



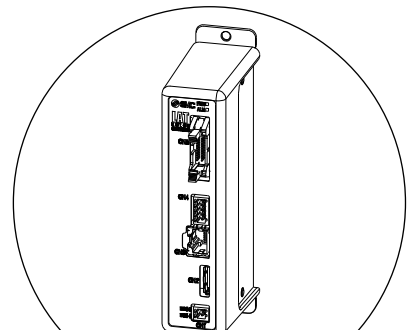
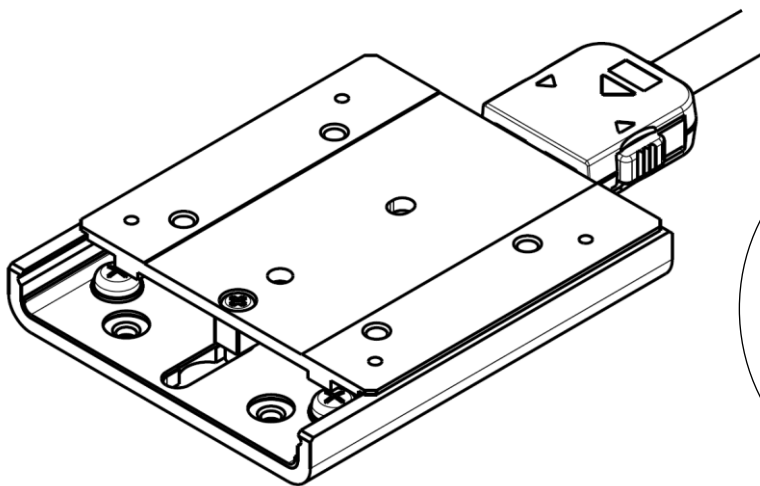
# Operation Manual

PRODUCT NAME

## *Card Motor Simple Setting (Step Data Input version)*

Model / Series / Product Number

## **LAT3/LATCA Series**



Controller  
LATCA Series

# SMC Corporation



### **About this Operation manual**

This Card Motor Simple Setting manual summarizes the the installation and initial setting of the Card Motor and Controller.

Refer to the Card Motor operation manual and the Card Motor Controller operation manual for further details.

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# LAT3 Series/Card Motor

## 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.



# LAT3 Series/Card Motor

## Safety Instructions

### Caution

**1. 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 regulation 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.**

## 2. Start up procedure / Connecting to a computer

The procedure for initial start up using a PLC are explained below.

### 2. 1 Preparation

#### (1) Confirmation of product

Check the part numbers on the product labels and the quantity of the accessories to confirm that the order is correct.

LAT3 series

No.	Description	Quantity	Note
1	Card Motor	1 pc.	
2	Actuator cable	1 pc.	
3	Card Motor controller	1 pc.	
4	Power supply plug	1 pc.	Included with controller
5	Counter plug	1 pc.	Included with controller
6	Controller setting software <sup>Note1)</sup>	1 pc.	
7	Controller setting cable <sup>Note2)</sup>	1 pc.	

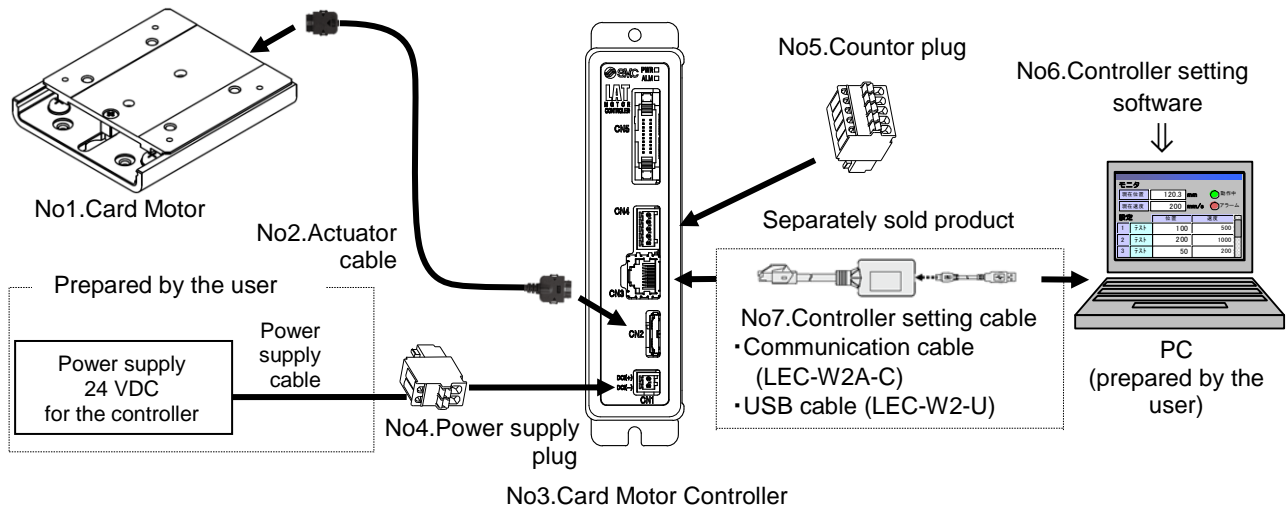
Note1) Download from SMC's website.

<https://www.smcworld.com/actuator/cardmotor.jsp>

Note2) The Controller setting cable is not included with the Card Motor or Card Motor controller. This should be ordered separately.

#### (2) Wiring

Follow the procedure below for wiring.



### (3) Installation of the Card Motor

Points for installation of the Card Motor.

**[Fixed side / moving side]**

**Fix the rail to the mounting surface with screws before operating the table.**

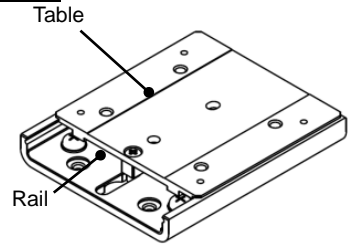
**[Mounting surface]**

**Keep the flatness of the mounting surface of the table and rail 0.02mm or less.**

Insufficient flatness of a work piece mounted to the table or insufficient flatness of the mounting surface for the rail can cause play in the guide and an increase in the sliding friction.

**Mount the Card Motor on materials with good heat dissipation such as a metal plate.**

If heat cannot dissipate, the product may over heat and it may damage the product.



**[Mounting screw specifications and tightening torques]**

**Use stainless steel screws with appropriate length.**

**Tighten the screws to the recommended tightening torque.**

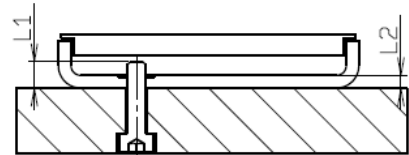
The internal components may get damaged if the maximum screw-in depth is exceeded.

Tightening to a torque greater than the specified range may damage the Card Motor.

Insufficient tightening torque may displace the actuator or the work piece or cause it to drop off.

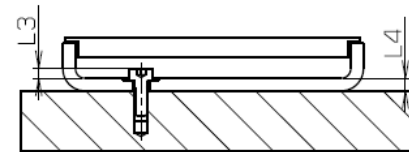
#### 1) Card Motor mounting from the bottom / tapped hole.

Screw material	SUS
Screw dimensions	M3 x 0.5
Recommended tightening torque [Nm]	0.48 to 0.63
L1 (Maximum screw-in depth) [mm]	4.6
L2 (Plate thickness) [mm]	2.1



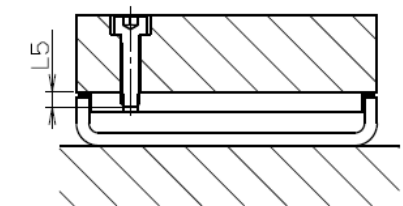
#### 2) Card Motor mounting from above / through hole.

Screw material	SUS
Screw dimensions	M2.5 x 0.45
Recommended tightening torque [Nm]	0.27 to 0.36
L3 (Maximum screw-in depth) [mm]	2.5
L4 (Plate thickness) [mm]	2.1



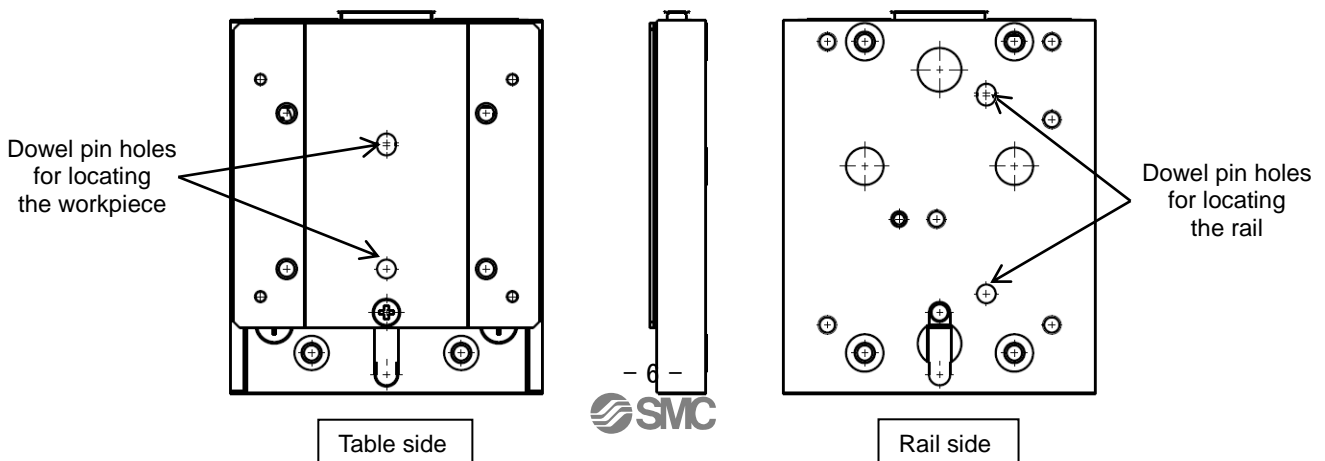
#### 3) Work piece mounting on top of the table.

Screw material	SUS
Screw dimensions	M3 x 0.5
Recommended tightening torque [Nm]	0.48 to 0.63
L5 (Maximum screw-in depth) [mm]	2.5



**[Locating of the Card Motor and work piece]**

**Locate the rail to the mounting surface and the work piece on to the table using the dowel pin holes on the rail and table.**



## ⚠ Warning

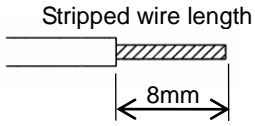
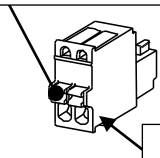
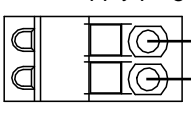
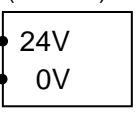
**Adjusting, mounting, inspection or changes to the wiring should never be done while power is being supplied to the product.**

Electrical shock, malfunction, and breakage can result.

## ⚠ Caution

**Refer to the Card Motor operation manual and Card Motor Controller operation manual for detailed installation and wiring.**

(4) Prepared and wired by the user.

Description	Conditions
PC	PC with Windows®7, Windows®8.1 or Windows®10 with USB1.1 or USB2.0 port. Windows®7, Windows®8.1 and Windows®10 are registered trademarks of United States Microsoft Corporation.
Controller power supply DC24V	Power supply voltage: 24 VDC +/- 10%, 3A or more (Do not use inrush current limiting type)
Power supply cable	20 AWG / 0.5 mm <sup>2</sup> Use a single multi-strand wire for each terminal. Strip the wires and twist the wires together, as shown. <div style="float: right; text-align: center;">  </div> * The insulation should be rated to withstand a temperature of 60°C minimum.
Wiring of the power supply plug	<p style="text-align: center;">Connect the positive terminal of the 24 VDC power supply to the DC1(+) terminal of the controller power supply plug, and the negative terminal to the DC1(-) terminal.</p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 10px;"> <p><u>Open / close lever</u> Push the open / close lever and insert the wire into the electrical wire entry.</p>  </div> <div style="margin-right: 10px;"> <p>Controller power supply plug</p>  </div> <div> <p>Power supply (24 VDC)</p>  </div> </div>

(5) Software installation

Install the controller setting software and controller setting cable in accordance with the installation procedure (PDF) from the SMC website.



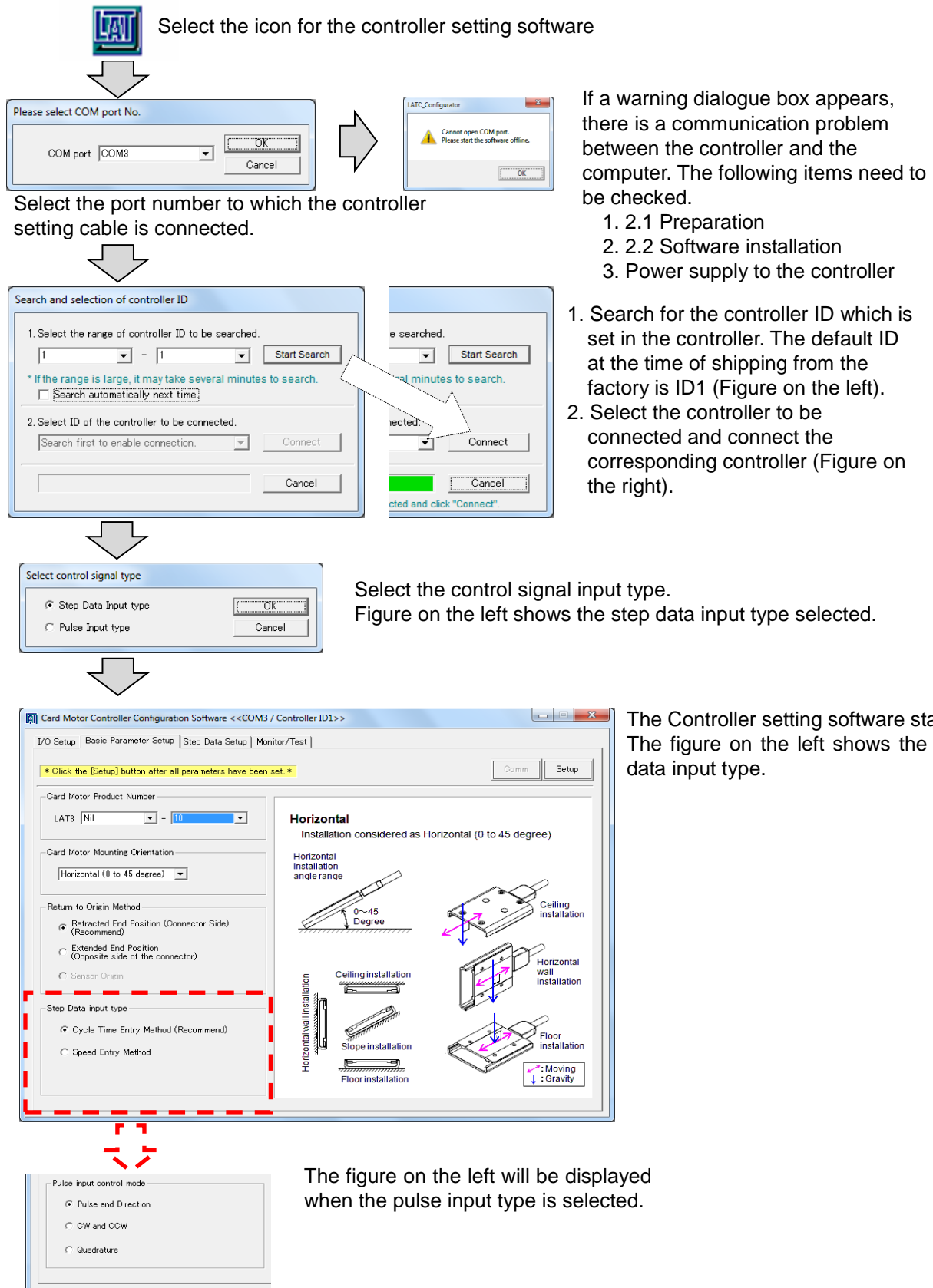
## 2. 2 Controller settings

The Card Motor model to be controlled and the controller operating conditions must be set using a computer.

This operation manual describes the step data input which allows checking of the operation set by the computer.

### (1) Start the setup software

After wiring, start the controller setting software following the flow chart below after supplying power to the controller.



## (2) Basic Parameter Setup

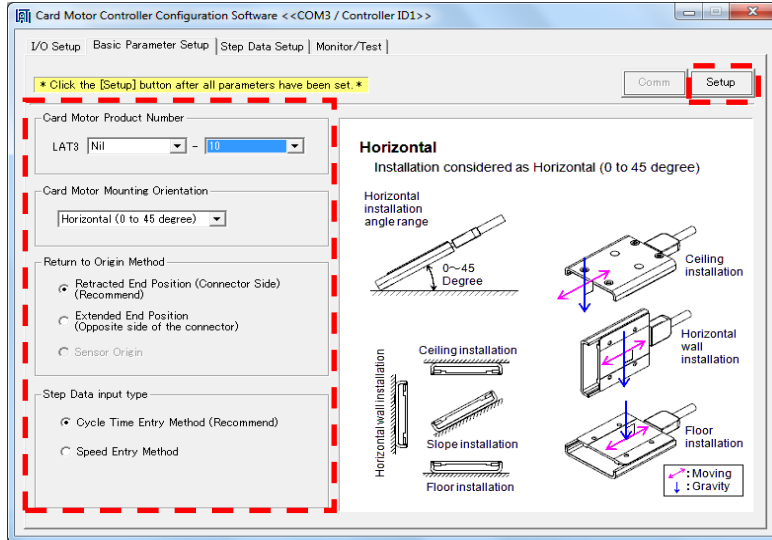
Select the setting for each item described below using the Basic Parameter Setup window and register it to the controller by selecting [Setup].

Card Motor Product Number: Product number of the applicable Card Motor.

Card Motor Mounting Orientation: Horizontal or Vertical mounting

Return to Origin Method: Retracted or Extended end Origin position

Step Data Input type: Cycle Time Entry Method (recommended).



## (3) Step data setting

Select the step data using the Step Data Setup window.

Operation mode: Position / Pushing

Movement MOD: Absolute / Relative

Target Position [mm]: Travel distance of the table

Positioning Time [s]: Time required to move to the target position

Thrust Setting Value: Thrust generated for the pushing operation.

Load Mass [g]: Loaded weight of work piece and tools.

After setting, download the step data to the controller.

▲Positioning Time & 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: 15mm  
Load Mass: 200g  
Positioning time should be set longer than 0.13s.

No.	Operation	Movement MOD	Target Position [mm]	Positioning Time [s]	Speed [mm/s]	Accel [mm/s <sup>2</sup> ]	Decel [mm/s <sup>2</sup> ]	Thrust Setting Value	Load Mass [g]
1	Position	Absolute	0.000	0.00	0	0	0	1.0	0
2	Position	ABS	0.000	0.00	0	0	0	1.0	0
3	Position	ABS	0.000	0.00	0	0	0	1.0	0
4	Position	ABS	0.000	0.00	0	0	0	1.0	0
5	Position	ABS	0.000	0.00	0	0	0	1.0	0
6	Position	ABS	0.000	0.00	0	0	0	1.0	0
7	Position	ABS	0.000	0.00	0	0	0	1.0	0
8	Position	ABS	0.000	0.00	0	0	0	1.0	0
9	Position	ABS	0.000	0.00	0	0	0	1.0	0
10	Position	ABS	0.000	0.00	0	0	0	1.0	0
11	Position	ABS	0.000	0.00	0	0	0	1.0	0
12	Position	ABS	0.000	0.00	0	0	0	1.0	0
13	Position	ABS	0.000	0.00	0	0	0	1.0	0
14	Position	ABS	0.000	0.00	0	0	0	1.0	0
15	Position	ABS	0.000	0.00	0	0	0	1.0	0

Target position: Input the absolute distance from the origin position to the position where the table is to travel.  
Setting range: 0 to 10 mm (0.001mm increments) The connector side is considered as absolute 0.  
Positioning repeatability: LAT3-\*: +0.09mm, LAT3F-\*: +0.005mm

Caution: Distance [mm]  
The shortest positioning time is a guideline. Determine the actual conditions of the equipment and set the positioning time accordingly.

 **Caution**

Refer to the Card Motor Controller operation manual for details of the data setting procedures and buttons.

**The Card Motor Product Number set in the Controller Setting Software must correspond with the connected Card Motor.**

If they do not correspond, the Card Motor will operate at a position, speed and thrust different from the settings leading to operation failure.

**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.**

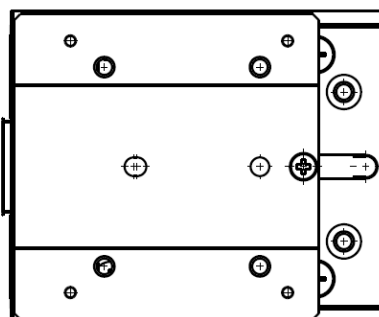
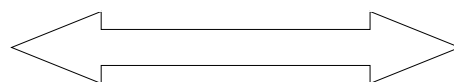
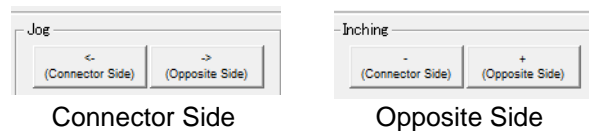
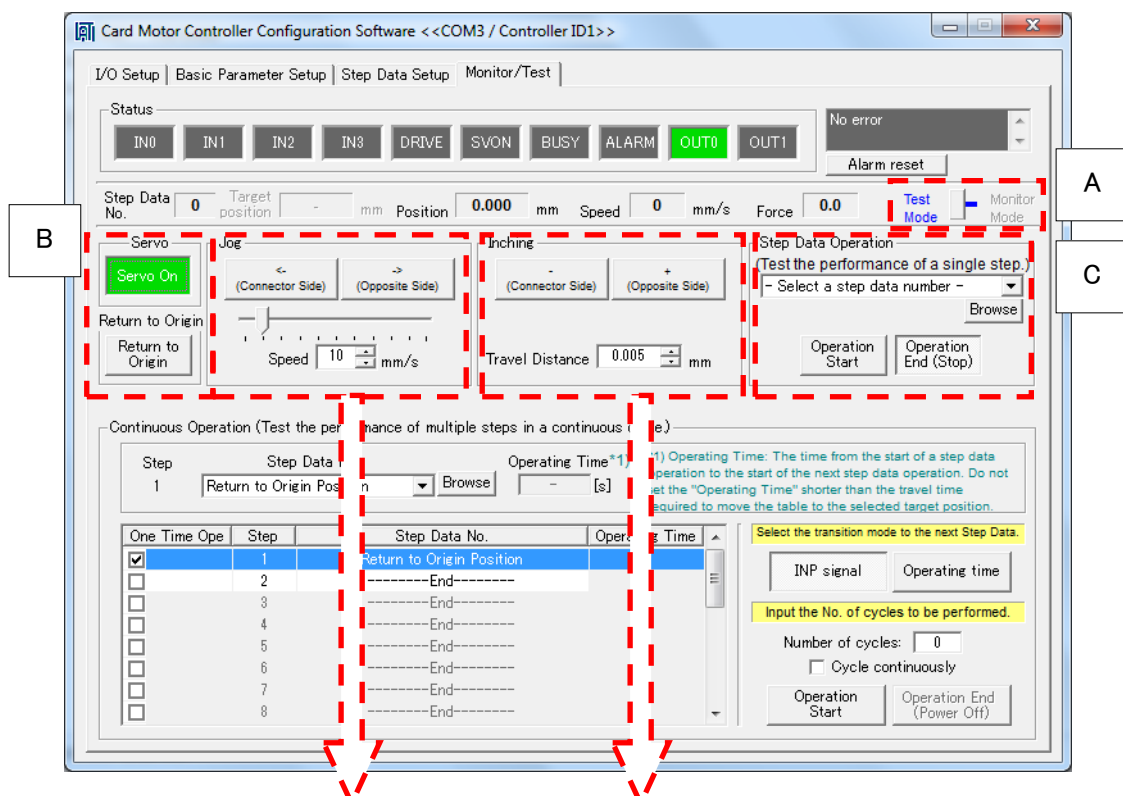
The table may vibrate if there is a large difference between the "load mass" set in the Step Data and the load mass mounted on the table.

### 3. Start up procedure / Test operation using a computer

#### 3. 1 Test operation using a computer (Step data operation)

A test operation can be performed using a computer. The operating performance and the controller settings can be tested and confirmed by operating the Card Motor under the actual operating conditions using the Card Motor Controller Setting Software in "Test Mode", as follows.

- A. Select Test mode on the Monitor/Test tab window for the test operation (the default mode is Test mode).
- B. Select the "Return to Origin" button for returning to origin.
  - \* When the Card Motor is not energized, "Servo Off" is displayed, and "Servo On" is displayed when the Card Motor is energized.
  - \* When turning off the power supply, select "Servo On" so that "Servo Off" is displayed.
- C. The selected Step Data can be operated (only when the Step Data Input type is selected)



 **Warning**

**Consider the movements of the table when the Card Motor is de-energized.**

If [Servo On] is pressed, no power will be supplied to the Card Motor, so the table will not be fixed and can be moved by external force. Check that the table movement cannot cause an injury or damage to the equipment.

 **Caution**

**Consider table movements of the Card Motor and external forces applied to it when the operation is ended (stopped).**

When [Operation End (Stop)] is pressed, the table stops moving. However, power is still supplied to the Card Motor to maintain the position of the table where it stopped. If an external force is applied to the table, the motor will generate heat when trying to return to this position. The motor will over heat and damage the Card Motor.

**Do not load the Card Motor with continuous or higher thrust than allowed for a prolonged time.**

When a pushing operation step data is selected, the pushing force is continuously generated from [Operation Start] until [Operation End (Stop)] is pressed.

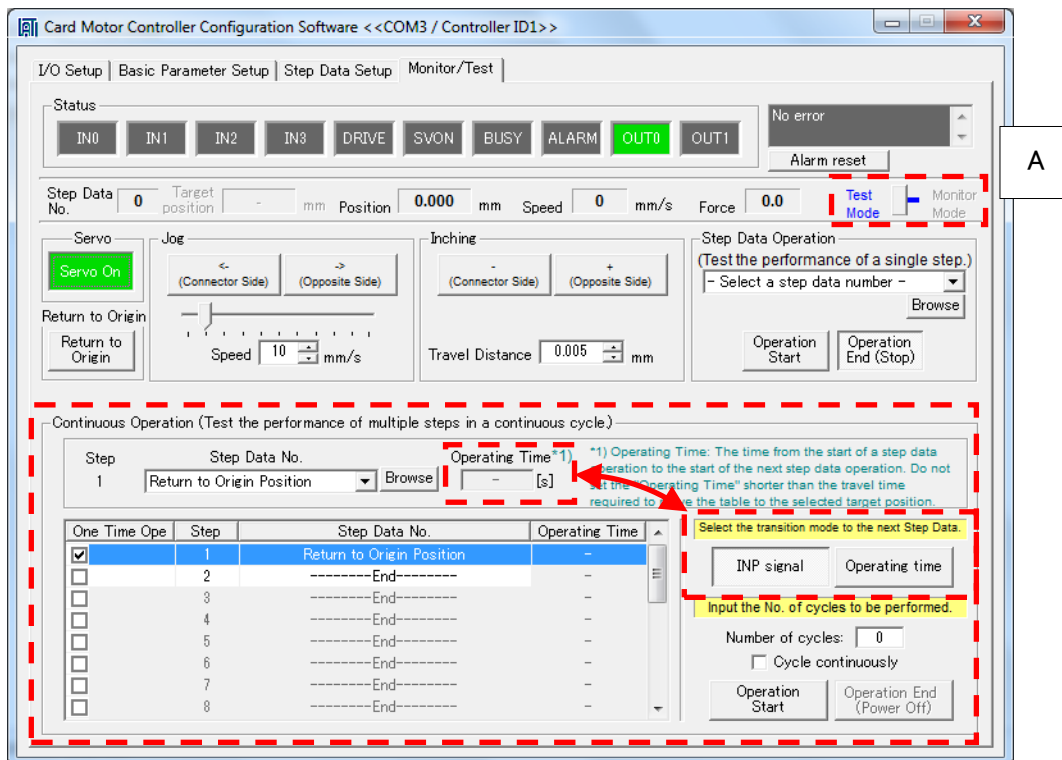
If a Thrust Setting Value is set higher than the maximum allowable value, the Card Motor will overheat and an overheating error and operation failure may occur. When a pushing operation is performed at the maximum allowable set thrust at 100% duty ratio or more, stop (end) the operation within 10 seconds. Refer to the Card Motor operation manual for specifications of the relationship between the set thrust and duty ratio.

### 3. 2 Test operation using a computer (Continuous operation)

A continuous test operation of the Card Motor can be performed using a computer when Step Data Input type is selected. The operating performance and the controller settings can be tested and confirmed by operating the Card Motor under the actual operating conditions using the Card Motor Controller Setting Software in “Test Mode” as follows.

- A. Select Test mode on the Monitor/Test tab window for the test operation (the default mode is Test mode).

In “Monitor Mode” it is not possible to operate the Card Motor with the Controller Setting Software.



Step: Sets the order of continuous operation

Step Data No.: Selects the Step data number for the operation

Operating Time: Can be selected when the step transition mode "Operating time" is selected.

Step transition mode: INP signal or Operating time can be selected

- \* When "Operating time" is selected for the step transition mode, a value greater than the operating time of the selected step data must be entered.

Number of cycles: Enter the number of cycles to continue the operation

Cycle continuously: The operation is repeated until "Operation End" is selected.

 **Warning**

**Consider the table movement.**

If the operation has ended (power is OFF), no power will be supplied to the card motor. The table will not be fixed and can be moved by external forces or the table's own weight (including workpieces). Be aware of the table movement so as not to cause an injury or damage to the equipment.

 **Caution**

**If an error occurs, all controls will be released.**

The power supply to the Card Motor will be turned off, the table will no longer be fixed and can be moved by external force or the table's own weight (including workpieces). Ensure that the table movements cannot cause an injury or damage to the equipment.

Note) It is possible to check the type of the alarm by a combination of lighting-up and flashing of ALARM and POWER LEDs. Please confirm controller (LATCA series) manual for a detailed content of the alarm.

**Complete the "Basic Parameter Setup" and "Step Data Setup" settings before operating the Card Motor.**

If the "Basic Parameter Setup and "Step Data Setup" settings have not been completed, the Card Motor will not operate and an alarm will be generated. Refer to section "[2.2 Controller settings](#)" for details of the Basic Parameter Setup and Step Data Setup.

**Confirm the operation using a PLC.**

The test operation can be performed easily using a computer, but the communication may be delayed depending on the computer condition and normal operation may not be available. Use a PLC for the verification of the response or accuracy of the actual card motor.

## 4. Start up procedure / Operation by PLC

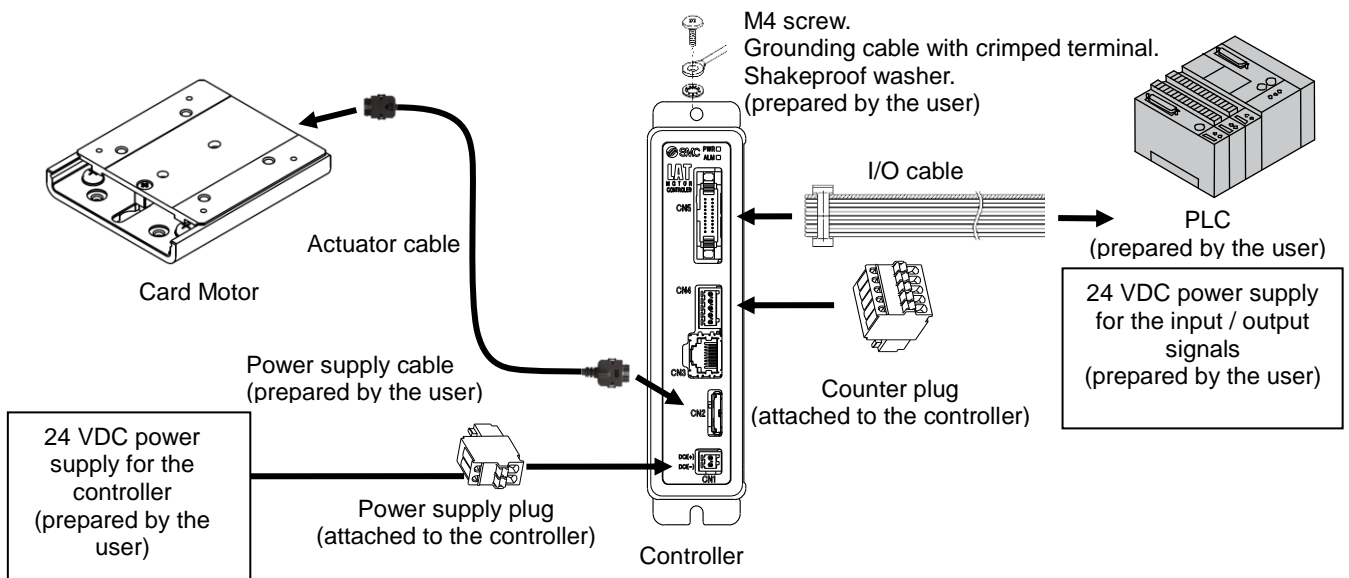
The Card Motor operates based on input/ output signals sent from a PLC.

Before operating the product using the PLC, perform the basic settings and the step data setting to the controller. (Refer to the section 2.2 Controller Setting for the setting instructions.)

Turn off the Controller Setting Software after the settings have been downloaded to the controller. Then turn off the controller once and turn it on again, or set it to "Monitor Mode" in the "Monitor/Test" window of the Controller Setting Software.

### 4. 1 Wiring

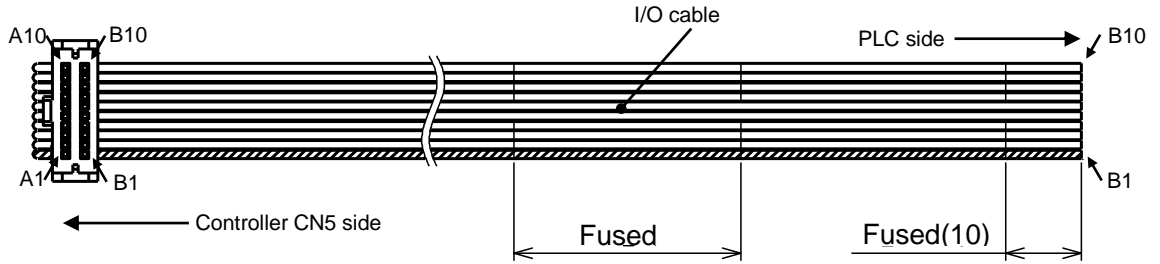
**Turn off the power to the controller,** and disconnect the controller setting cable from the controller. Connect the controller and the PLC using an I/O cable, referring to the I/O cable pin assignment and the controller circuit.





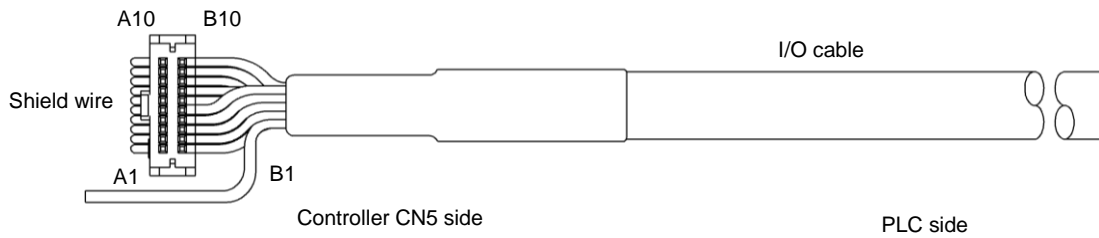
# I/O cable pin assignment

## LATH2-\*



Number of ways	20
AWG size	AWG28

## LATH5-\*



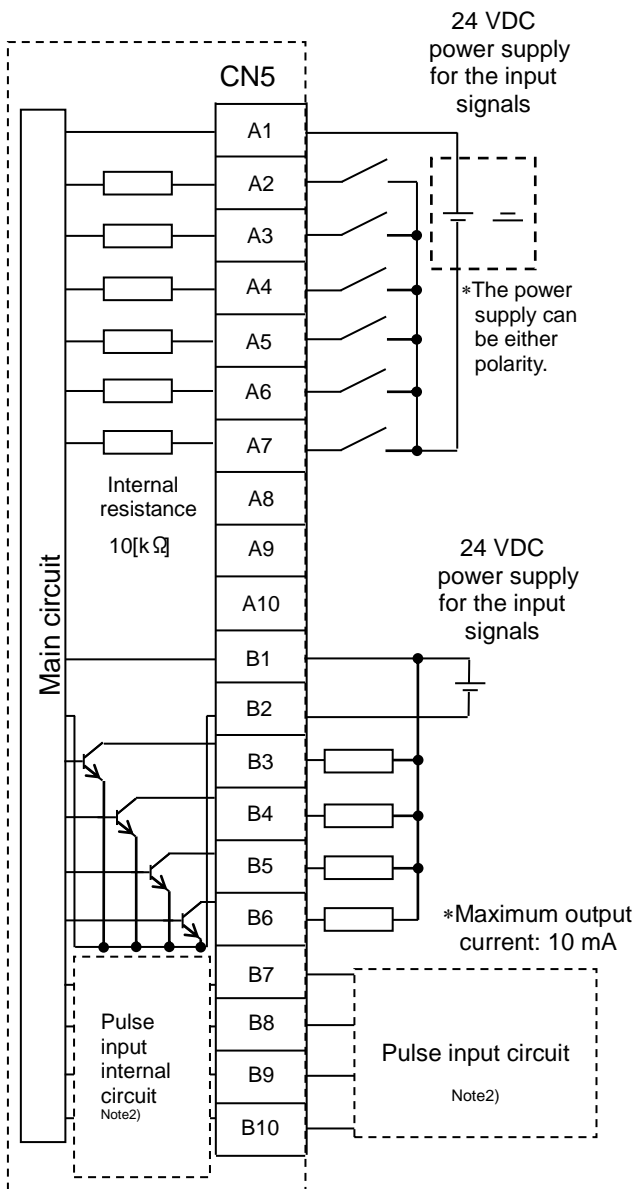
Number of ways	20
AWG size	AWG28

Number of ways	1
AWG size	AWG24

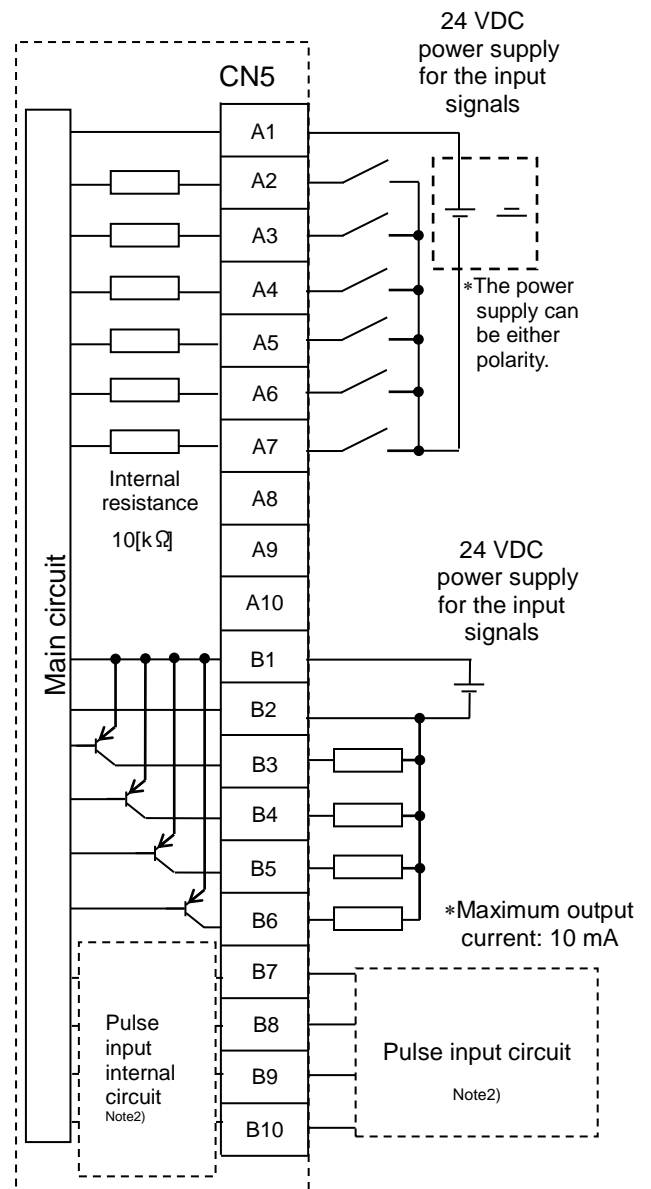
Terminal number	LATH2-*	LATH5-*		
	Insulator colour	Insulator colour	Dot	Dot colour
A1	Red	Light brown	■	Red
A2	Grey	Light brown		Black
A3	Grey	Yellow	■	Red
A4	Grey	Yellow		Black
A5	Green	Light green	■	Red
A6	Grey	Light green		Black
A7	Grey	Grey	■	Red
A8	Grey	Grey		Black
A9	Grey	White	■	Red
A10	Green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

# Controller Circuit

## (1) NPN type



## (2) 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 for when used as pulse input signal terminals.

Note 2) Refer to the Card Motor Controller operation manual for the pulse input internal circuit and the pulse input circuit wiring.

Note 3) Refer to the Card Motor Controller operation manual for the description of input and output signals and their functions.

## Caution

There are two types of parallel input and output for this controller; NPN type and PNP type. Please confirm the controller specification before wiring.

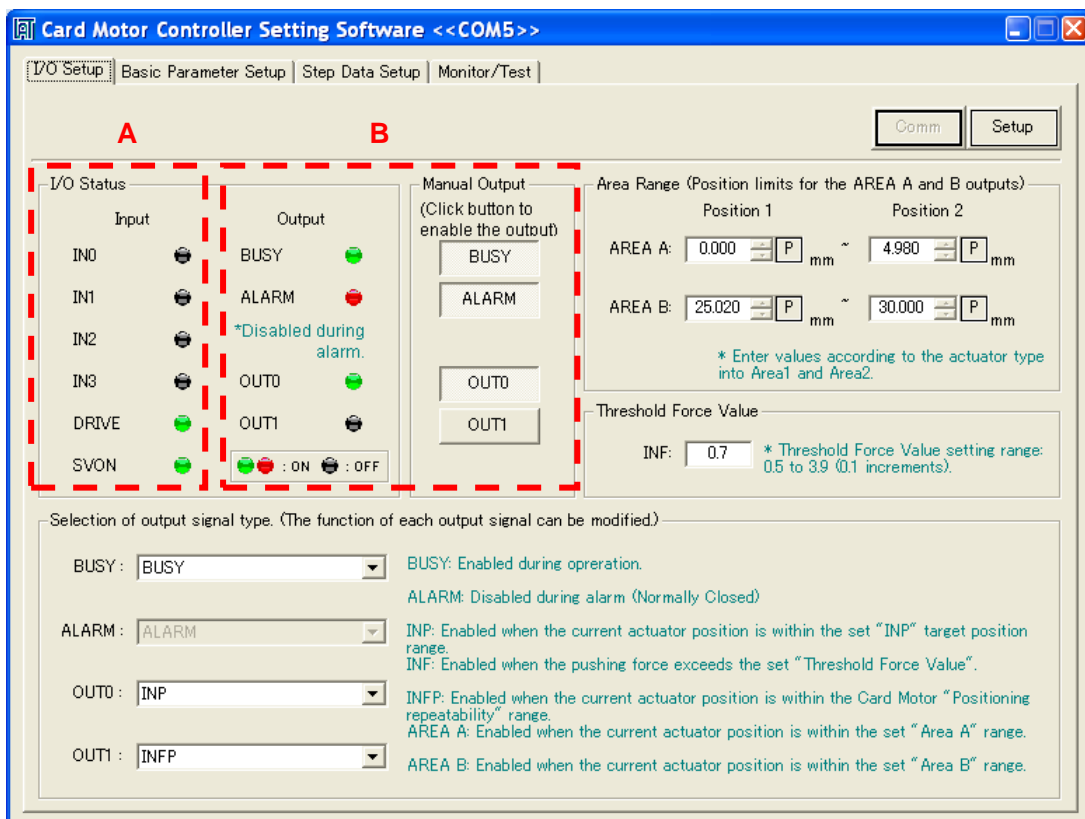
The 24 VDC power supply for the controller (CN1), and the 24 VDC power supply for the parallel I/O (CN5) should be separate.

### 4. 2 Parallel I/O connection check

The wiring and connections and the signal status of the controller and PLC can be checked using the “I/O status” and “Manual Output” functions.

Check that the controller recognizes the PLC output signals and the PLC recognizes the controller output signals.

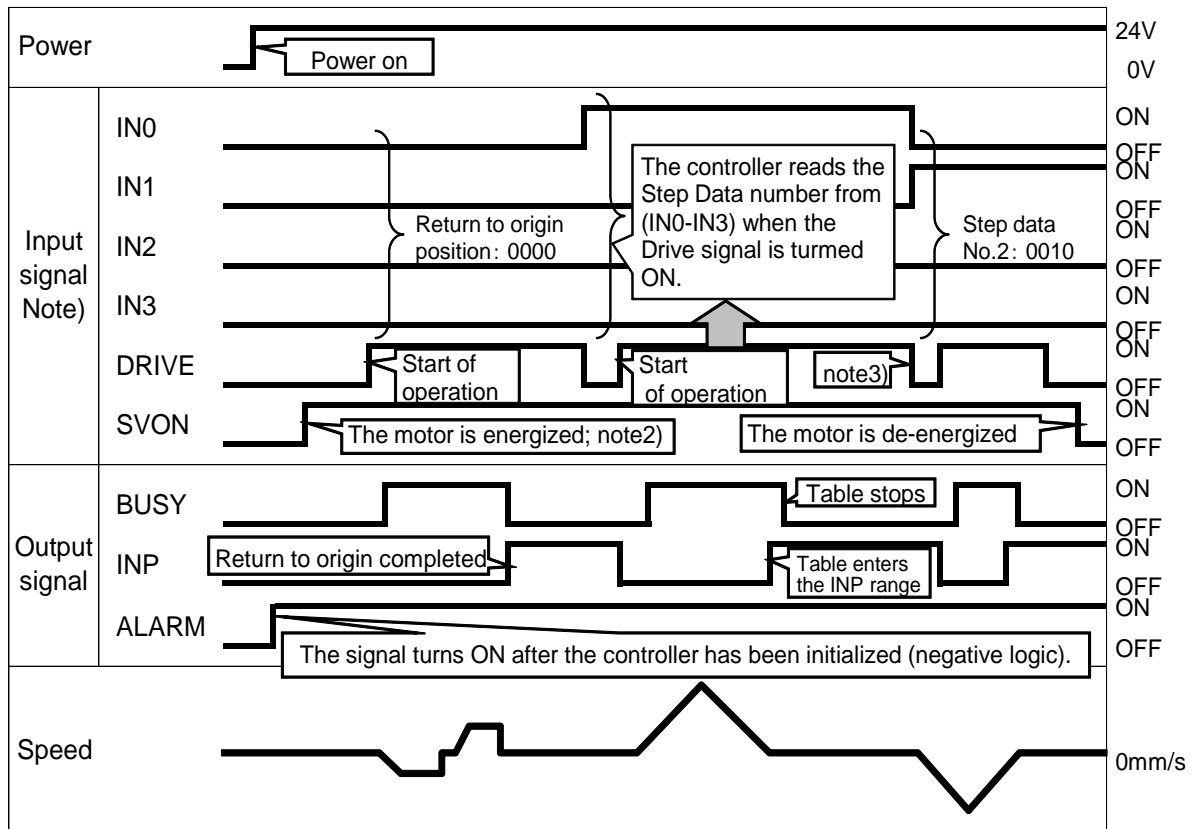
- A. Input signal check ---- Use the PLC to turn ON and OFF the output signals to the IN0, IN1, IN2, IN3, DRIVE, and SVON controller inputs and check the corresponding input signals using the Controller Setting Software. The indicator turns green when the controller detects a signal in ON status.
- B. Output signal check -- Manually turn ON and OFF the BUSY, ALARM, OUT0, and OUT1 output signals to check the corresponding input signals to the PLC. The indicator turns green (red for the ALARM output) when the controller outputs are ON (high).



### 4. 3 Timing diagram (Example)

The figure shows the timing diagram of operation for the selected step data input type and the PLC parallel input/ output signals used when power is supplied.

Return to Origin position → Step Data No.1 → Step Data No.2 →  
 Operation completed (The motor is de-energized)



Note1) A PLC processing delay and controller scan delay should be considered when using the controller I/O's. Use a 2 msec interval or more between input signals, and maintain the signal state for at least 2 msec.

Note2) Please turn on the SVON signal after turning on the ARARM signal.

Note3) Please keep the DRIVE signal ON, except the stopping the movement of the table.

### **Warning**

**If an error occurs, all controls will be released.**

The power supply to the Card Motor will be turned off, the table will no longer be fixed and can be moved by external force or the table's own weight (including workpieces). Ensure that the table movements cannot cause an injury or damage to the equipment.

Note) It is possible to check the type of the alarm by a combination of lighting-up and flashing of ALARM and POWER LEDs. Please confirm controller (LATCA series) manual for a detailed content of the alarm.

## 4. 4 Monitor mode

The status of the parallel I/O signals, the table position, speed and pushing force can be monitored in Monitor Mode when the Card Motor is operating using a PLC to control the parallel I/O signals.

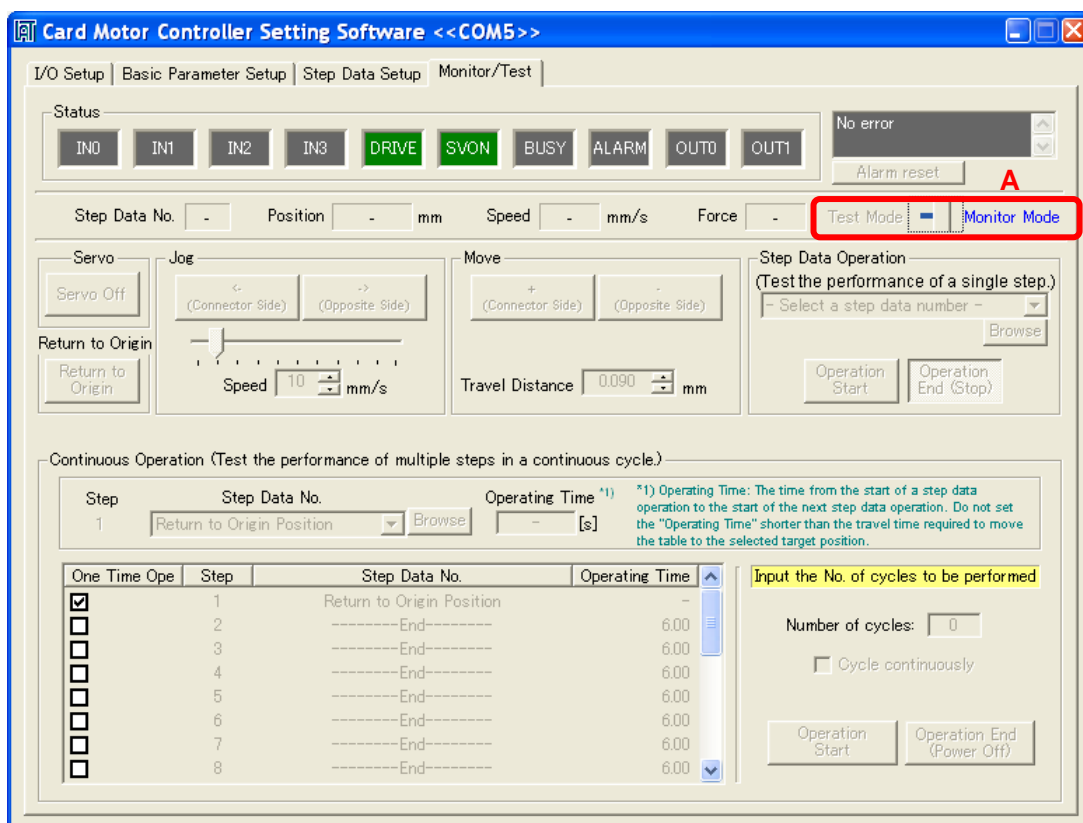
A. Select "Monitor Mode" in the "Test Mode / Monitor Mode" window.

It is not possible to operate the Card Motor in test mode using the parallel I/O signals from the PLC.

\*Return the table to Origin after switching between Test Mode and Monitor Mode.

**Test Mode** The Card Motor will operate based on operation commands from the Controller Setting Software.

**Monitor Mode** The Card Motor will operate based on operation commands sent from the PLC to the controller via the parallel I/O.



### Warning

**All of the limitations are cancelled by switching between Test Mode and Monitor Mode.**

The power supply to the Card Motor will be turned off, the table will no longer be fixed and can be moved by external force or the table's own weight (including workpieces). Ensure that the table movements cannot cause an injury or damage to the equipment.

### Caution

**Turn OFF the SVON and DRIVE signals before switching to Monitor Mode.**

Otherwise, it may lead to a Return to Origin error.

#### Revision history

1<sup>st</sup> printing: Revised in November 2015  
A: Revised in November 2019

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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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