



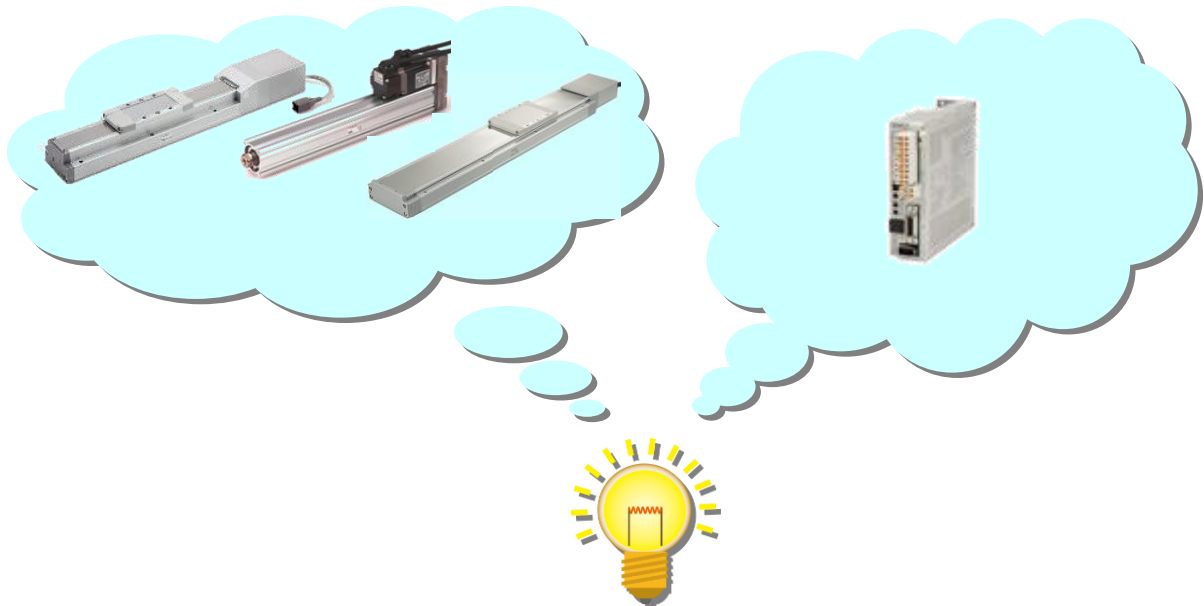
Operation Manual (Simplified Edition)

PRODUCT NAME

AC Servo Motor Driver (Pulse input type/Positioning type)

MODEL / Series / Product Number

LECSA Series



SMC Corporation

Contents

Contents.....	1
Introduction	6
Terms	6
1. Configuration.....	6
2. Pre-Operation Procedure.....	7
2.1 Flow chart	7
3. Wiring.....	8
3.1 Power Supply Wiring.....	8
3.2 I/O signal connection example.....	9
3.2.1 Position control mode (Sink I/O interfaces).....	9
3.2.2 Speed control mode (Sink I/O interfaces).....	12
3.2.3 Torque control mode (Sink I/O interfaces).....	13
3.2.4 Positioning mode (Sink I/O interfaces).....	14
3.2.5 Source I/O interfaces.....	15
4. List of Parameters for each Mode	16
4.1 Parameters common to each mode.....	16
4.2 Position control mode	16
4.3 Speed control mode	17
4.4 Torque control mode.....	17
4.5 Positioning mode	18
5. Parameter Configuration using Setup software (MR Configurator2™).....	19
5.1 PC Setup software (MR Configurator2™)	19
5.1.1 Installation Method	19
5.2 Basic driver set-up for Initial Test Drive	19
5.2.1 Start up the Setup software (MR Configurator2™)	20
5.2.2 “System Settings”	21
5.2.3 Model Selection.....	21
5.2.4 Driver ON LINE Check	22
5.2.5 Help Function	22
5.3 Parameter setting (Driver side).....	23
5.3.1 Change of parameter block	24
5.3.2 Read of parameters	24
5.3.3 Parameter Configuration Method (Ex. “Control mode” selection).....	25
5.3.4 Electronic Gears	26
5.3.5 Control mode selection.....	27
5.3.6 Set the parameter of command pulse input form	28
5.3.7 Verify of parameters	30
5.3.8 Parameter initialization.....	31
5.4 JOG Mode in the Setup Software	32
5.4.1 JOG Mode	33
5.5 Changing I/O Signal Allocation	34
5.5.1 Automatic Input Signal ON Selection Parameter Configuration	34
5.5.2 Initial I/O Signal Allocation.....	37

5.5.3 Signal Allocation using Setup Software.....	38
5.5.4 Allocation Examples for Position Control Mode (Pulse Input)	39
5.5.5 Setting a Maximum of 7 Points using the Point Table in Positioning mode (Point Table)	41
5.5.6 I/O Signal Allocation Check	45
5.6 Positioning Mode in Setup Software	46
5.6.1 Positioning Mode	47
5.6.2 Motorspeed Configuration	48
5.6.3 Acceleration/deceleration Time Configuration	49
5.6.4 Move distance Configuration and Operation< Move distance Configuration> ...	50
5.7 Positioning (Point Table) Operation using the Setup Software	51
5.7.1 Point table List	51
5.7.2 Point Table Data	52
5.7.3 Point table (Target position) Configuration	53
5.7.4 Point table (Rotation Speed) Configuration.....	56
5.7.5 Point Table (Acceleration time constant/Deceleration time constant) Configuration.....	57
5.7.6 Other Settings	57
5.7.7 Single-Step Feed	58
5.8 Saving/Loading Parameters	59
5.8.1 Saving Parameters.....	59
5.8.2 To Load saved Parameters	60
5.9 Saving/Loading Project.....	61
5.9.1 Saving Project	61
5.9.2 To Load saved Project.....	62
5.10 Saving/Loading Point table	63
5.10.1 Saving Point table	63
5.10.2 To Load saved Point table.....	64
5.11 Acquisition of motion waveform with graph monitor	65
5.11.1 Under the setting Tab: Setting of the items to display the graph.....	66
5.11.2 Trigger wait	70
5.11.3 Operation Instruction.....	71
5.11.4 Saving of waveform	72
5.12 Display All Monitor List.....	73
6. Home Position Return Method	75
6.1 Position Control Mode (Pulse Input).....	75
6.2 Positioning mode (point table).....	75
6.2.1 Stopper type home position return.....	76
7. Driving Methods for Each Mode	78
7.1 Position Control Mode (Pulse Input).....	78
7.1.1 Position Control Mode Instructions.....	78
7.2 Speed control mode	79
7.2.1 Speed Control Mode Operation Instruction	79
7.3 Torque control mode.....	80
7.3.1 Torque Control Mode Operation Instruction	80
7.4 Positioning Mode (Point table method).....	81
7.4.1 Operation Instruction of Point Table system	81
7.4.2 Setting method.....	83
7.5 Positioning Mode (Programing Method)	84
7.5.1 Setting method.....	84
7.5.2 Command in the program system.....	85
7.5.3 Operation Instruction Method of Program System	86

8. Troubleshooting	87
8.1 Alarms and Warning List	87
8.2 Alarm Display.....	89



LECSA Series / Driver Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “**Caution**,” “**Warning**” or “**Danger**.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)*¹⁾, and other safety regulations.

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components

ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components

IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements

ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots

etc.



Danger

Warning

Caution

Danger indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

Warning indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

Caution indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



Warning

1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results. The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product. This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

2. Only personnel with appropriate training should operate machinery and equipment.


The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

4. SMC products cannot be used beyond their specifications. They are not developed, designed, and manufactured to be used under the following conditions or environments. Use under such conditions or environments is not allowed.

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2. Use for nuclear power, railways, aviation, space equipment, ships, vehicles, military application, equipment affecting human life, body, and property, combustion equipment, entertainment equipment, emergency shut-off circuits, press clutches, brake circuits, safety equipment, etc., and use for applications that do not conform to standard specifications such as catalogs and operation manuals.
3. Use for interlock circuits, except for use with double interlock such as installing a mechanical protection function in case of failure. Please periodically inspect the product to confirm that the product is operating properly.

Note that the  CAUTION level may lead to a serious consequence according to conditions. Please follow the instructions of both levels because they are important to personnel safety.



LECSA Series / Driver Safety Instructions



Caution

SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries.

Use in non-manufacturing industries is not allowed.

Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country.

The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”. Read and accept them before using the product.

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*2)
Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.

***2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.
2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.

Introduction

It is recommended that the operator read the operation manual for LECSA prior to use. For the handling and details of other equipment, please refer to the operation manual for said equipment.

Check that the main circuit power supply (AC100V/AC200V) and controller circuit power supply (24V) are wired correctly. Please refer to chapter 3.1 of the "LECSA Operation Manual" and chapter 2 of the "LECSA Operation Manual (Simplified Edition)" for details.

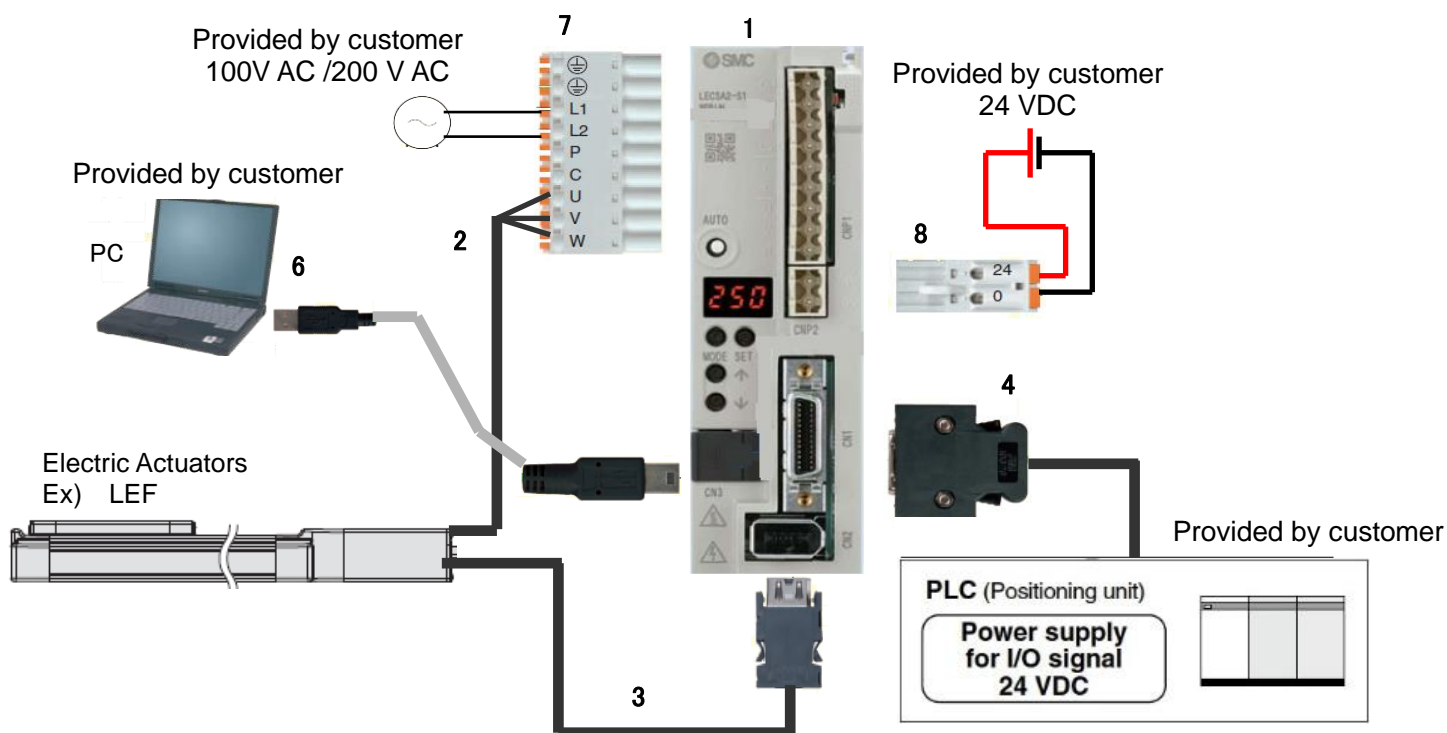
When setup software (MR Configurator2™) is used, the LECSA model selection is required. Select 'MR-JN-A' through "Model" - "New" and "Project".

Terms

Position control mode (pulse)	Control the motor rotation speed and direction with pulse train and perform positioning.
Positioning mode (Point table)	Set the positioning data, rotation speed, Acceleration/Deceleration time constant of the drivers point table and execute ON/OFF control of the positioning operation using the I/O signals (a maximum of 7 points can be used for the point table configuration).

1. Configuration

Minimum equipment and wiring requirements to get started

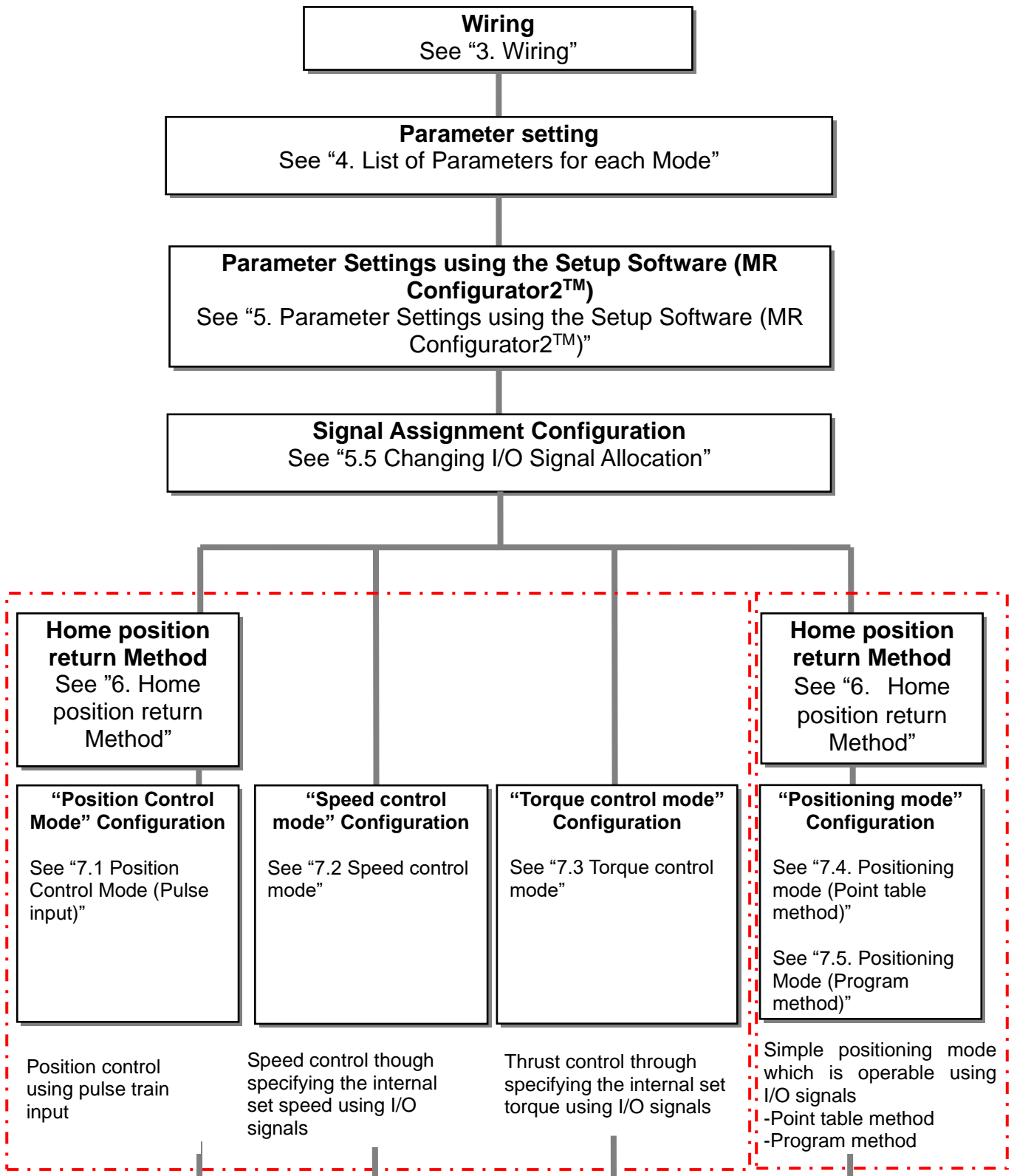


1	Driver	LECSA*-S*
2	Motor cable	LE-CSM-***
3	Encoder cable	LE-CSE-***
4	I/O connector	LE-CSNA
	I/O cable	LEC-CSNA-1
5	USB cable	LEC-MR-J3USB
6	Setup software (MR Configurator2™)	LEC-MRC2*
7	Main circuit power supply connector	CNP1 (Accessory)
8	Control circuit power supply connector	CNP2 (Accessory)

Note) The lock cable option is not shown on this drawing. Refer to the "LECSA Operation Manual" for details.

2. Pre-Operation Procedure

2.1 Flow chart



3.2 I/O signal connection example

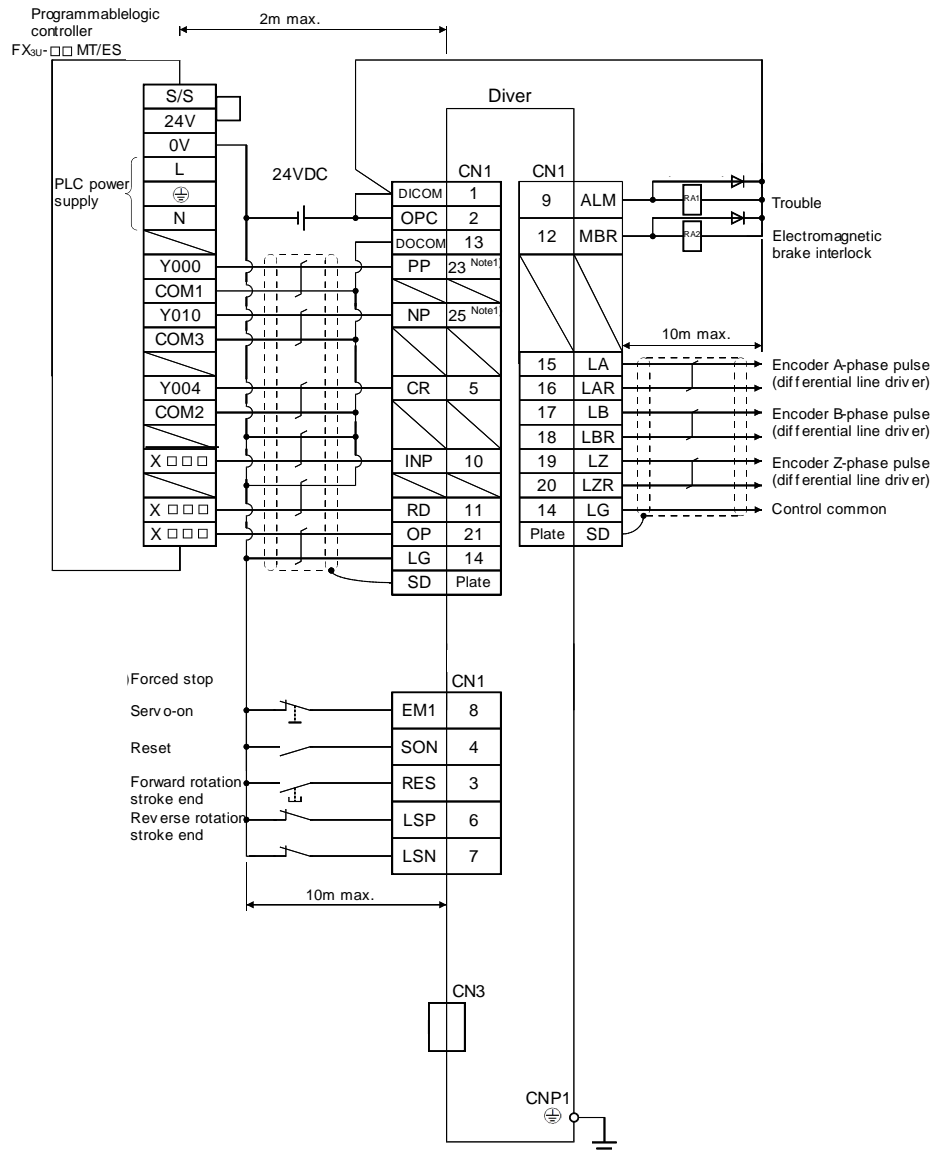
Detail of connection examples for the I/O signals of the driver.

3.2.1 Position control mode (Sink I/O interfaces)

(1) Connection example

An example of a connection for the position control mode is shown below. Connect wires as necessary.

This is a wiring example using the Mitsubishi Electric (FX3U-□□MT/ES) PLC for position control. (Connection example of the open collector system) See “LECSA Operation Manual” and the technical data disclosed the PLC and positioning unit operation manuals.



When connecting the CN1-23 pin and CN1-25 pin, supply the + 24V to OPC.

Refer to “LECSA Operation Manual”, section 3.2 for wiring details.

Refer to “LECSA Operation Manual (Simplified Edition)”, section 3.2.1 (2) and (3) for input/output signal details.

Note 1)

If the command pulse train input is open collector method, it supports only to the sink (NPN) type interface. It does not correspond to the source (PNP) type interface.

(2) Input signal

Position control mode: P, Speed control mode: S, Torque control mode: T, Point table method: CP, Program method: CL

●: Automatic ON can be set, ○: Initial setting, □: Assignment is available with parameter, —: Assignment is not available

Symbol	Device name	Automatic ON	P	S	T	CP/CL	Function
PP	Forward rotation pulse train	-	○	-	-	-	In the open collector system (max. input frequency 200kpps)
NP	Reverse rotation pulse train	-	○	-	-	-	Forward rotation pulse train across PP-DOCOM Reverse rotation pulse train across NP-DOCOM It supports only to the sink (NPN) type interface. It does not correspond to the source (PNP) type interface.
PG	Differential forward rotation pulse train	-	○	-	-	-	In the differential receiver system (max. input frequency 1Mpps)
NG	Differential reverse rotation pulse train	-	○	-	-	-	Forward rotation pulse train across PG-PP Reverse rotation pulse train across NG-NP
SON	Servo-on	●	○	○	○	○	Operation is available when SON is turned ON.
RES	Reset	-	○	○	○	□	Alarm can be reset.
LSP	Forward rotation stroke end	●	○	□	-	□	Turn this signal on before operation. When this signal turns off, the product is stopped suddenly and servo lock is enabled.
LSN	Reverse rotation stroke end	●	○	□	-	□	Turn this signal on before operation. When this signal turns off, the product is stopped suddenly and servo lock is enabled.
TL1	Internal torque limit selection	-	□	□	□	□	When this signal turns on, the torque will be lower than the set parameter torque.
ST1	Forward rotation start	-	-	○	-	○	Start the servo motor.
ST2	Reverse rotation start	-	-	○	-	○	Start the servo motor.
RS1	Forward rotation selection	-	-	-	○	-	Servo motor torque generating direction is selected.
RS2	Reverse rotation selection	-	-	-	○	-	Servo motor torque generating direction is selected.
SP1	Speed selection 1	-	-	○	○	-	The command rotation speed during operation is selected.
SP2	Speed selection 2	-	-	□	□	-	
SP3	Speed selection 3	-	-	□	□	-	
EM1	Forced stop	●	○	○	○	○	When this signal turns on, forced stop can be released.
CR	Clear	-	○	-	-	-	When CR is turned on, the droop pulses of the position control counter are cleared on its leading edge.
DI0	Point table No/Program No. selection 1	●	-	-	-	○	Select point table, program and return to home position mode with DI0 to DI2.
DI1	Point table No/Program No selection 2	●	-	-	-	○	
DI2	Point table No/Program No selection 3	●	-	-	-	□	
MD0	Automatic/manual selection	●	-	-	-	○	When this signal turns on, automatic operation mode is activated. When this signal turns off, manual operation mode is activated.

(3) Output signal

Position control mode: P, Speed control mode: S, Torque control mode: T, Point table method: CP, Program method: CL

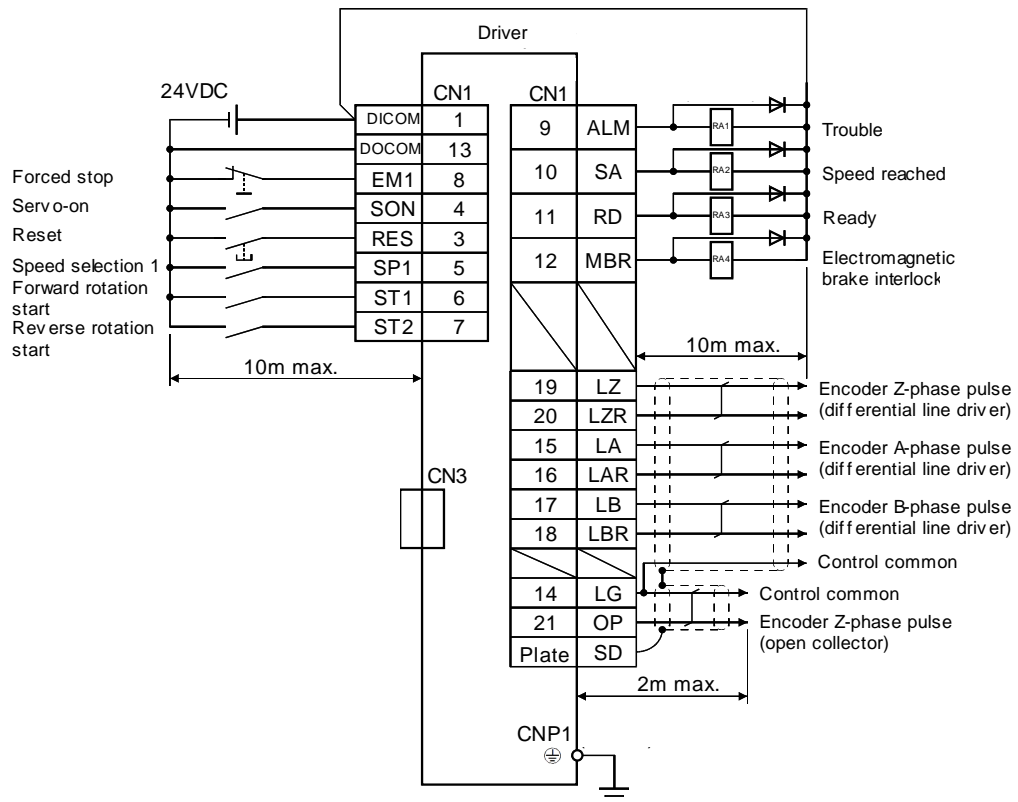
○: Initial setting, □: Assignment is available with parameter, —: Assignment is not available

Symbol	Device name	P	S	T	CP/ CL	Function
ALM	Trouble	○	○	○	○	This signal turns off while alarm is generated.
RD	Ready	○	○	○	○	When servo-on turns on and operation is available, this signal turns on.
INP	In-position	○	-	-	○	This signal turns on when the droop pulse is within the setting range.
SA	Speed reached	-	○	-	-	When the servo motor rotation speed reaches the set speed, this signal turns on.
VLC	Limiting speed	-	-	□	-	This signal turns on when reaching the speed restricted by parameter.
TLC	Limiting torque	□	□	-	□	This signal turns on when reaching the torque set by parameter while torque is generated. .
ZSP	Zero speed	□	□	□	□	When the servo motor rotation speed is lower than the speed set by parameter, this signal turns on.
MBR	Electromagnetic brake interlock	○	○	○	○	This signal turns off in case of servo off or when alarm is generated.

3.2.2 Speed control mode (Sink I/O interfaces)

(1) Connection example

An example of a connection for the speed control mode is shown below. Connect wires as necessary.



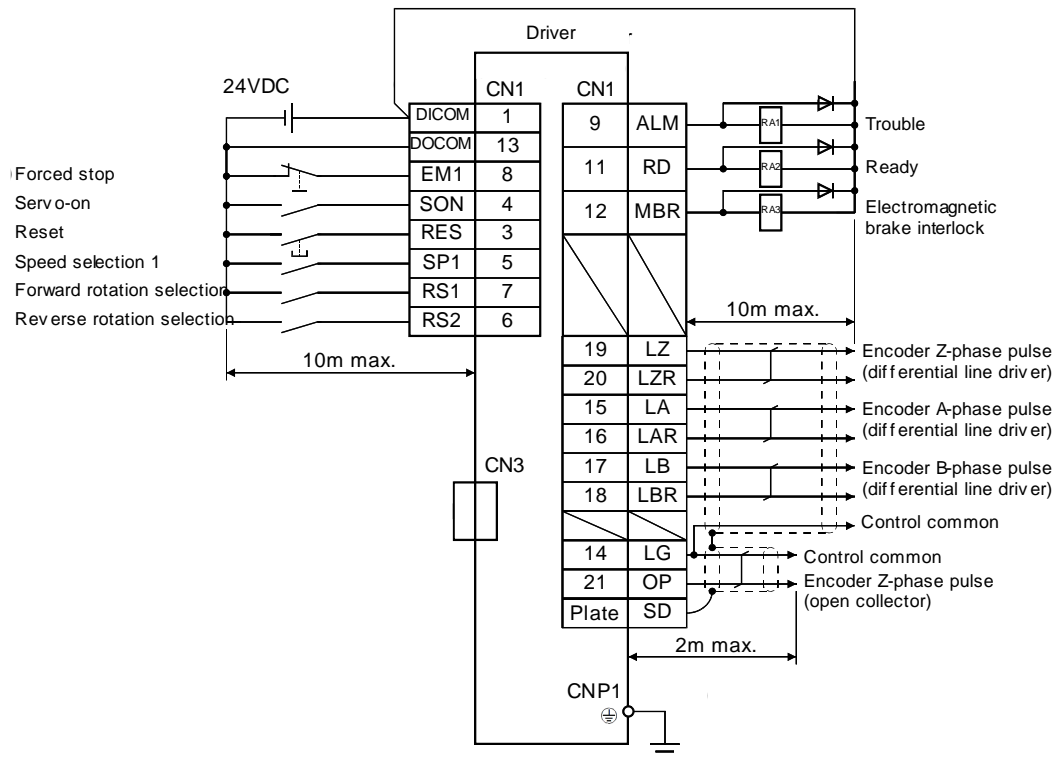
Refer to "LECSA Operation Manual", section 3.2 for wiring details.

Refer to "LECSA Operation Manual (Simplified Edition)", section 3.2.1 (2) and (3) for input/output signal details.

3.2.3 Torque control mode (Sink I/O interfaces)

(1) Wiring example

An example of a connection for the torque control mode is shown below. Connect wires as necessary.



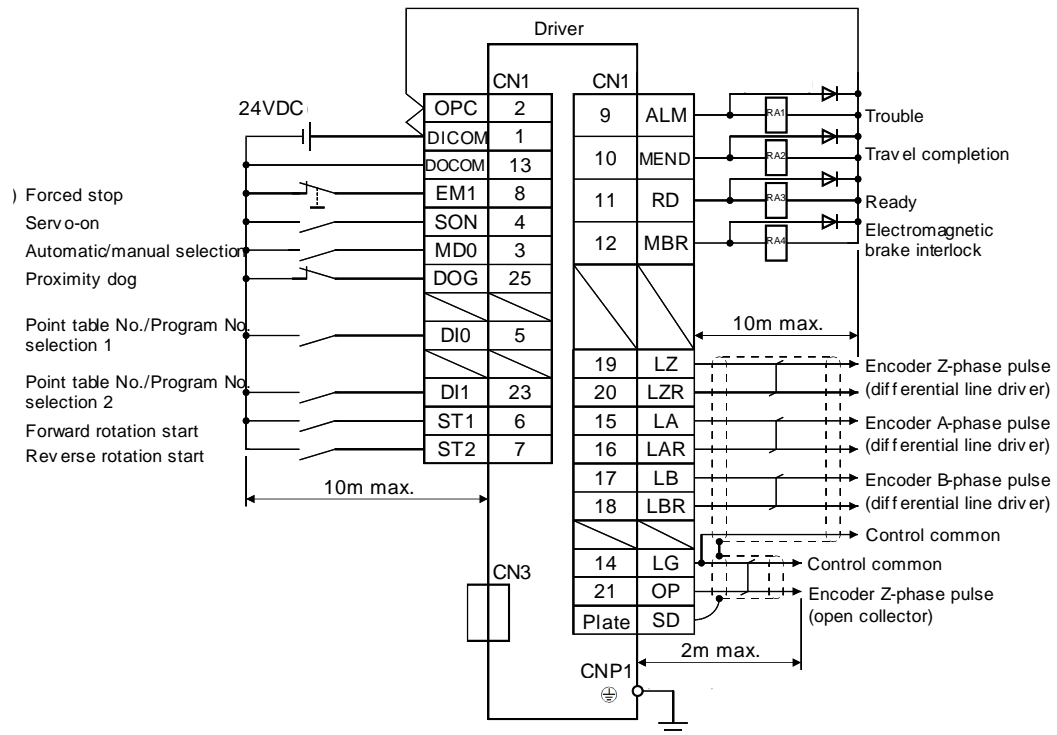
Refer to "LECSA Operation Manual", section 3.2 for wiring details.

Refer to "LECSA Operation Manual (Simplified Edition)", section 3.2.1 (2) and (3) for input/output signal details.

3.2.4 Positioning mode (Sink I/O interfaces)

(1) Connection example

An example of a connection for the position control mode is shown below. Connect wires as necessary.



When connecting the CN1-23 pin and CN1-25 pin, supply the + 24V to OPC.

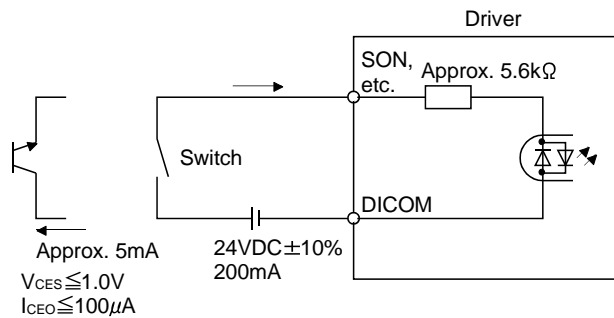
Refer to “LECSA Operation Manual”, section 3.2 for wiring details.

Refer to “LECSA Operation Manual (Simplified Edition)”, section 3.2.1 (2) and (3) for input/output signal details.

3.2.5 Source I/O interfaces

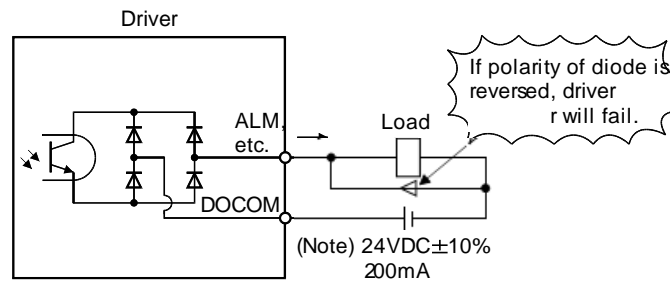
Source type I/O interfaces can be used with this driver. If used, all DI-1 input signals and DO-1 output signals are source type signals. Complete wiring according to the following interfaces.

(1) Digital input interface DI-1



(2) Digital output interface DO-1

A maximum voltage drop of 2.6V may occur in the driver.



ORIGINAL IMAGE REQUIRED

Note. If the voltage drop (2.6V max) interferes with the relay operation, apply high voltage (up to 26.4V) from external source.

4. List of Parameters for each Mode

These parameters require configuration in each control mode. Please configure parameters as required. Refer to “LECSA Operation Manual (Simplified Edition)”, section 5.3 and “LECSA Operation Manual”, chapter 4 for details.

Refer to “LECSA Operation Manual”, chapter 4 for parameters which are not disclosed in this document.

Setup software (MR Configurator2™ : LEC-MRC2E) is necessary for the setting of parameter.

*1 Setup software version 1.52E or above is required.

*2 The setup software (MR Configurator2™ : LEC-MRC2E) must be purchased as an additional item.

*3 The USB cable (LEC-MR-J3USB) must be purchased as an additional item.

4.1 Parameters common to each mode

(1) [Basic settings parameters (No.PA□□)]

No.	Symbol	Name	Initial value	Unit
PA01	*STY	Control mode	000h	

(2) [I/O setting parameters (No. PD□□)]

These parameters are set when changing the input/output signal assignment and switching the input signal automatic on. See “LECSA Operation Manual (Simplified Edition)”, section 5.5 and “LECSA Operation Manual” section 4.4 for details.

4.2 Position control mode

(1) [Basic settings parameters (No.PA□□)]

No.	Symbol	Description	Initial value	Unit
PA05	*FBP	Number of command input pulses per revolution	100	×100 pulse/rev
PA06	CMX	Electronic gear numerator (Command input pulse multiplying factor numerator)	1	
PA07	CDV	Electronic gear denominator (Command input pulse multiplying factor denominator)	1	
PA08	ATU	Auto tuning mode	001h	
PA09	RSP	Auto tuning response	6	
PA10	INP	In-position range	100	pulse
PA13	*PLSS	Command input pulse form	000h	
PA14	*POL	Rotation direction selection	0	

4.3 Speed control mode

(1) [Basic settings parameters (No. PA□□)]

No.	Symbol	Name	Initial value	Unit
PA08	ATU	Auto tuning mode	001h	
PA09	RSP	Auto tuning response	6	

(2) [Extension setting parameters (No. PC□□)]

No.	Symbol	Name	Initial value	Unit
PC01	STA	Acceleration time constant	0	ms
PC02	STB	Deceleration time constant	0	ms
PC05	SC0	Internal speed command 0	0	r/min
PC06	SC1	Internal speed command 1	100	r/min
PC07	SC2	Internal speed command 2	500	r/min
PC08	SC3	Internal speed command 3	1000	r/min
PC31	SC4	Internal speed command 4 [Applied]	200	r/min
PC32	SC5	Internal speed command 5 [Applied]	300	r/min
PC33	SC6	Internal speed command 6 [Applied]	500	r/min
PC34	SC7	Internal speed command 7 [Applied]	800	r/min

4.4 Torque control mode

(1) [Extension setting parameters (No. PC□□)]

No.	Symbol	Name	Default	Unit
PC01	STA	Acceleration time constant	0	ms
PC02	STB	Deceleration time constant	0	ms
PC05	SC0	Internal speed limit 0	0	r/min
PC06	SC1	Internal speed limit 1	100	r/min
PC07	SC2	Internal speed limit 2	500	r/min
PC08	SC3	Internal speed limit 3	1000	r/min
PC31	SC4	Internal speed limit 4 [Applied]	200	r/min
PC32	SC5	Internal speed limit 5 [Applied]	300	r/min
PC33	SC6	Internal speed limit 6 [Applied]	500	r/min
PC34	SC7	Internal speed limit 7 [Applied]	800	r/min

4.5 Positioning mode

(1) [Basic settings parameters (No. PA□□)]

No.	Symbol	Name	Initial value	Unit
PA05	*FBP	Number of command input pulses per revolution	100	×100 pulse/rev
PA06	CMX	Electronic gear numerator (Command input pulse multiplying factor numerator)	1	
PA07	CDV	Electronic gear denominator (Command input pulse multiplying factor denominator)	1	
PA08	ATU	Auto tuning mode	001h	
PA09	RSP	Auto tuning response	6	
PA10	INP	In-position range	100	pulse
PA13	*PLSS	Command input pulse form	000h	
PA14	*POL	Rotation direction selection	0	

(2) [Positioning setting parameters (No. PE□□)]

No.	Symbol	Name	Initial value	Unit
PE01	CTY	Command mode selection	0000h	
PE02	FTY	Feeding function selection	0000h	
PE03	ZTY	Home position return type	0010h	
PE04	ZRF	Home position return speed	500	r/min
PE06	ZST	Home position shift distance	0	μm
PE07	FTS	Home position return/JOG operation Acceleration/Deceleration time constants	100	ms
PE08	ZPS	Home position return position data	0	×10 ^{STM} μm
PE13	JOG	JOG speed	100	r/min
PE16	LMPL	Software limit +	0	×10 ^{STM} μm
PE17	LMPH			
PE18	LMNL	Software limit -	0	×10 ^{STM} μm
PE19	LMNH			

(3) [I/O setting parameters (No. PD□□)]

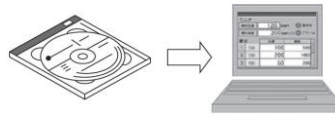
These parameters are set when changing the assignment of the input/output signal and using the point table at a maximum of 7 points.

See "LECSA Operation Manual (Simplified Edition)", section 5.5 and "LECSA Operation Manual", section 4.4 for details.

5. Parameter Configuration using Setup software (MR Configurator2™)

This section describes the configuration procedure for main parameters using the setup software (MR Configurator2™: LEC-MRC2E). See chapter 4 of the “LECSA Operation Manual” for parameter details.

5.1 PC Setup software (MR Configurator2™)



*1 Setup software version 1.52E or above is required.

*2 The setup software (MR Configurator2™: LEC-MRC2E) must be purchased as an additional item.

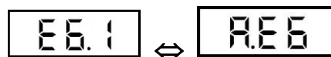
*3 The USB cable (LEC-MR-J3USB) must be purchased as an additional item.

5.1.1 Installation Method

Perform installation according to the “MR Configurator2™ instruction manual” (Manual/ib0300160*.pdf) contained on the setup software (MR Configurator2™) CD-ROM. The “MR Configurator2” software will be added to the PC.

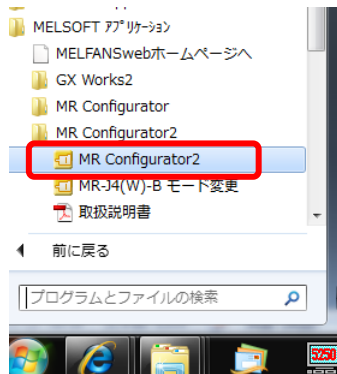
5.2 Basic driver set-up for Initial Test Drive

Switch on the 24 VDC and 230 VAC power supply to the LECSA driver and wait until the driver display flashes as shown below.

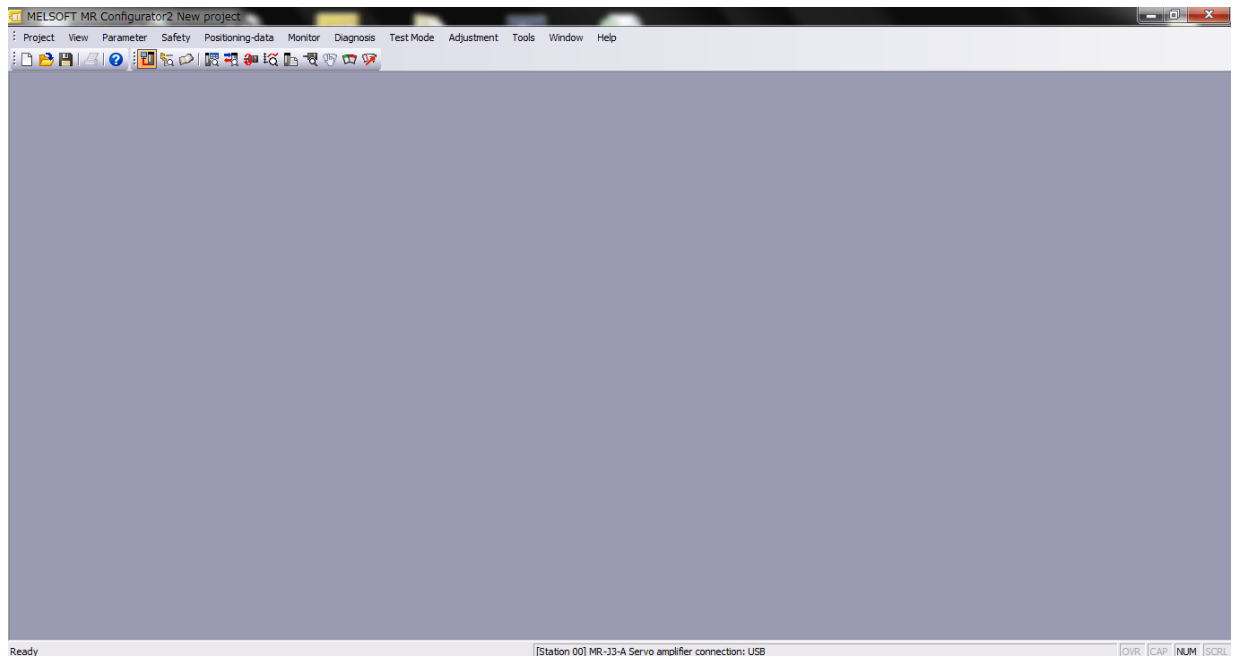


5.2.1 Start up the Setup software (MR Configurator2™)

- ① Connect the PC and LECSA using the USB cable.
- ② Turn on the power of the LECSA.
- ③ Start application “MR Configurator2”.

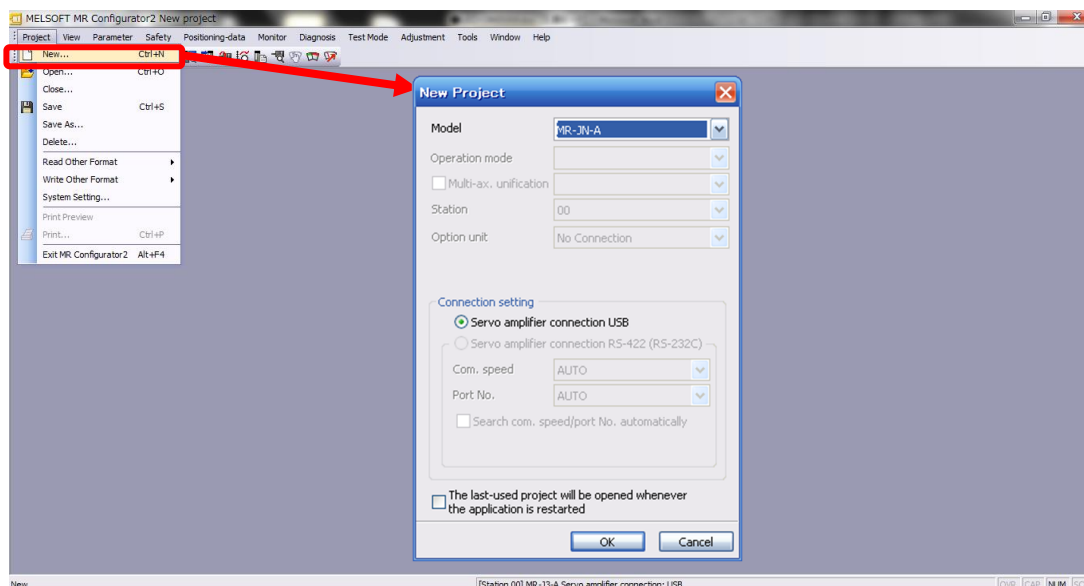


Once the application starts, the screen below will be displayed.



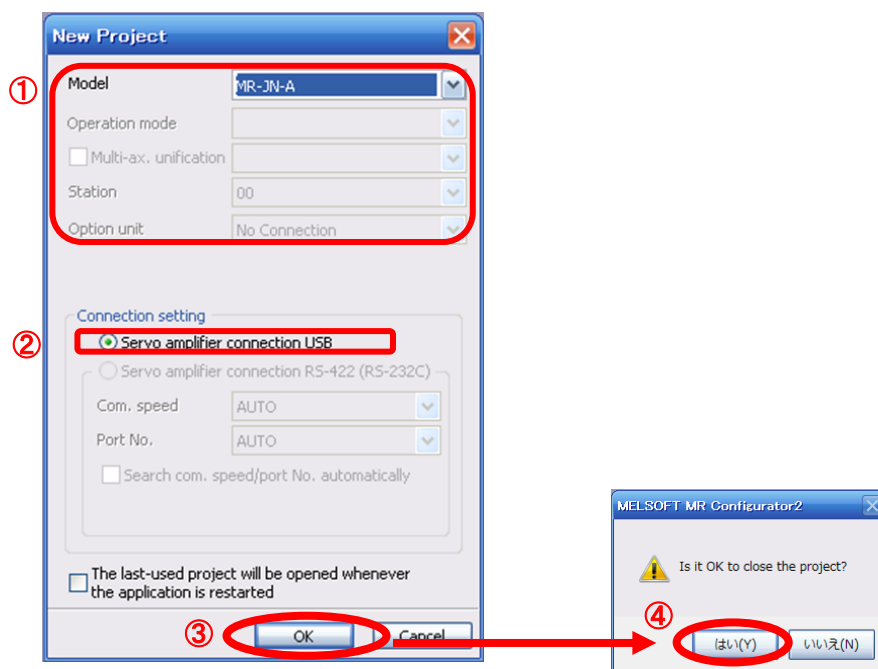
5.2.2 “System Settings”

- ① From “Project” menu select “New”, the “New project” window will be displayed.



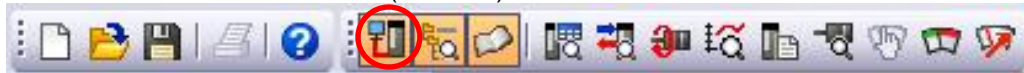
5.2.3 Model Selection

- ① The Mitsubishi Electric Corporation series will be displayed in the model selection list. Please select MR-JN-A when using the LECSA.
The station should be set to 00.
Be sure to change parameter [PC40] to [0].
The default value of parameter [PC40] is [0].
When using LECSA for the first time, please use the default parameter for [PC40] as [0].
Please select “servo amplifier connection USB” as the communication device. Click OK.
(PC40 - is a parameter data which enables the USB port to communicate with the LECSA controller)
(The default value for this parameter is 0 and should not be changed)
- ② Please select “servo amplifier connection USB” as the communication device.
- ③ Click OK.
- ④ Click OK.




5.2.4 Driver ON LINE Check

Check that the driver is enabled (ONLINE).



Check that the “ONLINE/OFFLINE” icon is displayed “”.

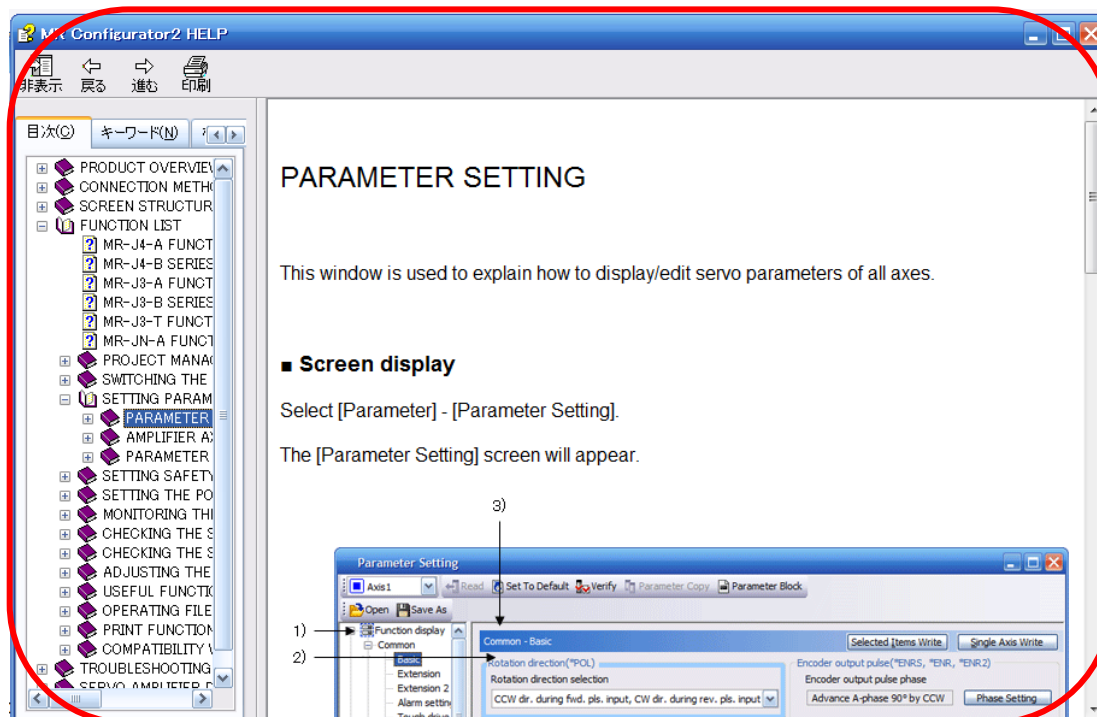
When It is OFFLINE it is displayed as “”.

* For OFFLine, PC and amplifier aren't communicating. Confirm the following points.

- Is amplifier's power supply turned on?
 - Is the PC and LECSA amplifier connected with the USB cable?
 - Is the USB driver installed?
 - Is the USB driver which is compliant to Windows version installed?
 - Is parameter [PC40] set to [0]?
- (PC40 - is a parameter data which enables the USB port to communicate with the LECSA controller)
(The default value for this parameter is 0 and should not be changed)

5.2.5 Help Function

By selecting “MR Configurator2 Help” in “Help” from any window of the setup software, a “HELP” screen will be shown.



5.3 Parameter setting (Driver side)

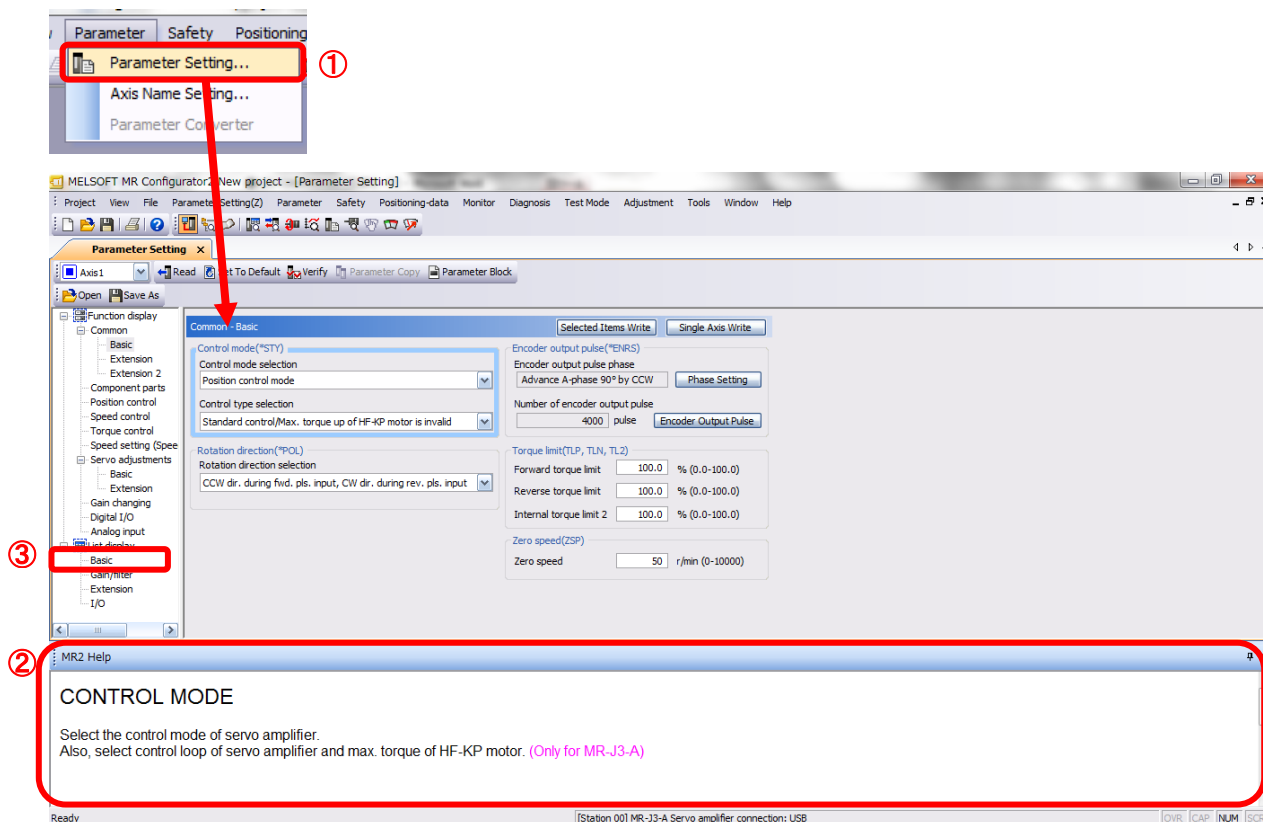
The setup software (MR Configurator2™: LEC-MRC2E) is necessary for setting the parameter.

*1 Setup software version 1.52E or above is required.

*2 The setup software (MR Configurator2™: LEC-MRC2E) must be purchased as an additional item.

*3 The USB cable (LEC-MR-J3USB) must be purchased as an additional item.

- ① From the “Parameter” menu select “Parameter Setting”, the “parameter setting” window will open.
- ② The explanation of the parameter item is displayed in “MR2 Help”.
(When it is not displayed, from the “View” menu select “Docking window” – “Docking Help”.)



- ③ When each item of “List display” is clicked, “Parameter list” screen along each item is displayed. When “Basic” is selected, it is displayed as follows.

Basic					
No.	Abbr.	Name	Units	Setting range	Axis 1
PA01	*STY	Control mode		0000-0F55	0000
PA02	*REG	Regenerative option		0000-71FF	0000
PA03	*ABS	Absolute position detection system		0000-0004	0000
PA04	*AOP1	Function selection A-1		0000-F031	0000
PA05	*FBP	Number of command input pulses per revolution		0-0 / 1000-50000	0
PA06	CMX	Elec. gear numerator (Cmd. pls. mult. factor num.)		1-1048576	1
PA07	CDV	Elec. gear denominator (Cmd. pls. mult. factor den.)		1-1048576	1
PA08	ATU	Auto tuning mode		0000-0003	0001
PA09	RSP	Auto tuning response		1-32	12
PA10	INP	In-position range	pulse	0-65535	100
PA11	TLP	Forward rotation torque limit	%	0.0-100.0	100.0
PA12	TLN	Reverse rotation torque limit	%	0.0-100.0	100.0
PA13	*PLSS	Command pulse input status		0000-0812	0000
PA14	*POL	Rotation direction selection		0-1	0
PA15	*ENR	Encoder output pulse	pulse/rev	1-1048576	4000
PA16	*ENR2	For manufacturer setting		0000-FFFF	0000
PA17	*MSR	For manufacturer setting		0000-FFFF	0000
PA18	*MTY	For manufacturer setting		0000-FFFF	0000
PA19	*BLK	Parameter block		0000-FFFF	000C

Refer to "LECSA Operation Manual", chapter 4 for details of each parameter.

5.3.1 Change of parameter block

To enable settings for all parameters.

- ① Select "Basic" tab and change "PA19" value to "00E".
- ② Click the "PA19" row then click "Selected Items Write".
- ③ **Cycle the power for parameters for this driver to be enabled.**

Basic					② Selected Items Write	Single Axis Write
No.	Abbr.	Name	Units	Setting range	Axis1	
PA01	*STY	Control mode		0000-0F55	0000	
PA02	*REG	Regenerative option		0000-71FF	0000	
PA03	*ABS	Absolute position detection system		0000-0004	0000	
PA04	*AOP1	Function selection A-1		0000-F031	0000	
PA05	*FBP	Number of command input pulses per revolution		0-0 / 1000-50000	0	
PA06	CMX	Elec. gear numerator (Cmd. pls. mult. factor num.)		1-1048576	1	
PA07	CDV	Elec. gear denominator (Cmd. pls. mult. factor den.)		1-1048576	1	
PA08	ATU	Auto tuning mode		0000-0003	0001	
PA09	RSP	Auto tuning response		1-32	12	
PA10	INP	In-position range	pulse	0-65535	100	
PA11	TLP	Forward rotation torque limit	%	0.0-100.0	100.0	
PA12	TLN	Reverse rotation torque limit	%	0.0-100.0	100.0	
PA13	*PLSS	Command pulse input status		0000-0812	0000	
PA14	*POL	Rotation direction selection		0-1	0	
PA15	*ENR	Encoder output pulse	pulse/rev	1-1048576	4000	
PA16	*ENR2	For manufacturer setting		0000-FFFF	0000	
PA17	*MSR	For manufacturer setting		0000-FFFF	0000	
PA18	*MTY	For manufacturer setting		0000-FFFF	0000	
PA19	*BLK	Parameter block		0000-FFFF	000C	①

- ④ Please click "Read".



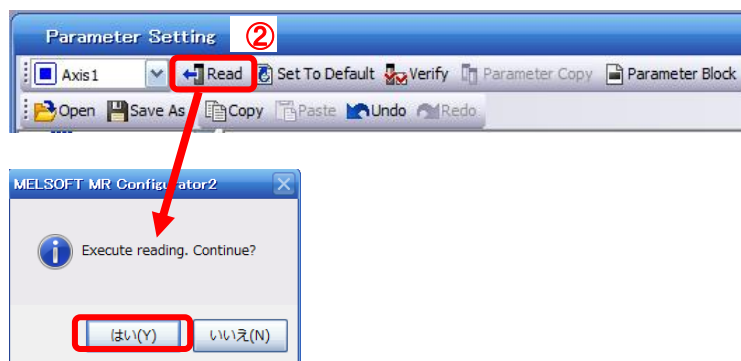
When changing of each parameter, note the following points.

- Note1) For Some of the parameters, there is "**Enable once on again turning the power OFF after setting**". (If you do not cycle the power, it does not register the data in the driver.)
- Note2) "Selected Items Write": It writes the parameter values of the corresponding frame to the driver.
 "Single Axis Write": Writes all of the parameters to the driver.
- Note3) Do not change "For manufacturer setting" parameters. If you change by these by mistake, it may cause the amplifier to not work properly.

5.3.2 Read of parameters

If you wish to read the parameters of the driver then, please select the "Read" operation.

- ① From the View menu bar "parameter (A)" - please click on the "parameter setting (P)". "Parameter Settings" screen will display.
- ② Please click on the "Read".



5.3.3 Parameter Configuration Method (Ex. "Control mode" selection)

Please set the parameters for each actuator.

Please change the parameter values according to usage.

Refer to "LECSA Operation Manual", chapter 4 for details of each parameter.

Refer to "LECSA Operation Manual, Appendix" for recommended parameter values for SMC supplied actuators. However, when using position control mode (pulse input), do not alter parameters PE02/PE03/PE04/PE07/PE08/PE10/PE11 from their initial values (Only change these parameters for Positioning mode (point table/program method)).

• Setting example of the Control mode (PA01) (in the case of setting to **"position control mode (pulse input)"**).

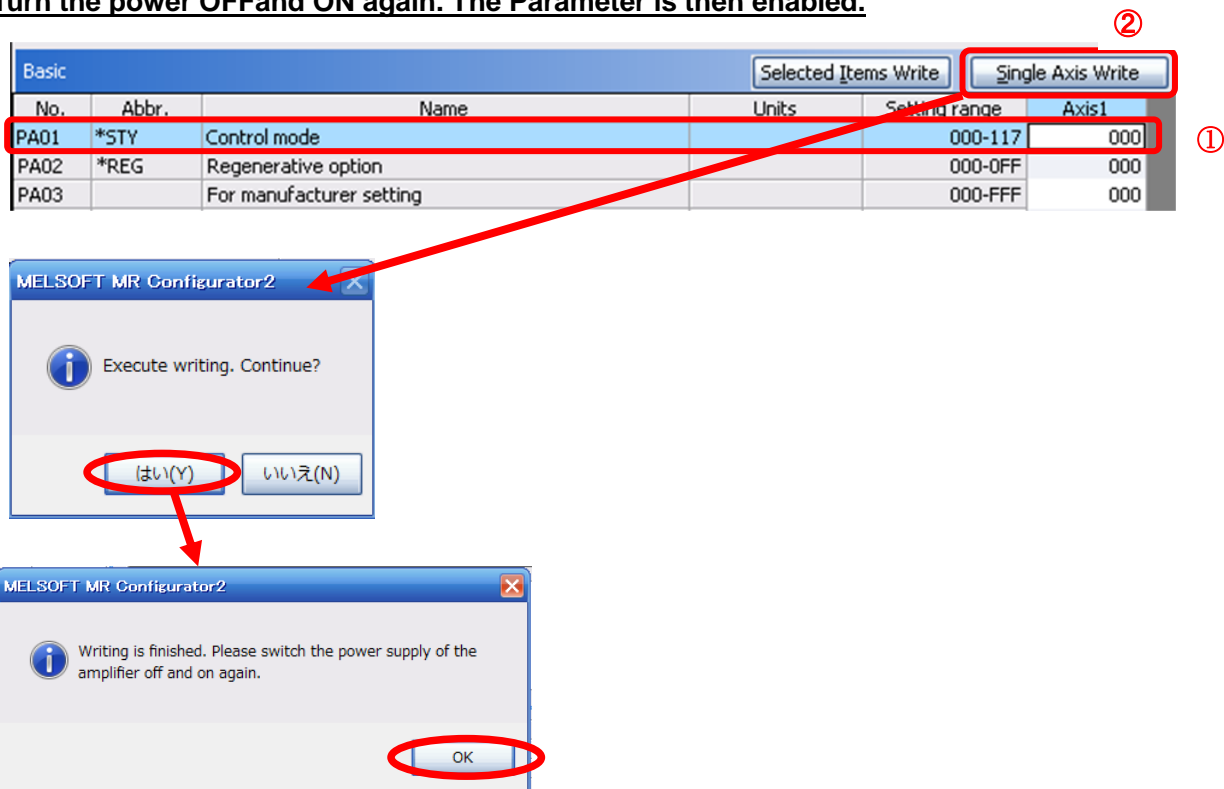
① Set the parameters of the PA01 to "000" in the "Basic" tab.

• Setting example of the Control mode (PA01) (in the case of setting to **"Positioning (Point table)"**).

① Set the parameters of the PA01 to "006" in the "Basic" tab.

② Click on the "Single Axis Write" button.

③ **Turn the power OFF and ON again. The Parameter is then enabled.**



When changing of each parameter, note the following points.

Note1) For some of the parameters, there is **"Enable once on again turning the power OFF after setting"**. (If you do not cycle the power, it does not register the data in the driver.)

Note2) "Selected Items Write": Writes the parameter values of the corresponding frame to the driver.

"Single Axis Write": Writes all of the parameters to the driver.

Note3) Do not change "For manufacturer setting" parameters. If you change these by mistake, then it may cause the amplifier to not work properly.

5.3.4 Electronic Gears

It is necessary to adjust the electric gear to convert from the command pulses sent from position unit to the travel amount of electrical actuator.

See "LECSA Operation Manual, Appendix" for the recommended values for electronic gears for each actuator model.

Please configure the electronic gear values according to the customer application.

(1) LECSA Parameter Configuration: [PA05], [PA06] and [PA07]

Parameter			Initial value	Setting range	Unit	Control mode			
No.	Symbol	Name				Position	Internal speed	Internal torque	Positioning
PA05	*FBP	Number of command input pulses per revolution	100	0 · 100 to 500	× 100 pulse/rev	○			○
PA06	CMX	Electronic gear numerator (Command pulse multiplying factor numerator)	1	1 to 65535		○			○
PA07	CDV	Electronic gear denominator (Command pulse multiplying factor denominator)	1	1 to 65535		○			○

(1) Complete configuration as shown below.

<ul style="list-style-type: none"> • [PA05] = 100 (Initial value) The initial value of 100 corresponds to the "Number of command input pulses per revolution" of 10000 [pulses/rev]. 	
<ul style="list-style-type: none"> • [PA06] = $\frac{[PA05] \times 100 \times P \times \frac{1}{1000}}{\lceil \text{Actuator lead } L[\text{mm}] \rceil \times n1/n2}$ 	
<ul style="list-style-type: none"> • [PA07] = $\frac{P: \text{Travel amount per 1 command pulse } [\mu\text{m}] *1}{n1/n2: \text{Pulley ratio} *2}$ 	

Ex.)

Travel amount per 1 command pulse (P=10μm)
Actuator lead (L = 6mm)
Pulley ratio (n1/n2 = 1/1)

[PA05] = 100 (Initial value)

$$\frac{[PA06]}{[PA07]} = \frac{100 \times 100 \times 10 \times \frac{1}{1000}}{6 \times 1/1} = \frac{100 \times 100 \times 0.01}{6}$$

$$\frac{[PA06]}{[PA07]} = \frac{100}{6}$$

*1 In case position control mode, "Travel amount per 1 command pulse" P = 10[μm]

In case positioning mode, "Travel amount per 1 command pulse" P = 1[μm]

*2 For pulley ratio, refer to Lead of "LECSA Operation Manual (Simplified Edition)", section 5.3.4.

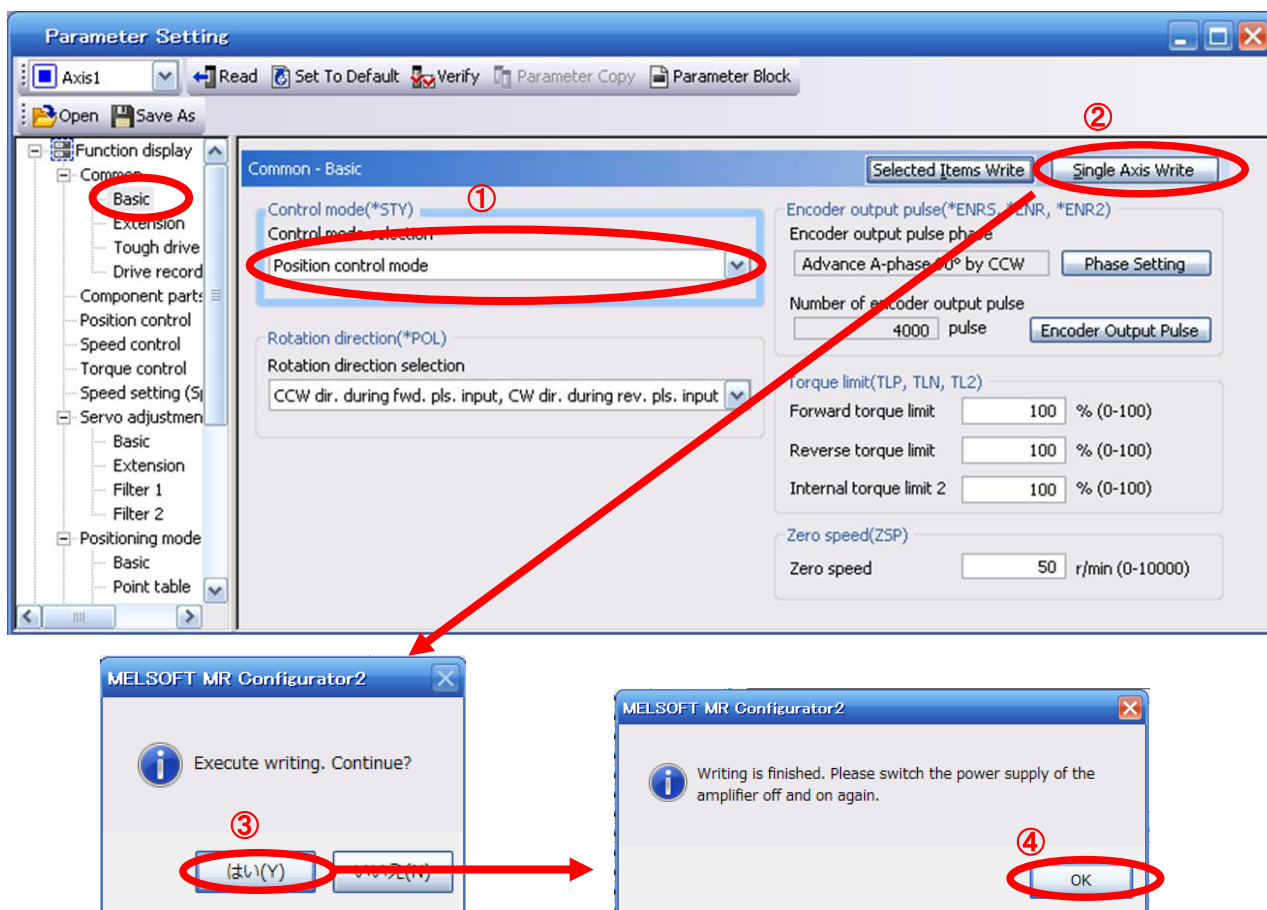
The actuator not described for pulley ratio is calculated by "1/1".

5.3.5 Control mode selection

- ① To use **position control mode (pulse input)**, navigate to the "Basic" tab of the "Parameter Setting" screen - "Control mode selection" - Please select "Position control mode".
("PA01" parameter in the "Basic" tab of the List display also changes to "000".)

To use **positioning mode (point table)**, navigate to the "Basic" tab of the "Parameter Setting" screen - "Control mode selection" - Please select "Positioning mode method".
("PA01" parameter in the "Basic" tab of the List display also changes to "006".)

- ② Click on the "Single Axis Write" button.
- ③ Click OK.
- ④ Click OK. (After power OFF→ON, the parameter is enabled.)



5.3.6 Set the parameter of command pulse input form

It is required to set the command input pulse form dependent on the upper unit pulse train when using the Position control mode (pulse input).

• Input form (3 types)

- ① Forward rotation pulse train/Reverse rotation pulse train
- ② Pulse train/ Direction phase pulse train/B-phase pulse train
- ③ A-phase pulse train/ B-phase pulse train

• Logic (2 types)

- ① Positive logic
- ② Negative logic

• Input form (3 pulse types) × positive/negative logic (2 types) = 6 selectable types

In the upper level device (positioning module), there is a parameter which sets the output pulse form (mode). The form of the upper level device (positioning module) must be made "compatible" with the LECSA. If the forms are not compatible, the operation work correctly. Please be aware that depending on the upper level device (positioning module), the "command input pulse forms" above may not be available.

Parameter			Initial value	Setting range	Unit	Control mode		
No.	Symbol	Name				Position	Internal speed	Internal torque
PA13	*PLSS	Command input pulse form	000h	Refer to the text.		○		

Select the input form of the pulse train input signal. Command pulses may be input in any of three different forms, for which positive or negative logic can be chosen.

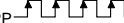



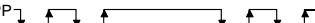



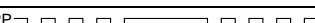

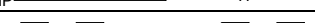

Arrow  or  in the table indicates the timing of importing a pulse train.

A- and B-phase pulse trains are imported after being multiplied by 4.

Parameter No. PA13

--	--	--

Selection of command input pulse form

Setting	Pulse train form	Forward rotation command	Reverse rotation command
00	Forward rotation pulse train Reverse rotation pulse train	PP  NP 	
01	Signed pulse train	PP  NP 	
02	A-phase pulse train B-phase pulse train	PP  NP 	
10	Forward rotation pulse train Reverse rotation pulse train	PP  NP 	
11	Signed pulse train	PP  NP 	
12	A-phase pulse train B-phase pulse train	PP  NP 	

Pulse train input filter selection

Setting	Command pulse frequency
0	1Mpps or less
1	500kpps or less
2	200kpps or less

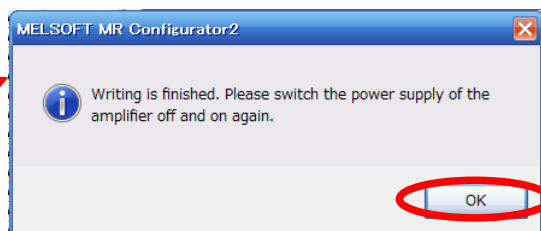
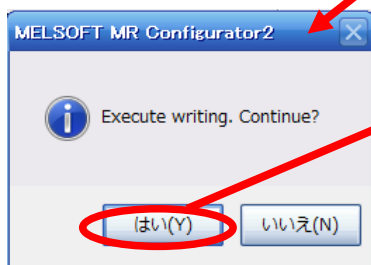
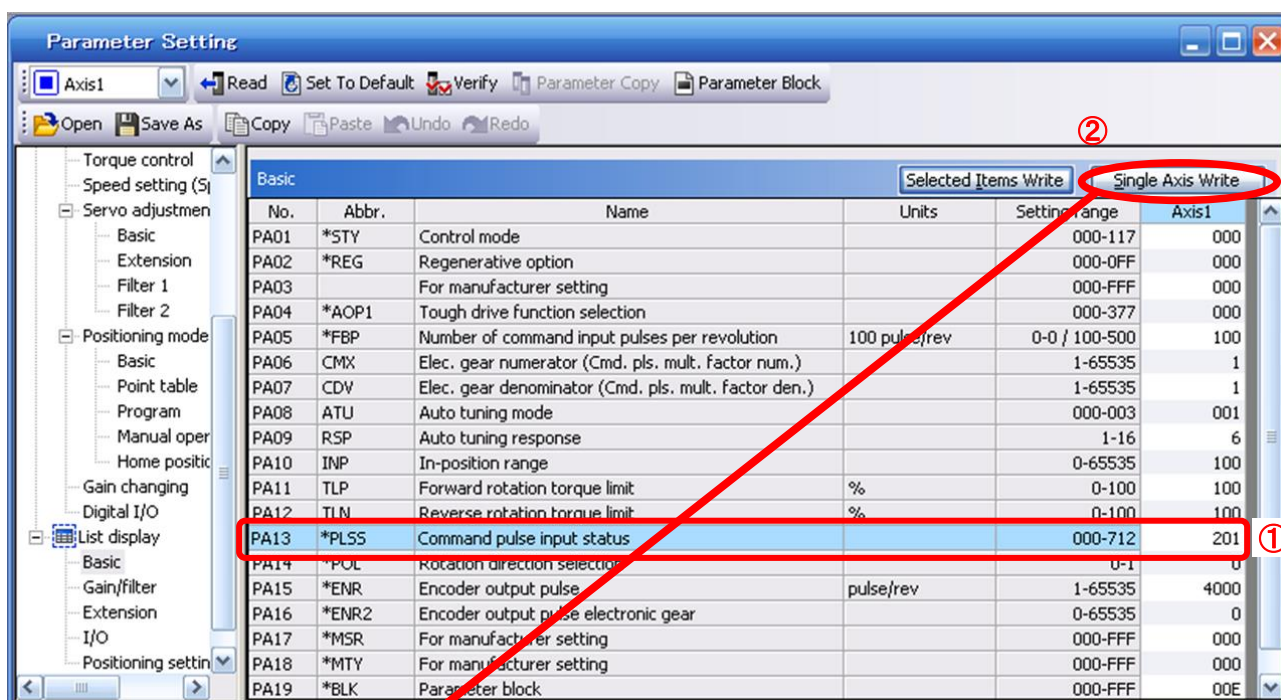
Ex.) Setting of Command input Pulse form, when:

(1) The command pulse frequency is 200kpps or less and

(2) The pulse train form is set to positive logic, with the NP signal high and low

[PA13] = 201

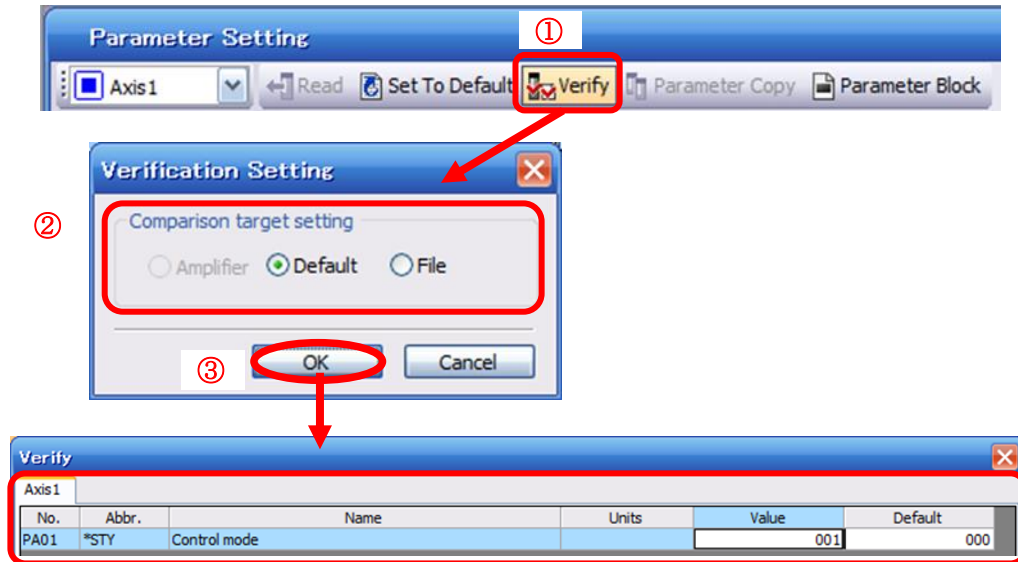
- ① Set the "PA13" to "201" in the "Basic" tab.
- ② Click on the "Single Axis Write" button.
- ③ **Turn the power OFF and ON again. Parameter is enabled.**



5.3.7 Verify of parameters

If you want to compare the "parameter" set in the setup software with the "Parameters set in the driver" / "Initial value parameter" / "Saved parameter", perform "Verify".

- ① Click the "Verify" button on the [Parameter Setting] window. "Verification Setting" screen will display.
- ② Please select the comparison target.
Amplifier : Compare with the parameters set in the driver.
Default : Compare with the initial value of the parameter.
File : Compare with saved parameters.
- ③ Please click "OK" button. The verified result is displayed.



5.3.8 Parameter initialization

If you want to initialize parameters in the driver, please perform "Set to Default".

When you initialize the parameters, parameters can not be undone.

Please be sure to save the parameters in use.

(Refer to "LECSA Operation Manual (Simplified Edition)", section 5.8.1 for the parameter storage method.)

- ① Click the "Set To Default" button on the [Parameter Setting] window.
- ② Please click "Yes" button. "Parameter Block" screen will display.
Set the default using an editable parameter as the browsable range of the selected parameter block.
- ③ Select the parameter block you want to initialize.
- ④ Please click "OK" button.
Set the default using an editable parameter as the browsable range of the selected parameter block.
- ⑤ Click on the "Single Axis Write" button.
- ⑥ **Turn the power OFF and ON again. Parameter is enabled.**

Parameter Setting

Axis1 [Set To Default] [Verify] [Parameter Copy] [Parameter Block]

MELSOFT MR Configurator2

Setting to default. Continue?

はい(Y) いいえ(N)

Parameter Block

Target axis: Axis1

*BLK	Parameter block	*BLK	PA	PB	PC	PD	PE
000		RW	RW	-	-	-	-
00A		RW	-	-	-	-	-
00B		RW	RW	RW	RW	-	-
00C		RW	RW	RW	RW	RW	-
00E		RW	RW	RW	RW	RW	RW
10B		RW	R	-	-	-	-
10C		RW	R	R	R	R	-
10E		RW	R	R	R	R	R

RW: Browse/write valid -: Browse/write invalid R: Only browse valid

OK Cancel

Basic

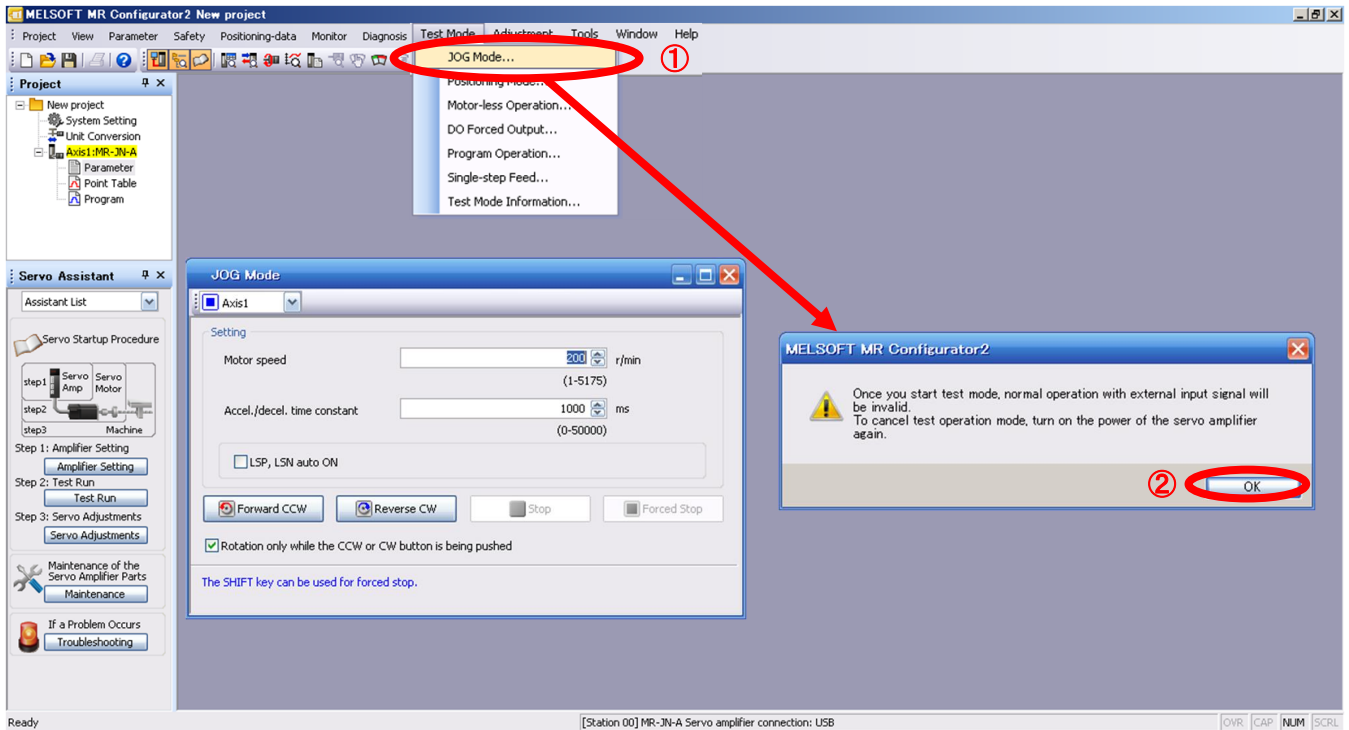
Selected Items Write Single Axis Write

No.	Abbr.	Name	Units	Setting range	Axis1
PA01	*STY	Control mode		000-117	000
PA02	*REG	Regenerative option		000-OFF	000
PA03		For manufacturer setting		000-FFF	000

5.4 JOG Mode in the Setup Software

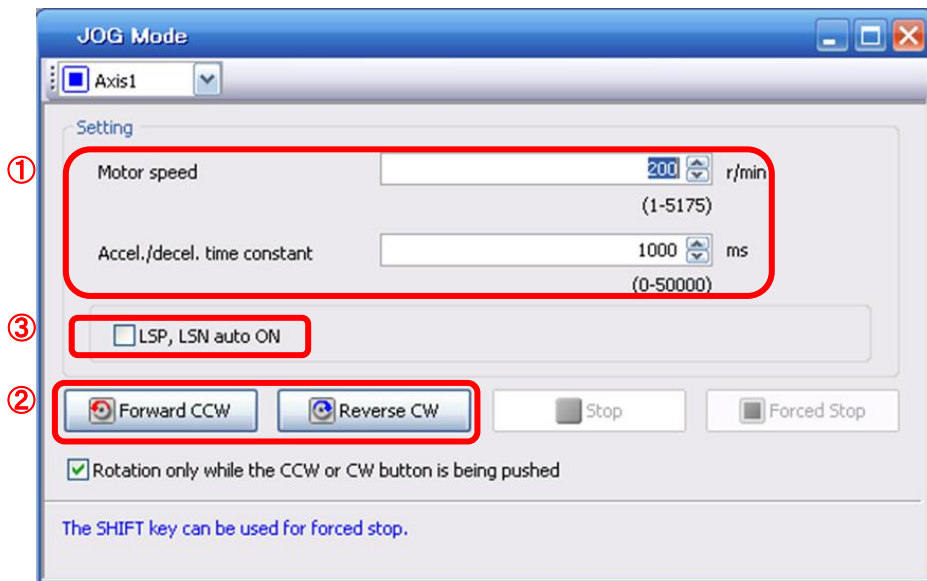
- ① The “JOG Mode” window can be displayed by selecting “Jog Mode” from the “Test Mode” menu in the **setup software**.
- ② Click “OK”.

(When using this function, all external input signal operation will be disabled. If controlling using a PLC or other upper device, please turn off the power and reset the device before use.)



5.4.1 JOG Mode

- ① In order to prevent accidental impact at the end of the stroke, test actuator operation at low speed. See “LECSA Operation Manual (Simplified Edition)”, section 5.6.2 for motor speed configuration. See “LECSA Operation Manual (Simplified Edition)”, section 5.6.3 for Acceleration/deceleration time.
- ② Check actuator JOG operation using [Forward (CCW)] and [Reverse (CW)] in JOG mode.
(if operation is not correct, please check wiring and parameters).
When performing JOG operation in the setup software, the rotation direction of the actuator does not change if you change the setting of parameter PA14 (Rotation direction selection).
The actuator moves in the direction of [Forward (CCW)] button and [Reverse (CW)] button.
- ③ If the selection “LSP and LSN are automatically turned ON” is not checked, an alarm will occur (if checked, the stroke end signals (LSP & LSN) will be automatically turned ON when this window is open).



Item	Setting range	Unit	Description
Motorspeed	0 ~ allowable actuator speed	r/min	Set the command speed of the servo motor for execution of positioning (motor rotations/minute).
Acceleration/deceleration time	0 ~ 50000	ms	Set the time until the servo motor reaches/stops to the rated speed (3000 r/min).

5.5 Changing I/O Signal Allocation

Input/output signal assignment can be changed as appropriate from initial settings.

There may be cases when changes to the Input/output signal assignment are required for actuator operation.

Please be aware that any changes will alter signals entered as initial settings.

Please allocate it according to your system specification.

*When configuring PD**, please set parameter write inhibit [PA19] to 00E.

See "LECSA Operation Manual", section 4.4 for details.

Set parameters related to I/O: [PD02] to [PD18]

PD02 to PD14 Input signal assignment (CN1-23, CN1-25, CN1-3 to CN1-8)
PD15 to PD18 Output signal assignment (CN1-9 to CN1-12)

5.5.1 Automatic Input Signal ON Selection Parameter Configuration

Configure the input signal automatic ON selection parameter.

The parameter "PD01: Input signal automatic ON selection 1" settings, defines which input signals will turn ON automatically when the control circuit power supply is turned on., doing this allows additional I/O signal selection range.

Please allocate it according to your system specification.

Configure the automatic ON selection in parameter [PD01], or configure the I/O signal layout.

When wiring I/O signal, do not set the corresponding signal in "PD01: Input signal automatic ON selection 1".

(Ex.) If the servo-on (SON) is automatically turned on with PD01, the actuator will always be in the servo-on state when the control circuit power supply is turned on.

Therefore, it is not possible to operate servo-on/servo-off from the I/O signal.

***If all I/O signals are controlled, please set PD01 to 0000.**

Please configure PD01 : Input signal automatic ON selection in Hexadecimal (HEX).

During Actuator Operation: <Signals which must be ON during actuator operation>

Set PD01 as 0C24. The following signals will automatically turn on when power supply turns on.

SON	Servo-on	OFF: Servo-off ON : Servo-on (operational)
LSP	Forward rotation Stroke end (normally closed contact)	OFF: Forward rotation Stroke end ON : Forward rotation Stroke end off (operational)
LSN	Reverse rotation Stroke end (normally closed contact)	OFF: Reverse rotation Stroke end ON : Reverse rotation Stroke end off (operational)
EM1	Forced stop (normally closed contact)	OFF: Forced stop ON : Forced stop off (operational)

In positioning mode (point table), configure the operation mode using automatic/manual selection **MD0**.

The MD0 off selection will allow Jog operation and it will require an input reserved for MD0.

For Automatic MD0 please set PD01 as 0C25. Will also include MD0 automatic ON.

MD0	Automatic/manual selection	OFF: Manual Operation Mode → JOG operation available. ON: Automatic Operation Mode → Home position return/positioning mode operation available.
-----	----------------------------	--

(1) PD01 : Input signal automatic ON selection 1

If you want to the LSP, LSN, EN1, SON, MD0 automatic ON, please set "PD01" to "0C25".

PD01	*DIA1	Input signal automatic ON selection 1 Select the input devices to be automatically turned ON.	0000h
------	-------	--	-------

Signal name				Initial value	
				BIN	HEX
Automatic/manual selection (MD0)				0	0
Servo-on (SON)				0	
Proportion control (PC)				0	
Forced stop (EM1)				0	0
Forward rotation stroke end (LSP)				0	
Reverse rotation stroke end (LSN)				0	

BIN 0: Used as external input signal
BIN 1: Automatic ON

If you want to the SON and MD0 to automatic ON

Binary number (BIN) "0101" to
Hexadecimal (HEX) "5"

If you want to the EM1 to automatic ON

Binary number (BIN) "0010" to
Hexadecimal (HEX) "2"

If you want to the LSP and LSN to automatic ON

Binary number (BIN) "1100" to
Hexadecimal (HEX) "C"

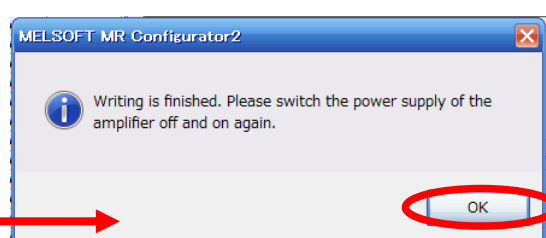
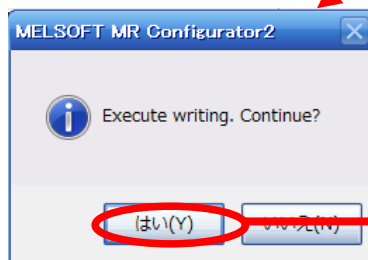
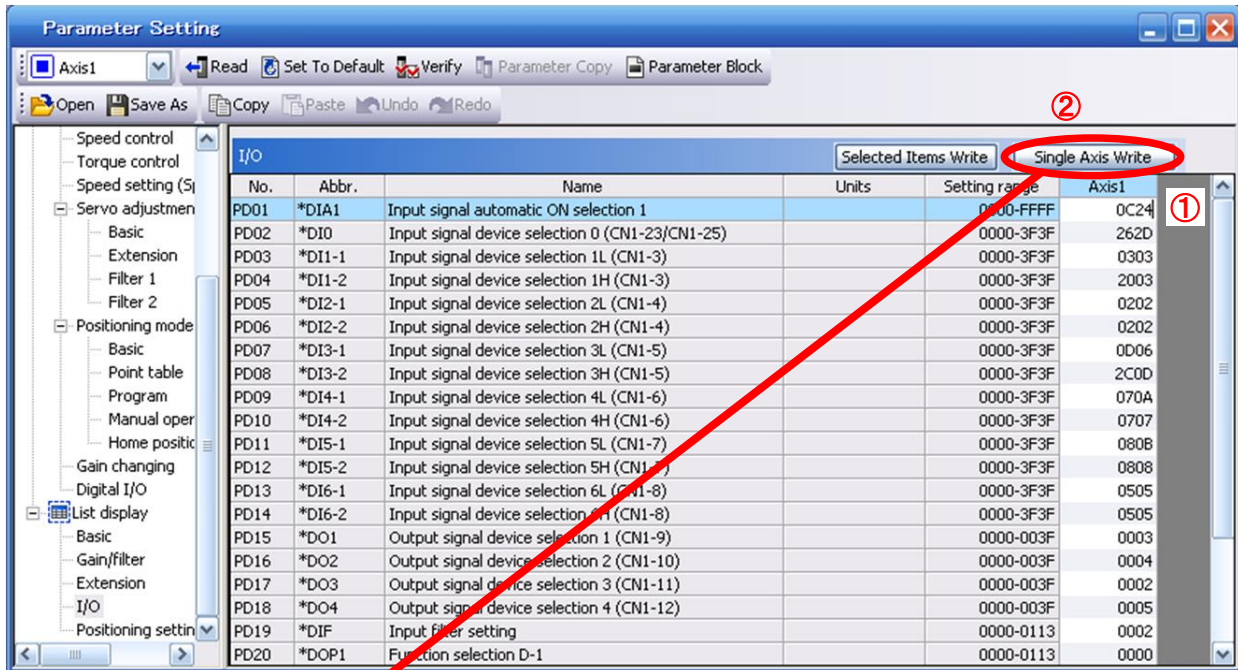
Binary number → Decimal / Hexadecimal

Binary number	Decimal	Hexadecimal
0 0 0 0	0	0
0 0 0 1	1	1
0 0 1 0	2	2
0 0 1 1	3	3
0 1 0 0	4	4
0 1 0 1	5	5
0 1 1 0	6	6
0 1 1 1	7	7
1 0 0 0	8	8
1 0 0 1	9	9
1 0 1 0	10	A
1 0 1 1	11	B
1 1 0 0	12	C
1 1 0 1	13	D
1 1 1 0	14	E
1 1 1 1	15	F

*** Enabling "Stroke end" (LSP, LSN), "Forced stop" (EM1) and "Servo-on" (SON) Signals**

- ① Set to PD01 to 0C24 in the I/O tab.
- ② Click on the "Single Axis Write" button.
- ③ **Cycle the power off, then for the changed Parameters to be enabled.**

* In this configuration, the stroke end (LSP, LSN), forced stop (EM1) and servo-on (SON) signals will be ON automatically when the power is turned ON.



5.5.2 Initial I/O Signal Allocation

(1) Position control mode (pulse input):

The initial (Default) allocation of I/O signals is shown below.

PD03 to PD14 Input signal assignment (CN1-3 to CN1-8)
PD15 to PD18 Output signal assignment (CN1-9 to CN1-12)

Input signal points (6): (position control mode) and initial assignment

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Reset	RES	CN1-3	DI-1	PD03	0303
Servo-on	SON	CN1-4	DI-1	PD05	0202
Clear	CR	CN1-5	DI-1	PD07	0D06
Forward rotation stroke end	LSP	CN1-6	DI-1	PD09	070A
Reverse rotation stroke end	LSN	CN1-7	DI-1	PD11	080B
Forced stop	EM1	CN1-8	DI-1	PD13	0505

Output signal points (4): (position control mode) and initial assignment

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Trouble	ALM	CN1-9	DO-1	PD15	0003
In-position	INP	CN1-10	DO-1	PD16	0004
Ready	RD	CN1-11	DO-1	PD17	0002
Electromagnetic brake interlock	MBR	CN1-12	DO-1	PD18	0005

See “LECSA Operation Manual”, section 3.5 and “LECSA Operation Manual”, section 3.6 for details regarding signals.

See “LECSA Operation Manual”, section 4.4.2 for parameter configuration values.

- ※ Pins CN1-23 and CN1-25 are pulse input terminals. These cannot be allocated as any other input signals.
- ※ Pins CN1-3 - CN1-8 (input signals) and CN1-9 - CN1-12 (output signals) can be allocated as current Sink (NPN) interface and current Source (PNP) interface wiring and I/O signal allocation.

(2) Positioning mode:

The initial allocation of the I/O signals is shown below.

PD02 to PD14 Input signal assignment (CN1-23, CN1-25, CN1-3 to CN1-8)
PD15 to PD18 Output signal assignment (CN1-9 to CN1-12)

Input signal points (8): (positioning mode) and initial assignment

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Forced stop	EM1	CN1-8	DI-1	PD14	0505
Proximity dog	DOG	CN1-25	DI-1	PD02	262D
Servo-on	SON	CN1-4	DI-1	PD06	0202
Automatic /manual selection	MD0	CN1-3	DI-1	PD04	2003
Forward rotation start	ST1	CN1-6	DI-1	PD10	0707
Reverse rotation start	ST2	CN1-7	DI-1	PD12	0808
Point table No. /Program No. selection 1	DI0	CN1-5	DI-1	PD08	2C0D
Point table No. /Program No. selection 2	DI1	CN1-23	DI-1	PD02	262D

Output signal points (4): (positioning mode) and initial assignment

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Trouble	ALM	CN1-9	DO-1	PD15	0003
In-position	INP	CN1-10	DO-1	PD16	0004
Ready	RD	CN1-11	DO-1	PD17	0002
Electromagnetic brake interlock	MBR	CN1-12	DO-1	PD18	0005

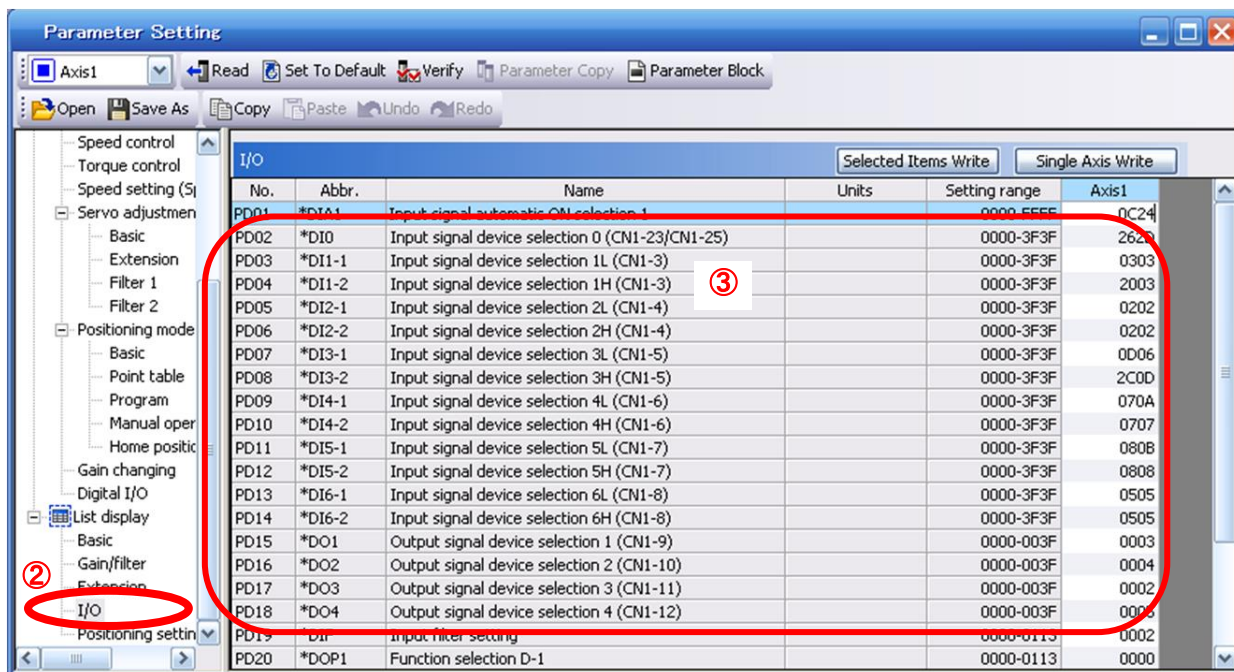
See “LECSA Operation Manual”, section 13.2.3 for details regarding signals.

See “LECSA Operation Manual”, section 4.4.2 for details on parameter setting values.

- ※ Pins CN1-23 and CN1-25 can be allocated in current Sink (NPN) interface wiring and I/O signal allocation only.
- ※ Pins CN1-3 and CN1-8 (input signals) and CN1-9 ~ CN1-12 (output signals) can be allocated in current Sink (NPN) interface and current Source (PNP) interface wiring and I/O signal allocation.

5.5.3 Signal Allocation using Setup Software

- ① The "Parameter Setting" window will be displayed when "parameter list" is selected from the "parameters" menu in the setup software.
- ② Click the I/O tab.
- ③ When changing the allocation of signals, parameters for "PD02" - "PD18" can be altered.



5.5.4 Allocation Examples for Position Control Mode (Pulse Input)

(1) Example of Gain switch (CDP) Settings

When changing pin CN1-4 from Servo-on (SON) to Gain switch (CDP).

①

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Reset	RES	CN1-3	DI-1	PD03	0303
Servo-on	SON	CN1-4	DI-1	PD05	0202
Clear	CR	CN1-5	DI-1	PD07	0D08
Forward rotation stroke end	LSP	CN1-6	DI-1	PD09	070A
Reverse rotation stroke end	LSN	CN1-7	DI-1	PD11	080B
Forced stop	EM1	CN1-8	DI-1	PD13	0505

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Reset	RES	CN1-3	DI-1	PD03	0303
Gain changing	CDP	CN1-4	DI-1	PD05	0202→0211
Clear	CR	CN1-5	DI-1	PD07	0D08
Forward rotation stroke end	LSP	CN1-6	DI-1	PD09	070A
Reverse rotation stroke end	LSN	CN1-7	DI-1	PD11	080B
Forced stop	EM1	CN1-8	DI-1	PD13	0505

① Changing PD05 from 0202 to 0211

PD05	*DI2-1	Input signal device selection 2L (CN1-4) Any input signal can be assigned to the CN1-4 pin. The devices that can be assigned and the setting method are the same as in parameter No. PD03.
------	--------	--

1 1

Position control mode
Internal speed control mode

Select the input device of the CN1-4 pin.

Setting	Control modes (Note 1)			
	P	S	T	CP/CL
00				
01	For manufacturer setting (Note 2)			
02	SON	SON	SON	SON
03	RES	RES	RES	RES
04	PC	PC		PC
05	EM1	EM1	EM1	EM1
06 (Note 4)	CR			
07		ST1	RS2	ST1
08		ST2	RS1	ST2
09	TL1	TL1		TL1
0A	LSP	LSP		LSP
0B	LSN	LSN		LSN
0C	For manufacturer setting (Note 2)			
0D		SP1	SP1	
0E		SP2	SP2	
0F		SP3	SP3	
10	LOP	LOP	LOP	
11	CDP	CDP		CDP
12 to 1F	For manufacturer setting (Note 2)			
20				MD0
21 to 23	For manufacturer setting (Note 2)			
24				TSTP
25	For manufacturer setting (Note 2)			
26				DOG
27				PI1(注 3)
28 to 2B	For manufacturer setting (Note 2)			
2C				DI0
2D				DI1
2E				DI2
2F to 3F	For manufacturer setting (Note 2)			

Note 1. P: Position control mode

S: Internal speed control mode

T: Internal torque control mode

CP: Positioning mode (Point table method)

CL: Positioning mode (Program method)

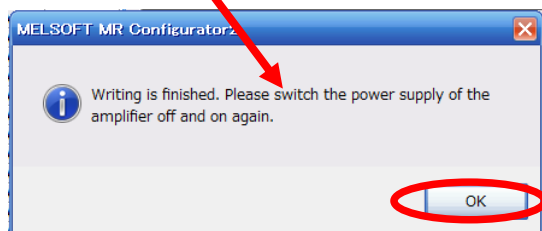
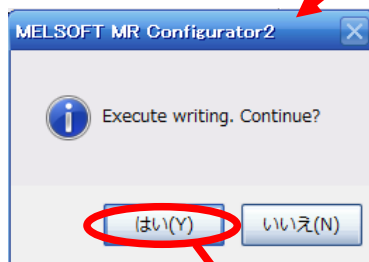
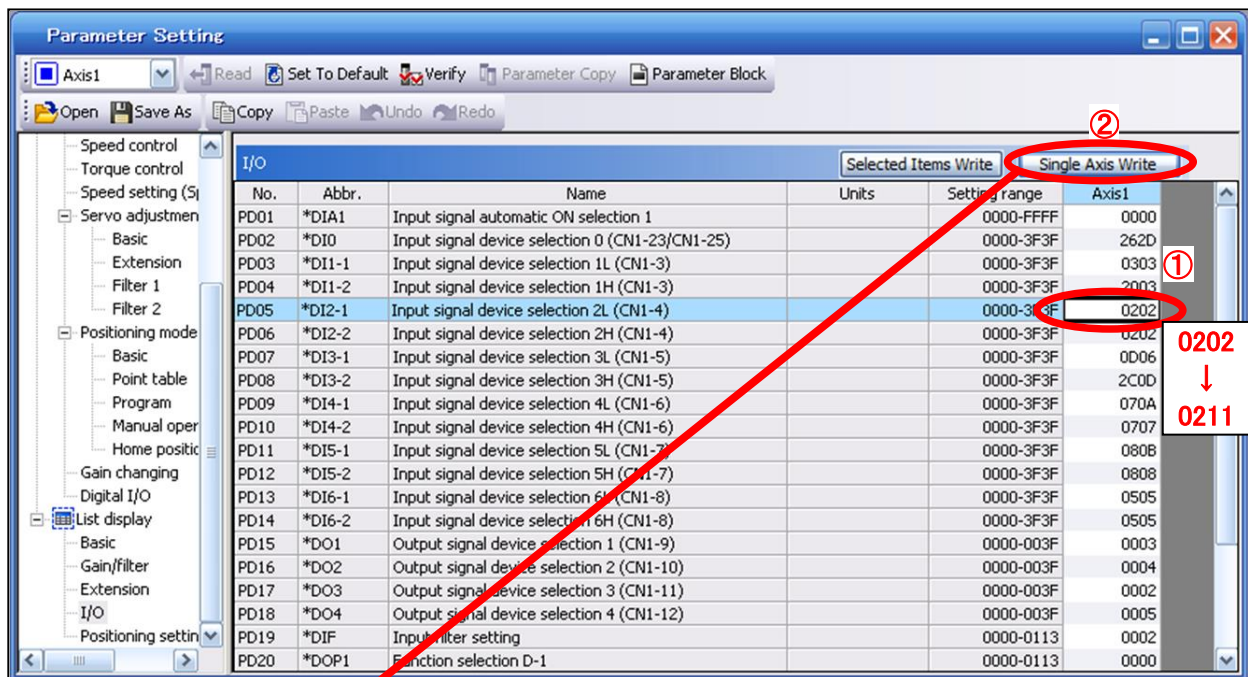
2. For manufacturer setting. Never set this value.

3. It is valid in the positioning mode (Program method) only.

4. When operating temporarily without using EM1 such as at startup, etc., set the EM1 to automatic ON in parameter No. PD01.

(2) Symbol allocation using the setup software:
Changing pins CN1 – 4 from servo-on (SON) to gain switch (CDP):

- ① Change PD05 from 0202 to 0211 in the I/O tab.
- ② Click on the "Single Axis Write" button.
- ③ Cycle the power off, then on for the parameters to be enabled.



- ※ Please allocate pins CN1-4 separately.
- ※ See “LECSA Operation Manual”, section 4.4.2 for details on allocation of input signals to pins CN1-3 - CN1-8.
- ※ See “LECSA Operation Manual”, section 4.4.2 for details on allocation of Output signals to pins CN1-9 - CN1-12.

5.5.5 Setting a Maximum of 7 Points using the Point Table in Positioning mode (Point Table)

The point table can reach a maximum of 7 points using input signals DI0, DI1 and DI2.

Device	Symbol	Connector pin No.	Functions/Applications	I/O division	Positioning mode																																									
					CP	CL																																								
Point table No. /Program No. selection 1	DI0	CN1-5	<In point table method> The point table No. and the home position return mode are selected by DI0 to DI2. <In program method> The program No. is selected by DI0 to DI2.	DI-1	○	○																																								
Point table No. /Program No. selection 2	DI1	CN1-23	<table><tr><th colspan="3">(Note) Device</th><th>Selection description</th></tr><tr><th>DI2</th><th>DI1</th><th>DI0</th><th>Point table method</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Home position return mode</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Point table No. 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Point table No. 2</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Point table No. 3</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Point table No. 4</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Point table No. 5</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Point table No. 6</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Point table No. 7</td></tr></table>	(Note) Device			Selection description	DI2	DI1	DI0	Point table method	0	0	0	Home position return mode	0	0	1	Point table No. 1	0	1	0	Point table No. 2	0	1	1	Point table No. 3	1	0	0	Point table No. 4	1	0	1	Point table No. 5	1	1	0	Point table No. 6	1	1	1	Point table No. 7	DI-1	○	○
(Note) Device			Selection description																																											
DI2	DI1	DI0	Point table method																																											
0	0	0	Home position return mode																																											
0	0	1	Point table No. 1																																											
0	1	0	Point table No. 2																																											
0	1	1	Point table No. 3																																											
1	0	0	Point table No. 4																																											
1	0	1	Point table No. 5																																											
1	1	0	Point table No. 6																																											
1	1	1	Point table No. 7																																											
Point table No. /Program No. selection 3	DI2		Note. 0: off 1: on	DI-1	△	△																																								

The default allocation, allocates signals DI0 to (CN1-5) and DI1 to (CN1-23).

Note – CN1-23 can only be used if the input is configured as current sink NPN

8 points can be specified , however 1 point is reserved for the home position return, 7 points can be specified in the point table.

When using a maximum of 7 point tables, wiring and input signal allocation of the DI2 must be implemented.

(1) Example of Allocation of a Maximum of 7 Points in current SINK (NPN) Interface

Changing pin CN1-7 from Reverse rotation start (ST2) to point table no./program no. selection 3 (DI2):

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Forced stop	EM1	CN1-8	DI-1	PD14	0505
Proximity dog	DOG	CN1-25	DI-1	PD02	262D
Servo-on	SON	CN1-4	DI-1	PD06	0202
Automatic /manual selection	MD0	CN1-3	DI-1	PD04	2003
Forward rotation start	ST1	CN1-6	DI-1	PD10	0707
Reverse rotation start	ST2	CN1-7	DI-1	PD12	0808
Point table No. /Program No. selection 1	DI0	CN1-5	DI-1	PD08	2C0D
Point table No. /Program No. selection 2	DI1	CN1-23	DI-1	PD02	262D

Device	Symbol	Connector pin No.	I/O division	Parameters No.	Initial value
Forced stop	EM1	CN1-8	DI-1	PD14	0505
Proximity dog	DOG	CN1-25 (Note)	DI-1	PD02	262D
Servo-on	SON	CN1-4	DI-1	PD06	0202
Automatic /manual selection	MD0	CN1-3	DI-1	PD04	2003
Forward rotation start	ST1	CN1-6	DI-1	PD10	0707
Point table No. /Program No. selection 3	DI2	CN1-7	DI-1	PD12	0808 → 2E08
Point table No. /Program No. selection 1	DI0	CN1-5	DI-1	PD08	2C0D
Point table No. /Program No. selection 2	DI1	CN1-23 (Note)	DI-1	PD02	262D

① Change PD12 from 0808 to 2E08.

PD12	*DI5-2	Input signal device selection 5H (CN1-7) Any input signal can be assigned to the CN1-7 pin. The devices that can be assigned and the setting method are the same as in parameter No. PD03.	0808h
------	--------	--	-------

2 E

Internal torque control mode } Select the input device of the CN1-7 pin.
Positioning mode }

Setting	Control modes (Note 1)			
	P	S	T	CP/CL
00				
01	For manufacturer setting (Note 2)			
02	SON	SON	SON	SON
03	RES	RES	RES	RES
04	PC	PC		PC
05 (Note 4)	EM1	EM1	EM1	EM1
06	CR			
07		ST1	RS2	ST1
08		ST2	RS1	ST2
09	TL1	TL1		TL1
0A	LSP	LSP		LSP
0B	LSN	LSN		LSN
0C	For manufacturer setting (Note 2)			
0D		SP1	SP1	
0E		SP2	SP2	
0F		SP3	SP3	
10	LOP	LOP	LOP	
11	CDP	CDP		CDP
12 to 1F	For manufacturer setting (Note 2)			
20				MD0
21 to 23				For manufacturer setting (Note 2)
24				TSTP
25				For manufacturer setting (Note 2)
26				DOG
27				PI1 (注 3)
28 to 2B				For manufacturer setting (Note 2)
2C				DI0
2D				DI1
2E				DI2

Note 1. P: Position control mode
S: Internal speed control mode
T: Internal torque control mode
CP: Positioning mode (Point table method)
CL: Positioning mode (Program method)
2. For manufacturer setting. Never set this value.
3. It is valid in the positioning mode (Program method) only.
4. When operating temporarily without using EM1 such as at startup, etc., set the EM1 to automatic ON in parameter No. PD01.

Note – CN1-23 can only be used if the input is configured as current sink NPN

(2) Example of Allocation of a Maximum of 7 Points in current Source (PNP) Interface

- ① Changing pins CN1-3 from Automatic/manual selection (MD0) to point table no./program no. selection 3 (DI2):
- ② Changing pins CN1-7 from Reverse rotation start (ST2) to point table no./program no. selection 2 (DI1):

Device	Symbol	Connector pin No.	I/O Division	Parameters No.	Initial value
Forced stop	EM1	CN1-8	DI-1	PD14	0505
Source (PNP) Assignment disable	-	CN1-25 (Note)	DI-1	PD02	-
Servo-on	SON	CN1-4	DI-1	PD06	0202
Automatic / manual selection	MD0	CN1-3	DI-1	PD04	2003
Forward rotation start	ST1	CN1-6	DI-1	PD10	0707
Reverse rotation start	ST2	CN1-7	DI-1	PD12	0808
Point table No./ Program No. selection1	DI0	CN1-5	DI-1	PD08	2C0D
Source (PNP) Assignment disable	-	CN1-23 (Note)	DI-1	PD02	-

Device	Symbol	Connector pin No.	I/O Division	Parameters No.	Initial value
Forced stop	EM1	CN1-8	DI-1	PD14	0505
Source (PNP) Assignment disable	-	CN1-25 (Note)	DI-1	PD02	-
Servo-on	SON	CN1-4	DI-1	PD06	0202
Point table No./ Program No. selection3	DI2	CN1-3	DI-1	PD04	2003→2E03
Forward rotation start	ST1	CN1-6	DI-1	PD10	0707
Point table No./ Program No. selection2	DI1	CN1-7	DI-1	PD12	0808→2D08
Point table No./ Program No. selection1	DI0	CN1-5	DI-1	PD08	2C0D
Source (PNP) Assignment disable	-	CN1-23 (Note)	DI-1	PD02	-

- ① Change PD04 from 2003 to 2E03.

PD04	*DI1-2	Input signal device selection 1H (CN1-3) Any input signal can be assigned to the CN1-3 pin. The devices that can be assigned and the setting method are the same as in parameter No. PD03.	2003h
		<div style="border: 1px solid black; padding: 2px;">2E</div> <div style="border: 1px solid black; padding: 2px;">Internal torque control mode</div> <div style="border: 1px solid black; padding: 2px;">Position control mode</div>	

- ② Change PD12 from 0808 to 2D08.

PD12	*DI5-2	Input signal device selection 5H (CN1-7) Any input signal can be assigned to the CN1-7 pin. The devices that can be assigned and the setting method are the same as in parameter No. PD03.	0808h
		<div style="border: 1px solid black; padding: 2px;">2D</div> <div style="border: 1px solid black; padding: 2px;">Internal torque control mode</div> <div style="border: 1px solid black; padding: 2px;">Positioning mode</div>	

Setting	Control modes (Note 1)			
	P	S	T	CP/CL
00				
01	For manufacturer setting (Note 2)			
02	SON	SON	SON	SON
03	RES	RES	RES	RES
04	PC	PC		PC
05 (Note4)	EM1	EM1	EM1	EM1
06	CR			
07		ST1	RS2	ST1
08		ST2	RS1	ST2
09	TL1	TL1		TL1
0A	LSP	LSP		LSP
0B	LSN	LSN		LSN
0C	For manufacturer setting (Note 2)			
0D		SP1	SP1	
0E		SP2	SP2	
0F		SP3	SP3	
10	LOP	LOP	LOP	
11	CDP	CDP		CDP
12 to 1F	For manufacturer setting (Note 2)			
20				MD0
21 to 23	For manufacturer setting (Note 2)			
24				TSTP
25	For manufacturer setting (Note 2)			
26				DOG
27				PI1(注3)
28 to 2B	For manufacturer setting (Note 2)			
2C				DI0
2D				DI1
2E				DI2
2F to 3F	For manufacturer setting (Note 2)			

Note 1. P: Position control mode

S: Internal speed control mode

T: Internal torque control mode

CP: Positioning mode (Point table method)

CL: Positioning mode (Program method)

2. For manufacturer setting. Never set this value.

3. It is valid in the positioning mode (Program method) only.

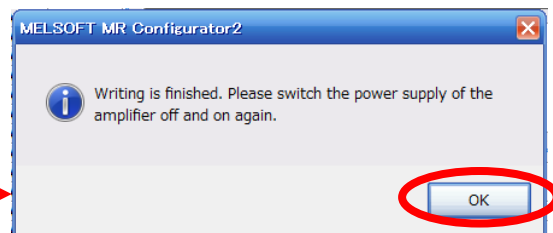
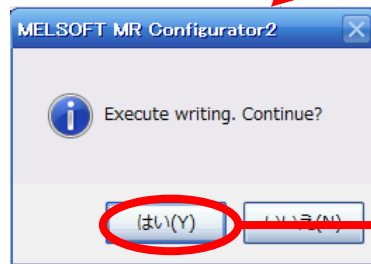
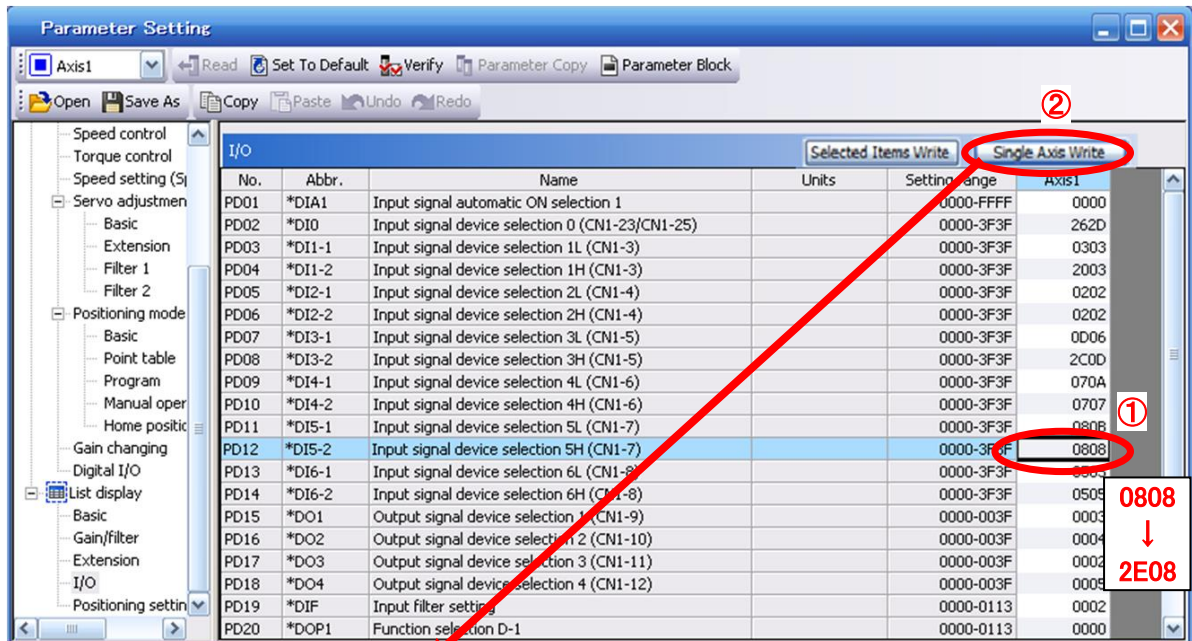
4. When operating temporarily without using EM1 such as at startup, etc., set the EM1 to automatic ON in parameter No. PD01.

Note) In the source (PNP) interface can not be assigned the wiring and the input signal to CN1-23 pin and CN1-25 pin.

(3) Example of Signal Allocation using the setup software

When changing pins CN1-7 from Reverse rotation start (ST2) to point table no./program no. selection 3 (DI2):

- ① Change PD12 from 0808 to 2E08 in the I/O tab.
- ② Click on the "Single Axis Write" button.
- ③ **Cycle the power off, and then on for the parameters to be enabled.**

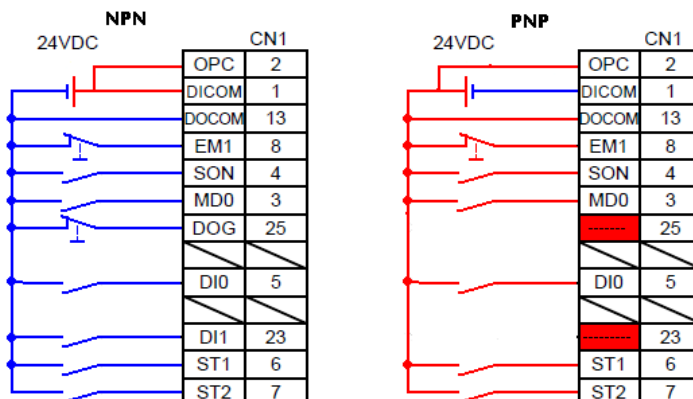


* Complete pin CN1-7 allocation separately.

* See "LECSA Operation Manual", section 4.4.2 for details on allocation of input signals to pins CN1-3 - CN1-8

* See "LECSA Operation Manual", section 4.4.2 for details on allocation of input signals to pins CN1-23 and CN1-25

* See "LECSA Operation Manual", section 4.4.2 for details on allocation of output signals to pins CN1-9 and CN1-12



5.5.6 I/O Signal Allocation Check

The ON/OFF state (including layout check) and signal names allocated to CN1 can be checked. When parameters for PD02 - PD18 have been changed, It is necessary to confirm these are correctly assigned.

- ① From the Monitor menu of the Setup Software select I/O Monitor. The I/O Monitor window opens and displays the inputs and outputs that are applicable. The window also displays the applicable MODE. The highlighted background implies the signals are active.

Positioning mode (point table)

MELSOFT MR Configurator2 New project

Project View I/O Monitor (2) Parameter Safety Positioning-data Monitor Diagnosis Test Mode Adjustment Tools Window Help

Project: New project, System Setting, Unit Conversion, Axis1:MR-JV-A, Parameter, Point Table, Program

Servo Assistant: Assistant List, Servo Startup Procedure, Step 1: Amplifier Setting, Step 2: Test Run, Step 3: Servo Adjustments, Maintenance of the Servo Amplifier Parts, If a Problem Occurs

I/O Monitor

Axis1 Clear

MR-JV-A

Input sig. CN1

Position	Speed	Torque	Positioning	CN1
RES	RES	RES	MD0	3
SON	SON	SON	SON	4
CR	SP1	SP1	D10	5
LSP	ST1	RS2	ST1	6
LSN	ST2	RS1	ST2	7
EM1	EM1	EM1	EM1	8

Output sig. CN1

Position	Speed	Torque	Positioning
9	ALM	ALM	ALM
10	INP	SA	Always OFF
11	RD	RD	RD
12	MBR	MBR	MBR

Cumulative enc. output pulses CN1

Pulse	Signal
15/16	LA/LAR
17/18	LB/LBR
19/20	LZ/LZR
21	OP

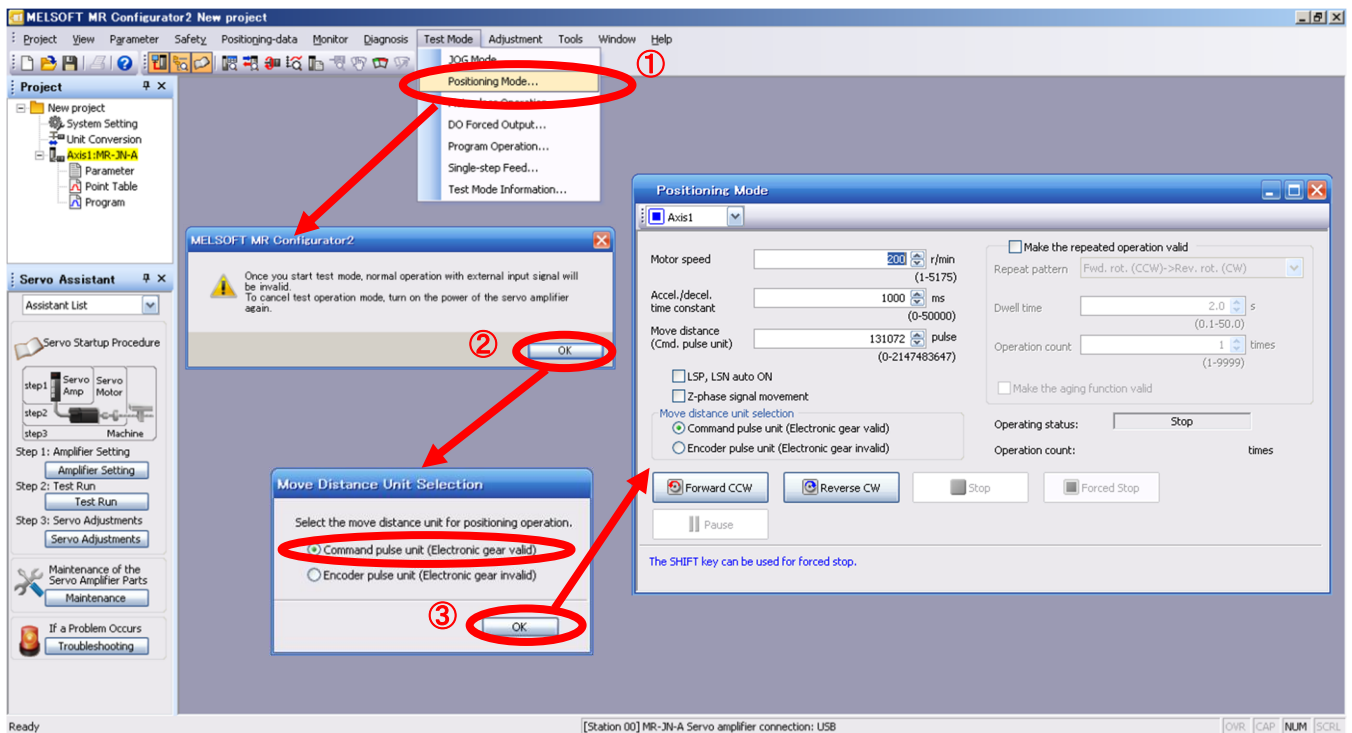
Cumulative command pulses CN1

Pulse	Signal
23/22	PP/PG
25/24	NP/NG

Count in LSP/LSN/RD ON

5.6 Positioning Mode in Setup Software

- ① From the Test Mode menu of the Setup Software select Positioning Mode. The Move Distance Unit Selection window opens.
- ② Check Command pulse unit (Electronic gear valid) and click OK.
Electronic gear ratio that is set in the PA05 / PA06 / PA07 is enabled.
- ③ Click OK.
(When using this function, external input signal operation will be disabled. When controlling from a PLC or upper level device, the power must be turned off and then on.)
- ④ The Positioning Mode window opens.



5.6.1 Positioning Mode

- ① In order to prevent accidental impact at the end of the stroke, operate the actuator at a low speed initially. When changing speed or movement, increase the values whilst checking operation (Change motorspeed, acceleration/deceleration time, movement distance values if required).
See “LECSA Operation Manual (Simplified Edition)”, section 5.6.2 for motorspeed configuration.
See “LECSA Operation Manual (Simplified Edition)”, section 5.6.3 for acceleration/deceleration time configuration.
See “LECSA Operation Manual (Simplified Edition)”, section 5.6.4 for move distance configuration.
- ② Actuator positioning operates using [Forward (CCW)] and [Reverse (CW)].
(Check wiring and parameters if operation cannot be performed correctly).
When performing positioning operation in the setup software, the rotation direction of the actuator does not change if you change the setting of parameter PA14 (Rotation direction selection). The actuator moves in the direction of [Forward (CCW)] button and [Reverse (CW)] button.
- ③ Check the command impulse unit (electronic gear enabled).
The electronic gear duty set to PA05/PA06/PA07 will be enabled.

See “LECSA Operation Manual, Appendix”– “Parameter Values by Actuator Model” for PA05/PA06/PA07 settings for each actuator.

If PA05/PA06/PA07 are set to the values in “LECSA Operation Manual, Appendix”– Parameter Values by Actuator Model, the travel distance of the actuator per 1 pulse will be calculated as follows.

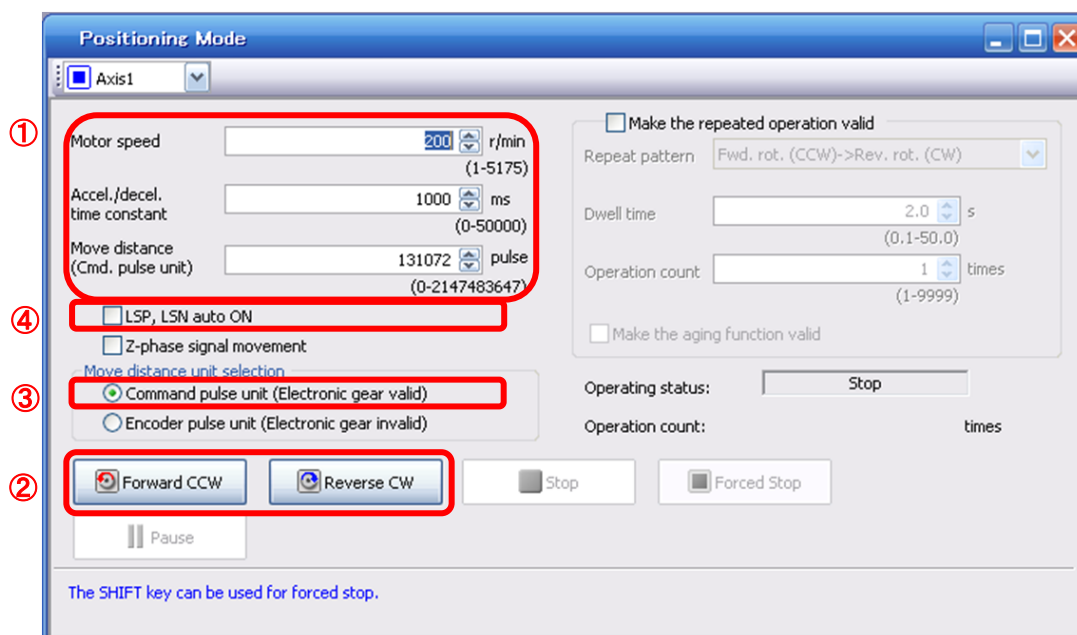
【Position control mode (pulse input)】

- travel distance of the actuator per 1 pulse = 10[μm] (0.01[mm])

【Positioning mode】

- travel distance of the actuator per 1 pulse = 1[μm] (0.001[mm])

- ④ If the “Stroke-end” (LSP, LSN) signal is not configured as ON, an alarm may occur. (When checked, the “stroke-end” (LSP, LSN) will be automatically turned ON only when this window is open.)



Item	Setting range	Unit	Description
Motorspeed	0 ~ Allowed Speed for each actuator	r/min	Set the command speed of the servo motor for execution of positioning (Motor rotations/min).
Acceleration/deceleration time	0 ~ 50000	ms	Set the time until the servo motor reaches/stops to the rated speed (3000 r/min).
Move distance	0 ~ 2147483647	pulse	Sets movement distance.

5.6.2 Motorspeed Configuration

<Rotation Speed Configuration>

- ① Motorspeed (r/min) configuration.

*r/min (rpm): Indicated motor rotation speed (motor rotations/min)

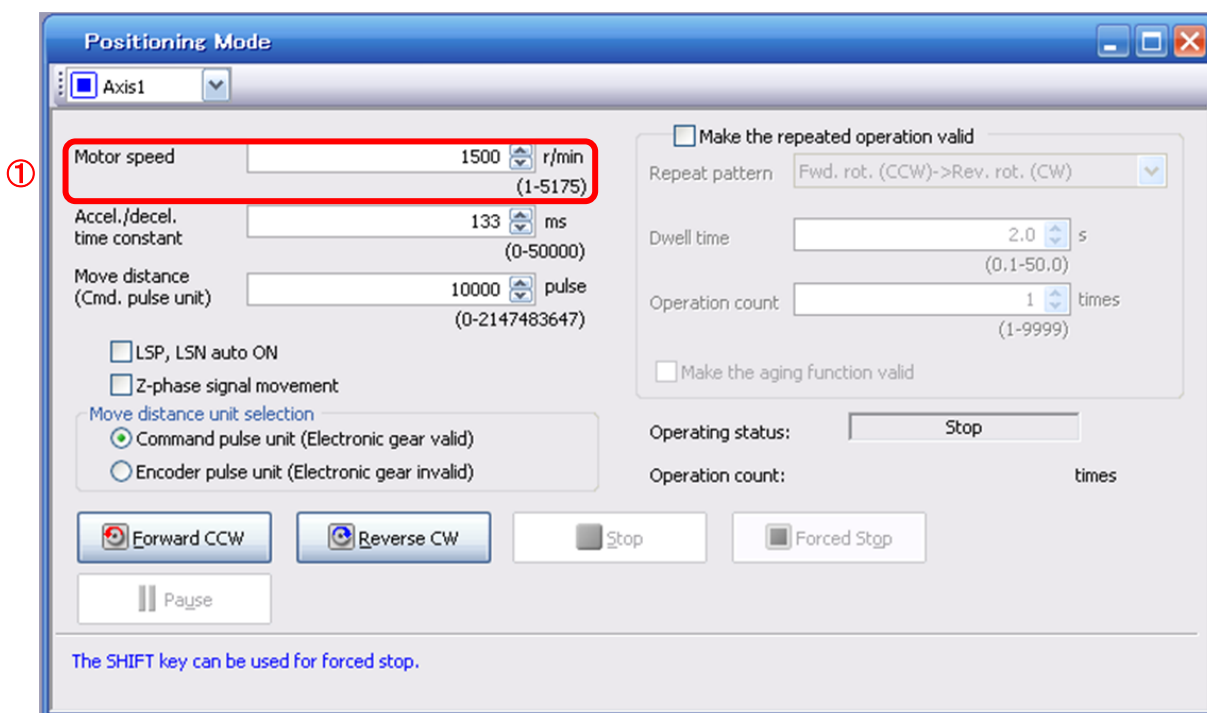
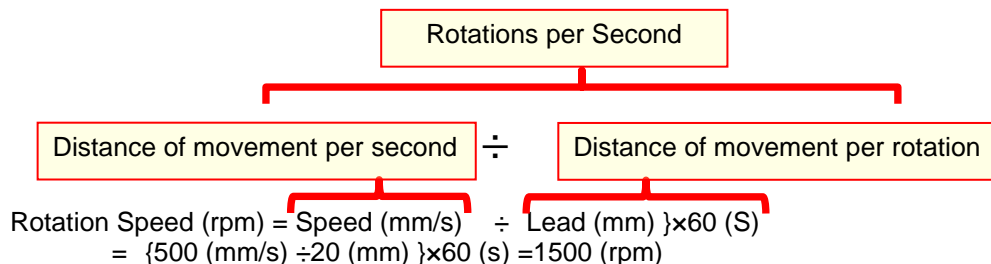
Rotation speed must be between 0 and the allowable speed limit for each actuator. Please be aware that the actuator will not operate if this is set to 0.

If the rotation speed is too low, this may cause vibration; check the actuator while changing settings.

Movement speed (mm/s) must be converted into rotation speed (r/min).

See below for the conversion formula.

Calculating motor speed conversion example using an actuator with a 20mm lead and 500 [mm/sec] speed.



5.6.3 Acceleration/deceleration Time Configuration

< Acceleration/deceleration Time Configuration >

- ① Acceleration/deceleration time (ms) configuration:

The acceleration/deceleration time sets the amount of time (ms) in which a prescribed number of rotations (3000[r/min]) is reached.

The acceleration/deceleration time must be set to a value between 0 and the allowable acceleration/deceleration speed for each actuator.

The acceleration/deceleration time must be converted from the acceleration/deceleration speed. See below for the conversion formula.

Calculating Acceleration/deceleration conversion example using an actuator with a 8 [mm] lead with an acceleration of 3000[mm/sec²].

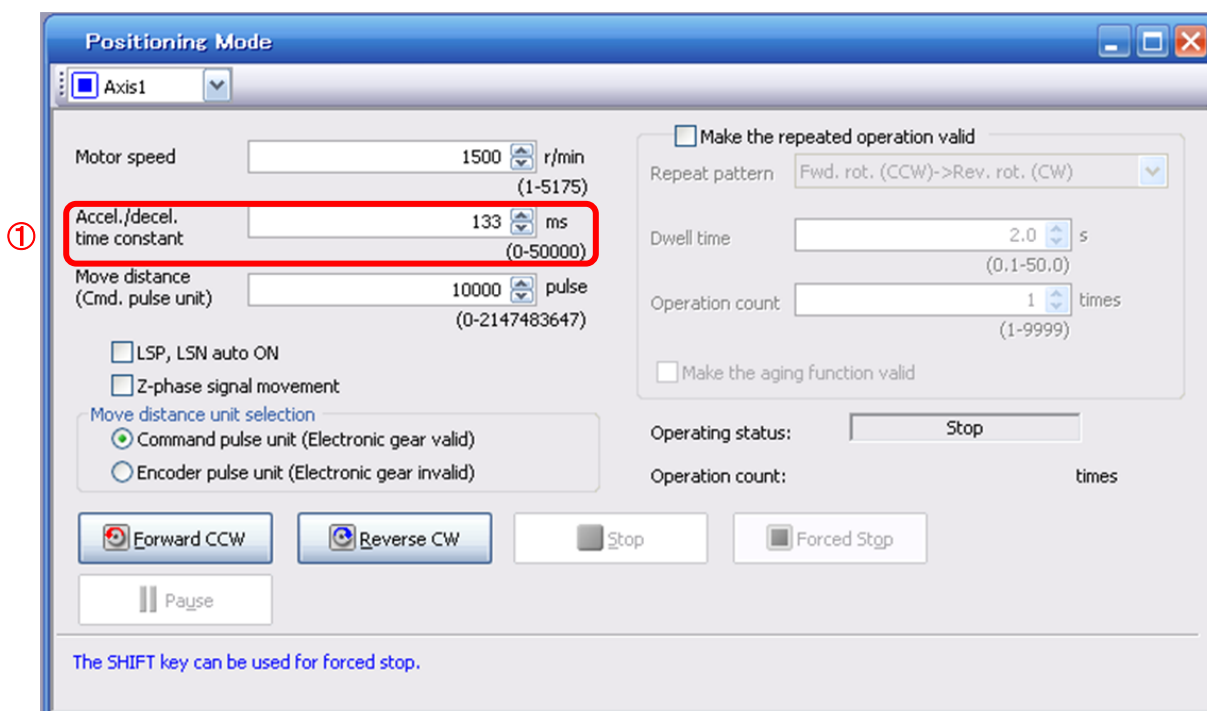
Speed at a rated motor rotation of 3000rpm

$$\text{Accel/decel time (ms)} = \frac{\{\text{Rated Rotation Speed (r/min)} \div 60 \text{ (S)}\} \times \text{Screw Lead (mm)} \times 1000}{\text{Acceleration/deceleration speed (mm/s}^2\text{)}} \quad * \text{Note)}$$

Acceleration/deceleration speed (mm/s²)

***Acceleration speed is measured in ms, so this must be calculated as (s) ×1000**

$$\begin{aligned} \text{Acceleration/deceleration time (ms)} &= \frac{\{3000 \text{ (r/min)} \div 60 \text{ (S)}\} \times 8 \text{ (mm)} \times 1000}{3000 \text{ (mm/s}^2\text{)}} \\ &= 133 \text{ (ms)} \end{aligned}$$



5.6.4 Move distance Configuration and Operation< Move distance Configuration>

< Move distance Configuration>

- ① Set the move distance [pulse]. Select a value within the stroke range.
- ② Actuator position will operate using [Forward (CCW)], [Reverse (CW)].
The position at which power is turned ON will be set as the home position, and the actuator will travel the amount set as move distance (check wiring and parameters If operation is not performed correctly).
When performing positioning operation in the setup software, the rotation direction of the actuator does not change if you change the setting of parameter PA14 (Rotation direction selection). The actuator moves in the direction of [Forward (CCW)] button and [Reverse (CW)] button.
- ③ Check command input pulse units (electronic gear enabled).
The electronic gear duty configured in PA05/PA06/PA07 will be enabled. See “LECSA Operation Manual, Appendix” for setting values for PA05/PA06/PA07 in each actuator.
If parameters PA05/PA06/PA07 are set according to “LECSA Operation Manual, Appendix”, the travel distance of the actuator per 1 pulse will be as follows.

[Position control mode (pulse input)]

- travel distance of the actuator per 1 pulse = 10[μm] (0.01[mm])

[Positioning mode]

- travel distance of the actuator per 1 pulse = 1[μm] (0.001[mm])

Travel distance (mm) must be converted to travel distance (pulse).
See below for the conversion formula.

As an example, for a travel of 100mm;

[Position control mode (pulse input)]

Travel distance of the actuator per 1 pulse = 0.01 (mm) *1
 $100 \text{ (mm)} / 0.01 \text{ (mm)} = 10000 \text{ (pulse)}$

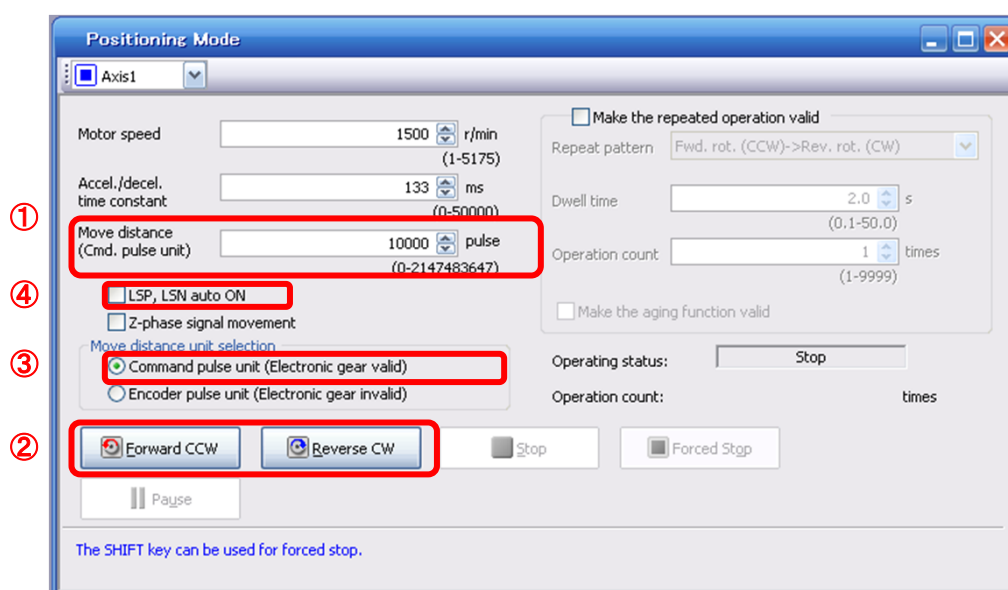
[Positioning mode]

Travel distance of the actuator per 1 pulse = 0.001 (mm) *1
 $100 \text{ (mm)} / 0.001 \text{ (mm)} = 100000 \text{ (pulse)}$

*1 The travel distance of the actuator per 1 pulse is set according to the electronic gears (PA05/PA06/PA07) outlined in “LECSA Operation Manual, Appendix” for Recommended Parameter Values by Actuator Model.

- ④ If the stroke end signals (LSP, LSN) are not turned ON, an alarm may occur (If checked, the stroke end (LSP, LSN) signals will be turned ON automatically only when this window is open).

* Ensure that the [Forward (CCW)] and [Reverse (CW)] driving directions are checked. If the driving direction is unclear, operate the actuator slowly with a small move distance while checking the driving direction.



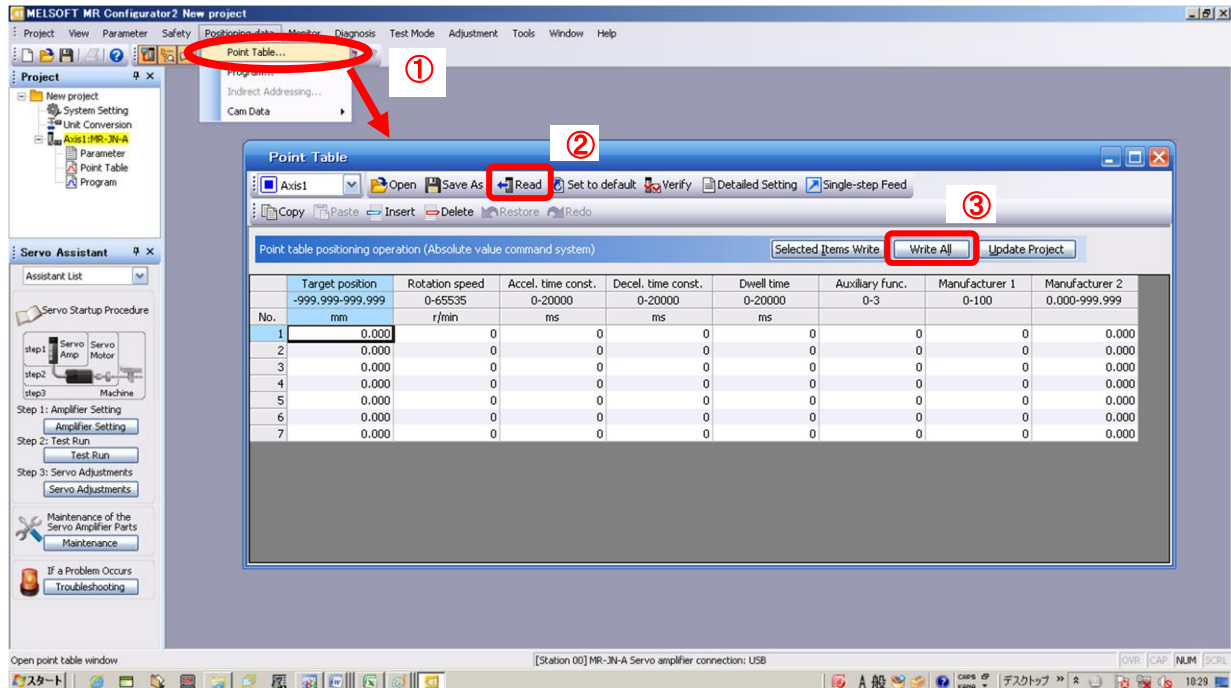
5.7 Positioning (Point Table) Operation using the Setup Software

This feature is only available in positioning (point table) mode.

When positioning using the positioning (point table) mode, the point table (target position, speed data, acceleration time, deceleration time etc.) must be configured.

5.7.1 Point table List

- ① Using the “Positioning Data” menu in the setup software. The “Point table list” can be opened by selecting “Point Table”
- ② “Read” : point table data will be read from the LECSA and displayed.
- ③ “Write All” : point table data will be written to the LECSA.



5.7.2 Point Table Data

By parameters "PE01: Command mode selection" settings, registration method of data of the point table is different.

(1) If the parameter " PE01: Command mode selection " setting is "0000: Absolute value command system " .

Item	Setting range	Unit	Description
Target position	−999.999 ~ 999.999	×10STM mm	(1) When using this point table as absolute value command system, set the target address (absolute value). (2) When using this point table as incremental value command system, set the travel distance. A "-" sign indicates a reverse rotation command. Number of decimal places changes according to STM (Feel length multiplication)
Rotation speed	0 ~ allowable actuator speed	r/min	Sets the command rotation speed (Motor rotations/min) when positioning is executed.
Acceleration time constant	0 ~ 20000	ms	Set the time until the servo motor reaches to the rated speed. (3000 r/min)
Deceleration time constant	0 ~ 20000	ms	Set the time until the servo motor stops from the rated speed. (3000 r/min)
Dwell	0 ~ 20000	ms	When dwell is set and the set dwell has passed after the position command of the selected point table is completed, the position command of the next point table is started. Set "0" in the auxiliary function to make the dwell invalid. Set "1" in the auxiliary function and 0 in the dwell to perform varied speed operation.
Auxiliary function	0 ~ 3		(1) When using this point table in the absolute value command system 0: Automatic operation is performed in accordance with a single point table chosen. 1: Operation is performed in accordance with consecutive point tables without a stop. (2) When using this point table in the incremental value command system 2: Automatic operation is performed in accordance with a single point table chosen. 3: Operation is performed in accordance with consecutive point tables without a stop. When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed. Setting "1" in point table No. 7 results in an error.
Manuf .1	Do not change.		
Manuf .2			

(2) If the parameter " PE01: Command mode selection " setting is "0001: Incremental value command system" .

Item	Setting range	Unit	Description
Target position	0 to 999999	×10STM mm	Set the travel distance. Number of decimal places changes according to STM (Feel length multiplication)
Rotation speed	0 ~ allowable actuator speed	r/min	Sets the command rotation speed (Motor rotations/min) when positioning is executed.
Acceleration time constant	0 ~ 20000	ms	Set the time until the servo motor reaches to the rated speed. (3000 r/min)
Deceleration time constant	0 ~ 20000	ms	Set the time until the servo motor stops from the rated speed. (3000 r/min)
Dwell	0 ~ 20000	ms	When dwell is set and the set dwell has passed after the position command of the selected point table is completed, the position command of the next point table is started. Set "0" in the auxiliary function to make the dwell invalid. Set "1" in the auxiliary function and 0 in the dwell to perform varied speed operation.
Auxiliary function	0, 1		0: Automatic operation is performed in accordance with a single point table chosen. 1: Operation is performed in accordance with consecutive point tables without a stop. When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed. Setting "1" in point table No. 7 results in an error.
Manuf .1	Do not change.		
Manuf .2			

5.7.3 Point table (Target position) Configuration

< Target position Configuration >

- ① Please set the parameters as "PE02 (Feed function selection)" and "Feed length multiplication (STM) (Multiplier)".
Please change the "PE02 (Feed function selection)".
"Feed length multiplication (STM) (Multiplier)" will be automatically scaled.

For actuators with a stroke less than 1000mm, set parameter "PE02 (Feed function selection)" to 0000 and the "Feed length multiplication (STM) (Multiplier)" value to x1.

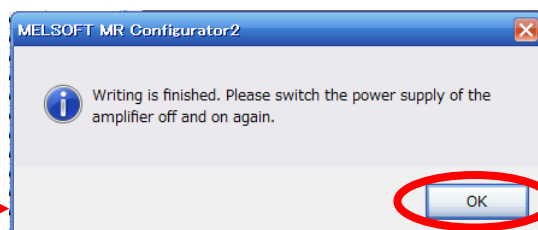
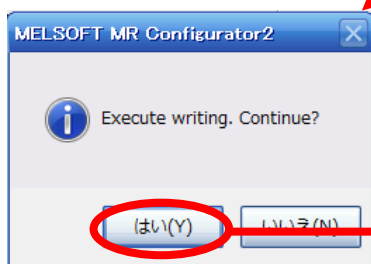
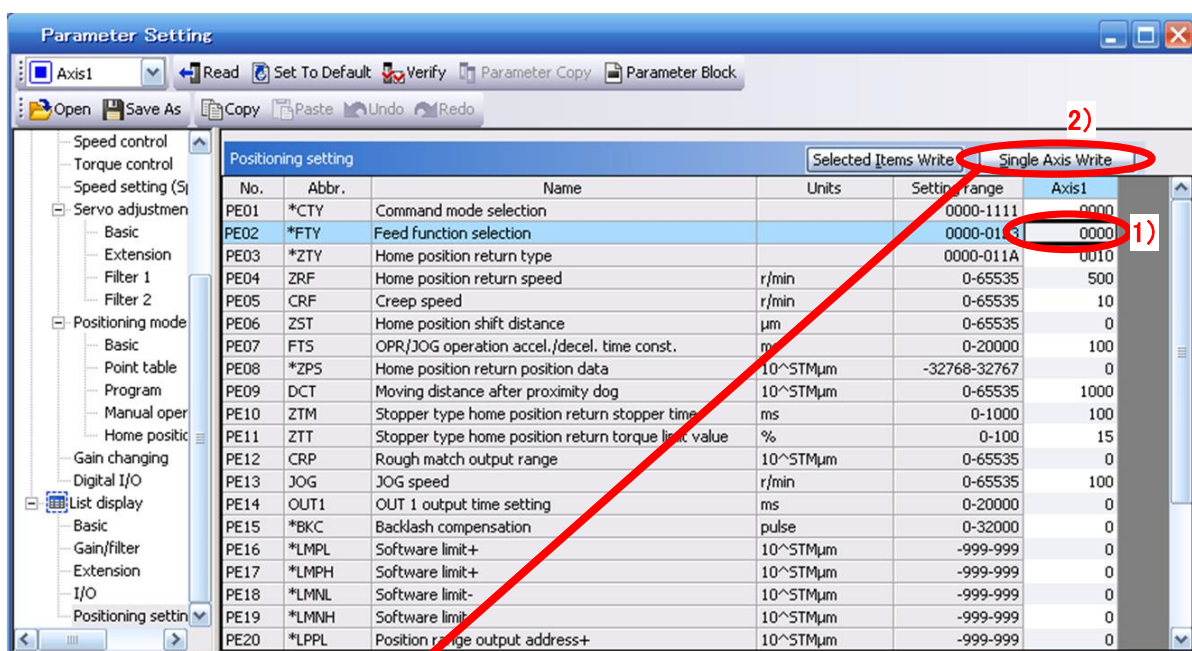
For actuators with a stroke more than 1000mm, set parameter "PE02 (Feed function selection)" to 0001 and the "Feed length multiplication (STM) (Multiplier)" value to x10.

Set the feed length multiplication (STM) (Multiplier) of target position in parameter No. PE02 (Feed function selection).

Parameter No. PE02 setting	Feed length multiplication (STM) (Multiplier) (Feed unit [μ m])	Target position input range [mm]
□□□0	1	-999.999 to +999.999
□□□1	10	-9999.99 to +9999.99
□□□2	100	-99999.9 to +99999.9
□□□3	1000	-999999 to +999999

Change of **parameter [PE02(Feed function selection)]**.

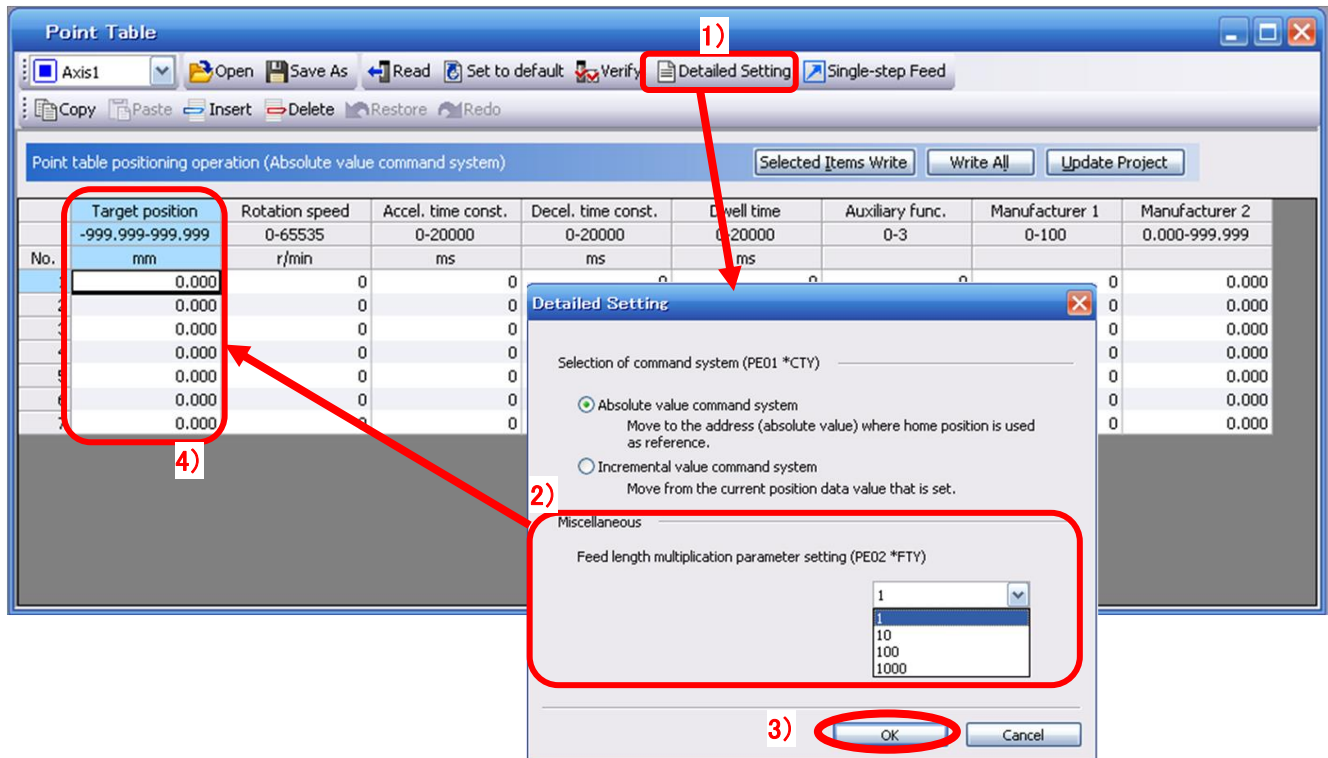
- 1) Set the parameters of the PE02 in the "Positioning setting" tab.
- 2) Click on the "Single Axis Write" button.
- 3) **Turn the power OFF and ON again. The Parameter is then enabled.**



Change of the target position input range

- 1) Please click on the [Detailed Setting] button in the [Point Table] tab.
- 2) Please confirmation or change of **[Feel length multiplication (STM) (Multiplier)]**.
- 3) Click on the "OK" button.
- 4) Target position input range varies depending on the set value of **[Feel length multiplication (STM) (Multiplier)]**.

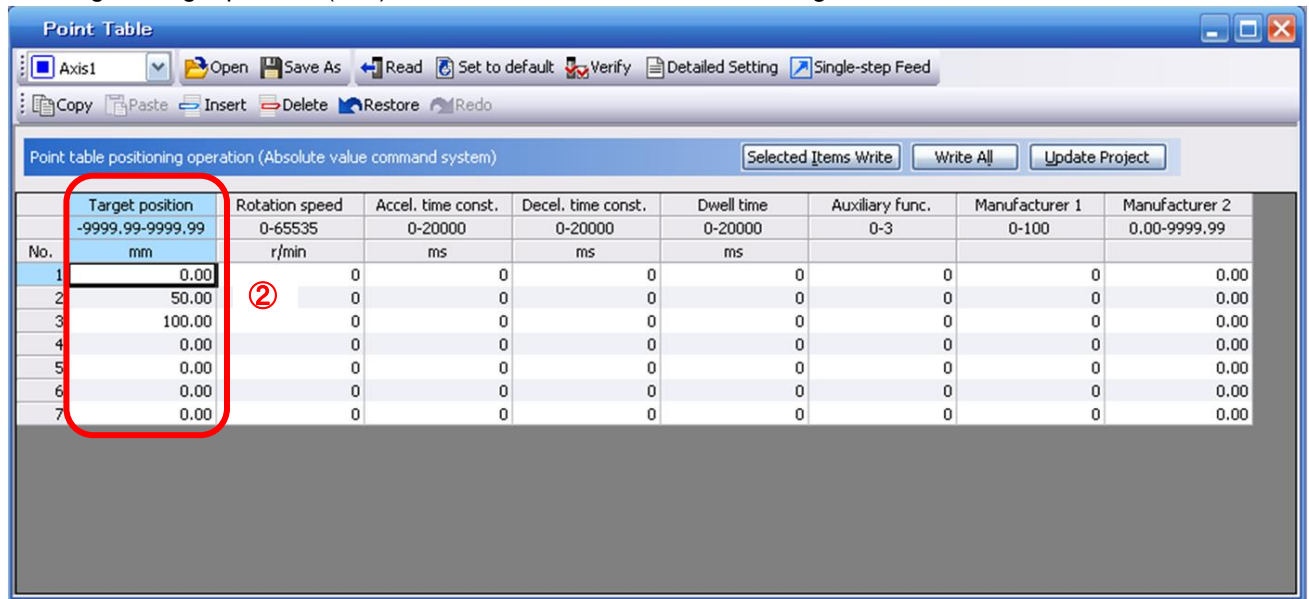
Feed length multiplication (STM) (Multiplier) (Feed unit [μ m])	Target position input range [mm]
1	-999.999 to +999.999
10	-9999.99 to +9999.99
100	-99999.9 to +99999.9
1000	-999999 to +999999



For actuators with a stroke less than 1000mm, set parameter "PE02 (Feed function selection)" to 0000 and the "Feed length multiplication (STM) (Multiplier)" value to x1.

For actuators with a stroke more than 1000mm, set parameter "PE02 (Feed function selection)" to 0001 and the "Feed length multiplication (STM) (Multiplier)" value to x10.

- ② Configure target position (mm). Set to a value within the stroke range.



* If electronic gear parameters (PA05/PA06/PA07) are set according to “LECSA Operation Manual, Appendix” in positioning mode:

The smallest unit for actuator movement is 1[μm] (0.001[mm]).

5.7.4 Point table (Rotation Speed) Configuration

<Rotation Speed Configuration>

① Rotation speed configuration:

*r/min (rpm): motor command rotation speed (motor rotations/min)

Travel speed (mm/s) must be converted into rotation speed (r/min).

See below for the conversion formula.

Example using a 20[mm] Lead Actuator with target travel speed of 500[mm/sec]

$$\begin{aligned}
 & \text{Rotations per second} \\
 & \text{Travel distance per second} \div \text{Travel distance per rotation} \\
 & \text{Rotation Speed (rpm)} = \{\text{Speed (mm/s)} \div \text{Lead (mm)}\} \times 60 \text{ (S)} \\
 & = \{500 \text{ (mm/s)} \div 20 \text{ (mm)}\} \times 60 \text{ (s)} = 1500 \text{ (rpm)}
 \end{aligned}$$

The rotation speed must be a value between 0 and the allowable actuator speed. The actuator will not operate if set to 0.

Too low rotation speed (r/min), may cause vibration (resonance);

Point Table

Axis1

Open Save As Read Set to default Verify Detailed Setting Single-step Feed

Copy Paste Insert Delete Restore Redo

Point table positioning operation (Absolute value command system)

Selected Items Write Write All Update Project

No.	Target position -9999.99-9999.99 mm	Rotation speed 0-65535 r/min	Accel. time const. 0-20000 ms	Decel. time const. 0-20000 ms	Dwell time 0-20000 ms	Auxiliary func. 0-3	Manufacturer 1 0-100	Manufacturer 2 0.00-9999.99
1	0.00	1500	0	0	0	0	0	0.00
2	50.00	1500	0	0	0	0	0	0.00
3	100.00	1500	0	0	0	0	0	0.00
4	0.00	0	0	0	0	0	0	0.00
5	0.00	0	0	0	0	0	0	0.00
6	0.00	0	0	0	0	0	0	0.00
7	0.00	0	0	0	0	0	0	0.00

5.7.5 Point Table (Acceleration time constant/Deceleration time constant) Configuration

< Acceleration time constant/Deceleration time constant Configuration >

① Acceleration time constant (ms)/Deceleration time constant (ms) configuration:

Acceleration/deceleration (mm/s²) must be converted to the acceleration time constant/deceleration time constant (ms). See below for the conversion formula.

Conversion example for a 8[mm] lead actuator driven at an acceleration of 3000 [mm/sec²]

Rated Motor Rotation Speed (mm/s)

$$\text{Acceleration time constant/deceleration time constant (ms)} = \frac{\{\text{Rated rotation speed (r/min)} \div 60 (S)\} \times \text{screw lead (mm)} \times 1000}{\text{Acceleration/deceleration speed (mm/s}^2\text{)}} \quad \text{*Note)}$$

***As the acceleration time constant/deceleration time constant units are in ms; this is calculated as (s) ×1000**

$$\begin{aligned} \text{Acceleration/Deceleration time constant (ms)} &= \frac{\{3000 (r/min) \div 60 (S)\} \times 8 (mm) \times 1000}{3000 (mm/s^2)} \\ &= 133 (ms) \end{aligned}$$

The acceleration time constant/deceleration time constant defines the time in (ms) when the motor rotations of (3000[r/min]) are met.

The acceleration time constant/deceleration time constant must be a number between 0 and the allowable acceleration/deceleration speed range for each actuator.

No.	Target position mm	Rotation speed r/min	Accel. time const. ms	Decel. time const. ms	Dwell time ms	Auxiliary func.	Manufacturer 1	Manufacturer 2
1	0.00	1500	133	133	0	0	0	0.00
2	50.00	1500	133	133	0	0	0	0.00
3	100.00	1500	133	133	0	0	0	0.00
4	0.00	0	0	0	0	0	0	0.00
5	0.00	0	0	0	0	0	0	0.00
6	0.00	0	0	0	0	0	0	0.00
7	0.00	0	0	0	0	0	0	0.00

5.7.6 Other Settings

The dwell and auxiliary functions are set to 0 as default.

Do not change Manuf .1 (0) or Manuf .2 (0.00) from the initial values.

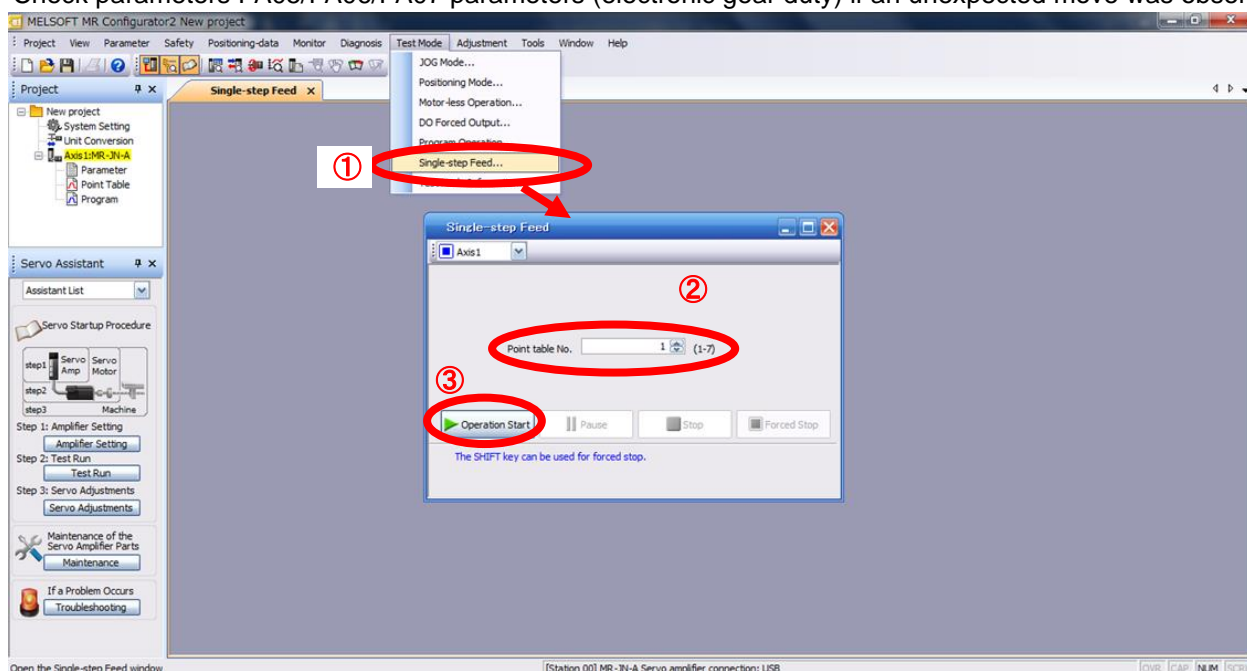
5.7.7 Single-Step Feed

In Test mode a single step within point table can be executed.

- ① From the “Test” menu in the setup software select “Single-step Feed” which opens a window for “Single-step feed”. (When using this function, external input signal operation will be disabled. If controlling using a PLC or other upper device, ensure the power is turned off and then on before operation.)
- ② Select point table number.
- ③ Press “Start”.

The actuator will set the position at which the power was turned on as the home position (0), and move towards the defined point table position.

* Check parameters PA05/PA06/PA07 parameters (electronic gear duty) if an unexpected move was observed.



Note

* Home position return cannot be performed in test mode.

In Test mode the default position of the actuator is set as the home position when the power was turned on. It is therefore possible to drive the actuator past the stroke ends. Please pay particular attention to the position of the actuator on power up.

5.8 Saving/Loading Parameters

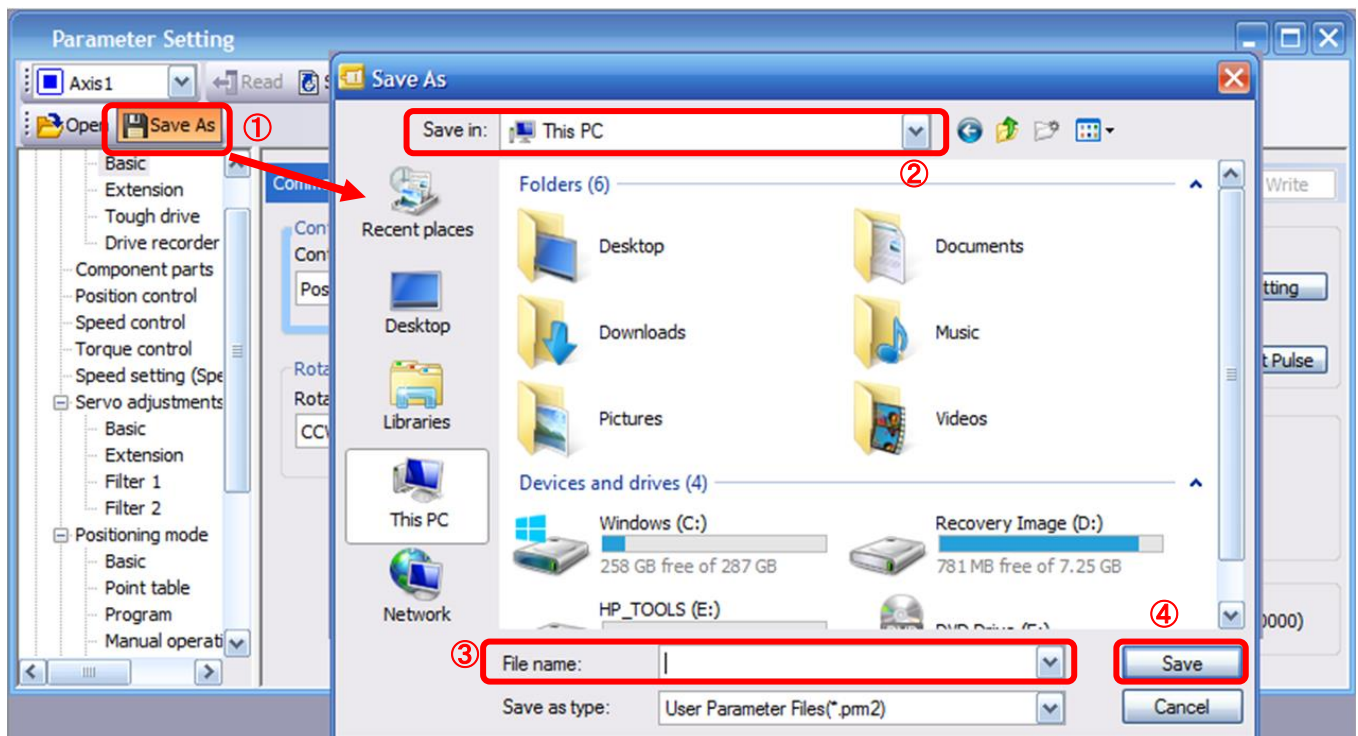
5.8.1 Saving Parameters

- ① From the “Parameter Setting” window in the setup software, select “Save As”.
- ② Please specify location to be saved.
- ③ Please enter any file name.
- ④ Click “Save”.

Files Saved

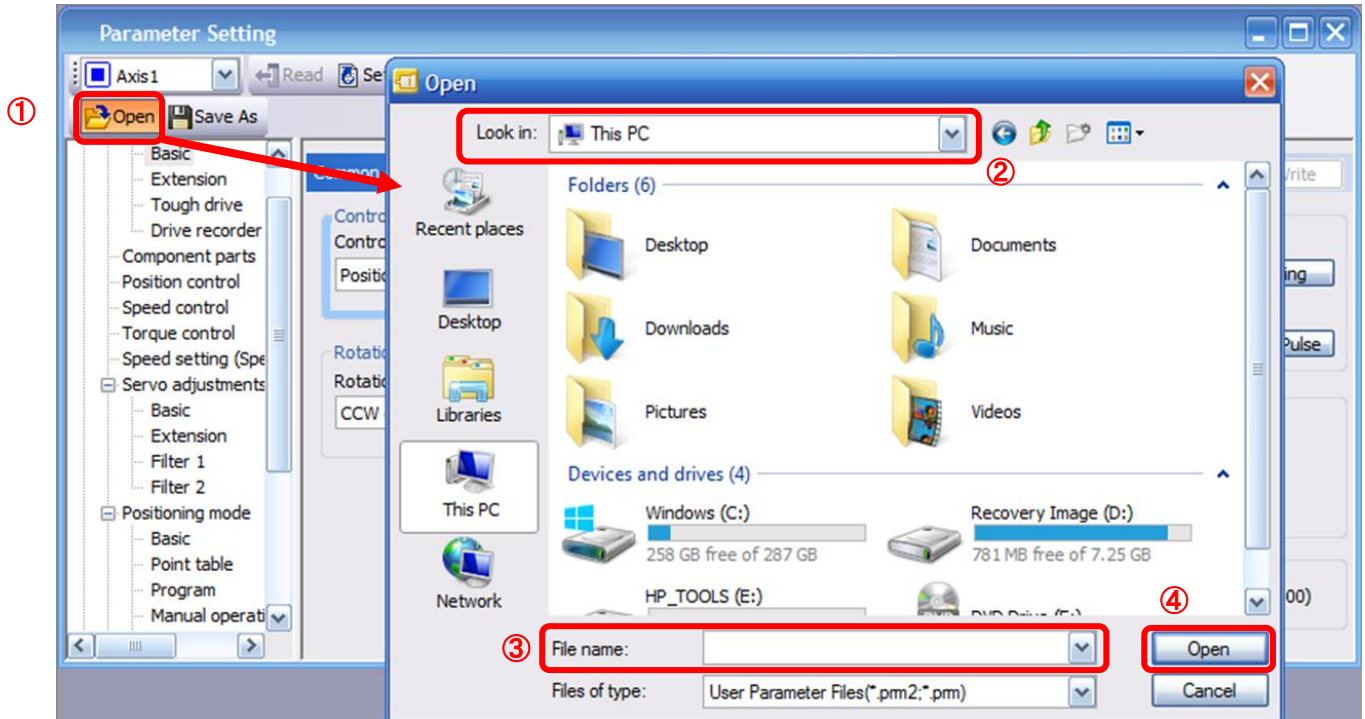
.prm2	Settings files for parameters PA, PB, PC, PD and PE
-------	---

* Note Always upload current parameters from the driver to the software before saving.
(See “LECSA Operation Manual (Simplified Edition)”, section 5.3.2 for uploading.)



5.8.2 To Load saved Parameters

- ① From the "Parameter Setting" window in the setup software, select "Open".
- ② Please specify location of the file.
- ③ Please select the file you wish to import parameters [.prm2].
- ④ Click "Open".
Parameters will be loaded.



5.9 Saving/Loading Project

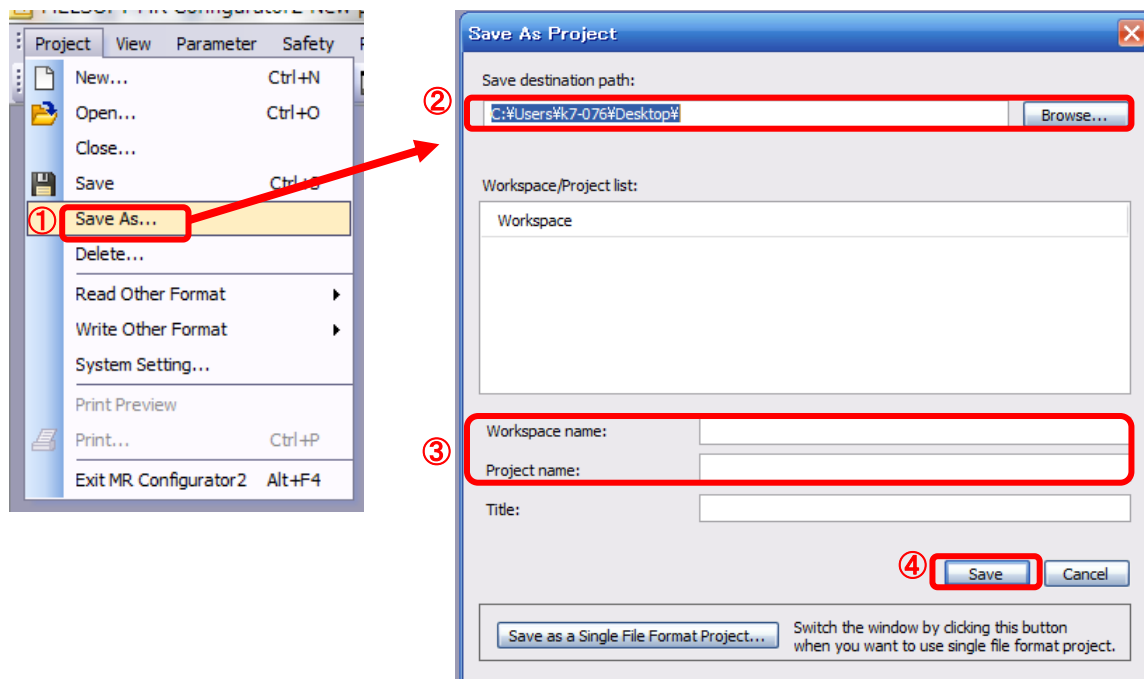
5.9.1 Saving Project

- ① From the "Project" menu in the setup software, select "Save As".
- ② Please specify location to be saved.
- ③ Please enter any file name.
- ④ Click "Save".

Project will be saved in the specified folder.

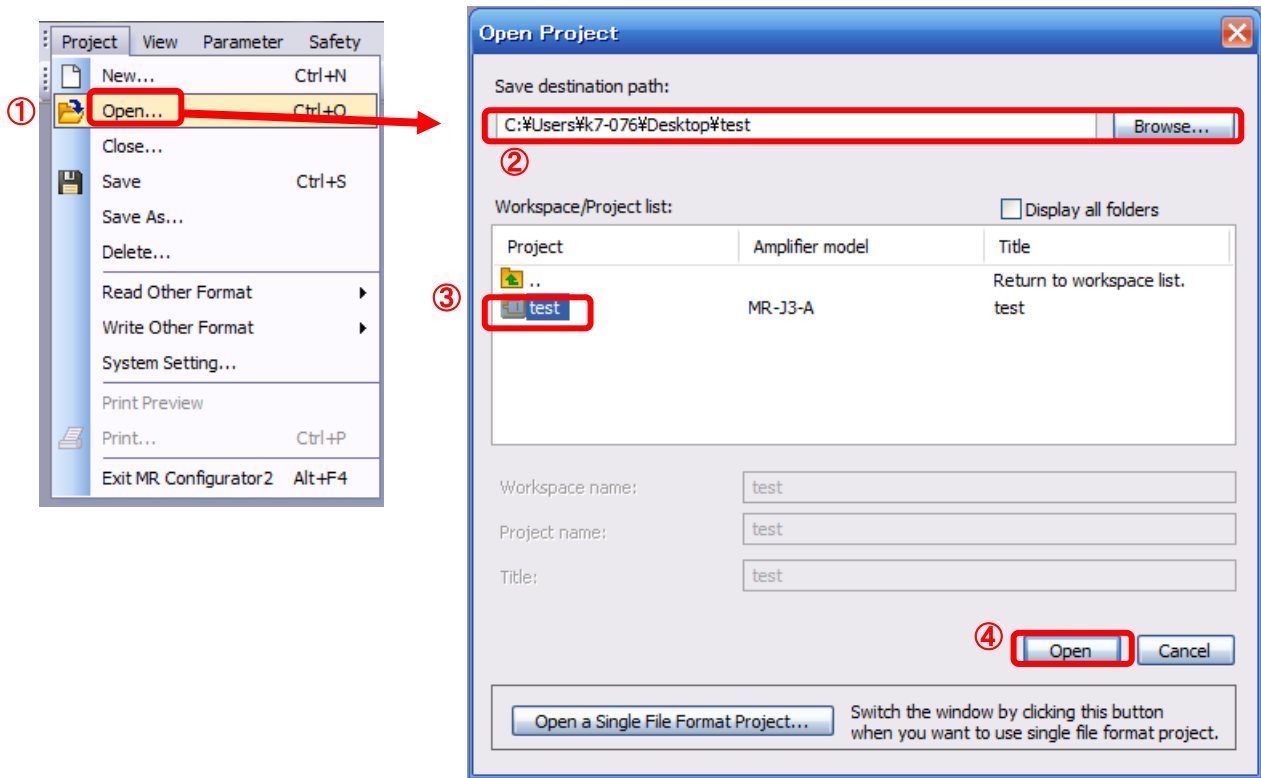
If you change the drive / path name, it will be saved in the "drive ¥path name ¥ project name" folder you have changed.

* Note Always upload current parameters from the driver to the software before saving.
(See "LECSA Operation Manual (Simplified Edition)", section 5.3.2 for uploading.)



5.9.2 To Load saved Project

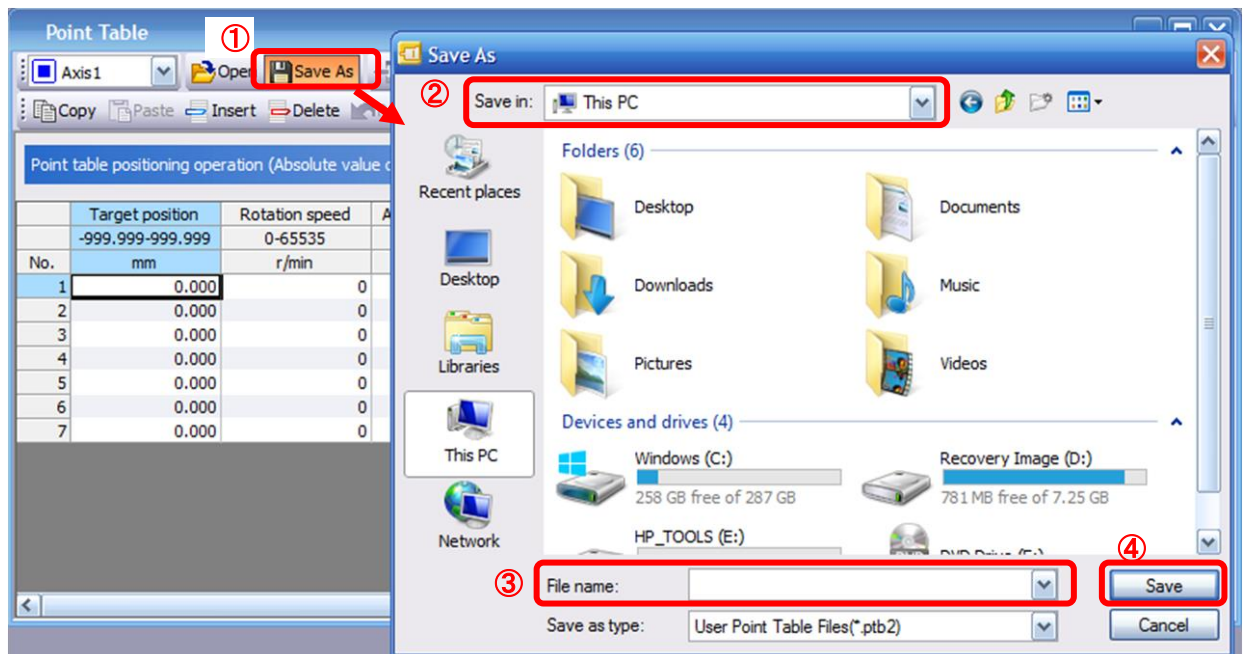
- ① From the "Project" menu in the setup software, select "Open".
- ② Please select the "drive ¥ path name ¥ project name" that you want to read parameters are stored.
- ③ Please select the file you wish to import project [.mrc2].
- ④ Click "Open".
Project will be loaded.



5.10 Saving/Loading Point table

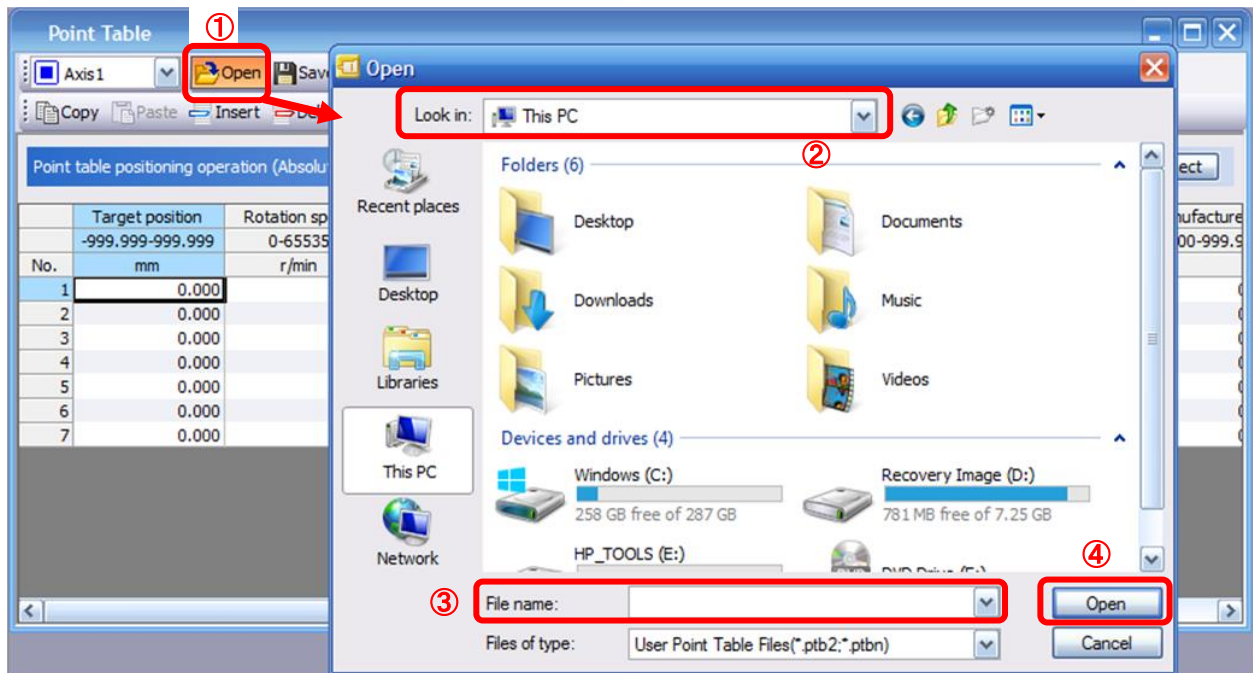
5.10.1 Saving Point table

- ① From the “Point Table” window in the setup software, select “Save As”.
- ② Please specify location to be saved.
- ③ Please enter any file name.
- ④ Click “Save”.



5.10.2 To Load saved Point table

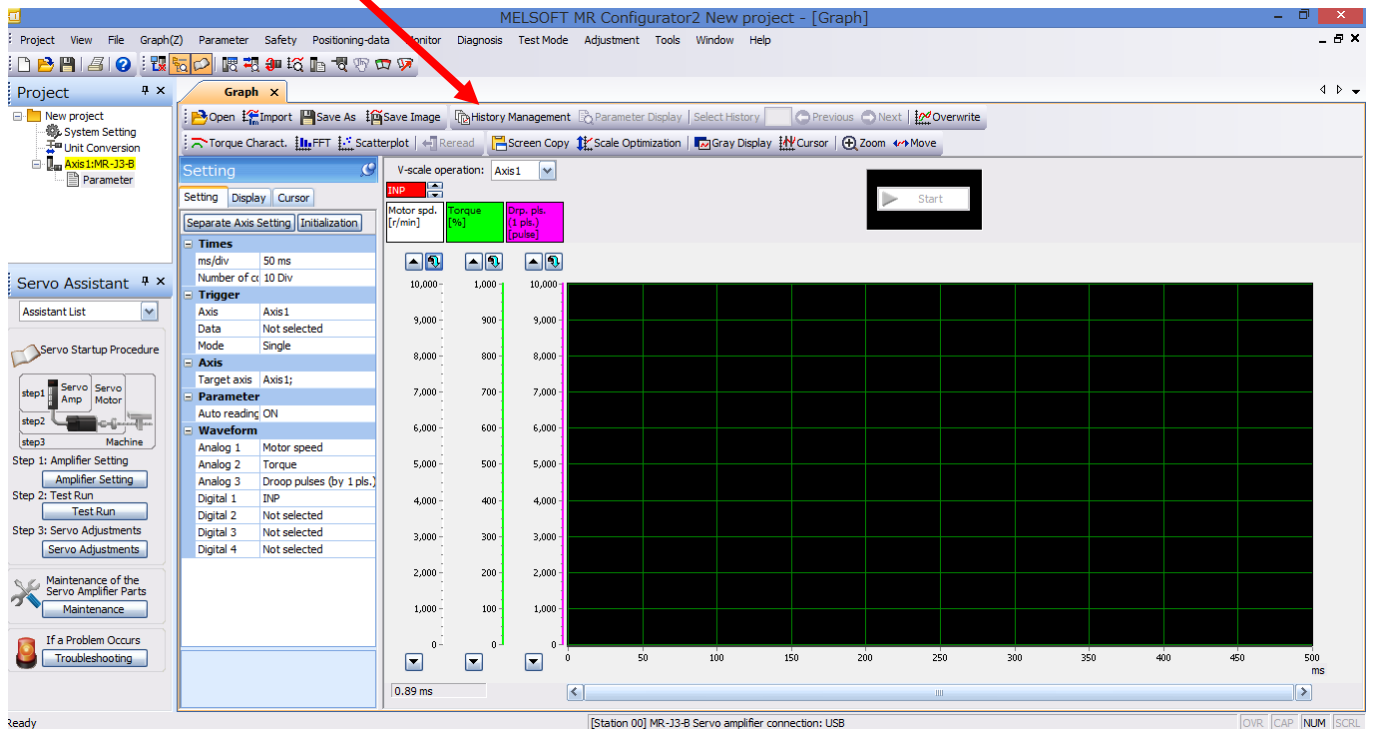
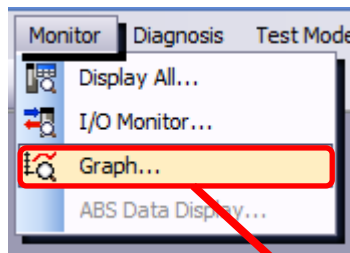
- ① From the “Point table” window in the setup software, select “Open”.
 - ② Please specify location of the file.
 - ③ Please select the file you wish to import point table [.ptb2].
 - ④ Click “Open”.
- Point table will be loaded.



5.11 Acquisition of motion waveform with graph monitor

With the setup software (MR Configurator2™: LEC-MRC2E) monitor graph function, the motion waveform during electric actuator operation can be obtained as described below.

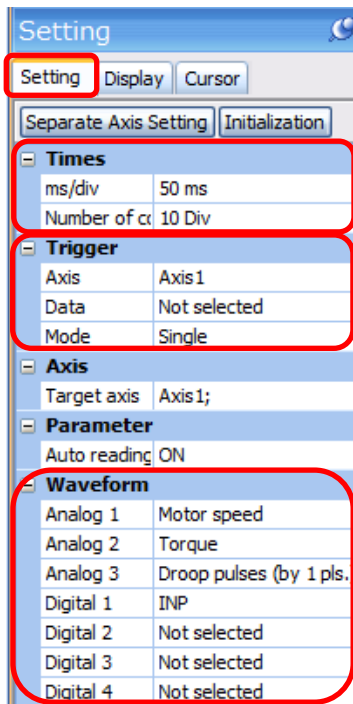
- ① Click “Monitor” - “Graph” of Setup software to display “Graph” window.



5.11.1 Under the setting Tab: Setting of the items to display the graph

Set the items to display analogue and digital waveform, trigger conditions and time for the Horizontal axis of the graph. Click the “Setting” tab of the “Setting” window to set the items to display the waveform, trigger conditions and horizontal axis of the graph.

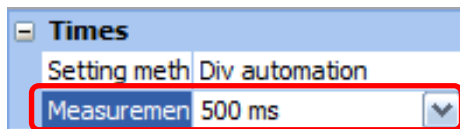
3 types analogue waveforms (analogue 1 to 3) and 4 types of digital waveforms (digital 1 to 4) can be set.




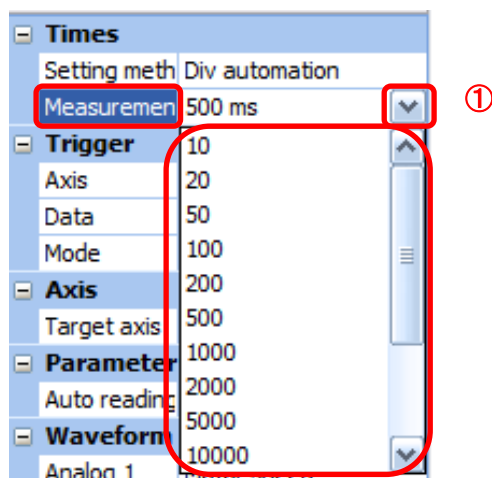
(1) Time

Set the Horizontal axis (Time axis) of the graph.

For LECSA, set “Measurement time” to the horizontal axis (Time axis).




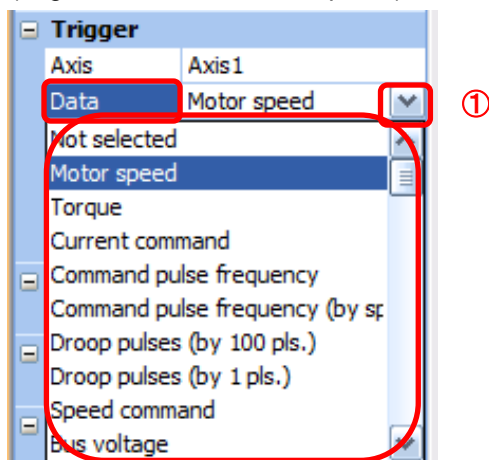
- ① Click “” of “Measurement time” to set the Measurement time. The unit ms of “Measurement time” is 1000ms=1s.




(2) Trigger

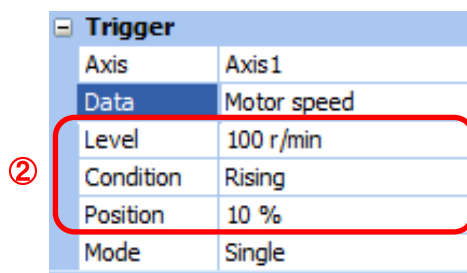
“Trigger” is a condition which decides the display timing of the graph.
If trigger conditions are not satisfied, waveform will not be displayed.

- ① Click “” of [Data] to set the condition.
(In general, set the Motor speed.)



(3) “Level” / “Condition” / “Position” are displayed.

- ② Click “” of “Level” / “Condition” to set the condition.



For Motor speed, when the operation direction is positive, “Level” should be 100 and when the operation direction is negative, “Level” should be -100.

Align the setting of “Condition” to the operation direction too.


“Level” / “Condition” setting (For Motor speed)

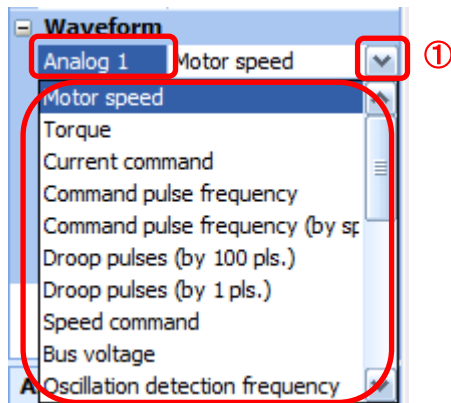
Operating direction	“Level” [r/min]	“Condition”
Positive direction operation	100	Startup
Negative direction operation	-100	Fall

“Position” should be 10%.

(4) Waveform

Set the waveform data which will be displayed in the graph.

- ① Click “” of each “Analog” or “Digital” and set the type of waveform to be displayed.



The analogue and digital waveforms that can be set with LECSA are shown below.

■ Analogue waveform

No.	Name	Function	Unit	Note
1	Motor speed	The servo motor speed is displayed.	1r/min	
2	Torque	The servo motor torque is displayed.	0.1%	
3	Current command	The current command to be given to the servo motor is displayed.	0.1%	
4	Command pulse frequency	The command pulse frequency is displayed.	1.125 kpulse/s	
5	Command pulse frequency (by speed)	The command pulse frequency is converted into the servo motor speed and displayed.	1r/min	
6	Droop pulse (by 100 pulse)	The droop pulse on the deviation counter is displayed in units of 100 pulse. The displayed number of pulses is units of the encoder pulses.	100pulse	
7	Droop pulse (by 1 pulse)	The droop pulse on the deviation counter is displayed in units of 1 pulse. (Note) Any area beyond the display range (-32768 pulse to 32767 pulse) is clamped and displayed in red.	1pulse	
8	Speed command	The speed command to be given to the servo motor is displayed.	1r/min	
9	Bus voltage	The bus voltage of the servo driver converter is displayed.	1V	
10	Oscillation detection frequency	The frequency at oscillation detection is displayed.	1Hz	
11	Tough drive times	The times moving to the tough drive is displayed.	Once	
12	Effective load ratio	The continuous effective load torque is displayed. The effective value for the last 15 seconds is displayed.	0.1%	
13	Regenerative load ratio	The ratio of regenerative power to permissible regenerative power is displayed in %.	0.1%	
14	Within one-revolution position	The within one-revolution position is displayed in encoder pulse.	16pulse	

No.	Name	Function	Unit	Note
15	Multi-revolution counter	The move distance from the home position in the absolute position detection system is displayed in the multiple-revolution counter value of the absolute position encoder.	1rev	
16	Load inertia moment ratio	The estimated ratio of the servo motor axis converted load inertia moment to the servo motor inertia moment is displayed.	0.1times	
17	Torque equivalent to disturbance	The difference between the torque required driving the servo motor and the actually required torque (Torque current value) is displayed in torque equivalent to disturbance.	0.1%	
18.	Overload alarm margin	The margin until the load reaches the overload (AL.50, AL.51) alarm level is displayed in %. An overload alarm will occur when margin is 0%.	0.1%	
19	Excessive error alarm margin	The margin until the error reaches the excessive error (AL.52) alarm level is displayed in encoder pulses. An excessive error alarm will occur when margin is zero pulses.	16pulse	
20	Settling time	The settling time for position control is displayed. The method for measuring the settling time can be selected from the separate axis setting.	1ms	
21	Overshoot amount	The overshoot amount for position control is displayed in encoder pulses. The method for measuring the overshoot amount can be selected from the separate axis setting.	1pulse	

■ Digital waveforms

SON, LSP, LSN, TL1, PC, RES, CR, SP1, SP2, SP3, ST1, ST2, LOP, EM1, MD0, DOG, TSTP, CDP, PI1, DI0, DI1, DI2, RS1, RS2, RD, SA, ZSP, TLC, VLC, INP, WNG, ALM, OP, MBR, CPO, ZP, POT, PUS, CDPS, IPF, MEND, MTTR, PT0, PT1, PT2, OUT1, SOUT

See "LECSA Operation Manual", section 3.5 for details of each digital waveform.

5.11.2 Trigger wait

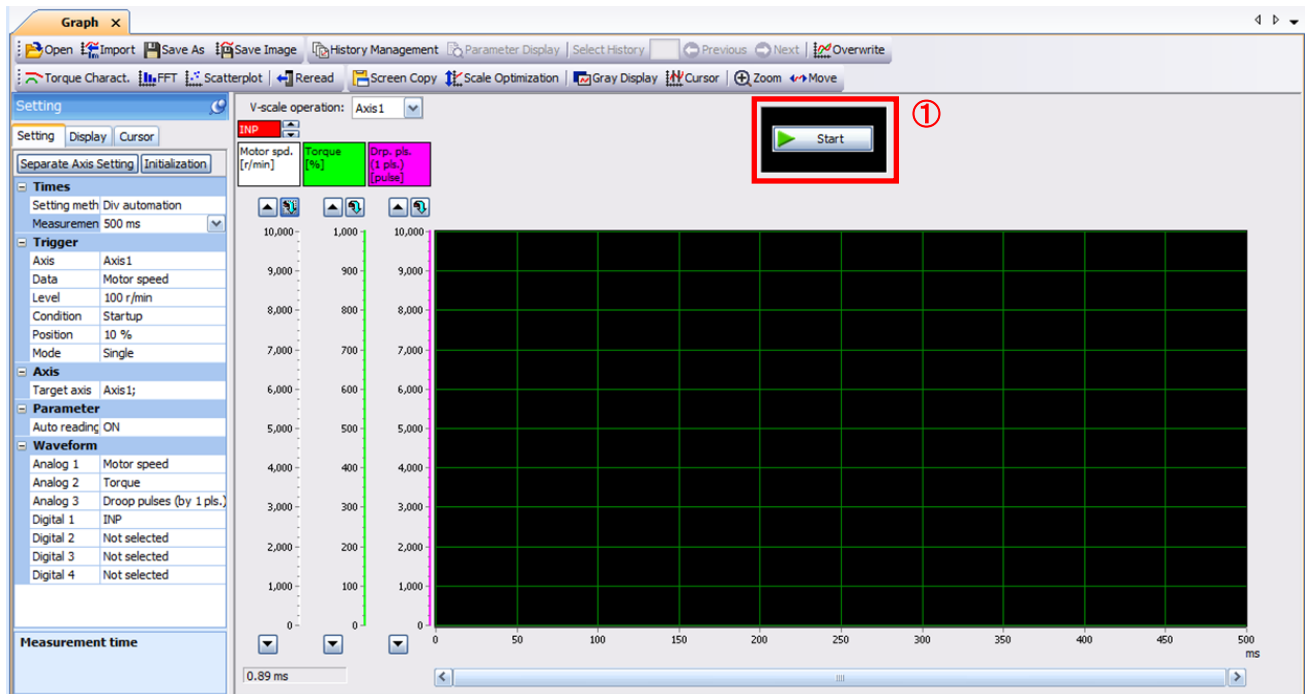
When the “Start” button is clicked, the screen will be on stand-by.

When trigger conditions are satisfied during the trigger wait, waveforms can be captured and displayed.

Click the “Start” button every time measurement fresh capture is required.

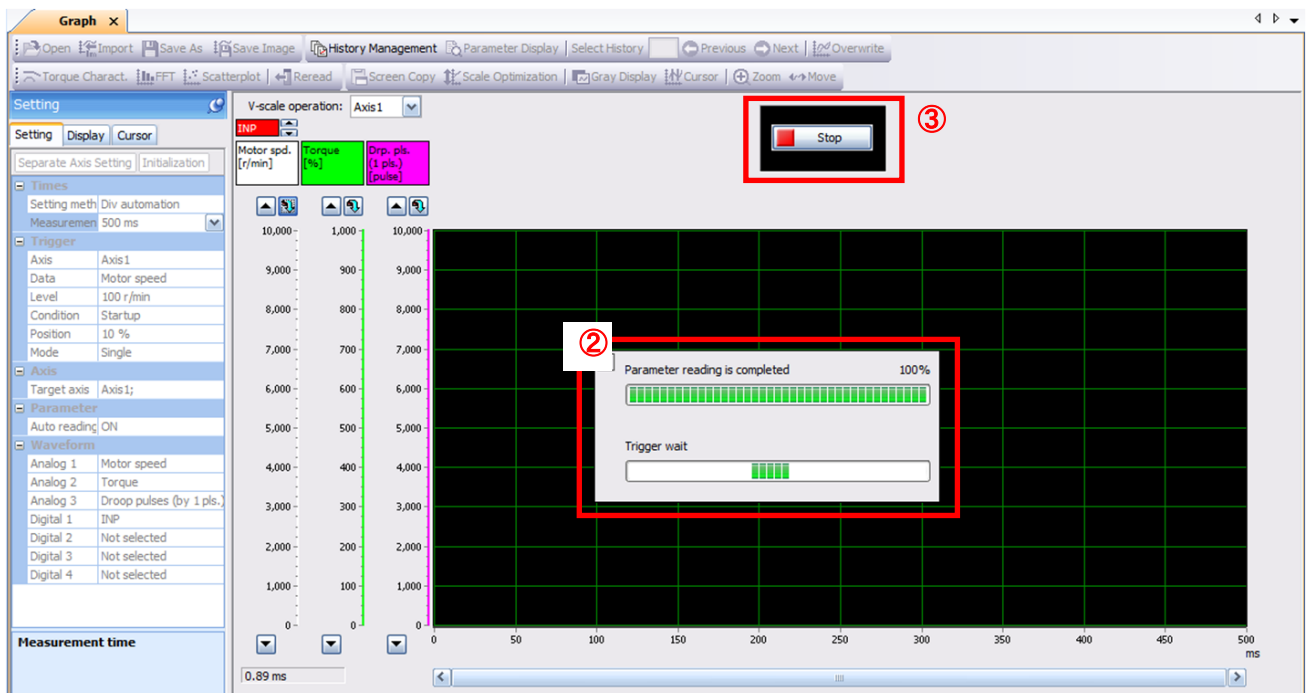
(The advantage of this method of capturing the waveform is a waveform will not be updated in the case of an incorrect operation.)

- ① Click the “Start” button.



- ② Trigger wait is displayed.

- ③ The acquisition of waveform will be canceled with “Stop” button.



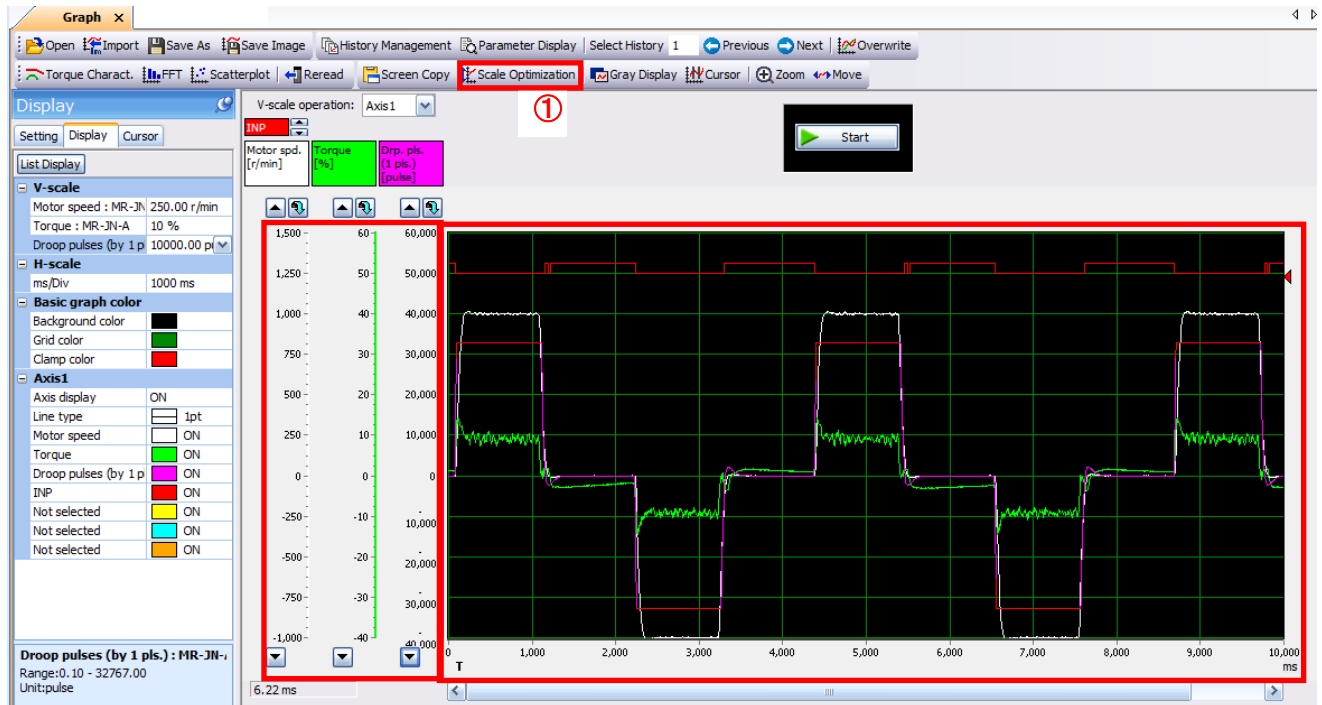
5.11.3 Operation Instruction

When the PLC on the master side sends the operation command, the actuator will operate.

When the trigger conditions in 5.11.1 (2) are satisfied, the operation waveforms can be captured.

When the time set in 5.11.1 (1) has passed after the acquisition start, the acquisition of the waveforms will complete and waveforms are displayed on the screen.

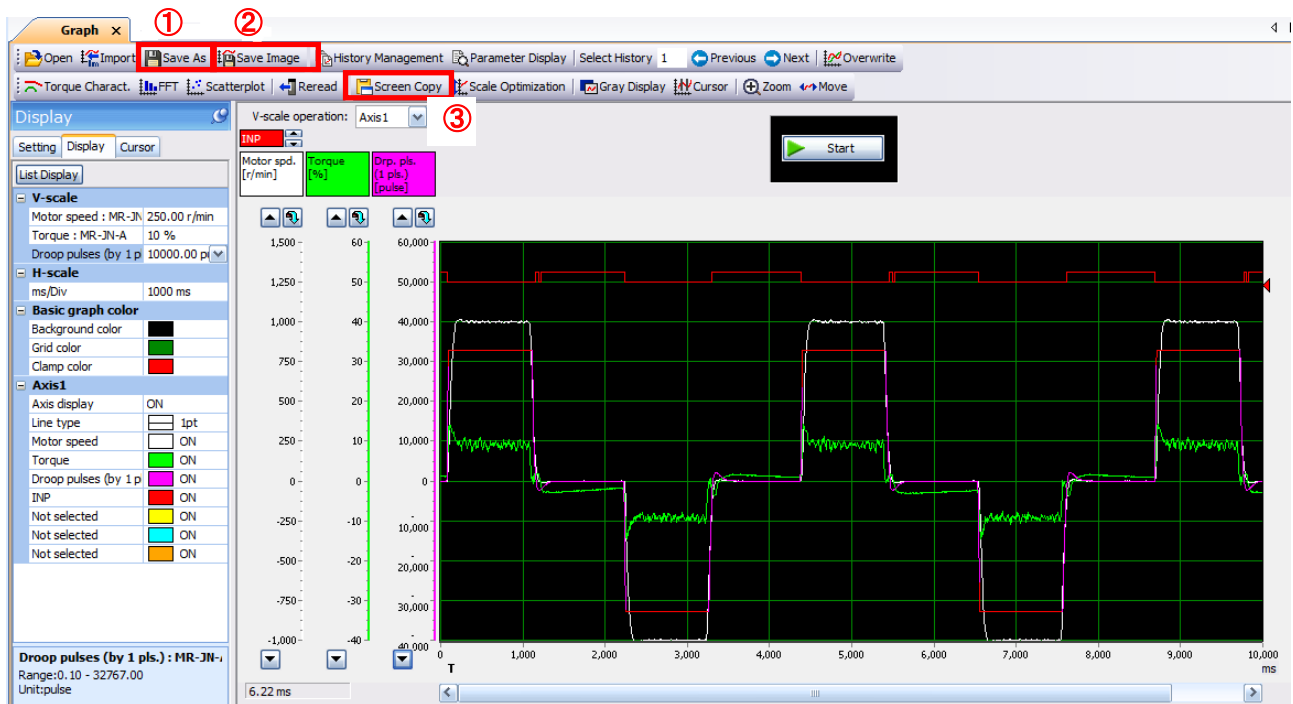
- ① When the “Scale Optimization” button is clicked, the vertical axis range is adjusted automatically.



5.11.4 Saving of waveform

After the waveform is displayed, it is possible to save the data in 3 ways.

- ① Click the “Save As” button.
Select the folder in which the step data is to be saved and save the data.
Waveform data file (extension: gpf2) will be prepared.
If the waveform condition needs to be checked, it can be displayed on the graph window.
- ② Click the “Save Image” button.
Select the folder in which the step data is to be saved and save the data.
An Image file (extension: jpg) will be prepared.
- ③ Click the “Screen Copy” button.
Save the displayed waveform screen (print screen).

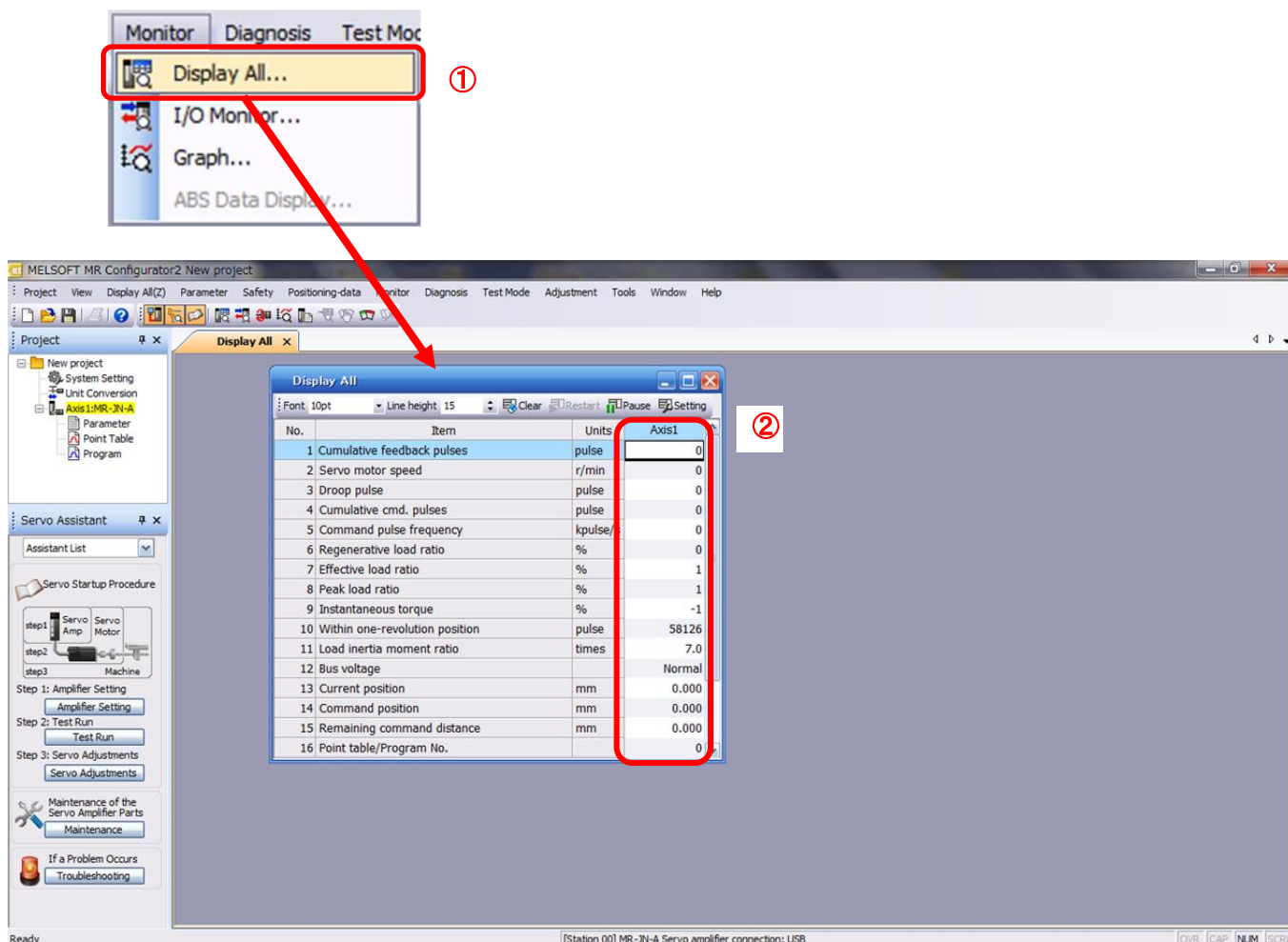


5.12 Display All Monitor List

The method how to obtain the electric actuator condition is described with the display all function of the setup software.

- ① Click "Monitor" - "Display All" of the setup software to display "Display All" window.
- ② The condition of each item is displayed.

For off line of the setup software, [----] will be displayed.



The following items are displayed for LECSA.

No.	Name	Function	Indication range	Unit
1	Cumulative feedback pulses	Feedback pulses from the servo motor encoder are counted and displayed. When exceed 999999999, it returns to zero. Press the [Clear] button to reset the display value to 0 (zero). Reverse rotation is indicated by a minus (-) sign.	-999999999 to 999999999	pulse
2	Servo motor speed	The servo motor speed is displayed. The value rounded off is displayed in 0.1r/min. Reverse rotation is indicated by a minus (-) sign.	-5400 to 5400	r/min
3	Droop pulses	The number of droop pulses in the deviation counter is displayed. Reverse rotation is indicated by a minus (-) sign.	-999999999 to 999999999	pulse
4	Cumulative command pulses	The position command input pulses are counted and displayed. Press the [Clear] button to reset the display value to zero. Reverse rotation is indicated by a minus (-) sign.	-999999999 to 999999999	pulse

No.	Name	Function	Indication range	Unit
5	Command pulse frequency	The frequency of the position command input pulses is displayed. Reverse rotation is indicated by a minus (-) sign. (Note) -1500 to 1500 kpulse/s is showed when inputting command pulse. Pulse unit of encoder is displayed during test operation.	-999999999 to 999999999	pulse
6	Regenerative load ratio	The ratio of regenerative power to permissible regenerative power is displayed in %. As the permissible regenerative power depends on whether there is the regenerative brake option or not. Set Parameter PA02 correctly according to the regenerative option. The guideline is 80% or less.	0 to 100	%
7	Effective load ratio	The continuous effective load torque is displayed. The effective value is displayed relative to the rated torque of 100%.	0 to 300	%
8	Peak load ratio	The maximum torque is displayed. The highest value in the past 15 seconds is displayed relative to the rated torque of 100%.	0 to 400	%
9	Instantaneous torque	Torque that occurred instantaneously is displayed. The value of the torque that occurred is displayed in real time relative to the rated torque of 100%.	0 to 400	%
10	Within one-revolution position	Position within one revolution is displayed in encoder pulses. The value returns to 0 when it exceeds the maximum number of pulses.	0 to 262143	pulse
11	Load inertia moment ratio	The estimated ratio of the servo motor axis converted inertia moment to the servo motor inertia moment is displayed.	0.0 to 300.0	times
12	Bus voltage	5: Overvoltage (About 400V or more) 4: High voltage (About 375V or more) 3: Normal 2: Low voltage (About 200V or less) 1: Undervoltage (About 160V or less)	Refer to the function on the left side.	-
13	Current position	The actual current position where the machine home position is assumed as zero is displayed.	-999999 to 999999 × 10STM	μm
14	Command position	Point table, position data within the program, and the command position being set are displayed.	-999999 to 999999 × 10STM	μm
15	Remaining command distance	The command remaining distance of the currently selected point table is displayed.	0 to 999999 × 10STM	μm
16	Point table/Program No.	The point table No./program No. which is being performed is displayed. Display range: Point table No. 0 to 7/Program No. 0 to 8	Refer to the function on the left side.	-
17	Step No.	The step No. of program which is being performed is displayed.	0 to 120	-
18	Settling time	The settling time is displayed.	0 to 999	ms
19	Oscillation detection frequency	The frequency at oscillation detection is displayed.	100 to 4500	Hz
20	Tough drive times	The times moving to the tough drive are displayed.	0 to 99	times

6. Home Position Return Method

6.1 Position Control Mode (Pulse Input)

When using the home position return in position control mode (pulse input), use the home position return function in the positioning module of the upper PLC.

Please see product operation manuals for positioning module layouts, parameter configuration, home position return method etc.

6.2 Positioning mode (point table)

In positioning mode (point table) a home position return function is available. There are 6 types of home position return as shown below. See “LECSA Operation Manual”, section 13.6 for details.

Type	Home position return method	Features
Dog type	With Deceleration started at the detection of front edge of a proximity dog switch signal, the position where the first Z-phase signal is given past the rear edge of the dog signal or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position. (Note)	<ul style="list-style-type: none"> • General home position return method using a proximity dog. • Good repeat accuracy of home position return • Decreases product load. • Used when the width of the proximity dog can be set greater than the deceleration distance of the servo motor.
Count type	With Deceleration started at the detection of front edge of a proximity dog switch signal, the position where the first Z-phase signal is given after advancement over the preset moving distance after the proximity dog switch signal or a motion has been made over the home position shift distance starting from the Z-phase signal is defined as a home position.	<ul style="list-style-type: none"> • Home position return method using a proximity dog. • Used when it is minimisation of the proximity dog length is required.
Data set type	An arbitrary position defined as a home position.	• No proximity dog required.
Stopper type	The position where the actuator stops when its slider is pressed against a machine stop is defined as a home position.	<ul style="list-style-type: none"> • Since the machine part collides with the machine be fully lowered. • The machine and stopper strength must be increased.
Home position ignorance (Servo-on position as home position)	The position where servo is switched on is defined as a home position.	
Dog type rear end reference	The position where the axis, which had started deceleration of the front edge of a proximity dog switch signal, has moved the after-proximity dog moving distance and home position shift distance after it has passed the rear edge of proximity dog switch signal is defined as a home position.	• Z-phase signal not required.
Count type front end reference	The position where the axis, which had started deceleration at the front edge of a proximity dog switch signal, has moved the after-proximity dog moving distance and home position shift distance is defined as a home position.	• Z-phase signal not required.
Dog cradle type	The position where the first Z-phase signal is detected after detection of the proximity dog front edge signal is defined as a home position.	

Note. The Z-phase signal is a signal recognised in the driver once per servo motor revolution. This cannot be used as an output signal.

Set parameter PE03 (Home position return type) for home position return. The parameter recommended in “LECSA Operation Manual, Appendix” is the stopper type (PE03 : 0003). Please select the home position return as appropriate to the customer application.

Parameter No. PE03

0			
---	--	--	--

Home position return type(a)

- 0: Dog type
- 1: Count type
- 2: Data set type
- 3: Stopper type
- 4: Home position ignorance
(Servo-on position as home position)
- 5: Dog type rear end reference
- 6: Count type front end reference
- 7: Dog cradle type

6.2.1 Stopper type home position return

In stopper type home position return, a machine part is pressed against a stopper using to make a home position return and that position is defined as the home position.

After completion of stopper type home position return, please move to any position (Not pressed position) from the pressing position.

If over a certain period of time in the state of the pressing position, an overload alarm (AL 50, AL 51) occurs for driver protection.

(1) Devices and Parameters

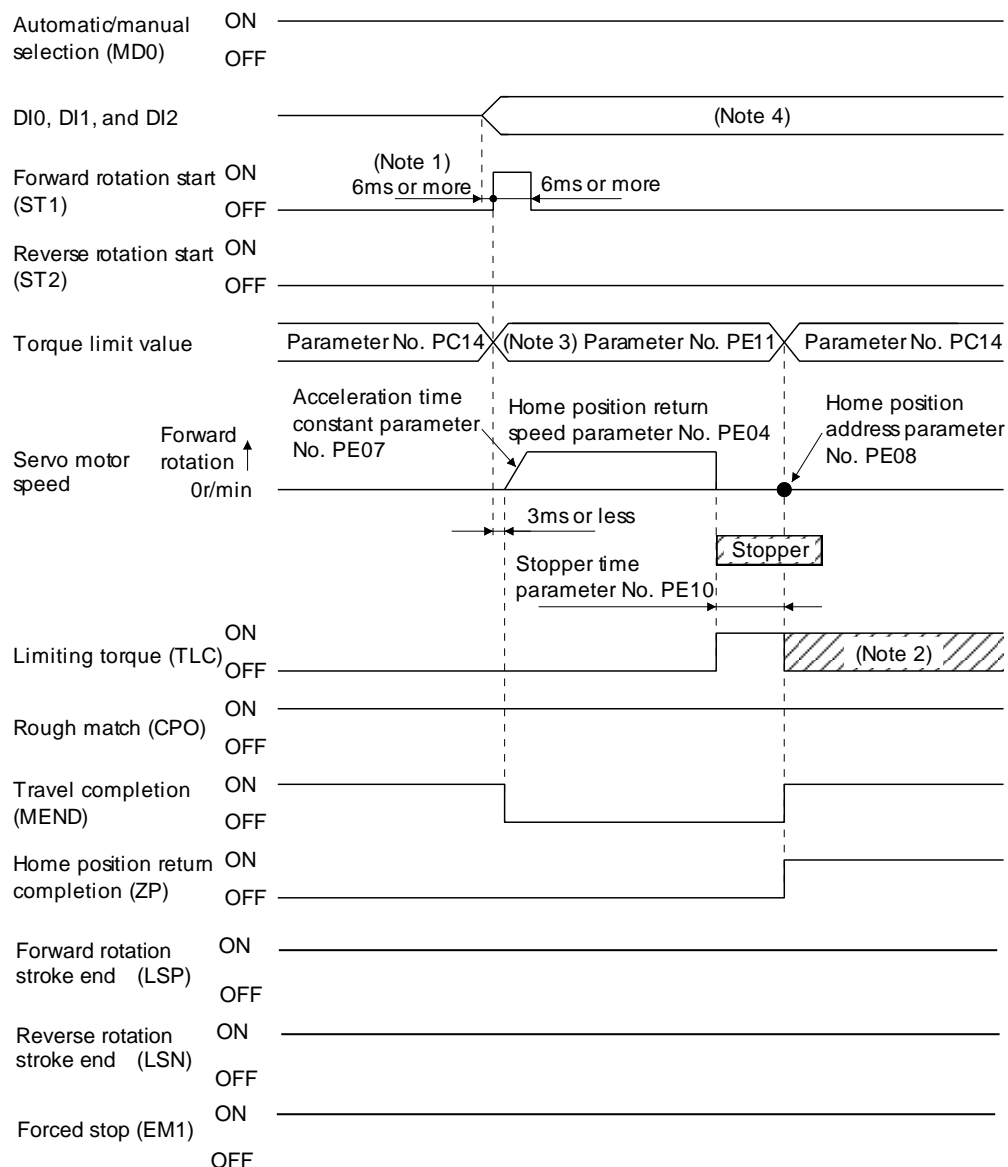
Configure the input devices and parameters as shown below.

Item	Device/Parameter used	Description
Manual home position return mode selection	Automatic/manual selection (MD0)	Turn MD0 ON.
	Point table No./Program No. selection 1 to 3 (DI0 to DI2)	Point table: Select the home position return mode by turning OFF DI0, DI1 and DI2. Program: Select a program that has the home position return "ZRT" command.
Stopper type home position return	Parameter No. PE03	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3: Stopper type home position return is selected.
Home position return direction	Parameter No. PE03	Select the home position return direction.
Home position return speed	Parameter No. PE04	Set the speed till contact with the stopper.
Stopper time	Parameter No. PE10	Time from when the part makes contact with the stopper to when home position return data is obtained to output home position return completion (ZP).
Stopper type home position return torque limit value	Parameter No. PE11	Set the servo motor torque limit value for execution of stopper type home position return.
Home position return Acceleration time constant	Parameter No. PE07	Set the Acceleration time constant during a home position return.
Home position return position data	Parameter No. PE08	Set the current position at home position return completion.

Note

* To set [PE**], set parameter write inhibit [PA19] to "00E".

(2) Timing chart



Note 1. External input signal detection is delayed by the input filter setting time of parameter No. PD19. Implement a sequence that changes DI0, DI1 and DI2 ahead of time by considering delays in output signal sequence from the PC or PLC and variations of a signal change due to hardware.

2. TLC turns ON when the torque reaches the value set in forward torque limit (parameter No. PA11), reverse torque limit (parameter No. PA12) or internal torque limit (parameter No. PC14).

3. The torque limit that is enabled at this point is as follows.

(Note) Input device	Limit value status		Validated torque limit values
TL1			
0			Parameter No. PE11
1	Parameter No. PC14 > Parameter No. PE11		Parameter No. PE11
	Parameter No. PC14 < Parameter No. PE11		Parameter No. PC14

Note. 0: off

1: on

4. Point table method: Select the home position return mode by turning OFF DI0, DI1 and DI2.

Program method: Select the program that has the home position return "ZRT" command.

The set value in parameter No. PE08 (home position return position data) is applied as position address at the time of the home position return being completed.

7. Driving Methods for Each Mode

7.1 Position Control Mode (Pulse Input)

The motor rotation speed and acceleration / deceleration and direction is controlled using the pulse train and executes positioning operation.

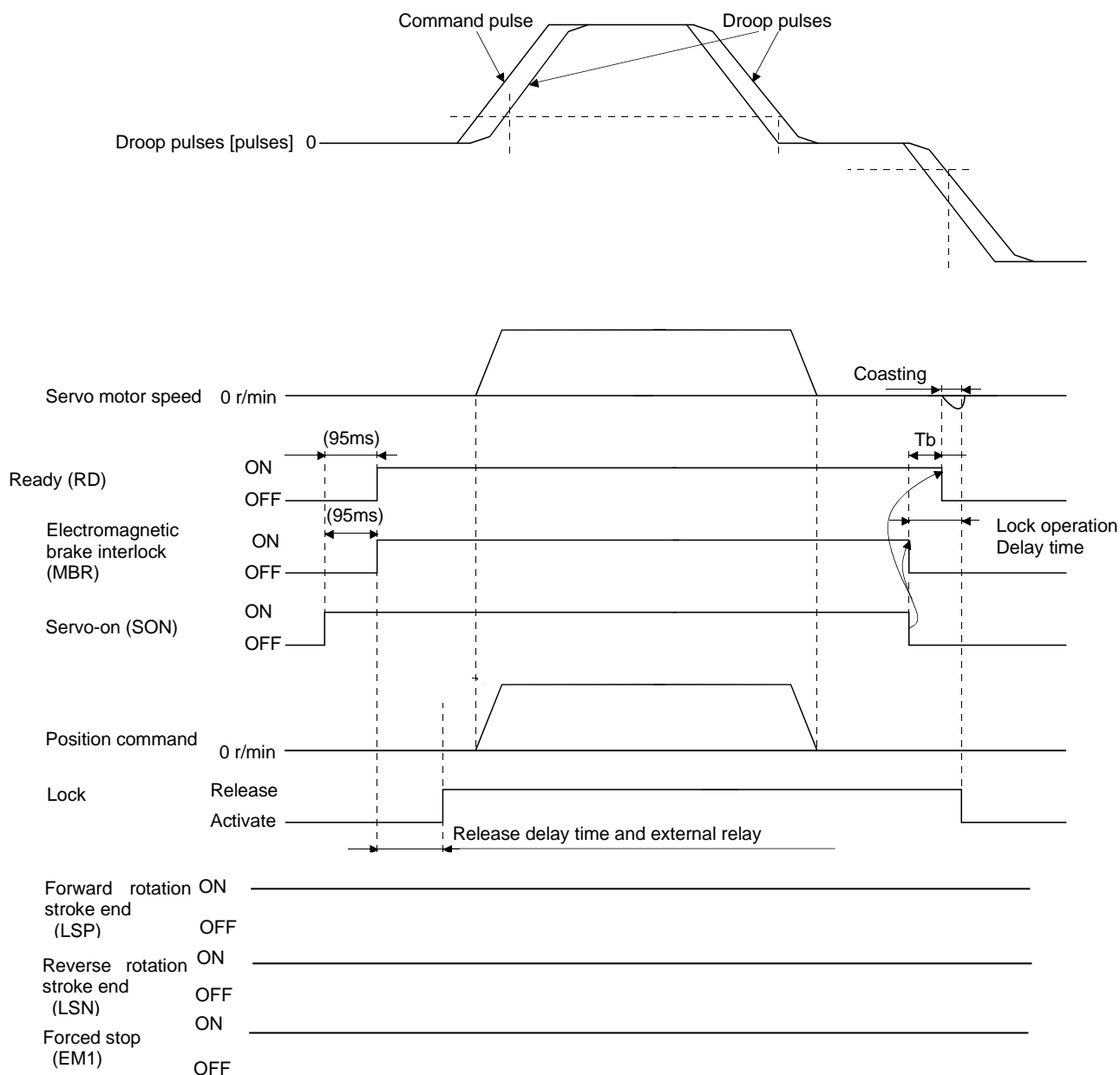
7.1.1 Position Control Mode Instructions

The command pulse (rotation speed and acceleration / deceleration and direction) sent as input to the driver from the positioning unit and the driver operates the actuator in accordance with the command pulse.

Rotation speed and acceleration / deceleration should be set within the specification range of each actuator.

For specifications of rotation speed and acceleration / deceleration, refer to the catalog, manual etc. of each actuator.

The command pulse and driver operation examples are shown below.



7.2 Speed control mode

This mode allows for accurate, smooth control of the rotation speed and direction of the servo motor.

* To set [PC**], set parameter write restriction [PA19] to "00E".

7.2.1 Speed Control Mode Operation Instruction

The servo motor will rotate when signal ST1 and ST2 turn on. An operation example of the speed control mode is shown below.

Internal speed command settings

Speed command and speed

The servo motor operates at the speed set in parameters.

Up to 8 speeds can be set to the internal speed command.

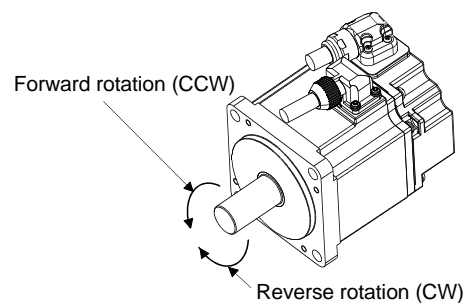
The following table indicates the rotation direction according to forward rotation start (ST1) and reverse rotation start (ST2) combination.

(Note 1) Input device		(Note 2) Rotation direction
ST2	ST1	
0	0	Stop (Servo lock)
0	1	Forward rotation (CCW)
1	0	Reverse rotation (CW)
1	1	Stop (Servo lock)

Note 1. 0: off

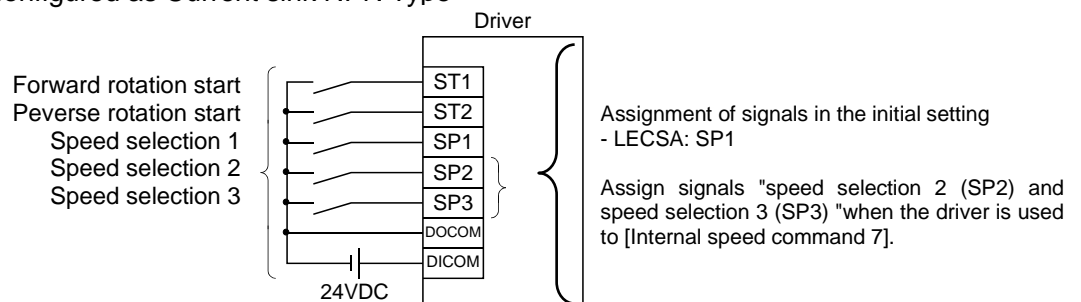
1: on

2. If the torque limit is canceled during servo lock, the servo motor may suddenly rotate according to position deviation in respect to the command position.



Connect the wirings as follows when operating in forward or reverse rotation with the internal speed command set to the eighth speed.

Note that the inputs are configured as Current sink NPN Type



Refer to "LECSA Operation Manual (Simplified Edition)", section 5.5 for signal assignment.

LECSA Speed Command Parameter Setting

(Note) Input device			Speed command value	
SP3	SP2	SP1		
0	0	0	Internal speed command 0 (parameter No. PC05)	Initial phase
0	0	1	Internal speed command 1 (parameter No. PC06)	
0	1	0	Internal speed command 2 (parameter No. PC07)	
0	1	1	Internal speed command 3 (parameter No. PC08)	
1	0	0	Internal speed command 4 (parameter No. PC31)	
1	0	1	Internal speed command 5 (parameter No. PC32)	
1	1	0	Internal speed command 6 (parameter No. PC33)	
1	1	1	Internal speed command 7 (parameter No. PC34)	

Note. 0:OFF

1:ON

8 patterns of speed configurations are available for LECSA.

7.3 Torque control mode

Servo motor output torque is controlled. Speed control function is also available.

* To set [PC**], set parameter write restriction [PA19] to "00E".

7.3.1 Torque Control Mode Operation Instruction

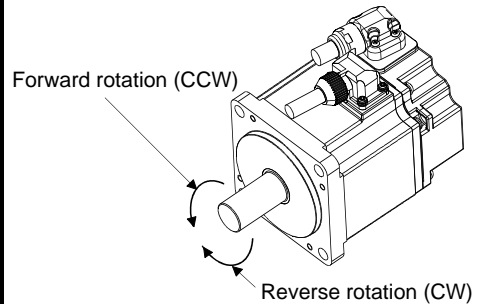
The servo motor will rotate when signal RS1 and RS2 turn on. An operation example of the torque control mode is shown below. Internal torque command settings:

Torque is controlled by the internal torque command set in parameter No. PC12.

If the internal torque command is small, the torque may vary when the actual speed reaches the speed limit value. In such case, increase the speed limit value.

The following table indicates the torque generation directions determined by the forward rotation selection (RS1) and the reverse rotation selection (RS2) when the internal torque command (parameter No. PC12) is used.

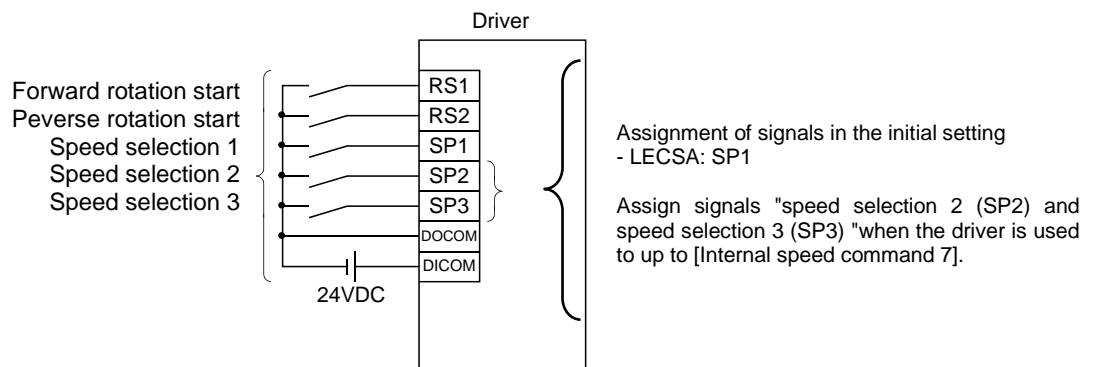
(Note) Input device		Rotation direction	
RS2	RS1	Internal torque command (parameter No. PC12)	
		0.1 to 100.0%	0.0%
0	0	Torque is not generated.	
0	1	Torque is not generated.	
1	0		
1	1		



Note. 0: off
1: on

Generally, make connection as shown below.

Note that the inputs are configured as Current sink NPN Type



Refer to "LECSA Operation Manual (Simplified Edition)", section 5.5 for assignment of signal.

LECSA speed restricted parameter setting

(Note) Input device			Speed command value	
SP3	SP2	SP1		
0	0	0	Internal speed command 0 (parameter No. PC05)	Initial phase
0	0	1	Internal speed command 1 (parameter No. PC06)	
0	1	0	Internal speed command 2 (parameter No. PC07)	
0	1	1	Internal speed command 3 (parameter No. PC08)	
1	0	0	Internal speed command 4 (parameter No. PC31)	
1	0	1	Internal speed command 5 (parameter No. PC32)	
1	1	0	Internal speed command 6 (parameter No. PC33)	
1	1	1	Internal speed command 7 (parameter No. PC34)	

Note. 0:OFF
1:ON

For LECSA, 8 patterns of speed setting are available.

7.4 Positioning Mode (Point table method)

Positioning operation can be executed by setting the target position, rotation speed, acceleration time constant, deceleration time constant to the point table data. (The maximum points that can be set in point table is 7.)

See "LECSA Operation Manual", section 13.3 for details regarding the positioning mode (point table).

7.4.1 Operation Instruction of Point Table system

Select the point table No. represented by the values of DI0, DI1 and DI2. Start the operation by selecting ST1 or ST2.

Device	Symbol	Connector pin No.	Functions/Applications	I/O division	Positioning mode																																									
					CP	CL																																								
Point table No. /Program No. selection 1	DI0	CN1-5	<In point table method> The point table No. and the home position return mode are selected by DI0 to DI2. <In program method> The program No. is selected by DI0 to DI2.	DI-1	○	○																																								
Point table No. /Program No. selection 2	DI1	CN1-23	<table border="1"><thead><tr><th colspan="3">(Note) Device</th><th>Selection description</th></tr><tr><th>DI2</th><th>DI1</th><th>DI0</th><th>Point table method</th></tr></thead><tbody><tr><td>0</td><td>0</td><td>0</td><td>Home position return mode</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Point table No. 1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Point table No. 2</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Point table No. 3</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Point table No. 4</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Point table No. 5</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Point table No. 6</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Point table No. 7</td></tr></tbody></table>	(Note) Device			Selection description	DI2	DI1	DI0	Point table method	0	0	0	Home position return mode	0	0	1	Point table No. 1	0	1	0	Point table No. 2	0	1	1	Point table No. 3	1	0	0	Point table No. 4	1	0	1	Point table No. 5	1	1	0	Point table No. 6	1	1	1	Point table No. 7	DI-1	○	○
(Note) Device			Selection description																																											
DI2	DI1	DI0	Point table method																																											
0	0	0	Home position return mode																																											
0	0	1	Point table No. 1																																											
0	1	0	Point table No. 2																																											
0	1	1	Point table No. 3																																											
1	0	0	Point table No. 4																																											
1	0	1	Point table No. 5																																											
1	1	0	Point table No. 6																																											
1	1	1	Point table No. 7																																											
Point table No. /Program No. selection 3	DI2		Note. 0: off 1: on	DI-1	△	△																																								
Program input 1	PI1		Turn PI1 on to resume the step stopped by the SINK (1) command in the program.	DI-1		△																																								

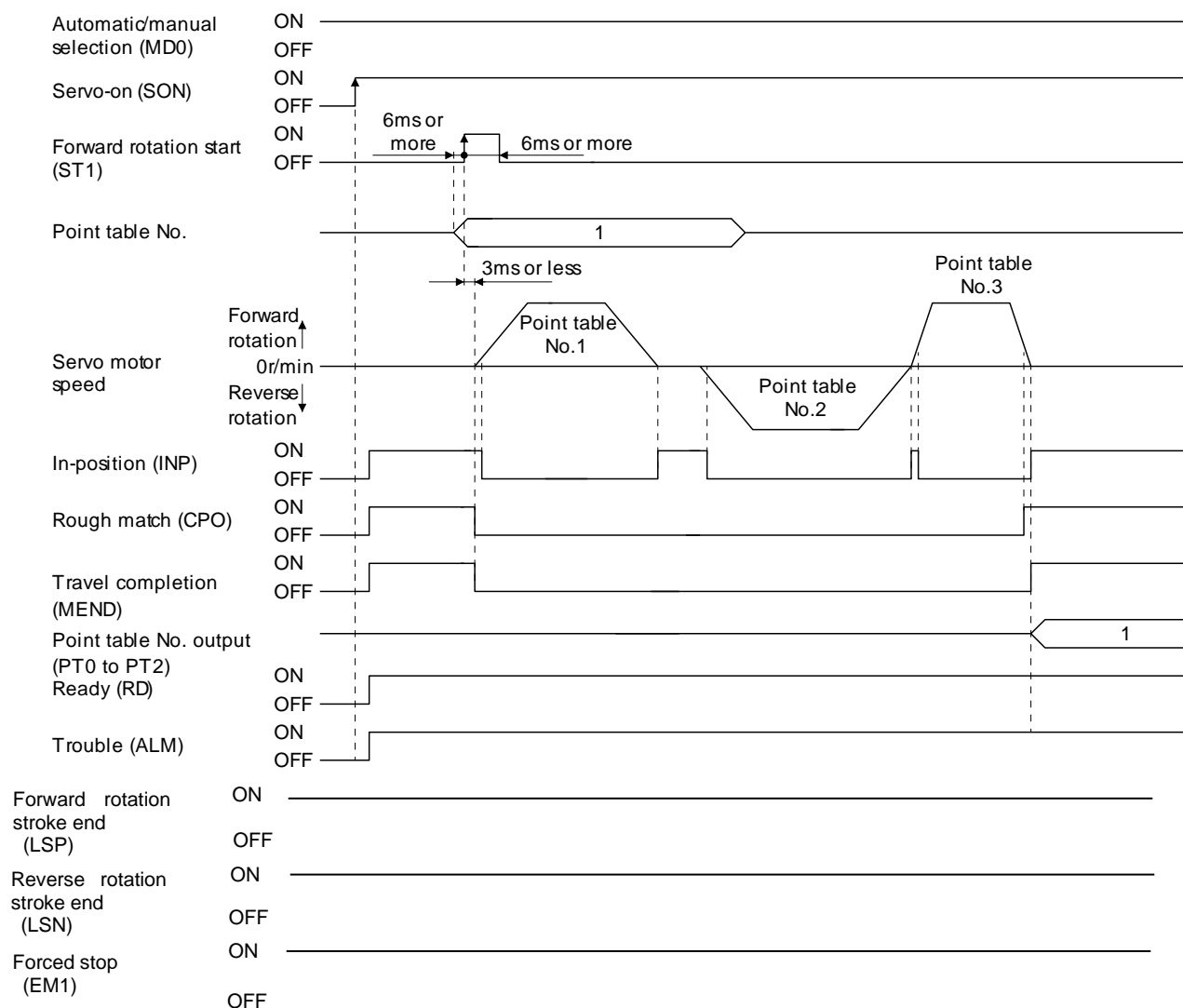
If the parameter " PE01 : Command mode selection " setting is "0000 : Absolute value command system " .

Point table No.	Target position [$\times 10^3 \mu\text{m}$]	Rotation speed [r/min]	Acceleration time constant [ms]	Deceleration time constant [ms]	Dwell [ms]	Auxiliary function
1	5.00	3000	100	150	100	1
2	-6.00	2000	100	100	0	3
3	3.00	3000	50	50	0	0 (Note)

Note. Always set "0" or "2" to the auxiliary function in the last point table among the consecutive point tables.

0: When point table is used in absolute value command system

2: When point table is used in incremental value command system

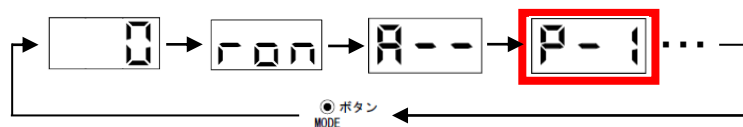


7.4.2 Setting method

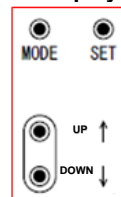
(1) Setting with the button on the front of the driver

Ex.) When the servo motor rotation speed of point table No.3 is changed from 2500 (r/min) to 1000 (r/min).

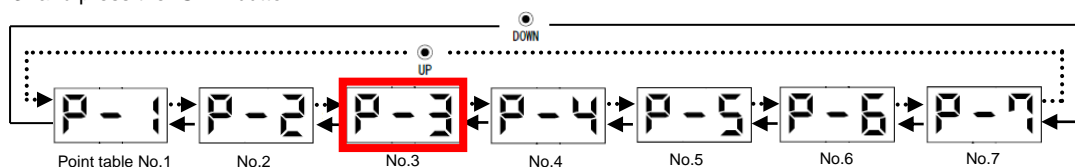
- a. When the "MODE" button on the driver operation is pressed, the display will be shifted as shown below. Select "P-1".



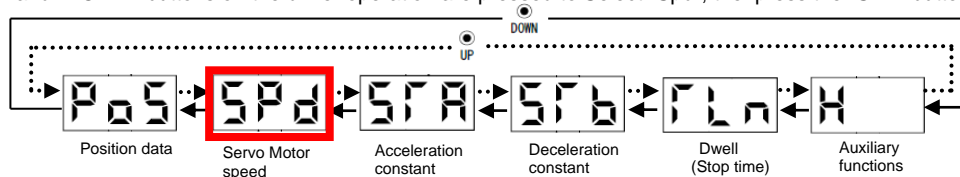
Driver operation display



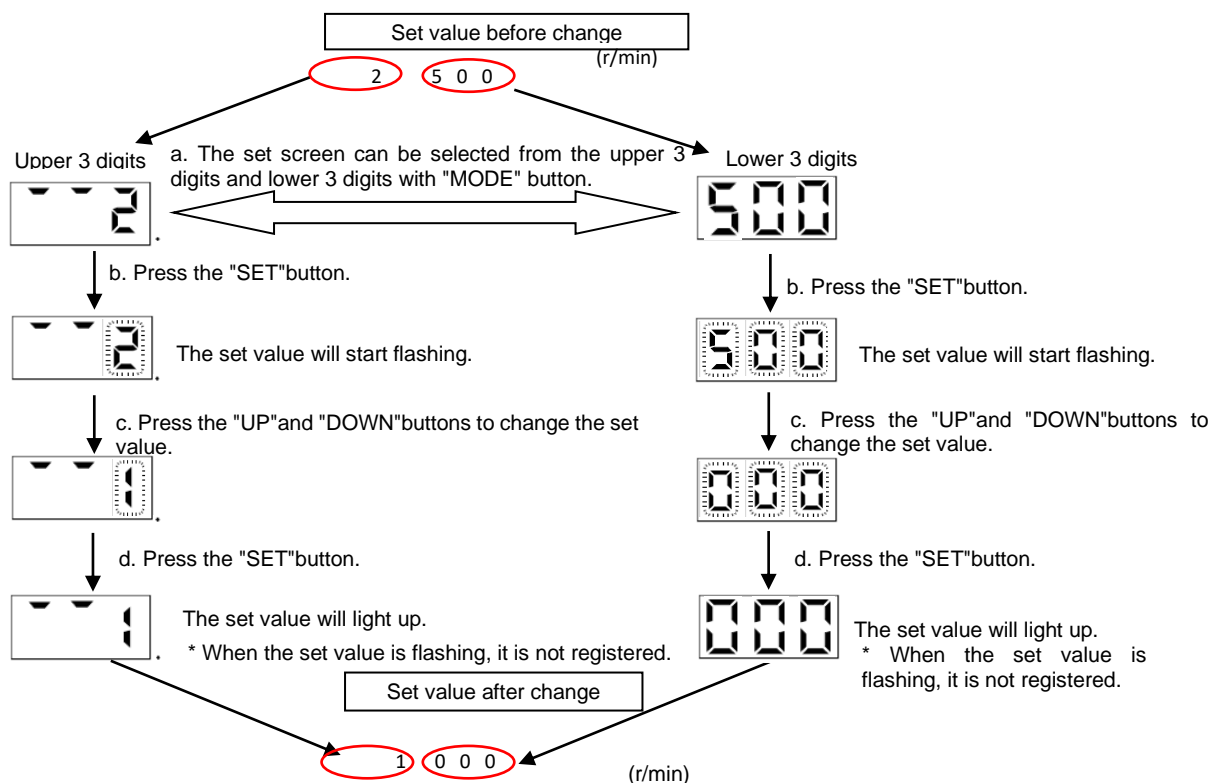
- b. When the "UP" and "DOWN" buttons on the driver operation are pressed, the display will be shifted as shown below, Select "P-3" and press the "SET" button.



- c. The "UP" and "DOWN" buttons on the driver operation are pressed to Select "Spd", then press the "SET" button.



- 500 is displayed. The lower 3 digits of the set value are displayed. The operation procedure is described below. When the "MODE" button is pressed, the upper 3 digits are displayed. Change the set value as shown below.



Refer to "LECSA Operation Manual", chapter 13 for details.

7.5 Positioning Mode (Programing Method)

To perform the positioning operation, create a program using target position, rotation speed, acceleration constant and deceleration constant (The maximum number of programs is 8 for which a total of 120 steps can be created per program). Install the setup software, MR Configurator2™ : LEC-MRC2E which is required for setting the program data with the program system.

*1 Setup software version 1.52E or above is required.

*2. Setup software should be prepared by the user.

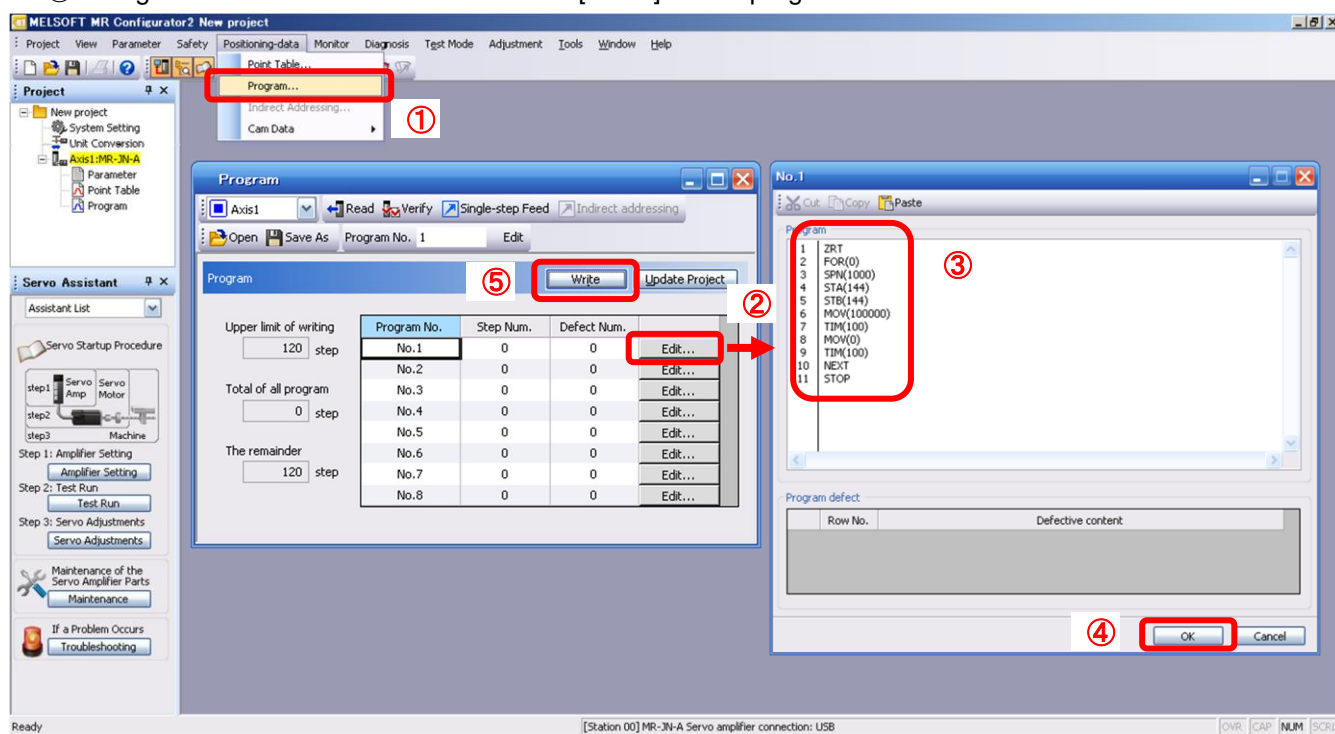
*3. USB cable (LEC-MR-J3USB) is required for software installation.

See “LECSA Operation Manual”, section 13.4 for details regarding the positioning mode (programming method).

See “LECSA Operation Manual”, section 13.9 for details regarding programming methods.

7.5.1 Setting method

- ① Launch the setup software and select [Program] of [Positioning data].
- ② Select [Edit] on the program window to open the program edition window.
- ③ Create programs.
- ④ Click [OK].
- ⑤ Program data is written to the driver with [Write] on the program window.



7.5.2 Command in the program system

An example of the program commands is shown below.

See “LECSA Operation Manual”, section 13.4.2 for details regarding programming command.

The maximum number of program steps is 120. Though up to 8 programs can be created, the total number of each program steps is up to 120.

The set program can be selected using point table no./program no. selection 1 (DI0) to point table no./program no. selection 3 (DI2).

(1) Ex.) Command list

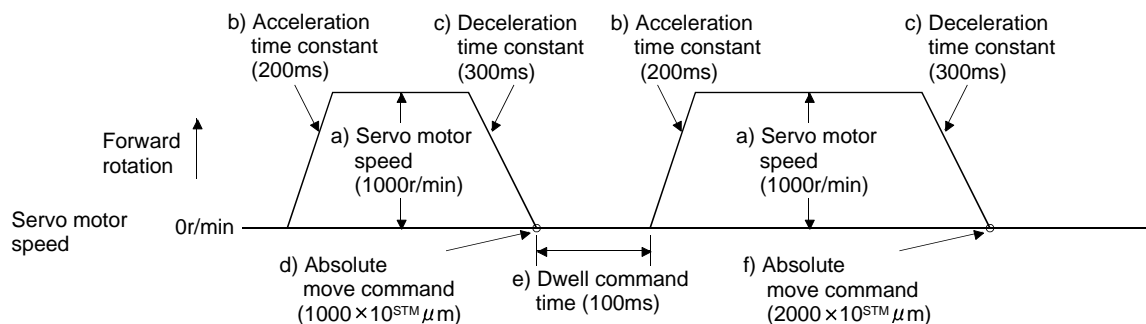
Command	Name	Setting	Setting range	Unit	Indirect addressing	Description
SPN	Speed (Motor speed)	SPN (Setting value)	0 to instantaneous permissible speed	r/min	○	Used to set the command speed of the servo motor for positioning. The set value should be equal to or less than the instantaneous permissible speed of the servo motor.
STA	Acceleration time constant	STA (Setting value)	0 to 20000	ms	○	Used to set the Acceleration time constant. The set value is the time in which the servo motor reaches the rated speed from a stop. It cannot be changed during command output.
STB	Deceleration time constant	STB (Setting value)	0 to 20000	ms	○	Used to set the Deceleration time constant. The set value is the time in which the servo motor stops from the rated speed. It cannot be changed during command output.

7.5.3 Operation Instruction Method of Program System

Select the program No. represented by the values of DI0, DI1 and DI2 and start the operation by selecting ST1.

Device	Symbol	Connector pin No.	Functions/Applications	I/O division	Positioning mode																																									
					CP	CL																																								
Point table No. /Program No. selection 1	DI0	CN1-5	<In point table method> The point table No. and the home position return mode are selected by DI0 to DI2. <In program method> The program No. is selected by DI0 to DI2.	DI-1	○	○																																								
Point table No. /Program No. selection 2	DI1	CN1-23	<table><tr><th colspan="3">(Note) Device</th><th>Selection description</th></tr><tr><th>DI2</th><th>DI1</th><th>DI0</th><th>Program method</th></tr><tr><td>0</td><td>0</td><td>0</td><td>Program No. 1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>Program No. 2</td></tr><tr><td>0</td><td>1</td><td>0</td><td>Program No. 3</td></tr><tr><td>0</td><td>1</td><td>1</td><td>Program No. 4</td></tr><tr><td>1</td><td>0</td><td>0</td><td>Program No. 5</td></tr><tr><td>1</td><td>0</td><td>1</td><td>Program No. 6</td></tr><tr><td>1</td><td>1</td><td>0</td><td>Program No. 7</td></tr><tr><td>1</td><td>1</td><td>1</td><td>Program No. 8</td></tr></table>	(Note) Device			Selection description	DI2	DI1	DI0	Program method	0	0	0	Program No. 1	0	0	1	Program No. 2	0	1	0	Program No. 3	0	1	1	Program No. 4	1	0	0	Program No. 5	1	0	1	Program No. 6	1	1	0	Program No. 7	1	1	1	Program No. 8	DI-1	○	○
			(Note) Device			Selection description																																								
			DI2	DI1	DI0	Program method																																								
			0	0	0	Program No. 1																																								
			0	0	1	Program No. 2																																								
			0	1	0	Program No. 3																																								
			0	1	1	Program No. 4																																								
			1	0	0	Program No. 5																																								
			1	0	1	Program No. 6																																								
1	1	0	Program No. 7																																											
1	1	1	Program No. 8																																											
Point table No. /Program No. selection 3	DI2	<div></div>	Note. 0: off 1: on	DI-1	△	△																																								
Program input 1	PI1	<div></div>	Turn PI1 on to resume the step stopped by the SINK (1) command in the program.	DI-1	<div></div>	△																																								

Program	Description		
SPN (1000)	Speed (Motor speed)	1000[r/min]	a) }
STA (200)	Acceleration time constant	200[ms]	b) }
STB (300)	Deceleration time constant	300[ms]	c) }
MOV (1000)	Absolute move command	1000[×10 ^{STM} μm]	d) ←
TIM (100)	Dwell command time	100[ms]	e) ←
MOV (2000)	Absolute move command	2000[×10 ^{STM} μm]	f) ←
STOP	Program end		



8. Troubleshooting

8.1 Alarms and Warning List

POINT

- As soon as an alarm occurs, turn off servo-on (SON) and the main circuit power supply.

When a fault occurs during operation, the corresponding alarm or warning is displayed. If an alarm or warning occurs, refer to “LECSA Operation Manual”, section 8.2 or “LECSA Operation Manual”, section 8.3 and take the appropriate action. When an alarm occurs, ALM turns off.

After removing the cause of the alarm, the alarm can be deactivated in any of the methods marked ○ in the alarm deactivation column. The warning is automatically canceled after removing the cause of occurrence.

	No.	LED display	Name	Alarm deactivation		
				Power OFF→ON	Press "SET" on current alarm screen.	Alarm reset (RES)
Alarms	A.10	R 10	Undervoltage	○	○	○
	A.12	R 12	Memory error 1 (RAM)	○		
	A.13	R 13	Clock error	○		
	A.15	R 15	Memory error 2 (EEP-ROM)	○		
	A.16	R 16	Encoder initial communication error1	○		
	A.17	R 17	Board error	○		
	A.19	R 19	Memory error 3 (Flash-ROM)	○		
	A.1A	R 1A	Motor combination error	○		
	A.1C	R 1C	Software combination error	○		
	A.1E	R 1E	Encoder initial communication error 2	○		
	A.1F	R 1F	Encoder initial communication error 3	○		
	A.20	R20	Encoder normal communication error 1	○		
	A.21	R21	Encoder normal communication error 2	○		
	A.24	R24	Main circuit error	○	○	○
	A.30	R30	Regenerative error	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A.31	R31	Overspeed	○	○	○
	A.32	R32	Overcurrent	○		
	A.33	R33	Overvoltage	○	○	○
	A.35	R35	Command frequency error	○	○	○
	A.37	R37	Parameter error	○		
	A.45	R45	Main circuit device overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A.46	R46	Servo motor overheat	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A.50	R50	Overload 1	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A.51	R51	Overload 2	(Note 1) ○	(Note 1) ○	(Note 1) ○
	A.52	R52	Error excessive	○	○	○
	A.8E	R8E	USB communication error	○	○	○
	888	888	Watchdog	○		

	No.	3-digit, 7-segment LED display	Name	The servo motor stops /does not stop.
Warning	A.90	A90	Home positioning incomplete warning	Stops
	A.91	A91	Driver overheat warning	Does not stop
	A.96	A96	Home position setting error	Stops
	A.97	A97	Program operation disabled	Does not stop
	A.98	A98	Software limit warning	Stops (Note 2)
	A.99	A99	Stroke limit warning	Stops (Note 2)
	A.E0	AEO	Excessive regeneration warning	Does not stop
	A.E1	AE1	Overload warning 1	Does not stop
	A.E6	AEE	Servo forced stop warning	Stops
	A.E9	AEE	Main circuit off warning	Stops
	A.EC	AEC	Overload warning 2	Does not stop
	A.ED	AEd	Output watt excess warning	Does not stop
	A.F0	AF0	Tough drive warning	Does not stop

Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

2. Operation to the direction which cancels the warning can be performed.

8.2 Alarm Display

The contents of the alarm / warning that is currently occurring in the driver are displayed in the alarm display function of the setup software.

In addition, history is listed for alarms that occurred in the past.

- ① Click "Diagnosis" - "Alarm Display" of the setup software to display "Alarm Display" window.
- ② Alarms / warnings currently occurring in the driver display the contents.
If no alarm / warning has occurred, it will not be displayed.
- ③ Lists the history (Maximum 16 cases) of alarms that occurred in the past.
(Warnings are not displayed.)

Alarm Display

Display	Detailed name	Cause	Check method	Check result	Action
51.2	Thermal overload error 3 during stopping	1) Power cable is cut. 2) Incorrect connections to/from the servo motor. 3) Misconnection of encoder cable. 4) Machine struck something. 5) Torque is saturated.	Perform the checking method of [AL 51.1]		

Additional information: (Alarm reset enable)

Alarm history

Number	Name	Time (h)	Detailed information
New	51.2		
1	52.3	253	02
2	52.3	253	03
3	52.3	253	03
4	52.3	253	03
5	16.3	253	03

Encoder initial communication error 1

Revision history

No.LEC-OM05601
Dec./2012 1st printing
No.LEC-OM05602
Dec./2013 2nd printing
No.LEC-OM05603
Jun./2014 3rd printing
No.LEC-OM05604
Aug./2014 4th printing
No.LEC-OM05605
Oct./2014 5th printing
No.LEC-OM05606
Oct./2014 6th printing
No.LEC-OM05607
Dec./2014 7th printing
No.LEC-OM05608
Apr./2015 8th printing
No.LEC-OM05609
Sep./2015 9th printing
No.LEC-OM05610 (No.JXC※-OMT0052)
Sep./2016 10th printing
No.LEC-OM05611 (No.JXC※-OMT0052-A)
Jun./2017 11th printing
No.JXC※-OMT0052-B
Mar./2018 12th printing
[5.5.1 Automatic Input Signal ON Selection Parameter Configuration]
Change the contents.
[7.1 Position Control Mode (Pulse Input)] Change the contents.
[7.1.1 Position Control Mode Instructions] Change the contents.
No.JXC※-OMT0052-C
Oct./2023 Delete chapter 5.3.4
No.JXC※-OMT0052-D
Feb./2025 Revision of Safety Instructions

SMC Corporation

Tel: + 81 3 5207 8249 Fax: +81 3 5298 5362
URL <https://www.smcworld.com>

Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.
© SMC Corporation All Rights Reserved