5 axis Montion Controller System

NCH02

Manual

Manual of NV8727T4V4

Contects

Chapter1 Introduction

➤➤ Chapter 1. Introduction

1.1 Product Introduction

Novusun CNC has engaged in the Numerical control industry for 7 years, specialized in the research, development and production of various CNC controller systems with high quality and high reliability. We produce the Brushless DC motor, Stepper motor driver, and also 1 to 6 axis CNC motion controllers.。

NCH02 is the 5 axis motion controller we spend 2 years to design.

NCH02 is a CNC system without computer. Only need a U-disk within G-CODE file, NCH02 can read the G file and run the G file.

This manual introduces operation, connection and usage schedule of our professional motion controller for engraving machine. Through a lot of the drawing the users can learn quickly how to use this motion controller.

1.2 Products specification

◊ Read G-CODE from U-DISK;

◊ Operation without computer;

◊ 8 ports photoelectric isolated input interface；

◊ 5 ports photoelectric isolated output interface；

◊ 1 port 0-10V spindle speed analog output interface(can change to PWM output)；

◊ can support 5 axis stepper systems,125KHz pulse output for every axis；

◊ ARM motion control chip；

◊ main device is 24VDC power supply input, current should higher than 1A；

Chapter1 Introduction

- Support standard MPG and NVMPG;

- 3.5" TFT screen;

- 19 user key;

1.3 Products Appearance and size

The Hand control system NCH02 appearance as the Figure 1-1 show: The host system NCD02 appearance as the Figure1-2.

The Hand control system NCH02 overall size is 168mm*108mm*30mm；

The host system NCD02 overall size is 100mm*70mm*23.5mm

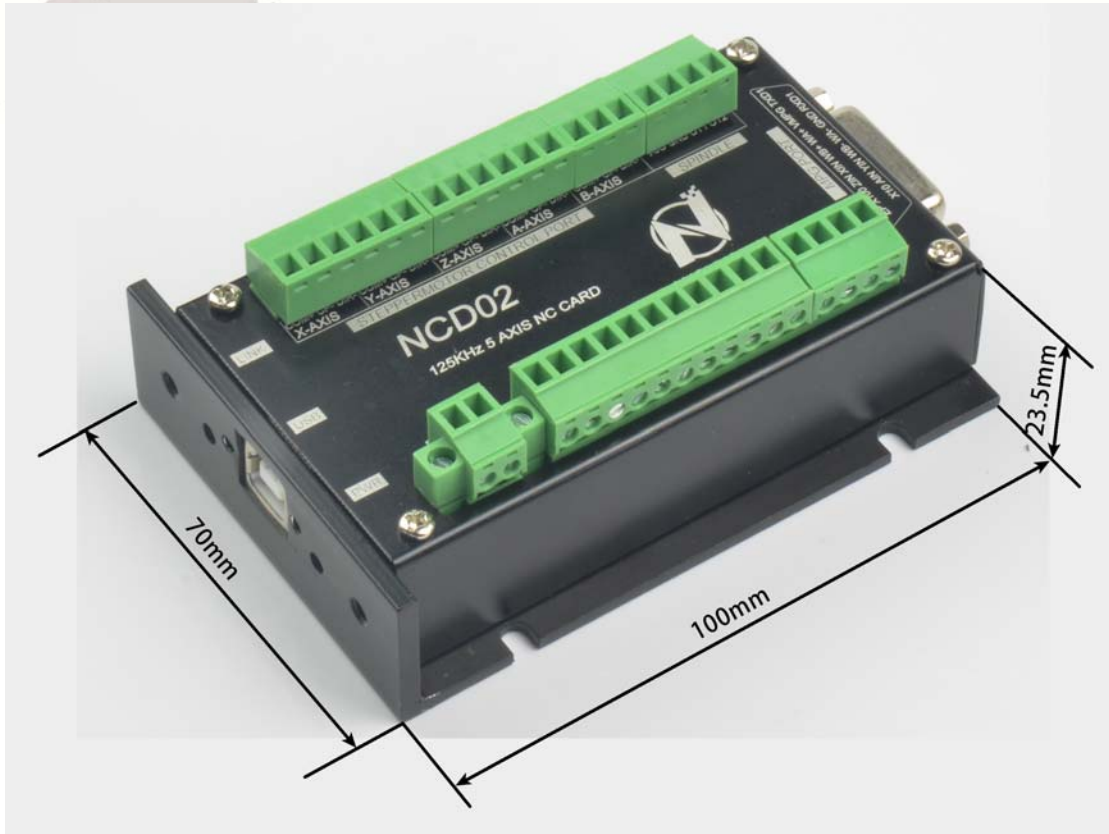Figure1-1.　　NCH02 front appearance and size

Figure1-2.　　The host system NCD02 appearance and size

Figure1-3.　　NCH02 with NCD02

Chapter1 Introduction

1.4 substantival explanation

When operate the NCH02, where will be a lot of English abbreviation, now we list all of them for your kindly references:

FRO: Feeding adjust: During the operating process, the F value already set, and need to adjust the current feeding speed, then we can adjust FRO value to realize it.

SRO: Spindle speed adjust: During the operating process, the S value already set, and need to adjust the current spindle speed, then we can adjust SRO value to realize it :

Current Speed S#=setting S*SRO.

SRJ: speed adjust manually

During the operating process,as the manual speed already set,and we need to adjust the current speed,and impossible to fix the value during it is working,then we can revise the SRJ value to realize it.

Current manual speed FS#=Setting manual speed*SRJ.

F:Feedingspeed,the unit is mm/min.For example F=200,means every minute feeding 2000mm.

S: Spindle Speed. Unit is rad/min.For example S=20000,means 20000 revolution/Minute.

X axis Coordinate

Y axis Coordinate

Z axis Coordinate

A axis Coordinate

B axis Coordinate

C axis Coordinate

Ready:ReadyMode.In the mode we can do any operation,include processing or values

modification or starting 2nd mode.

Reset: Reset mode.In this mode,it should stop every operation.

"Step":Manual Step Mode. Every axis candonduct the manual step operation at this mode.

MPG: MPG mode.Every axis can conduct the MPG operation at this mode.

1.5 Noting and Waring

Free from exposure to the electronics without waterproof function.Please environment as dry as possible. This is the icon.

Wiring warning, the IO input terminal of this equipment support the equipment with source switch (such as Inductive proximity switch.)When using such kind of switch, attention please: avoid the +terminal and –terminal of power supply to connect with GND.This equipment's analogy quantity output terminal of spindlecontrolalos have a certain load capacity. Please avoid this terminal connect with GND.in case that the interior components and parts be brokendown.

Operation warning, Please do the security measures well when connecting with the machine tools.The ESTOP, limit and other things must be perfected.When comes across the emergancy, please press the ESTOP key at once or cut off the power directly, thus avoiding the equipment damage and casualty.

High voltage danger, the primary device is 18-32VDC power supply.Voltage equipment.Pls pay attention to the electricity, safety when conducting the operation

Chapter 2.   Connection

2.1 Device Power supply Solution

The power supply solution in the field of the Industrial automation is always very complicated, there is a lot of the GND, now we descript the structure of the power supply as below:

The power supply structure as the Figure 2-1,main power supply input and MPG module and stepper control output module are common GND, Limited and Estop input module and Spindle speed adjust module are common GND, between main power supply and output module there are photoelectric isolation. The inputs of limited switch and Estop and so on are Common cathode, inside of the device, there is GND   as common-, no need to connect external power supply. Based on the reference of output GND interface, output a 0-10V adjustable voltage to adjust the spindle speed. The chassis is built with 220V to 48V DC supply to the DC brushless spindle and 4 step motor driver.
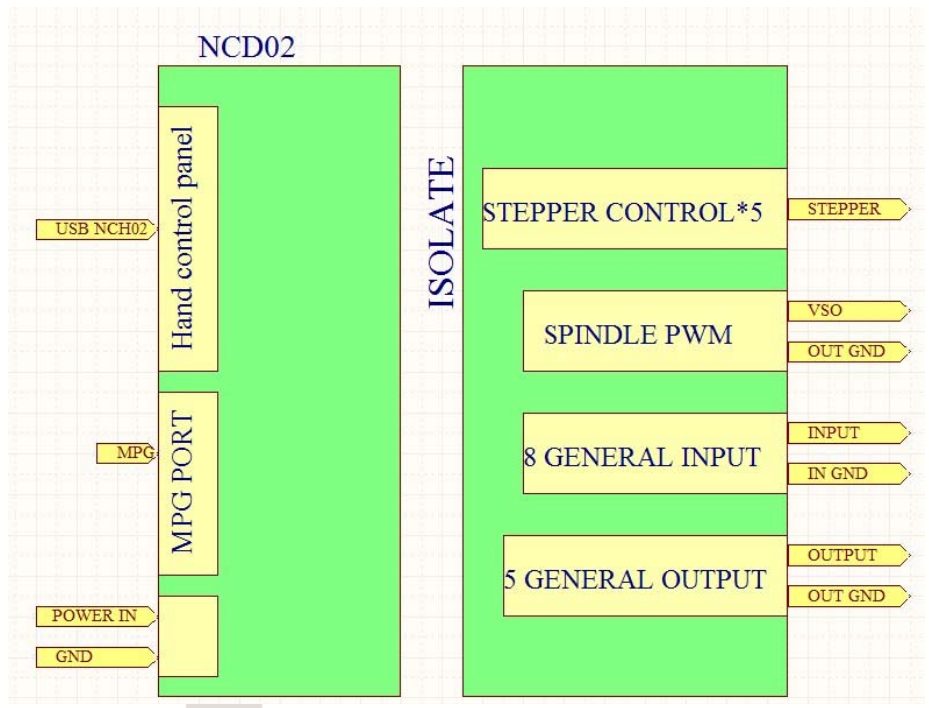

Figure2-1.   Power supply structure of NCD02

Chapter2 Connection

2.2 Hand control NCH02 KEYBOARD's Definition

2.2.1 KEYBOARD's Definition

KEYBOARD's Definition see as Table 2-1

Location	Icon	Name	Function
R 1 C 1		PAGE L	1：Page left
R 1 C 2		PAGE R	1：Page right
R 1 C 3		CANCEL	1：Cancel；2：Sign out
R 2 C 1		SHIFT	1：Shift，Call second functions
R 2 C 2		A+	1：A axis manual forward；2：Select A axis；3：Number 7
R 2 C 3		B+	1：B axis manual forward；2：Select B axis；3：Number 8
R 2 C 4		Z+	1：Z axis manual forward；2：Select Z axis；3：Number 9
R 3 C 1		RESET	1：Reset state switch
R 3 C 2		A−	1：A axis manual reverse；2：ZERO in Workpiece coordinates；3：Number 4
R 3 C 3		B−	1：B axis manual reverse；2：Go to zero in workpiece coordinates；3：Number 5
R 3 C 4		Z−	1：Z axis manual reverse；2：Find zero point Mechanical coordinates；3：Number 6

R 4 C 1	SPINDLE	SPINDLE	1：Start and Stop Spindle
R 4 C 2	A−	A−	1：A axis manual reverse；2：Probe；3：Number 1；4：Move left
R 4 C 3	Y+	Y+	1：Y axis manual forward；2：Select Y axis；3：Number 2；4：Move up
R 4 C 4	X+	X+	1：X axis manual forward；2：Select X axis；3：Number 3；4：Move left
R 5 C 1	START	START	1：Start the G code
R 5 C 2	PAUSE	PAUSE	1：Pause the G code
R 5 C 3	Y−	Y−	1：Y axis manual reverse；2：Number 0；3：Move down
R 5 C 4	STEP	STEP	1：Switch step/ continuous/MPG ；2：Number "."
R 1 C 4	PUSH	PUSH	1：Increase the number clockwise；2：Decrease the number Counter-clockwise；3：Confirm when push

Table 2-1.　　Keyboard definition

2.3 Port Definition and connection
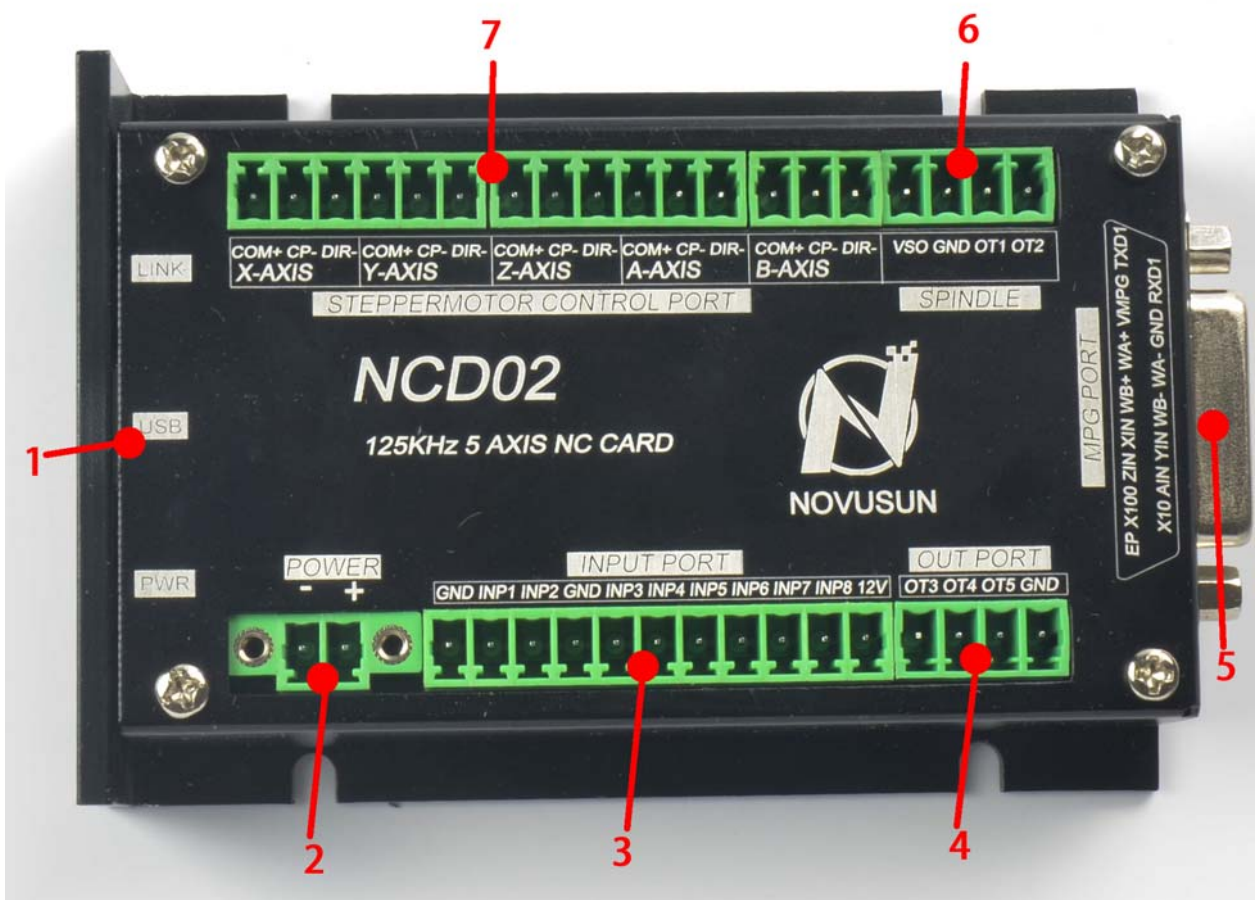
Figure2-2.　　Port of NCD02

As shown in Figure 2-2, the main controller indicates 1-7 are USB port, main power port,

general input port, general output port, MPG port, spindle port and stepper motor control port.

The detailed description of these functional modules and interfaces is described below.

2.3.1 USB port

As Figure 2-2 showed,No.1 terminal block is USB port, you can connect with NCH02

through this interface.

2.3.2　Main power supply port

As the Figure 2-2 show, The marked No. 2　port is power supply port. The access voltage

range is 24VDC, and the power is not less than 20W. The positive and negative connection of the

power supply see as the silk printing, See as Figure 2-2, left is GND, and right is "+".

2.3.3 Limit/Home input port

As the Figure 2-2 showed, Marked No. 3 position is the limited /home input port. they are the optical isolated Input interface. The input interface is a 11P 3.81 direct insertion terminal interface, as shown in Figure 2-2 shell silk print, and definition is GND/INP1/INP2/GND/INP3/INP4/INP5/INP6/INP7/INP8/12V from left to right. Internal structure reference figure 2-3. The interface is a common negative interface, which can be connected with a micro switch, a 2 line proximity switch or a NPN type 3 line proximity switch. The interface is isolated by the optocoupler, and the internal structure diagram is referred to figure 2-4. Estop, micro switch, 2 line proximity switch connection method reference figure 2-5.
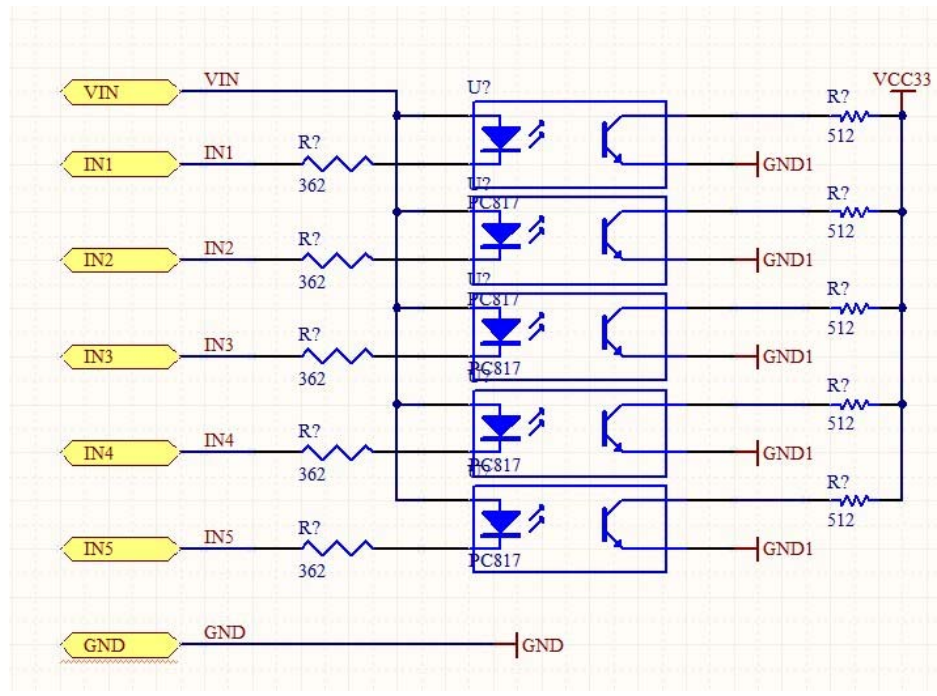
Figure2-3.   Internal structure diagram of the input port
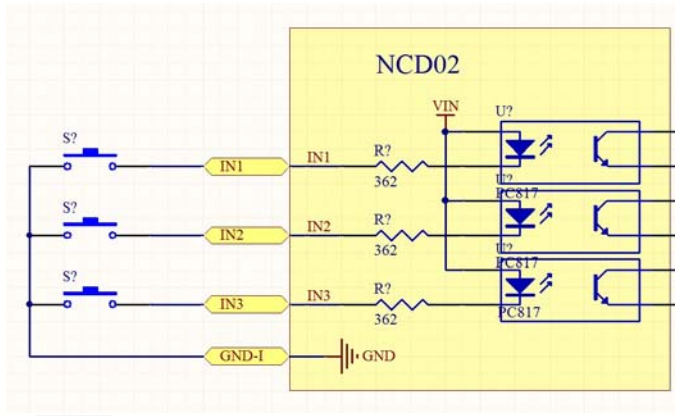
Figure2-4.   Probe/Estop/ ordinary fretting switch input connection
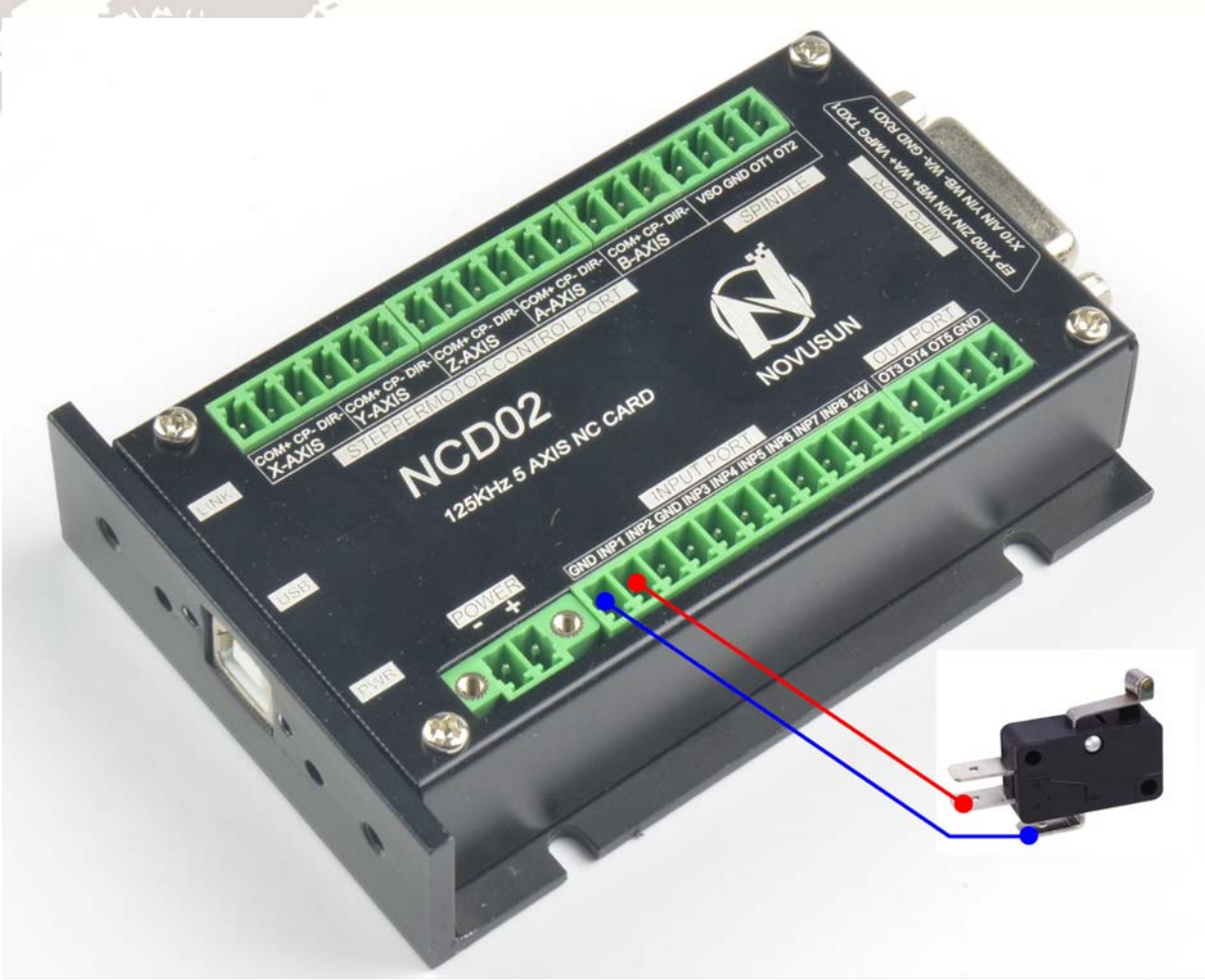
Figure2-5.   input interface serial number IN3 and 2 line proximity switch / common switch limit input

wiring diagram

3 lines Proximity Switch connection Figure 2-13,brown cable for Proximity switch connect

with 12V,Black cable connect channel, blue cable connect with GND1.

Only support NPN 3lines proximity switch.
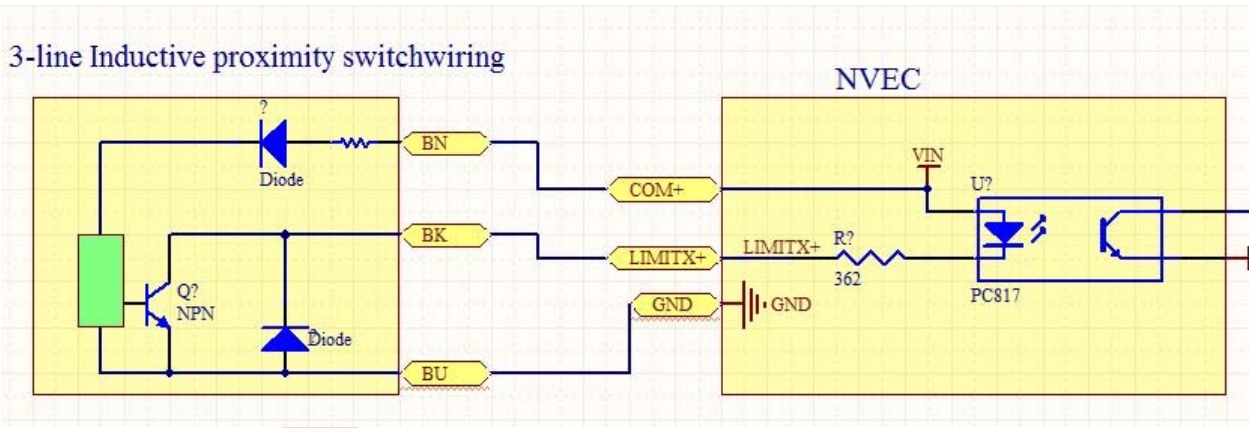
Figure2-6.   NPN 3 lines Proximity Switch connection drawing
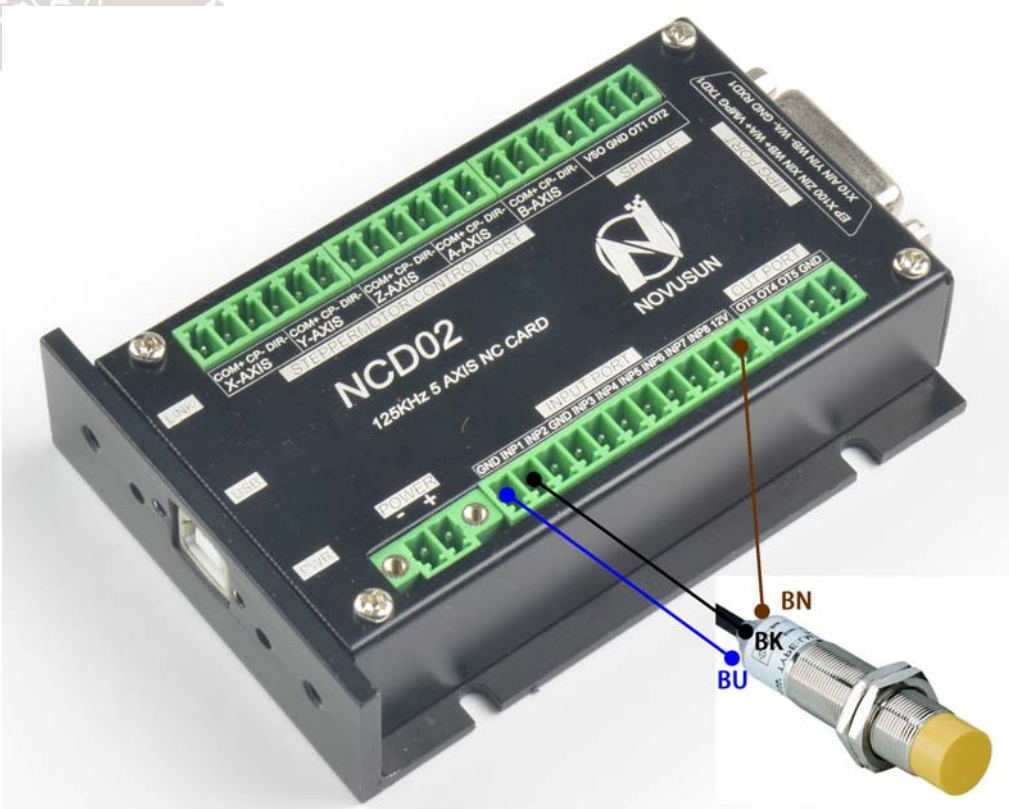
Figure2-7.　　NPN 3 line Proximity switch wiring

2.3.4 Output port

As Figure 2-2 showed,No.4 switch is Output port, The interface is an open-ground interface. The internal structure refers to figure 2-8, which can be absorbed not more than 50mA current.
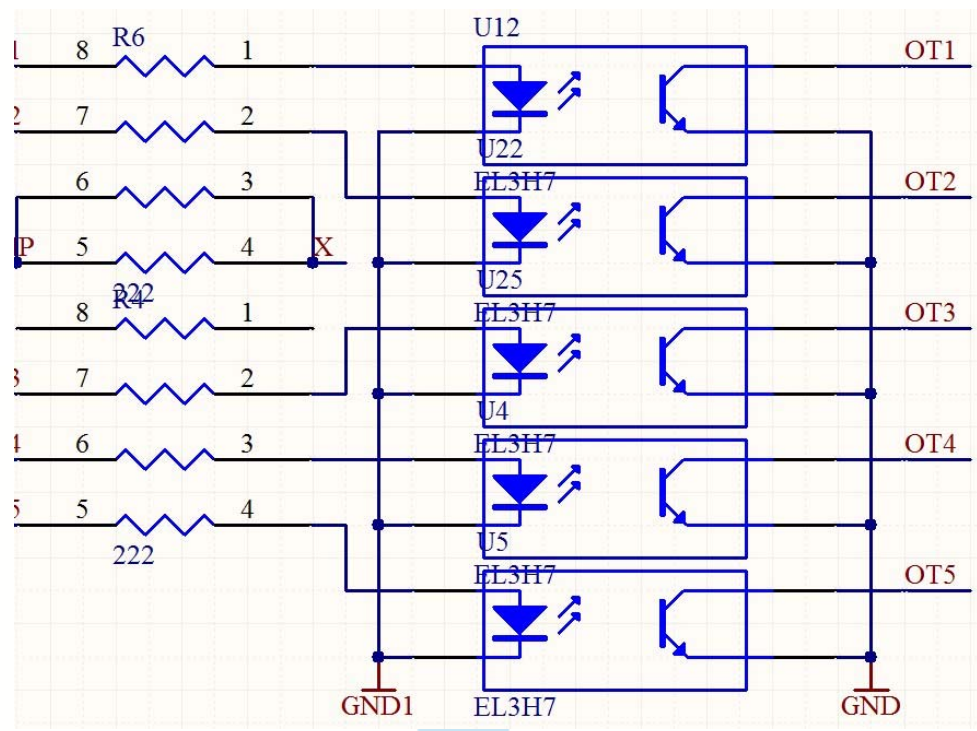
Figure2-8. the internal structure of the general output interface

The relay with a absorption current of no more than 50mA can be driven directly. If it's more than 50mA, and it is recommended to use a current amplification current, such as the use of a ULN2803 chip. Reference figure 2-9 for external power relay method.
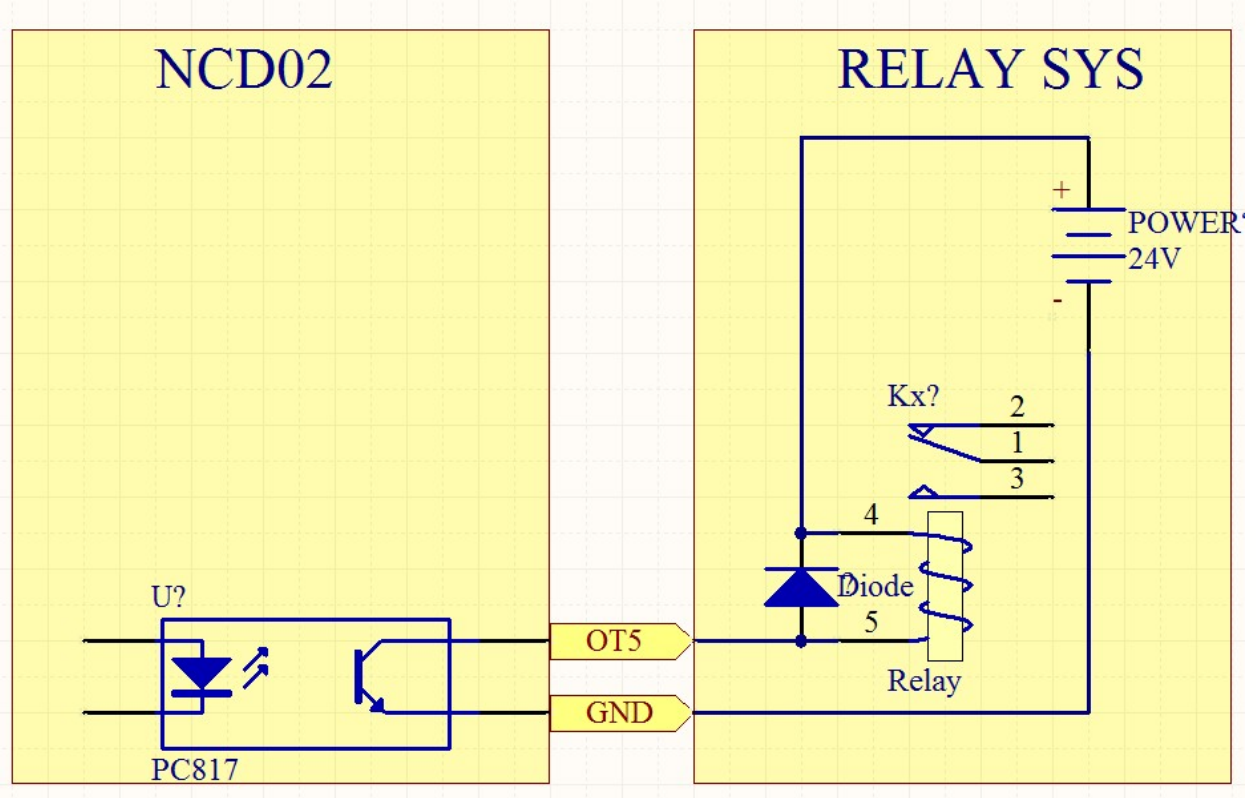
Figure2-9. general output interface connect with a small power relay

2.3.5 MPG port

As the Figure 2-2 showed, the marked No.5 position interface is MPG port . The pin order see as Figure 2-10.
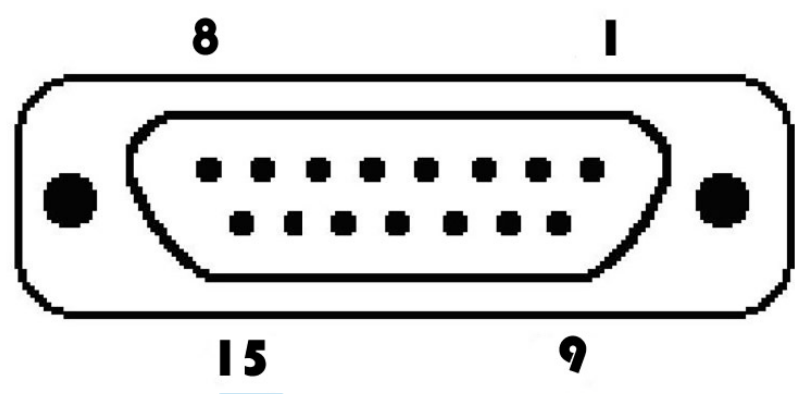
Figure2-10. MPG Port Pin order

This card connect with MPG by this port. The port definition see as table 2-2

No.	Mark	Definition
1	T1OUT	TXD of Serial port
2	VMPG	Power supply + for MPG(5V)
3	WHA+	A phase positive of the encoder
4	WHB+	B phase negative of the encoder
5	XIN	X axis select input
6	ZIN	Z axis select input
7	X100IN	100 rate select input
8	EP	Estop port
9	R1IN	RXD of Serial port
10	GND	Ground and common end
11	WHA-	A phase positive of the encoder
12	WHB-	B phase negative of the encoder
13	YIN	Y axis select input
14	AIN	A axis select input
15	X10IN	10 rate select input

Table 2-2.   MPG port definition

2.3.6 Spindle port

As Figure 2-2 showed,No.6 port is Spindle port. The interface definition is VSO/GND/OT1/OT2 from left to right. Where VSO is the 0-10V analog output, OT1/OT2 digital drive signal output, spindle control output interface and spindle inverter connection diagram figure 2-11. VSO/GND/OT1/OT2 are respectively connected with the inverter AIN1/COM/X1/X2, where AIN1 is the input speed signal, COM converter X1 and X2 are the

common end configured to forward and reverse.
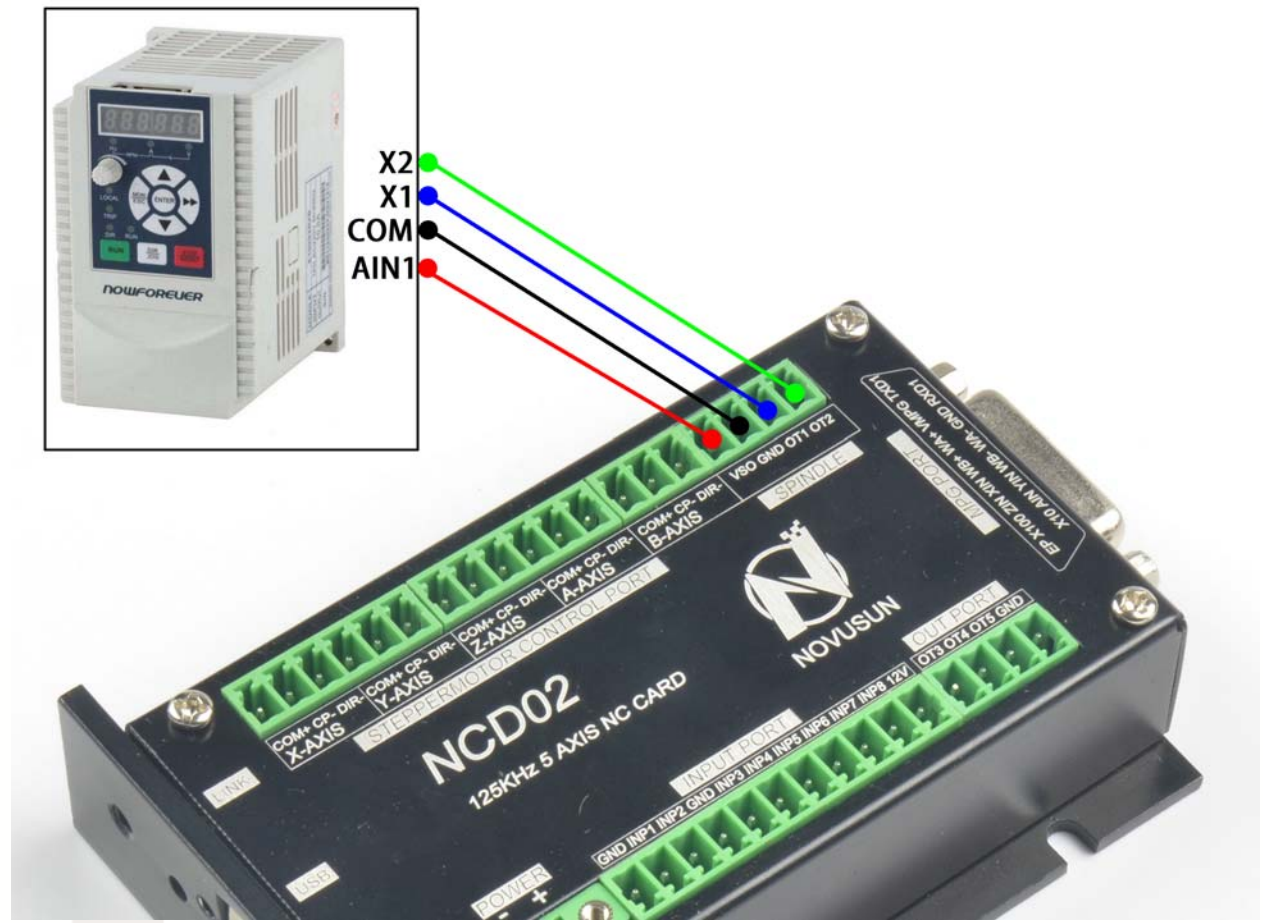
Figure2-11.   spindle port definition and connection

2.3.7 Stepper motor port

As Figure 2-2 showed,No.7 port is stepper motor port, which is define as X/Y/Z/A/B. Each

axis is define as COM+/CP-/DIR-. They are Common/Pulse-/Direction-. The connection method

with the stepper motor driver see as Figure 2-12.
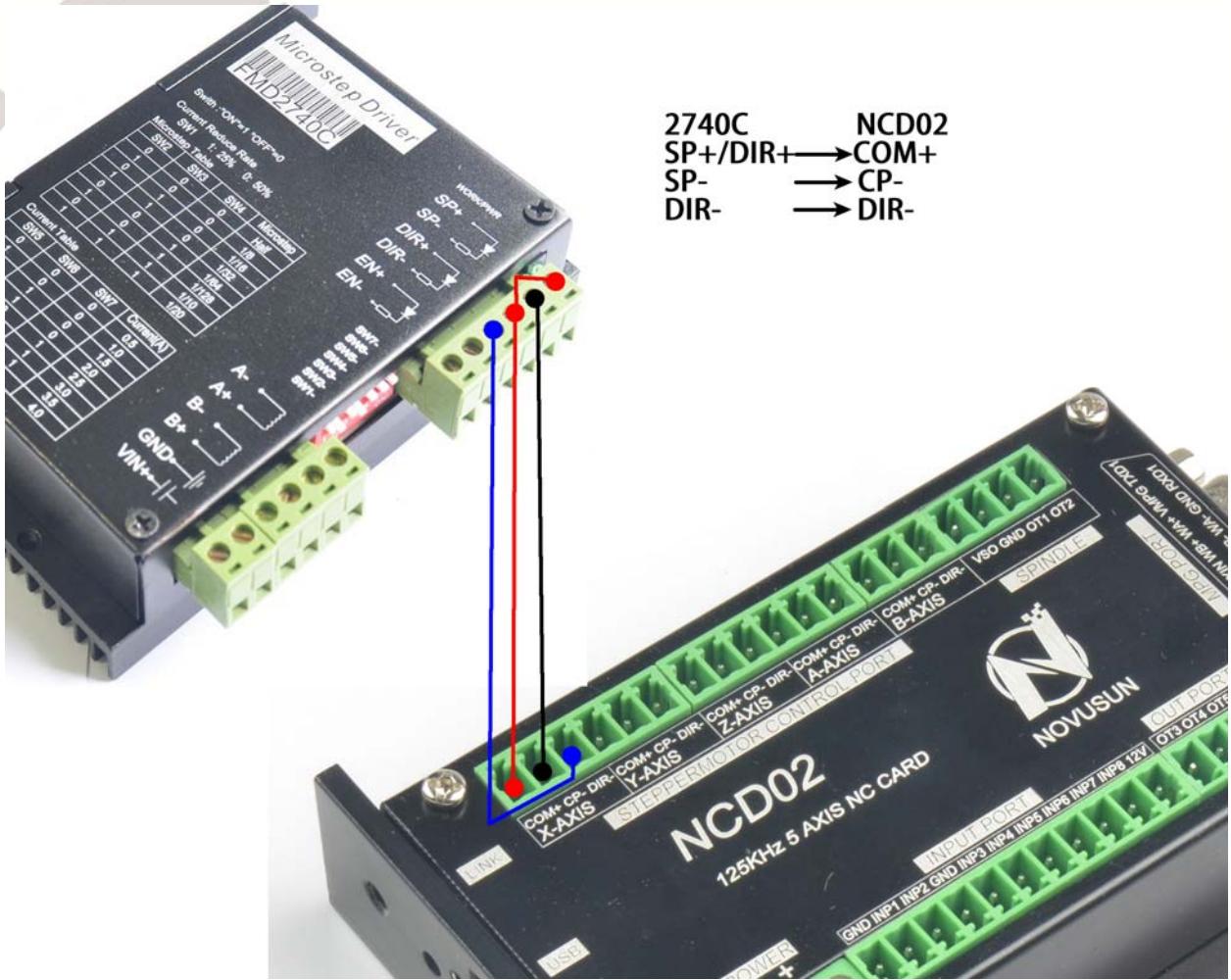
Figure2-12.   NCD02 Connect with stepper motor driver

The above detailed description of the NCD02 module definition and connection mode,

NCD02's integrated wiring diagram reference figure 2-13.
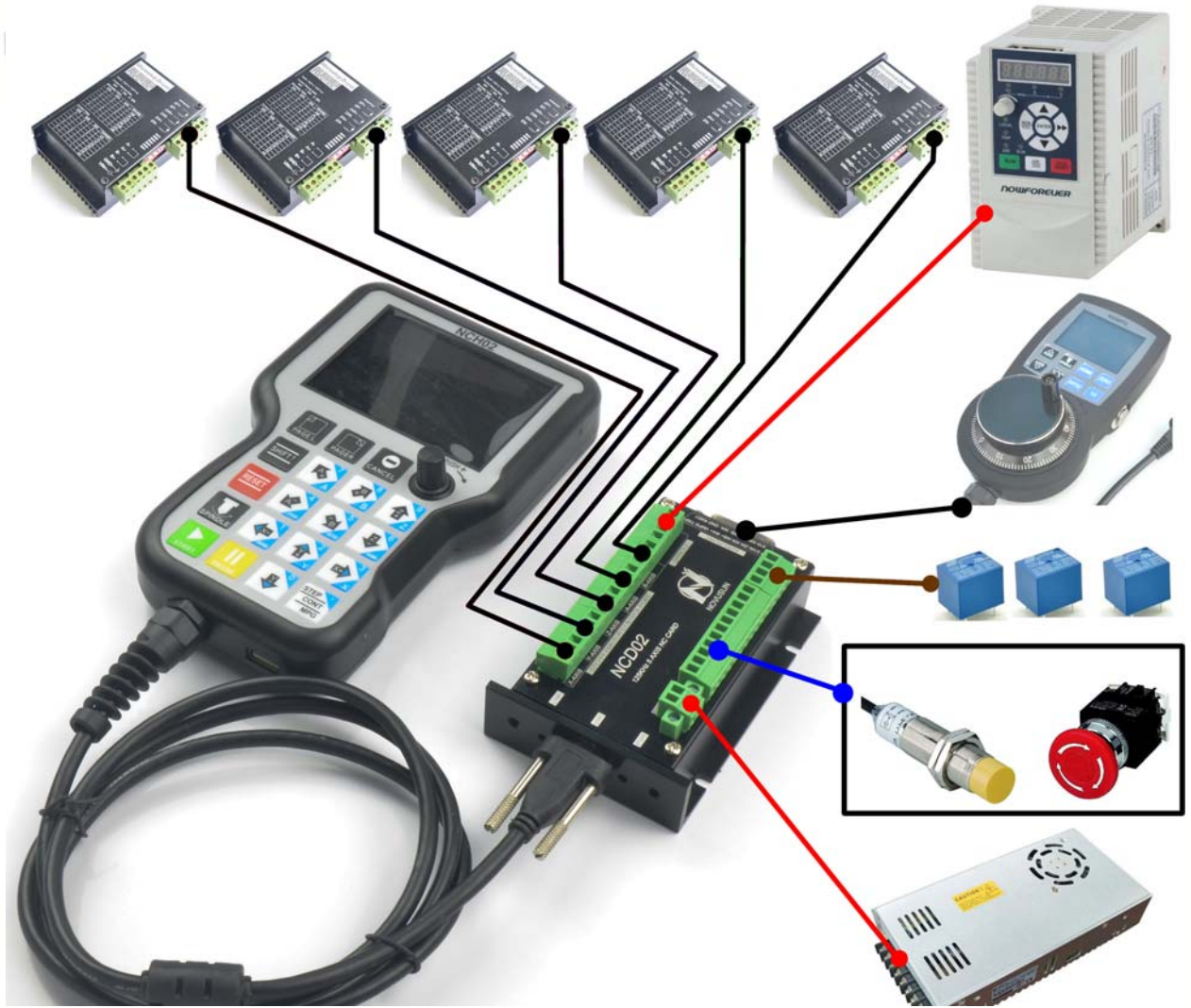
Figure2-13.　NCD02 and NCH02 integrated wiring diagram

Chapter 3. | Software & Config

The NCH02 software interface is divided into 4 pages, including main page, file management page, configuration page, test and diagnosis page. Now, the interface elements and basic operations on 4 pages are described below.

3.1 Main Page

The main page is divided into 20 regions, such as Figure 3-1, and the following 20 regions are described in detail.
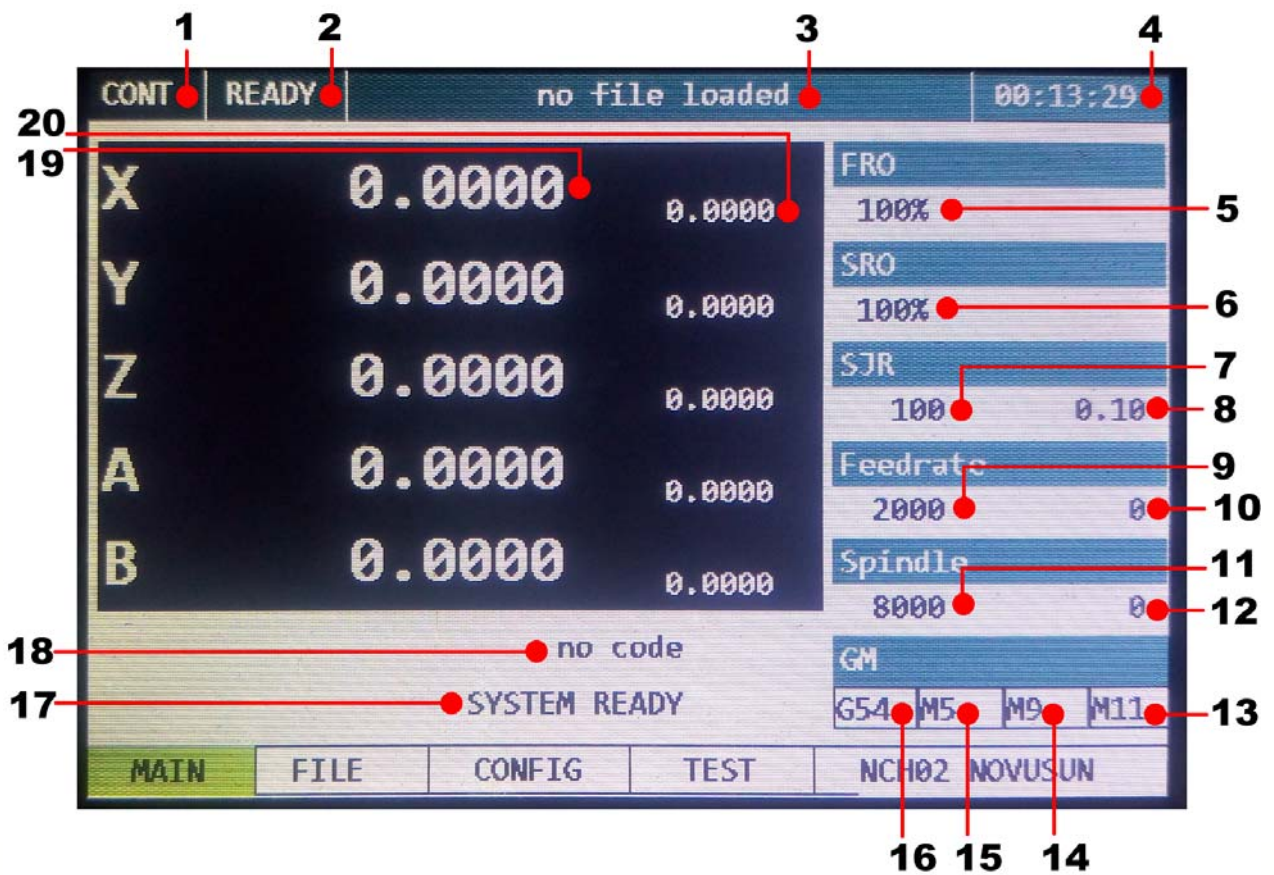
Figure3-1.   Main Page of NCH02

1. Manual mode bar

The status bar mainly displays the manual mode. There are three manual modes. They are manual continuous mode (shown as CONT), step mode (shown as STEP) andMPG mode (shown

as MPG). Under the ready state of system, push ![STEP CONT MPG] 3 modes can be switched.

2. Running status bar

The status bar mainly displays the working state of the system. There are four systems in it. They are reset state (shown as RESET), ready state (shown as READY), manual control state (shown as JOG) and running state (shown as RUN). In reset state, all operations are invalid, it's the system protection state; the ready state is ready for work. Any operation can be performed in the state of preparation; By pressing ![RESET], the system can be switched between the ready state (READY) and the reset state (RESET). In the ready state, when the G code is ready, the G code can be started by pressing ![START], or the start line of the G code can be specified by pressing ![SHIFT↑] + ![START]. In the process of running G code, the running status bar displays the RUN, indicating that the G code is running. During the operation of hand control operation, the running status bar shows JOG, indicating that hand control is working.

3. File status bar

The status bar displays the file loading G code or U disk information, It displays "No file loaded" in the file without loading condition; it displays "U-Disk Detected" when the U disk insert and correct recognition; "U-Disk Removed" display in the U disk pulled out; it display G code file name when loaded the correct G code;

4, time display bar

The time display bar mainly displays the current G code running time.

The adjustable parameters are described below, and all the adjustable parameters can be selected by the knob Clockwise rotation or a reversal.

Under normal conditions, the adjustable parameters are white background black words.

When turning the knob, you can see the valid position is changed with the knob, a parameter change to blue background and white word when it become a valid parameter.

When a parameter - we need to modify the value when it is selected. we need to click the PUSH (button of the knob), then the parameters become black background and white word, meaning it's in editing, we can modify the parameters according to the number keys.

After the modification, then press the PUSH, then it exit the edit state and enter the unselected state, then the parameter displays the adjusted value.

5, FRO parameter setting

FRO is a feed rate adjustment that can be adjusted through the knob, adjusting the range from 0~200%, and the actual feed speed #F=FRO*F (F is feed speed set value).

6, SRO parameter setting

SRO is the spindle rate adjustment, can be adjusted through the knob, the adjustment range from 0~200%, the actual spindle speed #S=SRO*S (S is the spindle speed set value).

7, SJR parameter setting

SJR is a manual speed rate adjustment that can be adjusted through the knob, adjusting the range from 0~100%, the actual manual speed #HF=SJR*HF (HF is the manual speed set value).

8,Step manual mode single step parameter setting

The single step parameters can be set into 3 gears, which are 1mm, 0.1mm and 0.01mm, which can be adjusted by the knob.

9, F parameter setting

This parameter defaults to the minimum speed of each axis in the parameter configuration item, and can be adjusted by the knob. If there is no F instruction in the G code, the G code is running in this speed. If there is F instruction in the G code, the feed speed is updated according to the F instruction.

10, F real-time display

F real-time display values show the real-time speed of F during the running of G code. Real time feed speed #F=FRO*F (set feed speed).

11, S parameter setting

This parameter defaults to the default spindle speed in the parameter configuration item, which can be adjusted by the knob. If there is no S instruction in the G code, the G code is running at this speed. If there is S instruction in the G code, then the spindle speed value is updated according to the S instruction.

12, S real-time display

S real-time display values show the real-time speed of S during the running of G code. Real time spindle speed #S=SRO*S (set the spindle speed).

13, M10/M11 state display

The state value of the M10/M11 switch is displayed, which can be manually modified by the knob or automatically modified according to the M10/M11 instruction in the running G file.

14, M8/M9 state display

The state value of the M8/M9 switch is displayed, which can be manually modified by the knob or automatically modified according to the M8/M9 instruction in the running G file.

15, M3/M4/M5 state display

The state value of the M3/M4/M5 switch is displayed, which can be manually modified by the knob or automatically modified according to the M3/M4/M5 instruction in the running G file.

16, G coordinate system display

The current coordinate system is displayed, with a modified range of G54~G59, which can be manually modified by the knob or automatically modified according to the G54~G59 instruction in the running G file.

17. System status bar

The status bar of the system is mainly prompted by the common system state, and the list of States is as follows

NO.	Display	Definition
1	SYSTEM REDAY	The system is ready to execute the G code
2	SYSTEM RESET	System reset state, no operation can be done
3	SYSTEM IS RUNNING	G code is running
4	X++ LIMITED	Positive limit of X axis is triggered. Same as other axis
5	X-- LIMITED	Negative limit of X axis is triggered. Same as other axis
6	X++ SOFT LIMITED	Positive soft limit of X axis is triggered. Same as other axis
7	X-- SOFT LIMITED	Negative soft limit of X axis is triggered. Same as other axis

Table 3-1.   system status prompt information and definition

18. The running G code display bar

In the process of running the G code, the current line number and the current line G code are displayed.

19. Coordinate values of each axis

The coordinate value of the workpiece is displayed here.

20. The mechanical coordinates of each axis

The mechanical coordinates of each axis are displayed here, and the mechanical coordinates of each axis are displayed behind the coordinate values of the workpiece, and the font is smaller than the coordinate value of the workpiece.

3.2 FILE Page

The file management page can be entered by pressing PAGER under the main control page. The file management page is shown in Figure 3-2.

CONT	READY	U0:\TEST1.TAP	00:03:40

NAME	SIZE	TIME
SYSTEM~1	20 KB	2017-08-08 15:30
TEST1.TAP	20 KB	2017-08-08 15:30
TEST3.NC	20 KB	2017-08-08 15:30
TEST2.TAP	20 KB	2017-08-08 15:30
TEST4.TAP	20 KB	2017-08-08 15:30
	20 KB	2017-08-08 15:30

MAIN	FILE	CONFIG	TEST	NCH02 NOVUSUN

Figure3-2.   File management page

The file management page displays all the files in the U disk and can display the file name,

the size of the file, and the last modification date.

In the file management page, you can select the G code file you want to run by the knob.

When selected, press the knob confirmation key (PUSH) to load the G code file. After the load is

finished, the system automatically switches to the main page.

3.3 CONFIG Page

In the file management page, press ![PAGER] to enter the parameter configuration page.

Press ![SHIFT↑] to switch the sub page of the configuration page. The parameter configuration

page contains 4 sub pages, respectively is the motor parameter configuration (MOTOR), input

configuration (INPUT), and the output spindle configuration (Spindle/OUT) and other(OTHER).

3.3.1 motor parameter configuration (MOTOR)

The motor parameter configuration page is shown in Figure 3-3. This page list   specific

parameters by row, and list number axis by column. The parameters of the axis can be adjusted

by the knob.
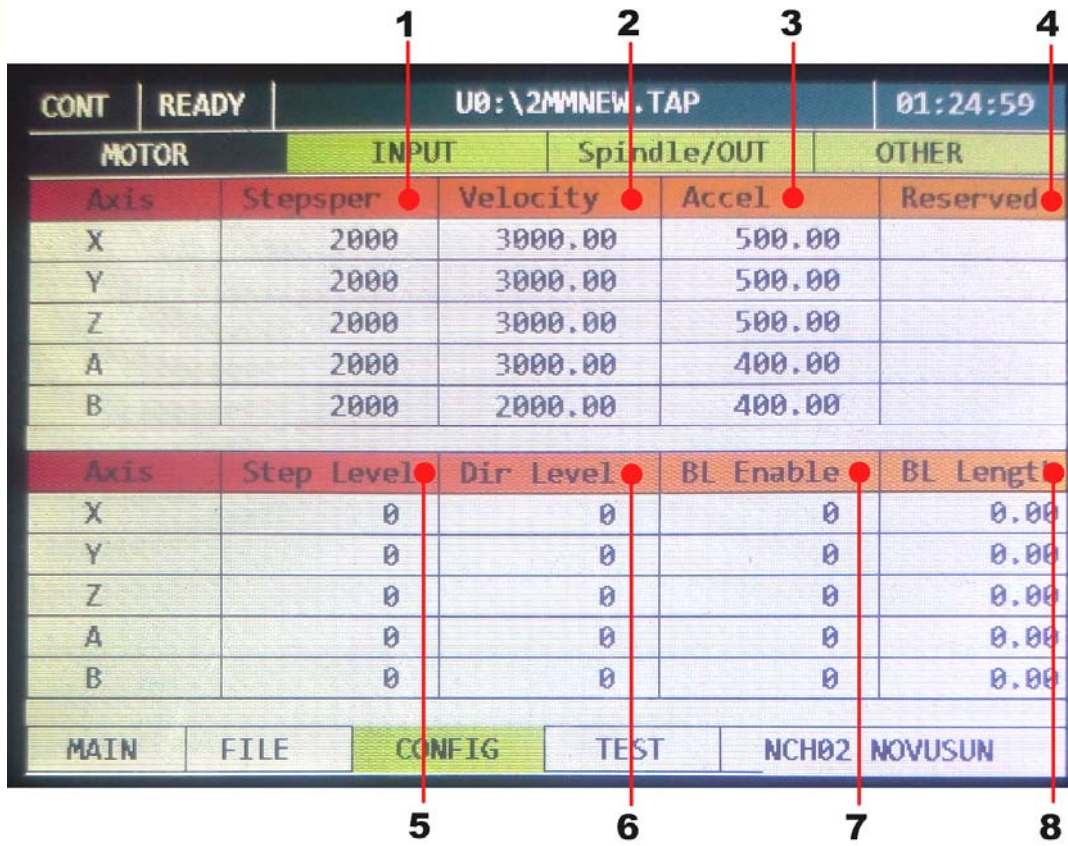
Figure3-3.　　motor parameter configuration page

The parameter item specifically defines show in table 3-2.

No.	Mark	Definition	Range
1	Stepsper	the number of pulses required for every forward 1mm	100-20000
2	Velocity	Speed: the manual or the axis G code runs maximum speed. The unit is mm/min	50-20000
3	Accel	Acceleration: the manual or the axis G code runs the maximum acceleration. The unit is mm/min2	10-5000
4	Reserved	System reserved, undefined	
5	Step level	The pulse level, 0 indicates that the output level is 0V when no pulse, and the 1 indicates	1/0

		that the output level is maximum when no pulse.	
6	Dir Level	The direction level is 0. When the axis goes to the coordinate + movement, the direction signal output level 0V, 1 indicates that the direction signal output level is the maximum when the axis moves towards the coordinate + movement.	1/0
7	BL Enable	Backlash Enable, 1: enable; 0: disable	1/0
8	BL Length	Backlash Length, The unit is mm	0-10

Table 3-2.　motor parameter configuration

3.3.2 Input parameter configuration (INPUT)

The input parameter configuration page is shown in Figure 3-4. This page list　specific parameters by row, and list number axis by column. The parameters of the axis can be adjusted by the knob.

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Figure3-4.　　Input configuration page (INPUT)

The parameter specifically defines see as table 3-3

No.	Mark	Definition	Range
1	Limit++	The forward hard limit pin setting, 0 indicates close the limit, and 1-8 indicates that the limit pin is configured on the IN1-IN8 specific input port interface.	0-8
2	L++ Level	The forward hard limit input level definition, 1 is the input high level effective; 0 is the input low level effective.	1/0
3	Limit--	The backward hard limit pin setting, 0 indicates close the limit, and 1-8 indicates that the limit pin is configured on the IN1-IN8	0-8

		specific input port interface.	
4	L-- Level	The backward hard limit input level definition, 1 is the input high level effective; 0 is the input low level effective.	1/0
5	Home	The home pin setting, 0　indicates close the home, and 1-8 indicates that the limit pin is configured on the IN1-IN8 specific input port interface.	0-8
6	Home Level	The home input level definition, 1 is the input high level effective; 0 is the input low level effective.	1/0
7	Home Dir	The home's direction , 1 indicates home's direction is +, and 0 indicates the home's direction is -.	1/0
8	HKB length	The return distance after the home operation is completed.	0-100

Table 3-3.　input parameter configuration

3.3.3 Spindle / output parameter configuration (Spindle/OUT)

The spindle / output parameter configuration page is shown in Figure 3-5. This page for a list of specific parameters to the parameter list, the list number axis. The parameters of the axis can be adjusted by the knob.

Figure3-5.   Spindle / output parameter configuration (Spindle/OUT)

Spindle parameters specific definition reference table 3-4.

No.	Mark	Definition	Range
1	Max Speed	The max spindle speed	100-40000
2	Default Speed	The default spindle speed	0-40000
3	M3/4 Delay	Delay time of M3/4 instruction	0-8

Table 3-4.   Spindle parameter configuration

NCD02's spindle speed regulation output is 0-10V voltage, output voltage and maximum spindle speed and default spindle speed (current speed) are related, the specific formula is: output voltage (VSO) =10*default spindle speed (current speed F) / maximum spindle speed (F max). For example, the current speed is F=20000, the maximum spindle speed F max=40000, at this time, the spindle output voltage is VSO=10*20000/40000=5V.

The M3/4 delay time is the time between running the G code in the M3/4 time to the actual execution of the IO output.

The output item parameters reference table 3-4

No.	Mark	PIN		Active Level	
		Definition	Range	Definition	Range
4	Spindle CW(M3)	M3 pin number	0-5	M3 effective level	1/0
5	Spindle CCW(M4)	M4 pin number	0-5	M4 effective level	1/0
6	Mist cool(M8)	M8 pin number	0-5	M8 effective level	1/0
7	Flood cool(M10)	M10 pin number	0-5	M10 effective level	1/0
8	EXT M60	M60 pin number	0-5	M60 effective level	1/0
9	EXT M61	M61 pin number	0-5	M61 effective level	1/0
10	EXT M62	M62 pin number	0-5	M62 effective level	1/0
11	EXT M63	M63 pin number	0-5	M63 effective level	1/0
12	EXT M64	M64 pin number	0-5	M64 effective level	1/0

Table 3-5.   OUT parameter configuration

Note: the output pin number is 0 indicates to close the current output, and the output pin number 1-5 indicates the corresponding OUT1-OUT5.

Output power level setting 1: execution of current M instruction to indicate output disconnecting with GND.

Output effective level setting 0: execution of current M instruction to indicate output connecting with GND.

3.3.4 other parameter configuration (OTHER)

The other parameter configuration pages are shown in Figure 3-6. The parameter page mainly includes the parameters of the soft limit of each axis, the language, the speed of HOME, the speed of BACKLASH, the speed of the probe and the coordinates of the position of the

tools sensor. The parameters of the axis can be adjusted by the knob. Page reference figure 3-6, page soft limit parameters specify reference table 3-6. Probe related item parameters reference table 3-7. other miscellaneous parameters reference 3-8.
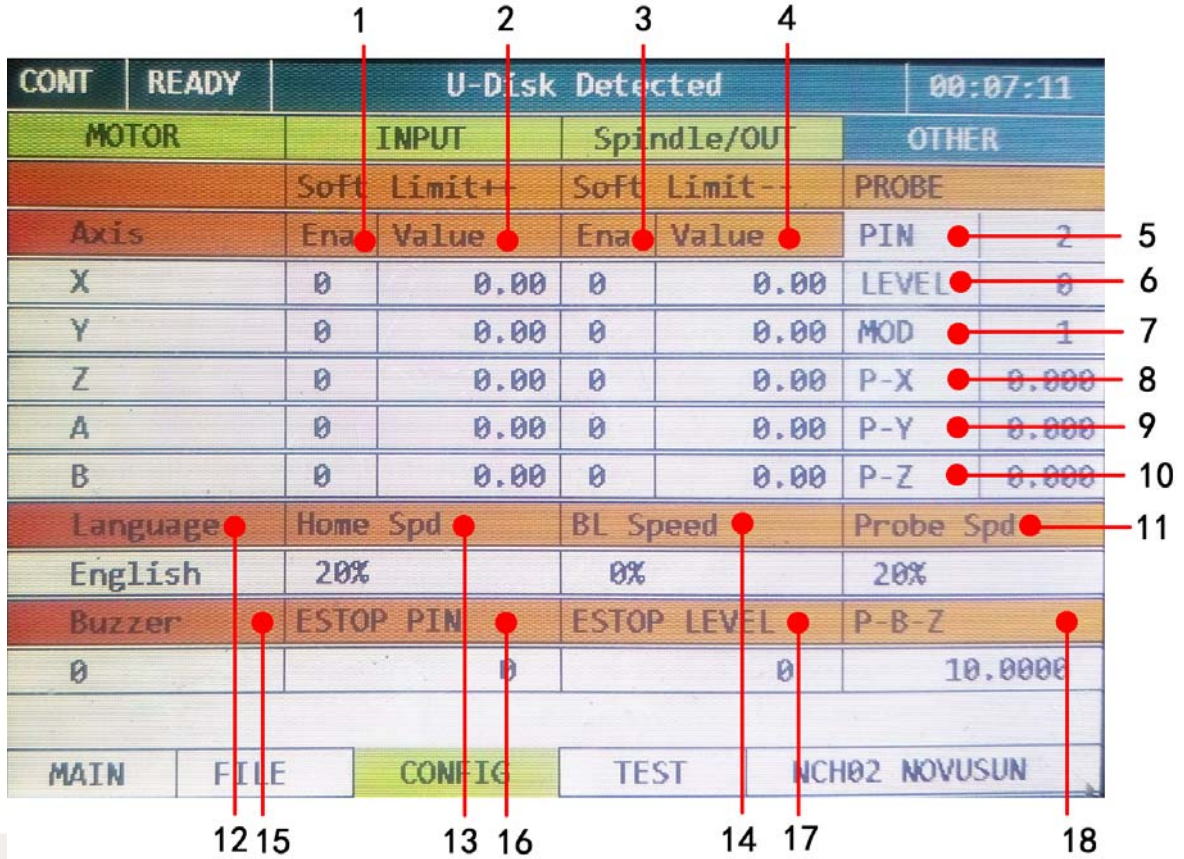

Figure3-6.　　other parameter configuration (OTHER)

No.	Mark	Definition	Range
1	Limit++_Ena	Enable of positive soft limit, 1:enable, 0:disable	1/0
2	Limit++_Value	Positive soft limit position limit value, in mechanical coordinate system as reference	0-10000
3	Limit--_Ena	Enable of negative soft limit, 1:enable, 0:disable	1/0
4	Limit--_Value	Negative soft limit position limit value, in mechanical coordinate system as reference	0-10000

Table 3-6.　　Configuration of soft limit

Note the soft limit configuration item XYZAB 5 axis can be set independently.

No.	Mark	Definition	Range
5	PROBE-PIN	The pin of Probe, 0 for closing, and 1-8 for the corresponding input pin IN1-IN8	0-8
6	PROBE-LEVEL	Effective level of Probe, 1: high efficiency, 0: low efficiency	1/0
7	PROBE-MOD	Probe mode, 0:fixed-position probe, 1:floating-position probe	1/0
8	P-X	X axis coordinate of Tool sensor in fixed-position mode	±10000
9	P-Y	Y axis coordinate of Tool sensor in fixed-position mode	±10000
10	P-Z	Z axis coordinate of Tool sensor in fixed-position mode	±10000
11	PROBE SPD	Probe speed ratio according to G0	0-100%

Table 3-7. Configuration of Probe

No.	Mark	Definition	Range
12	Language	Language settings (temporary support for English only)	0
13	Home Spd	Home speed ratio according to G0	0-100%
14	BL Speed	Backlash speed ratio according to G0	0-100%
15	Buzzer	Button buzzer switch, 0: close, 1: open	1/0

16	ESTOP PIN	The pin of Estop, 0 for closing, and 1-8 for the corresponding input pin IN1-IN8	0–8
17	ESTOP LEVEL	Effective level of Estop, 1: high efficiency, 0: low efficiency	1/0
18	P–B–Z	Back distance of Z axis after Probe in floating-position mode	0–100

Table 3-8.   Other parameter setting

3.4   Test and diagnosis page

The test and diagnosis page can be entered by pressing ![PAGER] under the parameter configuration page. The page mainly displays the basic function test information of the system, including key monitoring, input and output monitoring, spindle monitoring and so on. Page reference diagram 3-7. detailed description of reference table 3-9.
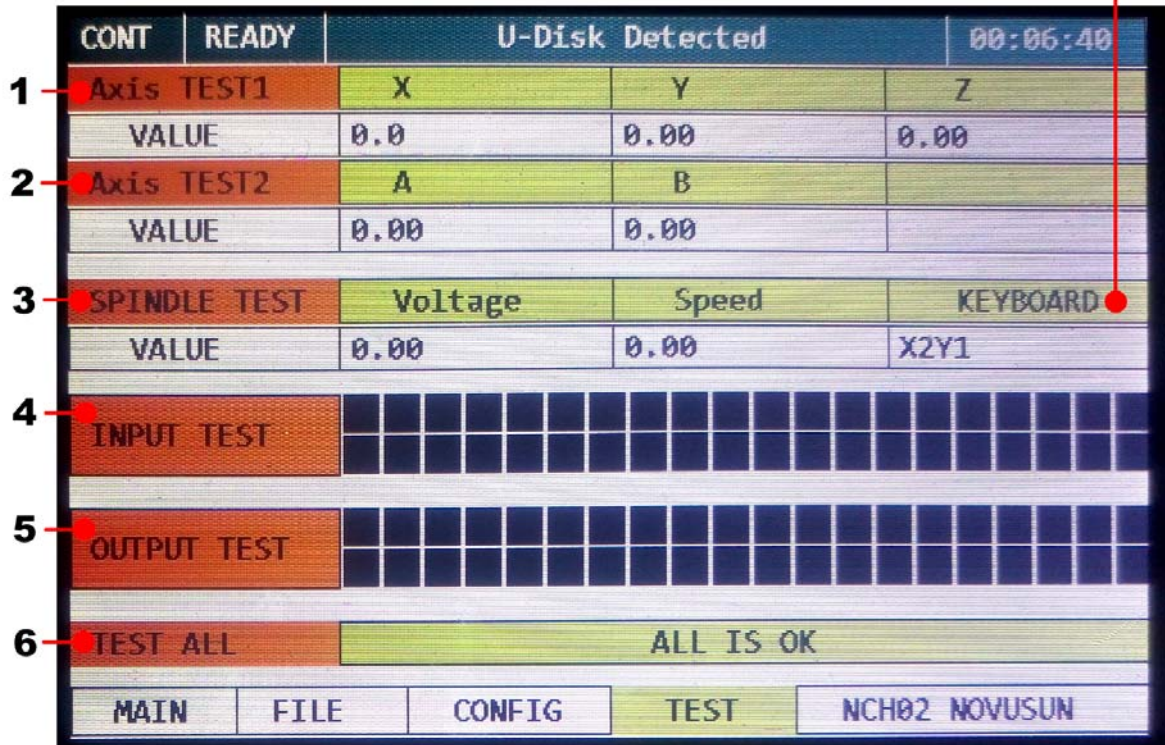
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Figure3-7. Test and diagnosis page (TEST)

No.	Mark	Definition
1	Axis TEST1	X/Y/Z 3 axis test, adjust the knob to select the function, after the confirmation (PUSH) to start the test, the X/Y/Z axis is run according to the design path.
2	Axis TEST2	A/B 2 axis test, adjust the knob to select the function, after the confirmation (PUSH) to start the test, the A/B axis is run according to the design path.
3	SPINDLE TEST	Spindle test, adjust the knob to select the function. According to the confirmation (PUSH), after starting the test, the spindle output is changed according to the design voltage, Voltage is the output voltage display, and Speed is the spindle speed display.
4	INPUT TEST	The input IO value is displayed in real time. One IO corresponds

		to a color block, the valid color block becomes red, and the invalid color is blackened.
5	OUTPUT TEST	The output IO value is displayed in real time. One IO corresponds to a color block, the output block becomes red, and the invalid color is blackened.
6	TEST ALL	The function is selected by the adjustment knob. After the test is started (PUSH), all modules are running or changing according to the design.
7	KEYBOARD	Button monitoring can monitor the press position in real time.

Table 3-9.   Description of test and diagnosis page

Chapter 4. Operation and Application

The basic operation is introduced in the front part of the keystroke. Here is not going to be exhausted. Here we introduce the use of this product from the perspective of an initial user. The first time we start the product, we first configure all the configuration items according to our actual needs. Here we introduce the usage method, no longer describe the configuration items, and all the configuration items are configured according to the customers' needs.

First of all, the system is started, our first step is to establish the machine coordinate system; the second step is probe, accurate zero; third step up the workpiece, the tip will move to zero workpiece, and the workpiece coordinate reset; the fourth step is to load the G file; the above work is finished, press START to start G code execution. The following sections describe these steps in detail.

4.1 Establish machine coordinate system

As shown in Figure 4-1, the engraving machine schematic diagram is installed. Each axis is equipped with a proximity switch. The limit and home share this switch. The X axis switch is installed in the X-- position. The Y axis switch is installed in the Y++ position; the Z axis switch is installed in the Z++ position. (here we test the prototype as a reference for installation, the actual application of the customer can be selected according to the needs of the installation).
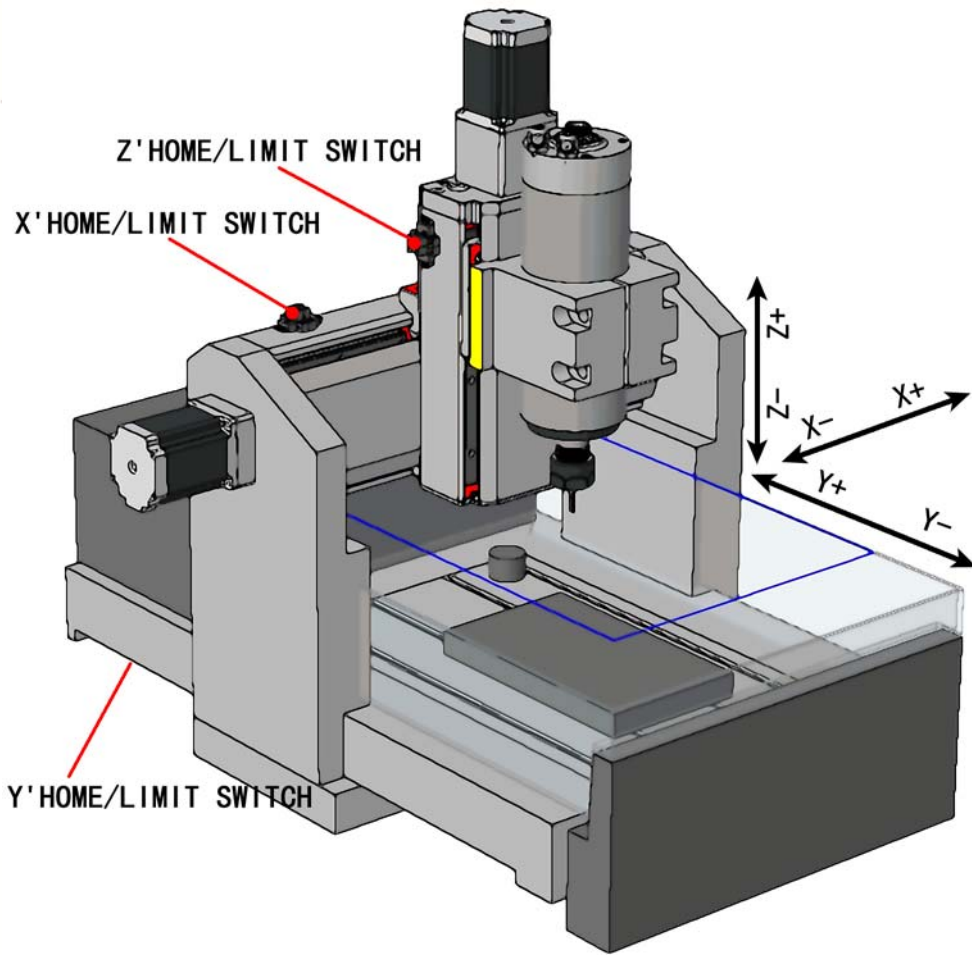
Figure4-1.   The switch position diagram of the test engraving machine

For the first time to use the system, we need to establish machine tool coordinate system, that is, HOME.

After starting the system, we switch to the parameter settings page, "INPUT" sub-page, and HOME configuration, according to our actual engraving machine configuration, as shown in Figure 4-2.   XYZ's HOME PIN is set to 3,4,5, LEVEL is set to 0, DIR X axis is set to 0, YZ axis are set to 1. HBlength are all set to 10.

Figure4-2.　　INPUT settings page

Switch to the parameter settings page "OTHER" subpage, find "Home Spd", and modify

the HOME speed to the appropriate value, as shown in Figure 4-3.

Figure4-3.　　Home speed settings

Single axis home operation: after setting, switch to the main page of "MAIN", we take X

as an example for single axis home, pressed ![SHIFT↑] + ![Z- HOME] + ![X+ X] , this is the X axis of

single axis home operation, the axis will run toward X-, stop until the trigger X axis HOME

switch, then switch back until the HOME switch change to the off state, the X axis machine

coordinate is automatically cleared, said here is the X axis mechanical zero point; then continue

to run 10mm X+ to stop (we set HOME back distance is 10 in the configuration), so X HOME

operation is complete.

The all axis mechanical zero operation: NCH02 supports all axis HOME operation on

the main page, press **SHIFT↑** + + to trigger all axis HOME operation, before

this, to ensure to all axis HOME open in INPUT setting, if one axis   HOME is close, jump to

the next axis operation. The order of HOME operation in full axis is X, Y, A and Z.

4.2 Probe

The Probe can be configured as a fixed-point probe or a floating-point probe. Below we

describe 2 kinds of probe operation in detail.

4.2.1 Fixed-point probe

Fixed point probe is to fix the tool sensor in a fixed position of the engraving machine, and

every time the probe is processed, the spindle tip automatically moves to this fixed position for

tool setting. The installation position of the tool sensor is shown in reference Figure 4-4.
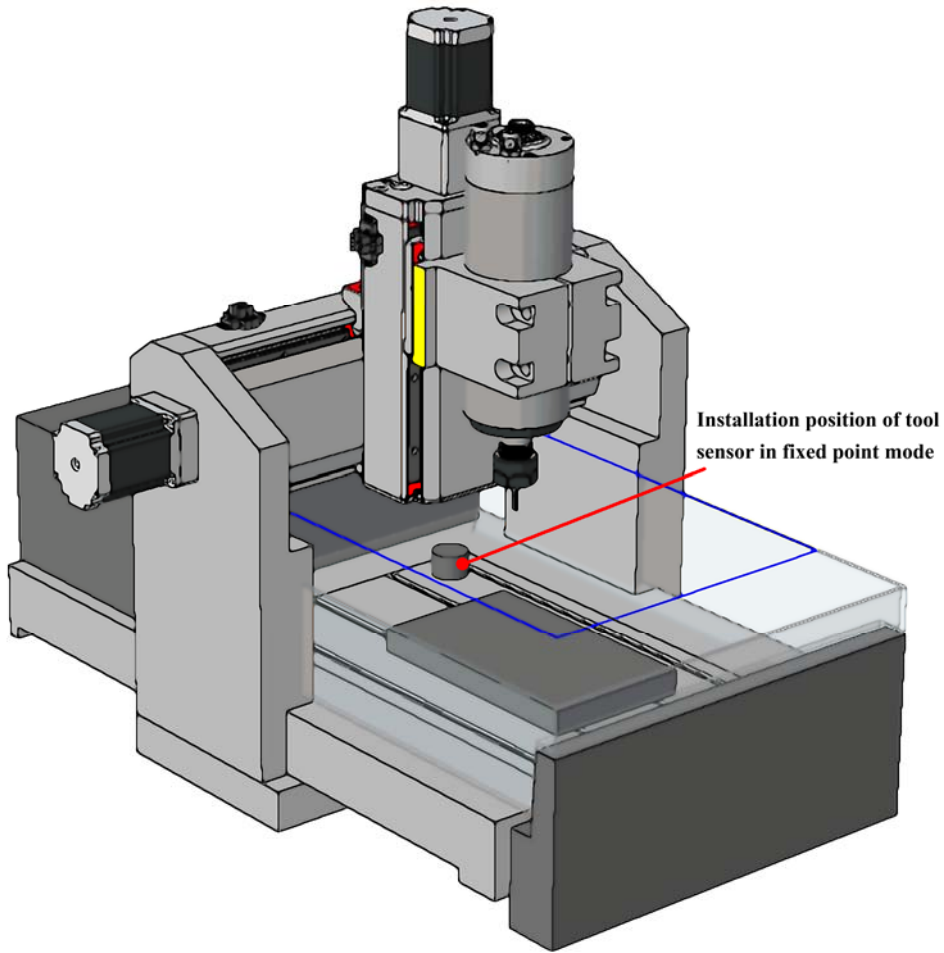
Figure4-4.　　Tool sensor installation position in fixed-point probe mode
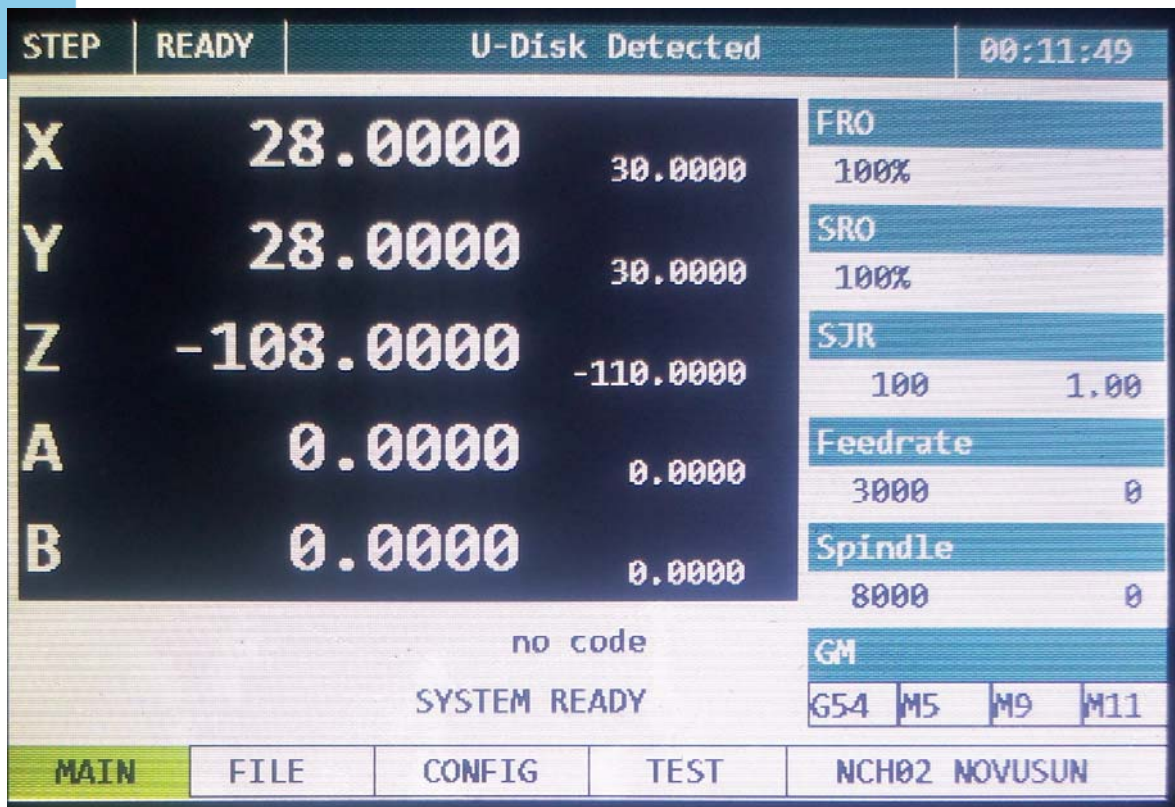

Figure4-5.　　Move to the installation position of the tool sensor

First, we manually move the tool tip to the center of the plane on the tool block, and read

Chapter4 Operation and Application

the XYZ axis mechanical coordinates. As shown in Figure 4-5, the plane center coordinates (X, Y,

Z) on the tool block are (30,30, -110).

Secondly, we enter the OTHER sub page under CONFIG. As shown in Figure 4-6, we find

fixed-point tool block location configuration item, and configure related parameters of cutter

block as shown in table 4-1.

No.	Mark	Value	Definition
1	PROBE-PIN	2	Take IN2 Port as probe input port
2	PROBE-LEVEL	0	The input port IN2 is low effective (effective when the input short with GND)
3	PROBE-MOD	0	Set to fixed-point probe mode
4	PROBE-P-X	30	The X coordinate value of the position of the tool sensor is 30
5	PROBE-P-Y	30	The Y coordinate value of the position of the tool sensor is 30
6	PROBE-P-Z	-110	The Z coordinate value of the position of the tool sensor is -110

Table 4-1 Probe configuration item in fixed point probe mode

Probe configuration item screenshot see as figure 4-6.

Figure4-6.   Probe configuration in fixed-point probe mode

After the configuration is completed, we enter the main page and move the spindle to any

position. (we suggest that the Z axis of the tool tip is higher than the plane of the tool sensor). Press

SHIFT↑ + ◀X▬ , the system starts automatic probe. At this moment, the system will automatically

move to the location of the set of tool sensor to automatically probe. After the probe is finished, the

system will automatically return to the just start position of the probe.

4.2.2 Floating-point probe

The floating probe means that the location of the tool sensor is not fixed at a certain

location, but is placed in any desired location. In this mode, we usually place the tool sensor on

the workpiece surface for floating-point probe. The position of the tool sensor is placed in

reference figure 4-8.

In the floating tool mode, there is no need to configure the position of the tool sensor. We

enter the OTHER subpage under CONFIG and set the probe related settings as shown in Table

4-2. Floating-point probe configuration item screenshot reference figure 4-7.

No.	Mark	Value	Definition
1	PROBE-PIN	2	Take IN2 Port as probe input port
2	PROBE-LEVEL	0	The input port IN2 is low effective (effective when the input short with GND)
3	PROBE-MOD	1	Set to floating-point probe mode
4	PROBE-B-Z	10	Back distance after probe

Table4-2 Probe configuration item in fixed point probe mode

Figure4-7. Probe configuration in fixed-point probe mode

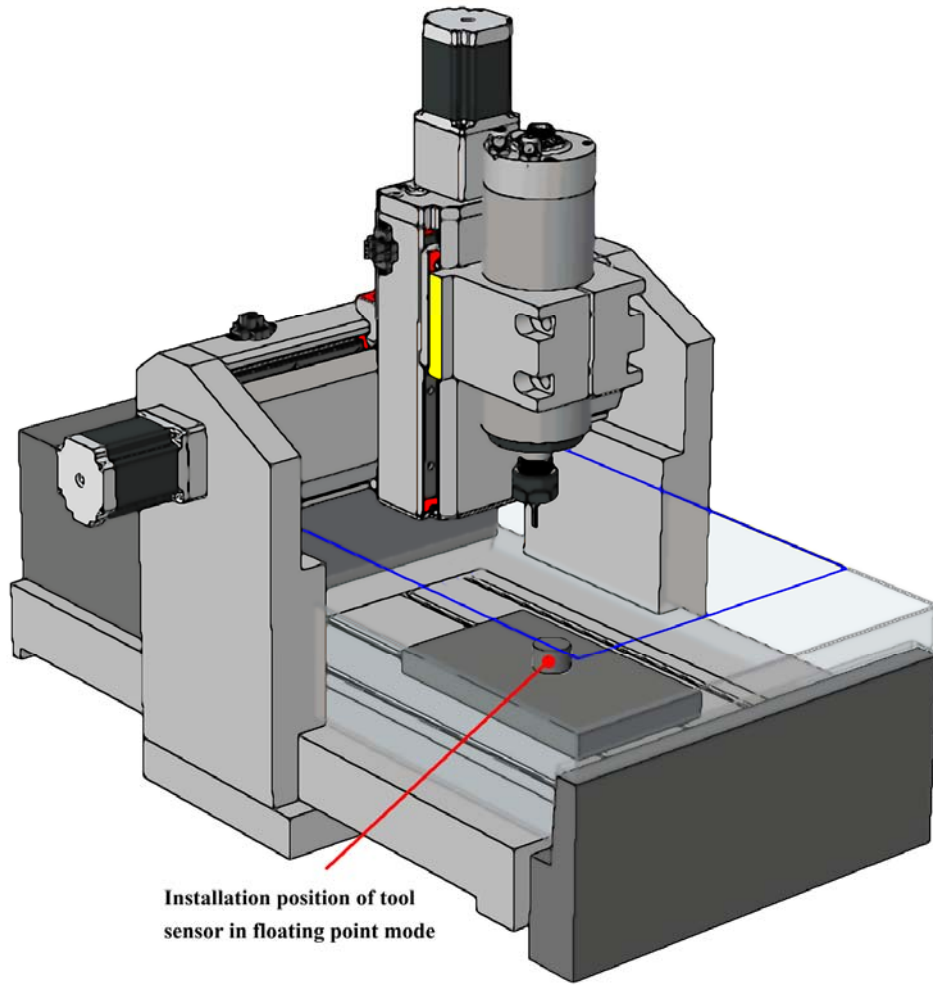Installation position of tool
sensor in floating point mode

Figure4-8.   Tool sensor installation position in floating-point probe mode

After completing the configuration we return to the main page, the tool sensor on the surface

of the workpiece, we only need to manually (MPG) move the spindle nose just above the tool

sensor, and then press **SHIFT↑** + [X-] , the system will automatically start probe, after the

probe completion of the Z axis will be automatically lift off the tool sensor plane 10mm.

4.3 Workpiece zero point

After the probe is completed , the next step is confirm workpiece zero point, we want to

carve a product, first get the G code, to ensure the workpiece zero position of the G code file .

Some G code file set the workpiece center as the workpiece zero, some set a workpiece the

corner as the workpiece zero. Here is an example of a positive center on the surface of the

workpiece. Under the main page, use manual (MPG) to move the tip of the spindle to the center of

the workpiece surface and then presses **SHIFT↑** + **A⁴ ZERO** + **A⁴ ZERO** to set axis coordinates to zero.

Then move the Z axis out of the workpiece surface to the safety height. At this point, the workpiece

zero is confirmed.

4.4 Load and run G code

Under the main page, press **PAGER** to switch to file management page, adjust the knob to

select the files that need to be processed. As shown in Figure 4-9, we selected the TEST2.TAP file.

SHIFT	READY	U-Disk Detected	01:06:41
NAME		SIZE	TIME
SYSTEM~1		20 KB	2017-08-08 15:30
TEST1.TAP		20 KB	2017-08-08 15:30
TEST3.NC		20 KB	2017-08-08 15:30
TEST2.TAP		20 KB	2017-08-08 15:30
TEST4.TAP		20 KB	2017-08-08 15:30
INSTALL		20 KB	2017-08-08 15:30
MAIN	FILE	CONFIG	TEST	NCH02 NOVUSUN

Figure4-9.   select TEST2.TAP file in management page

After selecting a the file, press the confirmation key to automatically load the G code and

automatically return it to the MAIN page. As shown in Figure 4-10, the title bar file display section

has already appeared TEST2.TAP, indicating that the G code file is loaded successfully.
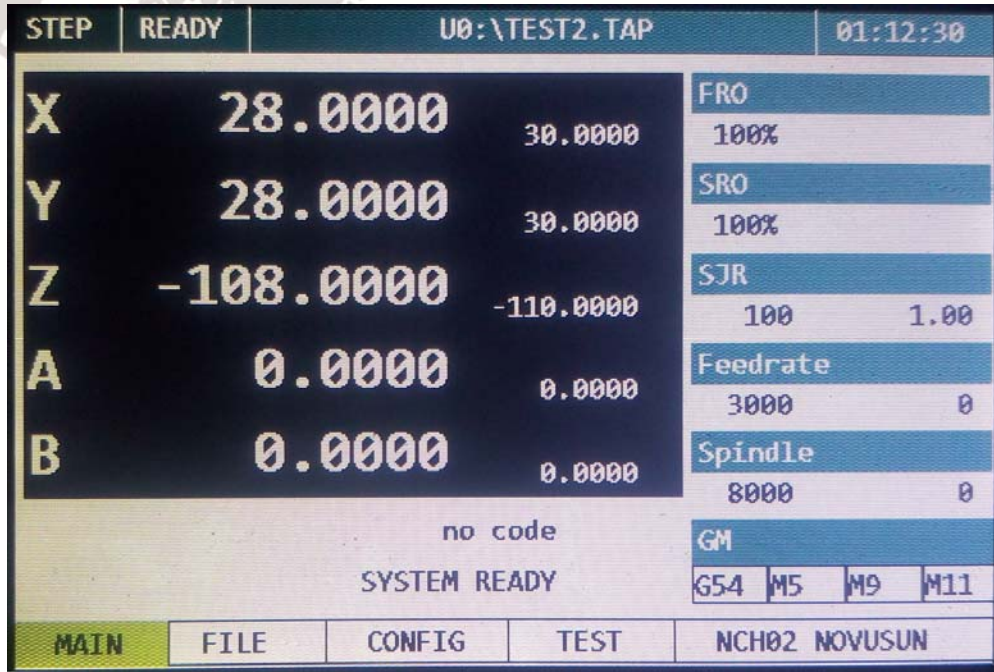
Figure4-10.   Estop and Probe dialog

When the G code is loaded, press. Start the process.

Chapter 5. G & M instructions supported

5.1 G instruction Supported

No.	Instruction	Definition
1	G0	Quick positioning
2	G1	Straightaway cut
3	G2	Cut along the circle
4	G3	Cut inversing the circle
5	G17	XY plane select
6	G18	ZX plane select
7	G19	YZ plane select
8	G28	Home
9	G31	Probe
10	G54	G54 coordinate system
11	G55	G55 coordinate system
12	G56	G56 coordinate system
13	G57	G57 coordinate system
14	G58	G58 coordinate system
15	G59	G59 coordinate system
16	G81	Drill hole code
17	G82	Drill hole code

18	G83	Circulation Drill hole code
19	G90	Absolute size mode
20	G91	Increment size mode
21	G98	Back to R point
22	G99	Fixed circulation

Table 5-1 G instruction supported

5.2 M instruction Supported

No.	Instruction	Definition
1	M3	Spindle rotates forward
2	M4	Spindle rotates backward
3	M5	Spindle stop
4	M8	Start of water -cooling
5	M9	Stop of water- cooling
6	M10	Start of Mist
7	M11	Stop of Mist
8	M30	End of G code
9	M60	Open switch 1
10	M61	Open switch 2
11	M62	Open switch 3
12	M63	Open switch 4
13	M64	Open switch 5
14	M80	Close switch 1

15	M81	Close switch 2
16	M82	Close switch 3
17	M83	Close switch 4
18	M84	Close switch 5

Table 5-2 M instruction supported