

Machine Automation Controller NJ-series

EtherCAT(R) Connection Guide

HMS Industrial Networks

Anybus X-gateway EtherCAT Slave

Network
Connection
Guide

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1. Related Manuals

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

The table below lists the manuals of HMS Industrial Networks (hereinafter referred to as HMS) and OMRON Corporation (hereinafter referred to as OMRON) related to this document.

Manufacturer	Cat. No.	Model	Manual name
OMRON	W500	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Hardware User's Manual
OMRON	W501	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Software User's Manual
OMRON	W505	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Built-in EtherCAT(R) Port User's Manual
OMRON	W504	SYSMAC-SE2□□□□	Sysmac Studio Version 1 Operation Manual
HMS	HMSI-27-262	—	User Manual Anybus X-gateway
HMS	HMSI-27-248	—	X-gateway Interface Addendum EtherCAT Slave
HMS	SP1747	—	Gateway Installation Sheet Anybus X-gateway
HMS	SP1766	—	Network Installation Sheet EtherCAT Slave Interface

2. Terms and Definitions

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

3. Precautions

- (1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing safety circuit in order to ensure safety and minimize risks of abnormal occurrence.
- (2) To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions and Precautions for Safe Use of manuals for each device which is used in the system.
- (3) The user is encouraged to confirm the standards and regulations that the system must conform to.
- (4) It is prohibited to copy, to reproduce, and to distribute a part or the whole of this document without the permission of OMRON Corporation.
- (5) The information contained in this document is current as of November 2014. It is subject to change without notice for improvement.

The following notation is used in this document.

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

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



Precautions for Correct Use

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



Additional Information

Additional information to read as required.

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

Symbol



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

4. Overview

This document describes the procedure for connecting Anybus X-gateway (hereinafter referred to as X-gateway) of HMS to NJ-series Machine Automation Controller (hereinafter referred to as Controller) of OMRON via EtherCAT and provides procedure for checking their connection.

Refer to *Section 6. EtherCAT Settings* and *Section 7. EtherCAT Connection Procedure* to understand the setting method and key points to operate PDO Communications of EtherCAT.

5. Applicable Devices and Device Configuration

5.1. Applicable Devices

The applicable devices are as follows:

Manufacturer	Name	Model
OMRON	NJ-series CPU Unit	NJ501-□□□□□ NJ301-□□□□□
HMS	Anybus X-gateway EtherCAT Slave	-



Precautions for Correct Use

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

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

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



Additional Information

For models of X-gateway series with EtherCAT Slave Interface, contact your HMS representative.



Additional Information

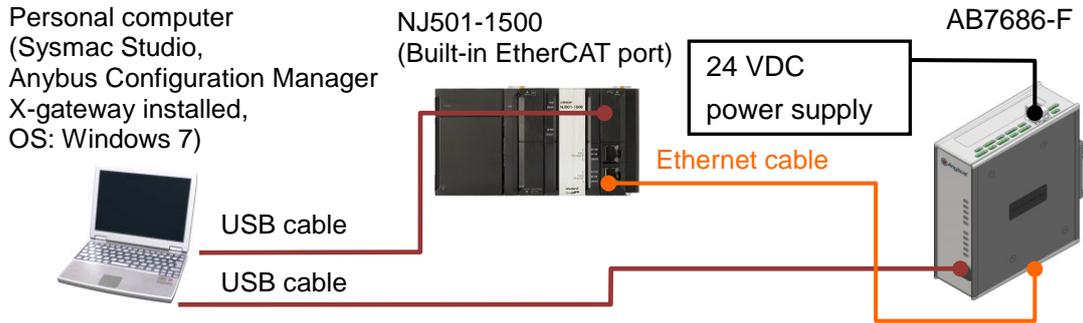
This document describes the procedure to establish the network connection. Except for the connection procedure, it does not provide information on operation, installation or wiring method. It also does not describe the functionality or operation of the devices. Refer to the manuals or contact the device manufacturer.

(HMS Industrial Networks <http://www.anybus.com/>)

This URL is the latest address at the time of this document creation. Contact each device manufacturer for the latest information.

5.2. Device Configuration

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



Manufacturer	Name	Model	Version
OMRON	CPU Unit (Built-in EtherCAT port)	NJ501-1500	Ver.1.09
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Sysmac Studio	SYSMAC-SE2[] [] [] []	Ver.1.10
-	Personal computer (OS: Windows 7)	-	
-	USB cable (USB 2.0 type B connector)	-	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-[]M[]-K	
HMS	Anybus X-gateway DeviceNet Adapter/Slave-EtherCAT Slave	AB7686-F	Ver.3.22
HMS	USB cable (USB 2.0 type B connector)	(Included in X-gateway)	
HMS	ESI file	ABXS_ECT_V_3_22_Fixe d_PDO_256bytes_for_OM RON_1.xml	
HMS	Anybus Configuration Manager X-gateway	-	Ver.1.1.1.5
-	24 VDC power supply	-	



Precautions for Correct Use

Prepare the ESI file shown in this section beforehand. The ESI file can be downloaded from HMS website.

<http://www.anybus.com/>

Contact HMS if the file is not available.



Precautions for Correct Use

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

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

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

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



Precautions for Correct Use

Update the Sysmac Studio to the version specified in this section or higher version using the auto update function.

If a version not specified in this section is used, the procedures described in *Section 7.* and subsequent sections may not be applicable. In that case, use the equivalent procedures described in the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).



Additional Information

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



Additional Information

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

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

6. EtherCAT Settings

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

Hereinafter, the X-gateway is referred as "Destination Device" or the "Slave Unit" in some descriptions.



Precautions for Correct Use

This document describes how to check the EtherCAT communications between the Controller and the X-gateway. However this does not describe how to make settings or checking for the DeviceNet communications in the X-gateway.

6.1. Parameter Settings

The parameters required connecting the Controller and the X-gateway via EtherCAT are given below.

Name	Setting item	Set value	Remarks
X-gateway	Node address	1	The node address is set by Sysmac Studio.
	Network Type(Upper)	DeviceNet Adapter/Slave	-
	Network Type(Lower)	EtherCAT Slave	-
	Output PDO Size	256Bytes	Fixed
	Input PDO Size	256Bytes	Fixed
	Control Word /Status Word	Disabled	Control Word and Status Word are disabled. (default setting)



Additional Information

DeviceNet Adapter is mounted on top and the EtherCAT Slave Interface is mounted on bottom of model AB7686-F that is used in this document.

The type and the mounted position of the interface differ depending on the device to use.



Additional Information

For details on EtherCAT-related parameters for the X-gateway, refer to *Chapter 4. CANopen Object Dictionary Implementation of the X-gateway Interface Addendum EtherCAT Slave (HMSI-27-248)*.

6.2. Device Variables

The PDO communications data for the Destination Device are allocated to the Controller's device variables.

The device variables and the data types are shown below.

■ Output area (from Controller to Destination Device)

Device variable name	Data type	Description
E001_Receive_PDO_1_Mapping _Output_Byte_1_2100_01	USINT	Output data to the X-gateway
E001_Receive_PDO_1_Mapping _Output_Byte_2_2100_02	USINT	
E001_Receive_PDO_1_Mapping _Output_Byte_3_2100_03	USINT	
·	·	
·	·	
·	·	
E001_Receive_PDO_1_Mapping _Output_Byte_128_2100_80	USINT	
E001_Receive_PDO_2_Mapping _Output_Byte_1_2101_01	USINT	
·	·	
·	·	
E001_Receive_PDO_2_Mapping _Output_Byte_128_2101_80	USINT	

■ Input area (from Destination Device to Controller)

Device variable name	Data type	Description
E001_Transmit_PDO_1_Mapping _Input_Byte_1_2000_01	USINT	Input data from the X-gateway
E001_Transmit_PDO_1_Mapping _Input_Byte_2_2000_02	USINT	
E001_Transmit_PDO_1_Mapping _Input_Byte_3_2000_03	USINT	
·	·	
·	·	
·	·	
E001_Transmit_PDO_1_Mapping _Input_Byte_128_2000_80	USINT	
E001_Transmit_PDO_2_Mapping _Input_Byte_1_2001_01	USINT	
·	·	
·	·	
E001_Transmit_PDO_2_Mapping _Input_Byte_128_2001_80	USINT	



Additional Information

For details on the I/O format, refer to *Chapter 3. Data Exchange of the X-gateway Interface Addendum EtherCAT Slave* (HMSI-27-248).



Additional Information

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

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

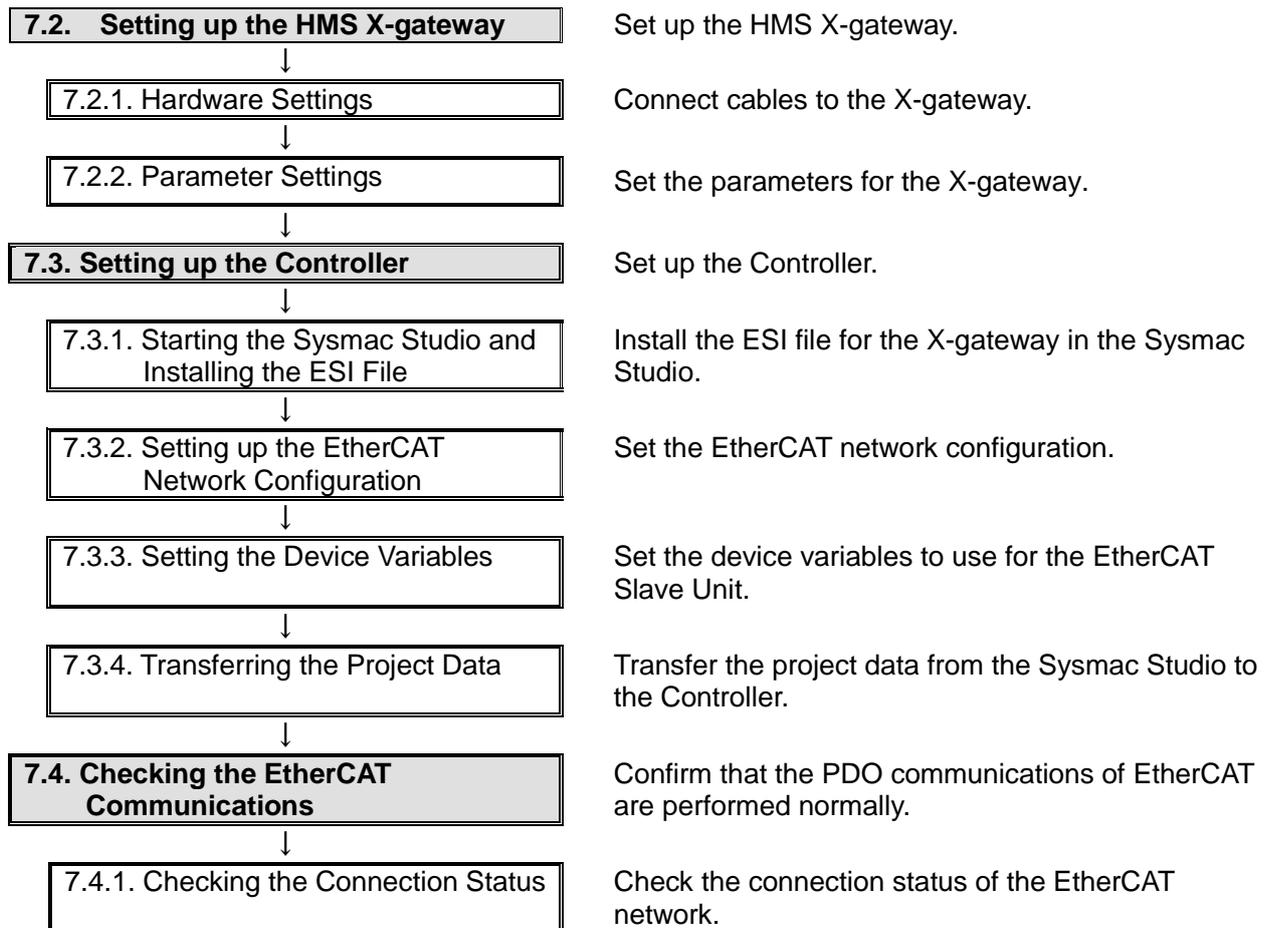
7. EtherCAT Connection Procedure

This section describes the procedure for connecting the Controller to the X-gateway via EtherCAT.

This document provides the explanation of the procedure for setting up the Controller based on the factory default setting. For the initialization, refer to *Section 8. Initialization Method*.

7.1. Work Flow

Take the following steps to perform PDO Communications of EtherCAT.



7.2. Setting up the HMS X-gateway

Set up the HMS X-gateway.

7.2.1. Hardware Settings

Connect cables to the X-gateway.



Precautions for Correct Use

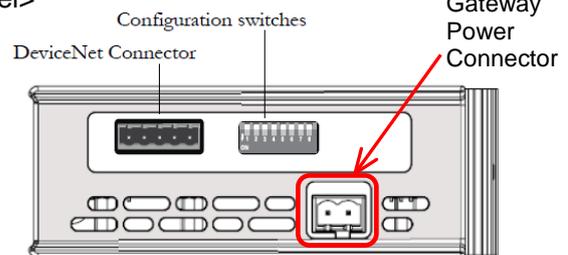
Make sure that the power supply is OFF when you perform the setting up.

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

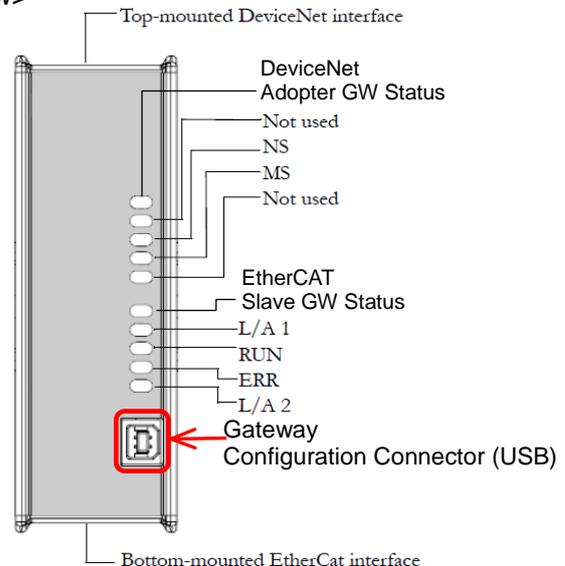
*If the power supply is turned ON, settings may not be applicable as described in the following procedures.

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

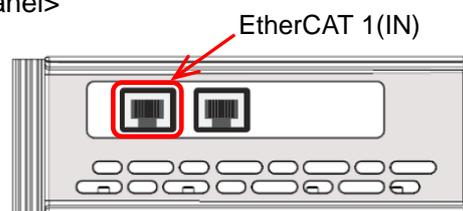
<Top Panel>



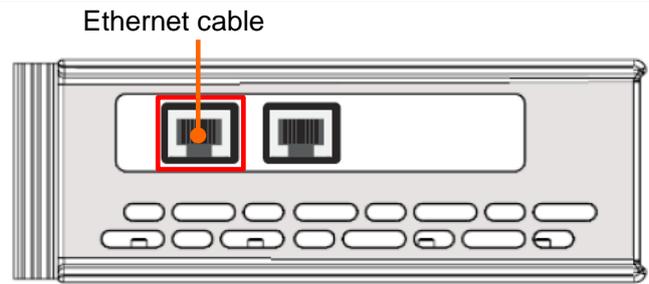
<Front View>



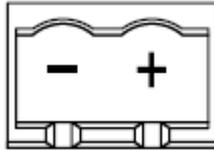
<Bottom Panel>



- 3 Connect the Ethernet cable to the ECAT 1(IN).



- 4 Connect the 24 VDC power supply to the Gateway Power Connector.



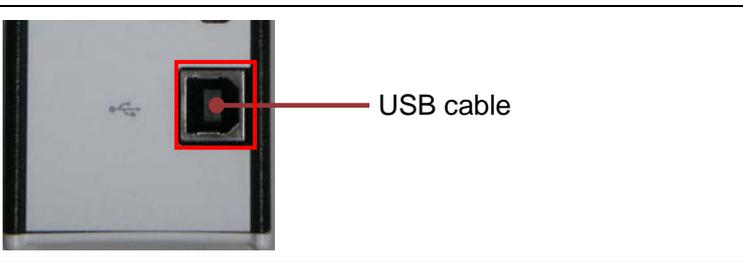
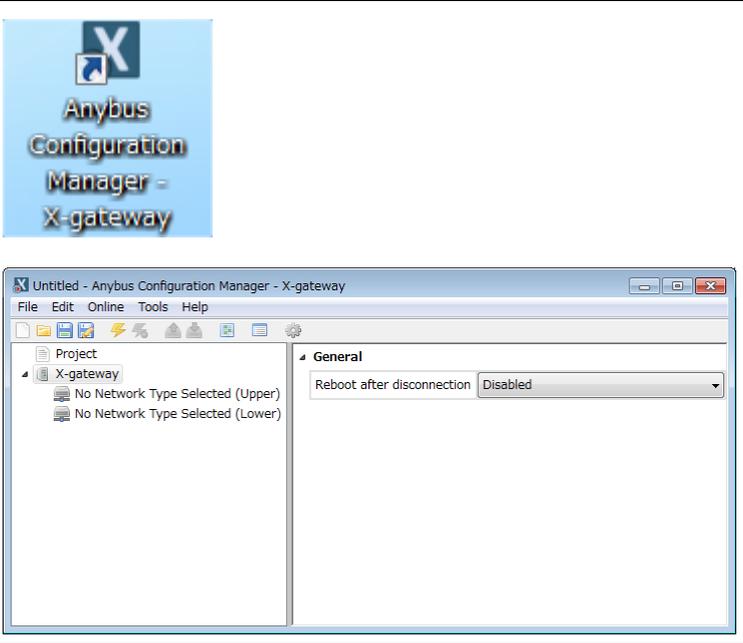
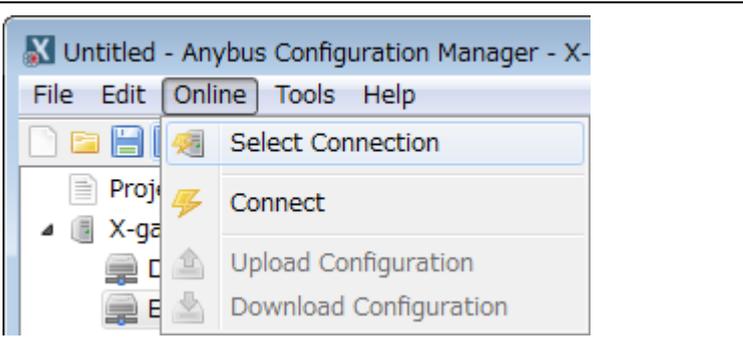
Pin	Signal
-	Ground
+	+24 VDC

7.2.2. Parameter Settings

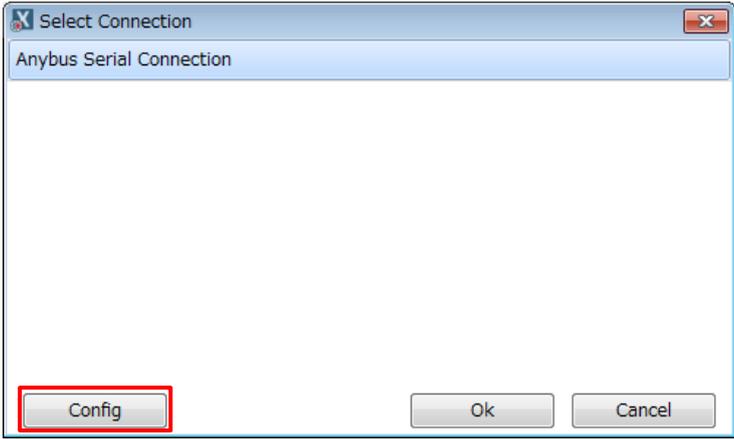
Set the parameters for the X-gateway.

Parameters are set by Anybus Configuration Manager X-gateway.

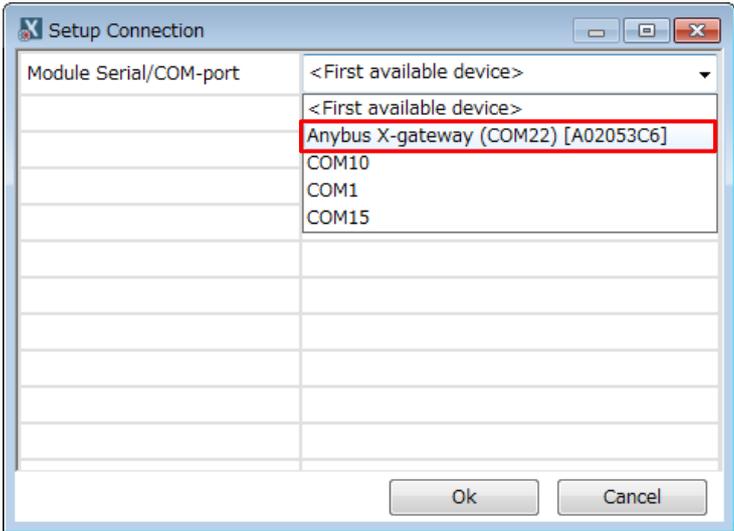
Install the software and USB Driver to the Personal computer beforehand.

<p>1 Connect the X-gateway and the Personal computer with a USB cable.</p>	
<p>2 Turn ON the power supply to the X-gateway.</p>	
<p>3 Start Anybus Configuration Manager X-gateway on the Personal computer.</p> <p>An Initial window of Anybus Configuration Manager X-gateway is displayed.</p>	
<p>4 Select Select Connection from the Online Menu.</p>	

- 5 Select Connection Dialog Box is displayed. Click the **Config** Button.

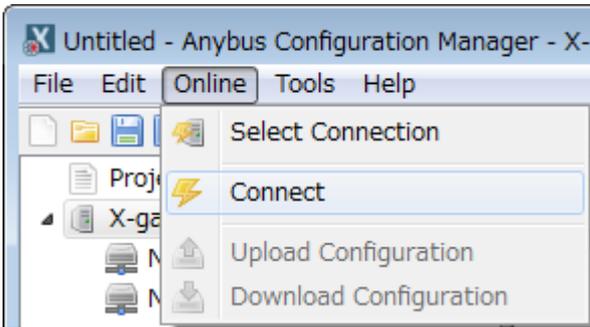

- 6 Setup Connection Dialog Box is displayed. Select **Anybus X-gateway** from the pull-down list for Module Serial/COM-port.

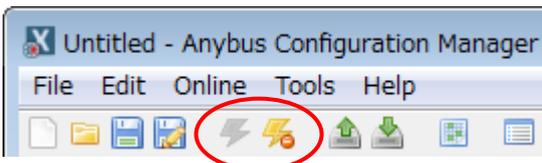
*Anybus X-gateway(COM22)[A02053C6] is selected in this document, however the numerical value of COMxx differs depending on the environment of the Personal computer to use.

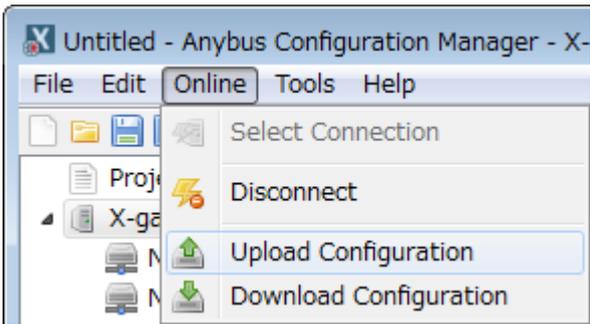
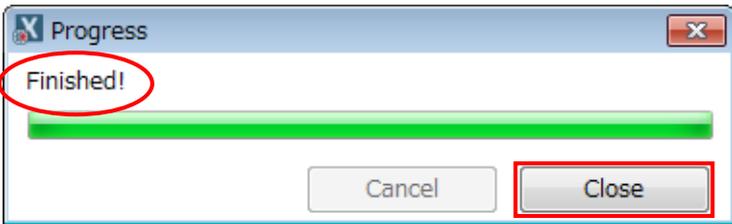
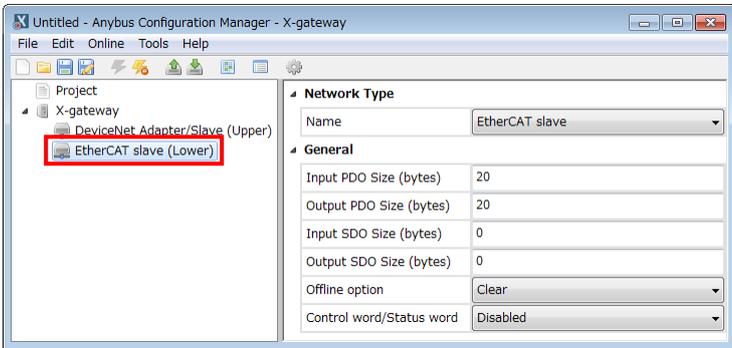
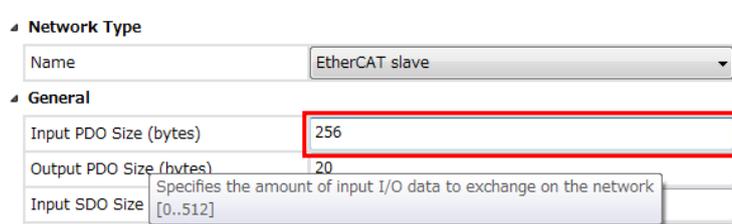
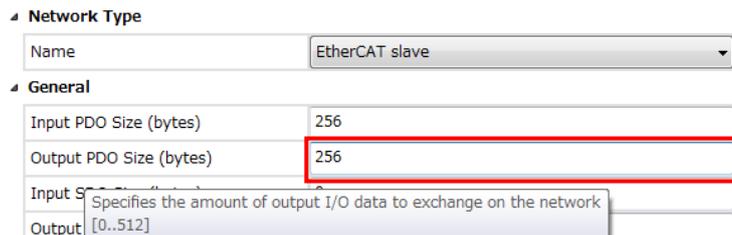

- 7 Click the **OK** Button to close the Setup Connection Dialog Box.


- 8 Click the **OK** Button to close the Select Connection Dialog Box.

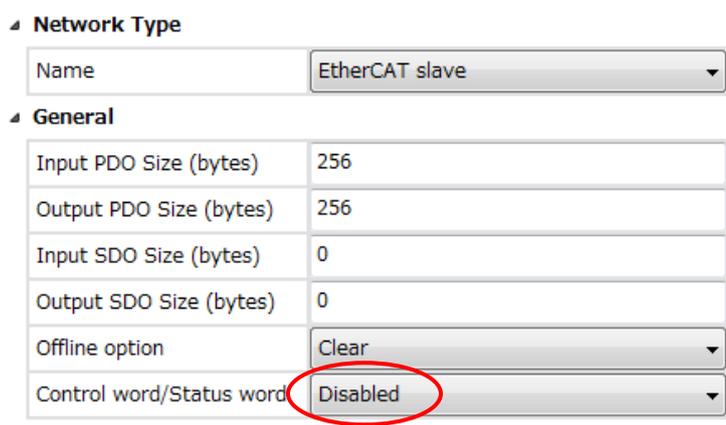

- 9 Select **Connect** from the Online Menu.


- 10 Check that the Connect Button on the toolbar is invalid and the Disconnect Button is valid.



- | | | |
|------------------|--|--|
| <p>11</p> | <p>Select Upload Configuration from the Online Menu.</p> |  |
| <p>12</p> | <p>Progress Window is displayed and the uploading the settings starts.
Check that Finished! is displayed. Click the Close Button.</p> |  |
| <p>13</p> | <p>Select EtherCAT Slave (Lower) from the X-gateway in the left structure.</p> |  |
| <p>14</p> | <p>Parameters of EtherCAT Slave are displayed on the right.
Enter 256 as the Input PDO Size (bytes) in the <i>General</i> Field.</p> |  |
| <p>15</p> | <p>Enter 256 as the Output PDO Size (bytes) in the <i>General</i> Field.</p> |  |

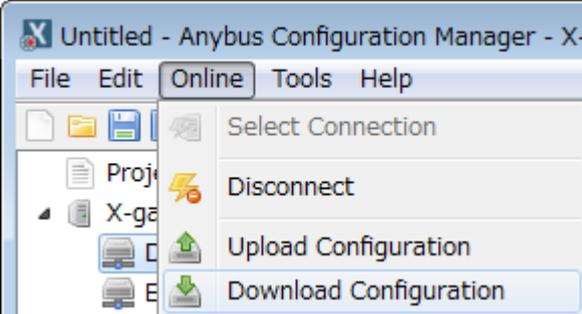
16 Check that Control word/Status word is Disabled in the *General* Field.



The screenshot shows a configuration window with the following settings:

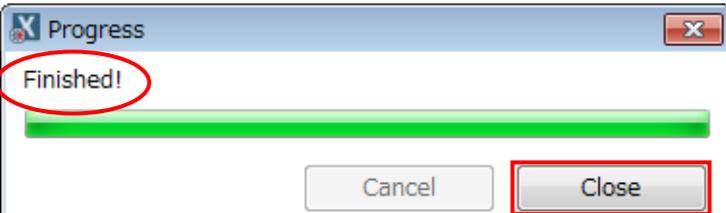
- Network Type**
 - Name: EtherCAT slave
- General**
 - Input PDO Size (bytes): 256
 - Output PDO Size (bytes): 256
 - Input SDO Size (bytes): 0
 - Output SDO Size (bytes): 0
 - Offline option: Clear
 - Control word/Status word: Disabled

17 Select **Download Configuration** from the Online Menu.



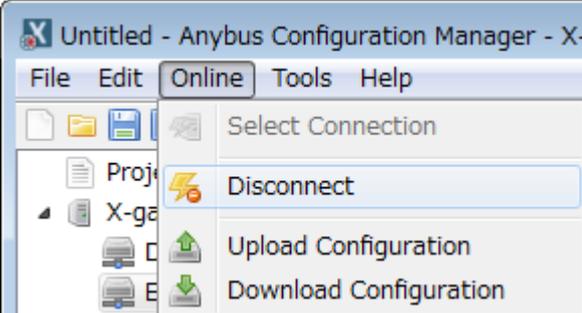
The screenshot shows the 'Online' menu of the configuration manager. The 'Download Configuration' option is highlighted.

18 Progress Window is displayed and the downloading the settings starts. Check that Finished! is displayed. Click the **Close** Button.



The screenshot shows a 'Progress' dialog box with a green progress bar. The text 'Finished!' is displayed above the bar, and the 'Close' button is highlighted with a red box.

19 Select **Disconnect** from the Online Menu.



The screenshot shows the 'Online' menu of the configuration manager. The 'Disconnect' option is highlighted.

20 Turn OFF the power supply to the X-gateway and remove the USB cable.

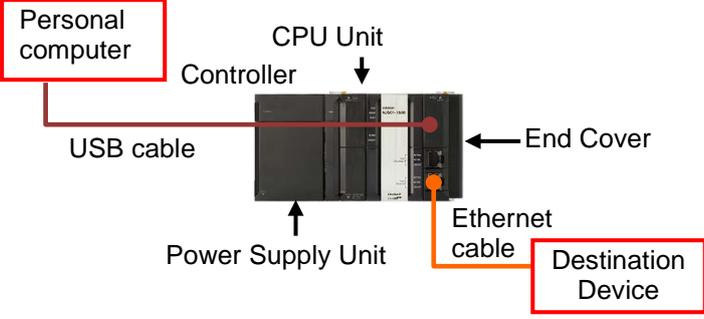
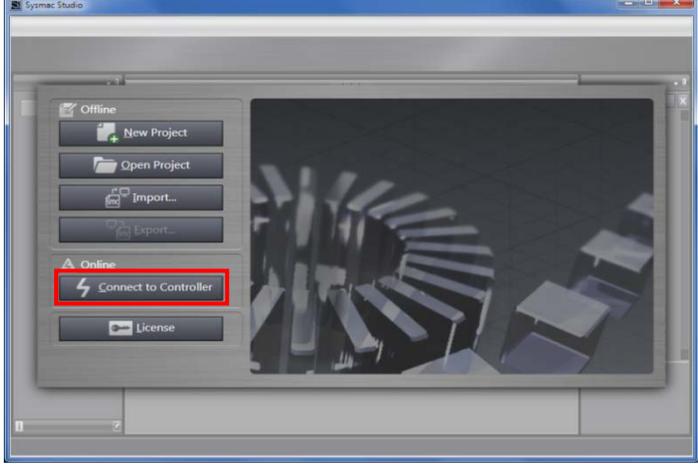
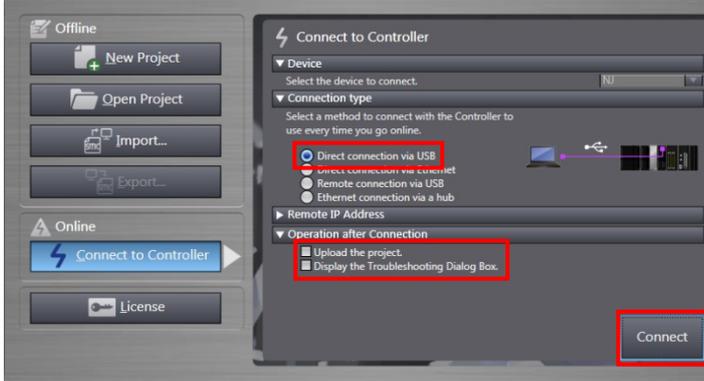
7.3. Setting up the Controller

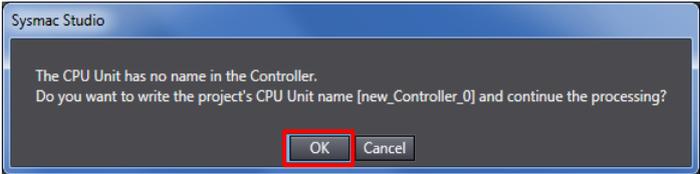
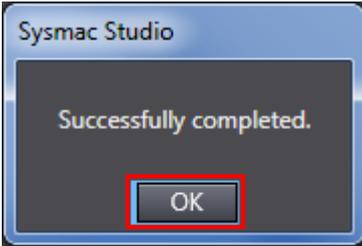
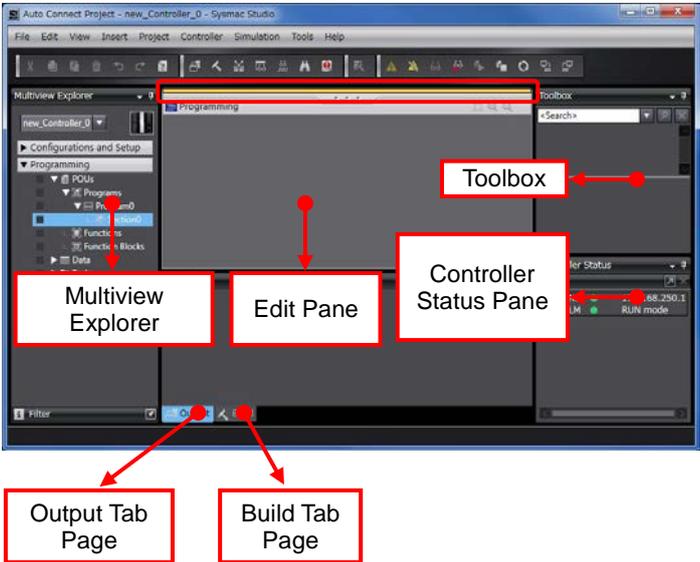
Set up the Controller.

7.3.1. Starting the Sysmac Studio and Installing the ESI File

Install the ESI file for the X-gateway in the Sysmac Studio.

Install the Sysmac Studio and USB driver in the Personal computer beforehand.

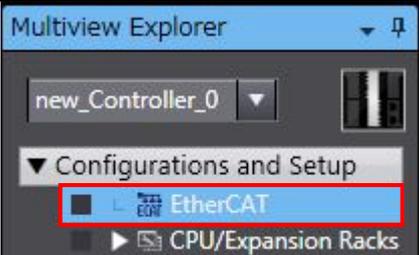
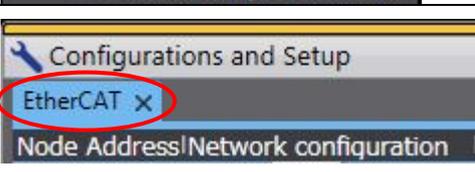
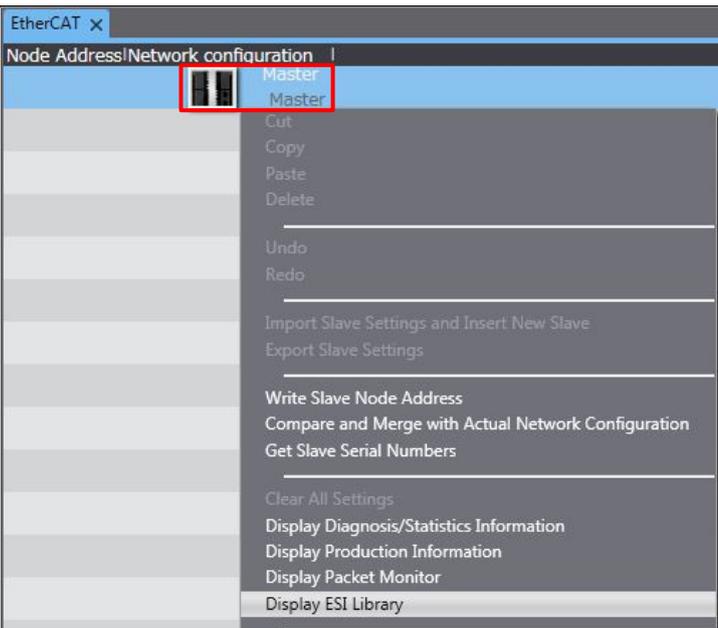
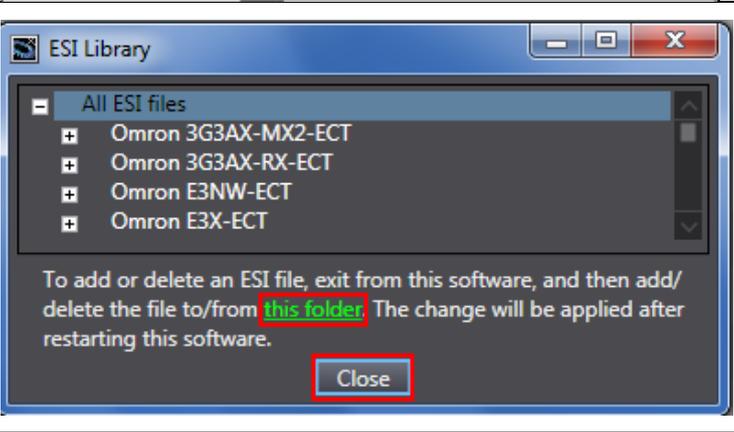
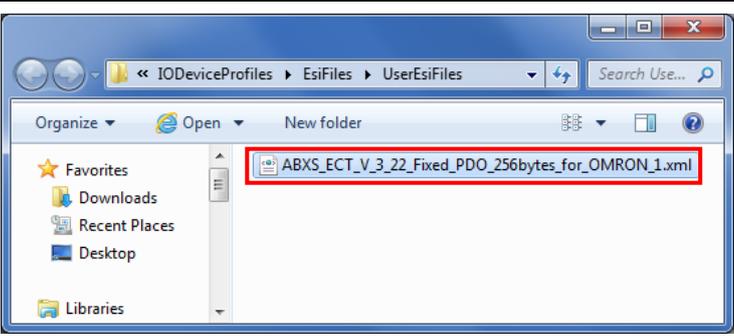
<p>1 Connect the Ethernet cable to the built-in EtherCAT port (PORT2) of the Controller, and connect the USB cable to the peripheral (USB) port. As shown in <i>Section 5.2. Device Configuration</i>, connect the Personal computer, the Destination Device, and the Controller.</p>	
<p>2 Turn ON the power supply to the Controller and the X-gateway.</p>	
<p>3 Start the Sysmac Studio.</p> <p>*If a confirmation dialog for an access right is displayed at start, execute a selection to start.</p>	
<p>4 The Sysmac Studio starts. Click the Connect To Controller Button.</p>	
<p>5 The Connect To Controller Dialog Box is displayed. Select the <i>Direct connection via USB</i> Option of Connection type. Uncheck both the <i>Upload the project</i> Check Box and the <i>Display the Troubleshooting Dialog Box</i> Check Box of Operation after Connection.</p> <p>Click the Connect Button.</p>	

<p>6</p>	<p>Check the contents and click the OK Button if a confirmation dialog box on the right is displayed.</p> <p>*The displayed dialog depends on the status of the Controller used. Check the contents and click the OK or Yes Button to proceed with the processing.</p>	
<p>7</p>	<p>A dialog box on the right is displayed. Check the contents and click the OK Button.</p>	
<p>8</p>	<p>The Auto Connect Project Dialog Box is displayed online. When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.</p> <p>The following panes are displayed in this window.</p> <ul style="list-style-type: none"> Left: Multiview Explorer Top right: Toolbox Bottom right: Controller Status Pane Middle top: Edit Pane <p>The following tab pages are displayed at the middle bottom of the window.</p> <ul style="list-style-type: none"> Output Tab Page Build Tab Page 	



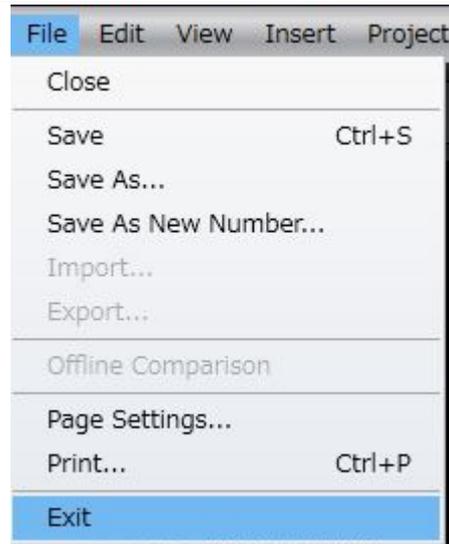
Additional Information

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

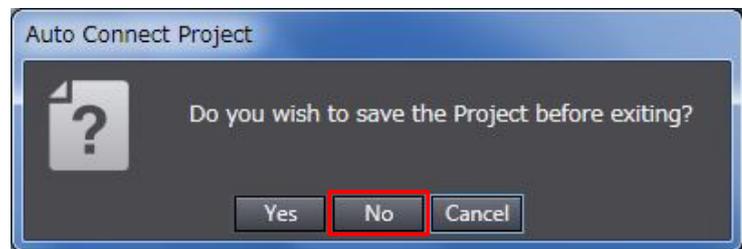
<p>9</p>	<p>Double-click EtherCAT under Configurations and Setup in the Multiview Explorer.</p>	
<p>10</p>	<p>The EtherCAT Tab Page is displayed in the Edit Pane.</p>	
<p>11</p>	<p>Right-click Master and select Display ESI Library.</p>	
<p>12</p>	<p>The ESI Library Dialog Box is displayed. Click the this folder link.</p> <p>When the Explorer starts, click the Close Button to close the dialog box.</p>	
<p>13</p>	<p>The Explorer starts, and a folder for installing the ESI file is opened.</p> <p>Copy the prepared ESI file <i>ABXS_ECT_V_3_22_Fixed_PD O_256bytes_for_OMRON_1.xml</i> / to this folder.</p>	

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

*After installing the ESI file, the Sysmac Studio needs to be restarted.



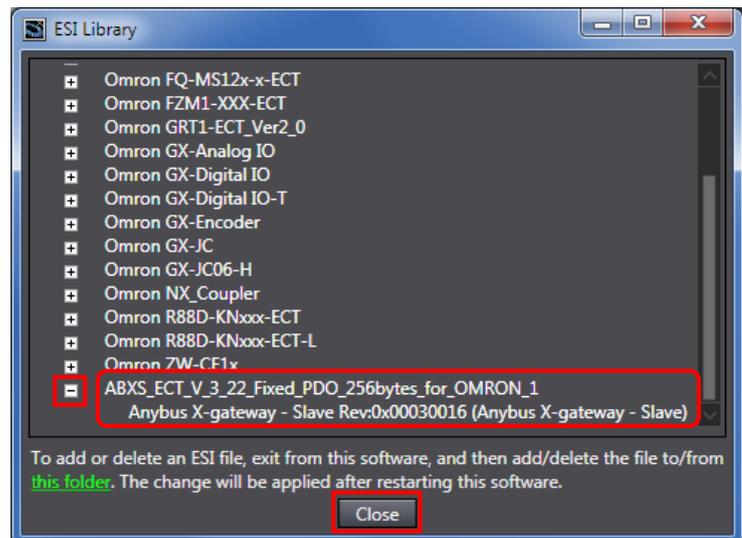
A dialog box asking to save the project is displayed. If no need to save it, click the **No** Button.



- 15 In the same way as steps 3 to 11, restart the Sysmac Studio and display the ESI Library Dialog Box. Click the **+** Button of *ABXS_ECT_V_3_22_Fixed_PD O_256bytes_for_OMRON_1* to confirm that Anybus X-gateway - Slave Rev:0xx00030016 device is displayed.

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

Click the **Close** Button.



Precautions for Correct Use

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

7.3.2. Setting up the EtherCAT Network Configuration

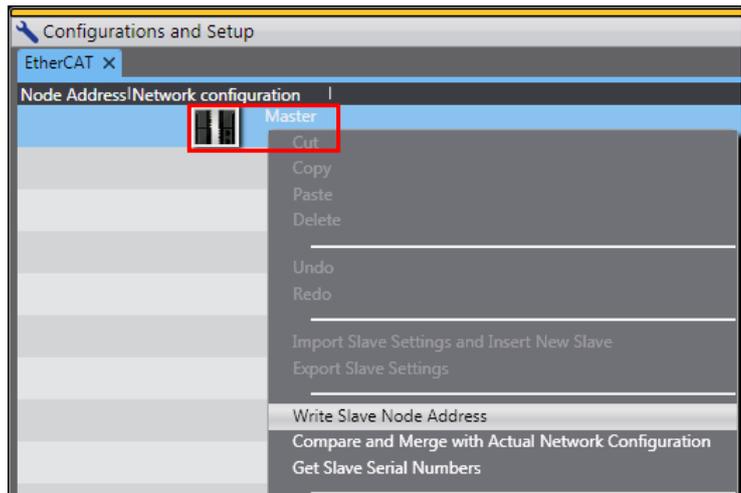
Set the EtherCAT network configuration.

Caution

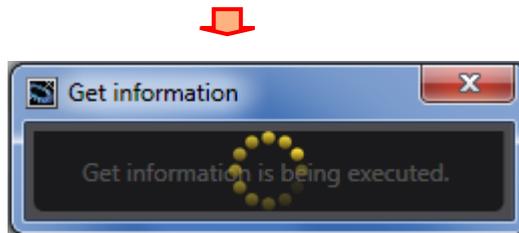
Cycle the power supply to the Slave Unit in step 6. Always confirm safety before cycling the power supply.

- 1 Right-click **Master** on the EtherCAT Tab Page, and select **Write Slave Node Address**.

*If the EtherCAT Tab Page is not displayed on the Edit Pane, take step 9 in Section 7.3.1. *Starting the Sysmac Studio and Installing the ESI file to display.*

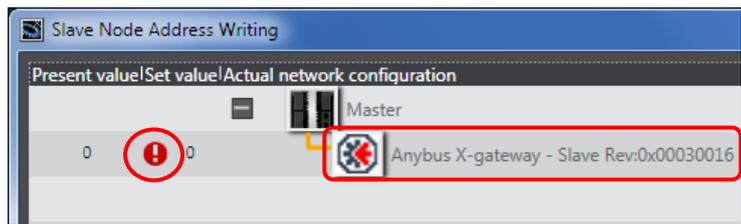


A screen is displayed stating "Get information is being executed".

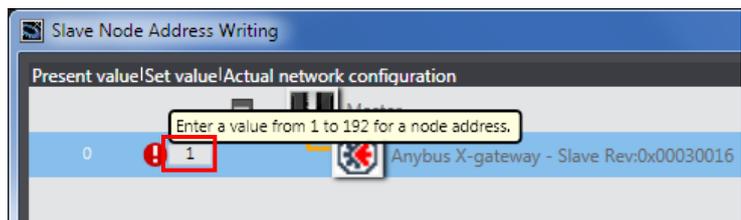


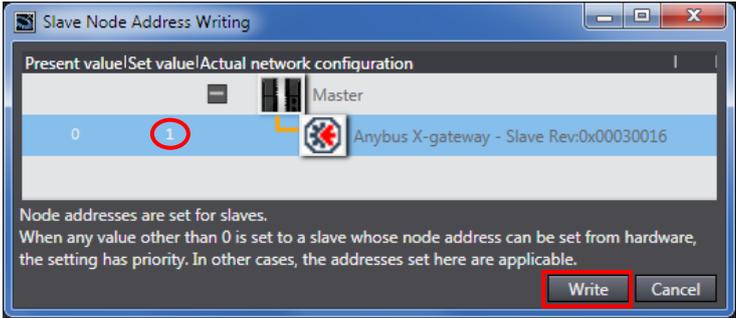
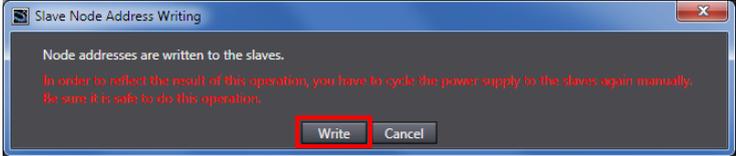
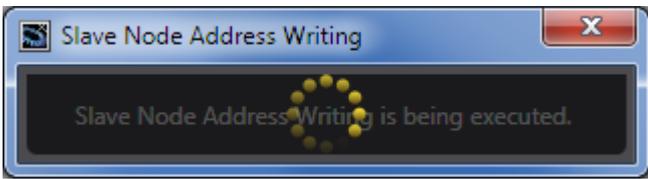
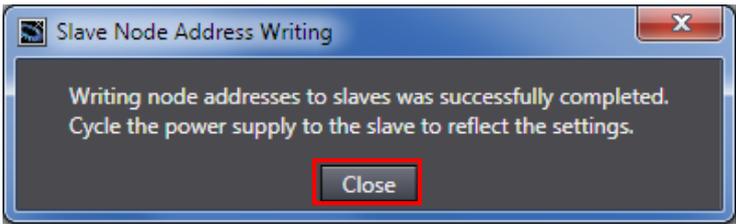
- 2 The Slave Node Address Writing Dialog Box is displayed. Anybus X-gateway - Slave Rev:0x00030016 is displayed in the Actual network configuration.

*If the present value of the node address is 0, an error is displayed with mark.

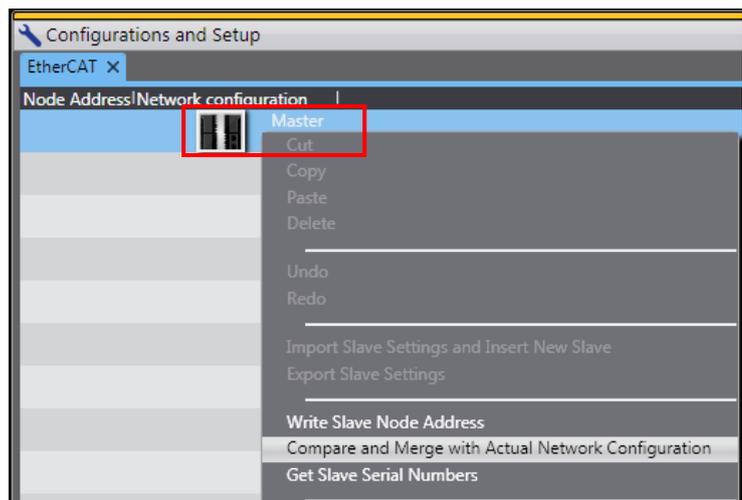


- 3 Enter 1 in the Set value Field for a node address.

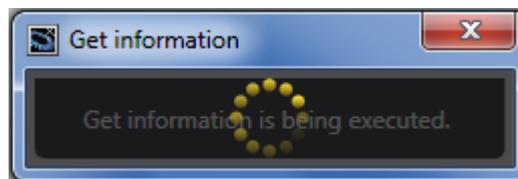


<p>4 Confirm that no error is displayed and the set value is 1. Click the Write Button.</p>	
<p>5 The Slave Node Address Writing Dialog Box is displayed. Check the contents and click the Write Button.</p> <p>A screen is displayed stating "Slave Node Address Writing is being executed".</p> <p>The dialog box on the right is displayed. Check the contents and click the Close Button.</p>	 <p style="text-align: center;">↓</p>  <p style="text-align: center;">↓</p> 
<p>6 Cycle the power supply to the Slave Unit.</p>	

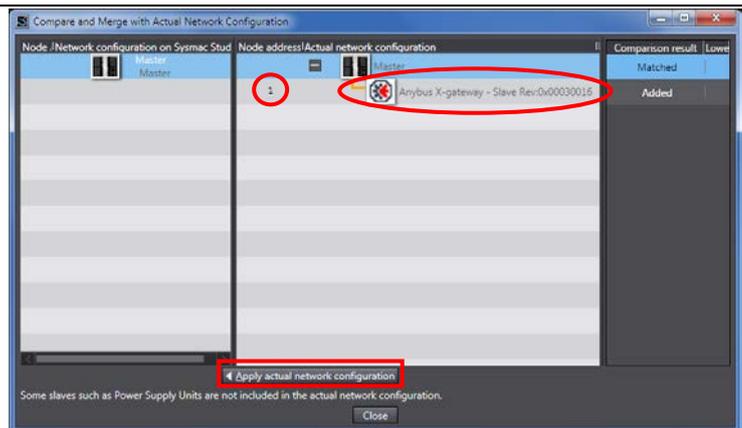
- 7 Right-click **Master** on the EtherCAT Tab Page, and select **Compare and Merge with Actual Network Configuration**.



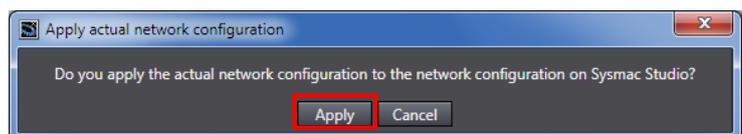
A screen is displayed stating "Get information is being executed".



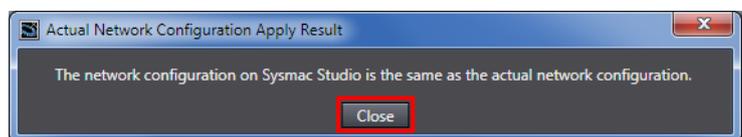
- 8 The Compare and Merge with Actual Network Configuration Dialog Box is displayed. Node address 1 and Anybus X-gateway - Slave Rev:0x00030016 are added to a real network configuration after the comparison. Click the **Apply actual network configuration** Button.



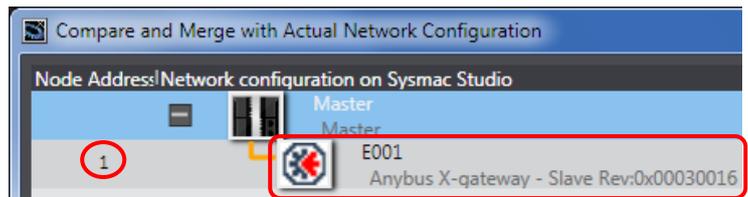
- 9 A confirmation dialog box is displayed. Check the contents and click the **Apply** Button.



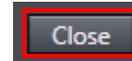
The dialog box on the right is displayed. Click the **Close** Button.



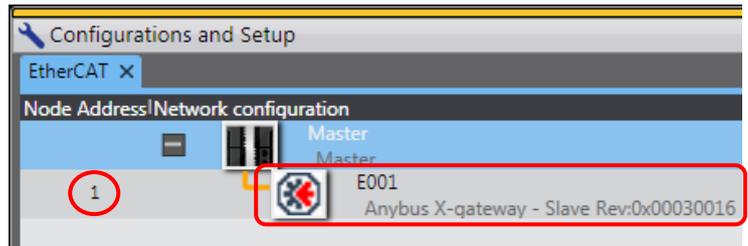
10 As a node address 1 slave, Anybus X-gateway - Slave Rev:0x00030016 is added to the Network configuration on the Sysmac Studio.



Confirm that the data above are added, and click the **Close** Button.

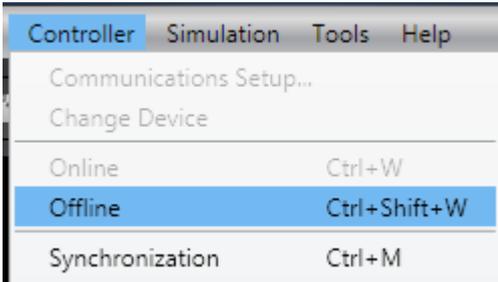
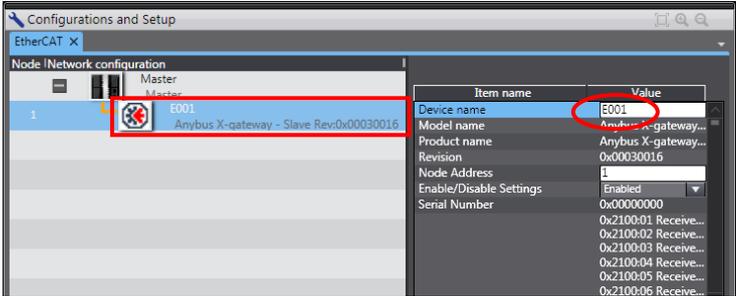
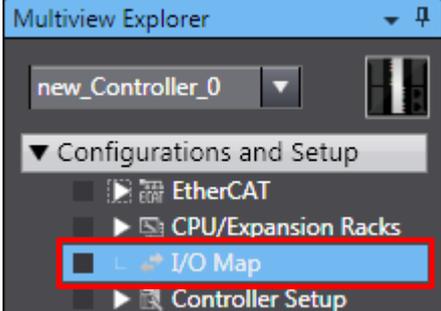
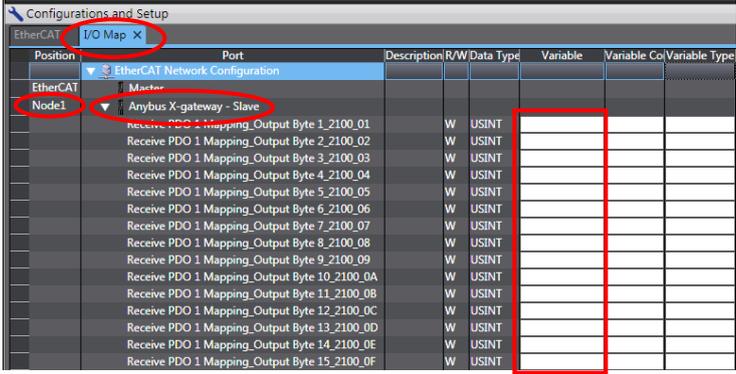


11 Node address 1 and E001 Anybus X-gateway – Slave Rev:0x00030016 are added to the EtherCAT Tab Page on the Edit Pane.

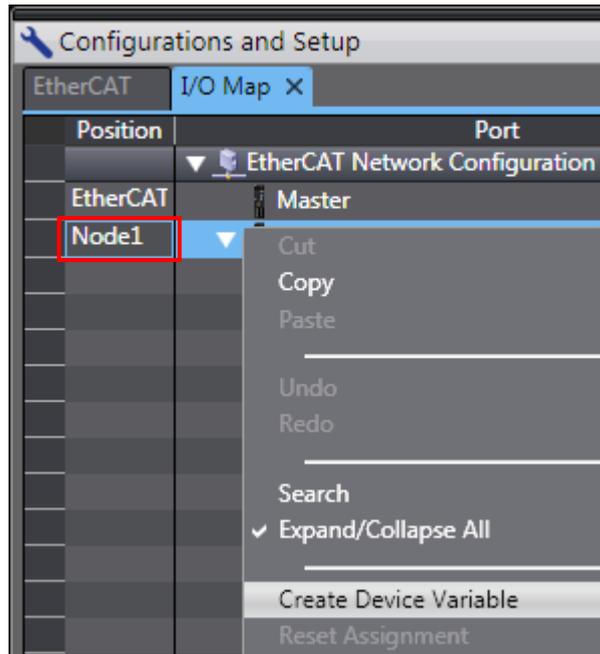


7.3.3. Setting the Device Variables

Set the device variables to use for the EtherCAT Slave Unit.

<p>1 Select Offline from the Controller Menu.</p> <p>The yellow bar on the top disappears.</p>																																																																																																																															
<p>2 Select <i>Anybus X-gateway - Slave</i> added in the previous section on the EtherCAT Tab Page.</p> <p>Check that the device name is E001.</p> <p>*The device name can be arbitrarily changed.</p>																																																																																																																															
<p>3 Double-click I/O Map under Configurations and Setup in the Multiview Explorer.</p>																																																																																																																															
<p>4 The I/O Map Tab Page is displayed on the Edit Pane. Confirm that Node1 is displayed in the <i>Position</i> Column and the Slave Unit added in the <i>Port</i> Column is displayed.</p> <p>*To manually set a variable name for the Slave Unit, click a column under the <i>Variable</i> Column and enter a name.</p>	 <table border="1" data-bbox="708 1429 1444 1803"> <thead> <tr> <th>Position</th> <th>Port</th> <th>Description/R/W</th> <th>Data Type</th> <th>Variable</th> <th>Variable Co</th> <th>Variable Type</th> </tr> </thead> <tbody> <tr> <td>EtherCAT</td> <td>Master</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Node1</td> <td>Anybus X-gateway - Slave</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 1_2100_01</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 2_2100_02</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 3_2100_03</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 4_2100_04</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 5_2100_05</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 6_2100_06</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 7_2100_07</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 8_2100_08</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 9_2100_09</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 10_2100_0A</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 11_2100_0B</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 12_2100_0C</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 13_2100_0D</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 14_2100_0E</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>Receive PDO 1 Mapping_Output Byte 15_2100_0F</td> <td>W</td> <td>USINT</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Position	Port	Description/R/W	Data Type	Variable	Variable Co	Variable Type	EtherCAT	Master						Node1	Anybus X-gateway - Slave							Receive PDO 1 Mapping_Output Byte 1_2100_01	W	USINT					Receive PDO 1 Mapping_Output Byte 2_2100_02	W	USINT					Receive PDO 1 Mapping_Output Byte 3_2100_03	W	USINT					Receive PDO 1 Mapping_Output Byte 4_2100_04	W	USINT					Receive PDO 1 Mapping_Output Byte 5_2100_05	W	USINT					Receive PDO 1 Mapping_Output Byte 6_2100_06	W	USINT					Receive PDO 1 Mapping_Output Byte 7_2100_07	W	USINT					Receive PDO 1 Mapping_Output Byte 8_2100_08	W	USINT					Receive PDO 1 Mapping_Output Byte 9_2100_09	W	USINT					Receive PDO 1 Mapping_Output Byte 10_2100_0A	W	USINT					Receive PDO 1 Mapping_Output Byte 11_2100_0B	W	USINT					Receive PDO 1 Mapping_Output Byte 12_2100_0C	W	USINT					Receive PDO 1 Mapping_Output Byte 13_2100_0D	W	USINT					Receive PDO 1 Mapping_Output Byte 14_2100_0E	W	USINT					Receive PDO 1 Mapping_Output Byte 15_2100_0F	W	USINT			
Position	Port	Description/R/W	Data Type	Variable	Variable Co	Variable Type																																																																																																																									
EtherCAT	Master																																																																																																																														
Node1	Anybus X-gateway - Slave																																																																																																																														
	Receive PDO 1 Mapping_Output Byte 1_2100_01	W	USINT																																																																																																																												
	Receive PDO 1 Mapping_Output Byte 2_2100_02	W	USINT																																																																																																																												
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	Receive PDO 1 Mapping_Output Byte 12_2100_0C	W	USINT																																																																																																																												
	Receive PDO 1 Mapping_Output Byte 13_2100_0D	W	USINT																																																																																																																												
	Receive PDO 1 Mapping_Output Byte 14_2100_0E	W	USINT																																																																																																																												
	Receive PDO 1 Mapping_Output Byte 15_2100_0F	W	USINT																																																																																																																												

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



- 6 The variable names and variable types are set.

Position	Port	Description/R/W Data Type	Variable	Variable Co	Variable Type
EtherCAT	Master				
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_1_2100_01		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_2_2100_02		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_3_2100_03		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_4_2100_04		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_5_2100_05		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_6_2100_06		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_7_2100_07		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_8_2100_08		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_9_2100_09		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_10_2100_0A		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_11_2100_0B		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_12_2100_0C		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_13_2100_0D		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_14_2100_0E		Global Variables
Node1	Receive PDO 1 Mapping Output	W USINT	E001_Receive_PDO_1_Mapping_Output_Byte_15_2100_0F		Global Variables



Additional Information

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

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



Additional Information

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

Device variables can also be manually named for ports.

7.3.4. Transferring the Project Data

Transfer the project data from the Sysmac Studio to the Controller.

WARNING

Always confirm safety at the Destination Device before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio.

The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.



Caution

After you transfer the user program, the CPU Unit restarts and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration.

Before you transfer the user program, confirm that it will not adversely affect the device.

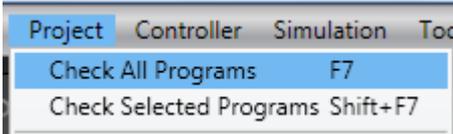


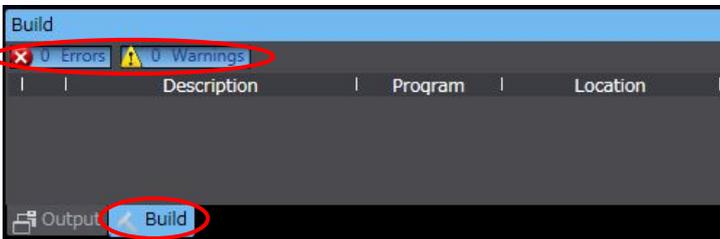
Caution

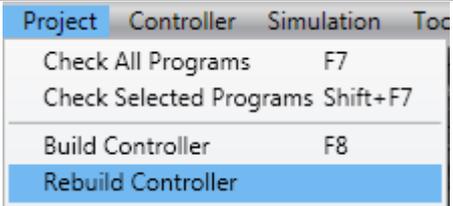
A slave will be reset after performing the synchronization in step 7 and subsequent steps. Always confirm safety before performing the synchronization.



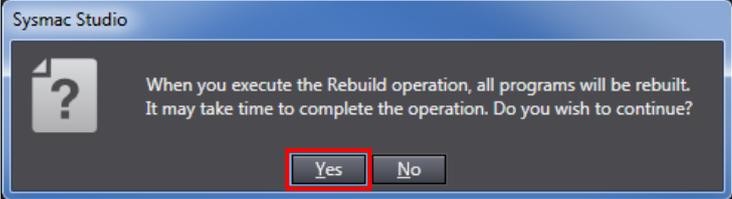
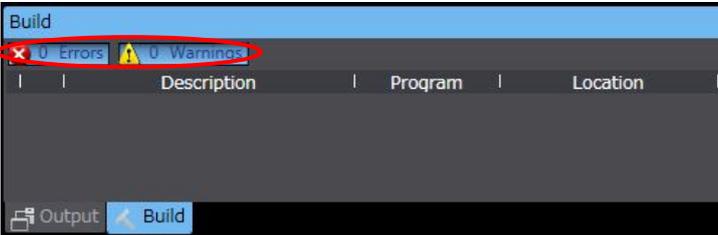
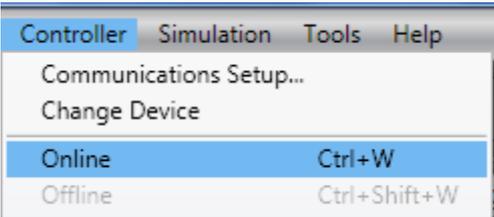
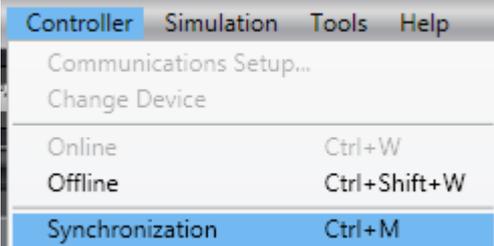
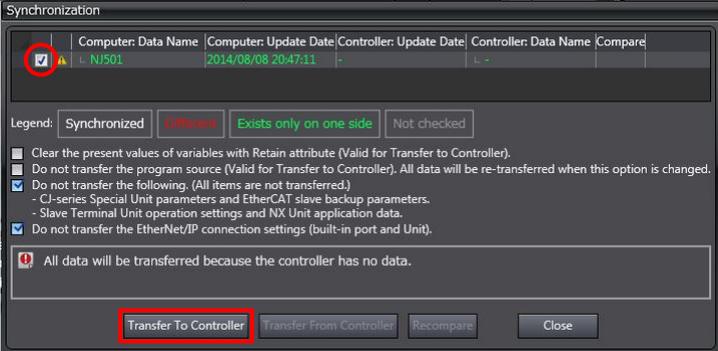
- 1 Select **Check All Programs** from the Project Menu.


- 2 The Build Tab Page is displayed. Check that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.

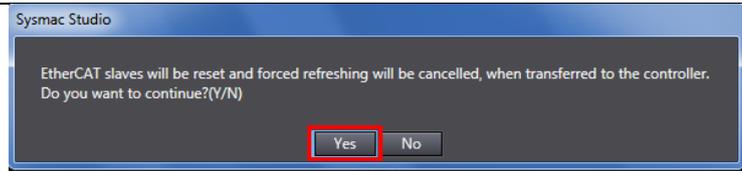

- 3 Select **Rebuild Controller** from the Project Menu.



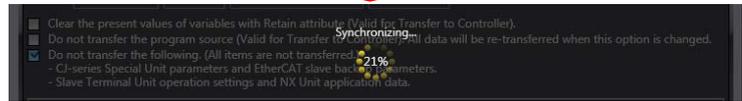
7. EtherCAT Connection Procedure

4	<p>A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the Yes Button.</p>	 <p>The dialog box asks: "When you execute the Rebuild operation, all programs will be rebuilt. It may take time to complete the operation. Do you wish to continue?" The "Yes" button is highlighted with a red box.</p>
5	<p>Check that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.</p>	 <p>The Build Tab Page shows "0 Errors" and "0 Warnings" with a red circle around the status indicators.</p>
6	<p>Select Online from the Controller Menu.</p>	 <p>The Controller menu is open, and "Online" is selected. A red arrow points down to the next screenshot.</p>  <p>A yellow bar is displayed on the top of the Edit Pane, labeled "Configurations and Setup".</p>
7	<p>Select Synchronization from the Controller Menu.</p>	 <p>The Controller menu is open, and "Synchronization" is selected.</p>
8	<p>The Synchronization Dialog Box is displayed. Confirm that the data to transfer (NJ501 in the right dialog box) is selected. Then, click the Transfer to Controller Button.</p> <p>*After executing the Transfer To Controller, the Sysmac Studio data is transferred to the Controller and the data is compared.</p>	 <p>The Synchronization dialog box is shown. The "NJ501" entry is selected in the table. The "Transfer To Controller" button is highlighted with a red box.</p>

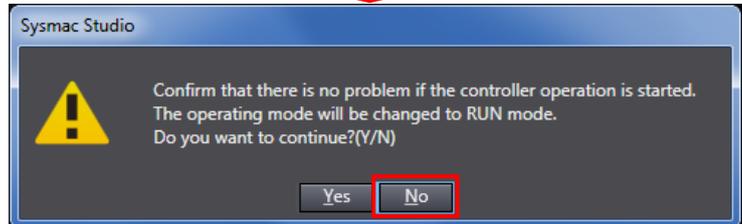
- 9 A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.



A screen stating "Synchronizing" is displayed.

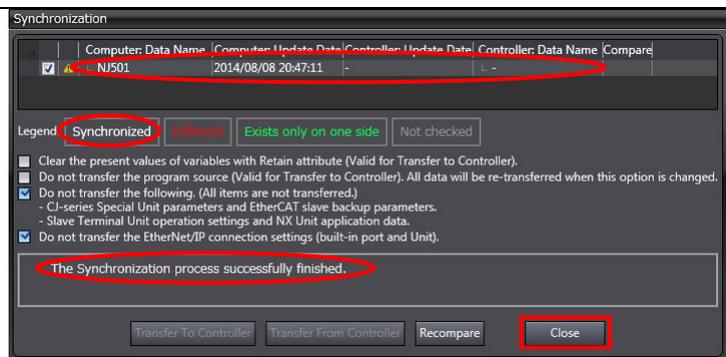


A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **No** Button.



*Do not return to RUN mode.

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



*A message stating "The synchronization process successfully finished" is displayed if the Sysmac Studio project data and the Controller data conform each other.

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

7.4. Checking the EtherCAT Communications

Confirm that the PDO communications of EtherCAT are performed normally.

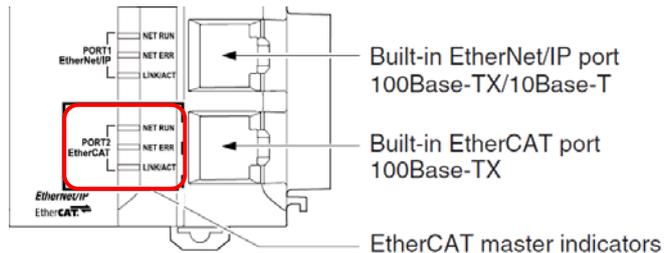
7.4.1. Checking the Connection Status

Check the connection status of the EtherCAT network.

- 1 Confirm that PDO communications via EtherCAT are performed normally by checking the LED indicators on the Controller.

The LED indicators in normal status are as follows:

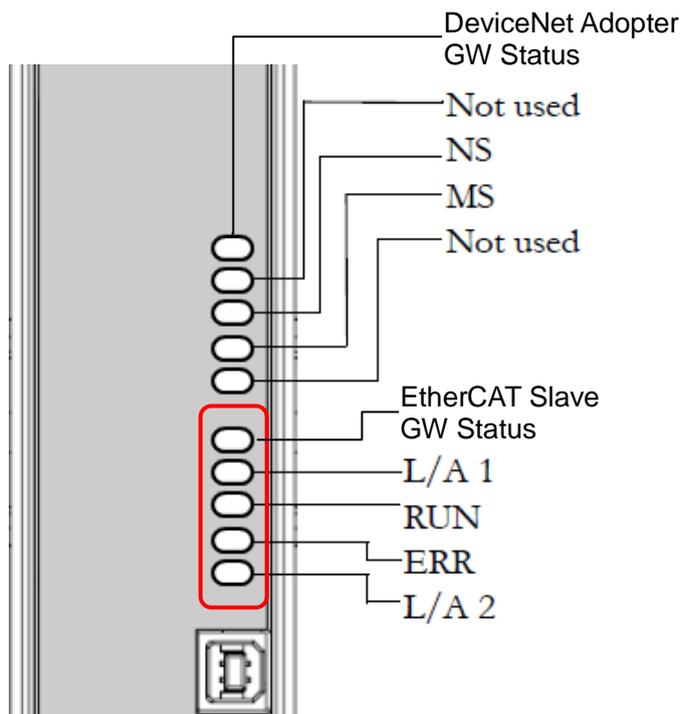
- NET RUN: Green lit
- NET ERR: Not lit
- LINK/ACT: Yellow flashing



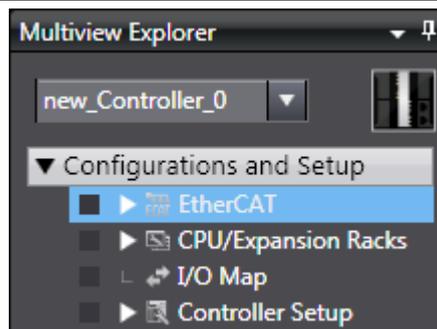
- 2 Check the LEDs of X-gateway.

The LED indicators in normal status are as follows:

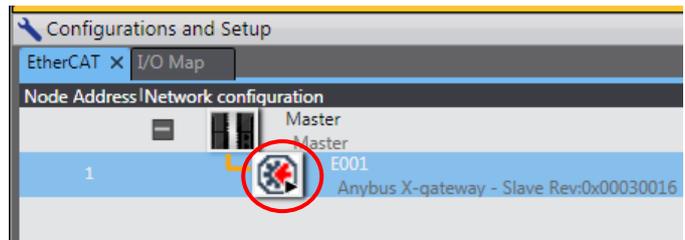
- EtherCAT Slave
- GW Status : Green lit
 - L/A1 : Green flickering
 - RUN : Green lit
 - ERR : Off
 - L/A2 : Off



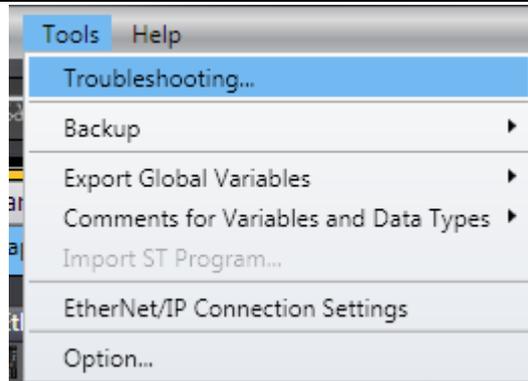
- 3 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.



- 4 The  icon for E001 is displayed on the Edit Pane.
- Confirm that the  mark which indicates normal communications of EtherCAT is displayed.



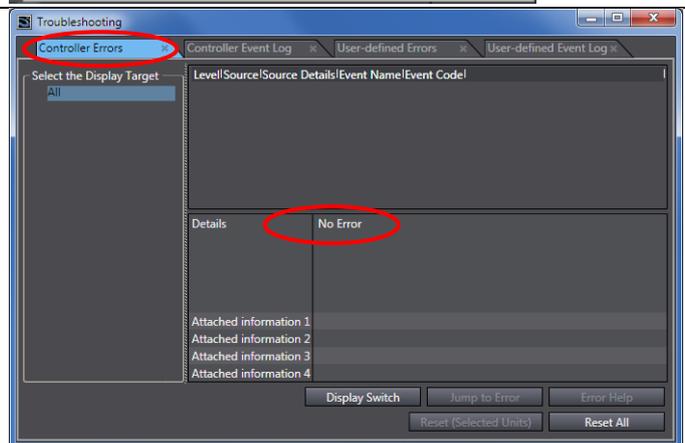
- 5 Select **Troubleshooting** from the Tools Menu.



- 6 The Troubleshooting Dialog Box is displayed.

Check that No Error is displayed in the *Details* Field in the Controller Errors Tab Page.

*A message stating "No Error" is displayed if the EtherCAT communications are performed normally.

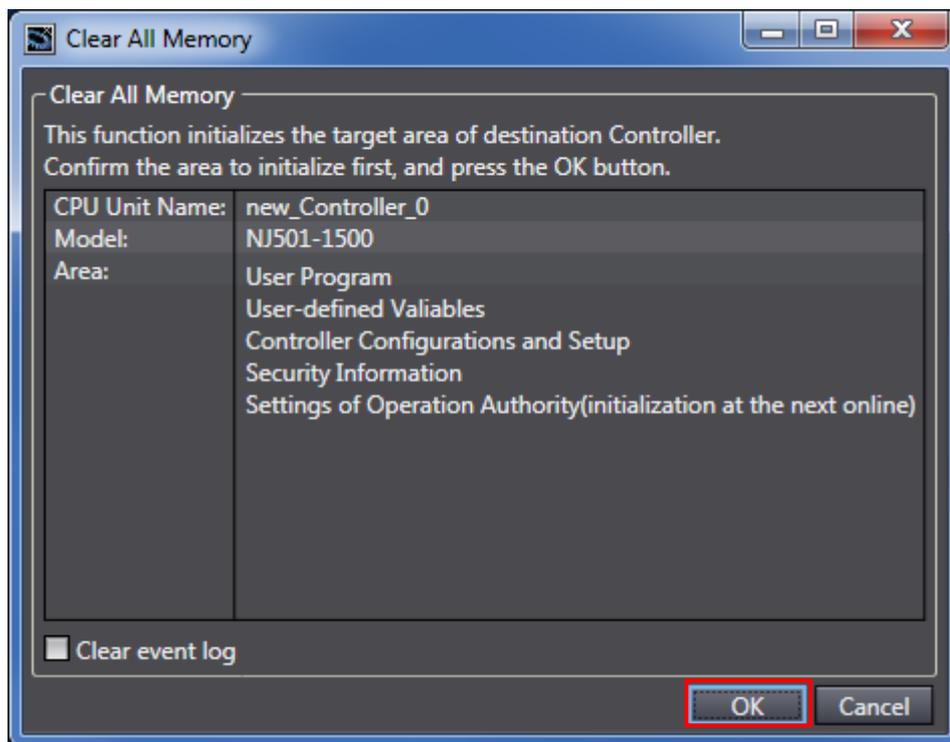


8. Initialization Method

This document explains the setting procedure from the factory default setting. Some settings may not be applicable as described in this document unless you use the devices with the factory default setting.

8.1. Initializing the Controller

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



9. Revision History

Revision code	Date of revision	Revision reason and revision page
01	November 25, 2014	First edition

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