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Industrial Automation Headquarters

Delta Electronics, Inc.
Taoyuan Technology Center
18 Xinglong Road, Taoyuan District,
Taoyuan City 33068, Taiwan (R.O.C.)
TEL: 886-3-362-6301 / FAX: 886-3-371-6301

Asia

Delta Electronics (Shanghai) Co., Ltd
No.182 Minyu Road, Pudong Shanghai,
People's Republic of China
Post code : 201209
TEL: 86-21-68723988 / FAX: 86-21-6872-3996
Customer Service: 400-820-9595

Delta Electronics (Japan), Inc.
Tokyo Office
2-1-14 Minato-ku Shibadaimon,
Tokyo 105-0012, Japan
TEL: 81-3-5733-1111 / FAX: 81-3-5733-1211

Delta Electronics (Korea), Inc.
1511, Byucksan Digital Valley 6-cha, Gasan-dong,
Geumcheon-gu, Seoul, Korea, 153-704
TEL: 82-2-515-5303 / FAX: 82-2-515-5302

Delta Electronics Int'l (S) Pte Ltd.
4 Kaki Bukit Ave 1, #05-05, Singapore 417939
TEL: 65-6747-5155 / FAX: 65-6744-9228

Delta Electronics (India) Pvt. Ltd.
Plot No 43 Sector 35, HSIIDC
Gurgaon, PIN 122001, Haryana, India
TEL: 91-124-4874900 / FAX : 91-124-4874945

Delta Electronics (Thailand) Public Company Limited
909 Soi 9, Moo 4,Bangpoo Industrial
Estate(Epz) Pattana 1rd., Tambol Phraksa
Amphur Muang, Samutprakarn 10280 Thailand
TEL: 66(0)2-709-2800

Delta Energy Systems Austral Pty Ltd.
Unit 20-21, 45 Normanby rd, Notting Hill Vic 3168, Australia
TEL: 61-3-9543-3720

Americas

Delta Products Corporation (USA)
Raleigh Office
P.O. Box 12173, 5101 Davis Drive,
Research Triangle Park, NC 27709, U.S.A.
TEL: 1-919-767-3800 / FAX: 1-919-767-3969

Delta Greentech (Brasil) S.A.
Sao Paulo Office
Rua Itapeva, 26 - 3° andar Edificio Itapeva One-Bela Vista
01332-000-São Paulo-SP-Brazil
TEL: 55-11-3568-3855 / FAX: 55-11-3568-3865

Delta Electronics Int. Mexico
Mexico Office
Via Dr. Gustavo Baz 2160, La Loma
C.P. 54060, Estado de México
TEL: 55-2628-3015

EMEA

Delta Electronics (Netherlands) B.V.
Eindhoven Office
De Witbogt 20, 5652 AG Eindhoven, The Netherlands
TEL: 31 (0) 40-8003800 / FAX: 31 (0) 40-8003898
MAIL: Sales.IA.EMEA@deltaww.com
MAIL: Sales.IA.Benelux@deltaww.com

Delta Energy Systems (France) S.A
ZI du bois Chaland 2 15 rue des Pyrénées,
Lisses 91056 Evry Cedex
MAIL: Sales.IA.France@deltaww.com

Delta Energy Systems (Spain) S.L.
Ctra. De Villaverde a Vallecas, 265 1º Dcha Ed.
Hormigueras – P.I. de Vallecas 28031 Madrid
C/Llul, 321-329 (Edif. CINC) | 22@Barcrelona | 08019 Barcelona
MAIL: Sales.IA.Iberia@deltaww.com

Delta Energy Systems Srl (Italy)
Via Senigallia 18/2 – 20161 Milano (MI)
Piazza Grazioli 18 – 00186 ROMA
MAIL: Sales.IA.Italy@deltaww.com

Delta Energy Systems (Germany) GmbH
Coesterweg 45, D-59494 Soest
MAIL: Sales.IA.DACH@deltaww.com

Delta Energy Systems LLC (CIS)
Vereyskaya Plaza II, office 112 Vereyskaya str.
17 121357 Moscow
MAIL: Sales.IA.RU@deltaww.com

Delta Greentech Ltd. (Turkiye)
Şerifali Mevkii Barbaros Bulvari Söyleşi Sokak
No:19 K:1 Yukari Dudullu 34775 Ümraniye
İstanbul Sarigazi V.D 2740624765
MAIL: Sales.IA.Turkey@delta-emea.com

Delta Energy Systems (AG Dubai BR)
P.O. Box 185668, Gate 7, 3rd Floor, Hamarain Centre,
Dubai, United Arab Emirates
MAIL: Sales.IA.MEA@deltaww.com

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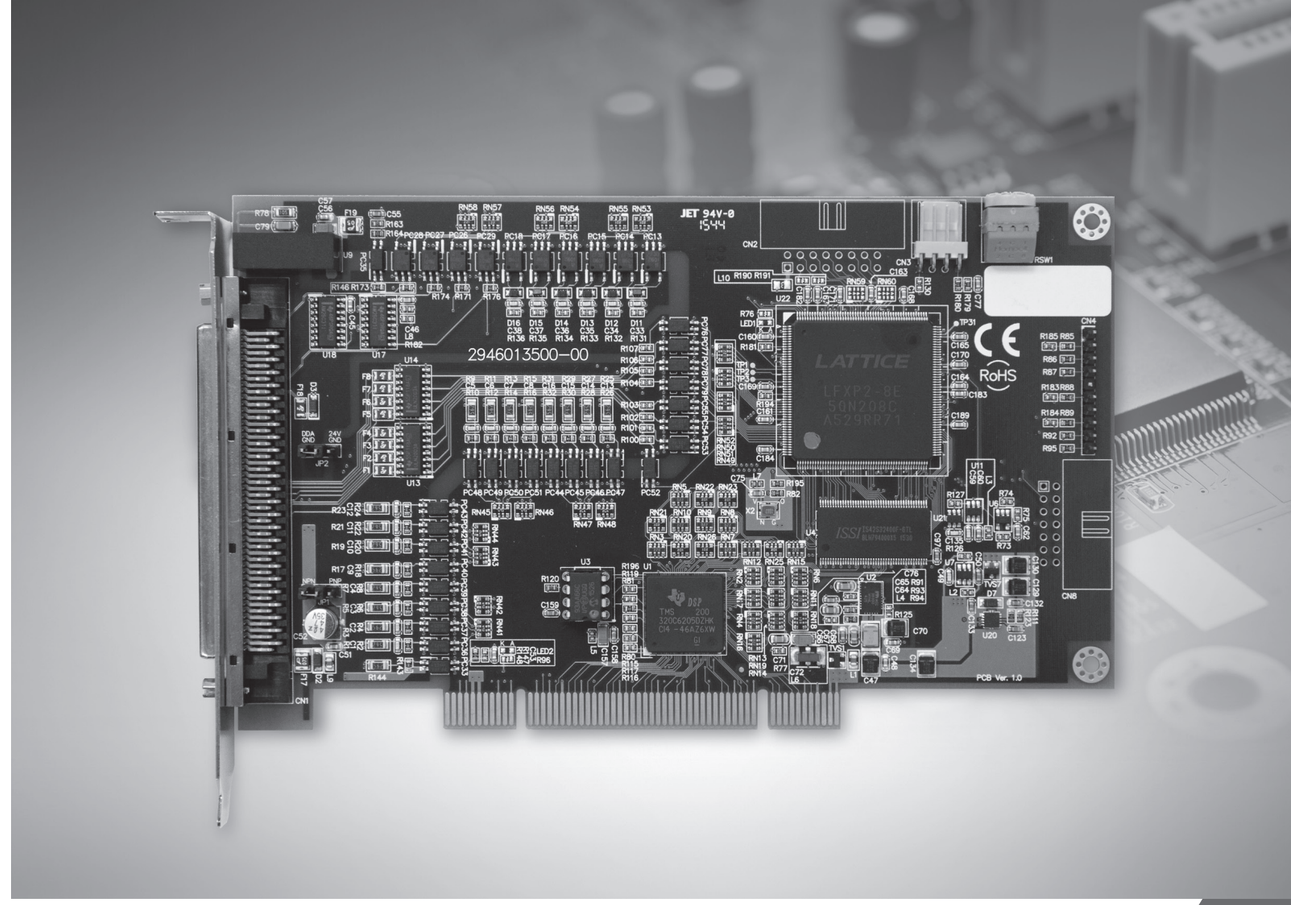

PCI-M324 User Guide

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Preface

Thank you for purchasing this product. This user guide provides hardware specifications and other information about the PCI-M324 motion control card.

This user guide includes:

- Product Overview
- Installation
- Signal Connection Interface
- Terminal Board
- Wiring
- EzDMC Functions

Product features of the PCI-M324 motion control card

PCI-M324 is a motion control card with DSP (Digital Signal Processor) as the core design, and the controlling method between the servo drive is with the use of pulse output. Through the high-performance chip to calculate the motion trajectory, it provides synchronous timing control for multiple axes and DI/O processing functions. With the general motion software library and diagnostic tool for the graphic interface, program development becomes easier, which also simplifies the system construction and troubleshooting for users.

How to use this user guide

You can refer to the information in this user guide when using the PCI-M324 motion control card. This user guide provides the hardware electrical specifications and wiring examples of the PCI-M324 card. Prior to connecting to external devices, please read this user guide to understand the features of each I/O pin of the PCI-M324 card and the hardware configuration.

Delta technical services:

Please consult your Delta equipment distributor or Delta Customer Service Center if you encounter any problems.

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Table of Contents

1 Product Overview

PCI-M324 is a 4-axis pulse type motion control card for 4-axis servo or stepping motion control. This chapter includes the function descriptions, specifications, safety instructions, and other information of the PCI-M324 motion control card to help you quickly understand the product features.

1.1 Function description

1

PCI-M324 is a 4-axis motion control card using a standard PCI interface. It generates high-frequency control pulses (3.2 MHz) to control the stepper motor or servo motor. With the 4-axis motion control function, it provides 2-axis circular interpolation motion control, 4-axis linear interpolation, or continuous interpolation motion control at constant speed. Multiple PCI-M324 motion control cards can operate simultaneously in one system and perform motion control functions. To allow users to quickly learn to operate the control card, Delta developed software auxiliary tools to help you complete the application development and wiring test work in the shortest possible time.

The four main axis controls of the PCI-M324 motion control card are built-in with the incremental encoder interface, which can correct the incorrect mechanical data transmission. PCI-M324 is equipped with precise and fast-motion position comparison and triggering functions, and does not take up additional CPU resources. In addition, the interfaces for the contacts, servo motor drive control, and general I/O signal control have a very intuitive design for wiring, so that beginners can quickly get hold of the motion control basics and reduce product losses for system integrators due to wiring errors. The motion control function includes acceleration / deceleration of linear motion and S-curve control, arbitrary 2-axis circular interpolation, 2- / 3-axis linear interpolation, continuous motion, 35 homing modes, etc. When executing these complex motion control functions, your CPU computing resources can deal with other applications without being occupied by the motion control functions.

1.2 Specifications

■ Product features

(1) Maximum 3.2 MHz, 4-axis pulse output
(2) Linear, circular, and continuous interpolations
(3) Programmable acceleration / deceleration time
(4) Programmable pulse output and interrupt functions
(5) Position comparison and signal trigger

■ Motion control specifications

(1) Pulse output control: OUT / DIR, CW / CCW, AB Phase
(2) Pulse output rate: maximum 3.2 Mpps
(3) Total number of pulse signals: 32 bits (±2,147,483,648 pulses)
(4) Homing modes: 35 types
(5) Speed curve control: T-curve and S-curve
(6) Interpolation modes: linear, circular, and continuous
(7) Total number of counter signals: 32-bit up / down counter x 4
(8) Position latch input: LTC x 4
(9) Position compare output: CMP x 2
(10) Incremental encoder input: ±EA x 4, ±EB x 4
(11) Encoder Z-phase signal input: ±EZ x 4
(12) Mechanical DI interface: PEL x 4, MEL x 4, ORG x 4, SLD x 4
(13) Servo drive interface: ALM x 4, RDY x 4, SVON x 4, INP x 4, ERC x 4
(14) General input point: IN x 4
(15) General output point: OUT x 4
(16) I/O pin type: optically isolated with 2.5 KV_{RMS} on all 100-pin SCSI

■ General electrical specifications

(1) PCI specification: 2.2; 32-bit support, 3.3 / 5 V_{DC} operation type
(2) Power consumption: typical +5 V_{DC} at 0.5A
(3) Operating temperature: 0°C - 50°C (32°F - 122°F)

1.3 Safety precautions

To avoid electric shock resulting in serious damage, please check the following precautions before installing the equipment:

(1) Before moving the host computer, please unplug the computer power cord from the power outlet.

(2) When adding hardware to the system, please connect the device's signal cable before connecting the power cord; when removing hardware from the system, please disconnect the device's signal cable before disconnecting the power cord. If possible, turn off the computer's power supply before installing the hardware.

(3) Before connecting or disconnecting any signal cables from the motherboard, please make sure all power cables are unplugged.

(4) Before using the interface card or expansion card, it is recommended that you first seek professional assistance, as these devices may interfere with the grounded circuits.

(5) Please make sure the voltage power supply unit is adjusted to the standard level used in the country / region where the machine is installed. If you are unsure of the supplying voltage of the given area, please contact the local power company for more information.

(6) If the power supply unit is damaged, do not repair it by yourself. Please contact technicians or distributors for assistance.

1.4 Operational safety instructions

Before you install a hardware device, please review the information provided in this user guide.

(1) Before using the product, make sure all cables and power cords are properly connected. If you find any major defects, please contact your distributor as soon as possible.

(2) To avoid short circuit, please put away all unused screws, paper clips, and other parts. Please do not leave them on the motherboard or the host computer.

(3) Dust, humidity, and severe temperature changes can affect the product lifespan. Thus, avoid placing the product in places with these conditions.

(4) Do not place the host computer on an unstable surface.

(5) If you have any technical questions regarding the use of this product, please contact a certified technician for assistance.

1.5 Supported software

- Programming Library

You can develop relevant applications on the Windows XP / 7 platform. By categorizing the motion control related API into usage condition and application, and with the programming guide, you can quickly develop relevant applications.

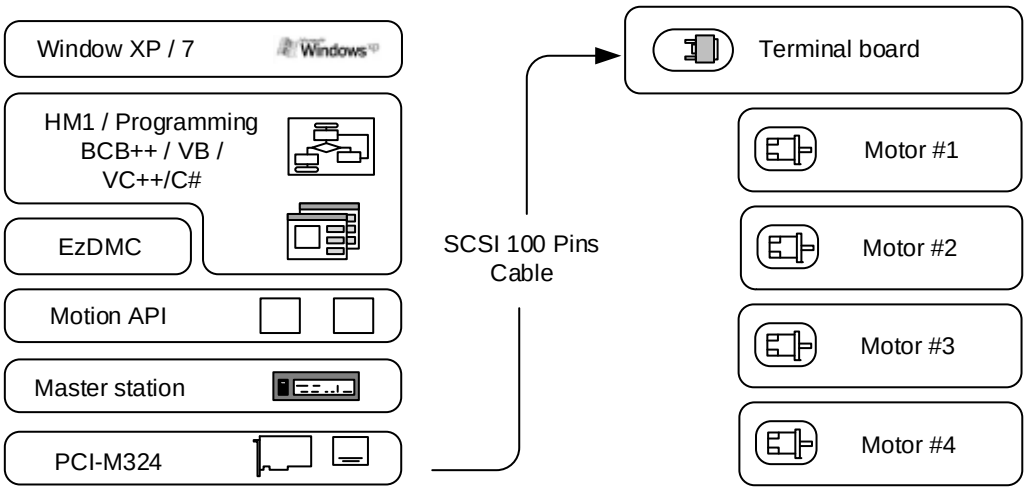
- EzDMC

EzDMC is an auxiliary software that can be operated on Windows XP / 7. Prior to developing the application, you can use the auxiliary program to check and set the hardware contact logic status to make sure that the external wiring is correct. You can also use this program to control the wired servo drive and motor to assist in the adjustment and testing of the machine. In the initial stage of using PCI-M324 for program development, you can also use EzDMC to simplify the parameter setting and functional test verification, which can help new users to reduce the time required for learning and development.

1

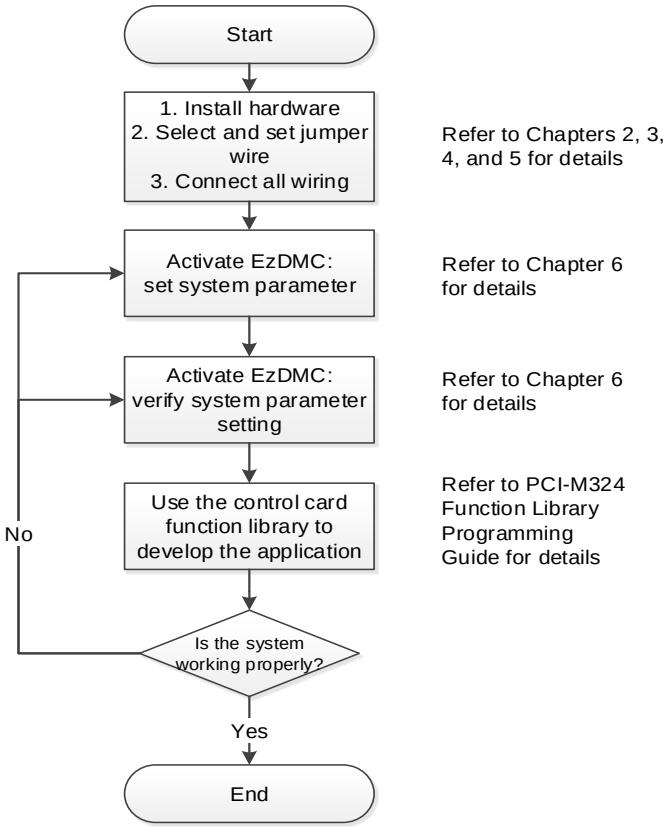
1.6 Application development

- Software application development structure



- Flow chart

The following is a flow chart for the application development process to help you understand how to use this user guide for the connection and reference of the program development. The connection between chapters and the sequence, as well as the development of the application, can be seen in the flow chart.



Installation 2

This chapter describes how to install the PCI-M324 motion control card. Please follow the installation procedure below.

2.1 Product packaging and accessories

The package should contain the following items:

2

Standard

- Advanced 4-axis servo or stepping PCI-M324 motion control card x 1
- PCI-M324 driver CD-ROM x 1
- PCI-M324 User Guide x 1

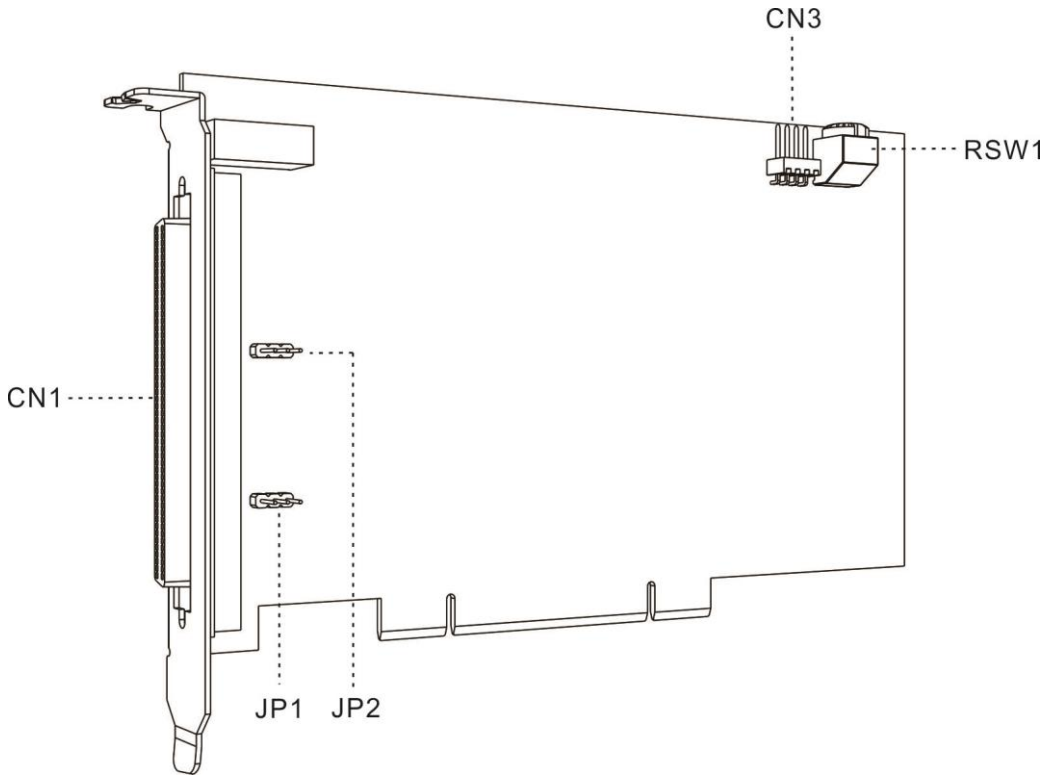
Optional

- Motion control terminal block
- SCSI 100-pin signal connector cable

If there are missing or damaged standard parts, please contact the distributor for the replacement parts. Please keep the packaging material in case of future shipping needs.

2.2 PCB diagram

This is the general structure of the PCI-M324 motion control card displaying the positions for CN1, JP1, JP2, CN3, and RSW1.



Description of each connector on the PCI-M324 card is as follows:

Name	Function
CN1	SCSI 100 pins, 4-axis motion control I/O signal port
CN3	Position comparison triggering signal port
JP1	Select jumper according to input signal type (NPN / PNP)
JP2	Pulse output I/O and external +24V ground signal jumper
RSW1	Card ID switch

2.3 Hardware installation

2.3.1 Hardware setting

The PCI-M324 is a standard Plug and Play expansion device for PCs. Whether the use of memory space configuration or I/O port configuration, or other basic system required functions, these are configured by the BIOS of the PC system. You do not need to set the hardware.

2.3.2 PCI slot selection

When your PC system is built-in with ISA and PCI expansion slots, please do not insert the PCI-M324 card into the ISA expansion slot. In addition to the shape not matching, this product is designed for PCI compatible devices, thus it can only function when inserted into a standard PCI expansion slot.

2.3.3 Installation procedure

Please read this user guide carefully and adjust the functions of RSW1, JP1, and JP2 according to the requirements before installation to meet your system development needs.

(1) Turn off the power. Make sure that the PC power supply is completely disconnected and turn off the power for the connected devices, such as the printer, modem, and screen.
(2) Remove the cover of your PC. Install the PCI-M324 card only in the standard PCI expansion slot. Please do not install it in the ISA or EISA expansion slot.
(3) Before you take out the card from the packaging, please neutralize the static electricity that might be on your body to avoid damaging the product.
(4) Insert the PCI-M324 card into the appropriate PCI standard expansion slot, then tighten the screws to fix the card onto the PC expansion slot.
(5) Make sure to disconnect the power supply before removing the PCI-M324 card.

2.3.4 Troubleshooting

If the system cannot start properly, please turn off the system first and disconnect the power. Remove the cover of your PC. Next, make sure the PCI-M324 card is properly installed, such as if the screws are loose or if the card is detached from the PCI expansion slot. Remove the PCI-M324 card from the PCI slot and restart the PC to check that the PC system is working properly. If the PC system is working properly, please reinstall the PCI-M324 card by following the installation procedure in Section 2.3.3. If the system still cannot start properly, please contact your distributor for assistance.

2.4 Driver software installation

Please note the following before installing the driver and application software:

(1) The driver for this product is currently only compatible with Windows XP / 7. Before installing this product, please make sure that the operating system meets the requirement of this product.

(2) Insert the Autorun driver CD-ROM into your CD-ROM drive and let the system automatically run the setup program.

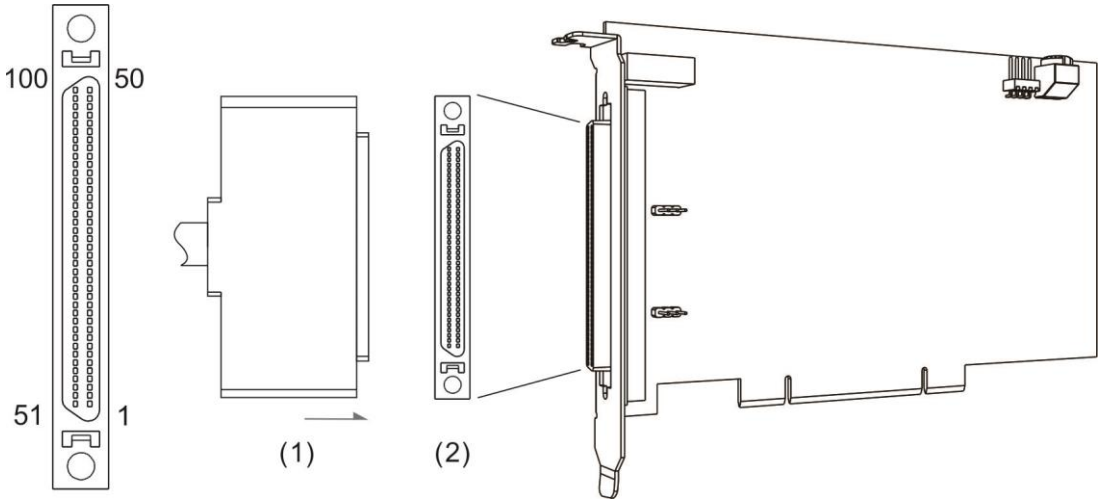
(3) When the setup program is launched, please follow the instructions for installing the product-related driver and auxiliary application.

(4) After the product-related driver and auxiliary application are installed, restart the operating system to ensure that the driver is installed. Please also make sure that the auxiliary application works properly after you restart the operating system.

2.5 Connector pin description

This section provides detailed specifications and functions of the PCI-M324 motion control card I/O signal terminals.

2



(1) CN1 connector (male); (2) CN1 I/O signal connector (female)

2.5.1 CN1: I/O signal port

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
1	24V		Power +24V / 200 mA	51	24V		Power +24V / 200 mA
2	EGND		24V ground signal	52	EGND		24V ground signal
3	EMG	I	Emergency stop signal	53	EMG	I	Emergency stop signal
4	MEL_1	I	1st mechanical negative limit signal	54	MEL_3	I	3rd mechanical negative limit signal
5	PEL_1	I	1st mechanical positive limit signal	55	PEL_3	I	3rd mechanical positive limit signal
6	ORG_1	I	1st origin position signal	56	ORG_3	I	3rd origin position signal
7	SLD_1	I	1st deceleration point signal	57	SLD_3	I	3rd deceleration point signal
8	MEL_2	I	2nd mechanical negative limit signal	58	MEL_4	I	4th mechanical negative limit signal
9	PEL_2	I	2nd mechanical positive limit signal	59	PEL_4	I	4th mechanical positive limit signal
10	ORG_2	I	2nd origin position signal	60	ORG_4	I	4th origin position signal
11	SLD_2	I	2nd deceleration point signal	61	SLD_4	I	4th deceleration point signal
12	RDY_1	I	1st servo ready	62	RDY_3	I	3rd servo ready
13	INP_1	I	1st servo in place signal	63	INP_3	I	3rd servo in place signal
14	ALM_1	I	1st servo alarm	64	ALM_3	I	3rd servo alarm
15	DI_1	I	1st axis GPIO input	65	DI_3	I	3rd axis GPIO input
16	RDY_2	I	2nd servo ready	66	RDY_4	I	4th servo ready
17	INP_2	I	2nd servo in place signal	67	INP_4	I	4th servo in place signal
18	ALM_2	I	2nd servo alarm	68	ALM_4	I	4th servo alarm

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
19	DI_2	I	2nd axis GPIO input	69	DI_4	I	4th axis GPIO input
20	EGND		24V ground signal	70	EGND		24V ground signal
21	SVON_1	O	1st servo on	71	SVON_3	O	3rd servo on
22	ERC_1	O	1st clear servo error counter	72	ERC_3	O	3rd clear servo error counter
23	ALMC_1	O	1st servo alarm clearing output	73	ALMC_3	O	3rd servo alarm clearing output
24	DO_1	O	1st axis GPIO output	74	DO_3	O	3rd axis GPIO output
25	SVON_2	O	2nd servo on	75	SVON_4	O	4th servo on
26	ERC_2	O	2nd clear servo error counter	76	ERC_4	O	4th clear servo error counter
27	ALMC_2	O	2nd servo alarm clearing output	77	ALMC_4	O	4th servo alarm clearing output
28	DO_2	O	2nd axis GPIO output	78	DO_4	O	4th axis GPIO output
29	EA+_1	I	1st A phase encoder signal (+)	79	EA+_3	I	3rd A phase encoder signal (+)
30	EA-_1	I	1st A phase encoder signal (-)	80	EA-_3	I	3rd A phase encoder signal (-)
31	EB+_1	I	1st B phase encoder signal (+)	81	EB+_3	I	3rd B phase encoder signal (+)
32	EB-_1	I	1st B phase encoder signal (-)	82	EB-_3	I	3rd B phase encoder signal (-)
33	EZ+_1	I	1st Z phase encoder signal (+)	83	EZ+_3	I	3rd Z phase encoder signal (+)
34	EZ-_1	I	1st Z phase encoder signal (-)	84	EZ-_3	I	3rd Z phase encoder signal (-)
35	EA+_2	I	2nd A phase encoder signal (+)	85	EA+_4	I	4th A phase encoder signal (+)
36	EA-_2	I	2nd A phase encoder signal (-)	86	EA-_4	I	4th A phase encoder signal (-)
37	EB+_2	I	2nd B phase encoder signal (+)	87	EB+_4	I	4th B phase encoder signal (+)
38	EB-_2	I	2nd B phase encoder signal (-)	88	EB-_4	I	4th B phase encoder signal (-)
39	EZ+_2	I	2nd Z phase encoder signal (+)	89	EZ+_4	I	4th Z phase encoder signal (+)
40	EZ-_2	I	2nd Z phase encoder signal (-)	90	EZ-_4	I	4th Z phase encoder signal (-)
41	DDA 5V		DDA 5V voltage output, I < 100 mA	91	DDA 5V		DDA 5V voltage output, I < 100 mA
42	IGND		DDA 5V ground signal	92	IGND		DDA 5V ground signal
43	DIR+_1	O	1st direction pulse signal (+)	93	DIR+_3	O	3rd direction pulse signal (+)
44	DIR-_1	O	1st direction pulse signal (-)	94	DIR-_3	O	3rd direction pulse signal (-)
45	OUT+_1	O	1st output pulse signal (+)	95	OUT+_3	O	3rd output pulse signal (+)
46	OUT-_1	O	1st output pulse signal (-)	96	OUT-_3	O	3rd output pulse signal (-)

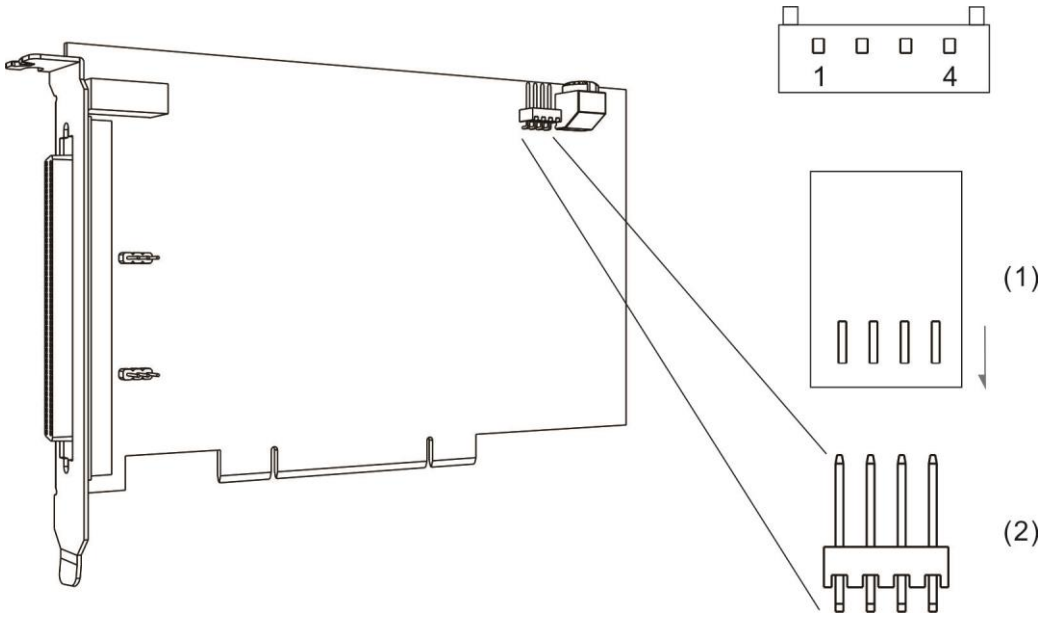
Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
47	DIR+_2	O	2nd direction pulse signal (+)	97	DIR+_4	O	4th direction pulse signal (+)
48	DIR-_2	O	2nd direction pulse signal (-)	98	DIR-_4	O	4th direction pulse signal (-)
49	OUT+_2	O	2nd output pulse signal (+)	99	OUT+_4	O	4th output pulse signal (+)
50	OUT-_2	O	2nd output pulse signal (-)	100	OUT-_4	O	4th output pulse signal (-)

Note:

1. GPIO is short for General Purpose Input / Output.
2. Pin 41, Pin 91: DDA 5V voltage output, I < 100 mA. Only for checking the 5V signal detection, not recommended as 5V voltage output.

2.5.2 CN3: position comparison triggering signal port

This section provides detailed specifications and functions of the PCI-M324 CN3.



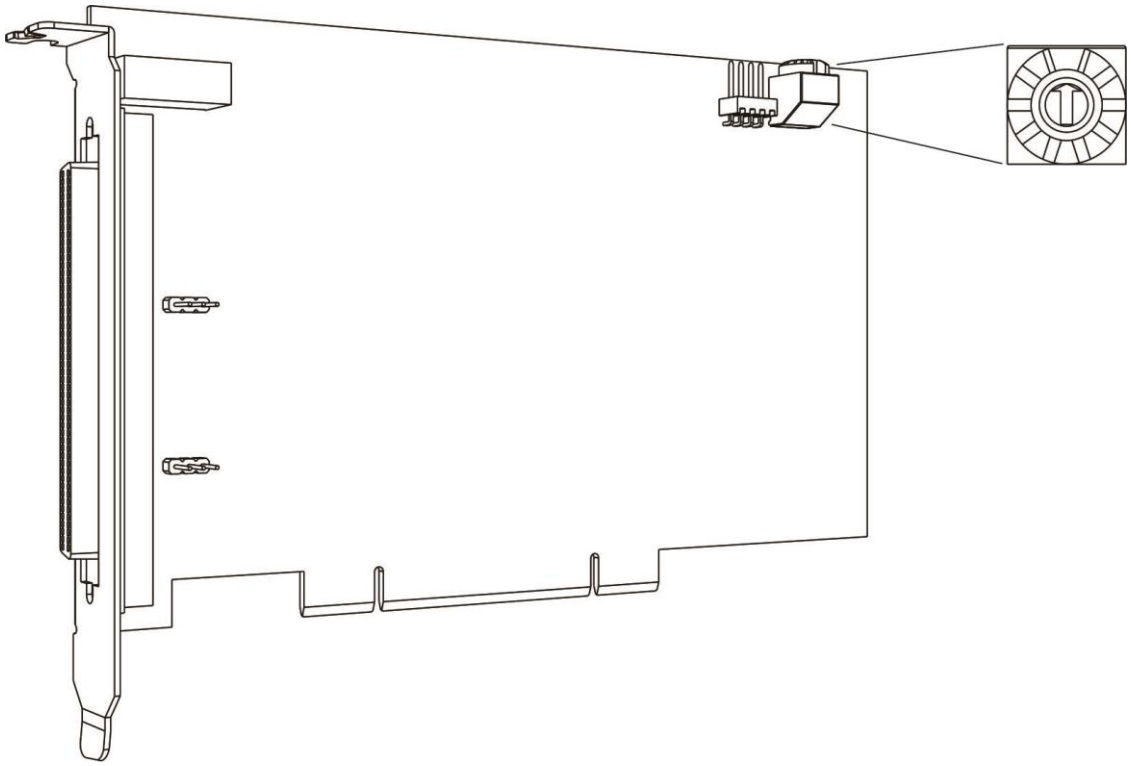
(1) CN3 connector (male); (2) CN3 connector (female)

The following table shows the CN3 pin definition:

Pin	Mark	Description
1	3.3V CMP_OUT	CMOS 3.3V triggering signal outputs when position reached
2	DGND	CMOS 3.3V ground signal
3	DGND	CMOS 3.3V ground signal
4	1.65(V) Vref	1.65V LVDS reference voltage

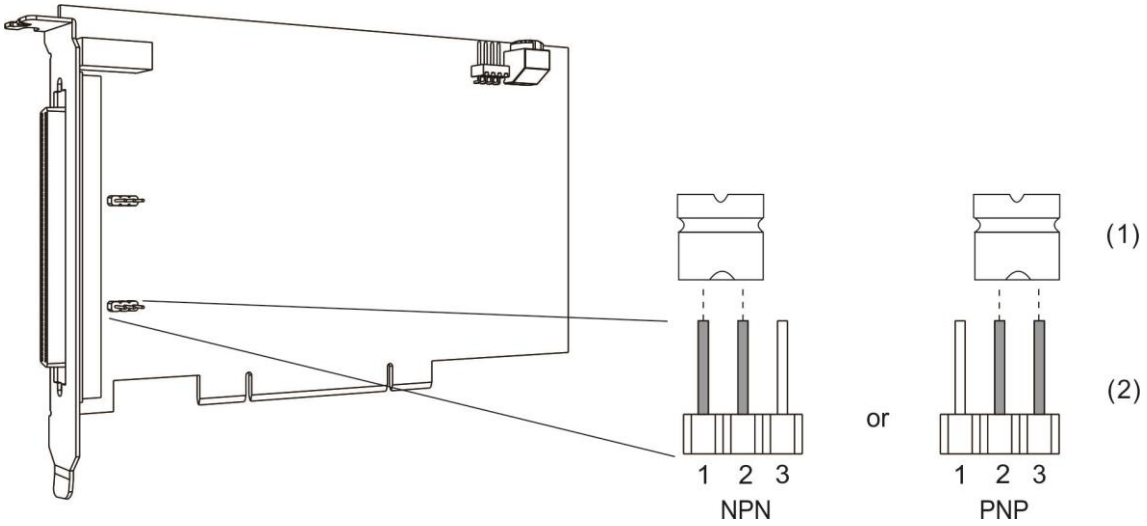
2.5.3 RSW1: switch for card ID number setting

This is the RSW1 switch knob. Card ID is the value corresponding to the position the knob is assigned to. The setting value range is 0 - 15.



2.5.4 JP1: select jumper according to input signal type (NPN / PNP)

This section introduces the PCI-M324 motion control card using the short-circuit latch for NPN / PNP switching.



The following table shows the JP1 pin definition:

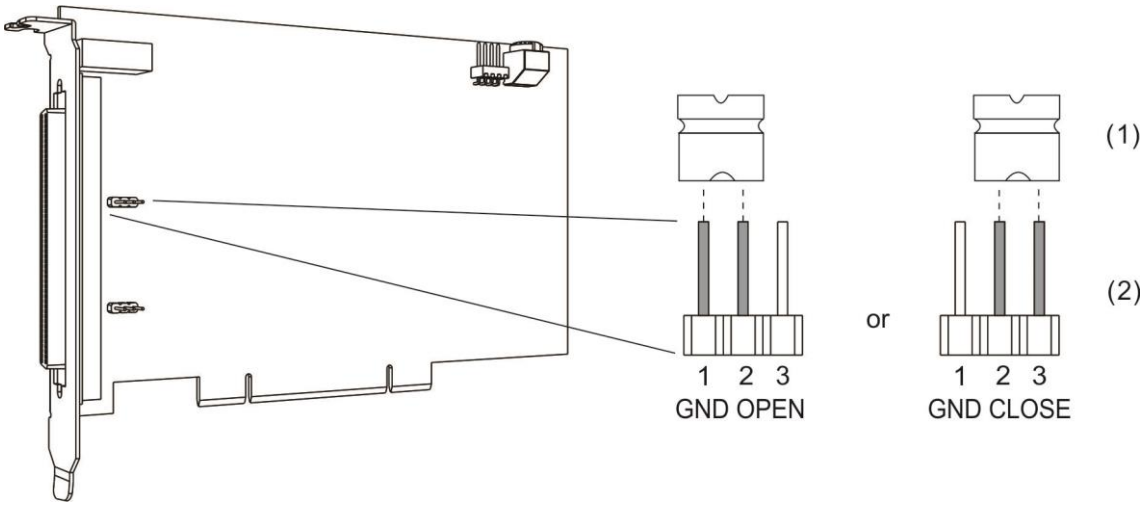
Pin	Mark	Description
1	I24 V	Internal +24V voltage contact
2	ICOM	Input signal internal common contact
3	EGND	24V ground signal

Note:

1. NPN mode: Pin 1 & Pin 2 short circuit. (Default)
2. PNP mode: Pin 2 & Pin 3 short circuit.

2.5.5 JP2: internal pulse (DDA) 5V ground and external +24V ground signal jumper

This section introduces the PCI-M324 motion control card using the short-circuit latch for common or individual grounding for the 5V ground and external ground signal.



The following table shows the JP2 pin definition:

Pin	Mark	Description
1	Not in use	Reserved (not in use)
2	IGND	DDA pulse ground signal
3	EGND	24V ground signal

Signal Connection Interface 3

This chapter introduces the PCI-M324 signal connection interface.

3.1 Operation interface

3.1.1 Mechanical DI/O interface

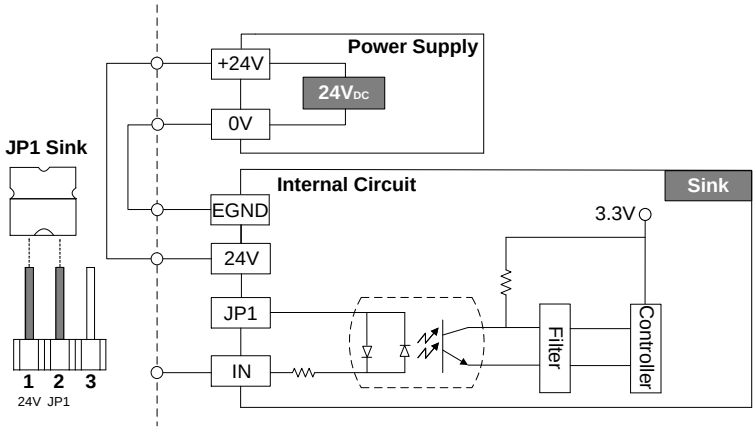
3

■ Mechanical limit signal PEL & MEL (axis control signal / DI signal)

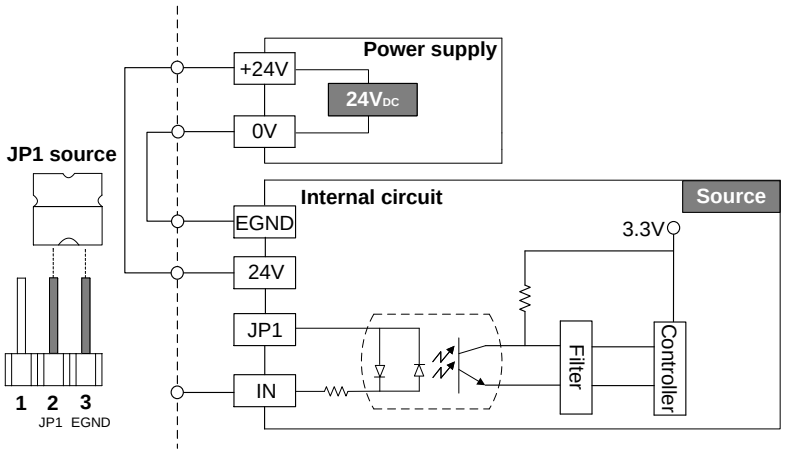
Endpoint setting function: in general, when executing motion control, users will set two limit sensors between a fixed distance. Setting the moving range of the motion axis avoids the risk of improper mechanical operation or control. The PEL and MEL endpoint sensor signals are connected to the PCI-M324 and servo drive at the same time, so that both the drive and the control card can effectively stop the motion beyond the allowable moving range.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
4	MEL_1	I	1st mechanical limit signal (-)	54	MEL_3	I	3rd mechanical limit signal (-)
5	PEL_1	I	1st mechanical limit signal (+)	55	PEL_3	I	3rd mechanical limit signal (+)
8	MEL_2	I	2nd mechanical limit signal (-)	58	MEL_4	I	4th mechanical limit signal (-)
9	PEL_2	I	2nd mechanical limit signal (+)	59	PEL_4	I	4th mechanical limit signal (+)

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)

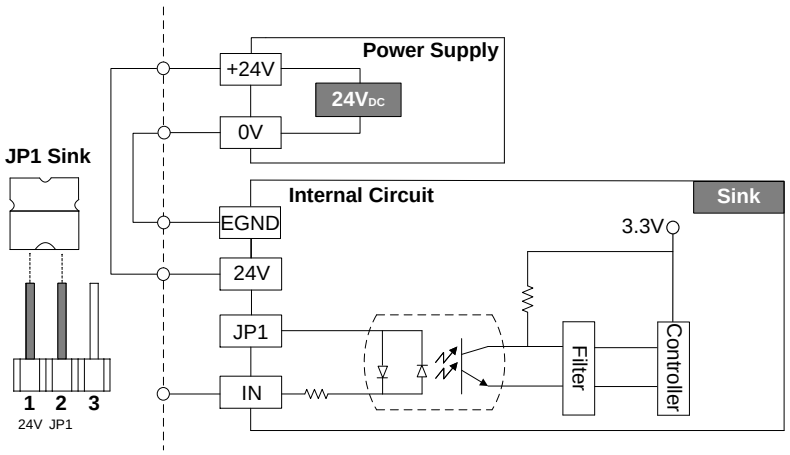


■ ORG (axis control signal / DI signal)

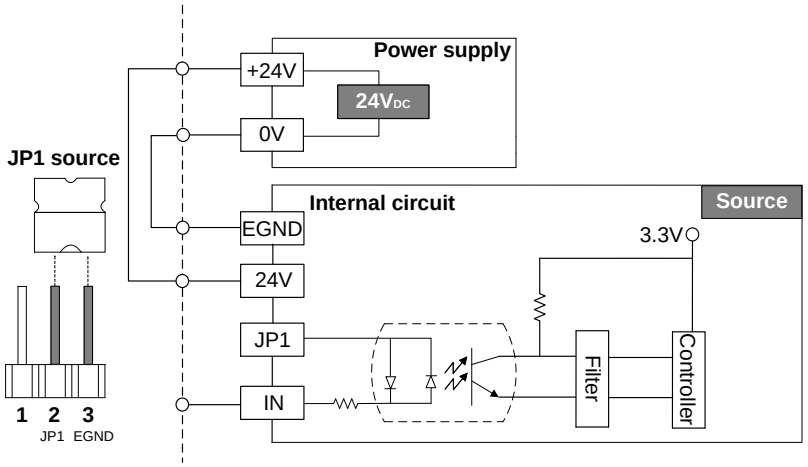
Determine the starting position of the motion control: the mechanical action error and execution order of the motion command will change the zero position of the servo drive and the starting position of the mechanical device. Thus, for open-type control mechanical devices, you need to execute homing after a certain motion distance or operation time to ensure the accuracy of the motion control.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
6	ORG_1	I	1st origin position signal	56	ORG_3	I	3rd origin position signal
10	ORG_2	I	2nd origin position signal	60	ORG_4	I	4th origin position signal

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)



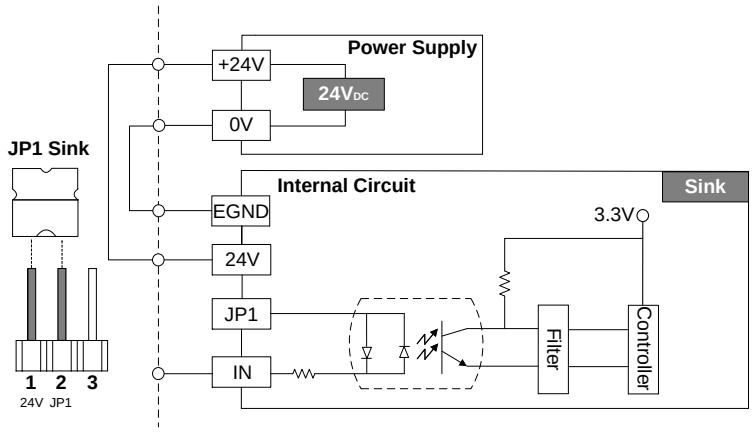
3

■ SLD (axis control signal / DI signal)

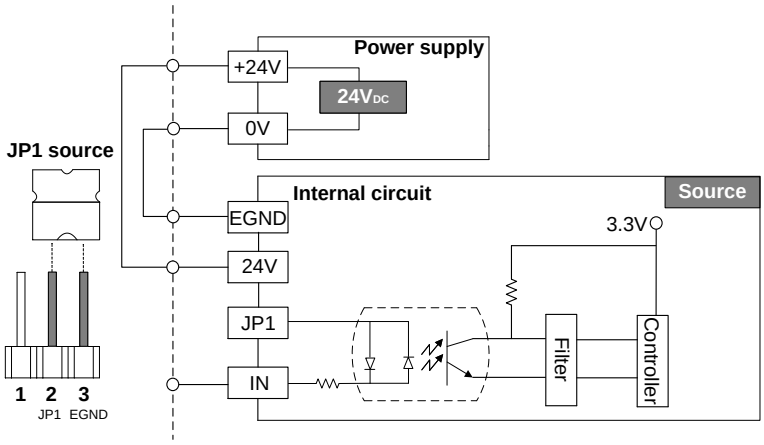
Deceleration point signal control: when the motion-controlled object passes through the sensor point, the motion speed reduces to the set deceleration motion control speed. When SLD control mode is required, enable the SLD function first. For more information, please refer to the PCI-M324 Programming Guide.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
7	SLD_1	I	1st deceleration point signal	57	SLD_3	I	3rd deceleration point signal
11	SLD_2	I	2nd deceleration point signal	61	SLD_4	I	4th deceleration point signal

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)



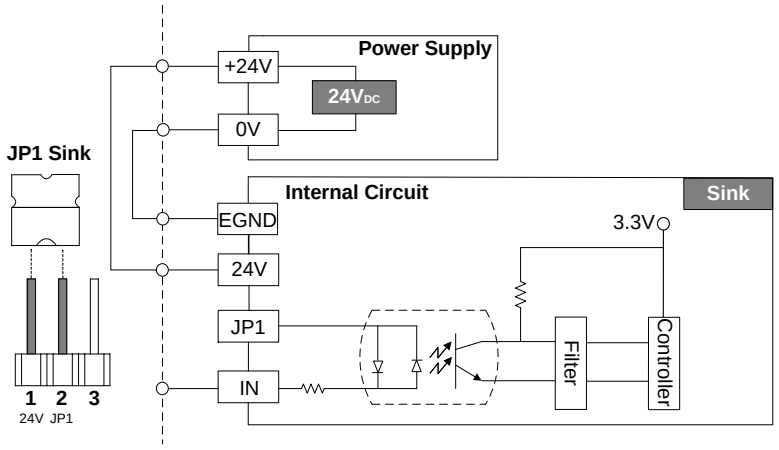
■ DI (axis control signal / DI signal)

Digital signal input for axis control, which can connect to external digital signals to provide reference signals to each PCI-M324 axis control.

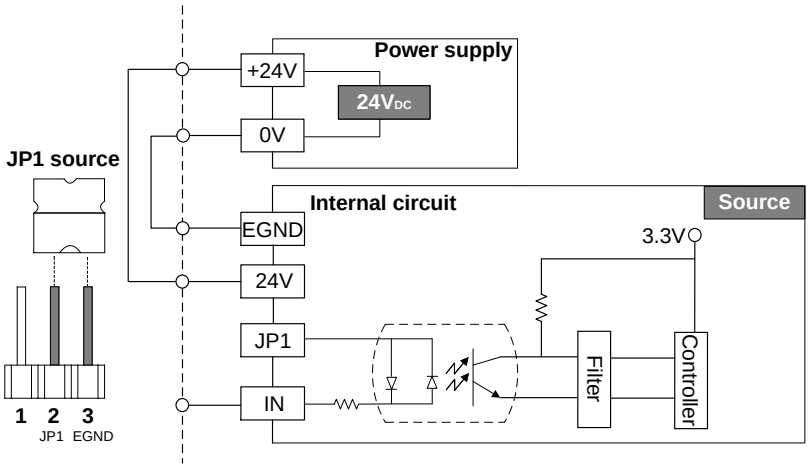
Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
15	DI_1	I	1st axis GPIO input	65	DI_3	I	3rd axis GPIO input
19	DI_2	I	2nd axis GPIO input	69	DI_4	I	4th axis GPIO input

Note: GPIO is short for General Purpose Input / Output.

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)



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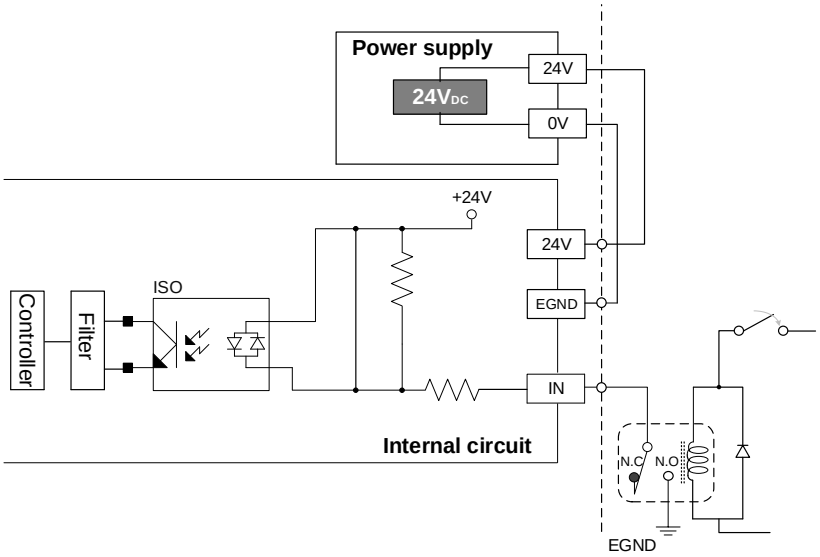
■ EMG (global signal / DI signal)

Emergency stop signal input point: when the emergency stop is in action, the motion control pulse output of each axis stops the output and enters the safety protection state. You can operate all motion axes only when this signal is cleared.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
3	EMG	I	Emergency stop signal	53	EMG	I	Emergency stop signal

(1) Sink mode (NPN mode)



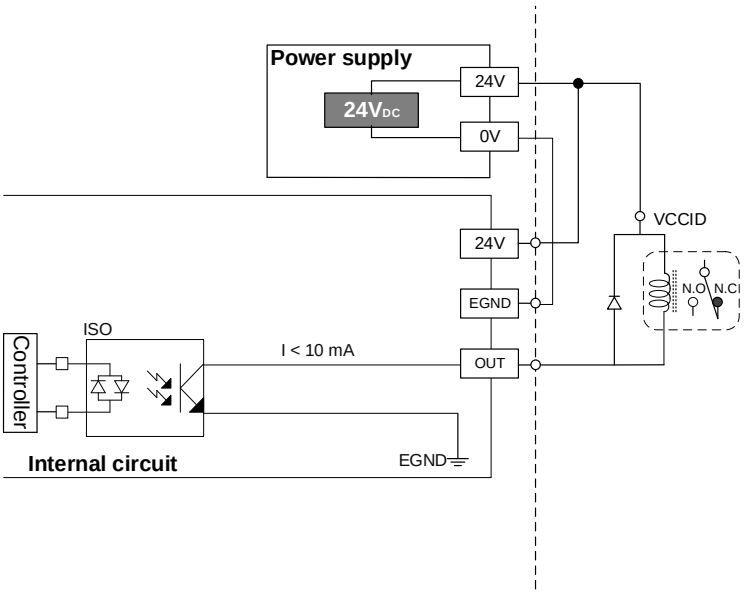
■ DO (axis control signal / DO signal)

Digital signal output for axis control, which can output digital signals to other peripheral devices. The four main motion axes of PCI-M324 are built-in with the DO function.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
24	DO_1	O	1st GPIO output	74	DO_3	O	3rd GPIO output
28	DO_2	O	2nd GPIO output	78	DO_4	O	4th GPIO output

Note: GPIO is short for General Purpose Input / Output.

(1) O.C mode

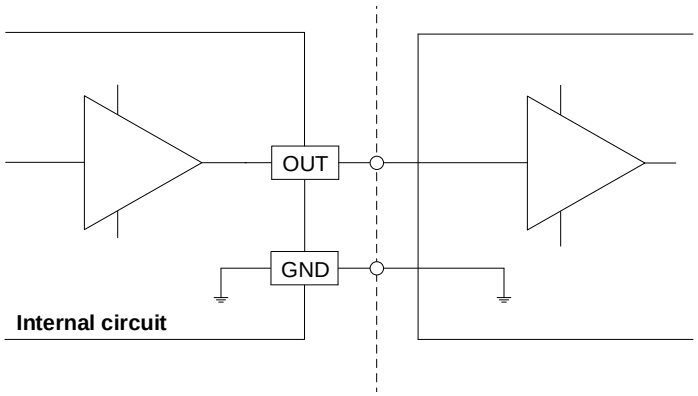


■ CMP (pulse output control / output signal)

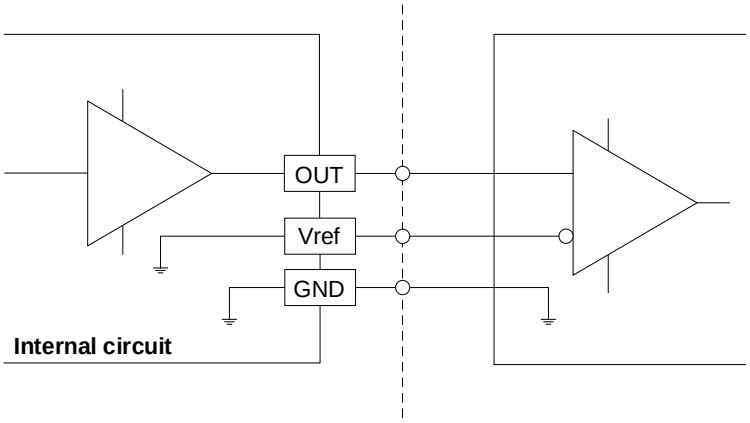
Position comparison function: when the motion control position matches the program's position comparison setting, the PCI-M324 generates a pulse signal. PCI-M324 has built-in functions for two high-elastic CMP comparators: Channels #0 and #1. Please refer to Section 3.1.4 for hardware interface details.

Pin	Mark	Description
1	3.3V CMP_OUT	CMOS 3.3V triggering signal outputs when position reached
2	DGND	CMOS 3.3V ground signal
3	DGND	CMOS 3.3V ground signal
4	1.6(V) Vref	LVDS reference voltage

(1) CMP signal circuit CMOS connection diagram



(2) CMP signal circuit LVDS connection diagram



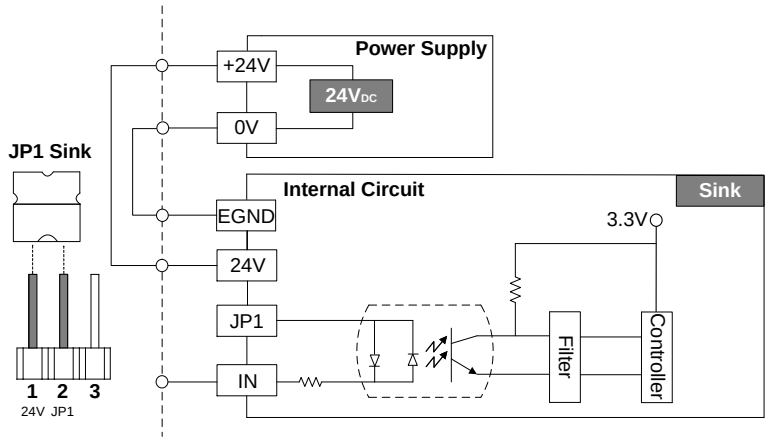
3.1.2 Servo drive DI/O interface

■ ALM (axis control signal / DI signal)

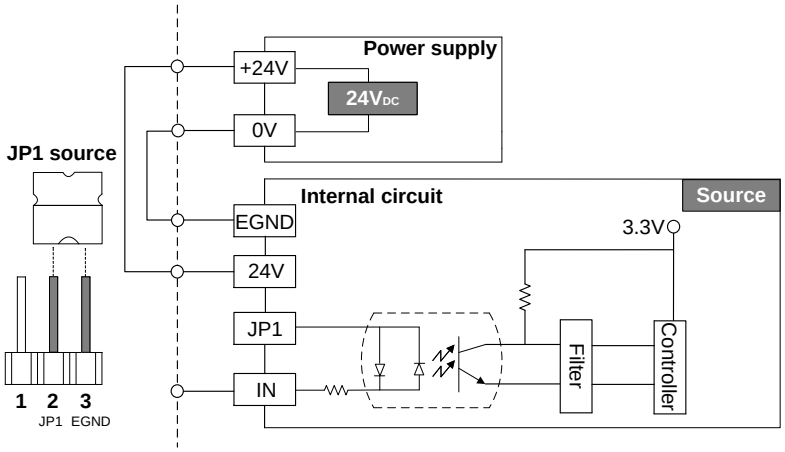
Servo drive alarm: when the servo drive is in error, it issues an alarm to the PCI-M324 to notify the control system that the current motion control cannot work properly.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
14	ALM_1	I	1st servo alarm	64	ALM_3	I	3rd servo alarm
18	ALM_2	I	2nd servo alarm	68	ALM_4	I	4th servo alarm

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)



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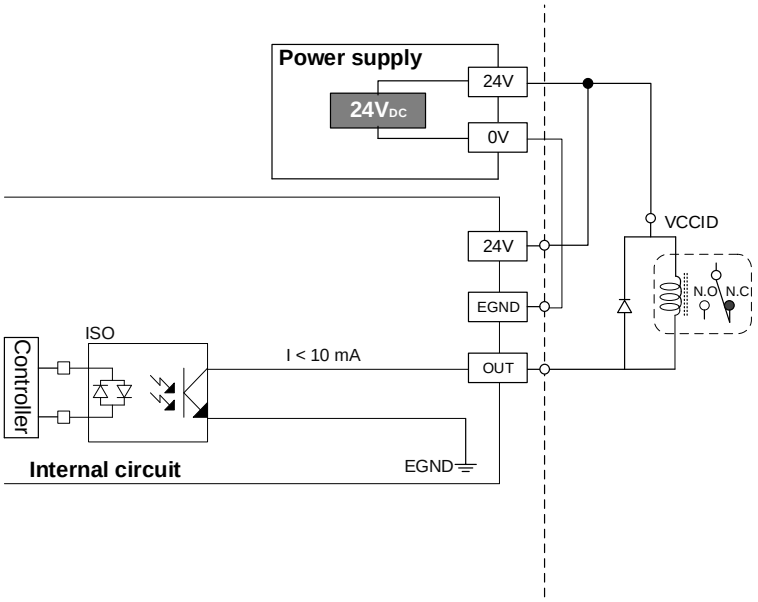
■ SVON (axis control signal / DO signal)

The output of the Servo On signal enables or disables the operation of the current connecting servo drive.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
21	SVON_1	O	1st servo on	71	SVON_3	O	3rd servo on
25	SVON_2	O	2nd servo on	75	SVON_4	O	4th servo on

(1) O.C mode

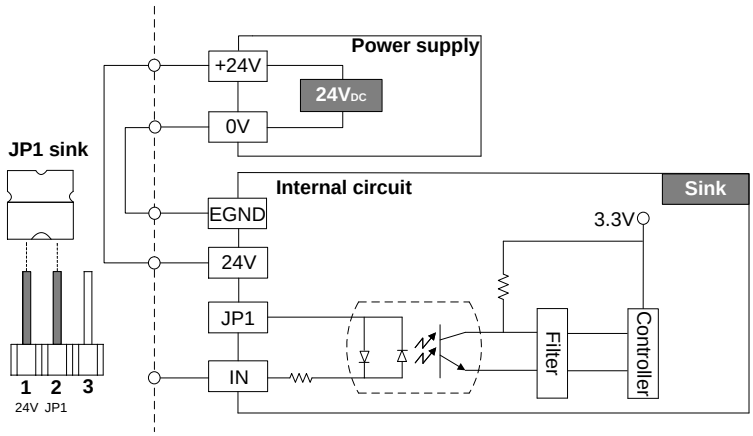


■ RDY (axis control signal / DI signal)

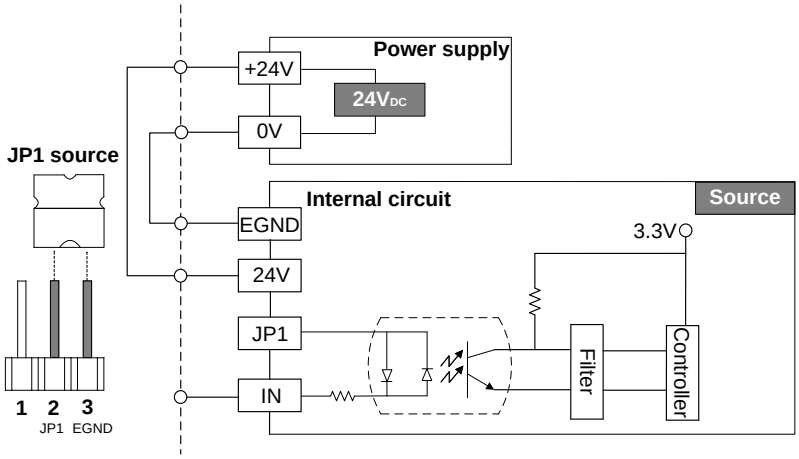
Servo drive ready signal input: the input of the ready signal notifies the users that the servo drive is ready and can operate normally.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
12	RDY_1	I	1st servo ready	62	RDY_3	I	3rd servo ready
16	RDY_2	I	2nd servo ready	66	RDY_4	I	4th servo ready

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)



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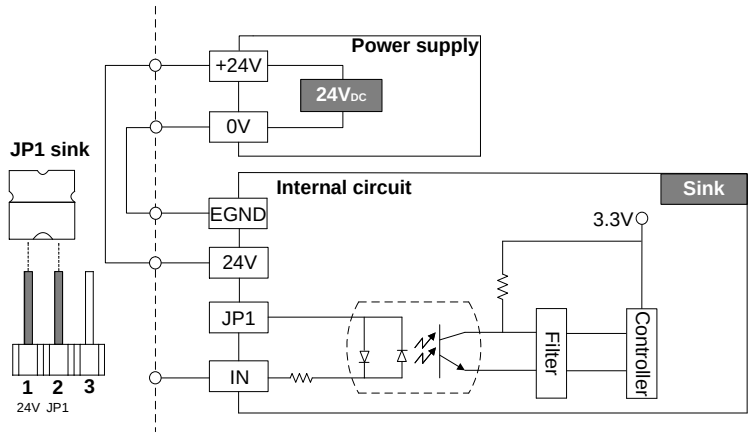
■ INP (axis control signal / DI signal)

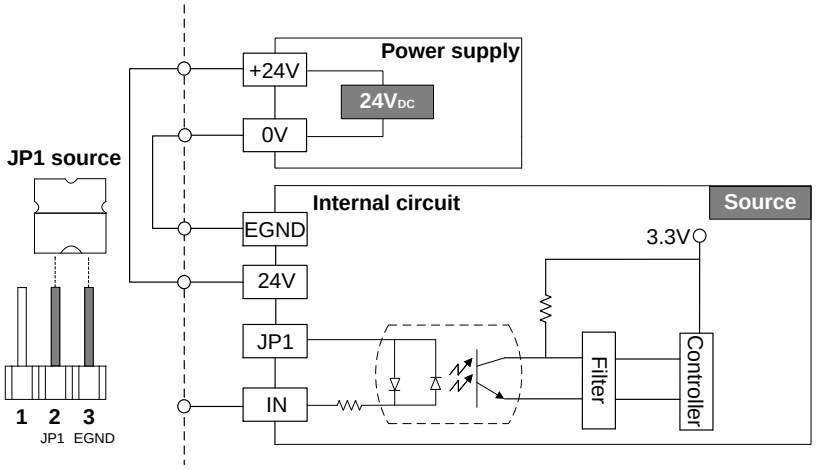
Servo in place notification function: notifies the users that the servo drive has reached the specified target position.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
13	INP_1	I	1st servo in place signal	63	INP_3	I	3rd servo in place signal
17	INP_2	I	2nd servo in place signal	67	INP_4	I	4th servo in place signal

(1) Sink mode (NPN mode)



(2) Source mode (PNP mode)

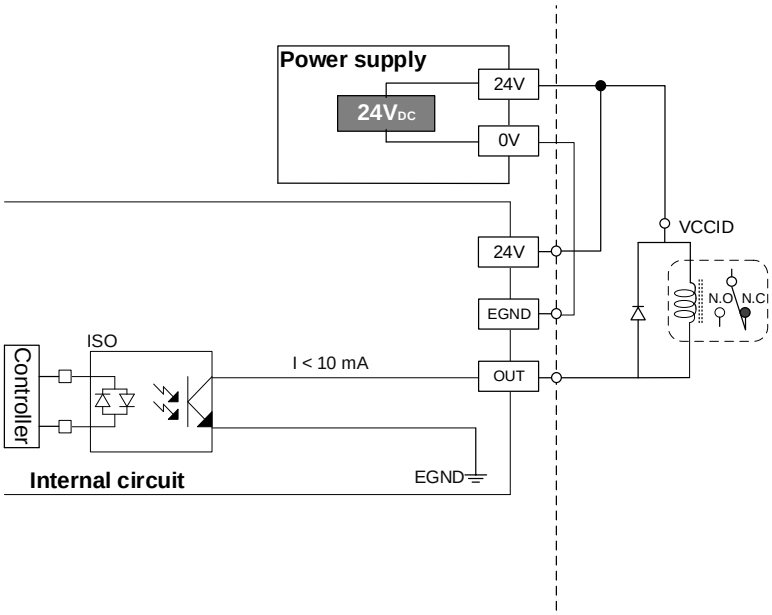


■ ALMC (axis control signal / DO signal)

Output signal for clearing the servo drive alarm.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
23	ALMC_1	O	1st alarm clearing signal	73	ALMC_3	O	3rd alarm clearing signal
27	ALMC_2	O	2nd alarm clearing signal	77	ALMC_4	O	4th alarm clearing signal

(1) O.C mode



3

■ ERC (axis control signal / DO signal)

Error value clearing function: when the following conditions occur, PCI-M324 outputs an ERC signal to the servo drive.

(1) PEL and MEL signals are triggered.

(2) EMG hardware circuit is triggered.

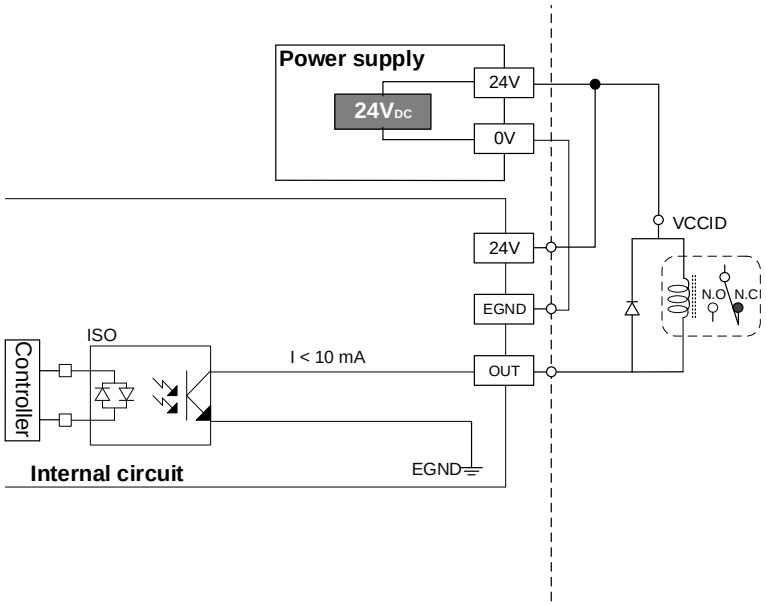
(3) Software EMG stop signal is triggered (API: _m324_emg_stop_erc).

(4) Force output ERC signal is triggered (API: _m324_set_erc_on).

(5) To follow the safety procedure, you must first clear the remaining command values in the servo drive before starting the servo drive.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
22	ERC_1	O	1st clear servo error counter	72	ERC_3	O	3rd clear servo error counter
26	ERC_2	O	2nd clear servo error counter	76	ERC_4	O	4th clear servo error counter

(1) O.C mode



3.1.3 Servo drive pulse I/O interface

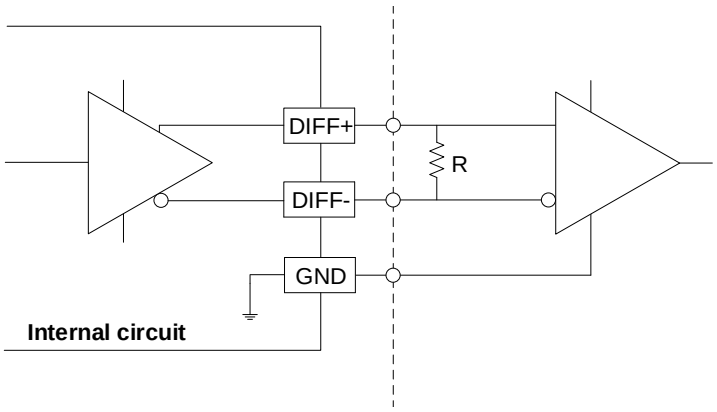
■ OUT / DIR (pulse output control / DO signal)

Pulse output control function: PCI-M324 is built-in with six different pulse output control functions, which are controlled by the DIR and OUT output interfaces. The hardware circuit is designed to adopt the RS-422 differential line driver output interface, which can connect to RS-422 differential, optocoupler, and TTL unipolar interfaces.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
43	DIR+_1	O	1st direction pulse signal (+)	93	DIR+_3	O	3rd direction pulse signal (+)
44	DIR-_1	O	1st direction pulse signal (-)	94	DIR-_3	O	3rd direction pulse signal (-)
47	DIR+_2	O	2nd direction pulse signal (+)	97	DIR+_4	O	4th direction pulse signal (+)
48	DIR-_2	O	2nd direction pulse signal (-)	98	DIR-_4	O	4th direction pulse signal (-)
45	OUT+_1	O	1st output pulse signal (+)	95	OUT+_3	O	3rd output pulse signal (+)
46	OUT-_1	O	1st output pulse signal (-)	96	OUT-_3	O	3rd output pulse signal (-)
49	OUT+_2	O	2nd output pulse signal (+)	99	OUT+_4	O	4th output pulse signal (+)
50	OUT-_2	O	2nd output pulse signal (-)	100	OUT-_4	O	4th output pulse signal (-)

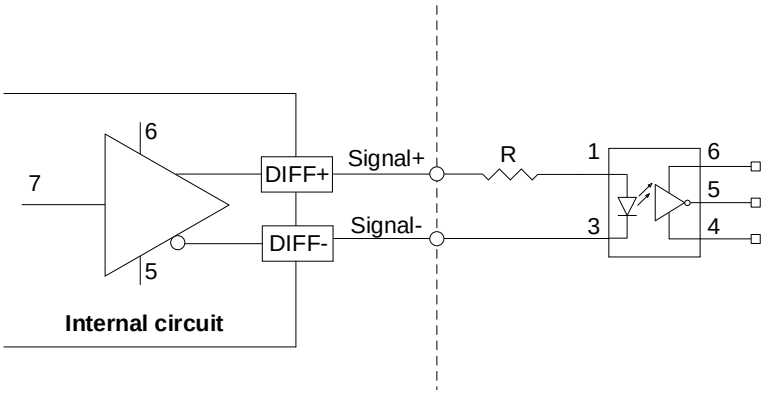
■ Differential mode

(1) Differential output connects to differential input

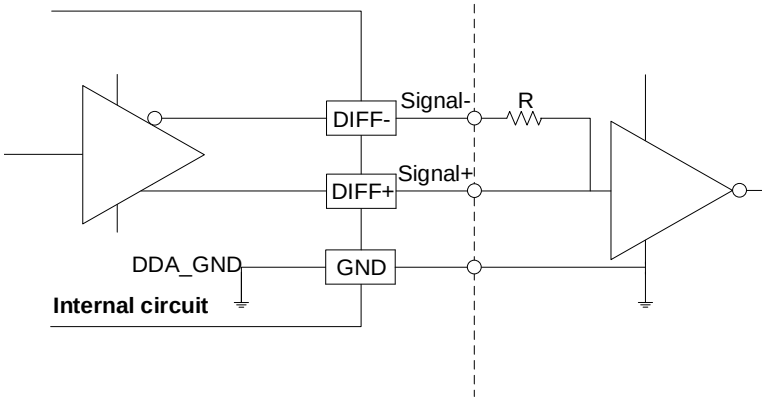


3

(2) Differential output connects to optocoupler



(3) Differential output connects to single-ended input



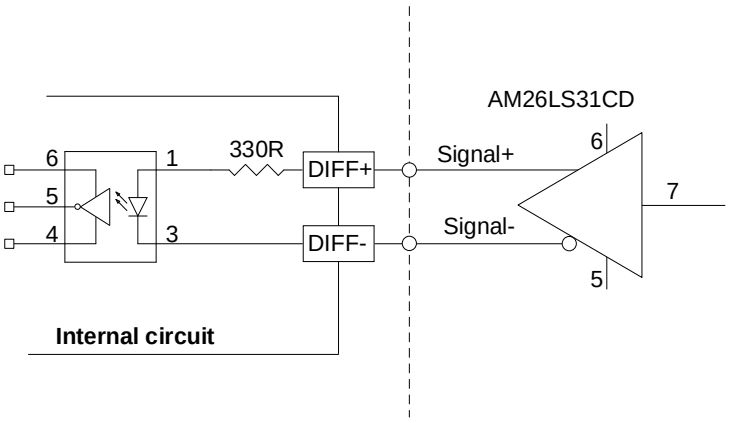
■ Encoder A phase, B phase, and Z phase (axis control signal / DI signal)

Encoder A phase, B phase, and Z phase feedback pulse input counter function: connects to the position feedback from the servo drive or external linear scale.

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
29	EA+_1	I	1st A phase encoder signal (+)	79	EA+_3	I	3rd A phase encoder signal (+)
30	EA-_1	I	1st A phase encoder signal (-)	80	EA-_3	I	3rd A phase encoder signal (-)
35	EA+_2	I	2nd A phase encoder signal (+)	85	EA+_4	I	4th A phase encoder signal (+)
36	EA-_2	I	2nd A phase encoder signal (-)	86	EA-_4	I	4th A phase encoder signal (-)
31	EB+_1	I	1st B phase encoder signal (+)	81	EB+_3	I	3rd B phase encoder signal (+)
32	EB-_1	I	1st B phase encoder signal (-)	82	EB-_3	I	3rd B phase encoder signal (-)
37	EB+_2	I	2nd B phase encoder signal (+)	87	EB+_4	I	4th B phase encoder signal (+)
38	EB-_2	I	2nd Z phase encoder signal (-)	88	EB-_4	I	4th B phase encoder signal (-)
33	EZ+_1	I	1st Z phase encoder signal (+)	83	EZ+_3	I	3rd Z phase encoder signal (+)
34	EZ-_1	I	1st Z phase encoder signal (-)	84	EZ-_3	I	3rd Z phase encoder signal (-)
39	EZ+_2	I	2nd Z phase encoder signal (+)	89	EZ+_4	I	4th Z phase encoder signal (+)
40	EZ-_2	I	2nd Z phase encoder signal (-)	90	EZ-_4	I	4th Z phase encoder signal (-)

■ Differential mode

(1) Differential input mode



3.1.4 Position comparison triggering signal output interface

PCI-M324 provides the position comparison triggering pulse output function, as shown in Figure 3.1.4.1. In this example, the encoder feedback value of the servo motor is compared with the P1 and P2 position set values. When the feedback value equals the P1 or P2 value, the pulse signal outputs respectively to trigger the image acquisition card or CCD to take images. The card provides two flexible high-speed comparator channels (Channels #0 and #1) for the users to choose from. You can choose different pulse comparison sources and pulse output interfaces according to the parameter settings to meet your application requirements.

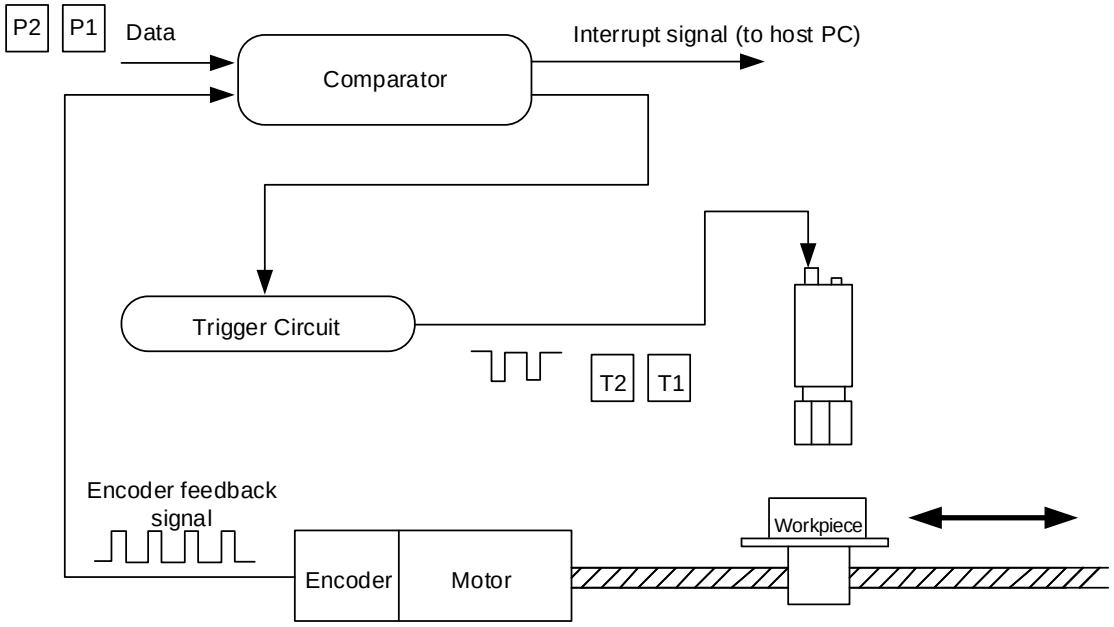


Figure 3.1.4.1 Position comparison triggering example

■ Channel #0 in-place comparator function description

The in-place comparator of Channel #0 has four sets of compare input sources for selection, and they are the position counter values for axes #0, #1, #2, and #3. The output interface also provides four sets of output interfaces for selection, and they are CMOS3.3V output, DO output of each axis (24V), axis #3 RS422 DIR single serial output, and axis #3 RS422 dual serial output at the same time (as shown in Figure 3.1.4.2).

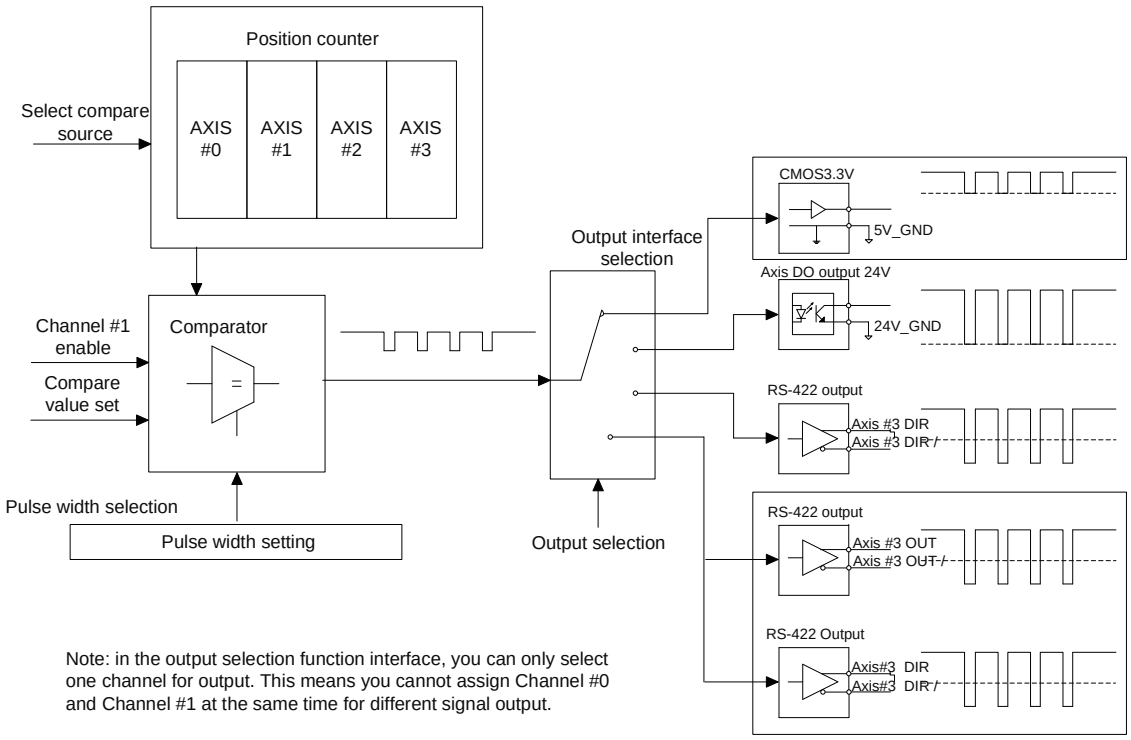


Figure 3.1.4.2 Diagram of Channel #0 in-place comparator

CMOS 3.3V output interface: please refer to Section 3.1.1 for the mechanical DI/O interface CMP signal description. Please do not share use with Channel #1.

DO output interface of each axis: please refer to Section 3.1.1 for the mechanical DI/O interface DO signal description.

Axis #3 RS-422 DIR single serial output interface: please refer to Section 3.1.3 for the servo drive I/O interface pulse output description.

Axis #3 RS-422 dual serial output interface: please refer to Section 3.1.3 for the servo drive I/O interface pulse output description. Please do not share use with Channel #1.

3

■ Channel #1 in-place comparator function description

The in-place comparator of Channel #1 has four sets of compare input sources for selection, and they are the position comparator values for axes #0, #1, #2, and #3. The output interface also provides four sets of output interfaces for selection, and they are CMOS3.3V output, DO output of each axis (24V), axis #3 RS-422 OUT single serial output, and axis #3 RS-422 dual serial output at the same time (as shown in Figure 3.1.4.3).

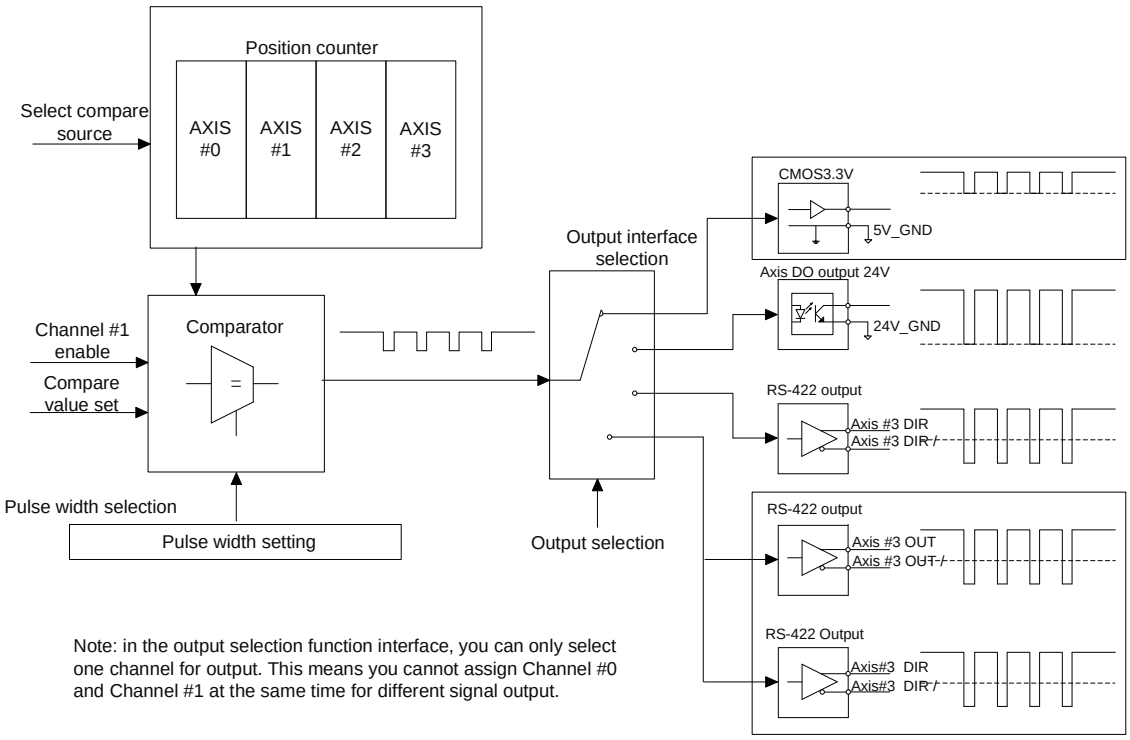


Figure 3.1.4.3 Diagram of Channel #1 in-place comparator

CMOS 3.3V output interface: please refer to Section 3.1.1 for the mechanical DI/O interface CMP signal description. Please do not share use with Channel #0.

DO output interface of each axis: please refer to Section 3.1.1 for the mechanical DI/O interface DO signal description.

Axis #3 RS-422 OUT single serial output interface: please refer to Section 3.1.3 for the servo drive I/O interface pulse output description.

Axis #3 RS-422 dual serial output interface: please refer to Section 3.1.3 for the servo drive I/O interface pulse output description. Please do not share use with Channel #0.

3.1.5 Position latch signal input interface

PCI-M324 provides the position latch function as shown in Figure 3.1.5.1. In this example, when the measuring probe touches the workpiece surface, it triggers the DI signal to execute the position latch function, which records the position counter value in the latch counter. Then, by reading the latch counter value, you can see the position value when triggered.

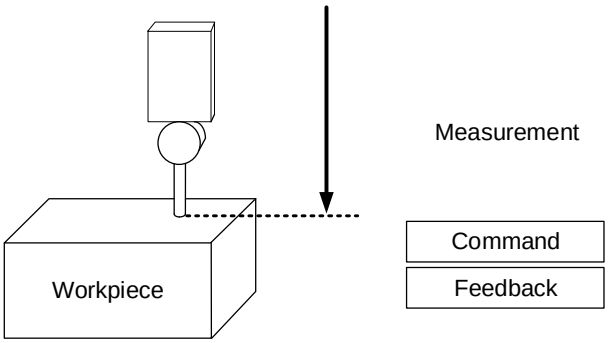


Figure 3.1.5.1 Position latch function example

This card is designed with four sets of latch triggering source for selection. For details, please refer to Figure 3.1.5.2.

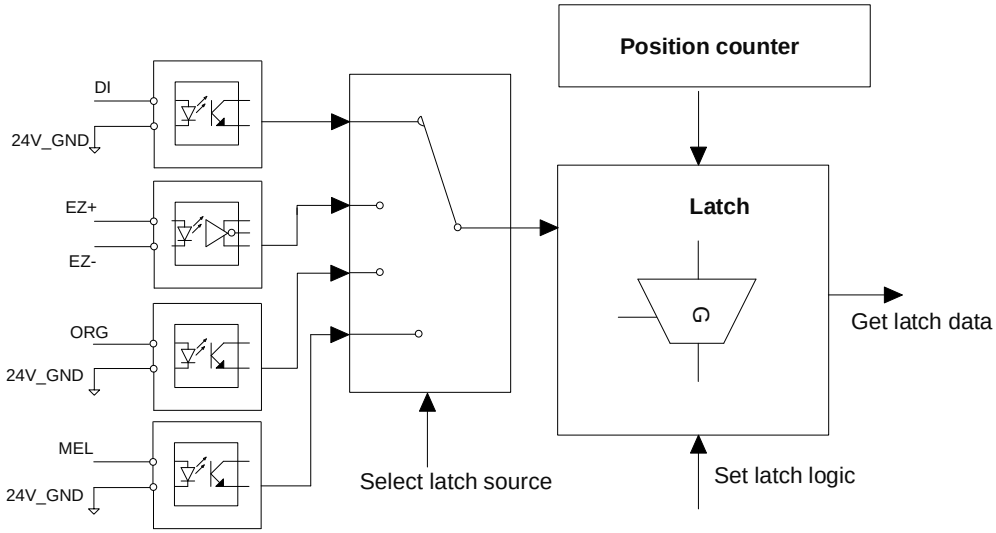


Figure 3.1.5.2 Position latch triggers source diagram

Axis DI, ORG, MEL input interfaces: please refer to Section 3.1.1 for the mechanical DI/O interface DI, ORG, and MEL signals description.
EZ+ and EZ- input interfaces: please refer to Section 3.1.3 for the servo drive I/O interface pulse input description.

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Terminal Board

4

PCI-M324 provides two types of terminal boards for you to choose from. They are DB-100S general terminal board and DB-M324 adapter board with 25-pin D-SUB connector and signal indicator. Please refer to the following sections for detailed specifications and instructions.

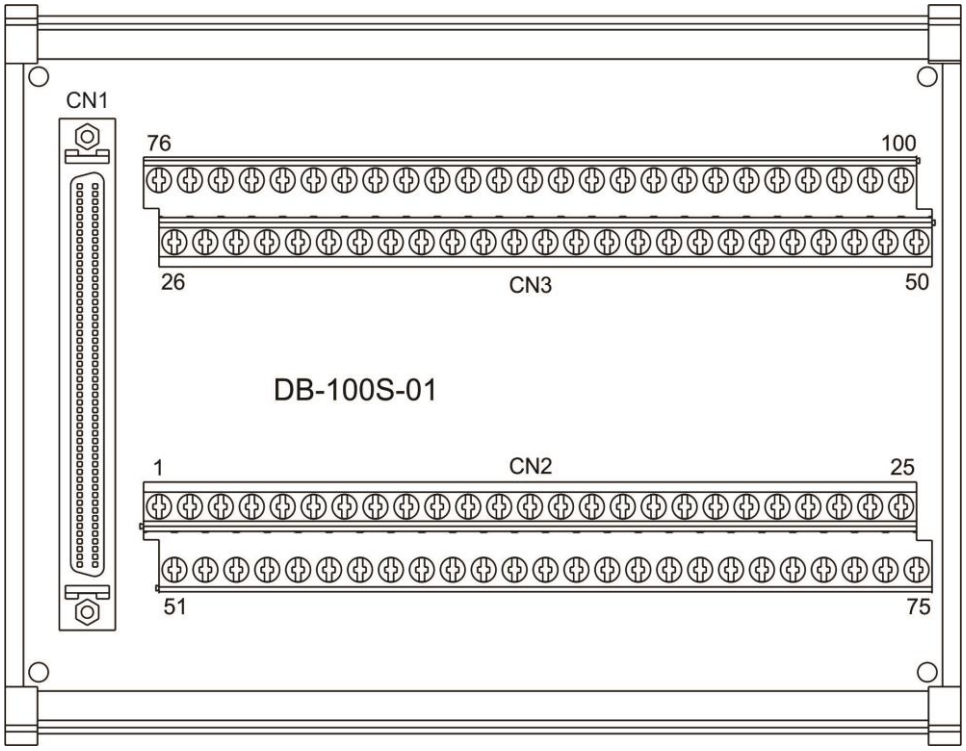
4.1 DB-100S general terminal board

4

■ Specifications

(1) SCSI 100-pin 1.27 mm female connector
(2) Supports DIN rail mounting
(3) Dimension (L-157 x W-122 x H-45 mm)
(4) Pitch: 5.00 mm
(5) Wire diameter: 26 - 14 AWG

■ DB-100S illustration



Description of each DB-100S pin:

Mark	Function
CN1	SCSI 100-pin female connector (pin to pin) Connector for the PCI-M324 servo motion control card and DB-100S
CN2	The terminal pins correspond to the CN1 pins
CN3	The terminal pins correspond to the CN1 pins

Note: the pin definition is the same as the CN1 on the PCI-M324 servo motion control card.

Please refer to Section 2.5.1.

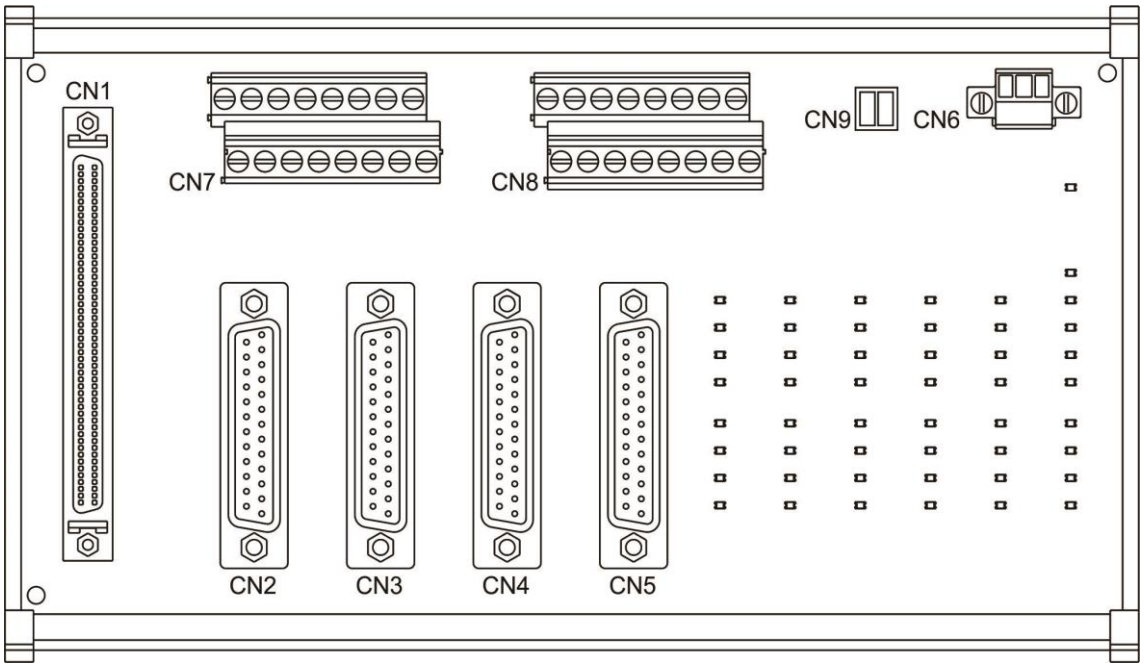
4.2 DB-M324 adapter board with signal indicator

■ Specifications

(1) SCSI 100-pin P1.27 mm female connector
(2) D-SUB 25 P2.27 mm female connector
(3) Supports DIN rail mounting
(4) Dimension L-117 x W-215 x H-60 mm (PCB L-107 x W-209)
(5) Pitch: 5.00 mm
(6) Operating temperature: 0°C - 60°C (32°C - 140°F)
(7) Emergency stop input: EMG
(8) Mechanical I/O interface signal input: PEL x4, MEL x4, ORG x4, SLD x4
(9) Servo drive interface signal output: ALM x4, ALMC x4, RDY x4, SVON x4, INP x4, ERC x4
(10) GPIO point: DI x4, DO x4
(11) Power supply input: +24 V_{DC} ± 10%; power consumption: 3W typical
(12) For DDA pulse level voltage output: +5 V_{DC} (output from PCI-M324), I < 100 mA
(13) Indicator light: power indicator, emergency stop input indicator, mechanical I/O interface signal indicator, servo drive interface signal output indicator, GPIO indicator
(14) DB-M324 is for NPN wiring type

4

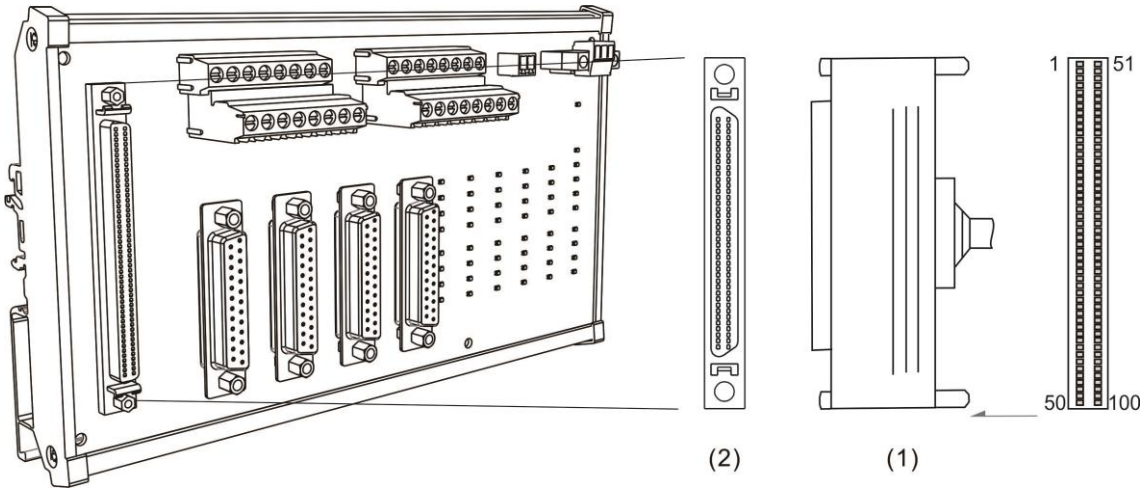
- DB-M324 illustration



Description of each DB-M324 pin:

Mark	Connector type	Function
CN1	SCSI 100-pin female connector	Connector for the PCI-M324 servo motion control card and DB-M324
CN2	D-SUB 25 female connector	Axis 1 motor connector
CN3	D-SUB 25 female connector	Axis 2 motor connector
CN4	D-SUB 25 female connector	Axis 3 motor connector
CN5	D-SUB 25 female connector	Axis 4 motor connector
CN6	Plug-in terminal block connector	24V power input connector
CN7	Screw terminal block connector	Axis 1, 2 motor connector for other signals
CN8	Screw terminal block port	Axis 3, 4 motor connector for other signals
CN9	Plug-in terminal block connector	DDA 5V voltage output

■ DB-M324 CN1 pin definition diagram

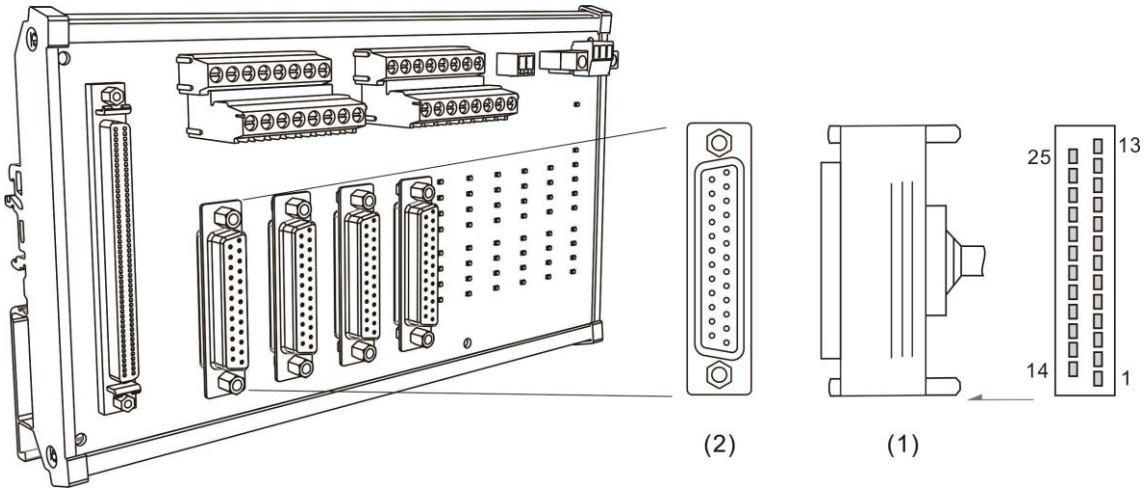


Note: the pin definition is the same as the CN1 on the PCI-M324 servo motion control card.

Please refer to Section 2.5.1.

4

- DB-M324 CN2 / CN3 / CN4 / CN5 (Axis 1 - Axis 4) pin definition diagram

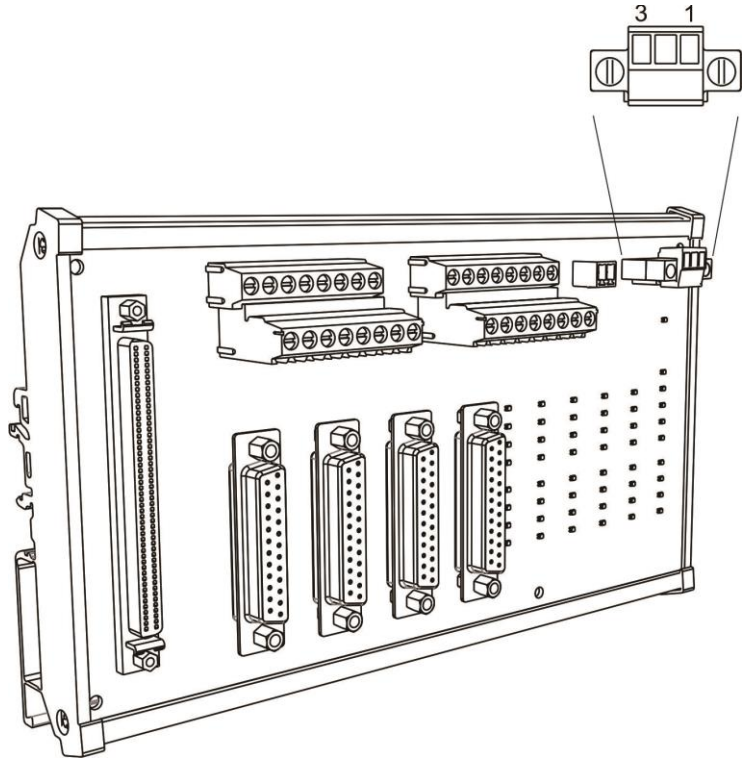


Description of each DB-M324 CN2 / CN3 / CN4 / CN5 pin:

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
1	OUT-	O	Output pulse signal (-)	14	DIR-	O	Direction pulse signal (-)
2	OUT+	O	Output pulse signal (+)	15	DIR+	O	Direction pulse signal (+)
3	DDA 5V	V	DDA 5V voltage output, I < 100 mA	16	INP	I	Servo in place signal
4	EGND	G	24V ground signal	17	PEL	I	Mechanical positive limit signal
5	MEL	I	Mechanical negative limit signal	18	24V	V	+24V power supply
6	SVON	O	Servo on	19	ALM	I	Servo alarm
7	EGND	G	24V ground signal	20	EGND	G	24V ground signal
8	EGND	G	24V ground signal	21	EGND	G	24V ground signal
9	ALMC	O	Servo alarm clearing output	22	ERC		Clear servo error counter
10	EZ+	I	Z phase encoder signal (+)	23	EZ-	I	Z phase encoder signal (-)
11	EA+	I	A phase encoder signal (+)	24	EA-	I	A phase encoder signal (-)
12	EB+	I	B phase encoder signal (+)	25	EB-	I	B phase encoder signal (-)
13	FG	G	FG				

Note: CN2 - CN5 correspond to the CN1 Axis 1 - Axis 4 control points respectively on the PCI-M324 servo motion control card. Please refer to Section 2.5.1.

- DB-M324 CN6 pin definition diagram

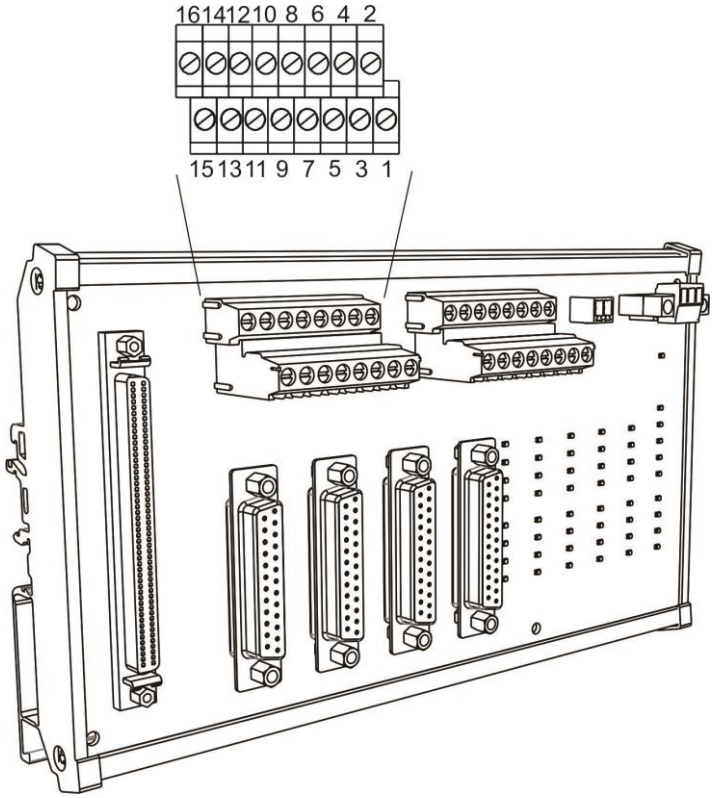


Description of each DB-M324 CN6 pin:

Pin	Mark	Description
1	FG	FG
2	EGND	24V ground signal
3	24V	Power +24V

4

- DB-M324 CN7 / CN8 (Axis 1, 2) pin definition diagram



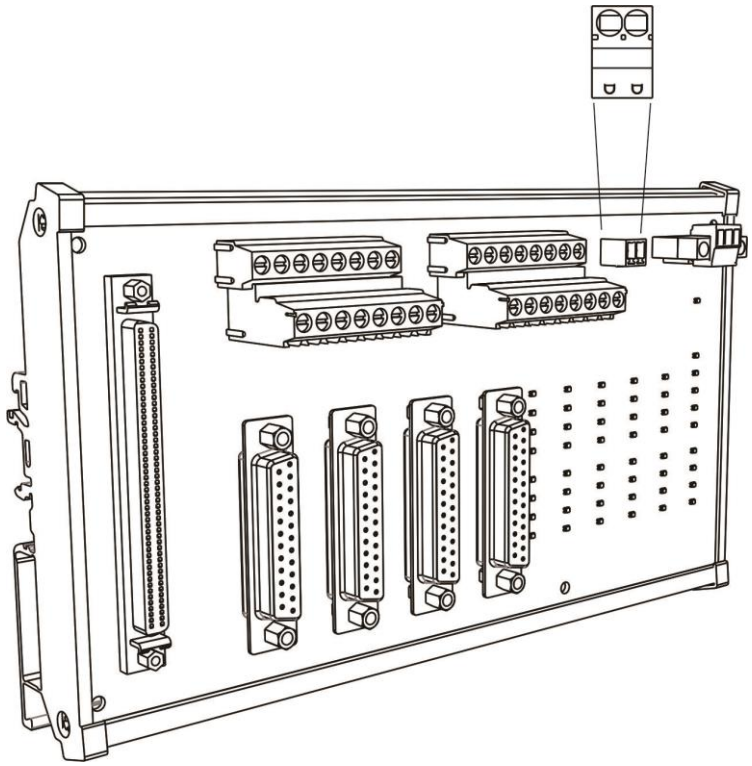
Description of each DB-M324 CN7 / CN8 pin:

Pin	Mark	I/O	Description	Pin	Mark	I/O	Description
1	ORG	I	1st origin position signal	9	DO	O	1st GPIO output
2	ORG	I	2nd origin position signal	10	DO	O	2nd GPIO output
3	SLD	I	1st deceleration point signal	11	MEL	I	1st mechanical negative limit signal
4	SLD	I	2nd deceleration point signal	12	MEL	I	2nd mechanical negative limit signal
5	RDY	I	1st servo ready	13	PEL	I	1st mechanical positive limit signal
6	RDY	I	2nd servo ready	14	PEL	I	2nd mechanical positive limit signal
7	DI	I	1st GPIO input	15	EMG	I	Emergency stop input
8	DI	I	2nd GPIO input	16	EGND	G	24V ground signal

Note:

1. GPIO is short for General Purpose Input / Output. The EMG of CN7 / CN8 is the same signal pin.
2. CN7 and CN8 correspond to the CN1 Axis 1 - Axis 4 control points respectively on the PCI-M324 servo motion control card. Please refer to Section 2.5.1.

- DB-M324 CN9 pin definition diagram



Description of each DB-M324 CN9 pin:

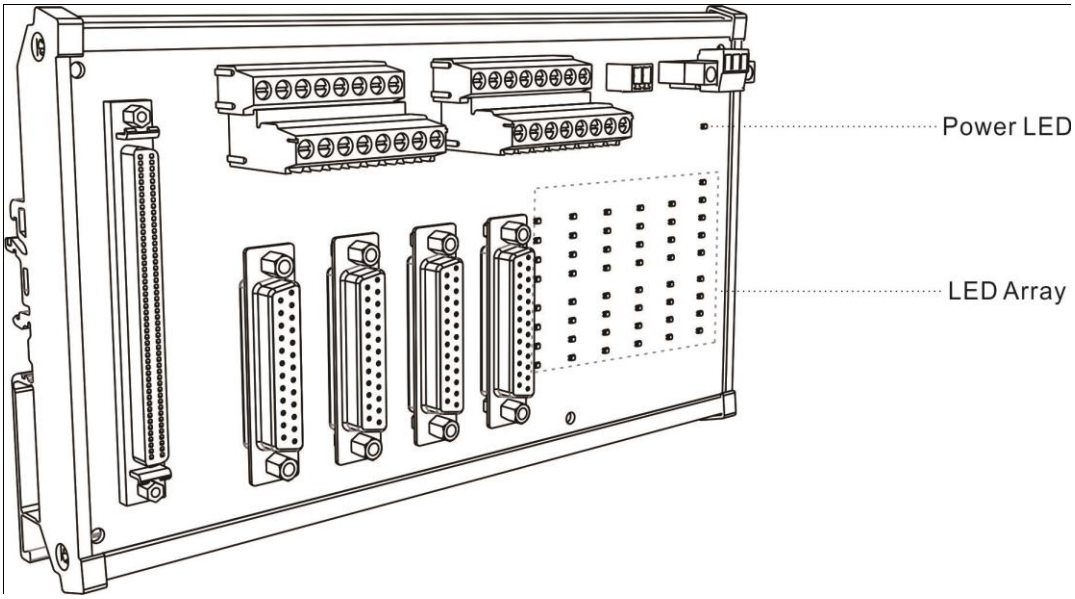
Pin	Mark	Description
1	5VGND	DDA 5V ground signal
2	DDA5V	DDA 5V voltage output

Note: CN9: The DDA 5V voltage output source is from the PCI-M324 control card, I < 100 mA.

Limited to use as a reference point for 5V voltage comparison.

4

- Description of the DB-M324 LED



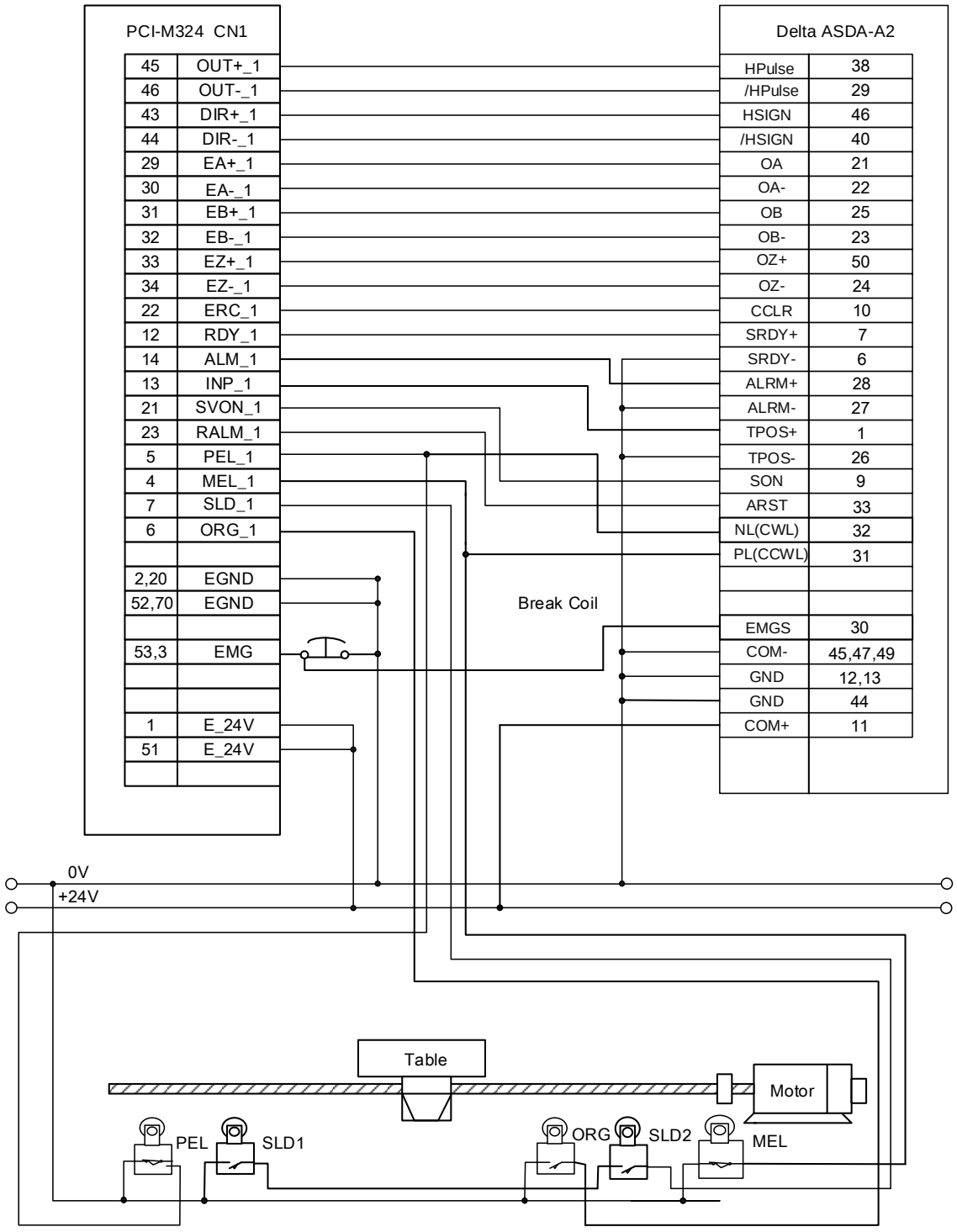
Item	Description
Power LED	24V power input indicator light
LED Array	The function definition of the LED signal indicator light is the same as the CN1 on the PCI-M324 servo motion control card. Please refer to Section 2.5.1.

5 Wiring

This chapter lists the standard wiring diagrams for the PCI-M324 motion control card connected to various series of servo drives.

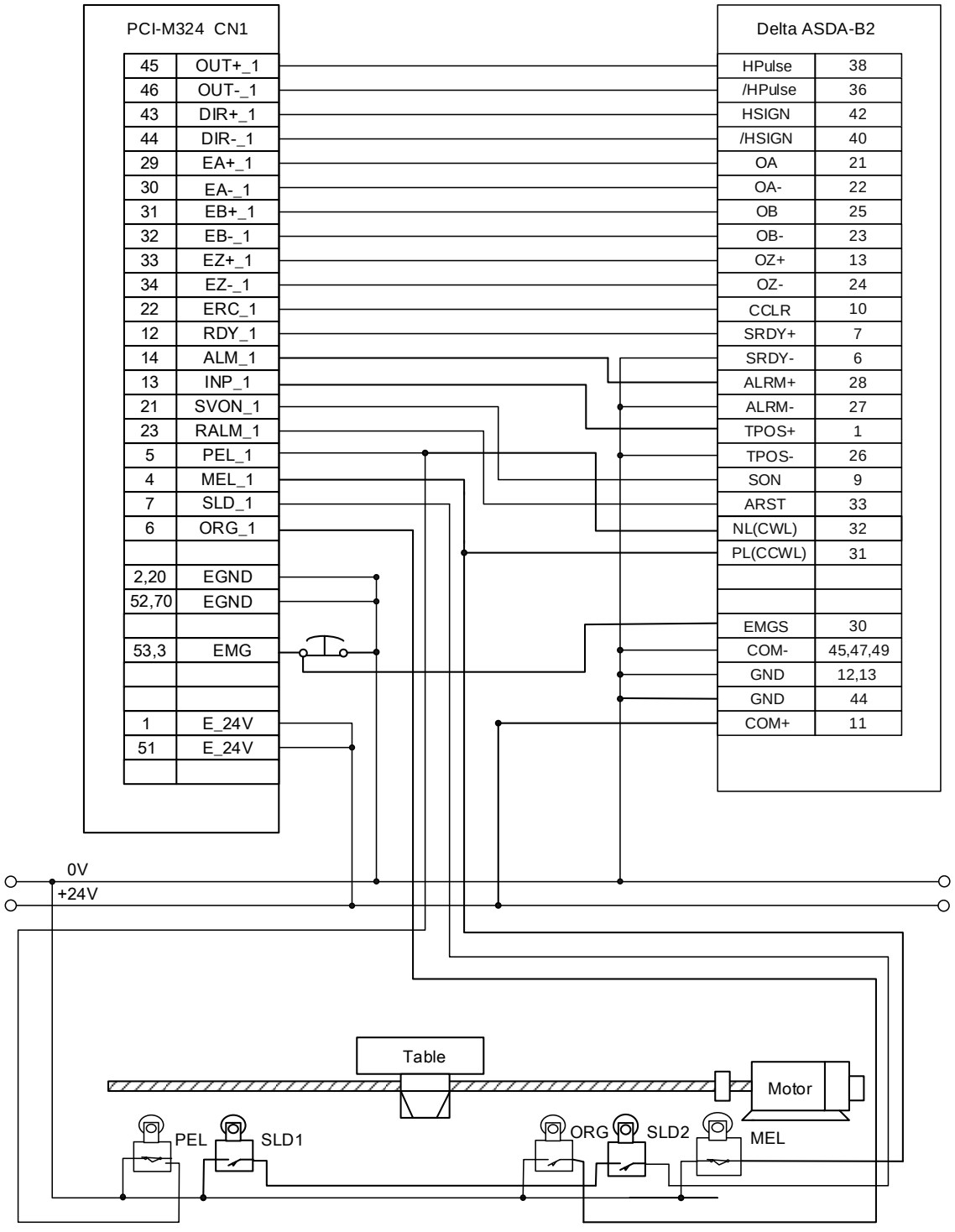
5.1 Terminal board wiring example

- Delta ASDA-A2 series servo drive



PCI-M324 Axis 1 connected to Delta ASDA-A2 series servo drive

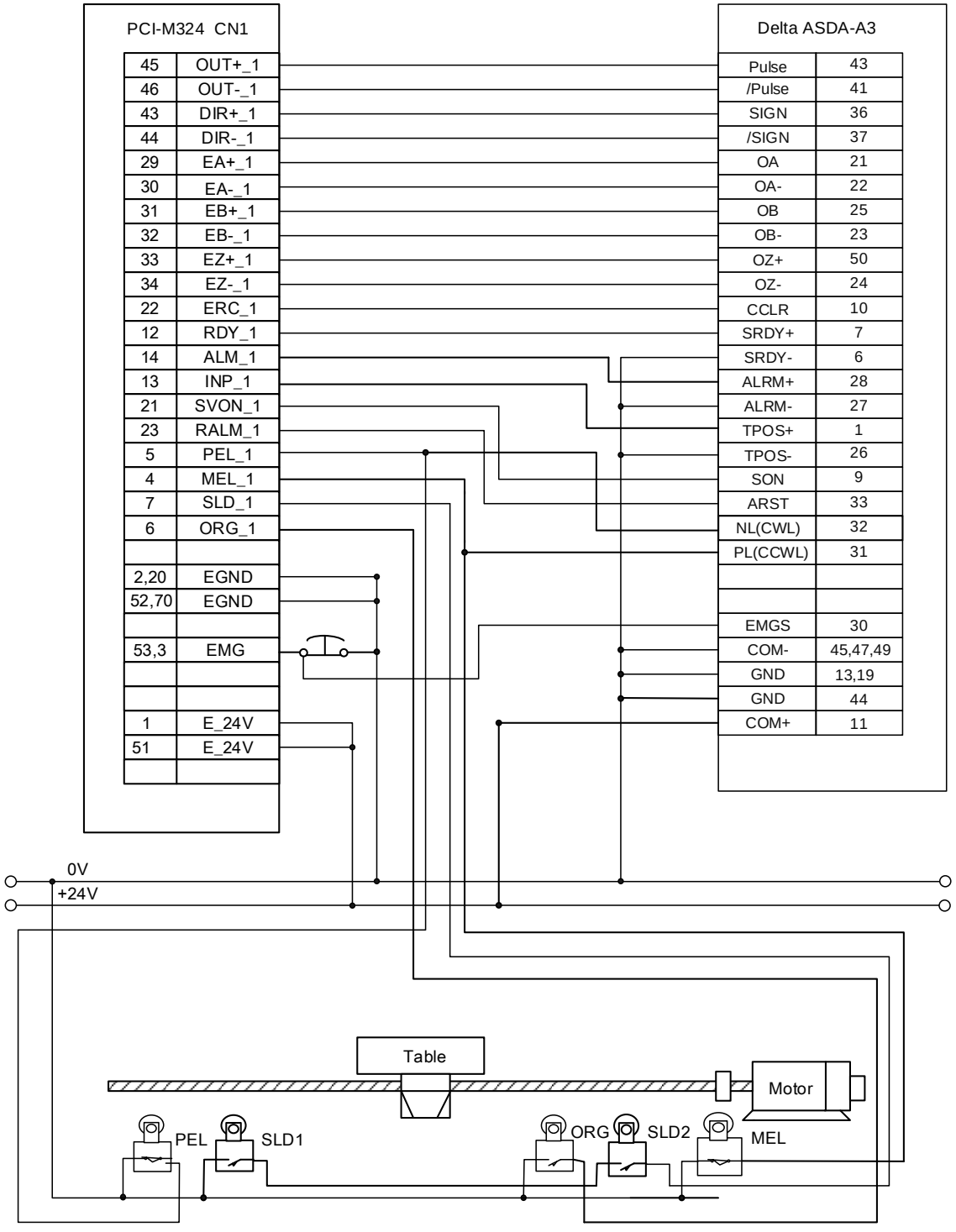
■ Delta ASDA-B2 series servo drive



PCI-M324 Axis 1 connected to Delta ASDA-B2 series servo drive

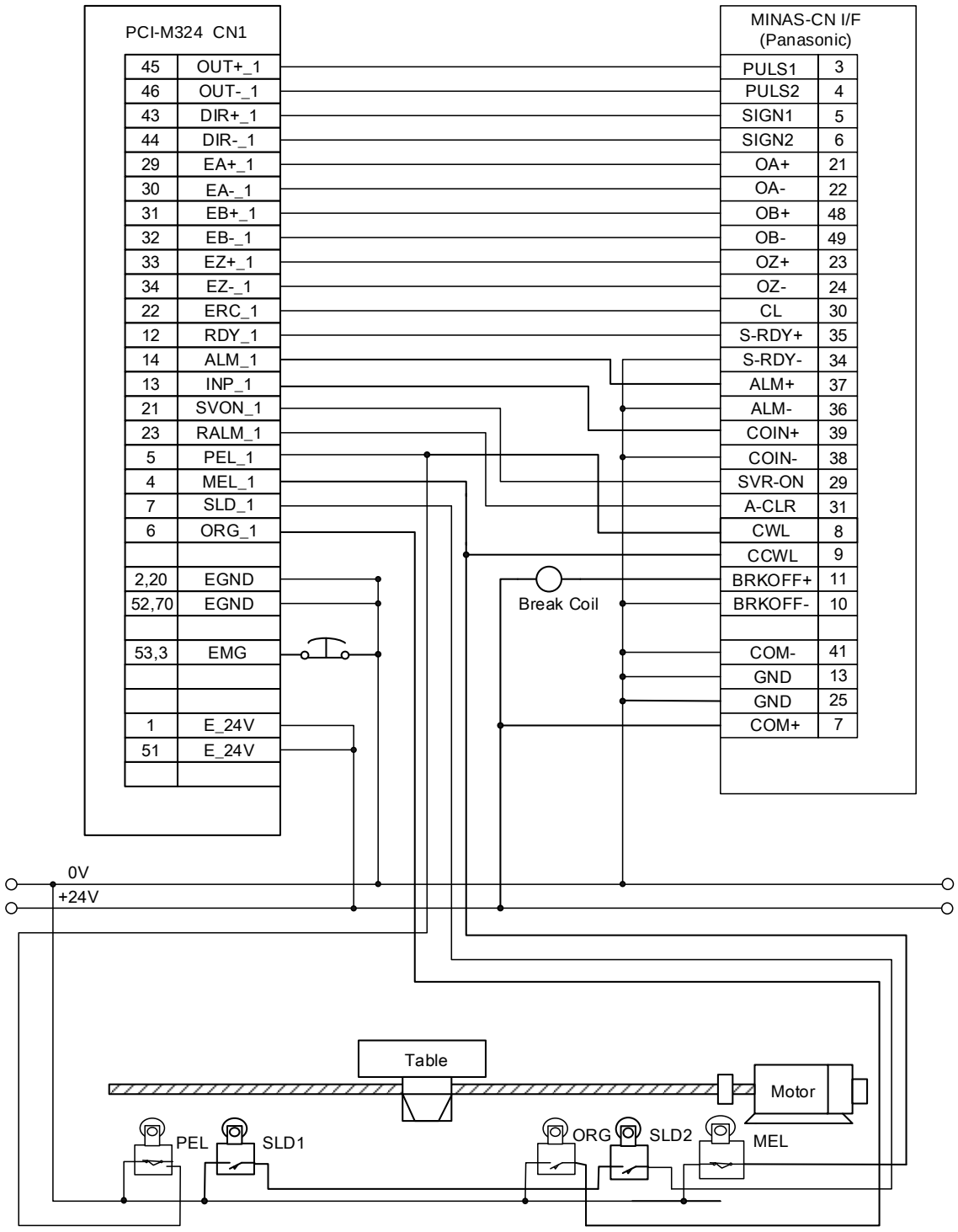
5

■ Delta ASDA-A3 series servo drive



PCI-M324 Axis 1 connected to Delta ASDA-A3 series servo drive

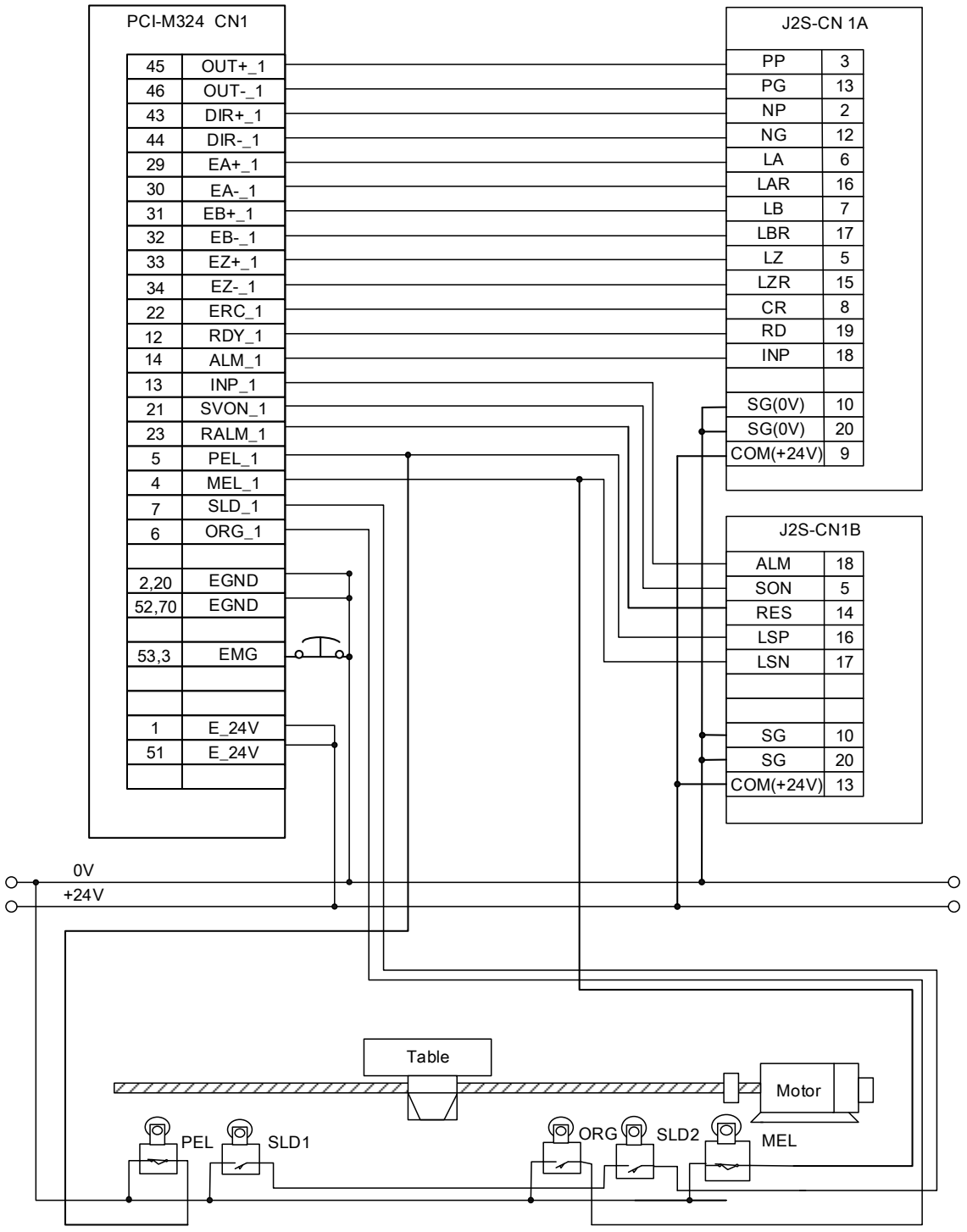
■ Panasonic Minas A series servo drive



PCI-M324 Axis 1 connected to Panasonic Minas A series servo drive

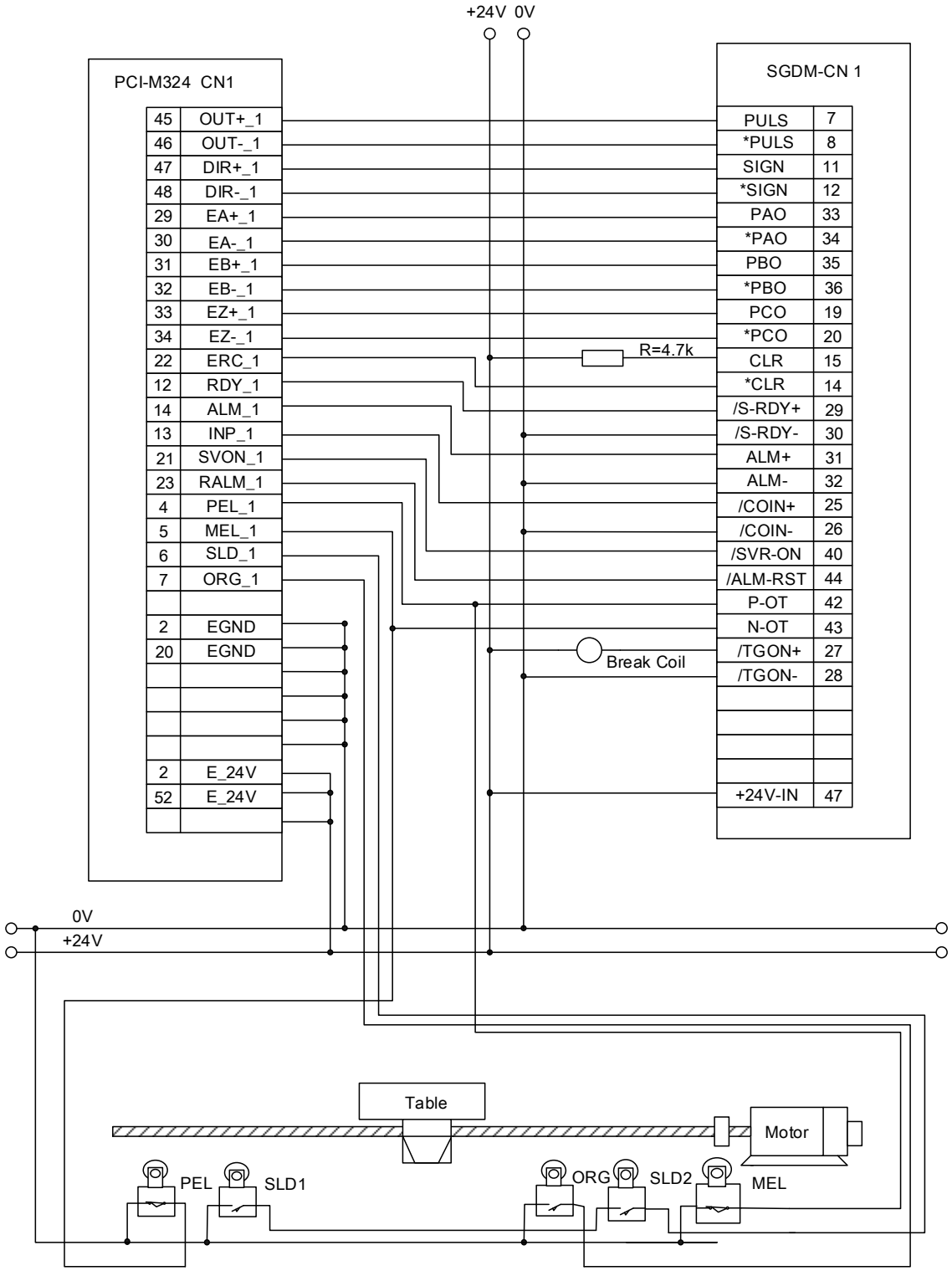
5

■ Mitsubishi J2S series servo drive



PCI-M324 Axis 1 connected to Mitsubishi J2S series servo drive

■ Yaskawa SGDM Sigma II series servo drive



PCI-M324 Axis 1 connected to Yaskawa SGDM Sigma II series servo drive

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EzDMC Functions

6

EzDMC is a serial control tool to test the functionality of the serial connection. When EzDMC is operating, the system monitors and automatically categorizes the connected PCI-M324 motion control cards. You may use the listed cards to determine if the cards are functioning properly and select each card for functional testing. The following introduces how to operate the functions of EzDMC.

6

6.1 Introduction to EzDMC functions

As shown in Figure 6.1.1, once you launch EzDMC, the program screen as shown below appears on your computer system. Please refer to the following table for the functions of each block.

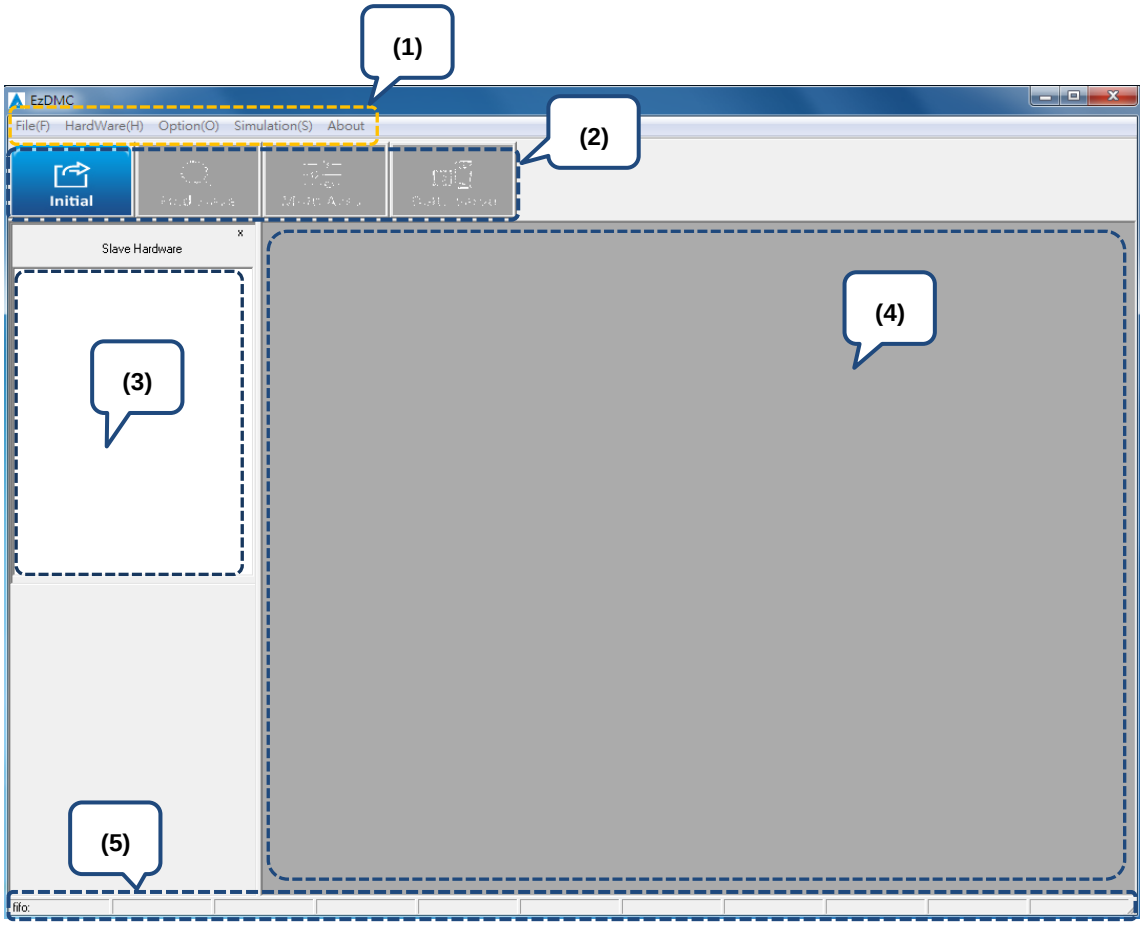

Figure 6.1.1

No.	Function
(1)	Function menu.
(2)	Tool bar for basic operating functions.
(3)	Area for displaying the main controller system and expansion module list.
(4)	Area for displaying the basic messages of expansion functions and operation control. It operates in SDI mode which can display multiple relevant information dialog box.
(5)	Program status display area: area for displaying the connection status of the system (for the DMC motion card).

6.2 Operate M324 functions with EzDMC

When the PCI-M324 card and connection modules (e.g. drive and motor) are set up, please follow the procedures below to use EzDMC to test the connection:

1. Open EzDMC.
2. Find the PCI-M324 master card. (Refer to Section 6.3.)
3. Open the motion control screen.
4. Set the pulse output / input mode and I/O related settings. After making sure the settings are correct, you can start the motion control.

6.3 Find PCI-M324 card

To find the PCI-M324 card, click **Initial** in the tool bar to scan the system as shown in Figure 6.3.1. This defines the amount and configuration status of all PCI cards in the current host system. When the search is complete, the device list displays the status of all found cards as well as the amount and configuration of the master cards.

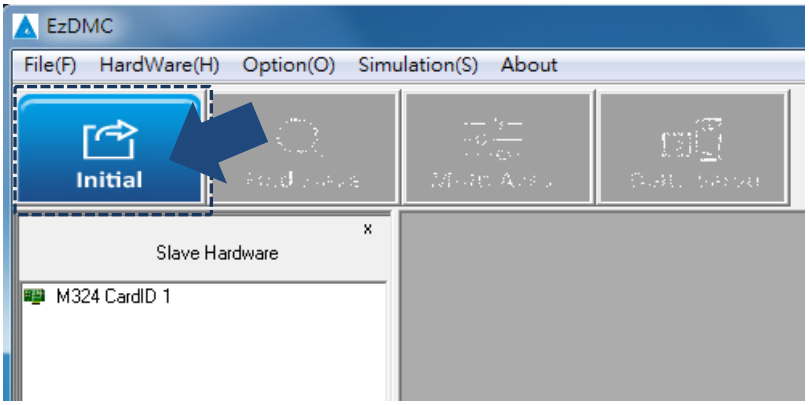

Figure 6.3.1

6.4 4-axis motion function control

6

After finding the M324 cards, select the card for operation (as shown in Figure 6.4.1), and the operation screen for the 4-axis motion module is displayed (Figure 6.4.2).

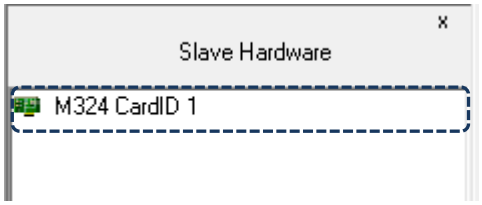

Figure 6.4.1

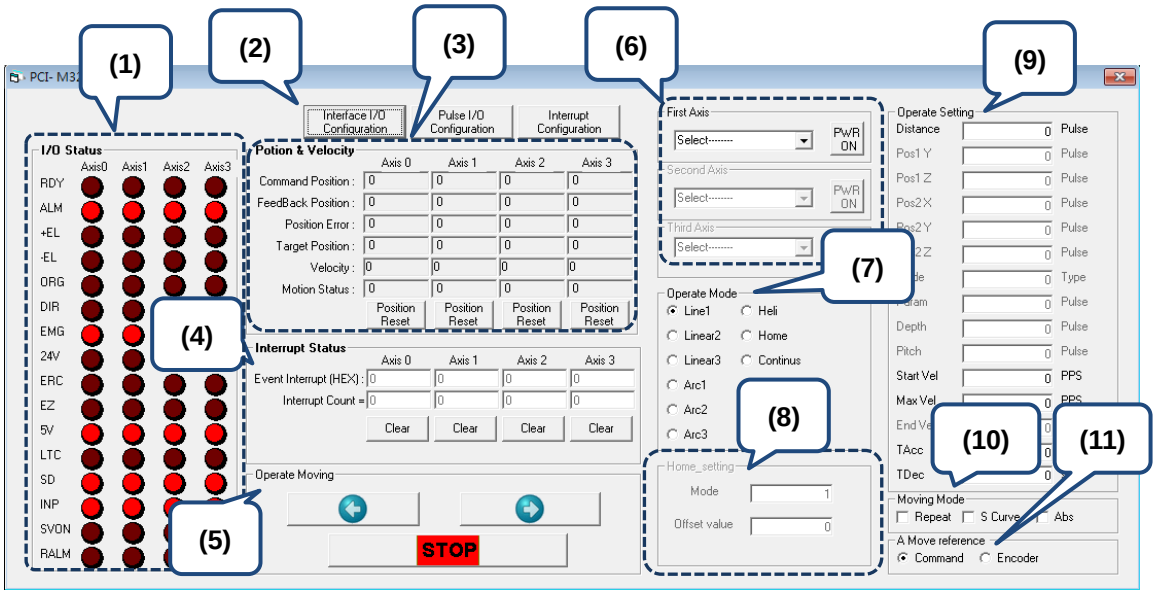

Figure 6.4.2

No.	Item	Description
(1)	I/O Status	Display the current status of the M324 card using the ON / OFF status signal.
(2)	Interface I/O Configuration Pulse I/O Configuration Interrupt Configuration	Interface I/O Configuration: I/O setting interface. Pulse I/O Configuration: pulse setting interface. Interrupt Configuration: interrupt setting interface.
(3)	Position / Velocity	Display each count value of the motion status, including command, position, speed, motion status, etc.
(4)	Interrupt Status	Display the events and number of times that interrupt occurred.
(5)	Operate Moving	Motion control buttons.
(6)	First / Second / Third Axis	Select the motion control axis.
(7)	Operate Mode	Set the motion operation mode, including point to point, homing, constant velocity, etc.
(8)	Home_setting	When executing homing, you need to set the parameters, homing mode, and the offset value when homing is complete.
(9)	Operate Setting	Set the motion commands, including motion distance, starting velocity, maximum velocity, and acceleration / deceleration time.

No.	Item	Description
(10)	Moving Mode	■ Check [Repeat] to repeatedly execute clockwise and counterclockwise motions. ■ Check [S Curve] to set S-Curve acceleration / deceleration; otherwise, T-Curve is used. ■ Check [Abs] to use absolute motion; otherwise, relative motion is used.
(11)	A Move Reference	Command: absolute motion follows the command counter. Encoder: absolute motion follows the feedback counter position.

After opening the main screen, you need to set the relevant settings before executing motion control.

■ Open the I/O related setting screen to set the signal logic, including ALM, INP, ELL, ORG, etc.

Click **Interface I/O Configuration** (Figure 6.4.3) on the M324 main screen to open the I/O related setting screen (Figure 6.4.4).

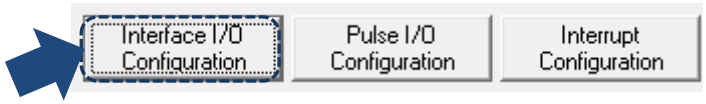

Figure 6.4.3

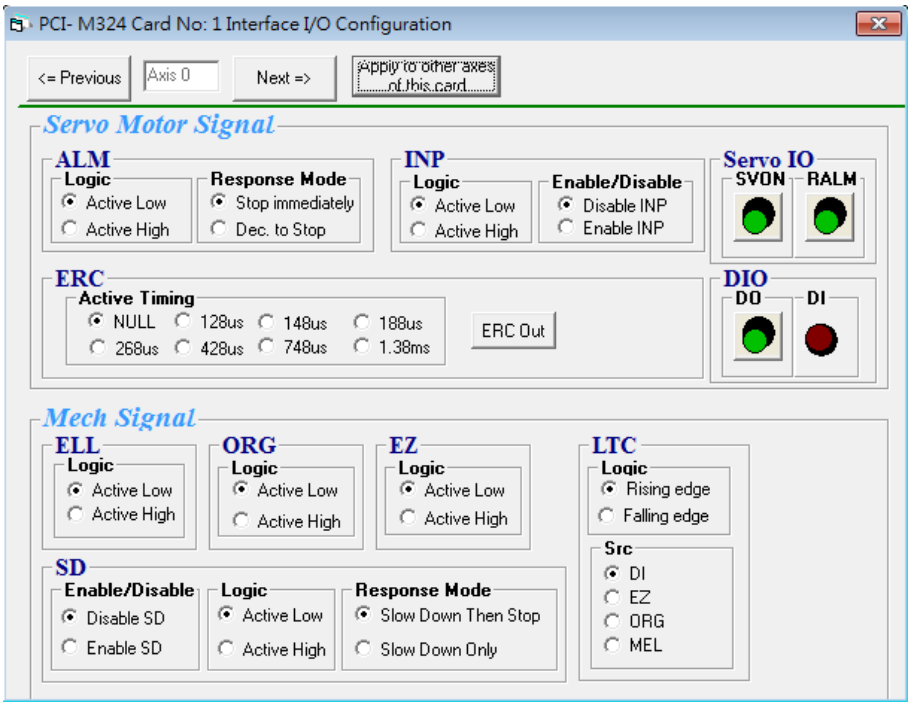

Figure 6.4.4

6

- Open the pulse I/O mode setting screen to set the relevant settings, i.e. AB Phase, CW/CCW, PLS/DIR, then you can execute motion control.

  Click **Pulse I/O Configuration** (Figure 6.4.5) on the M324 main screen to open the pulse I/O mode setting screen (Figure 6.4.6).

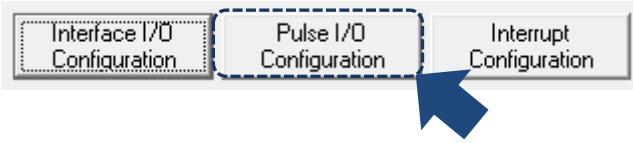

Figure 6.4.5 Function buttons

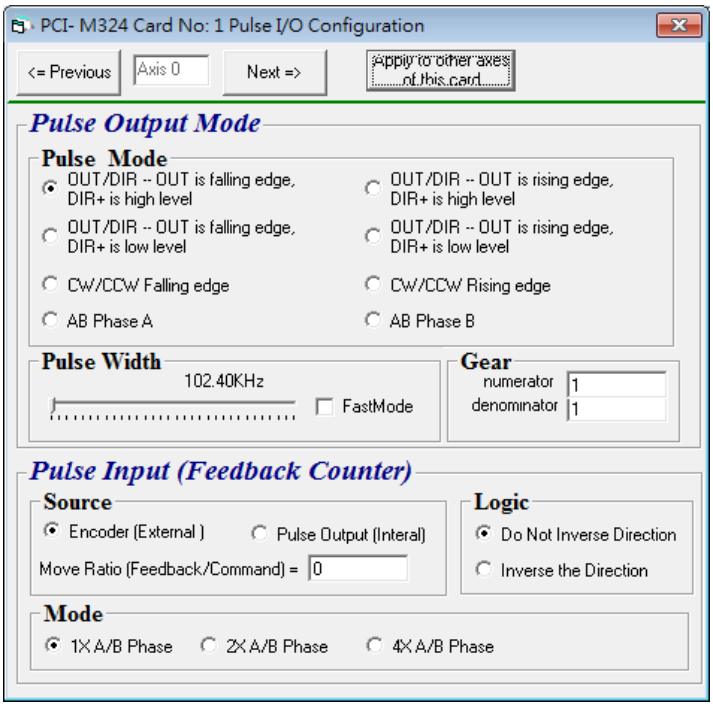

Figure 6.4.6 Pulse I/O mode setting

6.5 Function description of File and Simulation

1. Function to load / save configuration file

When you have completed the motion control, you can save the M324 motion control parameters by using [File] > [Save Configuration_M324] in the function menu. When you open EzDMC the next time, you can use [File] > [Load Configuration_M324] in the function menu to load the set motion control parameters to EzDMC, and execute the motion control of this configuration. Please refer to Figure 6.5.1 for the function menu as described above.

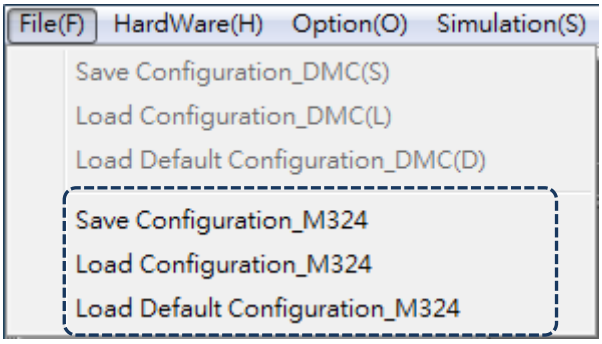

Figure 6.5.1 Function to load / save configuration file

2. Interrupt Configuration function page

Click **Interrupt Configuration** (Figure 6.5.2) on the M324 main screen to operate the interrupt function. Once you click this button, the [Interrupt Configuration] setting screen (Figure 6.5.3) pops up. Check the conditions for interruption and when the conditions are met, interruption occurs and enters the callback function, and the [Interrupt Status] screen shows the number of times that interruption occurred (Figure 6.5.4).

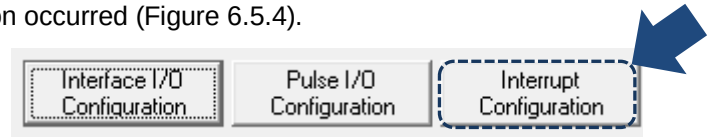

Figure 6.5.2 Function buttons

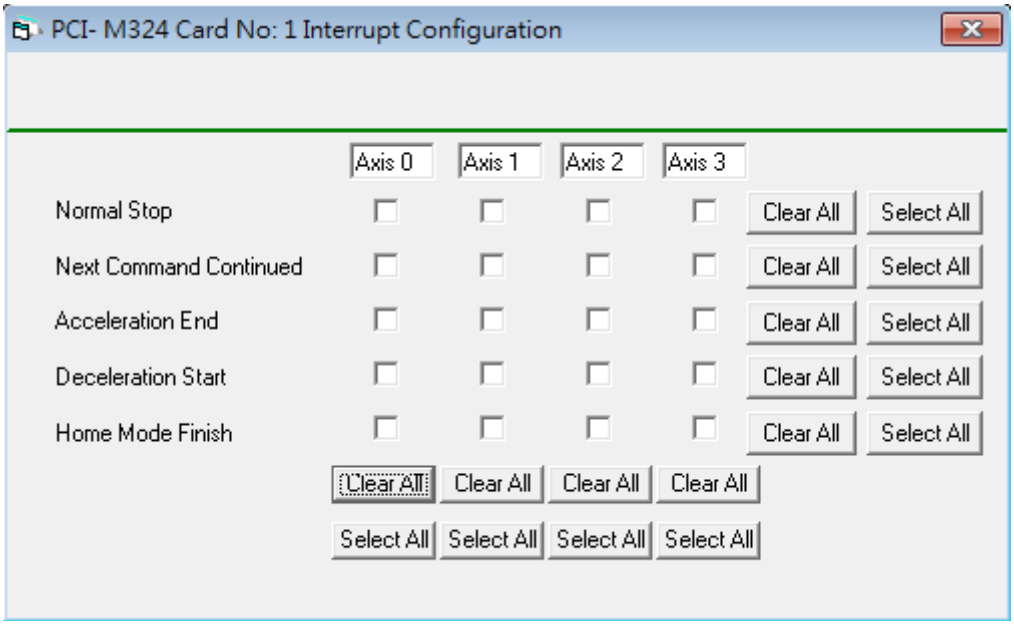

Figure 6.5.3 Interrupt Configuration setting page

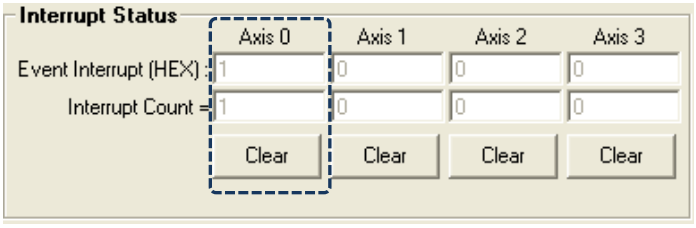

Figure 6.5.4 Number of times that interruption occurred

3. Speed / position curve page

You can open the speed and position simulation screen by clicking [Simulation] > [Drawspeed_M324] and [DrawsPos_M324] in the function menu. As shown in Figure 6.5.6 and Figure 6.5.7, these are the simulation images for the helical motion speed and position. After you select the [CardNo] and [Axis], click **Start**, and the motion image is displayed when the motion control card starts the movement.

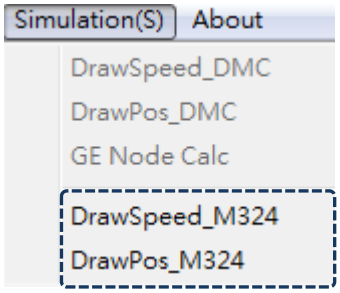

Figure 6.5.5 Speed / position curve selection function

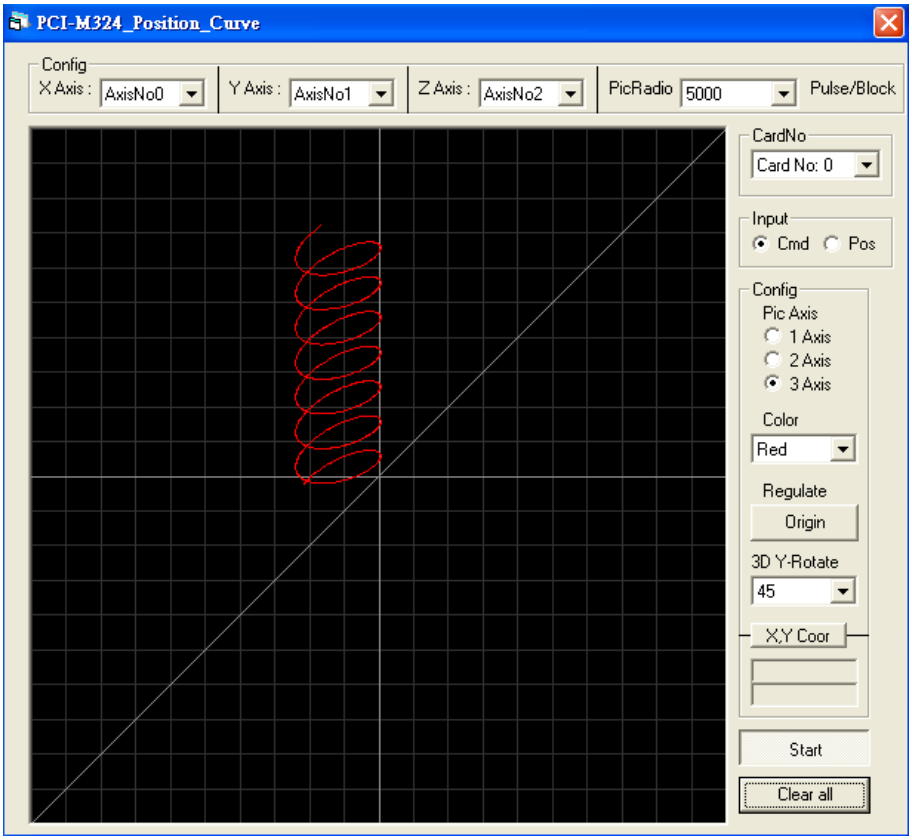

Figure 6.5.6 Position simulation image

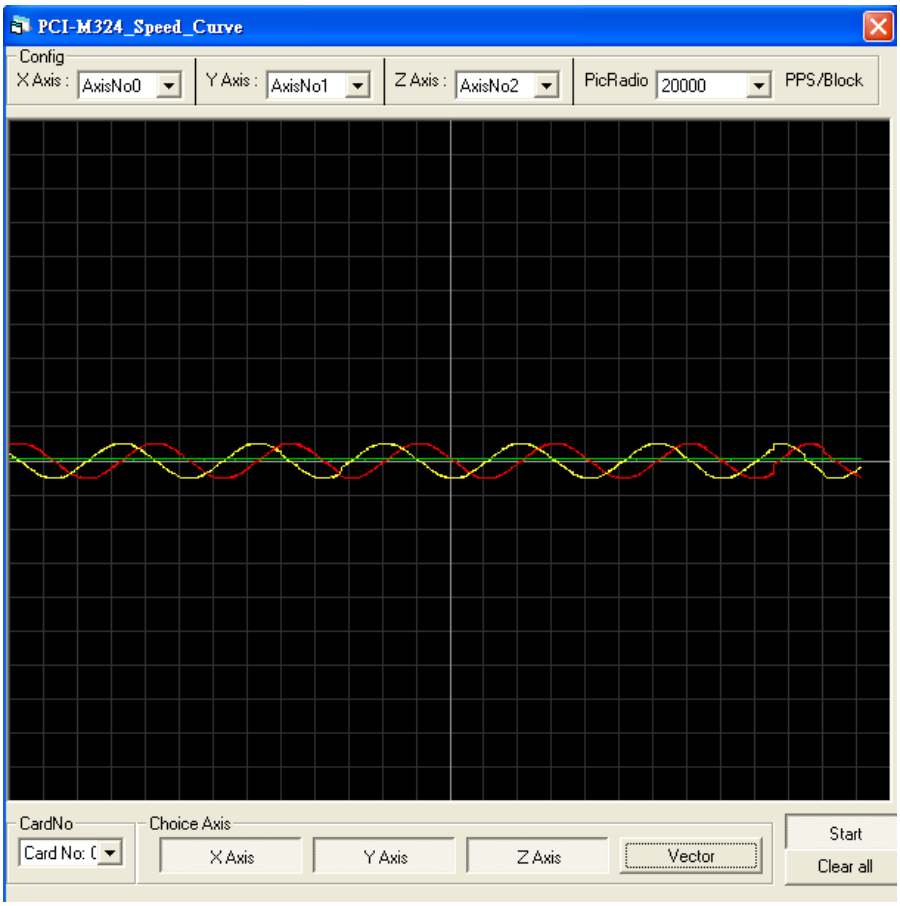

Figure 6.5.7 Speed simulation image

4. CMP setting screen

You can open the CMP setting screen (Figure 6.5.9) by clicking [Option] > [M324_Compare] in the function menu. To output the trigger signal when in motion, set the CMP start position, end position, and interval.

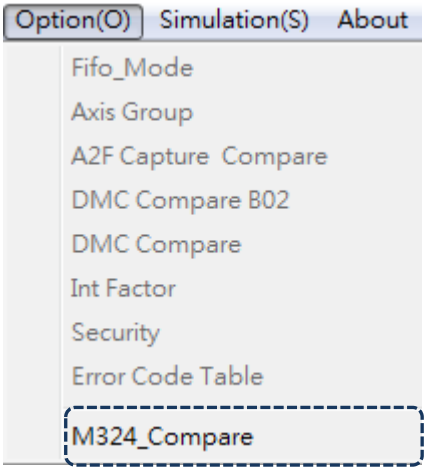

Figure 6.5.8 Open the position comparison setting screen

6

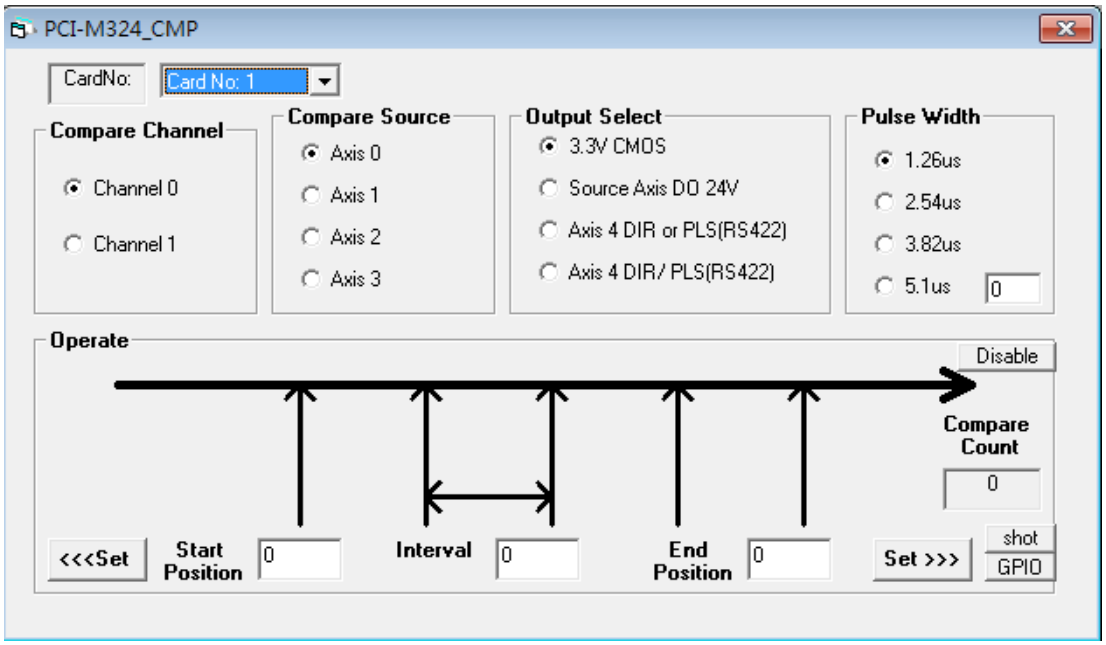

Figure 6.5.9 Position comparison function setting screen

Revision History

Release date	Version	Chapter	Revision contents
November, 2017	V1.0 (First edition)		

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