Preface

Thank you for choosing our products.

Please read through the manual before using the products to ensure correct use.

Because of continuous updating, the products you bought may differ from the written in this manual.

Company address, phone number and our website are listed here for your convenience. Any questions, please feel free to contact us. We will always be here and welcome you.

Company Name:	Weihong Electronic Technology Co., Ltd.
Headquarters Address:	No. 29, 2338 Duhui Rd., Minhang, Shanghai
Zip Code:	201108
Tel:	+86-21-33587550
Fax:	+86-21-33587519
Website:	http://en.weihong.com.cn
E-mail:	sales@ weihong.com.cn

Cautions

◆ **Storage and Transportation**

Attention
➢ The products should be transported properly in terms of the weight.
➢ An excess of specified quantity of stacking products is prohibited.
➢ Climbing, standing or placing heavy loads on the products is prohibited.
➢ Dragging or carrying the products via cables or devices connected to them is prohibited.
➢ Keep the products free from moisture during storage and transportation.

◆ **After Opening the Package**

Attention
➢ Please make sure whether the products are what you have ordered.
➢ Check if the products are damaged in transit.
➢ Check if the components and accessories are damaged or missing in terms of the detailed list.
➢ Please contact us promptly if product discrepancy, accessory missing or transit damage occurs.

◆ Installation Notices

Attention
➢ Only when this equipment installed in the qualified electricity cabinet can it be used. The construction of the cabinet must reach IP54 grade of protection.
➢ Paste sealing strips on the joint of the cabinet to seal all the cracks.
➢ Cable entry should be sealed while easy-to-open on the spot.
➢ A fan or heat exchanger should be adopted for the heat dissipation and air convection of the cabinet.
➢ If a fan is adopted, air strainer is a must in air inlet or air outlet.
➢ Dust or cutting fluids may have access to the CNC device via the tiny cracks and tuyere. Therefore it is necessary to pay attention to the surroundings and air flow direction of the air vent to make sure that the outflow gas is towards pollution source.
➢ 100 mm space should be preserved between the back of the CNC device and the cabinet wall for plugging cable connected with the device and the ventilation & heat dissipation in the cabinet.
➢ Space between this device and other equipments should also be preserved according to the requirements.
➢ The product should be installed firmly and without vibration. During installing, casting, knocking, striking, or loading on the product is forbidden.
➢ To reduce electromagnetic interference, power-supply components used should be above AC or DC 50V and the space between cable and CNC device should be preserved above 100mm.
➢ It will be better if the CNC device is installed at the position facilitating debugging and maintenance.

◆ **Wiring Notices**

Attention
➢ Only qualified people are allowed to participate in the wiring and checking.
➢ The CNC device should be grounded reliably and grounding resistance should be less than 4 ohm. Neutral line is absolutely not allowed to replace earth wire. Otherwise, the device may be likely to work improperly due to the interference.
➢ Wiring should be firm and steady, or misoperation may occur.
➢ Voltage values and positive & negative polarity of any connection plug should be in accordance with the manual, or such breakdowns as short circuit and device permanent damage may occur.
➢ To guard against electric shock or CNC device damage, fingers should keep dry before plugging or touching switch.
➢ The connecting wire should not be damaged and squeezed, or the leakage or short circuit may occur.
➢ It is prohibited to plug or open the chassis of CNC device when power on.

◆ **Running & Debugging Notices**

Attention
➢ Parameters setting should be checked before running, since wrong setting may lead to accidental movements.
➢ Modification to parameters should be within the allowable range, or such breakdowns as unsteady running and machine damage will occur.

◆ **Precautions in Use**

Attention
➢ Before power-on, please make sure that the switch is on blackout to avoid occasional start-up.
➢ Please check the electromagnetic compatibility during electrical design in order to avoid or reduce electromagnetic interference to the CNC device. A low pass filter should be employed to reduce electromagnetic interference if there are other electrical devices nearby.
➢ It is not allowed to frequently power on and power off. It is recommended 1 minute interval at least after power failure or blackout before power on.

Contents

1 Overview

1.1 NC65A/B

Independently developed and industrial-mainboard based, NC65A/B integrated CNC system comprises Lambda 4S/5S series controller and NC65A/B host integrating CPU, 60G SSD, 1G RAM, control card and NcStudio motion control software, having proven itself in glass edging, glass cutting, engraving & milling, and other cutting industries.

Running on PC-based OS platform, NC65A/B, through strict EMC test, is with digital verification function and thus anti-virus, featuring high reliability, high cost performance and compact design.

1.2 PM85A/PM95A

Independently developed by Weihong Electronic Technology Co., Ltd., PM85A/PM95A communication card, when used with NcStudio motion control software, has proven itself on routers, engraving and milling machines, drilling machines and cutting machines, available of comprehensive functions and convenient to use.

2 Configuration and Dimension

Configuration as follows:

- One communication card (PM85A or PM95A) or one NC65A/B host;
- One Lambda 4S/5S series controller;
- One NcStudio motion control software CD (Not required if software customized);
- One DB9M/F cable (Cable length customizable);
- One handwheel (Optional, including NK-MPG-06, aviation plug handwheel NK-MPG-09 and EHDW-DA5S-1M).

2.1 Dimensional Drawing of NC65A/B Host

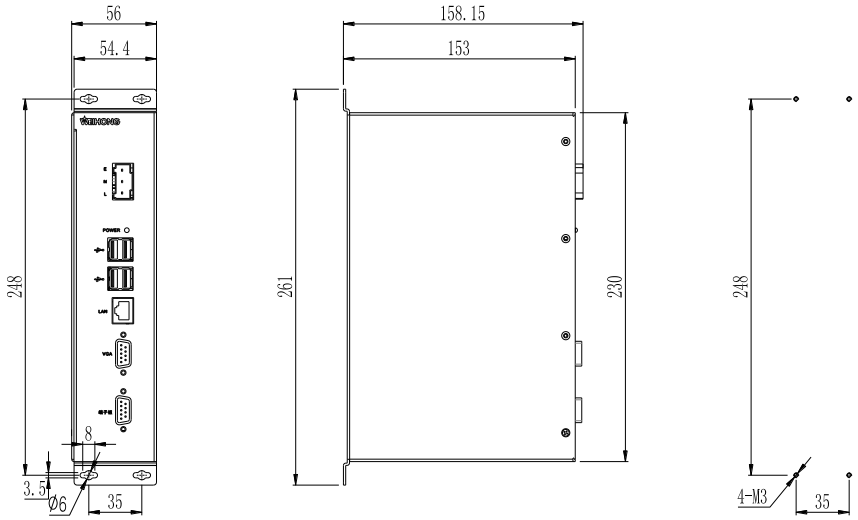


Fig. 2-1 Dimensional drawing of NC65A host

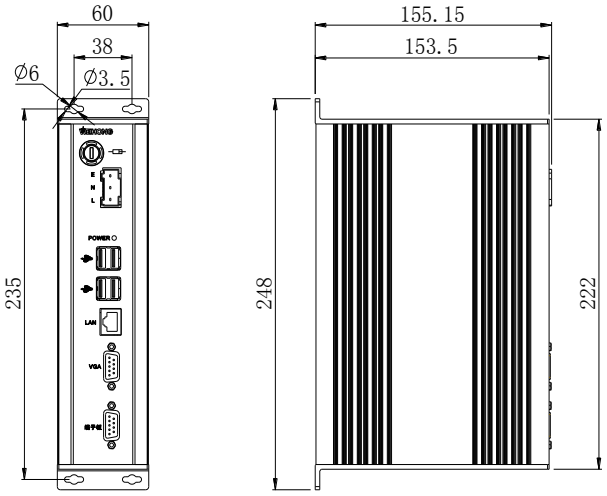


Fig. 2-2 Dimensional drawing of NC65B host

There are some external interfaces on the NC65A/B host:

- L, N and E: live wire, neutral wire and earth wire respectively, for external connection with 220V power supply;
- USB: for external connection with USB device (e.g. USB flash drive);
- LAN: Ethernet port, 100Mbps;
- VGA: video output interface;
- 端子板: for external connection with Lambda 4S/5S series controller;
- Fuse: replaceable, only available in NC65B host.

2.2 Structural Drawing of PM85A Communication Card

PM85A should be inserted into a PCI slot, and its dimension is 138.4mm * 59.7mm.

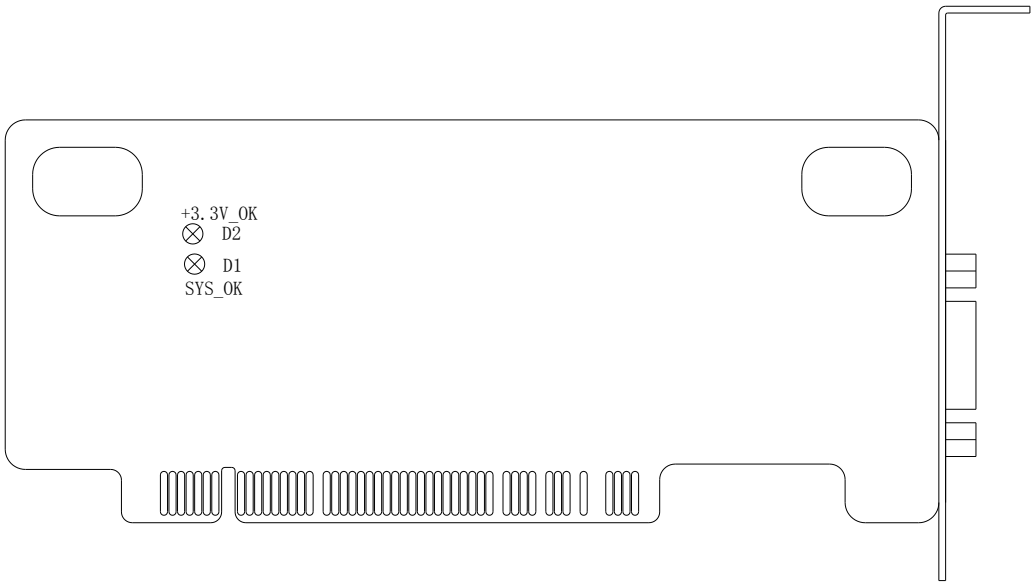


Fig. 2-3 Structural drawing of PM85A communication card

2.3 Structural Drawing of PM95A Communication Card

PM95A should be inserted into a PCI-E slot, and its dimension is 138mm * 60.5mm.

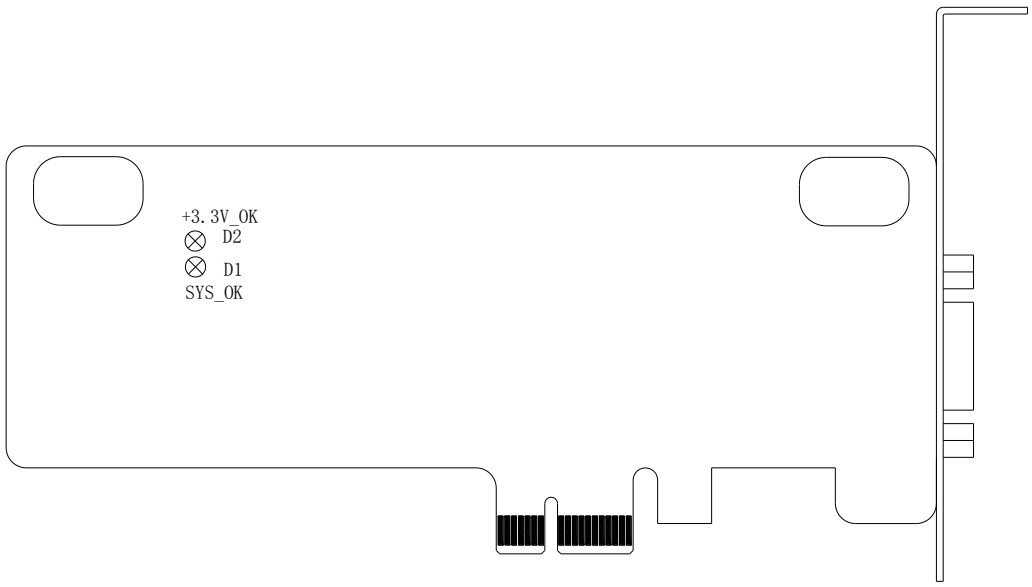


Fig. 2-4 Structural drawing of PM95A communication card

Note:

Both PM85A and PM95A have two indicator lamps—+3.3V_OK(D2) and SYS_OK (D1). The latter one is the system indicator lamp, flashing when the software is being started, and off when the software is started successfully. The former one is the power indicator lamp, on when the card is correctly inserted into the PC slot.

2.4 Dimensional Drawing of Lambda 4S/5S Series Controller

See Fig. 2-5 for the dimensional drawing of Lambda 5S series controller, whose dimension is the same as that of Lambda 4S series controller.

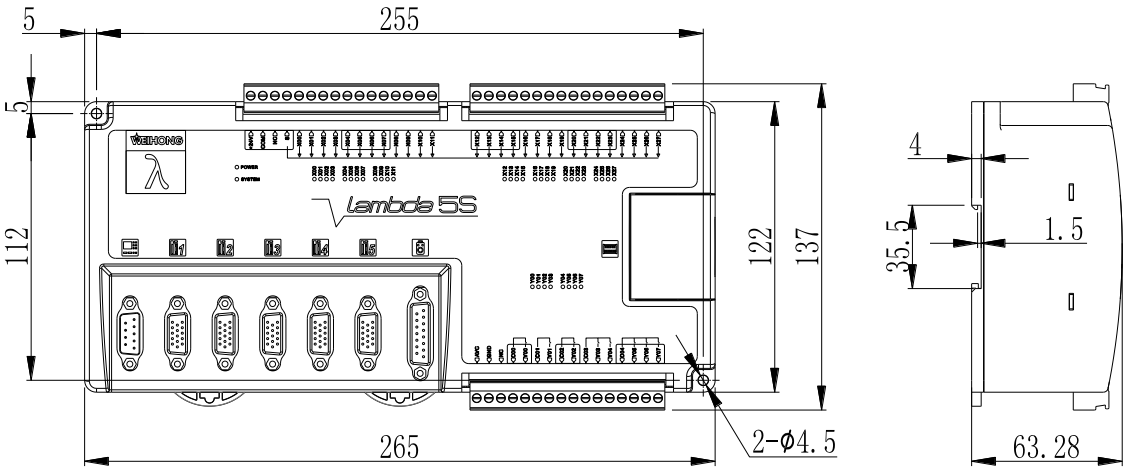


Fig. 2-5 Dimensional drawing of Lambda 5S controller

2.5 System Running Status Description

The system indicator lamp of PM85A/95A is SYS_OK, while that of Lambda 4S/5S series is SYSTEM. Their flash frequency is used to tell whether the system communication is normal, as follows:

- When physical connection is interrupted, the system indicator lamp flashes by being on for 0.5s and off for 0.5s sequentially.
- When physical connection is normal, but dada connection interrupted, for example, there is no logical data or data upload is blocked, the system indicator lamp flashes slowly by being on for 1.5s and off for 1.5s sequentially.
- When physical connection and data connection are both normal, the system indicator lamp flashes by being on for 0.25s and off for 0.25s sequentially.
- When system exception occurs, like CRC check error, pulses full, and hardware encryption error, the system indicator lamp flashes by being on for 0.05s and off for 0.05s sequentially.
- When hardware exception occurs, such as under voltage, hardware damage, pseudo soldering, and short circuit, the system indicator lamp is always on or off.
- For a Lambda 4S/5S series CNC system, when PC logical data or physical connection interrupted, the IO ports on the controller and the extended terminal board maintain their status.

3 Wiring Method

The wiring diagram of controller is as shown in Fig. 3-1.

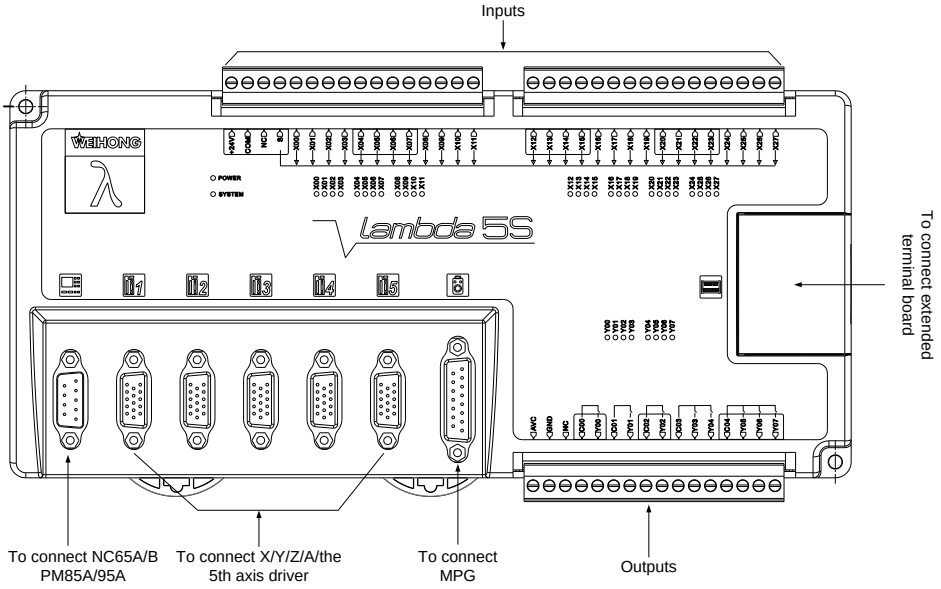


Fig. 3-1 Wiring diagram of Lambda 5S controller

Note:

Both Lambda 4S and Lambda 5S series controller support connecting with a MPG, and can be connected with an extended terminal board for adding inputs and outputs.

3.1 Driver Interface

Lambda series CNC system provides 5 pulse feed driver interfaces for X/Y/Z/the fourth/ the fifth axis. The 5 interfaces are 15-pin D-type sockets, and the pins definition is as shown in Fig. 3-2.

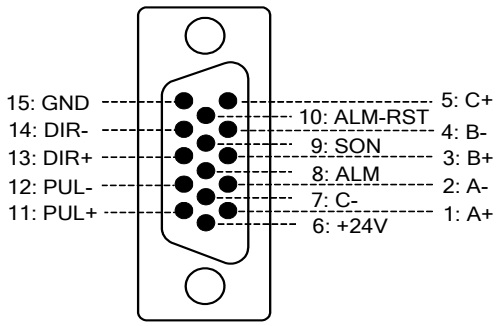


Fig. 3-2 Definition of driver interface

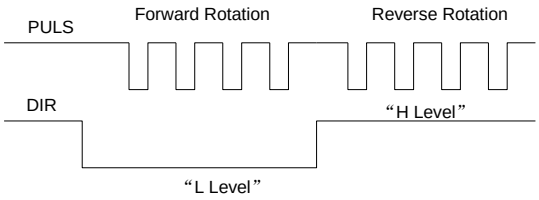
3.1.1 Servo Driver Interface Definition

Name	Definition	Input /Output	Description
A+, A-	Feedback signal of encoder phase A	Input, differential signal transmission mode	Receive the differential output from encoder signal (phase A, B, C) of driver frequency divider (equaling to RS422).
B+, B-	Feedback signal of encoder phase B	Input, differential signal transmission mode	
C+, C-	Feedback signal of encoder phase C	Input, differential signal transmission mode	
ALM	Driver alarm signal	Input	When breakdown occurs in driver, the output (transistor) will be closed or disconnected.
SON	Servo ON signal	Output	This signal is used for opening (power on) and closing (power off) servo motor. When this signal is connected to COM-, dynamic brake will be released and thus the driver is allowed to work (servo enabled).
ALM-RST	Driver alarm clear signal	Output	The alarm state will be cleared when this signal keeps closing with COM- for above 120ms.
PUL+, PUL-	Pulse output	Output, differential signal transmission mode	
DIR+, DIR-	Direction output	Output, differential signal transmission mode	
+24V, GND	DC 24V power	Output	Connected to driver

> Note:
>
> SON signal will be effective at 2 seconds after connecting of power supply. Don't try to drive the motor through external servo ON or servo OFF drive signal at any time, since the system controls the power-up state of the servo motor.

◆ **Technical Specifications**

Technical parameters	Description
Max. pulse frequency	1M

Technical parameters	Description
Encoder power	+5V, 150mA
Encoder signal	RS422 level
Signal output	Differential signal output, both pulse and direction signals adopt differential signal transmission mode.
Pulse format	Pulse + direction, negative logic. The “pulse + direction” output wave form of Lambda 4S/5S series is as shown below: 

3.2 MPG Interface

Lambda CNC system has a MPG (or called handwheel) interface for connecting with a handwheel up to 6 axes. You can buy MPGs from WEIHONG, or from other companies.

Our MPG interface is composed of dual-in line DB15 holes, and its pins definition is as shown in Fig. 3-3.

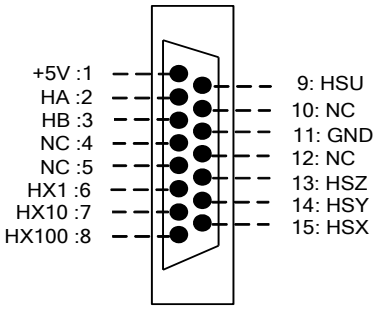


Fig. 3-3 Pins definition of MPG interface

Table 1 Definition of MPG interface

Pins No.	Function	Description
1	**+5V**	DC 5V of MPG (handwheel)
2	**HA**	Encoder phase A signal
3	**HB**	Encoder phase B signal
4	**NC**	
5	**NC**	

Pins No.	Function	Description
6	**X1**	X1 override
7	**X10**	X10 override
8	**X100**	X100 override
9	**HSU**	Selection of the fourth axis
10	**NC**	
11	**GND**	Digital ground
12	**NC**	
13	**HSZ**	Selection of Z-axis
14	**HSY**	Selection of Y-axis
15	**HSX**	Selection of X-axis

3.3 I/O Definition and Wiring

3.3.1 Five Axes Engraving

When used together with five axes engraving software, Lambda 5S controller should be wired according to Fig. 3-4.

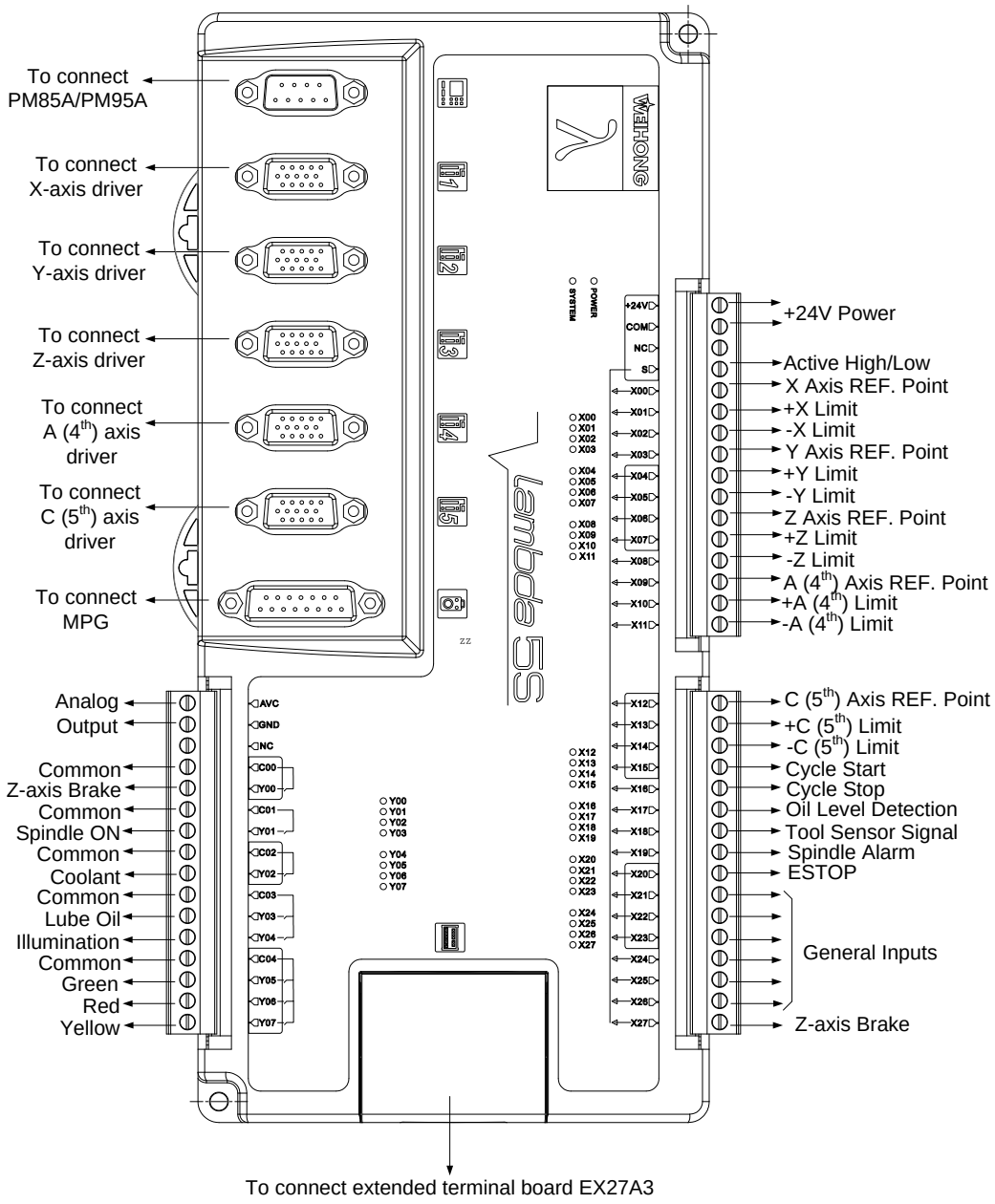


Fig. 3-4 Connection in AC configuration

Note:

For AB and BC configuration, the definitions of inputs and outputs are the same as those in AC configuration, except X09~X14 are defined as REF. point and ±limit of AB/BC axes respectively.

3.3.2 Four Axes Engraving

When used together with four axes engraving software, Lambda 4S controller should be wired according to Fig. 3-5.

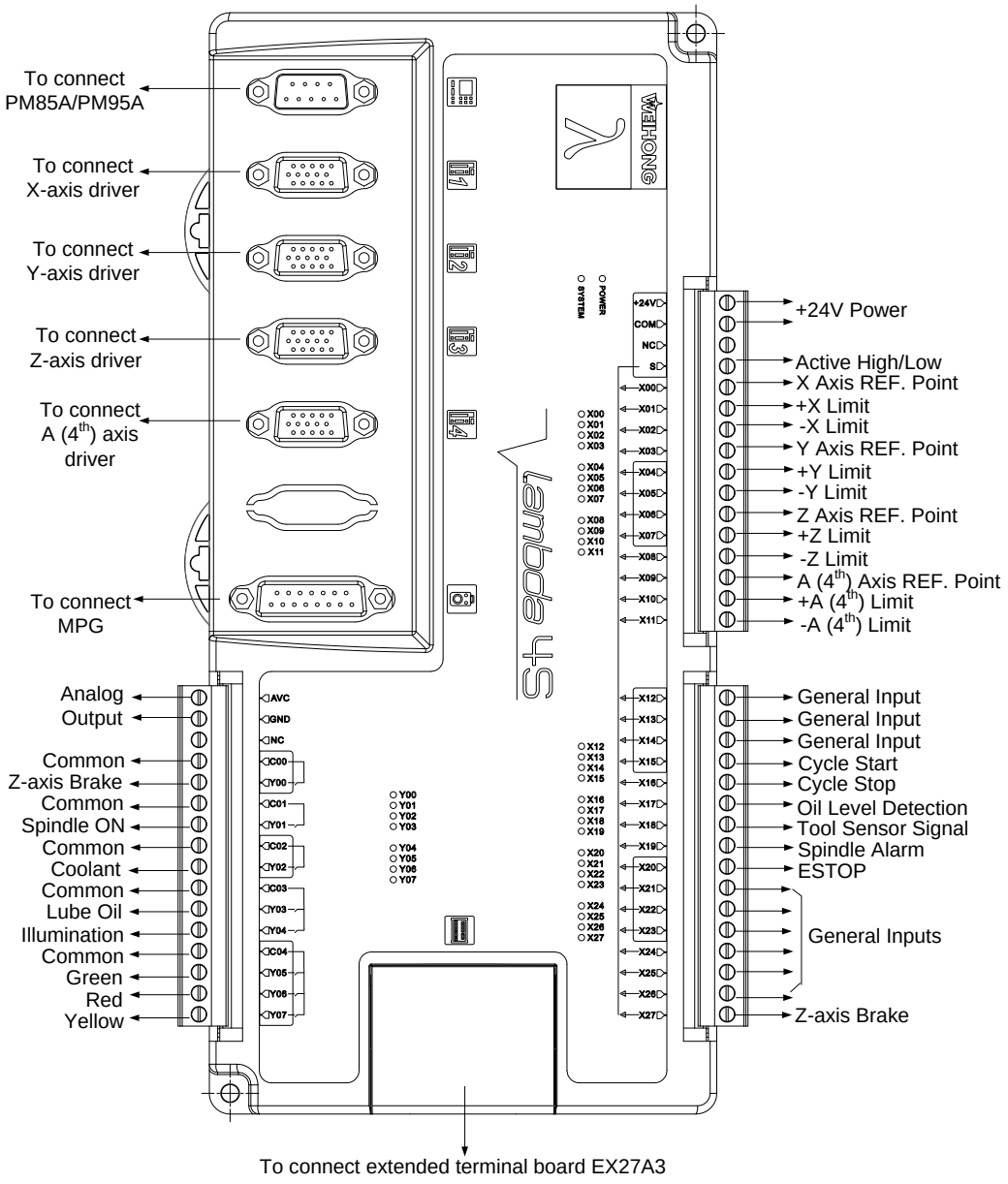


Fig. 3-5 Connection in four axes engraving

The extended terminal board EX27A3 (118mm*83mm*56.45mm) should be used in both four axes and fives axes engraving software, when the IOs are not enough. The wiring diagram is as shown below.

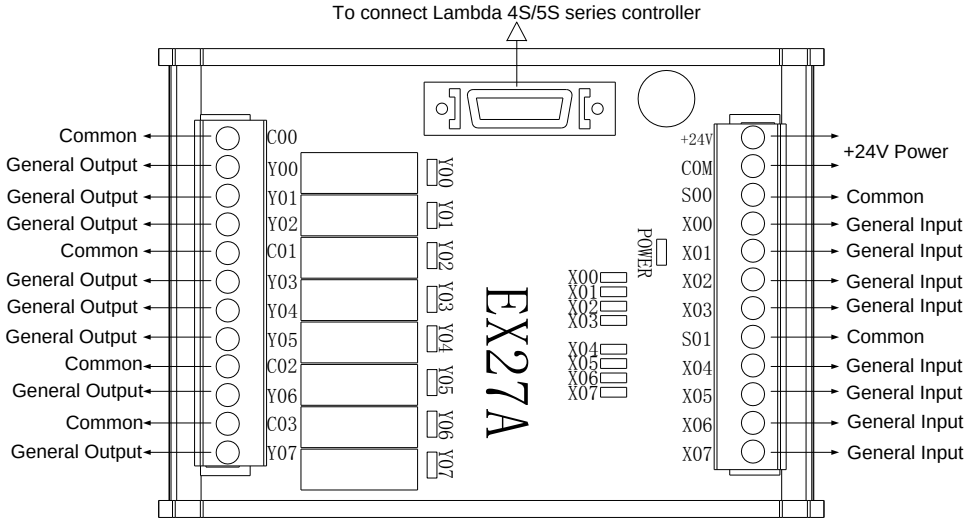


Fig. 3-6 Wiring example of extended terminal board EX27A3 in engraving software

3.3.3 Four Axes Glass Cutting with Edge Finder Function

When used together with four axes glass cutting software, Lambda 4S controller should be wired according to Fig. 3-7.

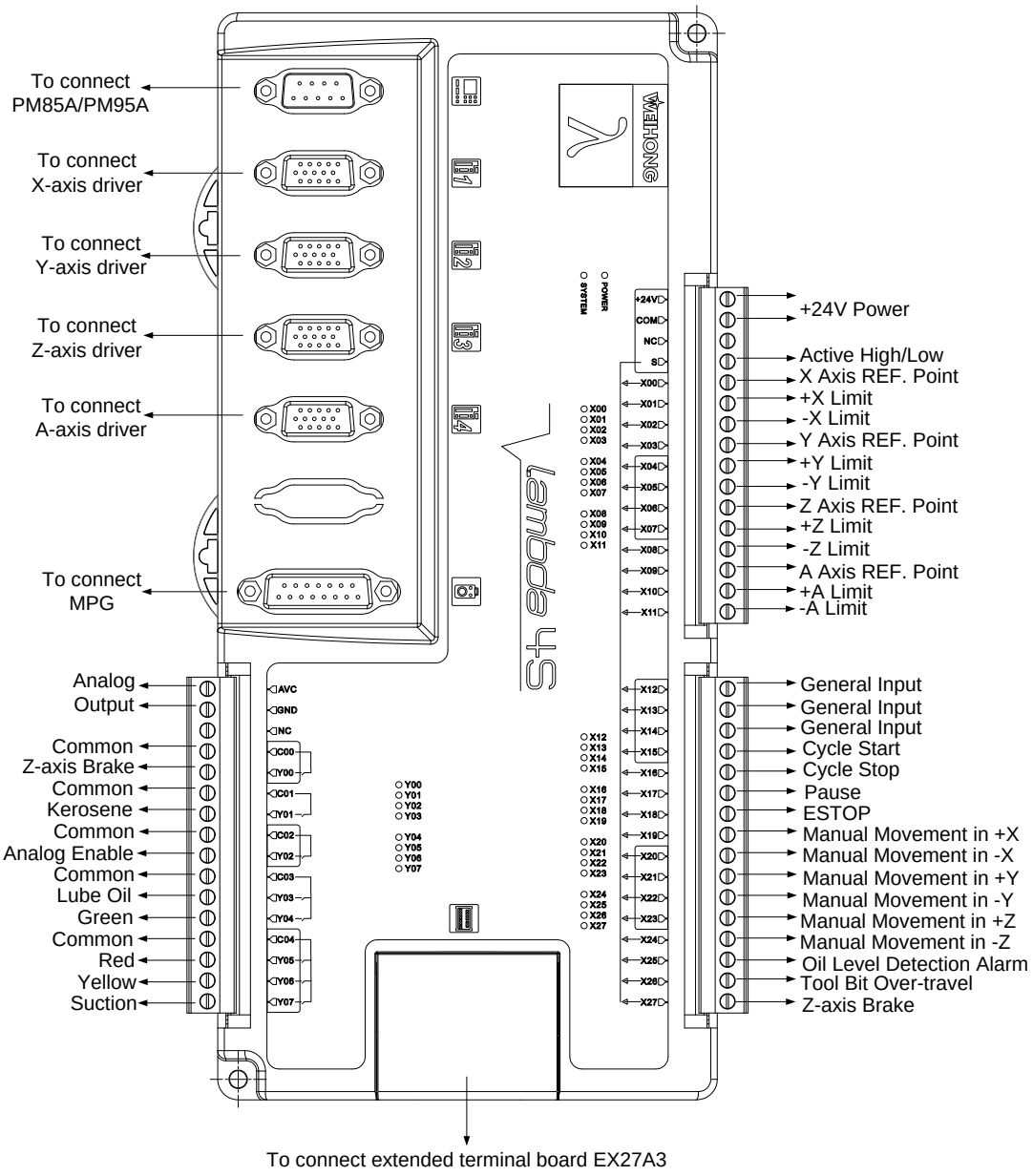


Fig. 3-7 Connection in XYZA with edge finder function configuration

Note:

For XYA with edge finder function configuration, the definitions of inputs and outputs are the same as those in XYZA with edge finder function configuration, except X06~X08 are defined as REF. point and ± limit of A axis, and X09~X11, X27 and Y00 defined as general inputs and output.

The extended terminal board EX27A3 (118mm*83mm*56.45mm) is required in XYA/XYZA with edge finder function configuration in glass cutting software. See Fig. 3-8 for the I/O definition and wiring diagram.

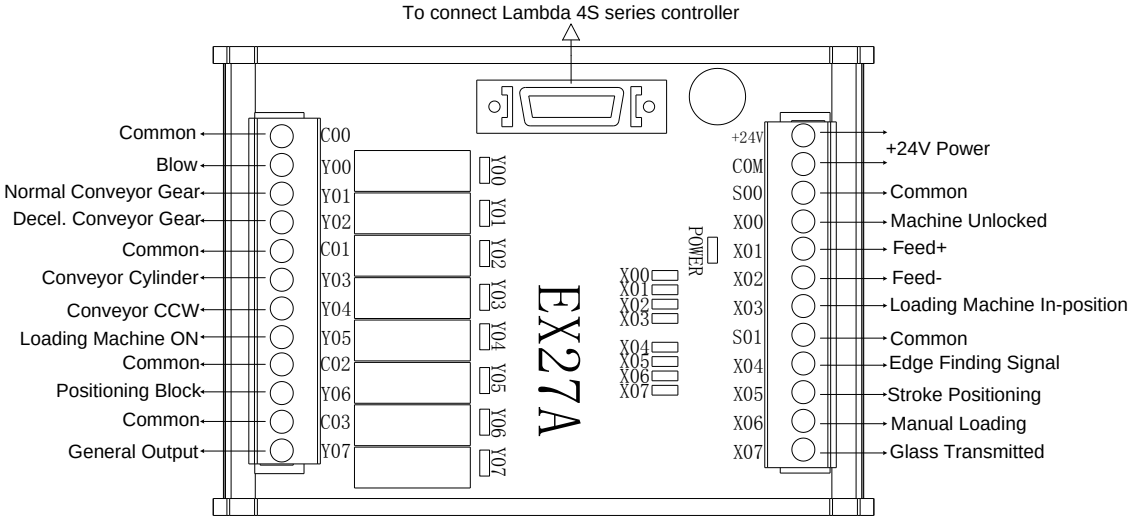


Fig. 3-8 Wiring example of extended terminal board EX27A3 in glass cutting software

3.3.4 Four Axes Glass Cutting without Edge Finder Function

In XYZA without encoder finder function configuration, Lambda 4S controller should be wired according to Fig. 3-9.

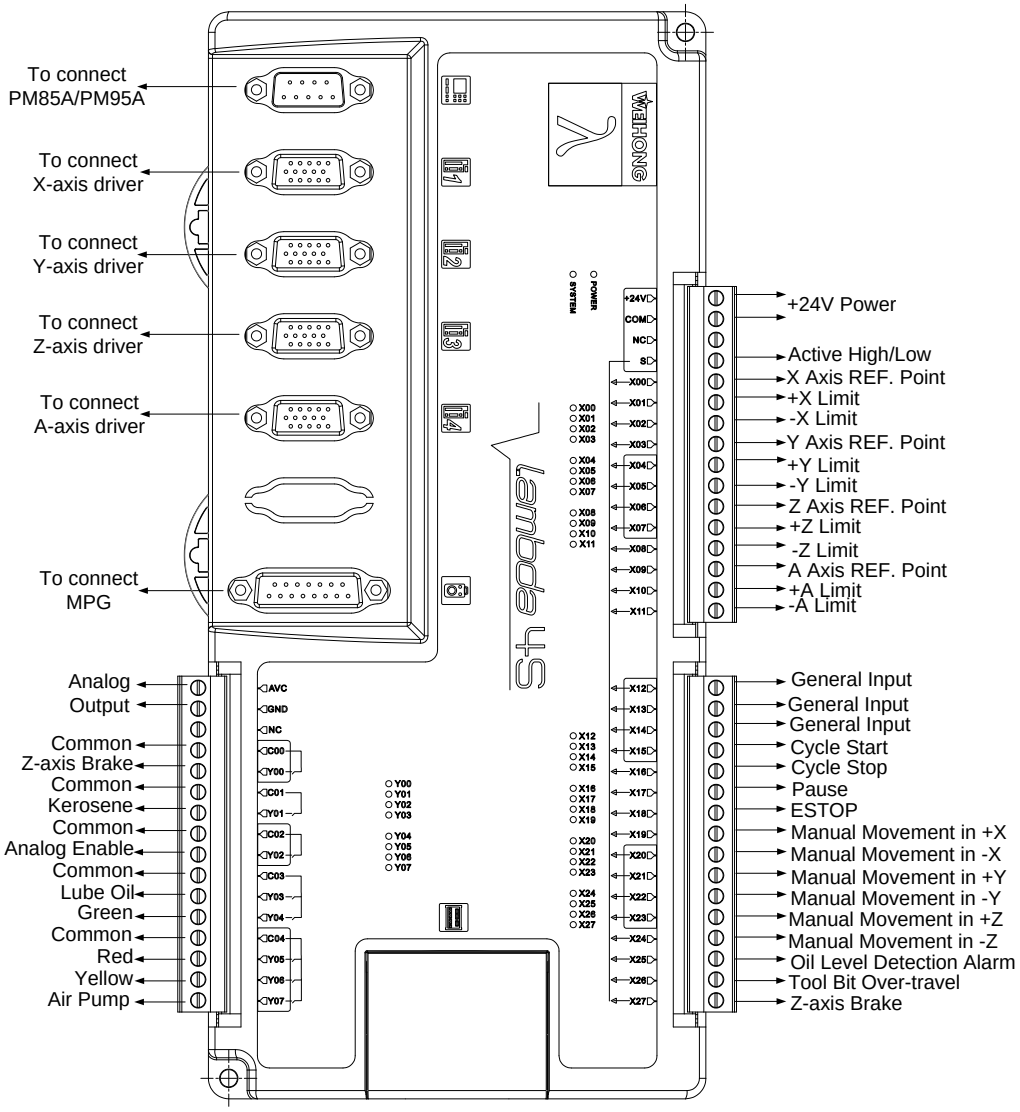


Fig. 3-9 Connection in XYZA without edge finder function configuration

Note:

For XYA without edge finder function configuration, the definitions of inputs and outputs are the same as those in XYZA without edge finder function configuration, except X06~X08 are defined as REF. point and ± limit of A axis, and X09~X11 defined as general inputs, X27 machine unlocked, Y00 blow, Y06 positioning block and Y07 suction.

The extended terminal board EX27A3 is not required in XYA/XYZA without edge finder function configuration.

3.3.5 Five Axes Waterjet Cutting (X, Y, Z, A, B)

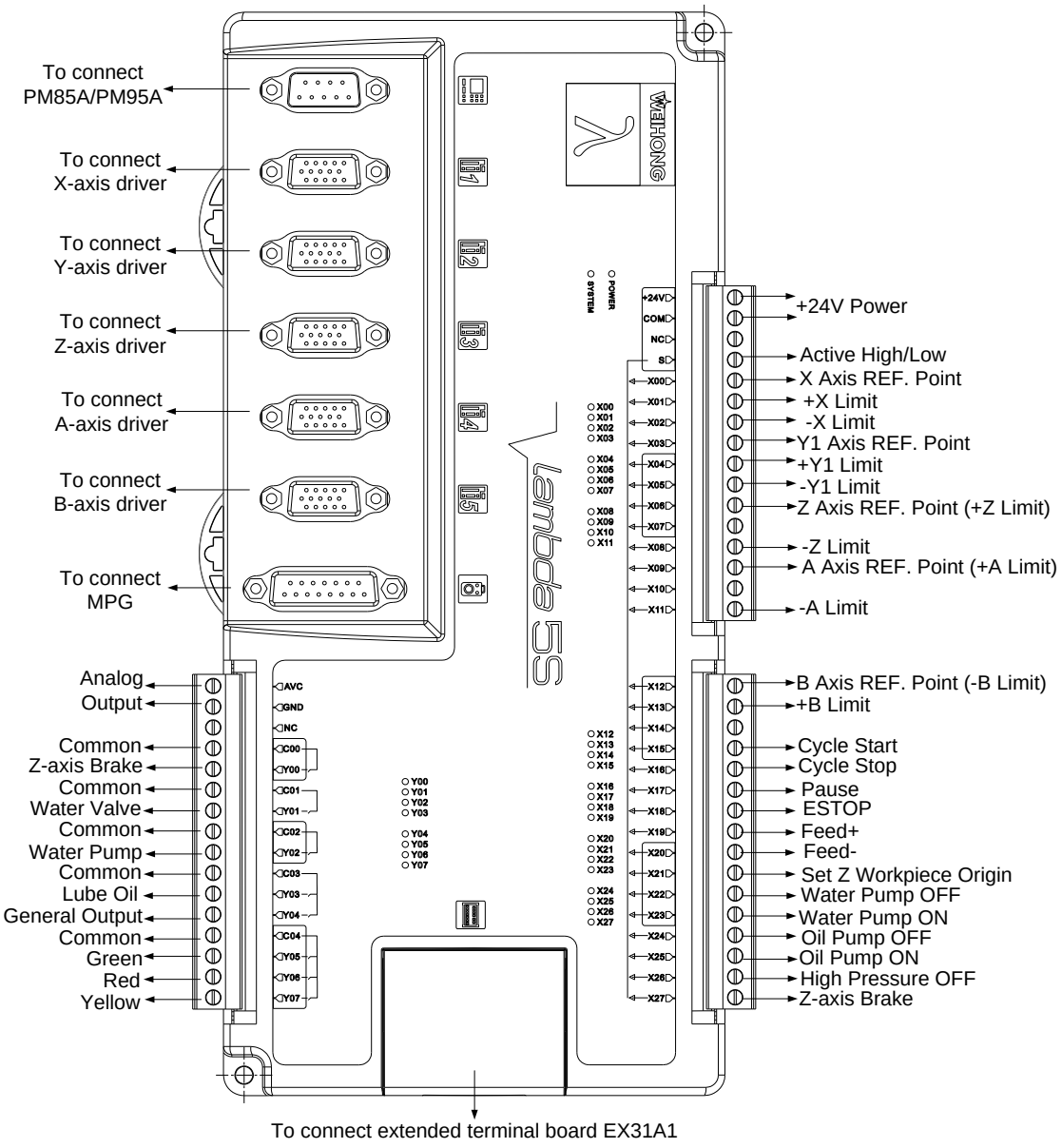


Fig. 3-10 Connection in five axes waterjet cutting (X, Y, Z, A, B)

Note:

The REF. point and positive limit of Z axis share the same port, so do the REF. point and positive limit of A axis, while the REF. point and negative limit of B axis share the same port.

The wiring of Lambda 5S controller in single Y configuration and dual Y configuration are the same, while the wiring of the first EX31A1 differs, see Fig. 3-11. The Y2 axis in dual Y configuration is controlled by pulses.

Two pieces of extended terminal board EX31A1 (153mm*118mm*56.45mm) are required in cascade connection in five axes waterjet cutting, with wirings as shown in Fig. 3-11 and Fig. 3-12 respectively.

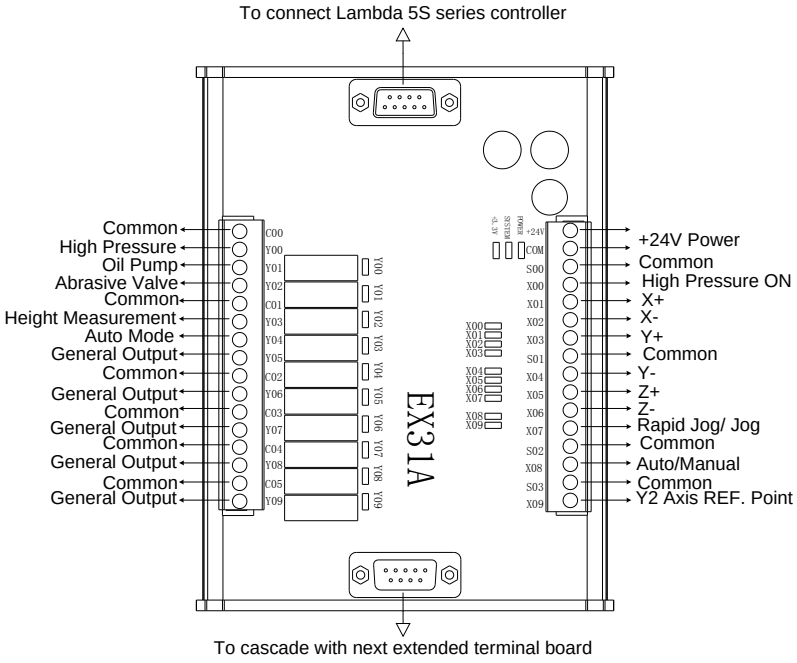


Fig. 3-11 Wiring of the first EX31A1 in five axes waterjet cutting

Note:

In dual Y configuration, X09 on the first extended terminal board EX31A1 is defined as REF. point of Y2 axis, while in single Y configuration, X09 is defined as general input.

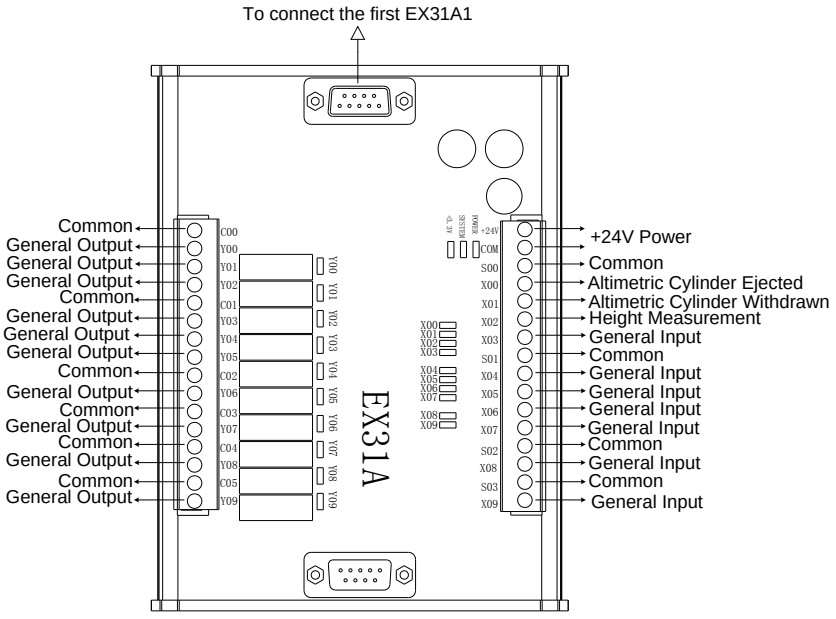


Fig. 3-12 Wiring of the second EX31A1 in five axes waterjet cutting

3.3.6 Four Axes Waterjet Cutting

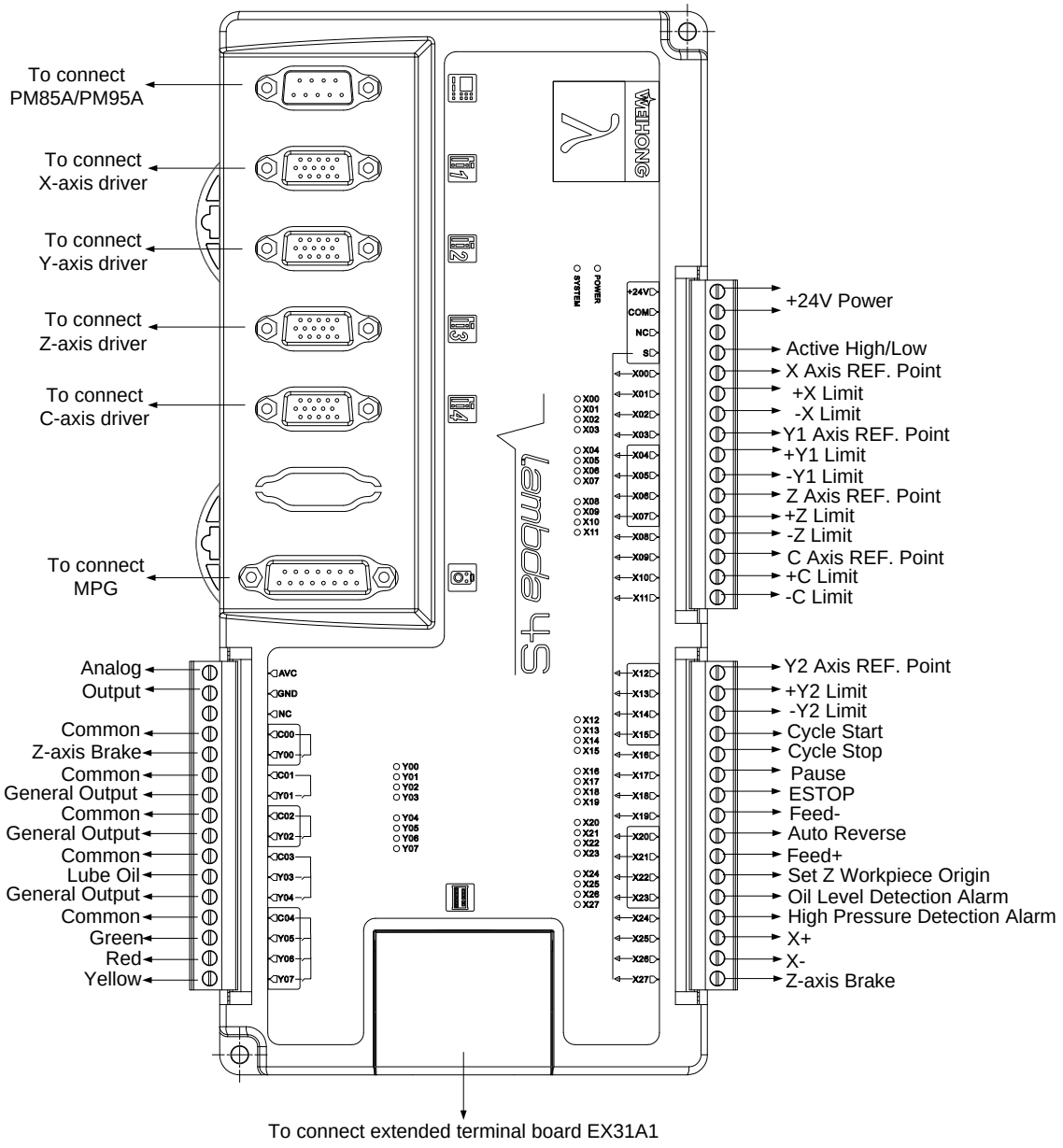


Fig. 3-13 Connection in four axes waterjet cutting

Note:

The above connection is in dual Y configuration; in single Y configuration, X12~X14 are defined as general inputs, while the other inputs and outputs are the same as those in dual Y configuration.

If an asynchronous motor is used on the Z axis, X06 and X27 are used as general inputs, and only one piece of extended terminal board EX27A3 is required.

Two pieces of extended terminal board EX31A1 (153mm*118mm*56.45mm) are required in cascade connection in four axes waterjet cutting, with wirings as shown in Fig. 3-14 and Fig. 3-15 respectively.

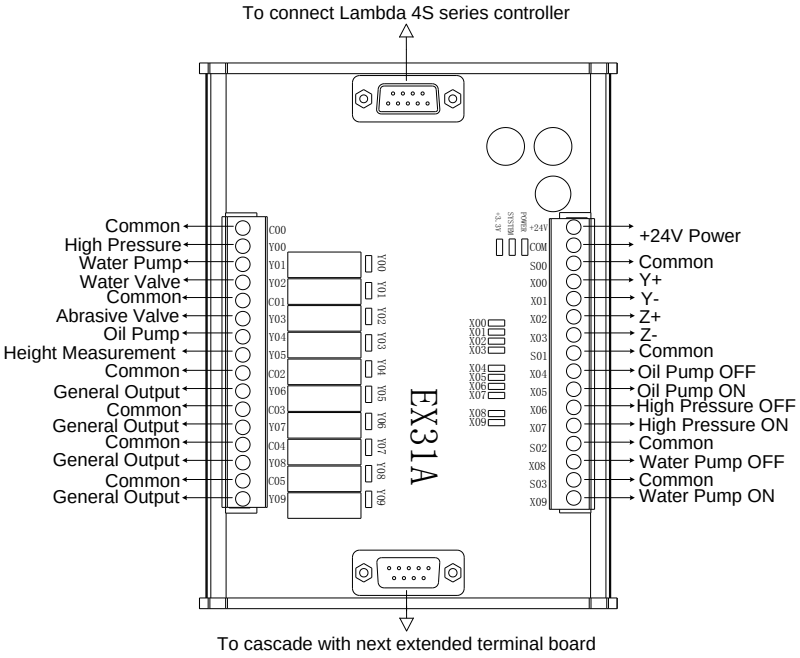


Fig. 3-14 Wiring of the first EX31A1 in four axes waterjet cutting

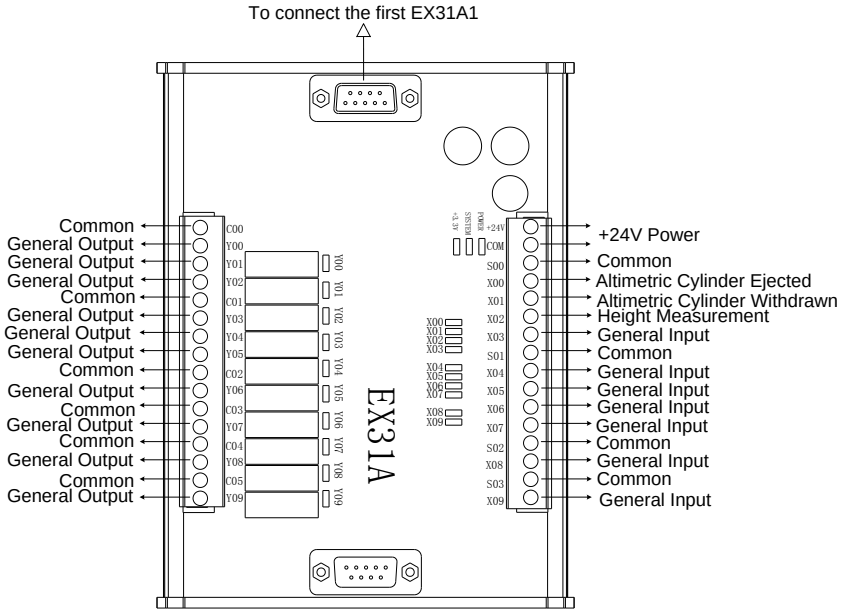


Fig. 3-15 Wiring of the second EX31A1 in four axes waterjet cutting

Note:

If height measurement function is not required in four axes waterjet cutting, only one piece of extended terminal board EX31A1 is enough.

If an asynchronous motor is used on the Z axis in four axes waterjet cutting, only one piece of extended terminal board EX27A3 (118mm*83mm*56.45mm) is enough. The wiring is as follows:

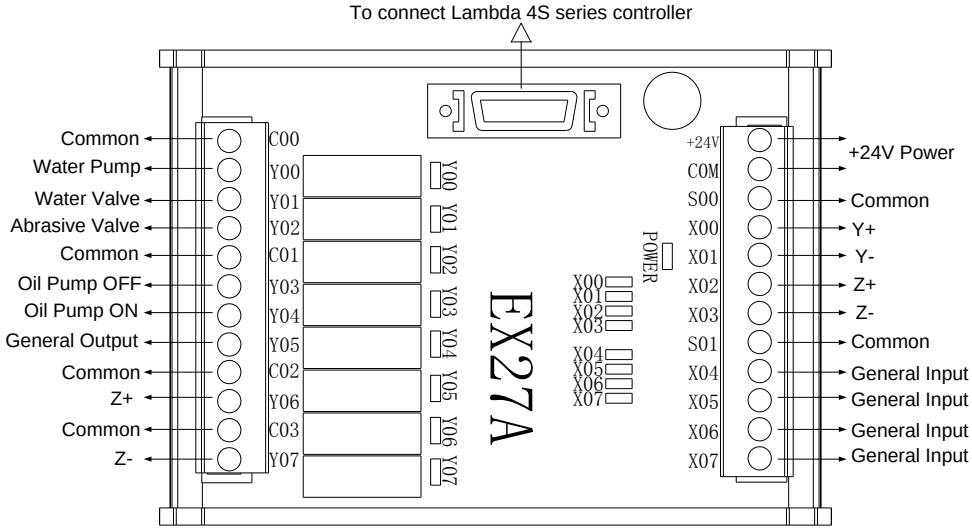


Fig. 3-16 Wiring of EX27A3 in four axes waterjet cutting

3.3.7 Dual Z Axes

When used together with dual Z axes software, Lambda 4S controller should be wired according to Fig. 3-17.

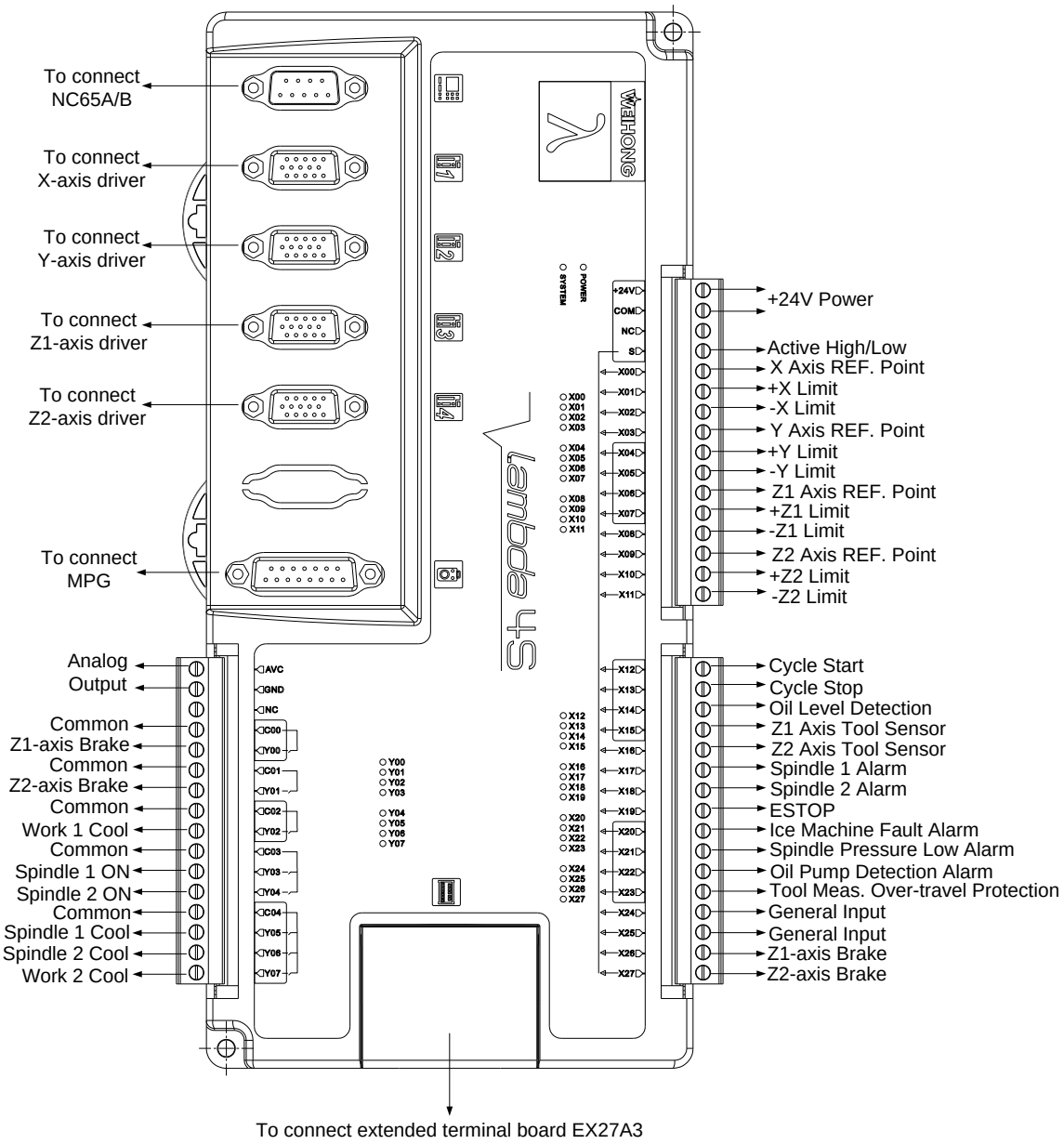


Fig. 3-17 Connection in dual Z axes

Extended terminal board EX27A3 (118mm*83mm*56.45mm) is required in dual Z axes, with wiring diagram as shown in Fig. 3-18.

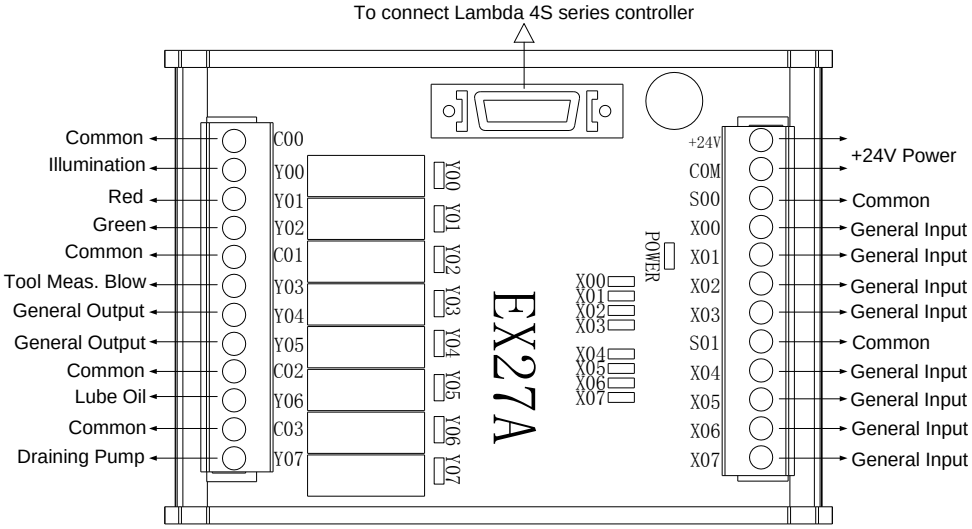


Fig. 3-18 Wiring of EX27A3 in dual Z axes

3.4 Signal Types

3.4.1 Binary Input Signal

Binary input signals can be active low or active high. See Fig. 3-19. When S is connected to COM, inputs are active high, when to +24V, active low.

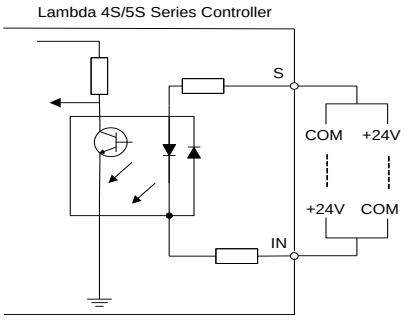


Fig. 3-19 Binary input connecting with mechanical switch

3.4.2 Relay Output Signal

The relay output contact points on the Lambda controller have load capacity: 10A/250VAC and 10A/30VDC, which can control 220V AC load of low power. If high power load is needed, a contactor can be used. See Fig. 3-20.

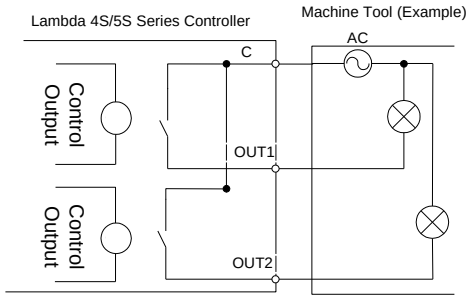


Fig. 3-20 Connection of relay output with contactor

3.4.3 Differential Output Signal

Pulse command format to control driver motion is “pulse + direction, negative logic”. Its maximum pulse frequency is 1MHZ and the pulse mode is as shown in Fig. 3-21.

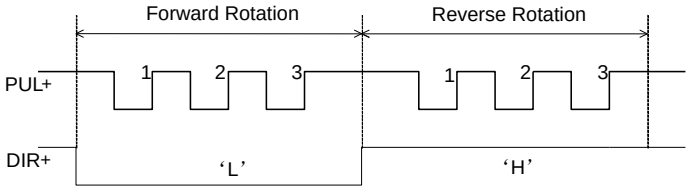


Fig. 3-21 Output type of pulse command

The output form of differential signal is as shown in Fig. 3-22.

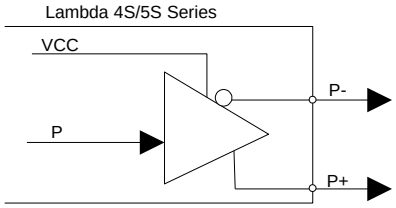


Fig. 3-22 Output circuit of pulse command

3.4.4 Analog Output Signal

SVC port, externally connected with the inverter analog voltage frequency command input port, can output voltage controlled from 0V to 10V. And it can control inverter frequency by voltage change in order to master spindle speed.

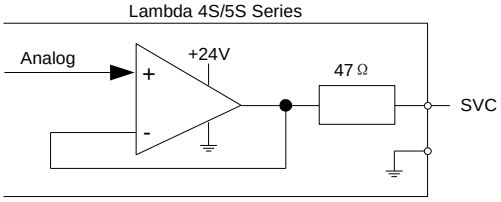


Fig. 3-23 Analog output signal circuit

4 Steps to Install Communication Card

1) Insert the software CD into the CD driver of computer, and then double click  in the NcStudio software CD for installation of the software;

2) Power off the computer, open the computer chassis, insert the communication card into a PCI slot (for PM85A) or PCI-E slot (for PM95A), fasten the screw of rail block, and cover the computer chassis;

3) Power on the computer. The computer will find the new hardware-device and install its driver automatically;

4) Double click the shortcut icon of NcStudio on the desktop; if it runs normally, installation is completed (if the software fails, please check whether the communication card is well inserted and whether gold fingers are clean).

If you install the software after installing the communication card, you need to update the driver manually, following the below steps:

1) Right click “My Computer”, select “Properties”, and click “Device Manager” under “Hardware” tab in the “System Properties” window. And then find “CNC Adapters” in the pop-up “Device Manager” window, right click the option under “CNC Adapters”, and select “Update Driver…” to start updating the hardware driver. A new window appears, as shown in Fig. 4-1.

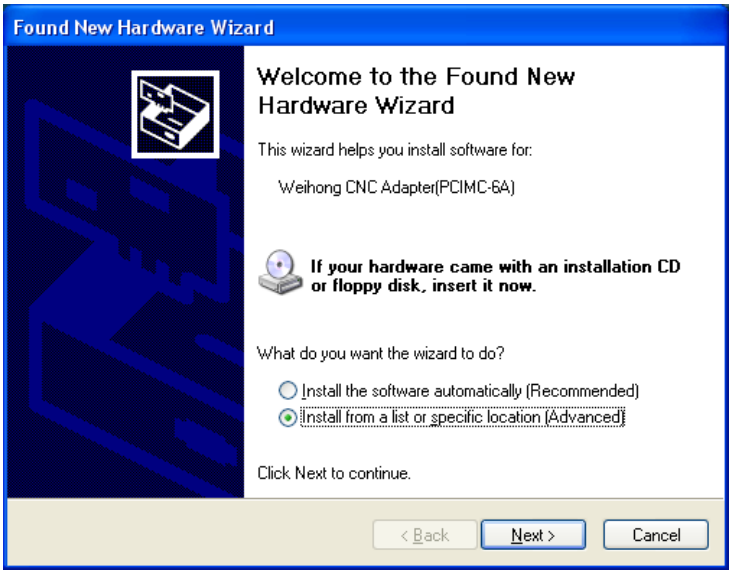


Fig. 4-1 Beginning of driver update

2) Select “Install from a list or specific location (Advanced)” in the pop-up “Found New Hardware Wizard”. And then click “Next”. See Fig. 4-2 for the new pop-up window.

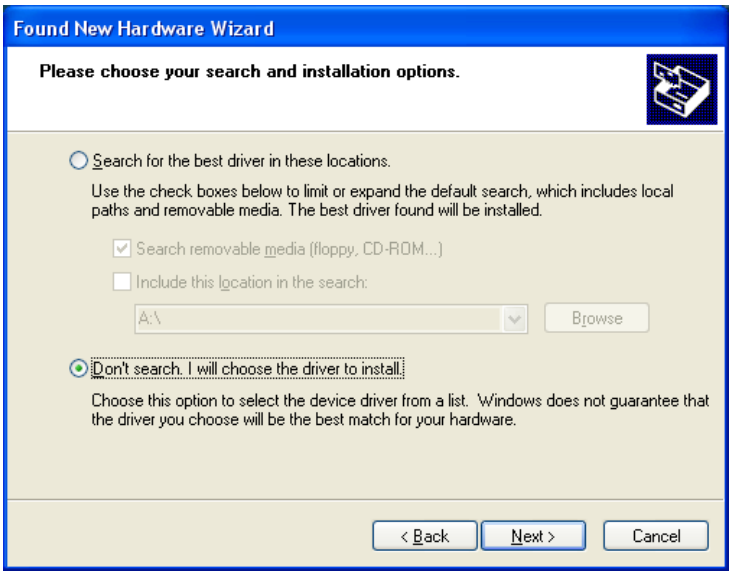


Fig. 4-2 Installation Options

3) Select “Don’t search. I will choose the driver to install”, and then click “Next”. See Fig. 4-3 for the new pop-up window.

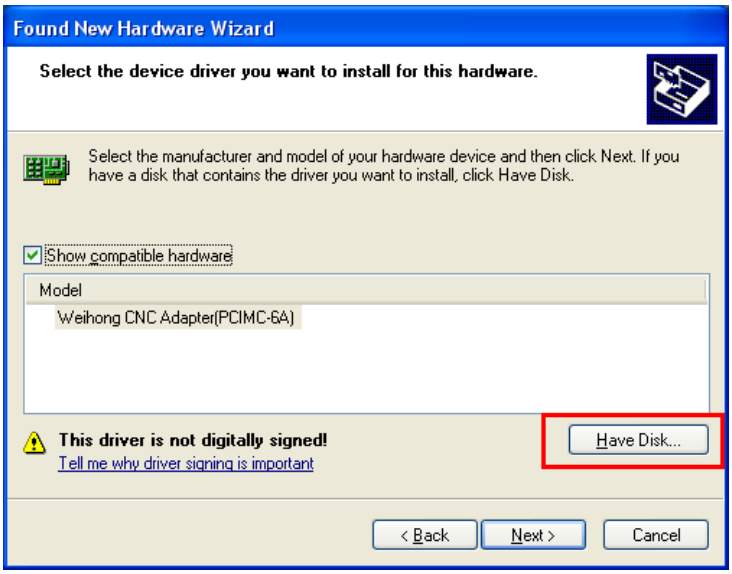


Fig. 4-3 Find driver location—1

4) Click “Have Disk…”, a new window to appear, as shown in Fig. 4-4.

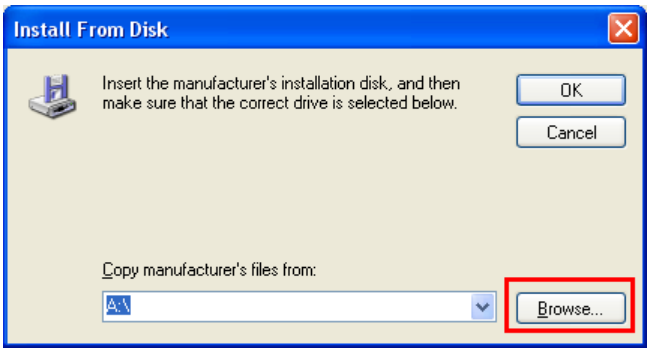


Fig. 4-4 Find driver location—2

5) Click the “Browse” button in the pop-up dialog “Install From Disk”, and select the target .inf file under “C:\Program Files\Naiky\PCIMC-Lambda”. NcadptPci(PCIMC-85A).inf is the driver file for the PM85A communication card, while NcadptPci(PCIEMC-95A).inf the driver file for the PM95A communication card. (Here takes PM85A as an example)

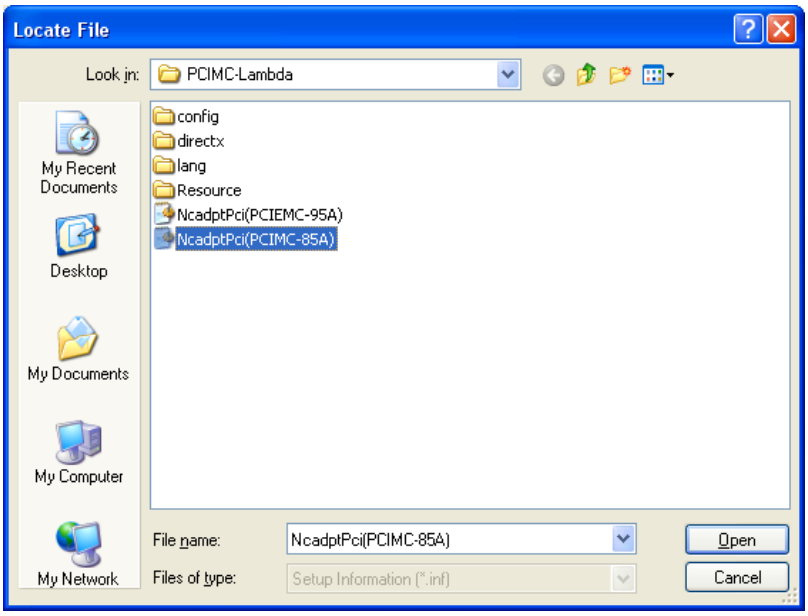


Fig. 4-5 Find driver location—3

6) After selecting the corresponding driver file, click “Open” to return to the previous page, showing the file directory under “Copy manufacturer’s files from”, as shown in Fig. 4-6.

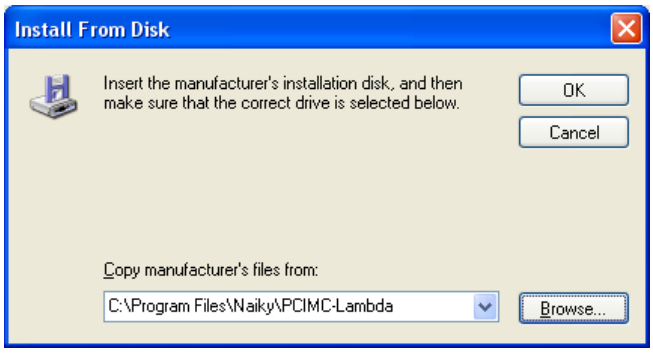


Fig. 4-6 Find driver location—3

7) Click “OK” to go back, and then click “Next” to start updating the hardware driver with the progress bar displayed. See Fig. 4-7.

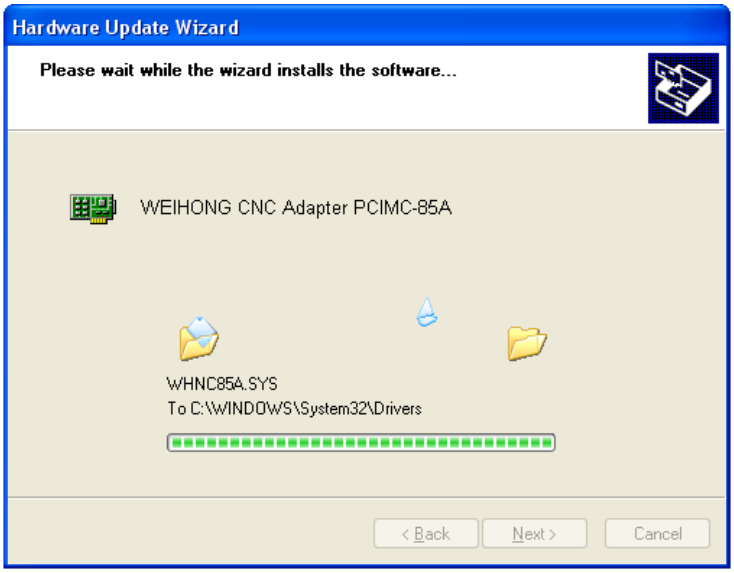


Fig. 4-7 Updating the driver

8) After updating completed, a new window, as shown in Fig. 4-8, appears. You just need to click “Finish” to complete the update of the hardware driver, and then you can open the software successfully.

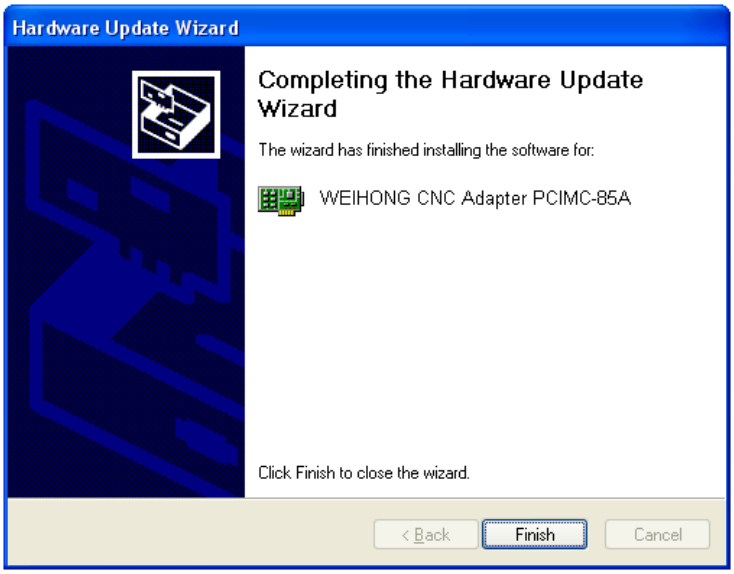


Fig. 4-8 Update driver complete

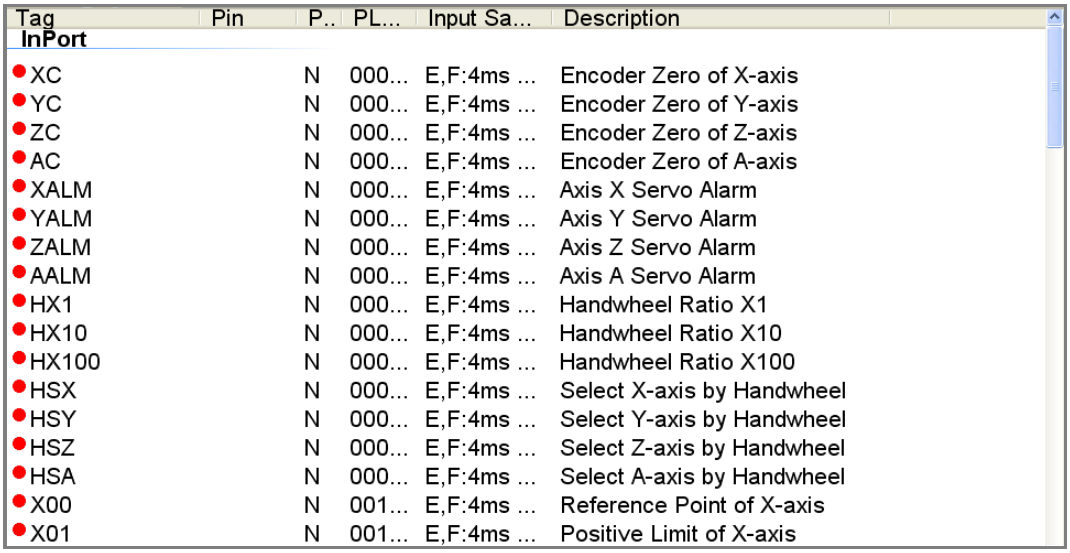
5 Machine Tool Debugging

5.1 Debugging Steps

After finishing connecting the electrical circuit in accordance with the instructions above-mentioned, start to debug the machine tool following the below steps:

1) Connect the Lambda controller to the communication card or NC65A/B host with a DB9M/F cable, provide 24V power supply for the controller, check whether the power indicator on the controller is on, and power on the machine signal system (proximity switch, etc). If the home switches connected are normally closed, at this time, three LEDs of X0, Y0 and Z0 should be on. Trigger a home switch through artificial imitation. (For a travel switch, artificial press can be used to observe whether the signals can be received. For a photoelectrical switch, artificially obstruct the light to see if the signals can be gotten. For a metal proximity switch, artificially approach it with a metal block to see if the signals can be gotten.) If the corresponding LED is out, it indicates the REF. point signals have been sent to the controller. If the home switches connected are normally open, LEDs should be usually out, and by artificially touching a switch, the LED should become light, which shows the REF. point signals have been sent to the controller. The same method can be taken to test other input ports to ensure the correctness of the wiring between the controller and the machine tool, to greatly shorten the debugging time.

2) Power on the computer, run NcStudio software, and then switch to “DIAG”→ IOPort” window, displaying input and output signals (in dual Z axes software, switch to “IOPort”). Solid dots indicate input signals, while hollow dots output signals; dots in red indicate the signals are invalid at the time (with no input or output), while dots in green indicate valid at the time. The “IOPort” window is as shown in Fig. 5-1. (It is for reference only. Ports displayed in the “IOPort” window vary with software version and hardware. The actual situation is in line with shipment).



Tag	Pin	P..	PL...	Input Sa...	Description
InPort					
XC		N	000...	E,F:4ms ...	Encoder Zero of X-axis
YC		N	000...	E,F:4ms ...	Encoder Zero of Y-axis
ZC		N	000...	E,F:4ms ...	Encoder Zero of Z-axis
AC		N	000...	E,F:4ms ...	Encoder Zero of A-axis
XALM		N	000...	E,F:4ms ...	Axis X Servo Alarm
YALM		N	000...	E,F:4ms ...	Axis Y Servo Alarm
ZALM		N	000...	E,F:4ms ...	Axis Z Servo Alarm
AALM		N	000...	E,F:4ms ...	Axis A Servo Alarm
HX1		N	000...	E,F:4ms ...	Handwheel Ratio X1
HX10		N	000...	E,F:4ms ...	Handwheel Ratio X10
HX100		N	000...	E,F:4ms ...	Handwheel Ratio X100
HSX		N	000...	E,F:4ms ...	Select X-axis by Handwheel
HSY		N	000...	E,F:4ms ...	Select Y-axis by Handwheel
HSZ		N	000...	E,F:4ms ...	Select Z-axis by Handwheel
HSA		N	000...	E,F:4ms ...	Select A-axis by Handwheel
X00		N	001...	E,F:4ms ...	Reference Point of X-axis
X01		N	001...	E,F:4ms ...	Positive Limit of X-axis

Fig. 5-1 NcStudio I/O ports window

3) Alter the input port polarity of the software in terms of the home switches and E-STOP button used: the polarity of NO input ports is N, while that of NC input ports is P. The way to alter the polarity is as follows:

In V8 version: press Ctrl, Alt and Shift simultaneously, while right clicking the signal to be modified its polarity, a menu to appear, and then choose “Toggle Polarity”. After changing the polarity of all desired ports, close and restart NcStudio, polarity modification to become valid instantly.

In V9 and V10 versions: directly click the manipulation button [ConvtPol] under [IOPort] screen

of [DIAG] function section. After changing the polarity of all desired ports, close and restart NcStudio, polarity modification to become valid instantly.

4) Electrify the electrical box. At this time, the dots in front of such input signals as REF. point signals of the three axes, E-STOP signal, cycle start/stop signals and tool sensor signal should be in red, indicating all these signals are invalid. Otherwise, it is necessary to check the correctness of electrical circuitry and signals polarity. If electrical circuitry is correct, alter the corresponding signal polarity to ensure the dots in front of the above-mentioned signals red.

5) Test whether the inputs and outputs on the controller work normally. For an input, the method is as following: short circuit an input and COM on the controller: if the corresponding LED on the controller turns on, but the corresponding input in the software does not have the signal, you need to check the connection of the cable DB9M/F between the communication card (NC65A/B host) and the controller. If the LED does not turn on, you need to check whether the controller meets a fault (like power supply issue). For an output, the method is as following: click the “TestOn” and “TestOff” buttons in the software, and observe whether the corresponding LED on the controller turns on or off accordingly. If so, the output works normally; if not, check the connection of the cable DB9M/F between the communication card (NC65A/B host) and the controller.

> Note:
>
> Switching power supply circuit is adopted for Lambda series controller circuit board, with overvoltage and undervoltage protection. When input voltage is lower than the starting voltage (20V), the power is switched off. The range of normal working voltage is 20V~26V, minimum current 2A and rated voltage 24V.

6) Set inverter parameters to make the inverter work under 0~10V analog voltage control mode. Spindle ON/OFF adopts forward rotation terminal control mode. Press down the [Spindle Start] button in the software, and observe in the IOPort window whether the color of signal dot in front of “Spindle” turns green, on the controller whether the green output indicator LED beside the corresponding relay becomes brightening, and whether the spindle starts to rotate. If the spindle does not rotate, please examine the connection of the inverter. Adjust the spindle speed in the software and the actual spindle speed should be changed correspondingly; otherwise, examine the connection and the parameters setting of the inverter. If the spindle rotates in a wrong direction, you can change the settings of the relative inverter parameters, or change the connection between the spindle and inverter: usually, there are three wires connected with the spindle. Exchanging any two of them will alter the spindle rotation direction.

7) Set the relative parameters of servo driver. Refer to chapter 0 for the setting of driver parameters.

8) Set pulse equivalent in the “manufacturer parameters” of Ncstudio. The password of manufacturer parameters is “ncstudio”. The smaller the pulse equivalent is, the higher the resolution will be. The value of pulse equivalent will affect the maximum feed speed. Generally speaking, regarding the pulse equivalent of a mold machine, 0.001mm/p (the corresponding

maximum feed rate is 9600mm/min) or 0.0005mm/p (the corresponding maximum feed rate is 4800mm/min) can be taken into consideration; for users who are not very critical of the accuracy, the pulse equivalent can be set a litter larger, such as 0.002mm/p (the corresponding maximum feed rate is 19200mm/min) or 0.005mm/p (the corresponding max. feed rate is 48000mm/min). When pulse equivalent is confirmed, calculate the electronic gear ratio of servo driver in terms of value of pulse equivalent. Refer to chapter 9.2 for the calculation of electronic gear ratio.

9) Move the machine tool manually to make sure the correctness of moving direction of each axis. Note that NcStudio adopts “right hand” coordinate system. For X-axis, right movement is the positive direction; for Z-axis, upward movement the positive direction; while the positive direction of Y-axis is to move away from the operator (if the movement of Y-axis is the movement of worktable, its positive direction is the worktable moving towards the operator). If the direction is not correct, alter the axis direction in the system parameters or the relative parameters of servo driver. If Z-axis has brake, check the relative wiring of brake and the relative parameters of servo driver before Z-axis starts to move for the first time. After confirmation, move Z-axis in jog mode at a slow speed, and observe the response of Z-axis, making sure the brake can be opened normally.

10) Examine whether the value of electronic gear matches with that of pulse equivalent. Make a mark on any axis of the machine tool and set this marked point as the workpiece zero. Drive this marked axis to move a fixed distance by direct command input, jog or handwheel, and so on. Measure the actual moving distance with a vernier caliper and check whether the result is equal to the distance showed in the software.

11) Set the worktable stroke in the manufacturer parameters according to the actual size of the machine tool to enable software limit function.

12) Set “Back to Machine Zero” parameter in manufacturer parameters according to the installation position of home switches of the three axes. After correct setting, perform the “Back to Machine Zero” function under menu “Operate”. At first, home a single axis. Home the other two axes on condition that the moving direction of the first axis is correct; otherwise, stop homing and revise “The Direction of Backing to Machine Zero” parameter in the manufacturer parameters until all axes can return to the machine zero.

13) Axial acceleration: it is used to describe the acceleration / deceleration ability of a single axis, in mm/s^2. The value is determined by the physical characteristic of the machine tool, such as quality of movement part, torque, resistance, cutting load of feed-motor, and so on. The larger the value is, the less time spent in the process of acceleration / deceleration will be, and the higher the efficiency will be. Generally, for a servo motor system, the value is between 400 and 1200. Set the value smaller at the beginning; make the machine tool perform various typical movements for a period of time, and carefully observe it; when there is no abnormal situation, increase the value gradually; otherwise, decrease the value and reserve 50% ~ 100% insurance allowance.

14) Turning acceleration: it is used to describe the acceleration/deceleration ability in synchronized

motion of multi-axis, in mm/s^2. The value limits the maximum speed of the machine tool in circular movement. The larger this value is, the higher the maximum allowable speed on circular movement of the machine tool will be. Generally, for a servo motor system, the value is between 1000 and 5000; for a heavy machine tool, the value should be smaller. Set the value smaller at the beginning; make the machine tool perform various typical movements for a period of time, and carefully observe it; when there is no abnormal situation, increase the value gradually; otherwise, decrease the value and reserve 50% ~ 100% insurance allowance.

Usually, given the drive ability of servo motor, frication of machine assembly, and endurance capacity of mechanical components, limit the maximum speed of the three axes in actual using by modifying the max. speed of each axis in the manufacturer parameters.

15) Set the parameter of auto lubrication (set a value smaller, such as once every 5 seconds). Observe if auto lubrication is executed correctly. If so, set it according to the actual need.

In case of any problem in the running of the machine tool, check every part carefully according to the steps above.

5.2 Pulse Test

If you suspect there is pulse loss, you can confirm it by either of the two following methods. Direct method: mark a little dot on the surface of a workpiece blank with a dagger; set this point as the workpiece zero; lift up Z-axis; set the coordinate of Z-axis as 0; repeatedly move the machine tool, for example, run a typical procedure with no tools (including synchronized movement of the three axes is much better), and pause or stop during machining is permitted; and then back to the workpiece zero; descend Z-axis slowly; observe whether the knifepoint matches with the marked dot. For servo system, there is a more precise method: set servo driver mode as “ input pulse count mode “ in the “surveillance mode“ (for example, the parameter of YASKAWA servo is UN00C); regulate it to display the lower 4 bits (with “L ” before the count value) in count value (hexadecimal system); set workpiece zero and then write down the pulse count value at this time, then repeatedly run the procedure with no tools on the machine tool, then back to the workpiece zero and see whether the pulse count value at this time is the same with the original value. For YASKAWA servo, as long as the value difference of pulse count value is no more than 4 (the frequency of host controller is 1/4 times the frequency of pulse sent by servo drive), indicating that the main controller sends the pulse within the tolerance of 1 pulse, the control system runs normally; otherwise, please check the pulse signal type of servo driver, and make the pulse type received by servo in accord with the pulse type sent by the system.

6 Customize Setup Installation Package

A tool, named NcHelper.exe under the installation directory, helps customize setup installation

package. For example, when you want to change the settings of some parameters and set them to default value in the process of using NcStudio, to achieve the best performance of a machine tool, you can change the settings, find this tool, double click it, select a default configuration, and generate a new software package with the parameter settings changed.

7 Software Setup and Upgrade in NC65A/B

Before leaving factory, the NC65A/B integrated CNC system has already been installed with software. In case of software failure, you can re-install the software by using “FirstRun” or by entering the desktop.

7.1 Software Setup

1) Insert the USB flash drive with the software to be installed, and then power on the system, the dialog of FirstRun Utilities to appear, as shown in Fig. 7-1.

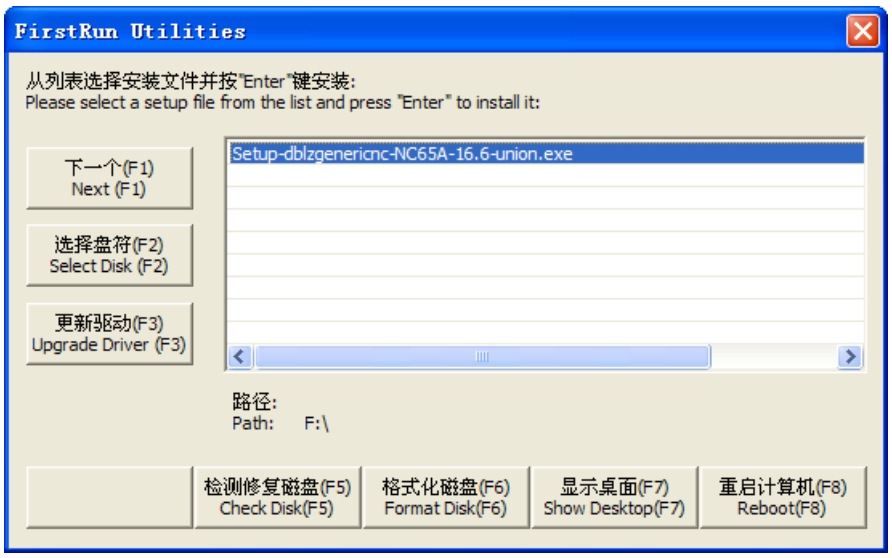


Fig. 7-1 Dialog of “FirstRun Utilities”

Select the desired software, and then press “Enter” to start software setup.

2) The first pop-up dialog is the setup language. See Fig. 7-2. Selecting “ENGLISH” will run the software in English. Likewise, if “选择中文界面” is selected, NcStudio will run in Chinese.

Fig. 7-2 Language selection

3) If there is an old version of NcStudio in the system, the installation package will delete the old files and give a prompt, as shown in Fig. 7-3. If “OK” is selected, the setup will continue. Otherwise, the setup will exit.

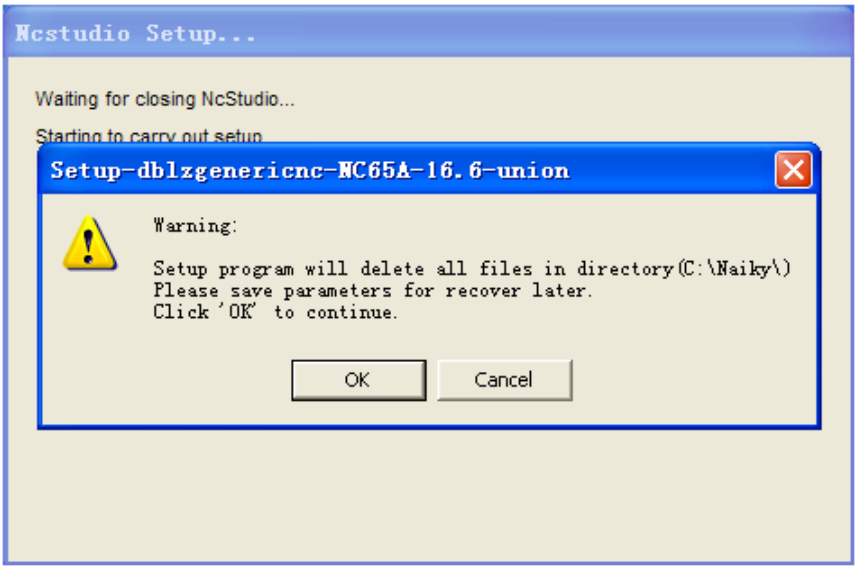


Fig. 7-3 Prompt to save parameters

4) Click “OK” to continue installation, the progress bar displayed, as shown in Fig. 7-4.

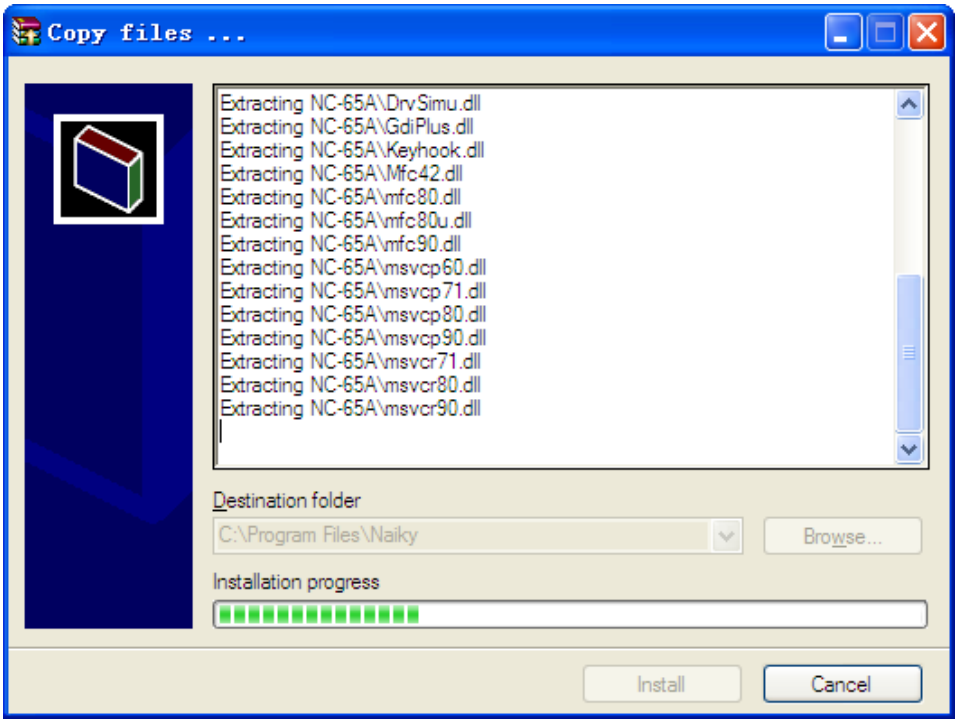


Fig. 7-4 Software setup progress

5) After setup completed, the system installs the drivers automatically. See Fig. 7-5.

Fig. 7-5 Driver installation

6) After driver installation completed, the following dialog appears. At this time, clicking “OK” will reboot the system. After reboot completed, NcStudio will be opened automatically.

Fig. 7-6 Driver installation completed

7.2 Upgrade

When you want to upgrade the software, you need to perform manual operations after entering the desktop. The detailed steps are as following:

1) After the operating system is opened, press “Ctrl+Alt+Delete” simultaneously to eject a task manager dialog.

2) Select “New Task (Run…)” under “File” menu. Then a new dialog will pop up.

3) Input “explorer” into the new pop-up dialog, and then select “OK” to enter the desktop.

4) Enter “My Computer” on the desktop, and then double click the newer software in the removable disk to start upgrade setup, whose steps are the same as those above-mentioned.

8 OS Backup and Restore in NC65A/B

8.1 OS Backup and Restore

The OS can be backed up and restored in NC65A/B, and the concrete steps are as following.

8.1.1 First-time OS Backup

1) Press F7 repeatedly at boot until entering the interface shown in Fig. 8-1.

Fig. 8-1 First-time backup interface

2) Select “1 分区 备份” (means Partition Backup) to start OS backup.

3) After backup completed, the OS before backup will be rebooted automatically.

8.1.2 Other Backups

1) Press F7 repeatedly at boot until entering the interface shown in Fig. 8-2.

Fig. 8-2 System restore

2) Select “取消(C)” (means Cancel) to enter the interface shown in Fig. 8-3.

Fig. 8-3 Backup interface under other conditions

3) Select “2 重新 备份” (means Re-backup) by Up and Down keys to start OS backup.

4) After backup completed, the OS before backup will be rebooted automatically.

8.1.3 OS Restore

1) Press F7 repeatedly at boot until entering the interface shown in Fig. 8-2.

2) Select “还原(R)” (means Restore) to start OS restore.

3) After restore completed, the fresh restored OS will be booted automatically.

> Note:
>
> Selecting “1 分区 还原” (means Partition Restore) in Fig. 8-2 will also execute OS restore.

8.2 OS Backup and Restore via USB Flash Driver

If OS failed and cannot be backed up or restored following the above steps, you can execute OS backup and restore by creating an USB startup disk.

8.2.1 Preparation

1) An USB flash drive (above 1G)

2) The backup and restore kit

8.2.2 Setup

◆ **Creating USB Startup Disk**

Double click “hpUpgsh\hpUpgsh.exe” under the designated file folder. As shown in Fig. 8-4, a dialog pops up. Select the drive letter, file system, format options and the path of boot files (H:\hpUpgsh\boot) in this dialog, and then select “Start” to begin formatting. Keep selecting “Yes” until the making of USB startup disk finishes.

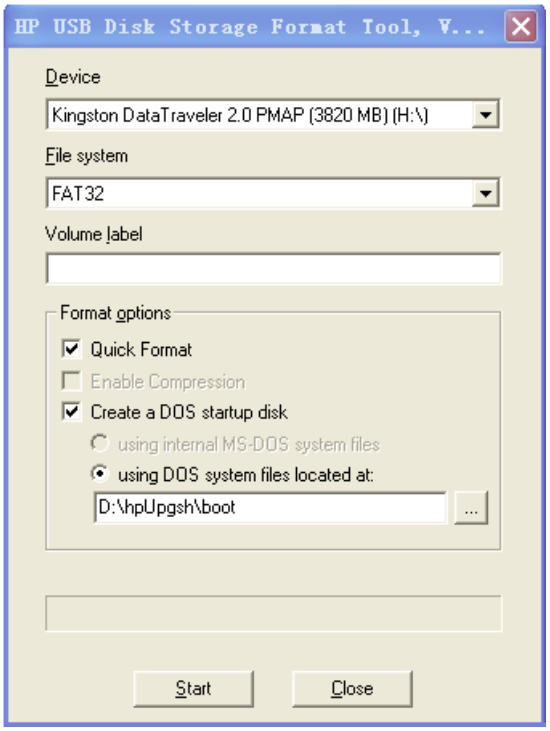


Fig. 8-4 The interface to make a USB startup disk

◆ **Tool Kit Installation**

After creating the USB startup disk successfully, double click the installation package file "WEIHONG-NC65A/B-XP-V*.exe". Select "浏览(W)…" (means Browse), and define "目标文件夹" (means Destination Folder) as the root directory of the USB flash drive. And then click "安装" (means Install) to start extracting, as shown in Fig. 8-5.

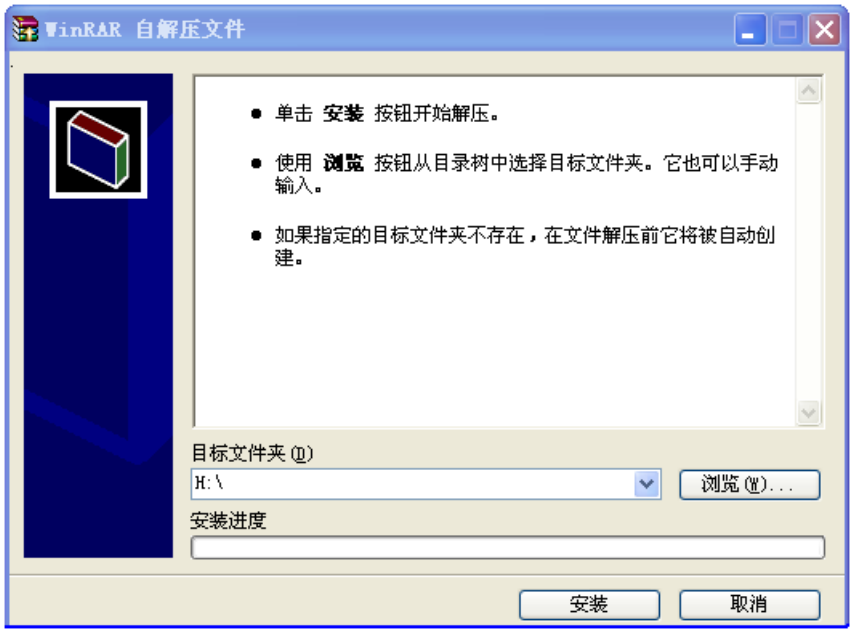


Fig. 8-5 Setup

After extraction finishes successfully, the setup of backup and restore kit is completed.

8.2.3 OS Backup and Restore

◆ **Setting BIOS Booting from USB Flash Drive and the Sequence of System Disk and Data Disk**

Insert the startup disk with the OS backup file into the NC65A/B host, and then reboot the NC65A/B, while pressing the “Delete” key to enter BIOS. Select “Advanced Bios Features –>Hard Disk Boot Priority” to set the disk sequence: U 盘设备(means USB flash drive)/Cho M/Cho S/; (note: for start-up the OS, the sequence must be Cho M/ Cho S). Otherwise, OS restore and backup may aim at the data disk.

◆ **One-key Restore**

After entering the one-key restore DOS environment by booting from the USB flash drive, there are two options. Continuously pressing “1” twice will make the tool kit restore the OS automatically. After restoring, remember to reset BIOS “Hard Disk Boot Priority” before removing the USB flash drive. Then the OS can be rebooted.

> Note: after restore, it is required to reboot the system in a normal way before installing the software, because write-protect is not opened after the OS is installed for the first time. After rebooting, write-protect is opened.

◆ **One-key Backup**

Select “2” to return to DOS environment after entering environment selection by booting from the USB flash drive. Input “back”, and then press “Enter” to enter backup selection environment. Selecting “2” will enter into backup state automatically. If there is already the image file “diskback.gho” in the USB flash drive, remember to rename it or cut it before one-key backup. Otherwise, the tool kit will exit from backup environment automatically if the image file has already existed in the USB flash drive.

◆ **Note:**

If abnormal conditions occur during system restore and backup, the most possible causes are as following:

1) The boot sequence of BIOS hard disk is wrong.

2) The OS has already been broken before backup.

3) The USB space is not enough.

4) The image file has already existed in the USB in the process of backup.

5) Sometimes, if backup or restore exits abnormally, it is possible that there are bad sectors in the

system CF card. The way to solve it is to repair the hard disk of CF card.

6) On account of the above issues, it is suggested to check and repair the system disk before OS restore and backup, or system performance may be affected, so is the data disk.

9 Appendix

9.1 Terminology Specification

9.1.1 Back to Machine Zero (Back to Reference Point)

Machine Zero (also called machine origin, home) is the datum mark of MCS (machine coordinate system). The process of returning to machine zero, varying with different machine structures & control software versions, is achieved via the execution of a block of G codes.

“Back to Reference Point” is a process to synchronize local coordinate system with actual external coordinate system via control system. In other words, since the system does not know the concrete position of each axis after start-up, it will control the motion of each axis and detect the switch signal pre-installed on each axis during the motion (the control system has already known the installation position of these switches). Thus, once these switch signals are found, the system will acquire the machine tool has reached the predetermined position and then set the coordinates of this position as current coordinates, namely, the local coordinate system is synchronous with the actual one.

Generally, these switches are installed at the position of machine zero, i.e. “Back to Machine Zero” equals to the term “Back to Reference Point” in our system. Absolutely, the switch of reference point is allowed to be at other locations rather than machine zero.

The process of “Back to Machine Zero” can be divided into two steps, “Coarse Positioning” and “Fine Positioning”.

The former one is used to drive X/Y/Z axis around the machine zero. And the following switches can be adopted for home switches in coarse positioning, involving proximity switch, mechanical switch, photoelectric switch, etc. Due to the limit of these switches on precision and repetition in positioning, the X/Y/Z axis is unable to return to machine zero exactly in coarse positioning, thus, fine positioning is compulsory.

> Note: Too low velocity in coarse positioning will keep you wait for a long time.
>
> “Back to Machine Zero” can be subdivided into two modes, “single axis back” and “Z-axis back firstly, followed by X/Y-axis simultaneously”. In order to avoid damage to the workpiece surface during “Back to Machine Zero”, please select “Z-axis firstly, then X/Y-axis successively” even under “single axis back” mode.

Fine positioning, with various methods, is used to make each axis return to machine zero

exactly by regarding encoder origin as fine positioning switch, i.e. the axis is locating for machine zero in the motion via detecting encoder origin. Due to one origin signal sent per revolution of encoder, the fine positioning signal is periodic.

9.2 Electronic Gear Ratio

9.2.1 Electronic Gear

Electronic Gear: assume that the system sends 5000 pulses per revolution of servo motor. When doubling revolutions of servo motor driven by the same amount of pulses is needed, there are two methods available, “set servo parameters” and “addition of mechanical gear between motor spindle and load-spindle”. Using circuit to realize the functions of mechanical gear is called electronic gear, viz. pulse frequency multiplication function.

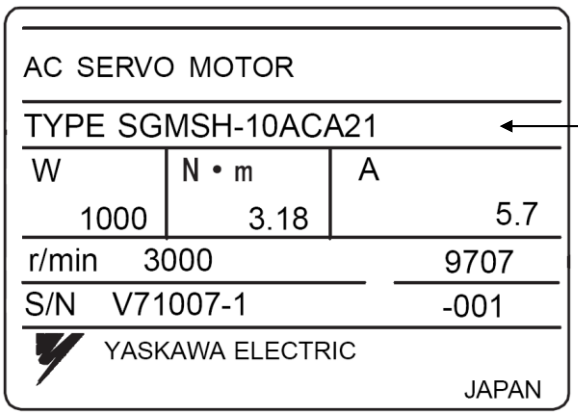
9.2.2 Electronic Gear Functions

Regarding “Electronic Gear”, it refers to a proportional control factor of output displacement to motor when a certain amount of pulses is input. For the “senior device” issuing pulses, it can be regardless of encoder pulse No. and mechanical deceleration ratio in controlling.

Functions of electronic gear: it can set the command unit freely (the displacement of screw corresponding to one pulse sent by the system). Frequency reduplication can be used to amplify the frequency of pulse issued by the system.

Electronic gear ratio= encoder resolution × command unit × mechanical deceleration ratio / screw pitch

Please see the servo motor label plate and then refer to the corresponding driver manual to confirm its encoder resolution. Fig. 9-1 is a label plate of YASKAWA SGMSH motor, and the 4th character of the motor type is the serial encoder specification, so the resolution of this motor is 2^{17}, i.e. 131072.



Motor Type:
TYPE SGMSH-1 0 A Ⓒ A 2 1
(The 4th character)

The 4th character: serial encoder spec.		
Sign	**Spec.**	**Remark**
2	17-bit absolute	Standard
C	17-bit incremental	Standard

Fig. 9-1 Name plate of servo motor-encoder resolution

For instance: (an example of YASKAWA servo) screw pitch of a certain type of machine is 5mm,

with 17 bit encoder resolution, “0.001mm/p” pulse equivalent and “1:1” deceleration ratio.

$$\text{Electronic gear ratio}\quad \frac{PN202}{PN203} = \frac{2^{17}}{5/0.001}\times 1 = \frac{131072}{5/0.001}\times 1 = \frac{16384}{625}$$

The conversion of electronic gear ratio is as shown below.

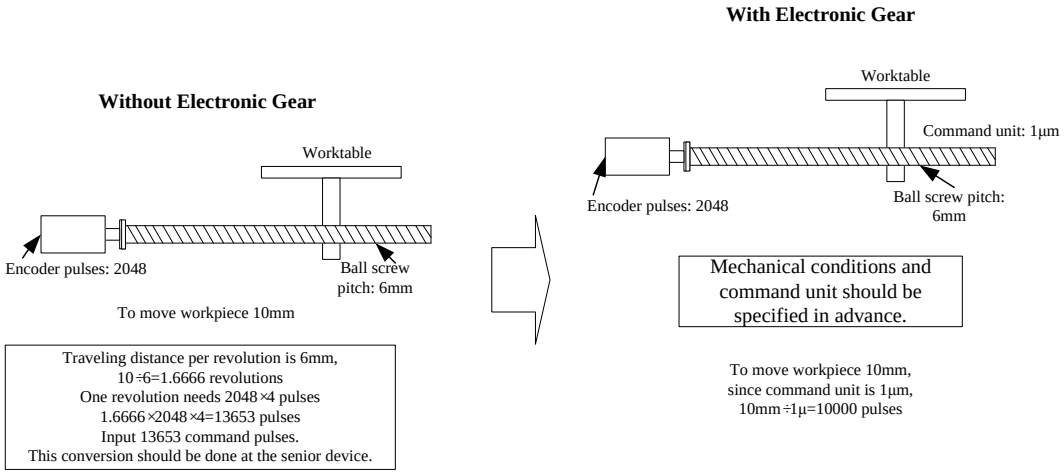


Fig. 9-2 Schematic conversion of electric gear ratio

9.2.3 Computing Method of Electric Gear Ratio

The setting of electronic gear ratio should be in accordance with the specification of equipment.

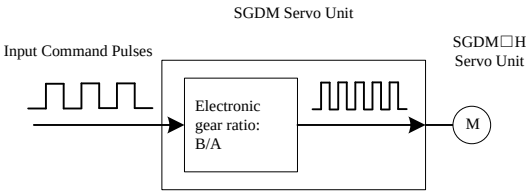


Fig. 9-3 Schematic map of electronic gear ratio function

$$\text{Electronic Gear Ratio}\ \frac{B}{A} = \frac{Pn202}{Pn203} = \frac{\text{Encoder Pulses}\times 4}{\text{Amount of movement per revolution of bearing axle}}\times\frac{m}{n}$$

$\frac{m}{n}$ is mechanical deceleration ratio.

9.2.4 Samples of Electronic Gear Setting

◆ **Sample One**

As screw pitch= 6mm (the screw travels 6mm per revolution of bearing axle), “2048” ($2^{13}/2^2$) pulses will be generated per revolution of servo motor with 13-bit incremental encoder.

Command unit= 0.001mm (the screw moves 0.001mm per pulse generated by the system)

Amount of movement per revolution of bearing axle= 6mm/0.001mm=6000

Ball Screw

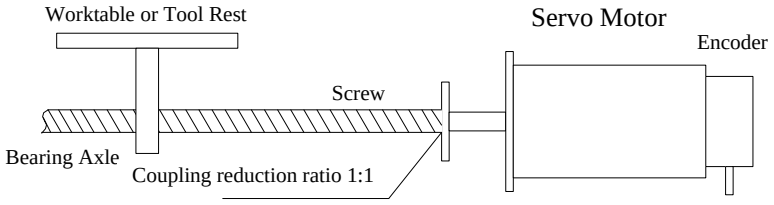


Fig. 9-4 Servo motor and screw sharing same axle (without reduction gearbox)

Servo motor and screw are sharing the same axle (without reduction gearbox), and one revolution of motor will lead to one rotation of screw.

$$\text{ElectronicGear Ratio}\frac{B}{A}=\frac{2048\times 4}{6000}\times\frac{1}{1}=\frac{8192}{6000}=\frac{Pn202}{Pn203}$$

(Note: for YASKAWA servo, “4” should be multiplied by the numerator.)

Table 2 Parameters setting value

Parameter	PN202	PN203
Setting Value	8192	6000

◆ **Sample Two**

Round Table

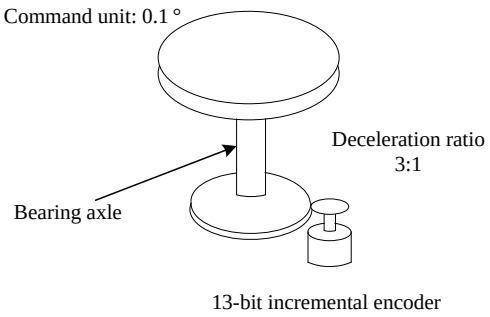


Fig. 9-5 Sample of round table

Pulses generated per revolution of motor=$2^{13}/2^2$=2048

Angle of rotation per revolution=360°

Command unit=0.1°

Amount of movement per revolution of bearing axle= 360°/ 0.1°=3600

$$\text{ElectronicGear Ratio}\frac{B}{A}=\frac{2048\times 4}{3600}\times\frac{3}{1}=\frac{Pn202}{Pn203}$$

Table 3 Parameters setting value

Parameter	PN202	PN203
Setting Value	24576	3600

◆ Sample Three

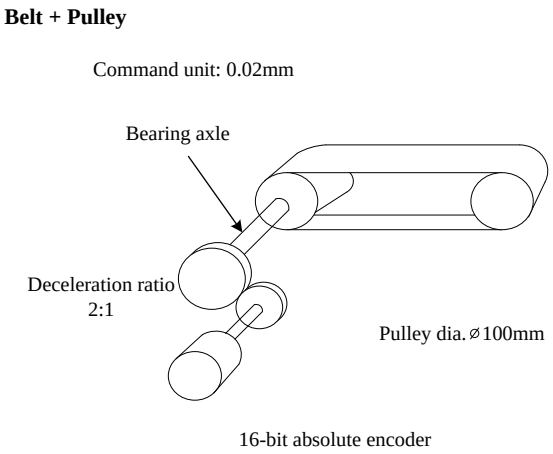


Fig. 9-6 Sample of belt and pulley

Pulses generated per revolution of motor=$2^{16}/2^2$=16384

Pulley diameter=100mm

Command unit=0.02mm

Amount of movement per revolution of bearing axle= 3.14×100mm/ 0.02mm=15700

$$\text{Electronic Gear Ratio}\ \frac{B}{A}=\frac{16384\times 4}{15700}\times\frac{2}{1}=\frac{Pn202}{Pn203}$$

Note: if the calculation result is out of setting range, both the numerator and denominator should be divided by their common divisor.

Table 4 Parameters setting value

Parameter	PN202	PN203
Setting Value	131072	15700

9.3 Driver Parameters

Driver parameters listed in the following chapters can only ensure normal working of a machine tool, without ensuring machining results. To get a better machining result, you need to set those parameters according to actual situations.

9.3.1 Parameter Setting of YASKAWA Σ–Ⅱ Servo Driver

Para. No.	Function	Value	Description
Fn010	Set password (to prevent arbitrary modification to parameters)	0000	Set [0000]: modification to user parameters [PnXXX] and part of auxiliary function parameters [FnXXX] permitted; Set [0001]: modification to user parameters [PnXXX] and part of auxiliary function parameters [FnXXX] prohibited.
Un00C	Surveillance mode	LXXXX (Hexadecimal system)	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
Pn000	Direction selection Control mode selection	0010	Bit 0: Set 0, “CCW” is forward rotation (viewed from the load end of screw ball); Set 1, the rotation direction of the motor is reversed. Bit 1: Set 1, position control mode (calculate pulse instruction all the time).
Pn200	Select pulse instruction mode	0005	Bit 0: Set 5, select the instruction input mode as “pulse + direction”, negative logic. Bit 3: Set 0, input differential signal into filter.
Pn50A	Selection function	8100	Bit 1: Set 0, Servo ON /S-ON, input from 40th pin; Set 7, Servo ON all the time. Bit 3: Set 8, positive rotation not used and signal input (P-OT) prohibited.
Pn50B	Selection function	6548	Bit 0: Set 8, reverse rotation not used and signal input (N-OT) prohibited.
Pn50F	Selection function	0300	Set it when servo motor with brakes. Bit 2: Set 3, brake interlock signal “/BK” is output from CN1-29, CN1-30 to control 24V relay for brake.
Pn50E	Selection function	0211	Set it when servo motor with brakes. To avoid of CN1-29 and CN1-30 being used for other function and leading to brake ineffective, “3” is not allowed to appear in the 4 digits.
Pn506	Servo off, time delay of brake	Depended	Set it when motor with brakes. Default setting is “0”, setting unit is 10ms.

<table>
<tr><th>Para. No.</th><th>Function</th><th>Value</th><th colspan="3">Description</th></tr>
<tr><td></td><td>when motor stops</td><td></td><td colspan="3"></td></tr>
<tr><td rowspan="4">Pn201</td><td rowspan="4">Encoder cycle-divided ratio (Pulses output per motor cycle by encoder after cycle-divided)</td><td rowspan="4">Right-side</td><td rowspan="4">Gain Encoder</td><td>Type</td><td>Encoder Pulse No. per Motor Circle (pulse/ revolution)</td></tr>
<tr><td>A</td><td>13bit 2048</td></tr>
<tr><td>B</td><td>16bit 16384</td></tr>
<tr><td>C</td><td>17bit 32768</td></tr>
<tr><td>Pn202</td><td>Electronic gear ratio (numerator)</td><td>Need Calculation</td><td colspan="3" rowspan="2">Pn202 = pulse No. of each encoder circle × 4 × mechanical deceleration ratio.
Pn203 = (screw pitch/ pulse equivalent).
Typical value: pitch 5mm, encoder 17-bit, deceleration ratio 1:1, pulse equivalent 0.001mm, Pn202＝16384; Pn203＝625.
Pitch 5mm, encoder 17-bit, deceleration ratio 1:1, pulse equivalent 0.0005mm, Pn202＝8192; Pn203＝625.</td></tr>
<tr><td>Pn203</td><td>Electronic gear ratio (denominator)</td><td>Need Calculation</td></tr>
</table>

9.3.2 Parameter Setting of YASKAWA Σ–Ⅴ Servo Driver

Para. No.	Function	Value	Description
Fn010	Parameter input prohibition setting	0000	Set [0000]: modification to user parameters [PnXXX] and part of auxiliary function parameters [FnXXX] permitted; Set [0001]: modification to user parameters [PnXXX] and part of auxiliary function parameters [FnXXX] prohibited.
Pn000	Function selection basic switch 0	0010	Bit 0: Set 0, positive rotation at positive rotation command. Bit 1: Set 1, position control mode (pulse sequence command).
Pn200	Format selection switch of position control command	0005	Bit 0: Set 5, select the instruction mode as “pulse + direction”, negative logic. Bit3: Set 0, input differential signal into filter.
Pn50A	Input signal selection 1	8100	Bit 1: Set 0, Servo ON /S-ON, input from the 40th pin; Set 7, Servo ON all the time. Bit 3: Set 8, positive rotation not used and signal input (P-OT) prohibited.
Pn50B	Input signal selection 2	6548	Bit 0: Set 8, negative rotation not used and signal input (N-OT) prohibited.
Pn50F	Output signal selection 2	0300	Set it when servo motor with brakes. Bit 2: Set 3, brake interlock signal “/BK” is output from CN1-29, CN1-30 to control 24V relay used for brake.
Pn50E	Output signal selection 1	0211	Set it when servo motor with brakes To avoid of CN1-29 and CN1-30 being used for other function and leading to brake ineffective, 3 is not allowed to appear in the 4 digits.
Pn506	Brake instruction- servo OFF and time delay	Depended	Set it when motor with brakes. Default setting is “0”, setting unit is ms.
Pn20E	Electronic gear ratio (numerator)	Need Calculation	$\frac{Pn20E}{Pn210}=\frac{\text{Encoder resolution}\times\text{Pulse equivalent}\times\text{Deceleration ratio}}{\text{Screw pitch}}$ For example, screw pitch 5mm, 20-bit encoder, deceleration ratio 1:1, pulse equivalent 0.001mm, $\frac{Pn20E}{Pn210}=\frac{2^{20}\times0.001}{5}=\frac{1048576}{5000}=\frac{131072}{625}$ When screw pitch is 10mm, $\frac{Pn20E}{Pn210}=\frac{1048576}{10000}=\frac{65536}{625}$ For a rotary axis with 13-bit encoder and deceleration ratio as 60, $\frac{Pn20E}{Pn210}=\frac{2^{13}\times0.001\times60}{360}=\frac{8192}{6000}=\frac{512}{375}$
Pn210	Electronic gear ratio (denominator)	Need Calculation	

9.3.3 Parameter Setting of Panasonic MINAS A4 Servo Driver

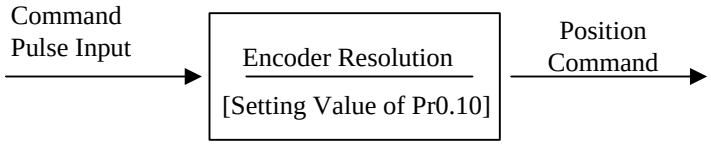
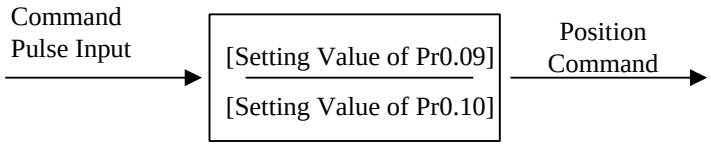
Para. No.	Function	Value	Description
Pr01	LED initial status	12	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
Pr02	Select control mode	0	0: position mode 1: velocity mode 2: torque mode
Pr40	Selection of command pulse input	1	1: input by differential exclusive circuit
Pr42	Select command pulse input mode	3	Set command pulse input mode: command pulse + command direction, negative logic
Pr48	1st numerator of command pulse frequency multiplication	Need calculation Range: 1~10000	Typical value: pitch 5 mm, encoder resolution 10000, deceleration 1:1, pulse equivalent 0.001mm: Pr48＝10000 Pr4B ＝ pitch 5mm / pulse equivalent 0.001mm＝5000 Pr48/Pr4B=10000/5000=2/1
Pr4B	Denominator of command pulse frequency multiplication	Need calculation Range: 1~10000	

9.3.4 Parameter Setting of Panasonic MINAS A5 Servo Driver

Para. No.	Function	Value	Description
Pr5.28	LED initial status	6	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
Pr0.01	Select control mode	0	0: position mode 1: velocity mode 2: torque mode
Pr0.05	Selection of command pulse input	XX	0: Photo-coupler input (PULS1, PULS2, SIGN1, SIGN2) 1: Exclusive input for line driver (PULSH1, PULSH2, SIGNH1,SIGNH2) Note: generally, "1" is selected for this parameter.
Pr0.07	Command pulse input mode setup	3	Set command pulse input mode: command pulse + command direction, negative logic.
Pr0.08	Command pulse No. per motor circle	0	When it is set as "0", parameters Pr0.09 and Pr0.10 are valid.
Pr0.09	1st numerator of command pulse frequency multiplication	Need calculation Range: $0\sim2^{30}$	Typical value: pitch 5 mm, encoder resolution 10000, deceleration ratio 1:1, pulse equivalent 0.001 mm: Pr0.09＝10000 Pr0.10＝pitch 5mm/ pulse equivalent 0.001mm＝5000 Pr0.09/Pr0.10=10000/5000=2/1
Pr0.10	Denominator of command pulse frequency multiplication	Need calculation Range: $0\sim2^{30}$	
When the value of Pr0.08 is not "0", it can be calculated in terms of the following formula: $\text{Command pulse No. per motor circle} = \frac{\text{Screw pitch}}{\text{Pulse equivalent} \times \text{Mechanical deceleration ratio}} = \frac{5\text{mm}}{0.001\text{mm} / p} = 5000$ When screw pitch is 5mm and pulse equivalent 0.001, the value of Pr0.08 is "5000".			

◆ **Attached List: relationship among parameters Pr0.08, Pr0.09 and Pr0.10**

Pr0.08	Pr0.09	Pr0.10	Description
$0\sim2^{20}$	— (no influence)	— (no influence)	Command Pulse Input → Encoder Resolution / [Setting Value of Pr0.08] → Position Command As shown above, the process is undergone in terms of the setting

Pr0.08	Pr0.09	Pr0.10	Description
			value of Pr0.08, not affected by the settings of Pr0.09 and Pr0.10.
0	0	0~2^{30}	 When the values of Pr0.08 and Pr0.09 are both set as “0”, as shown above, the process is undergone in terms of the setting value of Pr0.10.
	0~2^{30}	0~2^{30}	 When the value of Pr0.08 is “0”, but the value of Pr0.09 is not “0”, as shown above, the process is underdone in terms of the setting values of Pr0.09 and Pr0.10.

9.3.5 Parameter Setting of MITSUBISHI MR-E Servo Driver

Para. No.	Code	Function	Value	Description
0	*STY	Select control mode and regenerative fittings	X0X0	Bit 0: set 0: select position control mode. Bit 1, select motor series: 0: HC-KFE; 1:HC-SFE; Bit 3, select regenerative apparatus, set 0: not use. Bit 4, select motor power.
1	MBR	Function selection 1	001X	Bit 0: input signal filter. If external input signal causes chattering due to noises, etc., input filter is used to suppress it. Bit 1: CN1-12 function selection, set “1”: electromagnetic brake interlock (MBR); set “0”: zero speed detection signal.
3	CMX	Electronic gear numerator	Need calculation	CMX/CDV=command unit × servo motor resolution × mechanical deceleration ratio / screw pitch. E.G., pitch 5 mm, encoder resolution 10000, deceleration ratio 1:1, pulse equivalent 0.001 mm, CMX/CDV=10000×0.001/5 = 2/1; When pulse equivalent = 0.0005mm, CMX/CDV = 1/1. Electronic gear ratio range: 1/50 ~ 500
4	CDV	Electronic gear denominator	Need calculation	
18	*DMD	Status display selection	00XX	3: cumulative command pulses E: load inertia When the parameter is set [3], monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection to determine if there is electrical interference.
21	*OP3	Function selection 3 (command pulse format selection)	0001	Set pulse command input form: pulse train+ sign, negative logic
41	*DIA	Signal input SON-ON, LSP-ON and LSN-ON automatically selection	0110	Bit 0: Servo-ON selection. [0]: servo on by external input; [1]: servo on all the time inside. Bit 1: last signal of positive rotation range (LSP): [1]: auto servo on inside, without external wiring. Bit 3: last signal of negative rotation range (LSN): [1]: auto servo on inside and no need of external wiring.

9.3.6 Parameter Setting of DELTA ASDA-A Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection to determine if there is electrical interference.
P1-00	External pulse input type	ZYX	102	X=2: pulse + direction; Z=1: negative logic
P1-01	Control mode setup	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0 Y=0: forward rotation (CCW) (in terms of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode.
P1-32	Motor stop mode selection	YX	00	Y=0: when there is no servo enabled, motor dynamic brake occurs; Y=1: motor is free. X=0: motor stops instantly, X=1: motor stops with deceleration.
P1-44	Electronic Gear Ratio (Numerator)(N1)	1~32767	Need calculation	N1/M= encoder pulses× 4× pulse equivalent× mechanical deceleration ratio/ pitch Representative value: encoder pulses=2500, pitch=5mm, pulse equivalent=0.001, deceleration ratio=1, calculation as below: N1/M= 2500×4×0.001/5 = 2 / 1, N1=2, M=1; When the multi-electronic gear ratio is not used, P2-60~ P2-62 are not required.
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	Need calculation	
P2-10	Digital input pin DI1	X2X1X0	101	X1X0=01: digital input (DI1=SON) corresponds to 9th pin of CN1. X2 = 1: set DI1 input as NO (normally open) a-contact point.
P2-15	Digital input pin DI6	X2X1X0	100	Default factory setting of DI6 and DI7 are NC (normally closed) limit signal input pins; driver can't run without being connected to pin 32 and pin 31 of CN1. X2=1: set DI6 and DI7 inputs as NO (normally open) a-contact points; X1X0=00, limit signal input of the driver is not used.
P2-16	Digital input pin DI7	X2X1X0	100	

Para. No.	Function	Format & Range	Value	Description
P2-17	Function setting for digital input pin DI8	X2X1X0	100	External EMG stop input is not used.
P2-21	Function setting for digital output pin DO4	X2X1X0	108	DO4 corresponds to pin 1 & pin 26, used as clamping-position brake signal of Z-axis; X2=1: set DO4 output as NO (normally open) a-contact point; X2=0: set DO4 output as NC (normally closed) b-contact point; X1X0=08: set pin 1 and pin 26 as BK+ and BK- respectively.
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC (normally closed) b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.
P2-51	Servo ON (SON) setup		0	0: Servo ON must be triggered by numerical input signal. 1: when servo is powered, if there is no alarm signal, servo will be automatically on. Set 1 when there is no SON signal wire.

9.3.7 Parameter Setting of DELTA ASDA-A2 Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	102	X=2: pulse + direction; Z=1: negative logic
P1-01	Set control mode	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0; Y=0: forward rotation (CCW) (from the view of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode
P1-44	Electronic Gear Ratio (Numerator)(N1)	1~32767	Need calculation	$\frac{P1-44}{p1-45}=\frac{\text{Encoder resolution}\times\text{Pulse equivalent}\times\text{Deceleration ratio}}{\text{Screw pitch}}$ When encoder resolution is 1280000, screw pitch 5mm, pulse equivalent 0.001, and deceleration ratio 1:1, $\frac{P1-44}{P1-45}=\frac{1280000\times0.001}{5}=\frac{256}{1}$ When the multi-electronic gear ratio is not used, P2-60 ~P2-62 are not required.
P1-45	Electronic Gear Ratio (Denominator)(M)	1~32767	Need calculation	
P2-10	Function setting for digital input pin DI1	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 9th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.
P2-15	Function setting for digital input pin DI6	X2X1X0	100	Default factory setting of DI6 and DI7 is NC (normally closed) limit signal input; driver can't run without being connected to pin 32 and pin 31 of CN1. X2=1: set DI6 and DI7 inputs as NO a-contact point. X1X0=00, limit input of driver is not used.

Para. No.	Function	Format & Range	Value	Description
P2-16	Function setting for digital input pin DI7	X2X1X0	100	
P2-17	Function setting for digital input pin DI8	X2X1X0	100	External EMG stop input is not used.
P2-21	Function setting for digital output pin DO4	X2X1X0	108	DO4 corresponds to pin 1 & pin 26, used as clamping-position brake signal of Z-axis; X2=1: set DO4 output as NO (normally open) a-contact point; X2=0: set DO4 output as NC (normally closed) b-contact point; X1X0=08: set pin 1 and pin 26 as BK+ and BK- respectively.
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.

9.3.8 Parameter Setting of DELTA ASDA-B Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	102	X=2: pulse + direction; Z=1: negative logic
P1-01	Set control mode	YX1X0	000	Y=0: forward rotation (CCW) (from the view of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode
P1-32	Motor stop mode	YX	00	Y=0: when there is no servo enabled, motor dynamic brake occurs; Y=1: motor is free. X=0: motor stops instantly, X=1: motor stops with deceleration.
P1-44	Electronic Gear Ratio (Numerator)(N1)	1~32767	Need calculation	N1/M= mechanical deceleration ratio × 4 × encoder pulses× pulse equivalent / pitch. Representative value: encoder pulses=2500, pitch =5mm, pulse equivalent=0.001 mm/p, deceleration ratio = 1, calculation as below: N1 / M = 2500×4×0.001/5 = 2/1, N1=2, M=1; When the multi-electronic gear ratio is not used, P2-60 ~P2-62 are not required.
P1-45	Electronic Gear Ratio (Denominator)(M)	1~32767	Need calculation	
P2-10	Function setting for digital input pin 1 (DI1)	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 17th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.
P2-15	Function setting for digital input pin DI6	X2X1X0	100	Default factory setting of DI6 is NC (normally closed) limit signal input; driver can't run without being connected to pin 32 and pin 31 of CN1. X2=1: set DI6 input as NO a-contact point. X1X0=00, limit input of the driver is not used.

Para. No.	Function	Format & Range	Value	Description
P2-18	Function setting for digital output pin DO1	X2X1X0	108	DO1 corresponds to 16th pin, as clamping-position brake signal of Z-axis; X2=1: set DO1 output as NO a-contact point; X2=0: set DO1 output as NC b-contact point; X1X0=08: set 16th pin as BK+.
P2-20	Function setting for digital output pin DO3	X2X1X0	007	DO3 corresponds to pin 1, used as servo alarm signal. X2=0: set DO3 output as NC b-contact point. X1X0=07: set pin 1 as ALRM+.

9.3.9 Parameter Setting of DELTA ASDA-B2 Servo Driver

Para. No.	Function	Format & Range	Value	Description
P0-02	Driver status display		02	Monitor if the number of sent and received pulse is correct by setting this parameter. In Weihong control system, the correct quantity of pulse sent by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	102	X=2: pulse + direction; Z=1: negative logic
P1-01	Set control mode	ZYX1X0	0000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0; Y=0: forward rotation (CCW) (from the view of load); Y=1: the rotation direction is reversed. X1X0=00: position control mode
P1-44	Electronic Gear Ratio (Numerator)(N1)	1~32767	Need calculation	N1/M= mechanical deceleration ratio × 4 × encoder pulses× pulse equivalent / pitch. Representative value: encoder pulses=40000, pitch =5mm, pulse equivalent=0.001, deceleration ratio = 1, calculation as below: N1 / M = 40000×4×0.001/5 = 32/1, N1=32, M=1; When the multi-electronic gear ratio is not used, P2-60 ~P2-62 are not required.
P1-45	Electronic Gear Ratio (Denominator) (M)	1~32767	Need calculation	
P2-10	Digital Input Pin DI1	X2X1X0	101	X1X0=01: digital input (DI1 = SON) corresponds to 9th pin of CN1. X2=1: set DI1 input as NO (normally open) a-contact point.
P2-15	Function setting for digital input pin DI6	X2X1X0	100	Default factory setting of DI6 and DI7 is NC (normally closed) limit signal input; driver can't run without being connected to pin 32 and pin 31 of CN1. X2=1: set DI6 and DI7 inputs as NO a-contact point. X1X0=00, limit input of driver is not used.

Para. No.	Function	Format & Range	Value	Description
P2-16	Function setting for digital input pin DI7	X2X1X0	100	
P2-17	Function setting for digital input pin DI8	X2X1X0	100	External EMG stop input is not used.
P2-18	Function setting for digital output pin DO1	X2X1X0	108	DO1 corresponds to pin 6 & pin 7, used as clamping-position brake signal of Z-axis; X2=1: set DO1 output as NO (normally open) a-contact point; X2=0: set DO1 output as NC (normally closed) b-contact point; X1X0=08: set pin 6 and pin 7 as BK- and BK+ respectively.
P2-22	Function setting for digital output pin DO5	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal. X2=0: set DO5 output as NC b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.

9.3.10 Parameter Setting of SANYO PY Servo Driver

Para. No.	Abbr.	Name	Standard Value	Setting Range	Unit	Remark
1-2	EGER	Electronic gear ratio	4/1	1/32767 to 32767/1		Depend on the specific encoder resolution. The formula of electronic gear ratio of servo driver is as below: Electronic gear ratio numerator =mechanical deceleration ratio × 4× pulse No. per encoder circle; Electronic gear ratio denominator = (screw pitch / pulse equivalent) E.G. In Weihong system, the default pulse equivalent is 0.001mm/p, screw pitch is 5mm, pulse number per encoder circle is 2000 and deceleration ratio is 1:1; so the numerator of the electronic gear ratio is 8, and the denominator is 5. (Select an incremental type encoder)
1-16	MENP	Pulse amount of the motor encoder 1. Set the pulse amount of the motor encoder; 2. Standard configuration of the encoder pulse No. is as below. Incremental encoder omitting wiring: --2000P/R Absolute encoder:--2048P/R		500 to 65535	P/R	
2-0	PMOD	Pulse format of position command: Our system uses: direction + pulse format, the parameters are shown as following:				

<table>
<tr><th>Para. No.</th><th>Abbr.</th><th>Name</th><th>Standard Value</th><th>Setting Range</th><th>Unit</th><th>Remark</th></tr>
<tr><td></td><td></td><td colspan="5">PMOD
<table>
<tr><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
</table>
When bit 7=0
<table>
<tr><th rowspan="2">Bit 1</th><th rowspan="2">Bit 0</th><th>Command Pulse Input Digital Filter</th></tr>
<tr><th>Min. Pulse Width</th></tr>
<tr><td>0</td><td>0</td><td>0.8μs</td></tr>
<tr><td>0</td><td>1</td><td>0.2μs</td></tr>
<tr><td>1</td><td>0</td><td>0.4μs</td></tr>
<tr><td>1</td><td>1</td><td>1.6μs</td></tr>
</table>
When bit 7=1
<table>
<tr><th rowspan="2">Bit 1</th><th rowspan="2">Bit 0</th><th>Command Pulse Input Digital Filter</th></tr>
<tr><th>Min. Pulse Width</th></tr>
<tr><td>0</td><td>0</td><td>3.2μs</td></tr>
<tr><td>0</td><td>1</td><td>0.8μs</td></tr>
<tr><td>1</td><td>0</td><td>1.6μs</td></tr>
<tr><td>1</td><td>1</td><td>6.4μs</td></tr>
</table>
<table>
<tr><th>Bit6</th><th>Bit5</th><th>Command Pulse Format</th></tr>
<tr><td>1</td><td>0</td><td>Direction + Pulse</td></tr>
</table>
Switch of Digital Filter
<table>
<tr><td>0</td><td>High Speed</td></tr>
<tr><td>1</td><td>Low Speed (1/4)</td></tr>
</table></td></tr>
<tr><td>4-3</td><td>TYPE</td><td colspan="3">Control mode:
*Select one control mode from position, velocity, and torque modes.
<table>
<tr><th>Selection Item</th><th>Content</th></tr>
<tr><td>Position</td><td>Position control mode</td></tr>
<tr><td>Velocity</td><td>Velocity control mode</td></tr>
<tr><td>Torque</td><td>Torque control mode</td></tr>
<tr><td>Velo↔Torq</td><td>Velocity↔Torque switch mode</td></tr>
<tr><td>Posi↔Torq</td><td>Position↔Torque switch mode</td></tr>
<tr><td>Posi↔Velo</td><td>Position↔Velocity switch mode</td></tr>
</table>
Referring to the switch type, the requisite control mode can be selected from pin 36 or 35 of the CN1.
Func3, set Bit7 as 0: pin 36 is enabled.
set Bit7 as 1:pin 35 is enabled.
$$$: standard value varies with the reset setup (leave factory setting).</td><td>6 types</td><td>Our system selects position control mode.</td></tr>
</table>

9.3.11 Parameter Setting of SANYO R Servo Driver

Para. No.	Parameter Name	Set Value	Remarks
Group 0, parameter setting of tuning mode			
00	Setting of the tuning mode	00	Set as auto tuning mode
Group 8, setting of the control parameters			
00	Polarity of position input	00	Position command mode: positive rotation effective
11	Input command mode	02	Pulse + negative logic
15	Setting of electronic gear	8/5	It depends on the resolution of the specific encoder. E.G.: incremental encoder 2000, the motor needs 2000 ×4=8000 pulses per circle. When pulse equivalent of Weihong CNC system is 0.001mm/p, it needs 1000 pulses to move 1mm along line; in other words, if the screw pitch is 5, so, to move 5mm along line needs 5000 pulses, so F=8000/5000=8/5.
Group 9, setting of function effective			
05	Servo ON selection	02	Select servo ON state.
02	Servo alarm elimination	10	Make the function of servo alarm effective.
Setting of the system parameters			
02	Encoder selection	00	Standard incremental encoder. The parameter depends on the specific situation, what we list is only the representative one.
03	Encoder resolution	2000	500－65535, set the encoder resolution manually.
08	Control mode selection	02	Select position control mode.

9.3.12 Parameter Setting of SANYO Q Servo Driver

Para. No.	Parameter Name	Set Value	Remarks
Group 1			
GER1	Electronic gear ratio 1	1/1	Set electronic gear ratio for position command pulse. E.G., incremental encoder 2000, the motor needs 2000 ×4=8000 pulses per circle. When pulse equivalent of Weihong CNC system is 0.001mm/p, it needs 1000 pulses to move 1mm along line, in other words, if the screw pitch is 5, to move 5mm along line needs 5000 pulses, so F=8000/5000=8/5.
GER2	Electronic gear ratio 2	1/1	This setting is the same as that of electronic gear ratio 1 and activated during electronic gear switching.
Group 4			
PA400	Command pulse selection	00H	Set position command pulse as “pulse + direction”.
Group 8			
S-ON	Servo ON	02H	Select servo ON state.
AL-RST	Alarm reset	10H	Make the function of servo alarm effective.
Setting of the system parameters			
01	Encoder selection	00	Standard incremental encoder. The parameter depends on the specific situation, what we list is only the representative one.
03	Incremental encoder resolution	2000	500－65535, set the encoder resolution manually.
08	Control mode selection	02	Select position control mode.

9.3.13 Parameter Setting of KT270 Servo Driver

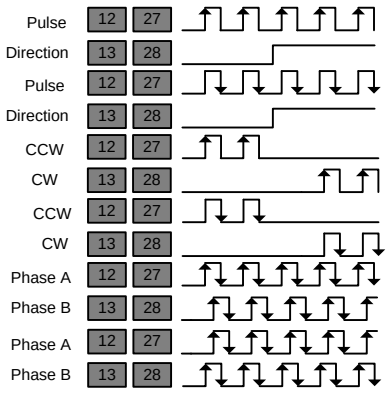
Para. No.	Parameter Name	Value	Description
PA4	Control mode selection	0	The control mode of the driver can be set through this parameter: 0: position control mode; 1: speed control mode; 2: trial run control mode; 3: JOG control mode.
PA12	Numerator of position command pulse ratio	2	Set the ratio of the position command pulse (electronic gear). Under position control mode, with the setting of the PA12 and PA13, it is convenient to match with pulse source of each type, which can reach users' perfect control resolution (that is angle/pulse). Expression: $P \times G = N \times C \times 4$ P: pulse amount of the input command; G: electronic gear ratio, G=ratio numerator / ratio denominator. N: circle number that the motor rotates; C: each circle line number of photo electricity encoder, C of our system =2500. E.G.: input command pulse with number of 6000 to make the servo motor rotate one circle, $G = \frac{N \times C \times 4}{P} = \frac{1 \times 2500 \times 4}{6000} = \frac{5}{3}$ So set PA12 as 5 and PA13 as 3. We recommend the range of electronic gear ratio as: $\frac{1}{50} \le G \le 50$
PA13	Denominator of the position command pulse ratio	1	Refer to parameter PA12.
PA14	Input mode of the position command pulse	0	Set the input mode of the position command pulse; there are following three modes which can be selected by setting the parameter: 0: pulse + symbol; 1: positive rotation pulse / negative rotation pulse; 2: two orthogonal pulses inputs

Para. No.	Parameter Name	Value	Description
PA20	Invalid input on the end of the stroke	1	0: Valid stroke end of LSP, LSN positive rotation, negative rotation. When switch LSP is connected, driving of the positive rotation is allowed; When switch LSP is disconnected, driving of the positive rotation is prohibited (torque of the positive direction is 0). LSN is the same as LSP. If LSP and LSN are both disconnected, the abnormal alarming of driving prohibited will occur (NO.7). 1: Invalid stroke end of LSP, LSN positive rotation, negative rotation. No matter which state of the switch LSP and LSN is in, driving of positive rotation and negative rotation are both allowed. Simultaneously, even if LSP and LSN are both disconnected, abnormal alarming of driving prohibited will not occur (NO.7). 2: Invalid stroke end of LSP, LSN positive rotation, negative rotation, and SON is forced to be effective. (Note: SON forcedly effective is only used for motor debugging. In normal use, we suggest controlling the state of SON by input port.) 3: Valid stroke end of LSP, LSN positive rotation, negative rotation. When switch LSP is connected, driving of the positive rotation is allowed; When switch LSP is disconnected, driving of the positive rotation is prohibited (the speed of positive direction is 0, but the torque is not 0). LSN is the same as LSP. When LSP and LSN are both disconnected, abnormal alarming of driving prohibited will not occur (NO.7).

9.3.14 Parameter Setting of FUJI FALDIC-β Servo Driver

Para. No.	Name	Value	Description
01	Command pulse numerator α	Need calculation 1~32767	Command pulse numerator and denominator are also equal to those of the electronic gear ratio. α / β=encoder resolution× pulse equivalent× mechanical deceleration ratio / screw pitch. Typical value: encoder resolution 65536, pitch 5mm, pulse equivalent 0.001, mechanical deceleration ratio 1, α / β=65536×0.001 / 5=8192 / 625, So α=8192, β=625.
02	Command pulse denominator β	Need calculation 1~32767	
03	Pulse string input form	0	Set the input mode of pulse string as: instruction + symbol, that is 'pulse + direction'.
04	Direction of rotation switch	0 or 1	Set 0: Positive direction: Forward rotation (CCW); Set 1: Positive direction: Reverse rotation (CW).
10	CONT1 signal distribution	1	CONT1 is distributed as RUN (i.e. SON); if not distributed, CONT1 will be auto ON if there is no alarming when powered.
11	CONT2 signal distribution	2	CONT2 is distributed as RST (i.e. servo alarming clearance CLR). When 12, 13, 14 are 0, that is CONT3, CONT4 and CONT5 can't be distributed as OT over-travel or EMG (external emergency stop).
15	OUT1 signal distribution	1	Set 1, OUT1 is distributed as a-contact point of alarming output; Set 2, OUT1 is distributed as b-contact point of alarming detection.
27	Parameter write-protection	0 or 1	Set 0, write-enable. Set 1, write-protected.
74	CONT Always ON 1	1	Its initial value is 0, and it is set "1" here to enable servo (RUN).

9.3.15 Parameter Setting of Stone GS Servo Driver

<table>
<tr><th>Para. No.</th><th>Para. Name</th><th>Value</th><th>Description</th></tr>
<tr><td>F0f</td><td>Electronic gear ratio numerator</td><td>2</td><td rowspan="2">Electronic gear ratio of position mode: 4× pulse frequency fed back by servo encoder = command pulse frequency× F0f / F10; value of F0f / F10 must be within 1/100~100. (calculation with pitch as 10mm)</td></tr>
<tr><td>F10</td><td>Electronic gear ratio denominator</td><td>1</td></tr>
<tr><td>F00</td><td>Control mode selection</td><td>2</td><td>0: External speed running mode; make sure the value and direction of motor speed according to the external analog -10V ~ +10V signal of CN2-16, 17;
1: Internal speed running mode; make sure the value and direction of motor speed according to the setting of parameter F33, F35, F37, F39 and the port status of CN2-9, CN2-25;
2: Position pulse running mode; accept the input of external position pulse and direction level signal;
3: Jog mode; make sure the motor speed in terms of parameter setting of F3b, and control the rotation direction by the direction keystroke ▼ and ▲;
4: Torque mode; make sure the value and direction of motor torque according to the external analog -10V ~ +10V signal of CN2-43, 1;
5~10: Mixed mode; select mode according to the port input status of CN2-24:
<table>
<tr><th rowspan="2">F00 Value</th><th colspan="2">CN2-24 Interface Status</th></tr>
<tr><th>OFF (Mode One)</th><th>ON (Mode Two)</th></tr>
<tr><td>5</td><td>Position Pulse Mode</td><td>External Speed Running Mode</td></tr>
<tr><td>6</td><td>Position Pulse Mode</td><td>Internal Speed Running Mode</td></tr>
<tr><td>7</td><td>Position Pulse Mode</td><td>Torque Mode</td></tr>
<tr><td>8</td><td>Internal Speed Running Mode</td><td>External Speed Running Mode</td></tr>
<tr><td>9</td><td>Internal Speed Running Mode</td><td>Torque Mode</td></tr>
<tr><td>10</td><td>External Speed Running Mode</td><td>Torque Mode</td></tr>
</table></td></tr>
<tr><td>F2e</td><td>Pulse input mode selection</td><td>2</td><td>Command pulse string mode selection of position mode:
1 – Single pulse train positive logic
2 – Single pulse train negative logic
3 – Double pulse train positive logic
4 – Double pulse train negative logic
5 – Orthogonal pulse positive logic
6 – Orthogonal pulse negative logic
 
</td></tr>
</table>

9.3.16 Parameter Setting of TECO TSDA Servo Driver

<table>
<tr><th>Para. No.</th><th>Function</th><th>Value</th><th colspan="3">Description</th></tr>
<tr><td rowspan="8">Pn010-1</td><td rowspan="8">Set control mode</td><td rowspan="8">1</td><td rowspan="2">Value</td><td colspan="2">Control mode</td></tr>
<tr><td>CN1 Pin12 open circuit</td><td>CN1 Pin12 closed circuit</td></tr>
<tr><td>0</td><td>Speed control</td><td>Speed control</td></tr>
<tr><td>1</td><td>Position control</td><td>Position control</td></tr>
<tr><td>2</td><td>Torque control</td><td>Torque control</td></tr>
<tr><td>3</td><td>Speed control</td><td>Speed control</td></tr>
<tr><td>4</td><td>Position control</td><td>Position control</td></tr>
<tr><td>5</td><td>Torque control</td><td>Torque control</td></tr>
<tr><td rowspan="4">Pn010-2</td><td rowspan="4">Set the pulse input format under position control mode</td><td rowspan="4">0</td><td>Value</td><td colspan="2">The format of pulse input</td></tr>
<tr><td>0</td><td colspan="2">Pulse + direction</td></tr>
<tr><td>1</td><td colspan="2">Dipulse</td></tr>
<tr><td>2</td><td colspan="2">A/B phase difference</td></tr>
<tr><td rowspan="3">Pn010-3</td><td rowspan="3">Set rotation direction of motor</td><td rowspan="3">1</td><td>Value</td><td colspan="2">Function</td></tr>
<tr><td>0</td><td colspan="2">Motor rotates CCW with input of positive order.</td></tr>
<tr><td>1</td><td colspan="2">Motor rotates CW with input of positive order.</td></tr>
<tr><td>Pn021</td><td>Electronic gear ratio numerator</td><td rowspan="2">Need Calculation</td><td colspan="3" rowspan="2">The input pulse amount will be multiplied by this number before output. Ratio range of parameter 21 to 22:
1/127＜parameter 21/ parameter 22＜127</td></tr>
<tr><td>Pn022</td><td>Electronic gear ratio denominator</td></tr>
<tr><td rowspan="3">Pn011-4</td><td rowspan="3">Set the function of Pin20 of CN1</td><td rowspan="3">1</td><td>Value</td><td colspan="2">Function</td></tr>
<tr><td>0</td><td colspan="2">Output of “0” speed signal</td></tr>
<tr><td>1</td><td colspan="2">Output of brake signal</td></tr>
<tr><td>Pn013-1</td><td>Set the max. pulse frequency received by the driver under position control mode</td><td>7</td><td colspan="3">It can correct the phenomenon of unauthorized over-travel. Received frequency is divided into 8 segments from 500Kpps to 200Kpps. “0” indicates 500Kpps while “7” 200Kpps.</td></tr>
</table>

Note:

For the parameter setting of driver of various brands, refer to the specific driver manual.

9.4 Wiring Diagram of Servo Driver

Wiring diagrams in this part are the wiring diagrams of control system-axes control-driver motion. When users want to use one axis of the control system to control the motion of two drivers, the wiring diagram is as shown in Figure 2 in chapter 9.4.1 and Figure 4 in chapter 9.4.4 (take YASKAWA driver and DELTA driver as an example; for YASKAWA server, its alarm signal wiring is NC type, while for DELTA server, its alarm signal wiring is NO type).

9.4.1 Wiring Diagram of YASKAWA AC Servo Driver

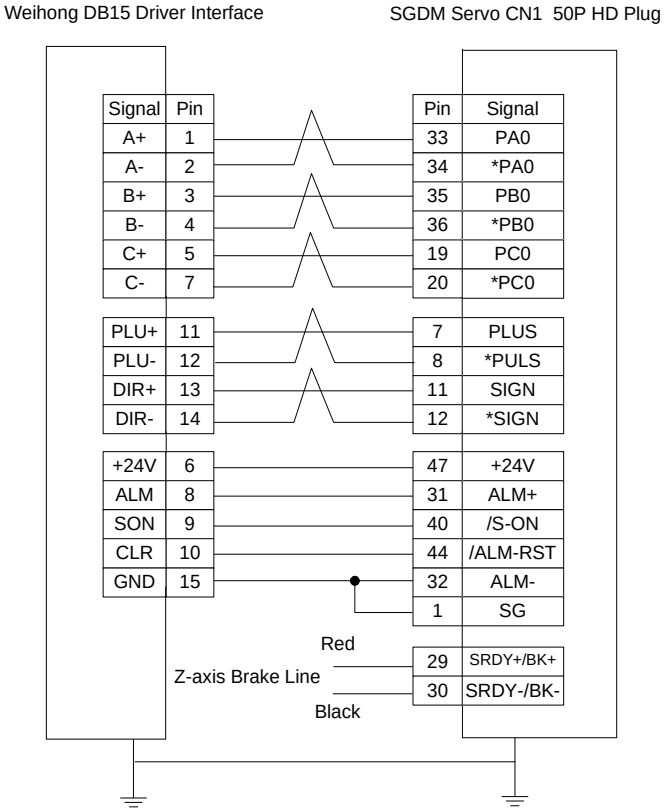


Figure 1

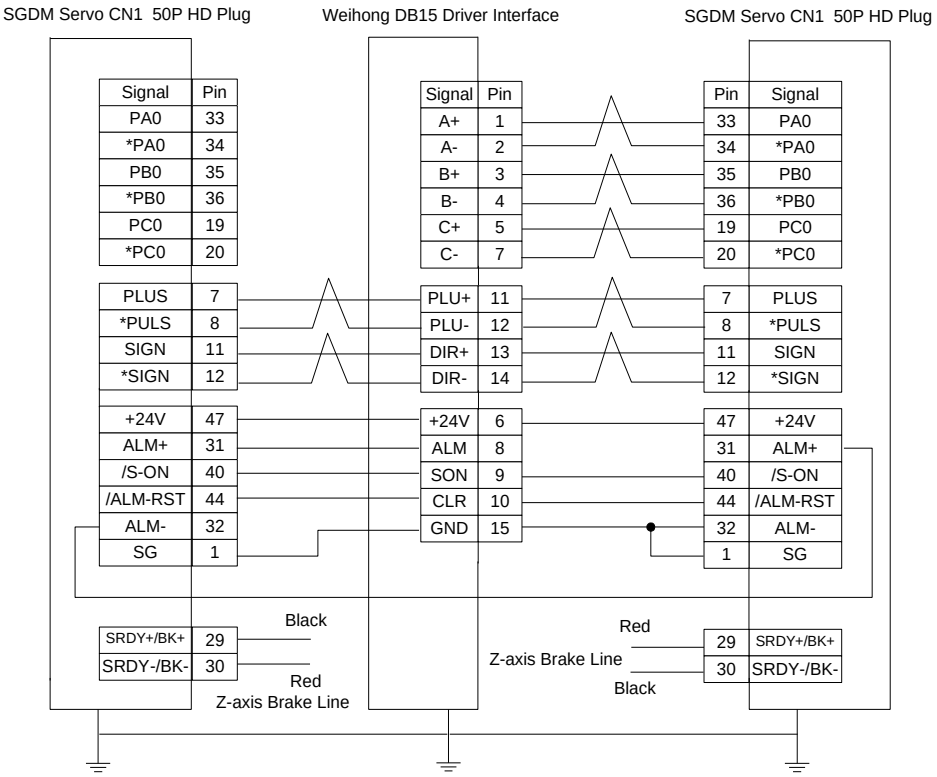
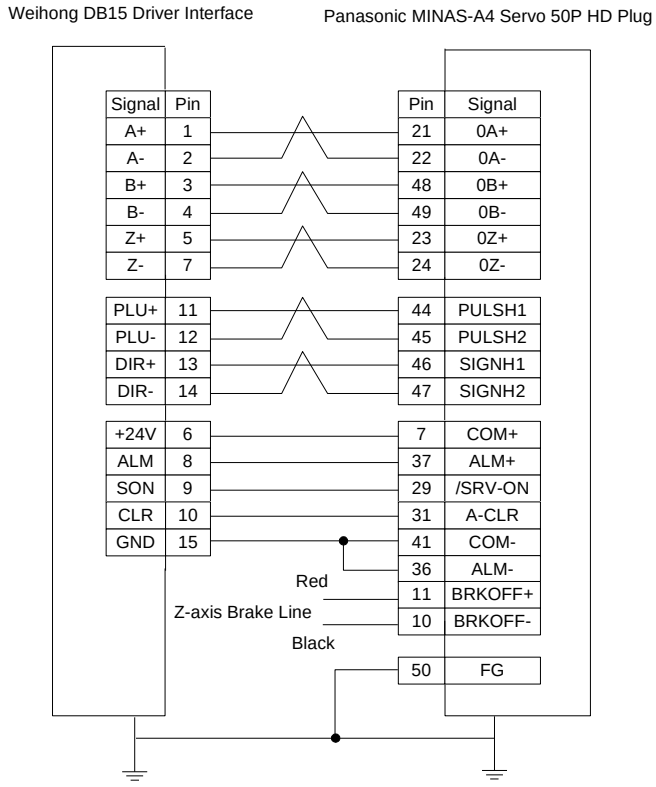
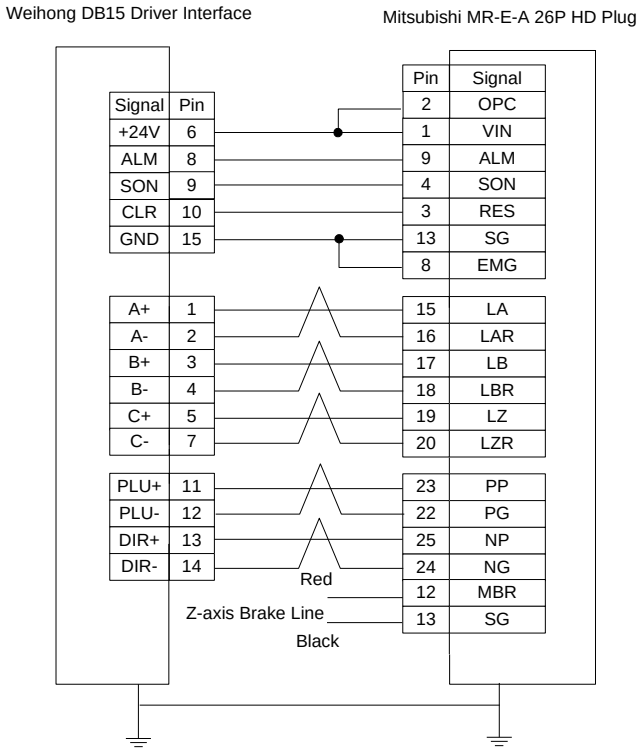


Figure 2

9.4.2 Wiring Diagram of PANASONIC AC Servo Driver



9.4.3 Wiring Diagram of MITSUBISHI MR-E Servo Driver



9.4.4 Wiring Diagram of DELTA Servo Driver

DELTA ASDA-A, ASDA-A2 and ASDA-AB use the same cable. Among them, the wiring pins of ASDA-A2 and ASDA-AB are totally the same. As for ASDA-A, with PULSE as 41 and /PULSE as 43, its pulse signal pins are opposite to those of ASDA-A2 and ASDA-AB, but the other wiring pins are totally the same. For the detailed parameters settings, see chapter 9.3.6 and chapter 9.3.7.

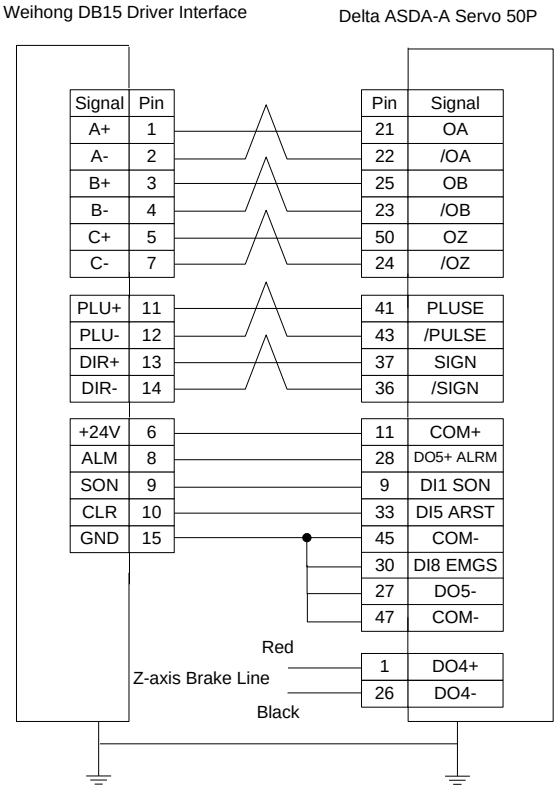


Figure 1

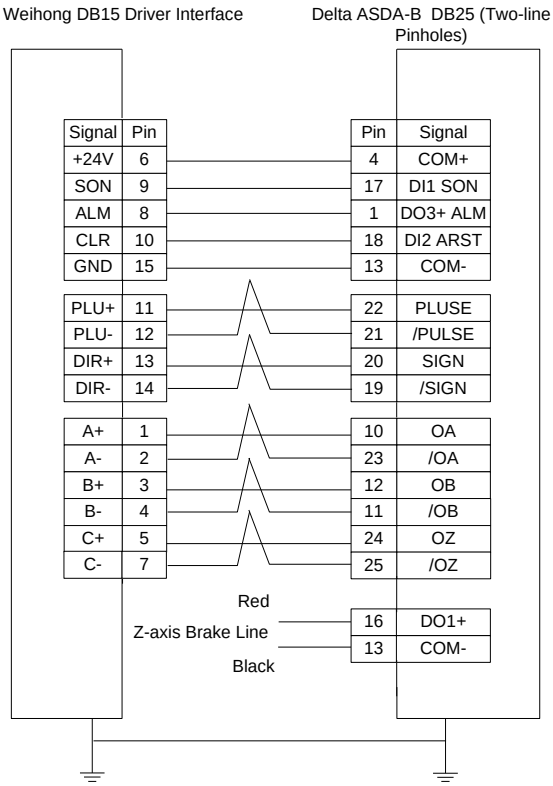


Figure 2

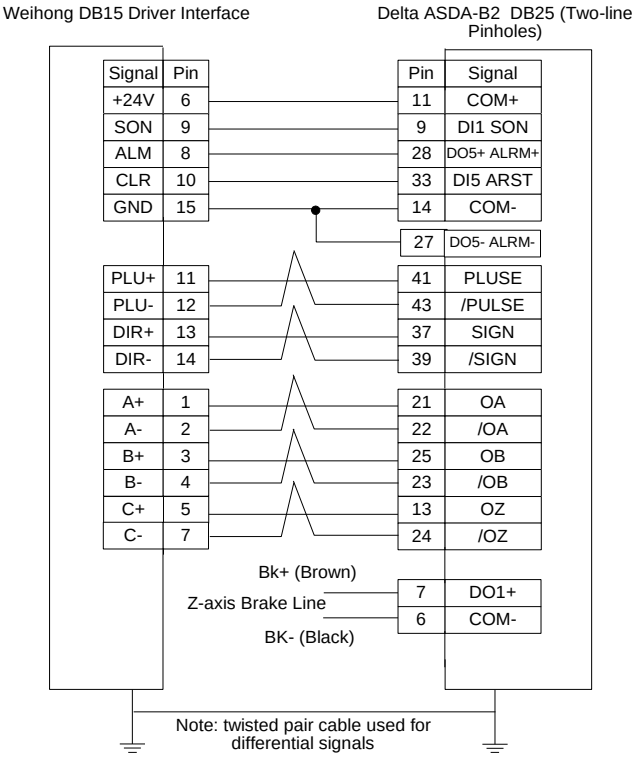


Figure 3

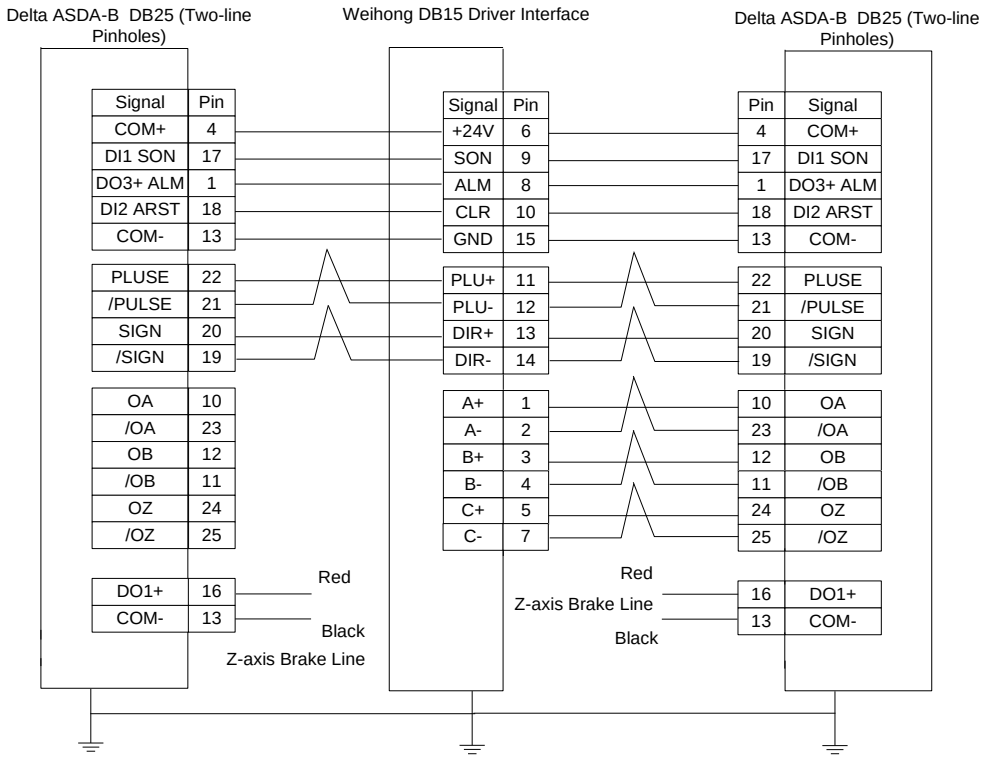
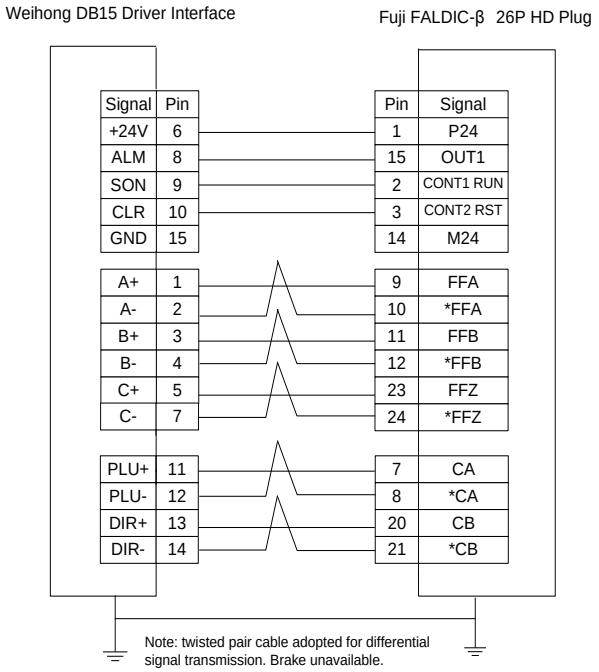
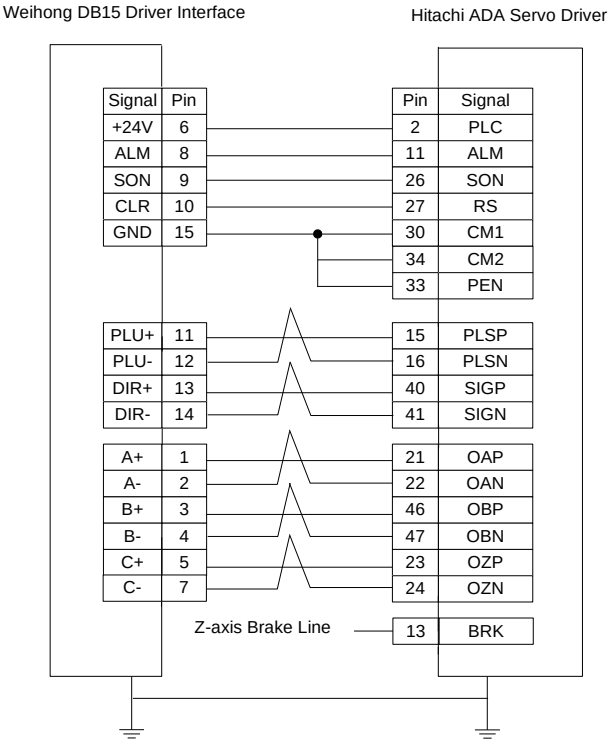


Figure 4

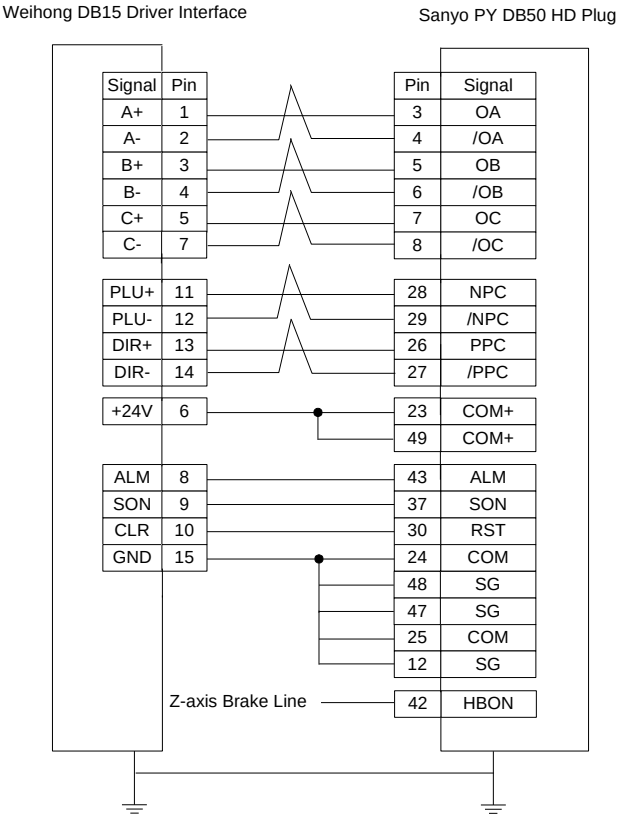
9.4.5 Wiring Diagram of FUJI Servo Driver



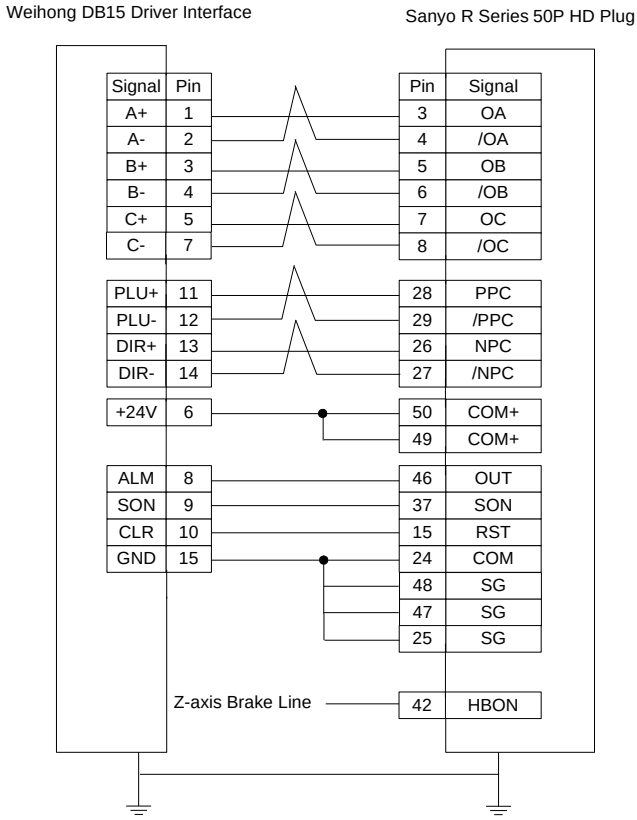
9.4.6 Wiring Diagram of HITACHI Servo Driver



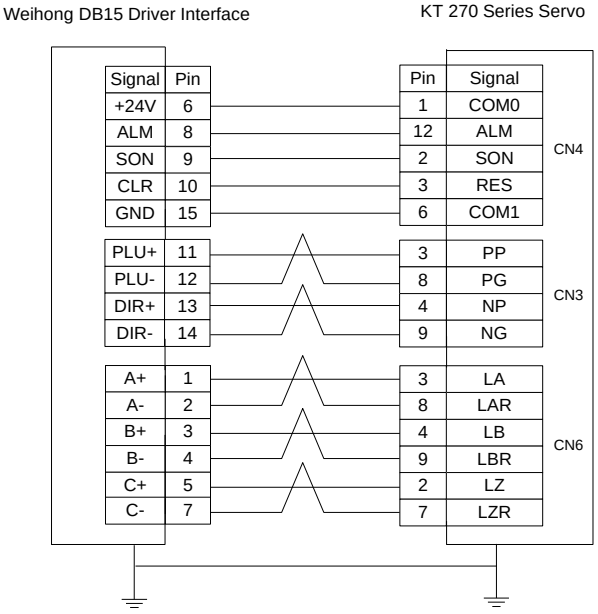
9.4.7 Wiring Diagram of SANYO PY Servo Driver



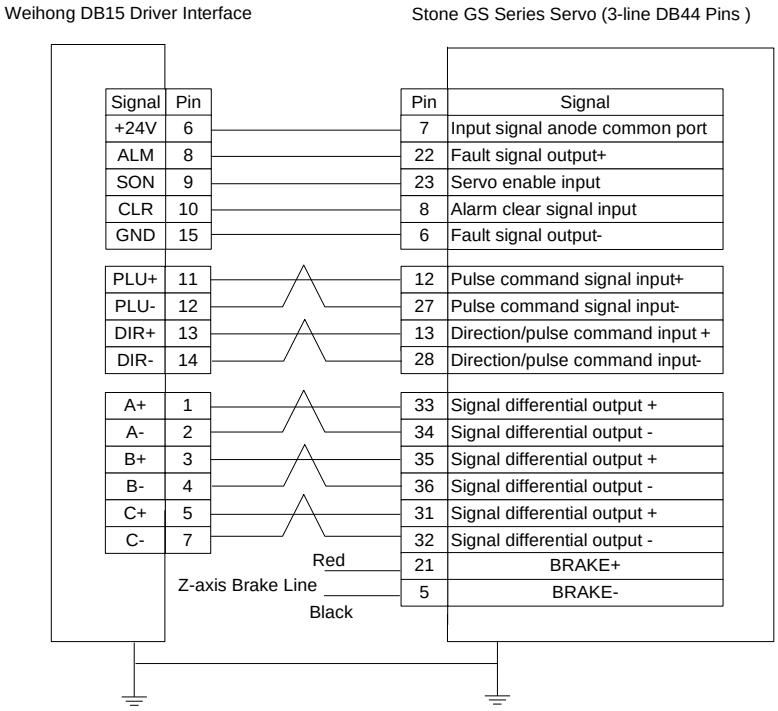
9.4.8 Wiring Diagram of SANYO R Servo Driver



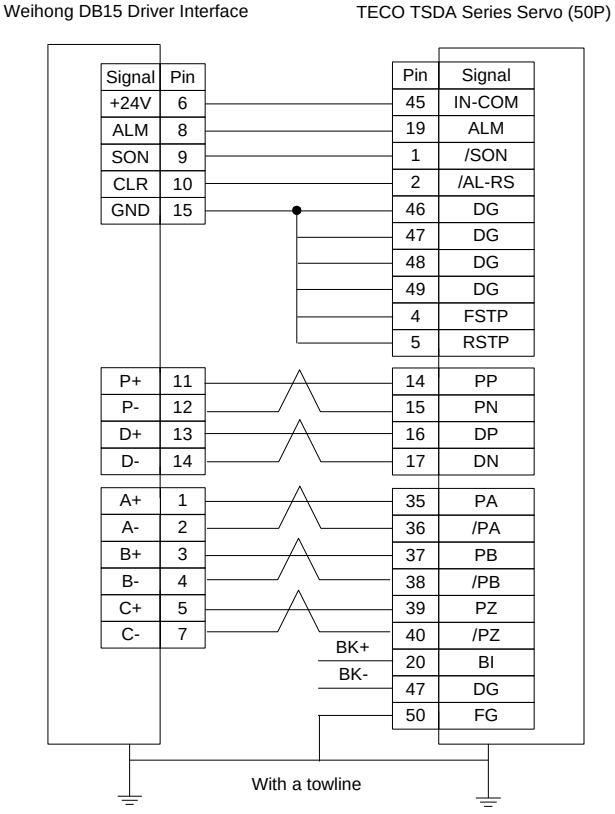
9.4.9 Wiring Diagram of KT270 Servo Driver



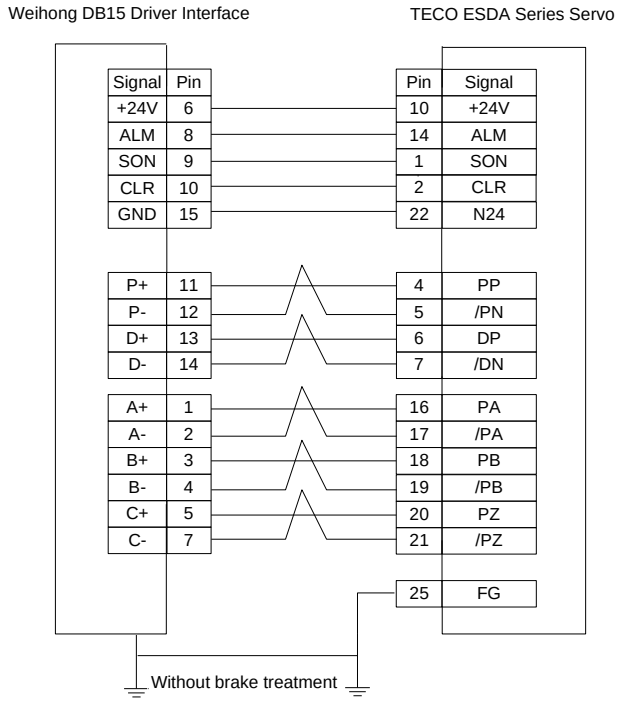
9.4.10 Wiring Diagram of Stone GS Servo Driver



9.4.11 Wiring Diagram of TECO TSDA Servo Driver



9.4.12 Wiring Diagram of TECO ESDA Servo Driver



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