OMRON

Machine Automation Controller NJ-series

EtherCAT(R) Connection Guide
IAI Corporation

X-SEL Controller
(XSEL-R/S/RX/SX/RXD/SXD)

SYSMAC
always in control

P549-E1-01

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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 IAI Corporation (hereinafter referred to as IAI) 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
IAI	ME0313	XSEL-R/S/RX/SX/RXD/SXD	X-SEL Controller R/S/RX/SX/RXD/SXD Type Operation Manual
IAI	ME0309	XSEL-R/S/RX/SX/RXD/SXD	EtherCAT(R) Operation Manual XSEL-R/S/RX/SX/RXD/SXD
IAI	ME0154	IA-101-X-MW IA-101-XA-MW IA-101-X-USBMW	PC Software for X-SEL Operation 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, 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 April 2015. 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, could result in death or serious injury. Additionally, there may be severe 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 X-SEL Controller (XSEL-R/S/RX/SX/RXD/SXD) of IAI 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-[][][][]
IAI	X-SEL Controller	XSEL-R/S/RX/SX/RXD/SXD-[]-[][][]-([]I[])-EC-[][][]-[]-[]
IAI	Actuator	-

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 S*ection 5.2.*, check the differences in the specifications by referring to the manuals before operating the devices.

Additional Information

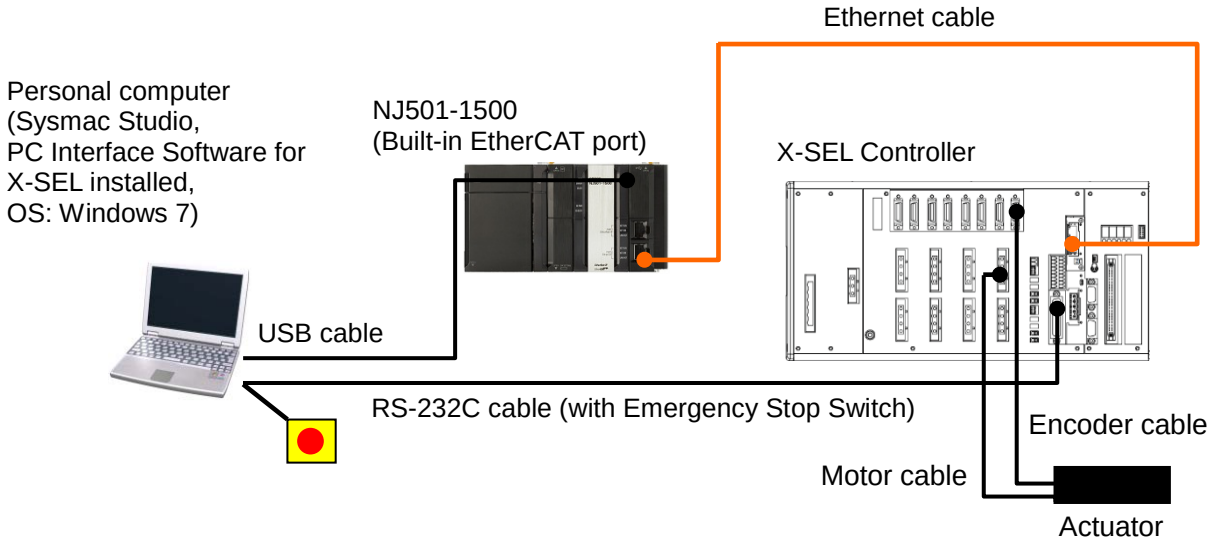
This document describes the procedure to establish the network connection. It does not provide information on operation, installation or wiring method which is not related to the connection procedure. It also does not describe the functionality or operation of the devices. Refer to the manuals or contact the device manufacturer.
(IAI Corporation http://www.intelligentactuator.com/)
This URL is the latest address at the time of this document creation. Contact each device manufacturer for the latest information.

Additional Information

Contact IAI Corporation for actuators connectable to X-SEL Controller.

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	
IAI	X-SEL Controller	XSEL-R-4-60I-60I-60I-60I-ECDVIA-N1E-2-3	Rev.1.07
IAI	Actuator	ISDBCR-S-I-60-8-200-T2-X07-A1E-AQ-B	
IAI	Motor cable	CB-X-MA[][][]	
IAI	Encoder cable	CB-X1-PA[][][]	
IAI	RS-232C cable (with Emergency Stop Switch)	CB-ST-E1MW050-EB	
IAI	PC Interface Software for X-SEL	IA-101-X-MW	Ver.11.00.00.00-E
IAI	ESI file	ESI_IAI_SEL_ECT_V_1_07_Rev_2.xml	

Precautions for Correct Use

Prepare the ESI file shown in this section beforehand. The latest ESI file can be downloaded from the IAI website.
IAI Corporation http://www.intelligentactuator.com/field-network-configuration-files/
Contact IAI 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 this document by referring to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

Precautions for Correct Use

For details on power supply wiring, refer to the *X-SEL Controller R/S/RX/SX/RXD/SXD Type Operation Manual* (ME0313).

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-SEL Controller is referred to as the "Destination Device" or the "Slave Unit" in some descriptions.

6.1. Parameters

The parameters required for connecting the Controller and the X-SEL Controller via EtherCAT are given below.
This document describes the case that only EtherCAT board is used for the X-SEL Controller which is configured as follows:

- Extension PIO Input32/Output16 NPN Board is already mounted to the I/O slot 1.
- I/O slot 2 is not mounted.
- EtherCAT board is already mounted to the Field Network Board (Option) Mounted Position 1.
- DeviceNet board is already mounted to the Field Network Board (Option) Mounted Position 2.

■Parameters for the X-SEL Controller

Name	Items	Set value	Remarks
X-SEL Controller	Node address	1	The node address is set by Sysmac Studio. Make sure that I/O parameter No. 226 is set to 0 in PC Interface Software for X-SEL.

■Parameters for PC Interface Software for X-SEL

Name	Items	I/O parameters		
		No.	Set value	Remarks
X-SEL Controller	I/O port assignment type	1	0	Fixed allocation (Default)
	I/O slot 1 (Extension PIO Input32/Output16 NPN Board)			
	Fix-Allocated Input Port Start No.(I/O1)	2	64	
	Fix-Allocated Output Port Start No.(I/O1)	3	364	
	Error Monitor(I/O1)	10	0	Do not monitor
	I/O slot 2 (not mounted)			
	Fix-Allocated Input Port Start No.(I/O2)	4	-1	Not used (Default)
	Fix-Allocated Output Port Start No.(I/O2)	5	-1	Not used (Default)
	Error Monitor(I/O2)	11	0	Do not monitor
	Field Network Board (Option) Mounted Position 1 (EtherCAT board)			
	No. of Remote Input Ports	14	256	(Default)
	No. of Remote Output Ports	15	256	(Default)
	Fix-Allocated Input Port Start No.	16	1000	(Default)
	Fix-Allocated Output Port Start No.	17	4000	(Default)
	Error Monitor	18	1	Monitor (Default)
	Node Address	226	0	Default setting The node address is set by Sysmac Studio.
	Baud Rate	227	0	Setting unnecessary (Default)
	Field Network Board (Option) Mounted Position 2 (DeviceNet board)			
	No. of Remote Input Ports	231	64	
	No. of Remote Output Ports	232	64	
	Fix-Allocated Input Port Start No.	233	0	
	Fix-Allocated Output Port Start No.	234	300	
	Error Monitor	235	0	No Monitoring
	Node Address	237	0	
	Baud Rate	238	2	

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_Out_OUT00_2003_01	UINT	Universal input
E001_Out_OUT01_2003_02	UINT	Universal input
E001_Out_OUT02_2003_03	UINT	Universal input
E001_Out_OUT03_2003_04	UINT	Universal input
E001_Out_OUT04_2003_05	UINT	Universal input
:	:	:
E001_Out_OUT11_2003_0C	UINT	Universal input
E001_Out_OUT12_2003_0D	UINT	Universal input
E001_Out_OUT13_2003_0E	UINT	Universal input
E001_Out_OUT14_2003_0F	UINT	Universal input
E001_Out_OUT15_2003_10	UINT	Universal input

■Input area (from Destination Device to Controller)

Device variable name	Data type	Description
E001_In_IN00_2004_01	UINT	Universal output
E001_In_IN01_2004_02	UINT	Universal output
E001_In_IN02_2004_03	UINT	Universal output
E001_In_IN03_2004_04	UINT	Universal output
E001_In_IN04_2004_05	UINT	Universal output
:	:	:
E001_In_IN11_2004_0C	UINT	Universal output
E001_In_IN12_2004_0D	UINT	Universal output
E001_In_IN13_2004_0E	UINT	Universal output
E001_In_IN14_2004_0F	UINT	Universal output
E001_In_IN15_2004_10	UINT	Universal output

Additional Information

In this document, the X-SEL Controller is used by the default PDO mapping.

Additional Information

For details on assignments of input and output areas, refer to *Section 3.2. Receiving and Forwarding of I/O Signals Necessary for Operation* in *Chapter 3 Operation* of the *X-SEL Controller R/S/RX/SX/RXD/SXD Type Operation Manual* (ME0313).

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-SEL Controller via EtherCAT.

This document explains the procedures for setting up the Controller and the X-SEL 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 IAI X-SEL Controller	Set up the IAI X-SEL Controller.
↓	
7.2.1. Hardware Settings	Set the hardware switches on the X-SEL Controller and connect the cables.
↓	
7.2.2. Parameter Settings	Set the parameters for the X-SEL Controller.
↓	
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-SEL Controller in the Sysmac Studio.
↓	
7.3.2. Setting up the 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. Error Reset of the X-SEL Controller	Reset an error of the X-SEL Controller.
↓	
7.4.2. Checking the Connection Status	Check the connection status of the EtherCAT network.
↓	
7.4.3. Checking the Sent and Received Data	Confirm that the correct data are sent and received.

7.2. Setting up the IAI X-SEL Controller

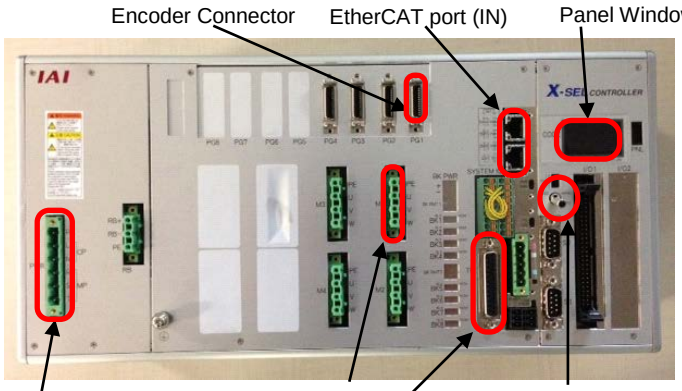
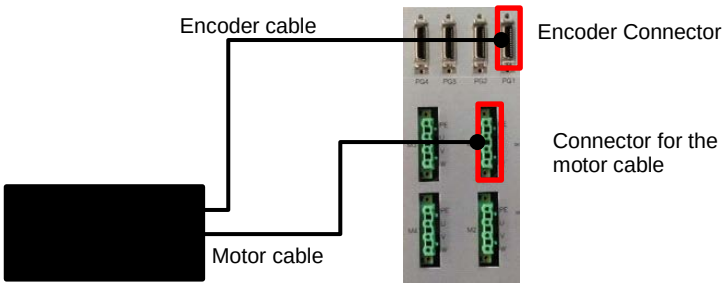
Set up the IAI X-SEL Controller.

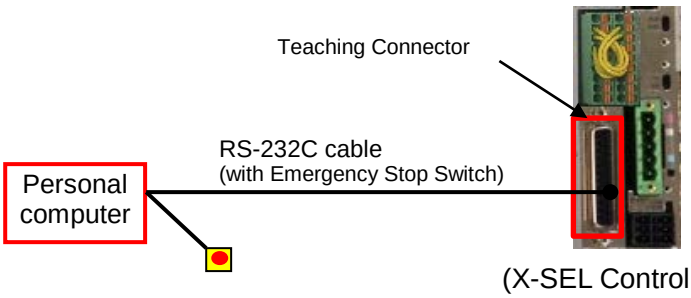
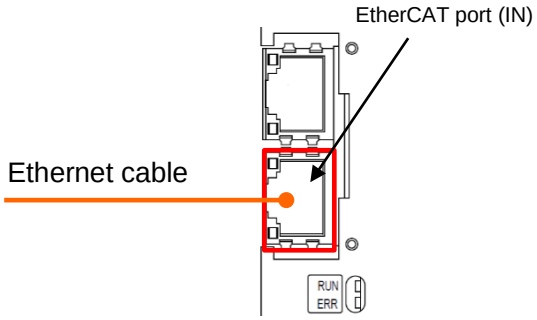
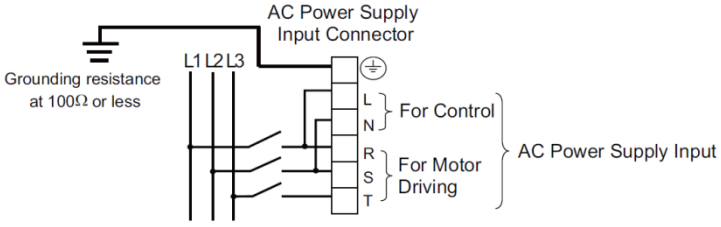
7.2.1. Hardware Settings

Set the hardware switches on the X-SEL Controller and connect the cables.

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-SEL 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 and the connectors on the front panel of the X-SEL Controller by referring to the right figure.	 (Front panel of X-SEL Controller)
3	Set the Mode Switch on the front of the X-SEL Controller to the MANU side.	 (X-SEL Controller)
4	Connect the Actuator to the Encoder Connector with the Encoder cable, and connect the Actuator to the Connector for the motor cable with the Motor cable.	 (Actuator) (X-SEL Controller)

5	Connect the Teaching Connector and the serial port of the Personal computer with the RS-232C cable (with Emergency Stop Switch).	 (X-SEL Controller)
6	Connect the Ethernet cable to the EtherCAT port (IN).	 (X-SEL Controller)
7	Connect the 200 VAC power supply to the AC Power Supply Input Connector. For details on the power supply wiring, refer to the *X-SEL Controller R/S/RX/SX/RXD/SXD Type Operation Manual* (ME0313).	 (X-SEL Controller (200V AC three phase specification))

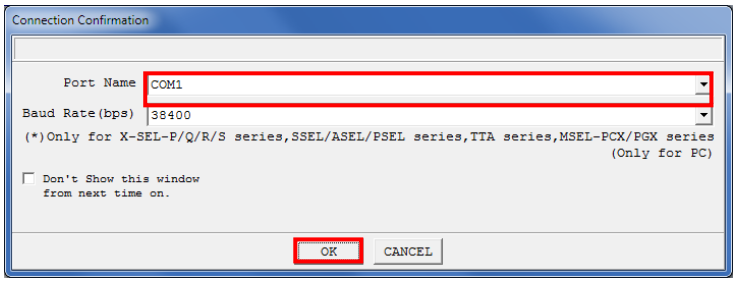
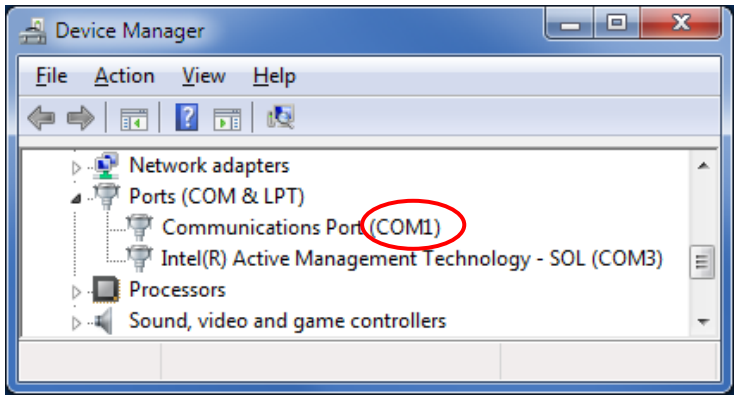
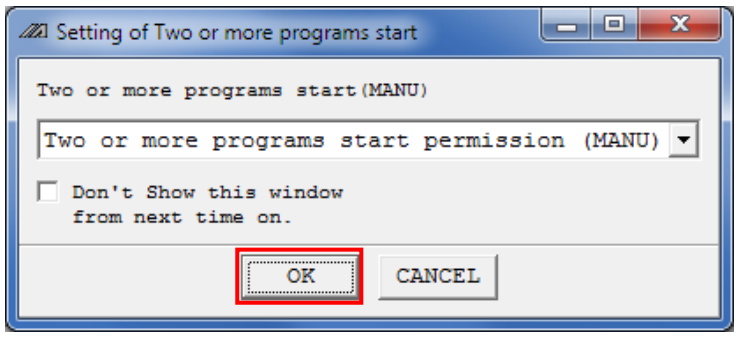
7.2.2. Parameter Settings

Set the parameters for the X-SEL Controller.

Parameters are set by PC Interface Software for X-SEL. Install the software to the Personal computer beforehand.

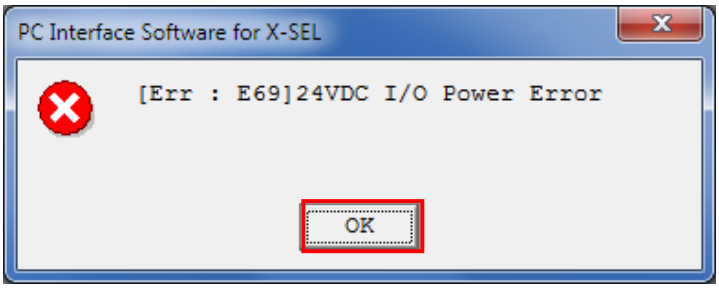
Additional Information

For how to install the software, refer to the *PC Software for X-SEL Operation Manual* (ME0154).

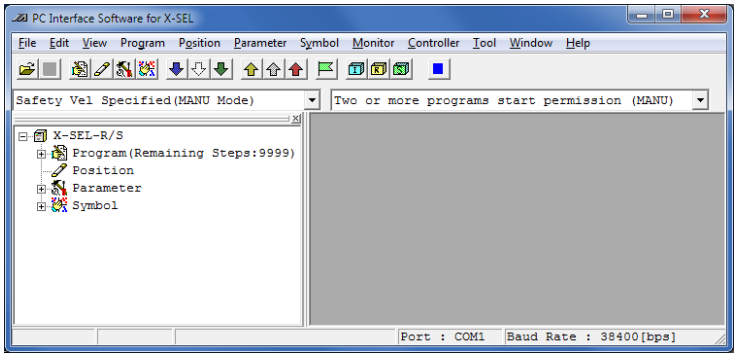
1	Turn ON the power supply to the X-SEL Controller. .	
2	Start the PC Interface Software for X-SEL from the Personal computer.	
3	When the software starts, the Connection Confirmation Dialog Box is displayed. Select the communications port No. in the *Port Name* Field and click the **OK** Button. *If there are multiple serial ports on the Personal computer, display the Windows Device Manager, and select the same port as the communications port No. that the X-SEL Controller is connected (COM1 in this example) shown under Ports (COM & LPT). *To display Device Manager, select ***Device Manager*** from Control Panel.	 
4	The Setting of Two or more programs start Dialog Box is displayed. Check the contents and click the **OK** Button.	

5 24 VDC power supply is not supplied to the standard I/O connector. So, a confirmation dialog box of abnormal 24-V I/O power source is displayed.

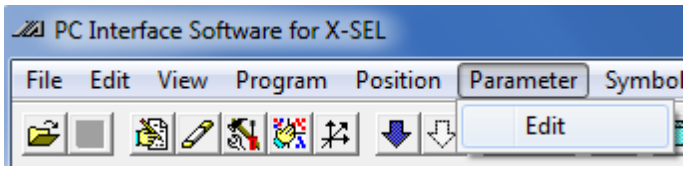
Check the contents and click the **OK** Button.



6 The PC Interface Software for X-SEL starts.



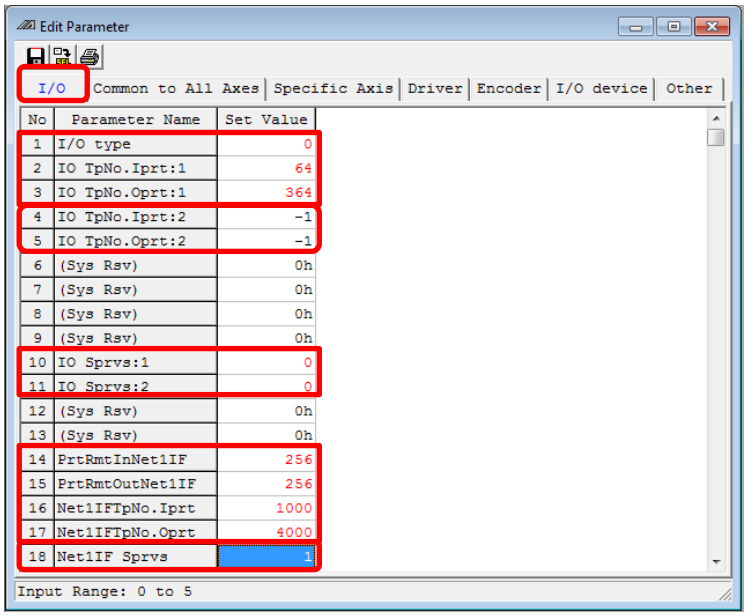
7 Select ***Edit*** from the Parameter Menu.

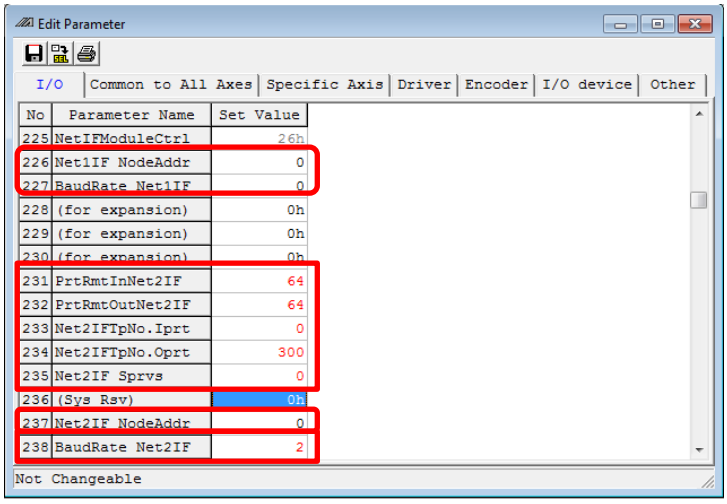
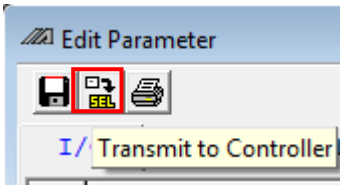
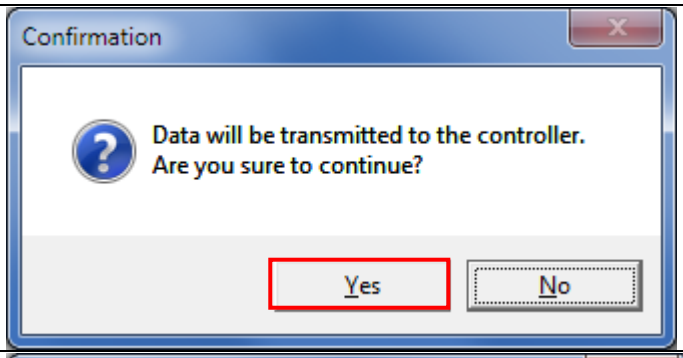
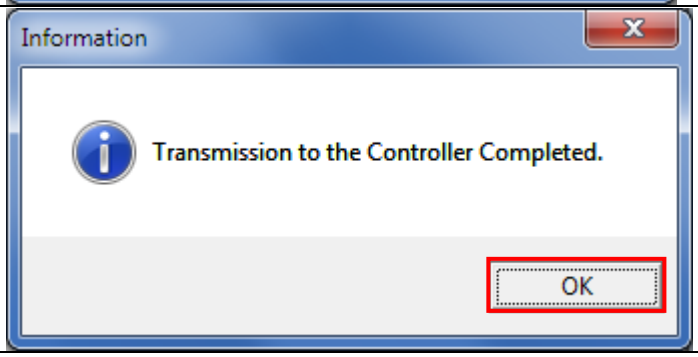


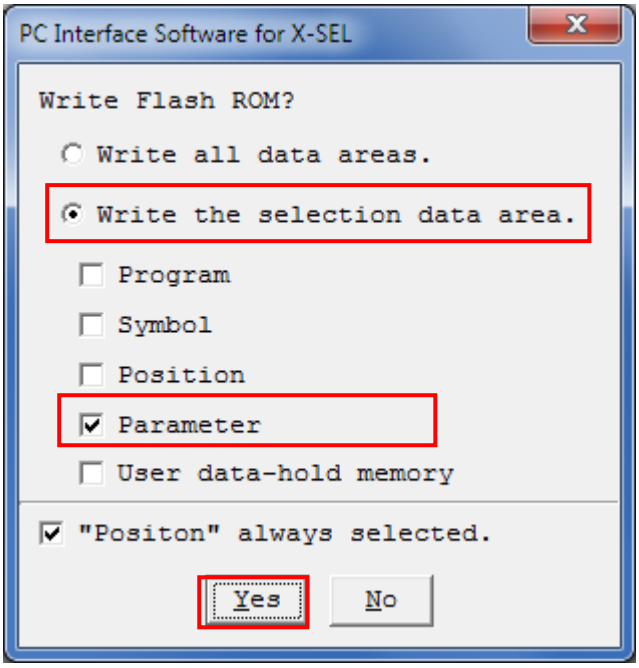
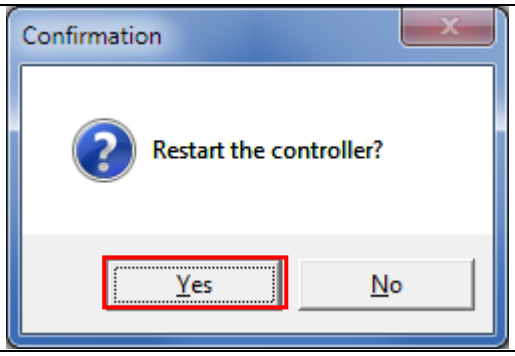
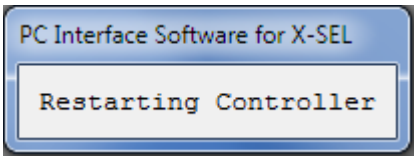
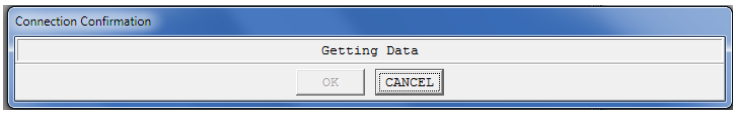
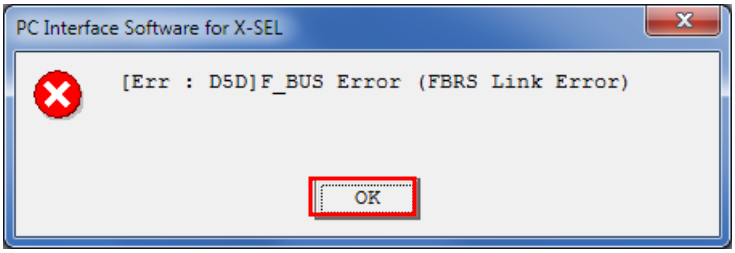
8 The I/O Tab Page in the Edit Parameter Dialog Box is displayed. Set the parameters as shown below.

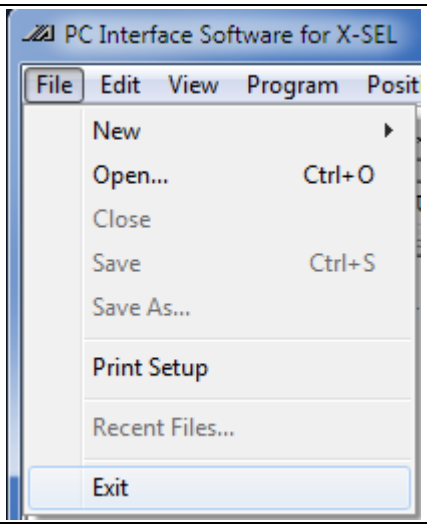
- No.1: *0*
- No.2: *64*
- No.3: *364*
- No.4: *-1*
- No.5: *-1*
- No.10: *0*
- No.11: *0*
- No.14: *256*
- No.15: *256*
- No.16: *1000*
- No.17: *4000*
- No.18: *1*

*The changed parameter is displayed in red.



9	Scroll the screen, and set the following parameters. ・No.226: *0* ・No.227: *0* ・No.231: *64* ・No.232: *64* ・No.233: *0* ・No.234: *300* ・No.235: *0* ・No.237: *0* ・No.238: *2*	
10	After setting the parameters, click the  icon (Transmit to Controller).	
11	A confirmation dialog box is displayed. Check the contents and click the **Yes** Button.	
12	The Information Dialog Box is displayed. Check the contents and click the **OK** Button.	

13	The dialog box on the right is displayed. Select the *Write the selection data area* Option, and select the *Parameter* Check Box. Click the **Yes** Button.	
14	The Confirmation Dialog Box is displayed. Check the contents and click the **Yes** Button.	
15	When the X-SEL Controller starts, the dialog box on the right is displayed.	
16	The dialog box on the right is displayed. When the X-SEL Controller is reconnected to the personal computer, the dialog box on the right is closed.	
17	A confirmation dialog box indicating F_BUS Error (FBRS link error) is displayed. Check the contents and click the **OK** Button. *At this time, the EtherCAT communications are not established between the X-SEL Controller and the Controller. So, the error shown on the right is displayed.	

18	Select ***Exit*** from the File Menu to exit the PC Interface Software for X-SEL.	
19	Turn OFF the power supply to the X-SEL Controller.	

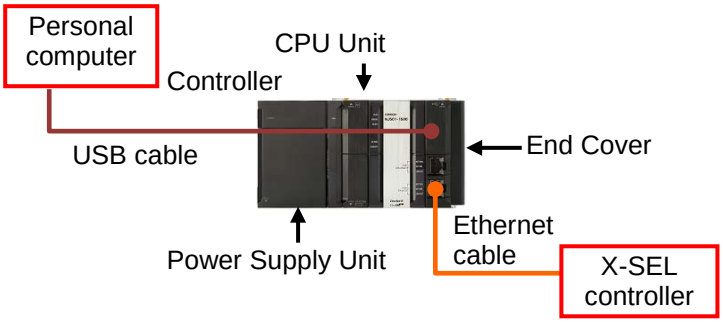
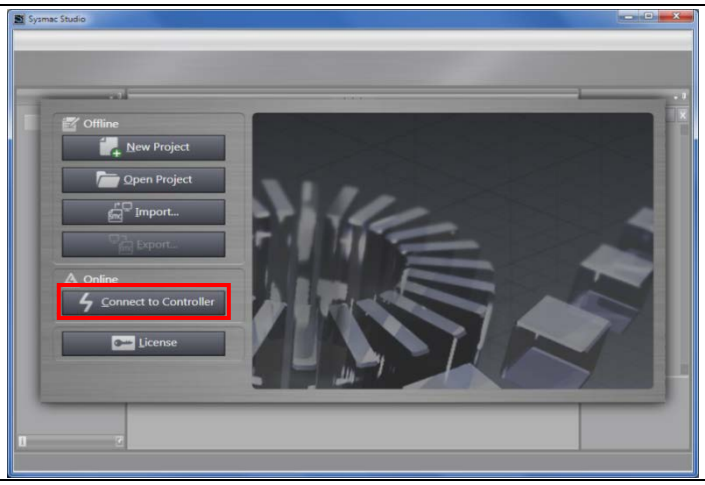
7.3. Setting up the Controller

Set up the Controller.

7.3.1. Starting the Sysmac Studio and Installing the ESI File

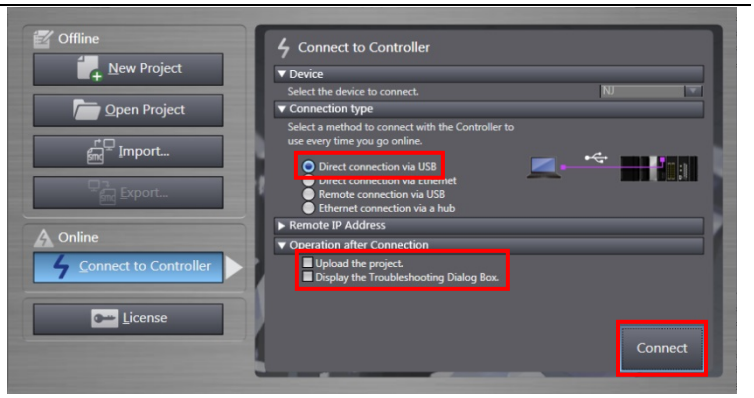
Install the ESI file for X-SEL Controller in the Sysmac Studio.

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 *Section 5.2. Device Configuration*, connect the Personal computer, the Destination Device, and the Controller.	
2	Turn ON the power supply to the Controller and the X-SEL Controller.	
3	Start the Sysmac Studio. *If a confirmation dialog for an access right is displayed at start, execute a selection to start.	
4	The Sysmac Studio starts. Click the **Connect to Controller** Button.	

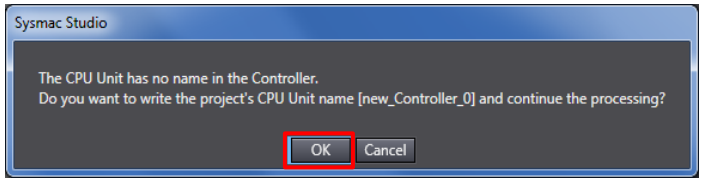
5 The Connect to Controller Dialog Box is displayed.
Select the *Direct connection via USB* Option for Connection type.
Uncheck both the *Upload the project* Check Box and the *Display the Troubleshooting Dialog Box* Check Box for Operation after Connection.

Click the **Connect** Button.

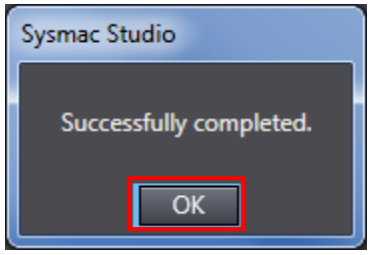


6 Check the contents and click the **OK** Button if a confirmation dialog box on the right is displayed.

*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.



7 A dialog box indicating the Successfully completed is displayed. Check the contents and click the **OK** Button.



8 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.

The following panes are displayed in this window.

Left: Multiview Explorer

Top right: Toolbox

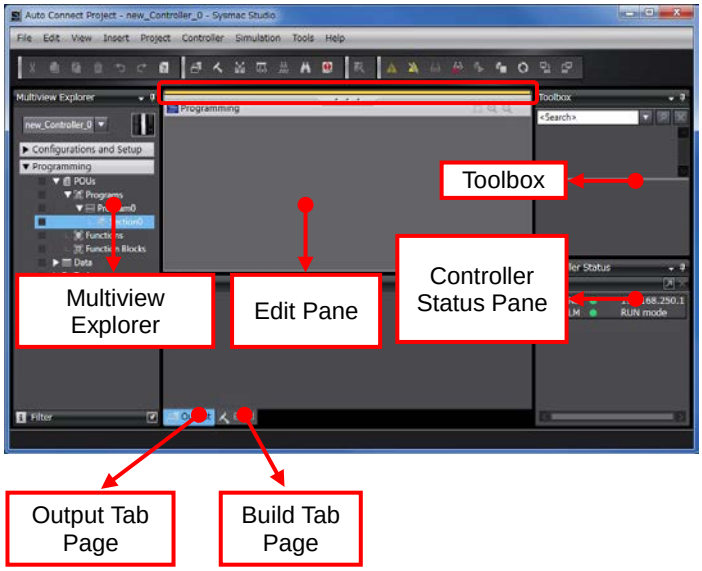
Bottom right: Controller Status Pane

Middle top: Edit Pane

The following tab pages are displayed at the middle bottom of the window.

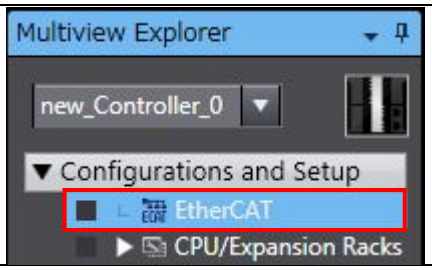
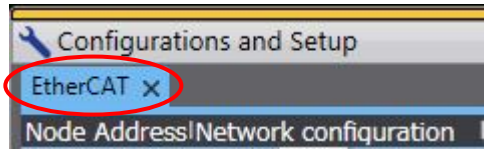
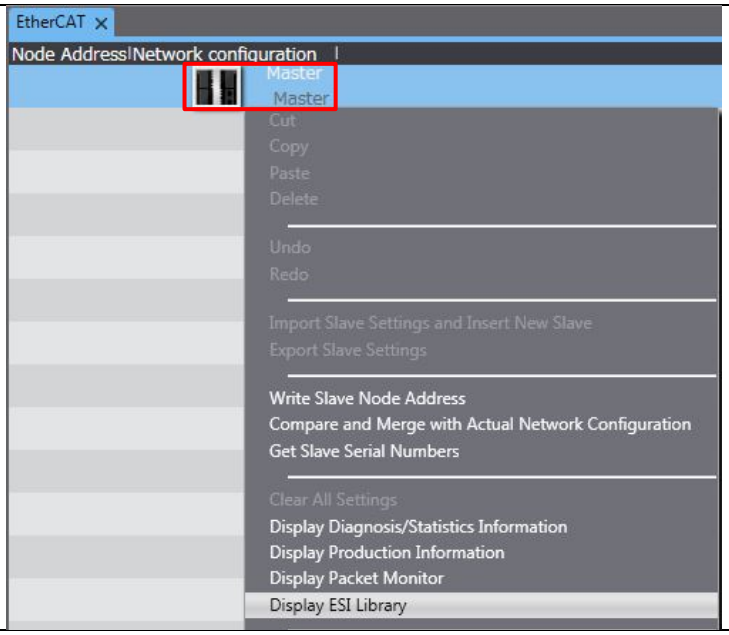
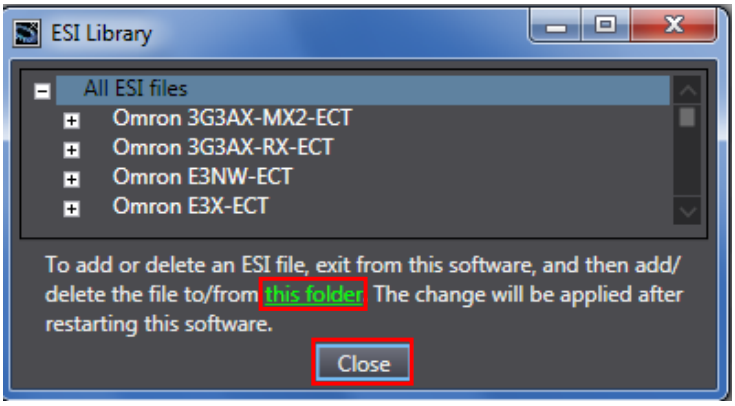
Output Tab Page

Build Tab Page

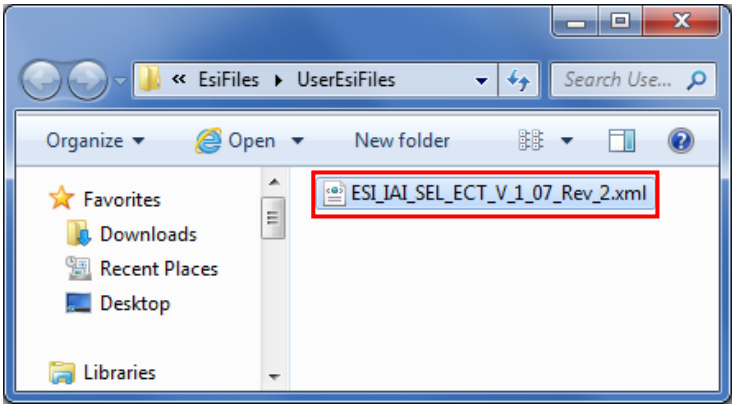


参考

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

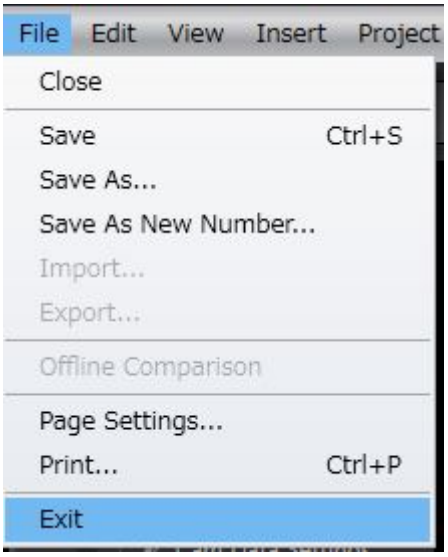
9	Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.	
10	The EtherCAT Tab Page is displayed in the Edit Pane.	
11	Right-click **Master** and select ***Display ESI Library***.	
12	The ESI Library Dialog Box is displayed. Click the **this folder** link. When the Explorer starts, click the **Close** Button to close the dialog box.	

13 The Explorer starts and a folder for installing the ESI file is opened. Copy the prepared ESI file *ESI_IAI_SEL_ECT_V_1_07_Rev_2.xml* to this folder.

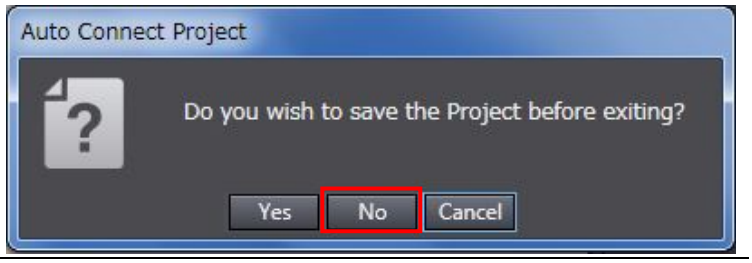


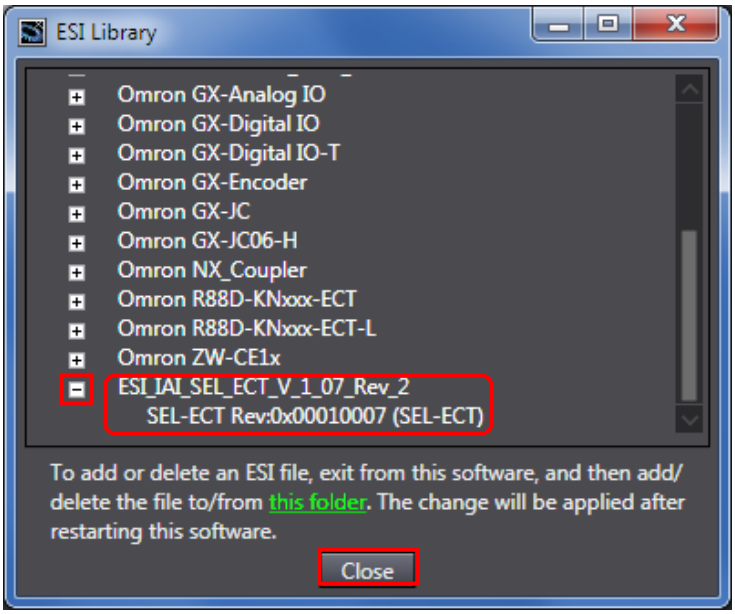
14 Select ***Exit*** from the File Menu to exit the Sysmac Studio.

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



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 ESI_IAI_SEL_ECT_V_1_07_Rev_2 to confirm that SEL-ECT Rev:0x00010007 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

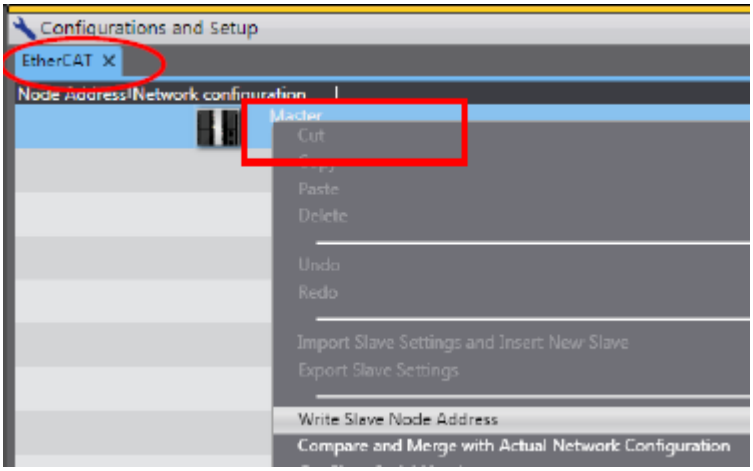
Set up the EtherCAT network configuration.

⚠ Caution

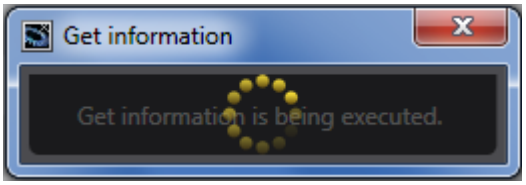
If you cycle the power supply to the Slave Unit in step 6, the devices may perform unexpected operation.
Always confirm safety before you cycle the power supply to the Slave Unit.

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 *7.3.1. Starting the Sysmac Studio and Installing the ESI File* to display.

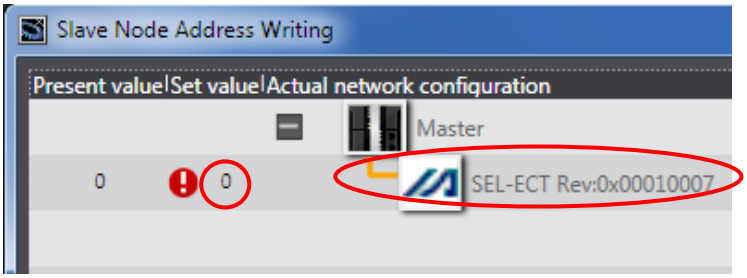


A screen is displayed stating "Get information is being executed".

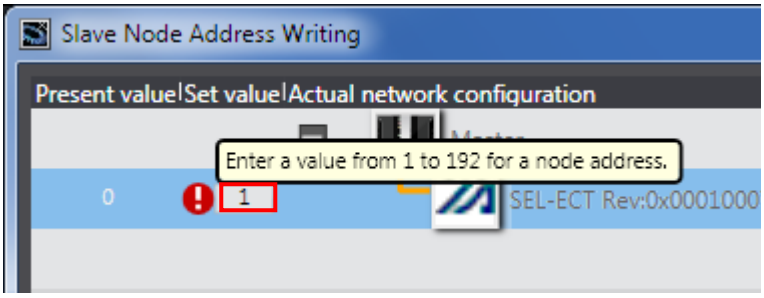


2 The Slave Node Address Writing Dialog Box is displayed. SEL-ECT Rev:0x00010007 is displayed in the Actual network configuration.

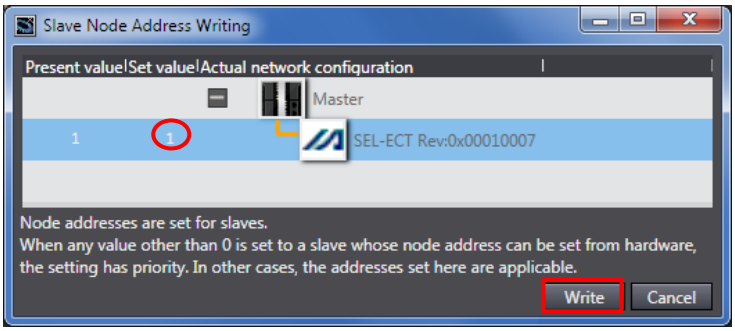
*If the present value of the node address is 0, an error is displayed with ❗ mark.



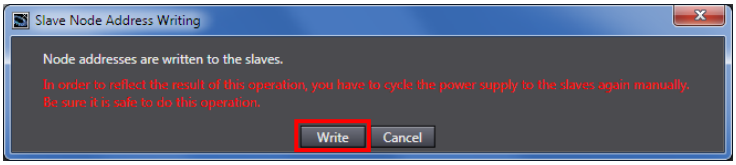
3 Enter *1* in the *Set value* Field for a node address.



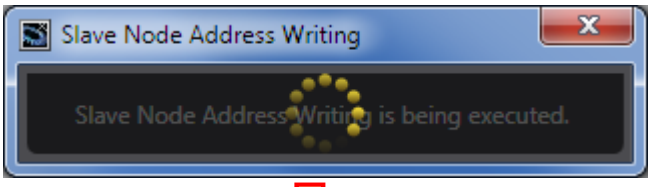
4 Confirm that no error is displayed and the set value is 1. Click the **Write** Button.



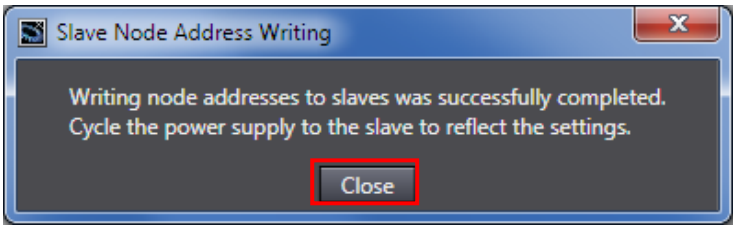
5 The Slave Node Address Writing Dialog Box is displayed. Check the contents and click the **Write** Button.



A screen is displayed stating "Slave Node Address Writing is being executed.".

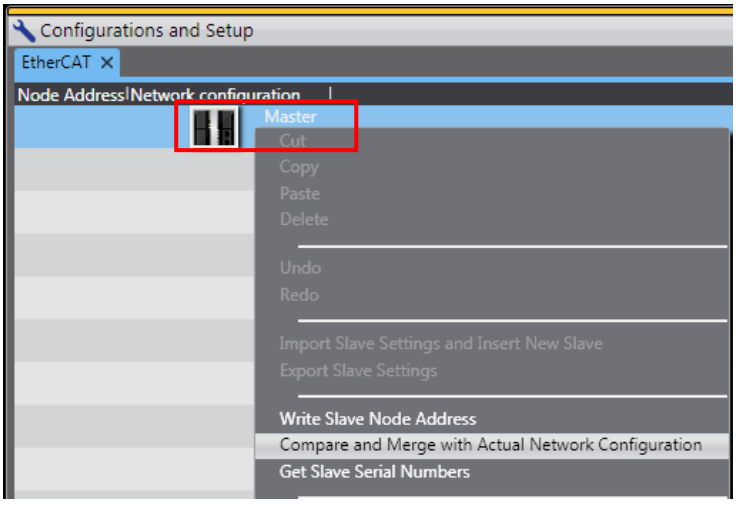


The dialog box on the right is displayed. Check the contents and click the **Close** Button.

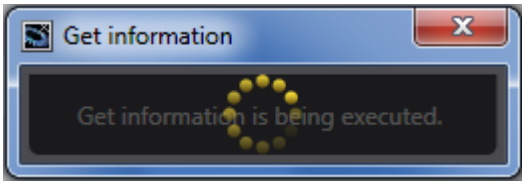


6 Cycle the power supply to the Slave Unit.

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

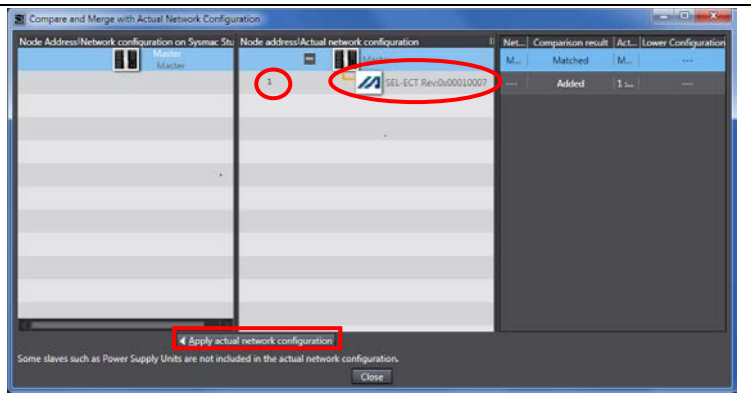


A screen is displayed stating "Get information is being executed.".

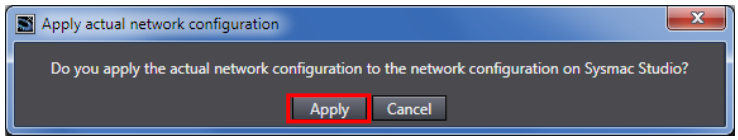


8 The Compare and Merge with Actual Network Configuration Dialog Box is displayed.
Node address 1 and SEL-ECT Rev:0x00010007 are added to the Actual network configuration after the comparison.

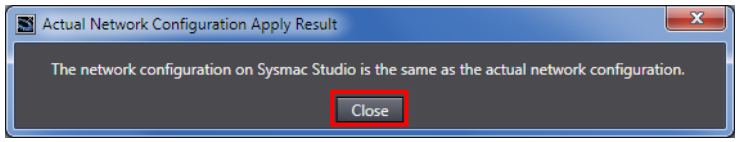
Click the **Apply actual network configuration** Button.



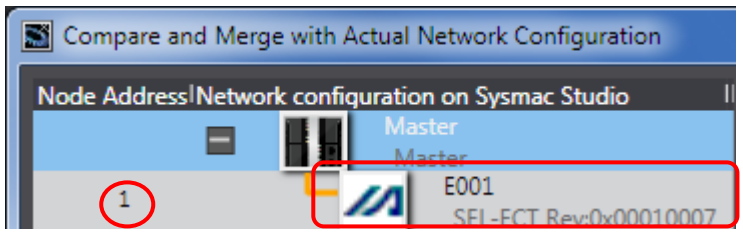
9 A confirmation dialog box is displayed. Check the contents and click the **Apply** Button.



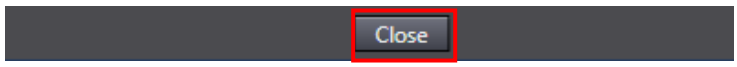
The dialog box on the right is displayed. Click the **Close** Button.



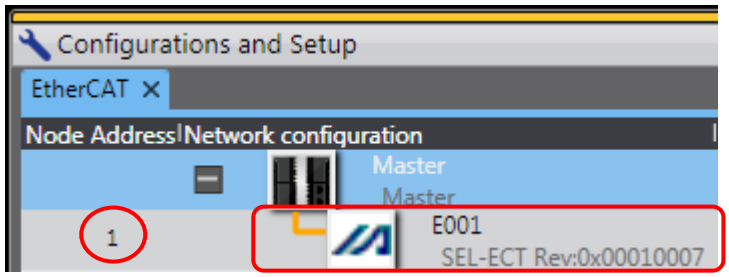
10 As a node address 1 slave, E001 SEL-ECT Rev:0x00010007 is added to the Network configuration on the Sysmac Studio.



Confirm that the data above are added. Click the **Close** Button.



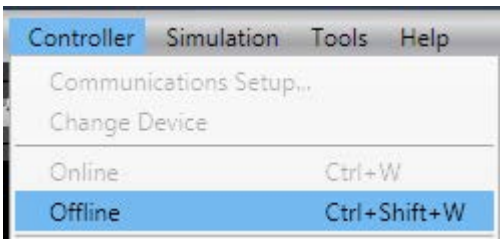
11 Node address 1 and E001 SEL-ECT Rev:0x00010007 slave are added to the EtherCAT Tab Page on the Edit Pane.



7.3.3. Setting the Device Variables

Set the device variables used for the EtherCAT Slave Unit.

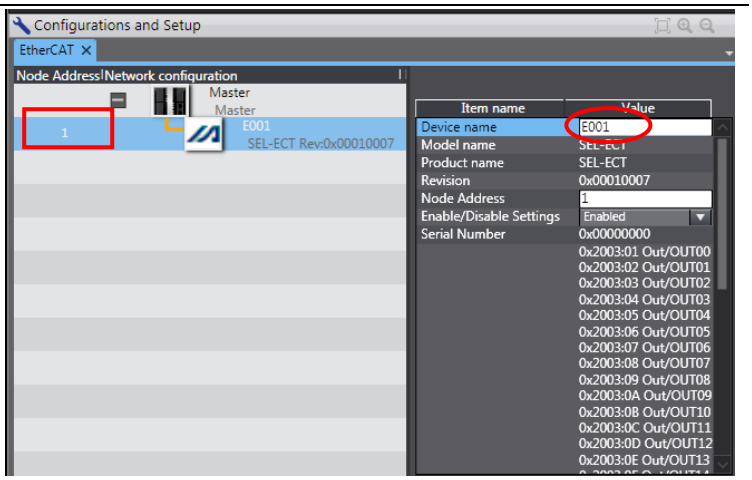
1 Select ***Offline*** from the Controller Menu.



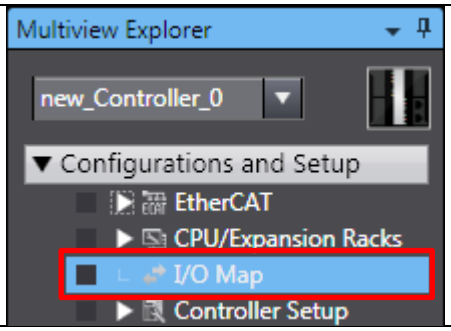
The yellow bar on the top disappears.

2 Select the slave for the node address 1 added in the previous section on the EtherCAT Tab Page.
Check that the device name is E001.

*The device name can be arbitrarily changed.

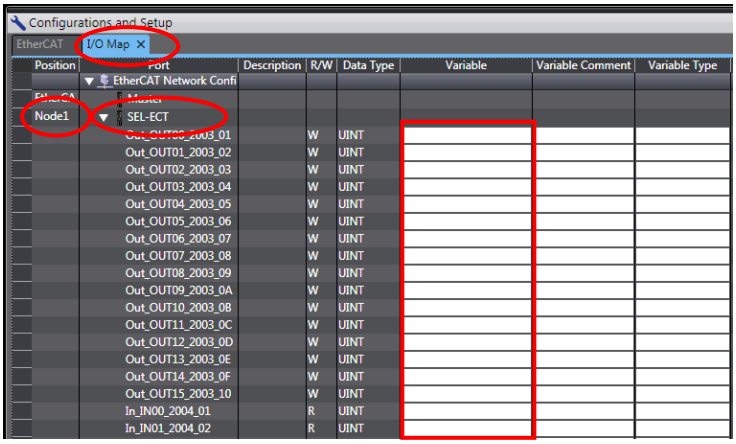


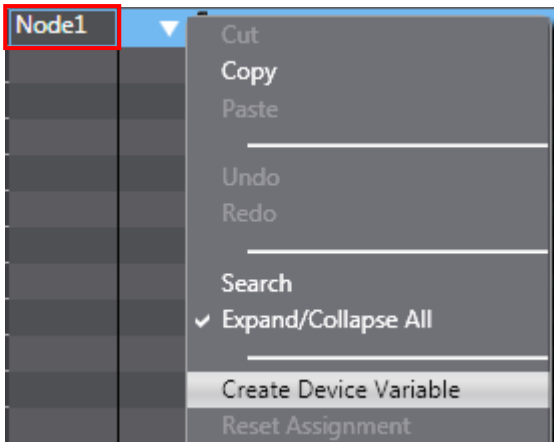
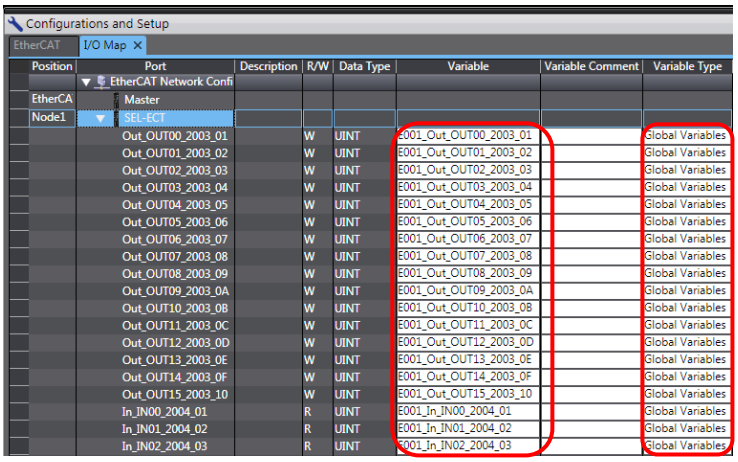
3 Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.



4 The I/O Map Tab Page is displayed in the Edit Pane.
Confirm that Node1 is displayed in the *Position* Column and the Slave Unit added in the *Port* Column 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 ports.

7.3.4. Transferring the Project Data

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

⚠ WARNING

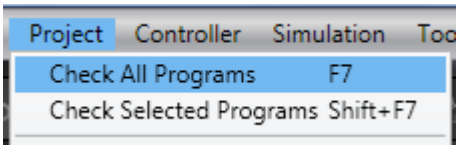
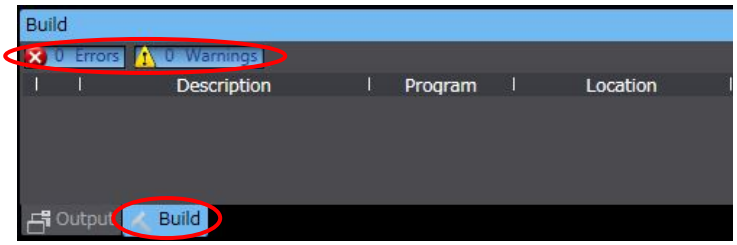
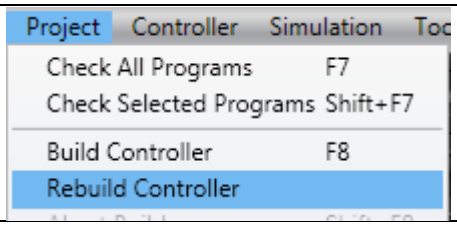
The devices or machines may perform unexpected operation regardless of the operating mode of the CPU Unit before you transfer a user program, configuration data, setup data, device variables, or values in memory used for CJ-series Units from the Sysmac Studio.
Always confirm safety at the Destination Device before you transfer the project data.

⚠ Caution

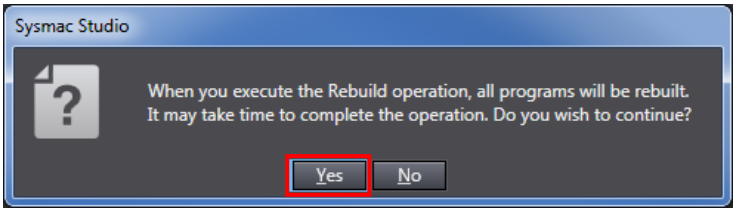
After you transfer the project data, the CPU Unit restarts and communications with the EtherCAT slaves are cut off. During the period, the slave outputs behave according to the slave settings. Also, the time that communications are cut off depends on the EtherCAT network configuration.
Before you transfer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

⚠ Caution

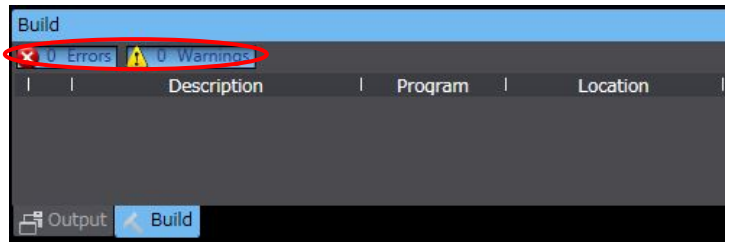
A slave will be reset after performing the synchronization in step 7 and subsequent steps, and the device may perform unexpected operation.
Always confirm safety before performing the synchronization.

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.	

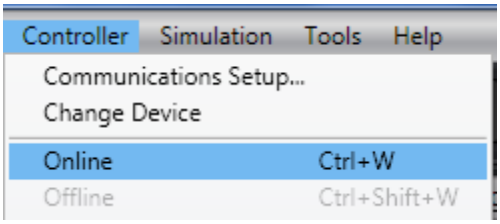
4 A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.



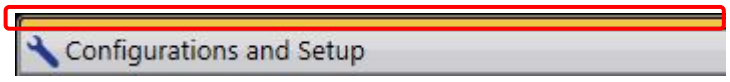
5 Check that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.



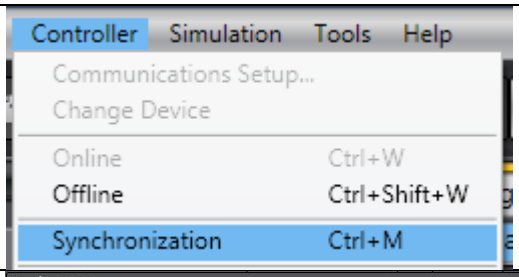
6 Select ***Online*** from the Controller Menu.



A yellow bar is displayed on the top of the Edit Pane.

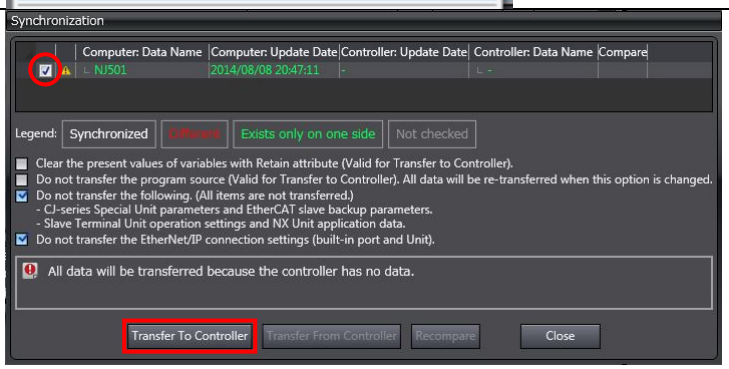


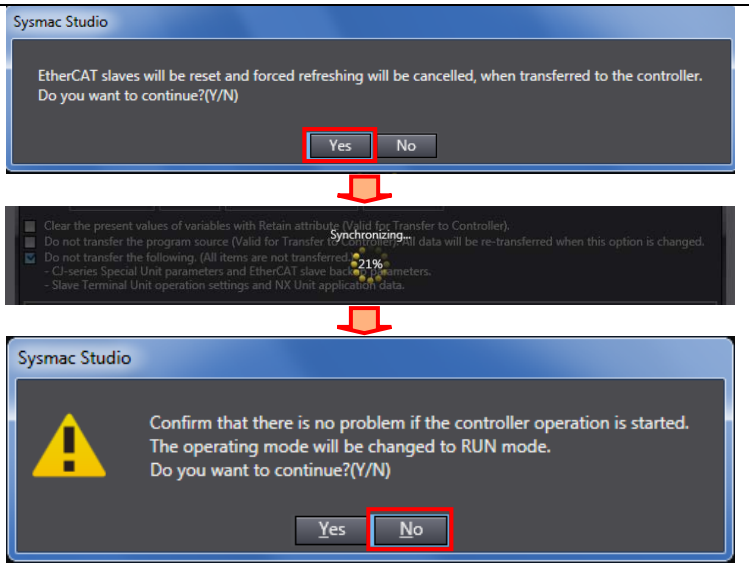
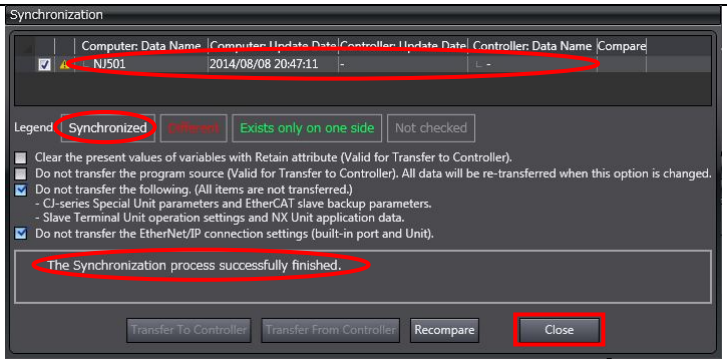
7 Select ***Synchronization*** from the Controller Menu.



8 The Synchronization Dialog Box is displayed.
Confirm that the data to transfer (NJ501 in the right dialog box) 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.



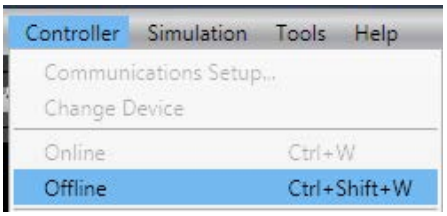
9	A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button. A screen stating "Synchronizing" is displayed. A confirmation dialog box on the right is displayed. Confirm that there is no problem and click the **No** Button. *Do not return to RUN 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 coincides with the Controller data. *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. Error Reset of the X-SEL Controller

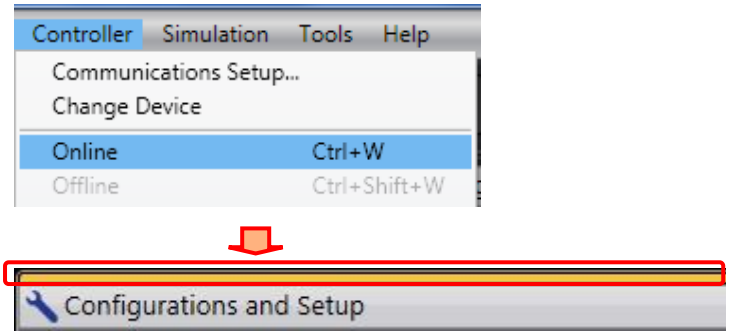
Reset an error of the X-SEL Controller.

1	Select ***Offline*** from the Controller Menu. The yellow bar on the top disappears.	 
2	Turn OFF the power supply to the X-SEL Controller and the Controller, and turn ON the power supply to them again at the same time.	

Precautions for Correct Use

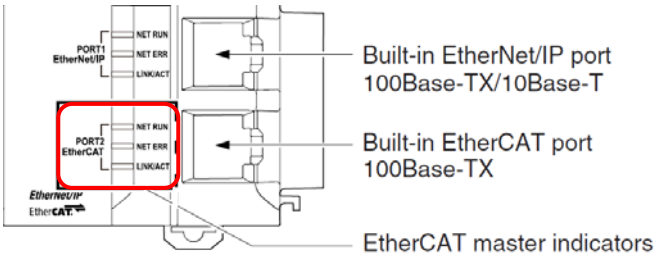
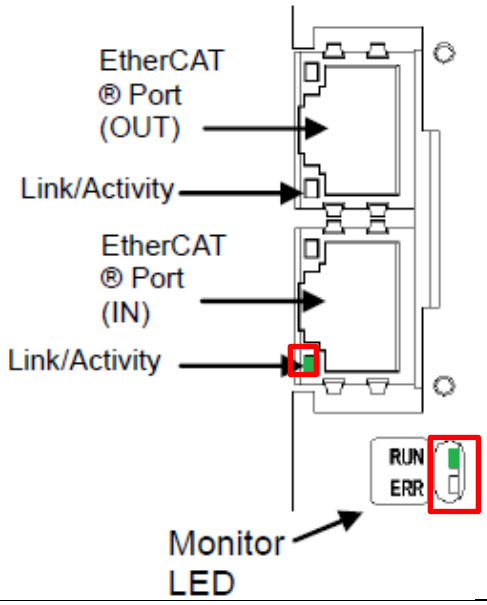
Turn ON the power supply to the X-SEL Controller and the Controller at the same time. To normally connect the X-SEL Controller and the Controller via the EtherCAT, the communications need to be started while the X-SEL Controller and the Controller are waiting each other for the establishment of the EtherCAT communications.
If you cannot turn ON the power supply at the same time, change the parameter No. 120 Network Attribute 1 (Time Setting to Wait for EtherCAT(R) Communication Establishment) for the X-SEL Controller according to the system you use, and then turn ON the power supply.
For details, refer to *Section 3.5.1. Parameter Setting* of the *EtherCAT(R) Operation Manual XSEL-R/S/RX/SX/RXD/SXD* (ME0309).

3	Check that the rdy (Normal connection to the Controller) is displayed on the Panel Window of the front side of the X-SEL Controller. *Perform step 2 again when the Ed5d (Fieldbus error) is displayed on the Panel Window.	 rdy(rdy): Normal connection to the Controller  Ed5d(Ed5d): Fieldbus error

4	Select ***Online*** from the Controller Menu. A yellow bar is displayed on the top of the Edit Pane.	

7.4.2. Checking the Connection Status

Check the connection status of the EtherCAT network.

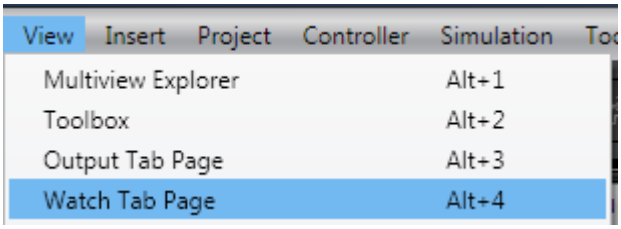
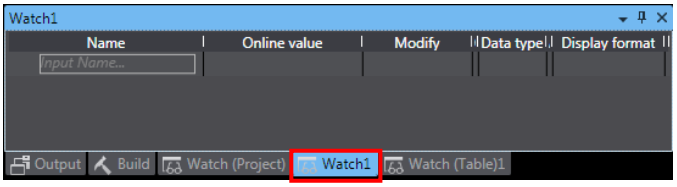
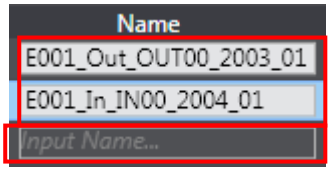
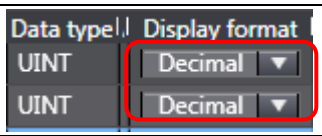
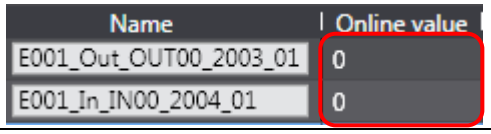
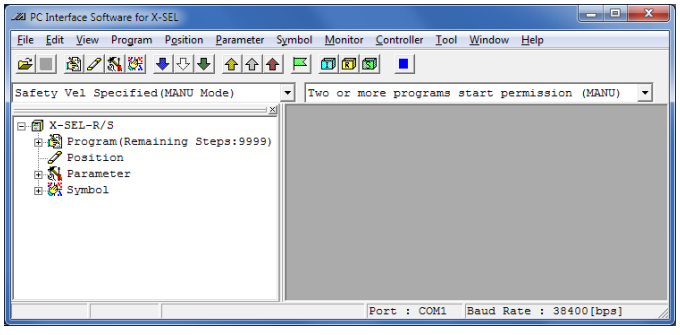
1	Confirm that PDO communications via EtherCAT are performed normally by checking the LED indicators on the Controller. The LED indicators in normal status are as follows: NET RUN: Green lit NET ERR: Not lit LINK/ACT: Yellow flashing	
2	Check the LED indicators on the X-SEL Controller. The LED indicators in normal status are as follows: RUN: Green lit ERR: Not lit Link/Activity: Green flickering	

7.4.3. Checking the Sent and Received Data

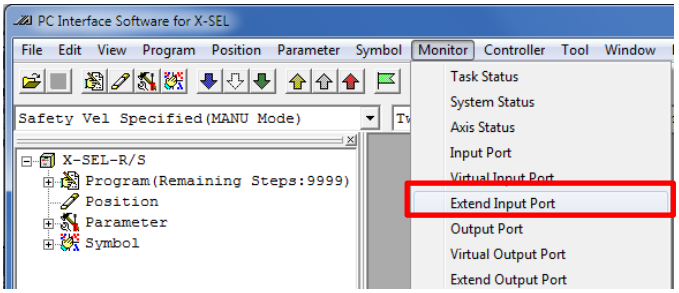
Confirm that the correct data are sent and received.

⚠ Caution

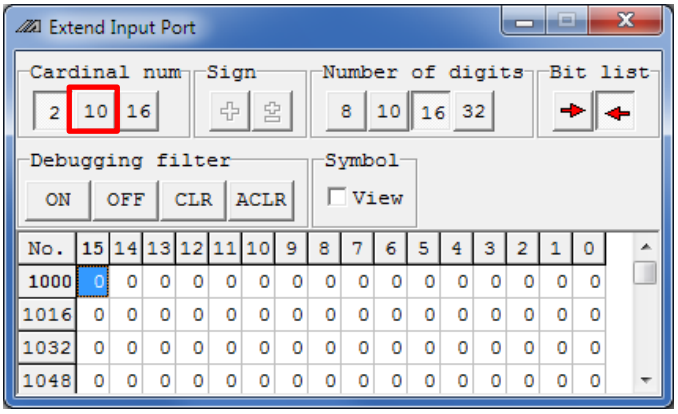
If you change the values of variables on the Watch Tab Page when the Sysmac Studio is online with the CPU Unit, the devices that are connected to output units may operate regardless of the operating mode of the CPU Unit. Sufficiently confirm safety before you change the values of variables on a Watch Tab Page when the Sysmac Studio is online with the CPU Unit.

1	Select ***Watch Tab Page*** from the View Menu.	
2	Select the **Watch1** Tab.	
3	As shown below, enter the following name of the variables for monitoring. Click the *Input Name…* in the *Name* Column to enter a new name. *E001_Out_OUT00_2003_01* *E001_In_IN00_2004_01*	
4	Check that the Display format of the set variables is Decimal.	
5	Check that the Online value is displayed in decimal.	
6	Open the main window of the PC Interface Software for X-SEL. *For information on how to start a PC Interface Software for X-SEL, refer to step 2 of *Section 7.2.2. Parameter Settings*.	

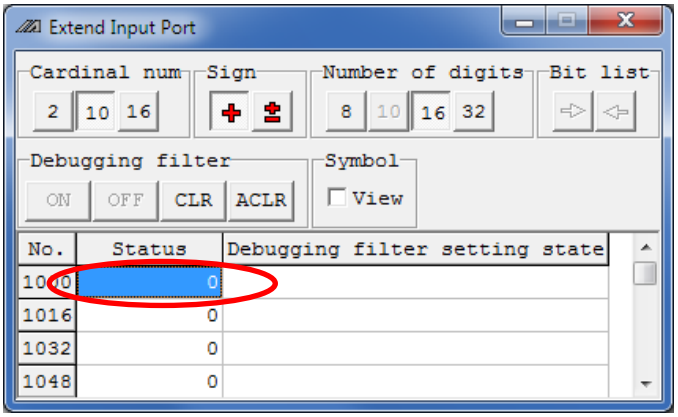
7 Select ***Extend Input Port*** from the Monitor Menu.



8 The Extend Input Port Window is displayed. Click the **10** Button for the *Cardinal num* Field.

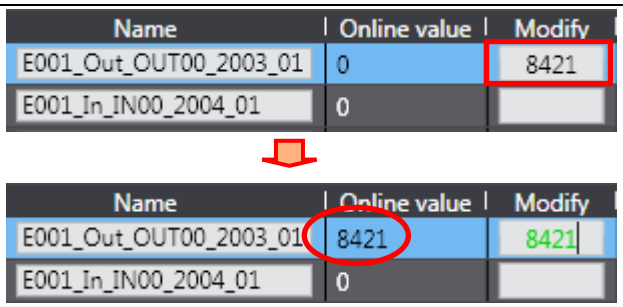


9 Check that the value for the Status of No. 1000 is 0.

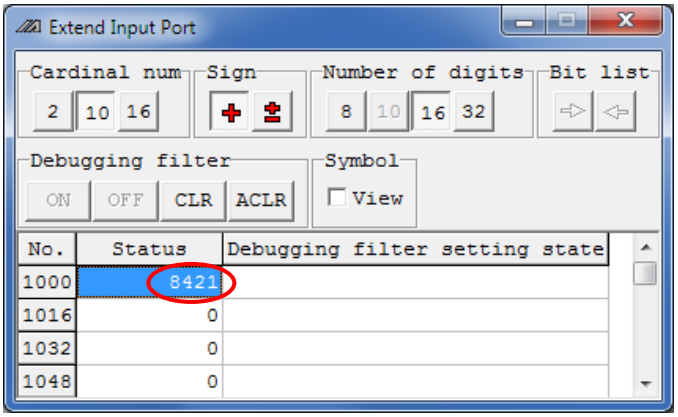


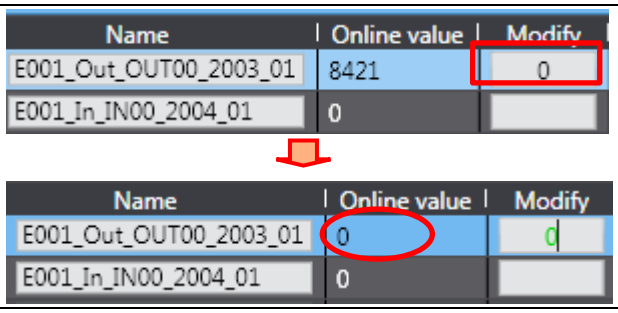
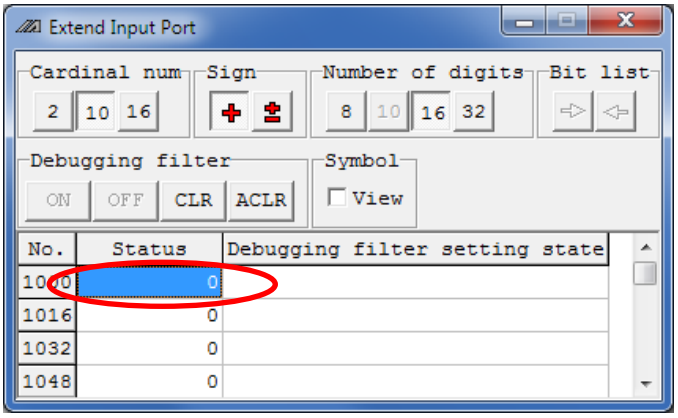
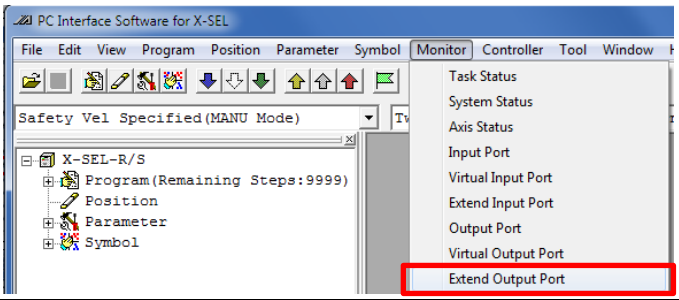
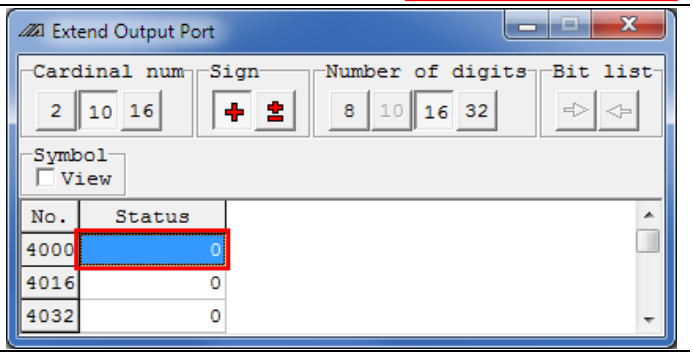
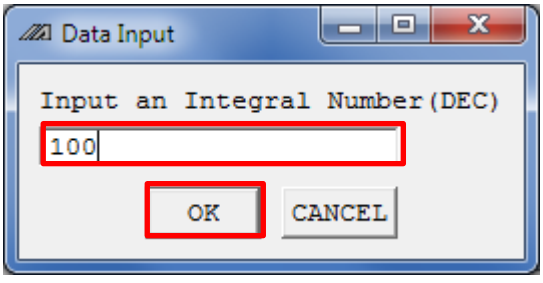
10 Enter *8421* in the *Modify* Column of *E001_Out_OUT00_2003_01*, and press Enter key on the Personal computer.

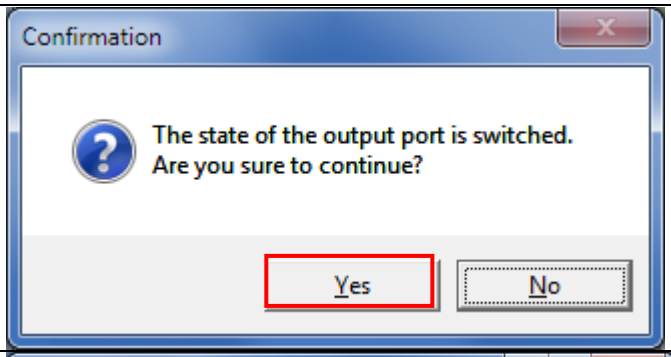
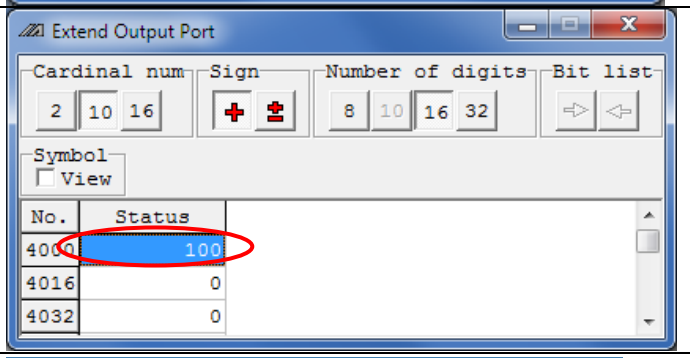
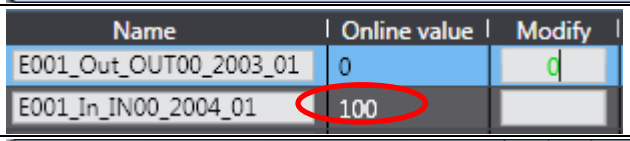
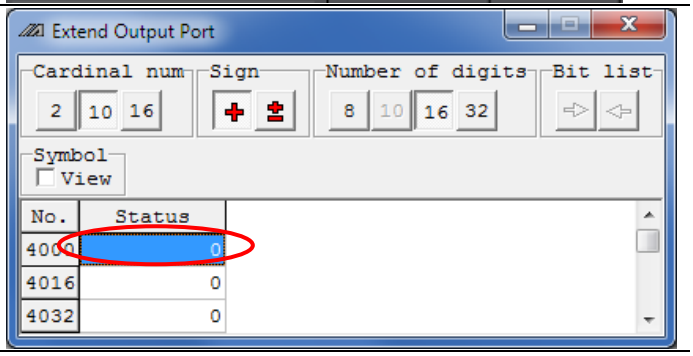
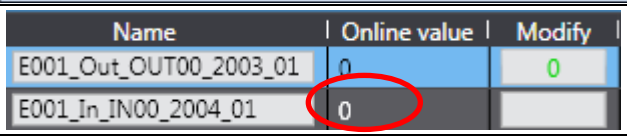
At this time, check that the Online value changes to 8421.



11 Check that the value for the Status of No. 1000 is 8421.



12	Enter *0* in the *Modify* Column of *E001_Out_OUT00_2003_01*, and press Enter key on the Personal computer. At this time, check that the Online value changes to 0.	
13	Check that the value for the Status of No. 1000 is 0.	
14	Select ***Extend Output Port*** from the Monitor Menu.	
15	The Extend Output Port Window is displayed. Select the Status of No. 4000, and double-click.	
16	The Data Input Dialog Box is displayed. Enter *100* and click the **OK** Button.	

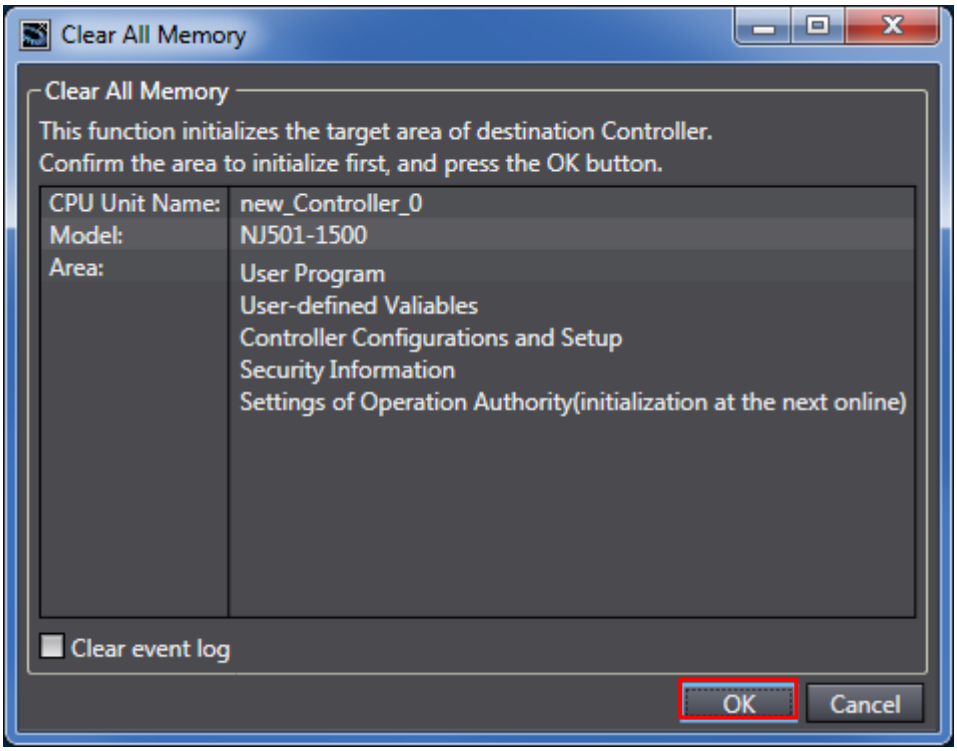
17	A Confirmation Dialog Box is displayed. Check the contents and click the **Yes** Button.	
18	Check that the value for the Status of No. 4000 changes to 100.	
19	Confirm that the Online value of *E001_In_IN00_2004_01* changes to 100 as you set in step 15.	
20	In the same way as steps 15 to 17, enter *0* in the Status of No. 4000 in the Extend Output Port Window. Check that the value for the Status of No. 4000 changes to 0.	
21	Confirm that the Online value of *E001_In_IN00_2004_01* changes to 0.	

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 IAI X-SEL Controller

For initialization of the IAI X-SEL Controller, refer to *Section 8.4. How to Initialize XSEL-R/S, RX/SX, RXD/SXD, SSEL/ASEL/PSEL Parameters (at the time of shipment)* of the *PC Software for X-SEL Operation Manual* (ME0154).

9. Revision History

Revision code	Date of revision	Revision reason and revision page
01	April 1, 2015	First edition

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