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FACTORY AUTOMATION

Mitsubishi Electric Programmable Controller
MELSEC iQ-F Series

Quick Connection Guide

MELSERVO-JET/J5 Series
for CC-Link IE TSN Motion Module

MELSEC iQ-F series × **MITSUBISHI ELECTRIC SERVO SYSTEM MELSERVO-JET**

INTRODUCTION

Thank you for purchasing the Mitsubishi Electric MELSEC iQ-F series programmable controllers.

This manual describes the settings for communications between FX5 CPU modules and servo amplifiers, which use CC-Link IE TSN Motion modules.

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.

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.
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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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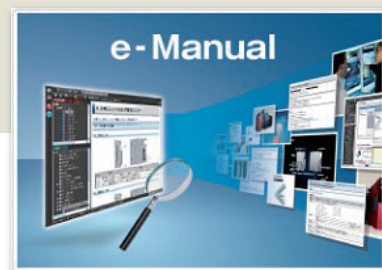
■ Concepts, features, and videos showing how to use e-Manual Viewer are presented on the following website.
http://fa-mel.com/fa/ref/ref.html?k=plceng&smerit=emaviewer_win

■ The download file for e-Manual Viewer (for Windows®) can be found on the following website.
http://fa-mel.com/fa/ref/ref.html?k=plceng&software=emaviewer_en

CONTENTS

RELEVANT MANUALS

The following relevant manuals can be downloaded from the Mitsubishi Electric FA site.

www.mitsubishielectric.com/fa/ref/ref.html?kisyu=plcf&manual=download_all

MELSEC iQ-F

[○: Available, —: Not available]

Manual name <manual number>	Available form	
	e-Manual	PDF
MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) <SH-082452ENG>	○	○
MELSEC iQ-F FX5 User's Manual (Application) <JY997D55401>	○	○
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup) <IB-0300251ENG>	○	○
MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) <IB-0300253ENG>	○	○
MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN) <IB-0300568ENG>	○	○
MELSEC iQ-F PLCopen Motion Control FB Reference <SH-082351ENG>	○	○

AC servo MELSERVO

[○: Available, —: Not available]

Manual name <manual number>	Available form	
	e-Manual	PDF
MR-JET-G User's Manual (Introduction) <IB-0300448ENG>	○	○
MR-JET User's Manual (Hardware) <IB-0300453ENG>	○	○
MR-JET User's Manual (Function) <IB-0300458ENG>	○	○
MR-JET-G User's Manual (Communication Function) <IB-0300463ENG>	○	○
MR-JET-G User's Manual (Object Dictionary) <IB-0300468ENG>	○	○
MR-JET User's Manual (Adjustment) <IB-0300473ENG>	○	○
MR-JET-G User's Manual (Parameters) <IB-0300478ENG>	○	○
MR-JET User's Manual (Troubleshooting) <IB-0300483ENG>	○	○

Engineering software
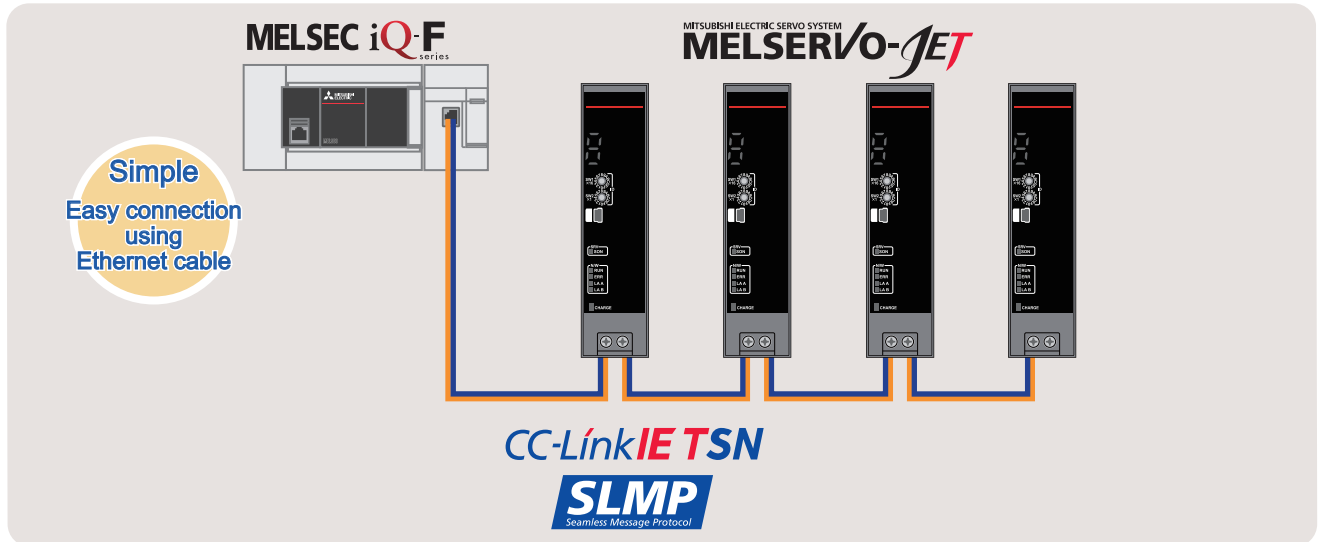
[○: Available, —: Not available]

Manual name <manual number>	Available form	
	e-Manual	PDF
GX Works3 Operating Manual <SH-081215ENG>	○	○
Programmable Controller Engineering Software MELSOFT GX Works3 FB Quick Start Guide <L-08475ENG>	—	○

Features

Point1

Motion modules compatible with CC-Link IE TSN

Being compatible with CC-Link IE TSN, the FX5-40SSC-G and FX5-80SSC-G achieve a highly flexible network configuration. This configuration can vary from a simple line topology system to one where star and line topologies are used together.


In addition, users can build more flexible networks by using Ethernet modules.

Point2

Simpler and more user-friendly

FBs compatible with the specifications of PLCopen® Motion Control FBs are available.

Using the FBs enables the following: reduction of the time required for debugging or the costs on training; improvement of the reusability of software or the quality of equipment or machinery.
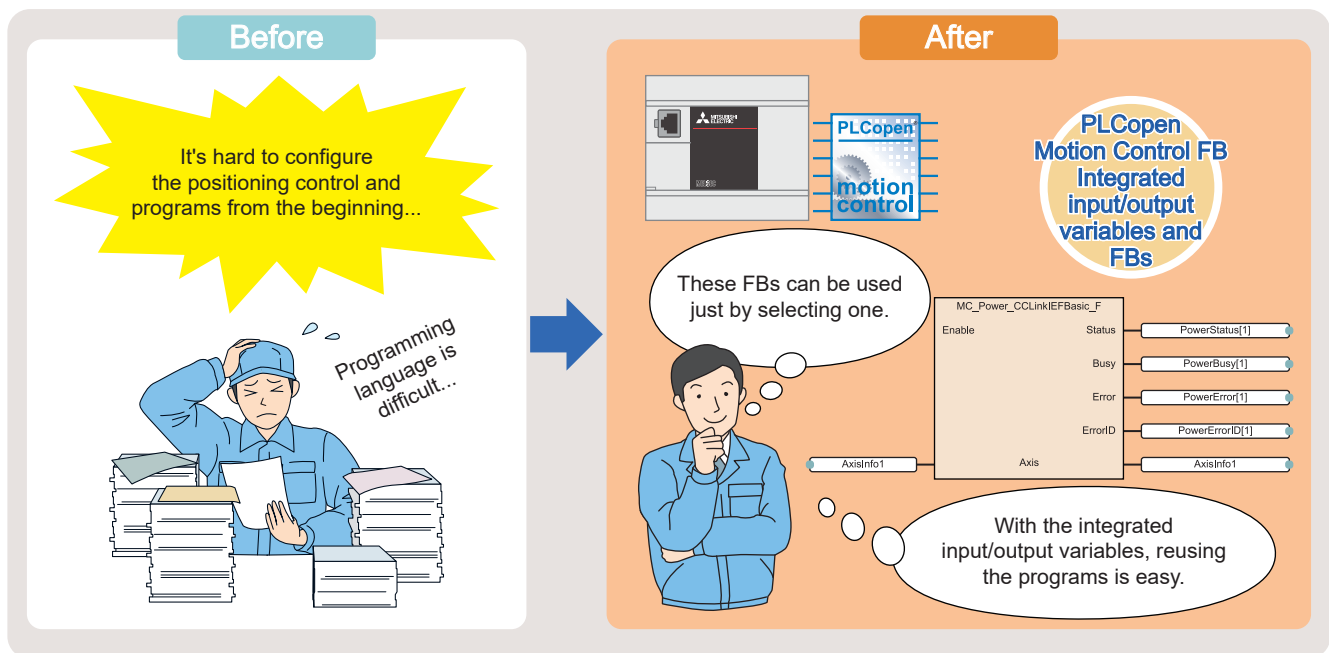
Point3

Simple settings using MR Configurator2

Operations from startup to maintenance of servo amplifiers can be easily performed on a personal computer by using MR Configurator2. MR Configurator2 provides various useful functions at every phase such as design, operation, and maintenance.

Parameter settings and monitor output on multiple axes at one time

Writing parameters to multiple axes at one time

Writing ranges can be specified

For features and functions of the servo amplifiers, refer to the following.

📖 MELSERVO-JET [L(NA)03187ENG]

1 PREPARATION

1.1 Applicable Models

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

Programmable controller			Servo amplifier (Ethernet-compatible)
FX5U CPU module	FX5UC CPU module	FX5-40SSC-G, FX5-80SSC-G	MR-JET-G[*1]

*1   The MR-JET-G-N1 cannot be used.

1.2 Operation Flow Diagram

1. Preparing the required products

2. Setting the servo amplifiers
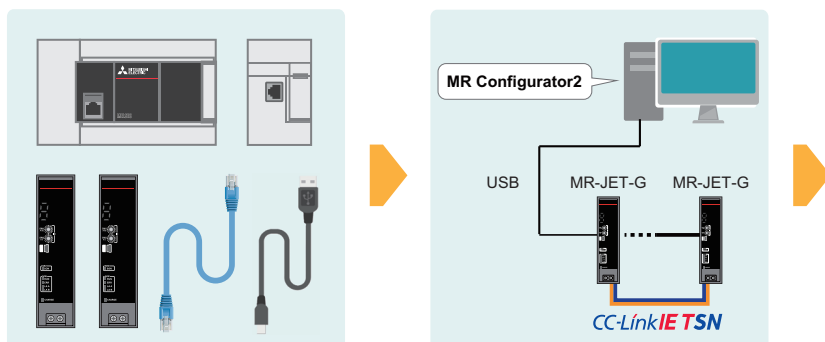
3. Setting the programmable controller

4. Checking the communication status
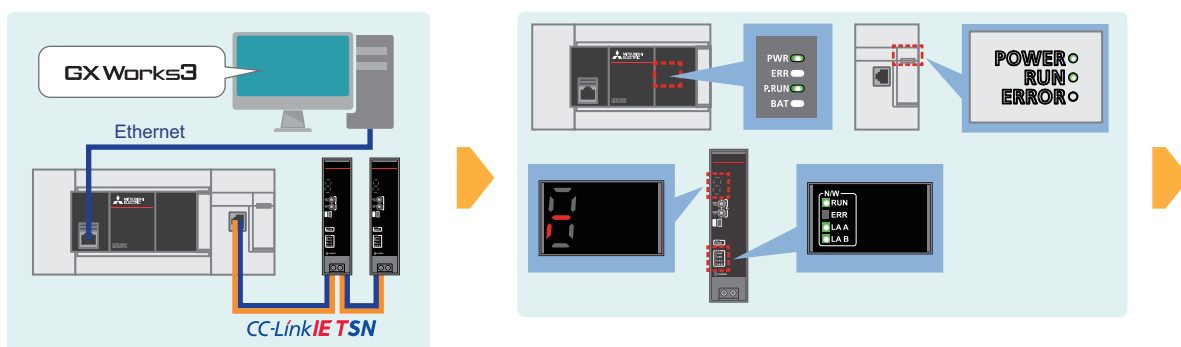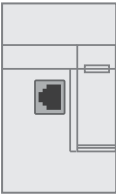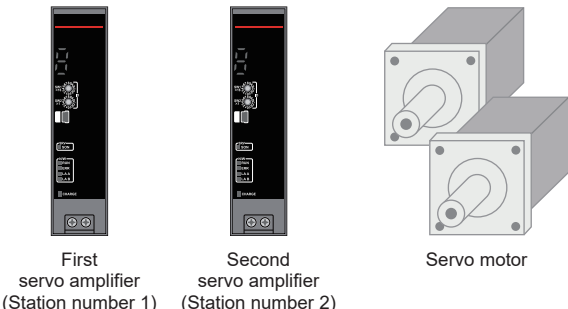
5. Creating programs and checking the operation
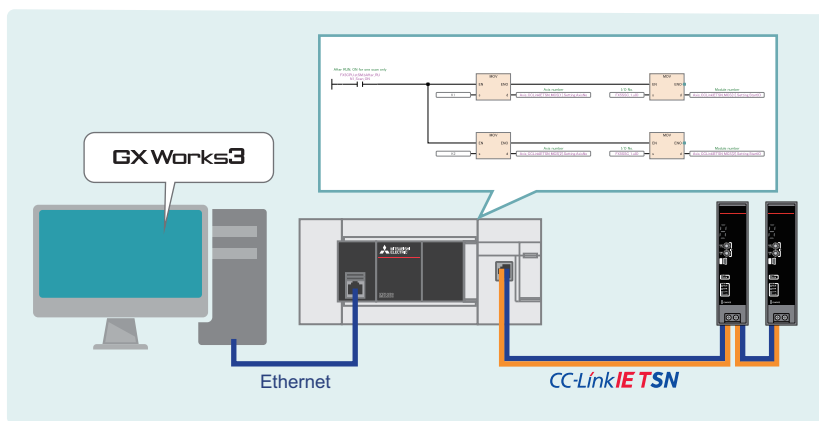
1.3　Required Products

This manual describes the procedures required for the communications between FX5U CPU modules and servo amplifiers, using a system configuration example where one FX5U CPU module and one FX5-40SSC-G Motion module are connected to two servo amplifiers (MR-JET-G).

FX5U CPU module × 1	FX5-40SSC-G Motion module × 1	MR-JET-G × 2, Servo motor × 2
		 First servo amplifier (Station number 1)　Second servo amplifier (Station number 2)　Servo motor
Use the FX5U satisfying the following. • Firmware version: 1.250 or later	Use the FX5-40SSC-G satisfying the following. • Firmware version: 1.002 or later	Use the MR-JET-G satisfying the following. • Firmware version: D8 or later Select applicable servo motors.[1]

*1　For applicable servo motors, refer to the following.
　　📖MR-JET User's Manual (Hardware) [1.2 Servo amplifier/motor combinations]

| Personal computer and software	Ethernet cable × 3	USB cable to connect personal computer
GX Works3 • Applicable software version: 1.096A or later MR Configurator2 • Applicable software version: 1.145B or later	Use Ethernet cables 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)	A USB cable has been checked for operation when the servo amplifier and a personal computer are connected. • MR-J3USBCBL3M (Mitsubishi Electric)

Software

GX Works3 must import the following.

Item	File name	Reference
FB library	MotionControl_CCLinkIETSN_MCS_F.mslm	Page 18 PROGRAMMABLE CONTROLLER SETTINGS
Profile[1]	0x0002_MR-JET-G_17_en.cspp	Page 54 Downloading and Registering a Profile

*1　The file before decompression (such as *.zip) can also be imported.

1.4   System Configuration

This manual uses the system configuration where one FX5U CPU module and one FX5-40SSC-G Motion module are connected to two servo amplifiers (MR-JET-G).

Use standard Ethernet cables for the connection and configure the system in a line topology.

In this example, the IP addresses are set to 192.168.3.□, and the subnet masks are set to 255.255.255.0 for all the devices. Note that, when communicating between multiple devices in a same network, the first three values of the IP addresses (first to third octets) need to be the same. For IP addresses used for the devices, users can select them. For subnet masks, set the same address to all the devices.
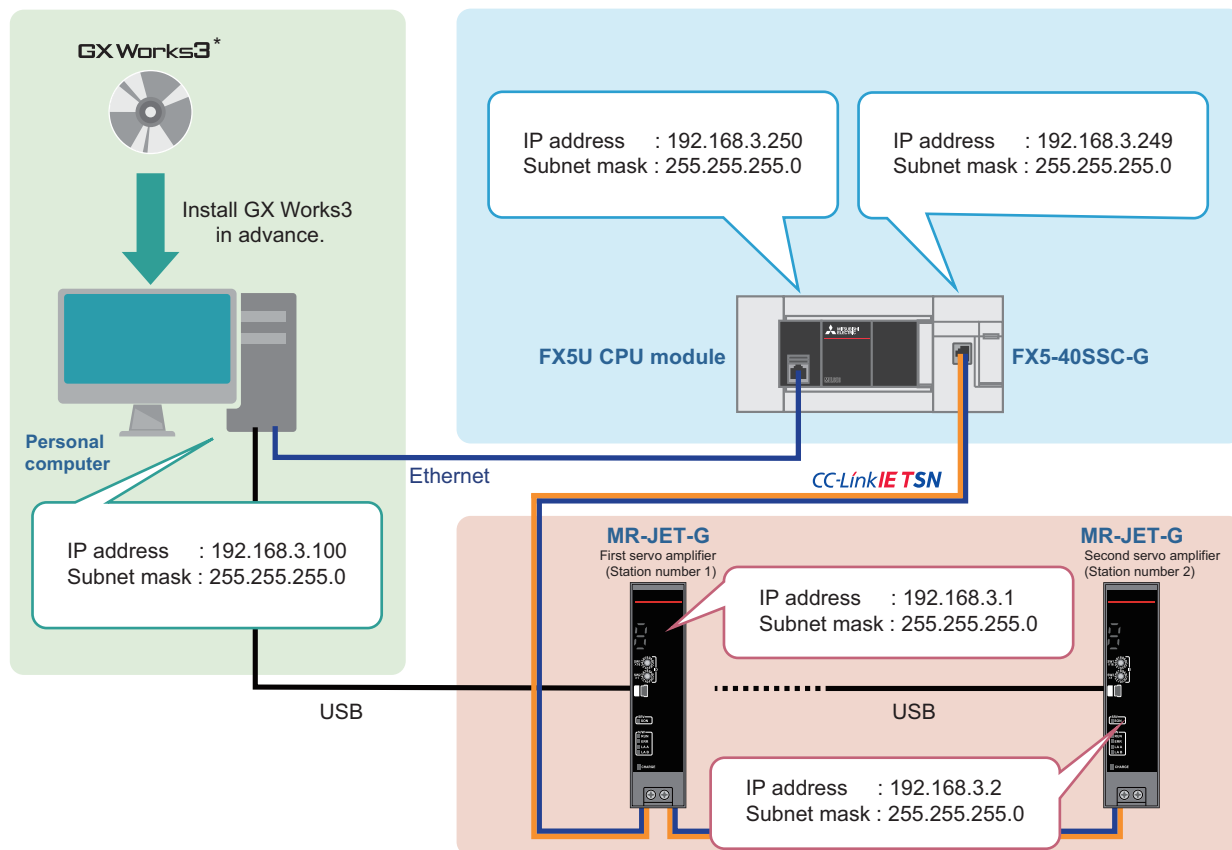
* MR Configurator2 is automatically installed by installing GX Works3.

For the wiring of the MR-JET-G to the power supply, refer to the following.

📖MR-JET User's Manual (Hardware) [3 SIGNALS AND WIRING]

For the wiring of an FX5 CPU module to the power supply, refer to the following.

📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) [15.4 Power Supply Wiring]

For the wiring of the FX5-40SSC-G to the power supply, refer to the following.

📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Startup) [5.2 Wiring [FX5-SSC-G]]

For the wiring between servo amplifiers and servo motors, refer to the following.

📖MR-JET User's Manual (Hardware) [3 SIGNALS AND WIRING]

📖Manual for the servo motor used

Point

There is no difference between CN1A and CN1B of the servo amplifier, and thus the system configuration does not change by switching the Ethernet cable connection from CN1A connector to CN1B connector, or vice versa.

Front side of the MR-JET-G

Ethernet cable connector (CN1B)

Ethernet cable connector (CN1A)
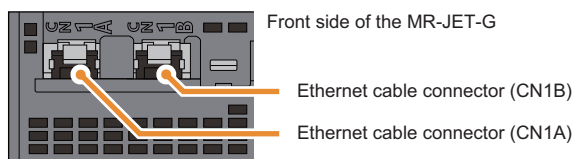
2 SERVO AMPLIFIER SETTING

2.1 Switch Setting and Display

The IP address can be set with the rotary switches of the MR-JET-G. The communication status and alarm status of the network can be checked with the LEDs.
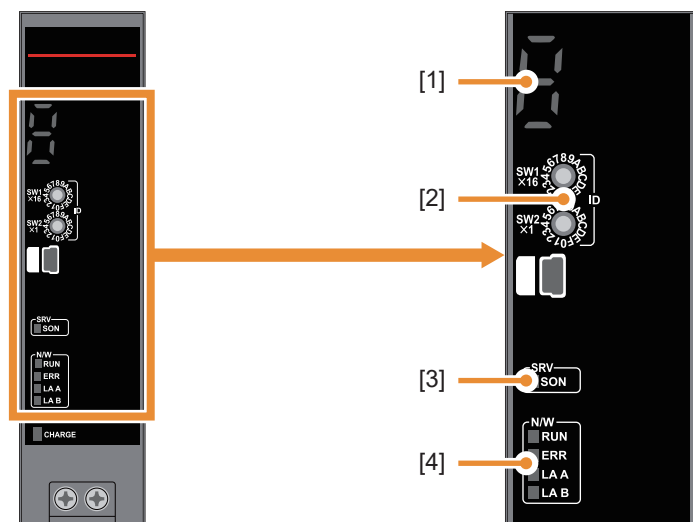
No.	Name		Description
[1]	Display		Indicates the servo status and an alarm number using one-digit, seven-segment LEDs.
[2]	Rotary switches (SW1/SW2)		Sets the IP address of the servo amplifier. (☞ Page 14 USB Connection with Personal Computer)
[3]	Servo status display LED (SRV)	SON	Off: Indicates Ready OFF and Servo OFF state. Flashing: Indicates Ready ON and Servo OFF state. On: Indicates Ready ON and Servo ON state.
[4]	Network status display LED (N/W)	RUN	Off: Indicates that an alarm has occurred. On: Indicates that the power is on.
		ERR	Off: Indicates that neither an alarm nor a warning has occurred. Flashing: Indicates that a warning has occurred. On: Indicates that an alarm has occurred.
		LA A	Indicates the link status for CN1A. On: Link-up
		LA B	Indicates the link status for CN1B. On: Link-up

For details on the switch setting and the display of the MR-JET-G, refer to the following.

📖MR-JET-G User's Manual (Introduction) [3.2 Switch setting and display of the servo amplifier]

2.2 List of Related Parameters

The following tables list the servo-amplifier parameters required to be set.

To perform Ethernet communications between servo amplifiers and connected devices, set the servo-amplifier parameters according to the communication specifications of the connected devices. If the initial setting is not configured or the setting has an error, data communications fail.

Related parameters

The following table lists the parameters required to be set to use the FB library described in this manual. Be sure to set these parameters as shown below.

Function display (List)	Parameter number	Parameter name	Initial value	Setting value	Description
Positioning	PA01.0	Control mode selection	0	0	Set "Network standard mode".
	PT29.0	Device input polarity 1	0	1	Dog detection with on
	PT45	Homing method	37	-3	Data set type
Position/speed/torque control	PD13.2	INP output signal ON condition selection	0	1	Set "Within the in-position range and at the completion of command output".
Common	PA04.2	Servo forced stop selection	0	1	Disabled (the forced stop input EM2 and EM1 are not used)
	PN13.0-3	Network protocol setting	0000h	0000h	Set for CC-Link IE TSN.
I/O	PD01.0-7	Input signal automatic ON selection 1	00000000	00001100	Set as follows. • Forward rotation stroke end (LSP): "ON" • Reverse rotation stroke end (LSN): "ON"
	PD41.2	Limit switch enabled status selection	0	1	Enabled only for homing mode
	PD41.3	Sensor input method selection	0	1	Input from controller (C_FLS/C_RLS/C_DOG)

2.3 USB Connection with Personal Computer

This manual describes the parameter setting method using MR Configurator2.

Connect the servo amplifier with a personal computer using USB, and set the parameters.

Point

First, connect the servo amplifier of the station number 1 with a personal computer using a USB cable, and write parameters. Then, connect the servo amplifier of the station number 2 with a personal computer using a USB cable, and write parameters.

The parameters to be written are the same for both the servo amplifiers of the station number 1 and 2.

MR Configurator2

MR-JET-G (Station number 1) MR-JET-G (Station number 2)

USB

CC-Link *IE TSN*
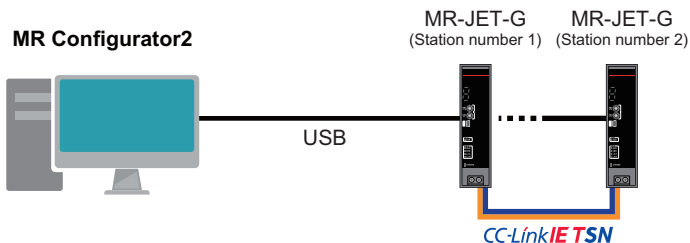
1. When the power of servo amplifiers is off, set the fourth octet of IP addresses of servo amplifiers using the rotary switches.
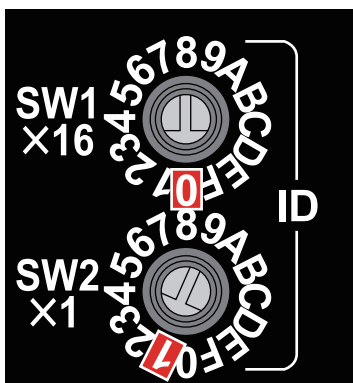
[Station number 1]
Turn the rotary switches to set as shown on the left side. (01h)
- SW1×16: 0
- SW2×1: 1
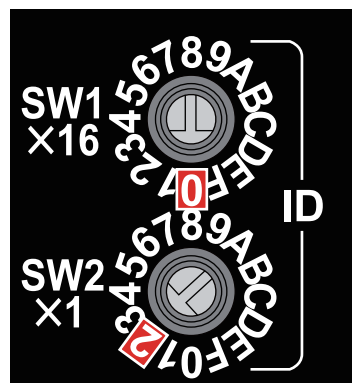
[Station number 2]
Turn the rotary switches to set as shown on the left side. (02h)
- SW1×16: 0
- SW2×1: 2

2. Power on the servo amplifiers.

3. Start MR Configurator2, and select [Project] ⇨ [New].
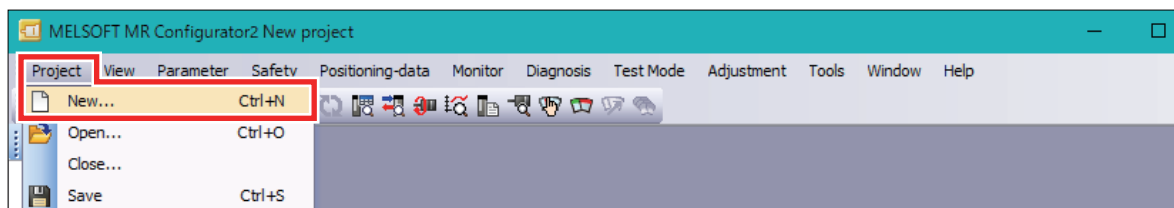
4. Specify [Model] of the servo amplifier.

2 SERVO AMPLIFIER SETTING
2.3 USB Connection with Personal Computer

2.4　Parameter Settings

1. Select [Parameter] ⇨ [Parameter Setting].
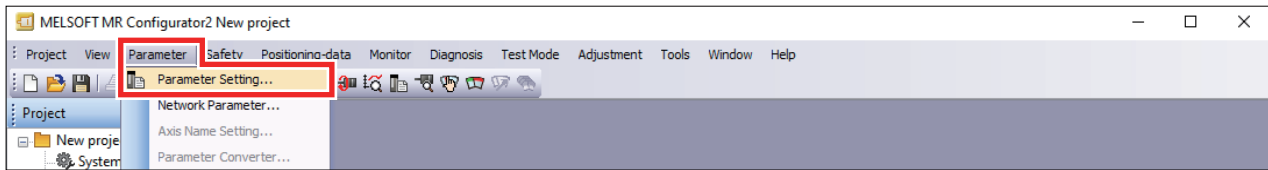
2. Set each item from [List display]. (Write the same value for both axis 1 and axis 2.)

List display	No.	Name	Setting value
Basic	PA04	Function selection A-1	00002100h
Extension	PC79	Extension C-G	0000000Eh
I/O	PD01	Input signal automatic ON selection 1	00000C00h
	PD13	Function selection D-2	00000100h
	PD41	Function selection D-4	00001100h
Positioning control	PT29	Function selection T-3	00000001h
	PN45	Homing method	-3

■ When "Basic" is selected

2.5 Write to Servo Amplifier

Write the set parameters to the servo amplifier.

1. Click the following icon on the toolbar to go online.

They are grayed out offline.

The functions are available online.

2. Click [Axis Writing].
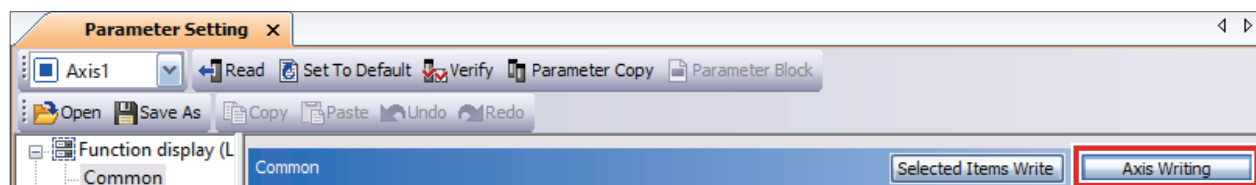
2.6 Servo Amplifier Reset

Reset the servo amplifier. For some parameters, set values do not take effect unless the servo amplifier is reset. This manual describes the reset operation using MR Configurator2.

1. Click the [Software Reset] icon on the toolbar.
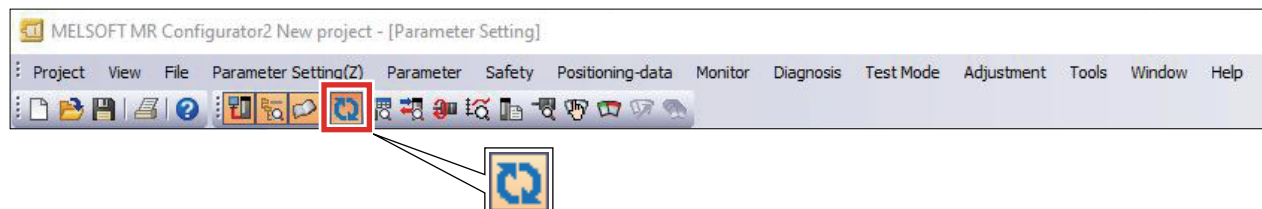
3 PROGRAMMABLE CONTROLLER SETTINGS

3.1 Part Names

For the part names of the FX5 CPU modules, refer to the following.

📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) [3.1 CPU Module]

3.2 Downloading the FB Library

In this manual, the FB library for MELSERVO PLCopen Motion Control is used.

To obtain the FB library, please contact your local Mitsubishi Electric representative.

3

3.3 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] ⇨ [New].

Set as follows, and click [OK].

Item	Setting value
Series	FX5CPU
Type	FX5U
Program Language	FBD/LD
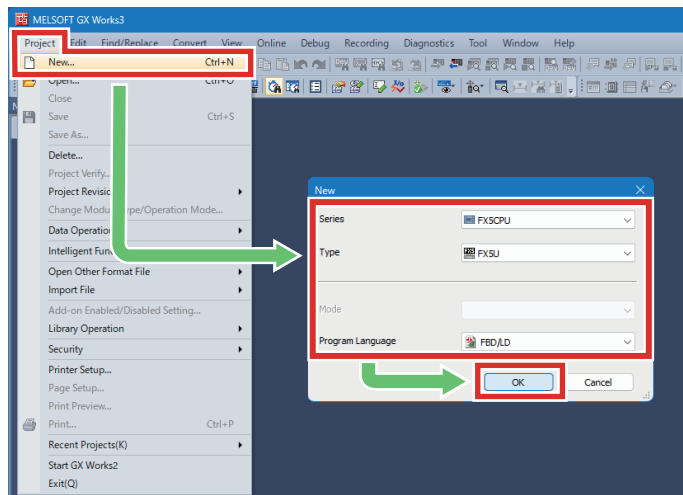
2. Select [Project] ⇨ [Library Operation] ⇨ [Register to Library List] ⇨ [Library].
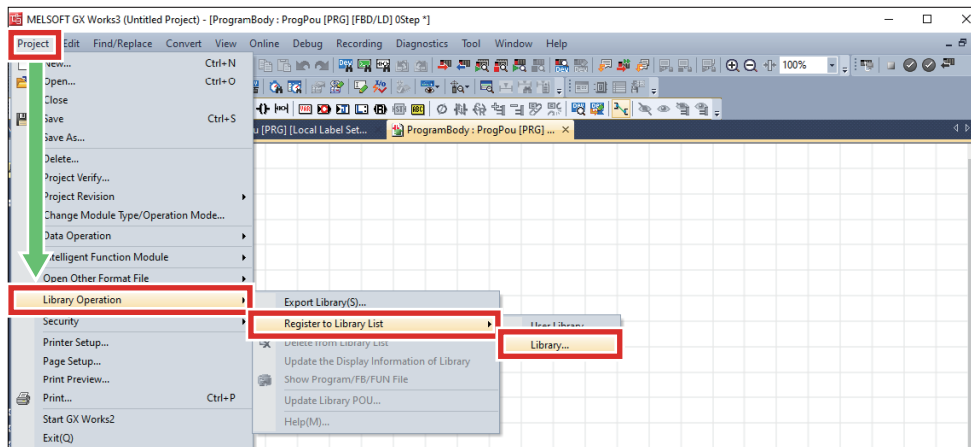
3. When the following window appears, click [OK].
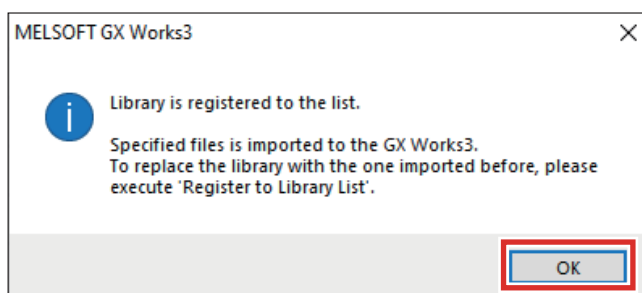
4. Select the "MotionControl_CCLinkIETSN_MCS_F.mslm" file in the decompressed FB library folder, and click [Open].
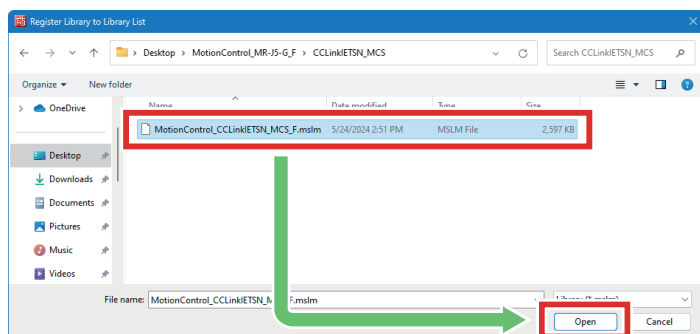
5. The selected file is added to [Library] in the "Element Selection" window.

Point
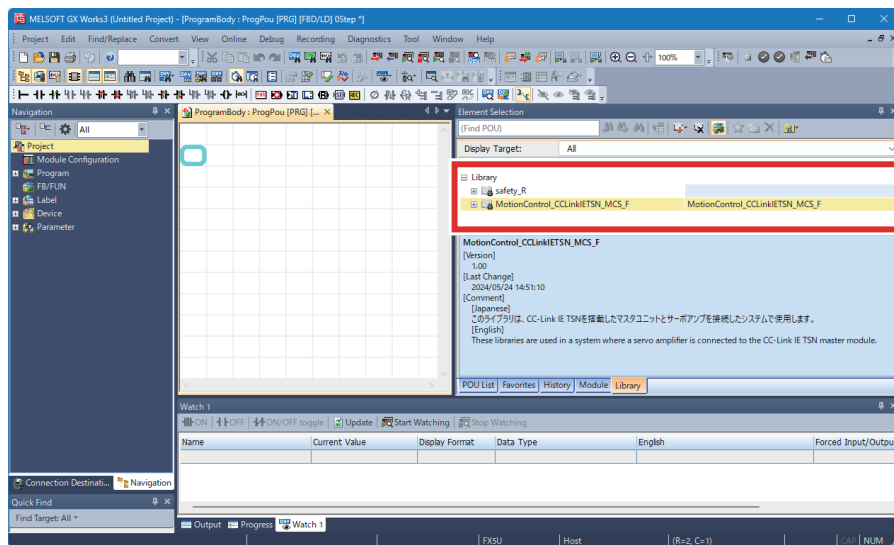
If the "Element Selection" window is not displayed, go to the menu bar, and select [View] ⇨ [Docking Window] ⇨ [Element Selection] to open the window.

3.4 Communication Settings of GX Works3

Connect the personal computer to the CPU module using an Ethernet cable. Perform the communication test before setting parameters.
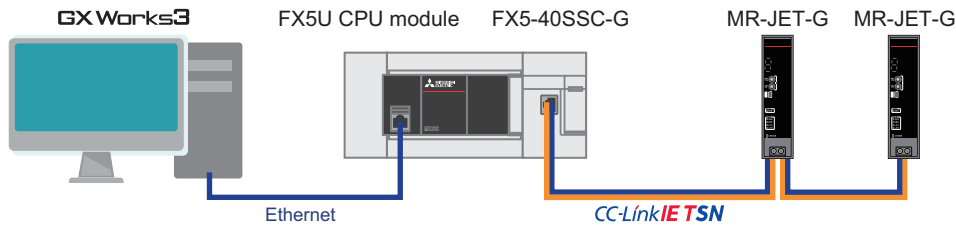
1. Select [Online] ⇨ [Current Connection Destination].
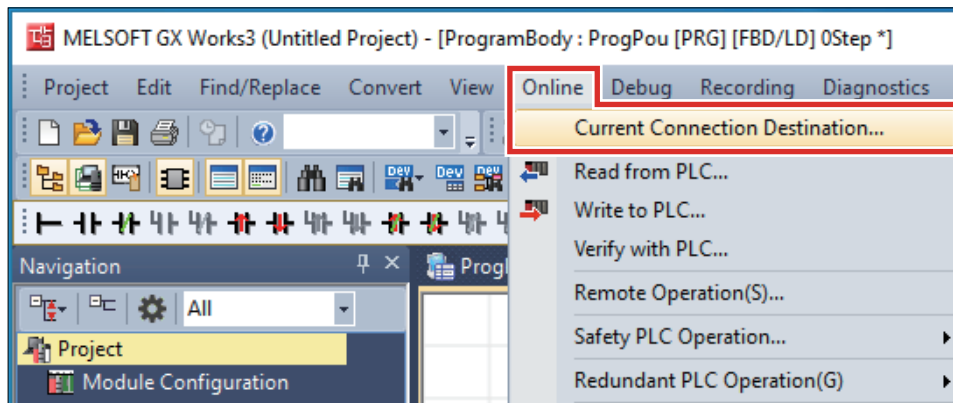
2. Select [Direct Coupled Setting], then [Ethernet]. Enter required items in [Adapter] and [IP Address of Adapter], then click [Communication Test].

3. When the following window appears, click [OK].

3 PROGRAMMABLE CONTROLLER SETTINGS
3.4 Communication Settings of GX Works3
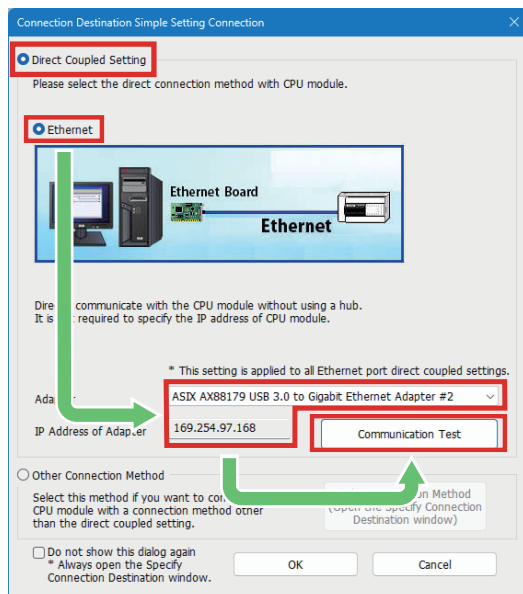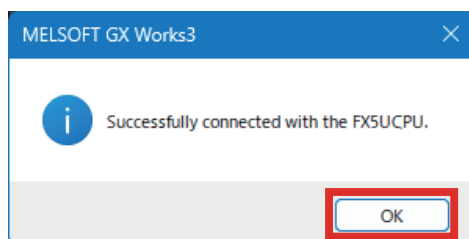
Precautions

When the communication test detects a connection failure, perform the following.

• Check the power supplies of the programmable controller and the servo amplifiers, wiring with Ethernet cables.

• Check the IP address and the subnet mask of the personal computer.

• Initialize the programmable controller.

For how to initialize the programmable controller, refer to the following.

📖GX Works3 Operating Manual [18.6 Initializing/Clearing a Memory]

3.5 Parameter Settings

This section describes how to set parameters required for the programmable controller using GX Works3.

1. In the "Navigation" window, select [Parameter] ⇨ right-click [Module Information], then click [Add New Module].
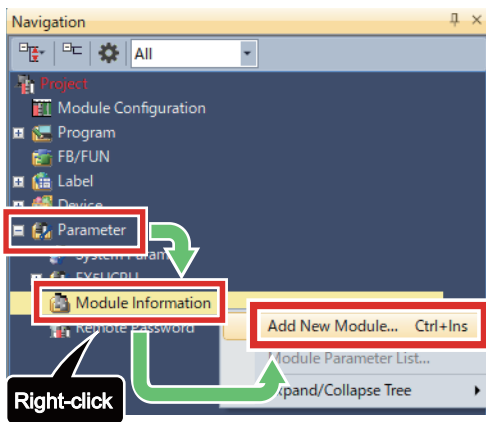
> **Point**
>
> If the "Navigation" window is not displayed, go to the menu bar, and select [View] ⇨ [Docking Window] ⇨ [Navigation] to open the window.

2. Set as follows in the "Add New Module" window, then click [OK].

Item	Description
Module Type	Motion Module
Model Name	FX5-40SSC-G(S)
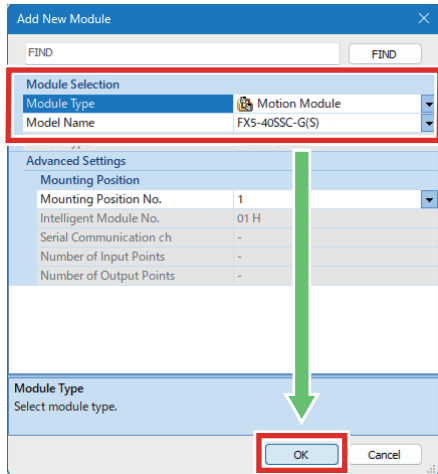
3. In the "Navigation" window, [Module Information] ⇨ [1[U1]:FX5-40SSC-G(S)] ⇨ double-click [Module Parameter (Network)].
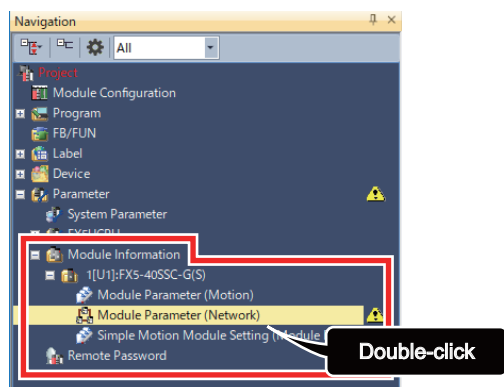
4. In Network Configuration Settings, double-click [Detailed Setting] of [Network Configuration Settings].
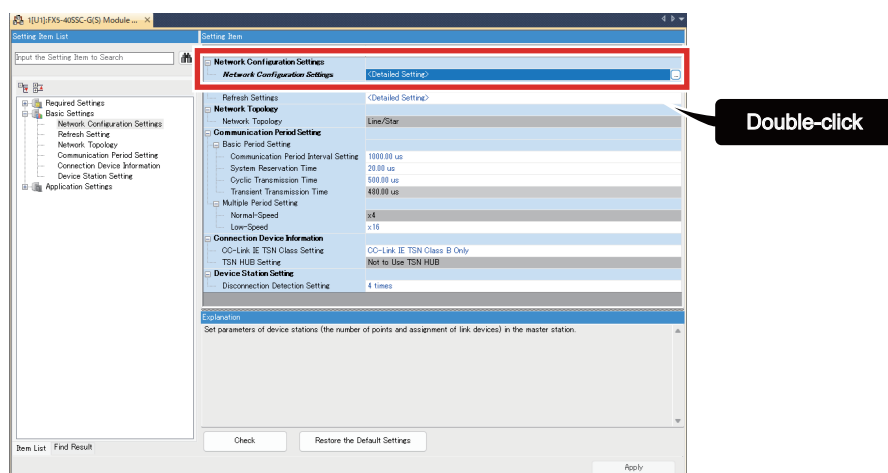
5. Click [Connected/Disconnected Module Detection].
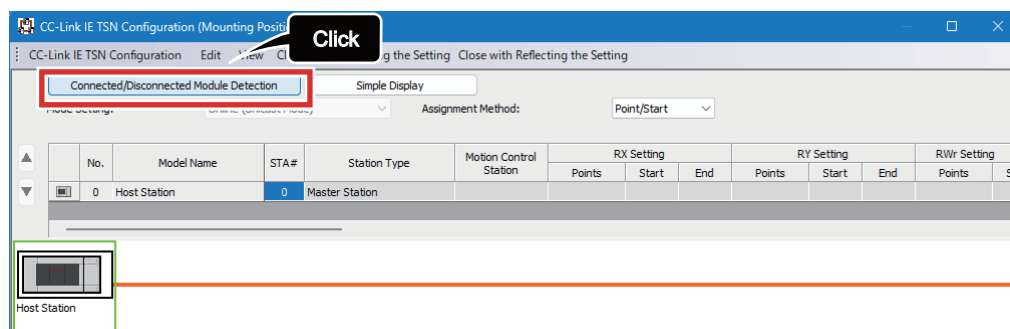
When the MR-JET-G profile is not registered, refer to the following.
☞ Page 54 Downloading and Registering a Profile

6. The information on the servo amplifiers connected to the programmable controller is displayed in the table. Check the settings of model name, reserved station, IP address, and subnet mask, and click [Close with Reflecting the Setting]. In this manual, the following setting values are used. (For the setting values, refer to ☞ Page 10 System Configuration.) If a displayed value is different from the one in the table below, correct the value.

Model Name	STA#	RSVD STA	IP Address	Subnet Mask
MR-JET-G	1	No Setting	192.168.3.1	255.255.255.0
MR-JET-G	2	No Setting	192.168.3.2	255.255.255.0
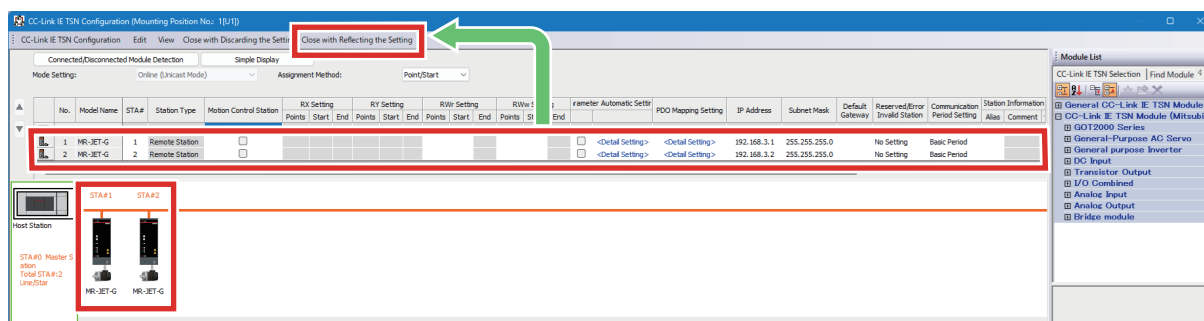
After closing the window with the setting reflected, click [Apply].

3 PROGRAMMABLE CONTROLLER SETTINGS
3.5 Parameter Settings
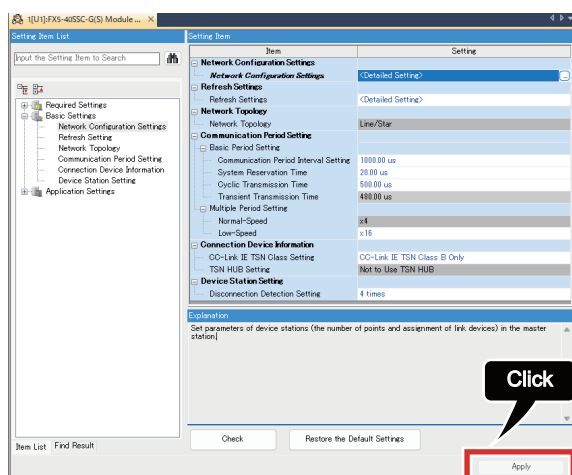
3.6 Adding Structures and Global Labels

This section describes how to add structures and global labels in the FB library to the project.

Addition of structures

1. Select [MotionControl_CCLinkIETSN_MCS_F] ⇨ [Structured Data Types] in the registered FB library. Right-click on [Structured Data Type] and select [Add to Project].
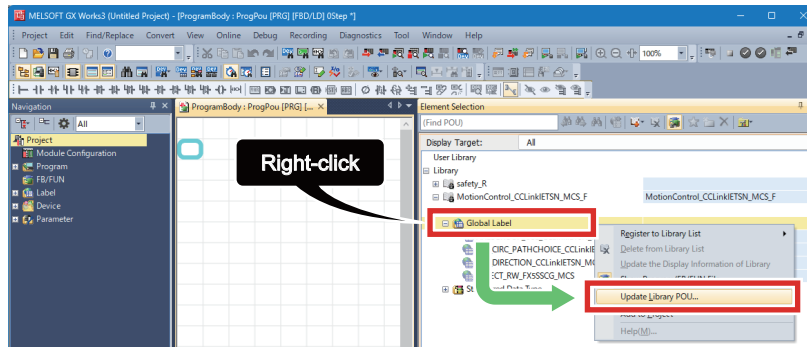
2. The following will be added to [Structured Data Types] of [Label].
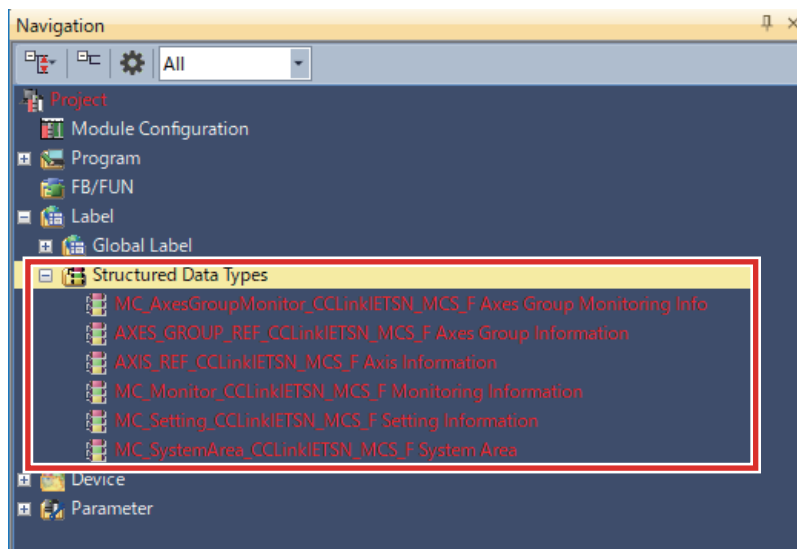
Addition of global labels

1. Select [Label] ⇨ [Global label] ⇨ [Global]. Double-click [Global] and set as follows.

Label Name[1]	Class[2]
Axis_CCLinkIETSN_MCS	VAR_GLOBAL
AxesGroup_CCLinkIETSN_MCS	VAR_GLOBAL

*1 Any desired label name can be set.
*2 The field will be displayed by clicking [Detailed Display].
*3 When [Detailed Display] is selected, [Easy Display] is displayed.

2. Set Data Type as shown below.

Label Name	Data Type	Class
Axis_CCLinkIETSN_MCS	AXIS_REF_CCLinkIETSN_MCS_F(1..2)	VAR_GLOBAL
AxesGroup_CCLinkIETSN_MCS	AXES_GROUP_REF_CCLinkIETSN_MCS_F(1..1)	VAR_GLOBAL
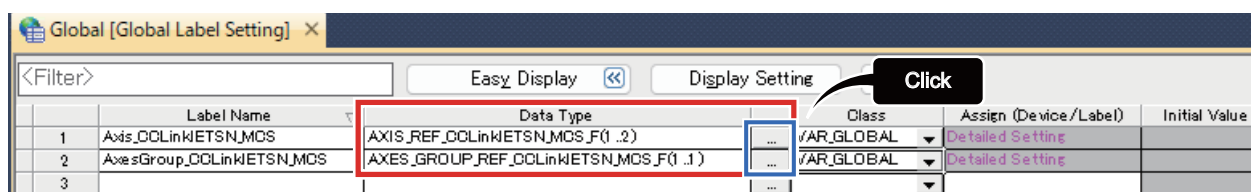
To set Data Type, click [...] and follow the step in the figure below.

Setting value	Type Category	Data Type	Element (1 dimension)	Element (2 dimensions)
AXIS_REF_CCLinkIETSN_MCS_F(1..2)	Structured Data Type	AXIS_REF_CCLinkIETSN_MCS_F	3	0
AXES_GROUP_REF_CCLinkIETSN_MCS_F(1..1)	Structured Data Type	AXES_GROUP_REF_CCLinkIETSN_MCS_F	2	0

"Element" can be set when the check box of "ARRAY" is selected.

[AXIS_REF_CCLinkIETSN_MCS_F(1..2)]　　　　　　　　[AXES_GROUP_REF_CCLinkIETSN_MCS_F(1..1)]
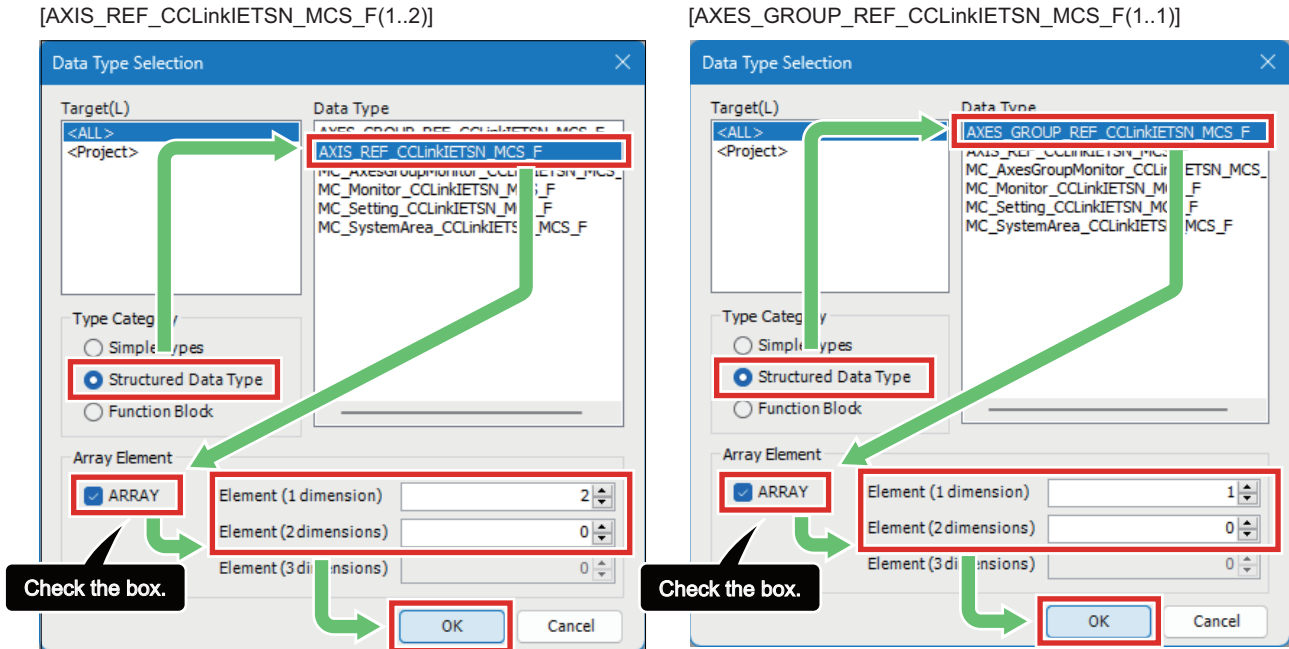
For the data type having a suffix of (0..2) and (0..1), correct the suffix to (1..2) and (1..1).[1]

[1]　When the suffix is corrected, a value for "Element (1 dimension)" in the "Data Type Selection" window is changed to 2.

3.　Input comments for the label in the comment field (English).

Label Name	Data Type	Class	English
Axis_CCLinkIETSN_MCS	AXIS_REF_CCLinkIETSN_MCS_F(1..2)	VAR_GLOBAL	Axis information
AxesGroup_CCLinkIETSN_MCS	AXES_GROUP_REF_CCLinkIETSN_MCS_F(1..1)	VAR_GLOBAL	Axes group information

3.7 Writing Data to the Programmable Controller

Write the parameter settings and programs to the programmable controller. Before the write execution, the operation to determine the parameters and programs is required.

Execute the write to the programmable controller while the CPU module is in STOP state.

1. Select [Convert] ⇨ [Rebuild All].
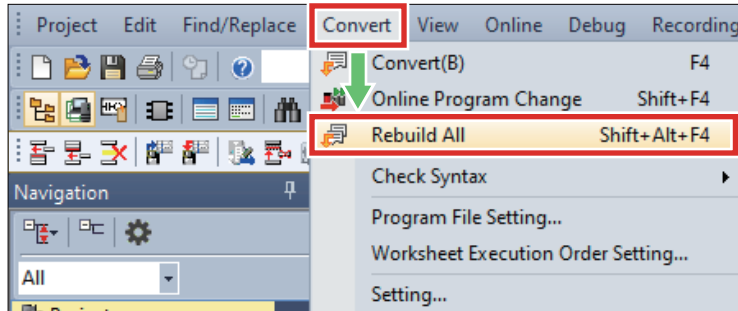
2. Click [OK].
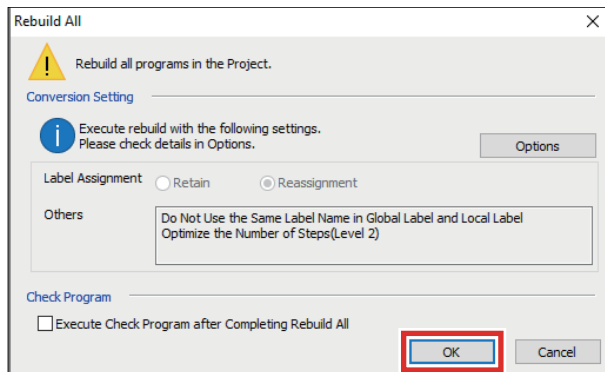
3. Select [Online] ⇨ [Write to PLC].
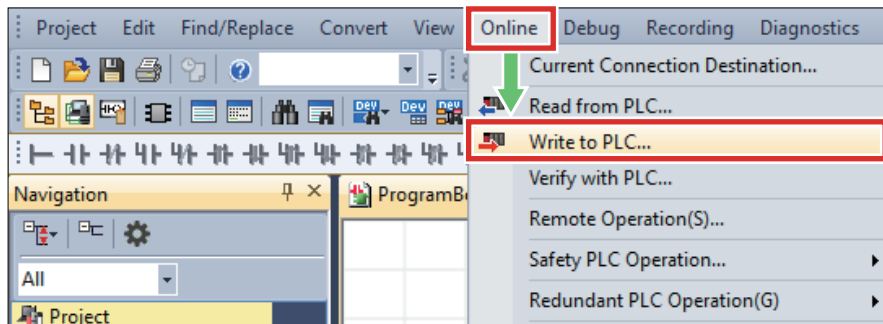
4. Click [Parameter + Program], and click [Execute].
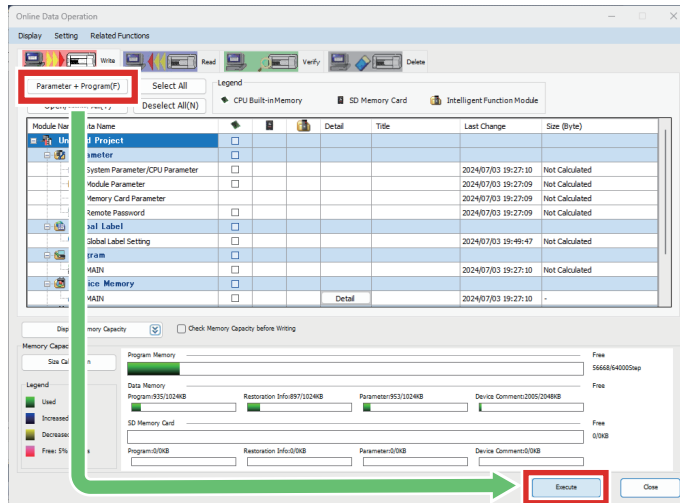
5. When the following window appears, click [Yes to all].
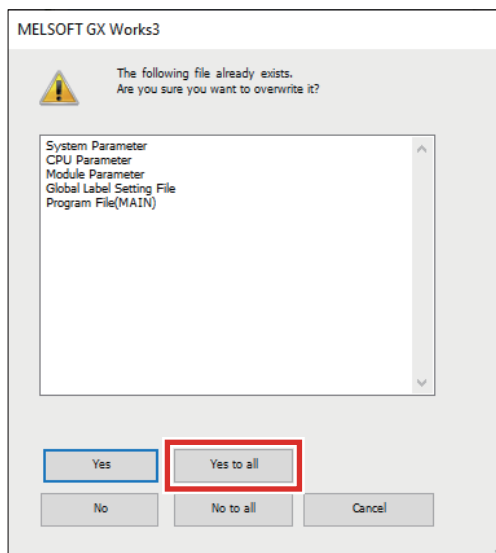
6. After the writing is complete, reset (or power off and on) the programmable controller.

4 COMMUNICATIONS CHECK OVER CC-Link IE TSN

Check communications over CC-Link IE TSN while the servo amplifiers are connected to the programmable controller.
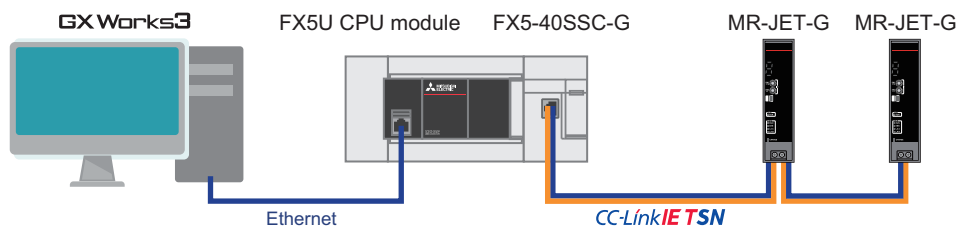
1. In GX Works3, select [Diagnostics] ⇨ [CC-Link IE TSN/CC-Link IE Field Diagnostics].
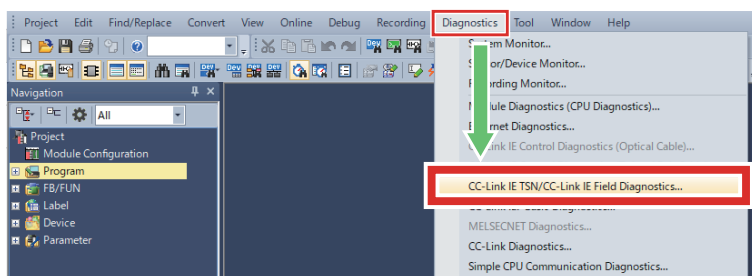
2. Check that the servo amplifier communicates with the programmable controller properly.
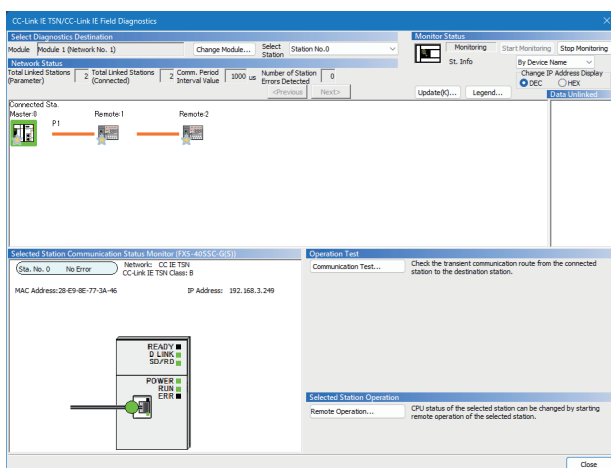
■ When communications have errors

Check the IP address, parameter settings, or error status of the servo amplifier.

For parameter settings, refer to the following.

☞ Page 23 Parameter Settings

For how to check the error status, refer to the following.

☞ Page 49 TROUBLESHOOTING

MEMO

5 CREATING PROGRAMS

5.1 Operation

MR-JET-G (Station number 1/2)

This program is to specify a target position and command speed, and to execute the linear interpolation. The MR-JET-G on the station number 1/2 performs the positioning according to the instructions.

1) Execute the OPR.

Programmable controller STOP
↓
RUN

X0 ON
Servo ON

X11 ON
OPR execution

2) Execute the JOG operation.

JOG operation — Executed

Not executed

Axis 1
X1 ON: Forward rotation
X2 ON: Reverse rotation

Axis 2
X3 ON: Forward rotation
X4 ON: Reverse rotation

3) After configuring settings such as the travel distance, execute the linear interpolation.

X5 ON
Axis addition

X6 ON
Axes group valid

X7 ON
Linear interpolation execution

X10 ON
Axes group invalid

Completed

5.2 Adding the FB Library

This section describes how to add the function blocks (FBs) in the FB library to the project.

1. Select [MotionControl_CCLinkIETSN_MCS_F] ⇨ [FB] in the FB library, and right-click the item shown in the figure below. Then, select [Add to Project] ⇨ [Create FB File]. When repeating it to add two or more FBs, select [Add to Project] ⇨ [FBFILE].

[FBs to be added]

Folder name	Data type
Management	MC_AddAxisToGroup_CCLinkIETSN_MCS_F
	MC_GroupDisable_CCLinkIETSN_MCS_F
	MC_GroupEnable_CCLinkIETSN_MCS_F
	MCv_AllPower_CCLinkIETSN_MCS_F
	MCv_GroupState_CCLinkIETSN_MCS_F
	MCv_State_CCLinkIETSN_MCS_F
Operation-Individual	MCv_Home_CCLinkIETSN_MCS_F
	MCv_Jog_CCLinkIETSN_MCS_F
	MCv_MoveLinearInterpolateRelative_CCLinkIETSN_MCS_F
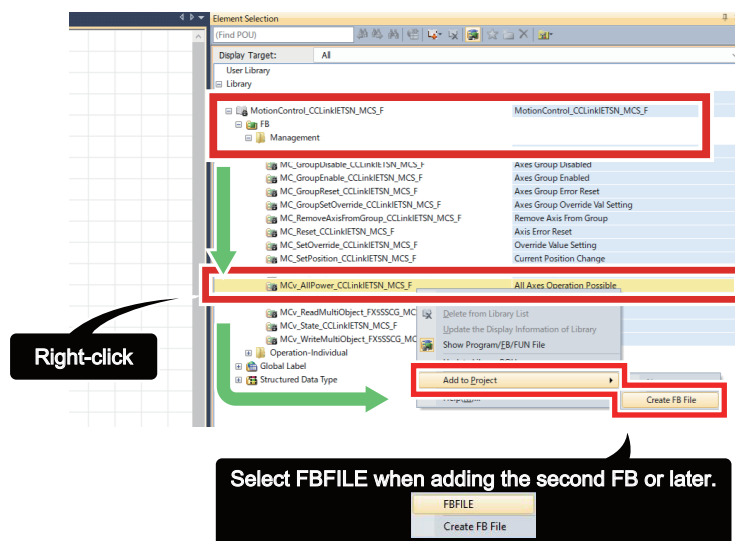
2. The FBs will be added to [FBFILE] of [FB/FUN].
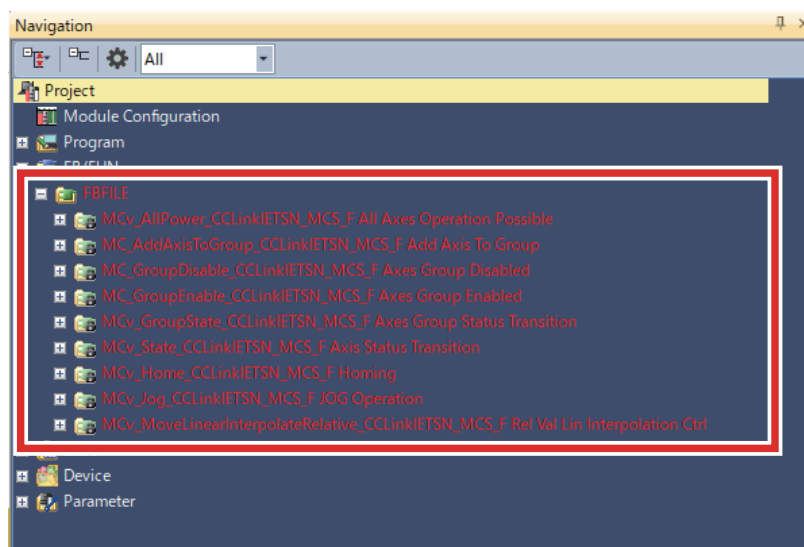
5.3 Local Labels

Set local labels to use for the programs.

How to set local labels

1. In the "Navigation" window, select [Program] ⇨ [Scan] ⇨ [MAIN] ⇨ [ProgPou] ⇨ [Local Label]. Double-click [Local Label].
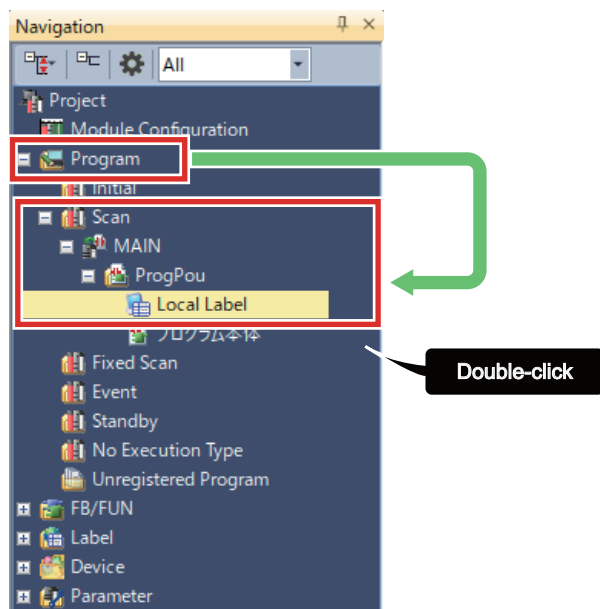
2. Set the local labels as shown below. For how to input the label name, class, and comment (English), refer to ☞ Page 27 Addition of global labels.

Label Name	Data Type	Class	English
JogSpeed	Double Word [Signed]	VAR	JOG velocity
TargetSpeed	Double Word [Signed]	VAR	Target velocity
AccelerationTime	Double Word [Signed]	VAR	Acceleration time
DecelerationTime	Double Word [Signed]	VAR	Deceleration time
Distance	Double Word [Signed] (0..3)	VAR	Travel distance
StateStatus	Bit (1..2)	VAR	Axis Status Transition FB_Transition possible
StateBusy	Bit (1..2)	VAR	Axis Status Transition FB_Executing
StateErr	Bit (1..2)	VAR	Axis Status Transition FB_Error
StateErrID	Word [Unsigned]/Bit String [16-bit] (1..2)	VAR	Axis Status Transition FB_Error code
AllPowerStatus	Bit	VAR	All Axes Operation Possible FB_Operation possible
AllPowerBusy	Bit	VAR	All Axes Operation Possible FB_Executing
AllPowerErr	Bit	VAR	All Axes Operation Possible FB_Error
AllPowerErrID	Word [Unsigned]/Bit String [16-bit]	VAR	All Axes Operation Possible FB_Error code
HomeDone	Bit (1..2)	VAR	Homing FB_Completed
HomeBusy	Bit (1..2)	VAR	Homing FB_Executing
homeCmdAborted	Bit (1..2)	VAR	Homing FB_Aborted
HomeErr	Bit (1..2)	VAR	Homing FB_Error
HomeErrID	Word [Unsigned]/Bit String [16-bit] (1..2)	VAR	Homing FB_Error code
JogDone	Bit (1..2)	VAR	JOG Operation FB_Completed
JogBusy	Bit (1..2)	VAR	JOG Operation FB_Executing
JogCmdAborted	Bit (1..2)	VAR	JOG Operation FB_Aborted
JogErr	Bit (1..2)	VAR	JOG Operation FB_Error
JogErrID	Word [Unsigned]/Bit String [16-bit] (1..2)	VAR	JOG Operation FB_Error code
AddAxisToGroupDone	Bit (1..2)	VAR	Add Axis To Group FB_Completed
AddAxisToGroupErr	Bit (1..2)	VAR	Add Axis To Group FB_Error

Label Name	Data Type	Class	English
AddAxisToGroupErrID	Word [Unsigned]/Bit String [16-bit] (1..2)	VAR	Add Axis To Group FB_Error code
GroupEnableDone	Bit	VAR	Axes Group Enabled FB_Completed
GroupEnableErr	Bit	VAR	Axes Group Enabled FB_Error
GroupEnableErrID	Word [Unsigned]/Bit String [16-bit]	VAR	Axes Group Enabled FB_Error code
MoveLinearInterpolateRelativeDone	Bit	VAR	Relative Value Linear Interpolation Control FB_Completed
MoveLinearInterpolateRelativeBusy	Bit	VAR	Relative Value Linear Interpolation Control FB_Executing
MoveLinearInterpolateRelativeCmdAborted	Bit	VAR	Relative Value Linear Interpolation Control FB_Aborted
MoveLinearInterpolateRelativeErr	Bit	VAR	Relative Value Linear Interpolation Control FB_Error
MoveLinearInterpolateRelativeErrID	Word [Unsigned]/Bit String [16-bit]	VAR	Relative Value Linear Interpolation Control FB_Error code
GroupDisableDone	Bit	VAR	Axes Group Disabled FB_Completed
GroupDisableBusy	Bit	VAR	Axes Group Disabled FB_Executing
GroupDisableErr	Bit	VAR	Axes Group Disabled FB_Error
GroupDisableErrID	Word [Unsigned]/Bit String [16-bit]	VAR	Axes Group Disabled FB_Error code
GroupStateStatus	Bit	VAR	Axes Group Status Transition FB_Transition possible
GroupStateBusy	Bit	VAR	Axes Group Status Transition FB_Executing
GroupStateErr	Bit	VAR	Axes Group Status Transition FB_Error
GroupStateErrID	Word [Unsigned]/Bit String [16-bit]	VAR	Axes Group Status Transition FB_Error code

5

5.4 Device Comments

Set device comments to use for the programs.

In the "Navigation" window, select [Device] ⇨ [Device Comment] ⇨ [Common Device Comment]. Double-click [Common Device Comment] and set the comments as shown below.

Input (X)

Device Name	English
X0	Motion control ready command
X1	Axis 1: Forward run JOG command
X2	Axis 1: Reverse run JOG command
X3	Axis 2: Forward run JOG command
X4	Axis 2: Reverse run JOG command
X5	Add Axis Execution command
X6	Axes Group Enabled Execution command
X7	Linear Interpolation Control Execution command
X10	Axes Group Disabled Execution command
X11	Homing Execution command

Output (Y)

Device Name	English
Y0	Motion control ready command (held in internal memory)
Y1	Ready signal
Y2	All states execution completed
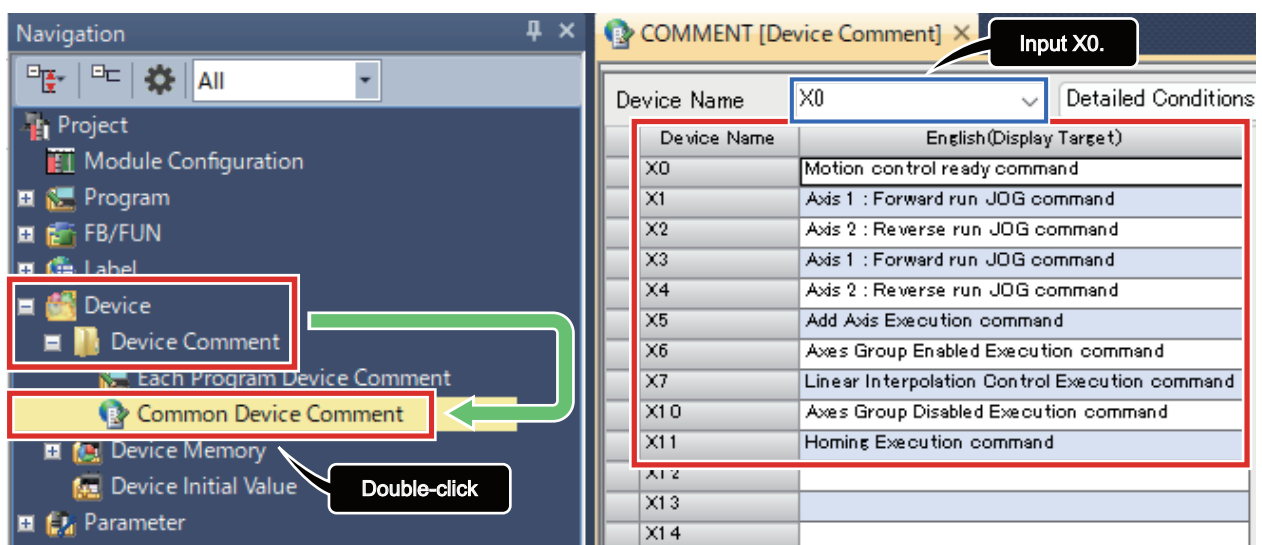
5.5 How to Use the FB Library

Select an FB registered in the library from "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. Select the [Library] tab in the "Element Selection" window. Select [Library] ⇨ [MotionControl_CCLinkIETSN_MCS_F] ⇨ [FB]. From [FB], select an FB to be used, and drop it in the program editor. When the "Undefined Label Registration" window appears, input the label name and comment and click [OK]. The following table lists the FBs to be used in this manual.

Folder Name	FB	Label Name	Comment
Management	MC_AddAxisToGroup_CCLinkIETSN_MCS_F	MC_AddAxisToGroup_CCLinkIETSN_MCS_F_1	Axis 1: Add Axis To Group FB
		MC_AddAxisToGroup_CCLinkIETSN_MCS_F_2	Axis 2: Add Axis To Group FB
	MC_GroupDisable_CCLinkIETSN_MCS_F	MC_GroupDisable_CCLinkIETSN_MCS_F_1	Axes Group Disabled FB
	MC_GroupEnable_CCLinkIETSN_MCS_F	MC_GroupEnable_CCLinkIETSN_MCS_F_1	Axes Group Enabled FB
	MCv_AllPower_CCLinkIETSN_MCS_F	MCv_AllPower_CCLinkIETSN_MCS_F_1	All Axes Operation Possible FB
	MCv_GroupState_CCLinkIETSN_MCS_F	MCv_GroupState_CCLinkIETSN_MCS_F_1	Axes Group Status Transition
	MCv_State_CCLinkIETSN_MCS_F	MCv_State_CCLinkIETSN_MCS_F_1	Axis 1: Status Transition FB
		MCv_State_CCLinkIETSN_MCS_F_2	Axis 2: Status Transition FB
Operation-Individual	MCv_Home_CCLinkIETSN_MCS_F	MCv_Home_CCLinkIETSN_MCS_F_1	Axis 1: Homing FB
		MCv_Home_CCLinkIETSN_MCS_F_2	Axis 2: Homing FB
	MCv_Jog_CCLinkIETSN_MCS_F	MCv_Jog_CCLinkIETSN_MCS_F_1	Axis 1: JOG Operation FB
		MCv_Jog_CCLinkIETSN_MCS_F_2	Axis 2: JOG Operation FB
	MCv_MoveLinearInterpolateRelative_CCLinkIETSN_MCS_F	MCv_MoveCircularInterpolateRelative_CCLinkIETSN_MCS_F_1	Relative Value Linear Interpolation Control FB

Point
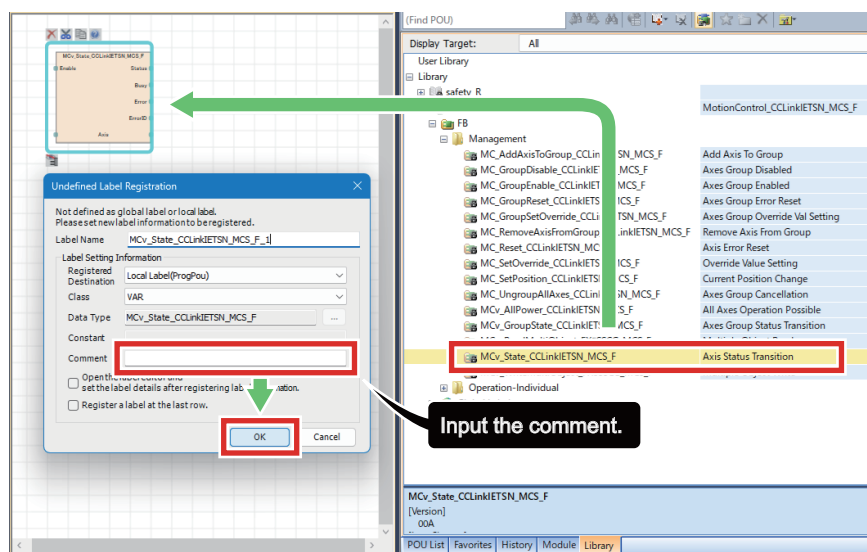
When the program editor is not displayed, in the "Navigation" window, select [Program] ⇨ [Scan] ⇨ [MAIN] ⇨ [ProgPou] ⇨ [ProgramBody], and double-click [ProgramBody].

2. The FB is pasted to the program editor.
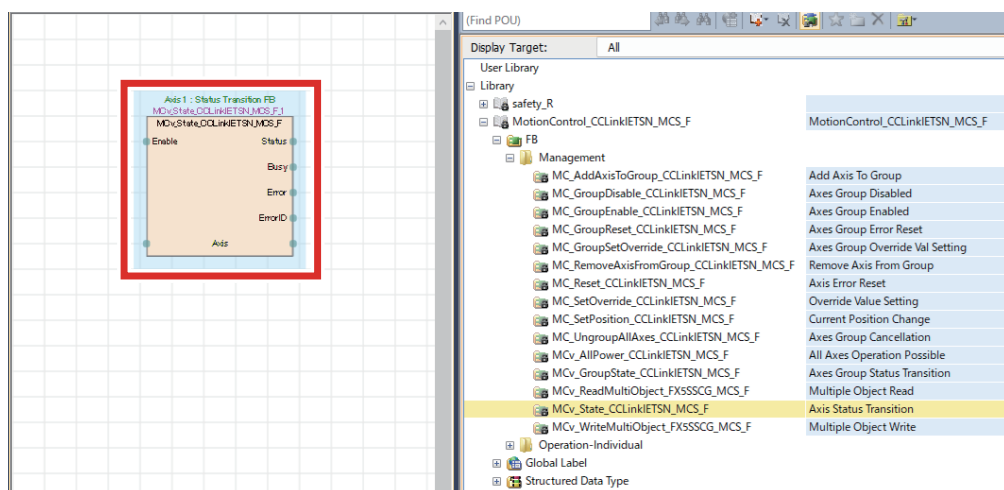
3. Arrange a busbar and contact Y0 in the program editor, and link them to Enable of the FB.
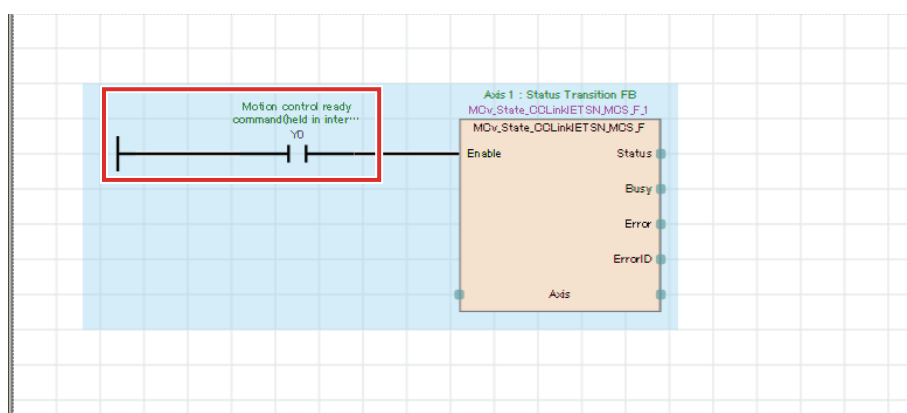
4. Link the Axis information label to the left side of the FB. Link the label of the output to the right side of the FB.
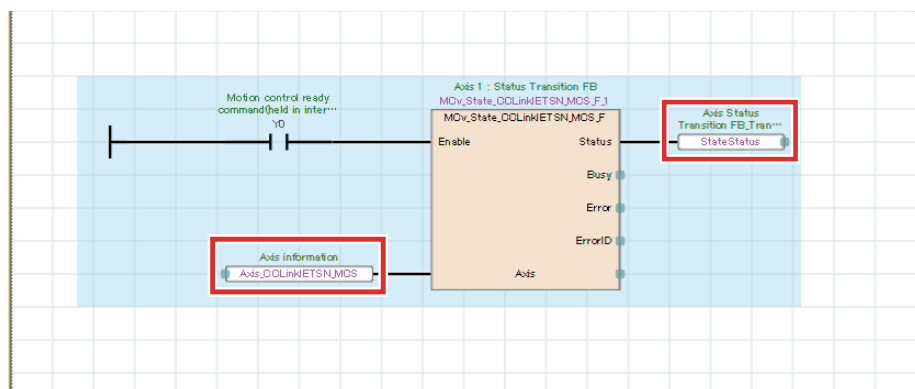
5. Repeat these steps to create the ladder.
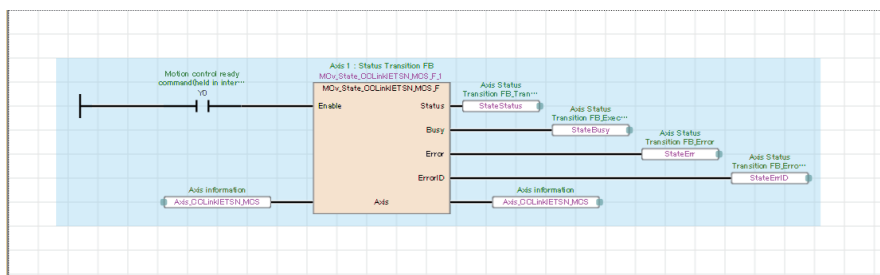
In this manual, the FB library provided by Mitsubishi Electric is used.

For how to set the FB library, refer to the following.

☞ Page 18 Downloading the FB Library

☞ Page 19 Importing the FB Library

5.6 Program Examples

The following programs are designed to control the servo amplifiers. The programs use the FBs for servo amplifiers compatible with CC-Link IE TSN.

This section provides the sample programs for the station number 1 and station number 2.

Initial setting

Servo ON
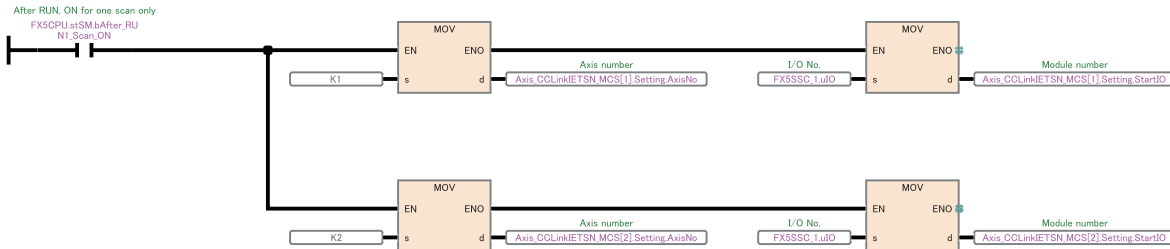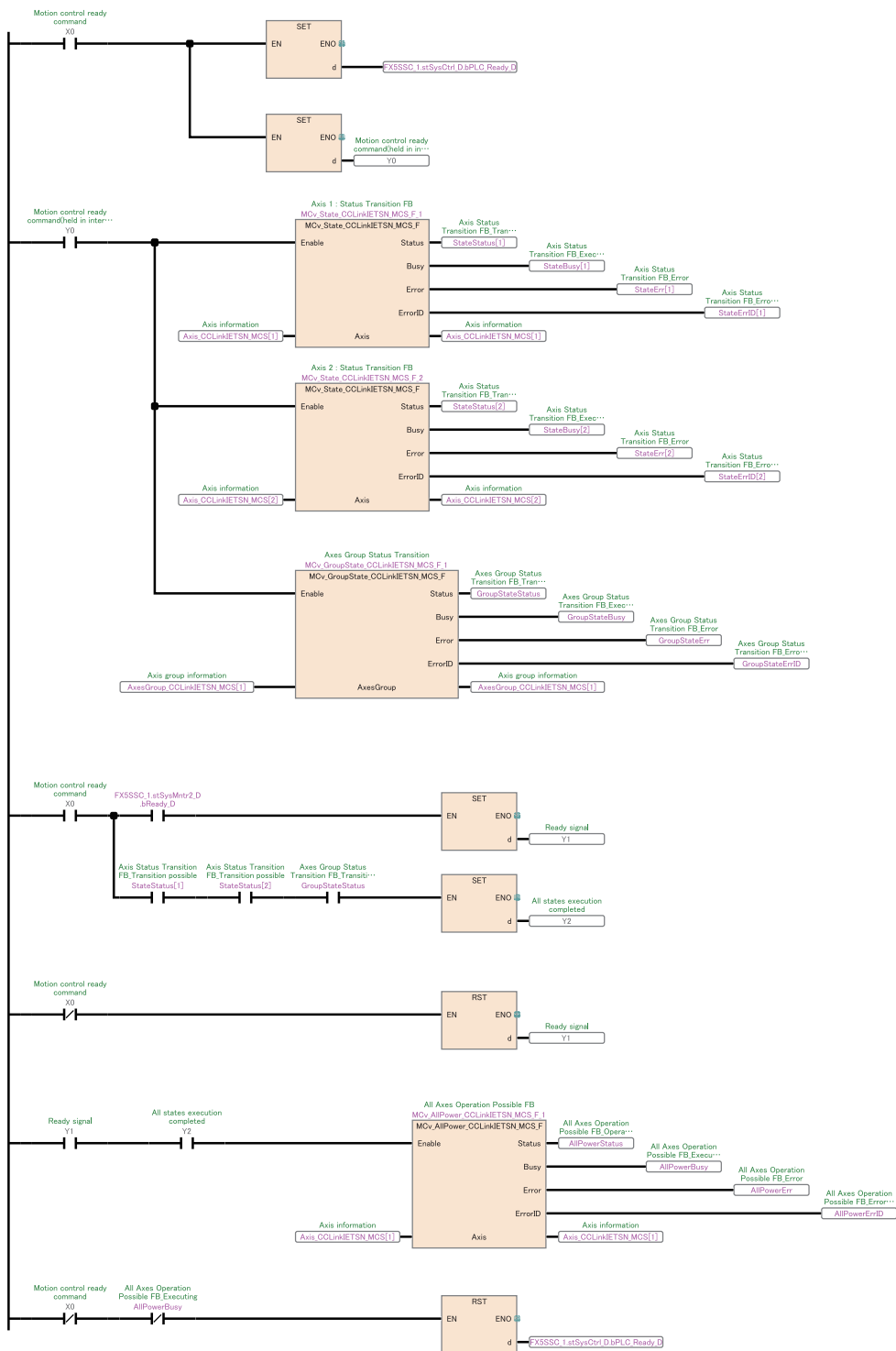
Homing
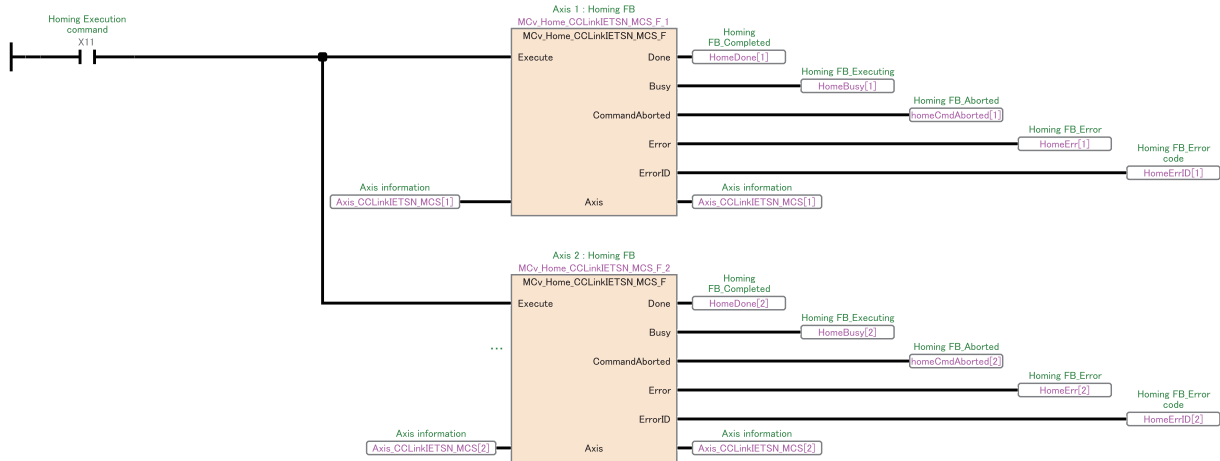
JOG operation
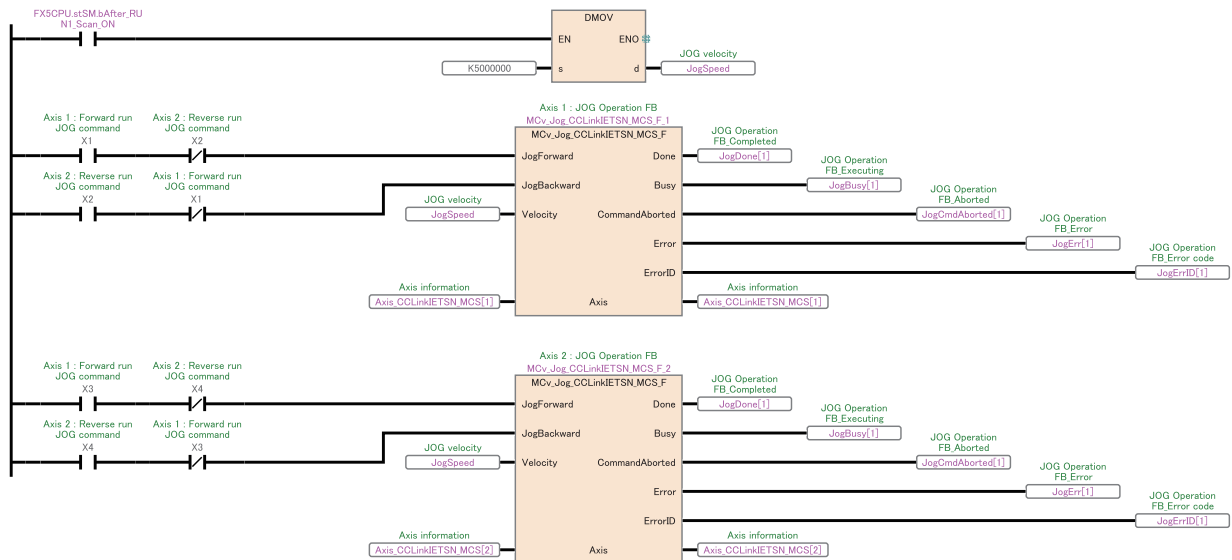
Adding axis 1 and axis 2 to axes group

5 CREATING PROGRAMS
5.6 Program Examples
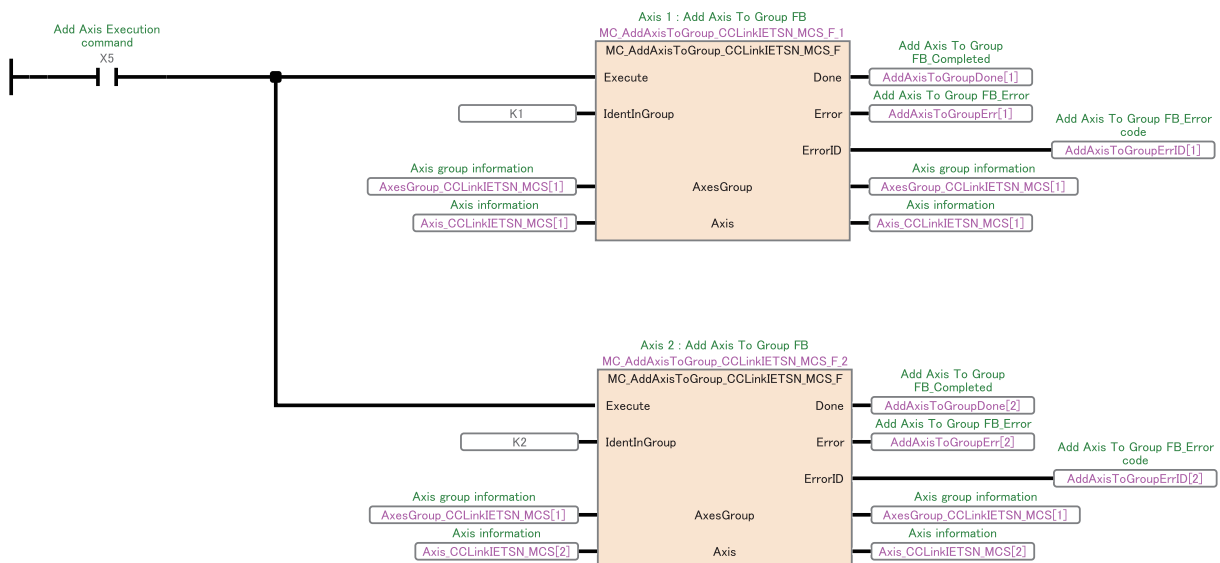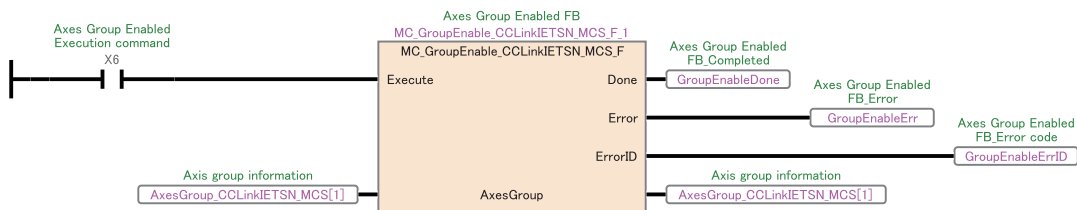
Axes group valid

Settings for movement amount, target speed, acceleration time, and deceleration time
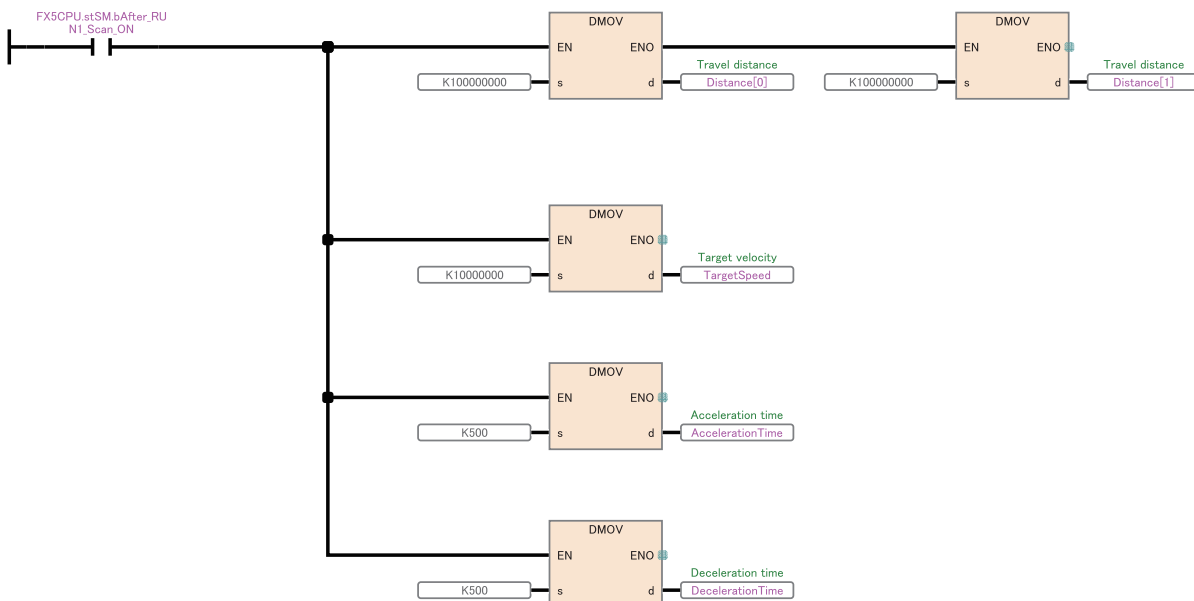
Linear interpolation execution

Axes group invalid

Point
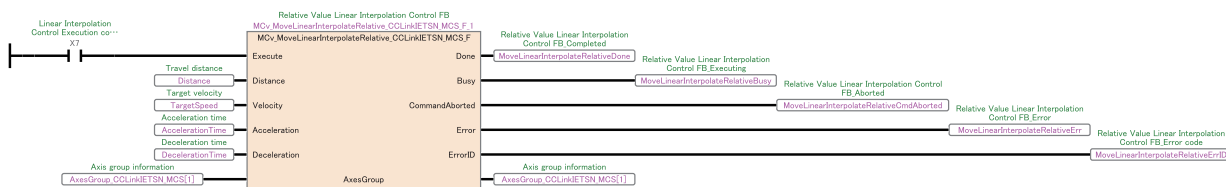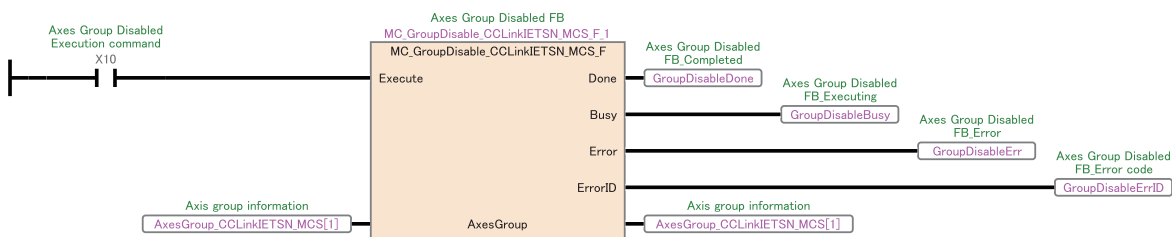
To display the comments, go to the menu bar and select [Display] ⇨ [Comment] ⇨ [Device/Label Comment].

5.7 Writing Data to the Programmable Controller

Write the programs and the settings to the programmable controller. For how to do it, refer to the following.

☞ Page 29 Writing Data to the Programmable Controller

5.8 Operation Check

After writing the programs and the parameters to the programmable controller, check whether the programmable controller and servo amplifiers communicate data properly.

Check it by following the procedures below.

> **Point**
>
> An input signal X, such as Servo ON, can be forcibly turned on in the program of GX Works3 by following the steps below.
>
> ❶ Press the [F3] key while the FBD/LD program is displayed in GX Works3. (The monitor execution status is entered.)
>
> ❷ Place the cursor on a device (such as X0) or a label to be turned on.
>
> ❸ Pressing the [Enter] key while the [Shift] key is being pressed turns on the device or label.
>
> (Doing the same once again turns it off.)
>
> To clear the monitor execution status, press the [F3] key while the [Alt] key is being pressed.

Servo ON

Executing the homing

Programmable controller
Station number 1/2 Turns on X11 (OPR execution).

Programmable controller operation
Station number 1 HomeDone[1] (OPR completed) turns on. Station number 2 HomeDone[2] (OPR completed) turns on.

Servo amplifier operation
"Current position" becomes 0.

<Check with MR Configurator2.>[*1]

No.	Item	Unit	Axis1
26	Number of tough drive operations	times	0
27	Unit power consumption	W	12
29	Current position	pulse	0
31	Remaining command distance	pulse	0
32	Command number		0
33	A1M1 for manufacturer setting		----
34	A1M2 for manufacturer setting		----

*1   For how to check the servo amplifier state with MR Configurator2, refer to the following.
☞ Page 48 How to check the servo amplifier state

Executing the JOG operation

Programmable controller
Station number 1 X1 (Axis 1: Forward run JOG command) turns on. X2 (Axis 1: Reverse run JOG command) turns on. Station number 2 X3 (Axis 2: Forward run JOG command) turns on. X4 (Axis 2: Reverse run JOG command) turns on.

Programmable controller operation
Station number 1/2 Busy of JOG operation FB (MCv_Jog_CCLinkIETSN_ MCS_F) turns on.

Servo amplifier operation
Forward rotation The value in "Current position" increases. Reverse rotation The value in "Current position" decreases.

<Check with MR Configurator2.>[*1]

No.	Item	Unit	Axis1
26	Number of tough drive operations	times	0
27	Unit power consumption	W	12
29	Current position	pulse	36396974
31	Remaining command distance	pulse	0
32	Command number		0
33	A1M1 for manufacturer setting		----
34	A1M2 for manufacturer setting		----

*1   For how to check the servo amplifier state with MR Configurator2, refer to the following.
☞ Page 48 How to check the servo amplifier state

Executing the linear interpolation

Programmable controller
Station number 1/2 X7 (Linear Interpolation Control Execution command) turns on.

Programmable controller operation
Station number 1/2 MoveLinearInterpolate RelativeDone (Relative Value Linear Interpolation Control FB_ Completed) turns on.

Servo amplifier operation
Axis 1 and 2 operate with the linear interpolation.

<Check with MR Configurator2.>[1]

No.	Item	Unit	Axis1
26	Number of tough drive operations	times	0
27	Unit power consumption	W	12
29	Current position	pulse	24732162
31	Remaining command distance	pulse	0
32	Command number		0
33	A1M1 for manufacturer setting		----
34	A1M2 for manufacturer setting		----

Display All

Font 10pt Line height 15 Clear Restart Pause Setting

*1   For how to check the servo amplifier state with MR Configurator2, refer to the following.
     ☞ Page 48 How to check the servo amplifier state

5 CREATING PROGRAMS
5.8 Operation Check

How to check the servo amplifier state

1. Place MR Configurator2 online, select [Monitor] ⇨ [Display All], and click [Display All].

For how to go online, refer to the following.

☞ Page 17 Write to Servo Amplifier
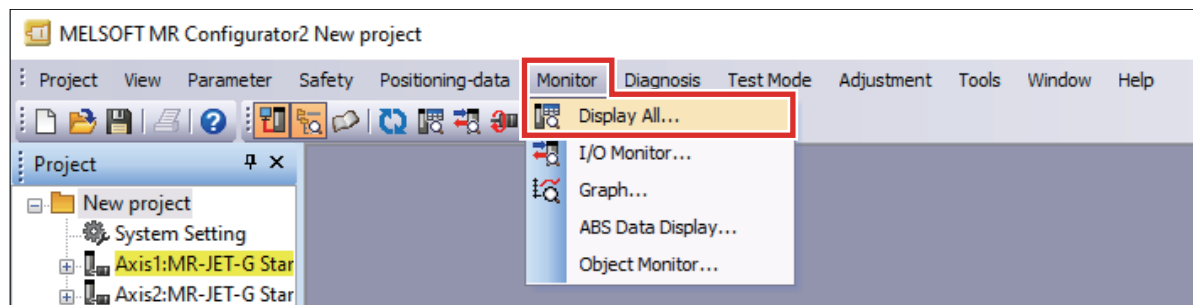
2. The servo amplifier state is quantified and displayed by each item.

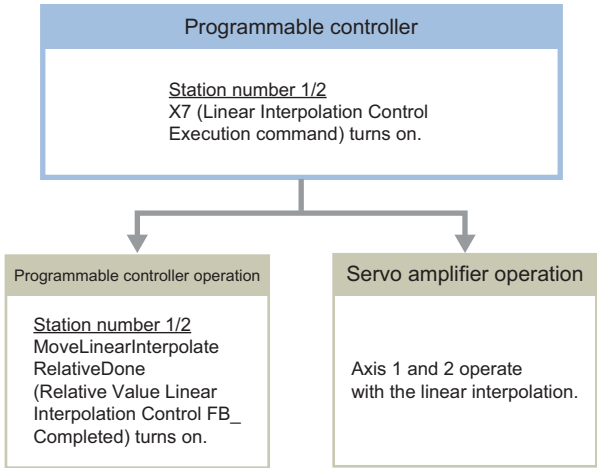| No.	Item	Unit	Axis1
1	Cumulative feedback pulses	pulse	676881455
2	Servo motor speed	r/min mm/s	101
3	Droop pulse	pulse	471363
4	Cumulative cmd. pulses	pulse	678220501
5	Command pulse frequency	kpulse/s	7071
6	Regenerative load ratio	%	0
7	Effective load ratio	%	1
8	Peak load ratio	%	2
9	Torque/Instantaneous torque	%	1
10	Within one-revolution position	pulse	2720559
11	ABS counter	rev	136
12	Load inertia moment ratio	times	8.43
13	Bus voltage	V	280
14	Load side encoder cumulative F/B pulses	pulse	0
15	Load side droop pulses	pulse	0
16	Load side encoder information 1		2720559
17	Load side encoder information 2		136
18	Servo motor thermistor temperature	°C	9999
19	Cumulative feedback pulses (Motor unit)	pulse	676881455
20	Electrical angle	pulse	2734728
21	Servo motor/load side position difference	pulse	0
22	Servo motor/load side speed difference	r/min	0
23	Internal temperature of encoder	°C	70
24	Settling time	ms	282
25	Oscillation detection frequency	Hz	0
26	Number of tough drive operations	times	0
27	Unit power consumption	W	12
28	Unit total power consumption	Wh	75
29	Current position	pulse	30336018
30	Command position	pulse	0
31	Remaining command distance	pulse	0
32	Command number		0

6 TROUBLESHOOTING

6.1 Checking Procedure

This section describes how to check the state of the programmable controller and the servo amplifiers.

Check with the LED status

Check the communication status with the LEDs of the programmable controller and the servo amplifiers.

For the programmable controller, ☞ Page 50 Check with the LED status

For the servo amplifiers, ☞ Page 51 Check with the display LED

Check depending on the error

Check the following depending on the error that has occurred in the programmable controller or the servo amplifiers.

For the programmable controller, ☞ Page 50 Check of error details

For the servo amplifiers, ☞ Page 51 Check with MR Configurator2

■Wiring

☞ Page 10 System Configuration

- Are the Ethernet cables fully inserted?

■Communication settings

For the programmable controller, ☞ Page 23 Parameter Settings

For the servo amplifiers, ☞ Page 14 USB Connection with Personal Computer

- Do the parameter settings on GX Works3 match with the parameter settings on the servo amplifiers?
- Are the IP addresses and the subnet masks of the programmable controller and the servo amplifiers set properly?
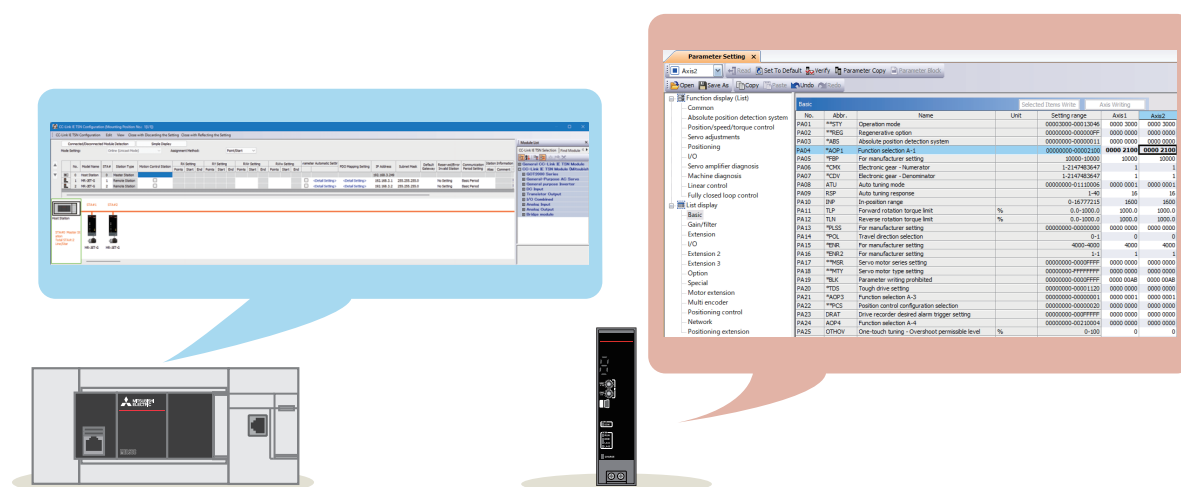
After changing a parameter value, reset (or power off and on) the programmable controller or servo amplifier.

■Programs

☞ Page 41 Program Examples

- Are the programs created as shown in the program examples?
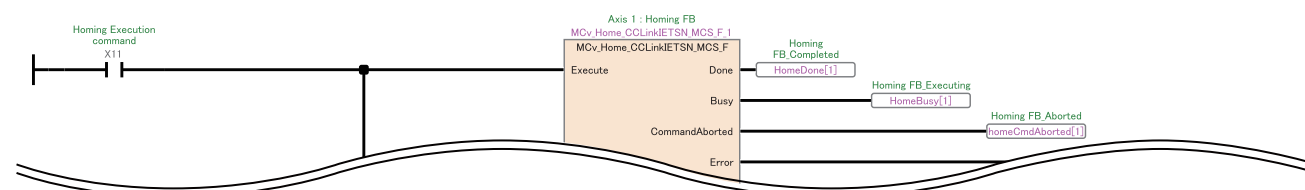
6.2 Checking the Programmable Controller

Check with the LED status

Check the programmable controller status with the LED.
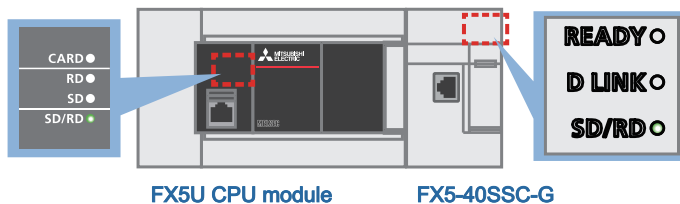
The SD/RD LED is on when the communications are properly performed. It is off when the communications have an error.

Check of error details

From the menu bar of GX Works3, select [Diagnostics] ⇨ [CC-Link IE TSN/CC-Link IE Field Diagnostics]. The network status are displayed, and error details of the programmable controller can be checked.
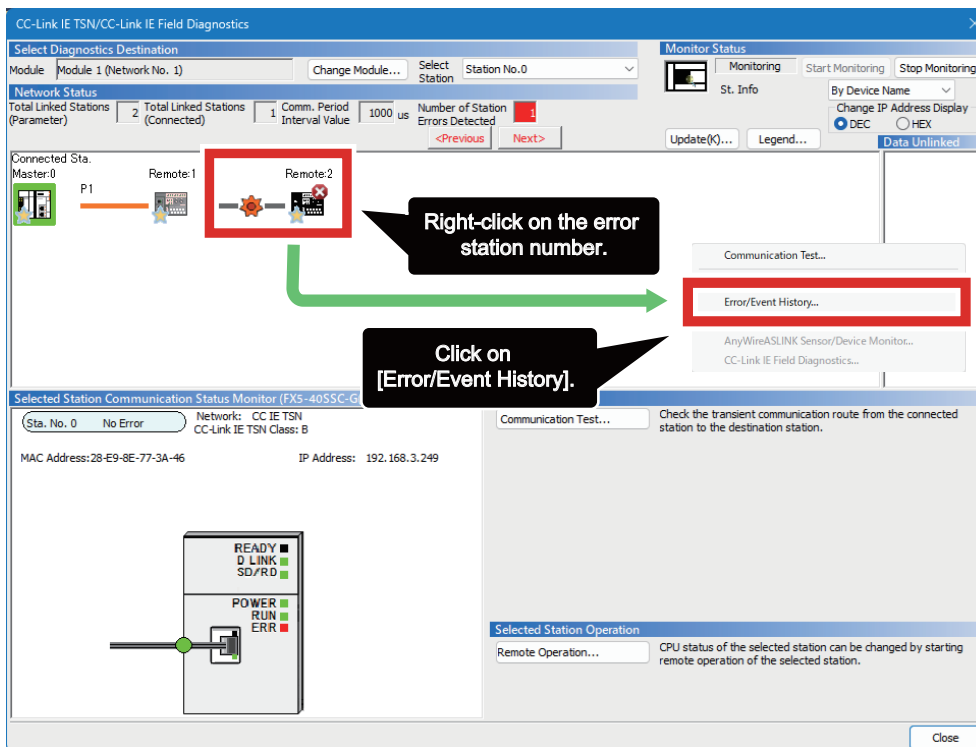
For details on the troubleshooting and error codes, refer to the following.

📖MELSEC iQ-F FX5 Motion Module/Simple Motion Module User's Manual (Application) [14 TROUBLESHOOTING]
📖MELSEC iQ-F FX5 Motion Module User's Manual (CC-Link IE TSN) [8 TROUBLESHOOTING]

6.3 Checking the Servo Amplifiers

Check with the display LED

The operation status can be checked with the servo status display LED of the servo amplifier.

Servo status display LED (SRV)

Network status display LED (N/W)
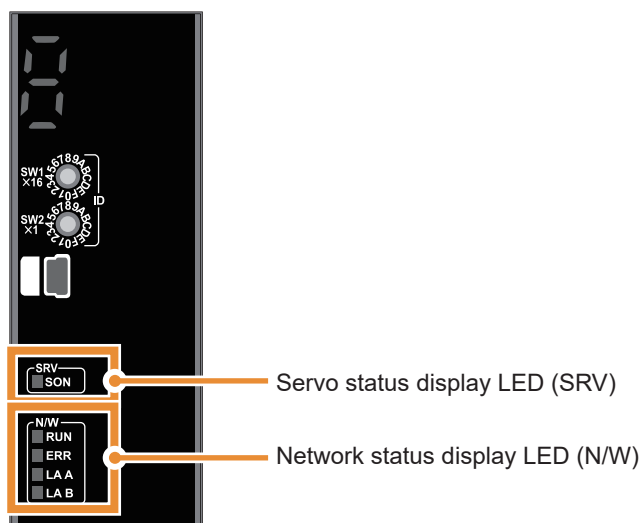
For details on the LEDs of the servo amplifier, refer to the following.
☞Page 12 Switch Setting and Display

Check with MR Configurator2

From the menu bar of MR Configurator2, select [Diagnostics] ⇨ [Alarm Display]. If an error has occurred on the servo system, the details of the alarm or the warning can be checked with the following window.
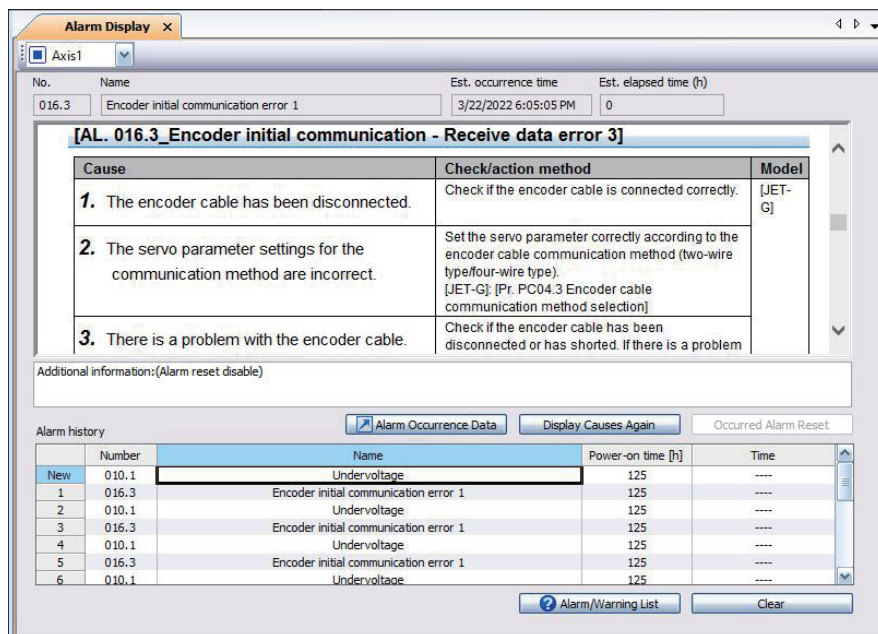
For details on alarm numbers of the MR-JET-G, refer to the following.
📖MR-JET User's Manual (Troubleshooting)

APPENDICES

Appendix 1 Application Examples of the FB Library

The following table lists the FBs included in the FB library for servo amplifiers compatible with CC-Link IE TSN. Create programs by combining the FBs according to applications.

FBs for servo amplifiers compatible with CC-Link IE TSN

Folder Name	Data Type	Description
Management	MC_AddAxisToGroup_CCLinkIETSN_MCS_F	Adds the specified axis to the axes group as its configuration axis.
	MC_GroupDisable_CCLinkIETSN_MCS_F	Transitions the state of the specified axes group and disables the axes group.
	MC_GroupEnable_CCLinkIETSN_MCS_F	Transitions the state of the specified axes group and enables the axes group.
	MC_GroupReset_CCLinkIETSN_MCS_F	Clears the errors and warnings in the configuration axis of the axes group.
	MC_GroupSetOverride_CCLinkIETSN_MCS_F	Executes the target speed change for the specified axes group.
	MC_RemoveAxisFromGroup_CCLinkIETSN_MCS_F	Deletes the specified axis from the configuration axes of the axes group.
	MC_Reset_CCLinkIETSN_MCS_F	Clears an error of the specified axis.
	MC_SetOverride_CCLinkIETSN_MCS_F	Executes the target speed change for the specified axis.
	MC_SetPosition_CCLinkIETSN_MCS_F	Changes the current position (command position, feedback position) of the specified axis.
	MC_UngroupAllAxes_CCLinkIETSN_MCS_F	Deletes all the configuration axes of the axes group.
	MCv_AllPower_CCLinkIETSN_MCS_F	Switches all the axes to the ready-to-operate state.
	MCv_GroupState_CCLinkIETSN_MCS_F	Transitions AxesGroupStatus (axes group status) of the specified axes group.
	MCv_ReadMultiObject_CCLinkIETSN_MCS_F	Reads multiple objects from the servo amplifier.
	MCv_State_CCLinkIETSN_MCS_F	Transitions AxisStatus (axes status) of the specified axis.
	MCv_WriteMultiObject_CCLinkIETSN_MCS_F	Writes data to multiple objects of the servo amplifier.

A

Folder Name	Data Type	Description
Operation-Individual	MC_GroupStop_CCLinkIETSN_MCS_F	Stops the configuration axes of the specified axes group forcibly.
	MC_MoveAbsolute_CCLinkIETSN_MCS_F	Sets a target position (absolute position) for the specified axis, and executes positioning.
	MC_MoveAdditive_CCLinkIETSN_MCS_F	Adds a specified relative position to the positioning command of the specified axis immediately before the execution, and executes the positioning.
	MC_MoveRelative_CCLinkIETSN_MCS_F	Moves the object by the specified movement amount from the current position.
	MC_MoveVelocity_CCLinkIETSN_MCS_F	Controls the speed of the specified axis with a set value.
	MC_Stop_CCLinkIETSN_MCS_F	Stops the specified axis forcibly.
	MC_TorqueControl_CCLinkIETSN_MCS_F	Performs a torque control for the specified axis with a set value.
	MCv_Home_CCLinkIETSN_MCS_F	Executes the OPR for the specified axis.
	MCv_Inch_CCLinkIETSN_MCS_F	Performs inching operation for the specified axis.
	MCv_Jog_CCLinkIETSN_MCS_F	Performs JOG operation for the specified axis.
	MCv_MoveCircularInterpolateAbsolute_CCLinkIETSN_MCS_F	Sets the end point and auxiliary point of the absolute position with the specified axes group, and executes positioning by circular interpolation with two axes.
	MCv_MoveCircularInterpolateRelative_CCLinkIETSN_MCS_F	Sets the relative positions from the current position at the start to the end point and to the auxiliary point with the specified axes group, and executes positioning by circular interpolation with two axes.
	MCv_MoveLinearInterpolateAbsolute_CCLinkIETSN_MCS_F	Specifies the target position determined by the absolute position of the specified axes group, and executes positioning by linear interpolation control.
	MCv_MoveLinearInterpolateRelative_CCLinkIETSN_MCS_F	Specifies the movement amount determined by the relative positions of the specified axes group, and executes positioning by linear interpolation control.

For program examples, refer to the following.

MELSEC iQ-F PLCopen Motion Control FB Reference [4 OPERATION EXAMPLES]

Appendix 2 Downloading and Registering a Profile

A profile is the data that stores information on a connected device (such as a model).

A profile can be used on a personal computer after it is registered using GX Works3 and shared with other MELSOFT products. Once a profile is registered using GX Works3, the profile data is reflected to other MELSOFT products.

To register or delete a profile, log on to the personal computer as a user with the administrator privilege, and close the project in advance.

1. To obtain the profile data, please contact your local Mitsubishi Electric representative.

2. Start GX Works3, and select [Tool] ⇨ [Profile Management] ⇨ [Register].
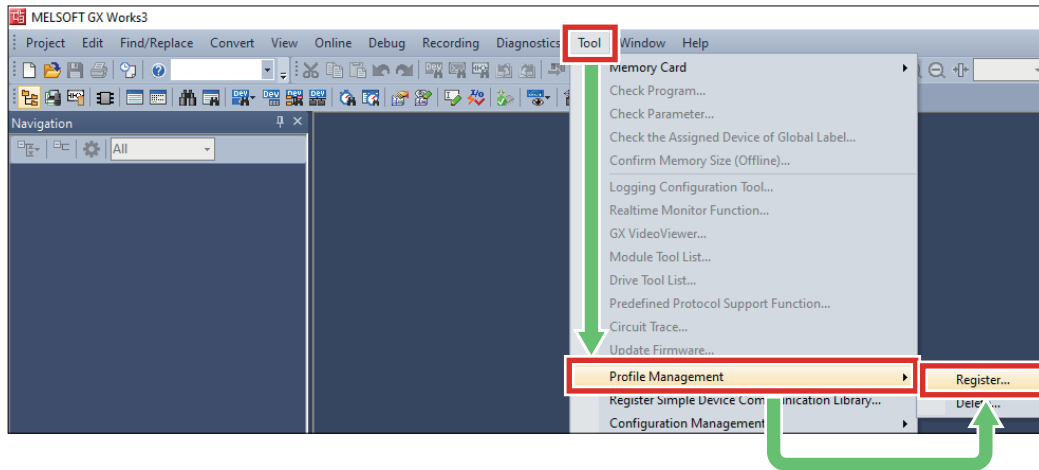
3. Select the obtained file on the "Register Profile" window, and click [Register]. A profile is a compressed file (such as *.zip, *.ipar, and *.cspp). Register the profile without decompressing.
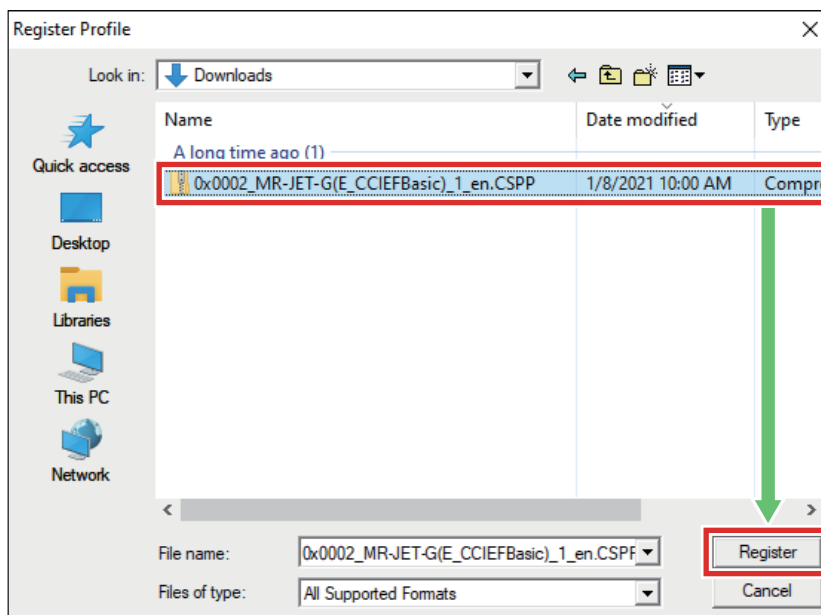
REVISIONS

Revision date	Version	Description
July 2024	A	First edition

WARRANTY

Please confirm the following product warranty details before using this product.
📖MELSEC iQ-F FX5S/FX5UJ/FX5U/FX5UC User's Manual (Hardware) [WARRANTY]
📖MR-JET-G User's Manual (Introduction) [WARRANTY]

SAFETY PRECAUTIONS

· Before using the product introduced in this manual, please read the manuals for the product carefully to handle the product correctly.
· This product has been manufactured as a general-purpose part for general industries, etc., 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.
· The 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.
· For design, wiring, and other precautions, read "SAFETY PRECAUTIONS" in the relevant manuals.

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