OMRON

Machine Automation Controller NJ/NX-series

EtherCAT®
Connection Guide

HMS Industrial Networks AB

Anybus Communicator for EtherCAT

SYSMAC
always in control

P560-E1-04

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Contents

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 HMS Industrial Networks AB (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-□□□□ NJ501-□□□□ NJ301-□□□□ NJ101-□□□□	NJ/NX-series CPU Unit Software User's Manual
OMRON	W505		NJ/NX-series CPU Unit Built-in EtherCAT® Port User's Manual
OMRON	W504	SYSMAC-SE2□□□	Sysmac Studio Version 1 Operation Manual
HMS	HMSI-168-95	AB7061	User Manual Anybus® Communicator™ for EtherCAT®
HMS	SP0991	AB7061	Anybus Communicator - EtherCAT Interface Installation Sheet

2. Terms and Definitions

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

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

3. Precautions

(1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing a safety circuit, in order to ensure safety and minimize the risk of abnormal occurrence.

(2) To ensure system safety, make sure 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 February 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 EtherCAT (hereinafter referred to as the "Communicator") to an OMRON NJ/NX-series Machine Automation Controller (hereinafter referred to as the "Controller") via EtherCAT and for checking their communication status.
Refer to *Section 6. EtherCAT Settings* and *Section 7. EtherCAT Connection Procedure* to understand setting methods and key points to perform PDO communications via EtherCAT.

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 for EtherCAT	AB7061

Precautions for Correct Use

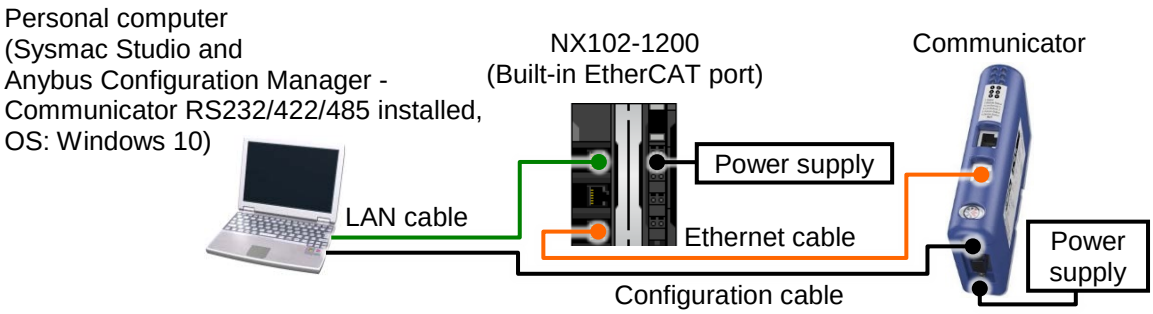
In this guide, the devices with models and versions listed in *5.2. Device Configuration* are used as examples of applicable devices to describe the procedures for connecting the devices and checking their connection. You cannot use devices with versions lower than those listed in *5.2*. To use the above 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 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.1.40
―	Power supply (24 VDC for Controller)	―	
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)	―	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-□M□-K	
HMS	Anybus Communicator for EtherCAT	AB7061-C	Ver.3.03
HMS	Configuration cable	(supplied with Communicator)	
HMS	ESI file	ABC_ETHERCAT_V_3_03C_ pdoupload_for_omron.xml	
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 AB to obtain the ESI 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 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 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

For information on the power supply specifications of the Communicator, refer to the User Manual Anybus® Communicator™ for EtherCAT® (HMSI-168-95).

6. EtherCAT Settings

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

Precautions for Correct Use

This guide describes the EtherCAT communication status check between the Controller and the Communicator. The parameters relating to the sub-network are therefore set only for the EtherCAT communication status check.

6.1. Parameters

The following parameters of the Communicator are required to connect to the Controller via EtherCAT.

Communicator parameter settings

Setting item	Setting value	Remarks
Node address	1	With Sysmac Studio
Fieldbus Type	EtherCAT	—
IO Sizes	Automatic	Default
Protocol Mode	Generic Data Mode	—
Producer Maximum Data length	32 bytes	Maximum 512 bytes can be set
Consumer Maximum Data length	32 bytes	Maximum 512 bytes can be set

Additional Information

Refer to the *User Manual Anybus® Communicator™ for EtherCAT®* (HMSI-168-95) for more information on parameters relating to the EtherCAT network and sub-network.

6.2. Device Variables

The process data of the Communicator is assigned to the Controller's device variables.
The device variable names and data types are shown below.

Output area (Controller to Communicator)

Device variable name	Data type	Description
E001_Outputs_Entry_2100_01	BYTE	Output data to the Communicator
E001_Outputs_Entry_2100_02	BYTE	
E001_Outputs_Entry_2100_03	BYTE	
E001_Outputs_Entry_2100_04	BYTE	
E001_Outputs_Entry_2100_05	BYTE	
E001_Outputs_Entry_2100_06	BYTE	
E001_Outputs_Entry_2100_07	BYTE	
E001_Outputs_Entry_2100_08	BYTE	
E001_Outputs_Entry_2100_09	BYTE	
E001_Outputs_Entry_2100_0A	BYTE	
E001_Outputs_Entry_2100_0B	BYTE	
E001_Outputs_Entry_2100_0C	BYTE	
E001_Outputs_Entry_2100_0D	BYTE	
E001_Outputs_Entry_2100_0E	BYTE	
E001_Outputs_Entry_2100_0F	BYTE	
E001_Outputs_Entry_2100_10	BYTE	
E001_Outputs_Entry_2100_11	BYTE	
E001_Outputs_Entry_2100_12	BYTE	
E001_Outputs_Entry_2100_13	BYTE	
E001_Outputs_Entry_2100_14	BYTE	
E001_Outputs_Entry_2100_15	BYTE	
E001_Outputs_Entry_2100_16	BYTE	
E001_Outputs_Entry_2100_17	BYTE	
E001_Outputs_Entry_2100_18	BYTE	
E001_Outputs_Entry_2100_19	BYTE	
E001_Outputs_Entry_2100_1A	BYTE	
E001_Outputs_Entry_2100_1B	BYTE	
E001_Outputs_Entry_2100_1C	BYTE	
E001_Outputs_Entry_2100_1D	BYTE	
E001_Outputs_Entry_2100_1E	BYTE	
E001_Outputs_Entry_2100_1F	BYTE	
E001_Outputs_Entry_2100_20	BYTE	

Input area (Communicator to Controller)

Device variable name	Data type	Description
E001_Inputs_Entry_2000_01	BYTE	Input data from Communicator
E001_Inputs_Entry_2000_02	BYTE	
E001_Inputs_Entry_2000_03	BYTE	
E001_Inputs_Entry_2000_04	BYTE	
E001_Inputs_Entry_2000_05	BYTE	
E001_Inputs_Entry_2000_06	BYTE	
E001_Inputs_Entry_2000_07	BYTE	
E001_Inputs_Entry_2000_08	BYTE	
E001_Inputs_Entry_2000_09	BYTE	
E001_Inputs_Entry_2000_0A	BYTE	
E001_Inputs_Entry_2000_0B	BYTE	
E001_Inputs_Entry_2000_0C	BYTE	
E001_Inputs_Entry_2000_0D	BYTE	
E001_Inputs_Entry_2000_0E	BYTE	
E001_Inputs_Entry_2000_0F	BYTE	
E001_Inputs_Entry_2000_10	BYTE	
E001_Inputs_Entry_2000_11	BYTE	
E001_Inputs_Entry_2000_12	BYTE	
E001_Inputs_Entry_2000_13	BYTE	
E001_Inputs_Entry_2000_14	BYTE	
E001_Inputs_Entry_2000_15	BYTE	
E001_Inputs_Entry_2000_16	BYTE	
E001_Inputs_Entry_2000_17	BYTE	
E001_Inputs_Entry_2000_18	BYTE	
E001_Inputs_Entry_2000_19	BYTE	
E001_Inputs_Entry_2000_1A	BYTE	
E001_Inputs_Entry_2000_1B	BYTE	
E001_Inputs_Entry_2000_1C	BYTE	
E001_Inputs_Entry_2000_1D	BYTE	
E001_Inputs_Entry_2000_1E	BYTE	
E001_Inputs_Entry_2000_1F	BYTE	
E001_Inputs_Entry_2000_20	BYTE	

Additional Information

For more information on the input and output areas, refer to *3. CANopen Object Dictionary Implementation* of the *User Manual Anybus® Communicator™ for EtherCAT®* (HMSI-168-95).

Additional Information

The device variables are automatically named with a combination of the device names and the port names. The default device names are "E" followed by a serial number starting from "001".

7. EtherCAT Connection Procedure

This section describes the procedures for connecting the Controller and the Communicator via EtherCAT. The procedure for setting up the Controller in this guide is based on the factory default settings. Refer to *Section 8. Initialization Method* for information on initialization.

7.1. Work Flow

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

7.2. HMS Communicator Setup	Set up the HMS Communicator.
↓	
7.2.1. Hardware Settings	Connect the cables to the Communicator.
↓	
7.2.2 Parameter Settings	Set parameters for the Communicator.
↓	
7.3. Controller Setup	Set up the Controller.
↓	
7.3.1. Starting Sysmac Studio and Installing the ESI File	Start Sysmac Studio and install the ESI file for the Communicator.
↓	
7.3.2. Setting the EtherCAT Network Configuration	Set the EtherCAT network configuration.
↓	
7.3.3. PDO Map Settings	Match the PDO mapping list and PDO entry list of the Communicator.
↓	
7.3.4. Setting Device Variables	Set device variables to use for PDO communications with the Communicator.
↓	
7.3.5. Transferring the Project Data	Transfer the project data created in Sysmac Studio to the Controller.
↓	
7.4. EtherCAT Communication Status Check	Confirm that PDO communications via EtherCAT is performed normally.
↓	
7.4.1. Checking the Connection Status	Check the EtherCAT connection status.

7.2. HMS Communicator Setup

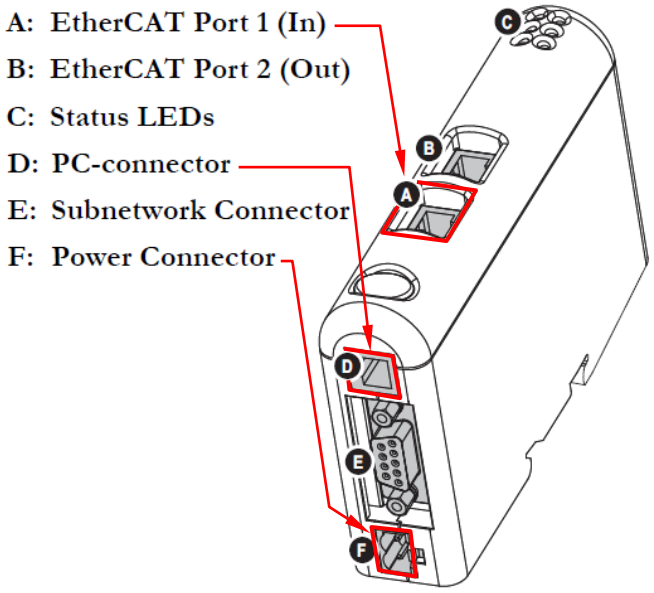
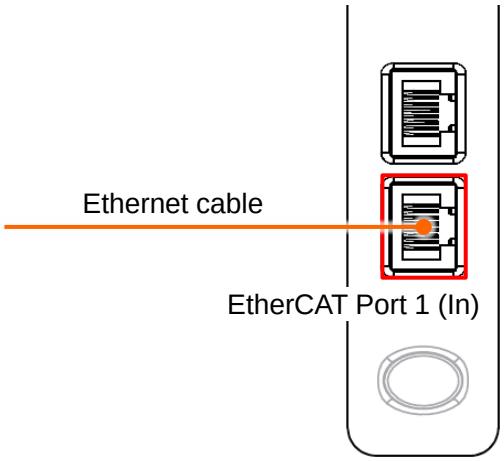
Set up the HMS Communicator.

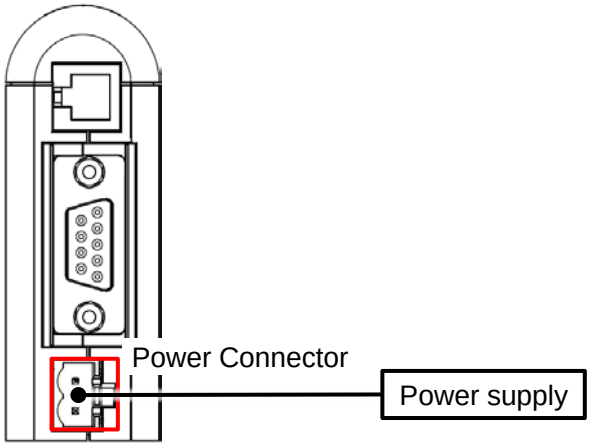
7.2.1. Hardware Settings

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 for Communicator is OFF.	
2	Check the position of connectors on Communicator by referring to the figure on the right.	
3	Connect an Ethernet cable to EtherCAT Port 1 (In).	

4	Connect Power supply for Communicator to Power Connector. *For information on the power supply connection to Communicator, refer to the *User Manual Anybus® Communicator™ for EtherCAT®* (HMSI-168-95) or the *Anybus Communicator - EtherCAT Interface Installation Sheet* (SP0991).	

7.2.2. Parameter Settings

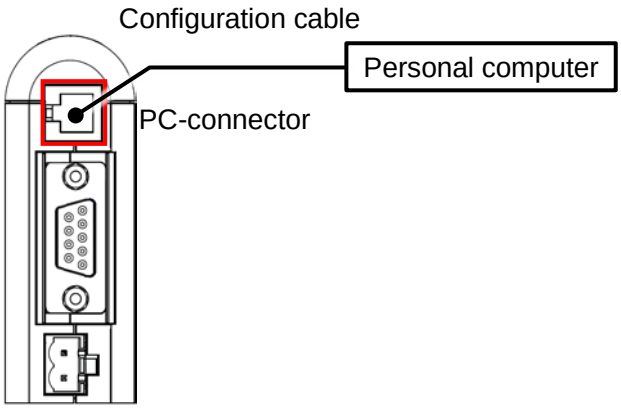
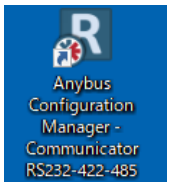
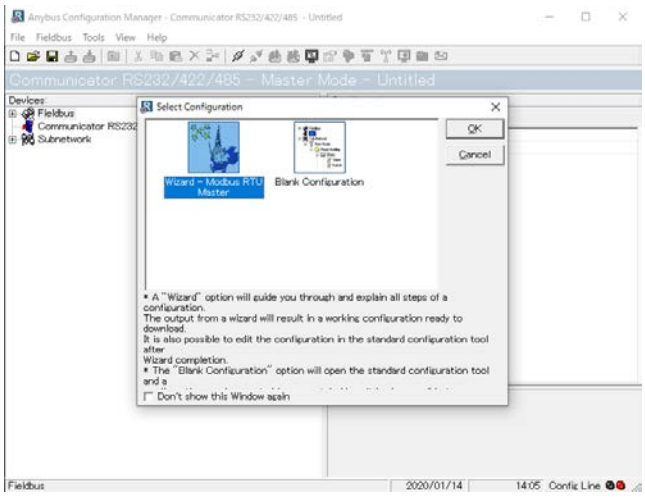
Set parameters for the Communicator.

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

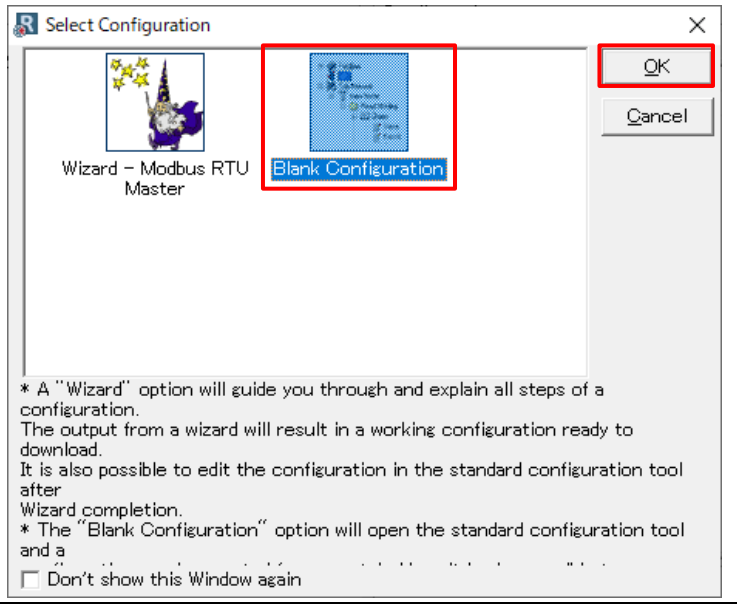
Install the software tool on your computer before proceeding.

Additional Information

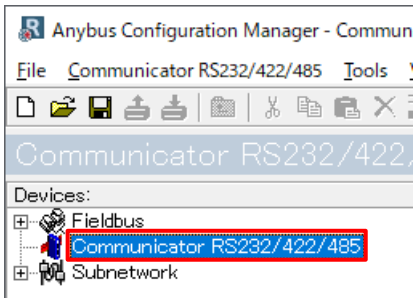
For information on how to install ACM, refer to the *User Manual Anybus® Communicator™ for EtherCAT®* (HMSI-168-95).

1	Connect the Configuration cable between Personal computer and PC-connector located at the bottom of Communicator. *For information on the connection between Communicator and Personal computer, refer to the *User Manual Anybus® Communicator™ for EtherCAT®* (HMSI-168-95) or the *Anybus Communicator - EtherCAT Interface Installation Sheet* (SP0991).	
2	Turn ON Communicator.	
3	Start ACM on Personal computer.	
4	ACM starts up. The Select Configuration Dialog Box appears.	

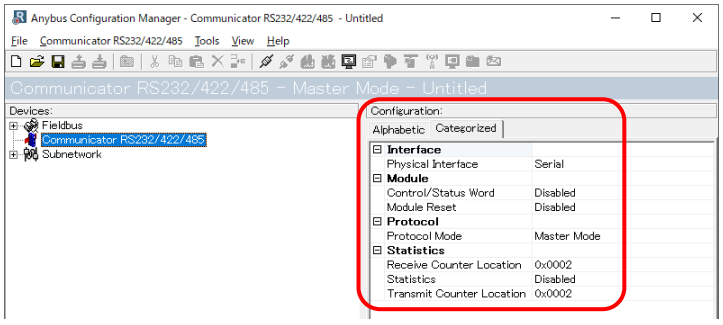
5 In the Select Configuration Dialog Box, select *Blank Configuration* and click **OK**.



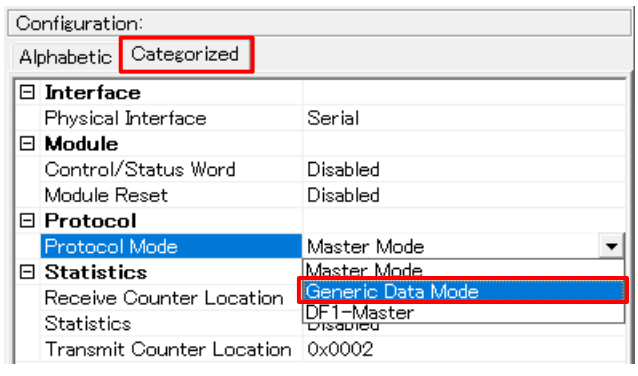
6 Select **Communicator RS232/422/485** displayed on the left side of the main window.



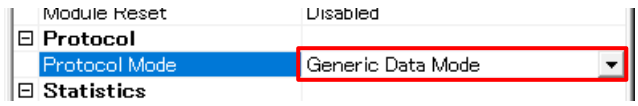
7 Parameters of Communicator RS232/422/485 appear on the right side of the main window.



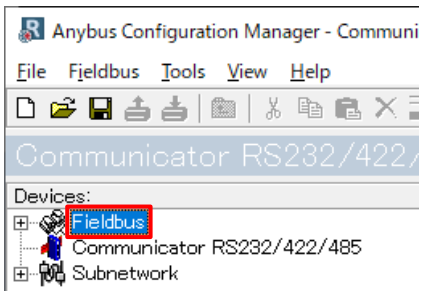
8 On the Categorized Tab Page (default display), select ***Generic Data Mode*** from the pull-down list in the *Protocol Mode* Field under Protocol.



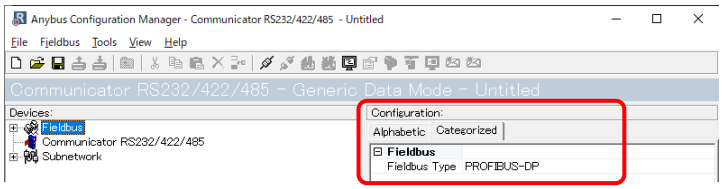
Check that Protocol Mode is set to Generic Data Mode.



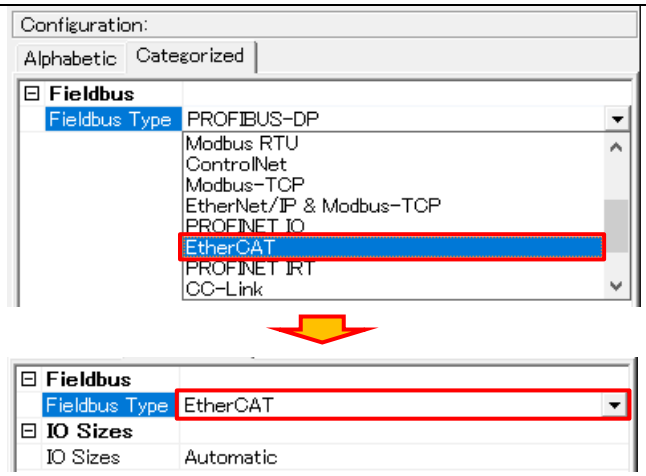
9 Click **Fieldbus** on the left side of the main window.



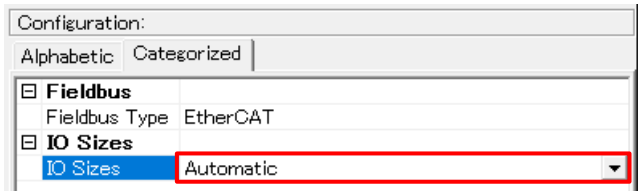
10 Parameters of Fieldbus appear on the right side of the main window.



11 In the same way as step 8, select ***EtherCAT*** from the pull-down list in the *Fieldbus Type* Field under Fieldbus.



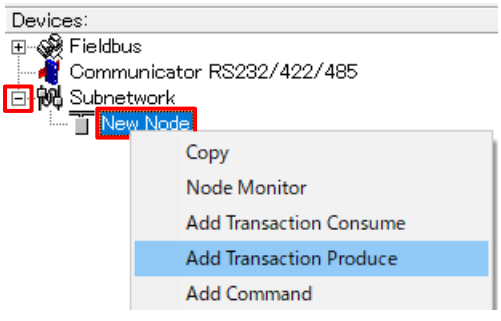
12 Select ***Automatic*** from the pull-down list in the *IO Sizes* Field under IO Sizes.

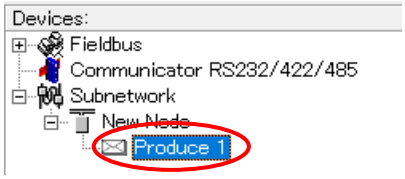


13 Click the **+** Button of Subnetwork on the left side of the main window to expand it.

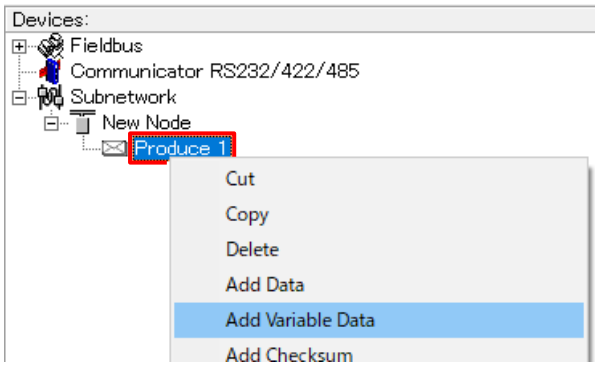
New Node is displayed. Right-click **New Node** and select ***Add Transaction Produce*** from the menu.

Check that Produce 1 is added under New Node.

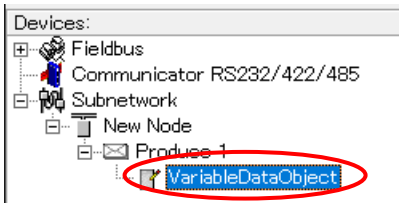




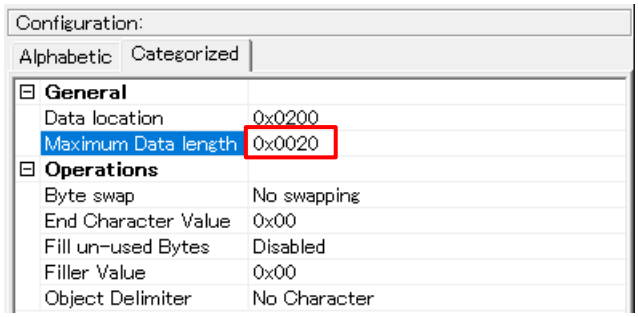
14 Right-click **Produce 1** and select ***Add Variable Data*** from the menu.



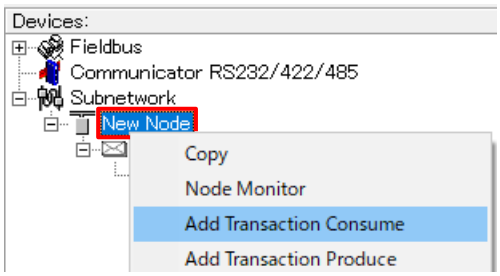
Check that VariableDataObject is added under Produce 1.



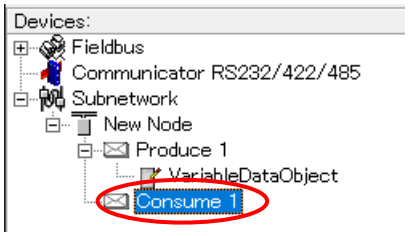
15 Parameters of VariableDataObject (under Produce 1) appear on the right side of the main window.
Enter *0x0020* (32 bytes) in the *Maximum Data length* Field.



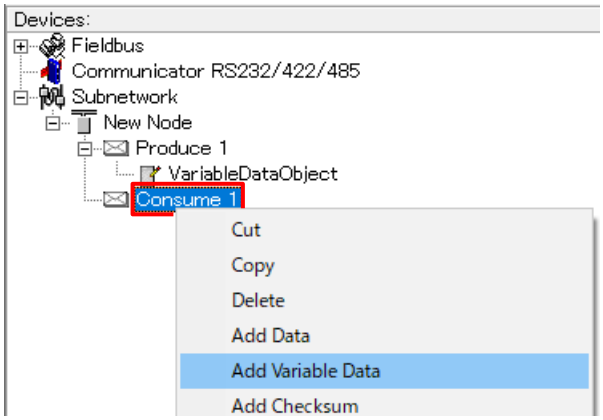
16 In the same way as step 13, right-click **New Node** and select ***Add Transaction Consume*** from the menu.



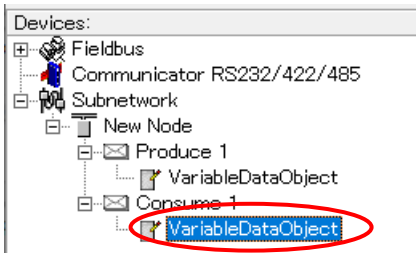
Check that Consume 1 is added under New Node.



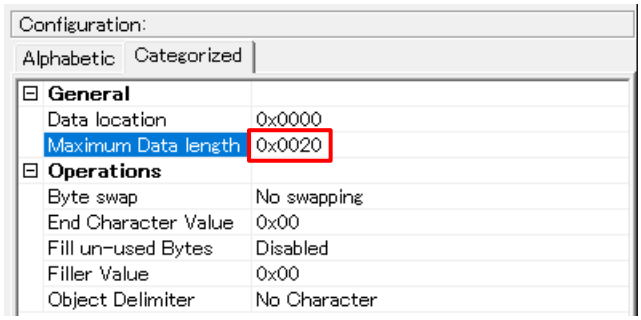
17 In the same way as step 14, right-click **Consume 1** and select ***Add Variable Data*** from the menu.



Check that VariableDataObject is added under Consume 1.

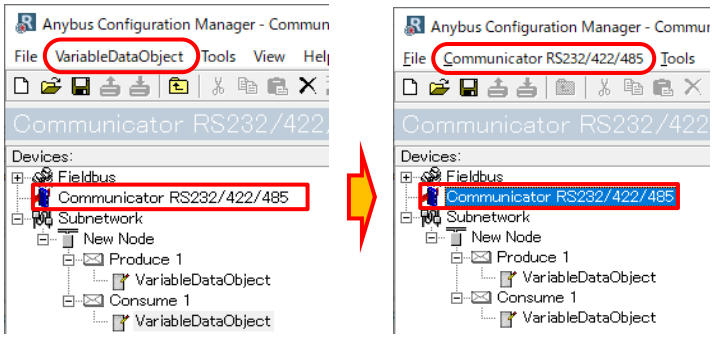


18 Parameters of VariableDataObject (under Consume 1) appear on the right side of the main window.
Enter *0x0020* (32 bytes) in the *Maximum Data length* Field.

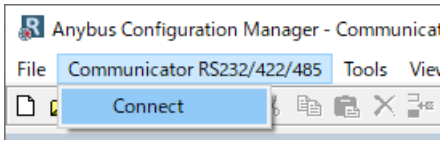


19 Select **Communicator RS232/422/485** on the left side of the main window.

On menu bar, the second menu from the left changes from VariableDataObject to Communicator RS232/422/485.

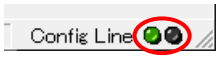


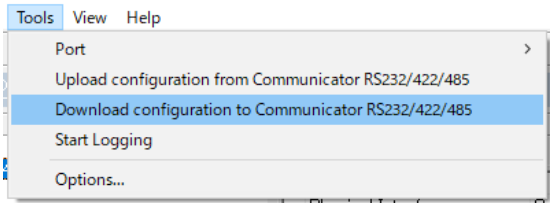
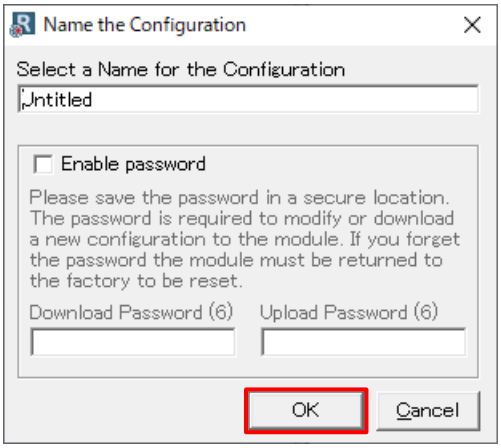
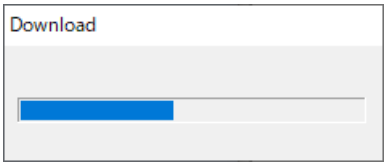
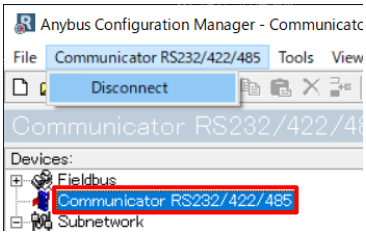
20 Select ***Connect*** from the Communicator RS232/422/485 Menu.



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

*It indicates that ACM is online with Communicator.



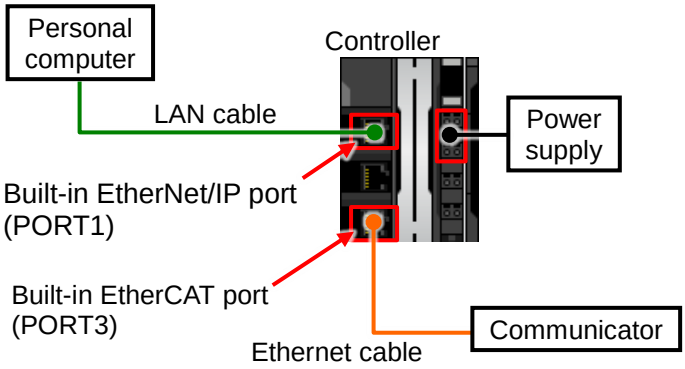
22	Select ***Download configuration to Communicator RS232/422/485*** from the Tools Menu.	
23	The Name the Configuration Dialog Box appears. Check the message and click **OK**. The Download Dialog Box appears and shows the progress of the download. The dialog box closes after the download is completed.	  
24	In the same way as step 19, select ***Disconnect*** from the Communicator RS232/422/485 Menu while selecting **Communicator RS232/422/485** on the left side of the main window.	
25	Check that the Config Line LED on the lower right side of the main window turns red. *It indicates that ACM is offline with Communicator.	
26	Turn OFF Communicator.	
27	Remove the Configuration cable that is connected between Personal computer and Communicator.	

7.3. Controller Setup

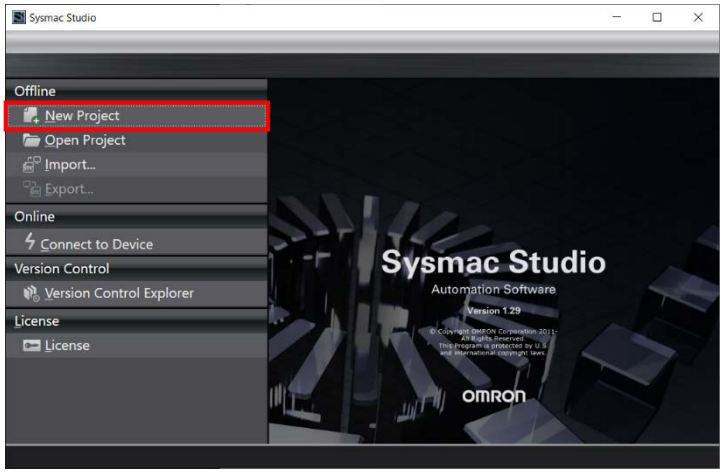
Set up the Controller.

7.3.1. Starting Sysmac Studio and Installing the ESI File

Start Sysmac Studio and install the ESI file for the Communicator.

1	Make sure Power supply for Controller and Communicator are powered 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 Communicator) 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 Communicator.	
4	Start Sysmac Studio. *If the User Account Control Dialog Box appears at start, make a selection to start Sysmac Studio.	

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

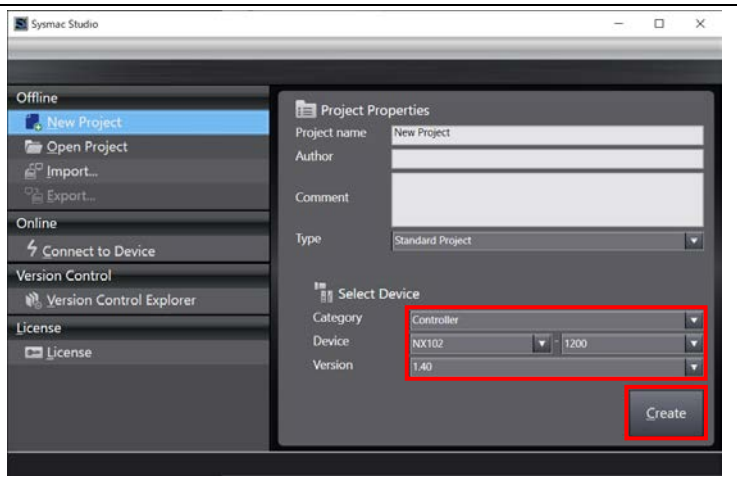


6 The Project Properties Screen appears. Select items appropriate for your Controller from the pull-down list in each field of Select Device.
Click **Create**.

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.



7 The New Project Window appears.

The following panes are displayed in the window.

Left: Multiview Explorer

Upper right: Toolbox

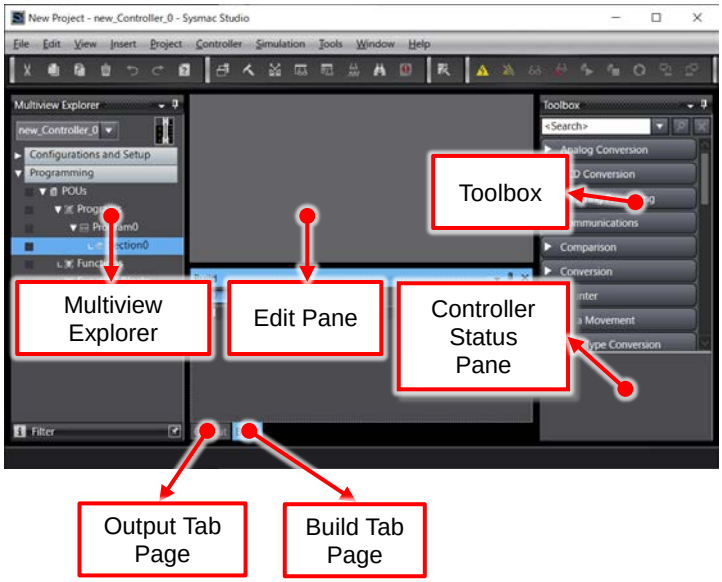
Lower right: Controller Status Pane

Upper middle: Edit Pane

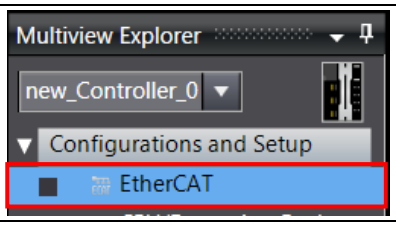
The following tabs are displayed in the lower middle of the window.

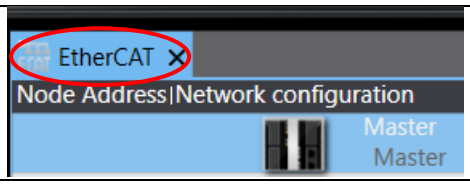
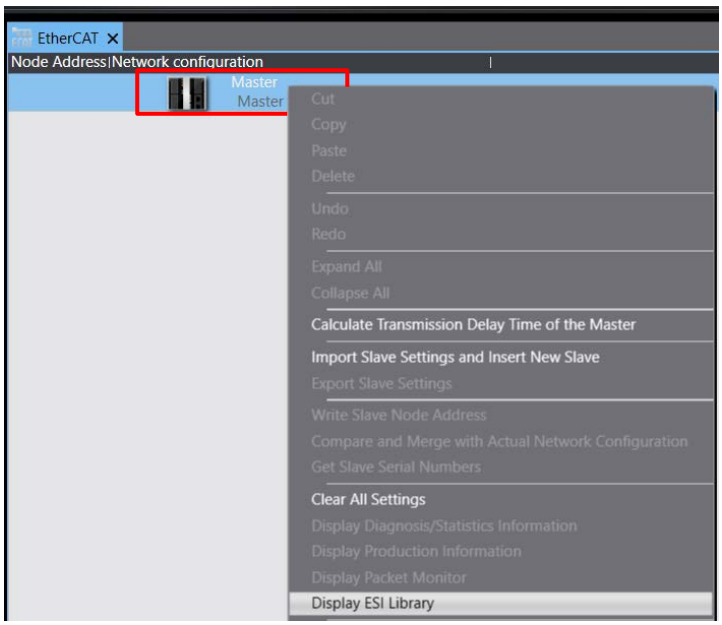
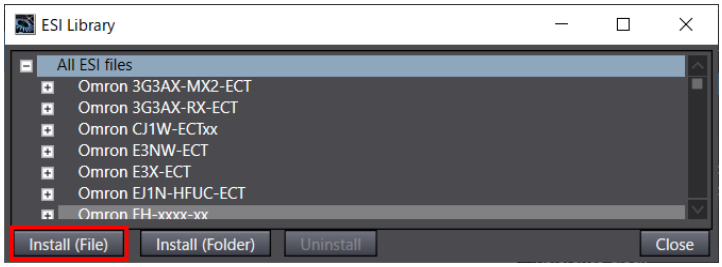
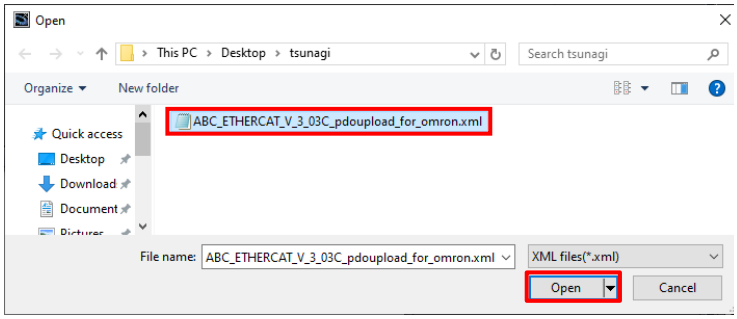
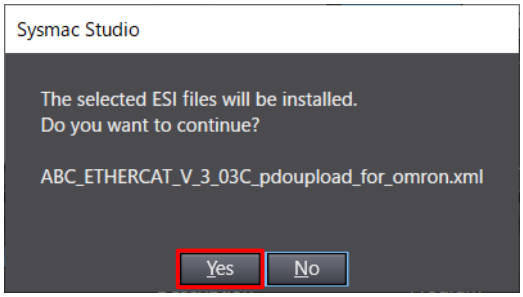
Output Tab Page

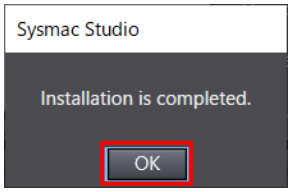
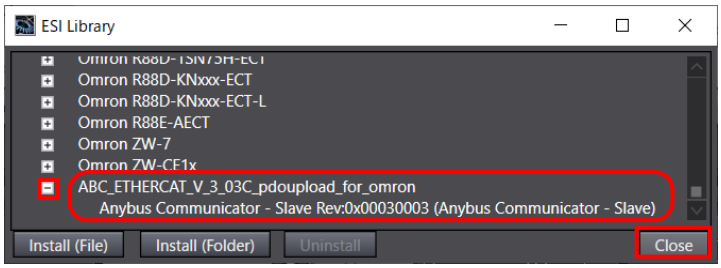
Build Tab Page



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



9	The EtherCAT Tab Page appears in the Edit Pane.	
10	Right-click **Master** and select ***Display ESI Library*** from the menu.	
11	The ESI Library Dialog Box appears. Click **Install (File)**.	
12	The Open Dialog Box appears. Select the prepared ESI file *ABC_ETHERCAT_V_3_03C_pdoupload_for_omron.xml* and click **Open**.	
13	The dialog box on the right appears. Check the message and click **Yes**.	

14	The dialog box on the right appears when the ESI file installation is completed. Check the message and click **OK**.	
15	Click the **+** Button of ABC_ETHERCAT_V_3_03C_ pdoupload_for_omron in the ESI Library Dialog Box, and check that Anybus Communicator - Slave Rev:0x00030003 (Anybus Communicator - Slave) is displayed. Check that there are no exclamation marks (errors). Click **Close**.	

Precautions for Correct Use

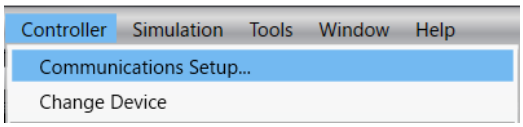
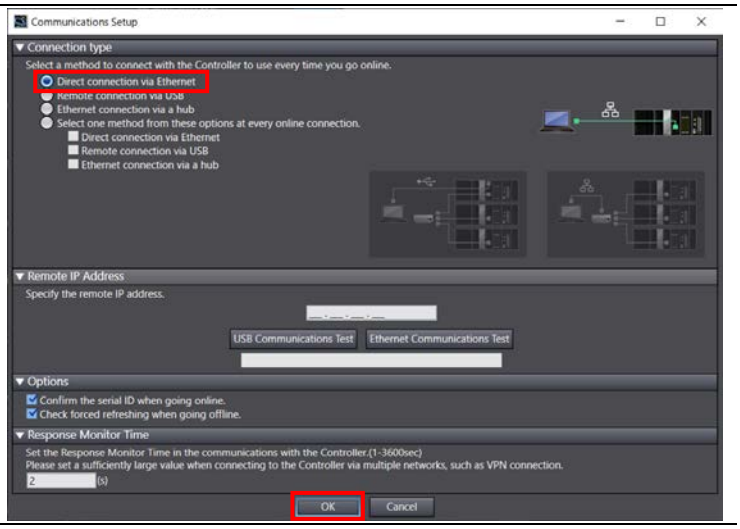
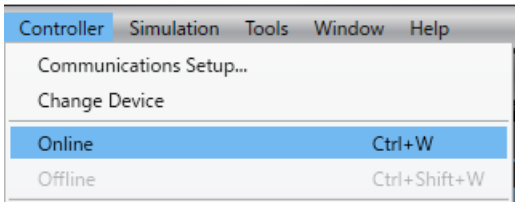
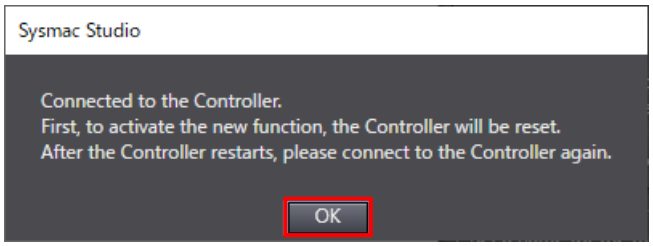
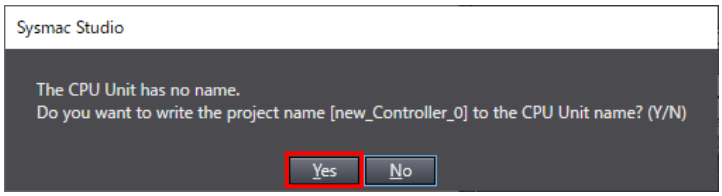
If an exclamation mark (error) appears for the ESI file, check the name of the ESI file and obtain the ESI file with a correct name. If an exclamation mark (error) still appears even when the name of the ESI file is correct, the file may be corrupted.
In that case, contact HMS Industrial Networks AB.

7.3.2. Setting the EtherCAT Network Configuration

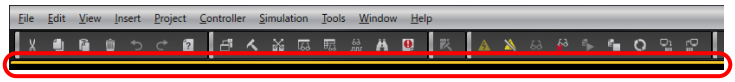
Set the EtherCAT network configuration.

⚠ Caution

The slave unit may perform unexpected operation after you power cycle it in step 10. Always confirm safety before you power cycle the slave unit.

1	Select ***Communications Setup*** from the Controller Menu.	
2	The Communications Setup Dialog Box appears. Select *Direct connection via Ethernet* in the *Connection type* Field. Click **OK**.	
3	Select ***Online*** from the Controller Menu.	
	*If the dialog box on the right appears, check the message and click **OK**, then, after checking that Controller has restarted, 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.	

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

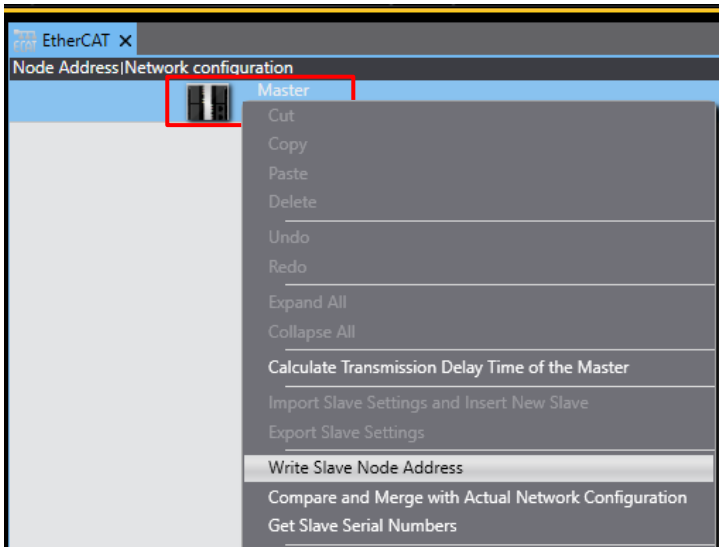


Additional Information

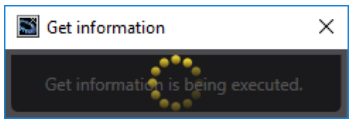
For information on online connections, refer to *Section 6. Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

5 Right-click **Master** on the EtherCAT Tab Page displayed in the Edit Pane, and select ***Write Slave Node Address*** from the menu.

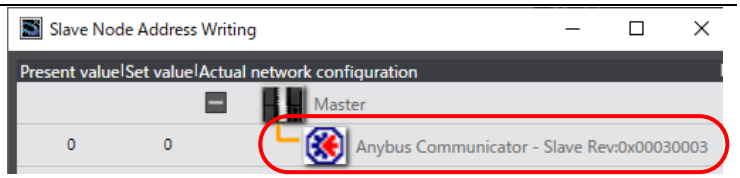
*If the EtherCAT Tab Page is not displayed in the Edit Pane, follow step 8 of *7.3.1. Starting Sysmac Studio and Installing the ESI File* to display the tab page.



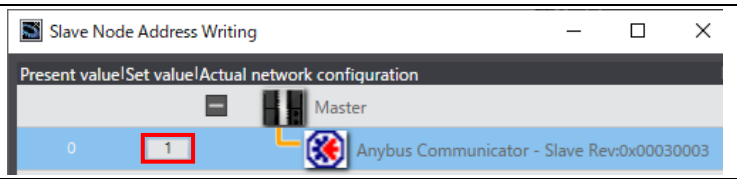
A dialog box appears stating "Get information is being executed".



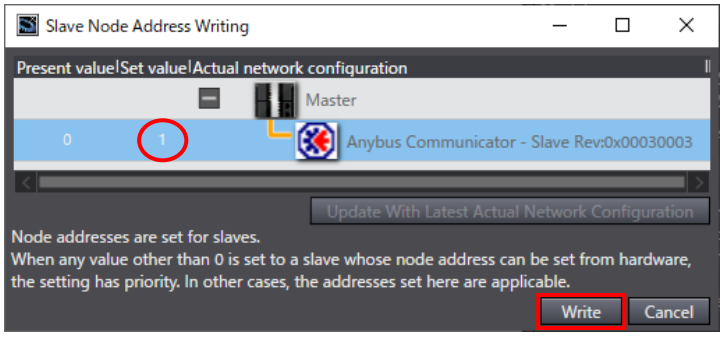
6 The Slave Node Address Writing Dialog Box appears. Anybus Communicator - Slave Rev:0x00030003 is displayed in the Actual network configuration.



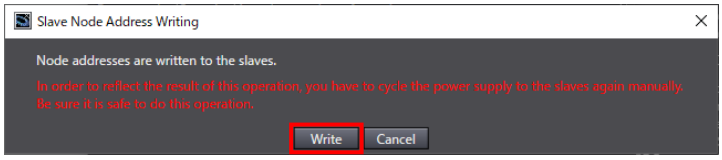
7 Enter *1* (node address) in the *Set value* Column.



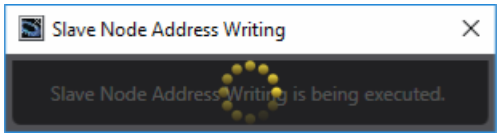
8 Check that no errors appear and that the set value is 1. Click **Write**.



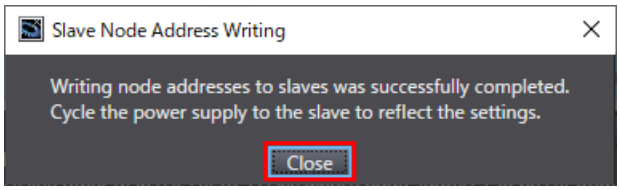
9 The Slave Node Address Writing Dialog Box appears. Check the message and click **Write**.



A dialog box appears stating "Slave Node Address Writing is being executed".

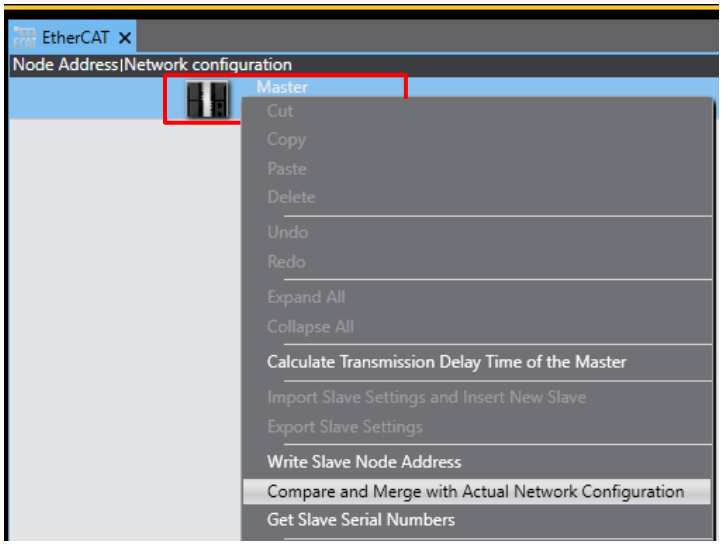


The dialog box on the right appears after the node address is successfully written to the slave unit. Check the message and click **Close**.

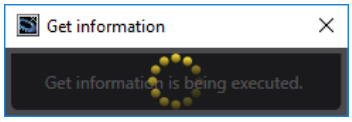


10 Power cycle Communicator.

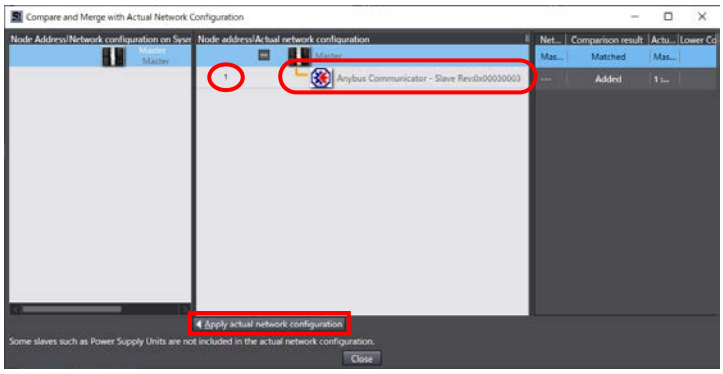
11 Right-click **Master** on the EtherCAT Tab Page displayed in the Edit Pane, and select ***Compare and Merge with Actual Network Configuration*** from the menu.



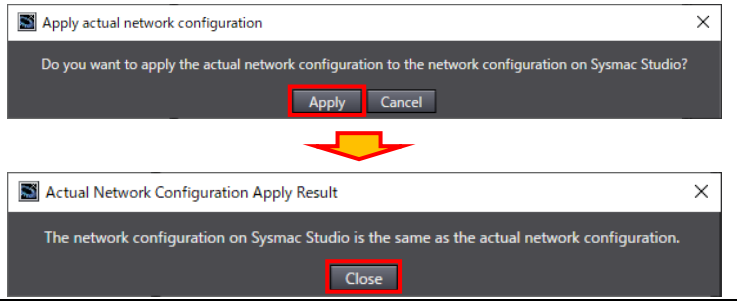
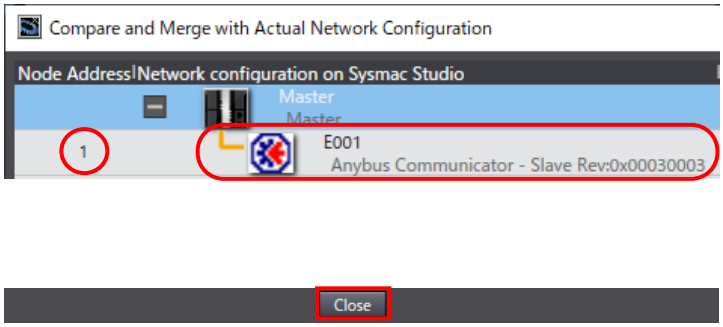
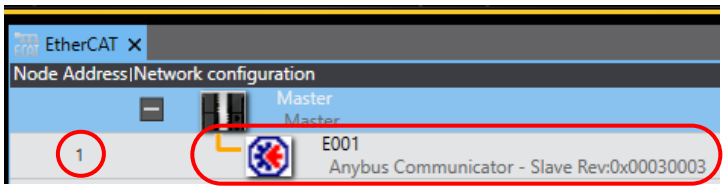
A dialog box appears stating "Get information is being executed".



12 The Compare and Merge with Actual Network Configuration Dialog Box appears.
After the comparison, Anybus Communicator - Slave Rev:0x00030003 is addressed as node 1 and is added to the Actual network configuration.

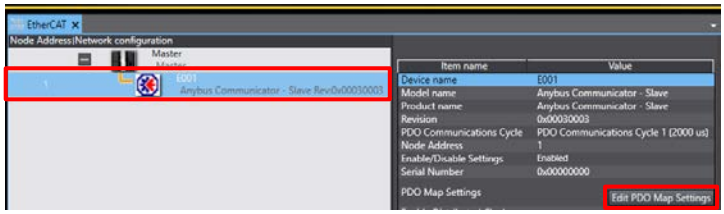
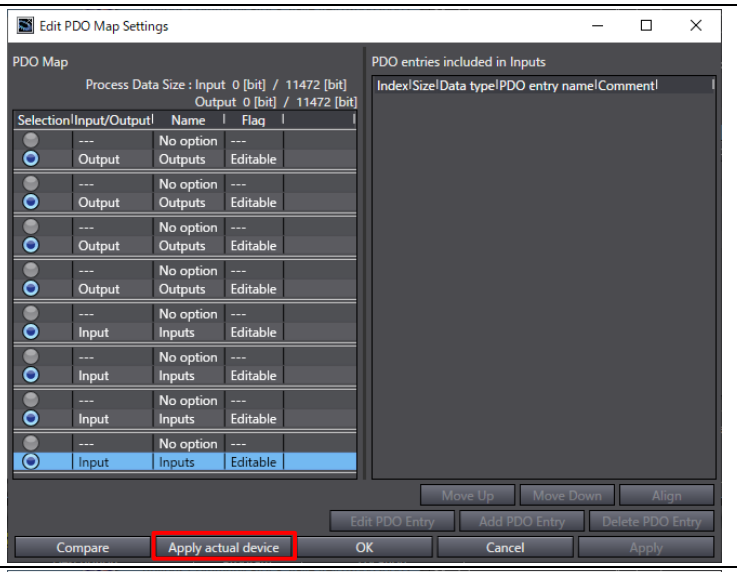
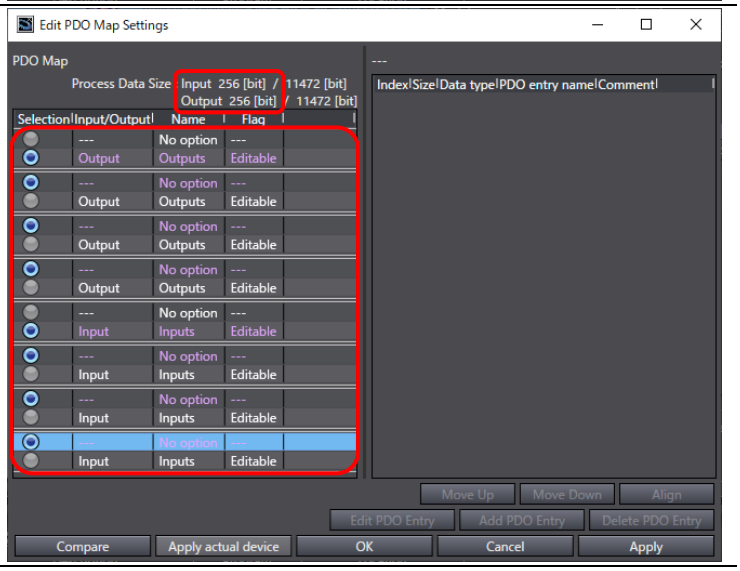


Click **Apply actual network configuration**.

13	A confirmation dialog box appears. Check the message and click **Apply**. A result dialog box appears. Check the message and click **Close**.	
14	E001 Anybus Communicator - Slave Rev:0x00030003 is addressed as node 1 and is added to the Network configuration on Sysmac Studio. Check that the data is added. Click **Close**.	
15	E001 Anybus Communicator - Slave Rev:0x00030003 is addressed as node 1 and is added to the EtherCAT Tab Page displayed in the Edit Pane.	

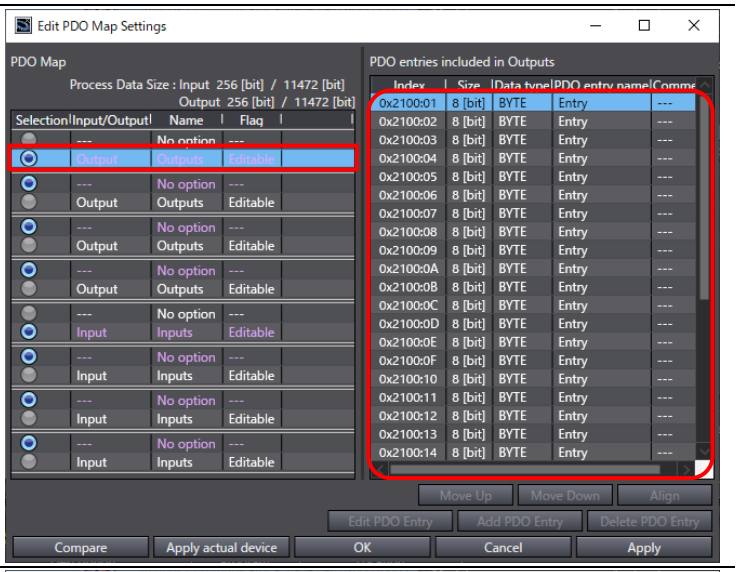
7.3.3. PDO Map Settings

Match the PDO mapping list and PDO entry list of the Communicator.

1	On the EtherCAT Tab Page displayed in the Edit Pane, select Communicator with node address 1, and click **Edit PDO Map Settings** in the *PDO Map Settings* Field.	
2	The Edit PDO Map Settings Dialog Box appears. Click **Apply actual device**.	
3	The PDO mapping data is updated, which corresponds to the process data size of the slave unit. Check that the following process data size is displayed. Input 256 [bit] (32 bytes) Output 256 [bit] (32 bytes)	

4 Select the following PDO mapping, and check that the total size of all PDO entries included in the PDO mapping is 32 bytes.

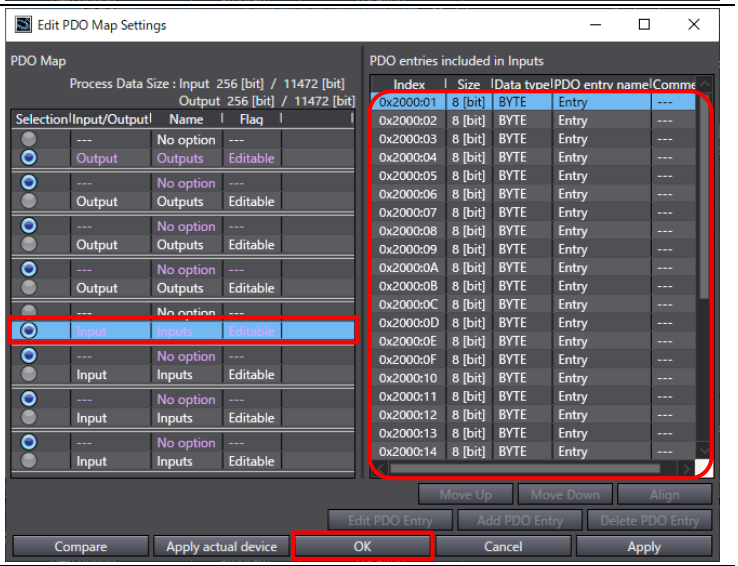
- Selection: ◉
- Input/Output: Output
- Name: Outputs



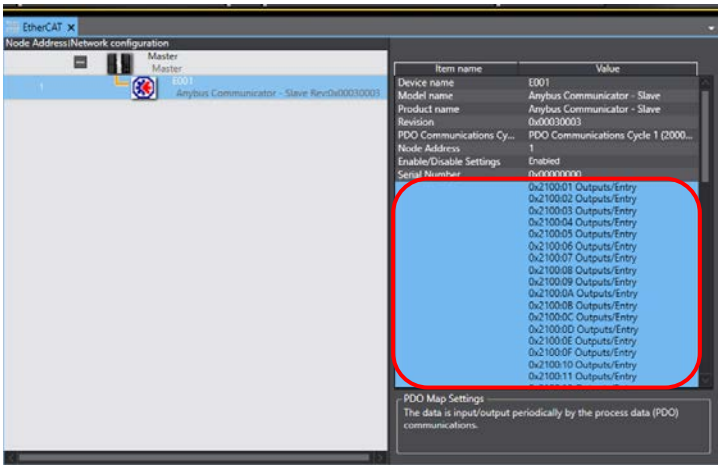
5 Select the following PDO mapping, and check that the total size of all PDO entries included in the PDO mapping is 32 bytes.

- Selection: ◉
- Input/Output: Input
- Name: Inputs

Click **OK**.

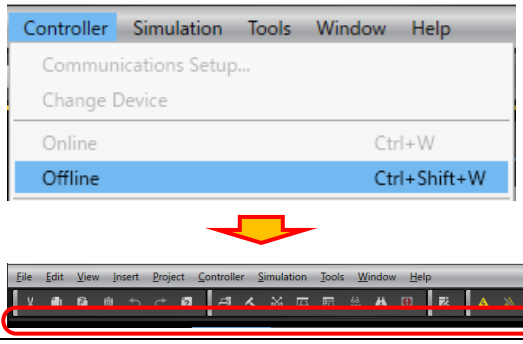
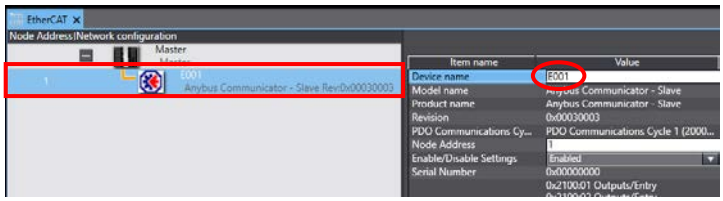
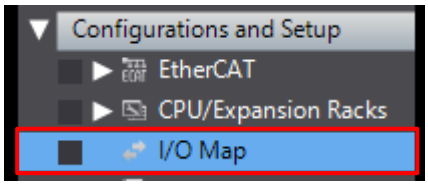
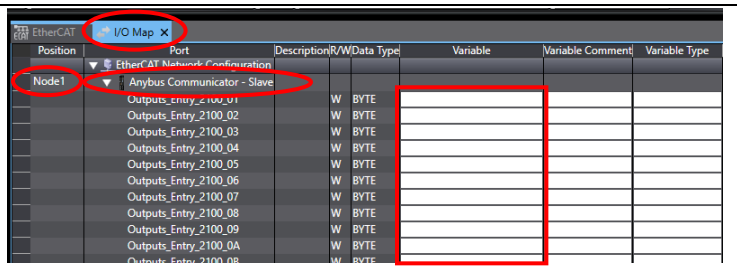


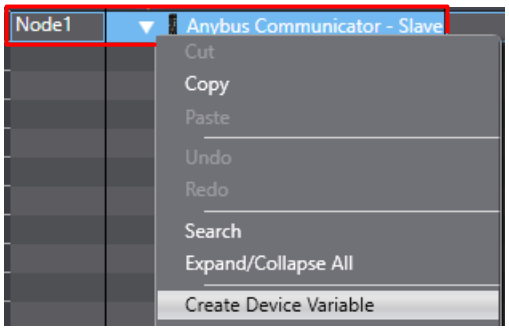
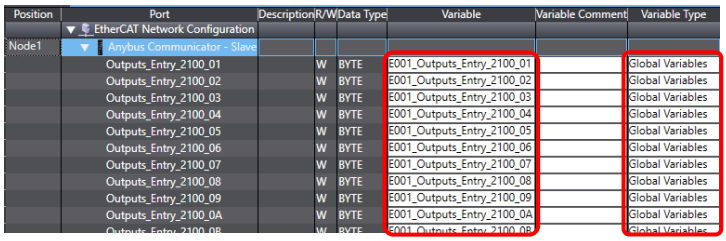
6 The set PDO mapping data is displayed in the *PDO Map Settings* Field.



7.3.4. Setting Device Variables

Set device variables to use for PDO communications with the Communicator.

1	Select ***Offline*** from the Controller Menu. The yellow line under the toolbar disappears.	
2	On the EtherCAT Tab Page displayed in the Edit Pane, select Communicator with node address 1, and check that the device name is E001. *The device name can be changed as desired.	
3	Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.	
4	The I/O Map Tab Page appears in the Edit Pane. Check that Node1 is displayed in the *Position* Column and that the added Communicator is displayed in the *Port* Column. *In next step, the device variables are automatically named for the I/O ports of the slave unit. To manually create variable names for I/O ports, click a cell in the *Variable* Column for a target port and enter a variable name.	

5	Right-click **Node1** and select ***Create Device Variable*** from the menu.	
6	The variable names and types are set.	

Additional Information

The device variables are automatically named with a combination of the device names and the port names.
The default device names are "E" followed by a serial number starting from "001".

Additional Information

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

7.3.5. Transferring the Project Data

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

⚠ WARNING

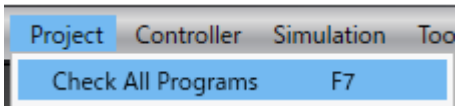
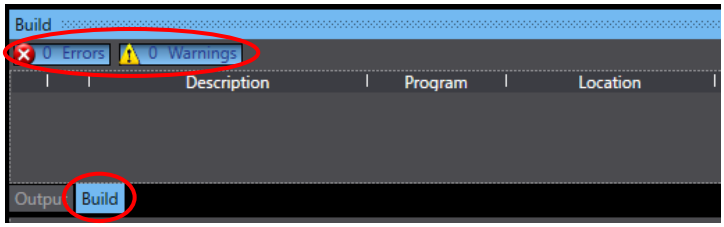
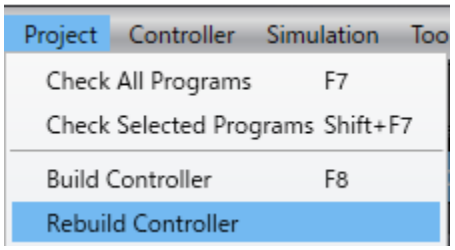
Regardless of the operating mode of the CPU Unit, devices or machines may perform unexpected operation when you transfer any of the following data from Sysmac Studio: a user program, configuration data, setup data or device variables. Always confirm safety at the destination node before you transfer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

⚠ WARNING

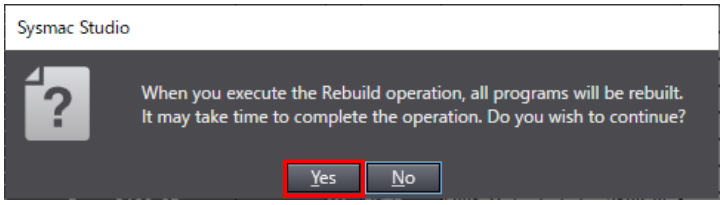
Before you transfer the parameters, check the specifications of the EtherCAT slave unit in manuals or other documentation and confirm that the system will not be adversely affected.

⚠ Caution

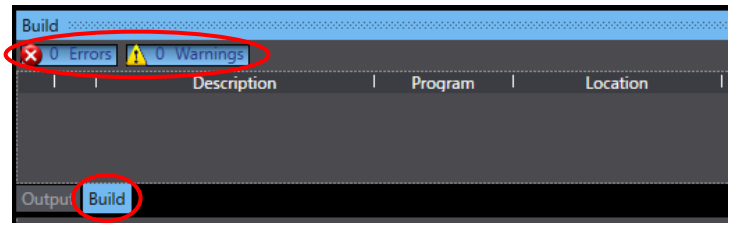
After you transfer the project data, the CPU Unit restarts, and communications with the slave unit is cut off. During the period, the outputs of the slave unit behave according to the slave unit settings. The time that communications is cut off depends on the EtherCAT network configuration. Before you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

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

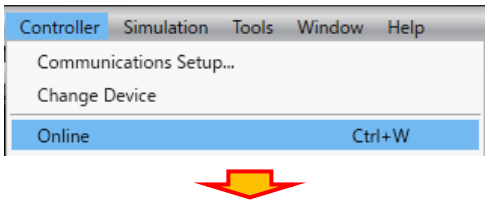


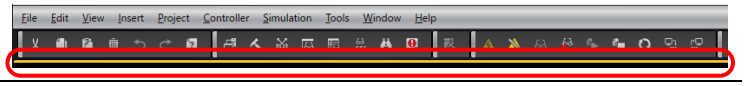
5 Check that "0 Errors" and "0 Warnings" are displayed on the Build Tab Page.



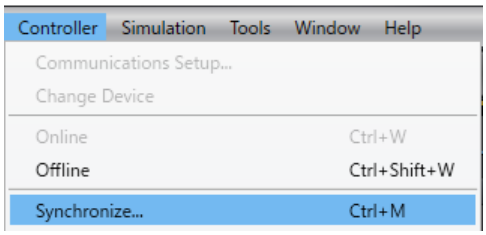
6 Select ***Online*** from the Controller Menu.

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



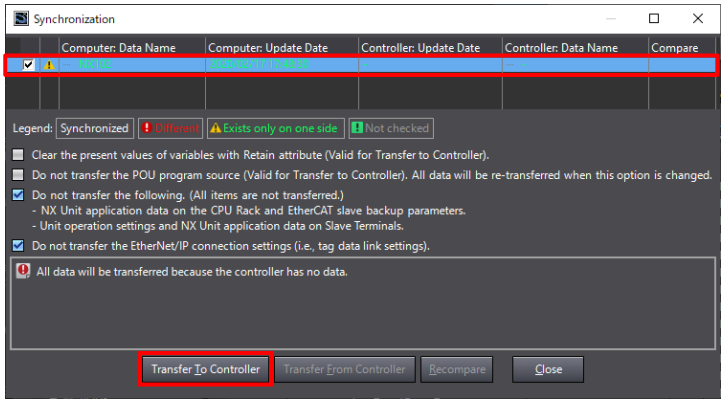


7 Select ***Synchronize*** from the Controller Menu.

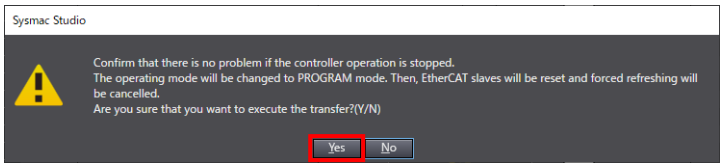


8 The Synchronization Dialog Box appears.
Check that the data to be transferred (e.g. NX102) is selected.
Click **Transfer To Controller**.

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



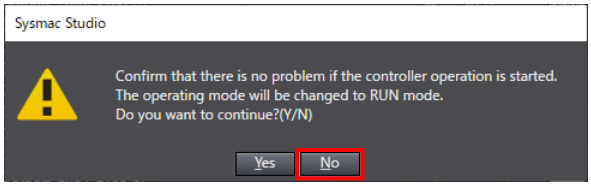
9 The dialog box on the right appears. Confirm that there is no problem, and click **Yes**.



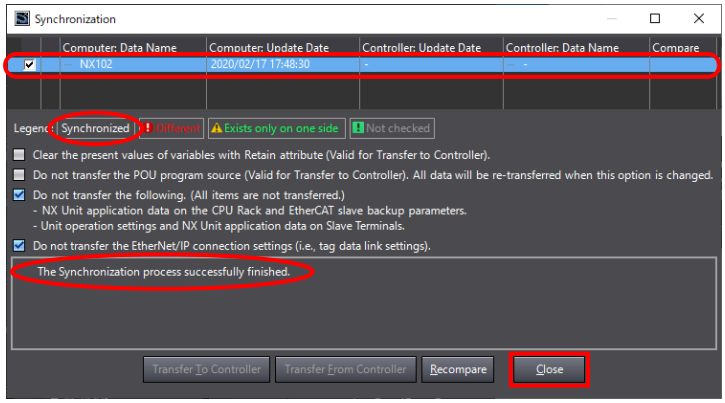
A message appears stating "Synchronizing".

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

*Do not return to RUN mode.



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



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

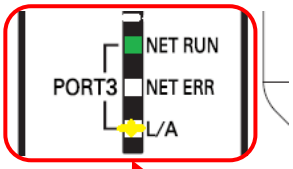
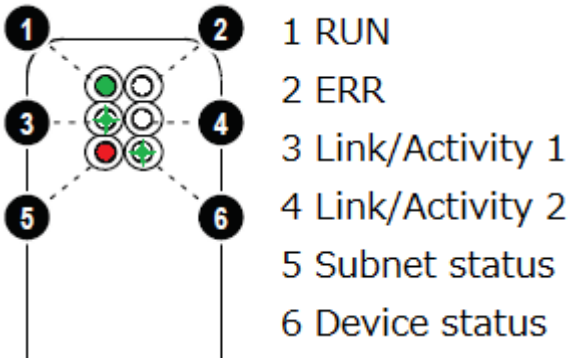
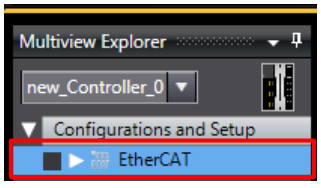
*If the synchronization fails, check the wiring and repeat from step 1.

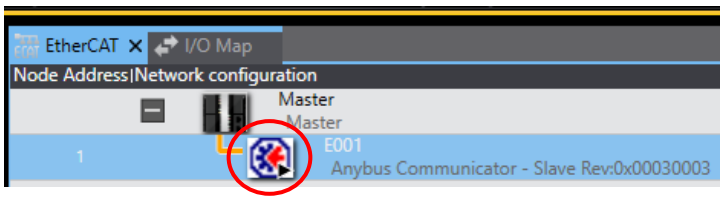
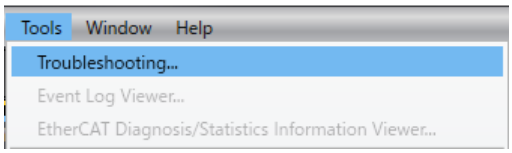
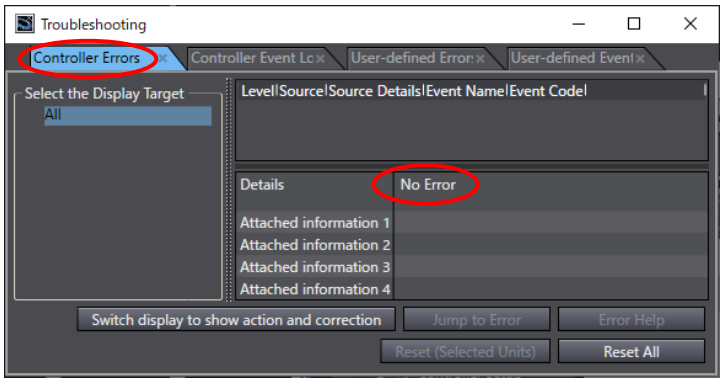
7.4. EtherCAT Communication Status Check

Confirm that PDO communications via EtherCAT is performed normally.

7.4.1. Checking the Connection Status

Check the EtherCAT connection status.

1	Check with the LED indicators on Controller that PDO communications via EtherCAT is performed normally. The 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.	 Built-in EtherCAT (Port 3) Status Indicators
2	Check the LED indicators on Communicator. The LED indicators in normal status are as follows: 1 RUN: Green lit 2 ERR: Not lit 3 Link/Activity 1: Green, flickering 4 Link/Activity 2: Not lit 5 Subnet status: Red lit 6 Device status: Green flashing *In this guide, the LED “5 Subnet status” is lit red as no connection is made via the sub-network. This LED status does not affect EtherCAT communications.	
3	Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.	

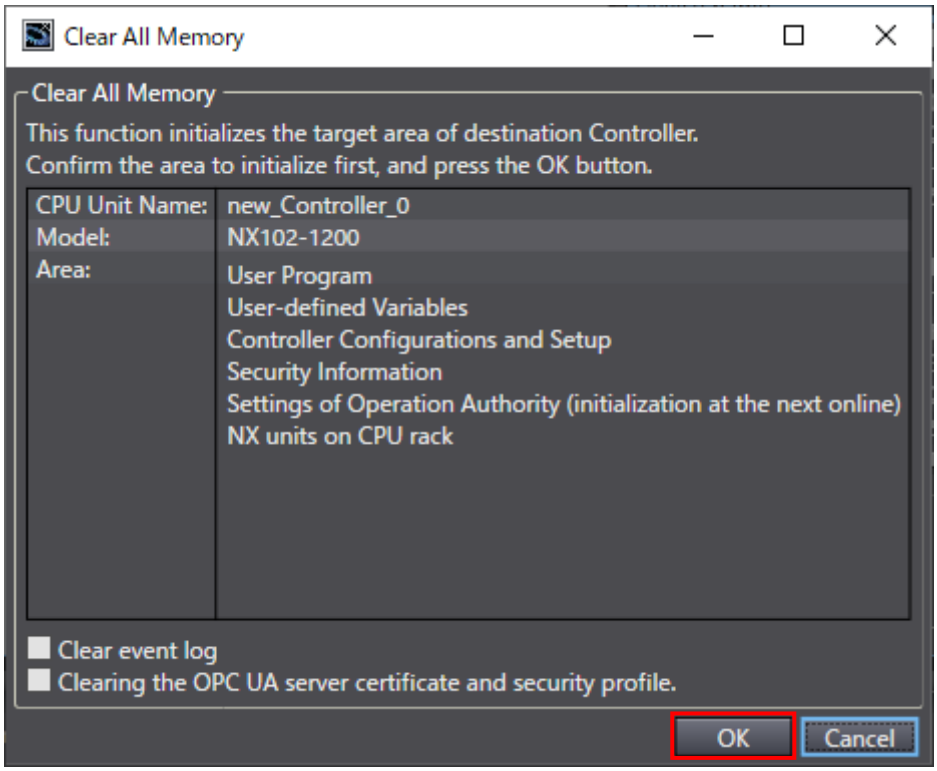
4	On the EtherCAT Tab Page displayed in the Edit Pane, check that the ▸ mark appears on the icon of Communicator. () *It indicates that EtherCAT communications is performed normally.	
5	Select ***Troubleshooting*** from the Tools Menu.	
6	The Troubleshooting Dialog Box appears. Check that "No Error" is displayed in the *Details* Field on the Controller Errors Tab Page. *The tab page reports "No Error" when there are no errors in EtherCAT communications.	

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 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	August 2013	First edition
02	March 2014	Correction of device variable names for input area Correction of erroneous description
03	September 2014	Changed some descriptions along with upgrading the NJ/NX-series Controllers, Sysmac Studio, Communicator and Anybus Configuration Manager. Changed the ESI file along with upgrading the Communicator. The procedure of "7.2. Setting Up HMS Communicator" is divided into "7.2.1. Hardware Settings “ and "7.2.2. Parameter Settings ".
04	March 2020	Changed some descriptions along with upgrading the NJ/NX-series Controllers and Sysmac Studio.

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