Doc No. JXC※-OMT0052-B

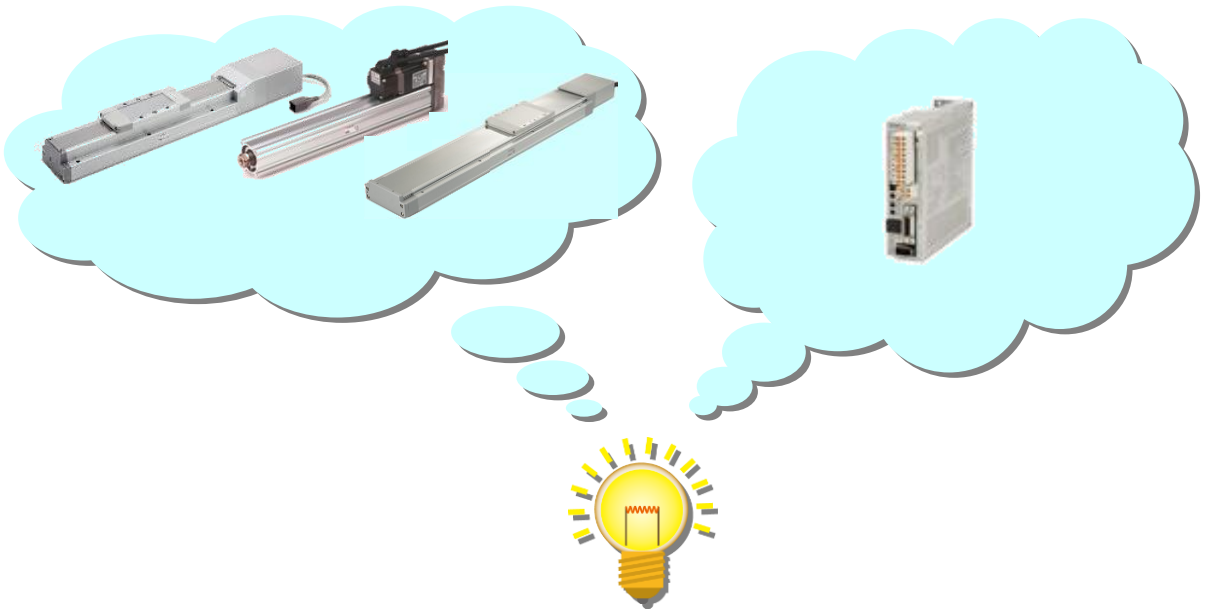
# Operation Manual
## (Simplified Edition)

PRODUCT NAME

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

MODEL / Series / Product Number

# LECSA Series



## SMC Corporation

# Contents

# 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), Japan Industrial Standards (JIS) *1.) and other safety regulations*2.).

*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems
ISO 4413: Hydraulic fluid power -- General rules relating to systems
IEC 60204-1: Safety of machinery -- Electrical equipment of machines (Part 1: General requirements)
ISO 10218: Manipulating industrial robots -- Safety

*2) Labor Safety and Sanitation Law, etc.

| | |
|---|---|
| **Caution** | **Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury. |
| **Warning** | **Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury. |
| **Danger** | **Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious 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.**
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.
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.
Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

**4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**
1) Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.
2) Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and lock circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.
3) An application which could have negative effects on people, property, or animals requiring special safety analysis.
4) Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.

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

**The product is provided for use in manufacturing industries.**
The product herein described is basically provided for peaceful use in manufacturing industries.
If considering using the product in other industries; consult SMC beforehand and exchange specifications or a contract if necessary.
If anything is unclear, contact your nearest sales branch.

## 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**

**The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.*3)**
**Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.**

**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.**

**Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

***3.) 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

When the product is exported, strictly follow the laws required by the Ministry of Economy, Trade and Industry (Foreign Exchange and Foreign Trade Control Law).

## 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.

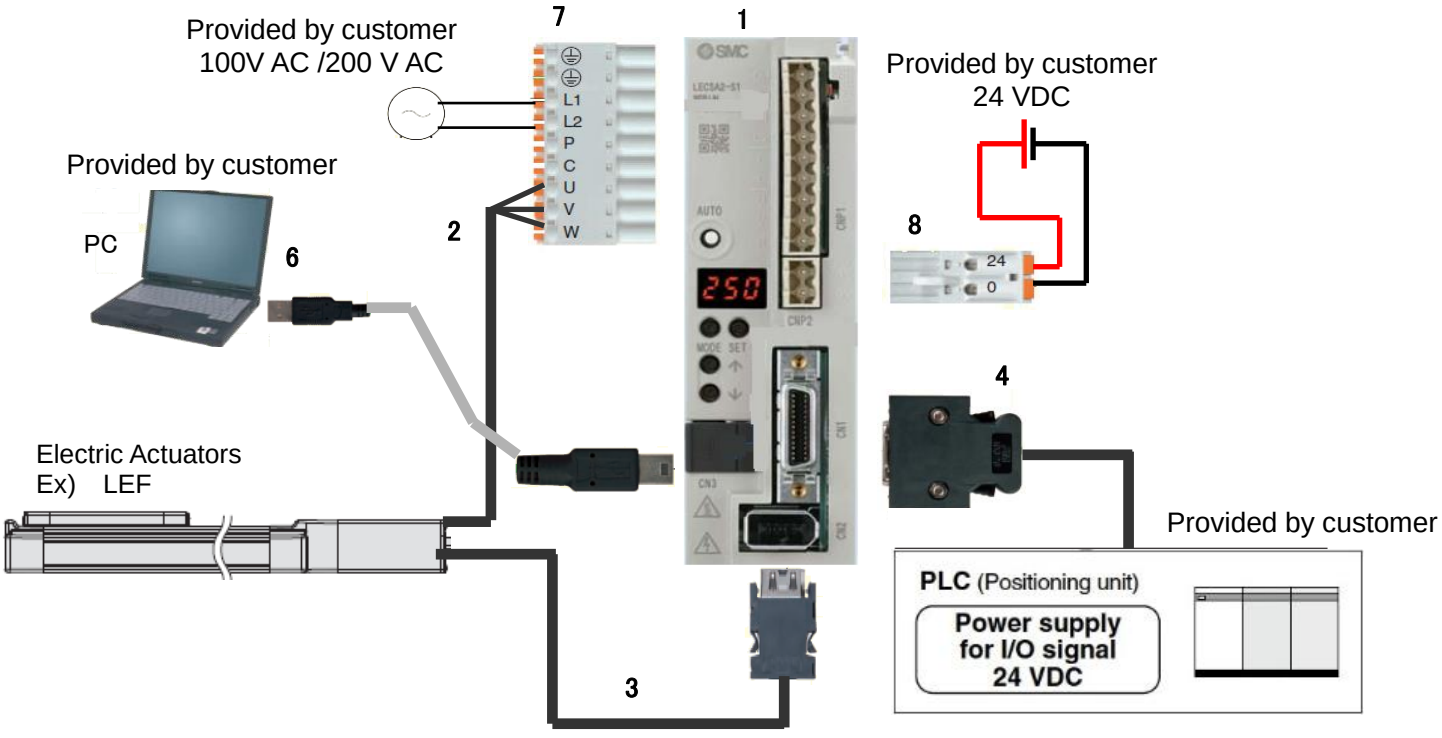
When setup software (MR Configurator2™) is used, the LECSA model selection is required.
Select 'MR-JN-A' through “Model" - "New" and "Project".

## 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

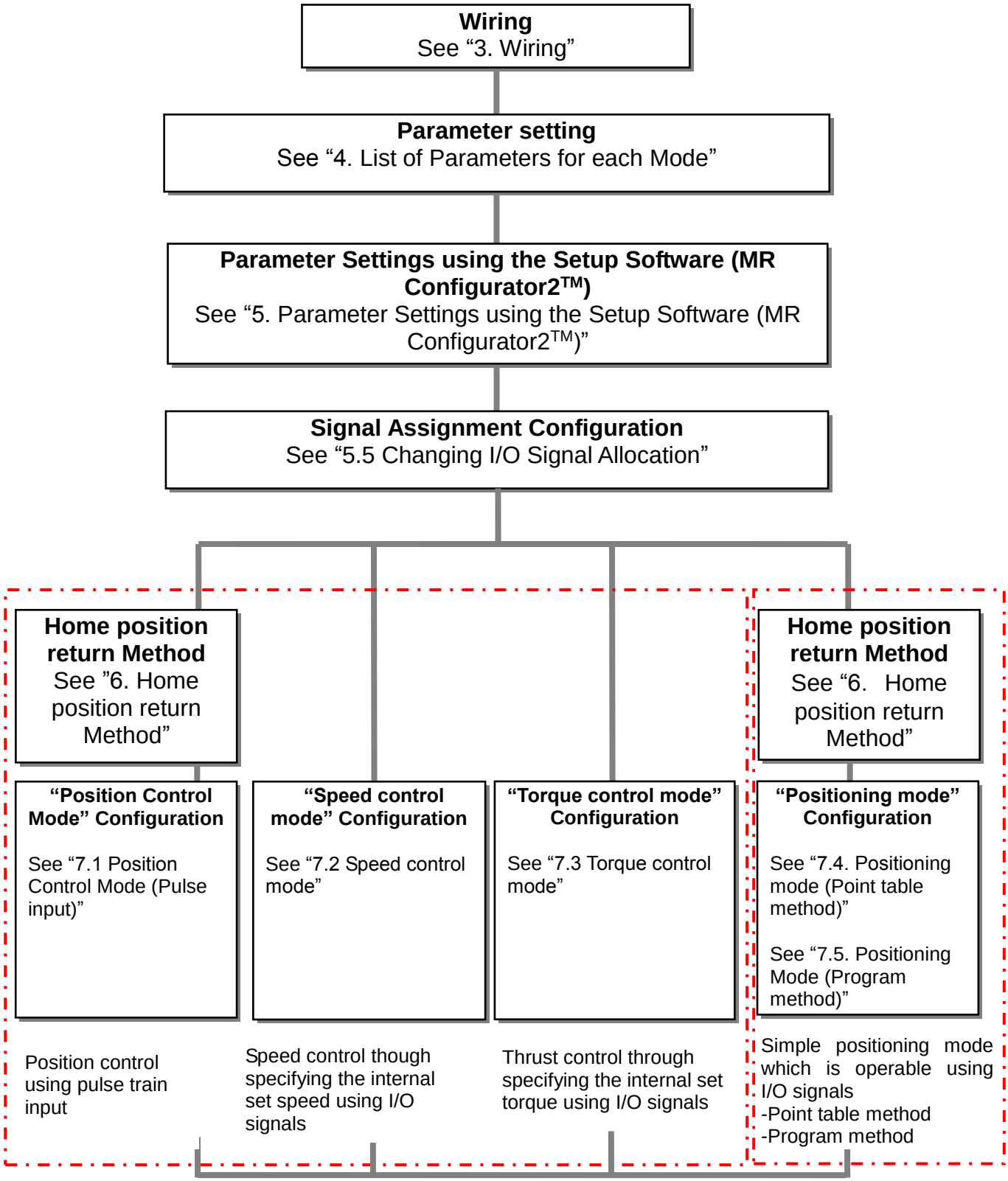



| | | |
|---|---|---|
| **1** | Driver | LECSA*-S* |
| **2** | Motor cable | LE-CSM-*** |
| **3** | Encoder cable | LE-CSE-*** |
| **4** | I/O connector | LE-CSNA |
| | I/O cable | LEC-CSNA-1 |
| **5** | USB cable | LEC-MR-J3USB |
| **6** | Setup software (MR Configurator2™) | LEC-MRC2* |
| **7** | Main 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



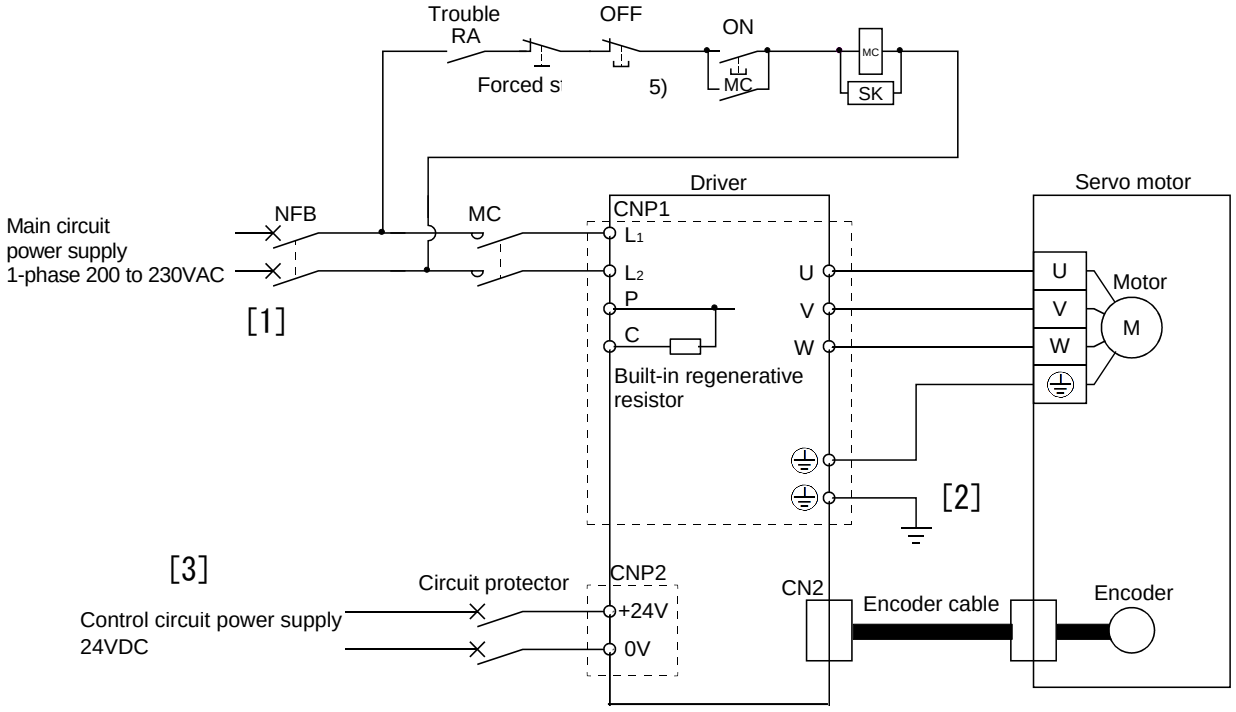
# 3. Wiring

## 3.1 Power Supply Wiring

Connect the actuator and driver power supply. This wiring diagram is common for each mode.

(1) LECSA (Incremental encoder)

EX.) Power supply voltage is 200VAC single phase




[1] Power supply input terminals, $L_1$ and $L_2$: Specify power supply to input terminals $L_1$ and $L_2$.

[2] Connect the motor power supply input terminal (U, V, W) to the driver power terminal (U, V, W).
Connect the motor ground terminal to the driver ground terminal.
Connect the encoder cable.

[3] Connect the 24VDC external power supply to the power supply for control circuit.

Refer to “LECSA Operation Manual”, Chapter 3 for further details if the power supply voltage is 100VAC.

## 3.2 I/O signal connection example

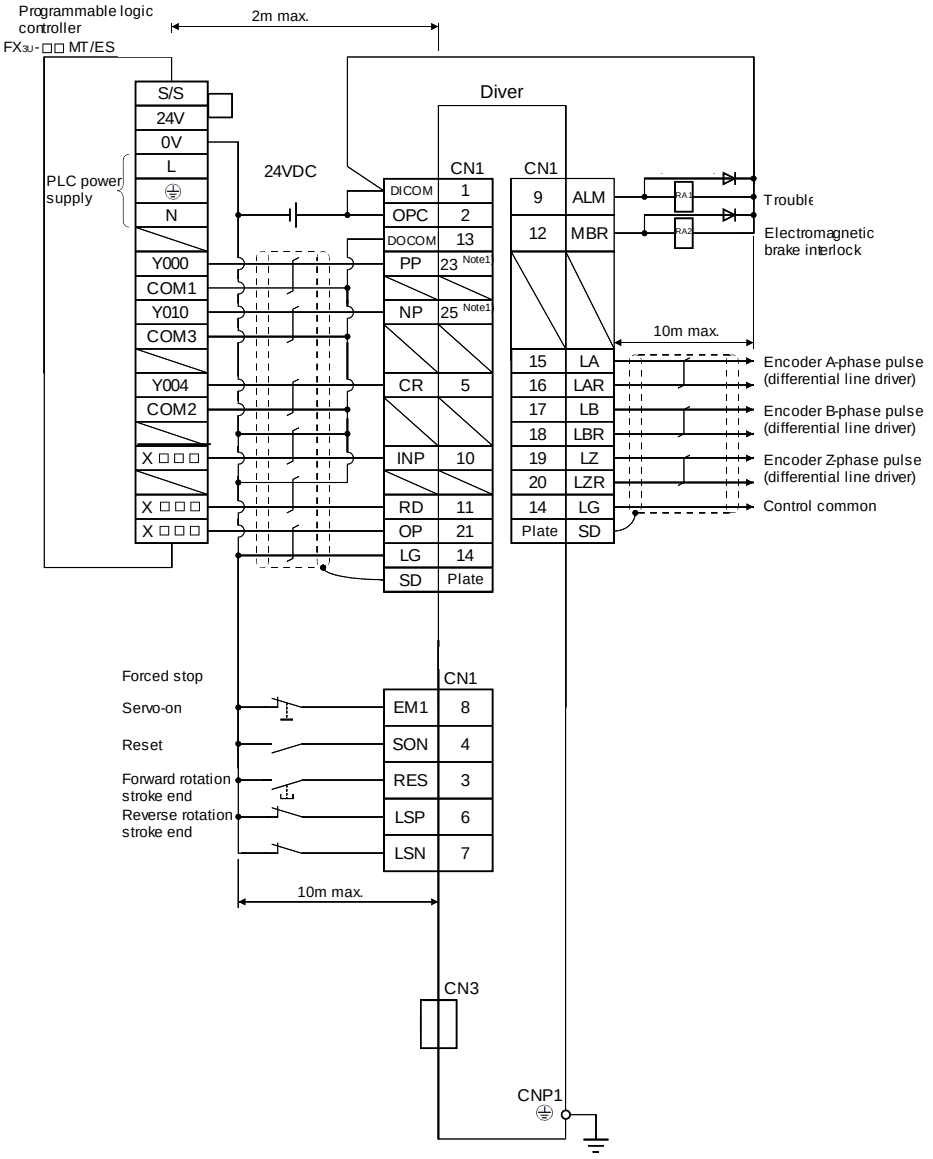
Detail of connection examples for the I/O signals of the driver.

### 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) 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. |
| NP | Reverse rotation pulse train | - | ○ | - | - | - | |
| PG | Differential forward rotation pulse train | - | ○ | - | - | - | In the differential receiver system (max. input frequency 1Mpps) Forward rotation pulse train across PG-PP Reverse rotation pulse train across NG-NP |
| NG | Differential reverse rotation pulse train | - | ○ | - | - | - | |
| 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

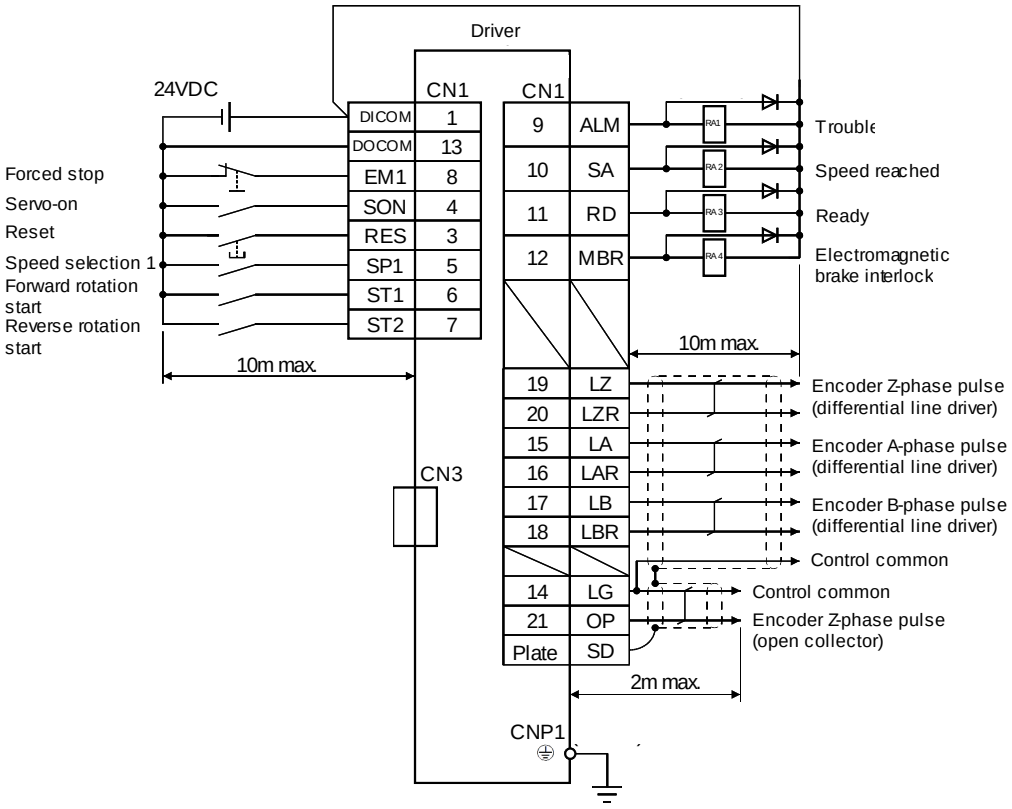
○: Initial setting, □: Assignment is available with parameter, ー: Assignment is not available

| 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.



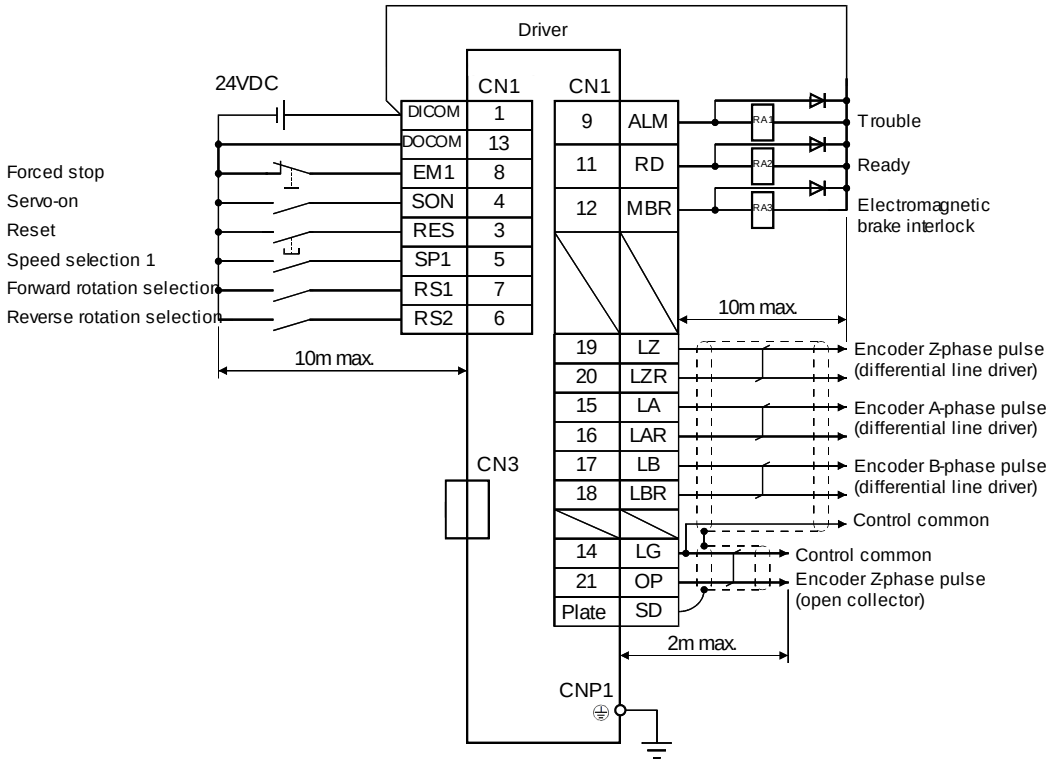

Refer to “LECSA Operation Manual”,section 3.2 for wiring details.

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.



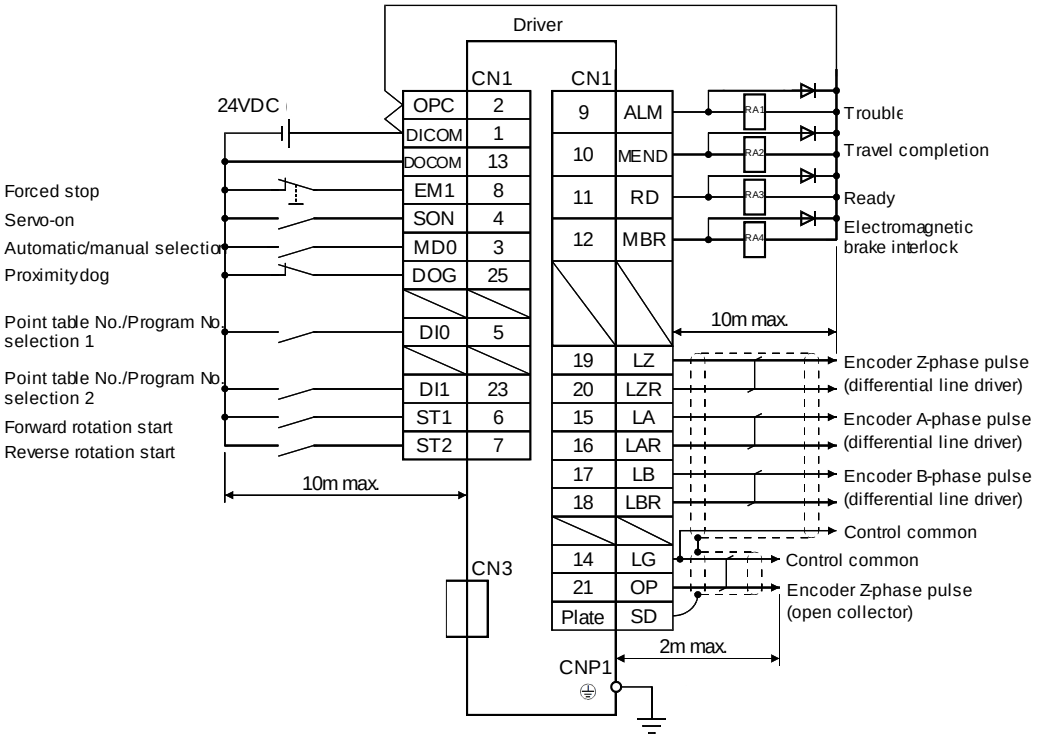

Refer to “LECSA Operation Manual”,section 3.2 for wiring details.

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.

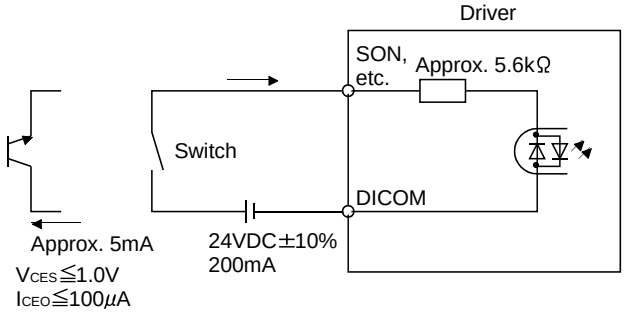
Refer to “LECSA Operation Manual”,section 3.2 for wiring details.

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

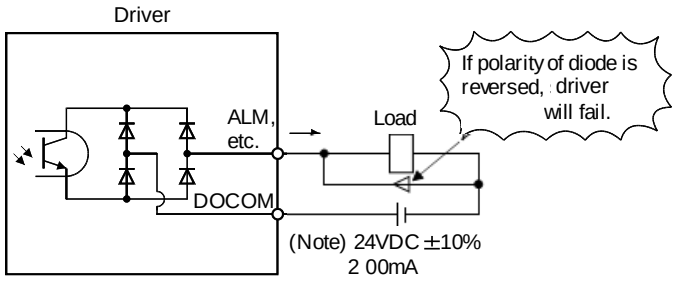
### 3.2.5 Source I/O interfaces

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 Accelerationeration/Deceleration time constants | 100 | ms |
| PE08 | ZPS | Home position return position data | 0 | $\times 10^{STM}$μm |
| PE13 | JOG | JOG speed | 100 | r/min |
| PE16 | LMPL | Software limit + | 0 | $\times 10^{STM}$μm |
| PE17 | LMPH | | | |
| PE18 | LMNL | Software limit - | 0 | $\times 10^{STM}$μm |
| PE19 | LMNH | | | |

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

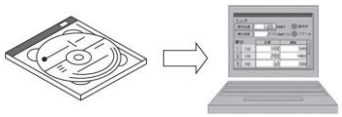
These parameters are set when changing the assignment of the input/output signal and using the point table at a maximum of 7 points.

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™ )



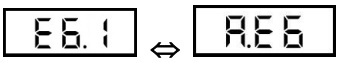
*1 Setup software version 1.52E or above is required.
*2 The setup software (MR Configurator2™ : LEC-MRC2E) must be purchased as an additional item.
*3 The USB cable (LEC-MR-J3USB) must be purchased as an additional item.

### 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.

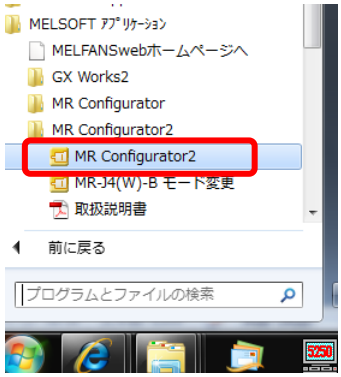
## 5.2 Basic driver set-up for Initial Test Drive

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

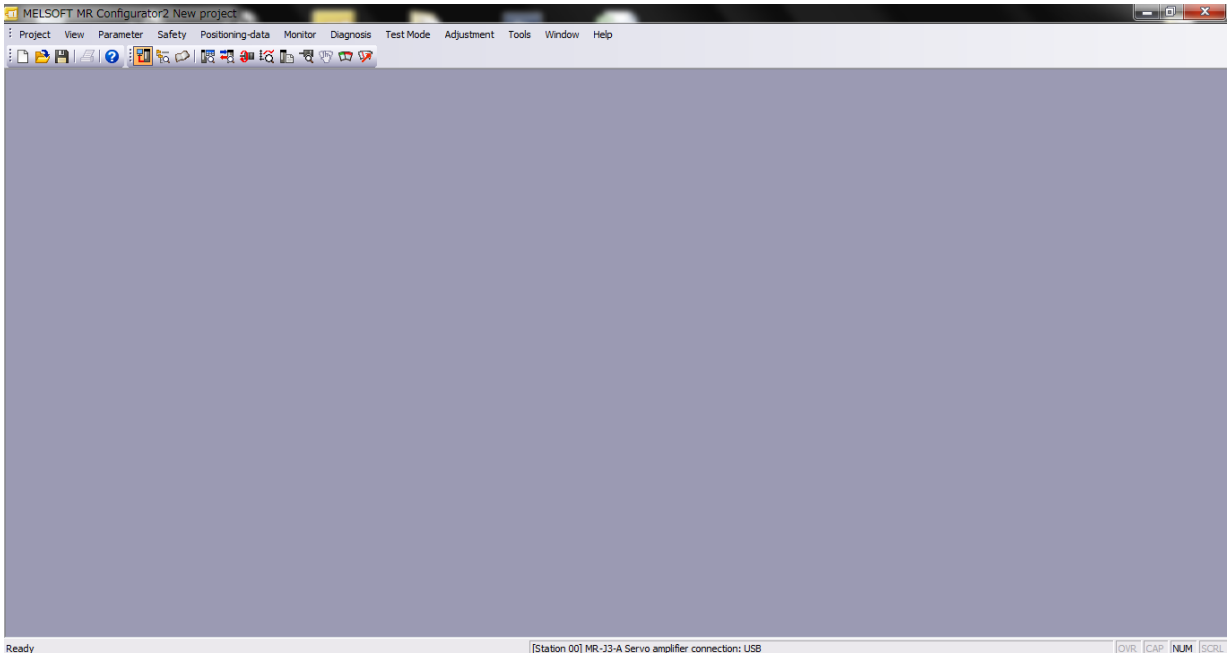


### 5.2.1 Start up the Setup software (MR Configurator2™)

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

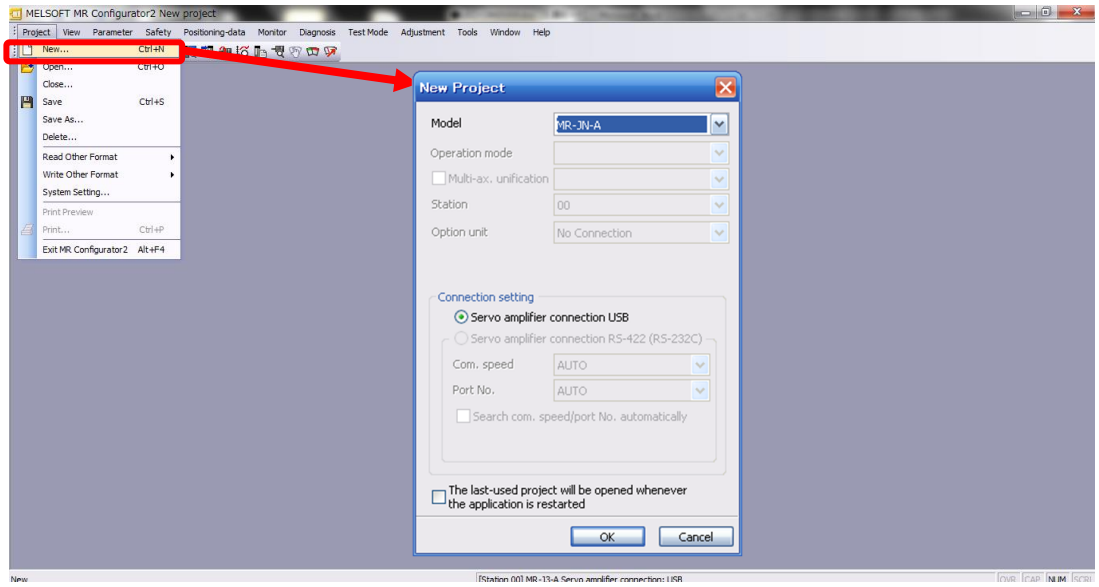



Once the application starts, the screen below will be displayed.



## 5.2.2 “System Settings”

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



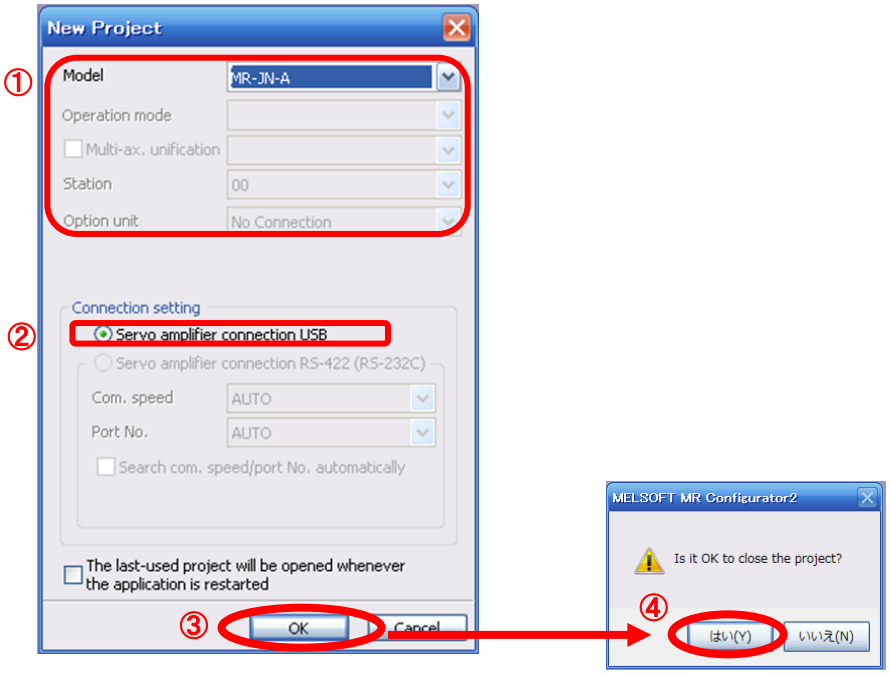

## 5.2.3 Model Selection

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).

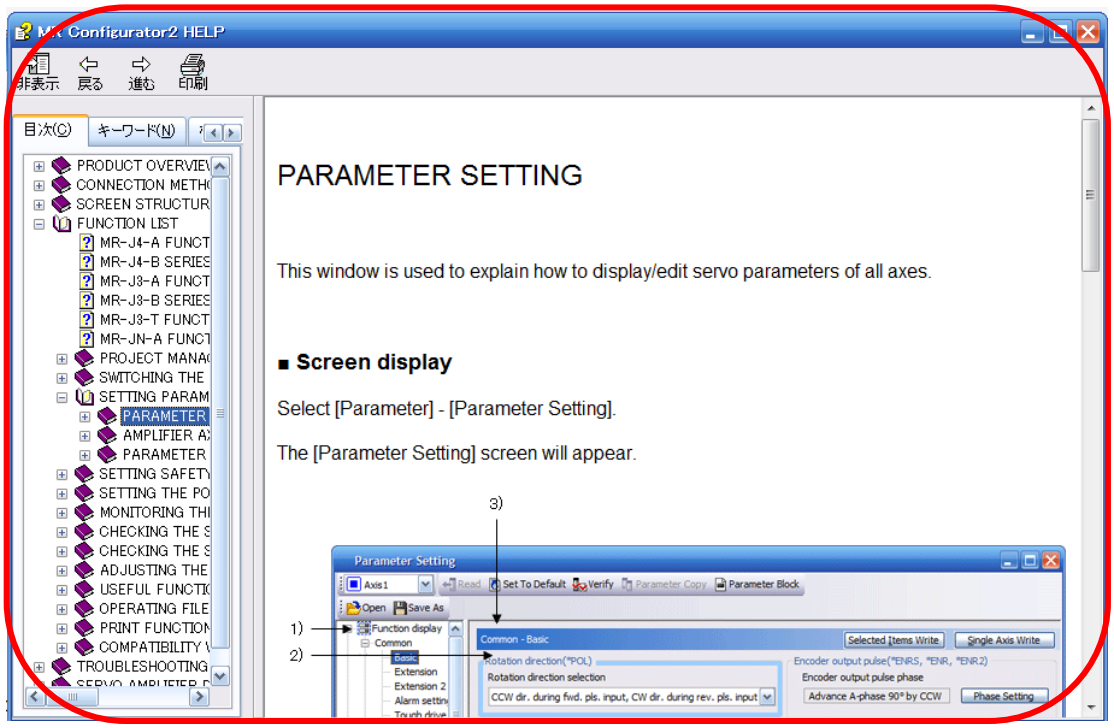
Check that the “ONLINE/OFFLINE” icon is displayed “  ”.

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.



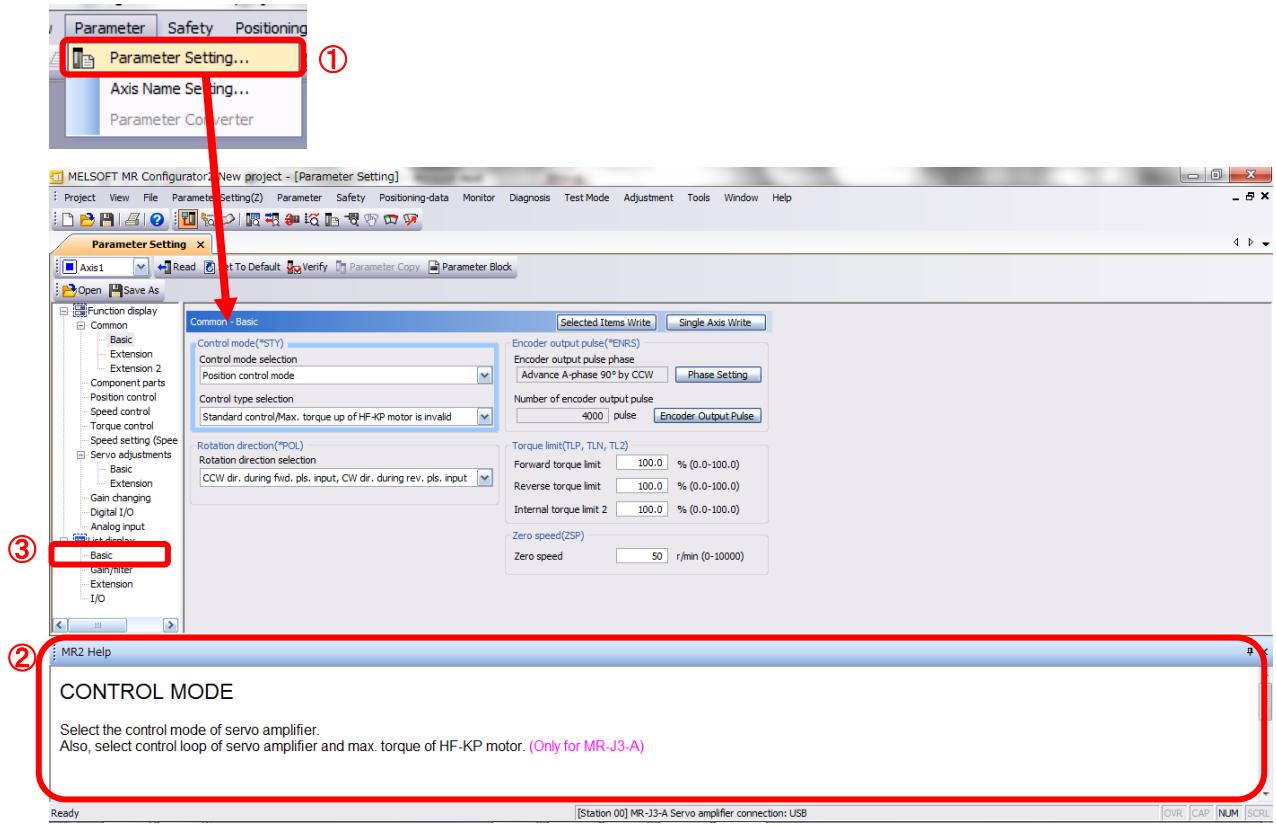
## 5.3 Parameter setting (Driver side)

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 — 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 |

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

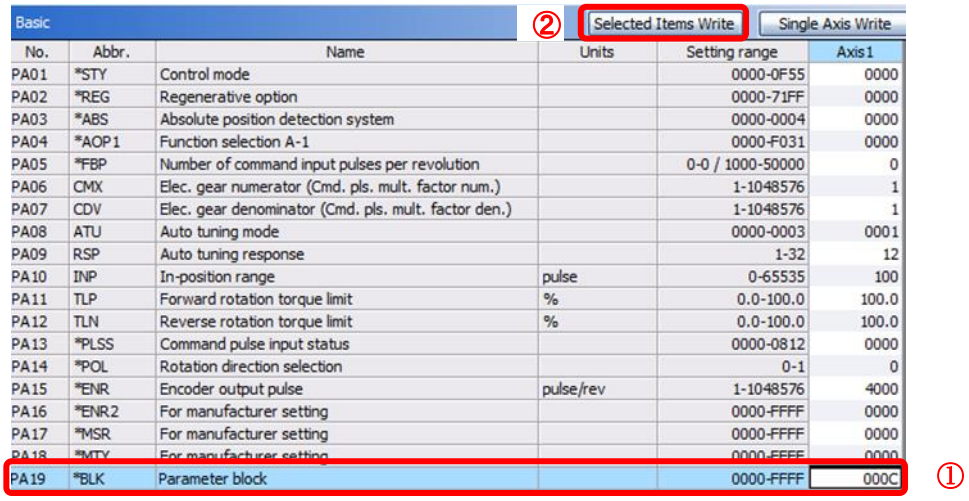
## 5.3.1 Change of parameter block

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.**




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.

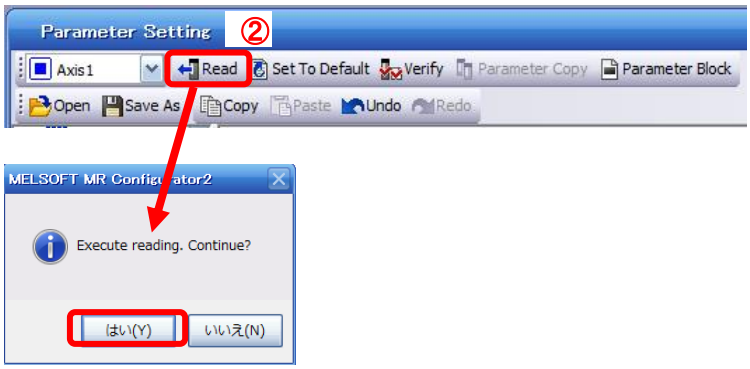
Note3) Do not change “For manufacturer setting” parameters. If you change by these by mistake, it may cause the amplifier to not work properly.

## 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 (Simplified Edition)”, section 5.4.3 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)").**

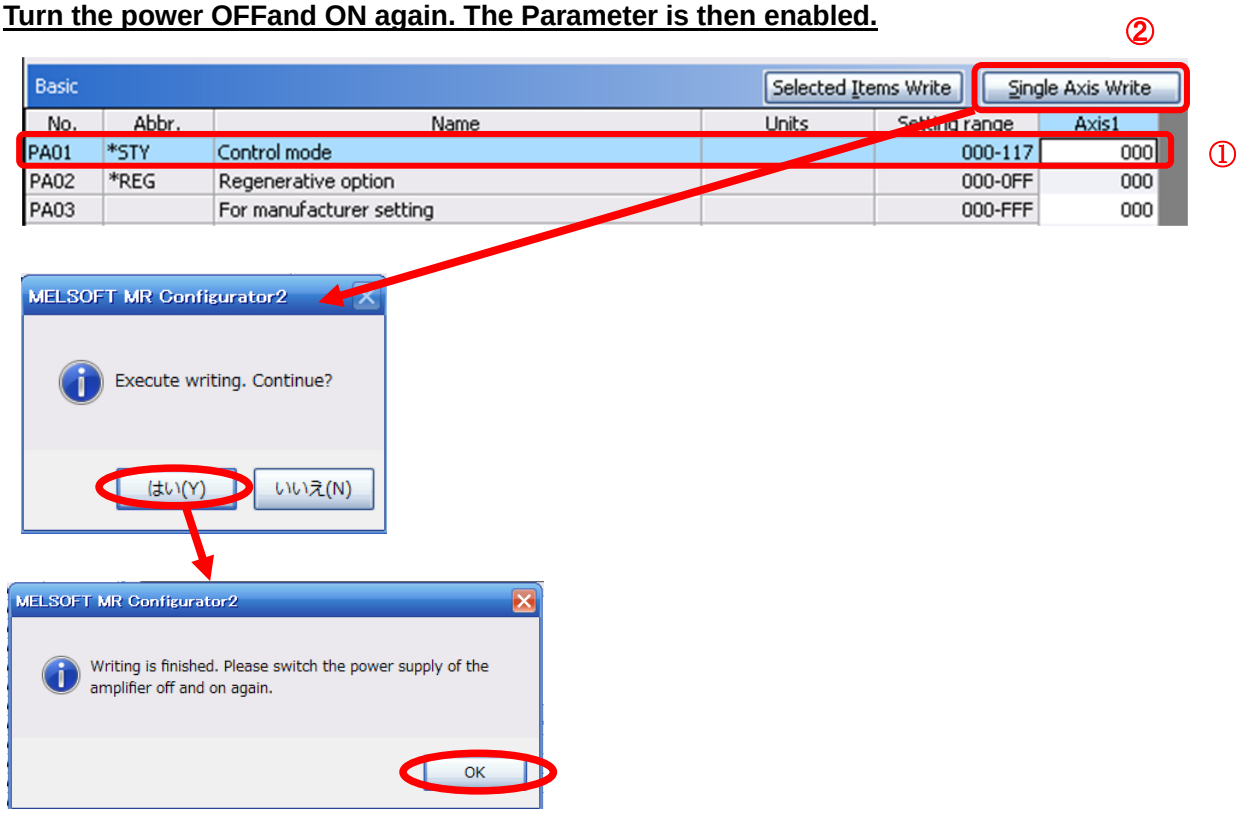
① Set the parameters of the PA01 to "000" in the "Basic" tab.

・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 OFFand 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 Recommended Parameter Values by Actuator Model

Please change the parameter values according to the customer application. See section 4 of the “LECSA Operation Manual” for details.

# Recommended Parameter Values [LEF]

| Series | | | LEFS25 | | | LEFS32 | | | LEFS40 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lead symbol | | H | A | B | H | A | B | H | A | B |
| | Lead | | 20 | 12 | 6 | 24 | 16 | 8 | 30 | 20 | 10 |
| Parameter *1,*2 | Para No | Initial value | Recommended Value | | | | | | | | |
| Number of command input pulses per revolution *3. | PA05 | 100 | **100** | | | | | | | | |
| Electronic gear numerator *3. | PA06 | 1 | **100 (Positioning mode: 10)** | | | | | | | | |
| Electronic gear denominator *3. | PA07 | 1 | **20** | **12** | **6** | **24** | **16** | **8** | **30** | **20** | **10** |
| Feel length multiplication (STM) (Multiplier) | PE02 | 0000 | **0000 ((<1000 stroke)/0001 (>1000 stroke)** | | | | | | | | |
| Home position return type | PE03 | 0010 | **□□□3 (Stopper type)** | | | | | | | | |
| Home position return direction | PE03 | 0010 | □□1□ (Motor side) | | | | | | | | |
| Home position return Speed (rpm) | PE04 | 500 | **90** | **150** | **300** | **75** | **113** | **225** | **60** | **90** | **180** |
| Home position return/JOG operation Accelerationeration/Deceleration time constants (msec) | PE07 | 100 | **1000** | **600** | **300** | **1200** | **800** | **400** | **1500** | **1000** | **500** |
| Home position return position data (μm) | PE08 | 0 | **-2000 (<1000 stroke)/-200 (>1000 stroke)** | | | | | | | | |
| Stopper type home position return stopper time (msec) | PE10 | 100 | **200** | | | | | | | | |
| Stopper type home position return torque limit value (%) | PE11 | 15 | **30** | | | | | | | | |
| Regenerative option | PA02 | 000 | **000 (Non)/002 (LEC-MR-RB-032)** | | | | | | | | |
| Rotation direction selection *4 | PA14 | 0 | **1 (+:Counter motors side)** | | | | | | | | |
| Adaptive tuning mode | PB01 | 000 | 000 | | | | | | | | |
| Load to motor inertia moment ratio | PB06 | 7 | 7 | | | | | | | | |
| Machine resonance suppression filter 1 | PB13 | 4500 | 4500 | | | | | | | | |
| Notch shape selection 1 | PB14 | 000 | 000 | | | | | | | | |

Differs to initial value

*1. Parameter is set to the recommended value. Please set parameter according to customer application.

*2. Mechanical resonance may occur depending on the shape or mounting orientation of the work piece. Please change this parameter during initial configuration.
(Parameter initial configuration ⇒ Set the recommended parameter value ⇒ Operation start)

*3. Other than positioning mode: Actuator travel distance at 10 [μm/pulse] per pulse.
Positioning Mode: Minimum actuator travel distance of 1[μm].

*4. When the motor mounting position is right side parallel (LEFS*R) or left side parallel (LEFS*L), the rotation direction selection is 0(+: Counter motors side).

| Series | | | LEFB25 | LEFB25U | LEFB32 | LEFB32U | LEFB40 | LEFB40U |
|---|---|---|---|---|---|---|---|---|
| | Lead symbol | | S | | | | | |
| | Lead | | 54 | | | | | |
| Parameter *1,*2 | Para No | Initial value | Recommended value | | | | | |
| Number of command input pulses per revolution *3. | PA05 | 100 | **100** | | | | | |
| Electronic gear numerator *3. | PA06 | 1 | **100 (Positioning mode: 10)** | | | | | |
| Electronic gear denominator *3. | PA07 | 1 | **54** | | | | | |
| Feel length multiplication (STM) (Multiplier) | PE02 | 0000 | **0000 (<1000 stroke)/0001 (>1000 stroke)** | | | | | |
| Home position return type | PE03 | 0010 | **□□□3 (Stopper type)** | | | | | |
| Home position return direction | PE03 | 0010 | □□1□ (Motor side) | | | | | |
| Home position return Speed (rpm) | PE04 | 500 | **33** | | | | | |
| Home position return/JOG operation Accelerationeration/Deceleration time constants (msec) | PE07 | 100 | **2700** | | | | | |
| Home position return position data (μm) | PE08 | 0 | **-3000 (<1000 stroke)/-300 (>1000 stroke)** | | | | | |
| Stopper type home position return stopper time (msec) | PE10 | 100 | **200** | | | | | |
| Stopper type home position return torque limit value (%) | PE11 | 15 | **30** | | | | | |
| Regenerative option | PA02 | 000 | **000 (Non)/002 (LEC-MR-RB-032)** | | | | | |
| Rotation direction selection | PA14 | 0 | **1 (+: Counter motors side)** | 0 (+: Counter motors side) | **1 (+: Counter motors side)** | 0 (+: Counter motors side) | **1 (+: Counter motors side)** | 0 (+: Counter motors side) |
| ★ Adaptive tuning mode | PB01 | 000 | **002** | | 000 | | | |
| ★ Load to motor inertia moment ratio | PB06 | 7 | **50** | | | | | |
| ★ Machine resonance suppression filter 1 | PB13 | 4500 | **400** | | 4500 | | | |
| ★ Notch shape selection 1 | PB14 | 000 | **030** | | 000 | | | |

★ Parameter setting required.

Differs to initial value

*1. Parameter is set to the recommended value. Please set parameter according to customer application.

*2. Mechanical resonance may occur depending on the shape or mounting orientation of the work piece. Please change this parameter during initial configuration.
(Parameter initial configuration ⇒ Set the recommended parameter value ⇒ Operation start)

*3. Other than positioning mode: Actuator travel distance at 10 [μm/pulse] per pulse.
Positioning Mode: Minimum actuator travel distance of 1[μm].

# Recommended Parameter Values [LEJ]

| Series | | | LEJS40 | | | LEJS63 | | | LEJB40 | LEJB63 |
|---|---|---|---|---|---|---|---|---|---|---|
| | Lead symbol | | H | A | B | H | A | B | T | |
| | Lead | | 24 | 16 | 8 | 30 | 20 | 10 | 27 | 42 |
| Parameter *1,*2 | Para. No | Initial value | Recommended value | | | | | | | |
| Number of command input pulses per revolution *3. | PA05 | 100 | **100** | | | | | | | |
| Electronic gear numerator *3. | PA06 | 1 | **100 (Positioning mode: 10)** | | | | | | | |
| Electronic gear denominator *3. | PA07 | 1 | **24** | **16** | **8** | **30** | **20** | **10** | **27** | **42** |
| Feel length multiplication (STM) (Multiplier) | PE02 | 0000 | **0000 (<1000 stroke)/0001 (>1000 stroke)** | | | | | | | |
| Home position return type | PE03 | 0010 | **□□□3 (Stopper type)** | | | | | | | |
| Home position return direction | PE03 | 0010 | □□1□ (Motor side) | | | | | | | |
| Home position return Speed (rpm) | PE04 | 500 | **75** | **113** | **225** | **60** | **90** | **180** | **133** | **86** |
| Home position return/JOG operation Accelerationeration/Deceleration time constants (msec) | PE07 | 100 | **1200** | **800** | **400** | **1500** | **1000** | **500** | **1350** | **2100** |
| Home position return position data (μm) | PE08 | 0 | **-2000 (<1000 stroke)/-200 (>1000 stroke)** | | | | | | | |
| Stopper type home position return stopper time (msec) | PE10 | 100 | **200** | | | | | | | |
| Stopper type home position return torque limit value (%) | PE11 | 15 | **30** | | | | | | | |
| Regenerative option | PA02 | 000 | **000 (Non)/002 (LEC-MR-RB-032)/003 (LEC-MR-RB-12)** | | | | | | | |
| Rotation direction selection | PA14 | 0 | **1 (+:Counter motors side)** | | | | | | 0 (+:Counter motors side) | |
| ★Adaptive tuning mode | PB01 | 000 | 000 | | | | | | **002** | 000 |
| ★Load to motor inertia moment ratio | PB06 | 7 | 7 | | | | | | **50** | |
| ★Machine resonance suppression filter 1 | PB13 | 4500 | 4500 | | | | | | **400** | 4500 |
| ★Notch shape selection 1 | PB14 | 000 | 000 | | | | | | **030** | 000 |

★ Parameter setting required.

Differs to initial value

*1. Parameter is set to the recommended value. Please set parameter according to customer application.

*2. Mechanical resonance may occur depending on the shape or mounting orientation of the work piece. Please change this parameter during initial configuration.
(Parameter initial configuration ⇒ Set the recommended parameter value ⇒ Operation start)

*3. Other than positioning mode: Actuator travel distance at 10 [μm/pulse] per pulse.
Positioning Mode: Minimum actuator travel distance of 1[μm].

# Recommended Parameter Values [LEY]

| Series | | | LEY25/LEYG25 | | | LEY25D/LEYG25D | | | LEY32/LEYG32 | | | LEY32D/LEYG32D | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Lead symbol | | A | B | C | A | B | C | A | B | C | A | B | C |
| | Lead | | 12 | 6 | 3 | 12 | 6 | 3 | 20 | 10 | 5 | 16 | 8 | 4 |
| Parameter *1,*2 | Para. No | Initial value | Recommended value | | | | | | | | | | | |
| Number of command input pulses per revolution *3. | PA05 | 100 | **100** | | | | | | | | | | | |
| Electronic gear numerator *3. | PA06 | 1 | **100 (Positioning mode: 10)** | | | | | | | | | | | |
| Electronic gear denominator *3. | PA07 | 1 | **12** | **6** | **3** | **12** | **6** | **3** | **20** | **10** | **5** | **16** | **8** | **4** |
| Feel length multiplication (STM) (Multiplier) | PE02 | 0000 | **0000 (<1000 stroke)/0001 (>1000 stroke)** | | | | | | | | | | | |
| Home position return type | PE03 | 0010 | **□□□3 (Stopper type)** | | | | | | | | | | | |
| Home position return direction | PE03 | 0010 | □□1□ (Motor side) | | | | | | | | | | | |
| Home position return Speed (rpm) | PE04 | 500 | **150** | **300** | **600** | **150** | **300** | **600** | **90** | **180** | **360** | **112** | **225** | **450** |
| Home position return/JOG operation Accelerationeration/Deceleration time constants (msec) | PE07 | 100 | **600** | **300** | **150** | **600** | **300** | **150** | **1000** | **500** | **250** | **800** | **400** | **200** |
| Home position return position data (μm) | PE08 | 0 | **-2000 (<1000 stroke)/-200 (>1000 stroke)** | | | | | | | | | | | |
| Stopper type home position return stopper time (msec) | PE10 | 100 | **200** | | | | | | | | | | | |
| Stopper type home position return torque limit value (%) | PE11 | 15 | **30** | | | | | | | | | | | |
| Regenerative option | PA02 | 000 | **000 (Non)/002 (LEC-MR-RB-032)** | | | | | | | | | | | |
| Rotation direction selection *4 | PA14 | 0 | 0 (+:Counter motors side) | | | **1 (+:Counter motors side )** | | | 0 (+:Counter motors side) | | | **1 (+:Counter motors side )** | | |
| Adaptive tuning mode | PB01 | 000 | 000 | | | | | | | | | | | |
| Load to motor inertia moment ratio | PB06 | 7 | 7 | | | | | | | | | | | |
| Machine resonance suppression filter 1 | PB13 | 4500 | 4500 | | | | | | | | | | | |
| Notch shape selection 1 | PB14 | 000 | 000 | | | | | | | | | | | |

Differs to initial value

*1. Parameter is set to the recommended value. Please set parameter according to customer application.

*2. Mechanical resonance may occur depending on the shape or mounting orientation of the work piece. Please change this parameter during initial configuration.
(Parameter initial configuration ⇒ Set the recommended parameter value ⇒ Operation start)

*3. Other than positioning mode: Actuator travel distance at 10 [μm/pulse] per pulse.
Positioning Mode: Minimum actuator travel distance of 1[μm].

*4. When the motor mounting position is right side parallel (LEY*R / LEYG*R) or left side parallel (LEY*L / LEYG*L), the rotation direction selection is 0(+: Counter motors side).

| Series | | | LEY63 | | | | LEY63D | | |
|---|---|---|---|---|---|---|---|---|---|
| | Lead symbol | | A | B | C | L | A | B | C |
| | Lead (Including pulley ratio) | | 20 | 10 | 5 | 5(2.86) (Pulley ratio 4/7) | 20 | 10 | 5 |
| Parameter *1,*2 | Para. No | Initial value | Recommended value | | | | | | |
| Number of command input pulses per revolution *3. | PA05 | 100 | **100** | | | | | | |
| Electronic gear numerator *3. | PA06 | 1 | **100 (10)** | | | **35 (7)** | **100 (10)** | | |
| Electronic gear denominator *3. | PA07 | 1 | **20** | **10** | **5** | **1 (2)** | **20** | **10** | **5** |
| Feel length multiplication (STM) (Multiplier) | PE02 | 0000 | **0000 (<1000 stroke)/0001 (>1000 stroke)** | | | | | | |
| Home position return type | PE03 | 0010 | **□□□3 (Stopper type)** | | | | | | |
| Home position return direction | PE03 | 0010 | □□1□ (Motor side) | | | | | | |
| Home position return Speed (rpm) | PE04 | 500 | **90** | **180** | **360** | **629** | **90** | **180** | **360** |
| Home position return/JOG operation Accelerationeration/Deceleration time constants (msec) | PE07 | 100 | **1000** | **500** | **250** | **143** | **1000** | **500** | **250** |
| Home position return position data (μm) | PE08 | 0 | **-4000 (<1000 stroke)/-400 (>1000 stroke)** | | | | | | |
| Stopper type home position return stopper time (msec) | PE10 | 100 | **200** | | | | | | |
| Stopper type home position return torque limit value (%) | PE11 | 15 | **30** | | | | | | |
| Regenerative option | PA02 | 000 | **000 (Non)/002 (LEC-MR-RB-032)/003 (LEC-MR-RB-12)** | | | | | | |
| Rotation direction selection *4 | PA14 | 0 | 0 (+:Counter motors side) | | | | **1 (+:Counter motors side )** | | |
| Adaptive tuning mode | PB01 | 000 | 000 | | | | | | |
| Load to motor inertia moment ratio | PB06 | 7 | 7 | | | | | | |
| Machine resonance suppression filter 1 | PB13 | 4500 | 4500 | | | | | | |
| Notch shape selection 1 | PB14 | 000 | 000 | | | | | | |

Differs to initial value

*1. Parameter is set to the recommended value. Please set parameter according to customer application.

*2. Mechanical resonance may occur depending on the shape or mounting orientation of the work piece. Please change this parameter during initial configuration.
(Parameter initial configuration ⇒ Set the recommended parameter value ⇒ Operation start)

*3. Other than positioning mode: Actuator travel distance at 10 [μm/pulse] per pulse.
Positioning Mode: Minimum actuator travel distance of 1[μm].

*4. When the motor mounting position is right side parallel (LEY*R / LEYG*R) or left side parallel (LEY*L / LEYG*L), the rotation direction selection is 0(+: Counter motors side).

## 5.3.5 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 (Simplified Edition)”, section 5.3.4 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.

・[PA05] = 100 (Initial value)
The initial value of 100 corresponds to the "Nomber of command input pulses per revolution" of 10000 [pulses/rev].

$$\frac{\text{・[PA06]}}{\text{・[PA07]}} = \frac{\text{[PA05]}\times 100\times P\times \frac{1}{1000}}{\text{「Actuator lead L[mm]」} \times n1/n2}$$

P: Travel amount per 1 command pulse [μm] *1
n1/n2: 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[um]
In case positioning mode, "Travel amount per 1 command pulse"P = 1[um]
*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”.

## 5.3.6 Control mode selection

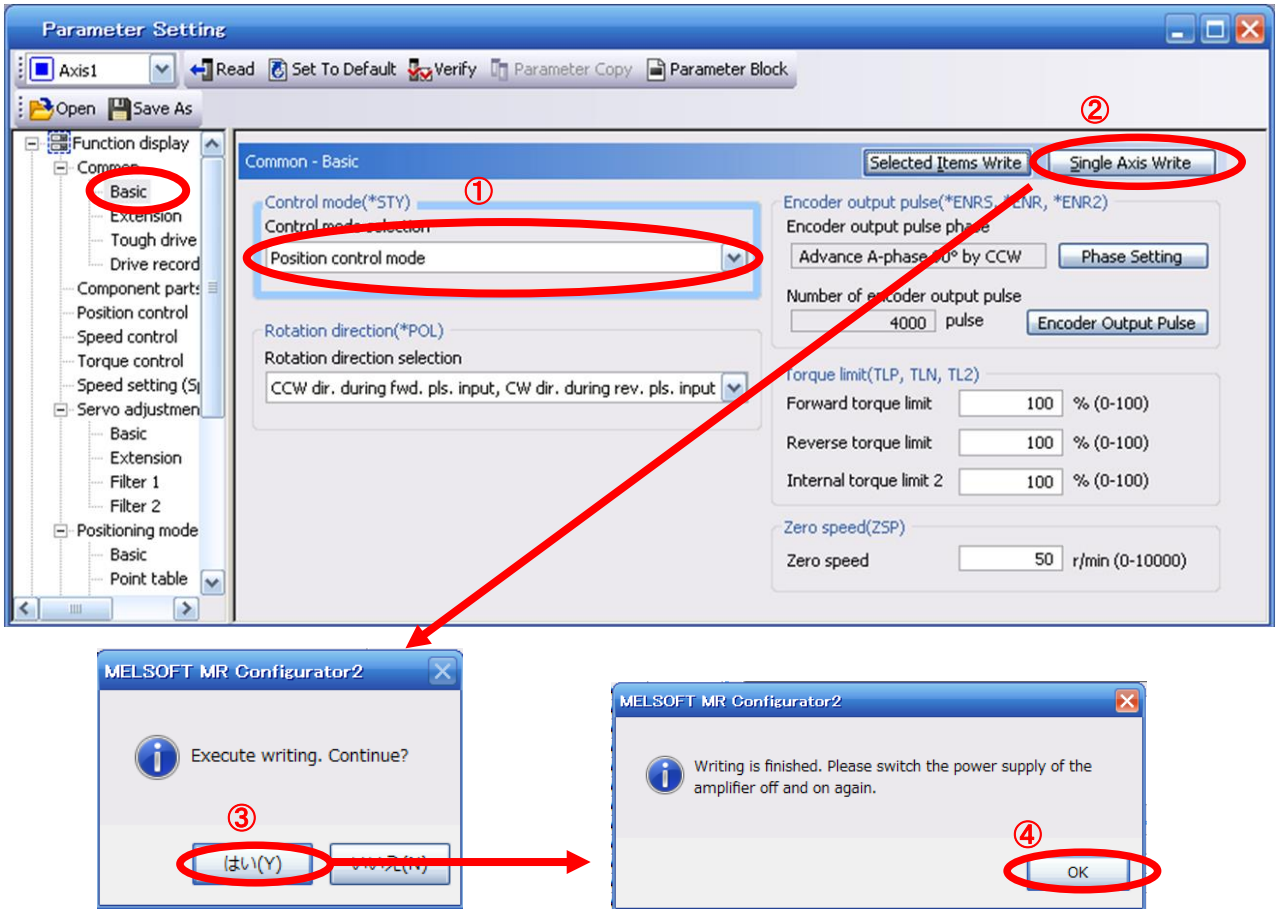
① To use **position control mode (pulse input)**, navigate to the "Basic" tab of the "Parameter Setting" screen - "Control mode selection" - Please select "Position control mode".
(“PA01” parameter in the "Basic" tab of the List display also changes to "000".)

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.)



## 5.3.7 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 “compatable” with the LECSA. If the forms are not compatable, 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.

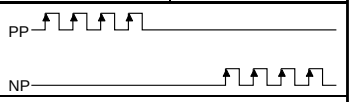
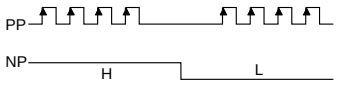
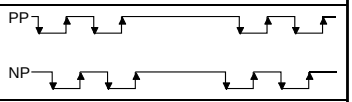
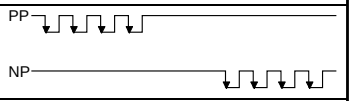
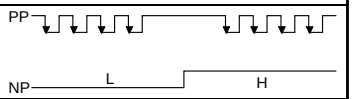
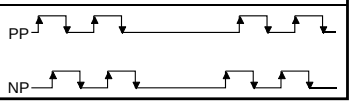
Arrow ⌐↑ or ⌐↓ in the table indicates the timing of importing a pulse train.

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 | Positive logic | Forward rotation pulse train<br>Reverse rotation pulse train |  | |
| 01 | | Signed pulse train |  | |
| 02 | | A-phase pulse train<br>B-phase pulse train |  | |
| 10 | Negative logic | Forward rotation pulse train<br>Reverse rotation pulse train |  | |
| 11 | | Signed pulse train |  | |
| 12 | | A-phase pulse train<br>B-phase pulse train |  | |

Pulse train input filter selection

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

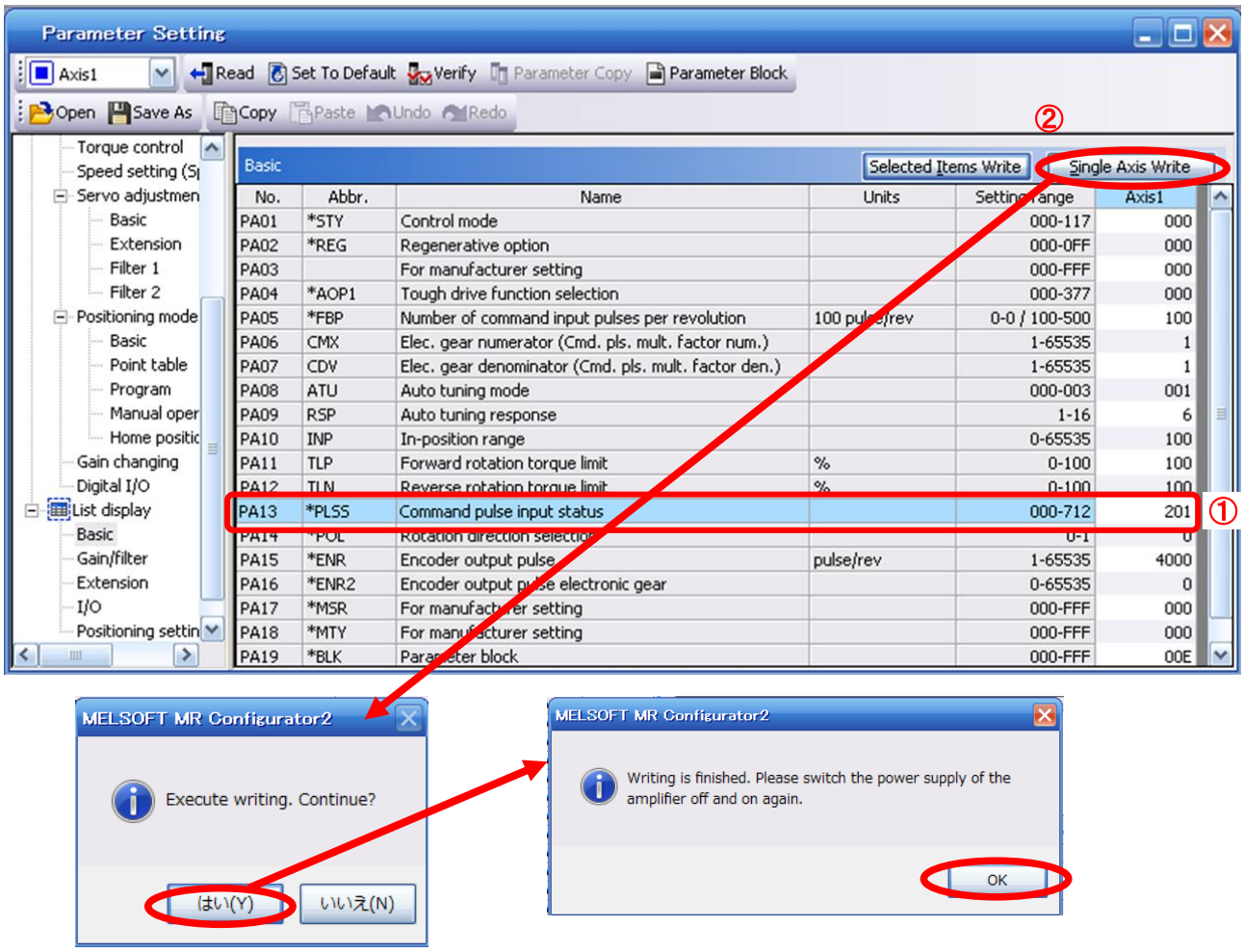
Ex.) Setting of Command input Pulse form, when:

(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.**



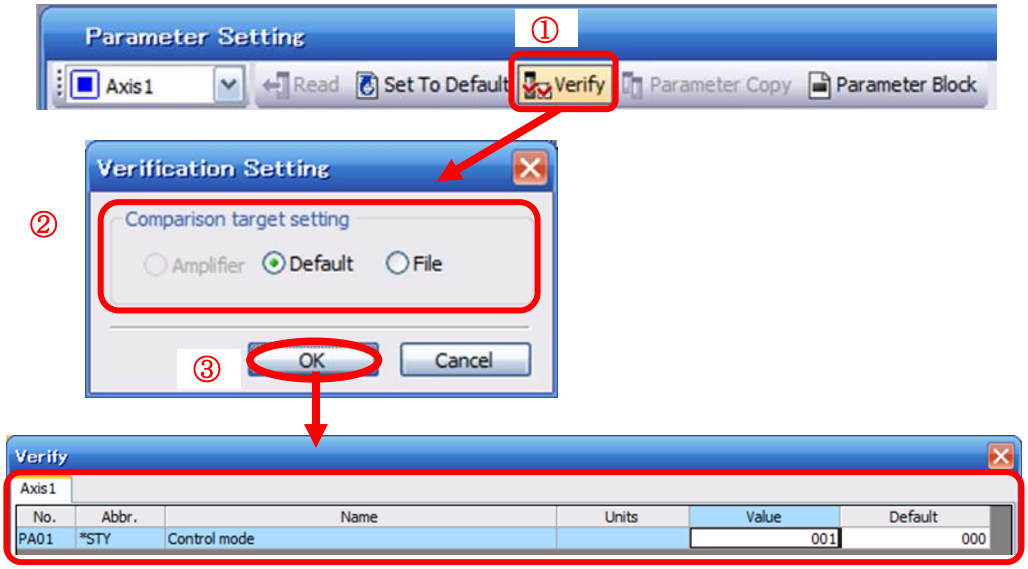
## 5.3.8 Verify of parameters

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.  "Verfication 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.

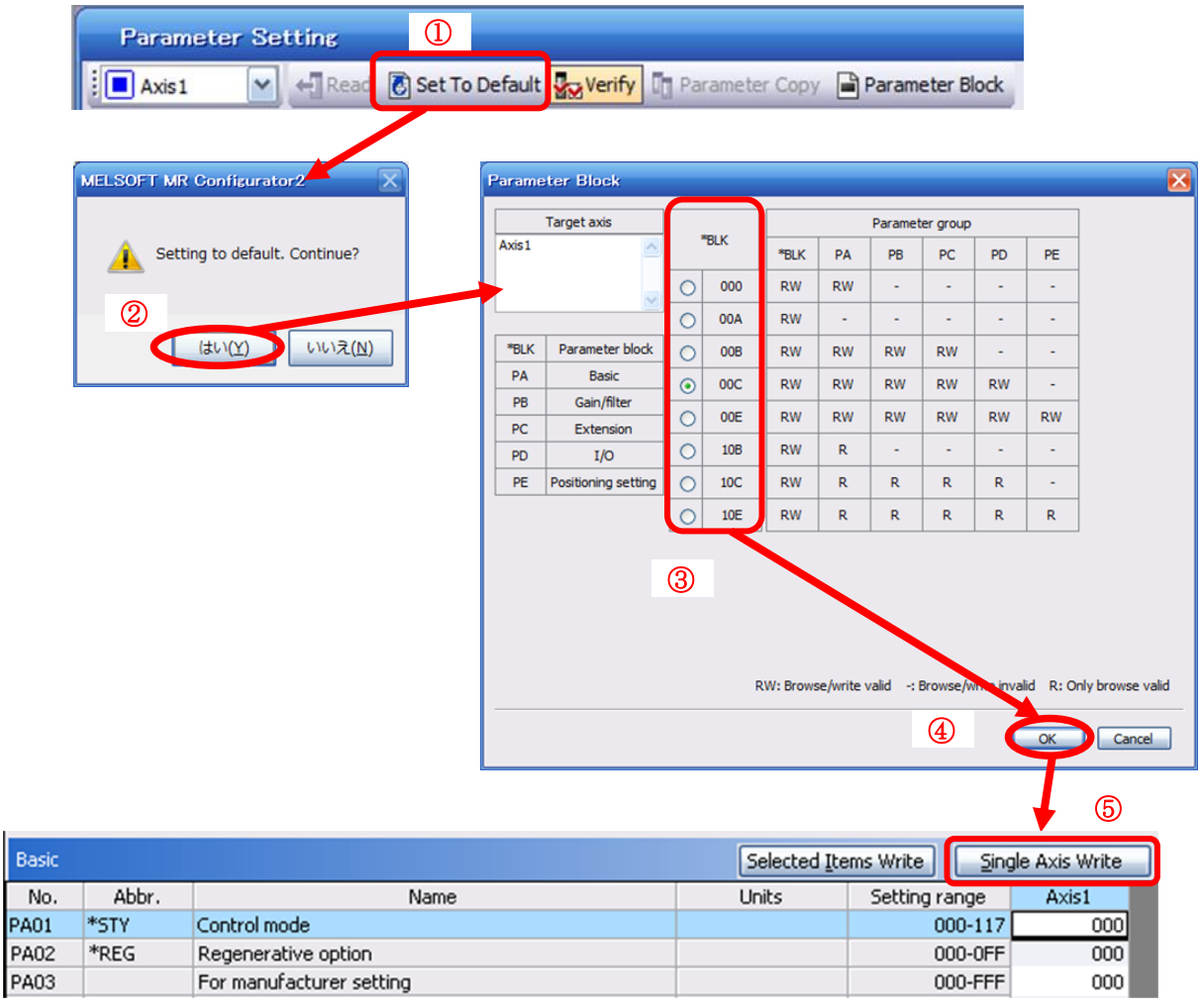
③ Please click "OK" button. The verified result is displayed.



## 5.3.9 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.**

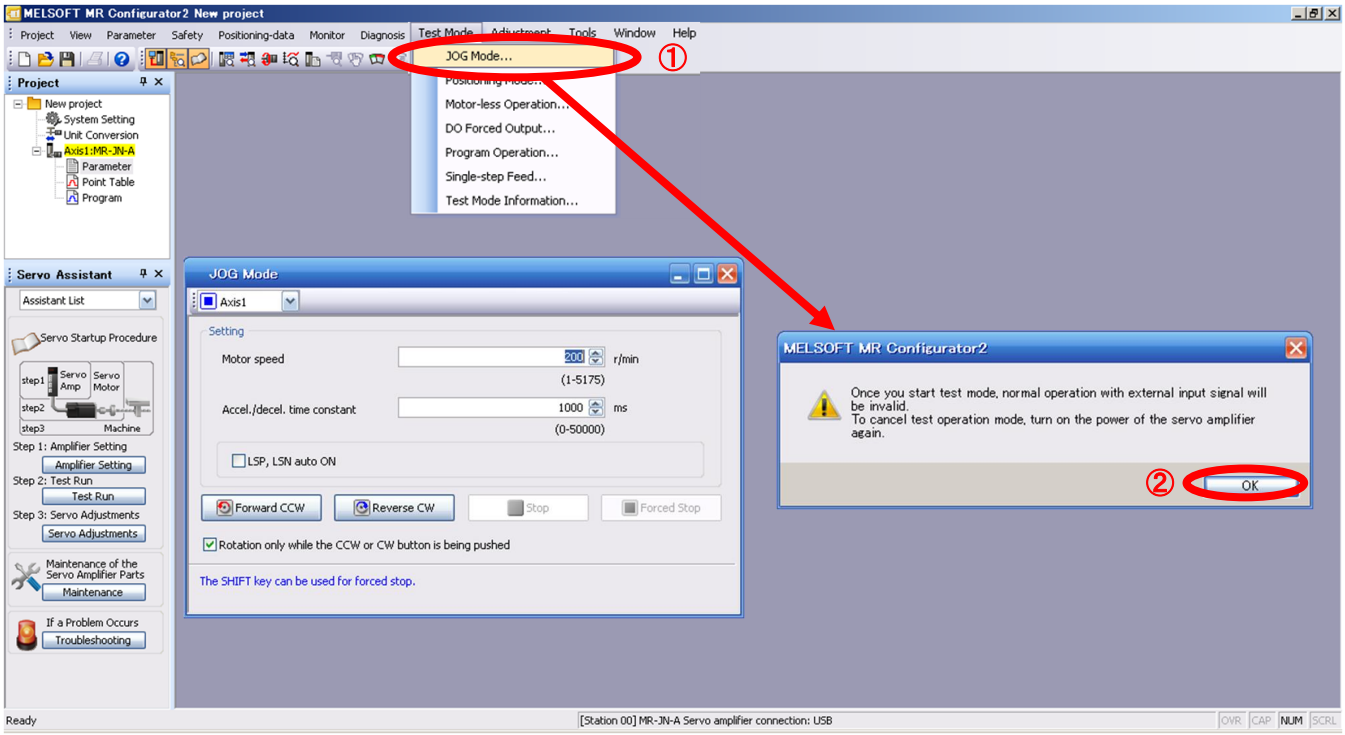


## 5.4 JOG Mode in the Setup Software

① T 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 diabled. If controlling using a PLC or other upper device, please turn off the power and reset the device before use.)

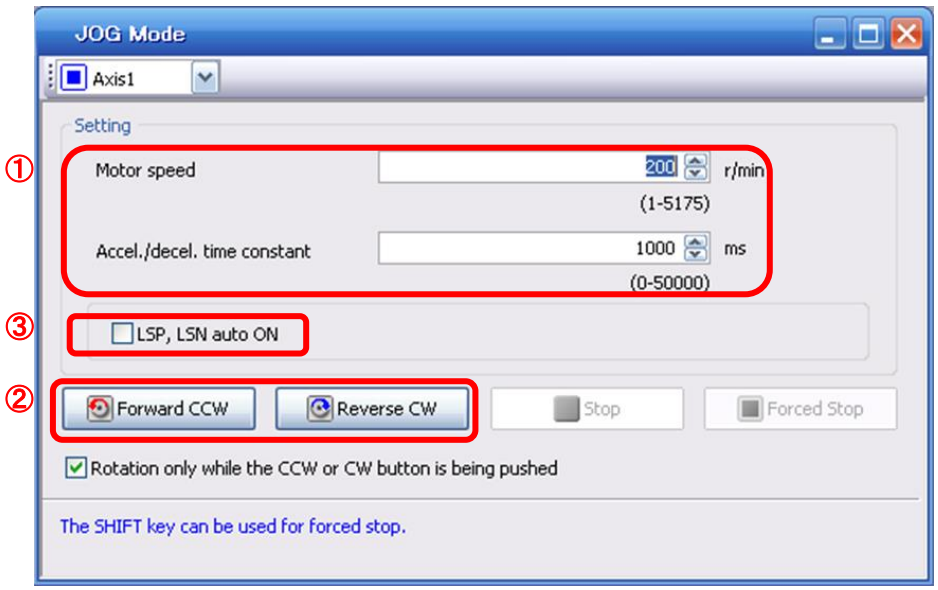


## 5.4.1 JOG Mode

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 supplyis 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**<br>**ON ：Servo-on (operational)** |
| LSP | Forward rotaion Stroke end<br>(normally closed contact) | **OFF： Forward rotaion Stroke end**<br>**ON ：Forward rotaion Stroke end off (operational)** |
| LSN | Reverse rotaion Stroke end<br>(normally closed contact) | **OFF：Reverse rotaion Stroke end**<br>**ON ：Reverse rotaion Stroke end off (operational)** |
| EM1 | Forced stop<br>(normally closed contact) | **OFF：Forced stop**<br>**ON ：Forced stop off (operational)** |

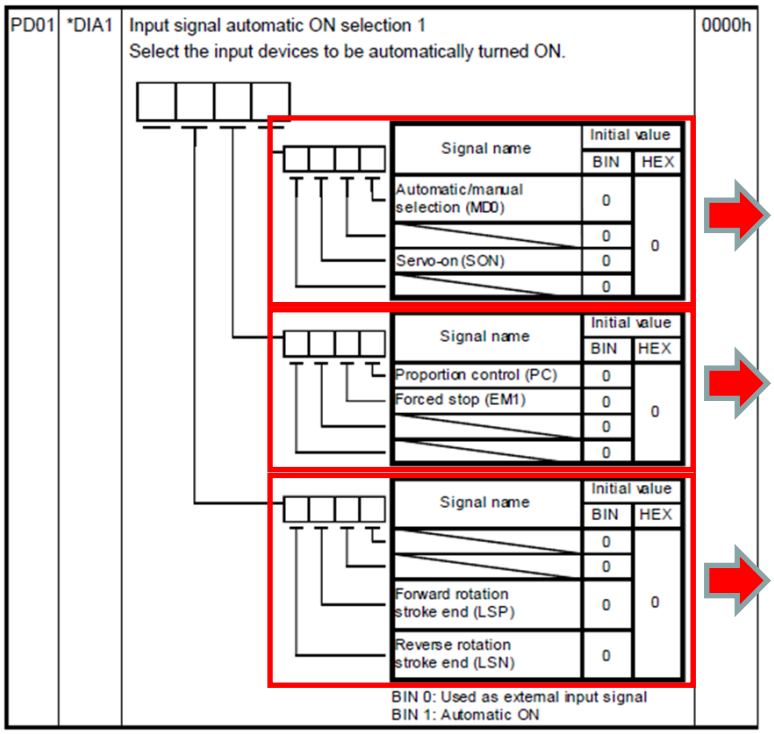
In positioning mode (point table), congifure the operation mode using automatic/manual selection **MD0.**
The MD0 off selection will allow Jog operation and it will require an input reserved for MD0.

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

| | | |
|---|---|---|
| MD0 | Automatic/manual selection | **OFF: Manual Operation Mode**<br>→ JOG operation available.<br>**ON: Automatic Operation Mode**<br>→ 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".




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 |

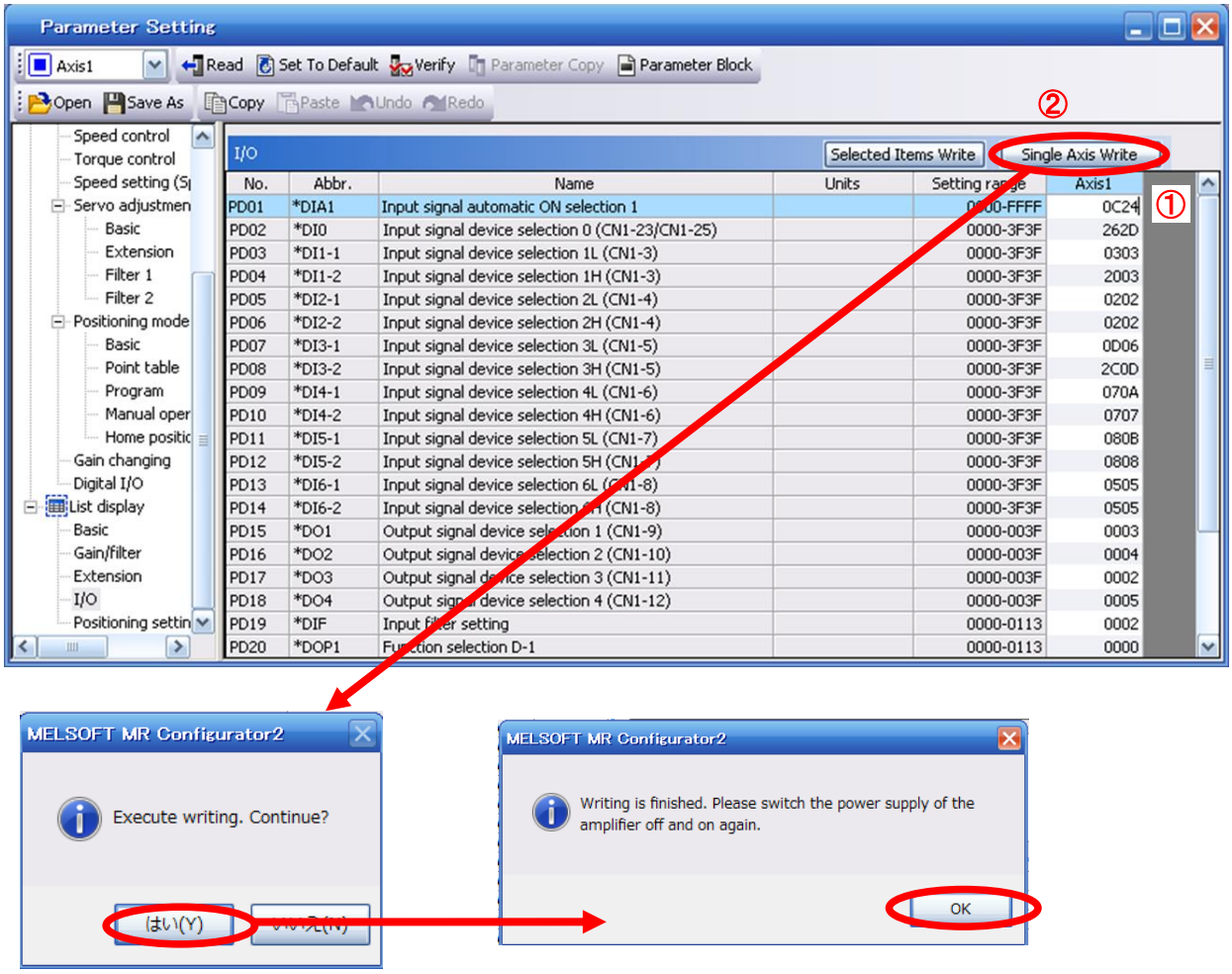
*** Enabling “Stroke end” (LSP, LSN) , “Forced stop” (EM1) and “Servo-on” (SON) Signals**

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 interface wiring and I/O signal allocation only.

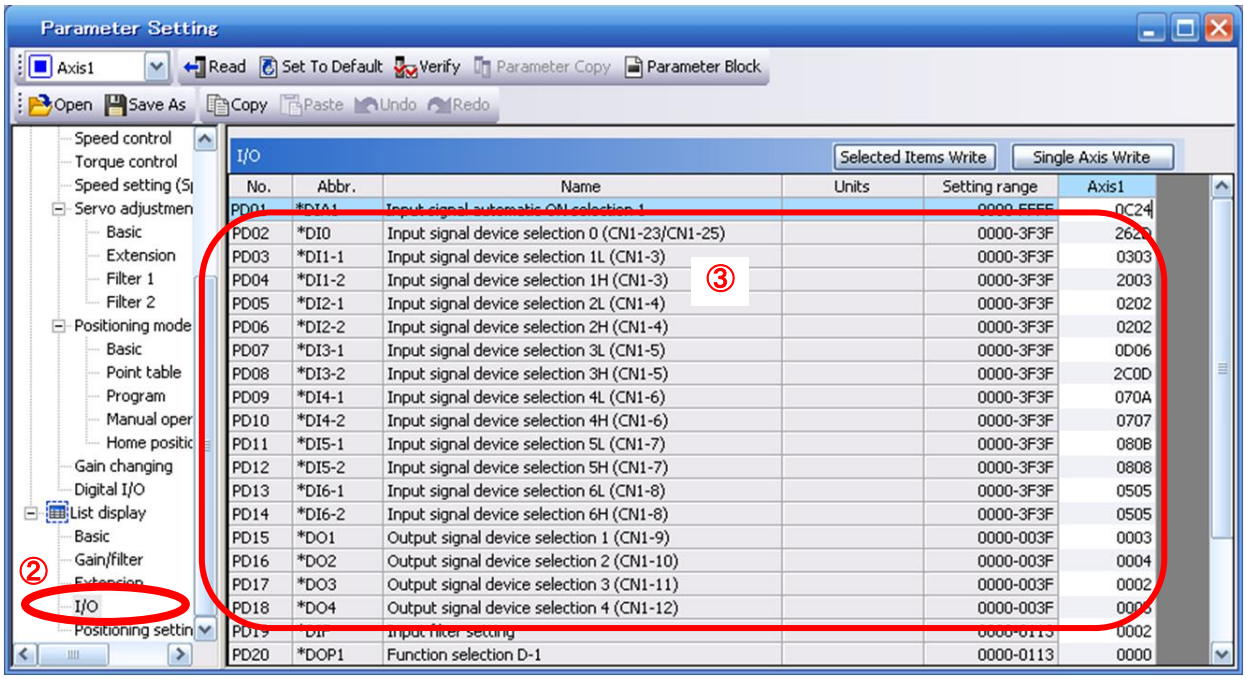
※ Pins CN1-3 and CN1-8 (input signals) and CN1-9 ~ CN1-12 (output signals) can be allocated in currect Sink (NPN) interface and current Source (PNP) interface wiring and I/O signal allocation.

## 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).

| 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 |

①

| 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 | 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 |

① Changing PD05 from 0202 to 02**11**

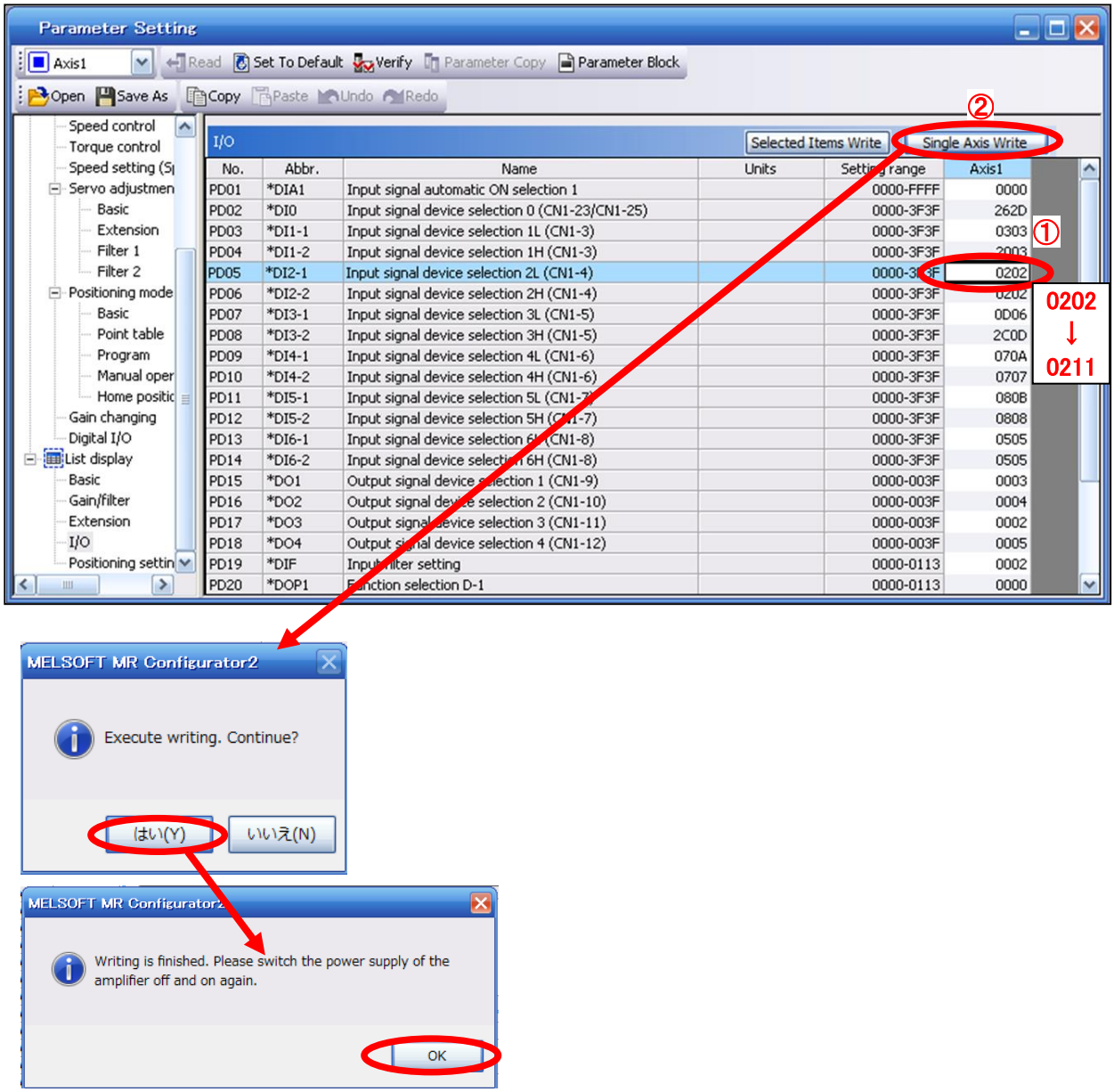
| | | |
|---|---|---|
| PD05 | *DI2-1 | Input signal device selection 2L (CN1-4)<br>Any input signal can be assigned to the CN1-4 pin.<br>The devices that can be assigned and the setting method are the same as in parameter No. PD03.<br>1 1<br>Position control mode<br>Internal speed control mode<br>Select 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 (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.

(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 parametersto 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.

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

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 |
| ① 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 **2E**08.

| | | | |
|---|---|---|---|
| PD12 | *DI5-2 | Input signal device selection 5H (CN1-7)<br>Any input signal can be assigned to the CN1-7 pin.<br>The devices that can be assigned and the setting method are the same as in parameter No. PD03.<br>2 E<br>Internal torque control mode<br>Positioning mode<br>Select the input device of the CN1-7 pin. | 0808h |

| 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 |

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 |
| ① Automatic / manual selection | MD0 | CN1-3 | DI-1 | PD04 | 2003 |
| Forward rotation start | ST1 | CN1-6 | DI-1 | PD10 | 0707 |
| ② 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)<br>Any input signal can be assigned to the CN1-3 pin.<br>The devices that can be assigned and the setting method are the same as in parameter No. PD03.<br>2 E<br>Internal torque control mode<br>Position control mode<br>Select the input device of the CN1-3 pin. | 2003h |

② Change PD12 from 0808 to 2D08.

| | | | |
|---|---|---|---|
| PD12 | *DI5-2 | Input signal device selection 5H (CN1-7)<br>Any input signal can be assigned to the CN1-7 pin.<br>The devices that can be assigned and the setting method are the same as in parameter No. PD03.<br>2 D<br>Internal torque control mode<br>Positioning mode<br>Select the input device of the CN1-7 pin. | 0808h |

| 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.

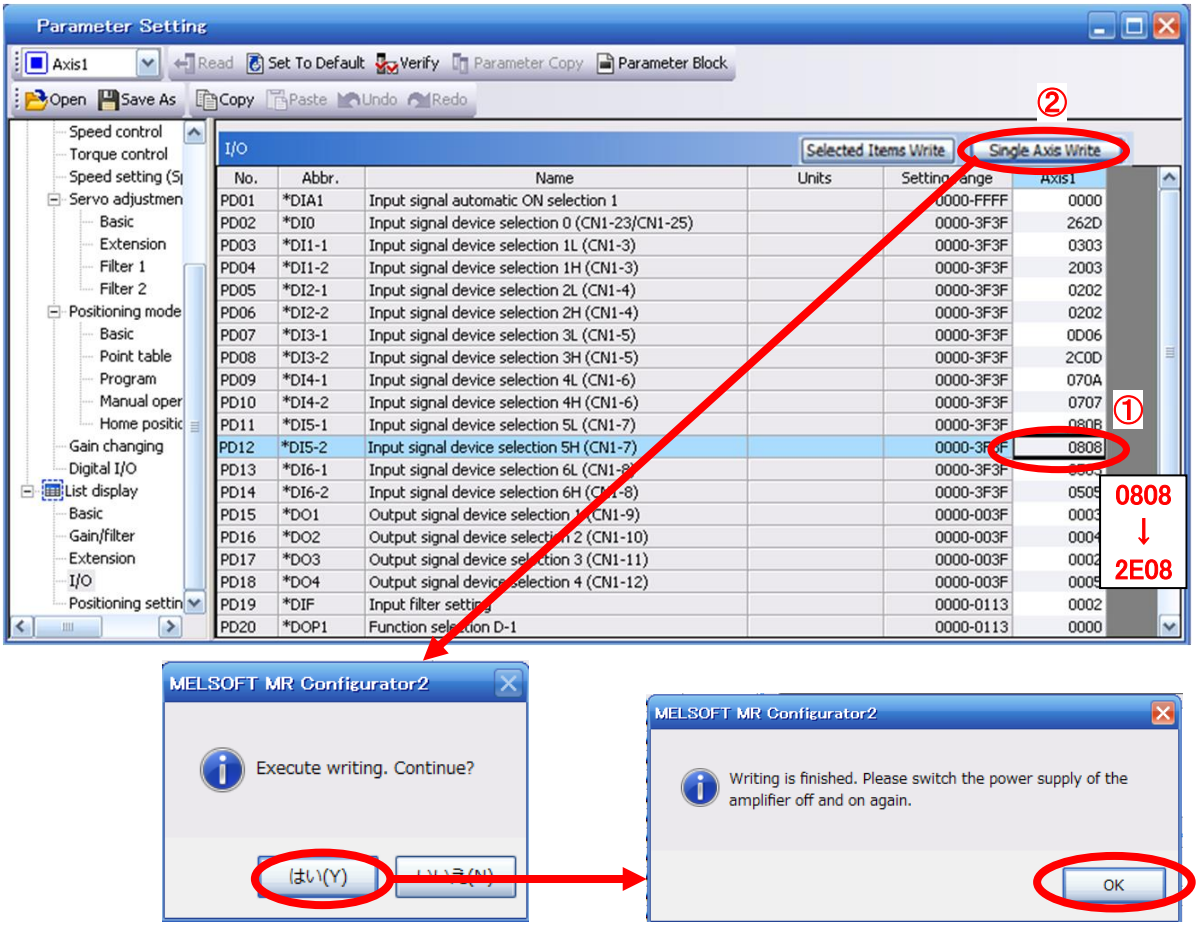
(3) Example of Signal Allocation using the setup software

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.

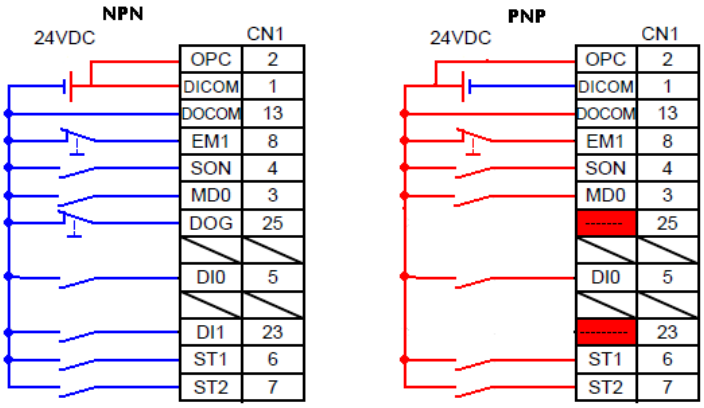
② Click on the "Single Axis Write" button.

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

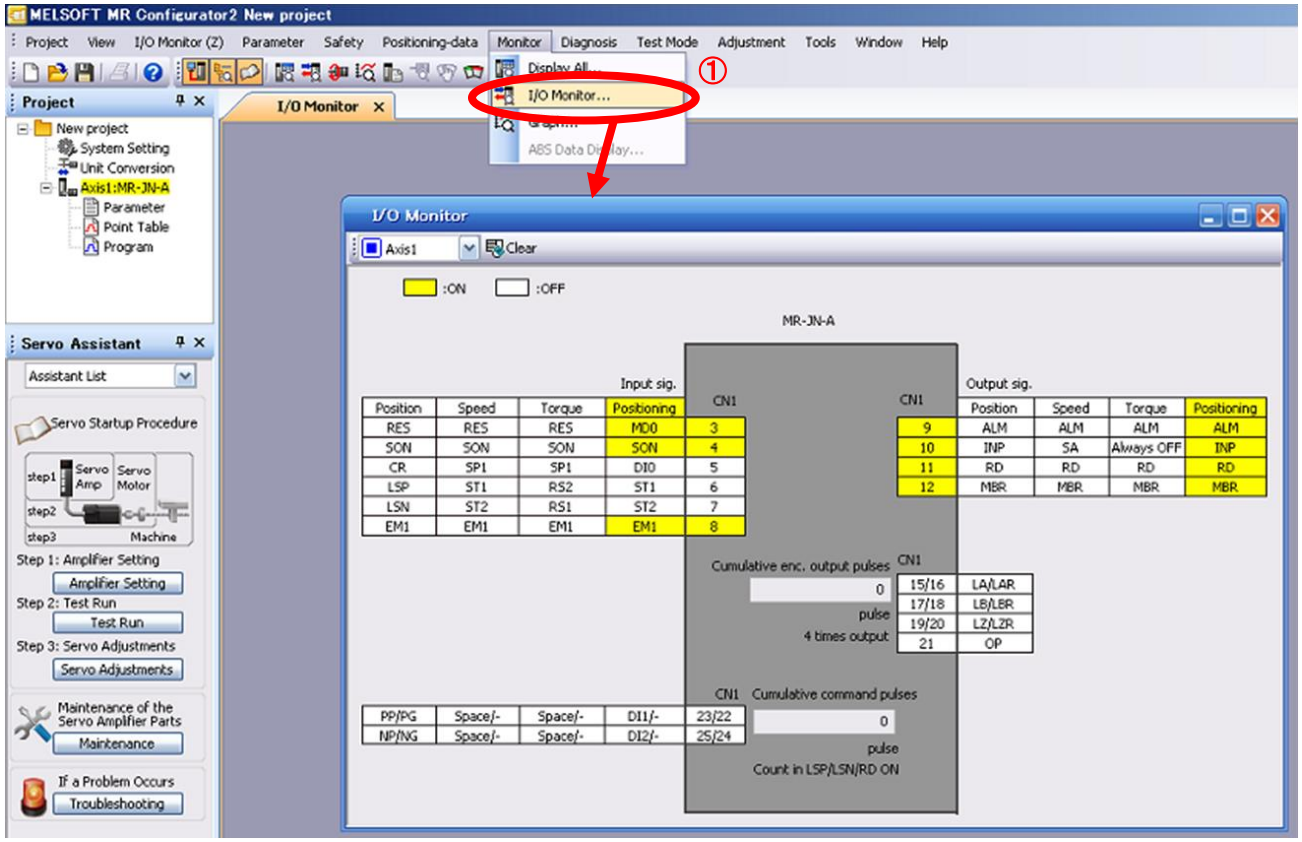


## 5.5.6 I/O Signal Allocation Check

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)



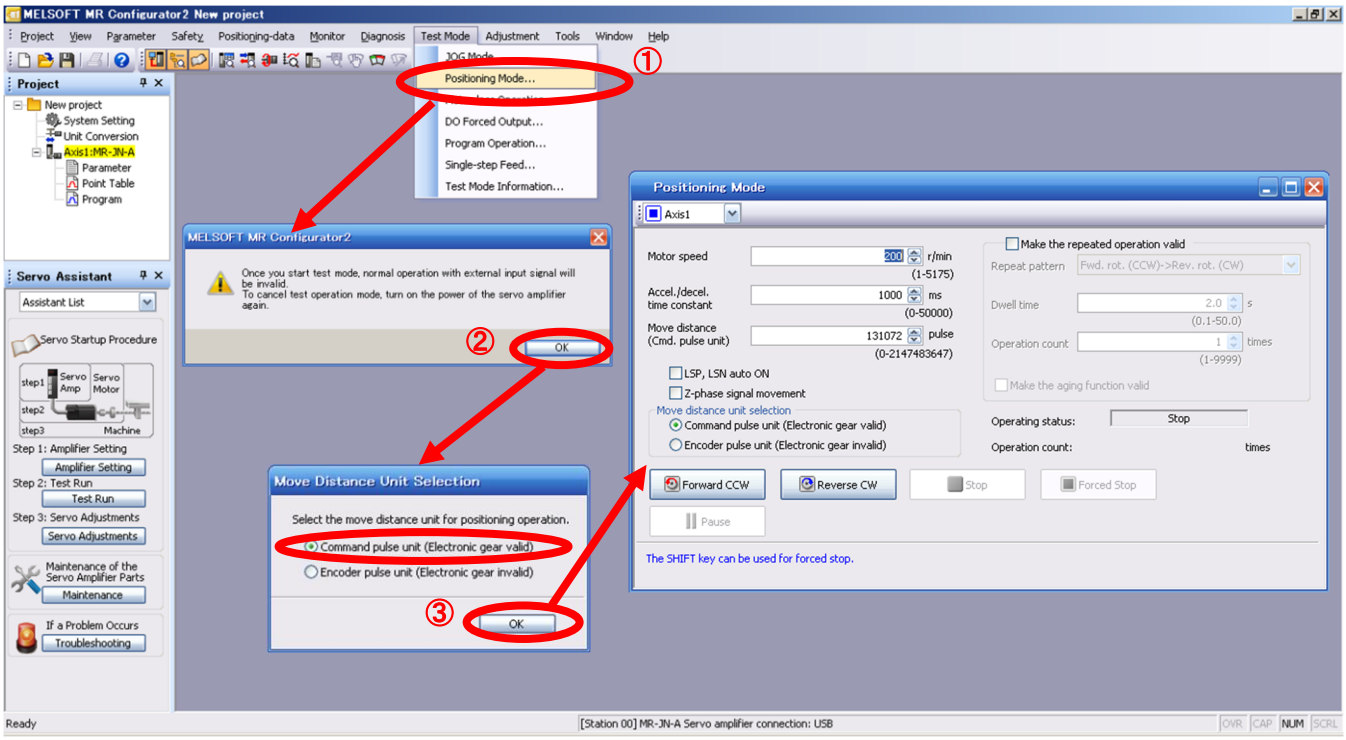
## 5.6 Positioning Mode in Setup Software

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.

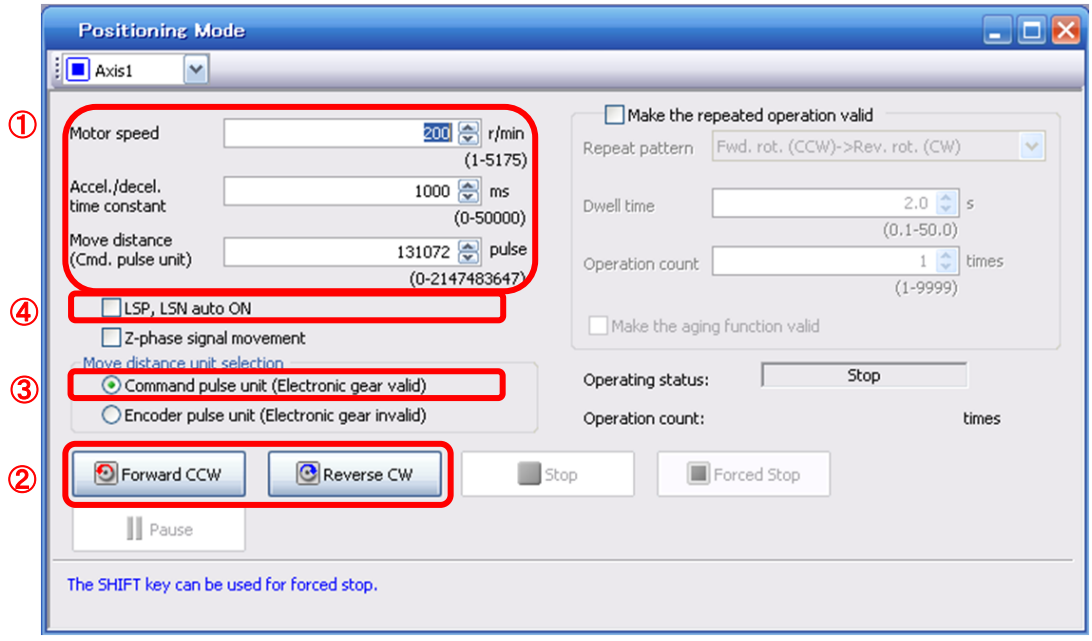
② Actuator positioning operates using [Forward (CCW)] and [Reverse (CW)].
(Check wiring and parameters if operation cannot be performed correctly).
When performing positioning operation in the setup software, the rotation direction of the actuator does not change if you change the setting of parameter 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 (Simplified Edition)", section 5.3.4 – "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 (Simplified Edition)", section 5.3.4– 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>**

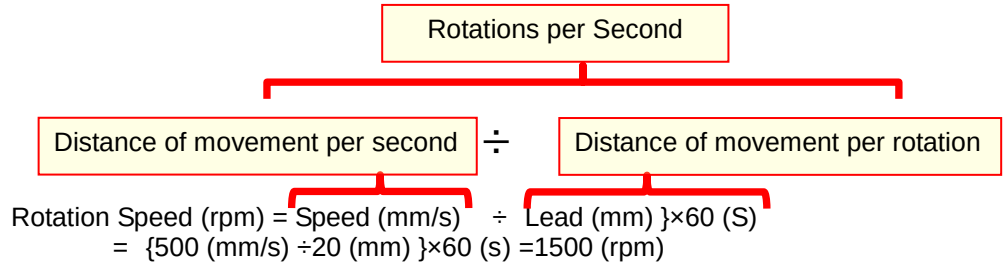
① Motorspeed (r/min) configuration.
*r/min (rpm): Indicated motor rotation speed (motor rotations/min)

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.

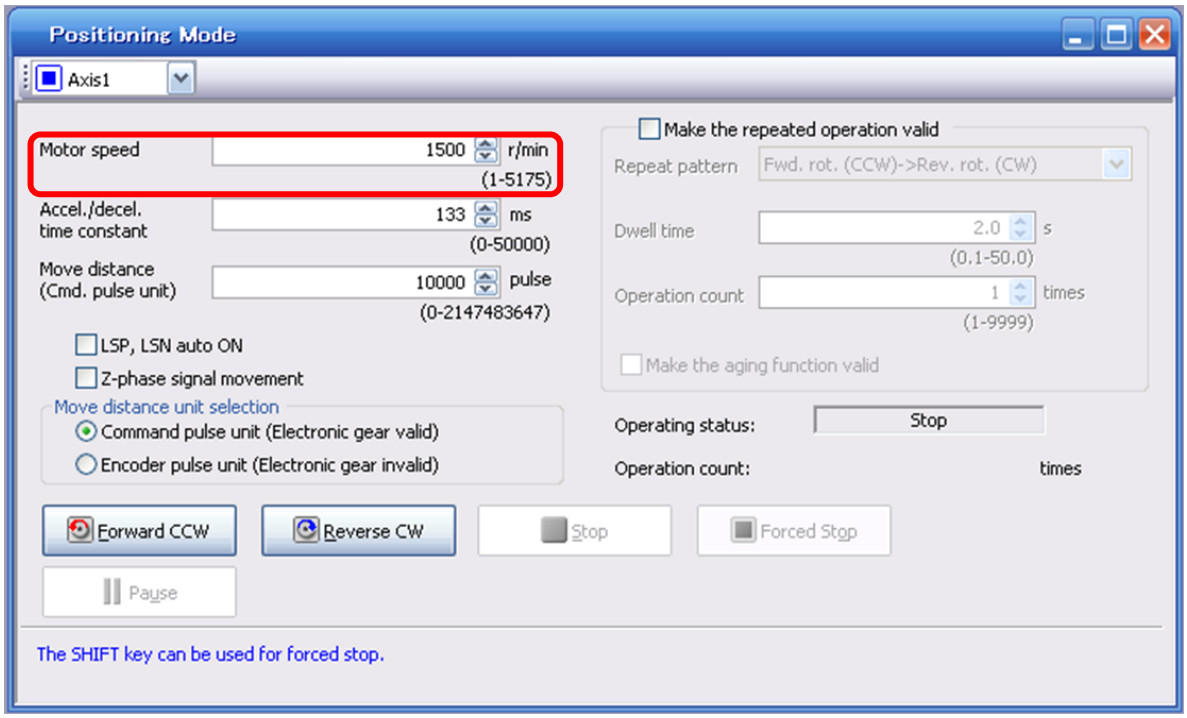
If the rotation speed is too low, this may cause vibration; check the actuator while changing settings.

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.




Rotation Speed (rpm) = Speed (mm/s) ÷ Lead (mm) }×60 (S)
= {500 (mm/s) ÷20 (mm) }×60 (s) =1500 (rpm)



## 5.6.3 Acceleration/deceleration Time Configuation

**< 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/sec$^2$].

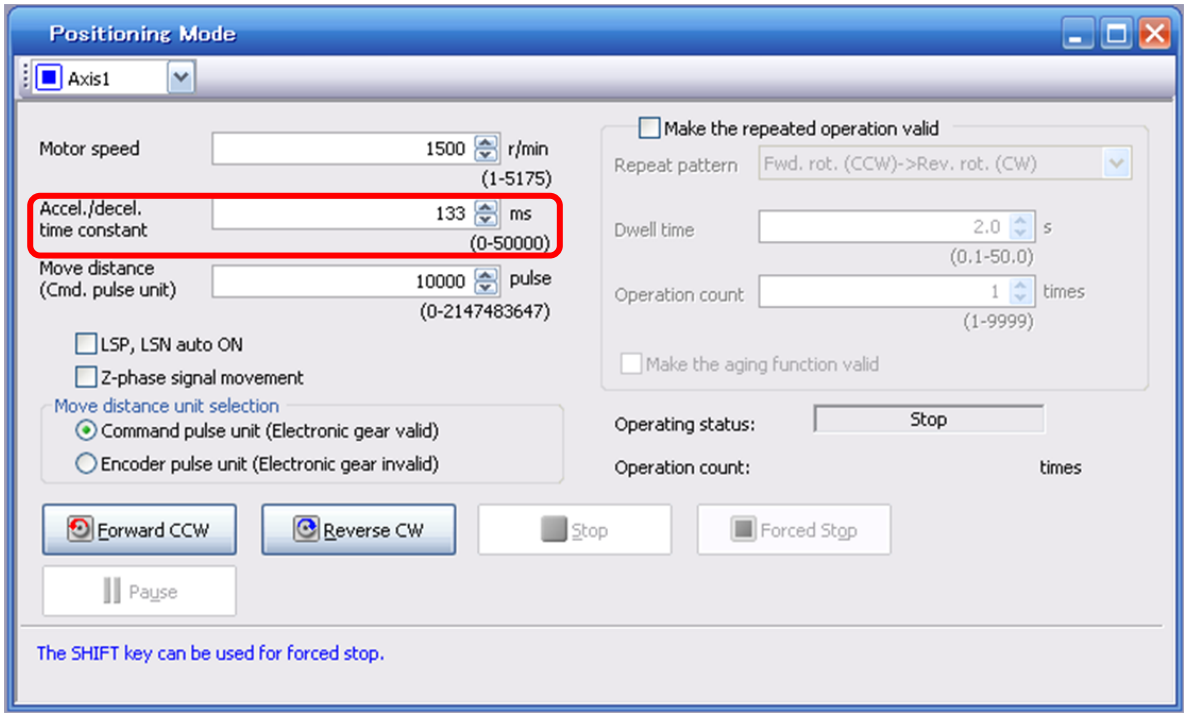
**Speed at a rated motor rotation of 3000rpm**

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

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

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

$$= 133\ (\text{ms})$$



## 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 (Simplified Edition)",section 5.3.4 for setting values for PA05/PA06/PA07 in each actuator. If parameters PA05/PA06/PA07 are set according to"LECSA Operation Manual (Simplified Edition)",section 5.3.4, the travel distance of the actuator per 1 pulse will be as follows.

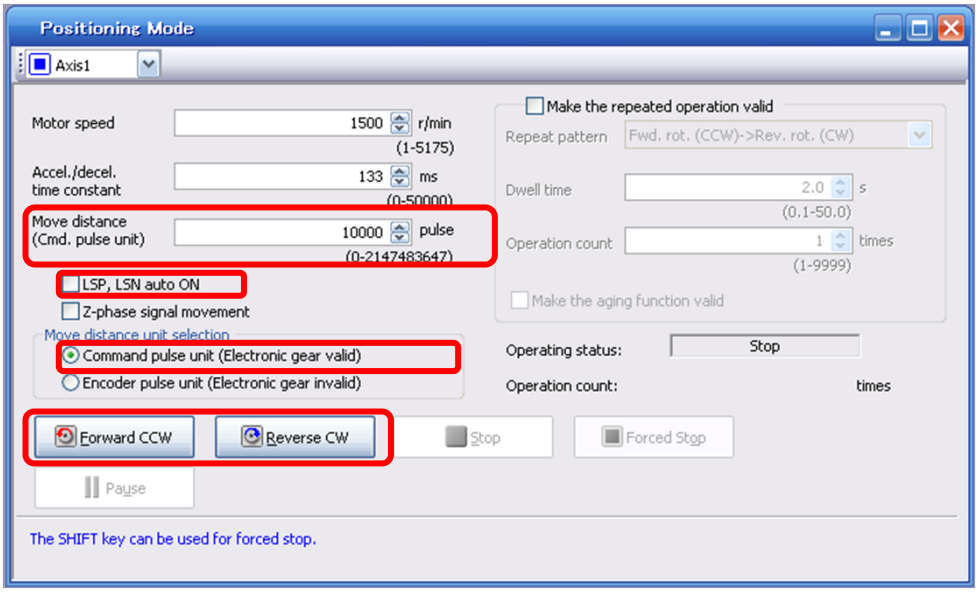
**【Position control mode (pulse input)】**
・ travel distance of the actuator per 1 pulse ＝ 10[μm] ( 0.01[mm])
**【Positioning mode】**
・ travel distance of the actuator per 1 pulse ＝ 1[μm] ( 0.001[mm])

Travel distance (mm) must be converted to tavel 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 (mm)/0.01 (mm) = 10000 (pulse)
**【Positioning mode】**
Travel distance of the actuator per 1 pulse = 0.001 (mm) *1
100 (mm)/0.001 (mm) = 100000 (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 (Simplified Edition)",section 5.3.4 "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.

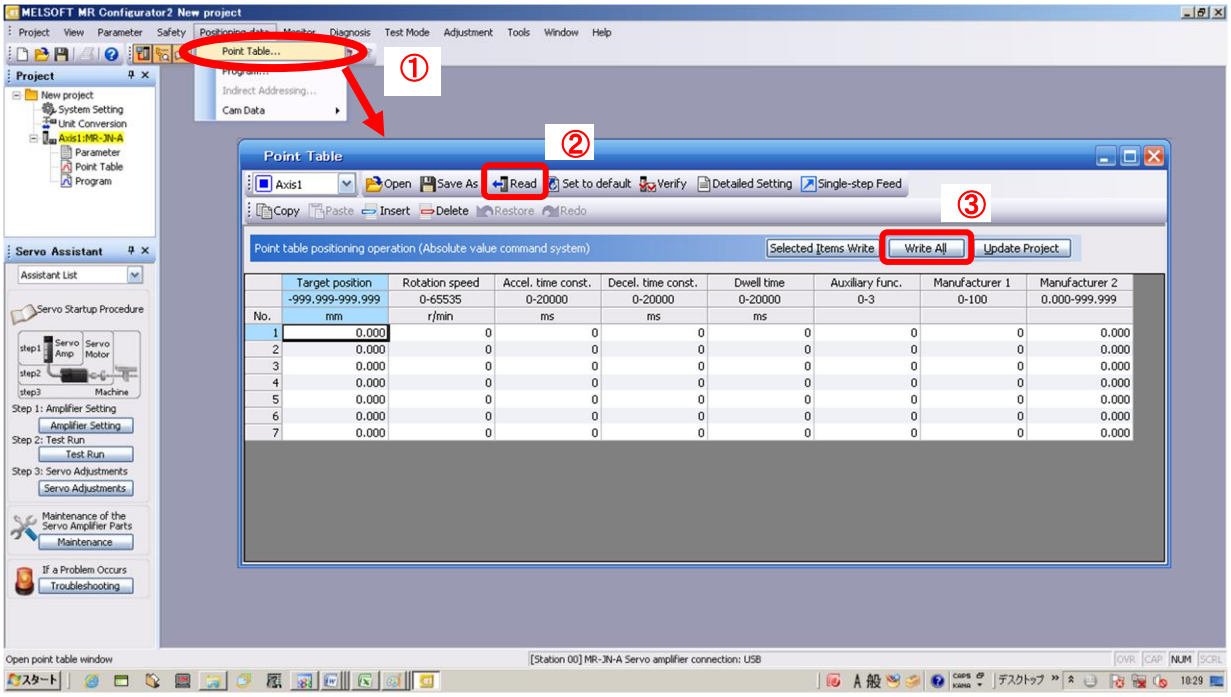
When positioning using the positioning (point table) mode, the point table (target position, speed data, acceleration time, deceleration time etc.) must be configured.

### 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).<br>(2) When using this point table as incremental value command system, set the travel distance. A "-" sign indicates a reverse rotation command.<br>**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.<br>Set "0" in the auxiliary function to make the dwell invalid.<br>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<br>0: Automatic operation is performed in accordance with a single point table chosen.<br>1: Operation is performed in accordance with consecutive point tables without a stop.<br><br>(2) When using this point table in the incremental value command system<br>2: Automatic operation is performed in accordance with a single point table chosen.<br>3: Operation is performed in accordance with consecutive point tables without a stop.<br><br>When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed.<br>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.<br>**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.<br>Set "0" in the auxiliary function to make the dwell invalid.<br>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.<br>1: Operation is performed in accordance with consecutive point tables without a stop.<br><br>When a different rotation direction is set, smoothing zero (command output) is confirmed and the rotation direction is then reversed.<br>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 "Feel length multiplication (STM) (Multiplier)". Please change the "PE02 (Feed function selection)".
" Feel 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.

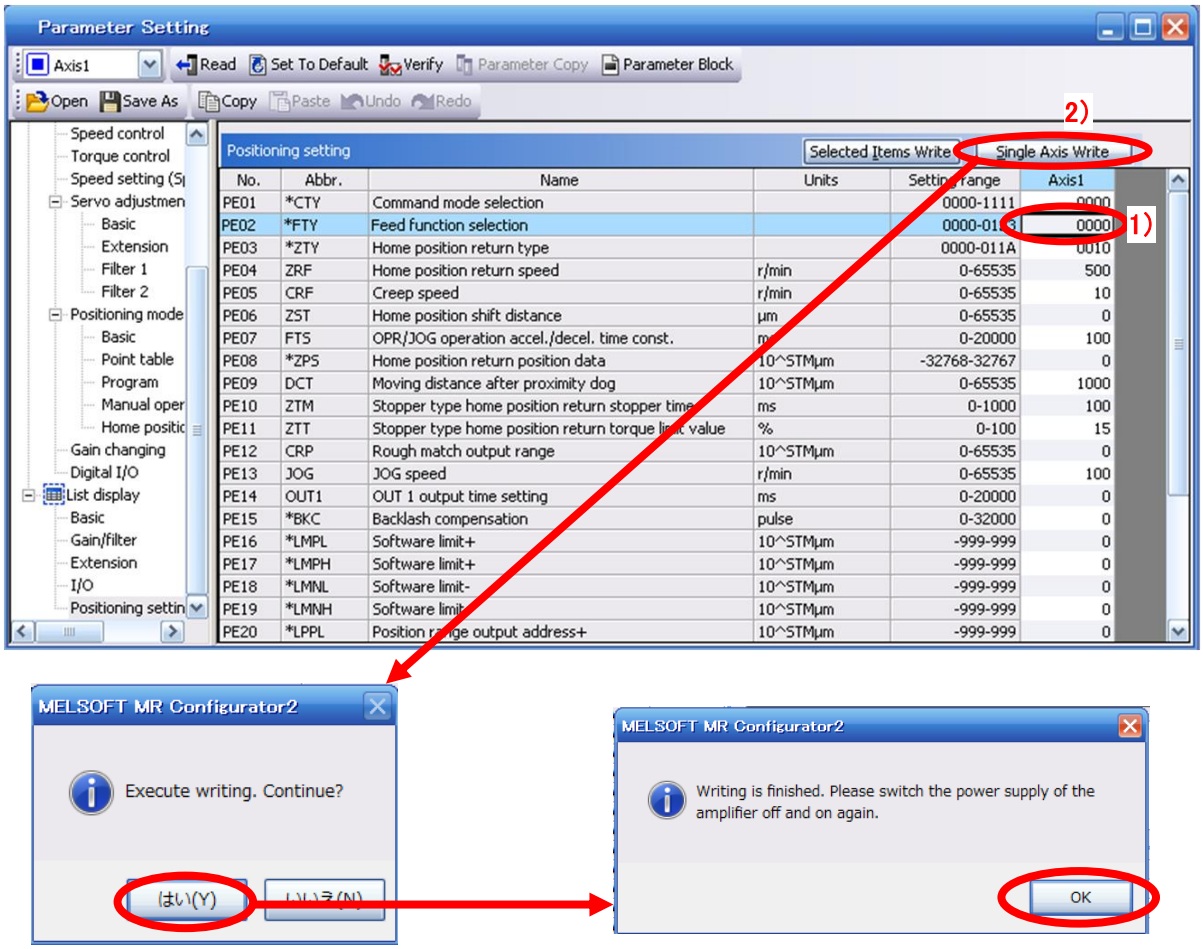
**For actuators with a stroke more than 1000mm, set** parameter “PE02 (Feed function selection)” to 0001 and the "Feed length multiplication (STM) (Multiplier)" value to x10.

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 [μm]) | 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)]**.

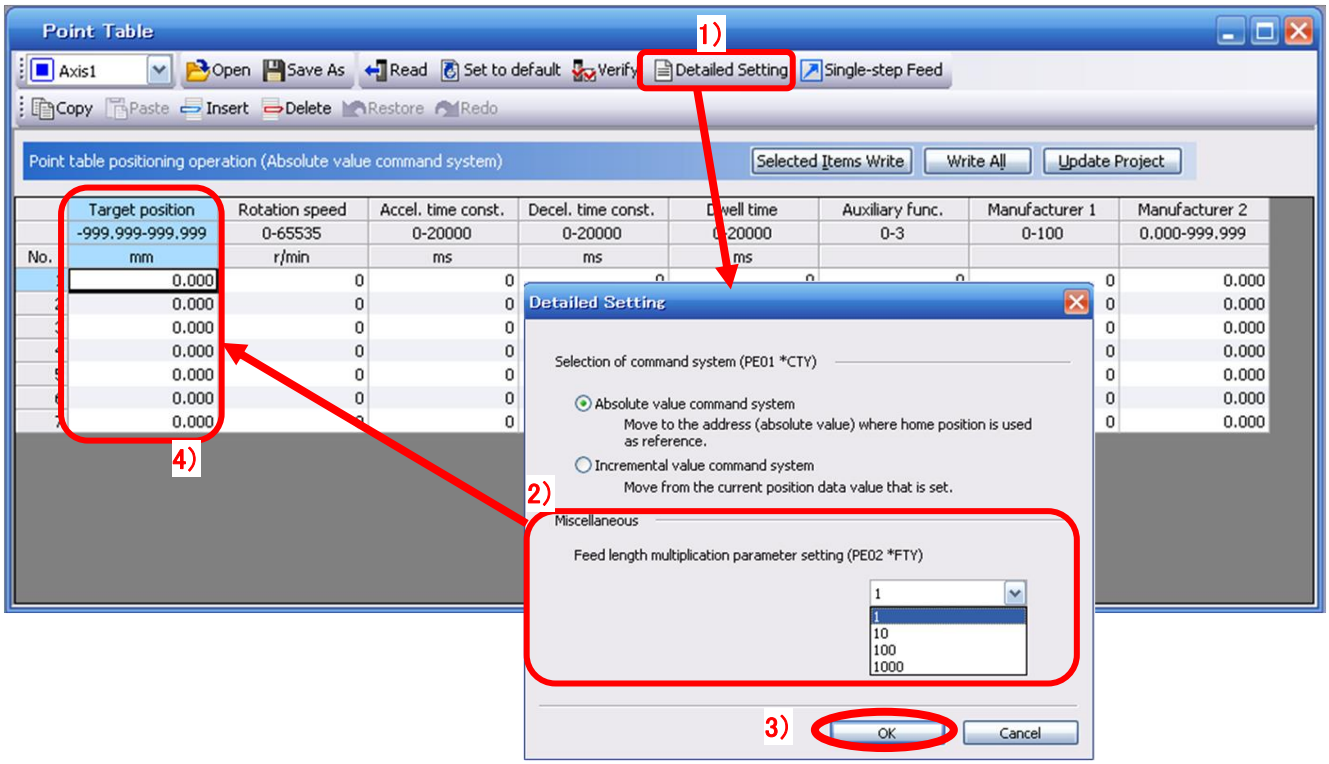
1) Set the parameters of the PE02 in the "Positioning setting" tab.
2) Click on the "Single Axis Write" button.
3) **Turn the power OFFand ON again. The Parameter is then enabled.**




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)].**

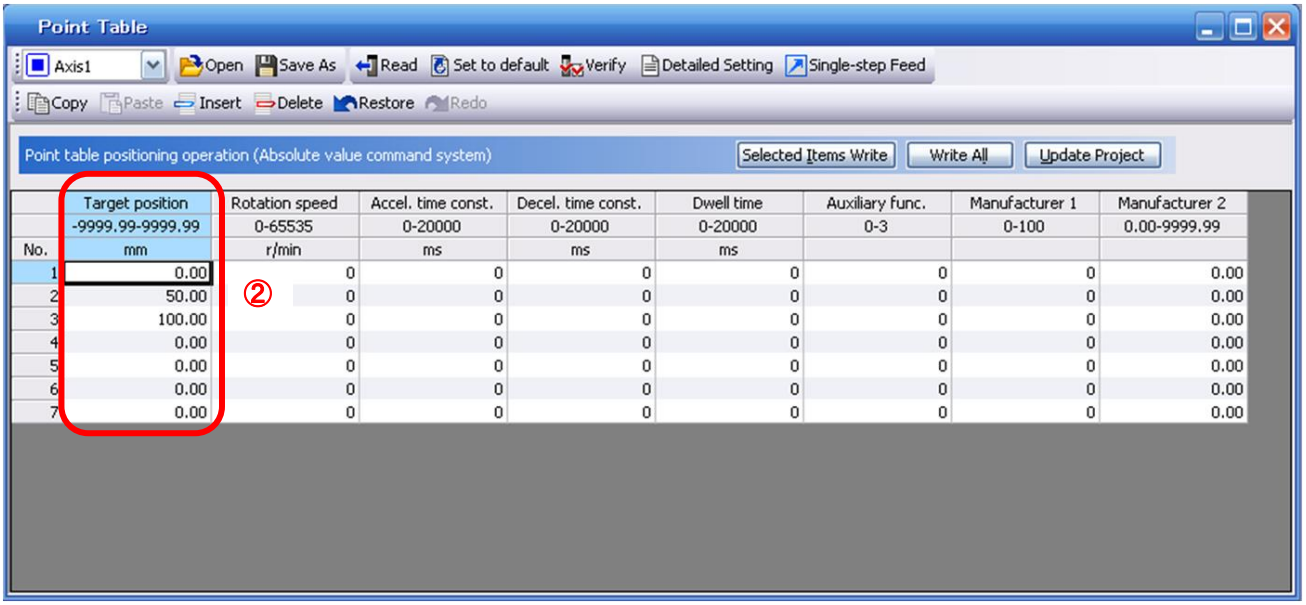
| Feed length multiplication (STM) (Multiplier) (Feed unit [μm]) | Target position input range [mm] |
|---|---|
| 1 | -999.999 to +999.999 |
| 10 | -9999.99 to +9999.99 |
| 100 | -99999.9 to +99999.9 |
| 1000 | -999999 to +999999 |




**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 (Simplified Edition)",section 5.3.4 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]

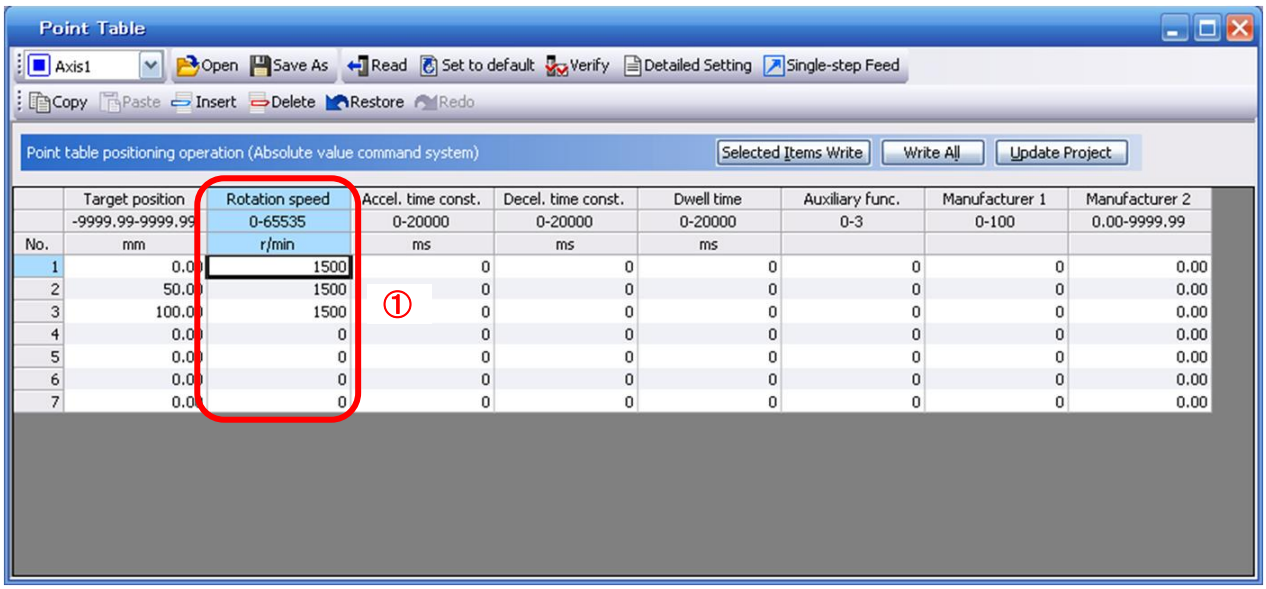
Rotations per second

Travel distance per second ÷ Travel distance per rotation

Rotation Speed (rpm) = {Speed (mm/s) ÷ Lead (mm) }×60 (S)
= {500 (mm/s) ÷20 (mm) }×60 (s) =1500 (rpm)

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);



## 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/s$^2$) 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/sec$^2$]

**Rated Motor Rotation Speed (mm/s)**

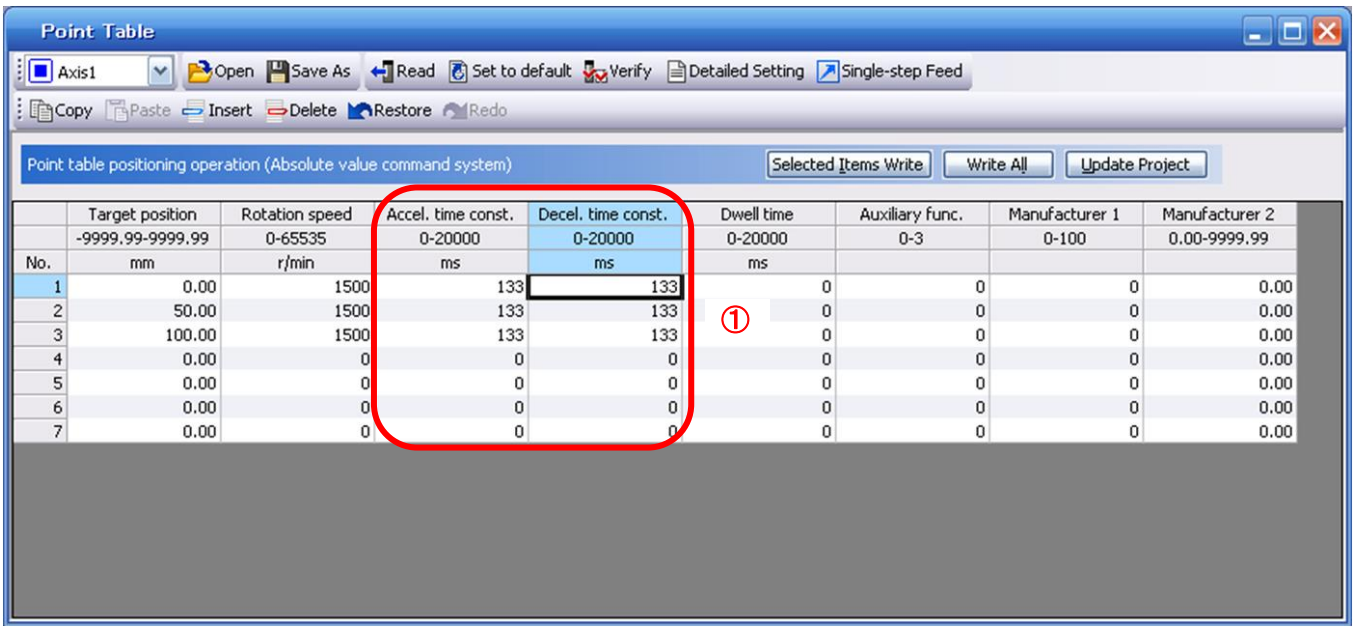
**Acceleration time constant/deceleration time constant (ms)** = $\dfrac{\{\text{Rated rotation speed (r/min)} \div 60\ (S)\ \} \times \text{screw lead (mm)} \times 1000}{\text{Acceleration/deceleration speed (mm/s}^2\text{)}}$ *Note)

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

Acceleration/Deceleration time constant (ms) = $\dfrac{\{3000\ (\text{r/min}) \div 60\ (S)\ \} \times 8\ (\text{mm}) \times 1000}{3000\ (\text{mm/s}^2)}$

= 133 (ms)

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.




| | Target position | Rotation speed | Accel. time const. | Decel. time const. | Dwell time | Auxiliary func. | Manufacturer 1 | Manufacturer 2 |
|---|---|---|---|---|---|---|---|---|
| | -9999.99-9999.99 | 0-65535 | 0-20000 | 0-20000 | 0-20000 | 0-3 | 0-100 | 0.00-9999.99 |
| No. | mm | r/min | ms | ms | ms | | | |
| 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.

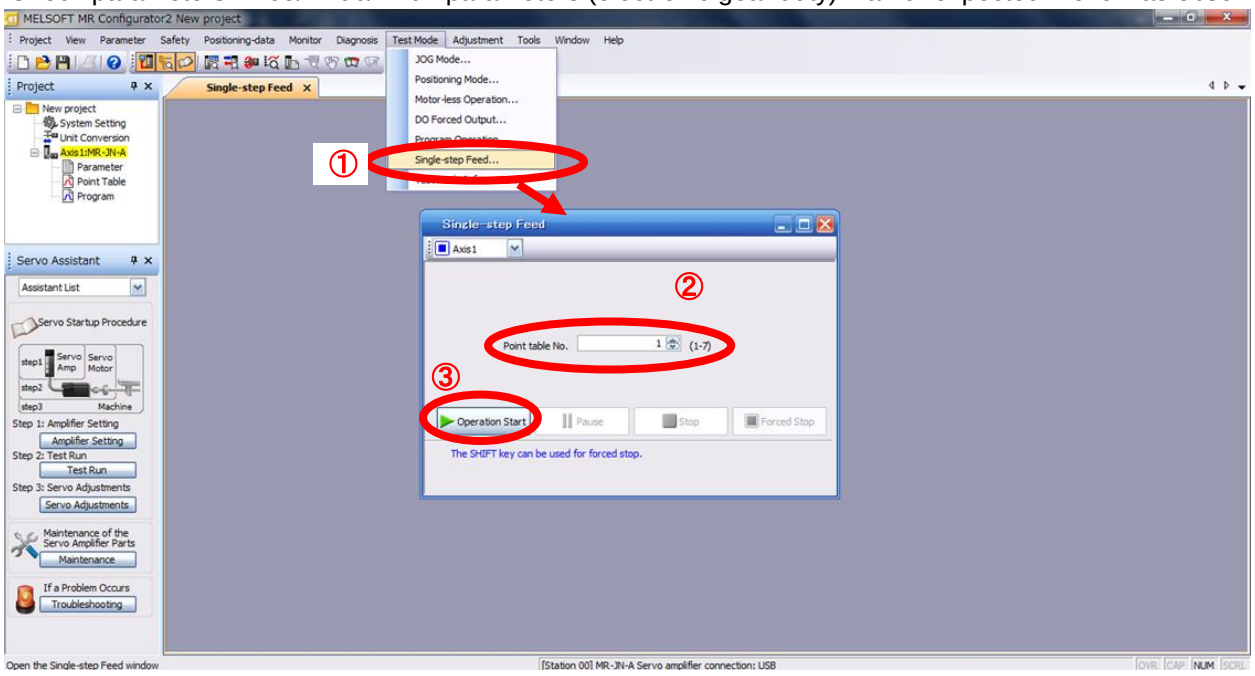
① From the “Test” menu in the setup software select “Single-step Feed” which opens a window for “Single-step feed”. (When using this function, external input signal operation will be disabled. If controlling using a PLC or other upper device, ensure the power is turned off and then on before operation.)

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

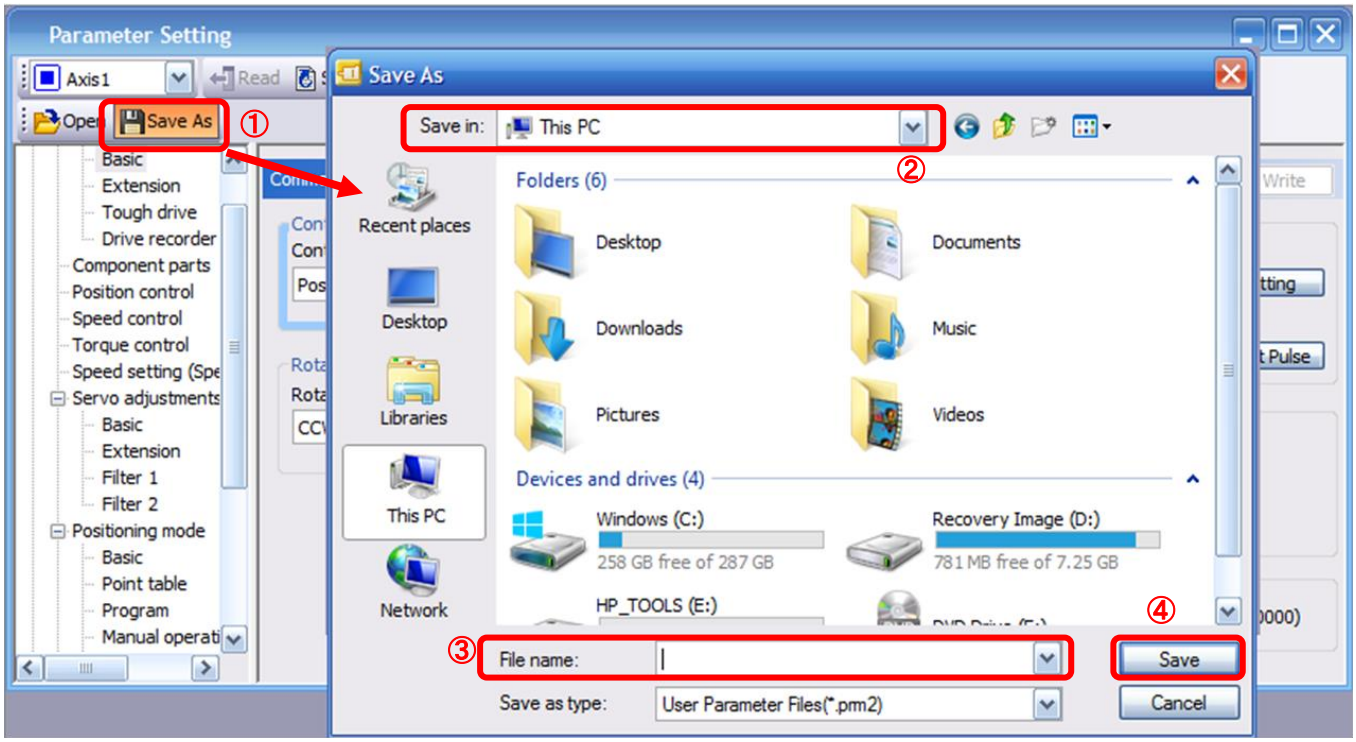
### 5.8.1 Saving Parameters

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.)



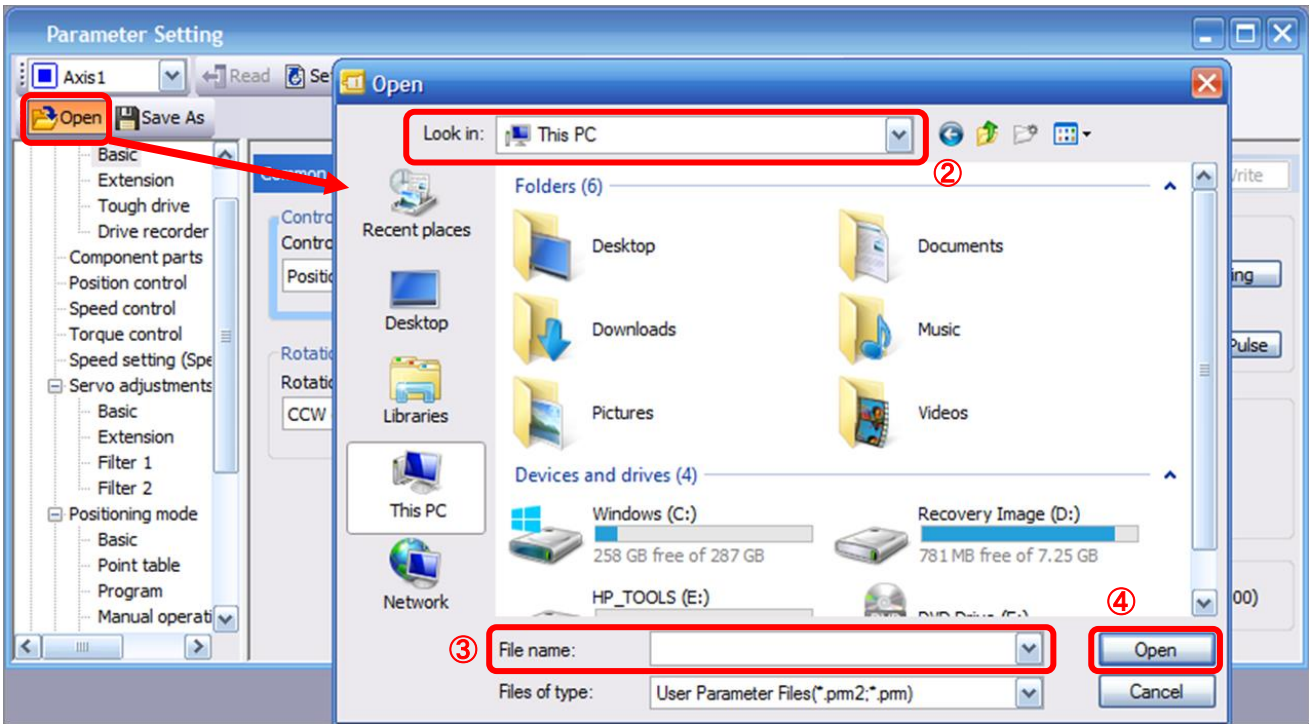
## 5.8.2 To Load saved Parameters

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.



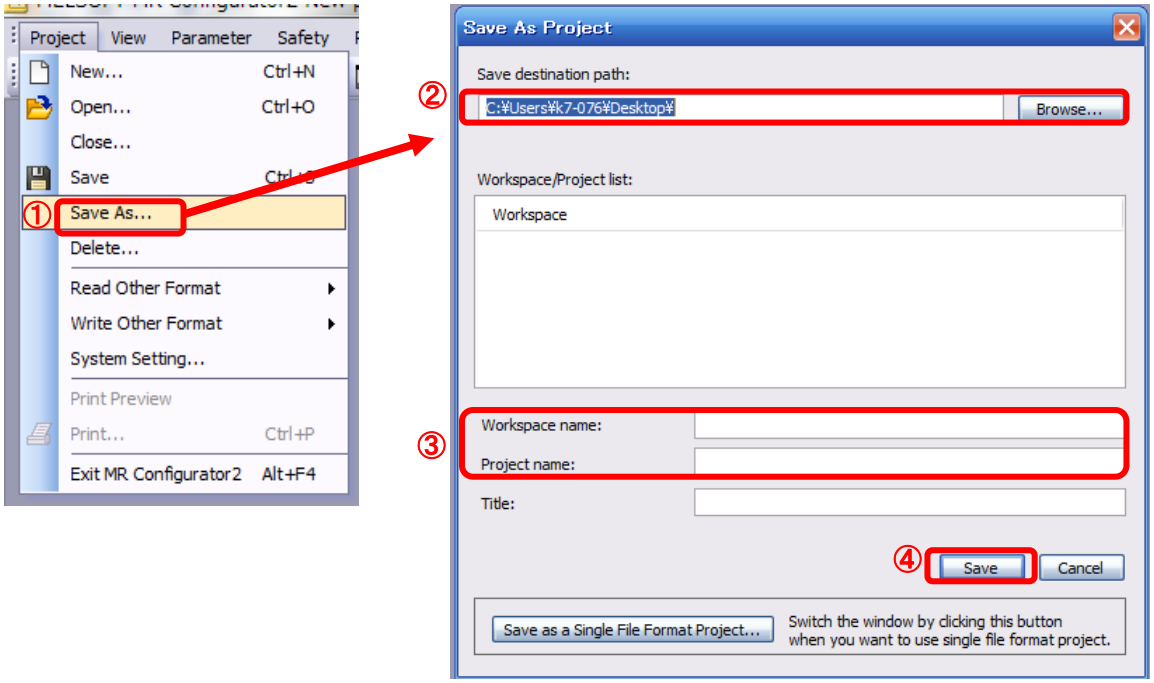
## 5.9 Saving/Loading Project

### 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.)



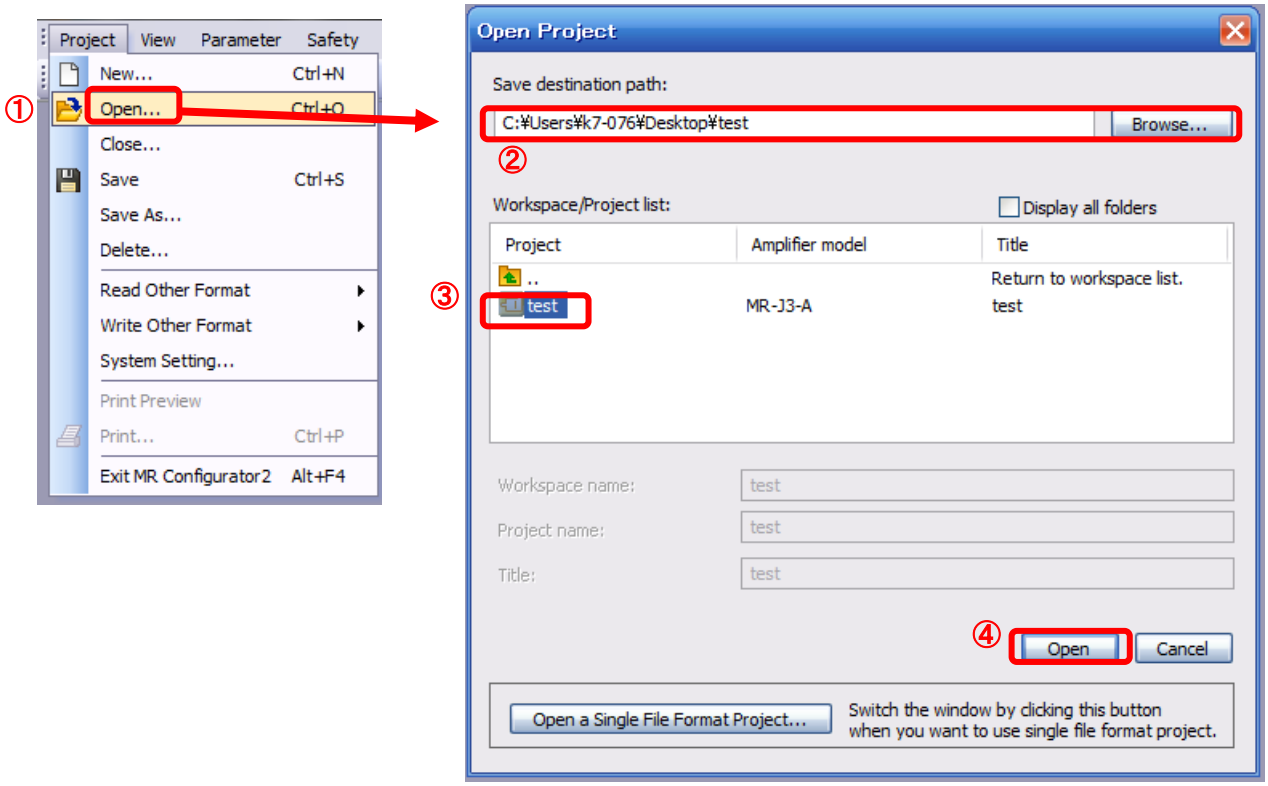
## 5.9.2 To Load saved Project

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

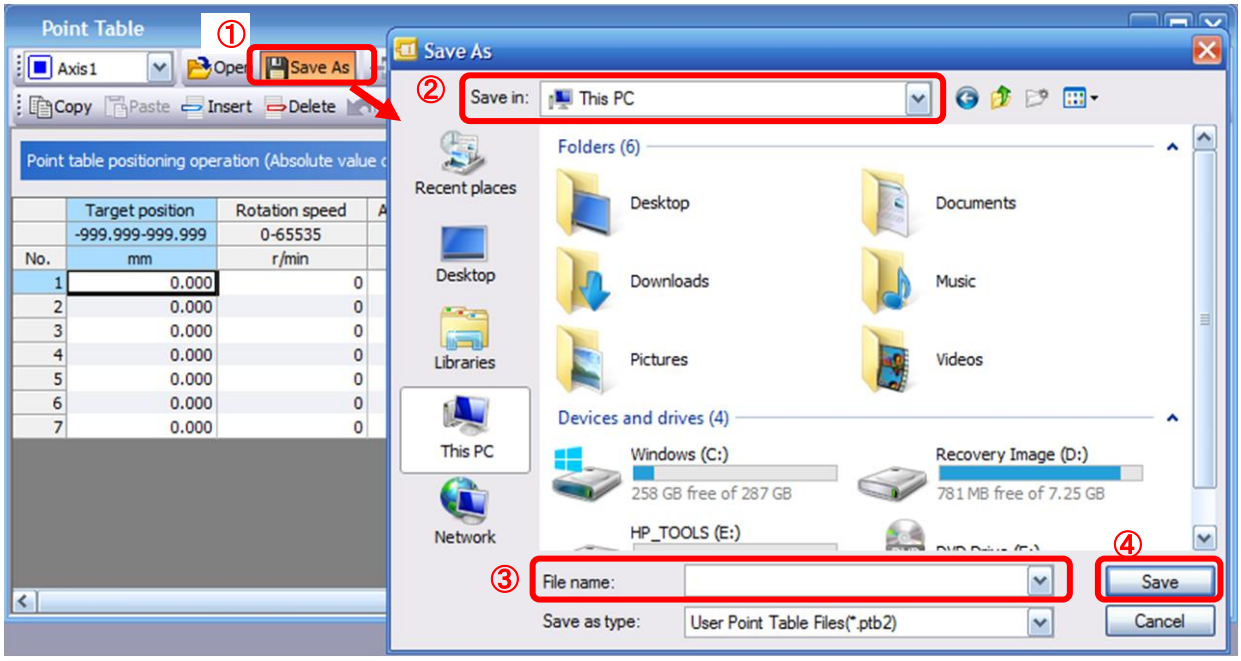
### 5.10.1 Saving Point table

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”.



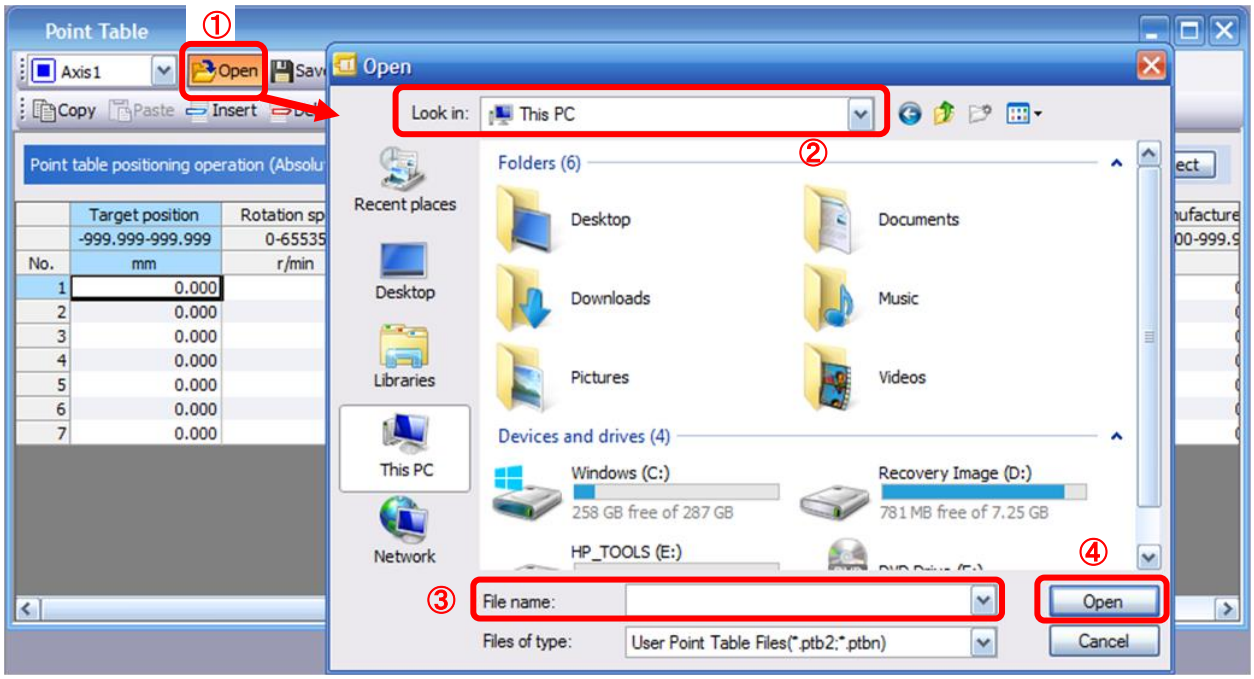
## 5.10.2 To Load saved Point table

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].

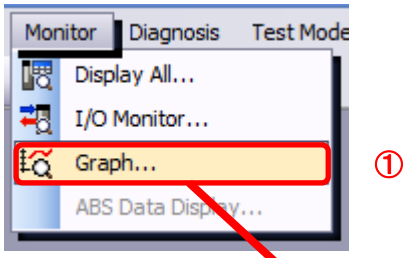
④ Click “Open”.
Point table will be loaded.

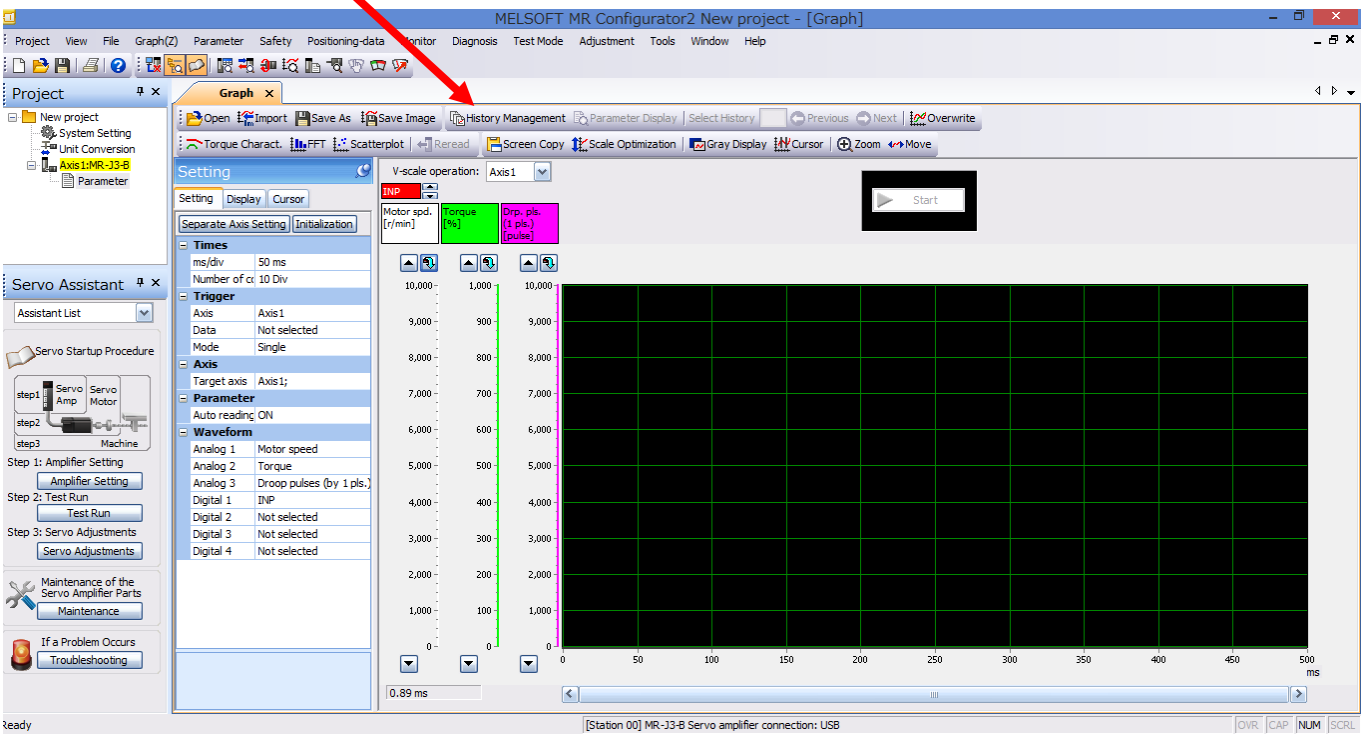


## 5.11 Acquisition of motion waveform with graph monitor

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

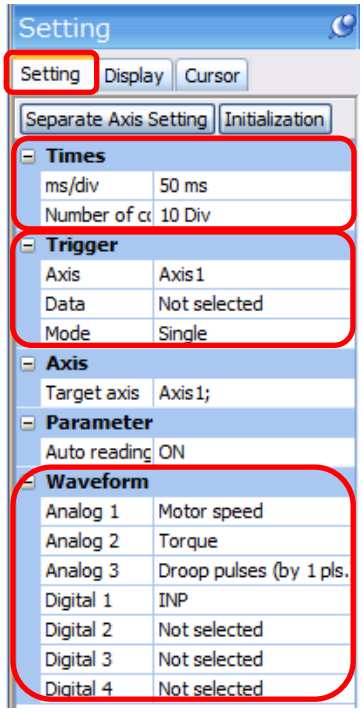
① Click “Monitor” - “Graph” of Setup software to display “Graph” window.



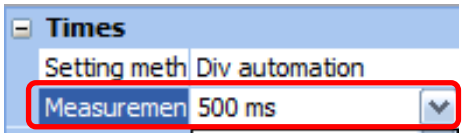
### 5.11.1 Under the setting Tab: Setting of the items to display the graph

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.

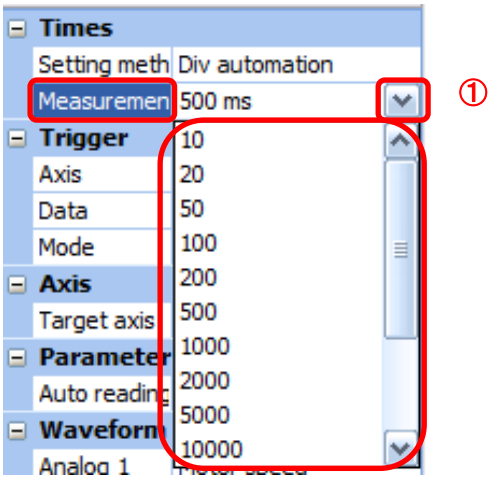



(1) Time

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



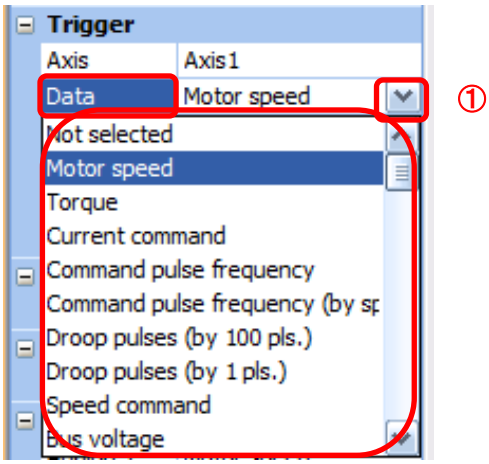

① Click “ ▼ ” of “Measurement time” to set the Measurement time.
The unit ms of “Measurement time” is 1000ms＝1s.



(2) Trigger

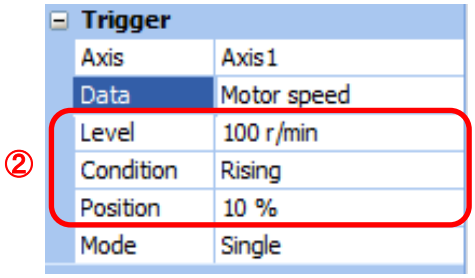
"Trigger" is a condition which decides the display timing of the graph.
If trigger conditions are not satisfied, waveform will not be displayed.

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 be100 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）

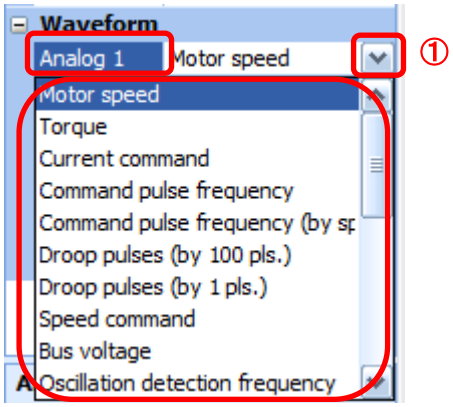
| Operating direction | "Level" [r/min] | "Condition" |
|---|---|---|
| Positive direction operation | 100 | Startup |
| Negative direction operation | -100 | Fall |

"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 %.<br>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.<br>An excessive error alarm will occur when margin is zero pulses. | 16pulse | |
| 20 | Settling time | The settling time for position control is displayed.<br>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.<br><br>The method for measuring the overshoot amount can be selected from the separate axis setting. | 1pulse | |

■Digital waveforms

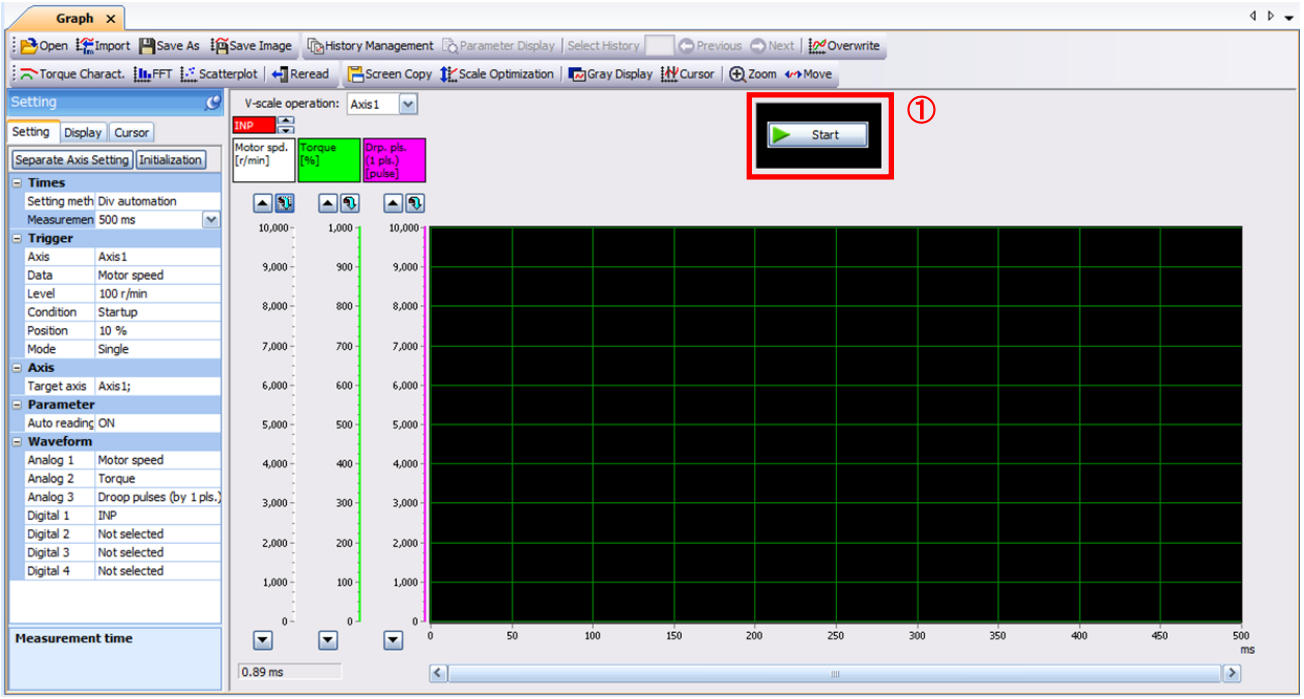
SON、LSP、LSN、TL1、PC、RES、CR、SP1、SP2、SP3、ST1、ST2、LOP、EM1、MD0、DOG、TSTP、CDP、PI1、DI0、DI1、DI2、RS1、RS2、 RD、SA、ZSP、TLC、VLC、INP、WNG、ALM、OP、MBR、CPO、ZP、POT、PUS、CDPS、IPF、MEND、MTTR、PT0、PT1、PT2、OUT1、SOUT

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

## 5.11.2 Trigger wait

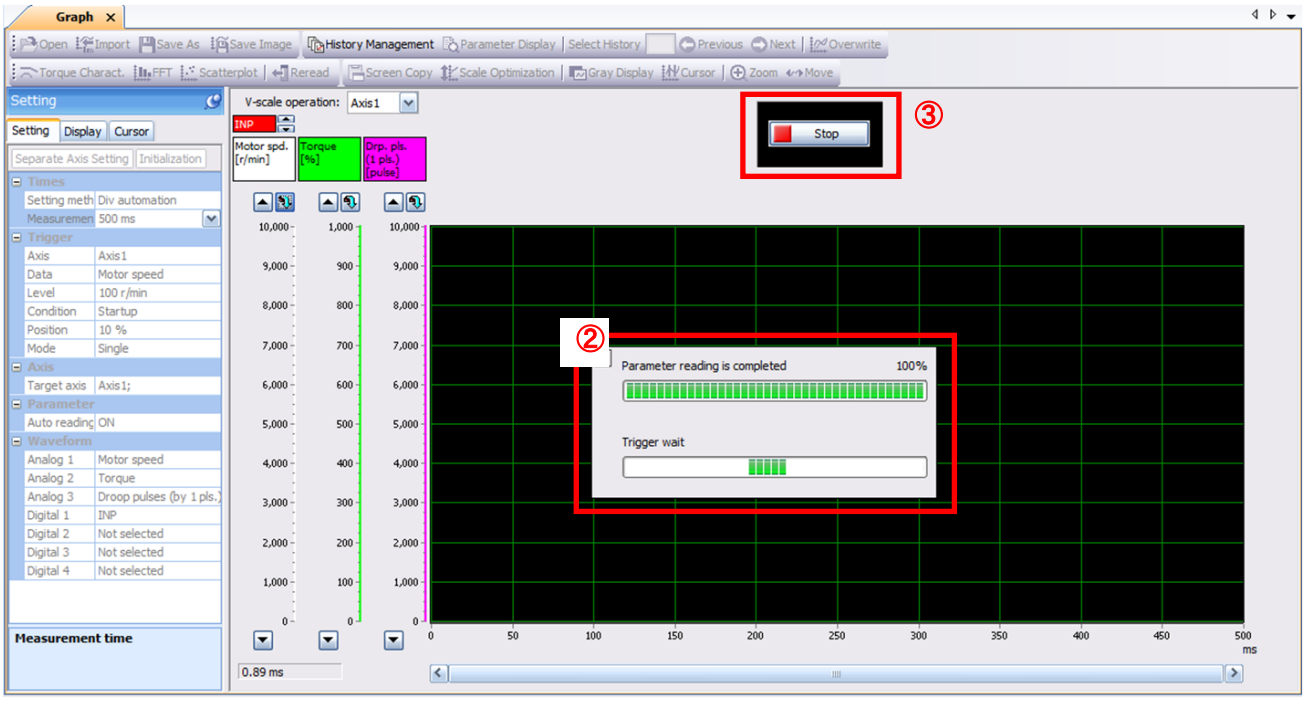
When the “Start” button is clicked, the screen will be on stand-by.
When trigger conditions are satisfied during the trigger wait, waveforms can be captured and displayed.
Click the “Start” button every time measurement fresh capture is required.
(The advantage of this method of capturing the waveform 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.

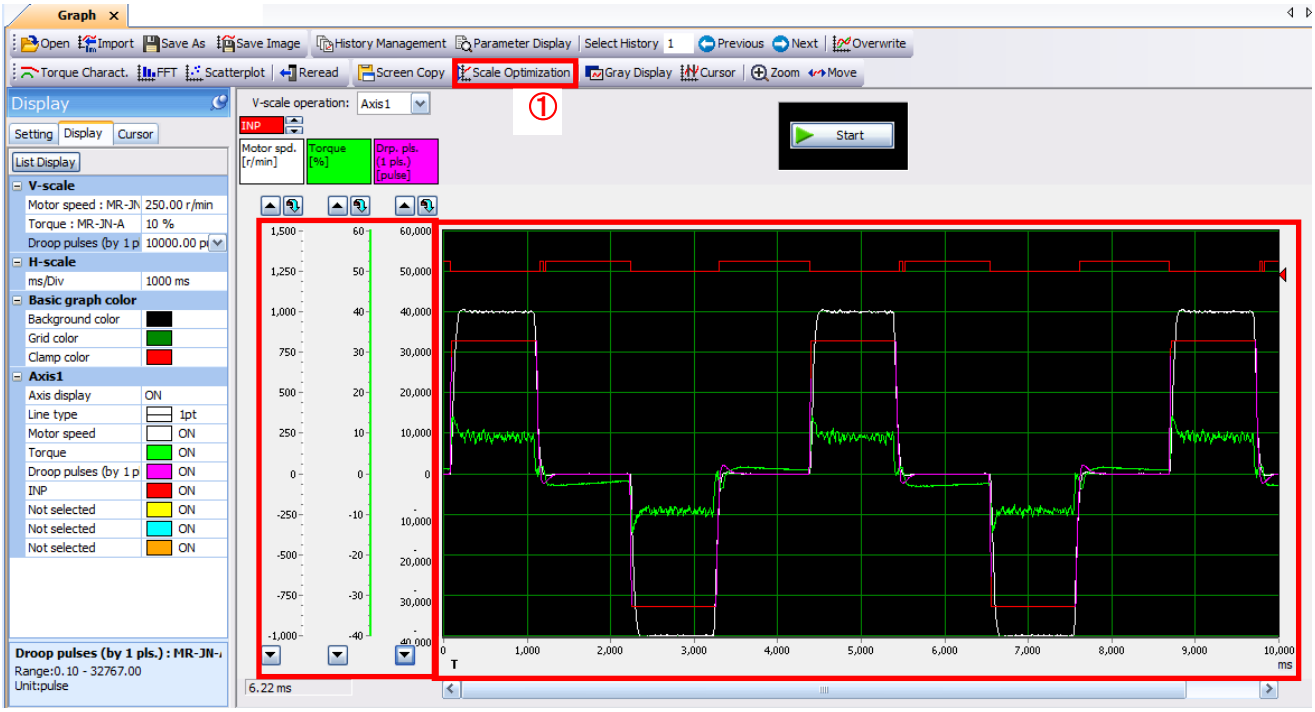


## 5.11.3 Operation Instruction

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.



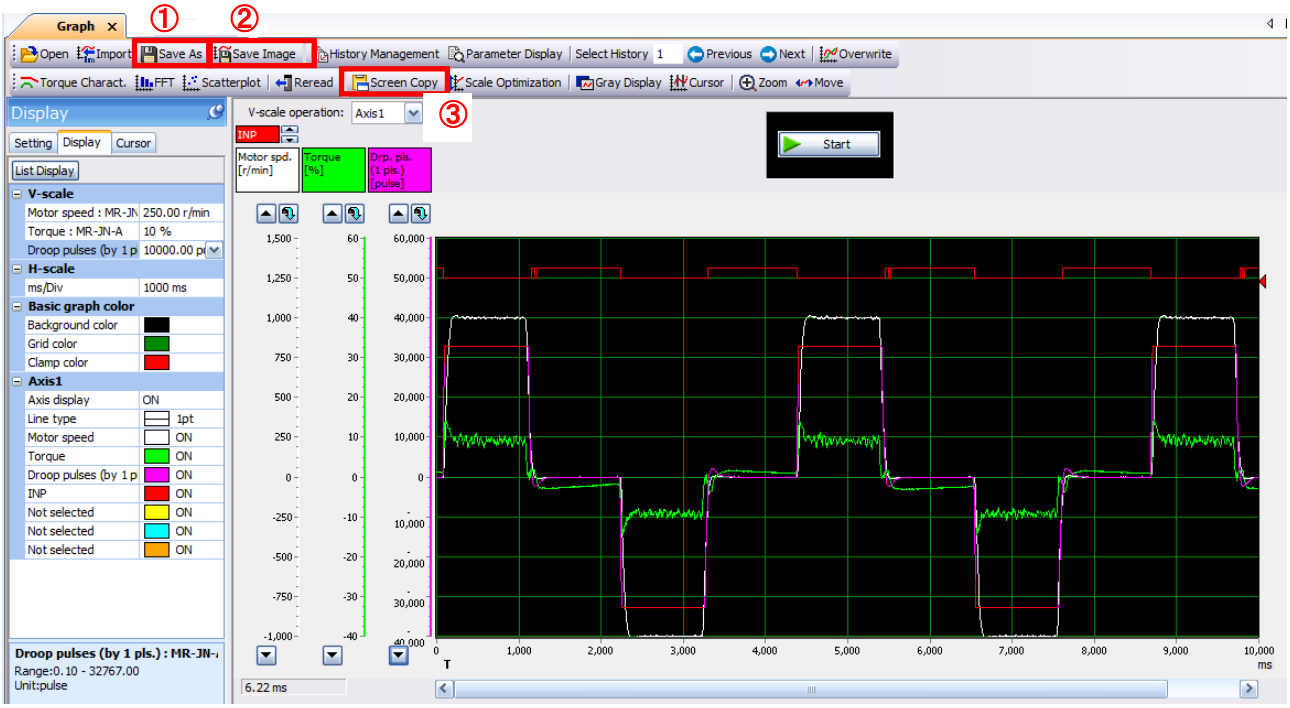
## 5.11.4 Saving of waveform

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).

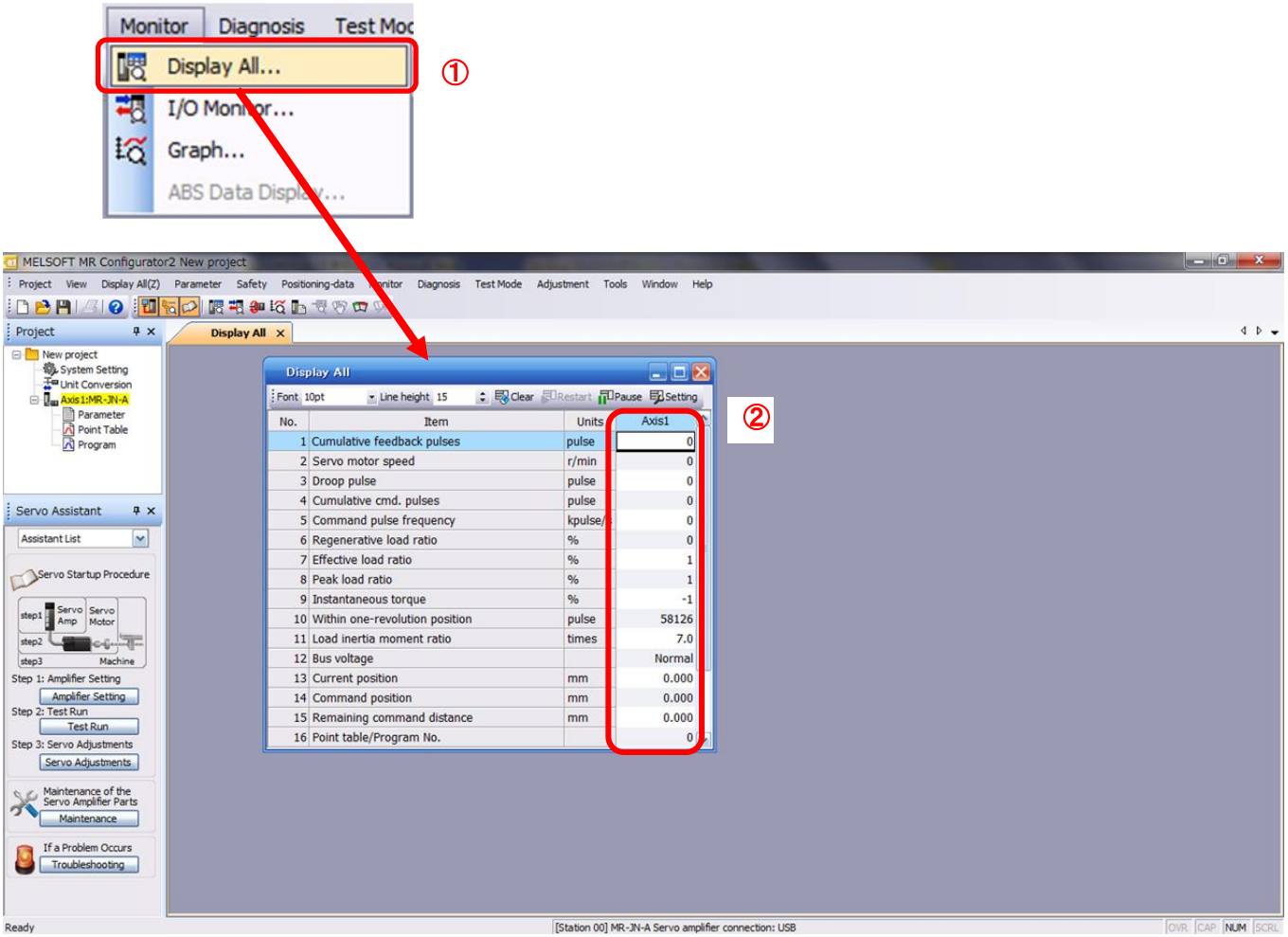


## 5.12 Display All Monitor List

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.<br>When exceed 999999999, it returns to zero.<br>Press the [Clear] button to reset the display value to 0 (zero).<br>Reverse rotation is indicated by a minus (-) sign. | -999999999 to 999999999 | pulse |
| 2 | Servo motor speed | The servo motor speed is displayed.<br>The value rounded off is displayed in 0.1r/min.<br>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.<br>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.<br>Press the [Clear] button to reset the display value to zero.<br>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.<br>Reverse rotation is indicated by a minus (-) sign.<br>(Note) -1500 to 1500 kpulse/s is showed when inputting command pulse.<br>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 %.<br>As the permissible regenerative power depends on whether there is the regenerative brake option or not.<br>Set Parameter PA02 correctly according to the regenerative option.<br>The guideline is 80% or less. | 0 to 100 | % |
| 7 | Effective load ratio | The continuous effective load torque is displayed.<br>The effective value is displayed relative to the rated torque of 100%. | 0 to 300 | % |
| 8 | Peak load ratio | The maximum torque is displayed.<br>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.<br>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.<br>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)<br>4: High voltage (About 375V or more)<br>3: Normal<br>2: Low voltage (About 200V or less)<br>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.<br>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 edgeof 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) | ・General home position return method using a proximity dog.<br>・Good repeat accuracy of home position return<br>・Decreases product load.<br>・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. | ・Home position return method using a proximity dog.<br>・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. | ・Since the machine part collides with the machine be fully lowered.<br>・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 dcceleration 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 dcceleration 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 (Simplified Edition)",section 5.3.4 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 Pparameters

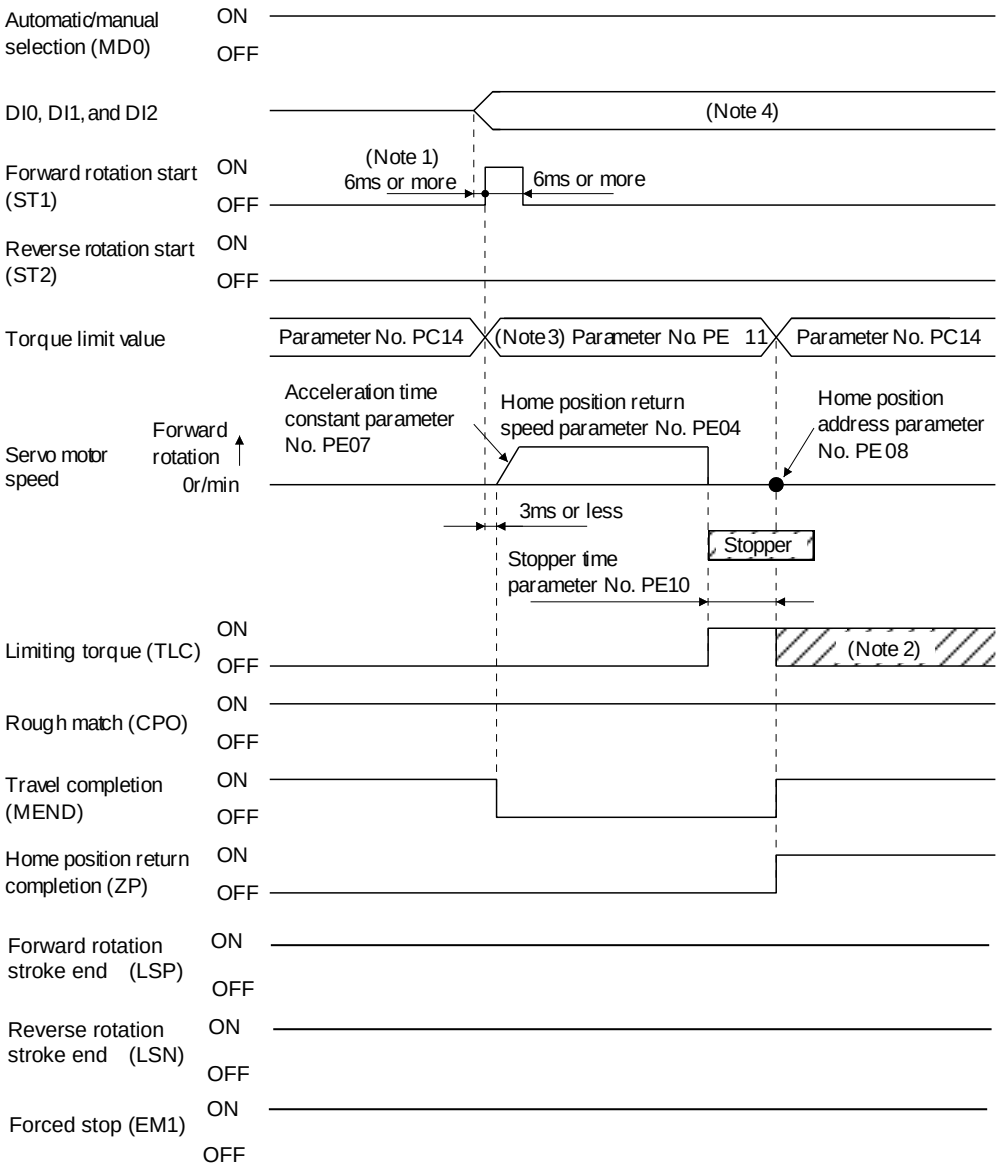
Configure the input devices and parameters as shown below.

| 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.<br>Program: Select a program that has the home position return "ZRT" command. |
| Stopper type home position return | Parameter No. PE03 | ☐ ☐ ☐ 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 TL1 | Limit value status | Validated torque limit values |
|---|---|---|
| 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. Diriving Methods for Each Mode

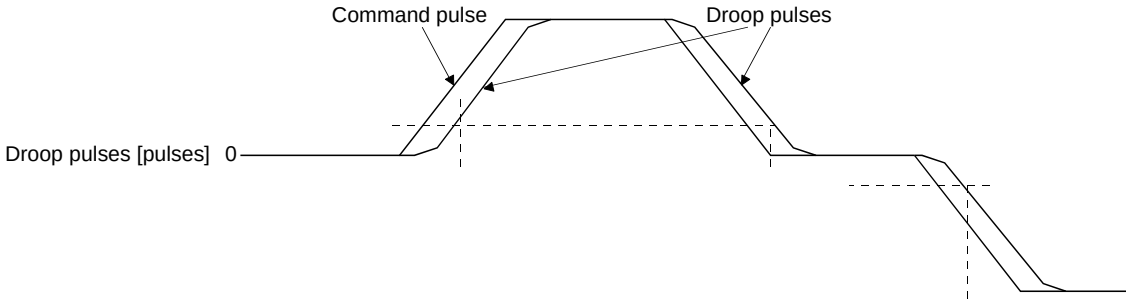
## 7.1 Position Control Mode (Pulse Input)

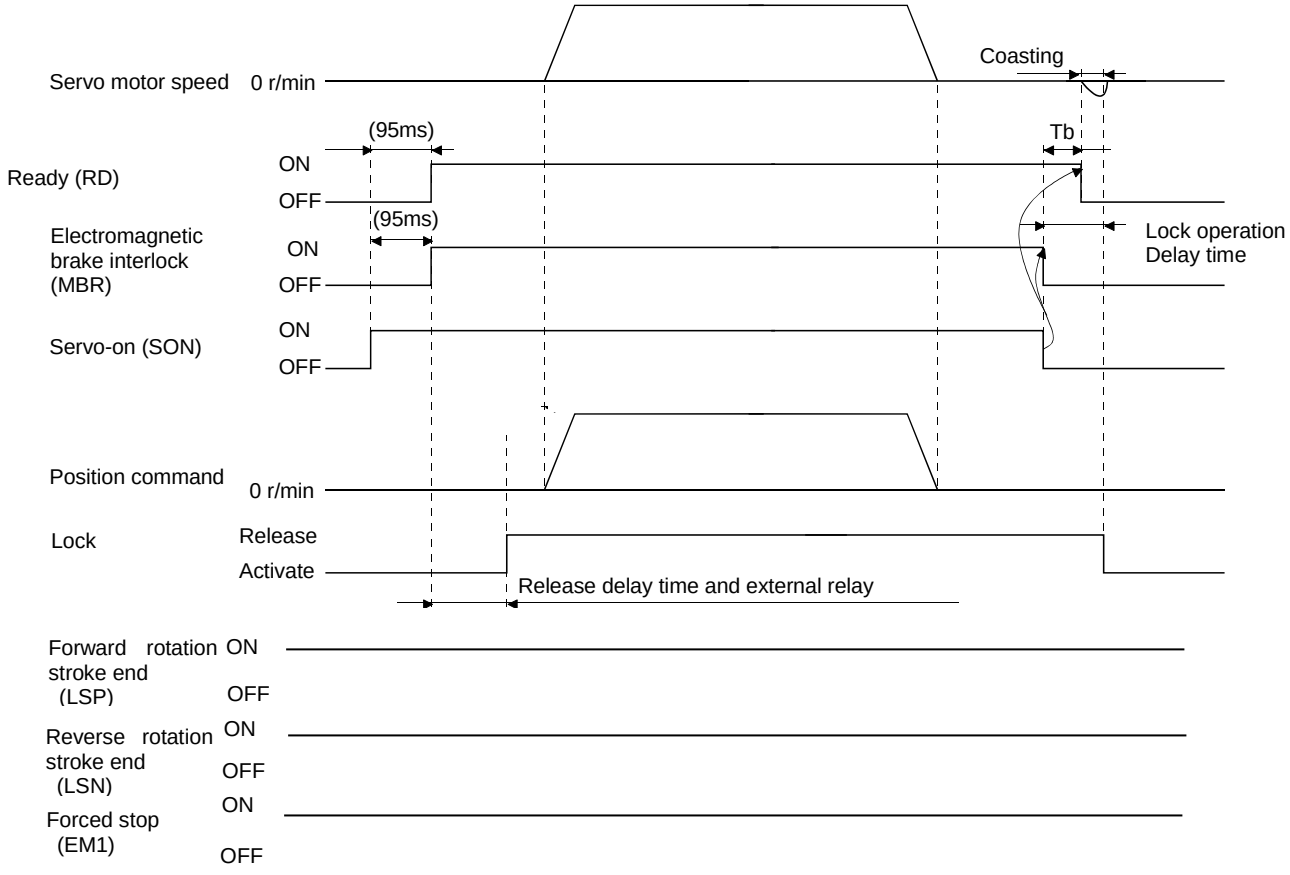
The motor rotation speed and acceleration / deceleration and direction is controlled using the pulse train and executes positioning operation.

### 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

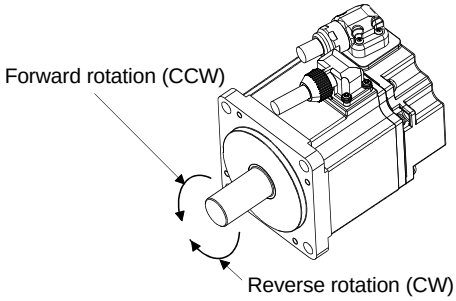
The servo motor operates at the speed set in parameters.

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.

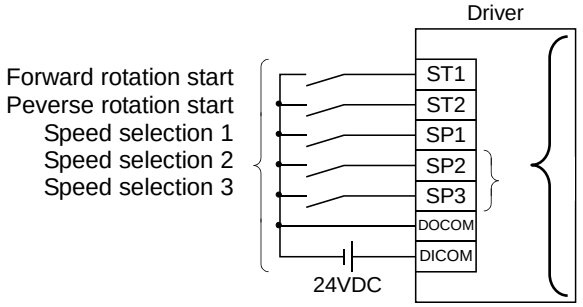
| (Note 1) Input device | | (Note 2) Rotation direction |
|---|---|---|
| ST2 | ST1 | |
| 0 | 0 | Stop (Servo lock) |
| 0 | 1 | Forward rotation (CCW) |
| 1 | 0 | Reverse rotation (CW) |
| 1 | 1 | Stop (Servo lock) |

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




Assignment of signals in the initial setting
- LECSA: SP1

Assign signals "speed selection 2 (SP2) and speed selection 3 (SP3) "when the driver is used to [Internal speed command 7].

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

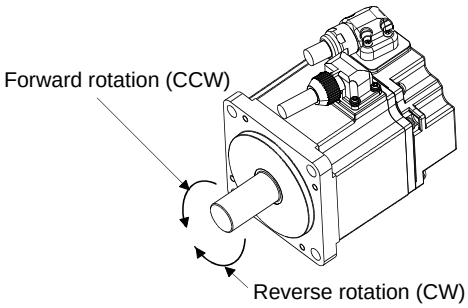
The servo motor will rotate when signal RS1 and RS2 turn on. An operation example of the torque control mode is shown below. Internal torque command settings:

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.

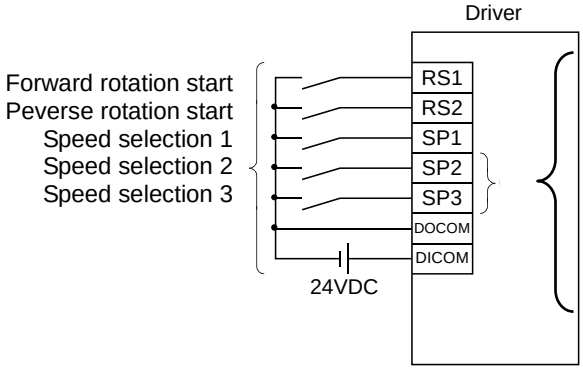
| (Note) Input device | | Rotation direction | |
|---|---|---|---|
| RS2 | RS1 | Internal torque command (parameter No. PC12) | |
| | | 0.1 to 100.0% | 0.0% |
| 0 | 0 | Torque is not generated. | Torque is not generated. |
| 0 | 1 | CCW (reverse rotation in driving mode/forward rotation in regenerative mode) | |
| 1 | 0 | CW (forward rotation in driving mode/reverse rotation in regenerative mode) | |
| 1 | 1 | Torque is not generated. | |




Note. 0: off
1: on

Generally, make connection as shown below.

Note that the inputs are configured as Current sink NPN Type




Assignment of signals in the initial setting
- LECSA: SP1

Assign signals "speed selection 2 (SP2) and speed selection 3 (SP3) "when the driver is used to up to [Internal speed command 7].

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.

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

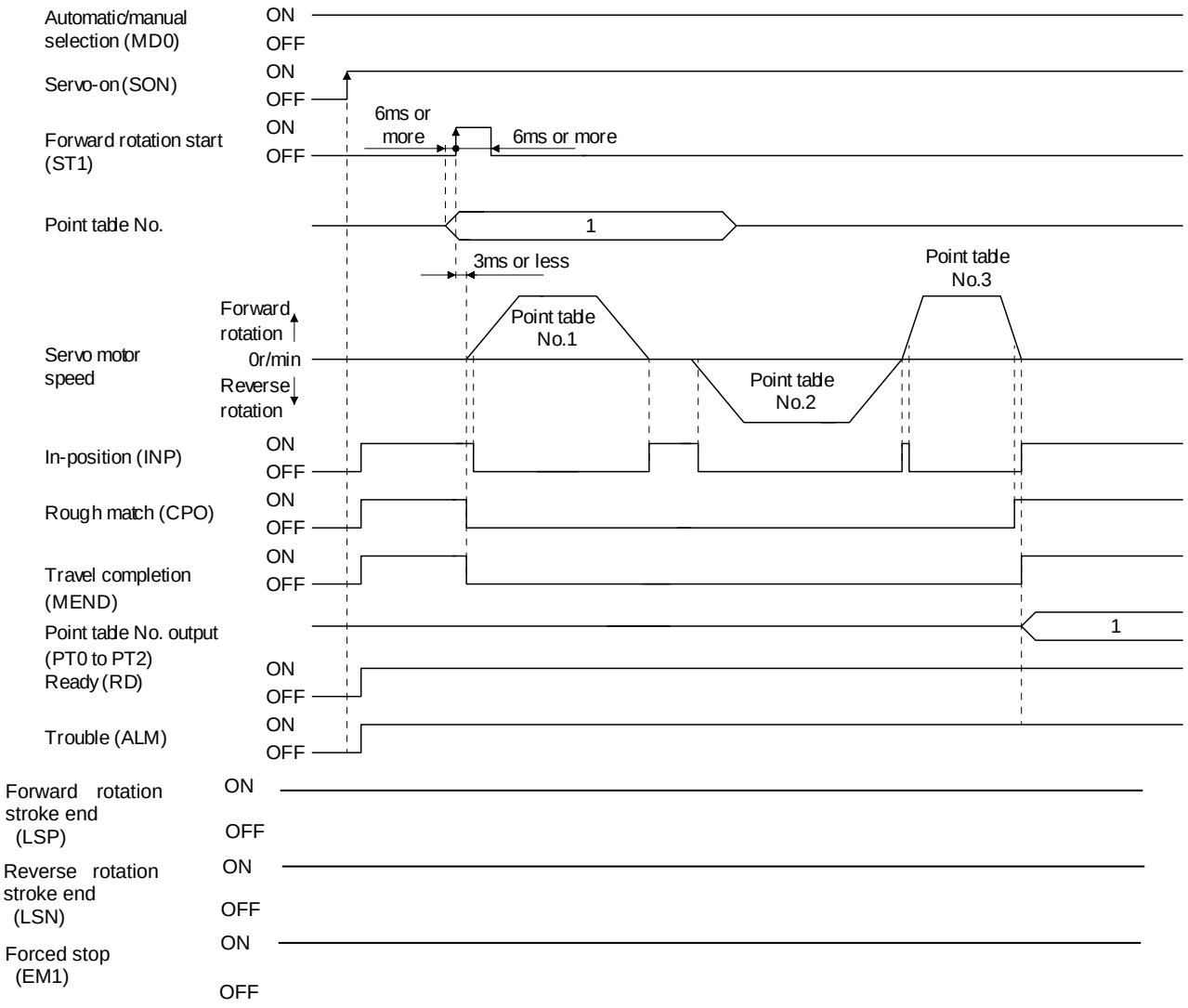
If the parameter " PE01：Command mode selection " setting is "0000：Absolute value command system " .

| Point table No. | Target position [×10$^{STM}$μm] | 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

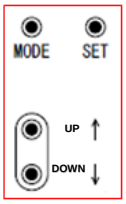

Automatic/manual selection (MD0)
ON
OFF
Servo-on (SON)
ON
OFF
Forward rotation start (ST1)
ON
OFF
6ms or more
6ms or more
Point table No.
1
3ms or less
Point table No.3
Forward rotation
Servo motor speed
0r/min
Reverse rotation
Point table No.1
Point table No.2
In-position (INP)
ON
OFF
Rough match (CPO)
ON
OFF
Travel completion (MEND)
ON
OFF
Point table No. output (PT0 to PT2)
1
Ready (RD)
ON
OFF
Trouble (ALM)
ON
OFF
Forward rotation stroke end (LSP)
ON
OFF
Reverse rotation stroke end (LSN)
ON
OFF
Forced stop (EM1)
ON
OFF

## 7.4.2 Setting method

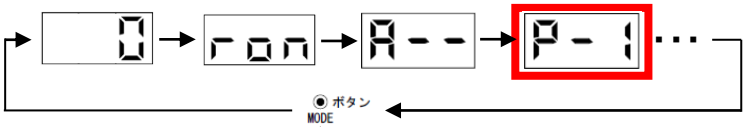
(1) Setting with the button on the front of the driver

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

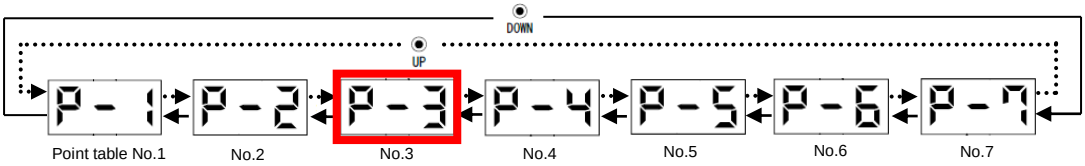
**Driver operation display**



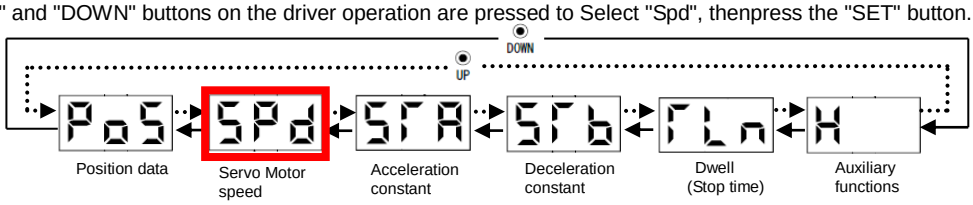

a. When the "MODE" button on the driver operation is pressed, the display will be shifted as shown below. Select "P-1".



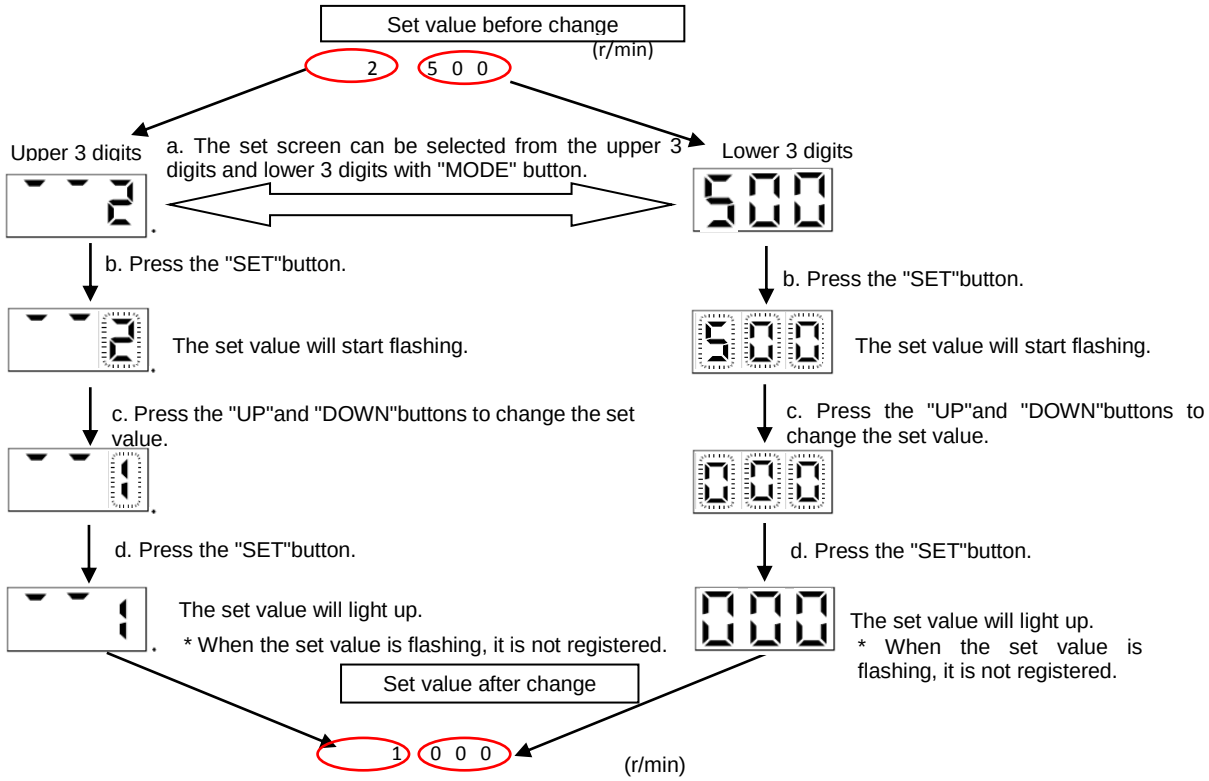

b. When the "UP" and "DOWN" buttons on the driver operation are pressed, the display will be shifted as shown below, Select "P-3" and press the "SET" button.




c. The "UP" and "DOWN" buttons on the driver operation are pressed to Select "Spd", thenpress 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 (Programimg 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

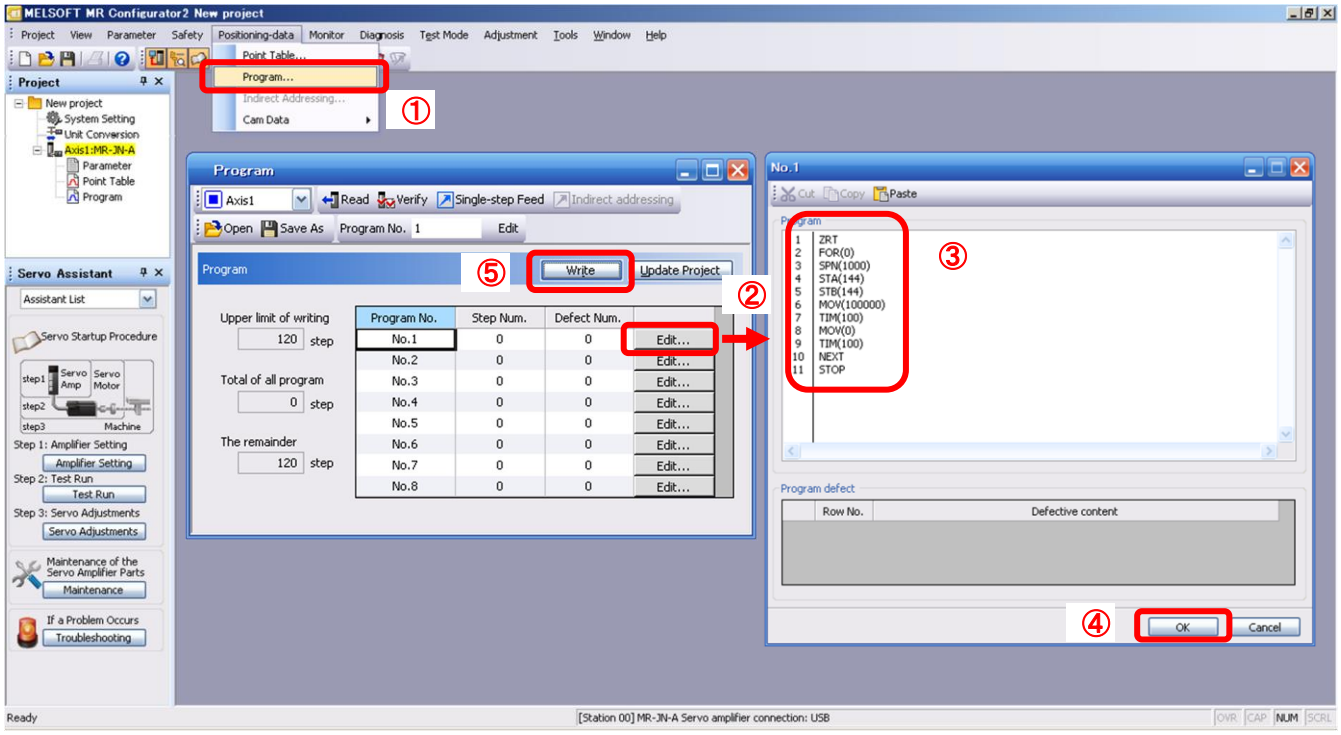
① Launch the setup software and select [Program] of [Positioning data].

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 [Writel] 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

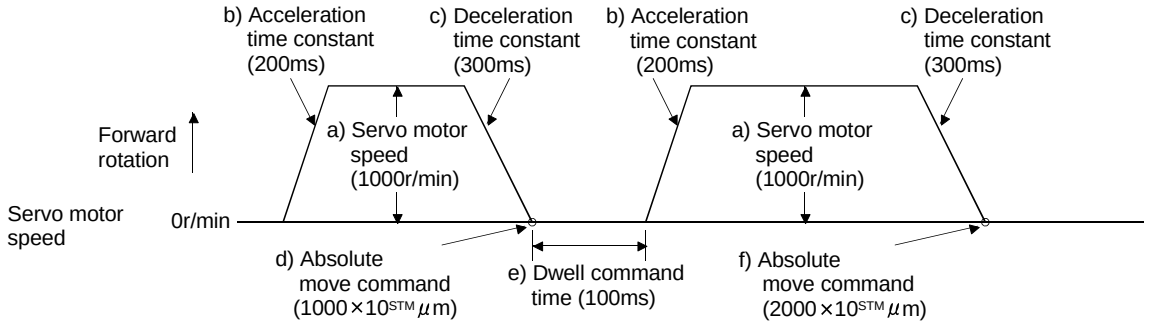
| Command | Name | Setting | Setting range | Unit | Indirect addressing | Description |
|---|---|---|---|---|---|---|
| SPN | Speed (Motor speed) | SPN (Setting value) | 0 to instantaneous permissible speed | r/min | ○ | Used to set the command speed of the servo motor for positioning.<br>The set value 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.<br>The set value is the time in which the servo motor reaches the rated speed from a stop.<br>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.<br>The set value is the time in which the servo motor stops from the rated speed.<br>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.

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

| 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 occurrs, 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 | A 10 | Undervoltage | ○ | ○ | ○ |
| | A.12 | A 12 | Memory error 1 (RAM) | ○ | | |
| | A.13 | A 13 | Clock error | ○ | | |
| | A.15 | A 15 | Memory error 2 (EEP-ROM) | ○ | | |
| | A.16 | A 16 | Encoder initial communication error1 | ○ | | |
| | A.17 | A 17 | Board error | ○ | | |
| | A.19 | A 19 | Memory error 3 (Flash-ROM) | ○ | | |
| | A.1A | A 1A | Motor combination error | ○ | | |
| | A.1C | A 1C | Software combination error | ○ | | |
| | A.1E | A 1E | Encoder initial communication error 2 | ○ | | |
| | A.1F | A 1F | Encoder initial communication error 3 | ○ | | |
| | A.20 | A20 | Encoder normal communication error 1 | ○ | | |
| | A.21 | A21 | Encoder normal communication error 2 | ○ | | |
| | A.24 | A24 | Main circuit error | ○ | ○ | ○ |
| | A.30 | A30 | Regenerative error | (Note 1) ○ | (Note 1) ○ | (Note 1) ○ |
| | A.31 | A31 | Overspeed | ○ | ○ | ○ |
| | A.32 | A32 | Overcurrent | ○ | | |
| | A.33 | A33 | Overvoltage | ○ | ○ | ○ |
| | A.35 | A35 | Command frequency error | ○ | ○ | ○ |
| | A.37 | A37 | Parameter error | ○ | | |
| | A.45 | A45 | Main circuit device overheat | (Note 1) ○ | (Note 1) ○ | (Note 1) ○ |
| | A.46 | A46 | Servo motor overheat | (Note 1) ○ | (Note 1) ○ | (Note 1) ○ |
| | A.50 | A50 | Overload 1 | (Note 1) ○ | (Note 1) ○ | (Note 1) ○ |
| | A.51 | A51 | Overload 2 | (Note 1) ○ | (Note 1) ○ | (Note 1) ○ |
| | A.52 | A52 | Error excessive | ○ | ○ | ○ |
| | A.8E | A8E | 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 | AE0 | Excessive regeneration warning | Does not stop |
| | A.E1 | AE1 | Overload warning 1 | Does not stop |
| | A.E6 | AE6 | Servo forced stop warning | Stops |
| | A.E9 | AE9 | 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 |

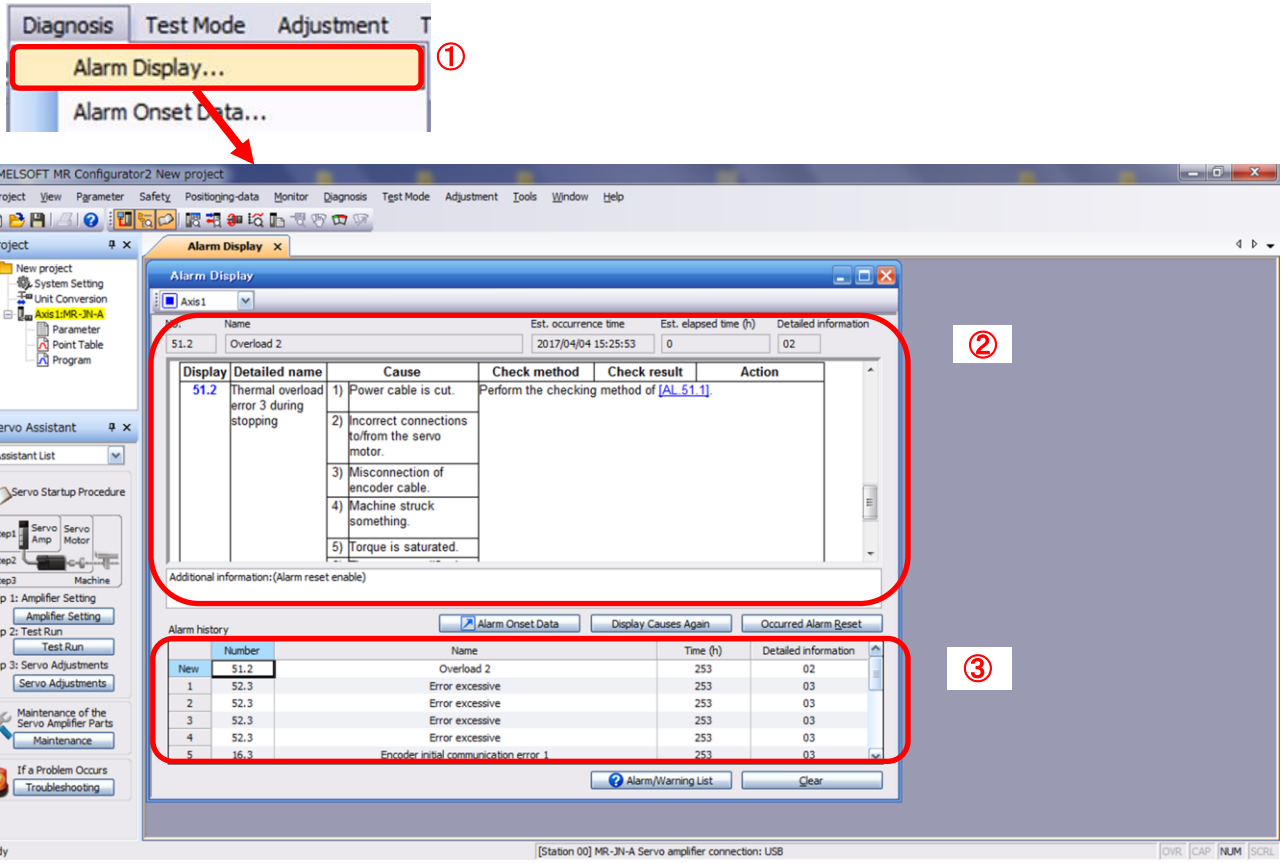
Note 1. Deactivate the alarm about 30 minutes of cooling time after removing the cause of occurrence.

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.)



| Revision history |
| --- |
| No.LEC-OM05601<br>Dec./2012 1st printing |
| No.LEC-OM05602<br>Dec./2013 2nd printing |
| No.LEC-OM05603<br>Jun./2014 3rd printing |
| No.LEC-OM05604<br>Aug./2014 4th printing |
| No.LEC-OM05605<br>Oct./2014 5th printing |
| No.LEC-OM05606<br>Oct./2014 6th printing |
| No.LEC-OM05607<br>Dec./2014 7th printing |
| No.LEC-OM05608<br>Apr./2015 8th printing |
| No.LEC-OM05609<br>Sep./2015 9th printing |
| No.LEC-OM05610 (No.JXC※-OMT0051)<br>Sep./2016 10th printing |
| No.LEC-OM05611 (No.JXC※-OMT0051-A)<br>Jun./2017 11th printing |
| No.JXC※-OMT0051-B<br>Mar./2018 12th printing<br>[5.5.1 Automatic Input Signal ON Selection Parameter Configuration] Change the contents.<br>[7.1 Position Control Mode (Pulse Input)] Change the contents.<br>[7.1.1 Position Control Mode Instructions] Change the contents. |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