition
node	It refers to a relay point, a junction point or an end point on an EtherNet/IP network made up of devices having an EtherNet/IP port. A device with one EtherNet/IP port is recognized as one node and two EtherNet/IP ports as two nodes on an EtherNet/IP network.
tag	A unit that is used to exchange data with tag data links. Data is exchanged between the local network variables and remote network variables specified in the tags or between specified I/O memory areas.
tag set	When a connection is established, one or more tags (up to eight tags including Controller status) are configured as a collective set of tags. This is called a tag set. Each tag set represents a unit of data for one tag data link connection. Tag data links are therefore created through a connection between one tag set and another tag set. A tag set name must be set for each tag set.
tag data links	The standard EtherNet/IP implicit communications are called tag data links. Tag data links enable cyclic tag data exchanges on an EtherNet/IP network between Controllers or between Controllers and other devices.
connection	It is used to exchange data as a unit within which data concurrency is maintained.
connection type	There are two kinds of connection types for tag data links. One is a multi-cast connection, and the other is a unicast (point-to-point) connection. The multi-cast connection sends an output tag set in one packet to more than one node. The unicast connection separately sends one output tag set to each node. Therefore, the multi-cast connection can reduce the communications load if one output tag set is sent to more than one node.
originator and target	To make tag data links, it is necessary to establish connections between nodes that perform tag data links. The node that requests the connection is called the originator, and the node that receives the request is called the target.
tag data link parameters	The information that is set to make tag data links (including tags, tag sets and connections) is called tag data link parameters.
EDS file	A file that describes information unique to a device such as the number of I/O points for an EtherNet/IP device.

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 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 November 2020. 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 an HMS Anybus Communicator for EtherNet/IP (hereinafter referred to as the "Communicator") and an OMRON NJ/NX-series Machine Automation Controller (hereinafter referred to as the "Controller") via EtherNet/IP and for checking their communication status.

Refer to *Section 6. EtherNet/IP Settings* and *Section 7. EtherNet/IP Connection Procedure* to understand setting methods and key points to operate EtherNet/IP tag data links.

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-□□□□
HMS	Anybus Communicator-EtherNet/IP Slave 2-port version single port version	AB7072 AB7007



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

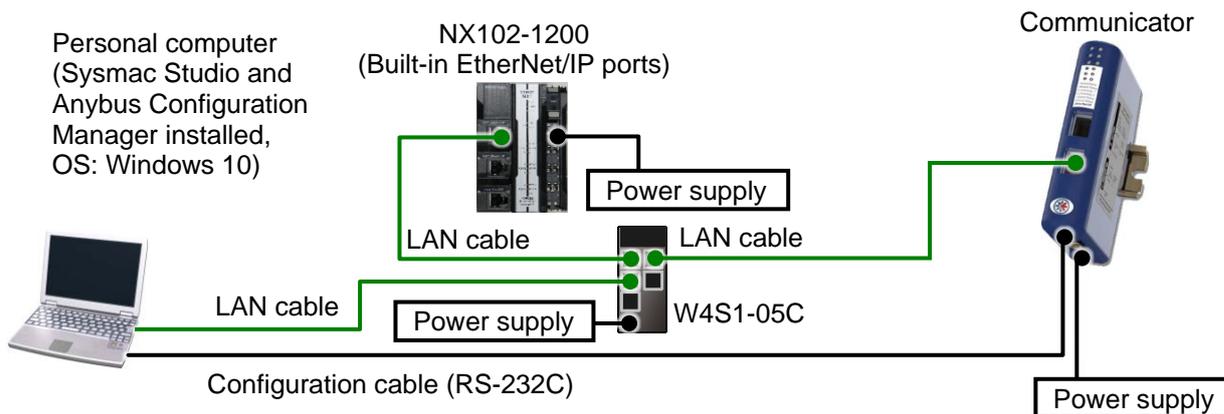
This guide describes the procedures for establishing the network connection.

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.

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 EtherNet/IP ports)	NX102-1200	Ver.1.40
—	Power supply (24 VDC for Controller)	—	
OMRON	Switching hub	W4S1-05C	Ver.1.0
OMRON	Sysmac Studio	SYSMAC-SE2□□□	Ver.1.29
—	Personal computer (OS: Windows 10)	—	
—	LAN cable (STP (shielded, twisted-pair) cable of Ethernet category 5 or higher)	—	
HMS	Anybus Communicator for EtherNet/IP	AB7072	Ver. 3.03
HMS	Configuration cable (RS-232)	(supplied with Communicator)	
HMS	EDS file	005A000C00540300.EDS.eds	Ver.1.3
HMS	Anybus Configuration Manager - Communicator RS232/422/485	—	Ver.4.5.1.0
—	Power supply (24 VDC for Communicator)	—	

 **Precautions for Correct Use**

Contact HMS Industrial Networks to obtain the EDS file specified above before proceeding. Please note that you need the EDS file relevant to your device. If you use the other model (not the one specified above), contact HMS Industrial Networks and obtain the relevant EDS file.

 **Precautions for Correct Use**

Update Sysmac Studio to the version 1.29 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 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 information on the power supply specifications of the switching hub, refer to the *Switching Hub W4S1-series Users Manual* (Cat. No. 0969584-7).



Additional Information

For information on the power supply specifications of the Communicator, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316).

6. EtherNet/IP Settings

This section describes the parameters, global variables, tag sets and connection settings that are all defined in this guide.

6.1. Parameters

The following parameters are required to connect the Communicator and the Controller via EtherNet/IP.

Name	Setting item	Setting value
Controller PORT1 (EtherNet/IP) (node 1)	IP address	192.168.250.1
	Subnet mask	255.255.255.0
Communicator (node 2)	Fieldbus type	EtherNet/IP & Modbus-TCP 2-Port
	IP address	192.168.250.2
	Subnet mask	255.255.255.0
	Protocol mode	Generic Data Mode
	Control/Status word	Disabled
	Input data size	32 bytes
	Output data size	32 bytes



Additional Information

For information on the setting values for the Communicator, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316).

6.2. Global Variables

The global variables are used for the Controller and can be specified as tags for tag data links. The following tables show the global variables and related settings.

Output (Controller to Communicator)

Name	Data type	Network publish	Communicator data assignment	Data size (byte)
EIP002_data_OUT	BYTE[32]	Output	Gateway data	32

Input (Communicator to Controller)

Name	Data type	Network publish	Communicator data assignment	Data size (byte)
EIP002_data_IN	BYTE[32]	Input	Gateway data	32



Precautions for Correct Use

The data type of tag data links for the Communicator can also be set to BOOL; however, if the data size is an odd-numbered byte, do not use the BOOL type but the BYTE type instead.



Additional Information

For information on setting the data in tag data links for the Communicator, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316).



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.)

6.3. Tag Sets

The tag sets for tag data links are shown below.

Output (Controller to Communicator)

Tag set name		Data size (byte)
EIP002_OUT		32
OUT No.	Tag name (global variable name)	Data size (byte)
1	EIP002_data_OUT	32

Input (Communicator to Controller)

Tag set name		Data size (byte)
EIP002_IN		32
IN No.	Tag name (global variable name)	Data size (byte)
1	EIP002_data_IN	32

6.4. Connection Settings

The connection settings (i.e. tag data link table) are shown below.

Connection name	Connection I/O type	RPI (ms)	Timeout value
default_001	Exclusive Owner	50.0	RPI x 4

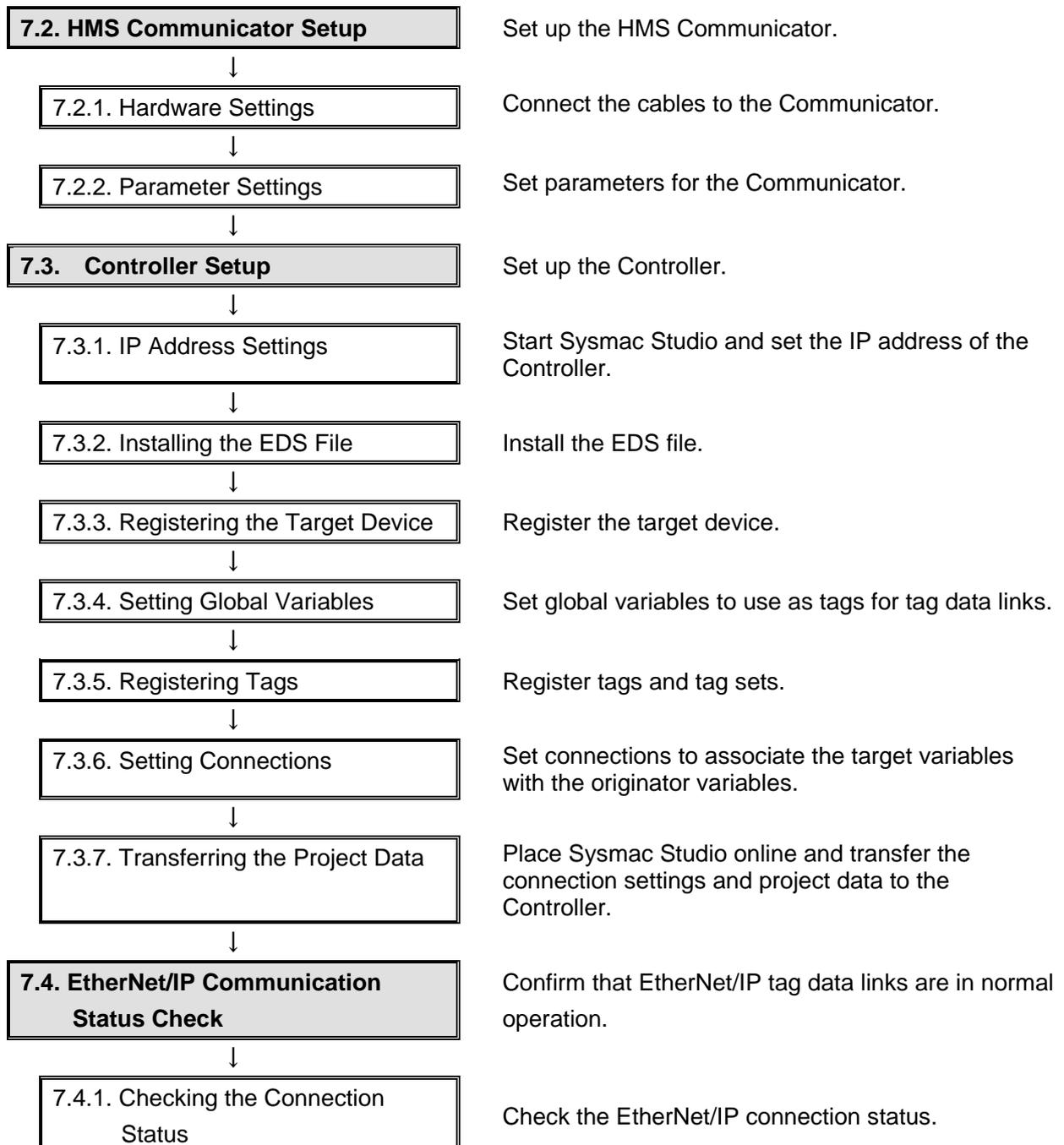
Input / Output	Target Device (Communicator)		Originator Device (Controller)		Connection type
	Target variable (instance number)	Size (byte)	Originator variable (tag set name)	Size (byte)	
Input	100	32	EIP002_IN	32	Point to Point connection
Output	150	32	EIP002_OUT	32	Point to Point connection

7. EtherNet/IP Connection Procedure

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

7.1. Work Flow

Take the following steps to connect the Communicator and the Controller via EtherNet/IP and to operate tag data links.



7.2. HMS Communicator Setup

Set up the HMS Communicator.

7.2.1. Hardware Settings

Connect the cables to the Communicator.



Precautions for Correct Use

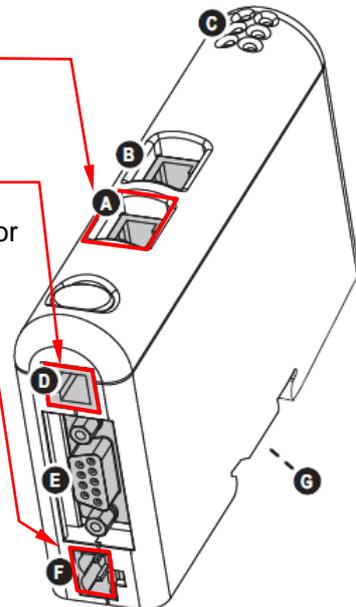
Make sure the power supply is OFF before setting up.

If it is ON, the settings described in the following steps and subsequent procedures may not be applicable.

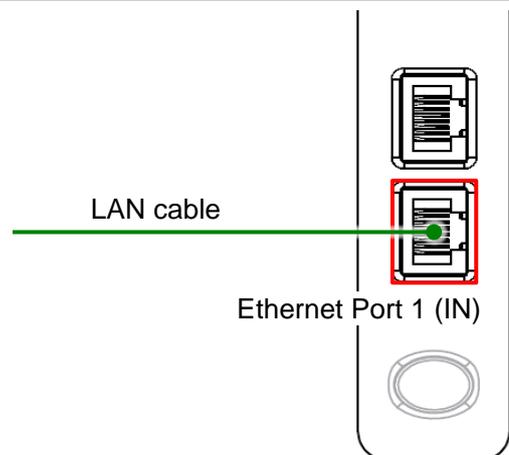
- 1 Make sure Power supply to Communicator is OFF.

- 2 Check the position of the connectors on Communicator by referring to the figure on the right.

A: Ethernet Port 1(IN)
 B: Ethernet Port 2(OUT)
 C: Status LEDs
 D: PC-Connector
 E: Subnetwork Connector
 F: Power Connector
 G: DIN-rail Connector

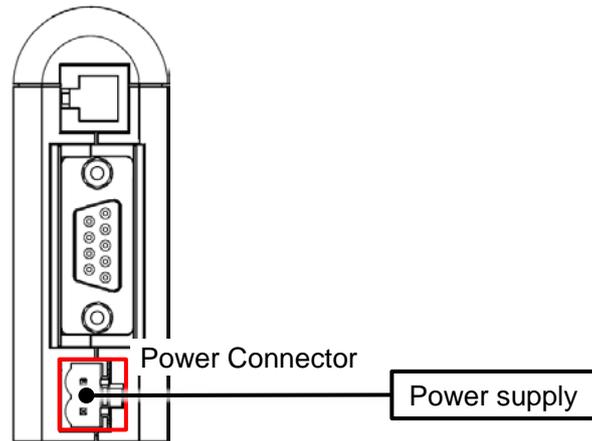


- 3 Connect a LAN cable to Ethernet Port 1(IN).



4 Connect Power supply to Power Connector.

*For information on the power supply connection to Communicator, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316) or the *Anybus Communicator - EtherNet/IP Interface Installation Sheet* (SP1708).



7.2.2. Parameter Settings

Set parameters for the Communicator.

The Anybus Configuration Manager - Communicator RS232/422/485 (hereinafter called "ACM") is used to set parameters.

Install the software on your computer before proceeding.



Additional Information

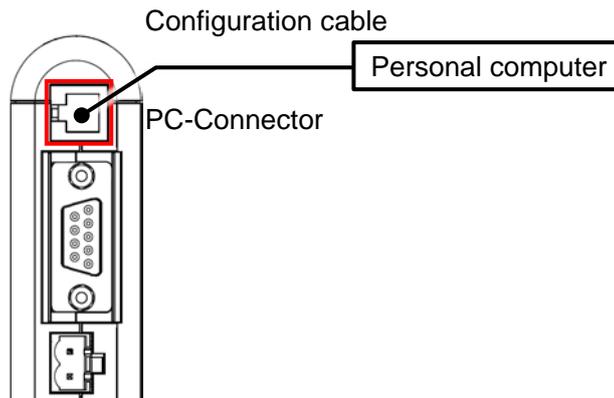
For information on how to install ACM, refer to 1.4 Software Installation of the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316).



Additional Information

This procedure provides the minimum necessary settings for EtherNet/IP communications. For more information on the parameter settings with ACM, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316).

- 1 Connect a Configuration cable between Personal computer and PC-Connector at the bottom of Communicator.



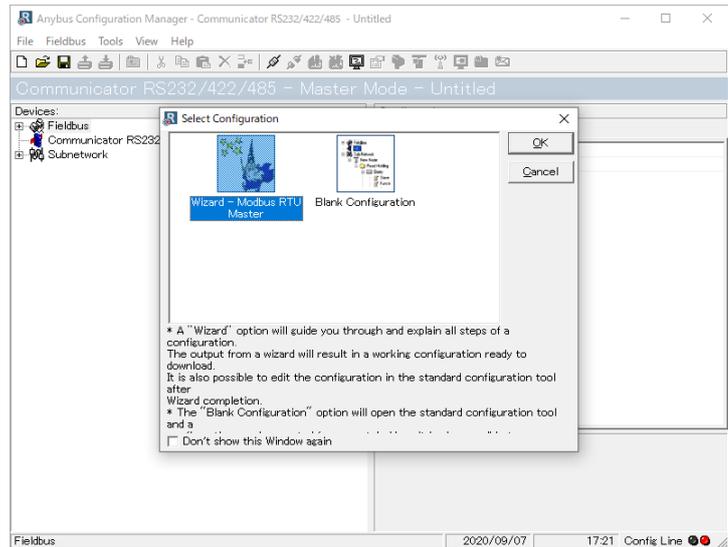
*For information on connecting Personal computer and Communicator, refer to the *User Manual Anybus® Communicator™ for EtherNet/IP™ / Modbus-TCP (2-port version)* (HMSI-27-316) or the *Anybus Communicator - EtherNet/IP Interface Installation Sheet* (SP1708).

- 2 Turn ON Communicator.

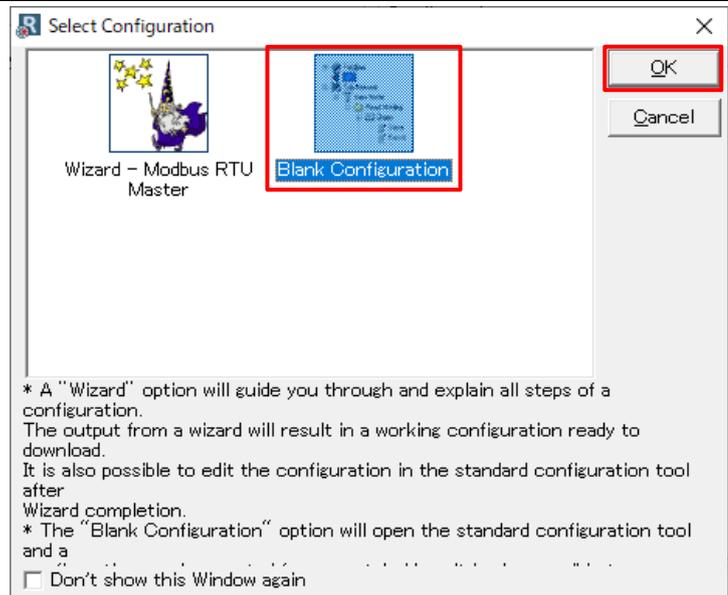
- 3 Start ACM on Personal computer.



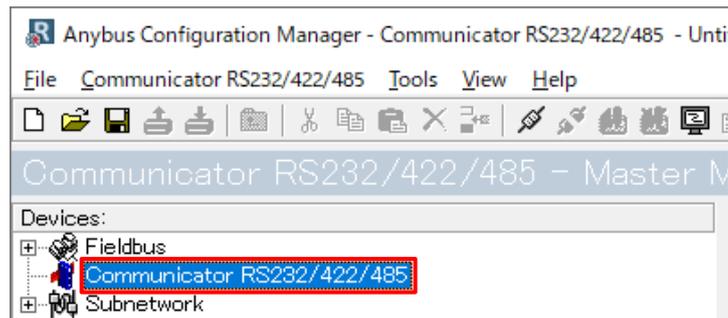
- 4 ACM starts up.
The Select Configuration Dialog Box appears.



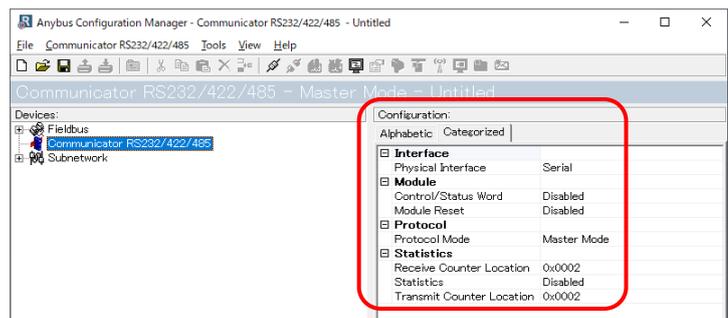
- 5 Select *Blank Configuration* and then click **OK** in the Select Configuration Dialog Box.



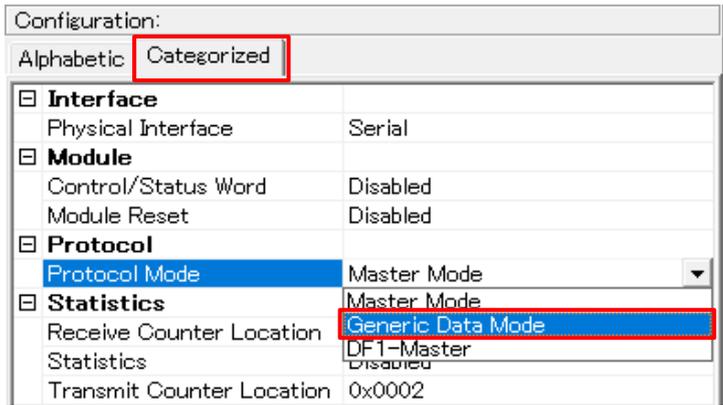
- 6 The main window of ACM appears. Select **Communicator RS232/422/485** in the Navigation Section (Devices) displayed on the left side of the main window.



- 7 The Parameter Section (Configuration) related to Communicator RS232/422/485 appears on the right side of the main window.



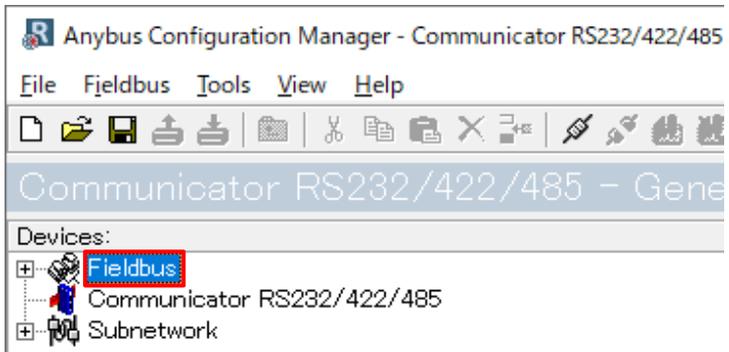
8 In the Parameter Section (Configuration), select **Generic Data Mode** from the pull-down list in the *Protocol Mode* Field under Protocol while selecting the Categorized Tab (default view).



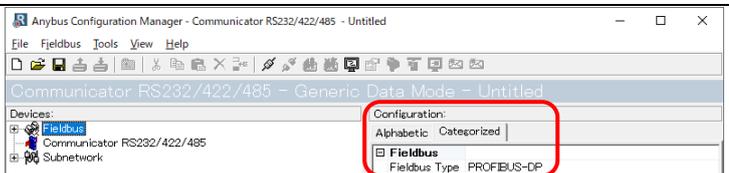
Check that Protocol Mode is set to Generic Data Mode.



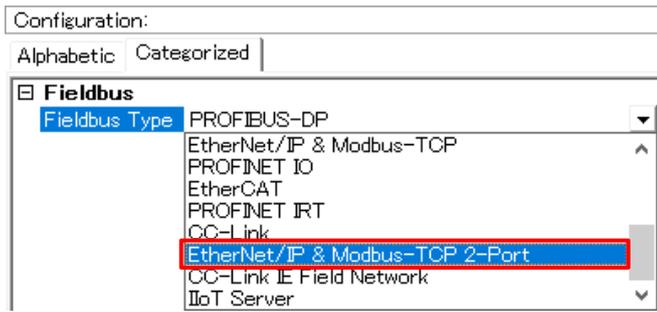
9 Select **Fieldbus** in the Navigation Section (Devices) displayed on the left side of the main window.



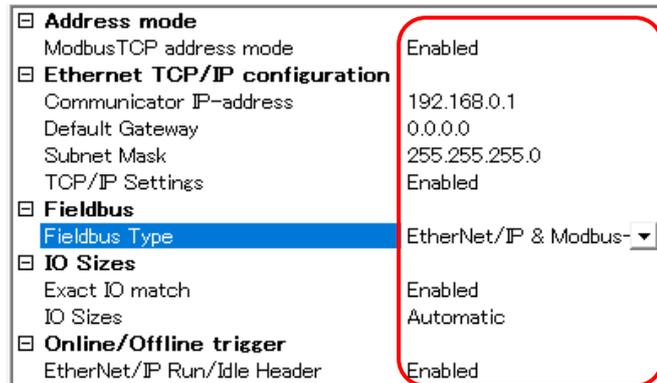
10 The Parameter Section (Configuration) related to Fieldbus appears on the right side of the main window.



11 In the same way as step 8, select **EtherNet/IP & Modbus-TCP 2-Port** from the pull-down list in the *Fieldbus Type* Field under Fieldbus.

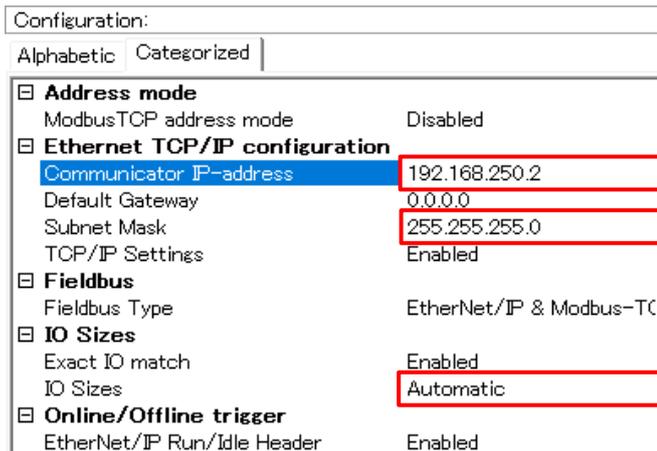


The parameters for EtherNet/IP & Modbus-TCP 2-Port are displayed.

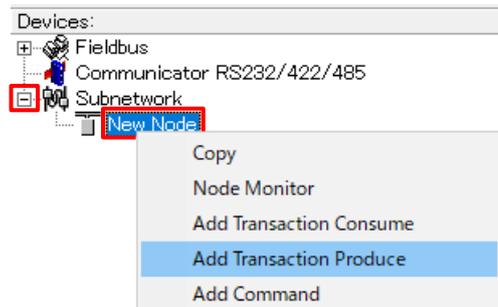


12 Set the following communication parameters.

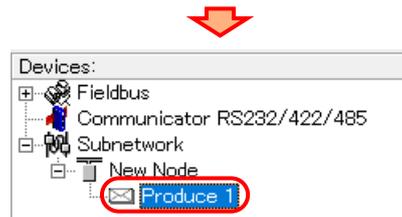
Communicator IP-address:
192.168.250.2
Subnet Mask:
255.255.255.0
IO Sizes:
Automatic



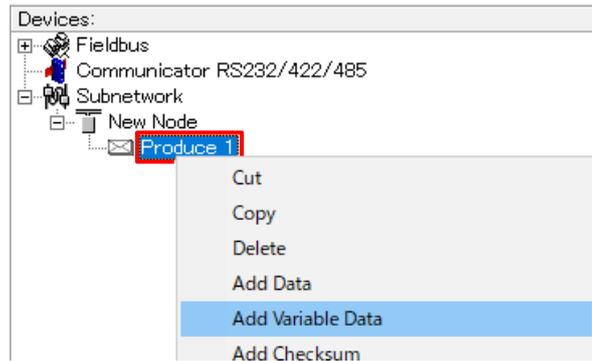
13 Click + to the left of Subnetwork in the Navigation Section (Devices) displayed on the left side of the main window, to expand the entry. The sub-entry "New Node" is displayed under Subnetwork. Right-click **New Node** and select **Add Transaction Produce** from the menu.



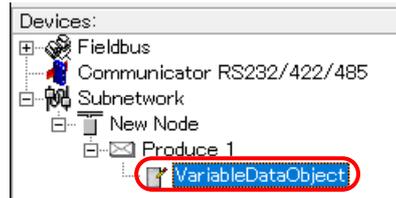
Check that Produce 1 is added under New Node.



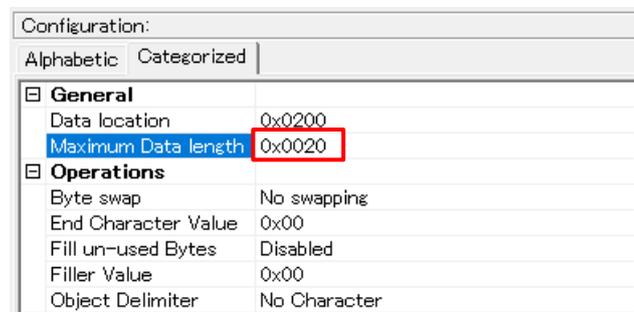
14 Right-click **Produce 1** and select **Add Variable Data** from the menu.



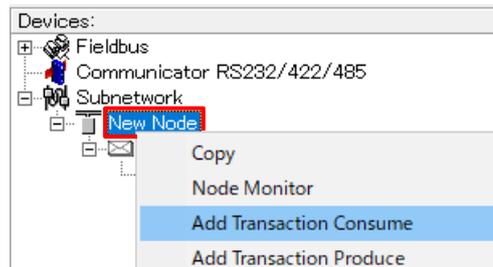
Check that VariableDataObject is added under Produce 1.



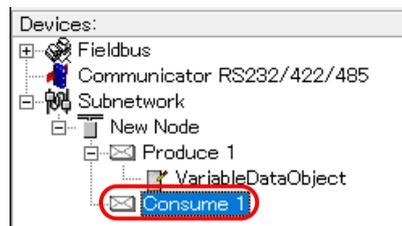
15 The Parameter Section (Configuration) related to VariableDataObject under Produce 1 appears on the right side of the main window. Set Maximum Data length to 0x0020 (32 bytes).



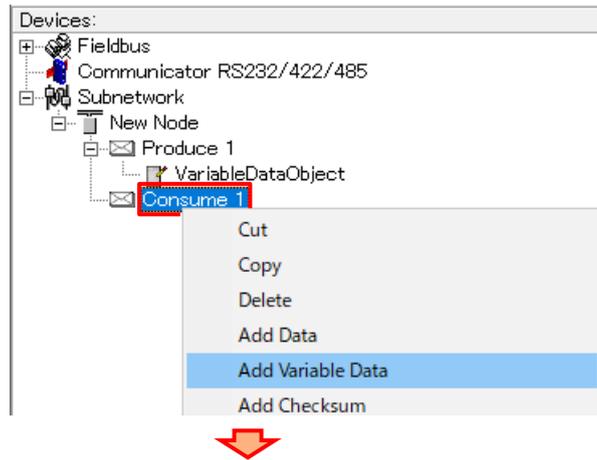
16 In the same way as step 13, right-click **New Node** and select **Add Transaction Consume** from the menu.



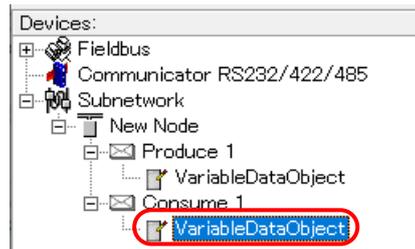
Check that Consume 1 is added under New Node.



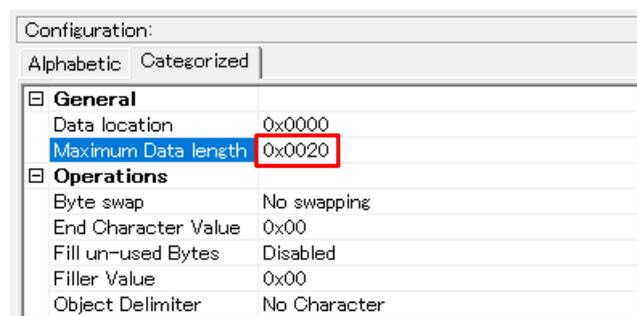
17 In the same way as step 14, right-click **Consume 1** and select **Add Variable Data** from the menu.



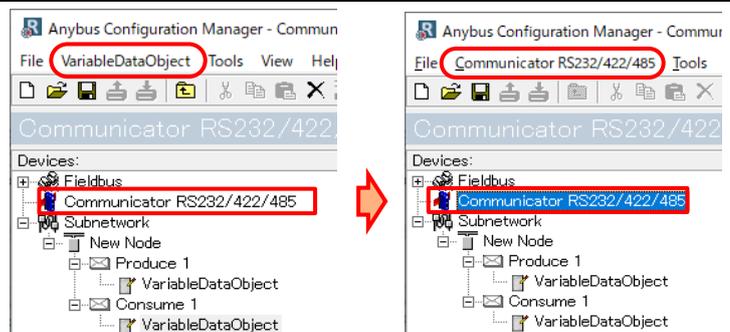
Check that VariableDataObject is added under Consume 1.



18 The Parameter Section (Configuration) related to VariableDataObject under Consume 1 appears on the right side of the main window. Set Maximum Data length to 0x0020 (32 bytes).



19 Select **Communicator RS232/422/485** in the Navigation Section (Devices) displayed on the left side of the main window.



VariableDataObject on the menu bar changes to Communicator RS232/422/485.

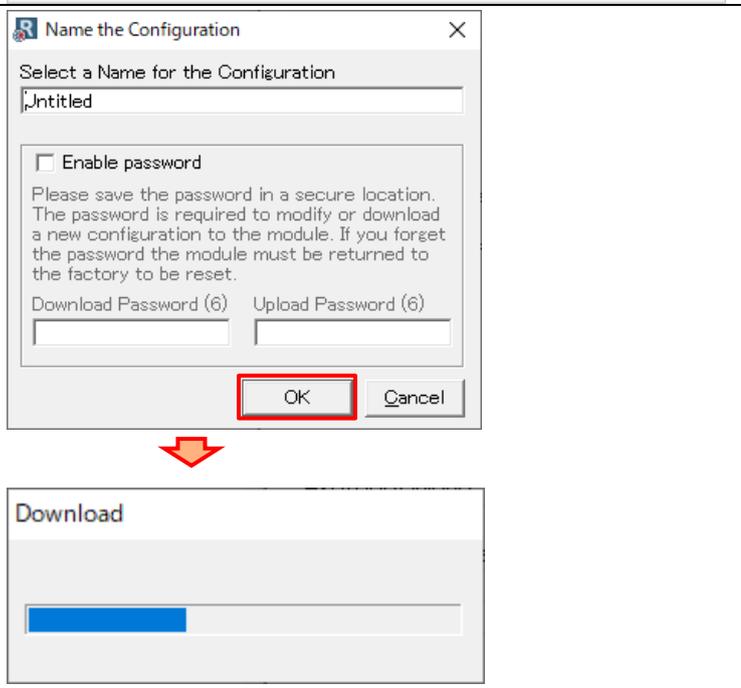
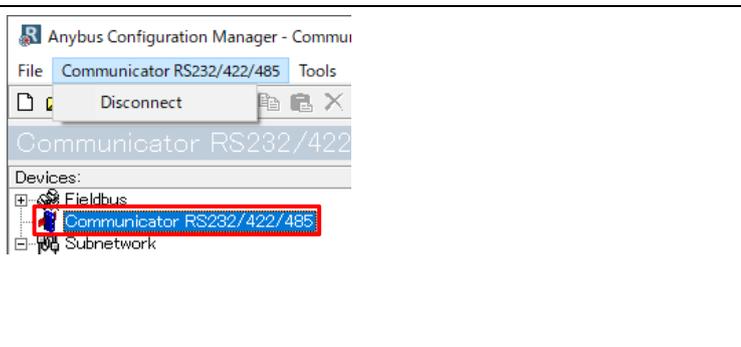
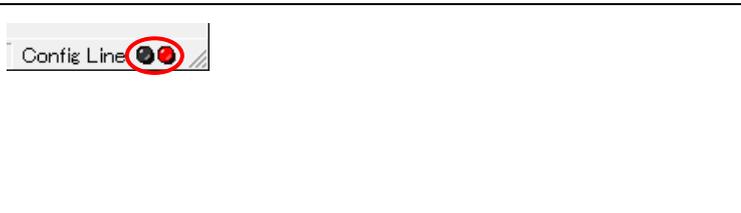
20 Select **Connect** from the Communicator RS232/422/485 Menu.



21 Check that the Config Line LED in the lower right of the main window turns green.



*It indicates that ACM is online.

<p>22 Select Download configuration to Communicator RS232/422/485 from the Tools Menu.</p>	
<p>23 The Name the Configuration Dialog Box appears. Check the message and click OK.</p> <p>The Download Dialog Box appears showing the download progress. Check that the dialog box is automatically closed when the download is completed.</p>	
<p>24 In the same way as step 19, select Disconnect from the Communicator RS232/422/485 Menu while selecting Communicator RS232/422/485 in the Navigation Section (Devices) displayed on the left side of the main window.</p>	
<p>25 Check that the Config Line LED in the lower right of the main window turns red.</p> <p>*It indicates that ACM is offline.</p>	
<p>26 Turn OFF Communicator.</p>	
<p>27 Disconnect the Configuration cable between Personal computer and Communicator.</p>	

7.3. Controller Setup

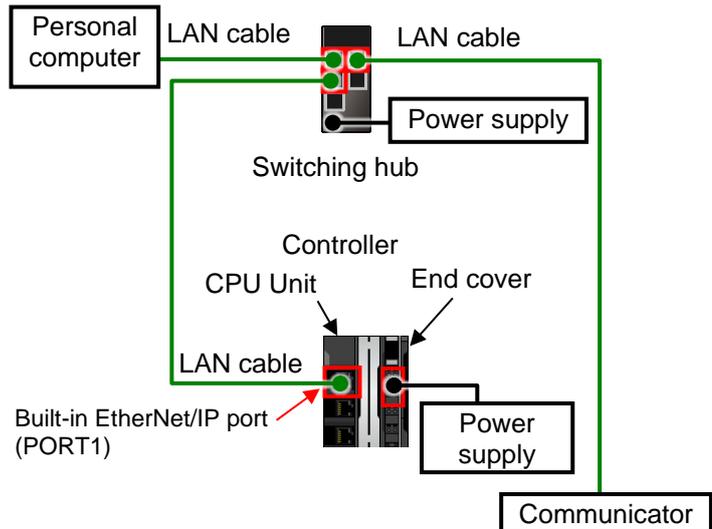
Set up the Controller.

7.3.1. IP Address Settings

Start Sysmac Studio and set the IP address of the Controller.

- 1 Make sure Power supplies to Switching hub, Controller and Communicator are all OFF.

- 2 Connect Personal computer and Switching hub with a LAN cable. Connect Switching hub and Built-in EtherNet/IP port (PORT1) on Controller with a LAN cable. Connect Switching hub and the other end of the LAN cable which at one end has been connected to Communicator in the previous procedure 7.2.1.



Connect Power supplies to Controller and Switching hub, respectively.

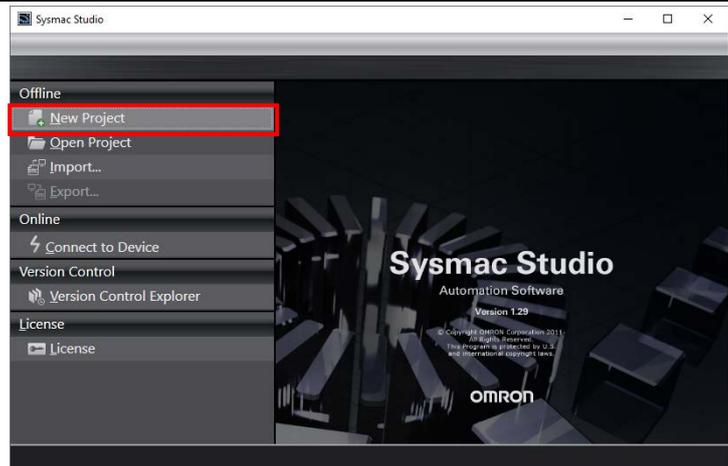
*For information on the power supply connection to Controller, refer to 5-4-1 *Wiring the Unit Power Supply* of the *NX-series NX102 CPU Unit Hardware User's Manual* (Cat. No. W593).

- 3 Start Sysmac Studio.



*If the User Account Control Dialog Box appears at start, make a selection to start Sysmac Studio.

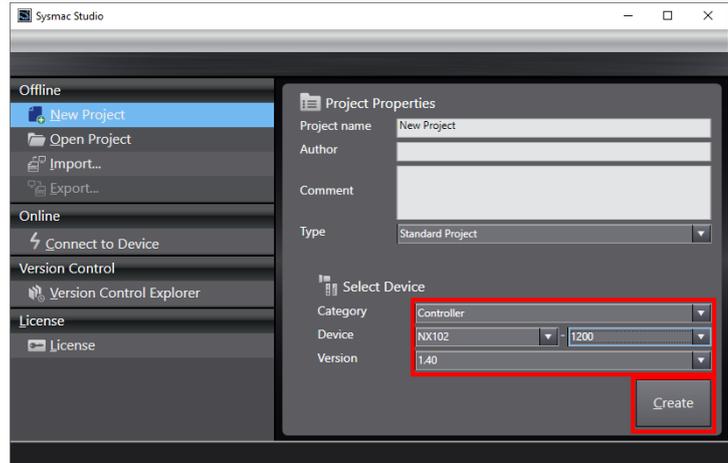
- 4 Sysmac Studio starts up.
Click **New Project**.



- 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**.

The following Controller is used in this guide.

- Category: Controller
- Device: NX102-1200
- Version: 1.40



*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

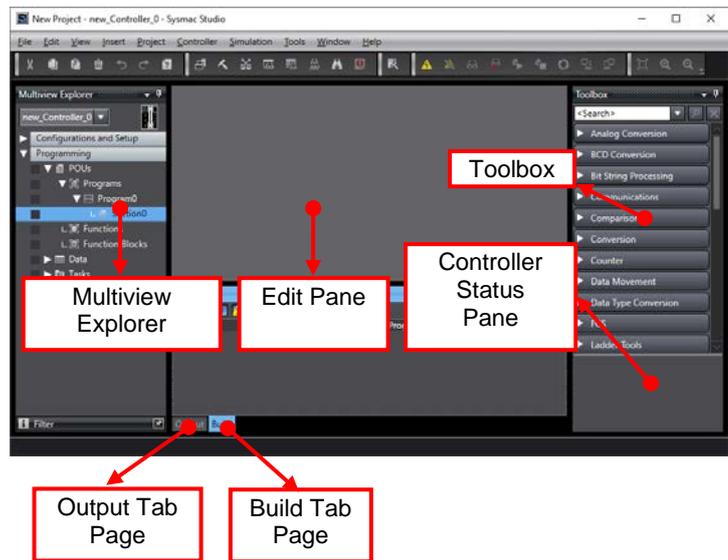
Lower right: Controller Status Pane

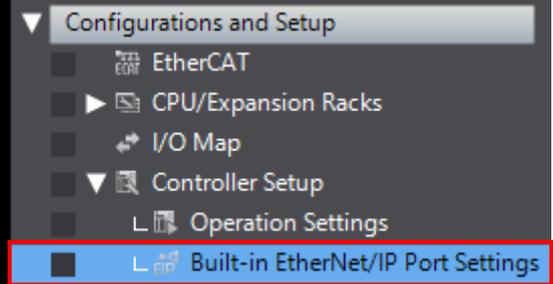
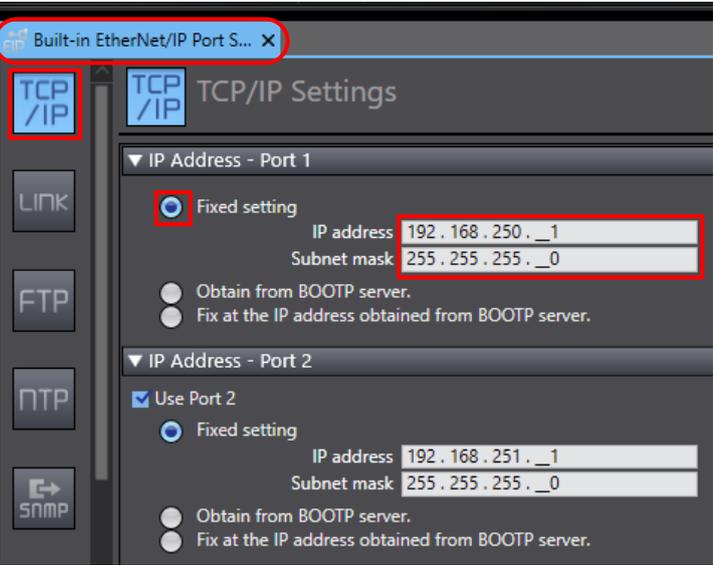
Upper middle: Edit Pane

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

Output Tab Page

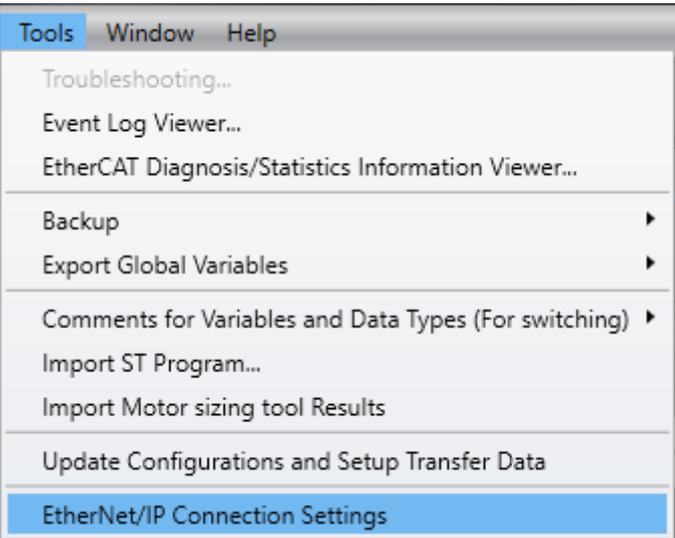
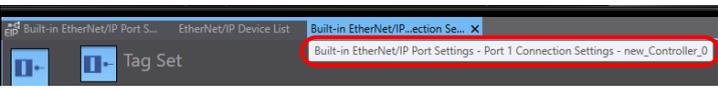
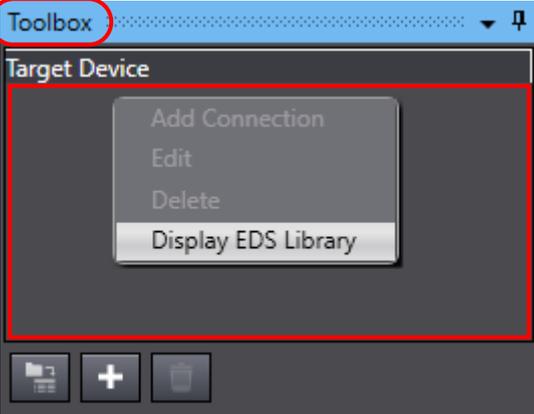
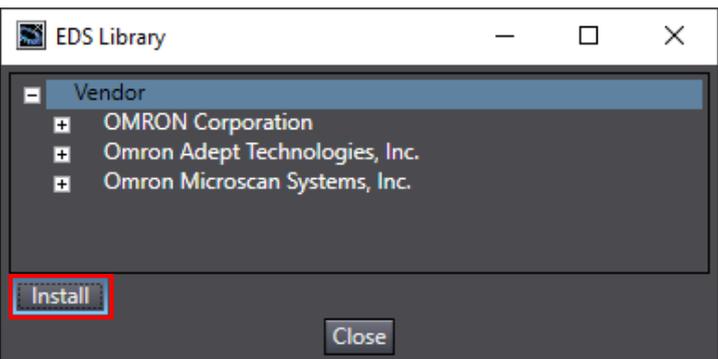
Build Tab Page



<p>7 Double-click Built-in EtherNet/IP Port Settings under Configurations and Setup – Controller Setup in the Multiview Explorer.</p>	
<p>8 The Built-in EtherNet/IP Port Settings Tab Page appears in the Edit Pane. Check that the TCP/IP settings are displayed and that the following values are set in the IP Address - Port 1.</p> <ul style="list-style-type: none"> • Fixed setting: select • IP address: 192.168.250.1 • Subnet mask: 255.255.255.0 	

7.3.2. Installing the EDS File

Install the EDS file.

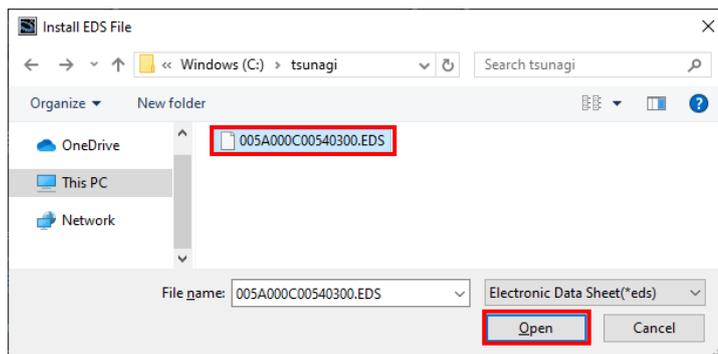
<p>1 Select EtherNet/IP Connection Settings from the Tools Menu.</p>	
<p>2 The EtherNet/IP Device List Tab Page appears in the Edit Pane. Right-click Built-in EtherNet/IP Port Settings - Port 1 and select Edit from the menu</p>	
<p>3 The Built-in EtherNet/IP Port Settings - Port 1 Connection Settings Tab Page appears in the Edit Pane.</p>	
<p>4 Right-click on a space (marked in red) under Target Device in the Toolbox, and select Display EDS Library from the menu.</p>	
<p>5 The EDS Library Dialog Box appears. Click Install.</p>	

6 The Install EDS File Dialog Box appears.

Select *005A000C00540300.eds* (EDS file) to be installed.

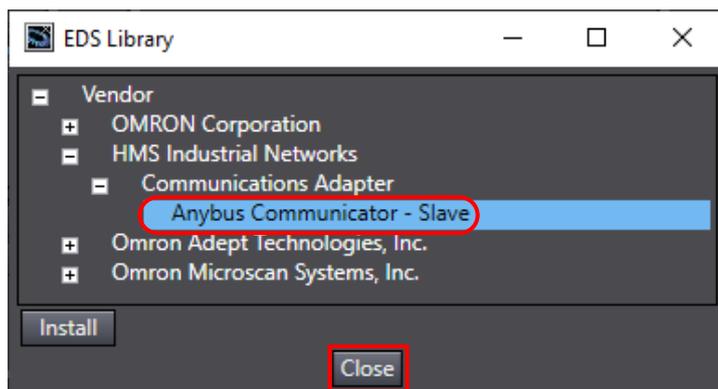
Click **Open**.

*For information on how to obtain the EDS file, refer to *Precautions for Correct Use of 5.2. Device Configuration*.



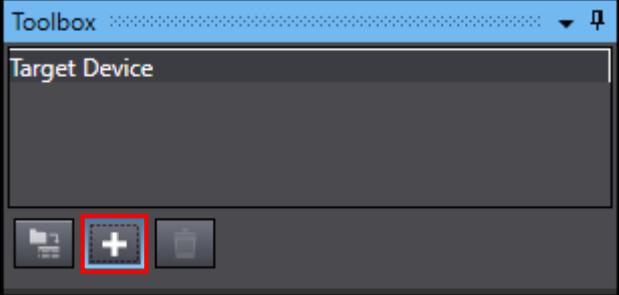
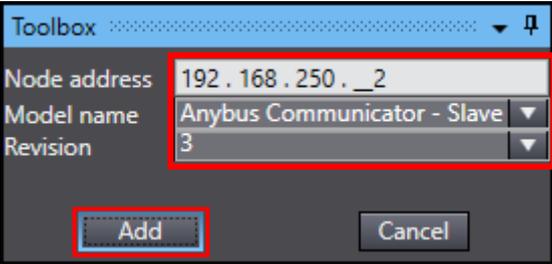
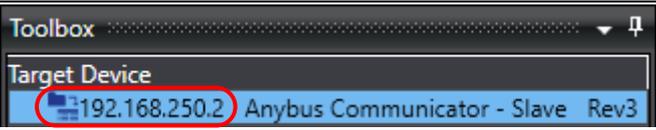
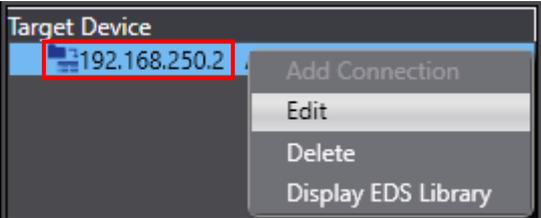
7 Check that the model name of Communicator is added to the EDS Library Dialog Box after the EDS file is successfully installed.

Click **Close**.



7.3.3. Registering the Target Device

Register the target device.

1	Click the + Button in the Toolbox.	
2	<p>Data fields of the target device registration appear.</p> <p>Enter <i>192.168.250.2</i> in the <i>Node address</i> Field.</p> <p>Select the following model name and revision number from respective pull-down lists in the <i>Model name</i> and <i>Revision</i> Fields.</p> <p>Model name: <i>Anybus Communicator - Slave</i></p> <p>Revision: <i>3</i></p> <p>Check the settings and click Add.</p>	
3	The device with IP address 192.168.250.2 is added to the target device list in the Toolbox.	
4	Right-click the target device (192.168.250.2) and select Edit from the menu.	

- 5 The data fields to set the parameters appear.
Enter the following values.

Output Size: 32

Input Size: 32

Click **OK**.

*The device parameters set in this dialog box will be added to the connection information that is set in 7.3.6. *Setting Connections*, and will be transferred to Controller in 7.3.7. *Transferring the Project Data*.

Toolbox

IP address 192 . 168 . 250 . _2

Parameters

Parameter Name	Value
0001 Output Size	32
0002 Input Size	32
0003 RPI Range	10000

Help

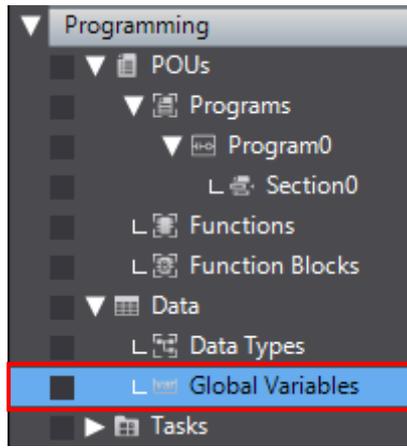
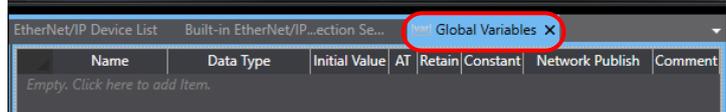
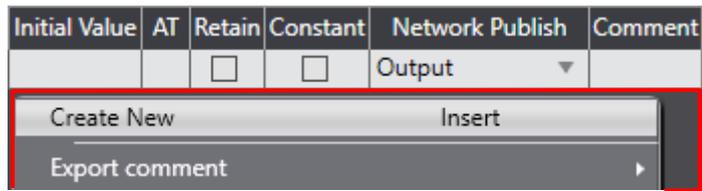
0002 Input Size
Default : 16 Min : 0 Max : 504

Return All to Default

OK Cancel

7.3.4. Setting Global Variables

Set global variables to use as tags for tag data links.

<p>1</p>	<p>Double-click Global Variables under Programming – Data in the Multiview Explorer.</p>																																																																																																																	
<p>2</p>	<p>The Global Variables Tab Page appears in the Edit Pane.</p> <p>Click on a space under the column header <i>Name</i>. A new variable can be entered.</p> <p>Enter <i>EIP002_data_OUT</i> in the <i>Name</i> Column.</p> <p>Enter <i>BYTE[32]</i> in the <i>Data Type</i> Column. After entering, check that the data type changes to <i>ARRAY[0..31] OF BYTE</i>.</p> <p>Select Output from the pull-down list in the <i>Network Publish</i> Column.</p>	 <p style="text-align: center;">↓</p> <table border="1" data-bbox="702 929 1428 996"> <thead> <tr> <th>Name</th> <th>Data Type</th> <th>Initial Value</th> <th>AT</th> <th>Retain</th> <th>Constant</th> <th>Network Publish</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td></td> <td>BOOL</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Do not publish</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="702 1108 1428 1176"> <thead> <tr> <th>Name</th> <th>Data Type</th> <th>Initial Value</th> <th>AT</th> <th>Retain</th> <th>Constant</th> <th>Network Publish</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>EIP002_data_OUT</td> <td>BOOL</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Do not publish</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="702 1232 1428 1299"> <thead> <tr> <th>Name</th> <th>Data Type</th> <th>Initial Value</th> <th>AT</th> <th>Retain</th> <th>Constant</th> <th>Network Publish</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>EIP002_data_OUT</td> <td>BYTE[32]</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Do not publish</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="702 1355 1428 1512"> <thead> <tr> <th>Name</th> <th>Data Type</th> <th>Initial Value</th> <th>AT</th> <th>Retain</th> <th>Constant</th> <th>Network Publish</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>EIP002_data_OUT</td> <td>ARRAY[0..31] OF BYTE</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Do not publish</td> <td></td> </tr> <tr> <td colspan="7"></td> <td>Do not publish</td> </tr> <tr> <td colspan="7"></td> <td>Publish Only</td> </tr> <tr> <td colspan="7"></td> <td>Input</td> </tr> <tr> <td colspan="7"></td> <td>Output</td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="702 1579 1428 1646"> <thead> <tr> <th>Name</th> <th>Data Type</th> <th>Initial Value</th> <th>AT</th> <th>Retain</th> <th>Constant</th> <th>Network Publish</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>EIP002_data_OUT</td> <td>ARRAY[0..31] OF BYTE</td> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td>Output</td> <td></td> </tr> </tbody> </table>	Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment		BOOL			<input type="checkbox"/>	<input type="checkbox"/>	Do not publish		Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment	EIP002_data_OUT	BOOL			<input type="checkbox"/>	<input type="checkbox"/>	Do not publish		Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment	EIP002_data_OUT	BYTE[32]			<input type="checkbox"/>	<input type="checkbox"/>	Do not publish		Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment	EIP002_data_OUT	ARRAY[0..31] OF BYTE			<input type="checkbox"/>	<input type="checkbox"/>	Do not publish									Do not publish								Publish Only								Input								Output	Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish	Comment	EIP002_data_OUT	ARRAY[0..31] OF BYTE			<input type="checkbox"/>	<input type="checkbox"/>	Output	
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EIP002_data_OUT	ARRAY[0..31] OF BYTE			<input type="checkbox"/>	<input type="checkbox"/>	Output																																																																																																												
<p>3</p>	<p>Right-click on a space under the entered variable, and select Create New from the menu.</p>																																																																																																																	

4 In the same way as step 3, enter the following data in a new entry line.

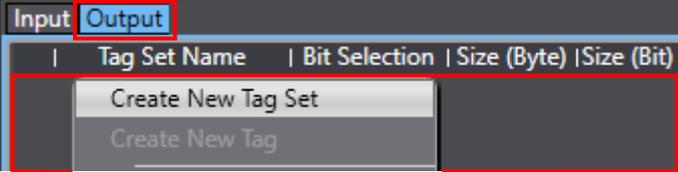
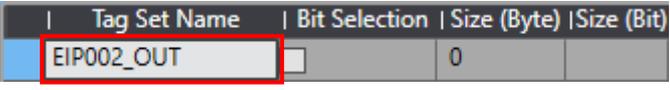
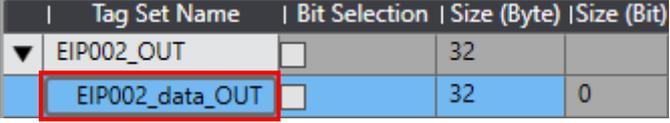
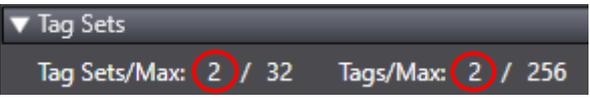
- Name: *EIP002_data_IN*
Data Type: *BYTE[32]*
Network Publish: ***Input***

Name	Data Type	Initial Value	AT	Retain	Constant	Network Publish
EIP002_data_OUT	ARRAY[0..31] OF BYTE			<input type="checkbox"/>	<input type="checkbox"/>	Output
EIP002_data_IN	ARRAY[0..31] OF BYTE			<input type="checkbox"/>	<input type="checkbox"/>	Input

7.3.5. Registering Tags

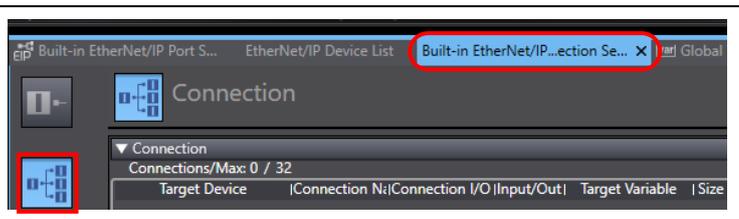
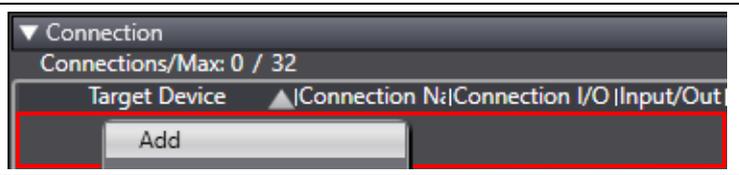
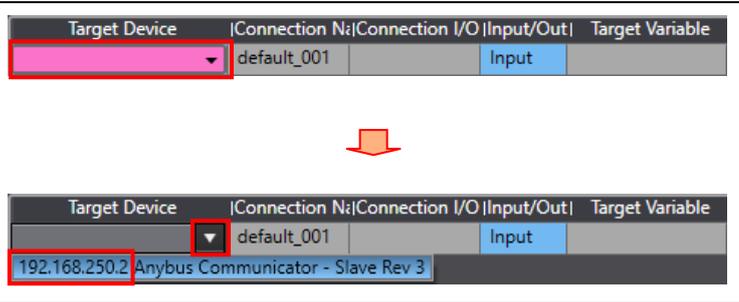
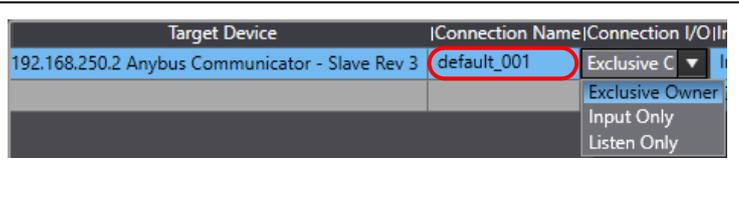
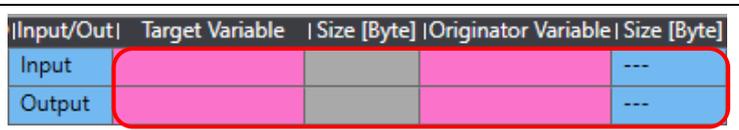
Register tags and tag sets.

<p>1 Click the Tag Set Button on the Built-in EtherNet/IP Port Settings - Port 1 Connection Settings Tab Page. Click the Input Tab in the Tag Sets.</p>																									
<p>2 Right-click on a space on the Input Tab Page, and select Create New Tag Set from the menu.</p>																									
<p>3 A new tag set name can be entered.</p> <p>Enter <i>EIP002_IN</i> in the <i>Tag Set Name</i> Column.</p>	<table border="1"> <thead> <tr> <th>Tag Set Name</th> <th>Bit Selection</th> <th>Size (Byte)</th> <th>Size (Bit)</th> <th>Instance ID</th> <th>Controller Status</th> </tr> </thead> <tbody> <tr> <td>EIP002_IN</td> <td><input type="checkbox"/></td> <td>0</td> <td></td> <td>Auto</td> <td>Not included</td> </tr> </tbody> </table>	Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)	Instance ID	Controller Status	EIP002_IN	<input type="checkbox"/>	0		Auto	Not included												
Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)	Instance ID	Controller Status																				
EIP002_IN	<input type="checkbox"/>	0		Auto	Not included																				
<p>4 While selecting <i>EIP002_IN</i>, right-click on a space and select Create New Tag from the menu.</p> <p>A new tag name can be entered under the tag set "EIP002_IN".</p> <p>Enter the global variable of IN No. 1 as a tag, which is listed in 6.3. Tag Sets.</p> <p>*When you enter the first character (E) of the variable name on the Input Tab Page, a list of the previously set variable names will appear as shown in the figure on the right.</p>	<table border="1"> <thead> <tr> <th>Tag Set Name</th> <th>Bit Selection</th> <th>Size (Byte)</th> <th>Size (Bit)</th> </tr> </thead> <tbody> <tr> <td>EIP002_IN</td> <td><input type="checkbox"/></td> <td>2</td> <td></td> </tr> <tr> <td><input type="text" value="E"/></td> <td><input type="checkbox"/></td> <td>2</td> <td>0</td> </tr> </tbody> </table> <table border="1"> <thead> <tr> <th>Tag Set Name</th> <th>Bit Selection</th> <th>Size (Byte)</th> <th>Size (Bit)</th> </tr> </thead> <tbody> <tr> <td>EIP002_IN</td> <td><input type="checkbox"/></td> <td>32</td> <td></td> </tr> <tr> <td>EIP002_data_IN</td> <td><input type="checkbox"/></td> <td>32</td> <td>0</td> </tr> </tbody> </table>	Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)	EIP002_IN	<input type="checkbox"/>	2		<input type="text" value="E"/>	<input type="checkbox"/>	2	0	Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)	EIP002_IN	<input type="checkbox"/>	32		EIP002_data_IN	<input type="checkbox"/>	32	0
Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)																						
EIP002_IN	<input type="checkbox"/>	2																							
<input type="text" value="E"/>	<input type="checkbox"/>	2	0																						
Tag Set Name	Bit Selection	Size (Byte)	Size (Bit)																						
EIP002_IN	<input type="checkbox"/>	32																							
EIP002_data_IN	<input type="checkbox"/>	32	0																						

- | | |
|---|--|
| <p>5 Click the Output Tab.
Right-click on a space on the Output Tab Page, and select Create New Tag Set from the menu.</p> |  <p>The screenshot shows the 'Output' tab selected. A right-click context menu is open, with 'Create New Tag Set' highlighted. The background table has columns: Tag Set Name, Bit Selection, Size (Byte), and Size (Bit).</p> |
| <p>6 A new tag set name can be entered. In the same way as step 3, enter <i>EIP002_OUT</i>.</p> |  <p>The screenshot shows the tag set table with 'EIP002_OUT' entered in the 'Tag Set Name' column. The 'Bit Selection' column has an unchecked checkbox, 'Size (Byte)' is 0, and 'Size (Bit)' is empty.</p> |
| <p>7 In the same way as step 4, enter the global variable of OUT No. 1 as a tag, which is listed in 6.3. <i>Tag Sets</i>.</p> |  <p>The screenshot shows the tag set table with two rows. The first row is 'EIP002_OUT' with a checked checkbox, 32 bytes, and 0 bits. The second row is 'EIP002_data_OUT' with an unchecked checkbox, 32 bytes, and 0 bits.</p> |
| <p>8 Check that the number of Tag Sets is 2 and that the number of Tags shows the total number of global variables previously set (e.g. 2).</p> |  <p>The screenshot shows a summary for 'Tag Sets' with 'Tag Sets/Max: 2 / 32' and 'Tags/Max: 2 / 256'. The numbers '2' are circled in red.</p> |

7.3.6. Setting Connections

Set connections to associate the target variables with the originator variables.

<p>1 Click the Connection Button on the Built-in EtherNet/IP Port Settings - Port 1 Connection Settings Tab Page.</p>	
<p>2 Right-click on a space under the column header <i>Target Device</i> in the Connection and select Add from the menu.</p>	
<p>3 A new connection can be entered.</p> <p>Select 192.168.250.2 from the pull-down list in the <i>Target Device</i> Column.</p>	
<p>4 The connection "default_001" is generated.</p> <p>Select Exclusive Owner from the pull-down list in the <i>Connection I/O Type</i> Column.</p>	
<p>5 The target variables and originator variables can be set.</p>	

- 6 Click on the cell in the *Target Variable* Column for Input.
- Press **Ctrl + Space** on the keyboard. Applicable instance numbers appear. (100, in this guide)
- *A list of instance numbers will also appear when you enter the first character (e.g. 1) of the instance number.
- Select the instance number 100.
- Likewise, select the instance number 150 from the list in the *Target Variable* Column for Output.
- 7 Click on the cell in the *Originator Variable* Column for Input. A pull-down list of the previously registered tag set names appears. Select the tag set name **EIP002_IN**.
- 8 Likewise, select the tag set name **EIP002_OUT** in the *Originator Variable* Column for Output.
- 9 Select **Point to Point connection** from the pull-down list in the *Connection Type* Column for both Input and Output.
- 10 Change the values in both the *RPI[ms]* and *Timeout Value* Columns.
- *In this guide, the default values are used.
- 11 Check that the number of Connections is 2.

Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input				---
Output				---



Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input				---
Output	100			---



Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	100	32		---
Output				---



Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	100	32		---
Output	150	2		---

Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	100	32		---
Output	150	32	EIP002_IN	---



Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	100	32	EIP002_IN	32
Output	150	32		---

Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	100	32	EIP002_IN	32
Output	150	32	EIP002_OUT	32

Input/Out	Target Variable	Size [Byte]	Originator Variable	Size [Byte]	Connection Type
Input	100	32	EIP002_IN	32	Multi-cast connection
Output	150	32	EIP002_OUT	32	Multi-cast connection

Originator Variable	Size [Byte]	Connection Type	RPI [ms]	Timeout Value
EIP002_IN	32	Point to Point connection	50.0	RPI x 4
EIP002_OUT	32	Point to Point connection		

▼ Connection
Connections/Max: 2 / 32

7.3.7. Transferring the Project Data

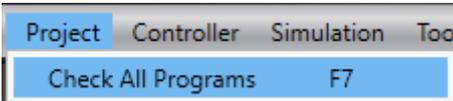
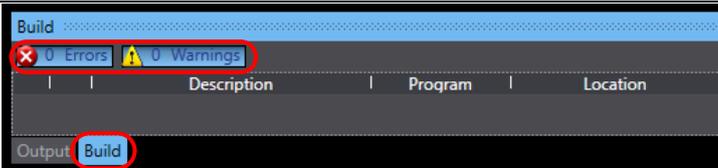
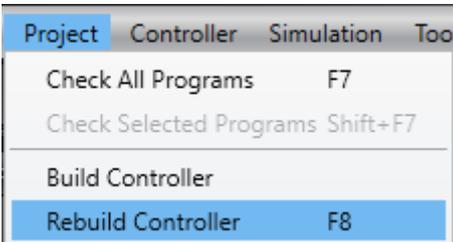
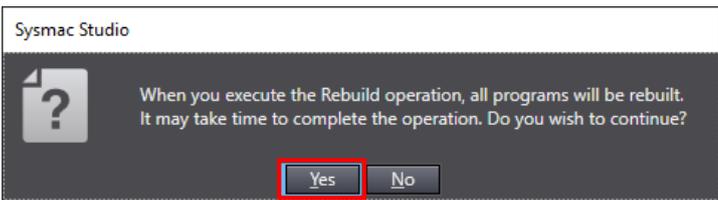
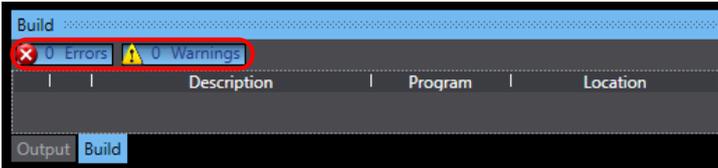
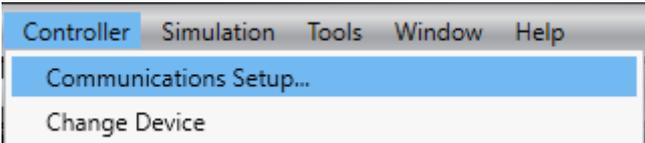
Place Sysmac Studio online and transfer the connection settings and project data to the Controller.

⚠ **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 ensure safety at the destination node before you transfer the project data.

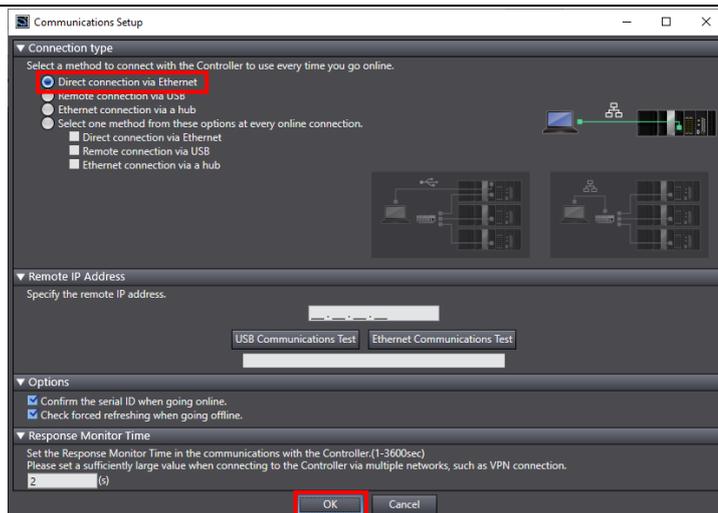


1	Turn ON Controller, Switching hub and Communicator.	
2	Select Check All Programs from the Project Menu.	
3	The results of the program check are displayed on the Build Tab Page. Check that the tab page shows the results "0 Errors" and "0 Warnings".	
4	Select Rebuild Controller from the Project Menu.	
5	The dialog box on the right appears. Confirm that there is no problem, and click Yes .	
6	Check that the Build Tab Page shows the results "0 Errors" and "0 Warnings".	
7	Select Communications Setup from the Controller Menu.	

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

Click **OK**.

*The direct connection via Ethernet is possible with or without a switching hub if you make a 1:1 connection between Sysmac Studio and Controller.

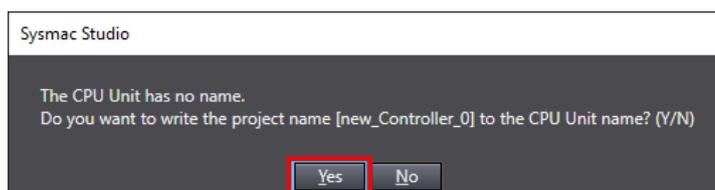
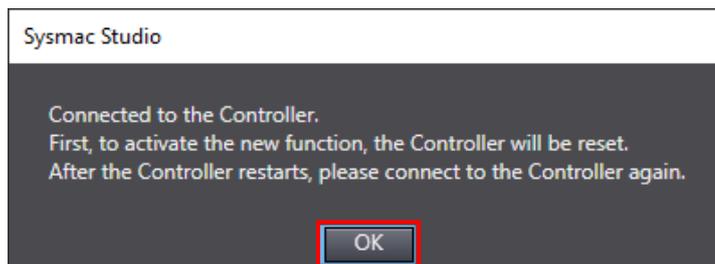
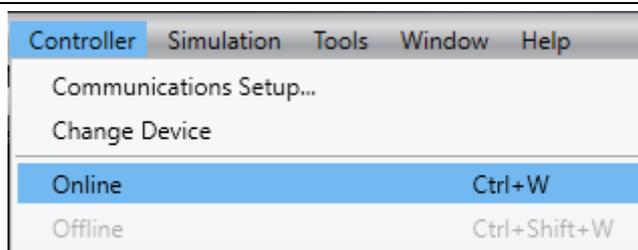


9 Select **Online** from the Controller Menu.

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

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

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



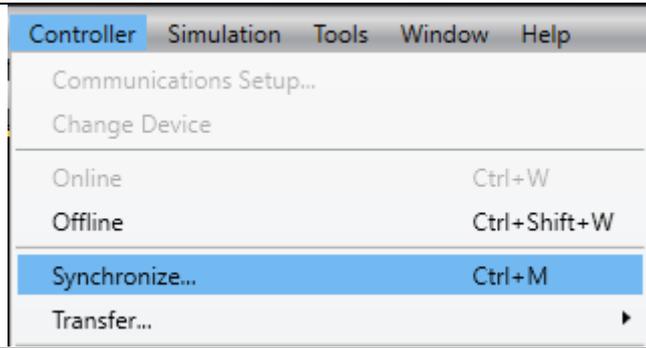
10 When an online connection is established, a yellow line appears under the toolbar.



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).

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

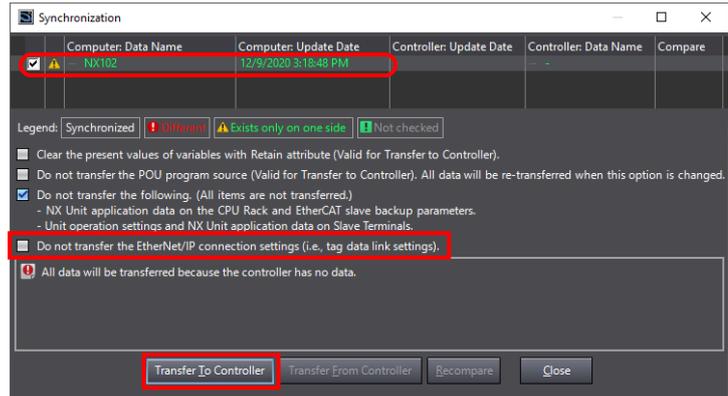


12 The Synchronization Dialog Box appears.

Check that the data to be transferred (e.g. NX102) is selected.

Uncheck the box for *Do not transfer the EtherNet/IP connection settings (i.e., tag data link settings)*.

Click **Transfer To Controller**.



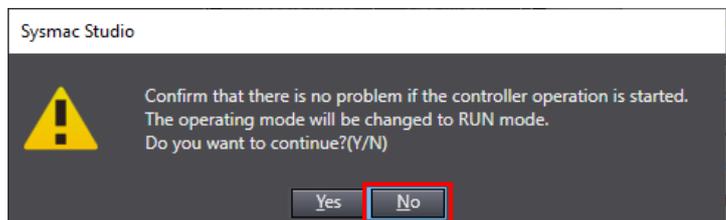
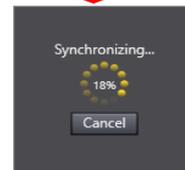
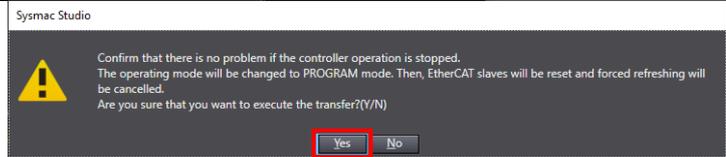
*After you click on the button, the data is transferred from the Sysmac Studio to the Controller and is synchronized.

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

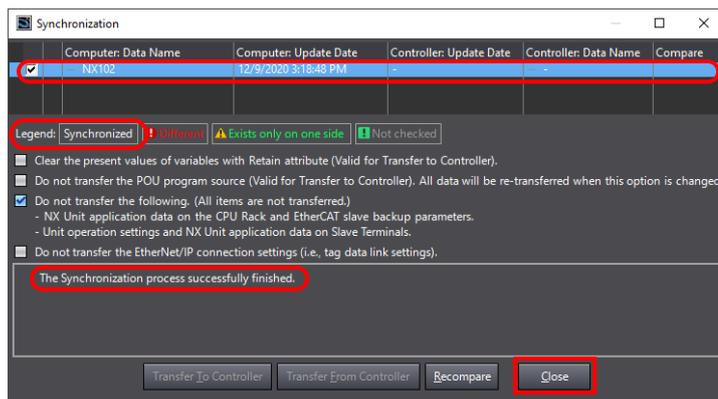
A message appears stating "Synchronizing".

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

*Do not return to RUN mode.



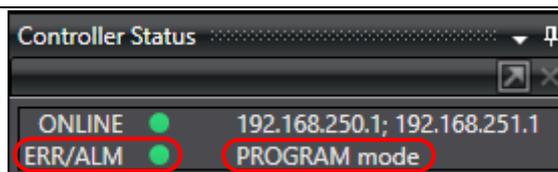
- 14 As shown in the figure on the right, the font color used to display the synchronized data changes to white which is the color used to specify "Synchronized". Check that a message appears stating "The Synchronization process successfully finished". Confirm that there is no problem, and click **Close**.



*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.

- 15 Check that the ERR/ALM indicator in the Controller Status Pane changes to a green color and that PROGRAM mode is displayed.

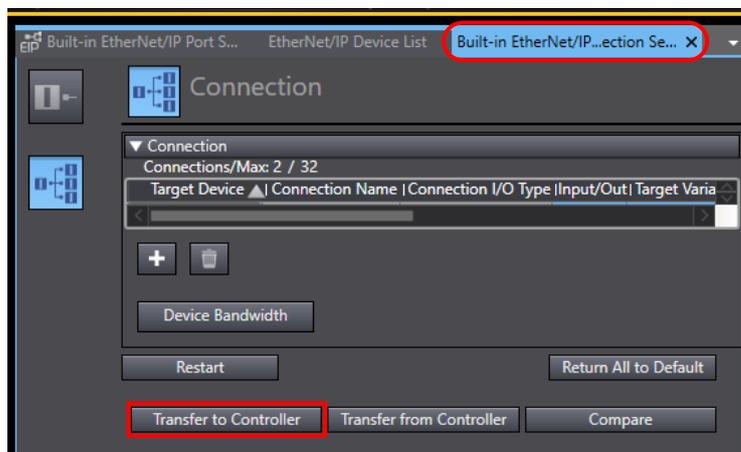




Precautions for Correct Use

If you change the connection settings (i.e. tag data link table) after synchronization, you cannot transfer the changed connection settings by synchronizing the data again.

To transfer the connection settings changed after synchronization, display the Built-in EtherNet/IP Port Settings - Port 1 Connection Settings Tab Page and then click **Transfer to Controller**, as shown in the figure on the right.



7.4. EtherNet/IP Communication Status Check

Confirm that EtherNet/IP tag data links are in normal operation.

7.4.1. Checking the Connection Status

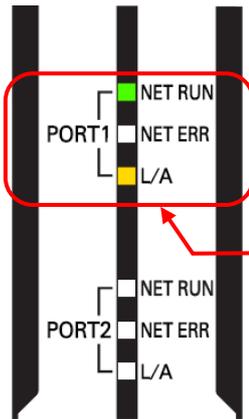
Check the EtherNet/IP connection status.

- 1 Check with the LED indicators on Controller that the tag data links are in normal operation.

The LED indicators in normal status are as follows:

- NET RUN: Green lit
- NET ERR: Not lit
- LINK/ACT: Yellow flashing (Flashing while packets are being transmitted and received)

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



Built-in EtherNet/IP (Port 1) Status Indicators

- 2 Check the LED indicators on Communicator.

The LED indicators in normal status are as follows:

- 1 MOD STATUS: Green lit
- 2 NET STATUS: Green lit
- 3 LINK/ACTIVITY1: Flashing while packets are being transmitted and received



- 3 Click the **EtherNet/IP Device List** Tab.

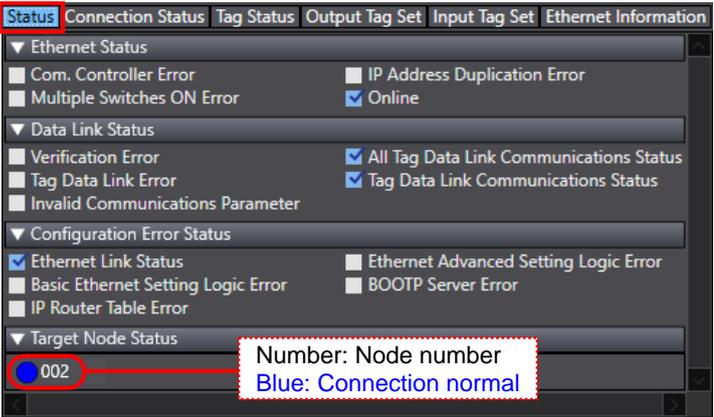
EtherNet/IP Device List		
Node Address	Device	
192.168.250.1	Built-in EtherNet/IP Port Settings - Port 1	
192.168.251.1	Built-in EtherNet/IP Port Settings - Port 2	

- 4 Right-click **Built-in EtherNet/IP Port Settings - Port 1** and select **Monitor** from the menu.

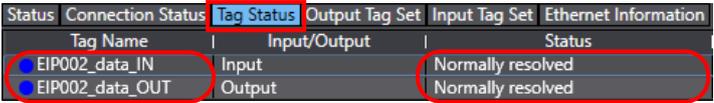
Node Address	Device	Description
192.168.250.1	Built-in EtherNet/IP Port Settings - Port 1	NX102-1200
192.168.251.1	Built-in EtherNet/IP Port Settings - Port 2	NX102-1200

- 5 The Built-in EtherNet/IP Port Settings - Port 1 Connection Monitor Tab Page appears.


- 6 Click the **Status** Tab.
The tag data links are in normal operation when the same check boxes as in the figure on the right are selected.


- 7 Click the **Connection Status** Tab.
Check that ● appears to the left of the applicable connection in the *Connection Name* Column.
Check that 00:0000 is displayed in the *Status* Column.


- 8 Click the **Tag Status** Tab.
Check that all the previously set tags are displayed in the *Tag Name* Column and that ● appears to the left of each tag.
Check that "Normally resolved" is displayed in the *Status* Column for each tag.



8. Initialization Method

The setting procedures in this guide are based on the factory default settings.

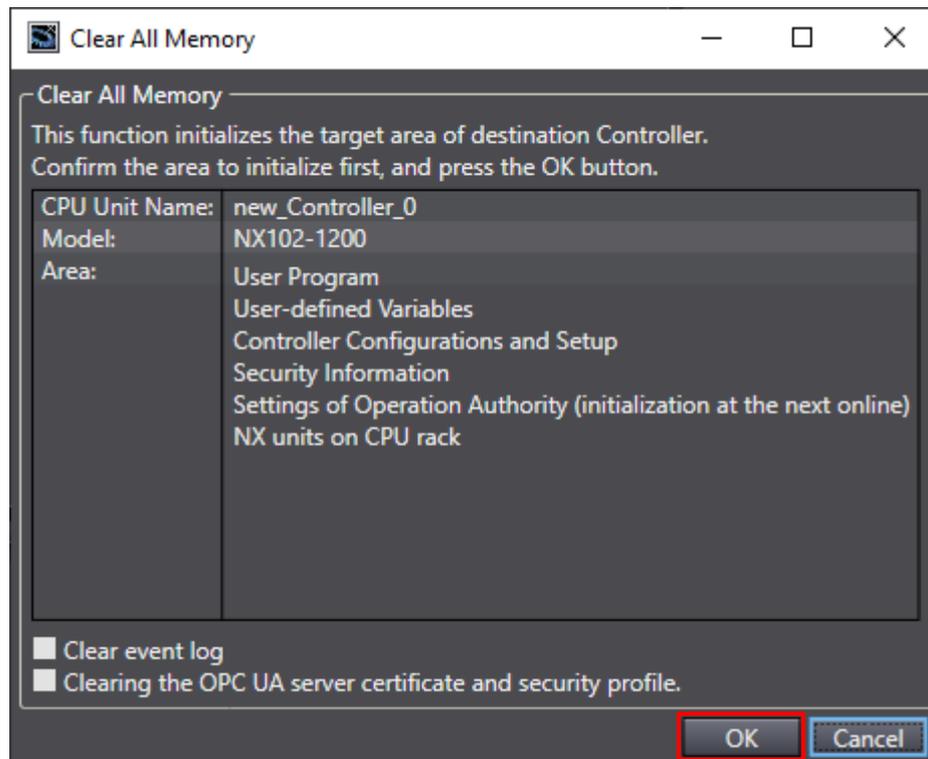
Some procedures may not be applicable unless you use the devices with the factory default settings.

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	January 2021	New entry

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