NK280B Integrated CNC System Manufacturer's Manual

（2nd Version）

（Special for Metal Line）

Weihong Electronic Technology Co., Ltd.

Preface

Manual Introduction

This manual is primarily intended for manufacturers and operators. If you are using this system for the first time, you need to read this manual carefully. If you are an experienced user, use the table of contents to quickly find information.

Module	Chapter	Content
Preface	-	Introduces the precautions, document conventions, and other related information in transport and storage, unpacking inspection, installation, wiring, operation and debugging, use. Users must read carefully before use to ensure safe operation.
System introduction	1	Introduce the operation panel, interface, product configuration and wiring diagram of the product before operation of NK280B.
	2	Introduce the signal types supported by NK280B and the port wiring definition of the controller.
Operation introduction	3	Introduce common operations during system machining and debugging.
	4	Introduces the related operations of setting workpiece coordinates: setting workpiece origin, workpiece offset, common offset, tool offset, etc.
	5	Introduces user operations when enabling the bus function.
	6	Introduces related operations of program files: import/export/access program files on local, USB and network.
	7	It is an auxiliary operation for machining and debugging.
System maintain	8	Introduces the related operations of updating and upgrading the system and software.
Reference information	9	Introduce the commonly used machining flow, debugging flow, product size chart, fault alarm processing and system parameters.
	10	Introduce the relevant parameters and wiring diagram of the driver.
Legal notices	-	User installed software license notice.

Applicable Product Model

This manual is applicable to metal line NK280B integrated CNC system, as shown as follow.

Product Model Name	Remark
NK280B integrated CNC system	Referred to as NK280B, it supports non-bus and bus control types. NK280B function according our company product line has some deferent, this manual only applies to metal line.

Product Model Name	Remark
	The product includes four configurations: Three-axis standard, turntable configuration, four-axis standard (type A), and double Z configuration. Unless otherwise specified, this manual introduces the three-axis standard configuration.

Write Rules

This manual follows the following write rules.

Type	Symbol	Example
Button	< >	• <System> indicates the "System" button in the "Function Menu" of the operation panel. • <M System Info> indicates the "M" key in the "Keyboard Keys" of the operation panel.
Operation process	→	• Indicates the next operation. • Such as: <Param> →<F Machine> (open the interface shown in figure 3-1). Indicates press the <F> key after pressing the <Param> key.
Instructions in the operation process	（）	• In the process, the content in brackets is the content presented after the operation or the operation that prompts the user to perform. • Such as: <Param> (open the interface shown in figure 3-1) → < ↑ >, < ↓ > (check or select the parameter) → <Enter> (set the parameter value in the pop-up dialog box). After pressing the <Param> key, the system opens the "Parameter Interface"； Check or select parameter items by pressing < ↑ >< ↓ > keys; After pressing the <Enter> key, the user can set in the pop-up dialog box.
Multi-level menu	\	Such as: Open the "System\System Info" interface Indicates to open the "System Info" interface under the "System" function menu.
Parameter	「」	Such as: "11001 Encoder Type" Among them, "11001" is the parameter number, and "Encoder Type" is the parameter name.

Our Contact Information

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Revised History

Through the following table, you can quickly query the revision records of each version of this manual.

Revised Date	Manual Version	Revised Content
2017.08	R1	First release. According to the company's metal product line NK280B integration software (BOOT version: V1.3.5; software version: NK280B-JS_General Metal_8.8.2_1708281648) written.
2023.08	R2	Second release. According to the company's metal product line NK280B integration software (BOOT version: V1.3.7; software version: NK280B-JS_Guangdong Jing Diao_8.8.88_2306211602) written.

Precaution

Precautions are divided into caution and warning types according to the degree to which failure to observe may cause harm.

: General type information, including but not limited to supplementary instructions, use limitations and other suggestive information. If you do not follow this information, you may not be able to generate use the function. Note that failure to observe this information may in some cases result in personal injury or damage to the machine.

: Information that requires special reminders. Failure to observe this information could result in personal injury or even death, damage to the machine, or damage to other property.

Wrining
1) Matters Related to Transportation and Storage ● This product must be transported correctly according to its weight; ● Stacked products shall not exceed the specified quantity; ● Do not climb or stand on the product, nor place heavy objects on it; ● Do not use cables or devices connected to the product to drag or carry the product; ● Pay attention to moisture during storage and transportation. **2) Matters Related to Installation** ● The device must be installed in an electric cabinet that meets the design requirements

Wrining

before it can be used, and the structure of the electric cabinet must reach the IP54 protection level;

- Sealing strips should be attached to the joints of electric cabinet doors to seal all gaps;
- The cable entrance should be sealed, and it should be easy to open again on site;
- Use fans or heat exchangers to dissipate heat and convect air in the electric cabinet;
- If fans are used for heat dissipation, air filters must be used at the air inlet or outlet;
- Dust or cutting fluid may enter the CNC device from tiny gaps and air vents, so attention should be paid to the environment and air flow direction on the side of the vent hole, and the outflow gas should be directed towards the pollution source;
- There is a gap of 100mm between the rear of the CNC device and the wall of the electric cabinet, so that the cables connected to the CNC device can be plugged in, so as to facilitate the air circulation and heat dissipation in the electric cabinet;
- There must be a gap between this product and other equipment as required;
- The product must be installed firmly without vibration. When installing, do not throw or hit the product, and do not have any impact or load on the product;
- To reduce electromagnetic interference, use DC or AC power supply components above 50V, and keep a distance of more than 100mm between the cable and the CNC device;
- It should be considered to install the CNC device in a place that is easy to debug and maintain.

3) Matters Related to Wiring

- Wiring and inspection personnel must have the ability to complete this work;
- The CNC device must be reliably grounded, and the grounding resistance should be less than 4 ohms. Never use a neutral wire instead of a ground wire. Otherwise, it may not work normally due to interference;
- The wiring must be correct and firm, otherwise it may cause malfunction;
- The voltage value and positive and negative (+/-) polarity on any wiring plug must comply with the regulations in the manual, otherwise faults such as short circuit or permanent damage to the equipment may occur;
- Before plugging in or pulling out the plug or flipping the switch, keep your fingers dry to prevent electric shock or damage to the CNC device;
- The connecting wires must not be damaged or squeezed, otherwise leakage or short circuit may occur;
- Do not plug or unplug the plug or open the CNC device case while the power is on.

4) Precautions for Running and Debugging

- Before running, check whether the parameter settings are correct. Wrong setting will cause unexpected movement of the machine;

Wrining

- The modification of the parameters must be within the allowable range of the parameter setting. Exceeding the allowable range may lead to unstable operation and damage to the machine.

5) Precautions for Use

- Before plugging in the power supply, make sure the switch is in the power-off position to avoid accidental starting;
- In order to avoid or reduce the influence of electromagnetic interference on the numerical control device, please confirm the electromagnetic compatibility when conducting electrical design. If there are other electronic devices near the system, electromagnetic interference may be generated, and a low-pass filter should be connected to weaken its influence;
- Do not power on and off the system frequently. After a power outage or power outage, if it is necessary to reconnect the power, the recommended interval is at least 1 minute.

Caution

1) Matters Related to Product and Manual

- For items related to "Restrictions" and "Available Functions", the manual issued by the manufacturer takes precedence over the contents of this manual;
- When writing this manual, it is assumed that all optional functions have been added. When using, please confirm with the specifications issued by the machine tool manufacturer;
- For the relevant instructions of various machine tools, please refer to the manual issued by the machine manufacturer;
- The screens and functions that can be used are defferent due to the control system (or version). Be sure to check the specifications before use.

2) Unpack and Check Related Items

- Confirm whether it is the product you purchased;
- Check whether the product is damaged during transportation;
- Check the list to confirm whether all parts and accessories are complete and whether there is any damage;
- In case of product discrepancy, lack of accessories, or transportation damage, please contact our company in time.

Content

1 NK280B Integrated System Introduction

NK280B integrated CNC system consists of hardware and software, which can complete machining operations such as tapping, engraving, engraving and milling as required.

1.1 Operation Panel

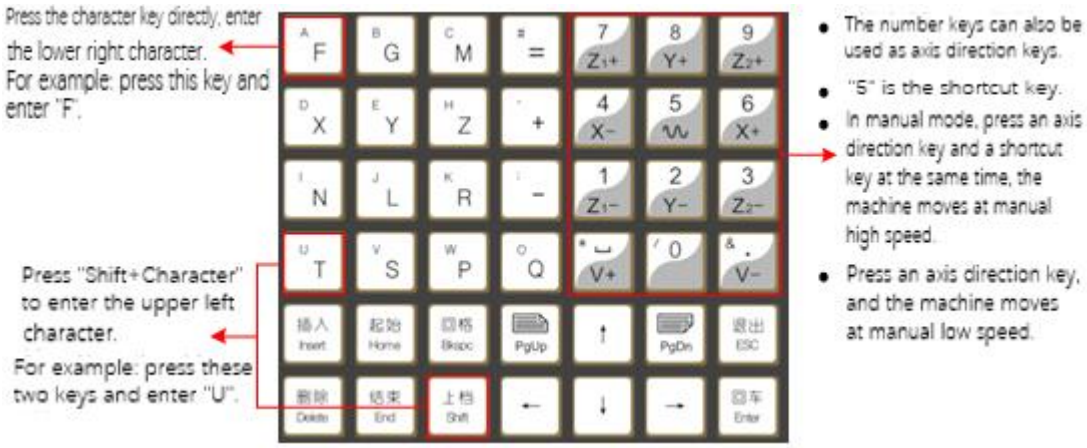
Figure 1-1 NK280B operation panel

Function Menu

- State: Used for return to the machine origin, set the spindle speed/feed speed, tool calibration, return to a fixed point, clear, view the motion track, select machining and statistics for the current program, etc.
- Advanced: Used to set workpiece offset/common offset/tool compensation/screw error compensation, execute centering operation/user instruction, night mode on and modify password.
- Program: It is used to perform operations such as loading, edit, and delete the local program/USB program, and provides machining wizard and common variable valuesettings.
- Parameter: Used to view/set/backup various parameters of the control system coordinate access; when the bus function is enabled, the driver parameters can also be set.
- System: Used to manage port, view alarm log, view system information, register, system upgrade/maintenance, select language/configuration, update FPGA firmware program, view network information, etc.

Keyboard Key

The rules of using the keys of the keyboard are the same as those of the computer keyboard, and the special instructions are as follows:



Mode Button

- The system supports five modes: automatic, jog, reference point, handwheel and step.
- When handwheel or step mode is selected, X100 is selected by default.
- "XUD" is customized step size; "X1/ X10/ X100" means step 0.001/ 0.01/ 0.1 (mm or inch).

E-stop Button

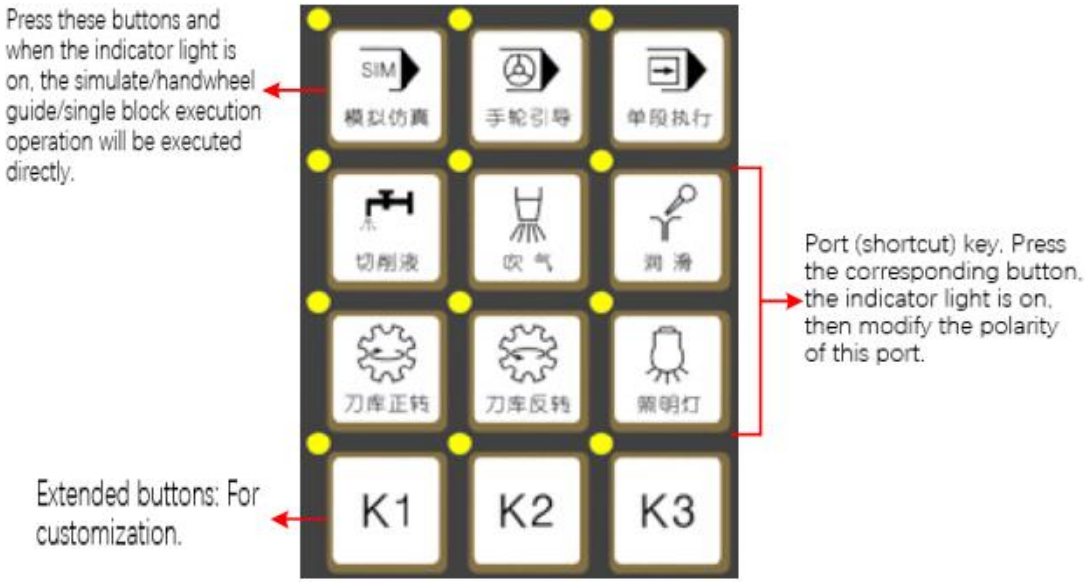
- When the machine is in a dangerous state, press the E-stop button to stop the machine

tool.

- After the danger is eliminated, turn the button clockwise to release the E-stop alarm.

Auxiliary Function Button

- There are three types of auxiliary function buttons, as shown below.
- Press the button, the indicator light is on, which means the function is enabled; the indicator light is off, the function is turned off.



Feed Override Knob/Spindle Override Knob

Adjust the feed override knob/spindle override knob to control the current feed speed/current spindle speed, the formula is as follows:

Current feed speed = feed speed X current feed override

Current spindle speed = spindle speed X current spindle override

USB Port

Rotate as shown, remove the cap, and then connect the USB device.

Motion Control Button

- Including spindle forward rotation, spindle reverse rotation, spindle stop, program start, program stop and breakpoint resume.
- Breakpoint resume: When power failure, emergency stop, etc. occur during machining, press this button when the workpiece origin is confirmed to be correct, and the machine

tool moves to the breakpoint quickly, and resume to execute the machining program from the last program stop line.

Operation Button

F1~F7: Corresponding to the 7 horizontally arranged software operations below the user interface.

1.2 Rear Interface

The rear interface description of NK280B is shown in figure 1-2.

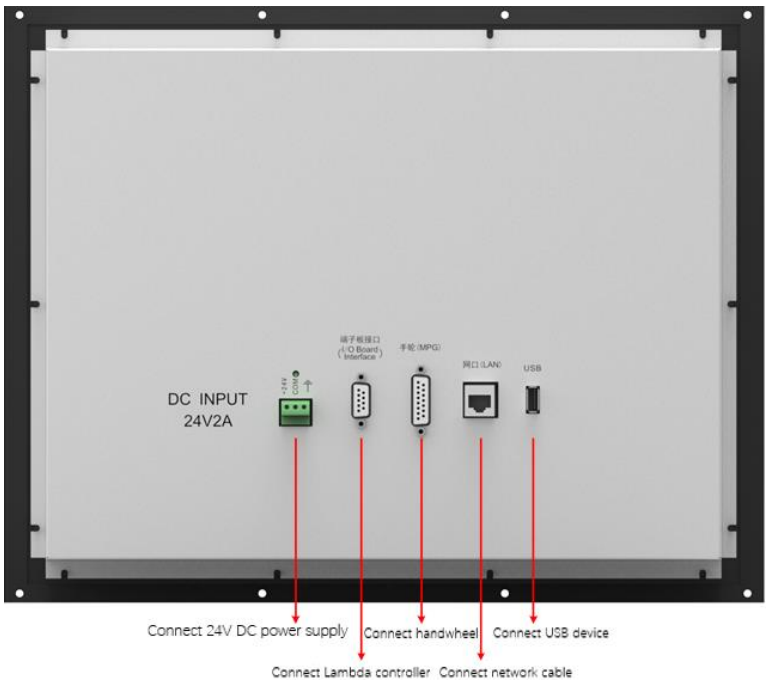


Figure 1-2 NK280B rear interface

1.3 Hardware Configuration

NK280B hardware configuration is different because of the type of control system, as follows.

Non-bus Type	Bus Type
• NK280B integrated system • Lambda 4S / Lambda 5S / Lambda 5E	• NK280B integrated system • Lambda 5M controller

controller • EX31A1 extended terminal board (Among them, Lambda 4S is equipped with EX27A expansion terminal board) • (Any brand) pulse driver • NK-MPG-06 handwheel (optional) • DB9M/F cable	• EX31A1 extended terminal board • YSKAWA Σ5 / YSKAWA Σ7 / Wise bus type driver • NK-MPG-06 handwheel (optional) • DB9M/F cable, M-Ⅱ bus cable

1.4 Product Wiring Diagram

The product wiring diagram is defferent because of the control system type.

1.4.1 Non-bus Type

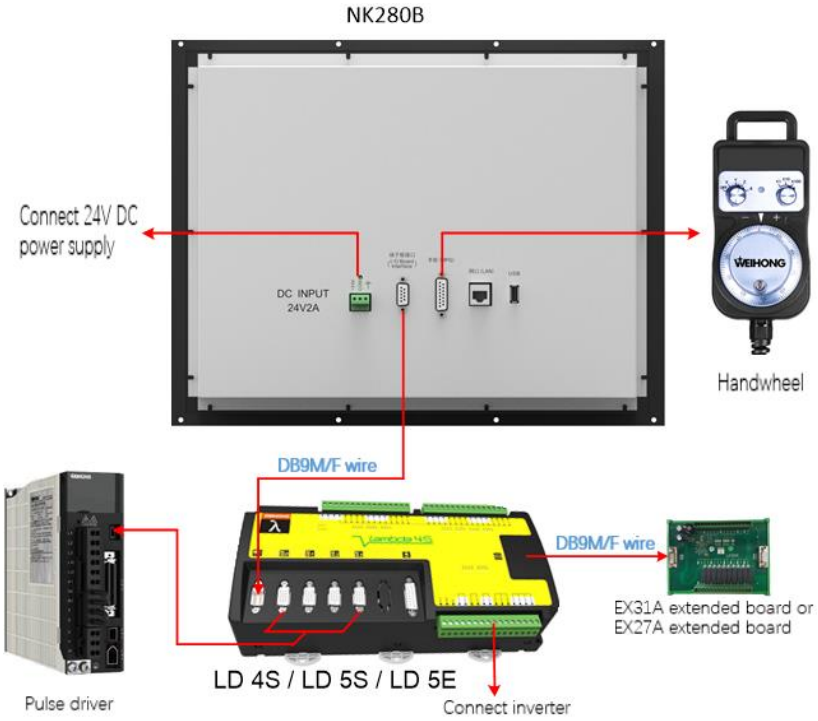
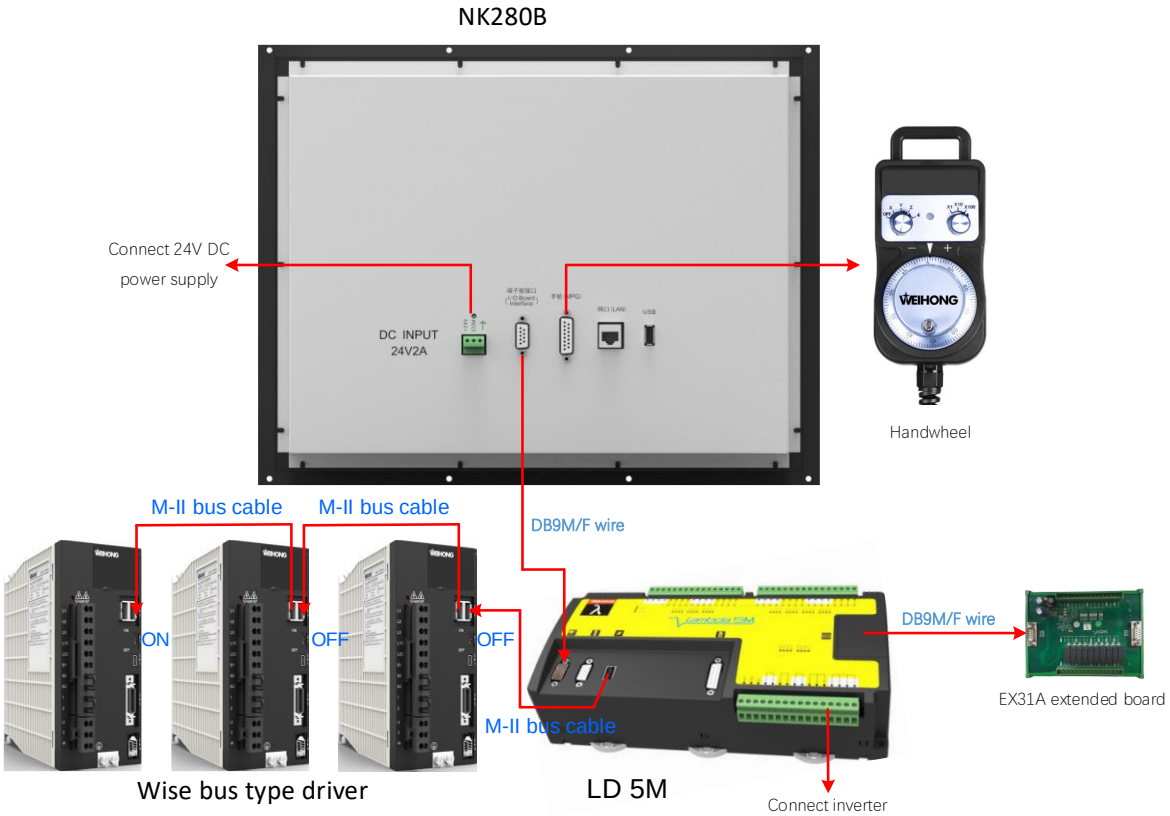


Figure 1-3 Product wiring diagram (non-bus type)

1.4.2 Bus Type



- When connecting the Wise driver, the last driver's DIP switch S1 is set to ON, and the rest are set to OFF. (The DIP switch is to enable the terminal resistance, it is enabled when it is ON, and it is closed when it is OFF)
- When connecting the Yaskawa driver, one of the bus interfaces of the last driver is connected to the terminal resistor.
- Yaskawa driver's CN1-1 and CN1-2 serial ports are brake BK+ and BK- respectively. When using the bus function, the two pins need to be soldered and connected to the brake input port on Lambda 5M (the brake port arrangement is the same as that of the pulse system).

Figure 1-4 Product wiring diagram (bus type)

2 Wiring

This chapter mainly introduces the signal types supported by NK280B, controller/terminal board wiring, and interface pin definitions to help users with wiring.

2.1 Signal Type

Introduction

NK280B system supports the following signal types: Switch value input signal, relay output signal, analog output signal, differential output signal (the bus system does not have this signal).

Switch Value Input Signal

- As shown in figure 2-1, this signal type supports high/low level input valid. When connected to normally open, it represents the received signal with COM conductive; when connected to normally closed, it is disconnected from COM to indicate received signal.
- NK280B signal input port supports high/low level valid. When the common terminal S of the Lambda controller is connected to COM, the input is valid at high level; when the common terminal S is connected to +24V, it is valid at low level.

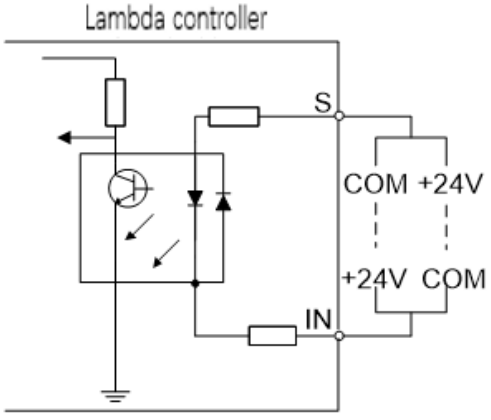


Figure 2-1 Enter switch value to connect machine switch

Relay Output Signal

The output type of the Lambda controller is relay output, and the load capacity of the relay contacts is: 7A/250V AC, 7A/30V DC. It can control low power 220V AC loads. If high power load is connected, a contactor can be connected, as shown in figure 2-2.

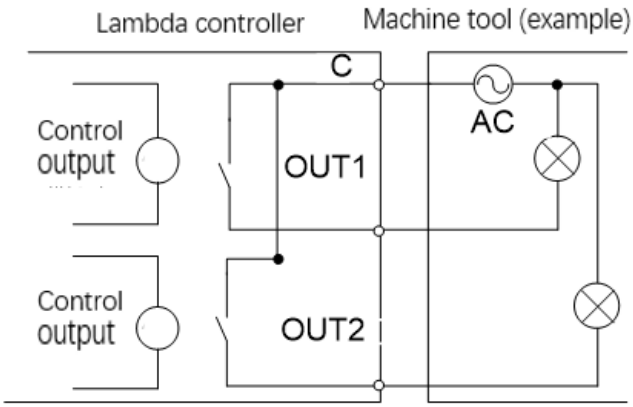


Figure 2-2 Relay output and contactor connection

Analog Output Signal

SVC is a controllable voltage output of 0~10V, which is externally connected to the analog voltage frequency command input port of the inverter. The frequency of the inverter is controlled by changing the voltage to control the spindle speed.

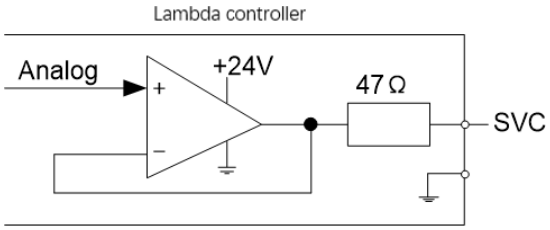


Figure 2-3 Analog output signal circuit

Differential Output Signal

- The form of pulse command to control the movement of the drive is pulse + direction, negative logic. The highest pulse frequency is 1MHz. The pulse method is shown in figure 2-4, and the differential signal output method is shown in figure 2-5.
- The M-II command of the bus system to control the movement of the driver, so there is no signal.

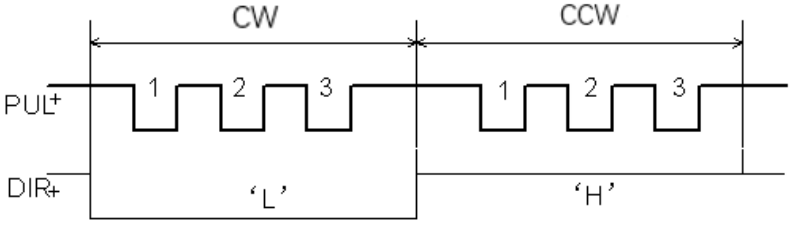


Figure 2-4 Differential signal pulse command output type

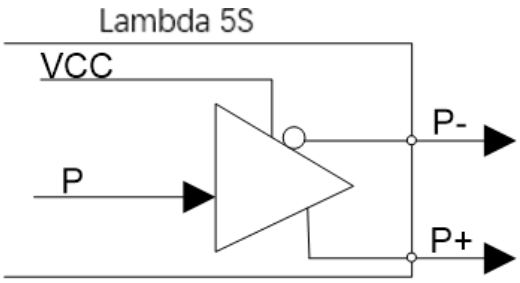


Figure 2-5 Differential signal pulse command output circuit

2.2 Pulse & Handwheel Interface

LD 4S / LD 5S / LD 5E / LD 5M controller provides pulse feed axis drive interface connection socket (DB15 three straight socket, used to connect pulse spindle) and handwheel interface socket (DB15 three straight socket, used to connect handwheel). The connection socket is a 15-core D-shaped socket. See figure 2-6, table 2-1, and table 2-2 for pin definitions and descriptions.

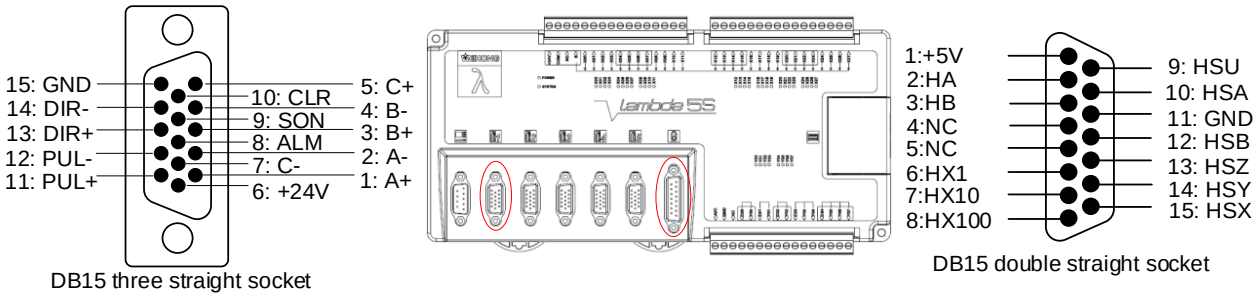


Figure 2-6 DB15 plug

Table 2-1 DB15 three straight plug pin definition

Signal Name	Definition	Input Output	Description
A+, A-	Encoder phase A feedback signal	Input, differential signal transmission mode	Accept differential output of encoder signal (A, B, C phase) from driving frequency divider (equaling to RS422).
B+, B-	Encoder phase B feedback signal		
C+, C-	Encoder phase C feedback signal		
ALM	Driver alarm signal	Input	This output (transistor) switches off when the drive detects a fault.
SON	Servo ON signal	Output	This signal is used to turn on (power on) and turn off (power off) the servo motor. When this

Signal Name	Definition	Input Output	Description
			signal is connected to COM-, the dynamic brake is released and the drive is allowed to work (servo enabled).
CLR	Drive alarm clear signal	Output	This signal is a clear/warning state. This signal can only clear the alarms with clearable property.
PUL+, PUL-	Pulse output	Output, differential signal transmission method	
DIR+, DIR-	Direction output	Output, differential signal transmission method	
+24V, GND	DC24V power supply	Output	Connect with the drive.

The SON signal is valid 2 seconds after the power is turned on, and the system will control the enable state of the servo motor, without using an external servo ON or OFF drive signal to drive the motor.

Table 2-2 DB15 double straight socket pin definition

Pin No.	Definition	Description
1	+5V	Power the handwheel
2	HA	Encoder phase A signal
3	HB	Encoder phase B signal
4	NC	-
5	NC	-
6	HX1	Select X1 override
7	HX10	Select X10 override
8	HX100	Select X100 override
9	HSU	Select 4-axis
10	HSA	Select 5-axis
11	GND	Digitally
12	HSB	Select 6-axis
13	HSZ	Select Z-axis

Pin No.	Definition	Description
14	HSY	Select Y-axis
15	HSX	Select X-axis

2.3 M-II Bus Interface

Bus is a public communication trunk line for transmitting information between functional components of a computer, and it is an internal structure. The M-II bus plug is similar to the USB plug, but has a locking structure, which is convenient and secure to connect with the device.

When using the bus function, the drive interface must be M-II communication command type. The user can determine the driver interface type by checking the nameplate and manual of the driver.

Figure 2-7 M-II bus plug

2.4 Lambda Port Wiring

Except for the spindle interface (red font in Figure 2-8 and Figure 2-10) for the Lambda controller port wiring of the non-bus type and bus type control systems, the definitions of other ports are the same. This section takes LD 5S and LD 5M as examples for direction.

The common ports corresponding to the output ports of the Lambda controller and the expansion terminal board are shown in the table below.

Lambda Controller		EX31A1 Terminal Board	
Port	**Common Port**	**Port**	**Common Port**
Y00	C00	Y00, Y01, Y02	C00
Y01	C01	Y03, Y04, Y05	C01
Y02	C02	Y06	C02
Y03, Y04	C03	Y07	C03

Y05, Y06, Y07	C04	Y08	C04
		Y09	C05

Caution

1. The brake output needs to be connected in series with 24V voltage. ★ marked port can only be connected to load with voltage below 24V, and cannot be connected to high voltage load, otherwise, the varistor will be burned, causing damage to the circuit of the port and making it unusable.
2. When connecting the handwheel to the Lambda controller, please set the manufacturer parameter "52014 Handwheel Connection Mode" to 0.

2.4.1 Three Axis Standard Configuration

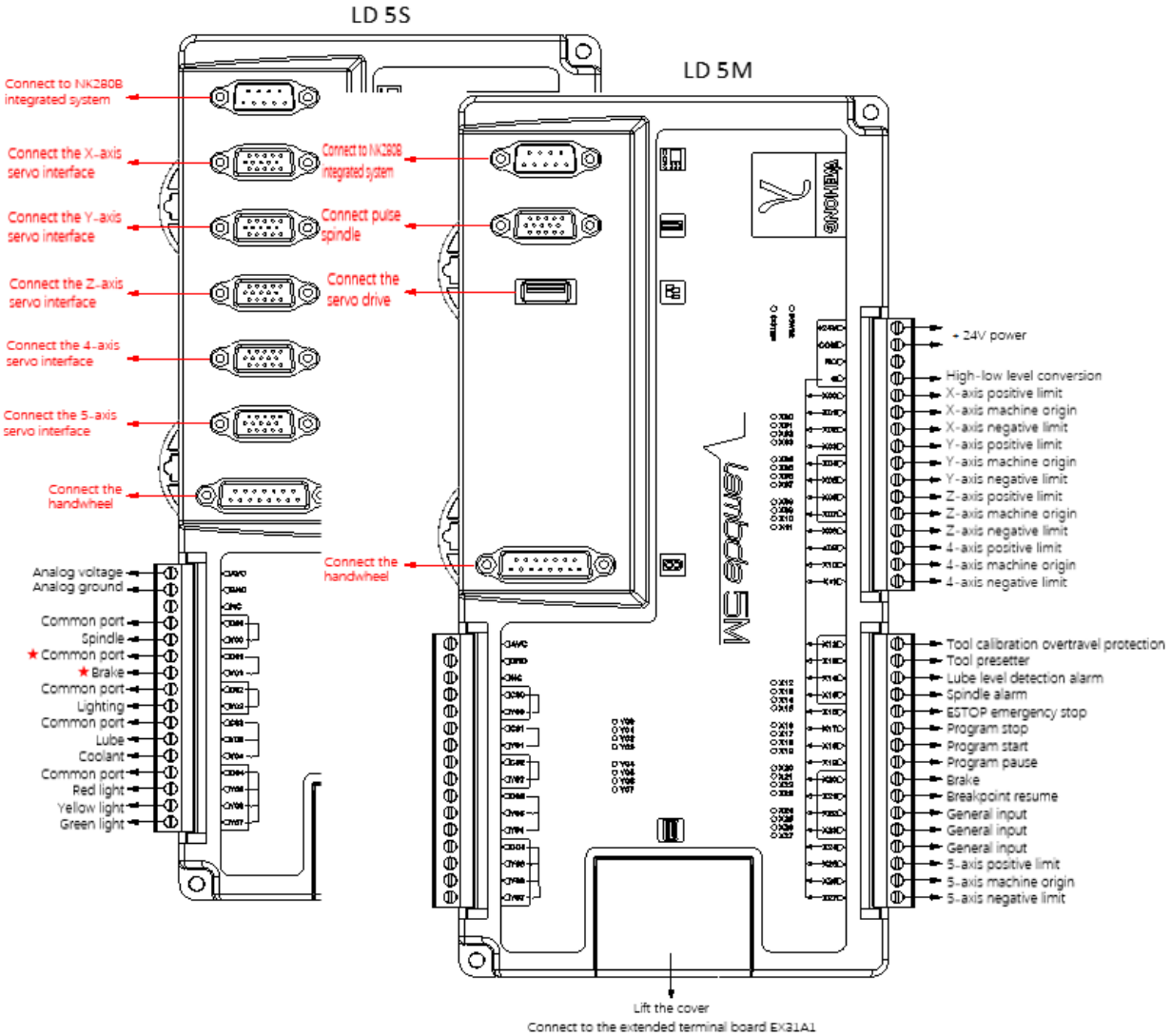
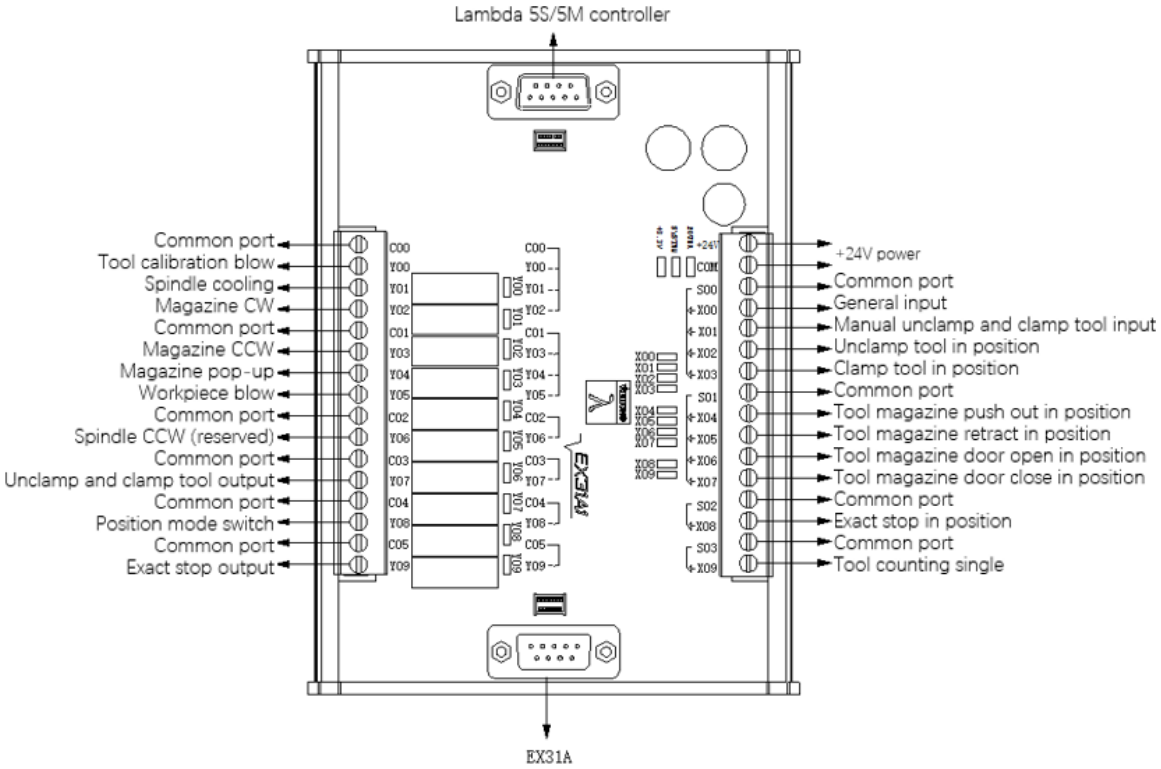


Figure 2-8 LD 5S/LD 5M port wiring diagram (three axis standard configuration)



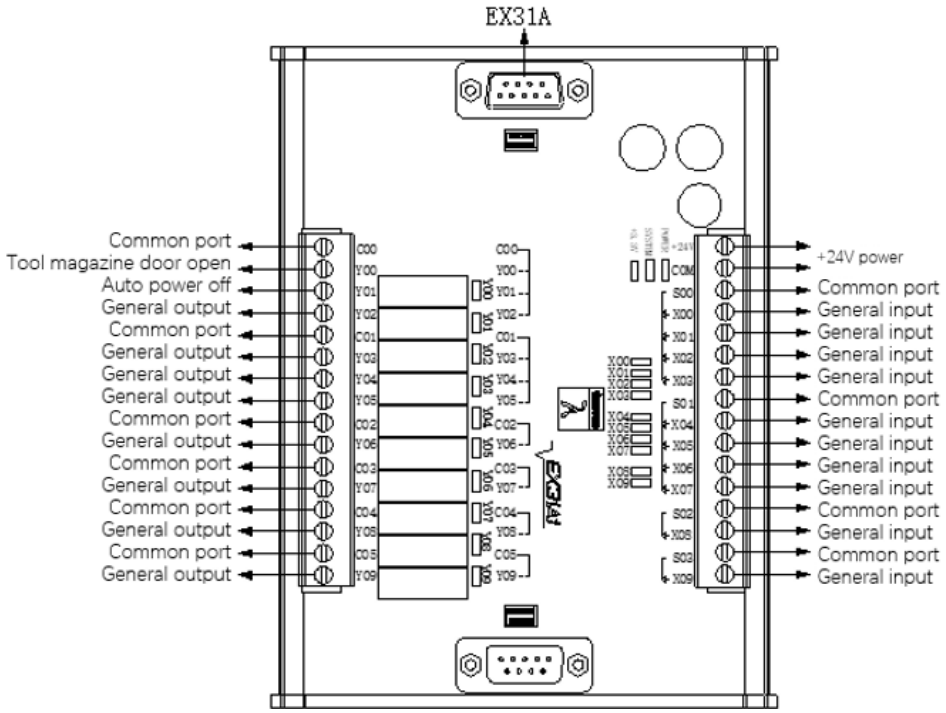


Figure 2-9 EX31A1 terminal board wiring diagram (three axis standard configuration)

2.4.2 Three Axis Standard Configuration (Type A)

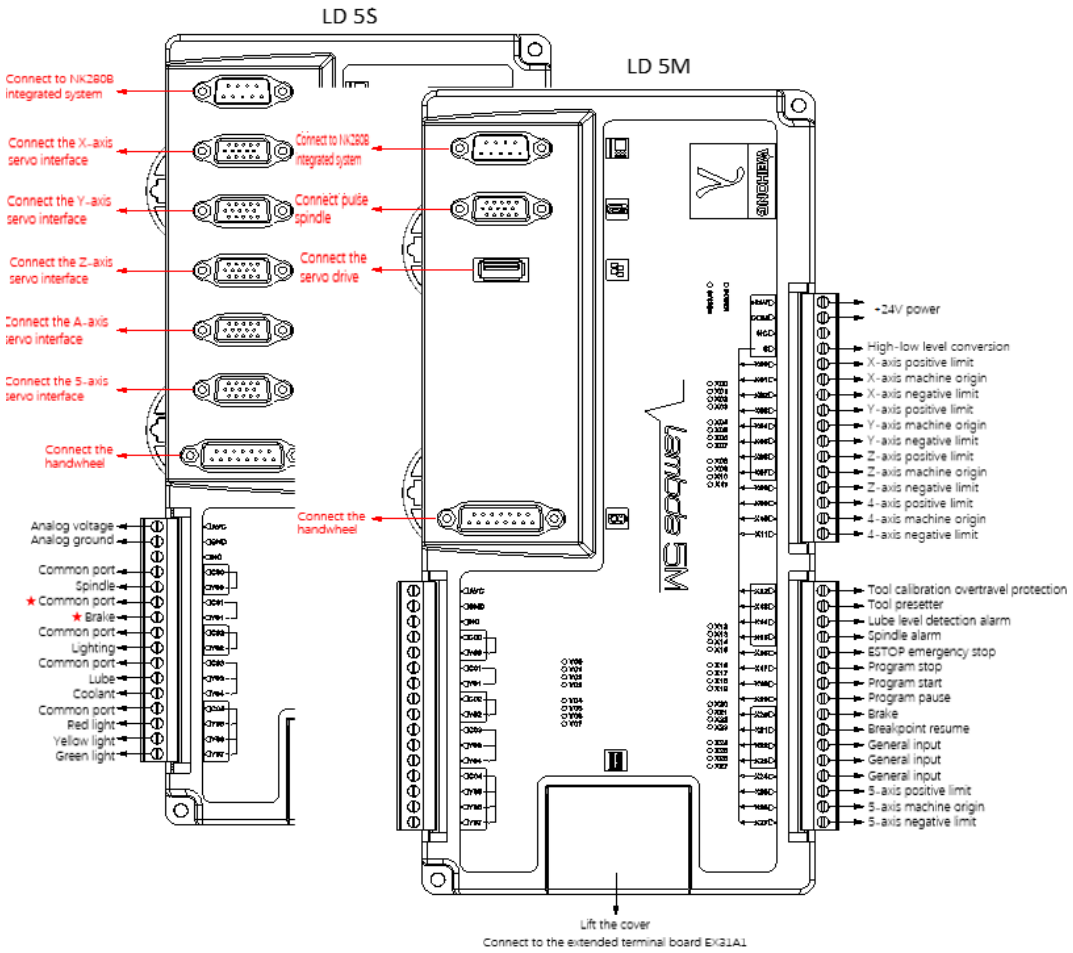


Figure 2-10 LD 5S/LD 5M port wiring diagram (four axis standard configuration type A)

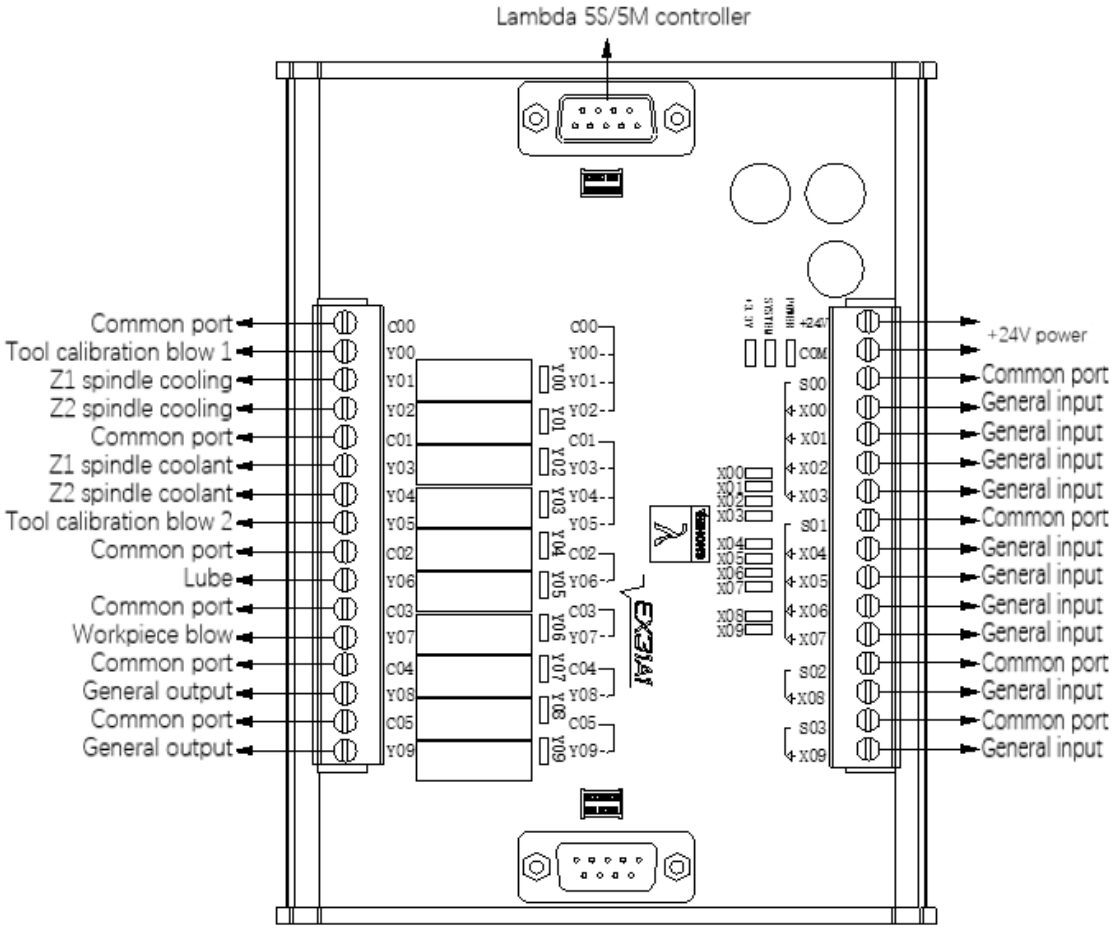


Figure 2-11 EX31A1 terminal board wiring diagram (double Z configuration)

3 Common Operation

3.1 Set Language

Description

The system provides Chinese (simplified) and English languages.

Operation

<System> →<C System Info> →<F3 Language> →< ↑ >, < ↓ > (select "Chinese Simplified" or "ENGLISH") →<Enter>.

3.2 Select Configuration

Description

The system provides three axis standard, turntable configuration, four axis standard (A type), 4-axis double Y (servo magazine), double Z configuration, three axis double Y configuration, double Y double Z configuration, five axis standard (AB type), double Z turntable configuration.

Operation

<System> →<M System Info> →<F4 Switch Config> → (input manufacturer password) →< ↑ >, < ↓ > (select configuration) →<Enter> →(power off and restart, the settings valid).

3.3 View/Modify Parameter

Description

Some functions of the system are controlled by parameters. Users can check the system parameters on the parameter interface to understand the current setting; they can also enable the required functions by setting some parameters.

System parameters include operator, manufacturer, and developer parameters. Manufacturer and developer parameters need to enter password to view.

Operation

1. <Param> →<F Machine > (open the interface shown in figure 3-1).

< ↑ >, < ↓ >, <PgUp>, <PgDn> (view or select parameter) → <Enter> (set parameter values in the pop-up dialog box).

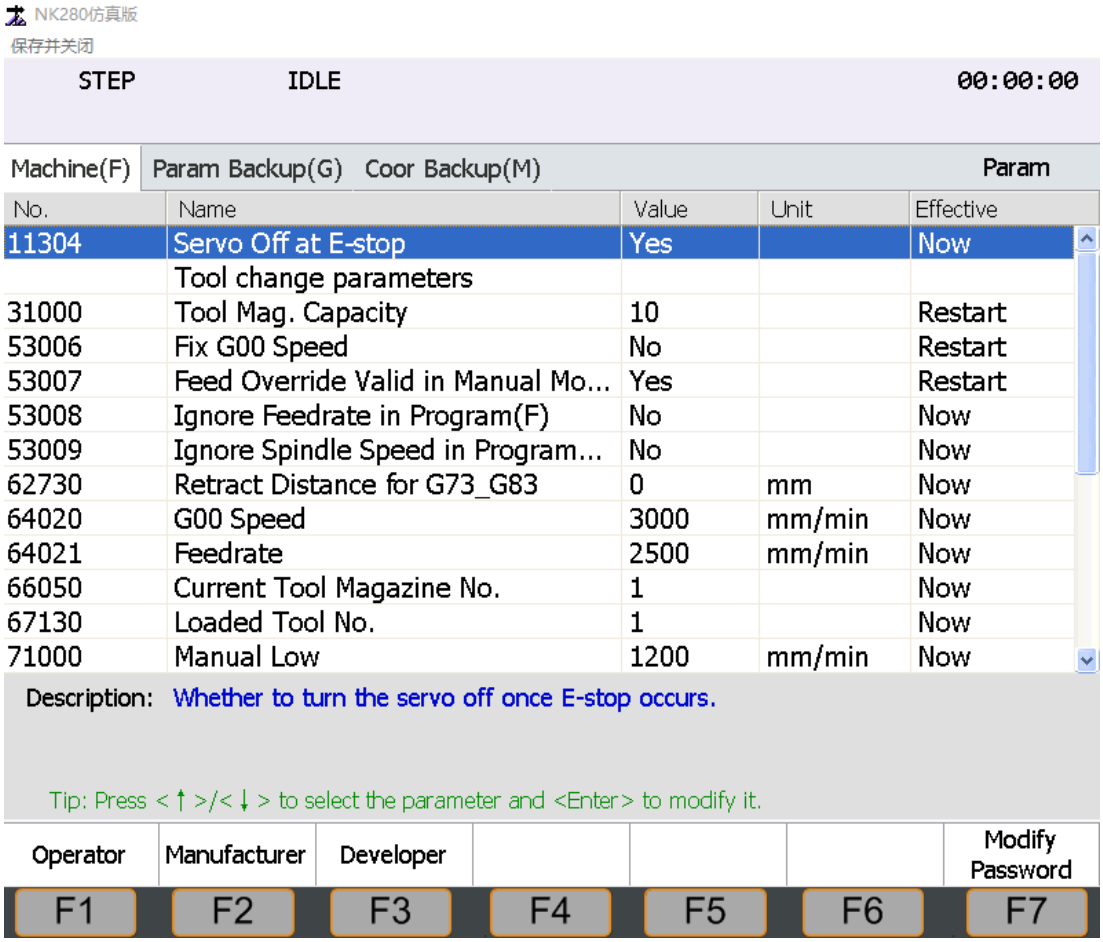


Figure 3-1 Parameter interface

3.4 Adjust Port Polarity

Description

Users can check the state of the machine tool, whether the electrical circuit connection is correct, do simulation test, etc. through the port information; modifying the port polarity can also release some alarms.

Basic Concept

- Input/output port polarity: The polarity of the normally closed switch is N; the polarity of the normally open switch is P.

- In the port interface, solid dots are input ports, and hollow dots are output ports.
- After the wiring of the machine tool is completed and the power is turned on, the input signal such as machine origin, emergency stop signal, program start, program stop, and tool calibration signal should be red solid dots (invalid state). If it is not a red solid dot, please check whether the electrical circuit connection is correct, and modify the polarity of the corresponding signal to make these signals appear as red solid dots.
- Green light: The port has a signal; red light: The port has no signal.

Operation

<System> →<F Port> (open the interface shown in figure 3-2) →< ↑ >, < ↓ > (select/view port information).

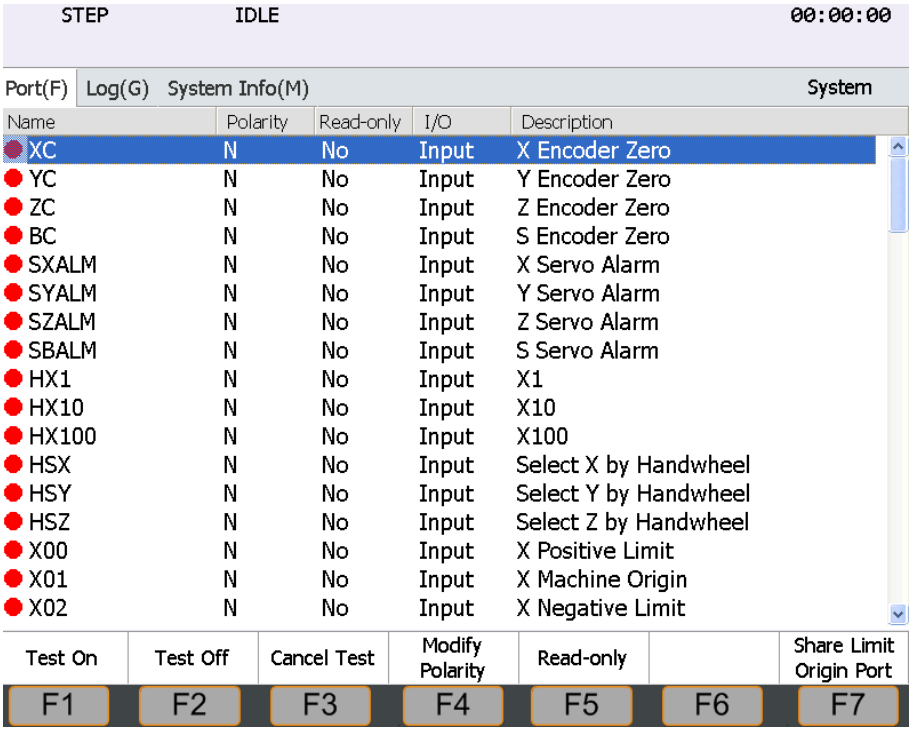


Figure 3-2 Port interface

Modify polarity	< ↑ >, < ↓ > (select port) → <F4 Modify Polarity>. The polarity of feed override, spindle override, mode switch, handwheel, and encoder zero must be N; The polarity is generally N unless the output port is specially defined.
Test on Test off	< ↑ >, < ↓ > (select port) → <F1 Test On>, <F2 Test Off>. This group of keys is mainly used to simulate hardware signals for simulation testing. The indicator light in front of the port is different in the test/real environment, and it is a solid cross in the test environment, .

Cancel test	< ↑ >, < ↓ > (select port) → <F3 Cancel Test>. It is used to cancel the analog signal and simulation test, and replace the analog signal with the real hardware signal.
Read-only	< ↑ >, < ↓ > (select port) → <F5 Read-only> → (enter manufacturer code). After the port attribute is changed to read-only, it cannot be tested on/off/modified polarity.
Share limit origin port	< ↑ >, < ↓ > (select port) → <F7 Share Limit Origin Port> → (enter manufacturer code) → <↑>, <↓>, <←>, <→> (select the multiplexed limit/origin) → <Enter> → <↑>, <↓> (select the multiplexed origin/limit) → <Enter> → <Y>. It is used to set the mechanical origin of the XYZ axis and the positive/negative limit of the axis. After the setting is successful, restart the software to take effect.

3.5 Adjust Axis Direction

Description

In the process of machine tool debugging, it is necessary to determine the positive direction of each axis according to the right-hand rule, and modify the relevant parameters.

Basic Concept

The right-hand rule coordinate system is shown in figure 3-3.

The direction of the coordinate axis of the machine tool depends on the type of the machine tool and the layout of each component. For engraving machine and engraving and milling machine, the judgment method is as follows:

- Z-axis: It coincides with the spindle axis, and the direction that the tool moves away from the workpiece is the positive direction (+Z).
- X-axis: Perpendicular to the Z-axis and parallel to the clamping surface of the workpiece. If it is a single-column milling machine, facing the tool spindle and looking towards the column, the direction of its right movement is the positive direction of the X-axis (+X).
- Y-axis: The direction that the tool moves away from the operator is the positive direction (+Y).

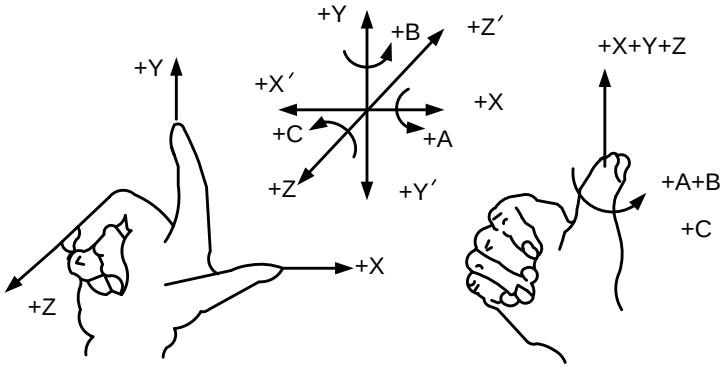


Figure 3-3 Right-hand rule coordinate system

Related Parameter

Parameter	Description	Set Value
10000 Axis direction (X-axis) 10001 Axis direction (Y-axis) 10002 Axis direction (Z-axis)	Direction of movement of the feed axis	1: positive direction -1: negative direction

Operation

1. Determine the positive direction of each axis according to the right-hand rule.
2. Manually operate the machine tool movement to judge whether the axis movement is correct. If the direction is opposite, modify the parameter "10000~10002".

   Take the X-axis as an example, manually operate the machine tool movement, and find that the X-axis moves in the opposite direction. At this time, the value of the parameter "10000" is 1, and the value can be changed to -1.

3.6 Adjust Pulse Equivalent (non-bus)

Description

This operation is only performed under non-bus control systems.

Basic Concept

◆ Pulse equivalent (p)

When the CNC system sends out a pulse, the straight-line distance that the lead screw moves or the degree of rotation of the rotary axis is also the minimum distance that the CNC system can control.

The smaller the value, the higher the machining accuracy of the machine tool and the surface quality of the workpiece; the larger the value, the greater the maximum feed speed of the machine tool. When the feed speed meets the requirements, it is recommended to set a smaller pulse equivalent. The relationship between the maximum feed speed that the machine tool can achieve and the pulse equivalent is:

Maximum feed speed = pulse equivalent x 60 x frequency

◆ Mechanical reduction ratio (m/n)

The ratio of the input speed of the reducer to the output speed is also equal to the ratio of the number of teeth of the driven gear to the number of teeth of the driving gear. In CNC machine tools, it is the ratio of the motor shaft speed to the screw speed. Right now:

$$\text{Mechanical reduction ratio} = \frac{\text{reducer input speed}}{\text{reducer output speed}} = \frac{\text{number of teeth of driven gear}}{\text{number of teeth of driving gear}} = \frac{\text{motor axis speed}}{\text{screw speed}}$$

◆ Pitch (d)

The axial distance between the corresponding points of two adjacent teeth on the thread.

◆ Electronic gear ratio (B/A)

Servo driver parameters (for example: Yaskawa driver, B is PN202, A is PN203).

The value of B/A greater than 1 means that the driver amplifies the received pulse frequency of the CNC system, and the value less than 1 means that it is reduced.

For example: If the input frequency of the upper computer is 100Hz, the numerator of the electronic gear ratio is set to 1, and the denominator is set to 2, then the actual running speed of the servo is carried out by 50Hz pulses. The input frequency of the upper computer is 100Hz, the numerator of the electronic gear ratio is set to 2, and the denominator is set to 1, then the actual running speed of the servo is performed at a pulse of 200Hz.

◆ Encoder resolution (F)

The number of pulses required for one turn of the servo motor axis. The resolution of the encoder can be determined by checking the nameplate of the servo motor and corresponding to the instruction manual of the driver.

For example: If the specification of the servo motor encoder is a 20-bit incremental encoder, the resolution of the encoder is 2^{20}, that is, 1048576.

Pulse Equivalent Calculation

◆ Step motor

The relationship of each parameter and the export formula of pulse equivalent are as follows:

$$\frac{d}{p}=\frac{360}{\theta}\times x\times\frac{m}{n} \Longrightarrow p=\frac{d}{\frac{360}{\theta}\times x\times\frac{m}{n}}$$

p: Pulse equivalent
θ: Step motor step angle
d: Lead screw pitch
x: Step drive subdivision
m/n: Mechanical reduction ratio

In general, set the number of subdivisions first, and then calculate the pulse equivalent; you can also set the pulse equivalent first, and then calculate the number of subdivisions.

For example: The X-axis of any one model machine tool uses a screw lead of 5 mm, the step motor with step angle of 1.8 degrees, and works in 10 subdivision mode. The motor and the screw are directly connected by a coupling. Then, the pulse equivalent of the X axis is:

$$\text{Pulse equivalent}=\frac{5mm}{\frac{360}{1.8}\times 10\times 1}=0.0025mm/p$$

◆ Servo motor

The relationship between each parameter is as follows:

$$\frac{B}{A}=\frac{F\times p}{d}\times\frac{m}{n}$$

p: Pulse equivalent
d: Lead screw pitch
F: Encoder resolution
B/A: Electronic gear ratio
m/n: Mechanical reduction ratio

In general, the default value of pulse equivalent is 0.001mm/p, and then the electronic gear ratio is calculated by the above formula.

For example: The lead screw pitch of any one machine tool (with Yaskawa driver) is 5mm, the encoder resolution is 17Bit, the pulse equivalent is 0.0001mm/p, and the mechanical reduction ratio is 1:1.

$$\text{Electronic gear ratio}=\frac{2^{17}\times 0.0001}{5}\times 1=\frac{8192}{3125}$$

Related Parameter

Parameter	Description	Set Value
10010 Pulse equivalent (X-axis) 10011 Pulse equivalent (Y-axis) 10012 Pulse equivalent (Z-axis)	Control the displacement or angle generated by the pulse on the feed axis.	0.0001~10

Caution

The pulse equivalent setting must match the electronic gear ratio of the servo drive or the subdivision setting of the step drive.

3.7 Set the Upper and Lower Limit of the Workbench Travel

Description

The workbench travel refers to the effective movement range of the machine tool in the X, Y, and Z directions, and has the soft limit protection.

Related Parameter

Parameter	Description	Set Value
10020 Travel limits-negative (X-axis)	When the travel range of the workbench is valid, the allowable	Related to the specific machine

Parameter	Description	Set Value
10021 Travel limits-negative (Y-axis) 10022 Travel limits-negative (Z-axis)	upper/lower limit of the travel of the workbench is the machine coordinate value of the X, Y, and Z axes.	
10030 Travel limits-positive (X-axis) 10031 Travel limits-positive (Y-axis) 10032 Travel limits-positive (Z-axis)		Related to the specific machine

When setting the upper and lower limits of the workbench travel for the first time, please confirm the actual effective range of the machine tool movement to prevent accidents.

3.8 Set the Encoder

Description

The parameters here are only displayed when the parameter "11400 Control System Type" is set to "Yes".

The system supports incremental encoder and absolute encoder.

Basic Concept

The encoder feedback function is used to detect and feedback the angular and linear displacement of the screw servo motor. Whether to enable the encoder feedback function will affect the process of return to machine origin, tool calibration, etc., see the corresponding chapters for details.

Related Parameter

Parameter	Description	Set Value
11000 Enable encoder feedback	Yes: Use the encoder feedback function No: Do not use the encoder feedback function	Yes
11001 Encoder type	0: Incremental encoder	1

Parameter	Description	Set Value
	1: Absolute encoder	
16020 Encoder digit (X-axis) 16021 Encoder digit (Y-axis) 16022 Encoder digit (Z-axis)	According to the servo motor matched with the driver selected	-

3.9 Return to Machine Origin

Description

The machine tool coordinate system is the fixed coordinate system of the machine tool, and the origin of the machine tool coordinate system is also called the machine origin or machine zero. After the machine tool is designed, manufactured, debugged and adjusted before leaving the factory, the origin is determined, and it is a fixed point.

After starting the system, it is usually necessary to perform motorized or manual return to the machine origin. The following functions can only be used after return to the machine origin: soft limit enable, set fixed point, tool change.

There are two ways to return to machine origin according to the encoder type and whether the encoder feedback function is enabled: a) incremental type; b) absolute type.

3.9.1 Incremental Return to Machine Origin

Principle

◆ Axis return to machine origin process

Take the X-axis as an example to introduce the process of return to machine origin, see figure 3-4 as following.

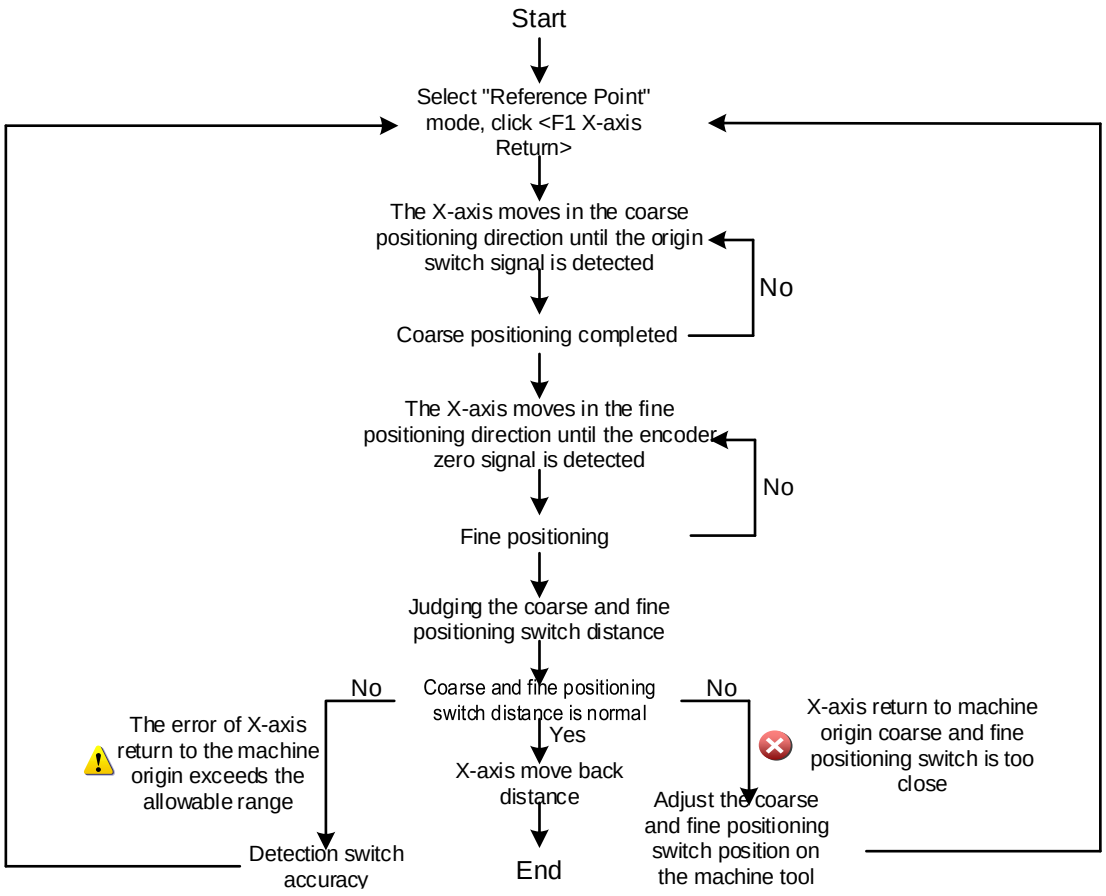


Figure 3-4 Flow chart of return to machine origin (X-axis)

◆ Return to machine origin process (without encoder feedback)

When "11000 Encoder Feedback Function" is set to "No", that is, without encoder feedback, use servo motor return to machine origin process is as follows.

• Coarse positioning stage

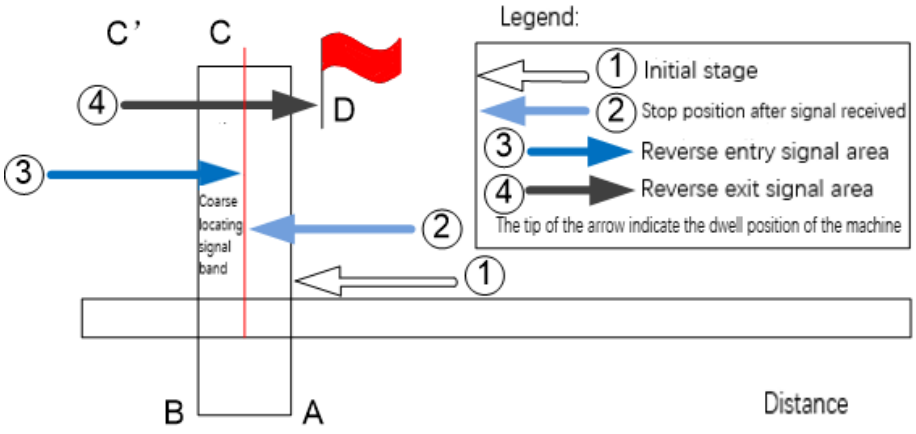


Figure 3-5 Coarse positioning stage schematic diagram (stop in the signal band after receiving the coarse positioning signal)

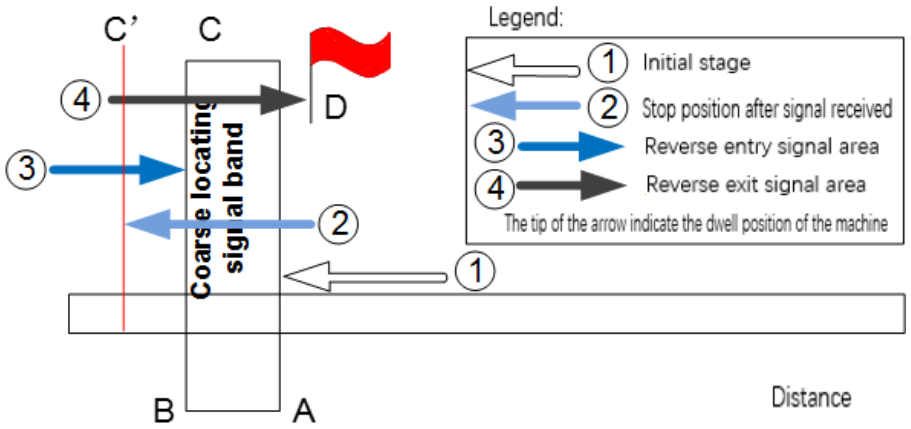


Figure 3-6 Coarse positioning stage schematic diagram (stop out the signal band after receiving the coarse positioning signal)

1. When the machine tool moves to position A and receive the origin signal, it stop immediately. Due to inertia and delay, it may be at position C or C'.
2. The machine tool moves in reverse at 1/3 of the coarse positioning speed until it get the origin signal (if the machine tool stay in the signal band in step 1, this step will not cause the machine tool to make any movement).
3. The machine tool move in reverse at 1/10 of the coarse positioning speed until the origin signal disappear (crossing the signal band).
4. After the stage end, the machine tool stay at flag D.

- Fine positioning stage

The process of fine positioning stage and coarse positioning stage is basically the same. After coarse positioning, quickly move to the encoder origin position, and slow positioning several times.

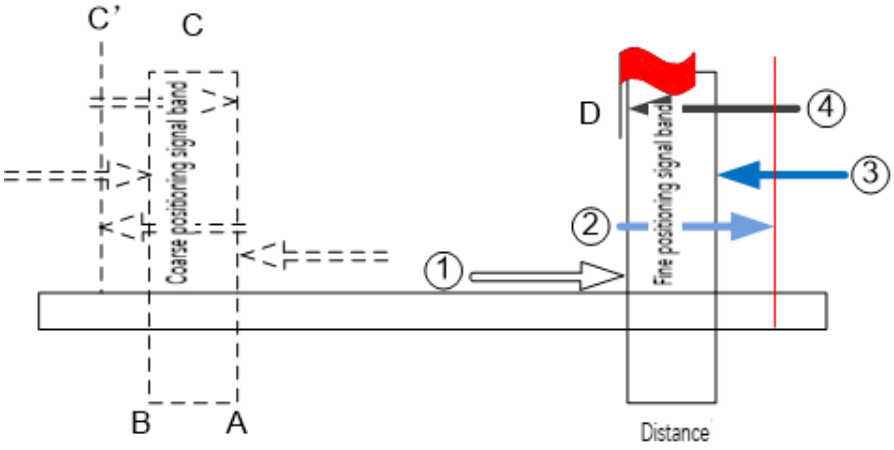


Figure 3-7 Fine positioning process

- Retract stage

After the fine positioning stage is completed, the system performs a retreat action. The recommended setting for the retract distance is 1/2 pitch.

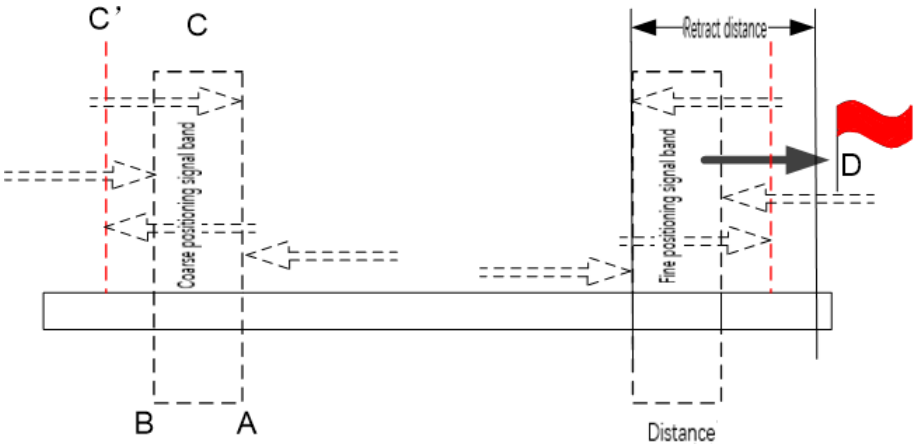


Figure 3-8 Retract stage

◆ Return to machine origin (with encoder feedback)

Return to the machine origin with encoder feedback include a coarse positioning and a fine positioning. The retract distance after fine positioning is the real retract distance that can be adjusted according to the actual situation. The specific process is shown in figure 3-9.

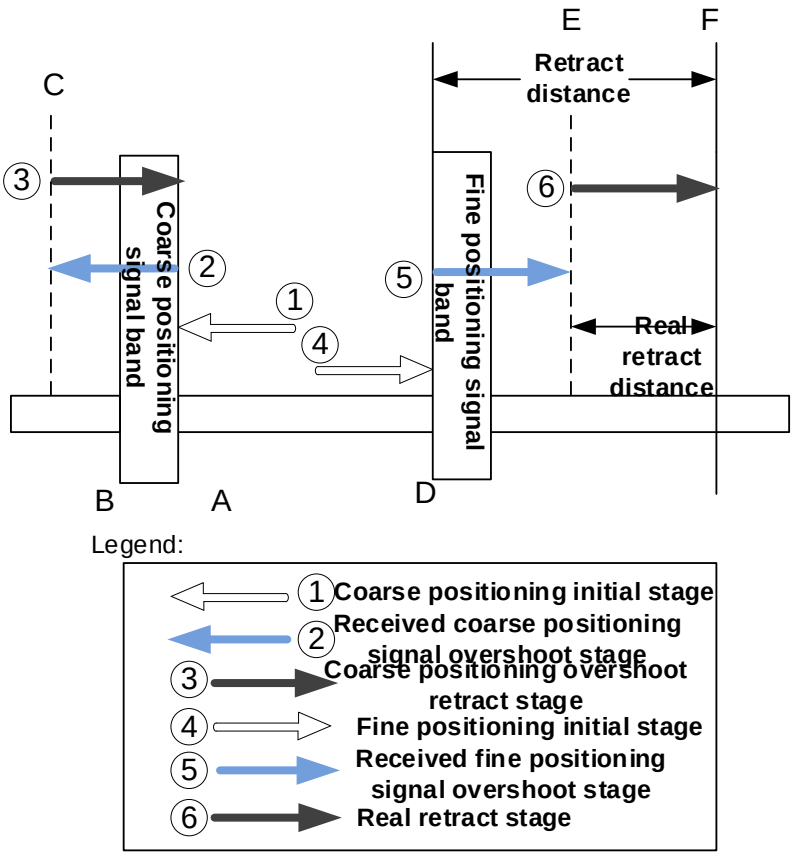


Figure 3-9 Return to machine origin process (with encoder feedback)

1. In the coarse positioning stage, the machine tool moves to position A and stop immediately after receive the machine origin signal. Due to inertia and delay, there will be an overshoot distance, and it may stay at position C.

2. Execute the coarse positioning retract stage.
3. In the fine positioning stage, the machine tool reverse to position D and stop immediately after receive the encoder zero signal, and at the same time latch the encoder feedback data. Due to inertia and delay, the machine tool produces an overshoot distance and may stay at E position. Calculate the distance from the encoder zero signal to the stop (DE), that is, the deceleration distance of the oversignal.
4. Calculate the actual retract distance based on the retract distance and the calculated oversignal deceleration distance, execute the actual retract distance, and stop the machine tool when it reache position F, so that the machine tool is far away from the signal source.

Related Parameter

Parameter	Description	Set Value
11400 Control system type	0: Non-bus control system 1: Bus control system	1
74000 Cancel origin symbol at E-stop	• Enable the encoder feedback function Yes: Cancel the return to machine origin mark after E-stop. No: Not cancel the return to machine origin mark after E-stop. • Disable the encoder feedback function Cancel the return to mechanical origin sign.	Yes
74001 Returning to mach origin required before mach	Yes: Return No: Not return	Yes
74020 Coarse positioning direction (X-axis) 74021 Coarse positioning direction (Y-axis) 74022 Coarse positioning direction (Z-axis)	During the return to machine origin, the motion direction of each axis in the coarse positioning stage. -1: Negative direction; 1: Positive direction	—
74030 REF switch positioning speed (X-axis) 74031 REF switch positioning speed (Y-axis) 74032 REF switch positioning speed (Z-axis)	In the process of returning to machine origin, the feed speed of each axis in the coarse positioning stage.	—
74060 Fine positioning direction (X-axis) 74061 Fine positioning direction	In the process of returning to machine origin, the feed speed of each axis in the fine positioning stage.	—

Parameter	Description	Set Value
(Y-axis) 74062 Fine positioning direction (Z-axis)		
74080 Retract distance (X-axis) 74081 Retract distance (Y-axis) 74082 Retract distance (Z-axis)	After the return to machine origin fine positioning stage end, the additional moving distance of each axis. Positive value move to the positive direction, negative value move to the negative direction.	—
74101 Coarse/Fine switches Min distance (X-axis) 74102 Coarse/Fine switches Min distance (Y-axis) 74103 Coarse/Fine switches Min distance (Z-axis)	It is used to detect whether the coarse and fine positioning switches are too close when return to machine origin.	—
74091 Screw pitch (X-axis) 74092 Screw pitch (Y-axis) 74093 Screw pitch (Z-axis)	The pitch of each axis is used to analyze the distance of the coarse and fine positioning switch when return to machine origin.	—

Operation

<Reference Point> →<State> →<F Coor-Ref> (open the interface shown in figure 3-10) → <F1 X> or <F2 Y> or <F3 Z> or <F7 All>.

For safety, when returning to the machine origin, please return to Z-axis first, and then return to X and Y axes. When selecting "All ", the system defaults to return to the Z-axis first, and then return to the X and Y axes at the same time.

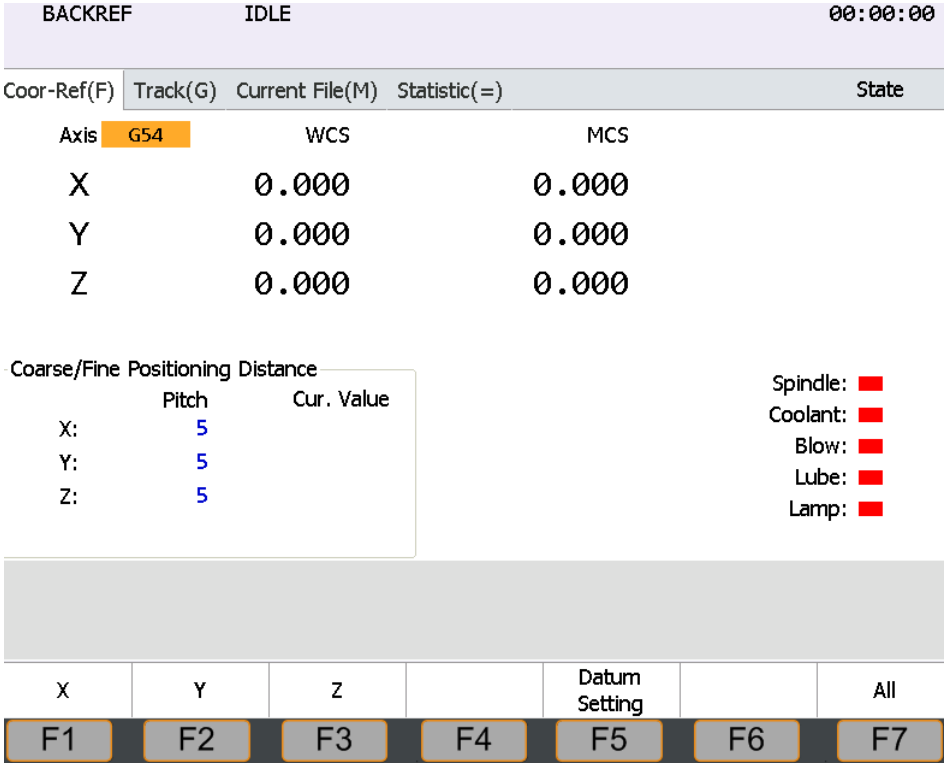


Figure 3-10 Incremental return to machine origin (reference point mode)

3.9.2 Absolute Setting of Machine Origin

Description

NK280B only support the bus type absolute encoder function.

The user directly set the machine origin through the "Basic Setting", and does not need to distinguish the order in which the axes return to the origin. After save or export the datum setting, in case of software restart, update, power failure, emergency stop, etc., the origin information can be read directly without resetting.

Related Parameter

Parameter	Description	Set Value
11400 Control system type	0: Non-bus control system 1: Bus control system	1
11000 Enable encoder feedback	Yes: Enable encoder feedback function No: Disable encoder feedback function	Yes
11001 Encoder type	0: Incremental encoder 1: Absolute encoder.	1
11200 Motor rotate mode (X-axis) 11201 Motor rotate mode (Y-axis) 11202 Motor rotate mode (Z-axis)	1: Take CW as the forward direction -1: Take CCW as the forward direction. It is controlled by the drive parameter "Motor Rotation Direction". If the motor rotates in CW direction, this parameter is set to 1.	—
74091 Screw pitch (X-axis) 74092 Screw pitch (Y-axis) 74093 Screw pitch (Z-axis)	• It is used to analyze the coarse and fine positioning switch distance when return to machine origin. • The displacement or angle generated on each axis when the lead screw rotates per circle. • Direct connection guide rail, the screw lead is set to the screw pitch; if there have gear, the value of the screw lead divided by the machine reduction ratio is set to the screw pitch.	—

Operation

◆ Enable bus and absolute encoder functions

Driver Parameter	NK280B Parameter
Wise driver: "Pr015 Absolute encoder setting"0 or 2	"11200 Motor rotate mode (X-axis)"：1 "11000 Enable encoder feedback"： Yes "11001 Encoder type"： 1
Yaskawa drive: "Pn002 Function selection application switch 2": n.□0□□	

◆ Set parameter related to the machine tool

When using the encoder for the first time, it is necessary to set the corresponding relationship between the absolute encoder and the actual machine position to determine the zero point. After the zero point is determined, the actual position of the machine tool can be directly read when the software is started again.

The exact position value of the machine tool is related to the setting of "Motor Rotation Mode".

Driver Parameter	NK280B Parameter
Wise driver: "Pr000 Rotation direction setting": 0 (CW is positive)	"11200 Motor rotate mode (X-axis) " ～ " Motor rotate mode (Z-axis)": 1
Yaskawa drive: "Pn000 Function basic selection switch 0": n.□□□1 (CW is positive)	
Wise driver: "Pr000 Rotation direction setting ": 1 (CW is positive)	"11200 Motor rotate mode (X-axis) " ～ " Motor rotate mode (Z-axis)": -1
Yaskawa drive: "Pn000 Function basic selection switch 0": n.□□□0 (CW is positive)	

◆ Absolute value encoder initialization setting

Before using the absolute value return to machine origin function, it is necessary to check whether the driver needs to be initialized. In the following situations, the user must initialize the absolute value encoder.

- The drive is powered on for the first time
- Change absolute encoder battery box
- "(A.810 Encoder Backup)" alarm occurs
- "(A.820 Encoder Verification)" alarm occurs

In the above cases, power off and restart, the bus type absolute value function will automatically complete the initialization setting. After the absolute encoder is initialized, the NK280B must be re-referenced.

◆ NK280B operation

<Reference Point> → <State> → <F Coor-Ref> → <F5 Datum Setting> (input the manufacturer's password,enter the interface shown in figure 3-11).

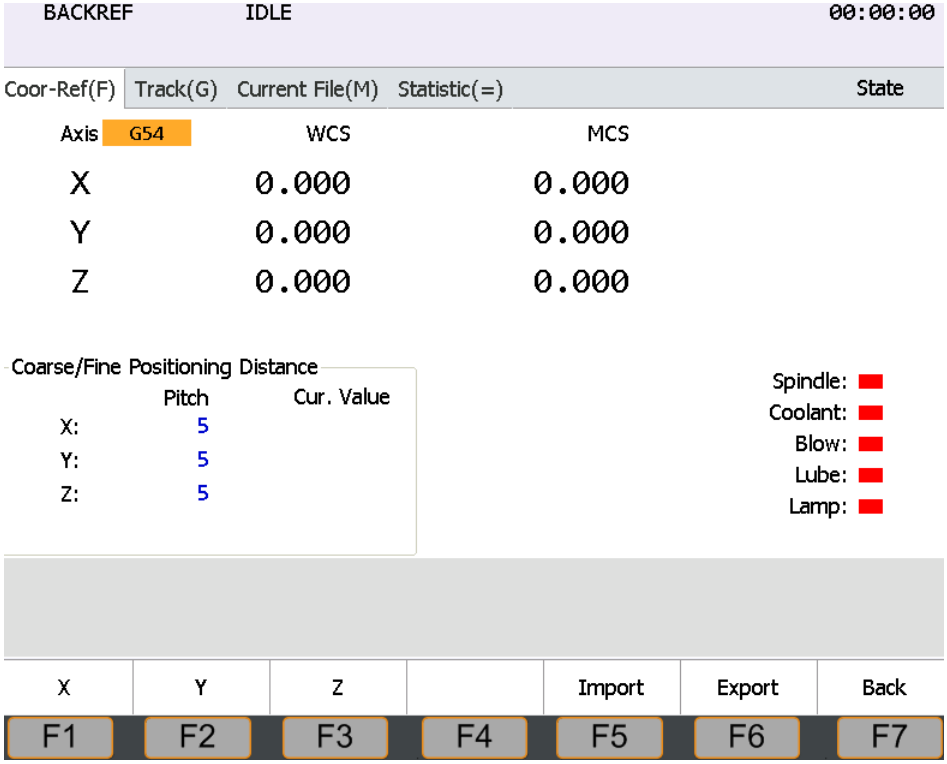


Figure 3-11 Datum setting (reference point mode)

X/Y/Z axis datum setting	In manual mode, manually move the axis to a fixed position on the machine tool, return to the reference point mode and press the corresponding key to set the corresponding axis reference. The software prompts "The modification of the absolute value initialization setting will only be valid after restart the software, please restart the software!" After confirming, restart the software.
Import	The software update will cause the previously set datum information loss, use the import and export functions to avoid repeated setting of the datum origin of the machine tool.
Export	• After the software set the datum, press <F6 Export> to export the currently recorded datum value to the root directory of the USB. • After installing the new software, press <F5 Import> to import the datum data previously saved in the root directory of the USB and apply them directly. After confirming the import, restart the software to take effect.

3.10 Set Speed Related Parameter

Users can set parameters related to machining speed in the main interface and parameter interface of the system.

3.10.1 Set Main Interface

Operation

◆ G00 speed/spindle speed/feed speed/cycle times

<Auto> → <State> → <F Coor-Auto> (open the figure 3-12 interface) → <↑> or <↓> or <→> or <←> (select the setting box) → <Enter> (input the setting value in the pop-up dialog box) → <F6 OK>.

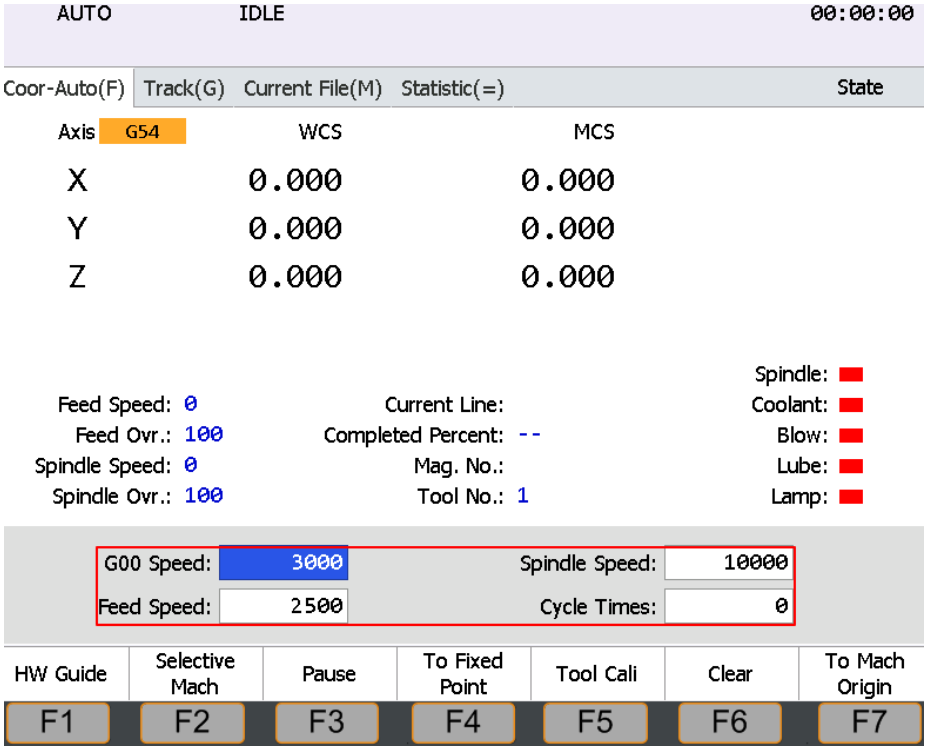


Figure 3-12 Set speed parameter

- When controlling the current feed speed/current spindle speed by adjusting the current feed axis override knob/spindle override knob, meet:

  Current feed speed = feed speed X current feed override

  Current spindle speed = spindle speed X current spindle override

- G00 speed refer to the running speed of the machine tool under the G00 command.

◆ Manual high speed/manual low speed

In handwheel or jog mode, set the running speed of the machine tool and the step value of each axis.

<State> → <F Coor-Manual> (open the interface shown in figure 3-13) → <↑> or <↓> or <→> or <←> (select the setting box) → <Enter> (input the setting value in the pop-up dialog box) → <F6 OK>.

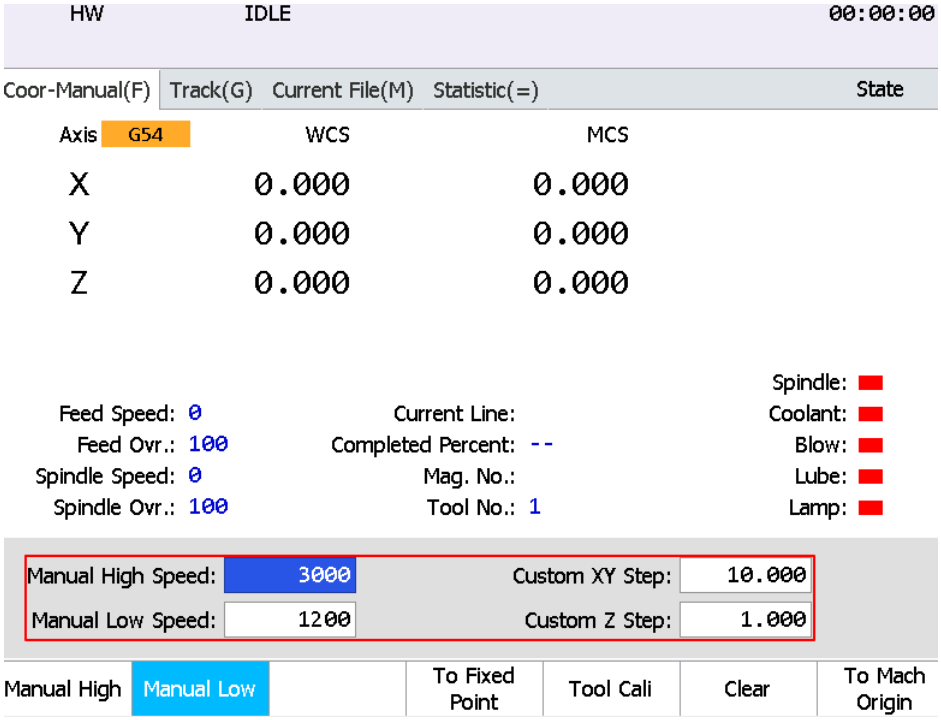


Figure 3-13 Manual high speed

Caution

In handwheel mode, "Manual Low Speed" is used by default; in jog mode, "Manual High Speed" and "Manual Low Speed" can be switched.

Related Parameter

Parameter	Description	Set Value
20001 Max spindle speed	The "Spindle Speed" value in the interface must be less than this value. This setting value corresponds to the SVC analog value of 10V. When the inverter reaches the maximum voltage value of 10V, the corresponding inverter speed is the maximum spindle speed value of parameter N20001. $\text{Analog SVC voltage} = \frac{\text{current spindle speed}}{\text{N20001}} \times 10V$	—

Parameter	Description	Set Value
53009 Ignore spindle speed in program	If it is set to "Yes", the spindle speed specified in the machining file will be invalid.	—
64021 Feedrate	The default speed when the machine tool is machining (not the speed when positioning).	—
53008 Ignore federate in program	If it is set to "Yes", the feed speed specified in the machining file will be invalid, and the feed speed specified by the system will be used.	—
53006 Fix G00 speed	If set to "Yes", the G00 override will be fixed at 100%.	—
71000 Manual low	Default speed in manual mode	—
71001 Manual high	Speed during high speed running in manual mode	—

3.10.2 Set Parameter Interface

Operation

Parameter setting operation see section 3.3.

Related Parameter

◆ Speed

Parameter	Description	Set Value
64000 Startup speed	Minimum speed during machining. This parameter is for the startup frequency in the step and servo drives, and this value should be set to zero in the drive. You can set a small value first, let the machine tool do typical actions and multi-axis linkage repeatedly, and gradually increase the value until the maximum startup speed is determined.	0~Z approach speed
64020 G00 speed	The default speed when the machine tool is positioned (not the speed during machining)	—
64022 Max feedrate	Maximum speed during machine tool machining	—

Parameter	Description	Set Value
53007 Feed override valid in manual mode	Yes, it is affected by feedrate override during manual; No, it is not affected by the feedrate override in manual mode, and the feedrate override is 100%.	—
79000 The selection for Z down feedrate	0: Not treatment; 1: Valid only for Z-axis down; 2: Valid for Z-axis down motion	—
79001 Z down feedrate	—	
62000 Z deceleration distance	During rapid positioning, the spindle starts to decelerate as far as it is from the target position, and then moves with the approach speed.	—
62001 Approaching speed	The feed speed when the tool is approaching the workpiece during positioning.	—
13000 Max axial velocity (X) 13001 Max axial velocity (Y) 13002 Max axial velocity (Z)	The encoder feedback direction of the X, Y, and Z feed axes. Optional values: 1: Positive direction; -1: Maximum speed allowed by the negative direction axis.	—

◆ Acceleration

Parameter	Description	Set Value
64080 Rotary axis angular acceleration	In any case, the acceleration of the rotary axis will not exceed this value. This value should be determined by the electrical characteristics of the machine tool.	—
64100 Axis acceleration	The maximum acceleration of each feed axis during machine tool machining.	—
64101 G00 acceleration	The maximum acceleration of each feed axis when the machine tool is positioned.	—
64120 Max acceleration at corners	Maximum cornering acceleration (mm/s^2).	—
64150 Axial jerk	—	—

◆ Reference circle, arc speed limit

Parameter	Description	Set Value
64207 Limit arc velocity	Yes: Arc speed limit is valid; No: Arc speed limit is invalid.	—
64208 Max velocity of Ref circle	The maximum allowable speed corresponding to a circle with diameter of 10mm.	—
64250 Enable short line velocity smoothing	Yes: Eliminate speed fluctuations to short lines; No: Not eliminate speed fluctuations to short lines.	—

Parameter	Description	Set Value
64251 Short line Ref length in velocity smoothing	Perform speed smoothing on short lines with length less than the reference length. The machine tool cut an arc first, and the centrifugal force during the cut arc will cause the machine tool to vibrate. The greater the arc speed, the more severe the vibration of the machine tool. Increase the feed speed to observe the vibration of the machine tool. Until the maximum arc speed that the machine tool can withstand without violent vibration is obtained. This arc can be regarded as the reference circle, and the maximum speed it can withstand is the maximum speed of the reference circle.	—
63006 Path smoothing time	The longer the time, the smoother the surface of the workpiece. But some of the details may be weakened.	—
62020 Enable arc IJK incremental mode	Yes: Valid. In the IJK programming mode of the arc, I, J, K represent the incremental values of the circle center coordinates in the X, Y, Z directions compared with the start point coordinates; No: Invalid.	—
62021 Arc radius tolerance	During IJK programming, the maximum radius tolerance between start point and end point.	—

◆ Interpolation algorithm

Parameter	Description	Set Value
63020 Delay for exact stop	The trajectory is the delay time at the acute angle.	—
64160 Look ahead path segements	Maximum number of look ahead segments when calculating connection speed.	—
64201 Max angle for fast corner velocity	When the connection angle of the line is greater than this value, the speed will not auto adjusted, but will start running at the startup speed.	—
64202 Look ahead distance for velocity	The system will analyze the situation within a certain distance before and after the current point to determine the speed planning strategy.	—
64203 Path interpolation algorithm options	0: Velocity triangle; 1: Velocity S type; 2: Trapezoid	—
81004 Path preprocess mode	Path preprocess mode before machining. 0: No treatment; 1: Tolerance treatment; 2: Smoothing treatment.	—
81005 Path preprocess accuracy	For the overall smoothness of the workpiece, the accuracy of trajectory preprocessing.	—

3.11 Compensation

3.11.1 Tool Compensation

Description

In the CNC machining process, the CNC system machining part contour by control the tool center or the motion trajectory of the tool holder related point.

There is a dimensional deviation between the tool tip or tool blade edge actually cut by the tool and the tool center or tool holder related point.

When the tool is worn, re-sharpened or replaced with a new tool, the radius of the tool trip changes. At this time, there is no need to modify the programmed machining program, just change the tool parameter value in the tool compensation interface.

Basic Concept

◆ Tool radius compensation

The tool radius compensation command can make the tool move only by the radius value of the tool offset, as shown in figure 3-14.

In order to make the offset equal to the tool radius value, the system first creates an offset vector (tool start), whose length is equal to the tool radius. The offset vector is perpendicular to the tool's forward direction, from the workpiece towards the direction of the tool center. If the linear or circular interpolation is specified after the tool start, the tool can be made to perform machining after only offsetting a certain offset vector.

Finally, make tool return to start point, cancel tool radius compensation.

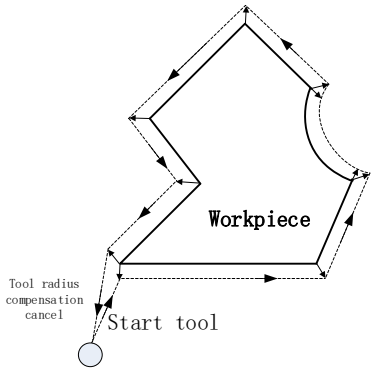


Figure 3-14 Tool radius compensation description diagram

◆ Tool compensation establishment type

Tool need to establish the tool compensation before the tool compensation, and need to cancel the tool compensation after machining the workpiece.

To establish tool compensation is to move the tool to the edge of the workpiece in a reasonable way; to cancel tool compensation is to move the tool from the edge of the workpiece to the specified point after machining the workpiece.

There are 3 vertical methods to establish tool compensation in the system.

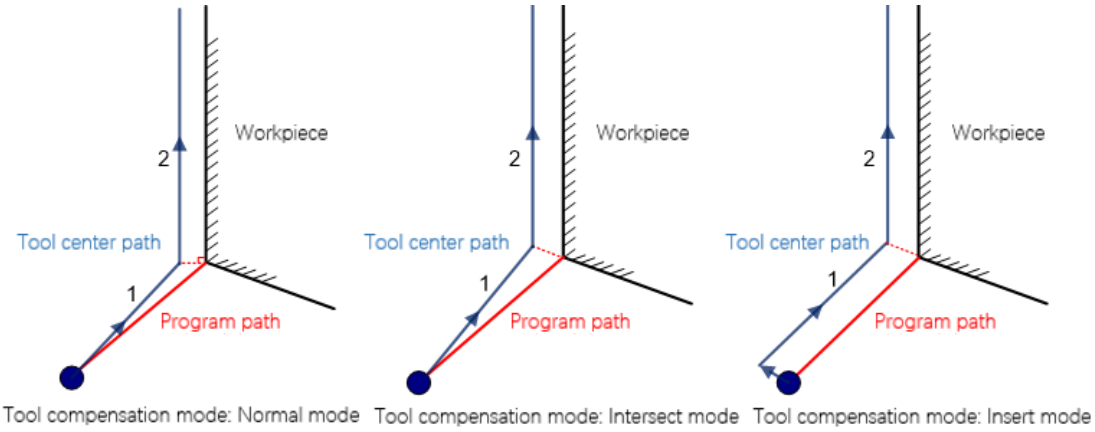


Figure 3-15 Tool compensation mode diagram

Normal mode	After the original programmed path is translated by 90°, the tool compensation establishment segment 2 is obtained. Set the first point of segment 2 as the end point of segment 1 to obtain the tool center path after tool radius compensation. This mode does not support arc establishment tool compensation.
Intersect mode	After the original programmed path is translated, the tool compensation establishment segment 2 is obtained. Set the first point of segment 2 as the end point of segment 1 to obtain the tool center path after tool radius compensation. This mode does not support arc establishment tool compensation.
Insert mode	After the original programmed path is translated, intersect the established segment 1 and 2 to obtain the intersection point, and insert a segment between the before offset to after offset start point of the tool compensation established segment 1, so that the tool can be directly offset to the required position along this segment. This mode support arc establishment, but it need to take an extra path, which affect efficiency.

◆ Tool compensation direction

Tool compensation direction diagram figure 3-16.

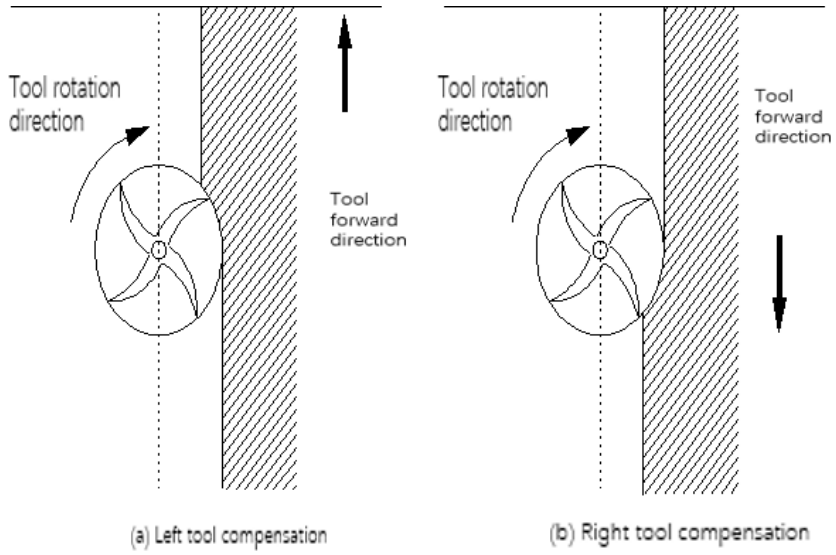


Figure 3-16 Tool compensation direction (a) Left tool compensation (b) Right tool compensation

Example: Figure 3-17 is a programming diagram for tool radius compensation.

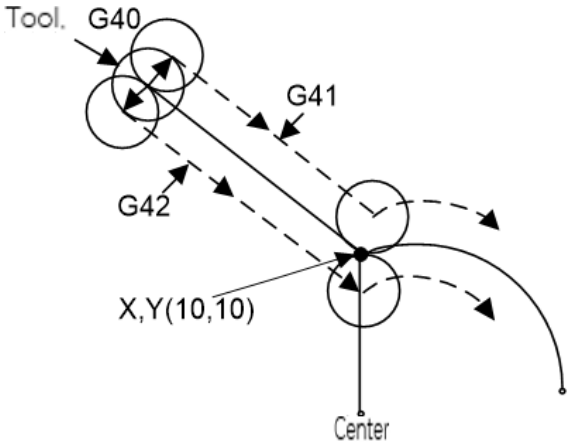


Figure 3-17 Tool compensation machining diagram

```
G17 G01 G41 (G42) X10 Y10 F1000 D01 ' Linear interpolation and radius compensation of the tool
G02 X_ Y_ I_ J_   ' Arc interpolation
```

G41 is the left tool compensation, that is, the tool offset a certain distance to the left of the tool forward direction, and this distance is the tool radius.
G42 is the right tool compensation, that is, the tool offset a certain distance to the right of the tool forward direction, and this distance is the tool radius.
X10Y10 are the coordinates of the end point of linear motion.
F1000 means running at 1000mm/min speed.
D01 is the parameter of G41/G42, that is the tool compensation number, from D00 to D07, it represents the corresponding radius compensation value in the tool compensation table.

For detailed explanation of tool compensation command programming, refer to "NcStudio Programming Manual".

◆ Tool compensation command

Set the parameter "Tool Compensation Valid" to "Yes". Tool compensation is available, including tool diameter compensation and tool length compensation.

- Tool length compensation uses commands G43 (forward offset) and G44 (negative offset).
- Tool diameter compensation uses commands G41 (left tool compensation) and G42 (right tool compensation).
- Cancel tool compensation uses commands G40 (cancel radius compensation) and G49 (cancel length compensation).

The above commands must be used together with G00/G01 to establish tool compensation.

Related Parameter

Parameter	**Description**	**Set Value**
62410 Enable tool compensation	Use tool compensation commands in CNC machining code.	Yes: Use No: Not used
62411 Tool compensation type	Specify the type of tool compensation. 1: Normal type 2: Intersect type 3: Insert type	
62412 Tool compensation interferometry type	0: No interference evading, normal tool compensation. 1: Perform three-segement tool interference evading processing. 2: Perform three-segement tool interference evading.	
62413 Tool compensation look ahead block No.	The number of look ahead segments when using tool compensation interference evading.	

Operation

1. <Advanced> → <= Compensation> (open the interface shown in figure 3-18).
2. Press < ↑ > or < ↓ > to select the tool number.
3. <→> or <←> (select the setting box) → <Enter> → (input the offset setting value in the pop-up dialog box).

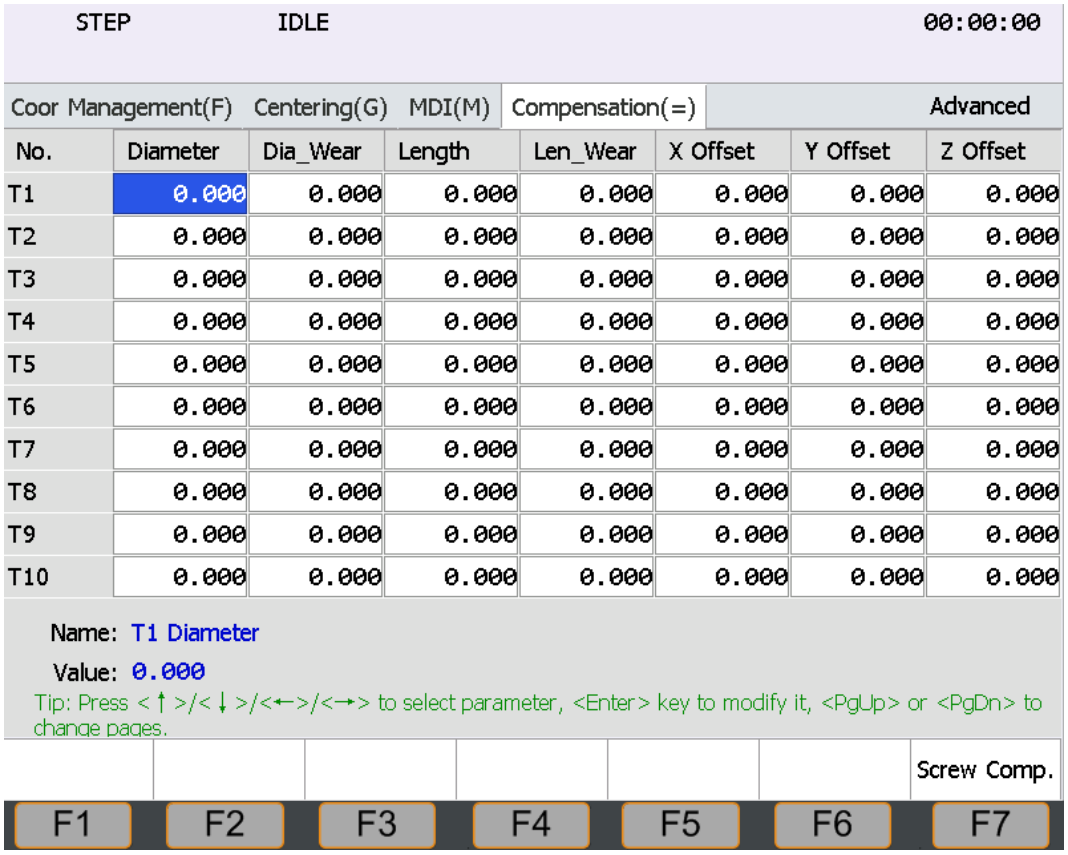


Figure 3-18 Tool information list

3.11.2 Lead Screw Error Compensation

Description

Screw error includes pitch error and error due to backlash.

In general, these two errors do not need to be compensated, but in the case of high precision requirements, the backlash needs to be compensated; if in the case of stricter precision requirements, two errors need to be compensated at the same time.

Basic Concept

◆ Pitch error compensation

Pitch error will be caused by lead screw production technic defects, long-term use resulting in wear and other reasons. In order to improve the feed accuracy, the pitch needs to be compensated to meet the requirements.

The sketch of the lead screw is shown in figure 3-19 figure A. Set the 0 point on the lead screw as the reference point, and establish coordinate system with the nominal value and actual value as the abscissa and ordinate, then the ideal moving curve should be curve 1 shown in figure 3-19 figure B, but in fact, due to the existence of pitch error, the moving curve may change to curve 2 shown in figure B of figure 3-19. That is to say, the actual value corresponding to the same nominal value has changed, which deviates from the ideal moving curve, and the difference between them is the error. Which is:

Error value = actual machine coordinate - nominal machine coordinate

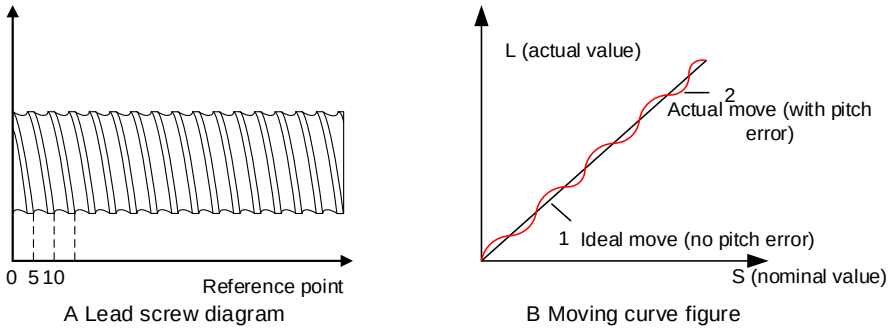


Figure 3-19 Pitch error principle analysis diagram

When performing pitch compensation, it is generally considered that the pitch error value has nothing to do with the feed direction. That is, when a pitch is too small during forward feed, additional feed pulses are required; when negative feed passes through the same point, the same number of feed pulses should also be added. If a pitch is too large, the feed pulse should be deducted, and the deducted number has nothing to do with the feed direction.

When using software compensation, the correction amount of each point on the error curve can be tabulated and stored in the memory of the CNC system. In this way, the CNC system can automatically compensate the coordinate positions of each point during the running process to improve the accuracy of the machine tool.

◆ Backlash compensation

Usually the spindle is fixed on the lead screw, and the outer wire of the lead screw cannot be completely matched with the inner wire attached to it. When the spindle moves to one side, if it suddenly moves to the opposite direction, it must complete the gap between the screw in the previous direction. The compensation for this error is called backlash compensation.

Assume that when the driving axis rotates clockwise, it is in reverse motion, and the slave axis is in reverse motion. When the driving axis suddenly changes to counterclockwise rotation (that is, forward movement), due to the existence of backlash in the mechanical transmission chain, it will cause the servo motor to dry run without moving the table. The table stays in a certain position for some time before moving in reverse with the driving axis; when the driving axis changes the direction of motion again, the situation is the same, this phenomenon is hysteresis

If there is no error in the pitch (that is, in an ideal state), the movement curve of the workbench is shown in figure 3-20, figure A. The horizontal section curve is the curve where the table does not move when the servo motor is dry running. The moving curve of the workbench under actual conditions is shown in figure 3-20, figure B.

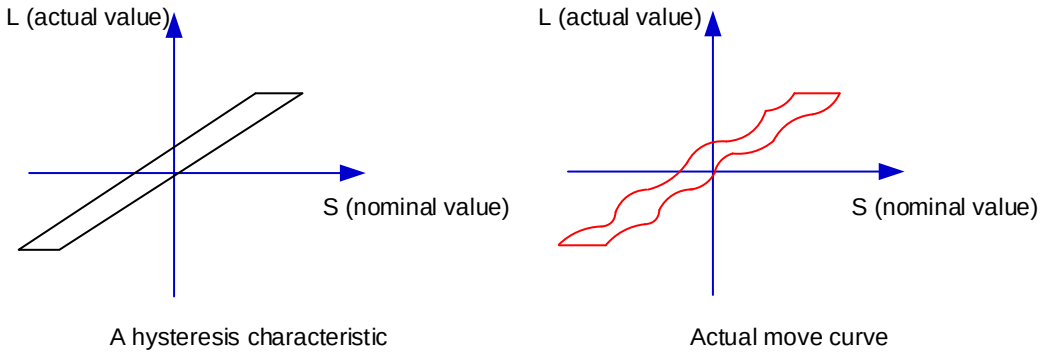


Figure 3-20 Backlash principle analysis diagram

The backlash can be measured by a special measuring instrument. First fix the instrument on the side of the spindle, put the hand at the zero position, then manually move a mm, and then go back for the same a mm, and observe that the hand actually move b mm. The backlash is (a-b) mm.

If an axis moves from positive to negative, it will output Q positive pulses before the reverse; if an axis changes from negative to positive, it will output Q negative pulses before the reverse (Q is the backlash, can be preset by the program).

◆ Lead screw error compensation

In fact, the system has combined the pitch error and the backlash error together for processing. List the reverse error and forward error of the corresponding nominal coordinates on each coordinate axis into the lead screw error compensation file, and the system automatically performs error compensation according to the error data in this file.

The file name of screw error compensation is axeserr.dat, which can be found in the installation directory. If the data in the screw error compensation file is modified, the software needs to be restarted, and the modified error compensation file will take effect.

◆ Lead screw error compensation file format

- Specifie the unit of length, currently only supports mm, written as: unit=mm.
- Specify the error sequence of each axis, the content of the sequence must be arranged in ascending order of the nominal mechanical coordinate value, otherwise it cannot work normally.
- Comment, comment must be on a separate line, start with a semicolon, and there are no other characters before the semicolon. Grammar:

  <Note Content>

Figure 3-1 Lead screw error compensation file name explanation

Noun	Axis name	X, Y, Z, ... (case insensitive)
	Nominal machine coordinate	The machine coordinate relative to the reference point calculated according to the given pitch and pulse equivalent (that is, the length calculated based on the nominal value of the pitch, not the actual physical length). With positive and negative sign, the small one come first and the big one follow. The nominal machine coordinate must be within the travel range, otherwise the compensation will be invalid.
	Reverse error value	The error produced when moving in the direction of decreasing coordinate value.
	Positive error value	The error generated when moving in the direction of increasing coordinate value.
Description	The error sequence writing method of each axis in the file format	【Axis Name】 Nominal machine coordinate, positive error value, reverse error value Nominal machine coordinate, positive error value, reverse error value Nominal machine coordinate, positive error value, reverse error value
	The positive and negative sign of nominal machine coordinate and real machine	Pay attention! Especially when using laser interferometer and other equipment to measure the length value, it should be correctly converted into the corresponding machine coordinates before calculation, otherwise it will cause wrong results.

	coordinate	
Example	Usually	;unit=mm 【X】 -570.025, 0.027, 0.083 -450.020, 0.025, 0.077 -330.015, 0.015, 0.068 -210.010, 0.000, 0.057
	When a axis only compensates for backlash	Simply write out the data for the first and last two points of the axis. Suppose the backlash of Y-axis is 0.03mm, and the value range is 0~1000. ;unit=mm 【Y】 0.000, 0.000, 0.030 1000.00, 0.000, 0.030

Related Parameter

Parameter	Description	Set Value
12001 Enable backlash compensation	0: Read backlash and pitch error data from the error file for comprehensive compensation. 1: Read the backlash data from the compensation parameter <Backlash> for compensation.	1
12002 Screw error comp	0: No compensation. 1: Single direction compensation. Compensate for backlash error and single direction error. 2: Two directions compensation. Compensate comprehensively by using error data in both direction.	—
Backlash	Set the screw backlash of each axis, only displayed when both "12001 Enable Backlash Compensation " and "12002 Screw Error Comp" are "1".	—

Operation

◆ Single direction compensation

Before compensation, please set parameter "12002 Screw Error Comp" to "1".

1. <Advanced> → <= Compensation> → <F7 Screw Comp.> (open the interface shown in figure 3-21).
2. Press <T X axis>, <S Y axis>, <P Z axis> to select an axis.
3. Perform corresponding operations on the error data through <F1 Insert> ~ <F6 Apply>.

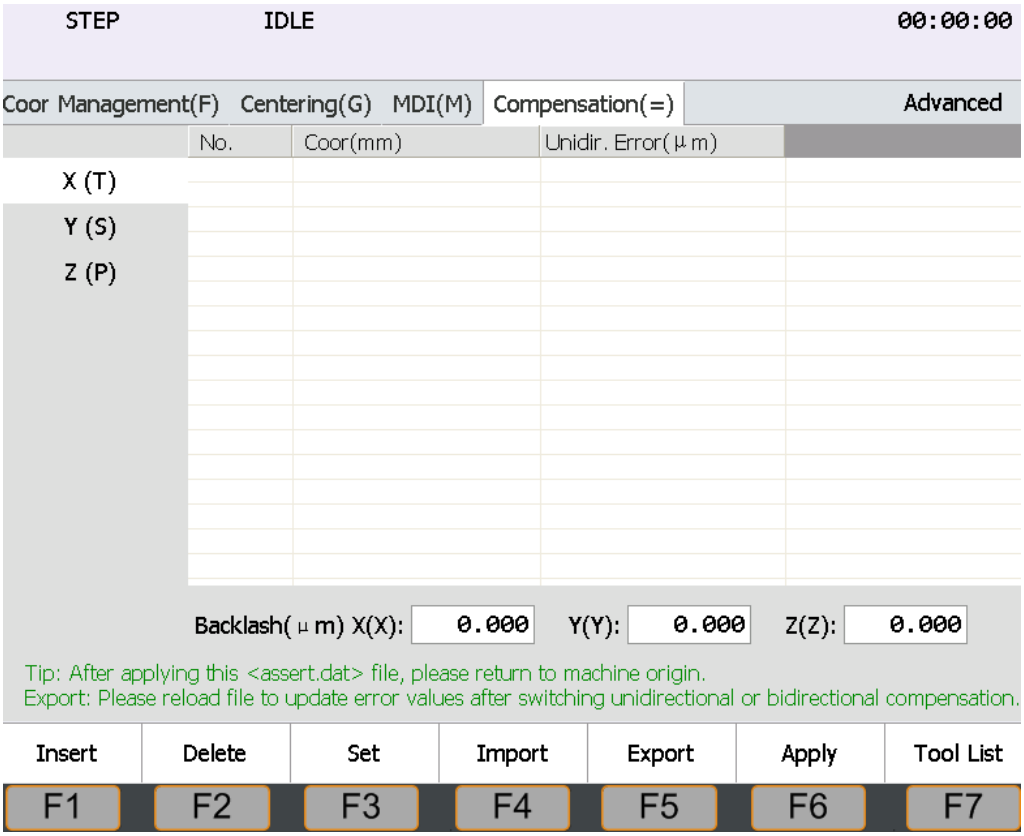
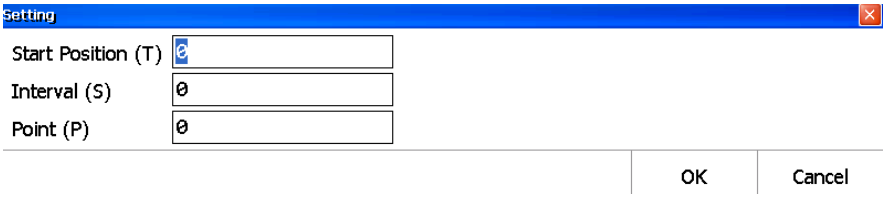


Figure 3-21 Lead screw error compensation – single direction compensation

Insert	Insert the data row. Consecutively insert multiple blank rows is prohibited. Only after insert a row and fill in the data, it can insert again.
Set	Press <F3 Set>, pop-up a dialog box, press <T Start Position>, <S Interval>, <P Point> respectively, and directly input the set value. After confirming, the system will generate a set of compensation data and fill in the compensation list. 
Import	Three types of files, .lin, .rtl and axeserr.dat can be imported, but it is necessary to confirm whether the imported .lin and .rtl files are generated normally.
Export	Export compensation data to USB axeserr.dat file.
Apply	Write the compensation data into the drive, and save the axeserr.dat file to the D disk at the same time. After the lead screw error compensation is modified, execute "Apply" to take effect. Before start machining, it is necessary to return to the machine origin, and the compensation data will be sent to the driver after the corresponding axis return to the machine origin.

1. After manually modifying the axeserr.dat file, it is necessary to confirm whether each axis is arranged in an increasing or decreasing sequence. Whether the relationship between the data (coordinate position, forward error, reverse error) and the backlash is correct.
2. After switching between single direction compensation, two directions compensation and restart the software, it is necessary to re-import the files to be used and refresh the error value in the interface.
3. For the imported file, in order to import the accuracy, the average value of the two errors at the same position is taken; for multiple back and forth, the average value of the same coordinates is used multiple times. And: Compensation error value = measured error value – 0 point error value.

3.11.3 QEC

Description

It is used to remove distortion phenomenon (usually sharp corner) at the transition caused by one quadrant entering into another. In order to eliminate this distortion, error compensation is required, which is called QEC.

The cross quadrant compensation parameter is used to perform sharp corner compensation when the machining arc cross quadrant. The setting in the positive and negative directions of X, Y, and Z are similar.

Related Parameter

Among them, there are 12 groups of parameters including time, compensation value, delay and intensity, one of which is listed.

Parameter	Description	Set Value
12020 Enable QEC	Whether to enable quadrant error compensation for corners.	Yes
12030 QEC time	The larger the value, the larger the range affected during compensation, and the recommended value is around 0.02s.	—
12031 QEC value	The larger the value, the compensation effect more clear. But note that if the value is too large, the arc will concave inward, and if it is too small, the height of the arc cannot be effectively reduced. It is recommended to use measuring instrument such as laser interferometer to measure the actual sharp corner height when adjust the machine. The setting value is generally between 0.3 ~ 3 times the height of the sharp corner (the compensation effect is related to the compensation time and compensation intensity).	—
12032 QEC delay	Because of the different machine properties of each machine tool, on some machine tools, the appearance of sharp corners is not necessarily just at the quadrant change point, but has a certain distance from the quadrant point. Please estimate the time corresponding to this distance and use it as the value of this parameter.	—

3.12 Simulation

Description

The simulation function provides the user with a fast and realistic simulated machining environment, which is convenient for the user to understand the movement form of the machine tool in advance, and prevent the machine tool from being damaged due to mistakes in programming the machining program.

During the simulation machining, the machine tool has no actual movement, and the "Track" interface displays the tool machining path at high speed.

Operation

Please load the machining program file first; there are two kinds of simulation operations.

- <State> → <G Track> (see figure 3-22) → < F1 Simulation >.

- Directly press <Simulation> in the auxiliary function button to view the machining state in the "Track" interface.

Figure 3-22 Motion track interface

3.13 Collect Data

Description

"Data Collection" is to compare the number of tool path pulses sent by the software with the actual pulses of the motor feedback to obtain the actual running data. Generate corresponding compensation files based on this data.

The data collection function is only valid when the bus function is enabled.

Operation

<System> → <= Data Collection> (pop-up dialog box shown in figure 3-23) → < ↑ > or < ↓ > (select the data to be collected) →<Enter>.

"Compensation File" in figure 3-23 refers to QEC file.

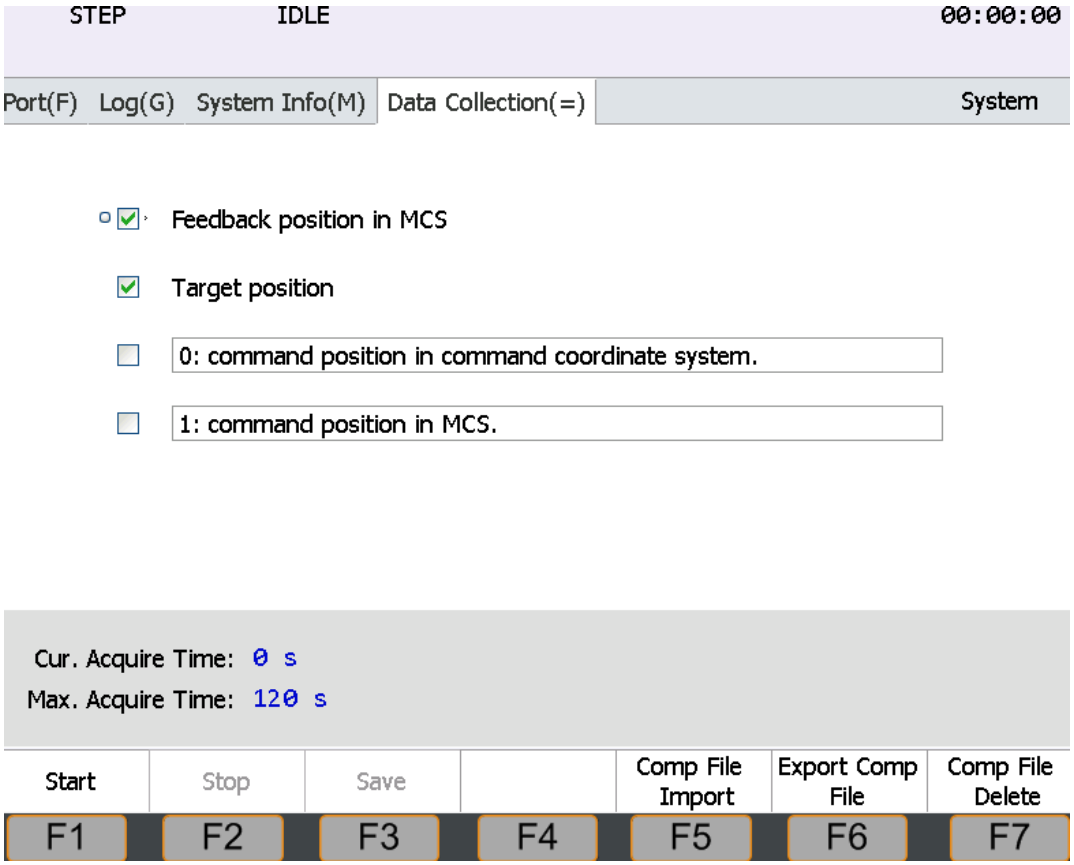


Figure 3-23 Data collection dialog

3.14 Register

The system supports software and driver registration (currently only Wise driver registration is supported, and it is only valid when the bus function is enabled). The remaining time is the minimum value between software and driver registration.

Users can view the remaining time of the system in the interface shown in figure 3-24.

The board number changes with the number of registrations, which is reflected in the last three digits of the board. When the number of registrations is 0, the last three digits are B00. When the number of registrations is 1, the last three digits are B01.

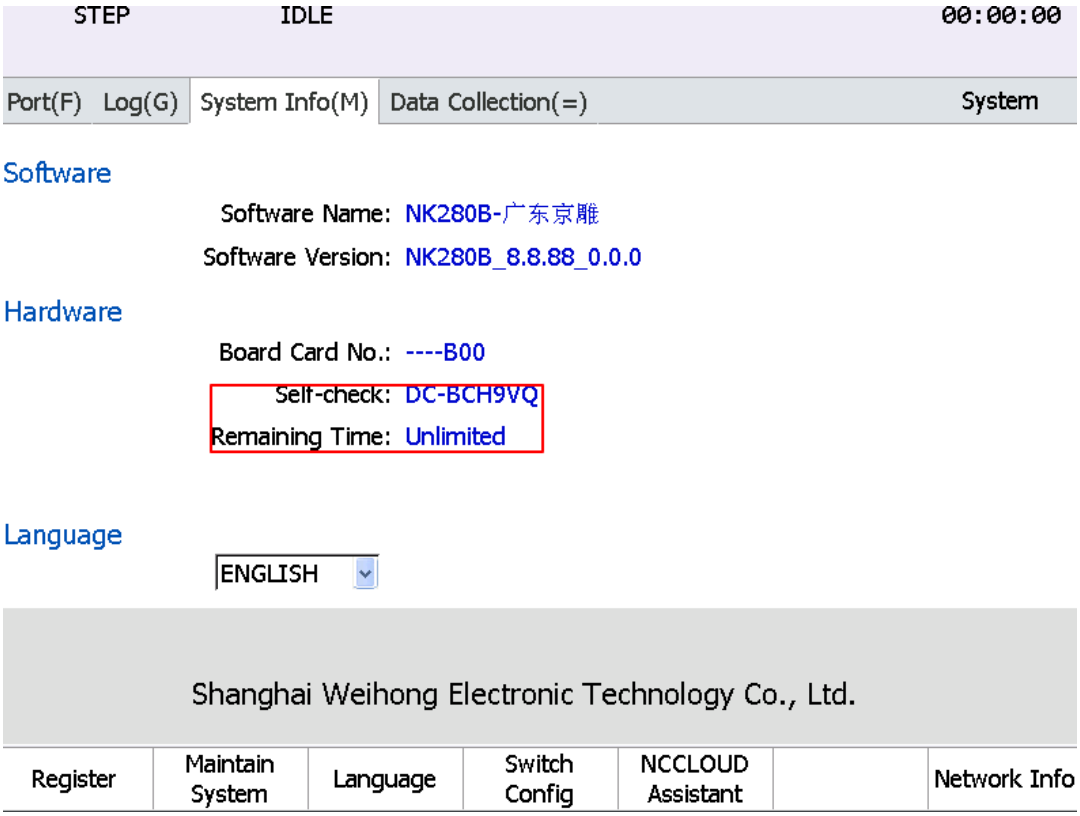


Figure 3-24 System information interface

3.14.1 Register Software

Description

Users can control the usage time of the system through the software registration function. Registering the software is divided into two stages: a) Get the registration code; b) Enter the registration code to complete the registration.

Get Registration Code

1. Search for "Weihong" in the Apple App Store, download and install the "NcStudio Generator" APP.

   Before using the APP, please contact Weihong company (customer service phone number: 400-882-9188), fill in the "APP Registration Information Confirmation Letter", stamp and send it back to Weihong company for information record.

2. Open the APP and bind the phone number.

   Company name, user name, phone number and other information must be consistent with the record information, otherwise you cannot register.

   The password are 6 digits and consist of "Letter + Number".

3. After binding the phone, log in to the APP, fill in the information as shown in figure 3-25, and obtain the registration code.

   If you forget the login password, please contact Weihong company. (Customer service phone: 400-882-9188)

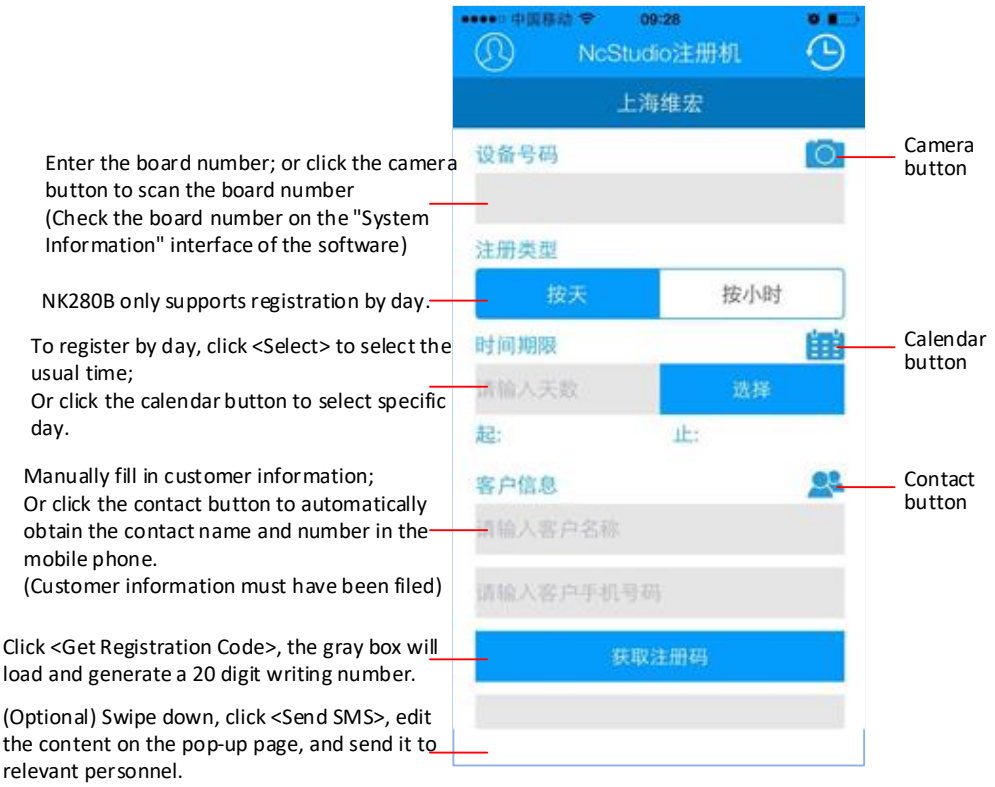


Figure 3-25 Get registration code

Caution

When registering by day, whether the system is powered off or not, the remaining time will be calculated according to the system's internal clock.

Enter Registration Code

1. Ensure that the machine tool is in a non-machining state (idle or emergency stop state).

   When the machine tool is in the machining or pause state, it cannot be registered, otherwise it will prompt a yellow alarm "Current machining state, this operation cannot be performed!".

2. Operation: <System> →<M System Info> (open the interface shown in figure 3-24) → <F1 Register> (pup-up dialog shown in figure 3-26) → (enter registration code) → <F6 OK> or <Enter> → (Power off and restart, registration is successful).

Figure 3-26 Registration dialog

3.14.2 Register Drive

Description

- Driver registration can only be performed when the bus function is enabled and driver registration is enabled (please set the related parameter). The system currently only supports Wise driver registration.
- Users do not need to register the driver separately. When registering the software, the system also register the driver.

Related Parameter

Parameter	Description	Set Value
11400 Control system type	0: Non-bus control system 1: Bus control system	1

16050 Default servo type	-1: Auto identification 0: Yaskawa Σ5 1: Yaskawa Σ7 2: Wise 3: Panasonic A5 4: Panasonic A6 5: Mitsubishi J4 6: Yaskawa Σ7M3 7: Inovance EtherCAT 8: HiTronic 9: Schneider 10: V&T 14: Wise all-in-one (M3_EC) 15: Wise all-in-one (M2_EC) 16: Wise all-in-one (LM_EC)	2
10090 Enable drive registration (X-axis) 10091 Enable drive registration (Y-axis) 10092 Enable drive registration (Z-axis)	Yes: Enable drive registration function No: Disable the drive registration function	Yes
16000 Drive station address (X-axis) 16001 Drive station address (Y-axis) 16002 Drive station address (Z-axis)	The driver has total of 32-bit station addresses, and the station address setting is controlled by the parameter "Servo Address", see table 3-2 for details.	0~15
16010 Servo address (X-axis) 16011 Servo address (Y-axis) 16012 Servo address (Z-axis)		No

Table 3-2

16010	Yaskawa Drive		Wise Drive	
	16000	Station Address in the Drive	16000	Station Address in the Drive
Yes	Currently not supported	—	Currently not supported	—
	1	51H	1	17
	2	52H	2	18
	……	……	……	……
	15	5FH	15	31
No	0	Invalid	0	Invalid
	1	41H	1	1
	2	42H	2	2
	……	……	……	……
	15	4FH	15	15

3.14.3 Registration Time Reminder

When the software/driver is successfully registered, it starts to limit the normal use time of the system. When the registration time is about to expire or has been used up, the system will give different prompts according to the current state and remaining time (some functions may not be used normally), see table 3-3.

Table 3-3 Registration time reminder

Remaining Time	Prompt Content	Prompt Sign	Prompt Cycle
More than 2 days	No prompt.	-	-
Less than 2 days	Software: The software is about to expire, and the remaining time: X days. Drive: XX axis X hours remaining.	Pop-up dialog box	When the software starts. When the software is running, 1 hour/time.
Expired	Software: The software has expired, please contact the supplier! Drive: XX axis is expired.	Pop-up dialog box	When the software starts. When the software is running, 1 hour/time.
	The software has expired and cannot be machined!	Information bar yellow prompt	When clicking <Program Start> and other buttons to start machining.

In the expired state of the software, commands such as "Program Start", "Select Machining Start", "Breakpoint Resume" and other machining actions cannot be used, but the machine tool is allowed to move manually.

3.15 View Log

Description

The log interface records information such as user operation, warning, and error. Users can query historical operations, system alarms, etc. by viewing logs.

Operation

<System> → <G Log> (open the interface shown in figure 3-27) → <↑> or <↓> or <PgUp> or <PgDn> (view item by item or page by page).

Press the operation button at the bottom of the interface to perform the corresponding operation.

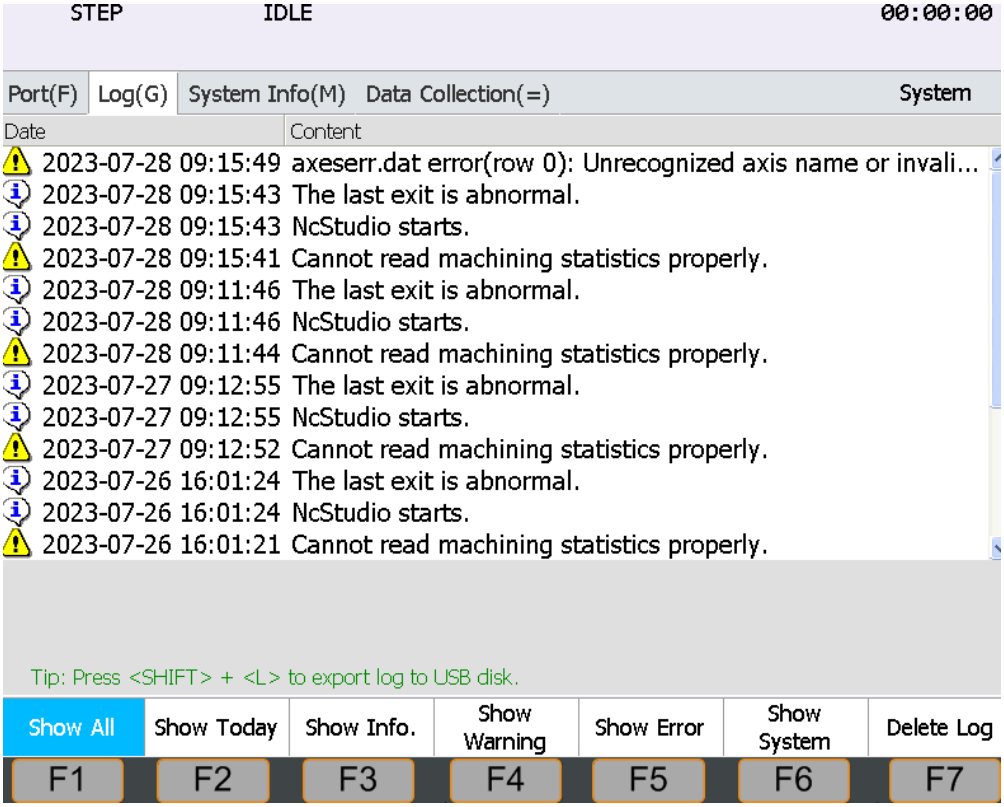


Figure 3-27 Log interface

4 Set Workpiece Coordinate

Set workpiece coordinate includes the following contents: Set workpiece origin, workpiece offset, common offset and tool offset.

Before set workpiece coordinate, you may need to know the knowledge of workpiece coordinate system and extended coordinate system.

4.1 Workpiece Coordinate System

Basic Concept

◆ Workpiece coordinate system

Programmers use the workpiece coordinate system when programming. They select a known point on the workpiece as the origin of the workpiece coordinate system (that is program origin) and establish a new coordinate system called the workpiece coordinate system.

◆ Workpiece origin

The workpiece coordinate system follows the right hand coordinate system. The origin of the workpiece coordinate system (that is the workpiece origin) is determined relative to a point on the workpiece, and it can float relative to the machine coordinate origin. The selection of workpiece origin should meet the conditions of simple programming, simple size conversion, and small machining error.

◆ Workpiece offset

The workpiece offset corresponds to the coordinate systems G54, G55, G56, G57, G58, and G59. The default coordinate system of the system is G54. The relationship between the workpiece offset and the machine coordinate system is shown in figure 4-1.

One or more workpiece offsets can be used in the machining program, as shown in figure 4-2, if three workpieces are installed on the workbench, each workpiece has a workpiece origin corresponding to the G code of the workpiece coordinate system.

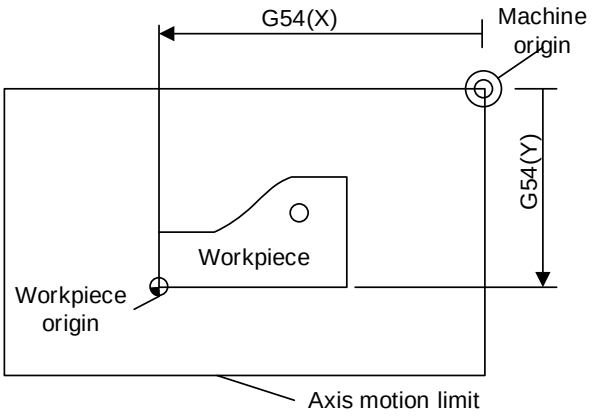


Figure 4-1 The relationship between workpiece offset and machine coordinate system

- Common offset

The public offset is for all coordinate systems and is used to adjust the workpiece origin of the X/Y/Z axis. This value will not change the offset value of G54~G59.

- Workpiece coordinate calculation formula

Workpiece coordinate = machine coordinate - workpiece offset - common offset - tool offset

Example

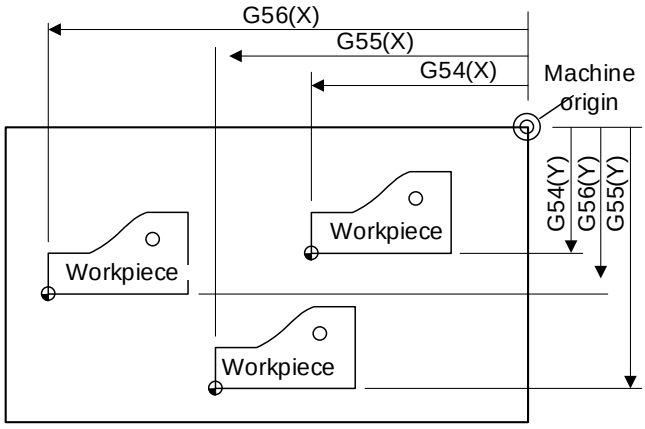


Figure 4-2 Example diagram

Drill a hole on each of the three workpieces in figure 4-2, and the calculation depth is Z-0.14. The specific programming example is as follows:

```
O1801
N1 G20
N2 G17 G40 G80
N3 G90 G54 G00 X5.5 Y3.1 S1000 M03          ′ Use G54
N4 G43 Z0.1 H01 M08
N5 G99 G82 R0.1 Z-0.14 P100 F8.0
N6 G55 X5.5 Y3.1                            ′ Turn to G55
N7 G56 X5.5 Y3.1                            ′ Turn to G56
N8 G80 Z1.0 M09
```

```
N9 G91 G54 G28 Z0 M05                    ′ Turn to G54
N10 M01
…
```

Blocks N3~N5 are related to the first workpiece and are in the G54 workpiece coordinate system.

Block N6 will drill the hole for the second part in the same installation in the G55 part coordinate system.

Block N7 will drill the third hole in the same installation in the G56 work coordinate system.

4.2 Extended Coordinate System

Description

The system provides 20 extended coordinate systems, making the total number of coordinate systems reach 26 (6+20). If the number of workpieces to be clamped at one time exceeds 6, the extended coordinate system can be used.

The system temporarily supports the extension of G54. In the coordinate management interface, press <PgUp> or <PgDn> to view the extended coordinate system.

Example

When programming, use the G54 Px (x: 0~19) command to select the extended coordinate system. Such as:

G54 P0	Select extended coordinate system 1
G54 P1	Select extended coordinate system 2
G54 P2	Select extended coordinate system 3
G54 Px	Select extended coordinate system (x+1)
G54 P19	Select extended coordinate system 20

4.3 Set Workpiece Origin

4.3.1 Centering

Description

Centering can be used to determine the workpiece origin of regular workpiece (regular rectangle/circle) and set workpiece offset.

NK280B supports two centering methods: a) Two points centering; b) Circle three points centering. The operations of the two methods are similar. For details, please refer to the description of the operation steps in this interface.

This section takes "Two Points Centering" as an example for introduction.

Related Parameter

Parameter	Description	Set Value
20005 Spinde speed abnormal detection delay	The spindle speed should be consistent with the setting value of the inverter when centering.	500

Two Points Centering Operation

<Handwheel> → <Advanced> → <G Centering> → <T Two Points> (open the interface shown in figure 4-3).

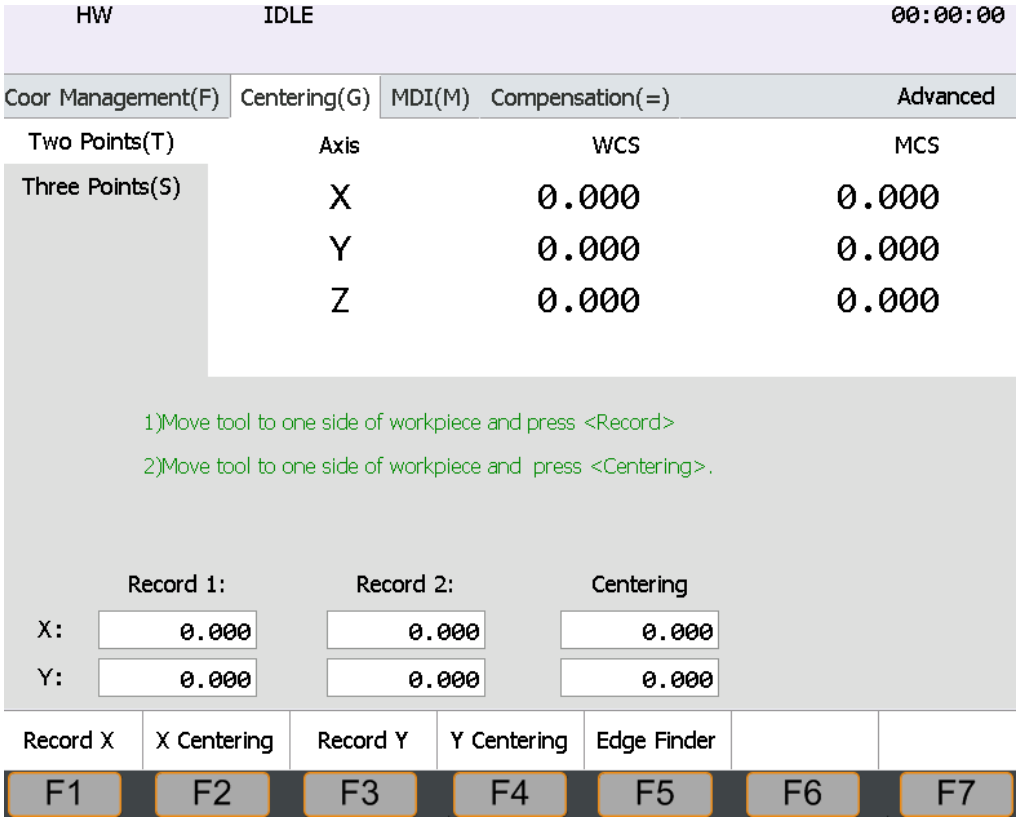


Figure 4-3 Two points centering

Take the X-axis as an example:

1	Move the tool to one side of the workpiece, press <F1 Record X>, and the software will record the machine coordinate of the current point.
2	Move the tool to the other side of the workpiece, press <F2 X Centering>. The software calculates the midpoint coordinate based on the current position coordinate and the recorded value of the first step, and sets it as the workpiece

	origin.

Caution

1. When an axis is centered, the other coordinate axes must remain still.
2. Turn on the centering rod for precise positioning. The spindle speed is the set value of the parameter "20005 Spinde Speed Abnormal Detection Delay". It is recommended that this value should not be too large.
3. When the centering rod is not turned on, the parameter "20005 Spinde Speed Abnormal Detection Delay" is invalid. Press <Spindle Forward> or <Spindle Reverse> to start the spindle, and the spindle speed is the speed set in the software or the spindle speed set in the program file.

4.3.2 Clear

Description

Through the clear operation, the machine coordinate value of each axis can be set to the corresponding workpiece offset value, and the machine coordinate of each axis keep unchanged.

Operation

Clear only works in auto or manual mode, please press <Auto> or <Jog> or <Handwheel> first. The following steps will be described in auto mode.

<State> →<F Coor-Auto> →<F6 Clear> (open the clear interface as shown in figure 4-4).

Press the corresponding operation button as needed to clear each axis.

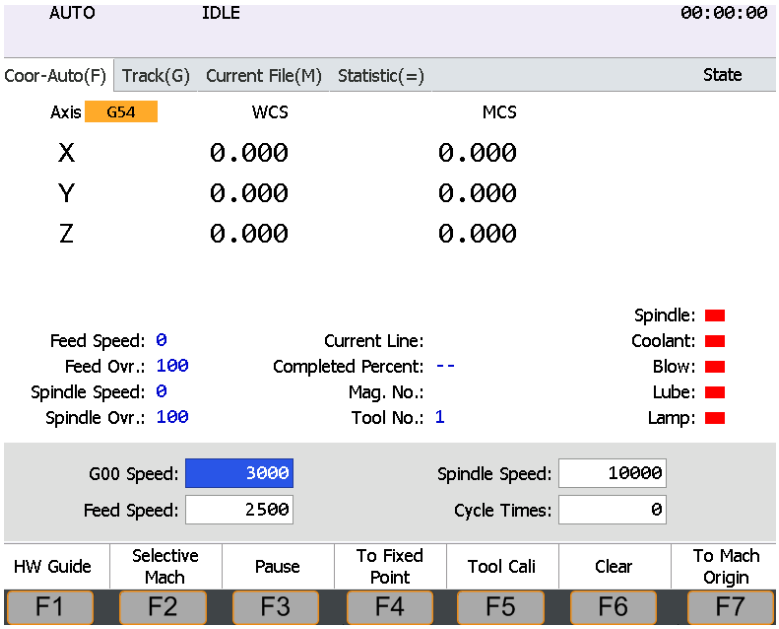


Figure 4-4 Clear

4.4 Set Workpiece Offset & Common Offset

Operation

1. <Advanced> → <F Coor Management> (open the interface shown in figure 4-5).
2. <→>, <←>, <PgUp>, <PgDn> (select coordinate system) → <F1 Select WCS> (the current coordinate system is displayed to the right of "Axes" with an orange background).
3. <↑>, <↓> (select the setup box on workpiece offset or common offset) → <Enter> (modify the offset value in the pop-up dialog box) → <F6 OK> or <Enter>.

   Modifying the Z-axis public offset can also be done through the following operations:

   <F7 Deepen Lift> → <Select Distance> (adjusted changes are shown in the “Z Lift and Distance Dis”) → <Deepen> or <Lift> (adjusted changes are shown in the “Public Offset of Z-axis”).

The workpiece offset and common offset setting results of each axis are directly displayed in the "WCS" column.

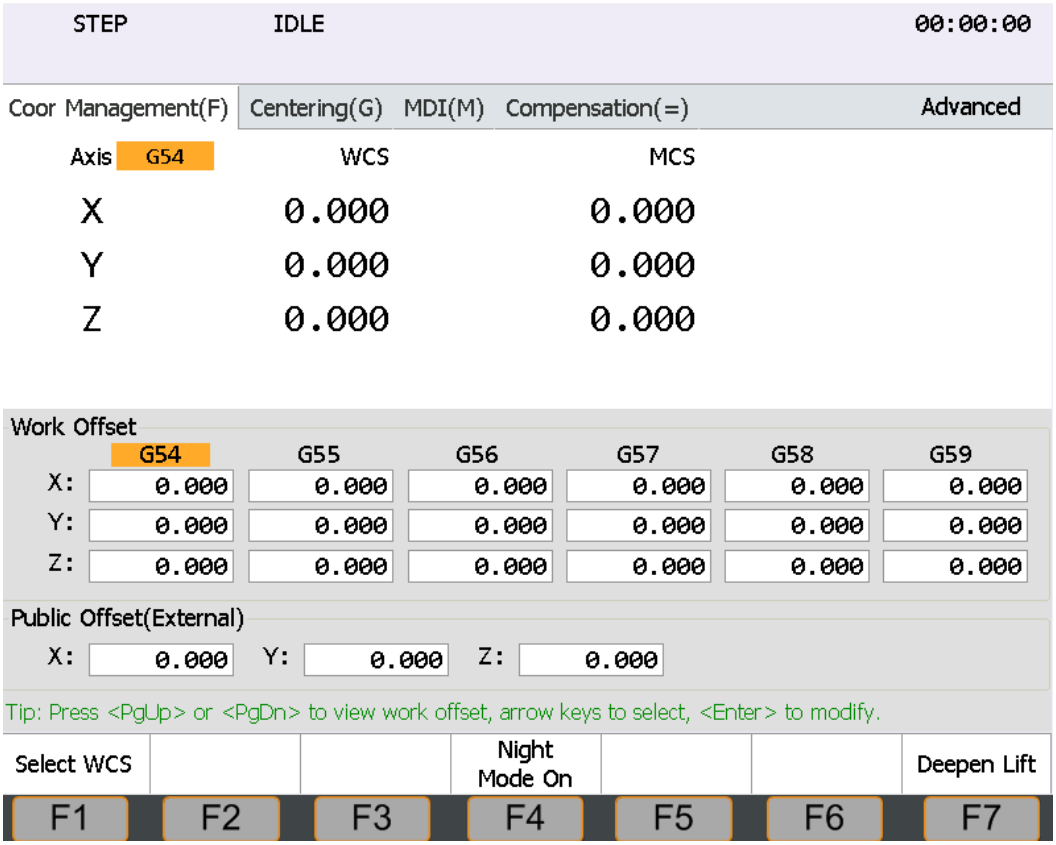


Figure 4-5 Coordinate management interface

4.5 Set Tool Offset

Description

The user can set the tool offset through "Tool Calibration", and then establish the specific position of the workpiece coordinate system in the machine tool coordinate system.

Traditional tool calibration is realized through the tool calibration presetter. The electrical wiring of the tool calibration presetter is shown in figure 4-6, and the schematic diagram of the tool calibration presetter is shown in figure 4-7. There are corresponding ports on the controller to connect with the CUT and COM ports of the tool calibration presetter. Ports such as "Overtravel Protection" can be added on the controller according to customer needs.

Tool calibration methods: a) Fixed tool calibration; b) First/second tool calibration; c) Floating tool calibration. NK280B does not support floating tool calibration for now.

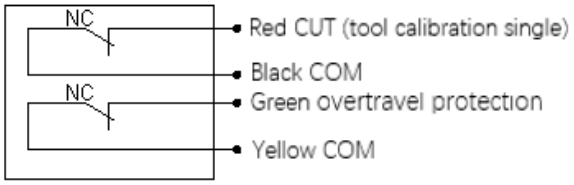


Figure 4-6 Electrical wiring diagram of tool calibration presetter

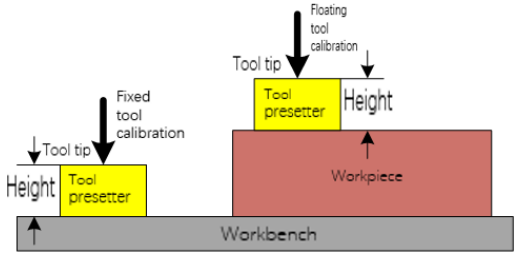


Figure 4-7 Schematic diagram of tool calibration presetter

Related Parameter

Parameter	Description	Set Value
11000 Enable encoder feedback	Yes: Enable the encoder feedback function (system use the tool calibration method with encoder). No: Disable the encoder feedback function (system use the traditional tool calibration method).	Set according to the actual situation
79102 Cali mode	1: Auto measurement mode (that is, fixed tool calibration) 2: First and exchange cali mode	
75002 Fine positioning times in tool calibration	The times of fine positioning when tool approaches the surface of tool sensor.	
75003 Coarse positioning speed in tool calibration	The speed that the tool touches the surface of tool sensor for the first time.	
75020 Max cali tolerance	The maximum tolerance of tool	

Parameter	Description	Set Value
	calibration.	
75100 Tool sensor thickness	The height of the tool calibration presetter surface relative to the workbench surface.	
75210 Fixed presetter position (X-axis)） 75211 Fixed presetter position (Y-axis)） 75212 Fixed presetter position (Z-axis)）	Set the position of the fixed tool calibration presetter.	

4.5.1 Fixed Tool Calibration

Description

Fixed tool calibration refers to the tool calibration operation in a fixed position of the machine tool.

During the machining process, after the tool is replaced due to tool breakage or other reasons, the length of the tool and the clamp position change. The user can redetermine the tool length offset by fixed tool calibration. Fixed tool calibration is used in multi-tool mode, commonly used in machines with tool magazines.

Principle

The schematic diagram of the fixed tool calibration process is shown in figure 4- 8 and figure 4-9.

The fixed tool calibration process records the machine coordinate value when the tool tip touch the tool calibration presetter surface, and set this machine coordinate value into the tool offset, as shown in figure 4-10.

Tool offset = machine coordinate

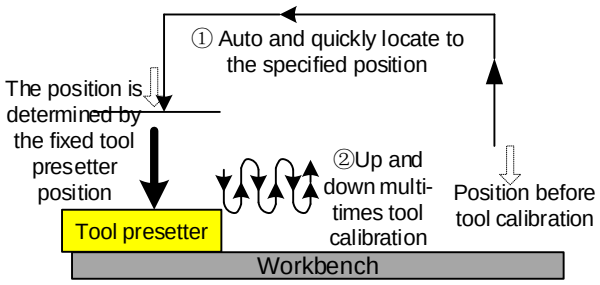


Figure 4-8 Fixed tool calibration process without encoder feedback function

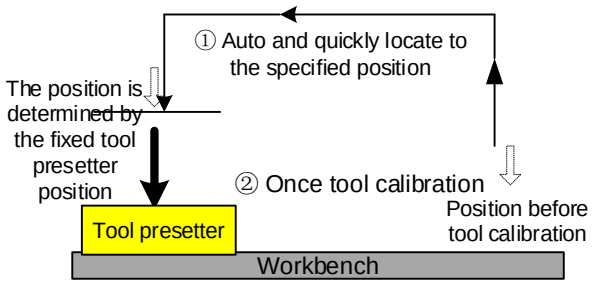


Figure 4-9 Fixed tool calibration process with encoder feedback function

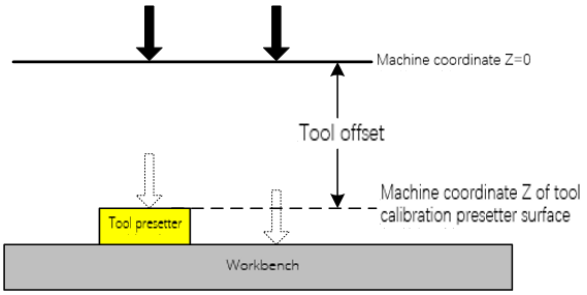


Figure 4-10 Tool offset diagram

Operation

Confirm that the parameter "79102 Cali mode" is set to 1.

Tool calibration is only performed in auto or manual mode, please press <Auto> or <Jog> or <Handwheel> first. The following steps will be described in auto mode.

1. <F Coor-Auto> →<F5 Tool Cali> (open the interface shown in figure 4-11).
2. According to tool number selection tool.
3. When there is a tool calibration presetter, press <F1 Auto Cali>; when there is no tool calibration presetter, you can press <F2 Set Tool Length> to manually set the tool offset Z.
4. Record the tool offset value.
5. Do step 3 and 4 for each tool.
6. Select any tool to move to the workpiece surface for clear.

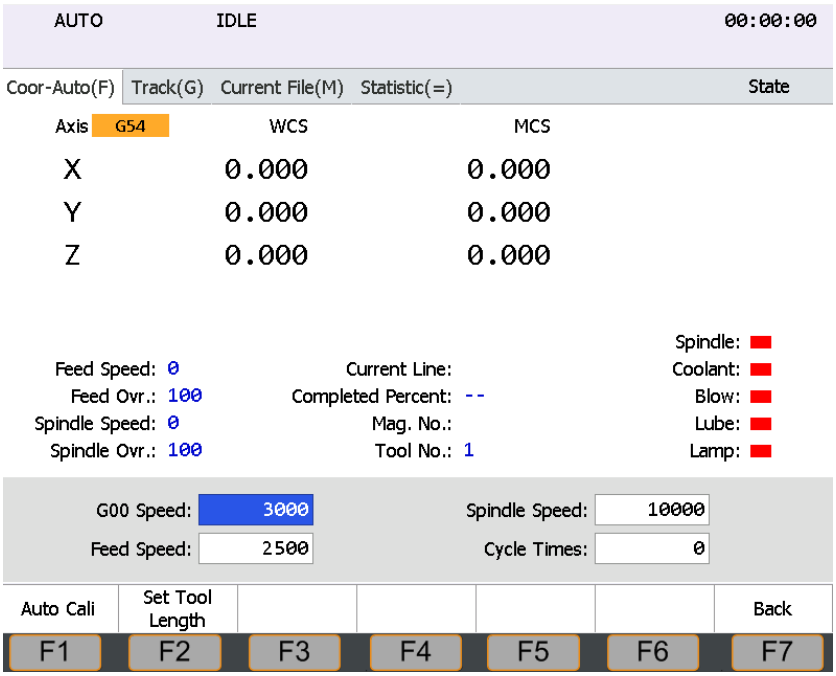


Figure 4-11 Fixed tool calibration

Caution

The fixed tool calibration operation must be performed first, and then the tool tip is moved to the workpiece surface to perform Z-axis clear.

4.5.2 First Time/Tool Calibration after Tool Change

Description

In this tool calibration method, the "Tool Difference" value is compensated to the workpiece offset.

Operation

Confirm that the parameter "79102 Cali mode" is set to 2.

Tool calibration is only performed in auto or manual mode, please press <Auto> or <Jog> or <Handwheel> first. The following steps will be described in auto mode.

1. <F Coor-Auto> →<F5 Tool Cali> (open the interface shown in figure 4-12).

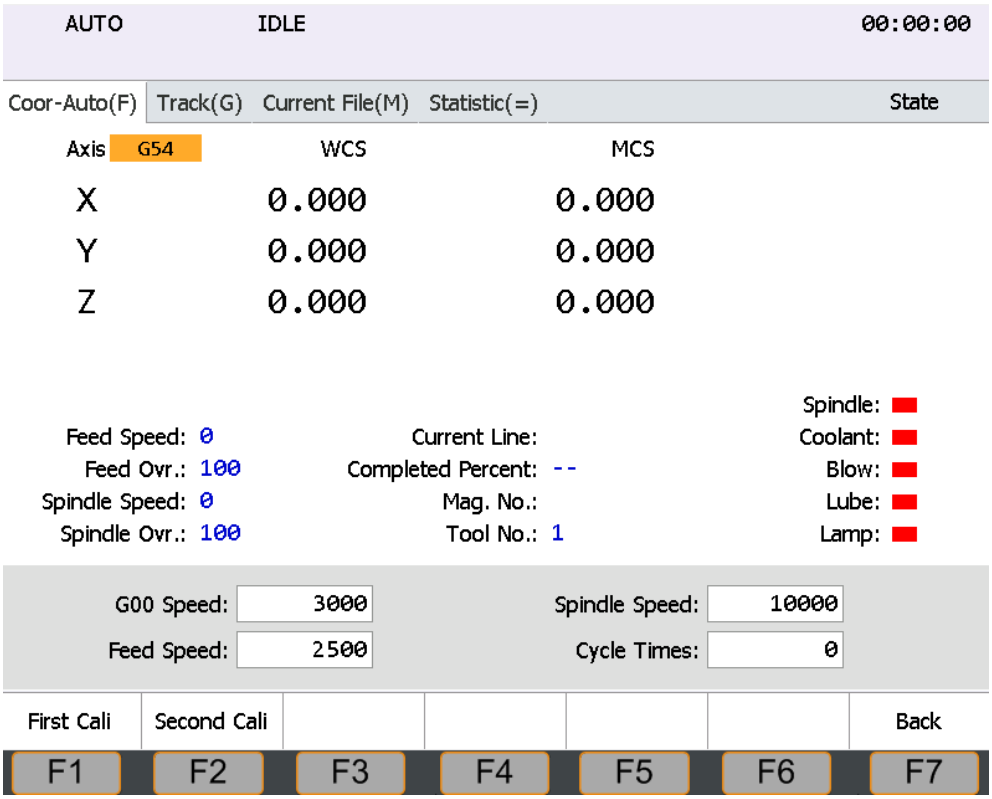


Figure 4-12 First/second tool calibration

2. Manually move the Z-axis to the workpiece surface, and determine the workpiece origin by manually clear.

3. Press <F1 First Cali> for the first tool calibration, and the system will automatically record the Z-axis machine coordinate value at this time.

   The first time tool calibration process is shown in figure 4-13.

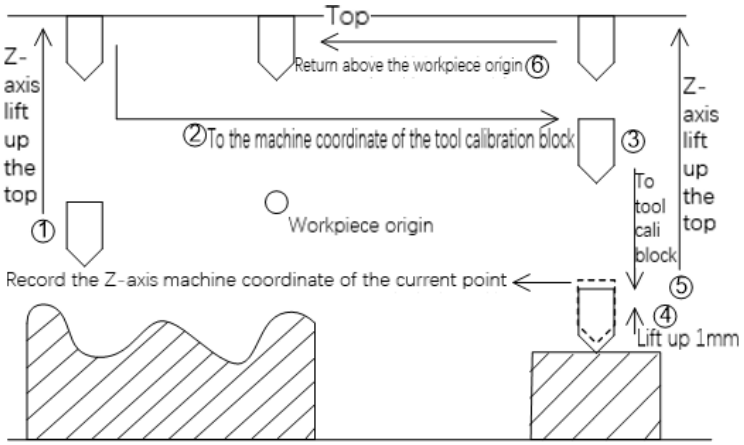


Figure 4-13 First time tool calibration diagram

4. After the first tool calibration is completed, workpiece machining is performed.

5. After tool change or tool breakage, press <F2 Second Cali> to perform tool calibration after tool change, and restore the Z-axis workpiece coordinate value at the current point.

   The second tool calibration process is shown in figure 4-14.

6. After tool calibration is completed, workpiece machining is performed.

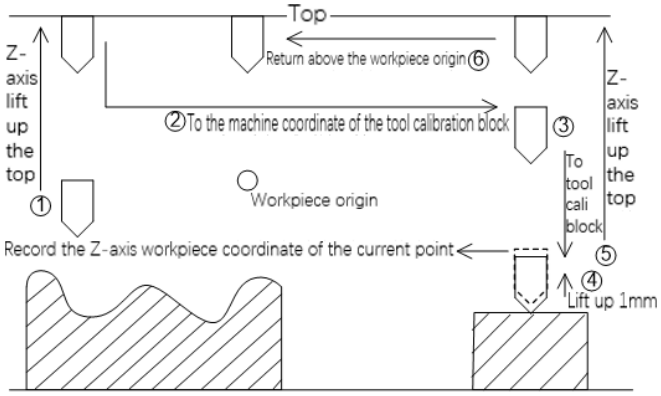


Figure 4-14 Second time tool calibration diagram

Caution

After the first time tool calibration is performed, the tool calibration after tool change can be performed.

5 Enable Bus Function

When the bus function is enabled, the main operations include: Set the drive station address, set control system parameter, set drive parameter, and auto adjustment.

5.1 Set the Drive Station Address

Description

Set the drive station address can realize the normal transmission of information among the control system, Lambda controller, and drive.

Please refer to section 5.1.1 for Yaskawa drive station address setting, and section 5.1.2 for WISE drive station address setting.

5.1.1 Yaskawa Drive

Operation

The station address of Yaskawa bus drive is set through the combination of rotary switch (S2) and toggle switch (S3).

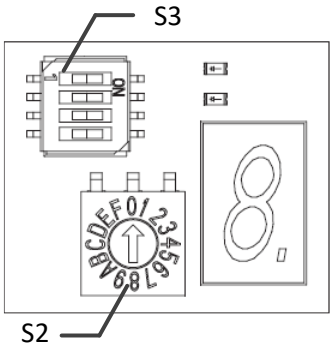


Figure 5-1 Yaskawa drive switch

1. Set S3: To use the bus function, you only need to modify the No. 3 switch, and use the factory settings for the rest. Please refer to table 5-1 for S3 switch description.
2. Set S2: Rotate S2 to the desired setting value, please refer to Table 5-2 for the actual station address.
3. After change the setting, please restart the driver to make the setting take effect.

Caution

1. In the same control system, the address number of each drive station is set uniquely and cannot be repeated.
2. The drive station address setting is controlled by the control system parameter "Drive Station Address Setting Switch". For details, please refer to "Drive Station Address" in section 0 "Parameter Setting Instruction".

Table 5-1 S3 Switch Setting Instruction

Switch No.	Function	Setting Instruction	Factory Setting
1	Communication speed setting	OFF: 4Mbps（M1）	ON
		ON : 10Mbps（M2）	
2	Setting the number of bytes to transfer	OFF: 17 bytes	ON
		ON : 32 bytes	
3	Station address setting	OFF: Actual address =40H+S2	OFF
		ON : Actual address =50H+S2	
4	System reservation (unchangeable)	OFF	OFF

Table 5-2 S2 Switch Setting Instruction

No. 3 of S3	S2	Station Address
OFF	0	Invalid
OFF	1	41H
OFF	2	42H
OFF	3	43H
OFF	4	44H
OFF	5	45H
OFF	6	46H
OFF	7	47H
OFF	8	48H
OFF	9	49H
OFF	A	4AH
OFF	B	4BH
OFF	C	4CH
OFF	D	4DH
OFF	E	4EH
OFF	F	4FH

No. 3 of S3	S2	Station Address
ON	0	50H
ON	1	51H
ON	2	52H
ON	3	53H
ON	4	54H
ON	5	55H
ON	6	56H
ON	7	57H
ON	8	58H
ON	9	59H
ON	A	5AH
ON	B	5BH
ON	C	5CH
ON	D	5DH
ON	E	5EH
ON	F	5FH

5.1.2 Wise Drive

Operation

The Wise drive station address setting is realized through the front panel of the drive.

1. Set the parameter "Pr001 Control Mode Setting" to "1 Position Control Mode", see figure 5-2.
2. Set the station address number, see figure 5-3.
3. After modify is successful, please restart the drive.

Caution

1. It is recommended to set the station address number in sequence (for example, X-axis: 1; Y-axis: 2; Z-axis: 3...).
2. When the station address number is set to 0, it means that the communication function is not enabled.
3. The drive station address setting is controlled by the control system parameter "Drive Station Address Setting Switch". For details, please refer to "Drive Station Address" in section 5.2 "Parameter Setting Instruction".
4. In the same control system, each drive station address number setting is unique and cannot be repeated.

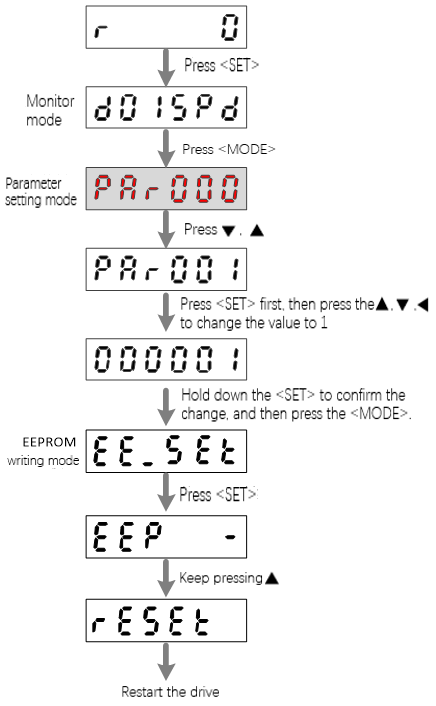


Figure 5-2 Set "Pr001"

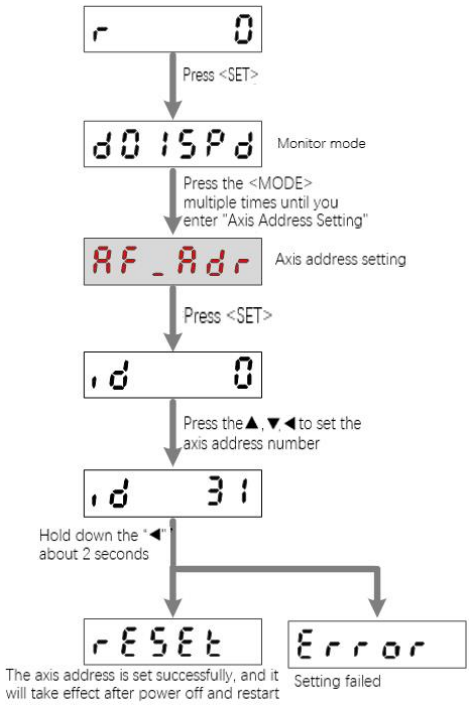


Figure 5-3 Set station address number

5.2 Set Control System Parameter

Related Parameter

Parameter	Description	Set Value
11400 Control system type	0: Non-bus control system 1: Bus control system	1
11000 Enable encoder feedback	Whether to enable the encoder feedback function.	Yes
11001 Encoder type	0: Incremental encoder 1: Absolute encoder	1
16050 Default servo type	-1: Auto identification 0: Yaskawa Σ5 1: Yaskawa Σ7 2: Wise 3: Panasonic A5 4: Panasonic A6 5: Mitsubishi J4 6: Yaskawa Σ7M3 7: Inovance EtherCAT 8: HiTronic 9: Schneider 10: V&T 14: Wise all-in-one (M3_EC) 15: Wise all-in-one (M2_EC) 16: Wise all-in-one (LM_EC)	-1
16000 Drive station address (X-axis) 16001 Drive station address (Y-axis) 16002 Drive station address (Z-axis)	It is consistent with the drive station address rotary switch setting. 0 is an invalid address.	X: 1 Y: 2 Z: 3
16010 Servo address (X-axis) 16011 Servo address (Y-axis) 16012 Servo address (Z-axis)	It is consistent with the drive station address setting. Yes: ON No: OFF	No
16020 Encoder digit (X-axis) 16021 Encoder digit (Y-axis) 16022 Encoder digit (Z-axis)	Servo motor encoder digits.	24
16030 Electronic gear ratio numerator (X-axis) 16031 Electronic gear ratio numerator (Y-axis) 16032 Electronic gear ratio numerator	It is consistent with the setting of the drive electronic gear ratio numerator.	1

Parameter	Description	Set Value
(Z-axis)		
16040 Electronic gear ratio denominator (X-axis) 16041 Electronic gear ratio denominator (Y-axis) 16042 Electronic gear ratio denominator (Z-axis)	It is consistent with the setting of the drive electronic gear ratio denominator.	1
10000 Axis direction (X-axis) 10001 Axis direction (Y-axis) 10002 Axis direction (Z-axis)	The motion direction of the feed axis.	—
11200 Motor Rotate Mode (X-axis) 11201 Motor Rotate Mode (Y-axis) 11202 Motor Rotate Mode (Z-axis)	1: Take CW as the forward direction -1: Take CCW as the forward direction. It is controlled by the drive parameter "Motor Rotation Direction". If the motor takes CW as the forward direction, then this parameter is set to 1.	—
10010 Pulse equivalent (X-axis) 10011 Pulse equivalent (Y-axis) 10012 Pulse equivalent (Z-axis)	Control the displacement or angle generated by the pulse on the feed axis.	—
74091 Screw pitch (X-axis) 74092 Screw pitch (Y-axis) 74093 Screw pitch (Z-axis)	The displacement or angle generated on each axis when the lead screw rotates per circle.	

Parameter Setting Instruction

Encoder digits	According to the servo motor encoder digits used by each axis, set it.
Drive type	According to the drive brand used by each axis, set it. The types of drivers used for each axis can be different (for example, the X-axis is Yaskawa driver, the Y-axis is Wise driver), but the Y1/Y2 axis of the double Y configuration software and the Z1/Z2 axis of the multi Z-axis software (or Z1/Z2/Z3/Z4 axis) must use the same type of drive and encoder.

<table>
<tr><td>Drivie station address</td><td>The drive has total of 32-bit station addresses, and the station address setting is controlled by parameter "16010 Servo address (X-axis)" ~ "16012 Servo address (Z-axis)", as follows:
<table>
<tr><td>16010 ～ 16012</td><td>16000 ～ 16002</td><td>Station address in Yaskawa driver</td><td>Station address in Wise driver</td></tr>
<tr><td rowspan="5">Yes</td><td>Currently not supported</td><td>—</td><td>—</td></tr>
<tr><td>1</td><td>51H</td><td>17</td></tr>
<tr><td>2</td><td>52H</td><td>18</td></tr>
<tr><td>……</td><td>……</td><td>……</td></tr>
<tr><td>15</td><td>5FH</td><td>31</td></tr>
<tr><td rowspan="5">No</td><td>0</td><td>Invalid</td><td>Invalid</td></tr>
<tr><td>1</td><td>41H</td><td>1</td></tr>
<tr><td>2</td><td>42H</td><td>2</td></tr>
<tr><td>……</td><td>……</td><td>……</td></tr>
<tr><td>15</td><td>4FH</td><td>15</td></tr>
</table></td></tr>
<tr><td>Electronic gear ratio</td><td>The default electronic gear ratio in the system parameters is 1:1. User can set the electronic gear ratio and other parameters according to actual needs, but it is necessary to ensure that the electronic gear ratio of the control system is consistent with the electronic gear ratio of the corresponding drive.</td></tr>
<tr><td>Motor rotation mode</td><td>This parameter is valid only for absolute encoders, and must be consistent with the drive parameter "Pr000 Rotation direction" setting.
For example, if the drive parameter Pr001 is set to 0 (when the forward command is used, the motor rotates in the CW direction), then the software parameters "11200 Motor rotate mode (X-axis)" ~ "11202 Motor rotate mode (Y-axis)" should be set to 1.</td></tr>
<tr><td>Pulse equivalent</td><td>Set according to the following formula:
$\text{Pulse equivalent} = \frac{\text{electronic gear ratio} \times \text{pitch}}{\text{encoder resolution} \times \text{mechanical reduction ratio}}$</td></tr>
</table>

Operation

Parameter setting operation, see section 3.3.

5.3 Set Drive Parameter

Related Parameter

The parameter setting of different brands drives is different, please set it in the following table.

Table 5-3 Drive related parameters

Drive	Parameter	Description	Set Value
Yaskawa	Pn000 Function selection basic switch 0	Rotation direction selection. 0000: Take the CCW direction as the forward direction. 0001: Take the CW direction as the forward direction.	0000
	Pn20E Electronic gear ratio (numerator)	—	64
	Pn210 Electronic gear ratio (denominator)	—	1
	Pn212 Encoder frequency division pulse number		2048
Wise	Pr000 Rotation direction setting	0: For forward command, the motor rotation direction is CW direction. 1: For forward command, the motor rotation direction is CCW direction.	—
	Pr008 Command pulse counts per one motor revolution	—	—
	Pr009 1st command division and multiplication numerator	—	1
	Pr010 1st command division and multiplication denominator	—	1
	Pr011 Output pulse counts per one motor revolution	—	—
	Pr015 Absolute encoder setting	0: Use as an absolute encoder 1: Use as an incremental encoder 2: Used as an absolute encoder, ignoring counter overflow for multiple revolutions	0

Parameter Setting Instruction

Pr000 Rotation direction setting	It is the same as NK280B parameter "11200 Motor rotate mode (X-axis)" ~ "11202 Motor rotate mode (Y-axis)" setting. This parameter can be set bidirectionally, that is, keep the control system parameters unchanged and set the drive parameters, or keep the drive parameters unchanged and set the control system parameters.
Pr008 Command pulse counts per one motor revolution	Set according to the following formula: $\mathrm{Pr}\,008=\frac{\text{pitch}}{\text{pulse equivalent}}$
Pr011 Output pulse counts per one motor revolution	Set according to the following formula: $\mathrm{Pr}\,011=\frac{\text{PG divide ratio (X4)}}{4}$ For example, if the PG divide ratio (X4) is set to 10000, then the parameter Pr011 is set to 2500; otherwise, the driver parameter Pr011 remains unchanged, and the PG divide ratio (X4) of the control system is set according to the above formula.
Pr009 1st command division and multiplication numerator Pr010 1st command division and multiplication denominator	The setting of Pr009 and NK280B parameter "16030~16032 Electronic gear ratio (numerator)" are consistent. The setting of Pr010 and NK280B parameter "16040～16042 Electronic gear ratio (denominator)" are consistent.
Pr015 Absolute encoder setting	Set according to NK280B parameter "11001 Encoder type". • If 11001 is set to 0 (incremental), then Pr015 is set to 1 (for incremental encoder). • If 11001 is set to 1 (absolute), then Pr015 is set to 0 (for absolute encoder).

Operation

1. <Parameter> → <= Drive Param> (open the interface shown in figure 5-4).
2. < ↑ >, < ↓ > select parameter; <→>, <←> select axis. (The types of drivers matched with different axes are different, and the parameters are also different)
3. <Enter>, modify the parameter value in the pop-up dialog box.

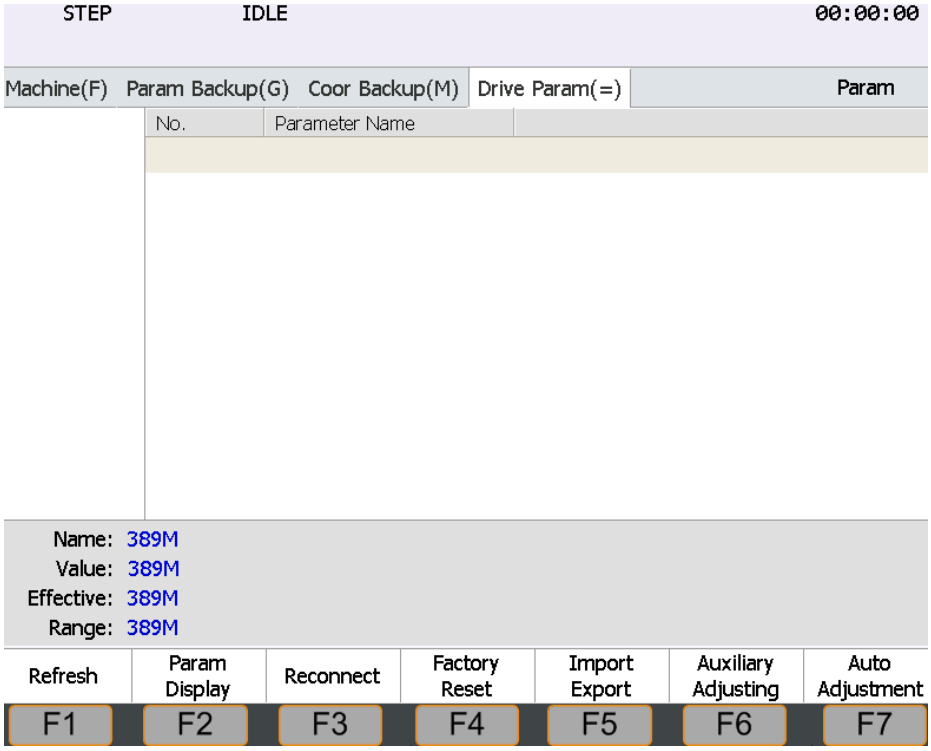


Figure 5-4 Drive parameter setting

Wise drive display all parameters; Yaskawa drive only display some parameters, if you need to add, you can press <F5 Import Export> → <F1 Import Servo Param>.

5.4 Auto Adjustment

Description

Auto adjustment refers to automatically adjust the servo gain of the servo unit according to the current machine status to optimize the responsiveness.

The auto adjustment process is different because of the driver type, see section 5.4.1 for the Yaskawa drive, and section 5.4.2 for the Wise drive.

NK280B auto adjustment is carried out separately according to the axis (that is, the automatic adjustment of X, Y, and Z axes is carried out separately). After the adjustment of an axis is completed, the adjustment operation of the next axis is performed.

5.4.1 Yaskawa Drive

Before Auto Adjustment

Before performing auto adjustment, please confirm the following:

- The main circuit power supply is ON

- No overtravel
- Gain switching selection switch must be manual gain switching (Pn139=n.□□□0)
- No motor test function selection must be invalid (Pn00C=n.□□□0)
- Alarm and warning that cannot be produced
- Hardware base block (HWBB) function must be invalid
- The writing prohibition setting of the parameter must not be set to "Prohibit Writing" (Fn010= n.□□□0)
- The free adjustment function must be set to invalid (Pn170=n.□□□0)

Adjustment Operation

Please press <F7 Auto Adjustment>, after open the auto adjustment window, please do the following steps.

◆ The first step: set axis and moving range

1. Press <T> to select the adjustment axis.
2. Manually move the axis to safe position, press <F5> to set the first limit; then move the axis to another safe position, press <F6> to set the second limit.

   When the auto adjustment start, the axis should be at the second limit, please do not move the machine tool after set the second limit, otherwise, you need to reset the second limit.
3. Press <F4> to next step.

◆ The second step: select the options

Press <S> or <P> to set the mechanism type and mode. (See table 5-4)

Table 5-4 Mechanism type and mode description

Setting Item	Specific Content	Description
Mechanism selection	Rigid system	Applicable to rigid systems and other mechanisms with high rigidity
	Belt	Applicable to less rigidity mechanisms such as belts
	Ball screw	Applicable to high rigidity mechanisms such as ball screw or linear servo motor

Setting Item	Specific Content	Description
Mode selection	Standard	Make standard gain adjustments. Expect for gain adjustment. It also automatically adjust the notch filter, A-type vibration suppression.
	Positioning	Used to perform positioning purpose specific adjustment. Expect for gain adjustment, it also automatically adjust the model track control, notch filter, A-type vibration suppression and vibration suppression.
	Enhance overshoot suppression	Adjustment not to overshoot for positioning purposes. Expect for gain adjustment. It also automatically adjust the notch filter, A-type vibration suppression and vibration suppression.

◆ The third step: make gain adjustment

Press <F1 Start>, and start inertia estimation after confirming that the information is correct; press <F2 Stop> during machine adjustment to stop estimation.

◆ The fourth step: complete adjustment

After adjustment is completed, the gain adjustment result is displayed in the area below the "Third Step".

Follow steps 1 to 4 to perform auto adjustment on each axis in turn; after the adjustment is complete, please restart the drive.

Generally, each axis needs to be adjusted 2 to 3 times (directly press <F1 Start Adjustment> to perform multiple adjustment operations on the same axis). If there is not much difference between the two adjustment results before and after, the auto adjustment can be ended; if the result deviation is still large after adjustment 5 times, please manually adjust the driver parameters.

Adjustment Failed

If adjustment failed, you can query and solve it according to the following table.

Phenomenon or Reason	Solution
Adjustment command return exception	Retry

Phenomenon or Reason	Solution
Tuning failed	• Expand positioning completion range (Pn522) • Adjust the speed loop gain (if the machine vibrates, Adjust the speed loop gain (if the machine tool vibrates, adjust it to a smaller value)
Poor movement	• Make sure the drive has no alarms, warnings • Make sure the main circuit power of the drive is ON • Make sure that the drive has no overshoot (if overshoot occurs, please reduce the gain of the position loop) • Make sure handware base block invalid
Interrupted by exception	Retry
Poor inertia calculation	Double the setting value of inertia ratio calculation start value (Pn324)

5.4.2 Wise Drive

Before Auto Adjustment

Before performing auto adjustment, please confirm the following items:

- The main circuit power supply is ON
- No overtravel
- Alarms and warnings not occur
- The driver station address is consistent with the control system software setting

Adjustment Operation

Please press <F7 Auto Adjustment>, after open the auto adjustment window, please do the following steps.

◆ The first step: set axis and moving range

1. Press <T> to select the adjustment axis.
2. Manually move the axis to safe position, press <F5> to set the first limit; then move the axis to another safe position, press <F6> to set the second limit.

   The auto adjustment should be at the second limit at the beginning, please do not move the machine tool after setting the second limit, otherwise, the second limit needs to be reset.
3. Press <F4> to next step.

◆ The second step: select the options

Press <S> or <P> to set the initial mode and initial rigidity. See table 5-5.

Table 5-5 Initial mode and initial rigidity description

<table>
<tr><th>Setting Item</th><th>Specific Content</th><th>Remark</th></tr>
<tr><td rowspan="4">Initial mode</td><td>1: Standard (track control, large load changes)</td><td>Basic mode (emphasis on stability). Variable load and friction compensation are not performed, gain switching is also not used.</td></tr>
<tr><td>2: Positioning (small friction)</td><td>Focus on the positioning mode. There is no variable load such as horizontal axis, and friction is also recommended for machines such as small ball screw drives.</td></tr>
<tr><td>3: Vertical axis (large variable load)</td><td>Expect for positioning mode. It also compensates for variable loads on the vertical axis, etc., making it easy to suppress deviation in positioning stabilization time.</td></tr>
<tr><td>4: Friction compensation (load with large dynamic friction)</td><td>Except for vertical axis mode, the positioning stability time is also shortened by using the one with high friction belt drive shaft, etc.</td></tr>
<tr><td>Initial rigidity</td><td>0: Very low
4: Low
8: Slightly lower
11: Standard (belt drive)
14: Standard (ball screw)</td><td>The rigidity ranges corresponding to different mechanical structures are shown in the following table, users can refer to the table for setting.
<table>
<tr><th>Machine Mechanism</th><th>Rigid Setting</th></tr>
<tr><td>Large carrier and transmission equipment</td><td>0～13</td></tr>
<tr><td>Belt drive mechanism</td><td>5～16</td></tr>
<tr><td>Manipulator</td><td>10～20</td></tr>
<tr><td>Ball screw+belt drive</td><td>13～25</td></tr>
<tr><td>Directly connected ball screw or high rigidity mechanism</td><td>18～31</td></tr>
</table>
</td></tr>
</table>

◆ The third step: inertia estimation

1. Press <F1 Start>, and start inertia estimation after confirming that the information is correct; press <F2 Stop> during machine adjustment to stop estimation.

2. Press <F4 Next> to enter the "Rigidity Setting" interface.

◆ The fourth step: set rigidity

For the fourth step, please refer to figure 5-8, and the setting instructions are as follows.

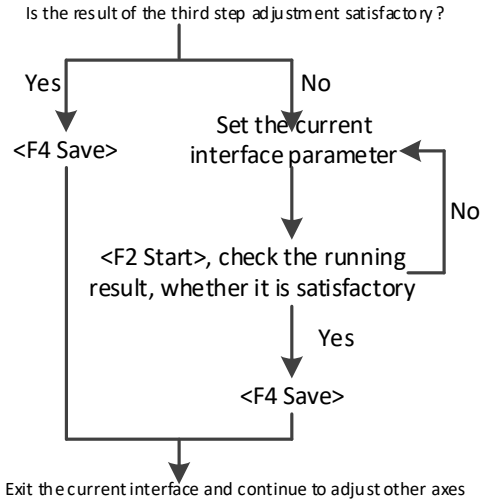


Figure 5-5 Rigid setting operation

- When the "Mode" setting is not 0, you can manually modify the "Rigidity Value". At this time, the parameter in ② will change, please press <F1 Refresh> to read the latest parameter value. (At this time, the parameters in ② cannot be changed manually, and the parameters in ③ can be changed manually)
- When the “Mode” is set to 0, the “Rigidity Value” cannot be modified manually, but the parameters in ② and ③ can be modified.
- When the "Filter Mode" is set to 1/2/3 and the motor is running, the resonance frequency needs to be refreshed in real time. (See table 5-6 for filter mode setting instruction)

Table 5-6 Filter mode setting instruction

0: Invalid	Adaptive filter is invalid. The 3rd and 4th notch filter related parameters keep the current value.
1: One valid	An adaptive filter becomes active. The parameters related to the 3rd notch filter are updated according to the adaptation result.
2: Two valid	Two adaptive filters become active. The parameters related to the 3rd notch filter are updated according to the adaptation result. The fourth notch filter parameter can set according to the second resonance point.
3: Resonance test	Test resonance frequency. The 3rd and 4th notch filter related parameters keep the current value.
4: Clear results	The related parameters of the 3rd and 4th notch filters are invalid, and the adaptation results are cleared.

Follow steps 1 to 4 to perform auto adjustment for each axis in turn; after adjustment is complete, please restart the drive.

Adjustment Failed

If adjustment failed, please refer to the following table for query and solution.

Phenomenon or Reason	Solution
Adjustment command return exception	Retry
Poor movement	• Make sure the drive has no alarms or warnings • Make sure the main circuit power of the drive is ON • Make sure that the drive has no overshoot (if overshoot occurs, adjust the position loop gain to a small value) • Make sure the station address is set correctly
Interrupted due to exception	Retry

6 Hypervisor File

This chapter mainly introduce the operations related to program files.

6.1 Manage Local/USB Program

Description

Local program and USB program have the same operation in the "Program" menu. This section use local program as an example to introduce.

Operation

1. <Program> → <F Local> (pop-up interface shown in figure 6-1).
2. After clicking < ↑ >, < ↓ > to select a file, press <F1> ~ <F7> to perform corresponding operations on the selected program.

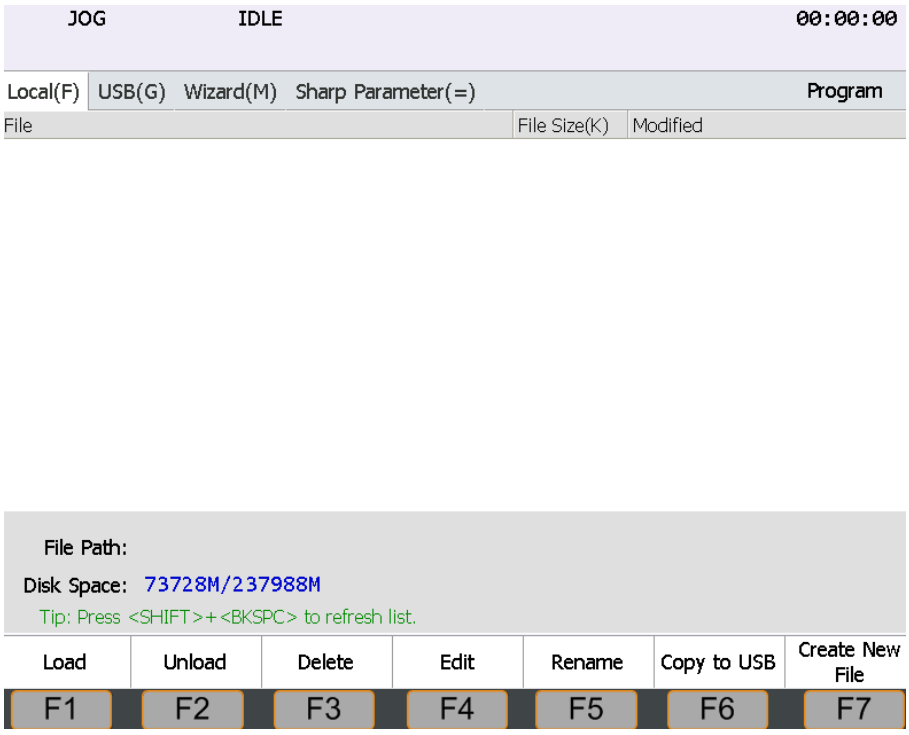


Figure 6-1 Local program interface

Caution

1. When the selected target file is in loading or editing state, it cannot be deleted.
2. The currently loaded file cannot be edited. If you want to edit, unload the current file first.
3. Only ".nc" format files are editable.

6.2 Machining Wizard Program Management

Description

NK280B provides five basic machining wizard programs: CirFrame, CirPocket, RecFrame, RecPocket, and LaMeasure.

After the relevant settings are completed and saved in the machining wizard interface, the corresponding program file can be generated, which is convenient for the user to perform simple machining operations.

This section takes the LaMeasure as an example to introduce.

Basic Concept

Screw compensation wizard is an added wizard function for measuring lead screw error and backlash with laser interferometer. The tool path file generated by it can assist the laser interferometer to generate data files for measuring screw error and backlash.

Operation

1. <Program> → <M Wizard> → <L LaMeasure > (pop-up interface shown in figure 6-2).
2. <X>, <Y>, <Z> select the axis type: X-axis, Y-axis, Z-axis.
3. < ↑ >, < ↓ > (select the setting box) → <Enter> → (input the set value in the pop-up dialog box) → <F6 OK> or <Enter>.
4. After the parameter setting is completed, press <F3 Save> →<F1 Load> (it is recommended to save first and then load to the system).

   After starting to run the program, it can assist the laser interferometer to measure, save the generated measurement data files to the root directory of the USB, and directly import them into the system on the screw error compensation interface to generate corresponding compensation files. (See 3.11.2)

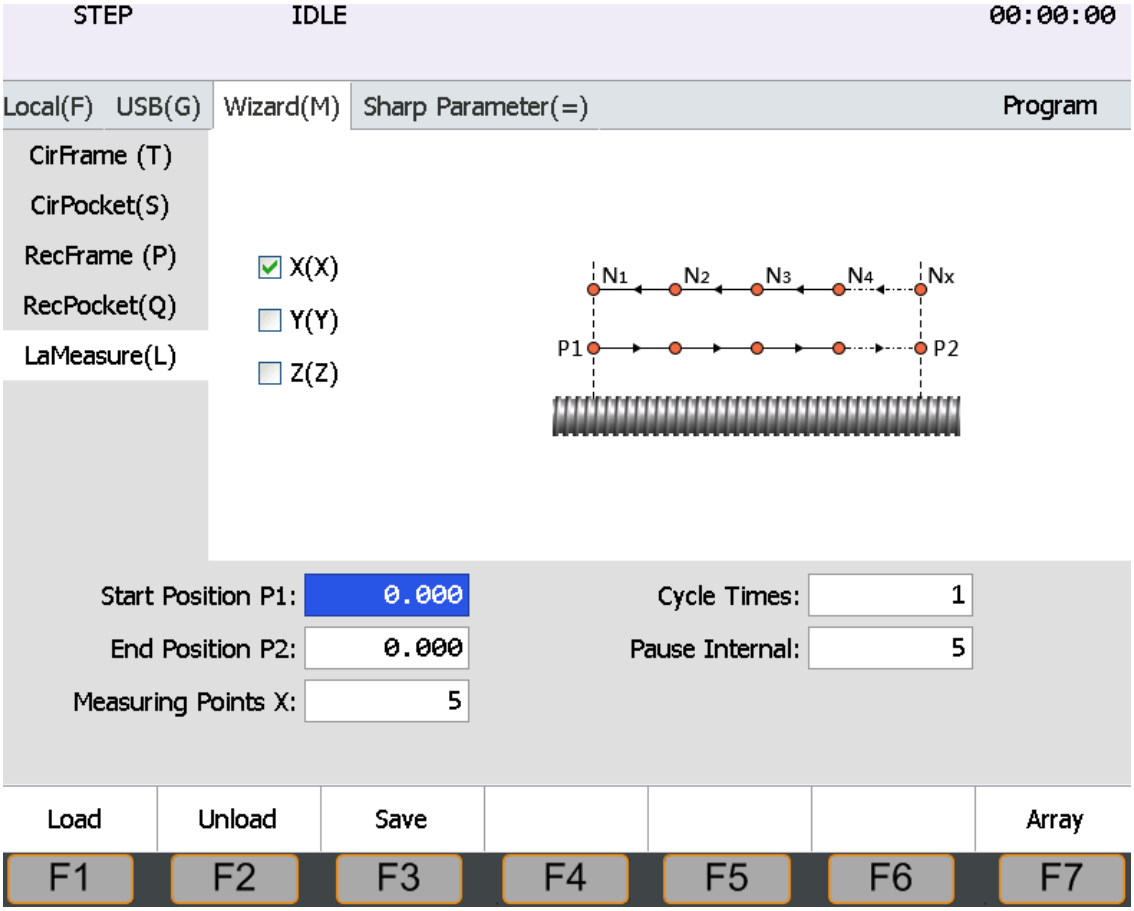


Figure 6-2 Screw compensation wizard

Caution

1. The start position and end position must be within the travel range; the end position must be larger than the start position.
2. Cycle once refers to the process of "start point→end point→start point". The laser interferometer records a set of data every cycle, and the generated screw error compensation file uses the average value.
3. Measurement distance = (end position - start position) / (measurement points - 1). Therefore, accurate measurement needs to accurately calculate the start and end positions and the measurement points to ensure that the measurement point positions are integers.

6.3 Network Management

Description

NK280B supports network connection, connects with PC (personal computer), and manages integrated machine program files on the PC.

Before using the network connection function, please connect the PC and the integrated machine to the LAN.

6.3.1 Set IP

Description

The purpose of setting IP is to establish a network connection channel between the PC and the integrated machine.

Please make sure that the PC and the integrated machine are in the same subnet. For example, when the subnet mask is 255.255.255.0, 192.168.1.0~192.168.1.255 are in the same subnet. (The first three digits of the IP are the same, and the last digit is an integer between 0 and 255)

IP Setting Method

Method	Description
Manual setting	Direct connection. Such as: • The two ends of the network cable are respectively connected to the PC and the integrated machine. • Or a PC is connected to multiple integrated machine through a switch (which does not support the DHCP function).
Automatically obtain	PCs and integrated machines are connected to a large LAN environment through router and other devices that support the DHCP function.

Please refer to the factory manual of the device to see whether the connected device supports the DHCP function.

Manually Set the IP Address

◆ Set the PC IP

Set IP address of the computer.

◆ Set the integrated machine IP

1. <System> → <M System Info> → <F7 Network Info> → <F5 IP Setting> (enter the manufacturer password, pop-up the dialog box shown in figure 6-4) → <S Manually Set IP>.
2. < ↑ >, < ↓ > (select input box, input number, see example) → <F6 OK> or <Enter>.

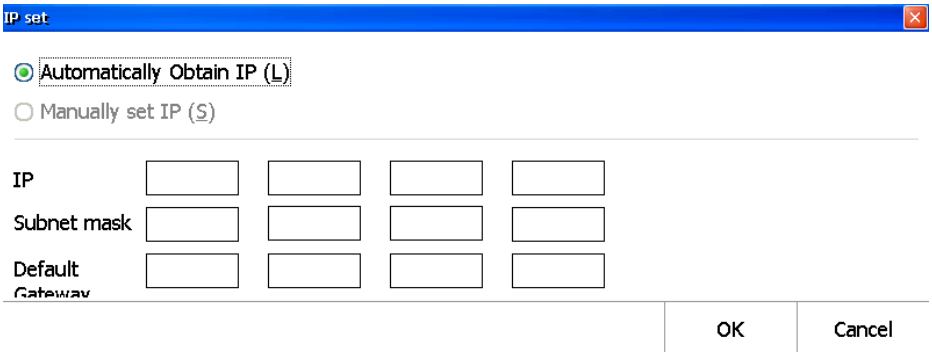


Figure 6-3 Set the integrated machine IP (manually set)

For example: IP address and subnet mask can be set as needed, as follows.

- IP address: 192.168.1.188 (the first three groups should be consistent with the PC setting)
- Subnet mask: 255.255.255.0 (consistent with PC)
- Default gateway: 192.168.1.1 (consistent with PC)

Automatically Set IP Address

◆ Description

If the connected device supports the DHCP function, it will directly use the automatic IP address by default. If the automatic obtain fails, please check whether the DHCP function setting is correct when the physical connection is correct.

Two methods:

- Obtain by local connection in the operation system (applicable to PC and integrated machine)
- Obtain from of network setting in the software system (applicable to integrated machine)

◆ Local connection (applicable to PC and integrated machine)

Open the local connection properties of the computer.

After using this method to set, open the "IP Settings" in the network information interface of NK280B, select "Automatically Obtain IP", and the system will display the obtained IP address.

◆ Network setting obtain (applicable to integrated machine)

<System> → <M System Info> → <F7 Network Info> → <F5 IP Setting> (enter the manufacturer password, pop-up the dialog box shown in figure 6-6) → <L Automatically Obtain IP>.

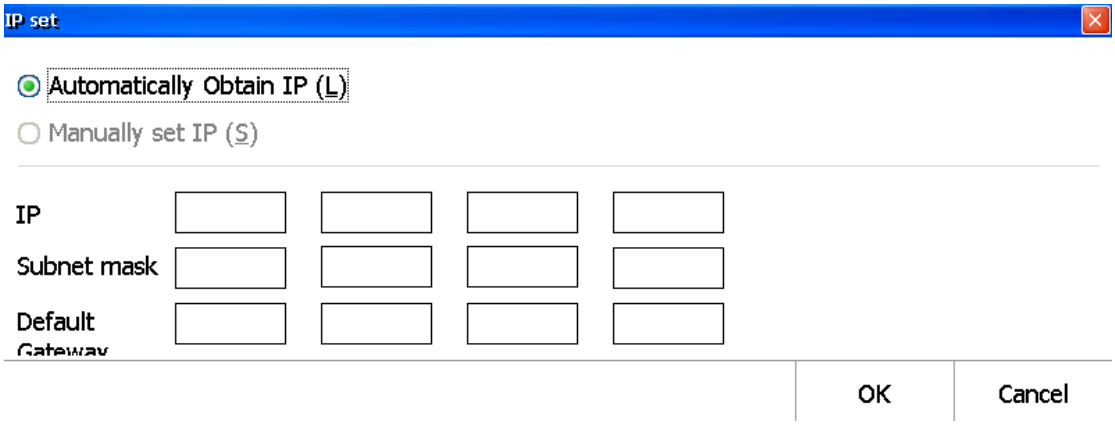


Figure 6-4 Automatically obtain IP (integrated machine)

When Connecting Multiple CNC Systems

◆ Description

If multiple CNC systems are connected, it is also necessary to ensure that the IP addresses of each CNC system are different.

If the IP is the same, please manually set the IP address again (the first three groups remain the same), and make sure that the MAC addresses of each machine are different.

◆ Operation

<System> → <M System Info> → <F7 Network Info> → <F6 Device Info> (the dialog box shown in figure 6-7) → < ↑ > or < ↓ > (select the input box to complete the modification).

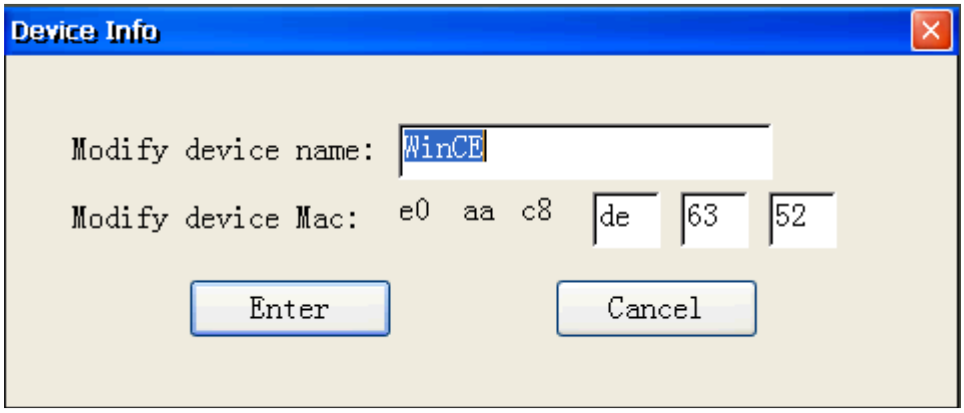


Figure 6-5 Modify device information

The device information name can be changed to WinCE01, WinCE02, WinCE03 ……

Device MAC is any hexadecimal number.

6.3.2 Verify Connection

Description

After the IP addresses of the integrated machine and PC are set, you can use the ping command to verify whether the connection settings are successful.

Operation

1. Computer <Start> → <Run> → (input "cmd" in the run dialog box) → <Enter>.
2. In the pop-up command line prompt dialog box, enter the command "ping ip" (such as: ping 192.168.1.189) → <Enter> (to view the ping result)

When the ping is successful, it is shown in figure 6-8. If it fails, please check whether the physical connection is normal and whether the above IP settings are correct.

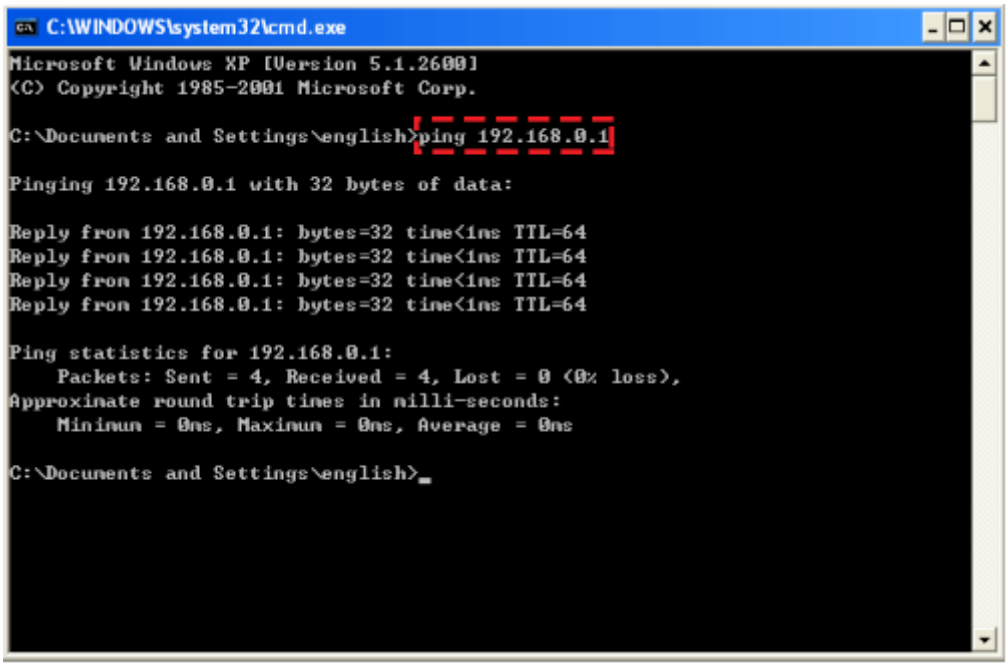


Figure 6-6 Ping pass graphic

6.3.3 PC Management Integrated Machine File

Description

After the network connection is correctly established, on the PC side, through network sharing or FTP method to manage shared files on the integrated machine.

Network Sharing Method

1. The open integrated machine network sharing interface method according to the computer operation system is different.
   - XP system: Click the computer <Start> → <Run> → (input "\\192.168.1.188" in the running dialog box) → <Enter> (open the integrated machine network sharing interface).

- Win7 system: Click the computer <Start> → <Control Panel> → (select "Large Icons" in "View Method") → Administrative tool → Local security policy (open the interface in figure 6-9) → (open as shown in figure 6-9 "Network Security: LAN Manager Authentication Level" property box) → (set LN and NTLM responses occur in the property box) → restart the computer.

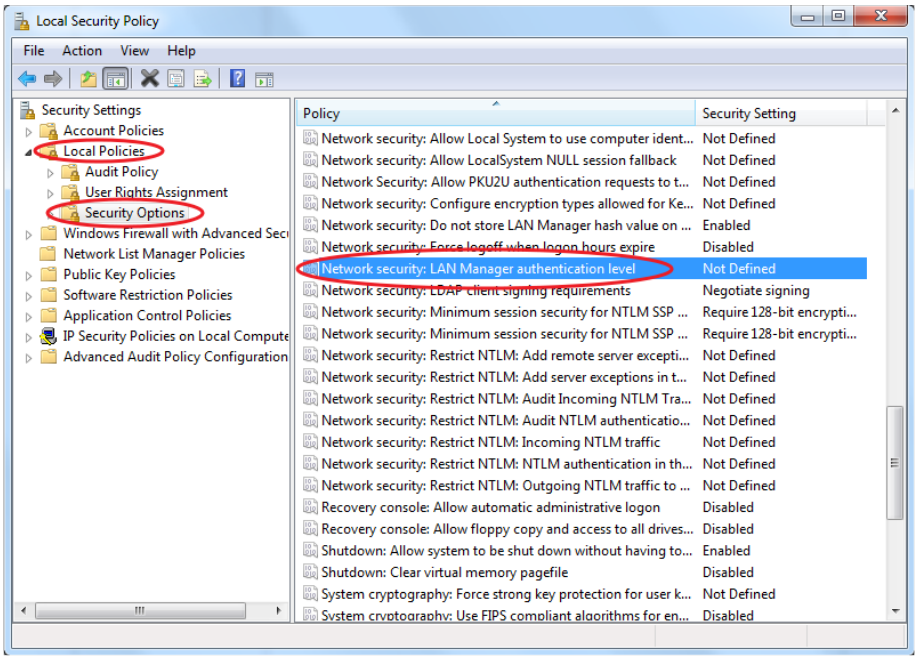


Figure 6-7 Local security policy (computer)

- In the local security setting page, change the authentication level to: LN and NTLM responses occur.

2. Double click "Sharedocs" to open the NK280B network folder.
3. In the folder, operations such as upload (transferring files to the integrated machine), download (copy files to the PC), edit, and delete can be performed.

FTP Method

If an FTP server has been established on the PC, the shared files on the integrated machine can also be accessed through the server.

1. Enter the address (such as ftp://192.168.1.188) in the address bar of the resource manager and press Enter to open the NK280B network folder.
2. FTP operations such as upload, download, and rename can be performed in the folder.

6.3.4 View Network File Change

After completing the operations of 6.3.1, 6.3.2, and 6.3.3, you can check the change of the network files in the "Local Program" interface of the integrated machine, press <Shift+Bksp> to refresh the interface, and the network files are marked as "Net", see figure 6-13 .

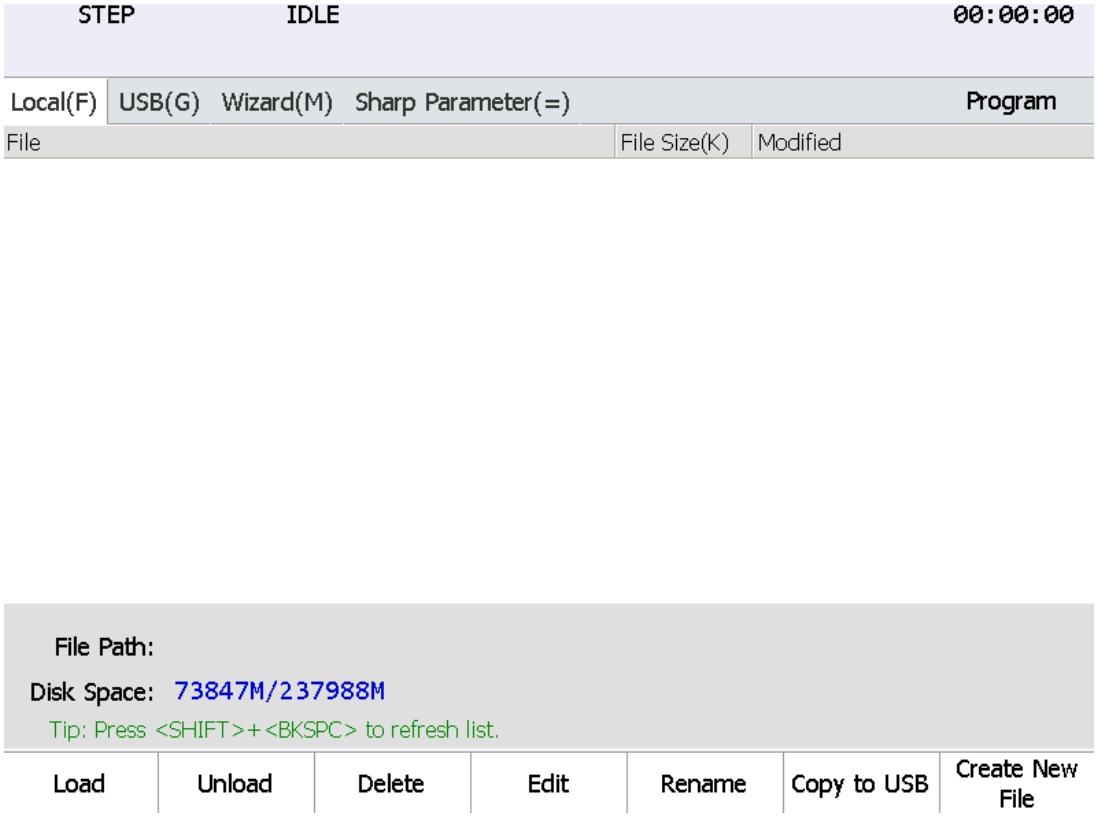


Figure 6-8 Network files in local program page

7 Auxiliary Operation

7.1 Handwheel operation

Basic Concept

◆ Handwheel mode

When enabling the handwheel mode, please press the <Handwheel> button at the "Mode Button" on the operation panel (the indicator light is on to indicate that this function is enabled).

In the handwheel mode, you can use the handwheel device to control the movement of the machine tool. See figure 7-1.

Figure 7-1 Handwheel

◆ Handwheel guide

Handwheel guide refers to an operation mode in which the automatic execution speed of the machining program is controlled manually in automatic machining. This method can prevent damage to the tool caused by load the wrong program or inappropriate program.

In the auto mode, press <Handwheel Guide> of the "Auxiliary Function Button" on the operation panel (the indicator light is on to enable this function); or press <State> → <F Coor-Auto> → <F1 HW Guide> to enable this function.

In the state of handwheel guide, the system executes the machining program as the handwheel rotate clockwise during machining, and the program stop machining when the handwheel stop shaking, and the machine tool can stop moving within 300ms. The machining speed changes with the shaking speed of the handwheel.

Related Parameter

Parameter	Description	Set Value
52001 Adopt precise pulse counting	Yes: The system motion handwheel specified distance. No: The machine tool only moves when the handwheel is shaken.	—
52002 Handwheel direction	The relationship between the handwheel rotation direction and the feed direction. 1: Same direction; -1: Opposite direction	—
52012 Handwheel acceleration	Smaller value gets smoother handwheel movements.	—
52014 Handwheel connection mode	0: Connect to Lambda controller 1: Connect to NK280B panel	—

7.2 Single Block Execution

Description

User can set the machining tasks to be executed as single block mode, and execute "Single Block Execution" operation, which can provide good support for error diagnosis and fault recovery. When the system is in single block mode, the machining program stops when the combined speed of each axis reaches 0.

Operation

After pressing the <Single Block Execution> button, each time you press the <Program Start> button, the software executes a command block and enter a pause state; press the <Program Start> button again, and then executes another command block until the whole machining program is executed.

7.3 Enable Night Mode

Description

It is used to avoid that the machine tool cannot be powered off after the machining task is completed when it is left unattended, causing the machine to be normally open and causing loss.

Operation

<Advanced> → <F Coor Management> → < F4 Night Mode On>.

After enable:

- When the machining task end normally, the output port <Auto Power Off> will output with delay of 10s.
- This function is invalid when the machining task end abnormally.

7.4 Select Machining

Description

It is used to realize the skip execution of the program.

Operation

In non-reference point mode (take auto mode as an example), the operation is as follows:

1. <State> → <F Coor-Auto> → < F2 Selective Mach> (pop-up figure 7-2 dialog box).
2. <T>, <S>, <P>, <Q> select the start line and end line of the program, enter the start and end line numbers in the pop-up box after <Enter>.
3. After pressing <Program Start> on the operation panel, the system machining specifies the program block, starting from the start line and ending with the end line.

Figure 7-2 Select machining

7.5 Tool Selection Machining

Description

It is used to select several of the tools for machining and to machine a part of the workpiece when the program file contains multiple tools and the parts of the workpiece being machined by each tool are different. Only available for G code files and ENG code files.

Operation

1. <State> →<M Current File> →< F2 Tool Selection> (pop-up dialog box).
2. < ↑ >, < ↓ > (select tool) → <Enter>.
3. After pressing <Program Start> on the operation panel, the system will machine the program block where the specified tool is located.

7.6 Breakpoint Resume

Description

When power off, emergency stop and other situations occur during the machining process, if the accuracy of the workpiece coordinates can be confirmed, the user can select this function to enable the machine tool to quickly move to the breakpoint to resume machining, saving machining time.

Operation

Press the <Breakpoint Resume> button of the "Motion Control Button" on the operation panel (the indicator light is on to indicate that this function is enabled).

The system automatically resumes machininig from the last machininig stop line number.

7.7 Return to Workpiece Origin

Operation

In non-reference point mode: <State> → <F Coro-Auto> → < F7 To Mach Origin>.

The spindle will automatically return to the workpiece origin from the current position.

7.8 Return to Fixed Point

Description

The fixed point refers to a fixed position on the machine tool, and the machine coordinates of this position are the fixed point machine coordinates.

Return to fixed point, good for:

- Change workpiece. When the program machining is completed, the Z-axis is automatically raised, the worktable is automatically moved out, and the operator can directly change the workpiece.
- Tool change. Set the fixed point coordinates as the change position, so that it is convenient to directly return to the position for tool change after the current program machining is completed.

Operation

In handwheel, jog or step mode: <State> → <F Coor-Auto> → <F4 To Fixed Point>.

7.9 Array Machining

Description

NK280B supports array machining for the currently loaded machining program.

Operation

1. <Program> → <M Wizard> → < F7 Arrary> (pop-up interface shown in figure 7-3).

< ↑ > or < ↓ > or <→> or <←> (select the input box) → <Enter> (input the value in the pop-up box) → <F6 OK>.

When "Array" is set to "Yes", press <Program Start>, the system will perform array machining on the current machining program.

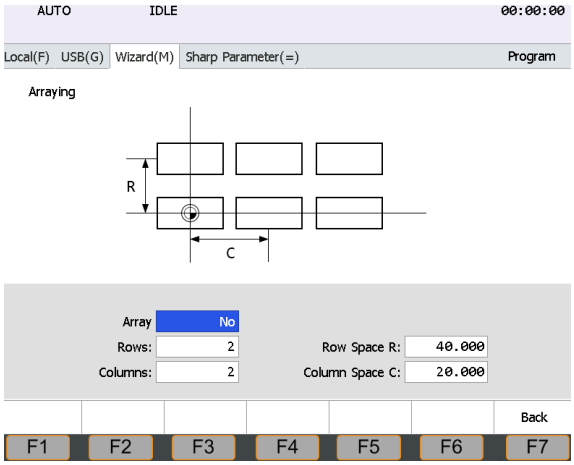


Figure 7-3 Array machining

7.10 Auto Backup Parameter

Description

The system has a parameter automatic backup function. If the user forgets to save the parameters after setting them, you can skip to the “Parameter Backup” interface to perform the “Recover” operation.

Operation

<Param> → <G Param Backup> (pop-up interface shown in figure 7-4).

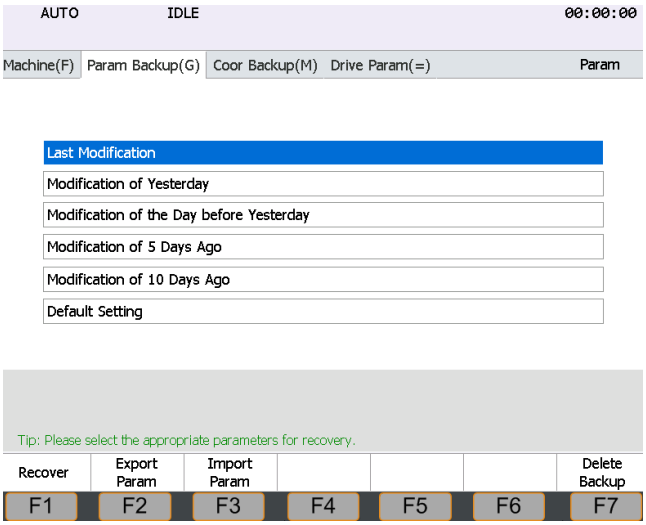


Figure 7-4 Parameter backup

Recover/Delete	After < ↑ > or < ↓ > select valid backup parameters, press <F1 Recover> or <F7 Delete Backup>.
Import/Export	Export the selected parameters to the USB or import the parameters in the USB into the system.

7.11 User Command

Description

User can quickly inquire or execute the input commands on the user command interface.

Operation

<Advanced> → <M MDI> (open the interface shown in figure 7-5) → < ↑ >, < ↓ > (select the input box) → <Insert> (input the command in the pop-up box) → <F6 OK> → (press the corresponding F1~F7 to execute the selected user command).

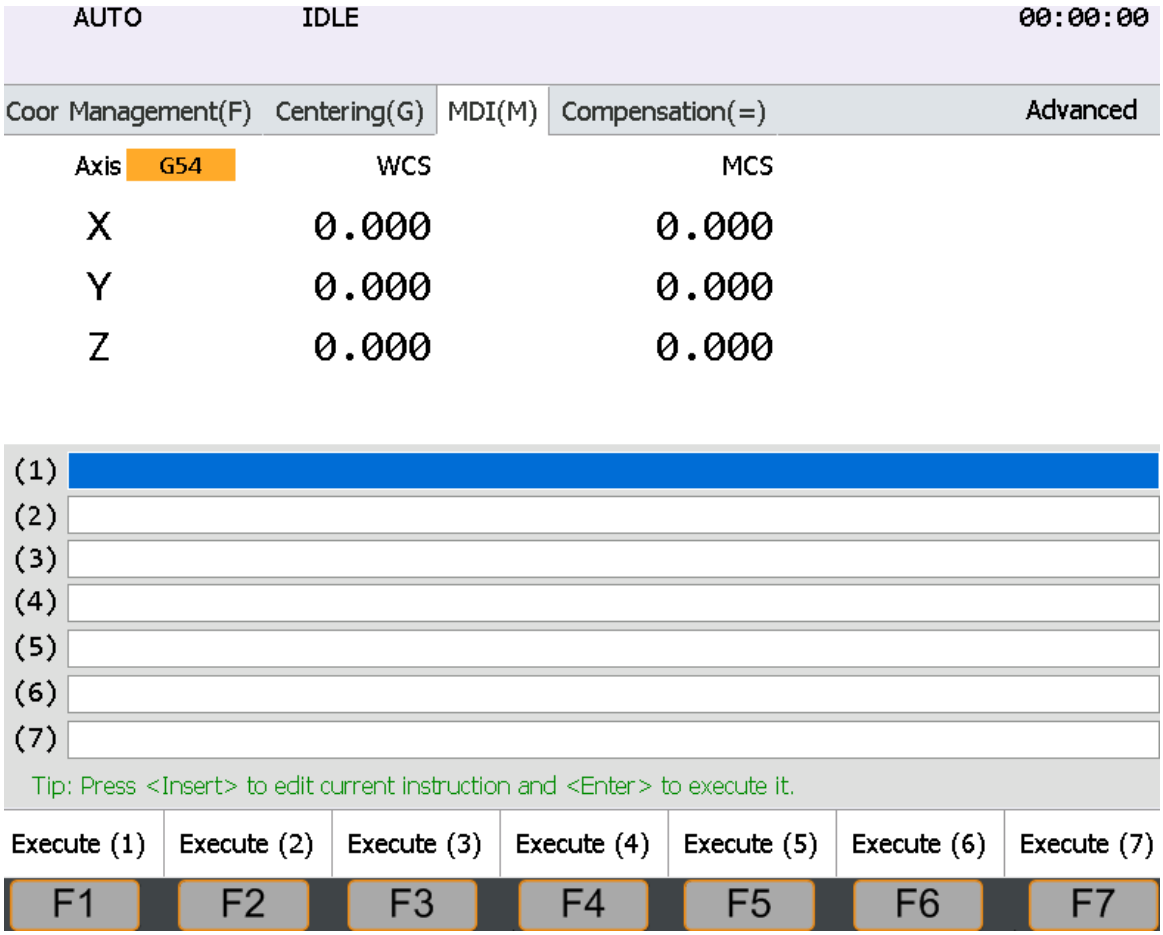


Figure 7-5 User command

7.12 Coordinate Backup

Description

The user can save the current workpiece offset to the system through the coordinate backup function, or restore the selected workpiece offset to the current workpiece coordinate system.

Operation

<Param> → <M Coor Backup> (open the interface shown in figure 7-6).

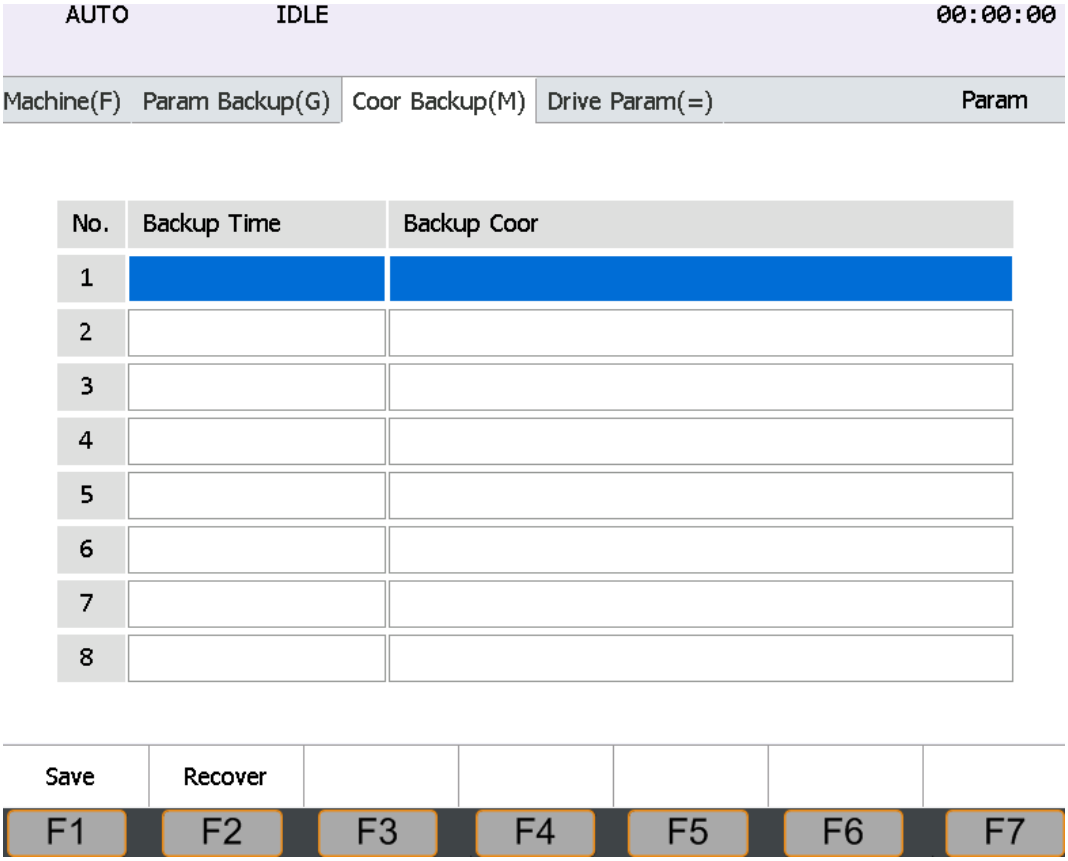


Figure 7-6 Coordinate backup

Save	Save the current work offset into the system.
Recover	After loading any machining file, select the required workpiece offset by <↑><↓> keys, and press <F2 Recover> to import the selected workpiece offset into the current workpiece coordinate system. When importing, a dialog box will pop up asking "Whether to modify the Z-axis origin offset coordinates", "Yes" will restore the offset coordinates of the X, Y, and Z axes at the same time; "No" will only restore other axes except the Z-axis offset coordinates.

7.13 Machining Statistic

Description

This function is used to display history and statistical information of the current machining file. After exporting, it is convenient for user to complete the statistical work of machining information.

Operation

<State> → <= Statistic> (open the interface shown in figure 7-7).

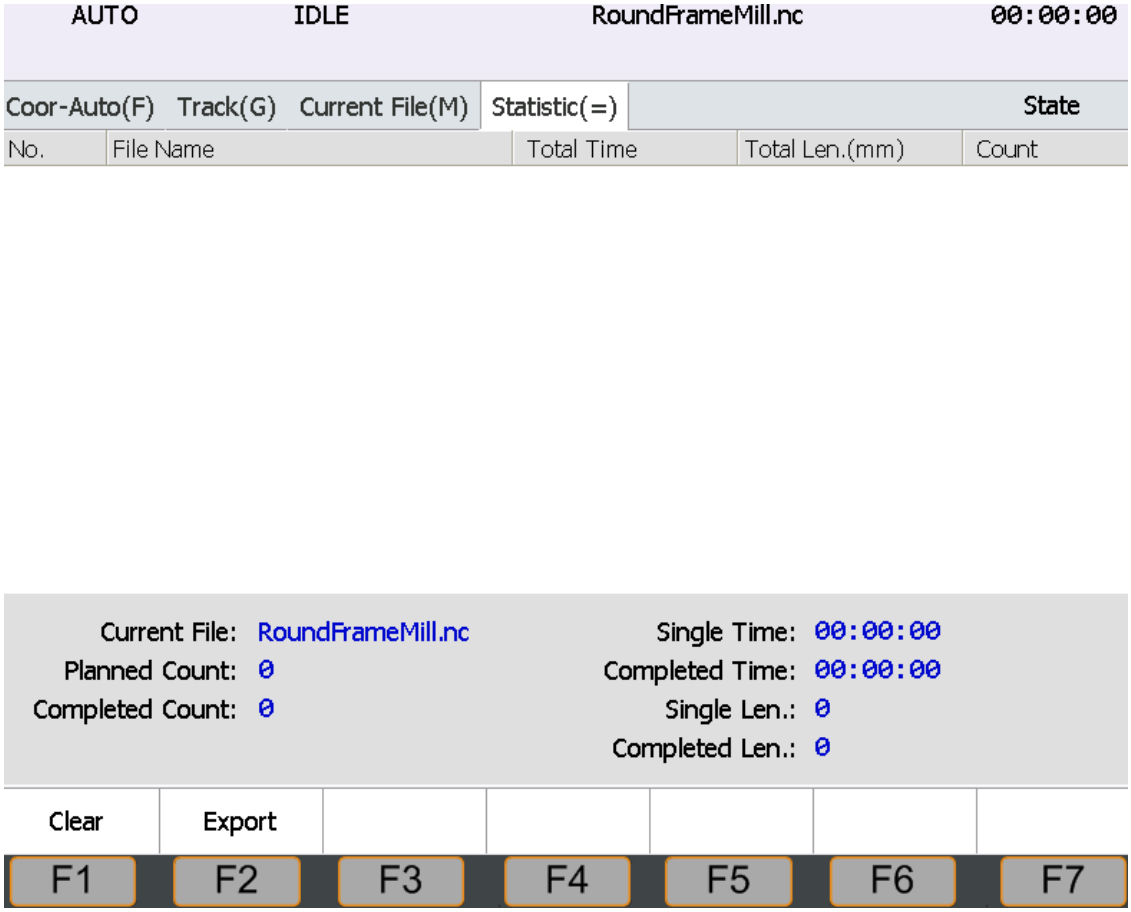


Figure 7-7 Machining statistic

Clear	Clear all history statistic records in the list.
Export	Export all machined program file information to external devices such as USB to form TXT files.

8 System Maintenance

8.1 System Update Method

When users first get NK280B, all systems have been installed and can be used directly. In case of failure, system maintenance can be carried out through the contents of this chapter.

Press and hold <M> while turning on the NK280B to enter the system update interface, as shown in figure 8-1.

Figure 8-1 System update interface

The NK280B provides 5 update methods, and the update operation can be performed directly by pressing the corresponding key.

Update system	The essence is "update image", which is an update method used when the system is damaged and the original system cannot be started.
Update EBOOT program	Update the EBOOT program.
Update picture	Update the picture displayed on the interface when the system starts.
Read version No.	Read the BOOT program version number and operating system OS version number of the current system.
System start	When the system is started, the software interface cannot be entered normally, but this operation can be performed.

Caution

During use, if the system is damaged and the original system cannot be started, you need to update the mirror; if the original system can be started, you only need to upgrade or reinstall the software.

8.2 Update the System

Operation

1. Insert the USB with the system mirror file NK280B_NK_Rx.x.x.nb0 into the USB port of the integrated machine.
2. Press and hold the <M> while starting the NK280B to enter the system update interface shown in figure 8-1.
3. Press the <T>, the interface will display "Reading the file NK280B_NK_Rx.x.x.nb0 from the USB disk". After scanning to the file, press <Y> to confirm the update.
4. The mirror update is complete.

The system after the mirror update has no software, and the software needs to be reinstalled. For the operation, see 8.3.

8.3 Install/Upgrade Software

Install Software Operation (after Mirror Update)

1. Insert the USB with the new software in ".weihong" format into the NK280B.
2. Press the <Z> after the system image update is complete. The system automatically recognizes the USB device, and skip to the BOOT system upgrade interface in figure 8-2 after the recognition is successful.
3. Press <F6 Update System>, select the software to be installed in the pop-up USB list, <Enter> to confirm and start the update。
4. After the software is installed, enter the new software interface. Figure 8-3 is the system startup interface.

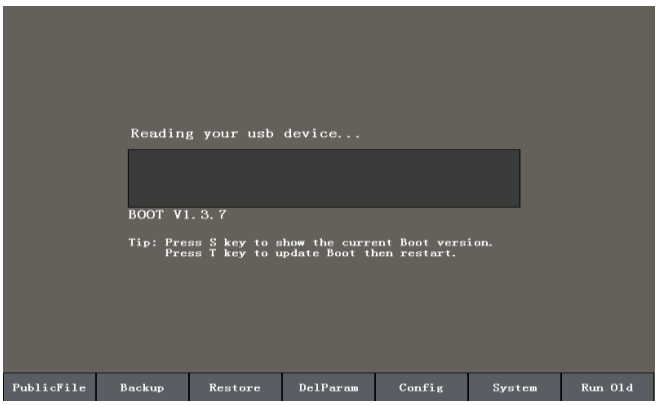


Figure 8-2 BOOT system upgrade interface

Public file	Update the public files, that is, use the new PUBLIC files in the USB, and save them in the two folders CHN\files and ENG\files in the root directory of the USB.
Backup	Export the system backup software to the NK280BBackup folder in the root directory of the USB. The software name of each backup contains the current time field, so the same software can back up multiple software with different parameter configurations.
Restore	Restore the backup software in the NK280BBackup folder in the USB.
Delete param	Before upgrading the software or installing new software, delete the parameter settings of the previous version of the software. If the customer needs to save the parameters of the machining settings, this operation is not required.
Config	Use new system configuration file, the Config file.
System	Update software. The new BOOT image can only recognize software with the file extension ".weihong".
Run old	Start the original system.

Figure 8-3 System startup interface

Upgrade Software Operation (when the System has Already Installed the Software)

1. Insert the USB with the new software in ".weihong" format into the NK280B integrated CNC system.
2. Through any of the following methods to enter the BOOT upgrade interface shown in Figure 8-2.
   - <System> → <M System Info> → <F2 Maintain System> → <F2 Update System>, confirm and close NK280B after passing the permission verification. After power on again, the system automatically enter the USB device identification interface, and if the identification is successful, it can enter the BOOT upgrade interface.

- At any time, press the <G> multiple times while turn on the power, and the system will automatically enter the USB identification interface. If the identification is successful, it will enter the BOOT upgrade interface.

3. In the figure 8-2 interface, press <F6 Update System>, select the software to be installed in the pop-up USB list, and start the update after confirming <Enter>.

4. After the software installation is complete, enter the new software interface. Figure 8-3 is the system startup interface.

Caution

When upgrading or installing software, please make sure that there is an installation software in ".weihong" format in the USB. Otherwise, the system cannot recognize it.

8.4 Update FPGA

Description

System supports online update NK280B, Lambda controller, expansion terminal board (when all hardware is connected) FPGA program.

Operation

<System> → <M System Info> → <F2 Maintain System> → <F4 Online Update> (pop-up dialog shown in figure 8-4) → <↑>, <↓> (select device) → <F6 Start Updating>, <Enter>.

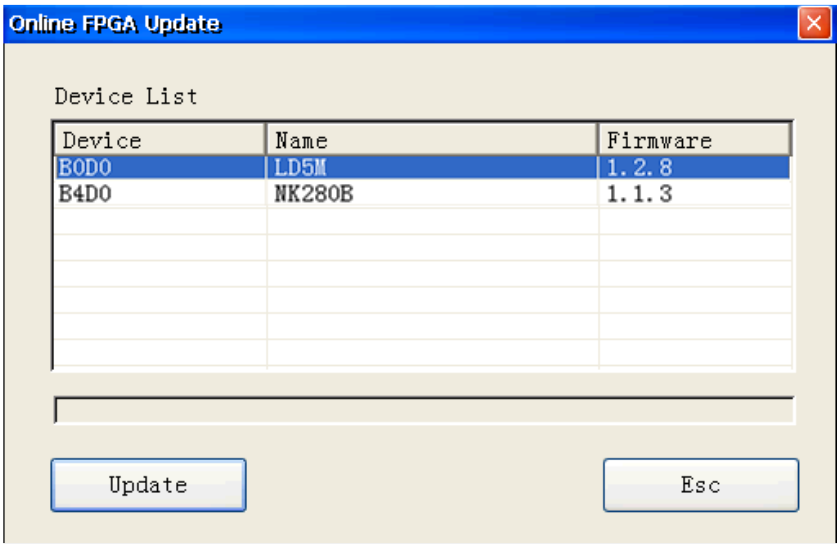


Figure 8-4 Update FPGA dialog box

8.5 Delete Temporary File

Description

When running the program, a large number of temporary files will be generated, occupying a large amount of memory, and affecting the running speed. Often cleaning temporary files can save disk space and optimize the system.

Operation

<System> → <M System Info> → <F2 Maintain System> → <F4 Online Update> (pop-up dialog box) → <F6 Start Updating>, <Enter>.

9 Appendix

9.1 Debugging Process

The debugging process is used for machine tool debugging before machining.

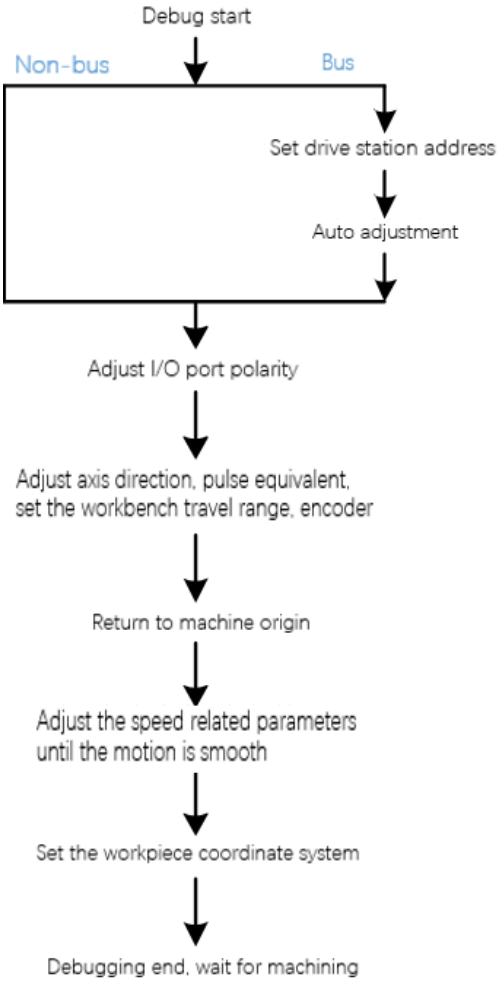


Figure 9-1 Debugging process

9.2 General Machining Flow

After the customer gets the debugged machine tool, he can refer to the machining documents of the general machining flow. For more specific machining operation, please refer to the corresponding chapter of the document.

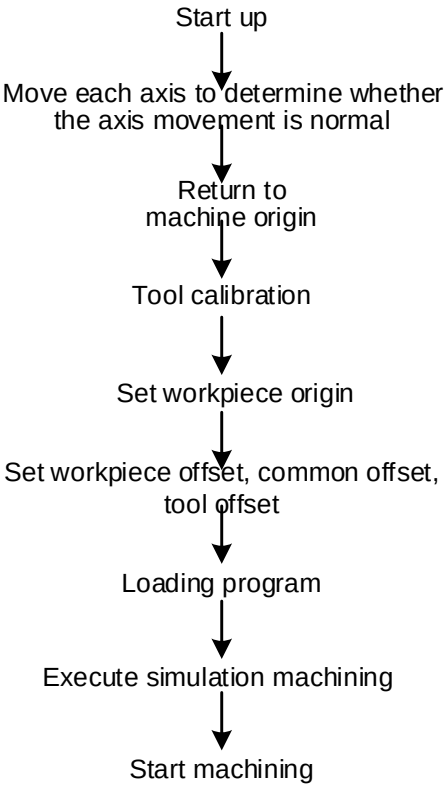
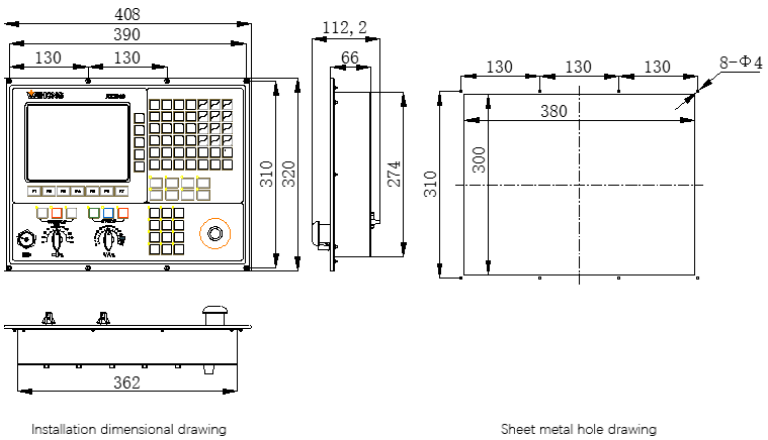


Figure 9-2 General machining flow

9.3 Product Dimensional Drawing

NK280B



Installation dimensional drawing

Sheet metal hole drawing

Figure 9-3 NK280B dimensional drawing

Lambda Controller

Lambda 4S/5S/5E/5M controllers are the same size.

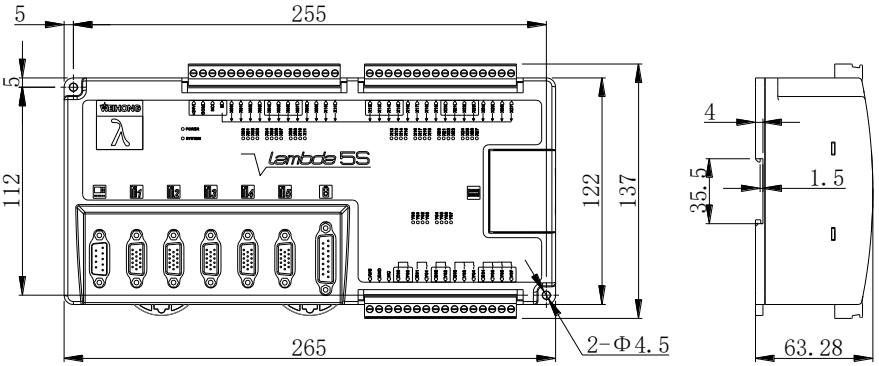


Figure 9-4 Lambda 5S controller dimensional drawing

EX31A1 Terminal Board

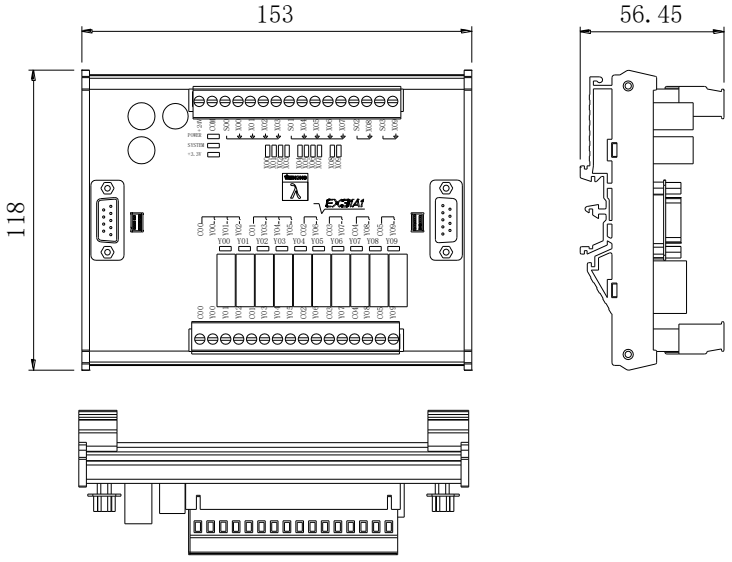


Figure 9-5 EX31A1 terminal board dimensional drawing

9.4 Alarm Information and Process

Alarm Type	Alarm Content	Reason	Process
⚠ Limit alarm	X (Y/Z) axis positive (negative) limit	X-axis positive limit port polarity error.	Enter the port sub-function interface in the system to modify the port polarity of this port. (Reference 3.1)
		During the X-axis movement, it directly collides with the limit switch.	Manually move the X-axis away from the limit switch.
		The limit switch itself has an error.	Check the limit switch is normal.
⚠ Servo alarm	X (Y/Z) axis servo alarm	X-axis servo alarm port polarity error.	Enter the port sub-function interface in the system to modify the port polarity of this port. (Reference 3.1)
		The X-axis servo drive itself has an error.	Check whether the X-axis servo drive is normal.
	A.c90 Encoder communication failure	The encoder connector has poor contact or wrong wiring.	Insert the connector for the encoder again, confirm the wiring of the encoder, then restart the driver, restart the software or Reset to reconnect.
		The encoder cable is disconnected, short circuited, or a cable with an impedance exceeding the specified impedance is used.	Use an encoder cable of the specified specification.
		Corrosion caused by temperature, humidity and gas; short circuit caused by water droplets and cutting oil; poor contact of connector caused by vibration.	Improve the use environment and replace the cable. If it still does not improve, replace the drive.
		Malfunction due to noise interference.	Correctly perform the wiring around the encoder (separate the encoder cable from the servo motor main circuit cable, grounding process, etc.).

Alarm Type	Alarm Content	Reason	Process
		Drive failure.	Connect the servo motor to another drive and turn on the control power. If no alarm occurs, the drive may be faulty. Please replace the drive.
	A.810 Encoder backup alarm (detected only when an absolute encoder is connected) (detected on the encoder side)	Turn on the absolute encoder power for the first time.	Perform encoder setting operation.
		The encoder cable was disconnected and reconnected.	Confirm the connection of the encoder and perform the setting operation of the encoder.
		Both the drive's control power supply (+5V) and the battery power supply have failed.	After recovering the power supply of the encoder (replacing the battery, etc.), perform the encoder setting operation.
		Absolute encoder failure.	If the alarm cannot be cleared by performing the setting operation again, replace the servo motor.
		Drive failure.	Possible drive failure, replace the drive.
	A.d00 The position deviation is too large (when the servo is ON, the position deviation exceeds the position deviation excessive alarm value (Pn520))	The wiring of U, V, W of the servo motor is incorrect.	Check whether the motor cable or encoder cable has any problems such as poor contact.
		Position command speed is too fast.	Reduce the position command speed or command acceleration, or adjust the electronic gear ratio.
		Position command acceleration is too high.	Reduce position command acceleration by bus command. Or select the position command filter (ACCFIL) through the bus command to smooth the position command acceleration.
		Relative to the operating conditions, the excessive position deviation alarm value (Pn520) is low.	Correctly set the value of parameter Pn520.

Alarm Type	Alarm Content	Reason	Process
		Drive failure.	Reconnect the driver power supply, if the alarm continues to occur, it may be a fault of the servo unit, replace the driver.
	A.001 Slave station lost	The driver wiring is not connected properly.	Restart the software after checking the drive wiring or Reset.
	A.94A: Data setting warning 1	Parameter usage error.	Set the correct parameters.
⚠ E-stop alarm	ESTOP emergency stop button press	ESTOP emergency stop port polarity error.	Enter the port sub-function interface in the system to modify the port polarity of this port. (Reference 3.1)
		Press the ESTOP button.	Rotate the ESTOP button clockwise to pop it out.
⚠ Lube level alarm	Lube level alarm	Lube level alarm port polarity error.	Enter the port sub-function interface in the system to modify the port polarity of this port. (Reference 3.1)
		The lube level line in the fuel tank is lower than the position below the lube level detection signal, output alarm signal.	There is too little lube in the fuel tank, need to add lube.
		The fuel tank lube level alarm signal output is abnormal.	Check whether the fuel tank lube level output relay or solenoid valve is damaged.
⚠ Spindle alarm	Spindle alarm	Spindle alarm port polarity error.	Enter the port sub-function interface in the system to modify the port polarity of this port. (Reference 3.1)
		Inverter error occur.	Check whether the inverter is working correctly.

Alarm Type	Alarm Content	Reason	Process
Hardware connection alarm	Expansion terminal board not connected; controller not connected.	The cable is not connected firmly or the Lambda controller hardware is faulty.	1. Re-plug the cable and restart the software to see whether the fault disappear; 2. Port polarity have problems, modify the polarity, and restart the software; 3. According to Lambda controller SYSTEM indicator to determine the cause of the problem; 4. Replace with a new Lambda controller or extended terminal board.
Return to machine origin related operation	The system does not return to the machine origin, operation failed!	The system does not return to machine origin, which is determined by parameter 3030 "Return to Machine Origin before Machining". This parameter is set to "Yes", it must return to the machine origin before machining.	Perform the return to machine origin operation first, and then use this function.
Errors related to state	The system is busy and cannot perform this operation	Some illegal operations may have been performed in the machining state.	Stop machining and perform some operations in an idle state.
	Please exit the simulation on the state page first, and then modify the state!	Some illegal operations may be performed in the simulation state. Such as modifying parameters or pressing some shortcut keys.	Stop the simulation and perform some other operations in an idle state.
	Please switch to auto state first.	In the mode of manual, reference point, etc., run the operations that can only be performed in the auto mode, such as pressing "Program Start" in the manual case.	Switch to auto state and then perform corresponding operations.

Alarm Type	Alarm Content	Reason	Process
	The current state cannot perform breakpoint resume operation	Press the "Breakpoint Resume" operation button during program machining.	When the power is interrupted during machining, the program stop button is manually pressed, and the machining needs to be restarted under emergency stop, etc., the breakpoint resume operation can be performed.
File error	The current parser does not load machining files.	The system does not load the machining file, but performs file machining.	Need load the machining file first.
	Failed to read the machining file, check whether the file path has changed.	The originally loaded file is deleted.	Need reload the machining file first.

9.5 Common Fault and Solution

9.5.1 Spindle not Rotate

1. Press the spindle start button, check whether the circle in front of the output port "Spindle" in the "System\Port" interface turns green (It turns green, indicating that the software is working normally), and check whether there is a problem with the software.
2. Turn on the spindle start output, and check whether the spindle start indicator on the terminal board turns on.
   - If it is not on, check whether the connecting cable of the terminal board is loose, turn off the host computer and make the machine tool power off. Try re-plugging the cable connected to the terminal board. If it still not on, check whether there is a problem with the terminal board cable or terminal board, system.
   - If it is on, use multimeter to test whether the SPIN port is connected. If it is conductive, it means that the spindle start output port is normal; if it is not conductive, there is a problem with the spindle start relay.
3. Use multimeter to test whether the analog voltage output between SVC and GND is normal. If it is not normal, check whether the terminal board connection cable is loose. If not, check whether there is a problem with the terminal board cable, terminal board, or system.
4. Check whether the inverter parameter setting is correct, check whether the spindle and the inverter are damaged, or whether there is any problem with the connecting cable between them.

9.5.2 An Axis not Move

1. Check whether the signal polarity setting of the output port "×Servo Enable" on the "System\Port" interface is correct (should be normally open N)。
2. Check whether the parameter settings of the servo drive are correct. (For example, the control mode is position control, drive pulse input port selection, etc.).
3. Check whether the servo cable of the axis is firm with NK280B and the servo driver.
4. Check whether the motor is enabled.
5. Manually move the machine tool, and check whether the drive receives pulses. If there have pluse, but the machine tool has no action output, please check whether the transmission device is loose; if there is no pulse, please replace the host computer or drive.

9.5.3 Z-axis Servo Motor Brake can not Turn On

1. Check whether there is a signal at the brake input. If there is no signal, check whether the servo drive is enabled and whether the brake output parameters setting of the servo drive is correct.
2. If there have signal, remove the brake output terminal (Y00-C00) connection line, start the system and power on the machine tool (excluding the system alarm signal), use a multimeter to measure whether the terminal is conductived. If there is not conductive, please check the upper computer system; if the conductive is normal, it means that the output of the brake port is normal.
3. Machine tool power off, reconnect the two removed connecting wires (connect the 24V power supply in the original circuit), and use a multimeter to measure whether the voltage at both ends of the brake wire on the motor side is 24V. If normal, the motor is damaged.
4. If the problem is not resolved, replace the Lambda controller.

9.5.4 When the Tool Calibration using the Tool Calibration Presetter, the Machine Tool Moves to the Tool Calibration Presetter Position and then Moves Upward

Check the "Tool Calibration Signal" in the "System\Port" interface, and judge whether the polarity of the "Tool Calibration Signal" is normal. When the system does not receive the tool calibration signal, the circle in front of the "Tool Calibration" signal should be red.

9.5.5 The Machine Tool Returns to Machine Origin Abnormally?

1. Limit alarm or servo drive alarm when returning to the machine origin.
   - Before checking "×Mechanical Origin" on the "System\Port" interface, make sure that the polarity of this point is consistent with the signal type of the origin switch.
   - Check whether the origin switch position is appropriate, check whether the distance between the origin and the limit switch position is too close, the origin switch position is behind the limit switch, or the origin switch position has exceeded the machine travel of the machine tool?
   - Manually move the machine tool to the origin switch position, and check whether the circle in front of the "XX Axis Machine Origin" in the "System\Port" interface changes

from red to green. If the color does not change, it means that the software cannot receive the origin signal. Check whether there is a problem with the origin switch or the wiring of the origin switch; You can use wires to connect the origin signal on the controller with the COM port (the origin switch is 24V when active high level) direct conductive, and observe whether the color of the circle in front of "XX Axis Machine Origin" changes in the port interface to check whether the system exists question.

- Check whether the parameter setting of "Coarse Positioning Stage Direction", "Fine Positioning Stage Direction" and "Retract Distance" in the feed axis parameters are correct. The parameter "Positioning Stage Direction" is consistent with the direction of "Retract Distance", and is opposite to "Coarse Positioning Stage Direction".

2. When the machine tool returns to machine origin, it always moves in a direction at a small speed (one tenth of the coarse positioning) until the limit is triggered.

   In the "System\Port" interface, check whether the polarity of the input port of "×Mechanical Origin" is correct. The origin switch should be green when it is triggered, that is, when there is a signal input, and it should be red when it is not triggered.

3. When the machine tool returns to machine origin, after coarse positioning, an axis moves in the opposite direction for a long distance at small speed or moves in the opposite direction all the time (reason: The system cannot detect the encoder zero signal of this axis).

   - Check whether the servo cable of the axis is in good contact with the system host and the connection of the servo drive.
   - If Yaskawa or TECO drives are used, set the drive parameter "Encoder Division Ratio" to 1/2 or 1/4 of the original value.
   - Check whether there is a problem with the drive or motor, servo cable and control system. (If with other axes that can return to the machine origin normally, in order to replace the servo cable and servo drive troubleshooting reason).

9.5.6 Incremental Return to Machine Origin

The Origin Signal cannot be Detected when Returning to Machine Origin

Usually is the problem of the origin switch, the detection and adjustment steps are shown in figure 9-6.

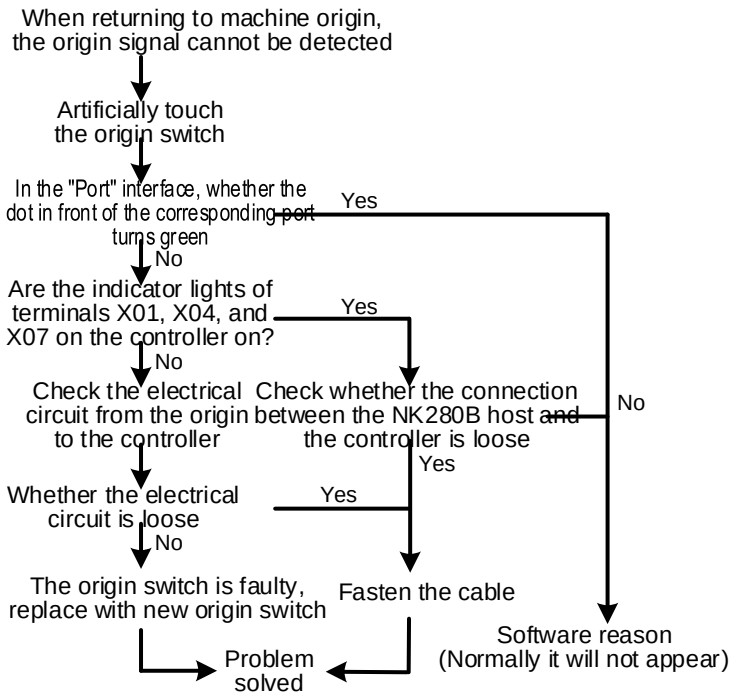


Figure 9-6 Detection step

The Machine Tool Movement Direction is Incorrect when Returning to Machine Origin

- Origin signal polarity is incorrect. At this time, please make sure that the polarity is N when the origin switch is normally open, and that the polarity is P when it is normally closed.
- Parameter setting error. At this time, please check the parameter "Coarse Positioning Stage Direction" and modify accordingly.

Coarse Positioning Speed is very Slow during Return to Machine Origin

- The setting value of the parameter "Coarse Positioning Stage Speed" is too small, modify this parameter.
- The origin signal polarity in the software does not match the type of the origin switch. If the origin switch used is normally closed and the origin signal polarity is N, the origin signal is already valid when starting to return to machine origin, and it will slowly move away from the origin at the fine positioning speed.

9.6 NK280B Parameter (Manufacturer)

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
Axis direction					
10000	X-axis	Motion direction of X, Y, Z feed	1	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
10001	Y-axis	axes.	1	●	●
10002	Z-axis	1: Positive direction; -1: Negative direction	1	●	●
Pulse equivalent					
10010	X-axis	The displacement or angle generated by each control pulse on the X, Y, and Z feed axes.	0.001mm/p	●	
10011	Y-axis		0.001mm/p	●	
10012	Z-axis		0.001mm/p	●	
Travel limits-negative					
10020	X-axis	The machine coordinate values of X, Y, and Z axes of allowable workbench travel lower limit.	0	●	●
10021	Y-axis		0	●	●
10022	Z-axis		-100	●	●
Travel limits-positive					
10030	X-axis	The machine coordinate values of X, Y, and Z axes of allowable workbench travel upper limit.	400	●	●
10031	Y-axis		400	●	●
10032	Z-axis		0	●	●
Enable travel limits					
10040	X-axis	Check whether the X, Y, and Z axes enable the workbench travel range of the workbench.	Yes	●	●
10041	Y-axis		Yes	●	●
10042	Z-axis		Yes	●	●
Enable drive registration					
10090	X-axis	Yes: Enable the drive registration function, only support Wise drive. No: Disable the drive registration function.	No		●
10091	Y-axis		No		●
10092	Z-axis		No		●
11000	Enable encoder feedback	Yes: Use the encoder feedback function No: Do not use the encoder feedback function	No		●
11001	Encoder type	0: Incremental encoder 1: Absolute encoder	0		●
Motor rotate mode					
11200	X-axis	1: Take CW as forward direction -1: Take CCW as forward direction This parameter needs to be set only when the "Absolute Encoder" function is enabled.	1		●
11201	Y-axis		-1		●
11202	Z-axis		-1		●
11303	Delay for	Cancel the E-stop, the time to	0.5sec	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
	stopping on E-stop	wait for the machine tool to stop completely after axis enable is turned on.			
11304	Servo off at E-stop	Yes, once the E-stop operation occurs, the servo enable is turned off.	No	●	●
11400	Control system type	0: Non-bus control system 1: Bus control system.	0	●	●
Compensation					
12001	Enable backlash compensation	0: Read backlash and pitch error data from the error file for comprehensive compensation. 1: Read the backlash data from the compensation parameter <Backlash> for compensation.	0	●	●
12002	Screw error comp	0: No compensation. 1: Single direction compensation. Compensate for backlash error and single direction error. 2: Two directions compensation. Compensate comprehensively by using error data in both direction.	0	●	●
QEC					
12020	Enable QEC	Whether the system enables the QEC function of arc sharp corner. Yes, enable; No, disable.	No	●	●
12030	QEC time		0sec	●	●
12031	QEC value		0mm	●	●
12032	QEC delay		0sec	●	●
Max axial velocity					
13000	X-axis	The encoder feedback direction of the X feed axis. Optional values: 1: Positive direction; -1: The maximum speed allowed by the negative direction axis.	60000mm/min	●	●
13001	Y-axis		60000mm/min	●	●
13002	Z-axis		60000mm/min	●	●
Encoder feedback direction					
14100	X-axis	Encoder feedback direction of X	1	●	

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
14101	Y-axis	feed axis. 1: Positive direction; -1: Negative direction	1	●	
14102	Z-axis		1	●	
PG divide ratio (x4)					
14210	X-axis	The number of pulses fed back by one turn of the motor rotation (x4)	10000	●	
14211	Y-axis		10000	●	
14212	Z-axis		10000	●	
Drive station address 1					
16000	X-axis				●
16001	Y-axis				●
16002	Z-axis				●
Servo address 2					
16010	X-axis	It is consistent with the drive station address setting. Yes: ON No: OFF	Yes		●
16011	Y-axis		No		●
16012	Z-axis		Yes		●
Encode digit					
16020	X-axis	The encoder digit corresponding to the axis.	23		●
16021	Y-axis		24		●
16022	Z-axis		17		●
Electronic gear ratio (numerator)					
16030	X-axis	It should be the same as the electronic gear ratio (numerator) of the drive.	2		●
16031	Y-axis		1		●
16032	Z-axis		1		●
Electronic gear ratio (denominator)					
16040	X-axis	It should be the same as the electronic gear ratio (denominator) of the drive.	2		●
16041	Y-axis		1		●
16042	Z-axis		1		●
Servo type					
16050	Default servo type	-1: Auto identification	2		●
		0: Yaskawa Σ5	1		●
		1: Yaskawa Σ7 2: Wise 3: Panasonic A5 4: Panasonic A6 5: Mitsubishi J4 6: Yaskawa Σ7M3 7: Inovance EtherCAT 8: HiTronic	1		●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
		9: Schneider 10: V&T 14: Wise all-in-one (M3_EC) 15: Wise all-in-one (M2_EC) 16: Wise all-in-one (LM_EC)			
20001	MAX spindle speed	The maximum allowable speed of the spindle should be consistent with the setting of the inverter.	24000r/min	●	●
20003	Spindle on delay	The delay time after the spindle receives the start or stop command, so that the spindle can reach a set speed at the start or stop completely at the end.	5000ms	●	●
20005	Spindle speed abnormal detection delay	The time to detect whether the spindle speed is abnormal.	5000ms	●	●
20006	Spindle speed during centering	The rotation speed of spindle during centering. It should be the same with the setting of the inverter.	500r/min	●	●
20009	Tapping type	0: No tapping: 1: Synchronize tapping; 2: Follow tapping	0	●	●
20011	Exact stop before tapping	—	No	●	●
20012	Z-axis position loop gain	Tapping Z-axis position loop gain	100	●	●
20013	Velocity feed forward ratio	Velocity feed forward control percentage	0	●	●
20014	Spindle Acc during tapping	Spindle speed change rate during tapping	150rev/sec^2	●	●
Tool change parameters					
31000	Tool Mag. capacity	The total number of tools that can be accommodated in the tool magazine	10	●	●
Tool position (T0 position in MCS)					
33000	X-axis	Tool 0 position X, Y, Z axis machine coordinate value	0mm	●	●
33001	Y-axis		0mm	●	●
33002	Z-axis		0mm	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
41000	Enable regular lube	Whether the system automatically turns on the lube pump periodically to add lube.	No	●	●
41001	Lube interval	The interval between lube actions.	18000sec	●	●
41002	Lube duration	The duration of each lube action.	5sec	●	●
50005	Deceleration time to soft limit	The duration time from running to stop status on soft limit.	0.5sec	●	●
52001	Adopt precise pulse counting	Yes: Execute strict handwheel counting, and the system will move the distance specified by the handwheel. No: Not executed, the machine tool moves only when the handwheel is shaken.	No	●	●
52002	Handwheel direction	The relationship between the handwheel rotation direction and the feed direction. 1: same direction, -1: opposite direction	1	●	●
52012	Handwheel acceleration	The smaller the value, the smoother the movement	200mm/s^2	●	●
52014	Handwheel connection mode	0: To Lambda controller；1: To operation panel	1	●	●
Enable connection with extended terminal board 1					
52031	Extended terminal board 1	Yes, the expansion board 1 connection is valid	No	●	●
52032	Extended terminal board 2	Yes, the expansion board 2 connection is valid	No	●	●
52033	Extended terminal board 3	Yes, the expansion board 3 connection is valid	No	●	●
52034	Extended terminal board 4	Yes, the expansion board 4 connection is valid	No	●	●
52035	Extended terminal board 5	Yes, the expansion board 5 connection is valid	No	●	●
53006	Fix G00 speed	If this parameter is set to "Yes", the G00 override will be fixed at 100%.	Yes	●	●
53007	Feed override valid in manual	Yes: When manual, it is affected by the feed override; No: When	Yes	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
	mode	manual, it is not affected by the feed override, and the feed override is 100%.			
53008	Ignore federate in program	If this parameter is set to "Yes", the feed speed specified in the machining file will be invalid, and the feed speed specified by the system will be used.	Yes	●	●
53009	Ignore spindle speed in program	If this parameter is set to "Yes", the rotation speed specified in the machining file will be invalid.	Yes	●	●
60011	Cycle machining interval	During cycle machining, the time interval between two machining tasks.	0sec	●	●
62000	Deceleration distance	During rapid positioning, the distance for spindle to deceleration than approach target position with approaching speed.	10mm	●	●
62001	Approaching speed	During rapid positioning, the feedrate of spindle when tool is approaching workpiece.	600mm/min	●	●
62020	Enable arc IJK incremental mode	Yes: Valid. In the arc IJK programming mode, I, J, K represent the incremental values of the circle center coordinates in the X, Y, Z directions compared with the start point coordinates; No: Invalid.	Yes	●	●
62021	Ace radius toleration	The maximum tolerance of the start and end radius in IJK programming.	2mm	●	●
Tool compensation					
62410	Enable tool compensation	Whether the tool compensation command in the CNC machining code is valid	No	●	●
62411	Tool compensation type	Tool compensation type: 1. Normal type, 2. Intersect type, 3. Insert type.	3	●	●
62412	Tool	0: None, 1: Three, 2: More.	1	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
	compensation interferometry				
62413	Tool compensation look ahead block No.	The segment number when tool compensation interferometry evading is enabled. Range [3~30].	3	●	●
62730	Retract distance for G73_G83	Tool lift distance for each drilling.	0mm	●	●
63006	Path smoothing time	The longer the time, the smoother the surface of the workpiece. But some of the details may be weakened.	0sec	●	●
Axis position loop gain					
63010	X-axis	X, Y, Z axis position loop gain.	0（1/s）	●	●
63011	Y-axis		0（1/s）	●	●
63012	Z-axis		0（1/s）	●	●
63020	Delay for exact stop	Track is the extended time at the sharp corner.	0ms	●	●
64000	Startup speed	Minimum speed during machining.	0mm/min	●	●
64020	G00 speed	The default speed during rapid positioning.	3500mm/min	●	●
64021	Feedrate	The default feedrate during machining.	3000mm/min	●	●
64022	Max feedrate	The maximum speed during machine tool machining.	10000mm/min	●	●
Rotary axis configuration					
64033	Programming unit options for rotary Y-axis	The measurement unit for the data of the rotar Y-axis in machining file in turntable mode. 0: Angle (unit: degree); 1: Surface distance of the rotary workpiece (unit: mm or inch).	0	●	●
64035	Rotary workpiece diameter	In turntable mode, the programmed diameter of the workpiece to be machined.	20mm	●	●
64036	Rotary axis startup speed	The startup speed when setting the Y-axis as the rotary axis.	0.2909rad/s	●	●
64037	Rotary axis max feedrate	No matter at any time, the rotation speed of the rotary axis	30r/min	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
		will not exceed this value. This value should be determined by the machine and electrical characteristics of the machine tool.			
64038	Rotary axis acceleration	No matter at any time, the rotation speed of the rotary axis will not exceed this value. This value should be determined by the machine and electrical characteristics of the machine tool.	6.9813rad/s	●	●
64100	Axis acceleration	The maximum linear acceleration of each axis during machining.	800mm/s^2	●	●
64101	G00 acceleration	The maximum linear acceleration of each axis during positioning.	800mm/s^2	●	●
64120	The Max acceleration at corners	The maximum acceleration at corners (mm/s^2).	3000mm/s^2	●	●
64150	Axial jerk	—	150000mm/s^3	●	●
64160	Look ahead path segments	Maximum number of look ahead segments when calculating connection speed.	50	●	●
64201	Max angle for fast corner velocity	If the path connection angle is higher than this value, startup speed is enabled as operating speed.	120deg	●	●
64202	Look ahead distance for velocity	The system will analyze the situation within a certain distance before and after the current point to determine the speed planning strategy.	0mm	●	●
64203	Path interpolation algorithm options	0: Velocity triangle; 1: Velocity S type; 2: Trapezoid.	1	●	●
64207	Limit arc velocity	Yes: The arc speed limit is valid; No: The arc speed limit is invalid.	Yes	●	●
64208	Max velocity of	The maximum allowable speed	3500mm/min	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
	Ref circle	corresponding to a circle with a diameter of 10mm.			
64250	Enable short line velocity smoothing	Yes: Eliminate speed fluctuations to short lines; No: Not eliminate speed fluctuations to short lines.	Yes	●	●
64251	Short line Ref length in velocity smoothing	Used to adjust speed fluctuations for lines whose length is shorter than reference length.	2mm	●	●
Plt file					
65000	Lift height for PLT	The lift height of tool during rapid traverse motion in PLT file. Reloading file is required.	5mm	●	●
65001	Plt unit	Generally, 1PLT=40.195mm. Setting this parameter can zoom in or zoom out.	40mm	●	●
65002	PLT tool space		0.025mm	●	●
65003	Cutting depth for PLT	Z-depth or cutting depth of 2D files. Reloading file is required.	-1mm	●	●
DXF file					
65100	Lift height for DXF	The lift height of tool during rapid traverse motion in DXF file. Reloading file is required.	1mm	●	●
65101	Cutting depth for DXF	Z-depth or cutting depth of DXF files. Reloading file is required.	-1mm	●	●
65103	Enable first point as WCS zero	Whether to ues the first point in DXF file as zero point. Reloading file is required.	Yes	●	●
65104	Enable single shape cutting	Whether to machine only one shape each time and go to next shape after last one finished. Reloading file is required.	No	●	●
65105	Enable flat bottom cutting	For 3D cutting, whether valve operation is executed only when tool arrives at workpiece surface. Reloading file is required.	No	●	●
65106	Force metric unit in DXF	Whether to force metric unit in DXF file. Reloading file is required.	No	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
Eng file					
65201	Lift height for ENG	The lift height of tool during rapid traverse motion in ENG file. Reloading file is required.	1mm	●	●
65202	Tool change notification	Whether to prompt operation to change tool when M6 is encountered. Reloading file is required.	Yes	●	●
65203	Cycle times for ENG	The machining times that needs to be cycled while machining ENG file. Reloading file is required.	1	●	●
65204	Enable ENG tool selection	With this function, cutting can be executed by tool with specified tool number. Reloading file is required.	Yes	●	●
65205	Peck drilling mode	The options for peck drilling. 0: Reciprocating chips removal; 1: High speed reciprocating chips removal. Reloading file is required.	0	●	●
65206	Retract distance	The retract amount after single feed motion under high speed reciprocating chips removal of peck drilling. Reloading file is required.	1mm	●	●
65207	Enable tool No. change in ENG	Whether to enable tool number change in ENG files so as to modify tool number for machining. Reloading file is required.	Yes	●	●
66000	Tool change prompt valid	When meets a tool change command whether to pause and prompt for tool change.	No	●	●
66001	Upper position in tool change	The upper position of Z-axis machine coordinate for tool change	-1mm	●	●
66002	Lower position in tool change	The lower position of Z-axis machine coordinate for tool change	0mm	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
Spindle position in tool change					
66008	X-axis	The machine coordinates of spindle X and Y during tool change	0mm	●	●
66009	Y-axis		0mm	●	●
Tool change ahead position					
66022	X-axis	X, Y, Z axis machine coordinate values of the deceleration position before entering the tool magazine	0mm	●	●
66023	Y-axis		0mm	●	●
66024	Z-axis		0mm	●	●
66032	Rapid traverse speed in tool change	The tapid traverse speed during tool change	3000mm/min	●	●
66033	Z speed in tool change	The default speed at upper and lower position of Z-axis during tool change.	60mm/min	●	●
66034	XY speed when tool in/out tool magazine	The default speed of Z-axis moving into/out of tool magazine during tool change.	60mm/min	●	●
66049	Automatic tool calibrate after tool change	Whether to automatically calibrate tool after tool change	No	●	●
66050	Current tool magazine No.	The current tool number in magazine.	1	●	●
66052	T0 treatment mode	0: Disanle; 1: Turn to empty tool status; 2: Initial tool No. is 0	0	●	●
66054	Delay for tool change	Dwell time for time change.	500ms	●	●
67000	Return prior position after tool change	Whether to return Z-axis to the previous position after tool change.	No	●	●
67130	Loaded tool No.	The currently used tool number	1	●	●
71000	Manual low	Default velocity under jog mode	1500mm/min	●	●
71001	Manual high	The velocity under rapid-jog mode	3500mm/min	●	●
71021	Notification options after end	After the processing task is finished, notify the type of operator. 0: Red light is off; 1: Red light is on for 3 seconds; 2: The red light is always on until the user has mouse or keyboard	0	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
		input.			
71022	Spindle action after end	Spindle action after machining. 0: Not move; 1: Return to fixed point; 2: Return to workpiece origin	0	●	●
71024	Spindle off after end	Spindle stops when cycle completed.	Yes	●	●
72004	Spindle off after stop	Whether to automacatically turn off spindle when machining stops.	Yes	●	●
72040	Turn on coolant at start	Whether to turn on coolant at start.	No	●	●
72041	Turn off coolant at end	Whether to turn off coolant at end.	No	●	●
72045	Turn on blow at cycle start	Whether to turn on blow when machining starts.	No	●	●
73004	Z lift distance on pause	Z-axis lift distance on pause.	10mm	●	●
73005	Spindle off on pause	Whether the spindle stops automatically when machining is paused.	Yes	●	●
74000	Cancel origin symbol at E-stop	With enoder feedback function enabled, origin symbol will be cleared when E-stop occurs if this parameter is set to Yes. While with feedback function disabled, origin symbol will always be cleared when E-stop occurs.	Yes	●	●
74001	Returning to mach origin required before mach	Whether returning to machine origin is required before machine	Yes	●	●
Coarse positioning direction					
74020	X-axis	During the return to machine origin, the motion direction of X, Y, and Z axes in the coarse positioning stage.	-1	●	●
74021	Y-axis		-1	●	●
74022	Z-axis		1	●	●
REF switch positioning speed					
74030	X-axis	During the return to machine	1800mm/min	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
74031	Y-axis	origin, the feed speed of X, Y, and Z axes in the coarse positioning stage.	1800mm/min	●	●
74032	Z-axis		1500mm/min	●	●
Fine positioning speed					
74060	X-axis	During the return to machine origin, the feed speed of X, Y, and Z axes in the fine positioning stage.	60mm/min	●	●
74061	Y-axis		60mm/min	●	●
74062	Z-axis		60mm/min	●	●
Retract distance					
74080	X-axis	After the return to machine origin fine positioning stage end, the additional moving distance of X, Y, Z axis. Positive value move to the positive direction, negative value move to the negative direction.	2mm	●	●
74081	Y-axis		2mm	●	●
74082	Z-axis		-2mm	●	●
Screw pitch					
74091	X-axis	X, Y, Z axis pitch is used to analyze the coarse and fine positioning switch distance when return to machine origin.	5mm	●	●
74092	Y-axis		5mm	●	●
74093	Z-axis		5mm	●	●
Coarse/Fine switches Min distance					
74101	X-axis	It is used to detect whether the coarse and fine positioning switches are too close when return to machine origin. Effective range: (minimum distance, lead screw pitch - minimum distance).	1mm	●	●
74102	Y-axis		1mm	●	●
74103	Z-axis		1mm	●	●
Tool cali					
75002	Fine positioning times in tool calibration	Fine tool calibration times	3	●	●
75003	Coarse positioning times in tool calibration	Coarse tool calibration speed	400mm/min	●	●
75020	Max cali tolerance	The maximum allowable tool calibration error value during multiple tool calibrations.	0.1mm	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
75100	Tool sensor thickness	The height of the tool calibration presetter surface relative to the workbench surface.	10mm	●	●
Fixed presetter position					
75210	X-axis	The Y mechanical coordinate of the position where the fixed tool calibration presetter is located	0mm	●	●
75211	Y-axis		0mm	●	●
75212	Z-axis		-1mm	●	●
Upper limit of tool change workbench					
75270	X-axis	Workbench travel upper limit X-axis machine coordinate value during tool change.	400mm	●	●
75271	Y-axis		400mm	●	●
75212	Z-axis		0mm	●	●
Lower limit of tool change workbench					
75280	X-axis	Workbench travel lower limit Z-axis machine coordinate value during tool change.	0mm	●	●
75281	Y-axis		0mm	●	●
75282	Z-axis		-100mm	●	●
79000	The selection for Z down feedrate	0: Not treatment; 1: Valid only for Z-axis down; 2: Valid for Z-axis down motion	0	●	●
79001	Z down feedrate	Z direction feed speed	300mm/min	●	●
79003	Safety height	Calculated relative to the workpiece coordinate zero point; the system considers it safe to move horizontally at this height. It is used when performing return to zero operation and breakpoint resume operation.	10mm	●	●
79102	Cali mode	1: Auto measurement mode; 2:First and exchange cali mode	2m	●	●
Fixed point position in MCS					
79110	X-axis	Fixed point machine coordinates	0mm	●	●
79111	Y-axis		0mm	●	●
79112	Z-axis		-1mm	●	●
79210	Prompt for public offset saving	Whether to prompt to keep the public offset when clearing and setting the workpiece offset. Yes: Prompt the user whether to keep the public offset; No: Not prompt, directly keep the public offset.	No	●	●
81004	Path preprocess mode	Path preprocess mode before machining. 0: No treatment; 1:	0	●	●

No.	Name	Description	Defult Value	Attribute	
				Non-bus	Bus
		Tolerance treatment; 2: Smoothing treatment.			
81005	Path preprocess accuracy	For the overall smoothness of the workpiece, the accuracy of trajectory preprocessing.	0.1mm	●	●

10 Drive Parameter and Wiring Diagram

10.1 Drive Parameter

The driver parameter setting listed in this chapter only ensure the normal movement of the machine tool, and not ensure the machining effect. The user can adjust the relevant parameter setting values according to the actual situation.

10.1.1 Wise Series

Non-bus Type

Para. No.	Function	Set Value	Description
Pr528	LED initial status	6	Monitor if the number of sent and received pulses 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.
Pr008	Command pulse No. per motor circle	0	When it is set to “0”, parameters Pr009 and Pr010 are valid.
Pr009	1st numerator of command pulse frequency division/ multiplication	Need calculation	Range: 0~2^{30} Typical value: pitch 5 mm, encoder resolution 10000, coupling direct connection, pulse equivalent 0.001 mm: Pr009＝10000 Pr010＝pitch 5mm/ pulse equivalent 0.001mm＝5000 Pr009/Pr010=10000/5000=2/1
Pr010	Denominator of command pulse frequency division/multiplication	Need calculation	
Pr011	Output pulse No. per motor circle	2500 (default)	Typical value: pulse equivalent 0.001mm/p and without reducer, pitch 10mm/p, sets this parameter to 2500;

Para. No.	Function	Set Value	Description
			pitch 5mm/p, sets this parameter 1250.
Pr100	1st position loop gain	480 (default)	Unit: 0.1/s. Set it according to the actual situation.
Pr101	1st velocity loop gain	270 (default)	Unit: 0.1Hz. Set it according to the actual situation.
Pr102	1st velocity loop integrated time constant	210 (default)	Unit: 0.1ms. Set it according to the actual situation.
When the value of Pr008 is not “0”, it should be calculated according to 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 is 0.001, the value of Pr008 is 5000.			

Bus Type

Para. No.	Function	Set Value	Description
Pr000	Rotation direction setting	1	Accounting to the actual situation specifies the relationship between the direction of the command and the direction of rotation of the motor. Forward command: 0: motor rotation direction is CW direction; 1: motor rotation direction is CCW direction. The opposite is true when the command is negative: 0 is CCW, 1 is CW. Note: CW/CCW direction is clockwise/counterclockwise when looking at the motor from the axis side).
Pr008	Command pulse No. per motor circle	0	When it is set to “0”, parameters Pr009 and Pr010 are valid.
Pr009	1st numerator of command pulse frequency division/ multiplication	1	Range: 0~2^{30} Typical value: pitch 5 mm, encoder resolution 10000, coupling direct connection, pulse equivalent 0.001 mm: Pr009＝10000

Para. No.	Function	Set Value	Description
Pr010	Denominator of command pulse frequency division/multiplication	1	Pr010＝pitch 5mm/ pulse equivalent 0.001mm＝5000 Pr009/Pr010=10000/5000=2/1
Pr011	Output pulse No. per motor circle	2500	Typical value: pulse equivalent 0.001mm/p and without reducer, pitch 10mm/p, sets this parameter to 2500; pitch 5mm/p, sets this parameter 1250.
Pr014	Position deviation too large setting	Need calculation	Set the unit and deviation calculation method according to Pr520 "Position setting unit selection".
Pr015	Absolute encoder setting	0	Set the usage method of 17 bit/23 bit absolute encoder according to the actual situation. 00: Use as an absolute encoder 1: Use as an incremental encoder 2: Used as an absolute encoder, ignoring counter overflow for multiple revolutions

The Relationship between Parameters Pr008, Pr009, and Pr010

Pr008	Pr009	Pr010	Description
$1\sim2^{20}$	— (no influence)	— (no influence)	Command Pulse Input → Encoder Resolution / Setting Value of Pr008 → Position Command As shown above, the process is undergone in terms of the setting value of Pr008, not affected by the settings of Pr009 and Pr010.
0	0	$1\sim2^{30}$	Command Pulse Input → Encoder Resolution / Setting Value of Pr010 → Position Command When the values of Pr008 and Pr009 are both set to “0”, as shown above, the process is undergone in terms of the setting value of Pr010.
	$1\sim2^{30}$	$1\sim2^{30}$	Command Pulse Input → Setting Value of Pr009 / Setting Value of Pr010 → Position Command When the value of Pr008 is “0”, but the value of Pr009 is not “0”, as shown above, the process is undergone in terms of the setting values of Pr009 and Pr010.

10.1.2 Yaskawa Σ-Ⅱ Series

Para. No.	Function	Set 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	Input command pulse counter	Hexadecimal count value L lower four digits	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	Select rotation direction Select control mode	0010	Bit 0: Set 0, “CCW” rotation 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 command mode	0005	Bit 0: Set 5, select the command input mode as “pulse + direction”, negative logic. Bit3: Set 0, input differential signal into filter.
Pn50A	Selection function	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, forward 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

Para. No.	Function	Set Value	Description
			function and leading to brake ineffective, “3” is not allowed to appear in the 4 digits.
Pn506	Servo off, time delay of brake when motor stops	Depended	Set it when motor with brakes. Default setting is “0”, setting unit is 10ms.
Pn201	PG frequency division ratio setting	Need Calculation	Range: 16 ~2^{14}. Set it according to actual PG frequency division ratio. Typical value: pulse equivalent 0.001mm/p, no reducer, pitch 10mm, set this parameter to 2500; pitch 5mm, set it to 1250.
Pn202	Electronic gear ratio (numerator)	Need Calculation	Pn202 = pulse No. of each encoder circle × 4 × machine deceleration ratio. Pn203 = (screw pitch/ pulse equivalent). Typical value: pitch 5mm, encoder 17-bit, coupling direct drag, pulse equivalent 0.001mm, Pn202＝16384; Pn203＝625. Pitch 5mm, encoder 17-bit, coupling direct drag, pulse equivalent 0.0005mm, Pn202＝8192; Pn203＝625.
Pn203	Electronic gear ratio (denominator)	Need Calculation	

10.1.3 Yaskawa Σ-Ⅴ/Σ-7 Series

Non-bus Type

Para. No.	Function	Set 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 command mode as “pulse + direction”, negative logic.
Pn50A	Input signal	8100	Bit 1: Set 0, Servo ON /S-ON, input from the 40th pin;

Para. No.	Function	Set Value	Description
	selection 1		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 command-servo OFF 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, coupling direct drag, pulse equivalent 0.001mm, $\frac{Pn20E}{Pn210}=\frac{2^{20}\times0.001}{5}=\frac{1048576}{5000}=\frac{131072}{625}$
Pn210	Electronic gear ratio (denominator)	Need calculation	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, $\frac{Pn20E}{Pn210}=\frac{2^{13}\times0.001\times60}{360}=\frac{8192}{6000}=\frac{512}{375}$
Pn212	Encoder frequency division pulse number	Need calculation	Range: 16~2^{30}, the specific value is set according to the PG frequency division ratio. Pulse equivalent 0.001mm/p, no reducer, pitch 10mm, set this parameter to 2500; pitch 5mm, set it to 1250.

Bus Type

Para. No.	Function	Set Value	Description
Pn00B	Function	0000	Setting value: 0000 (three-phase) or 0100

Para. No.	Function	Set Value	Description
	selection basic switch B		(single-phase), please choose according to the actual power supply. Bit 2 (power input selection of servo unit with three-phase input specification): Set "0" to use with three-phase power input; Set "1" to use three-phase input specifications with single-phase power input.
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.
Pn20E	Electronic gear ratio (numerator)	Need calculation	The electronic gear ratio is fixed at 1:1.
Pn210	Electronic gear ratio (denominator)	Need calculation	
Pn212	Encoder frequency division pulse number	2048	Range: 16~2^{30}, the specific value is set according to the PG frequency division ratio. Pulse equivalent 0.001mm/p, no reducer, pitch 10mm, set this parameter to 2500; pitch 5mm, set it to 1250.
Pn506	Brake command-servo OFF time delay	0	Set it when motor with brakes. Default setting is “0”, setting unit is ms.
Pn50A	Input signal selection 1	8881	Bit 3: Set 8, always fix the signal as "forward rotation side driveable".
Pn50B	Input signal selection 2	8888	Bit 3: Set 8, always fix the signal as "reverse rotation side driveable".
Pn520	Excessive position deviation alarm value	52428800	0~1073741823. Alarm occurs when the position deviation exceeds the set value.
Pn522	Positioning completed width	200	0~1073741824. Positioning completed width output signal when the difference between the command position and the current position (position deviation value) is smaller than the set value.
Pn600	Regenerative resistor capacity	0	According to the model (the upper limit value is the maximum output capacity of the applicable servo unit),

Para. No.	Function	Set Value	Description
			the unit is W.

10.1.4 Panasonic MINAS A4 Series

Para. No.	Function	Set 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: pulse + direction, negative logic
Pr44	Feedback pulse divider (numerator)	Need calculation	Range: 1 ~ 32767. Set it according to actual PG divider ratio. Pulse equivalent 0.001mm/p, no reducer, pitch 10mm, sets this parameter to 2500; pitch 5mm, set it to 1250.
Pr48	1st numerator of command pulse frequency multiplication	Need calculation	Range: 1~10000. Typical value: pitch 5 mm, encoder resolution 10000, coupling direct drag, pulse equivalent 0.001 mm: 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	

10.1.5 Panasonic MINAS A5 Series

Para. No.	Function	Set 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: pulse + direction, negative logic.
Pr0.08	Command pulse counts per one motor revolution	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: 0~2^{30} Typical value: pitch 5 mm, encoder resolution 10000, shaft coupling direct drag, 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	
Pr0.11	Output pulse No. per motor circle	2500	Range: 1 ~ 262144. Set it according to actual PG divider ratio. Pulse equivalent 0.001mm/p, without reduction box, pitch 10mm, sets this parameter to 2500; pitch 5mm, set it to 1250.
When the value of Pr0.08 is not “0”, it can be calculated in terms of the following formula:			

Para. No.	Function	Set Value	Description
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 0.001mm/p, the value of Pr0.08 is “5000”.			

The Relationship between Parameters Pr0.08, Pr0.09 and Pr0.10

Pr0.08	Pr0.09	Pr0.10	Description
$1\sim2^{20}$	— (no influence)	— (no influence)	Command Pulse Input → Encoder Resolution / Setting Value of Pr0.08 → Position Command The process shown above is undergone in terms of the setting value of Pr0.08, not affected by the settings of Pr0.09 and Pr0.10.
0	0	$1\sim2^{30}$	Command Pulse Input → Encoder Resolution / Setting Value of Pr0.10 → Position Command 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.
	$1\sim2^{30}$	$1\sim2^{30}$	Command Pulse Input → Setting Value of Pr0.09 / Setting Value of Pr0.10 → Position Command 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.

10.1.6 Mitsubishi MR-JE Series

Para. No.	Code	Function	Set Value	Description
PA01	*STY	Operation mode	XXX0	_ _ _x: select position control mode.
PD24	MBR	Output assignation to CN1-23 pin	XX05	_ _ xx: select MBR (electromagnetic brake interlock).

Para. No.	Code	Function	Set Value	Description
PA06	CMX	Electronic gear numerator	Need calculation	CMX/CDV=command unit × servo motor resolution × mechanical deceleration ratio / pitch of screw. E.G., pitch 5 mm, encoder resolution 10000, coupling direct drag, 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
PA07	CDV	Electronic gear denominator	Need calculation	
PC36	*DMD	Status display selection	00XX	_ _xx: status display selection at power-on. This is used to select a status display shown at power on. 00: cumulative feedback pulses 01: servo motor speed 02: droop pulses 03: cumulative command pulses 04: command pulse frequency
PA13	*PLSS	Command pulse input form	0011	Set command pulse input form: pulse train+ sign, negative logic.
PA15	*ENR	Encoder feedback pulse	Need calculation	Range: 1~65535, set according to the parameter setting of “Frequency Division Pulses of PG (X4)”. Typical value: pulse equivalent 0.001, screw pitch 10mm without a reduction box, PA15=2500; screw pitch 5mm, PA15=1250.
PD03	*DI1L	Input assignation to CN1-15 pin	XX02	_ _xx: select SON under position control mode.

10.1.7 Mitsubishi MR-E Series

Para. No.	Code	Function	Set Value	Description
0	*STY	Control mode selection and	X0X0	Bit 0: set 0: select position control mode. Bit 1, select motor series: 0: HC-KFE; 1:HC-SFE;

Para. No.	Code	Function	Set Value	Description
		regenerative fittings		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, coupling direct drag, 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
27	*ENR	Encoder output pulse	Need calculation	Range: 1 ~ 65535. Set it according to actual PG divider ratio. Pulse equivalent 0.001mm/p, no reducer, pitch 10mm, sets this parameter to 2500; pitch 5mm,

Para. No.	Code	Function	Set Value	Description
				set it to 1250.
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.

Caution

MITSUBISHI MR-E-A series drivers support position control mode and speed control mode, and MR-E-AG series only support analog input speed control mode.

10.1.8 Delta ASDA-A Series

Para. No.	Function	Format Range	Set 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.

Para. No.	Function	Format Range	Set Value	Description
				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	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 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	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	X2X1X0	007	DO5 corresponds to pin 28 & pin 27, used as servo alarm signal.

Para. No.	Function	Format Range	Set Value	Description
	pin DO5			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.

10.1.9 Delta ASDA-B Series

Para. No.	Function	Format Range	Set 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=0: positive logic
P1-01	Set control mode	YX1X0	000	Z=0: during control mode switching, DIO is maintaining the set value. Since switching control mode is not used, Z=0; Y=0: positive rotation (CCW) (from the view of load); Y=1: negative rotation (CCW) 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.

Para. No.	Function	Format Range	Set Value	Description
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	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 input as NO a-contact points. X1X0=00, limit input of driver is not used.
P2-18	Function setting for digital output pin DO1	X2X1X0	108	DO1 corresponds to pin 16, 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 16 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+.

10.1.10 Delta ASDA-A2 Series

Para. No.	Function	Format Range	Set 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	$\frac{\text{P1-44}}{\text{P1-45}} = \frac{\text{Encoder Reso.} \times \text{Pulse Equiv.} \times \text{Mech. Dece. Ratio}}{\text{Screw Pitch}}$ Assuming encoder resolution is 1280000, pitch 5mm, pulse equivalent 0.001, and non-cascade connection, then: $\frac{\text{P1}-44}{\text{P1}-45} = \frac{1280000 \times 0.001}{5} = \frac{256}{1}$ 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	
P1-46	Detector output pulse number setting	20~320000	Need calculation	Rotary single pulse number setting, the specific value is set according to the PG frequency division ratio. If the pulse equivalent is 0.001 and there is no reducer, when the pitch is 10mm, this parameter is set to 10000; when the pitch is 5mm, this parameter is set to 5000.

Para. No.	Function	Format Range	Set Value	Description
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 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, DI7 input as NO a-contact point. X1X0=00, limit input of driver is not used.
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 (normally closed) b-contact point. X1X0=07: set pin 28 and pin 27 as ALRM+ and ALRM- respectively.

10.1.11 Delta ASDA-B2 Series

Para. No.	Function	Format Range	Set 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

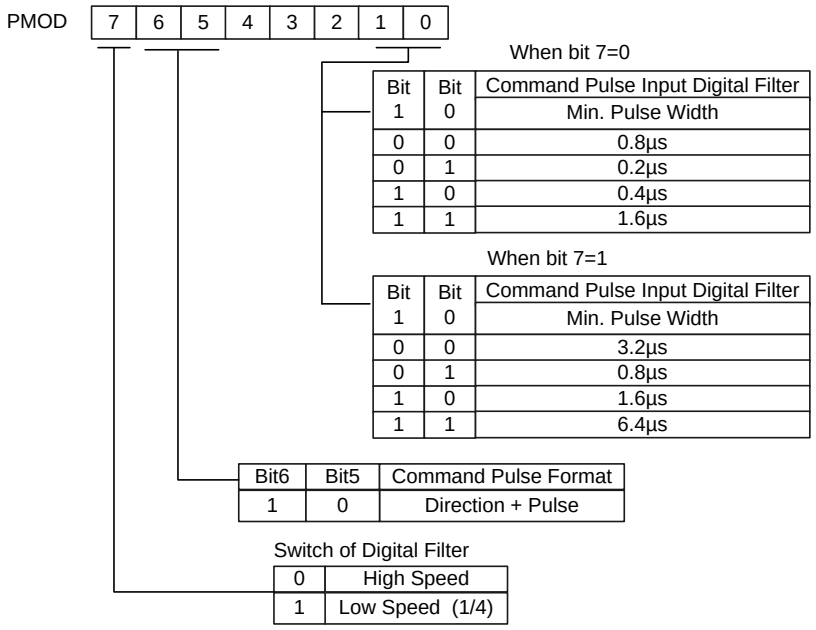
Para. No.	Function	Format Range	Set Value	Description
				by control card is detected by pulse inspection in order to determine whether there is electrical interference.
P1-00	External pulse train input type	ZYX	102	X=2: pulse + direction; Z=1: negative logic
P1-01	Set control mode	ZYX1X0	0000	Z=0: during 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	
P1-46	Detector output pulse number setting	20~40000	Need calculation	Rotary single pulse number setting, the specific value is set according to the PG frequency division ratio. If the pulse equivalent is 0.001 and there is no reducer, when the pitch is 10mm, this parameter is set to 10000; when the pitch is 5mm, this parameter is set to 5000.
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	000	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

Para. No.	Function	Format Range	Set Value	Description
P2-16	Function setting for digital input pin DI7	X2X1X0	000	of CN1. X2=0: set DI6 and DI7 inputs as NC b-contact point. X1X0=00, limit input of driver is not used.
P2-17	Function setting for digital input pin DI8	X2X1X0	000	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.

10.1.12 Sanyo PY Series

Para. No.	Abbr.	Name	Standard Value	Range	Unit	Remark
1-2	EGER	Electronic gear ratio	4/1	1/32767 to 32767/1		Depends 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

Para. No.	Abbr.	Name	Standard Value	Range	Unit	Remark
						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 shaft coupling direct drag, currently the numerator of the electronic gear ratio is 8, and the denominator is 5. (Select 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		50 to 65535	P/R	

<table>
<tr><th>Para. No.</th><th>Abbr.</th><th>Name</th><th>Standard Value</th><th>Range</th><th>Unit</th><th>Remark</th></tr>
<tr><td></td><td></td><td>encoder:--2048P/R</td><td></td><td></td><td></td><td></td></tr>
<tr><td>2-0</td><td>PMOD</td><td colspan="4">Pulse format of position command:
Our system uses: direction + pulse format, the parameters are shown as following:
 
</td></tr>
<tr><td>4-3</td><td>TYPE</td><td>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.
Note: 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>

10.1.13 Sanyo R Series

Para. No.	Parameter	Set Value	Remarks
Group 0, parameter setting of tuning mode			
00	Setting of 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, negative logic
15	Setting of electronic gear	8/5	It depends on the resolution of the specific encoder. E.G.: incremental encoder 2000, motor needs 2000 ×4=8000 pulses per circle. And pulse equivalent of Weihong control card 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

10.1.14 Sanyo Q Series

Para. No.	Parameter	Set Value	Remarks
Group 1			
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.
GER1	Electronic gear ratio 1	1/1	Set electronic gear ratio for position command pulse. E.G., incremental encoder 2000, motor needs 2000 ×4=8000 pulses per circle. And pulse equivalent of Weihong control card 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 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

10.1.15 Fuji FALDIC-β Series Servo Parameter Setting

Para. No.	Parameter	Set Value	Description
01	Command pulse numerator α	Need calculation 1~32767	Command pulse numerator and denominator are 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: command + symbol, that is 'pulse + direction'.
04	Rotation direction	0 or 1	Set 0: Positive direction: Forward rotation (CCW) Set1: 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	Whether to prohibit changing parameters	0 or 1	Set to 0, the drive parameters can be changed; Set to 1, prohibit changing parameters.
74	CONT always ON 1	1	Initial value: 0. when set "1", servo is activated (RUN).

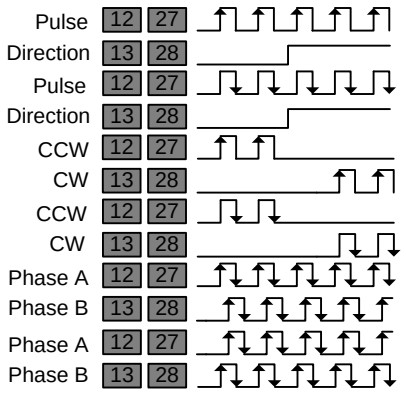
10.1.16 Kaitong KT270 Series

Para. No.	Parameter	Set 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 your 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 6000 command pulses 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 can be selected by setting the parameter:

Para. No.	Parameter	Set Value	Description
			0: pulse + symbol; 1: positive rotation pulse/ negative rotation pulse; 2: two orthogonal pulses inputs Default setting is 0: pulse + symbol, negative logic.
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 all 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 all allowed. Simultaneously, even if LSP and LSN are all 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 all disconnected, abnormal alarming of driving prohibited will not occur (NO.7).

10.1.17 STONE GS Series

<table>
<tr><th>Para. No.</th><th>Parameter</th><th>Set Value</th><th>Description</th></tr>
<tr><td>F0f</td><td>Electronic gear ratio numerator</td><td>6</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 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:</td></tr>
</table>

Para. No.	Parameter	Set Value	Description
			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 

10.1.18 TECO TSDA Series

Para. No.	Parameter	Set Value	Description		
Pn010-1	Set control mode	1	Value	Control mode	
				CN1 Pin12 open circuit	CN1 Pin12 closed circuit
			0	Speed control	Speed control
			1	Position control	Position control
			2	Torque control	Torque control
			3	Speed control	Speed control
			4	Position control	Position control
			5	Torque control	Torque control
Pn010-2	Set the pulse input format under position control mode	0	Value	The format of pulse input	
			0	Pulse + direction	
			1	Dipulse	
			2	A/B phase difference	
Pn010-3	Set rotation direction of motor	1	Value	Function	
			0	Input positive order, motor rotates CCW.	
			1	Input positive order, motor rotates CW.	
Pn021	Electronic gear ratio numerator	5	The input pulse amount will be multiplied with this number before output. Ratio range of parameter 21 to 22: 1/127＜parameter 21/ parameter 22＜127		

<table>
<tr><th>Para. No.</th><th>Parameter</th><th>Set Value</th><th>Description</th></tr>
<tr><td>Pn022</td><td>Electronic gear ratio denominator</td><td>1</td><td colspan="2">The input pulse amount will be multiplied with this number before output. Ratio range of parameter 21 to 22:
1/127＜parameter 21/ parameter 22＜127</td></tr>
<tr><td rowspan="3">Pn011-4</td><td rowspan="3">Set the value of Pin20 of CN1</td><td rowspan="3">1</td><td>Value</td><td>Function</td></tr>
<tr><td>0</td><td>Output of “0” speed signal</td></tr>
<tr><td>1</td><td>Output of brake signal</td></tr>
<tr><td>Pn013-1</td><td>Set the maximum pulse frequency received by the driver under position control mode</td><td>7</td><td colspan="2">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>

Caution

For the specific parameter settings, please refer to the manuals of the drives of each brand.

10.2 Wiring Diagram

The wiring diagram in this section is mainly the wiring diagram of one axis of the control system to control one drive movement. When you 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 section 10.2.2 and figure 4 in section 10.2.6 (take Yaskawa servo drive and Delta servo drive as an example; for Yaskawa server, its alarm signal wiring is NC type, while for Delta server, its alarm signal wiring is NO type).

10.2.1 Wise Series

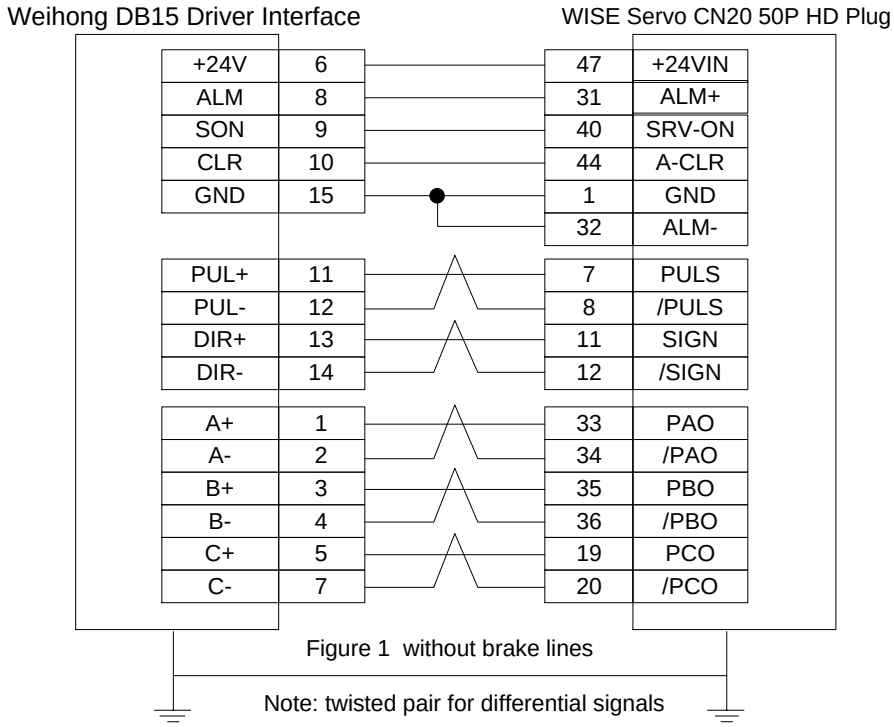


Figure 1 without brake lines

Note: twisted pair for differential signals

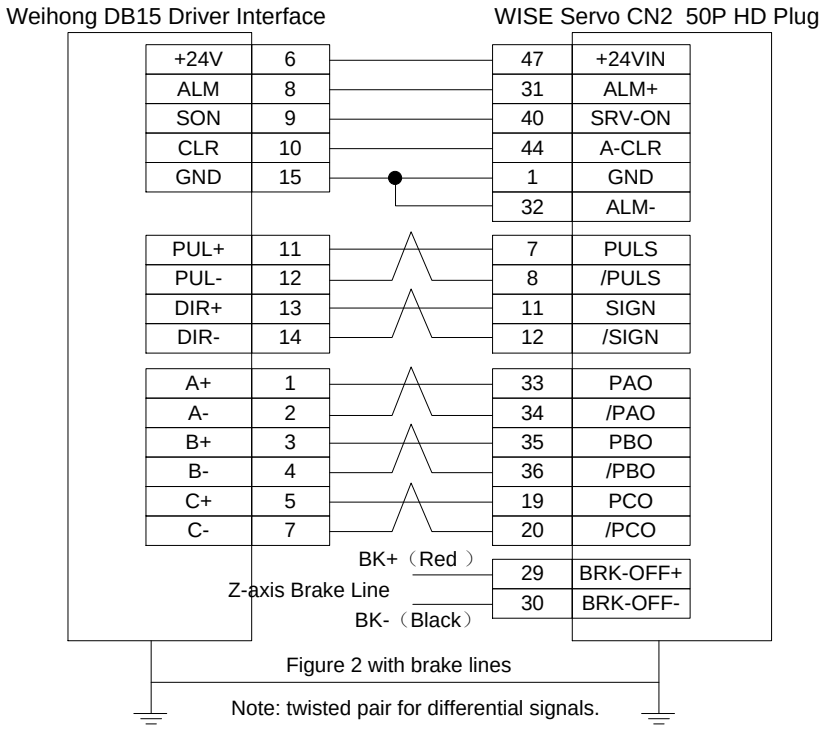


Figure 2 with brake lines

Note: twisted pair for differential signals.

10.2.2 Yaskawa Σ-Ⅱ/Σ-Ⅴ/Σ-7 AC

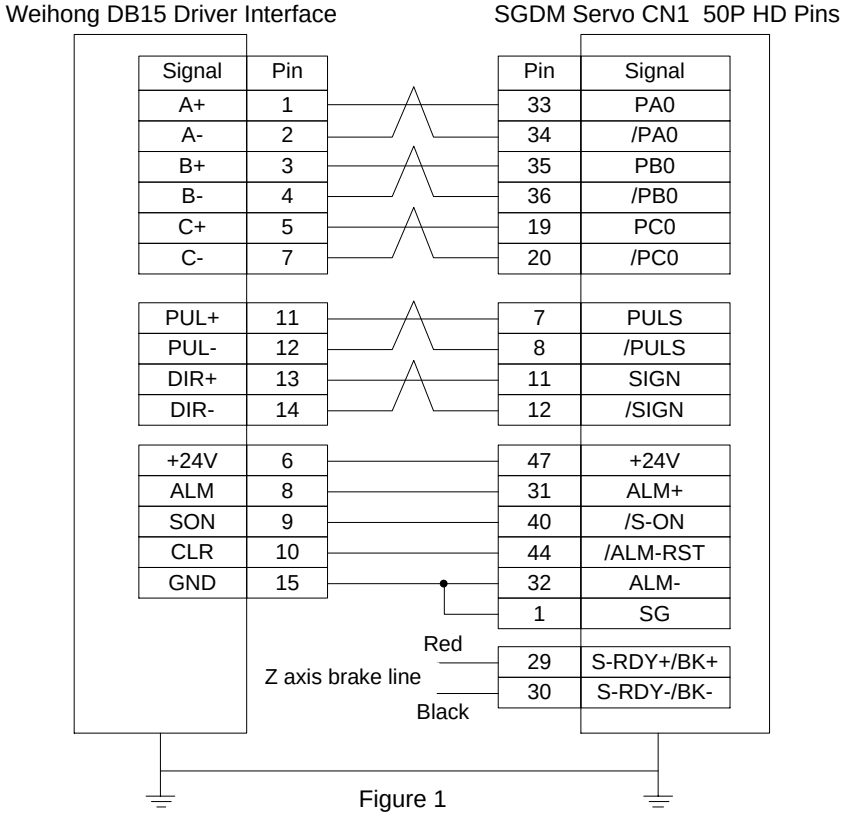


Figure 1

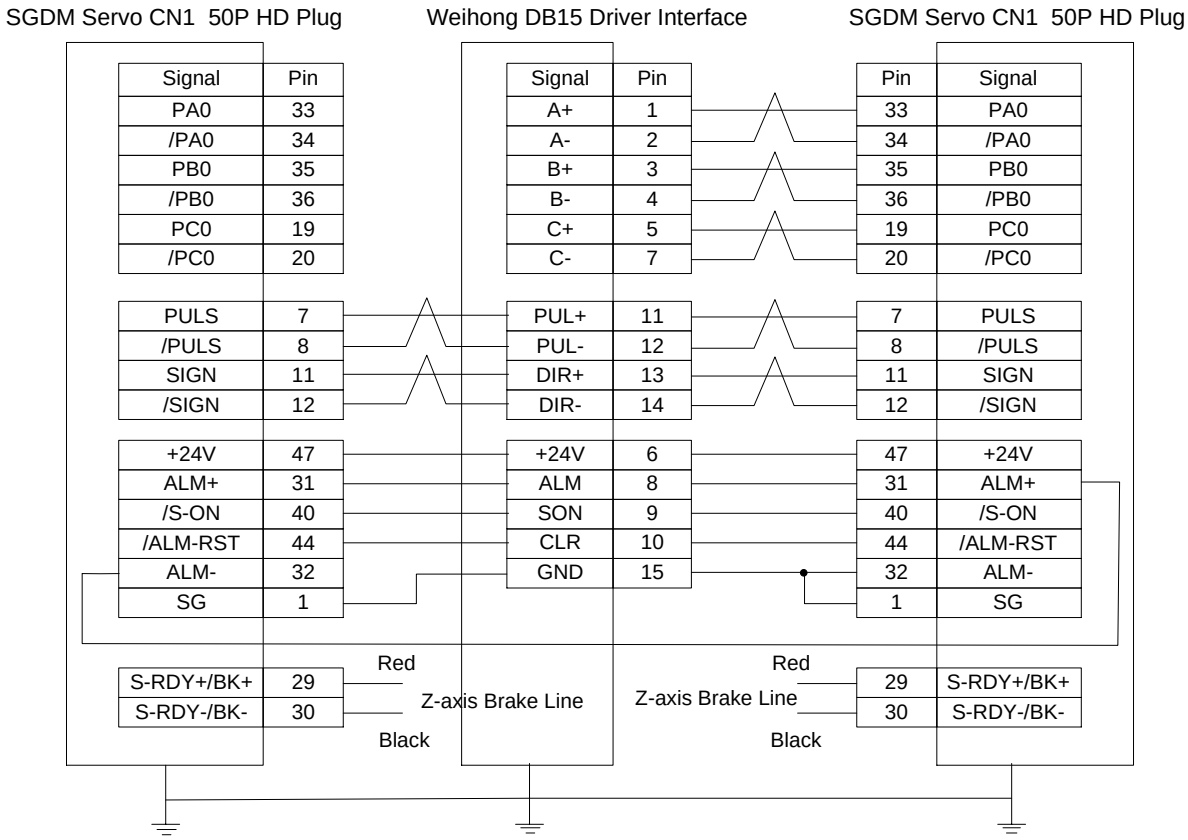
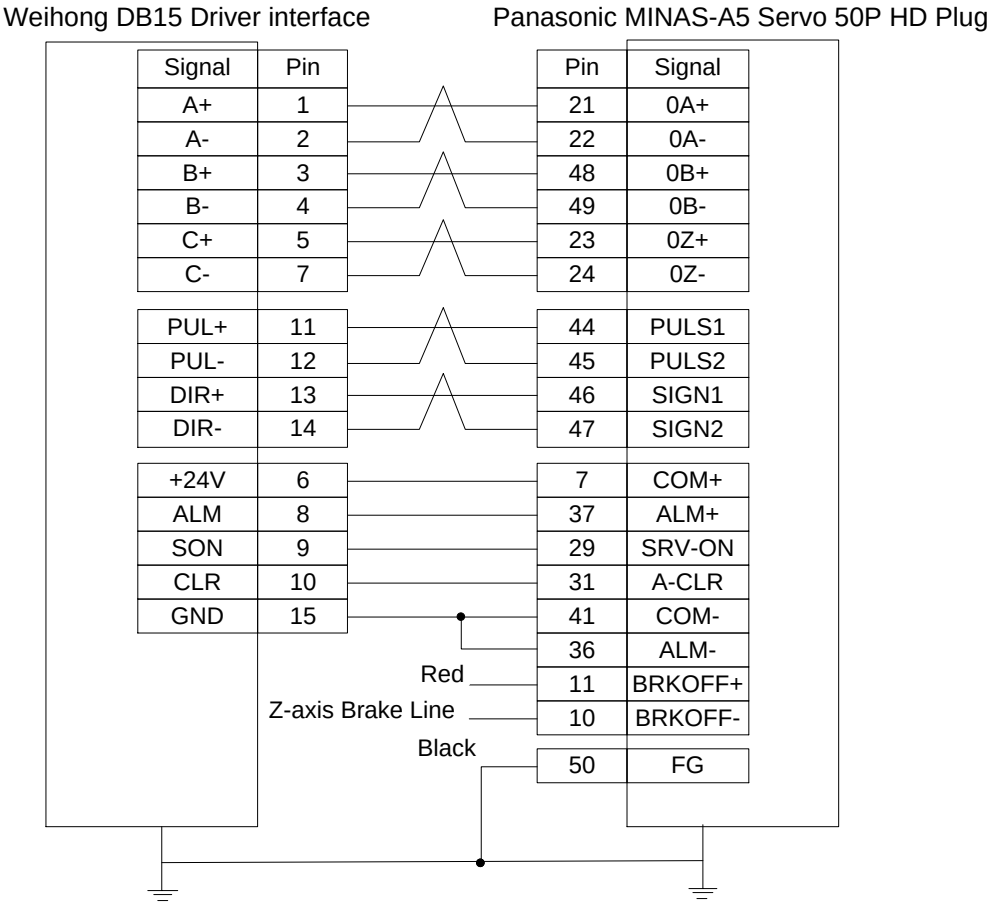

SGDM Servo CN1 50P HD Plug
Weihong DB15 Driver Interface
SGDM Servo CN1 50P HD Plug
Signal Pin
PA0 33
/PA0 34
PB0 35
/PB0 36
PC0 19
/PC0 20
PULS 7
/PULS 8
SIGN 11
/SIGN 12
+24V 47
ALM+ 31
/S-ON 40
/ALM-RST 44
ALM- 32
SG 1
S-RDY+/BK+ 29
S-RDY-/BK- 30
Red
Z-axis Brake Line
Black
Signal Pin
A+ 1
A- 2
B+ 3
B- 4
C+ 5
C- 7
PUL+ 11
PUL- 12
DIR+ 13
DIR- 14
+24V 6
ALM 8
SON 9
CLR 10
GND 15
Pin Signal
33 PA0
34 /PA0
35 PB0
36 /PB0
19 PC0
20 /PC0
7 PULS
8 /PULS
11 SIGN
12 /SIGN
47 +24V
31 ALM+
40 /S-ON
44 /ALM-RST
32 ALM-
1 SG
29 S-RDY+/BK+
30 S-RDY-/BK-
Red
Z-axis Brake Line
Black

Figure 2

10.2.3 Panasonic AC



10.2.4 Mitsubishi MR-JE

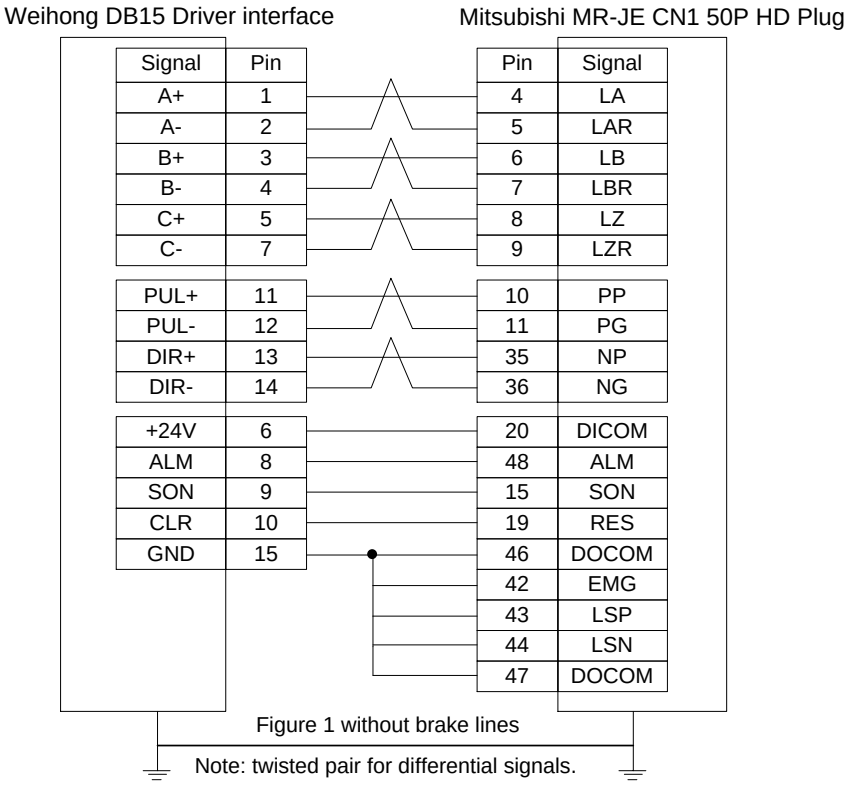


Figure 1 without brake lines

Note: twisted pair for differential signals.

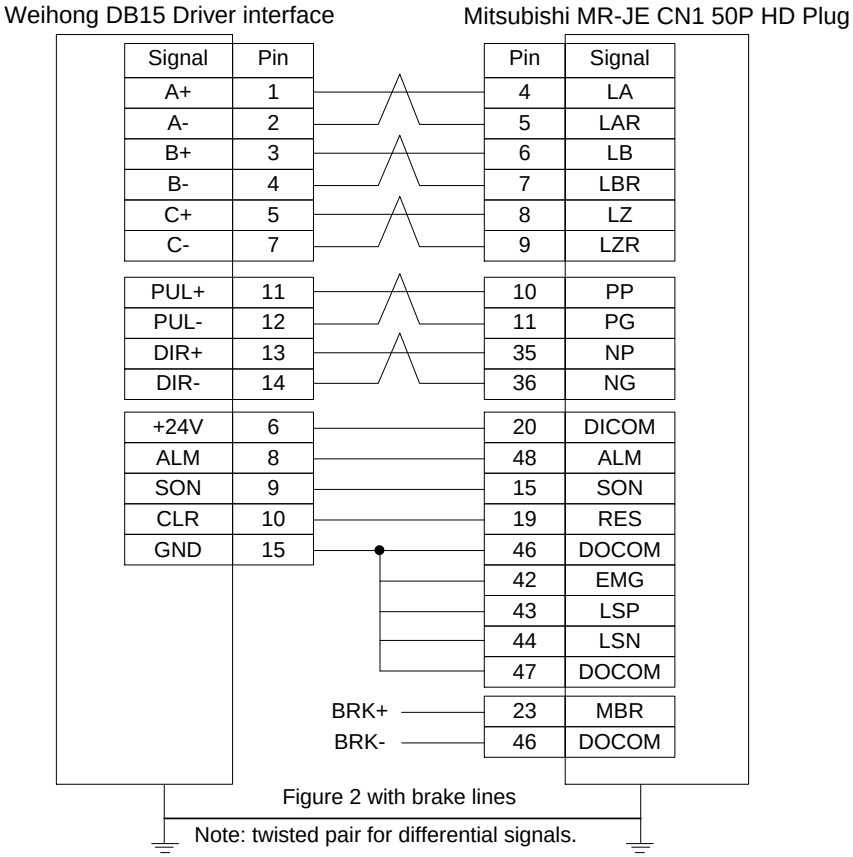
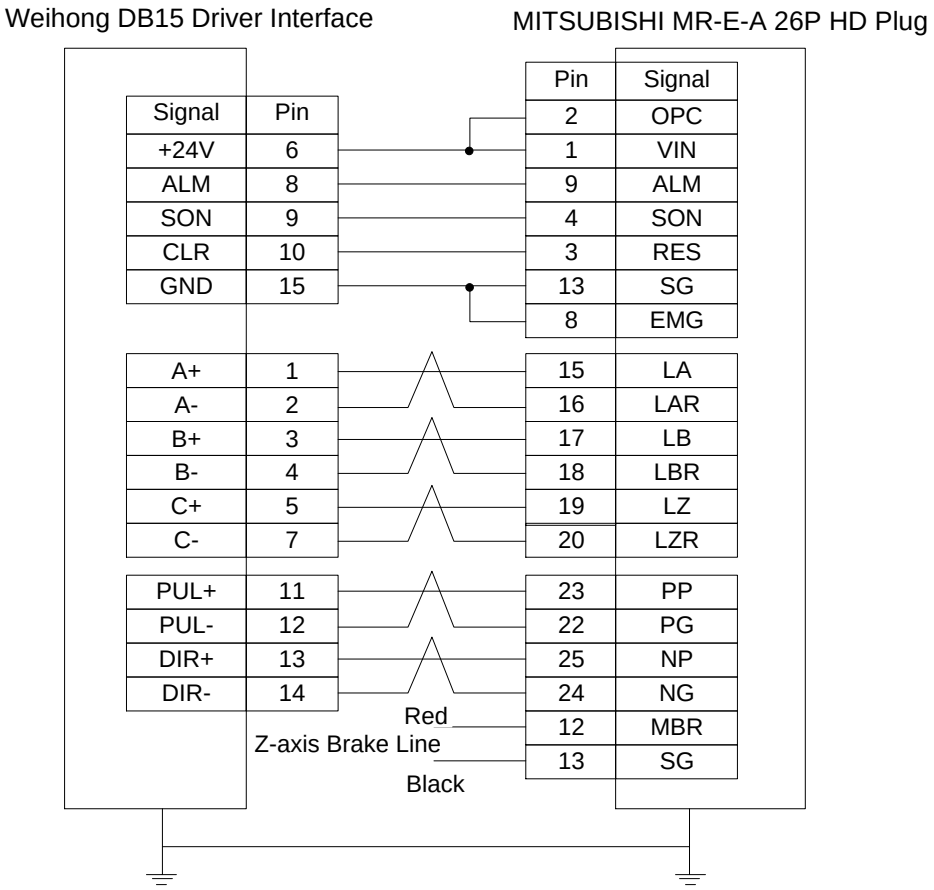


Figure 2 with brake lines

Note: twisted pair for differential signals.

10.2.5 Mitsubishi MR-E



10.2.6 Delta

DELTA ASDA-A, ASDA-B, ASDA-B (one drag 2 wiring), ASDA-B2 share the same wire. Among them, ASDA-A and ASDA-A2 have the same wiring pin while ASDA-A has the contrary pulse pin, with PULSE 43, /PULSE 41. For details, please see section 10.1.8, 10.1.9 and 10.1.1.11.

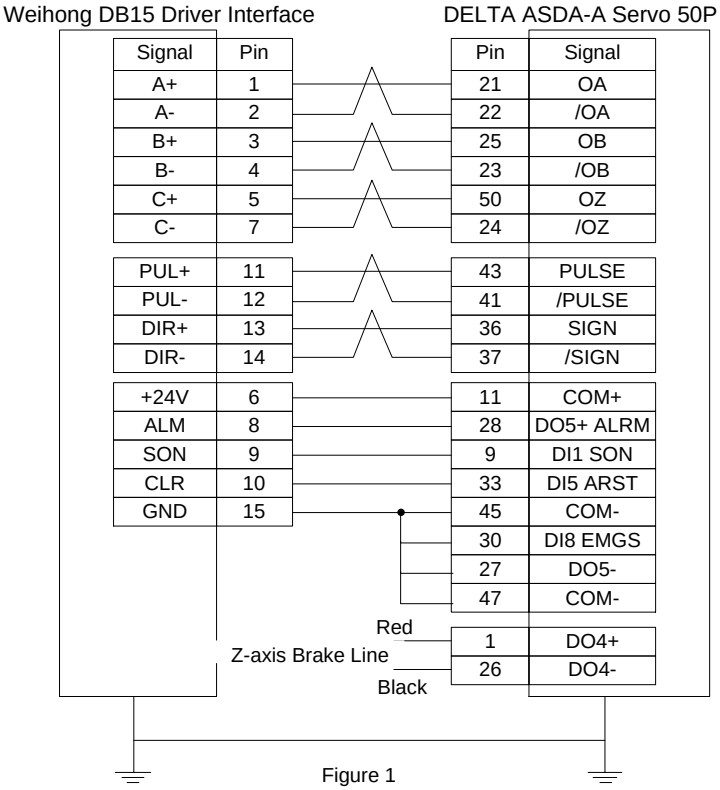


Figure 1

Weihong DB15 Driver Interface　　DELTA ASDA-B DB25 (Two-line Pinholes)

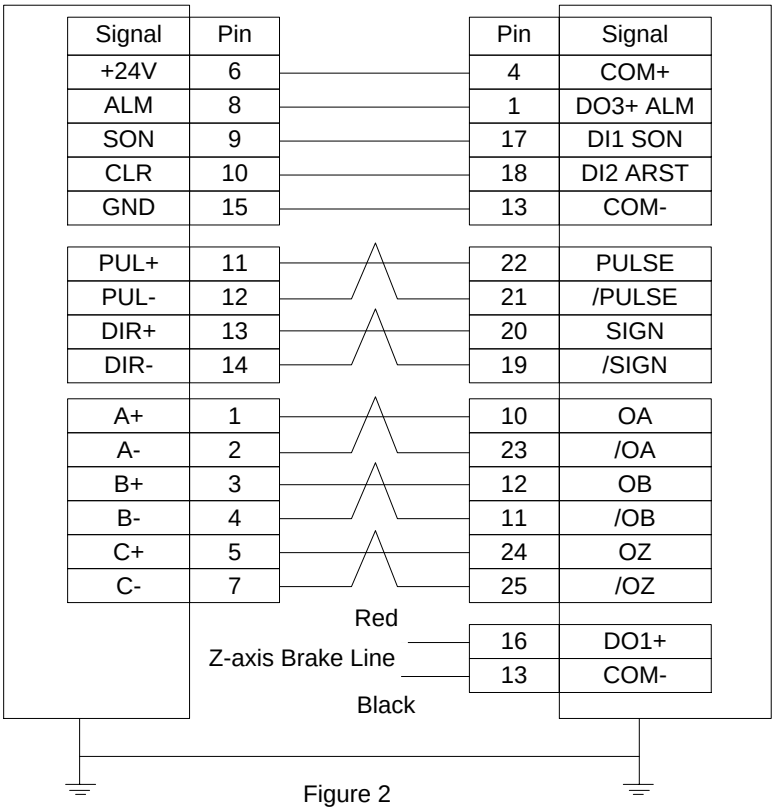
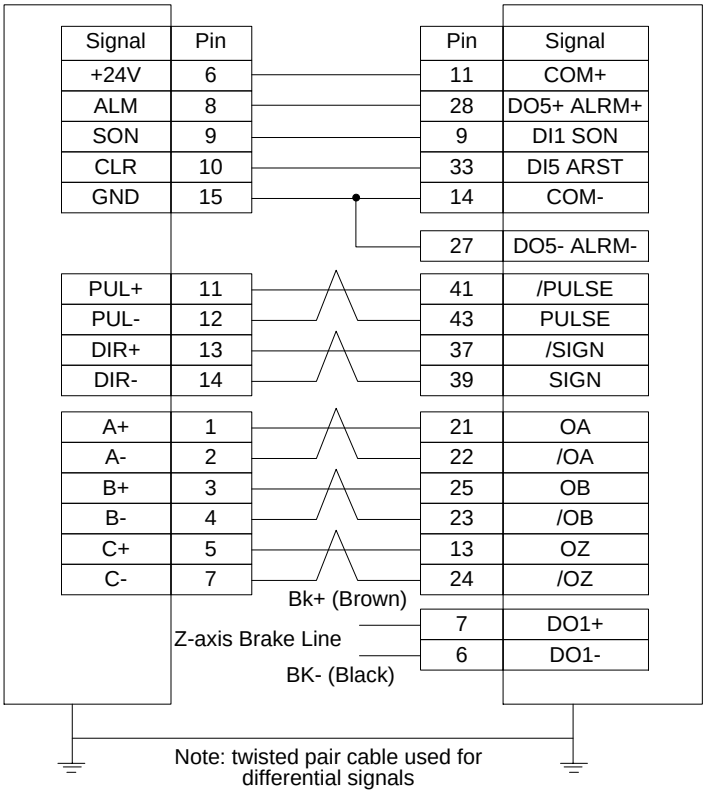


Figure 2

Weihong DB15 Driver Interface　　DELTA ASDA-B2 DB25(Two-line Pinholes)



Note: twisted pair cable used for differential signals

Figure 3

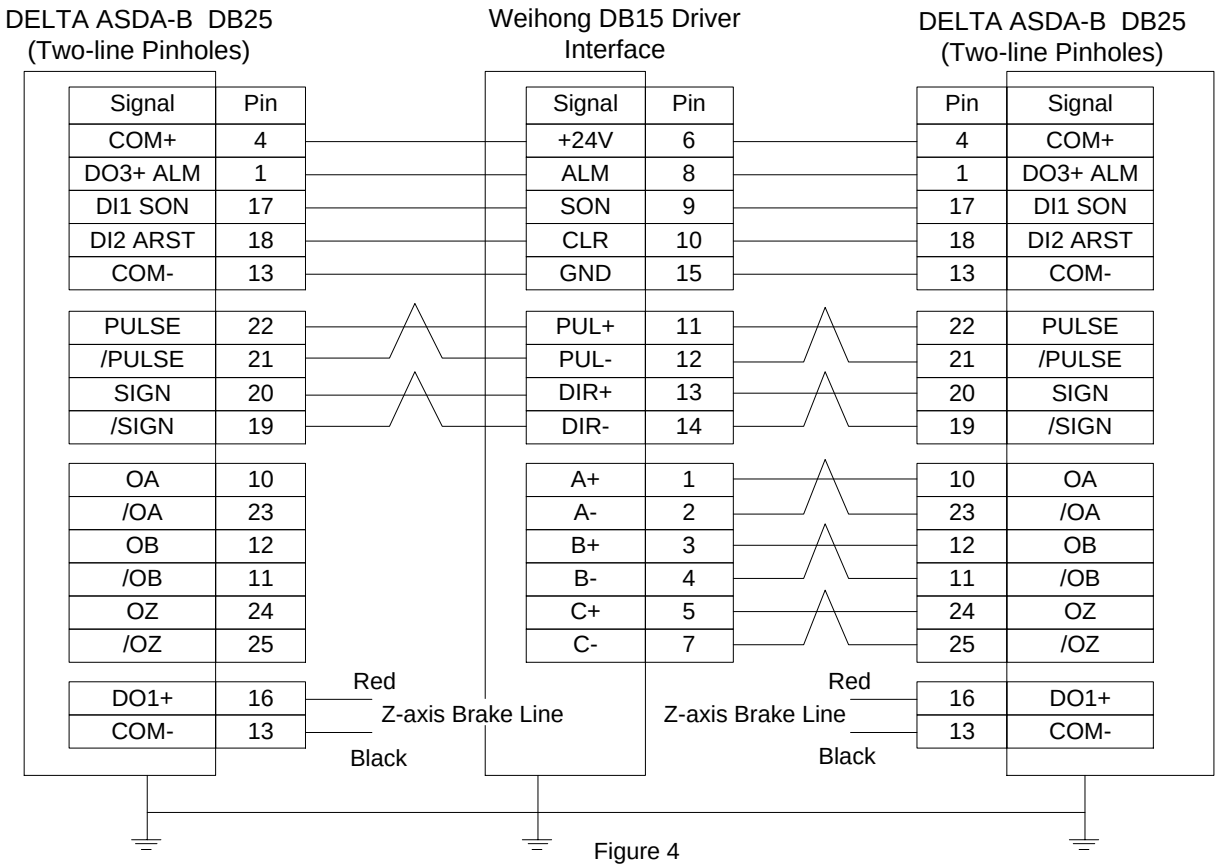
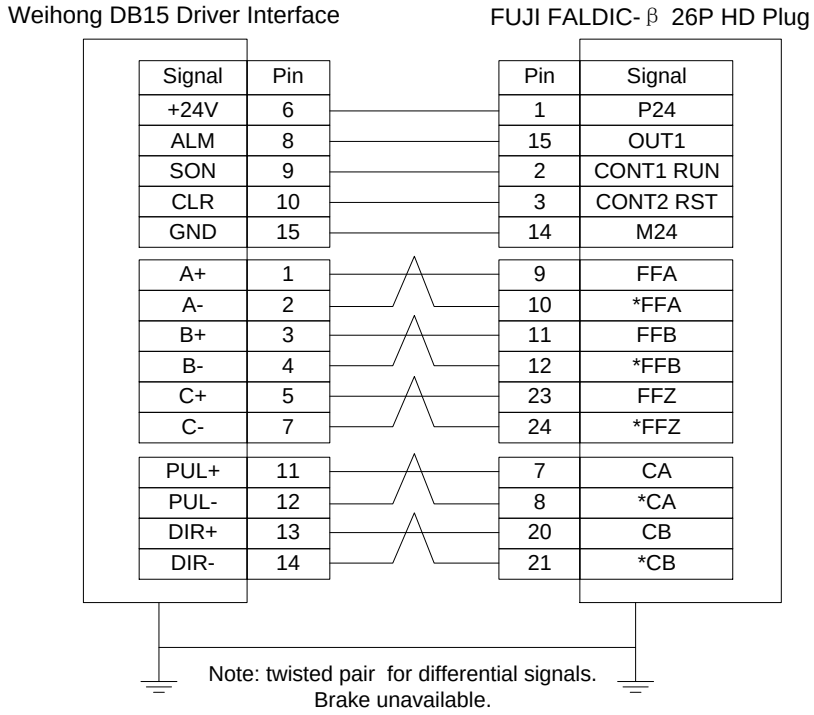
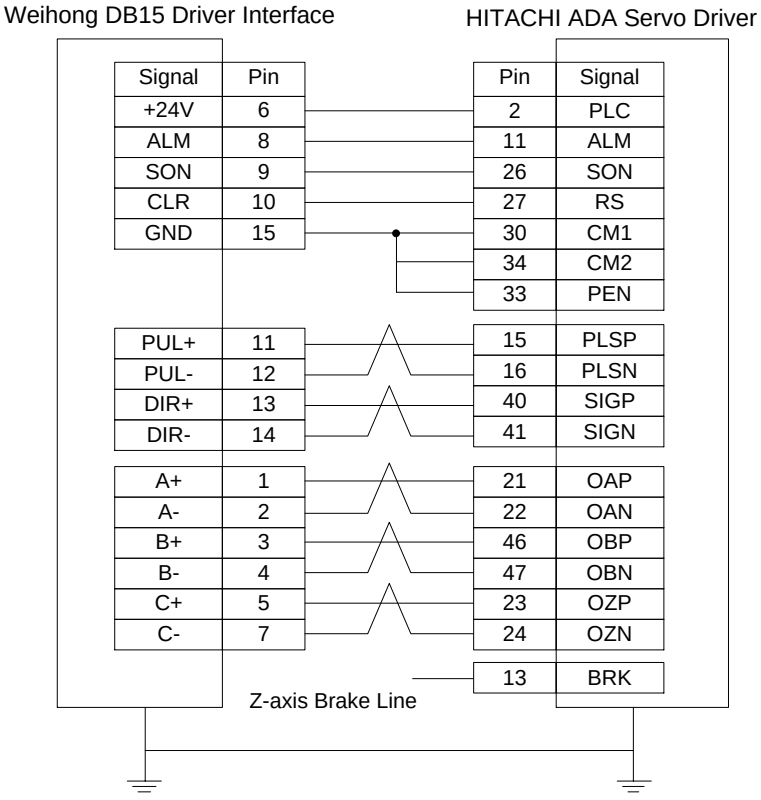

DELTA ASDA-B DB25
(Two-line Pinholes)
Weihong DB15 Driver
Interface
DELTA ASDA-B DB25
(Two-line Pinholes)
Signal Pin
COM+ 4
DO3+ ALM 1
DI1 SON 17
DI2 ARST 18
COM- 13
PULSE 22
/PULSE 21
SIGN 20
/SIGN 19
OA 10
/OA 23
OB 12
/OB 11
OZ 24
/OZ 25
DO1+ 16
COM- 13
Signal Pin
+24V 6
ALM 8
SON 9
CLR 10
GND 15
PUL+ 11
PUL- 12
DIR+ 13
DIR- 14
A+ 1
A- 2
B+ 3
B- 4
C+ 5
C- 7
Pin Signal
4 COM+
1 DO3+ ALM
17 DI1 SON
18 DI2 ARST
13 COM-
22 PULSE
21 /PULSE
20 SIGN
19 /SIGN
10 OA
23 /OA
12 OB
11 /OB
24 OZ
25 /OZ
16 DO1+
13 COM-
Red
Z-axis Brake Line
Black
Red
Z-axis Brake Line
Black

Figure 4

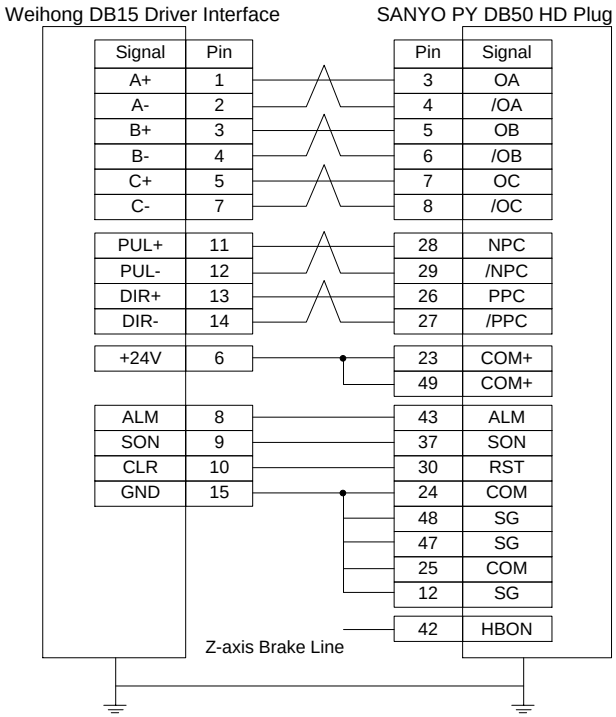
10.2.7 Fuji



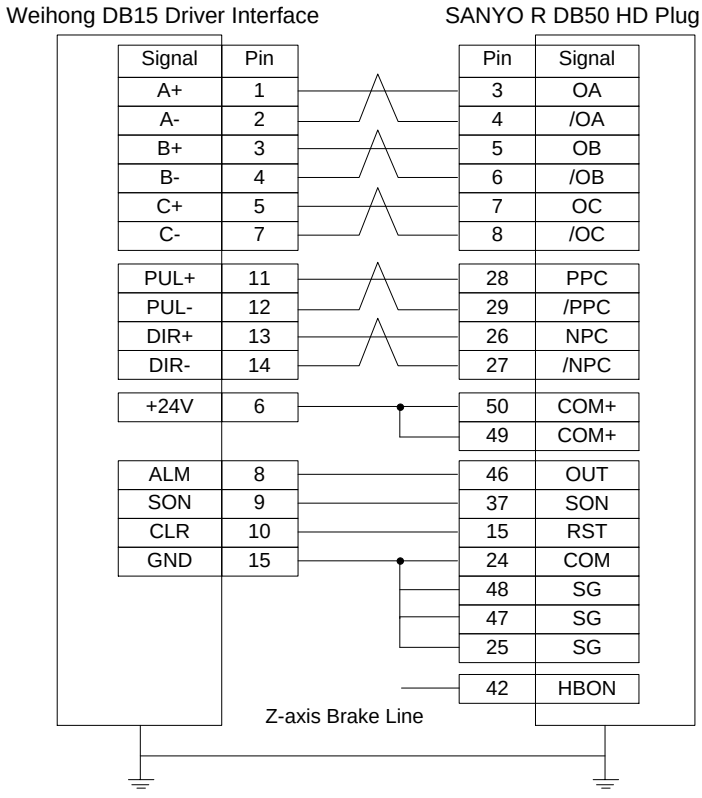
10.2.8 Hitachi



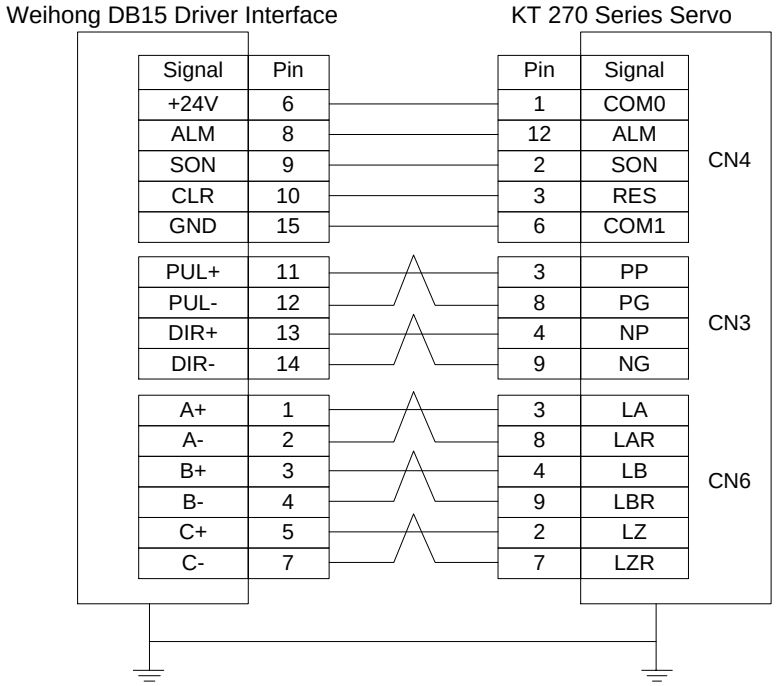
10.2.9 Sanyo PY Series



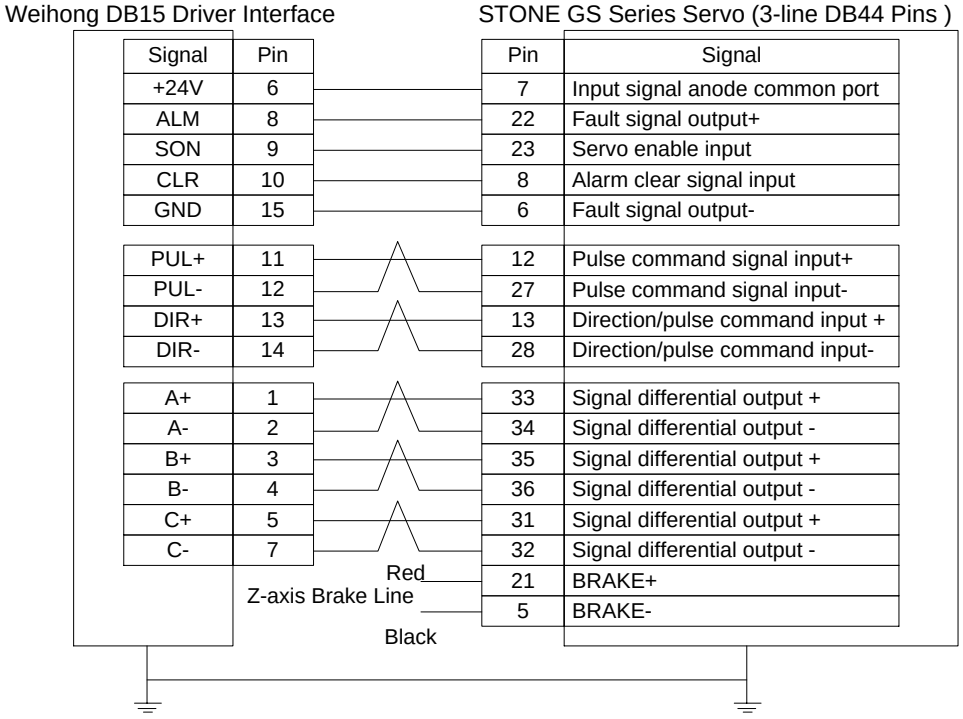
10.2.10 Sanyo R Series



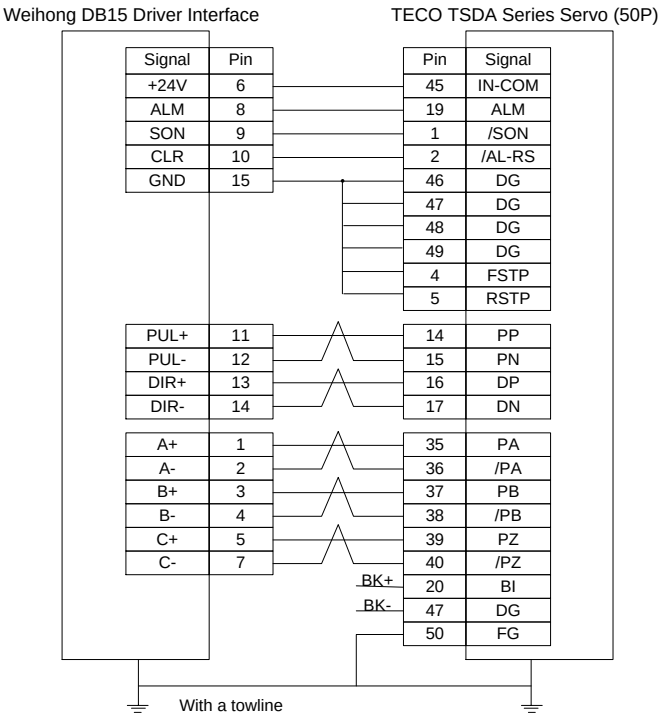
10.2.11 Kaitong KT270 Series



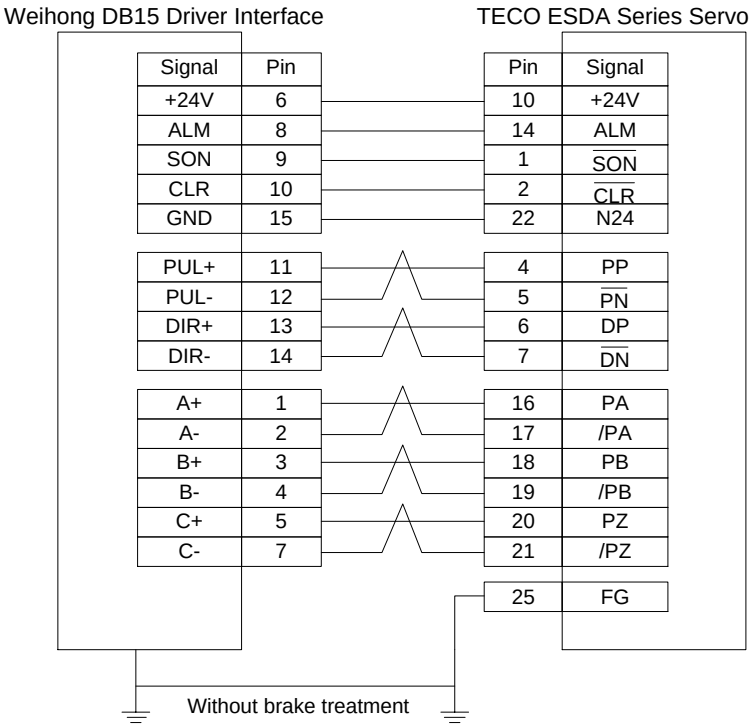
10.2.12 STONE GS Series



10.2.13 TECO TSDA Series



10.2.14 TECO ESDA Series



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