

## 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
MELSEC iQ-F FX5 Ethernet, EtherNet/IP, CC-Link IE Function Block Reference <jy997d64901></jy997d64901>	0	0
MELSEC iQ-F Character String Operation Function Block Library Reference <sh-082619eng></sh-082619eng>	0	0
GX Works3 Operating Manual <sh-081215eng></sh-081215eng>	0	0



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The installation file for Windows<sup>®</sup> can be downloaded from the following website.

www.mitsubishielectric.com/fa/ref/ref.html?k=plceng&software=emaviewer\_en

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, 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/DS, FX5UJ-60MT/DS, FX5UJ-24MT/DS, FX5UJ-24MT/DS, FX5UJ-40MT/DS, FX5UJ-40MT/DS, 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)

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# **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 <sup>*1</sup> • Applicable software version: 1.095Z or later Certificate Configuration Tool for FX5-ENET <sup>*1</sup> • 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	
Router	Three Ethernet cables	Azure Azure	

### 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 15.4 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				
Add a module. [Module Nam [Mounting Po	ne] FX5-ENET psition No.] 1	[[U1]		
Module Setting		Setting Change		
Module Label:Not use		^		
		Ý		
Do Not Show this Dialog Ag	ain	OK		

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

Options		
Project	<u>^</u>	El Operation Setting
Save		Use Module Label
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]
P Online		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-ENE [Mounting Position No.]	T 1[U1]		
Module Setting	Setting Change		
Module Label:Use	^		
	Y		
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		
Imput the Setting Item to Search       Basic Settings       Basic Settings       Operational Settings       CC-Unk IEF Basic Settings       BACnet Function Settings       BACnet Function Settings       BACnet Function Settings       BACnet Function Settings       BACnet Settings       BACnet Function Settings       BACnet Settings       BACnet Settings       BACnet Settings	Item  Report Destination Network No.  Report Destination IP Address Report Destination IP Address Report Destination IP Address Report Destination Port No.  Time Synchronization Setting AnalogInput Object Setting AnalogOutput Object Setting AnalogOutput Object Setting BinaryInput Object Setting BinaryInput Object Setting BinaryOutput Object Setting BinaryOutput Object Setting BinaryUnput Object S	Setting       0     Setting       192_168_0_254     47808       1gnore     Setting>       Cbetailed Setting>     Cbetailed Setting>	
tem List Find Result	Set external devices to be used for communications.		\$\$\$\$
		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

D E	therne	t Conf	iguration (Mounting Positio	n No.: 1[U1])						— 🗆 X
Eth	er <u>n</u> et (	Config	uration <u>E</u> dit <u>V</u> iew Clo	ose with Disc <u>a</u> rding t	he Setting	Close with <u>R</u> eflecting	g the Setting			
										i Module List ×
	C		Source (Core Marce) + 1/22							Ethernet Selection   Find Module   My F 4 🕨
	Conn	ected	.ourit (Cur./Max.): 1/32							122 24 1 🔁 🔤 📩 🖻 🗙
_				Communication		Fixed Buffer	PI	LC	or/Di	Ethernet Device (General)
		No.	Model Name	Method	Protocol	Send/Receive Setting	IP Address	Port No.	MAC	MELSOFT Connection 1 -
-			Heat Station				102 169 2 12		Jui C.	SLMP Connection Modul -
×	MOIT	1	MOTT Connection Module	MOTT	TIS		192.168.3.13	50000	100	Active Connection Module -
		•	ng r comector notale	1.9211	120		152.100.0.10	30000		P Unpassive Connection N -
				_						Fullpassive Connection -
			Drog one	I drop					_	BACnet/IP Connection -
	<		Dray and							Mail Server Connection -
										MQTT Connection Mod -
	_	1	Connection							Ethernet Device (Mitsubishi Ele
		L	No.1							
Hos	t Statio	00								General-Purpose AC Serup
Con	nected	Count								Inverter(FR-A800 Series)
:1			MQTT							Inverter(FR-F800 Series)
										Servo Amplifier(MELSERVO-J
										Vision Sensor
										[Outline]
			MQ11 Conn ection Modul							MQTT Connection Module
			e							[Specification] Use when specify open method by MOTT
			<						>	bee mich speeny opsimiled by Martin

#### 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	
eting Item List	Setting Item           Item           Item           Image: Image and the set of the set	Setting Host name aaaaa 1 bbbbb Verify
	The string within 1 to 492 characters and sat $A + (B + C) \times 2 + D <= 984$ A: the number of characters for MQTT serve B: the number of characters for client ID C: the number of characters for user name D: the number of characters for password	isfying the following conditions r host name
< >	Check Restore	e 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 setting	onnection method with CPU mo	odule.
● <u>E</u> thernet		
Directly communicate with It is not required to speci	Ethernet Board Ethernet h the CPU module without usin fy the IP address of CPU modul	g a hub.
A deabar	Not Specified	
<u>A</u> dapter	Not Specified	*
IP Address of Adapter		Communication <u>T</u> est
O Other Connection Method	i ————	
Select this method if you CPU module with a conne than the direct coupled s	want to connect to ection method other etting.	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialog * Always open the Spe Connection Destination	g again ecify OK n window.	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 Simp	le Setting Connection	×
Direct Coupled Setting     Please select the direct c	onnection method with CPU mo	odule.
● <u>E</u> thernet		
Directly communicate with It is not required to spec	Ethernet Board Etherne the CPU module without usin ify the IP address of CPU modul	et et under state stat
	* This setting is applied to all I	Ethernet port direct coupled settings.
<u>A</u> dapter	Not Specified	×
IP Address of Adapter		Communication <u>T</u> est
O Other Connection Method	d	
Select this method if you CPU module with a conne than the direct coupled s	want to connect to ection method other setting.	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialo * Always open the Sp Connection Destination	g again ecify OK n window.	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		
Directly communicate with It is not required to specifi	Ethernet Board Ethern hthe CPU module without usi fy the IP address of CPU modu	et ng a hub. ie.
	* This setting is applied to all	Ethernet port direct coupled settings.
<u>A</u> dapter	1000 Ehrlief Onle Do	
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	want to connect to ction method other etting.	Other Connection Method (Open the Specify Connection Destination window)
Do not show this dialog * Always open the Spe Connection Destination	again cify OK window.	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 Sr	pecify Execution Target	_
4 August 2022	12	Currently Specified Station $$	
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         6         7         8         9	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	irom <u>P</u> LC		
		Execute Close	

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

Project Edit Find/Replace Conv	ert View	Onli	ne Debug	Recording	Diagnostics	Too
i 🗅 🔒 💾 🎒 🕲 🖉			Current Cor	nection Destir	nation	國 .
		4	Read from F	LC		†a,
Navigation 4 ×	💼 ProgPo	7	Write to PLC			[LD]
	Setting Item		Verify with F	LC		
Reproject	Setting item		Remote Op	eration(S)		
Module Configuration			Safety PLC 0	Operation	•	
🗖 🔚 Program			Redundant	PLC Operation	(G) →	
🛗 Initial 🔲 📶 Scan			CPU Memo	ry Operation		

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

d Second	Kelateur	gicaons			_							
,))	Write	<b>₽ (((E</b> ) ∾	a 🛄	ø	Verity	· 🖳 🎸	Dele	te				
Parameter +	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			
lodule 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	
-	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	
-1	Remote Pi	assword	×						9/15/2022 9:12:27 AM	Not Calculate	ed	
- 🔁	bal Labe	l										
1.1	Global Lab	el Setting							9/15/2022 9:12:29 AM	Not Calculate	ed	
0 😘	gram											
1.14	MAIN		×						9/15/2022 9:12:29 AM	Not Calculate	ed	
• 🖪	vice Men	iory										
	MAIN					Detail			0/15/3022 0-12-20 AM	-		
Disp	amory Capac	8y 🔀 🗌 Check I	lemory Capacit	y before Wr	ting							
ory Canad												
Size Chi		Program Nemory									Free	
											64000/640005	tep
and		Data Memory						-			Free	
Used		Program:1024/1024KB Restoration Info:1024/1024KB Parameter:1024/1024KB Device Comment:2048(2048KB							204888			
Increased		SD Memory Card						Free				
Decreased											0/0KB	
Free: 5%	55	Program:0/0KB	Re	storation Inf	0:0/0KB	P	arameteri0/088		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 Cont	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>		1		D.L.			
	Generate a	New Client Certificate	Retres	sh	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.	(Two letter	code, e.g. US, JP,	)			
		Certificate Settings BSA Key Strength:	2049 bite	~				
		Contracting and Contracting an	2040 010	-				
		Signature Algorithm:	SHA-255	~				
		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.

iguration Tool for FX5-ENET	(Untitled Project)*			- 0	×
Help					
Module					
Serial No. Common	Name Orginization Name	Organization Unit Locality	State Country Valid From	Valid To	
test_thing	8		US LEDING		
Generate a New Clie	nt Certificate Refre	ish <u>D</u> elete	Last Refreshed: 1/10/00/1 2010	1.84	
	*	*	*		
Tool(Computer)	$\rightarrow$ Read CSR from Module	🗘 Replace to Module	▲ Read from Unit		
	×	*	*		
Certificate Autor	rity(CA)		Server (Objects/Clou	d)	
		[-+ Get a CSR	🖓 Beplace 🐧	Get a Qertificate	8
	Iguration Tool for FX3-ENET Help Serial No. Common Generate a New Clie Tool(Computer) Certificate Autor	Iguration Tool for FX-ENET (Untitled Project)* Help  Module  Serial No. Common Name Ore injustion Name Generate a New Client Certificate Refree  Tool(Computer) [+>Read CSR from Module  © Certificate Autority(CA)	iguration Tool for FX3-ENET (Unktitled Project)* Help  Module  Perial Ib Common Name Orcinication Name Orcinication Name Corcinication Name Corcificate Autority(CA)  C→ Oct o CSR	iguration Tool for FXS-ENET (Untitled Project)* Help Module General Name Orchication Name Orcanization Unit Locality State Country Valid From Generate a New Client Certificate Refresh Delete Last Refreshed Module © © © © © © © © © © © © © © © © © © ©	Iguration Tool for ISG-ENET (Unchilded Project)*   Help  Module  Serial No. Common Name Oreinization Name Oreinization Unit Locality State Country Valid From Valid To  Generate a New Client Certificate Retreet  K   Conf(Computer) [+Read from Module  Retreet to Module to Module  Retreet to Module  Retreet to Module

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  ></a  >		~		
Field Publ Sabi Basi Key	ic key lic key pi hority Ke ject Key c Constr Usage mbprint	arameters y Identifier Identifier aints	Value No. 2014 International States of the States International Toportion International States of the States International States of the State	ny da Tala Medita Ay Indiata (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	*
		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 Examily phone, or Skype No account? Greate and Carrt access your account? Nex	
Sign in with GitHub G Sign-in options	
	Terms of use

### **Configuring settings with Azure IoT Hub**

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

1. Click [Create a resource].

■ Microsoft Azure	₽ Search resource	s, services, and docs (G+/)			5 G	P © P	CATOROGINALISTON 🚭
A	Azure services	cktart Virtual App Services	Storage SQL databases Azu accounts	Jre Cosmos Kubernetes D8 services	→ More services		
R	Resources						
1	Recent Favorite						
,	Name	Туре		Last Viewed			
		No resources hav	e been viewed recently				
		View a	all resources				
Ν	Vavigate						
1	Subscriptions	Resource groups	All resources	Zi Dashboard			
Т	Tools						
l	Microsoft Learn Q <sup>4</sup> 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 optim cloud spend for fre	ize your e		
U	Jseful links			Azure mobile app			
Te	echnical Documentation of	Azure Services @" Find an Azure expert	Recent Azure Updates @*	App Store	Google Play		
A4	AME INSTRUCT INVIS	THE REPORTS SUPPORT	Concerning Control				

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



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

≡ Microsoft Azure	𝒫 Search resources, services, and docs (G+/)	5 G 🖉 🖉 🖉 R	Anti 1000-selations 💮
Home > Create a resource >			
IoT hub … Microsoft			×
Basics Networking Management Add-ons Tags Review + create			
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	rn more C		
Project details Choose the subscription you'll use to manage deployments and costs. Use resource groups organize and manage resources.	ike folders to help you		
Subscription * ()			
Resource group * ①			
Instance details         A resource group is a container that hold           IoT hub name * ①         resources for an Azure solution.	related		
Region * 🛈 Name *			
OK Cancel			
Daily message limit * O 400,000 N/A See all options	$\checkmark$		
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.

≡ Microsoft Azure		₽ Search resources, services, and docs (G+/)		D 6 🖓 🐵 🛛 R	nerrenden agt som 🧶
Home > Create a resource >					
IoT hub … Microsoft					×
Basics Networking Manageme	ent Add-ons Tags Review + create				
A Pricing information is unavailable for	or one or more tier editions in the selected region.				
Create an IoT hub to help you connect, i	monitor, and manage billions of your IoT assets. Le	n more 13"			
Project details Choose the subscription you'll use to ma organize and manage resources.	anage deployments and costs. Use resource groups	ke folders to help you			
Subscription * ①	second to ever contains if a white	100. ~			
Resource group * ()	test Create new	~			
Instance details					
IoT hub name * 🕕	test-hub-name	✓			
Region * ③	East US	✓			
Tier *	Free	✓			
	Free trial explores the app with live data. Trials of later.	nnot scale or be upgraded			
	Compare tiers				
Daily message limit * 🕕	8,000 N/A	<u> </u>			
Review + create	a.				
Point P					
	If an error occurs	after clicking the [Review + create	e] button, ask an	administrator to gr	ant the acces

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

Microsoft Azure	P Search resources, services, and docs (G+/)	⊠ ⊊ 🖓 © Ø R	Tatagalat process.
Home > Create a resource >			
loT hub			×
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			^
Basics Networking Management	Add-ons Tags Review + create		
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Subscription	bootence.com/www.weiterert.ec.u.u.u.u.u.u.u.u.u.u.u.u.u.u.u.u.u.u.		
Resource group	1927		
Penion			
Disaster recovery enabled	100 AU		
Tier	THE CONTRACT OF CONTRACT.		
Daily message limit	Autor dominante		
Networking			
Connectivity configuration	Public sources		
Private endpoint connections	Now .		
Allow public network access	Grunnel		
Minimum res version	La Contra C		
Management			
Tier			
Number of F1 IoT hub units			
Device-to-cloud partitions	1		
Enable Defender for IoT	pistel		
Device Update for IoT Hub			
Disabled			
Analysis - Device Trans			
<pre>create</pre> < Previous: Tags	Next > 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. Cም 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

The share all Polices            C Create a device            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate            I red cold de locate all devices on the locate cleate cleate all devices on the locate cleate	E Microsoft Azure	∠P Search resources, services, and docs (G+/)	∑ © © <i>R</i>	DAUTORissiphers 🕸
Create a device	Home > test-hub-name   Devices >			
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Devis D* 0	Find Certified for Azure IoT devices in the Device Catalog			
Text Union	Device ID * (i)			
Image: State Stat	test_things			~
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Printypine* ()       ()         Secondy Thompine* ()       ()         Second Thompine* ()       () <tr< td=""><td>(Symmetric key (X.509 Self-Signed) X.509 CA Signed)</td><td></td><td></td><td></td></tr<>	(Symmetric key (X.509 Self-Signed) X.509 CA Signed)			
when when instanting output	Primary Thumbprint * ①			
Secondary Tumbolari * O	and the second sec			
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Parent device Set a parent device	Enable Disable			
No parent device Sata parent device	Parent device ①			
	No parent device			
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Ste				
Sne				
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	Save			

### 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".

			+/)	D G 🖉 💩 (	) R 🕺 👘
Home > test-hub-name-U2111111	Overview >				
💦 test-hub-name 🖉	· 🛱 ····				×
	$ ightarrow$ Move $\lor$ 📋 Delete 🖒	Refresh 🔗 Feedback			
🕺 Overview					A
Activity log		contractationers Cytacificat first orbitestill appeals 2024 at	é menterréparén de léglerclinie filme. Transisianie despiré me	erite elgenetity lagrantice FML2021. <u>When its inset to its</u>	
Access control (IAM)					
🗳 Tags	A Essentials				JSON View
X Diagnose and solve problems	Status : Active		Hostname : ter	est-nub-name.azure-devices.net	
🗲 Events	Location : East US		Daily message limit : 8,0	000	
Device management	Service region : East US		Minimum TLS Version : 1.0	.0	
Devices	Subscription (move) :	an following an applied and a first state of the			
IoT Edge	Tags (edit) : Add tag	is and the second s			
Configurations + Deployments	See more				
Updates	Usage Get started				
🔎 Queries			Show data for last: 1 Hour 6 Hours 12 Hours 1Day 7 Days	s 30 Days	
Hub settings					
<ul> <li>Built-in endpoints</li> </ul>				Build and an and an	
😢 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 ①	70	- 70 60	
Properties			59	50	
Locks		IoT Devices: 0		30	
Security settings			_20		
% Identity			0	0	
Shared access policies			6 PM Aug 22 6 AM UTC+09.00	6 PM Aug 22 6 AM UTC+09.0 d2ctelemetry.ingress.success (Sum)	0
Networking			test-hub-name	test-hub-name	
🔎 Certificates					
Defender for IoT					
Cverview		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 V <sub>↑</sub>	Verify	<b>↓</b> 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	)	Server (	Certificate/CRL files			
Client Certificates				*			
	Tool						
	Trusted Certificates CRLs						
	Serial Common Name DigiCert TLS EC Microsoft RSA	Organizati Organizati	Lolality State Cou US US	un Valid From Vali	d To DNS N UP	NI IP Add.	
	Import	gelete from List					
	☆ Read from Module	♀ Verify with Module		Verify L	egend		
	*	, veni) win noune ⊗	¥		looi one	Moduk	e oniy
	Module						
	Trusted Certificates CRLs						
	Serial Common Name	Organizati Organizati	Locality State Cou	un Valid From Vali	il To INS N UF	ll IP Add	
	Update	Delete from List					
				<u>↑</u> <u>B</u> ead	*	± ⊮ite	_

### 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. ☞ 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.
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.
		\$MOV	MQTT_TEST Will message	R300	]	Set the Will message data for R300.
	M12 ──	MOV	K1	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.
		MOV	КО	D3	]	Set Will QoS to K0.
		 MOV	КО	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.
1						

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			M_FX5 (M+FX B: i_bEN	ENET_MC 5ENET_M MQTT (	QTT_Cor QTT_Co QTT_Co Connect	nnect onneo FB	_00A_1 ct_00A) o_bENO :B			M6
Connection number: K1		[FX5ENET_1][D0 ]	DUT: i_stModule UW: i_uConnect	ionNo			o_bOK :B o_bErr :B			
Timeout value: K30		[D1 ]-	UW: i_uTimeout B: i_bConnect	+		0	o_uErrld :UW	[D7	]	M9 M10
KeepAlive timer: K60 M3		[D2 ]	UW: i_uKeepaliv B: i_bCleanSess	eTimer ion	o_uC	Conne	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	t: K0 address ddress: I	[D4 ] : K0[D5 ] <300[D6 ]	UW: i_uTopicMe UW: i_uWillTopic UW: i_uWillMess	essageForr cNameDat sageDataA	mat aAddr addr					
			ם ק ק	bi_bUsePa bi_uLocal_ bi_uTarge bi_u2IP_A	aramete _Port_N et_Port_I \ddress	ers lo No				

# 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 topic name data	for R600.
SM40:	2	\$MOV	devices/test_things/messages/events	/ R600
M50	1         M_StrProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].uType := K3; //Set the Value type to K3 (character string).           2         M_StrProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].s32Key := 'Sample'; //Set the Key name to "Sample".           3         M_StrProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].s42Key := 'MQTT_TEST'; //Set Value to "MQTT_TEST".		Set JSON start address DMOV K1000	to K1000.
	M_StrProcessing_JSONSerialize_F_00A_1.pb_st30Member[0].uDepth := K1; //Set the depth of layer to K1.     M_StrProcessing_JSONSerialize_F_00A_1.pb_st30Member[1].uType := K0; //Set the Value type to K0 (end of the member]	structure an	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	К0	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_Publish (M+FX5ENET_MQTT_Publish MQTT Publish Send	hSend_00A_1 shSend_00A) d FB			
M69			B: i_bEN	o_bENO :B			M63
	-[FX5ENET_	1]-	DUT: i_stModule	o_bOK :B			O
Connection number: K1	-[D0	]_	UW: i_uConnectionNo	o_bErr :B			M65
			B: i_bPublish	o_uErrld :UW	—[D54	]—	
Binary/ASCII/Unicode strings: K0	-[D50	}	UW: i_uQoS	o_bSendOK :B			
			B: i_bMessageRetain o_uCo	onnectionStatus :UW			O
QoS: K0	[D51	]_	UW: i_uTopicMessageFormat		[D55	]	
Publish topic name data start address: K600	- D52	1	UW: i_uPublishTopicNameDataAdd	r			
Publish message size: K0	D53	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).

SM402	\$MOV	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	K0	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_MQTT_Subscribe_00A_1 (M+FX5ENET_MQTT_Subscribe_00A) MQTT Subscribe FB			
M29		B: i_bEN o_bENO :E			M23
[FX5ENET_	1]-	DUT: i_stModule o_bOK :E			M24
Connection number: K1	]-	UW: i_uConnectionNo o_bErr :E			M25
		B: i_bSubscribe o_uErrld :UW	-[ D14	]-	
M22		B: i_bUnSubscribe o_bSendOK :E			M26
Subscribe ID: K1	}	UW: i_uSubscribeId o_uConnectionStatus :UW	-[ D15	]-	
Maximum QoS: K0	]-	UW: i_uMaxQoS			
Topic message format: K0		UW: i_uTopicMessageFormat			
Subscribe topic name data start address: K700 D13	]_	UW: i_uSubscribeTopicNameDataAddr			

### 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+/	)				⊋ 🖉 ⊚	10.000 (maighteen 🐨
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 ()	Refresh 🔿 Assign tags	III Delete						Find devices using a query
Activity log	Trans								
Access control (IAM)	I enter device ib								
🗳 Tags	Device ID	Type	Status	Last status update	Authentication type	C2D messages gueued	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									
<ul> <li>Built-in endpoints</li> </ul>									
K Message routing									
File upload									
Failover									
Pricing and scale									
A Locks									
Security settings									
Identity									
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Defender for let									
Uverview .	*								

2. Click [Message to Device].

	∠ Search resources, services, and docs (G+/)	N 6	P © P	X01710000-religitures 🚳
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				
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+/)	Tabat Gali Services.
Home > test-hub-name   Devices > test_things >		
Message to device 🖉 …		×
test_things		
Send Message		
You can use this tool to send messages to a device in	your IoT Hub. Messages have both a body and optional properties organized as a collection of key/value string pairs.	
Device Id 💿		 0
test_tnings		U.
Message Body ()		 
{ sample : WiQIT_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).

MOV	K1100	D21	]	Set the receive topic name data start address to K1100.
MOV	K1300	D22	<u> </u>	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_Rece (M+FX5ENET_MQTT_Rec MQTT Receive F	M_FX5ENET_MQTT_Receive_00A_1 (M+FX5ENET_MQTT_Receive_00A) MQTT Receive FB B: i_bEN o_bENO :B -							
M36		B: i_bEN								
	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	- [121]	UW: i uReceiveTopicNameDataAddr	o uErrld :UW	F 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_uR	eceiveMessageSize :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]

1 [Device/Buffer Memory Batch Monitor] Monitoring												
Device <u>N</u> am	ie	R1300	~	Open D <u>i</u> splay Format	Detai <u>l</u> ed Conditions 🛞	Monitoring						
O Buffer <u>M</u> emo	лу	Intelligent Module No.( <u>U</u> )	~	(HEX) <u>A</u> ddress	V DEC V	Stop Monitoring						
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R1304	0 0	1 1 1 0 1 0 0 0	1 0 0 0 1 0	1486	2 *:							
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R1306	0 1	0 1 0 1 0 0 0 1	0 1 0 0 0 1	2158	IS QT							
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R1314	0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0		0							
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R1317	0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0		0							
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R1320	0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0		0							
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R1322	0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0		0							
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R1330	0 0	0 0 0 0 0 0 0 0	0 0 0 0 0 0		u	U						
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# 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 17.2 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  $\Rightarrow$  [New].

In this manual, the following settings are used.

Item	Description
Series	FX5CPU
Туре	FX5U
Program Language	Ladder

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酯															
P	roject Edit	Find/Replace C	onvert View	Online	Debug	Recording	g Diagnost	tics Tool Wi	indow Help	,					
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	Security		•					_	_						
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	Page Setu	ip													
	Print Prev	iew													
e	Print		Ctrl+P												
	Recent Pr	ojects(K)	•												
	Start GX V	Vorks2													
	Exit(Q)														

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

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ţ.		Recent Projects(K)	•		Help(M)					
R.		Start GX Works2		_						
		Exit(Q)								

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

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				<u>O</u> pen	Cance	1

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.

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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.

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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 number	W:i_wParameterNo Parameter number	o_bErr:B Failed end		M232 Failed end
hunder		o_wErrID:W Error code	Error code	
		o_wParameterVal:W Parameter value which was read	Parameter value which was read	
				[ END ]
			Copy Ladder Program (fo	or 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.

MELSOFT GX Works3 (Untitled Pro	oject) - (ProgPo	u (PRG) (LD) 15tep *)													- 0	×
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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 definition of FB				
M_INVERTER_CC_IEF_Basic_Running_F_00A_1 (	M+INVERTER-CC-IEF-Basic_Running_F			
i_bEN	o_bENO			
i_wStationNo	o_bOK			
i_bForword	o_bErr			
i_bReverse	o_wErrID			
i_bHigh				
i_bMiddle				
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.

💼 Prog	9Pou (PRG) (Local I	Label Set	🕐 🕐	ogPou (PR	G] [LD] 1Ste	p* ×						
Write	× 1	2	3	4	5	6	7	8	9	10	11	12
15						M_INVERTER_CC_IEF_Basic_Running_F_C Running_F_C	00A_1 (M+INVERTER-CC-IEF-Basic_Running_F_ unning					
16						B: i_bEN	o_bENO:B					
17					-[ 00 ]	W: i_wStationNo	o_bOK:B					
18	M1					B: i_bForword	o_bErr:B					M12
19	M2					B: i_bReverse	o_wErrID/W	-[ D10 ]				
20	M3					B: i_bHigh						
21	M4					B:i_bMiddle						
22	M5					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.





## REVISIONS

Revision date	Version	Description
October 2023	A	First edition
December 2023	В	■Modified parts RELEVANT MANUALS, Section 2.3, 6.1

Japanese manual number: L08899-B

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