

Machine Automation Controller NJ-series

# EtherCAT<sup>®</sup> Connection Guide SMC Corporation

Solenoid Valve  
(SI Unit EX180-SEC5-X23 [ ] )

Network  
Connection  
Guide

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## Table of Contents

<b>1. Related Manuals .....</b>	<b>1</b>
<b>2. Terms and Definitions .....</b>	<b>2</b>
<b>3. Precautions.....</b>	<b>3</b>
<b>4. Overview .....</b>	<b>4</b>
<b>5. Applicable Devices and Device Configuration .....</b>	<b>5</b>
5.1. Applicable Devices.....	5
5.2. Device Configuration.....	6
<b>6. EtherCAT Settings .....</b>	<b>8</b>
6.1. EtherCAT Communications Parameter Settings .....	8
6.2. Allocation for PDO Communications .....	8
<b>7. EtherCAT Connection Procedure.....</b>	<b>10</b>
7.1. Work Flow .....	10
7.2. Setting Up the SMC SI Unit.....	11
7.3. Setting Up the Controller.....	13
7.4. Checking the EtherCAT Communications .....	25
<b>8. Initialization Method.....</b>	<b>29</b>
8.1. Initializing the Controller.....	29
<b>9. Revision History .....</b>	<b>30</b>

## 1. Related Manuals

The table below lists the manuals related to this document.

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

Man. No.	Model	Manual name
W500	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Hardware User's Manual
W501	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Software User's Manual
W505	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Built-in EtherCAT Port User's Manual
W504	SYSMAC-SE2□□□□	Sysmac Studio Version 1 Operation Manual
EX※※ -OMR1006	EX180-SEC5-X23□	SI unit for EtherCAT Operation Manual

## 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"> <li>• With device variables for EtherCAT slave I/O</li> <li>• With Axis Variables for Servo Drive and encoder input slaves to which assigned as an axis</li> </ul>
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_CoESDORed (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	A node address is an address to identify a unit connected to EtherCAT.
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, always read and heed the information provided in all Safety Precautions, Precautions for Safe Use, and Precaution for Correct Use of manuals for each device used in the system.
- (3) The user is encouraged to confirm the standards and regulations that the system must conform to.
- (4) It is prohibited to copy, to reproduce, and to distribute a part or the whole of this document without the permission of OMRON Corporation.
- (5) The information contained in this document is current as of October 2013. It is subject to change without notice for improvement.

The following notations are 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 Safe Use**

Precautions on what to do and what not to do to ensure safe usage of the product.



#### **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.

#### **Symbols**



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 you must do.

## 4. Overview

This document describes the procedure for connecting SI Unit for Solenoid Valve (EX180-SEC5-X23[]), hereinafter referred to as SI Unit) of SMC Corporation (hereinafter referred to as SMC) to NJ-series Machine Automation Controller (hereinafter referred to as Controller) of OMRON Corporation (hereinafter referred to as OMRON) via EtherCAT and provides the 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 PDD 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-□□□□
SMC	SI Unit	EX180-SEC5-X230
		EX180-SEC5-X231
SMC	Solenoid Valve	SJ2000/3000 series
		S0700 series



#### 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 versions 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

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.

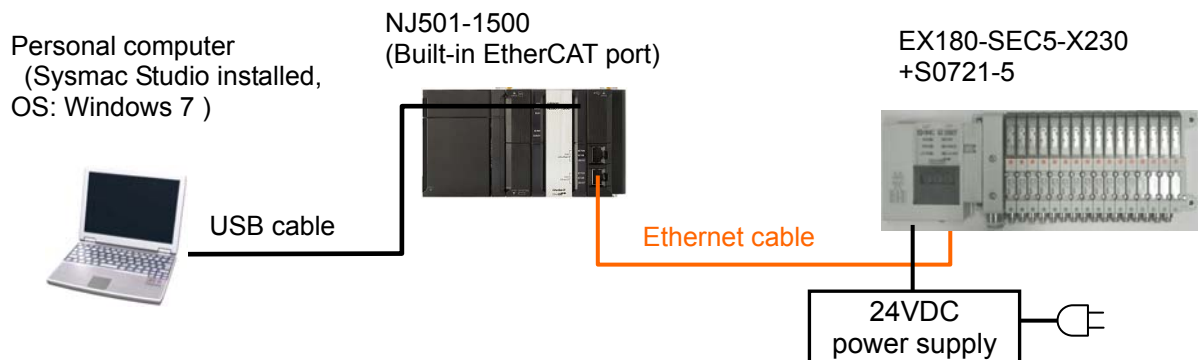
(SMC Corporation <http://www.smcworld.com/en/> )

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.1.06
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Sysmac Studio	SYSMAC-SE2□□□□	Ver.1.07
-	Personal computer (OS : Windows 7)	-	
-	USB cable (USB 2.0 type B connector)	-	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-□M□-K	
SMC	SI Unit	EX180-SEC5-X230	Rev : 0x00010001
SMC	Solenoid Valve	S0721-5	
-	24VDC power supply	-	
SMC	ESI file	SMC EX180-SEC5-x_V11.xml	



### Precautions for Correct Use

Prepare the applicable ESI file beforehand. The latest ESI file can be downloaded from the following website.

(SMC Corporation <http://www.smcworld.com/en/> )

Contact SMC Corporation if the file is not available.



### Precautions for Correct Use

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

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

Use the 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

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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).

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### Additional Information

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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 Port User's Manual* (Cat. No. W505).

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### Additional Information

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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).

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## 6. EtherCAT Settings

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

Hereinafter, the SI Unit is referred to as the "Destination Device" or the "Slave Unit" in some descriptions.

### 6.1. EtherCAT Communications Parameter Settings

The communications parameter required to connect the Controller and the Destination Device via EtherCAT is given below.

	SI Unit
Node address	1

### 6.2. Allocation for PDO Communications

The EtherCAT PDO communications data of the Destination Device are allocated to the Controller's device variables. The device variables and the data types are shown below.

#### ■ Output area (Controller → Destination Device)

Device variable name	Data type	Meaning
E001_Valve_Control_Valves_0_to_7_6001_01	BYTE	Digital output value (in units of 1 byte)
E001_Valve_0	BOOL	Output bit 00
E001_Valve_1	BOOL	Output bit 01
E001_Valve_2	BOOL	Output bit 02
E001_Valve_3	BOOL	Output bit 03
E001_Valve_4	BOOL	Output bit 04
E001_Valve_5	BOOL	Output bit 05
E001_Valve_6	BOOL	Output bit 06
E001_Valve_7	BOOL	Output bit 07
E001_Valve_Control_Valves_8_to_15_6001_02	BYTE	Digital output value (in units of 1 byte)
E001_Valve_8	BOOL	Output bit 08
E001_Valve_9	BOOL	Output bit 09
E001_Valve_10	BOOL	Output bit 10
E001_Valve_11	BOOL	Output bit 11
E001_Valve_12	BOOL	Output bit 12
E001_Valve_13	BOOL	Output bit 13
E001_Valve_14	BOOL	Output bit 14
E001_Valve_15	BOOL	Output bit 15

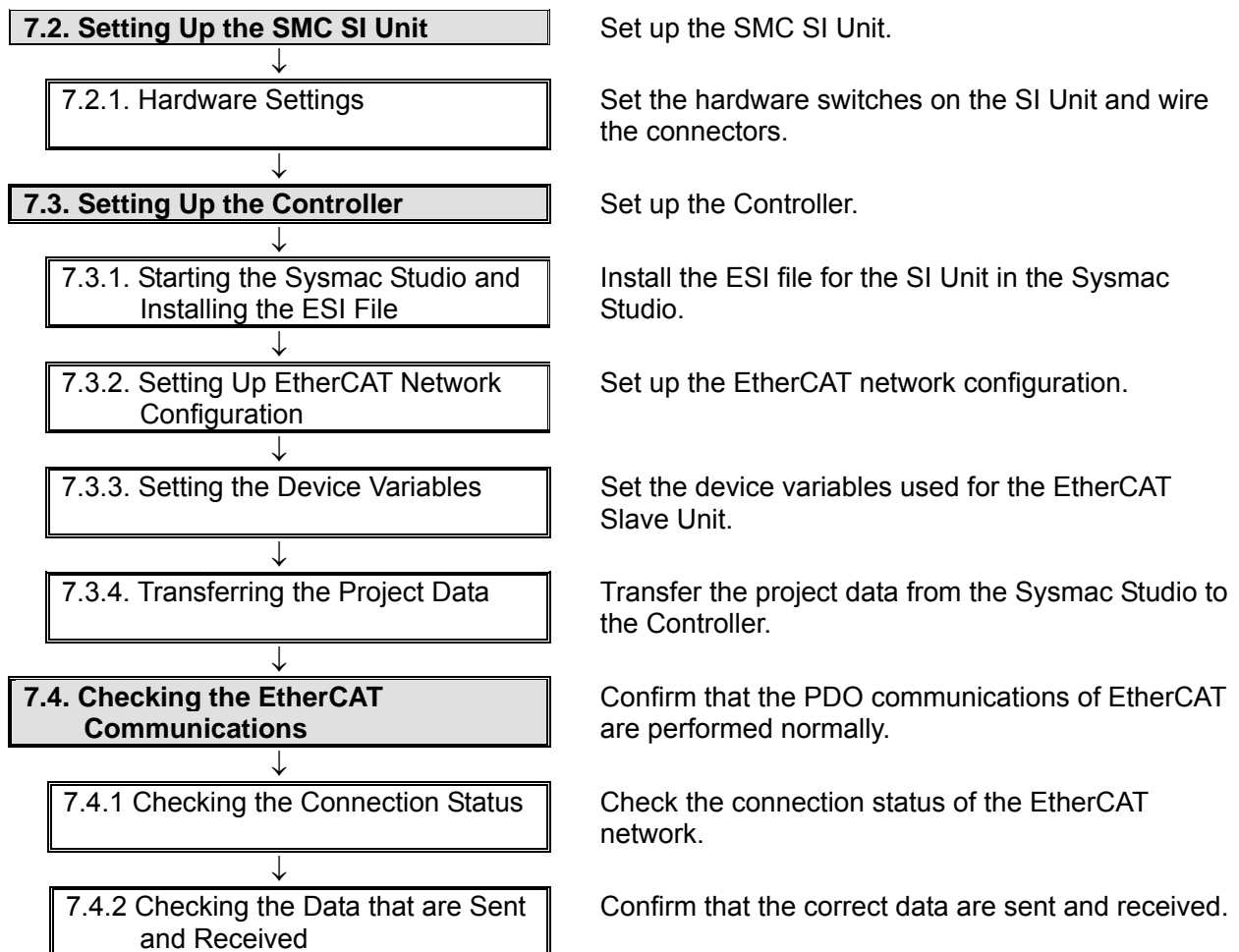
E001_Valve_Control_Valves_16_to_23_6001_03	BYTE	Digital output value (in units of 1 byte)
E001_Valve_16	BOOL	Output bit 16
E001_Valve_17	BOOL	Output bit 17
E001_Valve_18	BOOL	Output bit 18
E001_Valve_19	BOOL	Output bit 19
E001_Valve_20	BOOL	Output bit 20
E001_Valve_21	BOOL	Output bit 21
E001_Valve_22	BOOL	Output bit 22
E001_Valve_23	BOOL	Output bit 23
E001_Valve_Control_Valves_24_to_31_6001_04	BYTE	Digital output value (in units of 1 byte)
E001_Valve_24	BOOL	Output bit 24
E001_Valve_25	BOOL	Output bit 25
E001_Valve_26	BOOL	Output bit 26
E001_Valve_27	BOOL	Output bit 27
E001_Valve_28	BOOL	Output bit 28
E001_Valve_29	BOOL	Output bit 29
E001_Valve_30	BOOL	Output bit 30
E001_Valve_31	BOOL	Output bit 31

## 7. EtherCAT Connection Procedure

This section describes the procedure for connecting the Controller to the SI Unit via EtherCAT. This document explains the procedure for setting up the Controller and the SI Unit from 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 SMC SI Unit

Set up the SMC SI Unit.

### 7.2.1. Hardware Settings

Set the hardware switches on the SI Unit and wire the connectors.



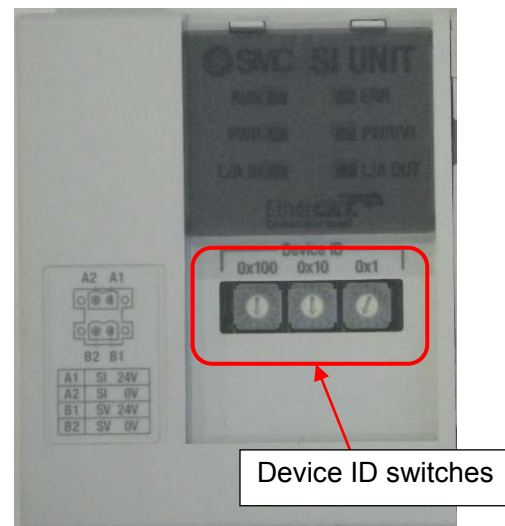
#### Precautions for Correct Use

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

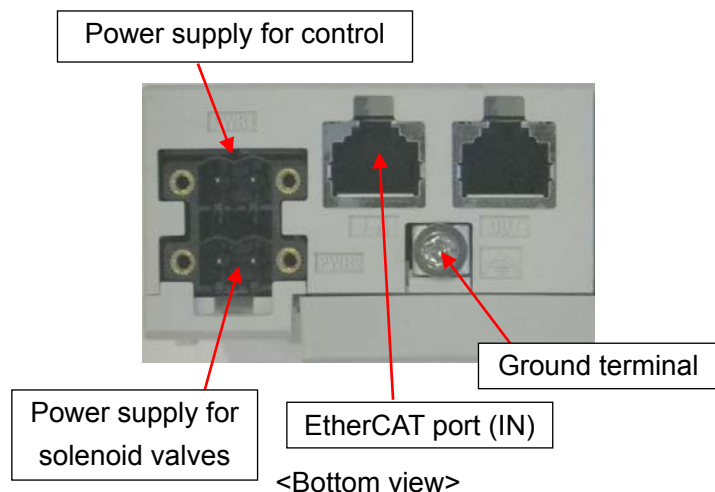
- 1 Confirm that the power supply to the SI Unit is OFF.

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

- 2 Check the position of the hardware switches and the connectors on the SI Unit by referring to the right figure.



<Front view>



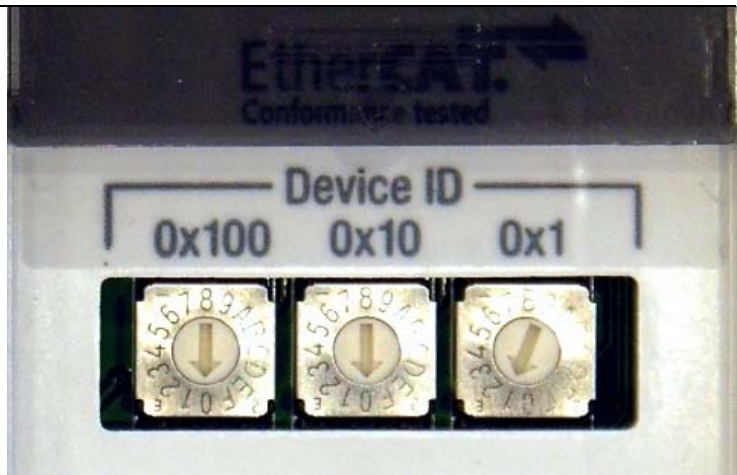
<Bottom view>

- 3 Set the Device ID switches as follows:

[Device ID 0x100] : 0

[Device ID 0x10] : 0

[Device ID 0x1] : 1



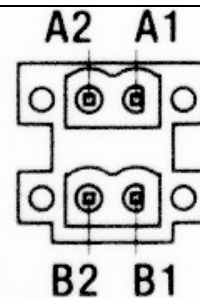
- 4 Connect the Ethernet cable to the EtherCAT port (IN).



Ethernet cable

- 5 Connect the 24 VDC power supply to both power supplies for control and for solenoid valves.

Connect the ground terminal of the SI Unit to ground.



	Pin No.	Signal name
Power supply for control	A1	SI 24V
	A2	SI 0V
Power supply for solenoid valves	B1	SV 24V
	B2	SV 0V

- 6 Turn ON the 24 VDC power supply.



### Additional Information

For specifications of wiring to the SMC SI Unit, refer to *Mounting and Installation of the SI unit for EtherCAT Operation Manual* (Cat. No. EX\* \*-OMR1006).

### 7.3. Setting Up the Controller

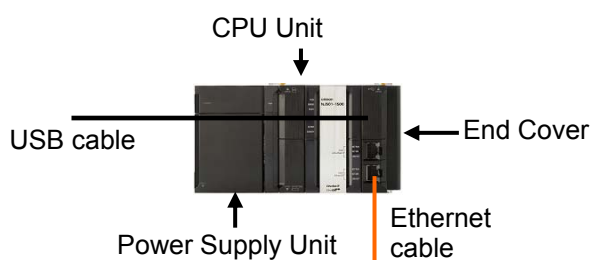
Set up the Controller.

#### 7.3.1. Starting the Sysmac Studio and Installing the ESI File

Install the ESI file for the SI Unit in the Sysmac Studio.

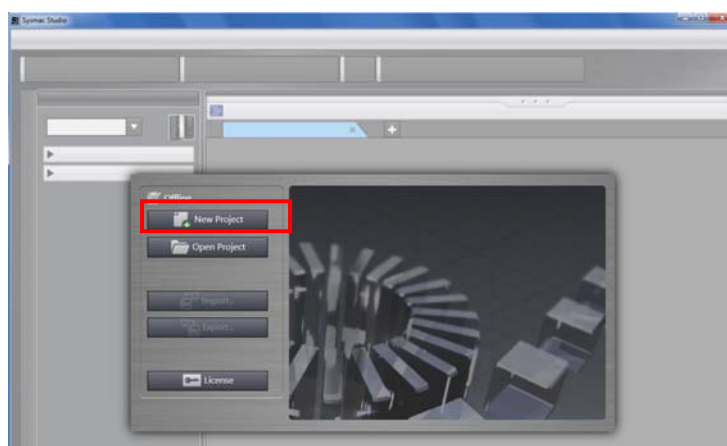
Install the Sysmac Studio and USB driver in the personal computer beforehand.

- 1 Connect the Ethernet cable to the built-in EtherCAT port (PORT2) of the Controller and the USB cable to the peripheral (USB) port. As shown in 5.2. *Device Configuration*, connect the personal computer, SI Unit, and Controller.  
Turn ON the power supply to the Controller.



- 2 Start the Sysmac Studio.  
Click the **New Project** Button.

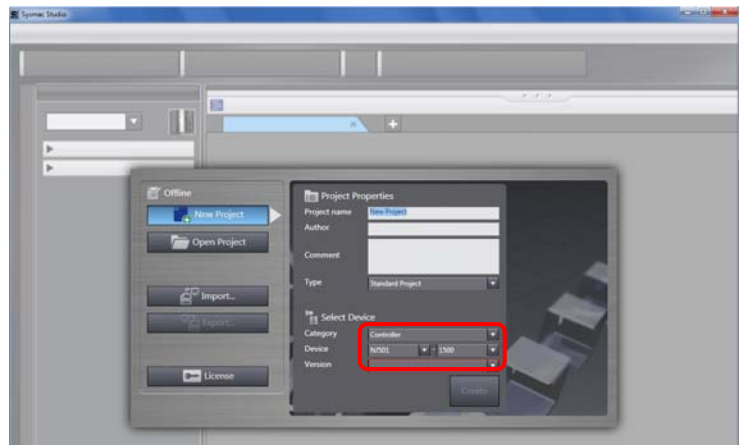
\* If a confirmation dialog for an access right is displayed at start, select to start.





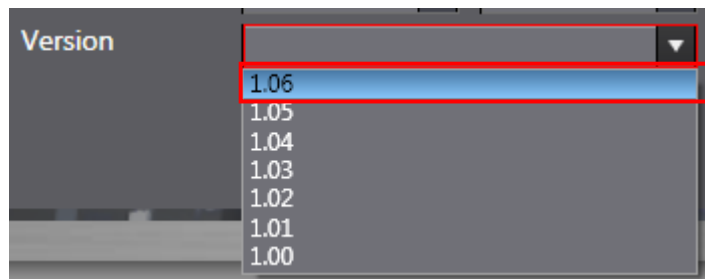
- 3 The Project Properties Dialog Box is displayed.  
\* In this document, New Project is used as the Project name.

Confirm that the device you use is shown in *Category* and *Device* in the *Select Device* Field.

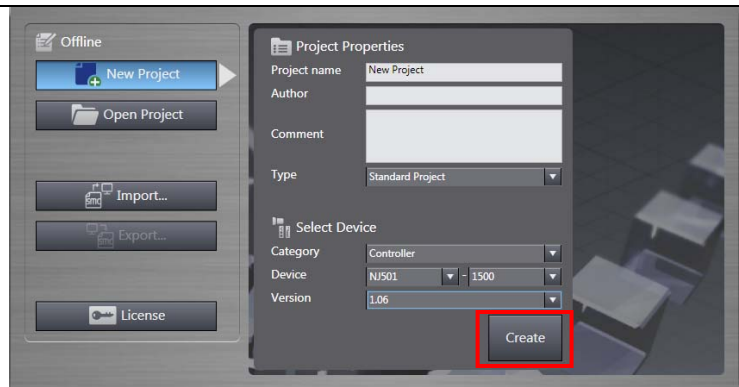


Select version **1.06** from the pull-down list of *Version*.

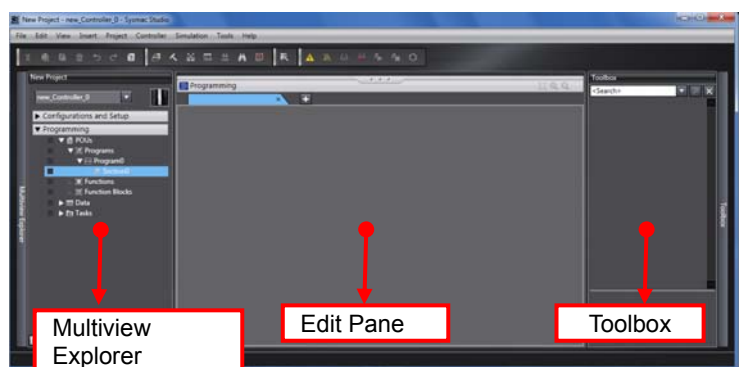
- \* Although 1.06 is selected in this document for example, select the version you actually use.



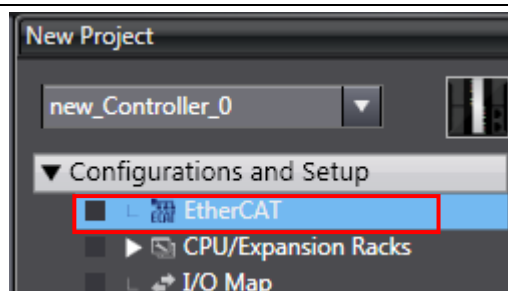
- 4 Click the **Create** Button.



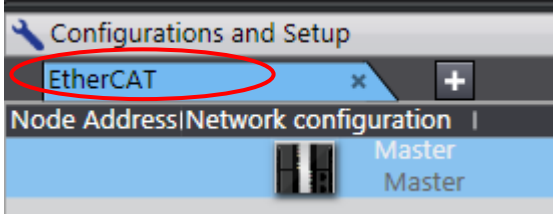
- 5 The New Project is displayed. The left pane is called Multiview Explorer, the right pane is called Toolbox and the middle pane is called Edit Pane.

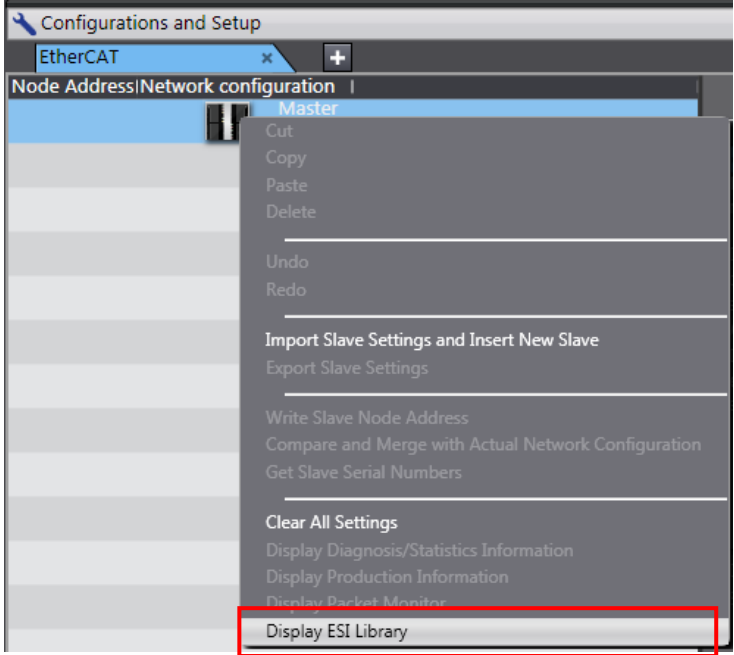


- 6 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.

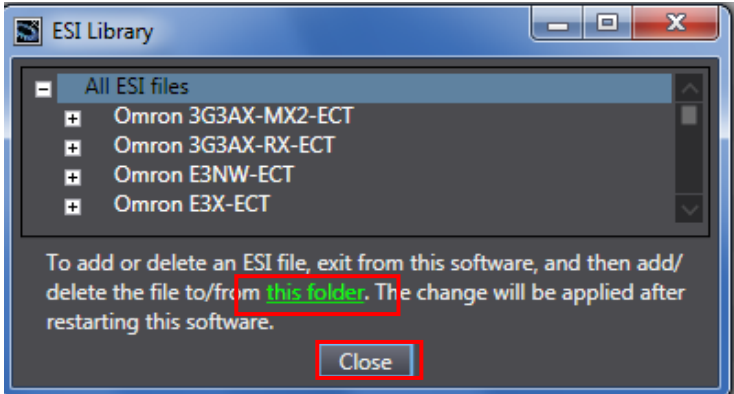


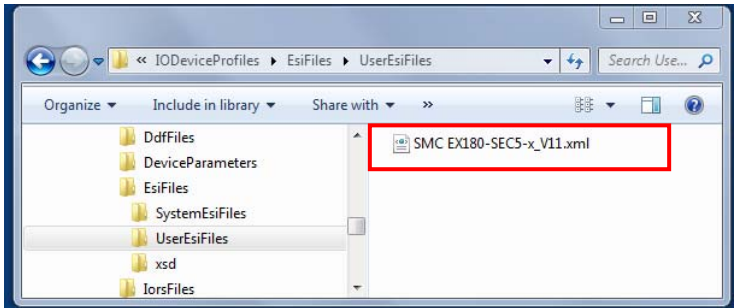
- 7 The EtherCAT Tab is displayed on the Edit Pane.


- 8 Right-click *Master* and select **Display ESI Library**.


- 9 The ESI Library Dialog Box is displayed. Click the **this folder** link.

When the Explorer starts, close the dialog box by clicking the **Close** Button.

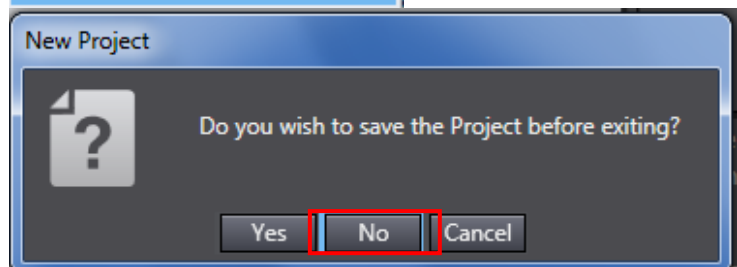
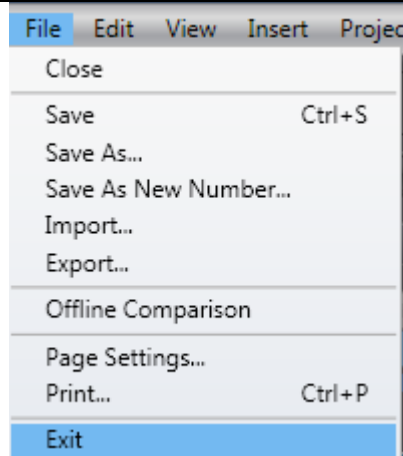

- 10 The Explorer starts and a folder is opened, allowing you to install the ESI file. Copy the prepared *SMC EX180-SEC5-x\_V11.xml* to this folder.



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

A dialog box is displayed confirming whether to save the project. If you do not need to save, click the **No** Button.

\* You need to restart the Sysmac Studio after installing the ESI file.

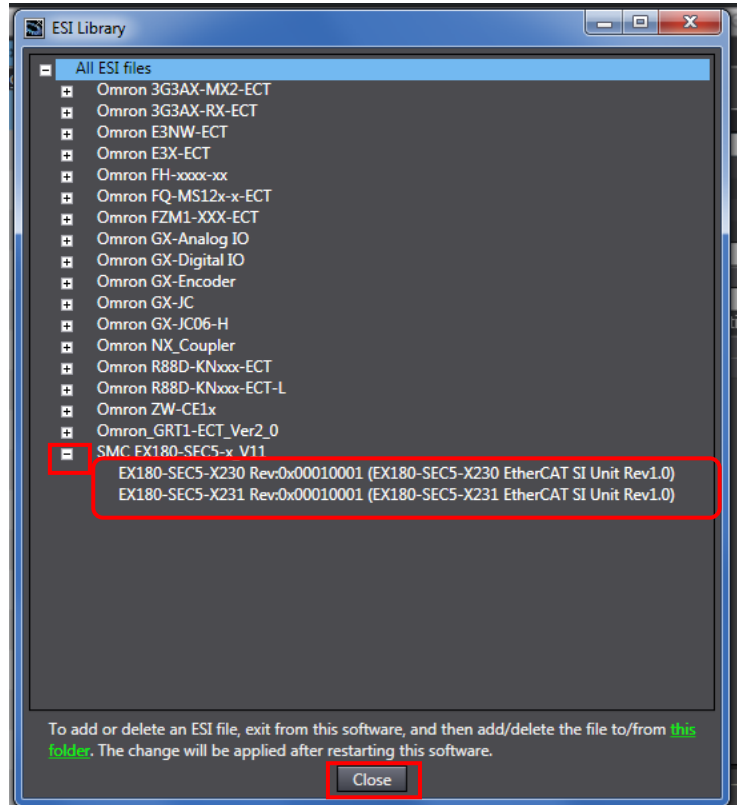


- 12 In the same way as steps 2 to 8, restart the Sysmac Studio and display the ESI Library Dialog Box.

Click the **+** Button of **SMC EX180-SEC5-x\_V11** to confirm that **EX180-SEC5-X230 Rev :0x00010001** is displayed.

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

Click the **Close** Button.

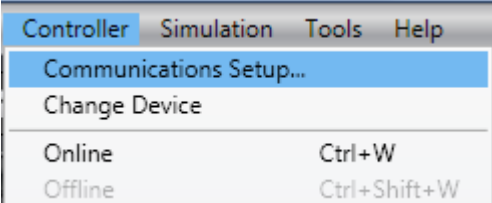
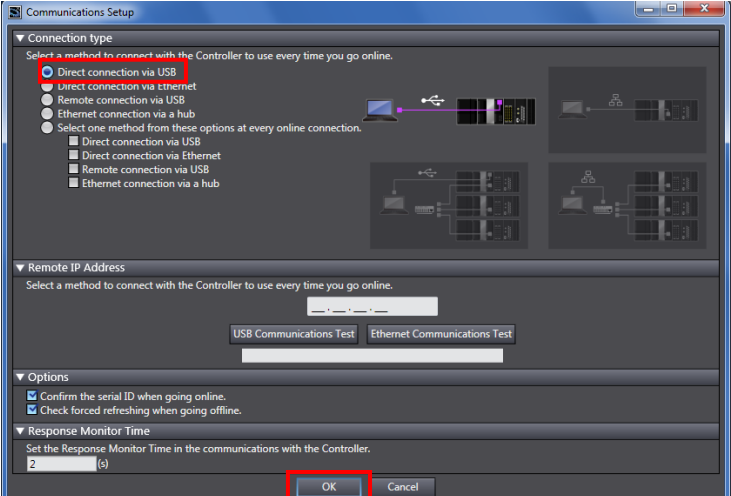
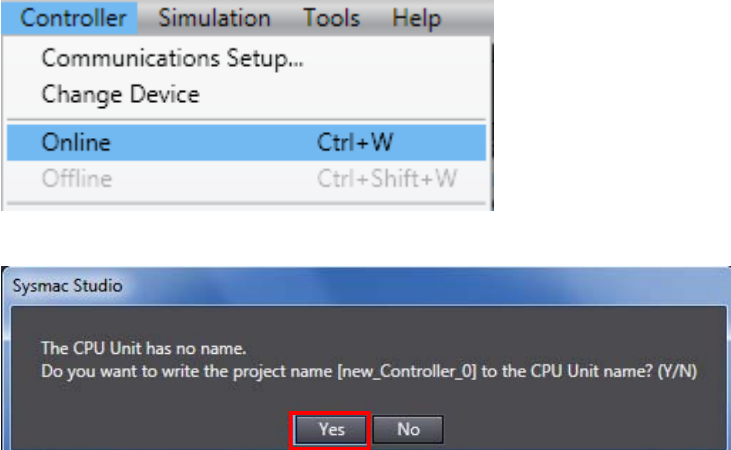


### Precautions for Correct Use

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

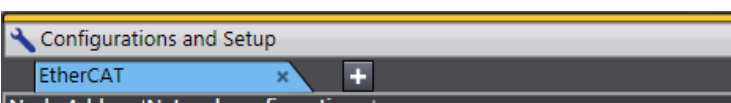
Set up EtherCAT network configuration with the Sysmac Studio.

<p>1 Select <b>Communications Setup</b> from the Controller Menu.</p>	
<p>2 The Communications Setup Dialog Box is displayed. Select the <i>Direct connection via USB</i> Option for Connection Type.  Click the <b>OK</b> Button.</p>	
<p>3 Select <b>Online</b> from the Controller Menu. A confirmation dialog box is displayed. Click the <b>Yes</b> Button.  * The displayed dialog depends on the status of the Controller used. Check the contents and click the <b>Yes</b> Button to proceed with the processing.</p>	

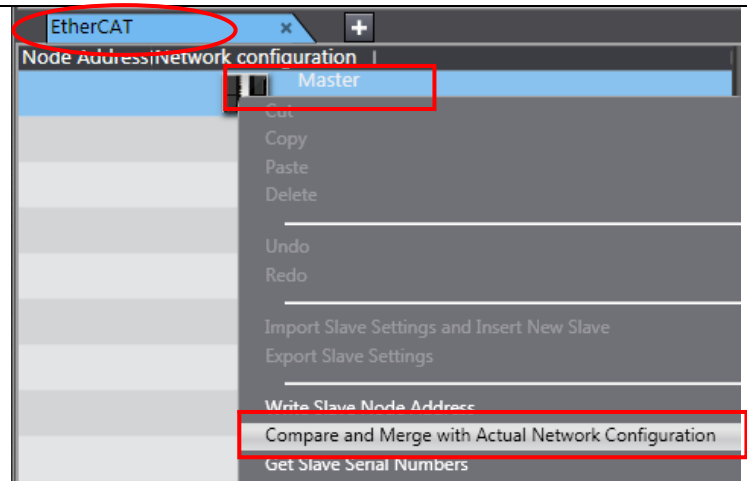


#### Additional Information

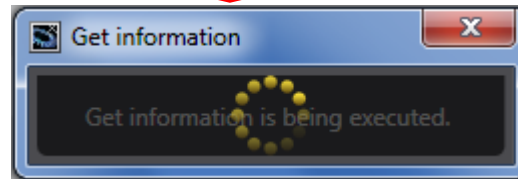
For details on online connections to a Controller, refer to *Section 5 Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

<p>4 When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.</p>	
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- 5 Right-click *Master* on the EtherCAT Tab Page, and select **Compare and Merge with Actual Network Configuration**.



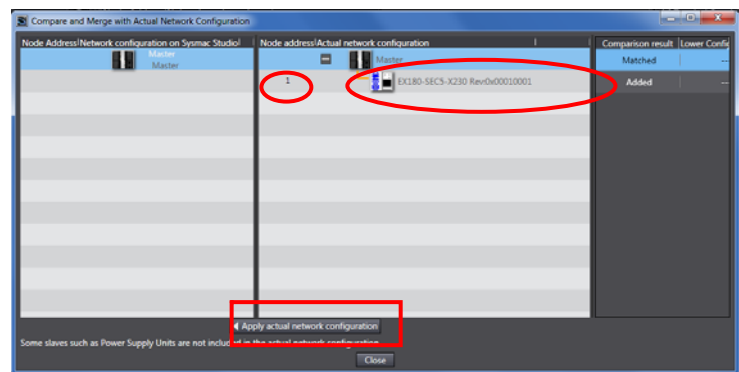
A screen is displayed stating "Get information is being executed".



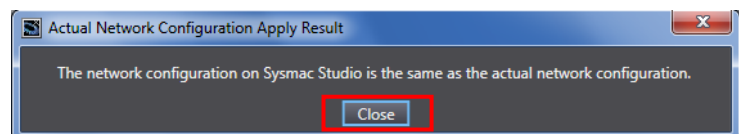
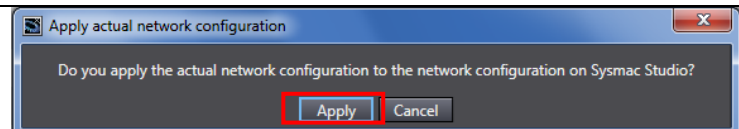
- 6 The Compare and Merge with Actual Network Configuration Pane is displayed.

Node address 1 and EX180-SEC5-X230 Rev :0x00010001 are added to the Actual network configuration after the comparison.

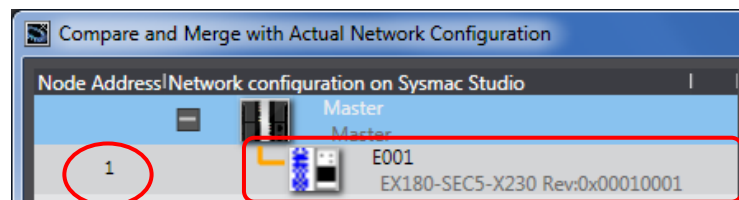
Click the **Apply actual network configuration** Button.



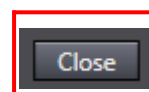
- 7 A confirmation dialog box is displayed. Check the contents and click the **Apply** Button.



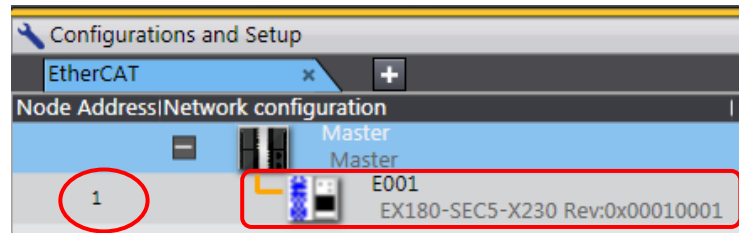
Node address 1, E001, and EX180-SEC5-X230 Rev:0x00010001 are added to the Network configuration on Sysmac Studio.



Confirm that they were added and click the **Close** Button.



- 8 Node address 1, E001, and EX180-SEC5-X230 Rev :0x00010001 are added to the EtherCAT Tab Page on the Edit Pane.

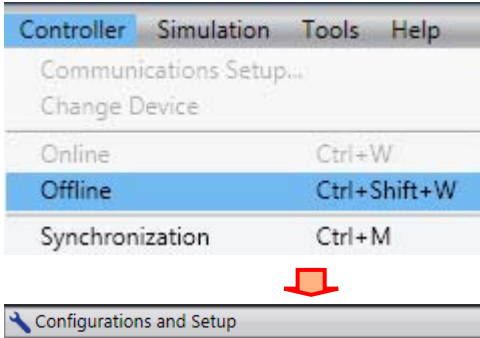


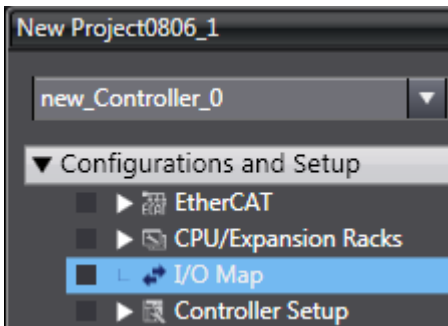
### 7.3.3. Setting the Device Variables

Set the device variables used for the EtherCAT Slave Unit.

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

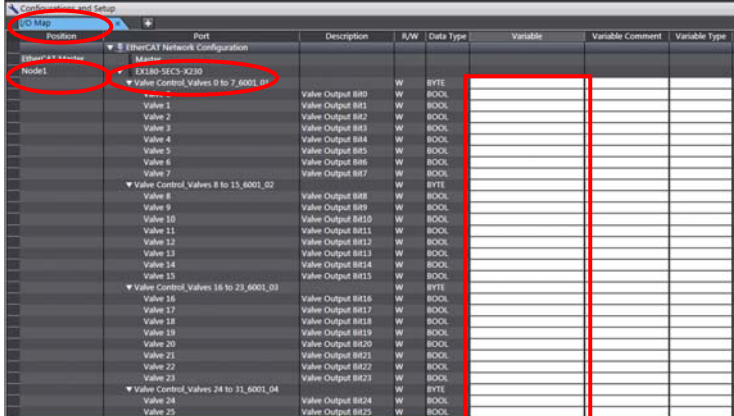
The yellow bar on the top of the Edit Pane disappears.


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

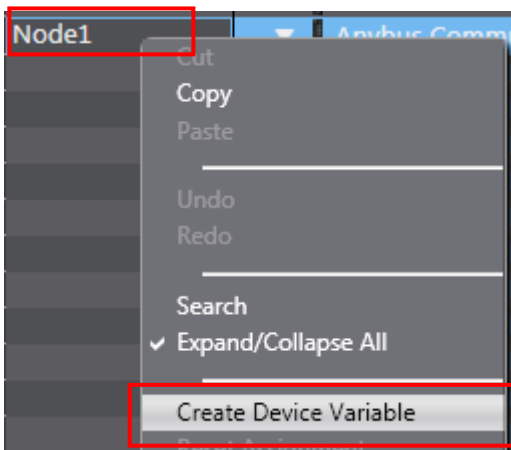

- 3 The I/O Map Tab is displayed on the Edit Pane.

Confirm that Node1 is displayed in the *Position* Column and the Slave Unit is displayed.

\* To manually set a variable name for the Slave Unit, click a column under the *Variable* Column and enter a name.



Position	Port	Description	R/W	Data Type	Variable	Variable Comment	Variable Type
Node1	EtherCAT Slave Unit	Master					
		Value Control, Values 0 to 7, 6001, 01					
		Value Output 880	W	BOOL			
		Value Output 881	W	BOOL			
		Value Output 882	W	BOOL			
		Value Output 883	W	BOOL			
		Value Output 884	W	BOOL			
		Value Output 885	W	BOOL			
		Value Output 886	W	BOOL			
		Value Output 887	W	BOOL			
		Value Control, Values 8 to 15, 6001, 02					
		Value Output 888	W	BOOL			
		Value Output 889	W	BOOL			
		Value Output 890	W	BOOL			
		Value Output 891	W	BOOL			
		Value Output 892	W	BOOL			
		Value Output 893	W	BOOL			
		Value Output 894	W	BOOL			
		Value Output 895	W	BOOL			
		Value Output 896	W	BOOL			
		Value Output 897	W	BOOL			
		Value Control, Values 16 to 23, 6001, 03					
		Value Output 898	W	BOOL			
		Value Output 899	W	BOOL			
		Value Output 900	W	BOOL			
		Value Output 901	W	BOOL			
		Value Output 902	W	BOOL			
		Value Output 903	W	BOOL			
		Value Output 904	W	BOOL			
		Value Output 905	W	BOOL			
		Value Control, Values 24 to 31, 6001, 04					
		Value Output 906	W	BOOL			
		Value Output 907	W	BOOL			
		Value Output 908	W	BOOL			
		Value Output 909	W	BOOL			
- 4 Right-click *Node1* and select **Create Device Variable**.



- 5 The variable names and variable types are automatically set.

Position	Port	Description	I/O Data Type	Variable	Variable Comment	Variable Type
EtherCAT Master						
Node1	20100101-0-01					
	▼ Valve Control_Valves 0 to 7_0001_01					
	Valve 0	Valve Output 880	W BOOL	201_Valve_Control_Valves_0_to_7_0001_01		Global Variable
	Valve 1	Valve Output 881	W BOOL	201_Valve_0		Global Variable
	Valve 2	Valve Output 882	W BOOL	201_Valve_1		Global Variable
	Valve 3	Valve Output 883	W BOOL	201_Valve_2		Global Variable
	Valve 4	Valve Output 884	W BOOL	201_Valve_3		Global Variable
	Valve 5	Valve Output 885	W BOOL	201_Valve_4		Global Variable
	Valve 6	Valve Output 886	W BOOL	201_Valve_5		Global Variable
	Valve 7	Valve Output 887	W BOOL	201_Valve_6		Global Variable
	▼ Valve Control_Valves 8 to 15_0001_02					
	Valve 8	Valve Output 888	W BOOL	201_Valve_7		Global Variable
	Valve 9	Valve Output 889	W BOOL	201_Valve_Control_Valves_8_to_15_0001_02		Global Variable
	Valve 10	Valve Output 890	W BOOL	201_Valve_8		Global Variable
	Valve 11	Valve Output 891	W BOOL	201_Valve_9		Global Variable
	Valve 12	Valve Output 892	W BOOL	201_Valve_10		Global Variable
	Valve 13	Valve Output 893	W BOOL	201_Valve_11		Global Variable
	Valve 14	Valve Output 894	W BOOL	201_Valve_12		Global Variable
	Valve 15	Valve Output 895	W BOOL	201_Valve_13		Global Variable
	▼ Valve Control_Valves 16 to 23_0001_03					
	Valve 16	Valve Output 896	W BOOL	201_Valve_14		Global Variable
	Valve 17	Valve Output 897	W BOOL	201_Valve_15		Global Variable
	Valve 18	Valve Output 898	W BOOL	201_Valve_Control_Valves_16_to_23_0001_03		Global Variable
	Valve 19	Valve Output 899	W BOOL	201_Valve_16		Global Variable
	Valve 20	Valve Output 900	W BOOL	201_Valve_17		Global Variable
	Valve 21	Valve Output 901	W BOOL	201_Valve_18		Global Variable
	Valve 22	Valve Output 902	W BOOL	201_Valve_19		Global Variable
	Valve 23	Valve Output 903	W BOOL	201_Valve_20		Global Variable
	▼ Valve Control_Valves 24 to 31_0001_04					
	Valve 24	Valve Output 904	W BOOL	201_Valve_21		Global Variable
	Valve 25	Valve Output 905	W BOOL	201_Valve_22		Global Variable
				201_Valve_23		Global Variable
				201_Valve_24		Global Variable
				201_Valve_25		Global Variable



### Additional Information

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

For slave units, the default device names start with an "E" followed by a sequential number starting 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 I/O 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.

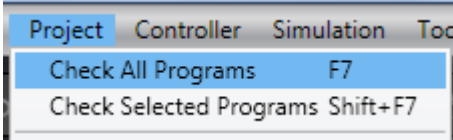
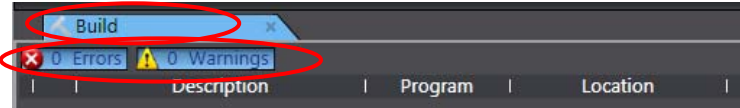
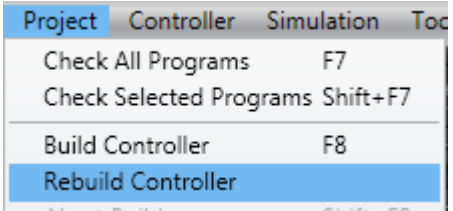
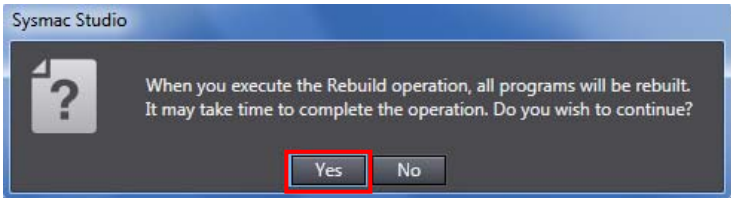
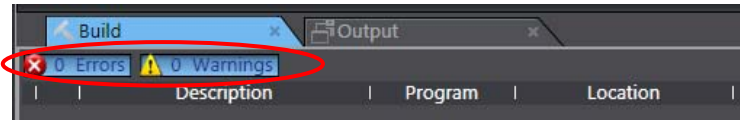
The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.

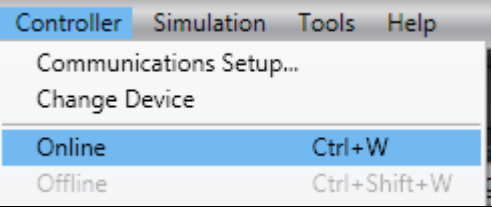
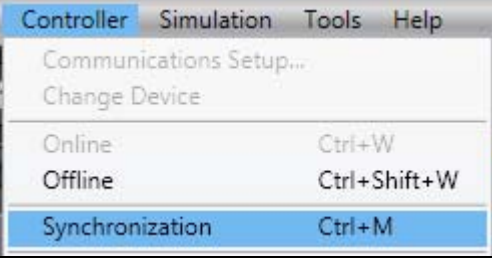
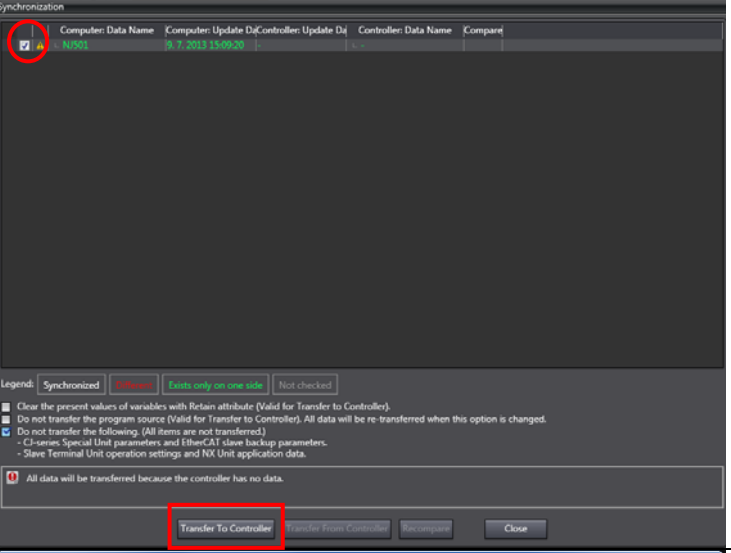
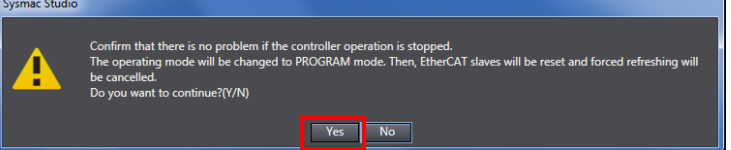
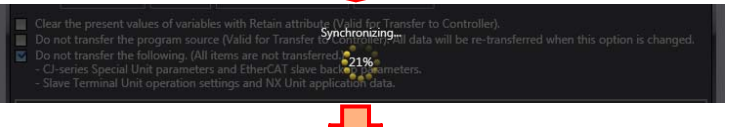
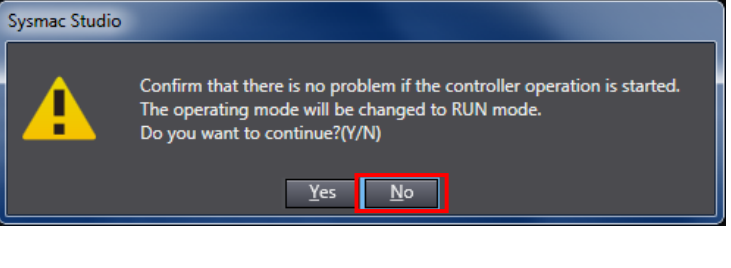


### Precautions for Safe Use

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.

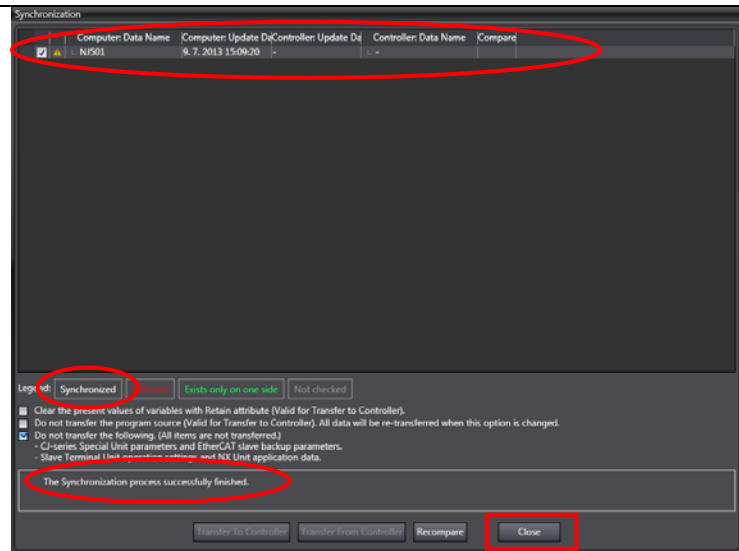
- 1 Select **Check All Programs** from the Project Menu.
 
- 2 The Build Tab Page is displayed on the Edit Pane. Confirm that "0 Errors" and "0 Warnings" are displayed.
 
- 3 Select **Rebuild Controller** from the Project Menu.
 
- 4 A confirmation dialog box is displayed. Confirm that there is no problem and click the **Yes** Button.
 
- 5 Confirm that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.
 

6	Select <b>Online</b> from the Controller Menu.	
7	Select <b>Synchronization</b> from the Controller Menu.	
8	<p>The Synchronization Dialog Box is displayed.</p> <p>Confirm that the data to transfer (NJ501 in the right dialog) is selected. Then, click the <b>Transfer To Controller</b> Button.</p> <p>* After executing the Transfer To Controller, the Sysmac Studio data is transferred to the Controller and the data are compared.</p>	
9	<p>A confirmation dialog box is displayed. Confirm that there is no problem and click the <b>Yes</b> Button.</p> <p>A screen stating "Synchronizing" is displayed.</p> <p>A confirmation dialog box is displayed. Confirm that there is no problem and click the <b>No</b> Button.</p> <p>* Do not return it to RUN mode.</p>	
		
		

10 Confirm that the synchronized data is displayed with the color specified by "Synchronized" and that 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 data in the Controller match.

\* 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.

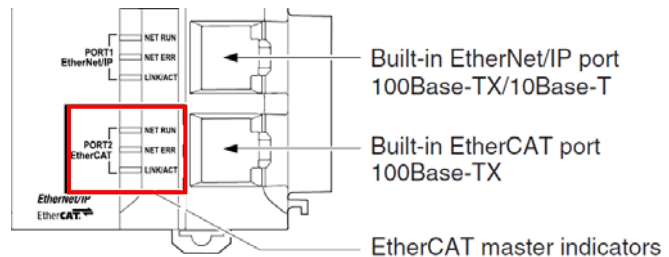
- 1 Confirm that the EtherCAT communications are performed normally by checking the LED indicators on the Controller.

LED indicators in normal status are as follows:

[NET RUN] : Lit green

[NET ERR] : Not lit

[LINK/ACT] : Flashing yellow



Label	Name	Color	Status	Meaning
EtherCAT NET RUN	RUN	Green	Lit	EtherCAT communications are in progress. • I/O data is being input and output.
			Flashing	EtherCAT communications are established. Communications is in one of the following states. • Only message communications is functioning. • Only message communications and I/O data input operations are functioning.
			Not lit	EtherCAT communications are stopped. • Power is OFF or the Unit is being reset. • There is a MAC address error, communications controller error, or other error.
EtherCAT NET ERR	ERROR	Red	Lit	There is an unrecoverable error, such as a hardware error or an exception.
			Flashing	There is a recoverable error.
			Not lit	There is no error.
EtherCAT LINK/ACT	Link/Activity	Yellow	Lit	The link is established.
			Flashing	A link is established and data is being sent and received. The indicator flashes whenever data is sent or received.
			Not lit	The link is not established.

- 2 Check the LED indicators on the SI Unit.

LED indicators in normal status are as follows:

[RUN] : Lit green

[ERR] : Not lit

[L/A IN] : Flickering

[L/A OUT] : Not lit



Name	LED Status	Description
RUN (Green)	OFF	Init
	Flashing	Pre-Operational
	Single flash	Safe-Operational
	Flickering	Initialization or Bootstrap
	ON	Operational
ERR (Red)	ON	PDI watchdog timeout
	Double flash	Application watchdog timeout
	Single flash	Unsolicited state change
	Flashing	Invalid configuration
	Flickering	Booting error
	OFF	No error
L/A IN (Green)	OFF	IN side : No link / No activity
	ON	IN side : Link / No activity
	Flickering	IN side : Link / Activity
L/A OUT (Green)	OFF	OUT side : No link / No activity
	ON	OUT side : Link / No activity
	Flickering	OUT side : Link / Activity

### 7.4.2. Checking the Data that are Sent and Received

Confirm that the correct data are sent and received.



## 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.

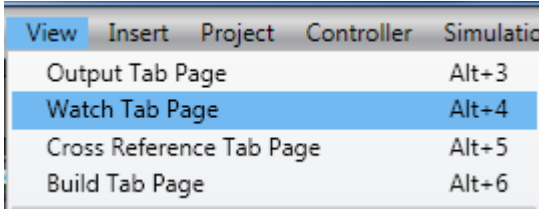

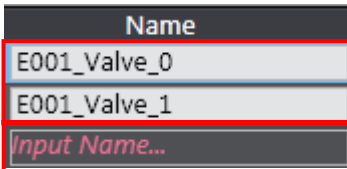
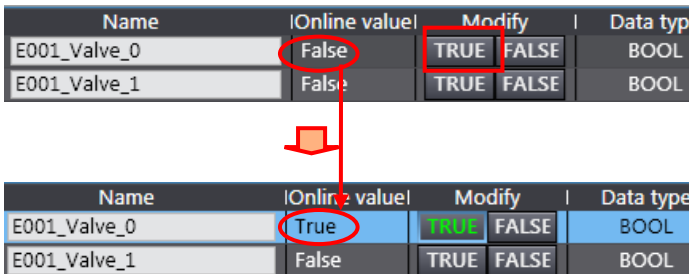
The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit.



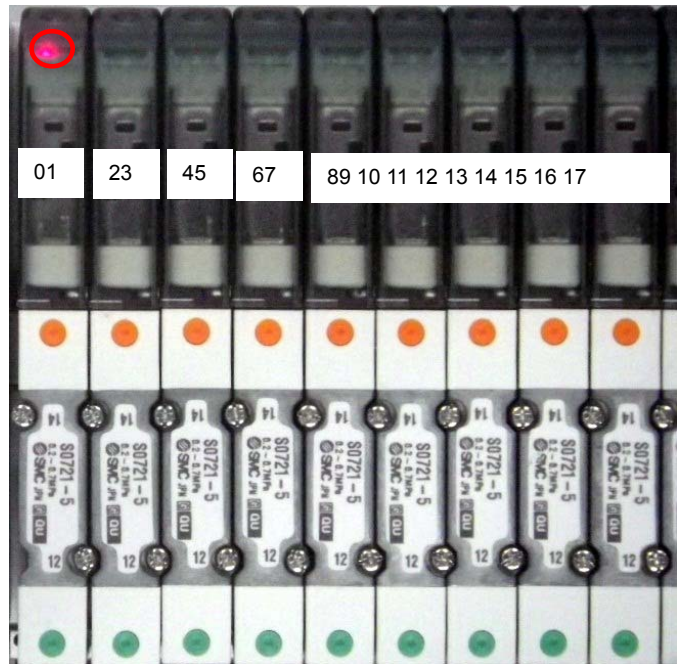
## Caution

The Destination Device will run if you proceed to this section. Confirm safety before operation. If you cannot confirm safety, do not proceed to this section after completing until *Section 7.4.1*. If you proceed to this section, make sure to complete all the steps and place the Destination Device in the safe state.



- 1 Select **Watch Tab Page** from the View Menu.
 
- 2 The Watch Window1 Tab Page is displayed in the lower section of the Edit Pane.
 
- 3 Enter the following names in the Watch Window1 Tab Page for monitoring.  
     *E001\_Valve\_0*  
     *E001\_Valve\_1*  
 To enter a new name, click the *Input Name* Column.
 
- 4 Confirm that the Online value of *E001\_Valve\_0* is False and click **TRUE** in the *Modify* Column.  
  
 Confirm that the Online value of *E001\_Valve\_0* changes to True.
 

- 5 Confirm that No.0 of the OUT Solenoid Valve turns ON (corresponding LED indicator is lit red).



- 6 Click **FALSE** in the *Modify* Column of *E001\_Valve\_0*.

Confirm that the Online value of *E001\_Valve\_0* changes to False and No.0 of the OUT Solenoid Valve turns OFF (corresponding LED indicator is not lit).

Name	Online value	Modify	Data type
E001_Valve_0	False	TRUE FALSE	BOOL
E001_Valve_1	False	TRUE FALSE	BOOL
Input Name...			

- 7 Confirm that the Online value of *E001\_Valve\_1* is False and click **TRUE** in the *Modify* Column.

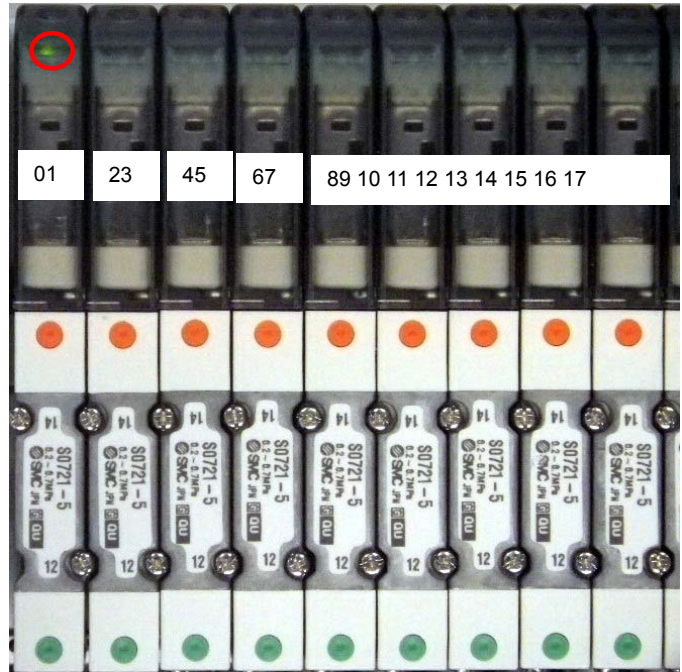
Confirm that the Online value of *E001\_Valve\_1* changes to True.

Name	Online value	Modify	Data type
E001_Valve_0	False	TRUE FALSE	BOOL
E001_Valve_1	False	TRUE FALSE	BOOL
Input Name...			

Name	Online value	Modify	Data type
E001_Valve_0	False	TRUE FALSE	BOOL
E001_Valve_1	True	TRUE FALSE	BOOL
Input Name...			



- 8 Confirm that No.1 of the OUT Solenoid Valve turns ON (corresponding LED indicator is lit green).



- 9 Click **FALSE** in the *Modify* Column of *E001\_Valve\_1*.

Confirm that the Online value of *E001\_Valve\_1* changes to False and No.1 of the OUT Solenoid Valve turns OFF (corresponding LED indicator is not lit).

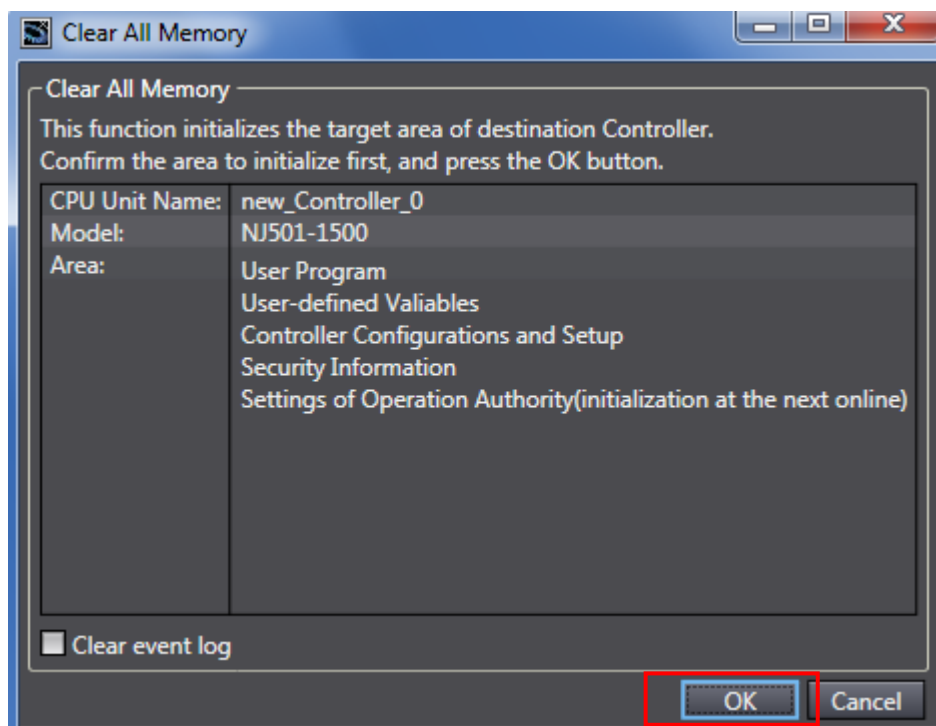
Name	Online value	Modify	Data type
E001_Valve_0	False	TRUE <b>FALSE</b>	BOOL
E001_Valve_1	<b>False</b>	TRUE <b>FALSE</b>	BOOL
Input Name...			

## 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	Oct. 8, 2013	First edition

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