



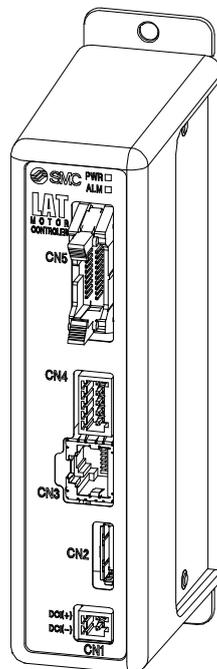
# Operation Manual

## PRODUCT NAME

### ***Card Motor Controller*** *(Step Data input edition)*

## Model / Series / Product Number

### **LATCA Series**



**SMC Corporation**



## About this operation manual

This operation manual summarizes how to operate the Card Motor controller (LATCA-\*, Ver2.5) and controller configuration software (Ver 2.2) when it is used in step data input mode. Refer to operation manual [Card Motor controller (pulse input version)] when it is used in pulse input mode, and refer to operation manual [Card Motor controller (serial communication version)] or [Card Motor controller (MODBUS communication version)] when serial communication is used.

## Configuration software

Use a configuration software corresponding to the version of the controller.

The configuration software can be downloaded from the SMC website.

[https://www.smcworld.com/products/pickup/en-jp/electric\\_actuator/download.html](https://www.smcworld.com/products/pickup/en-jp/electric_actuator/download.html)

## Correspondence table for controller version and configuration software version

Use the latest version of configuration software corresponding to the version of the controller.

Configuration software version	Functions added	Controller version (the time in the bracket indicates the schedule for switching)		
		Ver 2.0 (August 2014)	Ver2.1~Ver2.4 (Sept. 2015)	Ver2.5 (June 2020)
Ver 2.0	First edition	√ <sup>Note1</sup> Note2)	√ <sup>Note1</sup> Note2)	-
Ver 2.1	50mm stroke is Added	-	√ <sup>Note2</sup> )	-
Ver2.2 (Recommended)	Communication setting, error log display	-	√ <sup>Note2</sup> )	√

√ : Connectable

√<sup>Note1</sup>) : LAT3M and 50 mm stroke not available

LAT3M-\* and LAT3\*-50 cannot be set when the card motor type is selected.

√<sup>Note2</sup>) : Error log display and communication speed setting are not available.

Error log display and communication speed setting cannot be used.

— : Not connectable

If the configuration software is started "Unsupported controller is connected." will be displayed.

\*When the controller version must be checked, refer to section 14.7 Confirmation of the Version and Initialization (P74).

\* New features in the new version of the configuration software are not available in the previous versions.

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# LATCA Series Controller

## 1. 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 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 10218-1992: Manipulating industrial robots -Safety.

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.

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. 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 brake 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.



# LATCA Series Controller

## 1. 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

**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.**

### Caution

**SMC products are not intended for use as instruments for legal metrology.**

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

## 2. Product Overview

### 2.1 Features

This controller actuates a connected Card Motor based on parallel I/O signals or pulse train signals from a PLC or similar control device. In addition, the controller outputs signals such as the Card Motor table position and operation complete back to the PLC. Detailed features and functions of this product are listed below.

#### [Common functions]

(1) Selection of control signal type

The following control signal types can be selected.

i. Step data input type

The required Card Motor positions and operation patterns are initially set and stored as "Step Data" in the controller using the configuration software. The controller drives the Card Motor table based on the Step Data. Each Step Data is instigated by parallel input signals determined based on the Step Data number.

ii. Pulse input type

The controller drives the Card Motor controlled by pulse train signals from a PLC or similar control device.

(2) Applicable to all Card Motor models

This controller can be used with all Card Motor models regardless of the encoder resolution or stroke. The parameters of the selected Card Motor are automatically stored in the controller by selecting the appropriate Card Motor model to be connected using the dedicated "LATC Configurator" software.

(3) Encoder signal output

The linear encoder signal, which detects the Card Motor table position, can be output to an external signal reading device. Thus, the table position can be displayed and monitored in real time using an external device.

(4) Workpiece measurement and evaluation using the AREA output function

The size of a workpiece can be measured by driving the Card Motor table using a pushing operation against the workpiece, and the position where the table stopped can be output and displayed.

Workpiece identification and evaluation of a good and bad workpiece is possible using the AREA parallel output signals. The AREA output signal range corresponds to table positions, which can be preset.

(5) Parallel I/O connection and signal status function

The status of the parallel input signals can be checked and the parallel output signals can be manually switched. Correct wiring and the function of I/O signals between this controller and a master control device, such as a PLC, can be verified.

(6) Test operation using a computer

At the time of starting, the card motor can be driven using a personal computer with the configuration software installed as follows, without using an upper level device such as a PLC.

i. Jogging and inching a set distance

ii. Operation of step data

iii. Continuous operation of step data.

- (7) Monitoring the card motor condition with a PC.

When the product is powered, based on the parallel I/O signal and pulse train signal input from PLC, etc., the following operation status of the operating card motor can be checked.

- i. Current table position
- ii. Parallel I/O signal input / output status.
- iii. Alarm status, etc.

### **[Step data input type]**

The following functions can be used in Step Data Input type.

- (8) Easy configuring of Step Data using Cycle Time Entry Method.  
The positioning and pushing operation can be selected. After the target position, positioning time and pushing force have been set, the positioning and pushing operation can be performed.
- (9) 15 Step Data patterns can be configured.  
The Card Motor is operated according to the Step Data in the order specified by the parallel I/O signals.
- (10) Automatic Return to Origin sequence  
The actuator can be returned to the Origin position by sending a single signal to a specified terminal.
- (11) Operation with a specified force (Pushing operation)  
The pushing force of the Card Motor can be controlled.

### **[Pulse Input type]**

The following functions can be used in Pulse Input mode.

- (12) Operation by pulse input signals  
The table actuates according to the number of pulses, and the speed of movement is proportional to the pulse frequency.
- (13) Operation by 3 types of pulse train signals  
The controller can be configured to work with the following pulse input signal types by switching the DIP switches integrated into the controller.
- i. Open collector input (pulse signal power supply voltage 24V)
  - ii. Open collector input (pulse signal power supply voltage 5V)
  - iii. Differential input (equivalent to line driver 26C31)
- (14) Operation by 3 types of pulse input methods  
The following pulse input control methods can be selected using the dedicated "LATC Configurator" software.
- i. Pulse and Direction input
  - ii. CW and CCW input
  - iii. Quadrature input
- (15) Automatic Return to Origin sequence  
The actuator can be returned to the Origin position by sending a single signal to a specified terminal.

- (16) Operation with a specified force (Pushing operation)  
The pushing force of the Card Motor can be controlled.  
By switching the TL input on via the parallel I/O, the actuator moves at 6 mm/s and pushes the workpiece with the force stored in the Step Data.
- (17) Operation by 4 configurable (PID) control parameter (step data) patterns.  
Four different control parameter patterns can be configured to suit the Load Mass and Thrust Setting values. The actuator performance can be configured by tuning these control parameters according to the specific work load. Select one of the four different forces to perform the pushing operation.

### **[Serial communication]**

The following functions are available via the RS485 serial interface.

- (18) The following communication protocols are applicable (recognized automatically).
- i.Modbus RTU
  - ii.Modbus ASCII
  - iii.LATC original protocol
- (19) Multiple controllers can be accessed and controlled via one interface.  
A master PLC can communicate with up to 16 devices via the RS485 serial interface.
- (20) Configuration of Step Data  
The Step Data values can be configured.  
(The Step Data values can only be configured when the Card Motor power supply is OFF for safety reasons.)
- (21) Step Data operation  
The actuator can be commanded to operate according to Step Data stored in the controller.
- (22) Direct operation  
The actuator can be commanded to operate by setting the target position and positioning time (or target position, speed and acceleration).
- (23) Output of the table position  
The table position can be output and read externally.
- (24) Switching and monitoring of parallel I/O signals  
The parallel I/O signals can be switched and the output signals monitored.

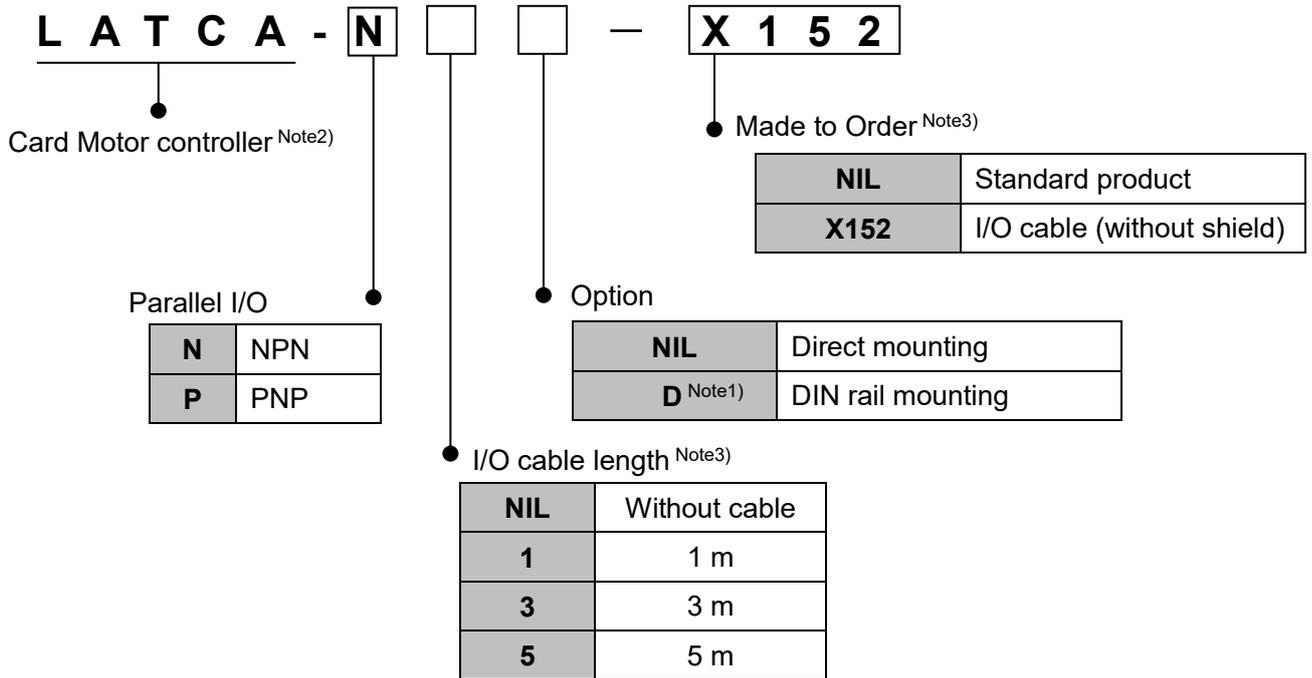
### **Caution**

When the device is set up or when failure occurs, refer to the operation manual of the actuator as well as to this operation manual.

\*Keep this operation manual accessible for reference when necessary.

## 2.2 How to order

How to order is shown below.



Note 1) The DIN rail is not included, this must be ordered separately.

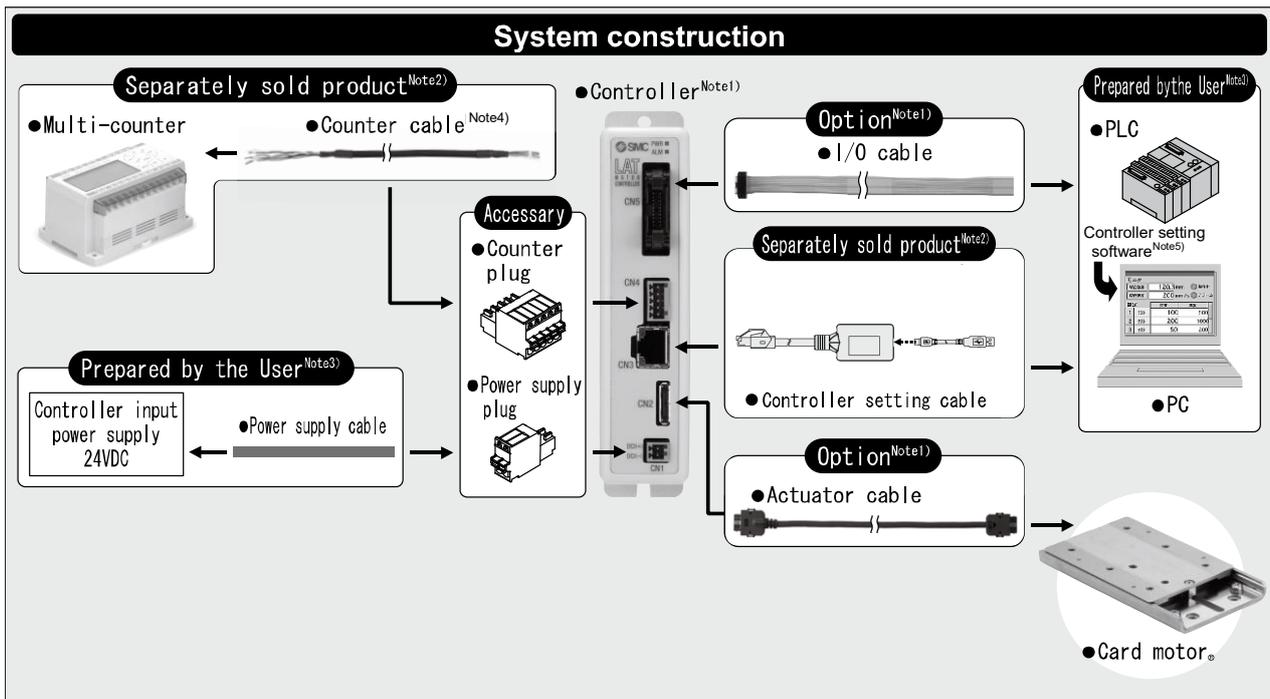
Note 2) Step Data Input type or Pulse Input type can be selected using the configuration software.

Note 3) When the I/O cable option is selected, the I/O cable (LATH5-\*) with shield is included.

When made to order option (X152) is selected, the I/O cable provided can be changed to (LATH2-\*) without shield.

## 2.3 Structure of the product

An example of the controller structure is shown below.



Note 1) It is possible to specify the controller and the actuator and I/O cables with the Card Motor part number.

Only the I/O cable can be specified with the controller part number.

Note 2) It is not possible to order the accessories with the Card Motor part number. Refer to section **15. Option (P.75)** and order it separately.

Note 3) PLC, power supply, power supply cables and PCs should be prepared by the user.

Note 4) These items are used to display and output the table position and active preset positions to external devices via digital outputs when length is measured.

Note 5) Download from SMC's website.

[https://www.smcworld.com/products/pickup/en-jp/electric\\_actuator/download.html](https://www.smcworld.com/products/pickup/en-jp/electric_actuator/download.html)

### Caution

Refer to section **4. External Connection (P.20)** for wiring.

Refer to section **17. Controller and Peripheral Devices Specific Precautions (P.85)** when handling the wiring and cables.

## 2.4 Start up procedure

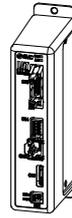
Refer to the following procedure for installation, wiring, setting and operating the controller when the product is to be used for the first time.

### (1) Check the contents of the package

Before using this controller, please check the contents supplied are as ordered.

Product name	Quantity
Controller (LATCA-***)	1 pc.
Power supply plug	1 pc.
Counter plug	1 pc.

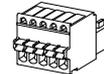
Controller



Power supply plug



Counter plug



\*If any parts are missing or damaged, please contact your distributor.

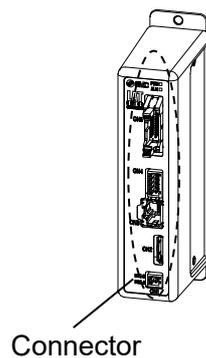
### (2) Mounting the controller

Refer to section [3.4 Mounting \(P. 18\)](#) for instructions on how to mount the controller.

### (3) Wiring and connection

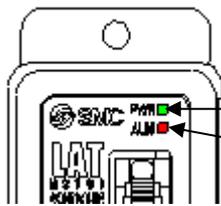
Connect the cables to the controller (CN1 to CN5).

Refer to section [4 External Connections \(P. 20\)](#) for the wiring of the connectors.



#### (4) Power supply ON and alarm check

Ensure that the wires are connected correctly and then turn on the 24 VDC power supply.



Controller

LED	Color	Status
PWR	Green	Normal operation
ALM	Red	Alarm is generated

If the [PWR] LED on the front of the controller is green, the controller is in the normal condition.

If the [ALM] LED on the front of the controller is ON or flashing red, an alarm has been generated.

### ⚠ Caution

#### When an alarm is generated

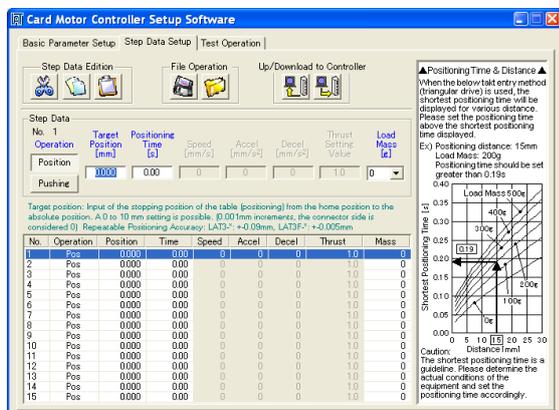
The type of the alarm can be checked by a combination of the ALARM and POWER LED's ON or flashing.

Check the type of alarm and remove the cause while referring to section **16. Alarm Detection (P. 82)**.

#### (5) Basic parameter setup and Step Data setup

Select the step Data Input type or Pulse Input type with a PC (controller configuration software) and set up the basic settings, such as the Card Motor model to be connected to the controller. In addition, set up the target position and positioning time in the step data for the step data input type, and set up the work load and pushing force set value in the step data for the pulse input type.

\* Personal computer (Controller configuration software, step data input type)



Refer to section **9. Controller Set Up (P.34)** and **14. Card Motor Controller Configuration software (P. 57)** for instructions on how to setup.

#### (6) Test operation

Refer to section **10. Monitor and Test Mode of the Controller (P.41)** and **14.5 Monitor/Test window (P. 68)** for instructions on operating instruction of test operation

## 3. Controller Specifications

### 3.1 Basic specifications

Basic specifications of the product.

Item	Specifications		
Input type <sup>Note 1)</sup>	Step data input type	Pulse input type	
Compatible motor	LAT3 series		
Number of axis per controller	Single axis		
Control method	Closed-loop control with encoder feedback signal		
Power supply specifications <sup>Note 2)</sup>	Power supply voltage: 24 VDC +/-10% Current consumption: 2 A (Maximum 3 A) <sup>Note 3)</sup> Power consumption: 48 W (Maximum 72 W) <sup>Note 3)</sup>		
Operation patterns	Positioning operation Pushing operation Automatic return to origin	Pulse sequence operation Pushing operation Automatic return to origin	
Number of step data	15	4	
Parallel input	6 inputs (Optically isolated. Pulse input terminals and COM terminal are excluded.)		
Parallel output	4 outputs (Optically isolated, open collector output)		
Pulse input mode	—	Open collector input	Differential input
Power supply voltage for pulse input signal		24V	5V
Maximum pulse frequency		100 kHz	200 kHz
Pulse input mode		Pulse and Direction CW and CCW Quadrature	
Serial communication	RS485 (Modbus protocol), RS485 (original protocol)		
Communication speed	2,400 bps, 9,600 bps, 19,200 bps, 38,400 bps, 57,600 bps		
Position display output <sup>Note 4)</sup>	A-phase and B-phase pulse signals, RESET signal (NPN open collector output)		
LED display	2 LED's (Green and Red)		
Operating temperature range	0 to 40oC (No condensation)		
Operating humidity range:	90 % or less (No condensation)		
Storage temperature range (oC)	-10 to 60oC (No condensation, no freezing)		
Storage humidity range	90% or less (No condensation)		
Insulation resistance	50 MΩ (500 VDC) between the case and FG		
Weight <sup>Note 5)</sup>	130 g (Direct mounting type) 150 g (DIN rail mounting type)		

Note 1) Step data input type or pulse input type can be selected using the configuration software.

Note 2) The controller should use a power supply which satisfies the maximum current consumption and maximum power consumption. Do not use an inrush current suppression type power supply.

Note 3) Rated current: Current consumption when continuous thrust is generated.

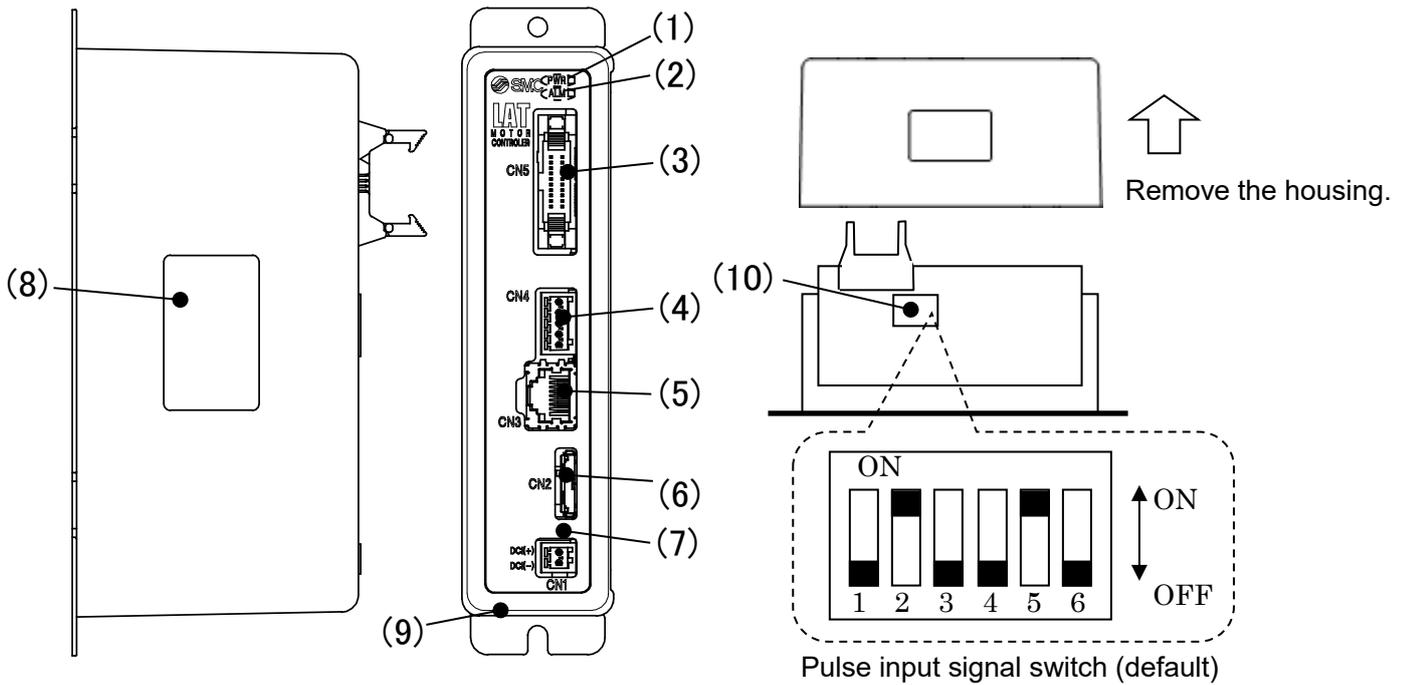
Peak current: Current consumption when maximum instantaneous thrust is generated.

Note 4) Specification for the connection of the CEU5 Multi-counter (supplied separately).

Note 5) Cables are not included.

### 3.2 2 Parts description

Details of the parts of the controller.

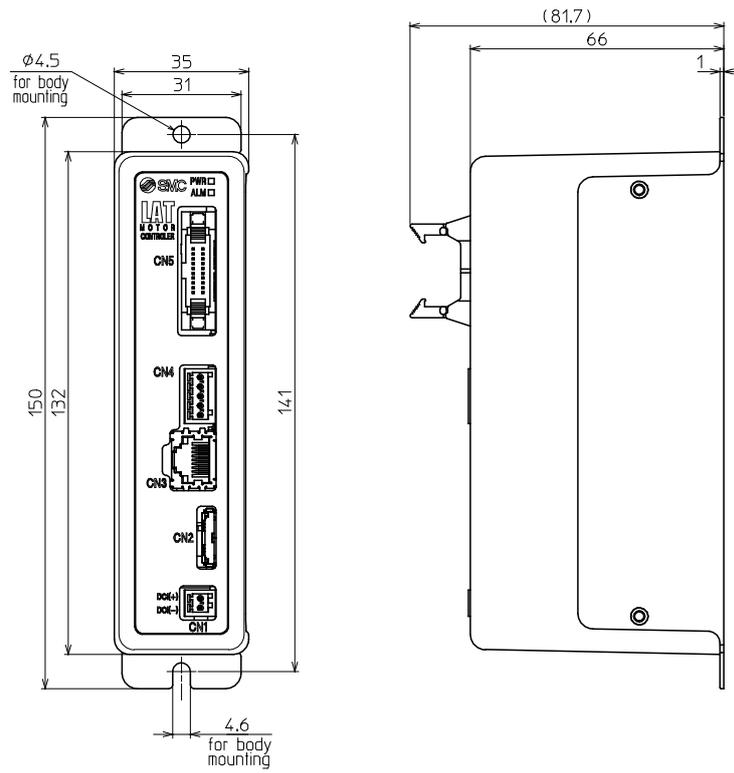


No.	Display	Name	Details
1	PWR	Power supply and alarm LED (Green)	Normal operation: Green is ON If the PWR and ALM LED's are ON or flashing simultaneously, an alarm has been generated.
2	ALM	Alarm LED (Red)	In alarm condition: Red is ON or flashing Red. The combination of when the ALM and PWR LED's are ON or flashing indicates an alarm.
3	CN5	Parallel I/O connector (20 pins)	Connection to a PLC using the LATH2-* I/O cable.
4	CN4	Counter connector (5 pins)	Connection to the CEU5 Multi-counter using the LATH3-* counter cable.
5	CN3	Serial I/O connector (9 pins)	Connection to a PC using the Controller Setting cable.
6	CN2	Motor Connector (18 pins)	Connection to the Card Motor using the LATH1-* actuator cable.
7	CN1	Power Supply Connector (2 pins)	24 VDC power supply connection to the controller using the power supply plug. The power supply cable should be prepared by the user.
8	-	Controller part number label	Label indicating the controller part number.
9	-	FG	Connection to Frame ground (Connect the grounding cable to the controller mounting, and fasten it with the controller mounting screw).
10	-	Pulse input signal switch	Switch to select the type of pulse input signal.

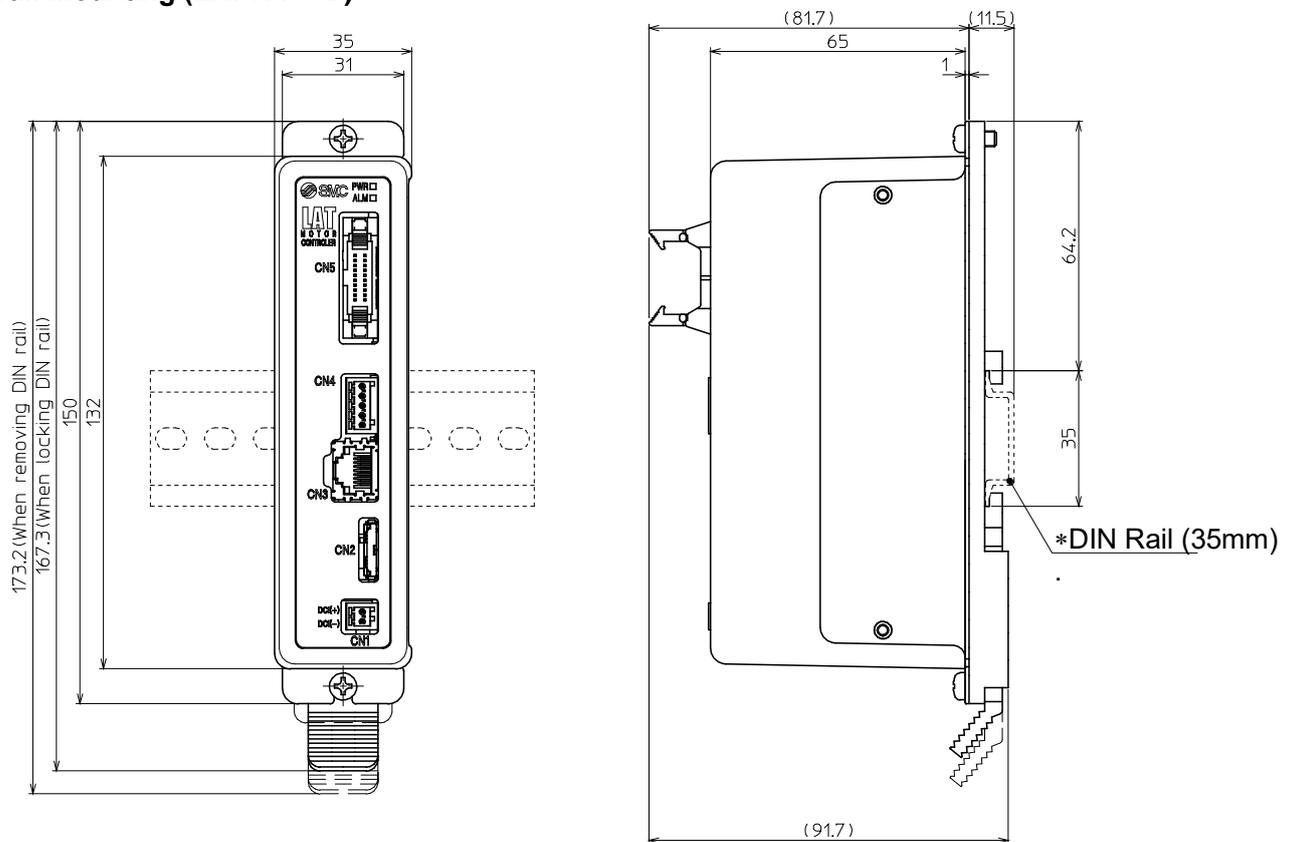
### 3.3 External dimensions

#### Controller external dimensions

##### (1) Direct mounting (LATCA-\*\*)



##### (2) DIN rail mounting (LATCA-\*\*D)

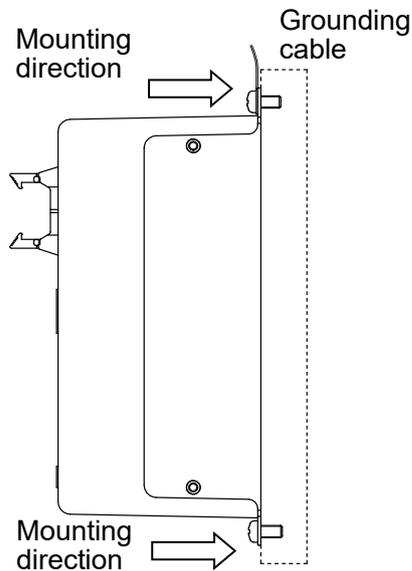


### 3.4 Mounting

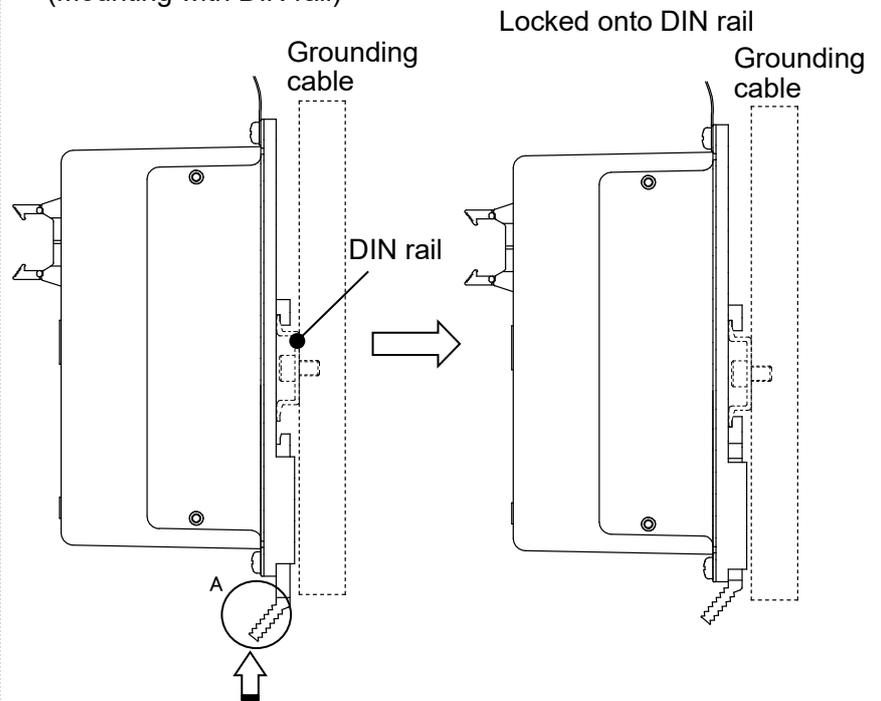
#### (1) Mounting

The controller can be direct mounted using screws or mounted on a DIN rail. Details of the controller mounting options are shown below.

##### - Direct mounting (LATCA-\*\*) (Mounting with two M4 screws)



##### - DIN rail mounting (LATCA-\*\*D) (Mounting with DIN rail)

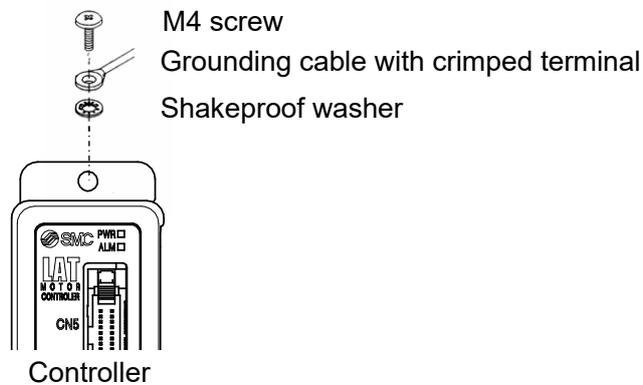


Hook the controller on to the DIN rail, and lock it to the rail by pushing part A in the direction of the arrow.

#### (2) Connection to ground

Place the grounding cable with crimped terminal between the M4 screw and shakeproof washer as shown below and tighten the screw.

The M4 screw, cable with crimped terminal and shakeproof washer must be prepared by the user.



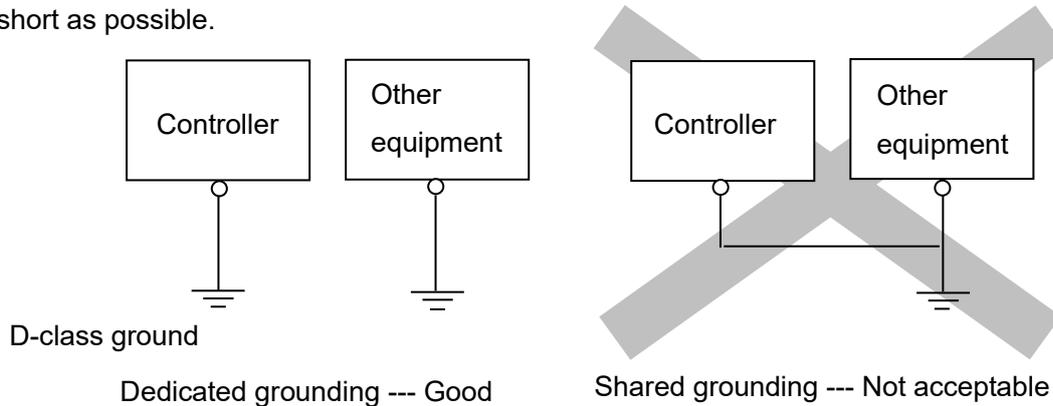
## ⚠ Caution

### The earth should be a dedicated earth connection.

Use a D-class ground connection (ground with a resistance of less than 100Ω).

The cross sectional area of the grounding cable shall be 2 mm<sup>2</sup> or more.

The Grounding point should be as near as possible to the controller. Keep the grounding cable as short as possible.



### (3) Mounting location

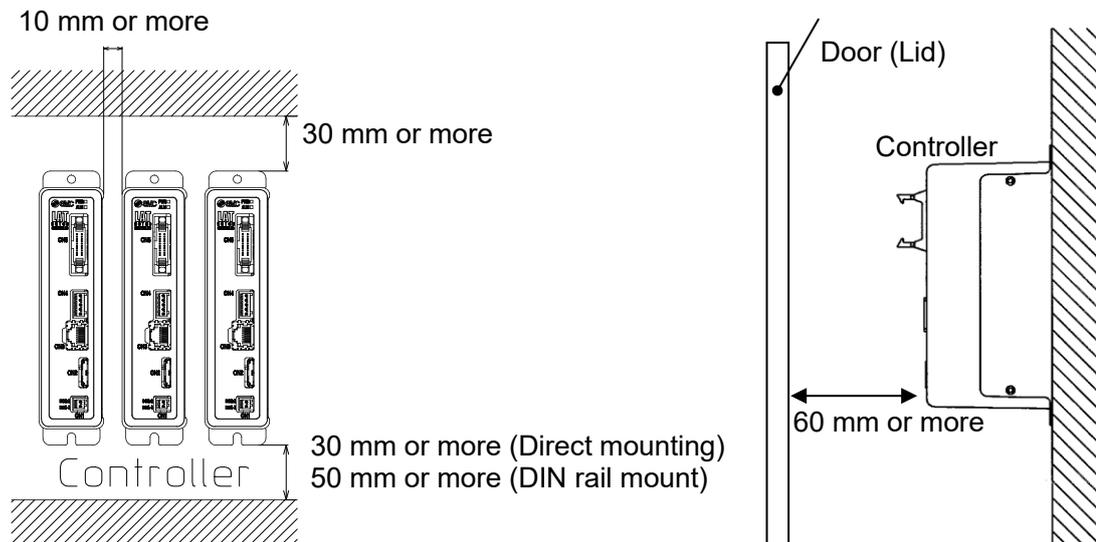
Design the size of the control panel and the installation type so that the temperature surrounding the controller is 40°C or less.

Mount the controller vertically on the wall with at least 30 mm (direct mounting) or 50 mm (DIN rail mounting) of space at the top and bottom of the controller as shown below.

Allow 60 mm or more space between the front of the controller and the enclosure cover (lid) for inserting and removing the connectors.

Enough space must be allowed around the controller so that the operating temperature of the controller stays within the specification range.

Avoid mounting the controller near a vibration source, such as a large electromagnetic contactor or circuit fuse breaker on the same panel, or keep it away from the controller.



## ⚠ Caution

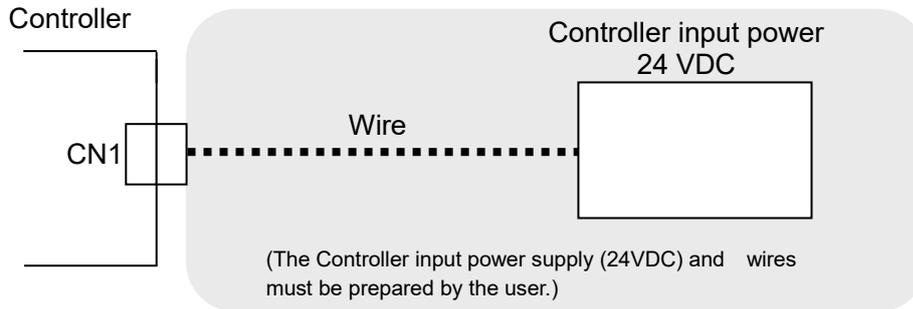
### The controller should be installed on a flat surface.

If the mounting surface is distorted or not flat, excessive force may be applied to the housing, etc. causing malfunction.

## 4. External Connections

An example of standard wiring of the controller is shown for each connector (CN1 to CN5).

### 4.1 CN1: Power supply connector



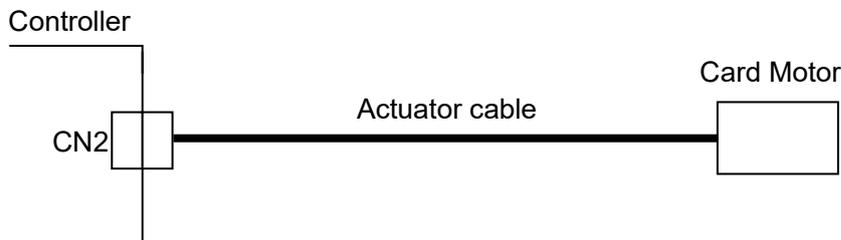
Refer to section **5. CN1: Power supply plug (P.22)** for wiring details.

### Caution

The controller should use a power supply (24 VDC) which satisfies the maximum current consumption and maximum power consumption. Do not use an inrush current suppression type power supply.

### 4.2 CN2: Motor connector

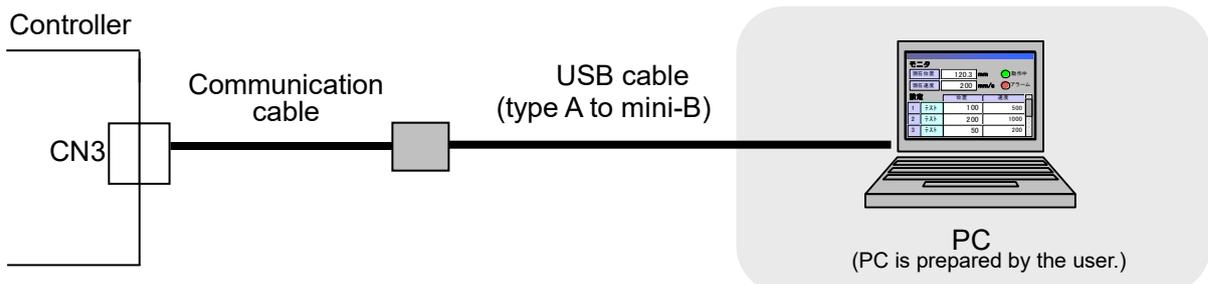
Connect the controller and the Card Motor using the actuator cable (LATH1-\*).



### 4.3 CN3: Serial I/O connector

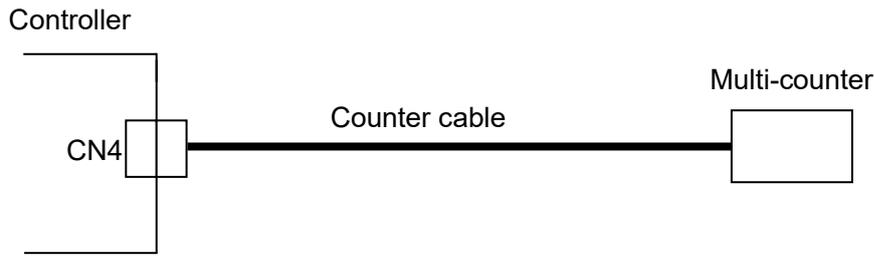
Connect the controller to the PC using the communication cable and USB cable.

To connect the controller to a PLC, refer to the operation manual "Card Motor Controller (Serial Communication edition)" or "Card Motor Controller (MODBUS Communication edition)".



#### 4.4 CN4: Counter connector (option)

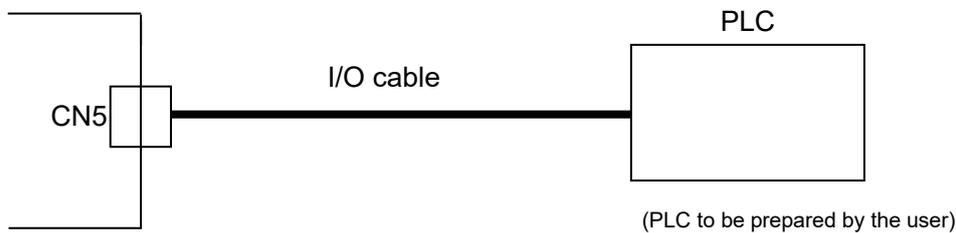
Connect the controller to the Multi-counter (CEU5) using the counter cable (LATH3-\*).



Refer to section [6.2 Counter plug wiring \(P.24\)](#).

#### 4.5 CN5: Parallel I/O connector

Connect the controller to a PLC using the I/O cable (shielded type LATH5-\* or not shielded type LATH2-\*). When using the pulse input method, the use of I/O cable (shielded type LATH5-\*) is recommended.



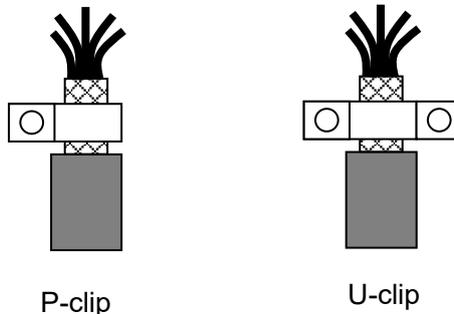
Refer to section [7.4 Parallel I/O signals \(P.27\)](#) for details of the parallel I/O signals .

Refer to section [7.6 Parallel I/O connector wiring \(P.32\)](#) for wiring.

### **Caution**

**Ground both ends of the I/O cable for protection from noise.**

**Ground the cable at the upper level device end such as a PLC with a metal cable clamp so that the entire circumference of the I/O cable shield contacts the clamp. Keep the stripped part of the shield as short as possible.**



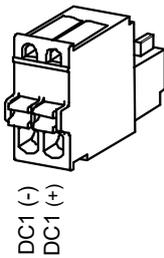
## 5. CN1: Power Supply Plug

### 5.1 Power supply plug specifications

The specifications of the power supply plug supplied with the controller are shown below.

Name	Part No.
Power supply plug	LATC4P-020S

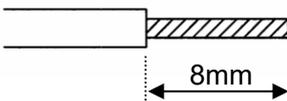
Power supply plug



Terminal	Function	Functional explanation
DC1 (-)	Power supply (-)	Power supply negative (-) supplied to the controller. The power supply (-) is also supplied to the Card Motor via the internal circuit of the controller and the actuator cable.
DC1 (+)	Power supply (+)	Power supply positive (+) supplied to the controller. The power supply (+) is also supplied to the Card Motor via the internal circuit of the controller and the actuator cable.

### 5.2 Electrical wiring specifications

Prepare the Electrical wiring according to the following specifications (to be prepared by the user).

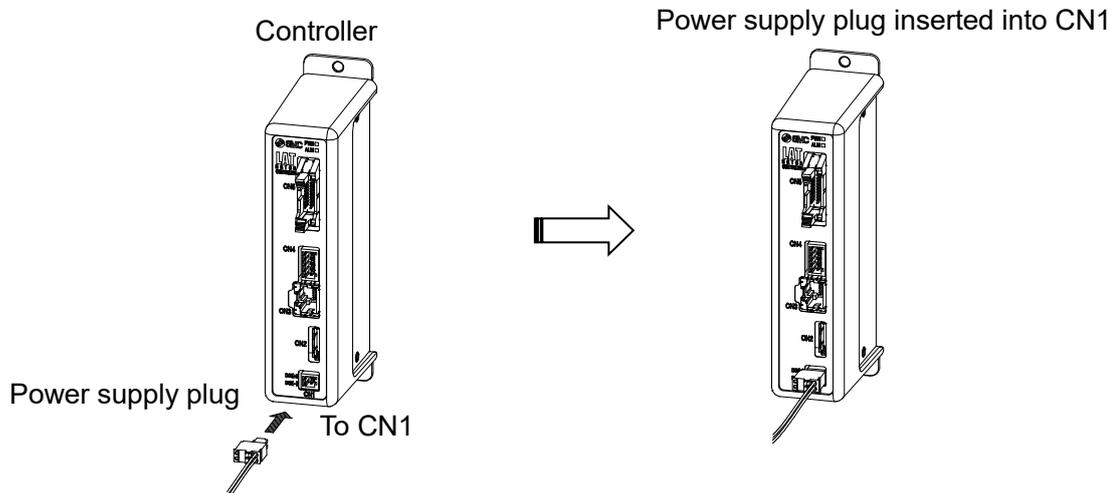
Item	Specifications
Applicable wire size	20 AWG / 0.5 mm <sup>2</sup> Use a single multi-strand wire in each terminal. Strip the ends as shown below and twist the strands together. * The rated temperature of the insulation coating should be 60°C or more.
Stripped wire length	

### Caution

Do not connect multiple wires to one terminal.

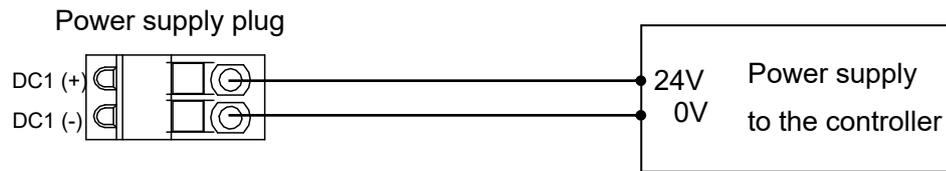
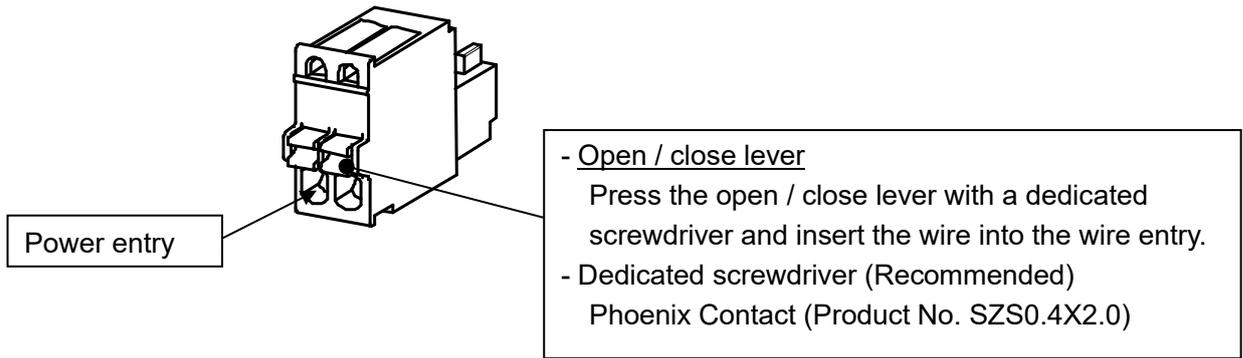
After wiring the power supply plug, connect it to CN1 power connector of the controller.

Refer to section [5.3 Power supply plug wiring \(P.23\)](#) for wiring.



### 5.3 Power supply plug wiring

Connect the power supply plug included as an accessory to 24 VDC power supply of the controller and connect it to the power entry of the power supply connector.



### Caution

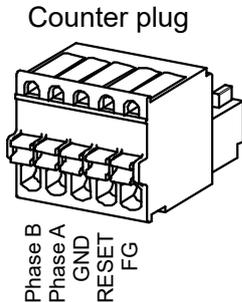
The controller should use a power supply (24 VDC) which satisfies the maximum current consumption and maximum power consumption. Do not use an inrush current suppression type power supply.

## 6. CN4: Counter Plug

### 6.1 Counter plug specifications

The specifications for the counter plug supplied with the controller are shown below.

Name	Part No.
Counter plug	LATC4P-050S



Name	Description
Phase B	B-phase pulse signal is output. Connect to Phase B of the counter cable.
Phase A	A-phase pulse signal is output. Connect to Phase A of the counter cable.
GND	Sensor input common. Connect to GND of the counter cable.
RESET	Reset signal is output. Connect to RESET of the counter cable.
FG	FG terminal. Connect to FG of the counter cable.

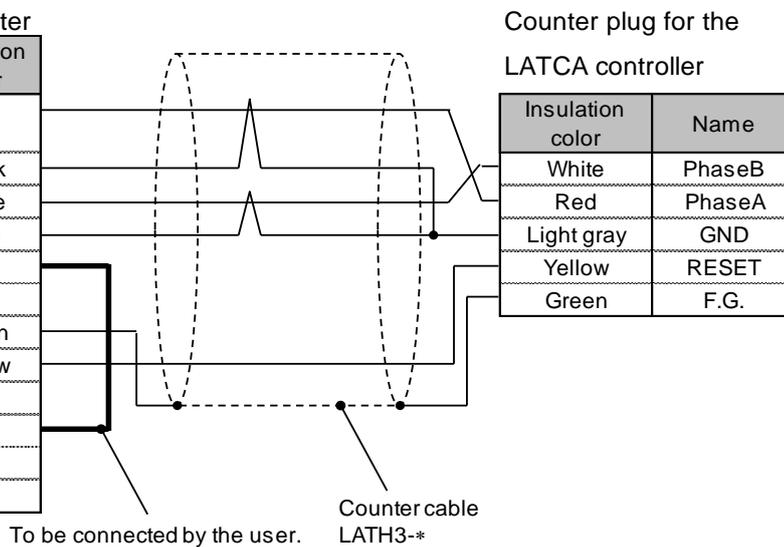
### 6.2 Counter plug wiring

The wiring of the counter cable (LATH3-\*) and Multi-counter (CEU5) is shown below.

Refer to the Multi-counter (CEU5) operation manual for further details.

Terminal block of the CEU5 Multi-counter

Name	Insulation color
A	Red
COM	Black
B	White
COM	Blue
DC12V	—
GND	—
F.G.	Green
RESET	Yellow
HOLD	—
COM	—
BANK1	—
BANK2	—



Note 1) Connect the control input common terminal (COM) to the sensor power supply output terminal (12 VDC).

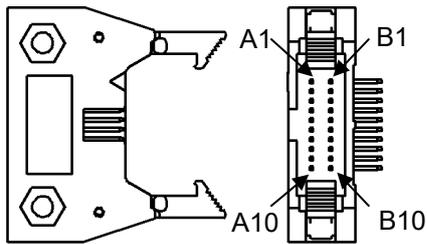
Note 2) Refer to section [15.5 Multi-counter CEU5 \(P. 78\)](#) for the Multi-counter settings (CEU5).

## 7. CN5: Parallel I/O Connector

### 7.1 Parallel I/O connector specifications

The Parallel I/O connector specifications are shown below.

Refer to section [7.5 Parallel I/O signal cable \(P.31\)](#) for correspondence of terminal numbers and I/O signals.



Item	Part No.
Controller side I/O connector	HIF6-20PA-1.27DS

\* Cable: Hirose Electric HIF6-20D-1.27R or equivalent

### 7.2 Parallel I/O specifications

#### - Input specifications

(NPN and PNP common, pulse input terminal is excluded)

Item	Specifications
Input circuit	Optically isolated open collector output
Number of inputs	6
Power supply	24 VDC $\pm 10\%$
Input current at ON state	2.4 mA $\pm 20\%$ (at 24 VDC)
Input current / voltage at OFF state	1.5 mA or less 15 V or less

#### - Output specifications

(NPN, PNP common)

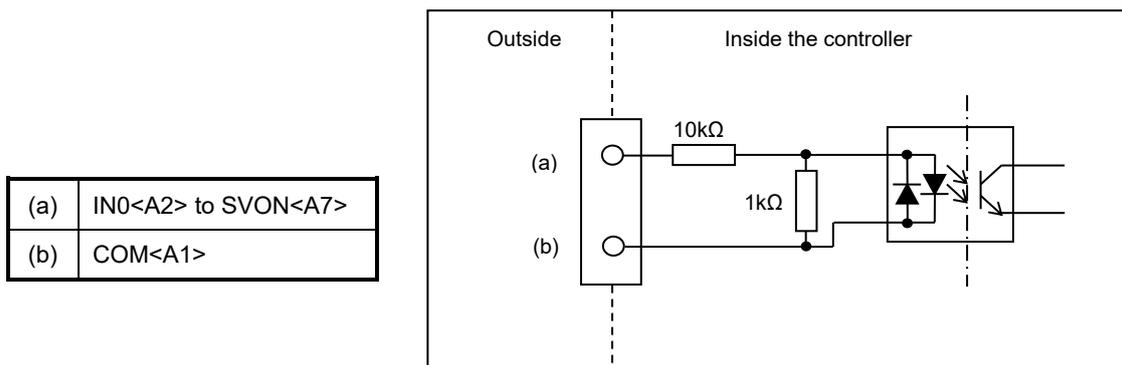
Item	Specifications
Output circuit	Optically isolated open collector output
Number of outputs	4
Maximum voltage between terminals	30 VDC
Maximum output current	10 mA
Saturation voltage between terminals	2.0 V (Max.)

### 7.3 Parallel I/O circuit (NPN, PNP)

This controller is available with NPN type (LATCA-N) and PNP type (LATCA-P) parallel I/O (The controller is different for NPN type and PNP type).

#### (1) Parallel I/O input circuit

Parallel I/O input circuit is shown below (NPN and PNP common, pulse input is excluded.).



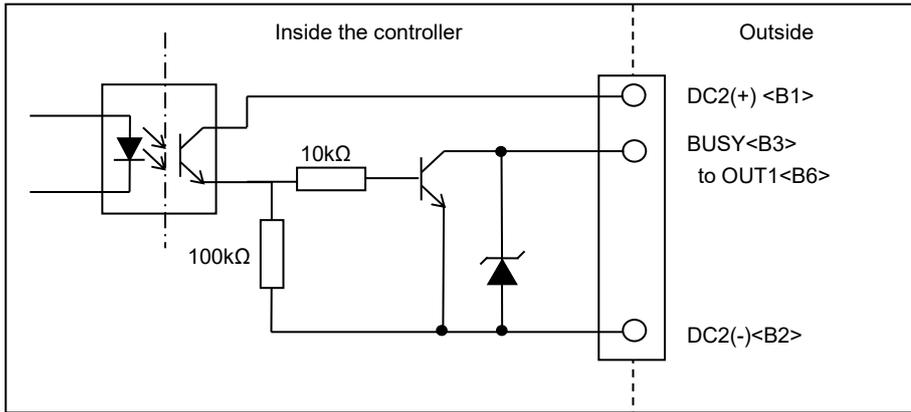
### ⚠ Caution

**Unused input terminals should not be in an unconnected (open) state.**

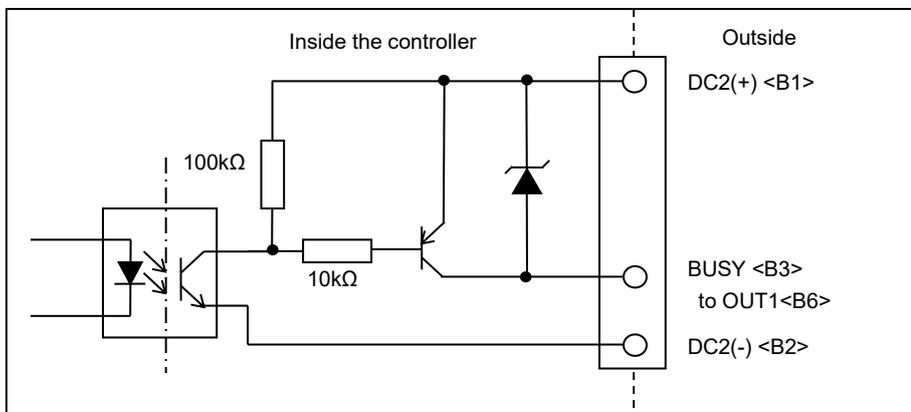
If the input signal is not connected (open), the controller may be affected by the surrounding noise, and the circuit in the controller may incorrectly recognize that the input has been activated.

## (2) Parallel I/O output circuit

-NPN type



-PNP type



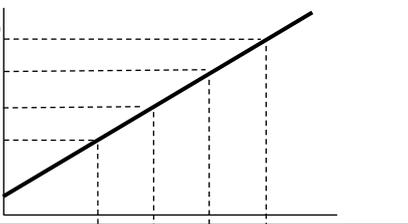
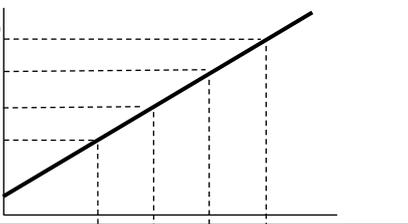
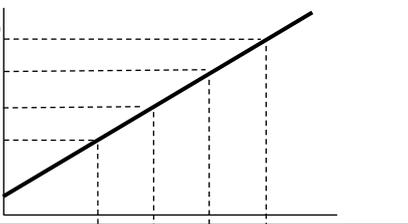
## 7.4 Parallel I/O signals (Step Data input type)

### (1) Input side (Step Data input type)

Function	Description												
COM	Common terminal for the input signal power supply. Connect the power supply + side (+ common) or power supply - side (- common) in accordance with the wiring specifications.												
IN0	Step data Bit No. is assigned (Input using a combination of IN0 to IN3) When all of IN0 to IN3 are turned OFF, return to origin position is performed (Step data No.0). Ex. (Step data No.3 has been assigned) <table border="1" style="margin-left: 40px;"> <thead> <tr> <th>IN3</th> <th>IN2</th> <th>IN1</th> <th>IN0</th> </tr> </thead> <tbody> <tr> <td>OFF</td> <td>OFF</td> <td>ON</td> <td>ON</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> </tr> </tbody> </table> ← 2, Binary code	IN3	IN2	IN1	IN0	OFF	OFF	ON	ON	0	0	1	1
IN3		IN2	IN1	IN0									
OFF		OFF	ON	ON									
0		0	1	1									
IN1													
IN2													
IN3													
DRIVE	When the DRIVE signal is turned ON, the system scans inputs IN0 to IN3 and starts the operation of the actuator according to the assigned step data. If the DRIVE signal is turned OFF while the actuator is operating, the movement will stop and the position will be held. <table border="1" style="margin-left: 40px;"> <thead> <tr> <th colspan="2" style="text-align: center;"> <b>Caution</b></th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;"><b>Turn ON the SVON signal and select the specified input signals (IN0 to IN3) before turning ON the DRIVE signal.</b></td> </tr> <tr> <td colspan="2" style="text-align: center;"><b>If the DRIVE input is turned OFF while the table moves, an overshoot may occur depending on the condition.</b></td> </tr> </tbody> </table>	 <b>Caution</b>		<b>Turn ON the SVON signal and select the specified input signals (IN0 to IN3) before turning ON the DRIVE signal.</b>		<b>If the DRIVE input is turned OFF while the table moves, an overshoot may occur depending on the condition.</b>							
 <b>Caution</b>													
<b>Turn ON the SVON signal and select the specified input signals (IN0 to IN3) before turning ON the DRIVE signal.</b>													
<b>If the DRIVE input is turned OFF while the table moves, an overshoot may occur depending on the condition.</b>													
SVON	The SVON signal turns the servo motor ON. [Servo ON] is an energizing command to the Card Motor. When the SVON signal turned OFF, the Card Motor is not energized, therefore the table is not controlled and is free to be moved by external forces. It is possible to clear an alarm (SVON reset) by resetting the SVON signal (ON to OFF to ON).												
NC	Open terminals (not in used)												

**(2) Output side (Step Data input type)**

Function	Description
DC2(+)	Connect the 24 V terminal of the power supply (24 VDC) for the input/output signals.
DC2(-)	Connect the 0 V terminal of the power supply (24 VDC) for the input/output signals.
BUSY	<p>The BUSY output signal will be ON when the Card Motor is moving (during the Return to Origin, positioning and pushing operations).</p> <p>The function of the BUSY output signal can be changed, or the BUSY function can also be assigned to other outputs in the "I/O Setup" window in the controller configuration software.</p> <div data-bbox="347 501 1406 723" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ Caution</b></p> <p><b>If the Card Motor is stopped during the pushing operation (no movement but the actuator is generating a pushing thrust), the BUSY signal will be OFF.</b></p> <p>Also, if the Card Motor operates at a speed slower than 5 mm/s, the BUSY signal may not turn ON at all.</p> </div>
ALARM	<p>ON when there are no alarms.</p> <p>OFF in alarm condition.</p>
<p>OUT0</p> <p>OUT1</p>	<p>The function of the OUT0 and OUT1 output signals can be changed to the functions listed below in the controller configuration software "I/O Setup" window.</p> <p>The INP signal function is set as a default for OUT0, and INF for OUT1.</p> <p><b>INP signal</b></p> <p>The output turns ON near the target position. The output condition varies depending on each operation mode.</p> <ul style="list-style-type: none"> <li>- During the return to origin <ul style="list-style-type: none"> <li>The INP output turns ON after the return to origin operation is completed.</li> </ul> </li> <li>- During positioning operation <ul style="list-style-type: none"> <li>The output turns ON within the INP range of the target position.</li> </ul> </li> <li>- During pushing operation <ul style="list-style-type: none"> <li>The output turns ON near the target position during the pushing operation.</li> <li>If the table exceeds the target position and moves outside the INP output range, the INP signal will turn OFF again</li> </ul> </li> </ul> <p><b>INF signal</b></p> <p>The INF output turns ON when the target position has been reached and the pushing force generated has exceeded the set "Threshold Force Value" during pushing operation. This output will be turned OFF during positioning operation and when the actuator is moving or held in position (when DRIVE signal is OFF).</p> <p>The "Threshold Force Value" can be set in the controller configuration software "I/O Setup" window.</p> <div data-bbox="347 1709 1386 1953" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ Caution</b></p> <p><b>The "Threshold Force Value" is set in the "I/O Setup" window as a general value for all pushing operation Step Data, but the "Thrust Setting Value" can be set individually for each Step Data.</b></p> <p>Therefore the INF output may be activated when the pushing force differs from the set "Thrust Setting Value".</p> </div>

<p>OUT0 OUT1</p>	<p>- INFP signal The output turns ON when the current Card Motor table position is within the positioning repeatability range (LAT3 is 0.09 mm, LAT3F is 0.005 mm) of the target position. The output conditions for each operation mode are similar to those for the INP signal.</p> <p>- AREA signal The output turns ON when the actuator is within the output range between "Position 1" and "Position 2". The range for "Position 1" to "Position 2" can be set in the controller configuration software "I/O Setup" window. A maximum of two position ranges, "AREA A" and "AREA B", can be selected for the AREA output signal, and the range from "Position 1" to "Position 2" can be set individually for each of them. It is possible to set only one signal function per output for OUT0 and OUT1. (e.g. OUT0 = INP, OUT1 = AREA A) Example of AREA signal output</p> <table border="1" data-bbox="363 674 1099 1093"> <tr> <td data-bbox="363 674 515 925">Table position</td> <td data-bbox="515 674 1099 925">  </td> </tr> <tr> <td data-bbox="363 925 515 1093">Status of the parallel I/O signals</td> <td data-bbox="515 925 1099 1093"> <table border="0"> <tr> <td data-bbox="515 925 691 965">AREA A signal</td> <td data-bbox="691 925 1099 965">ON</td> </tr> <tr> <td data-bbox="515 965 691 1005">AREA B signal</td> <td data-bbox="691 965 1099 1005">OFF</td> </tr> <tr> <td data-bbox="515 1005 691 1046">AREA A signal</td> <td data-bbox="691 1005 1099 1046">ON</td> </tr> <tr> <td data-bbox="515 1046 691 1086">AREA B signal</td> <td data-bbox="691 1046 1099 1086">OFF</td> </tr> </table> </td> </tr> </table> <p>- OVC signal This signal is turned ON when the current flowing into the Card Motor has exceeded the set "Threshold value". Monitoring OVC signal allows to detect when the table is stopped during positioning by an external force. The "Threshold value" can be set in the configuration software "I/O Setup" window. Please operate the product on the customer customer's equipment and set the threshold with a margin so that OVC signal does not turn on.</p> <p>- OVT signal This signal is turned ON when the internal temperature of the Card Motor has exceeded the set "Threshold value". Unusual temperature rise can be detected by monitoring the OVT signal. The "Threshold value" can be set in the configuration software "I/O Setup" window. Please operate the product on the customer customer's equipment and set the threshold with a margin so that OVT signal does not turn on.</p>	Table position		Status of the parallel I/O signals	<table border="0"> <tr> <td data-bbox="515 925 691 965">AREA A signal</td> <td data-bbox="691 925 1099 965">ON</td> </tr> <tr> <td data-bbox="515 965 691 1005">AREA B signal</td> <td data-bbox="691 965 1099 1005">OFF</td> </tr> <tr> <td data-bbox="515 1005 691 1046">AREA A signal</td> <td data-bbox="691 1005 1099 1046">ON</td> </tr> <tr> <td data-bbox="515 1046 691 1086">AREA B signal</td> <td data-bbox="691 1046 1099 1086">OFF</td> </tr> </table>	AREA A signal	ON	AREA B signal	OFF	AREA A signal	ON	AREA B signal	OFF
Table position													
Status of the parallel I/O signals	<table border="0"> <tr> <td data-bbox="515 925 691 965">AREA A signal</td> <td data-bbox="691 925 1099 965">ON</td> </tr> <tr> <td data-bbox="515 965 691 1005">AREA B signal</td> <td data-bbox="691 965 1099 1005">OFF</td> </tr> <tr> <td data-bbox="515 1005 691 1046">AREA A signal</td> <td data-bbox="691 1005 1099 1046">ON</td> </tr> <tr> <td data-bbox="515 1046 691 1086">AREA B signal</td> <td data-bbox="691 1046 1099 1086">OFF</td> </tr> </table>	AREA A signal	ON	AREA B signal	OFF	AREA A signal	ON	AREA B signal	OFF				
AREA A signal	ON												
AREA B signal	OFF												
AREA A signal	ON												
AREA B signal	OFF												
NC	Open terminals (not used)												

## ⚠ Caution

The step data is executed according to the input signal status of IN0 to IN3 as soon as the DRIVE signal has changed from OFF to ON (operation starts on the rising edge).

Ensure that the power supply has been turned ON and that the ALARM signal is ON before activating any input signals.

If input signals are ON before that, a “return to origin position not executed” error will occur. Turn ON the input signal again after turning OFF all signals.

Furthermore ensure the same I/O signal sequence, and turn OFF and ON again all input signals, when operating the Card Motor with parallel I/O signals, after communicating with the controller configuration software.

**Each threshold value is a reference.**

Check the operating conditions before setting and using the card motor.

The table below shows the changes in the output signal with respect to controllers state.

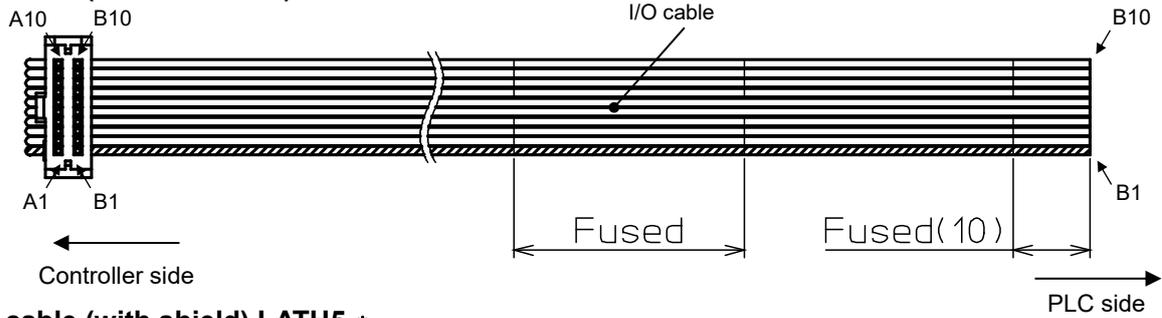
State	Output signal	BUSY	ALARM	OUT0,OUT1					
				INP	INF	INFP	AREA	OVC	OVT
Controller powered down [SVOFF] with no motion		OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Controller powered down [SVON] with no motion		OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF
Return to origin is in operation.		ON	ON	OFF	OFF	OFF	OFF	OFF	OFF
Return to origin completed.		OFF	ON	ON	OFF	ON	OFF	OFF	OFF
Movement by positioning in operation after return to origin.		ON	ON	OFF	OFF	OFF	ON	ON	ON
Positioning after return to origin completed (within positioning range).		OFF	ON	ON	OFF	ON	ON	ON	ON
Movement by pushing in operation after return to origin.		ON	ON	OFF	OFF	OFF	ON	ON	ON
Target position for pushing has been reached after return to origin.		ON	ON	ON	OFF	ON	ON	ON	ON
The force for pushing operation is generated after return to origin.		OFF	ON	OFF	ON	OFF	ON	ON	ON
Position held after return to origin completed (DRIVE signal OFF)		Hold	ON	Hold	OFF	Hold	Hold	Hold	Hold
Servo is OFF after return to origin.		OFF	ON	OFF	OFF	OFF	ON	ON	ON
Alarm is generated.		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

Note 1) “Hold” indicates the that the output signal status is maintained when the DRIVE signal is OFF.

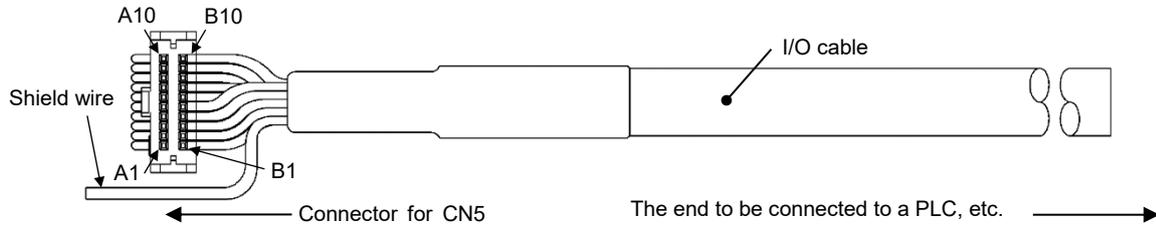
Note 2) “ON” is achieved when the output condition of each signal is satisfied.

## 7.5 Parallel I/O signal cable (Step Data input type)

### (1) I/O cable (without shield) LATH2-\*



### (2) I/O cable (with shield) LATH5-\*



Input/Output	Terminal number	Function (Step Data input)	LATH2-*	LATH5-*		
			Insulator color	Insulator color	Dot mark	Dot color
Input	A1	COM	Red	Light brown	■	Red
	A2	IN0	Grey			Black
	A3	IN1	Grey	Yellow	■	Red
	A4	IN2	Grey			Black
	A5	IN3	Green	Light green	■	Red
	A6	DRIVE	Grey			Black
	A7	SVON	Grey	Grey	■	Red
	A8	NC	Grey			Black
	A9	NC	Grey	White	■	Red
	A10	NC	Green			Black
Output	B1	DC2(+)	Red	Light brown	■ ■	Red
	B2	DC2(-)	Grey			Black
	B3	BUSY	Grey	Yellow	■ ■	Red
	B4	ALARM	Grey			Black
	B5	OUT0	Green	Light green	■ ■	Red
	B6	OUT1	Grey			Black
	B7	NC	Grey	Grey	■ ■	Red
	B8	NC	Grey			Black
	B9	NC	Grey	White	■ ■	Red
	B10	NC	Green			Black

Note 1) If pulse input type is selected for the controller input type, the function of the terminals will be different from those in the table above. If the controller is used with the pulse input type, refer to the operation manual [Card Motor Controller (Pulse input edition)].

### **⚠ Caution**

**When using the step data input method, do not wire to the terminals B7 to B10.**

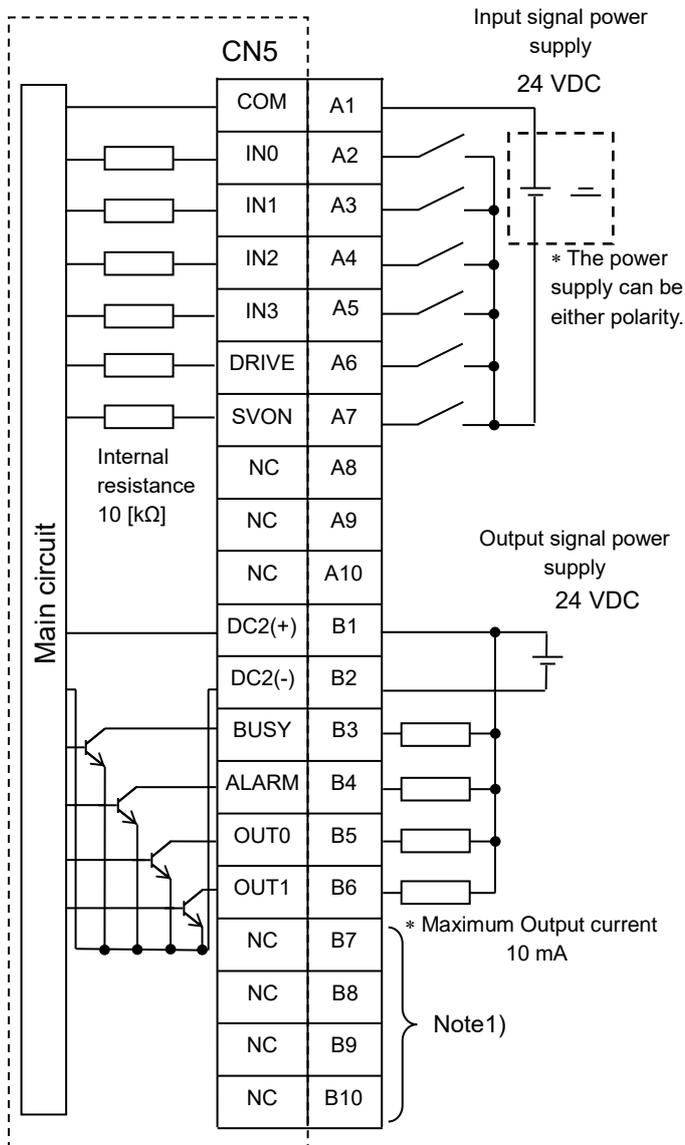
These input terminals incorporate an internal circuit for pulse input signal, so this may lead to failure.

## 7.6 Parallel I/O connector wiring (example)

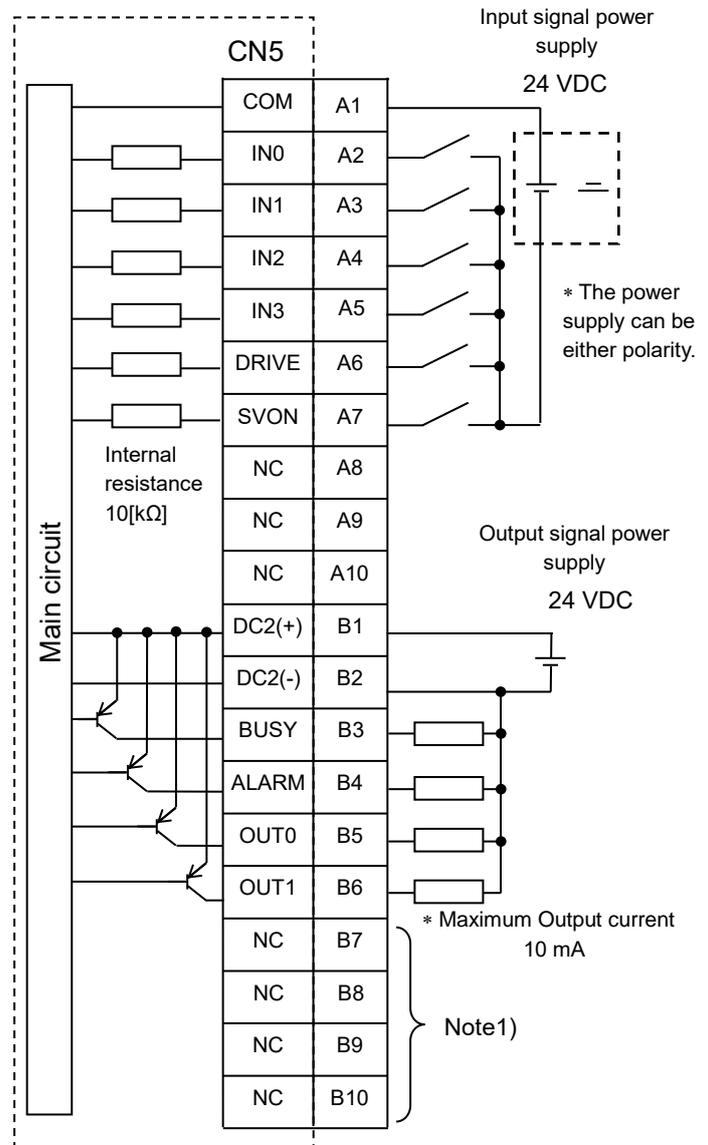
Use an I/O cable (LATH2-\* or LATH5-\*) for connecting the controller CN5 parallel I/O connector to a PLC. The wiring depends on the parallel input/output of the controller (NPN, PNP type).

Wire the product while referring to the wiring diagram below.

### - NPN type



### -PNP type



Note 1) When the step data input method is used, do not connect wires to the terminals B7 to B10. Internal circuits are included which are used as pulse input signal terminals.

## ! Caution

Prepare 2 separate 24 VDC power supplies for the CN1 controller power supply and CN5 input / output signal power supply.

## 8. Pulse Input Signal Switch

This switch is not used for the step data input type.

## 9. Controller Set Up

Before the controller can be operated, in order to move the Card Motor to a specific position, it is necessary to program the items shown below in the controller, using a PC with the controller configuration software installed. The data entered using the controller configuration software will be stored in the memory of the controller.

See **14. Controller Configuration Software** for details of the configuration software.

### 9.1 Communication Speed and Controller ID's

After selecting the communication speed for the serial communication (RS485), the controller configuration software will search the ID of the controller connected to the serial communication port (RS-485).

Selects the communication speed.

Name	Description
Communication speed	Communication speed is selected. Select a communication speed that matches the communication speed set on the controller (default value: 19200 bps).

Search and Selection of Controller ID

Name	Description
Start Search	Specifies the ID range for searching <sup>Note 1)</sup> , and searches for the connected controller ID within the specified range.
Connect	Starts communication with the controller of the selected controller ID.

Note 1) Specify the controller ID search range to find the controller connected to the PC. (Default searching range: 1 to 1).

If the search range is large, this may take several minutes for searching.

### 9.2 Selection of the input type

Select the controller input type from "Step Data Input type" or "Pulse Input type" in accordance with the host PLC.

The Input type can be changed by initializing the controller. However, initialization resets all of the settings, so the settings will be required again. (Refer to **14.6 Confirmation of the version and initialization (P. 72)**)

Details of input type selection

Name	Description
Step Data Input type	The Card Motor is operated by selecting Step Data preset in the controller using parallel I/O signals.
Pulse Input type	The Card Motor is operated according to the number of pulses entered into the controller at a speed proportional to the pulse frequency entered into the controller.

### 9.3 Basic parameter setup

The connected Card Motor product number connected to the controller and the operating conditions must be specified.

#### Basic parameter setup

Name	Input range	Description																		
Card Motor Product Number	8 options (Refer to the table on the right)	<p>Select the Card Motor product number that is connected to the controller.</p> <table border="1"> <thead> <tr> <th>Product No.</th> <th>Specifications</th> </tr> </thead> <tbody> <tr> <td>LAT3-10</td> <td>Stroke 10 mm, Resolution 30 μm</td> </tr> <tr> <td>LAT3-20</td> <td>Stroke 20 mm, Resolution 30 μm</td> </tr> <tr> <td>LAT3-30</td> <td>Stroke 30 mm, Resolution 30 μm</td> </tr> <tr> <td>LAT3M-50</td> <td>Stroke 50 mm, Resolution 5 μm</td> </tr> <tr> <td>LAT3F-10</td> <td>Stroke 10 mm, Resolution 1.25 μm</td> </tr> <tr> <td>LAT3F-20</td> <td>Stroke 20 mm, Resolution 1.25 μm</td> </tr> <tr> <td>LAT3F-30</td> <td>Stroke 30 mm, Resolution 1.25 μm</td> </tr> <tr> <td>LAT3F-50</td> <td>Stroke 50 mm, Resolution 1.25 μm</td> </tr> </tbody> </table>	Product No.	Specifications	LAT3-10	Stroke 10 mm, Resolution 30 μm	LAT3-20	Stroke 20 mm, Resolution 30 μm	LAT3-30	Stroke 30 mm, Resolution 30 μm	LAT3M-50	Stroke 50 mm, Resolution 5 μm	LAT3F-10	Stroke 10 mm, Resolution 1.25 μm	LAT3F-20	Stroke 20 mm, Resolution 1.25 μm	LAT3F-30	Stroke 30 mm, Resolution 1.25 μm	LAT3F-50	Stroke 50 mm, Resolution 1.25 μm
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LAT3-30	Stroke 30 mm, Resolution 30 μm																			
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LAT3F-10	Stroke 10 mm, Resolution 1.25 μm																			
LAT3F-20	Stroke 20 mm, Resolution 1.25 μm																			
LAT3F-30	Stroke 30 mm, Resolution 1.25 μm																			
LAT3F-50	Stroke 50 mm, Resolution 1.25 μm																			
Return to Origin Method	3 options (Refer to the table on the right)	<p>Select the operating direction at return to origin position. Refer to <b>12.1 Return to Origin example (P. 51)</b> for further details.</p> <table border="1"> <thead> <tr> <th>Method to return to origin position</th> </tr> </thead> <tbody> <tr> <td> <p>Retracted End Position (connector side) The table moves towards the connector end and sets the origin position.</p> </td> </tr> <tr> <td> <p>Extended End Position The table moves towards the end opposite to the connector and sets the origin position.</p> </td> </tr> <tr> <td> <p>Sensor Origin The table moves to the linear encoder origin position and sets the origin position at this point.</p> </td> </tr> </tbody> </table>	Method to return to origin position	<p>Retracted End Position (connector side) The table moves towards the connector end and sets the origin position.</p>	<p>Extended End Position The table moves towards the end opposite to the connector and sets the origin position.</p>	<p>Sensor Origin The table moves to the linear encoder origin position and sets the origin position at this point.</p>														
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Step Data input type	Cycle time entry method Speed entry method	Refer to <b>9.4 Step Data input type (P36)</b> .																		
Card Motor Mounting orientation	Horizontal Vertical	<p>Select the Card Motor mounting orientation.</p> <p>Horizontal: The angle of the Card Motor connector is 0 to 45oC to the vertical surface.</p> <p>Vertical: The angle of the Card Motor connector is 46 to 90oC to the vertical surface.</p>																		
Setting	-	<p>The changed value is sent to the controller connected to the PC.</p> <table border="1"> <thead> <tr> <th> <b>Caution</b></th> </tr> </thead> <tbody> <tr> <td> <p><b>To complete the setting, execute the controller reset operation before operating the Card Motor.</b></p> <p>A message will appear in the controller configuration software window instructing the user to perform a reset operation.</p> </td> </tr> </tbody> </table>	 <b>Caution</b>	<p><b>To complete the setting, execute the controller reset operation before operating the Card Motor.</b></p> <p>A message will appear in the controller configuration software window instructing the user to perform a reset operation.</p>																
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<p><b>To complete the setting, execute the controller reset operation before operating the Card Motor.</b></p> <p>A message will appear in the controller configuration software window instructing the user to perform a reset operation.</p>																				
Comm (Communication)	-	<p>If the communication is interrupted whilst the controller configuration software is running, the communication can be restored by clicking the [Comm] button. However, the communication cannot be completely restored unless the cause of the communication disconnection is solved.</p>																		

## 9.4 Step Data Input type

Select Step Data input type as follows.

Name	Description
Cycle Time Entry Method (recommended)	Used to operate the table based on position and positioning time, or to operate at high frequency. Speed, acceleration and deceleration are calculated automatically based on the set target position and positioning time. -Necessary settings: Target position, positioning time, and load mass
Speed entry method	To operate the table at a constant speed (trapezoidal movement profile). The table is moved based on the user defined settings. -Necessary settings: Target position, speed, acceleration, deceleration and load mass.

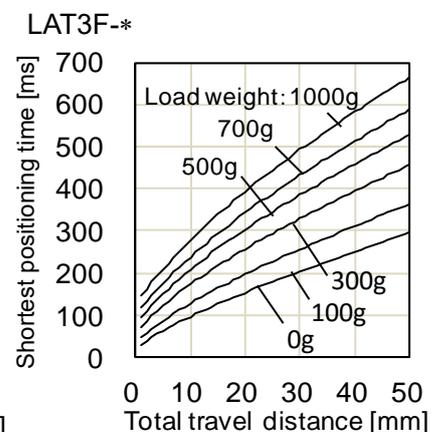
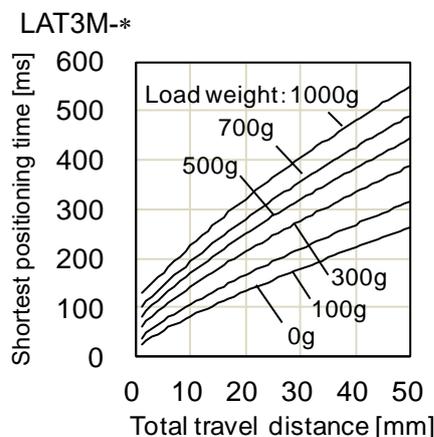
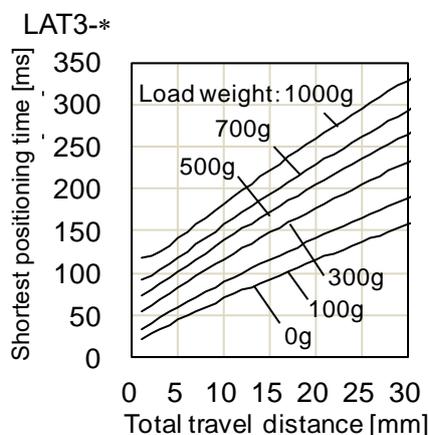
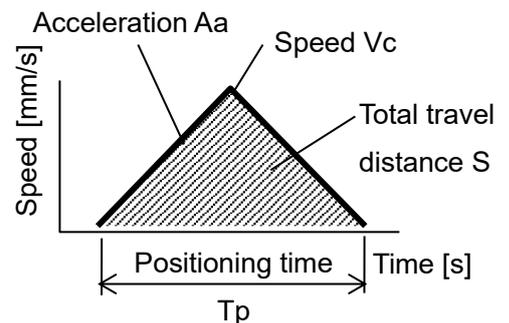
### (1) Cycle time entry method

Settings: , ,

To obtain the total travel distance  $S$  [mm] in absolute positioning mode, calculate the difference between the position from where the table travel starts, and the target position. The table will move to the Target Position within the set Positioning Time  $T_p$  [s] according to a triangular movement profile as shown in the diagram on the right.

In relative positioning mode the travel distance  $S$  [mm] is equal to the Target Position.

The positioning time should be set larger than the minimum positioning time shown below in relation to the travel distance and load mass applied during the operation. If overshoot or vibration occurs, set a longer positioning time.

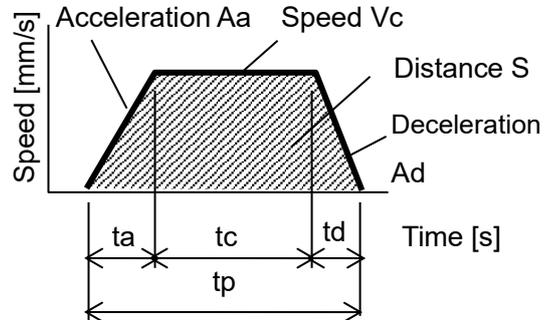


## (2) Speed entry method

Settings: , , , ,

To obtain the total travel distance  $S$  [mm] in absolute positioning mode, calculate the difference between the position from which the table travel starts to the target position. The table will move to the Target Position according to a trapezoidal movement profile as shown in the diagram on the right, based on the set speed  $V_c$  [mm/s], acceleration  $A_a$  [mm/s<sup>2</sup>] and deceleration  $A_d$  [mm/s<sup>2</sup>].

In relative positioning mode the travel distance  $S$  [mm] is equal to the Target Position.



Refer to the equations below for the acceleration time, constant velocity time and travel distance.

Acceleration time:  $t_a = V_c / A_a$  [s]

Deceleration time:  $t_d = V_c / A_d$  [s]

Acceleration distance:  $S_a = 0.5 \times A_a \times t_a^2$  [mm]

Deceleration distance:  $S_d = 0.5 \times A_d \times t_d^2$  [mm]

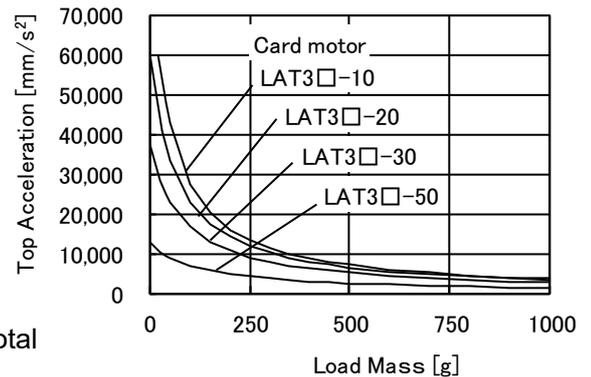
Travel distance with constant velocity:  $S_c = S - S_a - S_d$  [mm]

Travel time with constant velocity:  $t_c = S_c / V_c$  [s]

Positioning time:  $t_p = t_a + t_c + t_d$  [s]

(Add settling time to the Positioning time to get the total positioning time).

The acceleration and deceleration should be set lower than the maximum acceleration / deceleration in relation to the load mass during operation as shown in the figure on the right.



### Caution

**If the acceleration and deceleration is low, the table may not reach the set speed because the movement profile becomes triangular.**

## 9.5 I/O setup

Settings for parallel I/O signals:

Name	Input range	Description																						
I/O Status	-	Displays the current input and output signals status. Green/Red: ON, Black: OFF Refer to <b>7.4 Parallel I/O Signals (P.27)</b> for details of the I/O signals.																						
Manual Output	ON OFF	Each output signal can be turned ON and OFF manually regardless of their current status, to check the connection. Normally the ALARM output is OFF when an alarm has been generated, but the ALARM output can be turned ON/OFF manually by pressing the ALARM button. Manual outputs are cancelled when another window is selected.																						
Area Range	Refer to the table on the right.	Input the table positioning range where the AREA signal turns ON. (Unit: mm) Separate position ranges can be set for up to two outputs: "AREA A" and "AREA B". The position ranges should be set as follows: Position 1 ≤ Position 2. <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Part No.</th> <th>Range</th> <th>Resolution</th> </tr> </thead> <tbody> <tr> <td>LAT3-10</td> <td>0 to 10</td> <td rowspan="3">0.03</td> </tr> <tr> <td>LAT3-20</td> <td>0 to 20</td> </tr> <tr> <td>LAT3-30</td> <td>0 to 30</td> </tr> <tr> <td>LAT3M-50</td> <td>0 to 50</td> <td rowspan="4">0.005</td> </tr> <tr> <td>LAT3F-10</td> <td>0 to 10</td> </tr> <tr> <td>LAT3F-20</td> <td>0 to 20</td> </tr> <tr> <td>LAT3F-30</td> <td>0 to 30</td> </tr> <tr> <td>LAT3F-50</td> <td>0 to 50</td> <td></td> </tr> </tbody> </table>	Part No.	Range	Resolution	LAT3-10	0 to 10	0.03	LAT3-20	0 to 20	LAT3-30	0 to 30	LAT3M-50	0 to 50	0.005	LAT3F-10	0 to 10	LAT3F-20	0 to 20	LAT3F-30	0 to 30	LAT3F-50	0 to 50	
Part No.	Range	Resolution																						
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LAT3F-10	0 to 10																							
LAT3F-20	0 to 20																							
LAT3F-30	0 to 30																							
LAT3F-50	0 to 50																							
Threshold value [INF]	0.5 to 5.0 (in 0.1 increments)	This determines the condition for when the INF signal is activated. The INF signal turns ON when the pushing force generated by the Card Motor exceeds the set value. The "Threshold Force Value" and the "Threshold Setting Value" in the Step Data are independent of each other. The INF output will not be activated if the "Threshold Force Value" is larger than the "Threshold Setting Value" in the step data, because the "Threshold Force" will never be reached.																						
Threshold value [OVC]	1.5 to 3.0 (in 0.1 increments)	This determines the condition for when the OVC signal is output. This OVC signal is turned ON when the current flowing into the Card Motor has exceeded the set "threshold value".																						
Threshold value [OVT]	40 to 70 (in 10 increments)	This determines the condition for when the OVT signal is activated. This OVT signal is turned ON when the internal temperature of the Card Motor has exceeded the set "threshold value".																						
Configuration of Output Signal	9 types	The function of the parallel I/O signals OUT0 and OUT1 can be selected. Another signal function can also be assigned to the BUSY output terminal. It is possible to use the same function for more than one output terminal. Refer to section <b>7.4 Parallel I/O Signals (P.27)</b> for details of the I/O signals.																						

### Caution

**Each threshold value is a reference.**

Check the operating conditions before setting and using the card motor.

## 9.6 Step Data setup

A "step data" is the preset data mainly describing the movement of the motor. A total of 15 step data (2 types) can be handled by the controller.

### Step Data details

Name	Input scope	Description						
Editing of Step Data	Cut Copy Paste	Cut: Cuts the selected step data. Copy: Copies the selected step data. Paste: The copied or cut data is pasted to the selected step data.						
Get Posn (Position)		Reads the current table position, and pastes it to the "Target position". It is necessary to perform return to origin before this function can be used. The position can be pasted to the step data only in "Absolute" movement mode.						
File operation	Save Open	Save: Saves the step data in a file on the PC. Open: Reads the step data from a file on the PC.						
Up / Download to controller	Upload Download	Upload: Displays the data from the controller within the configuration software (PC). Download: Writes to the controller from the configuration software with the data displayed within the configuration software (PC).						
No.	1 to 15	Specifies the step data number						
Operation	Position Pushing	Select [Positioning] or [Pushing]. When [Positioning] is selected, it is not possible to enter a [Thrust setting value]. When [Pushing] is selected, it is possible to enter a [Thrust setting value].						
Movement MOD (mode)	Absolute (ABS) Relative (REL)	Specifies the co-ordinate system for the target position. <table border="1" data-bbox="584 1028 1458 1274"> <thead> <tr> <th>Operation mode</th> <th>Details</th> </tr> </thead> <tbody> <tr> <td>Absolute</td> <td>The target position will be defined in relation to the absolute origin point of the Card Motor.</td> </tr> <tr> <td>Relative</td> <td>The target position will be defined relative to the current position.</td> </tr> </tbody> </table>	Operation mode	Details	Absolute	The target position will be defined in relation to the absolute origin point of the Card Motor.	Relative	The target position will be defined relative to the current position.
Operation mode	Details							
Absolute	The target position will be defined in relation to the absolute origin point of the Card Motor.							
Relative	The target position will be defined relative to the current position.							
Target position	Absolute Positioning Setting Ranges [mm] 0 to 10 0 to 20 0 to 30 0 to 50  Relative Positioning Setting Ranges [mm] -10 to 10 -20 to 20 -30 to 30 -50 to 50	Set the target position, or the position to start pushing. (unit: mm) The input range varies depending on the Card Motor product number selected in the basic parameter set up. The target position setting ranges vary depending on the movement mode selected. Negative values can be entered only in Relative positioning mode. <div data-bbox="584 1520 1458 2056" style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>⚠ Caution</b></p> <p><b>In absolute positioning mode, the difference between the set "Target Position" and the current position, and in relative positioning mode, the set "Target Position" should be equal to or larger than the values shown below.</b></p> <p>LAT3-*: ±0.09 mm LAT3M-*: ±0.02 mm LAT3F-*: ±0.005 mm</p> <p>The Card Motor does not move when the travel distance is shorter than the positioning repeatability range. In pushing mode, when the travel distance is shorter than the positioning repeatability range, the table starts moving at a constant speed, in the extended direction (the opposite direction to the connector) from the current position to perform a pushing operation.</p> </div>						

Positioning time	0 to 60	<p>Set the positioning time to the target position (unit: s). It does not perform the positioning control when it is set to "0".</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>! Caution</b></p> <p><b>The operation may not be possible depending on the order of the step data.</b> In such a case, an alarm is output and the operation does not start. Be sure to check the operating condition and the order of the step data sufficiently before setting.</p> </div>
Speed	1 to 400	<p>Set the speed to move to the target position or the pushing start position. (unit: mm/s) The speed setting is enabled when [Speed Entry Method] has been selected in the "Basic Parameter Set up" window in the "Step Data Input Method" section.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>! Caution</b></p> <p><b>When parameters which cannot be realized are set, the controller might not operate in accordance with the set conditions.</b> Similar caution needs to be applied to the Accel and Decel settings.</p> </div>
Accel (Acceleration)	1 to 60000	<p>Set the acceleration required to reach the travel speed (unit: mm/s<sup>2</sup>). The acceleration setting is enabled when [Speed Entry Method] has been selected in the "Basic Parameter Set up" window in the "Step Data Input Method" section.</p>
Decel (Deceleration)	1 to 60000	<p>Set the deceleration required to reach the travel speed (unit: mm/s<sup>2</sup>). The deceleration setting is enabled when [Speed Entry Method] has been selected in the "Basic Parameter Set up" window in the "Step Data Input Method" section.</p>
Thrust Setting Value	1 to 5 1 to 4.8 1 to 3.9 1 to 2.0	<p>Set the maximum force for the pushing operation.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>! Caution</b></p> <p><b>The thrust setting value is a nominal value, therefore calibrate the thrust setting value according to the application and check the operation sufficiently when setting and before using the Card Motor and controller.</b></p> </div>
Load Mass	0 to 1000	<p>Select the load mass to be mounted on the Card Motor (unit: g). The load mass setting of Step data No. 1 is common with the return to origin operation and jog operation.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>! Caution</b></p> <p><b>Therefore operate the Card Motor under the same load conditions for the Return to Origin operation and Step Data No.1.</b> <b>Set the Load Mass in Step Data No.1 when the Card Motor is jogged with a load mounted.</b></p> <p><b>The selected load mass is a guideline only, therefore be sure to check the operation sufficiently when setting and before using the Card Motor and controller.</b></p> </div>

## 10. Monitor and Test Mode of the Controller

In the "Monitor / Test" window the Card Motor status can be monitored and the performance tested.

Monitor mode: The Card Motor status can be monitored from a PC when the Card Motor is operated by parallel I/O signals.

After selecting the Monitor Mode, execute the return to origin operation, using the parallel I/O signals before operating the Card Motor in Monitor Mode.

Test mode: A test operation can be performed by controlling the Card Motor from the connected PC.

All four test operation modes [Jogging], [Inching], [Single Step Data Operation] and [Continuous Operation] cycles can be performed in test mode.

### Test and Monitor operation details

Name	Description
Status	Displays the current parallel I/O status.
Current alarm	Displays the current alarm status.
Alarm history	Displays the alarm history.
Alarm reset	Displays the alarm history stored in the controller, and the alarm history can be reset.
Step Data No.	Displays the Step Data number that is currently being executed.
Target position	Displays the target position according to the pulse input (when operating in pulse input type).
Position	Displays the current position of the Card Motor table.
Speed	Displays the current speed of the Card Motor table.
Force	Displays the current pushing force of the Card Motor.
Test Mode / Monitor Mode	Switches between Test mode and Monitor mode.
Servo	When this is clicked a signal is sent to the controller to send an energizing command to the Card Motor. When this is clicked once again a signal is sent to the controller to send an energizing cancel command to the Card Motor.
Return to origin	A return to origin position command is sent to the controller immediately when this button is clicked. After the return to origin position is completed, the requirement to execute this function again is cancelled automatically. Select the method for the return to origin position operation from the [Return to Origin Method] menu in the Basic Parameter Set up window. The load mass setting for "Step Data No. 1" is used for the operation. Note that the controller needs to be restarted when the [Return to Origin Method] has been changed, and the [Setup] button must be clicked for the change to take effect.
Jog	← → The table moves in the direction of the arrow while the Jogging button is pressed. The table movement stops when the button is released. When the table has reached the stroke end of the Card Motor, the table movement stops even if the button is still pressed.

Speed	<p>Selects the speed for jogging and inching.          Setting range: from 1 to 100 mm/s.          (The set speed may not be achieved, depending on the operating conditions).</p>
Inching	<p>When either the “+” button or “-“ button is pressed, the table moves the preset travel distance. The position is held after the transfer motion has been completed.          The table will stop when it reaches the end of the Card Motor stroke range.          The table moves at the speed set in the “Speed” text box in the “Jog” section. The acceleration and deceleration are fixed, and cannot be changed.          The Load Mass setting for “Step Data No.1” is used for the inching operation.</p>
Travel distance	<p>Sets the range and minimum distances for inching.          LAT3-*: 0.09 mm to maximum stroke [mm] (in increments of: 0.03 mm)          LAT3M-*: 0.01 mm to maximum stroke [mm] (in increments of: 0.005 mm)          LAT3F-*: 0.005 mm to maximum stroke [mm] (in increments of: 0.001 mm)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;">  <b>Caution</b> </div> <p>For LAT3F, the set value will be rounded off to the nearest decimal of the positioning resolution of 0.00125 mm.</p>
Step data operation	<p>By selecting a Step Data and pressing the [Operation Start] button the selected operation is executed.          When the [Operation End (Stop)] button is pressed, the operation stops and the position is held.          Press the [Operation End (Stop) button] to stop the Card Motor operation. After that select the step data again.          The [Servo Off / Servo On] button corresponds to the SVON signal, selection of step data corresponds to the IN0 to IN3 signals, [Operation Start] corresponds to the DRIVE signal ON and [Operation End (Stop)] corresponds to the DRIVE signal OFF.          By using these software functions the Card Motor operation can be simulated and checked step by step.</p>
Operation Start	Starts the selected step data operation.
Operation End (stop)	Stops the operation and the position is held.
Continuous operation	<p>The Step Data can be executed in a sequence by selecting a Step Data and by pressing the [Operation Start] button. The operation and energizing are stopped by pressing the [Operation End (Power Off)] button.          The transition condition from one Step Data to another Step Data can be selected based on the [INP signal ON] or [Operating time passed].</p>
Step	The sequencing order of the Step Data to be executed.
Step Data No.	<p>Selects the step data number to be executed (return to origin position, step data and end) from the pulldown menu. (It is also possible to select this from the [Browse] button).          When [End] is selected, the step data number input values after that become invalid.</p>
Operating Time	<p>Sets the time allowed for the controller to complete the specified Step (unit : s).          When [Operating time passed] is selected as transition condition, the next Step will be executed when the controller has responded that the previous Step Data has been completed, and the set Operating Time has passed.          Enter an Operating Time for each Step that is longer than the time required for the Step Data operation to be completed and is equal to or shorter than 60.0 seconds.</p>

One time ope	When this item is selected for a step data, that step data will be executed only during the initial cycle, and will be skipped for the cycles thereafter, when the controller has been set to perform several consecutive cycles.
INP signal	The next Step is executed 0.1 seconds after the INP signal of the previously executed Step has turned ON. The target position of the next Step Data should be outside the INP signal output range of the target position of the previously executed Step. If the target position of the next Step Data is within the INP signal output range, this Step Data will not be executed, but the Step Data thereafter will be executed 0.1 seconds after that. When executing relative and pushing operation, select [Operating time passed]. When the target position for a relative operation exceeds the Card Motor available stroke range, the INP signal will not be output, and the operation stops. When the table has reached the target position during pushing operation, the INP signal turns ON and the next Step starts.
Operating time	The next Step will be executed when the controller has responded that the previous Step has been completed, and the set "Operating Time" has passed. Enter an "Operating Time" 0.1 seconds longer or more than the "Positioning Time" set for each Step Data.
Number of cycles	Enter the number of a series of step data (cycles) to be performed consecutively in a continuous cycle, with a positive number not more than 100. When executing the series of step data only one time, the number of cycles should be set to "0".
Cycle continuously	When this item is selected, the series of step data will be repeated until [Operation End (Power Off)] is clicked. In this operation mode, the value entered for [Number of cycles] becomes invalid.
Operation Start	Executes the return to origin position and the step data selected in step 1.
Operation End (Power Off)	Switches off the power supplied to the Card Motor.

### **Caution**

**Check the operation by testing the operation sufficiently before using the product.**

The operation may not be executed if the step data settings are not appropriate. In such a case, the controller may not operate as required, or because an alarm has been generated.

**Terminate other software running on the PC before starting a test operation.**

Some functions of other software running simultaneously on the PC, may cause the CPU of the PC to overload during communication between the controller and the PC, which may cause the Card Motor to malfunction and not operate according to the settings.

**At the end of the operation of the configuration software and when switching between test mode and monitor mode, the motor is turned off.**

# 11. Operation

## 11.1 Return to origin position

The Card Motor uses an incremental type sensor (linear encoder) to detect the table position.

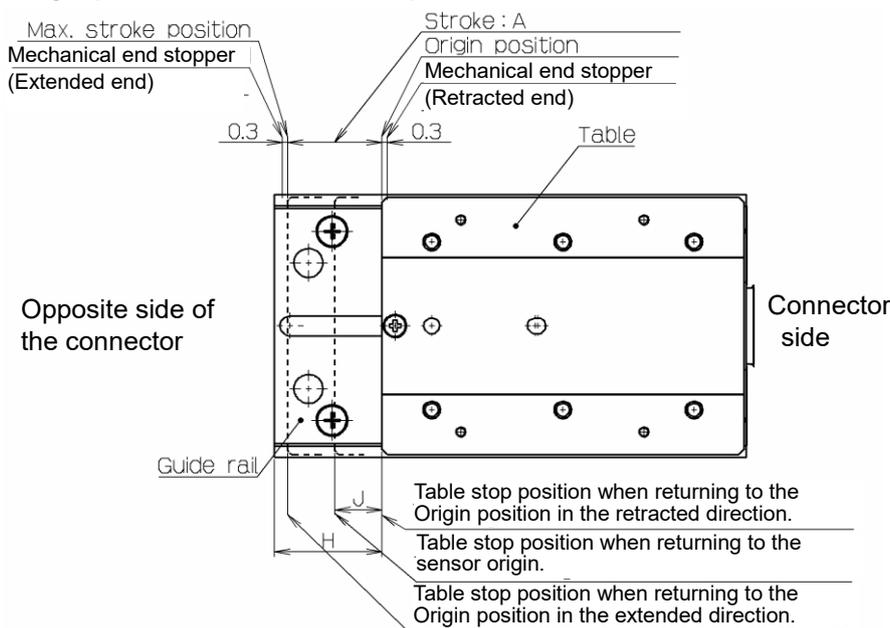
Therefore, it is necessary to return the table to the origin position after the power supply has been turned onto set the origin position.

There are three [Return to origin position] methods as described below.

In any of the methods, the origin position (0) will be set in the controller at the connector end. When the table moves toward the opposite end, after the [Return to origin] operation, the position of the table registered in the controller will be added (incremental positive direction).

Name	Description
Retracted End Position (Connector end) (Recommended)	The default origin position is set the end on connector side [Retracted End Position] The table is moved to the connector side, returns toward the side opposite the connector side by 0.3 mm from the end, and stops. The stop position is set as 0 (the origin position).
Extended End Position (Away from the connector side)	An external jig is used to stop the table of the Card Motor when the [Return to Origin Position] is performed. The table is moved to the side opposite the connector side, returns toward the connector side by 0.3 mm from the end, and stops. The origin position (0) is set at an A mm stroke away from the stopping position toward the connector side.
Sensor Origin	This method is used to achieve high positioning repeatability accuracy of the origin position. Only the LAT3M-* and LAT3F-*, which feature an integrated sensor equipped with an origin position signal, can use this method. The table is moved to the connector side, and while returning toward the side opposite the connector side from the end it stops at the position where the the sensor's origin position signal is detected. The origin position (0) is set at a certain distance (J) away from the stopping position toward the connector side.

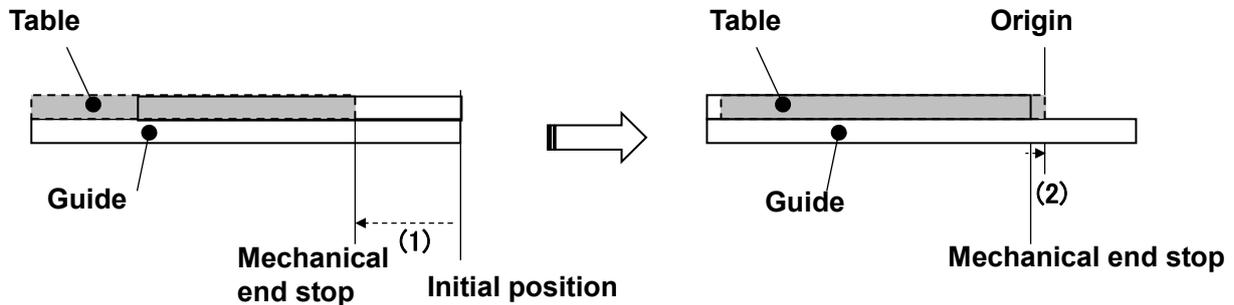
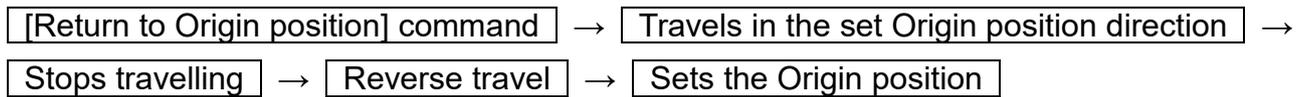
If the table is returned to the origin position by the mechanical end stopper installed in the Card Motor, the origin position will be set to the position shown below.



Model	A	H	J <sup>(note)</sup>
LAT3*-10	10	10.5	5
LAT3*-20	20	20.5	5
LAT3*-30	30	30.5	15
LAT3*-50	50	70	25

Note) LAT3M-\* and LAT3F-\* only

## Return to Origin position reference example



\*The controller uses the “Load Mass” value set in “Step Data No.1” for the “Return to Origin” operation. Therefore confirm that the “Load Mass” value for “Step Data No. 1” corresponds to the applied load for the “Return to Origin” operation.

### **⚠ Caution**

#### **Use a power supply with sufficient capacity.**

The maximum current may flow instantaneously, such as when returning to the origin. When the power supply is inadequate, the voltage drops, and when the controller is powered back on, the motor is powered off. Detection range may change.

When using multiple controllers on a common power supply, make sure that the number of connections is sufficient.

#### **Do not set the target position in the step data outside of the Card Motor travel range.**

If the return to Origin position is performed using an external jig or work piece to stop the table, the target position may be set outside of the travel range.

It may damage the work piece and the Card Motor.

#### **The direction and the position of the card motor’s origin vary depending on the setting.**

Set the operating conditions according to the requirements of the actual application.

#### **The Sensor Origin position varies depending on the stroke.**

Only with the LAT3M and LAT3F series, it is possible to return to the Sensor Origin.

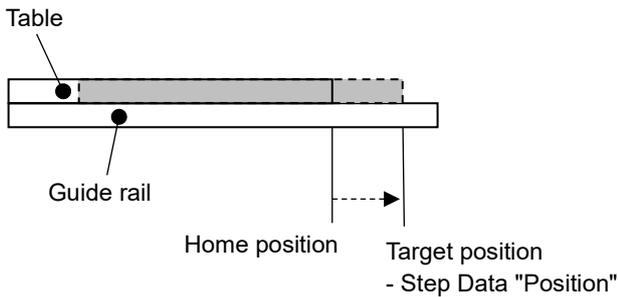
Refer to the Card Motor specifications for details.

## 11.2 Positioning operation

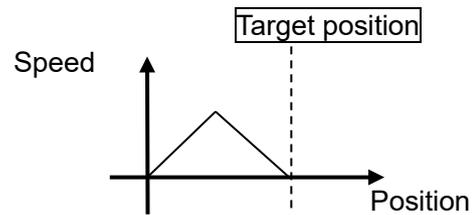
The "positioning" is registered in [Step data] - [Operation], the positioning operation is executed.

Travels to the target position set by [Step data] - [Target position].

### - Positioning operation example



### - Positioning [Cycle time entry] example



## ⚠ Caution

In absolute positioning mode, the difference between the set "Target Position" and the current position, and in relative positioning mode the set "Target Position", should be equal to or larger than the values shown below.

LAT3-\* :  $\pm 0.09$  mm

LAT3M-\* :  $\pm 0.02$  mm

LAT3F-\* :  $\pm 0.005$  mm

The Card Motor does not move when the travel distance is shorter than the positioning repeatability range.

## 11.3. Pushing operation

When [Pushing] is selected in "Step data" as "Operation" mode, a pushing operation is executed.

Like for positioning operation, the table moves to the Target Position which is set in the "Step Data" [Target Position] within the time set in [Positioning Time] and after that, the table continues to push at 6 mm/s speed. Once the table speed has reached the predefined pushing speed (6 mm/s) during deceleration, the table will continue at constant speed.

After the controller has recognized that the table has reached the workpiece, the table pushes the workpiece with the pushing force Note 1) set in the "Step Data" [Thrust Setting Value].

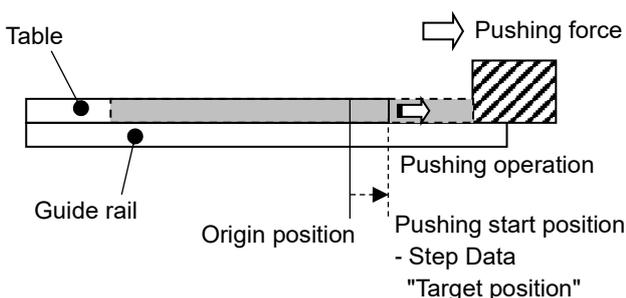
In a pushing operation, the INF signal turns ON when a current equal to or higher than the "Threshold Force Value" current set in the controller is applied. When the DRIVE signal is turned OFF, the INF signal will also turn OFF.

### (1) Successful pushing operation

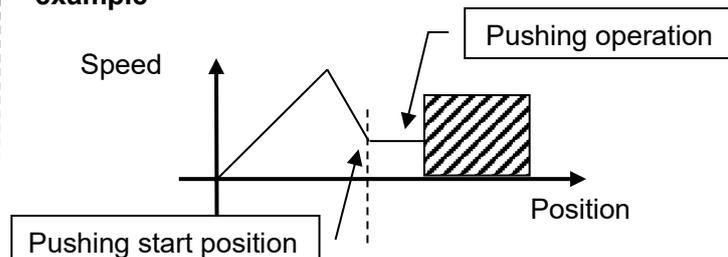
During the pushing operation, when the table is within the INP range of the [Target position] set in the Step Data, the INP output will be turned ON.

Note that once the table has passed the INP range of the target position and starts to push against the workpiece, OUT0 (INP) output will be turned OFF.

### - Pushing operation example



### - Pushing operation [Cycle Time Entry Method] example



Note1) The pushing force varies depending on the operating environment, pushing direction and table position. The pushing force set in the step data is a nominal value only. The thrust setting value needs to be calibrated by the user as required.

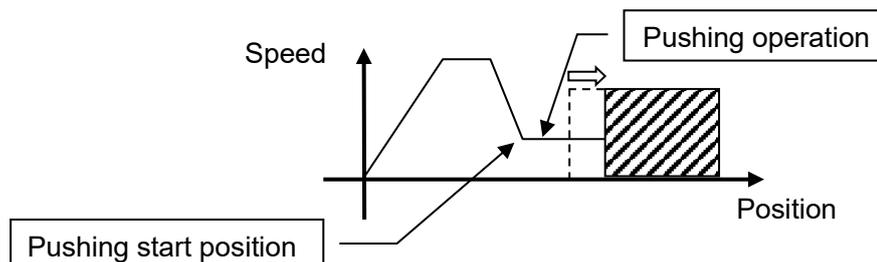
Note2) When the maximum speed is 6 mm/s or less during the positioning operation phase, the pushing speed during the uniform pushing speed phase will be the same as the maximum speed during the positioning phase. The lowest speed limit for the pushing operation is 1 mm/s.

If the positioning operation phase is performed at a speed lower than 1 mm/s, the actuator will not perform a pushing operation.

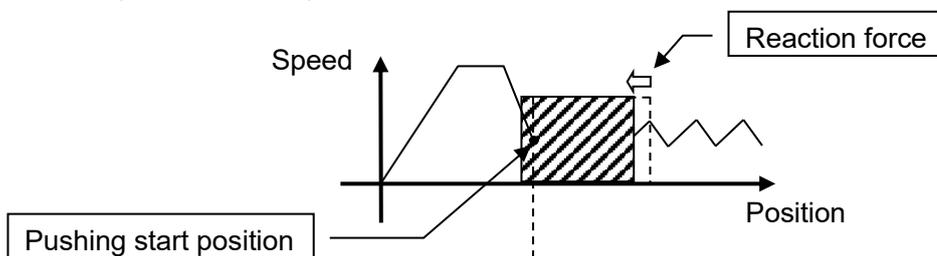
## (2) When the workpiece moves

(i) The workpiece moves in the pushing direction.

If the reaction force from the workpiece becomes smaller and the actuator moves with a force smaller than that specified in the [Step data] - [Thrust setting value] after the table has reached the workpiece, it continues pushing the workpiece until the specified pushing force is generated.



(ii) If the workpiece moves in the opposite direction to the pushing force (If it is returned due to a large reaction force from the work piece) or if the reaction force from the work piece becomes larger and the actuator is pushed back after the table has reached the work piece, it continues to be pushed back until the reaction force and pushing force are balanced (The actuator is pushed back in the pushing start direction).



## (3) Pushing operation without moving to Target Position

The pushing operation can be performed without the table moving first to the Target Position, but only in the pushing direction (opposite side to the connector),

When the DRIVE signal is turned ON after setting up the product under the following conditions, the table starts traveling at the pushing speed (6 mm/s). Once it is recognized that the table has reached the workpiece, the table pushes the workpiece with the pushing force specified in the "Step Data" - "Set pushing force".

Operation mode: Pushing operation

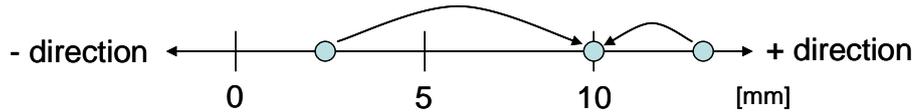
Movement mode: Relative

Target position: 0

\* Set the number other than "0" for the positioning time, speed, acceleration and deceleration.

## 11.4 Absolute positioning

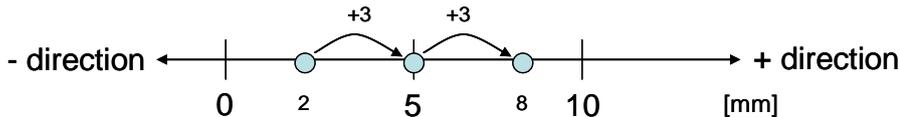
The Target Position is determined based on the "Origin Position". An example is shown below.



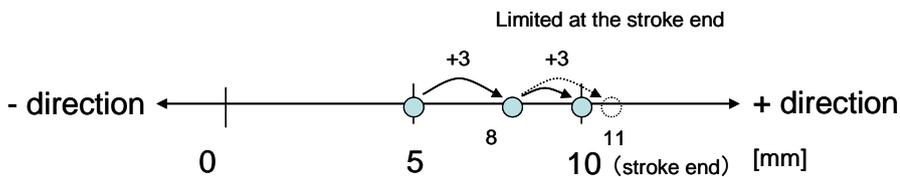
This example shows the Target Position set at 10 mm. The table of the Card Motor moves to 10 mm from the origin position.

## 11.5 Relative positioning

The Target Position is determined based on the current position. An example is shown below.



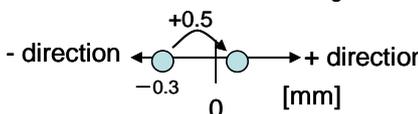
This example shows the Target Position set at +3 mm. The table moves +3 mm from the current position. When the destination exceeds the stroke end as shown in the figure below, the table motion will be limited at the end of the stroke, and the INP or INFP signals will not be output (No alarm will be generated).



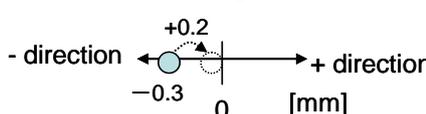
The Card Motor performs relative positioning operations as shown below if the table starts from a position outside of the software stroke range, for example when the table has reached the mechanical end stop in pushing operation or when it has been moved by an external force without the Card Motor being energized.

- If the target position is within the software stroke range:
  - The table moves the set travel distance from the current position.
- If the target position is outside of the software stroke range:
  - In "positioning" operation the table maintains the current position.
  - In "pushing" operation mode: The Card Motor performs a pushing operation in the pushing direction (opposite end to the connector) from the current position.

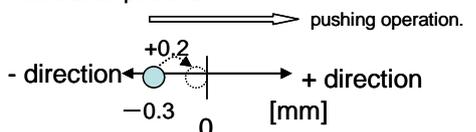
The table moves when the target position is within the available stroke range.



The table stays in the current position when the target position is outside the available stroke range.



If the target position is outside of the software stroke range in pushing operation the Card Motor performs the pushing operation in the extended direction from the current position.



### Caution

**In relative positioning the deviation will remain. Therefore the table destination may be shifted because of this deviation.**

Carefully check the initial position of the Card Motor table before starting relative positioning.

## 11.6 Response time for the controller input signals

The controller input signal response delay include the following factors.

- (1) Controller input signal scan delay
- (2) Delay due to input signal analysis
- (3) Delay of command analysis

Both the PLC and the controller processing cause delays. Ensure an interval of 2 msec or more is allowed between input signals, and maintain the signal state for at least 2 msec.

Time the input signal conditions according to the response output signals

## 11.7 Methods of interrupting operation

There are two methods of interrupting the operation and stopping the actuator during both positioning operation and pushing operation, as shown below.

The state after stopping is different, therefore use the method appropriate to the application.

- Stopped by the DRIVE signal

If the DRIVE signal is turned OFF during operation, the stopped position is held after the actuator decelerates and stops.

- Stopped by the SVON signal

If the SVON signal is turned OFF during operation, the power supplied to the actuator is cut off and the table will move freely.

### Warning

**Consider possible unexpected movements of the Card Motor in the event of an emergency stop, alarm or power failure.**

The table will not be held in place and may be moved by external forces if the power supply to the Card Motor is switched off due to an emergency stop or if the SVON signal is turned OFF, in the event of an alarm (when the temperature of the Card Motor exceeds 70°C) or at power failure. If the Card Motor is mounted vertically or at an angle, the table will drop.

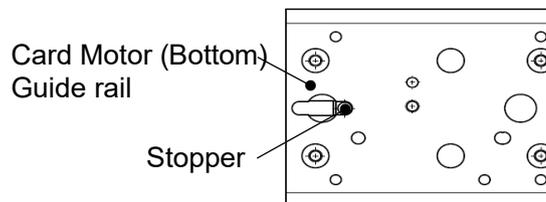
Design the Card Motor application to avoid injury and equipment damage caused by unexpected table movements.

### Caution

**Do not impact the stroke ends with the work piece in operations other than return to origin position or at speeds higher than the specified pushing speed during pushing operation.**

The Card Motor is equipped with a stopper to prevent the table from coming off and to take light impacts generated when returning to the origin position and when transferring work pieces within the specified limits. Excessive external force or impact may damage the Card Motor.

Install a separate external stopper if the operating conditions require.



**For pushing operations, set the target position at least 1 mm away from the position where the table or the pushing tool comes into contact with the work piece.**

Otherwise, the table may hit the work piece at a speed in excess of the specified 6 mm/s pushing speed, which could damage the work piece and the Card Motor.

**The Card Motor must not overheat.**

The temperature rise of the Card Motor depends on the ambient conditions and operation. Take the following countermeasures if the temperature of the Card Motor rises high enough to generate a temperature alarm:

- Reduce the Thrust Setting Value.
- Reduce the duty ratio by increasing the cycle time.
- Improve the heat transfer properties of the mounting base and the surroundings.

(Refer to section **16. Alarm Detection” (P.81)** for further details).

**Remove any obstacles within the Card Motor travel range.**

The obstacles will interfere with the Card Motor, resulting in damage to the Card Motor. Interference with obstacles may cause overcurrent to the Card Motor, which may cause overheating.

Ensure that there are no obstacles before starting operation

**The thrust force generated by the Card Motor varies in relation to the "Thrust Setting Value", depending on the table position, pushing direction and operating environment.**

The "Thrust Setting Value" in the step data is a nominal value. Therefore, calibrate the "Thrust Setting Value" according to the application under real conditions.

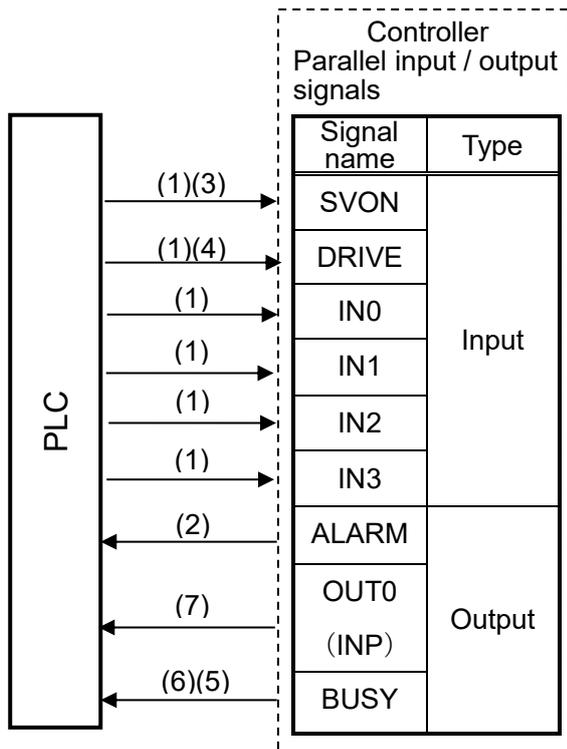
## 12. Operation Examples and Procedures

### 12.1 Return to origin example

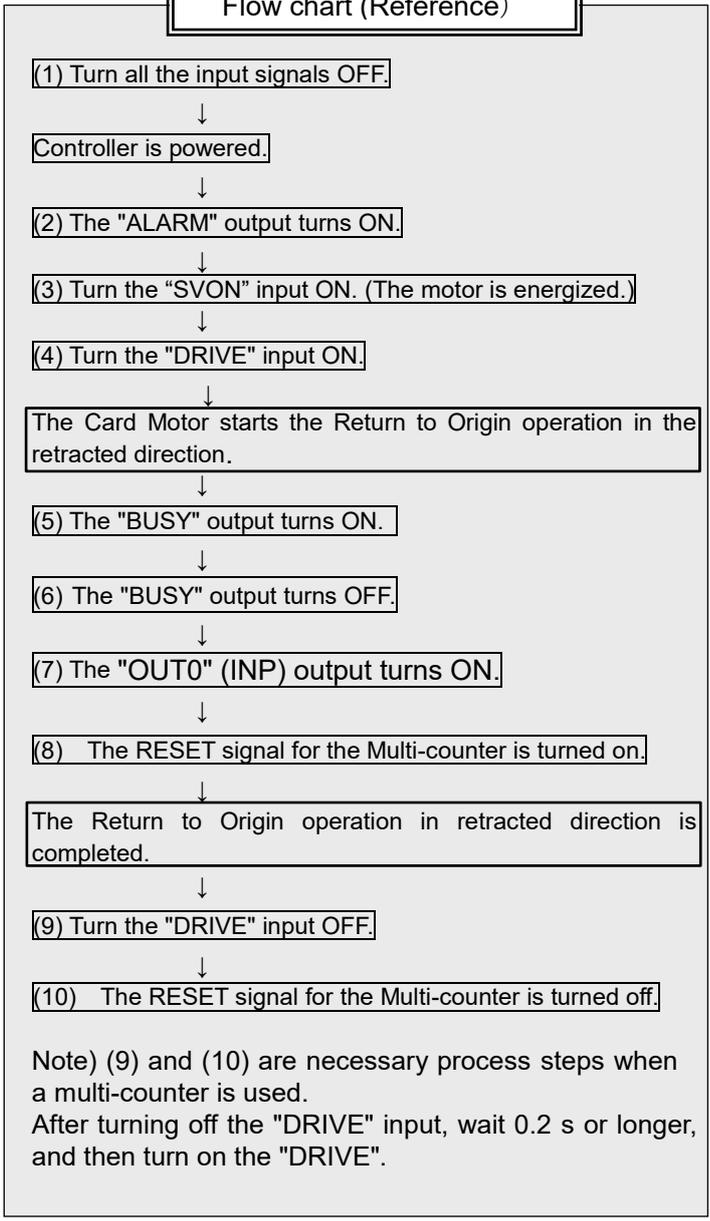
After power has been supplied, the table is returned to origin from its initial position 5 mm away from the retracted end without load.

#### - Basic setting example

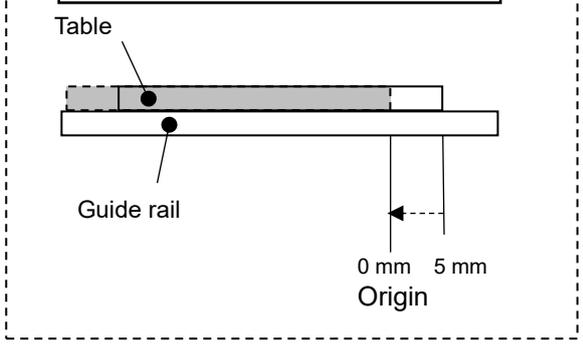
No.	Return to origin method
0	Origin at the retracted end



Flow chart (Reference)



Origin at the retracted end (Example)



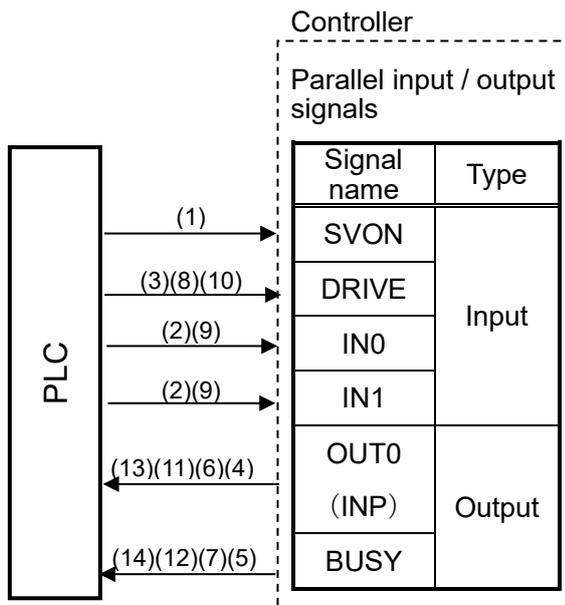
## 12.2 Positioning operation example

Step No. 1: The table is moved to absolute position 5 mm from the retracted end within 0.2 seconds without a load.

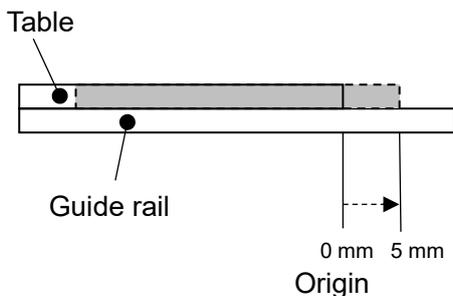
Step No. 2: The table is moved from absolute position 5 mm to absolute position 10 mm within 0.1 second.

### - Step Data setting example

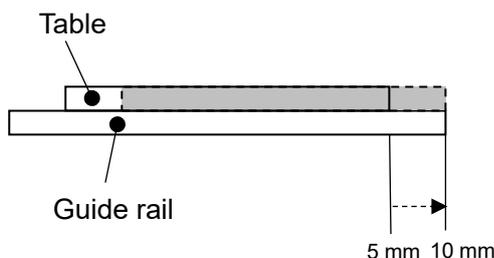
Step No.	Operation	Movement MOD	Target position [mm]	Positioning time [s]	Load mass [g]
0	-	-	-	-	-
1	Positioning	Absolute	5.00	0.20	0
2	Positioning	Absolute	10.00	0.10	0



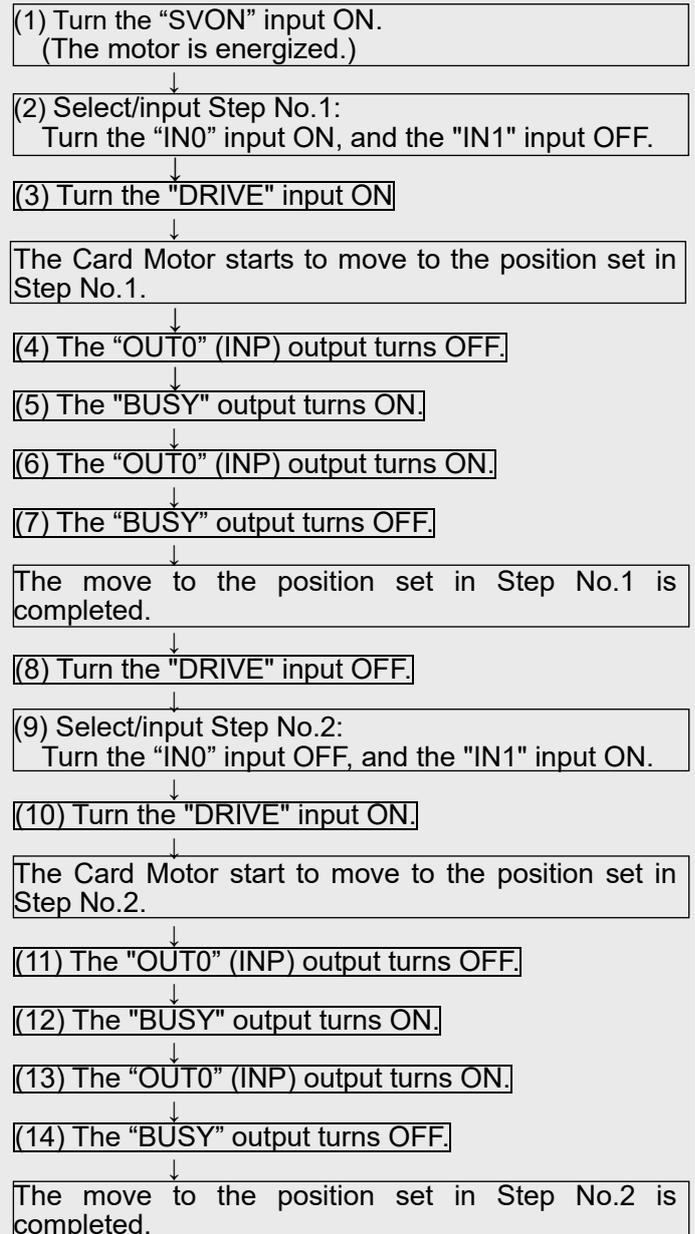
#### Step No.1 positioning operation (Example)



#### Step No.2 positioning operation (Example)



#### Flow chart (Reference)



Note) It is required that the Return to Origin is performed before Step Data can be executed.

## 12.3 Pushing operation example

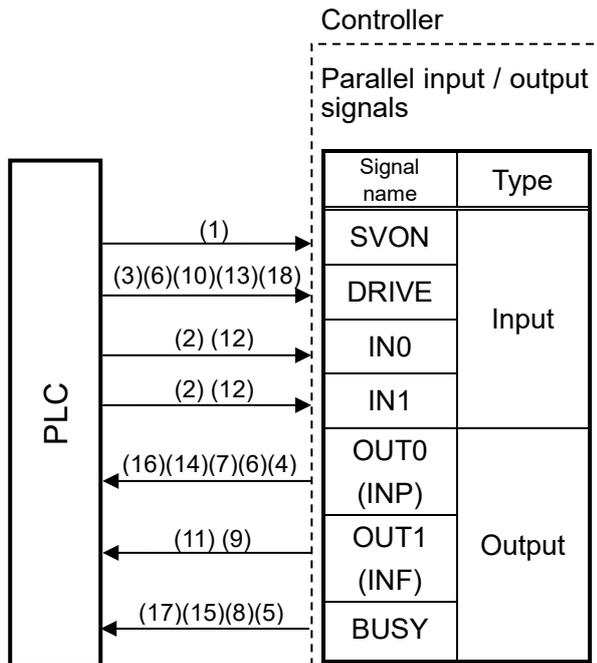
Step No. 1: The table is moved to absolute position 9 mm from the retracted end within 0.5 seconds with a load of 500 g.

From this position the speed is decelerated to 6 mm/s, the table comes into contact with the workpiece at that speed and pushes it with a thrust setting value of 2 or less.

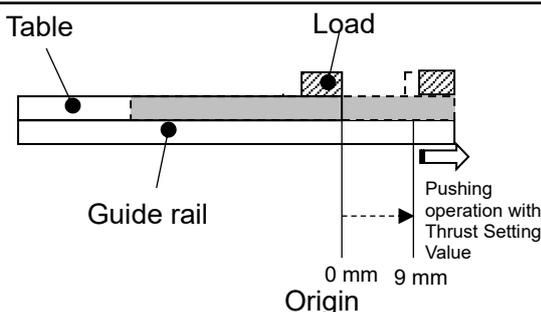
Step No. 2: From the position where the table pushes the workpiece, the table moves to absolute position 5 mm from the origin position within 0.1 second.

### - Step Data setting example

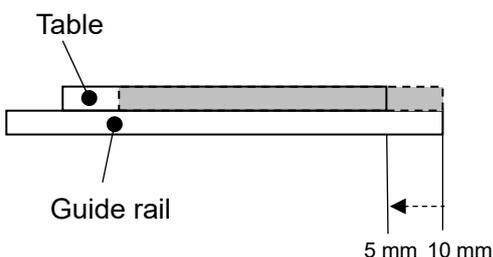
Step No.	Operation	Movement MOD	Target position [mm]	Positioning time [s]	Thrust setting value	Load mass [g]
0	-	-	-	-	-	-
1	Pushing	Absolute	9.00	0.50	2	500
2	Positioning	Absolute	5.00	0.10	-	500



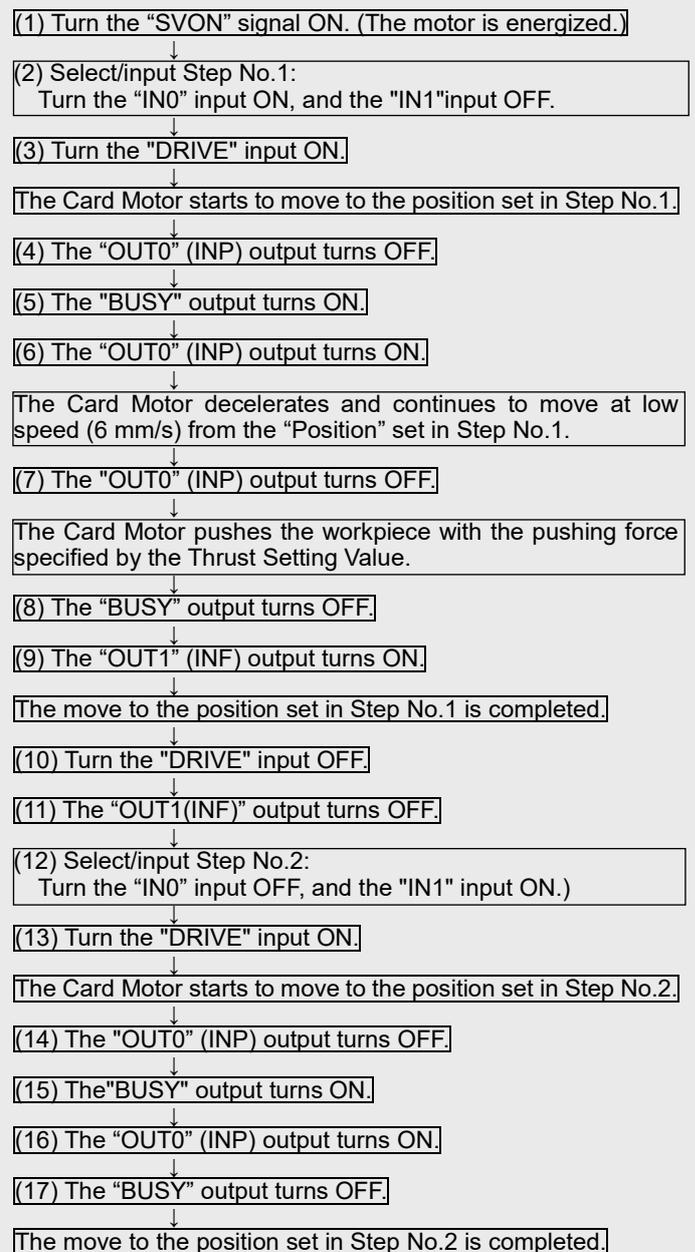
#### Step No.1 Pushing operation (Example)



#### Step No.2 Positioning operation (Example)



#### Flow chart (Reference)



Note) It is required that the Return to Origin is performed before Step Data can be executed.

# 13. Operation Instructions

## 13.1 Overview of the operation instructions

The Card Motor is operated by selecting step data preset in the controller using the digital I/O signals. Switch to Monitor Mode or terminate the Controller Configuration software to use parallel I/O signals for controlling the Card Motor.

To avoid accidents any active parallel I/O signals are ignored when the Controller Configuration software is started (except when it is in Monitor Mode) or when the power to the controller is turned on.

## 13.2 Parallel I/O operation procedures

Refer to the following "Procedures" and "Timing charts" for details of the Return to Origin, operation mode procedures and the signal timing.

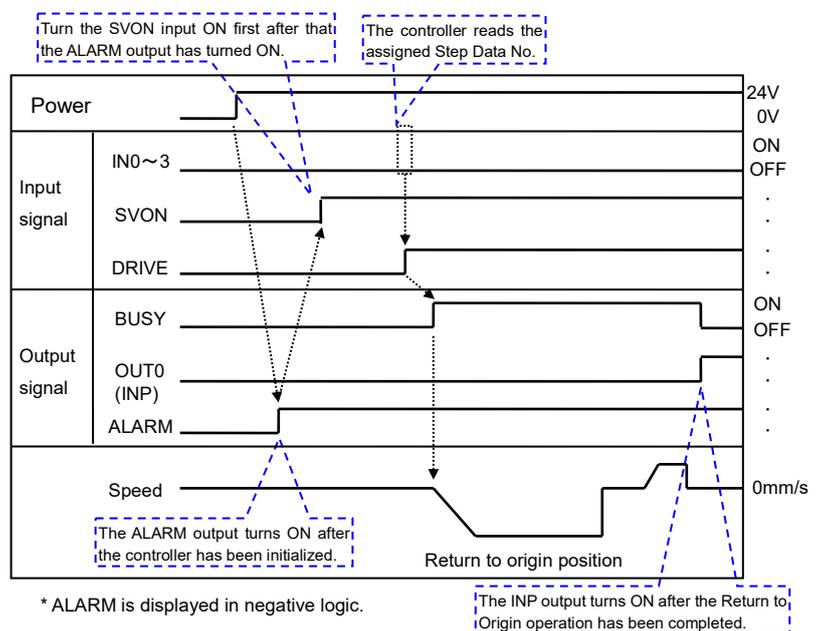
### (1) Power on and return to origin position

#### - Procedure

(when the Multi-counter is not used) -

- (i) Turn all of the input signals OFF.
- ↓
- (ii) Switch the power supply on.
- ↓
- (iii) The "ALARM" output turns ON.
- ↓
- (iv) Turn the "SVON" input ON.
- ↓
- (v) Assign Step Data No. for Origin:  
Turn OFF all Step Data No. inputs (IN0 to IN3).
- ↓
- (vi) Turn the "DRIVE" input ON.  
→ The Step Data No. inputs (IN0 to IN3) are read by the controller.
- ↓
- (vii) The "BUSY" output turns ON.  
(The Return to Origin operation starts.)
- ↓
- (viii) When the "OUT0" (INP) output turns ON and the "BUSY" output turns OFF, the Return to Origin position operation has been completed.

#### -Timing chart-



### Caution

**Ensure that no operation command input signals are activated before the ALARM output has turned ON.**

The controller will be initializing after the power supply has been turned on, until the ALARM output has turned ON.

**Make sure to turn OFF the SVON and DRIVE signals before supplying power to the controller.**

If power is supplied while the SVON and DRIVE signals are ON, it may cause a return to origin error.

**- Procedure (when the Multi-counter is used)-**

Perform the step (i) to (vi) of the Procedure (when the Multi-counter is not used).

(vii) When the "OUT0" (INP) output turns ON and the "BUSY" output turns OFF, the Return to Origin position operation has been completed.

At the same time, RESET output is ON

(viii) Keep the DRIVE input ON state while the multi-counter performs the reset operation (0.1s).

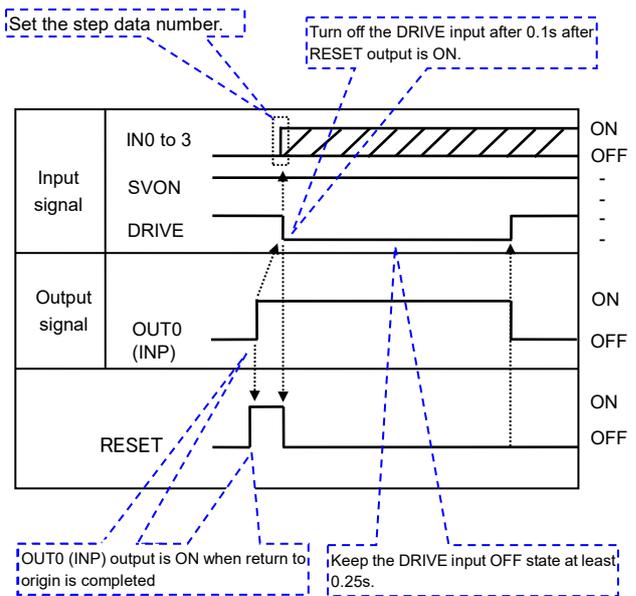
(ix) Turn off "DRIVE" input.

(x) Keep the DRIVE input OFF state while the multi-counter performs the reset completion process (0.25 seconds).

(xi) Set the step from IN0 to IN3. (Select the step data No. (IN0 to IN3 input)).

For the rest, refer to the procedure from step (ii) of origin position procedure.

**-Timing chart-**



**(2) Positioning operation**

**- Procedure -**

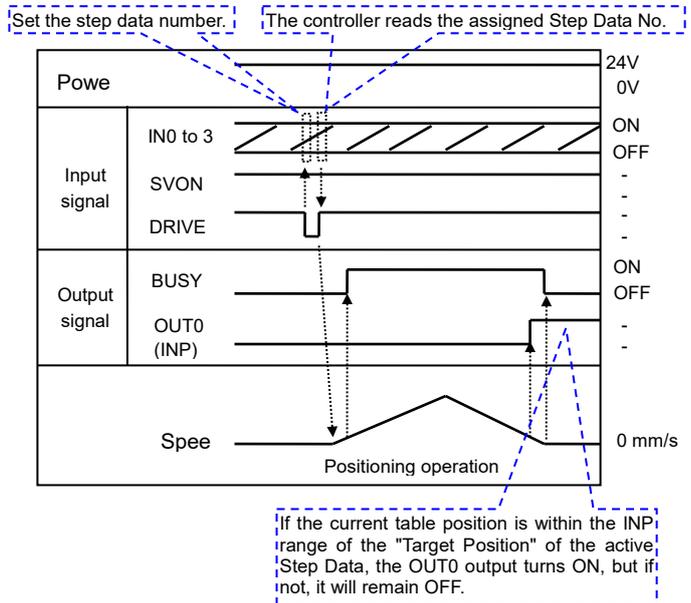
(i) Turn OFF the DRIVE input, and set IN0 to IN3. (Select the corresponding combination of high and low status for the Step Data No. inputs (IN0 to IN3).)

(ii) Turn the "DRIVE" input ON. Read the Step Data No. (IN0 to IN3 inputs), and start the positioning operation.

(iii) When the motor starts the operation, the BUSY output turns ON.

(iv) When OUT0 (INP) output turns ON close to the target position and the motor then travels at the specified speed (2 mm/s) or less, the BUSY output turns OFF.

**-Timing chart-**



**! Caution**

**In order to maintain the Target Position set in the Step Data, leave the DRIVE signal ON until the next operation instruction is given.**

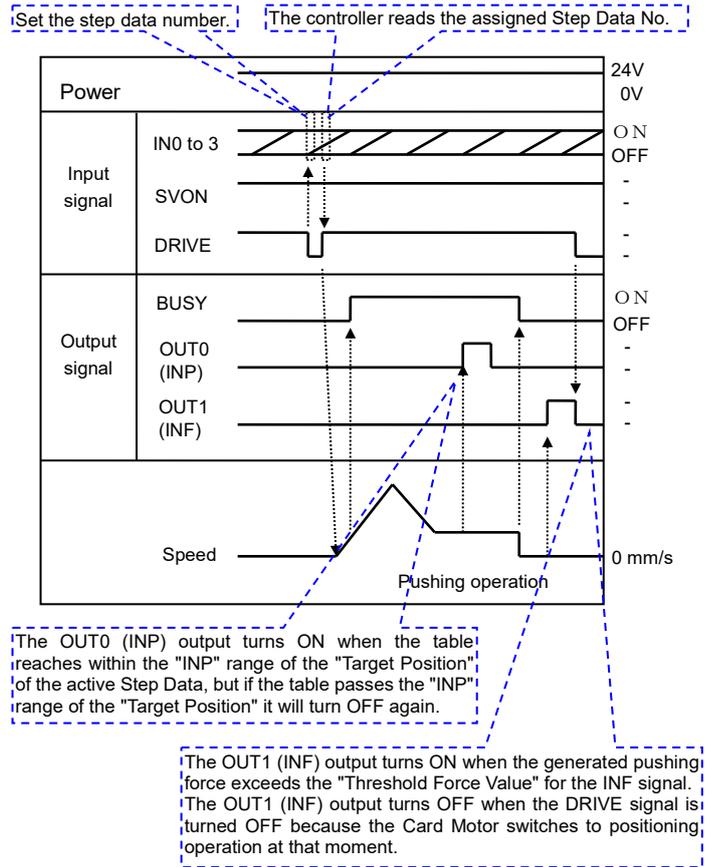
In order to read the next step data input signal, it is necessary to turn off the DRIVE signal and turn it ON again (for rising edge detection). When the DRIVE signal is turned off, the Card Motor stops and maintains the position regardless of the target position of the step data.

### (3) Pushing operation

#### - Procedure -

- (i) Turn OFF the DRIVE input, and set IN0 to IN3.  
(Select the corresponding combination of high and low status for the Step Data No. inputs (IN0 to IN3).)  
↓
- (ii) Turn the "DRIVE" input ON.  
Read the Step Data No. (IN0 to IN3 inputs), and start the pushing operation.  
↓
- (iii) When the motor starts the operation, the BUSY output turns ON.  
↓
- (iv) When the positioning operation has moved the table close to the target position, the pushing operation begins.  
↓
- (v) When the table is pushed against the workpiece, the BUSY output turns OFF, and the thrust according to the "Thrust setting value" set by the Step Data will be generated. When the thrust exceeds the set trigger level, OUT1 (INF) output turns ON.  
↓
- (vi) When the DRIVE input is turned OFF, the Card Motor stops the pushing operation, and the table maintains the position. OUT1 (INF) output turns OFF.

#### -Timing chart-

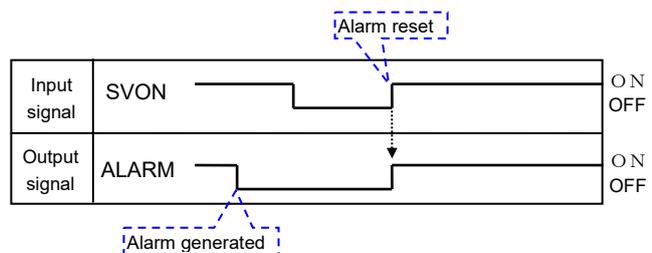


### (4) Alarm reset

#### - Procedure -

- (i) An alarm has been generated.  
(The "ALARM" output is OFF.)  
↓
- (ii) Turn the "SVON" input OFF.  
↓
- (iii) Turn the "SVON" input ON.  
↓
- (iv) The "ALARM" output is turned ON.

#### -Timing chart-



\* ALARM is displayed in negative logic.

## ⚠ Caution

Use a 2 msec interval or more between input signals, and maintain the signal state for at least 2 msec.

Refer to section **11.6 Response time for the controller input signal (P.49)** for details.

## 14. Controller Configuration Software

### 14.1 Setup

Describes how to set up the configuration software and communicate to the controller.

Connect the controller to the computer using a configuration cable (4. External connection for wiring) to power on the controller.

When performing testing or monitoring, connect the card motor to the controller and turn on the power to the controller.

#### (1) Install the configuration software

After installing the USB driver and the configuration cable, copy the execution file to your PC's desktop. Refer to the installation manual for details.

#### (2) Start-up

Double-click the icon shown below. Then the screen shifts to the COM port number and communication speed selection screen.



LATC\_Configurator.exe

#### (3) Select the COM port and communication speed

Select the COM port number of the computer to which you have connected the configuration cable and the communication speed that you have set for the controller, and click Next.

\* Default communication speed of the controller is 19200.



Enter the COM port number of the PC to which the controller setting cable is connected.

Available from the configuration software Ver2.2.

[COM port number and communication speed selection screen]

After a successful connection, the same COM port will be selected automatically at each start up. (The "Please select COM port No." dialog box will not appear again).

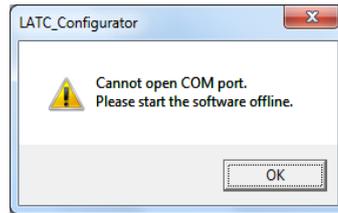
The error message shown below will appear on the display when the specified COM port is not found.



"COM port not found" is displayed. Check that the connection of the cables and installation of the USB driver. (Refer to the Installation Manual).

When you click "Next" while "COM port not found" is displayed, the following message is displayed, and the configuration software starts in off-line mode.

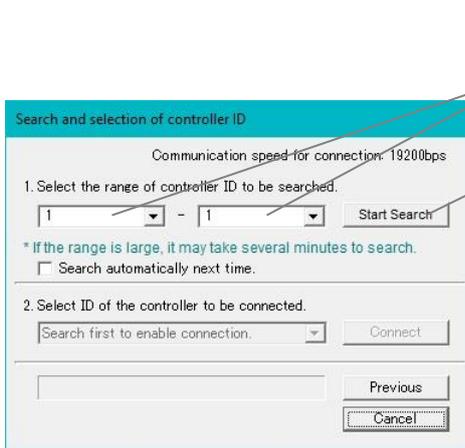
Only [Step Data Setup], [Save] and [Open] can be carried out in offline mode.



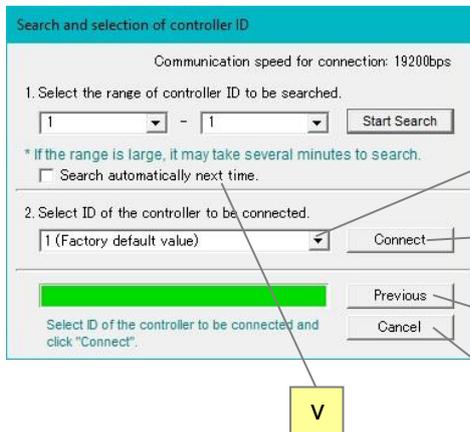
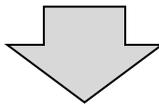
#### (4) Assignment of controller ID

The ID is stored in the controller. (Default is 1.)

Click [Start Search] to search the ID of the controller connected to the PC. Select the ID of the controller to be connected after the search operation has been completed and click [Connect].



【Before search for ID】



【After search for ID】

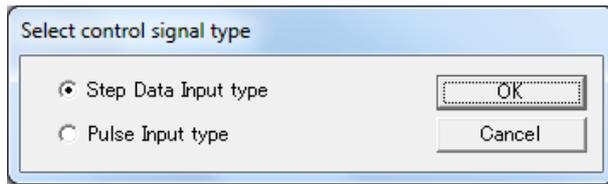
- i. Search range of the controller  
Specify the range of IDs to be searched.  
When the ID of the controller to be connected is already known, specify the numbers, for example from 1 to 1.
- \* When the range is specified, for example from 1 to 3, the ID of the controllers which are connected to the PC is searched in the range of 1 to 3.
- ii. Start Search  
ID of the controller connected to the PC is searched, and the result is shown
- iii. ID of the controller to be connected  
Specify the ID of the controller to be connected.
- iv. Connect  
Connects to the controller with the selected ID.
- v. Search automatically from the next time.  
Once this box is checked, the selected range is automatically searched from the next time after selecting the COM port.
- vi. Return  
Returns to the COM port number and communication speed selection screen
- vi. Cancel  
When this button is pressed during search, the search is cancelled.  
When this button is pressed except when searching, the connection is cancelled and the configuration software will start up with the controller unconnected.

In the following situations, the controller ID is not displayed in (4)iii. because the controller cannot be connected and the controller cannot be found.

1. The controller is powered off.
  2. The configuration cable is not fully connected.
  3. Communication speed set in the controller and the communication speed selected in [COM port number and communication speed selection screen] do not match.
- In such a case, confirm that power is supplied to the controller and the setting cables are correctly connected to the COM port, and search again.

## (5) Selection of the input type

When the “Select control signal type” dialog box appears, select Step Data Input type.

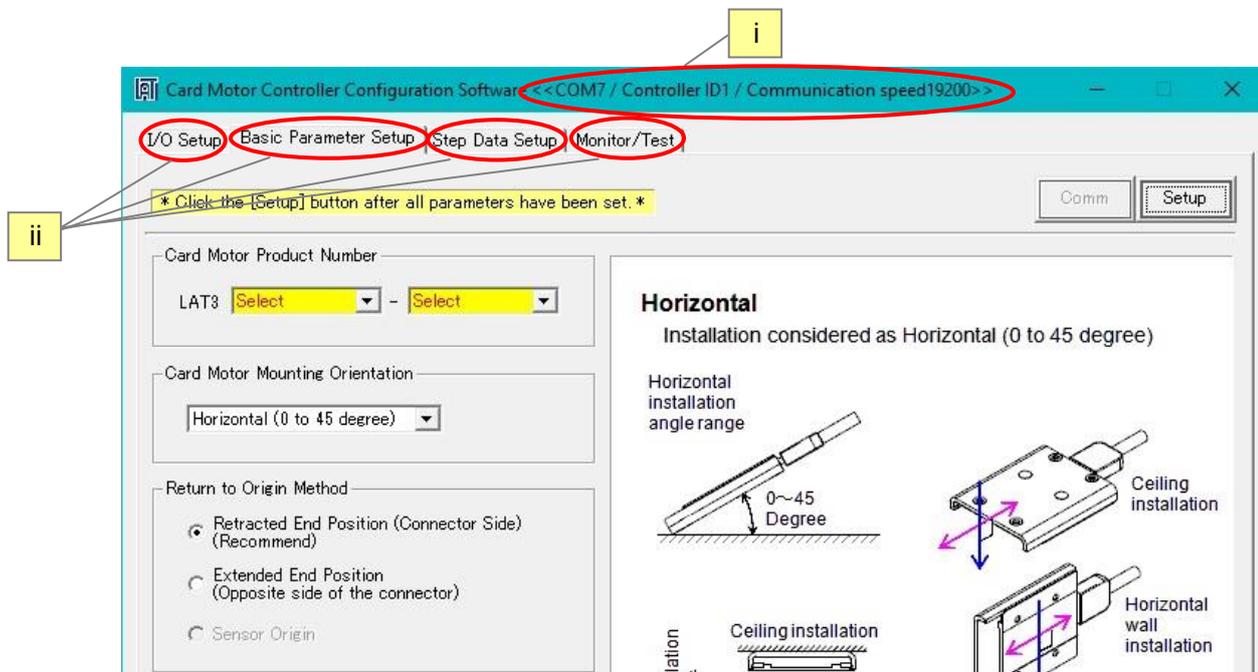


\*If the input type of the controller is already setup, the screen will not be displayed.

When the input type must be changed, initialize the controller and supply power again with reference to section **14.6 Confirmation of the version and Initialization (P.72)**.

## (6) Main window

- i. The main window will be displayed. The connected COM port number, controller ID, and communication speed will be displayed in the title bar.
- ii. Select a tab according to the application situation.



[Main window]

## ! Caution

**Do not turn off the power supply to the controller and do not connect or disconnect the controller setting cable whilst the Controller Configuration software is running.**

Turn off the power supply to the controller when disconnecting the controller setting cable.

If the power supply to the controller is turned off whilst the Controller Configuration software is running, turn on the power supply immediately to recover.

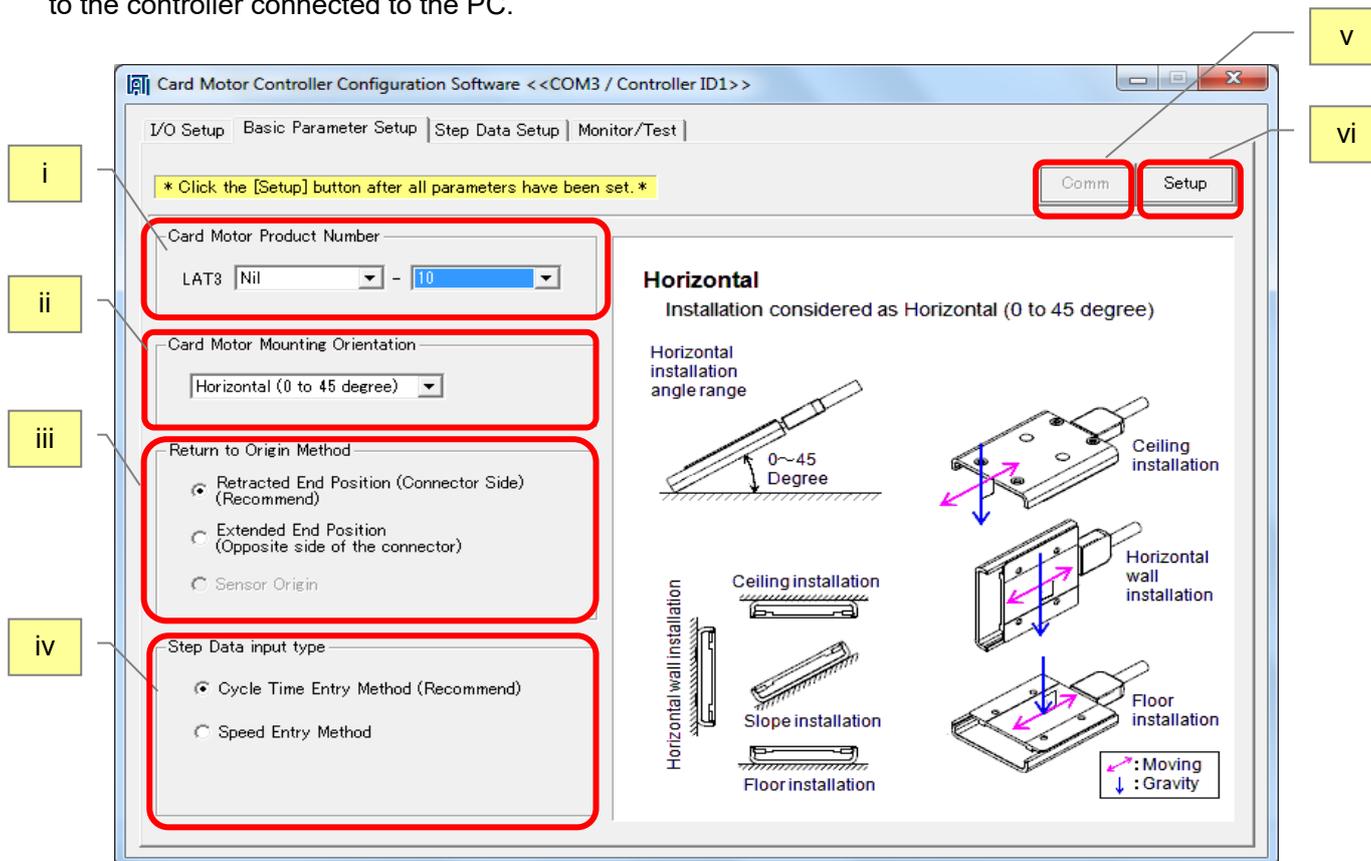
If the cable is disconnected, restart the Controller Configuration software after reconnecting the cable.

## 14.2 Basic Parameter Setup window

Register the basic parameter set up of the actuator (Card Motor).

If the controller is connected normally, the data registered in the controller will be displayed in the “Basic Parameter Set up” window immediately after the software starts up.

If the [Setup] button is selected after any of the parameters have been changed, the setting values are saved to the controller connected to the PC.



[Basic Parameter Setup window]

### i. Card Motor Product Number

Select the product number of the Card Motor connected to the controller.

### ii. Card Motor Mounting Orientation

Select horizontal or vertical Card Motor orientation.

### iii. Return to Origin Method

Select the required method of returning to origin position. (Sensor origin can only be selected for the LAT3M-\* and LAT3E-\*)

### iv. Step data input type

Cycle Time Entry Method: Specify [Target position], [Positioning time] and [Load mass] to operate the Card Motor.

Speed Entry Method: Specify [Target position], [Speed], [Acceleration], [Deceleration] and [Load mass] to operate the Card Motor.

v. Comm (Communication)

If the communication is disconnected whilst the Controller Configuration software is running, the communication can be restored by clicking the “Communication” button.

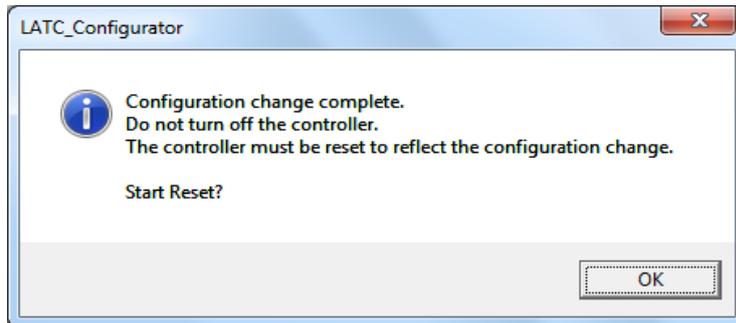
However, communication cannot be restored unless the cause of the communication disconnection is solved.

vi. Setup

The set Basic Parameters are sent to the controller connected to the PC.

### Caution

**To finalize the settings, execute the controller reset operation as shown below before operating the Card Motor.**



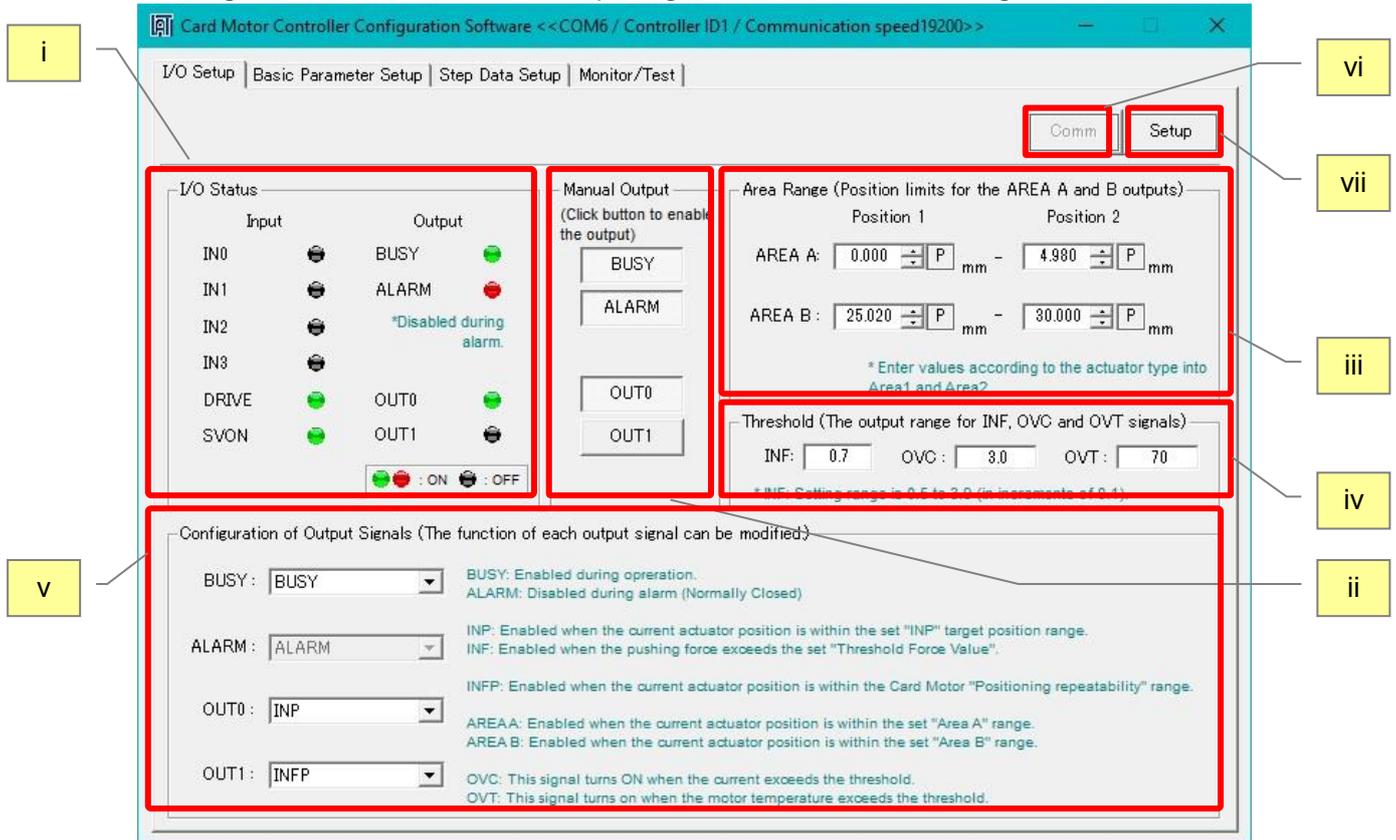
[Controller reset confirmation message]

**If the communication is discontinued during the transmission of the Basic Parameters, the data may not be stored correctly.**

If this happens, it may appear that the data has been stored correctly, when the software is restarted and the set data is read from the controller to the software, but the data has actually not been stored to the controller.

## 14.3 I/O Setup window

Parallel I/O signals can be checked and output signal functions can be configured.



[I/O Setup window]

### i. I/O Status

Displays the current input and output signals status.

Confirm that input signals turn on and off according to the signals output from the device connected to the parallel I/O connector.

### ii. Manual Output

Each output signal can be turned ON and OFF manually regardless of their current status, to check and verify the connections between the controller and a master control device, such as a PLC.

Normally the ALARM output is OFF when an alarm has been generated, but the ALARM output can be turned ON manually by pressing the ALARM button.

Manual outputs are cancelled when another window is selected.

Confirm that the input signals of the device connected to the parallel I/O connector turn on and off according to the output signals.

### iii. AREA range

The position ranges for the AREA output signals can be configured.

The setting range is 0-10 mm, 0-20 mm, 0-30 mm or 0-50 mm depending on the stroke of the Card Motor.

Individual position ranges can be set for up to two outputs: "AREA A" and "AREA B".

The resolution for the "Position 1" and "Position 2" settings varies depending on the Card Motor models.

Card Motor type	Resolution
LAT3-*	0.03 mm
LAT3M-*	0.005 mm
LAT3F-*	0.005 mm

The position ranges should be set as follows: Position 1 ≤ Position 2.

The current table position of the Card Motor can be read by pressing the P button after the return to origin has been completed.

\*If the Card Motor Product Number is changed and downloaded to the controller in the Basic Parameter Setup window then the current Area Range settings will be cancelled.

When a different Card Motor product number is entered, the Area Range values must be set again.

### iv. Threshold

Condition for when the INF, OVC and OVT signals are output.

Settable range - INF: 1 to 5, 1 to 4.8, 1 to 3.9 or 1 to 2.0 depending on the stroke of the Card Motor (increment of 0.1), OVC: 1.5 to 3.0 (increment of 0.1), OVT: 40 to 70 (increment of 10)

The INF signal turns on when the thrust generated has exceeded the threshold value.

The OVC signal turns on when the motor current has exceeded the threshold value.

The OVT signal turns on when the temperature has exceeded the threshold value.

The INF signal can be set regardless of the set thrust value in the step data, so if it is set to a value greater than the set thrust value, it will not be turned ON.

When the Card Motor part number is changed on the Basic Parameter Setup window, each threshold value will be changed to the default value (INF: 0.7, OVC: 2.0, OVT: 70). After changing the Card Motor Product Number, please set the Threshold Force Value again in the I/O Setup window.

 <b>Caution</b>
<b>Threshold value is a reference.</b>
Check the operating conditions before setting the card motor.

### v. Configuration of Output Signals

The function of the parallel I/O output signals OUT0 and OUT1 can be selected.

Another signal function can also be assigned to the BUSY output terminal. It is possible to use the same function for more than one output terminal.

Refer to **7.4 Parallel I/O Signals (Step Data Input type) (P.27)** for details of the output signals.

### vi. Comm (Communication)

If the communication is interrupted whilst the Controller Configuration Software is running, the communication can be restored by clicking the "Comm" button.

However, the communication may not be completely restored unless the cause of the communication disconnection is solved.

### vii. Setup

Changed values are sent to the controller connected to the PC.

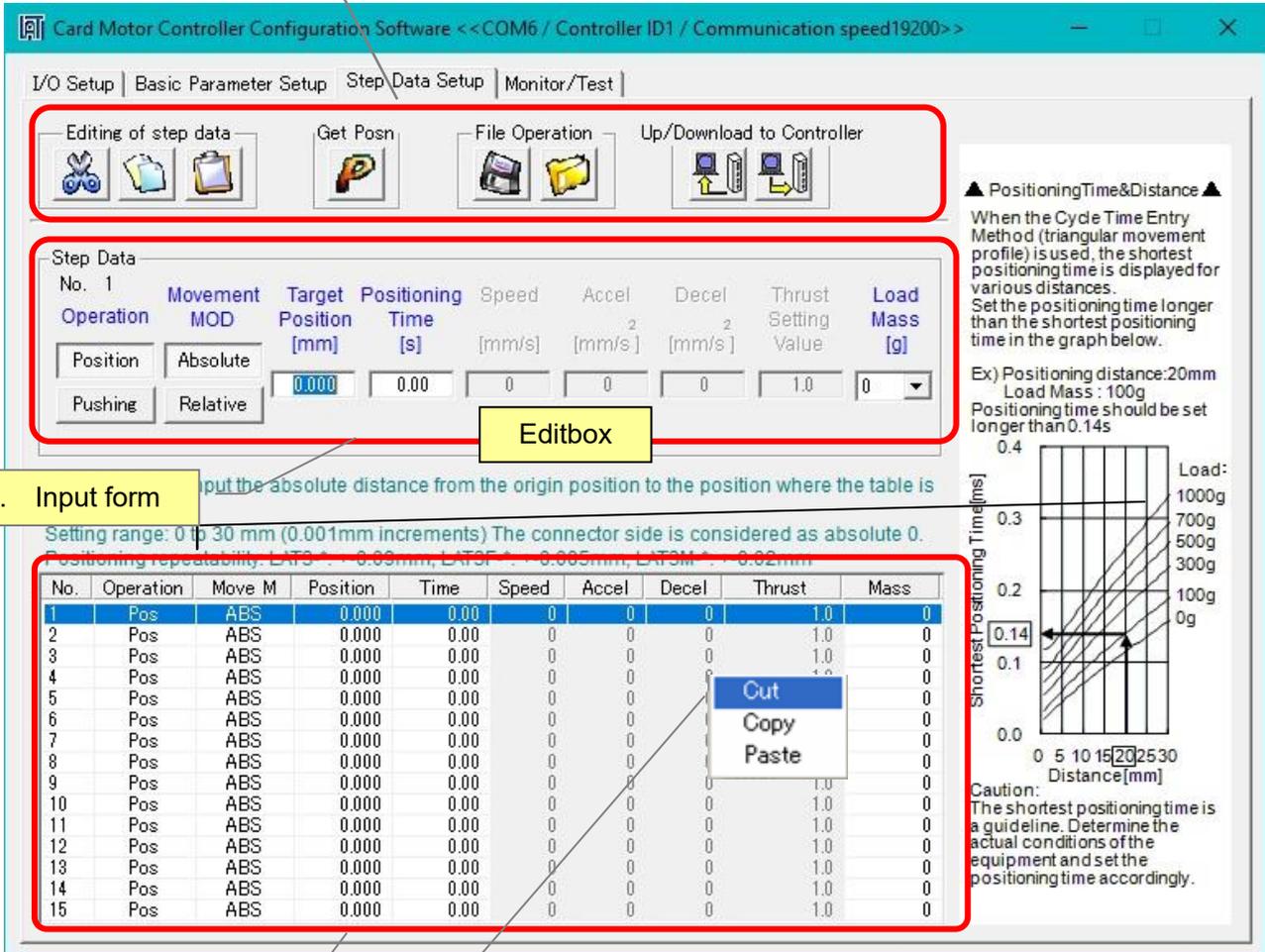
However, the Manual Output status will not be saved.

## 14.4 Step Data Setup window

The actuator (Card Motor) operation can be registered with up to 15 operations (steps).

When [Upload]  is executed, the applicable data registered in the controller is displayed in the List view. If [Download]  is executed after the settings have been changed, the setting values are sent to the controller connected to the PC.

### ii. Command buttons



▲ PositioningTime&Distance ▲  
When the Cycle Time Entry Method (triangular movement profile) is used, the shortest positioning time is displayed for various distances. Set the positioning time longer than the shortest positioning time in the graph below.  
Ex) Positioning distance:20mm  
Load Mass : 100g  
Positioning time should be set longer than 0.14s

No.	Operation	Move M	Position	Time	Speed	Accel	Decel	Thrust	Mass
1	Pos	ABS	0.000	0.00	0	0	0	1.0	0
2	Pos	ABS	0.000	0.00	0	0	0	1.0	0
3	Pos	ABS	0.000	0.00	0	0	0	1.0	0
4	Pos	ABS	0.000	0.00	0	0	0	1.0	0
5	Pos	ABS	0.000	0.00	0	0	0	1.0	0
6	Pos	ABS	0.000	0.00	0	0	0	1.0	0
7	Pos	ABS	0.000	0.00	0	0	0	1.0	0
8	Pos	ABS	0.000	0.00	0	0	0	1.0	0
9	Pos	ABS	0.000	0.00	0	0	0	1.0	0
10	Pos	ABS	0.000	0.00	0	0	0	1.0	0
11	Pos	ABS	0.000	0.00	0	0	0	1.0	0
12	Pos	ABS	0.000	0.00	0	0	0	1.0	0
13	Pos	ABS	0.000	0.00	0	0	0	1.0	0
14	Pos	ABS	0.000	0.00	0	0	0	1.0	0
15	Pos	ABS	0.000	0.00	0	0	0	1.0	0

[Step Data Set up window]

### i. List view and Input form

When an item in the List view is selected, the content can be edited in the input form (i).

Other step data lines can be selected and edited using one of the following methods:

- Select the step data line in the List view.
- Press the Enter key to skip to the next data line in List view or Input form.
- Press the up or down arrow keys ( $\uparrow/\downarrow$ ) in List view or Input form.

Store the content of the changed step data to the controller by selecting the download  button in the Command buttons area (ii). Data in the Input form can be cancelled by pressing the Esc key.

a) Operation

Select [Position] or [Pushing] operation. (The selected operation mode button becomes grey).  
When [Position] is selected, it is not possible to enter a [Thrust Setting Value].  
When [Pushing] is selected, it is possible to enter a [Thrust setting value].

b) Movement MOD (Move MOD)

Click "Absolute" for absolute positioning and "Relative" for relative positioning.

Absolute: The absolute distance from the origin position.

Relative: The relative distance from the current position.

ABS (Absolute positioning)

The position is determined in relation to the **"Origin position"**.

REL (Relative positioning)

The position is determined in relation to the **"Current table position"**.

c) Target position

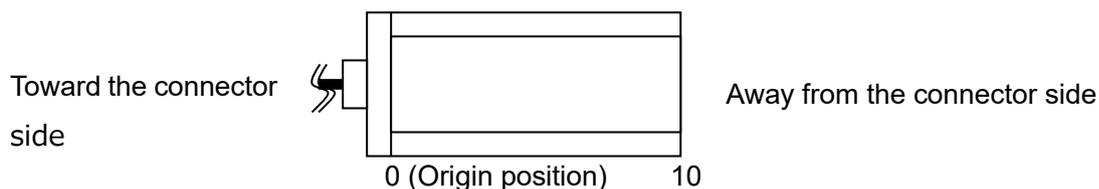
Enter the target position corresponding to the operation mode.

The setting range is 0-10 mm, 0-20 mm, 0-30 mm or 0-50 mm depending on the stroke of the Card Motor in 0.001 mm increments.

Negative values can be entered only in Relative mode. The table moves towards the connector end.

Depending on the current position of the table, the target position in relative position mode can be outside of the operation range of the Card Motor. In such cases, the target position is limited to the stroke end of the Card Motor, and the INP and INFP signals will not be output after the table movement has been completed.

-Example of when the stroke is 10 mm-



d) Positioning time

Set the time required to reach the [Target position] from the current table position. The setting range is 0 to 60 seconds.

The positioning control is not performed when the positioning time is set to "0".

(The positioning time can be entered when the [Cycle Time Entry Method] has been selected in the [Step Data Input Method] in the "Basic Parameter Set up" window.

The positioning time can be set in increments of 0.001 seconds).

e) Speed

Set the speed required for the uniform movement phase to reach the [Target position]. The setting range is 1 to 400 mm/s.

The speed can be entered when the [Speed Entry Method] has been selected in the [Step Data Input Method] in the "Basic Parameter Set up" window.

The Speed can be set in increments of 1 mm/s.

f) Accel

Set the acceleration required to reach from stop to [Speed]. The setting range is 1 to 60,000 mm/s<sup>2</sup>.

The acceleration can be entered when the [Speed Entry Method] has been selected in the [Step Data Input Method] in the "Basic Parameter Set up" window.

The Acceleration can be set in increments of 1 mm/s<sup>2</sup>.

g) Decel

Set the deceleration required from [Speed] to stop. The setting range is 1 to 60,000 mm/s<sup>2</sup>.

The deceleration can be entered when the [Speed Entry Method] has been selected in the [Step Data Input Method] in the "Basic Parameter Set up" window.

The Deceleration can be set in increments of 1 mm/s<sup>2</sup>.

h) Thrust Setting Value (Thrust)

Set the maximum force for the pushing operation. The setting range is 1 to 5, 1 to 4.8, 1 to 3.9 or 1 to 2.0 depending on the stroke of the Card Motor.

The Thrust Setting Value can be selected when [Pushing] has been selected in [Operation] in the "Basic Parameter Set up" window.

The Thrust Setting Value can be set in increments of 0.1.

\*The Thrust Setting Value should be less than the allowable thrust setting force of the Card Motor used.

Refer to the LAT3 series (Card Motor) operation manual for the allowable thrust force setting values.

i) Load Mass (Mass)

Set the load mass of the work piece mounted on the Card Motor. The setting ranges from 0 to 1000 g in increments of 50 g.

\*The selected load mass is a nominal value, therefore check the operation sufficiently before setting and using the Card Motor and controller.

\* The controller uses the load mass value set for "Step Data No.1" for the Return to Origin operation, and for Jogging and Inching. Confirm that the load mass set for "Step Data No.1" corresponds to the Return to Origin and/or Jogging and Inching operations.

 **Caution**

**Set the "load mass" value for the Step Data as close as possible to the load mass mounted onto the table. Avoid changing the load mass whilst the table is moving.**

The table may vibrate if there is a large difference between the "load mass" set in the Step Data and the load mass mounted on the table.

ii. Command buttons

 Cut

Cut the selected step data.

\* It is possible to cut the step data in the list view by right-clicking and selecting [Cut] from the pop-up menu.

 Copy

Copy the selected step data.

\* It is possible to copy the step data in the list view by right-clicking and selecting [Copy] from the pop-up menu.

 Paste

The copied or cut data can be pasted to the selected step data.

\* It is possible to paste the step data in the list view by right-clicking and selecting [Paste] from the pop-up menu.

 Get Posn (position)

The current position of the Card Motor table can be read. The read value will be set as the "Target Position".

\* This is valid only for the Step Data whose operation mode is set to Absolute Positioning.

The current position of the Card Motor will not be read for Step Data whose operation mode is set to Relative Positioning.

## Caution

**The Return to Origin operation must be completed before the current position can be read.**

After downloading (storing) the step data to the controller, the Return to Origin operation must be performed again before the current position can be read.



Save

Save the step data as a text file to the PC.



Open

Read the Step Data from the stored text file and display it in the List view (i).



Upload

Upload the data stored in the controller to the Setting software (PC), and display it in the Configuration software window (Controller -> PC).



Download

Download the data in the configuration software to the controller (PC -> controller).

## Caution

**If the process is interrupted whilst uploading, the data may not be displayed correctly. Perform uploading again.**

If the process is interrupted whilst downloading, the data may not be written correctly to the controller.

Turn the power back on and then set up and send the data again.

In this case, it may appear that the data has been stored correctly, when the software is restarted and the set data is read from the controller to the software, but the data has actually not been stored to the controller.

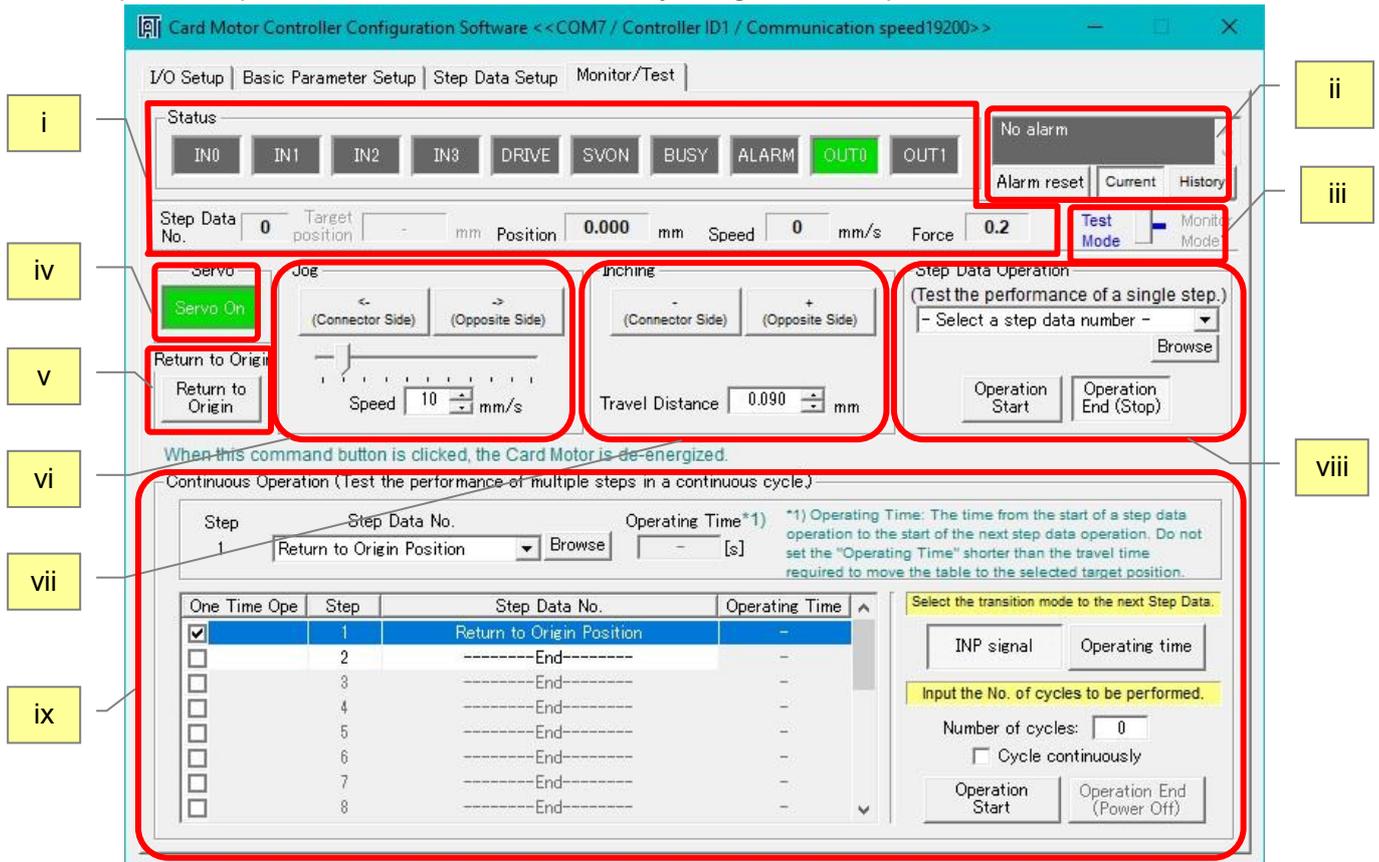
### iii. Pop-up menu

When right-clicking the List view, the pop-up menu will be displayed.



## 14.5 Monitor/Test window

This screen is used to monitor the input and output status of the controller when it is connected to the PLC and to perform operation tests of the Card Motor by using the set step data.



[Monitor/Test window]

### i. Status display

Current parallel I/O status, current step data No., position, speed and pushing force are displayed on the computer (after the Return to Origin operation has been performed). All values shown in this display are reference values only.

\* After a return to origin, the step data number is indicated as "99" until the product is operated with the next step data.

### ii. Alarm window

The latest alarm status or alarm history can be checked. The current alarm status can be displayed by pressing the [Current] button. The alarm history can be monitored by pressing the [History] button. The background is usually gray, but in case of error, it is changed to red, showing the current alarm status. When the background is gray, the error history is displayed until the alarm history is cleared.

The alarm history can be cleared by pressing the [Alarm reset] button below it.

\*The alarm history is not reset by turning off the power. Please reset the history after releasing the alarm once after generating the alarm. (Refer to section **16. Alarm Detection (P.81)**.)

### iii. Test mode/Monitor mode

By switching to Monitor Mode the Card Motor can be operated with parallel I/O signals, and the operating status can be monitored. (In Monitor Mode, it is not possible to control the operation using the controller configuration software).

Turn OFF all of the input signals before switching to Monitor Mode.

Once the mode is changed to Monitor Mode, perform Return to Origin position by PLC before use.

Note that every control function is cancelled when switching between Monitor Mode and Test Mode.

iv. Servo

When this button is clicked, a command to energize the Card Motor is sent to the controller.

When this button is clicked again, a command to de-energize the Card Motor is sent to the controller.

v. Return to Origin

When this button is clicked, a return to origin command is immediately sent to the controller.

After the return origin operation has been completed, this button is cancelled automatically.

Select the method for the Return to Origin operation from the [Return to Origin Method] menu in the "Basic Parameter Setup" window.

vi. Jog

Whilst the Jogging button is pressed, the Card Motor table moves at the speed set in the "Speed" list box or with the slide button. When this button is released, the Card Motor table stops operating. The right button is for + direction, and the left button is for -direction.

vii. Inching

By clicking this Inching (Move) button the Card Motor table moves the distance set in the "Move Distance" list box. The table moves in the + direction (towards the extended end) when the + button is clicked, and in the - direction (towards the retracted end) when the - button is clicked.

<b>Caution</b>
<b>Set the "Travel Distance" so that the target position will be within the stroke range.</b>
If the "Travel Distance" is set outside the target position, the Card Motor will stop at the stroke end.
<b>Turn OFF the SVON and DRIVE signals before switching to Monitor Mode.</b>
Otherwise, it may lead to a Return to Origin error.

viii. Step Data operation

Step Data is performed by selecting a Step Data number and by clicking the [Operation Start] button to start the operation and [Operation End (Stop)] button to end the operation.

[Operation Start] corresponds to DRIVE signal ON and [Operation End (Stop)] corresponds to DRIVE signal OFF. By using these signals, operation with parallel I/O signal can be simulated along with Step Data selection.

\* When the Card Motor test operation must be temporarily stopped, click the [Operation End (Stop)] button. When the test operation must be discontinued, click the [Operation End (Stop)] button and then [Servo Off] button to stop energizing the Card Motor.

It is possible to select the Step Data and refer to each parameter stored in the controller at the same time using the [Browse] button.

No.	Operation	Move M	Position	Time	Speed	Accel	Decel	Thrust	Mass
-	R	T	N	N	O	R	I	G	-
1	Pos	ABS	5,000	1,00	0	0	0	1,0	0
2	Pos	ABS	5,000	1,00	0	0	0	1,0	0
3	Pos	ABS	5,000	1,00	0	0	0	1,0	0
4	Pos	ABS	5,000	1,00	0	0	0	1,0	0
5	Pos	ABS	5,000	1,00	0	0	0	1,0	0
6	Pos	ABS	5,000	1,00	0	0	0	1,0	0
7	Pos	ABS	5,000	1,00	0	0	0	1,0	0
8	Pos	ABS	5,000	1,00	0	0	0	1,0	0
9	Pos	ABS	5,000	1,00	0	0	0	1,0	0
10	Pos	ABS	5,000	1,00	0	0	0	1,0	0
11	Pos	ABS	5,000	1,00	0	0	0	1,0	0
12	Pos	ABS	5,000	1,00	0	0	0	1,0	0
13	Pos	ABS	5,000	1,00	0	0	0	1,0	0
14	Pos	ABS	5,000	1,00	0	0	0	1,0	0
15	Pos	ABS	5,000	1,00	0	0	0	1,0	0

[Step data reference window]

Double click the Step Data line to be executed in the pop-up screen.

(When using the [Browse] button, it is necessary to perform [Upload] or [Download] described in section **14.4 Step data Setup window (P.65)** to upload or download the step data to or from the controller).

 **Caution**

**Click the [Operation End (Stop)] button to change the Step Data to be executed.**

ix. Continuous Operation

Several Step Data are continuously executed in the specified cycle and order automatically.

Continuous operation check can be performed.

a) One Time Ope

When the One Time Ope box has been ticked for a Step, then that Step will be executed only during the initial cycle and will be discarded for the cycles thereafter.

b) Step

Determines the order in which the Step Data are to be executed.

c) Step Data No.

Select the Step Data No. or Return to Origin position or End operations from the pulldown menu.

(It is possible to select the Step Data using the [Browse] button as described in (vi)).

When [End] is selected, the step input values after that become invalid.

d) Operating Time

Set the time allowed for the controller to complete the Step Data operation (minimum unit: 0.1 second). The next Step will be performed when the controller has responded that the previous Step Data has been completed and the set Operating Time has passed.

Enter an Operating Time for each Step that is longer than the time required for the Step Data operation to be completed and is equal to or shorter than 60.0 seconds.

e) Transition condition

Select the transition condition from one Step to the next Step.

- INP signal

The next Step is executed 0.1 seconds after the INP signal of the previously executed Step has turned ON. The target position of the next Step Data should be outside the INP signal output range of the target position of the previously executed Step Data. If the target position of the next Step Data is within the INP signal output range, this Step Data will not be executed but the Step Data thereafter will be executed 0.1 seconds after that.

When executing relative and pushing operation, select [Operating time].

When the target position for a relative operation exceeds the Card Motor available stroke range, the INP signal will not be output, and the operation stops. When the table has reached the target position during pushing operation, the INP signal turns ON and the next Step starts.

- Operating time

The next Step will be executed when the controller has responded that the previous Step has been completed and the set "Operating Time" has passed. Enter an "Operating Time" 0.1 seconds longer or more than the "Positioning Time" set for each Step Data.

- f) Number of cycles  
Input the number of the selected sequence of Steps (cycles) to be executed consecutively in a continuous series of cycles. Only positive numbers between 0 and 100 can be entered.  
When executing the cycle only once, the "Number of Cycles" should be set to "0".
- g) Cycle continuously  
When this box has been ticked, the selected sequence of Steps will be repeated until [Operation End (Power Off)] is clicked.  
In this operation mode, the value entered in "Number of Cycles" is ignored.
- h) Operation Start  
Starts the execution of the selected steps.
- i) Operation End (Power Off)  
Stops the operation and switches the power off from the Card Motor.

**! Caution**

**If the "Operating time" is set at 0.2 seconds or less, the parallel I/O signal, Step Data Number executed or position will not be displayed because of communication matters.**

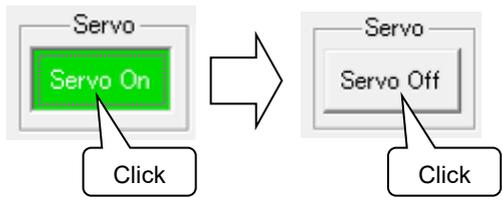
**When an alarm is generated**  
If the [ALM] LED on the front of the controller is red or flashing, an alarm has been generated.  
Perform SVON reset to cancel the alarm after measures and revisions have been made.



LED[PWR]: Green

LED[ALM]: Red

SVON reset  
Click [Servo On] first and then click [Servo Off].



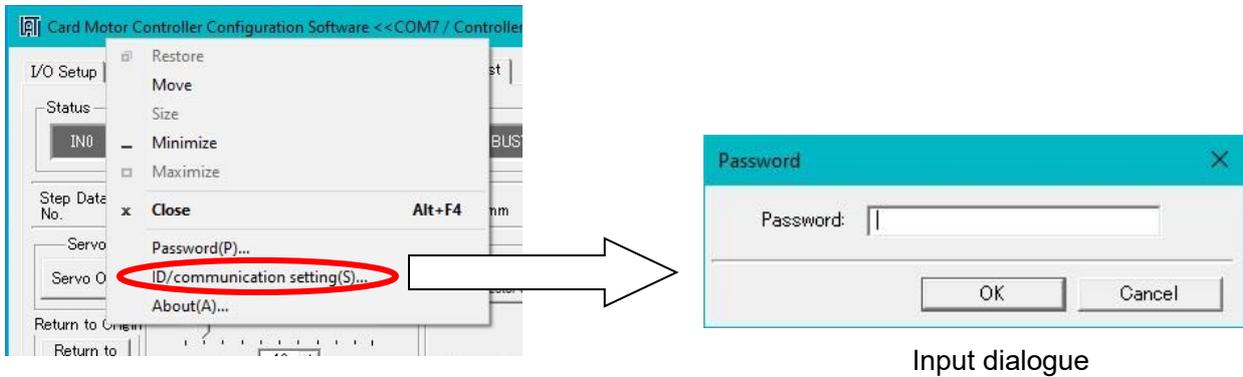
Note) The type of alarm can be checked by a combination of the ALM and PWR LED's on or flashing.  
Refer to section **16. Alarm Detection (P.81)** for detailed content of the alarms.

- \*When the target position is out of the stroke range due to repeated relative operation, the INP signal will not turn ON, and the operation will be stopped.
  - \*When operation time is 10 s or more, select [Operating time passed].
- When [INP signal] has been selected, and the INP signal does not turn ON within 10 s after [Operation start] has been clicked, an error will occur.

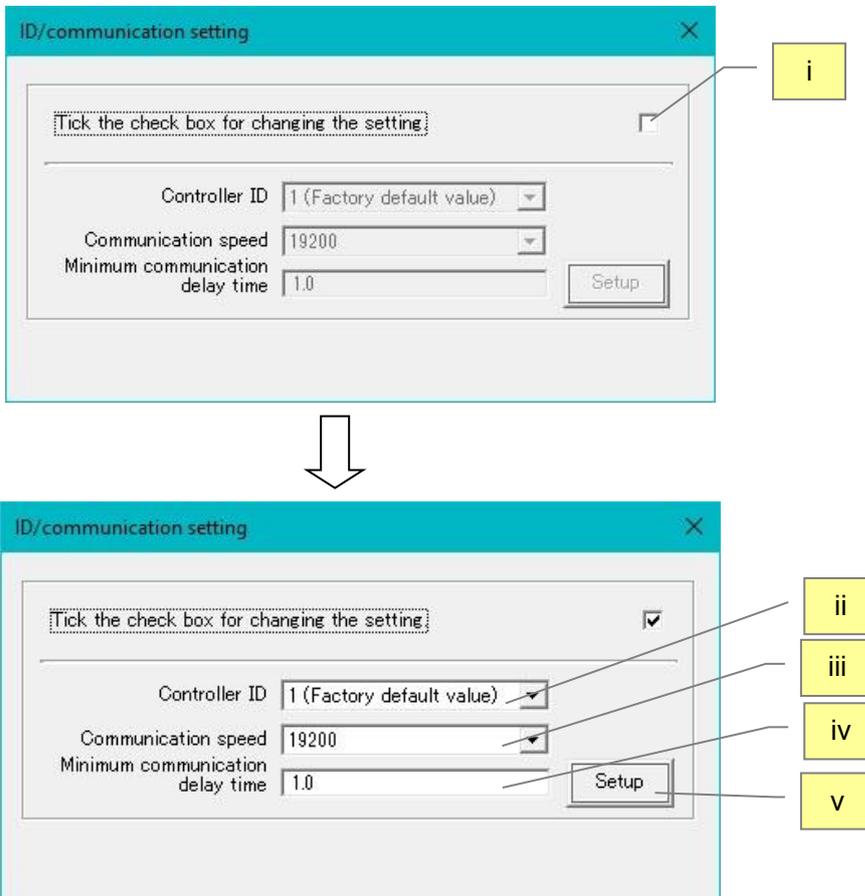
## 14.6. Controller ID / communication setting

The following describes how to set the controller ID, communication speed, and minimum communication delay time.

- (1) From the title menu (right-click the icon in the upper left), select ID and Communication configuration.
- (2) Enter bps in the input dialog and click OK. ("\*\*\*\*" will be displayed.)



- (3) ID and Communication speed configuration screen is displayed.  
Click i for changing the configuration.



- Check the box for confirmation of configuration changes  
Click to check when changing the Controller ID and communication configuration.
- Controller ID settings (setting range 1-16)  
The Controller ID can be changed.  
\*Default controller ID: 1

## ! Caution

**There should be only one controller with the selected controller ID.**

If the controller ID is the same as that of another connected controller, the response data may get jammed as the following settings will be transmitted to all the same controller IDs.

### iii. Communication speed

Specifies the communication speed of the controller

Set value [bps]: 2400, 9600, 19200, 38400, 57600

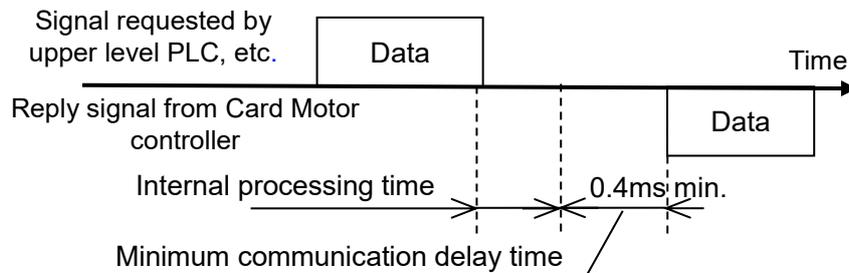
\*Default communication speed of the controller [bps]: 19200

### iv. Minimum communication delay time

Set the delay time (shown below) between when the controller receives communication from the upper PLC, etc. and starts communication of the response.

Setting range [ms]: 0.1 to 10.2 (0.1 ms increments)

\*Default minimum communication delay time of the controller [ms]: 1.0



### v. Setting

Set from ii to iv to the controller connected to the PC.

Finish the configuration software and turn off the controller power supply again.

## ! Caution

**Store the ID and communication speed of the modified controller with care, for example, by printing.**

If the ID and communication speed of the controller become unknown, communication with the controller may not be possible.

**Set the controller ID to a value of 16 or less that does not overlap with other controllers.**

It can be set from 1 to 255, but if a large value is set, the ID search range of the configuration software will expand, so the search may take a long time.

**If the ID and communication speed settings are changed, be sure to keep a record of the settings after the change (for example by printing).**

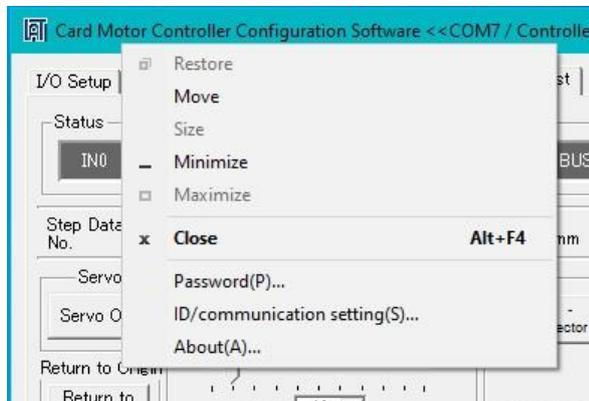
If the communication settings of the upper level device do not match the ID and communication speed set on the controller, communication cannot be performed.

## 14.7 Confirmation of the version and initialization

The version of the configuration software can be checked by clicking the icon in the upper left corner of the title bar, and then selecting "About(A)...". The version information window will be displayed.

The controller version will be displayed by clicking the "Details" button.

When the [Initialize] button is clicked, the controller will be initialized to default settings. If needed, save any Step Data as a text file in the Step Data Setup window before initializing the controller.



[Pop-up menu]



[Version information window]

## 14.8 Closing the software

The software can be closed by clicking the [Close] button on the top right of the window or from the title menu (by clicking the icon on the top left and then selecting “Close”).

### Caution

Turn the power supply to the controller OFF and ON again before operating the controller with the parallel I/O signals after the Controller Configuration software has been terminated.

Refer to section **13.1 Overview of the operation instructions (P.54)** regarding parallel I/O operation.

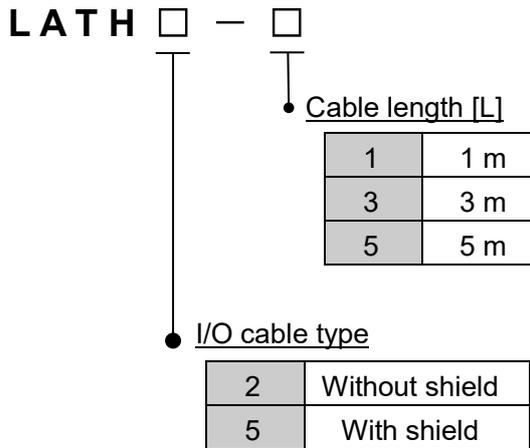
\* An operation test of this controller and configuration software can be performed by using only the controller and the configuration software with the following minimum requirements: [CPU speed 2.53 GHz, 2 GB RAM, Windows 7 Professional operating system], [CPU speed 1.6 GHz, 2 GB RAM, Windows 8.1 operating system], [CPU speed 2.4 GHz, 8 GB RAM, Windows 10 Professional operating system]. Note that depending on the specifications of the used PC and the operating conditions, the Card Motor may not operate in accordance with the set time, even if the test operation time is set to minimum.

\* Windows<sup>®</sup>7, Windows<sup>®</sup>8.1, Windows<sup>®</sup>10 are registered trademarks of the United States Microsoft Corporation.

# 15. Options

## 15.1 I/O cable

### (1) How to Order the I/O cable



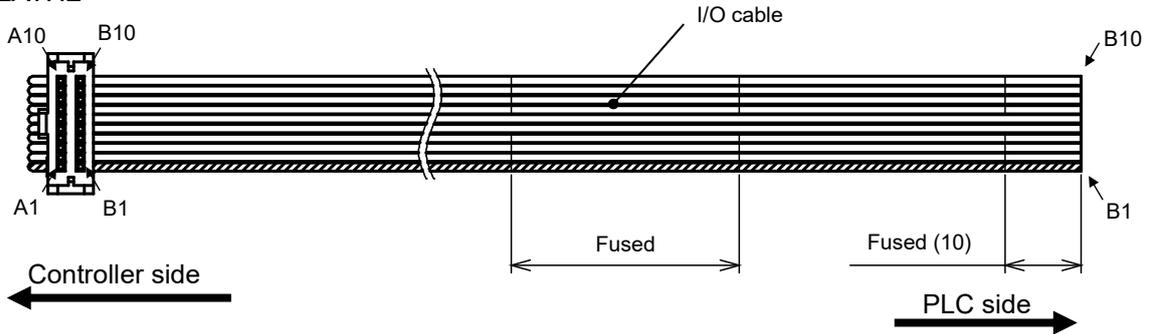
### (2) Parallel I/O cable connector terminals

Terminal number	LATH2-*	LATH5-*		
	Insulator color	Insulator color	Dot	Dot color
A1	Red	Light brown	■	Red
A2	Grey			Black
A3	Grey	Yellow	■	Red
A4	Grey			Black
A5	Green	Light green	■	Red
A6	Grey			Black
A7	Grey	Grey	■	Red
A8	Grey			Black
A9	Grey	White	■	Red
A10	Green			Black
B1	Red	Light brown	■ ■	Red
B2	Grey			Black
B3	Grey	Yellow	■ ■	Red
B4	Grey			Black
B5	Green	Light green	■ ■	Red
B6	Grey			Black
B7	Grey	Grey	■ ■	Red
B8	Grey			Black
B9	Grey	White	■ ■	Red
B10	Green			Black

\*Refer to section 7.6 Parallel I/O connector wiring for details of the wiring.

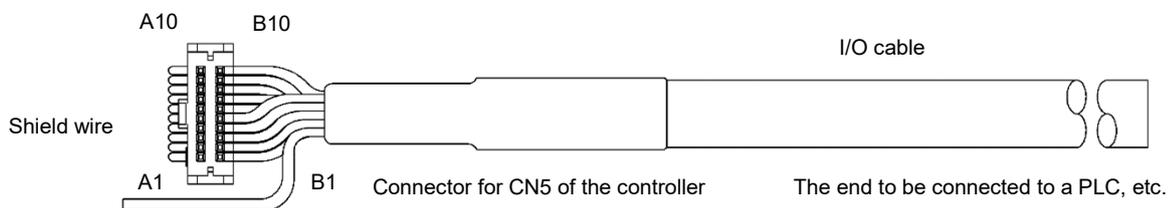
### (3) Dimensions of the I/O cable

#### i. LATH2-\*



Core number	20
AWG size	AWG28

#### ii. LATH5-\*



Core number	20
AWG size	AWG28

Shield wire	
Core number	1
AWG size	AWG24

## 15.2 Counter cable

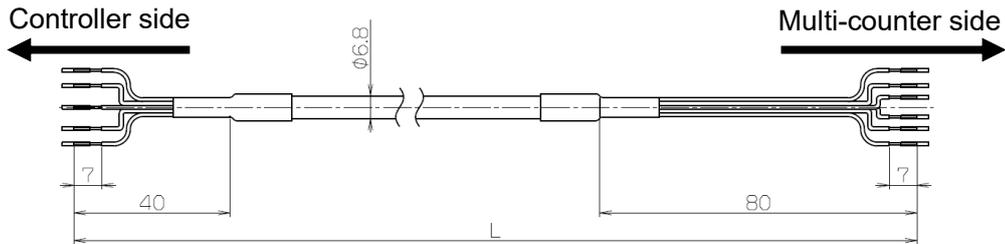
### (1) How to Order

**LATH3-1**

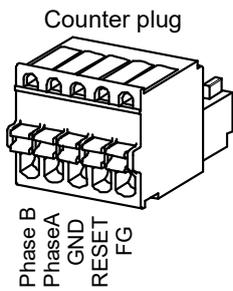
● Cable length (L)

1	1m
3	3m
5	5m

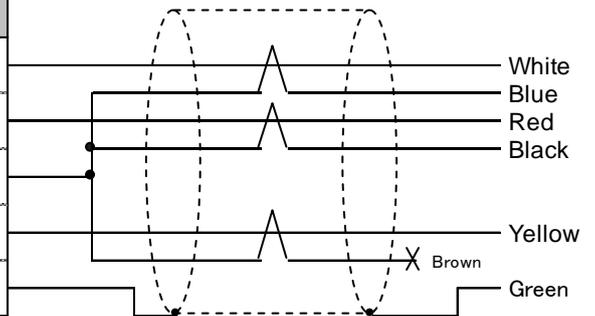
### (2) Dimensions



### (3) Wiring diagram



Terminal no.	Signal name	Insulation colour
1	PhaseB	White
2	PhaseA	Red
3	GND	Light gray
4	RESET	Yellow
5	FG	Green



## 15.3 Actuator cable

### (1) How to Order

**LATH1-1**

● Cable length (L)

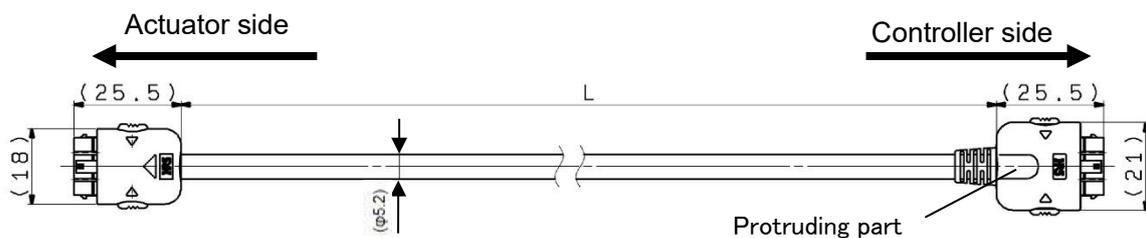
1	1m
3	3m
5	5m

Note) There is direction for the actuator cable.

Connect the actuator side to the card motor.

There is a raised part on the controller side.

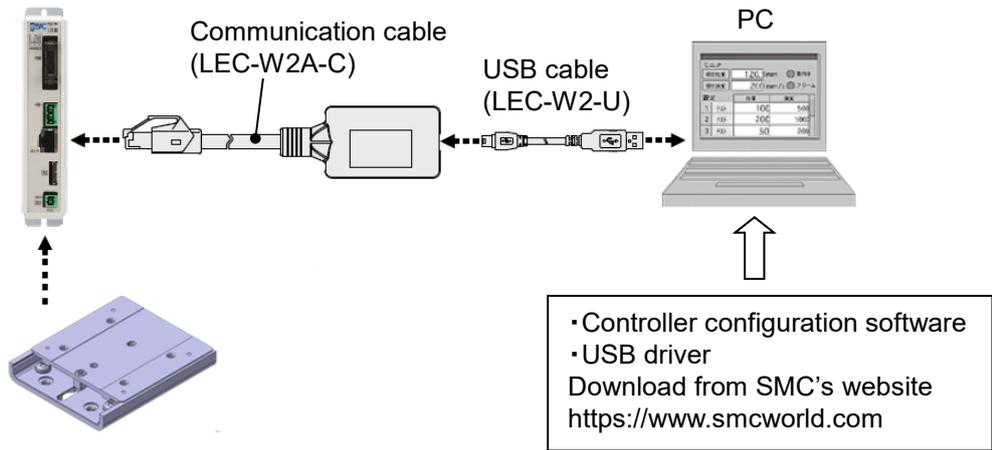
### (2) Dimensions



## 15.4 Controller setting cable

### (1) How to Order

- LEC-W2A-C  
● Communication cable
- LEC-W2-U  
● USB cable



### (2) Operating environment

IBM PC/AT converter with Windows<sup>®</sup>7, Windows<sup>®</sup>8.1 or Windows<sup>®</sup>10 with USB1,1 or USB2.0 port.

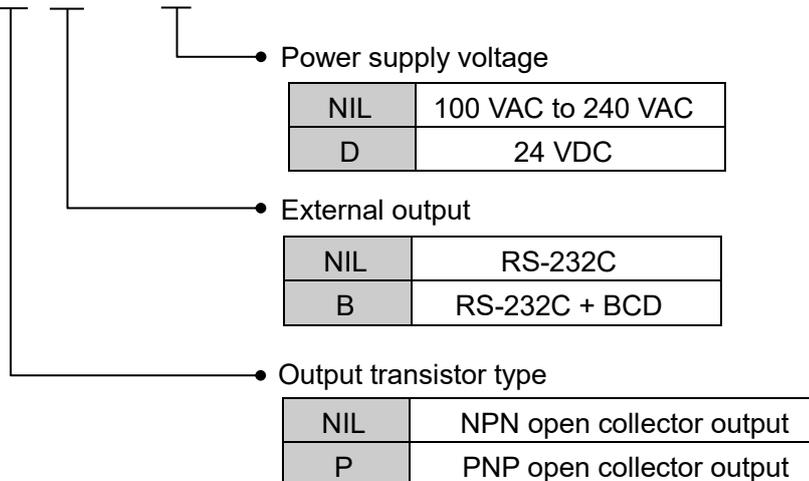
\*Windows<sup>®</sup>7, Windows<sup>®</sup>8.1, Windows<sup>®</sup>10 are registered trademarks of the United States Microsoft Corporation.

## 15.5 Multi-counter CEU5

Please refer to the operation manual for the CEU5 series Multi-counter for further details.

### (1) How to Order the Multi-counter

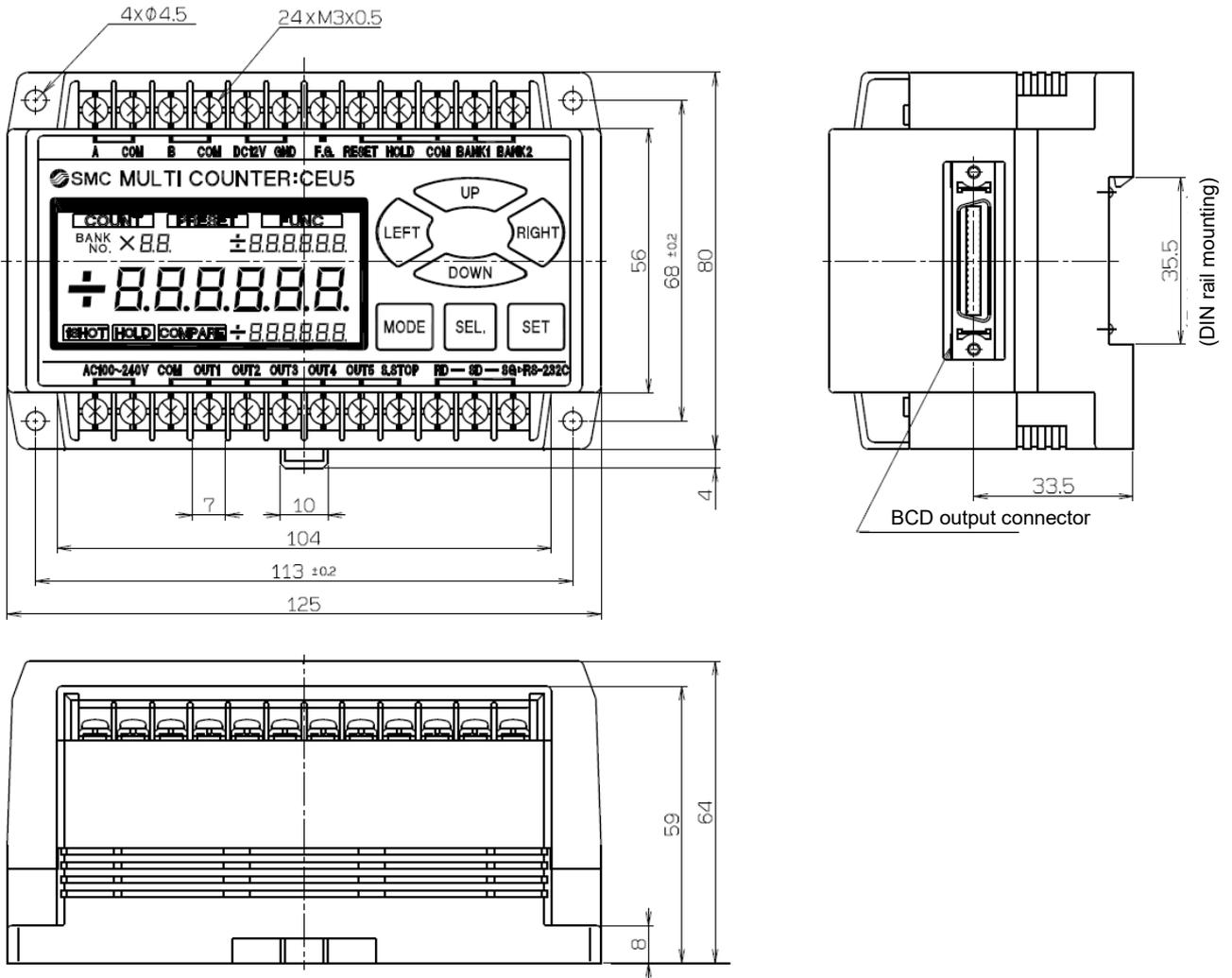
CEU5 □ □ - □



### (2) Specifications

Model	CEU5***-
Mounting method	Surface mounting (Fixed by DIN rail or screws)
Operation modes	Operating mode, Data setting mode, Function setting mode
Display type	LCD with back light
Number of digits	6 digits
Counting speed	100 kHz
Insulation resistance	Between case and AC line: 500 VDC, 50 MΩ or more
Ambient temperature	0 to 50°C (No freezing)
Ambient humidity	35 to 85% RH (No condensation)
Weight	350 g or less

### (3) Dimensions



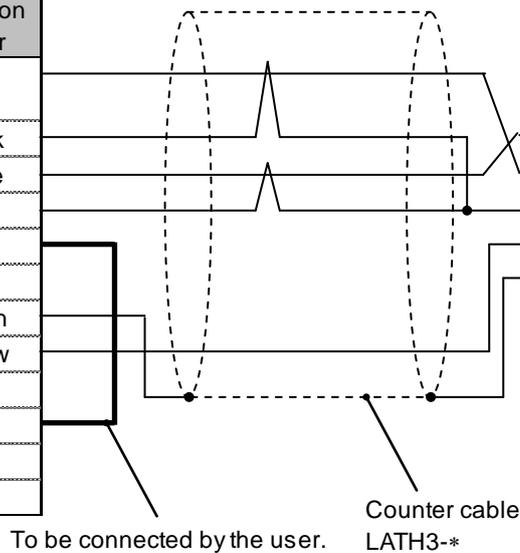
### (4) Wiring diagram

Terminal block of the CEU5 Multi-counter

Name	Insulation colour
A	Red
COM	Black
B	White
COM	Blue
DC12V	—
GND	—
F.G.	Green
RESET	Yellow
HOLD	—
COM	—
BANK1	—
BANK2	—

Counter plug for the LATCA controller

Insulation colour	Name
White	PhaseB
Red	PhaseA
Light gray	GND
Yellow	RESET
Green	F.G.



## (5) How to operate

When executing Step data No. 0 (Return to Origin Position), the RESET signal is output from the controller after the [Return to Origin Position] operation has been completed. With this operation, the CEU5 is reset and the position is set to zero, both in the controller and Multi-counter.

When [Sensor Origin] is selected as the [Return to Origin Method] in the “Basic Parameter Set up” window, the sensor origin position is set to zero. When [Extended End Position] is set as the origin position, the position after full-stroke is set to zero. Therefore, an offset in the counter position adjustment function must be added as required.

When returning to the origin (at the retracted end and extended end), a reset is performed at the position 0.3 mm from the end position at which it hits.

If the position where the table comes into contact with the external workpiece needs to reset the counter, reset the counter separately using the PLC etc. with the table pushed up against the workpiece.

### ⚠ Caution

CEU5 Multi-counter parameter settings:

Switch the CEU5 Multi-counter to Function mode [FUNC.] and set the Pre-scale [PRESCL] parameters to match the connected Card Motor model according to the specifications in the table below.

	LATH3-*	LAT3M-*	LAT3F-*		
Encoder resolution (μm)	30	5	5	2.5	1.25 <sup>Note 1)</sup>
Connected model	MANUAL				
Multiplier factor	X4	X4	X1	X2	X4
Value per 1 pulse	00.0300	00.0050	00.0050	00.0025	0.00125
Decimal point position	**,****				*,*****
Input type	2PHASE				

Note 1) Since the CEU5 Multi-counter has a 6-digit display, the tens of digits will not be displayed when the resolution is set to 1.25.

The Multi-counter may lose pulses when a long counter cable is used or when the Card Motor travels at high speed.

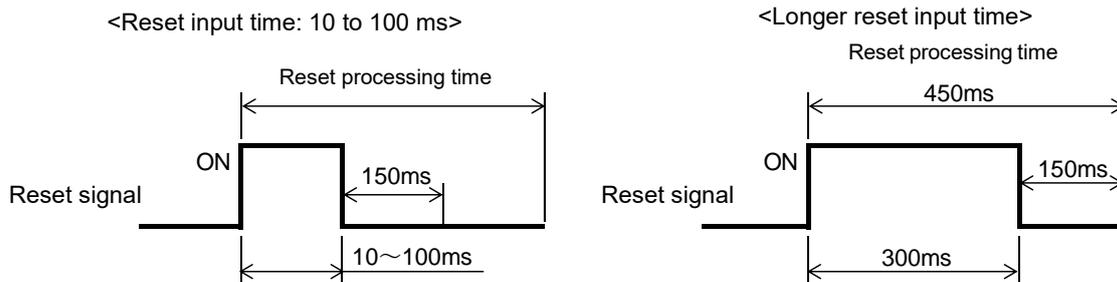
Refer to the CEU5 Multi-counter operation manual for setting details.

**The reset processing time is approximately 300 ms after reset is input. The count operation should be performed after 350 ms or more has lapsed after the reset.**

**If the reset signal is input from a PLC, the input time should be 10 to 100 ms.**

For a longer reset input time, the processing time takes approximately 150 ms from startup of the reset signal, and this will increase the total reset processing time.

If the table moves before the counter reset process is complete, the display value of the multi-counter may be shifted.



## 16. Alarm Detection

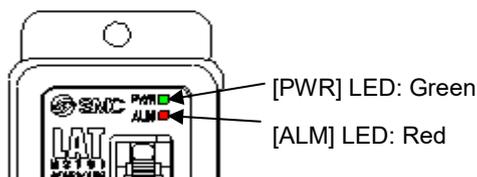
It is possible to check the type of an alarm by a combination of the ALM and PWR LED's on or flashing. When an alarm is generated, de-activate the alarm after troubleshooting and correct the error with reference to section **16.2 Alarms and countermeasures (P.82)**.

Alarms are divided into two types. One alarm type can be cleared by resetting the SVON input signal (ON-OFF-ON). The other type cannot be cleared unless the power supply to the controller is turned off.

### 16.1 Alarm LED display

The controller uses an LED display to indicate the type of alarm when an alarm is generated.

Content of alarm	LED		
	PWR	ALM	Flashing type
Memory error	Flashing	Flashing	Flashing alternately at 0.5 seconds
Actuator cable disconnected.	Flashing	Flashing	Flashing alternately at 1 s seconds
Temperature error	Flashing	Flashing	Flashing simultaneously at 0.5 seconds
Over current error	Flashing	ON	PWR flashing at 0.5 seconds
Pulse input error	ON	Flashing	ALM flashing at 1 seconds
Parameter error	ON	Flashing	ALM flashing at 0.5 seconds
Return to origin position not executed error	ON	ON	-



## 16.2 Alarms and countermeasures

Alarm name	Recovery method	Content / Countermeasure
Memory error	-	<p>&lt;Content of error&gt; Internal memory failure. Check if the conditions described below have occurred. (1) Power supply disconnected during data storing. (2) Disconnection of the power supply voltage. (3) Noise due to crossing of cables and power lines.</p> <p>&lt;Countermeasure&gt; Please contact SMC Sales.</p>
Actuator cable disconnected	Turn off the power and then turn it on again after connecting the Card Motor	<p>&lt;Content of error&gt; When operation signal is input to the controller with Card Motor unconnected to the controller, this error occurs.</p> <p>&lt;Countermeasure&gt; Check the connection of the Card Motor and actuator cable. Connect the Card Motor to the controller via an actuator cable, and start the operation again after turning on power or turning off the SVON signal.</p>
Temperature error	Turn the power off and on again or reset using the SVON input.	<p>&lt;Content of error&gt; The rated temperature has been exceeded due to increase in the temperature of the motor. Check if the conditions described below have occurred. (1) The product is used in a location where the specified ambient temperature is exceeded. (2) There is a heat generating source near the Card motor. (3) The product is used with a force exceeding the allowable thrust setting value.</p> <p>&lt;Countermeasure&gt; Review the ambient temperature and check the operation after supplying power again or after turning the SVON input signal OFF temporarily.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;"><b>⚠ Caution</b></p> <p>Please refer to the manual or the catalogue of the actuator for the allowable thrust setting value. When the Card Motor is not connected to the controller, a temperature error can be generated due to unstable temperature information. Check the Card Motor and controller connection.</p> </div>
Over current error (Motor overload error) (Over current error)	Turn the power off and on again or reset using the SVON input.	<p>&lt;Content of error&gt; This alarm is generated when the Card Motor has been overloaded causing an overcurrent to flow through the Card Motor, or when overcurrent flows through the parallel output terminals. Check if the conditions described below have occurred. (1) Motor overload error - The Card Motor cannot reach the target position during positioning due to obstacles. (2) Over current error - The connection of the output signal is not correct.</p> <p>&lt;Countermeasure&gt; Check the Card Motor type and rated value. Turn the power off and on again. Check the operation again after turning the SVON input signal OFF.</p>

<p>Pulse input error (Pulse speed error) (Pulse overflow error)</p>	<p>Turn the power off and on again or reset using the SVON input.</p>	<p>&lt;Content&gt; This error occurs when the input of the pulse input signals is incorrect. Check if any of the conditions described below have occurred. (1) Pulse speed error The pulse signal frequency exceeds the specified value. (2) Pulse overflow error The pulse counter in the controller overflows.  &lt;Countermeasure&gt; Check the pulse signal. Turn off and on the power supply or the SVON input signal and use within the specifications.</p>
<p>Parameter error (Origin parameter error) (Step Data parameter error) (Invalid parameter error)</p>	<p>Turn the power off and on again or reset using the SVON input.</p>	<p>&lt;Content of error&gt; The basic parameter setup and step data setup settings are not correct. Check if any of the conditions described below have occurred. (1) Origin parameter error Error related to the basic parameter data - [Card Motor product number] has not been selected. (2) Step Data parameter error Error related to the step data - "Target Position" of the step data is set outside of the stroke range, or the "positioning time", "speed", "acceleration" or "deceleration" is set to 0. (3) Invalid parameter error - It is not possible to achieve the [Target position] and [Positioning time] using the Cycle Time Entry Method (or "Speed", "Acceleration" or "Deceleration" using the Speed Entry Method) for the next step data from the current table position.  &lt;Countermeasure&gt; Check the basic parameter data and step data. Check the operation again after turning off and on the power supply or turning the SVON input signal OFF.</p>
<p>Return to origin position non-execution error</p>	<p>Turn the power off and on again or reset using the SVON input.</p>	<p>&lt;Content of error&gt; The operation has been interrupted while return to origin position has not yet been executed.  &lt;Countermeasure&gt; Perform the return to origin position operation after turning the SVON input signal OFF.</p>

## 17. Controller and Peripheral Devices Specific Precautions

### 17.1 Design and selection

#### Warning

##### **1. The specified voltage must be used.**

Otherwise, malfunction and damage to the controller may result.

If the applied voltage is lower than the specified voltage, it is possible that the load cannot be moved due to an internal voltage drop. Check the operating voltage before use. If the current supplied is too low, it may not be able to achieve the maximum force or may cause a malfunction.

##### **2. Do not operate beyond the specifications.**

Fire, malfunction, or damage to the product can result. Check the specifications before use.

##### **3. Install an emergency stop circuit.**

Install an emergency stop outside of the enclosure so that the system operation can be stopped immediately and the power supply disconnected.

##### **4. In order to prevent danger and damage due to the breakdown and the malfunction of this product, which may occur at a certain probability, a backup system should be established in advance by providing a multiple-layered structure or a fail-safe design to the equipment, etc.**

##### **5. If a fire or personal injury is expected due to abnormal heat generation, ignition, smoke from the product, etc, disconnect the power supply to the product and the system immediately.**

#### Caution

##### **1. SMC products are not intended for use as instruments for legal metrology.**

Measurement instruments that SMC manufactures or sells have not been qualified by type approval tests relevant to the metrology (measurement) laws of each country.

Therefore, SMC products cannot be used for business or certification ordained by the metrology (measurement) laws of each country.

### 17.2 Handling Precautions

#### Warning

##### **1. Never touch the inside of the controller/driver.**

It may cause an electric shock or damage to the controller.

##### **2. Do not perform operation or setting of this equipment with wet hands.**

It may cause an electric shock.

##### **3. A product that is damaged or missing any components should not be used.**

Electric shock, fire, and injury can result.

##### **4. Do not connect the controller to actuators other than the Card Motor.**

It may cause damage to the controller or the actuator.

##### **5. Be careful not to be caught or hit by the workpiece while the actuator is moving.**

It may cause an injury.

##### **6. Do not connect the power supply or power to the product until it is confirmed that the area where the workpiece moves is safe.**

The movement of the workpiece may cause an accident.

**7. Do not touch the product when it is energized and for some time after power has been disconnected, as it is very hot.**

It may cause burns due to the high temperature.

**8. Check the voltage using a tester at least 5 minutes after power-off when performing installation, wiring and maintenance.**

Electric shock, fire, and injury can result.

**9. Incorrect wiring can cause malfunction or damage the product. Do not touch the controller while power is supplied to it.**

Take safety measures against static electricity when it is necessary to touch the controller during maintenance.

**⚠ Caution**

**1. When the multi-counter is not used, mount the counter plug (supplied) to the counter connector.**

If foreign matter such as metal fragments enters the counter connector, short-circuit may occur.

**2. Be sure to perform a return to origin position operation before operating the actuator.**

If the origin position is not set, the product will not operate even if a step data command has been selected.

**3. The positioning time set and entered in the Controller configuration software is a nominal target value for operation. The positioning time is not guaranteed.**

The operation may not have been completed even if the set positioning time has passed. In such a case, detect that the operation has been completed by monitoring the BUSY and INP signals.

**4. Set the approximate weight of jigs or workpieces mounted on the Card Motor as the Load Mass in the controller configuration software.**

If the value selected in the controller configuration software and the weight of the workpieces are different, the product may vibrate or the positioning accuracy may decrease.

**5. When the load mounted on the Card Motor is small ( for example 100 g or less) and the Card Motor has stopped at a target position, the Card Motor may continuously hunt for the target position (vibrate) within the positioning accuracy range, depending on the operating conditions.**

Please contact an SMC sales representative for how to improve it.

**6. BUSY output signal**

The BUSY output signal turns ON when the Card Motor begins to operate, and it turns OFF when the operating speed reaches 2 mm/s or less.

However, when the Card Motor operates at a slower speed than 5 mm/s, the BUSY signal may not turn ON at all.

**7. INP output signal**

Both in positioning operation and pushing operation, if the specified INP positioning range of the set Target Position is reached, the INP signal will turn ON.

In pushing operation, if the table passes the INP range of the Target Position and stays outside the specified INP positioning range, the signal will turn OFF again.

**INP signal output range**

Model	Output range (mm)
LAT3F-*	+/-0.05
LAT3M-*	+/-0.1
LAT3-*	+/-0.3

## 17.3 Installation

### Warning

- 1. The controller and its peripheral devices should be installed on a fire-proof material.**  
Direct installation on or near a flammable material may cause fire.
- 2. Do not install this product in a place subject to vibration and impact.**  
A failure and malfunction can result.
- 3. Do not mount this controller and its peripheral devices near to a large electromagnetic contactor or no-fuse breaker which generates vibration on the same panel. Mount them on different panels, or keep the controller and its peripheral devices away from such a vibration source.**  
A failure and malfunction can result.
- 4. This controller and its peripheral devices should be installed on a flat surface.**  
If the mounting surface is distorted or not flat, excessive force may be applied to the housing, etc. causing malfunction.

## 17.4 Power supply

### Warning

- 1. Use a power supply with low noise between lines and between power and ground.**  
In cases where noise is high, use an isolation transformer.
- 2. The power supplies should be separated between the controller power and the I/O signal power and both Power supplies must not be of the “in-rush current limiting type”.**  
If the power supply is of the “in-rush current limiting type”, a voltage drop may occur during the acceleration of the actuator.
- 3. Take appropriate measures to prevent surges from lightning. Ground the surge absorber for lightning separately from the grounding of the controller and its peripheral devices.**
- 4. Use the UL-certified products listed below for the direct current (DC) power supply.**
  - Limited voltage current circuit in accordance with UL 508.  
A circuit to which power is supplied by a secondary coil of a insulated transformer that meets the following conditions
    - Maximum voltage (No load): 30 Vrms (42.4 V peak) or less
    - Maximum current: 8 A or less (including short circuit)Limited by circuit protector (such as fuse) with the following ratings

Voltage without load (V peak)	Maximum current rating (A)
0 to 20 [V]	5.0
Over 20 [V] up to 30 [V]	100 Peak voltage
  - Circuit (class 2) with maximum 30 Vrms (42.4 V peak) or less, which uses a class 2 power supply unit in accordance with UL1310 or class 2 transformer in accordance with UL 1585 as the power supply

## 17.5 Grounding

### Warning

- 1. Make sure the product is connected to ground to ensure the noise resistance of the controller.**  
Otherwise it may cause malfunction, damage, an electric shock or fire.  
Do not share the ground connection with equipment that generates a strong electromagnetic noise.

**2. A dedicated Ground connection must be used.**

Grounding should be to a D-class ground connection. (Ground resistance 100 Ω or less)

**3. The Ground connection should be as close as possible to the controller, and the ground wire kept as short as possible.**

**4. In the unlikely event that malfunction is caused by the ground connection, it may be disconnected.**

## 17.6 Wiring

 **Warning**

**1. Preparation for wiring**

Switch the power supply off before wiring or plugging and unplugging of connectors.

Mount a protective cover over the terminals after the wires have been connected.

**2. Do not route the digital I/O signal wires and power supply cables together.**

Malfunction due to noise may occur if the digital I/O signal and power cables are routed together.

**3. Confirm proper wiring before turning the power on.**

Incorrect wiring will lead to malfunction or may damage the controller or its peripheral devices depending on the seriousness of the wiring error.

Confirm that there is no mis-wiring before turning the power on.

**4. Reserve enough space for the routing of the cables.**

If the cables are forced into unreasonable positions, it may damage the cables and connectors, which may lead to misconnection or short-circuit and result in malfunction.

Avoid bending the cables in sharp angles close to the connectors or where they enter the product.

Fix the cable as close as possible to the connectors so that mechanical stress is avoided.

## 17.7 Operating environment

 **Caution**

**1. Do not use the product in an area where it could be exposed to dust, metallic powder, machining chips, or splashes of water, oil or chemicals.**

A failure or malfunction can result.

**2. Do not use the product in an area where a magnetic field is generated.**

It will cause failure or malfunction.

**3. Do not install the product in an environment where flammable gas, explosive or corrosive gas, liquids or other substances are present.**

It could lead to fire, explosion and corrosion.

**4. Avoid radiant heat from large heat sources such as direct sunlight or hot furnaces.**

It will cause failure of the controller or its peripheral devices.

**5. Do not use the product in an environment subjected to cyclic temperature changes.**

It will cause failure of the controller or its peripheral devices.

**6. Do not use in a place where surges are generated.**

When there are units that generate a large amount of surge around the product (for example solenoid type lifters, high frequency induction furnaces, motors, etc.), this may cause deterioration or damage to the product's internal circuit. Avoid surge generation and crossed lines.

**7. Neither the Card Motor nor the controllers have the tolerance to the thunder surge.**

**8. Do not install this product in an environment subjected to vibration and impact.**

It will cause failure or malfunction.

**9. If this product is used in conjunction with a relay or solenoid valve, use a type with a surge absorbing element built-in.**

**10. Do not expose the product to a strong light source such as direct sunlight.**

The Card Motor uses an optical sensor to detect the position, so if it is exposed to a strong light source such as direct sunlight, a malfunction could occur. In such a case, install a light shielding plate

## 17.8 Maintenance

 **Warning**

**1. Perform maintenance checks periodically.**

Confirm that wiring and screws are not loose.

Loose screws or wires may cause unexpected malfunction.

**2. Conduct an appropriate functional inspection and test after completing maintenance.**

In case of any abnormalities (if the actuator does not move, etc.), stop the operation of the system.

Otherwise, an unexpected malfunction may occur and it will become impossible to ensure safety.

Conduct an emergency stop test instruction to confirm safety of the equipment.

**3. Do not disassemble, modify or repair this controller or the peripheral devices.**

**4. Do not put anything conductive or flammable inside of this controller.**

Burning or explosion can result.

**5. Do not perform an insulation resistance test or insulation withstand voltage test.**

 **Caution**

**1. Ensure sufficient space for maintenance.**

Design the system that allows the required space for maintenance.

## 18. Troubleshooting

Refer to the table below for troubleshooting.

When none of the causes in the troubleshooting can be confirmed, it is presumed that the product is faulty and normal operation can only be recovered by the replacement of a part.

There is a possibility that this product has been damaged due to the operating conditions (problems relating to the application), so please contact SMC to discuss appropriate measures.

### 18.1 Operation errors

Problems	Possible causes	Investigation method and location of possible causes	Countermeasures
Does not operate at all.	Power supply failure.	Is the green LED in the controller ON?	Check the voltage and current supplied to the controller. → 4. External Connections (P.20) → 5. CN1: Power Supply Plug (P.22)
	External equipment failure	Check that the PLC connected to the controller operates correctly? Test the operation of the controller, using the controller setting software.	Refer to the controller operation manual and take appropriate measures. → 7.4 Parallel I/O signals (P.27)
	Incorrect wiring	Check that the wiring is correct. Refer to the wiring instructions in the controller operation manual and check the wiring for broken wires and short-circuits.	Correct the wiring and check that the input/output connection of each signal is correct. Separate the power supply for the CN1 controller and the CN5 I/O signal power supply. → 4. External Connections (P.20) → 7.6 Parallel I/O Connector wiring (example) (P.32)
	Alarm generated	Check if the controller has generated an alarm? Check the type of alarm. Refer to the controller operation manual, and take appropriate measures. When a temperature error has been generated without the Card Motor being heated too much, check the wiring of the Card Motor.	Refer to the controller operation manual and take appropriate measures. → 16. Alarm Detection (P.82) → 4. External Connections (P.20)
	Incorrect specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the connected Card Motor. → 14.2 Basic Parameter Setup window (P.60)
	Duplicated operation commands	The parallel I/O signals are activated in "Test Mode" whilst the Controller Configuration software is being started.	Select "Monitor Mode" in the Monitor/Test window of the Controller Configuration software, or terminate the configuration software. → 13.1 Overview of the Operation Instructions (P.54) → 14.5 Monitor/Test window (P.68)
	Signal timing	The parallel I/O signals have been activated after the power supply has been turned on and before the ALARM output has turned ON. The DRIVE signal is turned OFF during operation (except when the Card Motor is performing a pushing operation).	Activate the parallel I/O signals before the power supply is turned on and before the ALARM signal has been activated. If the DRIVE signal is turned OFF during operation, the Card Motor table will stop, and hold the position. If required, do not turn OFF the DRIVE signal until the operation has been completed. → 13.2 Parallel I/O operation procedures (P.54) → 7.4 Parallel I/O signal (P.27)
	Actuator cable disconnected	"Actuator cable disconnected" is displayed in the error window.	Connect the Card Motor to the controller via an actuator cable, and start the operation again after turning off the power to the controller.

Moved normally, but stopped working	Alarm generated	Check if the controller has generated an alarm? Check the type of alarm.	Refer to the controller operation manual and take appropriate measures. → 16. Alarm Detection (P.82)
	Incorrect wiring	Check that the wiring is correct. Refer to the controller operation manual to confirm wiring, and check for broken wires and short-circuits.	Correct the wiring and check that the input / output connection of each signal is correct. Separate the power supply for the CN1 controller and the CN5 I/O signal power supply. → 4. External Connections (P.20) → 7.6 Parallel I/O connector wiring (example) (P.32)
	Noise	Connect to Ground correctly. Avoid bundling the cables.	Refer to the controller operation manual and take appropriate measures. → 3.4 Mounting (P.18)
	Incorrect Parameter input	Check that the parameter values are correct. Reconfirm if an appropriate controller is used for the actuator.	Modify the parameters and test the operation. → 9.3 Basic parameter setup (P.35)
	Voltage drop	Temporary voltage drop in the power supply.	Check for the possibility of momentary voltage drop due to an inadequate power supply capacity, or that the power supply is an in-rush current limited type. → 3. Controller Specifications (P.15)
	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the connected Card Motor. → 14.2 Basic Parameter Setup window (P.60)
	Signal timing	Check the timing of the signals from the PLC to the controller.	PLC processing delay and controller scan delay are generated. Ensure an interval of 2 msec or more between input signals, and maintain the signal state for at least 2 msec. → 11.6 Response time for controller input signals (P.49)
	Setting error	The "Operating Time" in the "Continuous Operation (Test of multiple steps in a continuous cycle)" menu in the Controller Configuration software is set too short.	Modify the "Operating Time" settings. → 14.5 Monitor/Test window (P.68)
The Card Motor vibrates.	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the connected Card Motor. → 14.2 Basic Parameter Setup window (P.60)
	Incorrect parameter input	Check that the parameter values are appropriate and that the program is correct. Check and confirm that the target position, positioning time and load mass values are correct.	Amend the parameters by modifying the Step Data settings. Set the "Load Mass" value as close as possible to the weight of the workpiece mounted on the Card Motor. If the Card Motor still vibrates reduce the "Load Mass" value. After the possible causes are eliminated switch off the power supply and switch it on again. Modify the parameters as appropriate and test the operation. → 9.4 Step Data Input type (P.35) → 9.6 Step Data setup (P.39)
	The Card Motor or the workpiece is loose	Check if something has worked loose and confirm that the Card Motor is mounted correctly, and that the workpiece is mounted correctly to the Card Motor table.	Tighten the Card Motor and the workpiece mounting securely. Refer to the LAT3 Card Motor operation manual for details of tightening torques and fixing details.

Communication with the controller cannot be established. (LATC-W2)	The USB driver is not installed	Check that the USB driver is installed.	<p>If the USB driver has not been installed, the driver installation will start automatically when the conversion unit is connected to the PC. For details of the installation procedure refer to the "LATC-W2 Controller Configuration software Installation Manual".</p> <p>* The USB driver must be installed individually for each COM port.</p> <p>* If the installation does not start when the conversion unit is connected to the PC, the USB driver may have already been installed. A specific COM port number is assigned to each conversion unit connection. Check that the COM port number matches with the COM port the conversion unit is connected to.</p> <p>The COM port number can be checked using the Device Manager of the PC. For details of the COM port checking method refer to the "LATC-W2 Controller Configuration software Installation Manual".</p>
	Incorrect COM port setting	Check that the correct COM port is set in the Controller Configuration software.	<p>The COM port allocated to the conversion unit is different for different PC's. Check and confirm the COM port number with the conversion unit connected to the PC. The COM port number can be checked using the Device Manager in the PC. For details of the COM port checking and setting methods refer to the "LATC-W2 Controller Configuration software Installation Manual".</p>
	Connection failure	Confirm the connection status.	<p>Check that the LATCA controller communication cable, conversion unit, USB cable, and PC are connected correctly.</p> <p>For example, communication cannot be established if the connector has been damaged. Check that the power supply to the controller (LATCA) has been turned on.</p> <p>Communication cannot be established if the power supply is off.</p> <p>If any external equipment (PLC and measurement hardware), other than the LATCA controller, are connected to the PC, disconnect them. (There is a possibility that the other equipment may interfere with the communication.)</p>
	Communication speed is not stable.	Does the communication speed selected in the configuration software match the communication speed set on the controller?	Select a communication speed that matches the communication speed set on the controller.
	The CPU of the PC is busy or overloaded	Confirm that no other applications other than the Card Motor Controller Configuration software are running, and check that the CPU of the PC is not overloaded.	Terminate all other applications except the Card Motor Controller Configuration software.

## 18.2 Position-Speed-Pushing Force errors

Problems	Possible causes	Investigation method and location of possible causes	Countermeasures
The actuator is displaced from the Origin position	Incorrect Origin position	Check if the Card Motor table can complete the travel to the Origin position when executing the Return to Origin position operation in both extended and retracted direction? Perform the Return to Origin position operation several times to check the Origin position.	Check the actuator's operation (check for foreign matter etc.inside the product).
	Incorrect parameters	Check that the parameter values are appropriate and the program is correct. Check and confirm that the Target Position, Positioning Time and Load Mass values are correct.	Modify all parameters as appropriate and test the operation. → 9. Controller Set Up (P.33)
	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the Card Motor. → 14.2 Basic Parameter Setup window (P.60)
	Operating in a strong light source.	Check that the Card Motor is not exposed to a strong light source such as direct sunlight.	Install a light shielding plate as a cover.
	Signal timing	The Card Motor has been commanded to execute a new relative step data operation whilst the table of the Card Motor is still moving. A relative positioning operation has been performed from a position with an existing deviation.	In relative positioning the table moves the set travel distance from the current table position. Therefore confirm that the table starting position is where the table should be before starting the relative positioning operation. → 9.4 Step Data Input type (P.35)
The Card Motor does not move to the correct position	Incorrect wiring	Check that the wiring is correct. Refer to the controller operation manual to confirm wiring, and check for broken wires and short-circuits.	Correct the wiring and check that the input/output of each signal is correct. Separate the power supply for the CN1 controller and the CN5 I/O signal power supply. → 4. External Connections (P.20) → 7.6 Parallel I/O connector wiring (example) (P.32)
	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the Card Motor → 14.2 Basic Parameter Setup window (P.60)
	Signal timing	Check the timing of the signals from the PLC to the controller. Ensure that the DRIVE signal is not turned OFF whilst the Step Data is being executed.	A PLC processing delay and controller scan delay are generated. Please ensure an interval of 2 msec or more between input signals, and maintain the signal state. When the DRIVE signal is turned OFF, the table of the Card Motor stops, and holds the position. Do not turn OFF the DRIVE signal until the operation has been completed. → 11.6 Response time for controller input signals (P.49) → 7.4 Parallel I/O signals (P.27)
	Data not stored correctly	Check that the data (step data, parameter) is stored correctly. Do not turn off the controller power supply or remove the cable while data is being stored.	Turn the power OFF and ON again. Input the correct data (step data, parameter) again and check the operation. → 3.2 Parts description (P.16) → 9. Controller Set Up (P.33) → 14.4. Step Data Setup window (P.64)

Card Motor does not reach the required speed.	Incorrect parameters	Check that the parameter values are correct. Check and confirm that the target position, positioning time and load mass values are correct	Modify the parameters as appropriate and test the operation. → 9.6 Step Data setup (P.39)
	Operation pattern is not suitable.	Check that the correct positioning time and load mass has been entered based on the current position in relation to the target position of the Card motor.	Reduce the positioning time or increase the Load mass values in the step data. → 9.6 Step Data setup (P.39)
	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor product number and mounting orientation) are correct.	Set or correct the product number and mounting orientation of the Card Motor → 14.2 Basic Parameter Setup window (P.60)
	Voltage drop	Temporary voltage drop in the power supply.	Check for the possibility of momentary voltage drop due to an inadequate power supply capacity, or that the power supply is an in-rush current limited type. → 3. Controller Specifications (P.15)
The Pushing thrust does not reach the thrust setting value.	Incorrect parameters	Check that the parameter values are set correctly for a pushing operation in the Step Data. Check that pushing operation has been selected in the Step Data.	Modify all parameters as appropriate and test the operation. Set the speed to be 1 mm/s or more for the pushing operation. → 9.6 Step Data setup (P.39) → 11.3 Pushing operation (P.46)
	Unsuitable specification	Check that the Basic Parameter Setup in the controller (Card Motor Product Number and Mounting Orientation) are correct.	Set or correct the product number and mounting orientation of the Card Motor → 14.2 Basic Parameter Setup window (P.60)
	Voltage drop	Momentary voltage drop in the power supply.	Check for the possibility of momentary voltage drop due to an inadequate power supply capacity, or the power supply is an in-rush current limited type. → 3. Controller Specifications (P.15)

## 18.3 Configuration software

Problem	Possible cause of the trouble	Investigation method and location of possible causes	Countermeasures
COM port disabled or COM port cannot be opened.	Communication cable is not connected to the PC.	Check that the communication cable is connected to the PC.	Connect the controller and PC with the controller setting cable and USB cable and restart the configuration software.
Unsupported controller is connected.	The controller version and the configuration software version do not match.	The configuration software version corresponds to the controller version?	Use a configuration software version which matches the version of the controller. → P.1 <u>Correspondence table for controller version and configuration software version</u>
No controller is available for communication or there is no response from the controller.	The controller is not turned on.	Is the green LED in the controller ON?	Check the power is supplied to the controller. → 4. External Connections (P.20) → 5.CN1: Power Supply Plug (P.22)
	Communication cable is not connected to the PC.	Check that the communication cable is connected to the PC.	Connect the communication cable to the CN3 of the controller. → 2.3. Structure of the product (P.12)
	Does the communication speed selected in the configuration software match the communication speed set on the controller?	Select a communication speed that matches the communication speed set on the controller.	Communication speed is not stable.
	Controller ID is not in the range of search.	Check that the controller ID is included in the search range of the configuration software.	Specify the search range of the configuration software so that controller ID is included.
	The controller version and the configuration software version do not match.	The configuration software version corresponds to the controller version?	Use a configuration software version which matches the version of the controller. → P.1 <u>Correspondence table for controller version and configuration software version</u>
	COM port of the PC to which the communication cable is connected is wrong.	Check that the communication cable is connected to the COM port which has been selected in the configuration software.	Select the COM port to which the communication cable is connected using the configuration software.

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.

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