

# PISO-PS400 Getting Started Manual

(Version 3.2)

Hardware & Software & Application  
Using PISO-PS400 PCI Motion Control Card



**ICP DAS CO., LTD.**

泓格科技股份有限公司

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# 1 INTRODUCTION

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## 1.1 Introduction

The PISO-PS400 is a 4-axis stepping/pulse-type servo motor PCI motion card with maximum 4M PPS pulse output, and is suitable for general-purpose motion applications. This motion card contains a high-performance motion ASIC. Apart from a wide speed range, this intelligent motion controller also has a variety of motion control functions built in, such as 2~3-axis linear interpolation, 2-axis circular interpolation, T/S-curve acceleration/deceleration, various synchronous actions, automatic homing, and others. Besides, one FRnet port is contained in this motion card. The FRnet port allows this motion card to expand its fast remote I/O easily. The two-wired FRnet signal can automatically scan its 128 DI and 128 DO with a period of 0.72/2.88ms. In addition, most of the PISO-PS400 motion control functions are performed with little load on the processor. While driving the motors, the motion status, and the other I/O status on the PC can still be monitored. As a result of the low CPU loading requirements of PC, one or more motion control card may be used on a single PC (At most 16 PS400 motion card can be added in a PC). Multi-axes (4 or 8 ..... axes) motion control algorithm can be achieved in a single PC. ICPDAS has also provided a wide range of functions and examples to reduce the need for programming by users, making it a highly cost-effective solution for machine makers.

## 1.2 Hardware Specification

### 1.2.1 Main Specification

- ASIC Chip MCX314As
- Number of controllable 4-Axes, Pulse output (stepping & servo motor)
- Up to 4M PPS pulse output

### 1.2.2 Interpolation Function

#### 2-axes & 3-axes linear interpolation

- Interpolation range  $-2,147,483,646 \sim +2,147,483,646$
- Vectors speed of interpolation 1 PPS  $\sim$  4M PPS
- Precision of interpolation  $\pm 0.5$  LSB

#### Circular interpolation

- Interpolation range  $-2,147,483,646 \sim +2,147,483,646$
- Vectors speed of interpolation 1 PPS  $\sim$  4M PPS

#### Relative interpolation function

- Any 2-axes or 3-axes interpolation
- Fixed vectors speed
- Continuous interpolation

### 1.2.3 Pulse Output

- Output speed range 1 PPS ~ 4 MPPS
- Output precision  $\pm 0.1\%$
- Jerk range of S-curve 954 ~  $62.5 \times 10^6$  PPS/S<sup>2</sup>  
477 x 10<sup>3</sup> ~ 31.25 x 10<sup>9</sup> PPS/S<sup>2</sup>
- Acceleration/deceleration range 125 ~ 1 x 10<sup>6</sup> PPS/S  
62.5x10<sup>3</sup> ~ 500 x 10<sup>6</sup> PPS/S
- Speed precision 1 PPS ~ 500PPS(In accordance with a highest speed)
- Output numbers 0 ~ 4,294,967,295 / unlimited
- Velocity profiles mode:
  - ◆ Fixed
  - ◆ Symmetrical & Asymmetrical Trapezoidal velocity profile
  - ◆ Symmetrical & Asymmetrical S-curve velocity profile
- Acceleration & Deceleration mode
  - ◆ Auto
  - ◆ By user define
- Position & Speed change on the fly
- Fixed pulse output by Trapezoidal and S-curve velocity profile
- Pulse output option: CW/CCW, PULSE/DIR
- Programmable logic level

### 1.2.4 Encoder Input

- Encoder option: A/B phase, Up/Down (CW/CCW)
- Programmable A/B phase mode: 1, 1/2, and 1/4 A/B phase



## 1.2.5 Position Counter

- Command counter range                            -2,147,483,648 ~ +2,147,483,647
- Feedback counter range                           -2,147,483,648 ~ +2,147,483,647
- Programmable ring counter
- Programmable direction of counter
- Use DI(IN3) to clear feedback counter
- Programmable read & write counter

## 1.2.6 FRnet

- DI            → max up to 128
- DO            → max up to 128

## 1.2.7 Auto-Homing

- Four Steps
  - ◆ Step 1 ( High-speed to find "Near Home" sensor)
  - ◆ Step 2 ( Low-speed to find "Home" sensor)
  - ◆ Step 3 ( Low-speed to find Index Z sensor)
  - ◆ Step 4 ( Execute offset position of high-speed)

Every step can be set to execute or not, and running direction.

## 1.2.8 Servo Motor Input Signal

- Alarm
- In-Position
- Choose input signal: Enable/disable and logic level

## 1.2.9 Limit Switch Input Signal

- Two-limit switch signal for each axis: +EL, -EL
- Programmable logic level
- Programmable action mode( slow-down stop or immediately stop)

## 1.2.10 Other Input Signals

- IN3 : other purpose, as a trigger of synchronal control.....

## 1.2.11 Emergency Stop Signal Input

- There is an Emergency stop signal for Each motion card

## 1.2.12 General Output Signal

- The Servo-on signal (nOUT1) can be used as servo-on control or general purpose output signal for each axis.

## 1.2.13 Integral Input Signal Filters

- The motion card is equipped with an integral type filter in the input step for each input signal. User can select a digital filter with different time constant.

## 1.2.14 Software Limit

- There are two software end-limit for each axis: +SEL & -SEL (Setting range : -2,147,483,646 ~ +2,147,483,646)

## 1.2.15 Manual Pulse Generator

- Manual pulsar mode (A/B phase pulse mode)
- Fixed Pulse Driving Mode (CW/CCW pulse mode)
- Continuous Pulse Driving Mode (Low-level mode)
- Disable Mode: Disable manual pulse function

## 1.3 Environment

- Operating Temp: -20 ~ + 75°C
- Storage Temp: -30 ~ +85°C
- Operating Humidity: 10 ~ 85% , non-condensing
- Storage Humidity: 5 ~ 90% , non-condensing
- I/O optically isolated 2500Vrms
- External Power supply( Input): 24V DC (On Terminal Board)

## 1.4 Ordering Information

- PISO-PS400 4 axes PCI motion card
- DN-8468GB Terminal board for general purpose usage
- DN-8468MB Terminal board for Mitsubishi Servo motor
- DN-8468PB Terminal board for Panasonic Servo motor
- DN-8468DB Terminal board for Delta Servo motor
- CA-SCSI15 68-pin SCSI-II cable · length:1.5 m

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## 2 HARDWARE INSTALLATION

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### 2.1 Checking Package and Installation

#### 2.1.1 Check Package

PISO-PS400G/S includes the following item

- PISO-PS400 4-axes PCI motion card
- DN-8468GB Terminal board for general purpose usage
- CA-SCSI15 68-pin SCSI-II cable · length:1.5 m

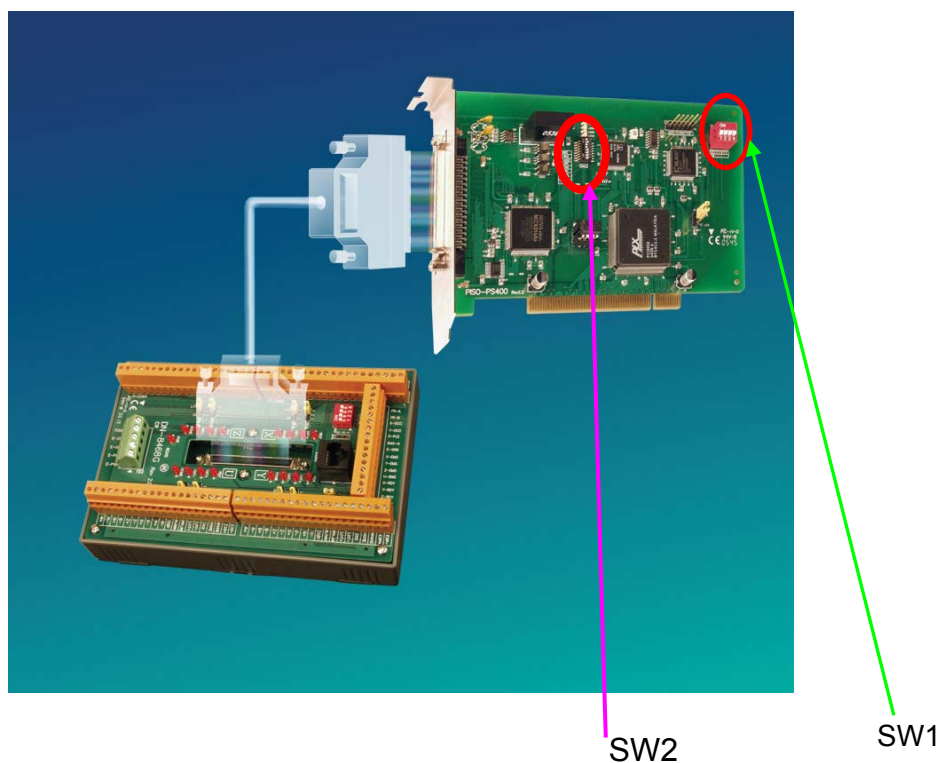
#### 2.1.2 Installation

##### ■ Prepare controller

1. Choose a personal PC with empty PCI slot.
2. Turn power off

##### ■ Motion card Plug-in and wiring

1. Switch SW1 and SW2 to desired position.
2. Plug in the PISO-PS400 into an empty PCI slot of PC.
3. Connect the PISO-PS400 with DN-8468G by a CA-SCSI15 cable, as the below figure:



### 2.1.3 SW1 Setting

The Card ID of each PISO-PS400 motion card is defined by setting the on-board switch SW1 (1~4) shown in section 2.1.2. The default setting of the Card ID is 0 by setting SW1(1~4) to be OFF. If users set 1 and 2 on SW1 to be ON, the Card ID of the motion card is 3. Up to 16 motion cards in the same system can be supported by setting different Card ID (Card ID = 0~15).

SW1	1	2	3	4
ON				
OFF				

Default setting

### 2.1.4 SW2 Setting

SW2(1~8) is designed for FRnet setting and is shown in section 2.1.2. Node 5 on SW2 is the transfer rate setting of FRnet. The default setting is ON for 250kHz transfer rate. If users change the node 5 to be OFF, the transfer rate will be 1MHz and the slave module must support 1MHz transfer rate to receive and send signals. Except the node 5 on SW2, the others node are for future extension setting. Do not change the default setting of SW2 except node 5. If users change the switch setting, the FRnet may not keep working.

SW2	1	2	3	4	5	6	7	8
ON								
OFF								

## 2.2 DN-8468G Terminal Board

The DN-8468 is the terminal board for general purpose amplifier usage. It has 4-axis I/O signals.

### 2.2.1 Board Layout for DN-8468G

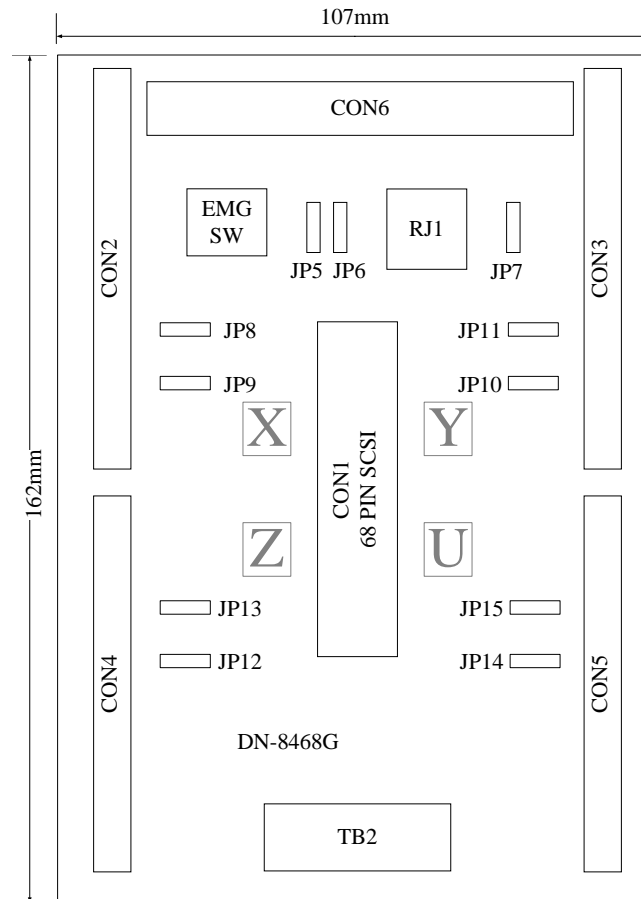


Fig. 2.0 Board layout for the DN-8468G

## 2.2.2 Signal Connections for DN-8468G

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468G is a 68-pin SCSI II connector that enables you to connect to the PISO-PS400 motion card. Fig. 2.1 shows the pin assignment for the 68-pin I/O connector on the DN-8468G (or on the PISO-PS400), and refer to Table 2.1, 2.2 for description of each motion I/O signal.

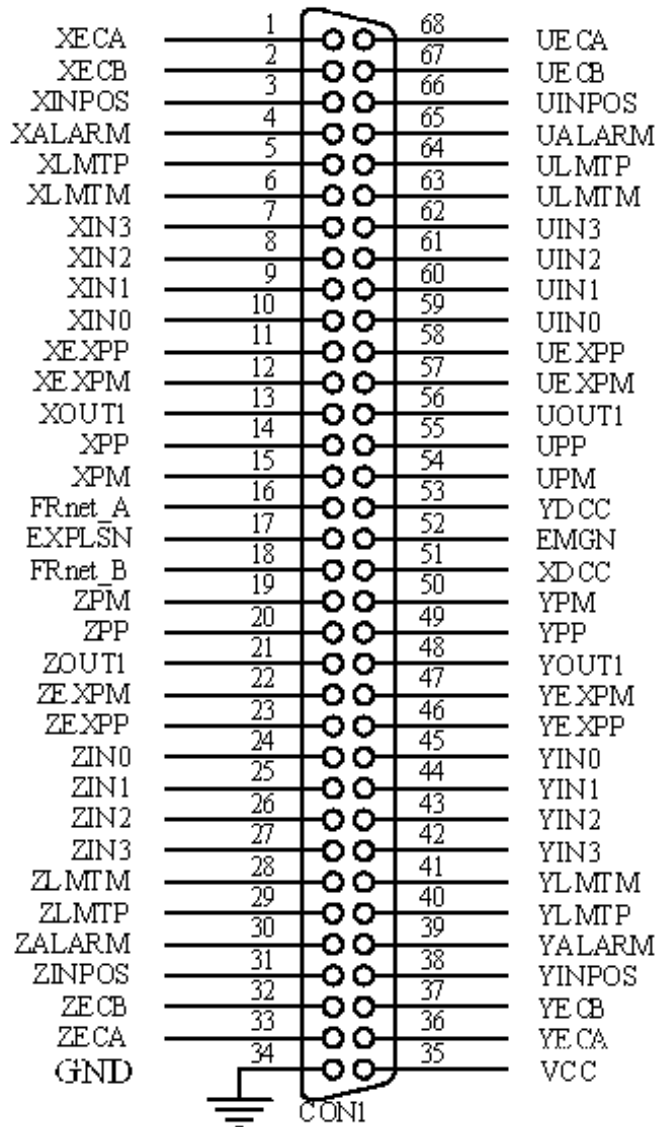


Fig. 2.1 I/O connector pin assignment for the CON1

Table 2.1 DN-8468G I/O connector signal description (part 1)

Pin name	Pin number	Description
XECA	1	Encoder A-phase signal for X axis
YECA	36	Encoder A-phase signal for Y axis
ZECA	33	Encoder A-phase signal for Z axis
UECA	68	Encoder A-phase signal for U axis
XECB	2	Encoder B-Phase signal for X axis
YECB	37	Encoder B-Phase signal for Y axis
ZECB	32	Encoder B-Phase signal for Z axis
UECB	67	Encoder B-Phase signal for U axis
XINPOS	3	In-position signal for X axis
YINPOS	38	In-position signal for Y axis
ZINPOS	31	In-position signal for Z axis
UINPOS	66	In-position signal for U axis
XALARM	4	Alarm signal for X axis
YALARM	39	Alarm signal for Y axis
ZALARM	30	Alarm signal for Z axis
UALARM	65	Alarm signal for U axis
XLMTM	5	Limit switch input signal (+) for X axis
YLMTM	40	Limit switch input signal (+) for Y axis
ZLMTM	29	Limit switch input signal (+) for Z axis
ULMTM	64	Limit switch input signal (+) for U axis
XLMTM	6	Limit switch input signal (-) for X axis
YLMTM	41	Limit switch input signal (-) for Y axis
ZLMTM	28	Limit switch input signal (-) for Z axis
ULMTM	63	Limit switch input signal (-) for U axis
XIN3	7	Input 3 signal for X axis
YIN3	42	Input 3 signal for Y axis
ZIN3	27	Input 3 signal for Z axis
UIN3	62	Input 3 signal for U axis
XIN2	8	Input 2 signal for X axis
XIN2	43	Input 2 signal for Y axis
XIN2	26	Input 2 signal for Z axis
XIN2	61	Input 2 signal for U axis
XIN1	9	Input 1 signal for X axis
YIN1	44	Input 1 signal for Y axis
ZIN1	25	Input 1 signal for Z axis
UIN1	60	Input 1 signal for U axis
XIN0	10	Input 0 signal for X axis
YIN0	45	Input 0 signal for Y axis
ZIN0	24	Input 0 signal for Z axis
UIN0	59	Input 0 signal for U axis



Table 2.2 DN-8468G I/O connector signal description (part 2)

Pin name	Pin number	Description
XEXPP	11	EXT pulsar input signal (+) for X axis
YEXPP	46	EXT pulsar input signal (+) for Y axis
ZEXPP	23	EXT pulsar input signal (+) for Z axis
UEXPP	58	EXT pulsar input signal (+) for U axis
XEXPM	12	EXT pulsar input signal (-) for X axis
YEXPM	47	EXT pulsar input signal (-) for Y axis
ZEXPM	22	EXT pulsar input signal (-) for Z axis
UEXPM	57	EXT pulsar input signal (-) for U axis
XDRIVE	13	Driver enable signal for X axis
YDRIVE	48	Driver enable signal for Y axis
ZDRIVE	21	Driver enable signal for Z axis
UDRIVE	56	Driver enable signal for U axis
XPP	14	Driving pulsar signal (+) for X axis
YPP	49	Driving pulsar signal (+) for Y axis
ZPP	20	Driving pulsar signal (+) for Z axis
UPP	55	Driving pulsar signal (+) for U axis
XPM	15	Driving pulsar signal (+) for X axis
YPM	50	Driving pulsar signal (+) for Y axis
ZPM	19	Driving pulsar signal (+) for Z axis
UPM	54	Driving pulsar signal (+) for U axis
XOUT1	16	Output 1 signal for X axis
YOUT1	48	Output 1 signal for Y axis
ZOUT1	21	Output 1 signal for Z axis
UOUT1	56	Output 1 signal for U axis
EXPLSN1	17	EXT pulse input signal for interpolation
EMGN1	52	Emergency stop input signal
FrnetA	16	FRnet port A
FrnetB	18	FRnet port B
XDCC	51	Deviation Counter Clear for X axis
YDCC	53	Deviation Counter Clear for Y axis
GND	34	Ground
VCC	35	External power (12~24V)

■ **CON2 ~ CON5 (I/O connector for each AXIS)**

The connectors CON2 ~ CON5 are 20-pin connectors that enable you to connect to the I/O signals for general purpose motor drivers. Fig. 2.2 shows the pin assignment for the 20-pin connector on the DN-8468G, and the Table 2.3 shows its I/O connector signal description.

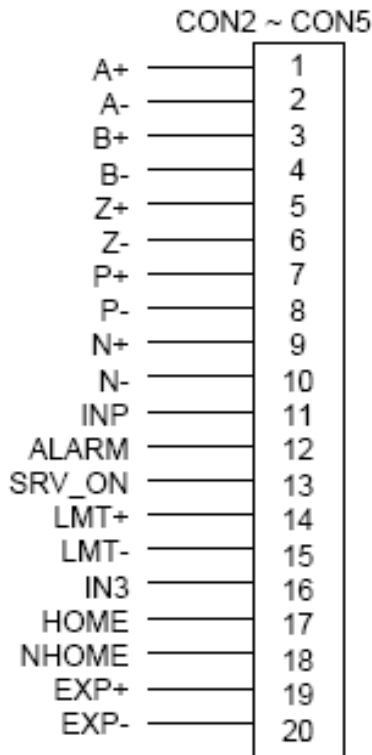


Fig. 2.2 Pin definition for CON2 ~ CON5

Table 2.3 CON2 ~ CON5 Signal Connection

Name	Number	Description
A+	1	Encoder A-Phase (+)
A-	2	Encoder A-Phase (-)
B+	3	Encoder B-Phase (+)
B-	4	Encoder B-Phase (-)
Z+	5	Encoder Z-Phase (+)
Z-	6	Encoder Z-Phase (-)
P+	7	Positive Direction Pulse Output(+)
P-	8	Positive Direction Pulse Output(-)
N+	9	Negative Direction Pulse Output(+)
N-	10	Negative Direction Pulse Output(-)
INP	11	Servo In Position
ALARM	12	Servo Alarm
SRV_ON	13	Servo On
LMT+	14	END Limit Signal (EL+)
LMT-	15	END Limit Signal (EL-)
IN3	16	Input Signal (IN3)
HOME	17	Home Sensor Input Signal
NHOME	18	Near Home Sensor Input Signal
EXP+	19	EXT Positive Direction Pulse (+)
EXP-	20	EXT Negative Direction Pulse (-)

## ■ CON6

The connector CON6 is 16-pin connector that enables you to connect to the signals of your motor drivers. The FRnet connectors, FR-A and FR-B, can be used to serially connect a I/O module of FRnet series, as FR-2053,FR-2057.... The more information, please refer to web-site of ICPDAS :

[http://www.icpdas.com/products/Remote\\_IO/frnet/frnet\\_introduction.htm](http://www.icpdas.com/products/Remote_IO/frnet/frnet_introduction.htm)

Fig.2.3 shows the pin assignment for the 16-pin connector on the DN-8468G, and the Table 2.4 shows its I/O connector signal description.

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
X-DCC	Deviation Counter Clear for X axis
Y-DCC	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground
X-EMG	EMG input signal for X axis
Y-EMG	EMG input signal for Y axis
Z-EMG	EMG input signal for Z axis
U-EMG	EMG input signal for U axis
X-RDY	Ready input signal for X axis
Y-RDY	Ready input signal for Y axis
Z-RDY	Ready input signal for Z axis
U-RDY	Ready input signal for U axis

CON6	
16	FR-A
15	FR-B
14	X-DCC
13	Y-DCC
12	E-PLS
11	EMG-A
10	E-GND
9	X-EMG
8	Y-EMG
7	Z-EMG
6	U-EMG
5	X-RDY
4	Y-RDY
3	Z-RDY
2	U-RDY
1	E-GND

Fig. 2-3 Pin definition for CON6

■ **TB2**

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.2.4 shows the pin assignment for the 5-pin connector on the DN-8468G, and the Table 2.5 shows its I/O connector signal description.

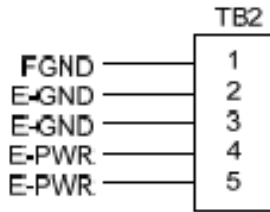


Table 2.5 TB2 Signal Connection

Name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

Fig. 2.4 Pin definition for TB2

► **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happen

■ **RJ1 (The I/O signals of the FRnet)**

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. The FRnet connectors, FR-A and FR-B, can be used to serially connect a I/O module of FRnet series, as FR-2053,FR-2057.... The more information, please refer to web-site of ICPDAS:

[http://www.icpdas.com/products/Remote\\_IO/frnet/frnet\\_introduction.htm](http://www.icpdas.com/products/Remote_IO/frnet/frnet_introduction.htm)

Fig.2.5shows the pin assignment for the 8-pin connector on the DN-8468G, and the Table 2.6 shows its I/O connector signal description.

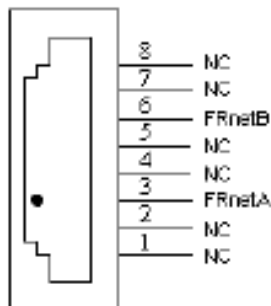


Table 2.6 RJ1

Pin name	Description
FRnetA	FRnet port A
FRnetB	FRnet port B
NC	No connection

Fig. 2.5 Pin definition for RJ1

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## 2.2.3 Jumper and Switch Settings

### ■ JP7

Jumper 7 controls the EMG-A signal of the CON6 connector. The following diagram is shown the selection condition of the jumper 7.

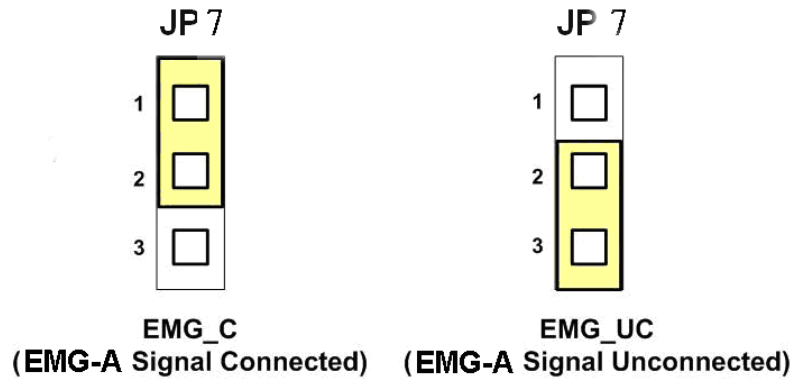


Fig. 2.6 Jumper 7 setting

### ■ JP8/9, JP10/11, JP12/13, JP14/15

The Jumper8~15 are used to set the signal type of the pulse output signals. The output signal type could be differential line driver output or open collector output. The JP8 ~JP9 are set XPP、XPM for X-axis(CON1), JP10 ~JP11 are for Y-axis, JP12 ~JP13 are for Z-axis and JP14 ~JP15 are for U-axis. The 2-3 Pin short is the differential line driver mode. The 1-2 Pin short is the Open Collector mode, as below example

▶ **note:** Open Collector output、P+ (N+) and EXT\_5V short、offer external usage (Refer to section 2.3)。

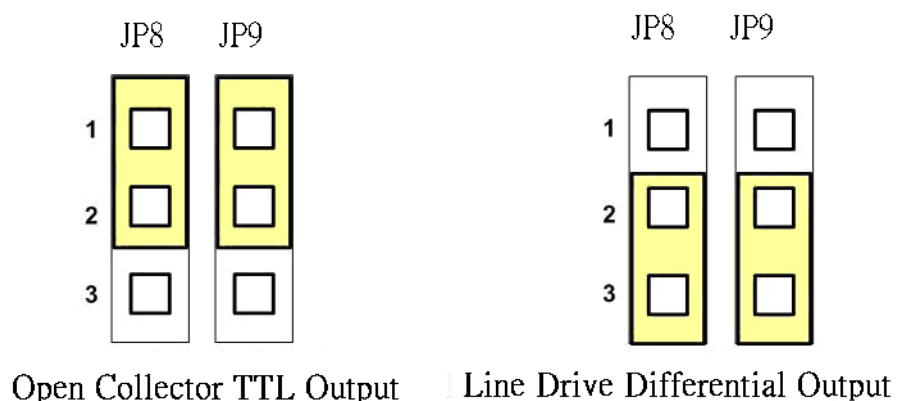


Fig. 2.10 Jumper 8, 9 setting

## ■ EMG SW

The emergency stop signal for each servo amplifier can be selected from EMG SW. The number 1, 2, 3, 4 on EMG SW are denoted as axis X, Y, Z, U, respectively. Fig. 2.7 is the default setting to connect the EMG signals to GND. The EMG signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 2.8, the emergency stop signals can be controlled from EMG signals in CON6.



Fig. 2.7 EMG SW setting for normally GND (Default setting)

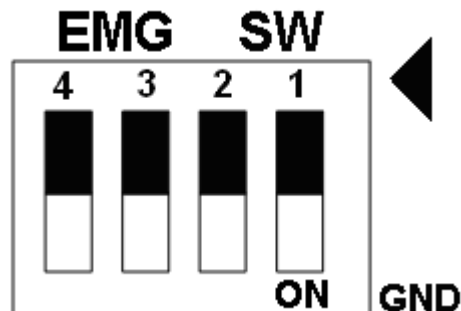


Fig. 2.8 EMG SW setting for user controlled signals.

## 2.3 Input/Output Connections

### 2.3.1 Output Pulse Signals

There are 4-axes pulse output signals on PISO-PS400. For every axis, two pairs of CW and CCW signals are used to send the pulse train. The CW and CCW signals can also be programmed as PULSE and DIR signals. Two types of the pulse output signal, Differential-Type and Open-Collector Type, can be selected from JP8/9, JP10/11, JP12/13, and JP14/15 and are described in section 2.2.3. The following wiring diagram is for the CW and CCW signals of the 4-axes.

#### ◆ Output to Motor Drivers in Differential Circuit

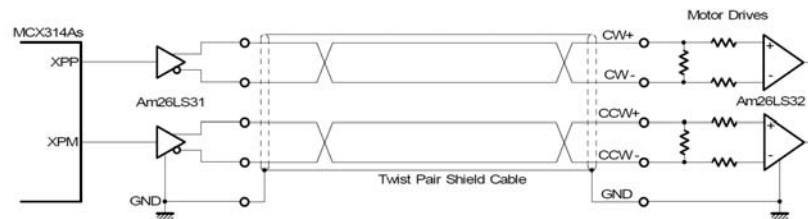


Fig. 2.9 Differential-Type pulse output circuit

#### ◆ Open Collector TTL Output

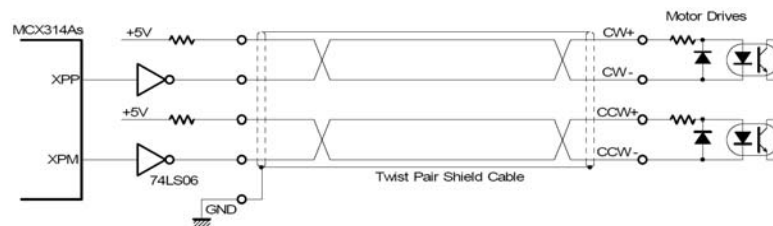


Fig. 2.10 Open-Collector pulse output circuit

#### ◆ Example: wiring of pulse signal

Two types of pulse output signal, Differential-Type and Open-Collector Type, can be selected from JP8/9, JP10/11, JP12/13, and JP14/15 for each axis. The following wiring diagram is an example to select pulse type of the output signal.

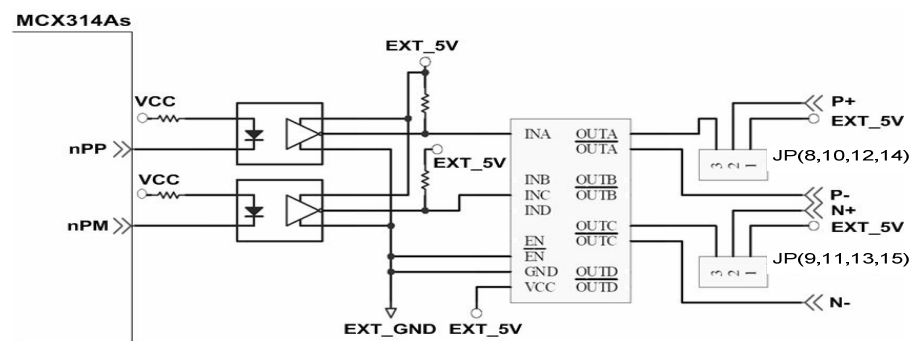
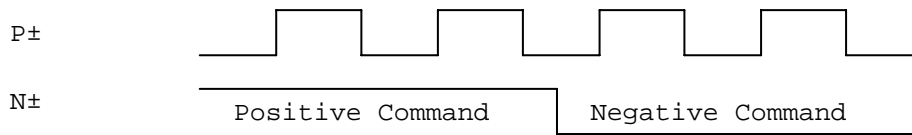


Fig. 2.11 Output pulse example

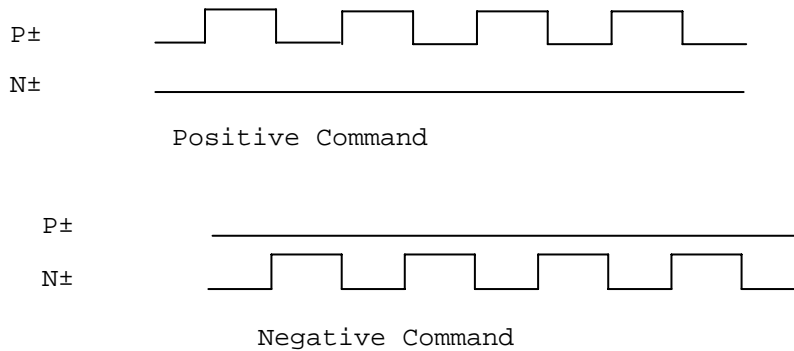
◆ Pulse/Direction pulse output mode:

In Pulse/Direction pulse output mode, the PULSE signal is output only at Pulse pins (P+, P-). The driving direction is decided from the electric potential of Direction pins (N+, N-). The following diagram is example signal of Pulse/Direction pulse output mode.



◆ CW/CCW pulse output mode:

In CW/CCW pulse output mode, the PULSE signal is output at both CW pins (P+, P-) and CCW pins (N+, N-). At the same time, the driving direction is determined directly. The following diagram is example signal of CW/CCW pulse output mode.





## 2.3.2 Connection for Limit Switch Signal

Limit Switch Signal can prevent the over traveling appearance of the motion system. User can set the hardware limit switch signal to be normal open or normal close by the software instruction in PISO-PS400 software manual. The following figure indicates that the photo couplers are used to keep out the sensor noise of the Limit Switch.

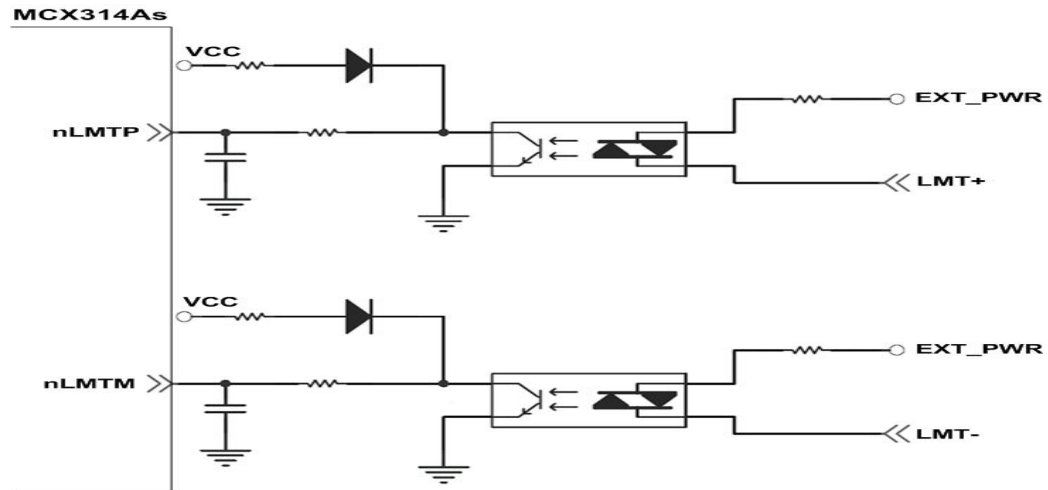


Fig. 2.11 Limit switch signal circuit

## 2.3.3 General Purpose Input Signal (nINPOS, nALARM)

INPOS is a digital input signal to indicate the In-Position signal of the driver. User can enable or disable the signal from the software instruction in PISO-PS400 software manual.

ALARM is a digital input signal to indicate the servo alarm signal of the driver. The output pulse will be stop if PISO-PS400 receives the ALARM signal. User can enable or disable the signal from the software instruction in PISO-PS400 software manual.

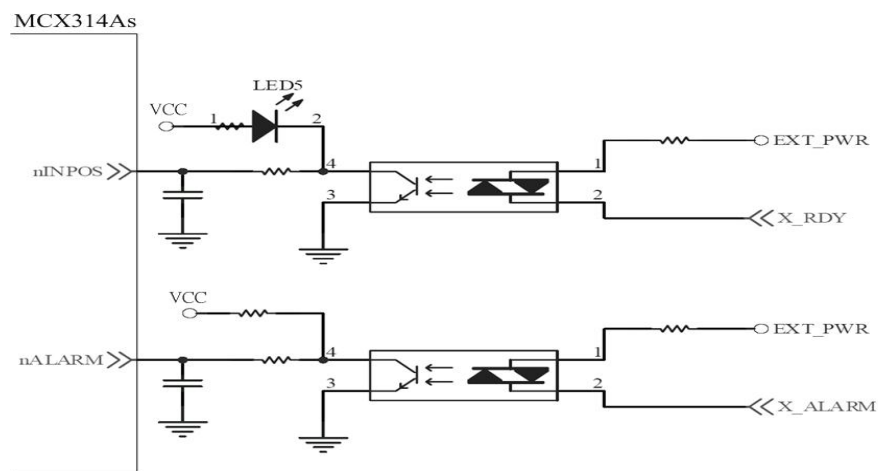


Fig. 2.12 General Digital Input circuit

## 2.3.4 Encoder Signals

The following diagram is for Differential-Type encoder signals. Connect the Phase A signal to A+ and A- pins and connect Phase B signal to B+ and B- pins. After the high speed photo coupler isolation, the isolated encoder signals are connected to motion IC.

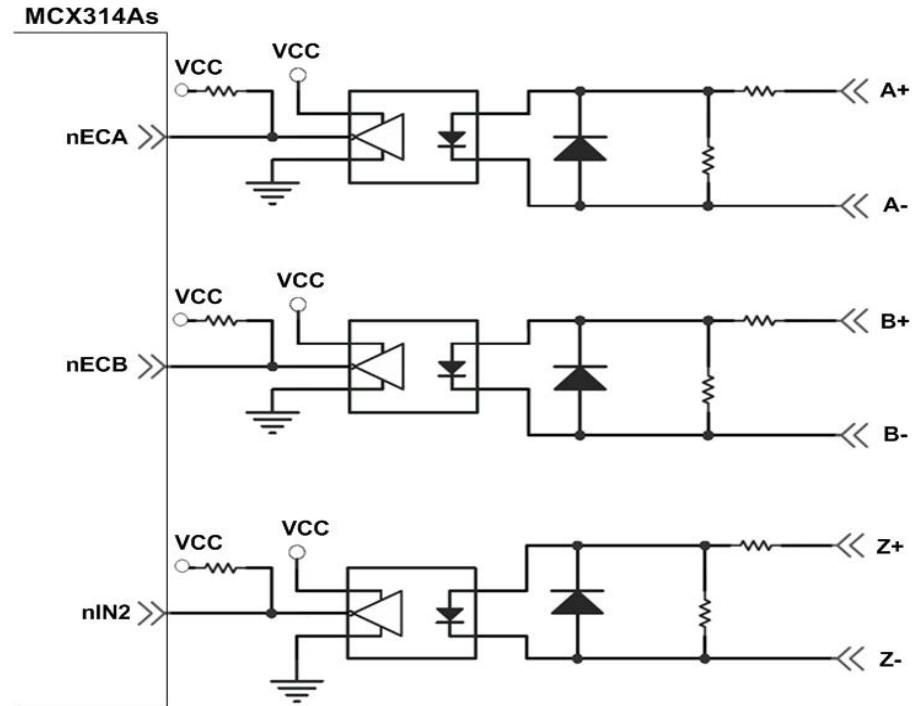


Fig. 2.13 Encoder signal connection

## 2.3.5 Emergency Stop Signal

The following diagram is for Emergency STOP signal. If the emergency signal is occurred, the output pulse for all axes will be STOP and the error flag will be set as 1. After the photo coupler isolation, the isolated emergency signal is connected to motion IC.

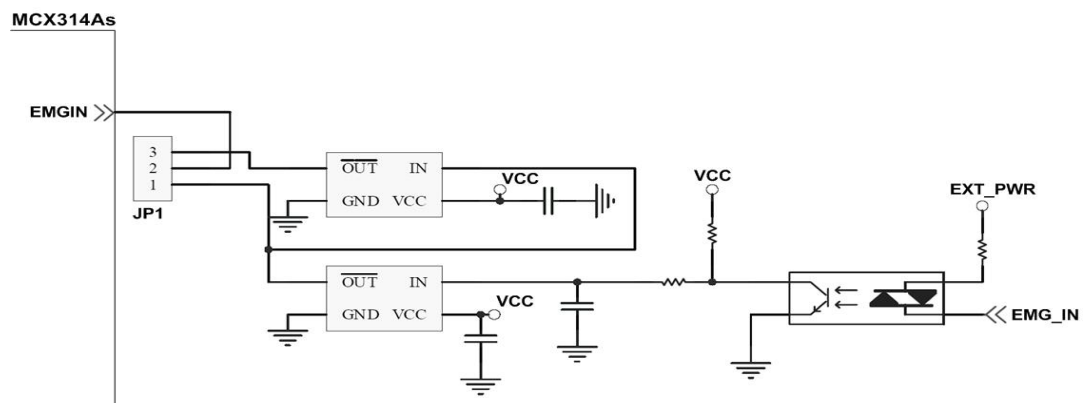


Fig. 2.15 Emergency Stop Signal connection

## 2.3.6 Manual pulse Generator Input Signals (EXP+,EXP-)

The signals, EXP+ and EXP-, are used for manual pulsar signals. The following diagram is an example connection for the external inputs. User can set the signals as fixed pulse CW/CCW mode, continuous pulse CW/CCW mode, or A/B phase manual pulsar mode by using the setting in section 3.5.

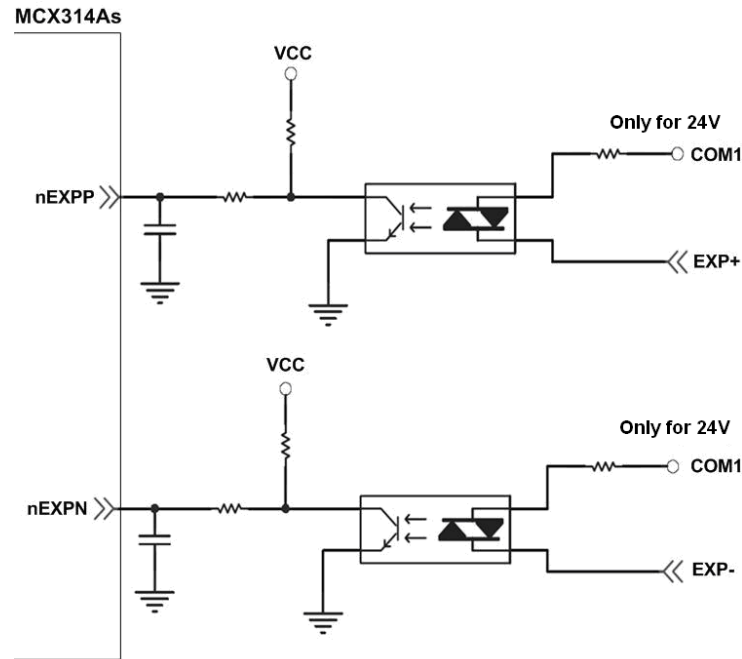


Fig. 2.16 EXP+/- connection diagram

## 2.3.7 General Purpose Output Signals(Servo On/Off)

The following diagram is a digital output signal for driver Servo On/Off signal. The output signal enable or disable the driver.

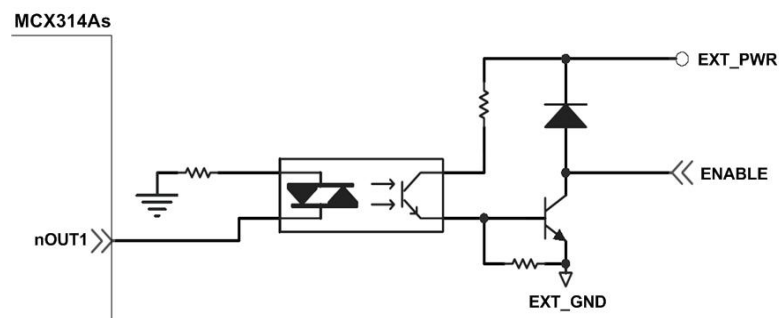


Fig. 2.17 Servo On/Off signal connection diagram

## 2.4 Connection Example for Motor Driver

The following diagram is the connection example between MITSUBISHI MR-J2S AC servo driver and the extension board DN-8468G.

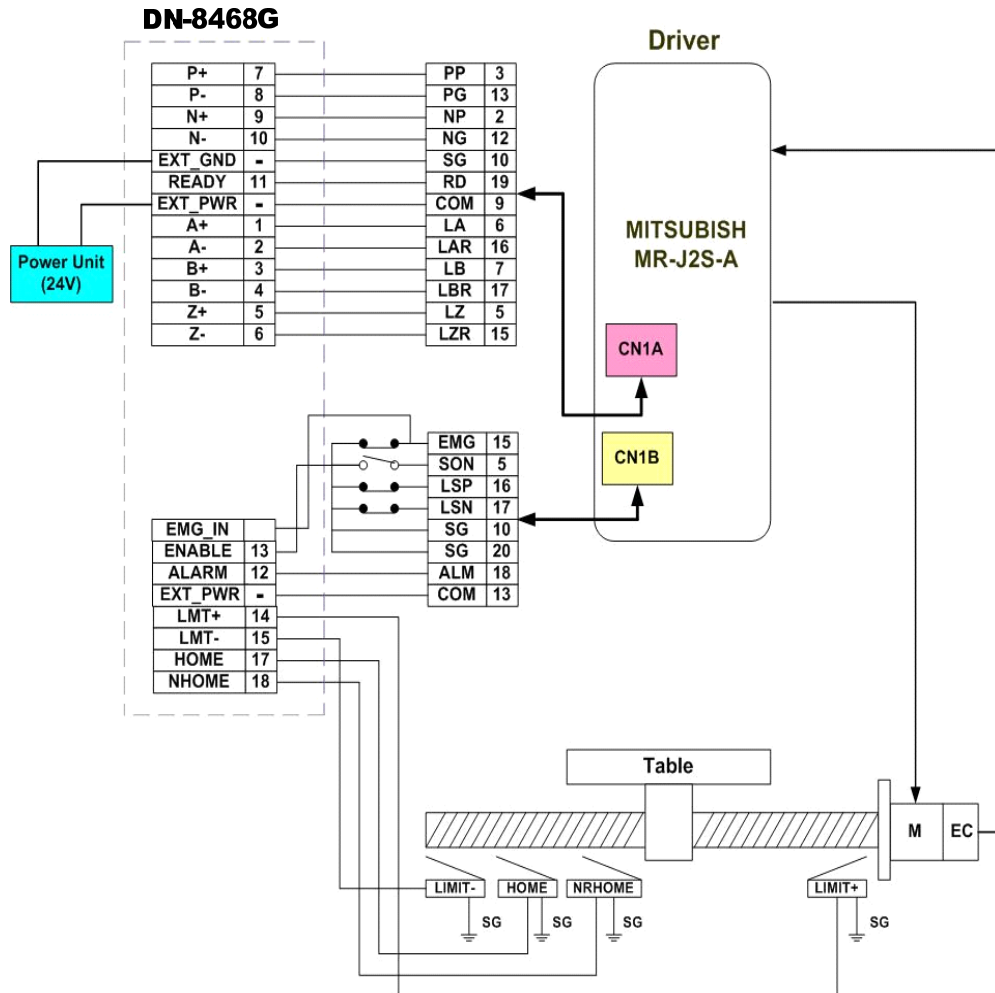


Fig. 2.18 The connection between MR-J2S AC servo driver and DN-8468G extension board.

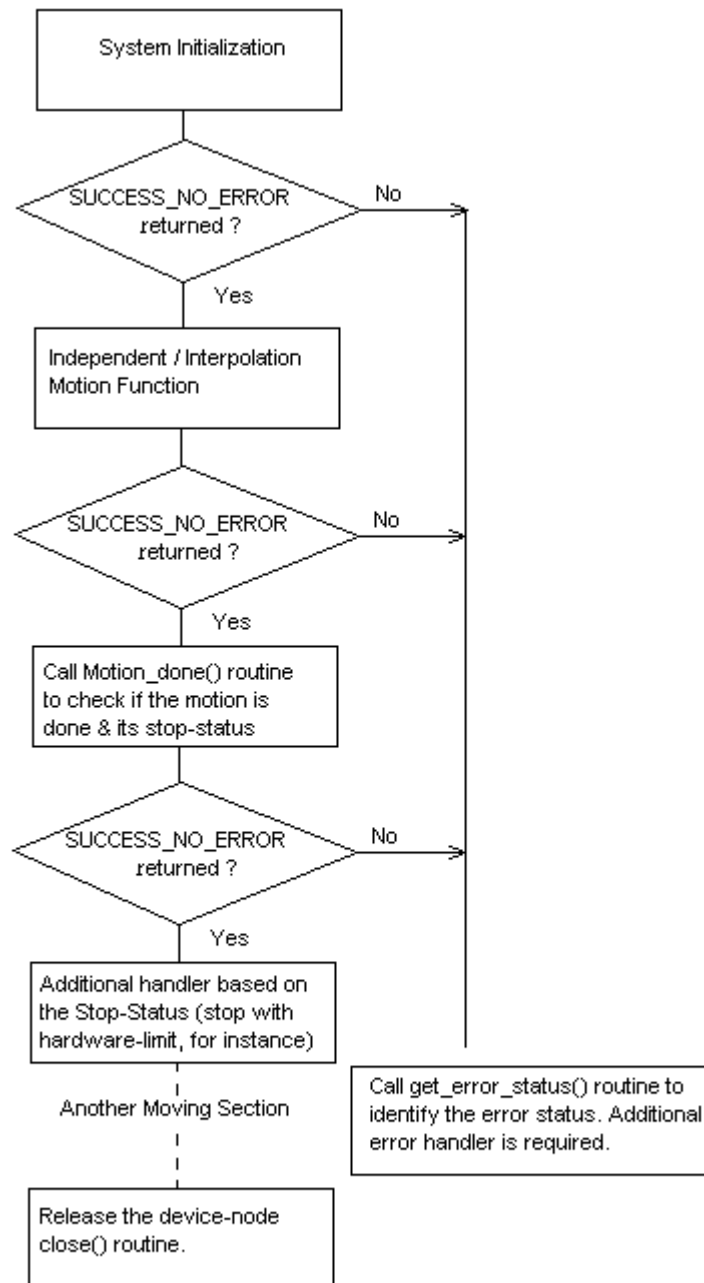
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## 3 SOFTWARE DEVELOPMENT OVERVIEW

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### 3.1 Software Development Overview

The programming following-chart is shown as follows:



The samples for VC6, VB6 and BCB6 are provided to demonstrate the related functions. Please refer to the samples for detail.

## 3.2 Safety IO Setting

There are many reasons to stop motion during driving. Some reasons are described in the subsections.

### 3.2.1 Emergency Stop Signal Input

The EMG-A input signal in CON6 is able to perform the emergency stop function immediately for all of the 4 axes during driving. The emergency stop function can prevent the critical damage occurrence from the critical accident. If user don't use this Emergency stop signal, please closing breaks between 2 and 3 of JP7 jumper. Otherwise, please closing breaks between 1 and 2 of JP7 jumper and connecting the EMG-A signal to CON6.

The EMG-X, EMG-Y, EMG-Z, and EMG-U input signals in CON6 are connected directly to the driver for each axis. These signals are able to perform the emergency stop function immediately for each driver during driving. User have to switch the EMG-SW to normal ON and connect external signal source to enable these signals.

### 3.2.2 Configure the Servo ALARM Signals

When the ALARM signals are occurred from servomotor drivers, users can be notified by these signals and determine what to do. The operating mode (Enable or Disable) and the proper trigger level of these signals can be set by user. Please refer to `ps400_set_alarm()` function, the section 2.3.2 of *PISO-PS400 Function Reference*.

### 3.2.3 Configure the Limit Switch Signals( $\pm$ EL)

To insure the machine in safety, hardware limit switches are placed at the both ends of machine traveling range. If the machine touch the hardware limit switch sensors, PISO-PS400 will stop immediately. The operating mode (Enable or Disable) and the proper trigger level of these signals can be set by user. Please refer to `ps400_set_limit ()` function, the section 2.2.5 of *PISO-PS400 Function Reference*.

### 3.2.4 Configure the Software Limite ( $\pm$ SEL)

To insure the machine in safety, hardware limit switches are placed at the both ends of machine traveling range. In addition, user can set the software limits to avoid the happening of the over range before the hardware limit takes effect. If the machine reach the software limits condition, PISO-PS400 will stop immediately. The operating mode (Enable or Disable) and the proper trigger condition of these signals can be set by user. Please refer to `ps400_set_softlimit ()` function, the section 2.3.4 of *PISO-PS400 Function Reference*.

## 3.3 Error Checking

Whenever the critical error is happened to some axis, that axis will stop immediately. And the following motion-function, say `ps400_t_move()`, will get the runtime error (-301~-315). User could get the detailed error status that terminates the motion by calling `ps400_get_error_status()`. Please refer to `ps400_get_error_status()` function, the section 9.9 of *PISO-PS400 Function Reference*.

## 3.4 Basic Configuration of Motion

The basic motion configuration must be set for necessarily general settings and are described below:

1. Pulse output mode setting: Pulse/Dir · CW/CCW...

✓ Relative function: `ps400_set_pls_cfg ()`

(Please refer to the section 2.2.3 of *PISO-PS400 Function Reference*)

2. Configure the range & accuracy of speed/acceleration/Jerk for each axis (If necessary)

✓ Relative function: `ps400_set_range()`

(Please refer to the section 2.2.1 of *PISO-PS400 Function Reference*)

3. Encoder input setting

✓ Relative function: `ps400_set_enc_cfg()`

(Please refer to the section 2.2.4 of *PISO-PS400 Function Reference*)

4. DI noise filter setting (If necessary)

✓ Relative function: `ps400_set_filter()`

(Please refer to the section 2.3.3 of *PISO-PS400 Function Reference*)

5. Circular motion declaration (Ring counter) (If necessary)

✓ Relative function: `ps400_set_vring()`

(Please refer to the section 7.1 of *PISO-PS400 Function Reference*)



## 3.5 Manual Pulse Generator Testing

User can use the manual pulse generator function directly to drive motion forward or backward. For further wiring and parameter tuning, user have to check the correction of the DI signals and the moving direction.

The manual pulse generator can be achieved from three driving methods described below:

### 1. A/B phase Manual Pulse Generator:

Use the A/B phase manual pulse signals for forward/backward moving.



### 2. Fixed-pulse driving Manual Pulse Generator:

User have to preset fixed driving pulses. After setting, user can push the forward or backward button to drive fixed pulses for each direction.

### 3. Continuous- pulse driving Manual Pulse Generator:

User can preset output-pulse frequency. After setting, user can push the forward or backward button to drive fixed velocity for each direction. If user release the button, the motion will be stop immediately.

ALL the above three methods and the operation mode (enable or disable) from external pulse input can be chosen and set from the function, `ps400_set_mpg()` (Please refer to the section 7.2 of *PISO-PS400 Function Reference*)

## 3.6 Home Search

PS400 provides the automatic homing function. After proper settings, the homing function can be operated automatically. Four homing steps are provided for setting and are described below:

- Near-home sensor searching under high-speed motion.
- Home sensor searching under low-speed motion.
- Servomotor Z-phase searching under low-speed motion.
- Offset movement to the origin of the working area under high-speed motion.

User can select which steps are ignored when setting for the actual operation. It performs automatically that economize the CPU resource and program code reducing. Although there are four home search steps, but user can create more than 10 types of different home search mode by vary with the software functions. It is attributed to the configurable home search direction and perform it or not of each step.

### 3.6.1 Home Search Configuration

1. Logic level setting for Near home sensor and Home sensor
2. Homing mode setting

`ps400_set_home_cfg ()` (Please refer to section 3.1 of *PISO-PS400 Function Reference*)

### 3.6.2 Running the Home Search

1. Start homing with specific speed/acceleration

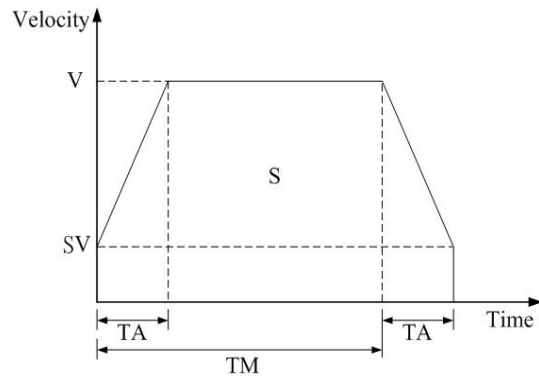
`ps400_Home_Start ()` (Please refer to section 3.2 of *PISO-PS400 Function Reference*)

2. Waiting for homing completion

`ps400_Home_Done ()` (Please refer to section 9.1 of *PISO-PS400 Function Reference*)

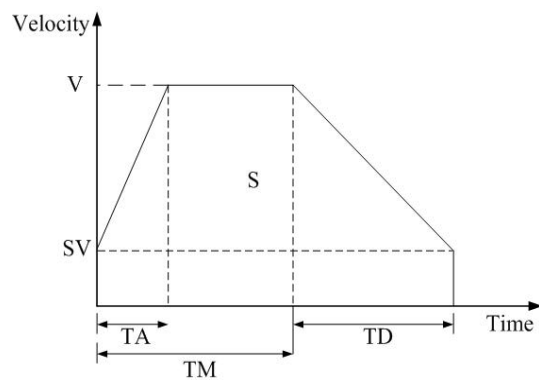
## 3.7 Basic Motion

### 3.7.1 Speed Profile of the Motion Control

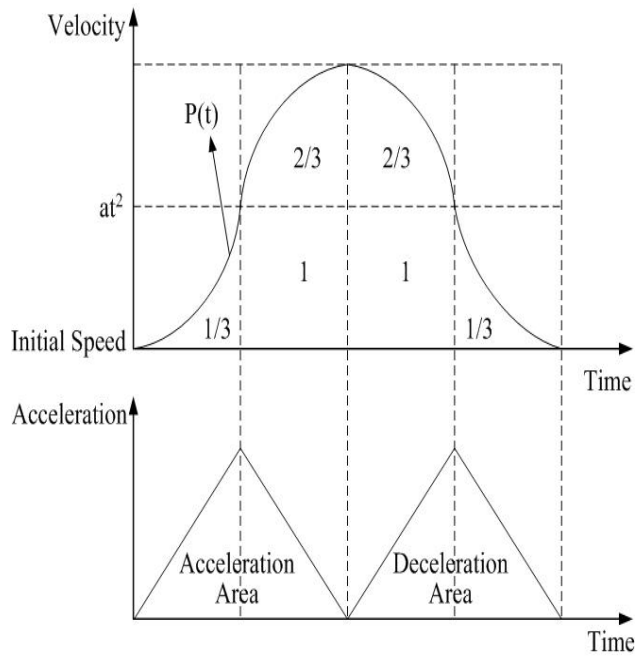


#### 1 Symmetrical T-profile of motion velocity

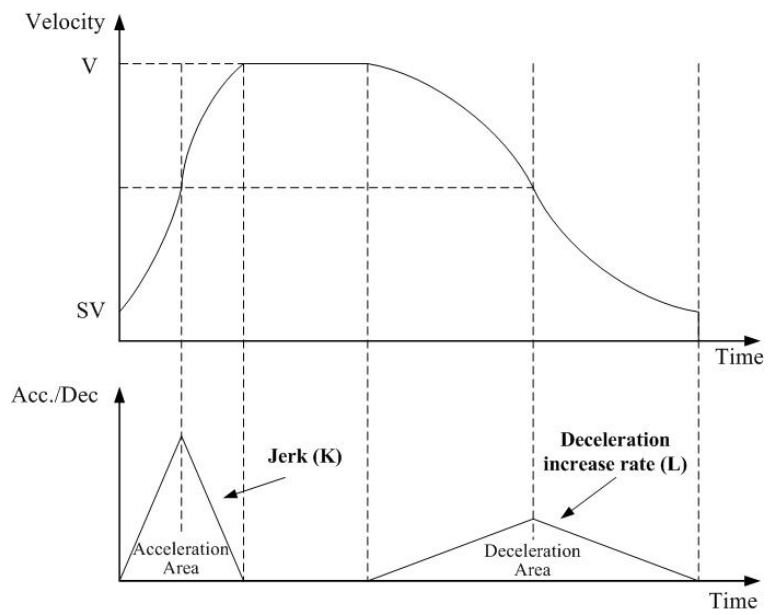
(If  $SV$  is larger than or equal to  $V$ , perform constant velocity driving)



#### 2 Asymmetrical T-profile of motion velocity



### 3 Symmetrical S-curve of motion velocity



### 4 Asymmetrical S-curve of motion velocity

## 3.7.2 Basic Motion of Single Axis

1. Fixed-pulse driving output: There are five speed profiles

- Constant speed (V)
  - ✓ Relative function: `ps400_const_move()`
- Symmetrical T-Profile (SV、V、A、AO)
  - ✓ Relative function: `ps400_t_move()`
- Symmetrical S-curve (SV、V、K、AO)
  - ✓ Relative function: `ps400_s_move()`
- Asymmetrical T-profile (SV、V、A、D、AO)
  - ✓ Relative function: `ps400_t_move()`
- Asymmetrical S-curve (SV、V、K、L、AO)
  - ✓ Relative function: `ps400_s_move()`

(Please refer to section 4.2~4.7 of *PISO-PS400 Function Reference*)

2. Continuous-pulse driving output: Perform continuous pulse output.

- ✓ Relative function: `ps400_velocity_move()`

(Please refer to section 4.1 of *PISO-PS400 Function Reference*)

3. Waiting for motion done: Waiting for the axis driving accomplished.

- ✓ Relative function: `ps400_motion_done()`

(Please refer to section 9.1 of *PISO-PS400 Function Reference*)

### 3.7.3 Basic Motion of Multi-Axes Interpolation

- Two-axes linear interpolation: Perform 2-axes linear interpolation.
  - ✓ Relative function: *ps400\_t\_line2\_move()*, *ps400\_s\_line2\_move()*  
( Please refer to section 5.1.1/5.1.2 of *PISO-PS400 Function Reference*)
  
- Three-axes linear interpolation: Perform 3-axes linear interpolation.
  - ✓ Relative function: *ps400\_t\_line3\_move()*, *ps400\_s\_line3\_move()*  
( Please refer to section 5.1.3/5.1.4 of *PISO-PS400 Function Reference*)
  
- Two-axes ARC interpolation: Perform 2-axes ARC interpolation.
  - ✓ Relative function: *ps400\_t\_arc2\_move ()*  
( Please refer to section 5.1.5 of *PISO-PS400 Function Reference*)
  
- The acceleration / deceleration modes of interpolation are: Constant Speed, T-Profile and S-Curve motion.
  
- Only one interpolation is allowed.

### 3.7.4 Motion of Multi-Axes Continuous Interpolation

- Only Constant-Vector-Speed is allowed in Continuous Interpolation motion. The associated axes should be assigned before starting interpolation-motion. The associated-axes of interpolation cannot be changed after starting interpolation.
  - ✓ Relative function: *ps400\_conti\_interp\_begin()*.( Please refer to section 5.2.1 of *PISO-PS400 Function Reference*)
  
- The next segment of continuous-interpolation should be prepared before the completion of current interpolation-segment. The function, *ps400\_conti\_interp\_next\_ready()*, helps to check the if the Motion ASIC is ready to accept the next interpolation-segment.
  - ✓ Relative function: *ps400\_conti\_interp\_next\_ready()*.( Please refer to section 5.2.2 of *PISO-PS400 Function Reference*)
  
- Both the linear and circular can be applied to continuous interpolation.
  - ✓ Relative function: *ps400\_conti\_interp\_line2\_move ()*,*ps400\_conti\_interp\_line3\_move ()* and *ps400\_conti\_interp\_arc2\_move ()*( Please refer to section 5.2.3 / 5.2.4 of *PISO-PS400 Function Reference*)
  
- When the continuous interpolation is completed, call *ps400\_conti\_interp\_end()* to restore the related settings.
  - ✓ Relative function: *ps400\_conti\_interp\_end()*.( Please refer to section 5.2.5 of *PISO-PS400 Function Reference*)

### 3.8 Synchronized Motion

- Synchronized motion for Multiple-axes (more than 2 axes) can be set in the same card by using the following function.
  - ✓ Relative function: *ps400\_set\_synch()*( Please refer to section 7.6 of *PISO-PS400 Function Reference*)
  
- If SYNC\_ACTION\_FIXED\_XXX\_DRIVE is configured as synchronization action of other-axes, the related parameters of fixed-driver can be set with the following functions.
  - ✓ Relative function: *ps400\_synch\_t\_move\_cfg()* and *ps400\_synch\_s\_move\_cfg()*.( Please refer to section 7.7 / 7.8 of *PISO-PS400 Function Reference*)

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## 4 PISO-PS400 PCEzGo(by Basic Function)

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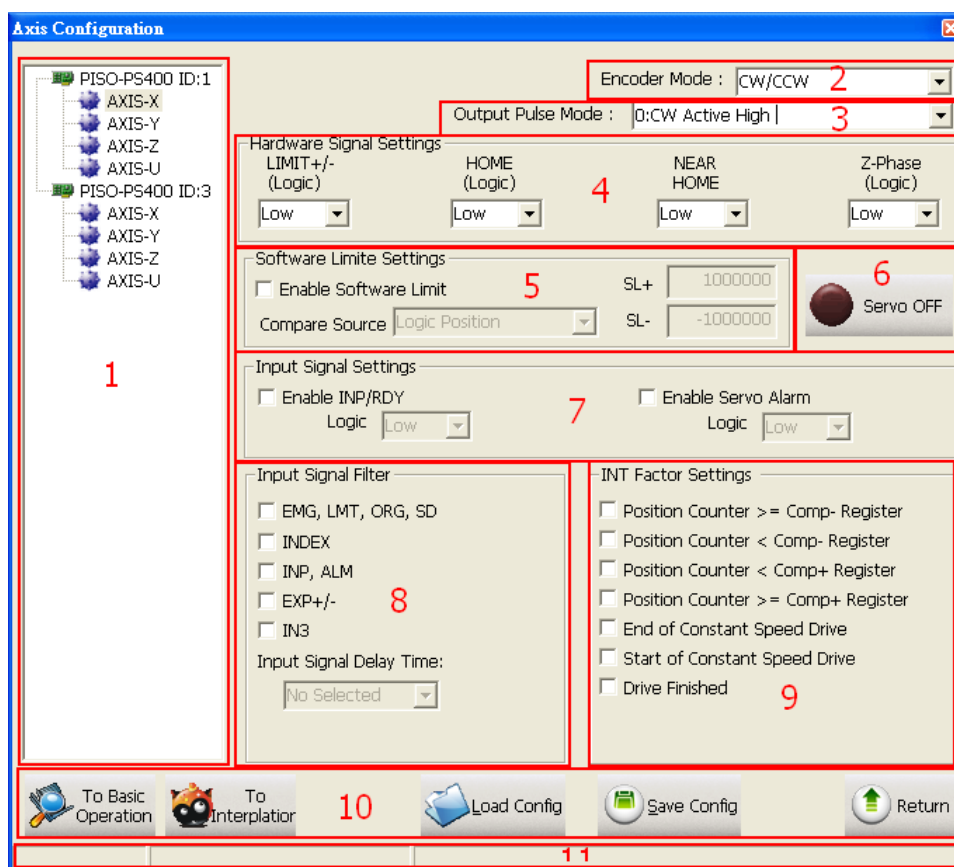
The initial frame of PISO-PS400 PCEzGo is shown in the following figure. Four categories of test function are displayed in the initial frame.



- ✧ Configuration (please refer to section 4.1)
- ✧ Basic Operation (please refer to section 4.2)
- ✧ Interpolation Operation (please refer to section 4.3)
- ✧ FRnet Operation (please refer to section 4.4)



## 4.1 Configuration Dialog



### Group Definition & User Guide

1. The tree-structure to show the available axes/cards :
  - Selects the target Axis of the specific motion card .
  
2. Encoder Mode :
  - Configures the encoder input mode as AB phase or CW/CCW (Up/Down count). Specify the frequency division at AB phase mode.( 1/1 AB Phase 、 1/2 AB Phase 、 1/4 AB Phase)
  - Relative Function : `ps400_set_enc_cfg()`.
  
3. Output Pulse Mode :
  - The types of pulse output are classified into 6 modes: 0, 1 is CW/CCW dual channel mode, 2~5 is PULSE/DIR single channel mode.
  - Relative Function : `ps400_set_pls_cfg()`.
  
4. Hardware Signals Settings :
  - The polarities of the hardware signals are set in this sub-item, including hardware

limits(LIMIT+/-), home sensor(HOME), near home sensor(NEAR HOME), servo motor Z-phase signal(INDEX).

- Relative Function : ps400\_set\_limit(), ps400\_set\_home\_cfg().

#### 5. Software Limit Settings :

- Reference in section 3.2.4
- Relative Function : ps400\_set\_softlimit().

#### 6. Servo On/Off Switch :

- Relative Function : ps400\_servo\_on().

#### 7. Servo Input Signal :

- Configurable feature enable/disable and logical trigger level of the Servo Alarm signal.
- Relative Function : ps400\_set\_alarm(), ps400\_set\_inp().

#### 8. Input Signals Filter Settings :

- Setting the delay time of each input signal filter:

The suitable delay time and the related removable maximum noise width are listed in the following table:

Code	Removable max. noise width	Input signal delay time
0	1.75μSEC	2μSEC
1	224μSEC	256μSEC
2	448μSEC	512μSEC
3	896μSEC	1.024 mSEC
4	1.792 mSEC	2.048 mSEC
5	3.584 mSEC	4.096 mSEC
6	7.168 mSEC	8.192 mSEC
7	14.336 mSEC	16.384 mSEC

- Setting the input signals with digital filter:

There are five check box (FE0 ~ FE4) to set the input signals to use digital filter.

FE0 is for Emg. Signal (EMGN), +/- limits (LMT±), Home limit(IN1), and Near Home limit(IN0)

FE1 is for Encoder Z phase signal (IN2)

FE2 is for Servo In-position signal (INP) and Servo alarm signal (ALM).

FE3 is for +/- external pulse input(EXP+/EXP-).

FE4 is for IN3 signal.

- Relative Function : `ps400_set_filter()` ◦

#### 9. INT Factor Settings :

- Ten kinds of interrupt event settings are provided in PISO-PS400 motion card
  1. **Position Counter  $\geq$  Comp- Counter:** Position counter is greater than or equal to the Negative-comparator.
  2. **Position Counter  $<$  Comp- Counter:** Position counter is less than the Negative-comparator.
  3. **Position Counter  $\geq$  Comp+ Counter:** Position counter is greater than or equal to the Positive -comparator.
  4. **Position Counter  $<$  Comp+ Counter:** Position counter is less than the Positive -comparator.
  5. **End of Constant Speed Drive:** The interrupt is triggered when Constant-speed driving is completed.
  6. **Start of Constant Speed Drive:** The interrupt is triggered when Constant-speed driving is started.
  7. **Drive Finished:** The interrupt is triggered when the specific axis is stopped.
- Relative Function : `ps400_set_int_factor()`.

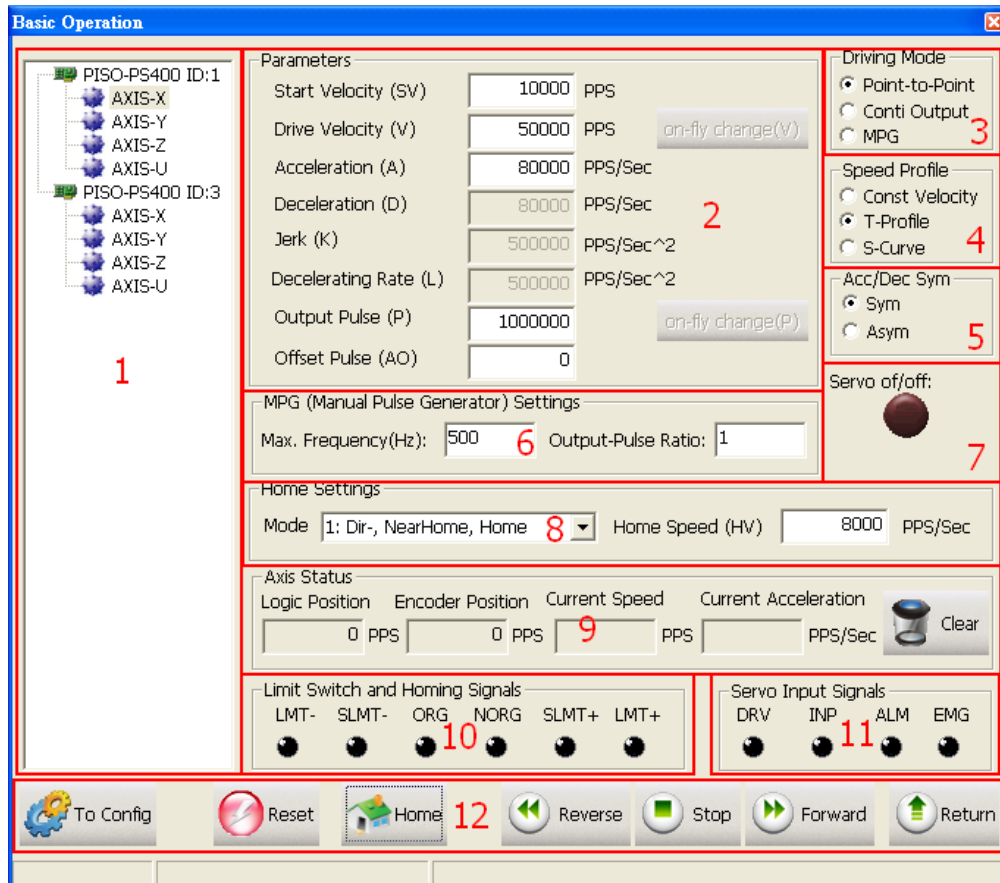
#### 10. Function of Buttons :

- To BasicOperation: The shortcut to Basic Operation Dialog.
- To Interpolation: The shortcut to Interpolation Dialog.
- LoadConfig: Loads the pre-defined configuration.
- SaveConfig: Saves the configuration of all available PISO-PS400 cards.
- Return : Returns to initial frame.

#### 11. Status Bar :

- Displays the Error Status.

## 4.2 Basic Operation Dialog



### Group Definition & User Guide

1. The tree-structure to show the available axes/cards :
  - Selects the target Axis of the specific motion card .
  
2. Parameter Setting :
  - The involved parameters are :  
Start Velocity(SV) 、 Driver Velocity(V) 、 Acceleration(A) 、 Deceleration(D) 、 Jerk(K) 、  
Deceleration Rate(L) 、 Output Pulse(P) 、 Offset Pulse(AO).
  
3. Driving Mode :
  - Point-to-point driving modes.
  - Continuous output driving modes.
  - MPG driving modes.
  
4. Speed Profile :
  - Const Velocity mode.

- T-Profile mode.
- S-Curve mode.

#### 5. Acc/Dec Symmetry Setting :

- Symmetry Mode.
- Asymmetry Mode.

#### 6. Manual Pulse Generator Setting :

- The maximum frequency of MPG and output-pulse ratio are required.

#### 7. Servo On/Off Status

- Indicates the current Servo status (On or Off).

#### 8. Home Setting

- Home search mode and home speed setting ◦
- Four typical scenarios are introduced to demonstrate the automatic home-searching:
  - 1: Dir-, NearHome, Home: Search Near-Home sensor in the reverse direction, and Home sensor in the forward direction.
  - 2: Dir+, NearHome, Home: Search Near-Home sensor in the forward direction, and Home sensor in the reverse direction.
  - 3: Dir-, NearHome, Home, Index : Search Near-Home sensor in the reverse direction, Home sensor in the forward direction and Index sensor in the reverse direction.
  - 4: Dir+, NearHome, Home, Index : Search Near-Home sensor in the forward direction, Home sensor in the reverse direction and Index sensor in the forward direction.
- Relative Function : `ps400_set_home_cfg()`.

#### 9. Axis Status :

- Displays the motion information for each axis, including the logic position counter, encoder position counter, current speed and acceleration.
- Relative Function : `ps400_get_cmdcounter()` 、 `ps400_get_position()` 、 `ps400_get_speed()` 、 `ps400_get_acc()`.

#### 10. Limit Switch and Homing Signals :

- Indicates the status of limit switches and home-related sensors.
- Relative Function : `ps400_get_mdi_status()`.

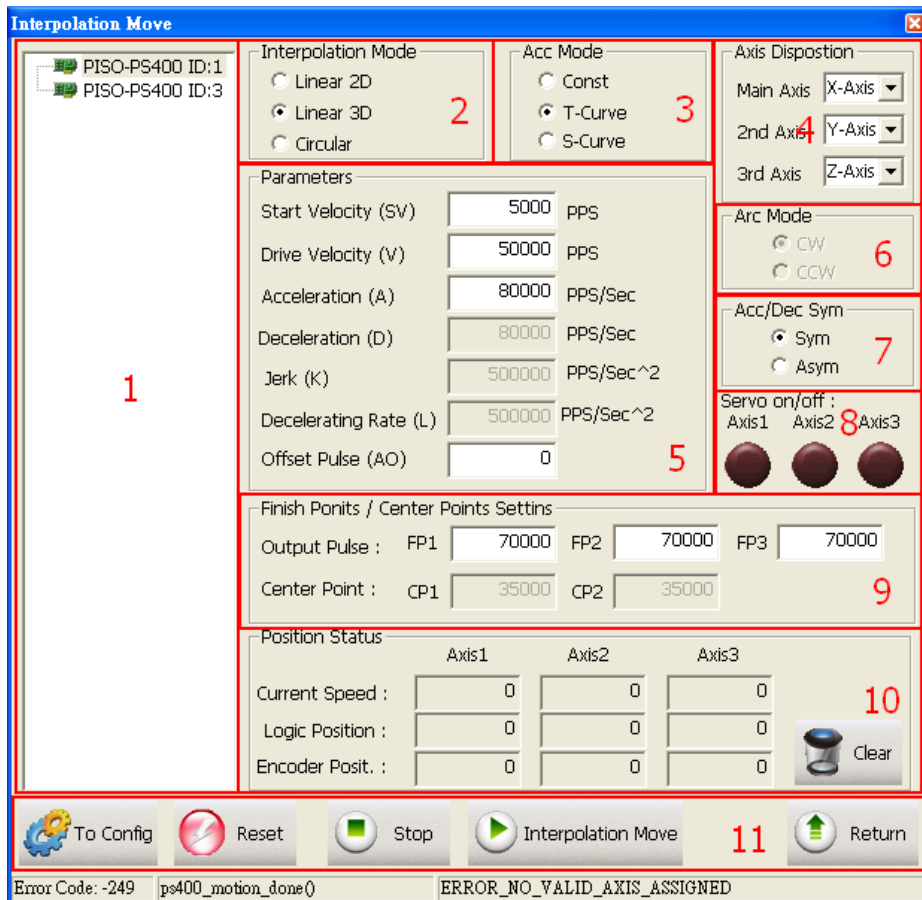
## 11. Servo Input Signal :

- Displays servo Input signal status.

## 12. Function of Buttons :

- To Config : The shortcut to Configuration Dialog.
- Reset : Resets the target card to the initial state.
- Home : Starts auto-home searching.
- Reverse : Starts motion in the reverse direction.
- Stop : Stops Motion.
- Forward : Starts motion in the forward direction.
- Return : Returns to initial frame.

## 4.3 Interpolation Dialog



### Group Definition & User Guide

1. The tree-structure to show the available axes/cards :
  - Selects the target motion card.
  
2. Interpolation Mode Setting :
  - Linear 2D/3D and Circular interpolation.
  - Relative Function : `ps400_t_line2_move()`, `ps400_s_line2_move()`, `ps400_t_line3_move()`, `ps400_s_line3_move()`, `ps400_t_arc2_move()`.
  
3. Acc Mode Setting :
  - Three acceleration modes are supported for interpolation: Constant-Speed, T-Profile and S-Curve acceleration modes.
  
4. Axis Disposition Setting:
  - Configures the axes that are related to interpolation operation.

## 5. Parameter Setting :

- The involved parameters are :  
Start Velocity(SV), Driver Velocity(V), Acceleration(A), Deceleration(D), Jerk(K) ,  
Deceleration Rate(L), Output Pulse(P), Offset Pulse(AO).

## 6. Arc Mode Setting :

- Indicates the direction of Circular Interpolation. Clockwise or Counter Clockwise in circular motion.

## 7. Acc/Dec Symmetry Setting :

- Symmetry Mode.
- Asymmetry Mode.

## 8. Servo On/Off Status :

- Indicates the current Servo status (On or Off).

## 9. Finish Points /Center Points Setting : Configures the each Finish-point of the interpolation-related axes; and the Center-Points for circular interpolation.

## 10. Position Status :

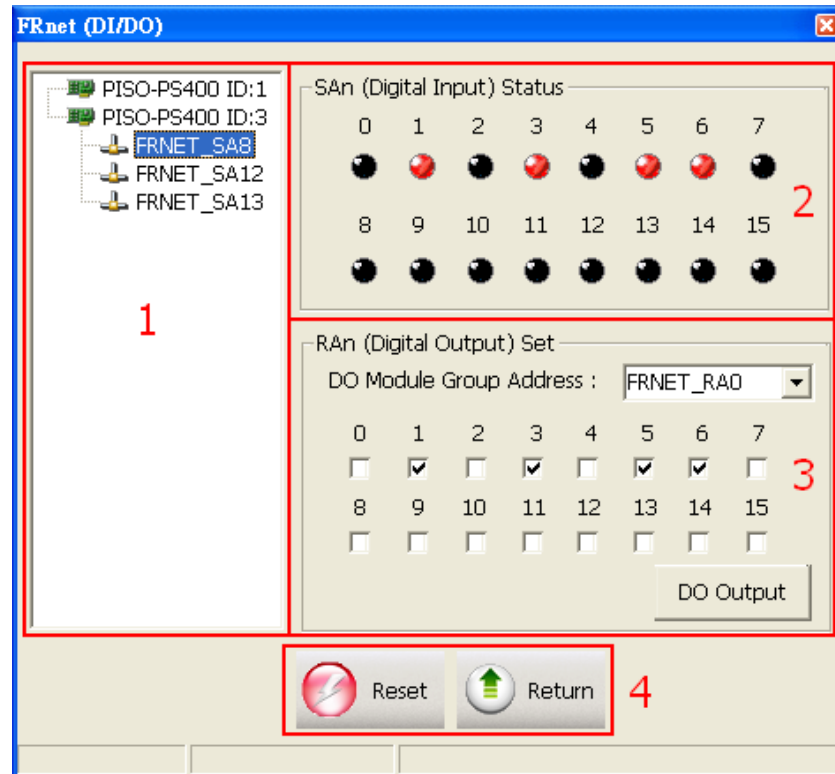
- Displays the motion information for each axis, including the logic position counter, encoder position counter and current speed.
- Relative Function : `ps400_get_cmdcounter()`, `ps400_get_position()`, `ps400_get_speed()`.

## 11. Function of Buttons :

- To Config : The shortcut to Configuration Dialog.
- Reset : Resets the target card to the initial state.
- Interpolation Move : Starts Interpolation motion.
- Stop : Stops Motion.
- Return : Returns to initial frame.



## 4.4 FRnet DI/DO Dialog



### Group Definition & User Guide

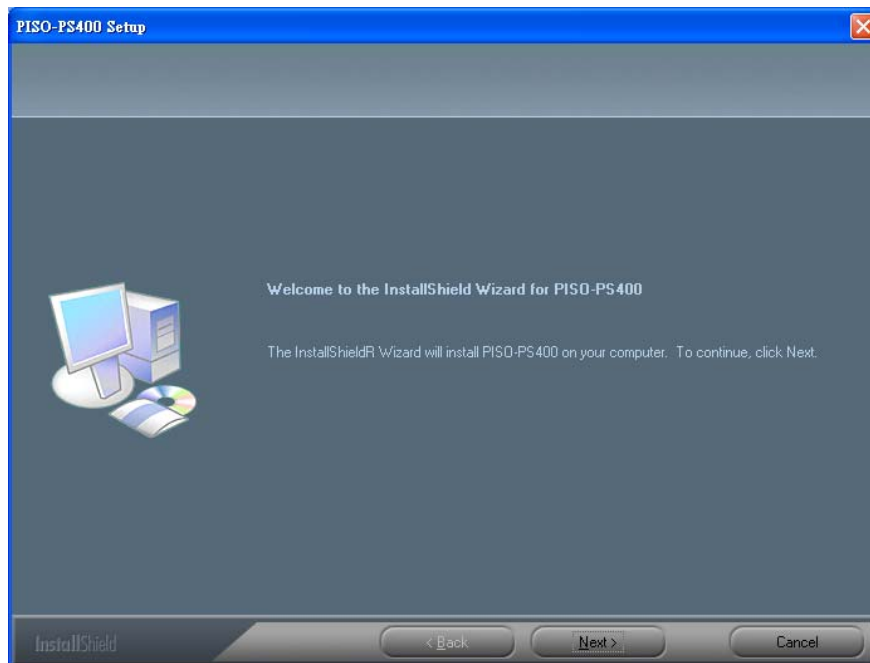
1. The tree-structure to show the available FRnet DI modules :
  - Selects the target DI FRnet DI module that is connected to the specific motion card .
2. SAn (Digital Input) Status :
  - Displays the DI status of target FRnet module.
  - Relative Function : `ps400_get_FRnet_DI()` °
3. RAn (Digital Output) Set :
  - Select the Group Address for specific FRnet DO module.
  - Sets the Digital Output to the DO module.
  - Relative Function : `ps400_set_FRnet_DO()` °
4. Function of Buttons :
  - Reset : Resets the FRnet connection.
  - Return : Returns to initial frame.

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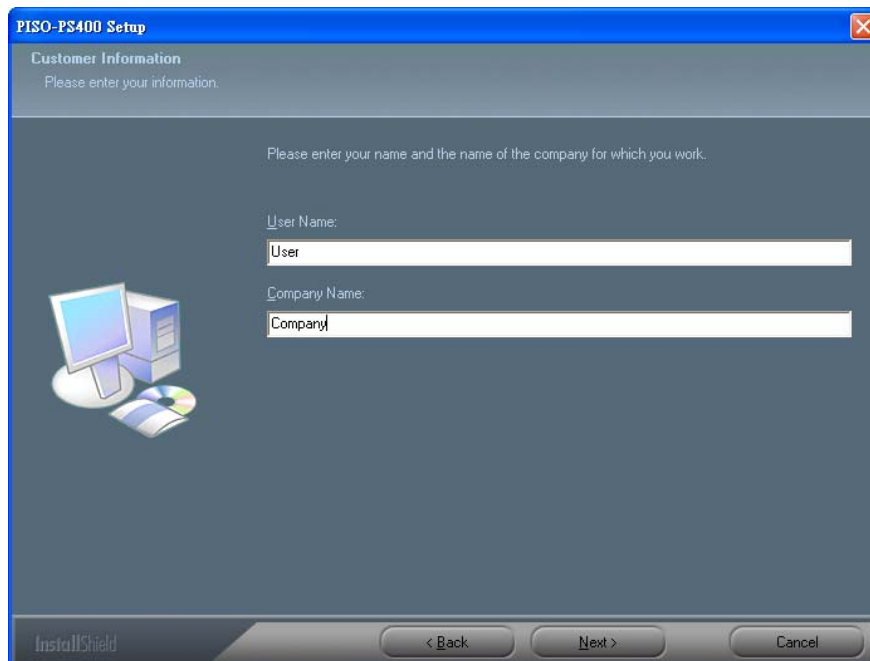
## APPENDIX-A1 PISO-PS400 Installation

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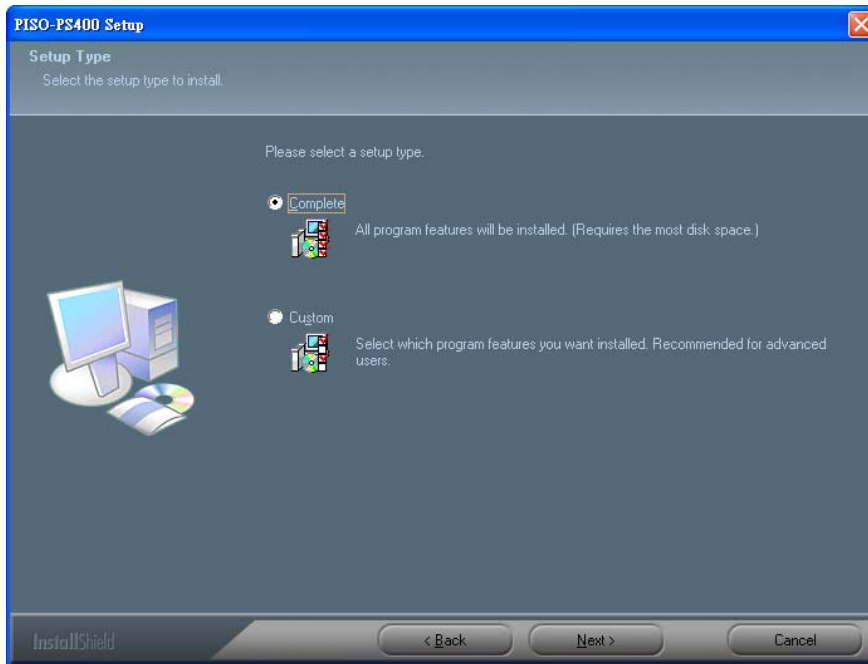
Please execute “setup.exe” from the directory, “/PC\_BASE/PCI/PISO\_PS400/Win2K\_XP/”, in CD and click ”Next”.



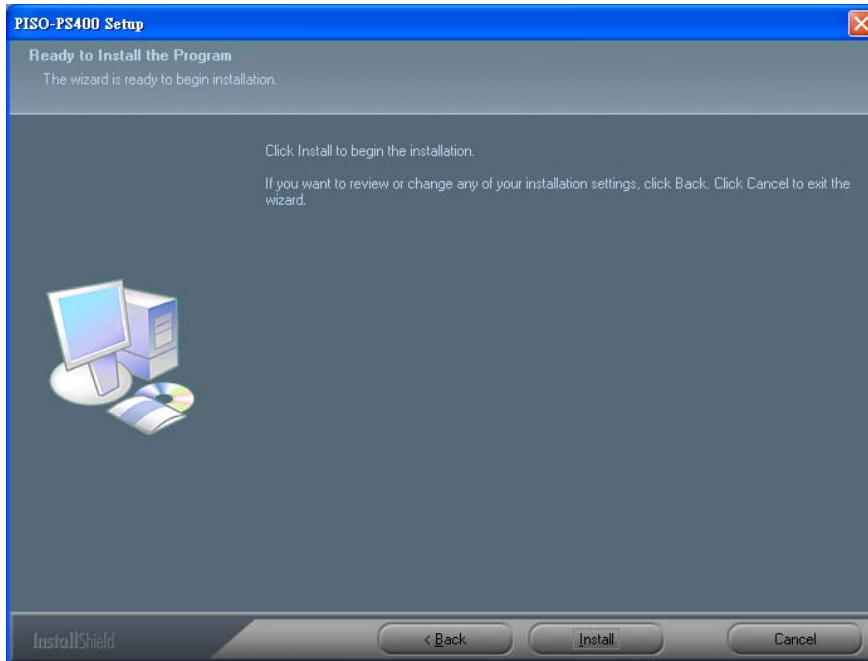
Key-in the User-Name and Company-Name, then click “Next”.



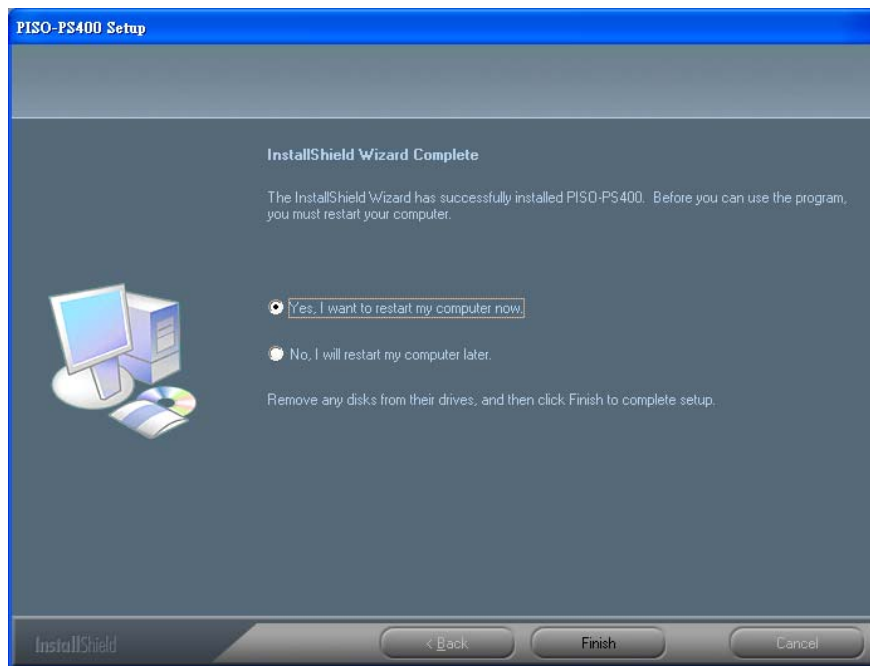
Select the setup-type, the “Complete” setup-type is recommended. Click the “Next” button to continue installation.



Click "Install" to begin the installation.



Please click the "Finish" button for reboot after installation accomplished



After installation, the folder/files are distributed as follows:

(Typically, the installed directory is, C:\ICPDAS\PISO\_PS400)

\$Installed_Directory	\Include		Header Files
	\LIB		Library Files
	\Manuals		All manuals
	\Utility		PCEzGo.exe
	\Driver	\Win2K	drivers and
		\WinXP	information file
	\Labview VI	\Ver 8.x	\ADVANCED MOTION CONFIGURATIONS VIs for Labview 8.x
			\AUTOMATIC HOME SERCH
			\FRNET IO EXTENSION
			\INDEPENDENT MOVING FUNCTIONS
			\INTERPOLATION MOVING FUNCTIONS
			\MISCELLANEOUS FUNCTIONS
			\OTHER MOTION FUNCTIONS
			\STATUS
			\SYSTEM INITIALIZATION
	\Samples	\VC6	Samples for VC 6.0, VB
		\VB6	6.0, BCB 6.0 and Labview
		\BCB6	8.x
		\Labview 8.x	

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## APPENDIX-A2 PISO-PS400 For RTX

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### RTX Library for PISO-PS400:

The RTX library for PISO-PS400 is provided as RTSS DLL. RTSS is an RTSS process that exports functions for use by other RTSS processes. An RTSS DLL is the analog of an implicitly loaded Win32 DLL. That means, RTSS DLL accurately mirrors the automatic resolution of reference to exported functions for implicitly loaded Win32 DLL.

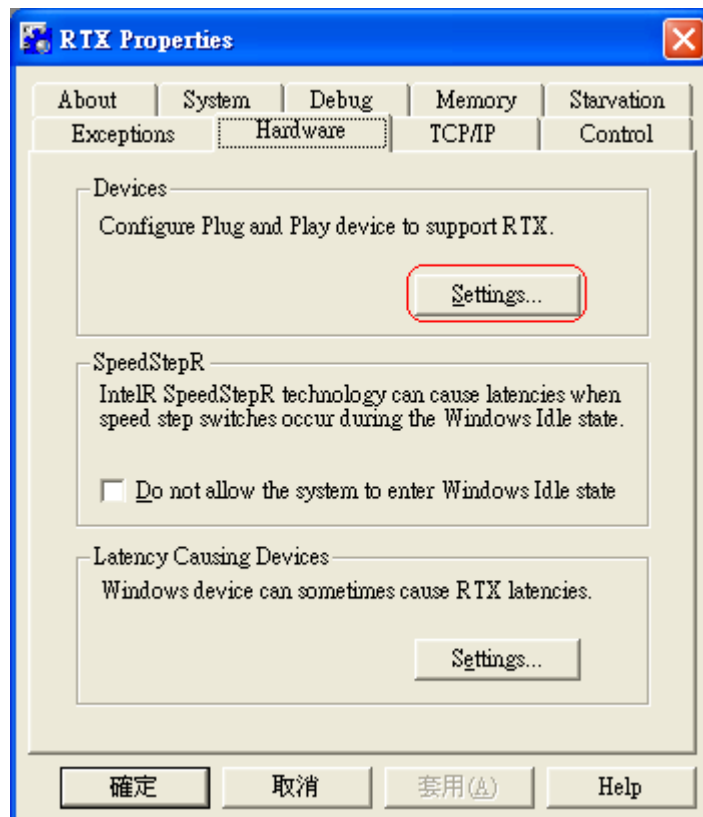
The primary difference between RTSS DLL and implicitly loaded Win32 DLL is:

- RTSS DLL must be explicitly loaded and unloaded in developer's system

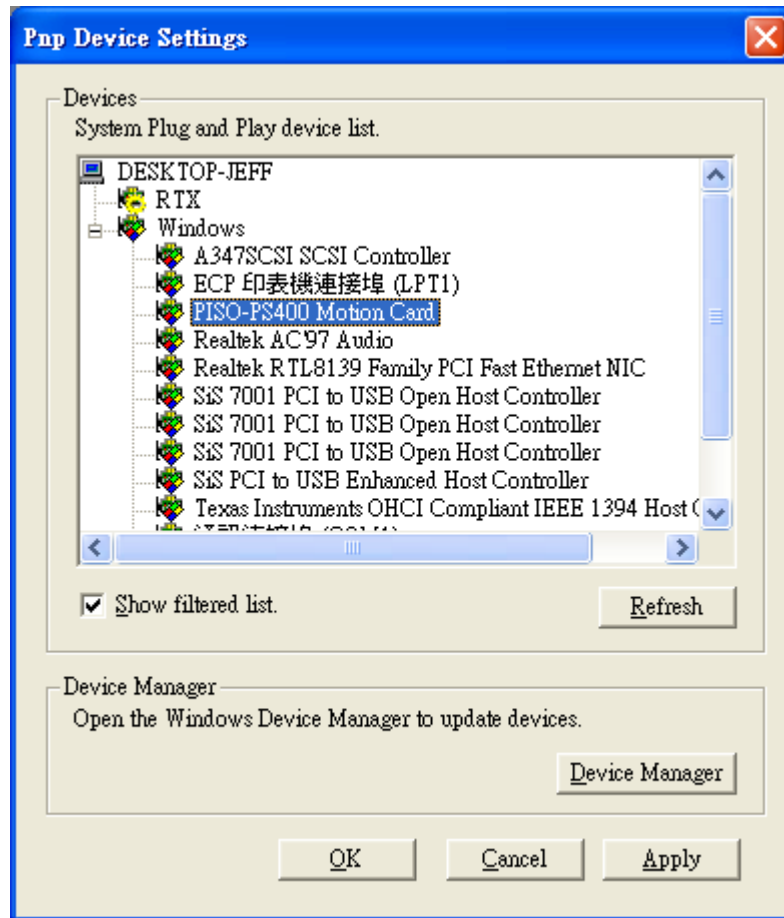
### How to setup PISO-PS400 in RTX:

In RTX, PISO-PS400 use the RTX Plug&Play driver, `rtxnp.sys`, to communicate with RTX. The following steps help to add the hardware-information into ***rtxnp.inf***:

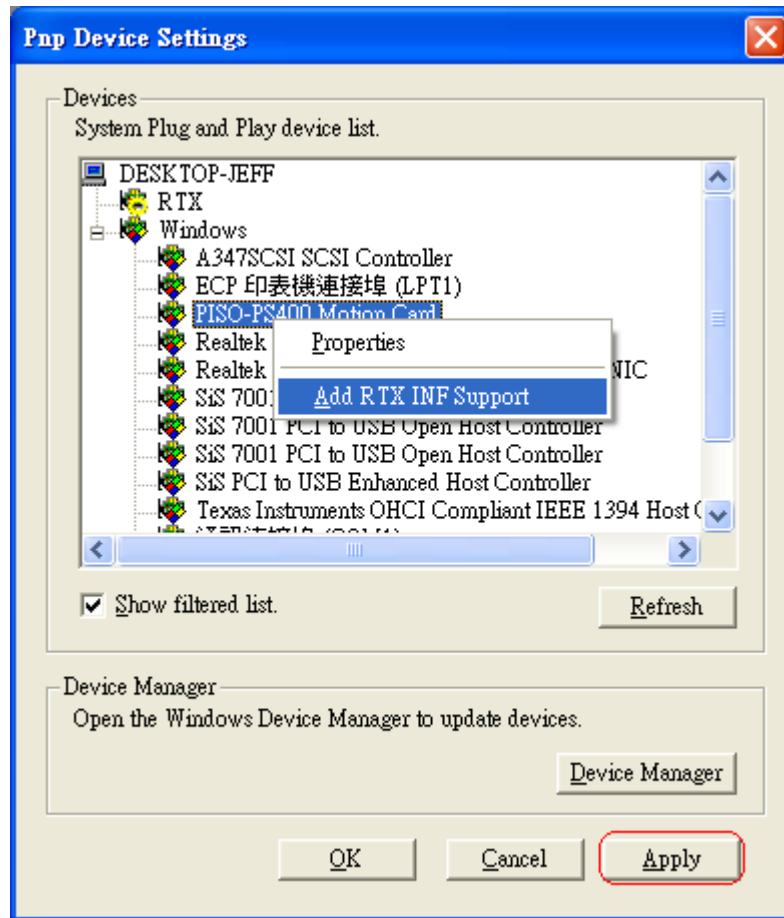
1. Make sure the official WDM driver of PISO-PS400 is installed.
2. Execute ***RTX Properties***, switch to ***Hardware*** tag and click the ***Settings*** in Device section.



3. In Pnp Device Settings, click the target device, ***PISO-PS400 Motion Card***.



4. Right-Click the selected device, and choose the **Add RTX INF Support** in popup menu. And then click the **Apply** button to add the hardware-information.



Another INF file, *rtxnp.inf*, now has the hardware-information of PISO-PS400. The *rtxnp.sys* can be updated with the changed *rtxnp.inf*.

For the detailed information, please refer to the “Hardware Settings” of online help, RTXRuntimeDocumentation.chm.

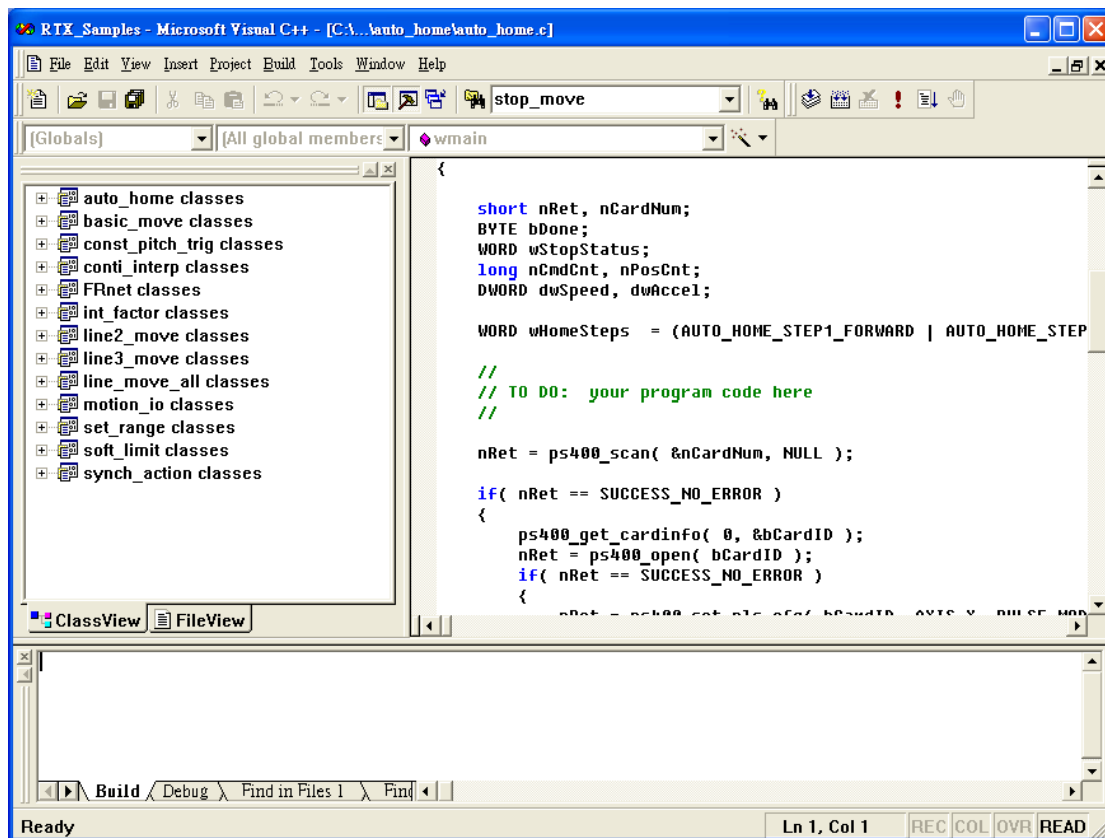
**Caveat:**

Please remove the Window WDM and control PISO-PS400 with RTSS DLL only. **DO NOT** access PISO-PS400 through both Win32 DLL and RTSS DLL.

## Folder in RTX software package:

Four directories are included in PISO-PS400 software package

- rtss\_dll\ : This folder contains the PISO-PS400 RTSS DLL, ps400\_rtx.rtss
- include\ : This folder contains the header file, ps400\_rtx.h.
- lib\ : This folder contains the LIB file, ps400\_rtx.lib.
  - samples\ : This folder contains the samples to demonstrate the most functions in ps400\_rtx.rtss. These samples are combined into single workspace, RTX\_Samples.dsw.





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## APPENDIX-B Others Terminal Boards

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### B.1 DN-8468M Daughter Board

The DN-8468M is the daughter board for Mitsubishi J2 Series Amplifier. It has 4-axis I/O signals.

#### B.1.1 Board Layout for DN-8468M

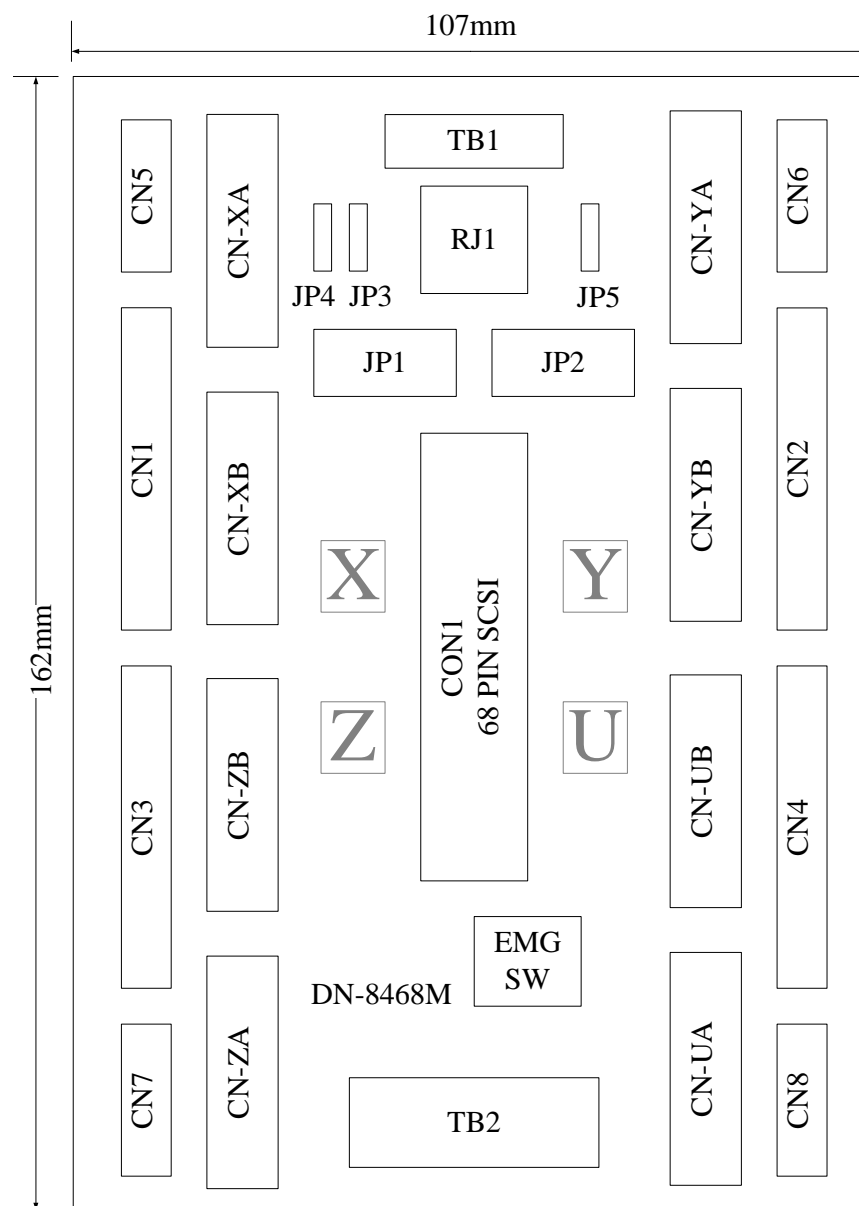


Fig. 1-1 Board layout for the DN-8468M

## B.1.2 Signal Connections for DN-8468M

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468M is a 68-pin SCSI II connector that enables you to connect to the PISO-PS400 motion card. Please refer to the section 2.2.1( page 15).

### ■ TB1

The connector TB1 is 7-pin connector that enables you to connect to the signals of your motor drivers. Fig.1-3 shows the pin assignment for the 7-pin connector on the DN-8468M, and the Table 1-4 shows its I/O connector signal description.

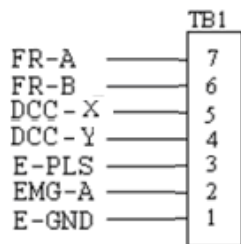


Fig. 1-3 Pin definition for TB1

Table 1-4 TB1 Signal Connection

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
DCC - X	Deviation Counter Clear for X axis
DCC - Y	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground

### ■ TB2

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.1-4 shows the pin assignment for the 5-pin connector on the DN-8468M, and the Table 1-5 shows its I/O connector signal description.

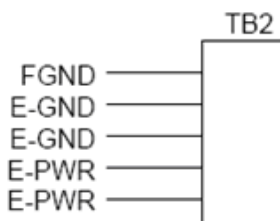


Fig. 1-4 Pin definition for TB2

Table 1-5 TB2 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

▶ **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happened.

■ **CN-XA, CN-YA, CN-ZA, CN-UA (CNA connector for each AXIS )**

The connectors CN-XA, CN-YA, CN-ZA, and CN-UA are 20-pin connectors that enable you to connect to the CNA connector of Mitsubishi motor drivers. Fig.1-5 shows the pin assignment for the 20-pin connector on the DN-8468M, and the Table 1-6 shows its I/O connector signal description.

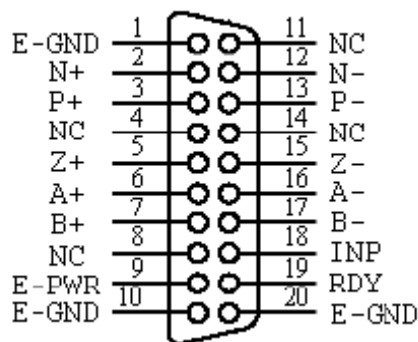


Table 1-6 CNA Signal Connection

Name	Number	Description
A+	6	Encoder A-Phase (+)
A-	16	Encoder A-Phase (-)
B+	7	Encoder B-Phase (+)
B-	17	Encoder B-Phase (-)
Z+	5	Encoder Z-Phase (+)
Z-	15	Encoder Z-Phase (-)
P+	3	Positive Direction Pulse Output(+)
P-	13	Positive Direction Pulse Output(-)
N+	2	Negative Direction Pulse Output(+)
N-	12	Negative Direction Pulse Output(-)
INP	18	Servo In Position
RDY	19	Servo Ready
E-PWR	9	EXT power +24V
E-GND	1, 10, 20	EXT power ground
NC	4,8,11,14	No connection

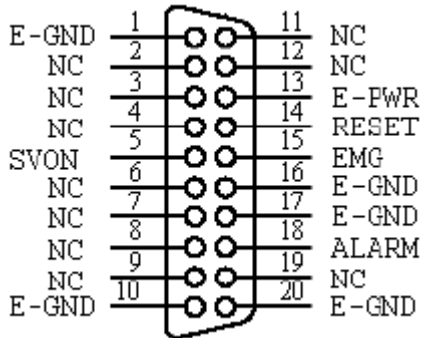
Fig. 1-5 Pin definition for CN-XA, CN-YA, CN-ZA, CN-UA

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CN-XA and the other is from CN5. In Y axis, one is from CN-YA and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CN-ZA and CN7 at the same time. In U axis, do not connect CN-UA and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

■ **CN-XB, CN-YB, CN-ZB, CN-UB (CNB connector for each AXIS )**

The connectors CN-XB, CN-YB, CN-ZB, and CN-UB are 20-pin connectors that enable you to connect to the CNB connector of your motor drivers. Fig.1-6 shows the pin assignment for the 20-pin connector on the DN-8468M, and the Table 1-7 shows its I/O connector signal description.

Table 1-7 CNB Signal Connection



Pin	Pin	Description
SVON	5	Servo On
RESET	14	Servo Reset
EMG	15	Emergent Stop
ALARM	18	Servo Alarm
E-PWR	13	EXT power +24V
E-GND	1, 10, 16, 17, 20	EXT power ground
NC	2, 3, 4, 6, 7, 8, 9, 11, 12, 19	No connection

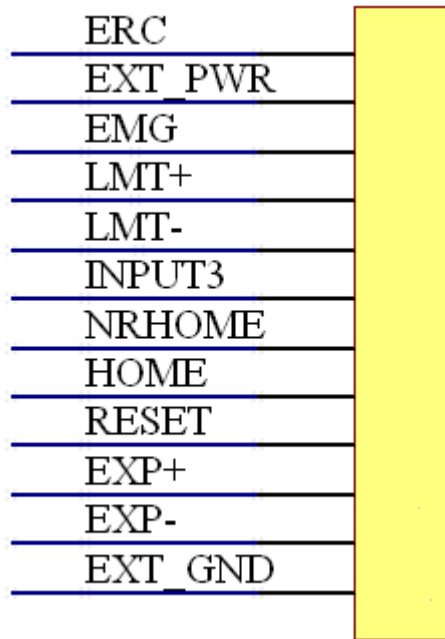
Fig. 1-6 Pin definition for CN-XB, CN-YB  
CN-ZB, CN-UB

▶ **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

■ **CN1~CN4 (The I/O signals of the X, Y, Z, U AXIS )**

The connectors CN1~CN4 are 11-pin connectors that enable you to connect to the signals of your motor drivers. Fig.1-7 shows the pin assignment for the 20-pin connector on the DN-8468M, and the Table 1-8 shows its I/O connector signal description.

Table 1-8 CN1~4 Signal Connection



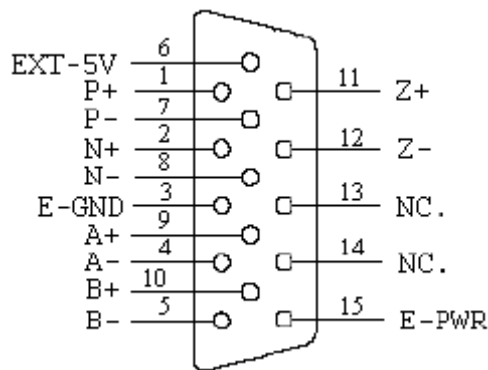
Name	Number	Description
ERC	12	Error Count Clear
EXT_PWR	11	EXT POWER 24V
EMG	10	Emergent Stop
LMT+	9	Limit switch Input Signal(+)
LMT-	8	Limit switch Input Signal(-)
INPUT3	7	Input Signal (IN3)
NRHOME	6	Near HOME Sensor Input Signal
HOME	5	HOME Sensor Input Signal
RESET	4	RESET Input Signal
EXP+	3	EXT Positive Direction Pulse(+)
EXP-	2	EXT Positive Direction Pulse(-)
EXT_GND	1	EXT POWER Ground

Fig 1-7 Pin definition for CN1~ CN4

## ■ CN5~CN8 (The I/O signals of the X, Y, Z, U AXIS )

The connectors CN5~CN8 are 15-pin connectors that enable users to connect the signals to external motor drivers. Fig.1-8 shows the pin assignment for the 15-pin connector on the DN-8468M, and the Table 1-9 shows its I/O connector signal description.

Table 1-9 CN5~8



Name	No.	Description
A+	9	Encoder A-Phase (+)
A-	4	Encoder A-Phase (-)
B+	10	Encoder B-Phase (+)
B-	5	Encoder B-Phase (-)
Z+	11	Encoder Z-Phase (+)
Z-	12	Encoder Z-Phase (-)
P+	1	Positive Direction Pulse Output(+)
P-	7	Positive Direction Pulse Output(-)
N+	2	Negative Direction Pulse Output(+)
N-	8	Negative Direction Pulse Output(-)
E-PWR	15	EXT power +24V
E-GND	3	EXT power ground
EXT-5V	6	EXT power +5V
NC	13, 14	No connection

Fig. 1-8 Pin definition for CN5~CN8

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## ■ RJ1 (The I/O signals of the FRnet)

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. Fig.1-9 shows the pin assignment for the 8-pin connector on the DN-8468M, and the Table 1-10 shows its I/O connector signal description.

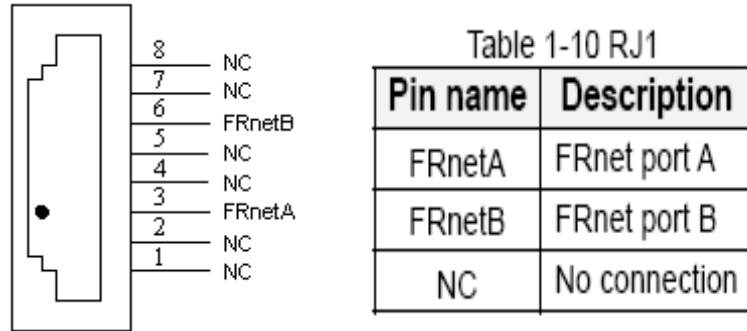


Fig. 1-9 Pin definition for RJ1

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## B.1.3 Jumper and Switch Settings

### ■ JP5

Jumper 5 controls the EMG-A signal of the TB1 connector. The following diagram is shown the selection condition of the jumper 5.

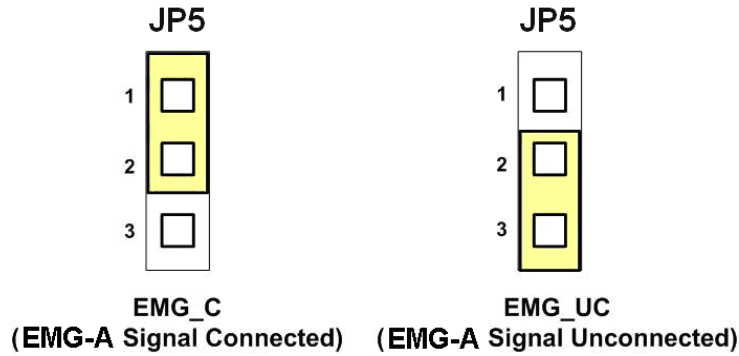


Fig. 1-10 Jumper 5 setting

### ■ JP1, JP2

The encoder signals of axis X and axis Y can be chosen from servo driver encoder or external encoder. Fig. 1-11 shows that the encoder signals are selected from servo driver encoder. In meantime, Fig. 1-12 shows that the encoder signals are selected from external encoder.

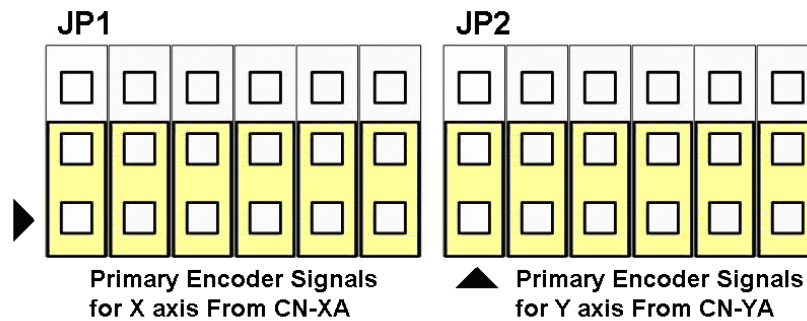


Fig. 1-11 Primary encoder signals setting

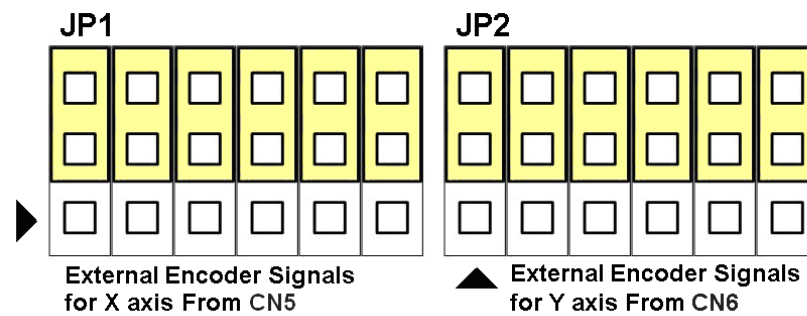


Fig. 1-12 External encoder signals setting



## ■ EMG SW

The emergency stop signal for each servo amplifier can be selected from EMG SW. The number 1, 2, 3, 4 on EMG SW are denoted as axis X, Y, Z, U, respectively. Fig. 1-13 is the default setting to connect the EMG signals to GND. The EMG signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 1-14, the emergency stop signals can be controlled from EMG signals in CN1 ~ CN4.



Fig. 1-13 EMG SW setting for normally GND (Default setting)

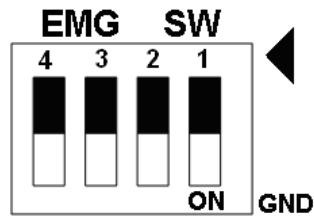


Fig. 1-14 EMG SW setting for user controlled signals.

## B.2 DN-8468P Daughter Board

The DN-8468P is the daughter board for Panasonic A4 Series Amplifier. It has 4-axis I/O signals.

### B.2.1 Board Layout for DN-8468P

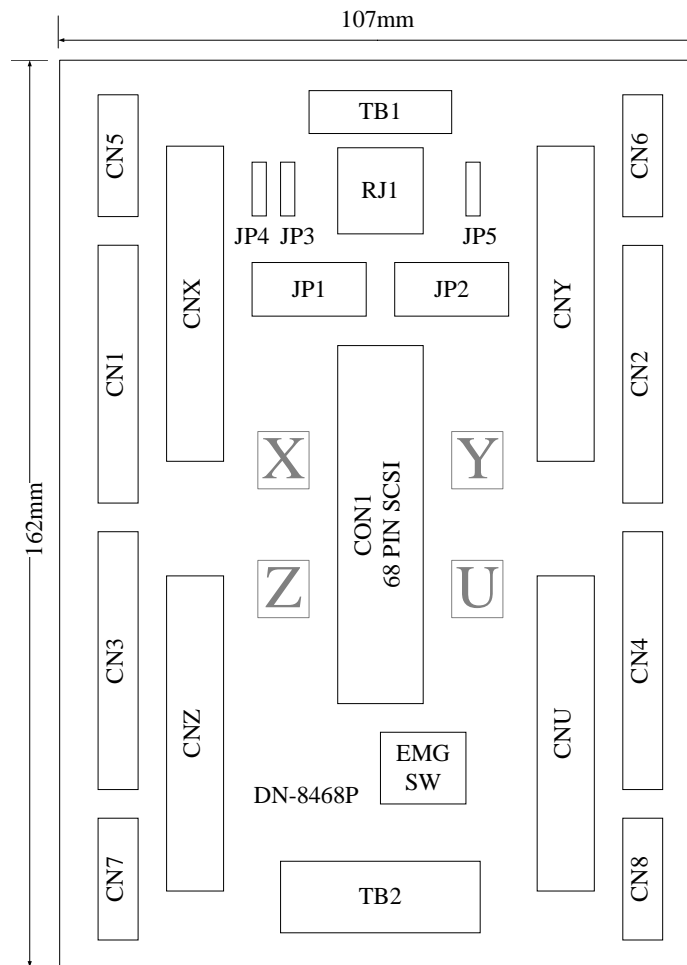


Fig. B2-1 Board layout for the DN-8468P

## B.2.2 Signal Connections for DN-8468P

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468P is a 68-pin SCSI II connector that enables you to connect to the PISO-PS400 motion card. Please refer to the section 2.2.1( page 15).

### ■ TB1

The connector TB1 is 7-pin connector that enables you to connect to the signals of your motor drivers. Fig.1-3 shows the pin assignment for the 7-pin connector on the DN-8468P, and the Table 1-4 shows its I/O connector signal description.

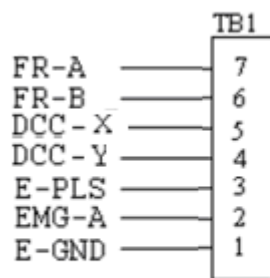


Fig. 1-3 Pin definition for TB1

Table 1-4 TB1 Signal Connection

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
DCC-X	Deviation Counter Clear for X axis
DCC-Y	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground

## TB2

---

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.1-4 shows the pin assignment for the 5-pin connector on the DN-8468P, and the Table 1-5 shows its I/O connector signal description.

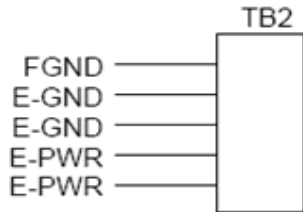


Table 1-5 TB2 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

Fig. 1-4 Pin definition for TB2

► **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happened.

■ **CNX, CNY, CNZ, CNU (CN X5 connector for each AXIS in Driver)**

The connectors CNX, CNY, CNZ, and CNU are 50-pin connectors that enable you to connect to the CN X5 connector of Panasonic motor drivers. Fig.1-5 shows the pin assignment for the 50-pin connector on the DN-8468P, and the Table 1-6 shows its I/O connector signal description.

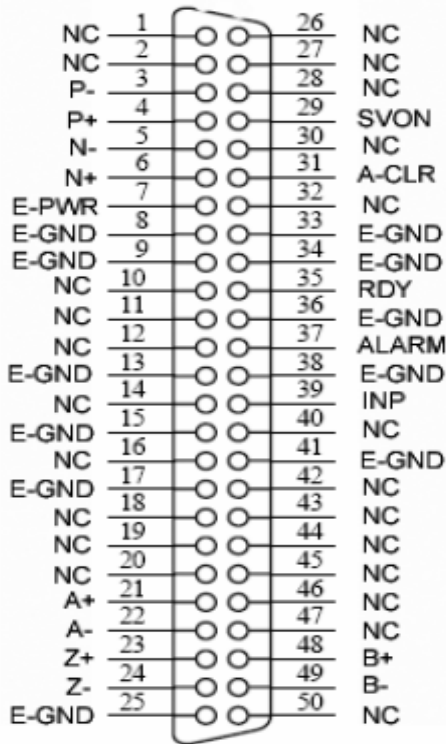


Fig. 1-5 Pin definition for CNX, CNY, CNZ, CNU

Table 1-6 CN X5 Signal Connection

Name	Number	Description
A+	21	Encoder A-Phase (+)
A-	22	Encoder A-Phase (-)
B+	48	Encoder B-Phase (+)
B-	49	Encoder B-Phase (-)
Z+	23	Encoder Z-Phase (+)
Z-	24	Encoder Z-Phase (-)
P+	4	Positive Direction Pulse Output(+)
P-	3	Positive Direction Pulse Output(-)
N+	6	Negative Direction Pulse
N-	5	Negative Direction Pulse Output(-)
INP	39	Servo In Position
RDY	35	Servo Ready
SVON	29	Servo On
A-CLR	31	Alarm Clear
ALARM	37	Servo Alarm
E-PWR	7	EXT power +24V
E-GND	8, 9, 13, 15, 17, 25, 33, 34, 36, 38, 41	EXT power ground
NC	1, 2, 10, 11, 12, 14, 16, 18, 19, 20, 26, 27, 28, 30, 32, 40, 42, 43, 44, 45, 46, 47, 50	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

■ **CN1~CN4 (The I/O signals of the X, Y, Z, U AXIS)**

The connectors CN1~CN4 are 11-pin connectors that enable you to connect to the signals of your motor drivers. Fig.1-7 shows the pin assignment for the 20-pin connector on the DN-8468P, and the Table 1-8 shows its I/O connector signal description.

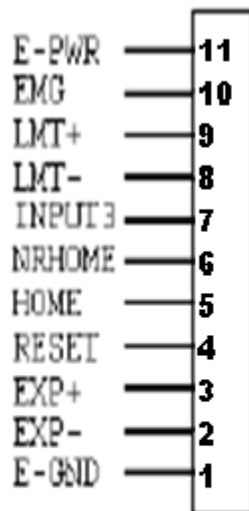


Fig. 1-7 Pin definition for CN1 ~ CN4

Table 3-8 CN1~4 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
EMG	EMG input signal
LMT+	Limit Switch Input Signal (+)
LMT-	Limit Switch Input Signal (-)
INPUT3	Input Signal (IN3)
NRHOME	Near Home Sensor Input Signal
HOME	Home Sensor Input Signal
RESET	Reset input signal
EXP+	EXT Positive Direction Pulse (+)
EXP-	EXT Negative Direction Pulse (-)
E-GND	EXT power ground

## ■ CN5~CN8 (The I/O signals of the X, Y, Z, U AXIS )

The connectors CN5~CN8 are 15-pin connectors that enable users to connect the signals to external motor drivers. Fig.1-8 shows the pin assignment for the 15-pin connector on the DN-8468P, and the Table 1-9 shows its I/O connector signal description.

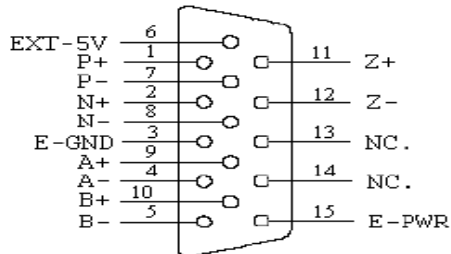


Fig. 1-8 Pin definition for CN5 ~ CN8

Table 1-9 CN5~8

Name	No.	Description
A+	9	Encoder A-Phase (+)
A-	4	Encoder A-Phase (-)
B+	10	Encoder B-Phase (+)
B-	5	Encoder B-Phase (-)
Z+	11	Encoder Z-Phase (+)
Z-	12	Encoder Z-Phase (-)
P+	1	Positive Direction Pulse Output(+)
P-	7	Positive Direction Pulse Output(-)
N+	2	Negative Direction Pulse Output(+)
N-	8	Negative Direction Pulse Output(-)
E-PWR	15	EXT power +24V
E-GND	3	EXT power ground
EXT-5V	6	EXT power +5V
NC	13, 14	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## ■ RJ1 (The I/O signals of the FRnet)

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. Fig.1-9 shows the pin assignment for the 8-pin connector on the DN-8468P, and the Table 1-10 shows its I/O connector signal description.

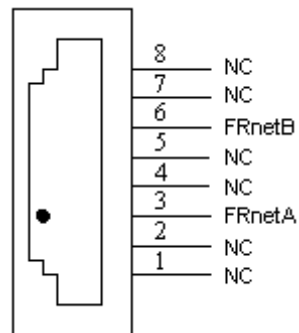


Table 1-10 RJ1

Pin name	Description
FRnetA	FRnet port A
FRnetB	FRnet port B
NC	No connection

Fig. 1-9 Pin definition for RJ

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.



## B.2.3 Jumper and Switch Settings

### ■ JP5

Jumper 5 controls the EMG-A signal of the TB1 connector. The following diagram is shown the selection condition of the jumper 5.

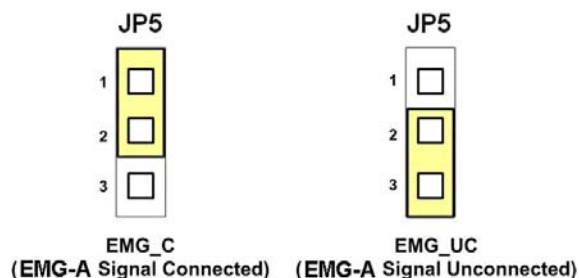


Fig. 1-10 Jumper 5 setting

### ■ JP1, JP2

The encoder signals of axis X and axis Y can be chosen from servo driver encoder or external encoder. Fig. 1-11 shows that the encoder signals are selected from servo driver encoder. In meantime, Fig. 1-12 shows that the encoder signals are selected from external encoder.

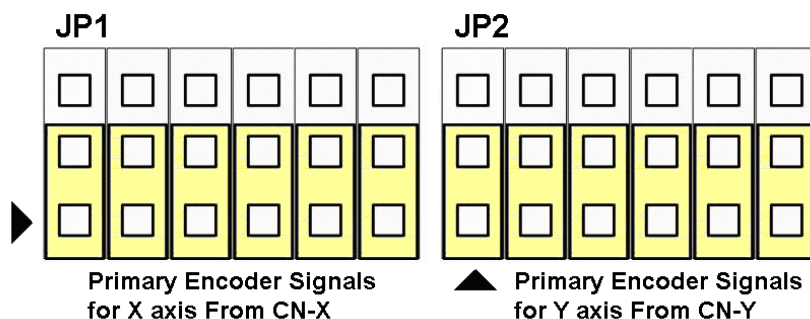


Fig. 1-11 Primary encoder signals setting

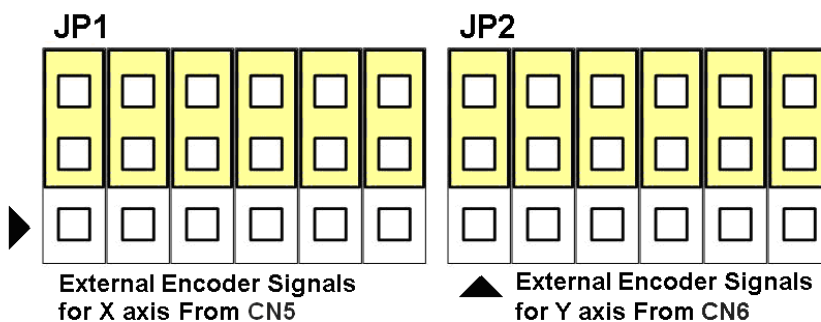


Fig. 1-12 External encoder signals setting

## ■ EMG SW

The emergency stop signal for each servo amplifier can be selected from EMG SW. The number 1, 2, 3, 4 on EMG SW are denoted as axis X, Y, Z, U, respectively. Fig. 1-13 is the default setting to connect the EMG signals to GND. The EMG signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 1-14, the emergency stop signals can be controlled from EMG signals in CN1 ~ CN4.

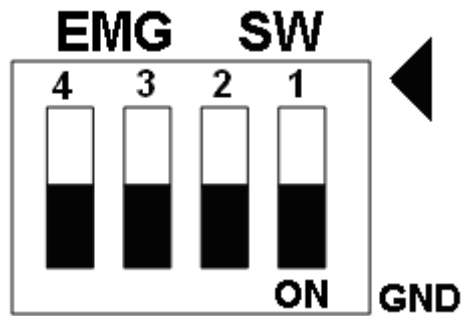


Fig. 1-13 EMG SW setting for normally GND (Default setting)

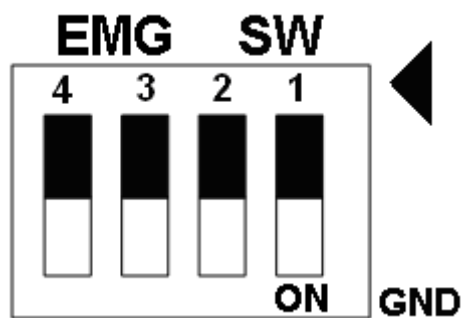


Fig. 1-14 EMG SW setting for user controlled signals.

## B.3 DN-8486Y Daughter Board

The DN-8468Y is the daughter board for Yaskawa Amplifier. It has 4-axis I/O signals.

### B.3.1 Board Layout for DN-8468Y

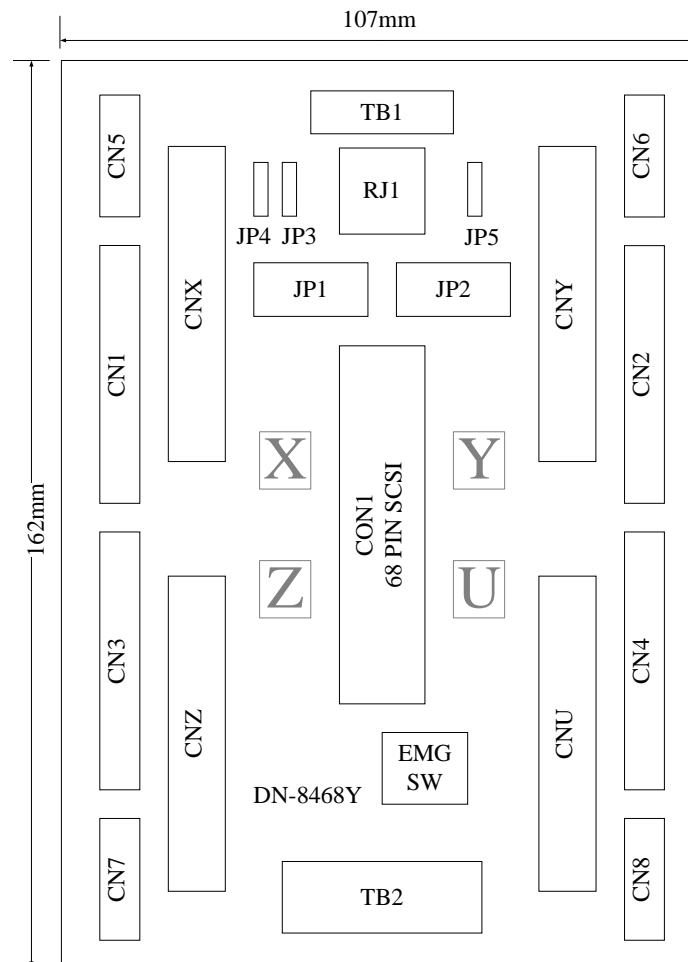


Fig. 3-1 Board layout for the DN-8468Y

## B.3.2 Signal Connections for DN-8468Y

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468Y is a 68-pin SCSI II connector that enables you to connect to the PISO-PS400 motion card. Please refer to the section 2.2.1( page 15).

### ■ TB1

The connector TB1 is 7-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-3 shows the pin assignment for the 7-pin connector on the DN-8468Y, and the Table 3-4 shows its I/O connector signal description.

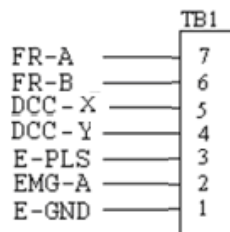


Fig. 1-3 Pin definition for TB1

Table 1-4 TB1 Signal Connection

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
DCC - X	Deviation Counter Clear for X axis
DCC - Y	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground

### ■ TB2

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-4 shows the pin assignment for the 5-pin connector on the DN-8468Y, and the Table 3-5 shows its I/O connector signal description.

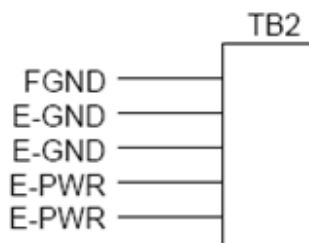


Fig. 1-4 Pin definition for TB2

Table 1-5 TB2 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

► **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happened.

■ **CNX, CNY, CNZ, CNU (CN X5 connector for each AXIS in Driver)**

The connectors CNX, CNY, CNZ, and CNU are 50-pin connectors that enable you to connect to the CN X5 connector of Panasonic motor drivers. Fig.3-5 shows the pin assignment for the 50-pin connector on the DN-8468Y, and the Table 3-6 shows its I/O connector signal description.

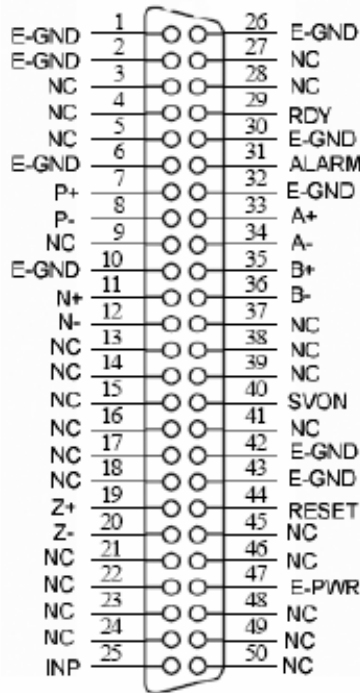


Fig. 3-5 Pin definition for CNX, CNY, CNZ, CNU

Table 3-6 CN1 Signal Connection

Name	Number	Description
A+	33	Encoder A-Phase (+)
A-	34	Encoder A-Phase (-)
B+	35	Encoder B-Phase (+)
B-	36	Encoder B-Phase (-)
Z+	19	Encoder Z-Phase (+)
Z-	20	Encoder Z-Phase (-)
P+	7	Positive Direction Pulse Output(+)
P-	8	Positive Direction Pulse Output(-)
N+	11	Negative Direction Pulse
N-	12	Negative Direction Pulse Output(-)
INP	25	Servo In Position
RDY	29	Servo Ready
SVON	40	Servo On
RESET	44	Parameter Reset
ALARM	31	Servo Alarm
E-PWR	47	EXT power +24V
E-GND	1,2,6,10, 28, 30,32, 42,43	EXT power ground
NC	3,4,5,9, 13,14,15, 18,17,18, 21,22,23, 24,27,28, 37,38,39, 41,45,46, 48,49,50,	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

■ **CN1~CN4 (The I/O signals of the X, Y, Z, U AXIS )**

The connectors CN1~CN4 are 11-pin connectors that enable you to connect to the signals of your motor drivers. Fig.3-7 shows the pin assignment for the 20-pin connector on the DN-8468Y, and the Table 3-8 shows its I/O connector signal description.

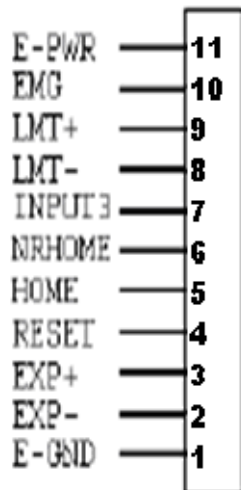


Fig. 1-7 Pin definition for CN1 ~ CN4

Table 3-8 CN1~4 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
EMG	EMG input signal
LMT+	Limit Switch Input Signal (+)
LMT-	Limit Switch Input Signal (-)
INPUT3	Input Signal (IN3)
NRHOME	Near Home Sensor Input Signal
HOME	Home Sensor Input Signal
RESET	Reset input signal
EXP+	EXT Positive Direction Pulse (+)
EXP-	EXT Negative Direction Pulse (-)
E-GND	EXT power ground

## ■ CN5~CN8 (The I/O signals of the X, Y, Z, U AXIS )

The connectors CN5~CN8 are 15-pin connectors that enable users to connect the signals to external motor drivers. Fig.3-8 shows the pin assignment for the 15-pin connector on the DN-8468Y, and the Table 3-9 shows its I/O connector signal description.

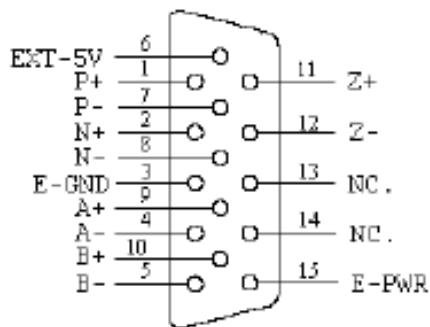


Fig. 3-8 Pin definition for CN5 ~ CN8

Table 3-9 CN5~8

Name	No.	Description
A+	9	Encoder A-Phase (+)
A-	4	Encoder A-Phase (-)
B+	10	Encoder B-Phase (+)
B-	5	Encoder B-Phase (-)
Z+	11	Encoder Z-Phase (+)
Z-	12	Encoder Z-Phase (-)
P+	1	Positive Direction Pulse Output(+)
P-	7	Positive Direction Pulse Output(-)
N+	2	Negative Direction Pulse Output(+)
N-	8	Negative Direction Pulse Output(-)
E-PWR	15	EXT power +24V
E-GND	3	EXT power ground
EXT-5V	6	EXT power +5V
NC	13, 14	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## ■ RJ1 (The I/O signals of the FRnet)

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. Fig.3-9 shows the pin assignment for the 8-pin connector on the DN-8468Y, and the Table 3-10 shows its I/O connector signal description.

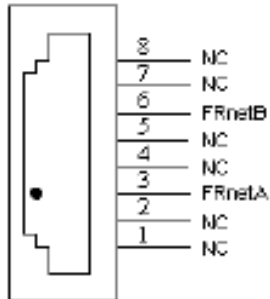


Table 3-10 RJ1

Pin name	Description
FRnetA	FRnet port A
FRnetB	FRnet port B
NC	No connection

Fig. 3-9 Pin definition for RJ1

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.



## B.3.3 Jumper and Switch Settings

### ■ JP5

Jumper 5 controls the EMG-A signal of the TB1 connector. The following diagram is shown the selection condition of the jumper 5.

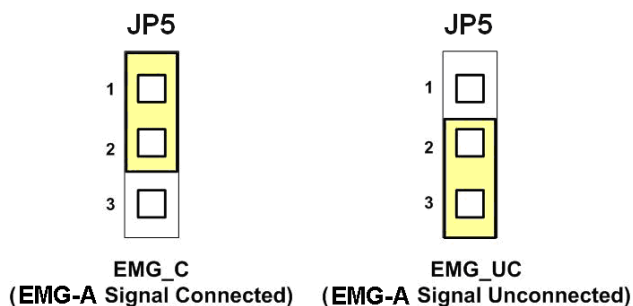


Fig. 3-10 Jumper 5 setting

### ■ JP1, JP2

The encoder signals of axis X and axis Y can be chosen from servo driver encoder or external encoder. Fig. 3-11 shows that the encoder signals are selected from servo driver encoder. In meantime, Fig. 3-12 shows that the encoder signals are selected from external encoder.

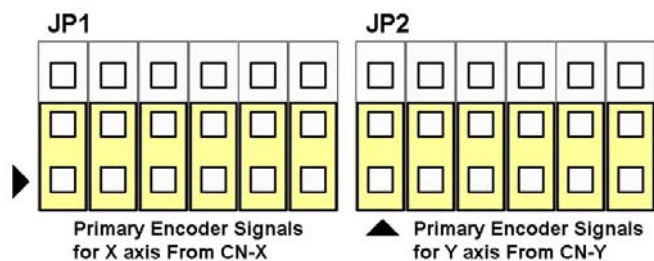


Fig. 3-11 Primary encoder signals setting

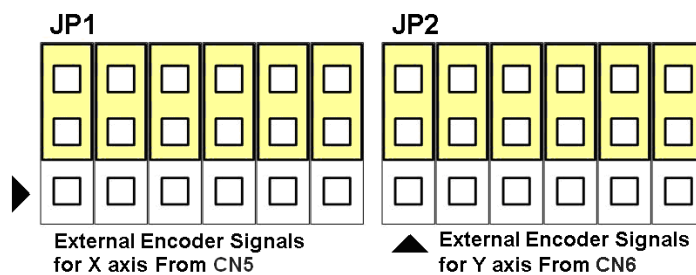


Fig. 3-12 External encoder signals setting

## ■ EMG SW

The emergency stop signal for each servo amplifier can be selected from EMG SW. The number 1, 2, 3, 4 on EMG SW are denoted as axis X, Y, Z, U, respectively. Fig. 3-13 is the default setting to connect the EMG signals to GND. The EMG signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 3-14, the emergency stop signals can be controlled from EMG signals in CN1 ~ CN4.

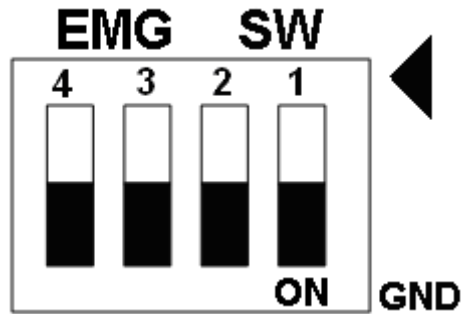


Fig. 3-13 EMG SW setting for normally GND (Default setting)

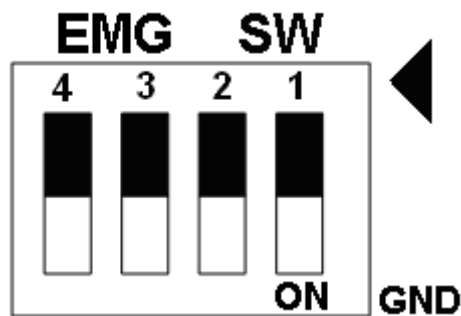


Fig. 3-14 EMG SW setting for user controlled signals.

## B.4 DN-8468D Daughter Board

The DN-8468D is the daughter board for Delta ASDA-A Series Amplifier. It has 4-axis I/O signals.

### B.4.1 Board Layout for DN-8468D

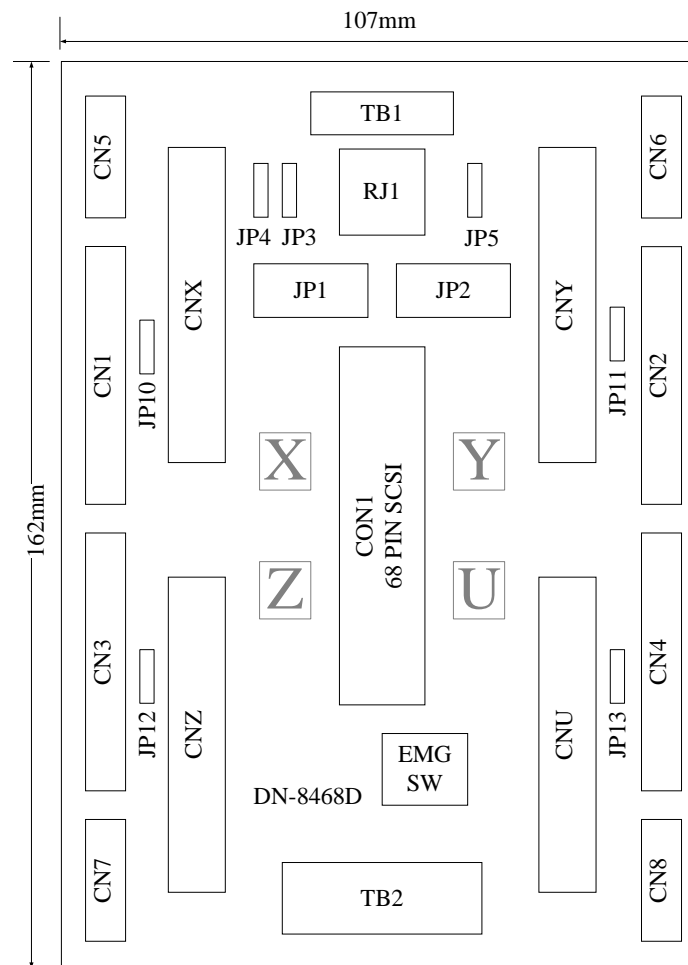


Fig. 3-1 Board layout for the DN-8468D

## B.4.2 Signal Connections for DN-8468D

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468D is a 68-pin SCSI II connector that enables you to connect to the I-8094 motion card. Fig. 3-2 shows the pin assignment for the 68-pin I/O connector on the DN-8468D (or on the I-8094), and refer to Table 3-2, 3-3 for description of each motion I/O signal.

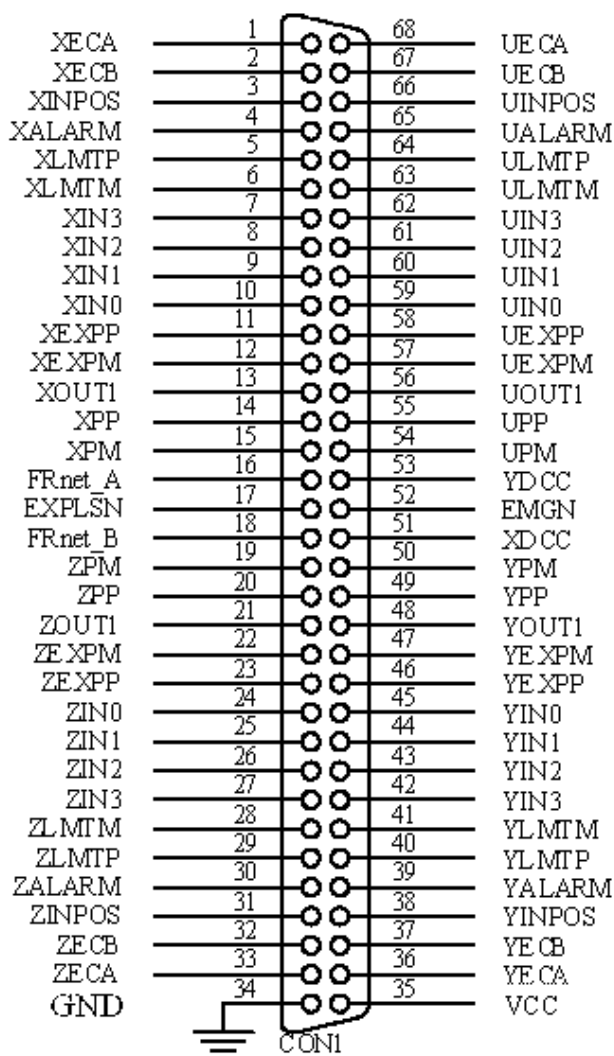


Fig. 3-2 I/O connector pin assignment for the CON1

Table 3-2 DN-8468D I/O connector signal description (part 1)

Pin name	Pin number	Description
XECA	1	Encoder A-phase signal for X axis
YECA	36	Encoder A-phase signal for Y axis
ZECA	33	Encoder A-phase signal for Z axis
UECA	68	Encoder A-phase signal for U axis
XECB	2	Encoder B-Phase signal for X axis
YECB	37	Encoder B-Phase signal for Y axis
ZECB	32	Encoder B-Phase signal for Z axis
UECB	67	Encoder B-Phase signal for U axis
XINPOS	3	In-position signal for X axis
YINPOS	38	In-position signal for Y axis
ZINPOS	31	In-position signal for Z axis
UINPOS	66	In-position signal for U axis
XALARM	4	Alarm signal for X axis
YALARM	39	Alarm signal for Y axis
ZALARM	30	Alarm signal for Z axis
UALARM	65	Alarm signal for U axis
XLMTM	5	Limit switch input signal (+) for X axis
YLMTM	40	Limit switch input signal (+) for Y axis
ZLMTM	29	Limit switch input signal (+) for Z axis
ULMTM	64	Limit switch input signal (+) for U axis
XLMTM	6	Limit switch input signal (-) for X axis
YLMTM	41	Limit switch input signal (-) for Y axis
ZLMTM	28	Limit switch input signal (-) for Z axis
ULMTM	63	Limit switch input signal (-) for U axis
XIN3	7	Input 3 signal for X axis
YIN3	42	Input 3 signal for Y axis
ZIN3	27	Input 3 signal for Z axis
UIN3	62	Input 3 signal for U axis
XIN2	8	Input 2 signal for X axis
XIN2	43	Input 2 signal for Y axis
XIN2	26	Input 2 signal for Z axis
XIN2	61	Input 2 signal for U axis
XIN1	9	Input 1 signal for X axis
YIN1	44	Input 1 signal for Y axis
ZIN1	25	Input 1 signal for Z axis
UIN1	60	Input 1 signal for U axis
XIN0	10	Input 0 signal for X axis
YIN0	45	Input 0 signal for Y axis
ZIN0	24	Input 0 signal for Z axis
UIN0	59	Input 0 signal for U axis

Table 3-3 DN-8468D I/O connector signal description (part 2)

Pin name	Pin number	Description
XEXPP	11	EXT pulsar input signal (+) for X axis
YEXPP	46	EXT pulsar input signal (+) for Y axis
ZEXPP	23	EXT pulsar input signal (+) for Z axis
UEXPP	58	EXT pulsar input signal (+) for U axis
XEXPM	12	EXT pulsar input signal (-) for X axis
YEXPM	47	EXT pulsar input signal (-) for Y axis
ZEXPM	22	EXT pulsar input signal (-) for Z axis
UEXPM	57	EXT pulsar input signal (-) for U axis
XDRIVE	13	Driver enable signal for X axis
YDRIVE	48	Driver enable signal for Y axis
ZDRIVE	21	Driver enable signal for Z axis
UDRIVE	56	Driver enable signal for U axis
XPP	14	Driving pulsar signal (+) for X axis
YPP	49	Driving pulsar signal (+) for Y axis
ZPP	20	Driving pulsar signal (+) for Z axis
UPP	55	Driving pulsar signal (+) for U axis
XPM	15	Driving pulsar signal (+) for X axis
YPM	50	Driving pulsar signal (+) for Y axis
ZPM	19	Driving pulsar signal (+) for Z axis
UPM	54	Driving pulsar signal (+) for U axis
XOUT1	16	Output 1 signal for X axis
YOUT1	48	Output 1 signal for Y axis
ZOUT1	21	Output 1 signal for Z axis
UOUT1	56	Output 1 signal for U axis
EXPLSN1	17	EXT pulse input signal for interpolation
EMGN1	52	Emergency stop input signal
FRnetA	16	FRnet port A
FRnetB	18	FRnet port B
XDCC	51	Deviation Counter Clear for X axis
YDCC	53	Deviation Counter Clear for Y axis
GND	34	Ground
VCC	35	External power (12~24V)

## ■ TB1

The connector TB1 is 7-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-3 shows the pin assignment for the 7-pin connector on the DN-8468D, and the Table 3-4 shows its I/O connector signal description.

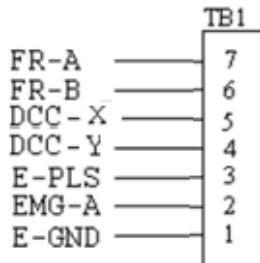


Fig. 1-3 Pin definition for TB1

Table 1-4 TB1 Signal Connection

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
DCC - X	Deviation Counter Clear for X axis
DCC - Y	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground

## ■ TB2

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-4 shows the pin assignment for the 5-pin connector on the DN-8468D, and the Table 3-5 shows its I/O connector signal description.

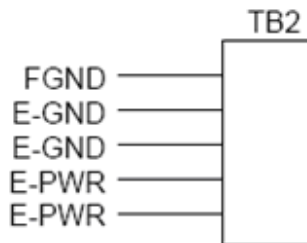


Fig. 1-4 Pin definition for TB2

Table 1-5 TB2 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

► **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happened.

■ **CNX, CNY, CNZ, CNU (CN 1 connector for each AXIS in Driver)**

The connectors CNX, CNY, CNZ, and CNU are 50-pin connectors that enable you to connect to the CN1 connector of Delta ASDA-A series motor drivers. Fig.3-5 shows the pin assignment for the 50-pin connector on the DN-8468D, and the Table 3-6 shows its I/O connector signal description.

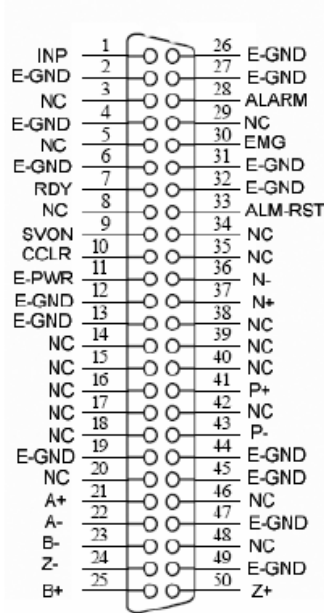


Fig. 3-5 Pin definition for CNX, CNY, CNZ, CNU

Table 3-6 CN 1 Signal Connection

Name	Number	Description
A+	21	Encoder A-Phase (+)
A-	22	Encoder A-Phase (-)
B+	25	Encoder B-Phase (+)
B-	23	Encoder B-Phase (-)
Z+	50	Encoder Z-Phase (+)
Z-	24	Encoder Z-Phase (-)
P+	41	Positive Direction Pulse Output(+)
P-	43	Positive Direction Pulse Output(-)
N+	37	Negative Direction Pulse Output(+)
N-	36	Negative Direction Pulse Output(-)
INP	1	Servo In Position
RDY	7	Servo Ready
SVON	9	Servo On
ALM-RST	33	Alarm Reset
CCLR	10	Error Counter Clear
ALARM	28	Servo Alarm
EMG	30	Emergent Stop
E-PWR	11	EXT power +24V
E-GND	2,4,6,12,13,19,26,27,31,32,44,45,47,49	EXT power ground
NC	3,5,8,14,15,16,17,18,20,29,34,35,38,39,40,42,46,48	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.



■ **CN1~CN4 (The I/O signals of the X, Y, Z, U AXIS)**

The connectors CN1~CN4 are 11-pin connectors that enable you to connect to the signals of your motor drivers. Fig.3-7 shows the pin assignment for the 20-pin connector on the DN-8468D, and the Table 3-8 shows its I/O connector signal description.

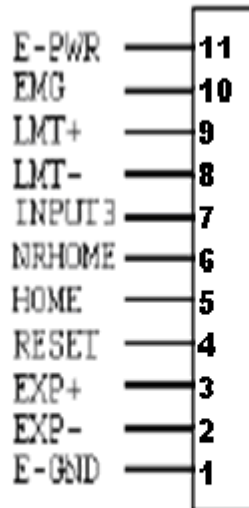


Fig. 1-7 Pin definition for CN1 ~ CN4

Table 3-8 CN1~4 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
EMG	EMG input signal
LMT+	Limit Switch Input Signal (+)
LMT-	Limit Switch Input Signal (-)
INPUT3	Input Signal (IN3)
NRHOME	Near Home Sensor Input Signal
HOME	Home Sensor Input Signal
RESET	Reset input signal
EXP+	EXT Positive Direction Pulse (+)
EXP-	EXT Negative Direction Pulse (-)
E-GND	EXT power ground

## ■ CN5~CN8 (The I/O signals of the X, Y, Z, U AXIS )

The connectors CN5~CN8 are 15-pin connectors that enable users to connect the signals to external motor drivers. Fig.3-8 shows the pin assignment for the 15-pin connector on the DN-8468D, and the Table 3-9 shows its I/O connector signal description.

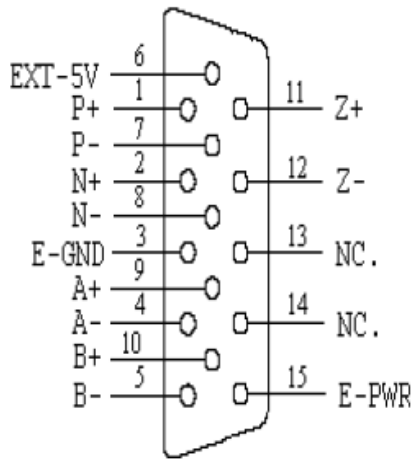


Fig. 3-8 Pin definition for CN5 ~ CN8

Table 3-9 CN5~8

Name	No.	Description
A+	9	Encoder A-Phase (+)
A-	4	Encoder A-Phase (-)
B+	10	Encoder B-Phase (+)
B-	5	Encoder B-Phase (-)
Z+	11	Encoder Z-Phase (+)
Z-	12	Encoder Z-Phase (-)
P+	1	Positive Direction Pulse Output(+)
P-	7	Positive Direction Pulse Output(-)
N+	2	Negative Direction Pulse Output(+)
N-	8	Negative Direction Pulse Output(-)
E-PWR	15	EXT power +24V
E-GND	3	EXT power ground
EXT-5V	6	EXT power +5V
NC	13, 14	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## ■ RJ1 (The I/O signals of the FRnet)

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. Fig.3-9 shows the pin assignment for the 8-pin connector on the DN-8468D, and the Table 3-10 shows its I/O connector signal description.

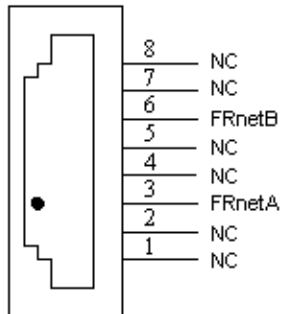


Table 3-10 RJ1

Pin name	Description
FRnetA	FRnet port A
FRnetB	FRnet port B
NC	No connection

Fig. 3-9 Pin definition for RJ1

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## B.4.3 Jumper and Switch Settings

### ■ JP5

Jumper 5 controls the EMG-A signal of the TB1 connector. The following diagram is shown the selection condition of the jumper 5.

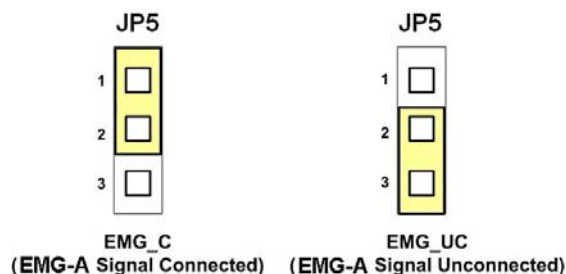


Fig. 3-10 Jumper 5 setting

### ■ JP1, JP2

The encoder signals of axis X and axis Y can be chosen from servo driver encoder or external encoder. Fig. 3-11 shows that the encoder signals are selected from servo driver encoder. In meantime, Fig. 3-12 shows that the encoder signals are selected from external encoder.

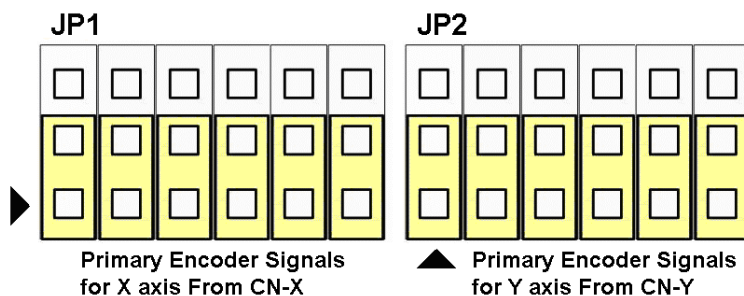


Fig. 3-11 Primary encoder signals setting

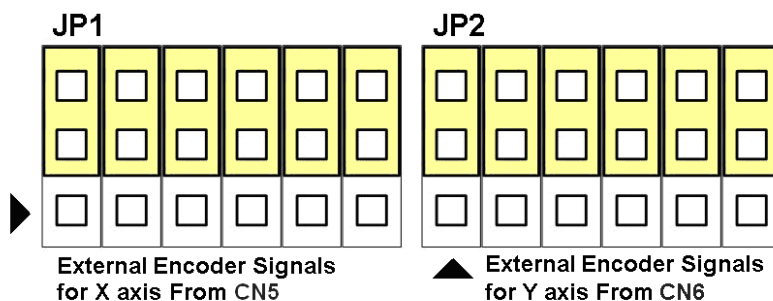


Fig. 3-12 External encoder signals setting

## ■ SW1

The emergency stop signal for each servo amplifier can be selected from SW1. The number 1, 2, 3, 4 on SW1 are denoted as axis X, Y, Z, U, respectively. Fig. 3-13 is the default setting to connect the EMG signals to GND. The EMG signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 3-14, the emergency stop signals can be controlled from EMG signals in CN1 ~ CN4.

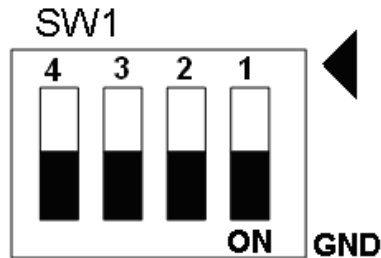


Fig. 3-13 SW1 setting for normally GND (Default setting)



Fig. 3-14 SW1 setting for user controlled signals.

## ■ JP10 ~ JP13

Jumper 10 ~ Jumper 13 can select the reset function in CN1 ~ CN4 for each axis. The following diagram is shown the selection condition of the JP10.

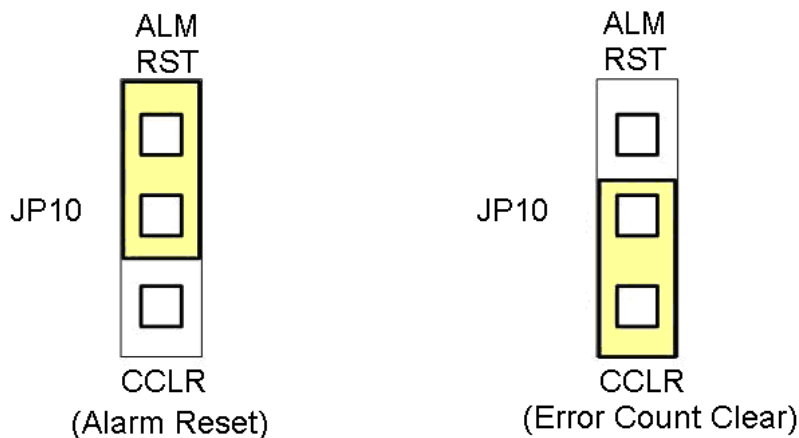


Fig. 3-15 JP 10 ~ 13 setting

## B.5 DN-8468FB Daughter Board

The DN-8468FB is the daughter board for FUJI FALDIC-W Series Amplifier. It has 4-axis I/O signals.

### B.5.1 Board Layout for DN-8468FB

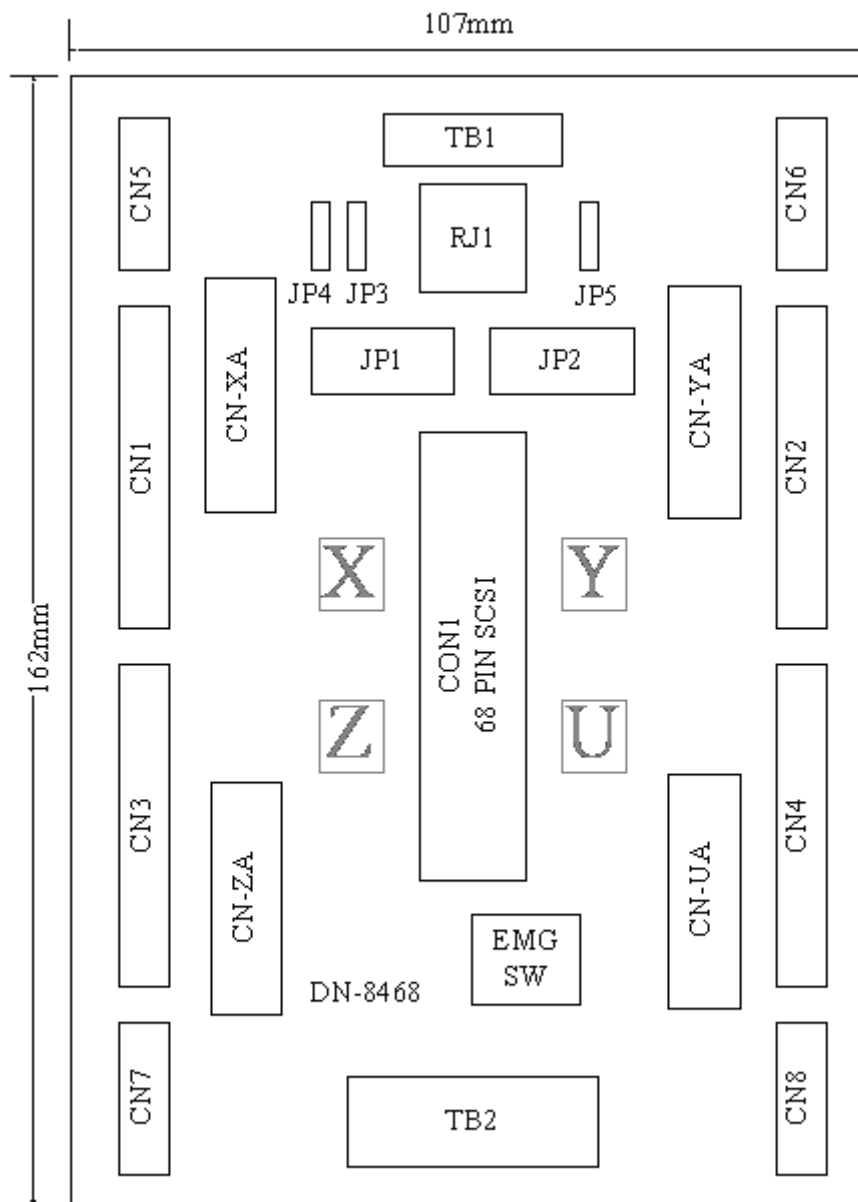


Fig. 3-1 Board layout for the DN-8468FB

## B.5.2 Signal Connections for DN-8468FB

Maintaining signal connections is one of the most important factors in ensuring that your application system is sending and receiving data correctly.

### ■ Pin Assignment for CON1

The I/O connector on the DN-8468FB is a 68-pin SCSI II connector that enables you to connect to the I-8094 motion card. Fig. 3-2 shows the pin assignment for the 68-pin I/O connector on the DN-8468FB (or on the I-8094), and refer to Table 3-2, 3-3 for description of each motion I/O signal.

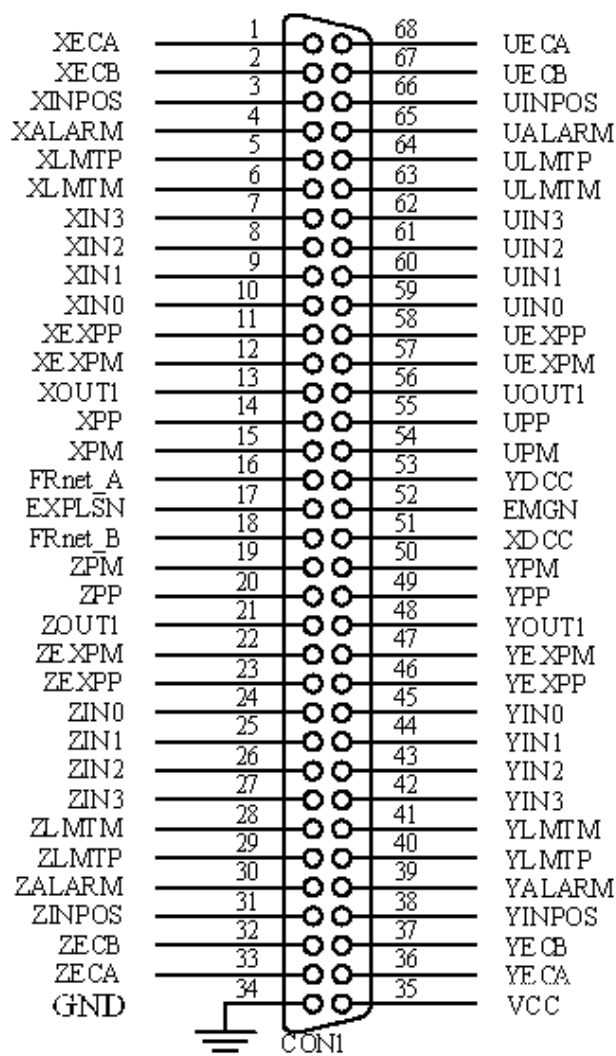


Fig. 3-2 I/O connector pin assignment for the CON1

Table 3-2 DN-8468FB I/O connector signal description (part 1)

Pin name	Pin number	Description
XECA	1	Encoder A-phase signal for X axis
YECA	36	Encoder A-phase signal for Y axis
ZECA	33	Encoder A-phase signal for Z axis
UECA	68	Encoder A-phase signal for U axis
XECB	2	Encoder B-Phase signal for X axis
YECB	37	Encoder B-Phase signal for Y axis
ZECB	32	Encoder B-Phase signal for Z axis
UECB	67	Encoder B-Phase signal for U axis
XINPOS	3	In-position signal for X axis
YINPOS	38	In-position signal for Y axis
ZINPOS	31	In-position signal for Z axis
UINPOS	66	In-position signal for U axis
XALARM	4	Alarm signal for X axis
YALARM	39	Alarm signal for Y axis
ZALARM	30	Alarm signal for Z axis
UALARM	65	Alarm signal for U axis
XLMTM	5	Limit switch input signal (+) for X axis
YLMTM	40	Limit switch input signal (+) for Y axis
ZLMTM	29	Limit switch input signal (+) for Z axis
ULMTM	64	Limit switch input signal (+) for U axis
XLMTM	6	Limit switch input signal (-) for X axis
YLMTM	41	Limit switch input signal (-) for Y axis
ZLMTM	28	Limit switch input signal (-) for Z axis
ULMTM	63	Limit switch input signal (-) for U axis
XIN3	7	Input 3 signal for X axis
YIN3	42	Input 3 signal for Y axis
ZIN3	27	Input 3 signal for Z axis
UIN3	62	Input 3 signal for U axis
XIN2	8	Input 2 signal for X axis
XIN2	43	Input 2 signal for Y axis
XIN2	26	Input 2 signal for Z axis
XIN2	61	Input 2 signal for U axis
XIN1	9	Input 1 signal for X axis
YIN1	44	Input 1 signal for Y axis
ZIN1	25	Input 1 signal for Z axis
UIN1	60	Input 1 signal for U axis
XIN0	10	Input 0 signal for X axis
YIN0	45	Input 0 signal for Y axis
ZIN0	24	Input 0 signal for Z axis
UIN0	59	Input 0 signal for U axis



Table 3-3 DN-8468FB I/O connector signal description (part 2)

Pin name	Pin number	Description
XEXPP	11	EXT pulsar input signal (+) for X axis
YEXPP	46	EXT pulsar input signal (+) for Y axis
ZEXPP	23	EXT pulsar input signal (+) for Z axis
UEXPP	58	EXT pulsar input signal (+) for U axis
XEXPM	12	EXT pulsar input signal (-) for X axis
YEXPM	47	EXT pulsar input signal (-) for Y axis
ZEXPM	22	EXT pulsar input signal (-) for Z axis
UEXPM	57	EXT pulsar input signal (-) for U axis
XDRIVE	13	Driver enable signal for X axis
YDRIVE	48	Driver enable signal for Y axis
ZDRIVE	21	Driver enable signal for Z axis
UDRIVE	56	Driver enable signal for U axis
XPP	14	Driving pulsar signal (+) for X axis
YPP	49	Driving pulsar signal (+) for Y axis
ZPP	20	Driving pulsar signal (+) for Z axis
UPP	55	Driving pulsar signal (+) for U axis
XPM	15	Driving pulsar signal (+) for X axis
YPM	50	Driving pulsar signal (+) for Y axis
ZPM	19	Driving pulsar signal (+) for Z axis
UPM	54	Driving pulsar signal (+) for U axis
XOUT1	16	Output 1 signal for X axis
YOUT1	48	Output 1 signal for Y axis
ZOUT1	21	Output 1 signal for Z axis
UOUT1	56	Output 1 signal for U axis
EXPLSN1	17	EXT pulse input signal for interpolation
EMGN1	52	Emergency stop input signal
FRnetA	16	FRnet port A
FRnetB	18	FRnet port B
XDCC	51	Deviation Counter Clear for X axis
YDCC	53	Deviation Counter Clear for Y axis
GND	34	Ground
VCC	35	External power (12~24V)

## ■ TB1

The connector TB1 is 7-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-3 shows the pin assignment for the 7-pin connector on the DN-8468FB, and the Table 3-4 shows its I/O connector signal description.

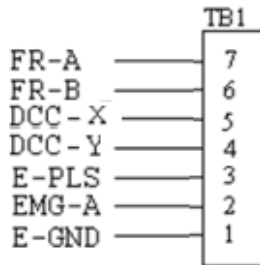


Fig. 1-3 Pin definition for TB1

Table 1-4 TB1 Signal Connection

Name	Description
FR-A	FRnet port A
FR-B	FRnet port B
DCC - X	Deviation Counter Clear for X axis
DCC - Y	Deviation Counter Clear for Y axis
E-PLS	EXT pulse signal
EMG-A	EMG input signal for all axes
E-GND	EXT power ground

## ■ TB2

The connector TB2 is 5-pin connector that enables you to connect to the signals of your motor drivers. Fig.3-4 shows the pin assignment for the 5-pin connector on the DN-8468FB, and the Table 3-5 shows its I/O connector signal description.

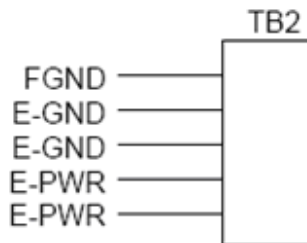


Fig. 1-4 Pin definition for TB2

Table 1-5 TB2 Signal Connection

Pin name	Description
E-PWR	EXT power supply +24V
E-GND	EXT power ground
FGND	Frame ground

► **Note:** Don't reverse connect signals with E\_PWR and E\_GND. Serious damage to your motion card and motion controller might be happened.

■ **CN-X, CN-Y, CN-Z, CN-U (CN1 connector for each AXIS in Driver)**

The connectors CN-X, CN-Y, CN-Z, and CN-U are 26-pin connectors that enable you to connect to the CN1 connector of FUJI FALDIC-W series motor drivers. Fig.3-5 shows the pin assignment for the 26-pin connector on the DN-8468FB, and the Table 3-6 shows its I/O connector signal description.

Table 3-6 CN-X ,CN-Y ,CN-Z ,CN-U

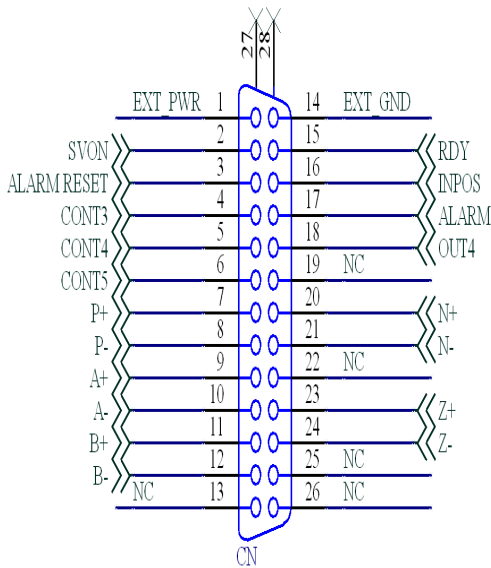


Fig 3-5 Pin definition for CN-X, CN-Y, CN-Z, CN-U

Name	No.	Description
EXT_PWR	1	EXT POWER 24V
SVON	2	CONT1 of Servo Motor (default: SVON)
ALARM RESET	3	CONT2 of Servo Motor (default: ALARM RESET)
CONT3	4	CONT3 of Servo Motor
CONT4	5	CONT4 of Servo Motor
CONT5	6	CONT5 of Servo Motor
P+	7	Positive Direction Pulse (+)
P-	8	Positive Direction Pulse (-)
A+	9	Encoder A-phase (+)
A-	10	Encoder A-phase (-)
B+	11	Encoder B-phase (+)
B-	12	Encoder B-phase (-)
NC	13	No connection
EXT_GND	14	EXT POWER Ground
RDY	15	OUT1 of Servo Motor (default: RDY)
INPOS	16	OUT2 of Servo Motor (default: INPOS)
ALARM	17	OUT3 of Servo Motor (default: ALARM)
OUT4	18	OUT4 of Servo Motor
NC	19	No connection
N+	20	Negative Direction Pulse (+)
N-	21	Negative Direction Pulse (-)
NC	22	No connection
Z+	23	Encoder Z-phase (+)
Z-	24	Encoder Z-phase (-)
NC	25	No connection
NC	26	No connection

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

■ **CN1~CN4 (The I/O signals of the X, Y, Z, U AXIS )**

The connectors CN1~CN4 are 12-pin connectors that enable you to connect to the signals of your motor drivers. Fig.3-7 shows the pin assignment for the 12-pin connector on the DN-8468FB, and the Table 3-8 shows its I/O connector signal description.

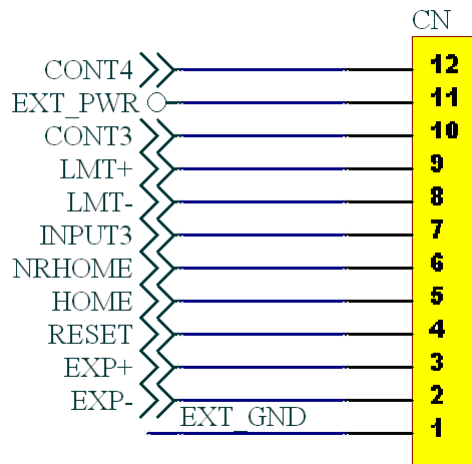


Table 3-8 CN1~CN4

Name	Number	Description
CONT4	12	CONT4 of Servo Motor
EXT_PWR	11	EXT POWER 24V
CONT3	10	CONT3 of Servo Motor
LMT+	9	Limit switch Input Signal(+)
LMT-	8	Limit switch Input Signal(-)
INPUT3	7	Input Signal (IN3)
NRHOME	6	Near HOME Sensor Input Signal
HOME	5	HOME Sensor Input Signal
RESET	4	RESET Input Signal
EXP+	3	EXT Positive Direction Pulse(+)
EXP-	2	EXT Positive Direction Pulse(-)
EXT_GND	1	EXT POWER Ground

Fig 3-7 Pin definition for CN1~ CN4

## ■ CN5~CN8 (The I/O signals of the X, Y, Z, U AXIS )

The connectors CN5~CN8 are 15-pin connectors that enable users to connect the signals to external motor drivers. Fig.3-8 shows the pin assignment for the 15-pin connector on the DN-8468FB, and the Table 3-9 shows its I/O connector signal description.

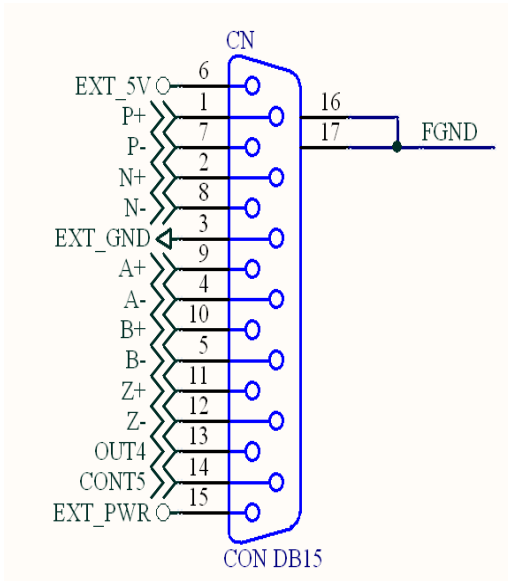


Fig 3-8 Pin definition for CN5~ CN8

Table 3-9 CN5~CN8

Name	Number	Description
P+	1	Positive Direction Pulse(+)
N+	2	Negative Direction Pulse(+)
EXT_GND	3	EXT POWER Ground
A-	4	Encoder A-phase(-)
B-	5	Encoder B-phase(-)
EXT_5V	6	EXT POWER 5V
P-	7	Positive Direction Pulse(-)
N-	8	Negative Direction Pulse(-)
A+	9	Encoder A-phase(+)
B+	10	Encoder B-phase(+)
Z+	11	Encoder Z-phase(+)
Z-	12	Encoder Z-phase(-)
OUT4	13	OUT4 of Servo Motor
CONT5	14	CONT5 of Servo Motor
EXT_PWR	15	EXT POWER 24V

- ▶ **Note 1:** There are two sets encoder signals for X and Y axes. In X axis, one is from CNX and the other is from CN5. In Y axis, one is from CNY and the other is from CN6. Users can select encoder signals from JP1 and JP2, respectively.
- ▶ **Note 2:** In Z and U axes, only one set of encoder signals is used for each axis. In Z axis, do not connect CNZ and CN7 at the same time. In U axis, do not connect CNU and CN8 at the same time.
- ▶ **Note 3 :** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## ■ RJ1 (The I/O signals of the FRnet)

The connectors RJ1 is an 8-pin RJ45 connector that enable you to connect to the signals of FRnet. Fig.3-9 shows the pin assignment for the 8-pin connector on the DN-8468FB, and the Table 3-10 shows its I/O connector signal description.

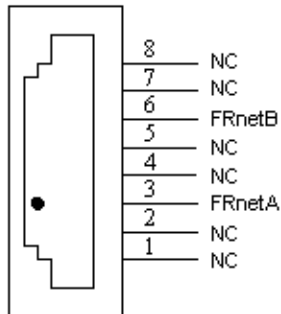


Table 3-10 RJ1

Pin name	Description
FRnetA	FRnet port A
FRnetB	FRnet port B
NC	No connection

Fig. 3-9 Pin definition for RJ1

► **Note:** Don't connect NC (not connected) signals. Connecting these signals could cause permanent damage to your motion controller.

## B.5.3 Jumper and Switch Settings

### ■ JP5

Jumper 5 controls the EMG-A signal of the TB1 connector. The following diagram is shown the selection condition of the jumper 5.

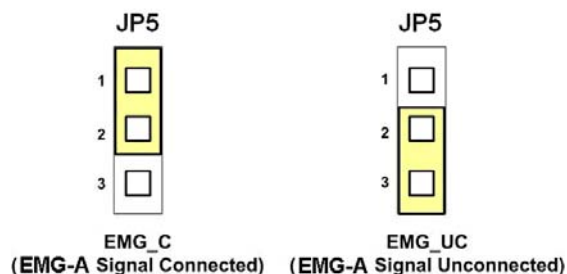


Fig. 3-10 Jumper 5 setting

### ■ JP1, JP2

The encoder signals of axis X and axis Y can be chosen from servo driver encoder or external encoder. Fig. 3-11 shows that the encoder signals are selected from servo driver encoder. In meantime, Fig. 3-12 shows that the encoder signals are selected from external encoder.

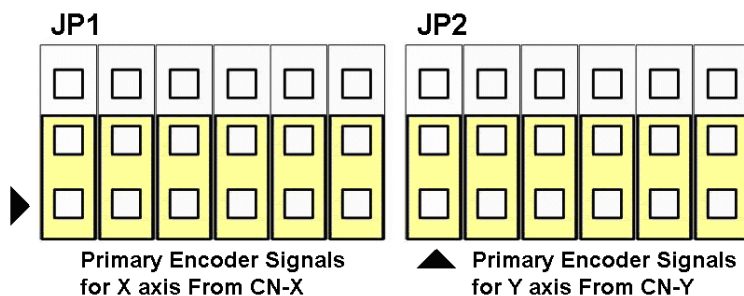


Fig. 3-11 Primary encoder signals setting

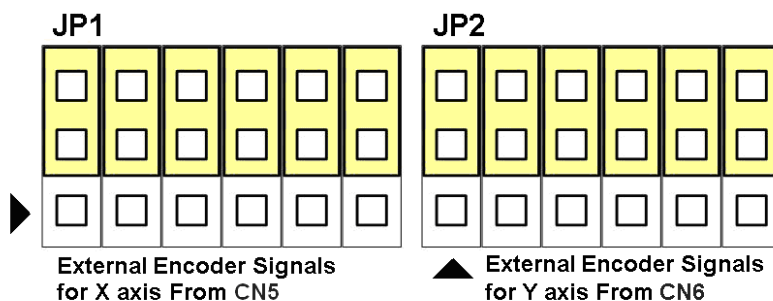


Fig. 3-12 External encoder signals setting

## ■ SW1

The CONT3 for each servo amplifier can be selected from SW1. The number 1, 2, 3, 4 on SW1 are denoted as axis X, Y, Z, U, respectively. Fig. 3-13 is the default setting to connect the CONT3 signals to GND. The CONT3 signals from CN1 ~ CN4 will not take effect. If the switch is disconnected as shown in Fig. 3-14, the CONT3 signals can be controlled from CONT3 signals in CN1 ~ CN4.

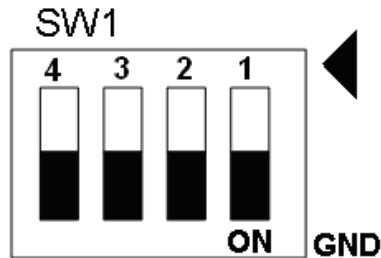


Fig. 3-13 SW1 setting for normally GND (Default setting)

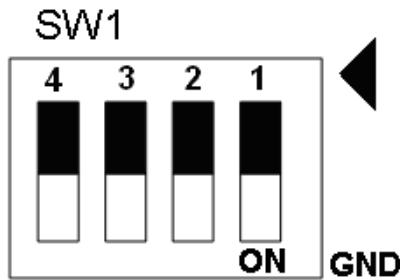


Fig. 3-14 SW1 setting for user controlled signals.