



Machine Automation Controller NJ-series

EtherNet/IP™ Connection Guide

OMRON Corporation

Vision Sensor
(FZ4 Series)

Network
Connection
Guide

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1. Related Manuals

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

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

Manufacturer	Cat. No.	Model	Manual name
OMRON	W500	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Hardware User's Manual
OMRON	W501	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Software User's Manual
OMRON	W506	NJ501-□□□□ NJ301-□□□□	NJ Series CPU Unit Built-in EtherNet/IP™ Port User's Manual
OMRON	W504	SYSMAC-SE2□□□□	Sysmac Studio Version 1 Operation Manual
OMRON	0969584-7	W4S1-05□ W4S1-03B	Switching Hub W4S1-series Users Manual
OMRON	2192132-1	FZ4-6□□/H6□□ FZ4-7□□/H7□□ FZ4-11□□/H11□□	Vision Sensor FZ Series INSTRUCTION MANUAL (SETUP)
OMRON	2192564-5	FZ4-6□□-10/H6□□-10 FZ4-7□□-10/H7□□-10 FZ4-11□□-10/H11□□-10	Vision Sensor FZ Series INSTRUCTION MANUAL (SETUP)
OMRON	2191093-1	FZ4-L35□/L35□-10	Vision Sensor INSTRUCTION SHEET
OMRON	Z318	FZ4-6□□/6□□-10 FZ4-H6□□/H6□□-10 FZ4-7□□/7□□-10 FZ4-H7□□/H7□□-10 FZ4-11□□/11□□-10 FZ4-H11□□/H11□□-10 FZ4-L35□/L35□-10	Vision Sensor FZ4 Series User's Manual
OMRON	Z319	FZ4-6□□/6□□-10 FZ4-H6□□/H6□□-10 FZ4-7□□/7□□-10 FZ4-H7□□/H7□□-10 FZ4-11□□/11□□-10 FZ4-H11□□/H11□□-10 FZ4-L35□/L35□-10	Vision Sensor FZ4 Series Processing Items List Manual
OMRON	1636843-6	FZ-M08	LCD monitor INSTRUCTION SHEET

2. Terms and Definitions

Term	Explanation and Definition
Node	Controllers and devices are connected to the EtherNet/IP network via the EtherNet/IP ports. 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, EtherNet/IP recognizes this device as two nodes. 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 EtherNet/IP, the tag and tag set can be exchanged cyclically between nodes without using the user program. This standard feature on 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. Specifying the tag set name (tag name) and specifying the instance number of Assembly Object are given as methods to specify the connection. In Sysmac Studio, the connection is set by specifying the instance number.
Connection Type	There are two kinds of connection types for the tag data link connection, one is a multi-cast connection and the other is a unicast (point-to-point) connection. The multi-cast connection sends an output tag set in one packet to multiple nodes. The unicast connection separately sends one output tag set to each node. Therefore, multi-cast connections can decrease the communications load if one output tag set is sent to multiple nodes.

Term	Explanation and Definition
Originator and Target	To perform tag data links, one node requests the opening of a communications line called a "connection". The node that requests to open the connection is called an "originator", and the node that receives the request is called a "target". Each data for communications is called an "originator variable" and a "target variable". In Sysmac Studio, the instance number is specified in the target variable.
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.
EDS file	A file that describes the number of I/O points for the EtherNet/IP device and the parameters that can be set via EtherNet/IP.

3. Precautions

- (1) Understand the specifications of devices which are used in the system. Allow some margin for ratings and performance. Provide safety measures, such as installing safety circuit, in order to ensure safety and minimize risks of abnormal occurrence.
- (2) To ensure system safety, make sure to always read and heed the information provided in all Safety Precautions and Precautions for Safe Use of manuals for each device which is used in the system.
- (3) The user is encouraged to confirm the standards and regulations that the system must conform to.
- (4) It is prohibited to copy, to reproduce, and to distribute a part or the whole of this document without the permission of OMRON Corporation.
- (5) The information contained in this document is current as of April 2015. It is subject to change without notice for improvement.

The following notation is used in this document.



Caution

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



Precautions for Correct Use

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



Additional Information

Additional information to read as required.

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

Symbol



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

4. Overview

This document describes the procedure for connecting Vision Sensor (FZ4 series) of OMRON to NJ-series Machine Automation Controller (hereinafter referred to as Controller) via EtherNet/IP and provides the procedure for checking their connection.

Refer to *Section 6. EtherNet/IP Settings* and *Section 7. EtherNet/IP Connection Procedure* to understand the setting method and key points to perform the tag data links for EtherNet/IP.



Additional Information

Settings which are described in 7.3. *Setting up Controller* are set in advance into the Sysmac Studio compact project file (hereinafter referred to as project file). Refer to *Section 9. Appendix Procedure Using the Project File* for usage method of the project file. Obtain the latest project file from OMRON.

Name	File name	Version
Sysmac Studio compact project file (Extension: csm2)	OMRON_FZ4_EIP_EV200.csm2	Ver.2.00

5. Applicable Devices and Device Configuration

5.1. Applicable Devices

The applicable devices are as follows:

Manufacturer	Name	expression
OMRON	NJ-series CPU Unit	NJ501-□□□□ NJ301-□□□□
OMRON	Vision Sensor	
	FZ4 series	FZ4-6□□/6□□-10 FZ4-H6□□/H6□□-10 FZ4-7□□/7□□-10 FZ4-H7□□/H7□□-10 FZ4-11□□/11□□-10 FZ4-H11□□/H11□□-10
	FZ4-Lite series	FZ4-L35□/L35□-10
OMRON	5 Megapixel Digital Camera 2 Megapixel Digital Camera 0.3 Megapixel Digital Camera 0.3 Megapixel High-Speed Camera 0.3 Megapixel Small Digital Camera 0.3 Megapixel Small Digital Pen-Shaped Camera Intelligent Compact Camera	FZ-SC5M2/S5M2 FZ-SC/S2M FZ-SC/S FZ-SHC/SH FZ-SFC/SF FZ-SPC/SP FZ-SQ010F/SQ050F FZ-SQ100F/SQ100N



Precautions for Correct Use

As applicable devices above, the devices with the models and versions listed in 5.2. *Device Configuration* 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 5.2.

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

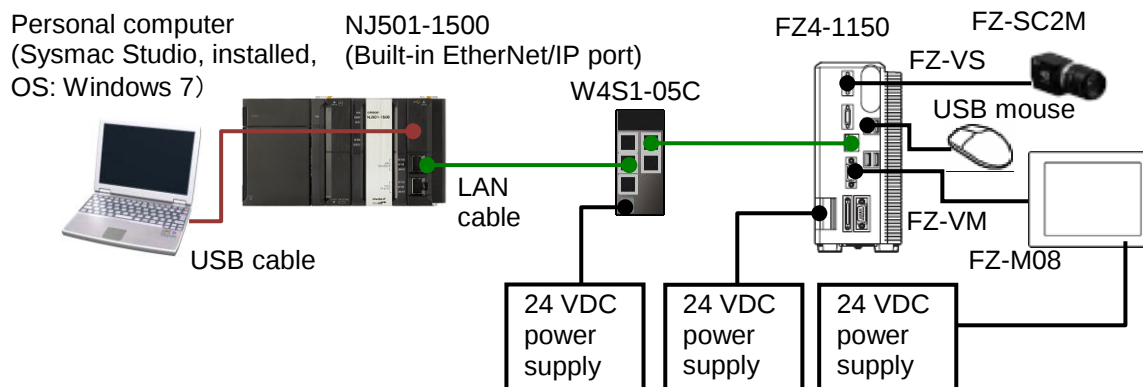


Additional Information

This document describes the procedure to establish the network connection. It does not provide information on operation, installation or wiring method which is not related to the connection procedure. It also does not describe the functionality or operation of the devices. Refer to the manuals or contact your OMRON representative.

5.2. Device Configuration

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



Manufacturer	Name	expression	Version
OMRON	NJ-series CPU Unit (Built-in EtherNet/IP port)	NJ501-1500	Ver.1.09
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Switching hub	W4S1-05C	Ver.1.00
-	24 VDC power supply (For Switching hub)	-	
OMRON	Sysmac Studio	SYSMAC-SE2□□□	Ver.1.10
-	Personal computer (OS: Windows 7)	-	
-	USB cable (USB 2.0 type B connector)	-	
-	LAN cable (STP (shielded, twisted-pair) cable of Ethernet category 5 or higher)	-	
OMRON	Vision Sensor	FZ4-1150	Ver.4.24
OMRON	Camera	FZ-SC2M	
OMRON	Camera cable	FZ-VS□	
OMRON	Monitor (analog RGB monitor)	FZ-M08	
OMRON	Monitor cable	FZ-VM	
-	USB mouse	-	
-	24 VDC power supply (For Vision Sensor)	-	
-	24 VDC power supply (For Monitor)	-	



Precautions for Correct Use

Update Sysmac Studio to the version specified in this clause or higher version.

If you use a version lower than the one specified in this clause, procedures described in Section 7. and subsequent sections may not be applicable. In that case, use the equivalent procedures described in this document by referring to the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).



Additional Information

For specifications of 24 VDC power supply available for Switching hub, refer to Switching hub *W4S1-series Users Manual* (Cat. No. 0969584-7).



Additional Information

For specifications of 24 VDC power supply available for Vision Sensor, refer to Vision Sensor *FZ Series INSTRUCTION MANUAL (SETUP)* (Cat. No. 2192132-1 / 2192564-5) and Vision Sensor *INSTRUCTION SHEET* (Cat. No. 2191093-1).



Additional Information

For specifications of 24 VDC power supply available for Monitor, refer to the *LCD monitor INSTRUCTION SHEET* (Cat. No. 1636843-6).



Additional Information

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

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

6. EtherNet/IP Settings

This section describes the specifications of parameters, global variables, tag sets, and a tag data link table that are all defined in this document.

Hereinafter, Vision Sensor is referred to as "Destination Device" in some descriptions.

6.1. Parameters

The parameter settings that are set in this document are as follows:

6.1.1. EtherNet/IP Communications Settings

The parameters required for connecting Controller and Destination Device via EtherNet/IP are given below.

Item	Controller	Vision Sensor
IP address	192.168.250.1	192.168.250.2
Subnet mask	255.255.255.0	255.255.255.0
Fieldbus	-	EtherNet/IP

6.1.2. Vision Sensor Settings

The parameters for Vision Sensor are given below.

Item	Set value
Fieldbus	EtherNet/IP
Output control	Handshaking
Timeout [s]	10.0



Precautions for Correct Use

When the output control of Vision Sensor is set to None, the originator device may not correctly detect a change in the status of a signal from Vision Sensor if RPI is longer than the output time (ON/OFF) on Vision Sensor.

In order to prevent a phenomenon that a change in the status of each signal cannot be detected by the target device, it is recommended that you set the output control setting for Vision Sensor to Handshaking.

6.2. Data Types for Tag Data Links

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

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

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 (Structures)

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	UDINT	Command parameter (CMD-PARAM)
CommandParam2	DINT	
CommandParam3	UDINT	

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

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	UDINT	Response data (RES-DATA)
OutputData	DINT[8]	Output data 0 to 7 (DATA 0 to 7)



Additional Information

For details on structures and unions, refer to *Accessing Communications Areas Using Variables with NJ-series Controllers in Control/Output through EtherNet/IP* in 7. Methods for Connecting and Communicating with External Devices of Vision Sensor FZ4 Series User's Manual (Cat. No. Z318).

6.3. Global Variables

The Controller treats the data in tag data links as global variables. The settings of the global variables are the following.

Name	Data type	Network publish	Destination Device allocation	Data size (byte)
EIPOutput	S_EIPOutput	Output	Command code	20
EIPInput	S_EIPInput	Input	Response Code	48

■EIPOutput Configuration

Destination Device data	Variable name	Data type
Control signal (32 bits)		U_EIPFlag
	EIPOutput.ControlFlag.F* ¹	BOOL[32]
	EIPOutput.ControlFlag.W	DWORD
Command code (CMD-CODE)	EIPOutput.CommandCode	DWORD
Command parameter (CMD-PARAM)	EIPOutput.CommandParam1	UDINT
	EIPOutput.CommandParam2	DINT
	EIPOutput.CommandParam3	UDINT

*1: Details on allocation of control signal

Allocation of EIPOutput.ControlFlag.F variable

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
							XEXE								EXE

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
															DSA

EXE: Command Execution Bit: Turns ON to execute a command.

XEXE: Measurement Execution Bit: Turns ON to request execution of a command.

DSA: Data Output Request Bit: Turns ON to request the next data output.

■ EIPInput Configuration

Destination Device data	Variable name	Data type
Control output (32 bits)		U_EIPFlag
	EIPInput.StatusFlag.F* ¹	BOOL[32]
	EIPInput.StatusFlag.W	DWORD
Command code (CMD-CODE)	EIPInput.CommandCodeEcho	DWORD
Response Code (RES-CODE)	EIPInput.ResponseCode	DINT
Response data (RES-DATA)	EIPInput.ResponseData	UDINT
Output data 0 (DATA0)	EIPInput.OutputData	DINT[8]
Output data 1 (DATA1)		
Output data 2 (DATA2)		
Output data 3 (DATA3)		
Output data 4 (DATA4)		
Output data 5 (DATA5)		
Output data 6 (DATA6)		
Output data 7 (DATA7)		

*1: Details on allocation of control signal

Allocation of EIPInput.StatusFlag.F variable

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
					XWAIT	XBUSY	XFLG				RUN	OR		BUSY	FLG

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
															GATE

FLG: Command Completion Bit: Turns ON when command execution is completed.

BUSY: Command Execution in Progress Bit: Turns ON when command execution is in progress.

OR: Overall Judgement: Turns ON when the overall judgement is NG.

RUN: RUN Window: Turns ON when FZ4 Vision Sensor is set to the RUN window.

XFLG: Measuring Command Completion Bit: Turns ON when measuring command execution is complete.

XBUSY: Measuring Command Executing Bit: Turns ON while a measuring command is being executed.

XWAIT: Measuring Command Standby Bit: Turns ON when a measuring command can be executed.

GATE: Data Output Completion Bit: Turns ON when data output is completed.



Precautions for Correct Use

If the data size of tag data links for Destination Device is an odd-numbered byte, use BYTE type to define, do not use BOOL type.

**Additional Information**

With 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)BOOL[16] / (2) ARRAY[0..15] OF BOOL

In this document, the data type is simplified by displaying BOOL[16].

(The example above means a BOOL data type with sixteen array elements.)

6.4. Tag Sets

This clause provides the detailed settings of the tag sets to execute the processing for the tag data links.

Data in the tag sets are allocated in the following OUT No. and IN No.

■ Output area (from Controller to Vision Sensor)

Originator variable (tag set name)		Data size (byte)
EIP002_OUT		20
OUT No.	Global variable name (tag name)	Data size (byte)
1	EIPOutput	20

■ Input area (from Vision Sensor to Controller)

Originator variable (tag set name)		Data size (byte)
EIP002_IN		48
IN No.	Global variable name (tag name)	Data size (byte)
1	EIPInput	48

6.5. Tag Data Link Table

This clause describes the detailed settings of the tag data link table (connection settings).

On Vision Sensor, set the connection type to **Point to Point** for both input and output.

Set the timeout value so that it is longer than Vision Sensor's measurement processing time.

When the measurement interval is short, the measurement processing load is high, or command processing for operations such as scene group changing is time-consuming, Vision Sensor prioritizes measurement and control processing over communication processing.

Therefore, communications between the external device and Vision Sensor may be temporarily interrupted or communications errors may occur. In this case, set the communication error timeout time longer than Vision Sensor processing time.

The values in a red frame are taken from the values in EDS file of Destination Device.

Connection Name	Connection I/O Type	RPI (ms)	Timeout Value
default_001	Data, In/Out	50.0	RPI x 4

Connection I/O Type	Input / Output	Target variable (Set value of Destination Device: instance number)	Size (byte)	Originator Variable (tag set name)	Size (byte)	Connection Type
Data, In/Out	Input	101	48	EIP002_IN	48	Point to Point connection
	Output	100	20	EIP002_OUT	20	Point to Point connection

7. EtherNet/IP Connection Procedure

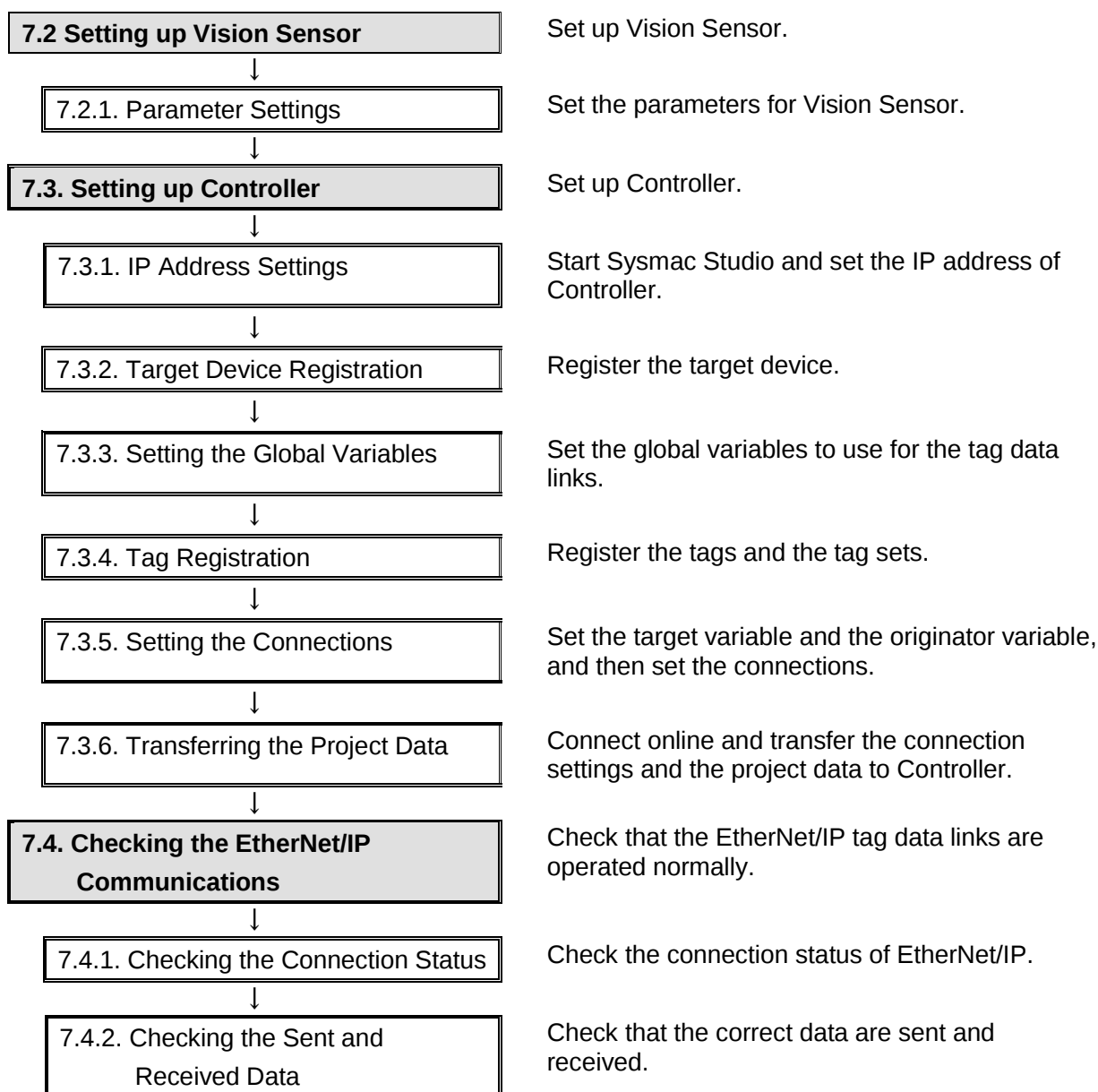
This section describes the procedure for connecting Vision Sensor and Controller on the EtherNet/IP network.

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

Initialization Method.

7.1. Work Flow

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



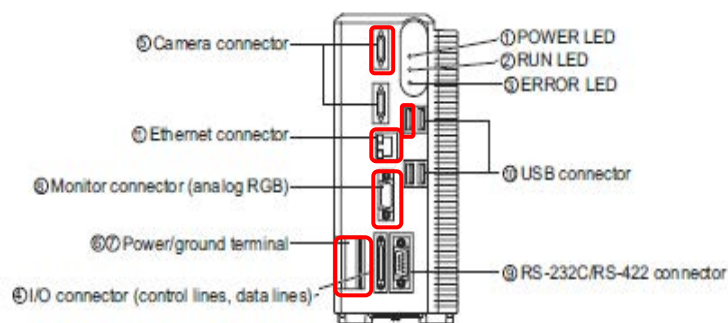
7.2. Setting up Vision Sensor

Set up Vision Sensor.

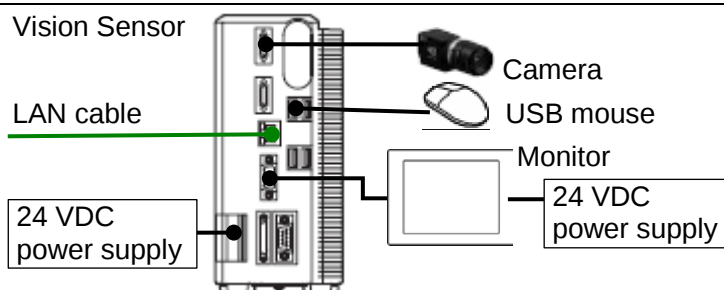
7.2.1. Parameter Settings

Set the parameters for Vision Sensor.

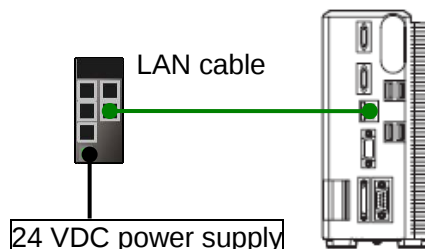
- 1 Check the positions of the connectors on Vision Sensor by referring to the right figure.



- 2 As shown in 5.2. *Device Configuration*, connect Camera, Monitor, USB mouse, 24 VDC power supply (For Vision Sensor), and LAN cable to Vision Sensor. Connect 24 VDC power supply (For Monitor) to Monitor.



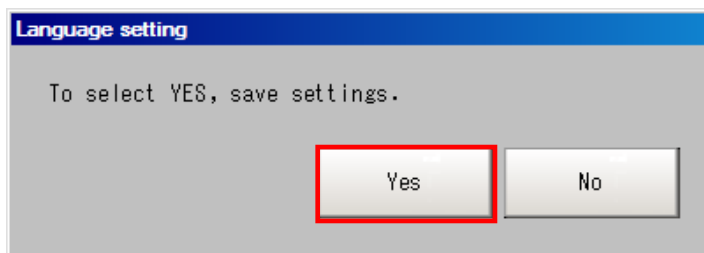
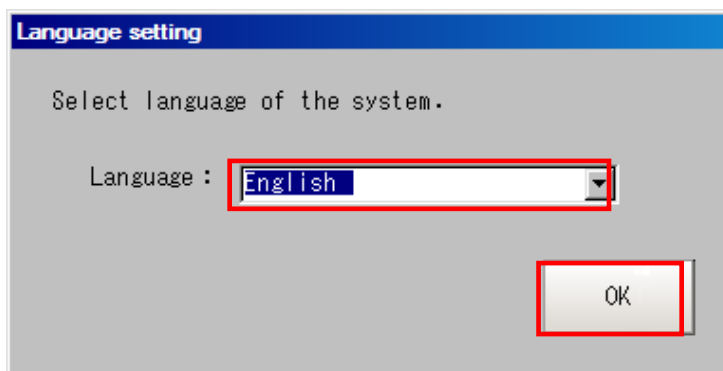
- 3 Connect Vision Sensor to Switching hub with LAN cable. Connect 24 VDC power supply (For Switching hub) to Switching hub.



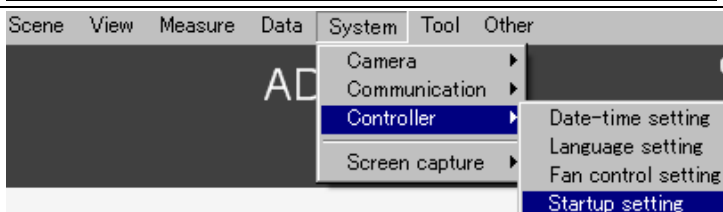
- 4 Turn ON the power supply to Vision Sensor and Monitor.

- 5** The Language setting Dialog Box is displayed on Monitor connected to Vision Sensor only at the initial start.
Select **English** and click **OK**.

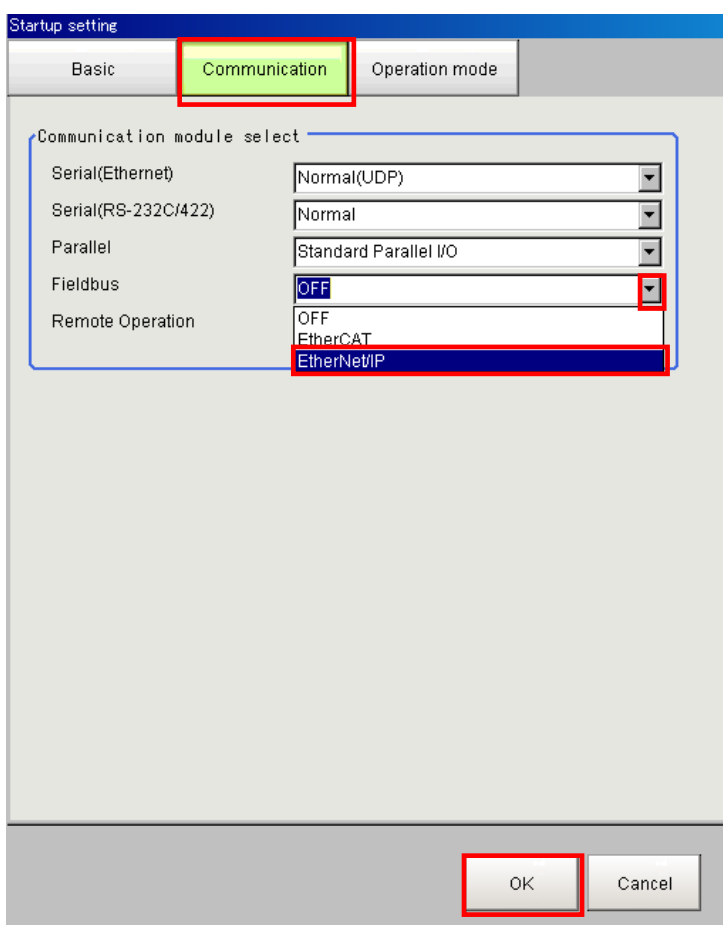
Check that your desired Language is selected and click **Yes**.

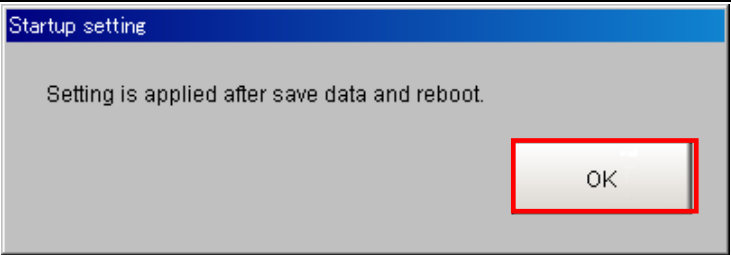
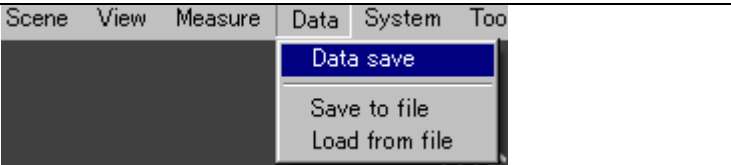
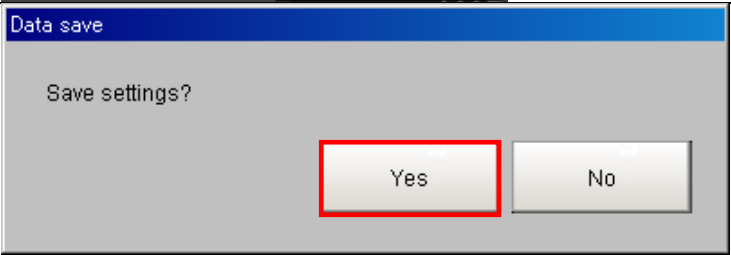
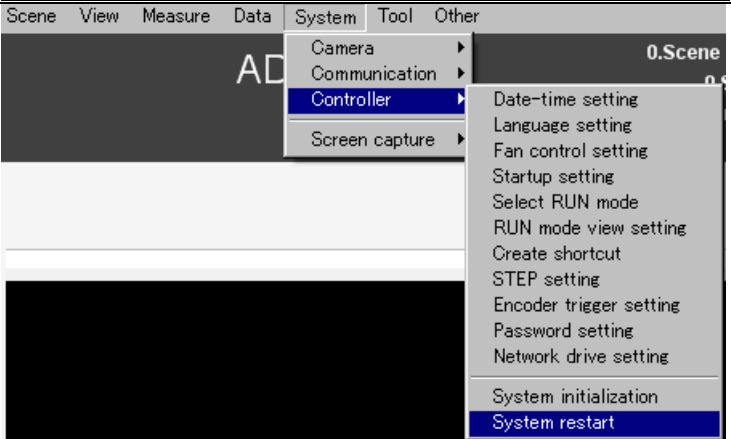
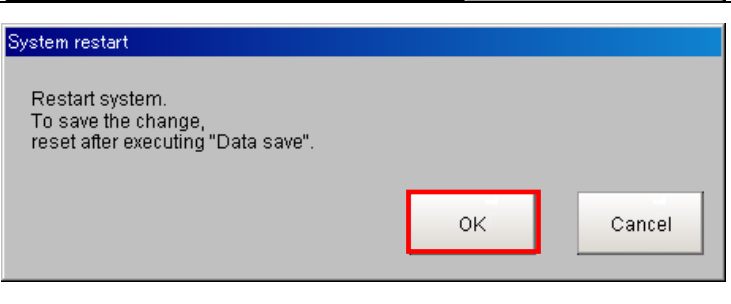


- 6** Select **Controller - Startup setting** from the System Menu on the displayed screen of Monitor for Vision Sensor.



- 7** The Startup setting Dialog Box is displayed. Select the **Communication** Tab. Select **EtherNet/IP** from the Fieldbus pull-down list. Then, click **OK**.



8	The Startup setting Dialog Box is displayed. Check the contents and click OK. *After the data set in the Startup settings Dialog Box are saved and then Vision Sensor is restarted as shown on the right, the settings become enabled.	 The 'Startup setting' dialog box is shown with a blue title bar. The main area contains the text 'Setting is applied after save data and reboot.' and an 'OK' button, which is highlighted with a red rectangle.
9	Select Data save from the Data Menu.	 The 'Data' menu is open, showing options: 'Data save' (highlighted), 'Save to file', and 'Load from file'.
10	The Data save Dialog Box is displayed. Check the contents and click Yes.	 The 'Data save' dialog box is shown with a blue title bar. The main area contains the text 'Save settings?' and two buttons: 'Yes' (highlighted with a red rectangle) and 'No'.
11	Select Controller - System restart from the System Menu.	 The 'System' menu is open, showing options: 'Camera', 'Communication', 'Controller' (highlighted), and 'Screen capture'. The 'Controller' submenu is also open, showing options: 'Date-time setting', 'Language setting', 'Fan control setting', 'Startup setting', 'Select RUN mode', 'RUN mode view setting', 'Create shortcut', 'STEP setting', 'Encoder trigger setting', 'Password setting', 'Network drive setting', 'System initialization', and 'System restart' (highlighted).
12	The System restart Dialog Box is displayed. Check the contents and click OK.	 The 'System restart' dialog box is shown with a blue title bar. The main area contains the text 'Restart system. To save the change, reset after executing "Data save".' and two buttons: 'OK' (highlighted with a red rectangle) and 'Cancel'.
13	After restarting, select Communication – Ethernet:Normal(UDP) from the System Menu.	 The 'System' menu is open, showing options: 'Camera', 'Communication' (highlighted), 'Controller', and 'Screen capture'. The 'Communication' submenu is also open, showing options: 'Standard Parallel I/O', 'RS-232C/422:Normal', 'Ethernet:Normal(UDP)' (highlighted), and 'EtherNet/IP'.

- 14** The Ethernet Dialog Box is displayed. Select *Use the following IP address* in the *Address setting* Field and enter the following values.

- IP address: 192.168.250.2
- Subnet mask: 255.255.255.0

After setting, click **OK**.

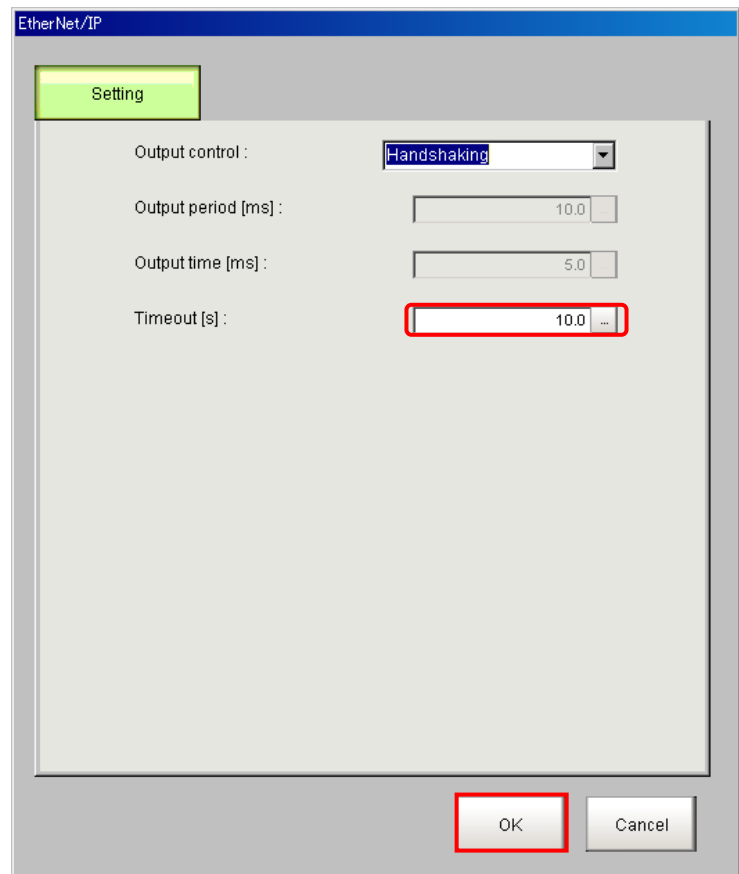
*To change a value, click the Button which is in the right of each octet of IP address. The numeric keyboard is displayed. Enter values using the mouse. After entering the values, click **OK** on the numeric keyboard.

*How to change values

- 15** Select **Communication - EtherNet/IP** from the System Menu.

- 16** The EtherNet/IP Dialog Box is displayed. Select **Handshaking** from the Output control pull-down list.

- 17** Check that the Timeout [s] is 10.0.
Click **OK**.



- 18** In the same way as steps 9 and 10, select **Data save** from the Data Menu.

- 19** In the same way as steps 11 and 12, select **Controller - System restart** from the System Menu.

7.3. Setting up Controller

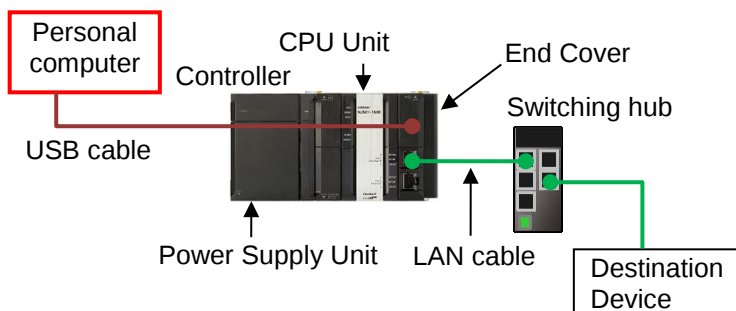
Set up Controller.

7.3.1. IP Address Settings

Start Sysmac Studio and set the IP address of Controller.

Install Sysmac Studio and USB driver in Personal computer beforehand.

- 1** Connect LAN cable to the Built-in EtherNet/IP port (PORT1) of Controller, and connect USB cable to the peripheral (USB) port. As shown in 5.2. *Device Configuration*, connect Personal computer and Switching hub to Controller.

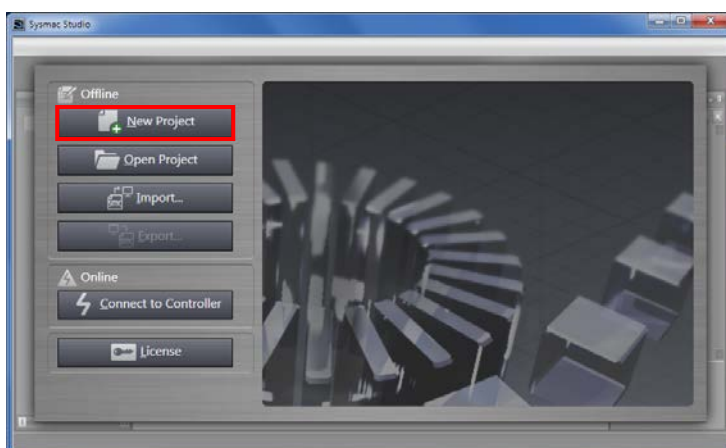


- 2** Start Sysmac Studio.

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



- 3** Sysmac Studio starts. Click **New Project**.



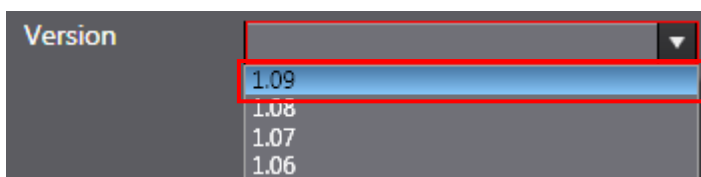
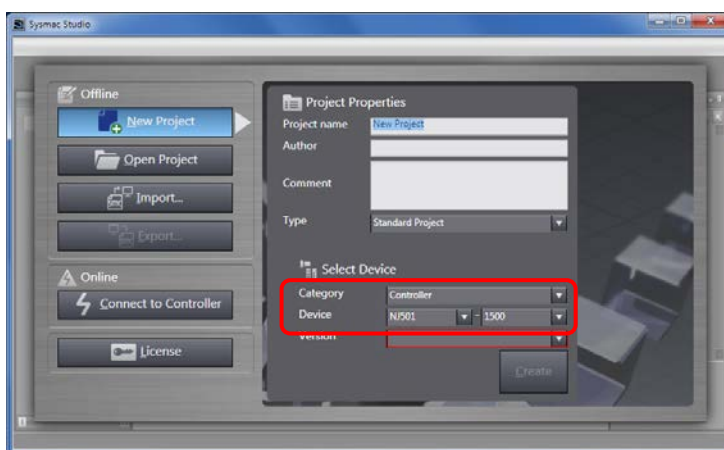
4 Project Properties Dialog Box is displayed.

*In this document, New Project is used as the Project name.

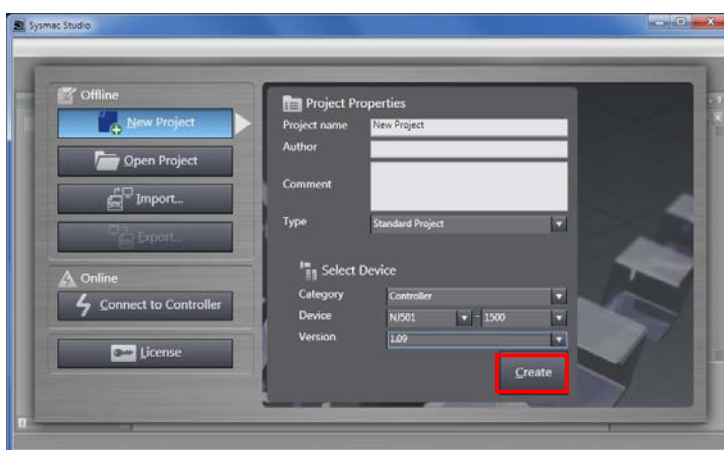
Check that the device used is shown in the *Category* and the *Device* Fields of Select Device.

Select an applicable version from the pull-down list of Version.

*Although 1.09 is selected in this document for example, select the version you actually use.



5 Click **Create**.



6 The New Project is displayed.

The following panes are displayed in this window.

Left: Multiview Explorer

Top right: Toolbox

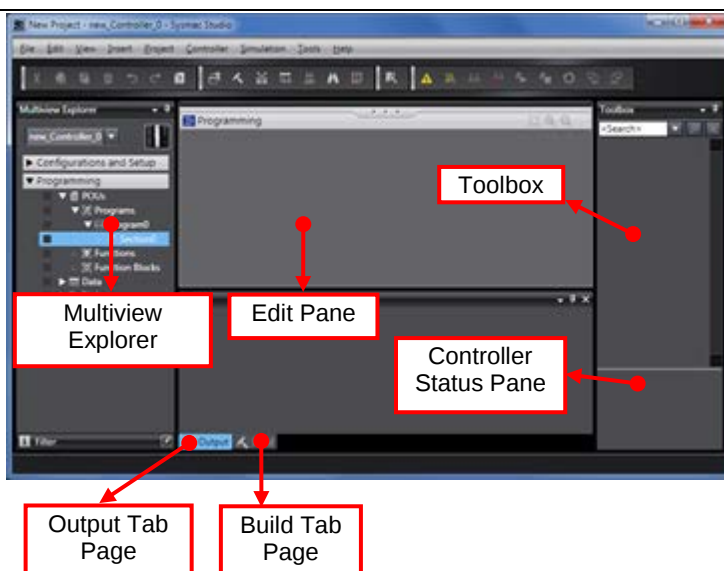
Bottom right: Controller Status Pane

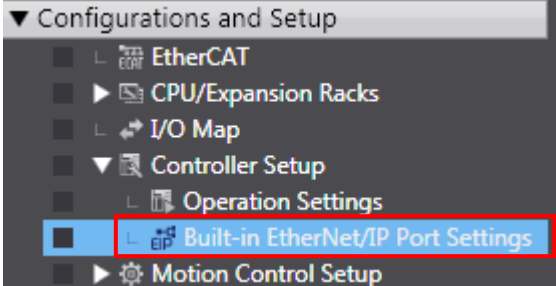
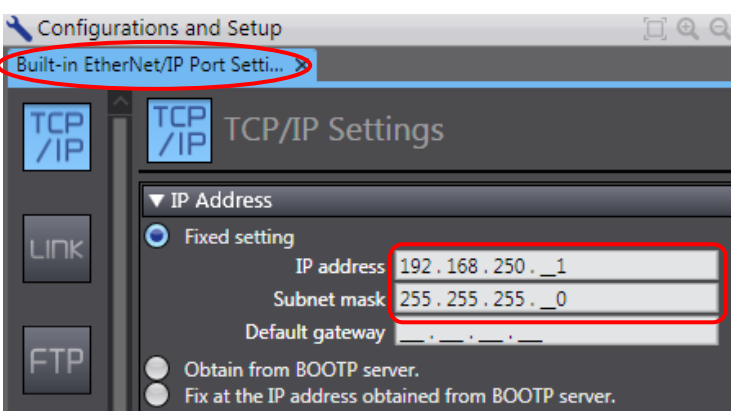
Middle top: Edit Pane

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

Output Tab Page

Build Tab Page

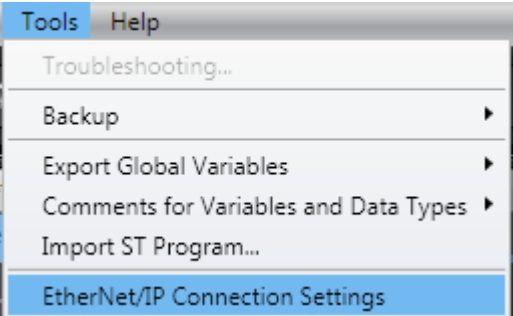


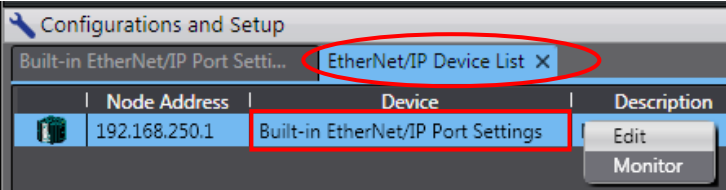
7	Double-click Built-in EtherNet/IP Port Settings under Configurations and Setup - Controller Setup in the Multiview Explorer.	
8	The Built-in EtherNet/IP Port Settings Tab Page is displayed in the Edit Pane. Check that the following settings are made in the <i>IP Address</i> Field. IP address: 192.168.250.1 Subnet mask: 255.255.255.0	

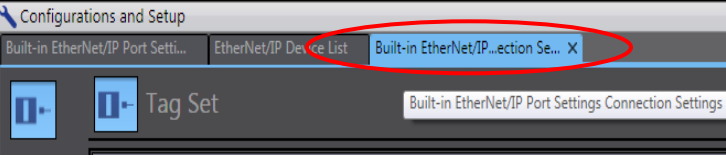
7.3.2. Target Device Registration

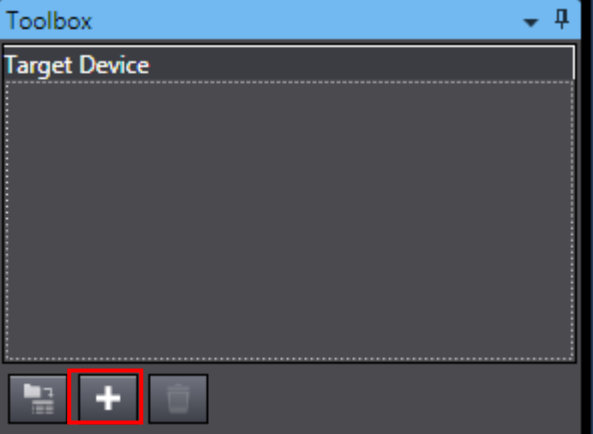
Register the target device.

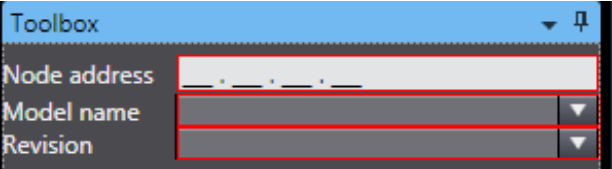
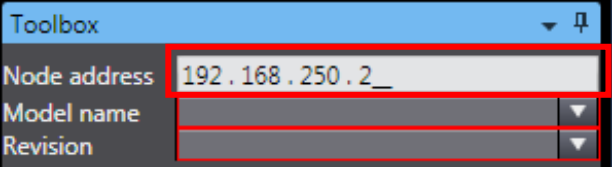
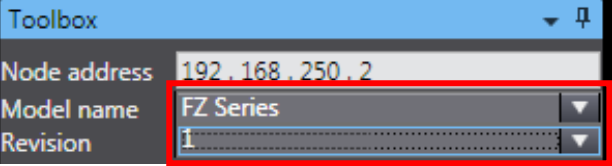
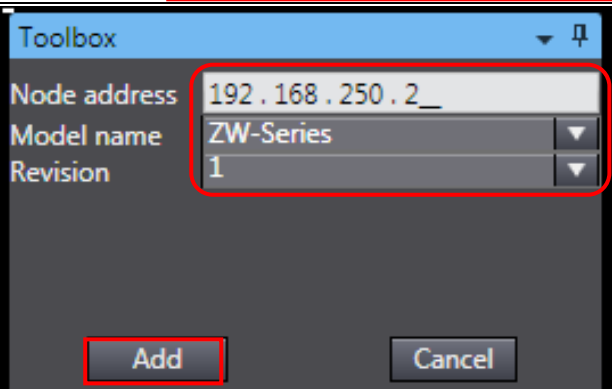
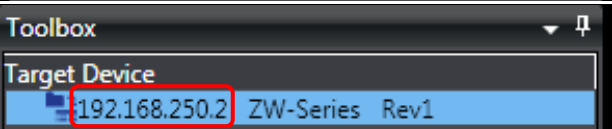
- 1** Select **EtherNet/IP Connection Settings** from the Tools Menu.


- 2** The EtherNet/IP Device List Tab Page is displayed in the Edit Pane.
While the Built-in EtherNet/IP Port Settings is being selected, right-click and select **Edit** from the menu.


- 3** The Built-in EtherNet/IP Port Settings Connection Settings Tab Page is displayed in the Edit Pane.


- 4** Click the + Button in Toolbox.

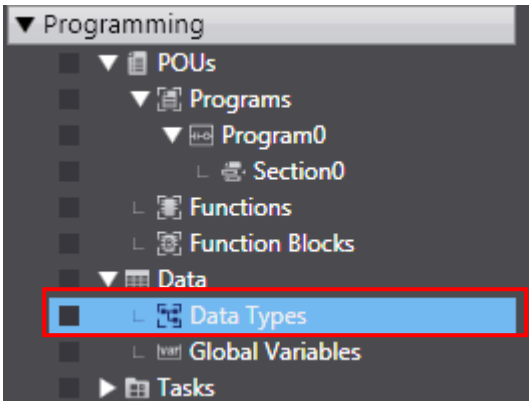


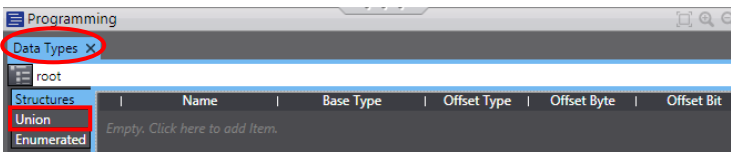
5 Data fields of the target device registration are displayed. Enter 192.168.250.2 in the <i>Node address</i> Field. Select the following values from the pull-down lists of Model name and Revision. Model name: FZ Series Revision: 1	 ↓  ↓ 
6 Check the settings and click Add.	
7 192.168.250.2 is registered in Target Device of Toolbox.	

7.3.3. Setting the Global Variables

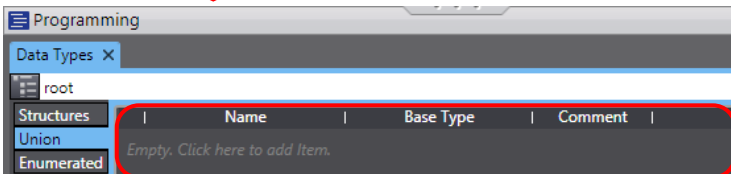
Set the global variables to use for the tag data links.

- 1** Double-click **Data Types** under **Programming - Data** in the Multiview Explorer.

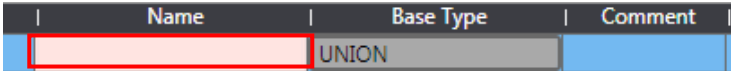

- 2** The Data Types Tab Page is displayed. Click the **Union** Side Tab to display.



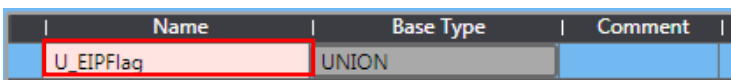
The Union Data Type Editor is displayed.

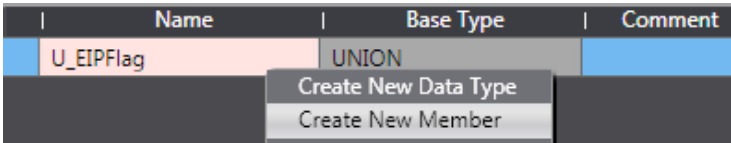


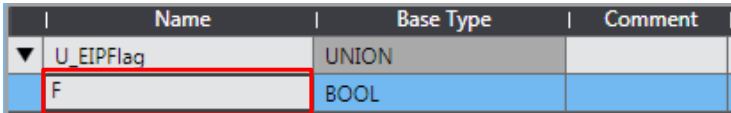
Click a column under the *Name* Column to enter a new data type.



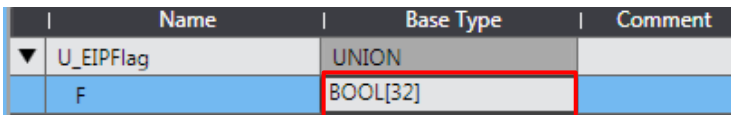
Enter *U_EIPFlag* in the *Name* Column.


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

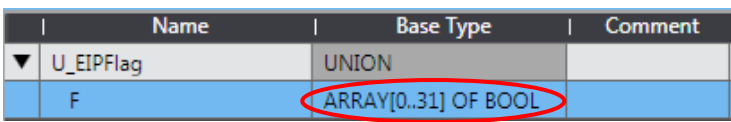

- 4** Enter *F* in the *Name* Column.



Enter *BOOL[32]* in the *Base Type* Column.



*After entering, the value changes to *ARRAY[0..31] OF BOOL* as shown on the right.



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

Name	Base Type	Offset Type	Offset Byte	Offset Bit
▼ S_EIPOutput	STRUCT	NJ		
ControlFlag	U_EIPFlag			
CommandCode	DWORD			
CommandParam1	UDINT			
CommandParam2	DINT			
CommandParam3	UDINT			
Create New Data Type Create New Member				

Enter *S_EIPInput* in the *Name* Column.



Name	Base Type	Offset Type	Offset Byte	Offset Bit
▼ S_EIPOutput	STRUCT	NJ		
ControlFlag	U_EIPFlag			
CommandCode	DWORD			
CommandParam1	UDINT			
CommandParam2	DINT			
CommandParam3	UDINT			
S_EIPInput	STRUCT	NJ		

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

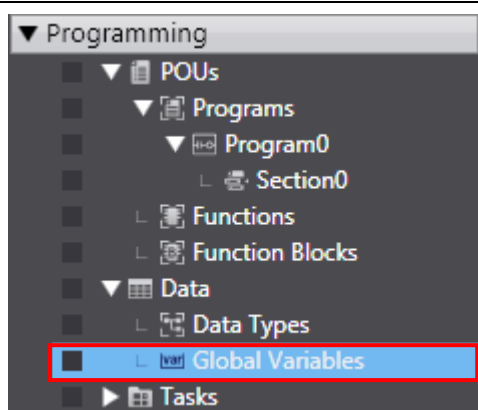
- Name: *StatusFlag*
Base Type: *U_EIPFlag*
- Name: *CommandCodeEcho*
Base Type: *DWORD*
- Name: *ResponseCode*
Base Type: *DINT*
- Name: *ResponseData*
Base Type: *UDINT*
- Name: *OutputData*
Base Type: *DINT[8]*

Name	Base Type	Offset Type	Offset Byte	Offset Bit
▼ S_EIPOutput	STRUCT	NJ		
ControlFlag	U_EIPFlag			
CommandCode	DWORD			
CommandParam1	UDINT			
CommandParam2	DINT			
CommandParam3	UDINT			
▼ S_EIPInput	STRUCT	NJ		
StatusFlag	U_EIPFlag			
CommandCodeEcho	DWORD			
ResponseCode	DINT			
ResponseData	UDINT			
OutputData	ARRAY[0..7] OF DINT			

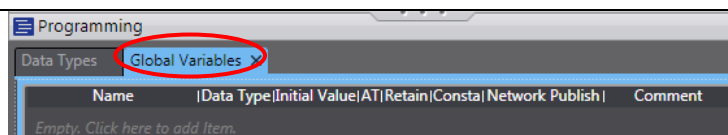
*Enter the members in order of the registration of structures listed in 6.2. *Data Types for Tag Data Links*.

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

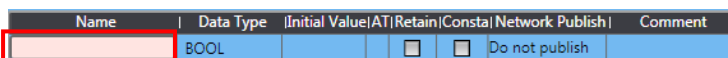
- 12** Double-click **Global Variables** under **Programming - Data** in the Multiview Explorer.



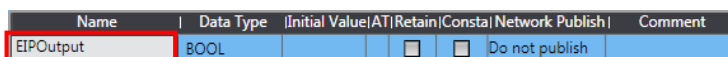
- 13** The Global Variables Tab Page is displayed in the Edit Pane.



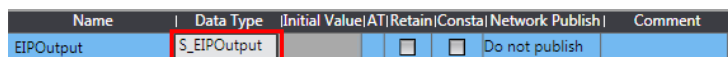
Click a column under the *Name* Column to enter a new variable.



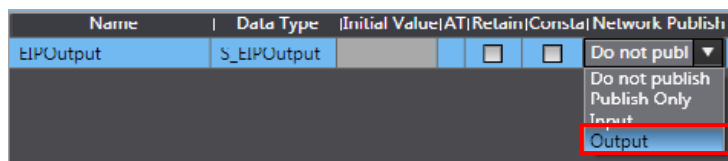
Enter *EIPOutput* in the *Name* Column.



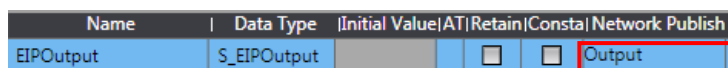
Enter *S_EIPOutput* in the *Data Type* Column.



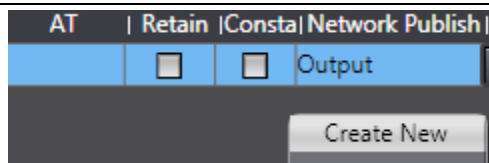
Select **Output** from the Network Publish Menu.



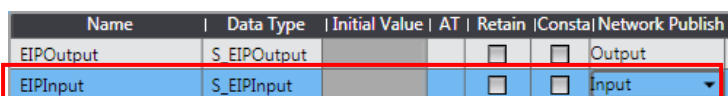
Check that Output is selected in the *Network Publish* Column.



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

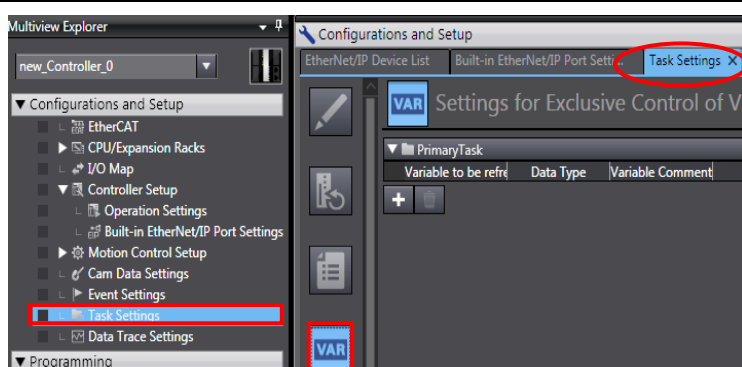


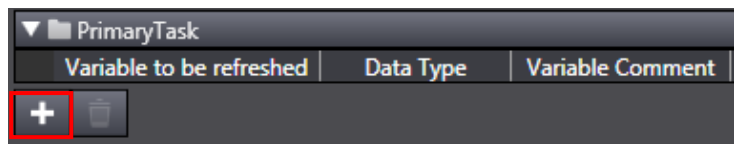
- 15** In the same way as step 13, enter the following data in the new columns.



- Name: *EIPIInput*
- Data Type: *S_EIPIInput*
- Network Publish: *Input*

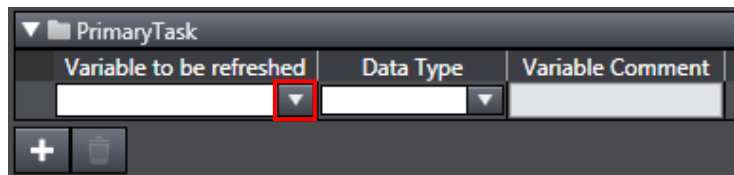
- 16** Double-click **Task Settings** under **Configurations and Setup** in the Multiview Explorer. The Task Settings Tab Page is displayed in the Edit Pane. Click **VAR**.



17 Click the + Button.

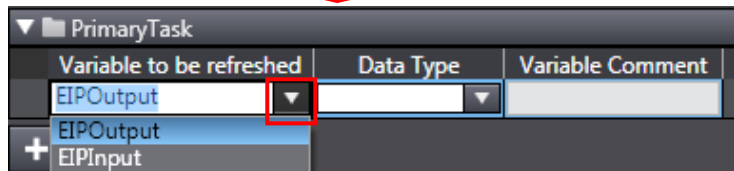
A new column is added.

Click the **Down Arrow** Button of the *Variable to be refreshed* Field (on the left side).



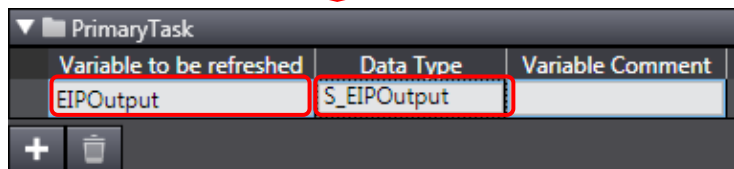
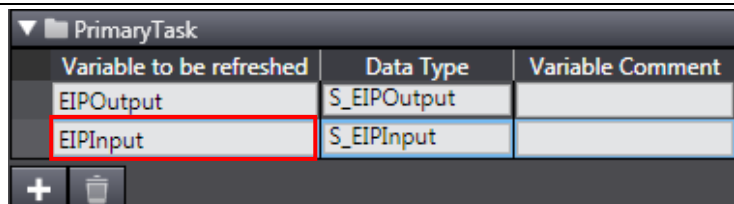
The variables set in this clause are displayed.

Select **EIOutput**.



EIOutput is added.

*The data types are displayed automatically, so no need to be set.

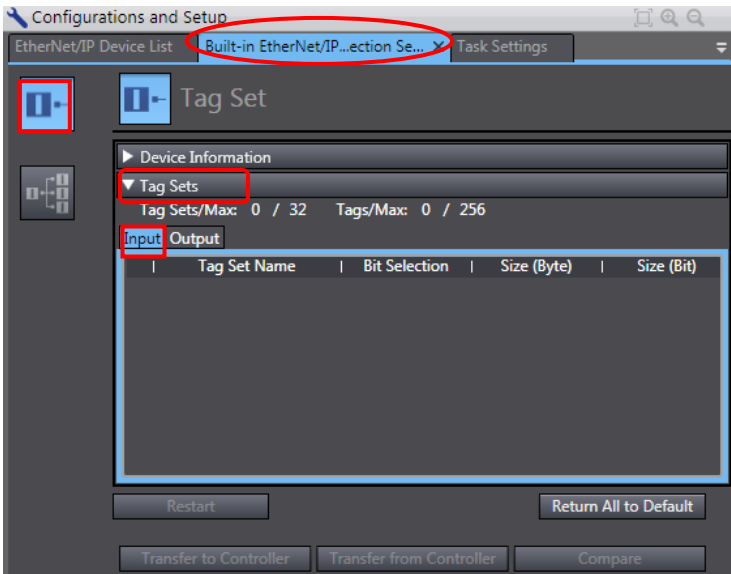
**18** In the same way as step 17, add the all variables set in this clause to the *Variable to be refreshed* Field (on the left side).

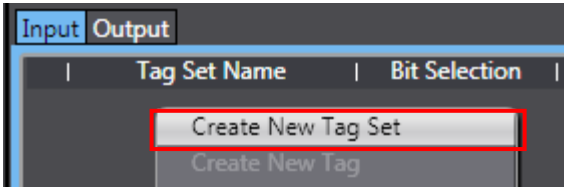
*The data types are displayed automatically, so no need to be set.

7.3.4. Tag Registration

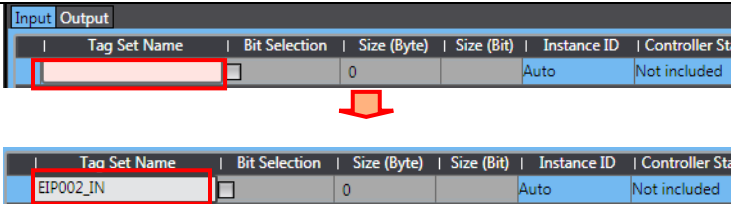
Register the tags and the tag sets.

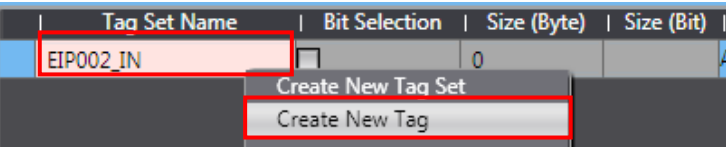
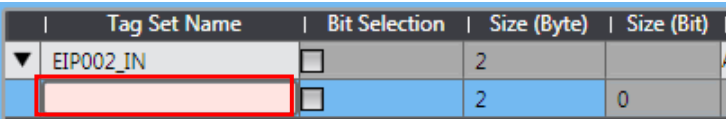
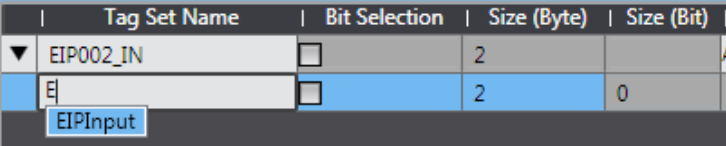
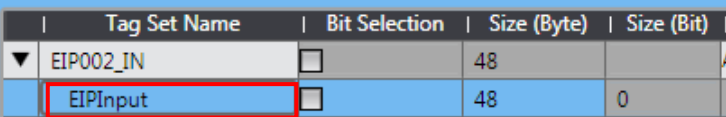
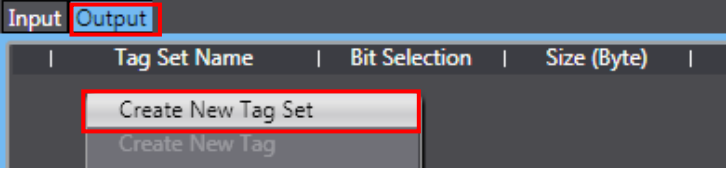
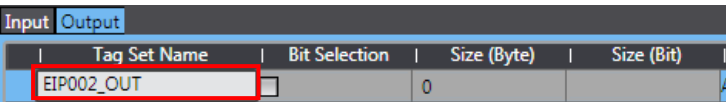
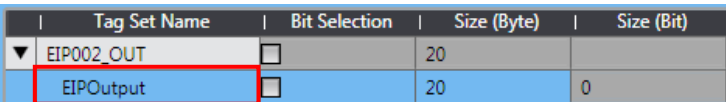
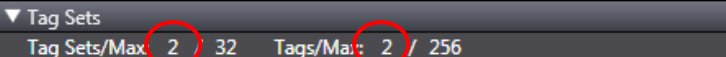
- 1** Click the **Tag Set** Button in the Built-in EtherNet/IP Port Settings Connection Settings Tab Page. Select the **Input** Tab in Tag Sets.


- 2** Right-click any open space in the Input Tab Page and select **Create New Tag Set** from the menu.


- 3** A new name in the *Tag Set Name* Column can be entered. Select the column newly added.

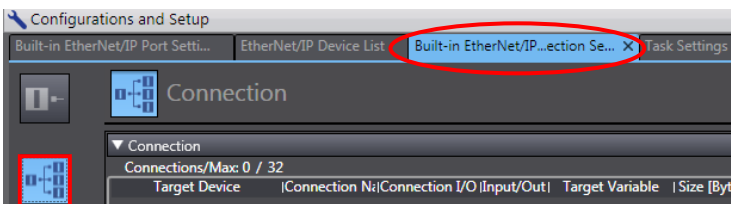
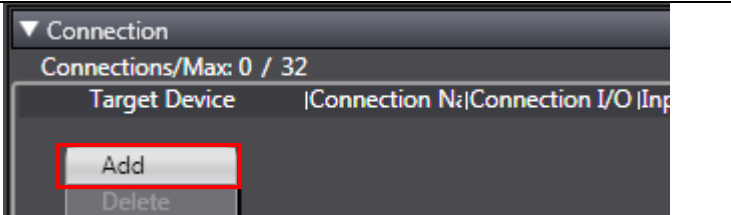
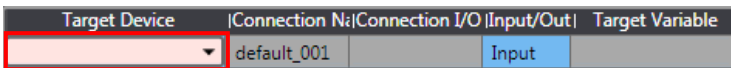
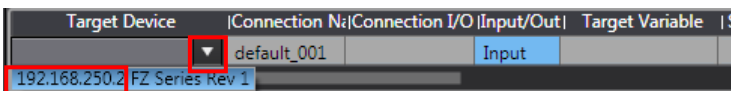
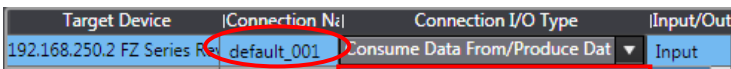
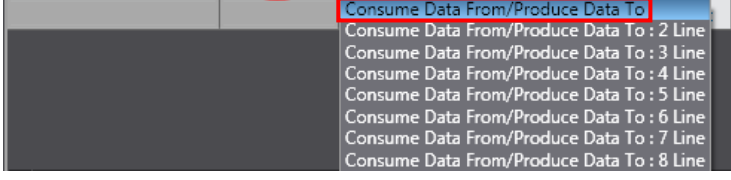
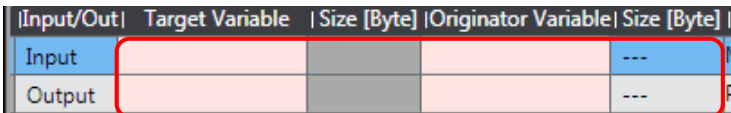
Enter *EIP002_IN*.



4 While the EIP002_IN is being selected, right-click and select Create New Tag from the menu. A new tag name can be entered in the EIP002_IN. Select the column newly added. Set the global variable of IN No.1 listed in 6.4. <i>Tag Sets</i> as a tag. *When the first character of the set variable is entered, the list that starts with the character entered is displayed.	 ↓  ↓  ↓ 
5 Select Output Tab. Right-click any open space in the Output Tab Page and select Create New Tag Set from the menu.	
6 A new name in the <i>Tag Set Name</i> Column can be entered. In the same way as step 3, enter <i>EIP002_OUT</i>.	
7 In the same way as step 4, set the global variable of OUT No.1 listed in 6.4. <i>Tag Sets</i> as a tag.	
8 Check that Tag Sets shows 2 and that the value of Tags shows the same as the number of the global variables set.	

7.3.5. Setting the Connections

Set the target variable (that receives the open request) and the originator variable (that requests opening), and set the connections (tag data link table).

1 Click the Connection Button in the Built-in EtherNet/IP Port Settings Connection Settings Tab Page.	
2 Right-click any open space in Connection and select Add from the menu.	
3 A new connection can be entered. Select the column newly added. Select 192.168.250.2 from the pull-down list under the <i>Target Device</i> Column.	 
4 The default_001 is created in the <i>Connection Name</i> Column. Select Consume Data From/Produce Data To from the Connection I/O Type pull-down list.	 
5 The target variable and the originator variable can be set.	

- 6** Click a column in *Target Variable* of Input.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input				---
Output				---



When you press **Ctrl + Space** on the keyboard, an applicable instance number appears.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input				---
Output	101			---
	103			
	105			
	107			
	109			
	111			
	113			
	115			



Select the instance number.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	101	48		---
Output				---



In the same way, set the target variable of Output.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	101	48		---
Output	100	20		---

- 7** Click a column in *Originator Variable* of Input.
The pull-down list is displayed.
Select the tag set name to use.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	101	48		---
Output	100	20	EIP002_IN	---



In the same way, set the originator variable of Output.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]
Input	101	48	EIP002_IN	48
Output	100	20	EIP002_OUT	20

- 8** Select **Point to Point connection** from the pull-down list of Connection Type.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]	Connection Type
Input	101	48	EIP002_IN	48	Multi-cast connection
Output	100	20	EIP002_OUT	20	Multi-cast connection



*On Vision Sensor, set the connection type to **Point to Point** connection for both input and output.

Input/Output	Target Variable	Size [Byte]	Originator Variable	Size [Byte]	Connection Type
Input	101	48	EIP002_IN	48	Point to Point connection
Output	100	20	EIP002_OUT	20	Point to Point connection

- 9** Set the RPI[ms] and the timeout value as required.

Originator Variable	Size [Byte]	Connection Type	RPI [ms]	Timeout V
EIP002_IN	48	Point to Point connection	50.0	RPI x 4
EIP002_OUT	20	Point to Point connection		

*In this document, the default values are used for these settings.



Precautions for Correct Use

Set RPI to 4ms or longer for Vision Sensor.

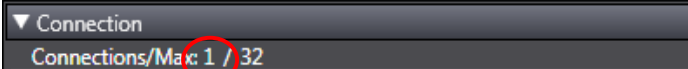
**Precautions for Correct Use**

When the measurement interval is short, the measurement processing load is high, or command processing for operations such as scene group changing is time-consuming, Vision Sensor prioritizes measurement and control processing over communication processing. Therefore, communications between the external device and Vision Sensor may be temporarily interrupted or communications errors may occur.

In this case, set the timeout value as shown below.

Packet Interval (RPI value) × Timeout Value > Vision Sensor's Processing Time

- 10** Check that Connections shows
1.



▼ Connection
Connections/Max: 1 / 32

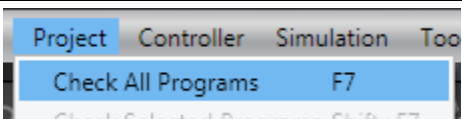
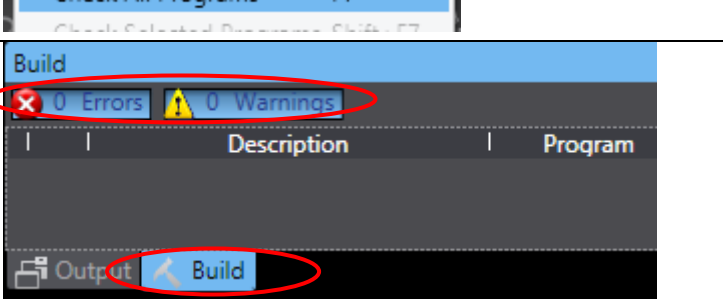
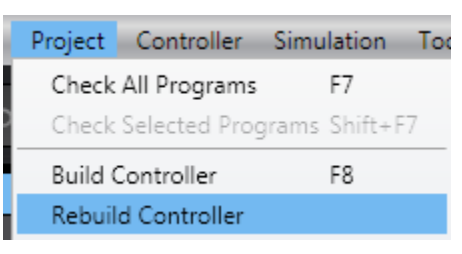
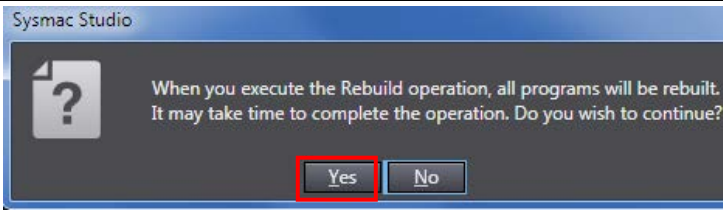
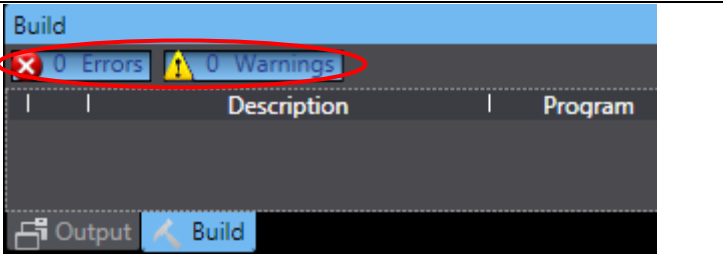
7.3.6. Transferring the Project Data

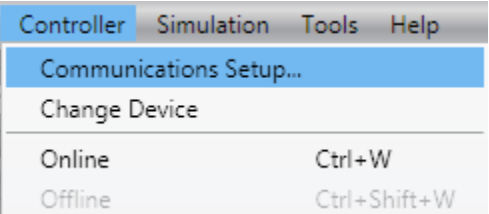
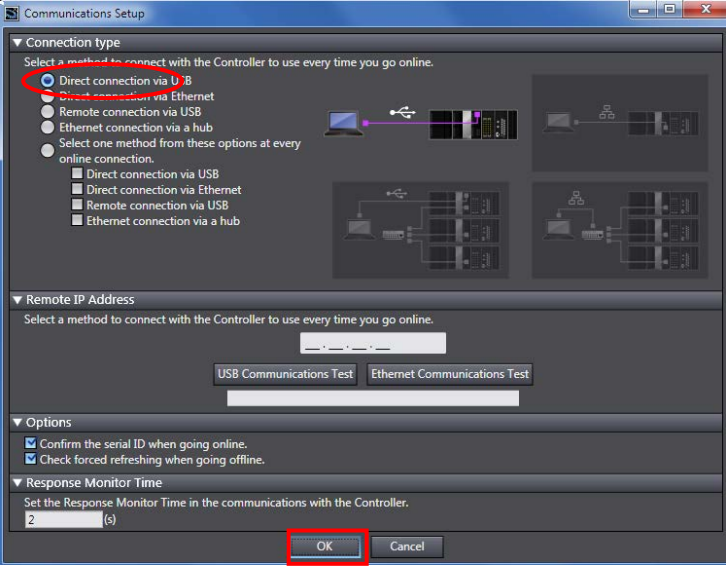
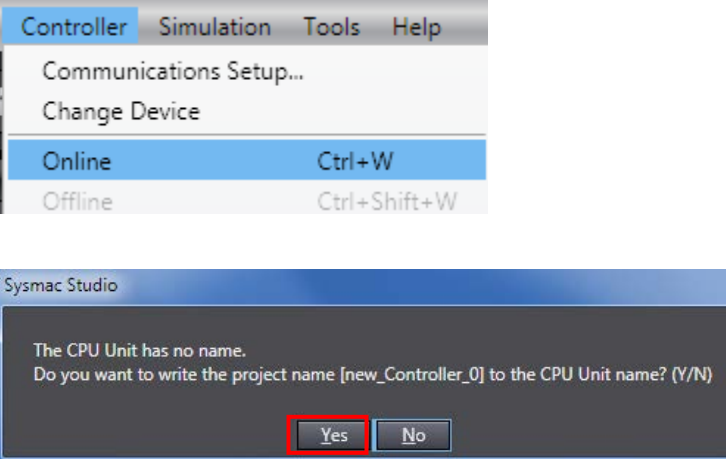
Connect online and transfer the connection settings and the project data to Controller.

⚠ WARNING

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



1	Turn ON the power supply to Controller and Switching hub.	
2	Select Check All Programs from the Project Menu.	
3	The Build Tab Page is displayed. Check that "0 Errors" and "0 Warnings" are displayed.	
4	Select Rebuild Controller from the Project Menu.	
5	A confirmation dialog box is displayed. Check the contents and click Yes .	
6	Check that "0 Errors" and "0 Warnings" are displayed in the Build Tab Page.	

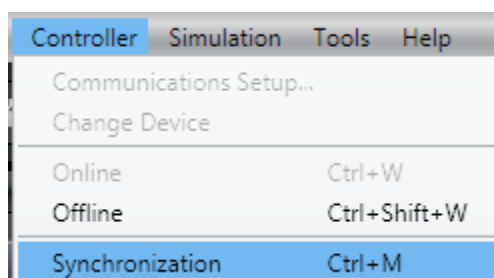
7 Select Communications Setup from the Controller Menu.	
8 The Communications Setup Dialog Box is displayed. Check that <i>Direct connection via USB</i> is selected for the Connection type. Click OK.	
9 Select Online from the Controller Menu. A confirmation dialog box is displayed. Check the contents and click Yes. *The displayed dialog depends on the status of Controller used. Check the contents and click OK or Yes to proceed with the processing.	
10 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 Controller, refer to *Section 6. Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

- 11** Select **Synchronization** from the Controller Menu.

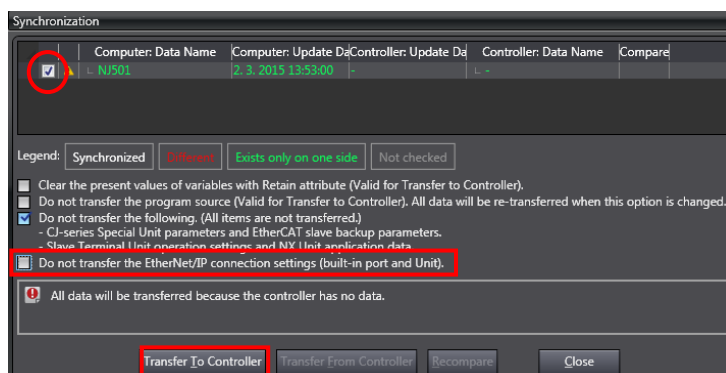


- 12** The Synchronization Dialog Box is displayed.

Check that the data to transfer (NJ501 in the right dialog box) is selected.

Uncheck *Do not transfer the EtherNet/IP connection settings (built-in port and Unit)*.

Click **Transfer To Controller**.



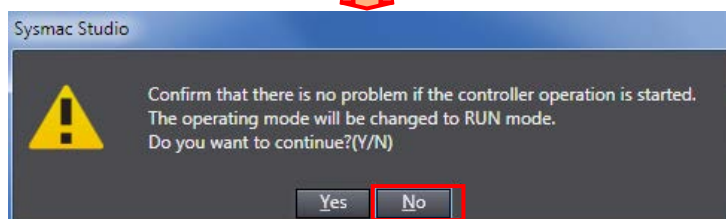
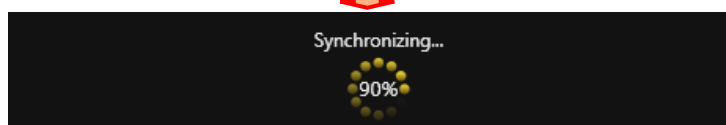
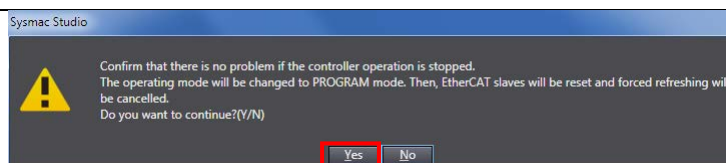
*After executing Transfer To Controller, the Sysmac Studio data is transferred to Controller and the data is compared.

- 13** A confirmation dialog box on the right is displayed. Check that there is no problem and click **Yes**.

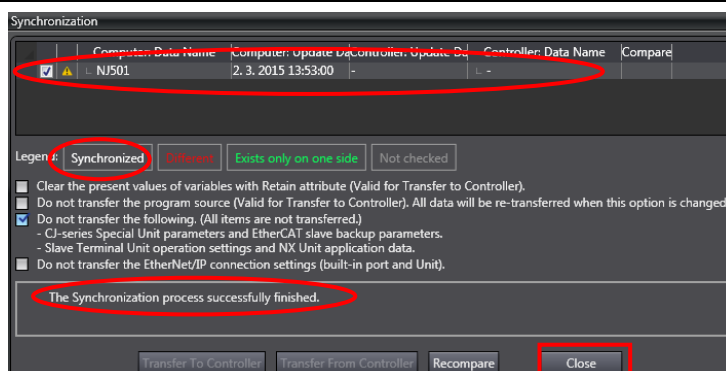
A screen stating "Synchronizing" is displayed.

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

*Do not return to RUN mode.



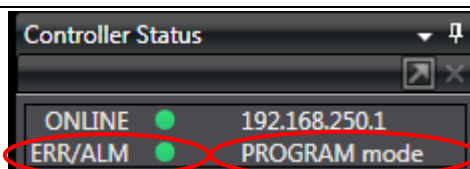
- 14** Check that the synchronized data is displayed with the color specified by "Synchronized", and that a message is displayed stating "The synchronization process successfully finished". If there is no problem, click **Close**.



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

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

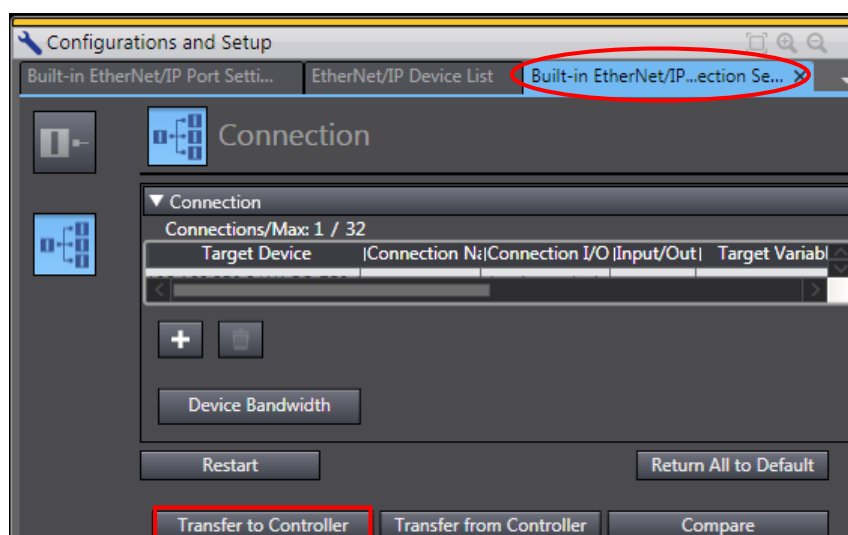
- 15** Check that ERR/ALM indicator in Controller Status Pane changes to green color and that PROGRAM mode is displayed.



Precautions for Correct Use

If changing the connection settings (tag data link table) after performing the synchronization, the connection settings (tag data link table) are not transferred even when performing the synchronization again.

When transferring, click **Transfer to Controller** in the Built-in EtherNet/IP Port Settings Connection Settings Tab Page to transfer.



7.4. Checking the EtherNet/IP Communications

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

7.4.1. Checking the Connection Status

Check the connection status of EtherNet/IP.

- 1 Check that the tag data links are performed normally by checking the LED indicators on Controller.

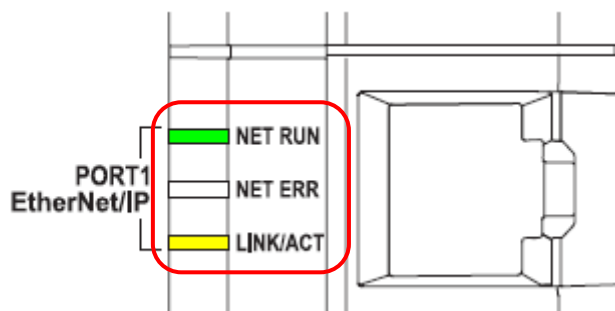
The LED indicators in normal status are as follows:

NET RUN: Green lit

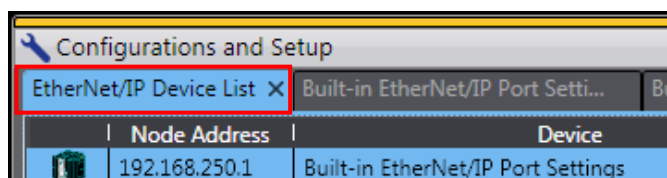
NET ERR: Not lit

LINK/ACT: Yellow flashing

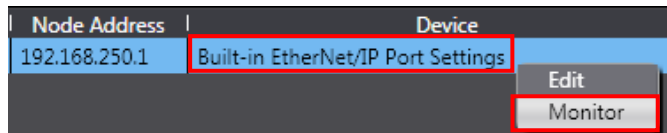
(Flashing while packets are being sent and received)



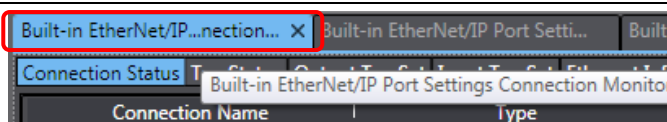
- 2 Select the **EtherNet/IP Device List** Tab.



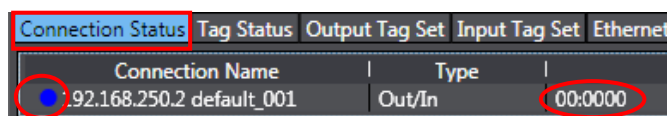
- 3 While the Built-in EtherNet/IP Port Settings is being selected, right-click and select **Monitor** from the menu.



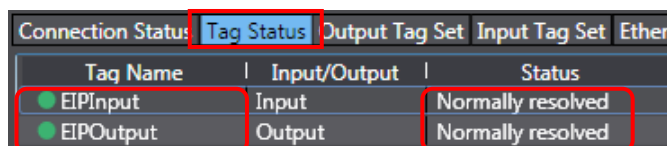
- 4 The Built-in EtherNet/IP Port Settings Connection Monitor Tab Page is displayed.



- 5 Select the **Connection Status** Tab. Check that a blue circle is displayed next to the applicable connection listed in the *Connection Name* Column. Check that the Status is 00:0000.



- 6 Select the **Tag Status** Tab. Check that all tags in the *Tag Name* Column are displayed and that green circles are displayed next to them. Check that the statuses for all tags are normally resolved.



7.4.2. Checking the Sent and Received Data

Check that the correct data are sent and received.

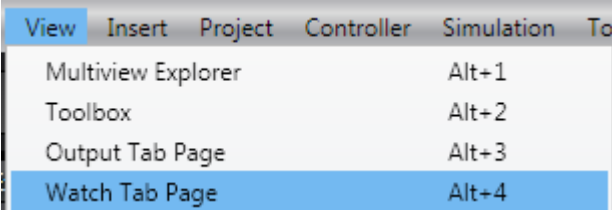
Caution

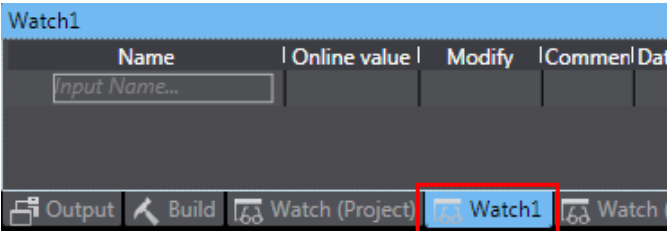
If you change the values of variables on a Watch Tab Page in the online state, the connected devices to the output unit may operate regardless of the operating mode of CPU Unit.

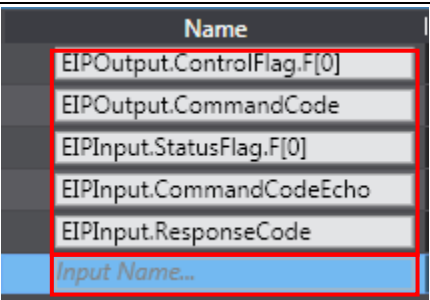
Sufficiently confirm safety before you change the values of variables on a Watch Tab Page when Sysmac Studio is online with CPU Unit.

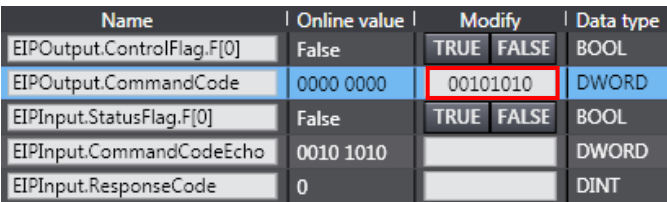


- 1** Select **Watch Tab Page** from the View Menu.

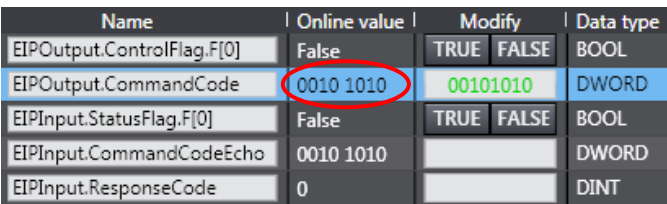

- 2** Select the **Watch1** Tab.


- 3** Click *Input Name*, and enter the name of the variables for monitoring.
When setting a new variable name, enter the following variable names.
EIOutput.ControlFlag.F[0]
EIOutput.CommandCode
EIInput.StatusFlag.F[0]
EIInput.CommandCodeEcho
EIInput.ResponseCode


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



By pressing **Enter**, the value is set and the online value of *EIOutput.CommandCode* changes to 00101010.



- 5** Click **TRUE** in the *Modify* Column of *EIPOutput.ControlFlag.F[0]*.

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	0010 1010		DWORD
EIPInput.ResponseCode	0		DINT



The online value changes to True.
(EIPOutput.ControlFlag.F[0]:
Command Execution Bit (EXE))

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

- 6** After completing the measurement, OK is displayed on Monitor.



- 7** The online values of *EIPInput.StatusFlag.F[0]*, *EIPInput.CommandCodeEcho*, and *EIPInput.ResponseCode* are as follows:

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

- *EIPInput.StatusFlag.F[0]* : True
(Command completed)
- *EIPInput.CommandCodeEcho* :
00101010
(The sent command code is
returned.)
- *EIPInput.ResponseCode* : 0
(The execution result of the
command 0: OK, -1: NG)

8. Initialization Method

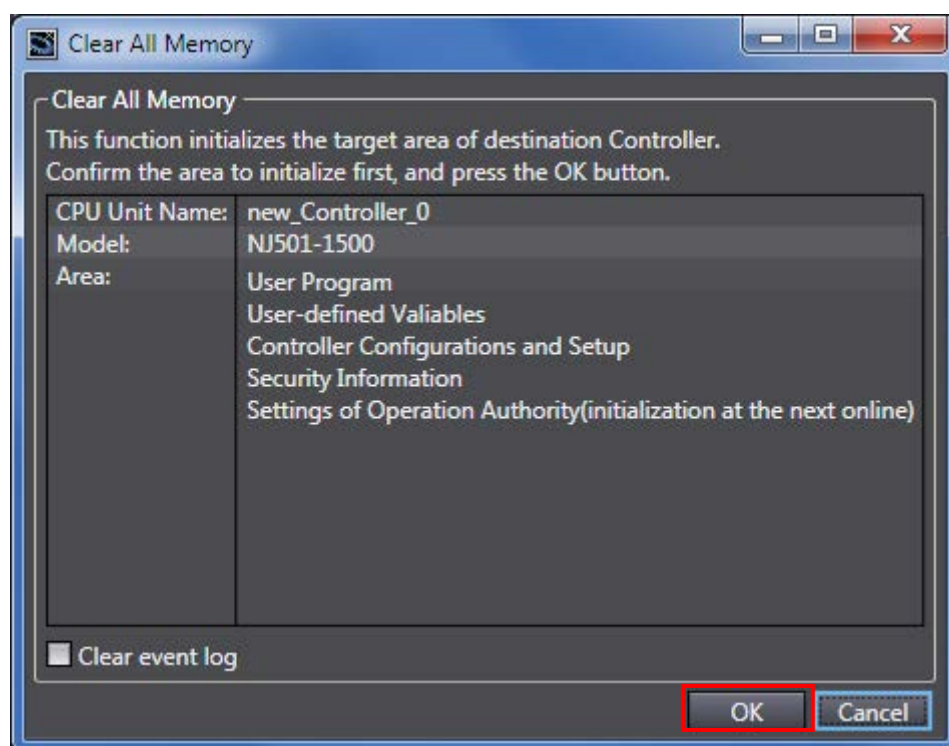
This document provides the explanation of the setting procedure based on the factory default setting.

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

8.1. Initializing Controller

To initialize the settings of Controller, it is necessary to initialize CPU Unit.

Change Controller to PROGRAM mode before the initialization. Select **Clear All Memory** from the Controller Menu of Sysmac Studio. The Clear All Memory Dialog Box is displayed. Check the contents and click **OK**.



8.2. Initializing Vision Sensor

For information on how to initialize Vision Sensor, refer to *Returning Controller to Factory Settings* in *1. Before Operation of Vision Sensor FZ4 Series User's Manual* (Cat. No. Z318).

9. Appendix Procedure Using the Project File

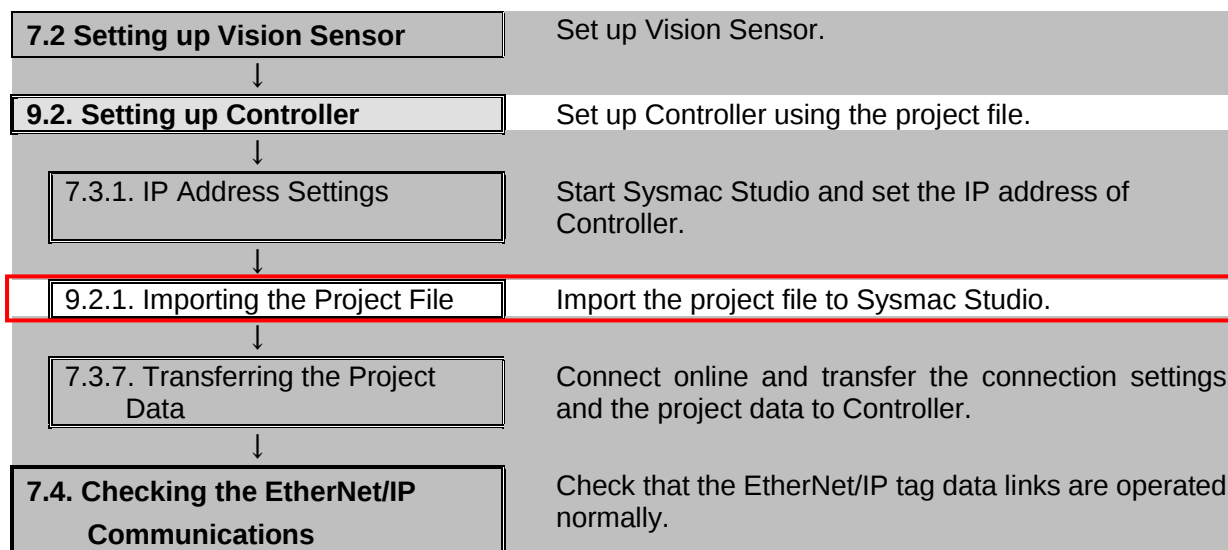
This section describes the procedure in which you use the following project file.
The project file includes the contents that are set in 7.3. *Setting up Controller*.
Obtain the latest project file from OMRON.

Name	File name	Version
Sysmac Studio compact project file (Extension: csm2)	OMRON_FZ4_EIP_EV200.csm2	Ver.2.00

9.1. Work Flow

Take the following steps to make the tag data link settings for EtherNet/IP using the project file.

Except 9.2.1. *Importing the Project File* enclosed in red, refer to each appropriate clause and sub-clause for further information.



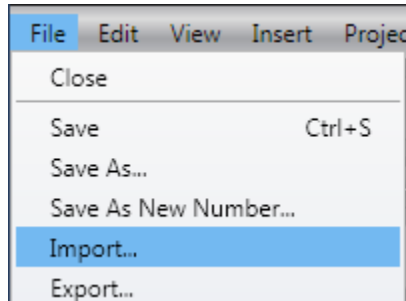
9.2. Setting up Controller

Set up Controller using the project file.

9.2.1. Importing the Project File

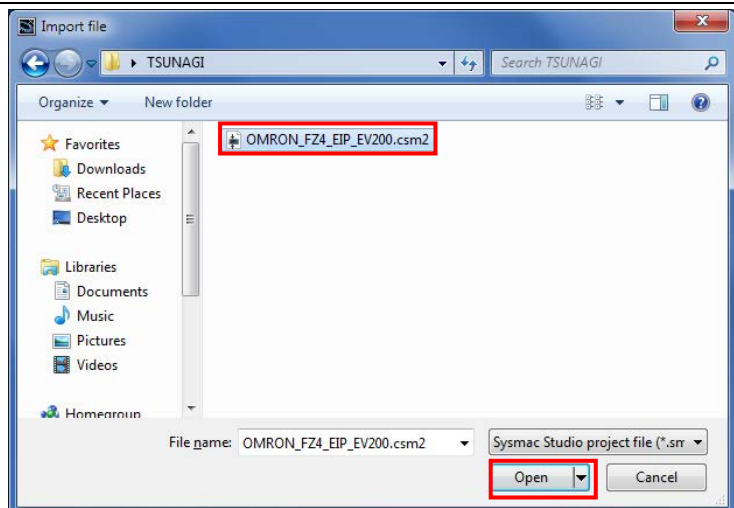
Import the project file to Sysmac Studio.

- 1 Select **Import** from the File Menu.



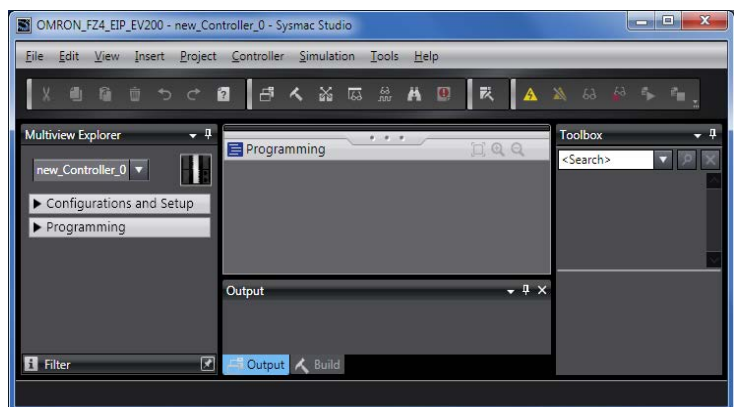
- 2 The Import file Dialog Box is displayed.
Select *OMRON_FZ4_EIP_EV200.csm2* (project file) and click **Open**.

*Obtain the project file from OMRON.

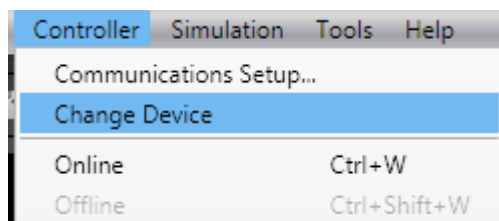


- 3 OMRON_FZ4_EIP_EV200 project is displayed.

*If an error message is displayed stating "Failed to Load Descendants", change the version of Sysmac Studio to the version specified in 5.2. *Device Configuration* or higher version.



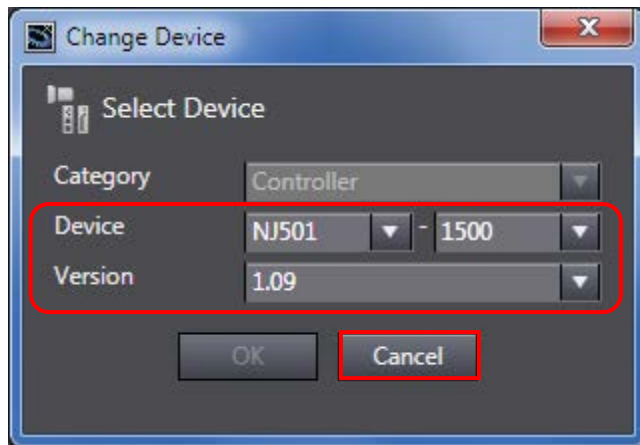
- 4 Select **Change Device** from the Controller Menu.



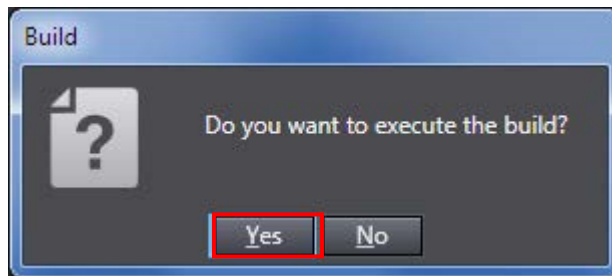
- 5** The Change Device Dialog Box is displayed.
Check that the *Device* and the *Version* Fields are set as shown on the right.

Click **Cancel**.

*If the settings are different, select the setting items from the pull-down list and click **OK**.



- 6** If you changed the settings in step 6, the Build Dialog Box is displayed. Check the contents and click **Yes**.



10. Revision History

Revision code	Date of revision	Revision reason and revision page
01	January 31, 2013	First edition
02	April 22, 2015	Revisions due to upgraded versions of Controller and Sysmac Studio. The procedures for EtherNet/IP connection setting changed to that by Sysmac Studio. Screens changed due to upgraded version of Vision Sensor. The setting for output control changed to handshaking. Point to Point connection set for input and output.

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Cat. No. P530-E1-02

0415- (0113)