

FACTORY AUTOMATION

Mitsubishi Electric Programmable Controller 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

[O: Available, -: Not available]

Manual name	Available form		
<manual number=""></manual>	e-Manual	PDF	
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) <sh-082452eng></sh-082452eng>	0	0	
MELSEC iQ-F FX5 User's Manual (Application) <jy997d55401></jy997d55401>	0	0	
MELSEC iQ-F FX5 Programming Manual (Program Design) <jy997d55701></jy997d55701>	0	0	
MELSEC iQ-F FX5 Programming Manual (Instructions, Standard Functions/Function Blocks) <jy997d55801></jy997d55801>	0	0	
MELSEC iQ-F FX5 User's Manual (Communication) <sh-082625eng></sh-082625eng>	0	0	
MELSEC iQ-F FX5 Ethernet Module User's Manual <sh-082026eng></sh-082026eng>	0	0	
GX Works3 Operating Manual <sh-081215eng></sh-081215eng>	0	0	



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e-Manual

Copying program examples to an engineering tool

Program examples contained in a document can be directly copied to an engineering tool, eliminating the need of inputting the programs.



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Latest documents and notes can be shared with multiple users using the document sharing function.

■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

Unless otherwise specifie	d. 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".
Торіс	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, 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-40MT/ESS, FX5UJ-60MR/DS, FX5UJ-24MT/DS, FX5UJ-24MT/DS, FX5UJ-24MT/DS, FX5UJ-40MT/DS, FX5UJ-60MT/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)

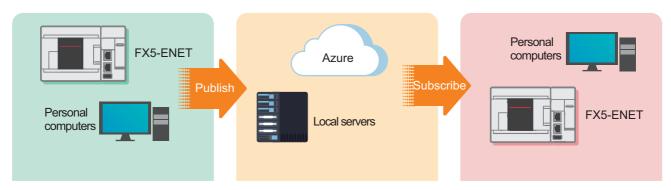
KEY FEATURES

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

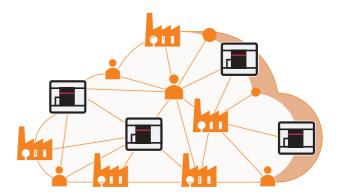
Connecting to Azure enables handling of information without preparation of the computing environment. Various services prepared by Azure (not only data accumulation, but also services such as data visualization and AI predictions) are available.

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)

8

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.

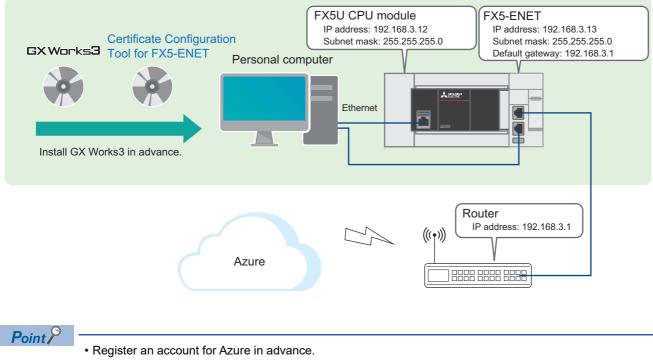
To use applicable CPU modules other than the FX5U CPU module, refer to the following manuals.

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.



• 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 conta	ct your local Mitsubishi Electric representative.	
Router	Three Ethernet cables	Azure account
		Azure
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.msIm	Page 48 FB Library

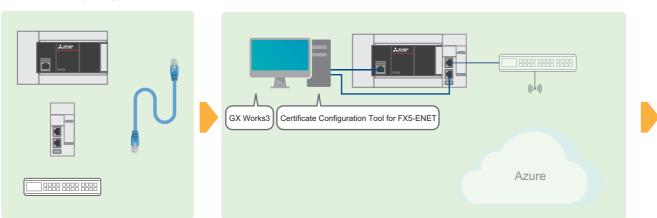
2.3 Wiring

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

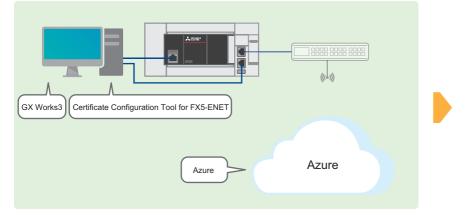
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware), Section 13.4 Power Supply Wiring

2.4 Operation Flow Diagram

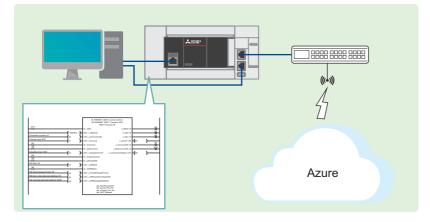
- **1.** Preparing the required products (wiring)
- 2. Configuring the clients (MQTT Publisher, MQTT Subscriber)



3. Configuring the server (MQTT broker) connection



4. Program examples and checking the operation



3 CONFIGURING CLIENTS (MQTT PUBLISHER, MQTT SUBSCRIBER)

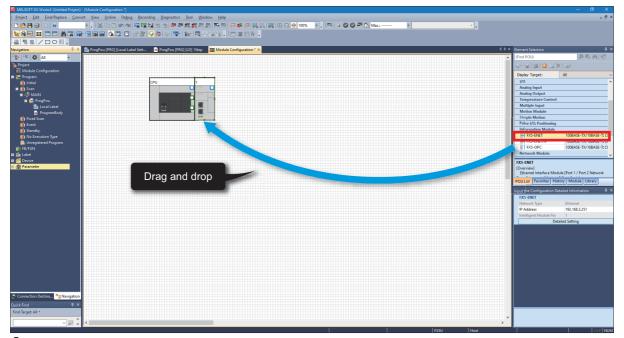
This chapter describes the setting items for the clients (MQTT Publisher, MQTT Subscriber).

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.



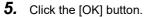
3. Click the [Setting Change] button.

MELSOFT GX Works3				
1	Add a module. [Module Name] FX5-ENET [Mounting Position No.] 1	[\/ 1]		
Modu	le Setting	Setting Change		
Mod	lule Label:Not use		^	
			~	
<u>D</u> o N	Not Show this Dialog Again	ОК		

3

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

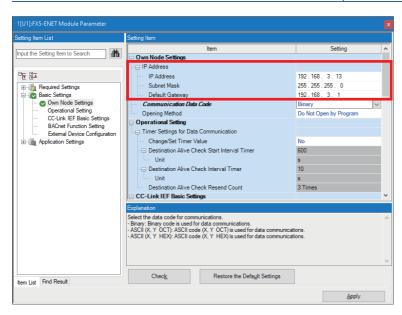
Options				
		Departion Setting		
Froject	<u>^</u>			
Save		Use Module Label Yes 🔻		
Revision		Kead Sample Comment		
Device Comment		Message		
Reference/Reflection Target		Show the confirmation message in adding module Yes		
Add New Module				
Navigation				
Element Selection				
🔁 Program Editor				
😼 Other Editor				
🔏 Edit				
H Find/Replace		Use Module Label		
Parameter		Select whether to add the module label in adding module.		
R Monitor		[Caution]		
Soline		Please set other than module labels as refresh destination for module parameter to use the		
Convert		label of direct access in program. If module labels are selected as refresh destination, the value which has been set to label of		
La Intelligent Function Module		direct access is overwritten in refreshing with the value of label for Auto-refresh.		
🚚 Simulation	¥			
		Import Export		
Back to Default Back to Us	e <u>r</u> C	efault Set as User Default OK Cancel		



MELSOFT GX Works3				
Add a module. [Module Name] FX5-EN [Mounting Position No.]				
Module Setting	Setting Change			
Module Label:Use	^			
	~			
Do Not Show this Dialog Again	ОК			

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>.

1[U1]:FX5-ENET Module Parameter			
Setting Item List	Setting Item		
Input the Setting Item to Search Image: Setting Item to Search Image: Setting Item to Setting Item Se	Item Heport Destination Network No. Report Destination IP Address Report Destination Port No. Time Synchronization Setting Actuality of the Address Analog Network Setting Analog Network Setting Analog Value Object Setting Binary/hour Object Setting Binary/out Object Setting Multi-state Input Object Setting Multi-state Input Object Setting Multi-state Input Object Setting Setting	Setting 0 Setting 192.168.0.254 47808 Ignore Ignore Obtailed Setting> Obtailed Setting> Obtailed Setting> Obtailed Setting>	
Item List Find Result	Set external devices to be used for communications. Check Restore the Default Settings		<
		Apply	

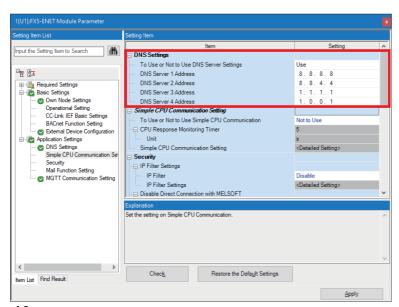
8. Drag and drop [MQTT Connection Module] to add it. Set the protocol and port number as shown below, and click [Close with Reflecting the Setting].

Item	Setting
Protocol	TLS
Port No.	50000

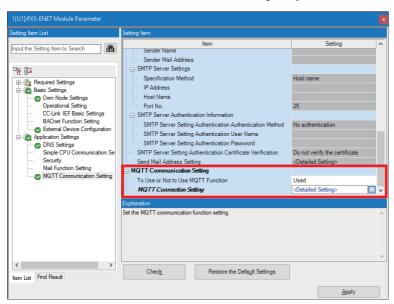
		figuration (Mounting Positio juration <u>E</u> dit <u>V</u> iew Clo		the Setting	lose with Reflectin	a the Setting			– D X
_		Count (Cur./Max.): 1/32				<u> </u>			Module List × Ethernet Selection Find Module My f 4 Ethernet Selection Find Module My f 4
	No.	Model Name	Communication Method	Protocol	Fixed Buffer Send/Receive Setting	PL IP Address	.C Port No.	or/Di MAC idre:	Ethernet Device (General)
	1 1	Host Station MQTT Connection Module	MQTT	TLS	1	192.168.3.13 192.168.3.13	50000		DDP Connection Module - Active Connection Mod - Dupassive Connection N -
Host	<	Connection No.1	l drop						Fillpassive Connection - Mail BaCnet/P Connection - Mail Server Connection - Mail Server Connection Mod - Ethernet Device (Mitsubishi Ele Code Reader GOT2000Series General-Purpose AC Servo Inverter(FR-A800 Series) Inverter(FR-A800 Series) Servo Amplifier(MELSERVO-J Vision Sensor
		MQTT Conn ection Modul e						>	[Outline] MQIT Connection Module [Specification] Use when specify open method by MQIT

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].



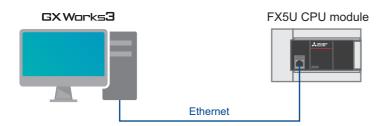
- **11.** To avoid errors, temporarily enter arbitrary character strings for "MQTT Server Host Name" and "Client ID". Click the [Apply] button.
- Configure the proper settings at the following timing.

Page 34 Configuring Settings with GX Works3

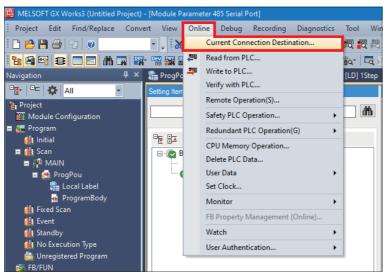
etting Item List	Setting Item		
sting Item List put the Setting Item to Search Particle Settings Particle Settings <	Item MQTT Connection Setting MQTT Server Specification Method MQTT Server Post Name MUTT Server IP Address Setting Verify Server Certificate Explanation	Host name Basasa 1 bbbbb Verify	ng
	Set the client ID of FX5-ENET(/IP). [Setting range] The string within 1 to 492 characters and sati $A + (B + C) \times 2 + D < 984$ A : the number of characters for MQTT server B: the number of characters for client ID C: the number of characters for user name D: the number of characters for password		
< >>	Chec <u>k</u> Restore	the Default Settings	

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".

Connection Destination Simpl	e Setting Connection	×
Direct Coupled Setting Please select the direct coupled	onnection method with CPU mo	odule.
• Ethernet		
	Ethernet Board Etherne h the CPU module without usin fv the IP address of CPU modul	ig a hub.
It is not required to speci		
	* This setting is applied to all I	Ethernet port direct coupled settings.
<u>A</u> dapter	Not Specified	~
IP Address of Adapter		Communication Test
O Other Connection Method	I	
Select this method if you CPU module with a conne than the direct coupled so	ction method other	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialog * Always open the Spe Connection Destination	ocify OK	Cancel

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.

Connection Destination Simpl	le Setting Connection	
Direct Coupled Setting Please select the direct of	onnection method with CPU mo	odule.
● <u>E</u> thernet		
	Ethernet Board Etherne	et
	h the CPU module without usin ify the IP address of CPU modul	
	* This setting is applied to all I	Ethernet port direct coupled settings.
<u>A</u> dapter	Not Specified	~
IP Address of Adapter		Communication Test
O Other Connection Method	d	
Select this method if you CPU module with a conne than the direct coupled s	ection method other	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialo * Always open the Spe Connection Destination	ecify OK	Cancel

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

Connection Destination Simple	e Setting Connection	
Direct Coupled Setting Please select the direct co	onnection method with CPU m	odule.
● <u>E</u> thernet		
	Ethernet Board Ethern hthe CPU module without using fy the IP address of CPU module	ng a hub.
		Ethernet port direct coupled settings.
<u>A</u> dapter	prosts strained counter the	· DE 01 H.H.
IP Address of Adapter	10.97.219.90	Communication <u>T</u> est
Other Connection Method		
Select this method if you CPU module with a conne than the direct coupled se	ction method other	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialog * Always open the Spe Connection Destination	cify OK	Cancel

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

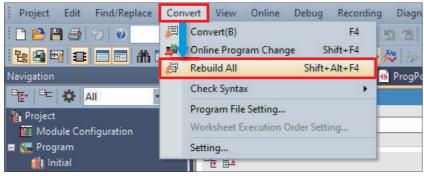
MELSEC iQ-F FX5 User's Manual (Communication), Section 4.2 Connection via a Hub

Writing data to the programmable controller

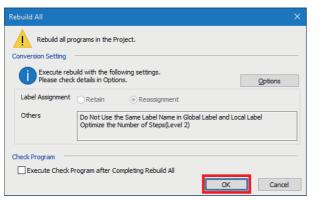
Write the program to the FX5U CPU module.

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

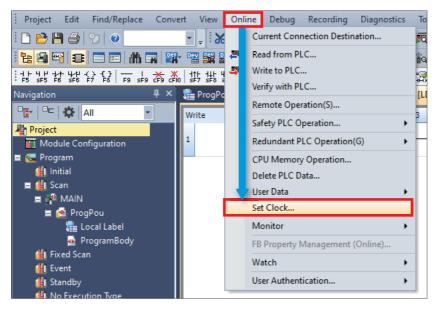
1. Select [Convert] ⇒ [Rebuild All].



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

Set Clock			×
PLC Time Zone	omment		
Date	Time S	pecify Execution Target	
4 A 12022 A	12	Currently Specified Station \sim	
▲ August 2023 ▶ Sun Mon Tue Wed Thu Fri Sat 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 1 2 3 4 5 7 8 9 10 11 2 3 4 5 7 8 9 13 1 2 3 4 5 7 8 9 10 04/x8/30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023 30/2023	9 3	Explanation From Get Time from PC setting, users are able to	
8/30/2023	10:10:00 AM	get the time coupled with the time zone set in PC. To set the setting, please execute it after matching the time zone of PLC and PC. From Get Time from PLC setting, users are able to get the Set Clock setting.	
Get <u>T</u> ime from PC Get Time f	from <u>P</u> LC		
		Execute Close	

5. Select [Online] \Rightarrow [Write to PLC].

Project Edit Find/Replace Conv	vert View	Onli	ne Debug	Recording	Diagnostics	Тоо
i 🗅 🖻 💾 🎒 🕲 🛛 🖉	- 🗐 🕺		Ourrent Conr	nection Destin	ation	1
12 9 9 2 9 8 4 7 3	- 🔤 📴 🖁	四	Read from Pl	.C		iq.
Navigation 🛛 🕹 🗙	💼 ProgPo	70	Write to PLC.			[LD]
□ <u>•</u> • □= 🋠 All -	Setting Item		Verify with Pl	.C		
Project			Remote Oper	ration(S)		
Module Configuration			Safety PLC O	peration	•	
🖿 🔚 Program			Redundant P	LC Operation	(G) 🔸	
👔 Initial 📼 🌆 Scan			CPU Memory	Operation		

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

y <u>S</u> etting	Related I	-			_		_					
,) i E	Write		* 🖳	ÓE	Veri's	< 🖳 🎸	Dele	5e				
Parameter 4	Program(E)	Select All	Legend									
Open/(e All(<u>T</u>)	Deselect All(<u>N</u>)	CPUI	Built-in Me	mory	SD N	temory Card	🛅 Inte	lligent Function Module			
odule Nan	ata Name		*			Detail	Title		Last Change	Size (Byte)		
📲 Un	d Project											
🕀 🚯	ameter											
	System Pa	rameter/CPU Parameter							9/15/2022 9:12:28 AM	Not Calculate	ed be	
-	Module Pa	rameter	×						9/15/2022 9:15:30 AM	Not Calculate	ed	
	Memory C	ard Parameter							9/15/2022 9:12:27 AM	Not Calculate	ed	
	Remote Pi	essword	×						9/15/2022 9:12:27 AM	Not Calculate	ed	
- 🚯	bal Labe											
1.1	Global Lab	el Setting							9/15/2022 9:12:29 AM	Not Calculate	ed	
0.65	gram											
1.14	MAIN		×						9/15/2022 9:12:29 AM	Not Calculate	ed	
0 🖪	vice Men	iory										
	MAIN					Detail			0/15/3022 0-12-20 AM	-		
Disp	amory Capac	ty 😮 🗌 Check M	lemory Capacit	y before W	iting							
ory Capac												
Size C81		Program Nemory									Free	
	_										64000/640005	жр
and		Data Memory							0		Free	
Used		Program:024/1024KB Restoration Info:1024/1024KB Parameter:1024/1024KB Device Comment:2048/2048KB										
Increased		SD Memory Card									Free	
Decreased											0,088	
Free: 5%	35	Program:0/0KB	Re	storation In	for0/0KB	P	arameter/0/088		Device Comment/0/088			

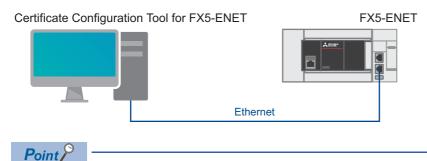
7. When the following window appears, click [Yes to all].

MELSOFT GX Works3	
The following file already exists. Are you sure you want to overwrite it?	
System Parameter CPU Parameter Module Parameter Program File(MAIN)	^
	~
Yes Yes to <u>a</u> ll	
No No to all Cancel	
	.::

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

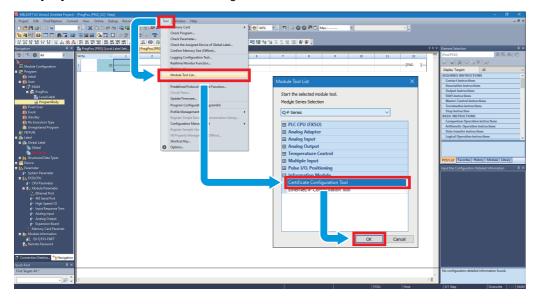
3.2 Configuring Settings with Certificate Configuration Tool for FX5-ENET

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



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.

B MELSOFT Certificate Con	figuration Tool for FXS-ENET (Untitled Project)* – 🗆 🗙
Project Connection Settings	Help
Server Certificates	Server(Objects/Cloud) Server Certificate/CRL files
Client Certificates	*
	Tool
	Trusted Certificates ORLs
	Serial Common Name Organizati Organizati Lolality State Coun Valid From Valid To DNS N URI IP Add
	Current connection Settings
	Host([P Address): 192.168.3.13
	Import Enable Password
	Reassword:
	Read from N Show Password Match Tool only Module only
	Communication Test QK Cancel
	Trusted Certificates CRLs
	Serial Common Name Organizati Organizati Locality State Coun Valid From Valid To DNS N URI IP Add
	Update Detels from List

Point P

- 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.

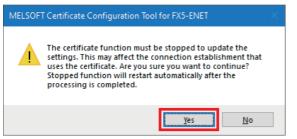
The set common name is used when creating devices in Azure.

Page 29 Creating devices

Item	Setting
Common Name	Any name
Country	US

AELSOFT Certificate Configurat	tion Tool for F	X5-ENET (Untitled Project)						- 0
ct Connection Settings Help	>							
r Certificates	lodule							
t Certificates S	erial No. (Common Name Orgini	zation Name	Organization Un	t Locality	State	Country Valid	From Valid To
	<u> </u>	New Client Certificate	Refres				efreshed//-	
	_		·		Delete	Last R	etreshed//-	;;
		Generate a New Client Ce	tificate(Self-Sig	ned Certificate)				×
		Subject		-				
Т	ool(Com	Common Name: *Mandato	ry test_things					
		Organization Name:						
		Organization Unit:						
		Locality (City):						
C.	ertificat	State:						
		Country:	US					
		Country.		code, e.g. US, JP,)			
		Certificate Settings RSA Key Strength:	2048 bits	~				
		Signature Algorithm:	SHA-256	~				
		Certificate Validity:	1 year	\sim				
		Certificate generation may	take approximatel	y 30-60 seconds.			Generate	Cancel
	L						_	
				[→		C		🕺 🟦 Get a Certificat

4. Click the [Yes] button.



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

🚟 MELSOFT Certificate Confi	iguration Tool for FX5-ENET	(Untitled Project)*			– 🗆 X
Project Connection Settings	<u>H</u> elp				
Server Certificates	Module				
Client Certificates	Serial No. Common	Name Orginization Name	Organization Unit Locality	State Country Valid From	Valid To
	test_thing	3		US	198.089
	Generate a New Clie	nt Certificate Refre	ish <u>D</u> elete	Last Refreshed: 1/10/01/11/11/11	184
		*	*	*	
	Tool(Computer)	\rightarrow Read CSR from Module	🗘 Replace to Module	▲ Read from Unit	
		*	*	*	
	Certificate Autor	ity(CA)		Server (Objects/Cloud)
			[-→ Get_a CSR	Geplace	Get a <u>C</u> ertificate

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

The copied value is used when creating devices in Azure.

Page 29 Creating devices

🙀 Certifi	cate				×
General	Details	Certification Pat	h		
Show:	<a >		~		
Auti Subj Basi Key	ic key pa hority Ke ject Key c Constr Usage mbprint		constructions Indext Page 1 Report Reports	nonana. Interation (8)	*
		8	ādit Properties	Copy to File.	
				С	ж

3

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 P

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/

Microsoft Azure Microsoft Sign in to contract to Microsoft Azure Email, phone, or Skype No account Create onel
Sign in to continue to Microsoft Ages Email, phone, or Skype
Can't access your account? Can't access your account? Next
Sign in with GitHub Sign in options

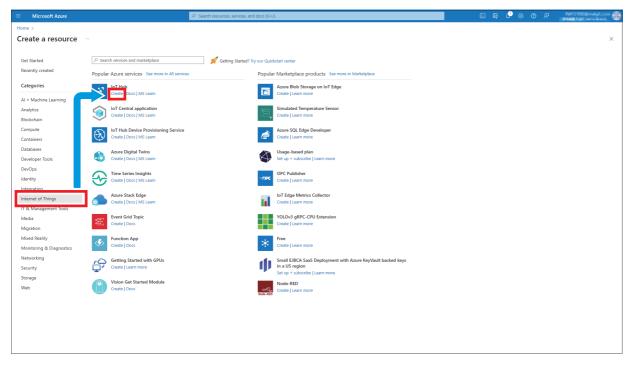
Configuring settings with Azure IoT Hub

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

1. Click [Create a resource].

₽ Search resource	is, services, and docs (G+/)			D & 🖓 🐵 🕐	R Distriction 🚭
Create a Subscriptions Qu	ickstart Virtual App Services enter machines	Storage SQL databases Ag accounts	ture Cosmos Kubernetes D8 services	→ More services	
Resources					
Recent Favorite					
Name	Туре		Last Viewed		
	No resources have	ve been viewed recently			
	View	all resources			
Navigate					
Subscriptions	Resource groups	All resources	Zi Dashboard		
Tools					
Learn Azure with free online training from Microsoft	Azure Monitor Monitor your apps and infrastructure	Microsoft Defender for Cloud Secure your apps and infrastructure	Cost Management Analyze and optimicloud spend for free	ize your	
Useful links			Azure mobile app		
Technical Documentation @	Azure Services @*	Recent Azure Updates 🔊		Google Play	
Azure Migration Tools	Find an Azure expert	Quickstart Center			

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



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

	P Search resources, services, and docs (G+/)	D & 🖓 🕺 Ø R	Xera Colored places 🚳
Home > Create a resource >			
IoT hub ···· Microsoft			×
Basics Networking Management Add-ons Tags Review + create			
A Pricing information is unavailable for one or more tier editions in the selected region.			
Create an IoT hub to help you connect, monitor, and manage billions of your IoT assets. Le	am more 0°		
Project details Choose the subscription you'll use to manage deployments and costs. Use resource groups organize and manage resources.	like folders to help you		
Subscription * ()			
Resource group * O Create new	v		
Instance details A resource group is a container that hold IoT hub name * ① resources for an Azure solution.	is related		
Region * 🛈 Name *			
Tier * OK Cancel			
Daily message limit * 400,000 N/A See all options	v		
Review + create Previous Next: Networking >			

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

		P Search resources, services, and docs (G+))					
Home > Create a resource >							
IoT hub ···· Microsoft			×				
Basics Networking Managemen	nt Add-ons Tags Review + create						
A Pricing information is unavailable for	Pricing information is unavailable for one or more tier editions in the selected region.						
Create an IoT hub to help you connect, m	nonitor, and manage billions of your IoT assets. Le	am more O					
Project details Choose the subscription you'll use to man organize and manage resources.	nage deployments and costs. Use resource groups	like folders to help you					
Subscription * ①	CONSTRUCTION CONTRACTORY AND						
Resource group * 🛈	test Create new	~					
Instance details							
IoT hub name * 🕕	test-hub-name	√					
Region * 🛈	East US	×					
Tier *	Free	×					
	Free trial explores the app with live data. Trials later.	annot scale or be upgraded					
	Compare tiers						
Daily message limit * 💿	8,000 N/A						
Review + create	g>						
Point P							
	If an error occurs	after clicking the [Review + create] button, ask a	ا administrator to grant the access				

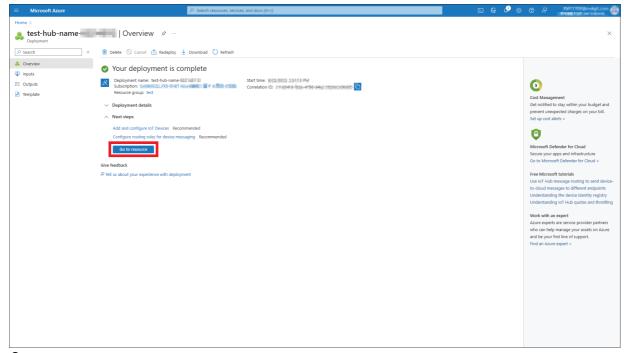
5. Check the settings, then click the [Create] button.

Microsoft Azure		D Search resources, services, and docs (G+/)	} 🖉 🐵 🤉	
Home > Create a resource >				
IoT hub				×
Microsoft				~
				-
Basics Networking Managemen	t Add-ons Tags Review + create			
Pricing				
IoT hub	in mp			
	per month-			
	change faseles			
Add-ons total	Change sold-une			
	·			
0 a class				
Basics				
Subscription Resource group	become and over a soluble of the first state			
	100 Tool - Long Color			
Region	047.15			
Disaster recovery enabled	10			
Tier	Page			
Daily message limit	Line demonts			
Networking				
Connectivity configuration	Public second			
Private endpoint connections Allow public network access	Farmer Seculited			
Allow public network access Minimum TLS Version	14			
Management				
	11			
Number of F1 IoT hub units	1			
Device-to-cloud partitions				
Enable Defender for IoT	cluber			
Device Update for IoT Hub				
Disabled				
				*
Create < Previous: Tags	Next > Automation options			
Create Previous, rags	Automation options			

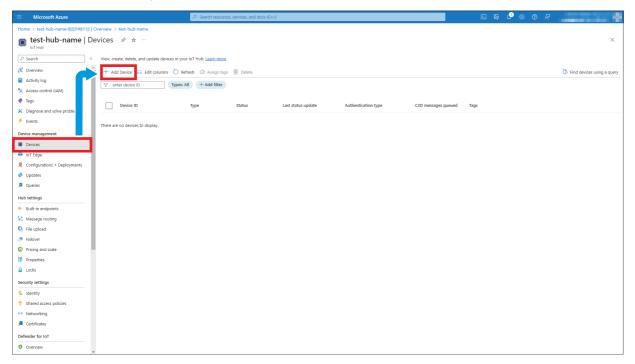
Creating devices

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. 또 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.
Secondary Thumbprint	The same as Primary Thumbprint

Microsoft Azure	P Search resources, services, and docs (G+/)	INCOMPANYALISM (
me > test-hub-name Devices >		
Create a device		×
•		
Find Certified for Azure IoT devices in the Device Catalog		
vice ID * 🛈		
est_things		✓
IoT Edge Device		
thentication type ③		
ymmetric key (X.509 Self-Signed) X.509 CA Signed		
mary Thumbprint * ①		
and a second		~
condary Thumbprint * ①		
Independent of the second		~
nnect this device to an IoT hub 🕕		
Enable Disable		
rent device ①		
lo parent device		
et a parent device		

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".

= Microsoft Azure	,P Search resources, services, and docs (G+/)				©	CALTURN Constants
Home > test-hub-name-IUUT III O	Home > test-hub-name-IUU-IUI = 1 Overview >					
💦 test-hub-name 🚿	☆ …					×
	$ ightarrow$ Move \lor 📋 Delete 🖒	Refresh 🔗 Feedback				
Cverview Activity log Activity log Activity log	S Transmorter our enterthere	en der kallman Operflum fein schöt sill aufsche Köll an	i nantanipasita da ligilardinisi Dona Transistania disepinis mar	rise nigotating lagrantice (10), 2021 <u>Wards Load Aude</u>		*
 Taqs 	∧ Essentials					JSON View
Diagnose and solve problems Events	Resource group (move) : test Status : Active Location : East US		Hostname : tes Tier : Fre Daily message limit : 8,0			
Device management	Service region : East US		Minimum TLS Version : 1.0			
Devices	Subscription (move) :	to fold that investigation and a state				
🗅 IoT Edge	Tags (edit) : Add_tag	ŝ				
Configurations + Deployments	See more					
🧼 Updates	Usage Get started					
🔎 Queries			Show data for last: 1 Hour 6 Hours 12 Hours 1 Day 7 Days	30 Days		
Hub settings						
 Built-in endpoints Message routing 		IoT Hub Usage	Number of messages used 🔗	Device to cloud messages	\$	
File upload				90		
🐣 Failover		Messages used today: 1	80	80		
O Pricing and scale		Daily messages quota: 8000 💿	70	70 60		
Properties			40			
Locks		IoT Devices: 0	30	30		
Security settings			20			
💲 Identity			0	•		
Shared access policies			6 PM Aug 22 6 AM UTC+09:00 date/MessageQuotal/sed (Max) tech-hub-name	6 PM Aug 22 6 AM d2c telemetryingress success (Sum) tett hub-name	UTC+09:00	
Networking						
🔎 Certificates						
Defender for IoT		Connected Devices	ム Total IoT Devices み			
Overview		Connected Devices	☆ Total IoT Devices			

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 P

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-subordinatecas-list

For the latest information, check the website of Azure.

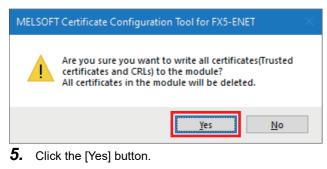
2. In Certificate Configuration Tool for FX5-ENET, select [Server Certificates] ⇔ [Import] button to import the server certificates.

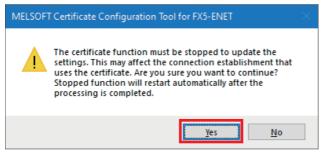
🚟 MELSOFT Certificate Confi							
Project Connection Settings	<u>H</u> elp						
Server Certificates	Server(Objects/Clou	d)	Server Cert	ificate/CRL files			
Client Certificates				*			
	Tool						
	Trusted Certificates CRLs						
	Serial Common Name	Organizati Organizati	Lolality State Coun	Valid From Valid To	DNS N URI	IP Add	
	Import	Delete from List					
	*	\$	*	Verify Legend			
		✤ Verify with Module	🕁 Write to module	Match	Tool only	Module o	nly
	*	*	×				
	Module						
	Trusted Certificates CRLs						
	Serial Common Name	Organizati Organizati	Locality State Coun	Valid From Valid To	DNS N URI	IP Add	
	Update	Delete from List	1	t_ Read Ψ _↑	Verify	⊥ Write	

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

🚟 MELSOFT Certificate Confi		d Project)*						
Project Connection Settings	<u>H</u> elp							
Server Certificates	Server(Objects/Cloud)	Ser	ver Certificate/CRL 1	iles			
Client Certificates				×				
	Tool							
	Trusted Certificates CRLs							
	Serial Common Name DigiCert TLS EC Microsoft RSA	Organizati Organizati.	Lolality State	Coun Valid From US US	Valid To	DNS N., URI	IP Add	
		Delete from List						
	,↑, Read from Module	☆ Verify with Module	∛. Write tom		Verify Legend		_	
	Read from Module	• verny with module	les write to mi ⊗	oquie	Match	Tool only	Module	only
	Module							
	Trusted Certificates CRLs							
	Serial Common Name	Organizati Organizati	Locality State	Coun Valid From	Valid To)ns n Uri	IP Add	
	Update	Delete from List		<u>↑</u> <u>B</u> ead	*		↓. Write	
				L Deau	*		± mrite	_

4. Click the [Yes] button.

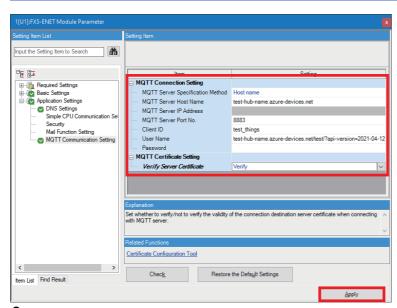




4.3 Configuring Settings with GX Works3

- **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.

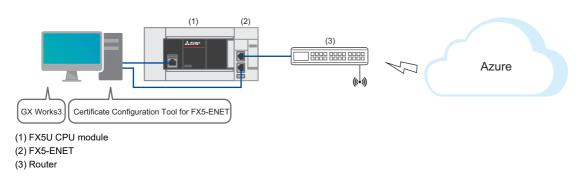
Item	Setting
MQTT Server Specification Method	Host name
MQTT Server Host Name	test-hub-name.azure-devices.net (own hostname) Enter the hostname that was copied in the section below. Image 31 Checking the hostname
MQTT Server Port No.	8883
Client ID	test_things Enter the name of the device ID that was created in the section below. Image 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 (Bernard Page 9 System Configuration), write the program to the FX5U CPU module and check the operation.



Point P

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.

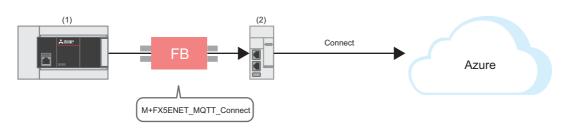
• The FX5-ENET subscribes data prepared with Azure IoT Hub.

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).

SM402	\$MOV	devices/test_things/messages/events/	R0		Set the Will topic name data for R0.
			1	J	
	\$MOV	MQTT_TEST Will message	R300		Set the Will message data for R300.
M12	MOV	К1	D0		Set the connection number to K1.
	MOV	K30	D1		Set the timeout value to K30.
	MOV	K60	D2		Set the KeepAlive timer to K60.
	NO V	Kou			
	MOV	К0	D3		Set Will QoS to K0.
		1/0	54]	
	MOV	KO	D4		Set the Will topic/message format to K0.
	MOV	КО	D5]	Set the Will topic name data start address to K0.
]	
	MOV	K300	D6		Set the Will message data start address to K300.

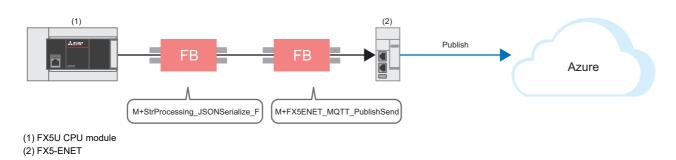
After M4 (Enable Will) turns on, M0 turns on. When FX5ENET_1.uSts_CertFuncReadyStatus_D (Certificate function ready-toenable state) turns on, M14 (Execution command) turns on. M1 (CONNECT instruction) subsequently turns on to establish the connection.

When the connection is successfully established, M9 (Establishment completion) turns on.

	TEST	FX5ENET_1.uSts_CertFund U1\G108899	cReadyStatus_D	К0	M13					
M13 M0				- SET - RST	M14 M14]]				
M14				ENET_MC 5ENET_M MQTT (QTT_C	onne				M6
Connection number: K1		[FX5ENET_1][D0]	DUT: i_stModule				o_bOK :B o_bErr :B			M7
Timeout value: K30		[D1]-	UW: i_uTimeout B: i_bConnect B: i_bDisconnec				o_uErrld :UW _bConnectOK :B DisconnectOK :B	[D7]	M9 M10
KeepAlive timer: K60 M3		[D2]	UW: i_uKeepaliv B: i_bCleanSess	eTimer	o_uC	_	ectionStatus :UW	—[D8]	
M4 Will QoS: K0 M5		[D3]	B: i_bEnableWill UW: i_uWillQoS B: i_bWillRetain							
Will topic/message forma Will topic name data start Will message data start a	address	D5	UW: i_uTopicMe UW: i_uWillTopic UW: i_uWillMess	cNameDat	aAddr					
			, p	bi_bUsePa bi_uLocal_ bi_uTarge bi_u2IP_A	_Port_N t_Port_I	lo				

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).



Registering the FB library

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

Page 48 FB Library

Program

■Send data creation

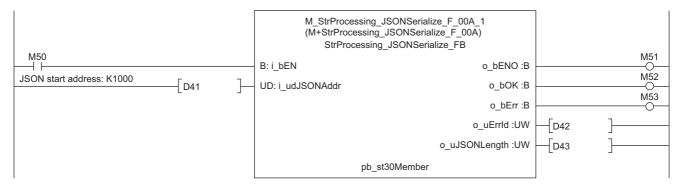
· Settings for data to be sent

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

			Set the Publish	n topic name	data f	or R600.
SM402		\$MOV	devices/test_things/r	messages/ev	ents/	R600
M50	4 M. St. Decession, ISON Capitize, E. 000, 1 ab. et 20 March et 01 uTures un V2: ((Cat the Value time to V2 (absorber string))		Set JS	ON start add	ress t 000	o K1000. D41
	1 M_StProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].uType := K3; //Set the Value type to K3 (character string). 2 M_StProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].s32Key := 'Sample'; //Set the Key name to 'Sample'; 3 M_StProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].s64Value := 'MQTT_TEST'; //Set the Let to 'MQTT_TEST'; 4 M_StProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].uDepth := K1; //Set the depth of layer to K1. 5 M_StProcessing_JSONSerialize_F_00A_1.pb_st30Member[1].uType := K0; //Set the Value type to K0 (end of the member)	r structure ar	rray).			

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).

M67 	MOV	K0	D50]	Set QoS to K0.
	MOV	K0	D51]	Set the binary/ASCII/Unicode strings to K0.
	MOV	K600	D52]	Set the Publish topic name data start address to K600
	MOV	K0	D53	}	Set the Publish message size to K0.

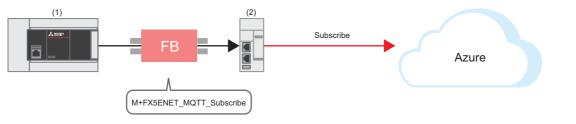
M69 (Execution command) turns on. After M63 (Execution status) turns on, M61 (PUBLISH instruction (Rise detection)) turns on for sending a message.

			M_FX5ENET_MQTT_PublishSend_00A_1 (M+FX5ENET_MQTT_PublishSend_00A) MQTT Publish Send FB				
M69			B: i_bEN o_bENC) :B			M63
	-[FX5ENET_1	ı]—	DUT: i_stModule o_bOł	К:В			M64
Connection number: K1	-[D0]_	UW: i_uConnectionNo o_bEr	r :B			M65
M61			B: i_bPublish o_uErrld :	JW	—[D54]	
Binary/ASCII/Unicode strings: K0	-[D50]_	UW: i_uQoS o_bSendOł	К:В			
M62			B: i_bMessageRetain o_uConnectionStatus :	JW			M66
QoS: K0	-[D51]_	UW: i_uTopicMessageFormat		—[D55]	
Publish topic name data start address: K600	- D52	\mathbf{r}	UW: i_uPublishTopicNameDataAddr				
Publish message size: K0	 	Ĩ	UW: i_uPublishMessageSize				
Publish message data start address: K1000	D41	-]	UW: i_uPublishMessageDataAddr				

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).

SM40	2 \$MC	V	devices/test_things/messag	es/device	bound/#	R700]	Set the Subscribe topic name data for R700.
M27				MOV	K1	D10]	Set subscribe ID to K1.
				MOV	К0	D11]	Set the maximum QoS to K0.
				MOV	K0	D12]	Set the topic message format to K0.
				MOV	K700	D13]	Set the Subscribe topic name start address to K700.

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.

		M_FX5ENET_MQT (M+FX5ENET_MQ MQTT S			
M29		B: i_bEN		M23	
	FX5ENET_1	DUT: i_stModule	o_bOK :B		M24
Connection number: K1	[D0]-	UW: i_uConnectionNo	o_bErr :B		M25
M21		B: i_bSubscribe	o_uErrld :UW	[D14]
M22		B: i_bUnSubscribe	o_bSendOK :B		M26
Subscribe ID: K1	[D10]-	UW: i_uSubscribeId	o_uConnectionStatus :UW	[D15]
Maximum QoS: K0	[D11]-	UW: i_uMaxQoS			
Topic message format: K0	[D12]-	UW: i_uTopicMessageFor	mat		
Subscribe topic name data start address: K700	[D13]-	UW: i_uSubscribeTopicNa	meDataAddr		

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.

Microsoft Azure		₽ Search resource	es, services, and docs (G+/)				⊋ 🖉 ⊚	10 CONSTRUCTION OF
Home > test-hub-name									
test-hub-name D	evices 🖈 🛧 …								×
✓ Search «	View, create, delete, and update devices in y	our IoT Hub. <u>Learn more</u>							
X Overview	+ Add Device ≣≣ Edit columns 💍 I	Refresh 🔿 Assign tags	III Delete						Find devices using a query
Activity log	Y enter device ID Types								
Access control (IAM)	I enter device ib								
🗳 Tags	Device ID	Туре	Status	Last status update	Authentication type	C2D messages queued	Tags		
X Diagnose and solve problems									
🗲 Events	test_things	IoT Device	Enabled		Self-signed X509 Certificate	0			
Device management									
Devices									
IoT Edge									
Configurations + Deployments									
Updates									
🔎 Queries									
Hub settings									
 Built-in endpoints 									
K Message routing									
File upload									
Failover									
Pricing and scale Properties									
Locks									
Security settings									
Shared access policies									
Shared access policies Networking									
 Certificates 									
Defender for IoT									
Overview									
Uverview .	*								

2. Click [Message to Device].

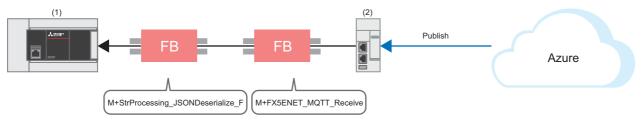
	∠ Search resources, services, and docs (G+/)	N 6	P © P	X0171000-religitoren 🚳							
Home > test-hub-name Devices >											
test_things ☆ … test-hub-name				×							
🗟 Save 🖾 Message to Device 🗲 🛙	irect method 🕂 Add Module Identity 🗏 Device twin 🕐 Refresh										
Device ID ①	test, things	6									
Primary thumbprint ①	••••••••••••••••••••••••••••••••••••••	6									
Secondary thumbprint ①	······	۵									
Tags (<u>edit</u>)	No tags										
Enable connection to IoT Hub 🕕	Enable Disable										
Parent device ①	No parent device										
Module Identities Configurations	Adule Identities Configurations										
Module ID Con	nection State Connection State Last Updated Last Activity Time (UTC)										
There are no module identities for this device	2.										

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

Microsoft Azure	P Search resources, services, and docs (G+/)	Hand Call Street Street
Home > test-hub-name Devices > test_things >		
Message to device 🖉 …		×
Send Message		
You can use this tool to send messages to a device in	in your IoT Hub. Messages have both a body and optional properties organized as a collection of key/value string pairs.	
Device Id ③		
test_things		D
Message Body ()		
{"Sample":"MQTT_TEST"}		
Properties ①		
Key 🛈		
Value 💿		
Add Property		
🗐 Delete		
Key	Value	

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).

M34 ⊢	34		K1100	D21		Set the receive topic name data start address to K1100.
		MOV	K1300	D22]	Set the receive message data start address to K1300.

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).

		M_FX5ENET_MQTT_Rec (M+FX5ENET_MQTT_Rec MQTT Receive F			
M36		B: i_bEN	o_bENO :B		M31
	FX5ENET_1	DUT: i_stModule	o_bOK :B		M32
Connection number: K1	[D0]-	UW: i_uConnectionNo	o_bErr :B		M33
Receive topic name data start address: K1100	D21	UW: i_uReceiveTopicNameDataAddr	o_uErrld :UW	- D23	1
Receive message data start address: K1300	[D22]	UW: i_uReceiveMessageDataAddr	o_uConnectionStatus :UW	- - D24]
		o_uNum	OfDiscardedPackets :UW	-[D25]
			o_uSubscribeId :UW	- D26]
		0	_uReceiveTopicSize :UW	-[D27]
		o_uF	ReceiveMessageSize :UW	-[D28]

■Acquisition of only the required strings from receive data

· Settings for required member information

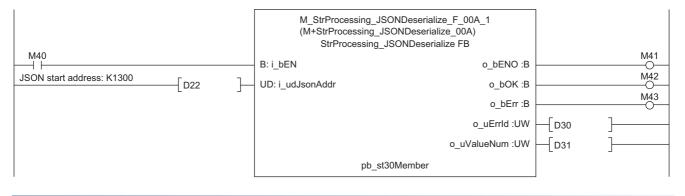
M40 (Execution command) turns on for setting the member information to be acquired.

M40

 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].uType := K3; //Set the Value type to K3 (character string).
 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].s32Key := 'Sample'; //Set the Key name to "Sample".
 M_StrProcessing_JSONDeserialize_F_00A_1.pb_st30Member[0].uDepth := K1; //Set the depth of layer to K1.
 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]

Device <u>N</u> ar	me	R1300	~	Open D <u>i</u> splay Format	Detailed Conditions	Monitoring
◯ Buffer <u>M</u> em	iory	Intelligent Module No.(<u>U</u>)	~	(HEX) <u>A</u> ddress	✓ DEC ∨	Stop Monitoring
Device Name	FE		2 1 0	Current Value	String	
R1300	0 0		0 1 1		827 {"	
R1301	0 1		0 1 1		915 Sa	
R1302	0 1	1 1 0 0 0 0 0 1 1 0 1	1 0 1		781 mp	
R1303	0 1	10010101101	1 0 0		964 le	
R1304	0 0				882 ":	
R1305	0 1		0 1 0		746 "M	
R1306 R1307	0		0 0 1		585 QT	
	0 1	0 1 1 1 1 1 0 1 0 1 0 1			404 T_	
R1308 R1309	0 1	0 0 0 1 0 1 0 1 0 1 0 1 0	0 0		748 TE 587 ST	
R 1309	0		0 1 1		034 "}	
R1310	0 0			32	0	
R1312	0 0		0 0 0		0	
R1313	0 0		0 0 0		0	
R1314	0 0		0 0 0		0	
R1315	0 0		0 0 0		0	
R1316	0 0		0 0 0		0	
R1317	0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0		0_	
R1318	0 0		0 0 0		0	
R1319	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1320	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1321	0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1322	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1323	0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1324	0 0	0 0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1325	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1326	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1327	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1328	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	
R1329	0 0		0 0 0		0	
R1330	0 0	0 0 0 0 0 0 0 0 0 0 0	0 0 0		0	

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?

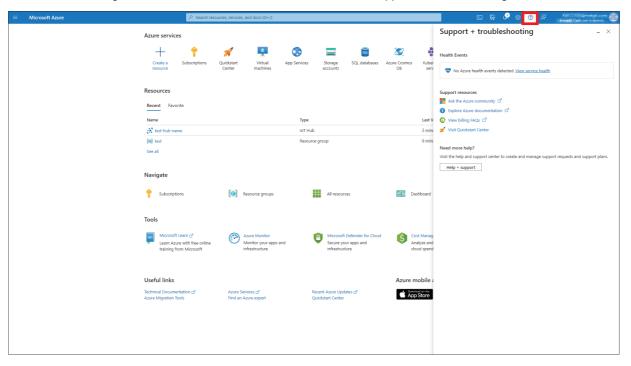
■Checking the communication settings

Refer to Same Page 12 CONFIGURING CLIENTS (MQTT PUBLISHER, MQTT SUBSCRIBER) and Same 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 \Rightarrow [New].

In this manual, the following settings are used.

Item	Description
Series	FX5CPU
Туре	FX5U
Program Language	Ladder

1979											
La M	LSOFT GX Works3										
Pro	ect Edit Find/Replace	Convert View	Online Debu	ig Recording	Diagnostics	Tool Windo	w Help				
	New	Ctrl+N	B 16 10 0		ð 28 AV 🖇	• 风夜风雨	III: III: III: III	# # F	. R. R 🗨 e	2 +0+	
	Open	Ctri+O		1 🤗 😵 🗔 🧸	o 🎭 😎-	1 📷 🗖 🖽 1		测用器			
	Close								*		
18	Save	Ctrl+S									
	Save As		1								
	Delete										
	Project Veri			Series		FX5CPU		~			
	Project Rev n	•		Serves		INI FXSCPU		~			
	Change Mc le Type/Opera	tion Mode		Type		🔛 FX5U		~			
	Data Opera 1	•		-		ES FX5U					
	Intelligent Fu.			Made		FX5U3					
	Open Other Format File	•		Tone		響 FX5S		_			
	Library Operation	•		Program Lang	Jage	🐏 Ladder		~			
	Security	•				-	_				
	Printer Setup					OK	Ca	incel			
	Page Setup										
	Print Preview										
Ð	Print	Ctrl+P									
	Recent Projects(K)	•									
	Start GX Works2										
	Exit(Q)										

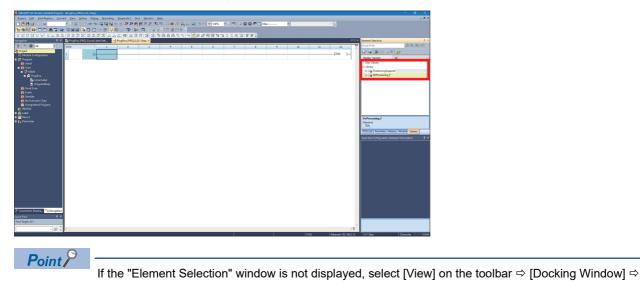
2. Select [Project] on the toolbar \Rightarrow [Library Operation] \Rightarrow [Register to Library List] \Rightarrow [Library].

_	LSOFT GX Work3 (United Project) - [ProgPoul left Eint Find/Replace Convet View REW., Ctrl+N Ctrl+N Oper., Ctrl+O Close Save As.,. Ctrl+S Save As.,.	PRG [LD 15tep] Online Debug Recording Diagnostics Tool Window Help 한 관계 핵 책 책 적 것 실 후 관 관 관 관 관 관 관 위 및 및 원 은 은 한 1538 할 때 한 발생 방생 홍승규 에 강경 것 같은 가 같이 가 같이 하는 주 . 9 발 방 방생 방송규 승규 에 강경 것 같은 구 등 중 중 한 번 판 준 중 중 면 같은 u[PRG][Local Label Set
	Delete Project Verify Project Revision Change Module Type/Operation Mode Data Operation Intelligent Function Module Öper Other Format File	~ 1 2 3 4 5
	Library Operation	Export Library(S)
	Security Printer Setup Print Prestup Print Presidew Print Ctrl+P Recent Projects(K) Start GK Works2 Extit(Q)	Register to Library List User Library Lobel from Library List Library Update the Display Information of Library Library Modate Library POU Help(M)

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

→ ~ ↑ 🗛 >	This PC > Desktop > fb-strprocessing_f_v	100	`	🗸 🖸 🔎 Se	arch fb-strprocessing_f_v
rganize 🔻 New fo	lder				
	Name	Date modified	Туре	Size	
🕈 Quick access	Manual_Chinese	8/22/2023 11:06 AM	File folder		
OneDrive	Manual_English	8/22/2023 11:06 AM	File folder		
This PC	Manual Japanese	8/22/2023 11:06 AM	File folder		
Network	StrProcessing_F.msIm	4/25/2023 9:07 AM	MSLM File	900 KB	
File	name: StrProcessing_F.mslm			→ Library I	*.mslm)

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



[Element Selection] to open the window.

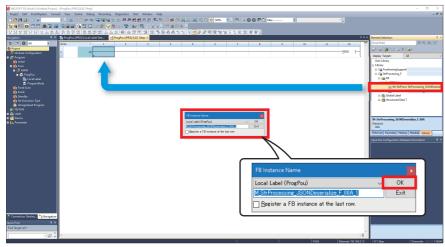
A

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.

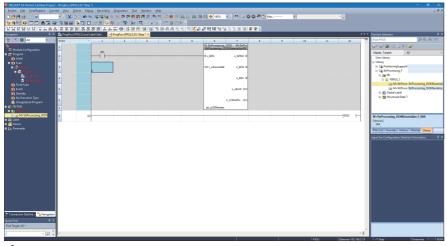
1. Go to the "Element Selection" window ⇒ the [Library] tab ⇒ [Library]. Then, select an FB to be used and drop it in the program editor. When the "FB Instance Name" window appears, click the [OK] button.



2. The FB is pasted to the program editor.

Project Edit Find/Replace Conv			Disquestics To	ol Window H	klo										- 0 ×
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🖬 🚱 Parameter															POUList Favorites History Module Library
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Connection Destina															
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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.

MELSOFT GX Works3 (Untitled Project)	- (ProgPou (PR)	G) (LD) 15tep *															- ø ×
Project Edit Bind/Replace Conv	et ∐ew Q	nine Debu	Becording	Diagnestics	jool <u>Window</u> j	jelo											_ 0 ×
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initial	2		\rightarrow					B USEN	o_bENO (B)							User Library	
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 Impandedy 	1								o_bErr (B)							😑 🕌 FBFILE_1	
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Find Target: All *																	
	4														21		
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5. Repeat these steps to create the ladder.

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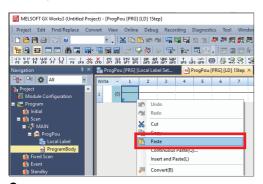
Appendix 3 How to Use the Program Copy Function of e-Manual

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

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

[D0]Station number	W:i_wStationNo Station number	o_bOK:B Normal end		M231 Normal end
[D220] Parameter	W:i_wParameterNo Parameter number	o_bErr:B Failed end		M232 Failed end
number		o_wErrID:W Error code	Error code	
		o_wParameterVal:W Parameter value which was read	Parameter value which was read	
				-[END]-
			Copy Ladder Program	n (for GX Works3)

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.

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Point P

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 defini	tion of FB	Properly d
/_INVERTER_CC_IEF_Basic_Running_F_00A_1 (M	+INVERTER-CC-IEF-Basic_Running_F	M_INVERTER_CC_IEF_Basic_Running_F_00M_ Runni
_bEN	o_bENO	B: i_bEN
_wStationNo	о_ЬОК	W: i_wStationNo
bForword	o_bErr	B: i_bForword
bReverse	o_wErrID	B: i_bReverse
bHigh		B:i_bHigh
bMiddle		B: i_bMiddle
_bLow		B: i_bLow

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

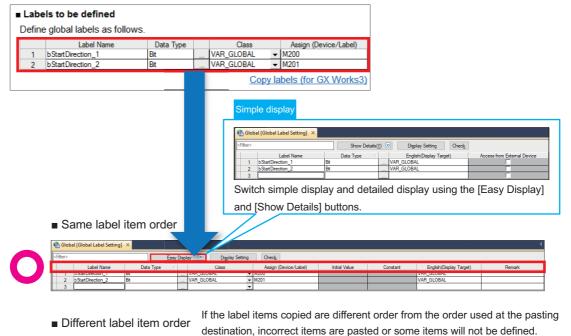
FB Instance Name ×					
Local Label (ProgPou) 🗸 🗸	OK				
M_INVERTER_CC_IEF_Basic_Running_F_00A_1	Exit				

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

Write	× 1	2	3	4	5	6	7	8	9	10	11	12
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16						B: i_bEN	o_bENO:B					M10
17						W: i_wStationNo	o_bOK:B					M11
18						B: i_bForword	o_bErr:B					M12
19						B: i_bReverse	o_wErrlD:W	-[D10]]			
10	M3					B:i_bHigh						
11						B: i_bMiddle						
22						B: i_bLow						

Point P

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.



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<	Filter>		Easy Display	🛛 🕜 🛛 Display Sett	ing Check					
E		Assign (Device/Label)	Label Name	Data Type	Class		Initial Value	Constant	English(Display Target)	Remark
F			bool							
	3]			*				

REVISIONS

Revision date	Version	Description
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Japanese manual number: L08899-A

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