OMRON

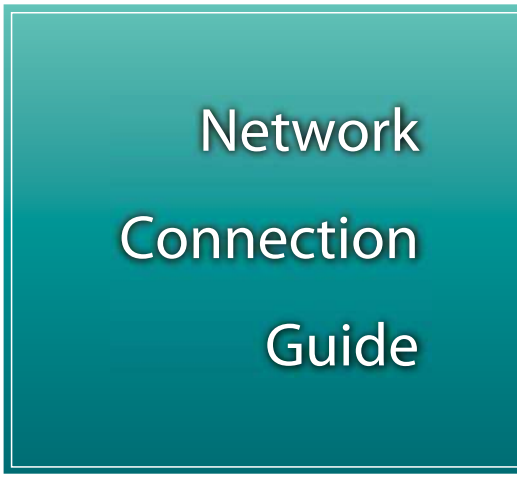
Machine Automation Controller NJ-series

EtherNet/IP™ Connection Guide

OMRON Corporation

Vision System

(FH-series)



SYSMAC
always in control

P576-E1-01

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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
W506	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Built-in EtherNet/IP™ Port User's Manual
W504	SYSMAC-SE2□□□	Sysmac Studio Version 1 Operation Manual
2285550-0	FH-1□□□/3□□□	Image Processing System Instruction Sheet
Z340	FH-1□□□/3□□□	Vision Sensor FH/FZ5 Series Vision System User's Manual
Z341	FH-1□□□/3□□□	Vision Sensor FH/FZ5 Series Vision System Processing Item Function Reference Manual
Z342	FH-1□□□/3□□□	Vision Sensor FH/FZ5 Series Vision System User's Manual (Communications Settings)
Z343	FH-1□□□/3□□□	Vision Sensor FH/FZ5 Series Vision System Operation Manual for Sysmac Studio

2. Terms and Definitions

Term	Explanation and Definition
Node	Controllers and devices are connected to the EtherNet/IP network via the EtherNet/IP ports. The EtherNet/IP recognizes each EtherNet/IP port connected to the network as one node. When a device with two EtherNet/IP ports is connected to the EtherNet/IP network, the EtherNet/IP recognizes this device as two nodes. The EtherNet/IP achieves the communications between controllers or the communications between controllers and devices by exchanging data between these nodes connected to the network.
Tag	A minimum unit of the data that is exchanged on the EtherNet/IP network is called a tag. The tag is defined as a network variable or as a physical address, and it is allocated to the memory area of each device.
Tag set	In the EtherNet/IP network, a data unit that consists of two or more tags can be exchanged. The data unit consisting of two or more tags for the data exchange is called a tag set. Up to eight tags can be configured per tag set for OMRON controllers.
Tag data link	In the EtherNet/IP, the tag and tag set can be exchanged cyclically between nodes without using the user program. This standard feature on the EtherNet/IP is called a tag data link.
Connection	A connection is used to exchange data as a unit within which data concurrency is maintained. The connection consists of tags or tag sets. Creating the concurrent tag data link between the specified nodes is called a "connection establishment ". When the connection is established, the tags or tag sets that configure the connection are exchanged between the specified nodes concurrently.
Originator and Target	To perform tag data links, one node requests the opening of a communications line called a "connection". The node that requests opening the connection is called an "originator", and the node that receives the request is called a "target".
Tag data link parameter	The tag data link parameter is the setting data to perform the tag data link. It includes the data to set tags, tag sets, and connections.

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 November 2013. It is subject to change without notice for improvement.

The following notation is used in this document.

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

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.

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 you must do.

4. Overview

This document describes the procedure for connecting the Vision System (FH series) of OMRON Corporation (hereinafter referred to as OMRON) to NJ-series Machine Automation Controller (hereinafter referred to as the Controller) via EtherNet/IP and provides the procedure for checking their connection.
It also contains the procedure for performing EtherNet/IP tag data link using the EtherNet/IP settings of the project file that is prepared beforehand (hereinafter referred to as the "procedure for using the Configuration Files").
Section 9 Appendix 1 and *Section 10 Appendix 2* describe the procedures for setting parameters with software without using files (hereinafter referred to as the "procedure for setting parameters from beginning").

To follow the "procedure for using Configuration Files", obtain the latest "Sysmac Studio project file" and "Network Configurator v3 network configuration file" (they are referred to as "Configuration Files") from OMRON in advance.

Name	File name	Version
Sysmac Studio project file (extension: smc)	OMRON_FH_EIP_EV100.smc	Ver.1.00
Network Configurator v3 network configuration file (extension: nvf)	OMRON_FH_EIP_EV100.nvf	Ver.1.00

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-□□□□
OMRON	FH Sensor Controller	FH-1□□□/ FH-1□□□-□□ FH-3□□□/FH-3□□□-□□
OMRON	0.3 Megapixel Digital Camera 0.3 Megapixel Small Digital Camera 0.3 Megapixel Small Digital Pen-Shaped Camera 0.3 Megapixel High-Speed Camera 0.3 Megapixel High-Speed CMOS Camera 2 Megapixel Digital Camera 2 Megapixel High-Speed CMOS Camera 4 Megapixel High-Speed CMOS Camera 5 Megapixel Digital Camera Intelligent Camera Intelligent Compact Camera Auto-Focus Camera	FZ-SC/S FZ-SFC/SF FZ-SPC/SP FZ-SHC/SH FH-SC/SM FZ-SC2M/S2M FH-SC02/SM02 FH-SC04/SM04 FZ-SC5M2/S5M2 FZ-SLC15/SLC100 FZ-SQ010F/SQ050F/SQ100F/SQ100N FZ-SZC15/SZC100

Precautions for Correct Use

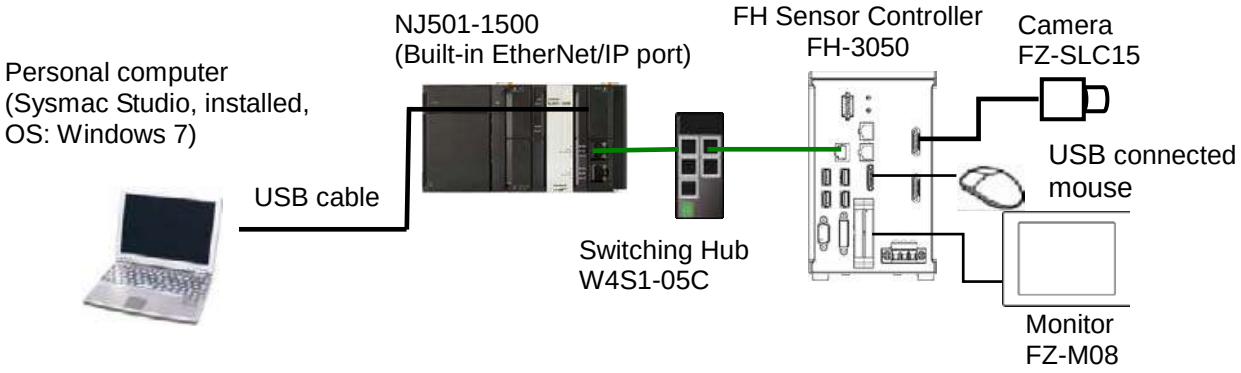
As applicable devices above, the devices with the models and versions listed in *Section 5.2*. are actually used in this document to describe the procedure for connecting devices and checking the connection.
You cannot use devices with versions lower than the versions listed in *Section 5.2.*
To use 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 your OMRON representative.

5.2. Device Configuration

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



Manufacturer	Name	Model	Version
OMRON	NJ-series CPU Unit (Built-in EtherNet/IP port)	NJ501-1500	Ver.1.06
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Switching Hub	W4S1-05C	Ver.1.00
OMRON	Sysmac Studio	SYSMAC-SE2[][][][]	Ver.1.07
OMRON	Network-Configurator	(Included in Sysmac Studio.)	Ver.3.56
OMRON	Sysmac Studio project file	OMRON_FH_EIP_EV100.smc	Ver.1.00
OMRON	Network Configurator v3 network configuration file	OMRON_FH_EIP_EV100.nvf	Ver.1.00
-	Personal computer (OS: Windows7)	-	
-	USB cable (USB 2.0 type B connector)	-	
-	LAN cable (STP (shielded, twisted-pair) cable of Ethernet category 5 or higher)	-	
OMRON	FH Sensor Controller (Camera 2ch type)	FH-3050	Ver.5.00
OMRON	Camera	FZ-SLC15	
OMRON	Camera cable	FZ-VS	
OMRON	Monitor (analog RGB monitor)	FZ-M08	
OMRON	Monitor conversion cable	FH-VMRGB	
-	USB connected mouse	-	

Precautions for Correct Use

Prepare the latest "Sysmac Studio project file" and "Network Configurator v3 network configuration file" from OMRON in advance.
(To obtain the files, contact your OMRON representative.)

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) and Network Configurator Online Help.

Additional Information

The system configuration in this document uses USB for the connection to the Controller. For 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. EtherNet/IP Settings

This section describes the specifications such as communication parameters and tag data link that are defined in this document.
Hereinafter, the FH Sensor Controller is referred to as the "Destination Device" in some descriptions.

6.1. EtherNet/IP Communications Parameters

The communications parameter required connecting the Controller and the Destination Device via EtherNet/IP is given below.

	Controller (node 1)	FH Sensor Controller (node 2)
IP address	192.168.250.1	192.168.250.2
Subnet mask	255.255.255.0	255.255.255.0

6.2. Data Types for Tag Data Links

The following data types are used for the data in the tag data links of the Destination Device.

■ Definition of the data type to access the signals (Union)

This data type is used to access the control signals and status signals.

Data type name	Data type
U_EIPFlag	UNION
F	BOOL[32]
W	DWORD

■ Definition of the data type to access the command area (Structure)

This data type is used to access the command area.

Data type name	Data type	Destination device data
S_EIPOutput	STRUCT	-
ControlFlag	U_EIPFlag	Control signal (32 bits)
CommandCode	DWORD	Command code (CMD-CODE)
CommandParam1	DINT	Command parameter (CMD-PARAM)
CommandParam2	DINT	
CommandParam3	DINT	

■ Definition of the data type to access the response/output areas (Structure)

This data type is used to access the response/output areas.

Data type name	Data type	Destination device data
S_EIPInput	STRUCT	-
StatusFlag	U_EIPFlag	Control output (32 bits)
CommandCodeEcho	DWORD	Command code (CMD-CODE)
ResponseCode	DINT	Response code (RES-CODE)
ResponseData	DINT	Response data (RES-DATA)
OutputData	DINT[8]	Output data 0 to 7 (DATA 0 to 7)

6.3. Allocating the Tag Data Links

The data in the tag data links of the Destination Device are allocated to the global variables of the Controller. The relationship between the device data and the global variables is shown below.

The following global variables are defined in the "Configuration file".

■ Output area (from Controller to FH Sensor Controller)

Variable	Data type	Data size
EIPOutput	S_EIPOutput	20 bytes

Offset (word)	Destination device data	Variable name	Data type
+0 to +1	Control signal (32 bits) (Data type: U_EIPFlag)	EIPOutput.ControlFlag.F*1	BOOL[32]
		EIPOutput.ControlFlag.W*1	DWORD
+2 to +3	Command code (CMD-CODE)	EIPOutput.CommandCode	DWORD
+4 to +5	Command parameter (CMD-PARAM)	EIPOutput.CommandParam1	DINT
+6 to +7		EIPOutput.CommandParam2	DINT
+8 to +9		EIPOutput.CommandParam3	DINT

* 1: Details on allocation of control signal

Allocation of EIPOutput.ControlFlag.F variable

Offset (word)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	ERCLR							XEXE							STEP	EXE
+1																DSA

EXE: Command Request Bit: Turned ON to execute a command.
STEP: Measure Bit: Turned ON to execute a measurement.
XEXE: Flow Command Request Bit: Turned ON to request execution of a command during execution of fieldbus flow control.
ERCLR: Error Clear Bit: Turned ON to clear the Error Status bit.
DSA: Data Output Request Bit: Turned ON to request data output.

Allocation of EIPOutput.ControlFlag.W variable

Offset (word)	15	14	13	・・・	2	1	0
+0	15	14	13	・・・	2	1	0
+1	31	30	29	・・・	18	17	16

Bits 31 to 0: EIPOutput.ControlFlag.W uses DWORD data from the offset +0 word.

■ Input area (from FH Sensor Controller to Controller)

Variable	Data type	Data size
EIPInput	S_EIPInput	48 bytes

Offset (word)	Destination device data	Variable name	Data type
+0 to +1	Control output (32 bits) (Data type: U_EIPFlag)	EIPInput.StatusFlag.F*1	BOOL[32]
		EIPInput.StatusFlag.W*1	DWORD
+2 to +3	Command code (CMD-CODE)	EIPInput.CommandCodeEcho	DWORD
+4 to +5	Response code (RES-CODE)	EIPInput.ResponseCode	DINT
+6 to +7	Response data (RES-DATA)	EIPInput.ResponseData	DINT
+8 to +9	Output data 0 (DATA0)	EIPInput.OutputData	DINT[8]
+10 to +11	Output data 1 (DATA1)		
+12 to +13	Output data 2 (DATA2)		
+14 to +15	Output data 3 (DATA3)		
+16 to +17	Output data 4 (DATA4)		
+18 to +19	Output data 5 (DATA5)		
+20 to +21	Output data 6 (DATA6)		
+22 to +23	Output data 7 (DATA7)		

* 1: Details on allocation of control signal

Allocation of EIPInput.StatusFlag.F variable

Offset (word)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	ERR					XWAIT	XBUSY	XFLG				RUN	OR		BUSY	FLG
+1																GATE

FLG: Command Completion Bit: Turned ON when command execution is completed.
BUSY: Command Busy Bit: Turned ON when command execution is in progress.
OR: Overall Judgement Bit: Turned ON when the overall judgement is NG.
RUN: Run Mode Bit: Turned ON while the Sensor Controller is in Run Mode.
XFLG: Flow Command Completion Bit: Turned ON when execution of a command that was input during the execution of fieldbus flow control has been completed (i.e., when XBUSY turns OFF).
XBUSY: Flow Command Busy Bit: Turned ON when execution of a command that was input during execution of fieldbus flow control is in progress.
XWAIT: Flow Command Wait Bit: Turned ON when a command can be input during the execution of fieldbus flow control.
ERR: Error Signal: Turned ON when the Sensor Controller detects an error signal.
GATE: Data Output Completion Bit: Turned ON when data output is completed.

Allocation of EIPInput.StatusFlag.W variable

Offset (word)	15	14	13	・・・	2	1	0
+0	15	14	13	・・・	2	1	0
+1	31	30	29	・・・	18	17	16

Bits 31 to 0: EIPInput.StatusFlag.W uses DWORD data from the offset +0 word.

Additional Information

For details on command codes and response codes, refer to *Communicating with EtherNet/IP* in *Section 2 Methods for Connecting and Communicating with External Devices* of the *Vision Sensor FH/FZ5 Series Vision System User's Manual (Communications Settings)* (Cat.No. Z342).

Additional Information

With the Sysmac Studio, two methods can be used to specify an array for a data type. After specifying, (1) is converted to (2) and the data type is always displayed as (2).

(1) WORD[3]/ (2)ARRAY[0..2] OF WORD

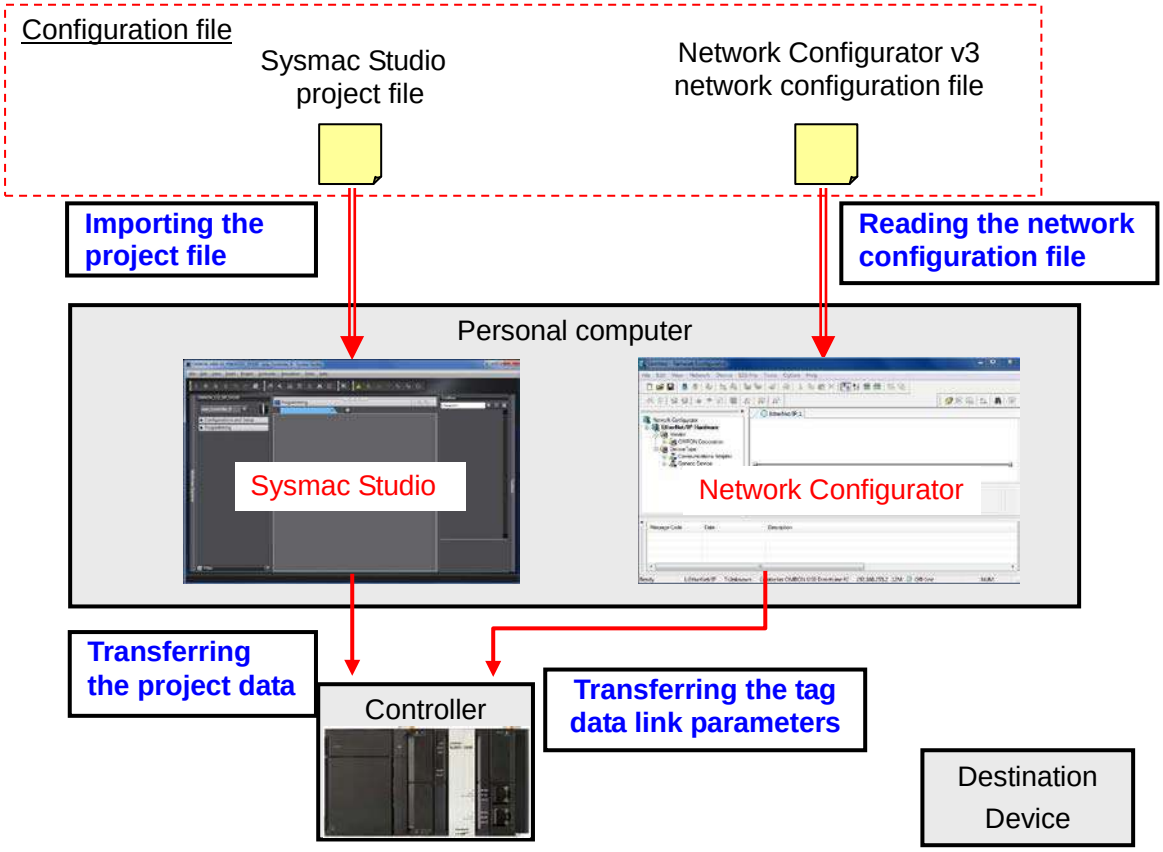
In this document, the data type is simplified by describing WORD[3].
(The example above means a WORD data type with three array elements.)

7. EtherNet/IP Connection Procedure

This section describes the procedure for connecting the FH Sensor Controller to the Controller via EtherNet/IP using the "procedures for using Configuration Files".
This document explains the procedures for setting up the Controller and the FH Sensor Controller from the factory default setting. For the initialization, refer to *Section 8 Initialization Method*.

■ Setting Overview

The following figure shows the relationship between the processes to operate the EtherNet/IP tag data link using the "procedure for using Configuration Files".



Precautions for Correct Use

Prepare the latest "Sysmac Studio project file" and "Network Configurator v3 network configuration file" from OMRON in advance.
(To obtain the files, contact your OMRON representative.)

7.1. Work Flow

Take the following steps to operate the tag data link for EtherNet/IP.

7.2. Setting Up the FH Sensor Controller	Set up the FH Sensor Controller.
↓	
7.2.1. Parameter Settings	Set the IP address of the FH Sensor Controller.
↓	
7.3. Setting Up the Controller	Set up the Controller.
↓	
7.3.1. Starting the Sysmac Studio and Importing the Project File	Start the Sysmac Studio and import the Sysmac Studio project file.
↓	
7.3.2. Connecting Online and Transferring the Project Data	Connect online with the Sysmac Studio and transfer the project data to the Controller.
↓	
7.4. Setting Up the Network	Set the tag data links for the EtherNet/IP.
↓	
7.4.1. Starting the Network Configurator and Opening the Network Configuration File	Start up the Network Configurator and open the Network Configurator v3 network configuration file.
↓	
7.4.2. Connecting Online and Transferring the Tag Data Link Parameters	Connect the Network Configurator online and transfer the tag data link parameters to the Controller.
↓	
7.5. Checking the EtherNet/IP Communications	Confirm that the EtherNet/IP tag data links are operated normally.
↓	
7.5.1 Checking the Connection Status	Check the connection status of EtherNet/IP.
↓	
7.5.2 Checking the Data that are Sent and Received	Confirm that the correct data are sent and received.

7.2. Setting Up the FH Sensor Controller

Set up the FH Sensor Controller.

7.2.1. Parameter Settings

Set the IP address of the FH Sensor Controller.

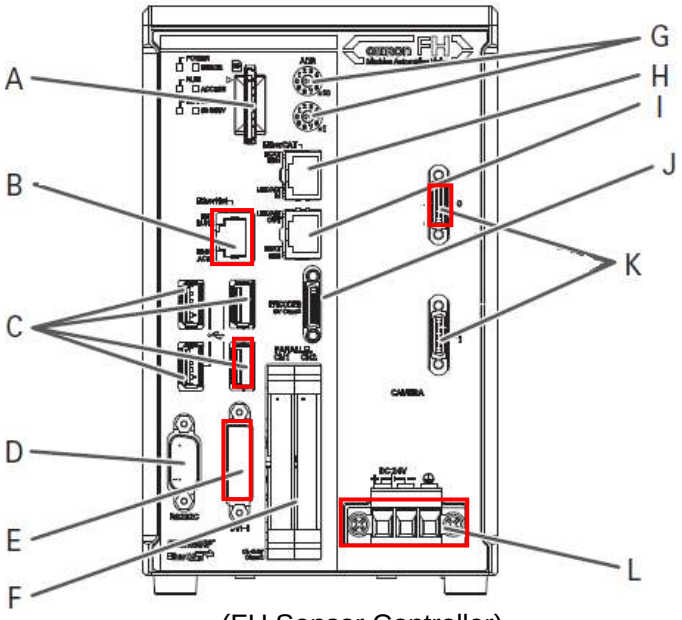
1 Check the position of the connectors on the FH Sensor Controller by referring to the right figure.

B: Connect the LAN cable to the Ethernet connector (PORT1).
K: Connect the camera cable to the camera connector.
E: Connect the DVI-I connector to the monitor connected with the monitor conversion cable.
C: Connect the mouse to the USB connector.
L: Connect the power supply cable to the power supply terminal connector.

* For Model (FH-1□□□-□□/3□□□-□□), connect the Ethernet communication LAN cable to the PORT2.

* Only the PORT2 can be used for EtherNet/IP communications. Therefore, you can use the PORT2 for EtherNet/IP communications with the Controller while the PORT1 is used for FTP or remote control communications.

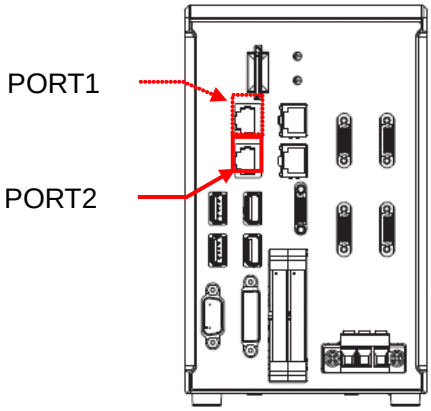
Model (FH-1□□□/3□□□) has one Ethernet port.



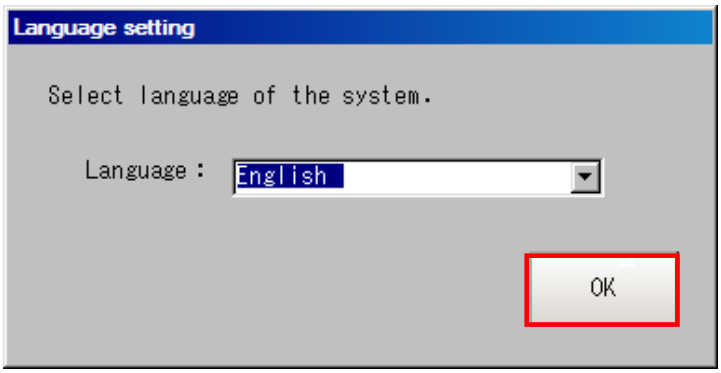
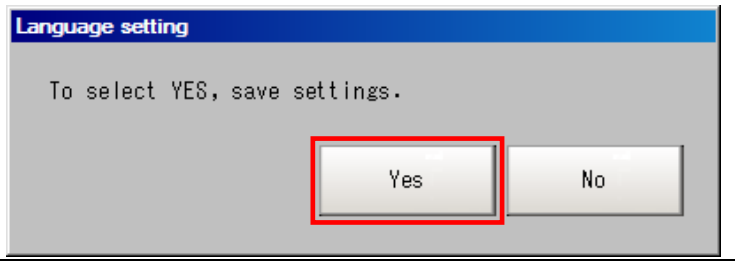
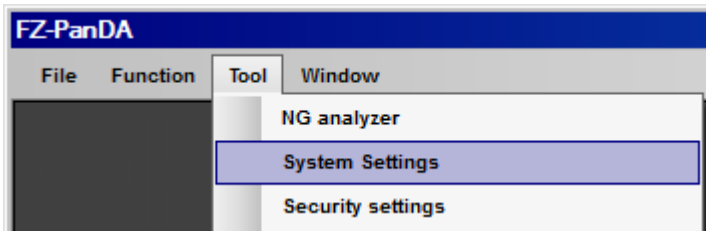
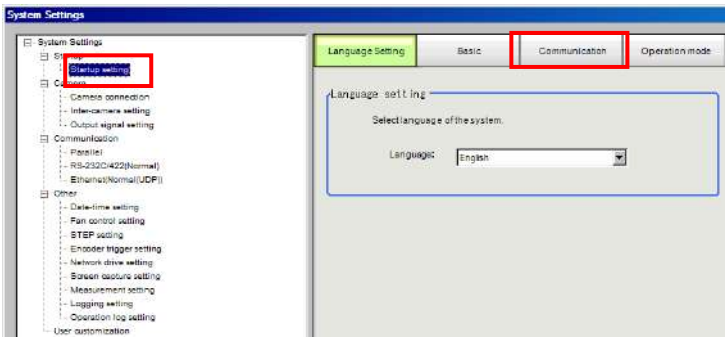
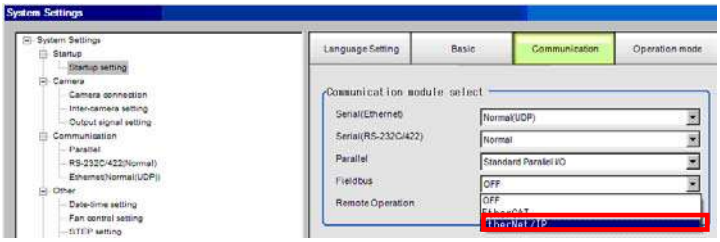
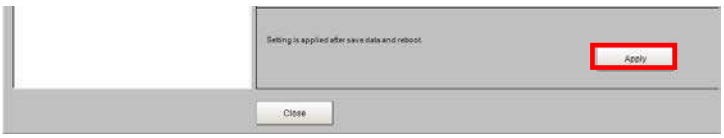
(FH Sensor Controller)

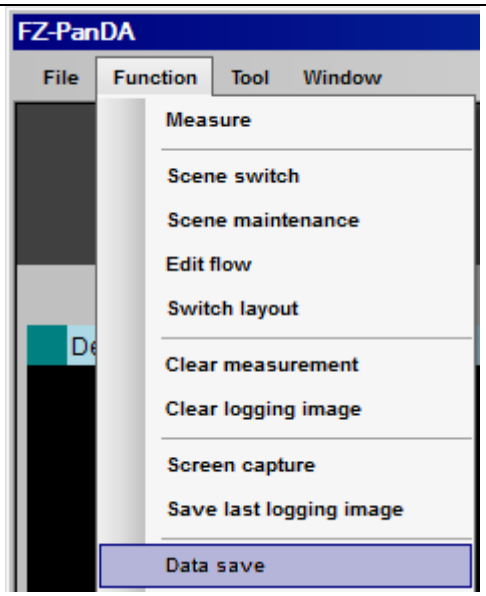
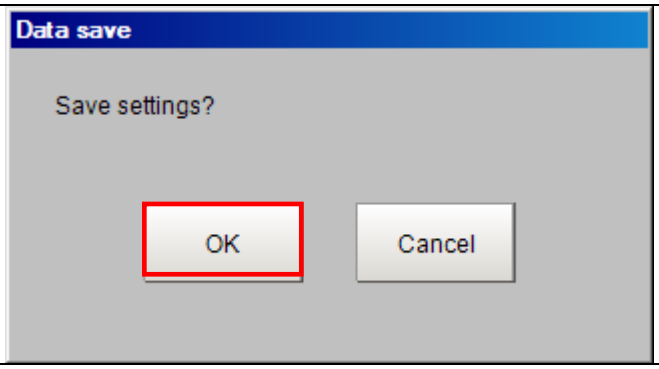
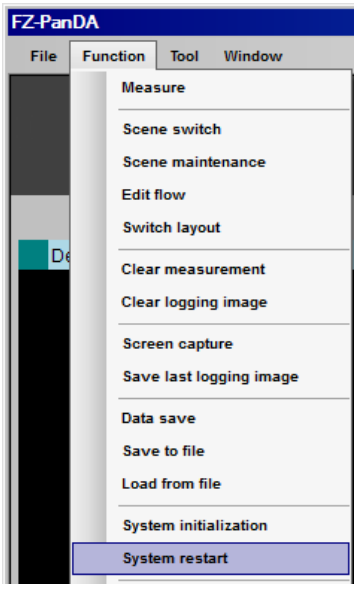
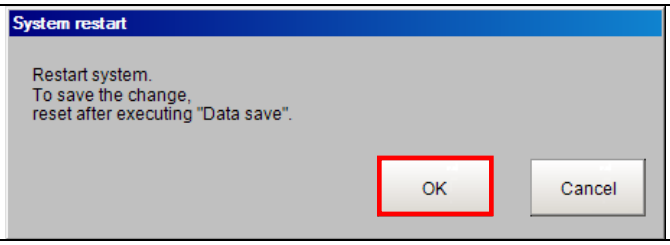
	Connector name	Description
A	SD memory card installation connector	Install the SD memory card. Do not plug or unplug the SD card during measurement operation. Otherwise measurement time may be affected or data may be destroyed.
B	Ethernet connector	Connect an Ethernet device.
C	USB connector	Connect a USB device. Do not plug or unplug it during measurement. Measurement time might be affected otherwise.
D	RS-232C connector	Connect an external device such as a programmable controller.
E	DVI-I connector	Connect a monitor.
F	I/O connector(control lines, data lines)	Connect the controller to external devices such as a sync sensor and PLC.
G	EtherCAT address setup volume	Used to set a station address as an EtherCAT communication device.
H	EtherCAT communication connector (IN)	Connect the opposed EtherCAT device.
I	EtherCAT communication connector (OUT)	Connect the opposed EtherCAT device.
J	Encoder connector	Connect an encoder.
K	Camera connector	Connect cameras.
L	Power supply terminal connector	Connect a DC power supply. Wire the controller independently on other devices. Wire the ground line. Be sure to ground the controller alone. Perform wiring using the attached power supply connector as referring to the description of wiring that connector.

* Model (FH-1□□□-□□/3□□□-□□) has two Ethernet ports.

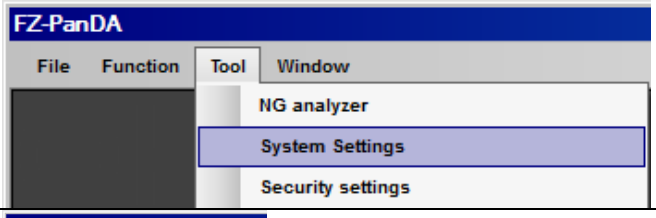


(FH Sensor Controller)

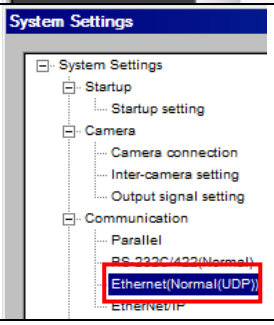
2	Turn ON the power supply to the FH Sensor Controller.	
3	The Language setting Dialog Box is displayed on the monitor connected to the FH Sensor Controller only at the initial start. Select ***English*** and click the **OK** Button.	
	The dialog box on the right is displayed. Click the **Yes** Button.	
4	Select ***System Settings*** from the Tool Menu.	
5	Select **System Settings**-**Startup**-**Startup setting**. The Language setting Dialog Box is displayed. Select the **Communication** Tab.	
6	The Communication module select Dialog Box is displayed. Select ***EtherNet/IP*** from the Fieldbus pull-down list. Then, click the **Apply** Button.	
	* The data set in the System Settings Dialog Box as shown on the right becomes enabled after the settings are saved, and then the FH Sensor Controller is restarted.	
7	Click the **Close** Button to close the System Settings Dialog Box.	

8	Select ***Data save*** from the Function Menu.	
9	The Data save Dialog Box is displayed. Click the **OK** Button.	
10	Select ***System restart*** from the Function Menu.	
11	The System restart Dialog Box is displayed. Check the contents and click the **OK** Button.	

12 After restarting, select ***System Settings*** from the Tool Menu.



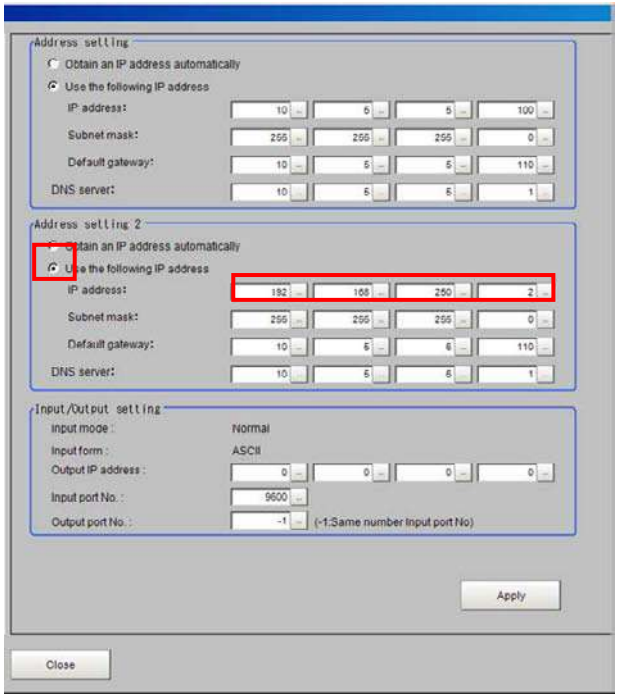
13 Select **System Settings** - **Communication** - **Ethernet: Normal(UDP)**.



14 The window on the right is displayed. Select the *Use the following IP address* Option for Address setting 2.

Enter the following values using the numeric keyboard and click the **OK** Button to confirm the values.

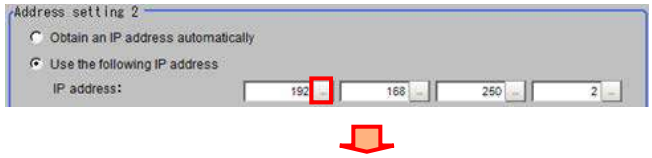
IP address: *192.168.250.2*
Subnet mask: *255.255.255.0*



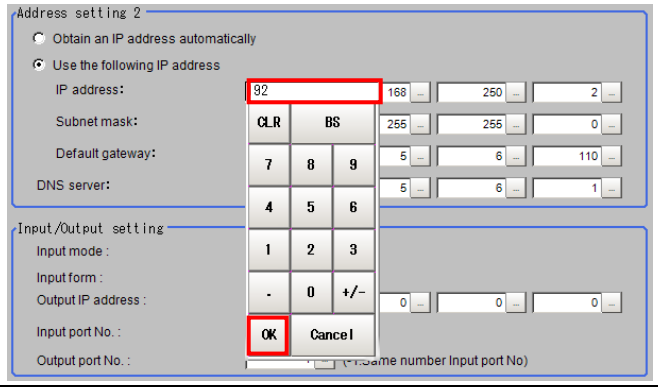
* When a value is changed, the Apply Button is displayed.

* How to change IP address.

* To change a value, click the ... Button in the item in which a value is to be set.

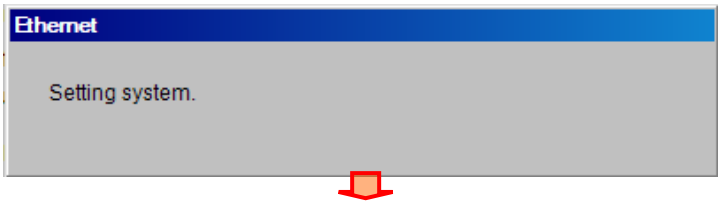


* The numeric keyboard is displayed. Enter values using the mouse. After entering the values, click the **OK** Button on the numeric keyboard.



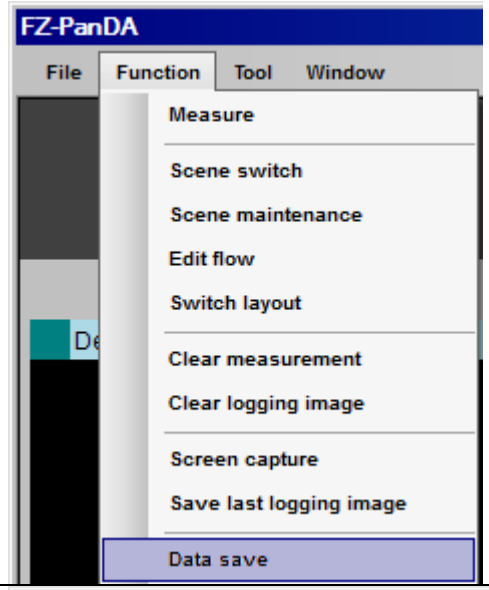
15 When a value is changed, the Apply Button is displayed. Click the **Apply** Button.

The Ethernet Dialog Box is displayed.

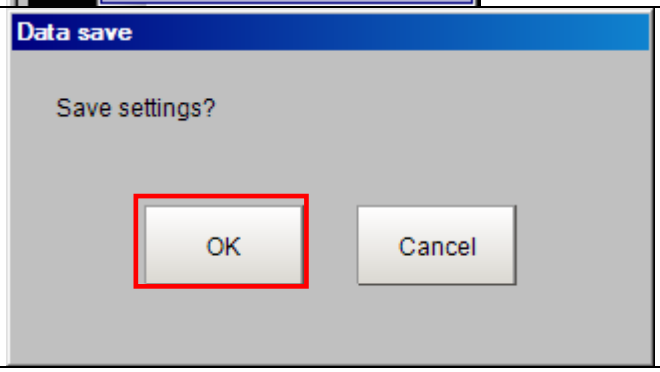


After the Ethernet Dialog Box disappears, click the **Close** Button to close the System Settings Dialog Box.

16 Select ***Data save*** from the Function Menu.



17 The Data save Dialog Box is displayed. Check the contents and click the **OK** Button.

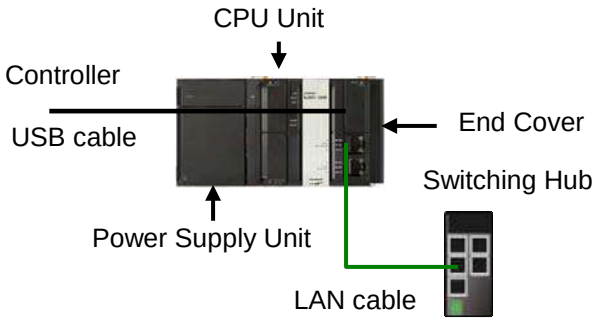
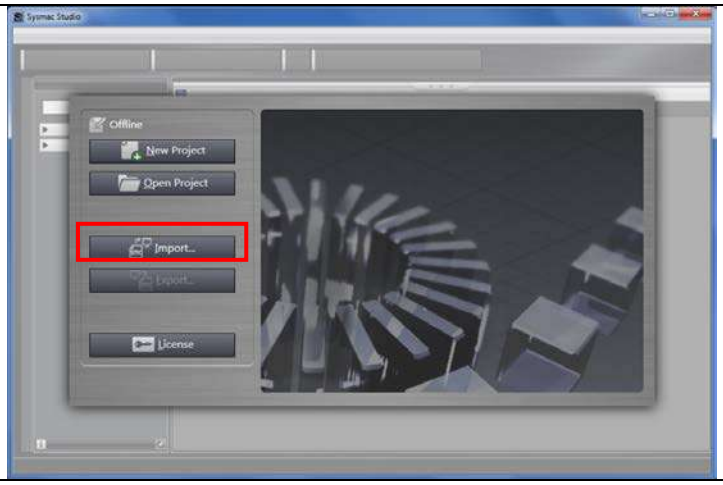
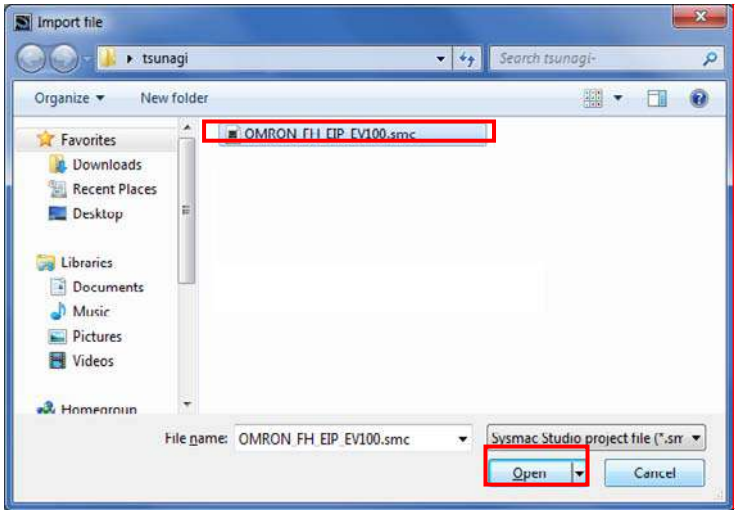


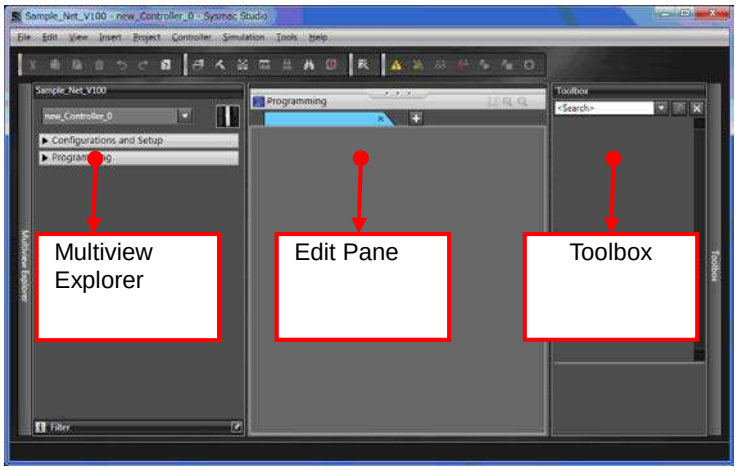
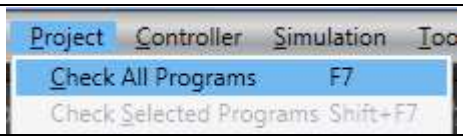
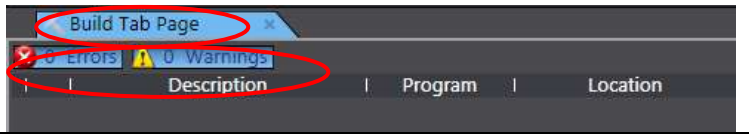
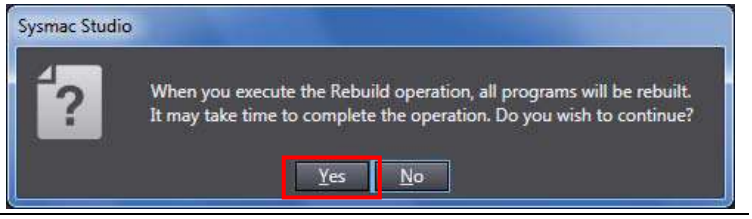
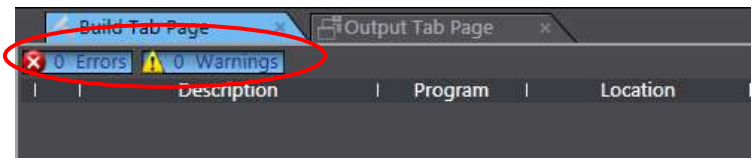
7.3. Setting Up the Controller

Set up the Controller.

7.3.1. Starting the Sysmac Studio and Importing the Project File

Start the Sysmac Studio and import the Sysmac Studio project file.
Install the Sysmac Studio and USB driver in the personal computer beforehand.

1	Connect the LAN cable to the built-in EtherNet/IP port (PORT1) of the Controller and the USB cable to the peripheral (USB) port. Then connect the Controller, personal computer, and switching hub by referring to *5.2. Device Configuration*.	
2	Turn ON the power supply to the Controller.	
3	Start the Sysmac Studio. Click the **Import** Button. * If a confirmation dialog for an access right is displayed at start, select to start.	
4	The Import file Dialog Box is displayed. Select *OMRON_FH_EIP_EV100.smc* (Sysmac Studio project file) and click the **Open** Button. * Obtain the Sysmac Studio project file from OMRON.	

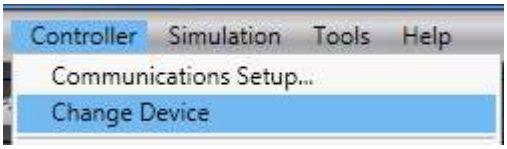
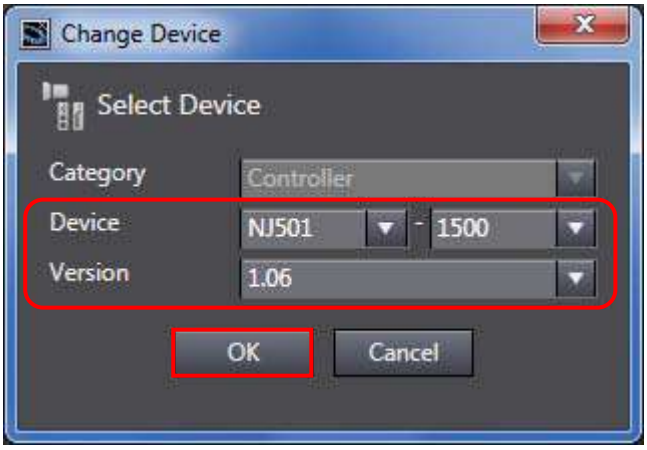
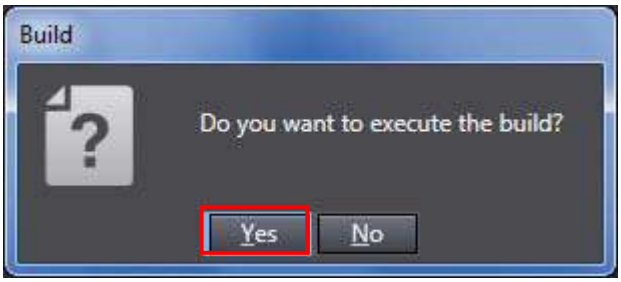
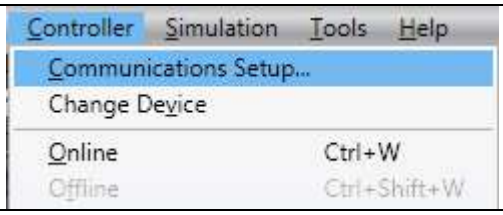
5	The OMRON_FH_EIP_EV100 project is displayed. The left pane is called Multiview Explorer, the right pane is called Toolbox and the middle pane is called Edit Pane. * If an error message is displayed stating "Failed to Load Descendants", change the version of the Sysmac Studio to the version specified in *5.2. Device Configuration* or higher version.	
6	Select ***Check All Programs*** from the Project Menu.	
7	The Build Tab Page is displayed on the Edit Pane. Confirm that "0 Errors" and "0 Warnings" are displayed.	
8	Select ***Rebuild Controller*** from the Project Menu.	
9	A confirmation dialog box is displayed. Confirm that there is no problem and click the **Yes** Button.	
10	Confirm that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.	

7.3.2. Connecting Online and Transferring the Project Data

Connect online with the Sysmac Studio and transfer the project data to the Controller.

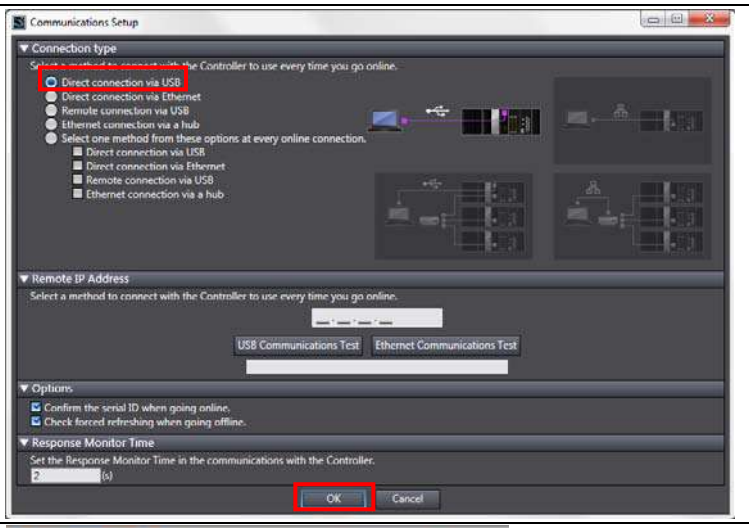
⚠ WARNING

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.

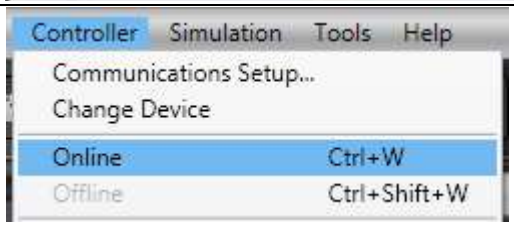
1	Select ***Change Device*** from the Controller Menu.	
2	The Change Device Dialog Box is displayed. Confirm that the *Device* and *Version* Fields are set as shown on the right. * If the settings are different, select the setting items from the pull-down list. Click the **OK** Button.	
3	If you changed the settings in step 2, the Build Dialog Box is displayed. Check the contents and click the **Yes** Button.	
4	Select ***Communications Setup*** from the Controller Menu.	

5 The Communications Setup Dialog Box is displayed. Select the *Direct connection via USB* Option for Connection type.

Click the **OK** Button.



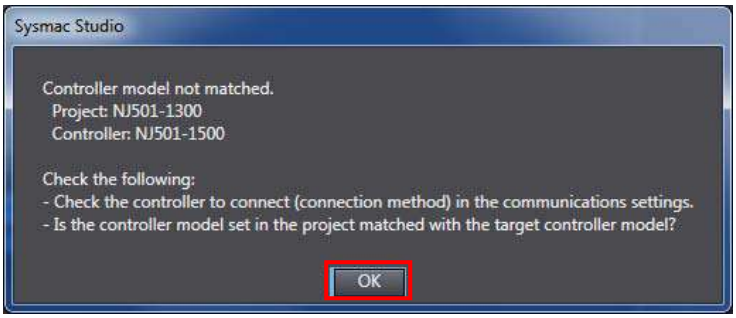
6 Select ***Online*** from the Controller Menu.

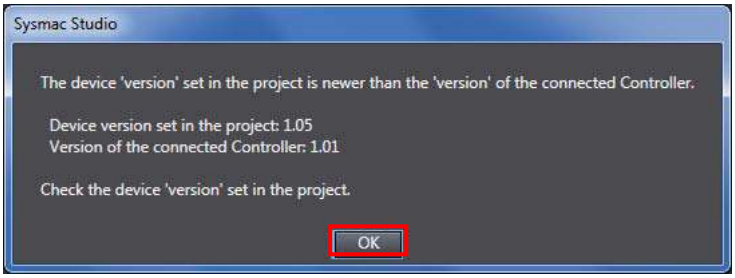


* If the dialog on the right is displayed, the model or version of the Controller does not match that of the project file. Match the Controller model and version by changing the device settings of the project file, and then repeat the procedure from step 1 in this section. Close the dialog box by clicking the **OK** Button.

* The model and version displayed on the confirmation dialog box differ depending on the Controller used and the device setting of the project file.

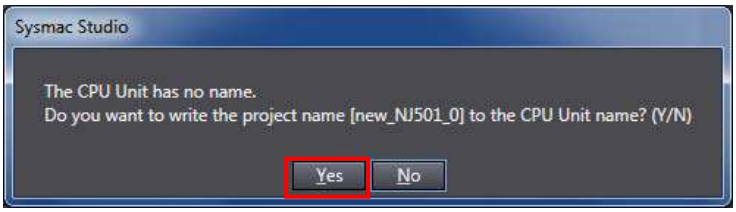
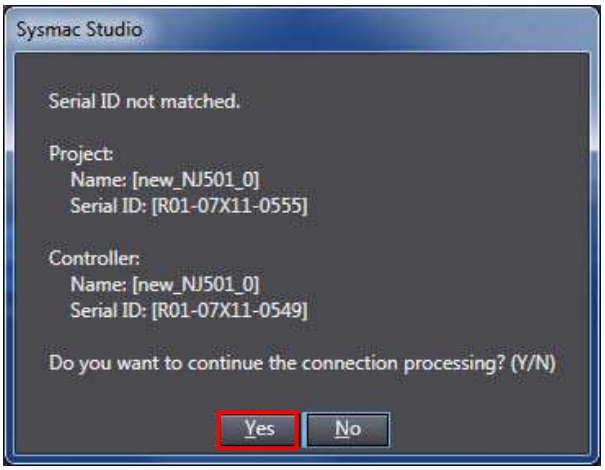
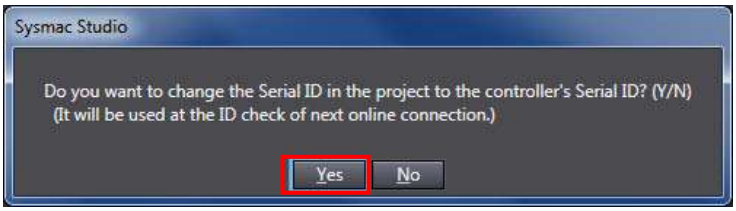
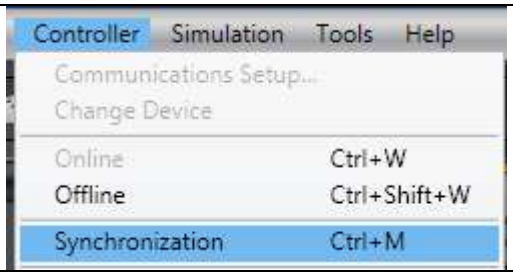
* Example of confirmation dialog box





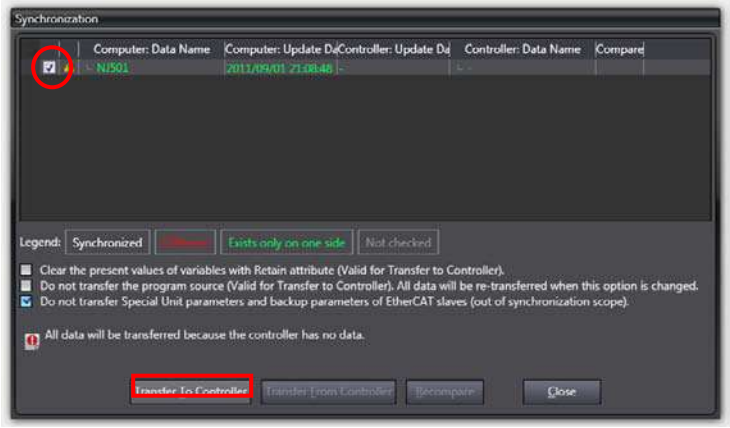
Additional Information

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).

7	A confirmation dialog box is displayed as shown on the right. Confirm that there is no problem and click the **Yes** Button. * The displayed dialog depends on the status of the Controller used. Click the **Yes** Button to proceed with the processing. * The displayed serial ID differs depending on the device.	  
8	When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.	
9	Select ***Synchronization*** from the Controller Menu.	

10 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.

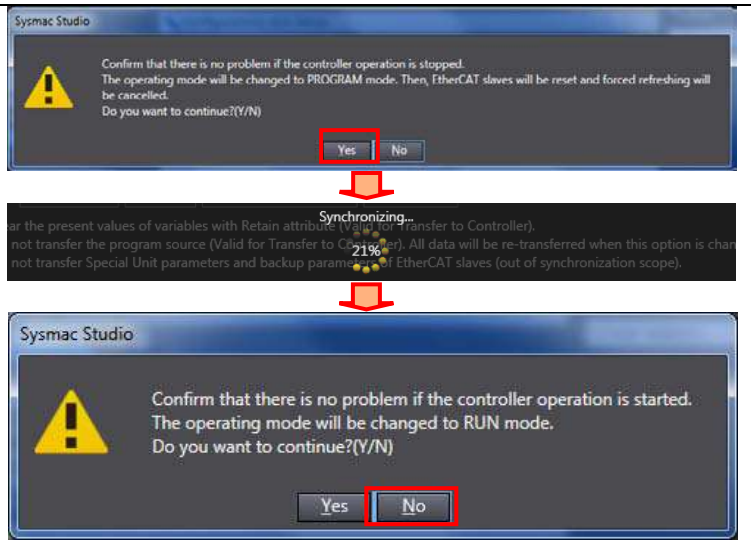
* After executing the Transfer To Controller, the Sysmac Studio data is transferred to the Controller and the data are compared.



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

A screen stating "Synchronizing" is displayed.

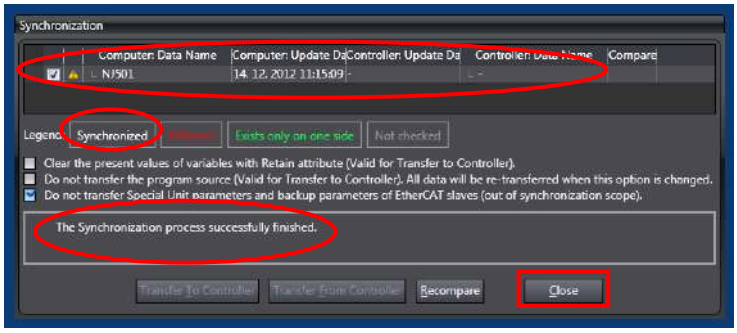
A confirmation dialog box is displayed. Confirm that there is no problem and click the **No** Button.
* Do not return it to RUN mode.



12 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. Setting Up the Network

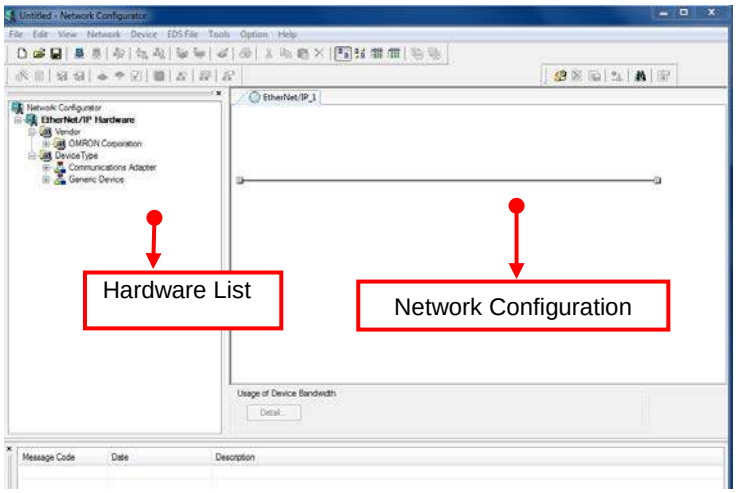
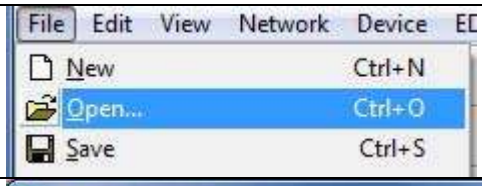
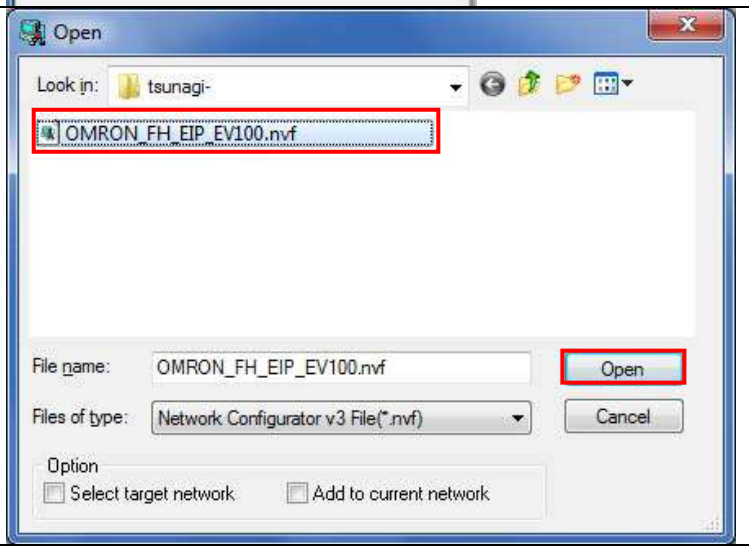
Set the tag data links for the EtherNet/IP.

7.4.1. Starting the Network Configurator and Opening the Network Configuration File

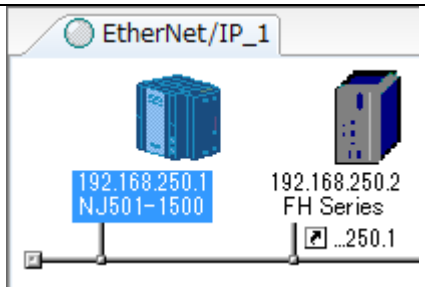
Start up the Network Configurator and open the Network Configurator v3 network configuration file.

Precautions for Correct Use

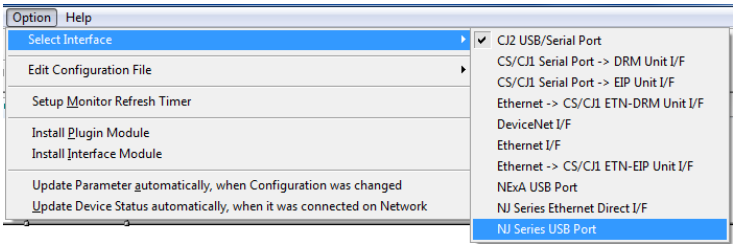
Please confirm that the LAN cable is connected before performing the following procedure. When it is not connected, turn OFF the power supply to each device and then connect the LAN cable.

1	Start the Network Configurator.	
2	Select ***Open*** from the File Menu.	
3	The Open Dialog Box is displayed. Select *OMRON_FH_EIP_EV100.nvf* (Network Configurator v3 network configuration file) and click the **Open** Button. * Obtain the Network Configurator v3 network configuration file from OMRON.	

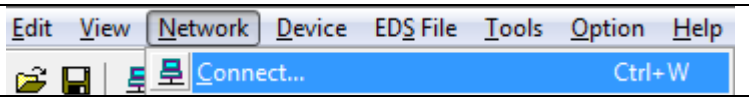
4 The following devices are displayed in the Network Configuration Pane as shown in the right figure.
IP address of node 1:
192.168.250.1
IP address of node 2:
192.168.250.2



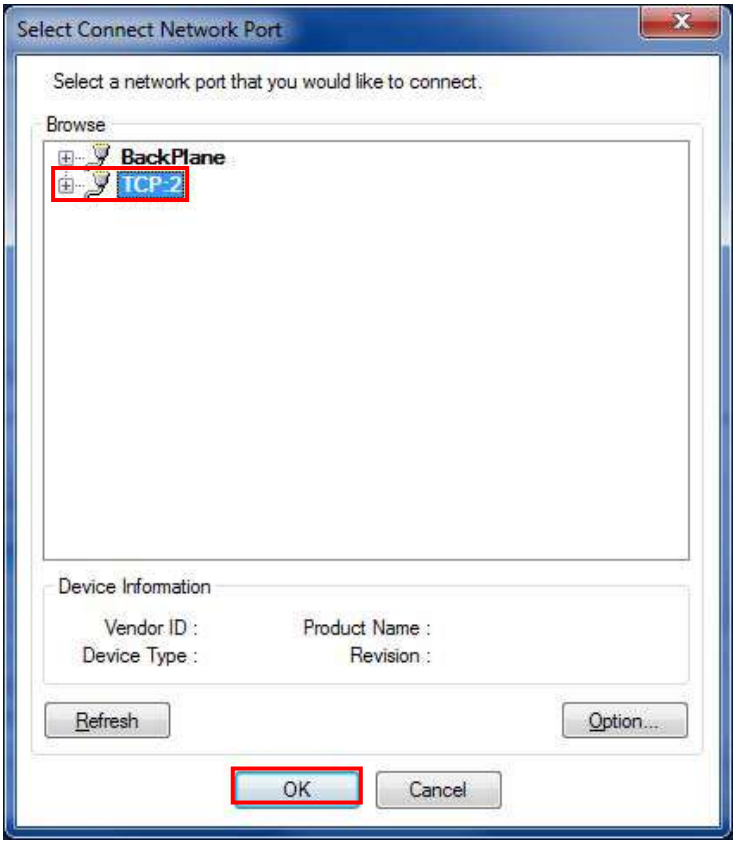
5 Select ***Select Interface*** - ***NJ Series USB Port*** from the Option Menu.

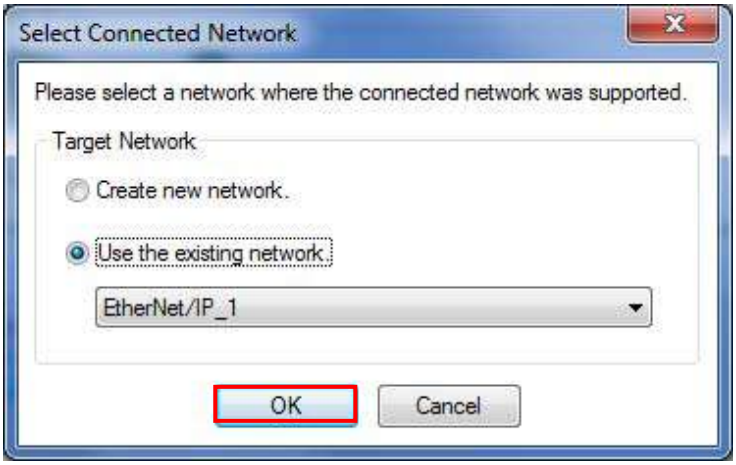
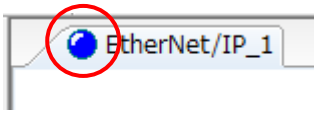


6 Select ***Connect*** from the Network Menu.



7 The Select Connect Network Port Dialog Box is displayed.
Select *TCP: 2*.
Click the **OK** Button.



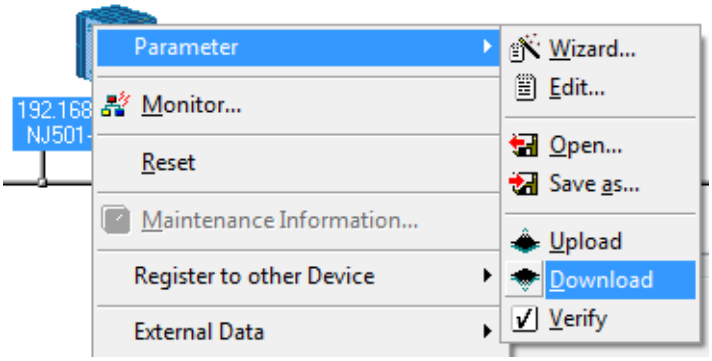
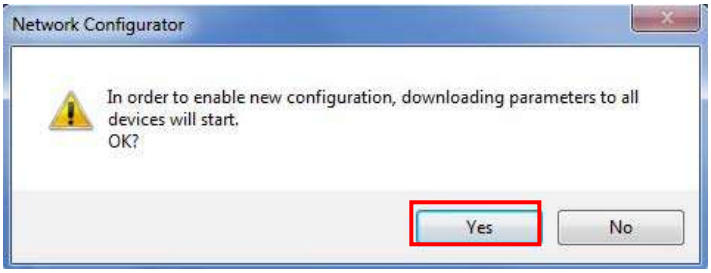
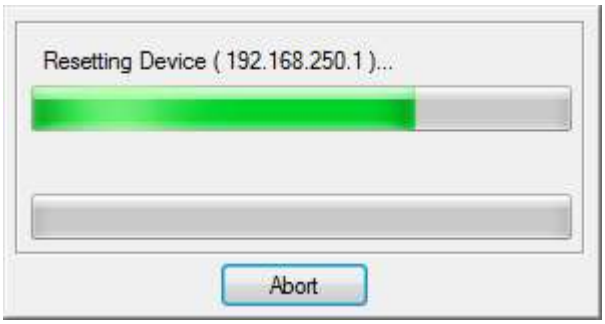
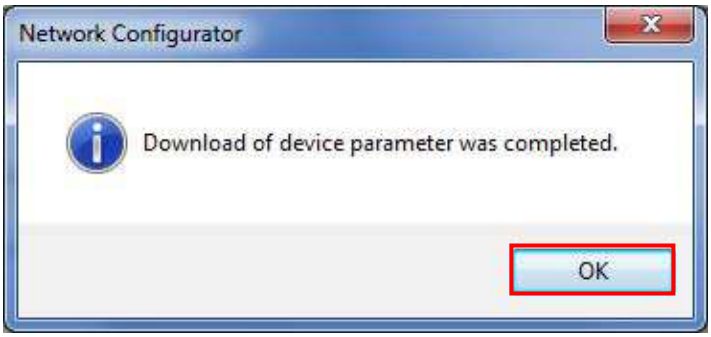
8	The Select Connected Network Dialog Box is displayed. Check the contents and click the **OK** Button.	
9	When an online connection is established normally, the color of the icon on the right figure changes to blue.	

Additional Information

If an online connection cannot be made to the Controller, check the cable connection. Or, return to step 4, check the settings and repeat each step.
For details, refer to *7. 2. 8 Connecting the Network Configurator* in *Section 7 Tag Data Link Functions* of the *NJ-series CPU Unit Built-in EtherNet/IP Port User's Manual* (Cat. No. W506).

7.4.2. Transferring the Tag Data Link Parameters

Transfer the tag data link parameters to the Controller.

1	Right-click the device icon of node 1 on the Network Configuration Pane and select ***Parameter*** - ***Download***.	
	The dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.	
2	Tag data link parameters are downloaded from the Network Configurator to the Controller.	
3	The dialog box on the right is displayed. Check the contents and click the **OK** Button.	

7.5. Checking the EtherNet/IP Communications

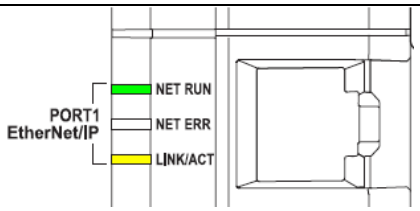
Confirm that the EtherNet/IP tag data links are operated normally.

7.5.1. Checking the Connection Status

Check the connection status of EtherNet/IP.

1 Confirm that the tag data links are normally in operation by checking the LED indicators on each device.

・The LED indicators on the Controller (Built-in EtherNet/IP port) in normal status are as follows:
[NET RUN]: Lit green
[NET ERR]: Not lit
[LINK/ACT]: Flashing yellow
(Flashing while packets are being sent and received)



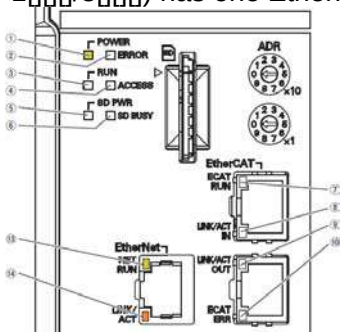
(Controller)

・FH Sensor Controller (FH-1□□□/3□□□) has one port.

The LED indicators in normal status are as follows:
[POWER]: Lit green
[ERROR]: Not lit
[NET RUN]: Lit green
[LINK/ACT]: Flashing orange
(Flashing while packets are being sent and received)

* Model (FH-1□□□/3□□□) has one Ethernet port.

PORT1



(FH Sensor Controller)

	LED name Description	Description
①	POWER LED	Lit while power is ON.
②	ERROR LED	Lit when an error has occurred.
③	RUN LED	Lit while the controller is in Measurement Mode.
④	ACCESS LED	Lit while the memory is accessed.
⑤	SD POWER LED	Lit while power is supplied to the SD card and the card is usable.
⑥	SD BUSY LED	Blinks while the SD memory card is accessed.
⑦	EtherCAT RUN LED	Lit while EtherCAT communications are usable.
⑧	EtherCAT LINK/ACT IN LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
⑨	EtherCAT LINK/ACT OUT LED	Lit when connected with an EtherCAT device, and blinks while performing communications.
⑩	EtherCAT ERR LED	Lit when EtherCAT communications have become abnormal.
⑬	EtherNet NET RUN2 LED	Lit when Ethernet communications are usable.
⑭	EtherNet NET LINK/ACK2 LED	Lit when connected with an Ethernet device, and blinks while performing communications.

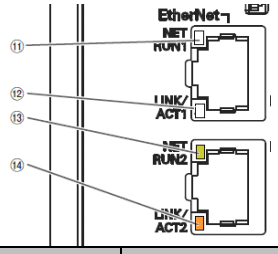
* For FH Sensor Controller (FH-1□□□-□□/3□□□-□□), check the status of the LED indicators for the PORT2.

The LED indicators in normal status are as follows:
[POWER]: Lit green
[ERROR]: Not lit
[NET RUN2]: Lit green
[LINK/ACT2]: Flashing orange
(Flashing while packets are being sent and received)

* Model (FH-1□□□-□□/3□□□-□□) has two Ethernet ports.

PORT1

PORT2



	LED name Description	Description
⑪	EtherNet NET RUN1 LED	Lit while EtherCAT communications are usable.
⑫	EtherNet NET LINK/ACK1 LED	Lit when connected with an Ethernet device, and blinks while performing communications.
⑬	EtherNet NET RUN2 LED	Lit when Ethernet communications are usable.
⑭	EtherNet NET LINK/ACK2 LED	Lit when connected with an Ethernet device, and blinks while performing communications.

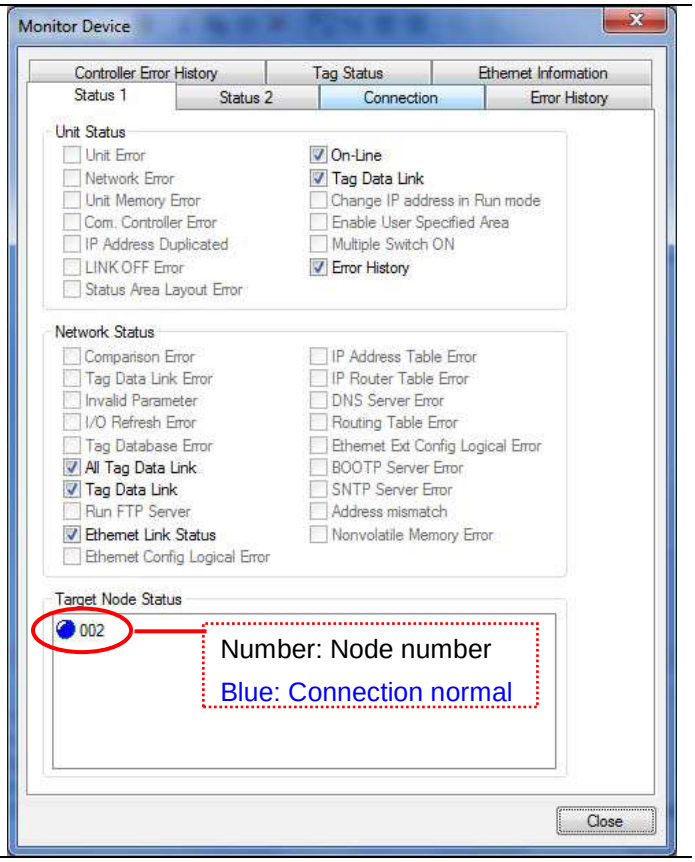
2 Confirm that the tag data links are normally in operation by checking the status information on the Monitor Device Window of the Network Configurator.

Right-click the device icon of node 1 on the Network Configuration Pane and select ***Monitor***.

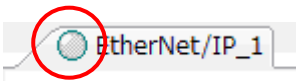
3 The dialog box on the right displays the Status 1 Tab Page of the Monitor Device Window.

When the same items are selected as shown on the right, the data links are normally in operation.

Click the **Close** Button.



4 Select ***Disconnect*** from the Network Menu to go offline. The color of the icon on the figure changes from blue.
Select ***Exit*** from the File Menu to exit the Network Configurator.

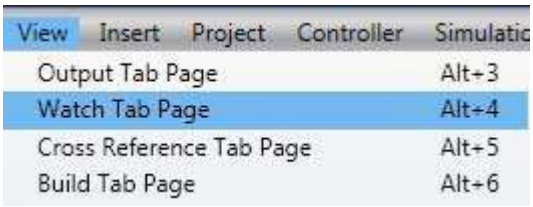
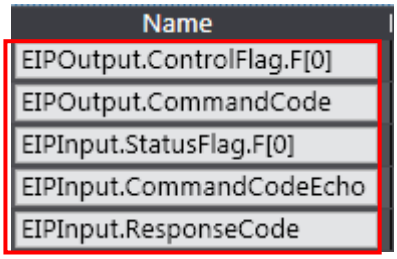


7.5.2. Checking the Data that are Sent and Received

Confirm that the correct data are sent and received.

⚠ WARNING

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

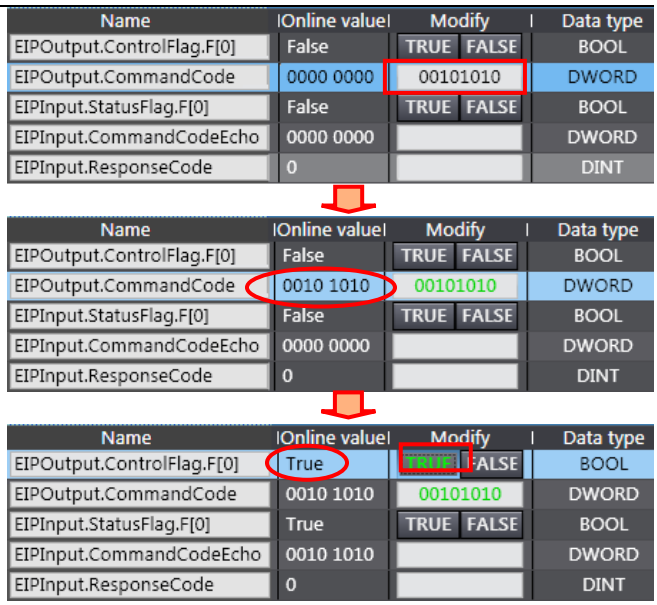
1	Select ***Watch Tab Page*** from the View Menu.	
2	The Watch Window1 Tab Page is displayed in the lower section of the Edit Pane.	
3	The following names are entered in the Watch Window1 Tab Page for monitoring. *EIPOutput.ControlFlag.F[0]* (EXE flag) *EIPOutput.CommandCode* *EIPInput.StatusFlag.F[0]* (FLG flag) *EIPInput.CommandCodeEcho* *EIPInput.ResponseCode*	

4

Enter *00101010* in the *Modify* Column of *EIPOutput.CommandCode.* (CommandCode [00101010]: Measurement)

By pressing the **Enter** Key, the value is set and the Online value of *EIPOutput.CommandCode* changes to 00101010.

Click **TRUE** in the *Modify* Column of *EIPOutput.ControlFlag.F[0]*(EXE flag). The Online value changes to True. (EIPOutput.ControlFlag.F[0](EXE flag): Command Request Bit)



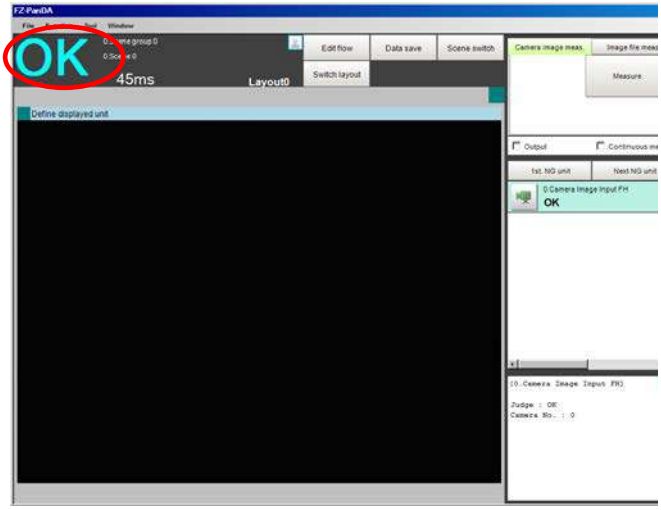
Name	Online value	Modify	Data type
EIPOutput.ControlFlag.F[0]	False	TRUE FALSE	BOOL
EIPOutput.CommandCode	0000 0000	00101010	DWORD
EIPInput.StatusFlag.F[0]	False	TRUE FALSE	BOOL
EIPInput.CommandCodeEcho	0000 0000		DWORD
EIPInput.ResponseCode	0		DINT

Name	Online value	Modify	Data type
EIPOutput.ControlFlag.F[0]	False	TRUE FALSE	BOOL
EIPOutput.CommandCode	0010 1010	00101010	DWORD
EIPInput.StatusFlag.F[0]	False	TRUE FALSE	BOOL
EIPInput.CommandCodeEcho	0000 0000		DWORD
EIPInput.ResponseCode	0		DINT

Name	Online value	Modify	Data type
EIPOutput.ControlFlag.F[0]	True	TRUE FALSE	BOOL
EIPOutput.CommandCode	0010 1010	00101010	DWORD
EIPInput.StatusFlag.F[0]	True	TRUE FALSE	BOOL
EIPInput.CommandCodeEcho	0010 1010		DWORD
EIPInput.ResponseCode	0		DINT

5

After the measurement is completed, OK is displayed on the dialog box.



6

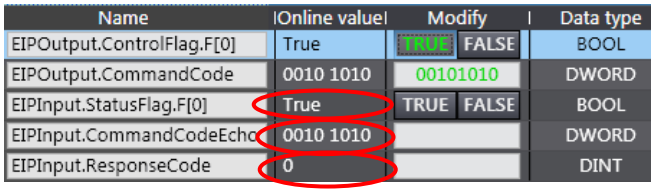
The Online values of *EIPInput.StatusFlag.F[0]*(FLG flag), *EIPInput.CommandCodeEcho,* and *EIPInput.ResponseCode* are as follows:

- *EIPInput.StatusFlag.F[0]*: True (FLG flag)
- *EIPInput.CommandCodeEcho*: 00101010

(The sent command code is returned.)

- *EIPInput.ResponseCode*: 0

(The execution result of the command (0: OK, -1(FFFFFFFF): NG) is reflected.)



Name	Online value	Modify	Data type
EIPOutput.ControlFlag.F[0]	True	TRUE FALSE	BOOL
EIPOutput.CommandCode	0010 1010	00101010	DWORD
EIPInput.StatusFlag.F[0]	True	TRUE FALSE	BOOL
EIPInput.CommandCodeEcho	0010 1010		DWORD
EIPInput.ResponseCode	0		DINT

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

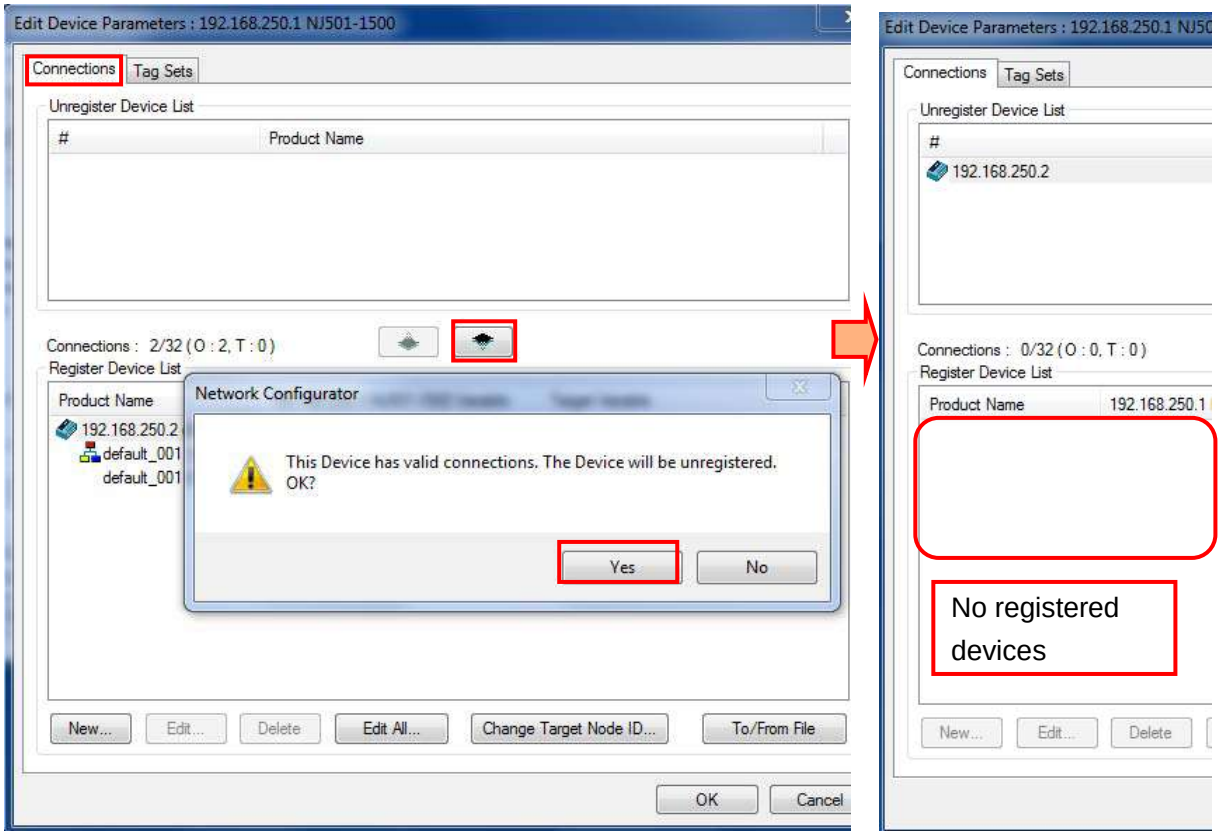
To initialize the settings of the Controller, the CPU Unit and EtherNet/IP port need to be initialized. Change the Controller to PROGRAM mode before the initialization.

8.1.1. EtherNet/IP port

Delete the connection information and tag information that are set for the EtherNet/IP port. Follow the procedure below to set blank connection information and blank tag information and delete them using the Network Configurator.

(1) Deleting connection information

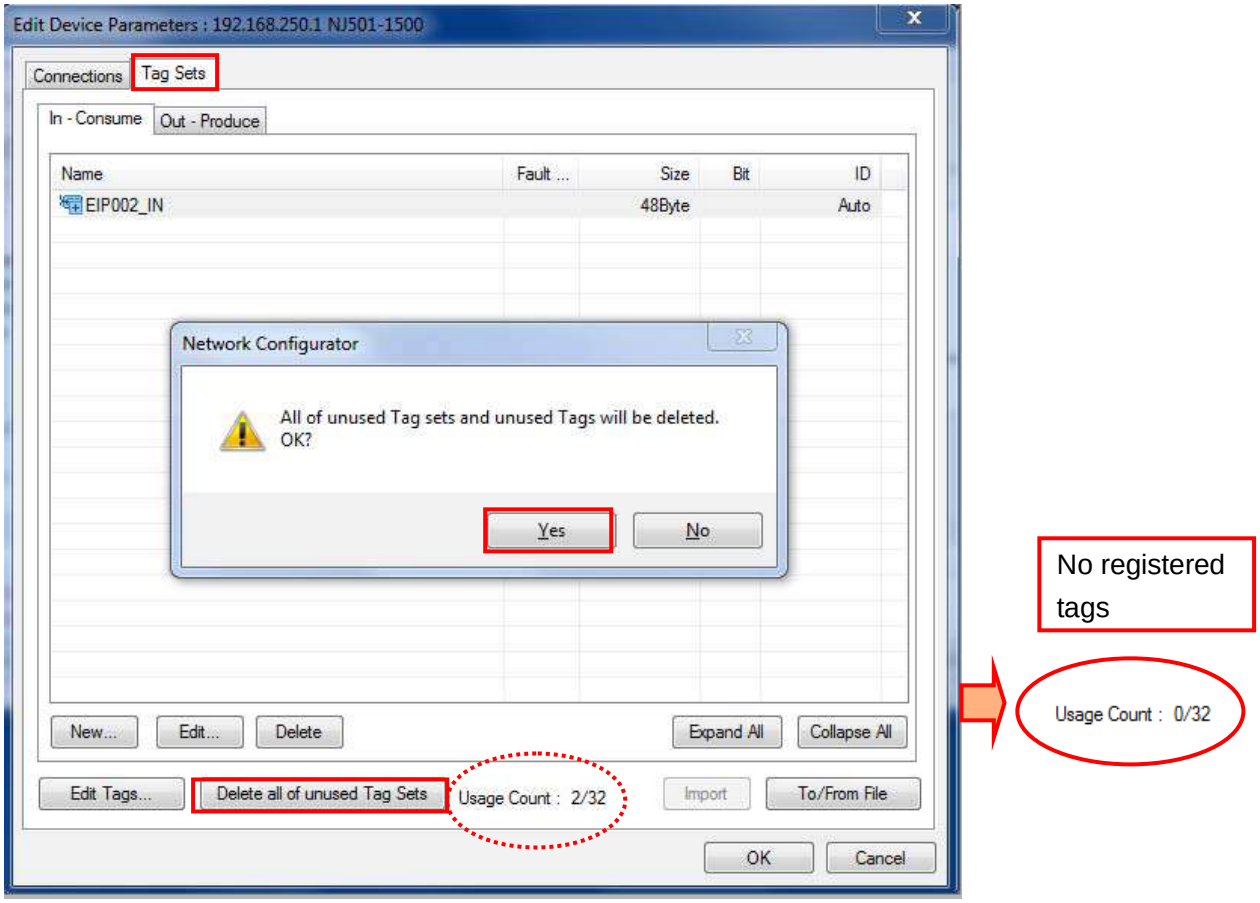
Select the **Connections** Tab Page of the Edit Device Parameters Dialog Box and move all devices registered in the Register Device List to the Unregister Device List.
If a confirmation dialog is displayed when you remove devices from the registration list, confirm that there is no problem and click the **Yes** Button.



(2) Deleting tag information

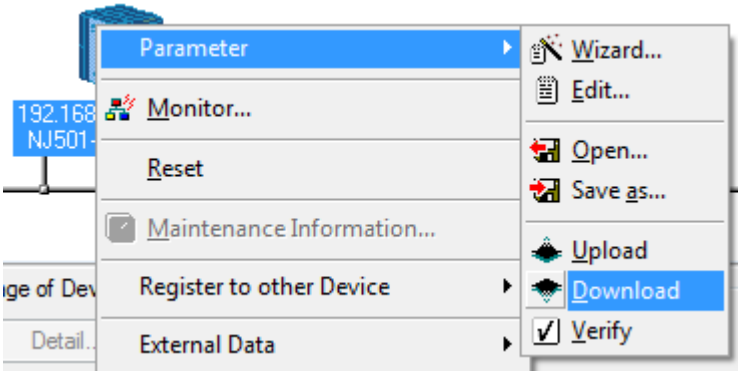
Select the **Tag Sets** Tab Page of the Edit Parameters Dialog Box and click the **Delete all of unused Tag Sets** Button.

If a confirmation dialog box on the right is displayed, confirm that there is no problem and click the **Yes** Button.



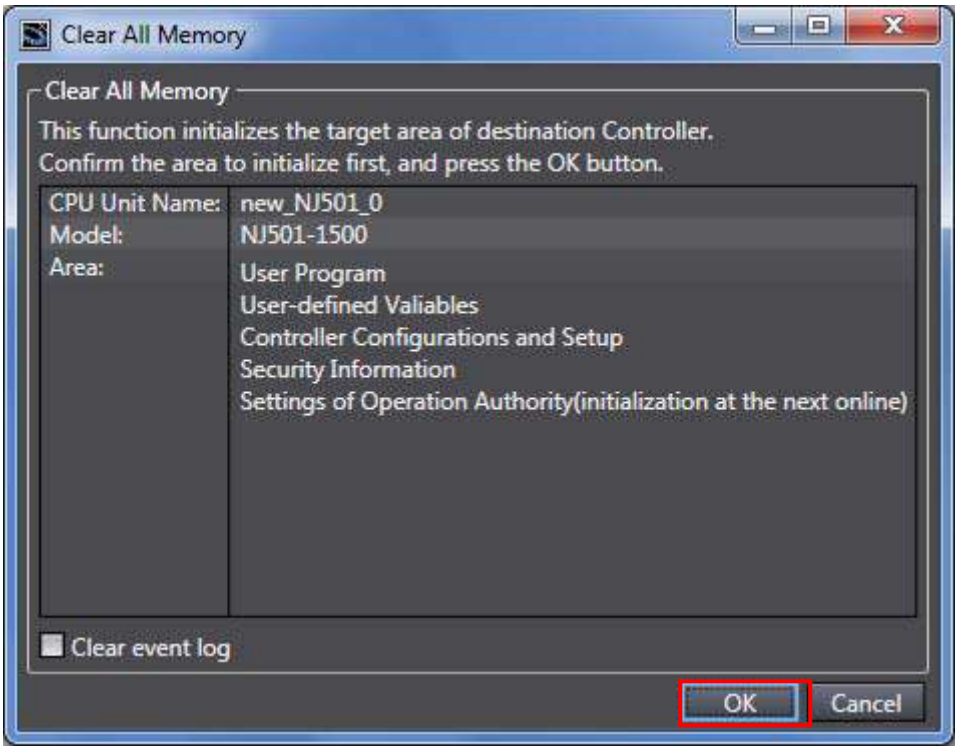
(3) Download

Right-click the Controller and select ***Parameter*** - ***Download*** from the menu that is displayed.



8.1.2. CPU Unit

To initialize the settings of the CPU Unit, 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 FH Sensor Controller

For how to initialize the FH Sensor Controller, refer to *Initializing the Controller* in *Section 1 Before Operation* of the *Vision Sensor FH/FZ5 Series Vision System User's Manual* (Cat.No.Z340).

9. Appendix 1 Detailed Settings of the Tag Data Links

This section provides the detailed settings necessary to perform tag data links which are set in this document.

9.1. Global Variable Table

The Controller accesses the data in tag data links as global variables. The following are the settings of the global variables. Use the Sysmac Studio to register a global variable table.

Name	Data type	Network publish	Destination device allocation
EIPOutput	S_EIPOutput	Output	Output data (20Byte)
EIPInput	S_EIPInput	Input	Input data (48Byte)

Additional Information

For details on command codes and response codes, refer to *Communicating with EtherNet/IP* in *Section 2 Methods for Connecting and Communicating with External Devices* of the *Vision Sensor FH/FZ5 Series Vision System User's Manual (Communications Settings)* (Cat.No. Z342).

Additional Information

With the Sysmac Studio, two methods can be used to specify an array for a data type. After specifying, (1) is converted to (2) and the data type is always displayed as (2).

(1)WORD[3] /(2)ARRAY[0..2]OF WORD

In this document, the data type is simplified by describing WORD[3].

(The example above means a WORD data type with three array elements.)

9.2. Relationship between Destination Device and Global Variables

Global variables need to be arranged in offset order of the Destination Device before setting the tag data link parameters.
The relationship between the memory allocation of the Destination Device and the global variables is shown below.

■ Output area (from Controller to FH Sensor Controller)

Variable	Data type	Data size
EIPOutput	S_EIPOutput	20 bytes

Offset (word)	Destination device data	Variable name	Data type
+0 to +1	Control signal (32 bits) (Data type: U_EIPFlag)	EIPOutput.ControlFlag.F*1	BOOL[32]
		EIPOutput.ControlFlag.W*1	DWORD
+2 to +3	Command code (CMD-CODE)	EIPOutput.CommandCode	DWORD
+4 to +5	Command parameter (CMD-PARAM)	EIPOutput.CommandParam1	DINT
+6 to +7		EIPOutput.CommandParam2	DINT
+8 to +9		EIPOutput.CommandParam3	DINT

*1: Details on allocation of control signal

Allocation of EIPOutput.ControlFlag.F variable

Offset (word)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	ERCLR							XEXE							STEP	EXE
+1																DSA

EXE: Command Request Bit: Turned ON to execute a command.
STEP: Measure Bit: Turned ON to execute a measurement.
XEXE: Flow Command Request Bit: Turned ON to request execution of a command during execution of fieldbus flow control.
ERCLR: Error Clear Bit: Turned ON to clear the Error Status bit.
DSA: Data Output Request Bit: Turned ON to request data output.

Allocation of EIPOutput.ControlFlag.W variable

Offset (word)	15	14	13	・・・	2	1	0
+0	15	14	13	・・・	2	1	0
+1	31	30	29	・・・	18	17	16

Bits 31 to 0: EIPOutput.ControlFlag.W uses DWORD data from the offset +0 word.

■ Input area (from FH Sensor Controller to Controller)

Variable	Data type	Data size
EIPInput	S_EIPInput	48 bytes

Offset (word)	Destination device data	Variable name	Data type
+0 to +1	Control output (32 bits) (Data type: U_EIPFlag)	EIPInput.StatusFlag.F[*1]	BOOL[32]
		EIPInput.StatusFlag.W[*1]	DWORD
+2 to +3	Command code (CMD-CODE)	EIPInput.CommandCodeEcho	DWORD
+4 to +5	Response code (RES-CODE)	EIPInput.ResponseCode	DINT
+6 to +7	Response data (RES-DATA)	EIPInput.ResponseData	DINT
+8 to +9	Output data 0 (DATA0)	EIPInput.OutputData	DINT[8]
+10 to +11	Output data 1 (DATA1)		
+12 to +13	Output data 2 (DATA2)		
+14 to +15	Output data 3 (DATA3)		
+16 to +17	Output data 4 (DATA4)		
+18 to +19	Output data 5 (DATA5)		
+20 to +21	Output data 6 (DATA6)		
+22 to +23	Output data 7 (DATA7)		

* 1: Details on allocation of control signal

Allocation of EIPInput.StatusFlag.F variable

Offset (word)	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
+0	ERR					XWAIT	XBUSY	XFLG				RUN	OR		BUSY	FLG
+1																GATE

FLG: Command Completion Bit: Turned ON when command execution is completed.
BUSY: Command Busy Bit: Turned ON when command execution is in progress.
OR: Overall Judgement Bit: Turned ON when the overall judgement is NG.
RUN: Run Mode: Turned ON while the Sensor Controller is in Run Mode.
XFLG: Flow Command Completion Bit: Turned ON when execution of a command that was input during the execution of fieldbus flow control has been completed (i.e., when XBUSY turns OFF).
XBUSY: Flow Command Busy Bit: Turned ON when execution of a command that was input during execution of fieldbus flow control is in progress.
XWAIT: Flow Command Wait Bit: Turned ON when a command can be input during the execution of fieldbus flow control.
ERR: Error Signal: Turned ON when the Sensor Controller detects an error signal.
GATE: Data Output Completion Bit: Turned ON when data output is completed.

Allocation of EIPInput.StatusFlag.W variable

Offset (word)	15	14	13	・・・	2	1	0
+0	15	14	13	・・・	2	1	0
+1	31	30	29	・・・	18	17	16

Bits 31 to 0: EIPInput.StatusFlag.W uses DWORD data from the offset +0 word.

9.3. Associating the Tag Data Links

Tag data link parameters are required to perform tag data links with a Destination Device.
Follow the procedures below to associate the tag data links.

(1) Use the Sysmac Studio to define the global variables to publish on the network.
Store the created global variables in a CSV file to use in the Network Configurator.
(2) Read the CSV file (tag list) created in step 1 to the Network Configurator.
(3) Make a single tag set that includes the tag lists.
(4) Link the tag set with the destination device information and create tag data link parameters.

The numbers shown in the tables below correspond to the steps above.

■ Output area (from Controller to FH Sensor Controller)

Controller setting (Set with Sysmac Studio.)		Data link table setting (Set with Network Configurator.)				Destination device information	
(1)			Tag set: EIPOutput		20Byte (4)	←	Output_100-[20Byte]
Global variable (Data type)			(3)	Tag list			
EIPOutput	S_EIPOutput	→ (2)		EIPOutput	(20Byte)		

■ Input area (from FH Sensor Controller to Controller)

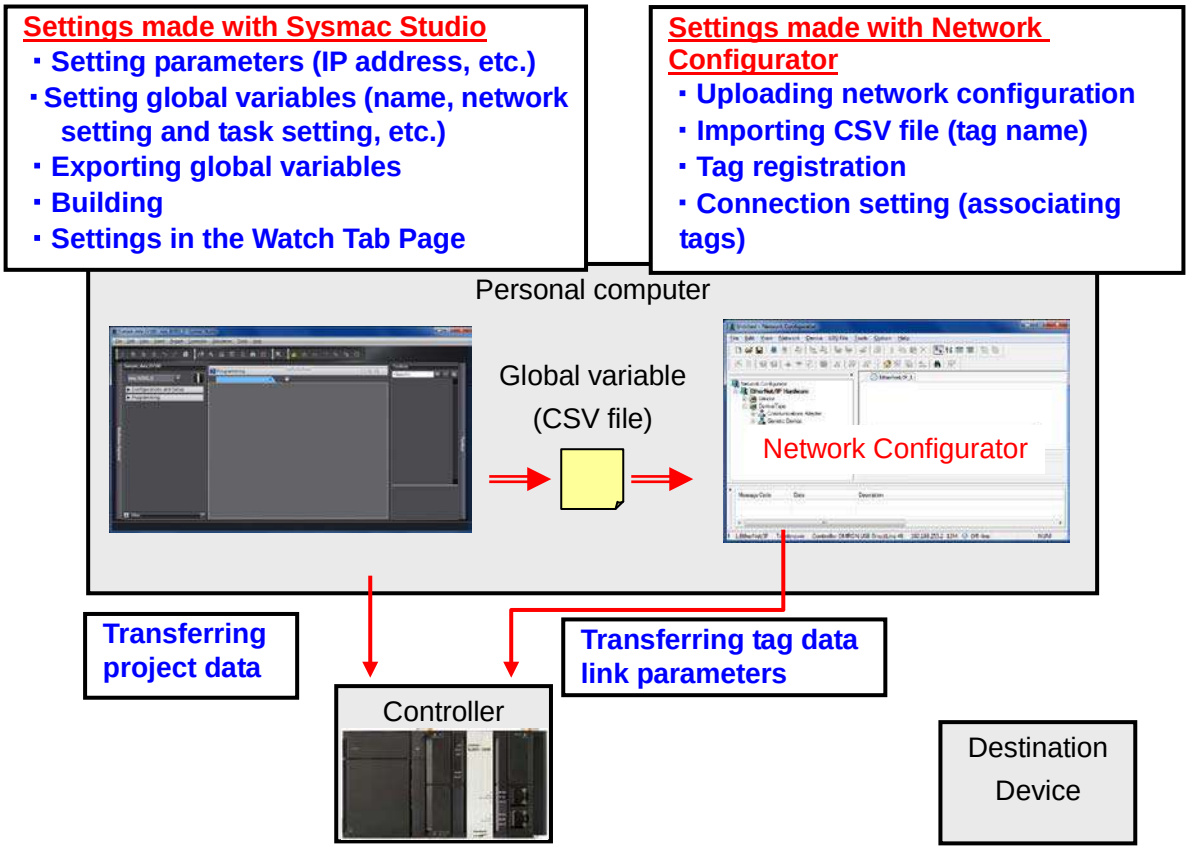
Controller setting (Set with Sysmac Studio.)		Data link table setting (Set with Network Configurator.)				Destination device information	
(1)			Tag set: EIPInput		48Byte (4)	←	Input_101-[48Byte]
Global variable (Data type)			(3)	Tag list			
EIPInput	S_EIPInput	→ (2)		EIPInput	(48Byte)		

10. Appendix 2 Setting the Tag Data Links Using the Software

This section describes the procedure for setting the Controller without the Configuration Files (Procedure for setting parameters from the beginning).
You can also refer to this section when you want to change the parameters of the Configuration Files.

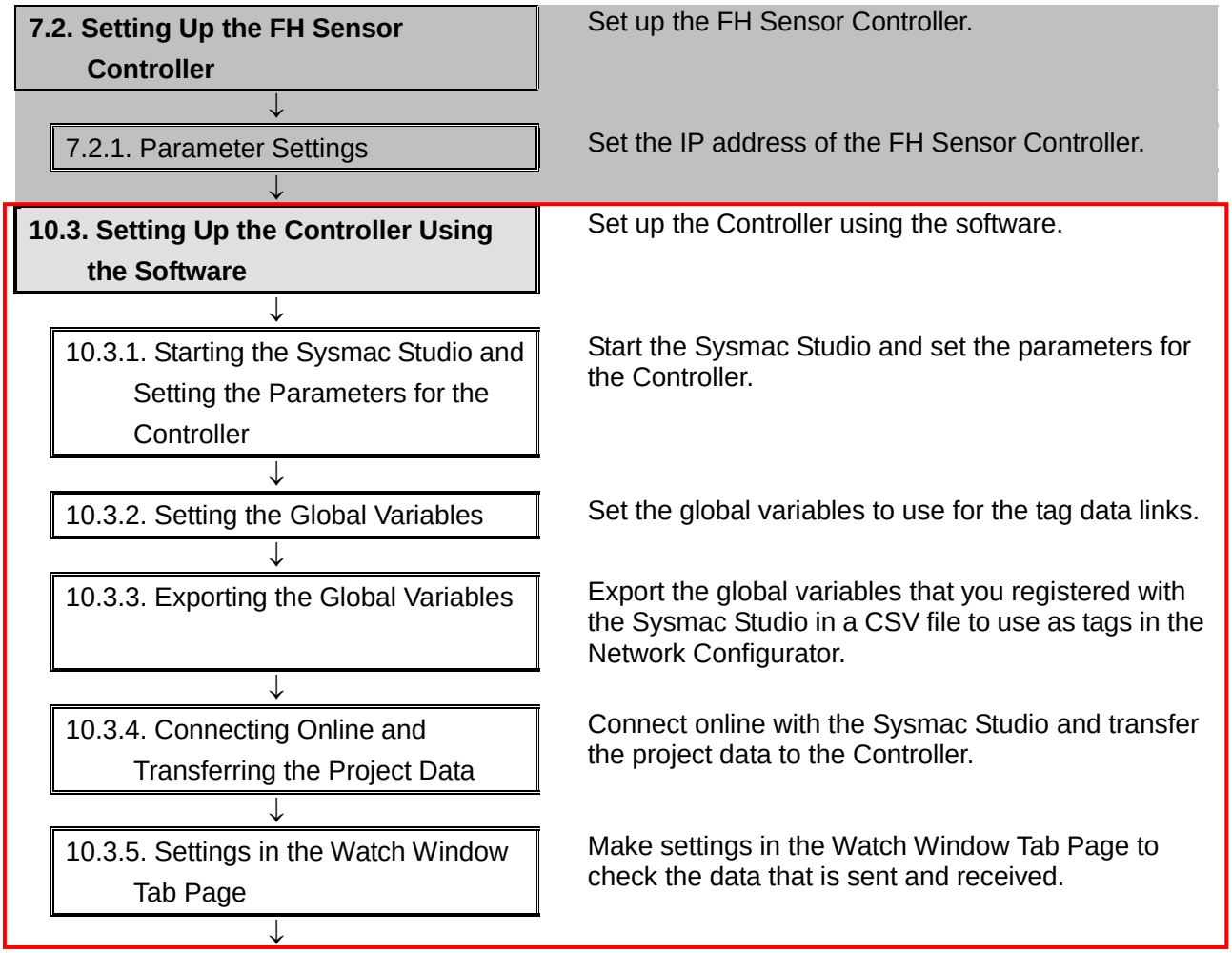
10.1. Overview of Setting Tag Data Links

The following is the relationship of operating the tag data links using the "procedure for setting parameters from the beginning".



10.2. Work Flow of "Procedure for Setting Parameters from the Beginning"

Take the following steps to make the tag data link settings for EtherNet/IP using the "procedure for setting parameters from the beginning".
This section describes the detailed procedures for *10.3. Setting Up the Controller Using the Software* and *10.4. Setting Up the Network Using the Software* (in red frames below).
For *7.2. Setting Up the FH Sensor Controller* and *7.5. Checking EtherNet/IP Communications*, refer to the procedures in *Section 7* as the same procedures for using the Configuration Files apply.



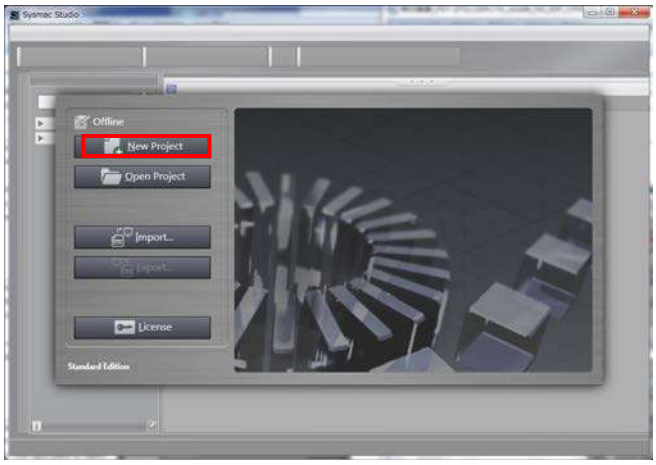
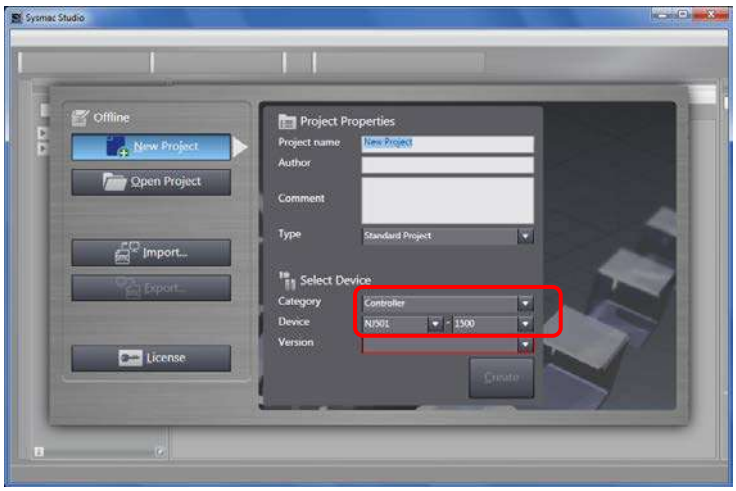
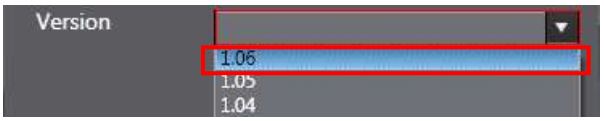
10.4. Setting Up the Network Using the Software	Set the tag data links for EtherNet/IP using the software.
↓	
10.4.1. Start the Network Configurator and Uploading Configuration	Start the Network Configurator, connect online with the Controller, and upload the network configuration.
↓	
10.4.2. Importing the File and Registering the Tags	Import the CSV file that you saved with the Sysmac Studio, and register tags of originator's send /receive areas as well as tag sets.
↓	
10.4.3. Setting the Connection	Associate the tags of the target device with the tags of the originator.
↓	
10.4.4. Transferring the Tag Data Link Parameters	Transfer the set tag data link parameters to the Controller.
↓	
7.5. Checking the EtherNet/IP Communications	Confirm that the EtherNet/IP tag data links are operated normally.
↓	
7.5.1 Checking the Connection Status	Check the connection status of EtherNet/IP.
↓	
7.5.2 Checking the Data that are Sent and Received	Confirm that the correct data are sent and received.

10.3. Setting Up the Controller Using the Software

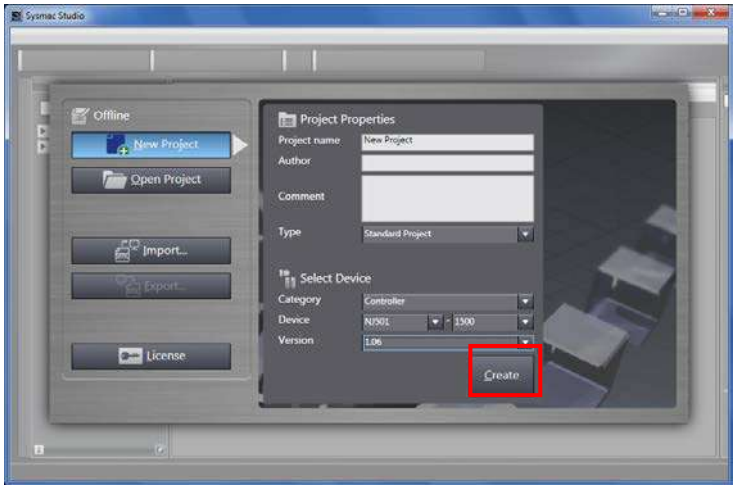
Set up the Controller using the software.

10.3.1. Starting the Sysmac Studio and Setting the Parameters for the Controller

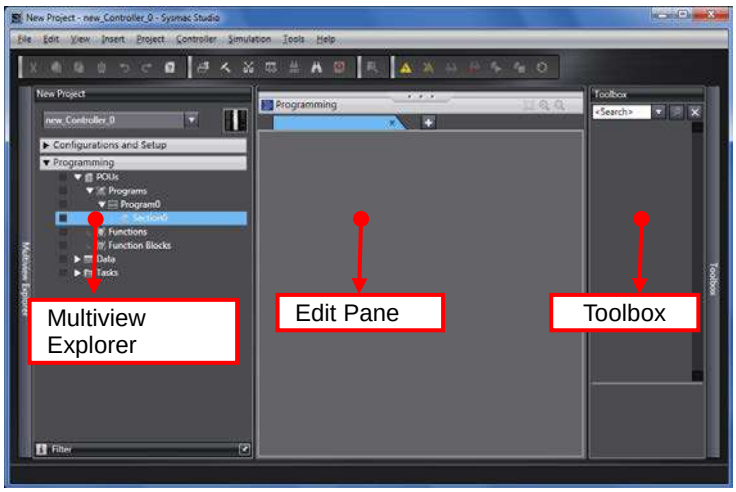
Start the Sysmac Studio and set the parameters for the Controller.
Install the Sysmac Studio and USB driver in the personal computer beforehand.

1	Connect the LAN cable and the USB cable to the Controller. * For details, refer to step 1 of *7.3.1. Starting the Sysmac Studio and Importing the Project File*.	
2	Turn ON the power supply to the Controller.	
3	Start the Sysmac Studio. Click the **New Project** Button. * If a confirmation dialog for an access right is displayed at start, select to start.	
4	The Project Properties Dialog Box is displayed. * In this document, New Project is used as the Project name. Confirm that the device you use is shown in the *Category* and *Device* Fields of Select Device. Select version ***1.06*** from the pull-down list of Version. * Although 1.06 is selected in this document for example, select the version you actually use.	 

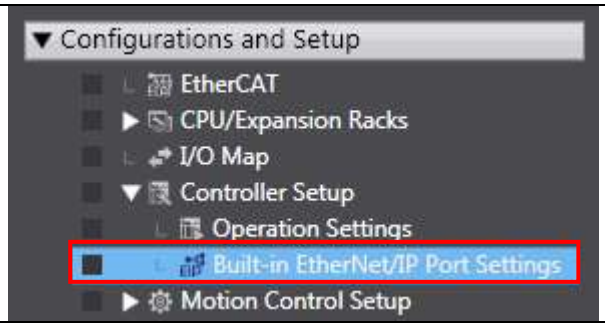
5 Click the **Create** Button.



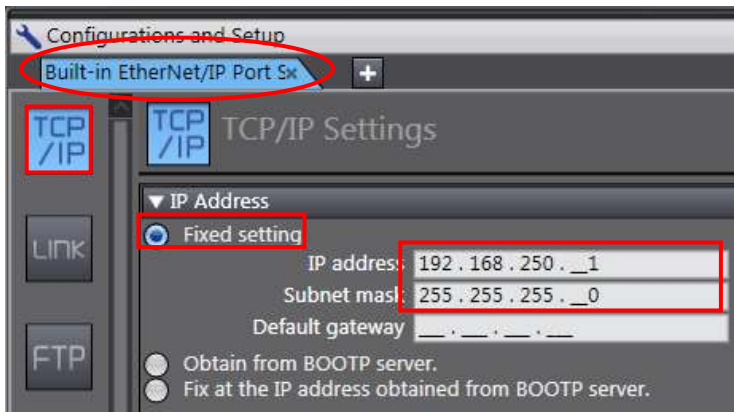
6 The New Project is displayed.
The left pane is called Multiview Explorer, the right pane is called Toolbox and the middle pane is called Edit Pane.



7 Double-click **Built-in EtherNet/IP Port Settings** under **Configurations and Setup** - **Controller Setup** in the Multiview Explorer.

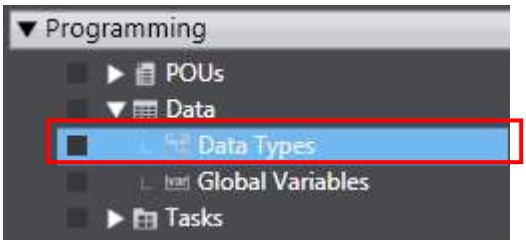
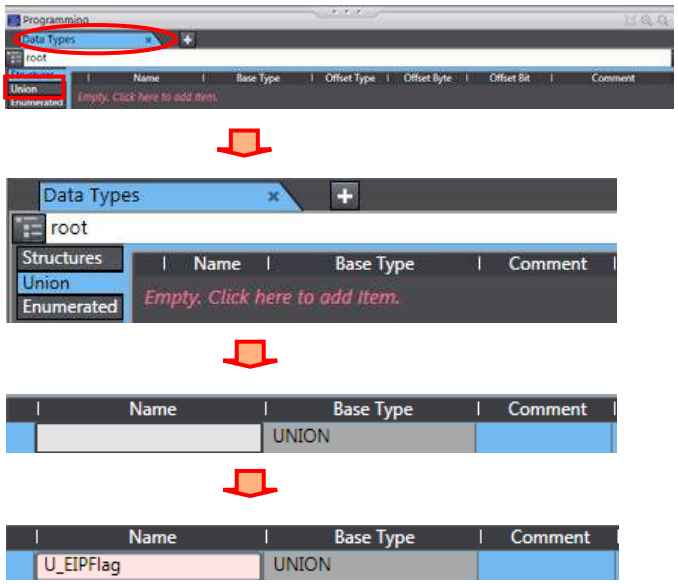
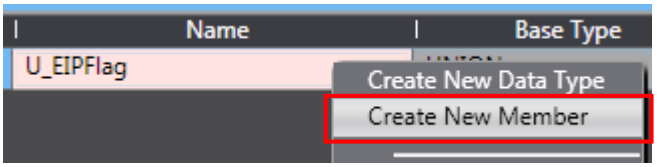
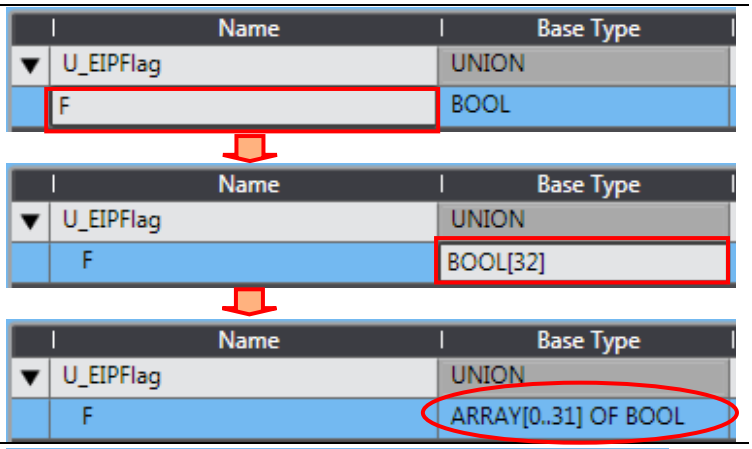
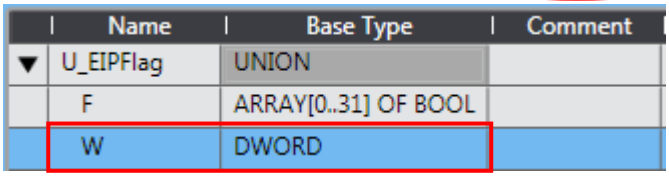


8 The Built-in EtherNet/IP Port Settings Tab Page is displayed in the Edit Pane.
Click the **TCP/IP** Button, select the *Fixed setting* Check Box in the *IP Address* Field, and make the following settings.
IP address: *192.168.250.1*
Subnet mask: *255.255.255.0*



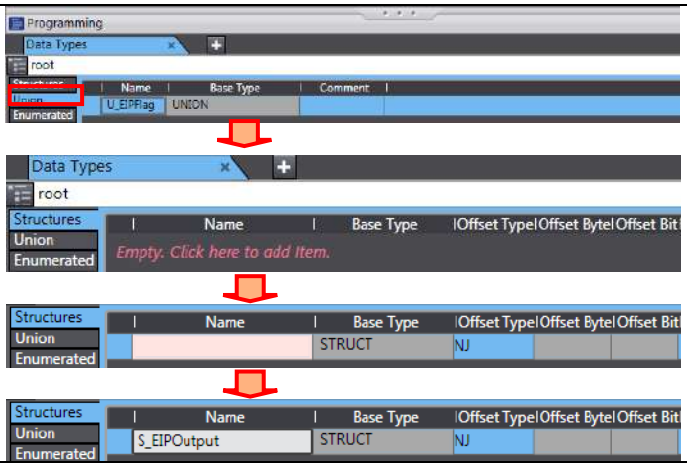
10.3.2. Setting the Global Variables

Set the global variables to use for the tag data links.

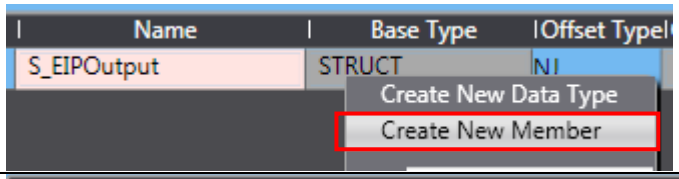
1	Double-click **Data Type** under **Programming** - **Data** in the Multiview Explorer.	
2	Click the **Structures** Tab and display the **Union** Tab on the Data Types Tab Page. Click a *Name* Column to enter a new data type. Enter *U_EIPFlag* in the *Name* Column.	
3	After entering, right-click and select ***Create New Member*** from the menu.	
4	Enter the following data in the new columns. Name: *F* Data type: *BOOL[32]* * After entering, the value changes to ARRAY[0..31] OF BOOL as shown on the right.	
5	In the same way as steps 3 and 4, enter the following data in the new columns. Name: *W* Base Type: *DWORD*	

6 Click the **Structures** Tab in the Edit Pane and display the Structures Tab on the Data Types Tab Page.
Click a *Name* Column to enter a new data type.

Enter *S_EIPOutput* in the *Name* Column.

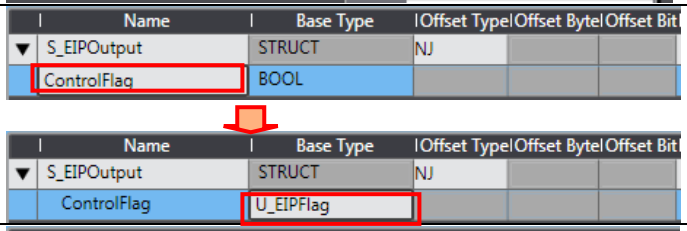


7 After entering, right-click and select ***Create New Member*** from the menu.



8 Enter *ControlFlag* in the *Name* Column.

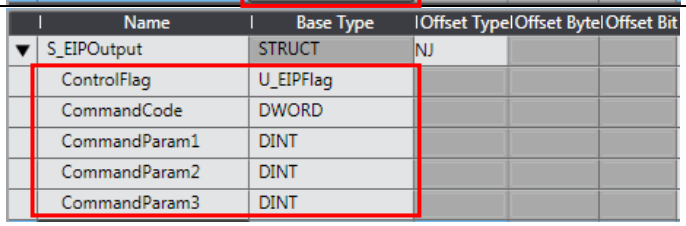
Enter *U_EIPFlag* in the *Base Type* Column.



9 In the same way as steps 7 and 8, enter the following data in the new member columns.

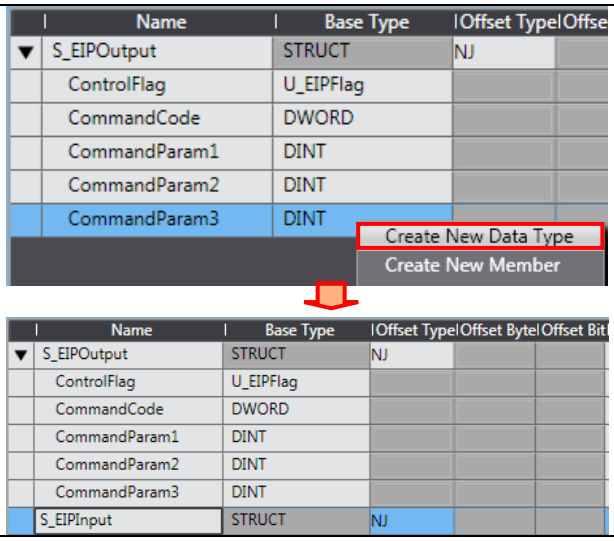
- Name: *CommandCode*
  Base Type: *DWORD*
- Name: *CommandParam1*
  Base Type: *DINT*
- Name: *CommandParam2*
  Base Type: *DINT*
- Name: *CommandParam3*
  Base Type: *DINT*

* Make sure that the members are displayed in order of the offsets as listed in *Section 9.2*.



10 After entering, right-click and select ***Create New Data Type*** from the menu.

Enter *S_EIPInput* in the *Name* Column.

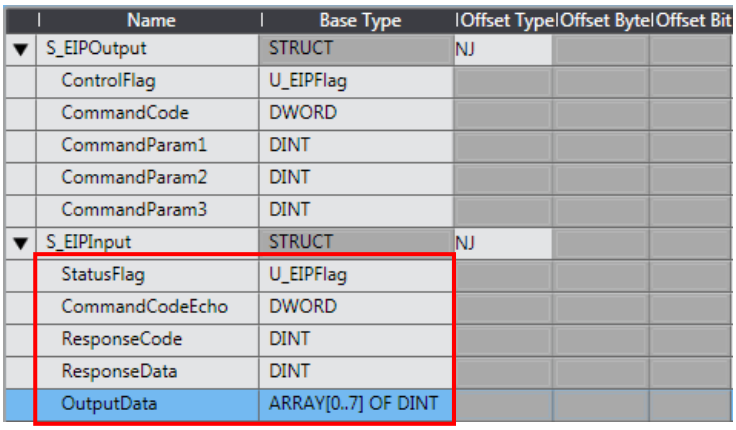


11 In the same way as steps 7 and 8, enter the following data in the new member columns.

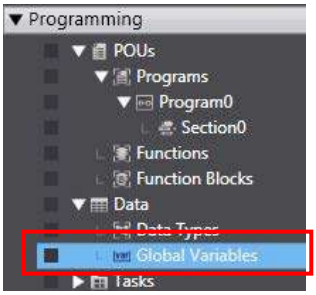
- Name: *StatusFlag*
  Base Type: *U_EIPFlag*
- Name: *CommandCodeEcho*
  Base Type: *DWORD*
- Name: *ResponseCode*
  Base Type: *DINT*
- Name: *ResponseData*
  Base Type: *DINT*
- Name: *OutputData*
  Base Type: *DINT[8]*

* After entering, the value changes to ARRAY[0..7] OF DINT as shown on the right.

* Make sure that members are displayed in order of the offsets listed in *Section 9.2*.



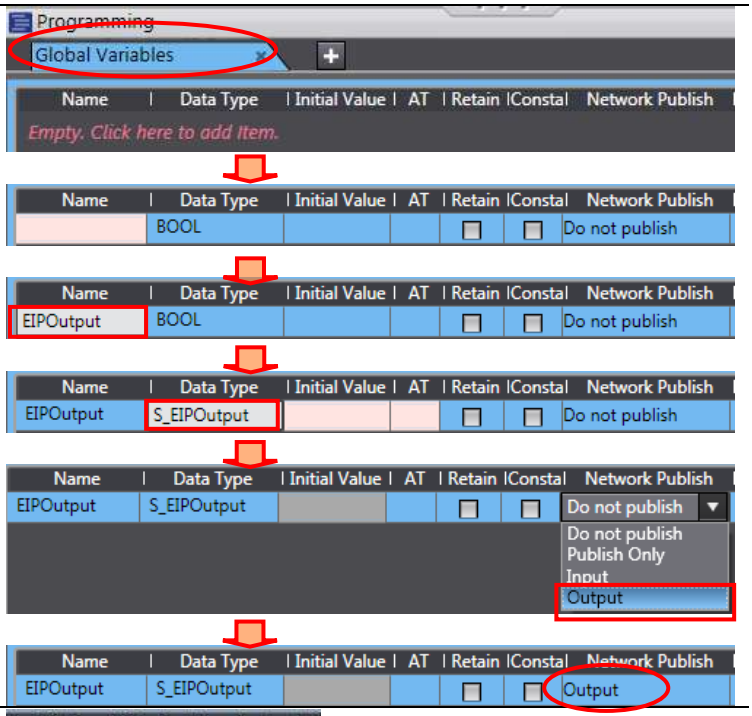
12 Double-click **Global Variables** under **Programming** - **Data** in the Multiview Explorer.



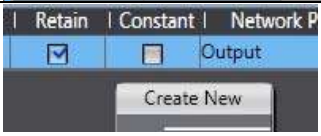
13 The Global Variables Tab Page is displayed in the Edit Pane. Click a column under the *Name* Column to enter a new variable. Enter *EIPOutput* in the *Name* Column.

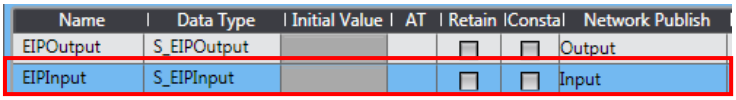
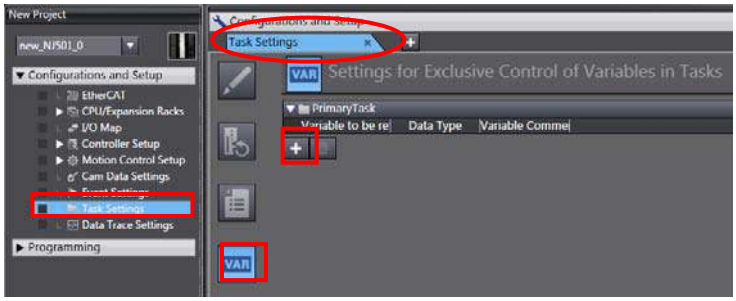
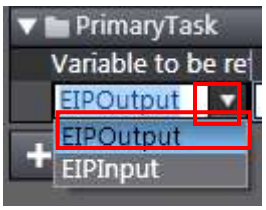
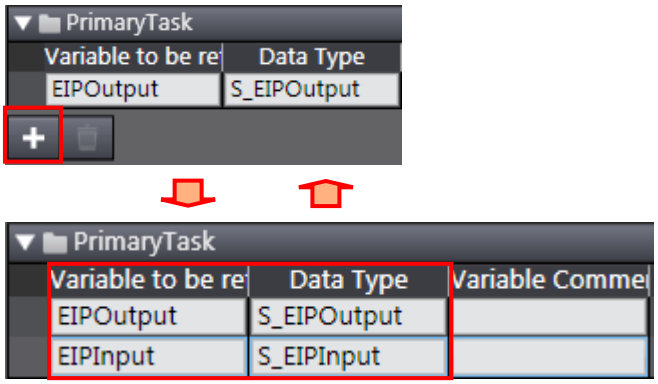
Enter *S_EIPOutput* in the *Data Type* Column.

Select ***Output*** from the Network Publish Menu.



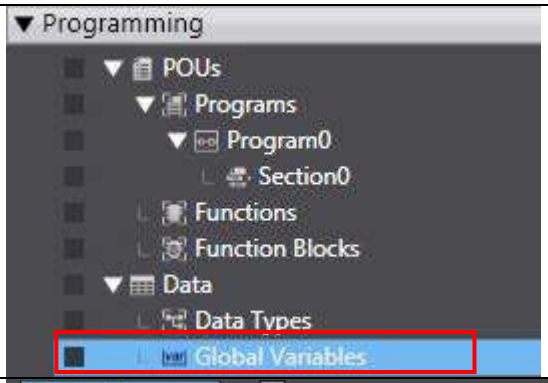
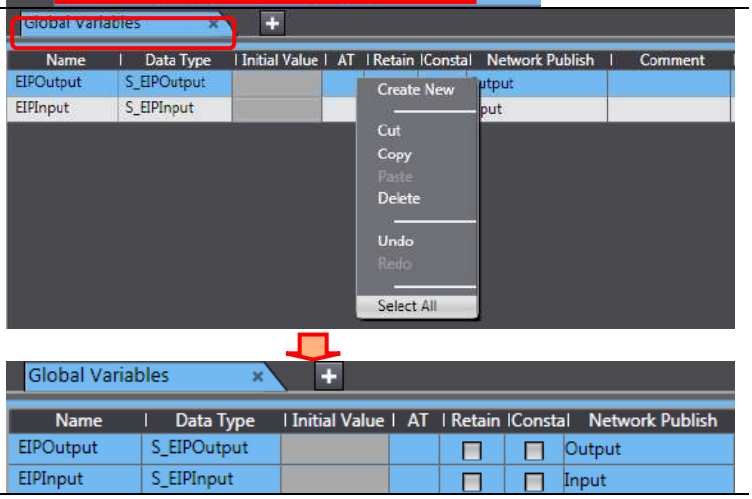
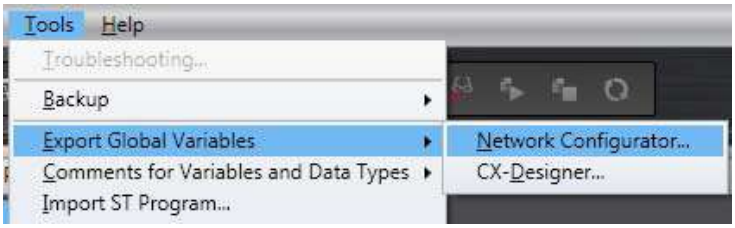
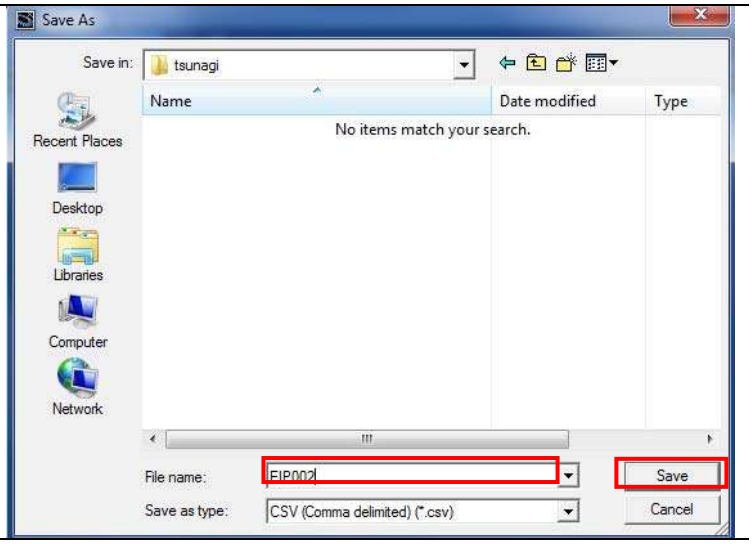
14 After entering, right-click and select ***Create New*** from the menu.



15	Enter the following data in the new columns in the same way as step 13. ・Name: *EIPInput* Data Type: *S_EIPInput* Network Publish: *Input*	
16	Double-click **Task Settings** under **Configurations and Setup** in the Multiview Explorer. The Task Settings Tab Page is displayed in the Edit Pane. Click the **VAR** Button. Click the **+** Button.	
17	Click the **Down Arrow** Button of the Variable to be refreshed. The variables set in steps 13 to 15 are displayed. Select ***EIPOutput***.	
18	Click the **+** Button and select a variable to be refreshed. * Since the data types are displayed automatically, you do not have to set them. Add all variables set in steps 13 and 15 as shown in the right figure.	

10.3.3. Exporting the Global Variables

Export the global variables that you registered with the Sysmac Studio in a CSV file to use as tags in the Network Configurator.

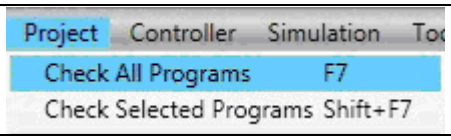
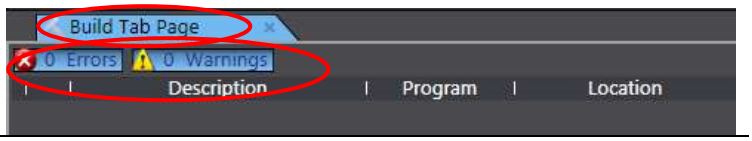
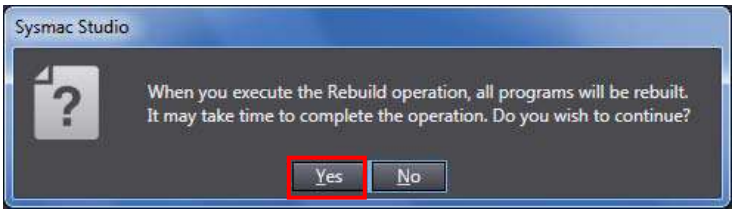
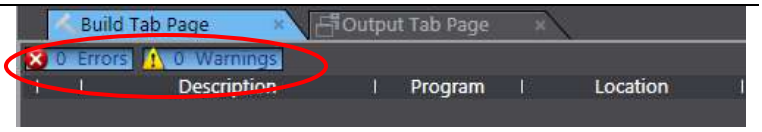
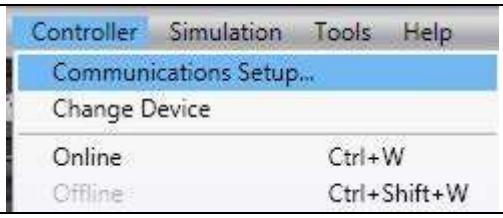
1	Double-click **Global Variables** under **Programming** - **Data** in the Multiview Explorer.	
2	The Global Variables Tab Page is displayed in the Edit Pane. Right-click on the pane and Select ***Select All***. All the selected variables are highlighted.	
3	Select ***Export Global Variables*** - ***Network Configurator*** from the Tools Menu.	
4	The Save As Dialog Box is displayed. Enter *EIP002* in the *File name* Field. Click the **Save** Button.	

10.3.4. Connecting Online and Transferring the Project Data

Connect online with the Sysmac Studio and transfer the project data to the Controller.

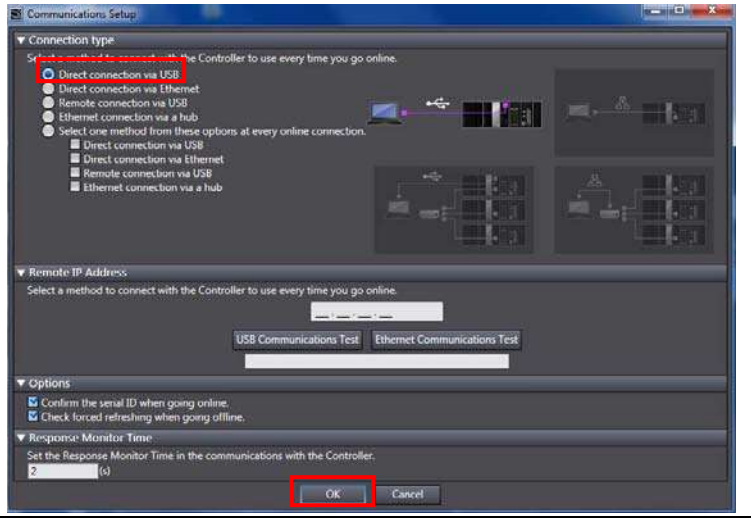
⚠ WARNING

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.

1	Select ***Check All Programs*** from the Project Menu.	
2	The Build Tab Page is displayed on the Edit Pane. Confirm that "0 Errors" and "0 Warnings" are displayed.	
3	Select ***Rebuild Controller*** from the Project Menu.	
4	A confirmation dialog box is displayed. Check the contents and click the **Yes** Button.	
5	Confirm that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.	
6	Select ***Communications Setup*** from the Controller Menu.	

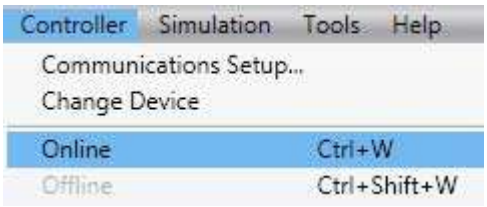
7 The Communications Setup Dialog Box is displayed. Select the *Direct connection via USB* Option for Connection Type.

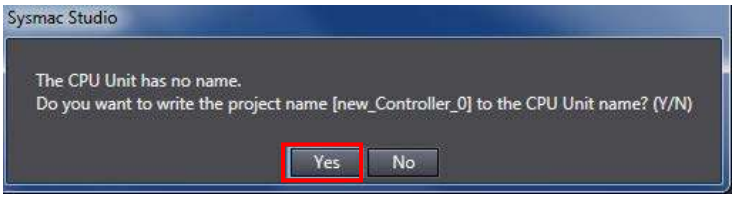
Click the **OK** Button.



8 Select ***Online*** from the Controller Menu.
A confirmation dialog box is displayed. Click the **Yes** Button.

* The displayed dialog depends on the status of the Controller used. Check the contents and click the **Yes** Button to proceed with the processing.



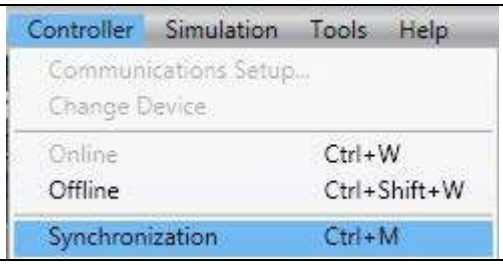


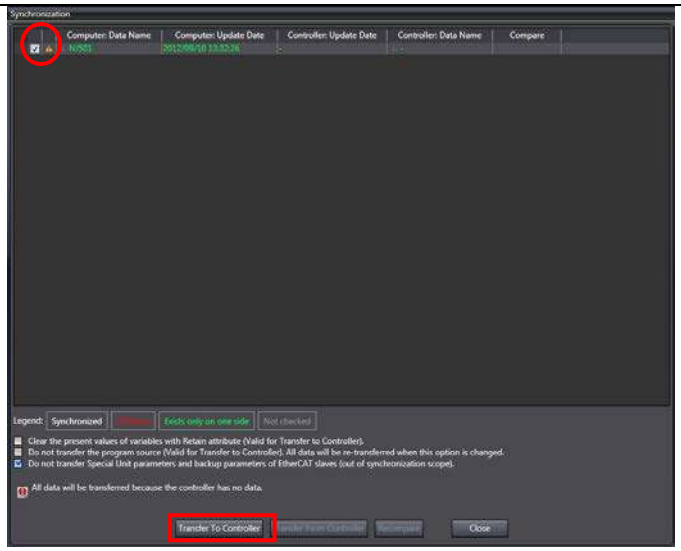
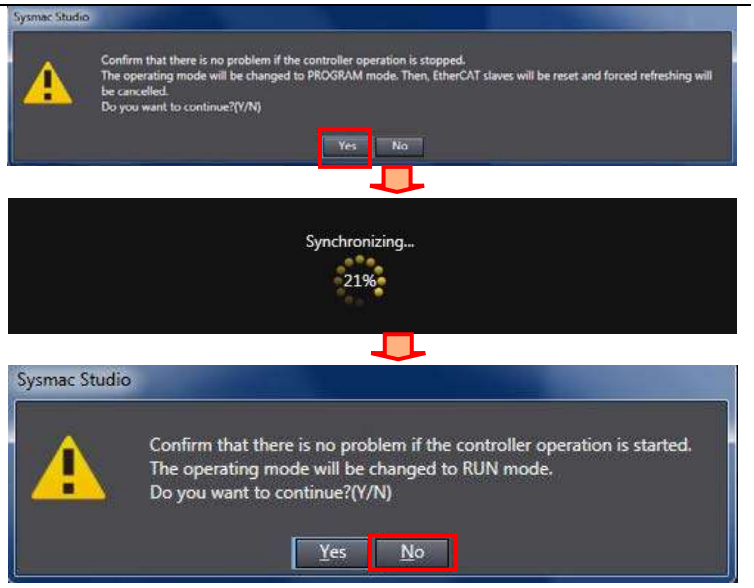
9 When an online connection is established, a yellow bar is displayed on the top of the Edit Pane.

Additional Information

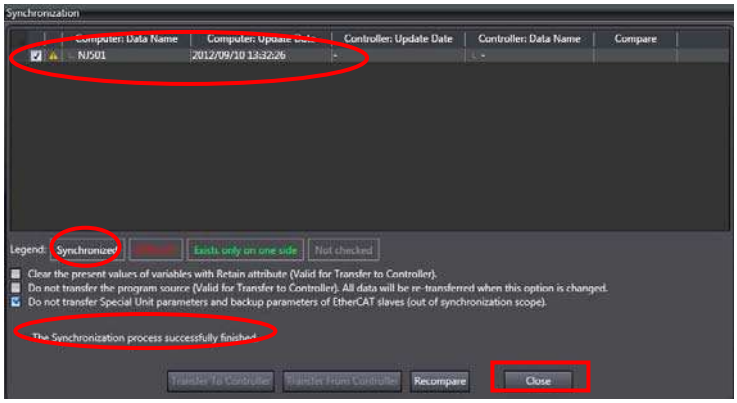
For details on online connections to a Controller, refer to *Section 5 Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

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



11	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 are compared.	
12	A confirmation dialog box is displayed. Confirm that there is no problem and click the **Yes** Button. A screen stating "Synchronizing" is displayed. A confirmation dialog box is displayed. Confirm that there is no problem and click the **No** Button. * Do not return it to RUN mode.	

13 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.

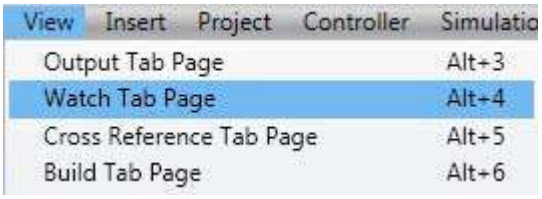
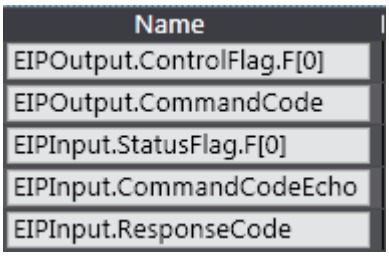


* A message stating "The synchronization process successfully finished" is displayed if the Sysmac Studio project data and the data in the Controller match.

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

10.3.5. Settings in the Watch Window Tab Page

Make settings in the Watch Window Tab Page to check the data that is sent and received.

1	Select ***Watch Tab Page*** from the View Menu.	
2	The Watch Window1 Tab Page is displayed in the lower section of the Edit Pane.	
3	Enter the following names in the Watch Window1 Tab Page for monitoring. Click a *Name* Column to enter a new name. *EIPOutput.ControlFlag.F[0]* (EXE flag) *EIPOutput.CommandCode* *EIPInput.StatusFlag.F[0]* (FLG flag) *EIPInput.CommandCodeEcho* *EIPInput.ResponseCode* * You will use the settings in *7.5.2. Checking the Data That are Sent and Received*.	

10.4. Setting Up the Network Using the Software

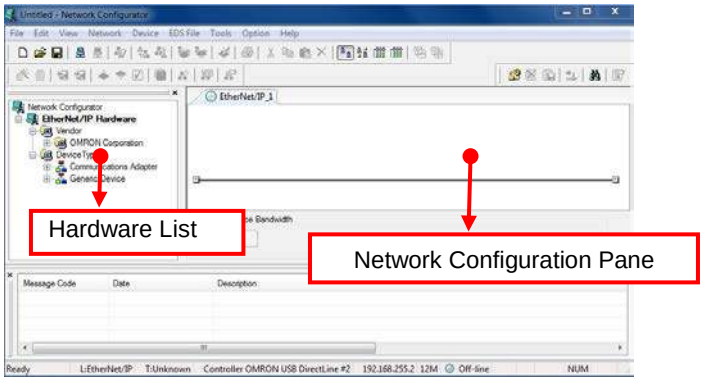
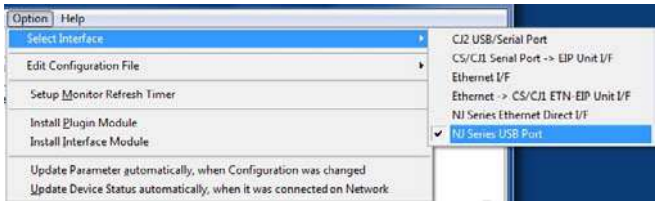
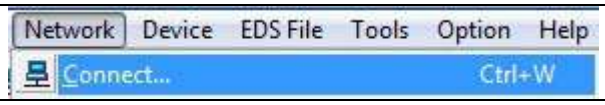
Set the tag data links for EtherNet/IP using the software.

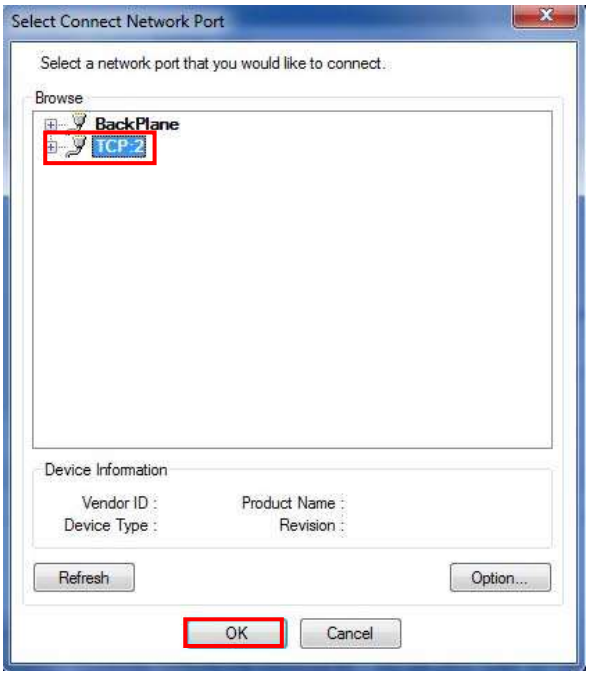
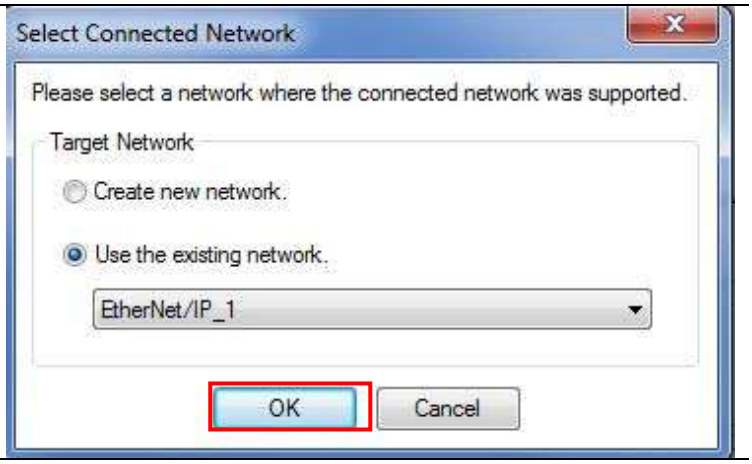
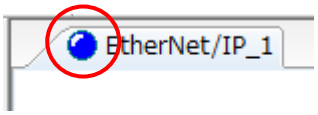
10.4.1. Starting the Network Configurator and Uploading the Configuration

Start the Network Configurator, connect online with the Controller, and upload the network configuration.

Precautions for Correct Use

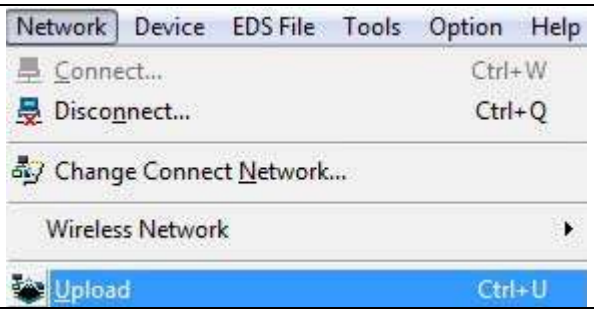
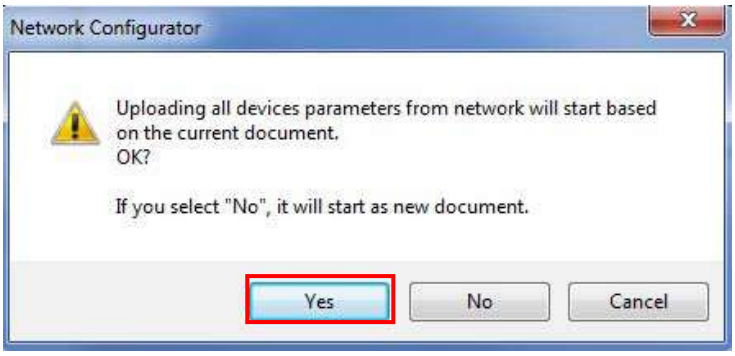
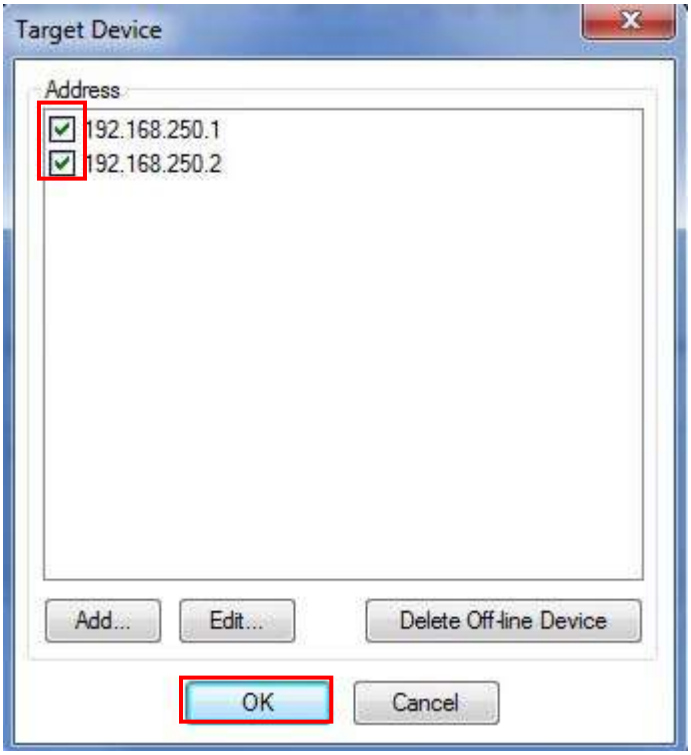
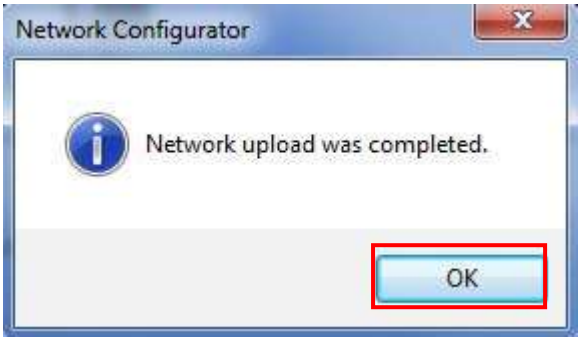
Please confirm that the LAN cable is connected before performing the following procedure. When it is not connected, turn OFF the power supply to each device and then connect the LAN cable.

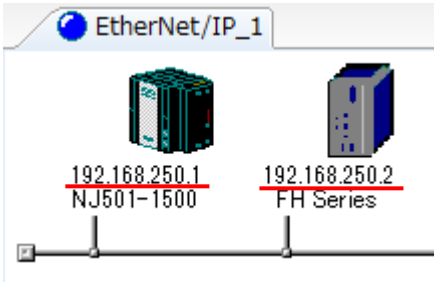
1	Start the Network Configurator.	
2	Select ***Select Interface*** - ***NJ Series USB Port*** from the Option Menu.	
3	Select ***Connect*** from the Network Menu.	

4	The Select Connect Network Port Dialog Box is displayed. Select *TCP: 2*. Click the **OK** Button.	
5	The Select Connected Network Dialog Box is displayed. Check the contents and click the **OK** Button.	
6	When an online connection is established normally, the color of the icon on the right figure changes to blue.	

Additional Information

If an online connection cannot be made to the Controller, check the cable connection. Or, return to step 5, check the settings and repeat each step.
For details, refer to *7. 2. 8 Connecting the Network Configurator* in *Section 7 Tag Data Link Functions of the NJ-series CPU Unit Built-in EtherNet/IP Port User's Manual* (Cat. No. W506).

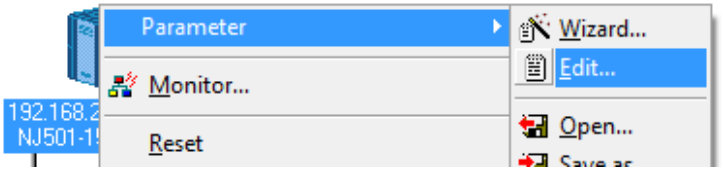
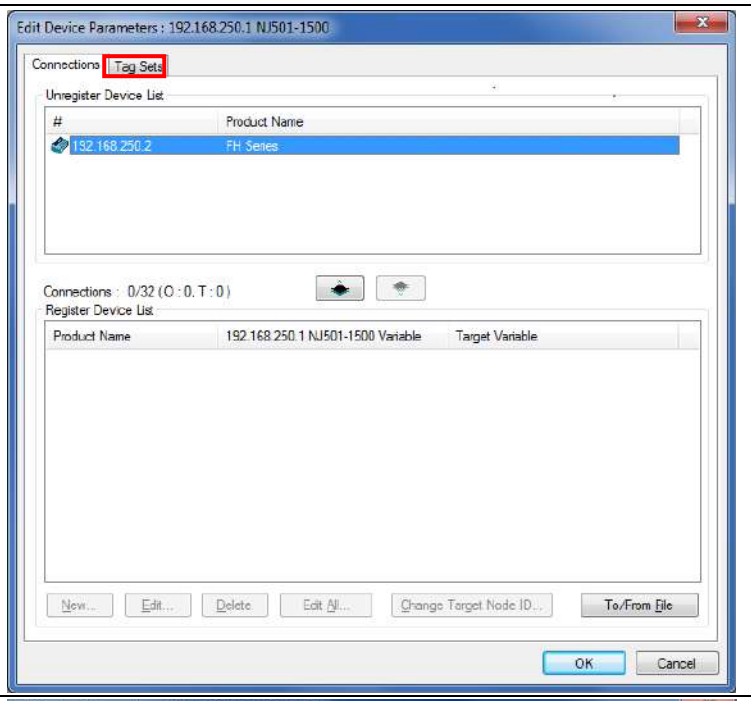
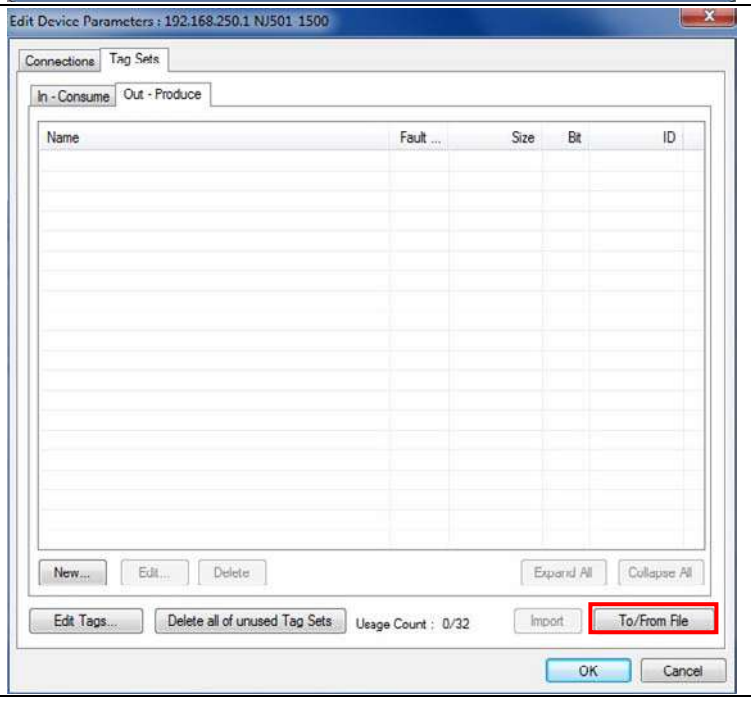
7	Select ***Upload*** from the Network Menu to upload the device information on the network.	
8	The dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.	
9	The Target Device Dialog Box is displayed. Select the*192.168.250.1* Check Box and the *192.168.250.2* Check Box, and click the **OK** Button. * If 192.168.250.1 and 192.168.250.2 are not displayed on the dialog box, click the **Add** Button to add the address. * The displayed addresses depend on the status of the Network Configurator.	
10	The device parameters are uploaded. When uploading is completed, the dialog box on the right is displayed. Check the contents and click the **OK** Button.	

11	After uploading is completed, confirm that the IP address of each node is updated on the Network Configuration Pane as follows: IP address of node 1: 192.168.250.1 IP address of node 2: 192.168.250.2	

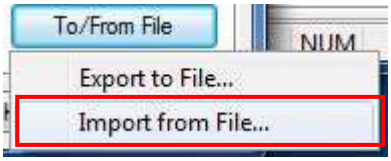
10.4.2. Importing the File and Registering the Tags

Import the CSV file that you saved with the Sysmac Studio, and register tags of originator's send /receive areas as well as tag sets.

This section explains the receive settings and send settings of the target node in order.

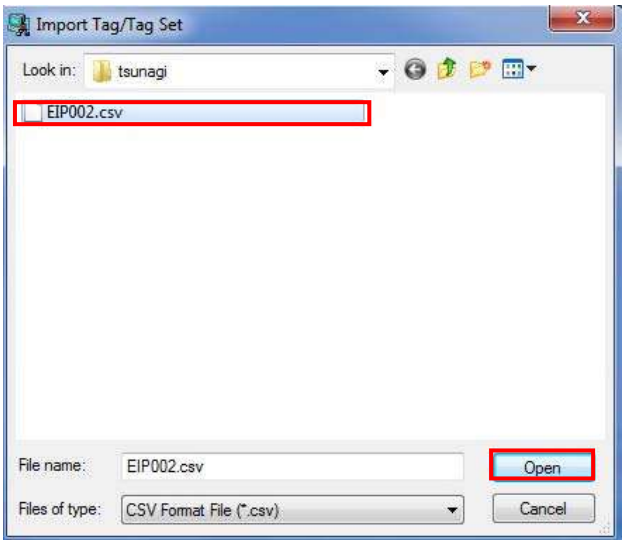
1	On the Network Configuration Pane of the Network Configurator, right-click the node 1 device and select ***Parameter*** - ***Edit***.	
2	The Edit Device Parameters Dialog Box is displayed. Select the **Tag Sets** Tab.	
3	The Tag Sets Tab Page is displayed. Select **To/From File** Button.	

4 Select ***Import from File***.



5 The Import Tag/Tag Set Dialog Box is displayed. Select *EIP002.csv* and click the **Open** Button.

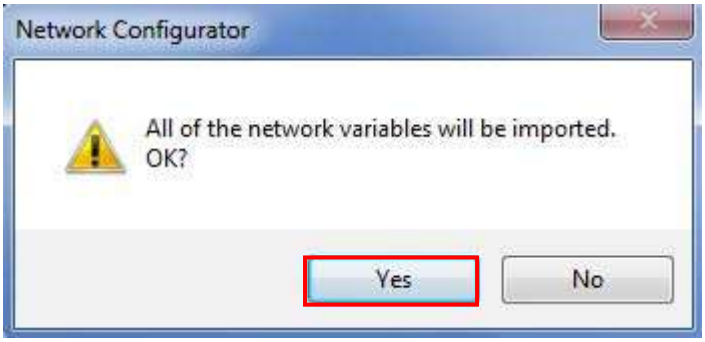
* In the *Look in* Field, specify the folder in which the file was saved in *Section 10.3.3 Exporting the Global Variables*.



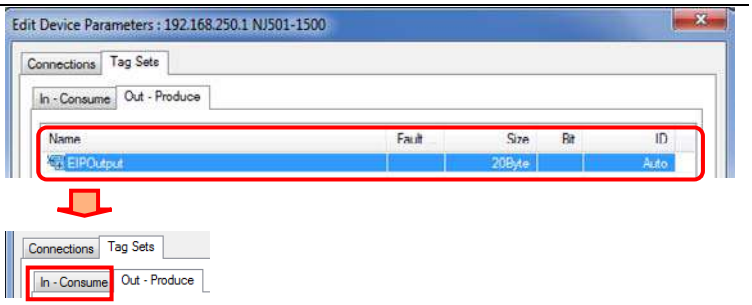
6 The right dialog boxes may not be displayed depending on the status of the Controller and software used. In such a case, proceed to the next step.

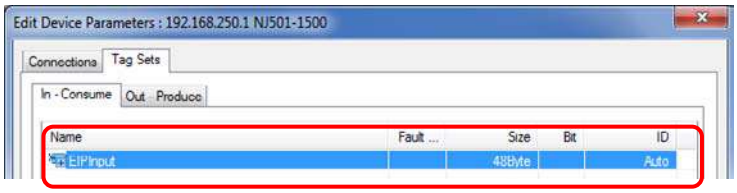
The right dialog box is displayed. Confirm that there is no problem and click the **Yes** Button

The dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button to create tag sets automatically.



7 The Out-Produce Tab Page is displayed on the Edit Device Parameters Dialog Box. *EIPOutput* and 20Byte are displayed.
After checking, select **In-Consume** Tab.

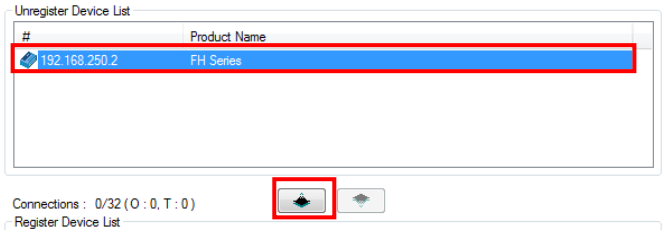


8	The In-Consume Tab Page is displayed. *EIPInput* and 48Byte are displayed.	

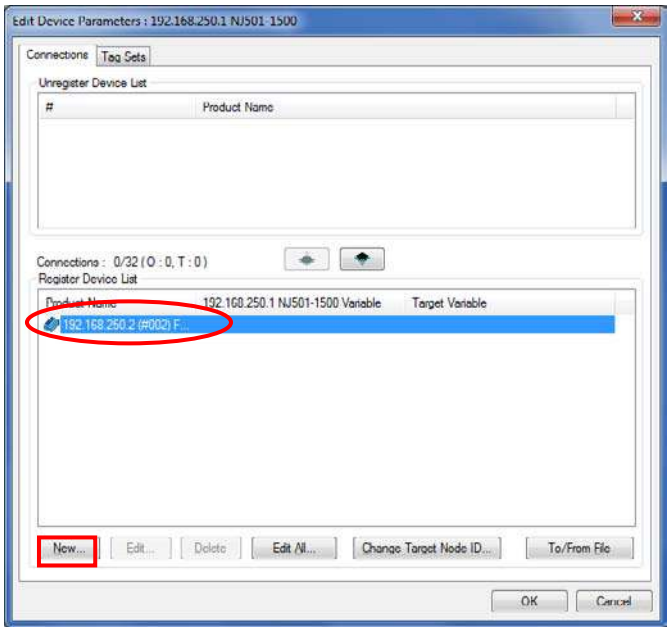
10.4.3. Setting the Connection

Associate the tags of the target device (that receives the open request) with the tags of the originator (that requests opening).

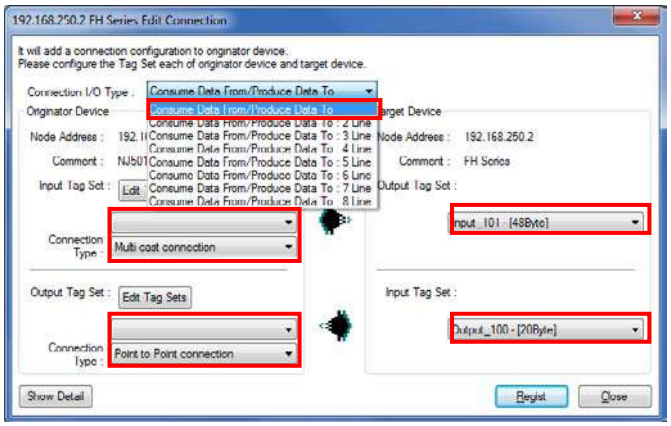
1 Select *192.168.250.2* in the *Unregister Device List* Field. Click the **Down Arrow** Button that is shown in the dialog box.



2 192.168.250.2 is registered in the *Register Device List* Field. Select *192.168.250.2* and click the **New** Button.

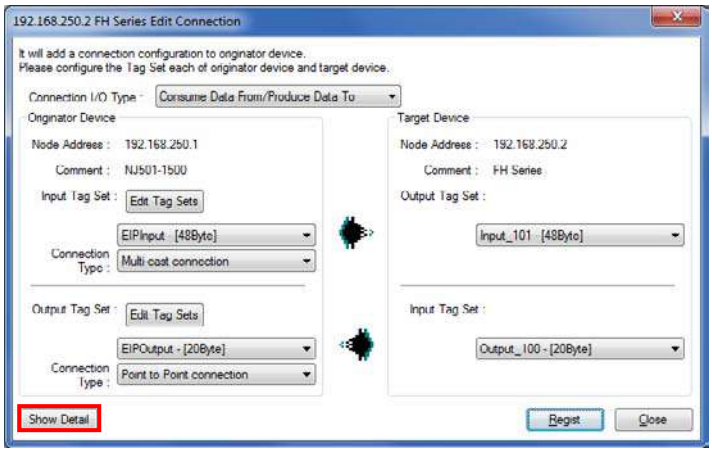
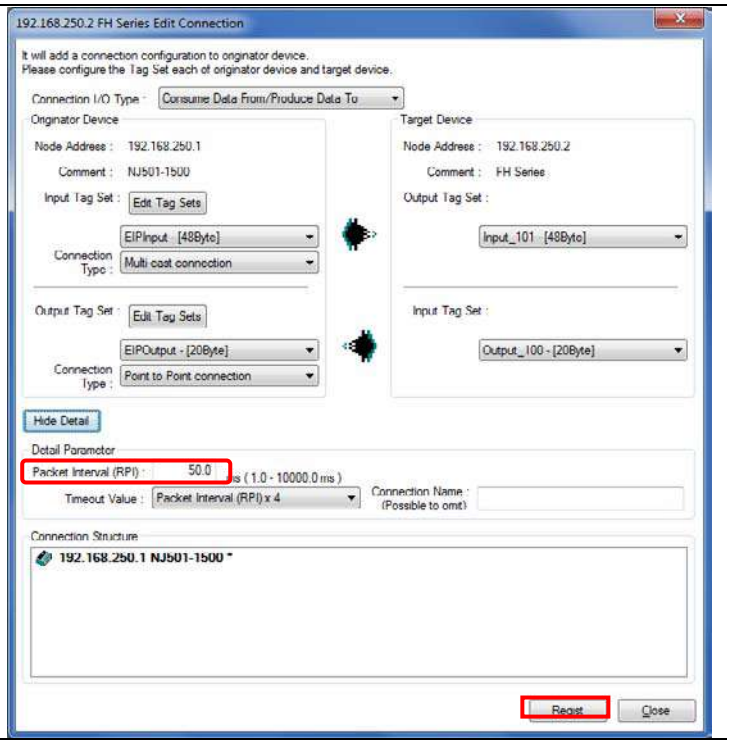


3 The Edit Connection Dialog Box is displayed. Select ***Consume Data From/Produce Data To*** from the Connection I/O Type pull-down list.
Set the values listed in the following table to the *Originator Device* Field and the *Target Device* Field.



■ Settings of connection

Connection allocation		Setting value
Connection I/O type		Consume Data From/Produce Data To
Originator device	Input Tag Set	EIPInput-[48 Byte]
	Connection Type	Multi-cast connection
	Output Tag Set	EIPOutput-[20 Byte]
	Connection Type	Point to Point connection
Target Device	Output Tag Set	Input_101-[48 Byte]
	Input Tag Set	Output_100-[20 Byte]

4	Confirm that the settings are correct and click the **Show Detail** Button.	
5	Confirm that the Packet Interval (RPI) is set to 4 ms or higher and click the **Regist** Button.	

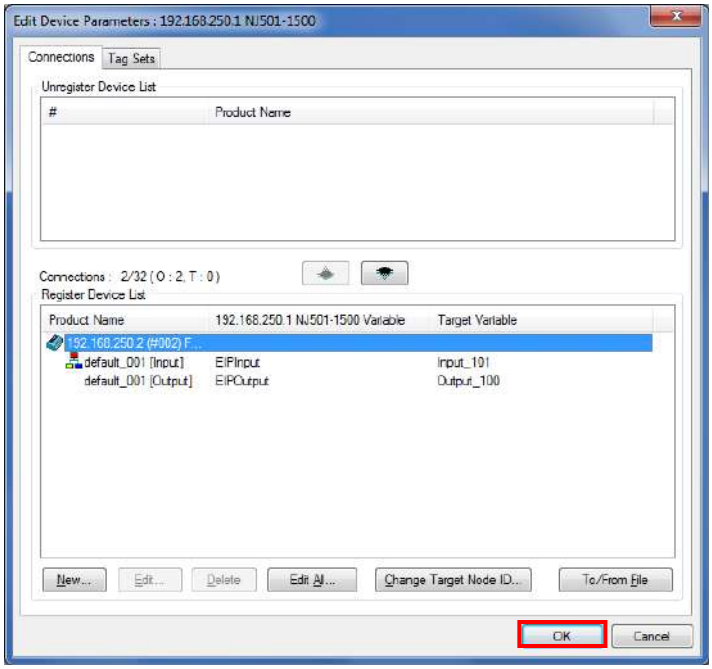
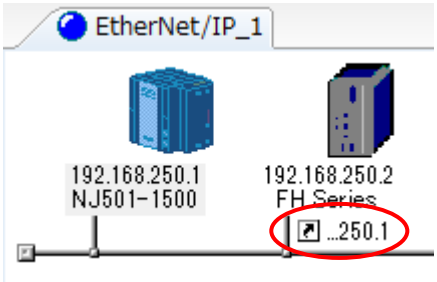
Precautions for Correct Use

If the RPI with EtherNet/IP is longer than the duration of the FH Sensor Controller signal change, the signal change may not be detected.
For details on communications cycle (RPI) with EtherNet/IP for the FH Sensor Controller, refer to *Communicating with EtherNet/IP* in *Section 2 Methods for Connecting and Communicating with External Devices* of the *Vision Sensor FH/FZ5 Series Vision System User's Manual (Communications Settings)* (Cat.No. Z342).

Precautions for Correct Use

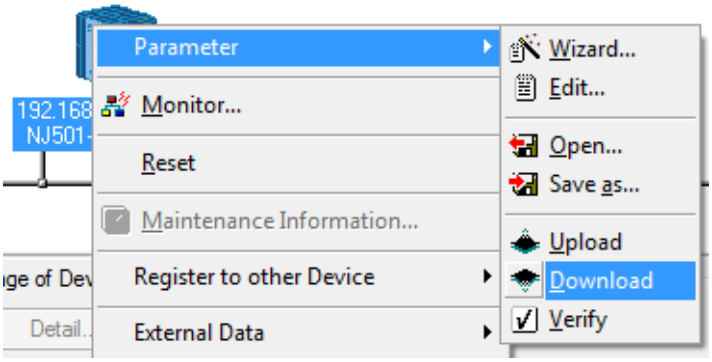
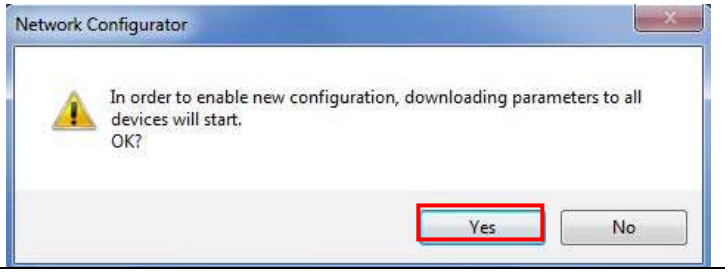
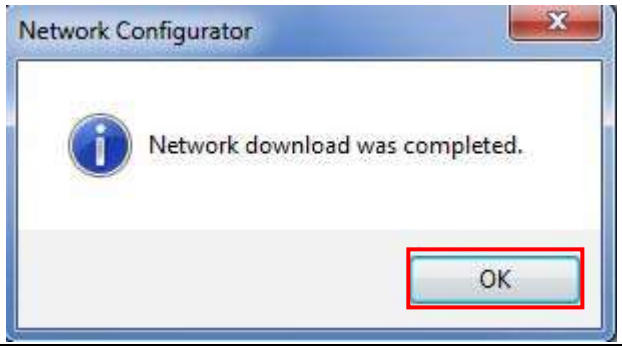
When the measurement interval is short or when the measurement processing load is high, the Sensor Controller will give priority to measurement processing over communications processing. Therefore, communications between the external device and the Sensor Controller may be temporarily interrupted or communications errors may occur.
If this happens, make the following settings:
Packet interval (RPI value) X Timeout value > Sensor Controller transaction time

For details on the timeout value for the FH Sensor Controller, refer to *Communicating with EtherNet/IP* in *Section 2 Methods for Connecting and Communicating with External Devices* of the *Vision Sensor FH/FZ5 Series Vision System User's Manual* (Communications Settings) (Cat. No. Z342).

6	The Edit Connection Dialog Box is displayed again. Click the **Close** Button.	
7	The Edit Device Parameters Dialog Box is displayed again. Click the **OK** Button.	
8	When the connection is completely allocated, the registration destination node address is displayed under the device icon of the Destination Device on the Network Configuration Pane.	

10.4.4. Transferring the Tag Data Link Parameters

Transfer the set tag data link parameters to the Controller.

1	Right-click the device icon of node 1 on the Network Configuration Pane and select ***Parameter*** - ***Download***.	
	The dialog box on the right is displayed. Confirm that there is no problem and click the **Yes** Button.	
2	Tag data link parameters are downloaded from the Network Configurator to the Controller.	
3	The dialog box on the right is displayed. Check the contents and click the **OK** Button.	

11. Revision History

Revision code	Date of revision	Revision reason and revision page
01	Nov. 29, 2013	First edition

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