

# MELSEC-L Series

Programmable Controllers

Quick Start Guide

## Simple Motion Module LD77MH





# About this manual

The texts, illustrations, diagrams and examples in this manual are provided for information purposes only. They are intended as aids to help explain the installation, operation, programming and use of the programmable controllers of MELSEC-L series.

If you have any questions about the installation and operation of any of the products described in this manual please contact your local sales office or distributor (see back cover).

You can find the latest information and answers to frequently asked questions on our website at [www.mitsubishi-automation.com](http://www.mitsubishi-automation.com).

MITSUBISHI ELECTRIC EUROPE B.V. reserves the right to make changes to this manual or the technical specifications of its products at any time without notice.









## Related manuals

For detailed information on various devices also refer to the following manuals.

These can be obtained free of charge from our website at [www.mitsubishi-automation.com](http://www.mitsubishi-automation.com).

Language	Device	Manual Name	Description
English	Simple Motion Module	MELSEC-L LD77MH Simple Motion Module User's Manual (Positioning Control)	This manual explains the functions of Simple Motion Module type LD77MH. In addition, it also describes the operations of devices and parameters, what is a basic knowledge necessary for programming.
		MELSEC-L LD77MH Simple Motion Module User's Manual (Synchronous Control)	This manual explains the functions of Simple Motion Module type LD77MH.
English	MELSEC-L series programmable logic controller	MELSEC-L Series Quick Start Guide	This quick start guide introduces the basic installation procedures of programmable controllers.
		MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection)	Specifications of the CPU modules, power supply modules, display unit, SD memory cards, and batteries, information on how to establish a system, maintenance and inspection, and troubleshooting.
		MELSEC-L CPU Module User's Manual (Function Explanation, Program Fundamentals)	This manual explains the functions of CPU modules. In addition, it also describes devices and parameters, basic knowledge necessary for programming, as well as the operation of display units.
		MELSEC System Q/L Series Programming Manual	This manual describes the programming and processing of the sequence and application instructions that are provided by the CPUs of the MELSEC System Q and L series.
English	Servo amplifier	SSCNET III Compatible MR-J3-B Servo Amplifier Instruction Manual	This manual explains I/O signals, parts identification, parameters, and start-up procedures.
		SSCNET III Compatible Linear Servo MR-J3-B-RJ004U Servo Amplifier Instruction Manual	This manual explains I/O signals, parts identification, parameters, and start-up procedures.
		SSCNET III interface 2-axis AC Servo Amplifier MR-J3W-B Servo Amplifier Instruction Manual	This manual explains I/O signals, parts identification, parameters, and start-up procedures.
English	Servo amplifier	SSCNET III/H interface AC Servo Amplifier MR-J4-B Servo Amplifier Instruction Manual	This manual explains I/O signals, parts identification, parameters, and start-up procedures.
		SSCNET III/H interface Multi-Axis AC Servo Amplifier MR-J4W2-B/MR-J4W3-B Servo Amplifier Instruction Manual	This manual explains I/O signals, parts identification, parameters, and start-up procedures.
		General-Purpose AC Servo MELSERVO-J4 Servo Amplifier Instruction Manual Trouble Shooting	This manual gives an overview of all alarms and warnings and explains remedies.



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# Safety guidelines

## For use by qualified staff only

This manual is only intended for use by properly trained and qualified electrical technicians who are fully acquainted with the relevant automation technology safety standards. All work with the hardware described, including system design, installation, configuration, maintenance, service and testing of the equipment, may only be performed by trained electrical technicians with approved qualifications who are fully acquainted with all the applicable automation technology safety standards and regulations. Any operations or modifications to the hardware and/or software of our products not specifically described in this manual may only be performed by authorised Mitsubishi Electric staff.

## Proper use of the products

The programmable controllers of the MELSEC-L series are only intended for the specific applications explicitly described in this manual. All parameters and settings specified in this manual must be observed. The products described have all been designed, manufactured, tested and documented in strict compliance with the relevant safety standards. Unqualified modification of the hardware or software or failure to observe the warnings on the products and in this manual may result in serious personal injury and/or damage to property. Only peripherals and expansion equipment specifically recommended and approved by Mitsubishi Electric may be used with the programmable controllers of the MELSEC-L series.

All and any other uses or application of the products shall be deemed to be improper.

## Relevant safety regulations

All safety and accident prevention regulations relevant to your specific application must be observed in the system design, installation, configuration, maintenance, servicing and testing of these products. The regulations listed below are particularly important in this regard.

This list does not claim to be complete; however, you are responsible for being familiar with and conforming to the regulations applicable to you in your location.

- VDE Standards
  - VDE 0100  
Regulations for the erection of power installations with rated voltages below 1000 V
  - VDE 0105  
Operation of power installations
  - VDE 0113  
Electrical installations with electronic equipment
  - VDE 0160  
Electronic equipment for use in power installations
  - VDE 0550/0551  
Regulations for transformers
  - VDE 0700  
Safety of electrical appliances for household use and similar applications
  - VDE 0860  
Safety regulations for mains-powered electronic appliances and their accessories for household use and similar applications.
- Fire safety regulations
- Accident prevention regulation
  - VBG No. 4  
Electrical systems and equipment

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### **Safety warnings in this manual**

In this manual special warnings that are important for the proper and safe use of the products are clearly identified as follows:



**DANGER:**

*Personnel health and injury warnings.*

*Failure to observe the safety warnings identified with this symbol can result in health and injury hazards for the user.*



**CAUTION:**

*Equipment and property damage warnings.*

*Failure to observe the safety warnings identified with this symbol can result in damage to the equipment or other property.*

---

## General safety information and precautions

The following safety precautions are intended as a general guideline for using PLC systems together with other equipment. These precautions must always be observed in the design, installation and operation of all control systems.



### **DANGER:**

- **Observe all safety and accident prevention regulations applicable to your specific application. Always disconnect all power supplies before performing installation and wiring work or opening any of the assemblies, components and devices.**
- **Assemblies, components and devices must always be installed in a shockproof housing fitted with a proper cover and fuses or circuit breakers.**
- **Devices with a permanent connection to the mains power supply must be integrated in the building installations with an all-pole disconnection switch and a suitable fuse.**
- **Check power cables and lines connected to the equipment regularly for breaks and insulation damage. If cable damage is found immediately disconnect the equipment and the cables from the power supply and replace the defective cabling.**
- **Before using the equipment for the first time check that the power supply rating matches that of the local mains power.**
- **Take appropriate steps to ensure that cable damage or core breaks in the signal lines cannot cause undefined states in the equipment.**
- **You are responsible for taking the necessary precautions to ensure that programs interrupted by brownouts and power failures can be restarted properly and safely. In particular, you must ensure that dangerous conditions cannot occur under any circumstances, even for brief periods. EMERGENCY OFF must be switched forcibly, if necessary.**
- **Residual current protective devices pursuant to DIN VDE Standard 0641 Parts 1-3 are not adequate on their own as protection against indirect contact for installations with PLC systems. Additional and/or other protection facilities are essential for such installations.**
- **EMERGENCY OFF facilities conforming to EN 60204/IEC 204 and VDE 0113 must remain fully operative at all times and in all control system operating modes. The EMERGENCY OFF facility reset function must be designed so that it cannot ever cause an uncontrolled or undefined restart.**
- **You must implement both hardware and software safety precautions to prevent the possibility of undefined control system states caused by signal line cable or core breaks.**
- **When using modules always ensure that all electrical and mechanical specifications and requirements are observed exactly.**
- **Do not install/remove the module or terminal block more than 50 times, after the first use of the product (conforming to IEC 61131-2). Failure to do so may cause the module to malfunction due to poor contact of connector.**

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### Precautions to prevent damages by electrostatic discharge

Electronic devices and modules can be damaged by electrostatic charge, which is conducted from the human body to components of the controller. Always take the following precautions, when handling the controller:



#### **CAUTION:**

- *Before touching a module of the controller, always touch grounded metal, etc. to discharge static electricity from human body.*
- *Wear isolating gloves when touching the powered controller, e. g. at maintenance during visual check.*
- *You shouldn't wear clothing made of synthetic fibre at low humidity. This clothing gets a very high rate of electrostatic charge.*



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# Symbols used in the manual

## Use of notes

Notes concerning important information are marked separately and are displayed as follows:

**NOTE**

| Note text

## Use of examples

Examples containing important information are clearly identified as follows:

**Example** ▾

Example text



## Use of numbering in the figures

Numbering within the figures is displayed by white numbers within black circles and is explained in a table following it using the same number, e.g.:

① ② ③ ④

## Use of handling instructions

Handling instructions are steps that must be carried out in their exact sequence during startup, operation, maintenance and similar operations.

They are numbered consecutively (black numbers in white circles):

① Text.

② Text.

③ Text.

## Use of footnotes in tables

Instructions in tables are explained in footnotes underneath the tables (in superscript). There is a footnote character at the appropriate position in the table (in superscript).

If there are several footnotes for one table then these are numbered consecutively underneath the table (black numbers in white circle, in superscript):

① Text

② Text

③ Text

## Writing conventions and guidance notes

Keys or key-combinations are indicated in square brackets, such as [Enter], [Shift] or [Ctrl]. Menu names of the menu bar, of the drop-down menus, options of a dialogue screen and buttons are indicated in italic bold letters, such as the drop down menu ***New*** in the ***Project*** menu or the option ***Serial USB*** in the "Transfer Setup Connection" screen.



# Contents

<b>1</b>	<b>Overview</b>	
1.1	Features of Simple Motion Module (LD77MH) .....	1-1
<b>2</b>	<b>Simple Motion Module start-up</b>	
2.1	Start-up procedure .....	2-2
2.2	System which combines LD77MH and MR-J3-B/MR-J4(W)-B.....	2-3
2.3	Preparing devices .....	2-4
2.4	Installing modules.....	2-5
2.5	Wiring and connecting cables.....	2-6
2.6	Installing application software .....	2-9
2.6.1	Installing MELSOFT GX Works2.....	2-9
2.6.2	Installing MR Configurator2.....	2-9
2.6.3	Checking the start-up of MELSOFT GX Works2 .....	2-10
2.7	Creating sequence programs by using GX Works2.....	2-11
2.7.1	Creating a new project.....	2-11
2.7.2	Creating sequence programs .....	2-12
2.7.3	Saving a sequence program as a project.....	2-13
2.7.4	Connecting CPU module and personal computer .....	2-14
2.7.5	Formatting of the CPU module.....	2-15
2.7.6	Writing the sequence program to the PLC CPU .....	2-16
2.8	Creating parameter and positioning data by using Simple Motion Module Setting Tool.	2-17
2.8.1	Adding a Simple Motion Module .....	2-17
2.8.2	Starting the Simple Motion Module Setting Tool.....	2-18
2.8.3	Creating a new project.....	2-19
2.8.4	System setting.....	2-20
2.8.5	Parameter setting .....	2-21
2.8.6	Servo parameter setting .....	2-25
2.8.7	Positioning data setting.....	2-26
2.8.8	Saving the Simple Motion Module as a project.....	2-28
2.8.9	Writing to the Simple Motion Module .....	2-29
2.8.10	Sample data for setting procedures .....	2-30
2.9	Operation check.....	2-31
2.9.1	JOG operation (for checking the rotation direction, the electronic gear setting etc.).....	2-31
2.9.2	OPR (for checking a home position) .....	2-36
2.9.3	Positioning control .....	2-38

<b>3</b>	<b>Synchronous control start-up</b>	
3.1	Start-up procedure in synchronous control.....	3-3
3.2	2-axes system where synchronous control is available .....	3-4
3.3	Creating parameter for synchronous control .....	3-5
3.3.1	System setting.....	3-5
3.3.2	Parameter and servo parameter settings .....	3-6
3.3.3	Positioning data setting.....	3-7
3.3.4	Synchronous control parameter setting .....	3-8
3.3.5	Cam data setting .....	3-11
3.4	Operation check of synchronous control .....	3-13
3.4.1	OPR (for establishing a home position) .....	3-13
3.4.2	Start-up of drive axis.....	3-14
3.4.3	Operation check of a synchronous axis .....	3-15
3.4.4	Operation check with digital oscilloscope (check of cam operation) .....	3-16

<b>A</b>	<b>Appendix</b>	
A.1	Start address setting.....	A-1
A.1.1	Start address of Simple Motion Module.....	A-1
A.1.2	Start address setting.....	A-2
A.2	Parameter and positioning data.....	A-3
A.2.1	Parameters .....	A-3
A.2.2	Positioning data .....	A-5
A.3	Various monitor functions .....	A-6
A.3.1	Axis monitor.....	A-6
A.3.2	Error history of Simple Motion Module Setting Tool.....	A-12
A.3.3	PLC diagnostics of GX Works2.....	A-13
A.4	Sample program .....	A-14
A.4.1	Used device list.....	A-14
A.4.2	Sequence program example for synchronous control with 2 axes .....	A-15

# 1 Overview

This english document is the original instruction.

This quick start guide describes the items and the operations which are needed to wire the Simple Motion Module, as well as to perform the JOG operation, the program operation and the simultaneous control by using the FA engineering software MELSOFT GX Works2 and MR Configurator2, for users who use the Simple Motion Module for the first time. To fully utilize each module, such as CPU modules of MELSEC-L series, please refer to the relevant manuals depending on the purpose.

For users who use the MELSEC-L series CPU module (hereafter "CPU module") for the first time, please read "MELSEC-L Series Quick Start Guide" once.

## 1.1 Features of Simple Motion Module (LD77MH)

- Wide range of controls is realised by high performance and multiple functions.  
This module realises positioning control, synchronous control, cam control and speed and torque control.
- Adoption of the built-in synchronous encoder interface realises cost reduction.
- Highly flexible baseless structure realises space-saving control board.
- This module supports SSCNET III and it can be connected with the high-performance servo amplifier.
- Simple control setting, without programs.
- Assistant function realises easy setup.

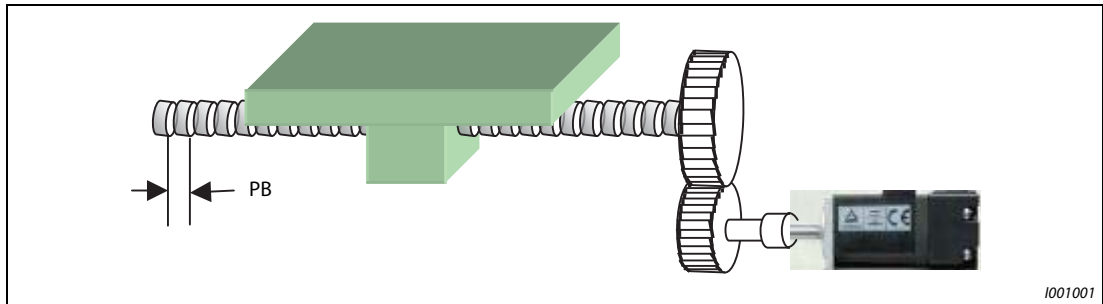
Parameters can be setup, from settings to adjustment, by using "Simple Motion Module Setting Tool" which is installed in GX Works2 as standard equipment or MR Configurator2.



## 2 Simple Motion Module start-up

This chapter explains the 1-axis system which applies a ball screw.

### Device



**Fig. 2-1:** 1-axis system

### Specifications

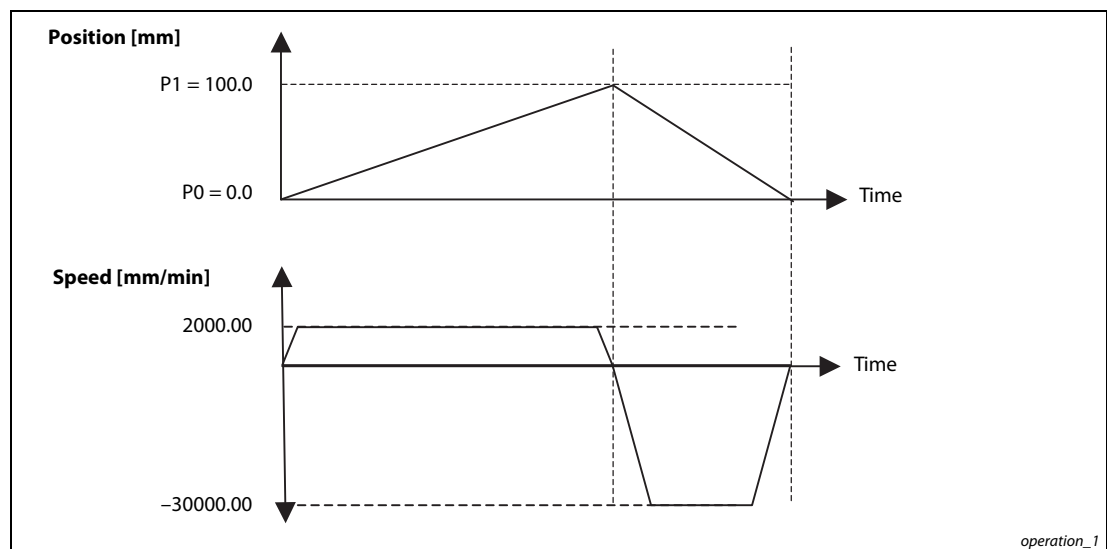
Ball screw lead (PB)	: 10000.0 $\mu\text{m}$ (= 10 mm)
Reduction gear ratio (Load side (NL)/Motor side (NM))	: 1/2 (The ball screw on load side makes one rotation for each 2 revolutions of the motor.)
Encoder resolution	: 262144 pls/rev
Servomotor	: HF-KP series
Servo amplifier	: MR-J3-B or MR-J4(W)-B series

### NOTE

The servo amplifier series MR-J4(W)-B has an encoder resolution of 4194304 pls/rev (22-bit).

### Operation pattern

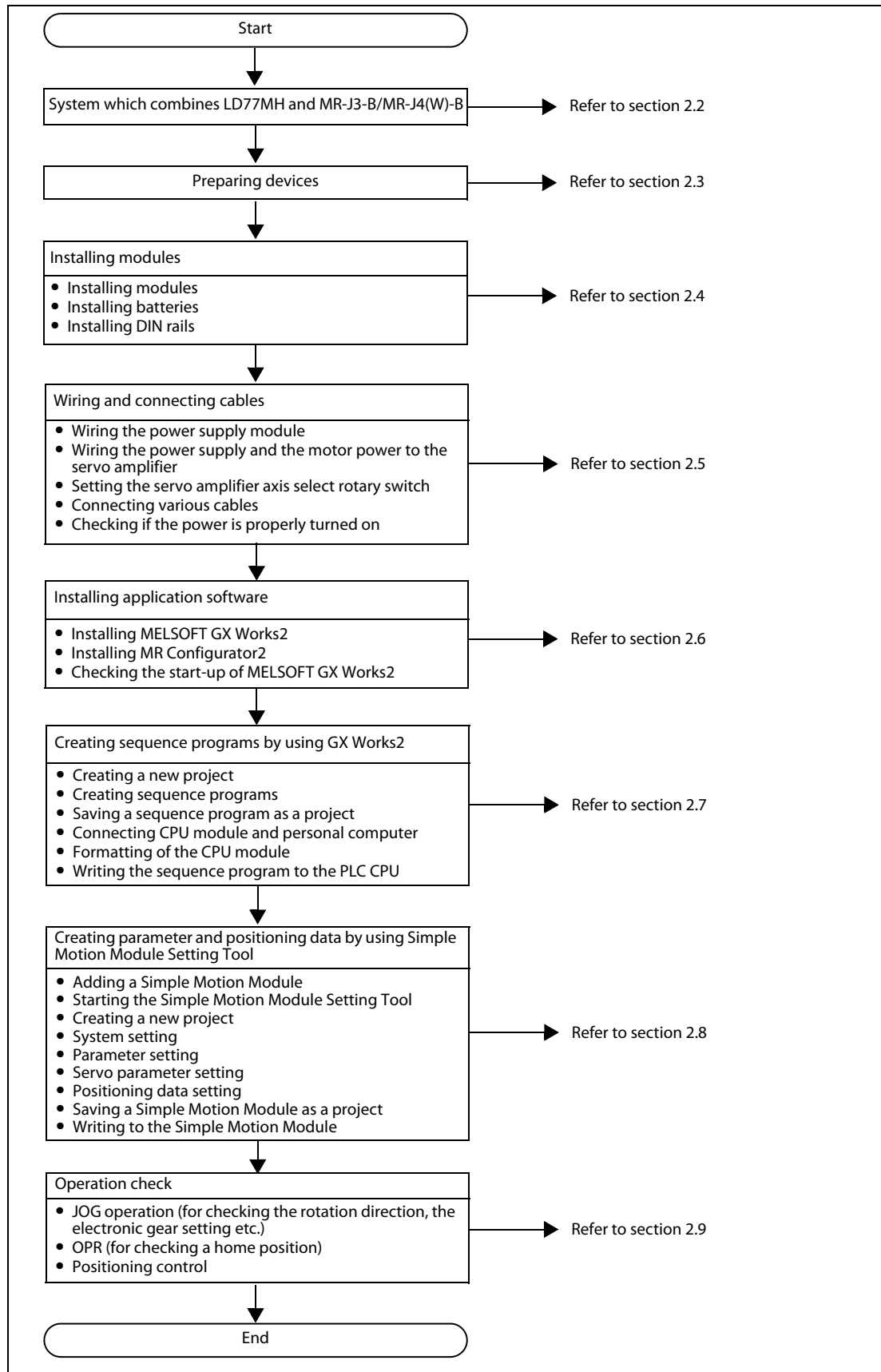
- ① Reciprocate between the home position (0 mm) and P1.
  - a) Move from the home position (0 mm) to P1 at the speed of 2000.00 mm/min.
  - b) Move from P1 to the home position at the speed of 30000.00 mm/min.
- ② Execute the continuous positioning control to a) and b).



**Fig. 2-2:** Operation pattern

## 2.1 Start-up procedure

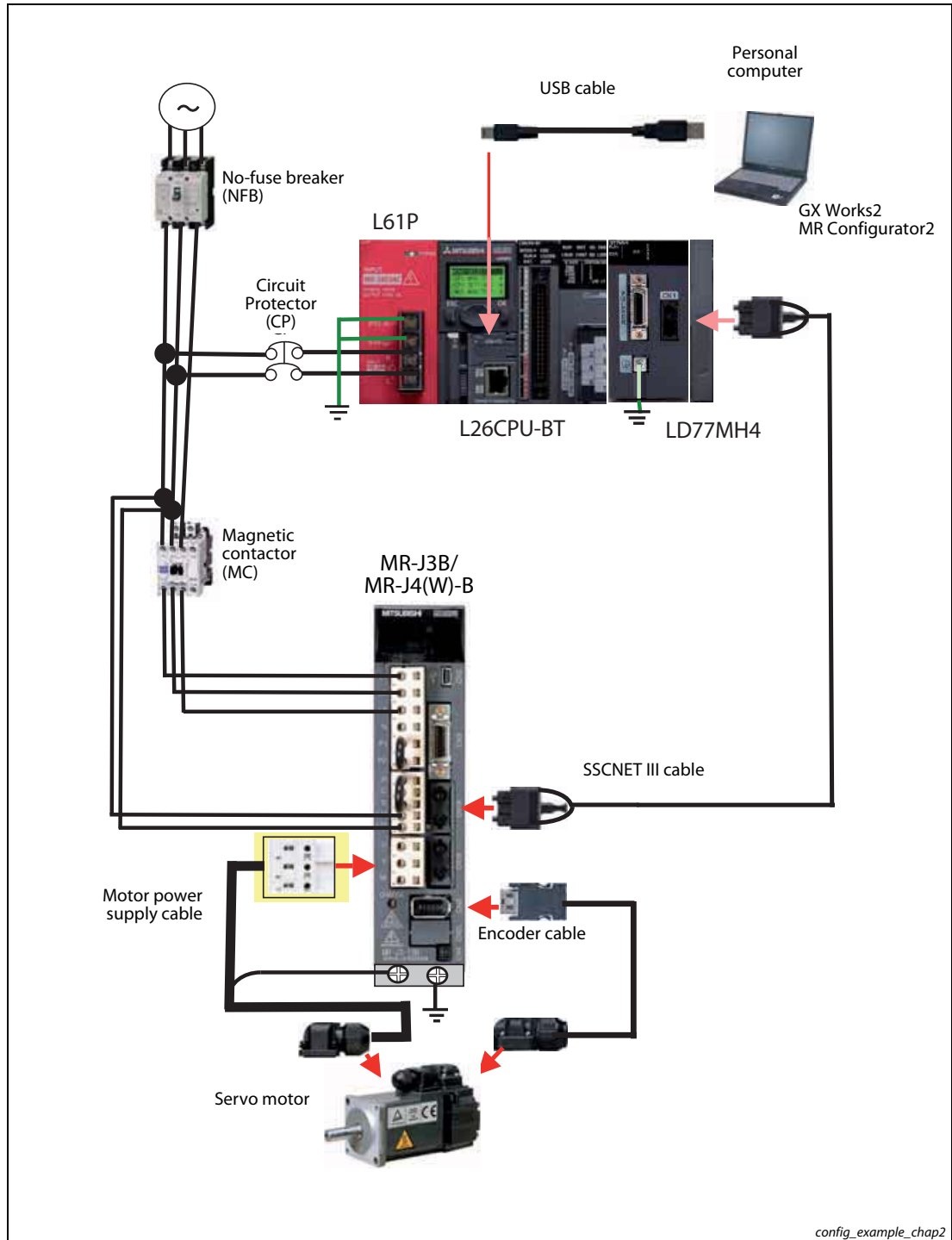
Following chart gives an overview of the operations and steps needed for starting up the system:





## 2.2 System which combines LD77MH and MR-J3-B/MR-J4(W)-B


















The following shows the configuration example of a system which combines LD77MH4, MR-J3-B/MR-J4(W)-B and a servomotor.



**Fig. 2-3:** Configuration example

## 2.3 Preparing devices

Please prepare the following devices, cables and software.

Simple Motion Module Main unit	Simple Motion Module LD77MH4 LD77MH16 			
Servo amplifier, Servomotor	Servo amplifier MR-J3-B 	Servo amplifier MR-J4(W)-B 	Servomotor 	
PLCs	Power supply module L61P 	CPU module 	END cover L6EC (Included with CPU module) 	Display unit L6DSP (Optional) 
	DIN rail (JIS C 2812) • TH35-7.5Fe • TH35-7.5Al • TH35-15Fe	DIN rail stopper		
Cables	USB cable MR-J3USBCBL3M (USB A type – USB mini B type) 	Encoder cable 	Motor power supply cable 	SSCNET III Cable MR-J3BUS□M 
Software	MELSOFT programming tool GX Works2 SW1DNC-GXW2-E Version 1.48A or later 	Servo amplifier setup soft- ware MR Configurator2 SW1DNC-MRC2-E Version 1.01B or later 		
Power distribution devices	No-fuse circuit breaker (NFB) 	Magnetic contactor (MC) 	Circuit protector (CP) 	

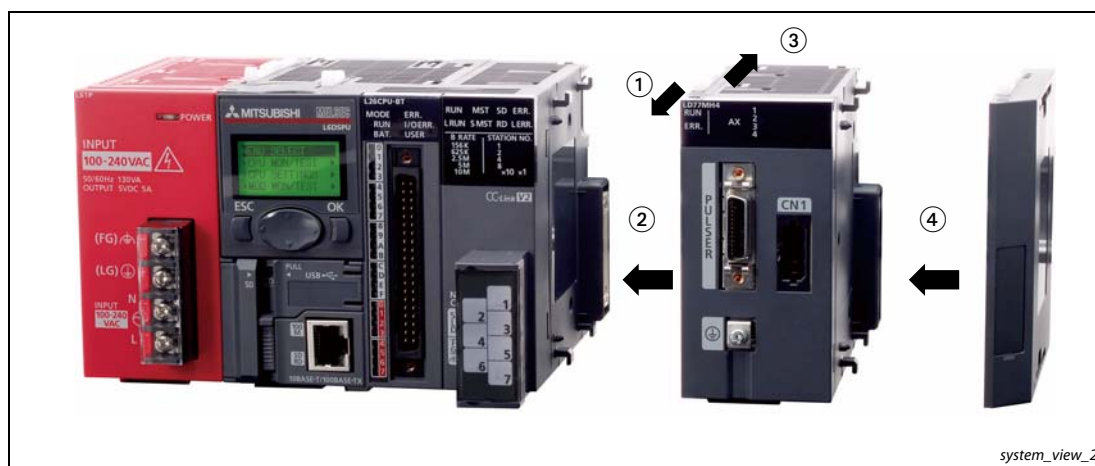
Tab. 2-1: Devices to be prepared

## 2.4 Installing modules

This section shows how to install the prepared modules.

### Installing modules

- ① Release the module joint levers located on the top and bottom of the LD77MH module. (Slide the hook forward.)
- ② Engage the LD77MH module and the connector of the CPU module by plugging them properly.
- ③ Lock the module joint levers located on the top and bottom of the LD77MH module. (Slide the hook backward.)
- ④ Follow the same procedures of steps ① to ③ to install the END cover.



**Fig. 2-4:** Installing modules

Installation of modules completed.

### Installing batteries

Connect a battery connector when using the CPU module for the first time.

### Installing DIN rails

Install the module to DIN rails.

Installation is completed.

## 2.5 Wiring and connecting cables

The following shows the connection examples of wiring and connecting cables of the Simple Motion Module (LD77MH) and the servo amplifier (MR-J3/MR-J4 series). Use cables with the same wire size as when the servo amplifier MR-J3-10B is used. In case that the capacity of the servo amplifier is different, refer to the servo amplifier instruction manuals.

### Wiring the power supply module (part ❶ of the figure below)

The following shows an example of wiring the power supply wires and grounding wire tor power supply module. Connect an isolation transformer when much noise is generated in the power supply system.

### Wiring the power supply and the motor power to the servo amplifier (part ❷ of the figure below)

Wire the control circuit power (L11, L21), main circuit power (L1, L2 and L3) and motor power line (U, V and W) to the servo amplifier.

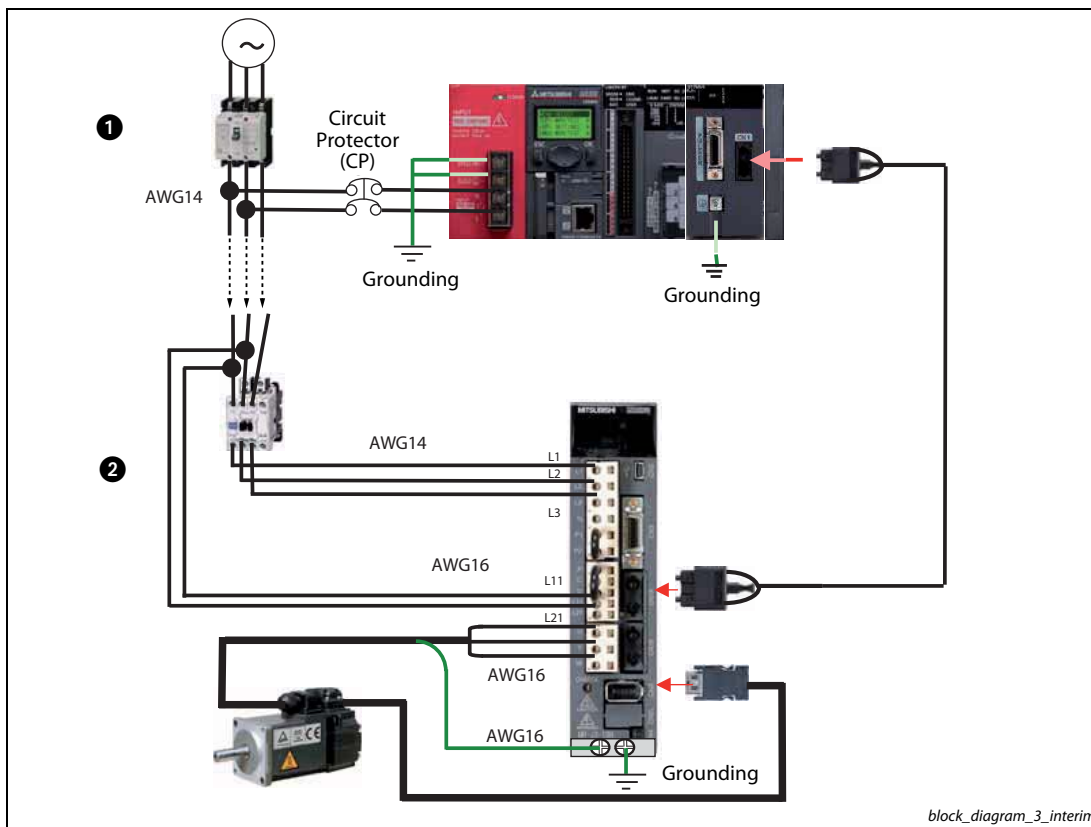


Fig. 2-5: Wiring example

Wire sizes and tightening torques:

Item	Applicable wire size	Tightening torque
Power supply wires	0.75 to 2 mm <sup>2</sup> (AWG18 to AWG14)	0.59 to 0.88 Nm
Grounding wire ❶	0.75 to 2 mm <sup>2</sup> (AWG18 to AWG14)	0.59 to 0.88 Nm
Control circuit power (L11, L21)	1.25 mm <sup>2</sup> (AWG16)	—
Main circuit power (L1, L2, L3)	2 mm <sup>2</sup> (AWG14)	—
Motor power line (U, V, W)	1.25 mm <sup>2</sup> (AWG16)	—
Grounding wire ❷	1.25 mm <sup>2</sup> (AWG16)	1.2 Nm

Tab. 2-2: Wire sizes and tightening torques

**Setting the servo amplifier axis select rotary switch**

The switches "0" to "F" of servo amplifier axis select rotary switch correspond to d01 to d16. The relationship between "SSCNET Structure" and axis select rotary switch is shown in the figure below.

Set the switches to the corresponding axis No.

Cover is opened

Axis select rotary switch

Servo amplifier MR-J3-B

Axis select rotary switch	d□□	Axis no.	Axis select rotary switch	d□□	Axis no.
"0"	d01	1	"8"	d09	9
"1"	d02	2	"9"	d10	10
"2"	d03	3	"A"	d11	11
"3"	d04	4	"B"	d12	12
"4"	d05	5	"C"	d13	13
"5"	d06	6	"D"	d14	14
"6"	d07	7	"E"	d15	15
"7"	d08	8	"F"	d16	16

Refer to section 2.8 for details of system setting.

*rotary\_switch, screen\_001*

**Fig. 2-6:** Setting of servo amplifier axis select rotary switch

**NOTE** | LD77MH4 can set up to axis 4, and LD77MH16 can set up to axis 16.

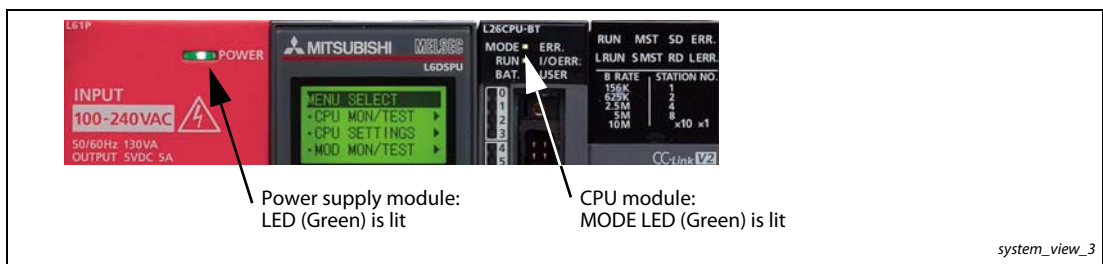
**Connecting various cables**

Connect the SSCNET III cable and the encoder cable. Connect the USB cable between personal computer and PLC CPU. (Refer to section 2.2)

**Checking if the power is properly turned on**

Make sure that the power supply of PLC and servo amplifier is properly turned on.

- ① Check the wiring of the PLC CPU module.
- ② Turn on the power supply of the PLC.



**Fig. 2-7:** Status of LEDs after turning on the power supply

When parameters and programs are not written to the CPU module, there is no problem with flashing of ERR LED in red. ERR LED is turned off when the power supply is turned off and then on after writing parameters and programs.

- ③ Check the wiring of the servo amplifier.
- ④ Turn on the power supply of the servo amplifier.  
The communication status with LD77MH can be checked in the servo amplifier display according to the table below.

Servo amplifier display	LED display	Status	Description	Wiring result
	AA ①	Initializing standby	The power supply of the LD77MH is turned off.	Normal
	Ab ①	Initializing	The power supply of the servo amplifier is turned on while the power supply of the LD77MH is turned off.	
	b01	Ready OFF	PLC ready signals of LD77MH are received.	Normal
	C01	Servo OFF	Servo off command is received.	
	d01	Servo ON	All axes servo on signal of LD77MH received.	
	E6	During servo forced stop	During servo forced stop of the servo amplifier	
	E7	During controller force stop	During force stop of LD77MH	
Off ②	—	The control power supply is turned off.	Error	

**Tab. 2-3:** Check of communication status

- ① The LED display of the servo amplifier is AA or Ab when parameters are not written to LD77MH, but there is no problem. Write parameters to LD77MH.
- ② Check the wiring of the control power supply when LED is turned off.


The wiring is completed.

## 2.6 Installing application software

The following shows how to install MELSOFT GX Works2 as a programming tool, and MR Configurator2 as a servo parameter setting tool.

### 2.6.1 Installing MELSOFT GX Works2


Install the software by following the instruction manual which comes with MELSOFT GX Works2.

Item	Model name	Function overview	Supported version
MELSOFT GX Works2 	SW1DNC-GXW2-E	Mitsubishi IQ Platform-compatible Programmable Controller Engineering Software (Integrated software of programming, simulation, module settings and monitoring tool function)	1.48A

**Tab. 2-4:** Software MELSOFT GX Works2

### 2.6.2 Installing MR Configurator2

Please contact your nearest Mitsubishi sales representative for the MR Configurator2.

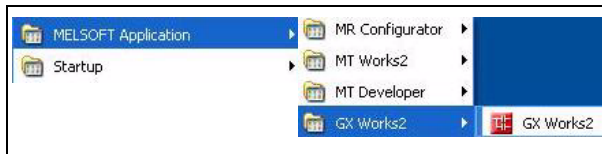
Item	Model name	Function overview	Supported version
MR Configurator2 	SW1DNC-MRC2-E	Parameter settings and adjustment of servo amplifier (Parameter settings, monitoring and graphs)	1.01B or later

**Tab. 2-5:** Software MR Configurator2

## 2.6.3 Checking the start-up of MELSOFT GX Works2

### Creating an icon of MELSOFT GX Works2

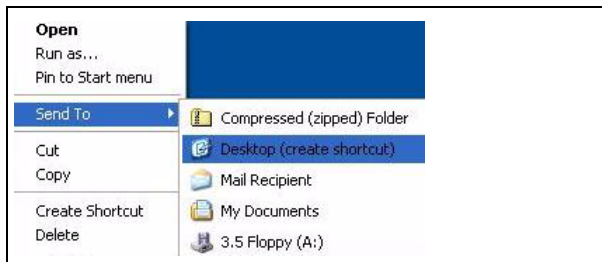
- ① Select **Start** → **All Programs** → **MELSOFT Application** → **GX Works2** → **GX Works2**.



**Fig. 2-8:**  
Selecting the program GX Works2

screen\_002/003

- ② Create the icon by right-clicking to select **Send To** → **Desktop (create shortcut)**.



**Fig. 2-9:**  
Creating an icon

screen\_004

### Starting MELSOFT GX Works2

- When there is an icon

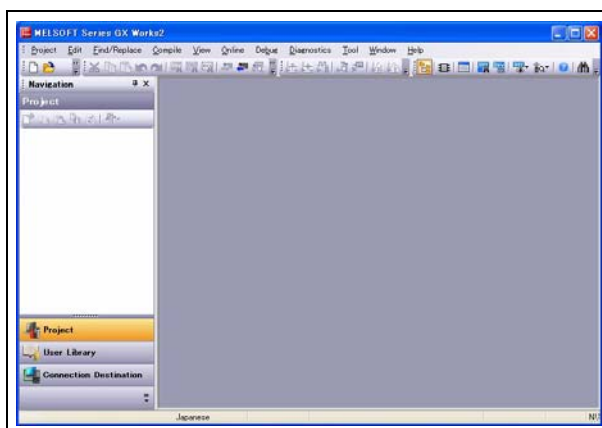


Double-click  to start MELSOFT GX Works2.

- When there is no icon

Select **Start** → **All Programs** → **MELSOFT Application** → **GX Works2** → **GX Works2** to start the software.

The main screen of GX Works2 will appear.



**Fig. 2-10:**  
GX Works2 main screen

screen\_005



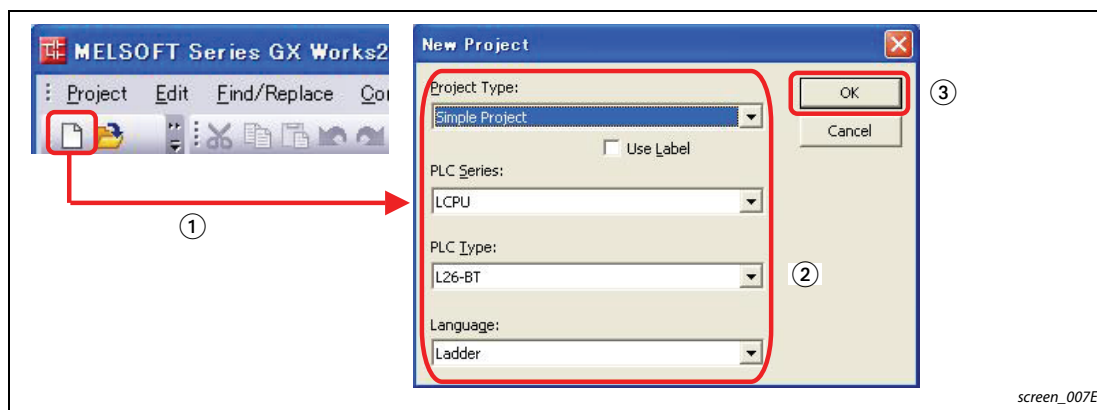
## 2.7 Creating sequence programs by using GX Works2

This section explains the methods from creating to saving a new project of the sequence program.

### 2.7.1 Creating a new project

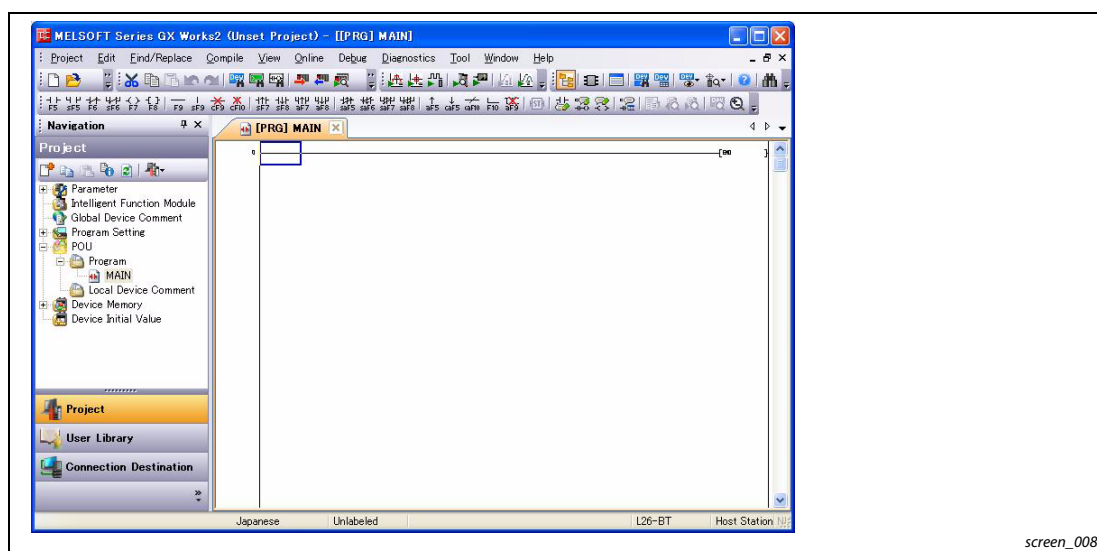
A project consists of programs, device comments, and parameters.  
This section explains the method with an example of using L26CPU-BT.

- ① Select the icon for creating a new project in the GX Works2 main screen.  
The "New Project" screen is displayed.
- ② Select the following settings:
  - Project Type : Simple Project
  - Use Label : Not used (do not click the checkbox)
  - PLC Series : LCPU
  - PLC Type : L26-BT (for using the L26CPU-BT in this example)
  - Language : Ladder
- ③ Click the **OK** button.



**Fig. 2-11:** Creating a new project

The project tree and circuit screen is displayed on the main screen.



**Fig. 2-12:** Project tree and circuit screen

New project creation is completed.

## 2.7.2 Creating sequence programs

For the next step, create a sequence program.

For the details, refer to the related manuals for the MELSEC-L series programmable logic controller.

In addition, if you wish to use sample data, please contact your nearest Mitsubishi sales representative.

### Sample data of LD77MH

Project name	Description
L02_LD77MH4_SEQ	for L02CPU and LD77MH4 (Axis 4 type)
L26_LD77MH4_SEQ	for L26CPU and LD77MH4 (Axis 4 type)
L02_LD77MH16_SEQ	for L02CPU and LD77MH16 (Axis 16 type)
L26_LD77MH16_SEQ	for L26CPU and LD77MH16 (Axis 16 type)

**Tab. 2-6:** LD77MH sample data for creating sequence programs

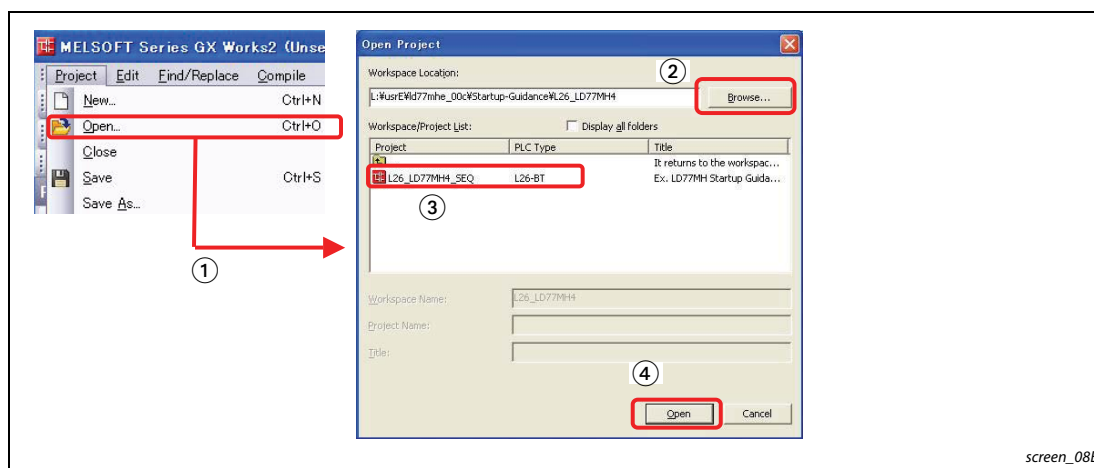
### Unpacking the LD77MH sample data

Unpack the LD77MH sample data (ld77mhe\_00c) into any folder.

### Reading sequence programs

Projects of the sequence program are read from the unpacked sample data.

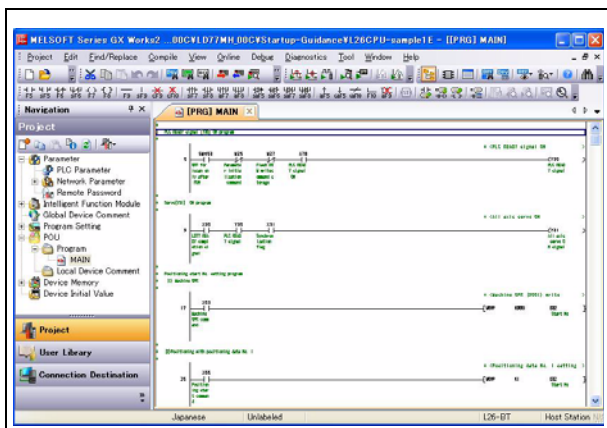
- ① Select **Project** → **Open...** from the menu.
- ② Click the **Browse...** button to select the folder in which the project is saved.
- ③ Select the project.
- ④ Click the **Open** button to display the main screen.



**Fig. 2-13:** Procedure of reading a sequence program

screen\_08E

The main screen is displayed.



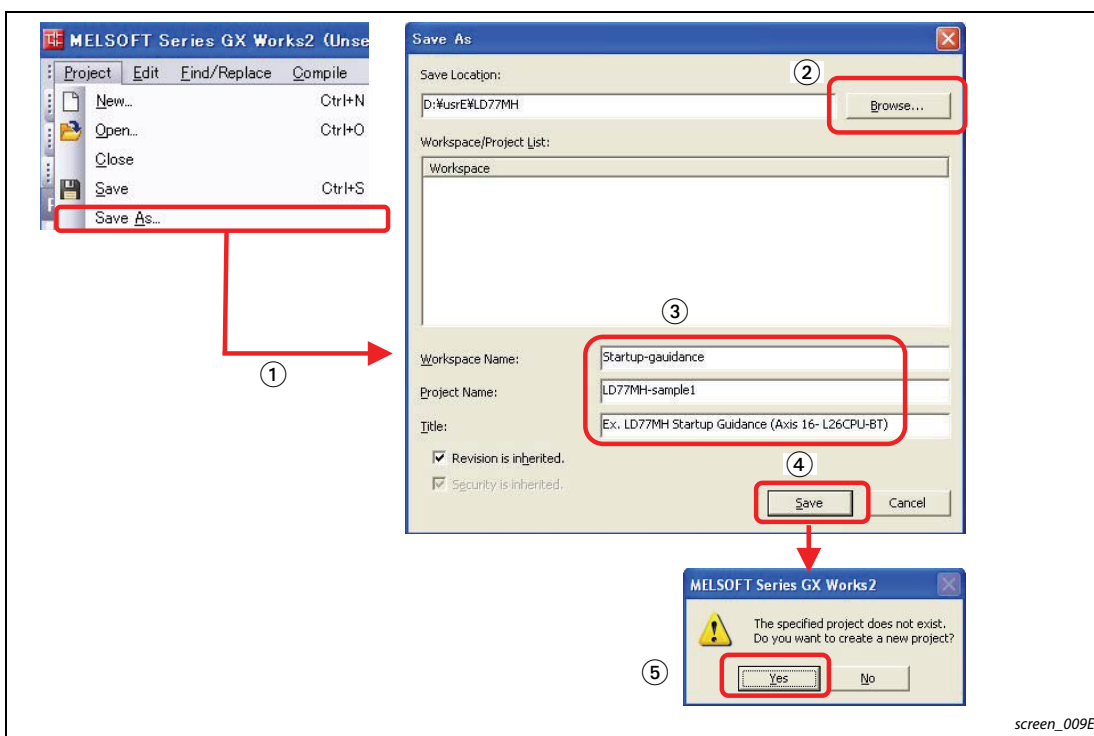
**Fig. 2-14:**  
Main screen for selected project

screen\_011

Reading of sequence program completed.

### 2.7.3 Saving a sequence program as a project

- ① Select **Project** → **Save As...** from the menu.
- ② Click the **Browse...** button to specify the save destination path.
- ③ Enter any names (for workspace, project and title).  
Make sure not to overwrite the original project.
- ④ Click the **Save** button. A confirmation message appears.
- ⑤ To save the project, click the **Yes** button.



screen\_009E

**Fig. 2-15:** Procedure of saving a program as a project

Saving project is completed.

## 2.7.4 Connecting CPU module and personal computer

### Connect the CPU module and personal computer via USB cable



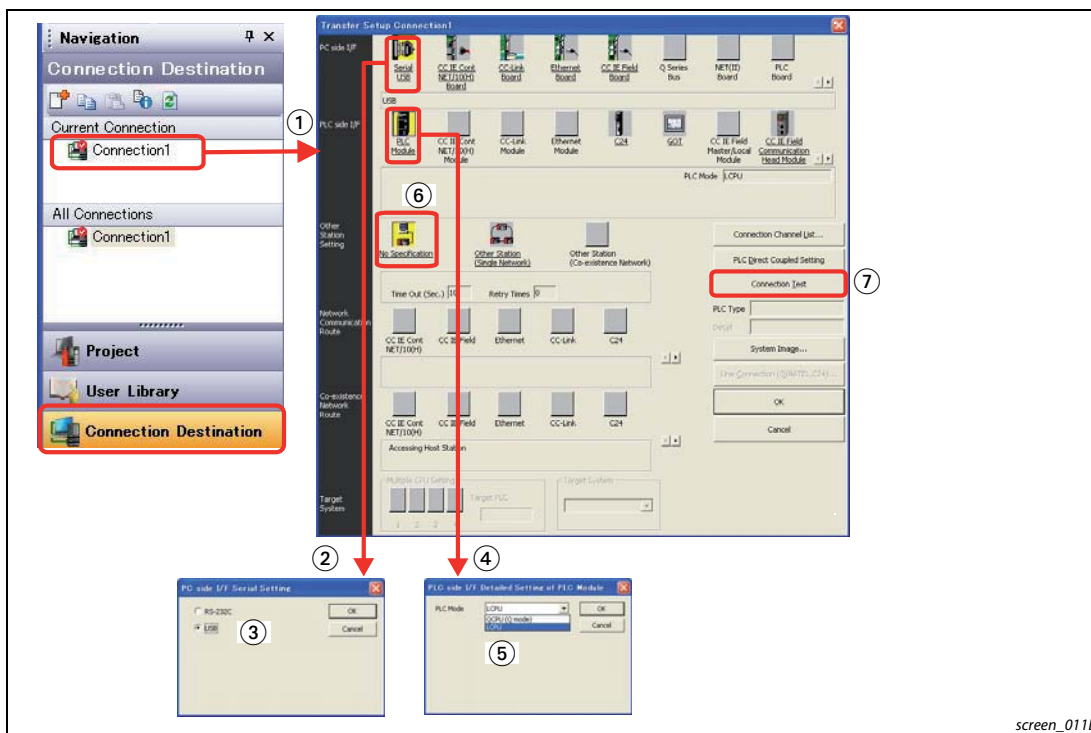
**Fig. 2-16:** Connection of PC and CPU module via USB

#### PLC power supply ON

Turn on the power of the power supply module.

#### Connection settings of GX Works2 and PLC

- ① Click **Connection Destination** in the GX Works2 main screen and double-click **Connection1**.
- ② Double-click **Serial USB** on "PC side I/F" section to display the "PC side I/F Serial Setting" screen.
- ③ Select **USB**. Confirm with **OK**.
- ④ Double-click **CPU Module** on "PLC side I/F" section to display the "PLC side I/F Detailed Setting of PLC Module" screen.
- ⑤ Select **LCPU**. Confirm with **OK**.
- ⑥ Click **No Specification** in "Other Stations Setting" section of "Transfer Setup Connection1" screen.
- ⑦ Click the **Connection Test** button.  
When the procedure is completed without error, the connection completion screen will appear.

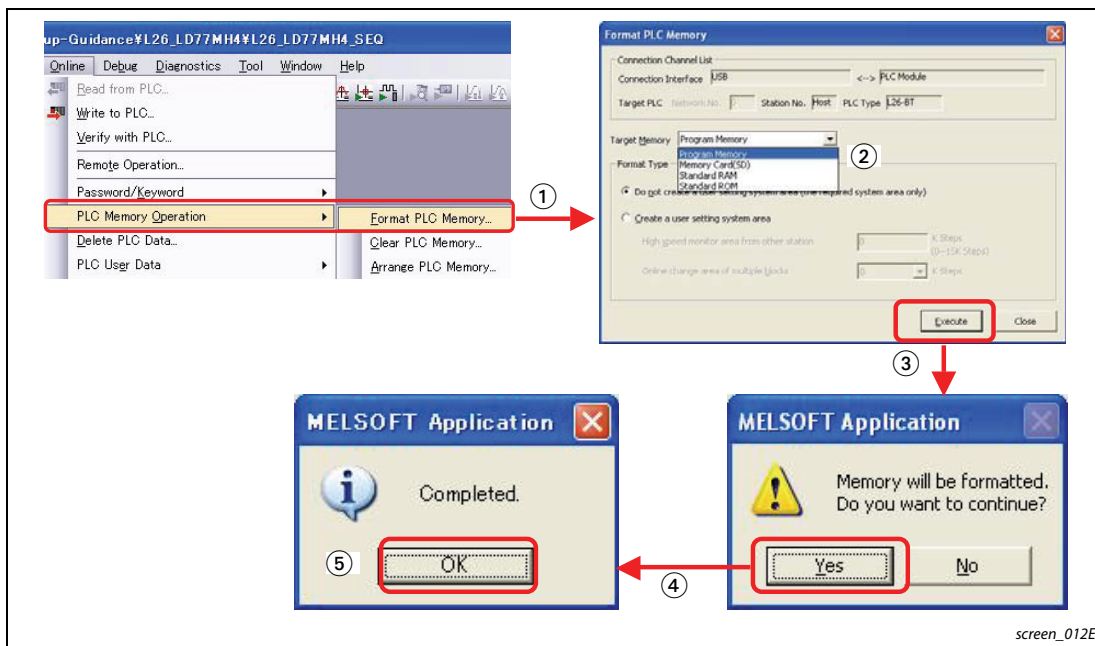


**Fig. 2-17:** Connection settings

Connecting CPU module and personal computer completed.

### 2.7.5 Formatting of the CPU module

- ① Select **Online** → **PLC Memory Operation** → **Format PLC Memory...** from the menu. The "Format PLC Memory" screen is displayed.
- ② Select **Program memory/Device memory** from "Target memory".
- ③ Click the **Execute** button to start the memory formatting process.
- ④ Click the **Yes** button to confirm memory formatting.
- ⑤ Click the **OK** button to confirm the completion message.



**Fig. 2-18:** Procedure of formatting the CPU module

Memory formatting is completed.

### 2.7.6 Writing the sequence program to the PLC CPU

Open the front side cover of CPU module, and move the RESET/RUN/STOP switch to the STOP position. Then, write data to CPU.

- ① Select **Online** → **Write to PLC...** from the menu.  
The "Online Data Operation" screen is displayed.
- ② Click the **Parameter + Program** button. The corresponding targets in the list are selected.
- ③ Click the **Execute** button to write to the PLC CPU.  
The "Write to PLC" screen is displayed.
- ④ Click the **Close** button to close the window after writing is completed.  
The "Online Data Operation" screen is displayed.
- ⑤ Click the **Close** button to close the window.

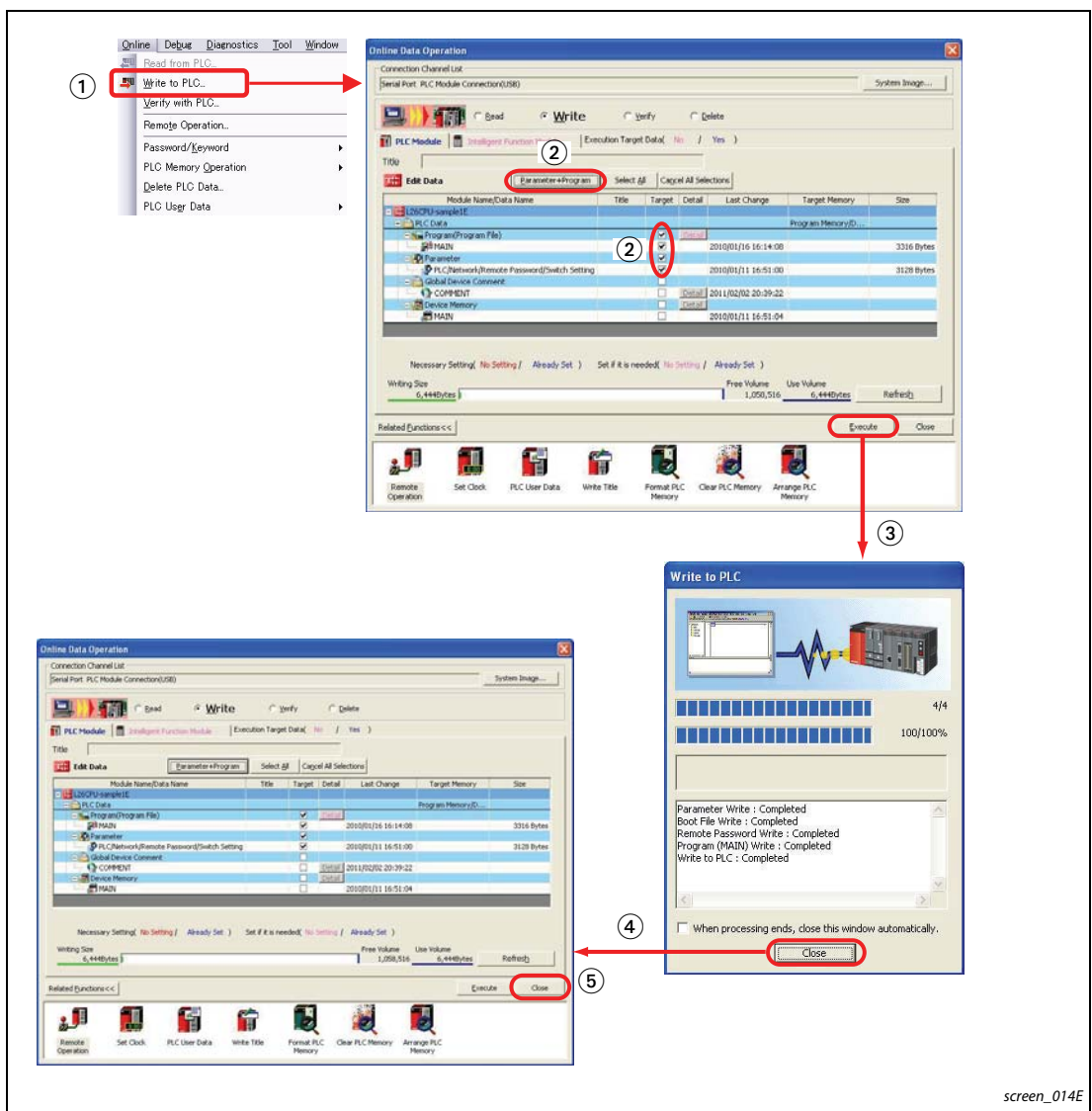


Fig. 2-19: Procedure of writing the sequence program to the PLC CPU

Writing to CPU module is completed.

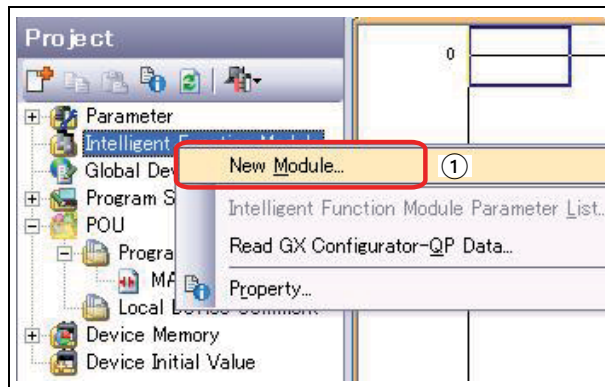


## 2.8 Creating parameter and positioning data by using Simple Motion Module Setting Tool

This section explains the setting methods of parameters and positioning data used in the Simple Motion Module (LD77MH).

### 2.8.1 Adding a Simple Motion Module

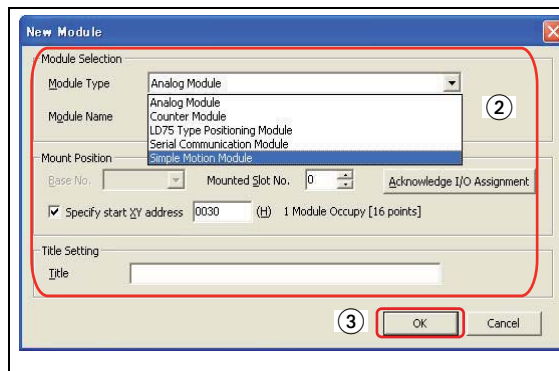
- Right-click on **Intelligent Function Module** in GX Works2 and select **New Module...**. The "New Module" screen is displayed.



**Fig. 2-20:** Select New Module

screen\_015E

- Select a module. The following shows a setting example of when the Simple Motion Module (LD77MH) is connected next to the CPU module.

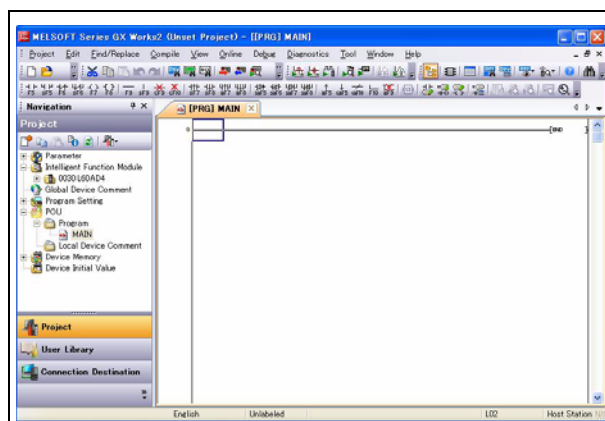


Item	PLC type	
	L02CPU	L26CPU-BT
Module Type	Simple Motion Module	
Module Name	LD77MH4	
Mounted Slot No.	0	
Specify start XY address	0010	0030
	<input checked="" type="checkbox"/> (Click the checkbox)	
Title	Optional	

screen\_029E

**Fig. 2-21:** Setting example

- Click the **OK** button to return to the main screen.



**Fig. 2-22:** Main screen

screen\_030J

**NOTE**

The start address of the Simple Motion Module (LD77MH) differs depending on the combination with CPU module. For details, refer to section A.1 "Start address setting".

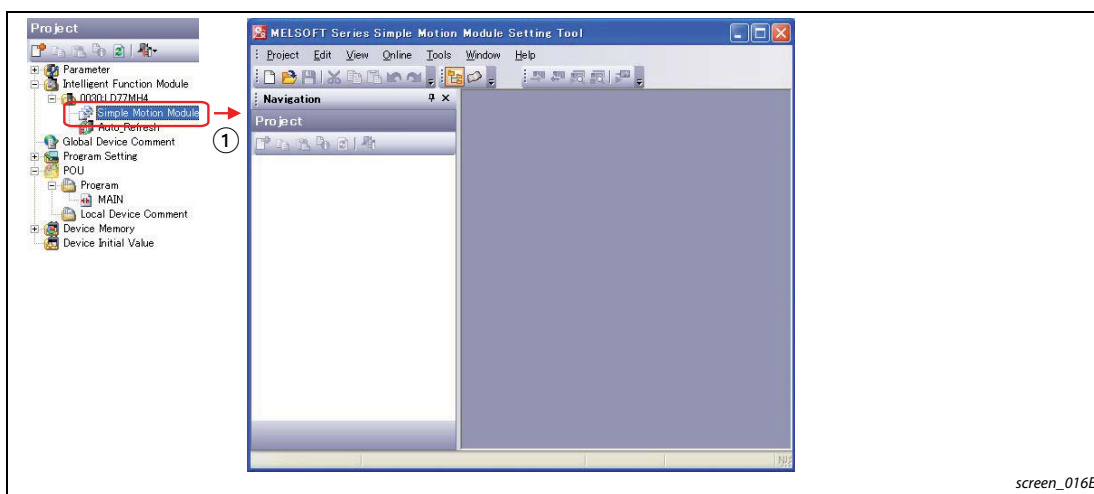
Setting is completed.

The following explains the setting method with the Simple Motion Module Setting Tool.

## 2.8.2 Starting the Simple Motion Module Setting Tool

- ① Select **Intelligent Function Module** → **LD77MH4** → **Simple Motion Module** in GX Works2 to start the Simple Motion Module Setting Tool.

The "MELSOFT Series Simple Motion Module Setting Tool" screen is displayed.

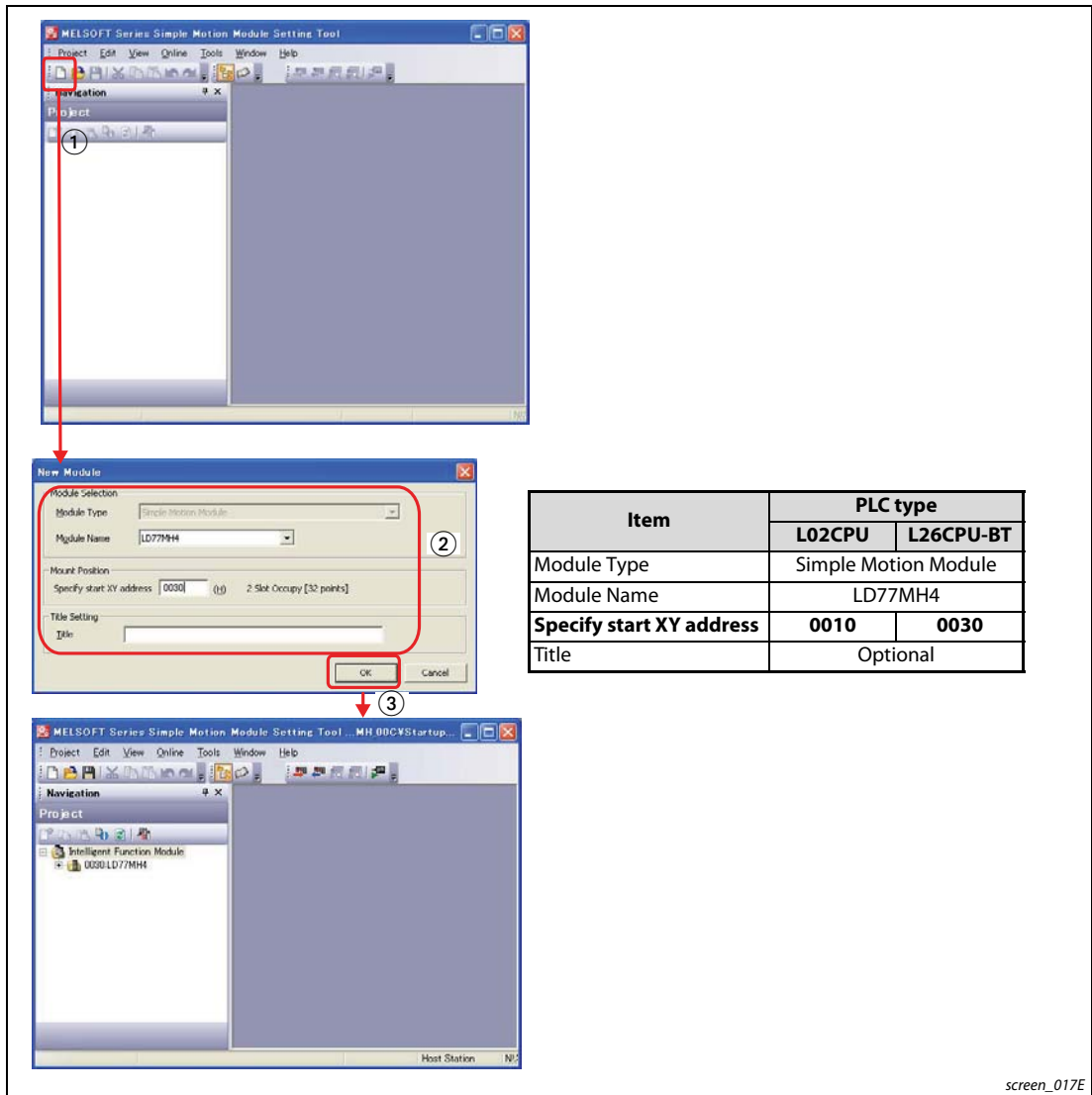


**Fig. 2-23:** Start the Simple Motion Module Setting Tool



### 2.8.3 Creating a new project

- ① Select the icon for creating a new project in the "MELSOFT Series Simple Motion Module Setting Tool" screen.  
The "New Module" screen is displayed.
- ② Make settings as follows:
  - Module Type: Simple Motion Module
  - Module Name: LD77MH4
  - Specify start XY address: 0030 (differs according to the PLC type used, see table below)
- ③ Click the **OK** button to add LD77MH to the intelligent function module of the project.



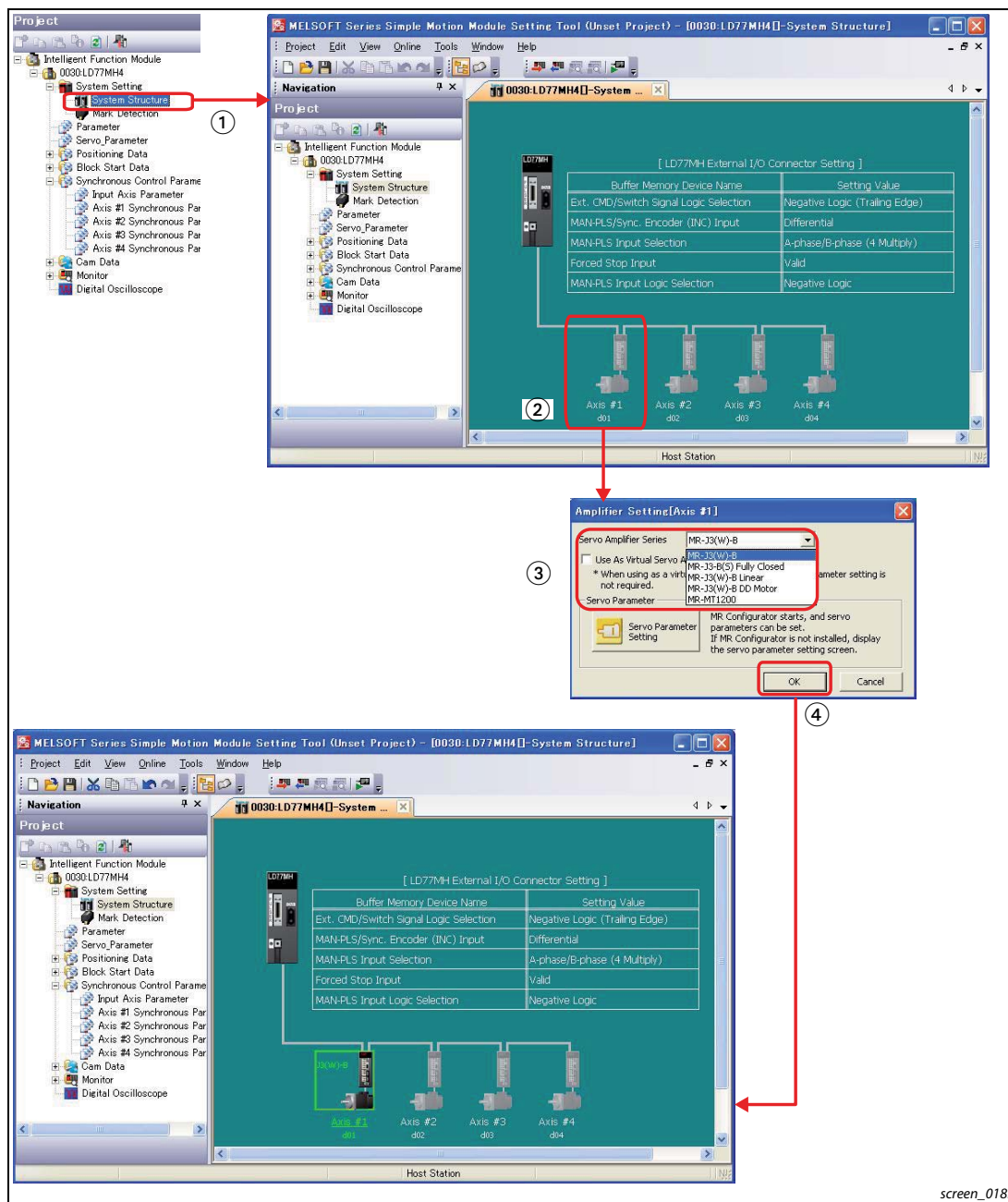
**Fig. 2-24:** Procedure of creating a new project via setting tool

Continue with the next section to set the system configuration.

## 2.8.4 System setting

Set the necessary parameters for the Simple Motion Module (LD77MH).

- ① Select **Intelligent Function Module** → **System Structure** in GX Works2.
- ② Double-click the image of the first axis of the servo amplifier.  
The "Amplifier Setting [Axis #1]" screen is displayed.
- ③ Select MR-J3(W)-B. If MR-J4 is used please select MR-J3-B
- ④ Click the **OK** button. The previous screen with selected servo amplifier is displayed.



**Fig. 2-25:** Setting the system configuration

System setting completed.

## 2.8.5 Parameter setting

- ① Select **Intelligent Function Module** → **Parameter** in GX Works2.
- ② Click the **Compute Basic Parameter 1** button for basic parameter settings. The "Compute Basic Parameters 1" screen for Axis No. 1 is displayed.
- ③ Select machine components and enter the machine data according to the specification of the device:
 

Machine Components	: Ball Screw, Horizontal
Unit Setting	: 0: mm
Lead of Ball Screw (PB) [μm]	: 10000.0
Reduction Gear Ratio (Load side (NL)/ Motor side (NM))	: 1/2
Encoder Resolution [pls/rev]	: 262144
- ④ Click the **Compute Basic Parameters 1** button.
- ⑤ Click the **OK** button to reflect the calculation result to the parameter.

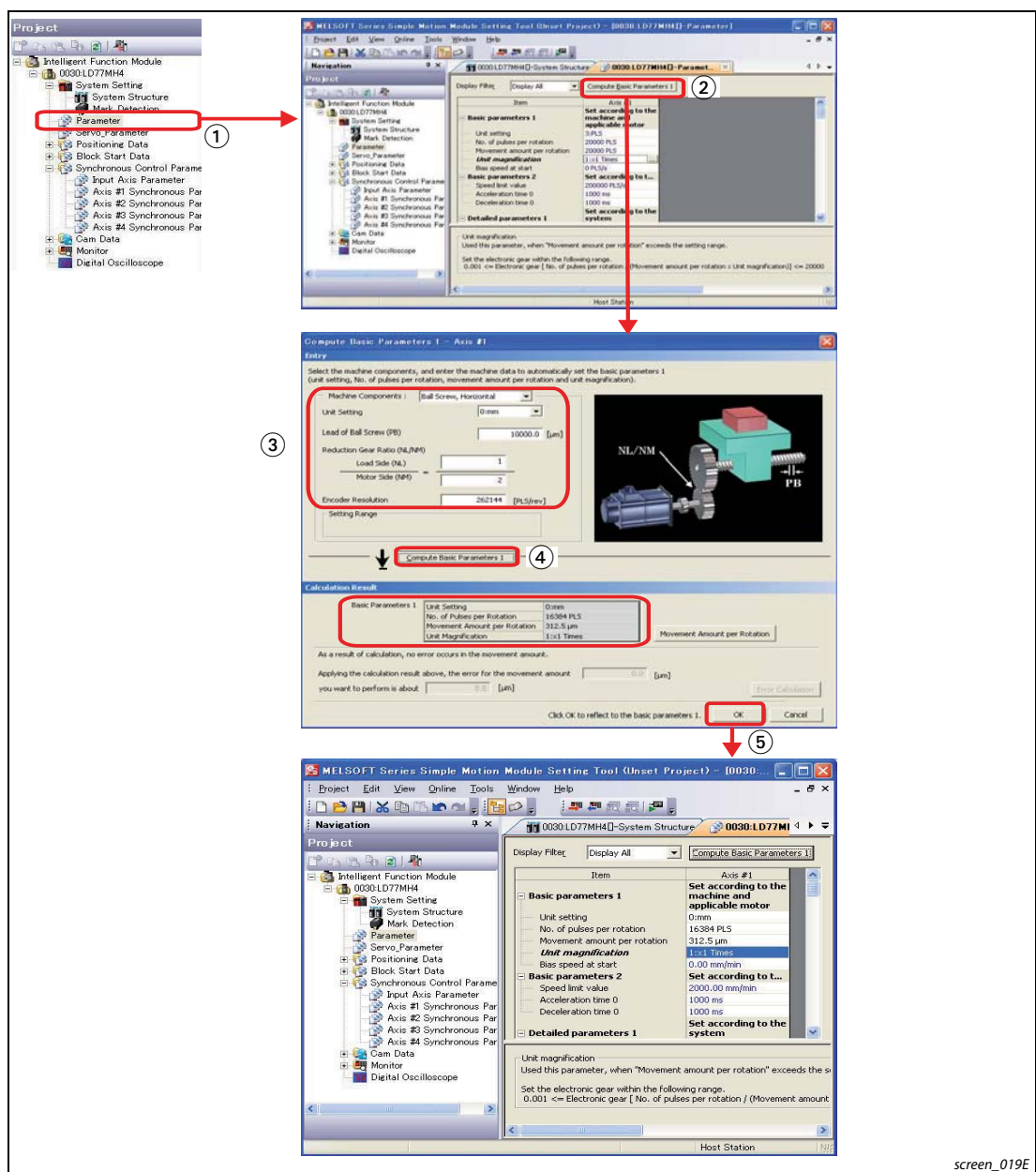


Fig. 2-26: Steps ① to ⑤ of parameter setting

## ⑥ Set other parameters.

Change the **underlined part**. (There is no need to change the basic parameter 1 since the parameter is already set in the previous section.)

The value can be changed by double-clicking each item of the parameter setting screen.

**NOTES**

The default values of the input signal logic selection upper limit and lower limit are set to negative logic, considering the safety. If you do not use these signals, change the values to positive logic before use.

Forced stop input signal is enabled, considering the safety. If users do not use this signal, switch it to be disabled before using.

Item	Description	
Basic parameters 1	Unit setting	<b><u>0: mm</u></b>
	Number of pulses per revolution	<b><u>16384 pls/rev (262144 pls/rev)</u></b>
	Movement amount per revolution	<b><u>312.5 μm (5000.0 μm)</u></b>
	Unit magnification	<b><u>1: x 1 time</u></b>
	Bias speed at start	0.00 mm/min
Basic parameters 2	Speed limit value	<b><u>30000.00 mm/min</u></b>
	Acceleration time 0	1000 ms
	Deceleration time 0	1000 ms
Detailed parameters 1	Backlash compensation amount	0.0 μm
	Software stroke limit upper limit value	214748364.7 μm
	Software stroke limit lower limit value	-214748364.8 μm
	Software stroke limit selection	0: Apply Software Limit to Current Feed Value
	Software stroke limit valid/invalid setting	0: Valid
	Command in-position width	10.0 μm
	Torque limit setting value	300 %
	M code ON signal output timing	0: WITH mode
	Speed switching mode	0: Standard Speed Switching Mode
	Interpolation speed designation method	0: Composite Speed
	Current feed value during speed control	0: Not update of current feed value
	Input signal logic selection : lower limit	<b><u>1: Positive Logic</u></b>
	Input signal logic selection : upper limit	<b><u>1: Positive Logic</u></b>
	Input signal logic selection : Stop signal	0: Negative Logic
	Input signal logic selection: External command/ switching signal ①	0: Negative Logic
	Input signal logic selection: Near-point dog signal	0: Negative Logic
	Input signal logic selection: Manual pulse generator input	0: Negative Logic
External Input signal selection	1: Use Input of Servo Amplifier	
Manual pulse generator/ Incremental synchronous encoder input selection	0: A-phase/B-phase mode (4 multiply)	
Speed-position function selection	0: Speed-Position Switching Control (INC Mode)	
Forced stop valid/invalid selection	<b><u>1: Invalid</u></b>	
Detailed parameters 2	Acceleration time 1	1000 ms
	Acceleration time 2	1000 ms
	Acceleration time 3	1000 ms
	Deceleration time 1	1000 ms
	Deceleration time 2	1000 ms
	Deceleration time 3	1000 ms
	JOG speed limit value	15000.00 mm/min
	JOG operation acceleration time selection	0: 1000
	JOG operation deceleration time selection	0: 1000
	Acceleration/deceleration process selection	0: Trapezoidal acceleration/ deceleration processing

**Tab. 2-7:** Other parameters setting (1)

Item	Description	
Detailed parameters 2	S-curve ratio	100 %
	Sudden stop deceleration time	1000 ms
	Stop group 1 sudden stop selection	0: Normal deceleration stop
	Stop group 2 sudden stop selection	0: Normal deceleration stop
	Stop group 3 sudden stop selection	0: Normal deceleration stop
	Positioning complete signal output time	300
	Allowable circular interpolation error width	10.0 μm
	External command function selection	0: External positioning start
	Speed control 10 x multiplier setting for degree axis	0: Invalid
	Restart allowable range when servo OFF to ON	0 pls/rev
	Manual pulse generator/ Incremental synchronous encoder input type selection	0: Differential output type
	Operation setting for speed-torque control mode: Speed initial value selection	0: Command speed
	Operation setting for speed-torque control mode: Condition selection at mode switching	0: Switching Conditions Valid at Switching Mode
	External command signal selection <sup>①</sup>	0: Unused
OPR (Original Point Return) Basic parameters	OPR method	<b>6: Data set method</b>
	OPR direction	0: Positive direction (address increment direction)
	OP address	0.0 μm
	OPR speed	0.01 mm/min
	Creep speed	0.01 mm/min
	OPR retry	0: Do not retry OPR with limit switch
OPR (Original Point Return) Detailed parameters	Setting for the movement amount after near-point dog ON	0.0 μm
	OPR acceleration time selection	0: 1000
	OPR deceleration time selection	0: 1000
	OP shift amount	0.0 μm
	OPR torque limit value	300 %
	Operation setting of incompleteness of OPR	0: Positioning control is not executed.
	Speed designation during OP shift	0: OPR speed
	Dwell time during OPR retry	0 ms
	Pulse conversion module: OPR request setting	0: Turn OPR Request ON at Servo OFF
	Pulse conversion module: Waiting time after clear signal output	100 ms
Expansion parameters	Optional data monitor: Data type setting 1	0: No Setting
	Optional data monitor: Data type setting 2	0: No Setting
	Optional data monitor: Data type setting 3	0: No Setting
	Optional data monitor: Data type setting 4	0: No Setting
	Operation cycle setting <sup>①</sup>	1: 1.77 ms

**Tab. 2-7:** Other parameters setting (2)

<sup>①</sup> The Operation cycle setting and External command signal selection are used only in a parameter of LD77MH16.

Parameter setting completed.

**Example** ▽ Setting the speed limit value in maximum motor speed

Ball screw lead : 10.0 mm  
Servomotor : HF-KP13 (262144 pls/rev)  
Gear ratio : 1/2  
Speed limit value = Maximum motor speed × Gear ratio × Ball screw lead  
= 6000 r/min × 1/2 × 10 mm  
= 30000.00 mm/min



## 2.8.6 Servo parameter setting

- ① Select **Intelligent Function Module** → **Servo Parameter** in GX Works2 to start MR Configurator2.
- ② Select **Invalid (Not use forced stop input (EM1))** of the "Servo forced stop selection".

### NOTE

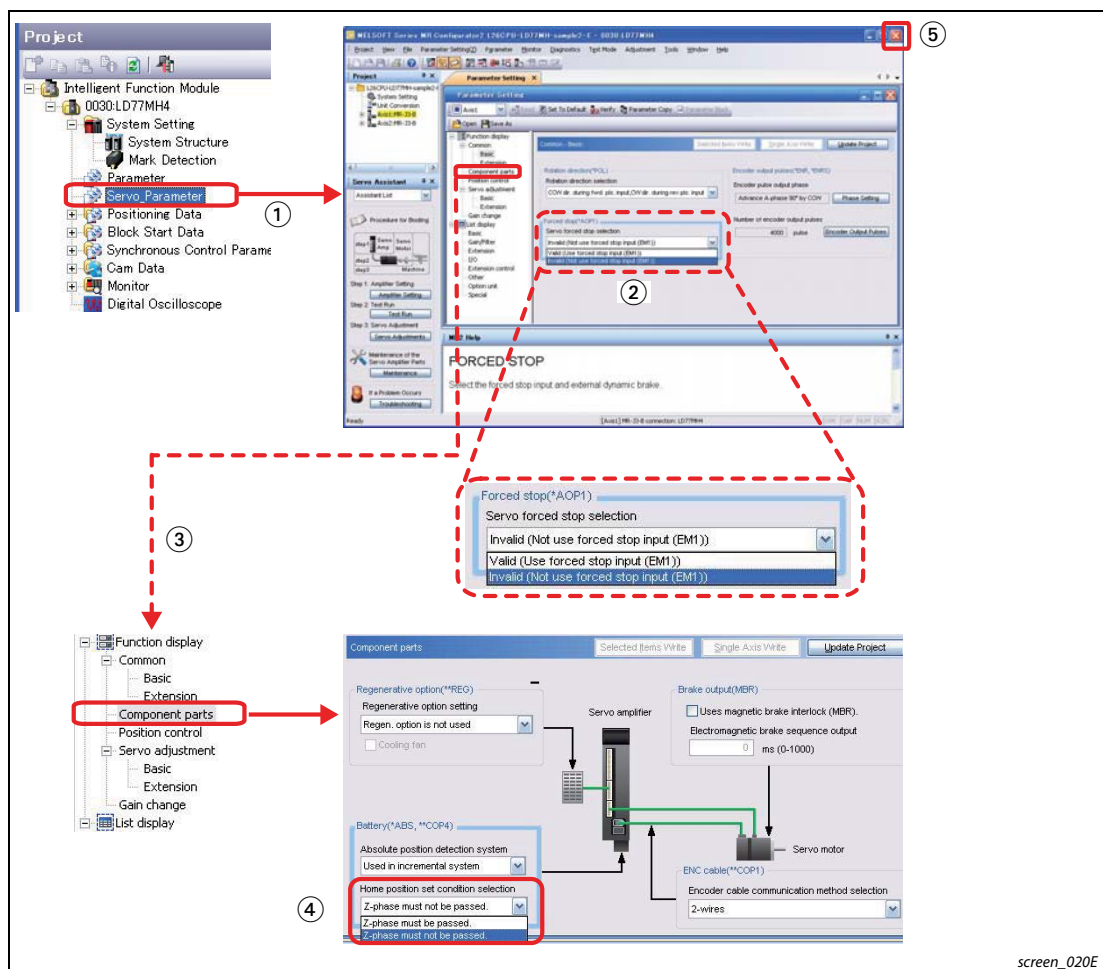
Forced stop input selection specifies whether to use the forced stop input signal from the servo amplifier or not. For safety reasons, the default setting is **Valid (Use forced stop input (EM1))**. For not using the forced input signal, change the setting to **Invalid (Not use forced stop input (EM1))**.

- ③ Click **Component parts** in the "Parameter Setting" screen to display the "Component parts" screen.
- ④ Select **Z-phase must not be passed** in the settings of "Home position set condition selection".

### NOTE

If selecting **Z-phase must not be passed**, it is possible to carry out the home position return (OPR) even though a motor has not turned 1 or more revolutions for home position return.

- ⑤ Close MR Configurator2:  
Click the **x** button to display the save confirmation screen of the changed contents.  
Click the **Yes** button on the save confirmation screen to close MR Configurator2.



**Fig. 2-27:** Steps ① to ⑤ of servo parameter setting

Servo parameter setting completed

## 2.8.7 Positioning data setting

This section explains the setting method of the positioning data with using program examples which reciprocate between the home position and P1.

**Example** ▾

Operation example of returning the original position after moving to P1

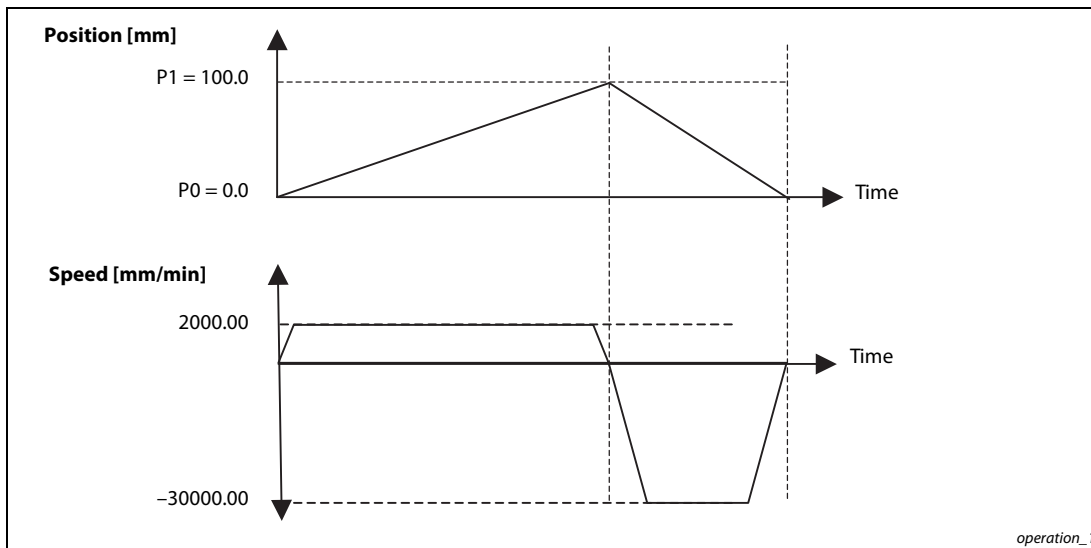


Fig. 2-28: Operation pattern of the example



### Selecting the positioning data

- ① Select **Intelligent Function Module** → **LD77MH4** → **Positioning Data** → **Axis #1 Positioning Data** to display the positioning data screen.
- ② Click the **Data Setting Assistant** button.

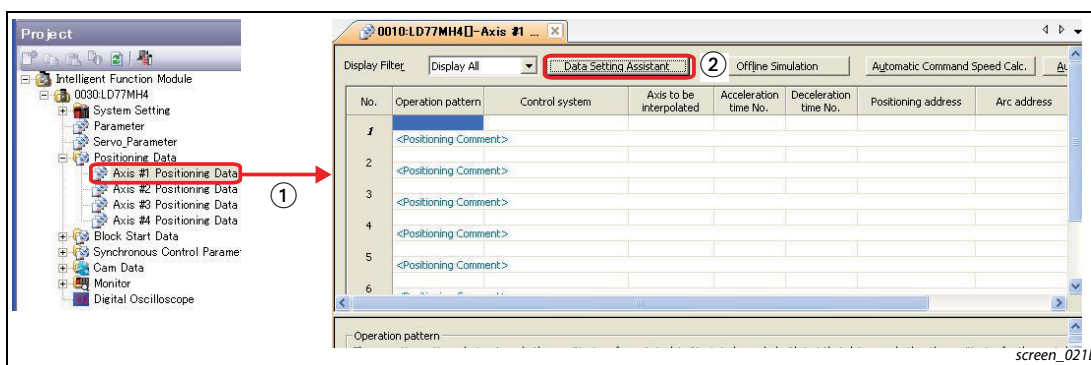


Fig. 2-29: Selecting positioning data (steps ① and ②)



③ In the following screen input data for each item and the positioning control system.

Item	Setting value
Positioning control selection	1-axis linear control (ABS)
Positioning Data No.	1
Positioning Address (Reference axis)	100000.0 μm
Command Speed	2000.00 mm/min
Operation Pattern	Continuation
Acceleration Time No.	0: 1000
Deceleration Time No.	0: 1000
Dwell Time	0: 0 ms
M code	0

screen\_022E

**Fig. 2-30:** Selecting positioning data (steps ③ and ④)

④ Click the **Set** button to close the data setting assistant screen.  
The positioning data screen with data is displayed.

No.	Operation pattern	Control system	Axis to be interpolated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address
1	1:CONT	0th:ABS Linear 1	-	0:1000	0:1000	100000.0 μm	0.0 μm
2	0:END	0th:ABS Linear 1	-	0:1000	0:1000	0.0 μm	0.0 μm
3	<Positioning Comment>						
4	<Positioning Comment>						

screen\_023E

**Fig. 2-31:** Positioning data screen with set data

⑤ Create the command which returns from P1 to the home position in the positioning data No. 2 by using the same method.

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	<b>1: Continuation</b>	<b>ABS linear 1</b>	—	1: 1000	1: 1000	<b>100000.0 μm</b>	0.0 μm	<b>2000.00 mm/min</b>	0 ms	0
2	<b>0: Completion</b>	<b>ABS linear 1</b>	—	1: 1000	1: 1000	<b>0.0 μm</b>	0.0 μm	<b>3000.00 mm/min</b>	0 ms	0

**Tab. 2-8:** Axis 1 positioning data

Positioning data completed.

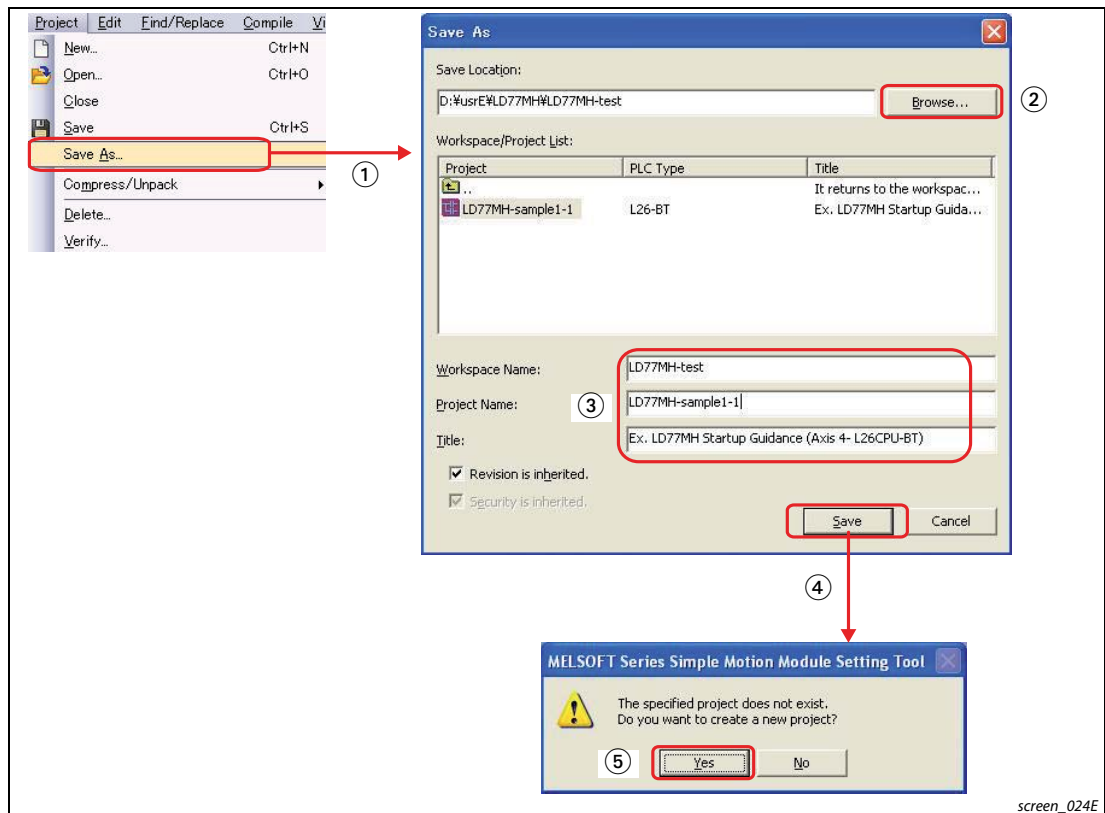
## 2.8.8 Saving the Simple Motion Module as a project

### Save data

Item	Description	Remark
System Structure	Existence of axes, amplifiers and virtual servo to be used	Always necessary
Parameter	Overall parameter of each axis	
Servo parameter	Parameter of servo amplifier	
Positioning data	Positioning data	
Block start data	Data for block start	If needed
Synchronous control parameter	Parameter for synchronous control	
Cam data	Cam pattern	

**Tab. 2-9:** Save data overview

- ① Select **Project** → **Save As** from the menu.
- ② Click **Browse** button to specify the save destination path.
- ③ Enter any names (for workspace, project and title).
- ④ Click the **Save** button.  
When the new project is saved, the save confirmation screen appears.
- ⑤ Click the **Yes** button to confirm.



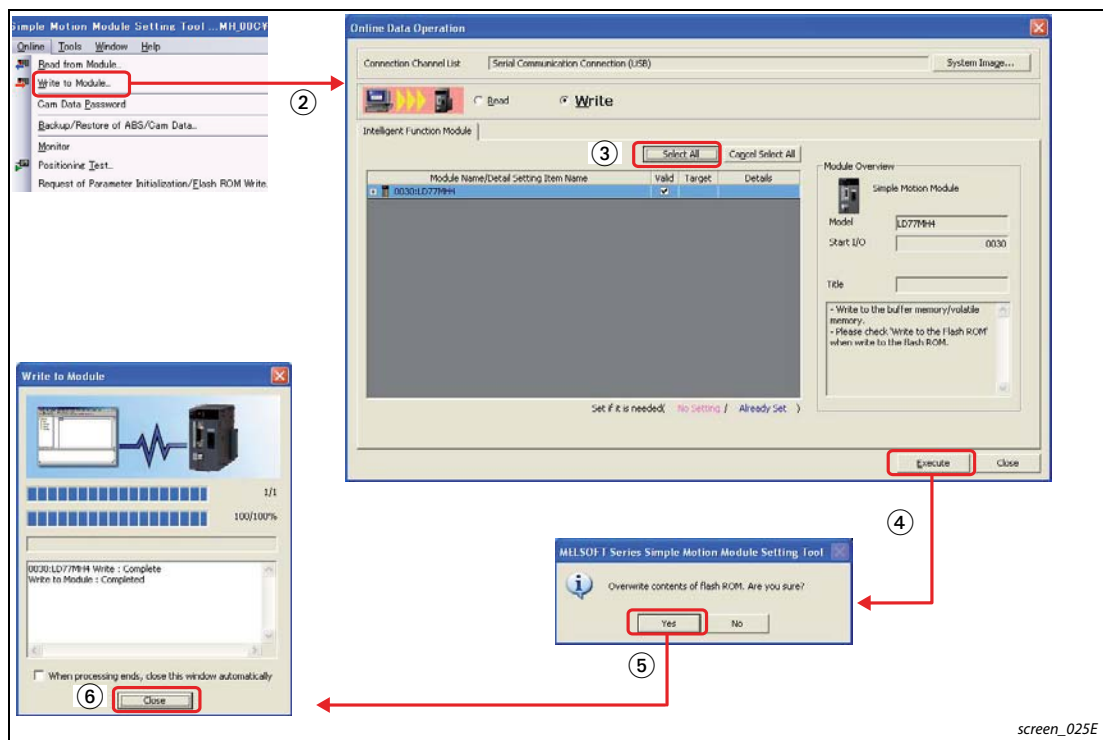
**Fig. 2-32:** Procedure of saving a project

Saving the project of the Simple Motion Module completed.

## 2.8.9 Writing to the Simple Motion Module

Write parameters and positioning data to the Simple Motion Module.

- ① Move the RESET/RUN/STOP switch on the front side of the PLC CPU module to STOP position.
- ② Writing to LD77MH:  
Select **Online** → **Write to Module...** from the menu.  
The "Online Data Operation" screen is displayed.
- ③ Click the **Select All** button. All items are selected.
- ④ Click the **Execute** button. A warning message is displayed.
- ⑤ Click the **Yes** button to confirm overwriting of the flash ROM contents.  
The "Write to Module" screen is displayed showing the progress of writing process.
- ⑥ After the writing procedure is completed, click **Close** to finish.



**Fig. 2-33:** Steps ② to ⑥ of writing procedure

**NOTE**

If the data is not written to the flash ROM, the data is erased by turning the power supply OFF to ON.

- ⑦ Power OFF to ON  
Reset the PLC CPU or power OFF to ON.  
If the servo parameter is overwritten, power the servo amplifier OFF to ON.

**NOTE**

Please write the sequence program, the parameters and the other data of the simple motion controller at first. And switch power off once and then switch it on again. When "ERR. LED" lights up or blinks please confirm the error and take measures according to the manual. Please refer to Appendix A.2 and A.3 for a way of the error confirmation.

Writing completed.

## 2.8.10 Sample data for setting procedures

Refer to the project of parameters and positioning data to be used in the Simple Motion Module (LD77MH). In addition, if you wish to use sample data, please contact your nearest Mitsubishi sales representative.

The projects provided on the website [www.mitsubishi-automation.com](http://www.mitsubishi-automation.com) contain sample data for section 2.8.4 "System setting" to section 2.8.7 "Positioning data setting".

### Sample data of LD77MH

Project name	Description	Remark
L02_LD77MH4_POS	for L02CPU and LD77MH4	Sample data of the simple motion 4-axis type
L26_LD77MH4_POS	for L26CPU and LD77MH4	
L02_LD77MH4_SYNC	for L02CPU and LD77MH4	
L26_LD77MH4_SYNC	for L26CPU and LD77MH4	
L02-LD77MH16_POS	for L02CPU and LD77MH16	Sample data of the simple motion 16-axis type
L26-LD77MH16_POS	for L26CPU and LD77MH16	
L02-LD77MH16_SYNC	for L02CPU and LD77MH16	
L26-LD77MH16_SYNC	for L26CPU and LD77MH16	

**Tab. 2-10:** LD77MH sample project data

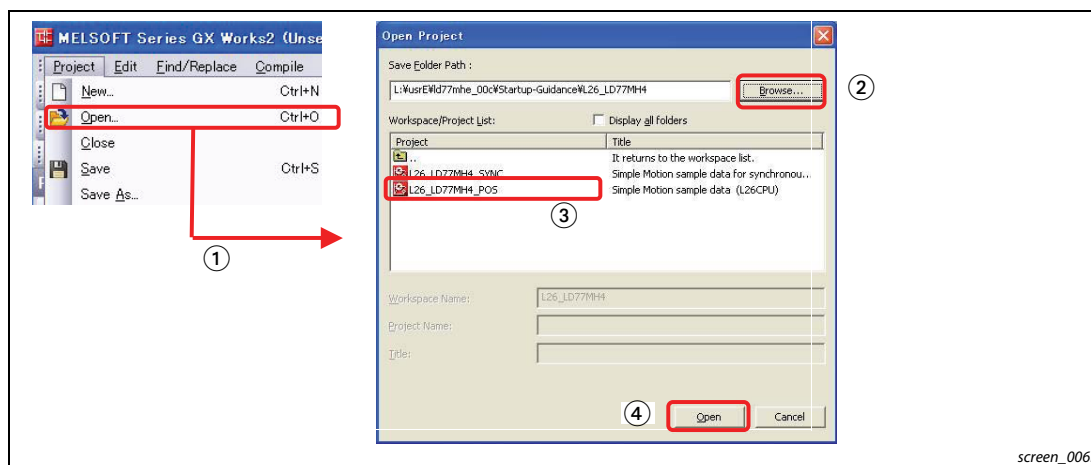
### Unpacking the download module

Unpack the download module into any folder.

### Reading a project

Projects are read from the unpacked sample data.

- ① Select **Project** → **Open...** from the menu.
- ② Click the **Browse...** button to select the folder in which the project is saved.
- ③ Select a project.
- ④ Click the **Open** button to open the project.



**Fig. 2-34:** Procedure of reading sample project data

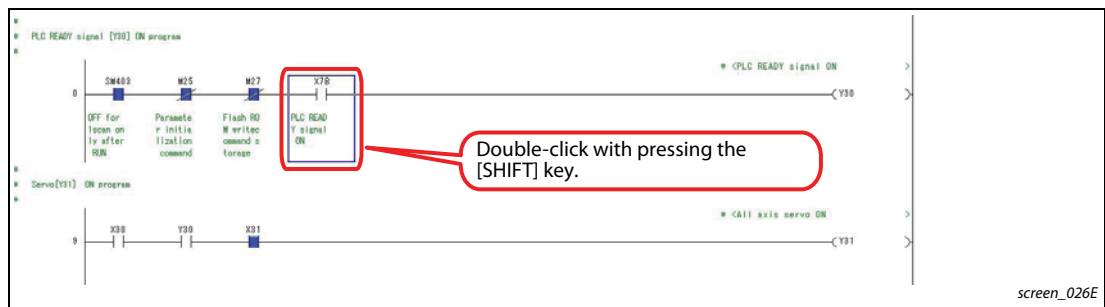
Reading sample project data completed.

## 2.9 Operation check

This sequence program is an example using LD77MH4 and L26CPU-BT. When other modules are used, the assignment of the signal is different. Please refer to the User's Manual (positioning control) for details of each signal.

### 2.9.1 JOG operation (for checking the rotation direction, the electronic gear setting etc.)

- ① Move the RESET/RUN/STOP switch on the front side of the PLC CPU module to RUN position.
- ② Turn the Servo ON device from the sequence program:  
 Select **Online** → **Monitor** → **Start Monitoring** in GX Works2 to display a monitor screen.  
 Move the cursor to the "PLC READY ON" signal (X7B).  
 Double-click the "PLC READY ON" signal (X7B) with pressing the [SHIFT] key to turn X7B ON.

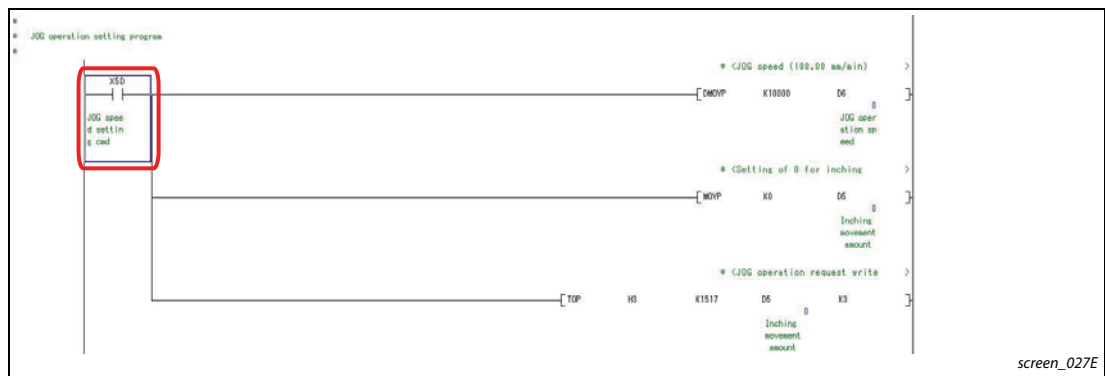


**Fig. 2-35:** Turn the Servo ON device from the sequence program

**NOTE**

To turn the device ON, double-click the specified device that is OFF with pressing the [SHIFT] key.  
 To turn the device OFF, double-click the device that is ON with pressing the [SHIFT] key.

- ③ JOG speed setting:  
 Double-click "JOG operation speed setting" (X5D) with pressing the [SHIFT] key.



**Fig. 2-36:** JOG speed setting

- ④ JOG starting:  
 Double-click "Forward run JOG" (X5E) with pressing the [SHIFT] key to turn X5E ON and the axis 1 rotates forward.  
 Furthermore, double-click "Forward run JOG" (X5E) with pressing the [SHIFT] key to turn X5E OFF and the axis 1 stops.



Fig. 2-37: JOG starting

- ⑤ Checking JOG operation:  
 Select **Intelligent Function Module** → **Monitor** → **Module Monitor** → **Axis Monitor** to display the axis monitor initial window.
- ⑥ Click **Select Monitor Axis** to display the "Select Monitor Axis" screen.
- ⑦ Select Monitor Axis: Axis #1. After selection, click **OK** to return to the axis monitor initial window.
- ⑧ Click **Select Monitor Item** to display the "Select Monitor Item" screen.

Fig. 2-38: Checking JOG operation

- ⑨ Select Monitor Items:
  - Forward JOG start, Reverse JOG start
  - Status: OPR request flag
  - Status: OPR complete flag
  - Start complete
  - External input signal: Lower limit
  - External input signal: Upper limit

**Axis Monitor**

Screen	Check Item	Value
<b>Axis Monitor</b> Monitor Type: Axis(Output Axis)		
Axis #1		
Current feed value 10900.2 μm	Axis 1 Current feed value	—
Machine feed value 10900.2 μm	Axis 1 Machine feed value	—
Axis error No. 0		
Axis warning No. 0		
Axis operation status JOG Operation	Axis operation status	JOG Operation
Axis feedrate 100.00 mm/min	Axis feed rate	100.00
Positioning data No. being executed -		
Positioning data being executed : Operation pattern Positioning Complete		
Positioning data being executed : Control system -		
Positioning data being executed : Acceleration time No. 0:1000		
Positioning data being executed : Deceleration time No. 0:1000		
Positioning data being executed : Axis to be interpolated -		
Positioning data being executed : M code -		
Deviation counter 3715 PLS		
Motor rotation speed 21.1 r/min		
Motor current value 1.4 %		
Servo status : Servo alarm OFF		
Servo status : Servo warning OFF		
Forward JOG start ON	Forward JOG start	ON
Reverse JOG start OFF	Reverse JOG start	OFF
Status : OPR request flag ON		
Status : OPR complete flag OFF		
Start complete OFF		
External input signal : Lower limit ON		
External input signal : Upper limit ON		

**Tab. 2-11:** Axis monitor (1)



Screen	Check Item	Value
<b>Module Information List</b> 	PLC READY LD77 READY Synchronization flag All axes servo ON Servo status : READY ON Axis 1 Servo status : Servo ON Axis 1 BUSY Axis 1	ON ON ON ON ON ON ON

**Tab. 2-11:** Axis monitor (2)

Item	Operation	Status
All axes servo ON	Turn X7B ON.	Check servo amplifier LED. Check the signal state of LD77 READY X30, Synchronization flag, PLC READY and All axis servo.
Axis 1 JOG speed setting	Turn X5D ON.	Check the JOG speed at the axis 1 current feed speed.
Axis 1 forward rotation command turns ON	Turn X5E ON.	Check if the servomotor rotates forward. Check if the axis 1 current feed value increases.
Axis 1 forward rotation command turns OFF	Turn X5E OFF.	Check if the servomotor stops.
Axis 1 reverse rotation command turns ON	Turn X5F ON.	Check if the servomotor rotates reversely. Check if the axis 1 current feed value decreases.
Axis 1 reverse rotation command turns OFF	Turn X5F OFF.	Check if the servomotor stops.

**Tab. 2-12:** Operation check procedure



⑩ Change the motor rotation direction to forward/reverse.

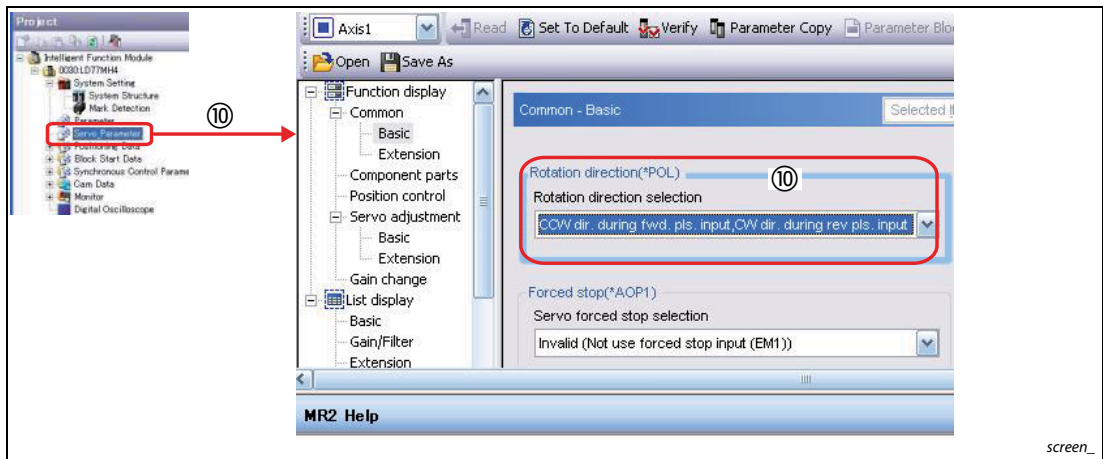
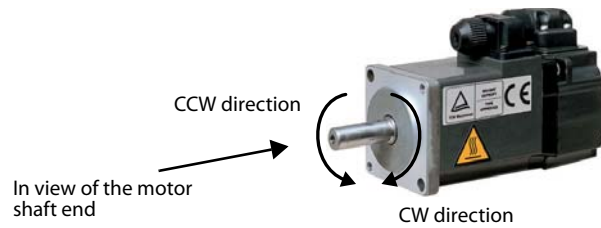


Fig. 2-39: Choosing the motor rotation direction

**NOTE**

Select either "CCW direction when the forward pulse is input, CW direction when the reverse pulse is input" or "CW direction when the forward pulse is input, CCW direction when the reverse pulse is input".



JOG operation check is completed.

### 2.9.2 OPR (for checking a home position)

OPR (Original Point Return) control includes "machine OPR" that establishes a machine OP without using address data, and "fast OPR" that carries out positioning to the coordinates established by the machine OPR.

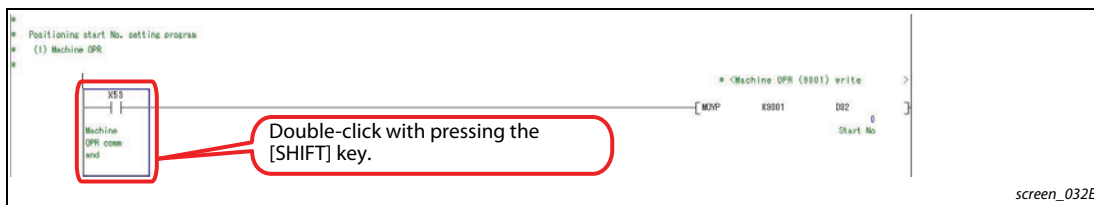
This section explains the method to operate the data setting type of machine OPR.

- ① To operate machine OPR:  
After setting the positioning start number, turn ON the positioning start to start OPR.

Item	Buffer memory		Signal	Description
	LD77MH4	LD77MH16		
Axis 1 positioning start No.	1500	4300	—	Set the positioning start No. Set 9001 for machine OPR.
Axis 1 positioning start	—	—	Y40	Execute the positioning start and OPR.

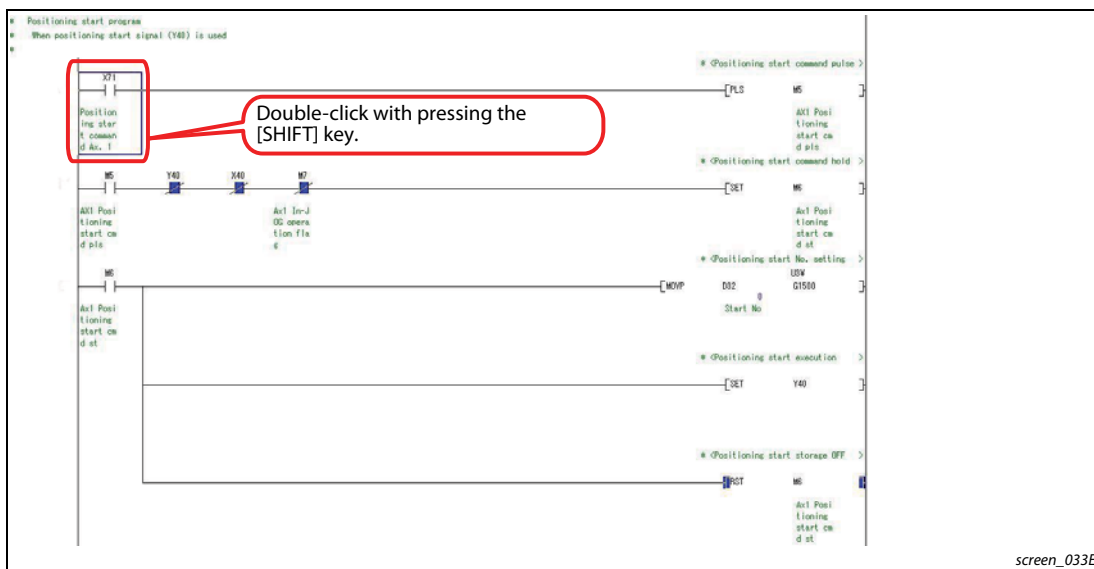
**Tab. 2-13:** Start OPR

- ② Setting the axis 1 positioning start No.:  
Double-click "Machine OPR command" (X53) with pressing the [SHIFT] key to turn X53 ON and to set 9001 to the start No. register.



**Fig. 2-40:** Setting the axis 1 positioning start No. to 9001

- ③ Axis 1 OPR start:  
Double-click "Positioning start command" (X71) with pressing the [SHIFT] key to turn X71 ON. OPR starts by setting 9001 of the start No. register to the buffer memory and turning the axis 1 positioning start signal ON.



**Fig. 2-41:** Starting OPR of axis 1

④ Checking of axis 1 OPR

Screen	Check Item	Value
<b>Axis Monitor</b> Monitor Type: Axis(Output Axis) Axis #1 Current feed value 0.0 μm Machine feed value 0.0 μm Axis error No. 0 Axis warning No. 0 Axis operation status Waiting Axis feedrate 0.00 mm/min Positioning data No. being executed - Positioning data being executed : Operation pattern Positioning Complete Positioning data being executed : Control system - Positioning data being executed : Acceleration time No. 0:1000 Positioning data being executed : Deceleration time No. 0:1000 Positioning data being executed : Axis to be interpolated - Positioning data being executed : M code - Deviation counter -1 PLS Motor rotation speed 1.0 r/min Motor current value 0.3 % Servo status : Servo alarm OFF Servo status : Servo warning OFF Status : OPR request flag OFF Status : OPR complete flag ON Start complete OFF	Axis 1 Current feed value Axis 1 Machine feed value  Axis operation status Axis feed rate         Status: OPR request flag Status: OPR complete flag	0.0 0.0  Waiting 0.00         OFF ON
<b>Module Information List</b> PLC READY(Y30) LD77 READY(X30) Synchronization flag(X31) All axes servo ON(Y31) Servo status : READY ON Axis No. 1 2 3 4 Servo status : Servo ON Axis No. 1 2 3 4 Forced stop input(U3#G1431) BUSY Axis No. 1 2 3 4 Error detection Axis No. 1 2 3 4 Status : Axis warning detection Axis No. 1 2 3 4	PLC READY LD77 READY Synchronization flag All axes servo ON Servo status : READY ON Axis 1 Servo status : Servo ON Axis 1	ON ON ON ON ON ON ON

Tab. 2-14: Monitoring of axis 1

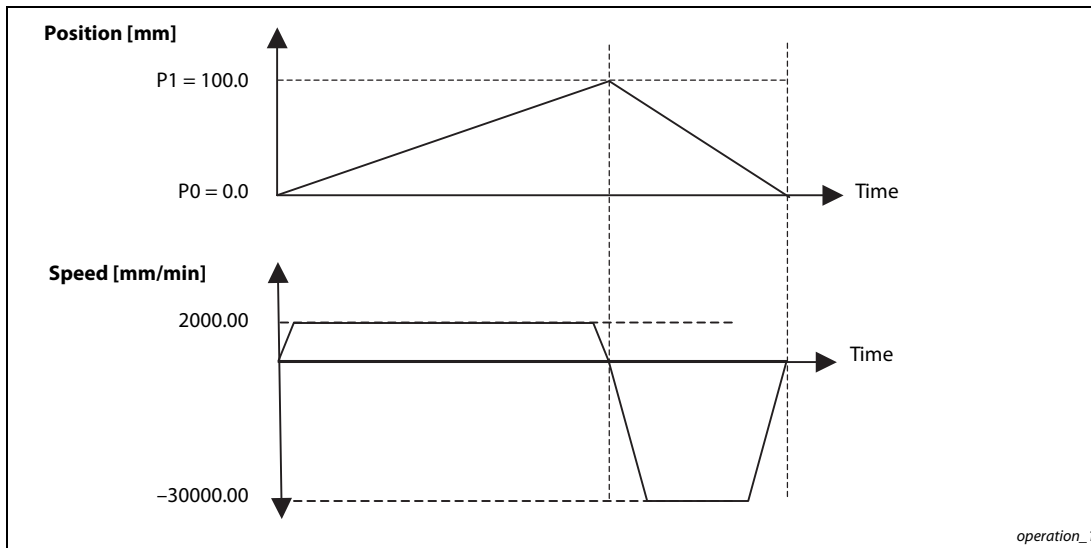
Completion of axis 1 OPR.

### 2.9.3 Positioning control

This section explains the operation check method of positioning control which uses the address information.

**Example** ▾

Operation example of returning the original position after moving to P1



**Fig. 2-42:** Operation pattern of the example

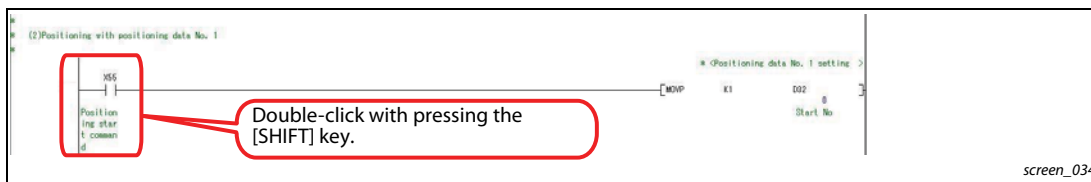


- ① To execute positioning:  
After setting the positioning start number, turn ON the positioning start signal (Y40) to start positioning.

Item	Buffer memory		Signal	Description
	LD77MH4	LD77MH16		
Axis 1 positioning start No.	1500	4300		Set the positioning start No.
Axis 1 positioning start			Y40	Execute the positioning start.

**Tab. 2-15:** Execution of positioning

- ② Setting the axis 1 positioning start number:  
Double-click "Positioning start command" (X55) with pressing the [SHIFT] key to turn X55 ON and to set 1 to the start No. register.



**Fig. 2-43:** Setting the axis 1 positioning Start No. to 1

- ③ Axis 1 positioning start:  
Double-click "Positioning start command" (X71) with pressing the [SHIFT] key to turn X71 ON. Positioning starts by setting 1 of the start No. register to the buffer memory and turning the axis 1 positioning start signal ON.

- ④ Checking of axis 1 positioning control:  
 Check if the axis 1 current feed value moves to 100.00 mm and returns to 0.0 mm.  
 Check if the axis 1 feedrate is the command speed.

Screen	Check Item	Value																																																
<b>Axis Monitor</b> Monitor Type: Axis(Output Axis) <table border="1"> <thead> <tr> <th colspan="2">Axis #1</th> </tr> </thead> <tbody> <tr> <td>Current feed value</td> <td>68770.3 μm</td> </tr> <tr> <td>Machine feed value</td> <td>68770.3 μm</td> </tr> <tr> <td>Axis error No.</td> <td>0</td> </tr> <tr> <td>Axis warning No.</td> <td>0</td> </tr> <tr> <td>Axis operation status</td> <td>Position Control</td> </tr> <tr> <td>Axis feedrate</td> <td>2000.00 mm/min</td> </tr> <tr> <td>Positioning data No. being executed</td> <td>1</td> </tr> <tr> <td>Positioning data being executed : Operation pattern</td> <td>Continuous Positioning Control</td> </tr> <tr> <td>Positioning data being executed : Control system (ABS)</td> <td>1 axis linear control</td> </tr> <tr> <td>Positioning data being executed : Acceleration time No.</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Deceleration time No.</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Axis to be interpolated</td> <td>-</td> </tr> <tr> <td>Positioning data being executed : M code</td> <td>-</td> </tr> <tr> <td>Deviation counter</td> <td>65046 PLS</td> </tr> <tr> <td>Motor rotation speed</td> <td>401.6 r/min</td> </tr> <tr> <td>Motor current value</td> <td>1.1 %</td> </tr> <tr> <td>Servo status : Servo alarm</td> <td>OFF</td> </tr> <tr> <td>Servo status : Servo warning</td> <td>OFF</td> </tr> <tr> <td>Status : OPR request flag</td> <td>OFF</td> </tr> <tr> <td>Status : OPR complete flag</td> <td>OFF</td> </tr> <tr> <td>Start complete</td> <td>OFF</td> </tr> <tr> <td>External input signal : Lower limit</td> <td>ON</td> </tr> <tr> <td>External input signal : Upper limit</td> <td>ON</td> </tr> </tbody> </table>	Axis #1		Current feed value	68770.3 μm	Machine feed value	68770.3 μm	Axis error No.	0	Axis warning No.	0	Axis operation status	Position Control	Axis feedrate	2000.00 mm/min	Positioning data No. being executed	1	Positioning data being executed : Operation pattern	Continuous Positioning Control	Positioning data being executed : Control system (ABS)	1 axis linear control	Positioning data being executed : Acceleration time No.	0:1000	Positioning data being executed : Deceleration time No.	0:1000	Positioning data being executed : Axis to be interpolated	-	Positioning data being executed : M code	-	Deviation counter	65046 PLS	Motor rotation speed	401.6 r/min	Motor current value	1.1 %	Servo status : Servo alarm	OFF	Servo status : Servo warning	OFF	Status : OPR request flag	OFF	Status : OPR complete flag	OFF	Start complete	OFF	External input signal : Lower limit	ON	External input signal : Upper limit	ON	Axis 1 Current feed value Axis 1 Machine feed value  Axis operation status Axis feed rate              External input signal : Lower limit External input signal : Upper limit	— —  Position Control —              ON ON
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PLC READY(Y30)	ON																																																	
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Axis No. 1 2 3 4	Axis 1																																																	
Error detection	none																																																	
Axis No. 1 2 3 4																																																		
Status : Axis warning detection	none																																																	
Axis No. 1 2 3 4																																																		

Tab. 2-16: Monitoring of axis 1

Operation check completed.



## 3 Synchronous control start-up

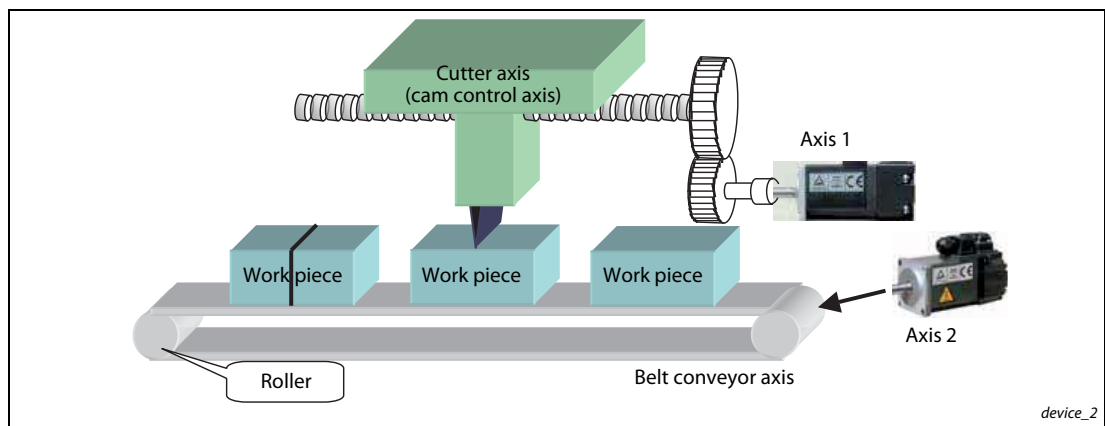
This chapter explains the synchronous control.

In particular, the operation check of the synchronous control parameter, positioning data for synchronous control and synchronous control are explained.

For existing parameters and servo parameters, refer to chapter 2.

### Cut on the fly

This is an example that makes the cutter axis (Axis 1) follow the operating conveyor axis (Axis 2) without stopping and cuts the center of a work piece. After cutting, the cutter axis moves to the standby position. Synchronous control where an electronic cam is used in the cutter axis is executed.



**Fig. 3-1:** Running cutoff device

### Specifications

As the roller of the belt conveyor rotates once, a work piece on the belt conveyor moves for one work step.

#### ● Specifications of cutter axis (cam control axis)

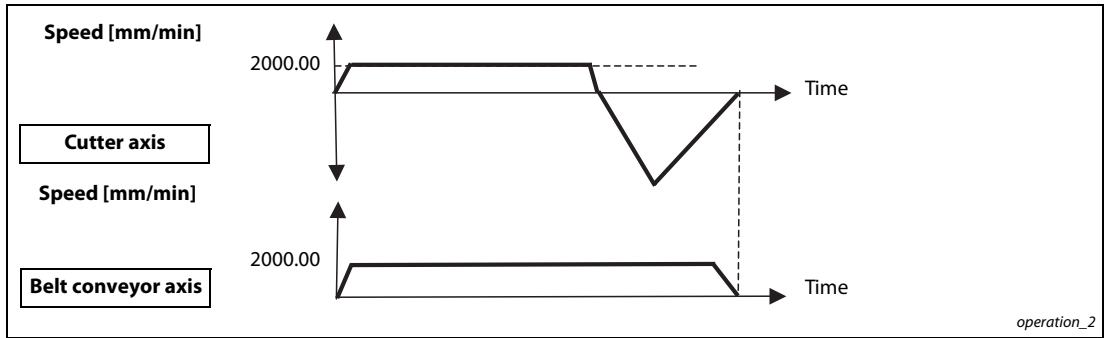
Ball screw lead (PB)	: 10 mm
Gear ratio of external reduction gear	: 1/2
Cam stroke	: 100.0000 mm

#### ● Specifications of belt conveyor

Roller diameter	: 50000 $\mu\text{m}$
Circumference of roller (= diameter $\times \pi$ )	: 157079.6 $\mu\text{m}$
Gear ratio of external reduction gear	: 1/1 (roller directly connected to a servomotor)

**Operation pattern of device**

The cutter axis (axis 1) moves constant distance in synchronization with the belt conveyor. After synchronization, the axis returns to the original position. The belt conveyor operates at constant speed.

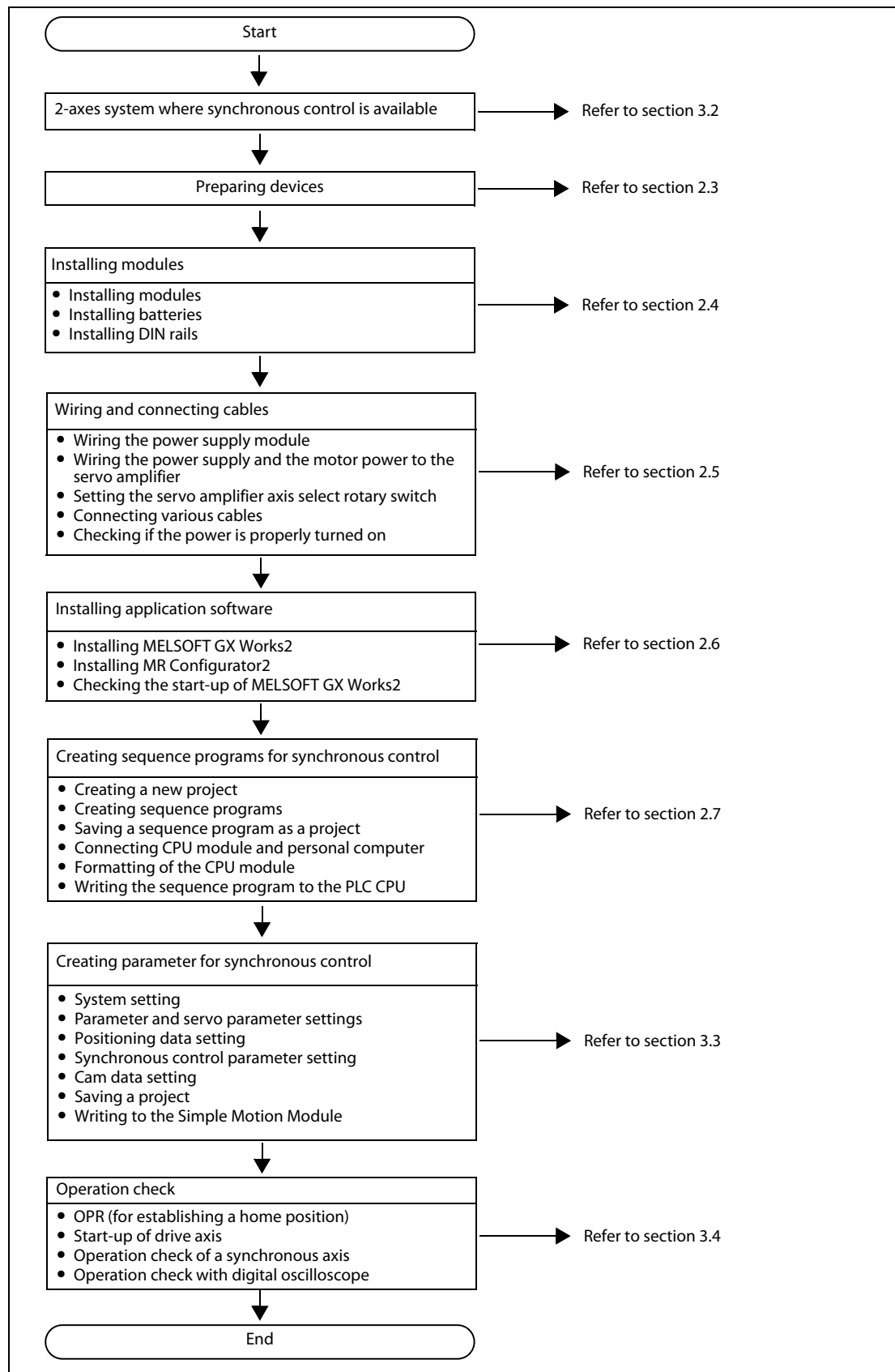


**Fig. 3-2:** Operation pattern



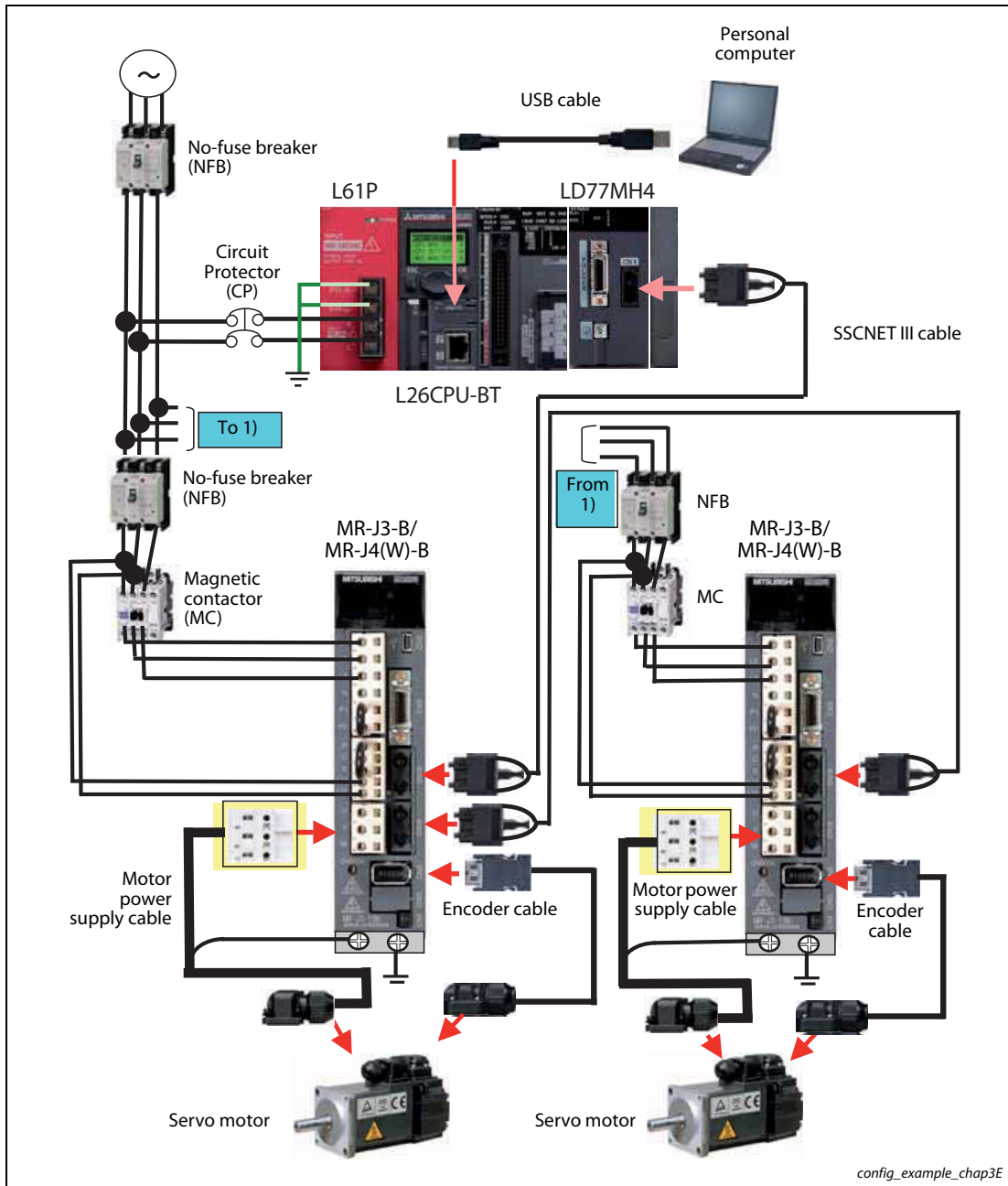
### 3.1 Start-up procedure in synchronous control

Following chart gives an overview of the operations and steps needed for starting up the synchronous control:



### 3.2 2-axes system where synchronous control is available

The following shows the configuration example of a system which combines LD77MH4, MR-J3-B/MR-J4(W)-B and a servomotor.

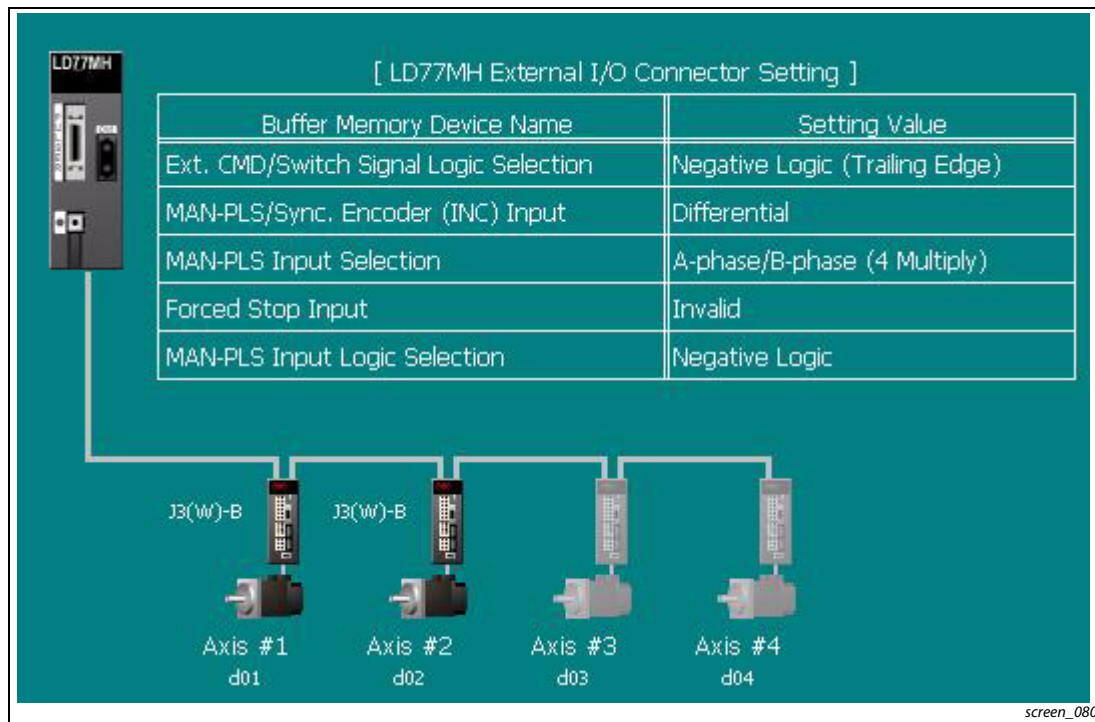


**Fig. 3-3:** System configuration for synchronous control with 2 axes

### 3.3 Creating parameter for synchronous control

#### 3.3.1 System setting

Set the system configuration for 2 axes:



**Fig. 3-4:** System configuration for 2 axes

### 3.3.2 Parameter and servo parameter settings

Set parameters and servo parameters of axis 1 and 2. Please refer to section 2.8.5 "Parameter setting" and section 2.8.6 "Servo parameter setting" for details of the setting procedure.

The setting list is given in section A.2 "Parameter and positioning data".

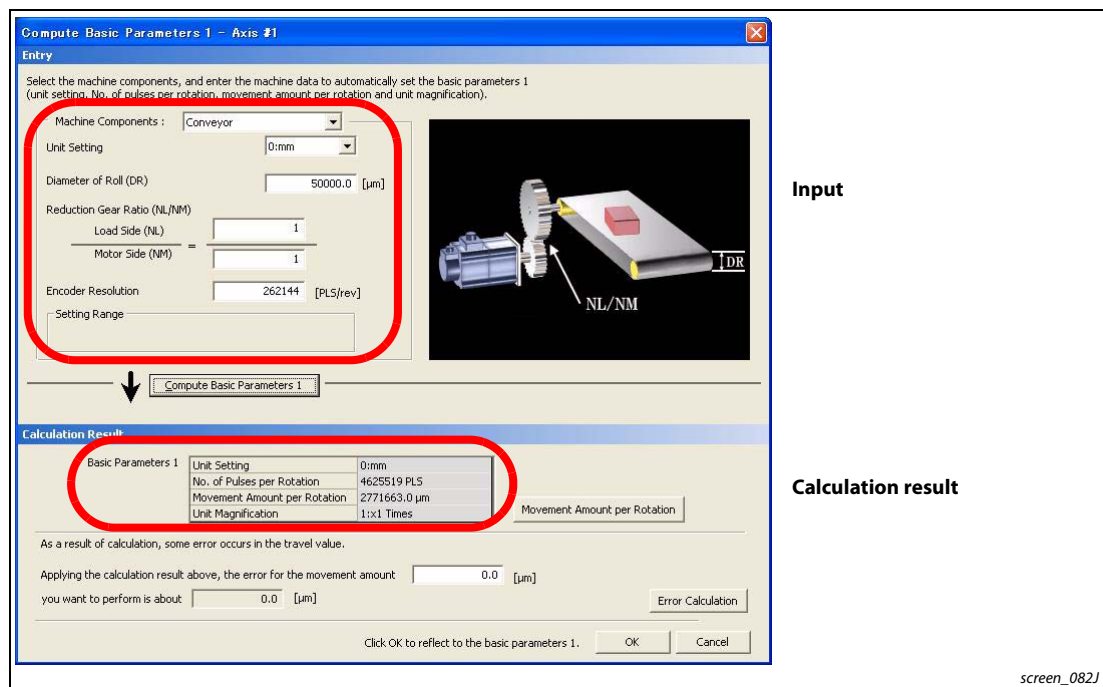
The electronic gear settings of the belt conveyor are described as follows:

#### Input:

Machine Components	: Conveyor
Unit Setting	: 0: mm
Diameter of Roll (DR) [ $\mu\text{m}$ ]	: 50000.0
Reduction Gear Ratio (Load side (NL)/ Motor side (NM))	: 1/1
Encoder Resolution [pls/rev]	: 262144

#### Calculation result for basic parameters 1:

Unit Setting	: 0: mm
No. of Pulses per Revolution	: 4625519 PLS
Movement Amount per Rotation	: 2771663.0 $\mu\text{m}$
Unit Magnification	: 1: $\times$ 1 Times



**Fig. 3-5:** Parameter settings of axis 1

### 3.3.3 Positioning data setting

Create a program where the belt conveyor (axis 2) moves to P1 from the home position. Create a cam data in synchronization with the belt conveyor for the axis 1 which executes the cam control.

**Example** ▾ Example of positioning data moving to P1 from home position.

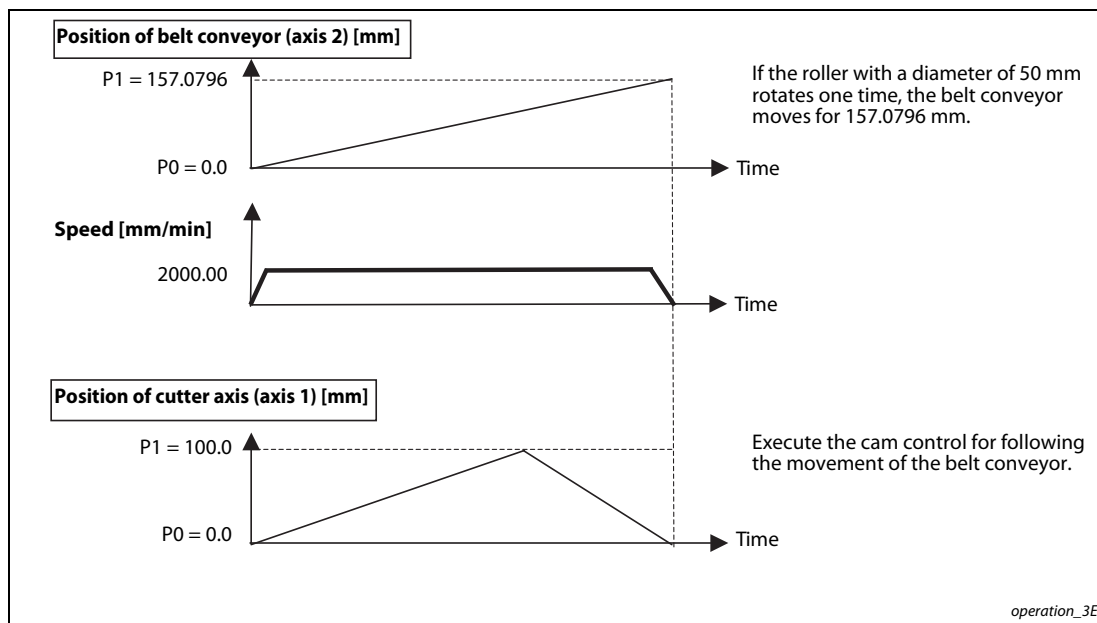


Fig. 3-6: Operation pattern of the example



#### Selecting the positioning data

- ① Select **Intelligent Function Module** → **LD77MH4** → **Positioning Data** → **Axis #2 Positioning Data** to display the "Positioning Data" screen.

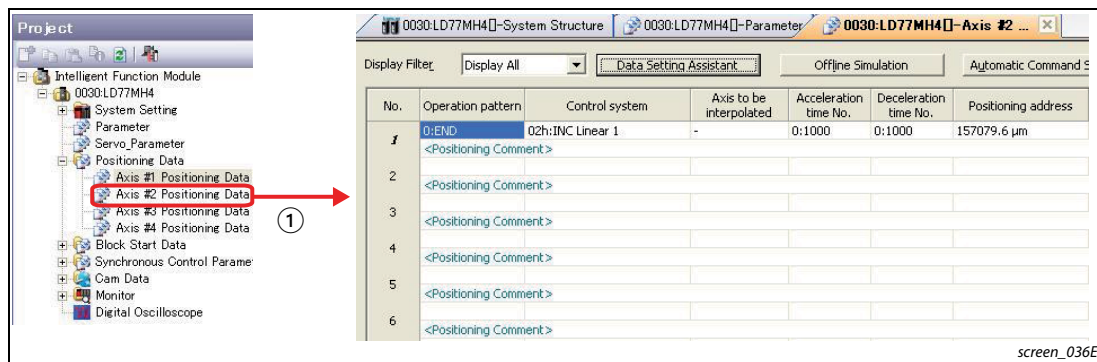


Fig. 3-7: Selecting the positioning data

#### Axis 2 Positioning data

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

Tab. 3-1: Axis 2 Positioning data

### 3.3.4 Synchronous control parameter setting

Set a parameter of the axis 1 that executes cam operation in synchronization with the current feed value of the axis 2 servo input axis.

Item	Description
Input axis parameter	Set the servo input axis type for the main axis. ("1: Current feed value" for the axis 2)
Synchronous parameter axis 1	Set the synchronous control parameter of the axis 1.

Tab. 3-2: Parameter setting

- ① Synchronous control parameter screen start-up  
 Select **Intelligent Function Module** → **LD77MH4** → **Synchronous Control Parameter** → **Axis #1 Synchronous Parameter**.
- ② Click the setting area of "Main Input Axis" to display the contents that can be set.  
 Select the "Type": **1: Servo input axis**.

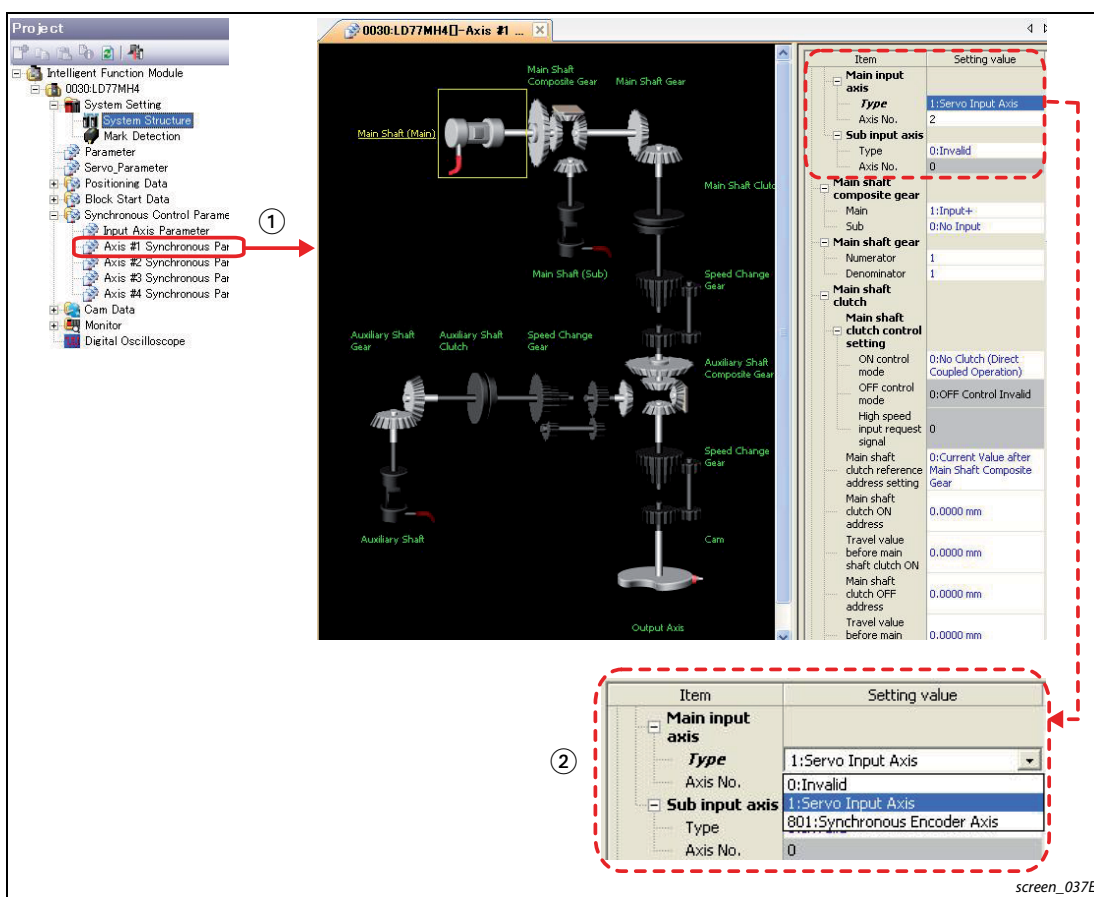


Fig. 3-8: Setting of synchronous parameters

③ In the same way, change the **underlined part** of synchronous parameter axis 1 as shown in following table:

Item		Description	
Main shaft	Main input axis No.	Type	<b><u>1: Servo input axis</u></b>
		Axis No.	<b><u>2</u></b>
	Sub input axis No.	Type	0: Invalid
		Axis No.	0
Main shaft composition gear	Main	1: Input+	
	Sub	0: Not input	
Main shaft gear	Numerator	1	
	Denominator	1	
Main shaft clutch	Main shaft clutch control setting	ON control mode	0: No Clutch (Direct Coupled Operation)
		OFF control mode	0: OFF Control Invalid
		High speed input request signal	0
	Main shaft clutch reference address setting		0: Current Value after Main Shaft Composite Gear
	Main shaft clutch ON address		0 pls/rev
	Travel value before main shaft clutch ON		0 pls/rev
	Main shaft clutch OFF address		0 pls/rev
	Travel value before main shaft clutch OFF		0 pls/rev
	Main shaft clutch smoothing system		0: Direct
	Main shaft clutch smoothing time constant		0 ms
	Slippage at main shaft clutch ON		0 pls/rev
	Slippage at main shaft clutch OFF		0 pls/rev
Auxiliary shaft	Type	0: Invalid	
	Axis No.	0	
Auxiliary shaft composite gear	Main shaft	1: Input+	
	Auxiliary shaft	0: No Input	
Auxiliary shaft gear	Numerator	1	
	Denominator	1	
Auxiliary shaft clutch	Auxiliary shaft clutch control setting	ON control mode	0: No Clutch (Direct Coupled Operation)
		OFF control mode	0: OFF Control Invalid
		High speed input request signal	0
	Auxiliary shaft clutch reference address setting		0: Current Value after Main Shaft Composite Gear
	Auxiliary shaft clutch ON address		0 pls/rev
	Travel value before auxiliary shaft clutch ON		0 pls/rev
	Auxiliary shaft clutch OFF address		0 pls/rev
	Travel value before auxiliary shaft clutch OFF		0 pls/rev
	Auxiliary shaft clutch smoothing system		0: Direct
	Auxiliary shaft clutch smoothing time constant		0 ms
	Slippage at auxiliary shaft clutch ON		0 pls/rev
	Slippage at auxiliary shaft clutch OFF		0 pls/rev
Speed change gear	Speed change gear arrangement		0: No transmission
	Speed change gear smoothing time constant		0 ms
	Speed change ratio	Numerator	1
		Denominator	1

**Tab. 3-3:** Synchronous parameter settings for axis 1 (1)

Item		Description	
Output axis	Cam axis cycle unit	Unit setting selection	0: Use units of Main Input axis
		Unit	<b>0 mm</b>
		number of decimal places	<b>0</b>
	Cam axis length per cycle		<b>157.0796 mm</b>
	Cam stroke amount		<b>100000.0 μm</b>
	Cam No.		<b>1</b>
	Cam axis phase correction advance time		0 μs
	Cam axis phase correction time constant		10 ms
Output axis smoothing time constant		0 ms	
Synchronous control initial position parameter	Current value per cycle after main shaft gear	Setting method	0: Previous Value
		Initial setting value	0 pls/rev
	Current value per cycle after auxiliary shaft gear	Setting method	0: Previous Value
		Initial setting value	0 pls/rev
		Cam axis position recovery target	0: Cam Axis Current Value per Cycle Recovery
	Cam reference position	Setting method	2: Current Feed Value
		Initial setting value	0.0 μm
	Cam axis current value per cycle	Setting method	0: Previous Value
Initial setting value		0 pls/rev	

Tab. 3-3: Synchronous parameter settings for axis 1 (2)

④ Input axis parameter setting of synchronous control parameter

Select **Intelligent Function Module** → **LD77MH4** → **Synchronous Control Parameter** → **Input Axis Parameter**.

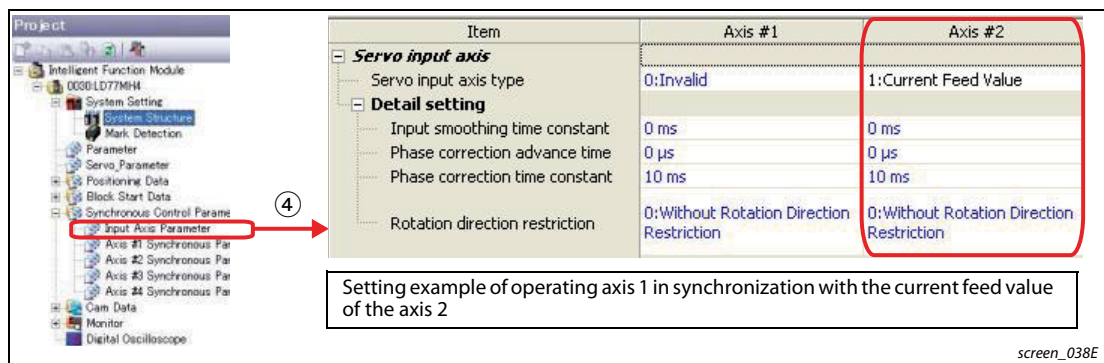


Fig. 3-9: Input axis parameter setting of synchronous control parameter

Input axis parameter (Axis 2)

Item		Description	
Servo input axis	Servo input axis type	<b>1: Current feed value</b>	
	Detail setting	Input smoothing time constant	0 ms
		Phase correction advance time	0 μs
		Phase correction time constant	10 ms
		Rotation direction restriction	0: Without Rotation Direction Restriction

Tab. 3-4: Parameter settings for axis 2

Setting of synchronous control parameter and input axis parameter completed.



### 3.3.5 Cam data setting

- ① Cam data screen start-up  
Right-click **Cam data** and select **Add new data**. The "New Data" screen is displayed.
- ② Set the Cam No.
- ③ Click the **OK** button. The initial screen to create cam data is displayed.

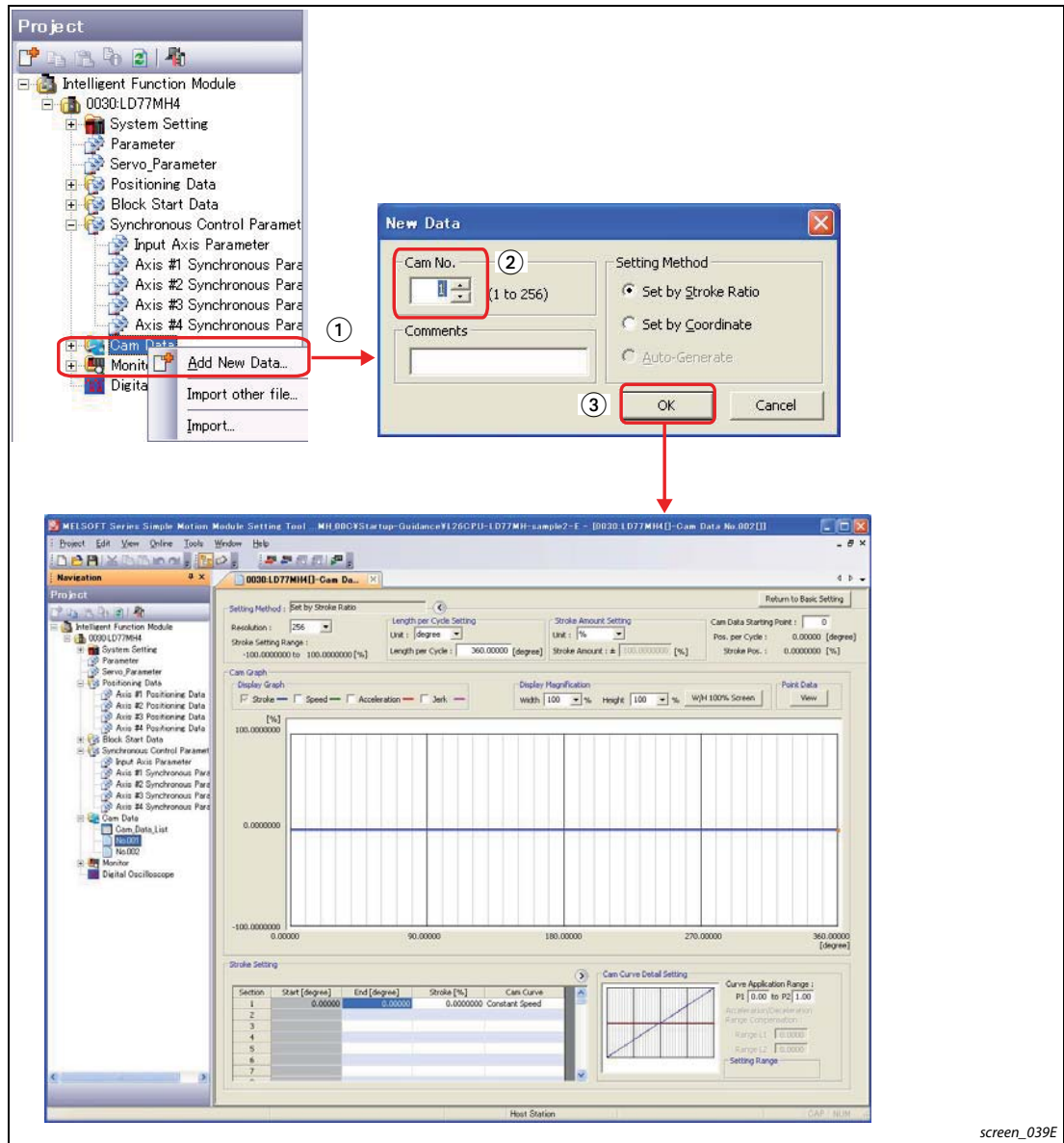


Fig. 3-10: Setting of cam data

④ Creating cam data

When the stroke and cam curve is set as (b), the cam graph appears as (a).

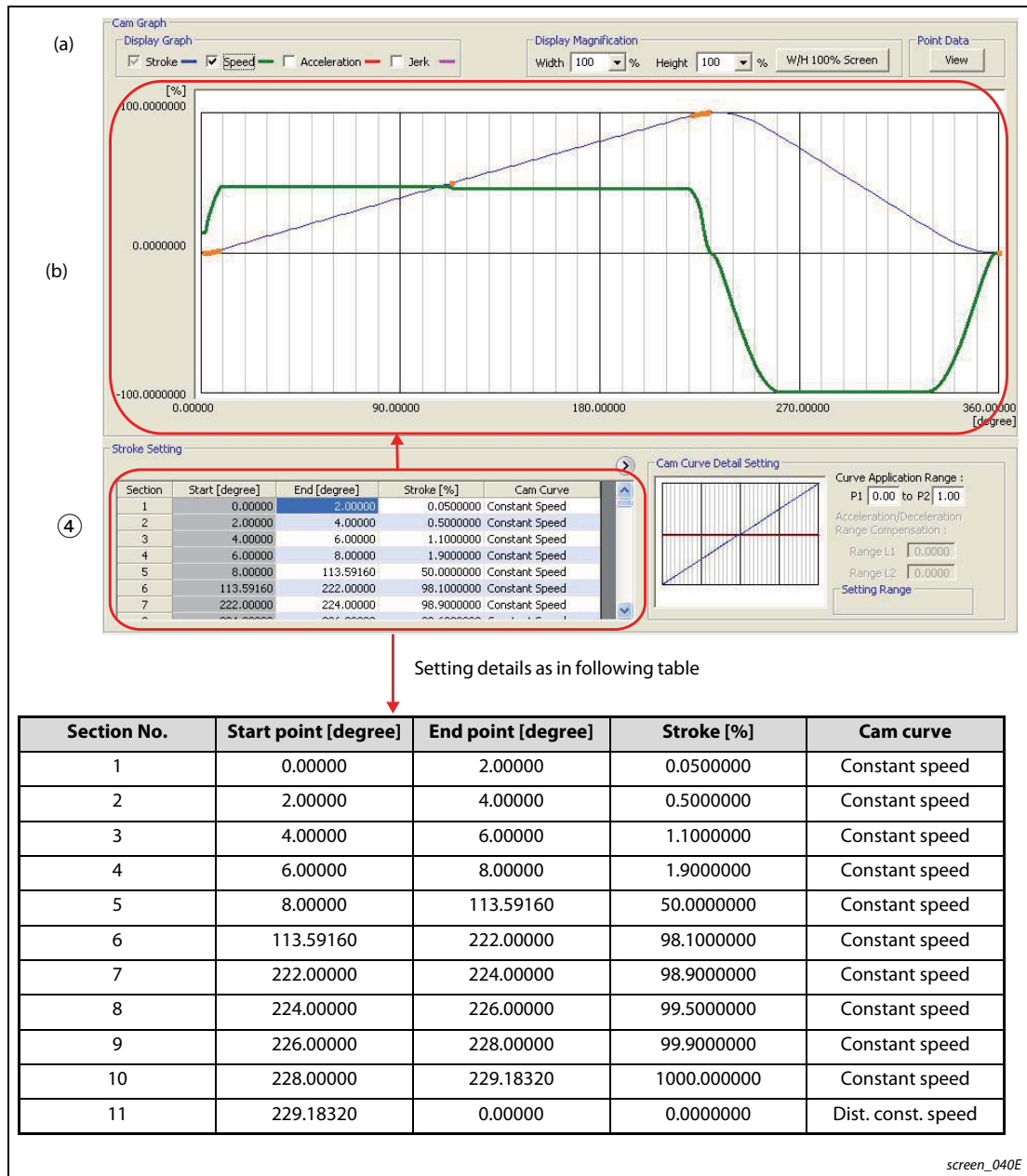


Fig. 3-11: Cam data

⑤ Saving a project

Refer to the previous section 2.8.8 "Saving the Simple Motion Module as a project".

⑥ Writing to the Simple Motion Module

Refer to the previous section 2.8.9 "Writing to the Simple Motion Module".

Synchronous control parameter setting is completed.

### 3.4 Operation check of synchronous control

For details of the operation check for JOG operation, OPR and positioning control, refer to chapter 2.

This section explains the operation check of the synchronous control.

Following the procedure below, the axis 1 executes the cam control in synchronization with the current feed value of the axis 2.

Item	Device	Description
OPR command	X53	Set the OPR No.
Axis 1 positioning start	X71	Turn ON the axis 1 positioning start Y40 and start OPR of the axis 1.
Axis 2 positioning start	X72	Turn ON the axis 2 positioning start Y41 and start OPR of the axis 2.
—	—	Turn OFF X71 and X72 once.
Synchronous control axis setting	X7D	Set the synchronous control axis and G36320 to 1.
Synchronous positioning No. setting	X56	Set positioning No. for the synchronous control.
Axis 2 positioning start	X72	Turn ON the positioning start of the axis 2 and start the synchronous control.

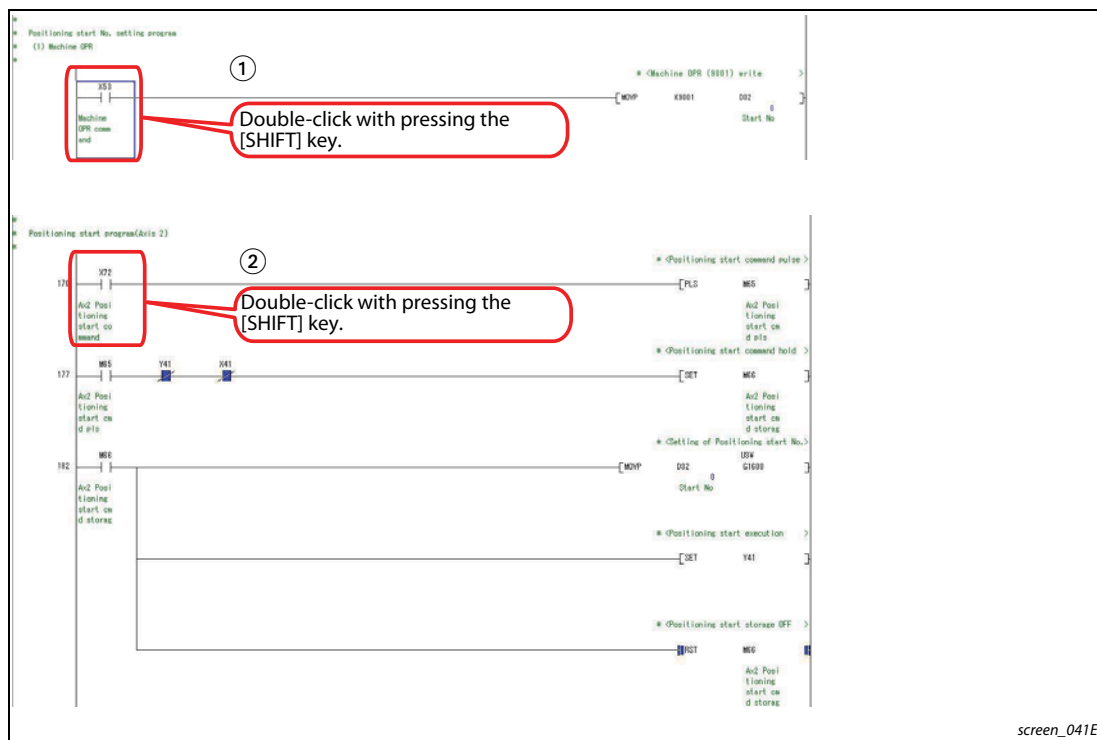
**Tab. 3-5:** Devices for checking synchronous control

#### 3.4.1 OPR (for establishing a home position)

Execute the OPR of the axis 2.

For details of the operation check for the OPR of the axis 1, refer to chapter 2.

- ① Turn "Machine OPR command" (X53) ON.
- ② Turn "Positioning start command" (axis 2) (X72) ON.



**Fig. 3-12:** OPR operation check of axis 2

OPR completed.

### 3.4.2 Start-up of drive axis

- ① Turn ON Synchronous control axis setting (X7D), and set H1 to the buffer memory (U3\G36320) and the axis 1 as the synchronous control axis.

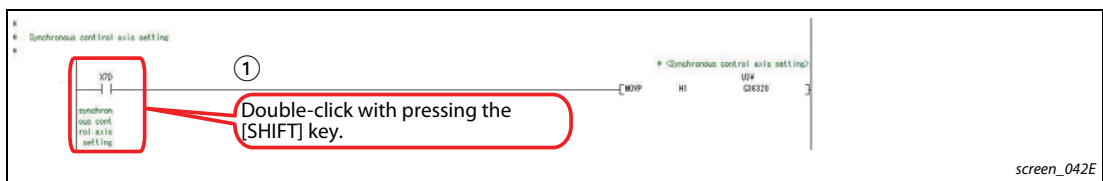


Fig. 3-13: Setting axis 1 as synchronous control axis

- ② Checking the axis 1 BUSY signal  
Check if the axis 1 BUSY signal is turned ON when setting H1 to the buffer memory (U3\G36320) of the synchronous control start.

Screen	Axis 1	Axis 2																																																																								
<p><b>Axis Monitor</b> Monitor Type: Axis(Output Axis) Font Size: 9pt</p> <table border="1"> <thead> <tr> <th></th> <th>Axis #1</th> <th>Axis #2</th> </tr> </thead> <tbody> <tr> <td>Current feed value</td> <td>0.0 μm</td> <td>0.0 μm</td> </tr> <tr> <td>Machine feed value</td> <td>0.0 μm</td> <td>0.0 μm</td> </tr> <tr> <td>Axis error No.</td> <td>0</td> <td>0</td> </tr> <tr> <td>Axis warning No.</td> <td>0</td> <td>0</td> </tr> <tr> <td>Axis operation status</td> <td>Synchronous Control</td> <td>Waiting</td> </tr> <tr> <td>Axis feedrate</td> <td>0.00 mm/min</td> <td>0.00 mm/min</td> </tr> <tr> <td>Positioning data No. being executed</td> <td>-</td> <td>-</td> </tr> <tr> <td>Positioning data being executed : Operation pattern</td> <td>Positioning Complete</td> <td>Positioning Complete</td> </tr> <tr> <td>Positioning data being executed : Control system</td> <td>-</td> <td>-</td> </tr> <tr> <td>Positioning data being executed : Acceleration time No.</td> <td>0:1000</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Deceleration time No.</td> <td>0:1000</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Axis to be interpolated</td> <td>-</td> <td>-</td> </tr> <tr> <td>Positioning data being executed : M code</td> <td>-</td> <td>-</td> </tr> <tr> <td>Deviation counter</td> <td>0 PLS</td> <td>0 PLS</td> </tr> <tr> <td>Motor rotation speed</td> <td>-0.5 r/min</td> <td>0.0 r/min</td> </tr> <tr> <td>Motor current value</td> <td>-1.0 %</td> <td>0.0 %</td> </tr> <tr> <td>Servo status : Servo alarm</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Servo status : Servo warning</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Status : OPR request flag</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Status : OPR complete flag</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>Start complete</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>External input signal : Lower limit</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>External input signal : Upper limit</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table>		Axis #1	Axis #2	Current feed value	0.0 μm	0.0 μm	Machine feed value	0.0 μm	0.0 μm	Axis error No.	0	0	Axis warning No.	0	0	Axis operation status	Synchronous Control	Waiting	Axis feedrate	0.00 mm/min	0.00 mm/min	Positioning data No. being executed	-	-	Positioning data being executed : Operation pattern	Positioning Complete	Positioning Complete	Positioning data being executed : Control system	-	-	Positioning data being executed : Acceleration time No.	0:1000	0:1000	Positioning data being executed : Deceleration time No.	0:1000	0:1000	Positioning data being executed : Axis to be interpolated	-	-	Positioning data being executed : M code	-	-	Deviation counter	0 PLS	0 PLS	Motor rotation speed	-0.5 r/min	0.0 r/min	Motor current value	-1.0 %	0.0 %	Servo status : Servo alarm	OFF	OFF	Servo status : Servo warning	OFF	OFF	Status : OPR request flag	OFF	OFF	Status : OPR complete flag	OFF	ON	Start complete	OFF	OFF	External input signal : Lower limit	ON	ON	External input signal : Upper limit	ON	ON	Synchronous Control	
	Axis #1	Axis #2																																																																								
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External input signal : Lower limit	ON	ON																																																																								
External input signal : Upper limit	ON	ON																																																																								
<p><b>Module Information List</b></p> <ul style="list-style-type: none"> <li>● PLC READY(Y30)</li> <li>● LD77 READY(X30)</li> <li>● Synchronization flag(X31)</li> <li>● All axes servo ON(Y31)</li> </ul> <p>Servo status : READY ON Axis No. 1 2 3 4</p> <p>Servo status : Servo ON Axis No. 1 2 3 4</p> <ul style="list-style-type: none"> <li>● Forced stop input(US#G1431)</li> </ul> <p>BUSY Axis No. 1 2 3 4</p> <p>Error detection Axis No. 1 2 3 4</p> <p>Status : Axis warning detection Axis No. 1 2 3 4</p>	BUSY																																																																									

Tab. 3-6: Checking operation status of axis 1

③ Setting the axis 2 program No.

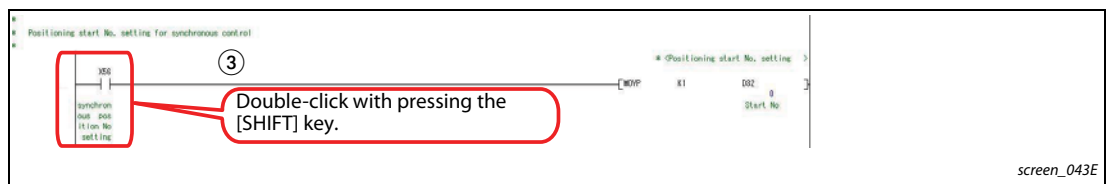


Fig. 3-14: Set positioning No. for the synchronous control

④ Starting the axis 2 program  
Turn Positioning start command (X72) ON.

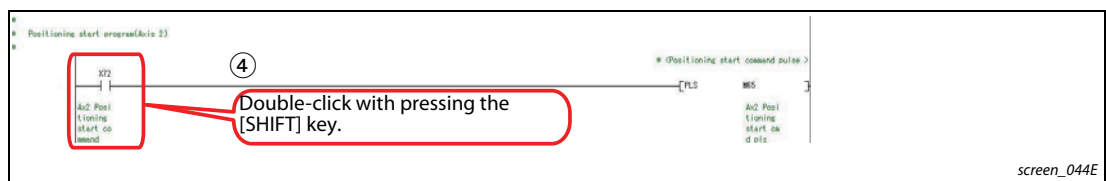


Fig. 3-15: Starting of synchronous control

### 3.4.3 Operation check of a synchronous axis

① Check if the servomotors of the axis 1 and 2 operate.

Screen	Axis 1	Axis 2																																																																								
<table border="1"> <thead> <tr> <th>Axis Monitor</th> <th>Axis #1</th> <th>Axis #2</th> </tr> </thead> <tbody> <tr> <td>Current feed value</td> <td>73647.2 μm</td> <td>117925.9 μm</td> </tr> <tr> <td>Machine feed value</td> <td>73647.2 μm</td> <td>117925.9 μm</td> </tr> <tr> <td>Axis error No.</td> <td>0</td> <td>0</td> </tr> <tr> <td>Axis warning No.</td> <td>0</td> <td>0</td> </tr> <tr> <td>Axis operation status</td> <td>Synchronous Control</td> <td>Position Control</td> </tr> <tr> <td>Axis feedrate</td> <td>4463.88 mm/min</td> <td>2000.00 mm/min</td> </tr> <tr> <td>Positioning data No. being executed</td> <td>-</td> <td>1.</td> </tr> <tr> <td>Positioning data being executed : Operation pattern</td> <td>Positioning Complete</td> <td>Positioning Complete</td> </tr> <tr> <td>Positioning data being executed : Control system</td> <td>-</td> <td>1 axis linear control (INC)</td> </tr> <tr> <td>Positioning data being executed : Acceleration time No.</td> <td>0:1000</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Deceleration time No.</td> <td>0:1000</td> <td>0:1000</td> </tr> <tr> <td>Positioning data being executed : Axis to be interpolated</td> <td>-</td> <td>-</td> </tr> <tr> <td>Positioning data being executed : M code</td> <td>-</td> <td>-</td> </tr> <tr> <td>Deviation counter</td> <td>-06901 PLS</td> <td>2375 PLS</td> </tr> <tr> <td>Motor rotation speed</td> <td>-695.5 r/min</td> <td>13.3 r/min</td> </tr> <tr> <td>Motor current value</td> <td>-2.0 %</td> <td>1.1 %</td> </tr> <tr> <td>Servo status : Servo alarm</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Servo status : Servo warning</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Status : OPR request flag</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Status : OPR complete flag</td> <td>OFF</td> <td>OFF</td> </tr> <tr> <td>Start complete</td> <td>OFF</td> <td>ON</td> </tr> <tr> <td>External input signal : Lower limit</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>External input signal : Upper limit</td> <td>ON</td> <td>ON</td> </tr> </tbody> </table>	Axis Monitor	Axis #1	Axis #2	Current feed value	73647.2 μm	117925.9 μm	Machine feed value	73647.2 μm	117925.9 μm	Axis error No.	0	0	Axis warning No.	0	0	Axis operation status	Synchronous Control	Position Control	Axis feedrate	4463.88 mm/min	2000.00 mm/min	Positioning data No. being executed	-	1.	Positioning data being executed : Operation pattern	Positioning Complete	Positioning Complete	Positioning data being executed : Control system	-	1 axis linear control (INC)	Positioning data being executed : Acceleration time No.	0:1000	0:1000	Positioning data being executed : Deceleration time No.	0:1000	0:1000	Positioning data being executed : Axis to be interpolated	-	-	Positioning data being executed : M code	-	-	Deviation counter	-06901 PLS	2375 PLS	Motor rotation speed	-695.5 r/min	13.3 r/min	Motor current value	-2.0 %	1.1 %	Servo status : Servo alarm	OFF	OFF	Servo status : Servo warning	OFF	OFF	Status : OPR request flag	OFF	OFF	Status : OPR complete flag	OFF	OFF	Start complete	OFF	ON	External input signal : Lower limit	ON	ON	External input signal : Upper limit	ON	ON	<p>—</p> <p>—</p> <p>Synchronous Control</p> <p>—</p> <p>ON</p> <p>ON</p>	<p>—</p> <p>—</p> <p>Positioning Control</p> <p>2000.00 mm/min</p> <p>ON</p> <p>ON</p>
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External input signal : Lower limit	ON	ON																																																																								
External input signal : Upper limit	ON	ON																																																																								

Tab. 3-7: Monitoring axes 1 and 2

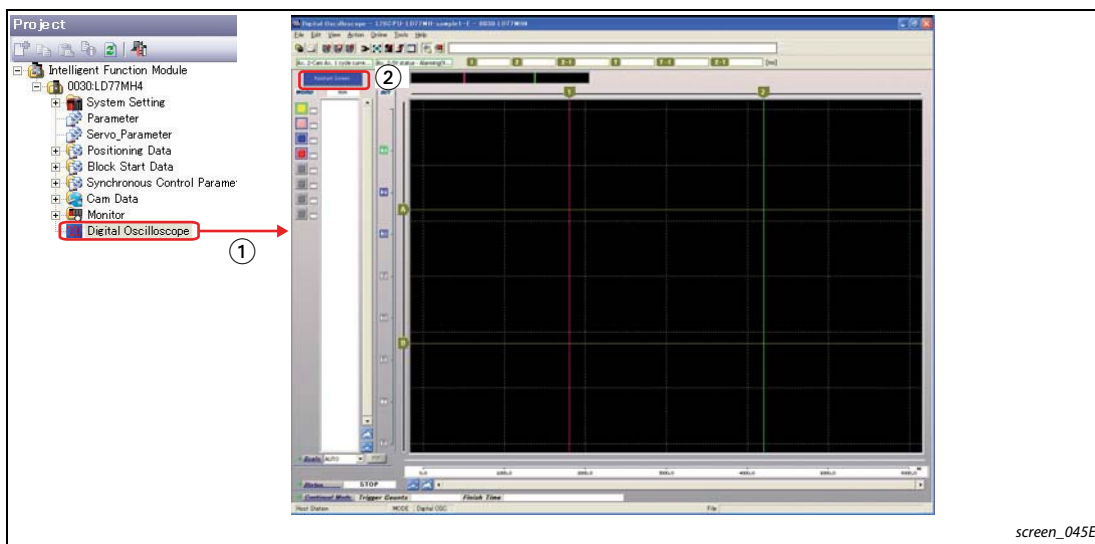
Operation check with the intelligent function module is completed.

### 3.4.4 Operation check with digital oscilloscope (check of cam operation)

This section explains the method for checking the cam operation with the assistant function of the digital oscilloscope.

① Starting the digital oscilloscope:

Select **Intelligent Function Module** → **LD77MH4** → **Digital Oscilloscope**.



screen\_045E

Fig. 3-16: "Digital Oscilloscope" screen

- ② Click the **Assistant Screen** button to start the "Assistant" screen.  
The section "Communicate with the simple motion module and sample the data" provides operation items for setting of the digital oscilloscope (see the following steps ③ to ⑤).
- ③ Select "1) Connect the personal computer with the simple motion module, and switch to [Online]". The "Online Setting" screen is displayed, where you can set the following items:
  - Sampling method: Module Buffering Method
  - Operation mode: Online
 Click **OK** to return to the "Assistant" screen.
- ④ Select "2) Select the probe item to be sampled". The "Assistant (Probe Selection)" screen is displayed. Select the "Cam operation" from the list and Axis No. "1".  
Click **OK** to return to the "Assistant" screen.
- ⑤ Select "3) Set the sampling condition". The "Assistant (Sampling Condition)" screen is displayed. Set the items:
  - Sampling rate (ms) :  $0.888 \times 1$
  - Sampling size (point): 8192
  - Trigger balance (%) : 90.00
  - After trigger
    - Sampling size (point): 7373
    - Sampling time (ms) : 6553.8
- ⑥ Click **OK** to return to the "Assistant" screen.

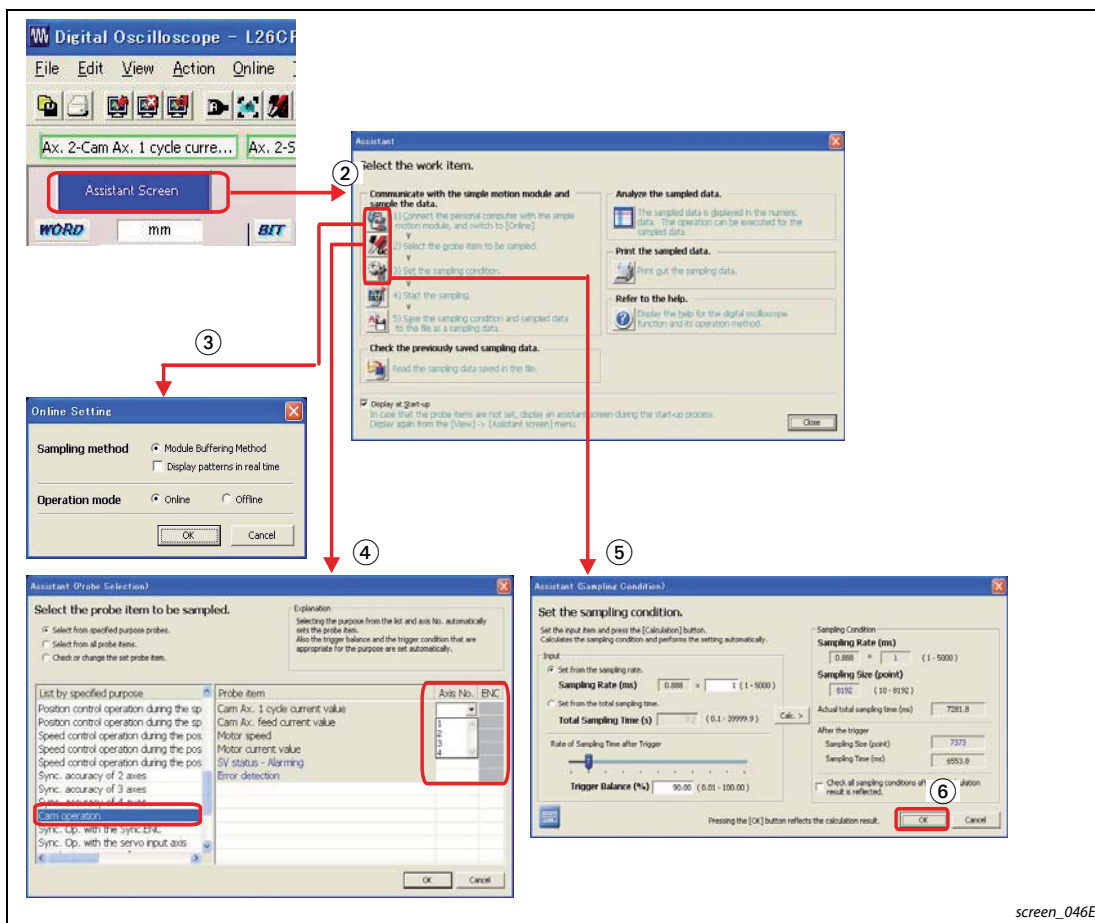



Fig. 3-17: Functions of the assistant screen



- ⑦ Setting the trigger condition:  
After closing the "Assistant" screen, select **Edit** → **Trigger...** to display the "TRIGGER" screen.
- ⑧ Select the **Trigger Setting** register card to display the screen for setting the trigger conditions .
- ⑨ Press the **Pattern** button repeatedly to display  .
- ⑩ Set the following items:
  - Axis 1 - Cam Axis 1 Cycle Current Value (42812)  100 (x0.0001 mm)
  - Axis 1 - Cam Axis Current Feed Value (42816)  10 (x0.1 μm)

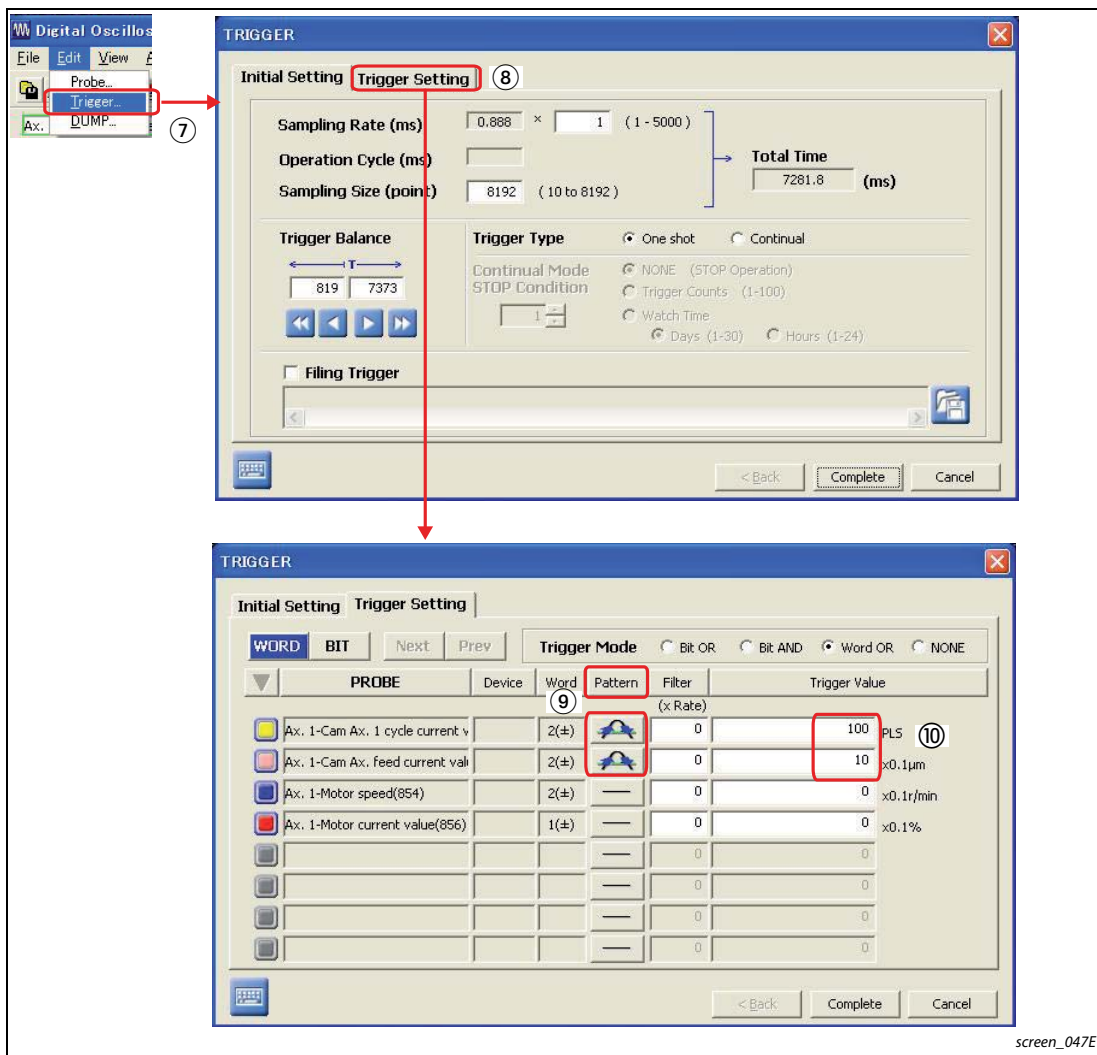


Fig. 3-18: Setting the trigger condition

- ⑪ Starting sampling  
Display the "Assistant" screen again (see step ②) and select "4) Start the sampling".  
The following screen appears.  
Click **Yes** to start sampling.

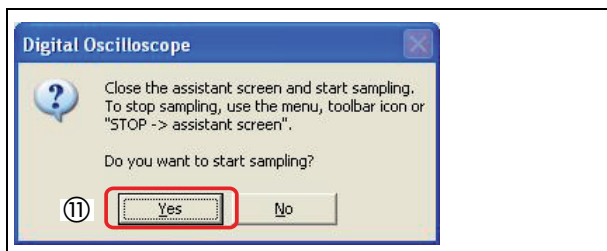


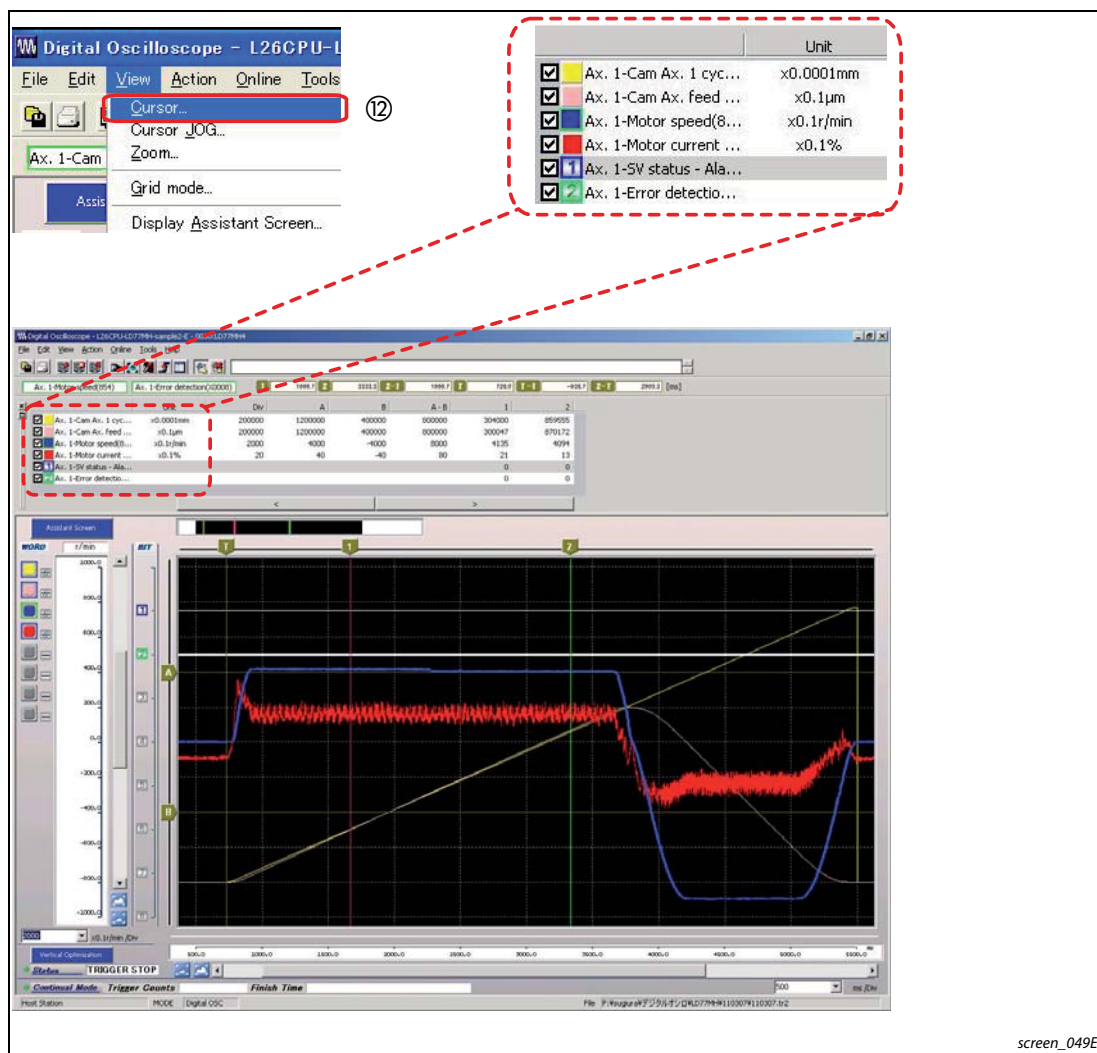
Fig. 3-19: Confirmation screen to start the sampling



⑫ Check the cam pattern with the digital oscilloscope.

Check if the pattern which created the cam data and the axis 1 current feed value of the digital oscilloscope are the same.

Select **View** → **Cursor** to display the explanation and value of each probe.



screen\_049E

**Fig. 3-20:** Cam pattern on the digital oscilloscope

Operation check completed.



# A Appendix

## A.1 Start address setting

### A.1.1 Start address of Simple Motion Module

CPU modules of L series are equipped with built-in I/O and built-in CC-Link (CC-Link only with L26CPU-BT). If connecting a Simple Motion Module to the right side of a CPU module, the start XY address becomes the number that is added to the No. of I/O points corresponding to the CPU module equipment. Since the number depends on CPU modules, refer to the following table.

#### Start address of Simple Motion Module

The start addresses are the default values.

**L26CPU-BT + LD77MH4**

**L26CPU-BT + LD77MH16**

	CPU module	LD77MH4	LD77MH16
L02CPU	00	10H	10H
L26CPU-BT	00	30H	30H

system\_view\_1, ld77mh4, ld77mh16

**Fig. A-1:** Start address setting depending on CPU module

### A.1.2 Start address setting

When newly adding a Simple Motion Module, specify the start XY addresses to both of GX Works2 and the Simple Motion Module Setting Tool.

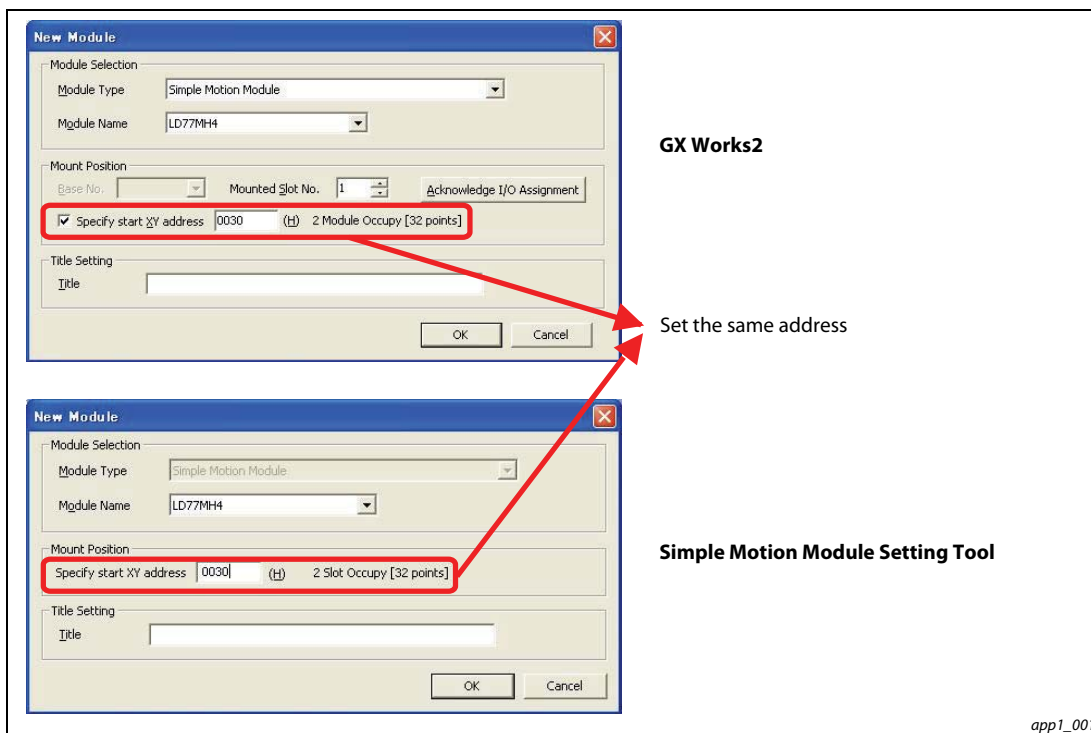


Fig. A-2: Start address setting

## A.2 Parameter and positioning data

This section shows the parameter and the positioning data that are used in this document.

### A.2.1 Parameters

Item		Axis 1	Axis 2
Basic parameter 1	Unit Setting	<b>0: mm</b>	<b>0: mm</b>
	No. of pulses per revolution	<b>16384 pls/rev</b>	<b>4625519 pls/rev</b> (262144 pls/rev)
	Movement amount per revolution	<b>312.5 μm</b>	<b>2771663.0 μm</b> (157079.6 μm)
	Unit magnification	1: time	1: time
	Bias speed at start	0.00 mm/min	0.00 mm/min
Basic parameter 2	Speed limit value	<b>30000.00 mm/min</b>	<b>30000.00 mm/min</b>
	Acceleration time	1000 ms	1000 ms
	Deceleration time	1000 ms	1000 ms
Detailed parameter 1	Backlash compensation amount	0.0 μm	0.0 μm
	Software stroke limit upper limit value	214748364.7 μm	214748364.7 μm
	Software stroke limit lower limit value	-214748364.8 μm	-214748364.8 μm
	Software stroke limit selection	0: Apply software stroke limit on current feed value	0: Apply software stroke limit on current feed value
	Software stroke limit valid/invalid setting	0: Valid	0: Valid
	Command in-position width	10.0 μm	10.0 μm
	Torque limit setting value	300 %	300 %
	M code ON signal output timing	0: WITH mode	0: WITH mode
	Speed switching mode	0: Standard speed switching mode	0: Standard speed switching mode
	Interpolation speed designation method	0: Composite speed	0: Composite speed
	Current feed value during speed control	0: Do not update current feed value	0: Do not update current feed value
	Input signal logic selection lower limit	<b>1: Positive logic</b>	<b>1: Positive logic</b>
	Input signal logic selection upper limit	<b>1: Positive logic</b>	<b>1: Positive logic</b>
	Input signal logic selection: External command/switching signal	0: Negative logic	
	Input signal logic selection: Near-point dog signal	0: Negative logic	0: Negative logic
	Input signal logic selection: Manual pulse generator input	0: Negative logic	
	Input signal logic selection	1: Input of servo amplifier	1: Input of servo amplifier
	Manual pulse generator input selection	0: A-phase/B-phase mode (multiplied by 4)	0: A-phase/B-phase mode (multiplied by 4)
Speed-position function selection	0: Speed-position switching control (INC mode)	0: Speed-position switching control (INC mode)	
Forced stop valid/invalid selection	<b>1: Invalid</b>		
Detailed parameter 2	Acceleration time 1	1000 ms	1000 ms
	Acceleration time 2	1000 ms	1000 ms
	Acceleration time 3	1000 ms	1000 ms
	Deceleration time 1	1000 ms	1000 ms
	Deceleration time 2	1000 ms	1000 ms
	Deceleration time 3	1000 ms	1000 ms

**Tab. A-1:** Parameter data (1)

Item	Axis 1	Axis 2	
Detailed parameter 2	JOG speed limit value	<b>15000.00 mm/min</b>	<b>15000.00 mm/min</b>
	JOG operation acceleration time selection	0: 1000	0: 1000
	JOG operation deceleration time selection	0: 1000	0: 1000
	Acceleration / deceleration process selection	0: Automatic trapezoidal acceleration / deceleration processing	0: Automatic trapezoidal acceleration / deceleration processing
	S-pattern ratio	100 %	100 %
	Sudden stop deceleration	1000 ms	1000 ms
	Stop group 1 sudden stop selection	0: Normal deceleration stop	0: Normal deceleration stop
	Stop group 2 sudden stop selection	0: Normal deceleration stop	0: Normal deceleration stop
	Stop group 3 sudden stop selection	0: Normal deceleration stop	0: Normal deceleration stop
	Positioning complete signal output time	300	300
	Allowable circular interpolation error width	10.0 μm	10.0 μm
	External command function selection	0: External positioning start	0: External positioning start
	Speed control 10 x multiplier setting for degree axis	0: Invalid	0: Invalid
	Restart allowable range when servo OFF to ON	0 pls/rev	0 pls/rev
	Manual pulse / INC synchronous encoder input type selection	0: Differential output type	
	Operation setting for speed / torque control mode: Speed default value selection	0: Command speed	0: Command speed
	Operation setting for speed-torque control mode: Condition selection at mode switching	0: Switching Conditions Valid at Switching Mode	0: Switching Conditions Valid at Switching Mode
External command signal selection <sup>①</sup>	0: Unused	0: Unused	
OPR basic parameters	OPR method	<b>6: Data set method</b>	<b>6: Data set method</b>
	OPR direction	0: Positive direction (address increment direction)	0: Positive direction (address increment direction)
	OP address	0.0 μm	0.0 μm
	OPR speed	0.01 mm/min	0.01 mm/min
	Creep speed	0.01 mm/min	0.01 mm/min
	OPR retry	0: Do not retry OPR with limit switch	0: Do not retry OPR with limit switch
OPR detailed parameters	Setting for the movement amount after near-point dog ON	0.0 μm	0.0 μm
	OPR acceleration time selection	0: 1000	0: 1000
	OPR deceleration time selection	0:1000	0:1000
	OP shift amount	0.0 μm	0.0 μm
	OPR torque limit value	300 %	300 %
	Operation setting for incompleteness of OPR	0: Positioning control is not executed.	0: Positioning control is not executed.
	Speed designation during OP shift	0: OPR speed	0: OPR speed
Dwell time during OPR retry	0 ms	0 ms	
Expansion parameters	Optional data monitor: Data type setting 1	0: No Setting	0: No Setting
	Optional data monitor: Data type setting 2	0: No Setting	0: No Setting
	Optional data monitor: Data type setting 3	0: No Setting	0: No Setting
	Optional data monitor: Data type setting 4	0: No Setting	0: No Setting
	Operation cycle setting <sup>①</sup>	1: 1.77 ms	

**Tab. A-1:** Parameter data (2)

<sup>①</sup> The Operation cycle setting and External command signal selection are used only in a parameter of LD77MH16.

## A.2.2 Positioning data

### Axis 1 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	<u>1:</u> <b>Continuation</b>	<b>ABS</b> <u>linear 1</u>	—	1:1000	1:1000	<u>100000.0</u> <u>μm</u>	0.0 μm	<u>2000.00</u> <u>mm/min</u>	0 ms	0
2	<u>0:</u> <b>Completion</b>	<b>ABS</b> <u>linear 1</u>	—	1:1000	1:1000	<u>0.0</u> <u>μm</u>	0.0 μm	<u>30000.00</u> <u>mm/min</u>	0 ms	0

**Tab. A-2:** Axis 1 Positioning data

### Axis 2 Positioning data

	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	<u>0:</u> <b>Completion</b>	<b>INC</b> <u>linear 1</u>	—	1:1000	1:1000	<u>157079.6</u> <u>μm</u>	0.0 μm	<u>2000.00</u> <u>mm/min</u>	0 ms	0

**Tab. A-3:** Axis 2 Positioning data

## A.3 Various monitor functions

### A.3.1 Axis monitor

#### Select Axis Monitor

- ① Select **Intelligent Function Module** → **Monitor** → **Module Monitor** → **Axis Monitor** to display the initial "Axis Monitor" screen.
- ② Click **Select Monitor Axis** to display the "Select Monitor Axis" screen.
- ③ Select the displayed axis and click **Add**:  
LD77MH4: Axis 1 to 4  
LD77MH16: Axis 1 to 16
- ④ Click **OK** to return to the initial "Axis Monitor" screen.

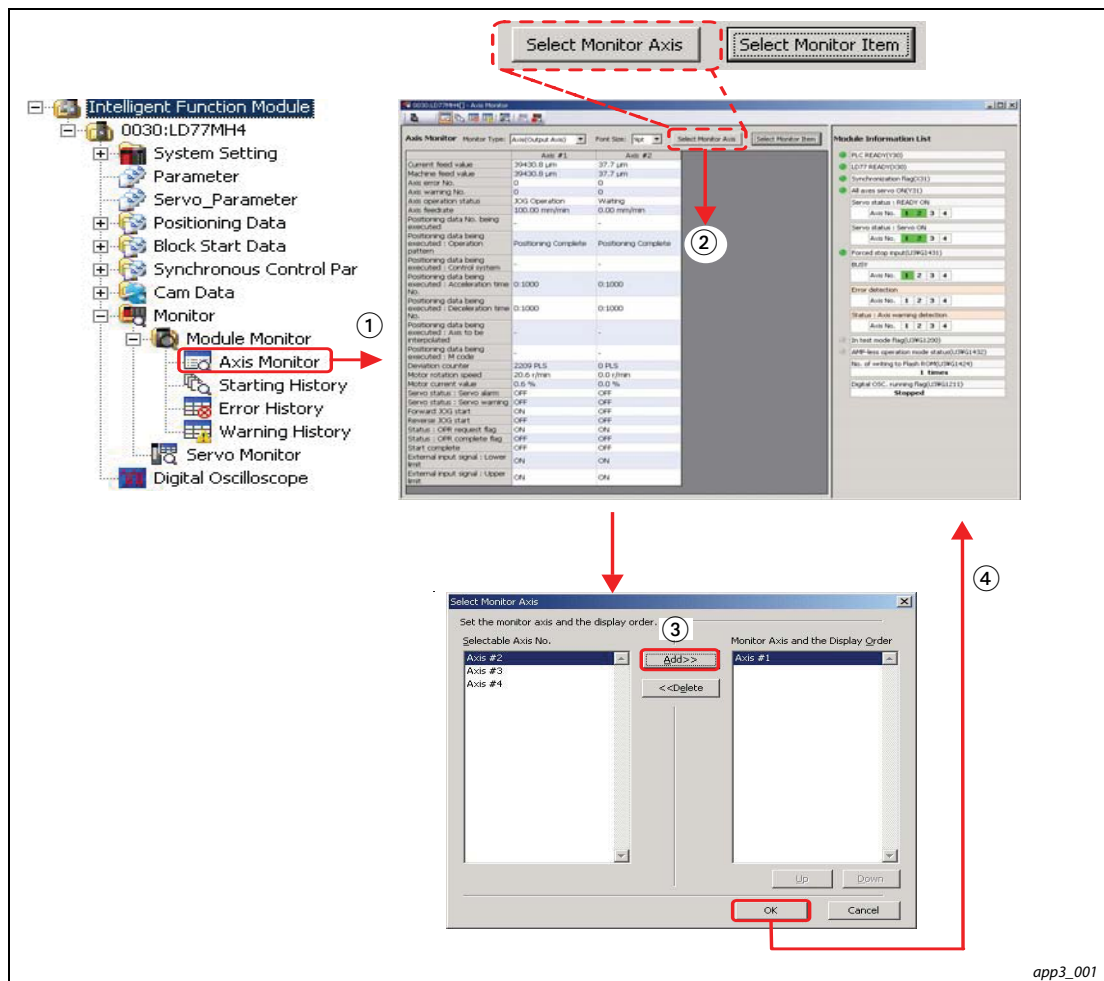
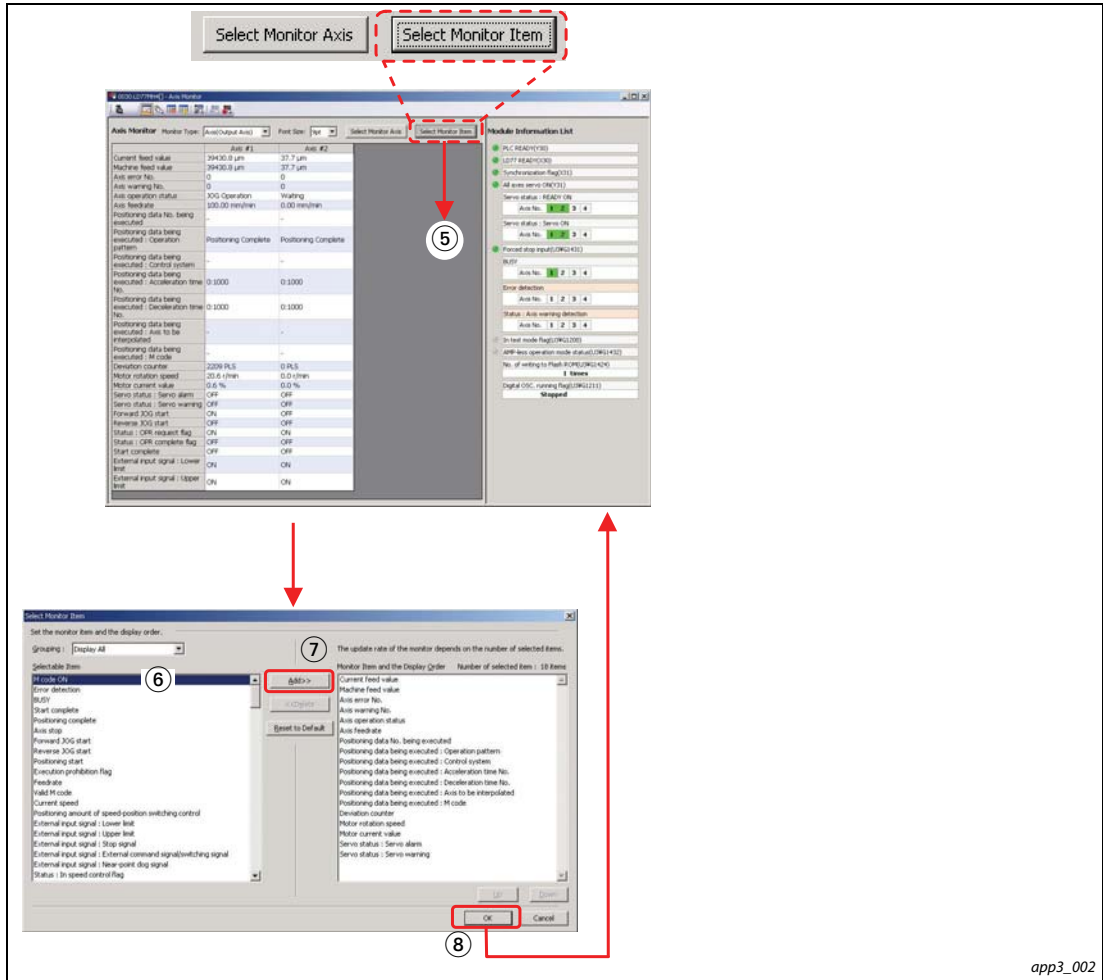


Fig. A-3: Steps ① to ④ of selecting axis monitor procedure



- ⑤ Click **Select Monitor Item** to display the "Select Monitor Item" screen.
  - ⑥ Select the monitoring item in the selectable item list.
  - ⑦ Click **Add** to add the selected item to the monitor item list.
  - ⑧ After selection of all desired monitor items click the **OK** button to return to the initial "Axis Monitor" screen.
- The statuses and values of the selected items are now shown for the selected axes.



**Fig. A-4:** Steps ⑤ to ⑧ of selecting axis monitor procedure

**Selectable Items: Input signal, Output signal, Axis monitor data, Axis control data**

Item	Selectable Item	Buffer memory address	
		LD77MH4	LD77MH16
Input signal (X)	M code ON	X4+n	—
	Error detection	X8+n	—
	BUSY	XC+n	X10+n
	Start complete	X10+n	—
	Positioning complete	X14+n	—
Output signal (Y)	Axis stop	Y4+n	—
	Forward JOG start	Y8+2n	—
	Reverse JOG start	Y9+2n	—
	Positioning start	Y10+n	Y10+n
	Execution prohibition flag	Y14+n	—

**Tab. A-4:** List of selectable monitor items (1)

Item	Selectable Item	Buffer memory address	
		LD77MH4	LD77MH16
Axis monitor data	Current feed value	800+100n	2400+100n
	Machine feed value	802+100n	2402+100n
	Feedrate	804+100n	2404+100n
	Axis error No.	806+100n	2406+100n
	Axis warning No.	807+100n	2407+100n
	Valid M code	808+100n	2408+100n
	Axis operation status	809+100n	2409+100n
	Current speed	810+100n	2410+100n
	Axis federate	812+100n	2412+100n
	Positioning amount of speed-position switching control	814+100n	2414+100n
	External input signal	816+100n	2416+100n
	Status In speed control, Speed-position switching latch, Command in-position, OPR request , OPR complete , Position-speed switching latch , Axis warning detection , Speed change 0 , M code On <sup>①</sup> , error detection <sup>①</sup> , start complete <sup>①</sup> , positioning complete <sup>①</sup>	817+100n	2417+100n
	Target value	818+100n	2418+100n
	Target speed	820+100n	2420+100n
	Movement amount after near-point dog ON	824+100n	2424+100n
	Torque limit stored value / Forward torque limit stored value	826+100n	2426+100n
	Special start data instruction: Code setting value	827+100n	2427+100n
	Special start data instruction: Parameter setting value	828+100n	2428+100n
	Start positioning data No. setting value	829+100n	2429+100n
	In speed limit flag	830+100n	2430+100n
	In speed change processing flag	831+100n	2431+100n
	Special start repetition counter	832+100n	2432+100n
	Control system repetition counter	833+100n	2433+100n
	Start data pointer being executed	834+100n	2434+100n
	Positioning data No. being executed	835+100n	2435+100n
	Block No. being executed	836+100n	2436+100n
	Last executed positioning data No.	837+100n	2437+100n
	Positioning data being executed : M code	839+100n	2439+100n
	Positioning data being executed : Dwell time	840+100n	2440+100n
	Positioning data being executed : Axis to be interpolated	—	2441+100n
	Positioning data being executed : Command speed	842+100n	2442+100n
	Positioning data being executed : Positioning address	844+100n	2444+100n
	Positioning data being executed : Arc address	846+100n	2446+100n
	OPR re-movement amount	848+100n	2448+100n
	Real current value	850+100n	2450+100n
	Deviation counter value	852+100n	2452+100n
	Motor rotation speed	854+100n	2454+100n
	Motor current value	856+100n	2456+100n
	Parameter error No	870+100n	2470+100n
	Servo status 1: Zero passage, Zero speed, Speed limit, PID control	876+100n	2476+100n
	Servo status 2: Control mode, Servo alarm, In-position, Torque limit, Absolute position lost, Servo warning	877+100n	2477+100n
	Regenerative load ratio / Optional data monitor output 1	878+100n	2478+100n
	Effective load ratio / Optional data monitor output 2	879+100n	2479+100n
	Peak load torque ratio / Optional data monitor output 3	880+100n	2480+100n

Tab. A-4: List of selectable monitor items (2)

Item	Selectable Item	Buffer memory address	
		LD77MH4	LD77MH16
Axis monitor data	Optional data monitor output 4	—	2481+100n
	Semi / Fully closed loop status	887+100n	2487+100n
	Servo alarm	888+100n	2488+100n
	Reverse torque limit stored value	891+100n	2491+100n
	Speed during command	892+100n	2492+100n
	Torque during command	894+100n	2494+100n
	Servo status 3 Continuous operation to torque control	858+100n	2458+100n
	Control mode switching status	895+100n	2495+100n
Axis control data	Positioning start No.	1500+100n	4300+100n
	Positioning starting point No.	1501+100n	4301+100n
	Axis error reset	1502+100n	4302+100n
	Restart command	1503+100n	4303+100n
	M code OFF request	1504+100n	4304+100n
	External command valid	1505+100n	4305+100n
	New current value	1506+100n	4306+100n
	New acceleration time value	1508+100n	4308+100n
	New deceleration time value	1510+100n	4310+100n
	Acceleration/deceleration time change during speed change, enable/disable selection	1512+100n	4312+100n
	Positioning operation speed override	1513+100n	4313+100n
	New speed value	1514+100n	4314+100n
	Speed change request	1516+100n	4316+100n
	Inching movement amount	1517+100n	4317+100n
	JOG speed	1518+100n	4318+100n
	Interrupt request during continuous operation	1520+100n	4320+100n
	OPR request flag OFF request	1521+100n	4321+100n
	Manual pulse generator 1 pulse input magnification	1522+100n	4322+100n
	Manual pulse generator enable flag	1524+100n	4324+100n
	New torque value/ forward new torque value	1525+100n	4325+100n
	Speed-position switching control movement amount change register	1526+100n	4326+100n
	Speed-position switching enable flag	1528+100n	4328+100n
	Position-speed switching control speed change register	1530+100n	4330+100n
	Position-speed switching enable flag	1532+100n	4332+100n
	Target position change value (New address)	1534+100n	4334+100n
	Target position change value (New speed)	1536+100n	4336+100n
	Target position change request flag	1538+100n	4338+100n
	Simultaneous starting axis start data No. (axis 1 start data No.)	1540+100n	4340+100n
	Simultaneous starting axis start data No. (axis 2 start data No.)	1541+100n	4341+100n
	Simultaneous starting axis start data No. (axis 3 start data No.)	1542+100n	4342+100n
	Simultaneous starting axis start data No. (axis 4 start data No.)	1543+100n	4343+100n
	Step mode	1544+100n	4344+100n
	Step valid flag	1545+100n	4345+100n
	Step start information	1546+100n	4346+100n
Skip command	1547+100n	4347+100n	
Teaching data selection	1548+100n	4348+100n	
Teaching positioning data No.	1549+100n	4349+100n	
ABS direction in degrees	1550+100n	4350+100n	

**Tab. A-4:** List of selectable monitor items (3)

Item	Selectable Item	Buffer memory address	
		LD77MH4	LD77MH16
Axis control data	Servo OFF command	1551+100n	4351+100n
	Torque output setting value	1552+100n	4352+100n
	Gain changing command	1559+100n	4359+100n
	Torque change function switching request	1563+100n	4363+100n
	New reverse torque value	1564+100n	4364+100n
	Parameter write request	1554+100n	4354+100n
	Parameter No.	1555+100n	4355+100n
	Change data	1556+100n	4356+100n
	Semi/Fully closed loop switching request	1558+100n	4358+100n
	PI-PID switching request	1565+100n	4365+100n
	Device selection for speed <--> position switching	1566+100n	4366+100n
	Speed <--> position switching command	1567+100n	4367+100n
	Control mode switching request	1574+100n	4374+100n
	Control mode setting	1575+100n	4375+100n
	Command speed at speed control mode	1576+100n	4376+100n
	Acceleration time at speed control mode	1578+100n	4378+100n
	Deceleration time at speed control mode	1579+100n	4379+100n
	Command torque at torque control mode	1580+100n	4380+100n
	Torque time constant at torque control mode (Forward direction)	1581+100n	4381+100n
	Torque time constant at torque control mode (Reverse direction)	1582+100n	4382+100n
	Speed limit value at torque control mode	1584+100n	4384+100n
	Speed limit value at continuous operation to torque control	1586+100n	4386+100n
	Acceleration time at continuous operation to torque control	1588+100n	4388+100n
	Deceleration time at continuous operation to torque control	1589+100n	4389+100n
	Target torque at continuous operation to torque control	1590+100n	4390+100n
	Torque time constant at continuous operation to torque control ( Forward direction)	1591+100n	4391+100n
	Torque time constant at continuous operation to torque control ( Reverse direction)	1592+100n	4392+100n
	Control mode switching conditions	1593+100n	4393+100n
	Control mode switching conditions (parameter)	1594+100n	4394+100n
	Axis stop	—	30100+10n
Forward run JOG start	—	30101+10n	
Reverse run JOG start	—	30102+10n	
Execution prohibition flag	—	30103+10n	

**Tab. A-4:** List of selectable monitor items (4)

- ① M code On , Error detection, Start complete and Positioning complete are defined in input signal (X) of LD77MH.

**Selectable Items: Synchronous control monitor / Synchronous control data**

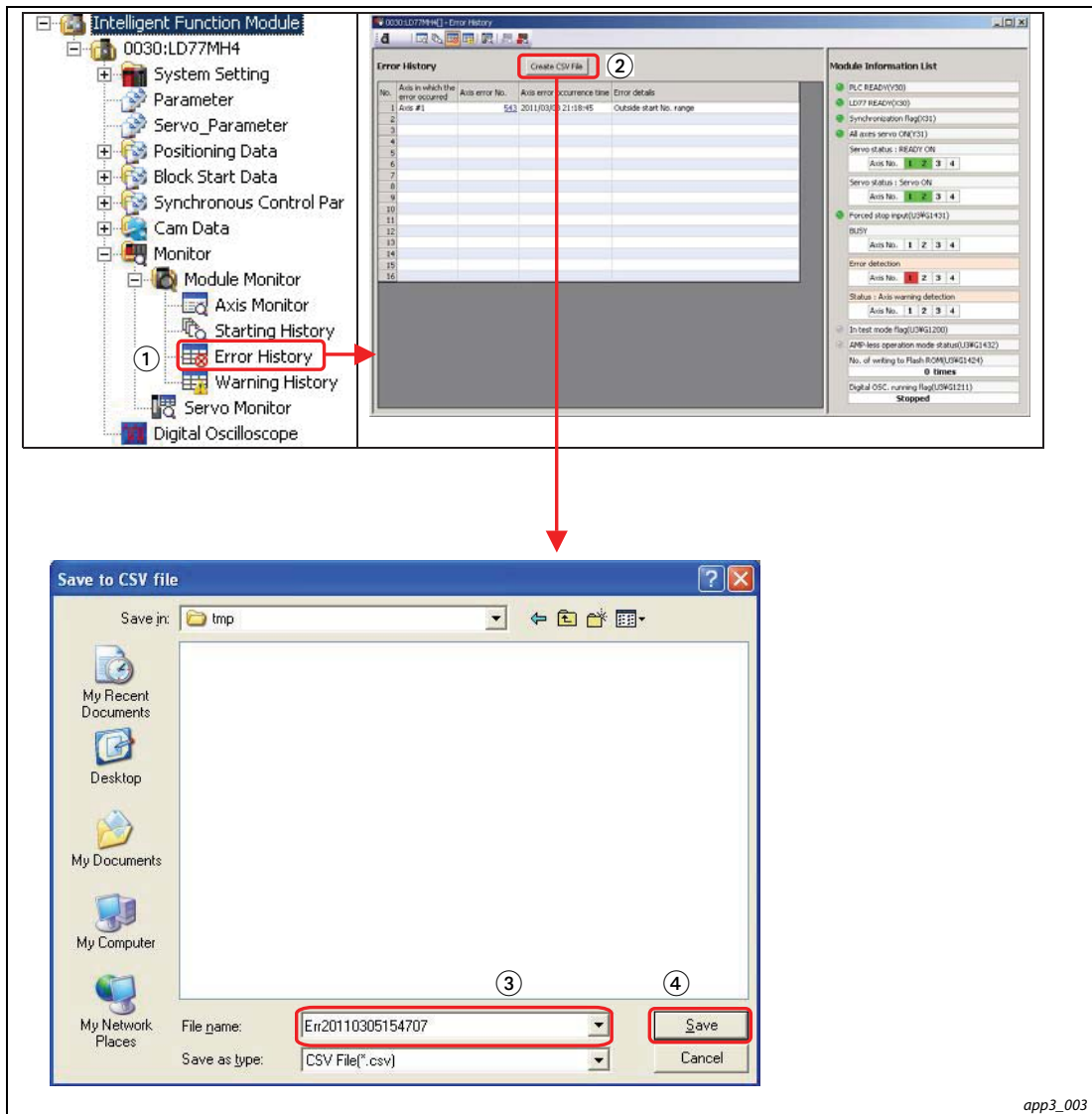
Item	Selectable Item	Buffer memory address
		LD77MH4 LD77MH16
Synchronous control monitor	Current value after main shaft composite gear	42800+40n
	Current value per cycle after main shaft gear	42802+40n
	Current value per cycle after auxiliary shaft gear	42804+40n
	Cam axis phase correction amount	42810+40n
	Cam axis current value per cycle	42812+40n
	Cam reference position	42814+40n
	Cam axis current feed value	42816+40n
	Execute cam No.	42818+40n
	Execute cam stroke amount	42820+40n
	Main shaft clutch ON/OFF status	42828+40n
	Main shaft clutch smoothing status	42829+40n
	Main shaft clutch slippage (cumulative)	42830+40n
	Auxiliary shaft clutch ON/OFF status	42832+40n
	Auxiliary shaft clutch smoothing status	42833+40n
	Auxiliary shaft clutch slippage(cumulative)	42834+40n
Synchronous control data	Main shaft clutch command	44080+20n
	Main shaft clutch control invalid command	44081+20n
	Main shaft clutch force OFF command	44082+20n
	Auxiliary shaft clutch command	44083+20n
	Auxiliary shaft clutch control invalid command	44084+20n
	Auxiliary shaft clutch force OFF command	44085+20n
	Synchronous control change request	44086+20n
	Synchronous control change command	44087+20n
	Synchronous control change value	44088+20n
	Synchronous control change reflection time	44090+20n

**Tab. A-5:** List of selectable monitor items for synchronous control

### A.3.2 Error history of Simple Motion Module Setting Tool

Error codes and warning codes at debugging a Simple Motion Module can be referred.

- ① Select **Intelligent Function Module** → **Monitor** → **Module Monitor** → **Error History** to display the "Error History" screen.
- ② Click the **Create CSV File** button to save the error history as a CSV file. The "Save to CSV file" screen is displayed.
- ③ Specify a file name.
- ④ Click the **Save** button to preserve the error history.



**Fig. A-5:** Procedure of saving the error history as a CSV file

app3\_003

### A.3.3 PLC diagnostics of GX Works2

Error codes and warning codes at debugging a sequence program can be referred.

- ① Select **Diagnostics** → **PLC Diagnostics....**  
The "PLC Diagnostics" screen with error information is displayed.

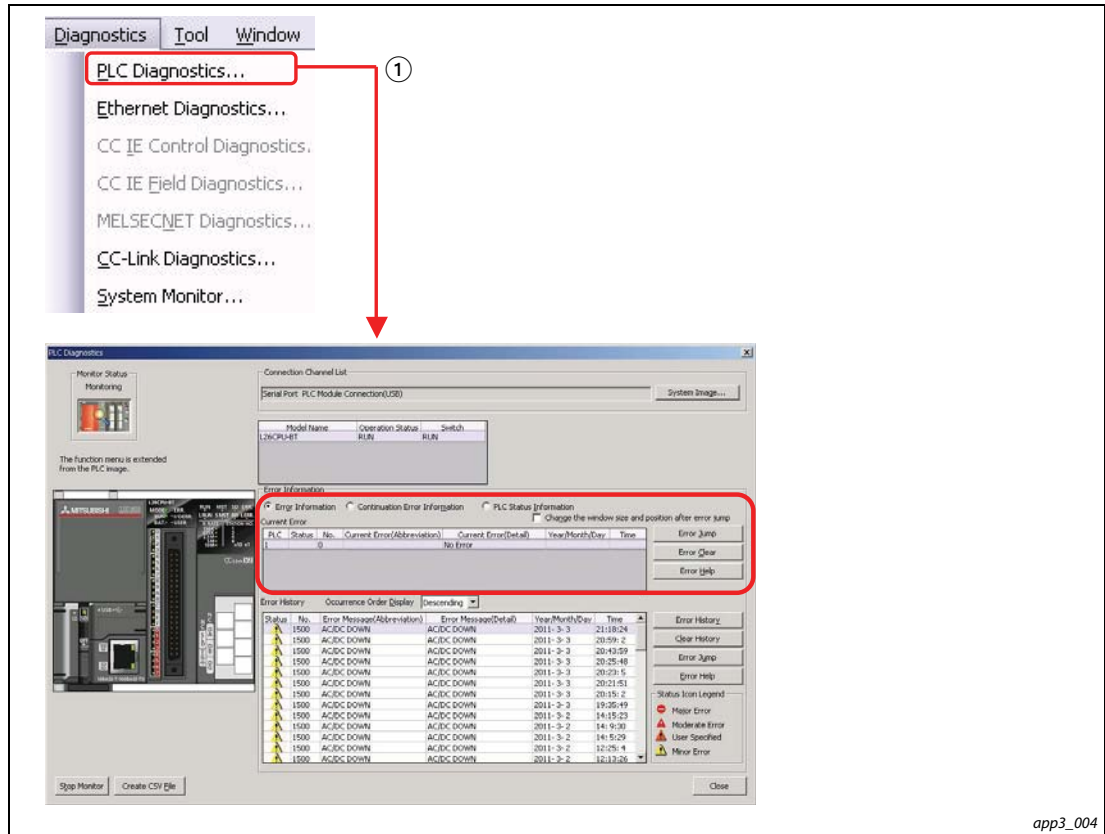


Fig. A-6: PLC diagnostics

app3\_004

## A.4 Sample program



### CAUTION:

- **This sequence program is an example using LD77MH4 and L26CPU-BT. When other modules are used, the assignment of the signals is different. Please refer to the user's manual (chapter of the positioning control) for details of each signal.**
- **The sequence program of this appendix is used in this start-up guidance. Be sure to add and verify the conformance with the desired system before diverting the programs of this appendix to the actual system.**

This sequence program is an excerpt from the User's Manual (Positioning Control) for the MELSEC-L LD77MH Simple Motion Module. For details refer to the chapter "Positioning program examples" in the User's Manual.

### A.4.1 Used device list

Classification	Device No.	Signal name	Signal
Input	X30	PLC ready completion signal	LD77MH ↓ PLC CPU
	X31	Synchronization flag	
	X38	Axis 1 error detection signal	
	X39	Axis 2 error detection signal	
	X3C	Axis 1 BUSY signal	
	X3D	Axis 2 BUSY signal	
	X40	Axis 1 start complete signal	
	X41	Axis 2 start complete signal	
	X50	JOG operation speed setting command	
	X53	Machine OPR No. setting	
	X55	Positioning No. setting	
	X56	Synchronous positioning No. setting	
	X5D	JOG operation speed setting command	
	X5E	Forward rotation JOG command	
	X5F	Reverse rotation JOG command	
	X6E	Error reset command	
	X6F	Stop command	
	X71	Axis 1 positioning start command	
	X72	Axis 2 positioning start command	
X7B	PLC ready ON	PLC CPU ↓ LD77MH	
X7D	Synchronous control axis setting		
Output	Y30	PLC ready signal	PLC CPU ↓ LD77MH
	Y31	All-axes servo ON signal	
	Y34	Axis 1 stop signal	
	Y38	Axis 1 forward rotation JOG start signal	
	Y39	Axis 1 reverse rotation JOG start signal	
	Y40	Axis 1 positioning start signal	
	Y41	Axis 2 positioning start signal	

**Tab. A-6:** List of used devices





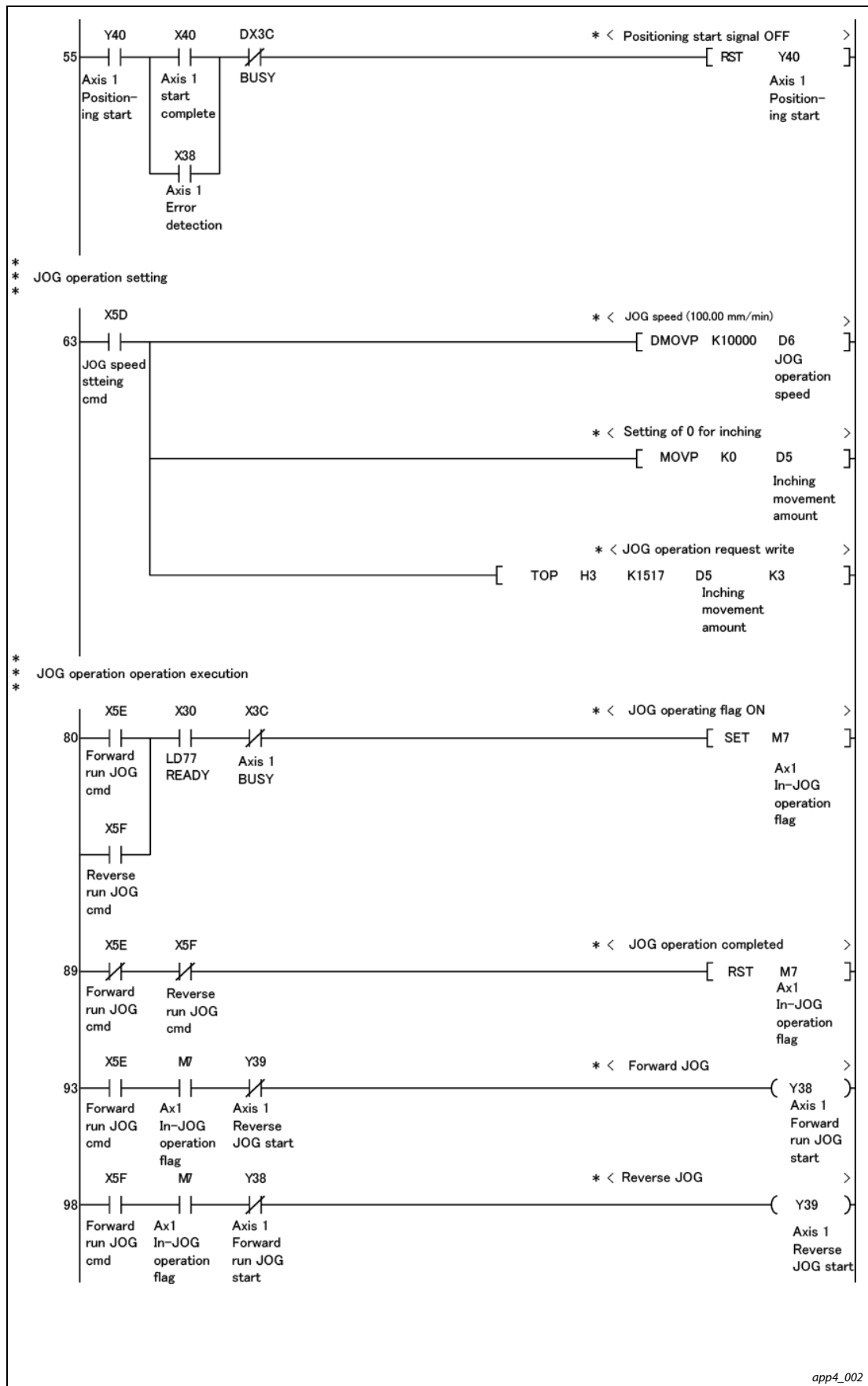


Fig. A-8: Sequence program example (2)

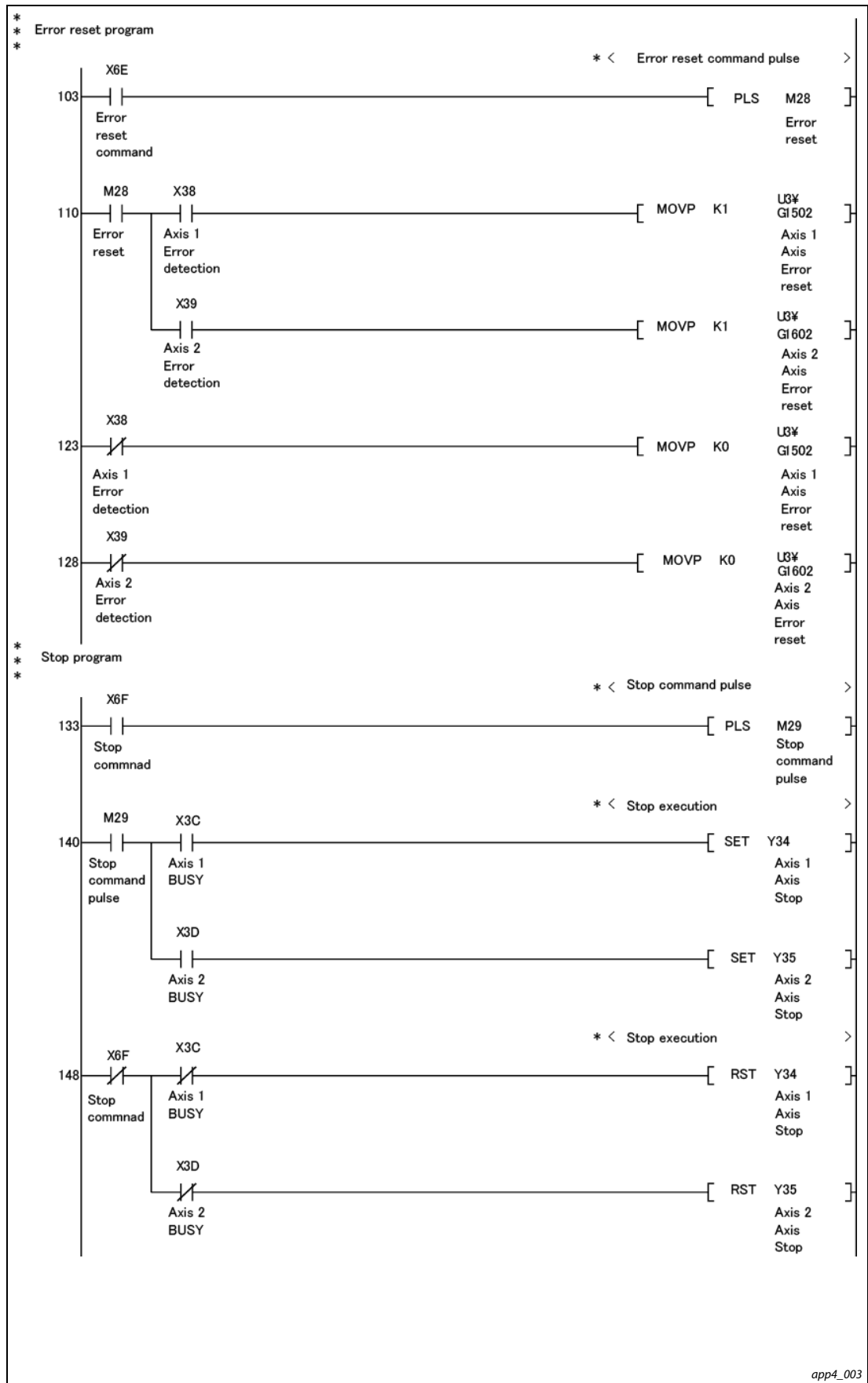
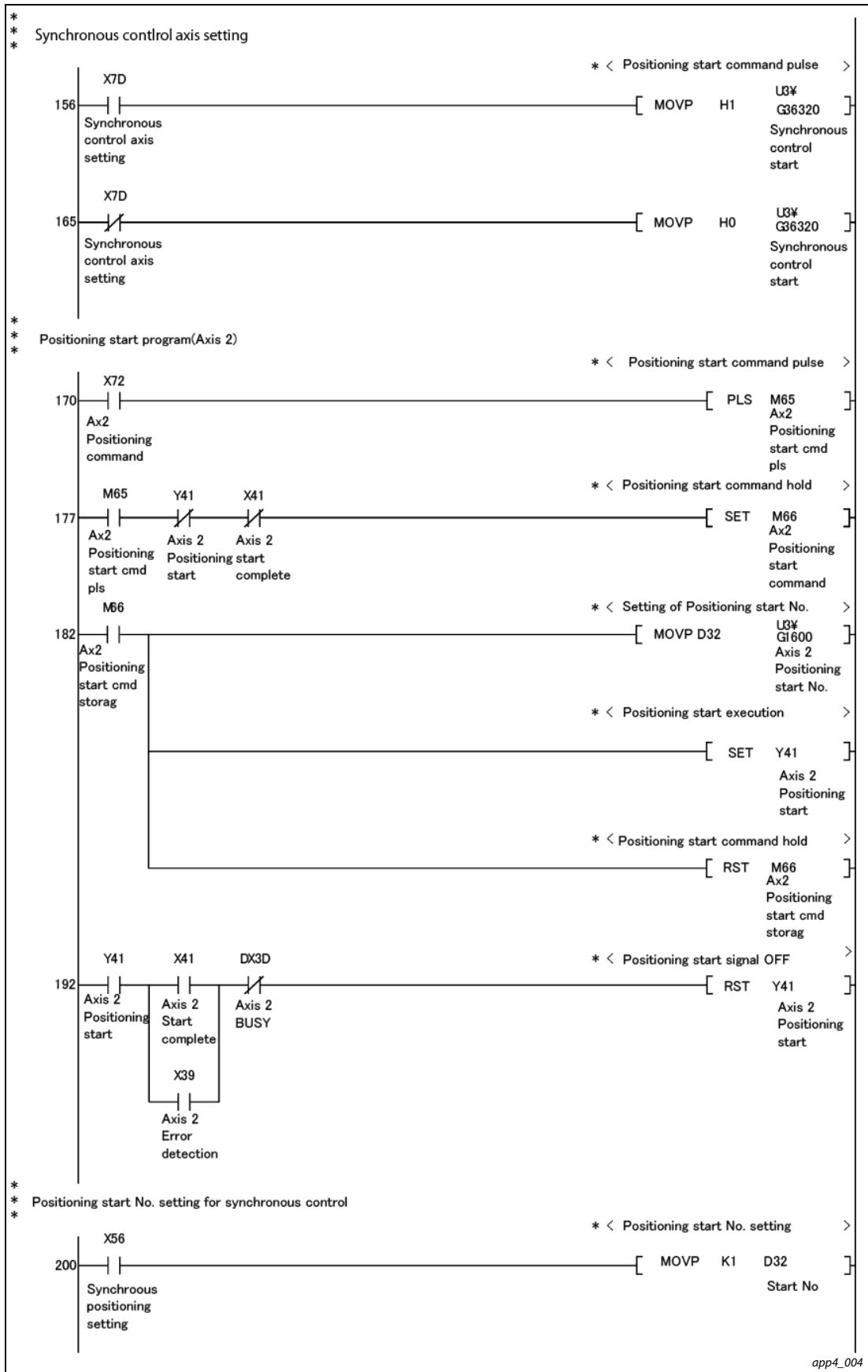


Fig. A-9: Sequence program example (3)



app4\_004

Fig. A-10: Sequence program example (4)

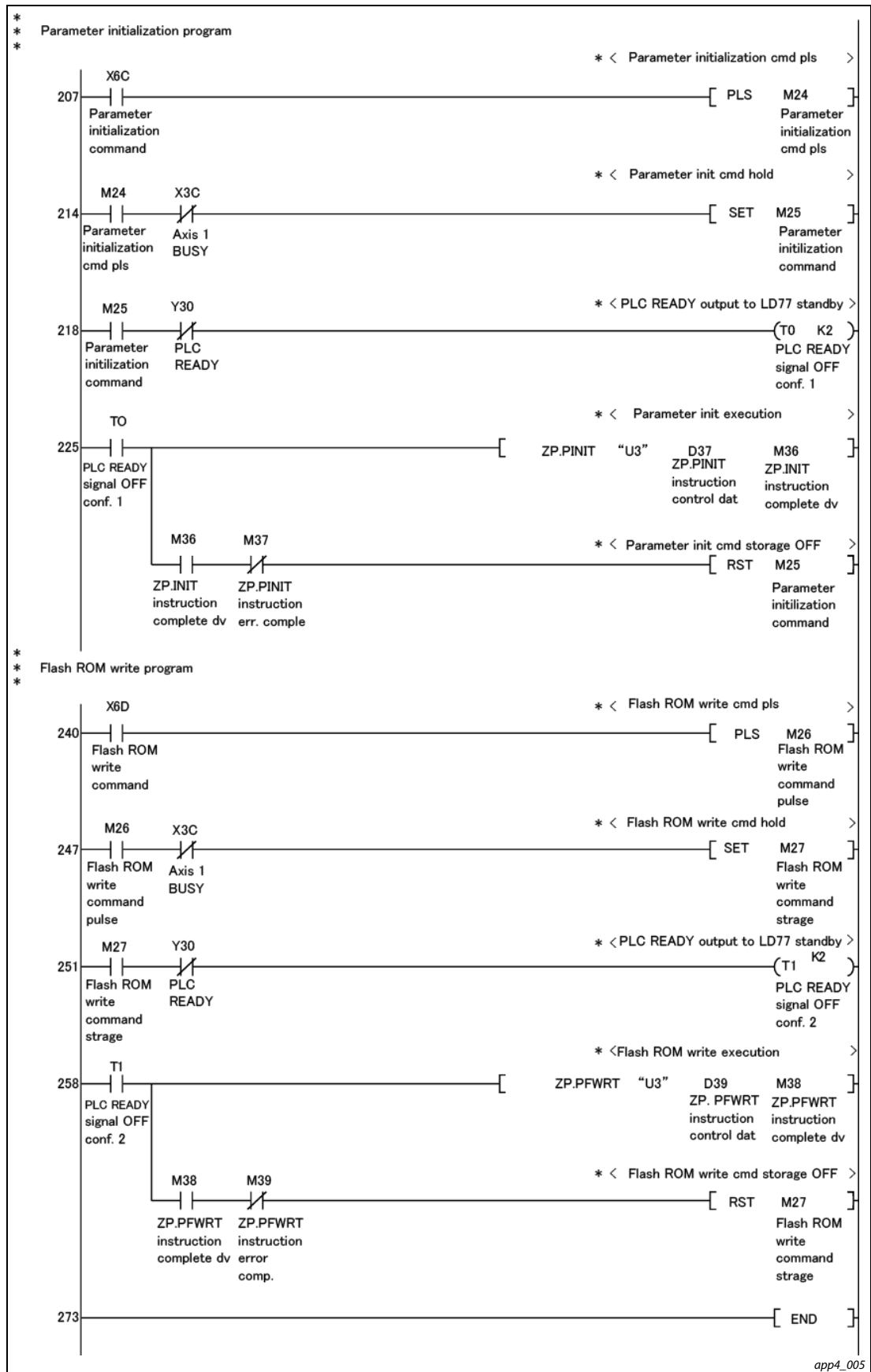


Fig. A-11: Sequence program example (5)



# Index

## A

Axis select rotary switch .....2-7

## C

### Connections

CPU module and PC ..... 2-14

Settings ..... 2-14

### CPU module

Formatting ..... 2-15

Write sequence programs ..... 2-16

### Create

New project ..... 2-11

New project (with Setting Tool) ..... 2-19

Sequence programs ..... 2-12

## I

### Installation

Application software .....2-9

Batteries .....2-5

DIN rails .....2-5

Modules .....2-5

## M

### MELSOFT GX Works2

Start ..... 2-10

Monitor functions ..... A-6

## O

### Operation check

Cam operation (synchronous control) ..... 3-16

JOG operation ..... 2-31

OPR (Original Point Return) ..... 2-36

OPR (synchronous control) ..... 3-13

Positioning control ..... 2-38

Start-up of drive axis (synchronous control) .. 3-14

Synchronous axis (synchronous control) ..... 3-15

## P

### Parameter

Axis parameter ..... A-3

### Positioning data

Settings overview ..... A-3

### Preparation

Devices .....2-4

### Project

New .....2-19

Save .....2-13

## S

### Sample data

Creation of sequence programs .....2-12

Program example ..... A-14

Setting procedures .....2-30

### Setting

Axis select rotary switch .....2-7

Basic parameters .....2-21

Positioning data .....2-26

Servo parameters .....2-25

### Simple Motion Module

Add with Setting Tool .....2-17

Error history ..... A-12

Setting Tool .....2-18

Start address .....A-1

Write to .....2-29

### Software tools

MELSOFT GX Works2 .....2-9

MR Configurator2 .....2-9

### Synchronous control

Cam data setting .....3-11

Control parameter setting .....3-8

Operation check .....3-13

Parameter setting .....3-6

Positioning data setting .....3-7

Servo parameter setting .....3-6

System configuration .....3-5

### System configuration

Setting .....2-20

**W**

Wiring

Example .....2-6  
Power supply module .....2-6  
Tightening torques .....2-6  
Wire sizes .....2-6





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