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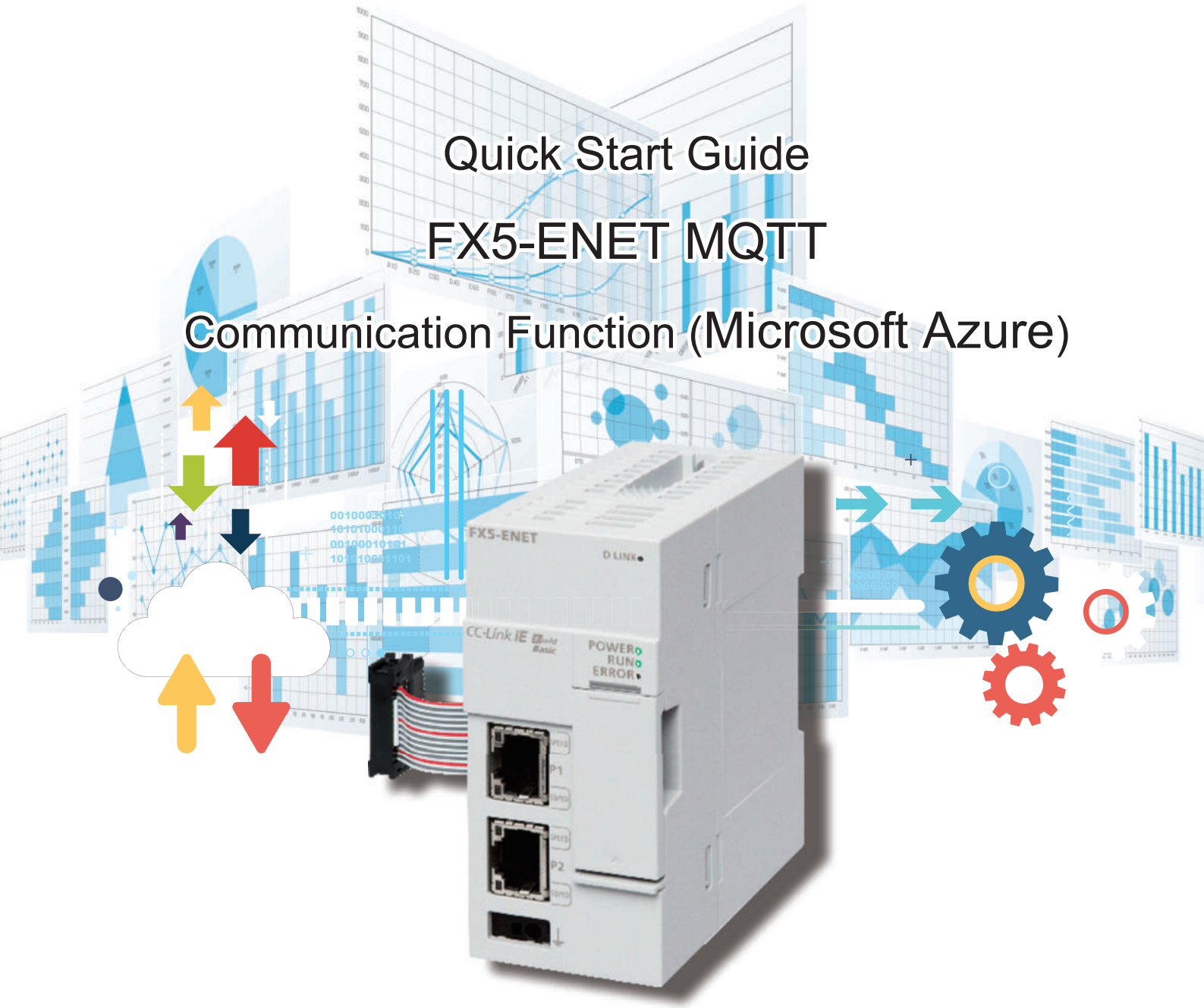
Mitsubishi Electric Programmable Controller
MELSEC iQ-F Series

Quick Start Guide

FX5-ENET MQTT

Communication Function (Microsoft Azure)



MELSEC iQ-F series

INTRODUCTION

Thank you for purchasing the MELSEC iQ-F series.
This manual describes the setting method for connecting to Microsoft Azure (hereinafter referred to as Azure) to send/receive JSON strings using the FX5-ENET Ethernet module (hereinafter referred to as FX5-ENET).
Before using this product, please read this manual and the relevant manuals carefully and develop familiarity with the specifications to handle the product correctly.
When applying the program examples provided in this manual to an actual system, ensure the applicability and confirm that it will not cause system control problems.
The screen images in this manual were captured when the manual was created. For the latest information, check the website of Azure.

Regarding use of this product

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, please contact Mitsubishi Electric sales office.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions into the system.

Note

- If in doubt at any stage during the installation of the product, always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use, please contact your local Mitsubishi Electric representative.
- Mitsubishi Electric will not accept responsibility for actual use of the product based on these illustrative examples. Please use it after confirming the function and safety of the equipment and system.
- The content, specifications etc. of this manual may be changed, for improvement, without notice.
- The information in this manual has been carefully checked and is believed to be accurate; however, if you notice a doubtful point, an error, etc., please contact your local Mitsubishi Electric representative. When doing so, please provide the manual number given at the end of this manual.

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RELEVANT MANUALS

The following relevant manuals can be downloaded from the Mitsubishi Electric FA site.
www.mitsubishielectric.co.jp/fa/ref/ref.html?kisyu=plcf&manual=download_all
[○: Available, —: Not available]

Manual name <manual number>	Available form	
	e-Manual	PDF
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) <SH-082452ENG>	○	○
MELSEC iQ-F FX5 User's Manual (Application) <JY997D55401>	○	○
MELSEC iQ-F FX5 Programming Manual (Program Design) <JY997D55701>	○	○
MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks) <JY997D55801>	○	○
MELSEC iQ-F FX5 User's Manual (Communication) <SH-082625ENG>	○	○
MELSEC iQ-F FX5 Ethernet Module User's Manual <SH-082026ENG>	○	○
GX Works3 Operating Manual <SH-081215ENG>	○	○

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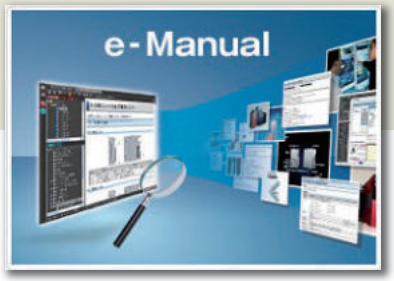

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■Introduction for the concept and features of e-Manual Viewer is available on the following website.
www.mitsubishielectric.com/fa/ref/ref.html?k=plceng&smerit=emaviewer_win
■The installation file for Windows® can be downloaded from the following website.
www.mitsubishielectric.com/fa/ref/ref.html?k=plceng&software=emaviewer_en

TERMS

Unless otherwise specified, this manual uses the following terms.

Term	Description
Broker	An MQTT server that mediates messages (MQTT broker)
Engineering tool	The product name of the software package for the MELSEC programmable controllers
Message	Data to be exchanged between the sender (publisher) and receiver (subscriber)
Publish/Subscribe message exchange model	A protocol capable of one-to-many asynchronous communications. The sender of a message is called a publisher, the receiver is called a subscriber, and an entity playing an intermediate role is called a broker. The term "publish" means "send", and "subscribe" means "receive".
Topic	A key to be used for messaging. In the topic hierarchy, a slash (/) is regarded as a delimiter. For example, when multiple sensors send their individual information to the topic, the messages can be appropriately organized according to their installation location and device name.
Will	This function sends a Will message with a specified Will topic name to subscribers when the publisher is disconnected and the server communications are disabled. If any unexpected disconnection or such an event occurs, subscribers can judge that the publisher is disconnected.

GENERIC TERMS AND ABBREVIATIONS

Unless otherwise specified, this manual uses the following generic terms and abbreviations.

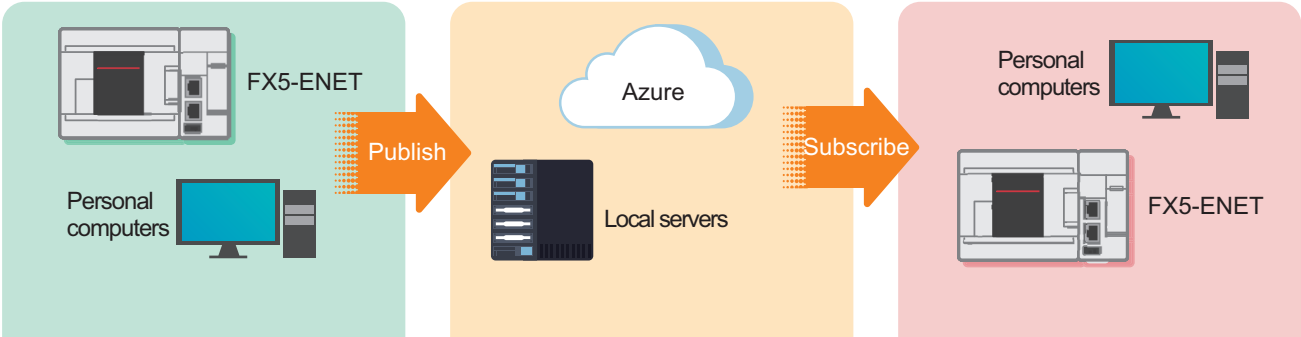
Generic term/abbreviation	Description
FX5U CPU module	A generic term for the FX5U-32MR/ES, FX5U-32MT/ES, FX5U-32MT/ESS, FX5U-64MR/ES, FX5U-64MT/ES, FX5U-64MT/ESS, FX5U-80MR/ES, FX5U-80MT/ES, FX5U-80MT/ESS, FX5U-32MR/DS, FX5U-32MT/DS, FX5U-32MT/DSS, FX5U-64MR/DS, FX5U-64MT/DS, FX5U-64MT/DSS, FX5U-80MR/DS, FX5U-80MT/DS, and FX5U-80MT/DSS
FX5UC CPU module	A generic term for the FX5UC-32MT/D, FX5UC-32MT/DSS, FX5UC-64MT/D, FX5UC-64MT/DSS, FX5UC-96MT/D, FX5UC-96MT/DSS, FX5UC-32MT/DS-TS, FX5UC-32MT/DSS-TS, and FX5UC-32MR/DS-TS
FX5UJ CPU module	A generic term for the FX5UJ-24MR/ES, FX5UJ-24MT/ES, FX5UJ-24MT/ESS, FX5UJ-40MR/ES, FX5UJ-40MT/ES, FX5UJ-40MT/ESS, FX5UJ-60MR/ES, FX5UJ-60MT/ES, FX5UJ-60MT/ESS, FX5UJ-24MR/DS, FX5UJ-24MT/DS, FX5UJ-24MT/DSS, FX5UJ-40MR/DS, FX5UJ-40MT/DS, FX5UJ-40MT/DSS, FX5UJ-60MR/DS, FX5UJ-60MT/DS, and FX5UJ-60MT/DSS
GX Works3	A generic product name for the product model SWnDND-GXW3 (where n represents the version)

KEY FEATURES

Point1

Publish: Sending information collected in the FX5 CPU module to the MQTT broker with the MQTT communication function, Subscribe: Subscribing the information from the MQTT broker

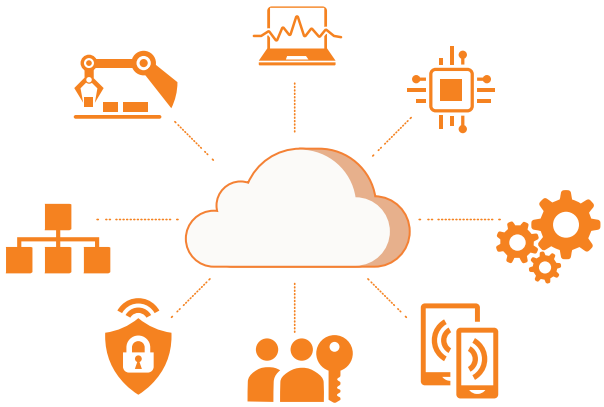
MQTT is an OASIS-standard communication protocol using a publish/subscribe message exchange model. Once the FX5-ENET executes publishing to the MQTT broker, information is distributed to all the information receive devices that have executed the subscribe request.
In addition, secure communication encrypted with TLS (MQTTS) is also supported.



Point2

Cloud connection

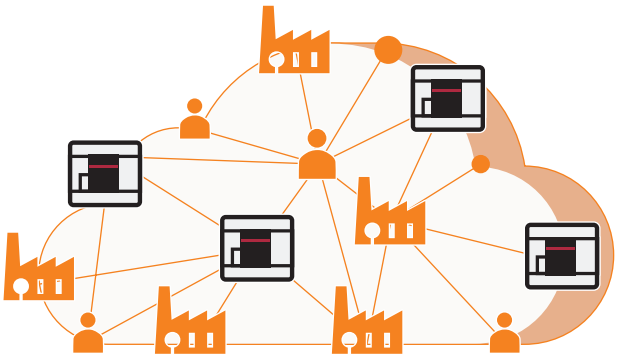
Connecting to Azure enables handling of information without preparation of the computing environment.
Various services prepared by Azure (not only data accumulation, but also services such as data visualization and AI predictions) are available.



Point3

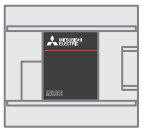
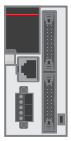
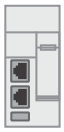
Managing programmable controllers collectively in a wide area

Connecting to Azure enables a wide-area network connection, which achieves quick resource sharing.
In addition, the programmable controllers can be collectively managed by creating a security group or granting the access right.



1 APPLICABLE MODELS

The following models can be used for a series of operations described in this manual.

FX5UJ CPU module	FX5U CPU module	FX5UC CPU module	Ethernet module (FX5-ENET)
			

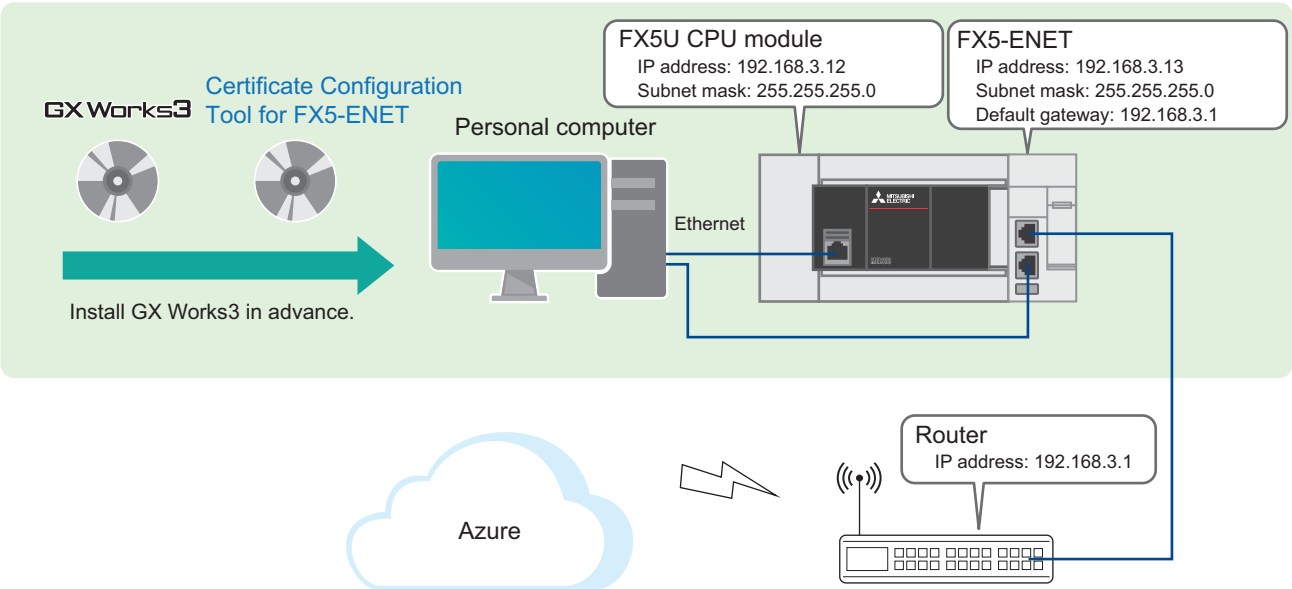
MEMO

2 PREPARATION

This manual describes a configuration example in which an FX5-ENET is connected to an FX5U CPU module and is connected to Azure via a router.
To use applicable CPU modules other than the FX5U CPU module, refer to the following manuals.
📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware)
📖MELSEC iQ-F FX5 Ethernet Module User's Manual, Appendix 7 Added and Changed Functions

2.1 System Configuration

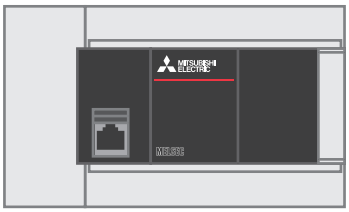
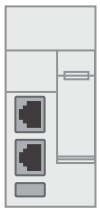
This section describes the system configuration in which one FX5-ENET is connected to one FX5U CPU module and is connected to Azure via a router.



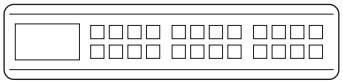
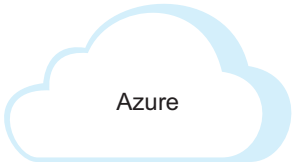
Point

- Register an account for Azure in advance.
- Prepare an Internet line on which a port 8883 can be used.

2.2 Required Products and Software

One FX5U CPU module	One FX5-ENET	Personal computer and software
		
Use an FX5U CPU module that meets the following conditions. • Serial number: 17X**** or later • Firmware version: 1.280 or later	Use an FX5-ENET that meets the following conditions. • Serial number: 234**** or later • Firmware version: 1.200 or later	GX Works3*1 • Applicable software version: 1.095Z or later Certificate Configuration Tool for FX5-ENET*1 • Applicable software version: 1.00A or later

*1 To obtain the latest version, please contact your local Mitsubishi Electric representative.

Router	Three Ethernet cables	Azure account
		
Use the router for connecting the programmable controller to Azure.	Use these cables for connecting the personal computer and the FX5U CPU module, the personal computer and the FX5-ENET, and the FX5-ENET and the router. Use an Ethernet cable compliant with the following standards. • Category 5 or higher, straight cable (double shielded/STP) • IEEE 802.3 (100BASE-TX) • ANSI/TIA/EIA-568-B (Category 5)	Register an account for Azure in advance.

FB library

GX Works3 must import the following.

Name	File name	Reference
Character string operation FB library	StrProcessing_F.mslm	Page 48 FB Library

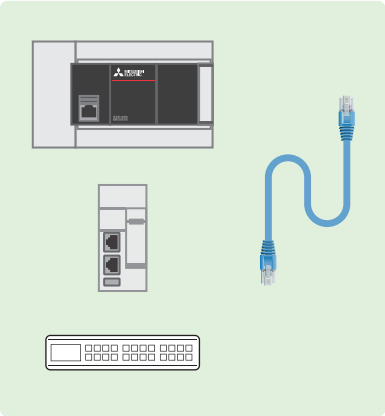
2.3 Wiring

For the power supply wiring of the FX5U CPU module, refer to the following.

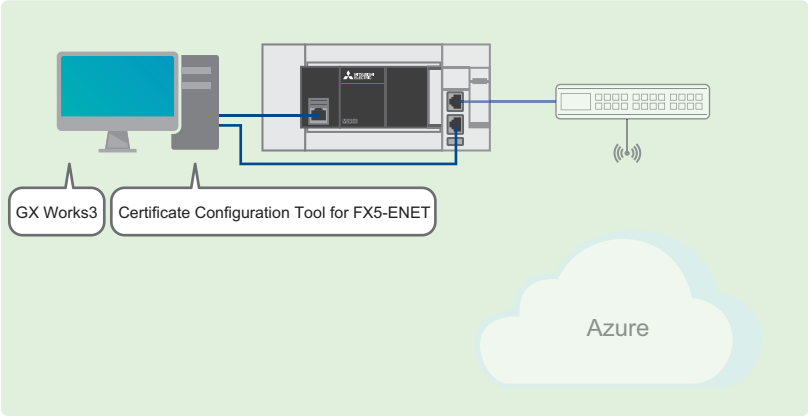
📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware), Section 13.4 Power Supply Wiring

2.4 Operation Flow Diagram

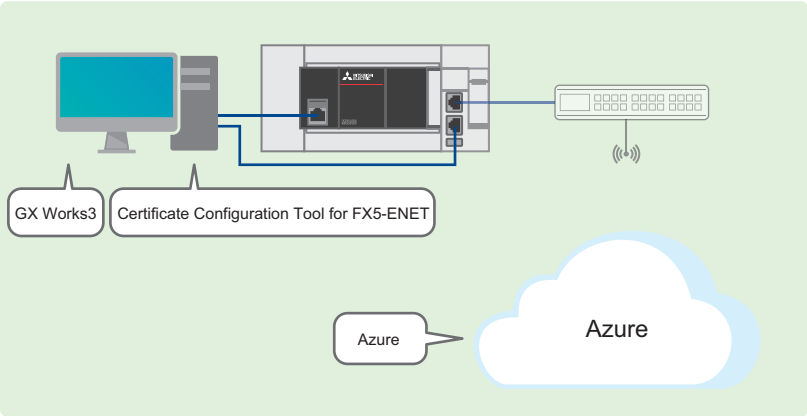
1. Preparing the required products (wiring)



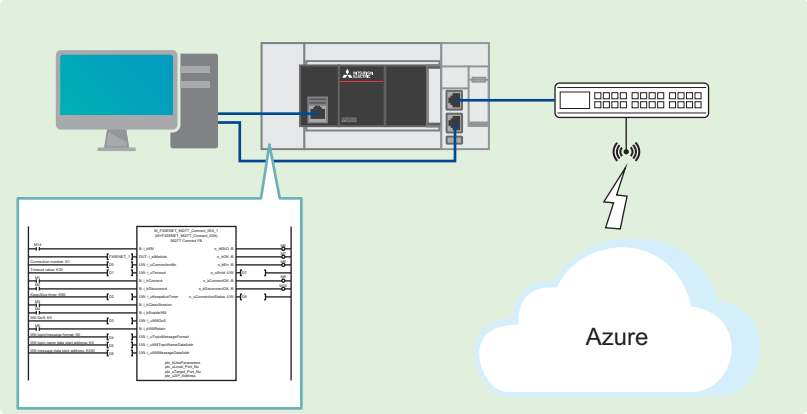
2. Configuring the clients (MQTT Publisher, MQTT Subscriber)



3. Configuring the server (MQTT broker) connection



4. Program examples and checking the operation



3 CONFIGURING CLIENTS (MQTT PUBLISHER, MQTT SUBSCRIBER)

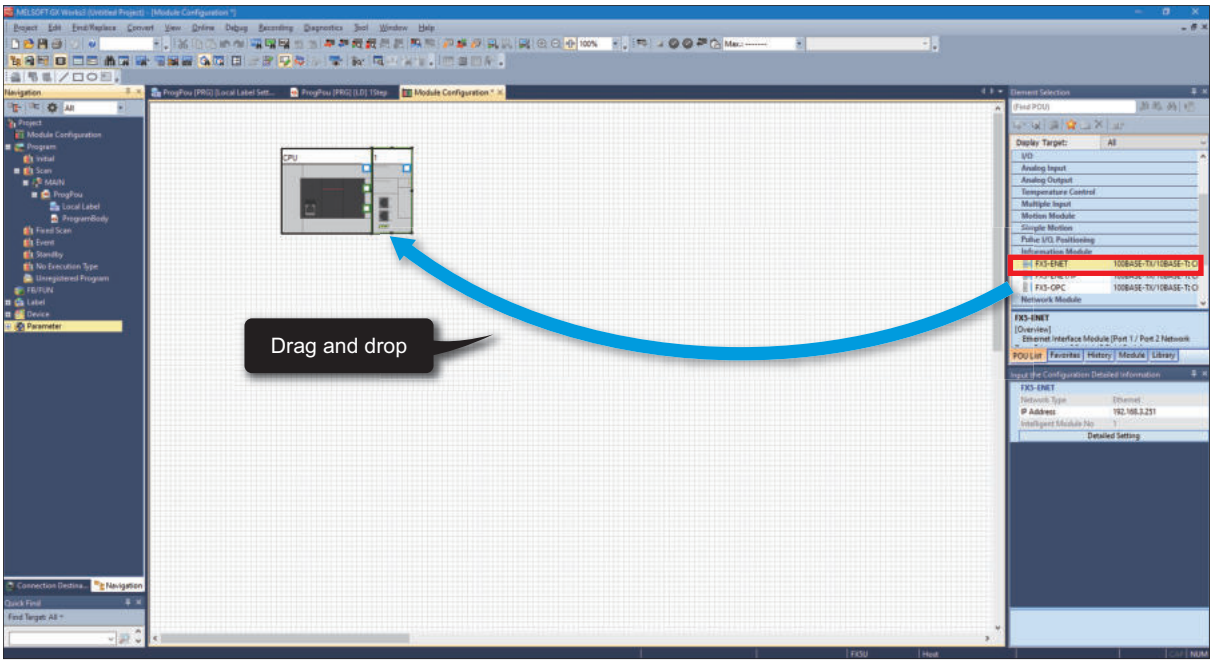
This chapter describes the setting items for the clients (MQTT Publisher, MQTT Subscriber).

3.1 Configuring Settings with GX Works3

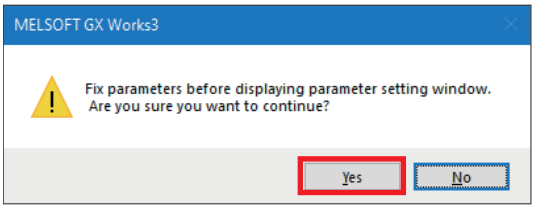
This section describes how to configure the settings with GX Works3.

Procedure for setting parameters

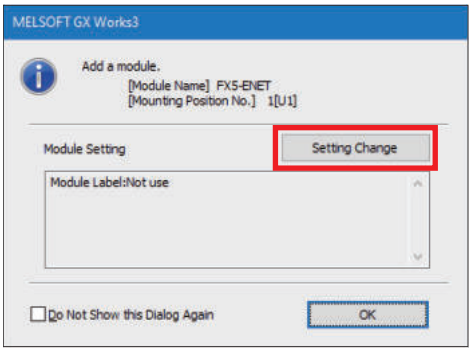
1. Open the "Navigation" window ⇨ [Module Configuration]. Drag and drop [FX5-ENET] to add it.



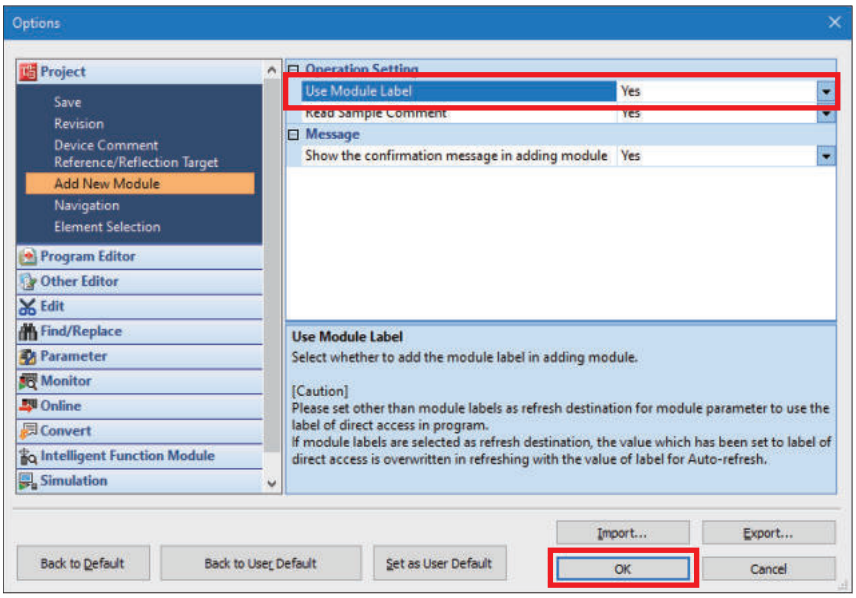
2. Double-click [FX5-ENET] on [Module Configuration]. Click the [Yes] button.



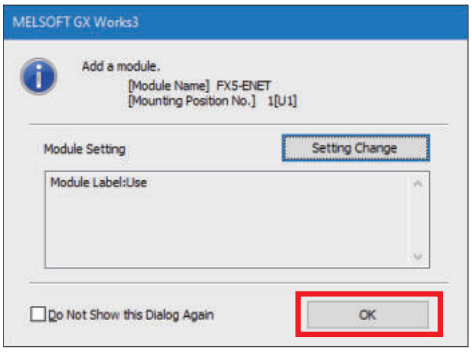
3. Click the [Setting Change] button.



4. Change [Use Module Label] to [Yes] and click the [OK] button.

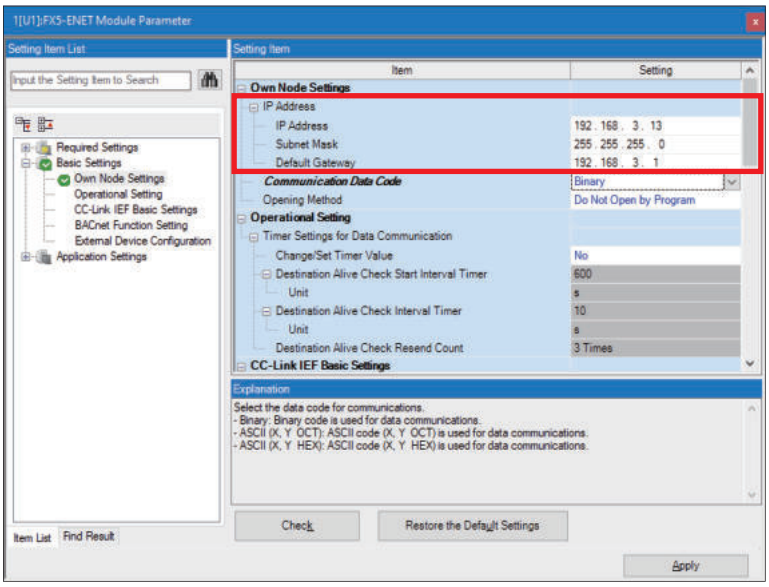


5. Click the [OK] button.

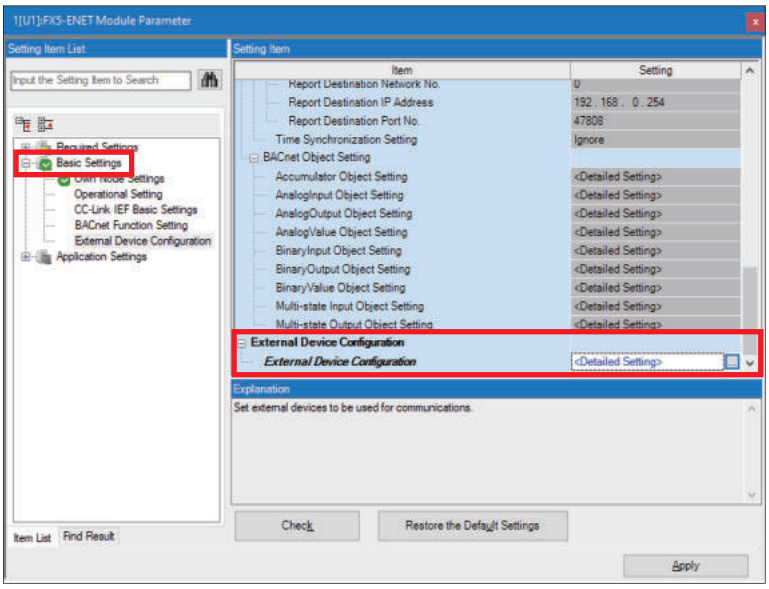


6. Select [Basic Settings] ⇨ [Own Node Settings] and configure [IP Address] as shown below.

Item	Setting
IP Address	192.168.3.13
Subnet Mask	255.255.255.0
Default Gateway	192.168.3.1

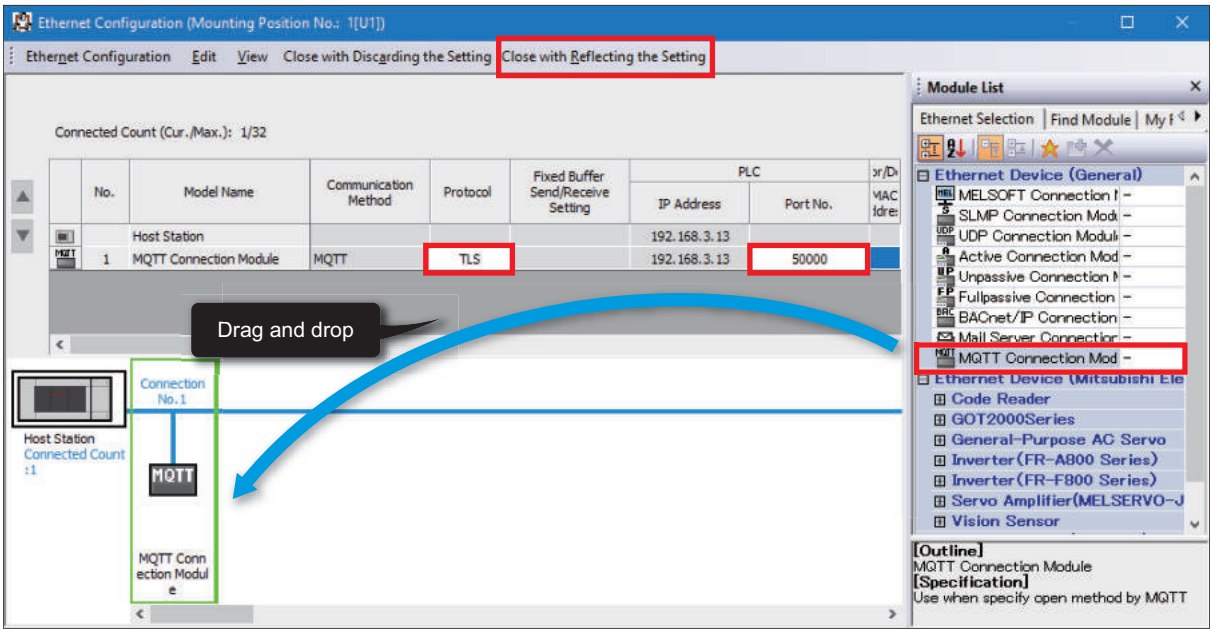


7. Select [Basic Settings] ⇨ [External Device Configuration] and double-click <Detailed Setting>.



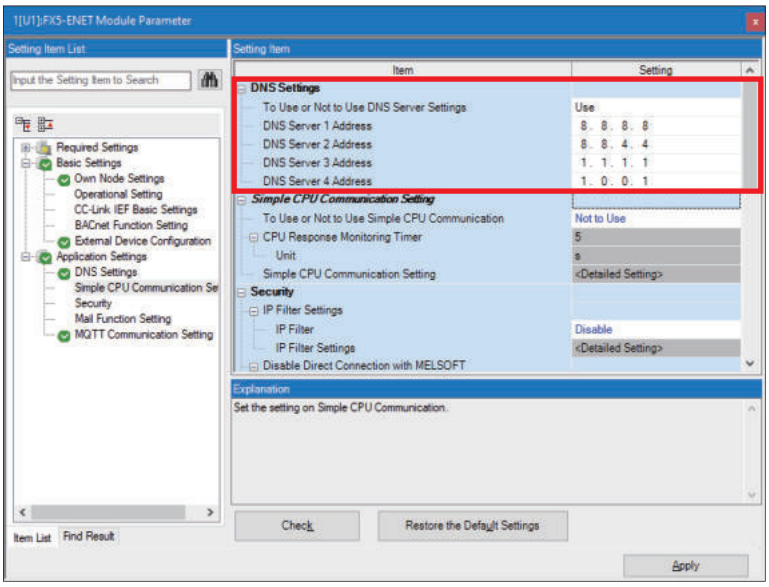
8. Drag and drop [MQTT Connection Module] to add it. Set the protocol and port number as shown below, and click [Close with Reflecting the Setting].

Item	Setting
Protocol	TLS
Port No.	50000

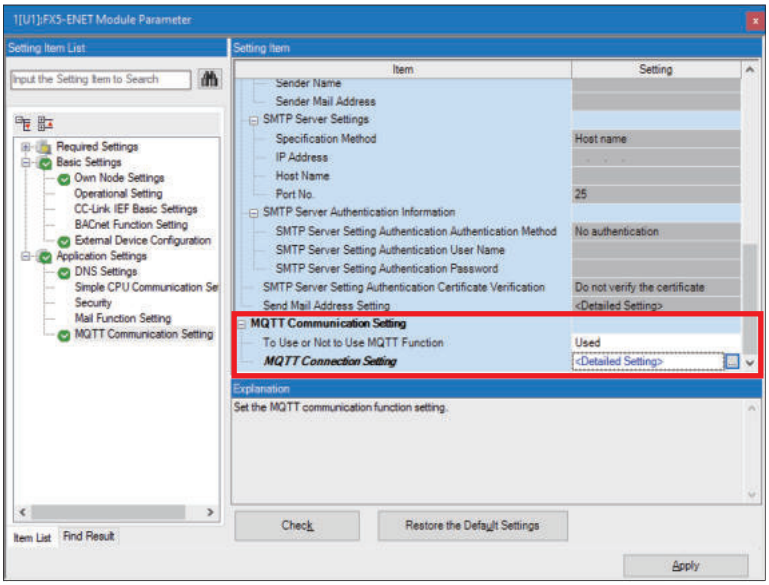


9. Select [Application Settings] and configure [DNS Settings] as shown below.

Item	Setting
To Use or Not to Use DNS Server Settings	Use
DNS Server 1 Address	8.8.8.8
DNS Server 2 Address	8.8.4.4
DNS Server 3 Address	1.1.1.1
DNS Server 4 Address	1.0.0.1



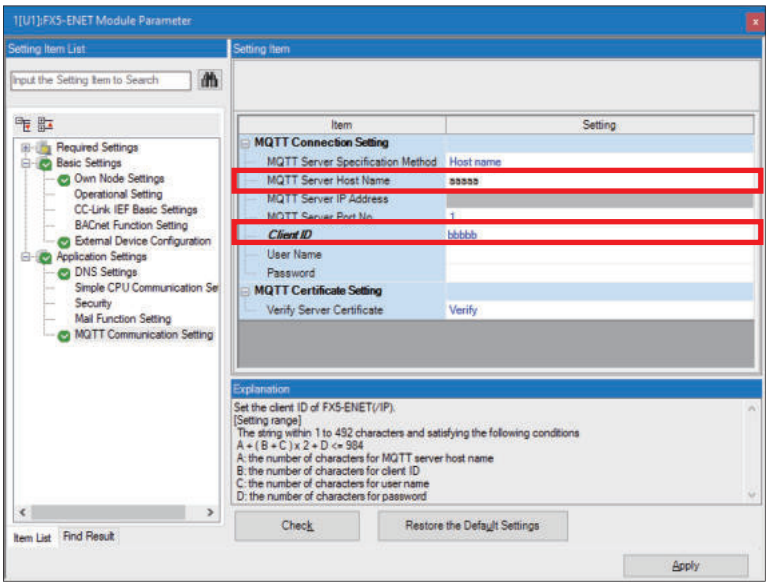
10. Select [Application Settings] ⇨ [MQTT Communication Setting], check that [To Use or Not to Use MQTT Function] is set to "Used", and double-click <Detailed Setting> of [MQTT Connection Setting].



11. To avoid errors, temporarily enter arbitrary character strings for "MQTT Server Host Name" and "Client ID". Click the [Apply] button.

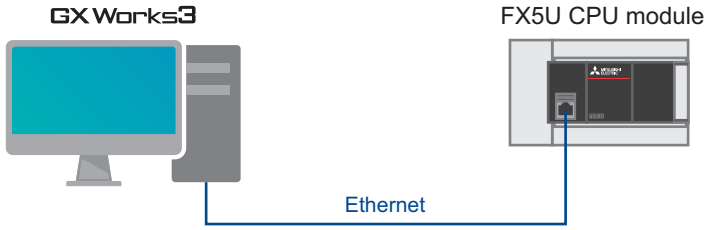
Configure the proper settings at the following timing.

☞ Page 34 Configuring Settings with GX Works3

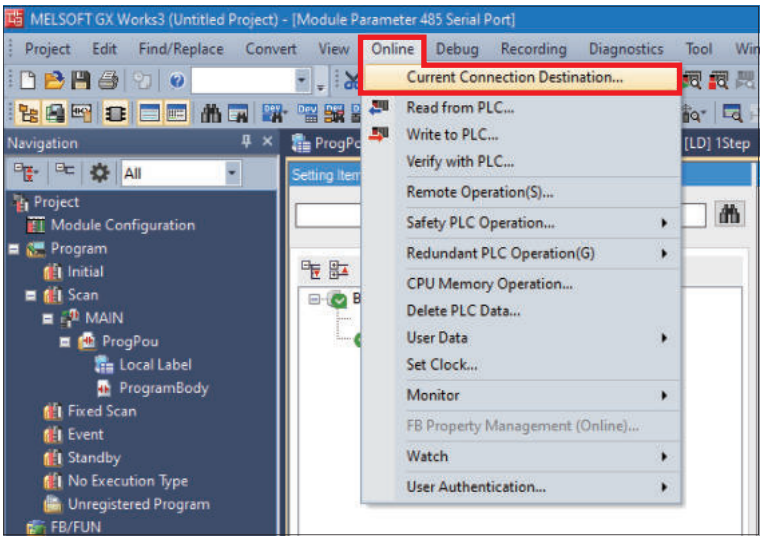


Configuring communication settings with GX Works3

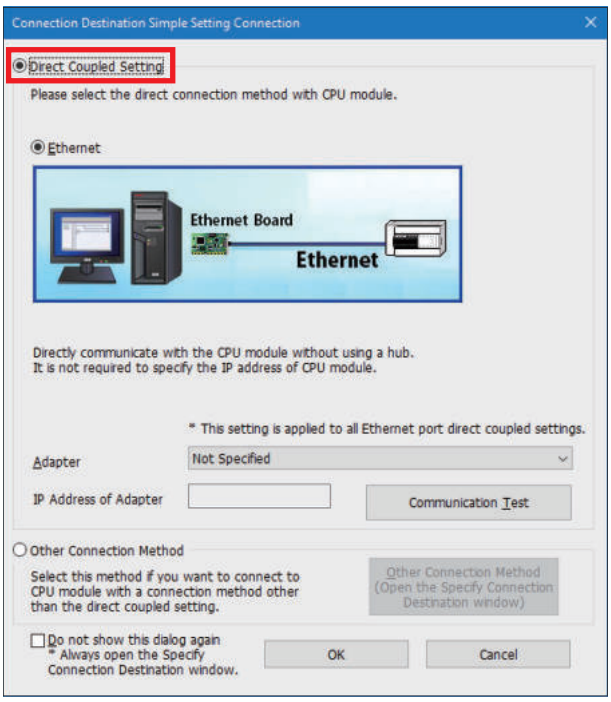
Directly connect the Ethernet ports as shown below. To execute the writing process, perform a communication test first.



1. Select [Online] ⇨ [Current Connection Destination].

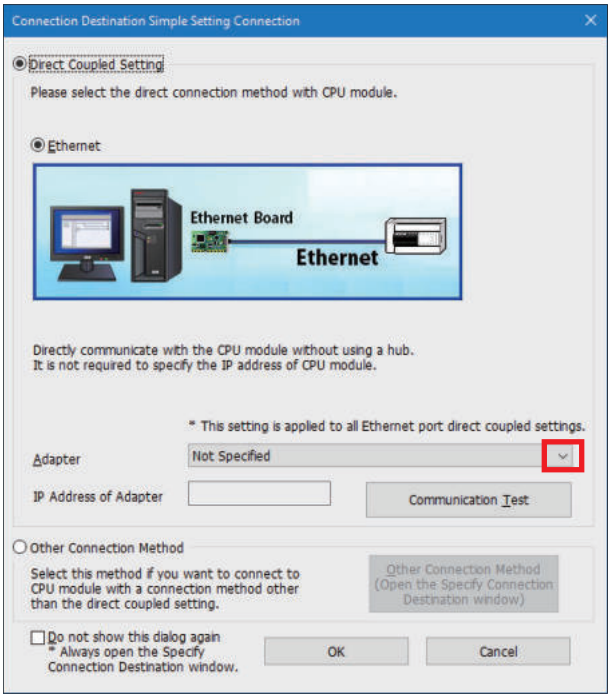


2. Select "Direct Coupled Setting".

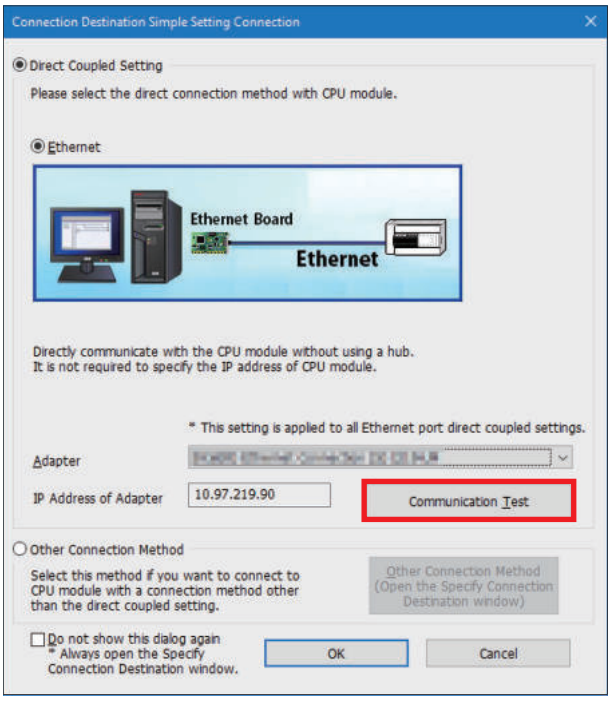


3. Specify an Ethernet adapter of the personal computer which is used when the personal computer is directly connected to the CPU module.

When [Not Specified] is set, select an adapter to be used from the drop-down list.



4. After the adapter is selected, click the [Communication Test] button.



For the connection via a hub, refer to the following.

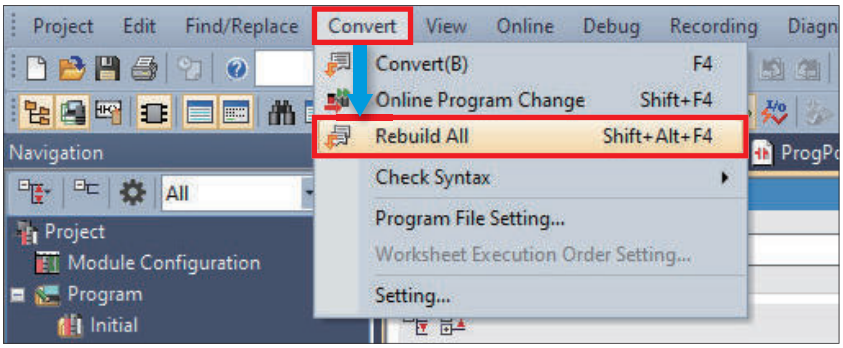
📖MELSEC iQ-F FX5 User's Manual (Communication), Section 4.2 Connection via a Hub

Writing data to the programmable controller

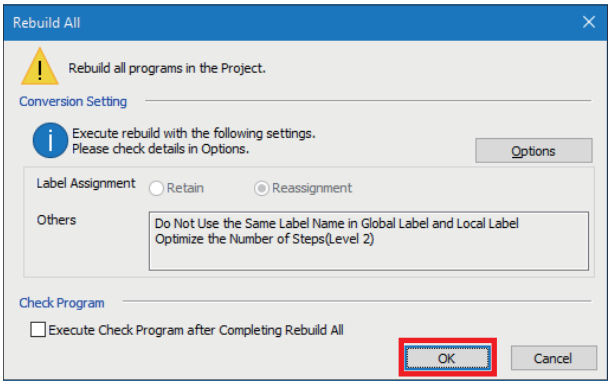
Write the program to the FX5U CPU module.

The operation to determine the programs and the parameters is required before writing them to the programmable controller.

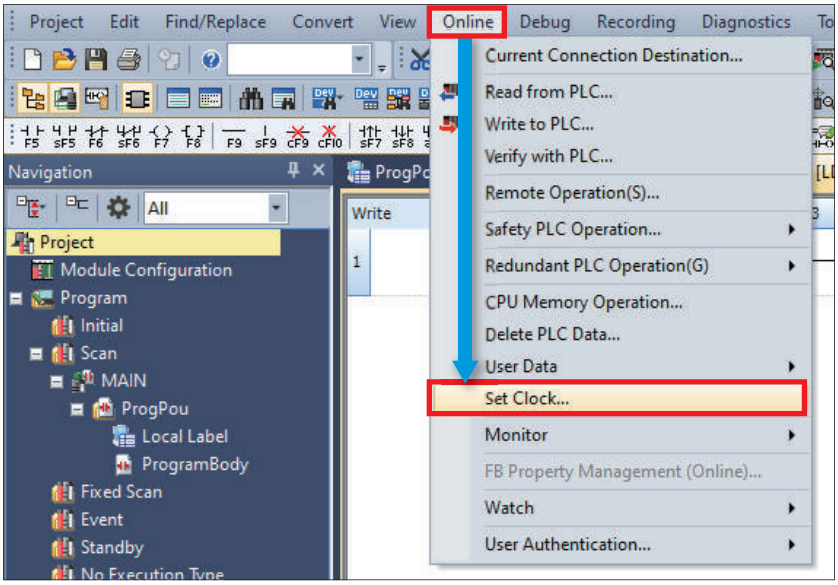
1. Select [Convert] ⇨ [Rebuild All].



2. Click the [OK] button.



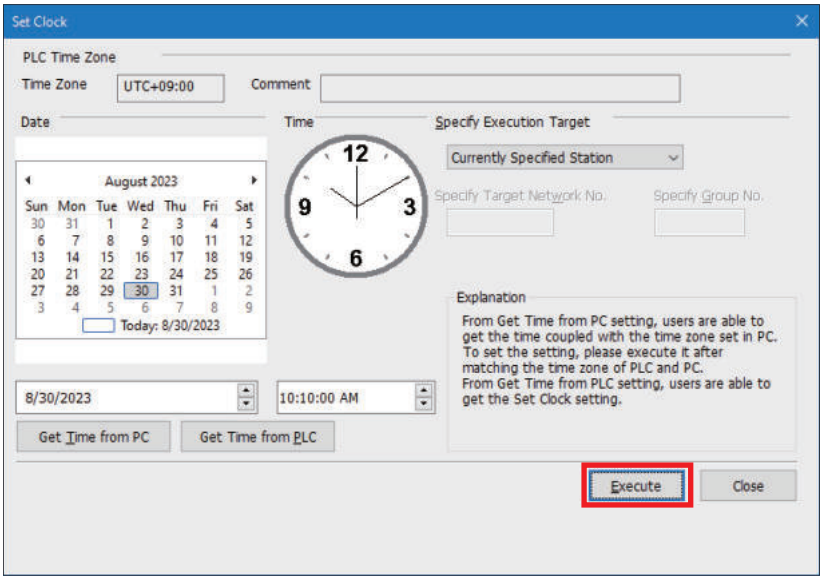
3. Select [Online] ⇨ [Set Clock].



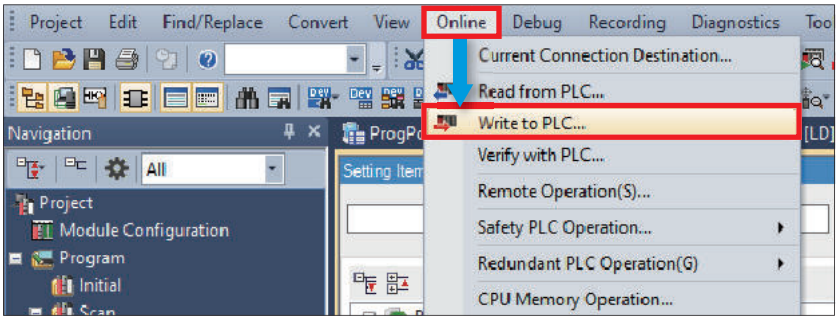
4. Configure the following settings and click the [Execute] button.

For the setting details, refer to the following.

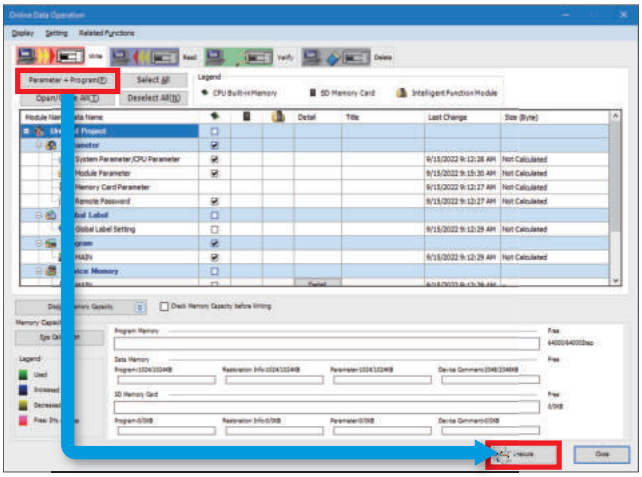
GX Works3 Operating Manual



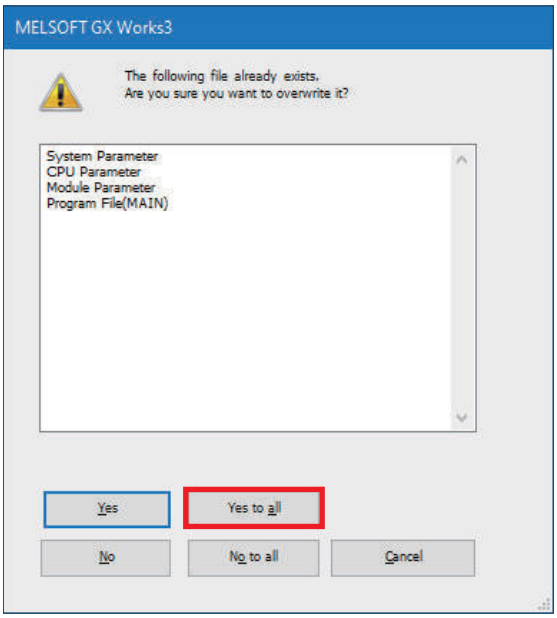
5. Select [Online] ⇨ [Write to PLC].



6. Click [Parameter + Program], and click [Execute].



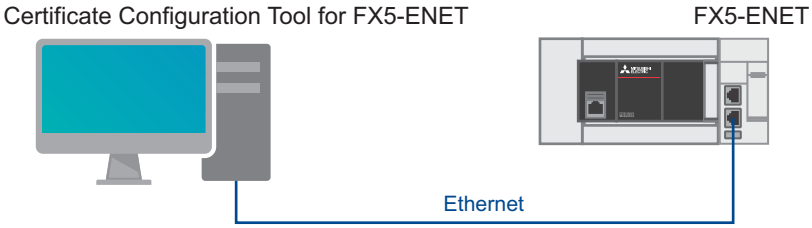
7. When the following window appears, click [Yes to all].



8. After the writing is complete, reset (or power off and on) the FX5U CPU module.

3.2 Configuring Settings with Certificate Configuration Tool for FX5-ENET

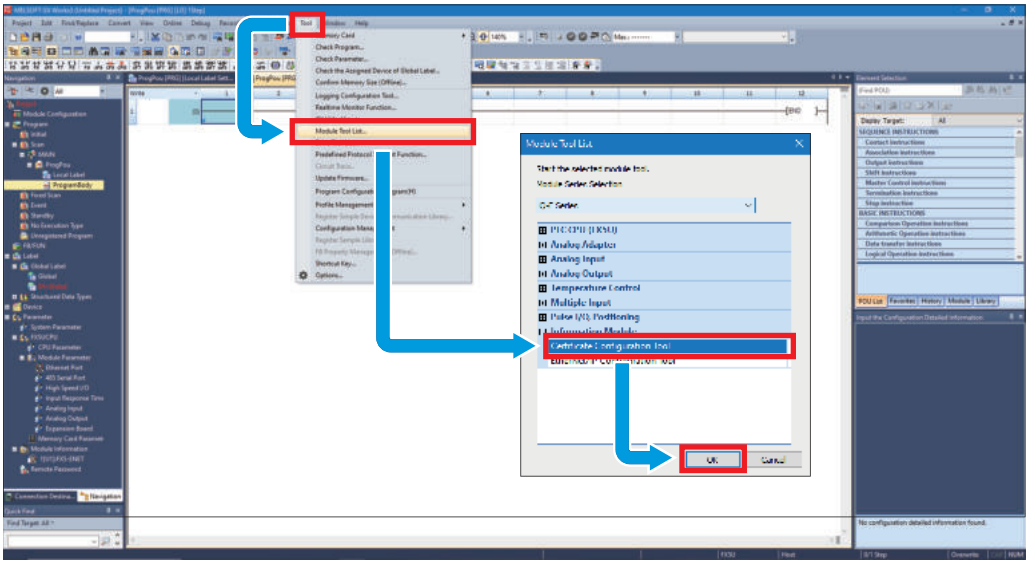
Start Certificate Configuration Tool for FX5-ENET, set the certificate, and perform the writing process.



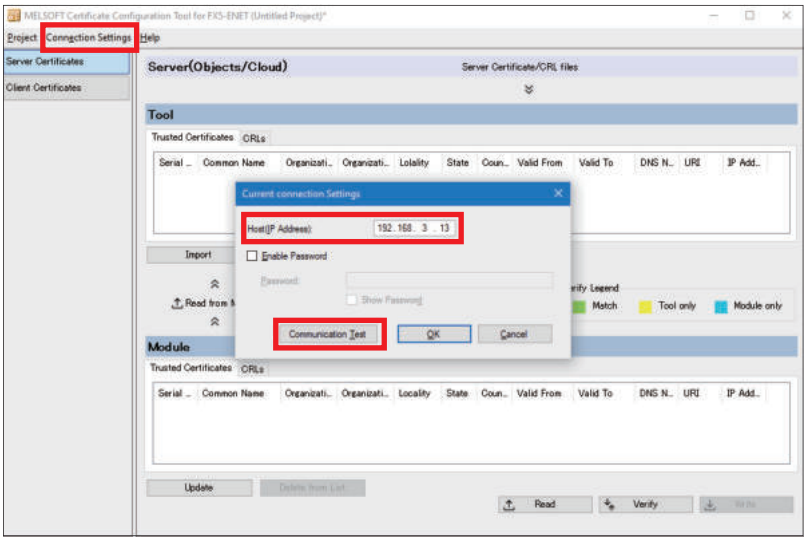
Point

Because the settings cannot be written to the FX5-ENET with the connection of a personal computer and an FX5U CPU module, connect a personal computer and the FX5-ENET with an Ethernet cable.

1. Select [Tool] ⇨ [Module Tool List] ⇨ [Information Module] ⇨ [Certificate Configuration Tool] of GX Works3 and click the [OK] button to start Certificate Configuration Tool for FX5-ENET.



2. Select [Connection Settings]. Enter the IP address of the FX5-ENET in [Host (IP Address)] and click the [Communication Test] button.



Point

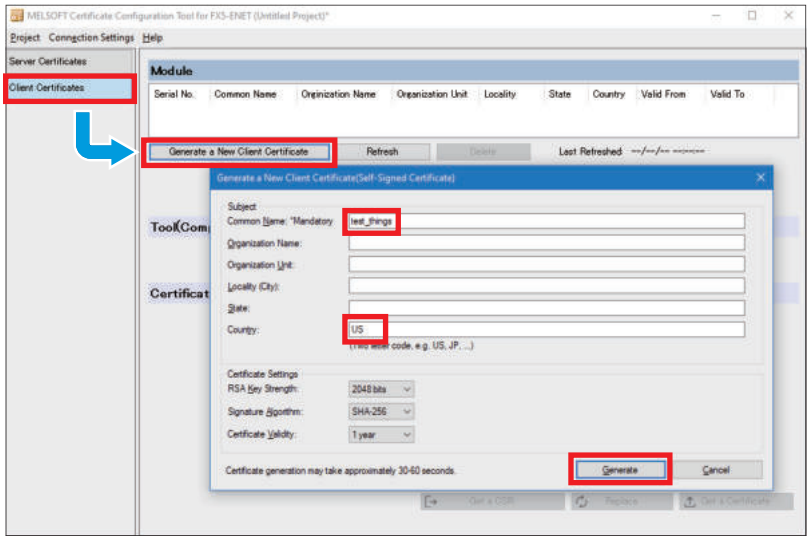
- If a firewall is set up between the FX5-ENET and the personal computer, the communication test will fail. In this case, permission must be given to a port to be used, so check the firewall settings.
- The IP address of the personal computer must be set to the same segment as the FX5-ENET, so review the IP address settings.

3. Select [Client Certificates] and click the [Generate a New Client Certificate] button. Configure the settings as shown below, and click the [Generate] button.

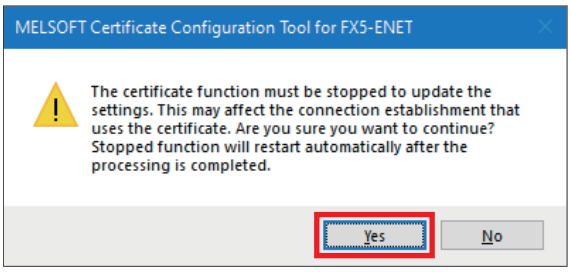
The set common name is used when creating devices in Azure.

☞ Page 29 Creating devices

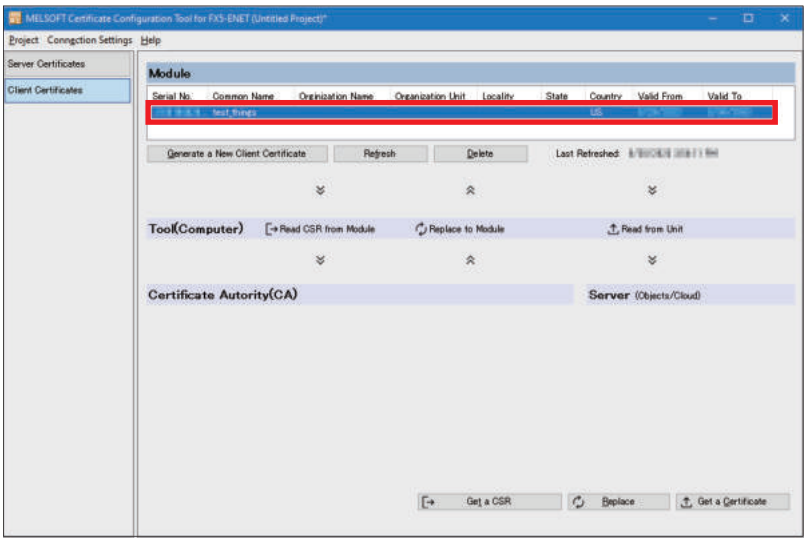
Item	Setting
Common Name	Any name
Country	US



4. Click the [Yes] button.



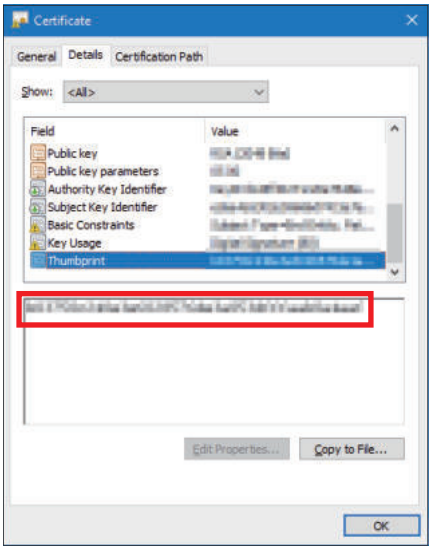
5. Double-click the certificate generated in step 3.



6. Copy the value of [Thumbprint] in the [Details] tab.

The copied value is used when creating devices in Azure.

☞ Page 29 Creating devices



4 CONFIGURING SERVER (MQTT BROKER) CONNECTION

This chapter describes the setting items for the server (MQTT broker).

4.1 Configuring Settings with Azure

Configure the server (MQTT broker) for connecting to Azure.

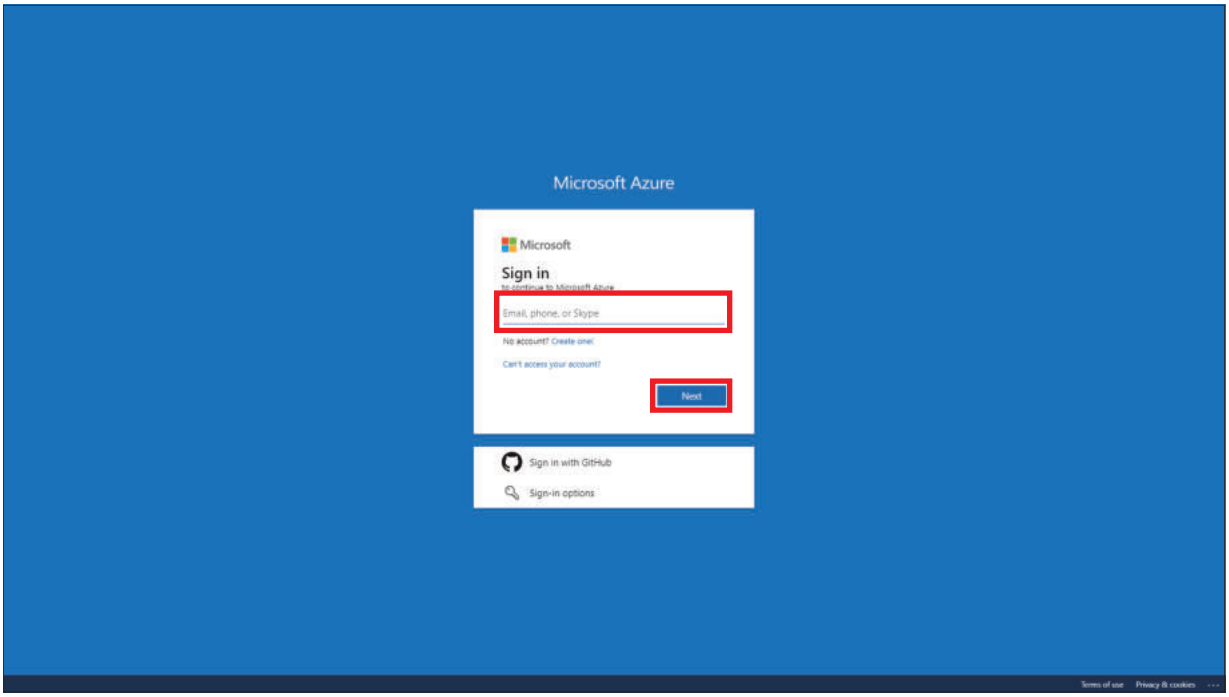
Point

Configure the server (MQTT broker) while signed in to Azure. Prepare your e-mail address and password in advance.

Sign-in

1. Access the following URL with a web browser, then enter the e-mail address and password to sign in.

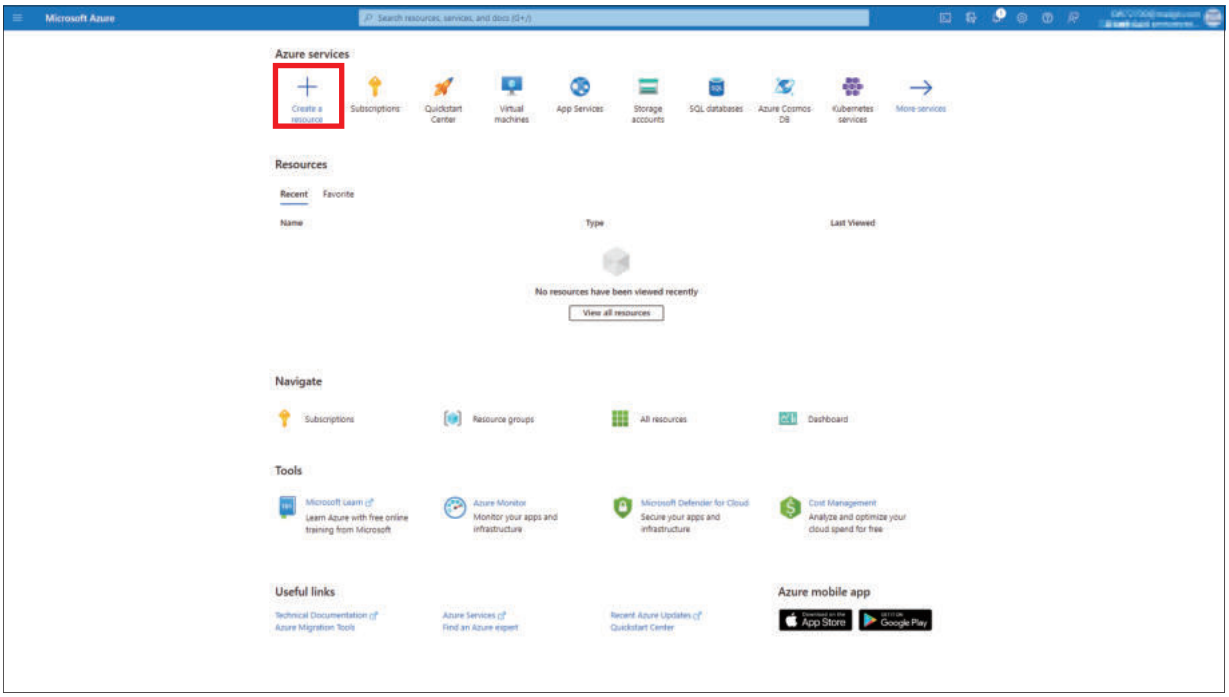
https://portal.azure.com/



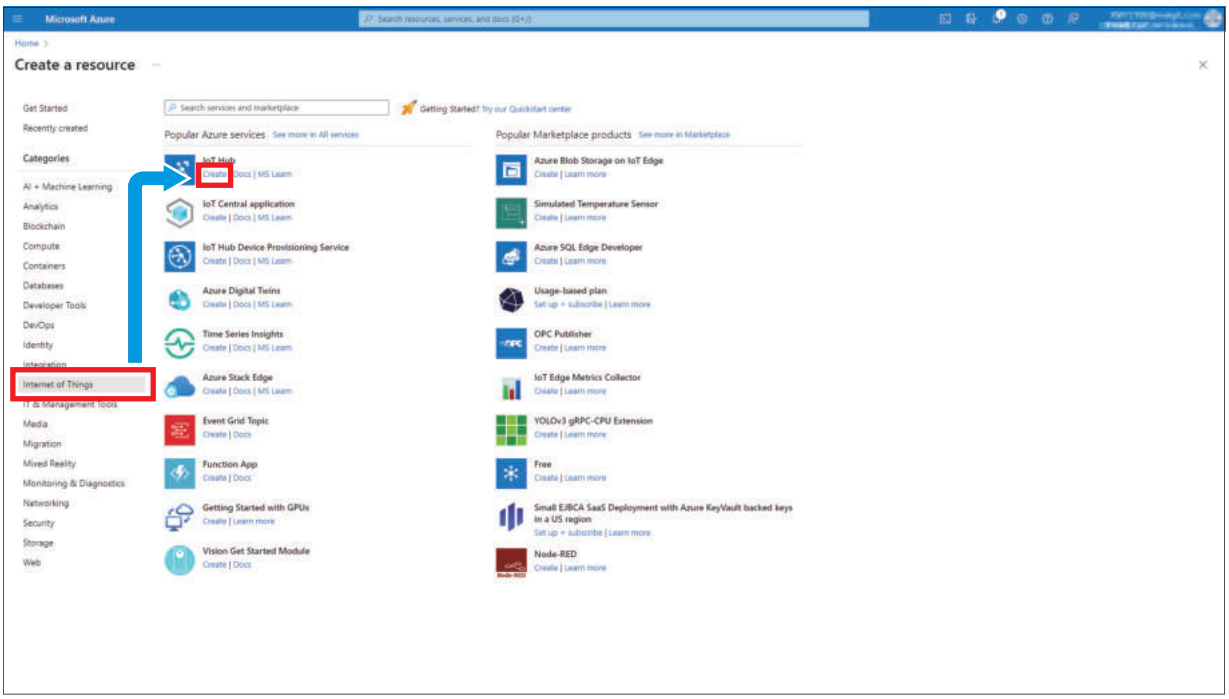
Configuring settings with Azure IoT Hub

Configure the settings for Azure IoT Hub to be used with Azure connection.

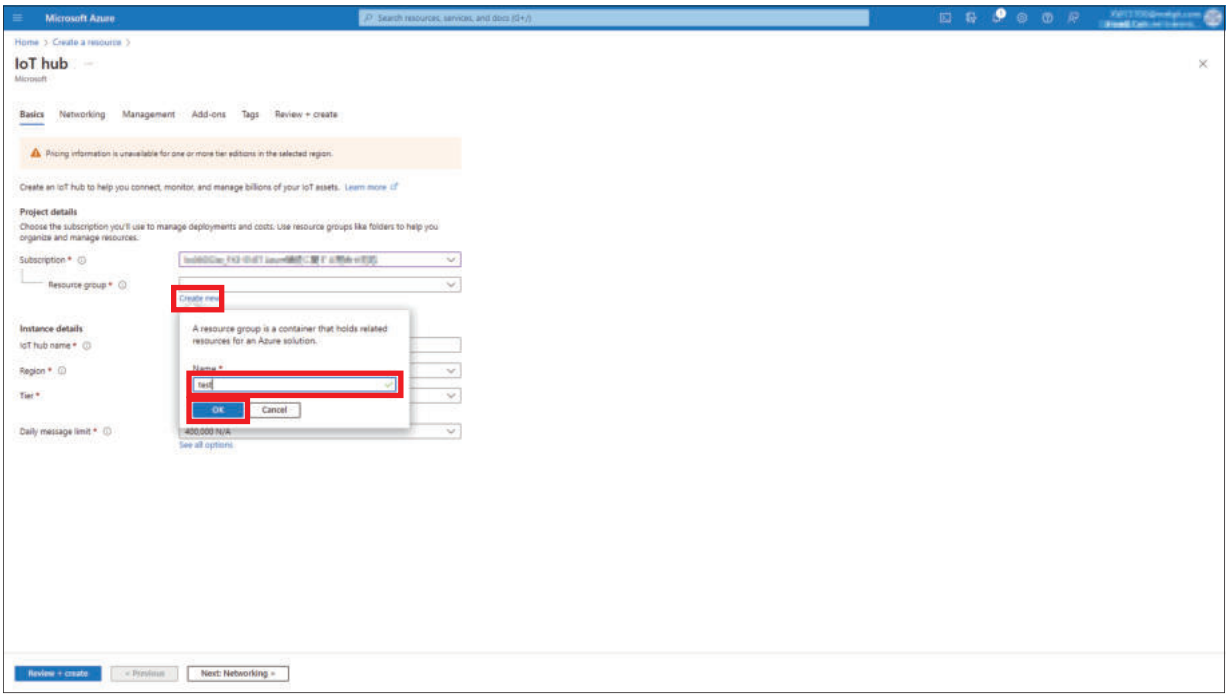
1. Click [Create a resource].



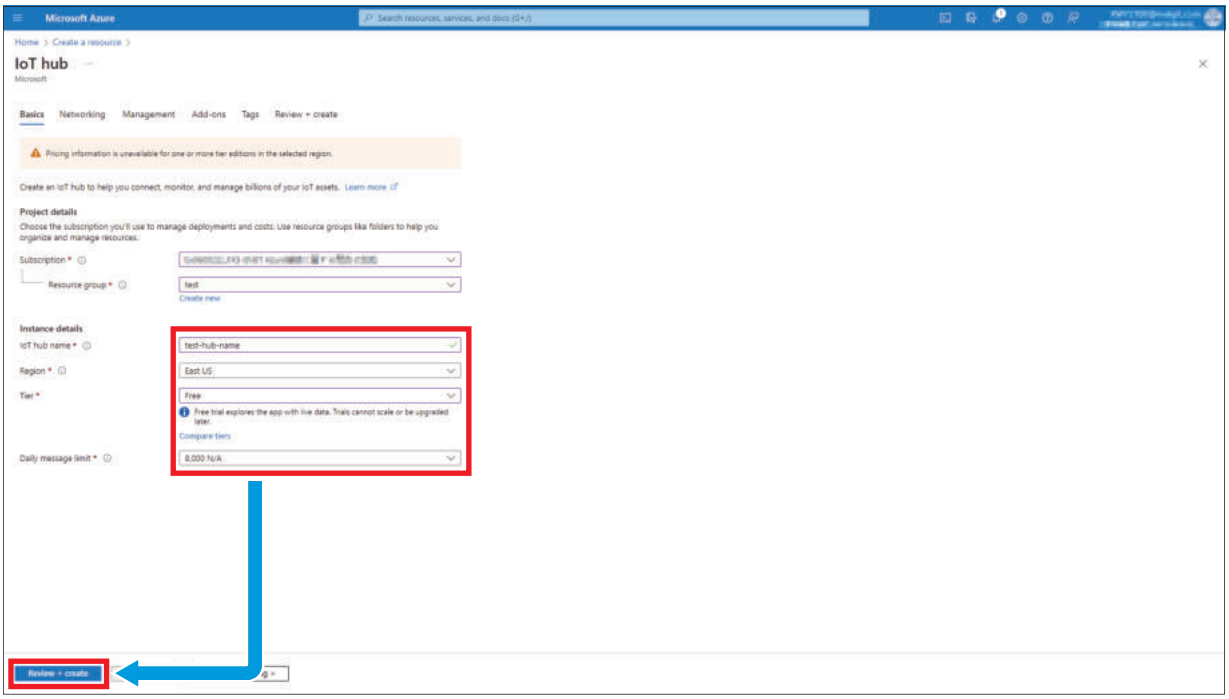
2. Click [Internet of Things] under Categories ⇨ [IoT Hub] ⇨ [Create].



3. Click [Create new]. Enter a resource name, click the [OK] button.



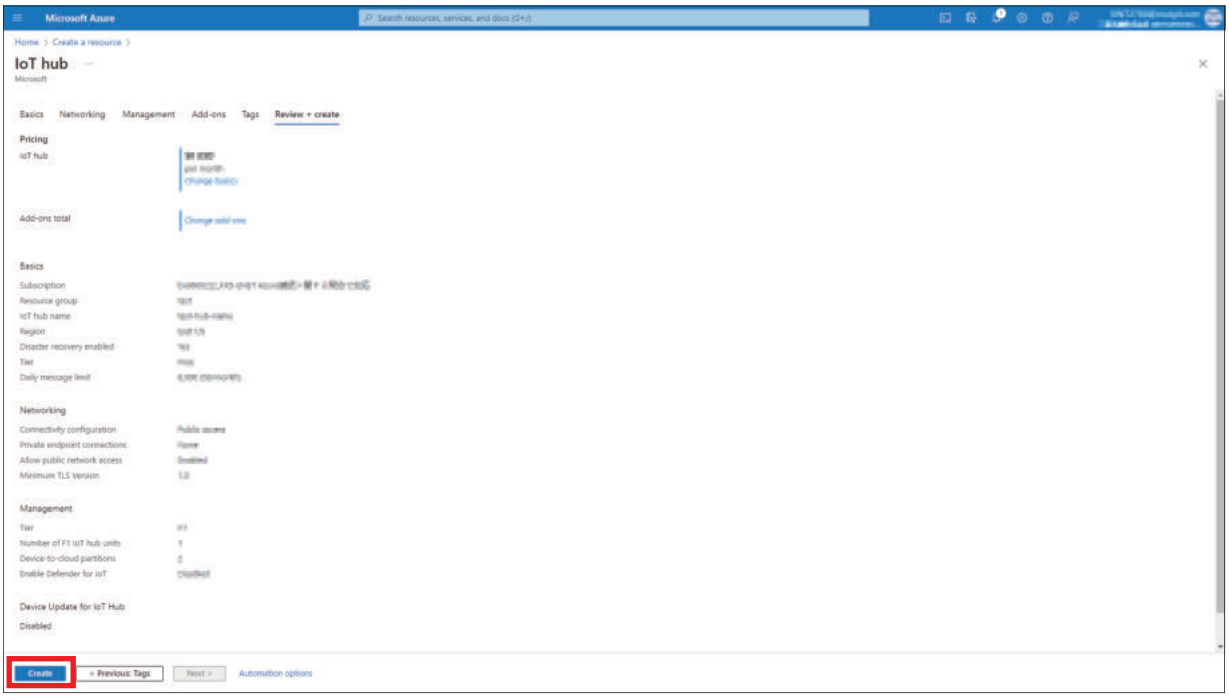
4. Configure settings for "Instance details" according to the use environment at customer's premises. Click the [Review + create] button.



Point

If an error occurs after clicking the [Review + create] button, ask an administrator to grant the access right.

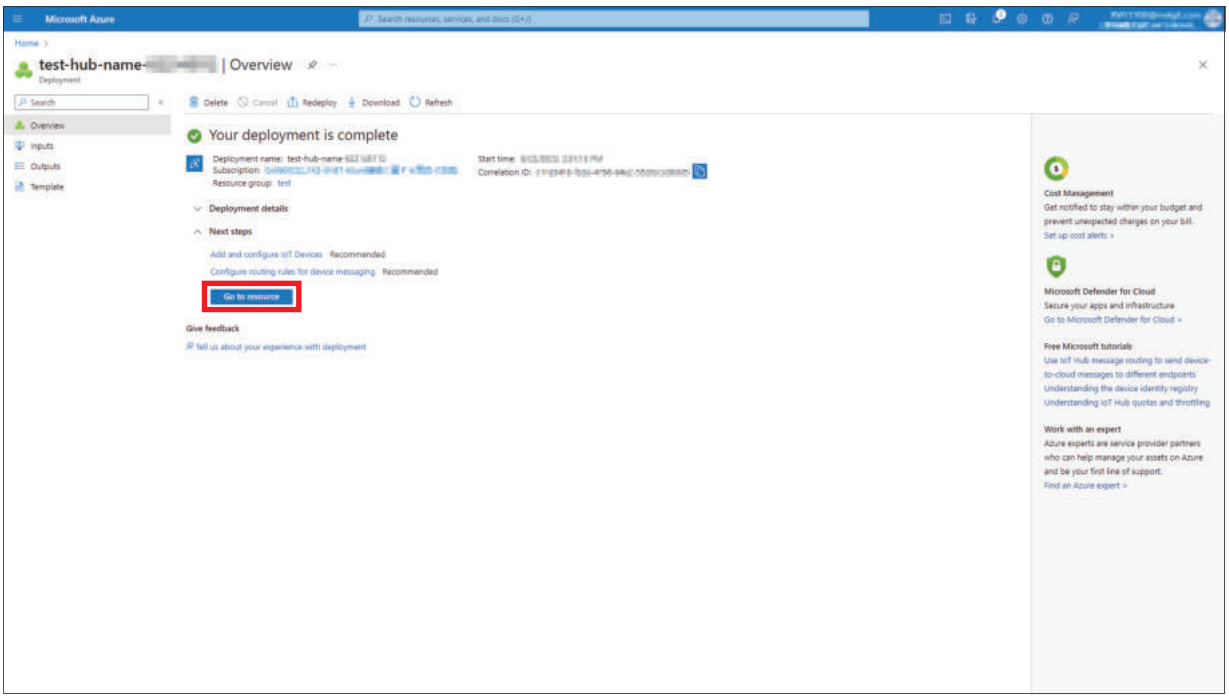
5. Check the settings, then click the [Create] button.



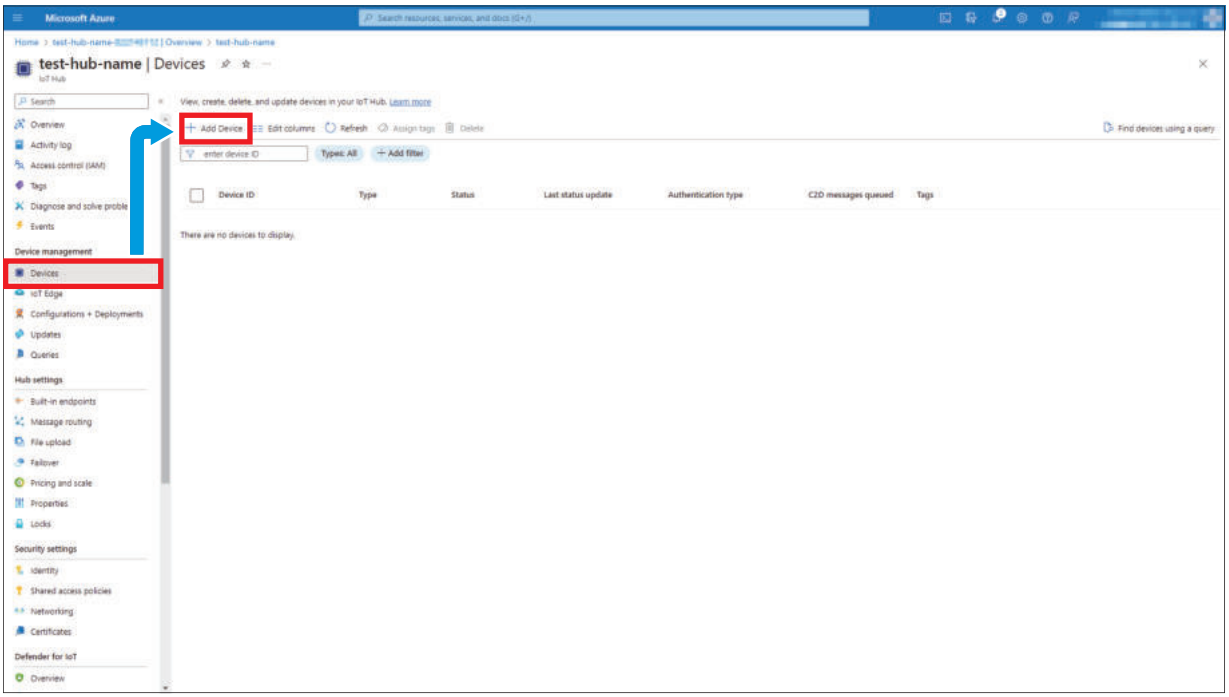
Creating devices

Link the device to the certificate created with Certificate Configuration Tool for FX5-ENET.

1. Click the [Go to resource] button.

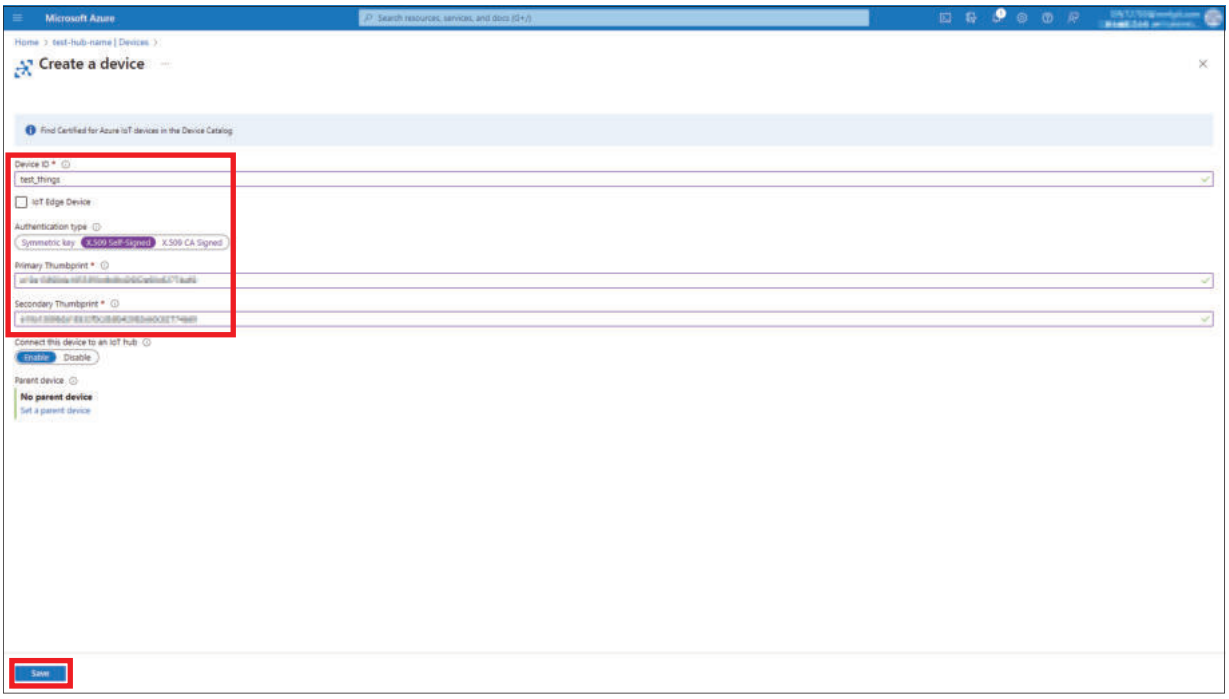


2. Select [Device management] ⇨ [Devices] from the left menu, and click [Add Device].



3. Configure the settings as shown below, and click the [Save] button.

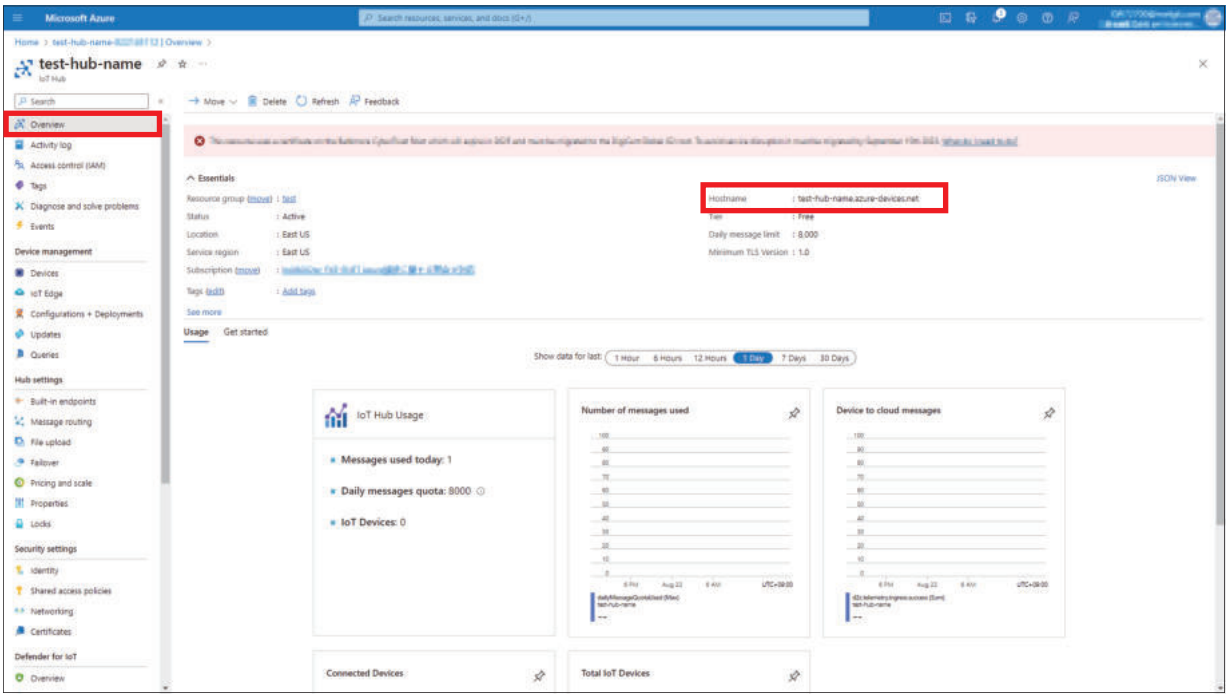
Item	Setting
Device ID	test_things Enter the common name that was set in the section below. ☞ Page 22 Configuring Settings with Certificate Configuration Tool for FX5-ENET
Authentication type	X.509 Self-Signed
Primary Thumbprint	Enter the value that was created in the section below. ☞ Page 22 Configuring Settings with Certificate Configuration Tool for FX5-ENET
Secondary Thumbprint	The same as Primary Thumbprint



Checking the hostname

The hostname will be needed for configuring the FX5U CPU module. Therefore, users are recommended to copy and keep it.

1. Select [Overview] in the left menu. The hostname is displayed in the items of "Essentials".



4.2 Configuring Settings with Certificate Configuration Tool for FX5-ENET

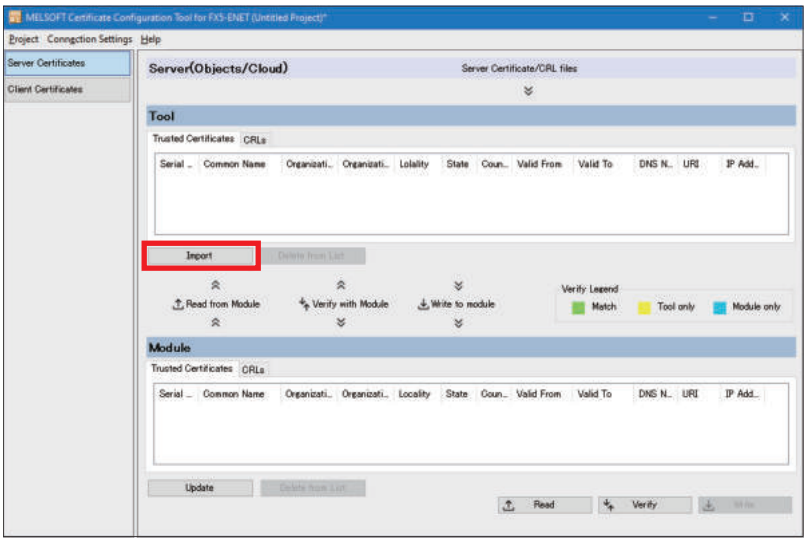
Writing the certificates from the server

1. Download two server certificates (DigiCert Global Root G2 and Microsoft RSA Root Certificate Authority 2017) from the server below.

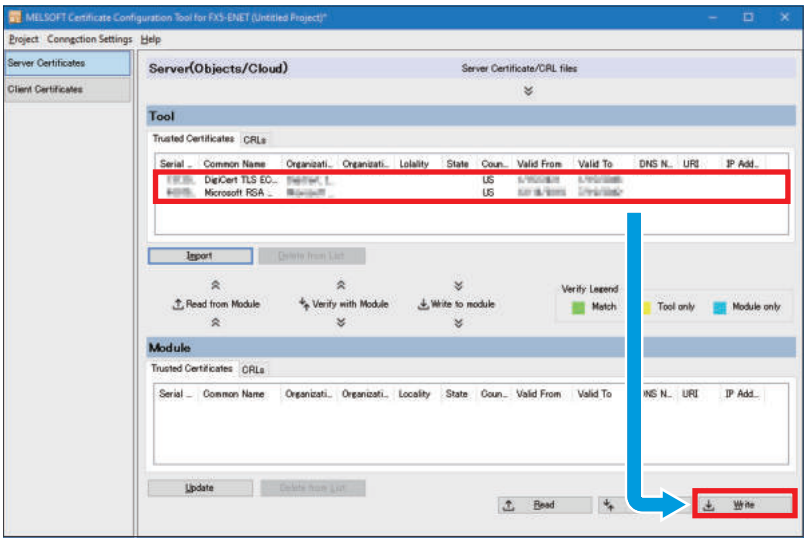
Point

The certificate can be downloaded from the following (as of the publication of this manual).
https://learn.microsoft.com/en-us/azure/security/fundamentals/azure-ca-details?tabs=root-and-subordinate-cas-list
For the latest information, check the website of Azure.

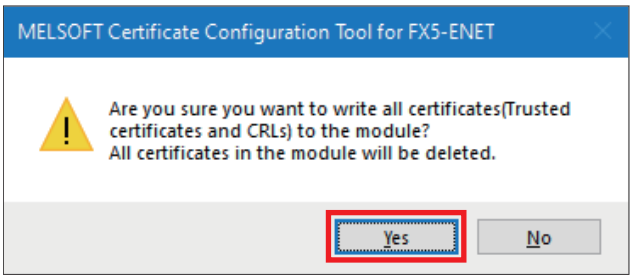
2. In Certificate Configuration Tool for FX5-ENET, select [Server Certificates] ⇨ [Import] button to import the server certificates.



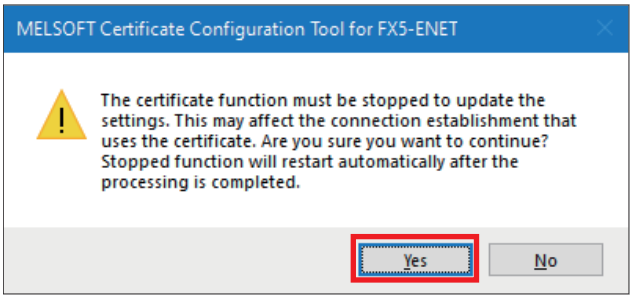
3. When the file has normally been imported, click the [Write] button to write it to the FX5-ENET.



4. Click the [Yes] button.



5. Click the [Yes] button.

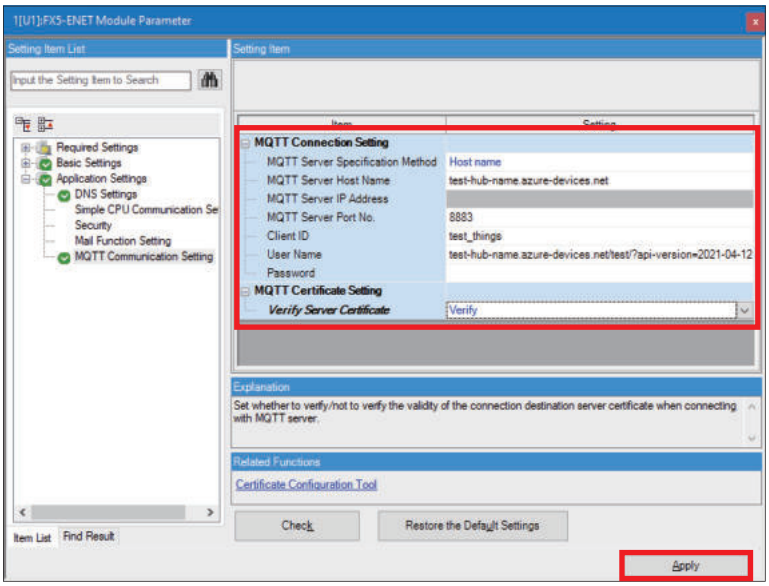


4.3 Configuring Settings with GX Works3

1. Select the "Navigation" window ⇨ [Module Information] ⇨ [FX5-ENET] ⇨ [Application Settings] ⇨ [MQTT Communication Setting] ⇨ [MQTT Connection Setting] and double-click <Detailed Setting>.

2. Configure the following settings and click the [Apply] button.

Item	Setting
MQTT Server Specification Method	Host name
MQTT Server Host Name	test-hub-name.azure-devices.net (own hostname) Enter the hostname that was copied in the section below. ☞ Page 31 Checking the hostname
MQTT Server Port No.	8883
Client ID	test_things Enter the name of the device ID that was created in the section below. ☞ Page 29 Creating devices
User Name	test-hub-name.azure-devices.net/test_things/?api-version=2021-04-12 Enter MQTT Server Host Name/Client ID/?api-version=****-**-**.
Verify Server Certificate	Verify

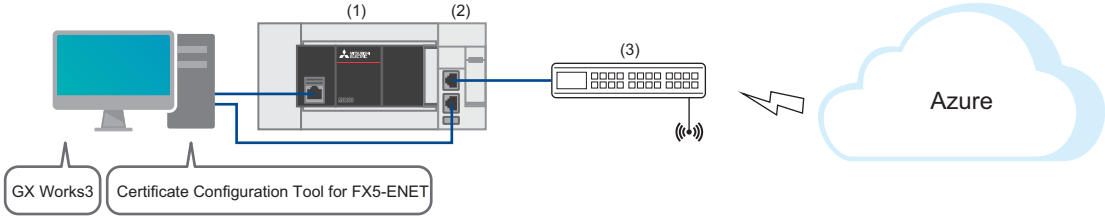


3. Configuring the settings with GX Works3 is completed by creating a program and writing it to the programmable controller.

☞ Page 35 CHECKING OPERATIONS
☞ Page 19 Writing data to the programmable controller

5 CHECKING OPERATIONS

Based on the system configuration (☞ Page 9 System Configuration), write the program to the FX5U CPU module and check the operation.



(1) FX5U CPU module
(2) FX5-ENET
(3) Router

Point

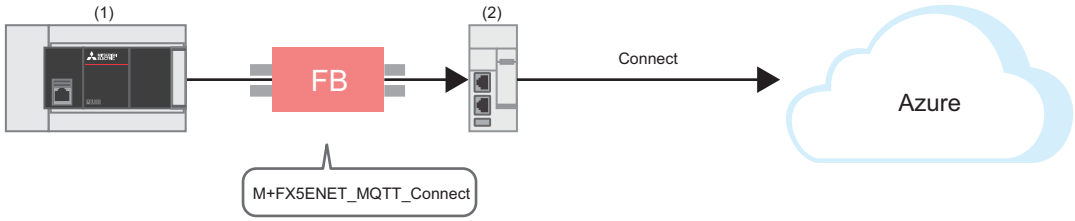
Broadcasting and inter-device communications from Azure IoT Hub to the FX5-ENET are not supported, so data published to Azure IoT Hub from the FX5-ENET cannot be subscribed.
The following operations can be performed.

- The FX5-ENET publishes data to Azure IoT Hub.
- The FX5-ENET subscribes data prepared with Azure IoT Hub.

For the latest information, check the website.
https://learn.microsoft.com/en-us/azure/?product=popular

5.1 Checking the Operation of Connect (MQTT Connection Establishment)

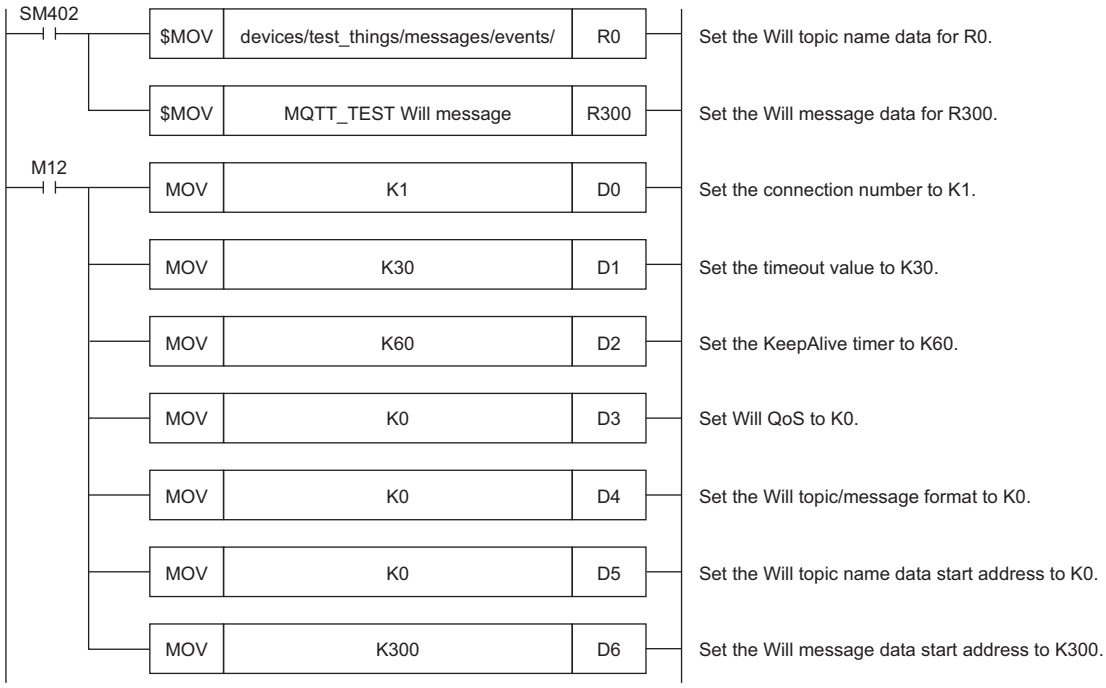
Use M+FX5ENET_MQTT_Connect (MQTT connection establishment) for controlling the connection with the server (MQTT broker).



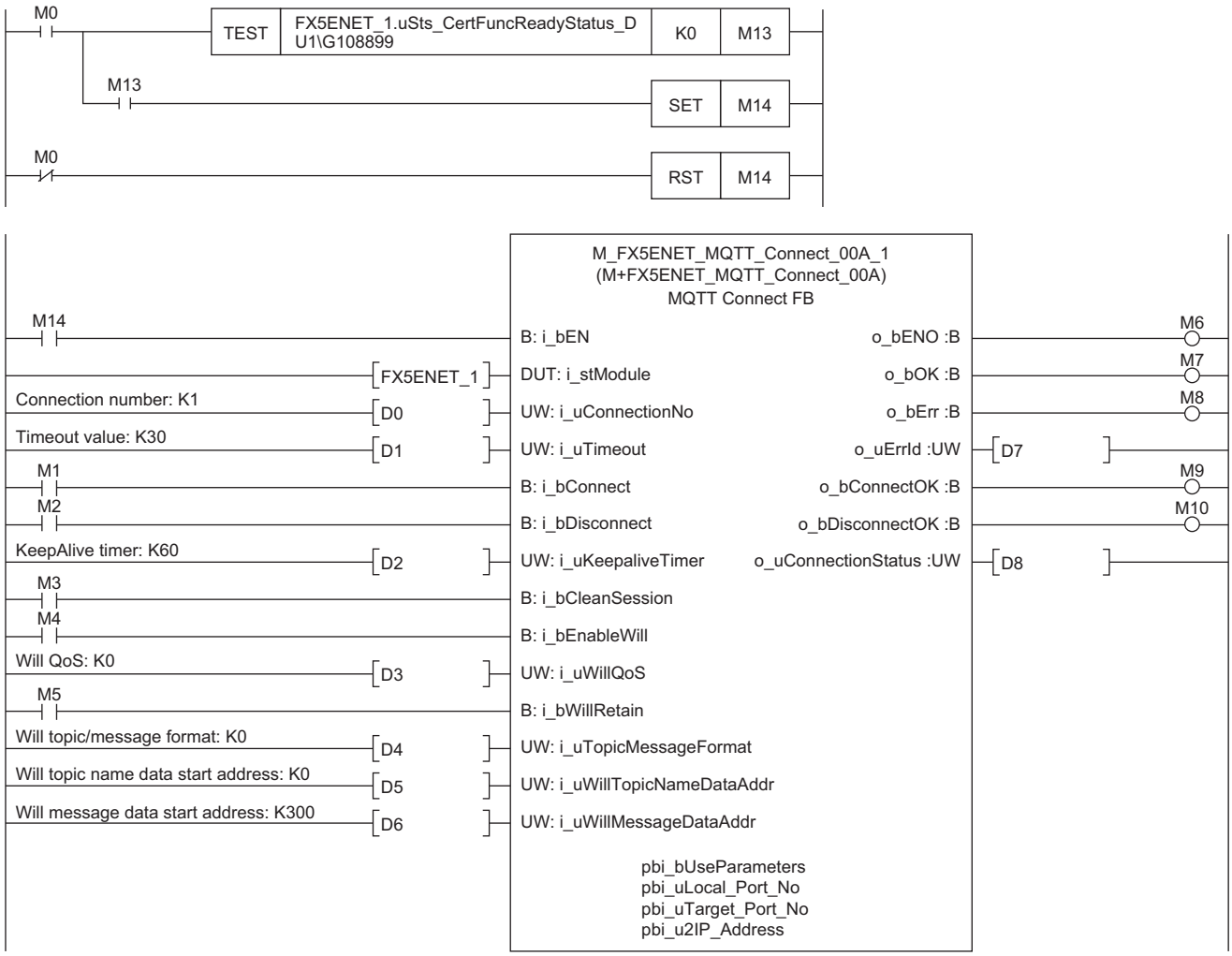
(1) FX5U CPU module
(2) FX5-ENET

Program

M12 turns on for setting the information used for M+ENET_MQTT_Connect (MQTT connection establishment).

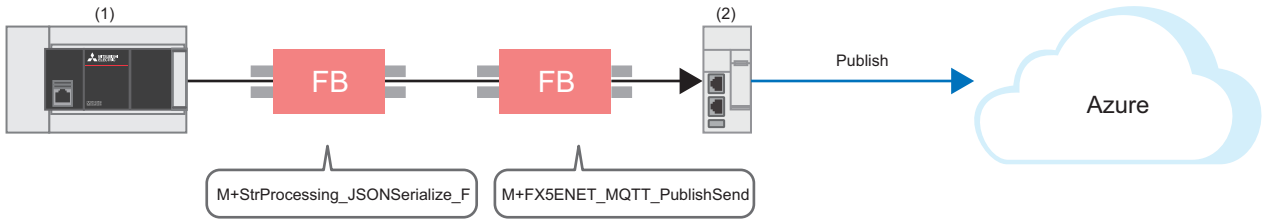


After M4 (Enable Will) turns on, M0 turns on. When FX5ENET_1.uSts_CertFuncReadyStatus_D (Certificate function ready-to-enable state) turns on, M14 (Execution command) turns on. M1 (CONNECT instruction) subsequently turns on to establish the connection.
When the connection is successfully established, M9 (Establishment completion) turns on.



5.2 Checking the Operation of Publish (Sending of MQTT Data)

After checking the operation of Connect (MQTT Connection Establishment) (☞ Page 36 Checking the Operation of Connect (MQTT Connection Establishment)), create a JSON string with M+StrProcessing_JSONSerialize_F, and use M+FX5ENET_MQTT_PublishSend (Sending of MQTT data) for sending messages to the server (MQTT broker).



(1) FX5U CPU module
(2) FX5-ENET

Registering the FB library

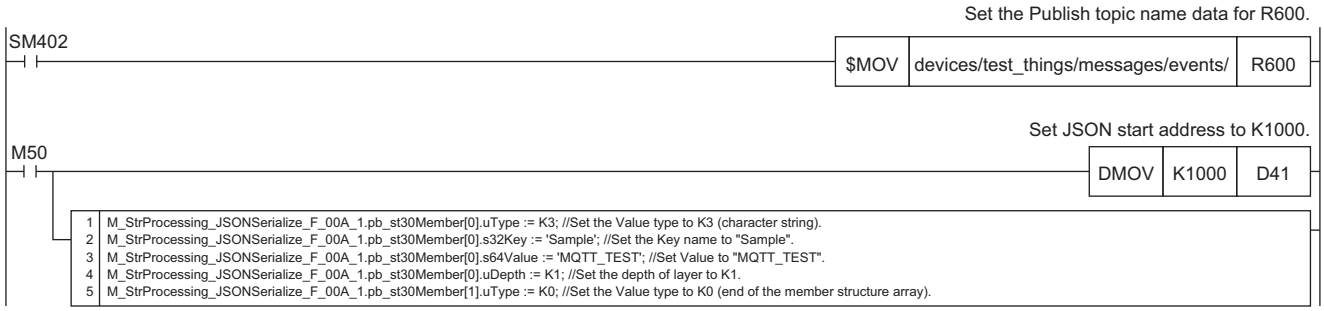
Register the FB library. For the operating procedures, refer to the following.
☞ Page 48 FB Library

Program

■Send data creation

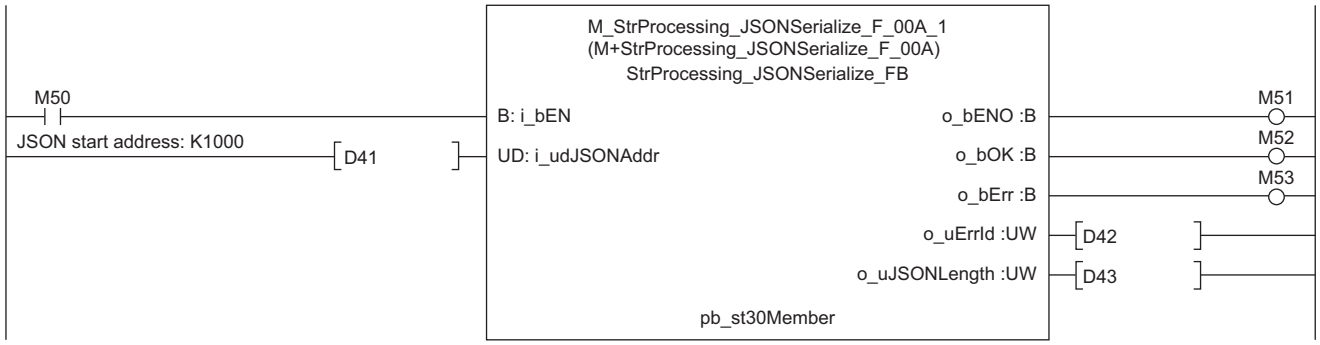
- Settings for data to be sent

M50 (Execution command) turns on for setting the data to be sent.



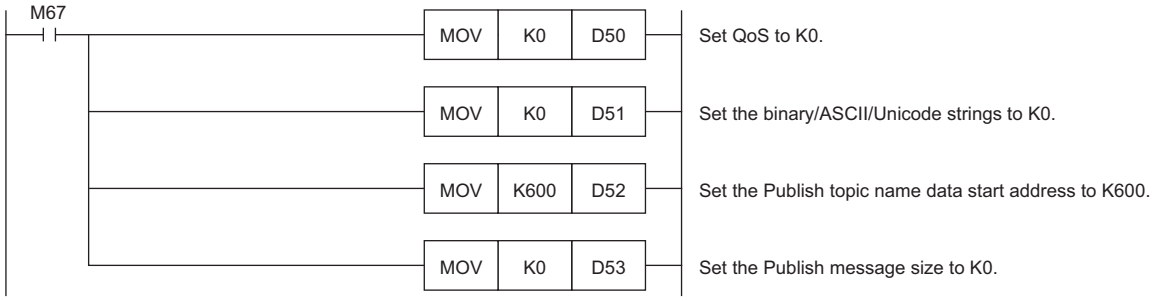
- JSON string creation

When M50 (Execution command) turns on, the function block creates a JSON string in accordance with the information of uType (Value type), s32Key (Key name), s64Value (value of Value), and uDepth (depth of layer) in the set member list (pb_st30Member) and it outputs the string to the file register at the address specified with the start address of the JSON string storage destination.

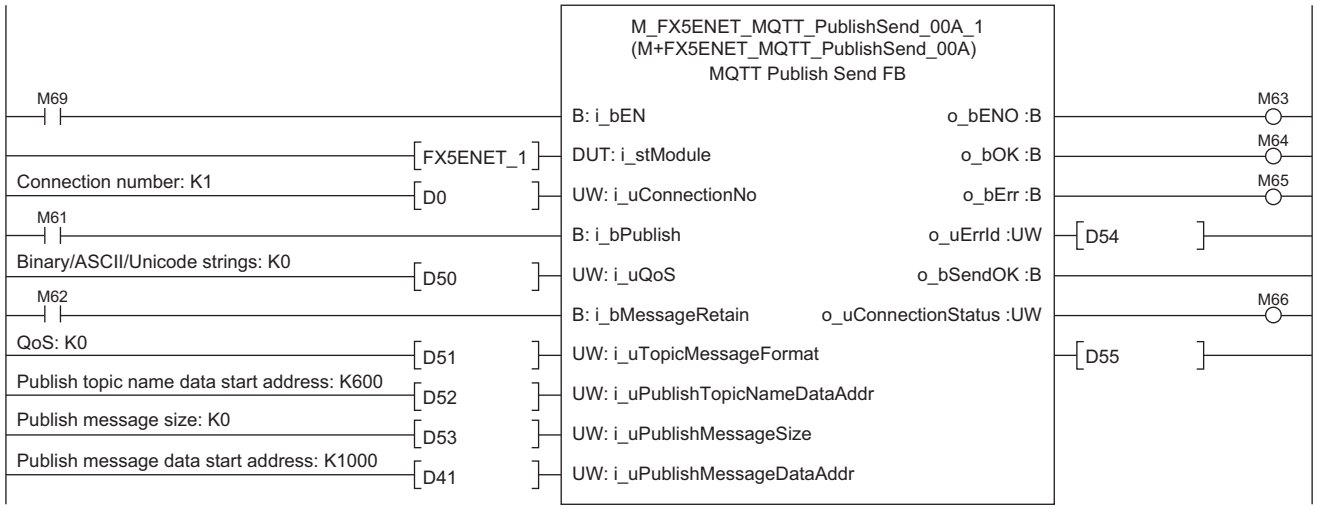


■Sending of message data

M67 turns on for setting the information used for M+ENET_MQTT_PublishSend (Sending of MQTT data).



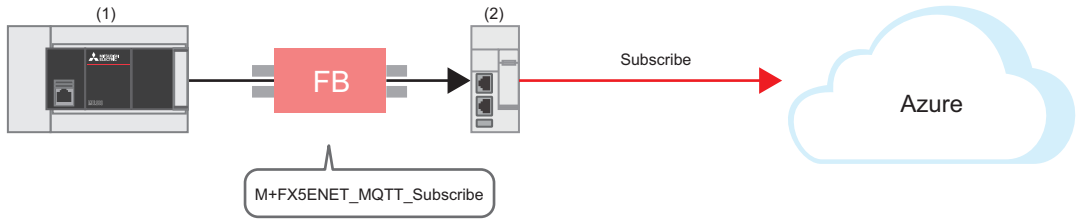
M69 (Execution command) turns on. After M63 (Execution status) turns on, M61 (PUBLISH instruction (Rise detection)) turns on for sending a message.



5.3 Checking the Operation of Subscribe

Checking the operation of Subscribe (Sending of Subscribe command)

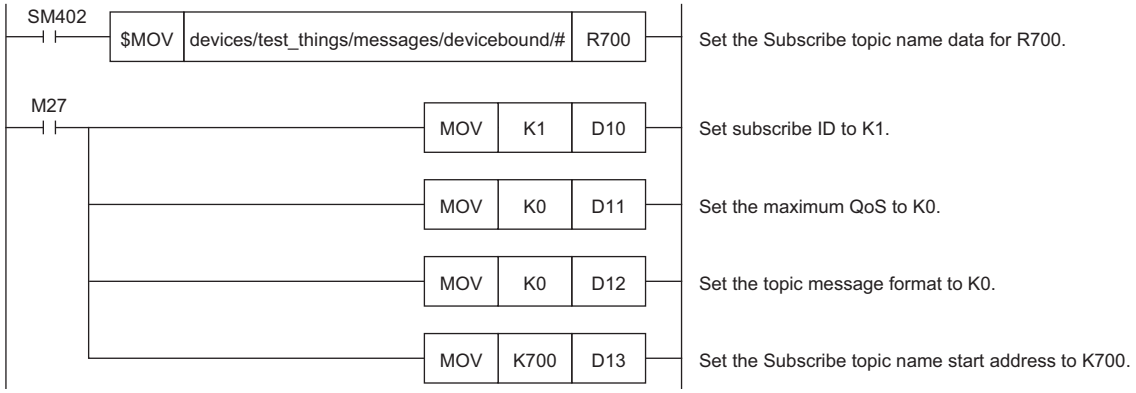
After checking the operation of Connect (MQTT Connection Establishment) (☞ Page 36 Checking the Operation of Connect (MQTT Connection Establishment)), use M+FX5ENET_MQTT_Subscribe (Sending of Subscribe command) for sending a SUBSCRIBE/UNSUBSCRIBE command to the server (MQTT broker).



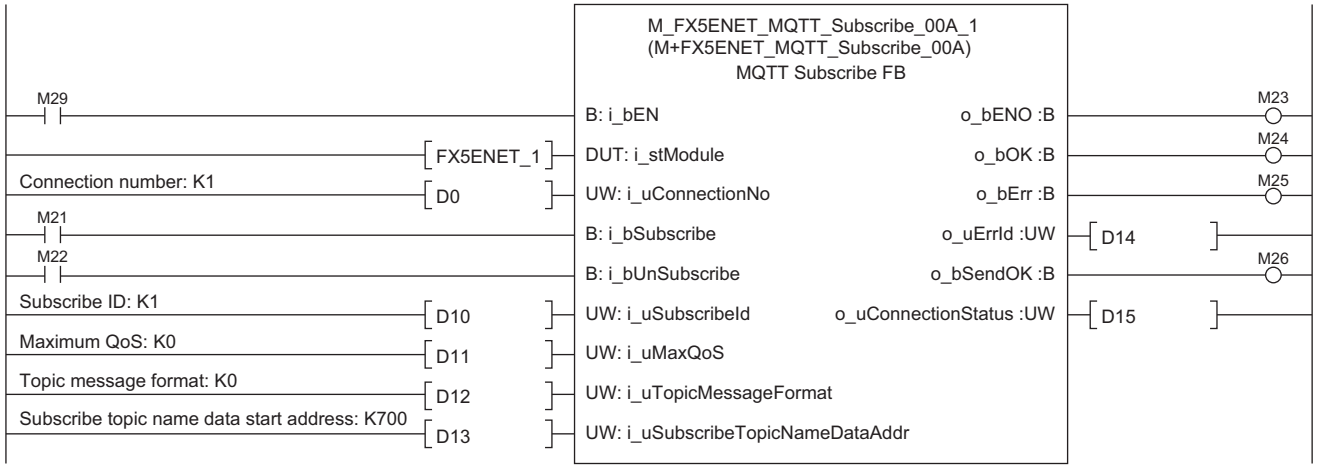
(1) FX5U CPU module
(2) FX5-ENET

Program

M27 turns on for setting the information used for M+ENET_MQTT_Subscribe (Sending of Subscribe command).



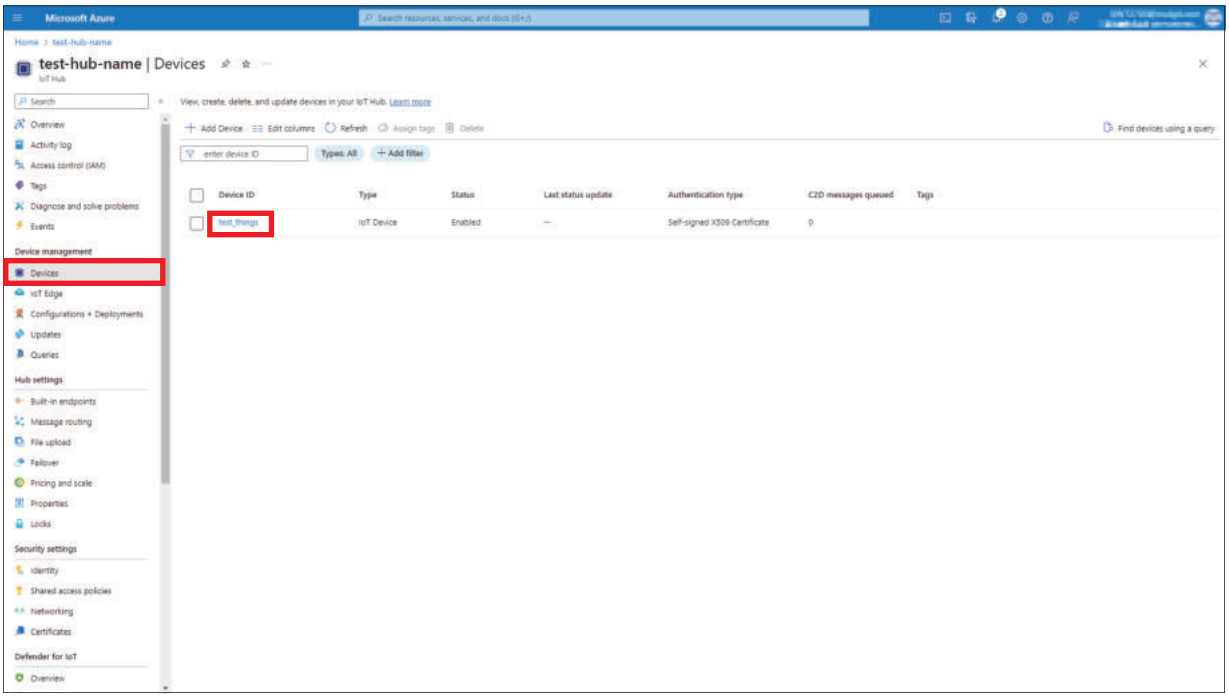
M29 (Execution command) turns on. After M23 (Execution status) turns on, M21 (SUBSCRIBE instruction) turns on for sending the subscribe.
After the Subscribe is successfully sent, M26 (Send completion) turns on.



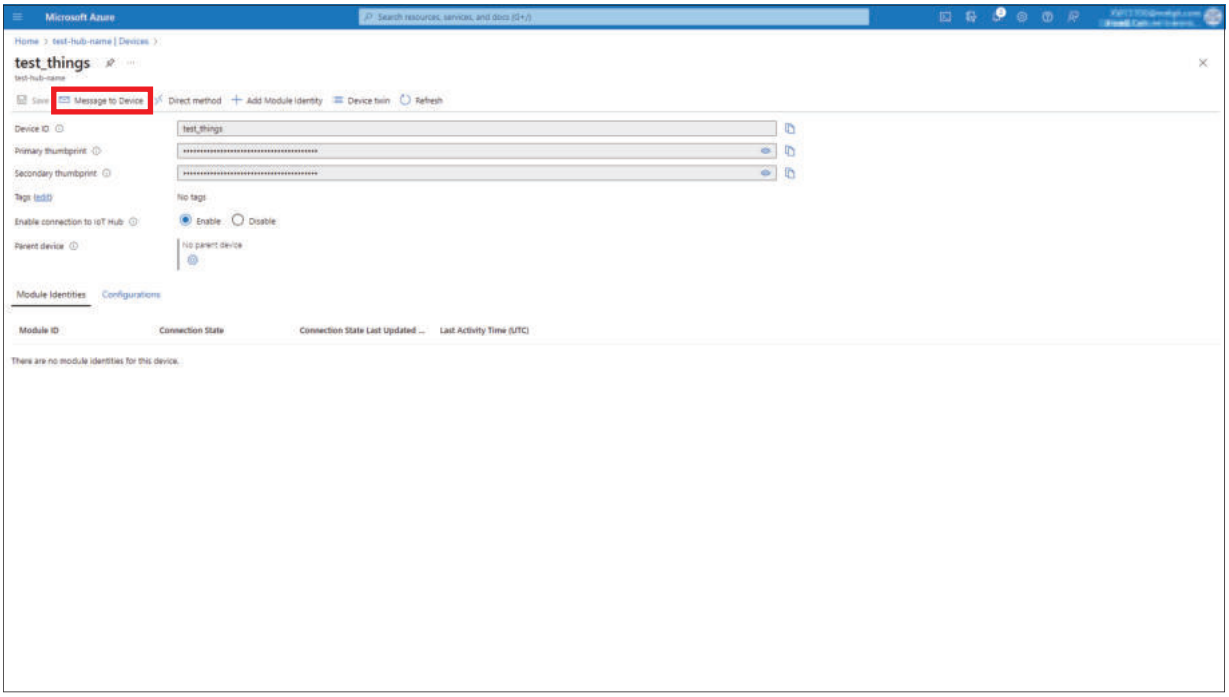
Preparing data with Azure IoT Hub

Prepare the data to be sent to the FX5-ENET with Azure IoT Hub.

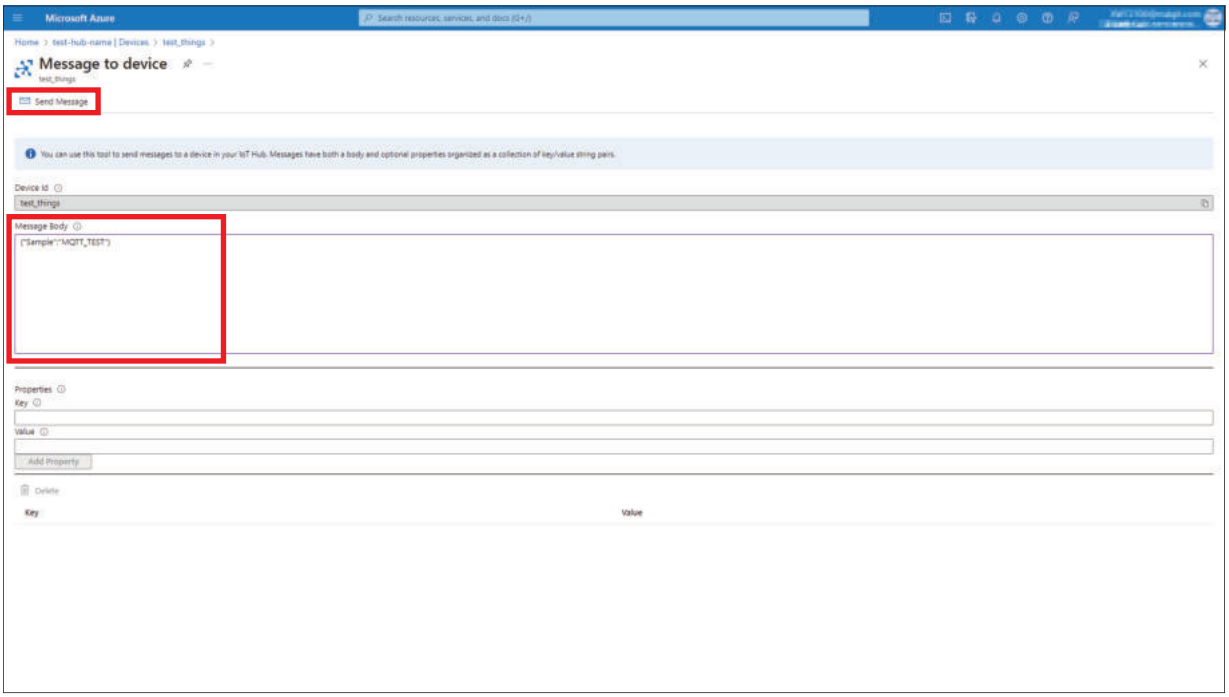
1. Click the device created.



2. Click [Message to Device].

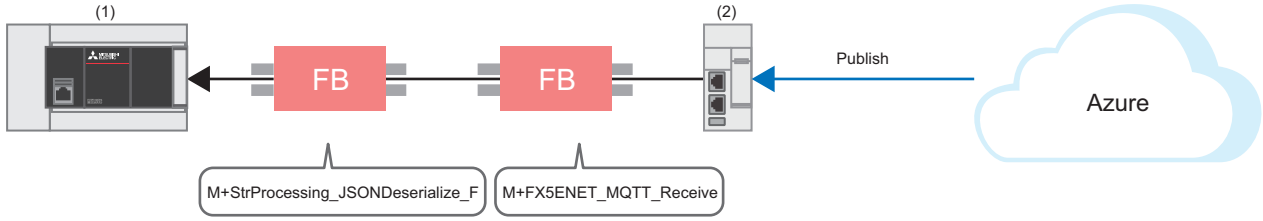


3. Enter a message to be sent in [Message Body], and click [Send Message].



Checking the operation of Subscribe (Receiving of MQTT data)

After preparing the data with Azure IoT Hub (☞ Page 41 Preparing data with Azure IoT Hub), use M+FX5ENET_MQTT_Receive (Receiving of MQTT data) for reading a message received from the server (MQTT broker).



(1) FX5U CPU module
(2) FX5-ENET

Registering the FB library

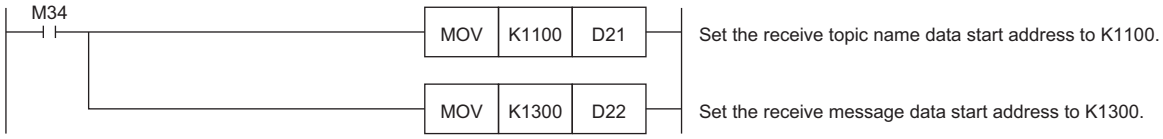
Register the FB library. For the operating procedures, refer to the following.

☞ Page 48 FB Library

Program

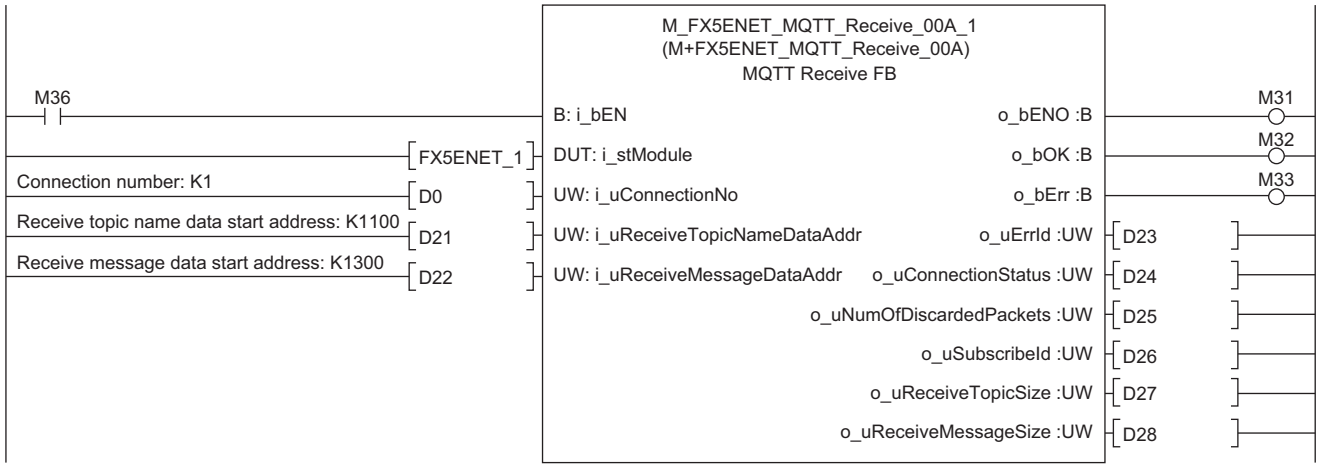
■Receiving of message data

M34 turns on for setting the information used for M+ENET_MQTT_Receive (Receiving of MQTT data).



M36 (Execution command) turns on for storing the receive data into the specified file register.

After the data is successfully received, M32 (Normal completion) turns on. The receive data is stored in the file register set with i_uReceiveTopicNameDataAddr (Receive topic name data start address) and i_uReceiveMessageDataAddr (Receive message data start address).



■Acquisition of only the required strings from receive data

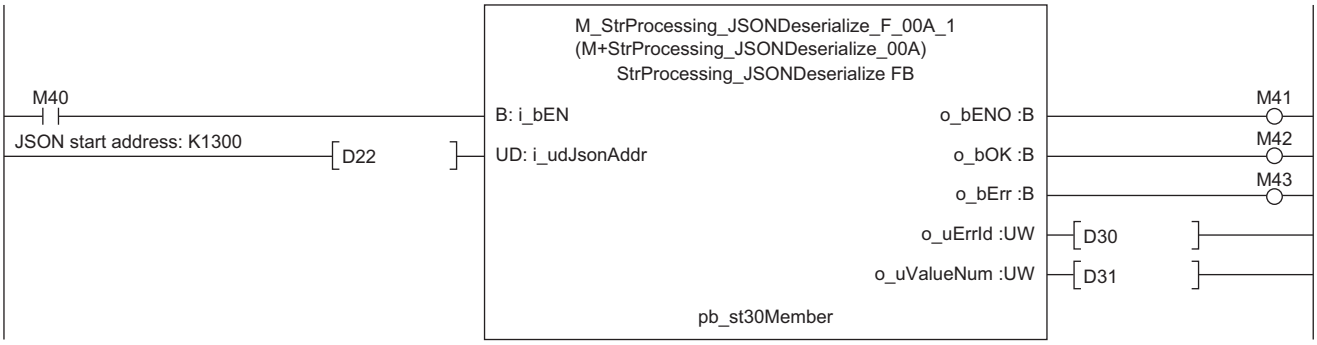
• Settings for required member information

M40 (Execution command) turns on for setting the member information to be acquired.

```
M40 ─┤├─
1 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].uType := K3; //Set the Value type to K3 (character string).
2 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].s32Key := 'Sample'; //Set the Key name to "Sample".
3 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].uDepth := K1; //Set the depth of layer to K1.
4 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[1].uType := K0; //Set the Value type to K0 (end of the member structure array).
```

• Acquisition of JSON string

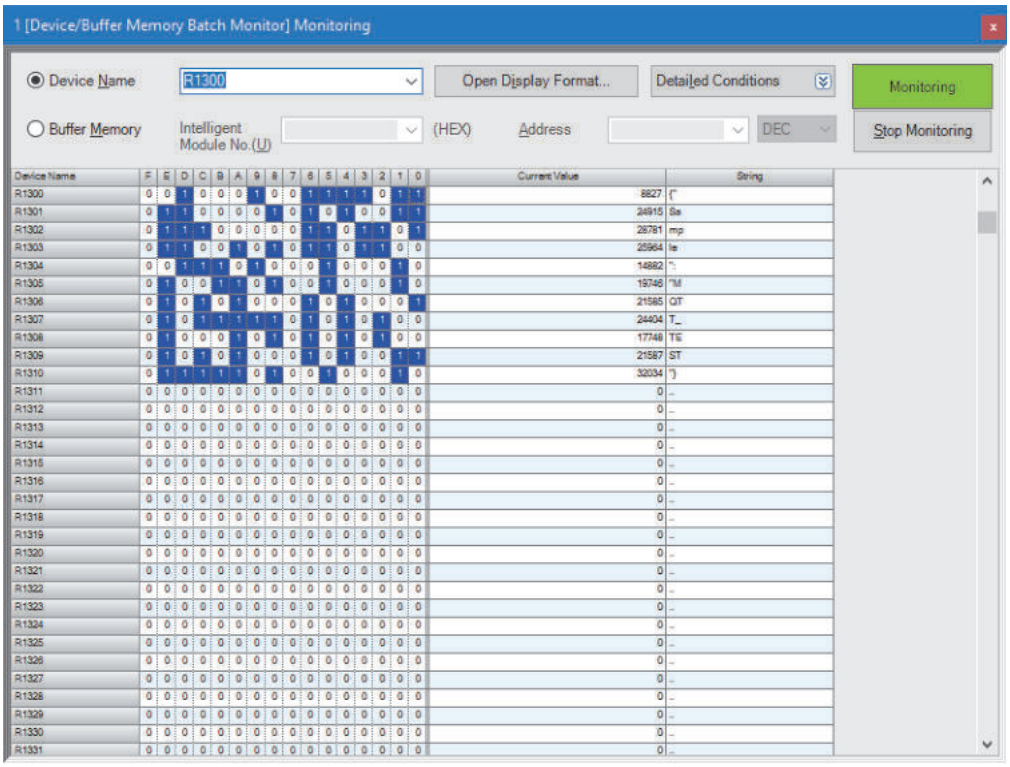
When M40 (Execution command) turns on, the function block acquires the Value strings that exactly match the values of uType (Value type), s32Key (Key name), and uDepth (depth of layer) in the set member list (pb_st30Member) from JSON strings stored at the JSON start address, and it stores the values into the s64Value (Value) values in the member list (pb_st30Member).



Checking reception on GX Works3

Messages received from Azure IoT Hub can be checked from "Device/Buffer Memory Batch Monitor" of GX Works3.

[Online] ⇨ [Monitor] ⇨ [Device/Buffer Memory Batch Monitor]



6 TROUBLESHOOTING

6.1 Checking Procedure

1. Checking the LED status

Check the communication status with the display status of the LEDs.

For the FX5U CPU module, refer to the following.

📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware), Section 15.2 Checking with LEDs

For the FX5-ENET, refer to the following.

📖MELSEC iQ-F FX5 Ethernet Module User's Manual, Section 10.1 Checking with LEDs

For the router, refer to the manual of the router used.

2. Checking the error code

Check the following according to the error code of the error occurred in the FX5U CPU module and FX5-ENET.

For the FX5U CPU module, refer to the following.

- Error codes common to CPU modules

📖MELSEC iQ-F FX5 User's Manual (Application), Appendix 3 Error Code

- Error codes related to Ethernet communication of CPU modules

📖MELSEC iQ-F FX5 User's Manual (Communication), Section 47.1 Ethernet Communication

For the FX5-ENET, refer to the following.

📖MELSEC iQ-F FX5 Ethernet Module User's Manual, Section 10.6 List of Error Codes

■Checking the wiring

For the wiring, refer to the following.

☞ Page 9 System Configuration

- Are the Ethernet cables fully inserted?

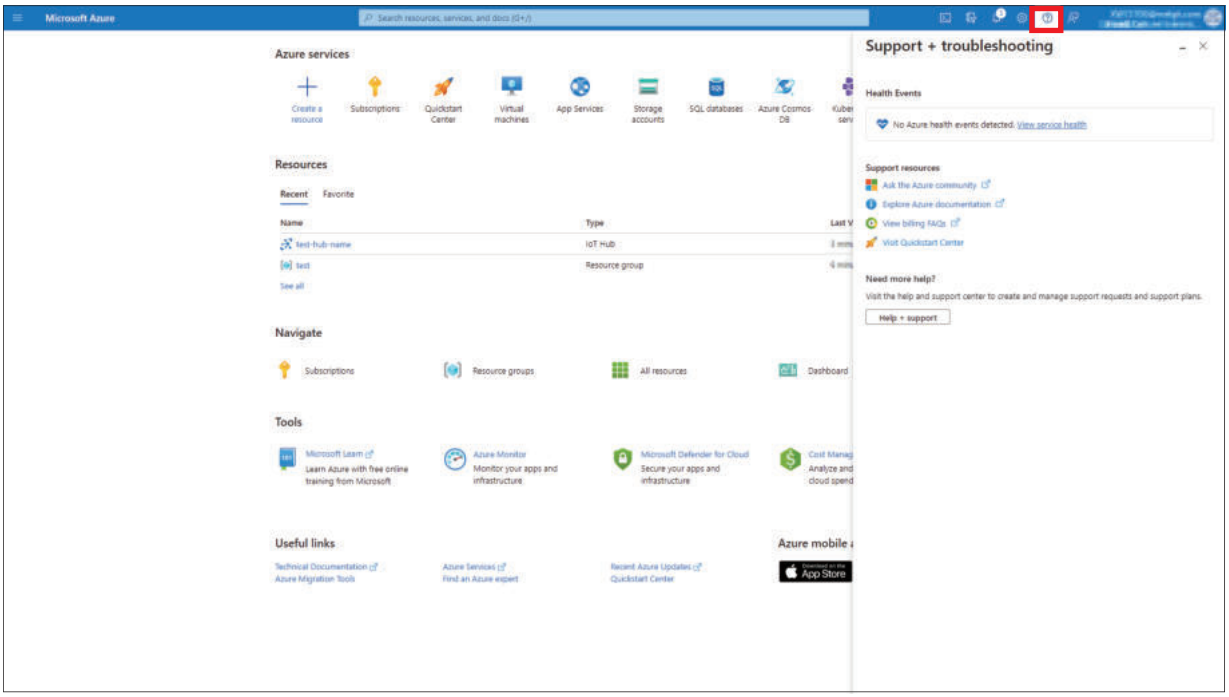
■Checking the communication settings

Refer to ☞ Page 12 CONFIGURING CLIENTS (MQTT PUBLISHER, MQTT SUBSCRIBER) and ☞ Page 25 CONFIGURING SERVER (MQTT BROKER) CONNECTION.

- Are the GX Works3 parameter settings, Certificate Configuration Tool for FX5-ENET settings, and Azure setting details correct?
- Are the IP address and subnet mask settings of the FX5U CPU module, FX5-ENET, personal computer, and router correct?
- If a firewall is set up between the FX5-ENET and the personal computer, has permission been given to the port to be used?

3. Checking the Azure settings

For the Azure settings, follow the instructions on the window or see "Support + troubleshooting".



APPENDICES

Appendix 1 List of FX5 Ethernet-equipped Module FBs

The FX5 Ethernet-equipped module FB library contains the following FBs. Programs are created by combining FBs according to each application.

Name	Description
M+FX5ENET_MQTT_Connect	Controls the connection with a server (MQTT broker) to establish a TCP or TLS session by the CONNECT instruction or to disconnect the session by the DISCONNECT instruction.
M+FX5ENET_MQTT_PublishSend	Sends a message to the server (MQTT broker).
M+FX5ENET_MQTT_Receive	Reads a message received from the server (MQTT broker).
M+FX5ENET_MQTT_Subscribe	Sends a SUBSCRIBE/UNSUBSCRIBE command to the server (MQTT broker).

Appendix 2 FB Library

Downloading the FB library

In this manual, the character string operation FB library is used.
To obtain the FB library, please contact your local Mitsubishi Electric representative.

Importing the FB library

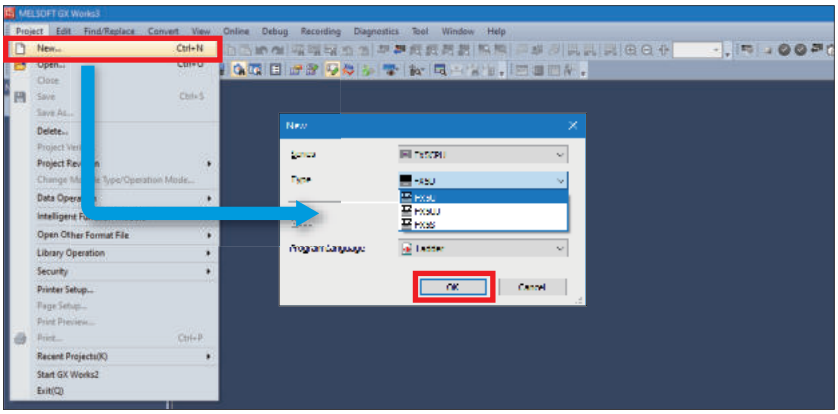
This section describes how to register the obtained FB library to GX Works3.

Decompress the FB library folder (zip file) before registering the FB library.

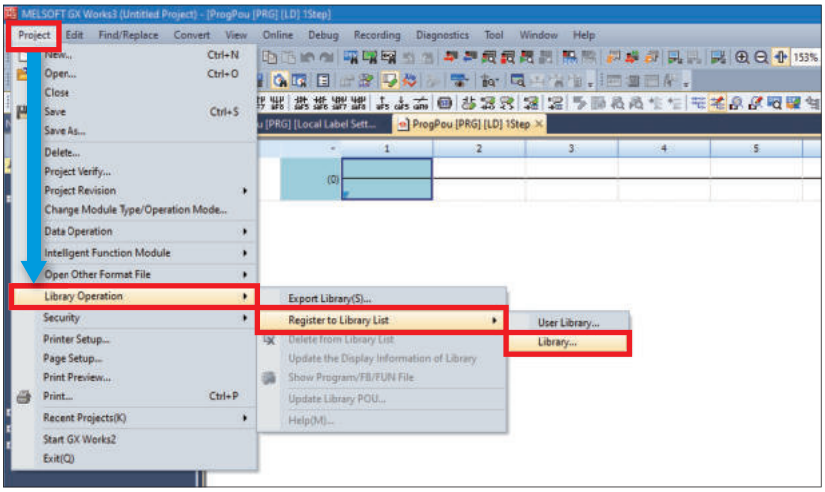
1. Start GX Works3, and select [Project] on the toolbar ⇨ [New].

In this manual, the following settings are used.

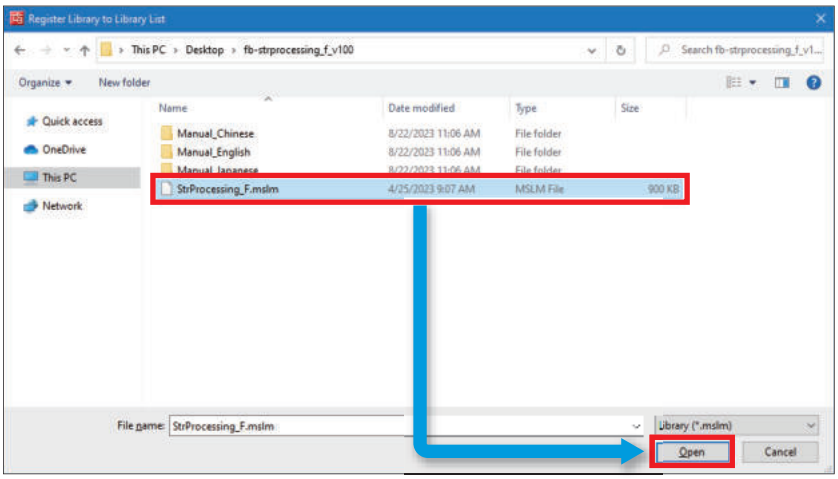
Item	Description
Series	FX5CPU
Type	FX5U
Program Language	Ladder



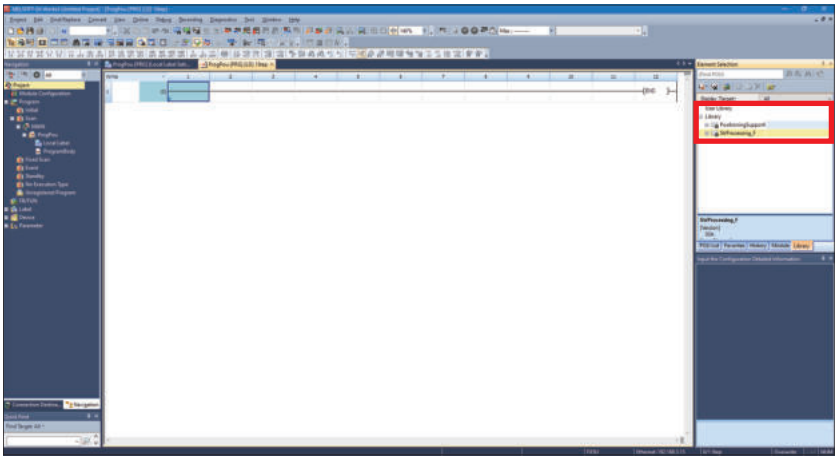
2. Select [Project] on the toolbar ⇨ [Library Operation] ⇨ [Register to Library List] ⇨ [Library].



3. Select the "StrProcessing_F.mslm" file in the decompressed FB library folder, and click [Open].



4. The selected file is added to [Library] in the "Element Selection" window.



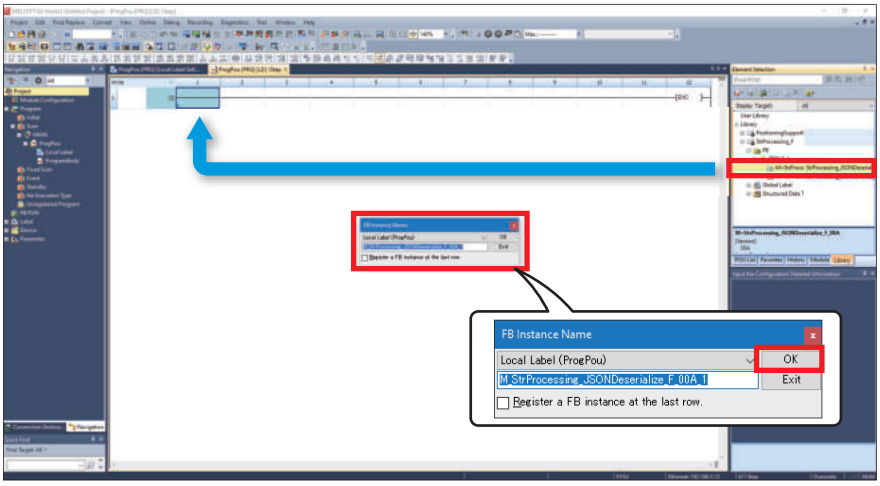
Point

If the "Element Selection" window is not displayed, select [View] on the toolbar ⇨ [Docking Window] ⇨ [Element Selection] to open the window.

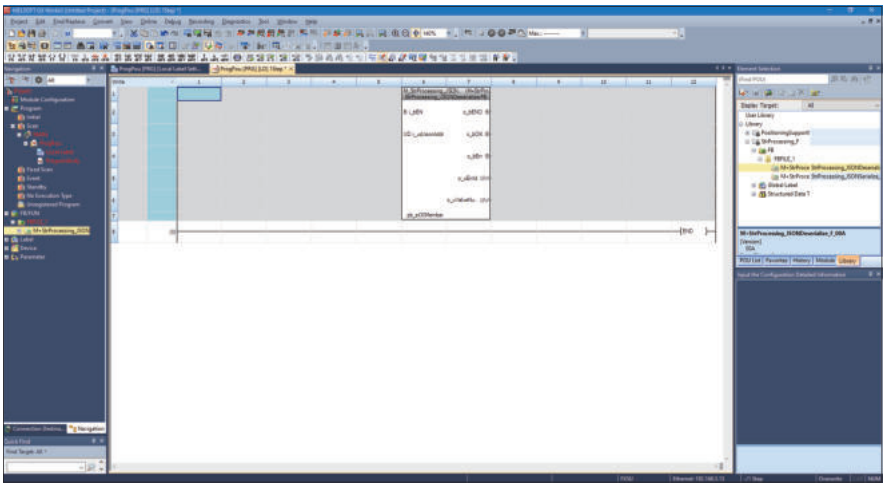
How to use the FB library

Select an FB registered in the library from the "Element Selection" window, and drag and drop it to the program editor. Create an input ladder and an output ladder of the pasted FB to create a program.
Arrange the FB input ladder to the left side, and output ladder to the right side of the window in the same manner as standard ladder programs.

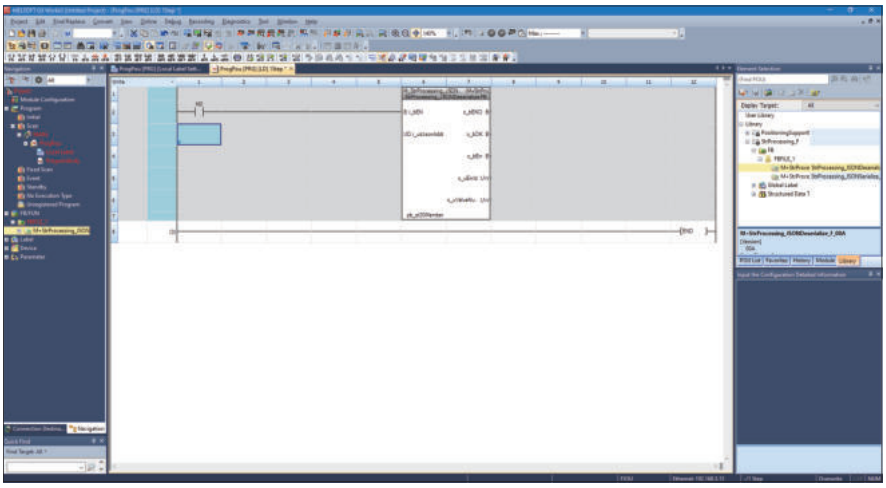
1. Go to the "Element Selection" window ⇨ the [Library] tab ⇨ [Library]. Then, select an FB to be used and drop it in the program editor. When the "FB Instance Name" window appears, click the [OK] button.



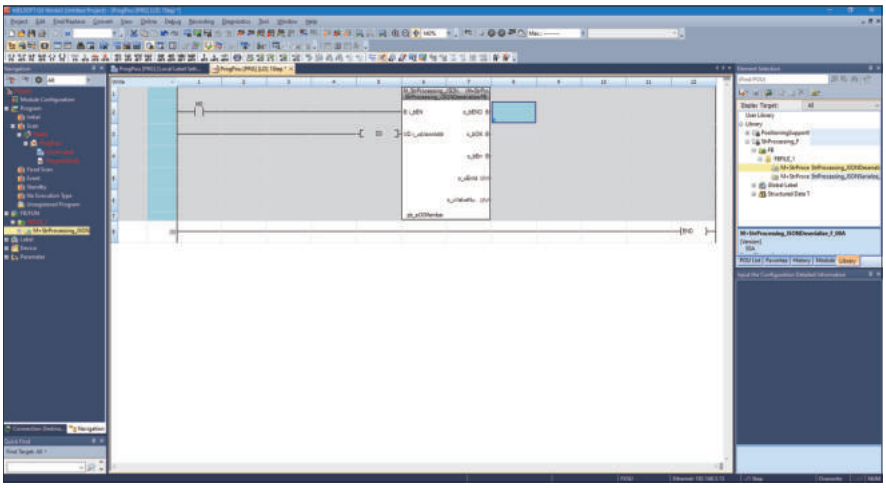
2. The FB is pasted to the program editor.



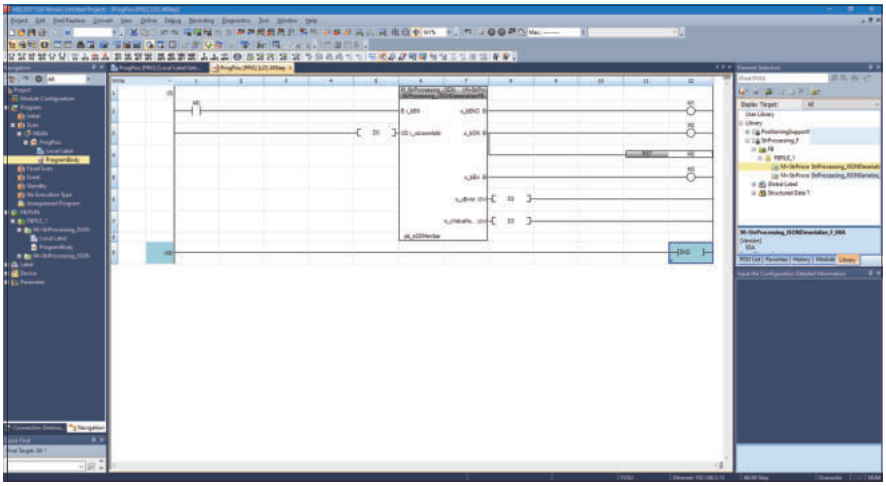
3. Insert a contact and input to B:i_bEN.



4. Insert an FB word device input to the left side of the FB. Insert an FB word device output to the right side of the FB.



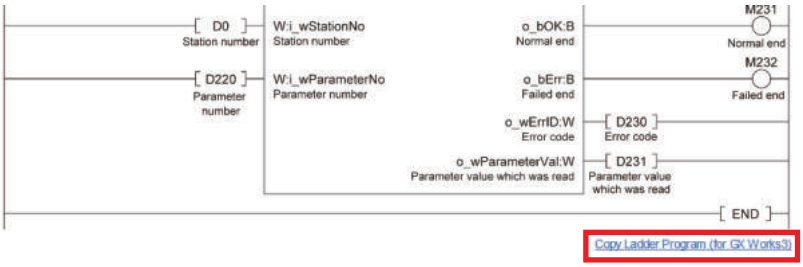
5. Repeat these steps to create the ladder.



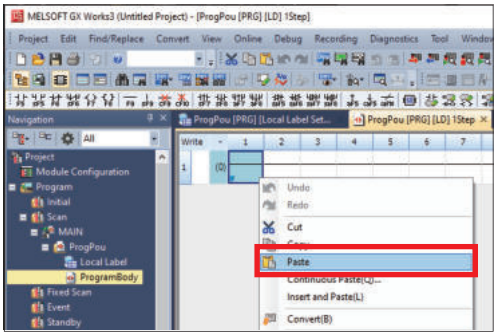
Appendix 3 How to Use the Program Copy Function of e-Manual

Program examples in e-Manual can be copied and pasted to GX Works3.

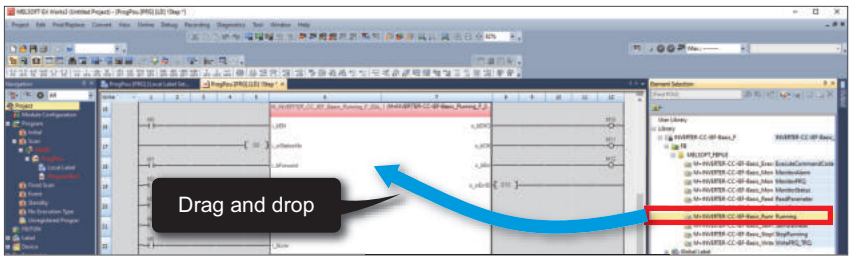
1. Click "Copy Ladder Program (for GX Works3)" in e-Manual.



2. Right-click the mouse on the ladder editor of GX Works3, and select [Paste].



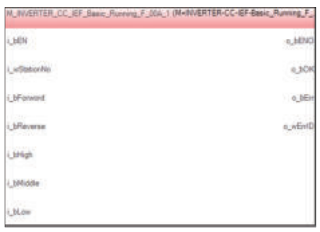
3. The copied program is pasted in undefined state. Select the FB used in the program example from [Library] on the "Element Selection" window, and drag and drop it to the FB area on the ladder editor.



Point

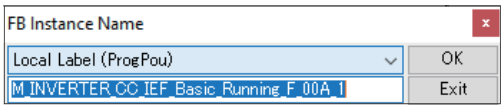
When an FB is used in the program example, the definition of the FB will be unclear immediately after the program is pasted to the ladder editor. Drag and drop the FB from the "Element Selection" window to define the FB properly.

Unclear definition of FB

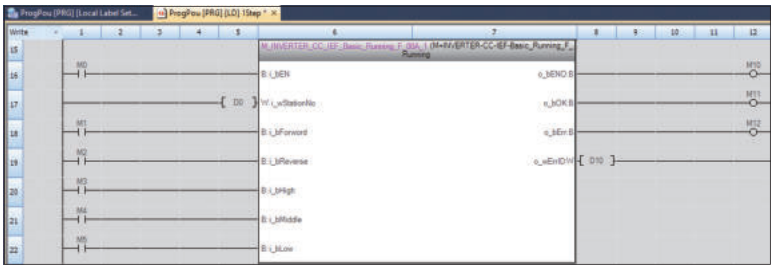


Properly defined FB

4. Click the [OK] button on the "FB Instance Name" window.

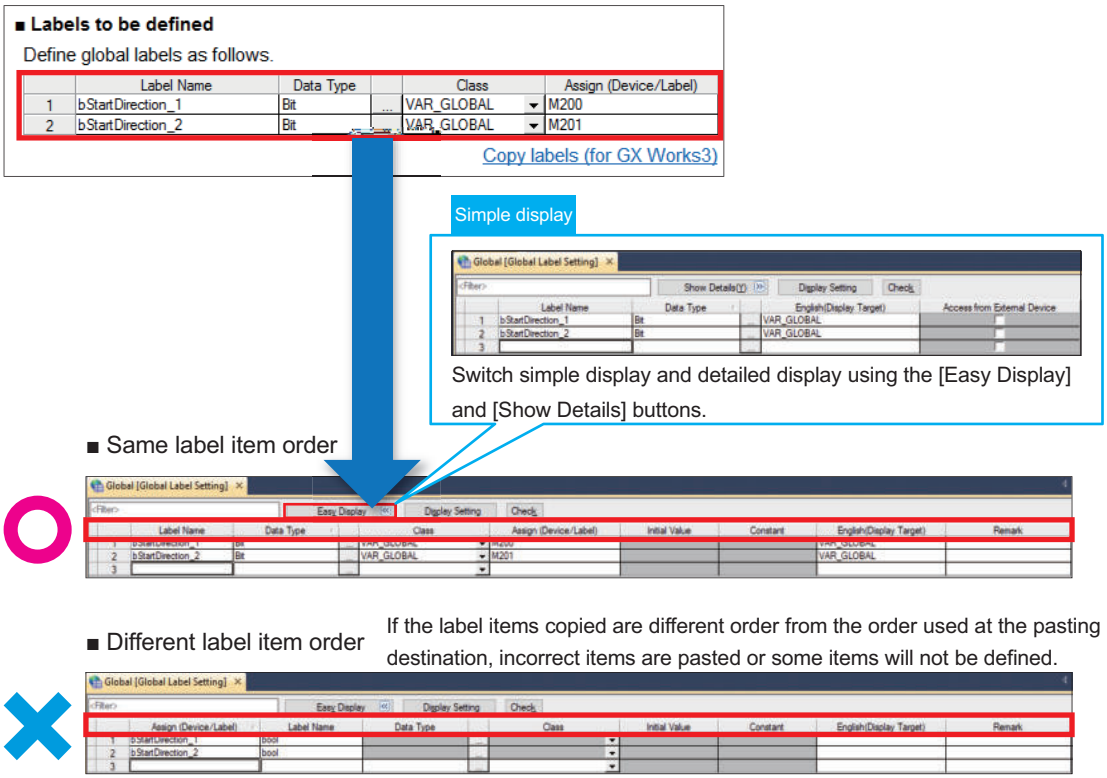


5. When the FB is properly defined, the FB instance name is highlighted in gray.



Point

Label items (label name, data type, and others) are copied in the order defined as an example in this manual. Therefore, define label items in the same order as shown on the label editor of the engineering tool.



A

REVISIONS

Revision date	Version	Description
October 2023	A	First edition

Japanese manual number: L08899-A

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WARRANTY

Please confirm the following product warranty details before using this product.

📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware), WARRANTY
📖MELSEC iQ-F FX5 Ethernet Module User's Manual, WARRANTY

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