



FACTORY AUTOMATION

Servo System Controllers Quick Start Guide

Let's Start! Quick Start Guide

MELSEC iQ-R Series Simple Motion Module







Applicable Model

- -RD77MS2
- -RD77MS4
- -RD77MS8
- -RD77MS16

SAFETY PRECAUTIONS

(Read these precautions before using this product.)

Before using this product, please read this manual and the relevant manuals carefully and pay full attention to safety to handle the product correctly.

The precautions given in this manual are concerned with this product only. Refer to the MELSEC iQ-R Module Configuration Manual for a description of the PLC system safety precautions.

In this manual, the safety precautions are classified into two levels: " A WARNING" and " CAUTION".

Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
Indicates that incorrect handling may cause hazardous conditions, resulting in minor or moderate injury or property damage.

Under some circumstances, failure to observe the precautions given under " A CAUTION" may lead to serious consequences.

Observe the precautions of both levels because they are important for personal and system safety. Make sure that the end users read this manual and then keep the manual in a safe place for future reference.

[Design Precautions]

WARNING

- Configure safety circuits external to the programmable controller to ensure that the entire system
 operates safely even when a fault occurs in the external power supply or the programmable controller.
 Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Emergency stop circuits, protection circuits, and protective interlock circuits for conflicting operations (such as forward/reverse rotations or upper/lower limit positioning) must be configured external to the programmable controller.
 - (2) When the programmable controller detects an abnormal condition, it stops the operation and all outputs are:
 - Turned off if the overcurrent or overvoltage protection of the power supply module is activated.
 - Held or turned off according to the parameter setting if the self-diagnostic function of the CPU module detects an error such as a watchdog timer error.
 - (3) All outputs may be turned on if an error occurs in a part, such as an I/O control part, where the CPU module cannot detect any error. To ensure safety operation in such a case, provide a safety mechanism or a fail-safe circuit external to the programmable controller. For a fail-safe circuit example, refer to "General Safety Requirements" in the MELSEC iQ-R Module Configuration Manual.
 - (4) Outputs may remain on or off due to a failure of a component such as a relay and transistor in an output circuit. Configure an external circuit for monitoring output signals that could cause a serious accident.
- In an output circuit, when a load current exceeding the rated current or an overcurrent caused by a load short-circuit flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Configure a circuit so that the programmable controller is turned on first and then the external power supply. If the external power supply is turned on first, an accident may occur due to an incorrect output or malfunction.
- For the operating status of each station after a communication failure, refer to manuals relevant to the network. Incorrect output or malfunction due to a communication failure may result in an accident.

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not write any data to the "system area" and "write-protect area" of the buffer memory in the module. Also, do not use any "use prohibited" signals as an output signal from the CPU module to each module. Doing so may cause malfunction of the programmable controller system. For the "system area", "write-protect area", and the "use prohibited" signals, refer to the user's manual for the module used.
- If a communication cable is disconnected, the network may be unstable, resulting in a communication failure of multiple stations. Configure an interlock circuit in the program to ensure that the entire system will always operate safely even if communications fail. Failure to do so may result in an accident due to an incorrect output or malfunction.
- To maintain the safety of the programmable controller system against unauthorized access from external devices via the network, take appropriate measures. To maintain the safety against unauthorized access via the Internet, take measures such as installing a firewall.
- Configure safety circuits external to the programmable controller to ensure that the entire system operates safely even when a fault occurs in the external power supply or the programmable controller.
 Failure to do so may result in an accident due to an incorrect output or malfunction.
 - (1) Machine home position return is controlled by two kinds of data: a home position return direction and a home position return speed. Deceleration starts when the proximity dog signal turns on. If an incorrect home position return direction is set, motion control may continue without deceleration. To prevent machine damage caused by this, configure an interlock circuit external to the programmable controller.
 - (2) When the module detects an error, the motion slows down and stops or the motion rapidly stops, depending on the stop group setting in parameter. Set the parameter to meet the specifications of a positioning control system. In addition, set the home position return parameter and positioning data within the specified setting range.
 - (3) Outputs may remain on or off, or become undefined due to a failure of a component such as an insulation element and transistor in an output circuit, where the module cannot detect any error. In a system that the incorrect output could cause a serious accident, configure an external circuit for monitoring output signals.
- If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differs from the safety directive operation in the system.

• Do not remove the SSCNETI cable while turning on the control circuit power supply of the module and servo amplifier. Do not see directly the light generated from SSCNETI connector of the module or servo amplifier and the end of SSCNETI cable. When the light gets into eyes, you may feel something wrong with eyes. (The light source of SSCNETI complies with class1 defined in JISC6802 or IEC60825-1.)

[Design Precautions]

- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- During control of an inductive load such as a lamp, heater, or solenoid valve, a large current (approximately ten times greater than normal) may flow when the output is turned from off to on. Therefore, use a module that has a sufficient current rating.
- After the CPU module is powered on or is reset, the time taken to enter the RUN status varies depending on the system configuration, parameter settings, and/or program size. Design circuits so that the entire system will always operate safely, regardless of the time.
- Do not power off the programmable controller or reset the CPU module while the settings are being written. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may cause malfunction or failure of the module.
- When changing the operating status of the CPU module from external devices (such as the remote RUN/STOP functions), select "Do Not Open by Program" for "Opening Method" of "Module Parameter". If "Open by Program" is selected, an execution of the remote STOP function causes the communication line to close. Consequently, the CPU module cannot reopen the line, and external devices cannot execute the remote RUN function.

[Installation Precautions]

• Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may result in electric shock or cause the module to fail or malfunction.

[Installation Precautions]

- Use the programmable controller in an environment that meets the general specifications in the Safety Guidelines included with the base unit. Failure to do so may result in electric shock, fire, malfunction, or damage to or deterioration of the product.
- To mount a module, place the concave part(s) located at the bottom onto the guide(s) of the base unit, and push in the module until the hook(s) located at the top snaps into place. Incorrect interconnection may cause malfunction, failure, or drop of the module.
- To mount a module with no module fixing hook, place the concave part(s) located at the bottom onto the guide(s) of the base unit, push in the module, and fix it with screw(s). Incorrect interconnection may cause malfunction, failure, or drop of the module.
- When using the programmable controller in an environment of frequent vibrations, fix the module with a screw.
- Tighten the screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- When using an extension cable, connect it to the extension cable connector of the base unit securely. Check the connection for looseness. Poor contact may cause malfunction.
- When using an SD memory card, fully insert it into the SD memory card slot. Check that it is inserted completely. Poor contact may cause malfunction.
- Securely insert an extended SRAM cassette into the cassette connector of the CPU module. After insertion, close the cassette cover and check that the cassette is inserted completely. Poor contact may cause malfunction.
- Do not directly touch any conductive parts and electronic components of the module, SD memory card, extended SRAM cassette, or connector. Doing so can cause malfunction or failure of the module.

[Wiring Precautions]

- Shut off the external power supply (all phases) used in the system before installation and wiring. Failure to do so may result in electric shock or cause the module to fail or malfunction.
- After installation and wiring, attach a blank cover module (RG60) to each empty slot and an included extension connector protective cover to the unused extension cable connector before powering on the system for operation. Failure to do so may result in electric shock.

- Individually ground the FG and LG terminals of the programmable controller with a ground resistance of 100 ohms or less. Failure to do so may result in electric shock or malfunction.
- Use a solderless terminal with an insulation sleeve for terminal block wiring. Note that up to two solderless terminals can be connected per terminal block.
- Use applicable solderless terminals and tighten them within the specified torque range. If any spade solderless terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.
- Check the rated voltage and signal layout before wiring to the module, and connect the cables correctly. Connecting a power supply with a different voltage rating or incorrect wiring may cause fire or failure.
- Connectors for external devices must be crimped or pressed with the tool specified by the manufacturer, or must be correctly soldered. Incomplete connections may cause short circuit, fire, or malfunction.
- Securely connect the connector to the module. Poor contact may cause malfunction.
- Do not install the control lines or communication cables together with the main circuit lines or power cables. Keep a distance of 100 mm or more between them. Failure to do so may result in malfunction due to noise.
- When an overcurrent caused by an error of an external device or a failure of a module flows for a long time, it may cause smoke and fire. To prevent this, configure an external safety circuit, such as a fuse.
- Place the cables in a duct or clamp them. If not, dangling cable may swing or inadvertently be pulled, resulting in damage to the module or cables or malfunction due to poor contact. Do not clamp the extension cables with the jacket stripped. Doing so may change the characteristics of the cables, resulting in malfunction.
- When disconnecting the communication cable or power cable from the module, do not pull the cable by the cable part. For the cable connected to the terminal block, loosen the terminal screws. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.
- Check the interface type and correctly connect the cable. Incorrect wiring (connecting the cable to an incorrect interface) may cause failure of the module and external device.
- Tighten the terminal screws or connector screws within the specified torque range. Undertightening can cause drop of the screw, short circuit, fire, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, fire, or malfunction.
- Tighten the terminal block mounting screws, terminal screws, and module fixing screws within each specified torque range. Undertightening of the terminal block mounting screws and terminal screws can cause short circuit, fire, or malfunction. Overtightening of them can damage the screw and/or module, resulting in drop, short circuit, or malfunction. Undertightening of the module fixing screws can cause drop of the screw. Overtightening of them can damage the screw and/or module, resulting in drop.
- When disconnecting the cable from the module, do not pull the cable by the cable part. For the cable with connector, hold the connector part of the cable. For the cable connected to the terminal block, loosen the terminal screw. Pulling the cable connected to the module may result in malfunction or damage to the module or cable.

- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- A protective film is attached to the top of the module to prevent foreign matter, such as wire chips, from entering the module during wiring. Do not remove the film during wiring. Remove it for heat dissipation before system operation.
- Programmable controllers must be installed in control panels. Connect the main power supply to the power supply module in the control panel through a relay terminal block. Wiring and replacement of a power supply module must be performed by qualified maintenance personnel with knowledge of protection against electric shock. For wiring, refer to the MELSEC iQ-R Module Configuration Manual.
- For Ethernet cables to be used in the system, select the ones that meet the specifications in this manual. If not, normal data transmission is not guaranteed.

[Startup and Maintenance Precautions]

- Do not touch any terminal while power is on. Doing so will cause electric shock or malfunction.
- Correctly connect the battery connector. Do not charge, disassemble, heat, short-circuit, solder, or throw the battery into the fire. Also, do not expose it to liquid or strong shock. Doing so will cause the battery to produce heat, explode, ignite, or leak, resulting in injury and fire.
- Shut off the external power supply (all phases) used in the system before cleaning the module or retightening the terminal screws, connector screws, or module fixing screws. Failure to do so may result in electric shock.

[Startup and Maintenance Precautions]

- When connecting an external device with a CPU module or intelligent function module to modify data of a running programmable controller, configure an interlock circuit in the program to ensure that the entire system will always operate safely. For other forms of control (such as program modification, parameter change, forced output, or operating status change) of a running programmable controller, read the relevant manuals carefully and ensure that the operation is safe before proceeding. Improper operation may damage machines or cause accidents.
- Especially, when a remote programmable controller is controlled by an external device, immediate action cannot be taken if a problem occurs in the programmable controller due to a communication failure. To prevent this, configure an interlock circuit in the program, and determine corrective actions to be taken between the external device and CPU module in case of a communication failure.
- Do not disassemble or modify the modules. Doing so may cause failure, malfunction, injury, or a fire.
- Use any radio communication device such as a cellular phone or PHS (Personal Handy-phone System) more than 25 cm away in all directions from the programmable controller. Failure to do so may cause malfunction.
- Shut off the external power supply (all phases) used in the system before mounting or removing the module. Failure to do so may cause the module to fail or malfunction.

[Startup and Maintenance Precautions]

- Tighten the screws within the specified torque range. Undertightening can cause drop of the component or wire, short circuit, or malfunction. Overtightening can damage the screw and/or module, resulting in drop, short circuit, or malfunction.
- After the first use of the product, do not mount/remove the module to/from the base unit, and the terminal block to/from the module, and do not insert/remove the extended SRAM cassette to/from the CPU module more than 50 times (IEC 61131-2 compliant) respectively. Exceeding the limit may cause malfunction.
- After the first use of the product, do not insert/remove the SD memory card to/from the CPU module more than 500 times. Exceeding the limit may cause malfunction.
- Do not touch the metal terminals on the back side of the SD memory card. Doing so may cause malfunction or failure of the module.
- Do not touch the integrated circuits on the circuit board of an extended SRAM cassette. Doing so may cause malfunction or failure of the module.
- Do not drop or apply shock to the battery to be installed in the module. Doing so may damage the battery, causing the battery fluid to leak inside the battery. If the battery is dropped or any shock is applied to it, dispose of it without using.
- Startup and maintenance of a control panel must be performed by qualified maintenance personnel with knowledge of protection against electric shock. Lock the control panel so that only qualified maintenance personnel can operate it.
- Before handling the module, touch a conducting object such as a grounded metal to discharge the static electricity from the human body. Failure to do so may cause the module to fail or malfunction.
- Before testing the operation, set a low speed value for the speed limit parameter so that the operation can be stopped immediately upon occurrence of a hazardous condition.
- Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
- When using the absolute position system function, on starting up, and when the module or absolute position motor has been replaced, always perform a home position return.
- Before starting the operation, confirm the brake function.
- Do not perform a megger test (insulation resistance measurement) during inspection.
- After maintenance and inspections are completed, confirm that the position detection of the absolute position detection function is correct.
- Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.

[Operating Precautions]

- When changing data and operating status, and modifying program of the running programmable controller from an external device such as a personal computer connected to an intelligent function module, read relevant manuals carefully and ensure the safety before operation. Incorrect change or modification may cause system malfunction, damage to the machines, or accidents.
- Do not power off the programmable controller or reset the CPU module while the setting values in the buffer memory are being written to the flash ROM in the module. Doing so will make the data in the flash ROM and SD memory card undefined. The values need to be set in the buffer memory and written to the flash ROM and SD memory card again. Doing so also may cause malfunction or failure of the module.
- Note that when the reference axis speed is specified for interpolation operation, the speed of the partner axis (2nd, 3rd, or 4th axis) may exceed the speed limit value.
- Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

[Disposal Precautions]

- When disposing of this product, treat it as industrial waste.
- When disposing of batteries, separate them from other wastes according to the local regulations. For details on battery regulations in EU member states, refer to the MELSEC iQ-R Module Configuration Manual.

[Transportation Precautions]

- When transporting lithium batteries, follow the transportation regulations. For details on the regulated models, refer to the MELSEC iQ-R Module Configuration Manual.
- The halogens (such as fluorine, chlorine, bromine, and iodine), which are contained in a fumigant used for disinfection and pest control of wood packaging materials, may cause failure of the product. Prevent the entry of fumigant residues into the product or consider other methods (such as heat treatment) instead of fumigation. The disinfection and pest control measures must be applied to unprocessed raw wood.

CONTENTS

SAFI	ETY PRECAUTIONS	1
СН	APTER 1 OVERVIEW	10
1.1	Simple Motion Module Features	
1.2	Relevant Manuals	
1.3	Video-based instructions	
СН	APTER 2 MODULE STARTUP	12
2.1	System Configuration	
2.2	Device Preparation	
2.3	Startup Procedure	
2.4	Installation of Modules	
2.5	Wiring and Cable Connection	
СН	APTER 3 POSITIONING CONTROL STARTUP	20
3.1	Creating a New Project	
3.2	Sequence Program Creation	
3.3	Parameter Settings for Simple Motion Module	
3.4	Operation Check	
	3.4.1 JOG operation	
	3.4.2 Home position return (Establishment of the home position)	
	3.4.3 Positioning control	
СН	APTER 4 SYNCHRONOUS CONTROL STARTUP	48
4.1	System Configuration	
4.2	Startup Procedure for Synchronous Control	
4.3	Parameter Creation for Synchronous Control	
	4.3.1 System configuration settings.	
	4.3.2 Parameters and servo parameters settings	
	4.3.3 Positioning data settings.	
	4.3.4 Synchronous control parameter settings	
	4.3.5 Cam data creation	
	4.3.6 Saving a project	
	4.3.7 Writing to the Simple Motion module	
4.4	Operation Check for Synchronous Control	60
	4.4.1 Home position return	60
	4.4.2 Synchronous control start	61
	4.4.3 Operation check with digital oscilloscope	64
СН	APTER 5 APPLICATION EXAMPLES	67
APF	PENDICES	69

Appendix 1 Simulation. 69 Appendix 2 Parameter and Positioning Data. 73 Appendix 3 Sample Program. 76 REVISIONS. 80

1 OVERVIEW

This document describes necessary items and operation for first-time users of the Simple Motion module to make wiring, perform JOG operation, program operation, and synchronous control with Programmable Controller Engineering Software, MELSOFT GX Works3.

Refer to related manuals, where necessary, to fully utilize capability of each module.

1.1 Simple Motion Module Features

- 1. A wide range of controls, such as positioning, advanced synchronous, cam, speed-torque controls, are available.
- 2. Advanced, extensive controls can be achieved just with function blocks (FB) and sequence programs.
- 3. Programming, Servo adjustment, operation and maintenance can be all covered by MELSOFT GX Works3 only.
- 4. The Simple Motion module can be connected to SSCNET III/H compatible, high-performance servo amplifiers.

1.2 Relevant Manuals

(1) Simple Motion module

Name	Number
MELSEC iQ-R Simple Motion Module User's Manual (Startup) This manual explains specifications, procedures before operation, system configuration, wiring, and operation examples of the Simple Motion module.	IB-0300245
MELSEC iQ-R Simple Motion Module User's Manual (Application) This manual explains functions, input/output signals, buffer memories, parameter settings, programming, and troubleshooting of the Simple Motion module.	IB-0300247
MELSEC iQ-R Simple Motion Module User's Manual (Advanced Synchronous Control) This manual explains functions and programming for the synchronous control of the Simple Motion module.	IB-0300249

(2) MELSEC iQ-R series PLC

Name	Number
MELSEC iQ-R CPU Module User's Manual (Startup) This manual explains the specifications of the CPU module, procedures before operation, and procedures for troubleshooting.	SH-081263
MELSEC iQ-R CPU Module User's Manual (Application) This manual explains the basic knowledge required for program design, CPU module functions, devices/labels, parameters etc.	SH-081264
MELSEC iQ-R Module Configuration Manual This manual explains the specifications of the power supply modules, base units, SD memory cards etc., and the mounting environment and mounting position.	SH-081262

(3) Servo amplifier

Name	Number
MR-J4B_(-RJ) Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for MR-J4B(-RJ)/MR-J4- _B4(-RJ)/MR-J4B1(-RJ) Servo amplifier.	SH-030106
MR-J4W2B/MR-J4W3B/MR-J4W2-0303B6 Servo amplifier Instruction Manual This manual explains the I/O signals, parts names, parameters, start-up procedure and others for Multi-axis AC Servo MR- J4W2B/MR-J4W3_B/MR-J4W2-0303B6 Servo amplifier.	SH-030105

1.3 Video-based instructions

To view instructions in video form, scan the QR codes listed in this quick start guide with your smartphone or similar device. Videos are posted on the official MITSUBISHI ELECTRIC Factory Automation Youtube channel.

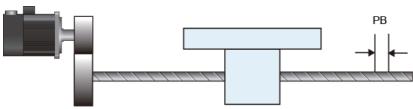
Official MITSUBISHI ELECTRIC Factory Automation channel URL : youtube.com/c/MitsubishiElectricFA

2 MODULE STARTUP

A 1-axis system with ball screw is used as an example in Chapter 2 to 3.







[Specifications]

Ball screw lead (PB) : 10000.0µm (=10mm)

Reduction ratio (NL/NM) : 1/2 (Load side [NL]/Motor side [NM])

• The load-side ball screw is made to rotate once by rotating the motor twice.

Encoder resolution : 4194304 [pulse/rev]

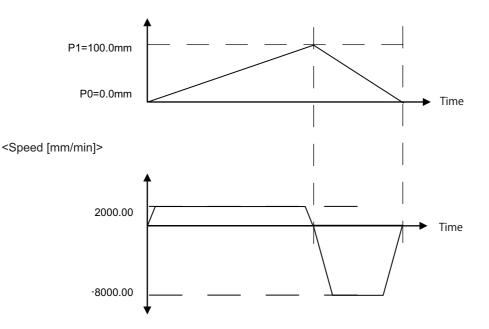
Servo amplifier : MR-J4-10B

Servo motor : HG-KR series

[Operation pattern]

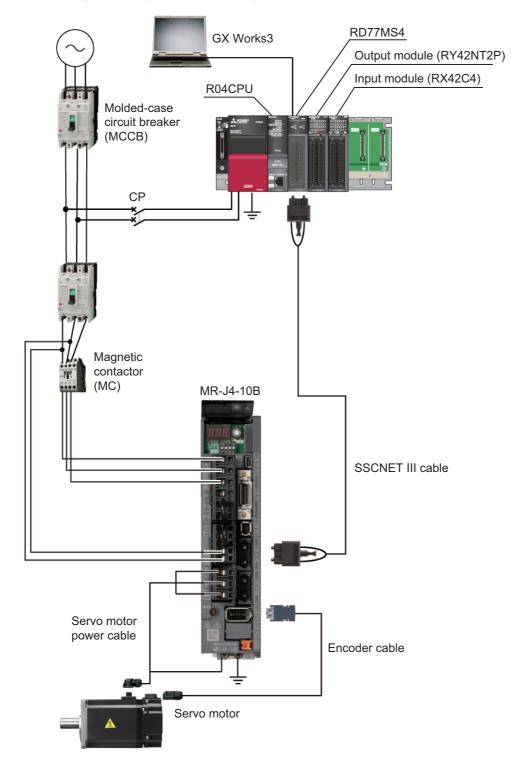
- **1.** The workpiece travels from home position to P1 back and forth.
- 1. It moves at 2000.00mm/min from home position (0 mm) to P1.
- 2. It moves at 8000.00mm/min from P1 to the home position.
- 2. Continuous positioning of 1. through 2. is performed.

<Position [mm]>



2.1 System Configuration

The following shows a system example using the Simple Motion module, MR-J4-10B, and a servo motor.



2.2 Device Preparation

Prepare the following devices, cables, and software.

Simple Motion module	Engineering Software
RD77MS4	MELSOFT GX Works3
₩ <u>22,0%</u> * ακ Ακ ² ο ο	Engineering environment
	Programmable Controller Engineering Software MELSOFT GX Works3

 Servo amplifier
 Servo motor

 MR-J4-10B
 HG-KR13





Main base unit	Power supply module	PLC CPU module	Input/output module	
R35B	R61P	R04CPU	RX42C4(Input) RY42NT2P(Output)	
	E 1925			
Encoder cable	Servo motor power cable	SSCNET III cable MR-J3BUS_M	USB cable	
		ide	- OO +C	
Molded-case circuit breaker (MCCB)	Magnetic contactor(MC)	Circuit protector (CP)		

2.3 Startup Procedure

The following sections explain operation details and procedures required for system startup.

- 2. MODULE STARTUP
- 2.1 System configuration
- 2.2 Device preparation
- 2.3 Startup procedure
- 2.4 Installation of modules
- 1. Installing a battery
- · 2. Inserting an extended SRAM cassette and a SD memory card
- 3. Installing a module
- 2.5 Wiring and cable connection
- 1. Wiring for power supply module
- · 2. Wiring for servo amplifier power supply and servo motor power cables
- 3. Connection of each cable
- · 4. Axis selection rotary switch of servo amplifier
- 5. Power-on of the system
- 6. Power-on of servo amplifier

3. POSITIONING CONTROL STARTUP

- 3.1 Creating a new project
- 1. Installing engineering software
- 2. Creating a new project
- · 3. Connecting the PLC CPU to a personal computer
- 4. Initializing the PLC CPU module
- 5. Settings for sequence program parameters
- 3.2 Sequence program creation
- 1. New sequence programs creation
- 2. Multiple comments display setting
- 3. Registration of global labels
- 4. Element selection window
- 5. Sequence program creation with labels
- · 6. Sequence program creation with module FB
- 7. Saving a project
- 8. Writing to PLC CPU
- 3.3 Parameter settings for Simple Motion module
- 1. Start of Simple Motion module setting function
- · 2. System settings
- 3. Parameter settings
- 4. Servo parameter settings
- 5. Positioning data setting
- · 6. Saving a project
- 7. Writing to the Simple Motion module
- 3.4 Operation check
- 3.4.1 JOG operation
- 3.4.2 Home position return (Establishment of the home position)
- 3.4.3 Positioning control

2.4 Installation of Modules

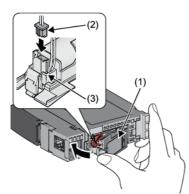
Install the modules.



1. Installing a battery

The connector plug of the Q6BAT is disconnected from the jack of the CPU module before shipment. To use the battery, connect the connector, following the procedure below.





- 1. Open the battery cover located on the bottom of the CPU module.
- 2. Check that the Q6BAT (1) is correctly installed.
- 3. Check the direction and securely insert the connector plug of the Q6BAT (2) to the jack (3) of the CPU module.
- 4. Close the battery cover.
- 2. Inserting an extended SRAM cassette and a SD memory card

Since the example system does not use an extended SRAM cassette and a SD memory card, the insertion/removal procedures are omitted in this document.

Refer to MELSEC iQ-R CPU Module User's Manual (Startup) for details.

3. Installing a module

Install each module to the main base unit.

Refer to MELSEC iQ-R Module Configuration Manual for details.

2.5 Wiring and Cable Connection

The following shows the wiring and cable connection example for the Simple Motion module and servo amplifiers. The system below 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. Wiring for power supply module

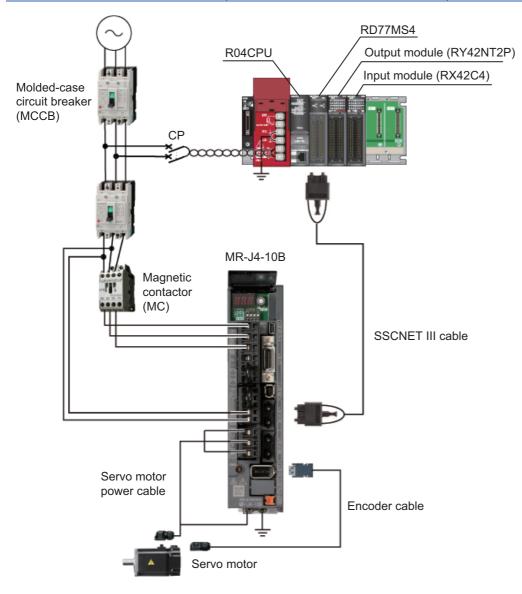
The following shows an example when a power wire and a grounding wire are connected to the power supply module. Connect an isolation transformer when noise often enters in the power supply system.

Item	Applicable wire size	Tightening torque
Power wire	0.75 to 2mm ² (AWG18 to AWG14)	1.02 to 1.38N•m
Grounding wire	0.75 to 2mm ² (AWG18 to AWG14)	1.02 to 1.38N•m

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 (AWG16)	-
Main circuit power supply (L1, L2, L3)	2mm ² (AWG14)	-
Grounding wire	1.25mm ² (AWG16)	1.2N•m



3. Connection of each cable

Connect the SSCNET III cable, the encoder cable, and the servo motor power cable. For between the personal computer and PLC CPU, connect a USB cable.



4. Axis selection rotary switch of servo amplifier

"0" to "F" of the axis selection rotary switch correspond to "d01" to "d16".

The following table shows the correspondence between SSCNET configuration and the switch No. Set the switch correctly checking the correspondence.



Servo amplifier MR-J4-10B	Description
	No. dno. Axis No. No. dno. Axis No.
	"0" d01 Axis 1 "8" d08 —
888	"1" d02 Axis 2 "9" d09 -
6189	"2" d03 Axis 3 "A" d10 —
	"3" d04 Axis 4 "B" d11 -
	"4" d05 — "C" d12 —
	"5" d06 — "D" d13 —
	"6" d07 — "E" d14 —
Axis selection rotary switch	"7" d08 — "F" d15 —
	[SSCHET Setting]: SSCHET III)H

- **5.** Power-on of the system
- 1. Check the wiring for the power supply module.
- 2. Confirm that the PLC CPU is in STOP status.
- 3. Turn ON the power of PLC CPU.



(a) Power supply module: LED (green light) turns ON.

(b) CPU module: READY LED (green light) turns ON.

• When parameters and programs are not written to the CPU module, the ERROR LED (red light) of the PLC CPU flickers, but no immediate error is occurring. After writing parameters and programs and turning the power OFF to ON, the ERROR LED will be OFF.

6. Power-on of servo amplifier

Turn the power ON after checking the following items.

- 1. Check the wiring for servo amplifier.
- 2. Turn the servo amplifier ON.

Servo amplifier	LED display	Status	Description	Wiring result
8.8.8.	AA	Initializing standby	The power supply of servo system controller is turned off while the power supply of servo amplifier is on.	Normal
	Ab	Initializing	During initial setting for communication specifications.	
	AC	Initializing	Initial setting for communication specifications has completed, and then the servo amplifier has been synchronized with the servo system controller.	
	Ad	Initializing	During communication with the servo system controller for initial parameter setting	
	AE	Initializing	During communication with the servo system controller for the servo motor/encoder information	
	AF	Initializing	During communication with servo system controller for initial signal data	
	AH	Initializing completion	The process for initial data communication with the servo system controller is completed.	
	b01	Ready-off	The ready-off command from the servo system controller was received.	
	C01	Servo-off	The servo-off command from the servo system controller was received.	
	d01	Servo-on	The servo-on command from the servo system controller was received.	
	E6.1	Forced stop warning	Forced stop warning	
	E7.1	Controller forced stop warning	Controller forced stop warning	
	OFF	-	Control power is off.	Abnormal

The communication status with the Simple Motion module can be checked on the display.

[Actions]

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

• If the LED turns OFF, check the wiring for control power supply.

3 POSITIONING CONTROL STARTUP

3.1 Creating a New Project

1. Installing engineering software

Install MELSOFT iQ Works or MELSOFT GX Works3, following the Installation Instruction provided with the software package.



Product	Model	Description
MELSOFT iQ Works	SW2DND-IQWK-E	FA Engineering Software • System Management Software [MELSOFT Navigator] • Programmable Controller Engineering Software [MELSOFT GX Works3] • Motion Controller Engineering Software [MELSOFT MT Works2] • Screen Design Software [MELSOFT GT Works3] • Robot Total Engineering Support Software [MELSOFT RT ToolBox2 mini] • Inverter Setup Software [MELSOFT FR Configurator2]
MELSOFT GX Works3	SW1DND-GXW3-E	Simple Motion module parameter settings, sequence program creation

Note) The screen windows in this document may differ from the ones you use.

(The system uses "MELSOFT GX Works3 Version 1.007H")

2. Creating a new project

Start MELSOFT GX Works3, and create a new project.

 $[Project] \rightarrow [New]$

Series : RCPU

Model : R04 (specify the CPU to be used)

Program language : Ladder

New	×
Series	RCPU V
Туре	12 R04 🗸
Program Language	Ladder 🔹
	OK Cancel

The window asking about module label addition appears. Click [Setting Change].

MELSOFT	GX Works3	
i	Add a module. [Module Name] R04CPU [Start I/O No.] 3E00	
Modul	e Setting	Setting Change
Mod	ule Label:Not use	*
		w
Do N	ot Show this Dialog Again	ОК

📑 Project	Operation Setting	
Auto-save Device Comment Reference/Reflection Target	Use Module Label Message Show the confirmation message in addir	Yes Ig mod Yes
Module Label		
Navigation		
🔁 Program Editor		
🚱 Other Editor		
🔏 Edit		
H Find/Replace		
🕂 Monitor	Use Module Label	
🔊 Online	Select whether to add the module label in	adding module.
🕫 Convert		-
ntelligent Function Module		
🖬 iQ Works Interaction		
		Import Export

3. Connecting the PLC CPU to a personal computer

Confirm the connection between the personal computer and the PLC CPU.

- 1. Connect the CPU module to the personal computer.
- 2. Select [Online] \rightarrow [Current Connection Destination] to open the [Specify Connection Destination Connection] window.
- 3. Select "CPU Module Direct Coupled Setting".
- 4. Select the connection method with CPU module.





4. Initializing the PLC CPU module Initialize a memory of the PLC CPU.

Click [Initialization] in the Memory Management window.

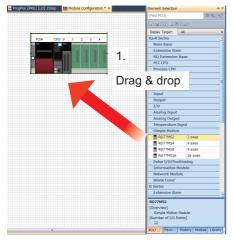
Onli	ne Debug Diagnostics Tool Wind			×		MELSOFT GX Works3	83
1.1	Current Connection Destination Read from PLC	■ Memory Management □ CPU Built-in Memo □ SD Memory Card	xy 🚸 CPU Built-in Memory			nitialize the selected r	memory.
	Write to PLC		Data Memory	Use Volume		Are you sure you want	t to continue?
	Verify with PLC			161/2049KB		Cost an and a will be in	n a status as following after initialization.
	Remote Operation(S)		Device/Label	16172049KB			Data Memory: Delete all the folders/files
	Safety PLC Operation +		File Storage Area	Use Volume		* Execute the initiali	lization and delete the event history when
	Redundant PLC Operation(G)			2/20KB		the event history file exists in	n the initialized target destination.
	CPU Memory Operation				-	motory me exists in	
	Delete PLC Data						
	User Data 🔸						
	Set Clock						<u>Y</u> es <u>N</u> o
	Monitor +						
	FB Property +						—
			Detail Initialization(E) Glear Value Refresh(N)				
				Close		M	IELSOFT GX Works3 💽
							Completed.
							ок

5. Settings for sequence program parameters

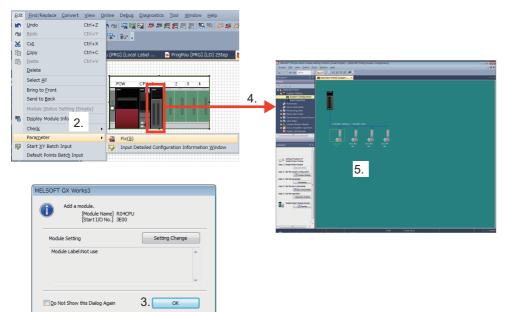
Set the system parameter and each module parameter.

[Creating a module configuration]

1. Select the main base unit, CPU, I/O, and Simple Motion module to be used from the POU list and drag & drop them onto the "Module Configuration" screen.



- 2. Select [Edit] \rightarrow [Parameter] \rightarrow [Fix] in the menu.
- 3. When the dialog box appears asking to add module labels for arranged modules, click [OK].
- 4. Double click on the Simple Motion module to open the "Simple Motion Module Setting Function" screen.
- 5. Set the parameters, then close the screen when finished.



3.2 Sequence Program Creation

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



1. New sequence programs creation

Appendix 3 provides the sequence program example.

2. Multiple comments display setting

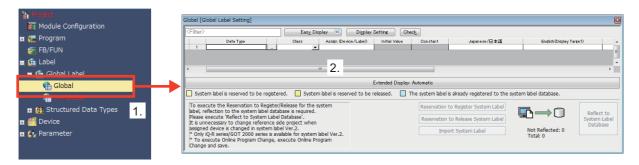
Check the "Enable Multiple Comments Display" box and "Target" boxes for each language to switch the language for comments in sequence programs.

View		W	Multiple	Comment	s Display S	etting	×
-	Toolbar(<u>T</u>) Status <u>b</u> ar	•	🔽 Ena	ble <u>M</u> ultiple	Comments D	Display	
	Color and Font		No.	Target	Available	Comment Title	
	Docking Window(<u>K</u>)	•	1	0		Comment	
	Zoom(<u>Z</u>)	•	2	0		Comment2	-
	Switch Display Language		3	0		Comment3	E
	Multiple Comments Display Setting		4	0		Comment4	
			5			Comment5	
			6	0	√	Japanese/日本語	
			7	۲	1	English	
			8	0		Chinese/中文	
			9	0		Korean/한국어	Ŧ
						OK Cance	

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 the same program to be used again with a different model/product.

- 1. Select [Label] \rightarrow [Global]. The global label registration window appears.
- 2. Register the global label, referring to the table below.



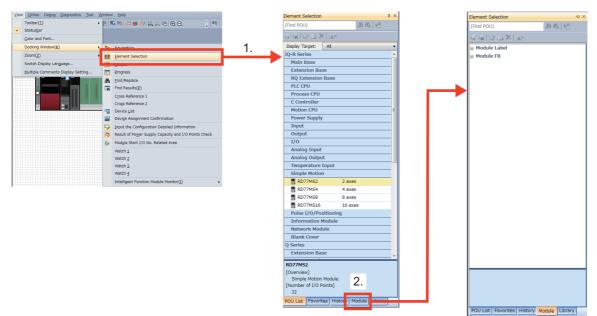
[Global label setting examples]

Label Name	Data type	Class	Device	Description
bDuringJOGInchingOperation	Bit	VAR_GLOBAL	M81	JOG/Inching Operation flag
bJogEND Bit		VAR_GLOBAL M82		JOG End Flag
bJogOK	Bit	VAR_GLOBAL	M83	JOG OK flag
bJogERR	Bit	VAR_GLOBAL	M84	JOG Error flag
bStartEND	Bit	VAR_GLOBAL	M85	Positioning Start Operation flag
bStartOK	Bit	VAR_GLOBAL	M86	Positioning Start OK
bStartERR	Bit	VAR_GLOBAL	M87	Positioning Start Error
bPositioningStartReq	Bit	VAR_GLOBAL	M80	Positioning Start Request
iAxisNo	Word [with signs]	VAR_GLOBAL	D14	Axis No
uwPositioningStartNo	Word [with signs]	VAR_GLOBAL	D16	Positioning Start No
i_JogSpeedData	Double word [with signs]	VAR_GLOBAL	D10	Jog Speed data memo
uwErrld	Word [with signs]	VAR_GLOBAL	D12	JOG Error code
bJogSpeedReq	Bit	VAR_GLOBAL	X60	JOG Speed Req
bAxis1	Bit	VAR_GLOBAL	X61	Axis 1
bAxis2	Bit	VAR_GLOBAL	X62	Axis 2 ^{*1}
bHomePositionData	Bit	VAR_GLOBAL	X63	Home Position return Data
bPositioningStartData	Bit	VAR_GLOBAL	X65	Positioning Start Data
bSyncPosiStartData	Bit	VAR_GLOBAL	X66	Synchronous Positioning Start data
bJogForwardReq	Bit	VAR_GLOBAL	X6E	JOG Forward Start req
bJogReverseReq	Bit	VAR_GLOBAL	X6F	JOG Reverse Start Req
bStartpositioning	Bit	VAR_GLOBAL	X71	Start Positioning req
bServoON	Bit	VAR_GLOBAL	X7B	Servo ON req
bErrorReset	Bit	VAR_GLOBAL	X7E	Error reset
bStopSwitch	Bit	VAR_GLOBAL	X7F	Stop
bSynchronous	Bit	VAR_GLOBAL	X7D	Synchronous Axis Set

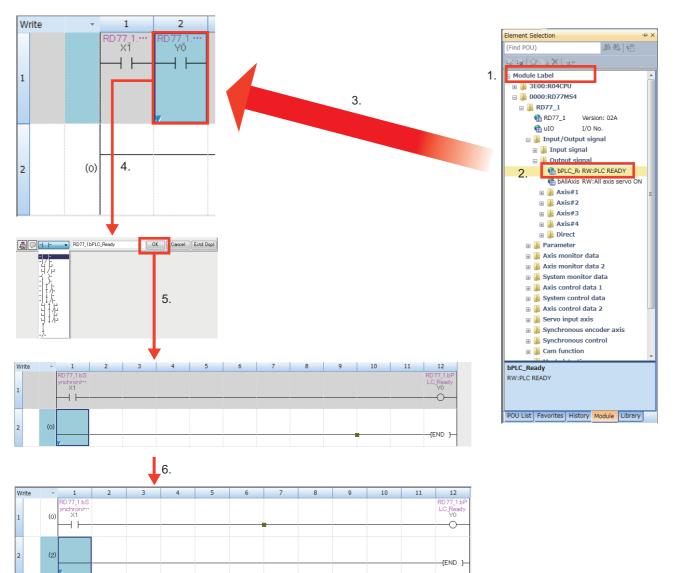
*1 The labels above are for the synchronous control system in Chapter 4.

4. Element selection window

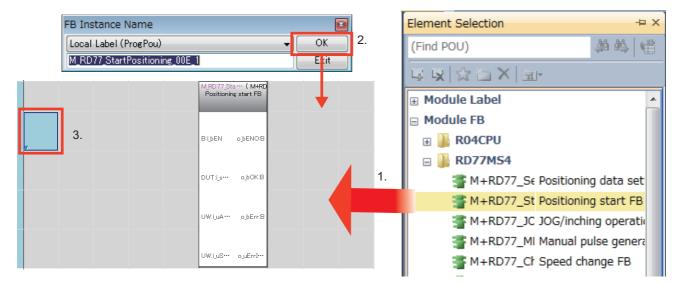
- 1. Select [View] \rightarrow [Docking Window] \rightarrow [Element Selection].
- 2. Select [Module] tab in the Element Selection window, and Module Label and Module FB are displayed.



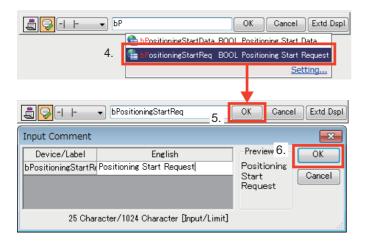
- **5.** Sequence program creation with module labels
- 1. Select [Module Label].
- 2. Select a label from the module label list.
- 3. Drag & drop the module label.
- 4. Change the contact to an arbitrary contact or coil by double-clicking it.
- 5. Click [OK] to create a circuit.
- 6. Select [Convert] \rightarrow [Convert] in the menu.



- 6. Sequence program creation with module FB
- 1. Drag & drop a necessary module FB.
- 2. "FB Instance Name" window appears.
- Select whether the instance is registered as a global label or a local label, and input an instance name.
- 3. Double click on where a circuit addition is made.



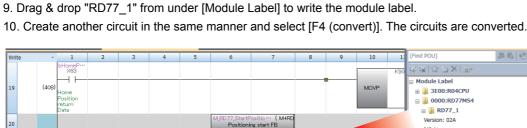
- 4. Select a circuit symbol, then enter variables.
- 5. Click [OK], and the "Input Comment" window appears.
- 6. After inputting comments, click [OK].



- 7. Move the cursor to where the circuit is added and click F9.
- 8. Click [OK] to create the circuit.

		isitioni····(M+RD ng start FB
bPositio····	BijbEN	o_bENO:B
Positionine Start Request	Execution command	Execution status
	DUT:i_stModule	o_bOK:B
	Module label	Normal completion
Horizontal Line (-1 to 10)		
4 OK Cancel	UW:i_uAxis	o_bErr:B
Stop at the Connection Point	Target axis	Error completion
8.		
	UW:i_uStartNo	o_uErrId:UW
	Cd.3: Positioning start No.	Error code

	M_RD77_StartPos Positioning	
	- BILDEN	o_bENO:B
Positioning Start Request	Execution command	Execution status
	DUT:i_stModule	о_ЬОК:В
	Module label	Normal completion
	UW:i_uAxis	o_bErr:8
	Target axis	Error completion
	UW:i_uStartNo	o_uErrId:UW
	Cd.3: Positioning start No.	Error code



Positioning start FB

o_bOK:E

9.

B:i bEI

7 DUT:LstMd

-Γ

Positic M80

 $\dashv \vdash$

Positionin Start Request

21

I/O No.

🗆 📗 Paran ietei

🗉 퉲 Axis#1

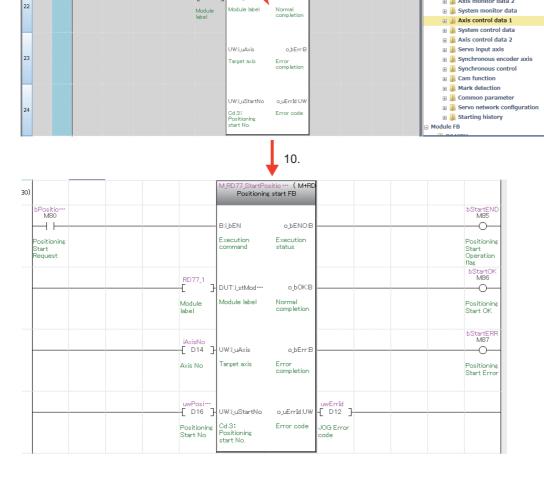
🗉 📗 Axis#2

Axis monitor data
 Axis monitor data 2

🗉 퉬 Input/Output signal

10. Create another circuit in the same manner and select [F4 (convert)]. The circuits are converted.

3 POSITIONING CONTROL STARTUP 3.2 Sequence Program Creation



7. Saving a project

Save a created project.

1. Select [Project] \rightarrow [Save as], then click [Save] after entering the file name.

Pro	ect <u>E</u> dit <u>F</u> ind/Replace	<u>C</u> onvert	📑 Save as		
Ľ	<u>N</u> ew	Ctrl+N	Save in:	MELSEC iQ-R	G 🏚 📂 🖽 -
B	<u>O</u> pen	Ctrl+0		Name	Date modified Type
	<u>C</u> lose		S	HTTL: RD77MS4_sample1.gx3	7/9/2015 2:31 AM GX3 File
	<u>S</u> ave	Ctrl+S	Recent Places	RD77MS4_start_up.gx3	7/9/2015 2:31 AM GX3 File
	S <u>a</u> ve As				
	<u>D</u> elete		Desktop		
	Project <u>V</u> erify				
	Project Revision	+	Libraries		
	Change Module Type				
	Data Operation(<u>E</u>)	•	Computer		
	Intelligent Function Mod	lule(<u>F</u>) +		1.	
	Open Othe <u>r</u> Format File	•	Network		,
	Library Operation	•		File name: RD77MS4_sample_aaa	▼ <u>S</u> ave
	Security(<u>U</u>)	+		Save as type: GX Works3 Project (*.gx3)	▼ Cancel
	Prin <u>t</u> er Setup			Title(<u>A</u>):	
	Page Setup		Other Format:		
	Print Preview			as a <u>W</u> orkspace Format Project :hange the windows with this button to use workspace fo	weak evaluat
9	Print	Ctrl+P	(MELSOI	FT Navigator supports this format.)	annac project.
	Recent Projects(G)	•			
	Start GX Works2				
	Exit(Q)				

[Saving data]

- · Parameters and sequence programs of the PLC CPU
- · Positioning data and parameters of the Simple Motion module
- · Parameters of servo amplifiers
- **8.** Writing to PLC CPU

Write set parameters and created programs to the PLC CPU.

- 1. Select [Online] \rightarrow [Write to PLC CPU] to open the Online Data Operation window.
- 2. Check the "System parameter/CPU parameter", "Module parameter", and "Program" boxes.
- 3. Click [Execute] to start writing the selected items to the PLC CPU.
- 4. Click [Close] after completion of the writing.

Onli	ne Debua	D iagnostics	Tool Wi	nde	0	nline Data Operation									
		<u>_</u>	<u> </u>			Display Setting Rel	ated Functions								
	Specify Co	nection Desti	nation			🖳)) 🏢 wa		Read	IJ.,	T	Verify	📙 🥎 🇊 Deleti	8		
2 0	<u>R</u> ead from	PLC		1.		Select Eavorites	Select All	Legend	U Built-in	Memory	SD Memo	ry Card 🕋 Intelliger	nt Function Module		
-50	<u>W</u> rite to Pl	LC				Open/Close All(<u>T</u>) Module Name/Data Nar	Deselect All(<u>N</u>)	*	5		Detail	Title	Last Change	Size (Byte)	-
	Verify With	n PLC				RD77MS4_sam	ple2_eng	-							
							Parameter/CPU Parame	•					2015/06/25 17:34:42	Not Calculation	
	Remote Op	peration(S)				Module F			-	-				Not Calculation	
	· · · · · ·					🝈 Simple N	lotion Module Setting:0		-2.		Detail	1	2015/06/25 17:34:43	Not Calculation	
	CPU Memo	ory Operation					Card Parameter						2015/06/25 17:33:59	Not Calculation	
						Remote		•					2015/06/25 17:33:59	Not Calculation	
	Delete PLC	C Data				Global Lab							2015/06/25 17:46:22		
						Global Lab		~					2015/06/25 17:46:22	Not Galculation	
	User Data	(<u>E</u>)		•				~					2015/06/25 17:46:22	Not Calculation	
	Set <u>C</u> lock					e 🚡 Local Labe		2							-
				-		Disp <u>l</u> ay Memory Ca	pacity 😵								
	Monitor(<u>M</u>)		•		Memory Capacity									
						Size Calculation	Program Memory							Fre	∞ 0/160KB
	Watch(<u>T</u>)			•		Legend									
							Data Memory							Fre	e 46/2049KB
						Used	Device/Label Memory	(File Sto	rago Órea)				Fre	
						Increased	Contract Education Memory	(110 010	age mea	v					6/256KB
						Decreased 5% or Less	SD Memory Card							Fre	
						5% or Less	,							3. 🛛 🖗	0KB
														Execute	Close

3.3 Parameter Settings for Simple Motion Module

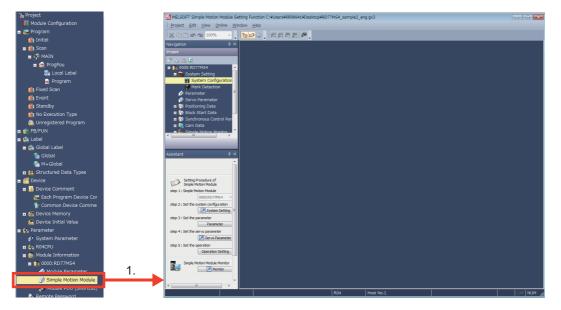
1. Start of Simple Motion module setting function

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



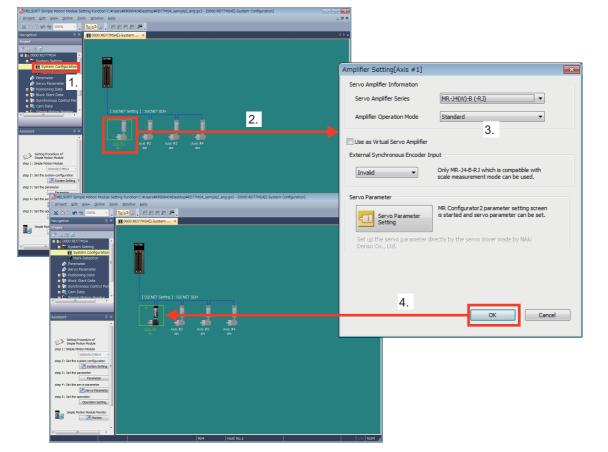
GX Works3 Menu

[Simple Motion Module Setting Function]



2. System settings

- 1. Select the [System Configuration].
- 2. Set the servo amplifiers according to the machine.
- 3. Set the details of servo amplifiers.
- 4. Click [OK], then the set servo amplifier is colored.



3. Parameter settings

[Equipment specifications]

Machine configuration : Horizontal ball screw

Unit setting : 0:mm

Ball screw pitch : 10000.0 [µm]

Reduction ratio (NL/NM) : 1/2 (Load side [NL]/Motor side [NM])

The load-side ball screw is made to rotate once by rotating the motor twice.

Encoder resolution : 4194304 [pulse/rev]

Servo amplifier : MR-J4-10B

Servo motor : HG-KR series

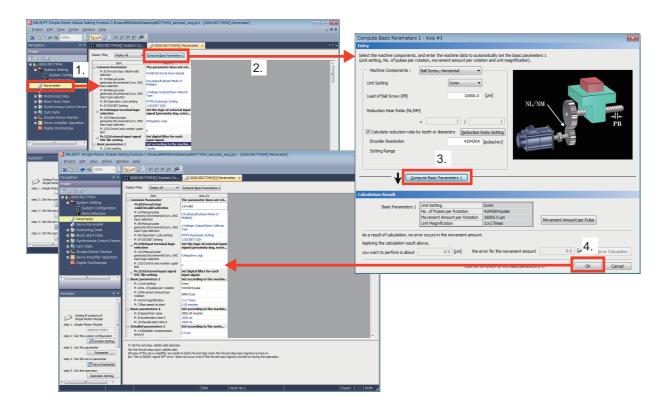
[Operation procedure]

1. Select [Parameter] from the Menu.

2. Click [Compute Basic Parameters 1] to open the electronic gear calculation screen.

3. Set the parameters according to the machine specification. After the setting, click [Compute Basic Parameters 1] to calculate the electronic gear.

4. Click [OK] to write the electronic gear data to the parameters.



Point P

1. Set [Pr.82 Forced stop valid/invalid selection] to "1: Invalid".

[Pr.82 Forced stop valid/invalid selection] is set to "valid" as default for safety. Since the machine does not use forced stop, change it to "1: Invalid".

2. Set the "Input type" in [Pr.116 FLS signal selection], [Pr.117 RLS signal selection], [Pr.118 DOG signal selection], and [Pr.119 STOP signal selection].

Select "15: Invalid" since the machine does not use Data set method, FLS, RLS, and STOP for home position return.

Display Filter Display All	Compute Basic Parameters 1	Pr.116:FLS signal selection : Input type Pr.116:FLS signal selection : Input terminal	1:Servo Amplifier 0:Simple Motion Module 1:Servo Amplifier
valid/invalid selection Pr.24:Manual pulse generator/Incremental Sync. ENC input selection	0:Valid (External Input Signal) ItInvalid 2:Valid (Buffer Memory)	Pr.117:RLS signal selection : Input type	2:Buffer Memory 15:Invalid 2.

Set common/basic/detailed/home position return/expansion parameters where necessary. (Refer to Appendix 2 for setting examples.)

4. Servo parameter settings

[Operation procedure]

- 1. Select [Servo parameter] in the menu.
- 2. Click [Basic] to open [Common Basic].

Project	Aress
l" 🖬 🖪 🖻	Effection days * Mose Association and Associationadiate and Associationadiate and Associationadiate and
0000:RD77MS4	Basic PAQ Mat Wat Coverage Rolation direction (POL)
📕 🖬 System Setting	Post Veta Veta Veta Veta Veta Veta Veta Vet
👔 System Configuration	Aarmat 7000 100 100 100 100 100 100 100 100 10
🇭 Mark Detection	- Component p PAO SP Auto tankgrepone 1-0 15 I BP to position range p Aute 0-65335 150
🕸 Parameter	- Valacion control - Valacion control - Valacion control - Valacion control - Valacion - Valacio - Valacion - Valacion - Valacion - Valacion
🔗 Servo Parameter	Exercise Auto decision decision decision Auto decision decision Auto decision decision Auto decision decision Auto decision Aut
😐 📷 Positioning Data	- Filer 1 PAU TWO For monofacture string 00007777 0000 Enabled (Use forced stop input EM 1 or EM2)
🗉 🔯 Block Start Data	Filter 3 74.9 70x 70x
🗉 🔯 Synchronous Control Param	- One-total 7422 19425 Postor control dividue selection 00002000 0000 Disabled (The force stop input EM1 and EM2 are not used)
🖬 🚉 Cam Data	Lut display 1/2-3 1/2-4 1/2-
🖬 🚉 Simple Motion Monitor	Cany Rter + PA27 *m. For manufacture setting 0000.0314 0000 * * 26.20 For manufacture setting 0000.0000 0000
🖬 📶 Servo Amplifier Operation	
🏧 Digital Oscilloscope	

3. Set [Rotation direction].



Set rotation direction according to the machine.

Select from [CCW direction during forward pulse input, CW direction during reverse pulse input], or [CW direction during forward pulse input, CCW direction during reverse pulse input].

CCW direction during forward pulse input

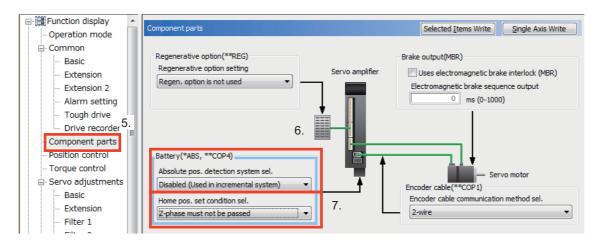


CW direction during reverse pulse input

4. Set the Servo forced stop selection to "Disabled".



The "Servo forced stop selection" sets whether to read forced stop input signals via servo amplifiers. This parameter is set to "Enabled (Use forced stop input EM2 or EM1.)" as default for safety. If an error occurs on mechanical system due to crush, etc., establish the absolute position after adjusting the error and ensuring safety. Since the machine in this section does not use forced stop, change it to "1: Disabled".



5. Select "Component parts" to open the Component parts window.

6. [Absolute position detection system/Incremental system selection]

Select "Disabled (Used in incremental system)" for absolute position detection system selection.

7. For the home position setting condition, select "1: Not need to pass servo motor Z-phase after power on".

Point P

When "1: Not need to pass servo motor Z-phase after power on" is selected, the home position return can be executed without waiting for the motor to rotate one time or more.

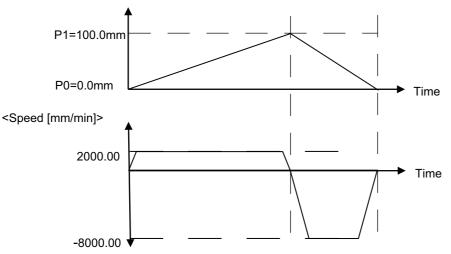
Set servo parameters where necessary.

5. Positioning data setting

The following explains how to set positioning data through a program example in which the axis travels back and forth from the home position (P0) to P1.

[Operation example when the axis moves back to the home position (P0) after moving to P1]

<Position [mm]>

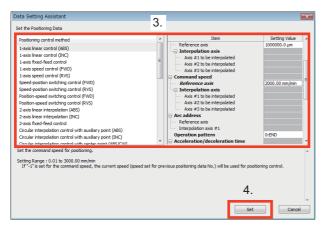


[Operation procedure]

- 1. Select "Axis #1 Positioning Data" in the menu.
- 2. Select [Data Setting Assistant].

Project		_											_
ř ⊾ 🛍 🖻		Disp	lay Filte	Display All	- Data Sett	tin <u>q</u> As	sistant	Offline Sin	nulation	Automatic Command S	Speed Calc.	utomatic Sub Arc Calc.	c.
a 👔 0000:RD77MS4 🖕 🕋 System Setting			No. C	Operation pattern	Control method	2	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Γ
System Configuration			1	Positioning Commer	nt>								
Mark Detection Parameter			2	Positioning Commer	nt>								
Servo Parameter			3	Positioning Commer	nt>								
🔳 🚱 Positioning Data	1.		4	<positioning commer<="" td=""><td>ats</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	ats								
Axis #1 Positioning Data		•		d oardoning commer		m							
Axis #2 Positioning Data		•				_		m					•
🕺 Axis #4 Positioning Data				pattern									
🖬 🍄 Block Start Data			e opera		ates whether positioning	ofac	ertain data No.	is to be ended v	with just that da	ata, or whether the positi	oning for the next	data No. is to be carrie	ed o
🖩 🔯 Synchronous Control Parameter													
🗉 🚉 Cam Data 🗉 💷 Simple Motion Monitor													
simple Motion Monitor Simple Motion Monitor Servo Amplifier Operation													

3. Select the positioning control method and enter each item.



Positioning control method	Positioning data No.	Positioning address	Command speed	Operation pattern	Acceleration time No.	Deceleration time No.	Dwell time	M-code
1-axis linear control (ABS)	1	100000.0µm	2000.00 mm/min	1: CONT	0:1000	0:1000	0:0 ms	0

4. Click [Set] to close the Data Setting Assistant window and display the positioning data window.

Display Fi	ilte <u>r</u> Display All	▼ Data Setting	Assistant	Offline Sir	mulation	Automatic Command	Speed Calc. A	utomatic Sub Arc Calc			
No.	Operation pattern	Control method	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M-code	^
1	1:CONT	01h:ABS Linear 1	-	0:1000	0:1000	100000.0 µm	0.0 µm	2000.00 mm/min	0 ms	0	
	<positioning comm<="" td=""><td>ient></td><td>1</td><td>1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	ient>	1	1							
2											
3	<positioning comm<="" td=""><td>nent></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>7.</td></positioning>	nent>									7.
			III								Þ.
		nates whether positioning of	a certain data No.	is to be ended	with just that da	ata, or whether the posit	tioning for the next d	lata No. is to be carrie	ed out in		

Create the positioning data in the same manner for the axis moving back to the home position from P1.

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M-code
1	1: CONT	01h:ABS Linear 1	_	0:1000	0:1000	100000.0 μm	0.0µm	2000.00 mm/min	0ms	0
2	0: END	01h:ABS Linear 1	—	0:1000	0:1000	0.0 μm	0.0µm	8000 mm/min	0ms	0

5. Positioning data creation is completed.

6. Saving a project

Save a created project.

1. Select [Project] \rightarrow [Save As]. Enter a file name, then click [Save].

					🔢 Save as			
					Save jn:	🕌 MELSEC iQ-R 👻	G 🌶 📂 🖽 -	
-	Proje	ect <u>E</u> dit <u>F</u> ind/Replace	<u>C</u> onvert	<u>V</u> iew <u>O</u> nlin	<u></u>	Name	Date modified	Туре
		<u>N</u> ew	Ctrl+N	5 📭 🖆 📂 (Recent Places	HRD77MS4_sample1.gx3	7/9/2015 2:31 AM	GX3 File
1	B	<u>O</u> pen	Ctrl+0	1 🏷 🗞	Incontent faces	🛗 RD77MS4_start_up.gx3	7/9/2015 2:31 AM	GX3 File
		<u>C</u> lose			Dudter			
•		<u>S</u> ave	Ctrl+S	ProgPou [PR	Desktop			
ł		S <u>a</u> ve As						
V IE C		<u>D</u> elete		3	Libraries			
ġ		Project <u>V</u> erify						
		Project Revision	•		Computer			
		Change Module Type				< III		Þ
		Data Operation(<u>E</u>)	•	-	Network	File name: RD77MS4_sample_aaa		Save
		Intelligent Function Mod	ule(<u>F</u>) >	RD77_1 Y0		Save as <u>type:</u> GX Works3 Project (*.gx3)	•	Cancel
		Open Othe <u>r</u> Format File	+			Title(A):	1.	
-					Other Format:			
						as a Workspace Format Project		
					(MELSC	change the windows with this button to use workspace fo FT Navigator supports this format.)	ormat project.	

[Saving data]

- · Parameters and sequence programs of the PLC CPU
- · Positioning data and parameters of the Simple Motion module
- · Parameters of servo amplifiers

- 7. Writing to the Simple Motion module
- 1. Select [Online] \rightarrow [Write to PLC...] to open the Online Data Operation window on MELSOFT GX Works3.
- 2. Select the Simple Motion module setting.
- 3. Click [Execute] to write the parameters and data to the Simple Motion module via the PLC CPU.
- 4. The confirmation message window for flash ROM overwriting appears. Click [Yes].
- 5. Click [Close] to complete the writing to the Simple Motion module.

E P	roject	<u>E</u> dit	t <u>F</u> ind/Re	place <u>C</u> or	nvert	View	v <u>O</u> r	nline	De <u>b</u> ug	Diagnostics	<u>T</u> ool <u>W</u> indow	H		
	1	8	0		Ţ 1	; Ib	C	Sp	pecify Co	nection Desti	nation 🐘			
맏				Dev Dev			1	Re	ead from	PLC				
									rite to Pl	C		l n		
				F9 sF9 cF9 c				<u></u>	erify With	_		0000		
	🔚 Pr	rogPou	[PRG] [Lo	cal Label	. 👘 🛃) Pro	gP	_	'	_	.abe	I Si		
Nav	Write	,		1	2			Re	emote Op	peration(<u>S</u>)				
Navigation	-			77 1					DLL Momo	nonoration		_		
3			ita Operation			_								
		Display	<u>S</u> etting R	lelated Function:	s									
	1	9	>> 🚮	rite 🔛 📢	R R	lead	9.	1	Verify	🗒 🥢 🇊 Dele	te			
			Select <u>F</u> avorites	Select	t <u>A</u> ll	Legend								
			Open/Close All(<u>T</u>) Deselect	: All(<u>N</u>)	CPI	U Built-ir	Memory	SD Mem	ory Card 👔 Intellige	nt Function Module			
		Mod	ule Name/Data N	lame		*			Detail	Title	Last Change	Size (By	rte)	
			RD77MS4_sa											
		E	😨 Paramete											
	2			n Parameter/CPU	Parame			2.			2015/06/25 17:34:42	Not Galcu		
	-		- 🙆 Module					-			2015/06/25 17:42:35	Not Galcu		
_				Motion Module Se					Detail		2015/06/25 17:34:43	Not Galcu		
				y Card Parameter							2015/06/25 17:33:59	Not Calcu		
			Remot								2015/06/25 17:33:59	Not Calcu	ulation	
		6	Global La				-							
				Label Setting abel Initial Valu							2015/06/25 17:46:22	Not Galcu	ulation	
		-			A6						2015/06/25 17:46:22	Not Galcu	MELSOFT GX Works3	83
		6		or bel Initial Value	0						2010/00/20 17:40.22	Not Galet		
			-		-	_		-				-	Overwrite contents of flash ROM. Are you si	
			Display Memory (Capacity 📚									U Overwrite contents of hash KOM. Are you si	re you want to continue:
			y Capacity	Program Mer	mory									
		S	ige Calculation											
		Legen	d	Data Memor	у ——								4.	Yes No
		0	lsed											
		in the	creased	Device/Labe	el Memory (File Stor	rage Area	0					Free	
		D	ecreased										256/256KB	
		5	Nor Less	SD Memory	Card —							3	- Free	
													0/0KB	
												<u>E</u> xecut	te Close	

[Writing data to the Simple Motion module]

- · Parameters and servo parameters
- · Positioning data and block start data
- · Synchronous control parameters and cam data

3

3.4 Operation Check

The sequence program used in this section is an example using R04CPU and RD77MS4.

When another different module is used, the signal assignment differs. Refer to MELSEC iQ-R Simple Motion Module User's Manual (Application) for details of each signal.

3.4.1 JOG operation

1. Servo ON

Servo amplifiers become servo ON status by turning ON [All axis servo ON (Y1)].

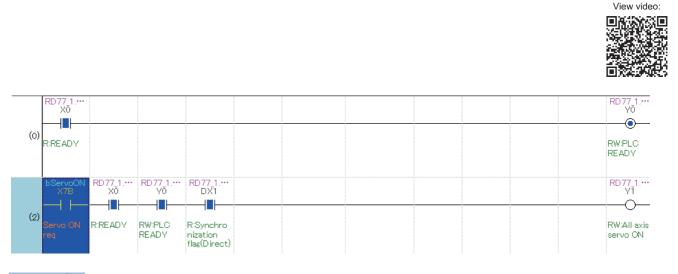
1. Move the PLC CPU switch (RESET/RUN/STOP) to the RUN side.

2. Servo ON by a sequence program

Select [Online] \rightarrow [Monitor] \rightarrow [Start Monitoring] to switch to the monitoring status.

Move the cursor to Servo ON req (X7B).

Servo ON req (X7B) is turned ON by double clicking it while pressing SHIFT key.



Point P

Double-clicking a device while pressing SHIFT key changes the status of the device from OFF to ON, and vice versa.

2. JOG speed settings

Turn ON the JOG Forward Start req and the JOG Reverse start req after setting JOG speed.

1. Double click the "JOG Speed Req" (X60) while pressing SHIFT key.

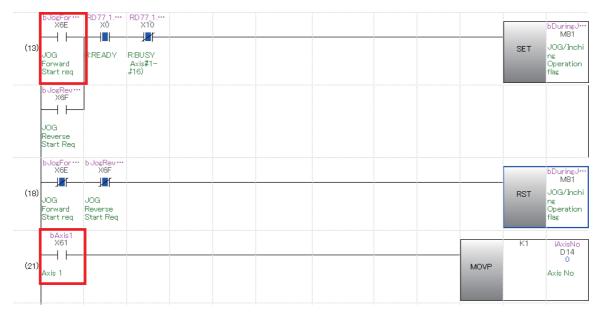
bJog3 Xe	Spe 50					<10000	i_JogSpe… D10
(8) JOG Speed	l Req			C	MOVP		D10 10000 Jog Speed data memo

3. JOG start

Confirm that the workpiece moves in the "+" direction by forward command, and in the "-" direction by reverse command. 1. Select Axis 1 (X61).

2. Select either the JOG Forward Start req (X6E) or the JOG Reverse Start req (X6F).

Move the cursor to "JOG Forward Start req" or "JOG Reverse Start req", and double click it while pressing SHIFT key.

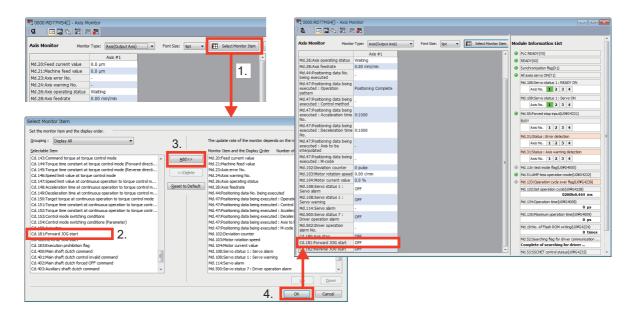


4. Confirming JOG operation

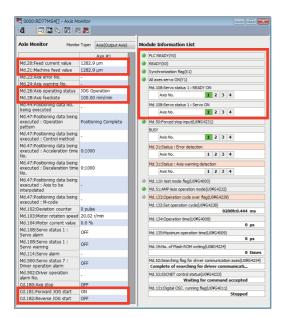
Check the JOG operation in the Axis Monitor window.

Signals, such as Forward JOG start and Reverse JOG start, can be added from the Selectable Items in the Axis Monitor window.

- 1. Click [Select Monitor Item] in the Axis Monitor window.
- 2. Select items to be added from the Selectable Item list.
- 3. Select "Cd.181 Forward JOG start", then click [Add].
- 4. Click [OK] to go back to the Monitor window.



Check the status of each area in the Axis Monitor window during JOG operation.

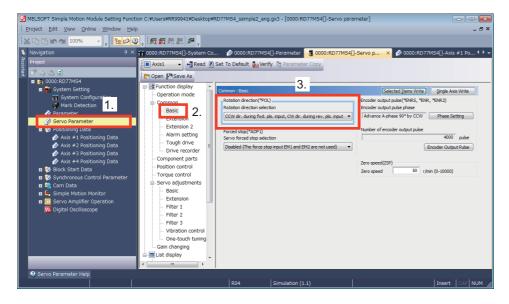


Axis monitor	Checking details
PLC READY (Y0)	ON?
READY (X0)	
Synchronization flag (X1)	
All axes servo ON (Y1)]
Md.20: Feed current value	-
Md.21: Machine feed value	
Md.26: Axis operating status	JOG operation
Md.28: Axis federate	100.00 mm/min
Md.108: Servo status 1: READY ON	ON?
Md.108: Servo status 1: Servo ON	
BUSY	Is Axis1 ON?
Cd.181: Forward JOG start	Is the starting axis ON?
Cd.182: Reverse JOG start	

5. Confirming the motor rotation direction

Switch the motor rotation direction to forward/reverse.

- 1. Select [Servo Parameter].
- 2. Select [Basic].
- 3. Select the servo motor rotation direction according to your machine.



Point P

Set the rotation direction according to the machine.

Select from [CCW direction during forward pulse input, CW direction during reverse pulse input], or [CW direction during forward pulse input, CCW direction during reverse pulse input].

After writing servo parameters to the Simple Motion module, cycle the power of both the servo amplifier and the Simple Motion module.

CCW direction during forward pulse input



CW direction during reverse pulse input

6. JOG operation check is completed.

3.4.2 Home position return (Establishment of the home position)

There are two types of home position return control:

- · Machine home position return which does not use address information to establish the home position.
- Fast home position return which performs positioning by using the coordinate defined by machine home position.

This document explains the method of performing the machine home position return using Data set method.



After setting "9001" as the positioning start No., the home position return is started by turning ON the Positioning start signal.

Item	Buffer memory	Signal	Description
Axis 1 positioning start No.	4300	—	Set the positioning start No. Set "9001" for machine home position return.
Axis 1 positioning start	—	Y10	Execute the home position return and positioning start.

Point P

After setting "9001" as the positioning start No., the machine home position return is started by turning ON the Positioning start.

1. Setting the home position return No.

1. Select the Axis 1. Double click it while pressing SHIFT.

(21)	Axis1 X61 Axis 1	1.	MOVP	K1	iAxisNo D14 1 Axis No
(25)	bAxis2 X62 Axis 2		MOVP	K2	iAxisNo D14 1 Axis No

2. Starting the home position return

1. To set the positioning start No. (9001) to the buffer memory, double click X63 while pressing SHIFT.

2. To start the positioning, double click "Positioning Start Request".

	bSyncPosiSt*** X66						K1	unPos
(404)	Synchronous Positioning Start data					MOVP		Positi Start
(400)	bHomePositi… X63 Home Position return Data	1.				MOVP	K9001	uwPo Positi Start
412)	bPositioning***			M,RD 77,StartPositi Positio	ioning_00E_2 (M+RD7 ning start FB			bS
	Positioning Start Request	2.		BIJEN Execution command	o,bENOB – Execution status			Posit
			RD77_1 []	DUT:i_stModule	0.50KB			ь
			Module label	Module label	Normal completion			Posit Start
			wAxisNo [D14]	UW:1_uAxis	o,bErr B	 		bS
			Axis No	Target axis	Error completion			Posit Start

3. Confirming the home position return

1. Check the status and monitor display values shown above in the Axis Monitor window.

🖁 0000:RD77MS4[] - Axis M 💶 🛛 🗔 🖬 🗞 🔣 📕						
Axis Monitor Monito	Type: Axis(Output Axis)		Mod	ule Information List	
	Axis #1		1	0	PLC READY(Y0)]
Md.20:Feed current value	0.0 µm		Π	0	READY(X0)]
Md.21:Machine feed value	0.0 µm			0	Synchronization flag(X1)	
Md.23:Axis error No.	-		Π		All axes servo ON(Y1)	
Md.24:Axis warning No.	-				Md. 108:Servo status 1 : READY ON	
Md.26:Axis operating status	Waiting				Axis No. 1 2 3 4	
Md.28:Axis feedrate	0.00 mm/min				AXIS NO. 1 2 3 4	
Md.30:External input signal :	ON			-	Md. 108:Servo status 1 : Servo ON	
Lower limit		E			Axis No. 1 2 3 4	
Md.30:External input signal : Upper limit	ON				Md. 50:Forced stop input(U0¥G4231)	
Md.31:Status : HPR request	0.55		Π		BUSY	
flag	OFF				Axis No. 1 2 3 4	1
Md.31:Status : HPR	ON					
complete flag			Ц		Md.31:Status : Error detection	
Md.44:Positioning data No. being executed	-				Axis No. 1 2 3 4	
Md.47:Positioning data being					Md.31:Status : Axis warning detection	1
executed : Operation	Positioning Complete	μ			Axis No. 1 2 3 4	
pattern						
Md.47:Positioning data being executed : Control method	-				Md. 1:In test mode flag(U0¥G4000)	
Md.47:Positioning data being				•	Md.51:AMP-less operation mode(U0¥G4232)	
executed : Acceleration time	0:1000				Md. 133:Operation cycle over flag(U0¥G4239)	
No.					Md. 132:Set operation cycle(U0¥G4238)	
Md.47:Positioning data being executed : Deceleration time	0.1000				0200h:0.444 ms	
executed : Deceleration time No.	0:1000				Md. 134:Operation time(U0¥G4008)	
Md.47:Positioning data being					0 µs	
executed : Axis to be	-		1		Md. 135:Maximum operation time(U0¥G4009)	
interpolated		-	I		0 µs	

Axis monitor	Checking value
Md.20: Feed current value	0.0[µm]
Md.21: Machine feed value	0.0[µm]
Md.26: Axis operating status	Waiting
Md.28: Axis feedrate	0.00[mm/min]
Md.31: Status: HPR request flag	OFF
Md.31: Status: HPR complete flag	ON

4. Home position return check is completed.

3.4.3 Positioning control

This section explains the operation check method for positioning control which performs positioning to a specified position using address information.

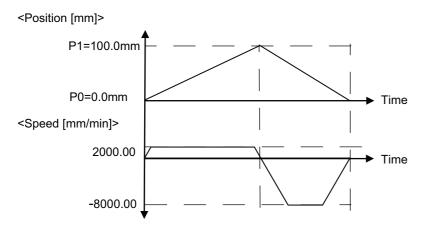
Positioning is started by a sequence program or a function block.

In this example, positioning control is started by a function block, and synchronous control is started by a sequence program.



3

[Operation example when the axis moves back to the home position (P0) after moving to P1]

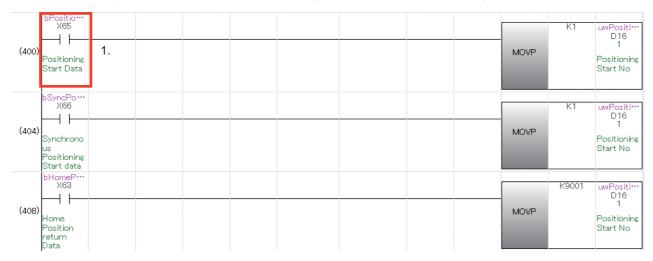


Positioning is started by setting the positioning start No. and turning ON the Positioning start signal.

Item	Buffer memory	Signal	Description
Axis 1 positioning start No.	4300	—	Set the positioning start No.
Axis 1 positioning start	—	Y10	Start the positioning.

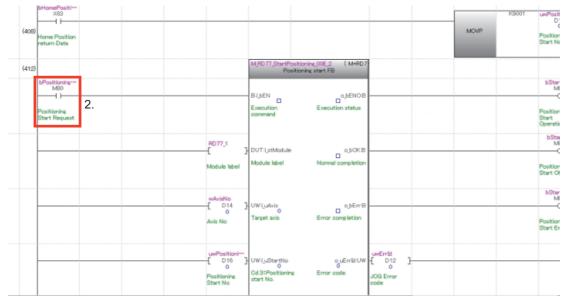
1. Setting the positioning control start No.

1. Set the positioning start No. Double click the Positioning Start Data (X65) while pressing SHIFT.



2. Positioning start

2. To start the positioning, double click M80 while pressing SHIFT.



3. Confirmation of Axis 1 positioning control

Check that Axis 1 moves to 100.0 mm and goes back to 0.0 mm through the Feed current value for Axis 1 in the Axis Monitor window.

Check that the Axis feedrate for Axis 1 is equal to the command speed.

Check each monitor value and status through the Axis monitor.

R 🛛 🖂 🖬 🗞 🔣 层					
Axis Monitor Monitor	Type: Axis(Output Axis)	•	Font	Мо	dule Information List
	Axis #1			9	PLC READY(Y0)
Md.20:Feed current value	35162.9 µm			0	READY(X0)
Md.21:Machine feed value	35162.9 µm			0	Synchronization flag(X1)
Md.23:Axis error No.	•			0	All axes servo ON(Y1)
Md.24:Axis warning No.					Md. 108:Servo status 1 : READY ON
Md.26:Axis operating status	Position Control				Axis No. 1 2 3 4
Md.28:Axis feedrate	2000.00 mm/min				
Md.30:External input signal : Lower limit	ON				Md. 108:Servo status 1 : Servo ON Axis No. 1 2 3 4
Md.30:External input signal : Upper limit	ON			0	Md.50:Forced stop input(U0¥G4231)
Md.31:Status : HPR request flag	OFF				BUSY Axis No. 1 2 3 4
Md.31:Status : HPR complete flag	OFF				
Md.44:Positioning data No. being executed	1				Md.31:Status : Error detection Axis No. 1 2 3 4
Md.47:Positioning data being executed : Operation	Continuous Positioning Control				Md.31:Status : Axis warning detection
pattern Md.47:Positioning data being	1-axis inear control			0	Md. 1:In test mode flag(U0¥G4000)
executed : Control method	(ABS)			0	Md.51:AMP-less operation mode(U0¥G4232)
Md.47:Positioning data being executed : Acceleration time No.	0:1000			0	Md. 133:Operation cycle over flag(U0¥G4239)
Md.47:Positioning data being executed : Deceleration time No.	0:1000				Md. 132:Set operation cycle(U0¥G4238) 0200h:0.444 ms Md. 134:Operation time(U0¥G4008)
Md.47:Positioning data being executed : Axis to be	-				0 µs Md. 135:Maximum operation time(U0¥G4009)
interpolated Md.47:Positioning data being executed : M-code	-				0 µs Md. 19:No. of Flash ROM writing(U0¥G4224)
Md.102:Deviation counter	0 pulse				0 time
Md.103:Motor rotation speed					Md. 52:Searching flag for driver communication ax Complete of searching for driver co
Md.104:Motor current value	0.0 %				
Md.108:Servo status 1 : Servo alarm	OFF				Md.53:SSCNET control status(U0¥G4233) Waiting for command accepted
Md.108:Servo status 1 : Servo warning	OFF				Md. 131:Digital OSC. running flag(U0¥G4011) Stopped
Md.114:Servo alarm	-				
Md.500:Servo status 7 : Driver operation alarm	OFF				
Md.502:Driver operation alarm No.	-				
Cd.180:Axis stop	OFF				
Cd.181:Forward JOG start	OFF				
Cd.182:Reverse JOG start	OFF				

Axis monitor	Checking details
Md.20: Feed current value	-
Md.21: Machine feed value	-
Md.26: Axis operating status	Position control
Md.28: Axis feedrate	2000.00[mm/min]
Md.30: External input signal: Lower limit	ON?
Md.30: External input signal: Upper limit	ON?
Md.31: Status: HPR request flag	OFF?
Module information	Checking details
PLC READY (Y0)	ON?
READY (X0)	
Synchronization flag (X1)	
All axes servo ON (Y1)	
BUSY	Is the starting axis ON?

4. Positioning operation check is completed.

4 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.

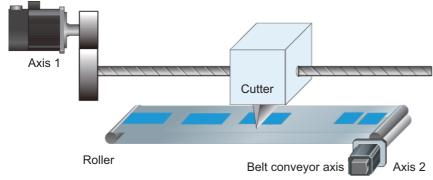
Axis 1 operation is the same as that described in Chapter 2.

Refer to Chapter 2 to 3 for details of the parameters and servo parameters.



[Flying Cutter]

Without stopping the conveyor axis (Axis 2), cutter axis (Axis 1) synchronizes to the movement of the conveyor belt and cuts the work piece evenly in half. After the cut, the cutter axis returns to the wait position. Synchronous control with electronic cam operation is used for the cutter axis.



[Specification]

A one-time belt conveyor rotation generates the conveyor movement for one work piece.

(1) Cutter axis (cam control axis) specification

Ball screw lead (PB) : 10 mm

Gear ratio of the external reducer : 1/2

Cam stroke amount : 100.0000 mm

(2) Belt conveyor axis specification

Roller diameter : 50 mm (Roller circumference 50mm × π = 157079.6µm)

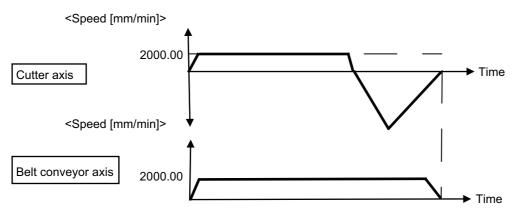
Gear ratio of the external reducer : 1/1 (Directly connect the servo motor to the roller)

[Machine operation pattern]

The cutter axis (Axis 1) moves for certain distance while synchronizing to the belt conveyor movement.

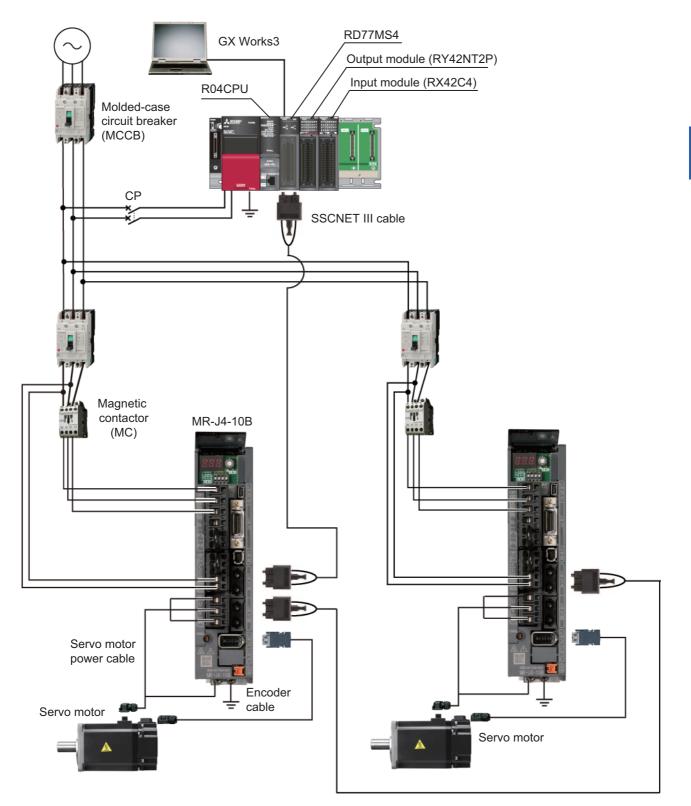
The cutter goes down in synchronization with the conveyor by sequence control, and the cutter returns to the original position after the synchronization.

The belt conveyor moves at a constant speed.



4.1 System Configuration

The following shows a system example consisting of the RD77MS, MR-J4-10B, and servo motors.



4.2 Startup Procedure for Synchronous Control

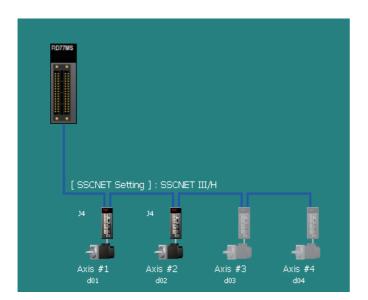
- 4. SYNCHRONOUS CONTROL STARTUP
- 4.1 System configuration
- 4.2 Startup procedure for synchronous control
- 4.3 Parameter creation for synchronous control
- 4.3.1 System configuration settings
- 4.3.2 Parameters and servo parameters settings
- 4.3.3 Positioning data settings
- 1. Positioning data selection
- 4.3.4 Synchronous control parameter settings
- 1. Synchronous parameter settings
- 2. Input axis parameter settings
- 3. Transition of synchronous control parameter window
- · 4. Settings for synchronous control parameters and input axis parameters are completed.
- 4.3.5 Cam data creation
- 1. Creating a new cam data
- 2. Cam curve creation
- 4.3.6 Saving a project
- 4.3.7 Writing to the Simple Motion module
- 4.4 Operation check for synchronous control
- 4.4.1 Home position return
- 4.4.2 Synchronous control start
- 1. Start and confirmation of output axis to be synchronized
- 2. Start and confirmation of the main shaft (input axis)
- 3. Operation check for main shaft (input axis)
- 4.4.3 Operation check with digital oscilloscope
- 1. Start of digital oscilloscope
- 2. Selecting probe
- 3. Sampling condition settings (No need to change)
- 4. Trigger condition settings (No need to change)
- 5. Start sampling
- · 6. Checking cam data

4.3 Parameter Creation for Synchronous Control

4.3.1 System configuration settings

Configure a 2-axis system.





4.3.2 Parameters and servo parameters settings

Set parameters and servo parameters for Axis 1 and Axis 2.

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

Compute Basic Parameters :	1 - Axis #1		
Entry			
	and enter the machine data to auto tation, movement amount per rota		ers 1
Machine Components :	Conveyor -]	
Unit Setting	0:mm -		
Outer diameter of Roll (DR)	50000.0	[µm]	
Reduction Gear Ratio (NL/NM)		
	= 1 /	1	
Calculate reduction ratio b	y teeth or diameters Reduction I	Ratio Setting	
Encoder Resolution	4194304	[pulse/rev]	NL/NM
Setting Range			
\	oute Basic Parameters 1		
Calculation Result			
Basic Parameters 1	Unit Setting No. of Pulses per Rotation	0:mm 172985333 pulse	
	Movement Amount per Rotation Unit Magnification	6478422.3 µm 1:x1 Times	Movement Amount per Pulse
As a result of calculation, some	error occurs in the movement amou	unt.	
Applying the calculation result a	bove,		
you want to perform is about	0.0 (um) the e	rror for the movement amount	0.0 [µm] Error Calculation
	Click OK t	to reflect to the basic parameter	rs 1. OK Cancel

[Input]

Machine	Unit Setting		Reduction Gear Ration	Encoder resolution	
Components		Roll	Load side [NL]	Motor side [NM]	
Conveyor	0:mm	50000.0 [µm]	1	1	4194304

[Calculation Result]

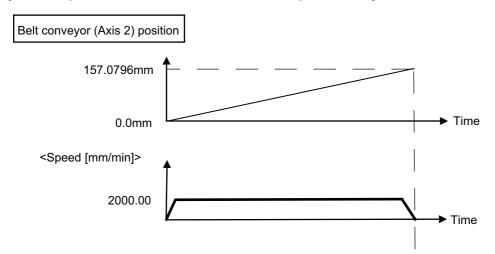
Unit Setting	Number of Pulses per Rotation	Movement Amount per Rotation	Unit Magnification
0mm	172985333 pulse	6478422.3 μm	1: ×1 times



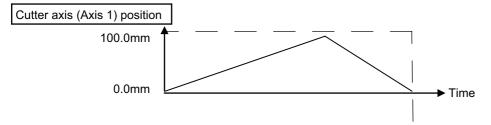
When the electronic gear value cannot be divided due to circumference ratio π , it will be automatically calculated to the value with less difference.

4.3.3 Positioning data settings

Create a program in which the belt conveyor (Axis 2) moves from the home position to P1. For Axis 1 operated with cam control, create cam data in which Axis 1 synchronizes to the belt conveyor. [Data example in which the axis moves from the home position to P1]



· Each time the 50 mm diameter roller rotates, the belt conveyor moves for 157.0796 mm.



- Cam control is carried out for Axis 1 following the movement of the belt conveyor.
- **1.** Positioning data selection

Select [Axis #2 Positioning Data] from the menu.

Navigation 🕂 X 👷	stem co.	produced//1	MS4[]-Parameter	0000:RD77M	54()-Servo pa	ird 📡 U	000:RD77MS4[]-Axi	s #1 PO	0000:RD77MS4[]-	AXIS
Project	Display F	ilter Display All	 Data Sett 	ting Assistant	Offline Sir	mulation	Automatic Command	Speed Calc.	utomatic Sub Arc Calc	
a 🛅 0000:RD77MS4	No.	Operation pattern	Control method	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dw
System Setting System Configuration	1	0:END 02 <positioning commen<="" td=""><td>2h:INC Linear 1</td><td></td><td>0:1000</td><td>0:1000</td><td>157079.6 µm</td><td>0.0 µm</td><td>2000.00 mm/min</td><td>0 ms</td></positioning>	2h:INC Linear 1		0:1000	0:1000	157079.6 µm	0.0 µm	2000.00 mm/min	0 ms
Mark Detection		<positioning commen<="" td=""><td>12</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	12							
Parameter	2	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
🔗 Servo Parameter	3	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
🗉 🔯 Positioning Data	4									
🔗 Axis #1 Positioning Data		<positioning commen<="" td=""><td>D</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	D							
Axis #2 Positioning Data	5	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
Axis #3 Positioning Data	6	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
🛚 🔯 Block Start Data	7									
🛚 🔯 Synchronous Control Parameter		<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
🖬 👰 Cam Data	8	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
Simple Motion Monitor Image: Serve Amplifier Operation	9	<positioning commen<="" td=""><td>t></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></positioning>	t>							
Digital Oscilloscope	•			III						F.
			tes whether positioning	of a certain data No	. is to be ended	with just that d	ata, or whether the posi	tioning for the next	data No. is to be carrie	ed out

[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	M-code
1	0:END	<u>INC</u> linear 1	—	1:1000	1:1000	<u>157079.6</u> μm	0.0µm	<u>2000.00</u> mm/min	0ms	0

4.3.4 Synchronous control parameter settings

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

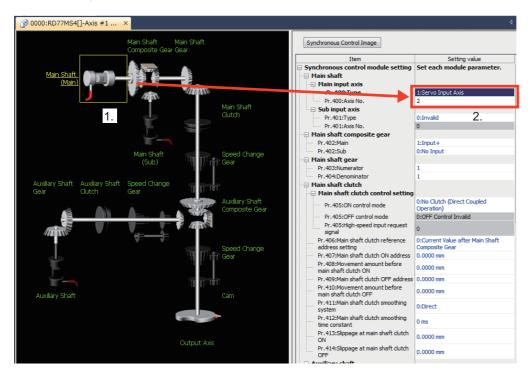
Item	Description
Input axis parameter	Set the servo input axis type for the main shaft. (Set "1: Feed current value " for Axis 2)
Axis 1 synchronous control parameter	Set the Axis 1 synchronous control parameter.
Synchronous control image	The configuration of output axes connected to the main shaft is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

1. Synchronous parameter settings

The following explains the settings that synchronize Axis 1 to the feed current value of Axis 2.

1. If you select [Main shaft (Main)], the [Type] for the Main input axis will be selected.

2. Set [Pr.400 Type] to "1: Servo Input Axis", and [Pr.400: Axis No.] to "2".



3. Change the items that are marked with " ** in the table below.

[Synchronous parameter Axis 1]

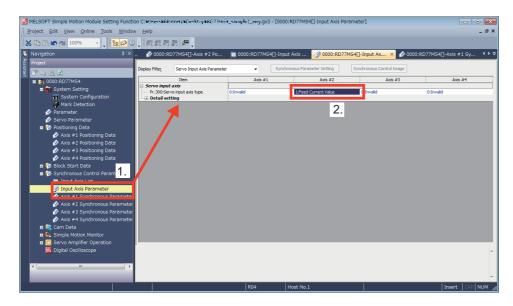
Item			Details				
Main shaft	Main input axis No.	Pr.400: Type	<u>1: Servo input axis[*]</u>				
		Pr.400: Axis No.	<u>2</u> *				
	Sub input axis No.	Pr.401:Type	0: Invalid				
		Pr.401: Axis No.	0				
Composite main shaft gear	composite main shaft gear Pr.402: Main		1: Input +				
	Pr.402: Sub	r.402: Sub					
Main shaft gear	Pr.403: Numerator		1				
	Pr.404: Denominator	Pr.404: Denominator					
Main shaft clutch	Main shaft clutch control setting	Pr.405: ON control mode	0: No clutch (Direct coupled operation)				
		Pr.405: OFF control mode	0: OFF control invalid				
		Pr.405: High speed input request signal	0				
Output axis	Cam axis cycle unit setting	Pr.438: Unit setting selection	0: Use units of main input axis				
		Pr.438: Unit	<u>0mm</u> *				
		Pr.438: Number of decimal places	<u>o</u> *				
	Pr.442: Cam axis length per cycle c	Pr.442: Cam axis length per cycle change setting					
	Pr.439: Can axis length per cycle		<u>157.0796mm[*]</u>				
	Pr.441: Cam stroke amount		<u>100000.0μm</u> *				
	Pr.440: Cam No.	Pr.440: Cam No.					
	Pr.444: Cam axis phase compensat	Pr.444: Cam axis phase compensation advance time					
	Pr.445: Cam axis phase compensat	ion time constant	10ms				
	Pr.446: Synchronous control decele	ration time	0ms				
	Pr.447: Output axis smoothing time	constant	0ms				

• Synchronous control parameters not marked with "*" all remain at default values.

2. Input axis parameter settings

The following explains the settings that synchronize Axis 1 to the feed current value of Axis 2.

- 1. Select [Input Axis Parameter].
- 2. Select [1: Feed Current Value] for [Pr.300 servo input axis type] for Axis 2.



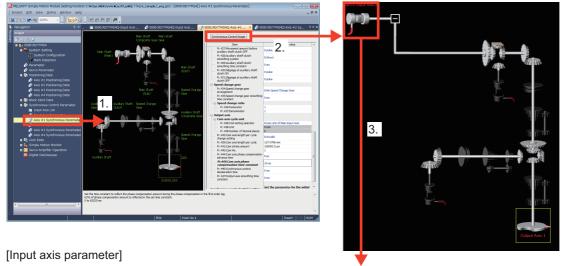
[Input axis parameter (Axis 2)]

Item	Item					
Servo input axis	Servo input axis type	1: Feed current value*				
	Detail setting	Smoothing time constant	0ms			
			Оµѕ			
		Phase compensation time constant	10ms			
		Rotation direction restriction	0: Without rotation direction restriction			

• Synchronous control parameters not marked with "*" all remain at default values.

- 3. Transition of synchronous control parameter window
- 1. Select [Axis #1 Synchronous Parameter] from the menu.
- Axis #1 synchronous parameters can now be set.
- 2. Click [Synchronous Control Image] to open the image screen.

[Synchronous parameter]



Display Filter	Servo Input Axis Parameter	✓ Synchrono	ous Parameter Setting Syr	chronous Control Image	
	Item	Axis #1	Axis #2	Axis #3	Axis #4
🖃 Servo input	axis				
Pr.300:5e	ervo input axis type	0:Invalid	1:Feed Current Value	0:Invalid	0:Invalid
🖃 Detail set	tting				
Pr.301:Ir	input smoothing time constant	0 ms	0 ms	0 ms	0 ms
Pr.302:P time	hase compensation advance	0 µs	0 µs	0 µs	0 µs
Pr.303:P constant	Phase compensation time t	10 ms	10 ms	10 ms	10 ms
Pr.304:R	Rotation direction restriction	0:Without Rotation Direction Re	0:Without Rotation Direction Re	0:Without Rotation Direction Re	0:Without Rotation Direction Res

3. Select the main shaft to open the input axis parameter.

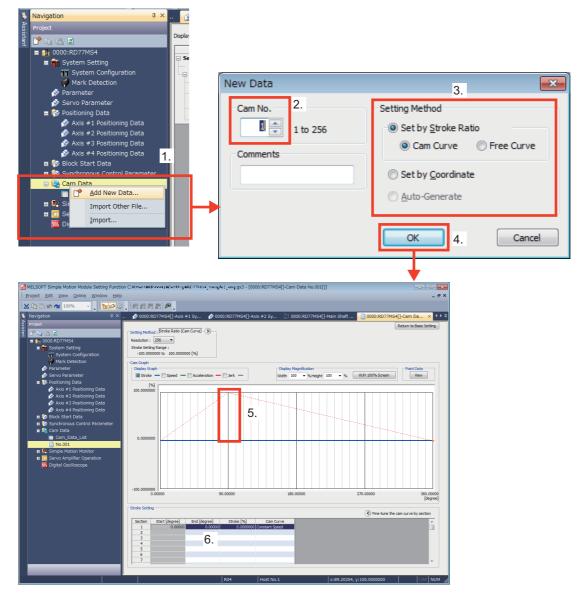
Parameters related to the input axis (Axis 2) can now be set.

4. Settings for synchronous control parameters and input axis parameters are completed.

4.3.5 Cam data creation

- 1. Creating a new cam data
- 1. Right click on [Cam Data], and select [Add New Data...] to open the New Data window.
- 2. Set the cam No.
- 3. Select "Set by Stroke Ratio" and "Cam Curve" in the Setting Method.
- 4. Click [OK]. The cam data creation screen appears.

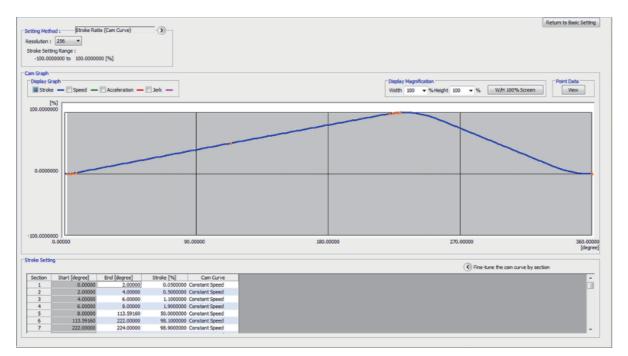




- 5. Make a rough cam graph by dragging an end of the cam waveform.
- 6. Based on the rough cam data, modify the end point and stroke to finish the cam data.

2. Cam curve creation

A cam data graph can be generated by inputting the end point and the stroke.



[Cam data]

Section No.	Start point[degree]	End point[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	0.7832080	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	98.1000000	Constant speed
7	228.47400	230.07400	98.6871323	Constant speed
8	230.07400	231.67400	99.2167920	Constant speed
9	231.67400	233.27400	99.6371323	Constant speed
10	233.27400	234.87400	99.9070074	Constant speed
11	234.87400	236.47400	100.0000000	Constant speed
12	236.47400	0.00000	0.000000	Dist. Constant speed

3. Cam data creation is completed.

4.3.6 Saving a project

Refer to Section 3.3 "(6) Saving a project".

4.3.7 Writing to the Simple Motion module

Refer to Section 3.3 "(7) Writing to the Simple Motion module".

4.4 Operation Check for Synchronous Control

Refer to Chapter 3 for details regarding JOG operation, home position return, and positioning control.

This section explains operation check for synchronous control.

Follow the procedure below so that the Axis 1 synchronizes to the feed current value of Axis 2 with cam operation.



4.4.1 Home position return

Perform home position return for Axis 1 and 2.

This section explains the operation check method for Axis 2 home position return.

Refer to Chapter 3 for details regarding the Axis-1 home position return operation check.

1. Select Axis 2. Double click X62 while pressing SHIFT.

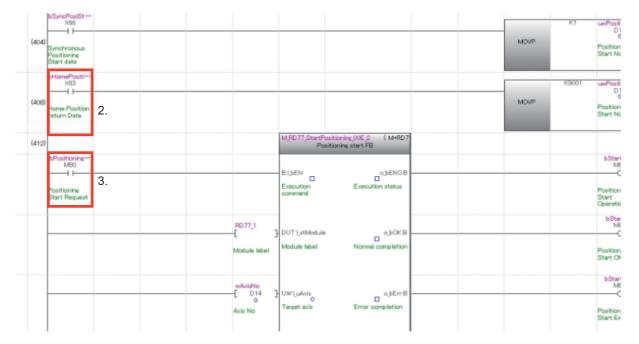
2. Set the Positioning start No. (9001). Double click X63 while pressing SHIFT.

3. Start the positioning. Double click M80 while pressing SHIFT.

[Axis 2 is selected]



[Axis-2 home position return start]



4. Home position return is completed.

4.4.2 Synchronous control start

Set the [Cd.380 synchronous control parameter] for each output axis to start synchronous control. Once the synchronous control starts, output axes operate in synchronization with the input axis operation.

1. Start and confirmation of output axis to be synchronized

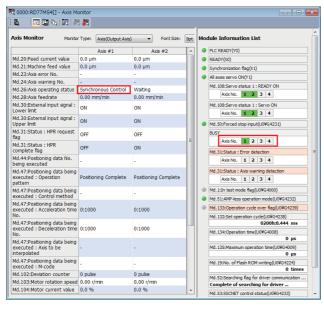
1. Start synchronous control for Axis 1. Double click X7D while pressing SHIFT.



2. Check Axis-1 BUSY signal

Check the axis operating status and BUSY flag.

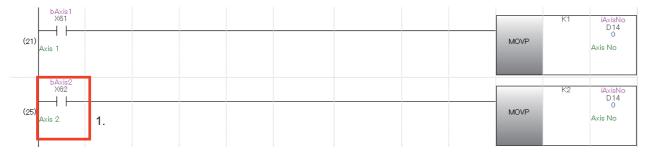
When setting H1 to the buffer memory for synchronous control start (U0\G36320), confirm that the Axis-1 BUSY signal is turned ON.



Item	Axis 1
Md.26: Axis operating status	Synchronous control
BUSY	Axis 1: ON

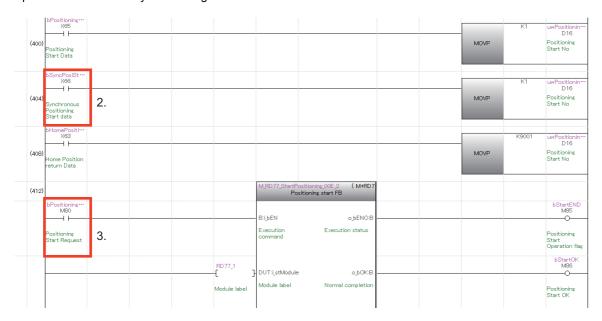
2. Start and confirmation of the main shaft (input axis)

1. Set the axis No. for the main shaft (input axis). Double click X62 while pressing SHIFT.



2. Set the program No. for Axis 2. Double click X66 while pressing SHIFT.

3. Start the main shaft (input axis). Double click M80 while pressing SHIFT. Output axes move while synchronizing to the movement of the main shaft.



3. Operation check for main shaft (input axis)

Check that the servo motors for Axis 1 and Axis 2 start operation.

Md.102:Deviation counter 0 pulse 0 pulse Md.52:Searching flag for driver communication Md.103:Motor rotation speed 13.26 r/min 12.71 r/min Complete of searching for driver						
Axis Monitor Nontro Type: Axis(Dutput Axis) Font Size: Model Information List Md.200Feed current value 42095-7 µm 41992.5 µm Immonitor Immonitor More 2000 Md.214Achine feed value 42095-7 µm 41992.5 µm Immonitor Immonitor More 2000 Immonitor Md.2245Ke endmon blo Immonitor Immonitor Immonitor More 2000 Immonitor Immonitor More 2000 Immonitor Immonitor More 2000 Immonitor Immonitor Immonitor Immonitor Immonitor More 2000 Immonitor Immonitor </th <th></th> <th></th> <th></th> <th></th> <th></th> <th></th>						
Md.25Freed current value 42995.7 µm 41992.5 µm Md.21Arachine feed value 42995.7 µm 41992.5 µm Md.21Arachine feed value 42995.7 µm 41992.5 µm Md.21Arachine feed value 42995.7 µm 41992.5 µm Md.24Arachine feed value 2005.97 µm 41992.5 µm Md.24Arachine feed value 2005.97 µm 41992.5 µm Md.25Arachine feed value 2005.90 µm/mn 2000.00 µm/mn Md.25Arachine feed value 2005.90 µm/mn 2000.00 µm/mn Md.30-Stockmin plott signal : OH OH OH Md.30-Stockmin plott signal : OH OH OH Md.31-Status : HPR request OFF OFF Md.31:Status : HPR request OFF Md.47-Postoning data being I-and inear control Note No. I and inear control Md.47-Postoning data being 0:1000 0:1000 Md.31:Status : HPR request Md.47:Status : H) Font Size:	9pt	Mod	ule Information List
Hd.21:Machine feed value 42095.7 µm 41992.5 µm 1 Md.22:Machine feed value 42095.7 µm 41992.5 µm 1 Md.25:Mass eperating status Synchronous Control Postbon Control 0 Md.25:Mass eperating status Synchronous Control Postbon Control 1 Md.25:Mass eperating status ON ON 0 Md.35:Mass reperating status OFF OFF 0 Md.47:Postboning data being executed: Oceparation 1 Add 10:0 0 Md.47:Postboning data being executed: Ocodo 0:1000 0:1000 0:1000 0:1000 No. - <th></th> <th>Axis #1</th> <th>Axis #2</th> <th>-</th> <th></th> <th>PLC READY(Y0)</th>		Axis #1	Axis #2	-		PLC READY(Y0)
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Id: Ada suscession Allow	Md.21:Machine feed value	42095.7 µm	41992.5 µm		11.	hthronization flag(X1)
Md 24 Sokas general No. Md 25 Aksa general gatus Synchronous Control Md 25 Aksa feedrate 2005.90 mm/min 2000.00 mm/min Md 25 Aksa feedrate No. ON ON ON ON ON ON ON ON ON ON	Md.23:AXIS error No.	-	-		0	All aves serve ON(V1)
Md.28Axs Generating status Synchronous Control Postion Control Postion Control Md.28Axs Generating status Synchronous Control Postion Control Md.28Axs Generating status Imd. Md.28Axs Generating status ON ON ON Md.28Axs Generating status Imd. Md.28Axs Generating status ON ON ON Md.28Axs Generating status Imd. Md.28Axs Generating status ON ON ON Md.28Axs Generating status Imd. Md.35Atsus : HBR (equest fight OFF OFF OFF Md.59Forced stop input/UV64233 Md.59Forced stop input/UV64233 Md.47Postoring data beng executed : Control method - 1 Md.35Isbast : End collection Md.35Isbast : Store dection Md.47Postoring data beng executed : Acceleration time executed : Control method 0:1000 0:1000 Md.35Isbast : Store dection No. 0:000 0:1000 0:1000 Md.135Mast End collection Md.135Mast End collection Md.32Postoring data beng executed : Acceleration time excuted : Acceleration ti	Md 24+Avis warning No			-		
Md./24/Sock Teedrates ZUBS.300 mmm ZUBS.300 mmm ZUBS.300 mmm Lower int Md.300-External input signal : ON ON Sock Teedrates Sock Teedrates <t< td=""><td>Md.26:Axis operating status</td><td>Synchronous Control</td><td>Position Control</td><td></td><td>2</td><td></td></t<>	Md.26:Axis operating status	Synchronous Control	Position Control		2	
Lower init UN UN UN UN Ma3Distant input synal : ON ON ON MasDistant input synal : Upper Init OFF OFF MasDistant input synal : MasDistant : MasDistant: MasDistant : MasDistant	Md.28:Axis feedrate	2085.90 mm/min	2000.00 mm/min	ш	-	Axis No. 1 2 3 4
Idd Jobstermi Ipput signal : ON ON Md JStatus : HPR request fig OFF OFF Md JStatus : HPR request fig OFF OFF Md JStatus : HPR request fig OFF OFF Md AS Postcomp data long pattern OFF OFF Md AS Postcomp data long pattern - 1 Md AS Postcomp data long pattern Postcoming Complete pattern Postcoming Complete pattern Md AS Postcomp data long pattern 0:1000 0:1000 Md AS Postcomp data beng executed : Acceleration time No. 0:1000 0:1000 Md AS Postcomp data beng executed : Acceleration time No. 0:1000 0:1000 Md AS Postcomp data beng executed : Acceleration time No. 0:1000 0:1000 Md AS Postcomg data beng executed : Acceleration time No. 0:1000 0:1000 Md AS Postcomg data beng executed : Acceleration time No. - - Md AS Postcomg data beng executed : Acceleration time No. 0 pulse 0 pulse Md AS Postcomg data beng executed : Acceleration time No. - - Md AS Postcomg data beng executed : Acceleration time No. - - Md AS Postcomg data beng executed : Acceleration time No. 0 pulse 0 pulse Md AS Postcomg data beng executed : Acceleration time No. 0 pulse 0 pulse M		ON	ON	П	1	Md. 108:Servo status 1 : Servo ON
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Md.47:Postchning data being No. 0:1000 0:1000 0:1000 0:000 Md.47:Postchning data being executed 1: Ass to be interpolated Md.47:Postchning data being executed 1: Ass to be miterpolated - - Md.135/Abrahom operators time(UM64003) Md.47:Postchning data being executed 1: Ass to be miterpolated - - - - Md.47:Postchning data being executed 1: Mc.0120-exiton counter 0 puble 0 puble 0 puble 0 puble Md.1033Motor rotation speed 13: 256 r/min 12.271 r/min Complete of searching for driver	executed : Acceleration time	0:1000	0:1000			Md. 133:Operation cycle over flag(U0¥G4239)
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executed : M-code of pulse 0 pulse 0 the control in doi:100.000 factor in doi:100.0000 factor in doi:100.000 factor in doi:100.000 f	Md.47:Positioning data being executed : Axis to be	-	-			Md. 135:Maximum operation time(U0¥G4009)
Md.102:Deviation counter 0 pulse 0 pulse Md.52:Searching flag for driver communication Md.103:Motor rotation speed 13.26 r/min 12.71 r/min Complete of searching for driver	Md.47:Positioning data being executed : M-code	-	-			Md. 19:No. of Flash ROM writing(U0¥G4224) 0 times
Md.103:Motor rotation speed 13.26 r/min 12.71 r/min Complete of searching for driver	Md.102:Deviation counter	0 pulse	0 pulse			
	Md.103:Motor rotation speed	13.26 r/min	12.71 r/min			
Md.104:Motor current value 0.0 % 0.0 % * Md.104:Motor current value 0.0 % * Md.53:SSCNET control status(U0¥G4233)	Md.104:Motor current value	0.0 %	0.0 %	-		

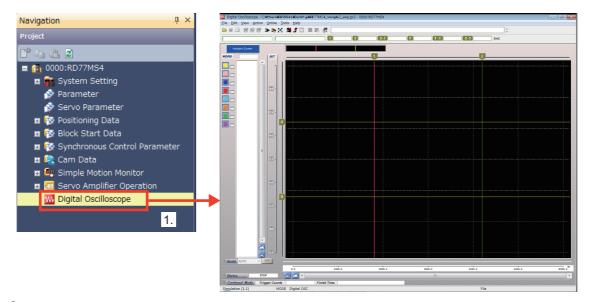
No.	Item	Axis 1	Axis 2
1	Md.20: Feed current value	—	-
	Md.21: Machine feed value	—	—
2	Md.26: Axis operating status	Synchronous control	Positioning control
	Md.28: Axis federate	—	2000.00 [mm/min]
3	Md.30: External input signal: Lower limit	ON	ON
	Md.30: External input signal: Upper limit	ON	ON
4	BUSY	ON	ON

4.4.3 Operation check with digital oscilloscope

The section explains how to check the cam operation with the assistant function of digital oscilloscope.



- **1.** Start of digital oscilloscope
- 1. Select [Digital Oscilloscope] from the menu.



- 2. Selecting probe
- 1. Click [Assistant Screen] to open the Assistant window.
- 2. Click [Select the probe item to be sampled.] to open the Assistant (Probe Selection).
- 3. Select [Cam operation] from "List by specified purpose".
- 4. Select the axis No.

	Assistant		
Assistant Screen		Assistant (Probe Selection)	
	Select the work retain. Anal Communicate with the simple motion module and sample the data. Image: Communicate with the simple and the s	List by specified purpose Probe tem Postion control operation during the sr Postion control operation during the sr Speed control operation during the post Md.409:Cam Ax. feed current v Md.103:Motor speed Md.409:Cam Ax. feed current value	
	☑ Display at Start-up In case that the probe items are not set, display an assistant screen during Display again from the [View] -> [Display Assistant Screen] menu.	Close	CK Cancel

3. Sampling condition settings (No need to change) Change the sampling condition where necessary. In this example, the default values are used.

Set the input item and press the [Calculation] button. Calculate the sampling condition and performs the setting automatically. Input Sampling Rate (ms) 0.888 x 1 (1-5000) Set from the total sampling time. (Recommend it when being two-dimensional trajectory diplay) Total Sampling Time (s) 14.5 (0.1-59999.9) Rate of Sampling Time after Trigger Trigger Balance (%) 90.00 (0.01-100.00)	Sampling Size (point) 16384 (10 - 131072) Actual total sampling time (ms)	(1 - 5000) 14563.6 14746 13107.6 Ter the calculation
--	---	--

4. Trigger condition settings (No need to change)

Set the trigger condition where necessary.

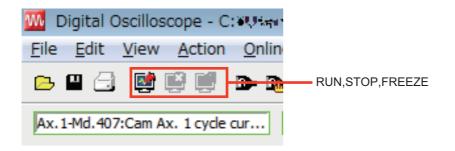
The default values are normally used.

- 1. Clicking [Edit] \rightarrow [Sampling Setting] \rightarrow [Trigger Setting] will display the "Trigger Setting" screen.
- 2. Select the Trigger Mode from Bit OR, Bit AND, Word OR, and NONE.
- 3. Select a pattern from options such as leading edge, trailing edge, change, etc.

	1.					
	-	_	OR			
▼ PROBE	Device	Word	Pattern	Filter	Trigger Val	Je
			**			pulse
						x0.01r/min
		<u> </u>				x0.1%
		1()		0	0	
	<u> </u>	<u> </u>	3.	0	0	
		<u> </u>	- 1	0	0	
			_	0	0	
要要到					< Back	Complete Cancel
	Initial Setting Trigger Mode NCNE Bit OR Trigger Mode NCNE Bit OR WORD BIT 2. PRUSE PRUSE Ax: 1404.407:Cam axis current value (2816) Ax: 1404.409:Cam Ax. feed current value(2816) Ax: 1404.103:Motor speed(2454) Ax: 1404.103:Motor current value(2455)	Initial Setting Trigger Mode NONE Bit OR Bit AND WORD BIT 2. Page Previous P ✓ PRUSE Device ▲x.144d.407:Cam axis current value per cycle(428 ↓x.144d.407:Cam Ax. feed current value(42816) ▲x.144d.103:Motor speed(2454) ▲x.144d.104:Motor current value(2456)	Initial Setting Trigger Mode NONE Bit OR Bit AND WORD BIT 2. Page PRUBE Device Word Ax: 1+4d.407:Cam axis current value per cycle(428 Ax: 1+4d.407:Cam Axis. Gred current value(42816) 2(4) Ax: 1+4d.407:Cam Axis. Gred current value(42816) 2(4) Ax: 1+4d.407:Cam Axis. Gred current value(42816) 2(4) Ax: 1+4d.103:Motor speed(245) 1(4) Image: State Stat	Initial Setting Trigger Mode NONE Bit OR Bit AND Word OR WORD BIT 2. Page Previous Page V PRUBE Device Word Pattern Avx.140d.407:Cam axis current value per cycle(428 2 (4)	Initial Setting Trigger Setting Trigger Mode NORE Bit OR Bit AND Word OR URD BIT 2. Page Previous Page PRUSE Device Word Pattern Filter (KRale) Ax.144d.407.Cam axis current value (42816) Ax.144d.407.Cam axis current value (42816) Ax.144d.409.Cam Ax. feed current value (42816) Ax.144d.1034Notor speed(2454) Ax.144d.1043Notor current value(2456) AX.144d.1043Notor current val	Initial Setting Trigger Mode NONE BLOR BLAND Word OR WORD BIT 2. Page Previous Page V PROse Device Word Pattern Filter Trigger Vak Ax:140d.407/Cam axis current value per cryde(428 2(4) 0 0 0 Ax:140d.407/Cam axis current value(42816) 2(4) 0 0 0 Ax:140d.407/Cam axis current value(42816) 2(4) 0 0 0 Ax:140d.407/Cam axis current value(42816) 1(4) 0 0 0 Ax:140d.003/Motor speed(2454) 2(4) 0 0 0 0 Ax:140d.1043/Motor current value(42850) 1(4) 0 0 0 0 Ax:140d.1043/Motor current value(4280) 1(4) 0 0 0 0 0 0

5. Start sampling

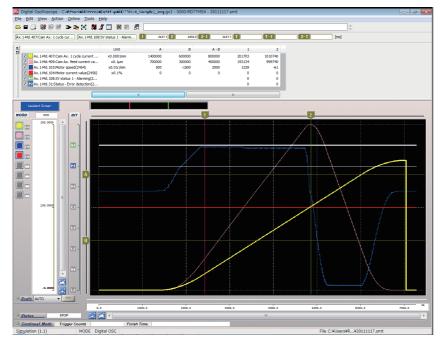
RUN: Start sampling. STOP: Stop sampling. FREEZE: Sampling pauses.



4

6. Checking cam data

Check that the created cam data and the digital oscilloscope data (Axis 1 feed current value) have a matching waveform.



7. Operation check is completed.

5 APPLICATION EXAMPLES

Here we offer application examples where a Simple Motion module is used.

1. Horizontal pillow bag packaging machine

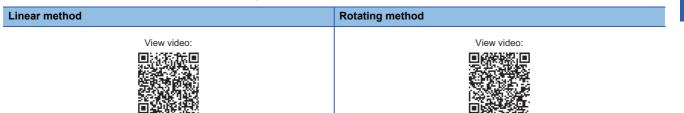
In this example, advanced synchronous control is applied to a horizontal pillow bag packaging machine.

Horizontal pillow bag packaging machine



2. Filling machine

In this example, cam control is applied to a filling machine.



APPENDICES

Appendix 1 Simulation

The MELSOFT GX Works3 can simulate the program on a personal computer without an actual machine during the debugging process, shortening the startup time.



1. Starting the simulation.

Debu	g Diagnostics Tool Window Help			
	Simulation	Start Simulation		
RENI	Modify Value Shift+Enter	Stop Simulation		
	Change History of Current Value	System Simulation		Start System Simulation
	Register/Cancel Forced Input/Output		Pre .	Connect Simulation
	Memory Dump			Disconnect Simulation
	Offline Monitor			Disconnece on Addition

Selecting [Add System] will display the screen for changing project settings. Change settings for the specified project upon start-up of GX Works3.

ile View Tool Help Add System	CREATE System GX Simulator3 Add System Add the system after reading the system configuration from the currently opened GX Works3 project.	·
	Project Name: SYTemp¥RD77MS4_sample2=1=Agx8	*
Start Stop Add a system configuration	or open a system environment file.	

Clicking "Start" after checking the box for RD77MS will start the simulation.

I GX Simulator3 - System:1	
<u>Eile View Iool H</u> elp	
Add System	
⊊ ♥ System I	*
🛛 🖉 🖉 Base0:R35B	
RDY ERE RUN USR RESET O STOP @ RUN	
🚽 🔽 RD77MS4	
	-
	•
Start Stop	
Add a system if you want to add it to current system configuration. Or select a module to simulate and start.	
Ur select a module to simulate and start.	
	Close
	Oluse

2. Connection destination settings

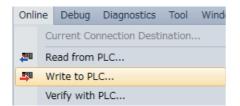
 $\label{eq:click} \mbox{[Debug]} \rightarrow \mbox{[Simulation]} \rightarrow \mbox{[System Simulation]} \rightarrow \mbox{[Connection Destination Settings]}.$

3		Specify Simulation Connection Destination
Debug Diagnostics Tool Window Help		System Configuration Information(S)
Modify Value Shift+Enter	Start Simulation Image: Constraint of the second	Base0:R35B
Change History of Current Value Register/Cancel Forced Input/Output Memory Dump Offline Monitor Process Control Extension	System Simulation System Simulation Connect Simulation Disconnect Simulation	
		♥ Show the Target Systems to Connect① Show the Target Modules to Connect(M) Update(U)
		Connect Cancel

After confirming the connection destination, click "Connect".

3. Writing programs

Clicking [Online] \rightarrow [Write to PLC] will display the write screen for parameters and programs. Select all of the areas shown below, then click "Execute" to write the program.



olay Setting Related Functions			_					
B A A Read	9	1	Verif	/ 🖳 🧳	Delete			
Parameter + Program(E) Select All Open/Close All(T) Deselect All(N)	Legend CPU I	Built-in Me	mory	SD N	1emory Card	🚹 Intelligent Function Module		
Module Name/Data Name				Detail	Title	Last Change	Size (Byte)	
⊡-41 RD77MS4_sample2-1								
😑 🚯 Parameter								
System Parameter/CPU Parameter	•					12/10/2014 2:16:54	Not Calculate	d
- 🙆 Module Parameter	~					12/10/2014 2:16:54		
Simple Motion Module Setting:0000:				Detail		11/19/2014 7:27:44	Not Calculated	
Memory Card Parameter						7/11/2014 11:46:22	Not Calculated	
Remote Password	~					7/11/2014 11:46:22	Not Calculate	d
🖨 🍈 Global Label								
Global Label Setting	~				_	11/30/2017 10:12:2	Not Calculate	d
🕂 🚰 Program	•			Detail				
MAIN	~			(11/27/2017 5:56:53	Not Calculate	d
e 🚰 POU	~			Detail				
Display Memory Capacity mory Capacity Spe Calculation								Free
								160/160KB
nd Data Memory								Free
Used								2045/2049KB
Increased Device/Label Memory (File Stor	Device/Label Memory (File Storage Area)							
Decreased								256/256KB
Free: 5% or Less SD Memory Card								Free
								0/0KB

4. Resetting the simulation

Reset GX Simulator3.

After resetting, select "RUN".

GX Simulator3 - System:1		
<u>F</u> ile <u>V</u> iew <u>T</u> ool <u>H</u> elp		
Add System Delete System		
System:1	1. 2.	^
♥ Base0:R35B	ERR RUN USR ERESET STOP RUN RD77MS4_sample2-1-Agx3	
🗹 RD77MS4		
		-
•		•
Start Stop		
Open a project file for each CPU from GX Wo If parameters or programs have not been writ	ks3/MT Works2 to connect to Simulator. en to Simulator, please write them from GX Works3/MT Works2 and reset Simulator.	
		Close

After selecting "RUN", the simulation can now be executed.

GX Simulator3 - System:1						×
<u>F</u> ile <u>V</u> iew <u>T</u> ool <u>H</u> elp						
Add System Delete System						
🖃 📝 System:1		3.			*	
🛶 🔤 📝 Base0:R35B		5.				
🔽 R04CPU	RDY ERR	RUN USR	RESET 💿 STOP 🧿 RUN	RD77MS4_sample2-1gx8		4
🔽 RD77MS4						
4					Ŧ	
Start Stop	m GV Warke 2 (MT	Werken to oppose	at to Simulator			
Open a project file for each CPU fro If parameters or programs have not	been written to Si	works2 to conner mulator, please wr	ite them from GX Works3/MT Work	s2 and reset Simulator.		
					Close	

5. Debug by simulation

Pressing F3 and switching to the monitor allows you to debug for the Simple Motion module with GX Simulator3.

(13)	X6E	X0 R:READY	RD77_1.bnB*** X10 # R:BUSY(Axis#1 -#16)				SET	bDuringJOGI M81 JOG/Inching Operation flag
	b JogRevers… X6F JOG Reverse Start Req							
(18)	JOG Forward	JOG Reverse JOG Reverse Start Req					RST	bDuringJOGI… M81 JOG/Inching Operation flag
(21)	Axis 1 Axis 1					MOVP	K1	wAxisNo D14 O Axis No

Axis Monitor screen

🖏 0000:RD77MS4 - Axis Moi					
Axis Monitor Monito	r Type: Axis(Output Axis) V Font S	ize: 9pt	•	Select Monitor Item
	Axis #1	Axis #2			
Md.20:Feed current value	150851.1 µm	0.0 µm			
Md.21:Machine feed value	150851.1 µm	0.0 µm			
Md.23:Axis error No.	-	-			
Md.24:Axis warning No.	-	-			
Md.26:Axis operation status	JOG Operation	Waiting			
Md.28:Axis feed speed	100.00 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 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	20.02 r/min	0.00 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.500:Servo status 7 : Driver operation alarm	OFF	OFF			
Md.502:Driver operation alarm No.	-	-			

Appendix 2 Parameter and Positioning Data

1. Parameters

Common Para Pr.82:Forced s	neter								
Pr.82:Forced s	neter	The parameter does not re	ly on axis and relate to the						
selection	top valid/invalid	1:Invalid							
input selection	emental Sync. ENC	0:A-phase/B-phase Mode (4 Mu	ltiply)						
Pr.89:Manual generator/Incr input type sele	emental Sync. ENC	1:Voltage Output/Open Collector Type							
Pr.96:Operation	on cycle setting	FFFFh:Automatic Setting							
Pr.97:SSCNET	-	1:SSCNET III/H							
Pr.150:Input selection Pr.151:Manual	terminal logic	Set the logic of external inp external command/switchi	out signal (proximity dog, ng) from the external devi						
input logic sele		0:Negative Logic							
limit	l axis number upper	0							
0SC file sett	-	Set digital filter for each inp	-						
Basic paramet			ne and applicable motor w						
Pr. 1:Unit settin	-	0:mm	0:mm						
	lses per rotation	172985333 pulse	172985333 pulse						
Pr.3:Movemen rotation		6478422.3 µm	6478422.3 μm						
Pr.4:Unit mag		1:x1 Times	1:x1Times						
Pr.7:Bias spee		0.00 mm/min	0.00 mm/min						
Basic paramet		_	ne and applicable motor w						
Pr.8:Speed lim		8000.00 mm/min	2000.00 mm/min						
Pr.9:Accelerat		1000 ms	1000 ms						
Pr. 10:Decelera		1000 ms	1000 ms						
Detailed paran		Set according to the system	n configuration when the s						
Pr.11:Backlash amount	compensation	0.0 µm	0.0 µm						
Pr.12:Softwar limit value	e stroke limit upper	214748364.7 µm	214748364.7 µm						
Pr.13:Softwar limit value	e stroke limit lower	-214748364.8 µm	-214748364.8 µm						
Pr.14:Softwar selection	e stroke limit	0:Set Software Stroke Limit to Feed Current Value	0:Set Software Stroke Limit to Feed Current Value						
Pr. 15:Softwar valid/invalid se		0:Valid	0:Valid						
Pr.16:Comman	d in-position width	10.0 µm	10.0 µm						
Pr. 17:Torque	imit setting value	300.0 %	300.0 %						
Pr. 18:M-code timing	ON signal output	0:WITH Mode	0:WITH Mode						
Pr. 19:Speed s	witching mode	0:Standard Speed Switching Mode	0:Standard Speed Switching Mode						
Pr.20:Interpol designation me		0:Vector Speed	0:Vector Speed						
Pr.21:Feed cu speed control	rrent value during	0:Not Update of Feed Current Value	0:Not Update of Feed Current Value						
Lower limit	nal logic selection :	0:Negative Logic	0:Negative Logic						
Upper limit	nal logic selection :	0:Negative Logic	0:Negative Logic						
Stop signal	nal logic selection :	0:Negative Logic	0:Negative Logic						
Pr.22:Input sig Proximity dog	nal logic selection : signal	0:Negative Logic	0:Negative Logic						
Pr.81:Speed-p selection	osition function	0:Speed-position Switching Control (INC Mode)	0:Speed-position Switching Control (INC Mode)						
Pr.116:FLS sig type	nal selection : Input	15:Invalid	15:Invalid						
terminal	nal selection : Input	00h:No Setting	00h:No Setting						
Pr.117:RLS sig type	nal selection : Input	15:Invalid	15:Invalid						
terminal	nal selection : Input	00h:No Setting	00h:No Setting						
Pr.118:DOG si Input type	gnal selection :	15:Invalid	15:Invalid						

	These	A.J. #4	A		
	Item Pr.118:DOG signal selection :	Axis #1	Axis #2		
	Input terminal	00h:No Setting	00h:No Setting		
	Pr.119:STOP signal selection : Input type	15:Invalid	15:Invalid		
	Pr.119:STOP signal selection : Input terminal	00h:No Setting	00h:No Setting		
🗆 D	etailed parameters 2	Set according to the syster	n configuration when the s		
	Pr.25:Acceleration time 1	1000 ms	1000 ms		
	Pr.26:Acceleration time 2	1000 ms	1000 ms		
	Pr.27:Acceleration time 3	1000 ms	1000 ms		
	Pr.28:Deceleration time 1	1000 ms	1000 ms		
	Pr. 29:Deceleration time 2	1000 ms	1000 ms		
	Pr.30:Deceleration time 3	1000 ms	1000 ms		
	Pr.31:JOG speed limit value	200.00 mm/min	200.00 mm/min		
	Pr.32:JOG operation acceleration time selection	0:1000	0:1000		
	Pr.33:JOG operation deceleration time selection	0:1000	0:1000		
	Pr.34:Acceleration/deceleration process selection	0:Trapezoidal Acceleration/Deceleration Process	0:Trapezoidal Acceleration/Deceleration Process		
	Pr.35:S-curve ratio	100 %	100 %		
	Pr.36:Rapid stop deceleration time	1000 ms	1000 ms		
	Pr.37:Stop group 1 rapid stop				
	selection Pr.38:Stop group 2 rapid stop	0:Normal Deceleration Stop	0:Normal Deceleration Stop		
	selection Pr.39:Stop group 3 rapid stop	0:Normal Deceleration Stop	0:Normal Deceleration Stop		
	selection Pr.40:Positioning complete signal	0:Normal Deceleration Stop	0:Normal Deceleration Stop		
	output time Pr.41:Allowable circular	300 ms	300 ms		
	interpolation error width Pr.42:External command function	10.0 µm	10.0 µm		
	selection	0:External Positioning Start	0:External Positioning Start		
	Pr.83:Speed control 10x multiplier setting for degree axis	0:Invalid	0:Invalid		
·	Pr.84:Restart permissible value range when servo OFF to ON	0 pulse	0 pulse		
	Pr.90:Operation setting for SPD-TRQ Cont. mode : Torque initial value selection	0:Command Torque	0:Command Torque		
	Pr.90:Operation setting for SPD-TRQ Cont. mode : Speed initial value selection	0:Command Speed	0:Command Speed		
	Pr.90:Operation setting for SPD-TRQ Cont. mode : Condition selection at mode switching	0:Switching Conditions Valid at Mode Switching	0:Switching Conditions Valid at Mode Switching		
	Pr.95:External command signal selection	0:Not Used	0:Not Used		
	Pr. 122:Manual pulse generator speed limit mode	0:Do Not Execute Speed Limit	0:Do Not Execute Speed Limit		
	Pr. 123:Manual pulse generator speed limit value	200.00 mm/min	200.00 mm/min		
	PR basic parameters	-	carrying out HPR control (
	Pr.43:HPR method	6:Data Set Method	6:Data Set Method		
	Pr.44:HPR direction	0:Forward Direction (Address Increase Direction)	0:Forward Direction (Address Increase Direction)		
	Pr.45:HP address	0.0 µm	0.0 µm		
·····	Pr.46:HPR speed	1000.00 mm/min	1000.00 mm/min		
	Pr.47:Creep speed	0.01 mm/min	0.01 mm/min		
	Pr.48:HPR retry	0:Do Not Retry HPR with Limit Switch	0:Do Not Retry HPR with Limit Switch		
🗆 H	PR detailed parameters	Set the values required for	carrying out HPR control (
	Pr.50:Setting for the movement				
	amount after proximity dog ON	0.0 µm	0.0 µm		

	Pr.51:HPR acceleration time selection	0:1000	0:1000
	Pr.52:HPR deceleration time selection	0:1000	0:1000
	Pr.53:HP shift amount	0.0 µm	0.0 µm
	Pr.54:HPR torque limit value	300.0 %	300.0 %
	Pr.55:Operation setting for incompletion of HPR	0:Positioning Control is Not Executed	0:Positioning Control is Not Executed
	Pr.56:Speed designation during HP shift	0:HPR Speed	0:HPR Speed
	Pr.57:Dwell time during HPR retry	0 ms	0 ms
	Pr.86:Pulse conversion unit : HPR request setting	0:Turn HPR Request ON at Servo OFF	0:Turn HPR Request ON at Servo OFF
	Pr.87:Pulse conversion unit : Waiting time after clear signal output	0 ms	0 ms
🚍 E	xpansion parameters	Set according to the system	n configuration when the s
	Pr.91:Optional data monitor : Data type setting 1	0:No Setting	0:No Setting
	Pr.92:Optional data monitor : Data type setting 2	0:No Setting	0:No Setting
	Pr.93:Optional data monitor : Data type setting 3	0:No Setting	0:No Setting
l	Pr.94:Optional data monitor : Data type setting 4	0:No Setting	0:No Setting

2. Positioning data

[Axis-1 positioning data]

No.	Operationp attern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M- code
1	1:CONT	<u>ABS</u> linear 1	—	1:1000	1:1000	<u>100000.0</u> μm	0.0µm	<u>2000.00</u> mm/min	0ms	0
2	0:END	ABS linear 1	—	1:1000	1:1000	<u>0.0µm</u>	0.0µm	8000.00 mm/min	0ms	0

[Axis-2 positioning data]

No.	Operationp attern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M- code
1	<u>0:END</u>	<u>INC</u> linear 1	—	1:1000	1:1000	<u>157079.6</u> <u>µm</u>	0.0µm	<u>2000.00</u> mm/min	0ms	0

The sequence program in the appendix is a program example used in this Quick Start Guide.

When applying the program examples provided in this document to an actual system, ensure the applicability and confirm that it will not cause system control problems.

1. Devices used

Classification	Device No.	Signal name	Signal
Input	X60	JOG speed Req	Input module
	X61	Axis 1	
	X62	Axis 2	PLC CPU
	X63	Home Position Return Data	
	X65	Positioning Start Data	
	X66	Synchronous Positioning Start data	
	X6E	JOG Forward Start req	
	X6F	JOG Reverse Start req	
	X71	Start Positioning req	
	Х7В	Servo ON req	
	X7D	Synchronous axis set	
	X7E	Error reset	
	X7F	Stop	
Output	YO	PLC READY	PLC CPU
	Y1	All axis servo ON	
	Y10	Positioning start (Axis#1 - 16)	RD77MS
	Y11	Positioning start (Axis#1 - 16)	1

2. Sequence program example

		1 RD77_1.bSynch…	2	3	4	5	6	7	8	9	10	11	12 RD77_1.bPLC_···
1	(0)	X1 R:Synchronizatio											Y0
		bServoON X7B	RD77_1.bReady X0	RD77_1.bPLC_··· Y0	RD77_1.bSynch···· DX1								RD77_1.bAllAxi···· Y1
2	(2)		RREADY	RW:PLC READY	R:Synchronizatio n flag(Direct)								RW:All axis servo ON
		bJogSpeedReq X60										K10000	d_JogSpeedData D10
3	(8)	JOG Speed Req									DMOVP		Jog Speed data memo
		bJogForwardReq X6E	RD77_1.bReady X0	RD77_1.bnBusy··· X10									bDuringJOGInc… M81
4	(13)		RREADY	R:BUSY(Axis#1- #16)								SET	JOG/Inching Operation flag
		bJogReverseReq X6F											
5		JOG Reverse Start Req											
		bJogForwardReq X6E	bJogReverseReq X6F										bDuringJOGInc… M81
6	(18)	JOG Forward Start req	JOG Reverse Start Req									RST	JOG/Inching Operation flag
		bAxis1 X61										K1	wAxisNo D14
7	(21)	Axis 1									MOVP		Axis No
		bAxis2 X62										K2	wAxisNo D14
8	(25)	Axis 2									MOVP		Axis No
9	(29)						M_RD77_JOG JOG	3_00E_1 (M+RD77_JOG_00E) A/inching operation FB					
	5	bDuringJOGInc···· M81					B:i_bEN	o_bENO:B					bJogEND M82
10		JOG/Inching Operation flag					Execution comman	d Execution status					JOG End Flag
						RD77_1	DUT:i_stModule	₀,bOK:B					bJogOK M83
11						Module label	Module label	Normal completion					JOG OK flag
						wAxisNo D14	UW:i_uAxis	o_bErr:B					bJogERR M84
12						Axis No	Target axis	Error completion					JOG Error flag
	2	bJogForwardReq X6E					BijbFJog	o_uErrld:UW	uwErrId -[D12]-				
13		JOG Forward Start req					Forward run JOG command		JOG Error code				
		bJogReverseReq X6F					B:i_bRJog						
14		JOG Reverse Start Req					Reverse run JOG command						
						d_JogSpeedD···· [D10]	UD:i.udJogSpeed						
15						Jog Speed data memo	Cd.17:JOG speed						
						- - مى	UW:i_uInching						
16	2					[ко]	Cd.16:Inching movement amount						
		bPositioningSt… X65										K1	uwPositioningS… D16
17	(400)	Positioning Start Data									MOVP		D16 Positioning Start No

		1 bSyncPosiStar…	2	3	4	5	6	7	8	9	10	11	12
		X66									-	K1	uwPositioningS… D16
18	(4(04) Synchronous Positioning Start									MOVP		Positioning Start No
		data											
		bHomePosition X63										K9001	uwPositioningS… D16
19	(40	08) Home Position return Data									MOVP		Positioning Start No
		return Data											
20	(4)	12)					M_RD77_StartPosit F	ioning_00E_2 (M+RD77_StartP vositioning start FB					
		bPositioningSt… M80											bStartEND M85
21		Positioning Start					B:i_bEN Execution comman	o_bENO:B d Execution status					Positioning Start
		Request											Operation flag
						RD77_1							bStartOK M86
22						Module label	DUT:i_stModule	o_bOK:B Normal completion					Positioning Start
						module label							OK OK
						wAxisNo							bStartERR M87
23							UW:i_uAxis Target axis	o_bErr:B Error completion					0
						Axis No	Target ans	Error completion					Positioning Start Error
									unterde				
24		-				uwPositioning… D16			uwErrid -[D12]				
						Positioning Start No	Cd.3: Positioning st No.	tart Error code	JOG Error code				
-		bErrorReset											RD77_1.stnAxC···
25	(70	X7E											U0¥G4302.0
25	(//	98) Error reset											RW:Axis error reset(Direct)
													RD77_1.stnAxC… U0¥G4402.0
													0
26													RW:Axis error reset(Direct)
		bStopSwitch	RD77_1.bnBusy···· X10										RD77_1.stnAxC… U0¥G30100.0
			X10										U0¥G30100.0
27	(80	05) Stop	R:BUSY(Axis#1- #16)										RW:Axis stop (Direct)
			RD77_1.bnBusy…										RD77 1 stn&vC····
			X11									0	RD77_1.stnAxC… U0¥G30110.0
28			R:BUSY(Axis#1- #16)										RW:Axis stop (Direct)
29	(81						M_RD77_Syn Startin	o_00E_1 (M+RD77_Sync_00E) z/ending synchronous FB					
		bSynchronous X7D					- B:i_bEN	o_bENO:B					bSyncEnd M90
30		Synchronous Axis Set					Execution comman						Synchronou Status
		Axis Set											
						RD77_1							bSyncOK M91
31						-[] Module label	DUT:i_stModule	o_bOK:B Normal completion					0
													bSyncErr M92
32						E HI]	UW:i_uOutputAxis Output axis No.	o_bErr:B Error completion					
									uwErrld				
33								o_uErrid:UW Error code	-[D12] JOG Error code				
								Line Code	SOG EHOL CODE				
34	(94	85)											(END)
	1.01												
						8 8 8							1

REVISIONS

*The manual number is given on the bottom left of the back cover.

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Mitsubishi Servo System Controllers Quick Start Guide

Country/Regior	Sales office		
USA	Mitsubishi Electric Automation, Inc. 500 Corporate Woods Parkway, Vernon Hills, IL 60061, U.S.A.	Tel : +1-847-478-2100	
Mexico	Mitsubishi Electric Automation, Inc. Mexico Branch	Tel : +52-55-3067-7512	
Brazil	Mitsubishi Electric do Brasil Comercio e Servicos Ltda. Avenida Adelino Cardana, 293, 21 andar, Bethaville, Barueri SP, Brazil	Tel : +55-11-4689-3000	
Germany	Mitsubishi Electric Europe B.V. German Branch Mitsubishi-Electric-Platz 1, 40882 Ratingen, Germany	Tel : +49-2102-486-0	
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, UK-Hatfield, Hertfordshire, AL10 8XB, U.K.	Tel : +44-1707-28-8780	
Italy	Mitsubishi Electric Europe B.V. Italian Branch Centro Direzionale Colleoni - Palazzo Sirio, Viale Colleoni 7, 20864 Agrate Brianza (MB), Italy	Tel : +39-039-60531	
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi, 76-80-Apdo. 420, E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-935-65-3131	
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, 92741 Nanterre Cedex, France	Tel : +33-1-55-68-55-68	
Czech Republic	Mitsubishi Electric Europe B.V. Czech Branch, Prague Office Pekarska 621/7, 155 00 Praha 5, Czech Republic	Tel : +420-255-719-200	
Poland	Mitsubishi Electric Europe B.V. Polish Branch ul. Krakowska 50, 32-083 Balice, Poland	Tel : +48-12-347-65-00	
Russia	Mitsubishi Electric (Russia) LLC St. Petersburg Branch Piskarevsky pr. 2, bld 2, lit "Sch", BC "Benua", office 720; 195027 St. Petersburg, Russia	Tel : +7-812-633-3497	
Sweden	Mitsubishi Electric Europe B.V. (Scandinavia) Fjelievagen 8, SE-22736 Lund, Sweden	Tel : +46-8-625-10-00	
Turkey	Mitsubishi Electric Turkey A.S. Umraniye Branch Serifali Mahallesi Nutuk Sokak No:5, TR-34775 Umraniye / Istanbul, Turkey	Tel : +90-216-526-3990	
UAE	Mitsubishi Electric Europe B.V. Dubai Branch Dubai Silicon Oasis, P.O.BOX 341241, Dubai, U.A.E.	Tel : +971-4-3724716	
South Africa	Adroit Technologies 20 Waterford Office Park, 189 Witkoppen Road, Fourways, South Africa	Tel : +27-11-658-8100	
China	Mitsubishi Electric Automation (China) Ltd. Mitsubishi Electric Automation Center, No.1386 Hongqiao Road, Shanghai, China	Tel : +86-21-2322-3030	
Taiwan	SETSUYO ENTERPRISE CO., LTD. 6F, No.105, Wugong 3rd Road, Wugu District, New Taipei City 24889, Taiwan	Tel : +886-2-2299-2499	
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 7F to 9F, Gangseo Hangang Xi-tower A, 401, Yangcheon-ro, Gangseo-Gu, Seoul 07528, Korea	Tel : +82-2-3660-9529	
Singapore	Mitsubishi Electric Asia Pte. Ltd. 307 Alexandra Road, Mitsubishi Electric Building, Singapore 159943	Tel : +65-6473-2308	
Thailand	Mitsubishi Electric Factory Automation (Thailand) Co., Ltd. 12th Floor, SV.City Building, Office Tower 1, No. 896/19 and 20 Rama 3 Road, Kwaeng Bangpongpang, Khet Yannawa, Bangkok 10120, Thailand	Tel : +66-2682-6522 to 65	531
Indonesia	PT. Mitsubishi Electric Indonesia Gedung Jaya 8th Floor, JL. MH. Thamrin No.12, Jakarta Pusat 10340, Indonesia	Tel : +62-21-3192-6461	
Vietnam	Mitsubishi Electric Vietnam Company Limited Unit 01-04, 10th Floor, Vincom Center, 72 Le Thanh Ton Street, District 1, Ho Chi Minh City, Vietnam	Tel : +84-28-3910-5945	
India	Mitsubishi Electric India Pvt. Ltd. Pune Branch Emerald House, EL-3, J Block, M.I.D.C., Bhosari, Pune - 411026, Maharashtra, India	Tel : +91-20-2710-2000	
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, P.O. Box 11, Rydalmere, N.S.W 2116, Australia	Tel : +61-2-9684-7777	

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN