OMRON

Machine Automation Controller NJ-series

EtherCAT(R) Conneciton Guide Hivertec Inc.

4-Axis Motion Slave Controller
HES-C400/NJ

SYSMAC
always in control

P539-E1-01

About Intellectual Property Rights and Trademarks

Table of Contents

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.

Cat. 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
	HES-C400/NJ	EtherCAT Motion Slave EtherCAT series HES-C400 User’s Manual <Hardware>
	HES-C400/NJ	EtherCAT Motion Slave EtherCAT series HES-C400 HES-M400 User’s Manual <Software>
	HES-C400/NJ	EtherCAT Motion Slave EtherCAT series User’s Manual ＜Introduction＞
	HES-C400/NJ	EtherCAT Motion Slave EtherCAT series User’s Manual ＜Operation＞
	HLS-C400/NJ	For OMRON Machine Automation Controller NJ Series Function Blocks for Hivertec EtherCAT Slave HLS-C400/NJ User’s Manual

2. Terms and Definitions

Term	Explanation and Definition
PDO communications (Communications using Process Data Objects)	This method is used for cyclic data exchange between the master unit and the slave units. 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). 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. It is accessed from the NJ-series Machine Automation Controller in the following ways. ・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)	This method is used to read and write the specified slave unit data from the master unit when required. The NJ-series Machine Automation Controller uses SDO communications for commands to read and write data, such as for parameter transfers, at specified times. 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.
Slave unit	There are various types of slaves such as Servo Drives that handle position data and I/O terminals that handle the bit signals. The slave unit receives output data sent from the master, and sends input data to the master.
Node address	A node address is an address to identify a unit connected to EtherCAT.
ESI file (EtherCAT Slave Information file)	The ESI files contain information unique to the EtherCAT slaves in XML format. Installing an ESI file enables the Sysmac Studio to allocate slave process data and make other settings.

3. Precautions

(1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing 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 March 2014. 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.

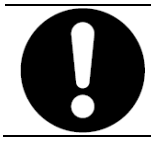
Precautions for Correct Use

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 4-Axis Motion Slave Controller (HES-C400/NJ) of Hivertec Inc. (hereinafter referred to as Hivertec) 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 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-□□□□
Hivertec	4-Axis Motion Slave Controller	HES-C400/NJ

Precautions for Correct Use

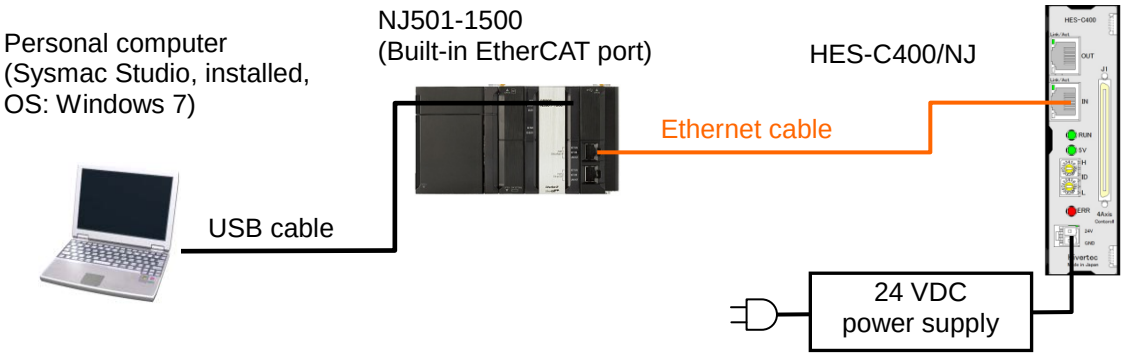
As applicable devices above, the devices with the models and versions listed in *Section 5.2*. are actually used in this document to describe the procedure for connecting devices and checking the connection.
You cannot use devices with versions lower than the versions listed in *Section 5.2.*
To use 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.
(Hivertec Inc. http://www.hivertec.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.1.07
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Sysmac Studio	SYSMAC-SE2[][][]	Ver.1.08
—	Personal computer (OS: Windows 7)	—	
—	USB cable (USB 2.0 type B connector)	—	
OMRON	Ethernet cable (with industrial Ethernet connector)	XS5W-T421-[]M[]-K	
Hivertec	4-Axis Motion Slave Controller	HES-C400/NJ	Rev.0x0000 0002
Hivertec	ESI file	Hivertec HESC400_531.xml	
—	24 VDC power supply	—	

Precautions for Correct Use

Prepare the ESI file shown in this section beforehand. To obtain the ESI file, contact Hivertec.

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

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 wring, refer to *Section 4 EtherCAT Network Wiring* of the *NJ-series CPU Unit Built-in EtherCAT 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 communication parameters and variables that are set in this document.
Hereinafter, the 4-Axis Motion Slave Controller is referred to as the "Destination Device" or the "Slave Unit" in some descriptions.

6.1. EtherCAT Communications Parameter Settings

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

■4-Axis Motion Slave Controller

Setting item	Setting value	Remarks
Node address/ slave ID	1／0	The node address used in EtherCAT communications is "Slave ID set value + 1".

6.2. Allocation for PDO Communications

The 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 (from Controller to Destination Device)

Device variable name	Data type	Meaning
E001_Command_Area1_X_Command1_7000_01	UINT	Command data 1 (X) Bits 15 to 0
E001_Command_Area1_X_Command2_7000_02	UINT	Command data 1 (X) Bits 31 to 16
E001_Command_Area1_X_Command3_7000_03	UINT	Command data 1 (X) Bits 47 to 32
E001_Command_Area1_X_Command4_7000_04	UINT	Command data 1 (X) Bits 63 to 48 (Control word)
E001_Command_Area2_Y_Command1_7000_05	UINT	Command data 2 (Y) Bits 15 to 0
E001_Command_Area2_Y_Command2_7000_06	UINT	Command data 2 (Y) Bits 31 to 16
E001_Command_Area2_Y_Command3_7000_07	UINT	Command data 2 (Y) Bits 47 to 32
E001_Command_Area2_Y_Command4_7000_08	UINT	Command data 2 (Y) Bits 63 to 48 (Control word)
E001_Command_Area3_Z_Command1_7000_09	UINT	Command data 3 (Z) Bits 15 to 0
E001_Command_Area3_Z_Command2_7000_0A	UINT	Command data 3 (Z) Bits 31 to 16
E001_Command_Area3_Z_Command3_7000_0B	UINT	Command data 3 (Z) Bits 47 to 32
E001_Command_Area3_Z_Command4_7000_0C	UINT	Command data 3 (Z) Bits 63 to 48 (Control word)
E001_Command_Area4_U_Command1_7000_0D	UINT	Command data 4 (U) Bits 15 to 0
E001_Command_Area4_U_Command2_7000_0E	UINT	Command data 4 (U) Bits 31 to 16
E001_Command_Area4_U_Command3_7000_0F	UINT	Command data 4 (U) Bits 47 to 32

Device variable name	Data type	Meaning
E001_Command_Area4_U_Command4_7000_10	UINT	Command data 4 (U) Bits 63 to 48 (Control word)
E001_Command_Error_Status_Reset_7000_11	UINT	Error status reset data

■ Input area (from Destination Device to Controller)

Device variable name	Data type	Meaning
E001_Response_Area1_X_Response1_6000_01	UINT	Response data 1 (X) Bits 15 to 0
E001_Response_Area1_X_Response2_6000_02	UINT	Response data 1 (X) Bits 31 to 16
E001_Response_Area1_X_Response3_6000_03	UINT	Response data 1 (X) Bits 47 to 32
E001_Response_Area1_X_Response4_6000_04	UINT	Response data 1 (X) Bits 63 to 48 (Response to the control word)
E001_Response_Area2_Y_Response1_6000_05	UINT	Response data 2 (Y) Bits 15 to 0
E001_Response_Area2_Y_Response2_6000_06	UINT	Response data 2 (Y) Bits 31 to 16
E001_Response_Area2_Y_Response3_6000_07	UINT	Response data 2 (Y) Bits 47 to 32
E001_Response_Area2_Y_Response4_6000_08	UINT	Response data 2 (Y) Bits 63 to 48 (Response to the control word)
E001_Response_Area3_Z_Response1_6000_09	UINT	Response data 3 (Z) Bits 15 to 0
E001_Response_Area3_Z_Response2_6000_0A	UINT	Response data 3 (Z) Bits 31 to 16
E001_Response_Area3_Z_Response3_6000_0B	UINT	Response data 3 (Z) Bits 47 to 32
E001_Response_Area3_Z_Response4_6000_0C	UINT	Response data 3 (Z) Bits 63 to 48 (Response to the control word)
E001_Response_Area4_U_Response1_6000_0D	UINT	Response data 4 (U) Bits 15 to 0
E001_Response_Area4_U_Response2_6000_0E	UINT	Response data 4 (U) Bits 31 to 16
E001_Response_Area4_U_Response3_6000_0F	UINT	Response data 4 (U) Bits 47 to 32
E001_Response_Area4_U_Response4_6000_10	UINT	Response data 4 (U) Bits 63 to 48 (Response to the control word)
E001_Response_Error_Status_6000_11	UINT	Error status data
E001_Status_SID_6010_01	UINT	PDO counter
E001_Status_X_Main_Status_6010_02	UINT	X-axis main status Bits 15 to 0
E001_Status_X_Sub_Status_6010_03	UINT	X-axis sub status Bits 15 to 0
E001_Status_Y_Main_Status_6010_04	UINT	Y-axis main status Bits 15 to 0
E001_Status_Y_Sub_Status_6010_05	UINT	Y-axis sub status Bits 15-0
E001_Status_Z_Main_Status_6010_06	UINT	Z-axis main status Bits 15 to 0
E001_Status_Z_Sub_Status_6010_07	UINT	Z-axis sub status Bits 15 to 0
E001_Status_U_Main_Status_6010_08	UINT	U-axis main status Bits 15 to 0
E001_Status_U_Sub_Status_6010_09	UINT	U-axis sub status Bits 15 to 0

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 4-Axis Motion Slave Controller via EtherCAT.

This document explains the procedure for setting up the Controller and the 4-Axis Motion Slave Controller 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 Hivertec 4-Axis Motion Slave Controller	Set up the Hivertec 4-Axis Motion Slave Controller.
↓	
7.2.1. Hardware Settings	Set the hardware switches on the 4-Axis Motion Slave Controller and connect cables.
↓	
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 4-Axis Motion Slave Controller in the Sysmac Studio.
↓	
7.3.2. Setting Up EtherCAT Network Configuration	Set up the EtherCAT network configuration.
↓	
7.3.3. Setting the Device Variables	Set the device variables used for the EtherCAT Slave Unit.
↓	
7.3.4. Transferring the Project Data	Transfer the project data from the Sysmac Studio to the Controller.
↓	
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.
↓	
7.4.2 Checking the Data that are Sent and Received	Confirm that the correct data are sent and received.

7.2. Setting Up the Hivertec 4-Axis Motion Slave Controller

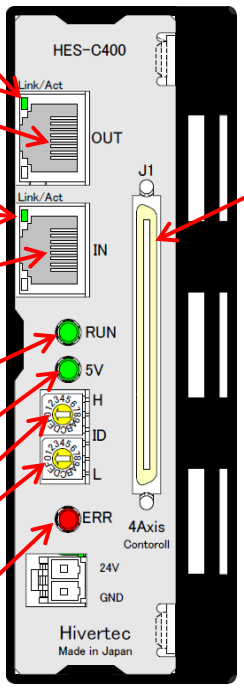
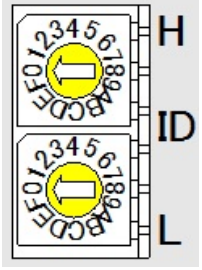
Set up the Hivertec 4-Axis Motion Slave Controller.

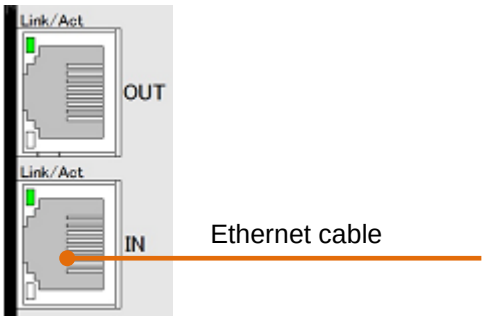
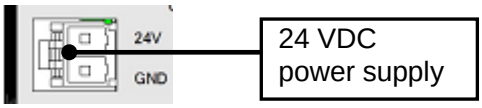
7.2.1. Hardware Settings

Set the hardware switches on the 4-Axis Motion Slave Controller and connect the cable.

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 4-Axis Motion Slave Controller 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 hardware switches on the front panel of the 4-Axis Motion Slave Controller by referring to the right figure.	Communication OUT: Link/Act LED Communication OUT: connector Communication IN: Link/Act LED Communication IN: connector Communication status indicator LED Power indicator LED Slave ID indicator High-order digit Low-order digit Error indicator LED Slave power connector  External signal connector
3	Set the Slave ID indicator to *00*. * By setting the Slave ID indicator to 00, the node address is set to 01. Node address = Slave ID set value + 1	

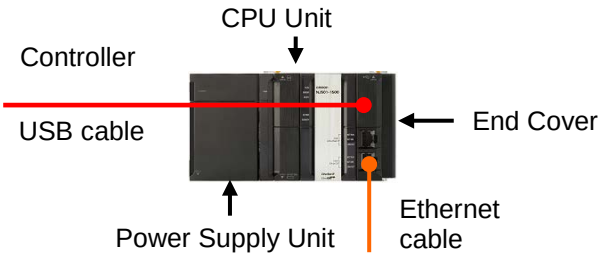
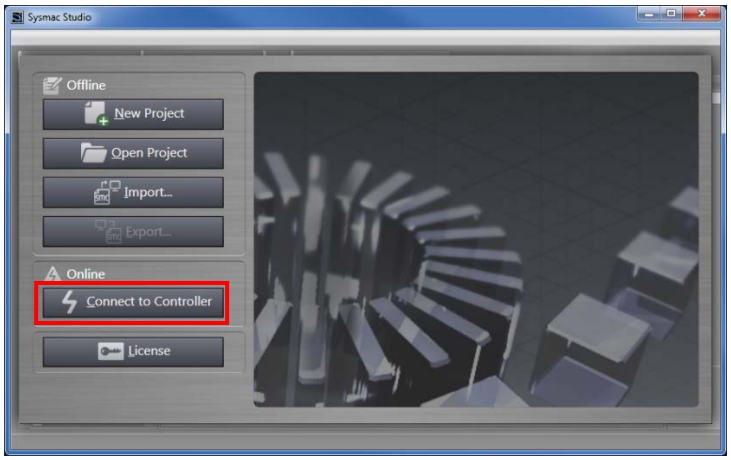
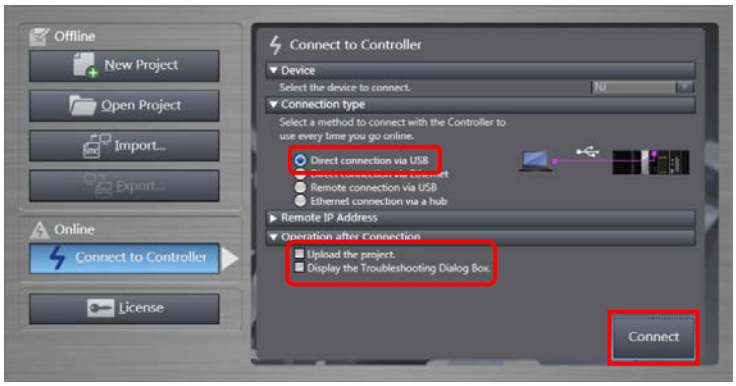
4	Connect the Ethernet cable to the Communication IN: connector.	
5	Connect the power supply to the Slave power connector, and then turn ON the power supply.	

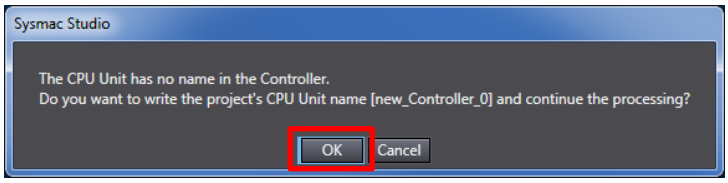
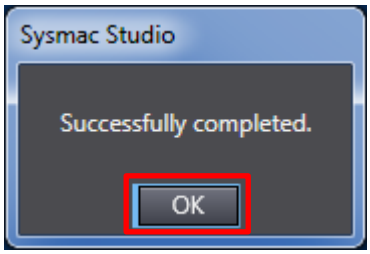
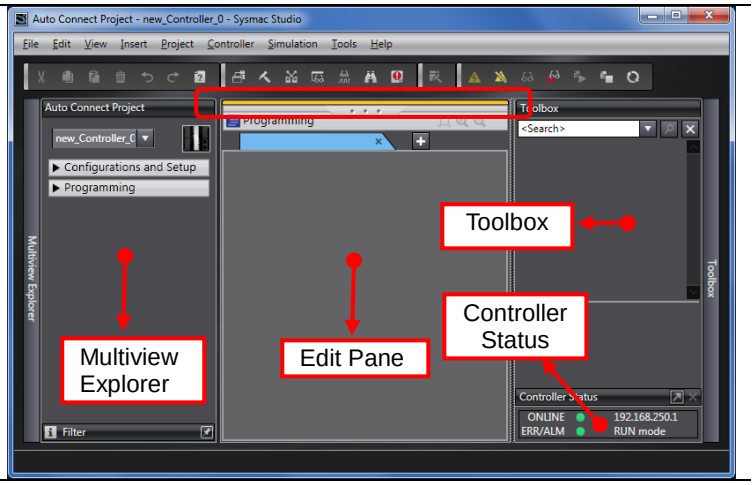
7.3. Setting Up the Controller

Set up the Controller.

7.3.1. Starting the Sysmac Studio and Installing the ESI File

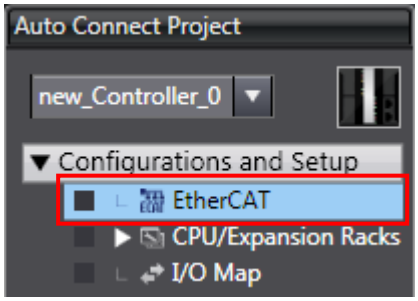
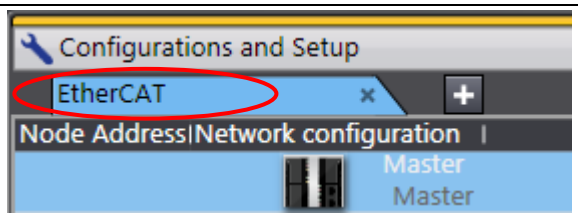
Install the ESI file for the 4-Axis Motion Slave Controller in the Sysmac Studio.
Install the Sysmac Studio and USB driver in the Personal computer beforehand.

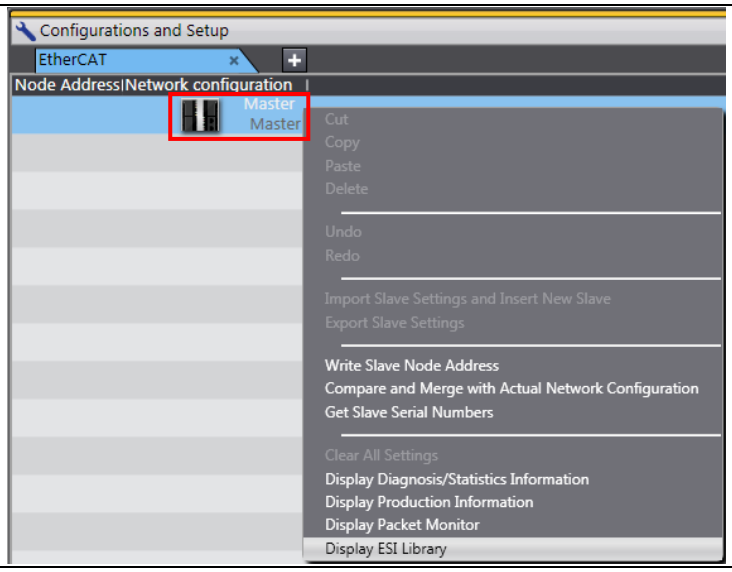
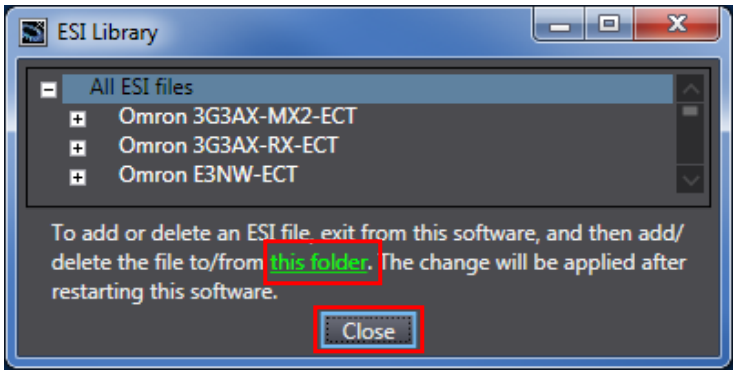
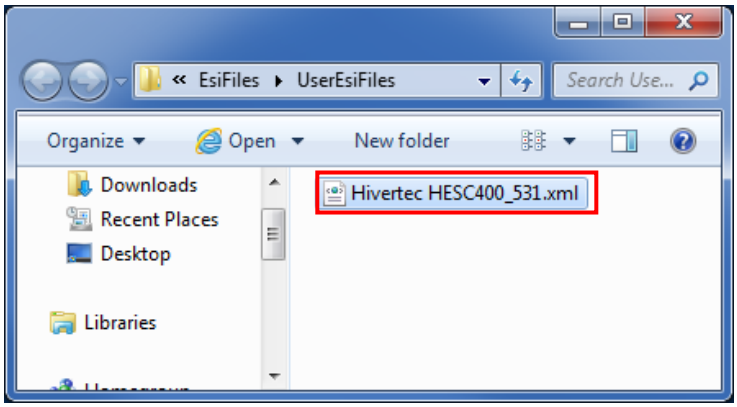
1	Connect the Ethernet cable to the built-in EtherCAT port (PORT2) of the Controller and connect the USB cable to the peripheral (USB) port. As shown in *5.2. Device Configuration*, connect the Personal computer, 4-Axis Motion Slave Controller, and Controller.	
2	Turn ON the power supply to the Controller.	
3	Start the Sysmac Studio. Click the **Connect To Controller** Button. * If a confirmation dialog for an access right is displayed at start, select to start.	
4	The Connect To Controller Dialog Box is displayed. Select the *Direct connection via USB* Option for Connection type. Uncheck the *Upload the project* Checkbox and the *Display the Troubleshooting Dialog box* Checkbox of Operation after Connection. Click the **Connect** Button.	

5	A confirmation dialog box on the right is displayed. Check the contents and click the **OK** Button. * The displayed dialog depends on the status of the Controller used. Click the **OK** Button to proceed with the processing.	
6	A confirmation dialog box is displayed. Check the contents and click the **OK** Button.	
7	The Auto Connect Project Dialog Box is displayed online. When an online connection is established, a yellow bar is displayed. The left pane is called Multiview Explorer, the top right pane is called Toolbox, the bottom right pane is called Controller Status, and the middle pane is called Edit Pane.	

Additional Information

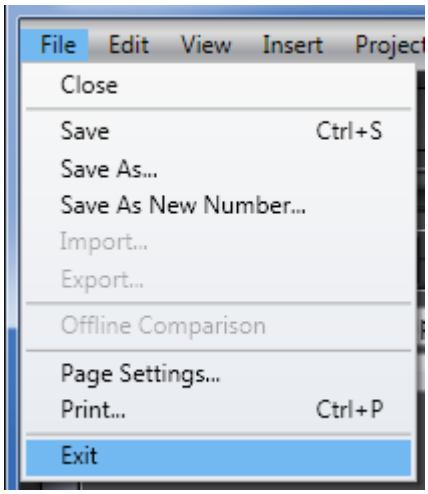
For details on online connections to a Controller, refer to *Section 5 Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

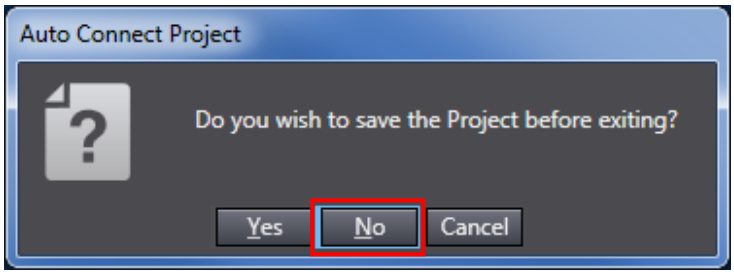
8	Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.	
9	The EtherCAT Tab is displayed on the Edit Pane.	

10	Right-click **Master** and select ***Display ESI Library***.	
11	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.	
12	The Explorer starts and a folder is opened, allowing you to install the ESI file. Copy the prepared *Hivertec HESC400_531.xml* to this folder.	

13 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.

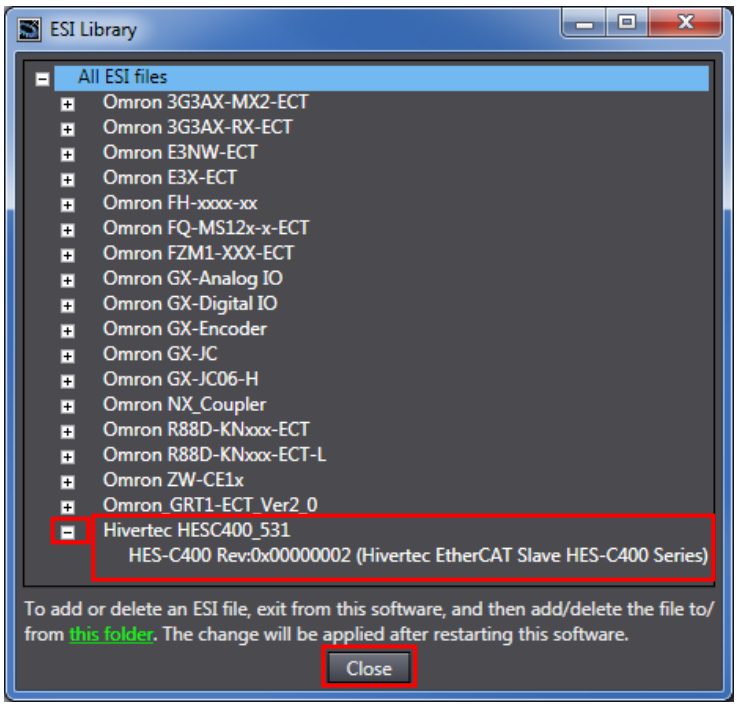




14 In the same way as steps 3 to 10, restart the Sysmac Studio and display the ESI Library Dialog Box.
Click the **+** Button of Hivertec HESC400_531 to confirm that the HESC400 Rev:0x00000002 device is displayed.

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

Click the **Close** Button.

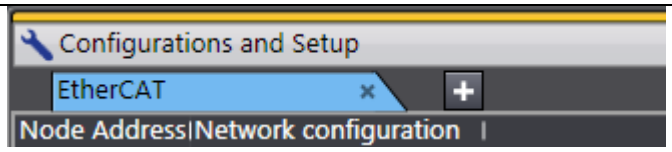
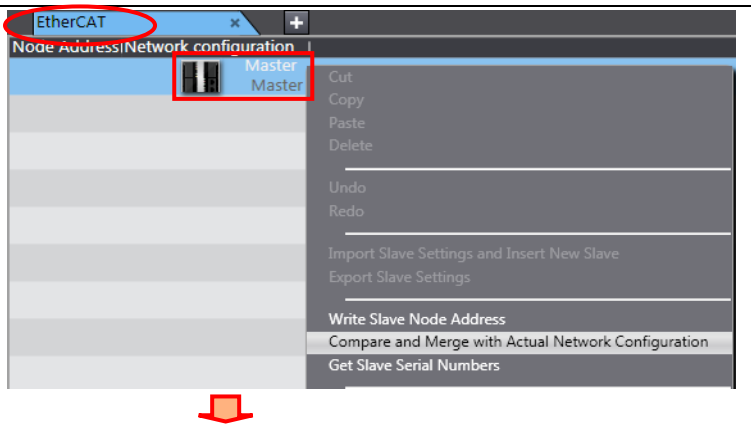
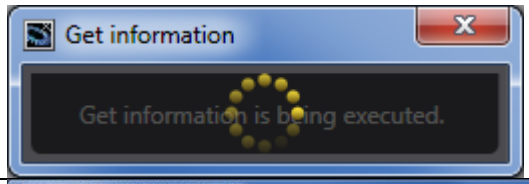
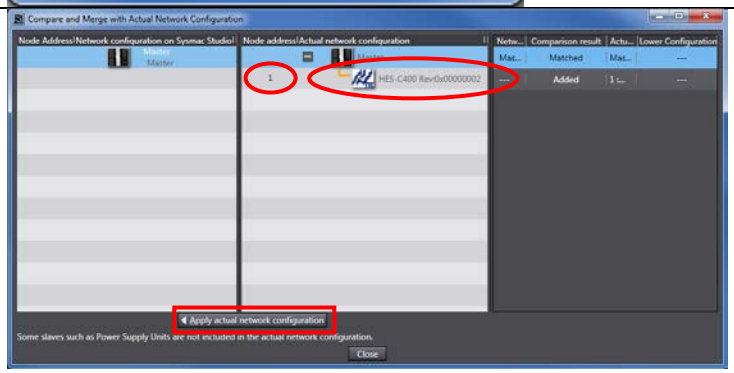
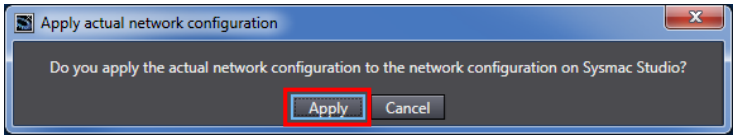
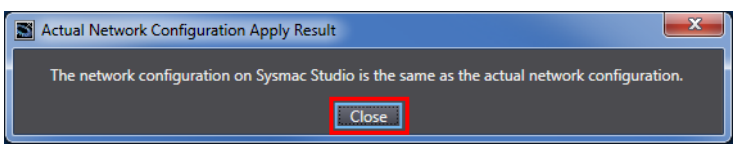


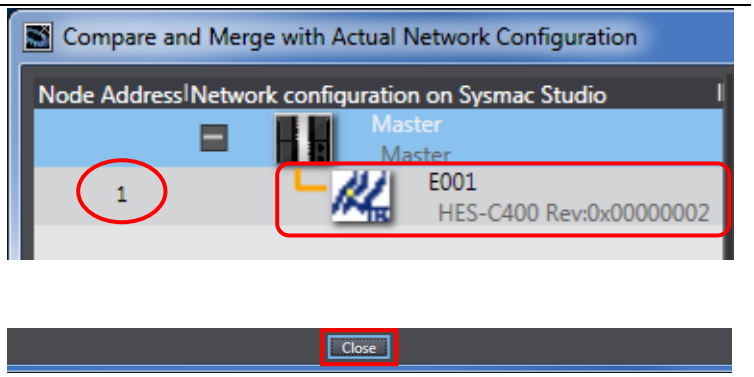
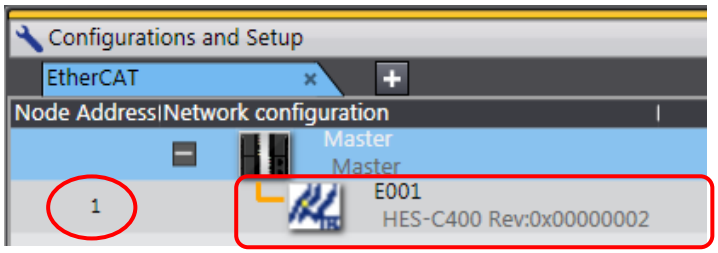
Precautions for Correct Use

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

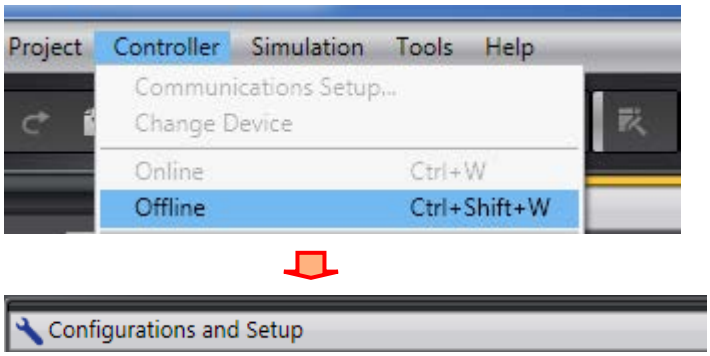
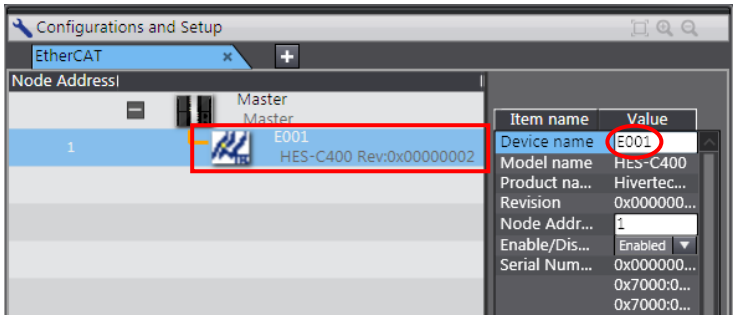
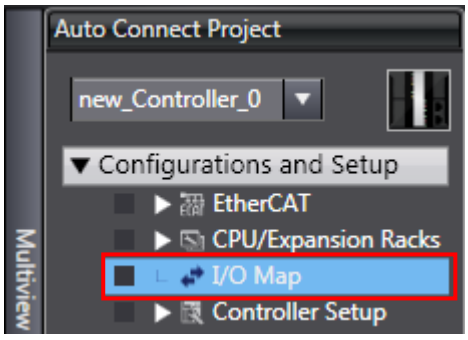
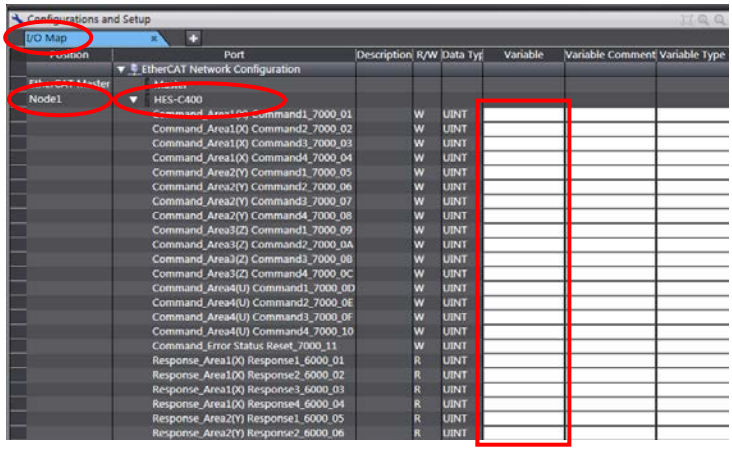
Set up the EtherCAT network configuration.

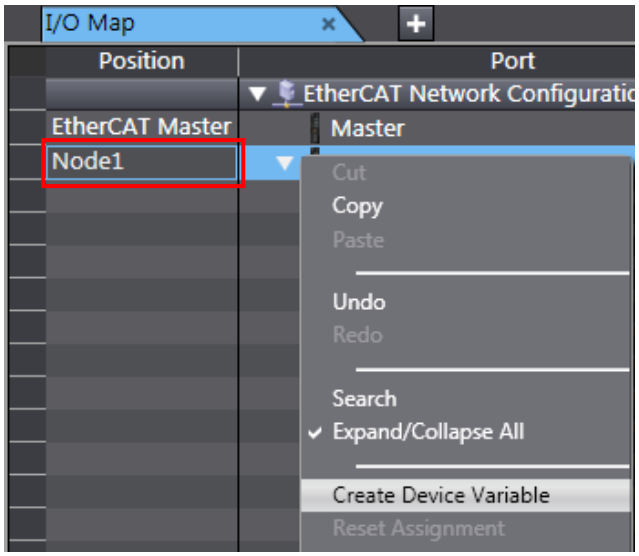
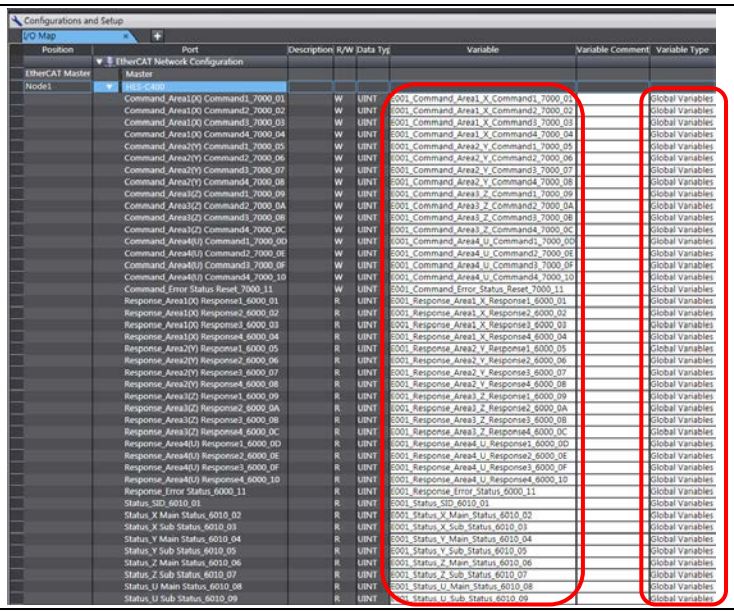
1	Confirm that a yellow bar is displayed on the top of the Edit Pane which indicates an online connection is established.	
2	Right-click **Master** on the EtherCAT Tab Page, and select ***Compare and Merge with Actual Network Configuration***. A screen is displayed stating "Get information is being executed".	 
3	The Compare and Merge with Actual Network Configuration Dialog Box is displayed. Node address 1 and HES-C400 Rev:0x00000002 are added to the Actual network configuration after the comparison. Click the **Apply actual network configuration** Button.	
4	A confirmation dialog box on the right is displayed. Check the contents and click the **Apply** Button. A confirmation dialog box on the right is displayed. Check the contents and click the **Close** Button.	 

5	Node address 1, E001 and HES-C400 Rev:0x00000002 are added to the Network configuration on the Sysmac Studio. Confirm that the data above are added and click the **Close** Button.	
6	Node address 1, E001, and HES-C400 Rev:0x00000002 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	Select **HES-C400 Rev:0x00000002** set in the previous steps in the EtherCAT Tab Page and confirm that Device name is E001. * Device name can be changed as desired.	
3	Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.	
4	The I/O Map Tab 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.	

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

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 I/O ports.

7.3.4. Transferring the Project Data

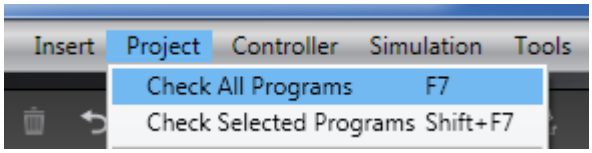
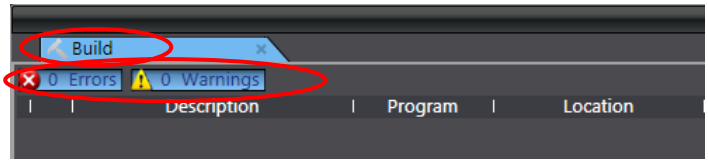
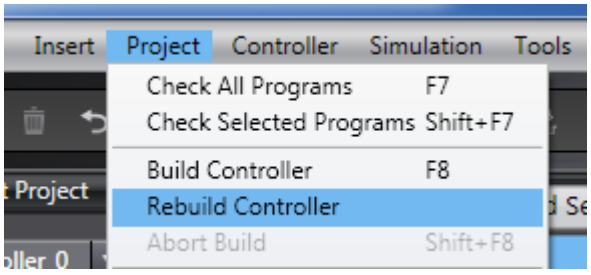
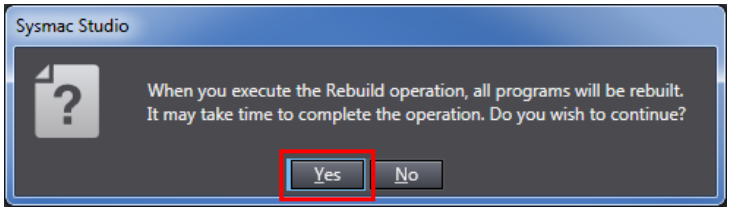
Transfer the project data from the Sysmac Studio to the Controller.

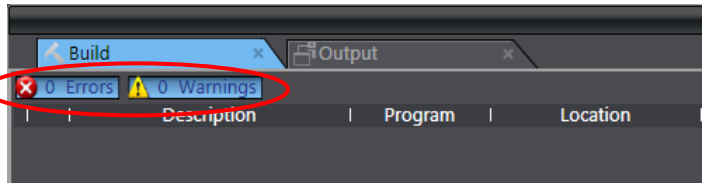
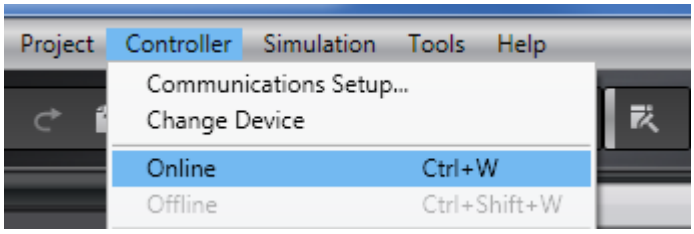
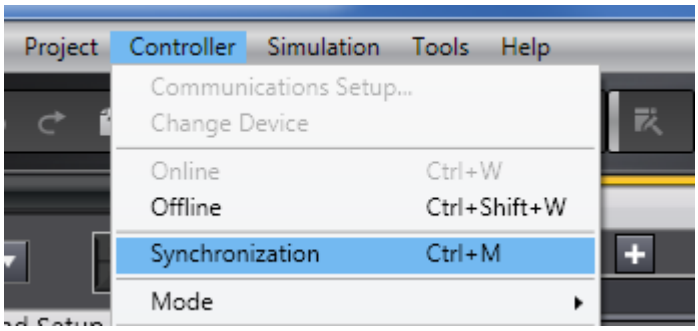
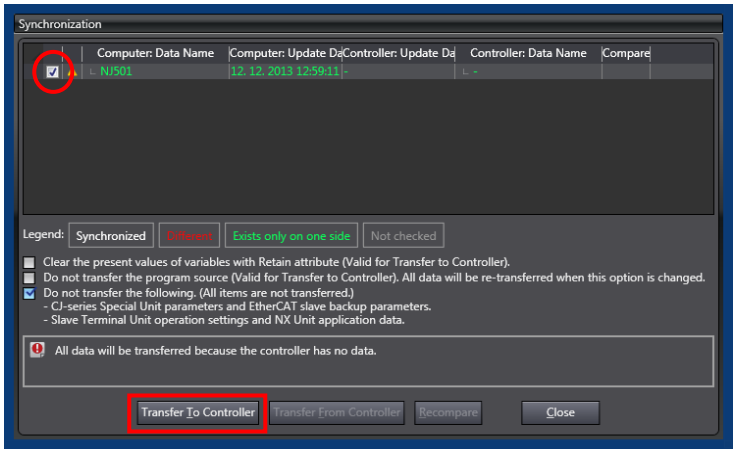
⚠ WARNING

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.

⚠ Caution

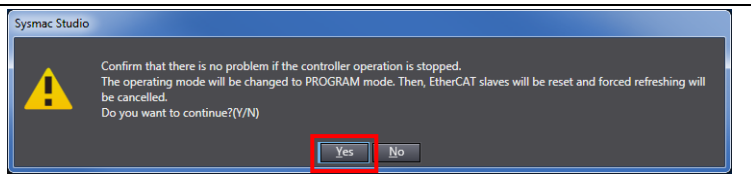
After you transfer the user program, the CPU Unit restarts and communications with the EtherCAT slaves are cut off. During that period, the slave outputs behave according to the slave settings. The time that communications are cut off depends on the EtherCAT network configuration.
Before you transfer the user program, confirm that it will not adversely affect the device.

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 on the right is displayed. Confirm that there is no problem and click the **Yes** Button.	

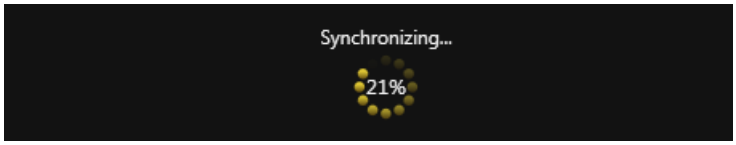
5	Confirm that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.	
6	Select ***Online*** from the Controller Menu.	
7	Select ***Synchronization*** from the Controller Menu.	
8	The Synchronization Dialog Box is displayed. Confirm that the data to transfer (NJ501 in the right dialog) is selected. Then, click the **Transfer To Controller** Button. * After executing the Transfer To Controller, the Sysmac Studio data is transferred to the Controller and the data is compared.	

9

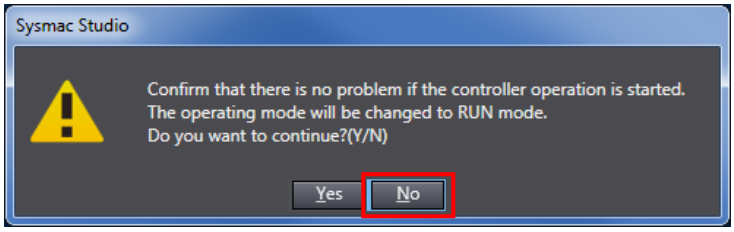
A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.



A screen stating "Synchronizing" is displayed.

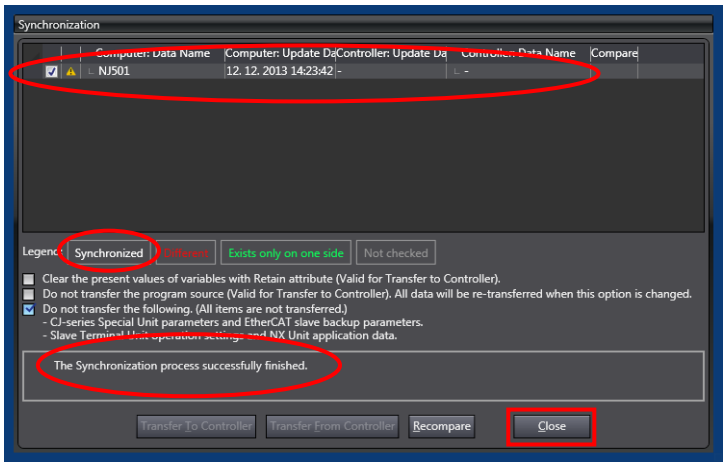


A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **No** Button.
* Do not return it to RUN mode.



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.

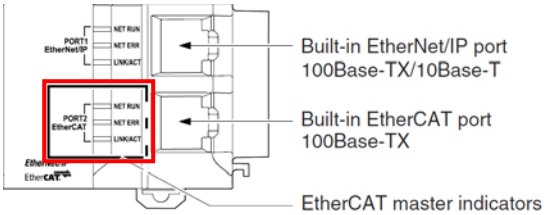
7.4.1. Checking the Connection Status

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.

The LED indicators in normal status are as follows:

[NET RUN]: Lit green
[NET ERR]: Not lit
[LINK/ACT]: Flashing yellow

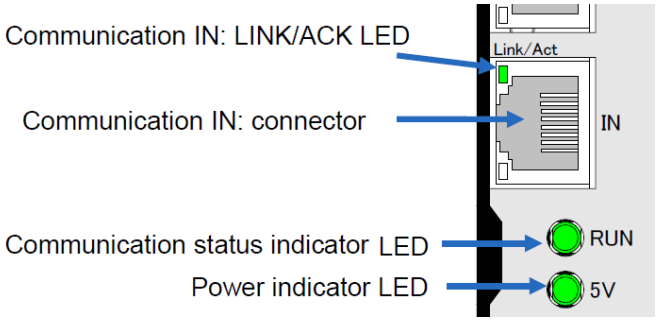


Label	Name	Color	Status	Meaning
EtherCAT NET RUN	RUN	Green	Lit	EtherCAT communications are in progress. Inputs and outputs for I/O data are in operation
			Flashing	EtherCAT communications are being established Communications is in one of the following states ・Only message communications is functioning ・Only message communications and I/O data input operations are functioning
			Not lit	EtherCAT communications are stopped ・The power supply is OFF or the CPU Unit is reset ・There is a MAC address error, communications controller error, or other error.
EtherCAT NET ERR	ERROR	Red	Lit	There is a MAC address error, communications controller error, or an unrecoverable error such as an exception.
			Flashing	A recoverable error occurs
			Not lit	There are no errors
EtherCAT LINK/ACT	Link/Activity	Yellow	Lit	A link was established
			Flashing	Data communications are in progress after establishing link Flashes every time data is sent or received
			Not lit	The link was not established

2 Check the LED indicators on the 4-Axis Motion Slave Controller.

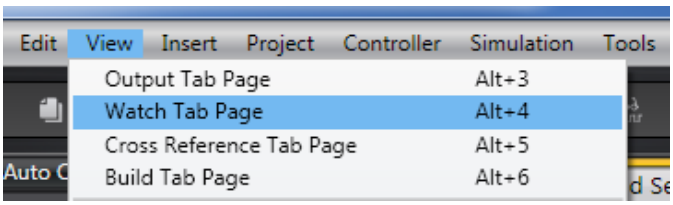
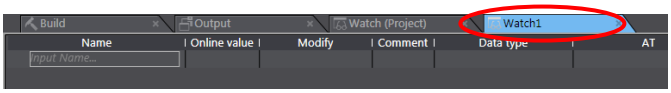
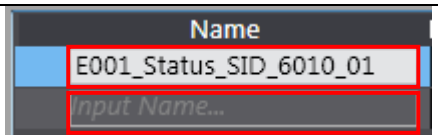
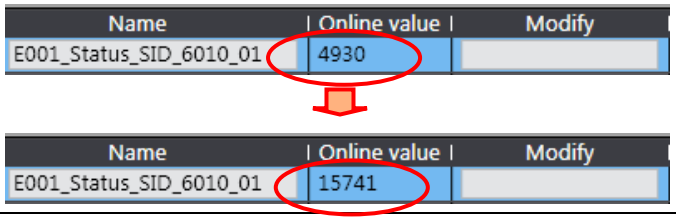
The LED indicators in normal status are as follows:

[Communication IN: LINK/ACK LED (IN)] : Flashing green
[Communication status indicator LED (RUN)] : Lit green
[Power indicator LED (5V)] : Lit green



7.4.2. Checking the Data that are Sent and Received

Confirm that the correct data are sent and received.

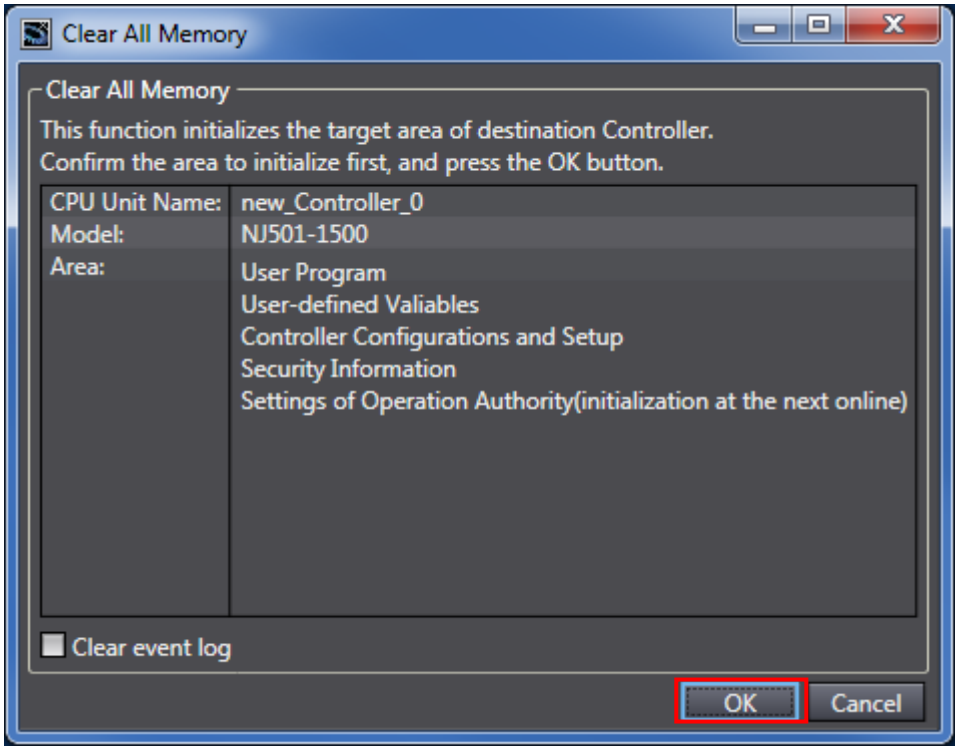
1	Select ***Watch Tab Page*** from the View Menu.	
2	The Watch1 Tab Page is displayed in the lower section of the Edit Pane.	
3	Enter the following name in the Watch1 Tab Page for monitoring. Click a column under the *Name* Column to enter a new name. *E001_Status_SID_6010_01*	
4	Confirm that the Online value is updated periodically.	

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.



8.2. Initializing the Hivertec 4-Axis Motion Slave Controller

For how to initialize the Hivertec 4-Axis Motion Slave Controller, refer to *2.2.3 Initializing the Register* of the *EtherCAT Motion Slave EtherCAT series HES-C400 HES-M400 User's Manual <Software>*.

9. Revision History

Revision code	Date of revision	Revision reason and revision page
01	Mar. 4, 2014	First edition

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