OMRON

Machine Automation Controller NJ-series

EtherCAT(R) Connection Guide FANUC CORPORATION

R-30iB Robot Controller

Network Connection Guide

SYSMAC always in control

P605-E1-01

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Table of Contents

1. Related Manuals

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

Cat. No.	Model	Manual name
W500	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Hardware User's Manual
W501	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Software User's Manual
W505	NJ501-□□□□ NJ301-□□□□	NJ-series CPU Unit Built-in EtherCAT(R) Port User's Manual
W504	SYSMAC-SE2□□□	Sysmac Studio Version 1 Operation Manual
B-83284EN	R-30iB	FANUC Robot series R-30iB/R-30iB Mate CONTROLLER OPERATOR'S MANUAL(Basic Operation)
B-83704EN	R-30iB	FANUC Robot series R-30iB/R-30iB Mate CONTROLLER EtherCAT Interface OPERATOR'S MANUAL

2. Terms and Definitions

Term	Explanation and Definition
PDO Communications (Communications using Process Data Objects)	This method is used for cyclic data exchange between the master unit and the slave units. PDO data (i.e., I/O data that is mapped to PDOs) that is allocated in advance is refreshed periodically each EtherCAT process data communications cycle (i.e., the period of primary periodic task). The NJ-series Machine Automation Controller uses the PDO Communications for commands to refresh I/O data in a fixed control period, including I/O data for EtherCAT Slave Units, and the position control data for the Servomotors. It is accessed from the NJ-series Machine Automation Controller in the following ways. ・With device variables for EtherCAT slave I/O ・With Axis Variables for Servo Drive and encoder input slave to which assigned as an axis
SDO Communications (Communications using Service Data Objects)	This method is used to read and write the specified slave unit data from the master unit when required. The NJ-series Machine Automation Controller uses SDO Communications for commands to read and write data, such as for parameter transfers, at specified times. The NJ-series Machine Automation Controller can read/write the specified slave data (parameters and error information, etc.) with the EC_CoESDORead (Read CoE SDO) instruction or the EC_CoESDOWrite (Write CoE SDO) instruction.
Slave unit	There are various types of slaves such as Servo Drives that handle position data and I/O terminals that handle the bit signals. The slave unit receives output data sent from the master, and sends input data to the master.
Node address	A node address is an address to identify a unit connected to EtherCAT.
ESI file (EtherCAT Slave Information file)	The ESI files contain information unique to the EtherCAT slaves in XML format. Installing an ESI file enables the Sysmac Studio to allocate slave process data and make other settings.
UOP	Peripheral I/O (UI/UO) is a group of specialized signals for robot control.
Digital I/O	Digital I/O (DI/DO) is a group of general-purpose digital signals for data exchange with peripheral equipments.

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 and Precautions for Safe 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 August 2014. It is subject to change without notice for improvement.

The following notations are used in this document.

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

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

Precautions for Safe Use

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

Precautions for Correct Use

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

Additional Information

Additional information to read as required.
This information is provided to increase understanding or make operation easier.

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 Robot Controller (R-30iB) of FANUC Corporation (hereinafter referred to as FANUC) to NJ-series Machine Automation Controller (hereinafter referred to as Controller) of OMRON Corporation (hereinafter referred to as OMRON) via EtherCAT and provides the procedure for checking their connection.
Refer to *Section 6 EtherCAT Settings* and *Section 7 EtherCAT Connection Procedure* to understand the setting method and key points to operate PDO Communications of EtherCAT.

5. Applicable Devices and Device Configuration

5.1. Applicable Devices

The applicable devices are as follows:

Manufacturer	Name	Model
OMRON	NJ-series CPU Unit	NJ501-□□□□ NJ301-□□□□
FANUC	Robot Controller	R-30iB (with optional EtherCAT slave function)
FANUC	Robot	Refer to the following Additional Information.

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

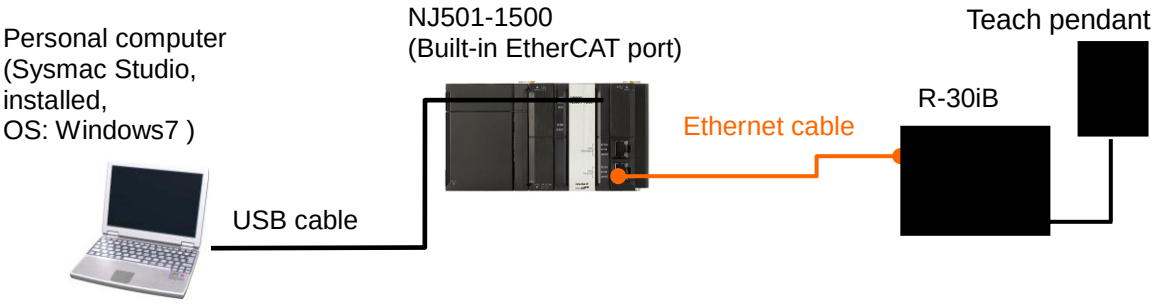
Contact sales representatives of FANUC Corporation for robots connectable to the Robot Controller.

Additional Information

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

5.2. Device Configuration

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



Manufacturer	Name	Model	Version
OMRON	CPU Unit (Built-in EtherCAT port)	NJ501-1500	Ver.1.08
OMRON	Power Supply Unit	NJ-PA3001	
OMRON	Sysmac Studio	SYSMAC-SE2[][][]	Ver.1.09
-	Personal computer (OS: Windows7)	-	
-	USB cable (USB 2.0 type B connector)	-	
-	Ethernet cable	-	
FANUC	Robot Controller	R-30iB (with optional EtherCAT slave function)	7DC2 series (ver.11 or higher), 7DC3 series
FANUC	Teach pendant	(Included with Robot Controller)	
FANUC	ESI file	fanuc_rs_esi0001.xml	0x0001

Precautions for Correct Use

The ESI file “ver. 0x0001” shown above is used in this document to check the operations.

Precautions for Correct Use

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

Precautions for Correct Use

The connection line of EtherCAT communication cannot be shared with other Ethernet networks.
Do not use devices for Ethernet such as a switching hub.
Use the cable (double shielding with aluminum tape and braiding) of Category 5 or higher, and use the shielded connector of Category 5 or higher.
Connect the cable shield to the connector hood at both ends of the cable.

Precautions for Correct Use

Update the Sysmac Studio to the version specified in this section or higher version using the auto update function.
If a version not specified in this section is used, the procedures described in *Section 7* and subsequent sections may not be applicable. In that case, use the equivalent procedures described in the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

Additional Information

For specifications of the Ethernet cables and network wirings, refer to *Section 4 EtherCAT Network Wiring* of the *NJ-series CPU Unit Built-in EtherCAT(R) Port User's Manual* (Cat. No. W505).

Additional Information

The system configuration in this document uses USB for the connection to the Controller.
For how to install a USB driver, refer to *A-1 Driver Installation for Direct USB Cable Connection* of the *Sysmac Studio Version 1 Operation Manual* (Cat.No. W504).

6. EtherCAT Settings

This section describes specifications such as the Robot Controller setup and allocation of PDO Communications that are set in this document. This is used to connect the Controller to the Robot Controller via EtherCAT. Hereinafter, the Robot Controller is referred to as the "Destination Device" or the "Slave Unit" in some descriptions.

6.1. Setting Up the Robot Controller

The setting of the Robot Controller is shown below.

Setting item		Set value
Node address		1 (default)
SMODE switch (EtherCAT board switch)		0 (fixed)
Switch on the front panel of Robot Controller	Three mode switch	AUTO
Switches on the Teach pendant	Teach pendant enable switch	OFF (disable)*1
Screen setting of the Teach pendant	The number of input	512 points (default)
	The number of output	512 points (default)
	Remote/local setup	Remote
	UOP auto assignment	Full *2 (default)

*1: When the Teach pendant enable switch is disabled, the operation of the Teach pendant is disabled. Accordingly, the Teach pendant cannot perform the jog feed, program operation, and test execution.

*2: The “UOP auto assignment” assigns all UOPs of input 18-points and output 20-points to I/O. When the "UOP auto assignment" is set to "Full", the Robot Controller automatically sets the following set values of the UOP assignment.

■ UOP output

#	Range	Rack	Slot	Start
1	UO[1-8]	106 (fixed)	1 (fixed)	1
2	UO[9-16]	106 (fixed)	1 (fixed)	9
3	UO[17-20]	106 (fixed)	1 (fixed)	17

■ UOP input

#	Range	Rack	Slot	Start
1	UI[1-8]	106 (fixed)	1 (fixed)	1
2	UI[9-16]	106 (fixed)	1 (fixed)	9
3	UI[17-18]	106 (fixed)	1 (fixed)	17

Precautions for Safe Use

For explanation purpose, this document uses the settings above as an example. The user must decide actual set values according to the application to be used after verifying its safety.

6.2. Allocation for PDO Communications

The section describes allocation of PDO Communications between the Destination Device and the Controller.

6.2.1. Device Variables of the Controller

The PDO communications data for the Destination Device are allocated to the Controller's device variables.

The device variables and the data types are shown below.

■ Output area (from Controller to Destination Device)

Device variable name	Data type	Meaning
E001_OUT512_DI00_2102_01	UINT[8]	UOP inputs (UI1 to 18), Digital inputs (DI1 to 110)
E001_OUT512_DI01_2102_02	UINT[8]	Digital inputs (DI111 to 238)
E001_OUT512_DI02_2102_03	UINT[8]	Digital inputs (DI239 to 366)
E001_OUT512_DI03_2102_04	UINT[8]	Digital inputs (DI367 to 494)

■ Input area (from Destination Device to Controller)

Device variable name	Data type	Meaning
E001_IN512_DO00_3102_01	UINT[8]	UOP outputs (UO1 to 20), Digital outputs (DO1 to 108)
E001_IN512_DO01_3102_02	UINT[8]	Digital outputs (DO109 to DO236)
E001_IN512_DO02_3102_03	UINT[8]	Digital outputs (DO237 to DO364)
E001_IN512_DO03_3102_04	UINT[8]	Digital outputs (DO365 to DO492)

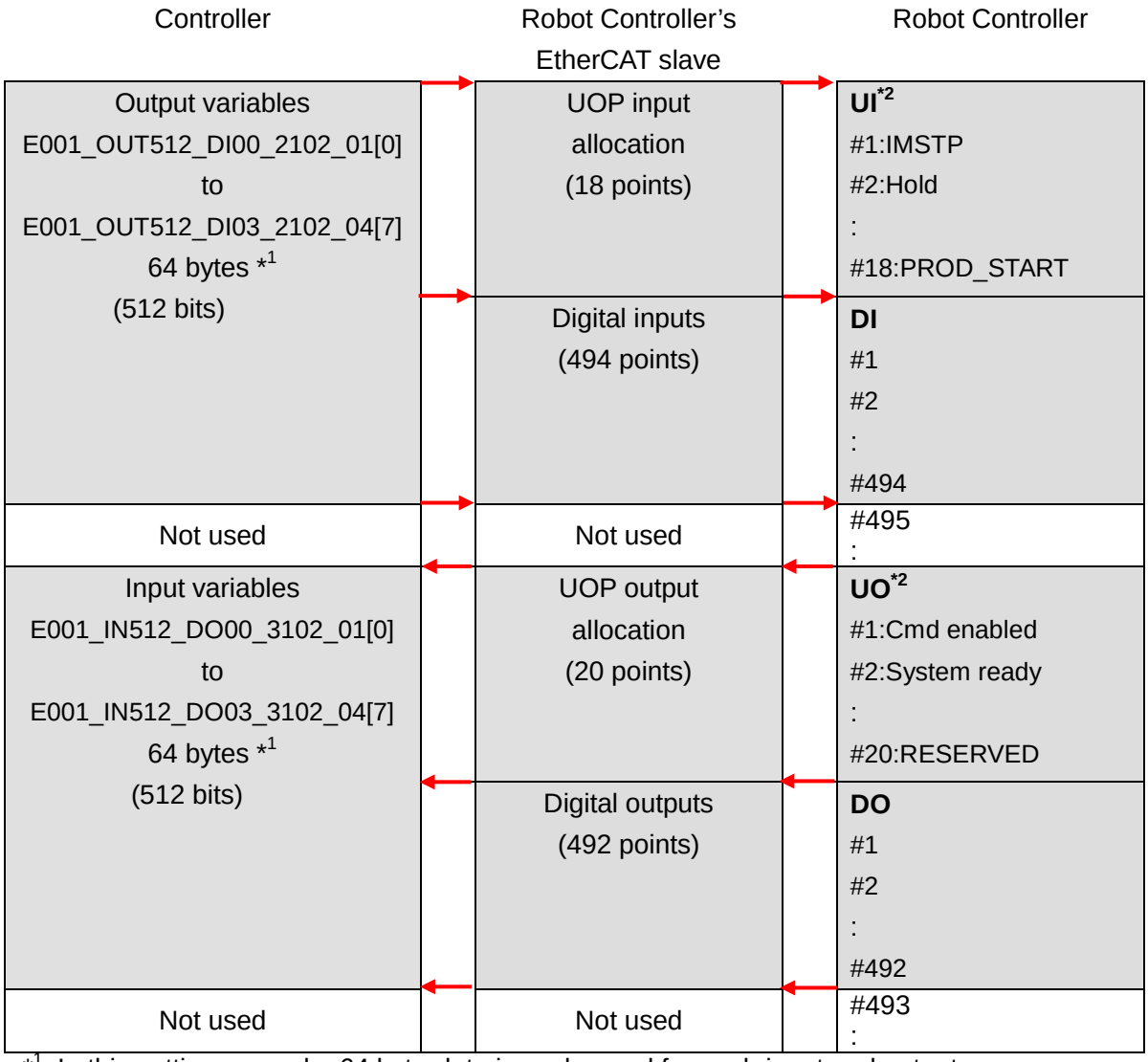
Additional Information

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

The default device names are “E" followed by a serial number that starts from 001.

6.2.2. I/O Allocation for the Robot Controller

The I/O allocation for the Robot Controller is shown below.



*1: In this setting example, 64 byte-data is exchanged for each input and output areas between the Controller and the Robot Controller's EtherCAT slave.

*2: The "UOP auto assignment" assigns all UOPs of input 18-points and output 20-points to I/O. Digital I/O is assigned for others.

7. EtherCAT Connection Procedure

This section describes the procedure for connecting the Controller to the Robot Controller via EtherCAT.

This document explains the procedures for setting up the Controller and the Robot Controller from the factory default setting. For the initialization, refer to *Section 8. Initialization Method*.

7.1. Work Flow

Take the following steps to perform PDO Communications of EtherCAT.

7.2. Setting Up the FANUC Robot Controller	Set up the FANUC Robot Controller.
↓	
7.2.1. Hardware Settings	Set the hardware switches on the Robot Controller and connect the cables.
↓	
7.2.2. Parameter Settings	Set the parameters for the Robot Controller.
↓	
7.3. Setting Up the Controller	Set up the Controller.
↓	
7.3.1. Starting the Sysmac Studio and Installing the ESI File	Install the ESI file for the Robot Controller in the Sysmac Studio.
↓	
7.3.2. Setting Up the EtherCAT Network Configuration	Set up the EtherCAT network configuration.
↓	
7.3.3. Setting the Device Variables	Set the device variables used for the EtherCAT Slave Unit.
↓	
7.3.4. Transferring the Project Data	Transfer the project data from the Sysmac Studio to the Controller.
↓	
7.4. Checking the EtherCAT Communications	Confirm that the PDO Communications of EtherCAT are performed normally.
↓	
7.4.1. Checking the Connection Status	Check the connection status of the EtherCAT network.
↓	
7.4.2 Checking the Data that are Sent and Received	Confirm that the correct data are sent and received.

7.2. Setting Up the FANUC Robot Controller

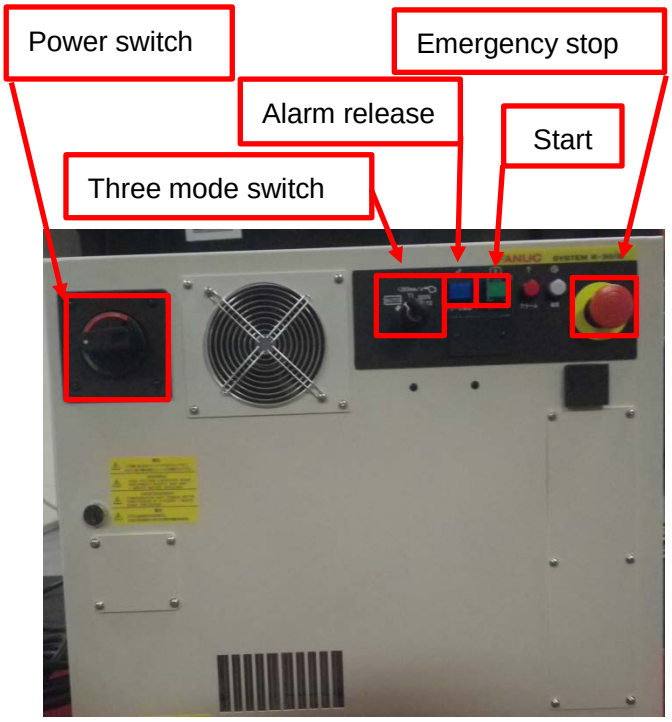
Set up the FANUC Robot Controller.

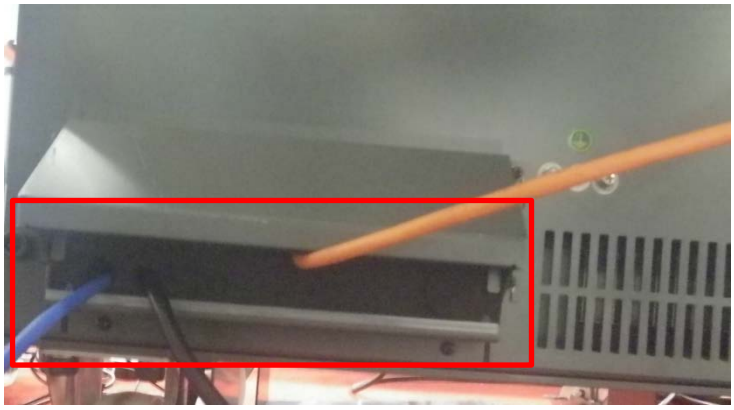
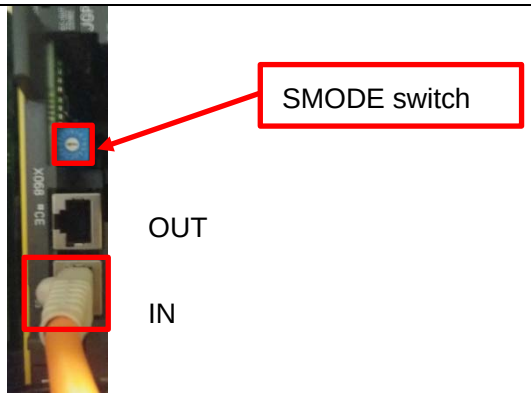
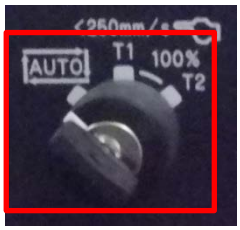
7.2.1. Hardware Settings

Set the hardware switches on the Robot Controller and connect the cables.

Precautions for Safe Use

Make sure that the power supply to the Robot Controller is OFF before opening its front panel. Touching the internal board may result in electric shock or equipment damage while the power is being supplied.

1	Make sure that the power supply to the Robot Controller is OFF. *Step 3 in this section is potentially hazardous that may result in electric shock or equipment damage. For safety, be sure to unplug the Power supply cable from the power supply source.	
2	Check the position of the connectors and switches on the Robot Controller.	 (Front panel of Robot Controller)

3	Open the front panel of the Robot Controller. Insert the Ethernet cable from the wiring outlet located in the lower left of the rear panel on the Robot Controller, and pull out the cable toward the front panel.	 (Lower left of the rear panel on Robot Controller)
4	Connect the Ethernet cable to the IN side of the connector on the EtherCAT board. Confirm that the SMODE switch on the EtherCAT board is 0. Close the front panel. *For safety, after wiring has been completed, be sure to close the front panel before performing the subsequent steps.	 (EtherCAT board)
5	Set the Three mode switch on the Robot Controller to the *AUTO* side.	T1 AUTO  T2 (Three mode switch)
6	Turn ON the Power switch on the Robot Controller to supply power. * After power ON, a message appears indicating the initialization is being processed on the connected Teach pendant. Then the operation screen is displayed. Do not start operation until the operation screen has been displayed.	ON OFF  (Power switch)

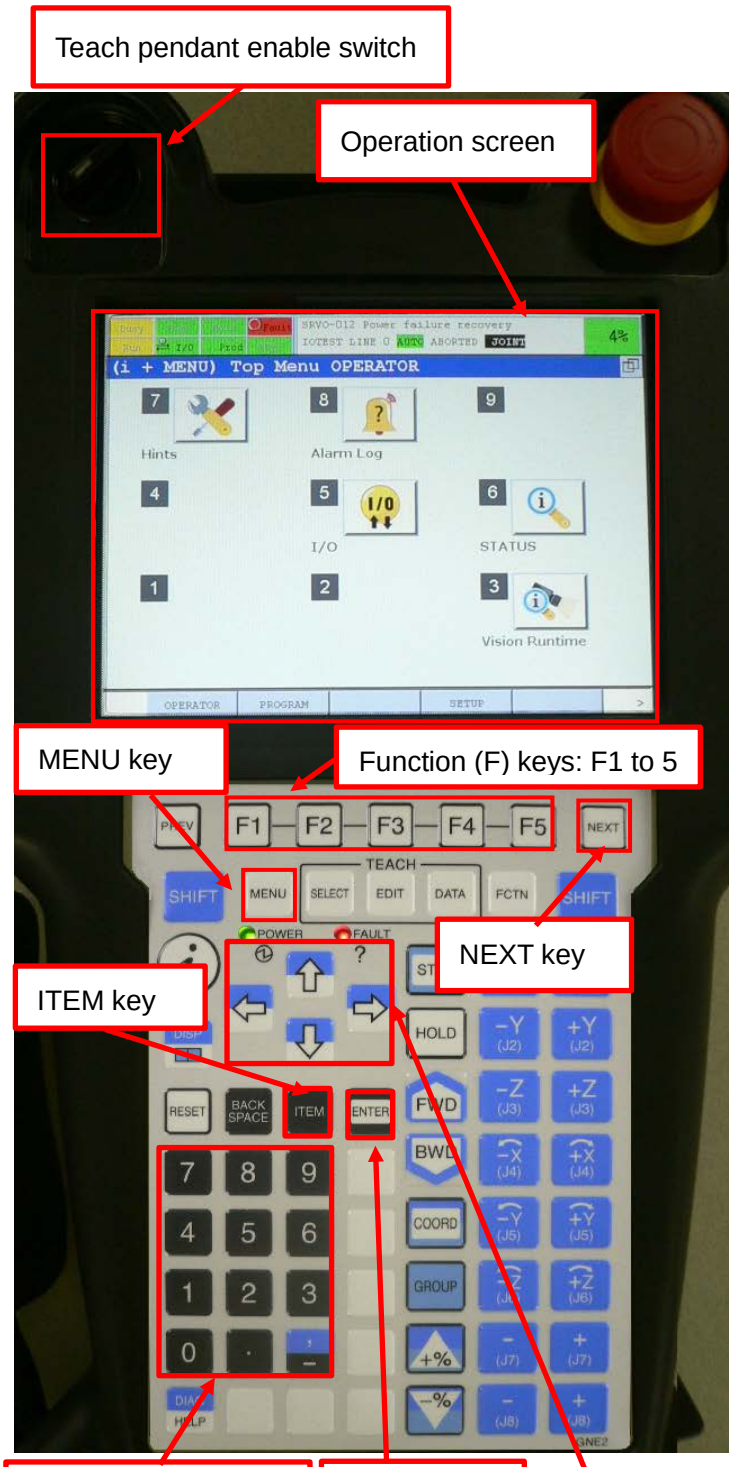
7.2.2. Parameter Settings

Set the parameters for the Robot Controller.

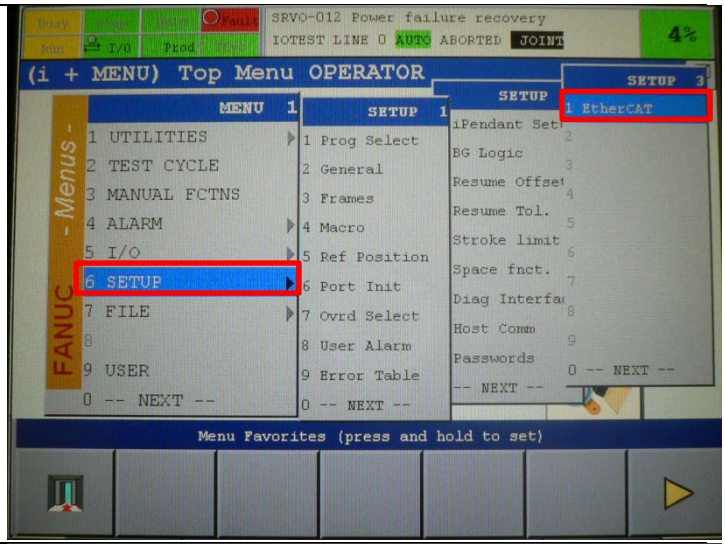
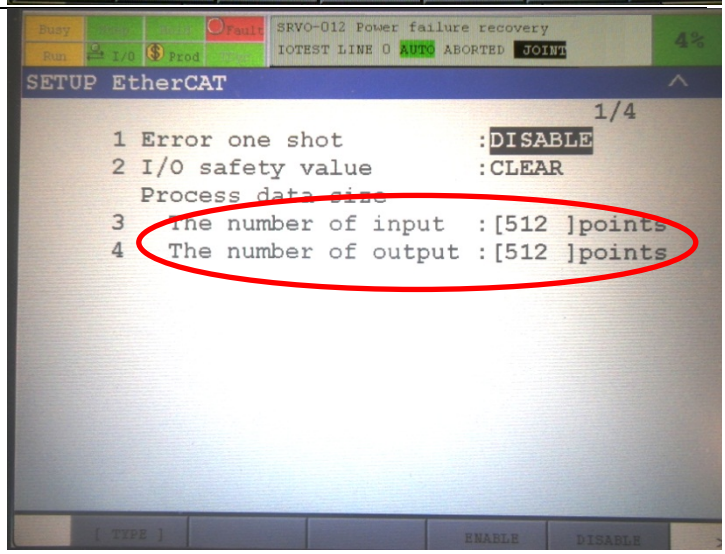
1 The following switch and keys are used to operate the Teach pendant. (Refer to the right figure.)

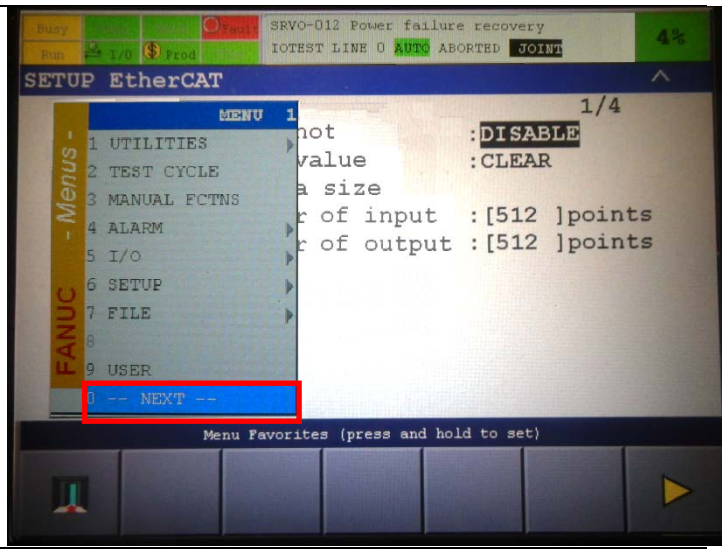
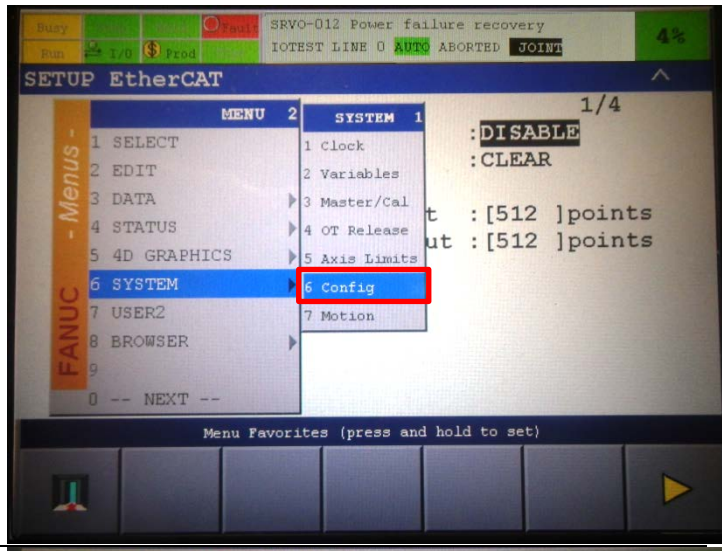
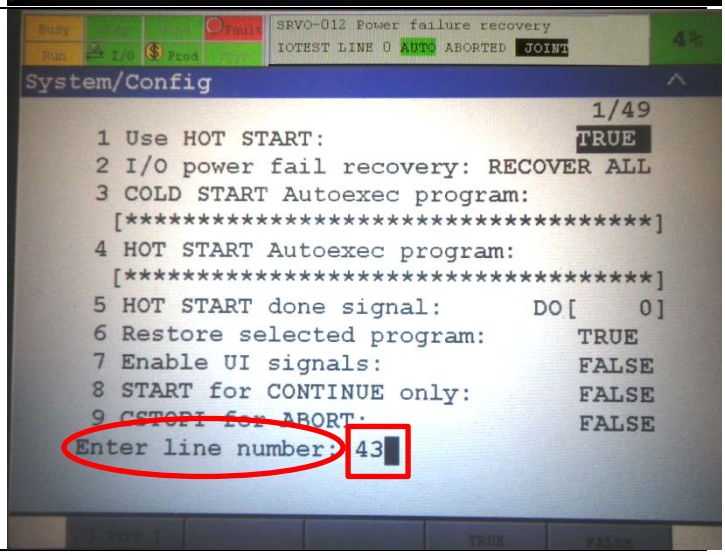
・Switch
Teach pendant enable switch

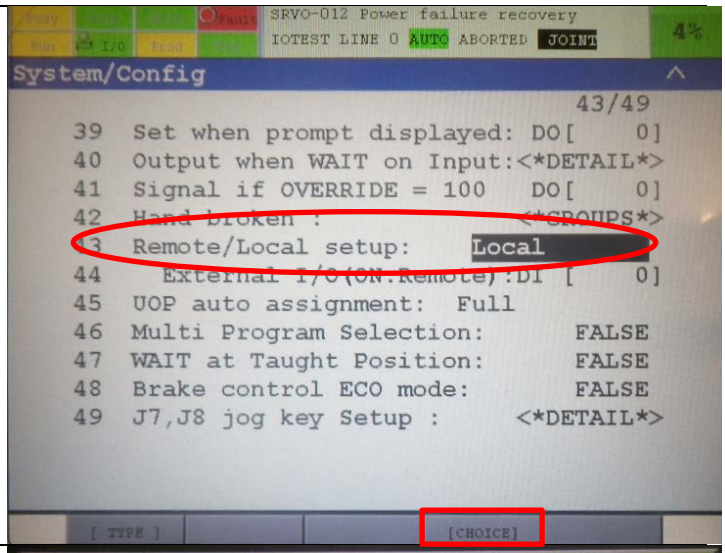
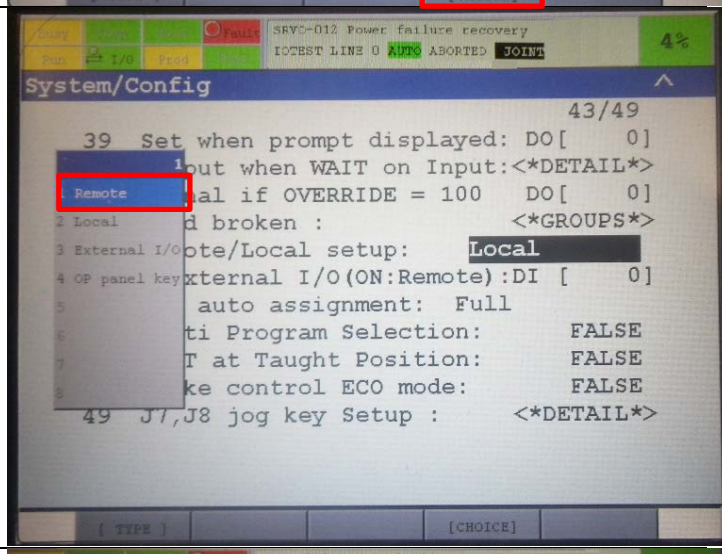
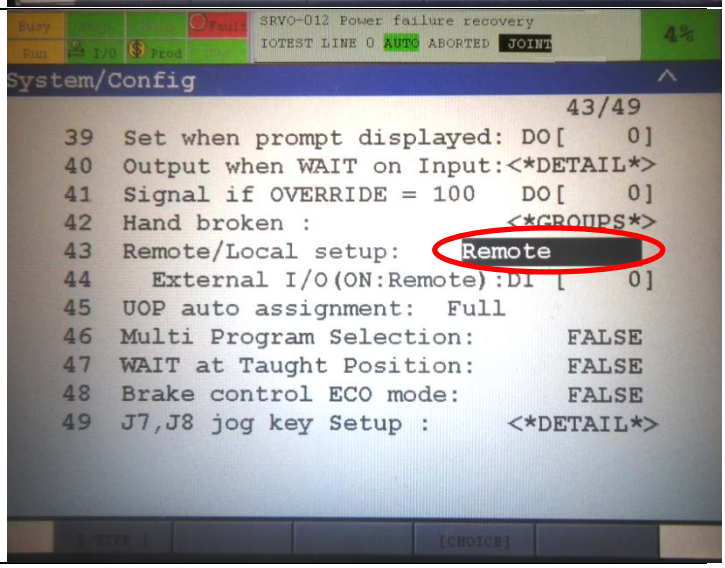
・Keys
Function (F) keys: F1 to 5, NEXT key, MENU key, Cursor keys (arrows), ITEM key, ENTER key, and Numeric keys: 0 to 9.



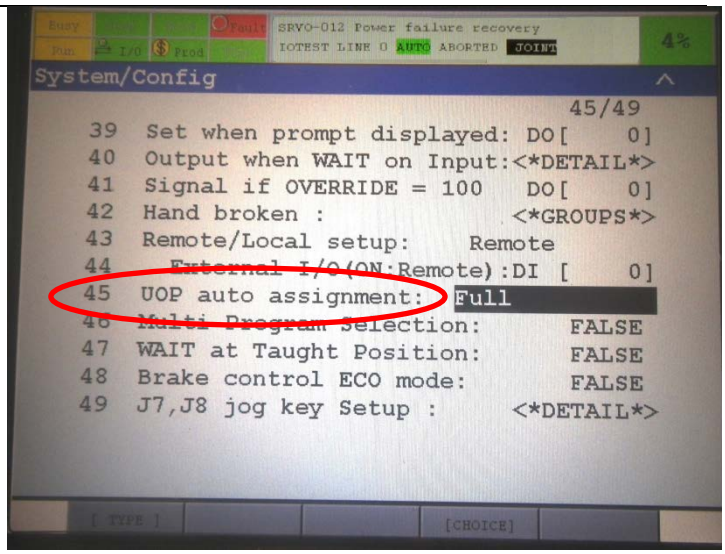
(Teach pendant)

2	Turn *OFF* (disable) the Teach pendant enable switch on the Teach pendant.	 OFF ON (Upper left of Teach pendant)
3	Press the **MENU** key on the Teach pendant. *After power ON, a message appears indicating the initialization is being processed. Then, the operation screen that was displayed before power OFF appears. Do not start operation until the operation screen has been displayed.	
4	Select ***6 SETUP*** from the MENU 1 Menu and select ***EtherCAT*** with the cursor key. Press the **ENTER** key. * The above setting operation can be executed whatever type of configuration is displayed on the screen.	
5	The SETUP EtherCAT Screen is displayed. Confirm that the settings are made as follows: The number of input: 512 points The number of output: 512 points *If any change is made to the setting, cycle the power supply. After restarting, the changes become available.	

6	Press the **MENU** key on the Teach pendant. Select ***0 --NEXT--*** from the MENU 1 Menu with the cursor key. Press the **ENTER** key.	
7	Confirm that the screen changes to MENU 2. Select ***6 SYSTEM*** – ***6 Config*** from the MENU 2 Menu with the cursor key. Press the **ENTER** key.	
8	The System/Config Screen is displayed. Press the **ITEM** key on the Teach pendant to display " Enter line number". Enter *43* to display "43 Remote/Local setup". Press the **ENTER** key.	

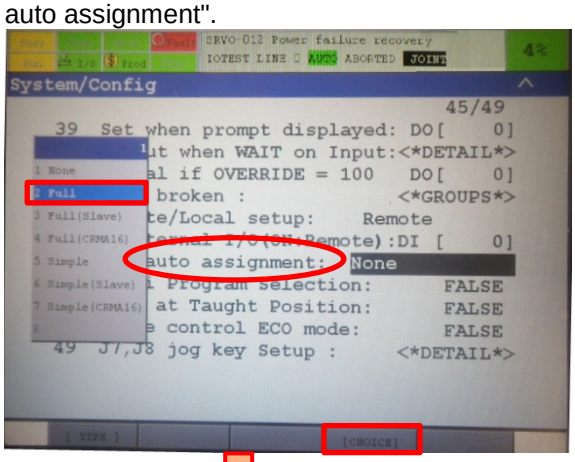
9	The cursor moves to "43 Remote/Local setup". Press the **F4** key (CHOICE).	
10	A screen menu is displayed. Select ***1 Remote*** with the cursor key. Press the **ENTER** key.	
11	Confirm that "43 Remote/Local setup" changes to Remote.	

12 Move the cursor to "45 UOP auto assignment" with the cursor key. Confirm that Full is indicated.



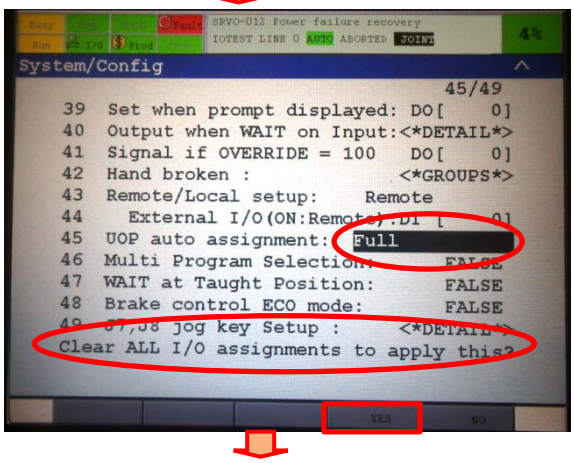
(Additional information)
* Assign I/O by changing the setting of "45 UOP auto assignment". Press the **F4** key (CHOICE) to display a screen menu and select ***2 Full***.

(Additional information)
When assigning I/O by changing the setting of "45 UOP auto assignment".

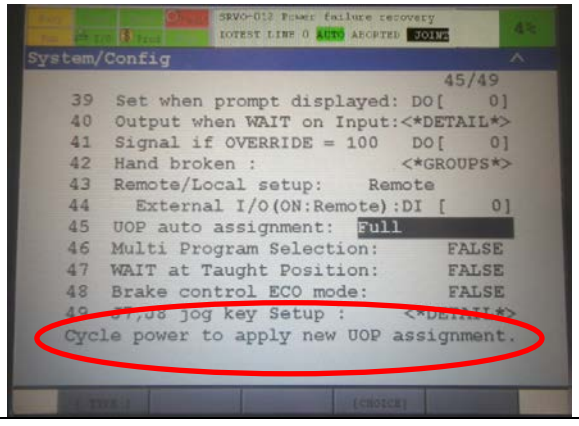


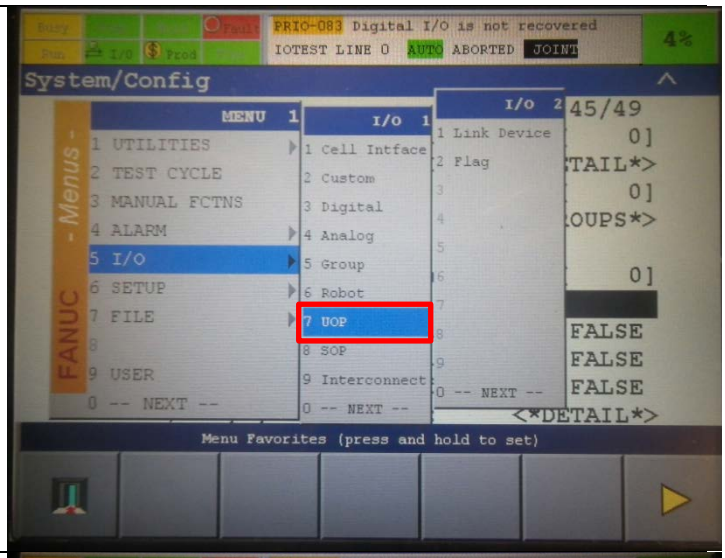
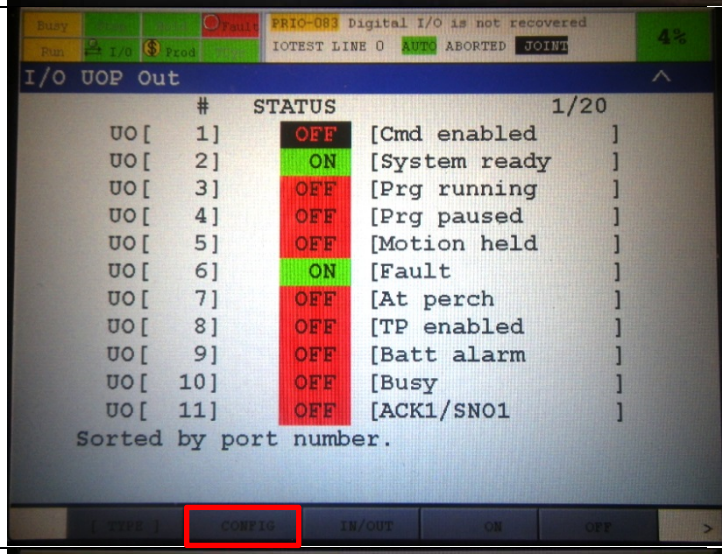
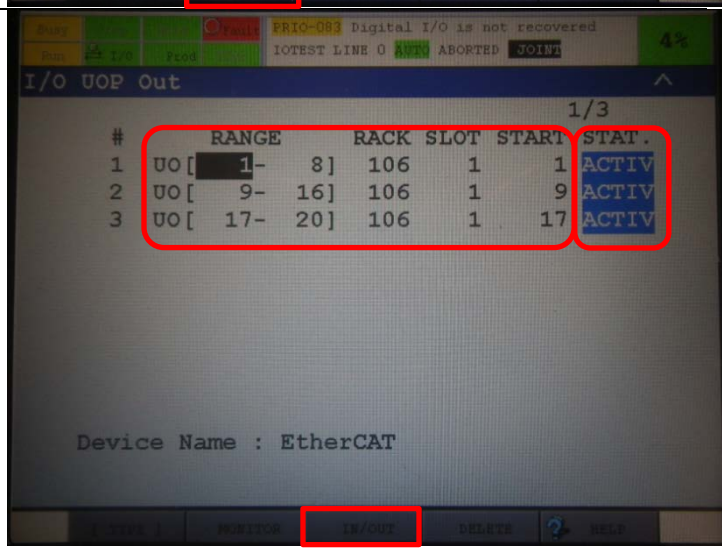
*"45 UOP auto assignment" indicates Full.
A message appears indicating "Clear ALL I/O assignments to Apply this?".

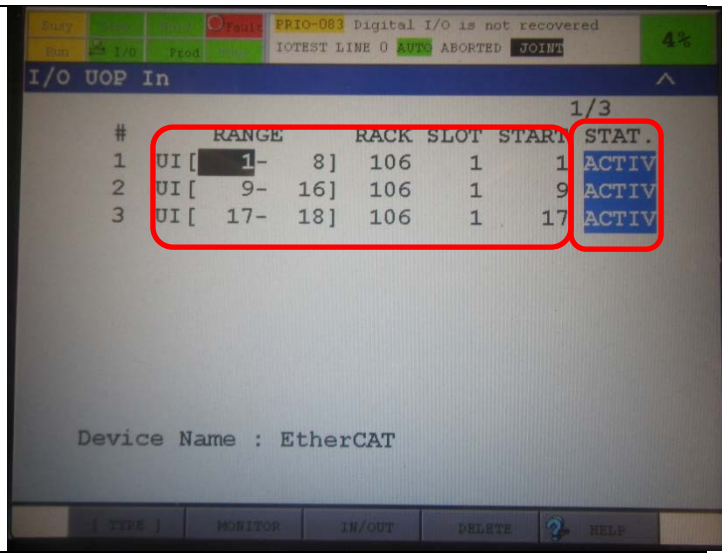
Check the contents and press the F4 key (CHOICE) to delete all the I/O assignments.



*A message appears indicating "Cycle power to apply new UOP assignment".
Cycling the power supply.
After power ON, UOP is automatically assigned according to the setting.
After restarting, the System/Config Screen is displayed.
Perform step 13.



13	Select ***5 I/O*** - ***7 UOP*** from the MENU 1 Menu with the cursor key. Press the **ENTER** key.	
14	The I/O UOP Out Screen is displayed. Press the **F2** key (CONFIG).	
15	The I/O UOP Out Screen is displayed for assignment. Confirm that the following settings are made for RANGE, RACK, SLOT, START. RANGE: RACK: SLOT: START ・UO[1-8]:106:1:1 ・UO[9-16]:106:1:9 ・UO[17-20]:106:1:17 Confirm that STATUS is ACTIV. *If the settings are different from the above, try again from step 3 to automatically assign UOP. Press the **F3** key (IN/OUT).	

16	The I/O UOP In Screen is displayed. Confirm that the following settings are made for RANGE, RACK, SLOT, START. RANGE: RACK: SLOT: START ・UI[1-8]:106:1:1 ・UI[9-16]:106:1:9 ・UI[17-18]:106:1:17 Confirm that STATUS is ACTIV. *If the settings are different from the above, try again from step 3 to automatically assign UOP.	

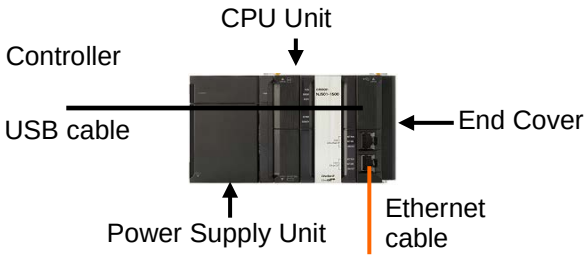
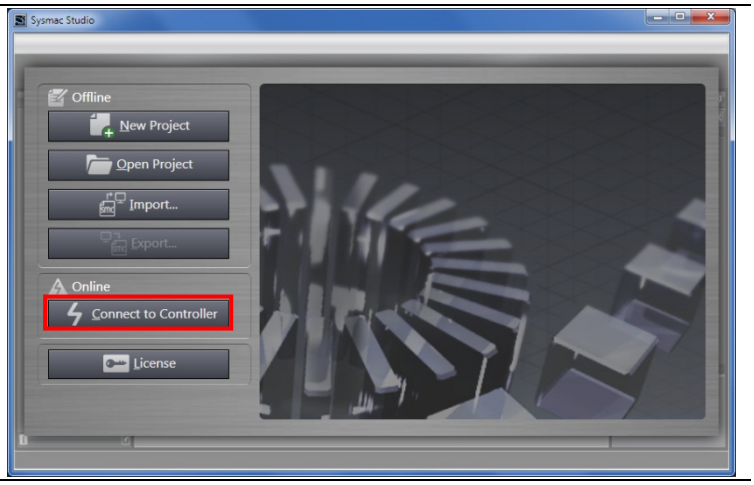
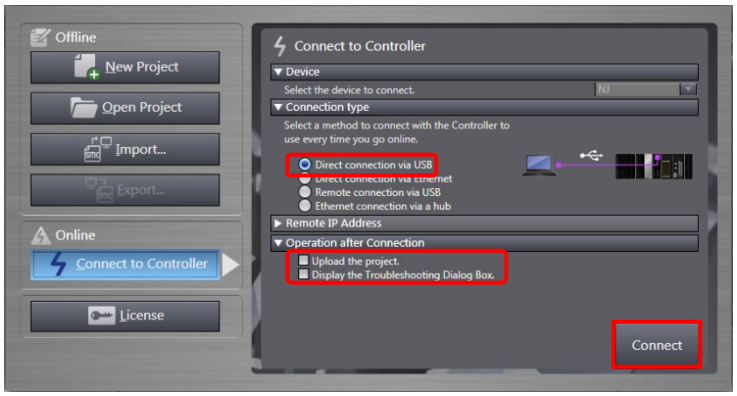
7.3. Setting Up the Controller

Set up the Controller.

7.3.1. Starting the Sysmac Studio and Installing the ESI File

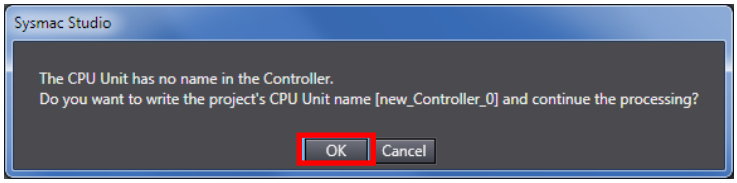
Install the ESI file for the Robot Controller in the Sysmac Studio.

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

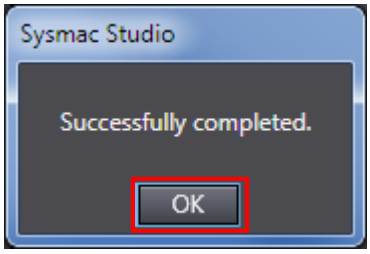
1	Connect the Ethernet cable to the built-in EtherCAT port (PORT2) of the Controller and connect the USB cable to the peripheral (USB) port. As shown in *5.2. Device Configuration*, connect the Personal computer, Robot Controller, and Controller.	
2	Turn ON the power supply to the Controller.	
3	Start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

5 A confirmation dialog box on the right is displayed. Check the contents and click the **OK** Button.

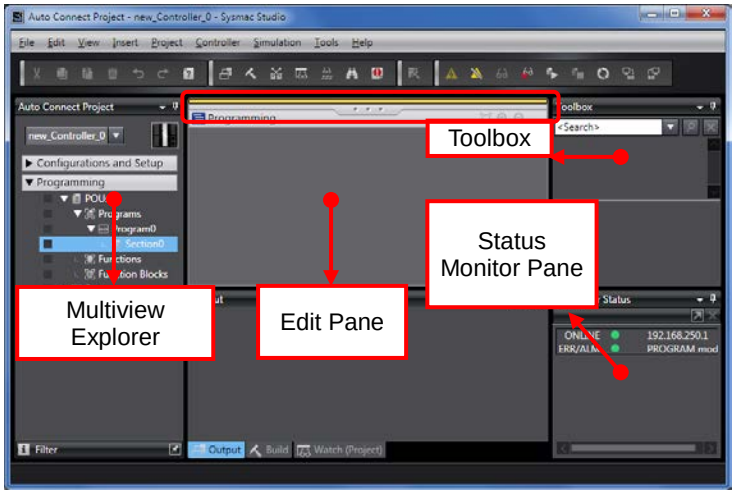
*The displayed dialog depends on the status of the Controller used. Check the contents and click the **OK** or **Yes** Button to proceed with the processing.



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



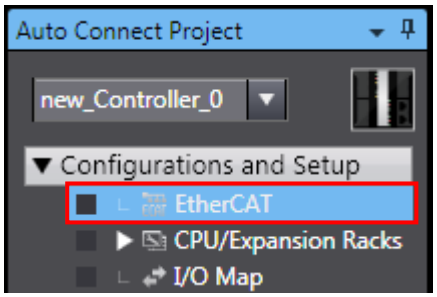
7 The Auto Connect Project Dialog Box is displayed online. When an online connection is established, a yellow bar is displayed on the Pane.
The left pane is called Multiview Explorer, the top right pane is called Toolbox, the bottom right pane is called Status Monitor Pane, and the middle pane is called Edit Pane.



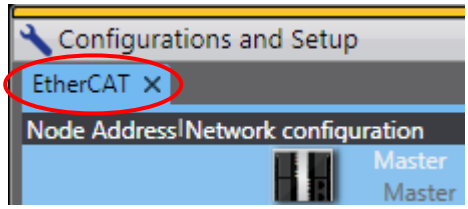
Additional Information

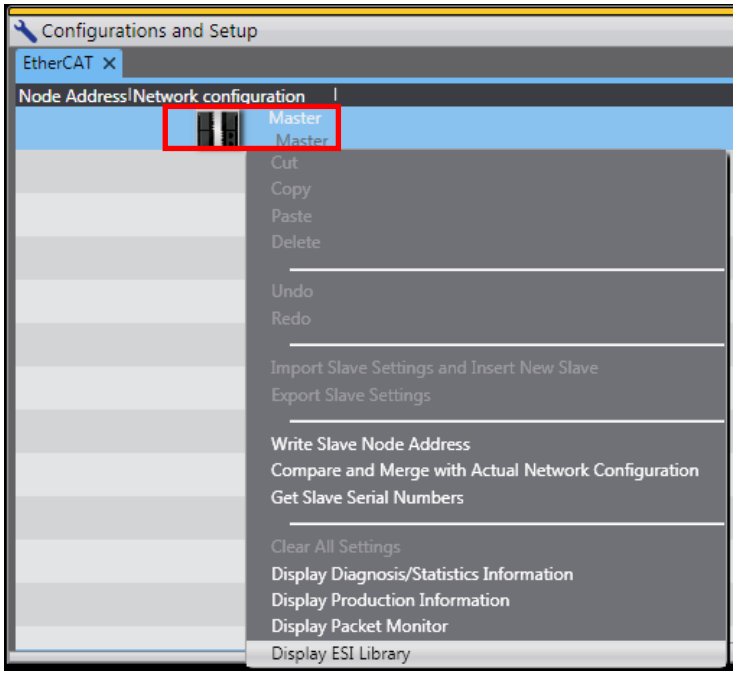
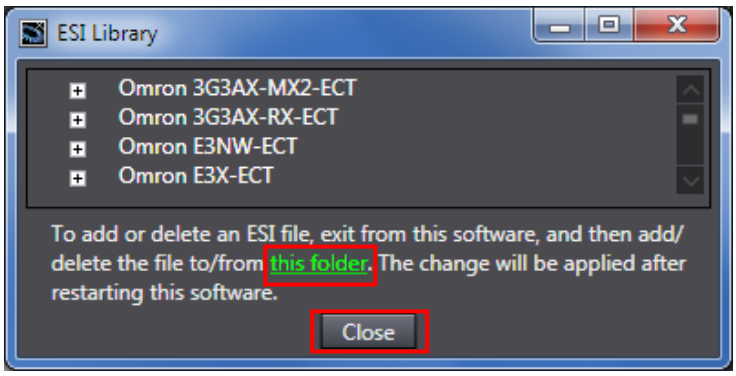
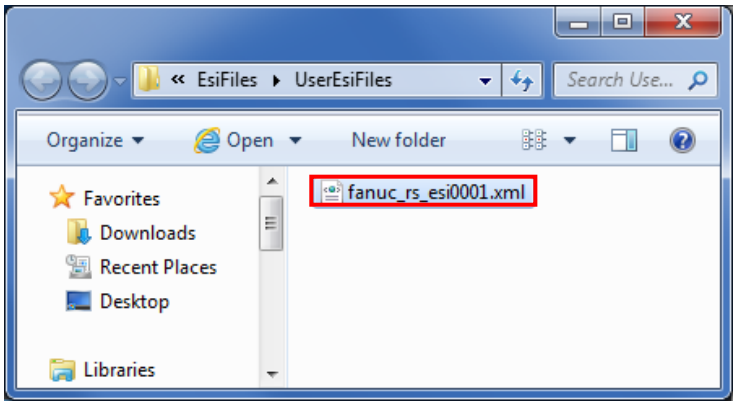
For details on online connections to a Controller, refer to *Section 6 Online Connections to a Controller* of the *Sysmac Studio Version 1 Operation Manual* (Cat. No. W504).

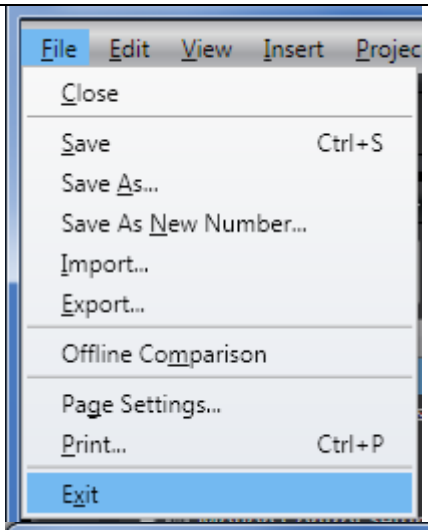
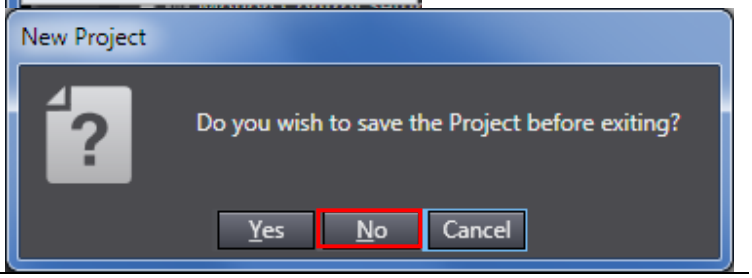
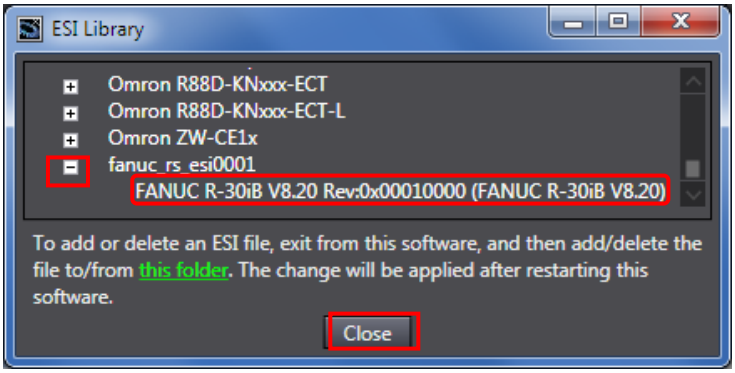
8 Double-click **EtherCAT** under **Configurations and Setup** in the Multiview Explorer.



9 The EtherCAT Tab Page is displayed in the Edit Pane.



10	Right-click **Master** and select ***Display ESI Library***.	
11	The ESI Library Dialog Box is displayed. Click the **this folder** link. When the Explorer starts, close the dialog box by clicking the **Close** Button.	
12	The Explorer starts and a folder is opened, allowing you to install the ESI file. Copy the prepared *fanuc_rs_esi0001.xml* to this folder.	

13	Select ***Exit*** from the File Menu to exit the Sysmac Studio. A dialog box is displayed confirming whether to save the project. If you do not need to save it, click the **No** Button. *You need to restart the Sysmac Studio after installing the ESI file.	 
14	In the same way as steps 3 to 10, restart the Sysmac Studio and display the ESI Library Dialog Box. Click the **+** Button of fanuc_rs_esi0001 to confirm that the FANUC R-30iB V8.20 Rev:0x00010000 device is displayed. Confirm that an exclamation mark (warning) is not displayed. Click the **Close** Button.	

Precautions for Correct Use

If an exclamation mark (warning) is displayed for the ESI file, check the name of the ESI file and obtain the ESI file with a correct name. If an exclamation mark (warning) is displayed even when the name of the ESI file is correct, the file may be corrupted.
Contact the device manufacturer.

7.3.2. Setting Up the EtherCAT Network Configuration

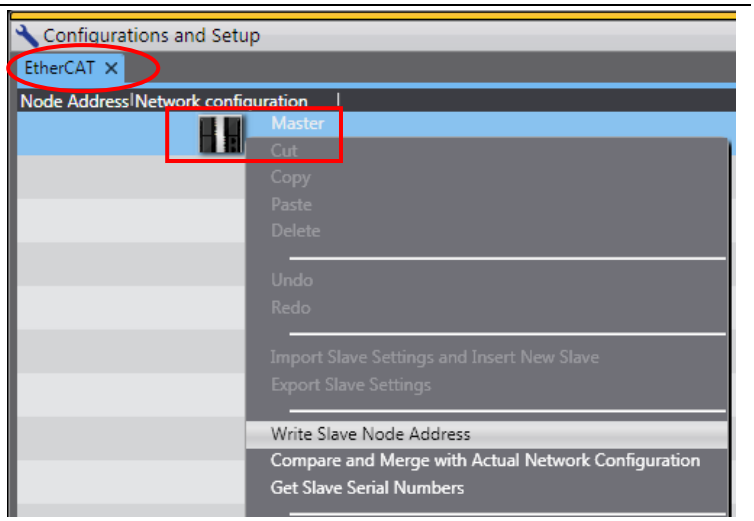
Set up the EtherCAT network configuration.

⚠ Caution

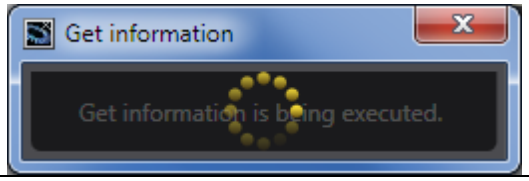
Always confirm safety before you reset the Controller or any devices.

1 Right-click **Master** on the EtherCAT Tab Page of the Edit Pane, and select ***Write Slave Node Address***.

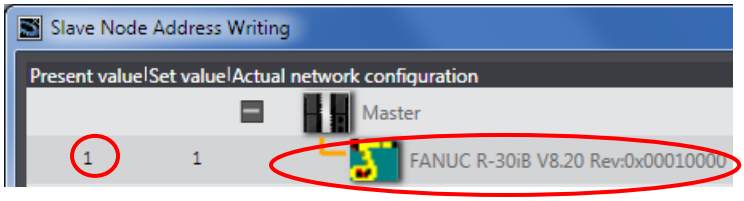
*If the EtherCAT Tab Page is not displayed on the Edit Pane, display it by following step 8 of *7.3.1. Starting the Sysmac Studio and Installing the ESI File*.



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

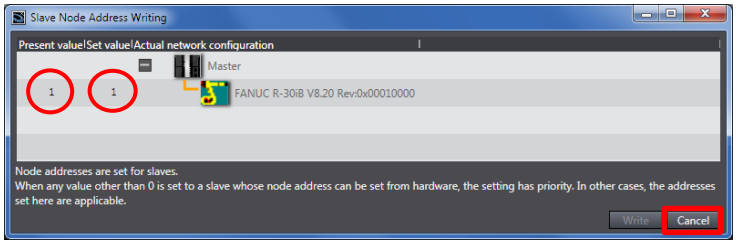


2 The Slave Node Address Writing Dialog Box is displayed.
The present value (setting node address) and FANUC R-30iB V8.20 Rev:0x00010000 are displayed in the Actual network configuration.

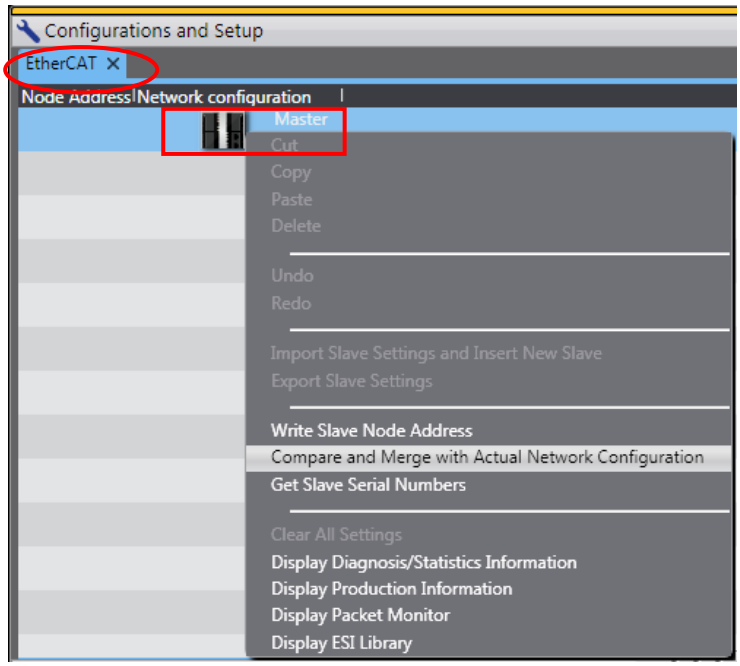


3 Confirm that the node address of present value and set value is 1, respectively.
Click the **Cancel** Button.

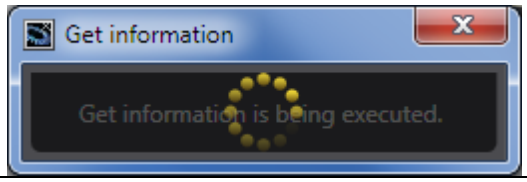
*If the node address of present value is not 1, set the value to *1*. Click the **Write** Button.
When finished, cycle the power supply to the Slave Unit.



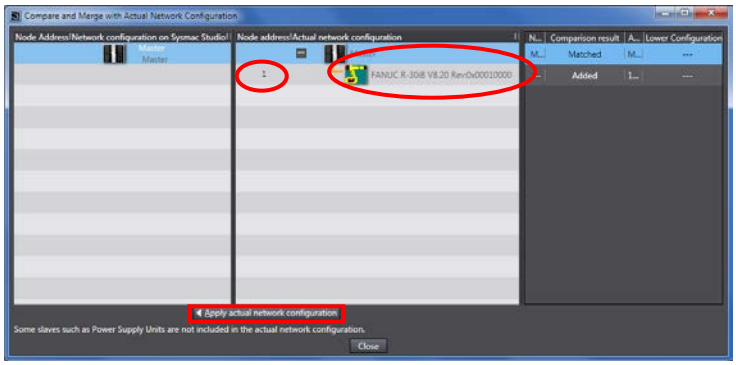
4 The EtherCAT Tab Page is displayed again. Right-click **Master** and select ***Compare and Merge with Actual Network Configuration***.



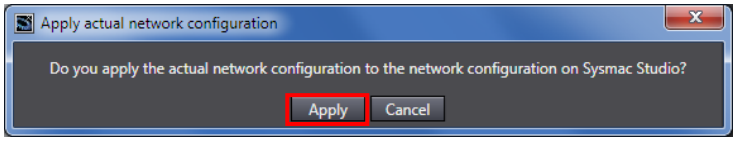
A screen is displayed stating "Get information is being executed".



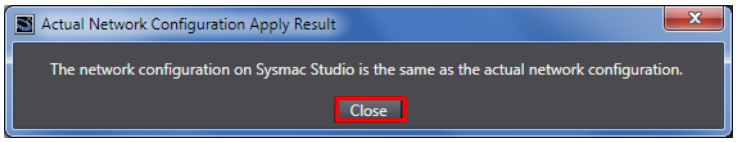
5 The Compare and Merge with Actual Network Configuration Dialog Box is displayed.
Node address 1 and FANUC R-30iB V8.20 Rev:0x00010000 are added to the Actual network configuration after the comparison.
Click the **Apply actual network configuration** Button.

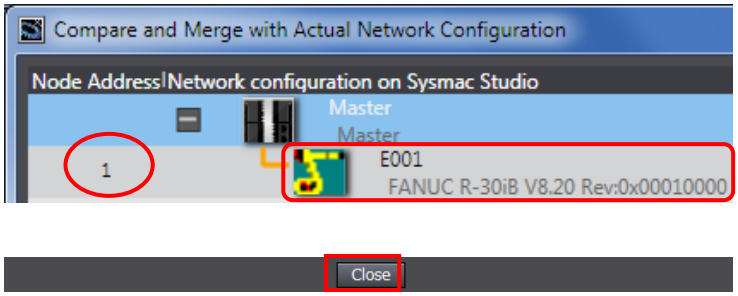
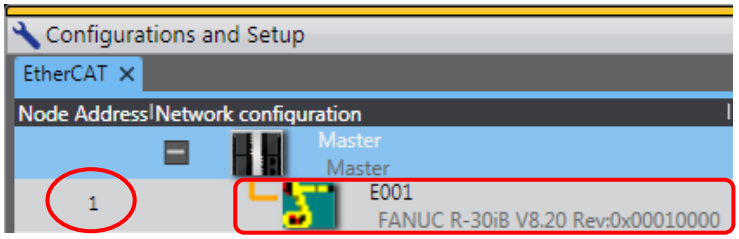


6 A confirmation dialog box is displayed. Check the contents and click the **Apply** Button.



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

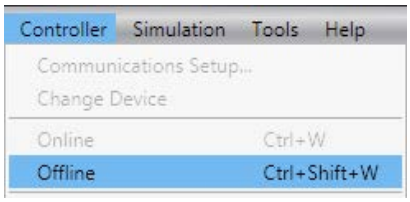


7	Node address 1, E001, and FANUC R-30iB V8.20 Rev:0x00010000 are added to the Network configuration on Sysmac Studio. Confirm that the data above are added and click the **Close** Button.	
8	Node address 1, E001, and FANUC R-30iB V8.20 Rev:0x00010000 are added to the EtherCAT Tab Page on the Edit Pane.	

7.3.3. Setting the Device Variables

Set the device variables used for the EtherCAT Slave Unit.

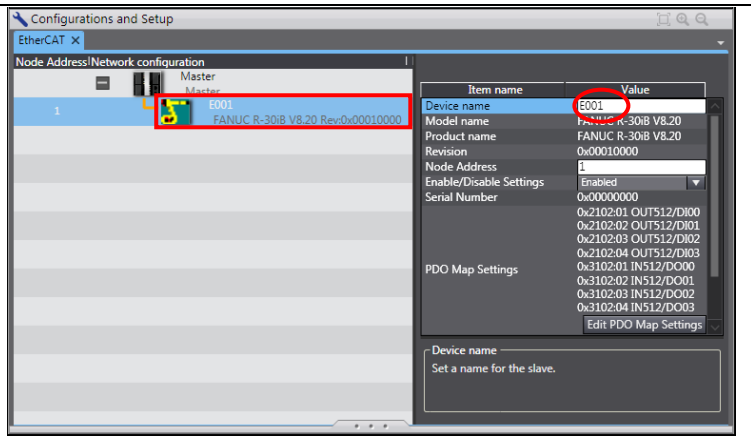
1 Select ***Offline*** from the Controller Menu.



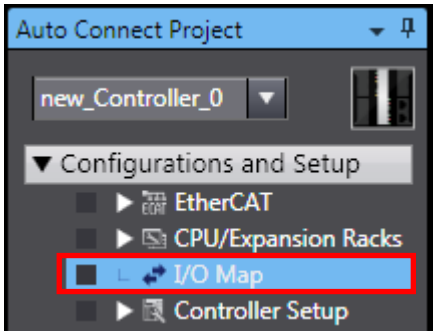
The yellow bar on the top of the Edit Pane disappears.

2 Select **FANUC R-30iB V8.20 Rev:0x00010000** set in the previous step in the EtherCAT Tab Page and confirm that Device name is E001.

*Device name can be changed as desired.

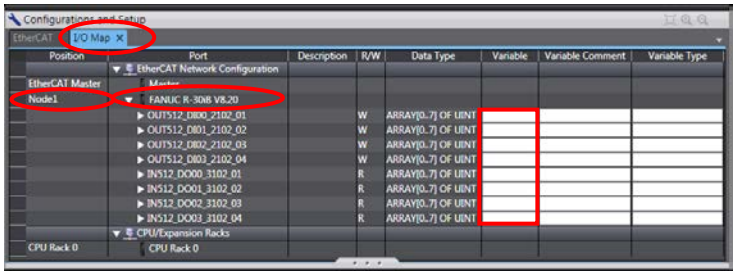


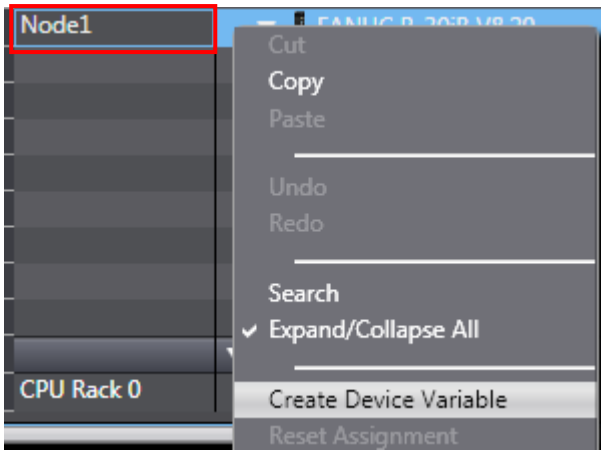
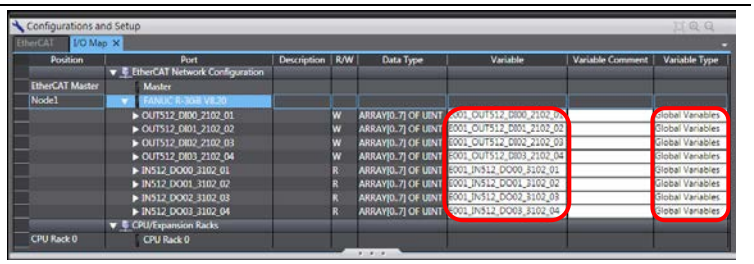
3 Double-click **I/O Map** under **Configurations and Setup** in the Multiview Explorer.



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

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



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

Additional Information

The device variables are named automatically from a combination of the device names and the port names. The default device names are “E" followed by a serial number that starts from 001.

Additional Information

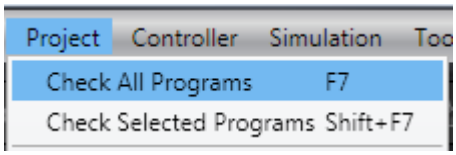
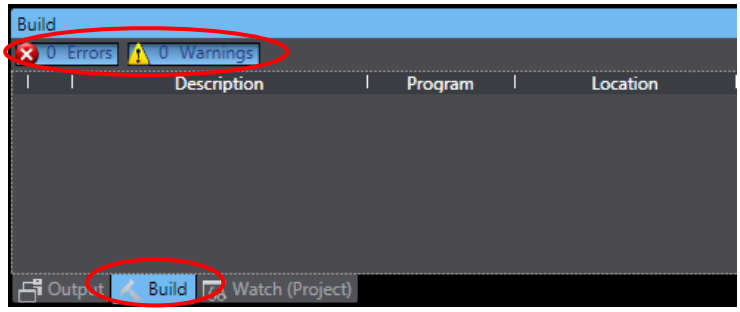
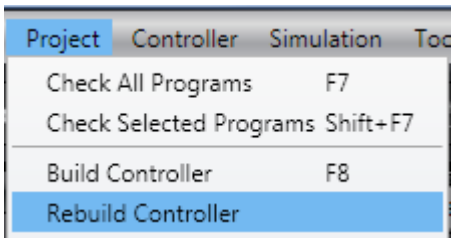
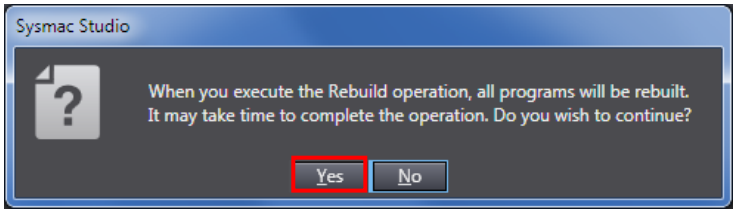
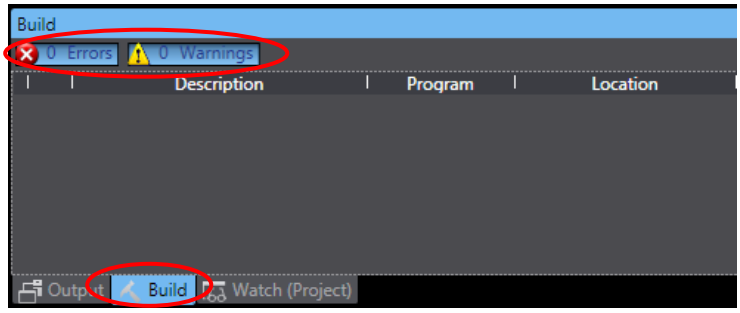
In this document, device variables are automatically named for a unit (a slave).
Device variables can also be automatically named for I/O ports.

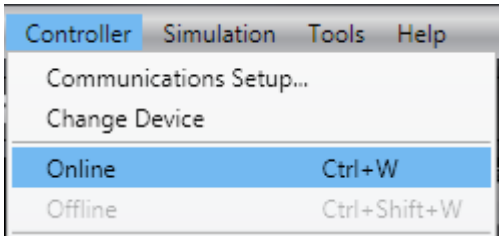
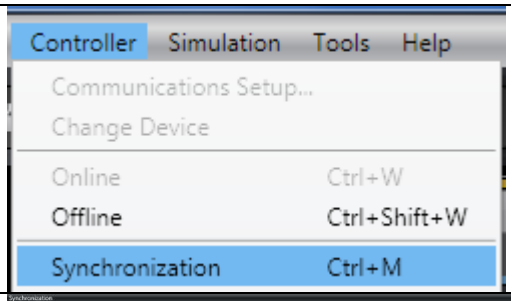
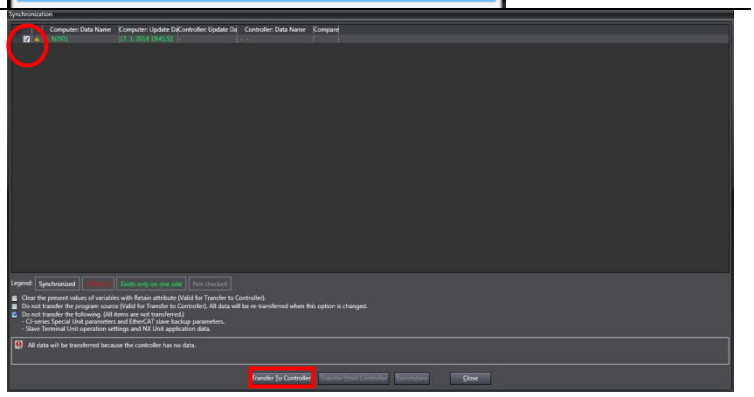
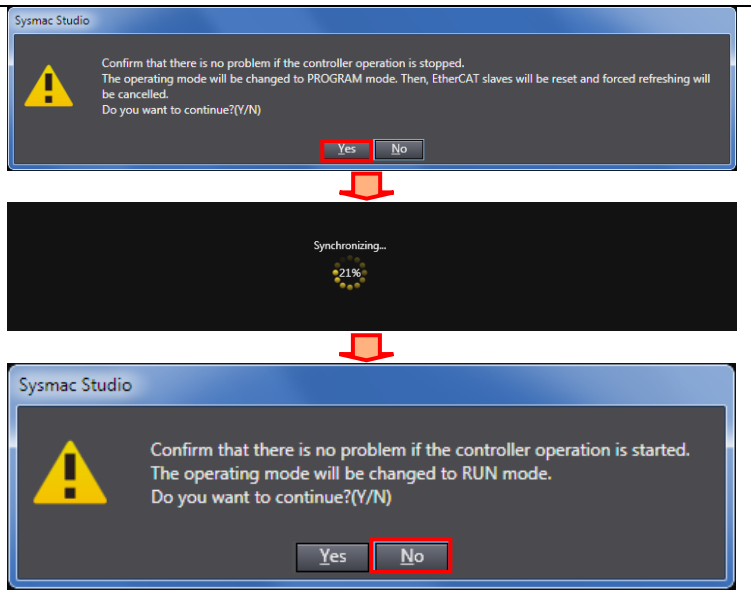
7.3.4. Transferring the Project Data

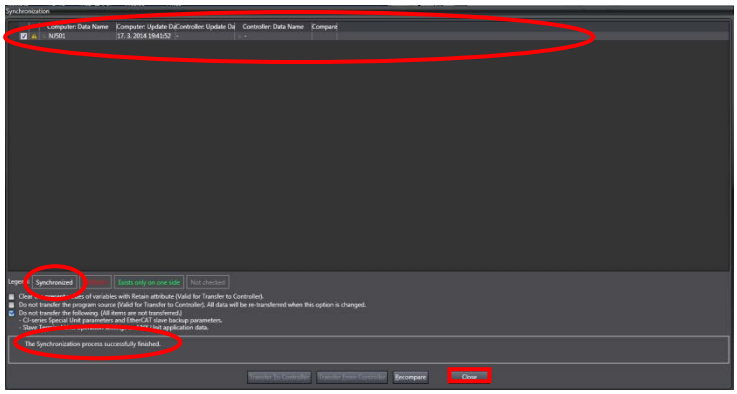
Transfer the project data from the Sysmac Studio to the Controller.

⚠ WARNING

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

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

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

10	Confirm that the synchronized data is displayed with the color specified by "Synchronized", and that a message is displayed stating "The synchronization process successfully finished". If there is no problem, click the **Close** Button. *A message stating "The synchronization process successfully finished" is displayed if the Sysmac Studio project data and the data in the Controller match each other. *If the synchronization fails, check the wiring and repeat from step 1.	

7.4. Checking the EtherCAT Communications

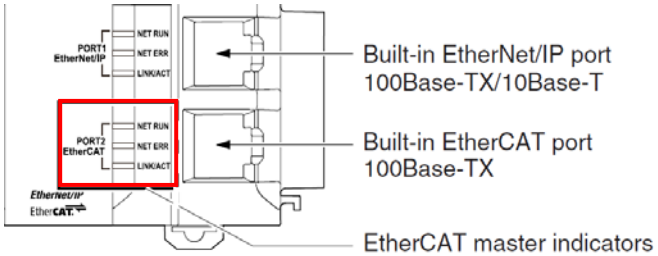
Confirm that the PDO Communications of EtherCAT are performed normally.

7.4.1. Checking the Connection Status

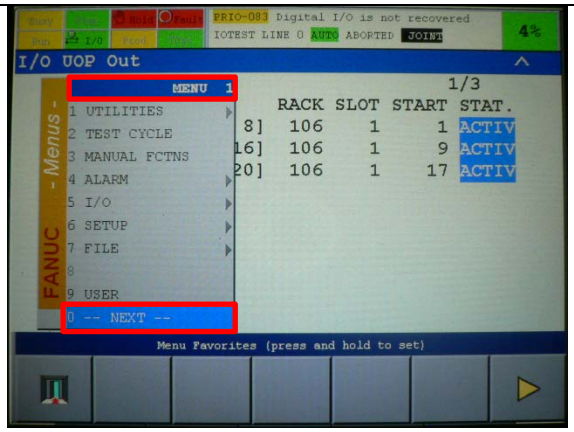
Check the connection status of the EtherCAT network.

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

The LED indicators in normal status are as follows:
[NET RUN]: Lit green
[NET ERR]: Not lit
[LINK/ACT]: Flashing yellow

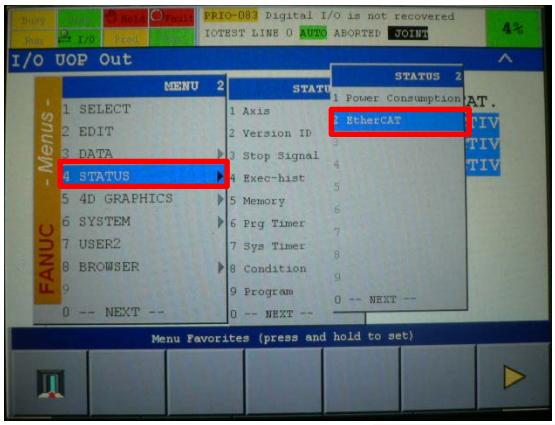


2 Select ***0 --NEXT--*** from the MENU 1 Menu of the Teach pendant on the Robot Controller with the cursor key.
Press the **ENTER** key.



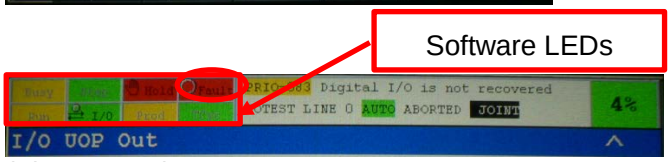
(FANUC Teach pendant)

Select ***4 STATUS*** from the MENU 2 Menu, and then select ***EtherCAT*** with the cursor key.
Press the **ENTER** key.

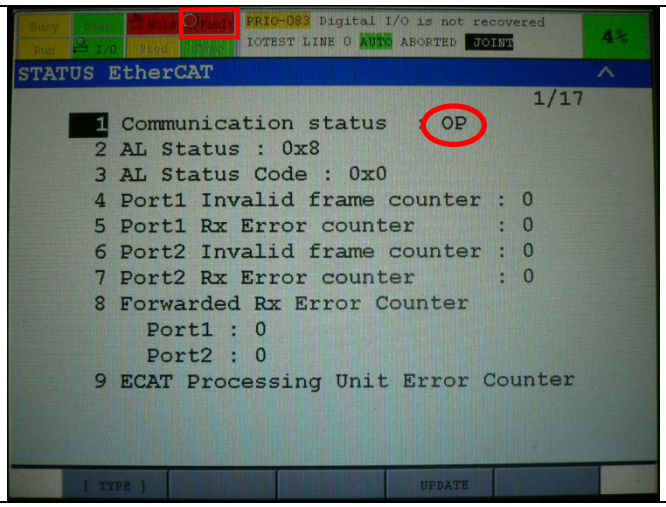
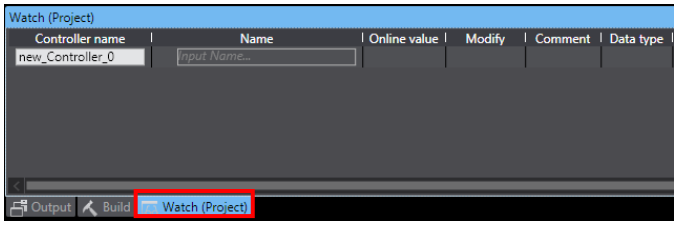
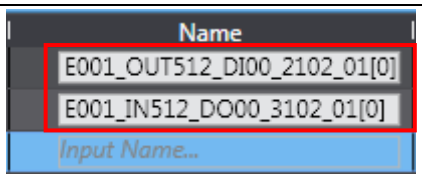
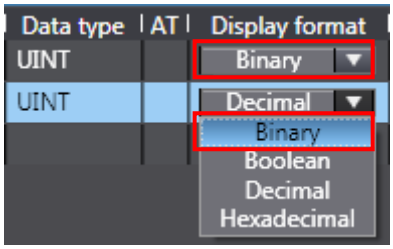


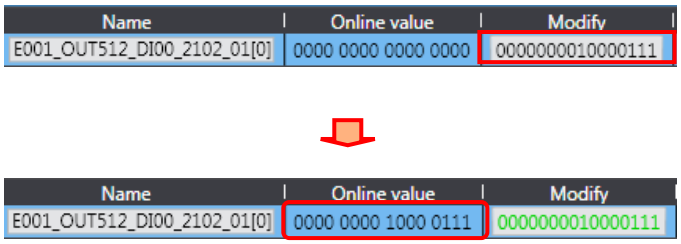
*The software LED "Fault" indicated by a red circle shows the following status:
Lit red (ON): Alarm occurs.
Lit green (OFF): Alarm released.

* If the software LED "Fault" is lit red (ON), resolve the cause of the alarm and release them by performing steps 4 to 8.



(Alarm status)

3	Confirm that the EtherCAT communications are performed normally on the Teach pendant. The following are displayed. Communication status: OP Software LED "Fault": Lit red (ON) *Software LED "Fault" can be lit red under an error status other than an EtherCAT error.	
4	Take the following steps to release the alarm caused by other than an EtherCAT communications error on the Robot Controller. Select the **Watch (Project)** Tab Page.	
5	Enter the following names in the Watch (Project) Tab Page for monitoring. Click an *Input Name*… in the *Name* Column to enter a new name. *E001_OUT512_DI00_2102_01[0]* *E001_IN512_DO00_3102_01[0]*	
6	Select ***Binary*** from the pull-down list of Display format of the variable you set.	

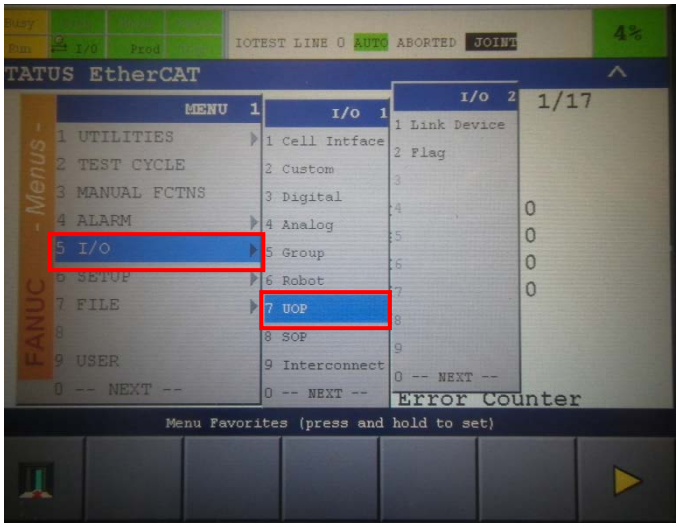
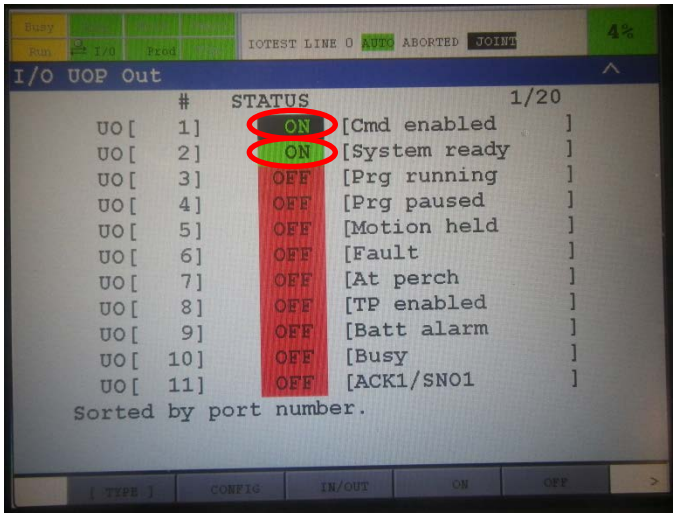
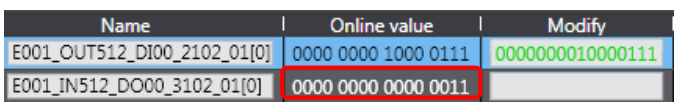
7	Enter *0000 0000 1000 0111* in the *Modify* Column of *E001_OUT512_DI00_2102_01[0]*. The Online value of *E001_OUT512_DI00_2102_01[0]* changes to 0000 0000 1000 0111. *As shown on the right figure, turn ON UI[1](*IMSTP:immediate stop), UI[2](*Hold: temporary stop), UI[3](*SFSPD: safety speed), and UI[8](Enable: ENBL). Do not turn ON UI[6](Start: external start), UI[7](Home: Homing),and UI[18](Prod Start: automatic operation start).	
8	Press the **Alarm release** Button on the front panel of the Robot Controller.	

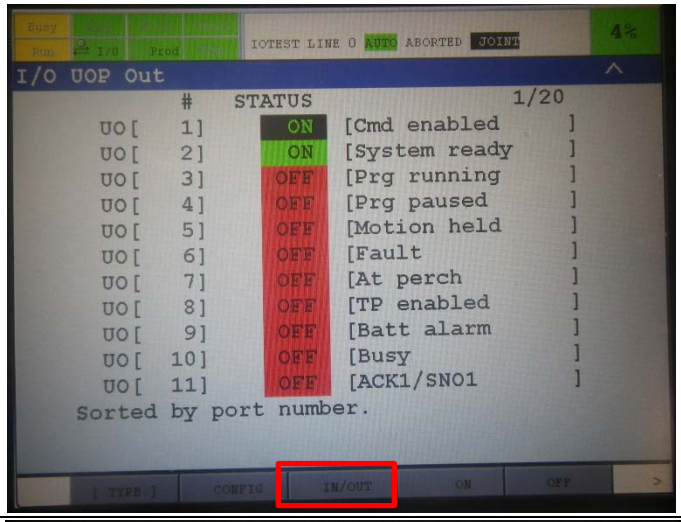
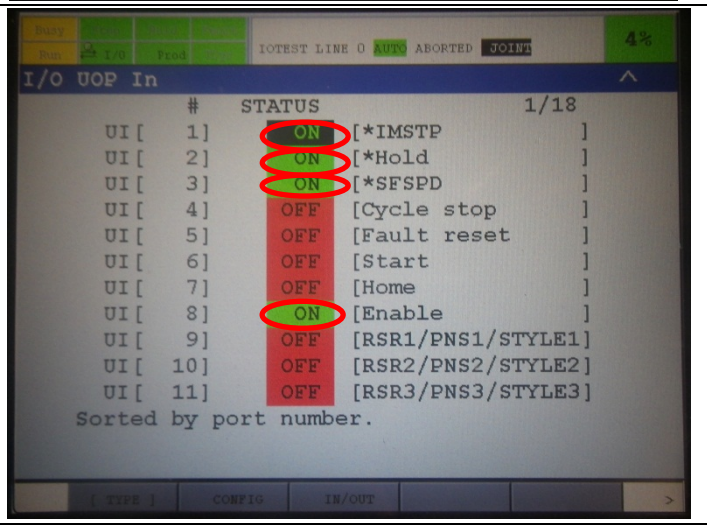
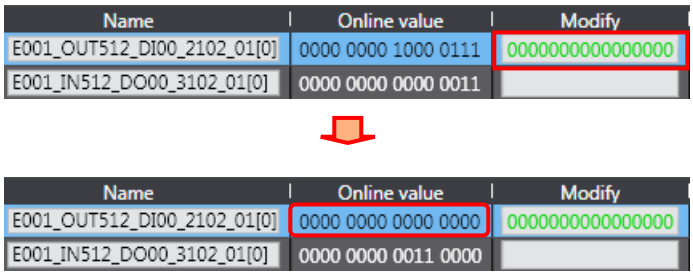
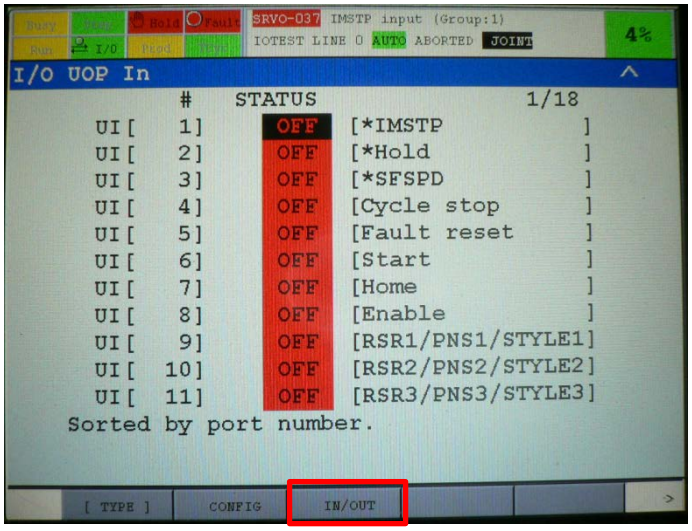
7.4.2. Checking the Data that are Sent and Received

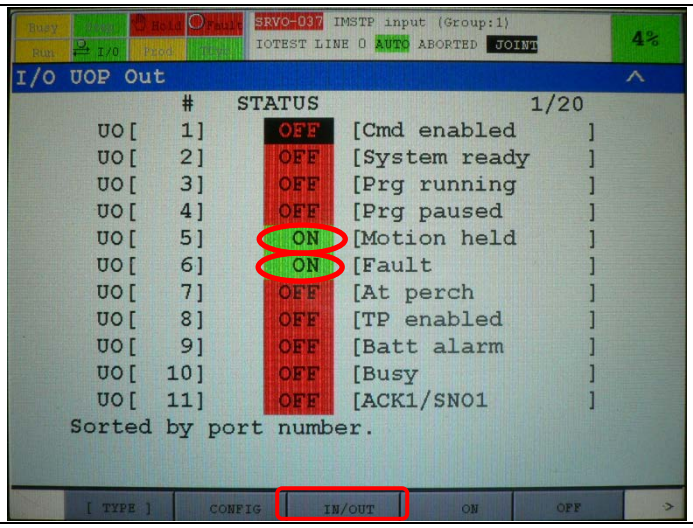
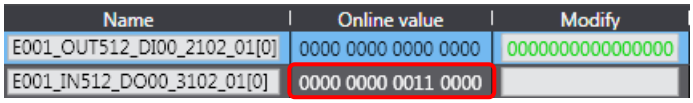
Confirm that the correct data are sent and received.

⚠ WARNING

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

1	Press the **MENU** key on the Teach pendant. Select ***5 I/O*** - ***7 UOP*** from the MENU 1 Menu with the cursor key. Press the **ENTER** key.	
2	The I/O UOP Out Screen is displayed. On the right figure, UO[1] and UO[2] are turned ON that shows the status of the Robot Controller.	
3	The Online value of *E001_IN512_DO00_3102_01[0]* changes to 0000 0000 0000 0011. *For information on how to set the Watch Tab Page, refer to steps 5 to 8 of *7.4.1. Checking the Connection Status*.	

4	Press the **F3** key (IN/OUT).	
5	The I/O UOP In Screen is displayed. On the right figure, UI[1], UI[2], UI[3], UI[8] of the Robot Controller are turned ON.	
6	Enter *0000 0000 0000 0000* in the *Modify* Column of *E001_OUT512_DI00_2102_01[0]*. The Online value of *E001_OUT512_DI00_2102_01[0]* changes to 0000 0000 0000 0000.	
7	The I/O UOP In Screen is displayed. Press the **F3** key (IN/OUT).	

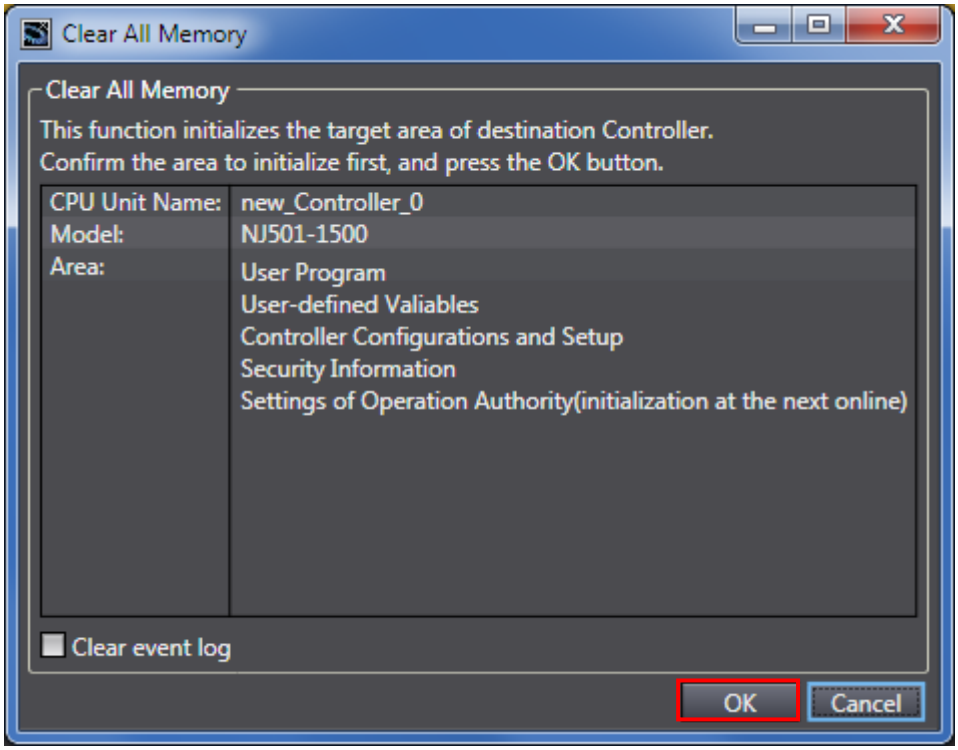
8	The I/O UOP Out Screen is displayed. On the right figure, UO[5] and UO[6] are turned ON that shows the status of the Robot Controller.	
9	The Online value of *E001_IN512_DO00_3102_01[0]* changes to 0000 0000 0011 0000. *For information on how to release the software LED "Fault" by turning ON UO[1](Cmd Enabled) and UO[2](System Ready), refer to steps 4 to 8 of *7.4.1. Checking the Connection Status*.	

8. Initialization Method

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

8.1. Initializing the Controller

To initialize the settings of the Controller, select ***Clear All Memory*** from the Controller Menu of the Sysmac Studio. The Clear All Memory Dialog Box is displayed. Check the contents and click the **OK** Button.



8.2. Initializing the FANUC Robot Controller

The Robot Controller is initialized by restoring a backup of factory default parameters.
For details on how to backup and restore parameters of the Robot Controller, refer to the *FANUC Robot series R-30iB/R-30iB Mate CONTROLLER EtherCAT Interface OPERATOR'S MANUAL*(Cat.No.B-83704EN).

9. Revision History

Revision code	Date of revision	Revision reason and revision page
01	Aug. 18, 2014	First edition

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