Operation Manual
（Simplified edition）

AC Servo Motor Driver (MECHATROLINK-II type)

LECYM Series

SMC Corporation

Contents

LECYM Series / Driver
Safety Instructions

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

*1) ISO 4414: Pneumatic fluid power - General rules and safety requirements for systems and their components
ISO 4413: Hydraulic fluid power - General rules and safety requirements for systems and their components
IEC 60204-1: Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 10218-1: Robots and robotic devices - Safety requirements for industrial robots - Part 1:Robots
etc.

⚠	**Danger**	**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.
⚠	**Warning**	**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.
⚠	**Caution**	**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.

⚠ Warning

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

2. Only personnel with appropriate training should operate machinery and equipment.
The product specified here may become unsafe if handled incorrectly. The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.
1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.
2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.
3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

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

LECYM Series / Driver
Safety Instructions

⚠ **Caution**
SMC develops, designs, and manufactures products to be used for automatic control equipment, and provides them for peaceful use in manufacturing industries. **Use in non-manufacturing industries is not allowed.** Products SMC manufactures and sells cannot be used for the purpose of transactions or certification specified in the Measurement Act of each country. The new Measurement Act prohibits use of any unit other than SI units in Japan.

Limited warranty and Disclaimer/Compliance Requirements

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

Limited warranty and Disclaimer

1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.[*2)]
   Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.
2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.
   This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.
3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.
 	
    *2) Vacuum pads are excluded from this 1 year warranty.
      A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.
      Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty

Compliance Requirements

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

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Introduction

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

Select ΣV as an object series when you use SigmaWin+.
Refer to the table for the following type when you select the model (parameter edit at offline etc.).

Driver type	Driver select		Motor select	
	SMC	Sigma Win+	SMC	Sigma Win+
MECHATROLINK-Ⅱ	LECYM2-**	SGDV-****11* Y572AA	V5	SGDV-R90A11B
			V7	SGDV-1R6A11B
			V8	SGDV-2R8A11B
			V9	SGDV-5R5A11A

Please download setup software (SigmaWin+) via our website.
Refer to "LECYM Operation Manual",section 2.2 for method of installing setup software (SigmaWin+).

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1. Procedure before operation

1.1 Flow chart

Wiring check	- - -	Confirm that the cables to the driver and the actuator are connected correctly. Refer to [2. Wiring].
Surrounding environment check	- - -	Check the surrounding environment (cable routing and impurity such as wire off cuts or metallic dust) of the driver and the servo motor.
Power-on of the power supply	- - -	Follow the procedure shown in the "LECYM Operation Manual" to supply power to the product. When the power supply is turned on first, it is necessary to set up the absolute encoder. (Only the absolute encoder) Refer to [2. Wiring].
Communication setting of MECHATROLINK	- - -	Set the MECHATROLINK communication. Refer to [3. Communication setting].
Parameter setting	- - -	Set the parameters. Refer to [4. Parameter setting (Driver side)].
Test operation (JOG operation)	- - -	Use the test operation mode (JOG operation) at the slowest speed and check whether the servo motor rotates. Refer to [6. Trial Operation (SigmaWin+)].
Gain tuning	- - -	Operation with a vibration might be done according to the condition.In that case, adjust gain. Refer to the operation manual for LECYM.
Actual operation	- - -	Check if the cables to the driver and actuator are connected correctly. * "Return to home position" and "Positioning operation" etc. are possible by the instruction from PLC. Refer to the manual of the PLC for details.
Stop	- - -	Stop command to stop the operation.

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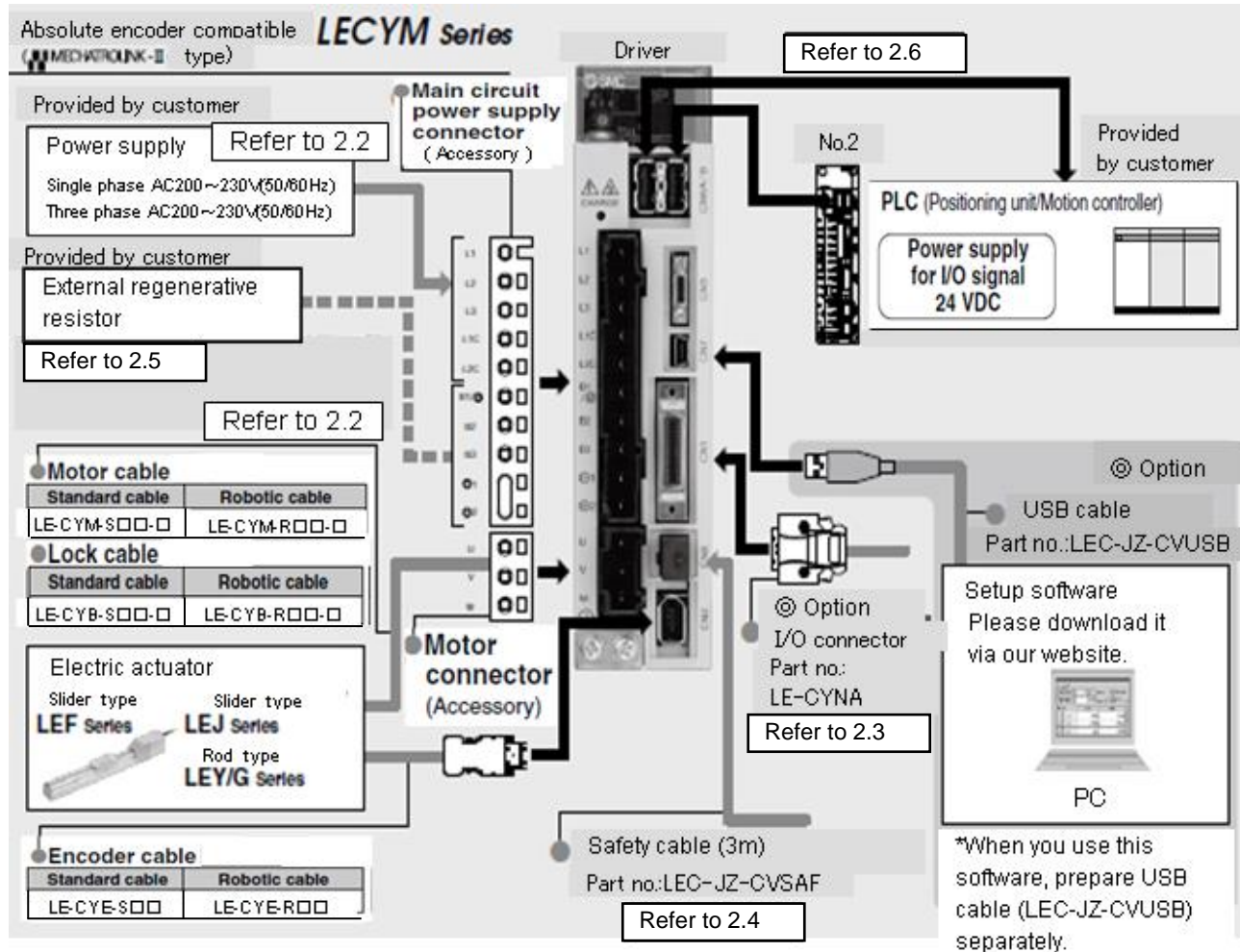# 2. Wiring

2.1 System configuration
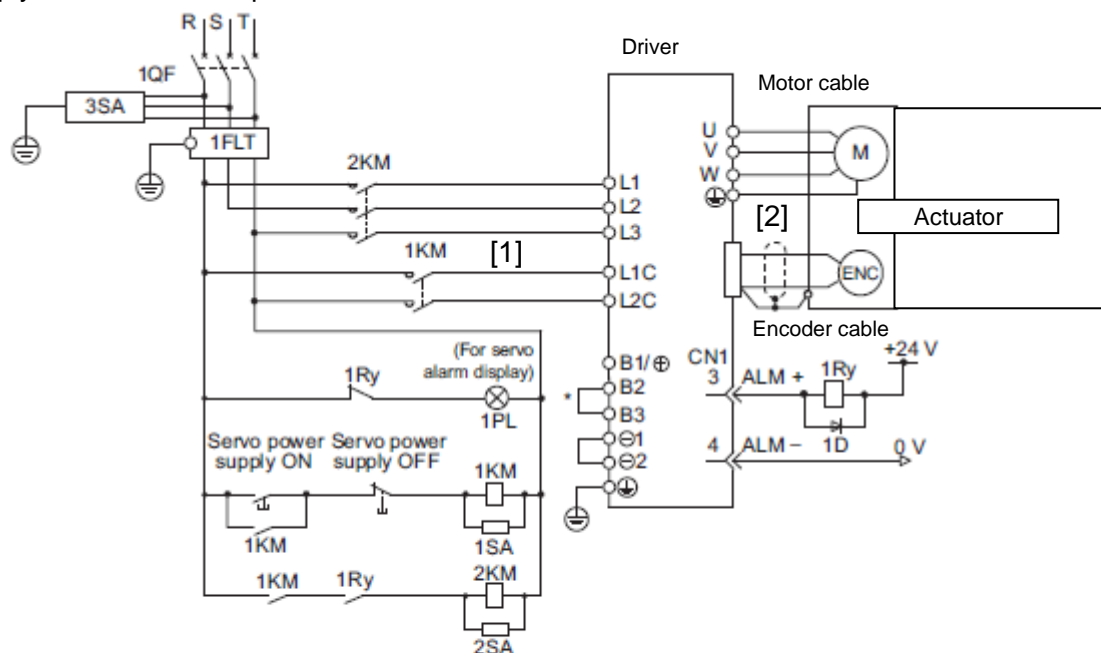
The system configuration chart is shown below.
Refer to the next paragraph for details of the wiring for each cable.

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2.2 Wiring for power supply

Connect the actuator and driver power supply.

(1) Power supply is AC200V three phase

Electric wire specifications

Item	Specifications
Applicable Wire size	L1, L2, L3, L1C, L2C Single line, twisted wire AWG14 (20mm^2)
Stripped section length	8~9mm

1QF: Molded-case circuit breaker
1FLT: Noise filter
1KM: Magnetic contactor (for control power supply)
2KM: Magnetic contactor (for main circuit power supply)
1Ry: Relay

1PL: Indicator lamp
1SA: Surge absorber
2SA: Surge absorber
3SA: Surge absorber
1D: Flywheel diode

∗ For the LECYM2-V5, V7, V8, terminals B2 and B3 are not short-circuited.
   Do not short-circuit these terminals.

[1] Main circuit power input terminals, L1, L2, L3 and Control power input terminals, L1, L2: Connect the 200VAC external power supply to the power supply. Refer to the power supply specification for the size of the acceptable electric wire.

[2] Connect the motor cable (U, V, W) to the servomotor connection terminals (U, V, W).
   Connect the motor ground terminal to the driver ground terminal.
   Connect the encoder cable to the encoder cable connector.

*Please connect lock connection terminal (B) with the DC24V power supply for the motor cable with the lock.
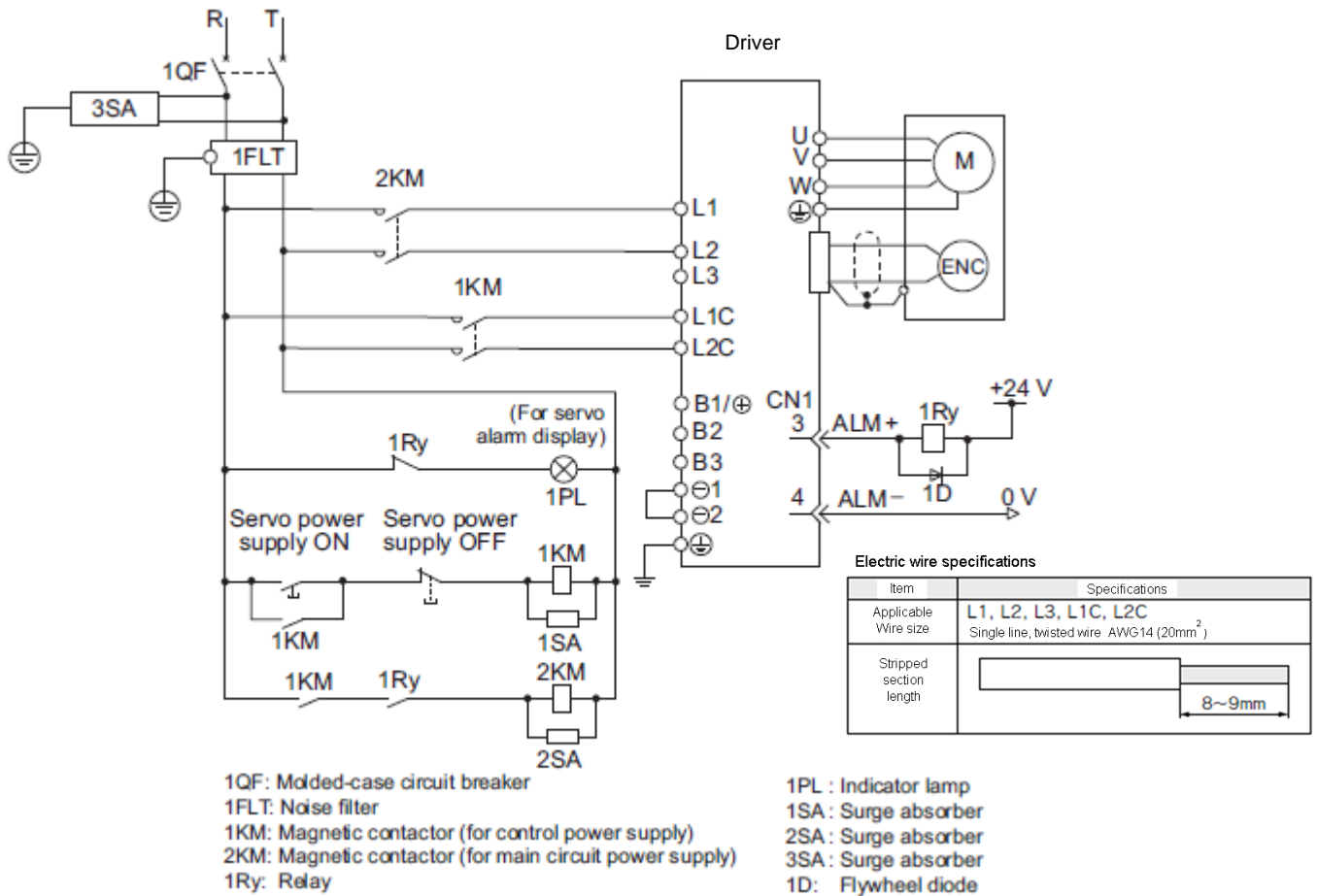

IMPORTANT

When starting the machine for the first time, setting up and reinitialization of the absolute encoder are necessary. When the absolute encoder is used as the incremental encoder, it is unnecessary.

In the SigmaWin+ main window, click **Setup**, point to **Set Absolute Encoder** and click **Reset Absolute Encoder**.

Please close unnecessary screens such as alarm display screen and parameter screen at this time.

The absolute encoder can only be set up while the servo is off. Turn the power back on after the encoder has been successfully set up.

(2) Power supply is AC200V single phase

Electric wire specifications		
Item	Specifications	
Applicable Wire size	L1, L2, L3, L1C, L2C Single line, twisted wire AWG14 (20mm^2)	
Stripped section length		8~9mm

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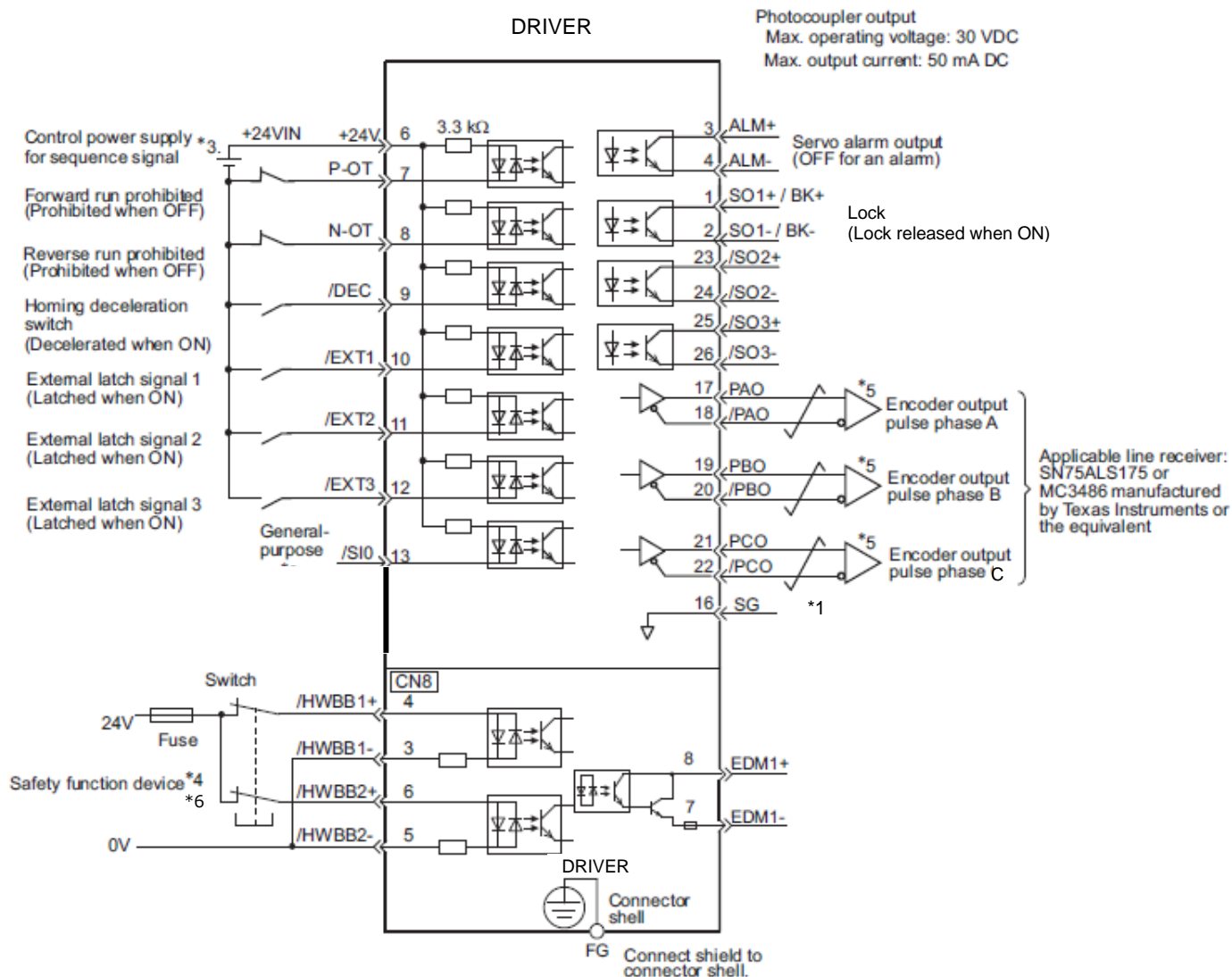unnecessary.
In the SigmaWin+ main window, click **Setup**, point to **Set Absolute Encoder** and click
Reset Absolute Encoder.
Please close unnecessary screens such as alarm display screen and parameter screen at
this time.
The absolute encoder can only be set up while the servo is off. Turn the power back on after
the encoder has been successfully set up.

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2.3 I/O signal connection example (Sink I/O interfaces)

The following diagram shows a typical connection example.

DRIVER

Photocoupler output
Max. operating voltage: 30 VDC
Max. output current: 50 mA DC

Control power supply *3
for sequence signal

+24VIN   +24V   6   3.3 kΩ

Forward run prohibited
(Prohibited when OFF)   P-OT   7

3   ALM+   Servo alarm output
4   ALM-   (OFF for an alarm)

Reverse run prohibited
(Prohibited when OFF)   N-OT   8

1   SO1+ / BK+   Lock
2   SO1- / BK-   (Lock released when ON)

Homing deceleration
switch
(Decelerated when ON)   /DEC   9

23   /SO2+
24   /SO2-

External latch signal 1
(Latched when ON)   /EXT1   10

25   /SO3+
26   /SO3-

External latch signal 2
(Latched when ON)   /EXT2   11

17   PAO   *5   Encoder output
18   /PAO   pulse phase A

External latch signal 3
(Latched when ON)   /EXT3   12

19   PBO   *5   Encoder output
20   /PBO   pulse phase B

Applicable line receiver:
SN75ALS175 or
MC3486 manufactured
by Texas Instruments or
the equivalent

General-
purpose   /SI0   13

21   PCO   *5   Encoder output
22   /PCO   pulse phase C

16   SG   *1

CN8

Switch   /HWBB1+   4
24V   Fuse   /HWBB1-   3

8   EDM1+

Safety function device *4
*6   /HWBB2+   6

7   EDM1-

0V   /HWBB2-   5

DRIVER

Connector
shell

FG   Connect shield to
connector shell.

*1. ⫰ represents twisted-pair wires.

*3. The 24-VDC power supply is not included. Use a 24-VDC power supply with double insulation or reinforced insulation.

*4. When using the safety function, a safety function device must be connected and the wiring that is necessary to activate the safety function must be done to turn ON the servomotor power. When not using the safety function, use the
DRIVER with the Safety Jumper Connector (provided as an accessory) inserted into the CN8.

*5. Always use line receivers to receive the output signals.

*6. It is a safety function equivalent to the STO function (IEC 61800-5-2) using the hard wire base block function (HWBB).

Note: Refer to "LECYM Operation Manual",section 3.2.1 and "LECYM Operation Manual (Simplified Edition)",section 2.3.1 for input/output signal details.
Refer to "LECYM Operation Manual", section 3.4 and "LECYM Operation Manual (Simplified Edition)",section 2.3.2 and 2.3.3 for wiring details.
The functions allocated to the input signals /DEC, P-OT, N-OT, /EXT1, /EXT2, and /EXT3 and the output signals /SO1, /SO2, and /SO3 can be changed by using the parameters. Refer to "LECYM Operation Manual",section 3.3.1. and 3.3.2.

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The following table shows the names and functions of I/O signals (CN1).

(1) Input Signals

Signal	Pin No.	Name	Function
P-OT (/SI1) N-OT (/SI2)	7 8	Forward run prohibited, Reverse run prohibited	With overtravel prevention: Stops servomotor when movable part travels beyond the allowable range of motion.
/DEC (/SI3)	9	Homing deceleration switch signal	Connects the deceleration limit switch for homing.
/EXT 1 (/SI4) /EXT 2 (/SI5) /EXT 3 (/SI6)	10 11 12	External latch signal 1 External latch signal 2 External latch signal 3	Connects the external signals that latch the current feedback pulse counter.
/SI0	13	General-purpose input signal	Used for general-purpose input. Monitored in the I/O monitor field of MECHATROLINK-II.
+24VIN	6	Control power supply for sequence signal	Control power supply input for sequence signals. Allowable voltage fluctuation range: 11 to 25 V Note: The 24 VDC power supply is not included.
/P-CL /N-CL	Can be allocated	Forward external torque limit Reverse external torque limit	The allocation of an input signal to a pin can be changed in accordance with the function required.

Note 1. The allocation of the input signals (/SI1 to /SI6) can be changed. For details, refer to "LECYM Operation Manual",section 3.3.1.

2. If the Forward run prohibited/ Reverse run prohibited function is used, the DRIVER is stopped by software controls, not by electrical or mechanical means. If the application does not satisfy the safety requirements, add an external circuit for safety reasons as required.

(2) Output Signals

| Signal	Pin No.	Name	Function
ALM+ ALM-	3 4	Servo alarm output signal	Turns OFF when an error is detected.
/BK+ (/SO1+) /BK- (/SO1-)	1 2	Lock interlock signal	Controls the lock. The lock is released when the signal turns ON. Allocation can be changed to general-purpose output signals (/SO1+, /SO1-).
/SO2+ /SO2- /SO3+ /SO3-	23 24 25 26	General-purpose output signal	Used for general-purpose output. Note: Set the parameter to allocate a function.
/COIN /V-CMP /TGON /S-RDY /CLT /VLT /WARN /NEAR	Can be allocated	Positioning comple- tion Speed coincidence detection Rotation detection Servo ready Torque limit Speed limit detection Warning Near	The allocation of an output signal to a pin can be changed in accordance with the function required.
PAO /PAO	17 18	Phase-A signal	Encoder output pulse signals for two-phase 90° phase differential
PBO /PBO	19 20	Phase-B signal	
PCO /PCO	21 22	Phase-Z signal	Origin pulse output signal
SG	16	Signal ground	Connects to the 0 V pin on the control circuit of the PC or PLC ... etc.
FG	Shell	Frame ground	Connected to frame ground if the shielded wire of the I/O sig- nal cable is connected to the connector shell.

Note: The allocation of the output signals (/SO1 to /SO3) can be changed. For details, refer to "LECYM Operation Manual",section 3.3.2.

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2.3.2 Sequence Input Circuit

(1) Photocoupler Input Circuit

CN1 connector terminals 6 to 13 are explained below.

The sequence input circuit interface is connected through a relay or open-collector transistor circuit. When connecting through a relay, use a low-current relay. If a low-current relay is not used, a faulty contact may result.
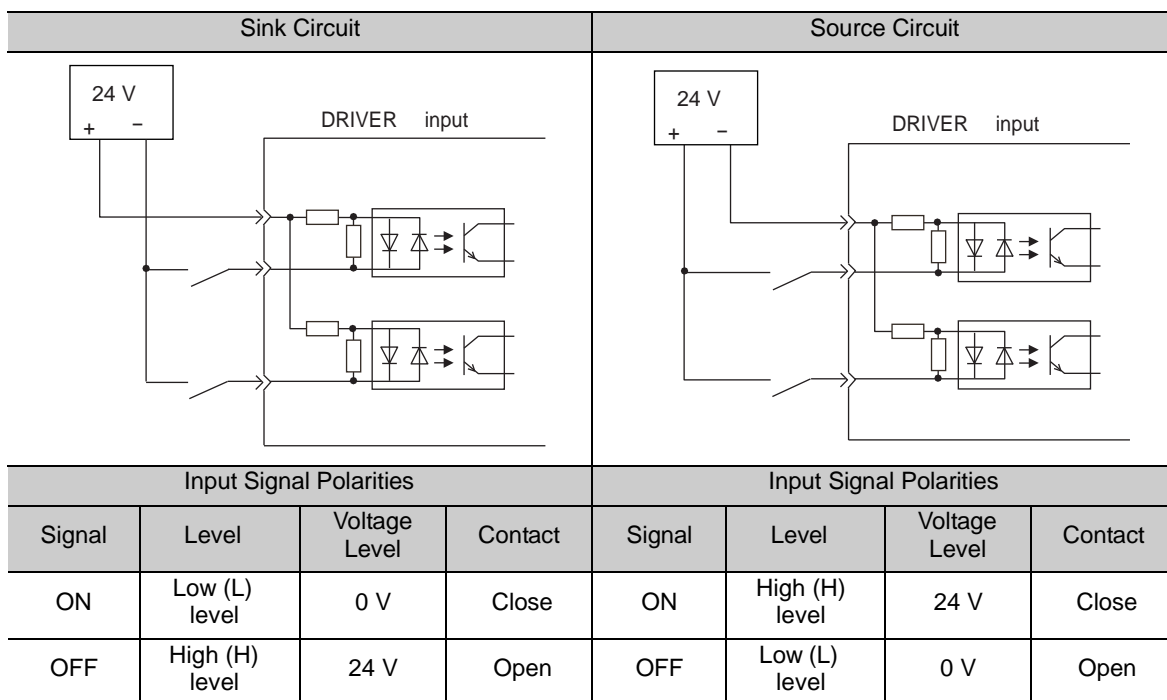
Relay Circuit Example	Open-collector Circuit Example
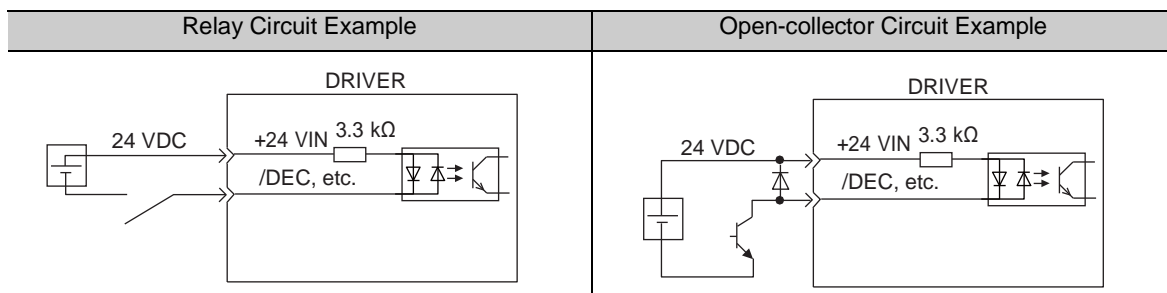
Note: The 24 VDC external power supply capacity must be 50 mA minimum.

The DRIVER's input circuit uses bidirectional photocoupler. Select either the sink circuit or the source circuit according to the specifications required for each machine.

Note: - The connection example in 2.3 shows sink circuits.
- The ON/OFF polarity differs between when a sink circuit is connected and when a source circuit is connected.

Sink Circuit	Source Circuit

Input Signal Polarities				Input Signal Polarities			
Signal	Level	Voltage Level	Contact	Signal	Level	Voltage Level	Contact
ON	Low (L) level	0 V	Close	ON	High (H) level	24 V	Close
OFF	High (H) level	24 V	Open	OFF	Low (L) level	0 V	Open

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2.3.3 Sequence Output Circuit

> **!** **IMPORTANT**
> Incorrect wiring or incorrect voltage application to the output circuit may cause short-cir- cuit.
> If a short-circuit occurs as a result of any of these causes, the holding lock will not work.
> This could damage the machine or cause an accident resulting in death or injury.

(1) Photocoupler Output Circuit
Photocoupler output circuits are used for servo alarm (ALM), servo ready (/S-RDY), and other sequence out- put signal circuits. Connect a photocoupler output circuit through a relay or line receiver circuit.

Relay Circuit Example (Sink Circuit)	Line Receiver Circuit Example (Source Circuit)

Line Receiver Circuit Example
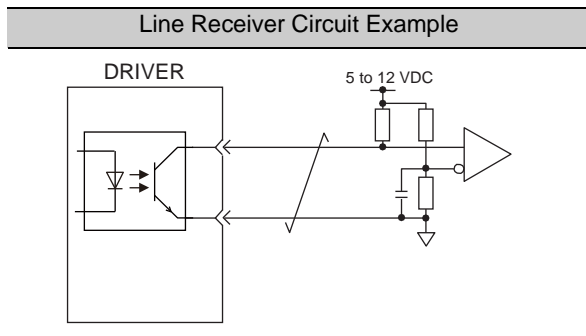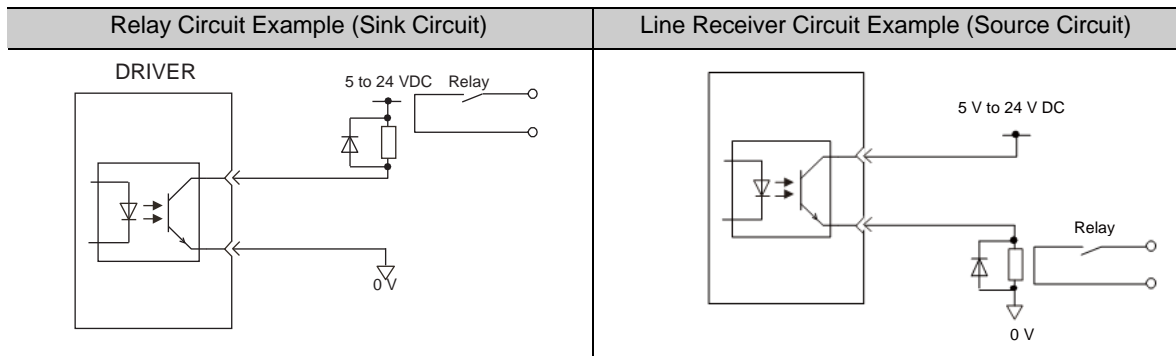
Note: The maximum allowable voltage and the allowable range of current capacity for photocoupler output circuits are as follows.
- Voltage: 30 VDC
- Current: 5 to 50 mA DC

Note: The connection example in 2.3 shows sink circuits.

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(2) Line Driver Output Circuit

CN1 connector terminals, 17-18 (phase-A signal), 19-20 (phase-B signal), and 21-22 (phase-Z signal) are explained below.

These terminals output the following signals via the line-driver output circuits.

- Output signals for which encoder serial data is converted as two phases pulses (PAO, /PAO, PBO, /PBO)
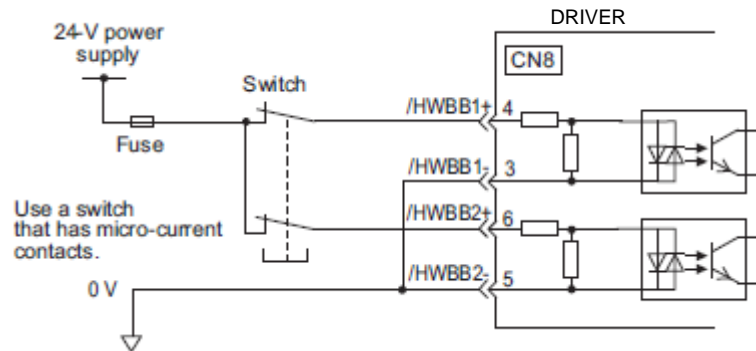- Origin pulse signals (PCO, /PCO)

Connect the line-driver output circuit through a line receiver circuit at the PC or PLC ... etc.

Line Receiver Circuit Example

DRIVE   PC or PLC ... etc

Applicable line receiver:
SN75ALS175 or the
equivalent

220 to
470 Ω

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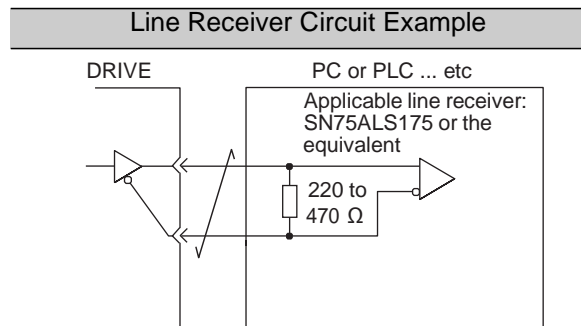
2.4 Wiring for Safety cable

(1) Connection Example for input signals
  The input signals must be redundant.

! IMPORTANT	For safety function signal connections, the input signal is the 0 V common and the output signal is the source output. When using the safety function, a safety function device must be connected and the wiring that is necessary to activate the safety function must be done to turn ON the servomotor power. When not using the safety function, use the DRIVER with the Safety Jumper Connector (provided as an accessory) inserted into the CN8.

(2) Connection Example for output signals
  EDM1 output signal is used for source circuit. **It is not able to use the sink output.**

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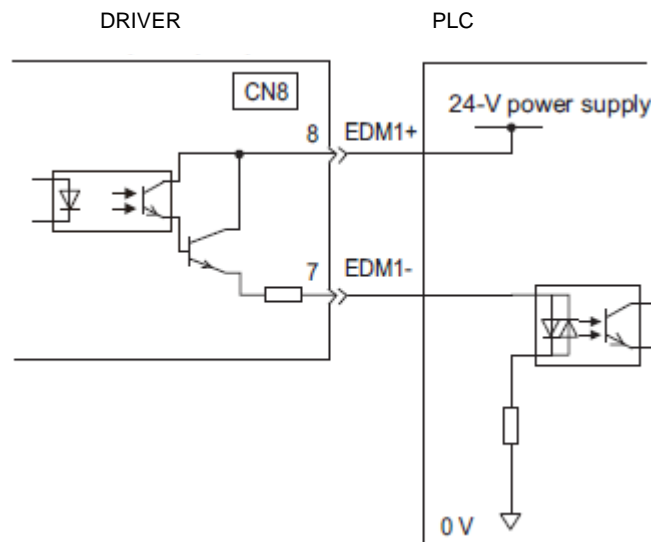
2.5 Wiring for external regenerative resistor

Please prepare it in your company when the external regenerative resistor is necessary.
Refer to the catalog of each actuator for the selection of the external regenerative resistor.

(1) DRIVERs: Model LECYM2-V5, V7, V8

Connect an external Regenerative resistor between the B1/⏚ and B2 terminals on the DRIVER. After connecting a option, select the capacity. For more information on how to set the capacity of Regenerative resistors, Refer to "LECYM Operation Manual (Simplified Edition)",section 4.6.

Enlarged View
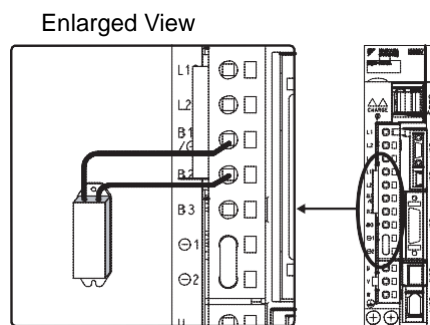
(2) DRIVER: Model LECYM2-V9

Disconnect the wiring between the DRIVER's B2 and B3 terminals and connect an external Regenerative resistor between the B1/⏚ and B2 terminals. After connecting the option, select the capacity. For more information on how to set the capacity of Regenerative resistors, Refer to "LECYM Operation Manual (Simplified Edition)",section 4.6.

Note: Be sure to take out the lead wire between the B2 and B3 terminals.

Enlarged View
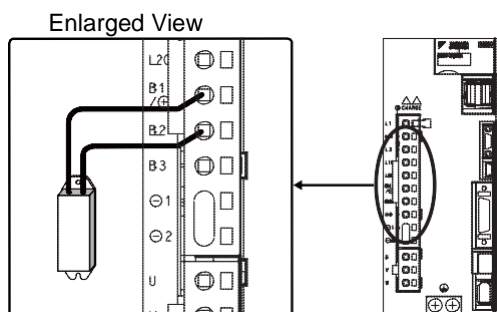
⚠ WARNING

Be sure to connect the regenerative resistor correctly. Do not short-circuit between B1/ ⊕ and B2. Doing so may result in fire or damage to the regenerative resistor or DRIVER.

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2.6 MECHATROLINK cable wiring

The following diagram shows an example of connections between a PC or PLC... etc and a DRIVER using MECHATROLINK-II communications cables (CN6A, CN6B).
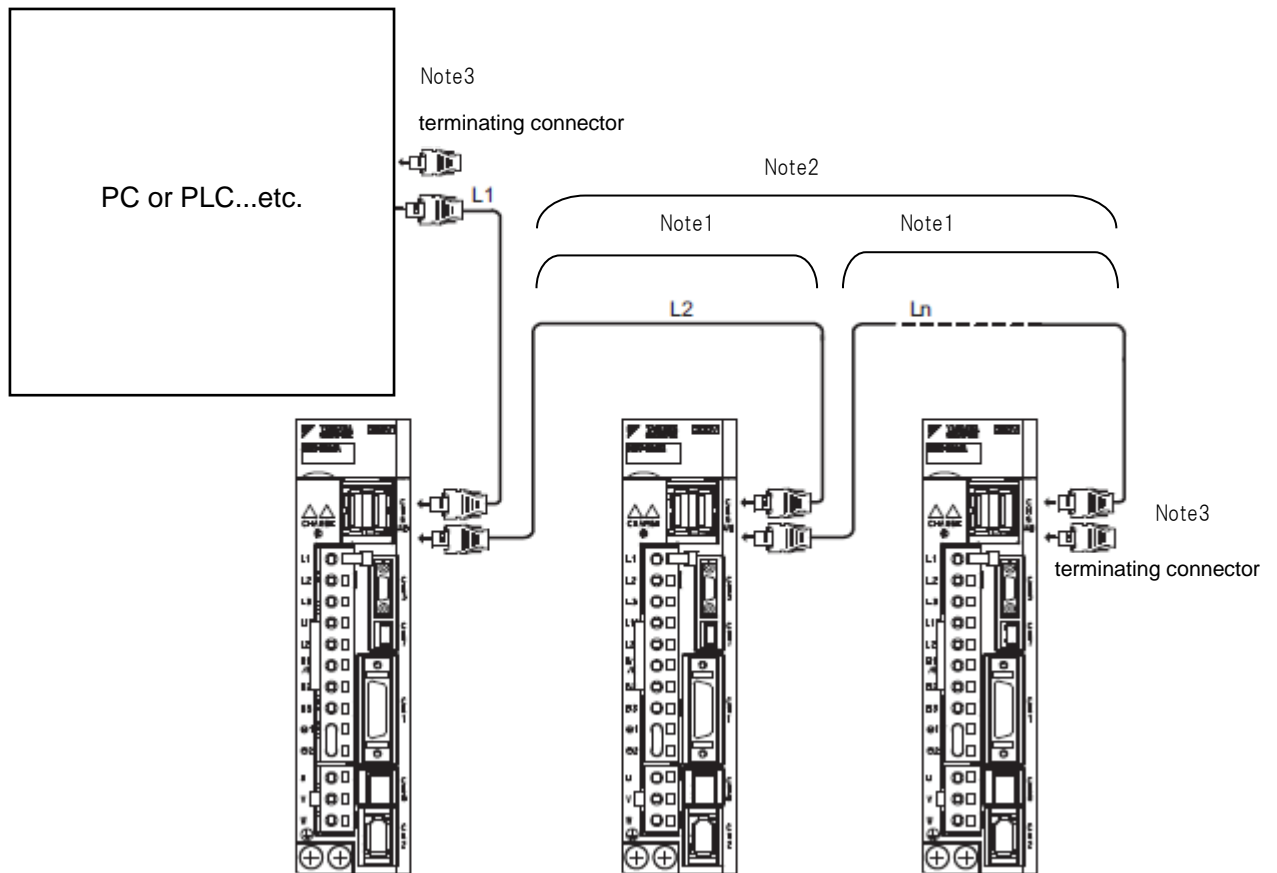

Note 1. The length of the cable between stations (L1, L2 ... Ln) must be 0.5 m or more.
   2. The total cable length must be L1 + L2 ... + Ln ≤ 50.
   3. Please connect terminating connector with PLC. When multiple DRIVERs are connected by MECHATROLINK-II communications cable, a terminating connector must be installed at the final DRIVER.

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3. Communications Setting

The SW2 DIP switch is used to make the settings for MECHATROLINK-II communications. The station address is set using the rotary switch (SW1) and the DIP switch (SW2).
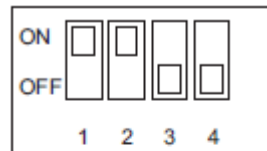
SW2 (factory settings)
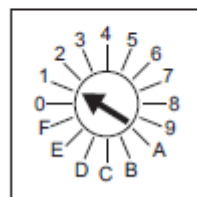
SW1 (factory setting)

(1) Settings for the SW2 DIP Switch

The following table shows the settings of the DIP switch (SW2).

SW2	Function	Setting	Description	Factory setting
Pin 1	Sets the baud rate.	OFF	4 Mbps (MECHATROLINK-I)	ON
		ON	10 Mbps (MECHATROLINK-II)	
Pin 2	Sets the number of trans-mission bytes.	OFF	17 bytes	ON
		ON	32 bytes	
Pin 3	Sets the station address.	OFF	Station address = 40H + SW1	OFF
		ON	Station address = 50H + SW1	
Pin 4	Reserved. (Do not change.)	OFF	–	OFF

	• When connecting to a MECHATROLINK-I network, turn OFF pins 1 and 2.
IMPORTANT	• When using a MECHATROLINK-I network (Baud rate: 4 Mbps), the settings for the number of transmission bytes is disabled and the number of transmission bytes is always 17.

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(2) Setting the Station Address

The following table lists the possible settings of the rotary switch (SW1) and the DIP switch (SW2) that can be combined to form a station address.

The factory setting for the station address is 41H (SW2 = OFF, SW1 = 1).

Bit 3 of SW2	SW1	Station Address	Bit 3 of SW2	SW1	Station Address
OFF	0	Disabled	ON	0	50H
OFF	1	41H	ON	1	51H
OFF	2	42H	ON	2	52H
OFF	3	43H	ON	3	53H
OFF	4	44H	ON	4	54H
OFF	5	45H	ON	5	55H
OFF	6	46H	ON	6	56H
OFF	7	47H	ON	7	57H
OFF	8	48H	ON	8	58H
OFF	9	49H	ON	9	59H
OFF	A	4AH	ON	A	5AH
OFF	B	4BH	ON	B	5BH
OFF	C	4CH	ON	C	5CH
OFF	D	4DH	ON	D	5DH
OFF	E	4EH	ON	E	5EH
OFF	F	4FH	ON	F	5FH

! IMPORTANT	• Turn the power OFF and then ON again to validate the new settings.

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Ex) When you connect three station
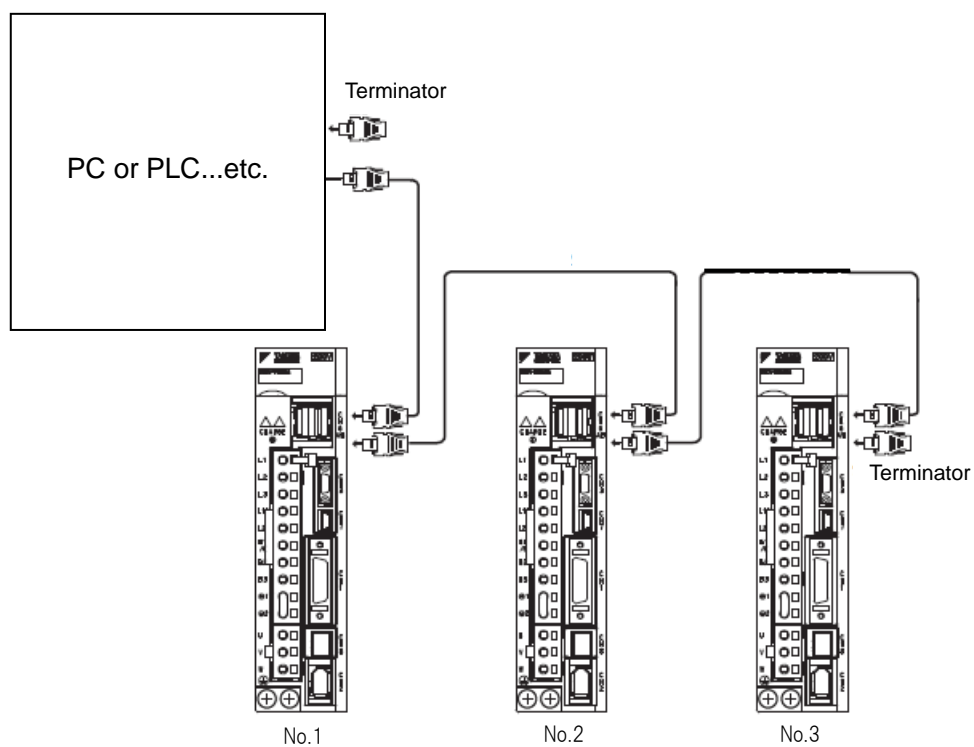
Setting the Station Address

	Bit 3 of SW2	SW1	Station Address
N0.1		1	41H
N0.2	OFF	2	42H
N0.3		3	43H

SMC

4. Parameter setting (Driver side)

The setting is a necessary parameter. Please optionally set it. Please refer to "LECYM manual" for a detailed parameter.
Setup software (SigmaWin+) is necessary for the setting of the parameter.
※1 Please download setup software via our website.
※2 Prepare USB cable (LEC-JZ-CVUSB) separately.

4.1 power supply specifications

When using the DRIVER with single-phase, 200 V power input, set parameter Pn00B.2 to 1.

Parameter		Meaning	When Enabled	Classification
Pn00B	n.□0□□ [Factory setting]	Enables use of three-phase power supply for three-phase DRIVER.	After restart	Setup
	n.□1□□	Enables use of single-phase power supply for three-phase DRIVER.		

4.2 Overtravel

For machines that move using linear motion, connect limit switches to P-OT and N-OT of CN1 as shown below to prevent machine damage. To prevent a contact fault or disconnection from causing accidents, make sure that the limit switches are normally closed.
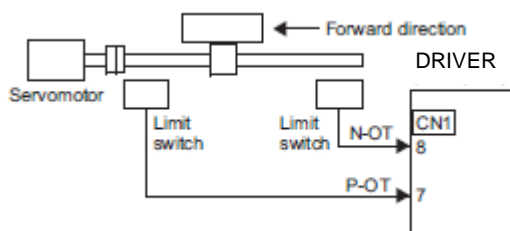
Parameters Pn50A and Pn50B can be set to enable or disable the overtravel function.
If the overtravel function is not used, no wiring for overtravel input signals will be required.

Parameter		Meaning	When Enabled	Classification
Pn50A	n.1□□□ [Factory setting]	Inputs the Forward Run Prohibited (P-OT) signal from CN1-7.	After restart	Setup
	n.8□□□	Disables the Forward Run Prohibited (P-OT) signal. Allows constant forward rotation.		
Pn50B	n.□□□2 [Factory setting]	Inputs the Reverse Run Prohibited (N-OT) signal from CN1-8.		
	n.□□□8	Disables the Reverse Run Prohibited (N-OT) signal. Allows constant reverse rotation.		

*P-OT and N-OT of the factory setting are effective.
Please set it invalidly when you use neither P-OT nor N-OT. (Please set to parameter Pn50A=n.8 □□□ and Pn50B=n. □□□ 8.)

SMC

4.3 Rotation Direction

The servomotor rotation direction can be reversed with parameter Pn000.0 without changing the polarity of the speed/position reference. This causes the rotation direction of the servomotor to change, but the polarity of the signal, such as encoder output pulses, output from the DRIVER does not change.

Parameter		Forward/ Reverse Reference	Direction of Motor Rotation and Encoder Output Pulse	Applicable Over-travel (OT)
Pn000	n.□□□0 Sets CCW as forward direction. [Factory setting]	Forward Reference		P-OT
		Reverse Reference		N-OT
	n.□□□1 Sets CW as forward direction. (Reverse Rotation Mode)	Forward Reference		P-OT
		Reverse Reference		N-OT

SMC

4.4 Recommended parameter values for each actuator

For recommended parameter values for each actuator, refer to the "LECYM Operation Manual, Appendix".

4.4.1 Electronic Gear

It is necessary to set it on the PLC side according to the kind of PLC.
The electronic gear enables the workpiece travel distance per reference unit input from the host PC or PLC etc. The minimum unit of the position data moving a load is called a reference unit.
Set the electronic gear ratio using Pn20E and Pn210.

Pn20E	Electronic Gear Ratio (Numerator)			Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824	1	4	After restart	Setup
Pn210	Electronic Gear Ratio (Denominator)			Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	1 to 1073741824	1	1	After restart	Setup

$$\frac{\cdot \ Pn20E}{\cdot \ Pn210} = \frac{M \times P \times (1/1000)}{Actuator\ lead\ \ L[mm] \times (n1/n2)}$$

M : Servo motor resolution is 1048576 [Pulse/rev]
P : Travel amount per 1 command pulse [μm]
n1/n2 : Pulley ratio *1

Ex.) To Travel amount per 1 command pulse (P=1μm) by actuator lead (L = 6mm)
and pulley ratio (n1/n2 = 1/1)

$$\frac{Pn20E}{Pn210} = \frac{1048576 \times 1 \times \dfrac{1}{1000}}{6 \times 1/1}$$

$$\frac{Pn20E}{Pn210} = \frac{1048576}{6 \times 1000}$$

$$\frac{Pn20E}{Pn210} = \frac{1048576}{6000}$$

$$\frac{Pn20E}{Pn210} = \frac{65536}{375}$$

*1 For pulley ratio, refer to Lead of "LECYM Operation Manual, Appendix".
   The actuator not described for pulley ratio is calculated by "1/1".
   Please change the electronic gear ratio according to the method of use.

> **IMPORTANT**
>
> Electronic gear ratio setting range: 0.001 ≤ Electronic gear ratio (B/A) ≤ 4000
> If the electronic gear ratio is outside this range, a parameter setting error 1 (A.040) will be output.

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4.5 Positioning Completed Width

This signal indicates that servomotor movement has been completed during position control.

When the difference between the number of references output by the host PC or PLC...etc and the travel distance of the servomotor (position error) drops below the set value in the parameter, the positioning completion signal will be output.

Note: Use parameter Pn50E.0 to allocate the /COIN signal for use. Refer to "LECYM Operation Manual",section 3.3.

Pn522	Positioning Completed Width			Position	Classification
	Setting Range	Setting Unit	Factory Setting	When Enabled	
	0 to 1073741824	1 reference unit	7	Immediately	Setup

The positioning completed width setting has no effect on final positioning accuracy.

Note: If the parameter is set to a value that is too large, a positioning completed signal might be output if the position error is low during a low speed operation. This will cause the positioning completed signal to be output continuously. If this signal is output unexpectedly, reduce the set value until it is no longer output.

4.6 Regenerative Resistor

Please prepare it in your company when the external regenerative resistor is necessary.
Refer to the catalog of each actuator for the selection of the external regenerative resistor.

When using an external Regenerative resistor, set the Pn600 so that the Regenerative resistor capacity is equivalent to the resistor capacity.

⚠ WARNING

If parameter Pn600 is set to 0 while an external Regenerative resistor is connected, the regenerative over- load alarm (A.320) may not be detected. If the regenerative overload alarm (A.320) is not detected correctly, the external Regenerative resistor may be damaged and an injury or fire may result.

Pn600	Regenerative resistor Capacity		Speed	Position	Torque	Classification
	Setting Range	Unit	Factory Setting	When Enabled		
	0 to DRIVER capacity	10 W	0	Immediately		Setup

Be sure to set the Regenerative resistor capacity (Pn600) to a value that is in accordance with the allowable capacity of the actual external Regenerative resistor being used.

The setting will vary with the cooling method of external Regenerative resistor:

For natural convection cooling: Set the value to a maximum 20% of the actually installed regenerative option capacity (W).
For forced convection cooling: Set the value to a maximum 50% of the actually installed regenerative option capacity (W).

Example: Set 20 W (100 W × 20%) for the 100-W external Regenerative resistor with natural convection cooling method:
Pn600 = 2 (unit: 10 W)

Note 1.   If Pn600 is not set to the optimum value, alarm A.320 will occur.
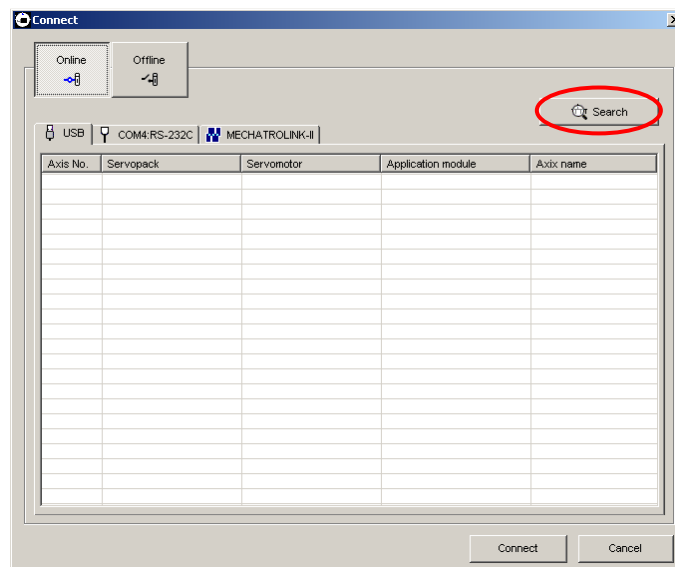2.   When set to the factory setting (Pn600 = 0), the DRIVER's built-in option has been used.

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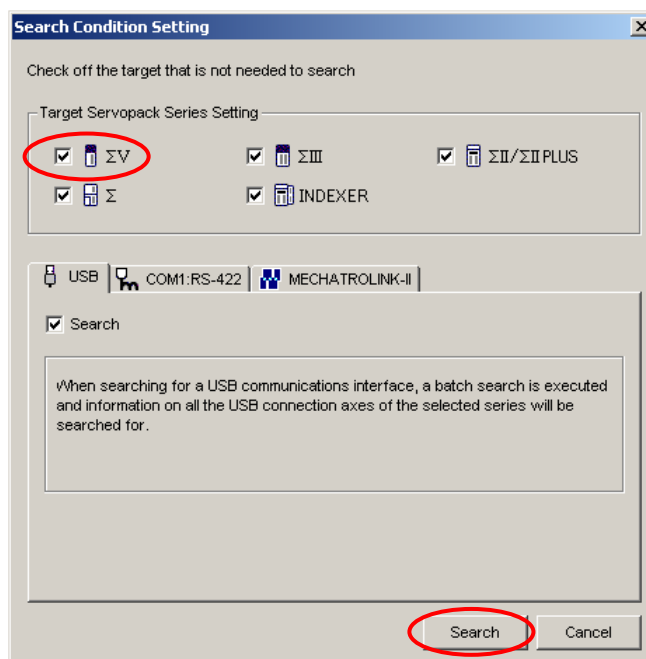| IMPORTANT	• When the external Regenerative resistors for power are used at the rated load ratio, the resistor temperature increases to between 200 °C and 300 °C. The resistors must be used at or below the rated values. Check with the manufacturer for the resistor's load characteristics. For safety, use the external Regenerative resistors with thermoswitches.

SMC

5. Trial Operation (SigmaWin+)

The procedure of the test driving with setup software (SigmaWin+) is shown below. When use the setup software (SigmaWin+), order USB cable (LEC-JZ-CVUSB) separately.

5.1 Communications setting for PC

When SigmaWin+ is initially started, the Connect dialog box appears. Enter the settings for communications between SigmaWin+ and the DRIVER by means of a communication port.

Select the method to set up the DRIVER: online or offline. Online is the default setting.

Online: Select when setting up or tuning the servo drive with the DRIVER connected

Offline: Select when editing parameters or checking screens for tracing or mechanical analysis without the DRIVER connected

<When Offline is selected>

Select the DRIVER series and click **Starting**. The SigmaWin+ main window will appear.

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<When Online is selected>

Enter the necessary settings for communication setup.
1. Click **Search**.

SMC

2. Select DRIVER series and make the settings required. Click **Search**.
   After the DRIVERs have been successfully connected to SigmaWin+, a list of the connected DRIVERs will appear on the screen.
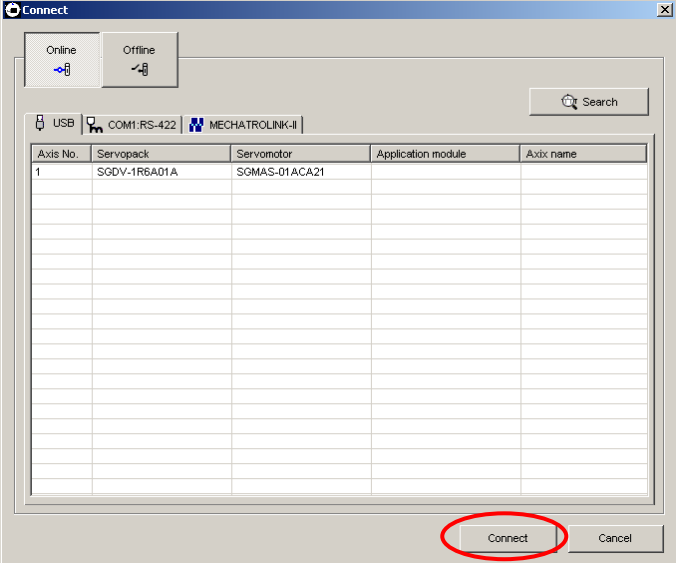
DRIVER Selection Box

3. Select the DRIVER to be connected and then click **Connect**, or just double-click the DRIVER to be connected. The SigmaWin+ main window will appear.
   Click **Cancel** to close the dialog box.

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5.2 JOG Operation

This function turns the motor at the set JOG speed. The rotational direction and the speed setting can be verified without connecting a PC or PLC etc.

⚠WARNING

Performing JOG operation while the motor is running is dangerous. Be sure to check the user's manual before executing. Pay particular attention to the following.
- Check the safety of the area adjoining the drive unit. The motor runs at the JOG speed, while the Forward or Reverse button is pressed. Make sure that there is no danger in running the motor before execution.
- The Forward Run Prohibit (P-OT) and Reverse Run Prohibit (N-OT) signals are disabled during JOG operation. During operation, make sure to verify the actual operation and position of the motor or machine.

Perform a JOG operation using the following procedure.

1. In the SigmaWin+ main window, click **Test Run**, and then click **Jog**. A warning message appears reminding you of the dangers that are possible when using this operation.
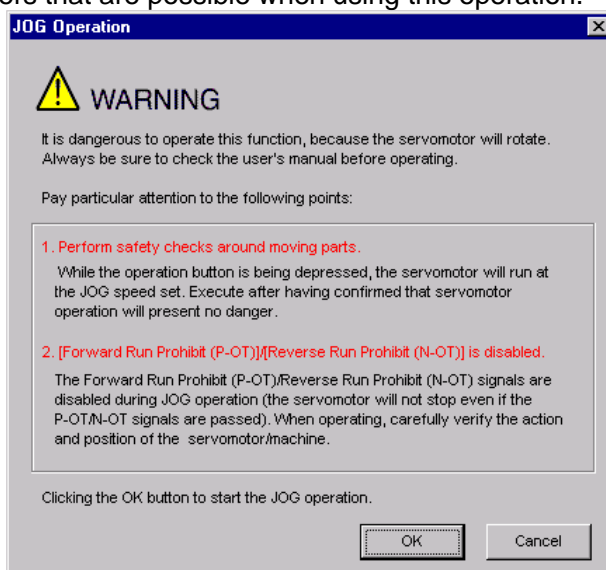
Click **Cancel** to return to the main window without performing JOG operation.
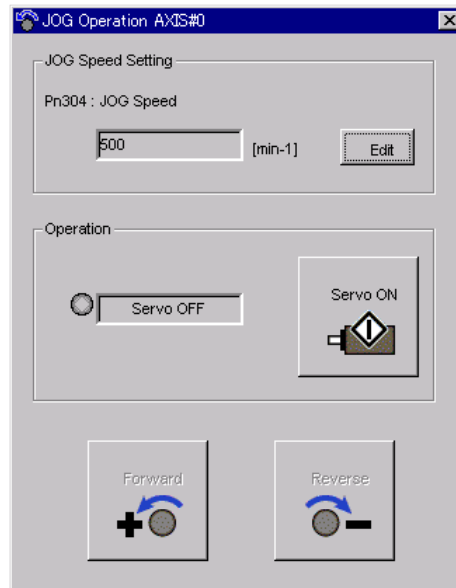<When the Write Prohibited Setting is ON>
   If the write prohibited setting is ON, the following message will appear.
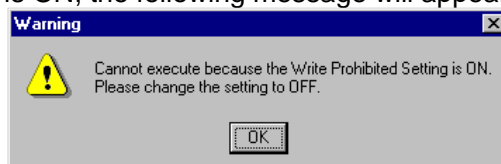
   Click **OK**, and set the write prohibited setting to OFF. Refer to "LECYM Operation Manual", Section 6.12 for details.

2. Click **OK**, and the JOG Operation box appears. If the servo is on, an error message will appear. Make sure that the servo is off.


Pn304: JOG Speed
Parameter Pn304 displays the JOG speed. Click **Edit** to change the JOG speed.
Operation
On the left, shows if the servo is on or off and the corresponding LED display. On the right, the button changes according to the servo's status. When the servo is off, the **Servo ON** button appears; when the servo is on, **Servo OFF** button appears.

3. Check the JOG speed. To change the JOG speed, click **Edit**.
4. Click **Servo ON**.
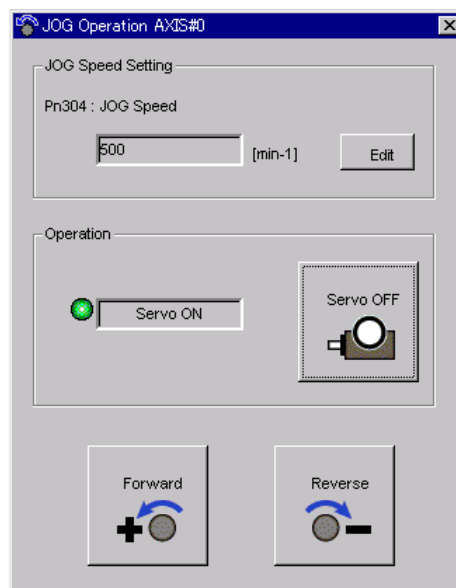
5. Press **Forward** or **Reverse**. A JOG operation is performed only while one of these buttons is pressed.

5.3 Program JOG Operation

This function allows automatic operation determined by the preset pattern of operation.

⚠WARNING

Using the program JOG operation function while the motor is running is dangerous. Be sure to check the user's manual before using this function. Pay particular attention to the following items.
• Check the safety of the area adjoining the drive unit. The motor actually runs based on a preset pattern when this function is used. Make sure that there is no danger in running the motor before actually using it.
• Confirm the position of the machine. Reset the machine position using the Origin Return function before using the program JOG function.


⚠CAUTION

Two methods are available to stop program JOG operation while the motor is running, and the motor will stop according to the method selected. Make sure to select the best method for the situation.
• If the Servo OFF button is used, the motor stops according to the stopping method after servo off specified by the parameters.
• If the Cancel button is used, the motor coasts to a stop and then enters a zero clamp state.
  Note: The Cancel button may not be used with some DRIVERs.


To perform the JOG operation for a particular pattern, use the following procedure.
1. In the SigmaWin+ main window, click **Test Run** and then click **Program JOG Operation**. A warning message appears, reminding you of the possible dangers.
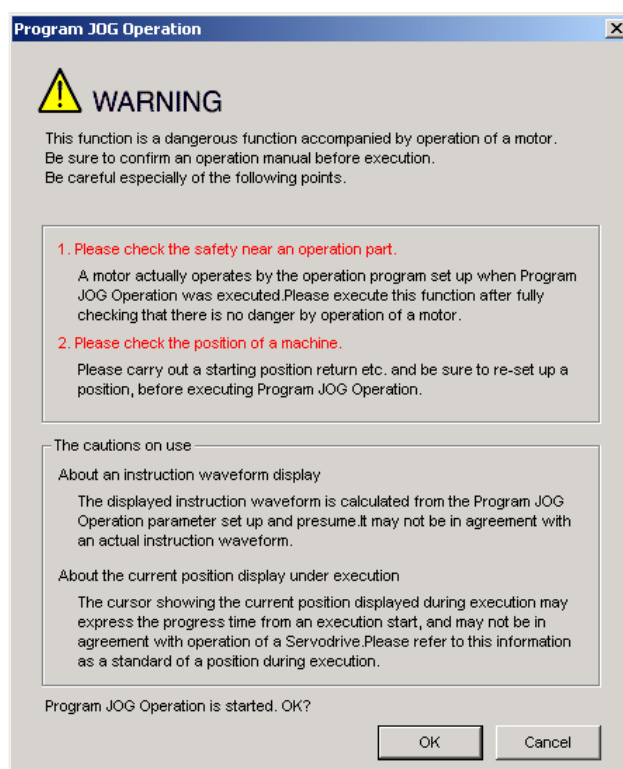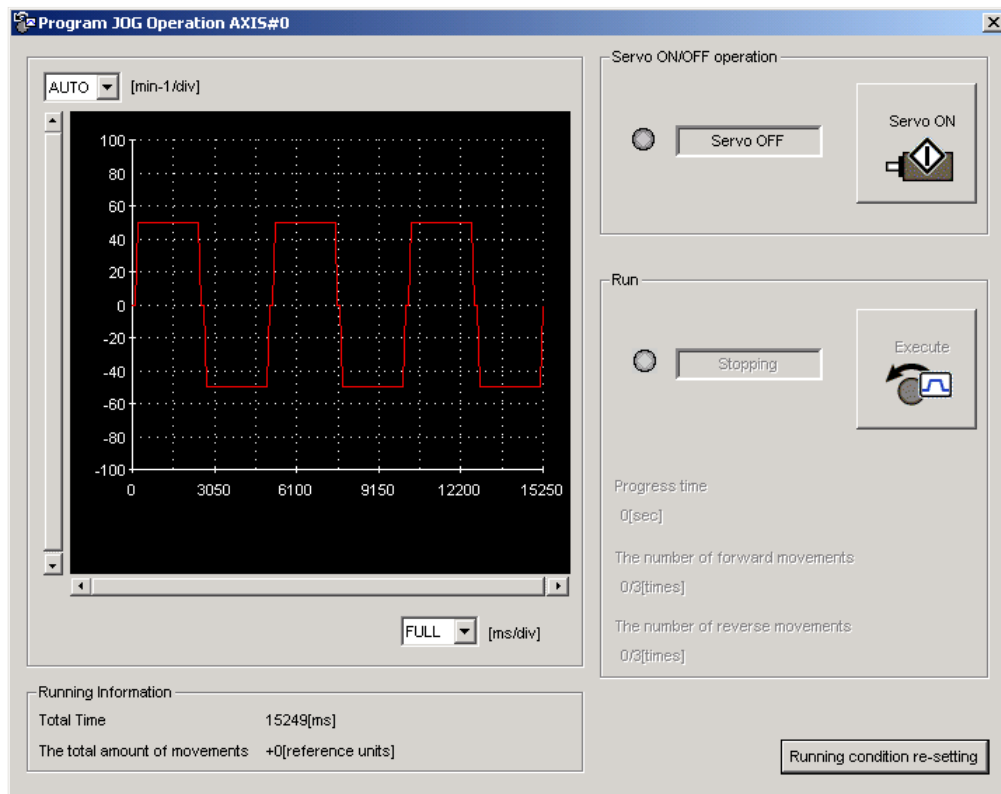

Click **Cancel** to return to the main window without performing program JOG operation.
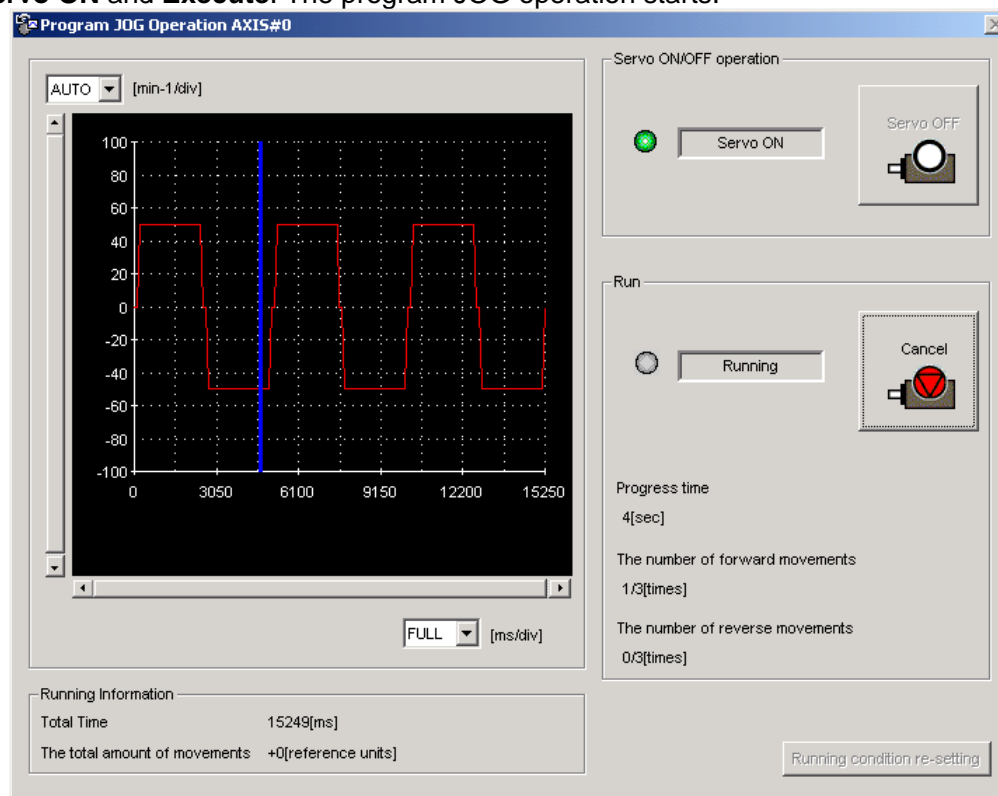
2. Click **OK**, and the Running Condition Setting box appears.
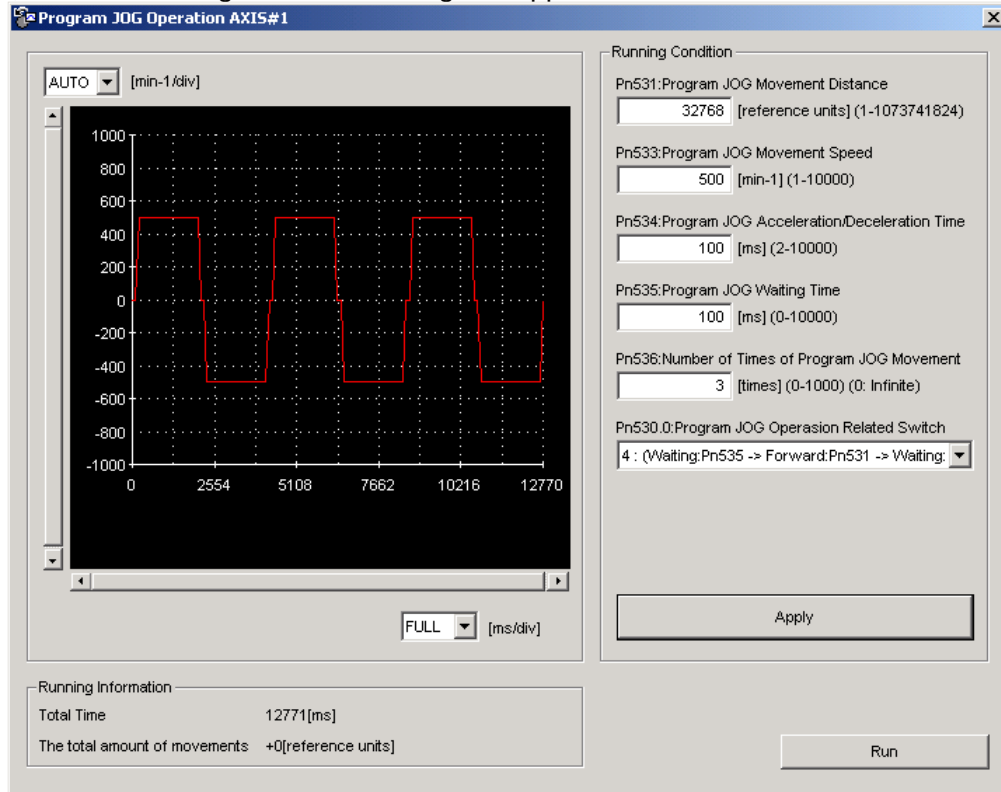
3. Set the running conditions and click **Apply**. The graph for the operation pattern is displayed.
4. Click **Run** and the Program JOG Operation box appears.

5. Click **Servo ON** and **Execute**. The program JOG operation starts.

6. Troubleshooting

When a fault occurs during operation, the corresponding alarm or warning is displayed. If an alarm or warning occurrs, refer to "LECYM Operation Manual",section 9.1.2 or "LECYM Operation Manual",section 9.2.2 and take the appropriate action. When an alarm occurs, ALM turns off.

After removing the cause of the alarm or warning, the alarm or warning can be deactivated in any of the methods marked   in the alarm / warning deactivation column.

"6" of the figure, "B" of the alphabet, and "D" are displayed as follows.

6→ [6]   B→ [b]   D→ [d]
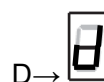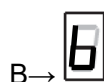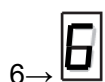
7.1 Alarms List

This section provides list of alarms.
After its cause has been removed, the alarm can be deactivated in any of the methods marked ○ in the alarm reset column.

	Alarm Number	Alarm Name	Servo motor Stop ping Method[*1]	Alarm reset			
				Power OFF ↓ ON	Alarm warning clear command [ALM-CLR]	SigmaWin+ [Alarm] | [Display Alarm] | Reset button	SigmaWin+ [Setup] | [Software Reset] | Execute button
Alarm	A.020	Parameter Checksum Error 1	Gr.1	○	–	–	○
	A.021	Parameter Format Error 1	Gr.1	○	–	–	○
	A.022	System Checksum Error 1	Gr.1	○	–	–	○
	A.030	Main Circuit Detector Error	Gr.1	○	○	○	○
	A.040	Parameter Setting Error 1	Gr.1	○	–	–	○
	A.041	Encoder Output Pulse Setting Error	Gr.1	○	–	–	○
	A.042	Parameter Combination Error	Gr.1	○	–	–	○
	A.044	Semi-closed/Fully-closed Loop Control Parameter Setting Error	Gr.1	○	–	–	○
	A.04A	Parameter Setting Error 2	Gr.1	○	–	–	○
	A.050	Combination Error	Gr.1	○	○	○	○
	A.051	Unsupported Device Alarm	Gr.1	○	–	–	○
	A.0B0	Cancelled Servo ON Command Alarm	Gr.1	○	○	○	○
	A.100	Overcurrent or Heat Sink Overheated	Gr.1	○	–	–	○
	A.300	Regeneration Error	Gr.1	○	○	○	○
	A.320	Regenerative Overload	Gr.2	○	○	○	○
	A.330	Main Circuit Power Supply Wiring Error	Gr.1	○	○	○	○
	A.400	Overvoltage	Gr.1	○	○	○	○
	A.410	Undervoltage	Gr.2	○	○	○	○
	A.450	Main-Circuit Capacitor Overvoltage	Gr.1	○	–	–	○
	A.510	Overspeed	Gr.1	○	○	○	○
	A.511	Overspeed of Encoder Output Pulse Rate	Gr.1	○	○	○	○
	A.520	Vibration Alarm	Gr.1	○	○	○	○
	A.521	Autotuning Alarm	Gr.1	○	○	○	○
	A.710	Overload: High Load	Gr.2	○	○	○	○
	A.720	Overload: Low Load	Gr.1	○	○	○	○
	A.730	Dynamic Brake Overload	Gr.1	○	○	○	○
	A.731	Overload of Surge Current Limit Resistor	Gr.1	○	○	○	○
	A.740	Heat Sink Overheated	Gr.1	○	○	○	○
	A.7A0	Built-in Fan in DRIVER Stopped	Gr.2	○	○	○	○
	A.7AB	Encoder Backup Error	Gr.1	○	○	○	○
	A.810	Encoder Checksum Error	Gr.1	○	–	–	○
	A.820	Absolute Encoder Battery Error	Gr.1	○	–	–	○
	A.830	Encoder Data Error	Gr.1	○	○	○	○

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Alarm Number	Alarm Name	Servo motor Stop ping Method*1	Alarm reset			
			Power OFF ↓ ON	Alarm warning clear command [ALM-CLR]	SigmaWin+ [Alarm] | [Display Alarm] | Reset button	SigmaWin+ [Setup] | [Software Reset] | Execute button
A.840	Encoder Overspeed	Gr.1	O	–	–	O
A.850	Encoder Overheated	Gr.1	O	–	–	O
A.860	External Encoder Error	Gr.1	O	–	–	O
A.8A0	External Encoder Error of Module	Gr.1	O	O	O	O
A.8A1	External Encoder Error of Sensor	Gr.1	O	O	O	O
A.8A2	External Encoder Error of Position	Gr.1	O	O	O	O
A.8A3	External Encoder Overspeed	Gr.1	O	O	O	O
A.8A5	External Encoder Overheated	Gr.1	O	O	O	O
A.8A6	Regeneration Error	Gr.1	O	O	O	O
A.B31	Current Detection Error 1	Gr.1	O	–	–	O
A.B32	Current Detection Error 2	Gr.1	O	–	–	O
A.B33	Current Detection Error 3	Gr.1	O	–	–	O
A.B6A	MECHATROLINK Communications ASIC Error 1	Gr.1	O	–	–	O
A.B6B	MECHATROLINK Communications ASIC Error 2	Gr.2	O	–	–	O
A.BF0	System Alarm 0	Gr.1	O	–	–	O
A.BF1	System Alarm 1	Gr.1	O	–	–	O
A.BF2	System Alarm 2	Gr.1	O	–	–	O
A.BF3	System Alarm 3	Gr.1	O	–	–	O
A.BF4	System Alarm 4	Gr.1	O	–	–	O
A.C10	Servo Overrun Detected	Gr.1	O	O	O	O
A.C80	Absolute Encoder Clear Error and Multiturn Limit Setting Error	Gr.1	O	–	–	O
A.C90	Encoder Communications Error	Gr.1	O	–	–	O
A.C91	Encoder Communications Position Data Error	Gr.1	O	–	–	O
A.C92	Encoder Communications Timer Error	Gr.1	O	–	–	O
A.CA0	Encoder Parameter Error	Gr.1	O	–	–	O
A.CB0	Encoder Echoback Error	Gr.1	O	–	–	O
A.CC0	Multiturn Limit Disagreement	Gr.1	O	–	–	O
A.CF1	Feedback Option Module Communications Error (Reception error)	Gr.1	O	–	–	O
A.CF2	Feedback Option Module Communications Error (Timer stop)	Gr.1	O	–	–	O
A.D00	Position Error Overflow	Gr.1	O	O	O	O
A.D01	Position Error Overflow Alarm at Servo ON	Gr.1	O	O	O	O
A.D02	Position Error Overflow Alarm by Speed Limit at Servo ON	Gr.2	O	O	O	O
A.D10	Motor-load Position Error Overflow	Gr.2	O	O	O	O
A.E02	MECHATROLINK Internal Synchronization Error 1	Gr.1	O	O	O	O
A.E40	MECHATROLINK Transmission Cycle Setting Error	Gr.2	O	O	O	O
A.E50	MECHATROLINK Synchronization Error	Gr.2	O	O	O	O
A.E51	MECHATROLINK Synchronization Failed	Gr.2	O	O	O	O
A.E60	MECHATROLINK Communications Error (Reception error)	Gr.2	O	O	O	O
A.E61	MECHATROLINK Transmission Cycle Error (Synchronization interval error)	Gr.2	O	O	O	O
A.E71	Safety Option Module Detection Failure	Gr.1	O	–	–	O
A.E72	Feedback Option Module Detection Failure	Gr.1	O	–	–	O
A.E74	Unsupported Safety Option Module	Gr.1	O	–	–	O
A.E75	Unsupported Feedback Option Module	Gr.1	O	–	–	O
A.EA2	DRV Alarm 2 (DRIVER WDC error)	Gr.2	O	O	O	O
A.EB1	Safety Function Signal Input Timing Error	Gr.1	O	–	–	O
A.ED1	Command Execution Timeout	Gr.2	O	O	O	O
A.F10	Main Circuit Cable Open Phase	Gr.2	O	O	O	O
FL-1*2	System Alarm	–	O	–	–	–
FL-2*2	System Alarm	–	O	–	–	–
CPF00	Digital Operator Transmission Error 1	–	O	–	–	–
CPF01	Digital Operator Transmission Error 2	–	O	–	–	–
A.--	Not an error	–	–	–	–	–

*1 Gr.1: The servomotor is stopped according to the setting in Pn001.0 if an alarm occurs. Pn001.0 is factory-set to stop the servomotor by applying the DB.

Gr.2: The servomotor is stopped according to the setting in Pn00B.1 if an alarm occurs. Pn00B.1 is factory-set to stop the servomotor by setting the speed reference to "0." The servomotor under torque control will always use the Gr.1 method to stop. By setting Pn00B.1 to 1, the servomotor stops using the same method as Gr.1. When coordinating a number of servomotors, use this stopping method to prevent machine damage that may result due to differences in the stop method.

*2 These alarms are not stored in the alarm history and are displayed only in the panel display.

6.2 Warning List

This section provides list of warnings.

After its cause has been removed, the warning can be deactivated in any of the methods marked ○ in the warning reset column.

	Warning Number	Warning Name	Warning reset			
			Power OFF ↓ ON	Alarm warning clear command [ALM-CLR]	SigmaWin+ [Alarm] | [Display Alarm] | Reset button	SigmaWin+ [Setup] | [Software Reset] | Execute button
Warning	A.900[*3]	Position Error Overflow	○	○	○	○
	A.901[*3]	Position Error Overflow Alarm at Servo ON	○	○	○	○
	A.910[*3]	Overload	○	○	○	○
	A.911[*3]	Vibration	○	○	○	○
	A.920[*3]	Regenerative Overload	○	○	○	○
	A.921[*3]	Dynamic Brake Overload	○	○	○	○
	A.930[*3]	Absolute Encoder Battery Error	○	○	○	○
	A.94A[*4]	Data Setting Warning 1 (Parameter Number Error)	○	○	○	○
	A.94B[*4]	Data Setting Warning 2 (Out of Range)	○	○	○	○
	A.94C[*4]	Data Setting Warning 3 (Calculation Error)	○	○	○	○
	A.94D[*4]	Data Setting Warning 4 (Parameter Size)	○	○	○	○
	A.94E[*4]	Data Setting Warning 5 (Latch Mode Error)	○	○	○	○
	A.95A[*4]	Command Warning 1 (Unsatisfying Command)	○	○	○	○
	A.95B[*4]	Command Warning 2 (Non-supported Command)	○	○	○	○
	A.95D[*4]	Command Warning 4 (Command Interference)	○	○	○	○
	A.95E[*4]	Command Warning 5 (Subcommand Disable)	○	○	○	○
	A.95F[*4]	Command Warning 6 (Undefined Command)	○	○	○	○
	A.960[*4]	MECHATROLINK Communications Warning	○	○	○	○
	A.971[*5]	Undervoltage	○	○	○	○
	A.9A0[*3]	Overtravel	○	○	○	○

∗3. Use Pn008.2 to activate or not the warning detection.

∗4. Use Pn800.1 to activate or not the warning detection.

∗5. Use Pn008.1 to activate or not the warning detection.

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