

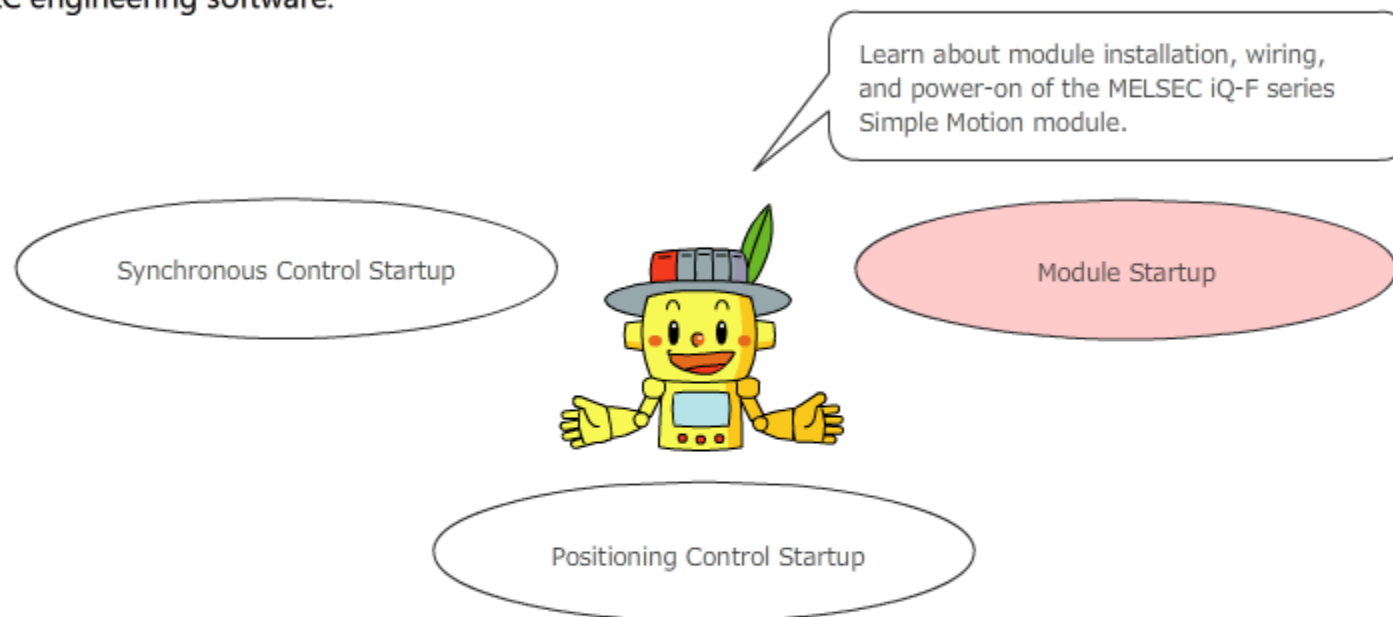
Servo System Controller

MELSEC iQ-F Series Simple Motion Module

This course is for participants who will establish a motion control system using the MELSEC iQ-F series Simple Motion module for the first time.

Introduction Purpose of the Course

This course targets those who establish a motion control system using the MELSEC iQ-F series Simple Motion module for the first time. This course describes the procedures for system design, installation, wiring, and the operations required before operating the Simple Motion module with MELSOFT GX Works3, the PLC engineering software.



The basic knowledge of MELSEC iQ-F series PLCs, AC servos, and positioning control is required to take this course.

For beginners, taking the following courses are recommended.

- "MELSEC iQ-F Series Basic" course
- "PLC Engineering Software MELSOFT GX Works3 (Ladder)" course
- "MELSERVO Basics (MR-J4)" course
- "FA Equipment for Beginners (Positioning)" course

Introduction **Course Structure**



The contents of this course are as follows.
We recommend that you start from Chapter 1.

Chapter 1 - Module Startup

Learn about module installation, wiring, and power-on of the MELSEC iQ-F series Simple Motion module.

Chapter 2 - Positioning Control Startup

Learn about how to perform the positioning control with the MELSEC iQ-F series Simple Motion module.

Chapter 3 - Synchronous Control Startup

Learn about how to perform the synchronous control with the MELSEC iQ-F series Simple Motion module.

Final Test

5 sections in total (7 questions) Passing grade: 60% or higher.

Introduction Screen Switching Operations



Go to the next page		Go to the next page.
Back to the previous page		Back to the previous page.
Move to the desired page		"Table of Contents" will be displayed, enabling you to navigate to the desired page.
Exit the learning		Exit the learning. Window such as "Contents" screen and the learning will be closed.

Introduction Cautions for Use

Safety precautions

When you learn by using actual products, please fully read "Safety Instructions" in the corresponding manuals and use them correctly.

Precautions in this course

- The displayed screens of the software version that you use may differ from those in this course.

The following shows the software used in this course and each software version.

For the latest version of each software, check the Mitsubishi Electric FA Website.

- MELSOFT GX Works3 Ver.1.011M

Reference materials

The following is the reference related to the learning. (You can learn without it.)

Click the reference name to download.

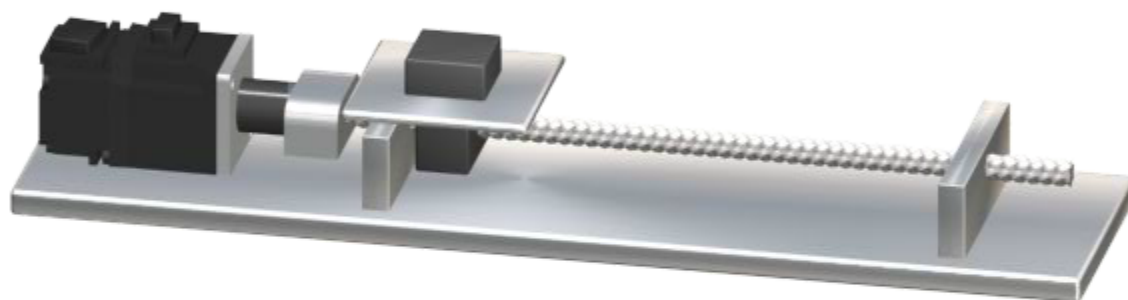
Name of reference	File format	File size
Recording paper	Compressed file	7.06 kB

Chapter 1 Module Startup



This chapter explains a 1-axis system using ball screws as the system used in this course.
Please check the following PDF file for the operation pattern diagram and the machine specifications.

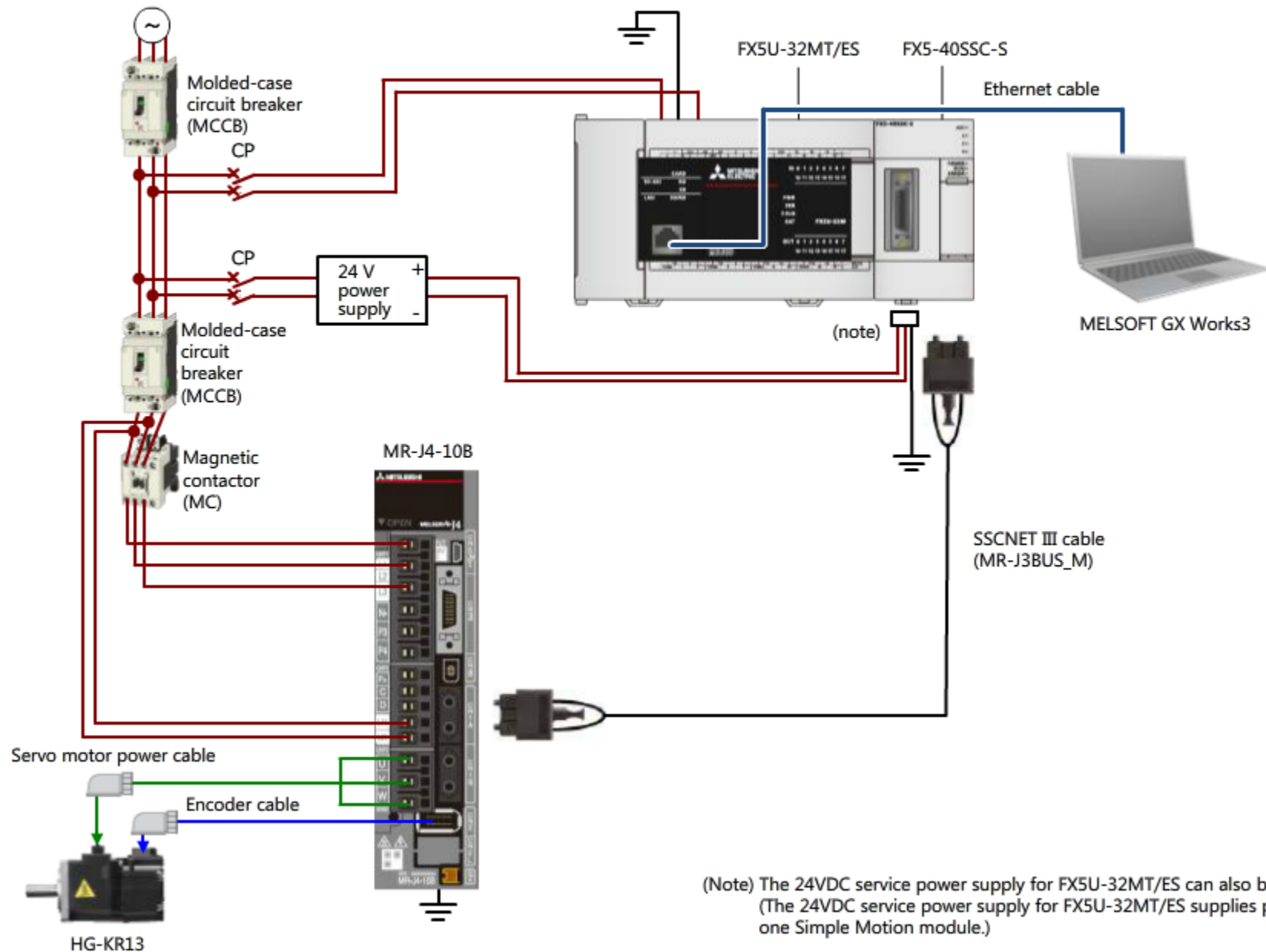
[Sample system details <PDF>](#)



1.1

System Configuration

The following shows the configuration of the sample system used in this course.



1.2**Startup Procedure**

The following shows the establishment procedure of a servo system with the MELSEC iQ-F series Simple Motion module. This course explains module installation, wiring, and cable wiring following the establishment procedure.

(1) Mounting

..... Section 1.3

- Installing a Simple Motion module

**(2) Wiring and cable connection**

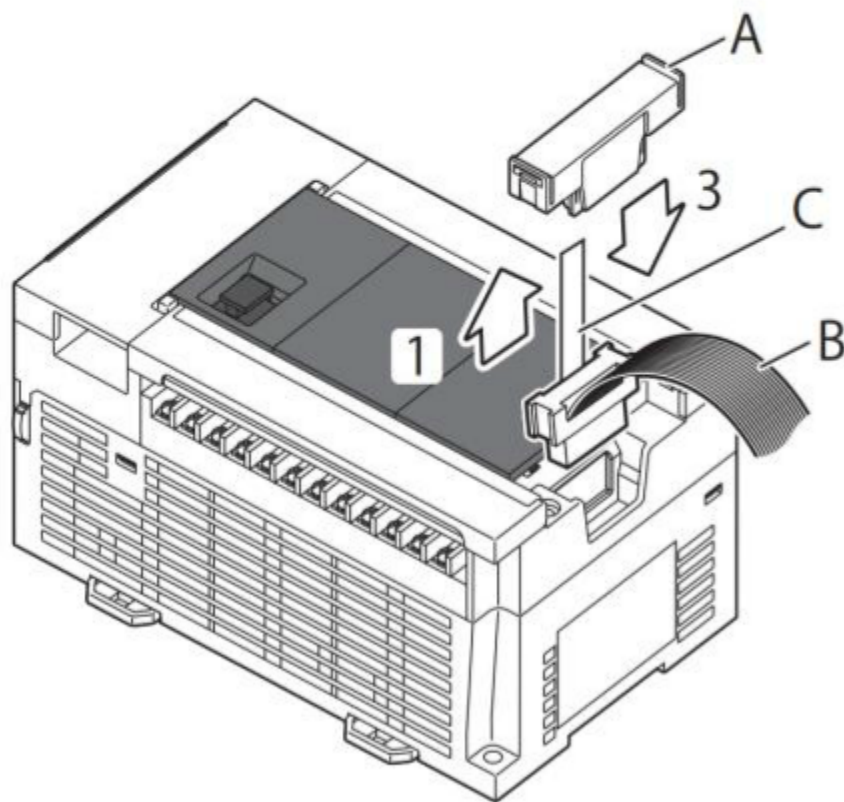
..... Section 1.4

- Wiring of the PLC and Simple Motion module power supply
- Wiring for servo amplifier power supply and servo motor power cables
- Axis Number Settings
- SSCNET III/H Connection
- Power-on of the system
- Power-on of servo amplifier

1.3 Mounting

Install a Simple Motion module.

1. Remove the extension connector cover (A in the figure below) on the right side on the surface of the FX5U PLC.
2. Connect the extension cable (B in the figure below) from the Simple Motion module to the extension connector of the PLC. Push the pull tab (C in the figure below) of the extension cable inside the extension connector cover.
3. Attach the extension connector cover.



1.4

Wiring and Cable Connection

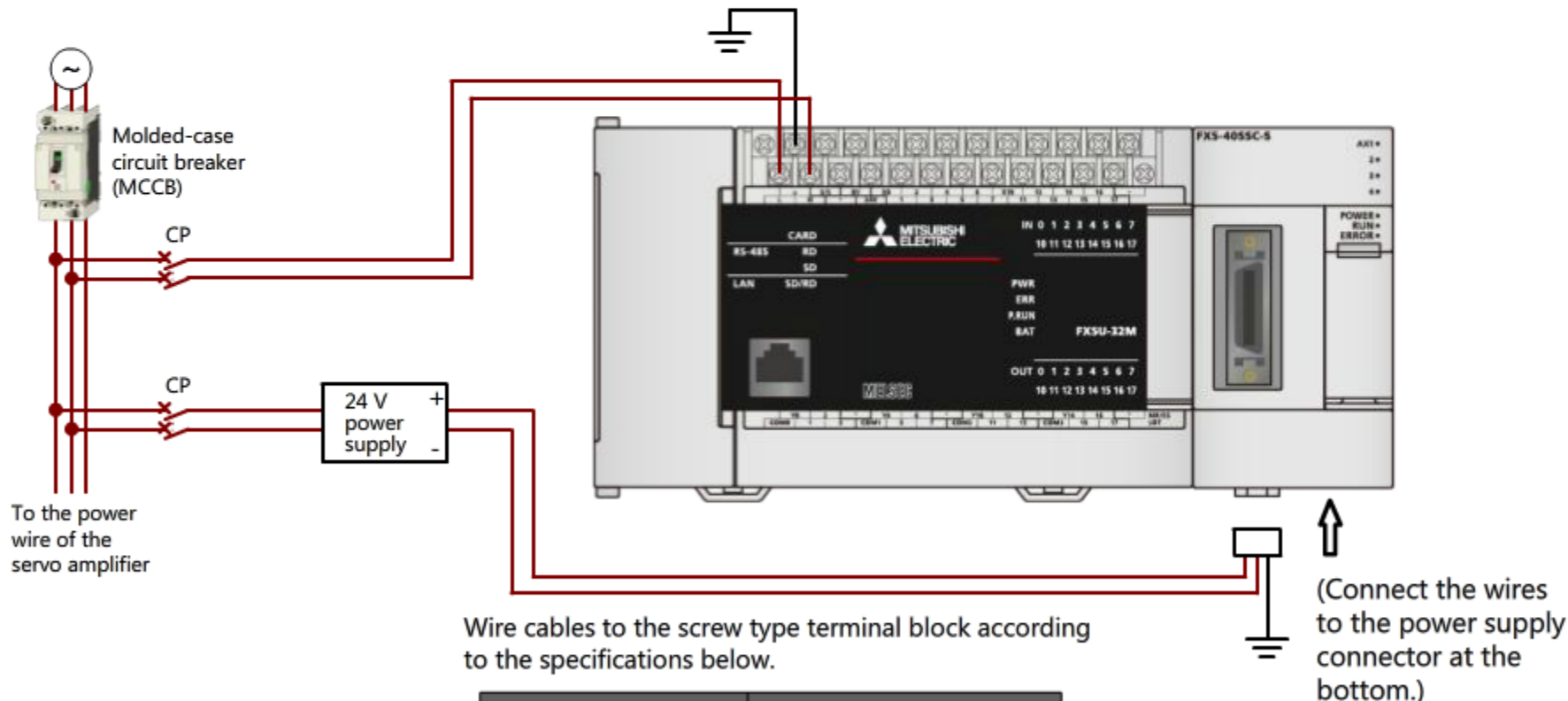
This section explains the wiring and cable connection example for the Simple Motion module and servo amplifiers. The system in this course uses the cables for MR-J4-10B. If the capacity of the servo amplifier is different, refer to SERVO AMPLIFIER INSTRUCTION MANUAL for each model.

1.4.1 Wiring of the PLC and Simple Motion module power supply

The following shows an example when a power wire and a grounding wire are connected to the FX5U PLC and Simple Motion module.

At wiring, open the terminal block cover on the top of the PLC and wire cables.

Connect an isolation transformer when noise often enters in the power supply system.



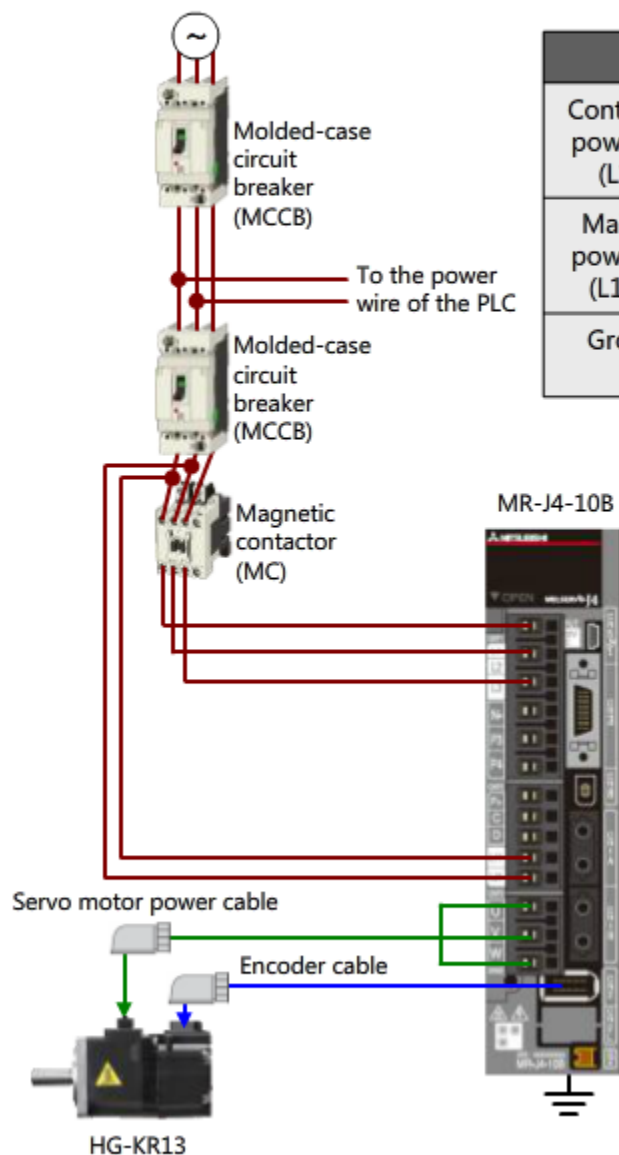
Terminal screw size	Tightening torque
M3	0.5~0.8 N·m

(Connect the wires to the power supply connector at the bottom.)

1.4.2

Wiring for Servo Amplifier Power Supply and Servo Motor Power Cables

Wire the control circuit power supply (L11, L21) and the main circuit power supply (L1, L2, L3) of the servo amplifier, and the servo motor power cable.



Item	Applicable wire size	Tightening torque
Control circuit power supply (L11, L21)	1.25mm ² to 2mm ² (AWG16 to 14)	-
Main circuit power supply (L1, L2, L3)	2mm ² (AWG14)	-
Grounding wire	1.25mm ² (AWG16)	1.2N·m

1.4.3 Axis Number Settings

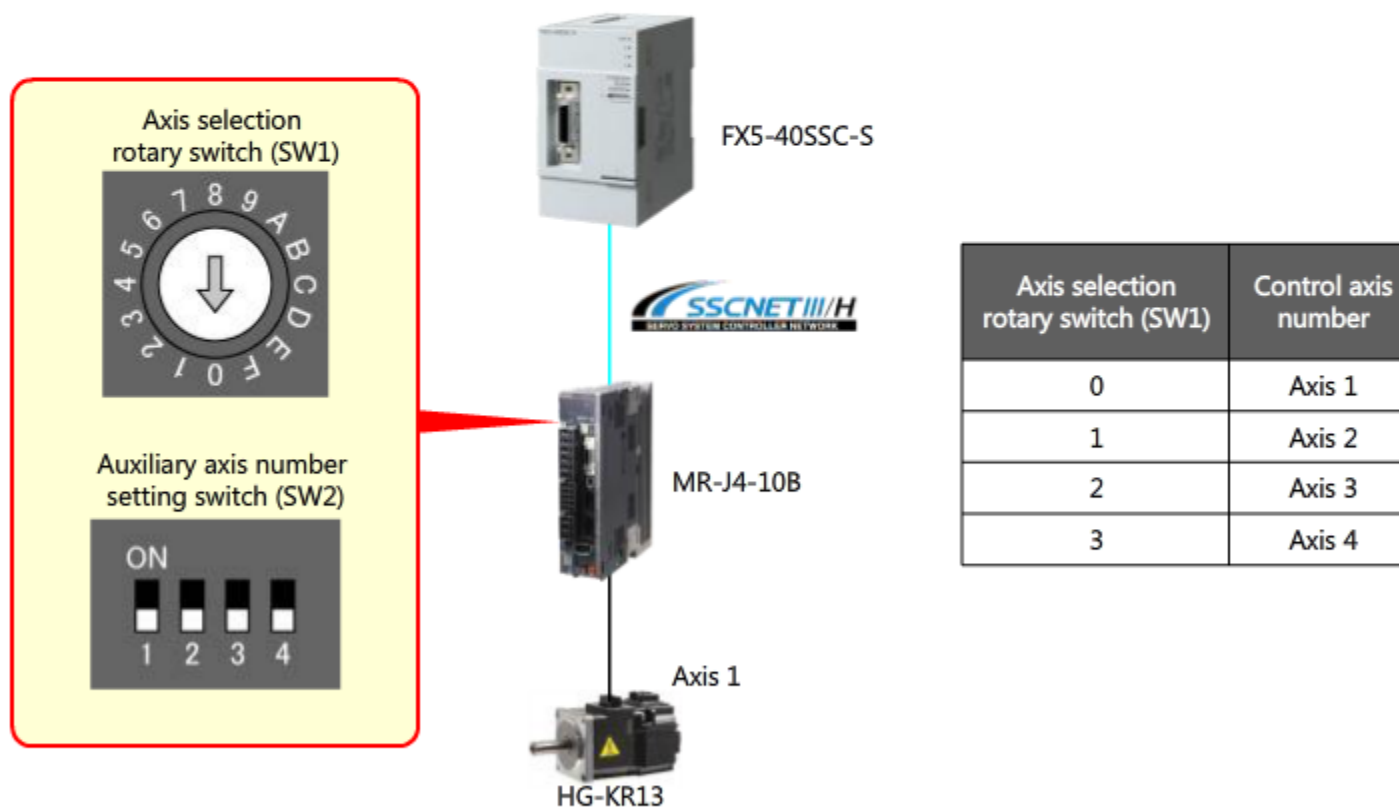
Set a control axis number to the servo amplifier.

A control axis number is assigned to each servo amplifier to identify control axes. Up to 4 axis numbers can be set regardless of the order of connection.

Note that the operation may not be performed properly if the set control axis numbers overlap in one servo system.

Select the control axis number of the servo amplifier with the axis selection rotary switch (SW1). Refer to the following table for the relation between each setting value of the axis selection rotary switch and axis number.

Turn "off (down)" all auxiliary axis number setting switches (SW2).



1.4.4 SSCNET III/H Connection

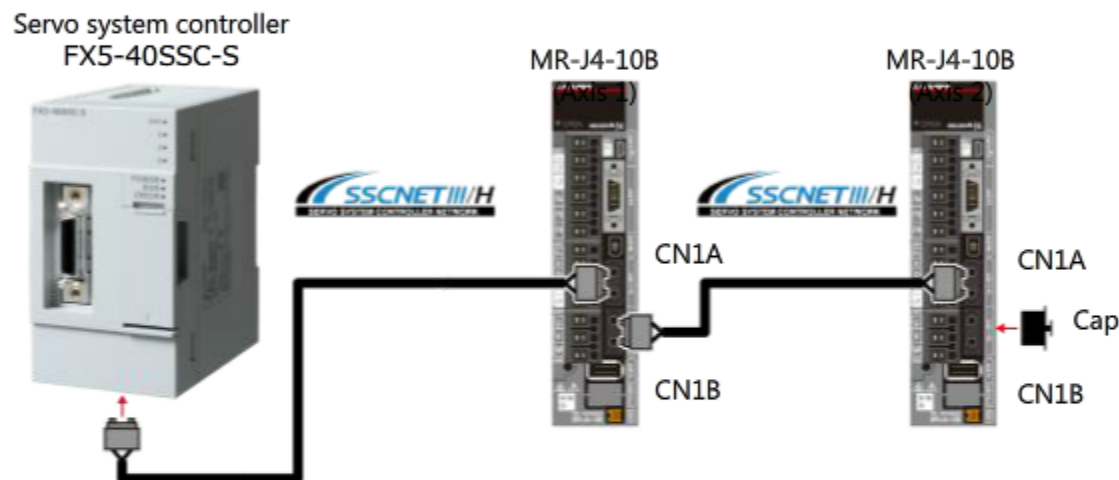
Connect the servo amplifier with a controller.

The MR-J4-B servo amplifier has an SSCNET III/H interface.

Using the optical communication method, SSCNET III/H achieves high noise tolerance and high-speed, full-duplex communication.

Use a dedicated cable to connect the servo amplifier with the controller. The cable with connectors allows easy connection and disconnection.

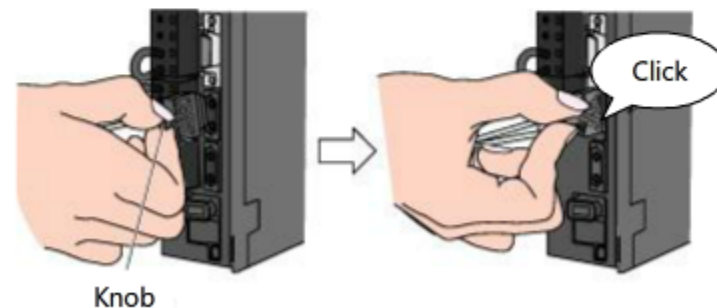
The following figure shows a 2-axis system as an example.



Note the following points when using SSCNET III cables.

- If any power such as a great shock or lateral pressure is applied to the cable, or the cable is pulled, suddenly bent, or twisted, inside parts are distorted or damaged, and optical transmission will not be available.
- As the optical fibers are made of synthetic resin, it will be thermally deformed if exposed to a fire or high temperature.
- If the end face of an optical cord tip is dirty, optical transmission is interrupted and it may cause malfunctions.
- Do not look directly at the light output from the connector or the end of the cable.
- For your safety and protection of the connector, put a supplied cap in the unused connector (CN1B) on the final-axis servo amplifier.

■ How to connect

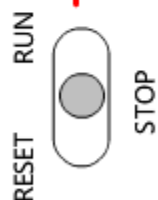
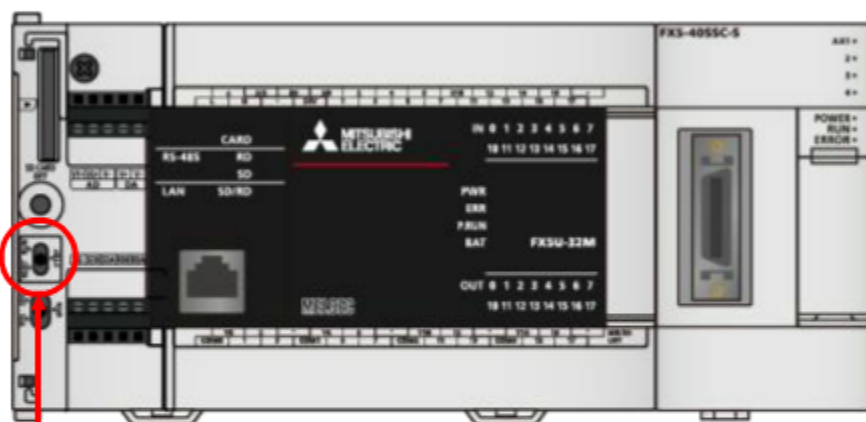


1.4.5

Power-on of the Programmable Controller

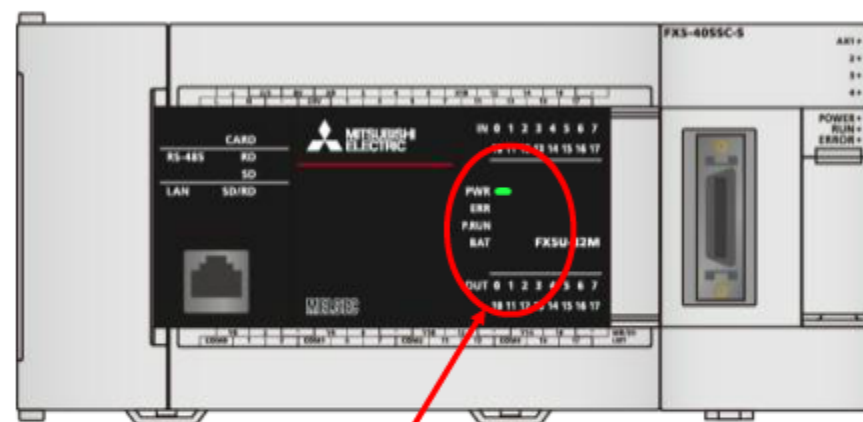
Check that the wiring to the power supply of the PLC is correct and the PLC CPU module is in the STOP status. After that, power on the PLC.

PLC operation status



Check that the RUN/STOP/RESET switch of the PLC is in the STOP status.

LED status after power-ON



PWR LED (green light) turns ON.

When parameters and programs are not written to the PLC, the ERR LED (red light) flashes, but no immediate error occurring. After writing parameters and programs and turning the power OFF to ON, the ERR LED will be OFF.

1.4.6

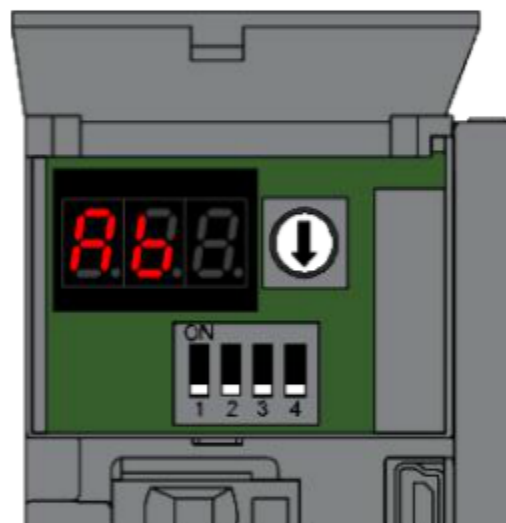
Power-on of Servo Amplifier

Turn on the control circuit power supply and the main circuit power supply of the servo amplifier. "AA" (Initializing standby) or "Ab" (Initializing) is displayed in the display of the servo amplifier. No servo system controller is connected in this sample system. Thus, configure required settings and start up the system with the "Ab" state.

Power on the
servo amplifier.



"AA" or "Ab" is displayed
in the display.



When parameters are not written to the Simple Motion module, the LED displays "AA" or "Ab", but no immediate error is occurring.

1.5 Summary of This Chapter

In this chapter, you have learned:

- System Configuration
- Startup Procedure
- Mounting
- Wiring and Cable Connection

Important points

System Configuration	<ul style="list-style-type: none">• Configure a system using MELSEC iQ-F series PLCs including a Simple Motion module and MELSERVO J4 series servo amplifiers and servo motors.
Startup Procedure	<ul style="list-style-type: none">• After wiring of the programmable controller, wiring of the power supplies of the servo amplifiers and the power cables of the servo motors, setting of axis numbers, and connecting to SSCNET are completed, turn on the power supplies of the PLC and the servo amplifiers.
Mounting	<ul style="list-style-type: none">• Connect the Simple Motion module to the extension connector of the PLC.
Wiring and Cable Connection	<ul style="list-style-type: none">• Wire the power supplies of the PLC and Simple Motion module, wire the power supplies of servo amplifiers and the power cables of servo motors, set the control axis numbers of servo amplifiers, and connect to SSCNETIII/H.• After all the wiring and cable connection operations are completed, power on the PLC and the servo amplifiers to check that these module have been properly connected.

Chapter 2 Positioning Control Startup

Positioning control startup is performed in chapter 2.

2.1 Creating a New Project

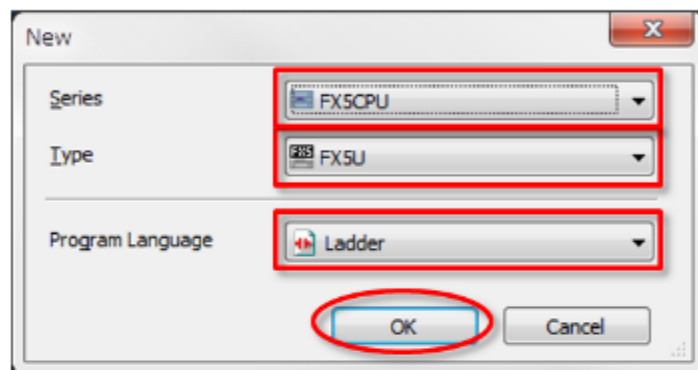
Use MELSOFT GX Works3 to create a project and sequence program.
The contents in this course require MELSOFT GX Works3 of version 1.011M or later.

How to check the version of MELSOFT GX Works3

Start MELSOFT GX Works3, and select [Help] - [Version Information].

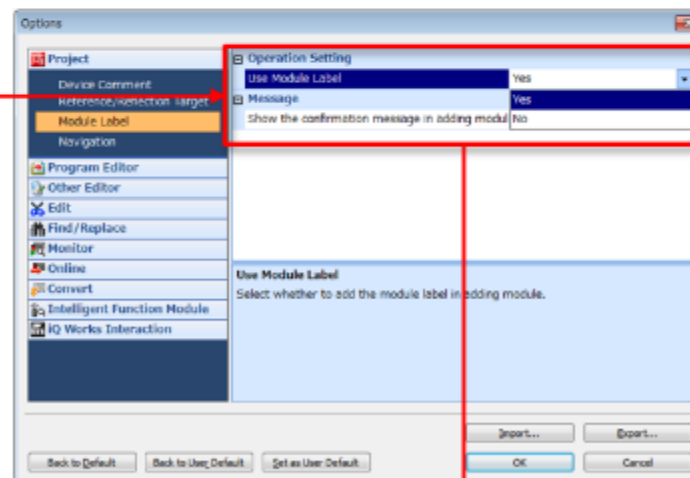
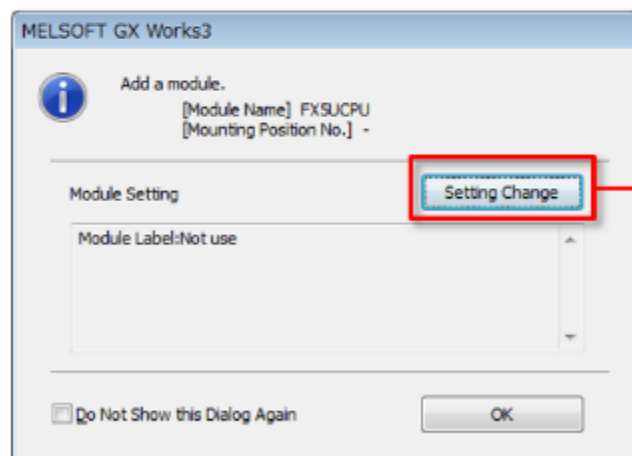
2.1.1 Creating a New Project

Start MELSOFT GX Works3, and create a new project.
Select [Project] - [New] in the menu, set the items as follows, and click [OK].

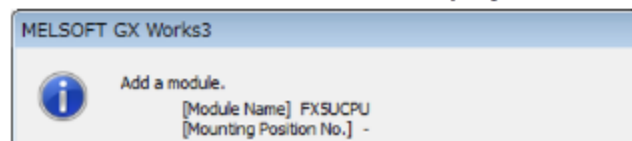


Item	Setting
Series	FX5CPU
Model	FX5U
Program language	Ladder

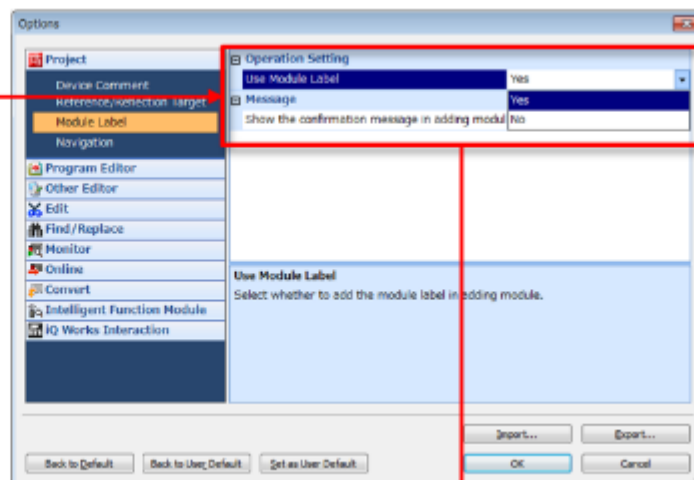
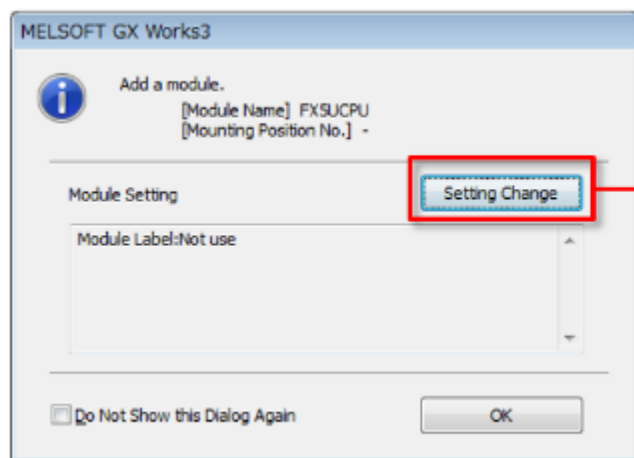
The window asking you to add a module appears. Click the [Setting Change] button and change the setting of [Use Module Label] to [Yes].



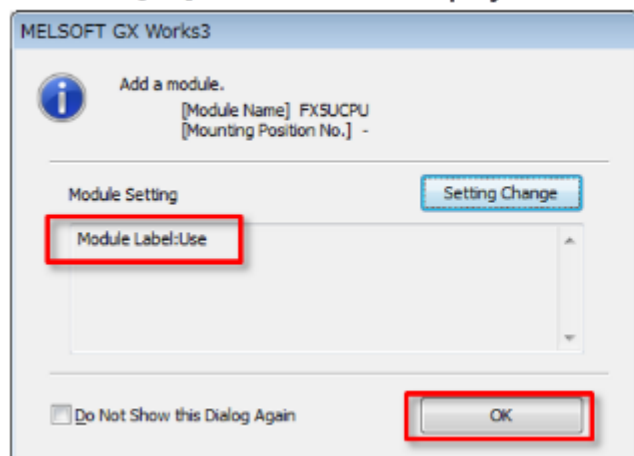
Click the [OK] button to create a project.



2.1.1 Creating a New Project



Click the [OK] button to create a project.

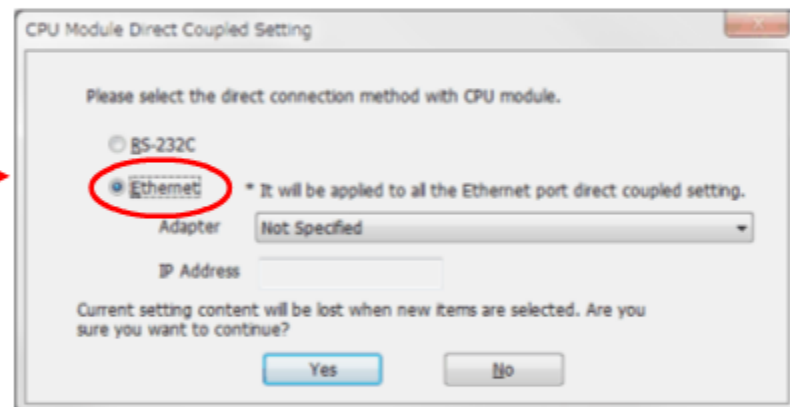
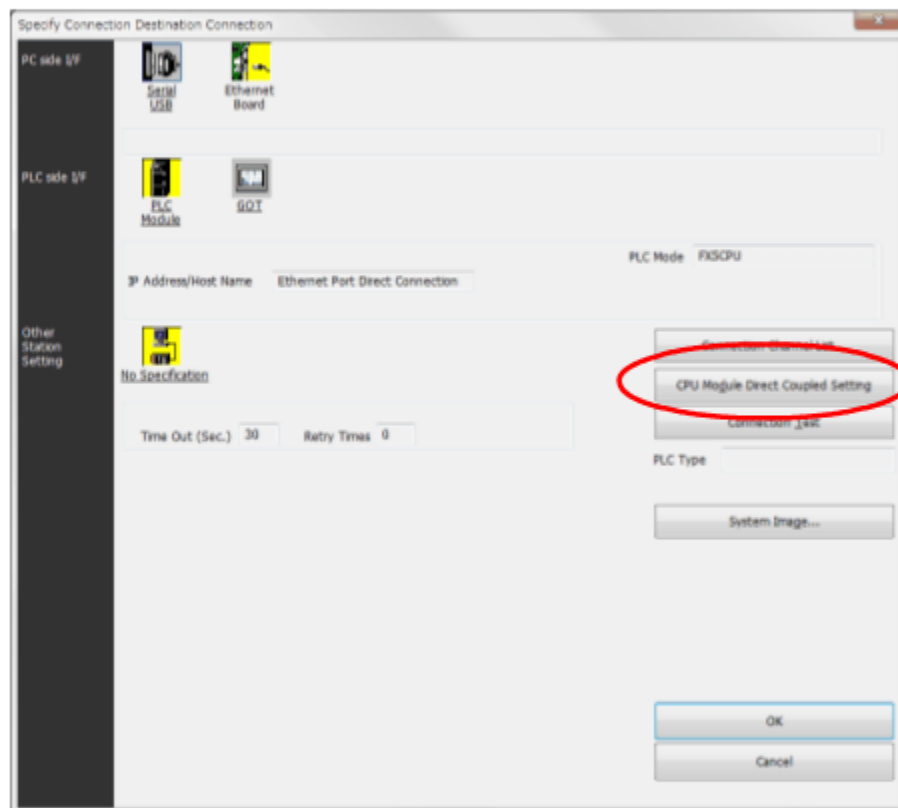


2.1.2

Connecting the PLC to a Personal Computer

Confirm the connection between a personal computer and the PLC.

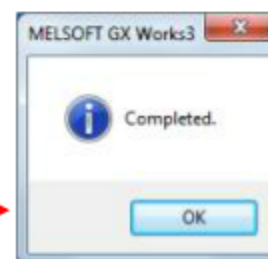
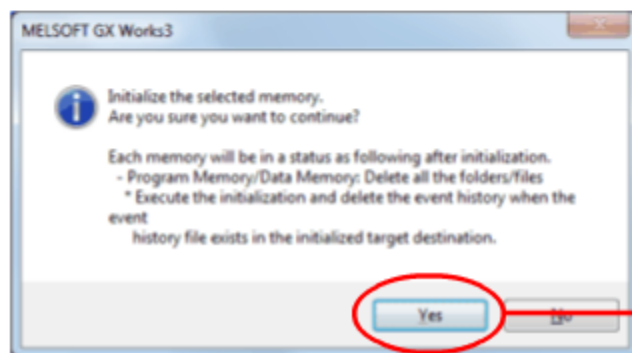
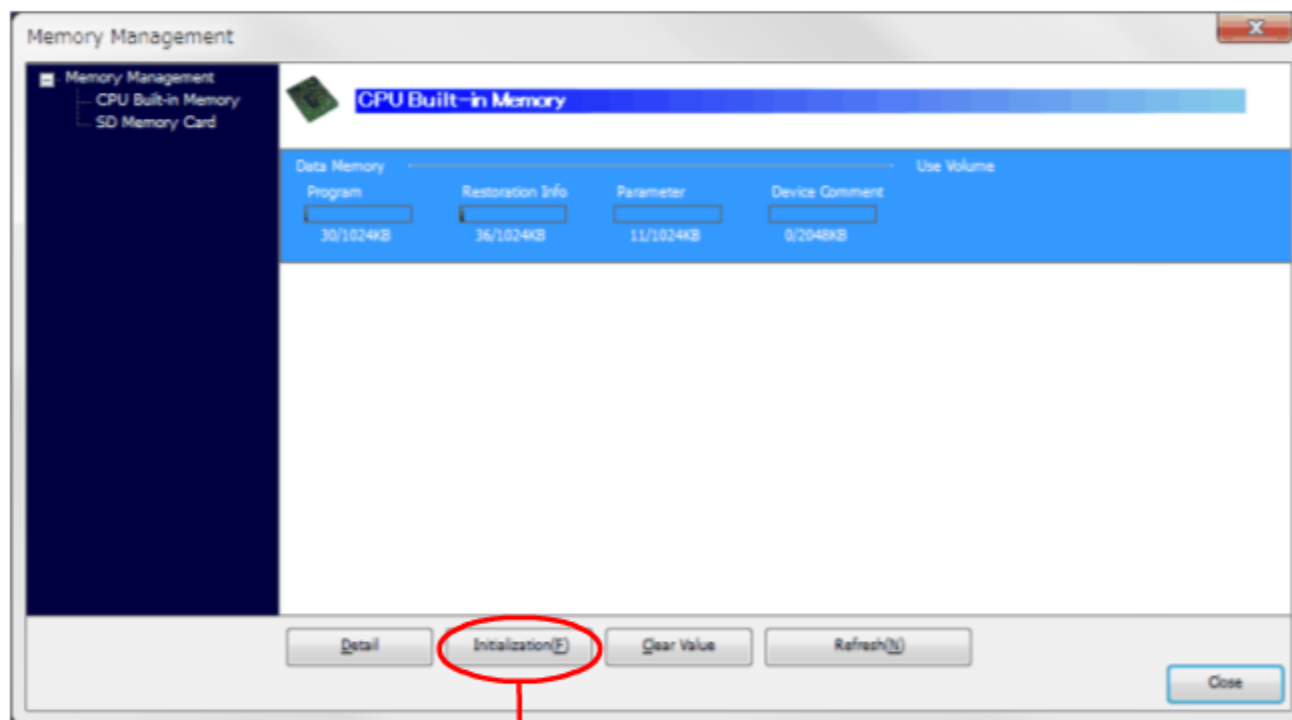
Connect the PLC to a personal computer with an Ethernet cable. Select [Online] - [Specify Connection Destination] in the menu to display the "Specify Connection Destination Connection" window, and select [CPU Module Direct Coupled Setting]. Select [Ethernet] as the method of connecting with the CPU module.



2.1.3 Initializing the PLC CPU

Initialize a memory of the PLC CPU.

Select [Online] - [CPU Memory Operation] in the menu, and click [Initialization] in the Memory Management window.

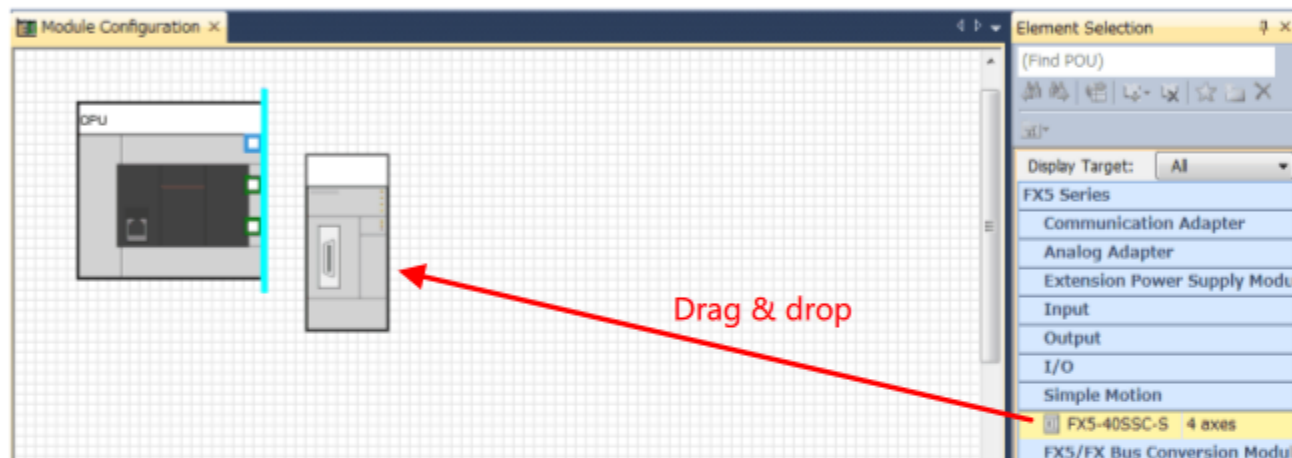


2.1.4 Creating a Module Configuration

Create a module configuration diagram and fix the parameter.

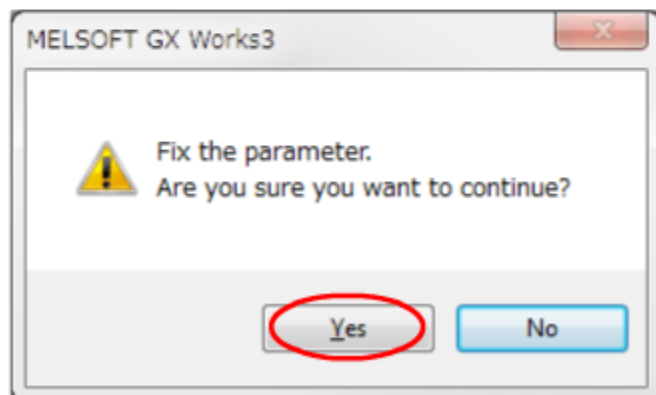
Double-click [Module Configuration] in the Navigation tree to open the module configuration diagram.

Select a Simple Motion module from the Element Selection window, and drag and drop it into the configuration diagram.



After creating the module configuration diagram, select [Edit] - [Parameter] - [Fix] from the menu.

The window asking about module label addition appears for the selected modules. Click [Yes].

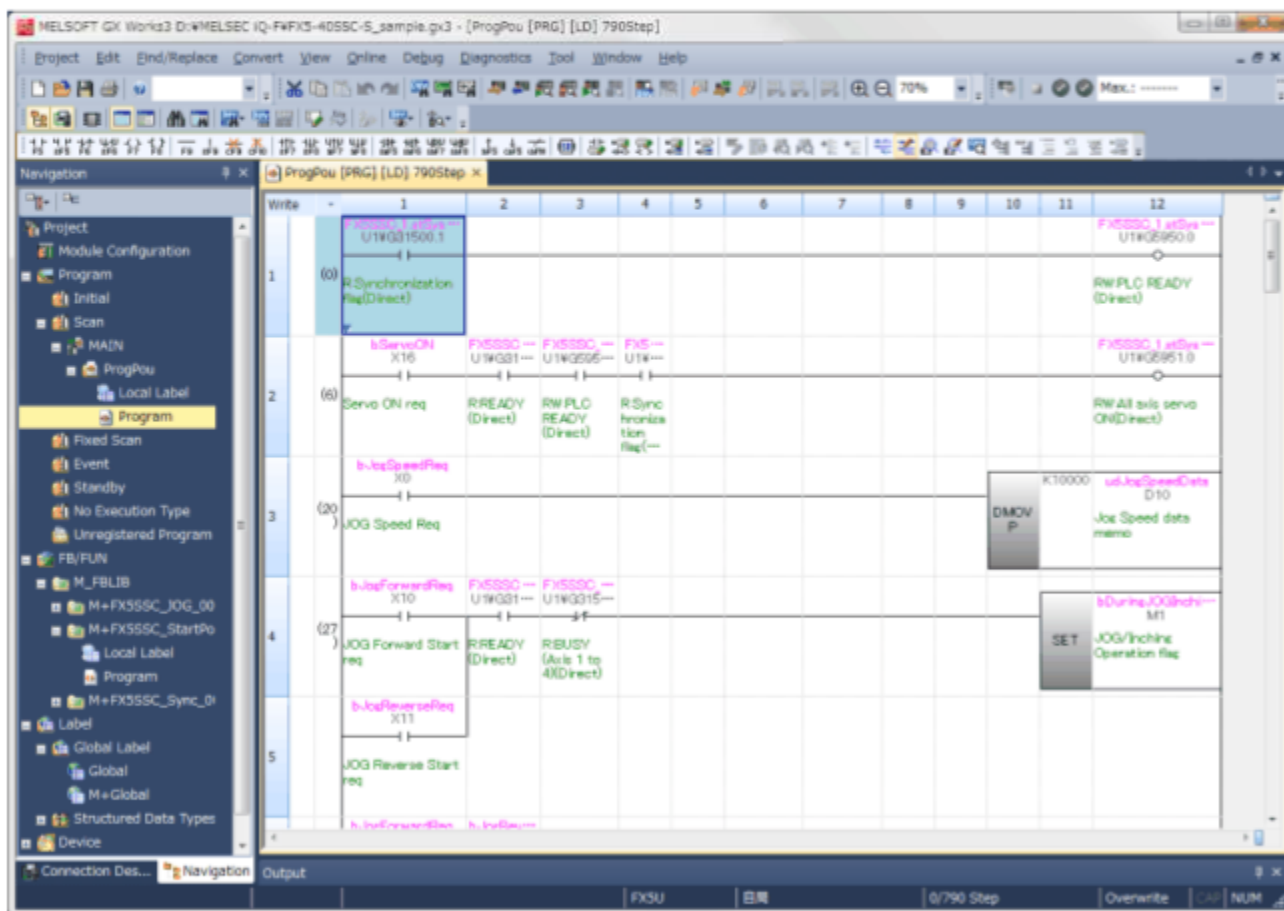


2.2 Sequence Program Creation

Create a sequence program.

2.2.1 New Sequence Programs Creation

The use of label and function block (FB) removes the need to remember devices when programming.

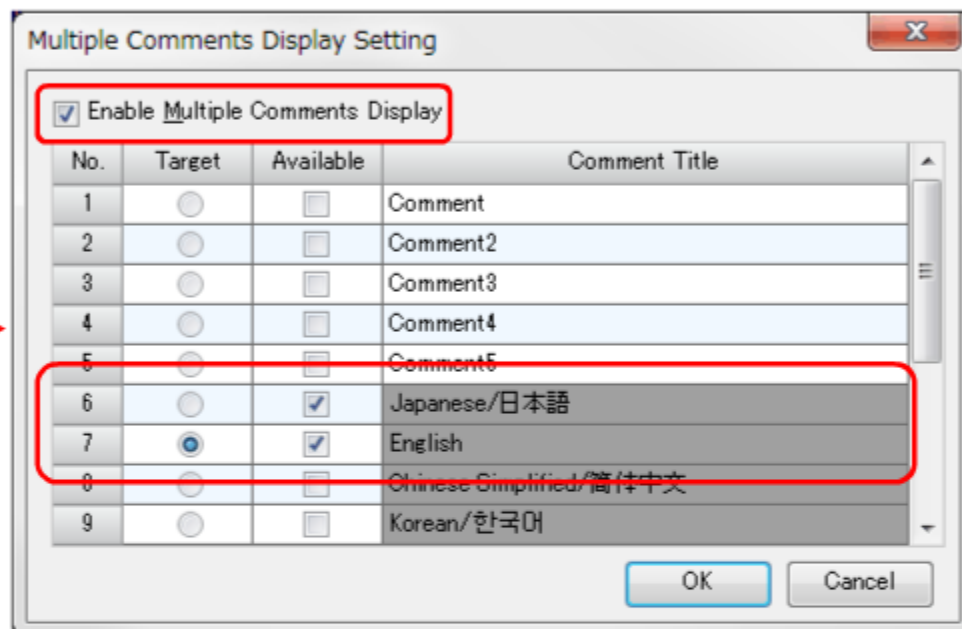
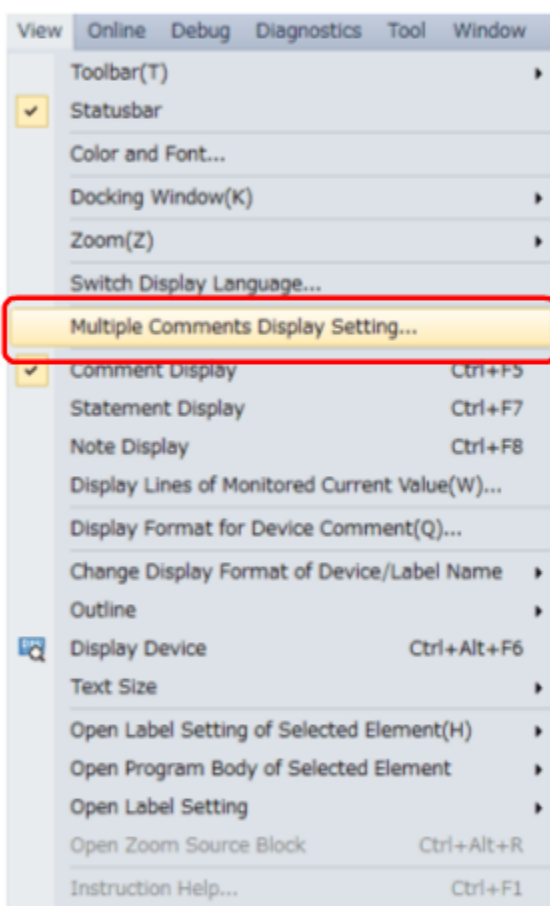


2.2.2

Multiple Comments Display Setting

Check the "Enable Multiple Comments Display" box and "Target" boxes for each language to switch the language for comments in sequence programs.

Select [View] - [Multiple Comments Display Setting] in the menu to open the setting screen.



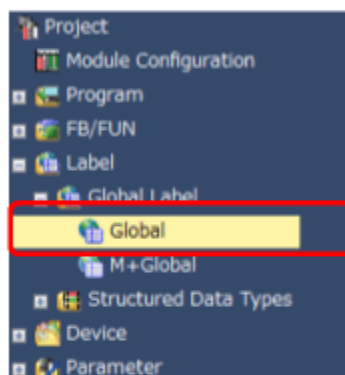
2.2.3 Registration of Global Labels

Labels are variable elements that allow you to put arbitrary names or data types to programs, etc. The use of labels allows you to create a program without worries about devices and buffer memory, enabling a different model/product to be used with the same program.

Select [Label] - [Global] in the menu to display the screen for registering global labels.

For registered contents, refer to the following PDF file.

[Global label setting examples <PDF>](#)



Global [Global Label Setting]

<Filter> Easy Display Display Setting Check

Label Name	Data Type	Class	Assign Device	Initial Val	Const	コメント	日本語/日本語	English(Display Times)	備考
1	@@@@@_XIOInchOperation	BIT	VAR_GLOBAL	M01			JOG/インテグレーション中フラグ	JOG/Inch Operation flag	
2	@@@End	BIT	VAR_GLOBAL	M02			JOG実行完了	JOG End flag	
3	@@@OK	BIT	VAR_GLOBAL	M03			JOG完了	JOG OK flag	
4	@@@ERR	BIT	VAR_GLOBAL	M04			JOG異常完了	JOG Error flag	
5	@@@Start	BIT	VAR_GLOBAL	M05			位置決め始動	Positioning Start Operation flag	
6	@@@StartOK	BIT	VAR_GLOBAL	M06			位置決め始動完了OK	Positioning Start OK	
7	@@@StartErr	BIT	VAR_GLOBAL	M07			位置決め始動異常	Positioning Start Error	
8	@@@PositioningStartReq	BIT	VAR_GLOBAL	M08			位置決め始動要求	Positioning Start Request	
9	@@@AutoNo	Word (Signed)	VAR_GLOBAL	X04			無し	Auto No	
10	@@@PositioningStartNo	Word (Signed)	VAR_GLOBAL	X08			位置決め始動No	Positioning Start No	
11	@@@SpeedData	Double Word (Signed)	VAR_GLOBAL	X10			JOG速度設定メモ	JOG Speed data memo	
12	@@@ErrMid	Word (Signed)	VAR_GLOBAL	X12			JOGエラーコード	JOG Error code	
13	@@@SpeedReq	BIT	VAR_GLOBAL	X00			JOG速度設定	JOG Speed Req	
14	@@@Auto1	BIT	VAR_GLOBAL	X01			無し	Auto 1	
15	@@@Auto2	BIT	VAR_GLOBAL	X02			無し	Auto 2	
16	@@@HomePositionData	BIT	VAR_GLOBAL	X03			原点復帰フラグ設定	Home Position return Data	
17	@@@PositioningStartData	BIT	VAR_GLOBAL	X05			位置決め始動フラグ	Positioning Start Data	
18	@@@SyncPositionData	BIT	VAR_GLOBAL	X06			同期用位置決め始動フラグ	Synchronous Positioning Start data	
19	@@@ForwardReq	BIT	VAR_GLOBAL	X0E			JOG正転	JOG Forward Start req	
20	@@@ReverseReq	BIT	VAR_GLOBAL	X0F			JOG逆転	JOG Reverse Start Req	
21	@@@StartPositioning	BIT	VAR_GLOBAL	X01			位置決め始動	Start Positioning req	
22	@@@ServoON	BIT	VAR_GLOBAL	X0B			サーボON要求	Servo ON req	

Extended Display: Automatic

System label is reserved to be registered.
 System label is reserved to be released.
 The system label is already registered to the system label database.

To execute the Reservation to Register/Release for the system label, reflection to the system label database is required. Please execute 'Reflect to System Label Database'.

It is unnecessary to change reference side project when assigned device is changed in system label Ver.2.
 * Only iQ-R series/GOT 2000 series is available for system label Ver.2.
 * To execute Online Program Change, execute Online Program Change and save.

Reservation to Register System Label
 Reservation to Release System Label
 Import System Label

Reflect to System Label Database
 Not Reflected: 0
 Total: 0

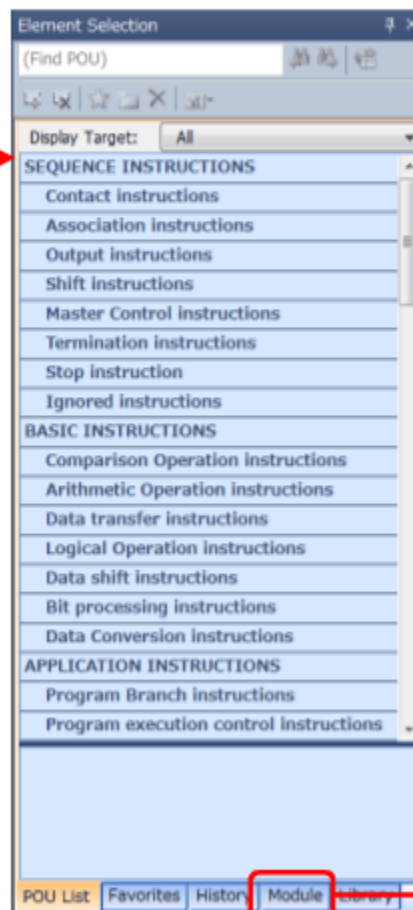
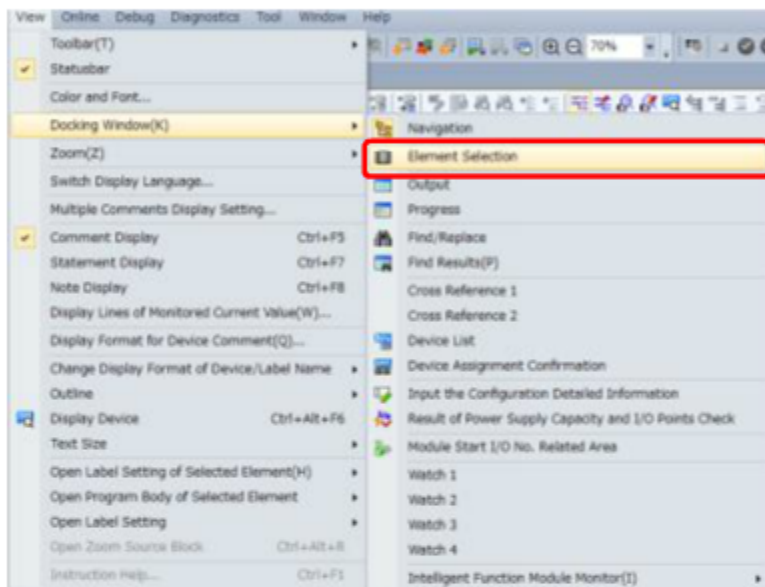
2.2.4

Element Selection Window

Display the Element Selection window.

Select [View] - [Docking Window] - [Element Selection] in the menu to display the Element Selection window.

Select [Module] tab in the Element Selection window, and Module Label and Module FB are displayed.



2.2.5

Sequence Program Creation with Module Labels

Create a sequence program using module labels.

Drag and drop the module label to be used from the Element Selection window, change it to an arbitrary contact or coil, and convert it.

For sequence program examples, refer to the following link.

[Sequence program for positioning control <PDF>](#)

The screenshot illustrates the process of creating a sequence program using module labels. It shows the 'Element Selection' window on the left, the main ladder logic editor, and a context menu.

- (1) Select a label from the module label list.** The 'bReady_D' label is selected in the 'Module Label' list.
- (2) Drag & drop the module label.** The 'bReady_D' label is dragged from the list to the ladder logic editor.
- (3) Double-click.** The 'bReady_D' label is double-clicked in the ladder logic editor.
- (4) Change the contact to an arbitrary contact or coil.** The contact is changed to an arbitrary contact or coil.
- (5) Click [OK] to create a circuit.** The 'OK' button is clicked to create the circuit.
- (6) Select [Convert] - [Convert] in the menu and convert it.** The 'Convert(B)' option is selected in the context menu.

The ladder logic editor shows the following steps:

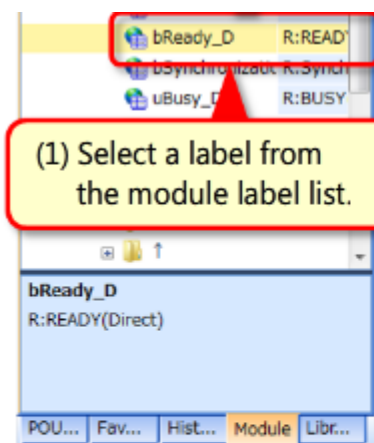
- Step 1: A contact labeled 'FX5S...' is placed in the first step.
- Step 2: A coil labeled '(O)' is placed in the second step.

The context menu shows the following options:

- Convert(B) F4
- Online Program Change
- Rebuild All Shift+Alt+F4
- Program File Setting...
- Setting...

2.2.5

Sequence Program Creation with Module Labels

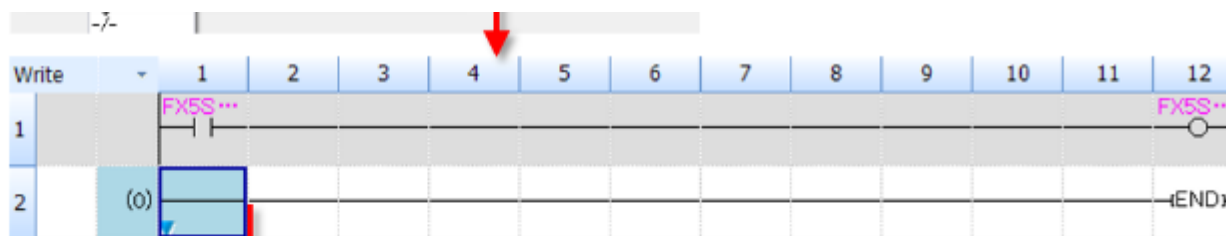


bReady_D R:READ
bSynchronizati R:Synch
uBusy_D R:BUSY

(1) Select a label from the module label list.

bReady_D
R:READY(Direct)

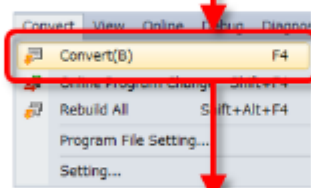
POU... Fav... Hist... Module Libr...



Write 1 2 3 4 5 6 7 8 9 10 11 12

1 FX5S...

2 (0) (END)



Convert View Online Setup Diagon

Convert(B) F4

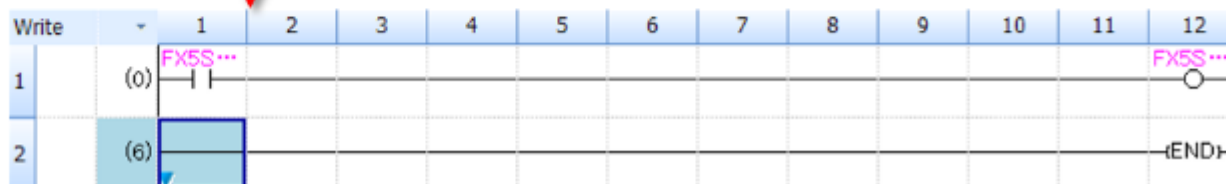
Online Program Chang Shift+F4

Rebuild All Shift+Alt+F4

Program File Setting...

Setting...

(6) Select [Convert] - [Convert] in the menu and convert it.



Write 1 2 3 4 5 6 7 8 9 10 11 12

1 (0) FX5S...

2 (6) (END)

2.2.6

Sequence Program Creation with Module FB

Create a sequence program using module FBs.

On the next page, operate the actual screen and create a sequence program using module FBs.

The screenshot displays the MELSOFT GX Works3 software interface for creating a sequence program. The main window shows a ladder logic program with the following steps:

Step	Network	Module FB	Parameter	Comment
9	Start of JOG/inching operation	M1		
10	JOG/inching Operation flag	BJEN	oJEN	Execution command status
11	Normal completion	DUTL	oJOKB	JOG OK flag
12	Error completion	UWJ	oJErrB	JOG Error flag
13	JOG Forward Start req	BJF	oJErr	Error code

The interface includes a navigation pane on the left, a menu bar at the top, and a status bar at the bottom showing the current step (0/790 Step) and other parameters.

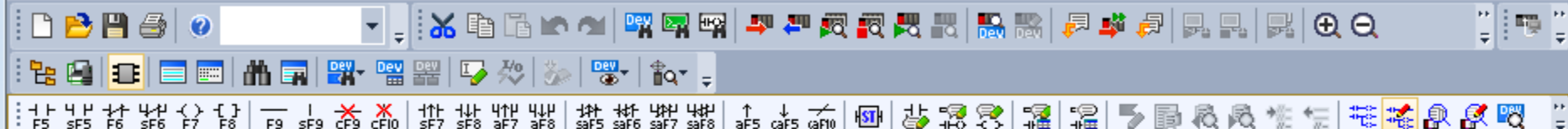
2.2.6

Sequence Program Creation with Module FB



MELSOFT GX Works3 D:\MELSEC IQ-F\FX5-40SSC-S_sample.gx3 - [ProgPou [PRG] [LD] 790Step]

Project Edit Find/Replace Convert View Online Debug Diagnostics Tool Window Help



ProgPou [PRG] [LD] 790Step x

Element Selection

Write	1	2	3	4	5	6	7	8	9	10	11	12
2	(3					M_FX5...	(M+FX5					
2	4					Positioning sta...						
	1)											
2		bPositioning...				Bi_bEN	o_bE...					bStartEND
		M0										M5
2												o
3		Positioning				Exec	Exec					Positioning
		Start Request				ution comm	ution statu					Start
						and	s					Operation flag
2					F...							bStartOK
4					[]	DUT:i...	o_bO...					M6
						Modul	Normal					o
						le label	al compl					Positioning
						label	etion					Start OK
2					uA...							bStartERR
5					[D14]	UW:i...	o_bEr...					M7
						Axis	Error					o
						No	comple					Positioning
						t axis	tion					Start
2					uP...							
					[D16]	UW:i...	o_uEr...	uE...				
								[D12]				


(Find POU)

Module Label

- FX5UCPU
- 1[U1]:FX5-40SSC-S
 - FX5SSC_1
 - FX5SSC_1
 - uIO
 - Parameter
 - Axis monitor data
 - System monitor data
 - Axis control data 1
 - System control data

FX5SSC_1

The sequence program creation using module FBs is completed.

Click  to proceed to the next screen.

FX5U

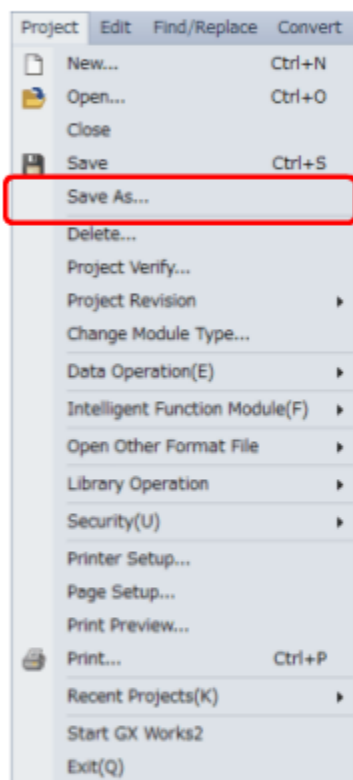
Host-192.168.3.250

317/790 Step

2.2.7 Saving a Project

Save a created project.

Select [Project]-[Save as] in the menu, and click [Save] after entering the file name.



2.2.8

Writing to the Programmable Controller

Write the set parameters and created program into the PLC.

Select [Online] - [Write to PLC] in the menu to display the Online Data Operation window.

Select System Parameter/CPU Parameter, Module Parameter, and program files and click [Execute] to start writing to the PLC.

Click [Close] to complete the writing to the Programmable Controller.

The screenshot displays the 'Online Data Operation' window. On the left, the 'Write to PLC...' menu item is highlighted with a red box and an arrow. The main window shows a table of data to be written, with checkboxes for 'Parameter', 'Global Label', 'Program', and 'POU' selected. The 'Execute' button is highlighted with a red box.

Module Name/Data Name	Detail	Last Change	Size (Byte)
FX5-4BSSC-S_sample			
Parameter			
System Parameter/CPU Parameter		2015/12/07 14:58:56	Not Calculation
Module Parameter		2015/12/07 14:58:56	Not Calculation
Simple Motion Module Setting:01:FX5...	Detail	2015/11/27 16:22:24	Not Calculation
Memory Card Parameter		2015/11/27 16:02:02	Not Calculation
Remote Password		2015/11/27 16:02:02	Not Calculation
Global Label			
Global Label Setting		2015/12/21 16:47:11	Not Calculation
Program			
MAIN		2015/12/21 16:47:08	Not Calculation
POU			

Memory Capacity

Program Memory: Free 64000/64000Step

Data Memory: Free

Program:1024/1024KB Restoration Info:1024/1024KB Parameter:0/0KB Device Comment:0/0KB

SD Memory Card: Free 0/0KB

Program:0/0KB Restoration Info:0/0KB Parameter:0/0KB Device Comment:0/0KB

2.3

Parameter Settings for Simple Motion Module

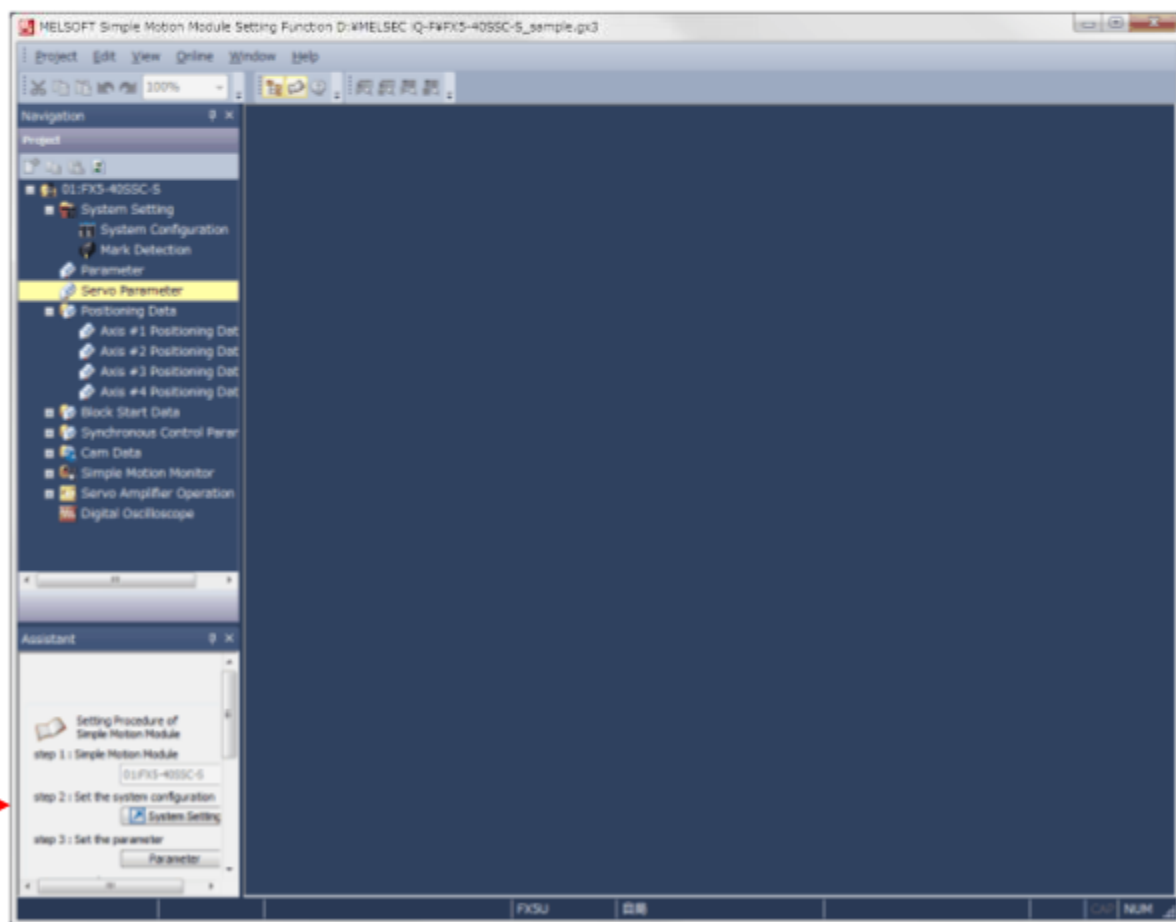
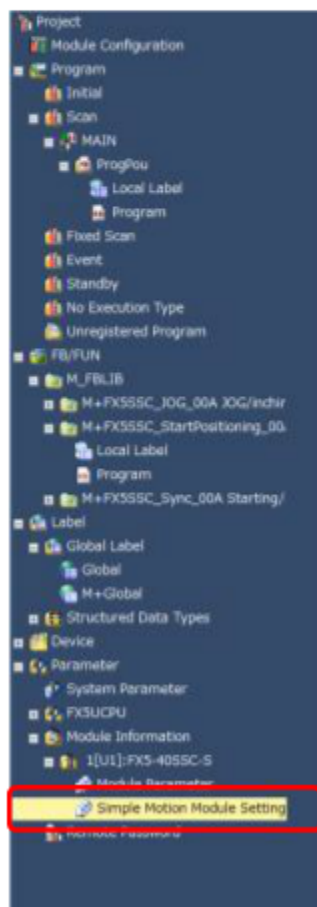
Set parameters of the Simple Motion module.
For parameter setting examples, refer to the following link.

[Parameter setting example <PDF>](#)

2.3.1

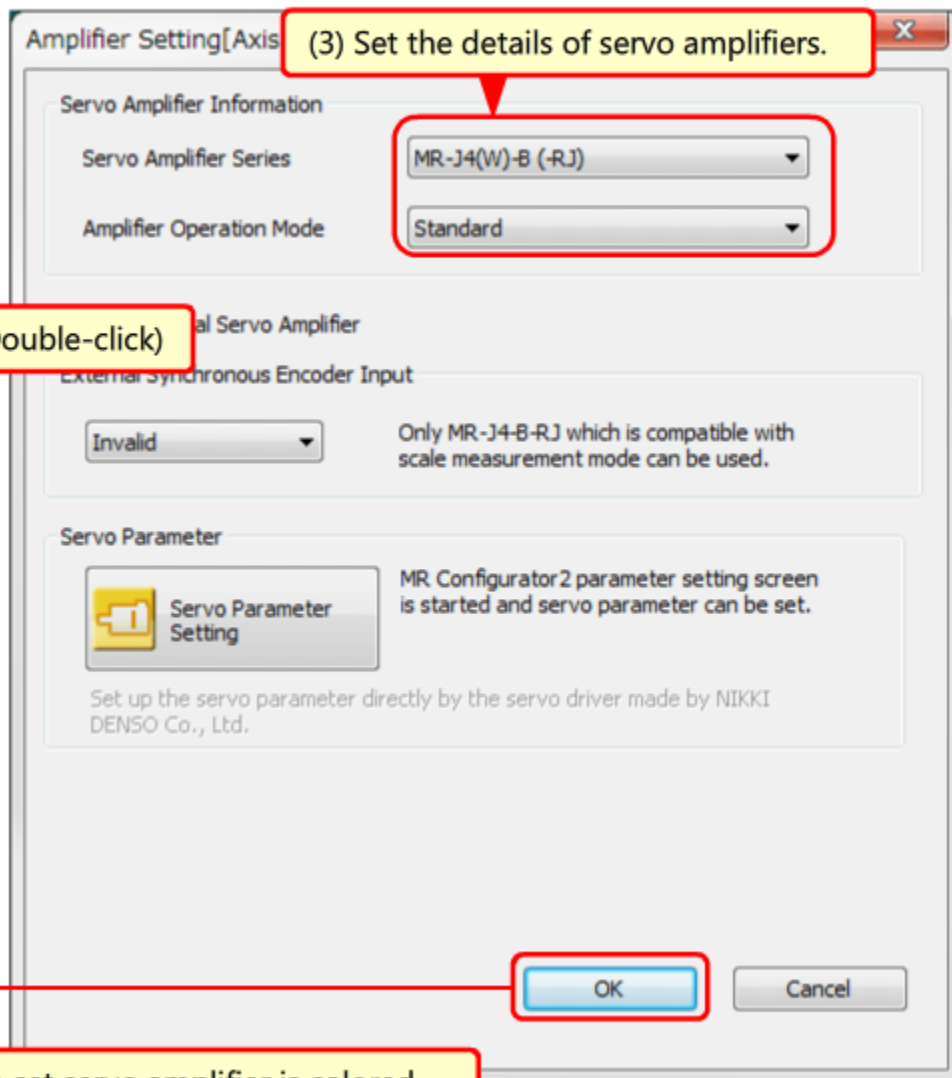
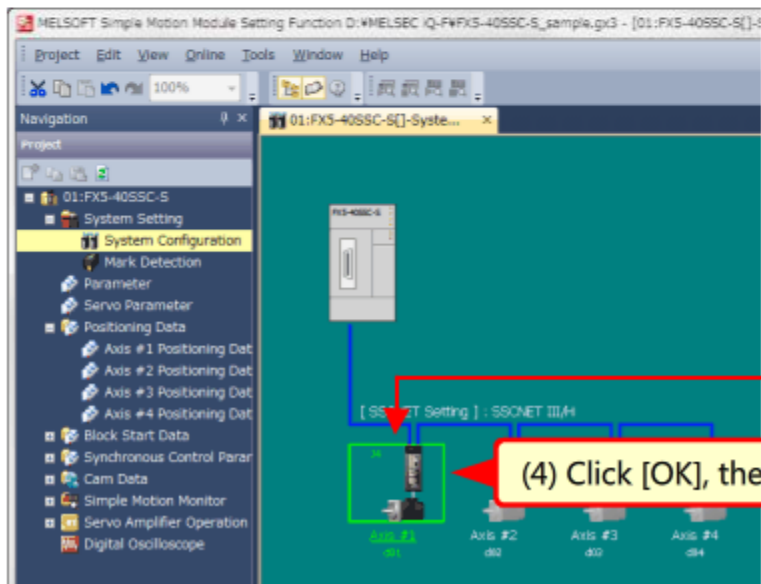
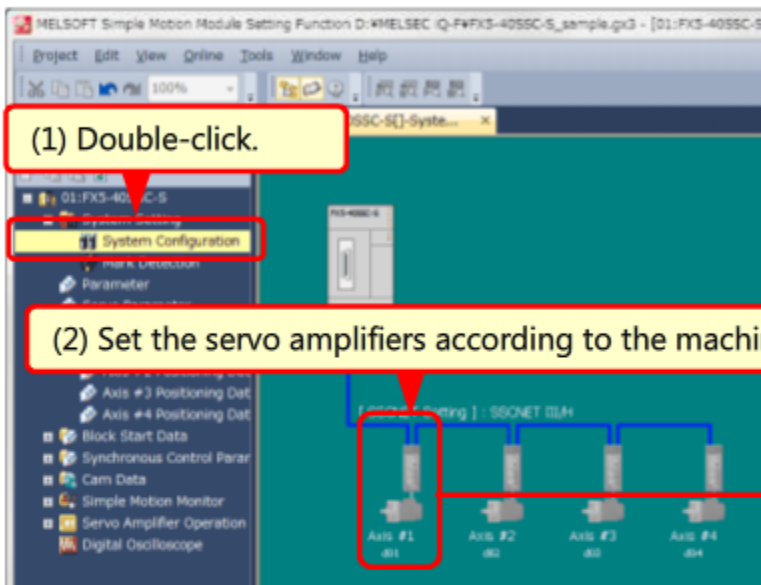
Start of Simple Motion Module Setting Function

Double click [Simple Motion Module Setting] in the menu of MELSOFT GX Works3 to open the Simple Motion Module Setting Function window.



2.3.2 System Settings

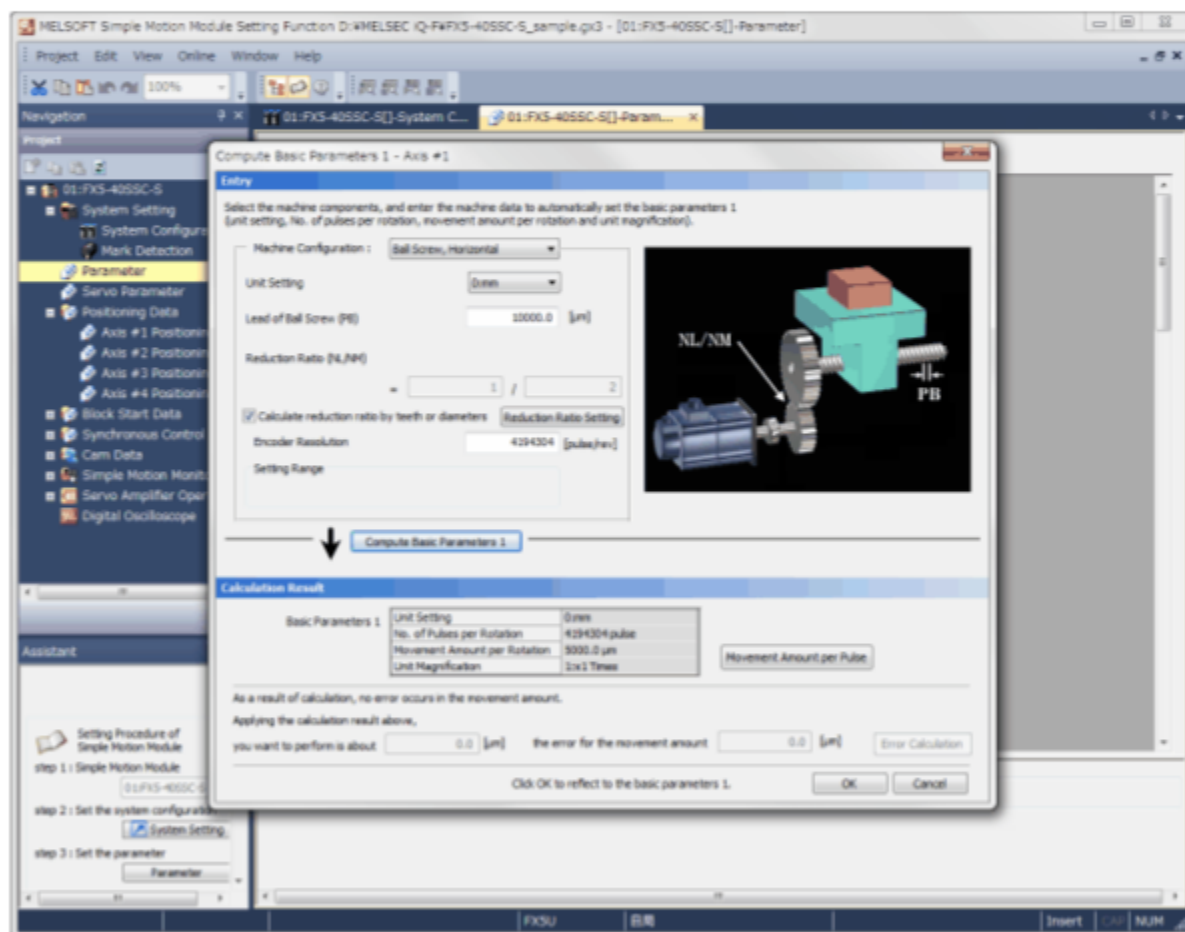
Configure the system setting.



2.3.3 Parameter Settings

Set parameters.

On the next page, operate the actual screen and set parameters.



2.3.3

Parameter Settings



MELSOFT Simple Motion Module Setting Function D:\MELSEC IQ-F\FX5-40SSC-S_sample.gx3

Project Edit View Online Window Help



Navigation

Project

01:FX5-40SSC-S

System Setting

System Configuration

Mark Detection

Parameter

Servo Parameter

Positioning Data

Block Start Data

Synchronous Control Param

Cam Data

Simple Motion Monitor

Servo Amplifier Operation

Digital Oscilloscope

01:FX5-40SSC-S[]-Param...

Display Filter

Display All

Compute Basic Parameters 1

Item	Axis #1
Common Parameter	The parameter does not r...
Pr.82:Forced stop valid/invalid selection	1:Invalid
Pr.24:Manual pulse generator/Incremental Sync. ENC input selection	0:A-phase/B-phase Mode (4 Multiply)
Pr.89:Manual pulse generator/Incremental Sync. ENC input type selection	1:Voltage Output/Open Collector Type
Pr.96:Operation cycle setting	FFFFh:Automatic Setting
Pr.97:SSCNET Setting	1:SSCNET III/H
Pr.150:Input terminal logic selection	Set the logic of external in...
Pr.151:Manual pulse generator/Incremental Sync. ENC input logic selection	0:Negative Logic
Pr.152:Control axis number upper limit	0
Pr.153:External input signal OSC file setting	Set digital filter for each i...
Basic parameters 1	Set according to the mach...
Pr.1:Unit setting	0:mm
Pr.2:No. of pulses per rotation	4194304 pulse
Pr.3:Movement amount per rotation	5000.0 μm
Pr.4:Unit magnification	1:x1 Times
Pr.7:Bias speed at start	0.00 mm/min
Basic parameters 2	Set according to the mach...
Pr.8:Speed limit value	2000.00 mm/min
Pr.9:Acceleration time 0	1000 ms
Pr.10:Deceleration time 0	1000 ms
Detailed parameters 1	Set acco
Pr.11:Backlash compensation amount	0.0 μm

Setting parameters is completed.

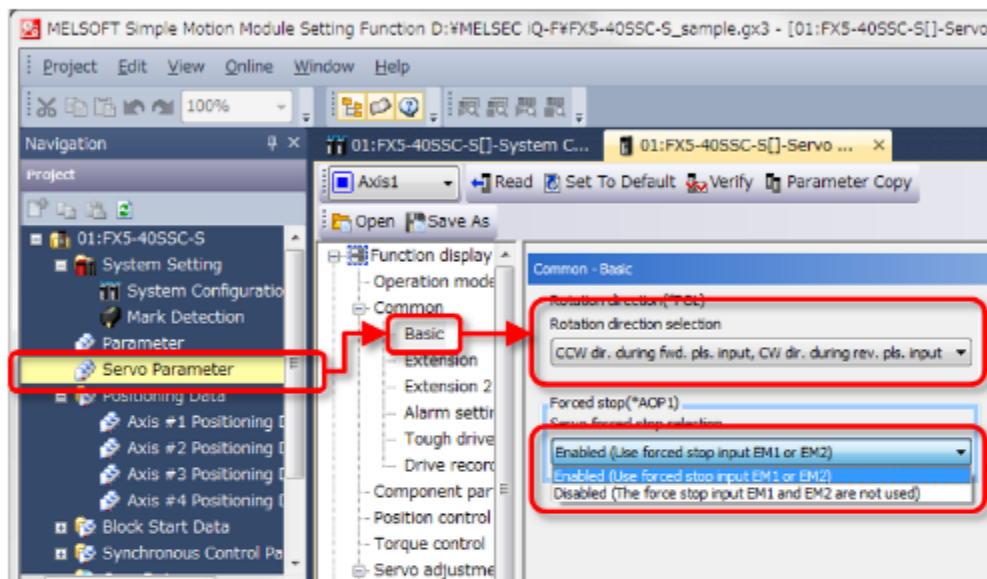
Click  to proceed to the next screen.

FX5U



Host-192.168.3.250

2.3.4 Servo Parameter Settings (Basic)

Set the items in Basic of Servo Parameter.



When setting the items in Basic of Servo Parameter, pay attention to the following parameters.

Parameter item	Function Explanation	Initial values	Setting for the Sample System
Rotation direction selection	<p>Use this option to set the rotation direction of the servo motor when being moved by forward rotation commands. The rotation direction is either counter-clockwise (CCW) or clockwise (CW) as seen from the load side (side attached to the machine).</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  Counter-clockwise (CCW) </div> <div style="text-align: center;">  Clockwise (CW) </div> </div> <p>Set the rotation direction considering the machine specifications. In the sample system, the servo motor in</p>	CCW for forward rotation command, CW for reverse command	CCW for forward rotation command, CW for reverse command

2.3.4

Servo Parameter Settings (Basic)

2/2

Servo forced stop selection	Turn this option ON to enable use of the forced stop input (EM2 or EM1) signal. The initial value is set to [Enabled] for safety reasons. In the sample system, the servo forced stop signal is not used. Thus, set this option to [Disabled].	Enabled (Either forced stop input EM2 or EM1 is used.)	Disabled (Neither forced stop input EM2 nor EM1 is used.)
-----------------------------	---	---	--

2.3.4 Servo Parameter Settings (Component Parts)

Set Component parts of Servo Parameter.

MELSOFT Simple Motion Module Setting Function D:\¥MELSEC IQ-F¥FX5-40SSC-S_sample.gx3 - [01:FX5-40SSC-S]-Servo parameter

Project Edit View Online Window Help

Navigation 100%

Project

01:FX5-40SSC-S

- System Setting
 - System Configuration
 - Mark Detection
 - Parameter
 - Servo Parameter**
- Positioning Data
 - Axis #1 Positioning
 - Axis #2 Positioning
 - Axis #3 Positioning
 - Axis #4 Positioning
- Block Start Data
- Synchronous Control Pa...

Assistant

Axis1 Read Set To Default Verify Parameter Copy

Open Save As

Function display

- Operation mode
- Common
 - Basic
 - Extension
 - Extension 2
 - Alarm setting
 - Tough drive
 - Drive record
- Position control
- Torque control
- Servo adjustment
 - Basic
 - Extension
 - Filter 1
 - Filter 2

Component parts

Selected Items Write Axis Writing

Regenerative option(**REG)

Regenerative option setting

Regen. option is not used

Servo amplifier

Brake output(MBR)

Uses electromagnetic brake interlock (MBR)

Electromagnetic brake sequence output

0 ms (0-1000)

Servo motor

Encoder cable(**COP1)

Encoder cable communication method sel.

Z-wire

Battery(*ABS, **COP4)

Absolute pos. detection system sel.

Disabled (Used in incremental system)

Home pos. set condition sel.

Z-phase must be passed

Parameter item	Function Explanation	Initial values	Setting for the Sample System
Absolute position detection system/Incremental system selection	Select Used in incremental system or Used in ABS pos. detect system.	Disabled (Used in incremental system)	Disabled (Used in incremental system)
home position setting condition select	When "Z-phase must not be passed" is selected, the home position return can be executed without waiting for the motor to rotate one time or more.	Z-phase must be passed	Z-phase must not be passed

2.3.4**Servo Parameter Settings (Component Parts)**

home position setting condition select	When "Z-phase must not be passed" is selected, the home position return can be executed without waiting for the motor to rotate one time or more.	Z-phase must be passed	Z-phase must not be passed
--	---	------------------------	----------------------------

2.3.5 Positioning Data Setting

Set positioning data based on the operation pattern of the system used in this course.

On the next page, operate the actual screen and configure the positioning data setting.

MELSOFT Simple Motion Module Setting Function D:\MELSEC IQ-F\FXS-40SSC-S_sample.px3 - [01:FXS-40SSC-S]-Axis #1 Positioning Data

Project Edit View Online Tools Window Help

Navigation 100%

Project

- 01:FXS-40SSC-S
 - System Setting
 - System Configuration
 - Mark Detection
 - Parameter
 - Servo Parameter
 - Positioning Data
 - Axis #1 Positioning Data
 - Axis #2 Positioning Data
 - Axis #3 Positioning Data
 - Axis #4 Positioning Data
 - Block Start Data
 - Synchronous Control Param
 - Cam Data
 - Simple Motion Monitor
 - Servo Amplifier Operation
 - Digital Oscilloscope

Display Filter: Display All Data Setting Assistant Offline Simulation Automatic Command Speed Calc. Automatic Sub Arc Calc.

No.	Control method	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	H code
1	0.3h:ABS Linear 1 <Positioning Comment>	-	0:1000	0:3000	100000.0 μm	0.0 μm	2000.00 mm/min	0 ms	0
2	0.3h:ABS Linear 1 <Positioning Comment>	-	0:1000	0:3000	0.0 μm	0.0 μm	8000.00 mm/min	0 ms	0
3	<Positioning Comment>								
4	<Positioning Comment>								
5	<Positioning Comment>								
6	<Positioning Comment>								
7	<Positioning Comment>								
8	<Positioning Comment>								
9	<Positioning Comment>								
10	<Positioning Comment>								
11	<Positioning Comment>								
12	<Positioning Comment>								
13	<Positioning Comment>								
14	<Positioning Comment>								
15	<Positioning Comment>								
16	<Positioning Comment>								
17	<Positioning Comment>								
18	<Positioning Comment>								
19	<Positioning Comment>								
20	<Positioning Comment>								
21	<Positioning Comment>								
22	<Positioning Comment>								

Assistant

Setting Procedure of Simple Motion Module

step 1: Simple Motion Module

step 2: Set the system configuration

step 3: Set the parameter

FX5U 日商 Insert CAP NUM

2.3.5

Positioning Data Setting



MELSOFT Simple Motion Module Setting Function D:\MELSEC IQ-F\FX5-40SSC-S_sample.gx3 - [01:FX5-40SSC-S[]-Axis #1 Positionin...

Project Edit View Online Tools Window Help

Navigation 01:FX5-40SSC-S[]-Axis #... x

Project

- 01:FX5-40SSC-S
 - System Setting
 - System Configuration
 - Mark Detection
 - Parameter
 - Servo Parameter
 - Positioning Data
 - Axis #1 Positioning Data
 - Axis #2 Positioning Data
 - Axis #3 Positioning Data
 - Axis #4 Positioning Data
 - Block Start Data
 - Synchronous Control Parameter
 - Cam Data
 - Simple Motion Monitor
 - Servo Amplifier Operation
 - Digital Oscilloscope

Display Filter Display All Data Setting Assistant Offline Simulation Automatic Command Sp

No.	Operation pattern	Control method	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address
1	1:CONT <Positioning Comment>	01h:ABS Linear 1	-	0:1000	0:1000	100000.0 μm
2	0:END <Positioning Comment>	01h:ABS Linear 1	-	0:1000	0:1000	0.0 μm
3	<Positioning Comment>					
4	<Positioning Comment>					
5	<Positioning Comment>					
6	<Positioning Comment>					
7	<Positioning Comment>					
8	<Positioning Comment>					
9	<Positioning Comment>					
10	<Positioning Comment>					
11	<Positioning Comment>					

Setting positioning data is completed.
Click to proceed to the next screen.

FX5U Host-192.168.3.250

2.3.6

Writing to the Simple Motion Module

Write the set parameters and positioning data into the Simple Motion module.

Before writing them, save the project. (Refer to Section 2.2.7.)

1) Select [Online] - [Write to PLC] in the menu to display the Online Data Operation window.

2) Select Simple Motion Module Setting.

3) Click [Execute] to start writing the selected items to the Simple Motion module.

4) Click [Close] after completion of the writing.

Power on the PLC after completion of the writing.

The screenshot displays the MELSOFT GX Works3 interface. On the left, the 'Online' menu is open, with 'Write to PLC...' highlighted by a red box and arrow labeled '1)'. The main window, 'Online Data Operation', shows a tree view of data items. The 'Simple Motion Module Setting:01:FXS...' item is selected, and its checkbox is checked, indicated by a red box and arrow labeled '2)'. Below the tree view, there are memory usage statistics for Data Memory, SD Memory Card, and Program, with 'Execute' and 'Close' buttons at the bottom right. A red box and arrow labeled '3)' points to the 'Execute' button. In the bottom left, a confirmation dialog box titled 'MELSOFT GX Works3' asks 'Overwrite contents of flash ROM. Are you sure you want to continue?'. The 'Yes' button is highlighted with a red box and arrow labeled '4)'. A red box and arrow labeled '3)' also points to the 'Execute' button in the Online Data Operation window.

Online Data Operation

Display Setting Related Functions

Parameter + Program(E) Select All Legend
 Open/Close All(T) Deselect All(N) CPU Built-inMemory SD Memory Card Intelligent Function Module

Module Name/Data Name	Detail	Title	Last Change	Size (Byte)
FXS-48SSC-S_sample				
Parameter				
System Parameter/CPU Parameter			2015/12/07 14:58:56	Not Calculation
Module Parameter			2015/12/07 14:58:56	Not Calculation
Simple Motion Module Setting:01:FXS...	<input checked="" type="checkbox"/>	Detail	2015/11/27 16:22:24	Not Calculation
Memory Card Parameter			2015/11/27 16:02:02	Not Calculation
Remote Password			2015/11/27 16:02:02	Not Calculation
Global Label				
Global Label Setting			2015/12/21 16:47:11	Not Calculation
Program				
MAIN			2015/12/21 16:47:08	Not Calculation
POU				

The confirmation message window for flash ROM overwriting appears. Click [Yes].

MELSOFT GX Works3

Overwrite contents of flash ROM. Are you sure you want to continue?

Yes No

Free 62949/64000Step

Free

Program:993/1024KB Restoration Info:987/1024KB Parameter:1012/1024KB Device Comment:2048/2048KB

Free

SD Memory Card

Program:0/0KB Restoration Info:0/0KB Parameter:0/0KB Device Comment:0/0KB

Free

0/0KB

Execute Close

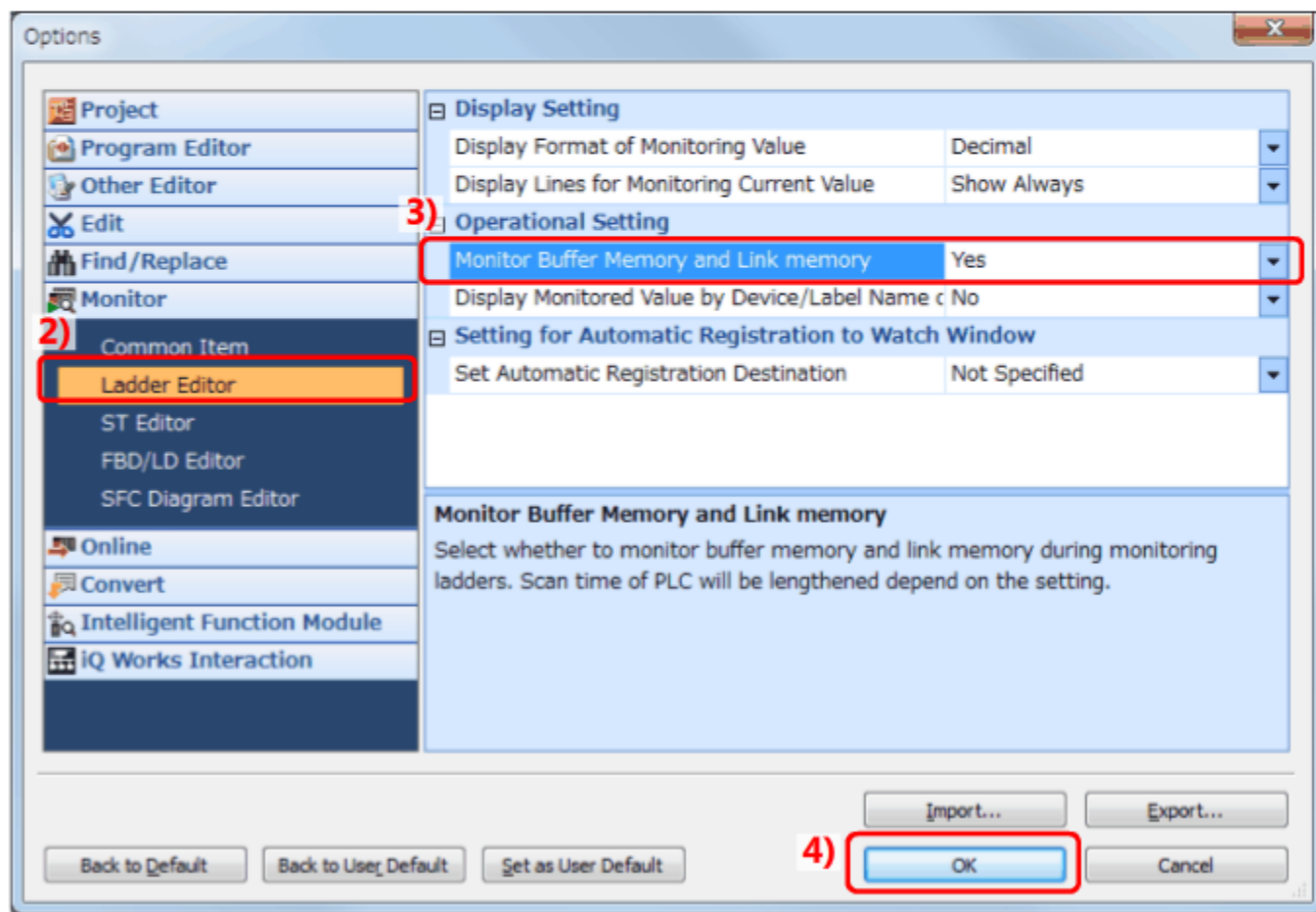
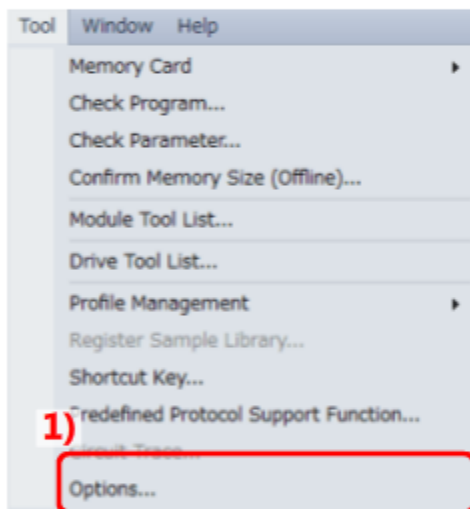
2.4

Operation Check

Check the operation of the system in this course.

Before the operation check, set some items so that the buffer memory can be monitored on the monitor window of GX Works3.

- 1) Select [Tool] → [Options] from the menu to display the following window.
- 2) Select [Monitor] → [Ladder Editor].
- 3) Set [Monitor Buffer Memory and Link Memory] of "Operational Setting" to [Yes].
- 4) Click the [OK] button.



2.4.1 JOG Operation

Check the operation with the JOG operation.

On the next page, operate the actual screen and check the operation with the JOG operation.

The screenshot displays the 'Axis Monitor' window for a MELSEC iQ-F Series Simple Motion Module. The window is divided into two main sections: 'Axis Monitor' and 'Module Information List'.

Axis Monitor Section:

- Monitor Type:** Axis (Output Axis)
- Font Size:** 9pt
- Select Monitor Item:** (Grid icon)
- Select Monitor Axis:** (Grid icon)

Item	Axis #1
Md.20:Feed current value	0.0 μm
Md.21:Machine feed value	0.0 μm
Md.23:Axis error No.	-
Md.24:Axis warning No.	-
Md.26:Axis operation status	Waiting
Md.28:Axis feed speed	0.00 mm/min
Md.44:Positioning data No. being executed	-
Md.47:Positioning data being executed : Operation pattern	Positioning Complete
Md.47:Positioning data being executed : Control method	-
Md.47:Positioning data being executed : Acceleration time No.	0:1000
Md.47:Positioning data being executed : Deceleration time No.	0:1000
Md.47:Positioning data being executed : Axis to be interpolated	-
Md.47:Positioning data being executed : M-code	-
Md.102:Deviation counter	0 pulse
Md.103:Motor rotation speed	0.00 r/min
Md.104:Motor current value	0.0 %
Md.108:Servo status 1 : Servo alarm	OFF
Md.108:Servo status 1 : Servo warning	OFF
Md.114:Servo alarm	-
Md.31:Status : HPR request flag	OFF
Md.31:Status : HPR complete flag	ON

Module Information List Section:

- PLC READY (J1WG5950) ●
- READY (J1WG31500.0) ●
- Synchronization flag (J1WG31500.0) ●
- All axes servo ON (J1WG5951) ●
- Md.108:Servo status 1 - READY ON
 - Axis No. 1 2 3 4
- Md.108:Servo status 1 - Servo ON
 - Axis No. 1 2 3 4
- Md.50:Forced stop input (J1WG4231) ●
 - Axis No. 1 2 3 4
- Md.31:Status : Error detection
 - Axis No. 1 2 3 4
- Md.31:Status : Axis warning detection
 - Axis No. 1 2 3 4
- Md.51:AMP-less operation mode (J1WG4232) ●
- Md.133:Operation cycle over flag (J1WG4236) ●
- Md.134:Operation time (J1WG4006)
 - 100 μs
- Md.135:Maximum operation time (J1WG4009)
 - 240 μs
- Md.19:No. of Flash ROM writing (J1WG4224)
 - 0 times
- Md.52:Searching flag for driver communication ex...
 - Complete of searching for driver co...
- Md.53:SSCNET control status (J1WG4233)
 - Waiting for command accepted
- Md.131:Digital OSC. running flag (J1WG4011)
 - Stopped

2.4.1

JOG Operation



MELSOFT Simple Motion Module Setting Function D:\MELSEC IQ-F\FX5-40SSC-S_sample.gx3 - [01:FX5-40SSC-S[]-Servo parameter]

Project Edit View Online Window Help



Navigation

Project

 01:FX5-40SSC-S
 System Setting
 System Configuration
 Mark Detection
 Parameter
Servo Parameter
 Positioning Data
 Block Start Data
 Synchronous Control Par

01:FX5-40SSC-S[]-Servo ...

Axis1 Read Set To Default Verify Parameter Copy

Open Save As

 Function display
 Operation mode
 Common
 Basic
 Extension
 Extension
 Alarm set
 Tough drive
 Drive reception
 Component parameter

Common - Basic

Selected Items Write

Rotation direction(*POL)

Rotation direction selection

CW dir. during fwd. pls. input, CCW dir. during rev. pls. input

Forced stop(*AOP1)

Servo forced stop selection

Enabled (Use forced stop input EM1 or EM2)

Encoder output pulse(*ENRS, *ENR, *

Encoder output pulse phase

Advance A-phase 90° by CCW

Number of encoder output pulse

Enc

Zero speed(ZSP)


Servo Parameter Help

ROTATION DIRECTION/MOVING DIRECTION

Select the rotation direction/moving direction of the command input pulse.

[Link list](#)

The JOG operation check is completed.

Click  to proceed to the next screen.

FX5U

Host-192.168.3.250

2.4.2

Home Position Return

Perform the home position return.

Perform the data set type home position return in this course.

On the next page, operate the actual screen and perform the home position return.

The screenshot displays the 'Axis Monitor' window for '01:FX3-40SSC-S - Axis Monitor'. The interface is divided into two main sections: 'Axis Monitor' and 'Module Information List'.

Axis Monitor Section:

- Monitor Type:** Axis (Output Axis)
- Font Size:** 10pt
- Buttons:** Select Monitor Item, Select Monitor Axis
- Table:** A table with 'Axis #1' as the header. It lists various parameters such as feed current value (78666.6 μm), machine feed value (78666.6 μm), axis error No. (-), axis warning No. (-), axis operation status (Position Control), axis feed speed (2000.00 mm/min), positioning data No. being executed (1), and positioning data being executed (Continuous Positioning Control). Other parameters include acceleration and deceleration times (0:1000), M-code (-), deviation counter (0 pulse), motor rotation speed (399.99 r/min), motor current value (0.0 %), servo status 1 (OFF), and external input signals (ON).

Module Information List Section:

- PLC READY (J19G595):** ON
- READY (J19G1500.0):** ON
- Synchronization flag (J19G1500.0):** ON
- All axes servo ON (J19G595.0):** ON
- Mel 108: Servo status 1: READY ON:** Axis No. 1, 2, 3, 4
- Mel 108: Servo status 1: Servo ON:** Axis No. 1, 2, 3, 4
- Mel 50: Forced stop input (J19G4231):** OFF
- BUSY:** Axis No. 1, 2, 3, 4
- Mel 31: Status: Error detection:** Axis No. 1, 2, 3, 4
- Mel 31: Status: Axis warning detection:** Axis No. 1, 2, 3, 4
- Mel 51: AMP-less operation mode (J19G4232):** OFF
- Mel 133: Operation cycle over flag (J19G4236):** OFF
- Mel 134: Operation time (J19G4035):** 199 μs
- Mel 135: Maximum operation time (J19G4036):** 245 μs
- Mel 10: No. of Flash-ROM writing (J19G4224):** 0 times
- Mel 52: Searching flag for driver communication error:** Complete of searching for driver communication error
- Mel 53: SSCNET control status (J19G4233):** Waiting for command accepted
- Mel 131: Digital CSC running flag (J19G4011):** Stopped

2.4.2

Home Position Return



01:FX5-40SSC-S - Axis Monitor

Axis Monitor

Monitor Type:

Axis(Output Axis)

Font Size:

9pt

Select

	Axis #1
Md.28:Axis feed speed	0.00 mm/min
Md.44:Positioning data No. being executed	-
Md.47:Positioning data being executed : Operation pattern	Positioning Complete
Md.47:Positioning data being executed : Control method	-
Md.47:Positioning data being executed : Acceleration time No.	0:1000
Md.47:Positioning data being executed : Deceleration time No.	0:1000
Md.47:Positioning data being executed : Axis to be interpolated	-
Md.47:Positioning data being executed : M-code	-
Md.102:Deviation counter	0 pulse
Md.103:Motor rotation speed	0.00 r/min
Md.104:Motor current value	0.0 %
Md.108:Servo status 1 : Servo alarm	-
Md.108:Servo status 1 : Servo warning	-
Md.114:Servo alarm	-
Md.31:Status : HPR request flag	OFF
Md.31:Status : HPR complete flag	ON

Md.31: Status: HPR request flag turns OFF.
Md.31: Status: HPR complete flag turns ON.

Module Information List

- PLC READY(U1%G5950)
- READY(U1%G31500.0)
- Synchronization flag(U1%G31500.1)
- All axes servo ON(U1%G5951)
- Md. 108:Servo status 1 : READY ON
Axis No. 1 2 3 4
- Md. 108:Servo status 1 : Servo ON
Axis No. 1 2 3 4
- Md. 50:Forced stop input(U0%G4231)
- BUSY
Axis No. 1 2 3 4
- Md. 31:Status : Error detection
Axis No. 1 2 3 4
- Md. 31:Status : Axis warning detection
Axis No. 1 2 3 4
- Md. 51:AMP-less operation mode(U1%G4232)
- Md. 133:Operation cycle over flag(U1%G4239)
- Md. 134:Operation time(U1%G4008)

The home position return operation check is completed.

Click to proceed to the next screen.

0 times

2.4.3

Positioning Control

Check the operation with the positioning control.

On the next page, operate the actual screen and check the operation with the positioning control.

The screenshot displays the '01:FX5-40SSC-S - Axis Monitor' software window. It is divided into two main sections: 'Axis Monitor' and 'Module Information List'.

Axis Monitor: This section shows a table of monitoring data for various axes. The 'Monitor Type' is set to 'Axis (Output Axis)'. The table lists parameters such as feed current, machine feed, axis error, and positioning status for multiple axes.

Item	Value
Md.20:Feed current value	78666.6 μm
Md.21:Machine feed value	78666.6 μm
Md.23:Axis error No.	-
Md.24:Axis warning No.	-
Md.26:Axis operation status	Position Control
Md.28:Axis feed speed	2000.00 mm/min
Md.44:Positioning data No. being executed	1
Md.47:Positioning data being executed : Operation pattern	Continuous Positioning Control
Md.47:Positioning data being executed : Control method	1-axis linear control (ABS)
Md.47:Positioning data being executed : Acceleration time No.	0:1000
Md.47:Positioning data being executed : Deceleration time No.	0:1000
Md.47:Positioning data being executed : Axis to be interpolated	-
Md.47:Positioning data being executed : M-code	-
Md.102:Deviation counter	0 pulse
Md.103:Motor rotation speed	399.99 (1/min)
Md.104:Motor current value	0.0 %
Md.108:Servo status 1 : Servo alarm	OFF
Md.108:Servo status 1 : Servo warning	OFF
Md.114:Servo alarm	-
Md.30:External input signal : Lower limit	ON
Md.30:External input signal : Upper limit	ON
Md.31:Status : HPR request flag	OFF
Md.31:Status : HPR complete flag	OFF

Module Information List: This section provides a detailed status for various modules. It includes indicators for PLC readiness, synchronization, servo status, forced stop inputs, and error detection for axes 1 through 4.

- PLC READY (JRG5950): ON
- READY (JRG1500.0): ON
- Synchronization flag (JRG1500.0): ON
- All axes servo ON (JRG595.0): ON
- Md.108:Servo status 1 : READY ON (Axis No. 1, 2, 3, 4)
- Md.108:Servo status 1 : Servo ON (Axis No. 1, 2, 3, 4)
- Md.50:Forced stop input (JRG4231): OFF
- BUSY (Axis No. 1, 2, 3, 4): OFF
- Md.31:Status : Error detection (Axis No. 1, 2, 3, 4): OFF
- Md.31:Status : Axis warning detection (Axis No. 1, 2, 3, 4): OFF
- Md.51:AMP less operation mode (JRG4232): OFF
- Md.133:Operation cycle over flag (JRG4236): OFF
- Md.134:Operation time (JRG4000): 199 μs
- Md.135:Maximum operation time (JRG4000): 245 μs
- Md.10:No. of Flash ROM writing (JRG4224): 0 times
- Md.52:Searching flag for driver communication ax...: Complete of searching for driver co...
- Md.53:SSCNET control status (JRG4233): Waiting for command accepted
- Md.131:Digital CSC, running flag (JRG4011): Stopped

2.4.3

Positioning Control



01:FX5-40SSC-S - Axis Monitor

Axis Monitor

Monitor Type:

Axis(Output Axis)

Font Size:

9pt

Select

	Axis #1
Md.47:Positioning data being executed : Control method	-
Md.47:Positioning data being executed : Acceleration time No.	0:1000
Md.47:Positioning data being executed : Deceleration time No.	0:1000
Md.47:Positioning data being executed : Axis to be interpolated	-
Md.47:Positioning data being executed : M-code	-
Md.102:Deviation counter	0 pulse
Md.103:Motor rotation speed	0.00 r/min
Md.104:Motor current value	0.0 %
Md.108:Servo status 1 : Servo alarm	OFF
Md.108:Servo status 1 : Servo warning	OFF
Md.114:Servo alarm	-
Md.30:External input signal : Lower limit	ON
Md.30:External input signal : Upper limit	-
Md.31:Status : HPL request flag	OFF
Md.31:Status : HPR complete flag	OFF

Md.31: Status: HPR complete flag turns OFF.

Module Information List

- PLC READY(U1%G5950)
- READY(U1%G31500.0)
- Synchronization flag(U1%G31500.1)
- All axes servo ON(U1%G5951)
- Md. 108:Servo status 1 : READY ON
Axis No. 1 2 3 4
- Md. 108:Servo status 1 : Servo ON
Axis No. 1 2 3 4
- Md. 50:Forced stop input(U1%G4231)
- BUSY
Axis No. 1 2 3 4
- Md. 31:Status : Error detection
Axis No. 1 2 3 4
- Md. 31:Status : Axis warning detection
Axis No. 1 2 3 4
- Md. 51:AMP-less operation mode(U1%G4232)
- Md. 133:Operation cycle over flag(U1%G4239)
- Md. 134:Operation time(U1%G4008)

The positioning control operation check is completed.
Click to proceed to the next screen.

0 times

2.5**Summary of This Chapter**

In this chapter, you have learned:

- Creating a New Project
- Sequence Program Creation
- Parameter Settings for Simple Motion Module
- Operation Check

Important points

Creating a New Project	<ul style="list-style-type: none">• Use MELSOFT GX Works3 to create a project and sequence program.• The contents in this course require MELSOFT GX Works3 of version 1.011M or later.
Sequence Program Creation	<ul style="list-style-type: none">• The use of label and function block (FB) removes the need to remember devices when programming.• Check the "Enable Multiple Comments Display" box and "Target" boxes for each language to switch the language for comments in sequence programs.
Parameter Settings for Simple Motion Module	<ul style="list-style-type: none">• Double-click [Simple Motion Module Setting] in the menu of MELSOFT GX Works3 to open the Simple Motion Module Setting Function window.
Operation Check	<ul style="list-style-type: none">• Double-clicking a device while pressing the SHIFT key changes the status of the device from OFF to ON, and vice versa.

Chapter 3 SYNCHRONOUS CONTROL STARTUP

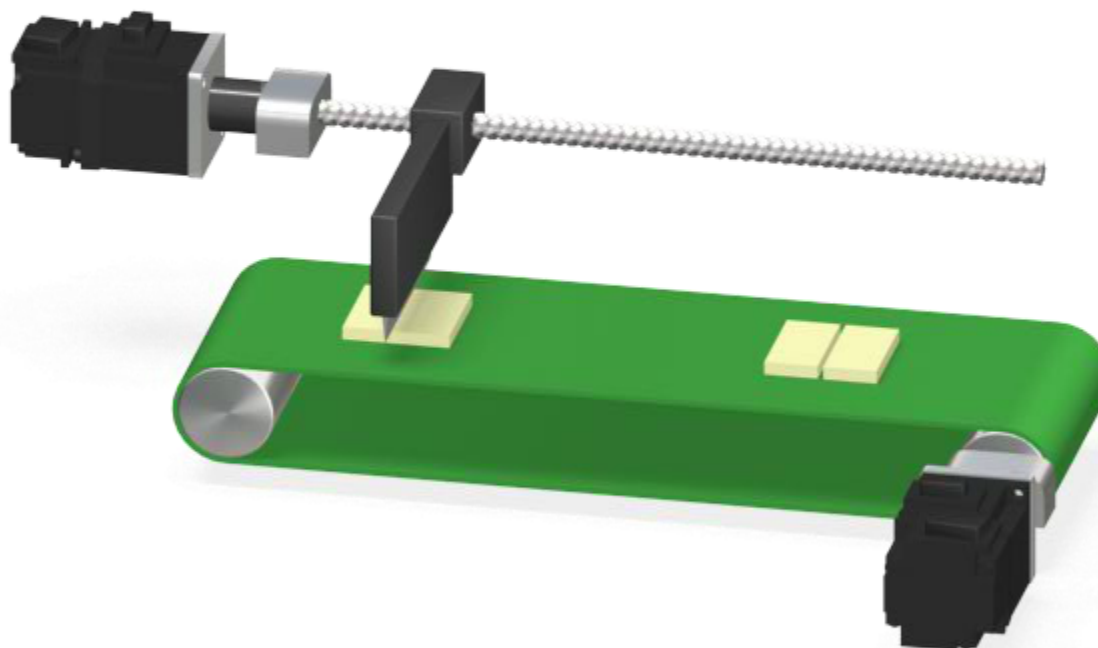
This chapter describes synchronous control, mainly about the synchronous control parameter, positioning data for synchronous control, and operation check for synchronous control.

Axis 1 operation is the same as that described in Chapter 1.

Refer to Chapter 1 to 2 for details of the parameters and servo parameters.

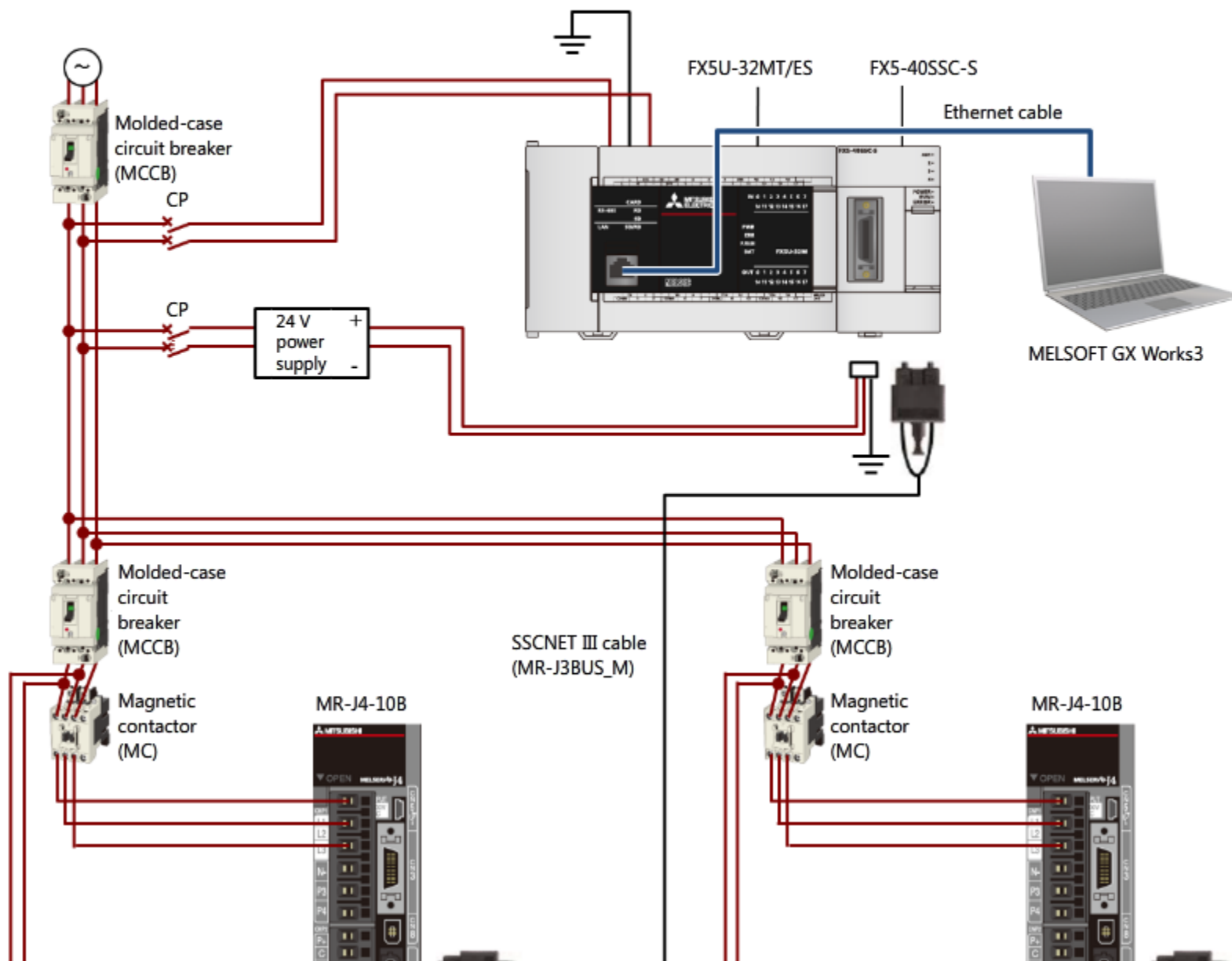
For the operation pattern diagram and machine specifications, check the following PDF file.

[Sample system details \(Synchronous control\) <PDF>](#)

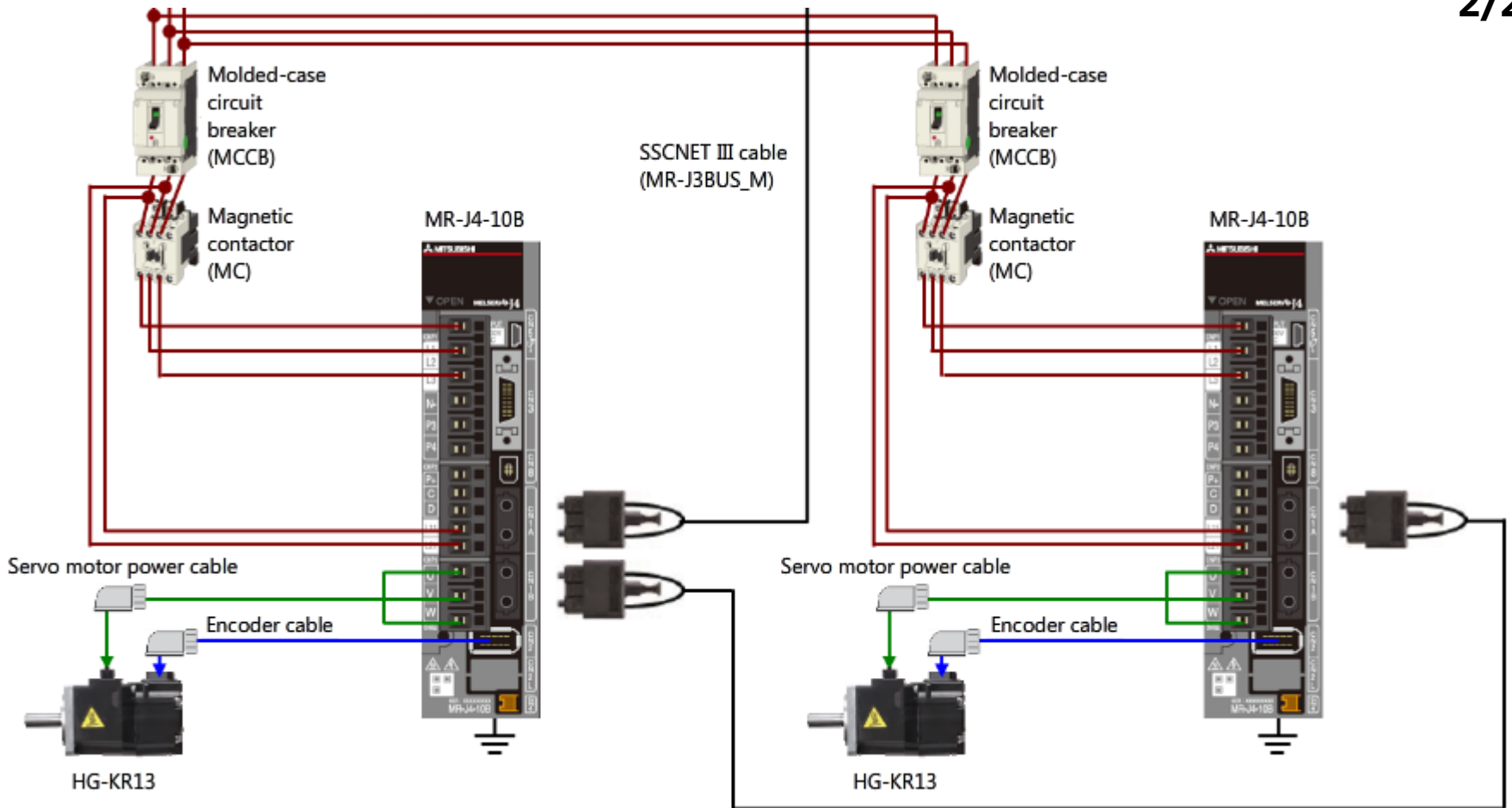


3.1 System Configuration

The following shows the configuration of the sample system used in this chapter.



3.1 System Configuration



The following shows the synchronous control startup procedure.

(1) System Configuration Settings Section 3.3.1



(2) Parameters and Servo Parameters Settings Section 3.3.2



(3) Positioning Data Settings Section 3.3.3



(4) Synchronous Control Parameter Settings Section 3.3.4

- Synchronous parameter settings
- Input axis parameter settings
- Transition of synchronous control parameter window



(5) Cam Data Creation Section 3.3.5

- Creating a new cam data
- Cam curve creation



(6) Writing to the Simple Motion Module Section 3.3.6

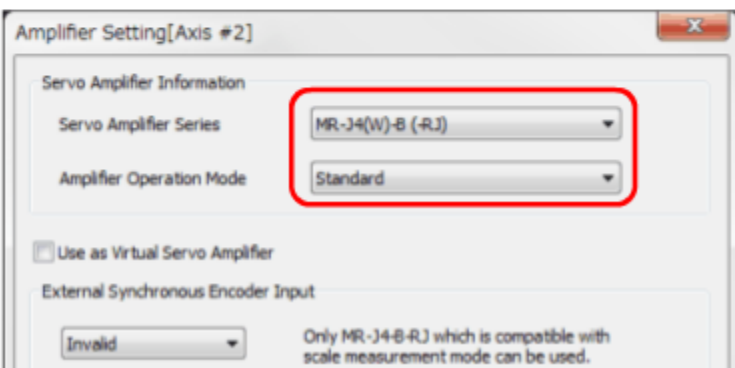
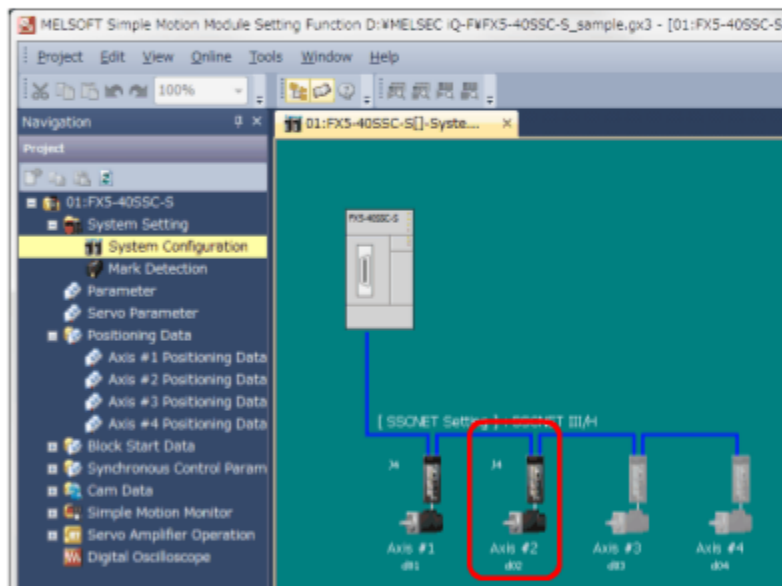
3.3 Parameter Creation for Synchronous Control

Create parameters for synchronous control.

3.3.1 System Configuration Settings

Configure a 2-axis system.

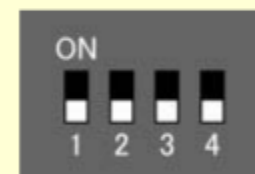
Add an axis in the System Configuration window.



Axis selection rotary switch (SW1)



Auxiliary axis number setting switch (SW2) (Note)



(Note) Turn "off (down)" all auxiliary axis number setting switches (SW2).

3.3.2

Parameters and Servo Parameters Settings

Set parameters and servo parameters for axis 2.

The following shows the setting details of the electronic gear setting for the belt conveyor.

Compute Basic Parameters 1 - Axis #1

Entry

Select the machine components, and enter the machine data to automatically set the basic parameters 1 (unit setting, No. of pulses per rotation, movement amount per rotation and unit magnification).

Machine Components: Conveyor

Unit Setting: 0mm

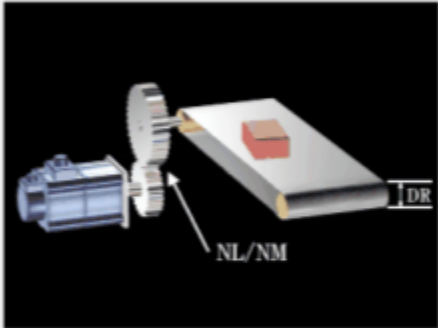
Outer diameter of Roll (DR): 50000.0 [μm]

Reduction Gear Ratio (NL/NM): = 1 / 1

Calculate reduction ratio by teeth or diameters [Reduction Ratio Setting]

Encoder Resolution: 4194304 [pulse/rev]

Setting Range:



Compute Basic Parameters 1

Calculation Result

Basic Parameters 1	
Unit Setting	0mm
No. of Pulses per Rotation	172985333 pulse
Movement Amount per Rotation	6478422.3 μm
Unit Magnification	1: x1 Times

Movement Amount per Pulse

As a result of calculation, some error occurs in the movement amount.

Applying the calculation result above,

you want to perform is about 0.0 [μm] the error for the movement amount 0.0 [μm] [Error Calculation]

Click OK to reflect to the basic parameters 1.

OK Cancel

[Input]

Item	Description
Machine Components	Conveyor
Unit Setting	0:mm
Outer diameter of Roll	50000.0 [μm]
Reduction Gear Ratio (NL/NM)	
Load side [NL]	1
Motor side [NM]	1
Encoder resolution	4194304 [pulse/rev]

[Calculation Result]

Item	Description
Unit Setting	0:mm
Number of Pulses per Rotation	172985333 pulse
Movement Amount per Rotation	6478422.3 μm
Unit Magnification	1: x1 times

3.3.3 Positioning Data Settings

Set Axis #2 Positioning Data.

The screenshot displays the MELSOFT Simple Motion Module Setting Function interface. The title bar indicates the project is '01:FX5-40SSC-S[]-Axis #2 Positioning Data'. The left-hand navigation pane shows a tree view with 'Axis #2 Positioning Data' selected and highlighted in yellow. A red arrow points from this selection to the main data table. The table has columns for No., Operation pattern, Control method, Axis to be interpolated, Acceleration time No., Deceleration time No., Positioning address, Arc address, Command speed, and Dwell time. The first row (No. 1) contains the following data: Operation pattern '0:END', Control method '02h:INC Linear 1', Axis to be interpolated '-', Acceleration time No. '0:1000', Deceleration time No. '0:1000', Positioning address '157079.6 μm', Arc address '0.0 μm', Command speed '2000.00 mm/min', and Dwell time '0 ms'. The rest of the rows (2-12) contain '<Positioning Comment>'. The status bar at the bottom shows 'FX5U', '自局', 'Insert', 'CAP', and 'NUM'.

No.	Operation pattern	Control method	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time
1	0:END	02h:INC Linear 1	-	0:1000	0:1000	157079.6 μm	0.0 μm	2000.00 mm/min	0 ms
2	<Positioning Comment>								
3	<Positioning Comment>								
4	<Positioning Comment>								
5	<Positioning Comment>								
6	<Positioning Comment>								
7	<Positioning Comment>								
8	<Positioning Comment>								
9	<Positioning Comment>								
10	<Positioning Comment>								
11	<Positioning Comment>								
12	<Positioning Comment>								

[Axis 2 positioning data]

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	Mcode
1	0: END	INC linear 1	-	1:1000	1:1000	157079.6 μm	0.0 μm	2000.00 mm/min	0 ms	0

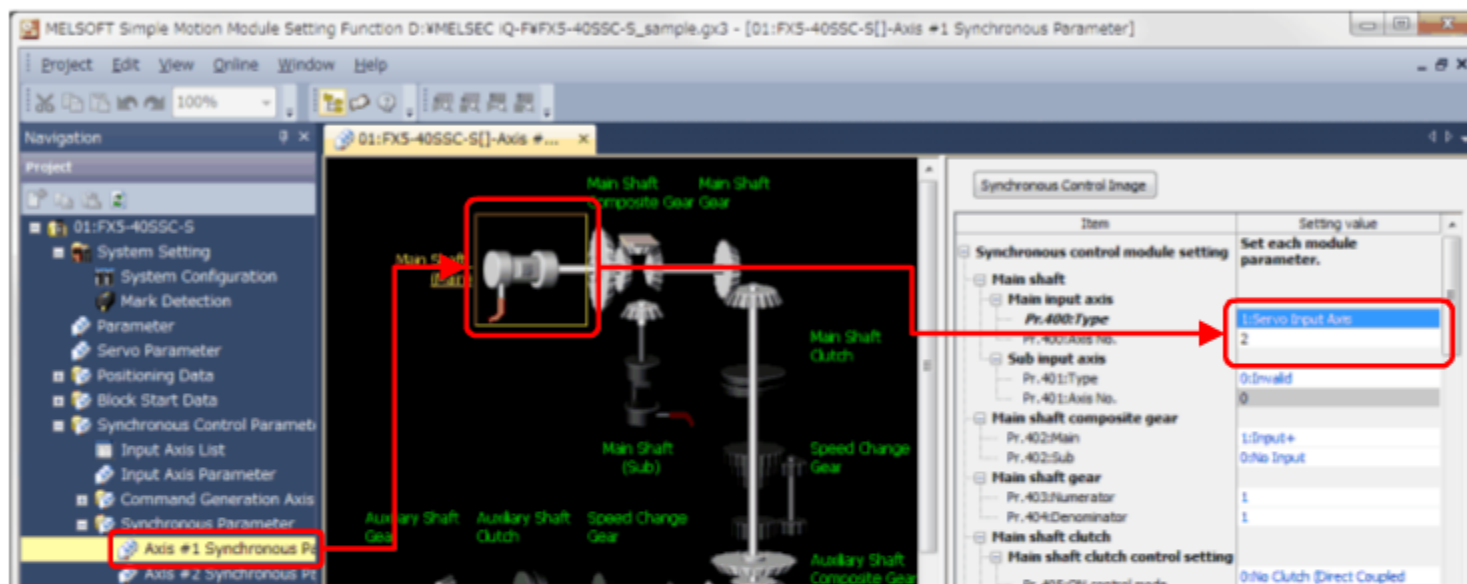
3.3.4 Synchronous Control Parameter Settings

Set parameters for axis 1 which synchronizes to the input axis (axis 2) feed current value in cam operation.

Item	Description
Input axis parameter	Set the servo input axis type for the main shaft. (Set "1: Feed current value " for axis 2)
Axis 1 synchronous control	Set the axis 1 synchronous control parameter.
Synchronous control image	The configuration of output axes connected to the main shaft is displayed. The configuration of input/output axes can be checked at a glance.

3.3.4 Synchronous Parameter Settings

The following explains the settings that synchronize the axis 1 to the axis 2 feed current value. Select [Axis #1 Synchronous Parameter] in the Navigation menu, and select [Main shaft (Main)] to display the parameters of the main shaft.

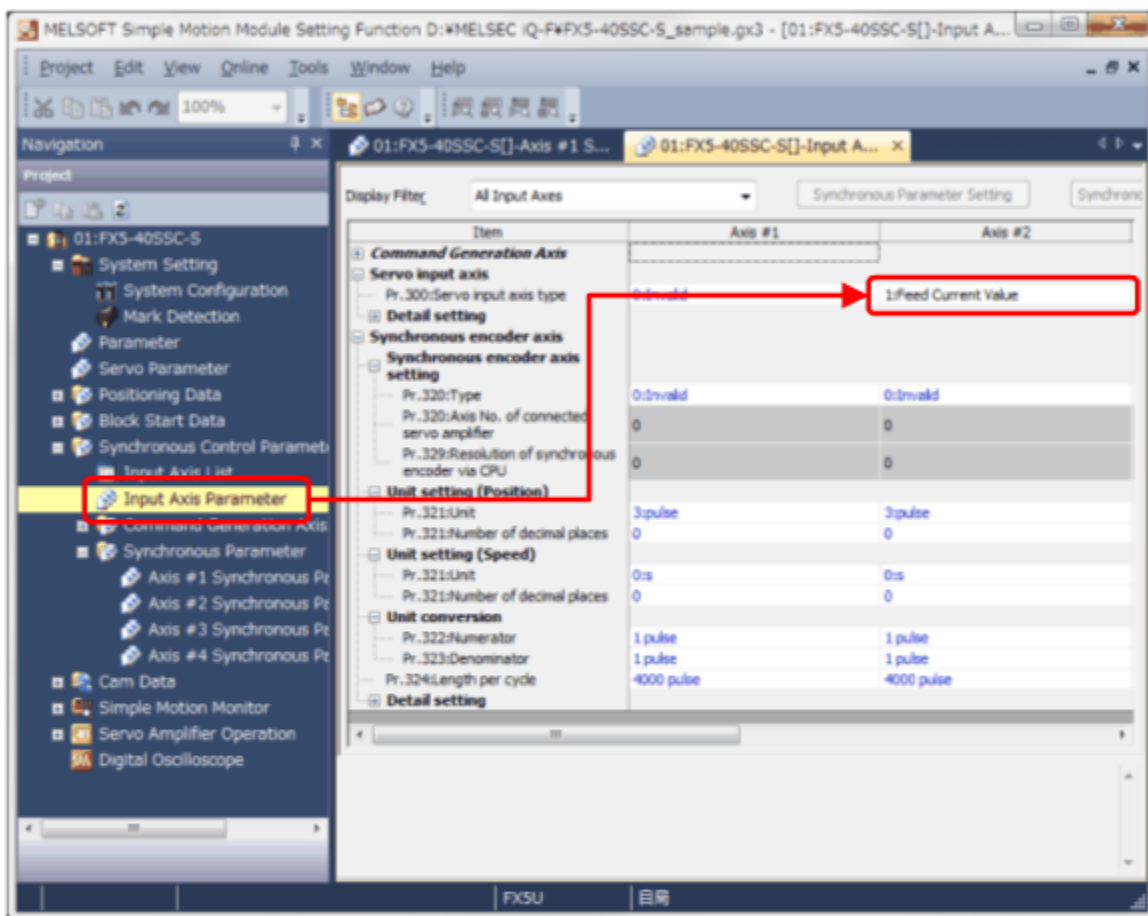


Change the following parameters. Use the default values for the synchronous parameters other than the following.

Item		Description
Main shaft	Main input axis No.	Pr.400: Type
		Pr.400: Axis No.
Output axis	Cam axis cycle unit setting	Pr.438: Unit
		Pr.438: Number of decimal places
	Pr.439: Can axis length per cycle	
	Pr.441: Cam stroke amount	
Pr.440: Cam No.		

3.3.4 Input Axis Parameter Settings

The following explains the settings that synchronize the axis 1 to the axis 2 feed current value. Select [Input Axis Parameter] in the Navigation menu to display the Input Axis Parameter window.



Change the following parameters. Use the default values for the I/O axis parameters other than the following.

Item	Description
Servo input axis	Pr.300: Servo input axis type
	1: Feed current value

3.3.4

Transition of Synchronous Control Parameter Window

The following shows the synchronous parameter window transition.

[Synchronous parameter]

(2) Click [Synchronous Control Image] to open the image screen.

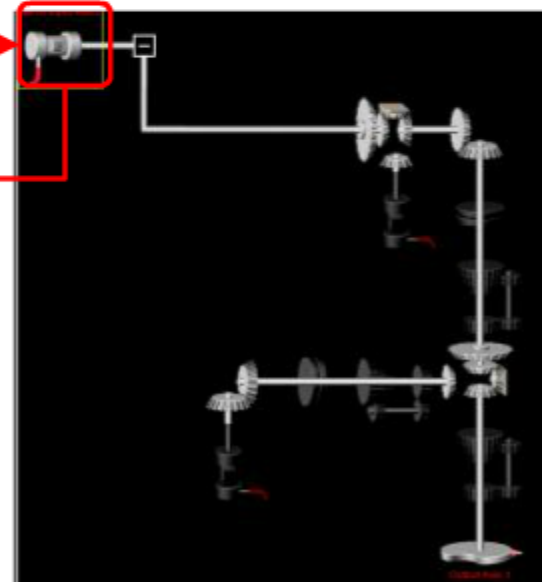
(1) Select [Axis # 1 Synchronous Parameter] in the menu. Then, the axis 1 synchronous parameter can be changed.

[Synchronous control image]

[Input axis parameter]

Item	Axis #1	Axis #2	Axis #3	Axis #4
Servo input axis	0:Invalid	0:Invalid	0:Invalid	0:Invalid
Pr. 300: Servo input axis type	0:Invalid	0:Invalid	0:Invalid	0:Invalid
Pr. 301: Input smoothing time constant	0 ms	0 ms	0 ms	0 ms
Pr. 302: Phase compensation advance time	0 μs	0 μs	0 μs	0 μs
Pr. 303: Phase compensation time constant	10 ms	10 ms	10 ms	10 ms
Pr. 304: Rotation direction restriction	0:Without Rotation Direction Restriction	0:Without Rotation Direction Restriction	0:Without Rotation Direction Restriction	0:Without Rotation Direction Restriction

(3) Select the main shaft to open the input axis parameter. Parameters related to the input axis (axis 2) can be set.



3.3.5

Cam Data Creation

Create cam data.

On the next page, operate the actual screen and create cam data.

MELSOFT Simple Motion Module Setting Function D:\MELSEC_iQ-F\FX5-40SSC-S_sample.gx3 - [01:FX5-40SSC-S]-Cam Data No.001[]

Project Edit View Online Window Help

Navigation 01:FX5-40SSC-S-Cam D... x

Project

- 01:FX5-40SSC-S
 - System Setting
 - System Configuration
 - Mark Detection
 - Parameter
 - Servo Parameter
 - Positioning Data
 - Block Start Data
 - Synchronous Control Param
 - Input Axis List
 - Input Axis Parameter
 - Command Generation Ax
 - Synchronous Parameter
 - Axis #1 Synchronous
 - Axis #2 Synchronous
 - Axis #3 Synchronous
 - Axis #4 Synchronous
 - Cam Data
 - Cam_Data_List
 - No.001
 - Simple Motion Monitor
 - Servo Amplifier Operation
 - Digital Oscilloscope

Setting Method : Stroke Ratio (Cam Curve)

Resolution : 256

Stroke Setting Range : -100.000000 to 100.000000 [%]

Return to Basic Setting

Cam Graph

Display Graph

Stroke Speed Acceleration Jerk

Display Magnification

Width 100 %Height 100 % W/H 100% Screen

Point Data View

100.000000

0.000000

-100.000000

0.00000 90.00000 180.00000 270.00000 360.00000 [degree]

Stroke Setting

Fine-tune the cam curve by section

Section	Start [degree]	End [degree]	Stroke [%]	Cam Curve
1	0.00000	1.60000	0.0929926	Constant Speed
2	1.60000	3.20000	0.3628677	Constant Speed
3	3.20000	4.80000	0.7632080	Constant Speed
4	4.80000	6.40000	1.3128677	Constant Speed
5	6.40000	8.00000	1.9000000	Constant Speed
6	8.00000	228.47400	98.3000000	Constant Speed
7	228.47400	230.07400	98.6871323	Constant Speed

FX5U 0.00 NUM

3.3.5

Cam Data Creation



MELSOFT Simple Motion Module Setting Function D:\MELSEC IQ-F\FX5-40SSC-S_sample.gx3 - [01:FX5-40SSC-S[]-Cam Data No.001[]]

Project Edit View Online Window Help

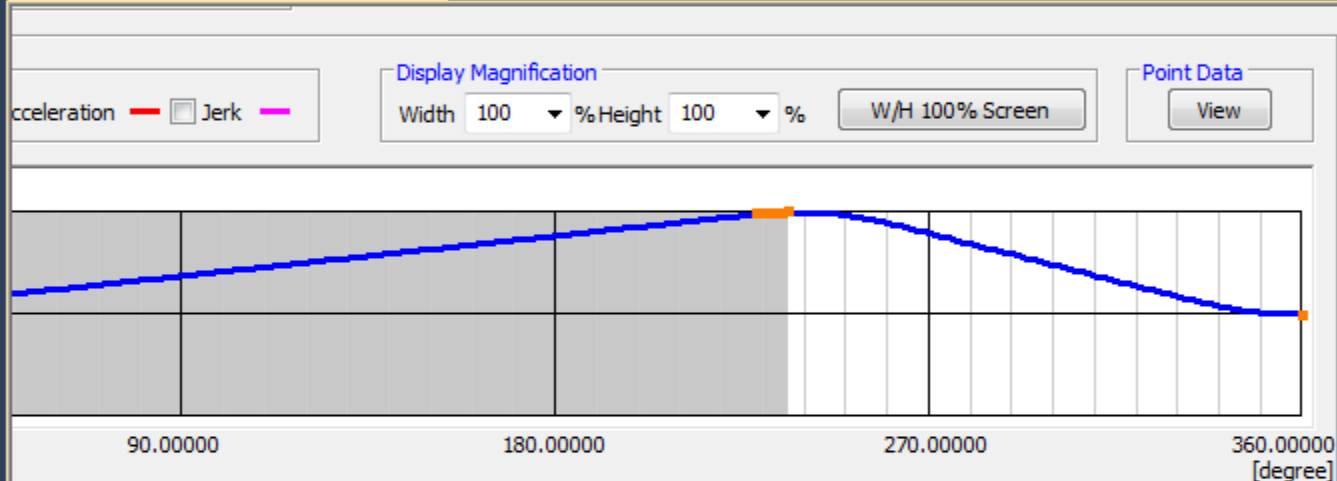


Navigation

Project

- 01:FX5-40SSC-S
 - System Setting
 - Parameter
 - Servo Parameter
 - Positioning Data
 - Block Start Data
 - Synchronous Control Param
 - Cam Data
 - Cam_Data_List
 - No.001
 - Simple Motion Monitor
 - Servo Amplifier Operation
 - Digital Oscilloscope

01:FX5-40SSC-S[]-Cam D... x



Fine-tune the cam curve by section

id [degree]	Stroke [%]	Cam Curve
236.47400	100.0000000	Constant Speed
0.00000	0.0000000	Dist.Const.Speed

Cam data creation is completed.

Click to proceed to the next screen.

3.4**Operation Check for Synchronous Control**

Check the operation of synchronous control.

Save the project first. (Refer to Section 2.2.7.)

After saving the project, write the synchronous control parameters and cam data into the Simple Motion module.
(Refer to Section 2.3.6.)

3.4.1

Starting the Synchronous Control and Checking the Operation

Start the synchronous control and check the operation.

On the next page, operate the actual screen and start the synchronous control and check the operation.

Axis Monitor Monitor Type: Axis(Output Axis) Font Size: 10pt Select Monitor Item Select Monitor Axis

	Axis #1	Axis #2
Md.20:Feed current value	73057.8 μm	277464.7 μm
Md.21:Machine feed value	73057.8 μm	277464.7 μm
Md.23:Axis error No.	-	-
Md.24:Axis warning No.	-	-
Md.26:Axis operation status	Synchronous Control	Position Control
Md.28:Axis feed speed	4727.35 mm/min	2000.00 mm/min
Md.44:Positioning data No. being executed	-	1
Md.47:Positioning data being executed : Operation pattern	Positioning Complete	Positioning Complete
Md.47:Positioning data being executed : Control method	-	1-axis linear control (INC)
Md.47:Positioning data being executed : Acceleration time No.	0:1000	0:1000
Md.47:Positioning data being executed : Deceleration time No.	0:1000	0:1000
Md.47:Positioning data being executed : Axis to be interpolated	-	-
Md.47:Positioning data being executed : M-code	-	-
Md.102:Deviation counter	0 pulse	0 pulse
Md.103:Motor rotation speed	-945.47 (r/min)	12.72 (r/min)
Md.104:Motor current value	0.0 %	0.0 %
Md.108:Servo status 1 : Servo alarm	OFF	OFF
Md.108:Servo status 1 : Servo warning	OFF	OFF
Md.114:Servo alarm	-	-
Md.30:External input signal : Lower limit	ON	ON
Md.30:External input signal : Upper limit	ON	ON
Md.31>Status : HPR request flag	OFF	OFF
Cd.181:Forward JOG start	OFF	OFF
Cd.182:Reverse JOG start	OFF	OFF
Cd.180:Axis stop	OFF	OFF

Module Information List

- PLC READY(I:9G5950)
- READY(I:9G31500.0)
- Synchronization flag(I:9G31500.0)
- All axes servo ON(I:9G5951)
- Md.108:Servo status 1 : READY ON
Axis No. 1 2 3 4
- Md.108:Servo status 1 : Servo ON
Axis No. 1 2 3 4
- Md.50:Forced stop input(I:9G4021)
- BUSY
Axis No. 1 2 3 4
- Md.31>Status : Error detection
Axis No. 1 2 3 4
- Md.31>Status : Axis warning detection
Axis No. 1 2 3 4
- Md.51:AMP-less operation mode(I:9G4111)
- Md.133:Operation cycle over flag(I:9G4230)
- Md.134:Operation time(I:9G4000)
242 μs
- Md.135:Maximum operation time(I:9G4000)
263 μs
- Md.19:No. of Flash ROM writing(I:9G4124)
0 times
- Md.52:Searching flag for driver communication ak...
Complete of searching for driver ca...
- Md.53:SSCNET control status(I:9G4111)
Waiting for command accepted
- Md.131:Digital OSC - running flag(I:9G4011)
Stopped

3.4.1

Starting the Synchronous Control and Checking the Operation



01:FX5-40SSC-S - Axis Monitor

Axis Monitor

Monitor Type:

Axis(Output Axis)

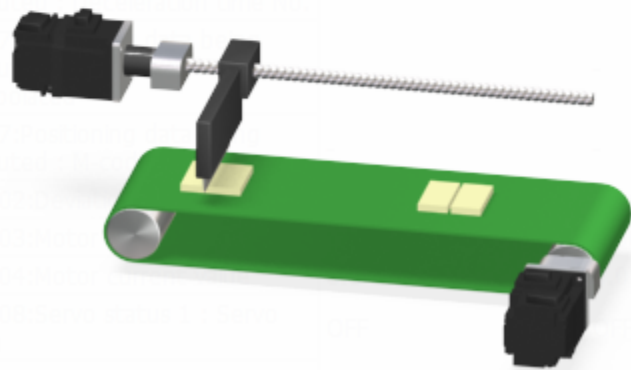
Font Size:

9pt

Select Mo

	Axis #1	Axis #2
Md.20:Feed current value	0.0 μm	157079.6 μm
Md.21:Machine feed value	0.0 μm	157079.6 μm
Md.23:Axis error No.	-	-
Md.24:Axis warning No.	-	-
Md.26:Axis operation status	Synchronous Control	Waiting
Md.28:Axis feed speed	0.00 mm/min	0.00 mm/min
Md.44:Positioning data No. being executed	-	-
Md.47:Positioning data being executed : Operation pattern	Positioning Complete	Positioning Complete
Md.47:Positioning data being executed : Control method	-	-
Md.47:Positioning data being	-	-


<Operation image>



Module Information List

- PLC READY(U1#G5950)
- READY(U1#G31500.0)
- Synchronization flag(U1#G31500.1)
- All axes servo ON(U1#G5951)
- Md.108:Servo status 1 : READY ON
Axis No. 1 2 3 4
- Md.108:Servo status 1 : Servo ON
Axis No. 1 2 3 4
- Md.50:Forced stop input(U1#G4231)
- BUSY
Axis No. 1 2 3 4
- Md.31:Status : Error detection
Axis No. 1 2 3 4
- Md.31:Status : Axis warning detection
Axis No. 1 2 3 4
- Md.51:AMP-less operation mode(U1#G4232)
- Md.133:Operation cycle over flag(U1#G4239)
- Md.134:Operation time(U1#G4008)

Starting the synchronous control and checking the operation are completed.

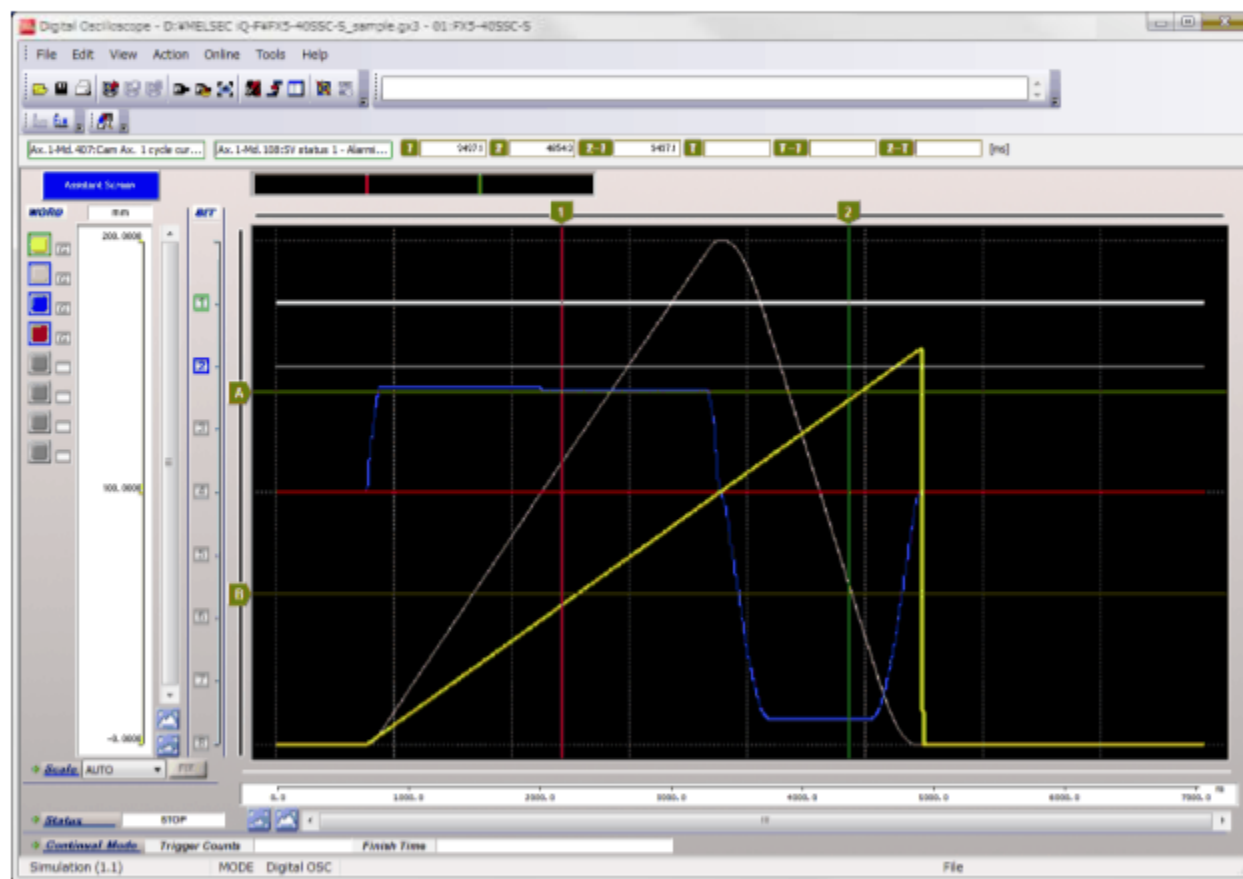
Click  to proceed to the next screen.

0 times

3.4.2 Operation Check with Digital Oscilloscope

Check the operation with a digital oscilloscope.

On the next page, operate the actual screen and check the operation with a digital oscilloscope.



3.4.2

Operation Check with Digital Oscilloscope



Digital Oscilloscope - D:\MELSEC iQ-F\FX5-40SSC-S_sample.gx3 - 01:FX5-40SSC-S

File Edit View Action Online Tools Help



Check that the waveform of the created cam data matches that of axis 1 feed current value in digital oscilloscope. (The display of the graph varies depending on the timing to stop sampling.)

- Cam Ax. 1 cycle current value
- Cam Ax. Feed current value
- Motor speed
- Motor current value



Scale AUTO FIT

Status STOP

Continual Mode Trigger Counts Finish Time

Simulation (1.1) MODE Digital OSC

Checking the operation with a digital oscilloscope is completed.
Click to proceed to the next screen.

3.5**Summary of This Chapter**

In this chapter, you have learned:

- System Configuration
- Startup Procedure for Synchronous Control
- Parameter Creation for Synchronous Control
- Operation Check for Synchronous Control

Important points

System Configuration	<ul style="list-style-type: none">• To add an axis, set servo amplifiers and control axis numbers with the SSCNETIII connection, add and wire servo motors, and configure the setting with MELSOFT GX Works3.
Startup Procedure for Synchronous Control	<ul style="list-style-type: none">• As the establishment procedure of a servo system with the MELSEC iQ-F series Simple Motion module, set the system configuration, parameters, servo parameters, positioning data, and synchronous control parameters, create cam data, and write the set items to the Simple Motion module.
Parameter Creation for Synchronous Control	<ul style="list-style-type: none">• Parameters for synchronous control include synchronous parameters, input axis parameters, and cam data (cam curve).
Operation Check for Synchronous Control	<ul style="list-style-type: none">• On the Axis Monitor window, it's possible to check the synchronous control status.• Use a digital oscilloscope to check the synchronous control status in a graph.

Now that you have completed all of the lessons of the MELSEC iQ-F Series Simple Motion Module Course, you are ready to take the final test.

If you are unclear on any of the topics covered, please take this opportunity to review those topics.

There are a total of 5 questions (7 items) in this Final Test.

You can take the final test as many times as you like.

How to score the test

After selecting the answer, make sure to click the **Answer** button. Your answer will be lost if you proceed without clicking the Answer button. (Regarded as unanswered question.)

Score results

The number of correct answers, the number of questions, the percentage of correct answers, and the pass/fail result will appear on the score page.

Correct answers : 5

Total questions : 5

Percentage : 100%

To pass the test, you have to answer **60%** of the questions correct.

Proceed

Review

- Click the **Proceed** button to exit the test.
- Click the **Review** button to review the test. (Correct answer check)
- Click the **Retry** button to retake the test again.

Please select the software required for performing the positioning control with the MELSEC iQ-F series Simple Motion module.

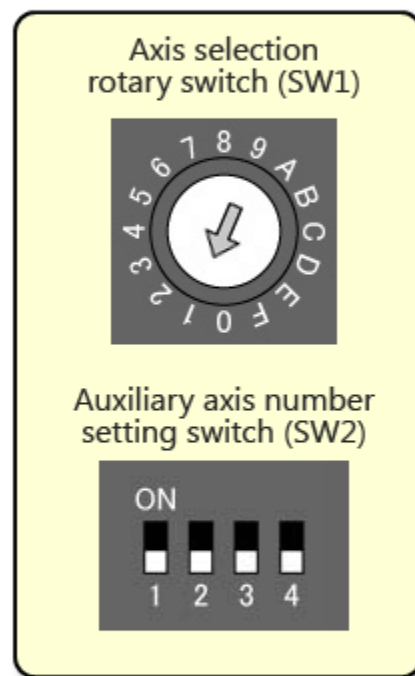
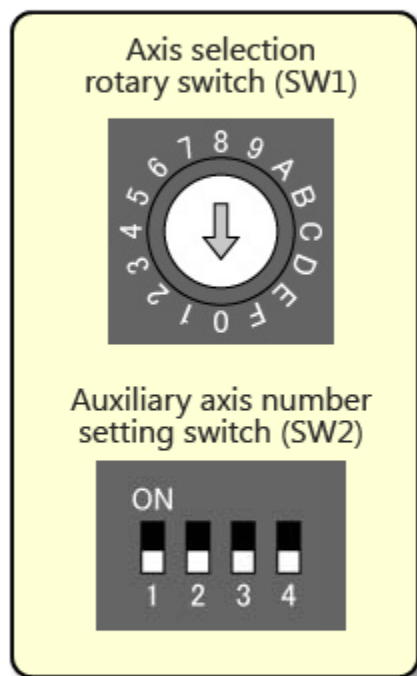
- MELSOFT GX Works2
- MELSOFT GX Works3
- MELSOFT MT Works2
- MELSOFT GT Works3
- RT ToolBox2

Test

Final Test 2



Please select the correct control axis number of the servo amplifier for Axis 1.



Answer

Back

Test**Final Test 3**

Please select the correct method of turning on or off an arbitrary device in the sequence program during monitoring with MELSOFT GX Works3.

- Double-click a device.
- Double-click a device while pressing the Alt key.
- Double-click a device while pressing the SHIFT key.

[Answer](#)[Back](#)

Please select the appropriate synchronous control startup procedure.

- A → E → C → D → B → F
- E → D → C → B → A → F
- B → F → E → A → D → C

A: Cam data creation

B: Synchronous parameter settings

C: Positioning data settings

D: Parameters and servo parameters settings

E: System configuration settings

F: Writing to the Simple Motion module

Answer

Back

Please select the correct explanation of each item of digital oscilloscope from the term box.

- ▼ : Sampling target data can be set.
- ▼ : A sampling cycle and sampling rate before and after a trigger can be set.
- ▼ : Conditions to start sampling can be set.

Term

- 1: Sampling condition
- 2: Trigger setting
- 3: Probe selection

You have completed the Final Test. Your results are as follows.
To end the Final Test, proceed to the next page.

Correct answers : 5

Total questions : 5

Percentage : 100%

Proceed

Review

Congratulations. You passed the test.

You have completed the **MELSEC iQ-F Series Simple Motion Module** Course.

Thank you for taking this course.

We hope you enjoyed the lessons and the information you acquired in this course will be useful in the future.

You can review the course as many times as you want.

Review

Close