MITSUBISHI

Mitsubishi Programmable Controller

MELSEC *L* series

MELSEC-L LD77MH Simple Motion Module Quick Start Guide

Simple
Motion

Advanced motion control similar to a positioning module

1. OVERVIEW
2. SIMPLE MOTION MODULE START-UP
3. SYNCHRONOUS CONTROL START-UP
APPENDICES
  Appendix 1 Start address setting
  Appendix 2 Parameter and positioning data
  Appendix 3 Various monitor functions
  Appendix 4 Sample program

Quick Start Guide

● SAFETY PRECAUTIONS ●

(Please read these instructions before using this equipment.)

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

Refer to the Users manual of the CPU module to use for a description of the PLC system safety precautions.

In this manual, the safety instructions are ranked as "DANGER" and "CAUTION".

⚠ DANGER	Indicates that incorrect handling may cause hazardous conditions, resulting in death or severe injury.
⚠ CAUTION	Indicates that incorrect handling may cause hazardous conditions, resulting in medium or slight personal injury or physical damage.

Depending on circumstances, procedures indicated by ⚠ CAUTION may also be linked to serious results.

In any case, it is important to follow the directions for usage.

Please save this manual to make it accessible when required and always forward it to the end user.

For Safe Operations

1. Prevention of electric shocks

⚠DANGER

- ● Never open the front case or terminal covers while the power is ON or the unit is running, as this may lead to electric shocks.
- ● Never run the unit with the front case or terminal cover removed. The high voltage terminal and charged sections will be exposed and may lead to electric shocks.
- ● Never open the front case or terminal cover at times other than wiring work or periodic inspections even if the power is OFF. The insides of the module and servo amplifier are charged and may lead to electric shocks.
- ● Completely turn off the externally supplied power used in the system before mounting or removing the module, performing wiring work, or inspections. Failing to do so may lead to electric shocks.
- ● When performing wiring work or inspections, turn the power OFF, wait at least ten minutes, and then check the voltage with a tester, etc. Failing to do so may lead to electric shocks.
- ● Be sure to ground the module, servo amplifier and servomotor (Ground resistance: 100 Ω or less). Do not ground commonly with other devices.
- ● The wiring work and inspections must be done by a qualified technician.
- ● Wire the units after installing the module, servo amplifier and servomotor. Failing to do so may lead to electric shocks or damage.
- ● Never operate the switches with wet hands, as this may lead to electric shocks.
- ● Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to electric shocks.
- ● Do not touch the module, servo amplifier, servomotor connector or terminal blocks while the power is ON, as this may lead to electric shocks.
- ● Do not touch the built-in power supply, built-in grounding or signal wires of the module and servo amplifier, as this may lead to electric shocks.

2. For fire prevention

⚠CAUTION

- ● Install the module, servo amplifier, servomotor and regenerative resistor on incombustible. Installing them directly or close to combustibles will lead to fire.
- ● If a fault occurs in the module or servo amplifier, shut the power OFF at the servo amplifier's power source. If a large current continues to flow, fire may occur.
- ● When using a regenerative resistor, shut the power OFF with an error signal. The regenerative resistor may abnormally overheat due to a fault in the regenerative transistor, etc., and may lead to fire.
- ● Always take heat measures such as flame proofing for the inside of the control panel where the servo amplifier or regenerative resistor is installed and for the wires used. Failing to do so may lead to fire.
- ● Do not damage, apply excessive stress, place heavy things on or sandwich the cables, as this may lead to fire.

3. For injury prevention

⚠CAUTION

- ● Do not apply a voltage other than that specified in the instruction manual on any terminal. Doing so may lead to destruction or damage.
- ● Do not mistake the terminal connections, as this may lead to destruction or damage.
- ● Do not mistake the polarity (+ / -), as this may lead to destruction or damage.
- ● Do not touch the heat radiating fins of module or servo amplifier, regenerative resistor and servomotor, etc., while the power is ON and for a short time after the power is turned OFF. In this timing, these parts become very hot and may lead to burns.
- ● Always turn the power OFF before touching the servomotor shaft or coupled machines, as these parts may lead to injuries.
- ● Do not go near the machine during test operations or during operations such as teaching. Doing so may lead to injuries.

4. Various precautions

Strictly observe the following precautions. Mistaken handling of the unit may lead to faults, injuries or electric shocks.

(1) System structure

⚠CAUTION

- ● Always install a leakage breaker on the module and servo amplifier power source.
- ● If installation of an electromagnetic contactor for power shut off during an error, etc., is specified in the instruction manual for the servo amplifier, etc., always install the electromagnetic contactor.
- ● Install the emergency stop circuit externally so that the operation can be stopped immediately and the power shut off.
- ● Use the module, servo amplifier, servomotor and regenerative resistor with the correct combinations listed in the instruction manual. Other combinations may lead to fire or faults.
- ● Use the CPU module and Simple Motion module with the correct combinations listed in the instruction manual. Other combinations may lead to faults.
- ● If safety standards (ex., robot safety rules, etc.,) apply to the system using the module, servo amplifier and servomotor, make sure that the safety standards are satisfied.
- ● Construct a safety circuit externally of the module or servo amplifier if the abnormal operation of the module or servo amplifier differ from the safety directive operation in the system.
- ● In systems where coasting of the servomotor will be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use dynamic brakes.
- ● Make sure that the system considers the coasting amount even when using dynamic brakes.
- ● In systems where perpendicular shaft dropping may be a problem during the forced stop, emergency stop, servo OFF or power supply OFF, use both dynamic brakes and electromagnetic brakes.
- ● The dynamic brakes must be used only on errors that cause the forced stop, emergency stop, or servo OFF. These brakes must not be used for normal braking.
- ● The brakes (electromagnetic brakes) assembled into the servomotor are for holding applications, and must not be used for normal braking.

⚠CAUTION

- The system must have a mechanical allowance so that the machine itself can stop even if the stroke limits switch is passed through at the max. speed.
- Use wires and cables that have a wire diameter, heat resistance and bending resistance compatible with the system.
- Use wires and cables within the length of the range described in the instruction manual.
- The ratings and characteristics of the parts (other than module, servo amplifier and servomotor) used in a system must be compatible with the module, servo amplifier and servomotor.
- Install a cover on the shaft so that the rotary parts of the servomotor are not touched during operation.
- There may be some cases where holding by the electromagnetic brakes is not possible due to the life or mechanical structure (when the ball screw and servomotor are connected with a timing belt, etc.). Install a stopping device to ensure safety on the machine side.

(2) Parameter settings and programming

⚠CAUTION

- Set the parameter values to those that are compatible with the module, servo amplifier, servomotor and regenerative resistor model and the system application. The protective functions may not function if the settings are incorrect.
- The regenerative resistor model and capacity parameters must be set to values that conform to the operation mode and servo amplifier. The protective functions may not function if the settings are incorrect.
- Set the mechanical brake output and dynamic brake output validity parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the stroke limit input validity parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servomotor encoder type (increment, absolute position type, etc.) parameter to a value that is compatible with the system application. The protective functions may not function if the setting is incorrect.
- Set the servomotor capacity and type (standard, low-inertia, flat, etc.) parameter to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Set the servo amplifier capacity and type parameters to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.
- Use the program commands for the program with the conditions specified in the instruction manual.
- Set the sequence function program capacity setting, device capacity, latch validity range, I/O assignment setting, and validity of continuous operation during error detection to values that are compatible with the system application. The protective functions may not function if the settings are incorrect.

⚠CAUTION

- Some devices used in the program have fixed applications, so use these with the conditions specified in the instruction manual.
- The input devices and data registers assigned to the link will hold the data previous to when communication is terminated by an error, etc. Thus, an error correspondence interlock program specified in the instruction manual must be used.
- Use the interlock program specified in the intelligent function module's instruction manual for the program corresponding to the intelligent function module.

(3) Transportation and installation

⚠CAUTION

- Transport the product with the correct method according to the mass.
- Use the servomotor suspension bolts only for the transportation of the servomotor. Do not transport the servomotor with machine installed on it.
- Do not stack products past the limit.
- When transporting the module or servo amplifier, never hold the connected wires or cables.
- When transporting the servomotor, never hold the cables, shaft or detector.
- When transporting the module or servo amplifier, never hold the front case as it may fall off.
- When transporting, installing or removing the module or servo amplifier, never hold the edges.
- Install the unit according to the instruction manual in a place where the mass can be withstood.
- Do not get on or place heavy objects on the product.
- Always observe the installation direction.
- Keep the designated clearance between the module or servo amplifier and control panel inner surface or the module and servo amplifier, module or servo amplifier and other devices.
- Do not install or operate modules, servo amplifiers or servomotors that are damaged or that have missing parts.
- Do not block the intake/outtake ports of the servo amplifier and servomotor with cooling fan.
- Do not allow conductive matter such as screw or cutting chips or combustible matter such as oil enter the module, servo amplifier or servomotor.
- The module, servo amplifier and servomotor are precision machines, so do not drop or apply strong impacts on them.
- Securely fix the module, servo amplifier and servomotor to the machine according to the instruction manual. If the fixing is insufficient, these may come off during operation.
- Always install the servomotor with reduction gears in the designated direction. Failing to do so may lead to oil leaks.

⚠CAUTION

● Store and use the unit in the following environmental conditions.

Environment	Conditions	
	Module/Servo amplifier	Servomotor
Ambient temperature	According to each instruction manual.	0°C to +40°C (With no freezing) (32°F to +104°F)
Ambient humidity	According to each instruction manual.	80% RH or less (With no dew condensation)
Storage temperature	According to each instruction manual.	-20°C to +65°C (-4°F to +149°F)
Atmosphere	Indoors (where not subject to direct sunlight). No corrosive gases, flammable gases, oil mist or dust must exist	
Altitude	1000m (3280.84ft.) or less above sea level	
Vibration	According to each instruction manual	

● When coupling with the servomotor shaft end, do not apply impact such as by hitting with a hammer. Doing so may lead to detector damage.

● Do not apply a load larger than the tolerable load onto the servomotor shaft. Doing so may lead to shaft breakage.

● When not using the module for a long time, disconnect the power line from the module or servo amplifier.

● Place the module and servo amplifier in static electricity preventing vinyl bags and store.

● When storing for a long time, please contact with our sales representative.
   Also, execute a trial operation.

● Make sure that the connectors for the servo amplifier and peripheral devices have been securely installed until a click is heard.
   Not doing so could lead to a poor connection, resulting in erroneous input and output.

(4) Wiring

⚠CAUTION

● Correctly and securely wire the wires. Reconfirm the connections for mistakes and the terminal screws for tightness after wiring. Failing to do so may lead to run away of the servomotor.

● After wiring, install the protective covers such as the terminal covers to the original positions.

● Do not install a phase advancing capacitor, surge absorber or radio noise filter (option FR-BIF) on the output side of the servo amplifier.

● Correctly connect the output side (terminal U, V, W). Incorrect connections will lead the servomotor to operate abnormally.

● Do not connect a commercial power supply to the servomotor, as this may lead to trouble.

⚠ CAUTION

● Do not mistake the direction of the surge absorbing diode installed on the DC relay for the control signal output of brake signals, etc. Incorrect installation may lead to signals not being output when trouble occurs or the protective functions not functioning.
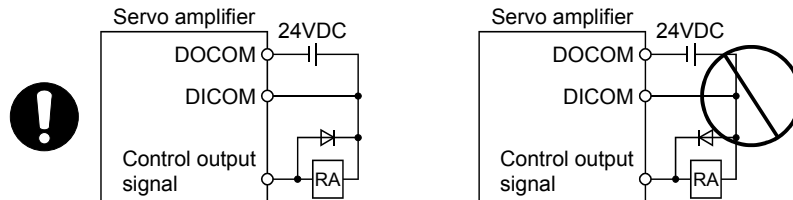
● Do not connect or disconnect the connection cables between each unit, the encoder cable or PLC expansion cable while the power is ON.
● Securely tighten the cable connector fixing screws and fixing mechanisms. Insufficient fixing may lead to the cables combing off during operation.
● Do not bundle the power line or cables.
● Use applicable solderless terminals and tighten them with the specified torque.
  If any solderless spade terminal is used, it may be disconnected when the terminal screw comes loose, resulting in failure.

(5) Trial operation and adjustment

⚠ CAUTION

● Confirm and adjust the program and each parameter before operation. Unpredictable movements may occur depending on the machine.
● Extreme adjustments and changes may lead to unstable operation, so never make them.
● When using the absolute position system function, on starting up, and when the module or absolute value motor has been replaced, always perform a home position return.
● Before starting test operation, set the parameter speed limit value to the slowest value, and make sure that operation can be stopped immediately by the forced stop, etc. if a hazardous state occurs.
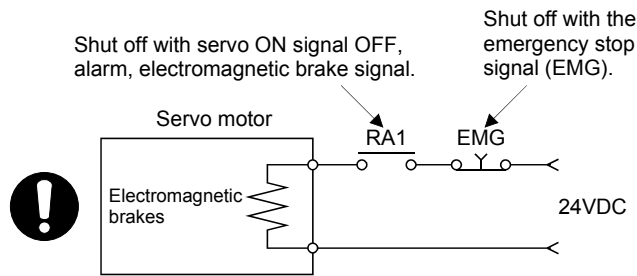
(6) Usage methods

⚠CAUTION

● Immediately turn OFF the power if smoke, abnormal sounds or odors are emitted from the module, servo amplifier or servomotor.

● Always execute a test operation before starting actual operations after the program or parameters have been changed or after maintenance and inspection.

● Do not attempt to disassemble and repair the units excluding a qualified technician whom our company recognized.

● Do not make any modifications to the unit.

● Keep the effect or electromagnetic obstacles to a minimum by installing a noise filter or by using wire shields, etc.
Electromagnetic obstacles may affect the electronic devices used near the module or servo amplifier.

● When using the CE Mark-compliant equipment design, refer to the "EMC Installation Guidelines" (data number IB(NA)-67339) and refer to the corresponding EMC guideline information for the servo amplifiers and other equipment.

● Note that when the reference axis speed is designated for interpolation operation, the speed of the partner axis (2nd axis, 3rd axis and 4th axis) may be larger than the set speed (larger than the speed limit value).

● Use the units with the following conditions.

Item	Conditions	
	L61P	L63P
Input power	100 to 240VAC$_{-15\%}^{+10\%}$ (85 to 264VAC)	24VDC$_{-35\%}^{+30\%}$ (15.6 to 31.2VDC)
Input frequency	50/60Hz ±5%	
Tolerable momentary power failure	10ms or less	

(7) Corrective actions for errors

⚠CAUTION

● If an error occurs in the self diagnosis of the module or servo amplifier, confirm the check details according to the instruction manual, and restore the operation.
● If a dangerous state is predicted in case of a power failure or product failure, use a servomotor with electromagnetic brakes or install a brake mechanism externally.
● Use a double circuit construction so that the electromagnetic brake operation circuit can be operated by emergency stop signals set externally.

Shut off with servo ON signal OFF, alarm, electromagnetic brake signal.

Shut off with the emergency stop signal (EMG).

Servo motor

Electromagnetic brakes

RA1   EMG

24VDC

● If an error occurs, remove the cause, secure the safety and then resume operation after alarm release.
● The unit may suddenly resume operation after a power failure is restored, so do not go near the machine. (Design the machine so that personal safety can be ensured even if the machine restarts suddenly.)

(8) Maintenance, inspection and part replacement

⚠CAUTION

● Perform the daily and periodic inspections according to the instruction manual.
● Perform maintenance and inspection after backing up the program and parameters for the module and servo amplifier.
● Do not place fingers or hands in the clearance when opening or closing any opening.
● Periodically replace consumable parts such as batteries according to the instruction manual.
● Do not touch the lead sections such as ICs or the connector contacts.
● Before touching the module, always touch grounded metal, etc. to discharge static electricity from human body. Failure to do so may cause the module to fail or malfunction.
● Do not directly touch the module's conductive parts and electronic components.
  Touching them could cause an operation failure or give damage to the module.
● Do not place the module or servo amplifier on metal that may cause a power leakage or wood, plastic or vinyl that may cause static electricity buildup.
● Do not perform a megger test (insulation resistance measurement) during inspection.
● When replacing the module or servo amplifier, always set the new module settings correctly.

⚠CAUTION

● When the module or absolute value motor has been replaced, carry out a home position return operation using one of the following methods, otherwise position displacement could occur.

　1) After writing the servo data to the Simple Motion module using programming software, switch on the power again, then perform a home position return operation.

● After maintenance and inspections are completed, confirm that the position detection of the absolute position detector function is correct.

● Do not drop or impact the battery installed to the module.
Doing so may damage the battery, causing battery liquid to leak in the battery. Do not use the dropped or impacted battery, but dispose of it.

● Do not short circuit, charge, overheat, incinerate or disassemble the batteries.

● The electrolytic capacitor will generate gas during a fault, so do not place your face near the module or servo amplifier.

● The electrolytic capacitor and fan will deteriorate. Periodically replace these to prevent secondary damage from faults. Replacements can be made by our sales representative.

● Lock the control panel and prevent access to those who are not certified to handle or install electric equipment.

● Do not mount/remove the module or terminal block more than 50 times (IEC61131-2-compliant), after the first use of the product. Failure to do so may cause malfunction.

● Do not burn or break a module and servo amplifier. Doing so may cause a toxic gas.

(9) About processing of waste

When you discard module, servo amplifier, a battery (primary battery) and other option articles, please follow the law of each country (area).

⚠CAUTION

● This product is not designed or manufactured to be used in equipment or systems in situations that can affect or endanger human life.

● When considering this product for operation in special applications such as machinery or systems used in passenger transportation, medical, aerospace, atomic power, electric power, or submarine repeating applications, please contact your nearest Mitsubishi sales representative.

● Although this product was manufactured under conditions of strict quality control, you are strongly advised to install safety devices to forestall serious accidents when it is used in facilities where a breakdown in the product is likely to cause a serious accident.

(10) General cautions

⚠CAUTION

● All drawings provided in the instruction manual show the state with the covers and safety partitions removed to explain detailed sections. When operating the product, always return the covers and partitions to the designated positions, and operate according to the instruction manual.

REVISIONS

Print Date	＊ Manual Number	Revision
Jun., 2011	SH(NA)-030102-A	First edition

INTRODUCTION

Thank you for choosing the Simple Motion Module LD77MH.
Before using the equipment, please read this manual carefully to develop full familiarity with the functions and performance of the Simple Motion Module you have purchased, so as to ensure correct use.

CONTENTS

1. OVERVIEW

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)

1) Wide range of controls is realized by high performance and multiple functions.

This module realizes positioning control, synchronous control, cam control and speed and torque control.

2) Adoption of the built-in synchronous encoder interface realizes cost reduction.

3) Highly flexible baseless structure realizes space-saving control board.

4) This module supports SSCNETIII and it can be connected with the high-performance servo amplifier.

5) Simple control setting, without programs.

6) Assistant function realizes 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.

1.2 Related Manuals

(1) Simple Motion Module

Name	Manual Number

Type 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.
	IB-0300172

Type LD77MH Simple Motion Module User's Manual (Synchronous control) This manual explains the functions of Simple Motion Module type LD77MH.	IB-0300174

(2) MELSEC-L series programmable logic controller

| Name	Manual Number
Programmable Controllers MELSEC-L Series Quick Start Guide This quick start guide introduces the basic installation procedures of programmable controllers.	**L08180E**
MELSEC-L CPU Module User's Manual (Hardware Design, Maintenance and Inspection) This manual explains the specifications and the methods for installation, maintenance and inspection of the CPU modules and power supply modules.	SH-080890

MELSEC-L CPU Module User's Manual (Function Explanation, Programmable 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.
	SH-080889

(3) Servo amplifier

Name	Manual Number
SSCNETIII Compatible MR-J3- B SERVO AMPLIFIER INSTRUCTION MANUAL This manual explains I/O signals, parts identification, parameters and startup procedures.	SH-030051
SSCNETIII Compatible Linear Servo MR-J3- B-RJ004U INSTRUCTION MANUAL This manual explains I/O signals, parts identification, parameters and startup procedures.	SH-030054
SSCNETIII interface 2-axis AC Servo Amplifier MR-J3W-B SERVO AMPLIFIER INSTRUCTION MANUAL This manual explains I/O signals, parts identification, parameters and startup procedures.	SH-030073

2. SIMPLE MOTION MODULE START-UP

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

<Device>

<Specifications>
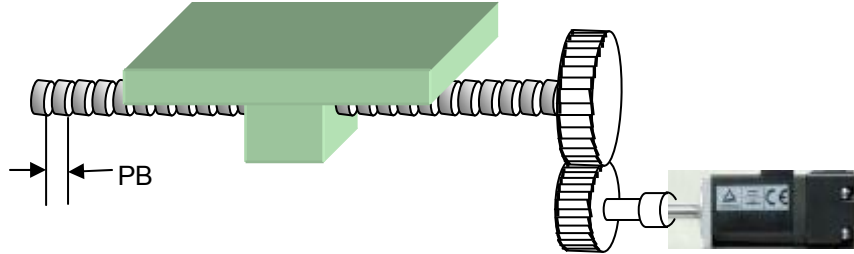
|	
Ball screw lead (PB)	: 10000.0μm (=10mm)
Reduction ratio (NL/NM)	: 1/2 (Load side [NL]/Motor side [NM])
	The ball screw on load side makes one rotation for each 2 revolutions of the motor.
Encoder resolution	: 262144PLS
Servomotor	: HF-KP series
Servo amplifier	: MR-J3-B series

<Operation pattern>

(1) Reciprocate between the home position (0mm) and P1.

    1) Move from the home position (0mm) to P1 at the speed of 2000.00mm/min.

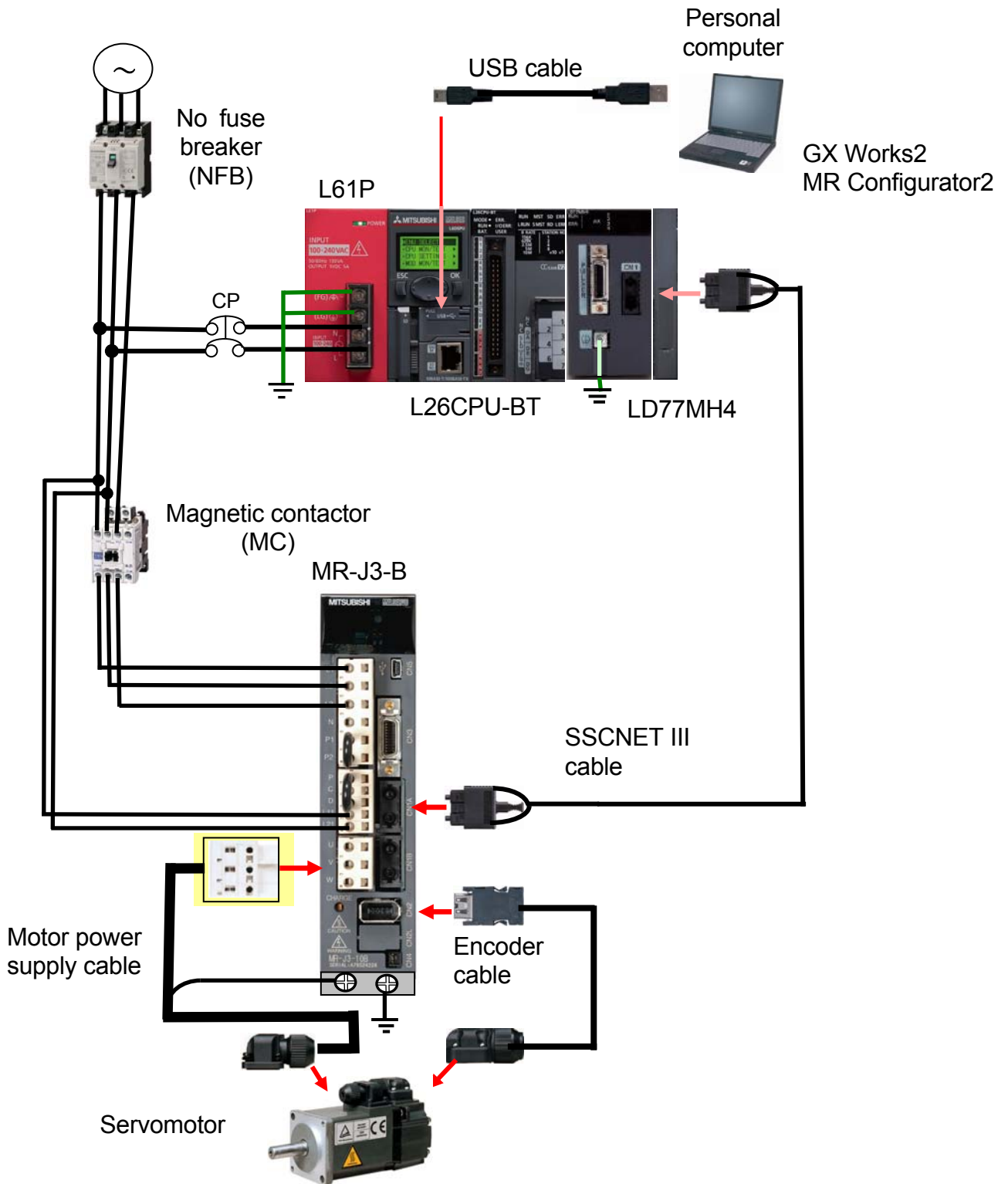   2) Move from P1 to the home position at the speed of 30000.00mm/min.

(2) Execute the continuous positioning control to 1) and 2).
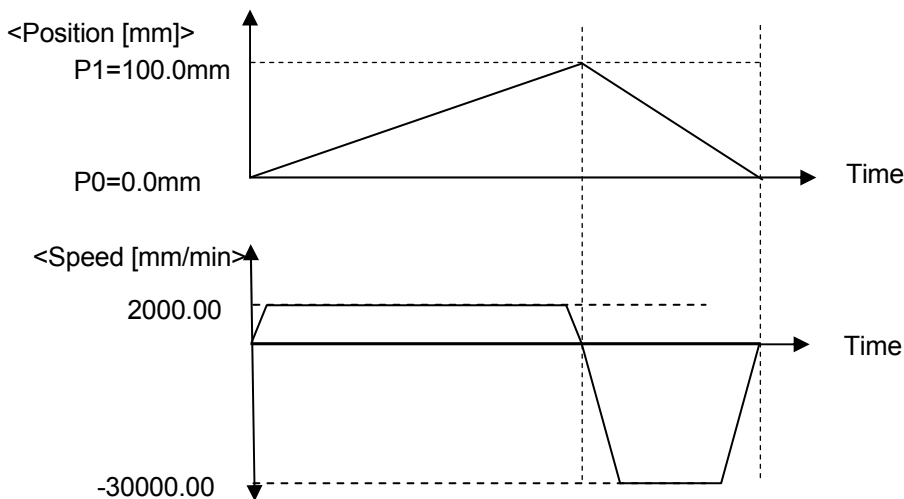
2.1 System which Combines LD77MH and MR-J3-B

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

2.2 Preparing devices

Please prepare the following devices, cables and software.

(1) Simple Motion Module

Main unit
Simple Motion Module LD77MH4 LD77MH16

(2) Servo amplifier, servomotor

Servo amplifier MR-J3-B	Servomotor

(3) PLCs

Power supply module L61P	CPU module L26CPU-BT or L02CPU	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		

(4) Cables

USB cable MR-J3USBCBL3M (USB A type – USB mini B type)	Encoder cable	Motor power supply cable	SSCNET III Cable MR-J3BUS□M

(5) Software

MELSOFT programming tool GX Works2 SW1DNC-GXW2-E Version 1.48A or later	Servo amplifier setup software MR Configurator2 SW1DNC-MRC2-E Version 1.01B or later

(6) Power distribution devices

No fuse circuit breaker (NFB)	Magnetic contactor (MC)	Circuit protector (CP)

2.3 Startup procedures

This section describes the operations and steps of items needed for starting up the system.

2.1 System which combines LD77MH and MR-J3- B.	

2.2 Preparing devices	

2.3 Startup procedures	

2.4 Installing modules	(1) Installing modules (2) Installing batteries (3) Installing DIN rails

2.5 Wiring and connecting cables	(1) Wiring the power supply module (2) Wiring the power supply and the motor power to the servo amplifier (3) Setting the servo amplifier axis select rotary switch (4) Connecting various cables (5) Checking if the power is properly turned on

2.6 Installing application software	(1) Installing MELSOFT GX Works2 (2) Installing MR Configurator2 (3) Checking the startup of MELSOFT GX Works2

2.7 Creating sequence programs by using GX Works2	(1) Creating a new project (2) Creating sequence programs (3) Saving a sequence program as a project (4) Connecting CPU module and personal computer (5) Format of the CPU module (6) Writing the sequence program to the PLC CPU

2.8 Creating parameter and positioning data by using Simple Motion Module Setting Tool	(1) Adding a Simple Motion Module (2) Starting the Simple Motion Module Setting Tool (3) Creating a new project (4) Setting the system setting (5) Parameter setting (6) Servo parameter setting (7) Positioning data setting (8) Saving a Simple Motion Module as a project (9) Writing to the Simple Motion Module

2.9 Operation check	(1) JOG operation (for checking the rotation direction, the electronic gear setting etc.) (2) OPR (for checking a home position) (3) Positioning control

2.4 Installing modules

Install the prepared modules.
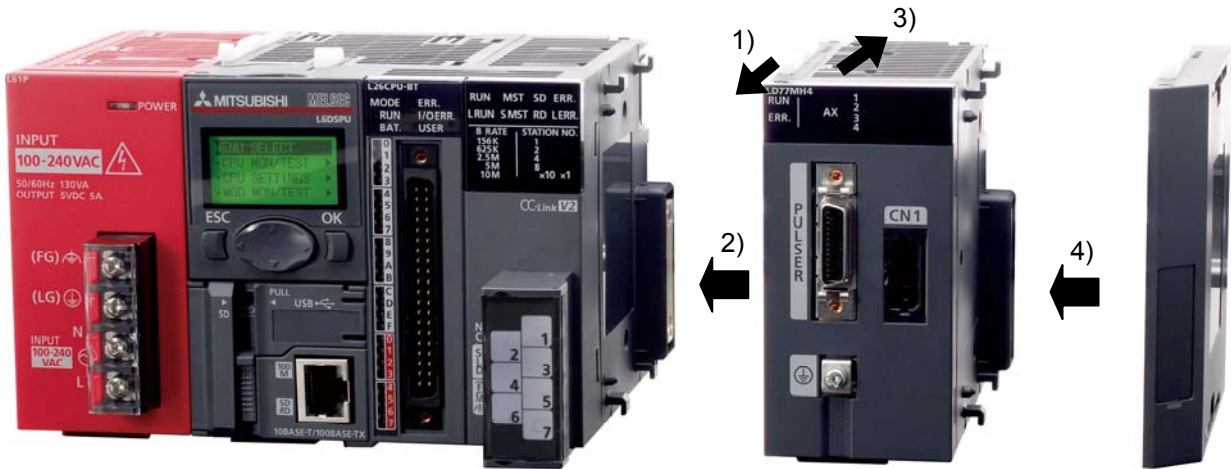
(1) Installing modules

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 1) to 3) to install the END cover.

5) Completed

(2) Installing batteries

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

(3) Installing DIN rails

Install the module to DIN rails.

(4) Installation completed

6

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 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.

(1) Wiring the power supply module

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.

Item	Applicable wire size	Tightening torque
Power supply wires	0.75 to 2mm^2 (AWG18 to AWG14)	0.59 to 0.88N•m
Grounding wire	0.75 to 2mm^2 (AWG18 to AWG14)	0.59 to 0.88N•m

CP

AWG14

To the following figure 1)

Grounding

CP: Abbreviation for Circuit Protector
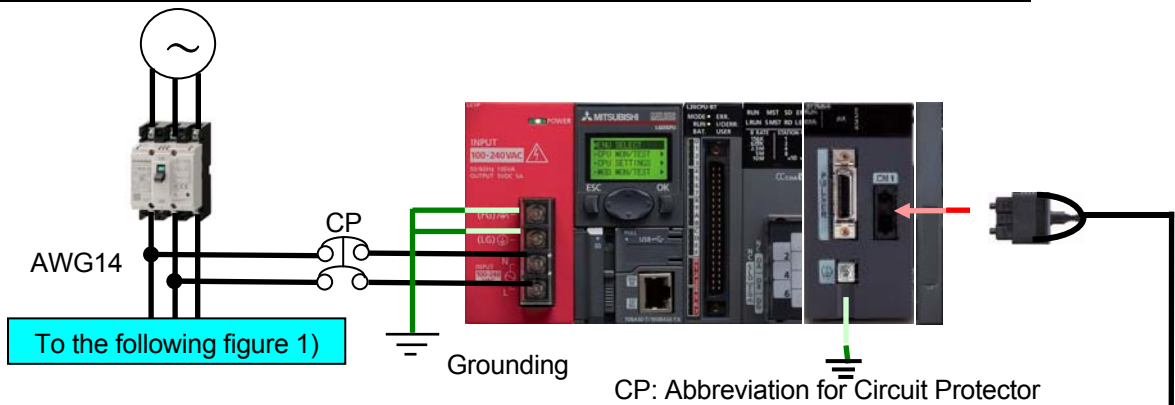
(2) Wiring the power supply and the motor power to the servo amplifier

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.

Item	Applicable wire size	Tightening torque
Control circuit power (L11, L21)	1.25mm^2 (AWG16)	-
Main circuit power (L1, L2, L3)	2mm^2 (AWG14)	-
Motor power line (U, V, W)	1.25mm^2 (AWG16)	-
Grounding wire	1.25mm^2 (AWG16)	1.2N•m

1)

AWG14

L1
L2
L3

AWG16

L11

L21

AWG16

AWG16

Grounding

Next page

7
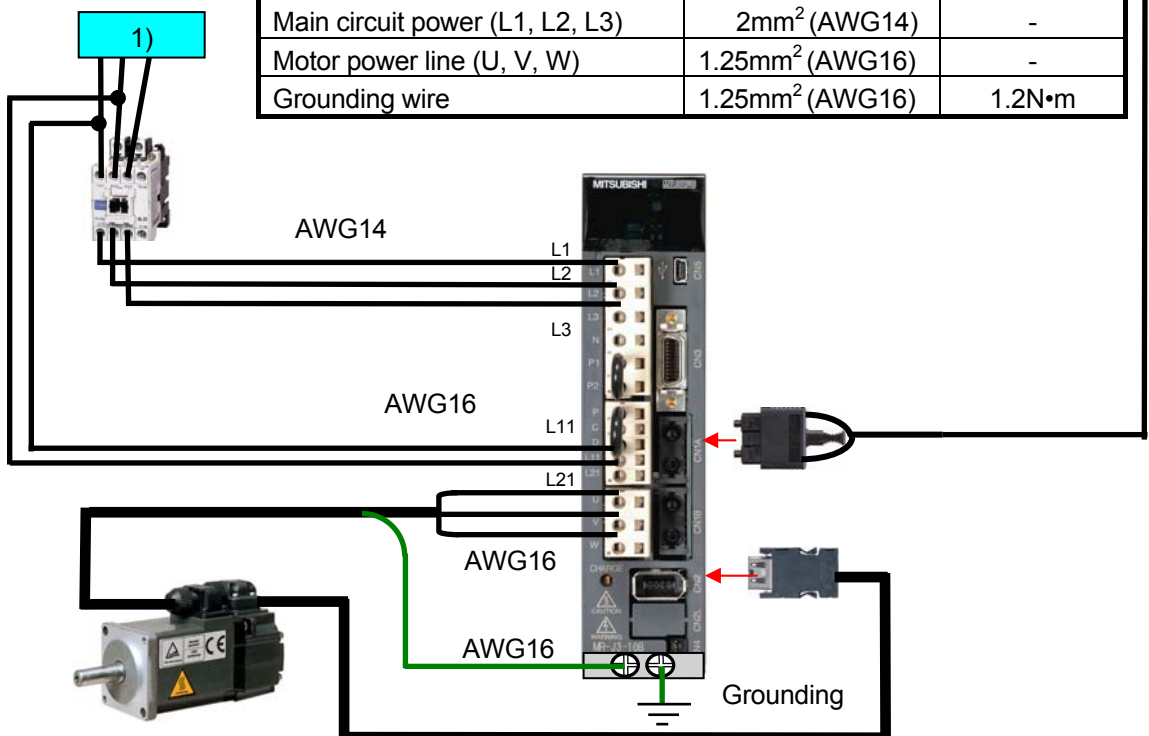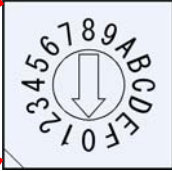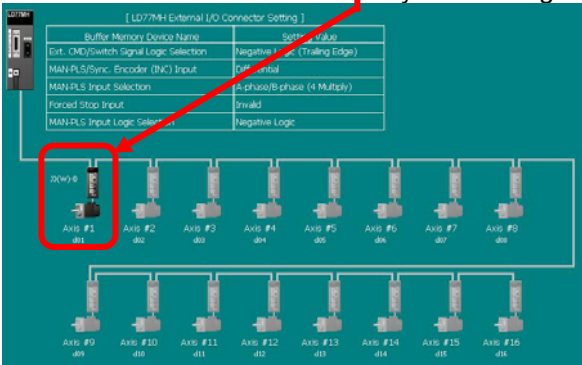
(3) Setting the servo amplifier axis select rotary switch

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.

MR-J3-▢B	Axis select rotary switch	Description					
Cover is opened		Axis select rotary switch	dno.	Axis No	Axis select rotary switch	dno.	Axis No
		"0"	d01	Axis 1	"8"	d09	Axis 9
		"1"	d02	Axis 2	"9"	d10	Axis 10
Servo amplifier		"2"	d03	Axis 3	"A"	d11	Axis11
		"3"	d04	Axis 4	"B"	d12	Axis 12
		"4"	d05	Axis 5	"C"	d13	Axis 13
		"5"	d06	Axis 6	"D"	d14	Axis 14
		"6"	d07	Axis 7	"E"	d15	Axis15
		"7"	d08	Axis 8	"F"	d16	Axis16

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

Refer to Section 2.8 for details of system setting.

(4) Connecting various cables

Connect the SSCNETIII cable and the encoder cable. Connect the USB cable between personal computer and PLC CPU. (Refer to Section 2.1)

Next page

(5) 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.

(a)   (b)
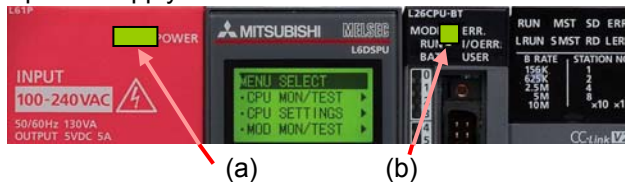
(a) Power supply module: LED (Green) is lit.

(b) CPU module: MODE LED (Green) is lit.

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.

Servo amplifier	LED display	Status	Description	Wiring result
	AA	Initializing standby	The power supply of the LD77MH is turned off.	Normal
	Ab	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.	
	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	-	The control power supply is turned off.	Error

<Countermeasures>

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.

(6) 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.

(1) Installing MELSOFT GX Works2

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

Item	Model name	Overview	Supported version
MELSOFT GX Works2	SW1DNC-GXW2-E	1) Mitsubishi IQ Platform-compatible Programmable Controller Engineering Software (Integrated software of programming, simulation, module settings and monitoring tool function)	1.48A

MELSOFT
GX Works2

(2) Installing MR Configurator2

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

Item	Model name	Overview	Supported version
MR Configurator2	SW1DNC-MRC2-E	1) Parameter settings and adjustment of servo amplifier (Parameter settings, monitoring and graphs)	1.01B or later

(3) Checking the startup of MELSOFT GX Works2

1) Creating an icon of MELSOFT GX Works2.

Select [Start] → [All Programs] → [MELSOFT Application] → [GX Works2] → [GX Works2].
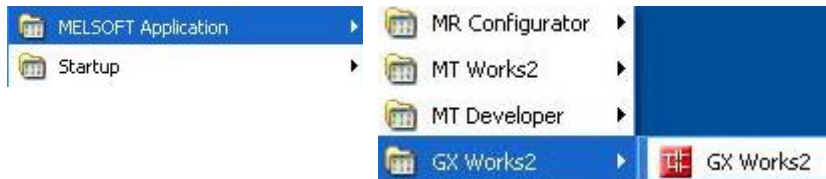
And then, the icon can be created on desktop by right-clicking to select [Send To] → [Desktop (Create Shortcut)].
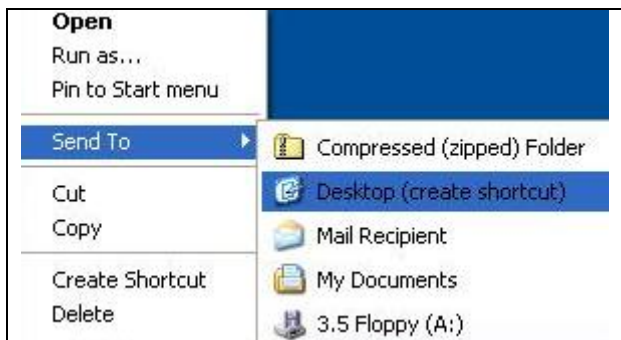
2) Starting MELSOFT GX Works2

• When there is an icon

Double-click to start MELSOFT GX Works2

• When there is no icon

Click [Start] → [All Programs] → [MELSOFT Application] → [GX Works2] → [GX Works2] to start the software.

The main screen of GX Works2 will appear.
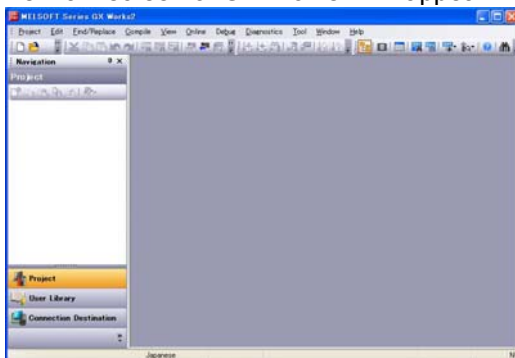
(4) Completed

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.

(1) Creating a new project

1) Starting MELSOFT GX Works2

Double-click [GX Works2 icon] to start MELSOFT GX Works2

2) Creating a new project

A project contains programs, device comments and parameters.
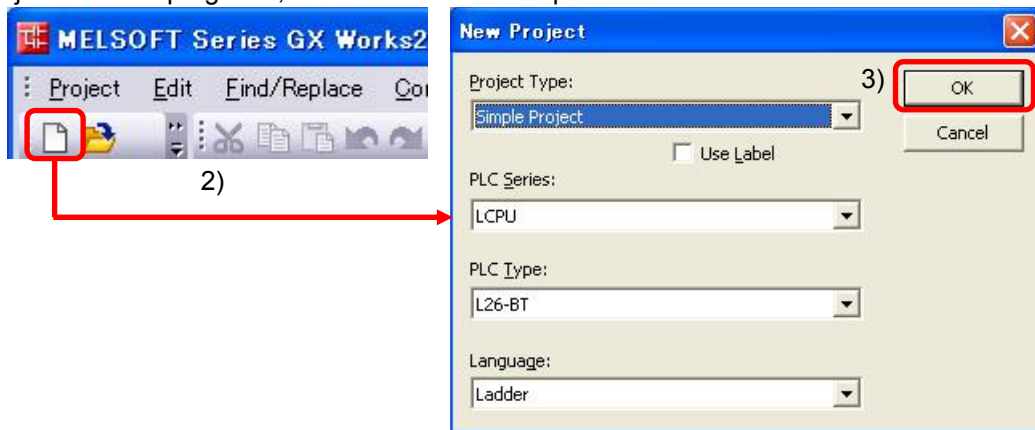
Project Type	: Simple Project
PLC Series	: LCPU
PLC Type	: L26-BT (This section explains the method with an example of using L26CPU-BT.)
Programming Language	: Ladder
Use Label	: Not Use

3) Displaying the main screen

Click the OK button to display a project tree and circuit screen on the main screen.
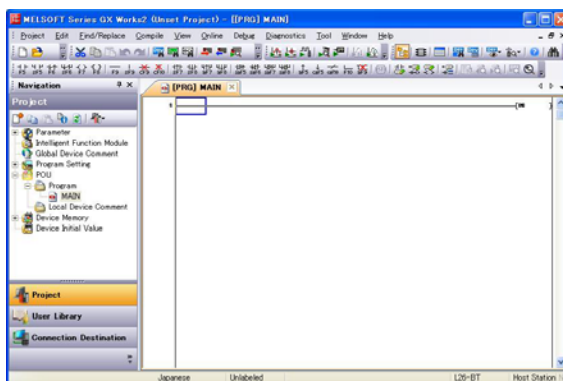
4) New project creation completed

(2) Creating sequence programs

For the next step, create a sequence program.

For the details, refer to the related manuals written in "1.2 Related manuals (2) MELSEC-L series programmable logic controller".

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

1) Sample data

[Sample data of LD77MH]

Item	Project name	Description
LD77MH sample data	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)

2) Unpacking the LD77MH sample data

Unpack the LD77MH sample data into any folder.

Item	Packed data
LD77MH sample data	ld77mhe_00c

3) Reading sequence programs

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

(a) Select [Project] → [Open Project] from the menu.

(b) Click the [Browse] button to select the folder in which the project is saved.

(c) Select the project.

Next page

13
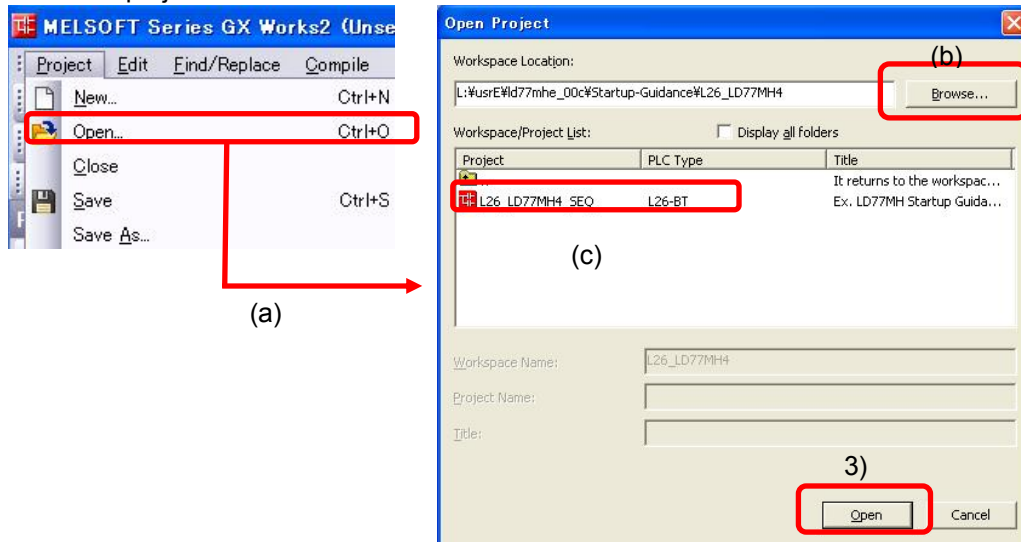
4) Displaying the main screen

Click the [Open] button to display the main screen.
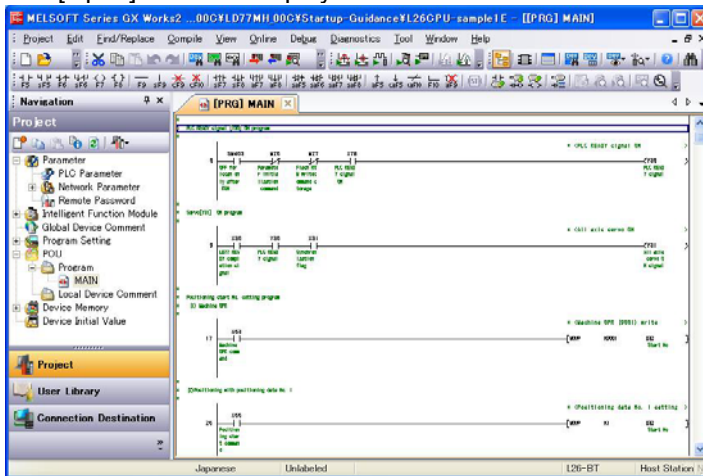
5) Sequence program completed

(3) Saving a sequence program as a project

1) Select [Project] → [Save As] from the menu.

2) Select [Browse] to specify the save destination path.

3) Enter any names (for workspace, project and title).

Make sure not to overwrite to the original project.

4) Click the [Save] button.

5) To save the project, click the [Yes] button.
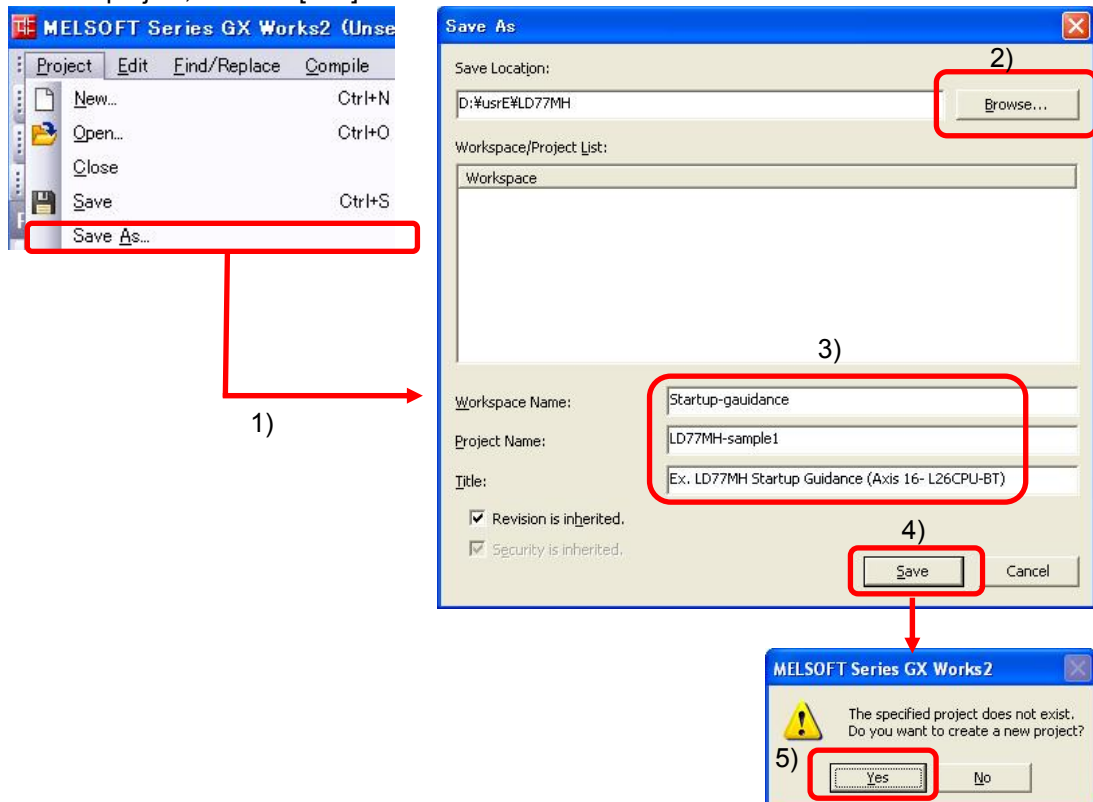
6) Saving projects completed

(4) Connecting CPU module and personal computer
Write sequence programs to PLC CPU.

1) Connecting CPU module and personal computer

2) PLC power supply ON
Turn on the power of the power supply module.

3) Connection settings of GX Works2 and PLC
Click the [Connection Destination] and double-click the [Connection 1] button.
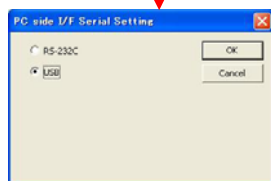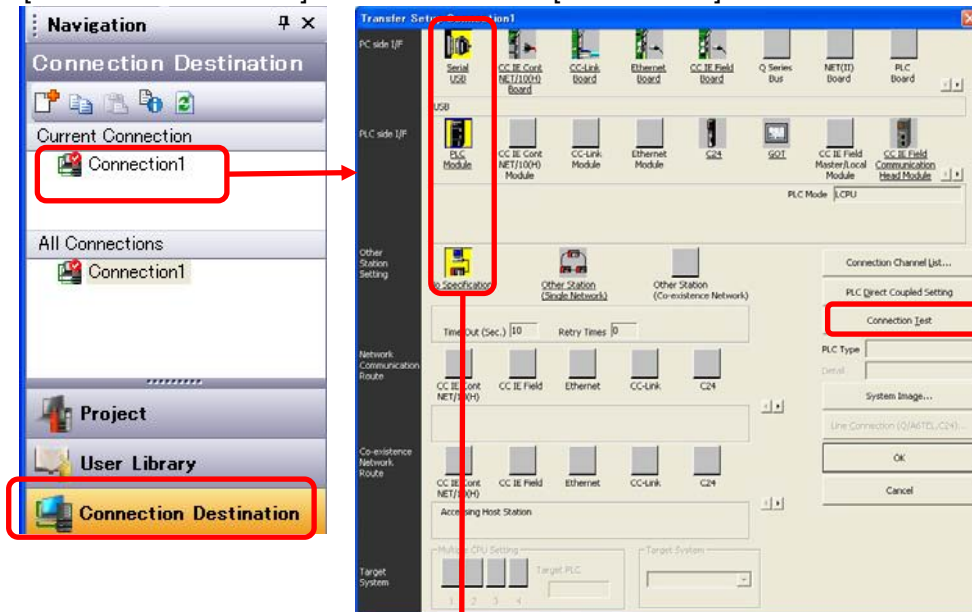
Double-click [Serial USB] on PC side I/F to display the screen shown left.

Select "USB".
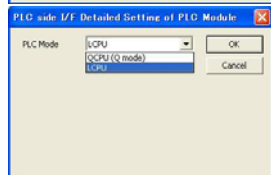
Double-click [CPU Module] on PLC side I/F to display the screen shown left.

Select "LCPU".

Select "No Specification" in specification of Other Stations Setting.

Press the button of the connection test.
When the procedure is completed without error, the connection completion screen will appear.

4) Connecting CPU module and personal computer completed

(5) Format of the CPU module

1) Format of the CPU module

Select [Online] → [PLC Memory Operation] → [PLC Memory Format] from the menu.
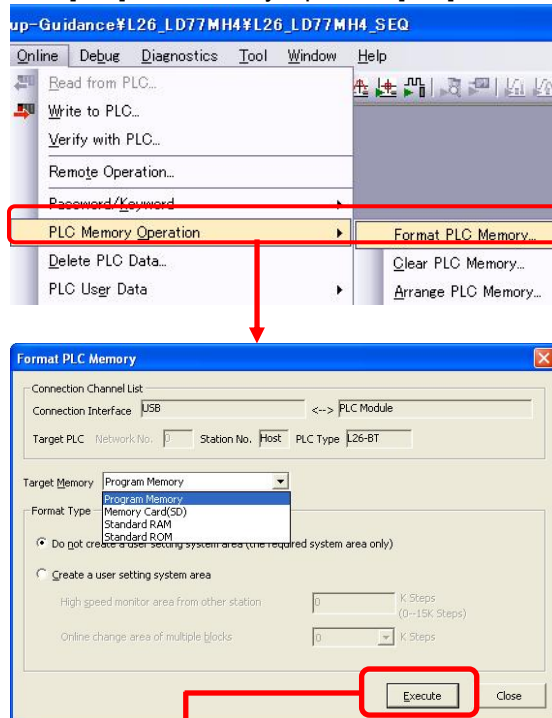
Select [Program memory/Device memory] from the target memory.

2) Click the [Execute] button to display the memory format confirmation screen.
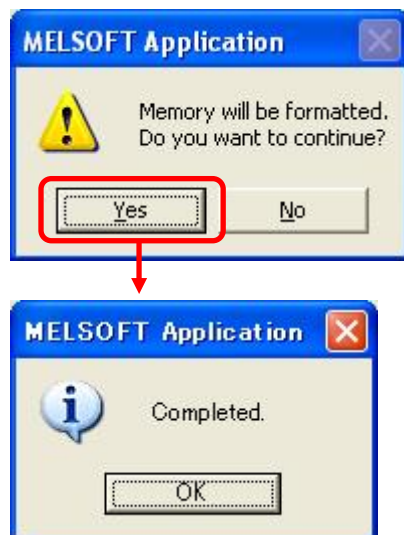
3) Memory format completed

(6) Writing the sequence program to the PLC CPU

Open the front side cover of CPU module, and place the switch to the position of STOP. Then, write data to CPU.

1) Writing to CPU module

Click [Parameter + Program], and also click [Execute] to write to the PLC CPU.
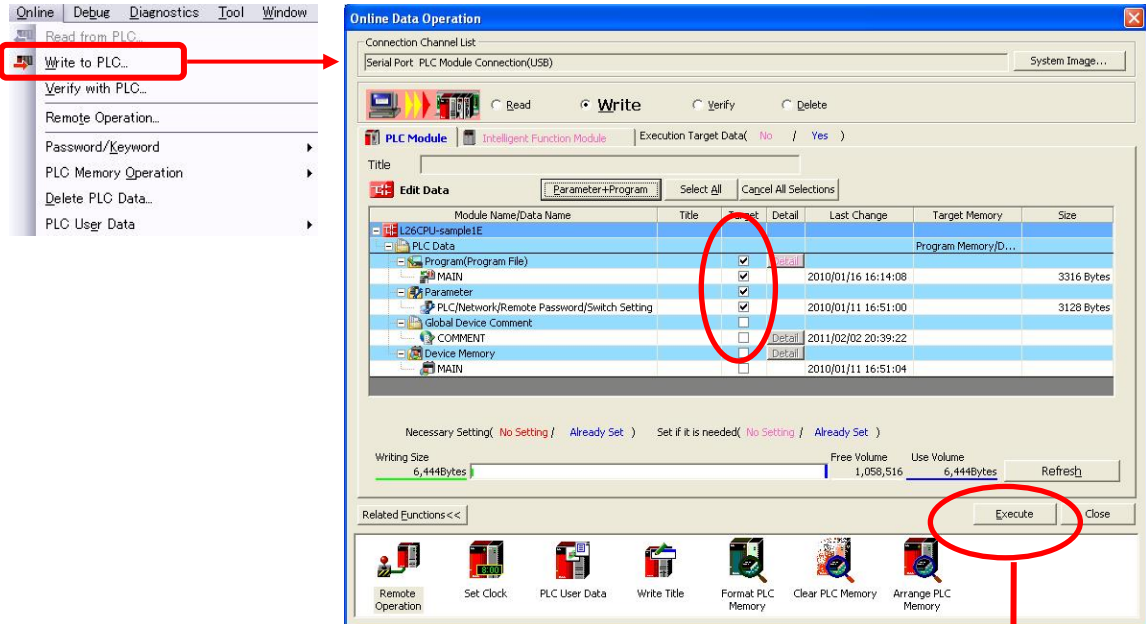
2) Transference to CPU module

Click [Close] to close the window after writing is completed.

Next page

17
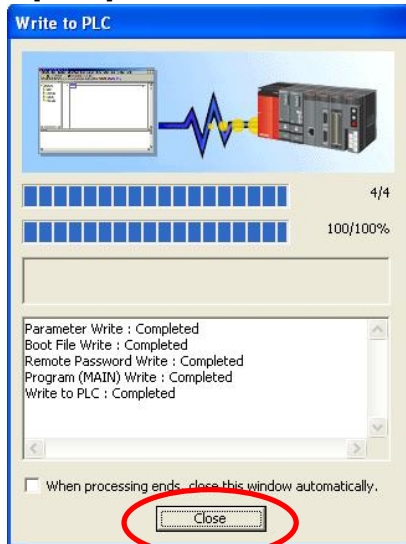
3) Termination of writing to CPU
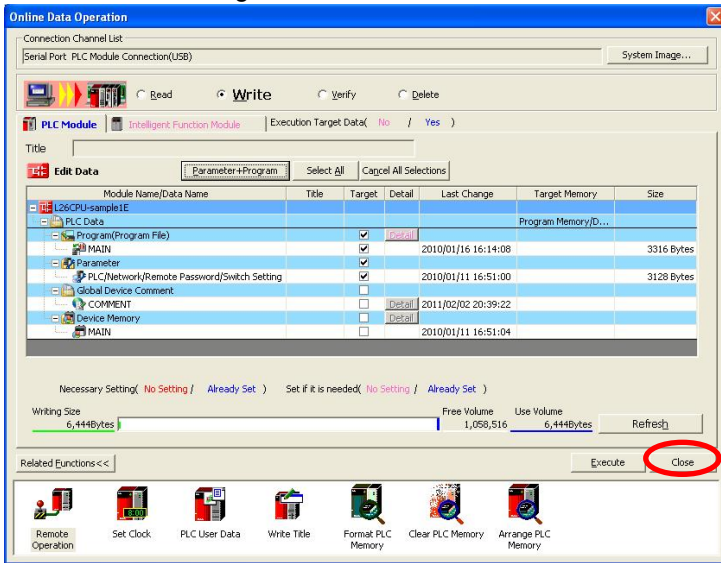
Click [Close] to close the window.

4) Writing to CPU module 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).

(1) Adding a Simple Motion Module

1) Right-click on [Intelligent Function Module] in GX Works2 to select [New Module].
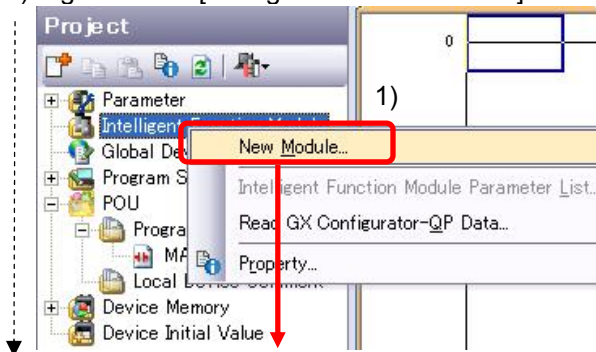
2) Select a module.
The following shows a setting example of when the Simple Motion Module (LD77MH) is connected next to the CPU module.
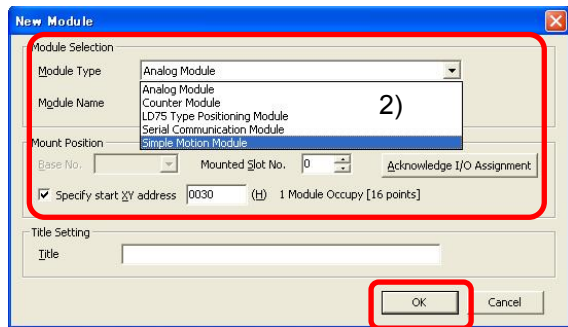
Item	PLC type	
	L02CPU	L26CPU-BT
Module Type	Simple Motion Module	
Module Name	LD77MH4	
Mounted Slot No.	**0**	
Specify start XY address	**0010**	**0030**
Specify start XY address	☑ **(Click the checkbox.)**	
Title	Optional	

3) Click the [OK] button.
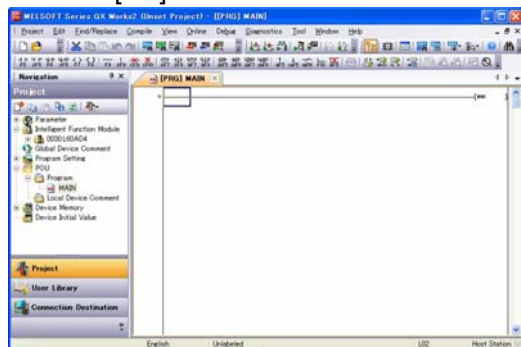
Point
The start address of the Simple Motion Module (LD77MH) differs depending on the combination with CPU module. For details, refer to Appendix 1.

4) Setting completed

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

(2) Starting the Simple Motion Module Setting Tool

1) Double-click the [Simple Motion Module] button to start the Simple Motion Module Setting Tool.
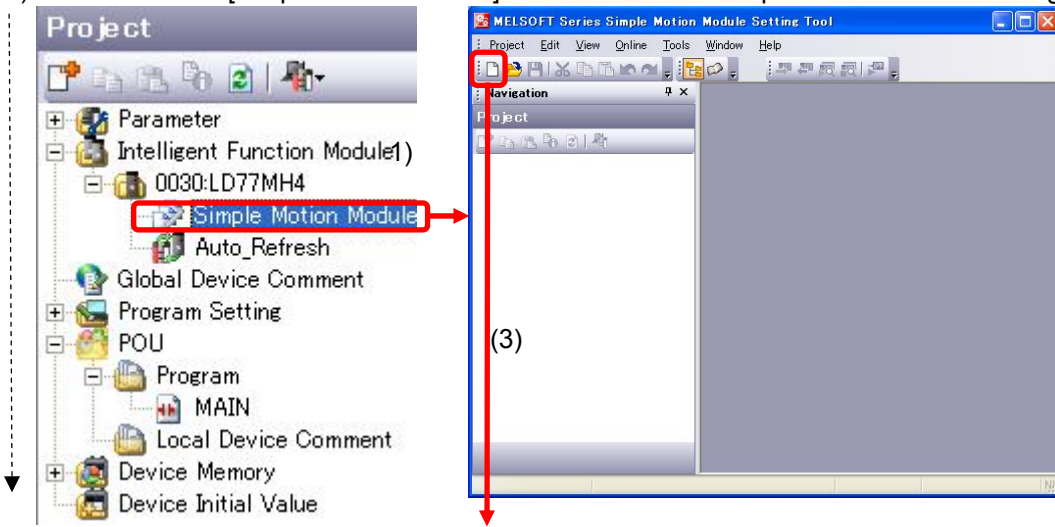
(3) Creating a new project

1) Click the [New] button.

Item	PLC type	
	L02CPU	L26CPU-BT
Module type	Simple Motion Module	
Module name	LD77MH4	
Specify start XY address	**0010**	**0030**
Title	Optional	
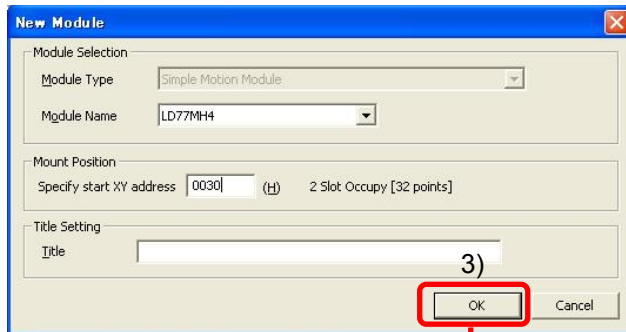
Module type:
　　　Simple Motion Module
Module name　　　　　: LD77MH4
Specify start XY address　: 0030

2) Click the [OK] button to add LD77MH to the intelligent function module of the project.
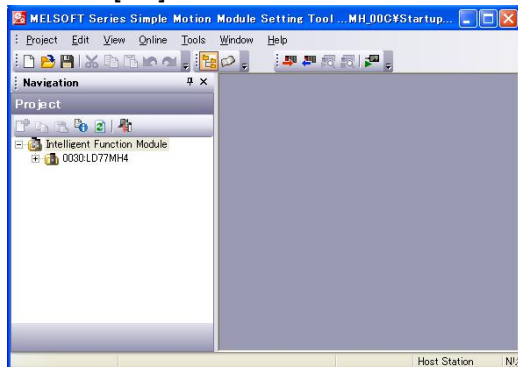
3) Continue to (4) Setting the system setting.

(4) Setting the system setting

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

1) Double-click the [Intelligent Function Module] → [System Structure] buttons.
2) Double-click the image of the first axis of the servo amplifier.
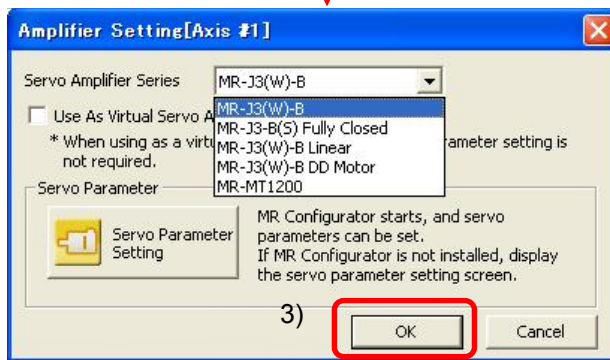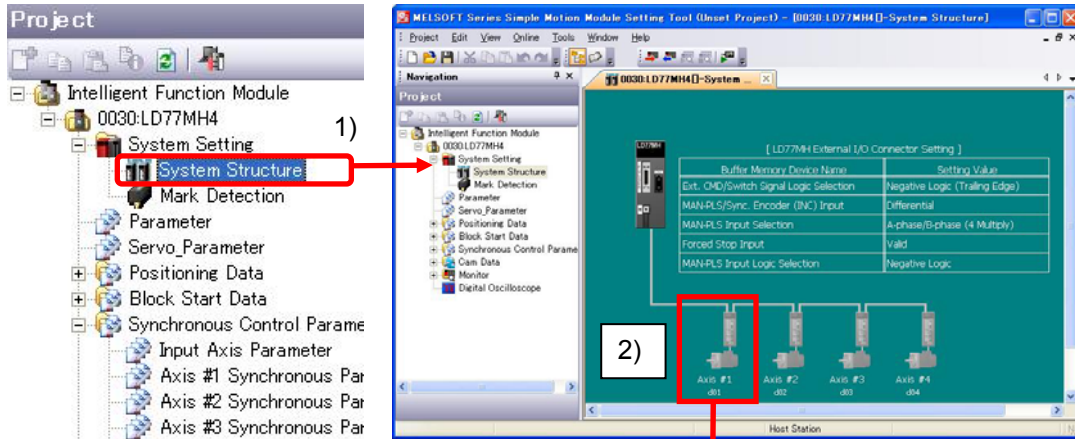
3) Select MR-J3(W)-B and click the [OK] button to display the servo amplifier.
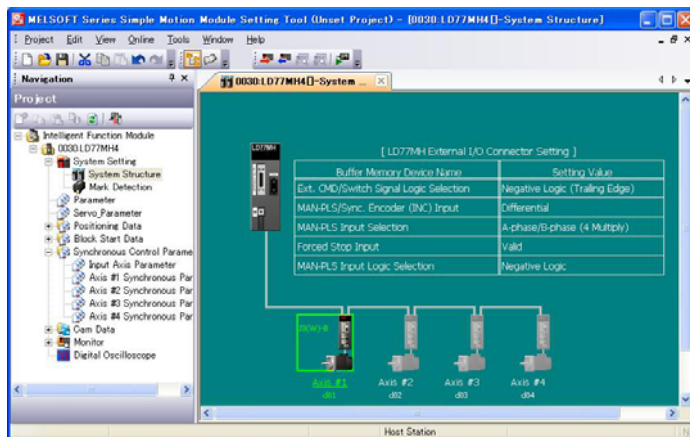
4) System configuration setting completed

(5) Parameter setting

1) Double-click the [Intelligent Function Module] → [Parameter] buttons.
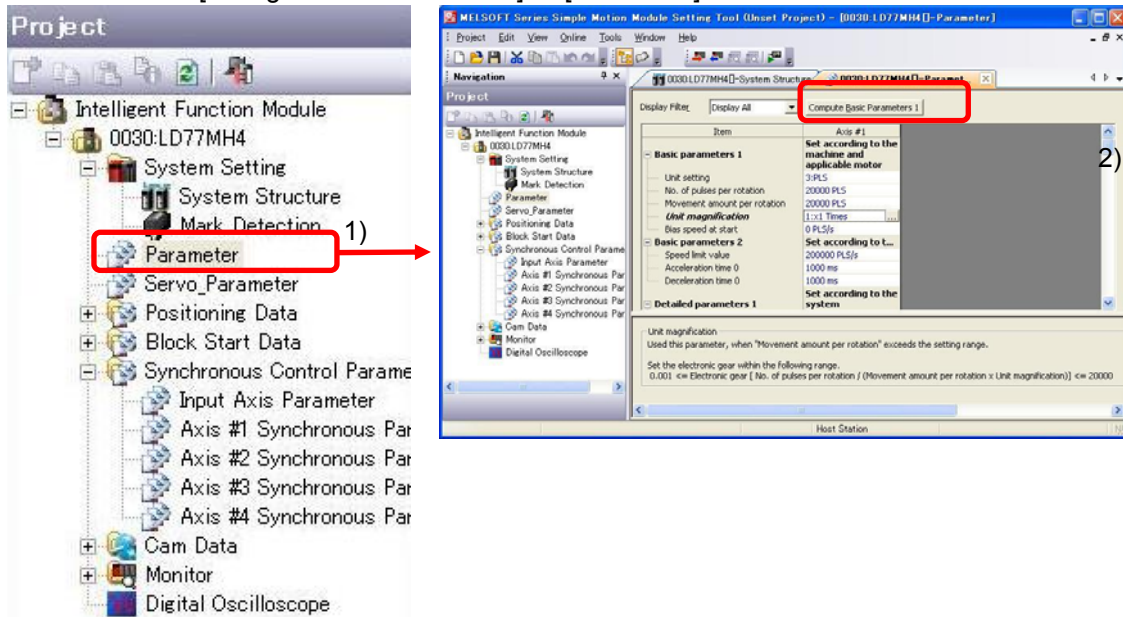
2) Basic parameter setting

   Click the [Compute Basic Parameter 1 (B)] button.

3) Enter a numerical value according to the specification of the device.

   <Device specifications>

   Machine Components   : Ball Screw, Horizontal

   Unit setting   : 0mm

   Lead of Ball Screw   : 10000.0 [μm]

   Reduction ratio (NL/NM)   : 1/2 (Load side [NL]/Motor side [NM]) Motor side makes two rotations while the load side makes one.

   Encoder Resolution   : 262144 [PLS/rev]

4) Click the [Compute Basic Parameters 1] button.

5) The calculation result is reflected to the parameter by clicking the [OK] button.

22
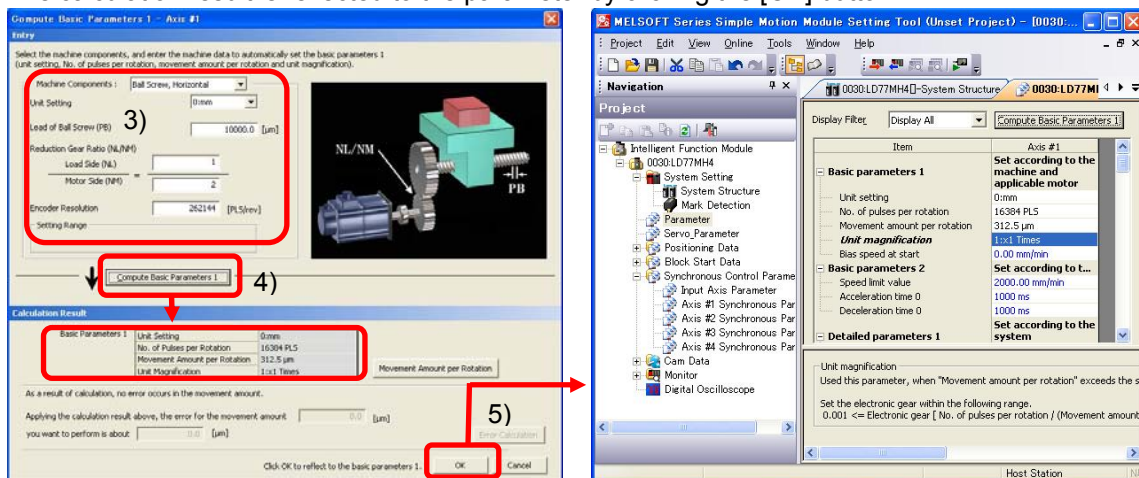
6) Set other parameters.

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.

> | Point |
> | --- |
> | (a) 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. |
> | (b) 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	**0: mm**
	Number of pulses per revolution	**16384 [PLS] (262144 [PLS])**
	Movement amount per revolution	**312.5 [μm] (5000.0 [μm])**
	Unit magnification	**1: × 1 time**
	Bias speed at start	0.00 mm/min
Basic parameters 2	Speed limit value	**30000.00 [mm/min]**
	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	**1: Positive Logic**
	Input signal logic selection : upper limit	**1: Positive Logic**
	Input signal logic selection : Stop signal	0: Negative Logic
	Input signal logic selection: External command/ switching signal	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	**1: Invalid**
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]

Item		Description
Detailed parameters 2	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
	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]
	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	0:Unused
OPR （Original Point Return） basic parameters	OPR method	**6: Data set method**
	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 incompletion 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	1: 1.77 ms

Note 1 : The Operation cycle setting and External command signal selection are used only in a parameter of LD77MH16.

<Example of setting the speed limit value in maximum motor speed>

Ball screw lead　　 : 10.0 [mm]
Servomotor　　　　 : HF-KP13 (262144 [pulse/rev])
Gear　　　　　　　 : 1/2

Speed limit value = Maximum motor selection [r/min] × Gear ratio (n) × Ball screw lead [mm]
　　　　　　　　 = 6000 [r/min] × 1/2 × 10 [mm]
　　　　　　　　 = 30000.00 [mm/min]

7) Parameter setting completed

(6) Servo parameter setting

1) Start MR Configurator2.
   Click the [Servo Parameter Setting] button to start MR Configurator2.
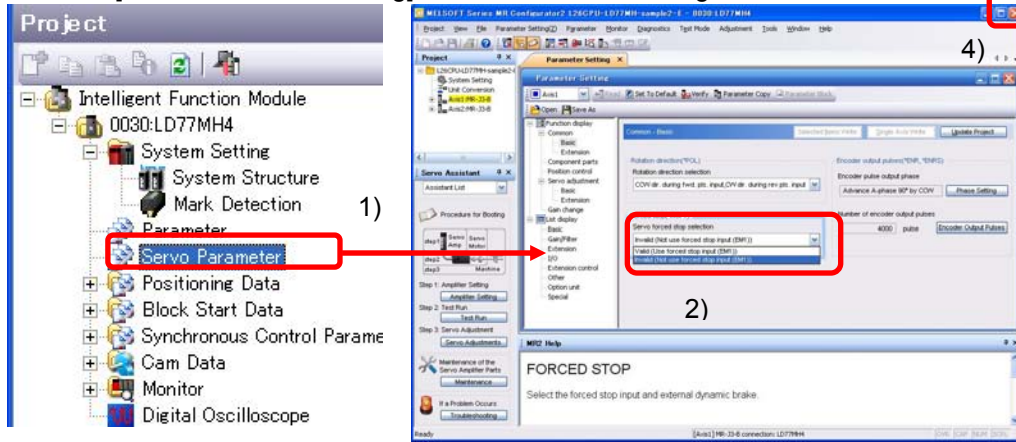
2) Invalidity of forced stop signal
   Select "Invalid (Not use forced stop input (EMI))" in the servo forced stop selection.
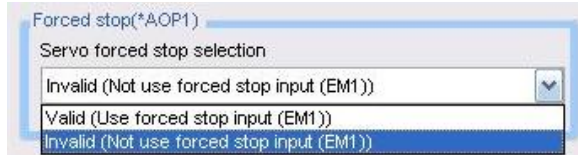
Point
Forced stop input selection specifies whether to load or not the forced stop input signal from the servo amplifier. For safety reasons, the default setting is "Select Forced Stop Input Selection (EM1)". For not loading the forced input signal, change to setting to "Not Select Forced Stop Input Selection (EMI)".

3) Home position set condition selection
   Click [Component parts] to display the component parts screen.
   Select "Z-phase must not be passed." in the home position set condition selection.
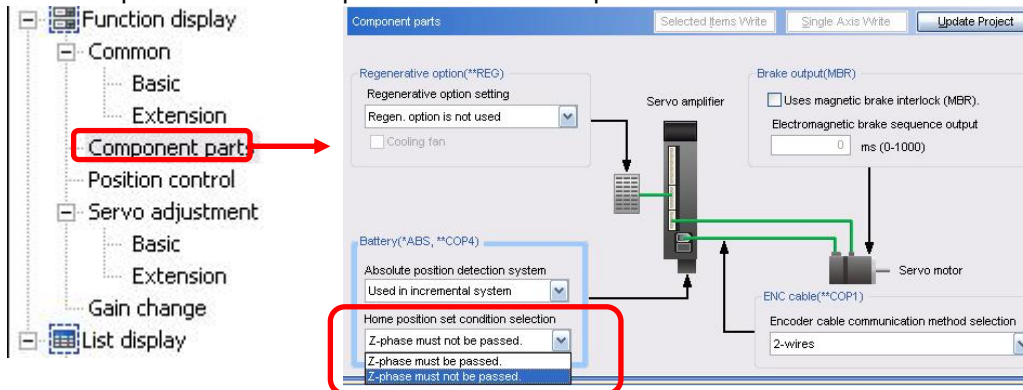
Point
If selecting "Z-phase must not be passed.", it is possible to carried out the home position return (OPR) even though a motor has not turned 1 or more revolutions for home position return.

4) Close MR Configurator2.
   Click the [×] button to display the save confirmation screen of the changed contents.
   Click the [Yes] button to close MR Configurator2.

5) Servo parameter setting completed

(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.

[Operation example of returning the original position after moving to P1]
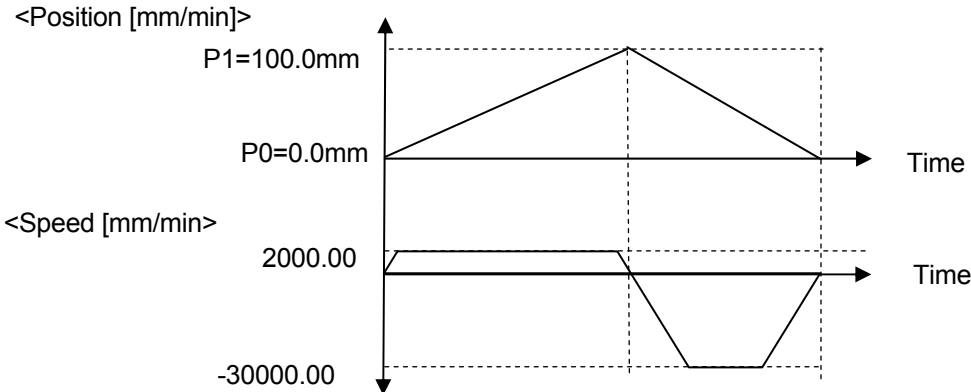
1) Selecting the positioning data

Double-click [Positioning Data Axis 1] to display the positioning data screen.
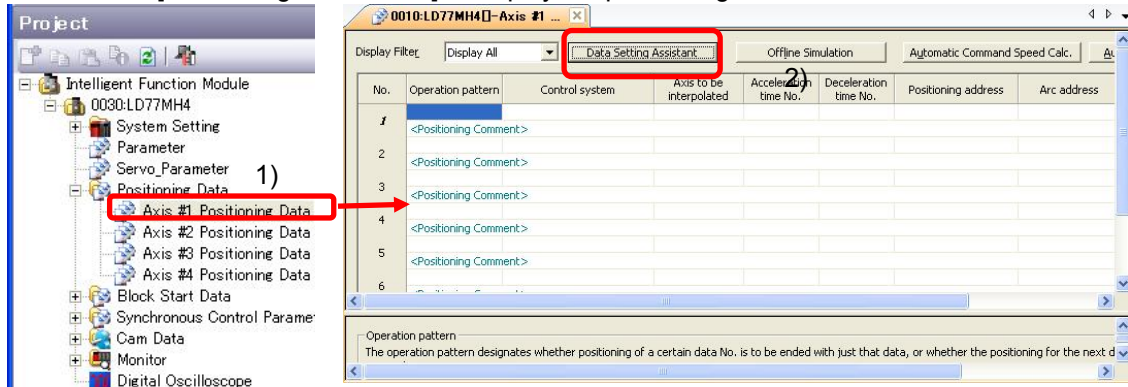
2) Selecting the data setting assistant

Click the [Data Setting Assistant] button to display the screen as follows.

3) Input data for each item and the positioning control system.

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….1: Continuation
Acceleration Time No. ……0: 1000
Deceleration Time No. ……0: 1000
Dwell Time…………………..0: 0 [ms]
M code………………...…0

Next page

4) Click the [Set] button to close the data setting assistant screen and display the positioning data screen.
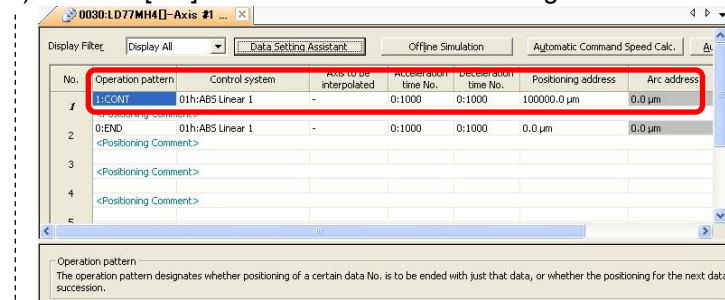
5) Create the command which returns from P1 to the home position in the positioning data No.2 by using the same method.

No.	Operation pattern	Control system	Axis to be interpo-lated	Acceleration time No.	Deceleration time No.	Positioning address	Arc address	Command speed	Dwell time	M code
1	1: Continuation	ABS linear 1	–	1:1000	1:1000	100000.0µm	0.0 µm	2000.00 mm/min	0ms	0
2	0: Completion	ABS linear 1	–	1:1000	1:1000	0.0 µm	0.0 µm	30000.00 mm/min	0ms	0

6) Positioning data completed

(8) Saving a Simple Motion Module as a project

Save a project of the Simple Motion Module.

<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	

1) Select [Project] → [Save As] from the menu.

2) Select [Browse] to specify the save destination path.

3) Enter any names (for workspace, project and title).
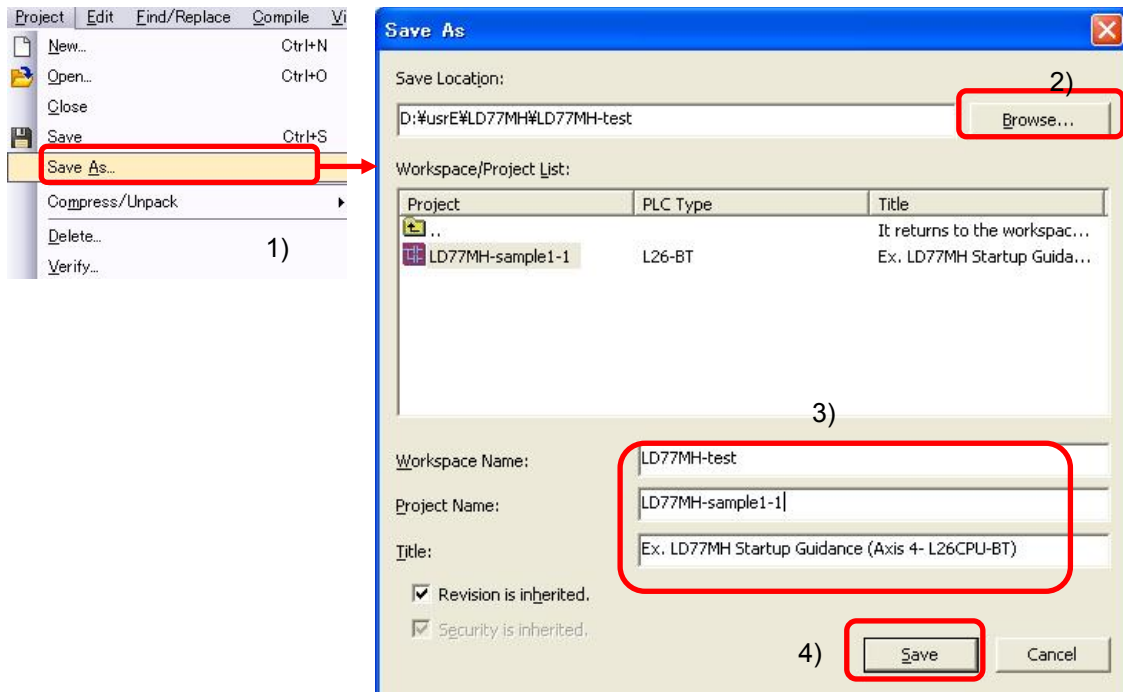
4) Click the [Save] button.

When the new project is saved, the save confirmation screen appears.

5) Saving the project of the Simple Motion Module completed

(9) Writing to the Simple Motion Module

Write parameters and positioning data to the Simple Motion Module.

1) Change the [RESET/RUN/STOP] switch of the PLC CPU module to STOP.

2) Writing to LD77MH

Select [Online] → [Write to Module] to display the screen to write to LD77MH.
After setting [Select All], press the [Execute] button to display the write to module screen.
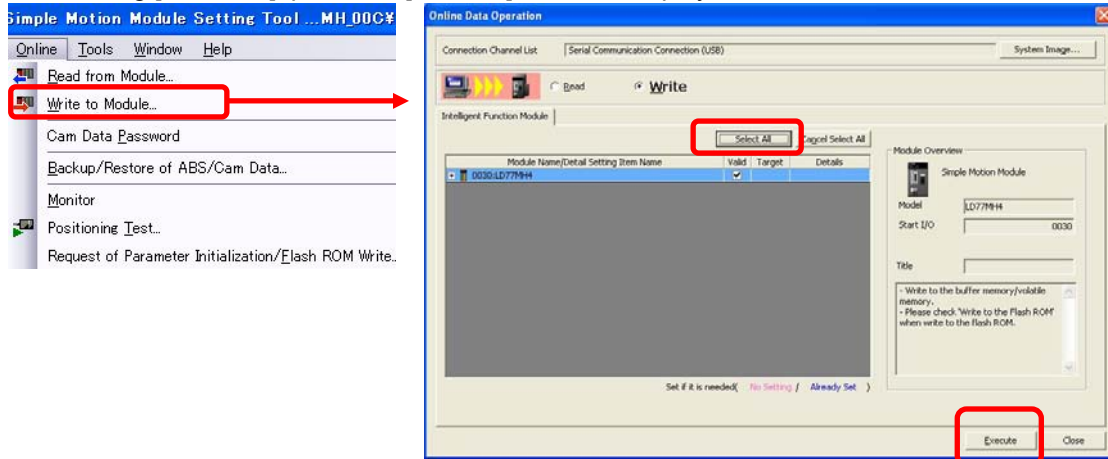
3) Writing flash ROM

Press the [Yes] button to write data to the flash ROM of the Simple Motion Module.
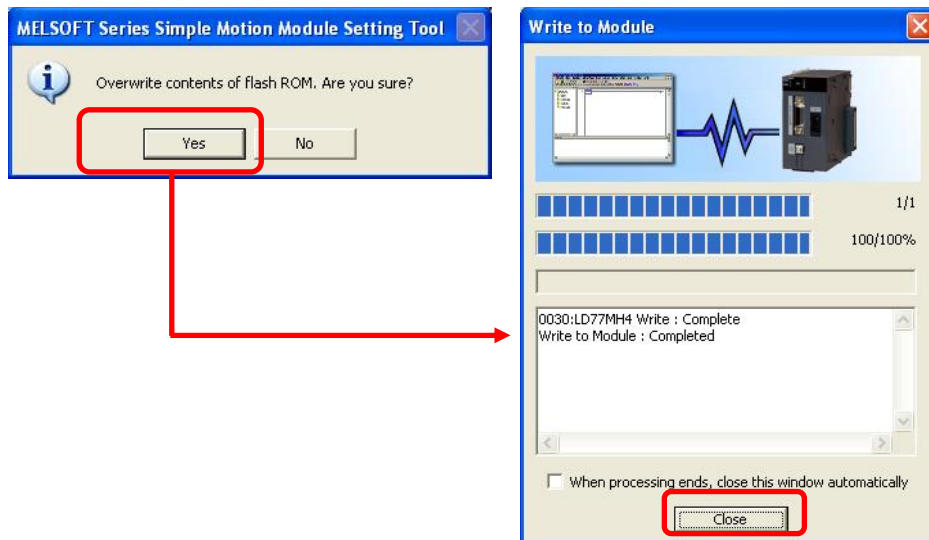
Point
If the data is not written to the flash ROM, the data is erased by turning the power supply OFF to ON.

Next page

29

4) 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.

Point
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 3.2 and 3.3 for a way of the error confirmation.

5) Writing completed

REMARK

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.

1) Sample data.

Item	Project name	Descriptions		Remark
LD77MH sample data	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	Sample data for synchronous control of the simple motion	
	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	Sample data for synchronous control of the simple motion	
	L26-LD77MH16_SYNC	for L26CPU and LD77MH16		

2) Unpacking the download module
   Unpack the download module into any folder.

3) Reading a project
   Read the project from the unpacked sample data
   (a) Select [Project] → [Open Project] from the menu.
   (b) Click the [Browse] button to select the folder in which the project is saved.
   (c) Select a project.
   (d) Click the [Open] button to open the project.
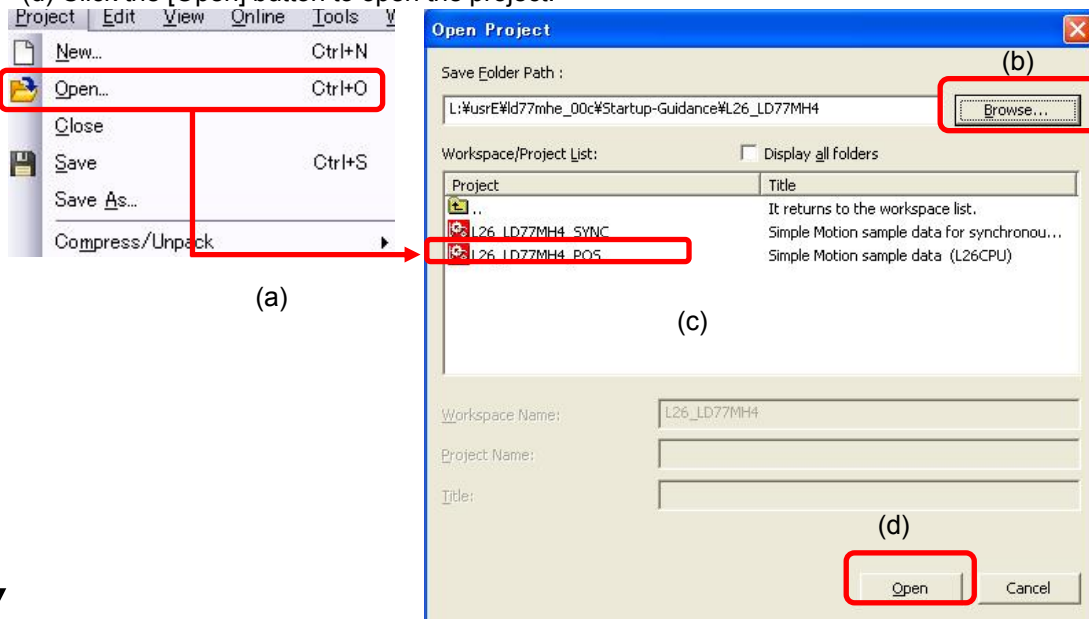
4) Reading the project completed
   The projects provided on MELFANSweb contains the explained contents in this section "(4) Setting the system setting" to "(7) Positioning data setting".

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.

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

1) Change the [RESET/RUN/STOP] switch of the PLC CPU module to RUN.

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.
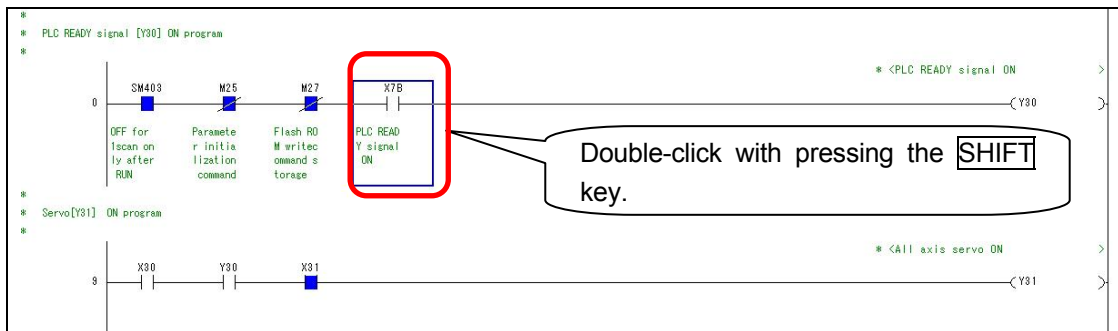

```
Point
```

• 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 the SHIFT key turns.

3) JOG speed setting

Double-click JOG operation speed setting (X5D) with pressing the SHIFT key.
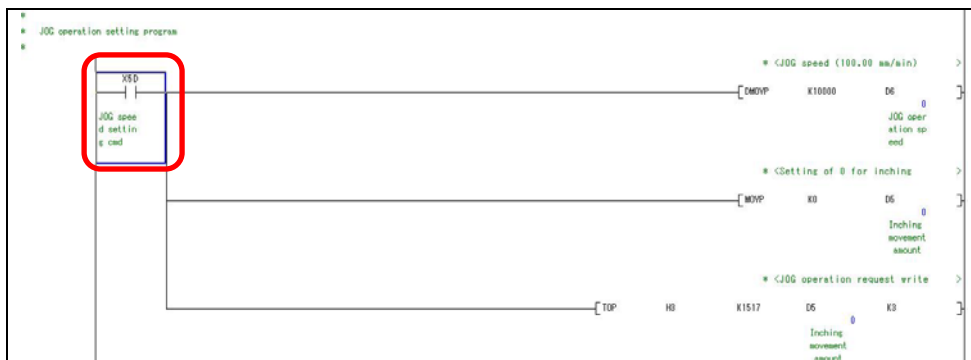
4) JOG starting

Double-click Forward rotation JOG (X5E) with pressing the SHIFT key to turn X5E ON and the axis 1 rotates forward.

Furthermore, double-click Forward rotation JOG (X5E) with pressing the SHIFT key to turn X5E OFF and the axis 1 stops.
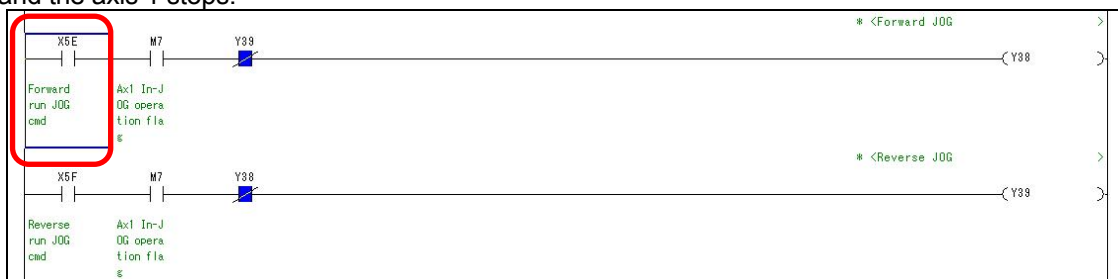
5) Checking JOG operation
   Double-click the [Intelligent Function Module] → [Monitor] → [Module Monitor] → [Axis Monitor]button
      to display the axis monitor initial window.
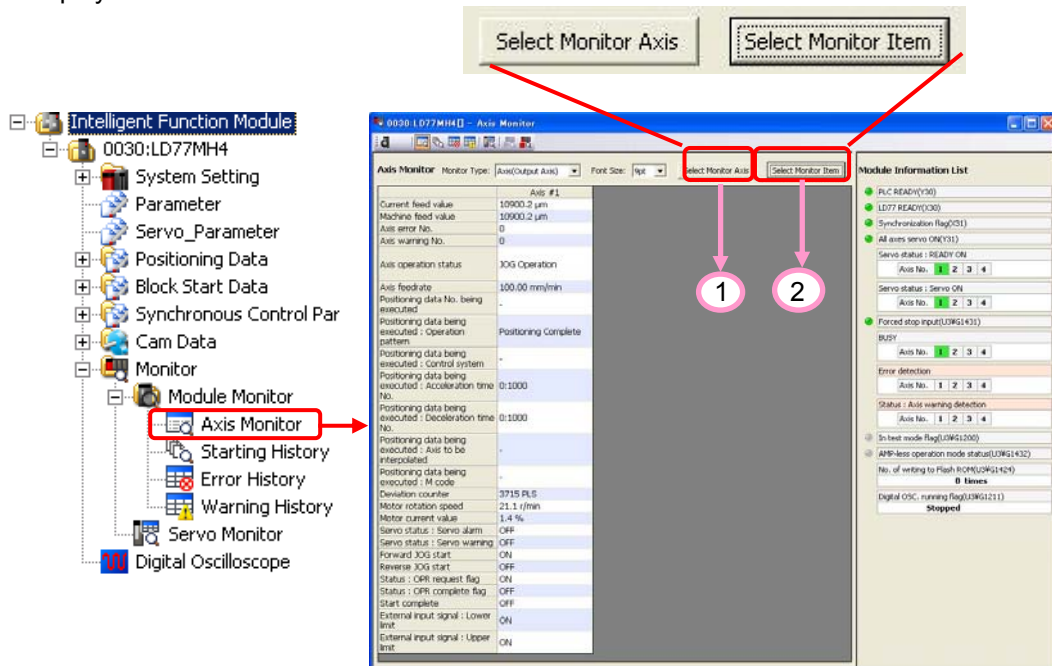
Click [Select Monitor Axis] to display a Axis Monitor screen.
Select the displayed axis.
Click [Select Monitor Item] to display a Axis Monitor screen.
Select the displayed item.
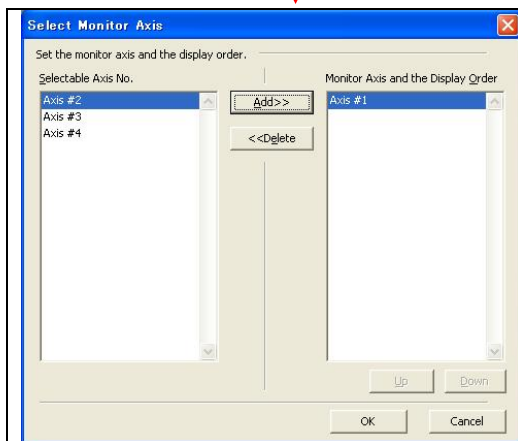
Select Monitor Axis : Axis #1	Select Monitor Item
	Forward JOG start, Reverse JOG start
	Status : OPR request flag
	Status : OPR complete flag
	Start complete
	External input signal : Lower limit
	External input signal : upper limit
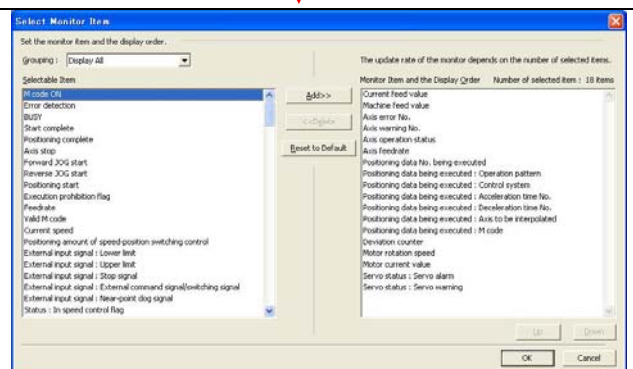
Axis Monitor

Screen	Check Item	Value
	Axis 1 Current feed value Axis 1 Machine feed value	- -
	Axis operation status Axis feed rate	JOG Operation 100.00
	Forward JOG start Reverse JOG start	ON OFF
	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

[Operation check procedure]

Item	Operation	Status
All axis 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.

6) Change of motor rotation direction

Change the motor rotation direction to forward/reverse.
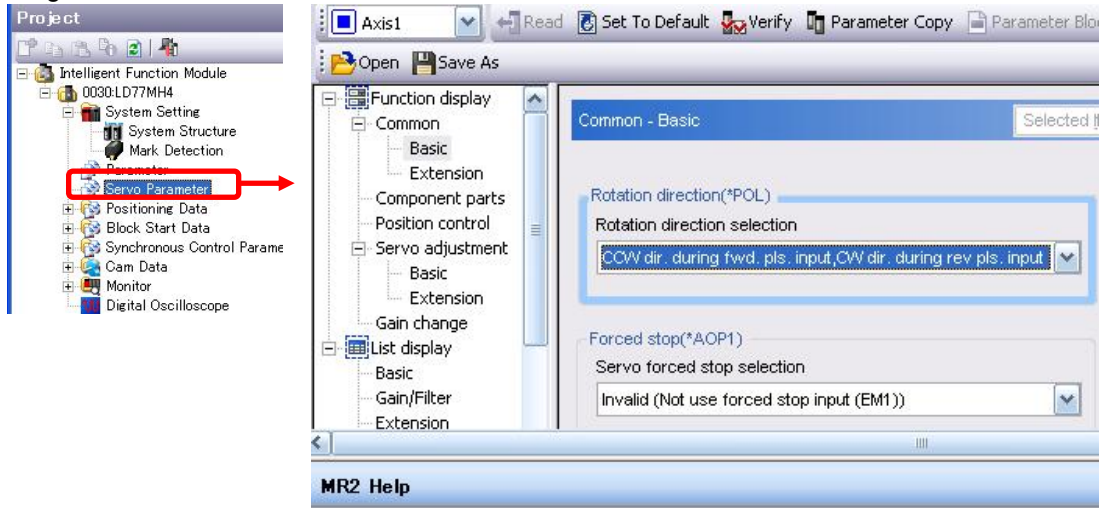
Point

• 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".

CCW direction when the forward pulse is input

CW direction when the reverse pulse is input

CW direction when the forward pulse is input

CCW direction when the reverse pulse is input

7) Completion of the JOG operation check

(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 document 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.

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.
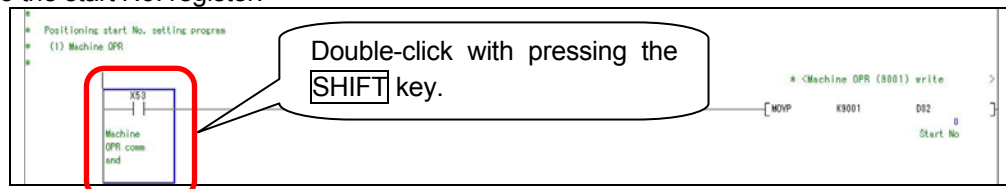
3) Axis 1 OPR start

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.

Next page

3) Checking of axis 1 OPR

Screen	Check item	Value
	Axis 1 Current feed value Axis 1 Machine feed value Axis operation status Axis feedrate	0.0 0.0 Waiting 0.00
	Status: OPR request flag Status: OPR complete flag	OFF ON
	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

4) Completion of axis 1 OPR
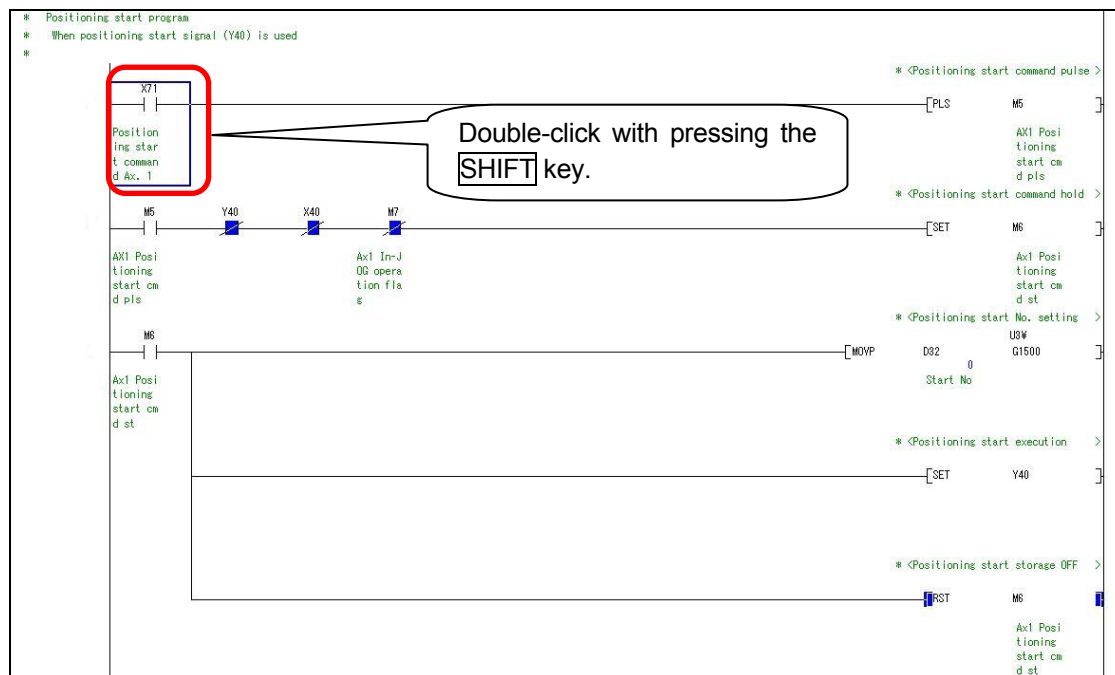
(3) Positioning control

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

[Operation example of returning the original position after moving to P1]
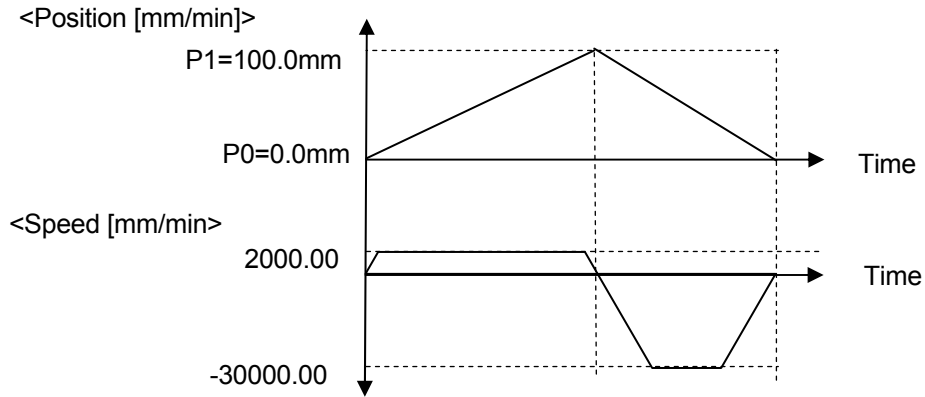
1) To execute positioning

After setting the positioning start number, turn ON the positioning start 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.

2) Setting the axis 1 positioning start No.

Double-click Positioning start command (X55) with pressing the SHIFT key to turn X55 ON and to set 1 to the start No. register.
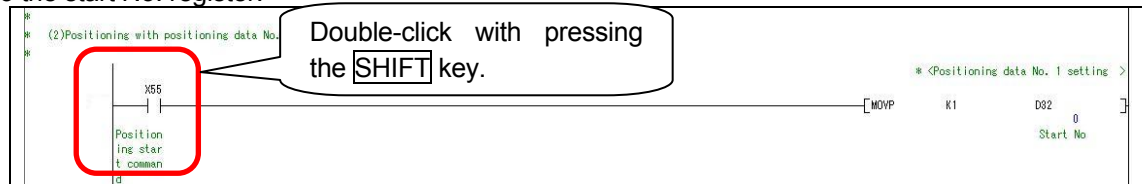
3) Axis 1 positioning start

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
	Axis 1 Current feed value	—
	Axis 1 Machine feed value	—
	Axis operation status	Position Control
	Axis federate	-
	External input signal : Lower limit	ON
	External input signal : upper limit	ON
	PLC READY	ON
	LD77 READY	ON
	Synchronization flag	ON
	All axes servo ON	ON
	Servo status : READY ON	
	Axis 1	ON
	Servo status : Servo ON	
	Axis 1	ON
	BUSY	
	Axis 1	ON
	Error detection	
		none
	Axis warning detection	none

(4) Completion of operation check

3. SYNCHRONOUS CONTROL START-UP

This section 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.

<Running cutoff device>

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

<Specifications>
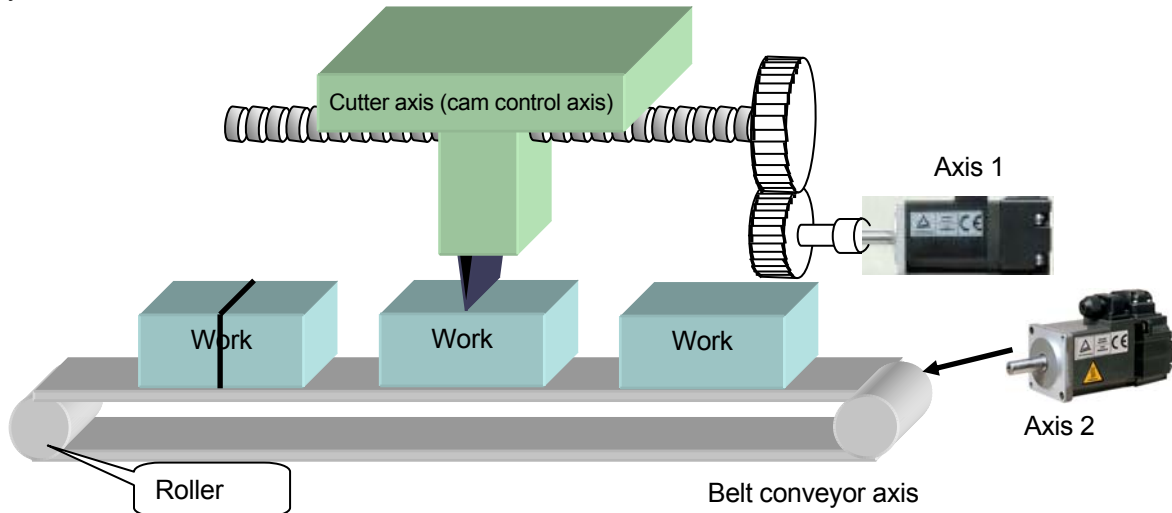
As the roller of the belt conveyer rotates once, a work on the belt conveyor moves for one work size.

(1) Specifications of cutter axis (cam control axis)

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

(2) Specifications of belt conveyor

Roller diameter   : 50mm(Circumference of roller 50mm × π= 157079.6μm)
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.

40
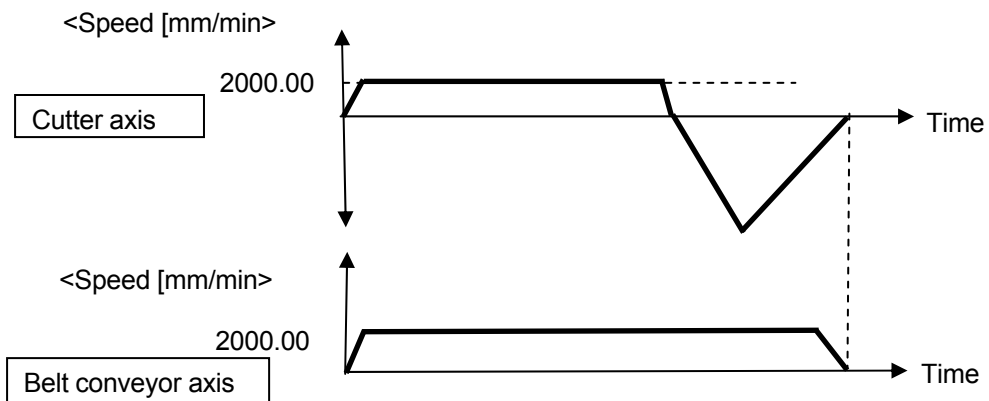
3.1 2-axes System where Synchronous Control is Available

The following shows the configuration example of a system which combines LD77MH4, MR-J3- B and a servomotor.
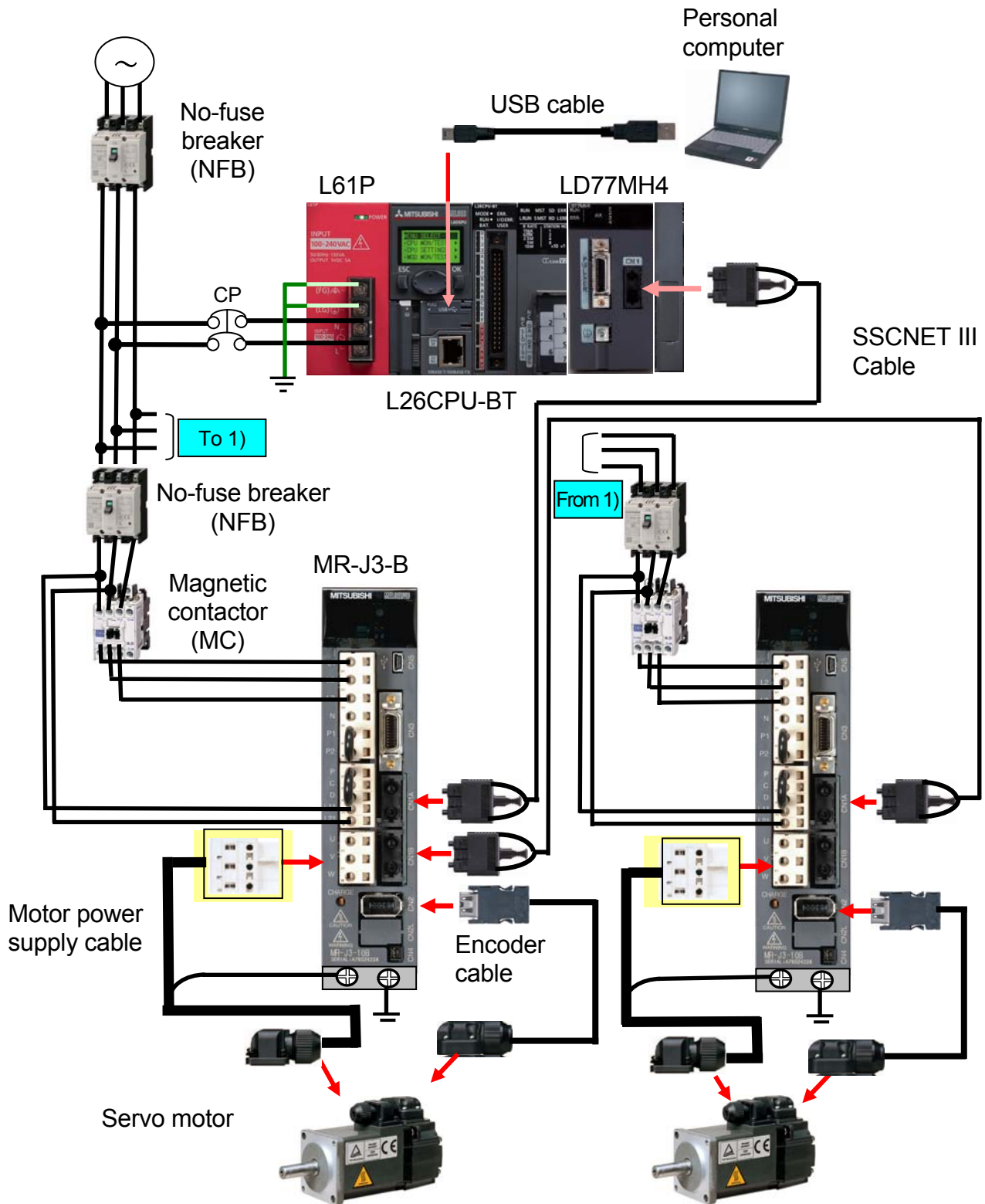
3.2 Start-up Procedure in Synchronous Control

3.1 2-axes system where synchronous control is available	

Preparing devices	Refer to 2.2 Preparing devices.

Installing modules	Refer to 2.4 Installing modules.

Wiring and connecting cables	Refer to 2.5 Wiring and connecting cables

Installing application software	Refer to 2.6 Installing application software

Creating sequence programs for synchronous control	(1) Creating a new project (2) Creating sequence programs (3) Saving a sequence programs as a project (4) Connecting CPU module and personal computer (5) Format the CPU module (6) Writing the sequence program to the PLC CPU

3.3 Creating parameter for synchronous control	(1) Setting the system setting (2) Parameter and servo parameter settings (3) Positioning data setting (4) Synchronous control parameter setting (5) Cam data setting (6) Saving a project (7) Writing to the Simple Motion Module

3.4 Operation check	(1) OPR (for establishing a home position) (2) Start-up of drive axis (3) Operation check of a synchronous axis (4) Operation check with digital oscilloscope

3.3 Creating Parameter for Synchronous Control

(1) Setting the system setting

Set the system configuration of 2-axes system.
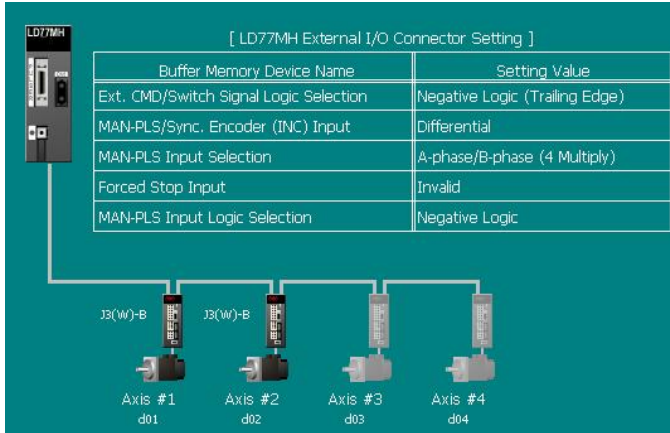
(2) Parameter and servo parameter settings

Set parameters and servo parameters of the axis 1 and 2.

The setting list is given in Appendix 2.

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

[Input]
Machine components   : Conveyor
Unit Setting   : 0:mm
Diameter of Roll   : 50000.0 [μm]
Reduction Gear Ratio (NL/NM)
　Load Side [NL]   : 1
　Motor Side [NM]   : 1
Encoder resolution   : 262144

[Calculation result]
Unit Setting: 0:mm
Number of Pulses per Revolution:
　　　　　　　4625519PLS
Moving Amount per Rotation:
　　　　　　　2771663.0μm
Unit Magnification: 1: × 1 time

(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 of positioning data moving to P1 from home position]

Position of belt conveyor (axis 2)

157.0796mm

0.0mm → Time

If the roller whose diameter is 50 mm rotates one time, the belt conveyor moves for 157.0796 mm.

<Speed [mm/min]>

2000.00

→ Time

Position of cutter axis (axis 1)

100.0mm

0.0mm → Time

Execute the cam control for following the movement of the belt conveyor.
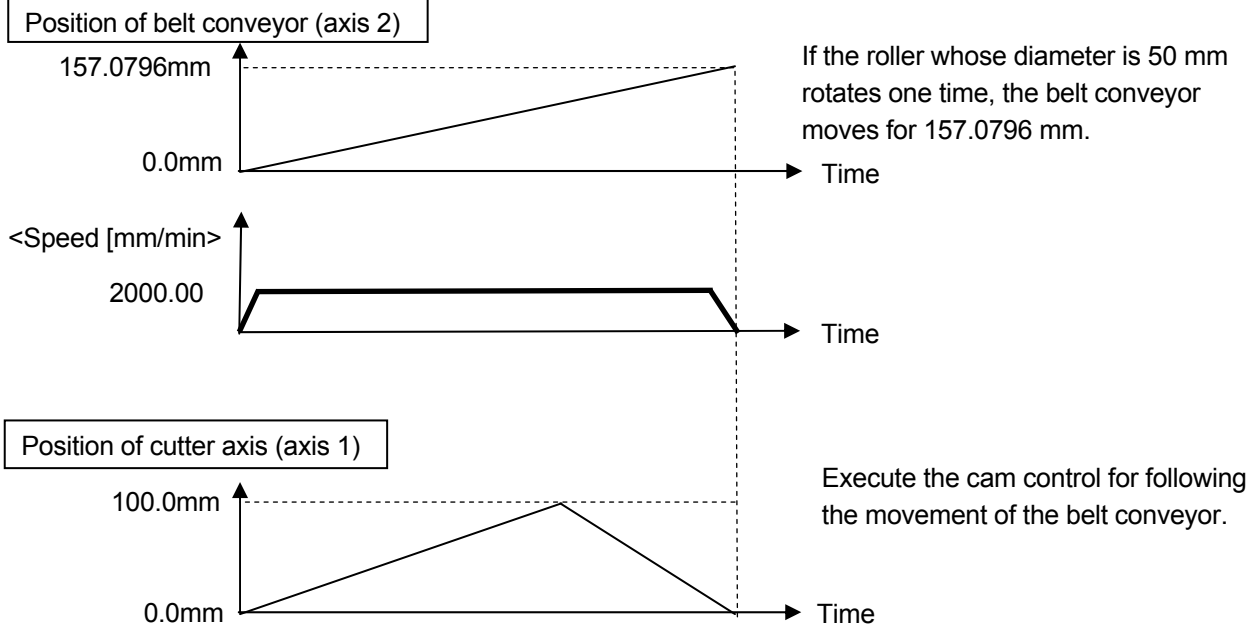
1) Selecting the positioning data

Double-click [Intelligent Function Module] → [LD77MH4] → [Positioning Data] → [Positioning Data Axis #2] to display the positioning data screen.

<Axis 2 Positioning data>

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

(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.

1) Synchronous control parameter screen start-up

Double-click [Intelligent Function Module] → [LD77MH4] → [Synchronous Control Parameter] → [Synchronous Control Parameter Axis 1].
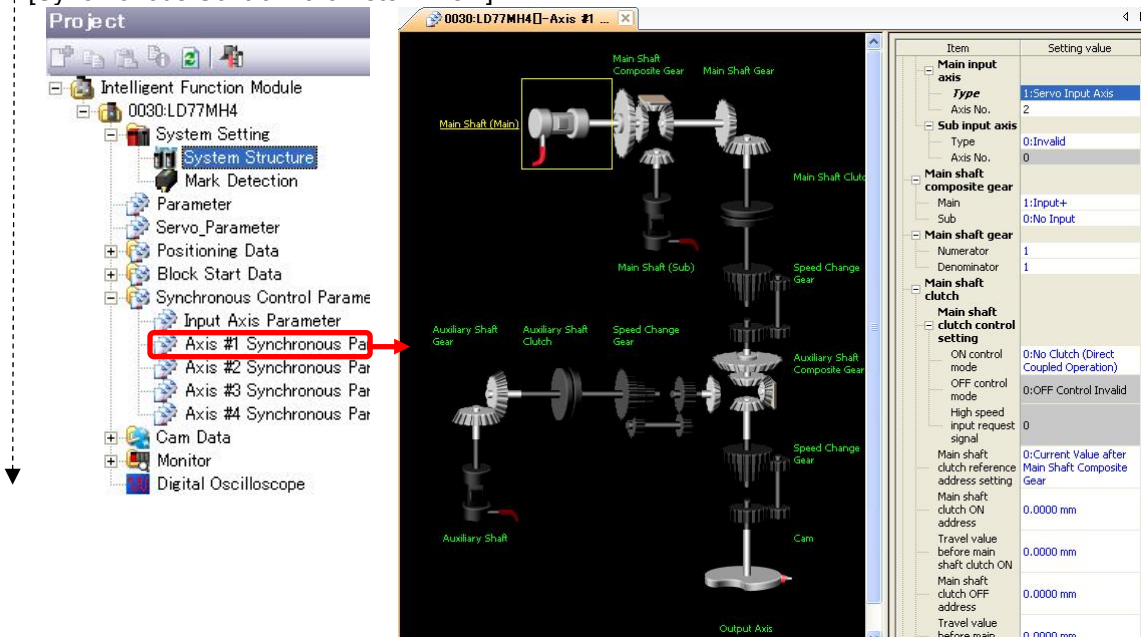
2) Synchronous control parameter setting

Click the setting area of [Main Input Axis No.] to display the contents that can be set.

Select [1: Servo input axis].
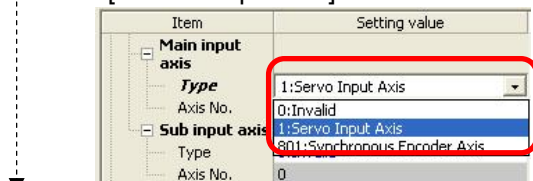
In the same way, change the underlined part.

<Synchronous parameter axis 1>

Item			Description
Main shaft	Main input axis No.	Type	**1: Servo input axis**
		Axis No.	**2**
	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
	Travel value before main shaft clutch ON		0 PLS
	Main shaft clutch OFF address		0 PLS
	Travel value before main shaft clutch OFF		0 PLS
	Main shaft clutch smoothing system		0:Direct
	Main shaft clutch smoothing time constant		0 ms
	Slippage at main shaft clutch ON		0 PLS
	Slippage at main shaft clutch OFF		0 PLS
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
	Travel value before auxiliary shaft clutch ON		0 PLS
	Auxiliary shaft clutch OFF address		0 PLS
	Travel value before auxiliary shaft clutch OFF		0 PLS
	Auxiliary shaft clutch smoothing system		0:Direct
	Auxiliary shaft clutch smoothing time constant		0 ms
	Slippage at auxiliary shaft clutch ON		0 PLS
	Slippage at auxiliary shaft clutch OFF		0 PLS

Item			Description
Speed change gear	Speed change gear arrangement		0: No transmission
	Speed change gear smoothing time constant		0ms
	Speed change ratio	Numerator	1
		Denominator	1
Output axis	Cam axis cycle unit	Unit setting selection	0: Use units of Main Input axis
		Unit	**0mm**
		number of decimal places	**0**
	Cam axis length per cycle		**157.0796mm**
	Cam stroke amount		**100000.0μm**
	Cam No.		**1**
	Cam axis phase correction advance time		0μs
	Cam axis phase correction time constant		10ms
	Output axis smoothing time constant		0ms
Synchronous control initial position parameter	Current value per cycle after main shaft gear	Setting method	0:Previous Value
		Initial setting value	0 PLS
	Current value per cycle after auxiliary shaft gear	Setting method	0:Previous Value
		Initial setting value	0 PLS
	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	0.0μm
	Cam axis current value per cycle	Setting method	0:Previous Value
		Initial setting value	0 PLS

3) Input axis parameter setting of synchronous control parameter

Double-click [Intelligent Function Module] → [LD77MH4] → [Synchronous Control Parameter] → [Input Axis Parameter].

Setting example operating axis 1 in synchronization with the current feed value of the axis 2

Item	Axis #1	Axis #2
Servo input axis		
Servo input axis type	0:Invalid	1:Current Feed Value
Detail setting		
Input smoothing time constant	0 ms	0 ms
Phase correction advance time	0 μs	0 μs
Phase correction time constant	10 ms	10 ms
Rotation direction restriction	0:Without Rotation Direction Restriction	0:Without Rotation Direction Restriction

<Input axis parameter (Axis 2)>

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

4) Setting completion of synchronous control parameter and input axis parameter

(5) Cam data setting

1) Cam data screen start-up

Right-click the [Cam data] button and select [Create new data] to display the creating new data screen.
Set the cam No. and click the [OK] button.
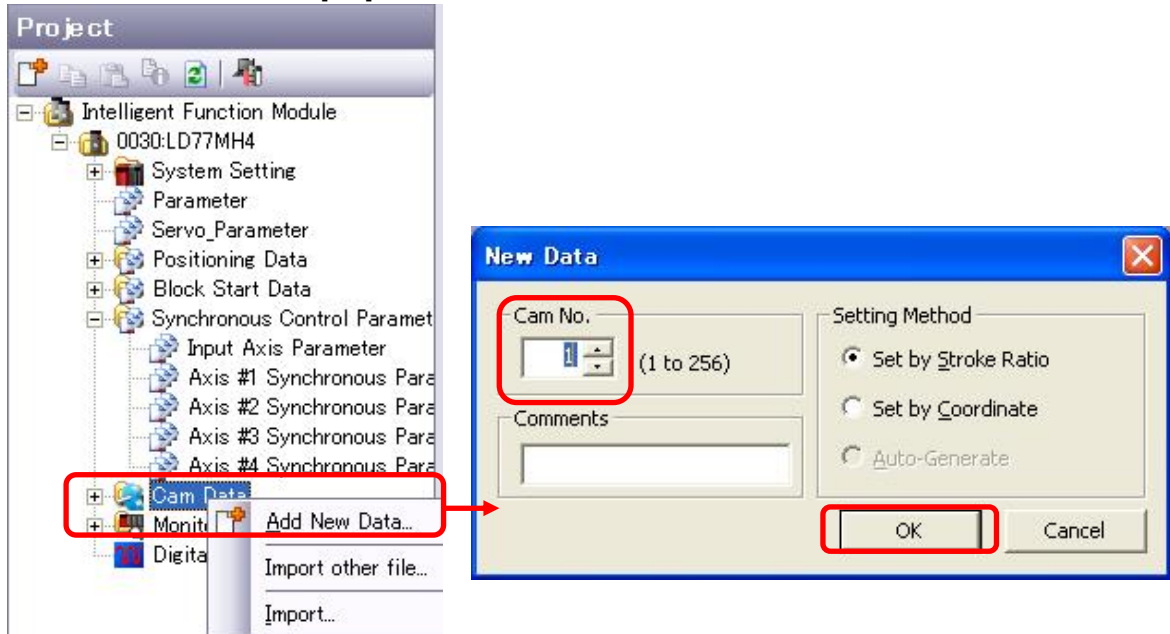
2) Cam data screen start-up

The initial screen is displayed to create cam data.
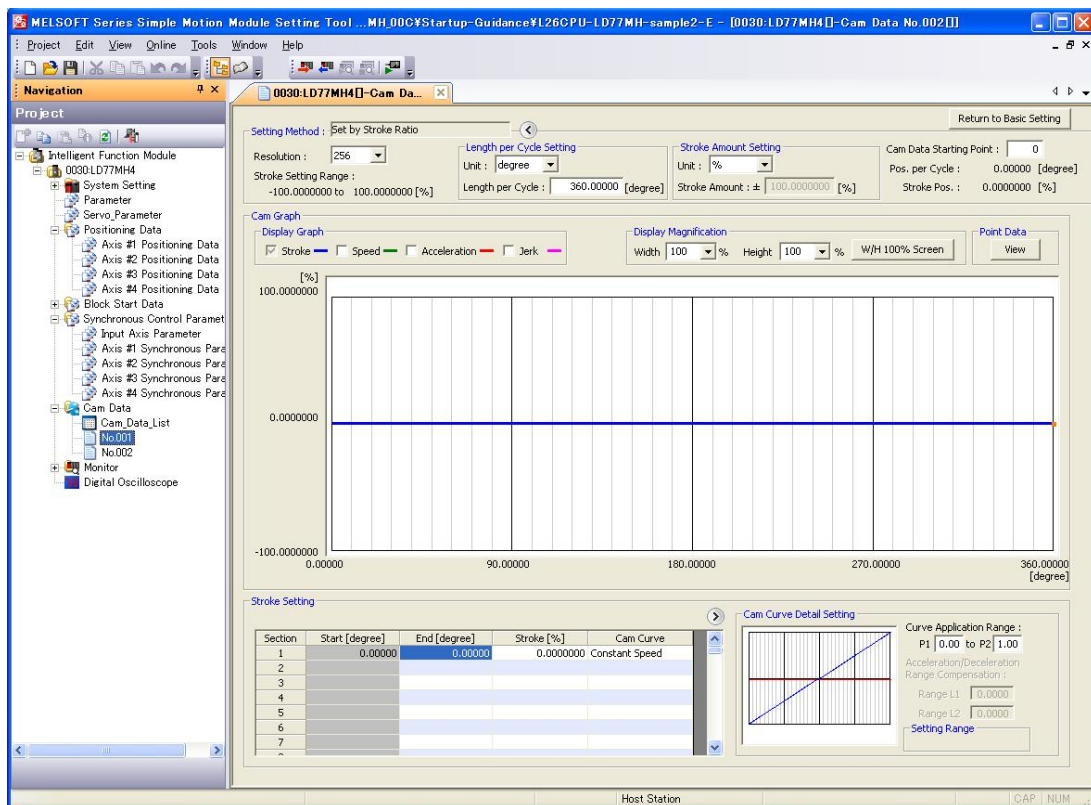
Next page

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

<Cam data>
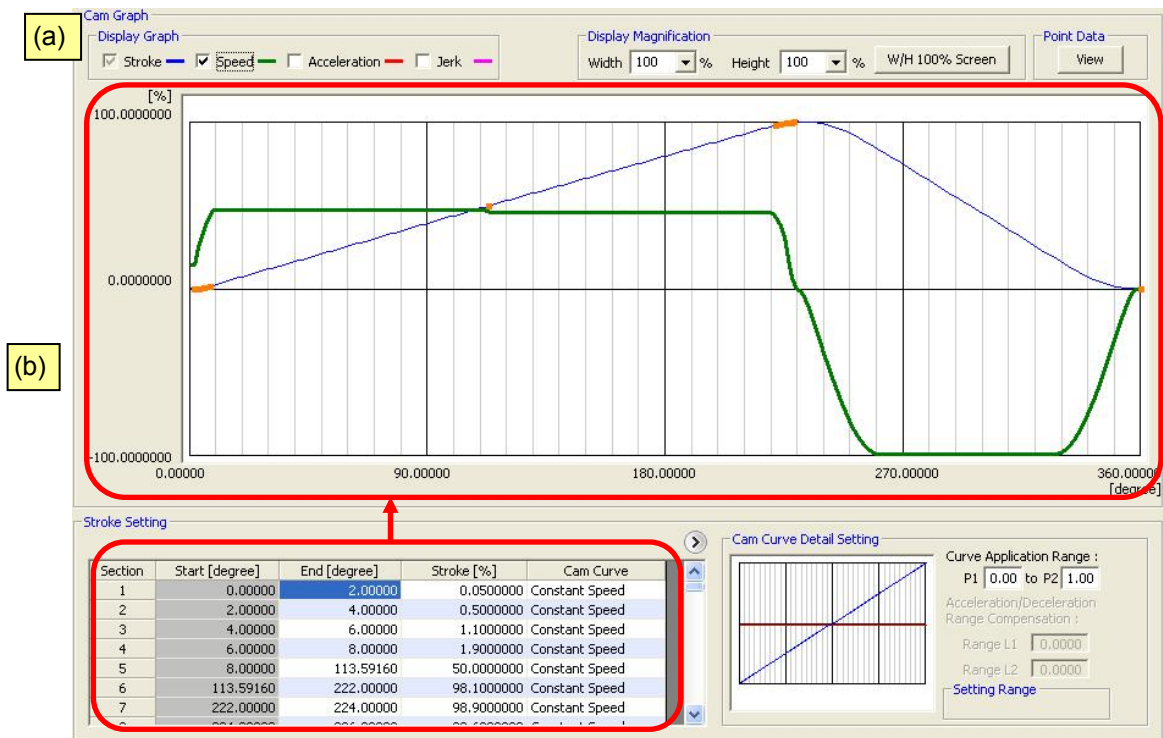
Section No.	Start point [degree]	End point [degree]	Stroke [%]	Cam curve
1	0.00000	2.00000	0.0500000	Constant speed
2	2.00000	4.00000	0.5000000	Constant speed
3	4.00000	6.00000	1.1000000	Constant speed
4	6.00000	8.00000	1.9000000	Constant speed
5	8.00000	113.59160	50.0000000	Constant speed
6	113.59160	222.00000	98.1000000	Constant speed
7	222.00000	224.00000	98.9000000	Constant speed
8	224.00000	226.00000	99.5000000	Constant speed
9	226.00000	228.00000	99.9000000	Constant speed
10	228.00000	229.18320	100.0000000	Constant speed
11	229.18320	0.00000	0.0000000	Dist. const. speed

(6) Saving a project
Refer to the previous section "Saving a Simple Motion Module as a project".

(7) Writing to the Simple Motion Module
Refer to the previous section "Writing to the Simple Motion Module".

(8) Completion of Synchronous control parameter setting

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.

(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.
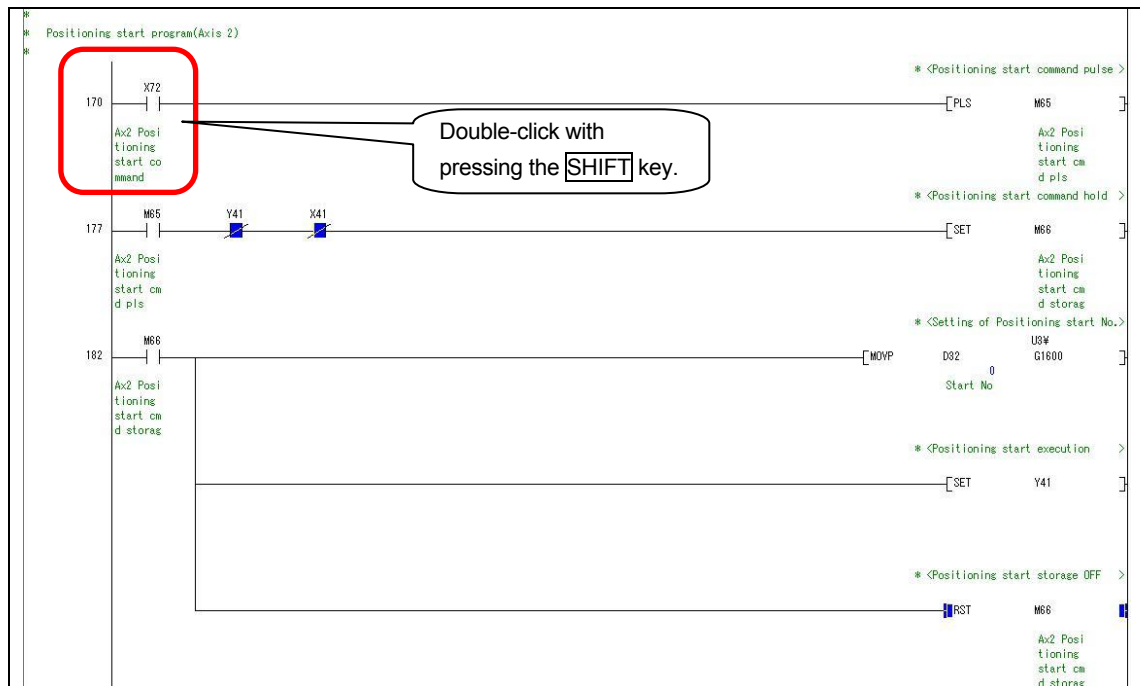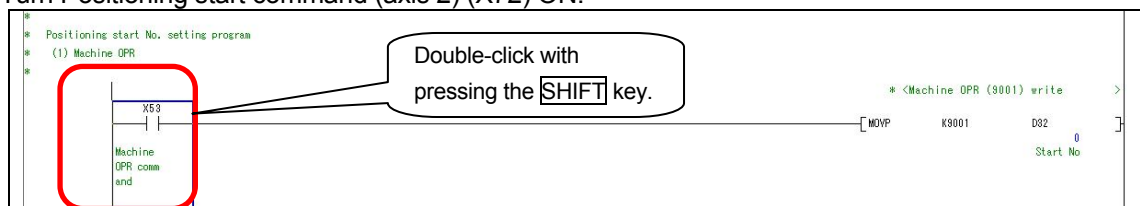
3) Completion of OPR

51

(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.

Double-click with pressing the SHIFT key.
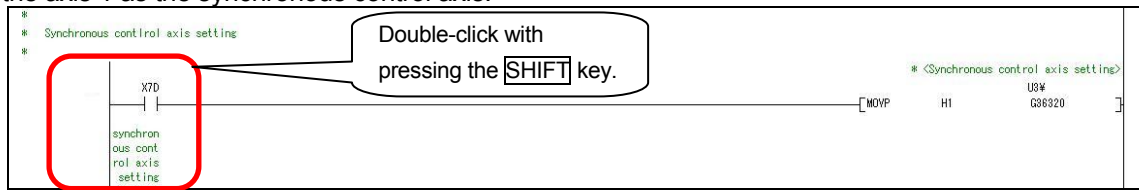
2) Checking the axis 1 BUSY signal

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
	Axis 1: Synchronous Control	
	Axis 1 : BUSY	

Next page

52

3) Setting the axis 2 program No.

Double-click with
pressing the SHIFT key.
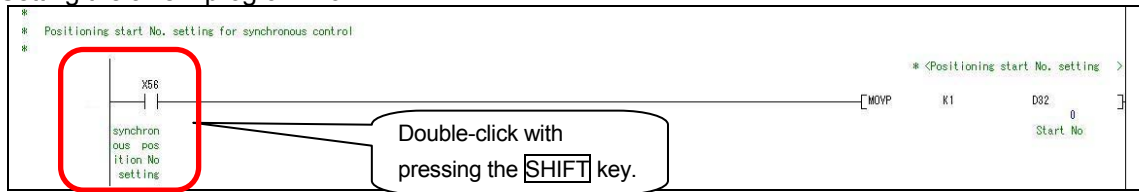
4) Starting the axis 2 program
Turn Positioning start command (X72) ON.

Double-click with
pressing the SHIFT key.
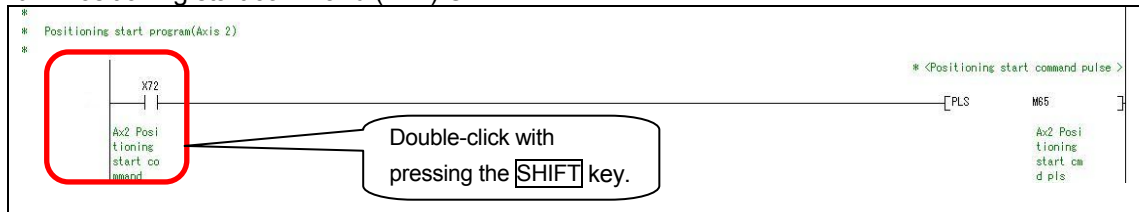
(3) Operation check of a synchronous axis

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

Screen	Axis 1	Axis 2
	— — Synchronous Control - ON ON	— — Positioning Control 2000.00mm/min ON ON

2) Completion of the operation check with the intelligent function module

54

(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

Double-click [Digital Oscilloscope].
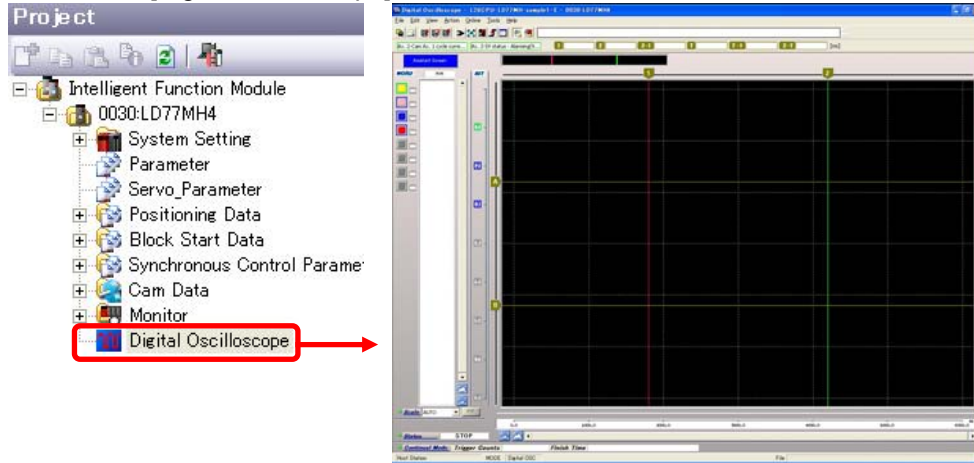
2) Starting the assistant screen
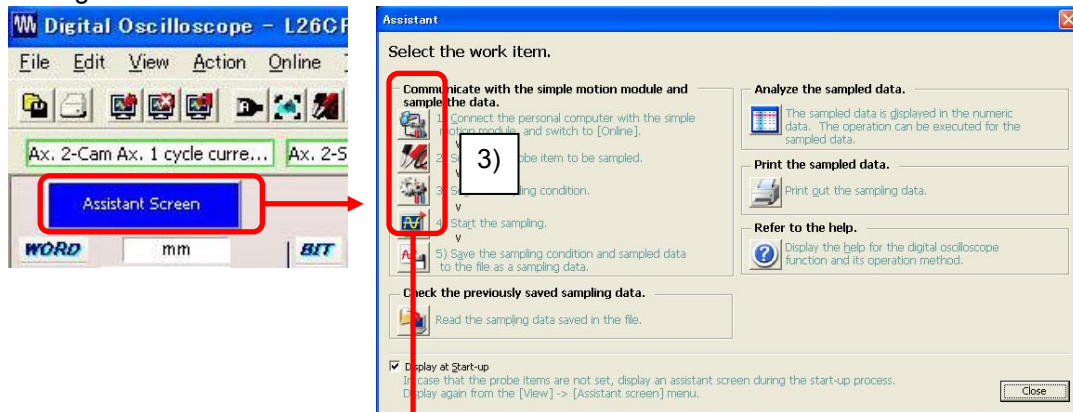
3) Selecting operation items from the assistant screen

The digital oscilloscope can be easily set by using the assistant function.
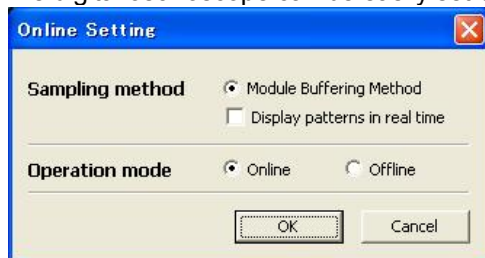
[Select Online/Offline]
• Module buffering method
• Online
Select the above.
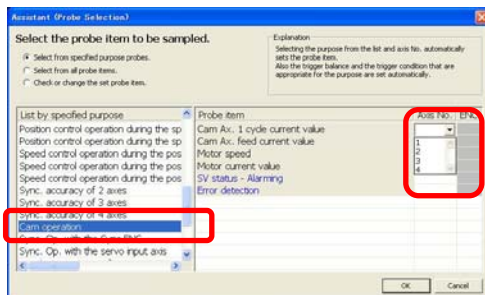
[Select probe items]
• To check the cam operation
• Axis No. "1"
Specify the above.

Next page
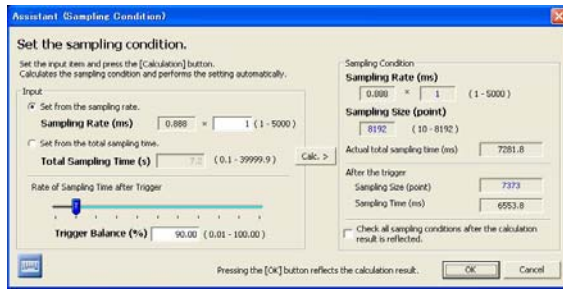
[Setting of sampling condition]

Sampling rate (ms)	: 0.888 × 1
Sampling size	: 8192
Trigger balance (%)	: 90.00
After trigger	
Sampling size	: 7373
Sampling time (ms)	: 6553.8

4) Setting the trigger condition

After closing the assistant screen, select [Edit] → [Trigger] to display the Initial Setting screen.
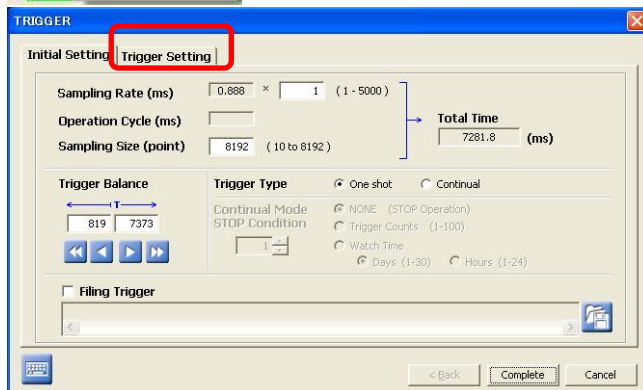
Select the [Trigger Setting] button.

Clicking the [Trigger Setting] button displays the screen to set the trigger conditions.
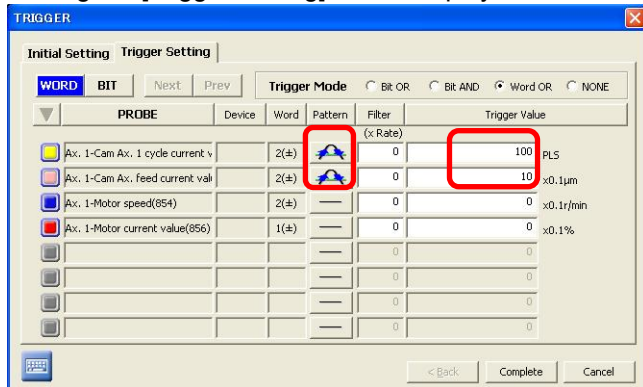
Press the [Pattern] button repeatedly to display .

Set the following items.

Axis 1 – Cam Axis 1 Cycle Current Value (42812)

 100×0.0001 mm

Axis 1 – Cam Axis Current Feed Value (42816)

 10×0.1µm

Next page

56

5) Starting sampling
   Display the assistant screen again and select "4) Start sampling (R)".
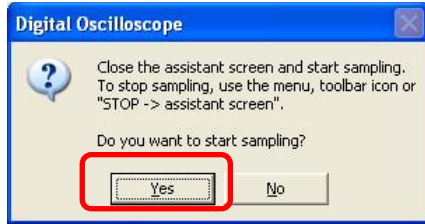
[Start sampling]
Select the [Yes] button to start sampling.

6) 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 prove.

Zoom in
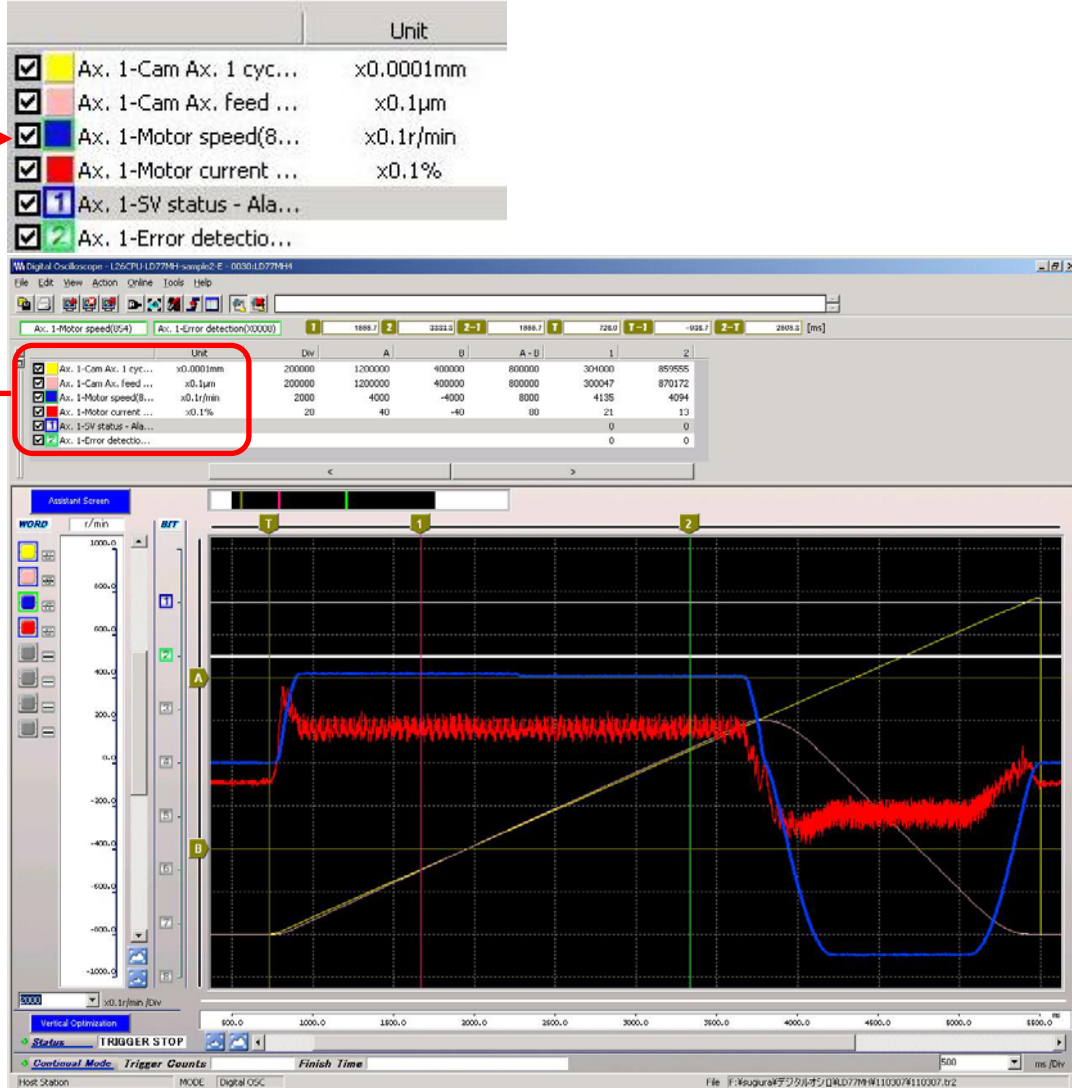
(5) Completion of operation checks

APPENDICES

Appendix 1 Start address setting

(1) Start address of Simple Motion Module

CPU modules of L series are equipped with built-in I/O and built-in CC-Link. If connecting a Simple Motion Module to the right side of a CPU module, the start XY address becomes the number that is added 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.

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

(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.

1) GX Works2
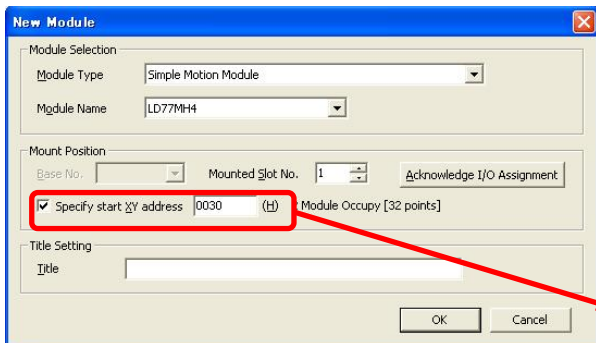
Set the same address.

2) Simple Motion Module Setting Tool
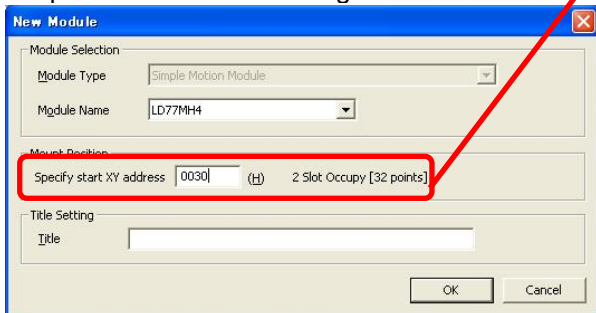
Appendix 2 Parameter and positioning data

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

(1) Parameters

	Item	Axis 1	Axis 2
Basic parameter 1	Unit Setting	**0: mm**	**0: mm**
	No. of pulses per revolution	**16384[PLS]**	**4625519[PLS]** (262144[PLS])
	Movement amount per revolution	**312.5[μm]**	**2771663.0[μm]** (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	**30000.00[mm/min]**	**30000.00[mm/min]**
	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	**1: Positive logic**	**1: Positive logic**
	Input signal logic selection upper limit	**1: Positive logic**	**1: Positive logic**
	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	**1: Invalid**	
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]

	Item	Axis 1	Axis 2
Detailed parameter 2	JOG speed limit value	**15000.00[mm/min]**	**15000.00[mm/min]**
	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]	0[PLS]
	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	0:Unused	0:Unused
OPR basic parameters	OPR method	**6: Data set method**	**6: Data set method**
	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 incompletion 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	1: 1.77ms	

Note 1 : The Operation cycle setting and External command signal selection are used only in a parameter of LD77MH16.

Start-up Guidance

(2) Positioning data

<Axis 1 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	**1: Continuation**	**ABS linear 1**	–	1: 1000	1: 1000	**100000.0µm**	0.0 µm	**2000.00 mm/min**	0ms	0
2	**0: Completion**	**ABS linear 1**	–	1: 1000	1: 1000	**0.0 µm**	0.0 µm	**30000.00 mm/min**	0ms	0

<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	**0: Completion**	**INC liner 1**	–	1: 1000	1: 1000	**157079.6 µm**	0.0 µm	**2000.00 mm/min**	0ms	0

Appendix 3 Various monitor functions

Appendix 3 1 Axis monitor

(1) Select Axis Monitor

1) Double-click the [Intelligent Function Module] → [Monitor] → [Module Monitor] →
[Axis Monitor]button to display the axis monitor initial window.
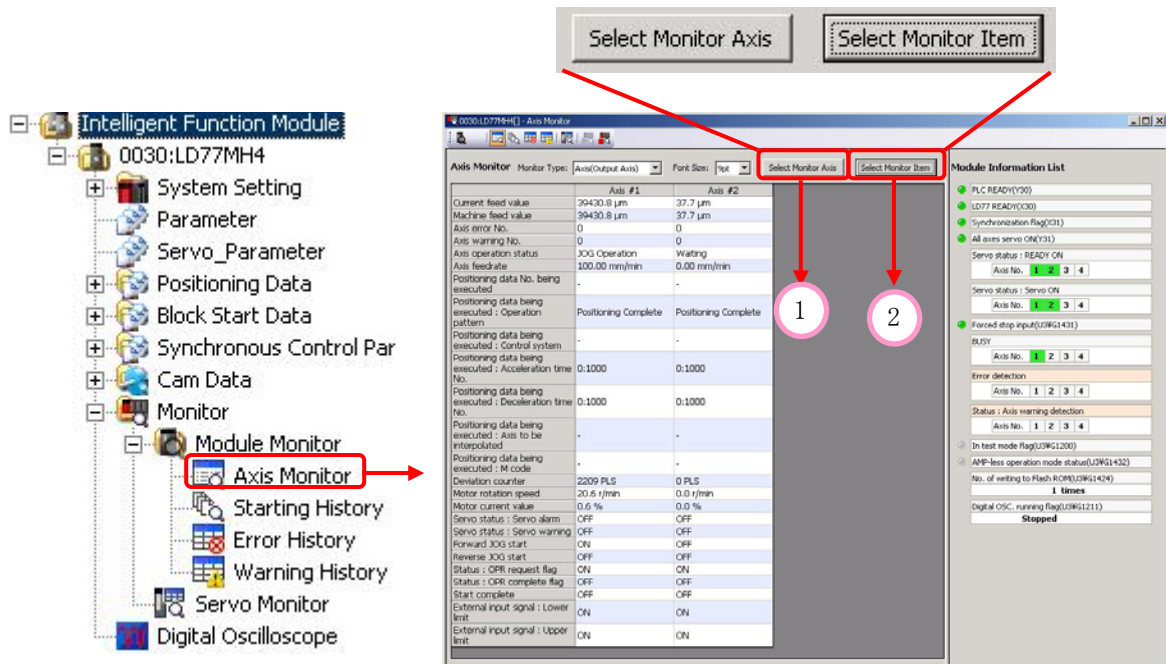
2) Select Monitor Axis
Click [Select Monitor Axis] to display a Axis Monitor screen.
Select the displayed axis.

LD77MH4: Axis 1 to 4
LD77MH16: Axis 1 to 16
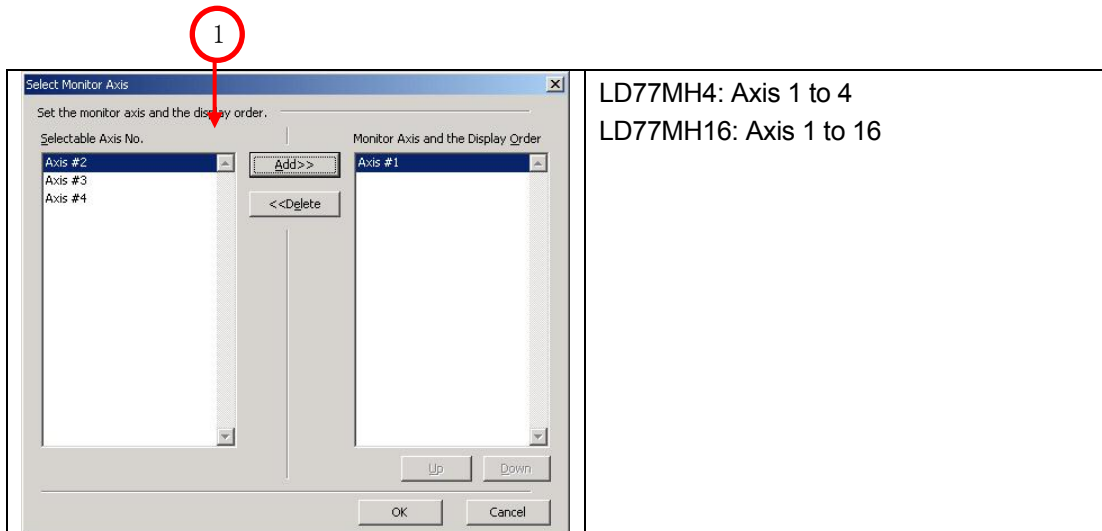
3) Select Monitor Item
   Click [Select Monitor Item] to display a Axis Monitor screen.
   Select the displayed item. Select the monitoring item in the Selectable Item.
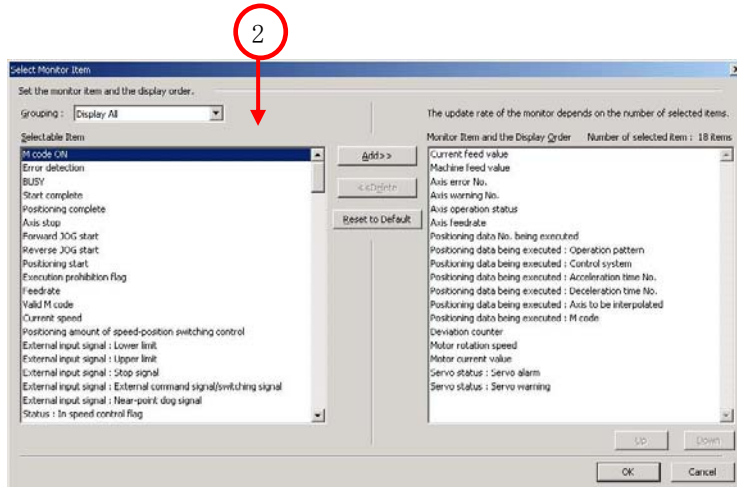
(a). Selectable Item _____ Input signal, output signal, Axis Monitor Data

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	−
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 (Note-1) 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 , error detection, start complete, positioning complete	817+100n	2417+100n

(Note-1) : M code On , error detection, start complete and positioning complete are defined in input signal (X) of
         LD77MH.

(b). Selectable Item _____ Axis Monitor Data (continued)

Item	Selectable Item	buffer memory address	
		LD77MH4	LD77MH16
Axis Monitor Data	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
	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

(c). Selectable Item _____ Axis Control Data

Item	Selectable Item	buffer memory address	
		LD77MH4	LD77MH16
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
	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

(d). Selectable Item _____ Axis Control Data (continued)

Item	Selectable Item	buffer memory address	
		LD77MH4	LD77MH16
Axis Control Data	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

66

(e). Selectable Item _____ Synchronous Control Monitor

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)	$42834+40n$

(f). Selectable Item _____ Synchronous Control Data

Item	Selectable Item	buffer memory address
		LD77MH4 LD77MH16
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	$44090+20n$

Appendix 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) Double-click the [Intelligent Function Module] → [Monitor] → [Module Monitor] → [Axis Monitor] button to display the axis monitor initial window.
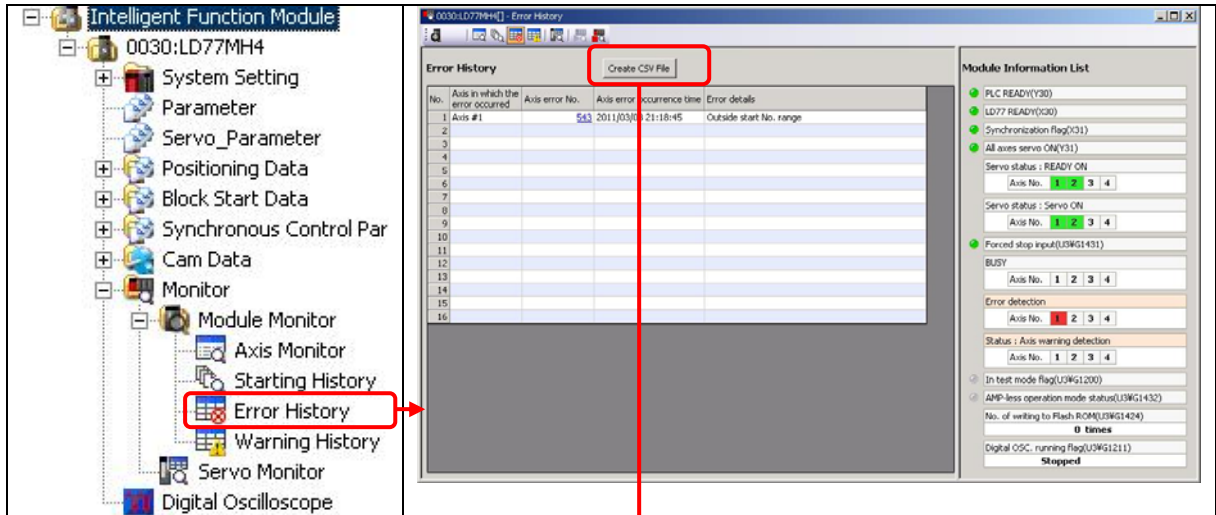
2) Save to CSV file

The save screen of the CSV file is displayed when clicking on a [Create CSV File]button.

When the file name is specified, the error history is preserved.

Appendix 3.3 PC diagnosis of GX Works2

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

1) Select [Diagnostics] → [PC Diagnostics] to display the PC diagnostics screen.
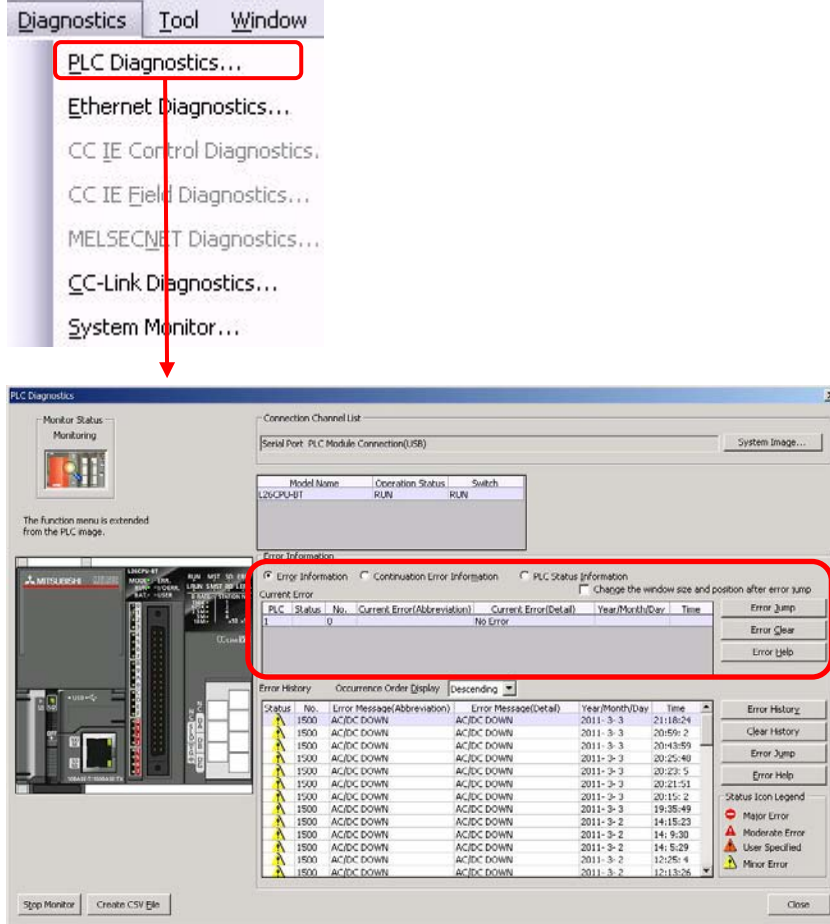
Appendix 4 Sample program

<table>
<tr><td align="center">⚠ CAUTION</td></tr>
<tr><td>(a) 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 (chapter of the positioning control) for details of each signal.
(b) The sequence program of this appendix is used in this startup guidance. Be sure to add and verify the conformance with the desired system before diverting the programs of this appendix to the actual system.</td></tr>
</table>

These sequence programs were excerpted from the necessary part of MELSEC-L Type LD77MH Simple Motion Module User's Manual. For details, refer to the user's manual.

(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	Input unit ↓ PLC CPU
	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	
	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	

Start-up Guidance

(2) Sequence program example

```
*
* PLC READY signal [Y30] ON program
*

        SM403      M25        M27        X7B              * <   PLC READY signal ON        >
   0 ────┤├────────┤/├────────┤/├────────┤├───────────────────────────────────────( Y30 )──┤
        OFF for    Paramete   Flash RO   PLC READ                                     PLC
        1scan on   r initia   M write    Y signal                                     READ
        ly after   lization   command    ON
        run        command    storage

*
* Servo[Y31] ON program
*

        X30        Y30        X31                          * <   All axis servo ON          >
   9 ────┤├────────┤├────────┤├──────────────────────────────────────────────────( Y31 )──┤
        LD77 REA   PLC READ   Synchron                                              All axis
        DY         Y          ization                                              servo
                              flag                                                  ON

*
* Positioning start No. setting program
*  (1) Machine OPR
*

        X53                                                * <   Machine OPR (9001) write   >
  17 ────┤├───────────────────────────────────────────────────────[ MOVP  K9001  D32  ]──┤
        Machine                                                                Start No.
        OPR comm
        and

*
* (2)Positioning with positioning data No. 1
*

        X55                                                * <   Positioning data No. 1 setting >
  25 ────┤├───────────────────────────────────────────────────────[ MOVP  K1     D32  ]──┤
        Positioning                                                           Start No.
        start
        command

*
* Positioning start program
* When positioning start signal
*

        X71                                                * <   Positioning start command pulse >
  32 ────┤├───────────────────────────────────────────────────────────────[ PLS  M5  ]──┤
        Positioning                                                         AX1 Position
        start                                                               ing start
        command                                                             cmd pls
        AX. 1

        M5         Y40        X40        M7                * <   Positioning start command hold >
  39 ────┤├────────┤/├────────┤/├────────┤/├─────────────────────────────[ SET    M6  ]──┤
        AX1 Posi   Axis 1     Axis       Ax1 In-                                 Ax1 Posi
        tioning    Position   start      JOG                                     tioning
        start cmd  ing start  complete   operation                               start
        pls                              flag                                    cmd storag

        M6                                                 * <   Positioning start No. setting >
  45 ────┤├───────┬──────────────────────────────────────────────[ MOVP  D32    U3¥ ]──┤
        Ax1 Posi  │                                                      Start No.  GI500
        tioning   │                                                                 Axis 1
        start     │                                                                 Position
        cmd storag│                                                                 ing start
                  │                                                                 No.
                  │                                               * <   Positioning start execution >
                  ├──────────────────────────────────────────────────────[ SET    Y40 ]──┤
                  │                                                               Axis 1 Posi
                  │                                                               tioning
                  │                                                               start
                  │
                  │                                               * <   Positioning start storage OFF >
                  └──────────────────────────────────────────────────────[ RST    M6  ]──┤
                                                                                  Ax1 Posi
                                                                                  tioning
                                                                                  start
                                                                                  cmd storag
```

71

```
        Y40        X40       DX3C                      * < Positioning start signal OFF    >
 55 ────┤├────────┤├────────┤/├──────────────────────────────────────────[ RST   Y40    ]
      Axis 1     Axis 1     BUSY                                                   Axis 1
      Position-  start                                                             Position-
      ing start  complete                                                         ing start

                   X38
                 ──┤├──
                  Axis 1
                  Error
                  detection


 *
 *   JOG operation setting
 *

        X5D                                            * < JOG speed (100.00 mm/min)      >
 63 ────┤├──────┬─────────────────────────────────────────────────[ DMOVP  K10000  D6   ]
      JOG speed │                                                                  JOG
      stteing   │                                                                  operation
      cmd       │                                                                  speed
                │
                │                                      * < Setting of 0 for inching       >
                ├───────────────────────────────────────────────────────[ MOVP   K0   D5   ]
                │                                                                  Inching
                │                                                                  movement
                │                                                                  amount
                │
                │                                      * < JOG operation request write    >
                └──────────────────────────────[ TOP   H3   K1517   D5   K3   ]
                                                                          Inching
                                                                          movement
                                                                          amount

 *
 *   JOG operation operation execution
 *

        X5E        X30       X3C                       * <  JOG operating flag ON         >
 80 ────┤├────┬───┤├────────┤/├──────────────────────────────────────────[ SET   M7     ]
      Forward  │  LD77      Axis 1                                                 Ax1
      run JOG  │  READY     BUSY                                                   In-JOG
      cmd      │                                                                  operation
               │                                                                  flag
        X5F    │
      ──┤├─────┘
      Reverse
      run JOG
      cmd

        X5E        X5F                                 * <  JOG operation completed       >
 89 ────┤/├────────┤/├────────────────────────────────────────────────────[ RST   M7     ]
      Forward     Reverse                                                          Ax1
      run JOG     run JOG                                                          In-JOG
      cmd         cmd                                                              operation
                                                                                  flag

        X5E        M7        Y39                       * <  Forward JOG                   >
 93 ────┤├────────┤├────────┤/├────────────────────────────────────────────────( Y38   )
      Forward     Ax1        Axis 1                                                Axis 1
      run JOG     In-JOG     Reverse                                              Forward
      cmd         operation  JOG start                                           run JOG
                  flag                                                           start

        X5F        M7        Y38                       * <  Reverse JOG                   >
 98 ────┤├────────┤├────────┤/├────────────────────────────────────────────────( Y39   )
      Forward     Ax1        Axis 1                                                Axis 1
      run JOG     In-JOG     Forward                                             Reverse
      cmd         operation  run JOG                                             JOG start
                  flag       start
```

72

```
*
*  Error reset program
*
                                                                    * <    Error reset command pulse      >
        X6E
103     ┤├                                                                              [ PLS    M28    ]
        Error                                                                                   Error
        reset                                                                                   reset
        command

        M28     X38                                                                             U3¥
110     ┤├      ┤├                                                             [ MOVP   K1      GI502  ]
        Error   Axis 1                                                                          Axis 1
        reset   Error                                                                           Axis
                detection                                                                       Error
                                                                                                reset

                X39                                                                             U3¥
                ┤├                                                            [ MOVP   K1      GI602  ]
                Axis 2                                                                          Axis 2
                Error                                                                           Axis
                detection                                                                       Error
                                                                                                reset

        X38                                                                                     U3¥
123     ┤/├                                                                  [ MOVP   K0       GI502  ]
        Axis 1                                                                                  Axis 1
        Error                                                                                   Axis
        detection                                                                               Error
                                                                                                reset

        X39                                                                                     U3¥
128     ┤/├                                                                  [ MOVP   K0       GI602  ]
        Axis 2                                                                                  Axis 2
        Error                                                                                   Axis
        detection                                                                               Error
                                                                                                reset
*
*  Stop program
*
                                                                    * <    Stop command pulse           >
        X6F
133     ┤├                                                                              [ PLS    M29    ]
        Stop                                                                                    Stop
        commnad                                                                                 command
                                                                                                pulse

                                                                    * <    Stop execution              >
        M29     X3C
140     ┤├      ┤├                                                                      [ SET    Y34    ]
        Stop    Axis 1                                                                          Axis 1
        command BUSY                                                                            Axis
        pulse                                                                                   Stop

                X3D
                ┤├                                                                      [ SET    Y35    ]
                Axis 2                                                                          Axis 2
                BUSY                                                                            Axis
                                                                                                Stop

                                                                    * <    Stop execution              >
        X6F     X3C
148     ┤/├     ┤/├                                                                     [ RST    Y34    ]
        Stop    Axis 1                                                                          Axis 1
        commnad BUSY                                                                            Axis
                                                                                                Stop

                X3D
                ┤/├                                                                     [ RST    Y35    ]
                Axis 2                                                                          Axis 2
                BUSY                                                                            Axis
                                                                                                Stop
```

```
*
*
*   Synchronous contlrol axis setting
                                                         * < Positioning start command pulse    >
          X7D                                                              U3¥
      156 ─┤ ├─────────────────────────────────────────────[ MOVP    H1   G36320 ]─
          Synchronous                                                      Synchronous
          control axis                                                     control
          setting                                                          start

          X7D                                                              U3¥
      165 ─┤/├─────────────────────────────────────────────[ MOVP    H0   G36320 ]─
          Synchronous                                                      Synchronous
          control axis                                                     control
          setting                                                          start

*
*
*   Positioning start program(Axis 2)
                                                         * < Positioning start command pulse    >
          X72
      170 ─┤ ├─────────────────────────────────────────────────[ PLS     M65 ]─
          Ax2                                                              Ax2
          Positioning                                                     Positioning
          command                                                         start cmd
                                                                          pls
          M65     Y41     X41                             * < Positioning start command hold    >
      177 ─┤ ├────┤/├─────┤/├───────────────────────────────────[ SET     M66 ]─
          Ax2     Axis 2  Axis 2                                          Ax2
          Positioning Positioning start                                  Positioning
          start cmd start   complete                                     start
          pls                                                            command
          M66                                             * < Setting of Positioning start No.   >
      182 ─┤ ├──┬──────────────────────────────────────────[ MOVP D32   U3¥  ]─
          Ax2   │                                                       GI600
          Positioning                                                   Axis 2
          start cmd                                                     Positioning
          storag│                                                       start No.
                │                                         * < Positioning start execution        >
                ├──────────────────────────────────────────────[ SET     Y41 ]─
                │                                                         Axis 2
                │                                                         Positioning
                │                                                         start
                │                                         * < Positioning start command hold     >
                └──────────────────────────────────────────────[ RST     M66 ]─
                                                                          Ax2
                                                                          Positioning
                                                                          start cmd
                                                                          storag
          Y41     X41     DX3D                            * < Positioning start signal OFF        >
      192 ─┤ ├──┬─┤ ├─────┤/├───────────────────────────────────[ RST     Y41 ]─
          Axis 2│ Axis 2  Axis 2                                         Axis 2
          Positioning Start  BUSY                                        Positioning
          start │ complete                                               start
                │
                │ X39
                └─┤ ├
                  Axis 2
                  Error
                  detection

*
*
*   Positioning start No. setting for synchronous control
                                                         * < Positioning start No. setting        >
          X56
      200 ─┤ ├─────────────────────────────────────────────[ MOVP    K1    D32 ]─
          Synchroous                                                       Start No
          positioning
          setting
```

Start-up Guidance

```
*
*  Parameter initialization program
*
                                                                    * < Parameter initialization cmd pls  >
        X6C
207 ———| |——————————————————————————————————————————————————————————————[ PLS    M24  ]
      Parameter                                                                  Parameter
      initialization                                                             initialization
      command                                                                    cmd pls

                                                                    * < Parameter init cmd hold          >
        M24       X3C
214 ———| |———————|/|——————————————————————————————————————————————————————[ SET    M25  ]
      Parameter   Axis 1                                                          Parameter
      initialization BUSY                                                         initilization
      cmd pls                                                                     command

                                                                    * < PLC READY output to LD77 standby >
        M25       Y30
218 ———| |———————|/|——————————————————————————————————————————————————————————(T0    K2  )
      Parameter   PLC                                                             PLC READY
      initilization READY                                                        signal OFF
      command                                                                    conf. 1

                                                                    * <    Parameter init execution      >
        T0
225 ———| |————————————————————————————————————————————[ ZP.PINIT  "U3"    D37       M36  ]
      PLC READY                                                      ZP.PINIT    ZP.INIT
      signal OFF                                                     instruction  instruction
      conf. 1                                                        control dat  complete dv

                                                                    * < Parameter init cmd storage OFF   >
                  M36       M37
              ———| |———————|/|—————————————————————————————————————————————————[ RST    M25  ]
              ZP.INIT    ZP.PINIT                                                 Parameter
              instruction instruction                                            initilization
              complete dv err. comple                                            command

*
*  Flash ROM write program
*
                                                                    * < Flash ROM write cmd pls          >
        X6D
240 ———| |——————————————————————————————————————————————————————————————[ PLS    M26  ]
      Flash ROM                                                                  Flash ROM
      write                                                                     write
      command                                                                   command
                                                                               pulse

                                                                    * < Flash ROM write cmd hold         >
        M26       X3C
247 ———| |———————|/|——————————————————————————————————————————————————————[ SET    M27  ]
      Flash ROM   Axis 1                                                         Flash ROM
      write       BUSY                                                          write
      command                                                                   command
      pulse                                                                     strage

                                                                    * < PLC READY output to LD77 standby >
        M27       Y30                                                                    K2
251 ———| |———————|/|——————————————————————————————————————————————————————————(T1       )
      Flash ROM   PLC                                                             PLC READY
      write       READY                                                          signal OFF
      command                                                                    conf. 2
      strage

                                                                    * <Flash ROM write execution         >
        T1
258 ———| |————————————————————————————————————————————[ ZP.PFWRT  "U3"    D39       M38  ]
      PLC READY                                                      ZP. PFWRT   ZP.PFWRT
      signal OFF                                                     instruction  instruction
      conf. 2                                                        control dat  complete dv

                                                                    * < Flash ROM write cmd storage OFF  >
                  M38       M39
              ———| |———————|/|—————————————————————————————————————————————————[ RST    M27  ]
              ZP.PFWRT   ZP.PFWRT                                                 Flash ROM
              instruction instruction                                            write
              complete dv error                                                  command
                         comp.                                                   strage

273 ——————————————————————————————————————————————————————————————————————————[ END  ]
```

MEMO

WARRANTY

Please confirm the following product warranty details before using this product.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the sales representative or Mitsubishi Service Company.

However, if repairs are required onsite at domestic or overseas location, expenses to send an engineer will be solely at the customer's discretion. Mitsubishi shall not be held responsible for any re-commissioning, maintenance, or testing on-site that involves replacement of the failed module.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual have been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found to not be the responsibility of Mitsubishi or that admitted not to be so by the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not available after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of loss in opportunity and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, loss in opportunity, lost profits incurred to the user by Failures of Mitsubishi products, special damages and secondary damages whether foreseeable or not, compensation for damages to products other than Mitsubishi products, replacement by the user, maintenance of on-site equipment, start-up test run and other tasks.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

MELSEC-L LD77MH Simple Motion Module
Quick Start Guide

Precautions before use

This publication explains the typical features and functions of the products herein and does not provide restrictions and other information related to usage and module combinations. Before using the products, always read the product user manuals. Mitsubishi Electric will not be held liable for damage caused by factors found not to be the cause of Mitsubishi Electric; opportunity loss or lost profits caused by faults in Mitsubishi Electric products; damage, secondary damage, or accident compensation, whether foreseeable or not, caused by special factors; damage to products other than Mitsubishi Electric products; and to other duties.

⚠ For safe use

- To use the products given in this publication properly, always read the relevant manuals before use.
- The products have been manufactured as general-purpose parts for general industries, and have not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the products for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

MITSUBISHI ELECTRIC CORPORATION

When exported from Japan, this manual does not require application to the Ministry of Economy, Trade and Industry for service transaction permission.

New publication effective Jun. 2011
Specifications subject to change without notice.