



NOVUSUN

5 axis Motion Controller System

with MPG—— DM800

Manual

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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.。

DM800 is the 5 axis motion controller we spend 2 years to design.

DM800 is a CNC system without computer. Only need a U-disk within G-CODE file, DM800 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;
- SD card inside
- Ethernet communication from handle to main board.
- Operation without computer;
- 20 ports photoelectric isolated input interface;
- 12 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,460KHz pulse output for every axis;

- ARM motion control chip;
- main device is 24VDC power supply input, current should higher than 1A;
- MPG build-in;
- 3.8" TFT screen;
- 16 user key;

1.3 Products Appearance and size

The Hand control system DM800 appearance as the Figure 1-1 show: The host system DM800 appearance as the Figure1-2.

The Hand control system DM800 overall size is 208mm*132mm*32mm;

The host system DM800 overall size is 142mm*100mm*42mm



Figure1-1. DM800 front appearance and size

1.4 substantial explanation

When operate the DM800, 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 $S\# = \text{setting } S * SRO$.

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 $FS\# = \text{Setting manual speed} * SRJ$.

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 can conduct the manual step operation at this mode.

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

1.5 Noting and Warning



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 spindle control also have a certain load capacity. Please avoid this terminal connect with GND. In case that the interior components and parts be broken down.



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 emergency, 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 24VDC 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 describe 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.

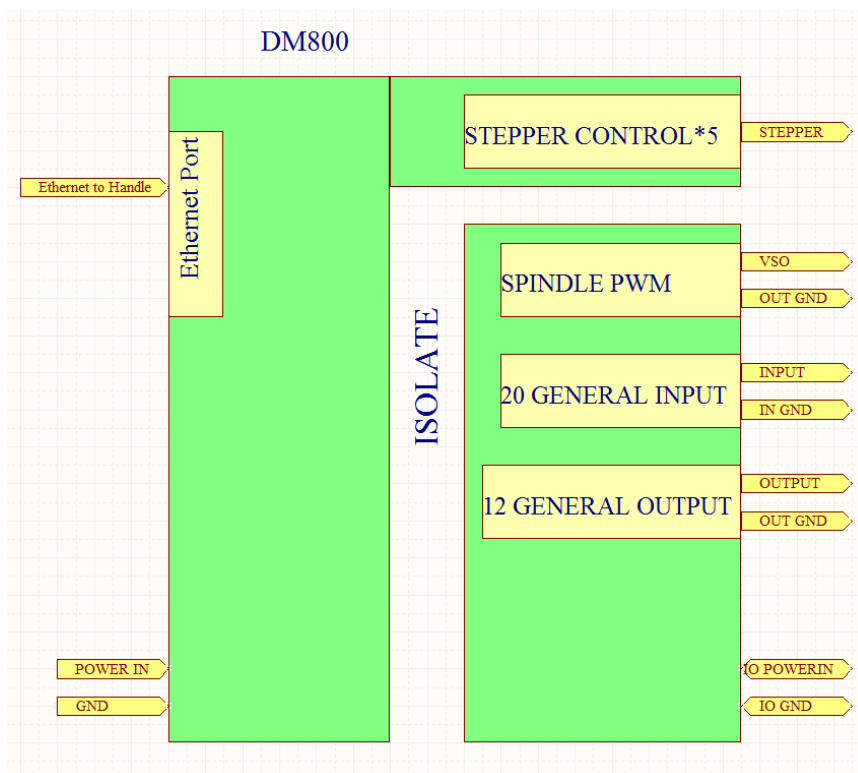




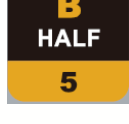






Figure2-1. Power supply structure of DM800

2.2 Hand control DM800 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	1: Page Right; 2: Number 1
R 1 C 2		SHIFT	1: Second function; 2: Number 2
R 1 C 3		GOTO 0	1: Goto work piece Zero point; 2: Copy; 3: Number 3
R 2 C 1		HOME	1: Find Machine zero; 2: Delete; 3: Number 3
R 2 C 2		A	1: A axis select; 2: Probe; 3: Number 4
R 2 C 3		B	1: B axis select; 2: Halve the Coordinate value 3: Number 5
R 2 C 4		MODE	1: Change MPG mode; 2: Paste; 3: Number 6
R 3 C 1		ZERO	1: Zero; 2: Character M; 3: dot
R 3 C 2		X	1: X axis select; 2: Number 7
R 3 C 3		Y	1: Y axis select; 2: Number 8
R 3 C 4		Z	1: Z axis select; 3: Number 9
R 4 C 1		CANCEL	1: Start and Stop Spindle

2.3.3 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.

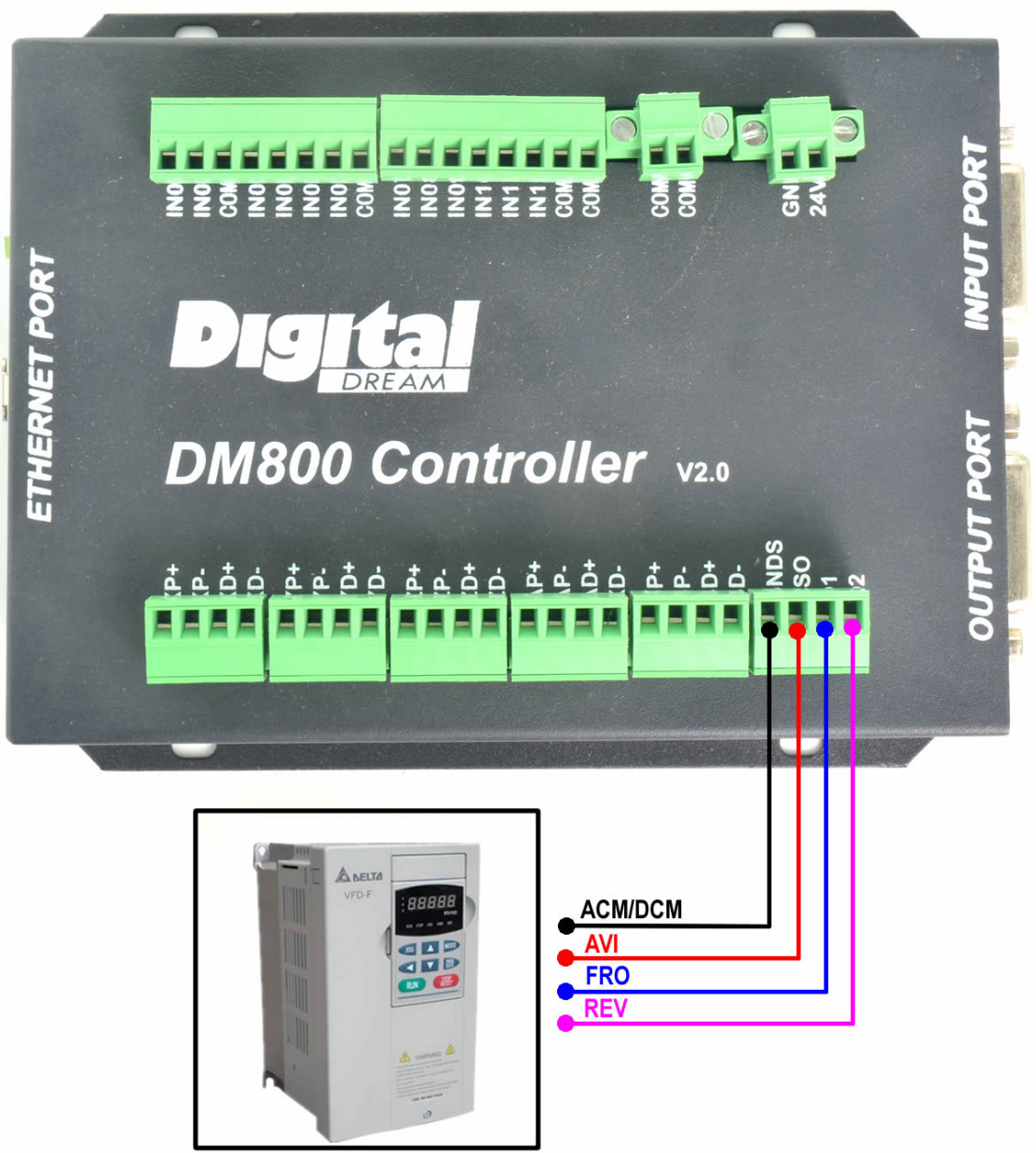


Figure2-4. spindle port definition and connection

2.3.4 Output port

As Figure 2-2 showed, No.8 switch is Output port, The interface is an open-ground interface. Definition of PORT 8 see as Table 2-1. The internal structure refers to figure 2-8, which can be absorbed not more than 50mA current. Output port definition

PIN NO.	Mark	Definition
1	03	Output port No. 3
2	COM-	Common port -
3	06	Output port No. 6
4	07	Output port No. 7
5	COM-	Common port -
6	010	Output port No. 10
7	011	Output port No. 11
8	COM-	Common port -
9	04	Output port No. 4
10	05	Output port No. 5
11	COM-	Common port -
12	08	Output port No. 8
13	09	Output port No. 9
14	COM-	Common port -
15	012	Output port No. 12

Table 2-1. Definition of PORT8

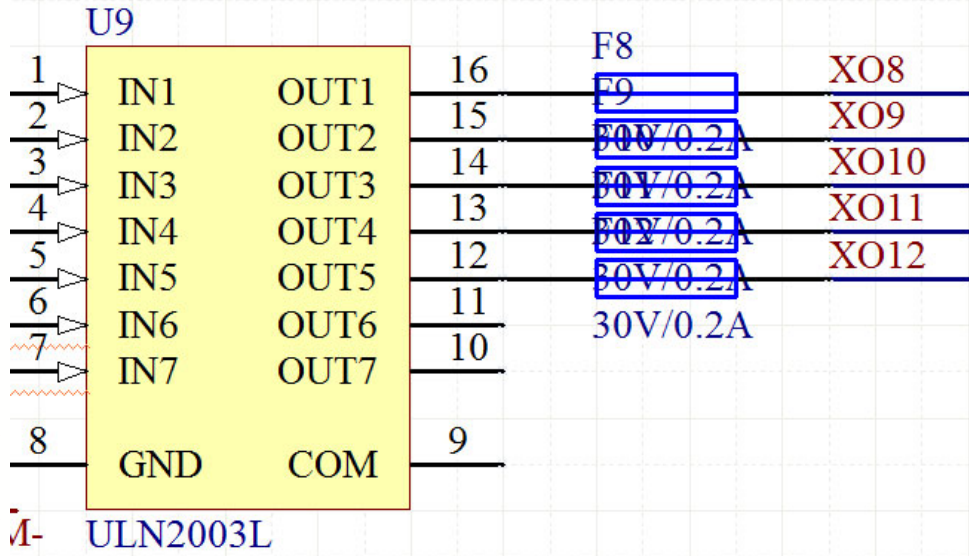
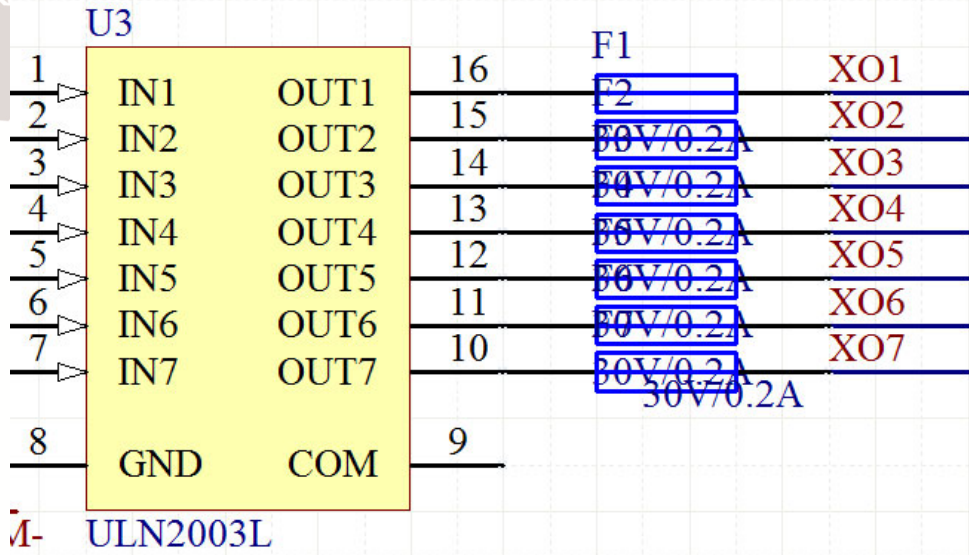


Figure2-5. the internal structure of the general output interface

The relay with a absorption current of no more than 50mA can be driven directly.

Reference figure 2-9 for external power relay method.

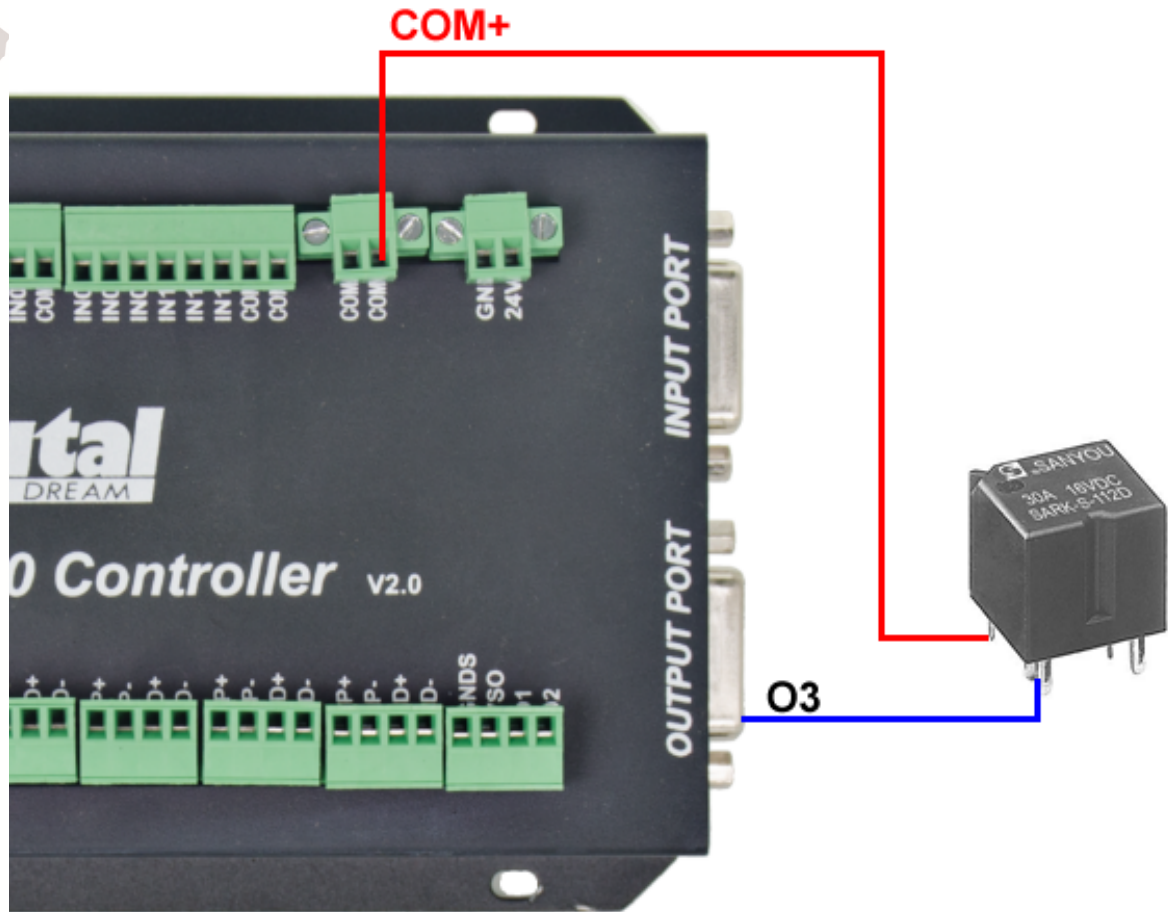


Figure2-6. general output interface connect with a small power relay

2.3.5 Main power supply port

As the Figure 2-2 show, The marked No. 10 and 11 port is power supply port for system and IO. 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 "+"

2.3.6 Limit/Home input port

As the Figure 2-2 showed, Marked No. 9/12/13 position is the limited /home input port. they are the optical isolated Input interface. Definition of Port9 see as Table 2-2. 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.

PIN NO.	Mark	Definition
1	COM-	Common port -
2	INPUT13	No. 13 pin input port
3	COM-	Common port -
4	INPUT16	No. 16 pin input port
5	INPUT17	No. 17 pin input port
6	COM-	Common port -
7	INPUT20	No. 20 pin input port
8	COM+	Common port +(24V)
9	COM-	Common port -
10	INPUT14	No. 14 pin input port
11	INPUT15	No. 15 pin input port
12	COM-	Common port -
13	INPUT18	No. 18 pin input port
14	INPUT19	No. 19 pin input port
15	COM+	Common port +(24V)

Table 2-2. Definition of PORT9

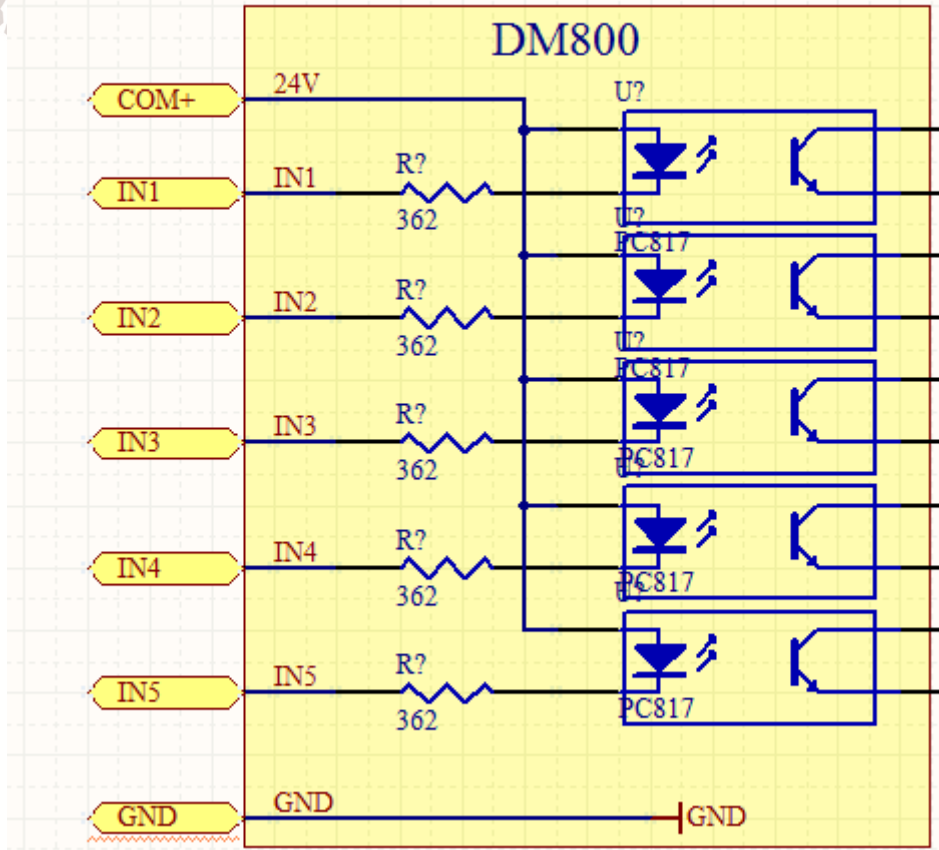


Figure2-7. Internal structure diagram of the input port

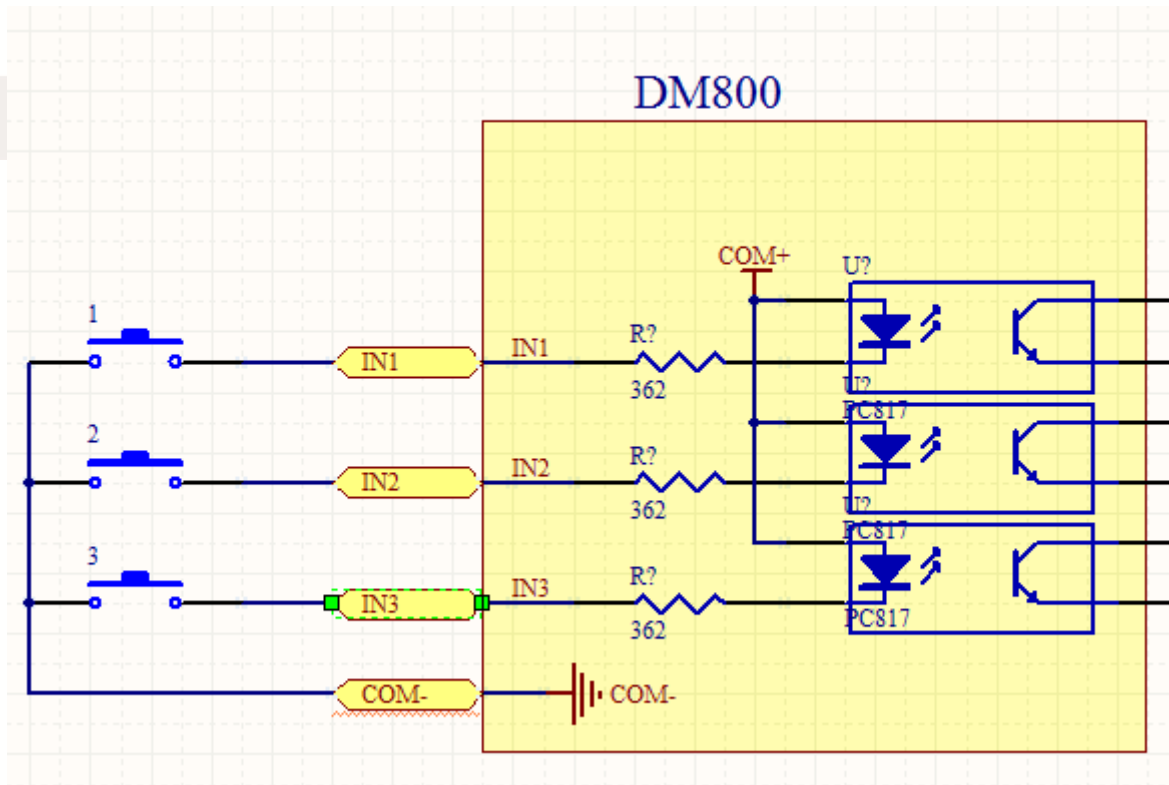


Figure2-8. input connection

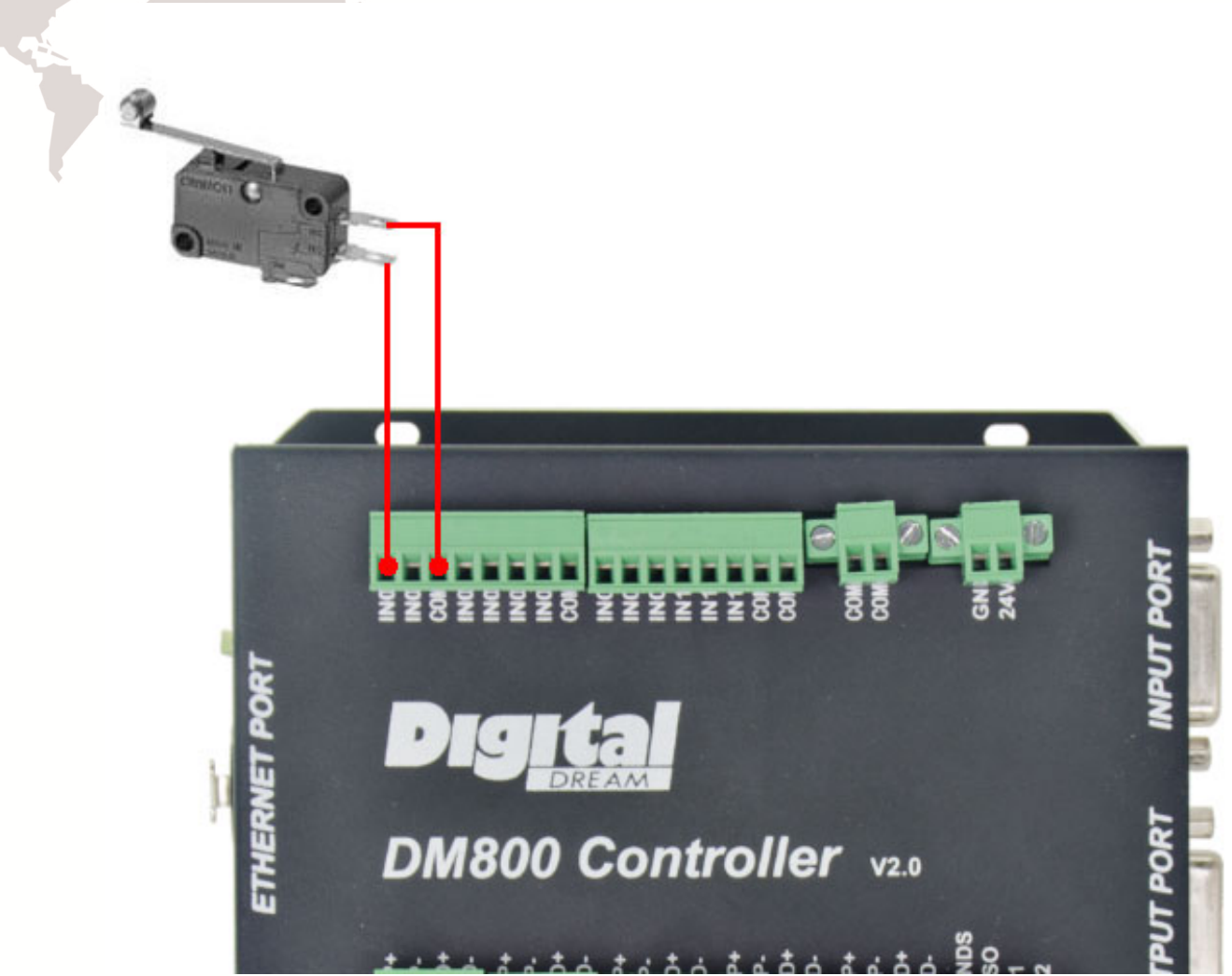


Figure2-9. Probe/Estop/ ordinary fretting switch input connection

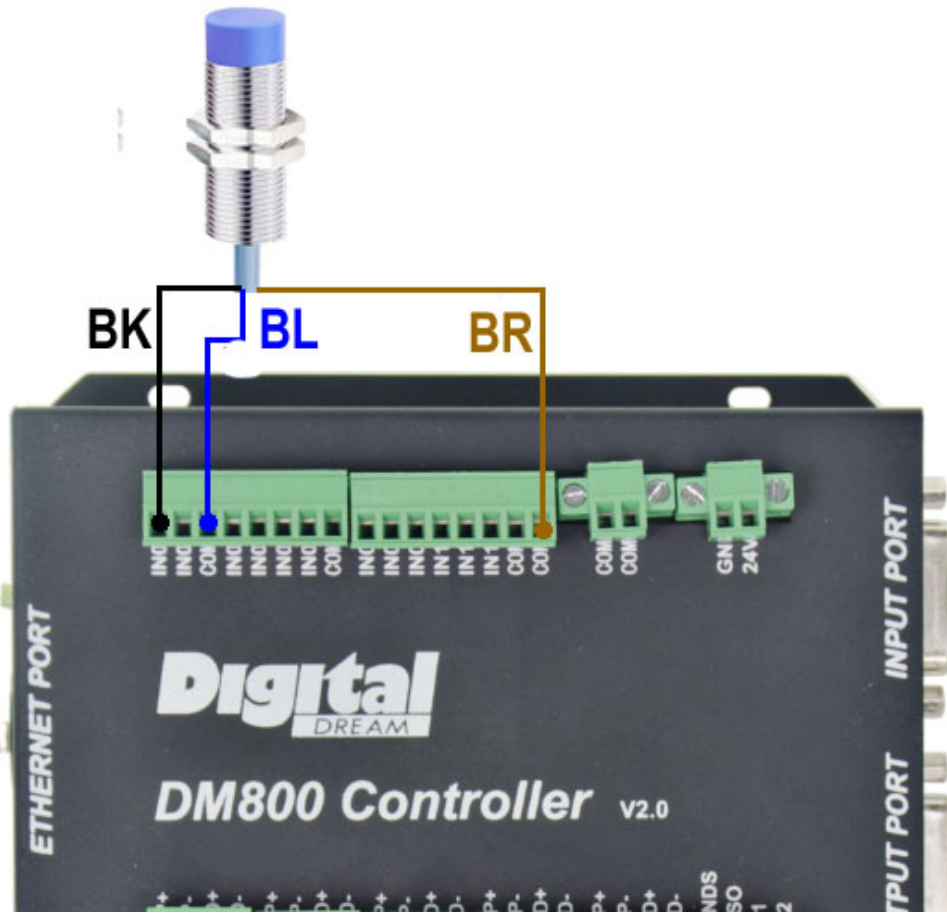


Figure2-10. input interface serial number IN3 and 2 line proximity switch / common switch limit input wiring diagram

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.

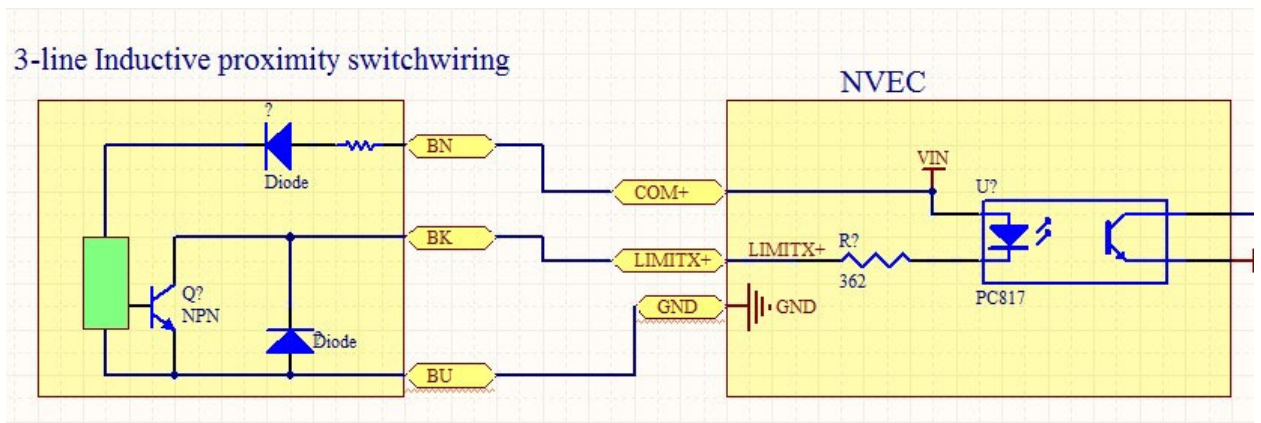


Figure2-11. NPN 3 lines Proximity Switch connection drawing

Chapter 3. Software & Config

The DM800 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 DM800

1. Manual mode bar

The status bar mainly displays the manual mode. There are three manual modes. They are

system mode (shown as SYS), x1 rate mode (shown as X1) , x10 rate mode (shown as X10), x100




rate mode (shown as X100). Under the ready state of system, push  4 modes can be switched.

2. Running status bar

The status bar mainly displays the working state of the system. There are 3 state in it. They are reset state (shown as ESTOP), ready state (shown as READY) 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 and release ESTOP button, the system can be switched between the ready state (READY) and the reset state (ESTOP). In the ready state, when the G code is ready, the G code can be started by



pressing . In the process of running G code, the running status bar displays the RUN, indicating that the G code is running.

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 handwheel Clockwise rotation or a reversal.

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

When turning the handwheel, you can see the valid position is changed with the handwheel, 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 ENTER botton, 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 ENTER botton, 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,Feedrate setting

The

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 **1** under the main control page. The file management page is shown in Figure 3-2.

SYS	READY	U disk Detect		00:00:00
NAME		SIZE	TIME	
2MMNEW.TAP		1526 KB	2018-7-15 17:12	
INSTALL		DIR	2019-8-5 9:20	
STMF4.BIN		158 KB	2019-5-25 11:37	

MAIN	FILE	CONFIG	TEST	DM800@DDREAM
------	------	--------	------	--------------

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  to enter the parameter configuration page.



Press  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.

SYS	READY	no file			00:00:00
MOTOR	INPUT	Spindle/OUT	TOOLS	OTHER	
Axis	Stepsper	Velocity	Accel	Step lvl	Dir lvl
X	2000.00	3000.00	500.000	0	0
Y	2000.00	3000.00	500.000	0	0
Z	2000.00	3000.00	500.000	0	0
A	2000.00	3000.00	400.000	0	0
B	2000.00	3000.00	400.000	0	0

Axis	Home	Level	Dir	HB Length	BL Dist
X	10	1	0	0.00	0.00
Y	11	1	0	0.00	0.00
Z	12	1	0	0.00	0.00
A	0	1	0	0.00	0.00
B	0	1	0	0.00	0.00

MAIN	FILE	CONFIG	TEST	DM800@DREAM
------	------	--------	------	-------------

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/min ²	10-5000
4	Step lvl	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.	
5	Dir Lvl	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
6	BL Dist	Backlash Length, The unit is mm	0-10
7	HB Length	The return distance after the home operation is completed.	0-100
8	Dir	The home's direction , 1 indicates home's direction is +, and 0 indicates the home's direction is -.	
9	Level	Home signal active level	1/0
10	Home	Home signal number	0-20

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.

SYS	READY	no file			00:00:00
MOTOR	INPUT	Spindle/OUT	TOOLS	OTHER	
Axis	Limit++	Level	Limit--	Level	Safe-Z
X	0	1	0	1	0.00
Y	0	1	0	1	BL SPD
Z	0	1	0	1	20%
A	0	1	0	1	HOME SPD
B	0	1	0	1	20%
EXT Input	Pin	Level	EXT Input	Pin	Level
M50	0	1	M51	0	1
M52	0	1	M53	0	1
M54	0	1	M55	0	1
M56	0	1	M57	0	1
M58	0	1	M59	0	1
MAIN	FILE	CONFIG	TEST	DM800@DDREAM	

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	0-8

		the limit pin is configured on the IN1-IN8 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 SPD	Home speed , speed=Home SPD*G0	0-100%
6	BL SPD	Back lash speed=BL SPD*G0	0-100%
7	Safe-Z	Safe of Z axis	0-1000
8/10	Pin	The home pin setting, 0 indicates close the home, and 1-20 indicates that the limit pin is configured on the IN1-IN20 specific input port interface.	0-20
9/11	Level	The home input level definition, 1 is the input high level effective; 0 is the input low level effective.	1/0

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.

SYS	READY	no file			00:00:00
MOTOR	INPUT	Spindle/OUT	TOOLS	OTHER	
Max Speed		Default Speed		M3/4 Delay	
8000		8000		3	
Signal	Pin	Level	Signal	Pin	Level
M3	0	0	M4	0	0
M8	0	0	M10	0	0
M60	0	0	M61	0	0
M62	0	0	M63	0	0
M64	0	0	M65	0	0
M66	0	0	M67	0	0
M68	0	0	M69	0	0
M70	0	0	M71	0	0
M72	0	0	M73	0	0
MAIN	FILE	CONFIG	TEST	DM800@DDREAM	

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

DM800'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	Definition
4	Signal	Signal of output M instructions
5	Pin	Pin number of M instructions
6	Level	Level of M instructions

Table 3-5. OUT parameter

No.	Valid(ON)	Invalid(OFF)
1	M3	M5
2	M4	M5
3	M8	M9
4	M60	M80
5	M61	M81
6	M62	M82
7	M63	M83
8	M64	M84
9	M65	M85
10	M66	M86
11	M67	M87
12	M68	M88
13	M69	M89
14	M70	M90

15	M71	M91
16	M72	M92
17	M73	M93
18	M74	M94

Table 3-6. OUT signal configuration

Note: the output pin number is 0 indicates to close the current output, and the output pin number 1-12 indicates the corresponding OUT1-OUT12. The max number is 12.

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.

SYS	READY	no file				00:00:00				
MOTOR	INPUT	Spindle/OUT		TOOLS		OTHER				
		Soft Limit++		Soft Limit--		PROBE				
Axis	Ena	Value	Ena	Value	PIN					
X	0	0.00	0	0.00	LEVEL	0				
Y	0	0.00	0	0.00	MOD	0				
Z	0	0.00	0	0.00	P-X	0.000				
A	0	0.00	0	0.00	P-Y	0.000				
B	0	0.00	0	0.00	P-Z	0.000				
		PIN	LEVEL	P-B-Z	0.000	T pos				
ESTOP	0	1	Probe Spd	20%	0					
START	0	1	Tool Spd	0	TCH					
PAUSE	0	1	ABC mod	1	20					
ZERO	0	1	Buzzer	0						
MAIN	FILE	CONFIG	TEST	DM800@DDREAM						

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 3-7. Configuration of soft limit

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

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

Table 3-8. Configuration of Probe

No.	Mark	Definition	Range
11	Extended function PIN	The pin of Estop/START/PAUSE/ZERO, 0 for closing, and 1-8 for the corresponding input pin IN1-IN8	0-8
12	Extended function LEVEL	Effective level of Estop/START/PAUSE/ZERO, 1: high efficiency, 0: low efficiency	1/0
13	Buzzer	Button buzzer switch, 0: close, 1: open	1/0
14	ABC mod	The 4 th axis and 5 th axis definition 0: 4/5 axis are A/B axis, 1:4/5axis are B/C axis, 2:4/5 axis are A/C axis	0/1/2
15	Tool spd	Not used yet	0
17	P-B-Z	Back distance of Z axis after Probe in	0-100

		floating-position mode	
18	TCH	Not used yet	0
19	T pos	Not used yet	0

Table 3-9. Other parameter setting

3.4 Test and diagnosis page



The test and diagnosis page can be entered by pressing **1** 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.

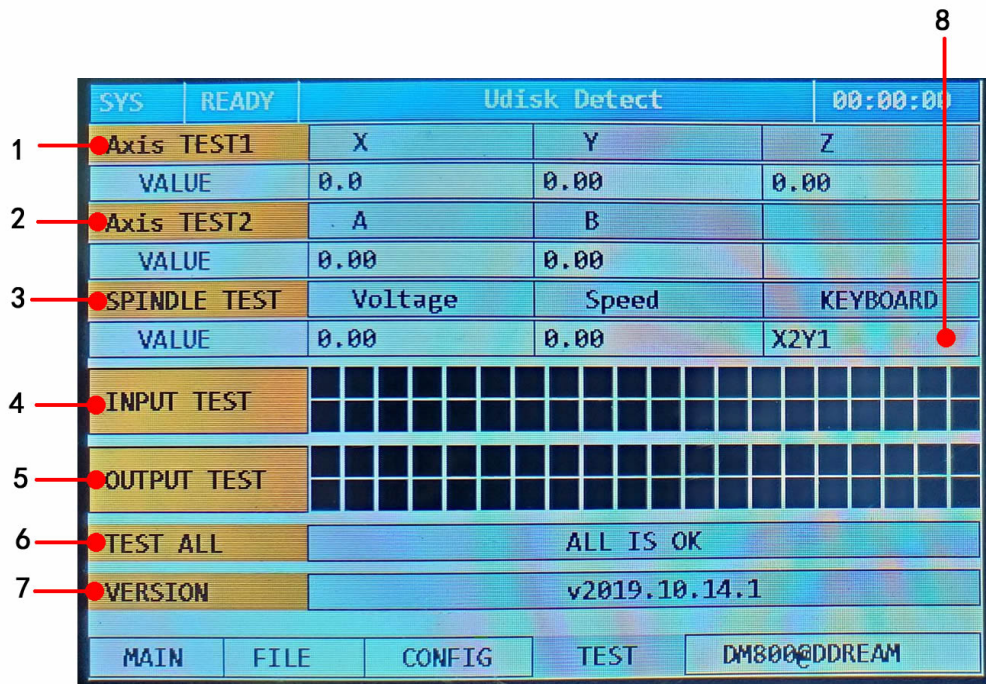


Figure3-7. Test and diagnosis page (TEST)

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	VERSION	Indicate the software version
8	KEYBOARD	Button monitoring can monitor the press position in real time.

Table 3-10. 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).

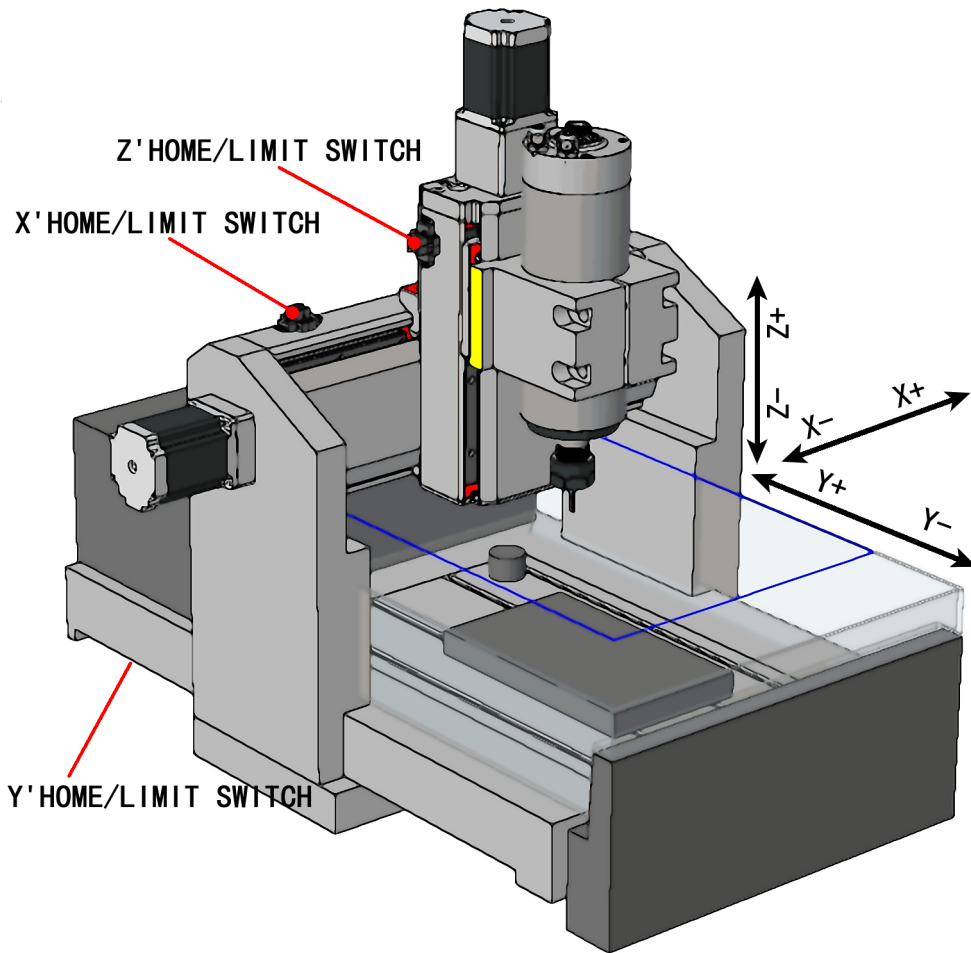


Figure4-1. The switch position diagram of the test engraving machine

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.

SYS	READY	Udisk Detect				00:00:00
MOTOR		INPUT		Spindle/OUT	TOOLS	OTHER
Axis	Stepsper	Velocity	Accel	Step Lvl	Dir Lvl	
X	2000.00	3000.00	500.000	0	0	
Y	2000.00	3000.00	500.000	0	0	
Z	2000.00	3000.00	500.000	0	0	
A	2000.00	3000.00	400.000	0	0	
B	2000.00	1.00	4.000	0	0	
Axis	Home	Level	Dir	HB Length	BL Dist	
X	3	0	0	10.00	0.00	
Y	4	0	1	10.00	0.00	
Z	5	0	1	10.00	0.00	
A	0	1	0	0.00	0.00	
B	0	1	0	0.00	0.00	
MAIN		FILE	CONFIG	TEST	DM800@DDREAM	

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.

SYS	READY	Udisk Detect				00:00:00
MOTOR		INPUT		Spindle/OUT	TOOLS	OTHER
Axis	Limit++	Level	Limit--	Level	Safe-Z	
X	0	1	0	1	0.00	
Y	0	1	0	1	BL SPD	
Z	0	1	0	1	20%	
A	0	1	0	1	HOME SPD	
B	0	1	0	1	20%	
EXT Input	Pin	Level	EXT Input	Pin	Level	
M50	0	1	M51	0	1	
M52	0	1	M53	0	1	
M54	0	1	M55	0	1	
M56	0	1	M57	0	1	
M58	0	1	M59	0	1	
MAIN		FILE	CONFIG	TEST	DM800@DDREAM	



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  + , 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: DM800 supports all axis HOME operation on

the main page, press  +  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.

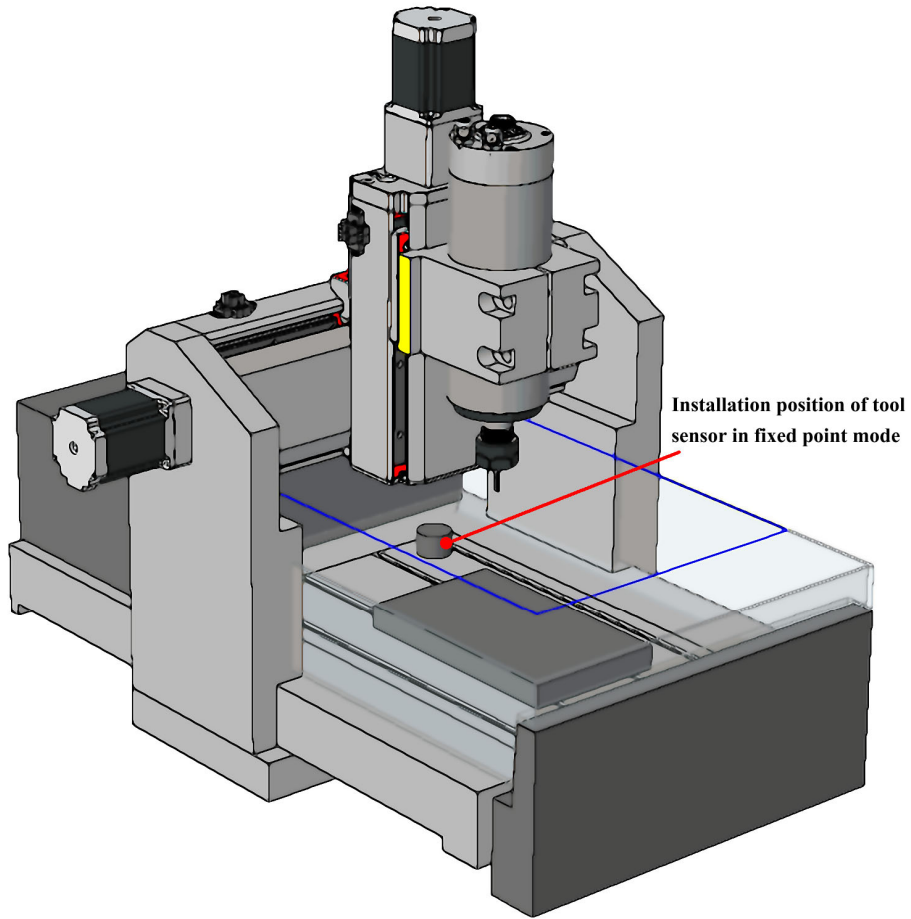


Figure4-4. Tool sensor installation position in fixed-point probe mode

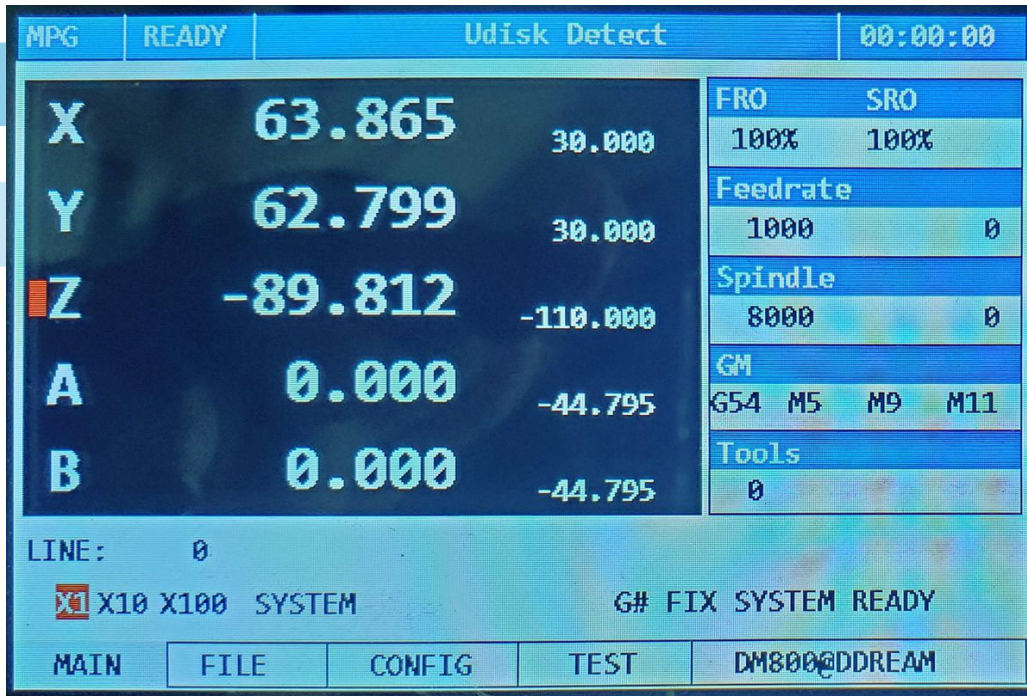


Figure4-5. Move to the installation position of the tool sensor

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

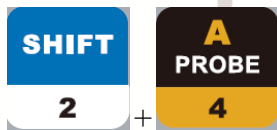
Table 4-1 Probe configuration item in fixed point probe mode

Probe configuration item screenshot see as figure 4-6.

SYS	READY	Udisk Detect				00:00:00
MOTOR	INPUT	Spindle/OUT		TOOLS	OTHER	
		Soft Limit++		Soft Limit--		PROBE
Axis	Ena	Value	Ena	Value	PIN	
X	0	0.00	0	0.00	LEVEL	1
Y	0	0.00	0	0.00	MOD	0
Z	0	0.00	0	0.00	P-X	30.000
A	0	0.00	0	0.00	P-Y	30.000
B	0	0.00	0	0.00	P-Z	-120.000
		PIN	LEVEL	P-B-Z	0.000	T pos
ESTOP	0	1	Probe Spd	20%	0	
START	0	1	Tool Spd	0	TCH	
PAUSE	0	1	ABC mod	1	20	
ZERO	0	1	Buzzer	0		
MAIN	FILE	CONFIG	TEST	DM800@DDREAM		

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



, 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

SYS	READY	Udisk Detect				00:00:00	
MOTOR	INPUT	Spindle/OUT		TOOLS	OTHER		
		Soft Limit++		Soft Limit--		PROBE	
Axis	Ena	Value	Ena	Value	PIN	2	
X	0	0.00	0	0.00	LEVEL	0	
Y	0	0.00	0	0.00	MOD	1	
Z	0	0.00	0	0.00	P-X	0.000	
A	0	0.00	0	0.00	P-Y	0.000	
B	0	0.00	0	0.00	P-Z	0.000	
	PIN	LEVEL	P-B-Z	10.000	T pos		
ESTOP	0	1	Probe Spd	20%	0		
START	0	1	Tool Spd	0	TCH		
PAUSE	0	1	ABC mod	1	20		
ZERO	0	1	Buzzer	0			
MAIN	FILE	CONFIG	TEST	DM800@DDREAM			

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

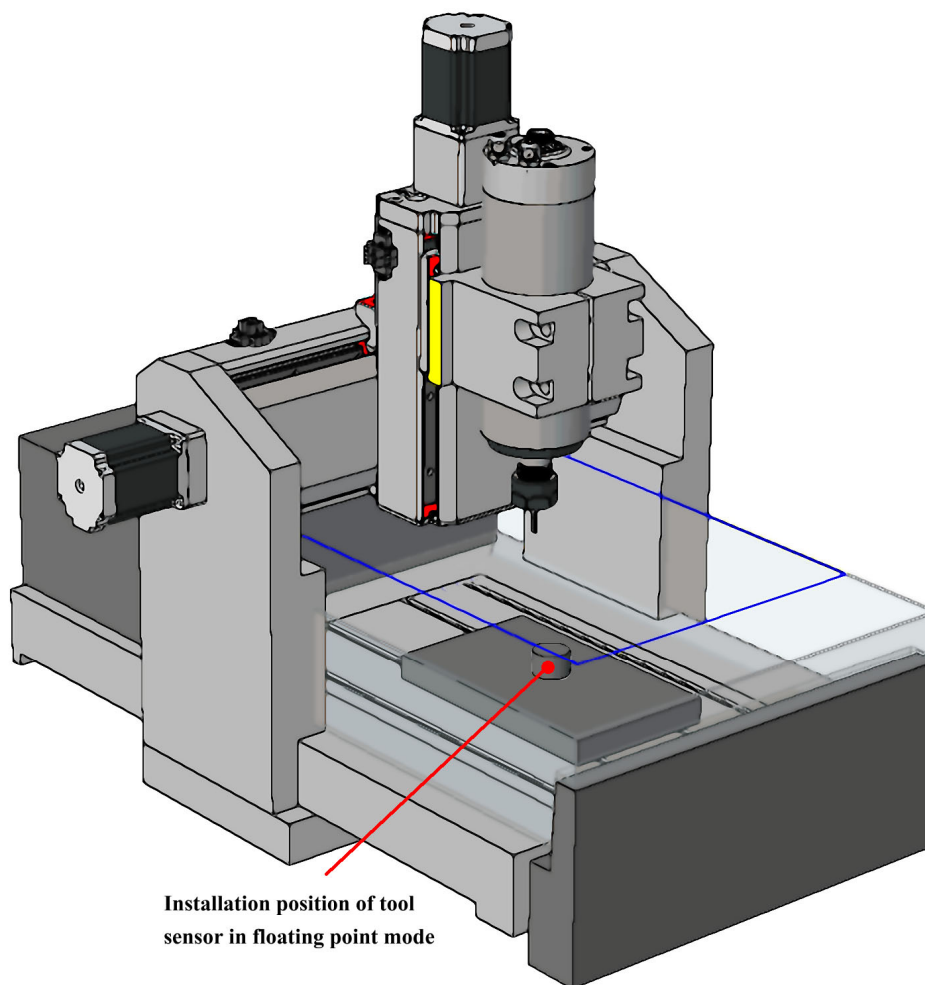






Figure4-8. Tool sensor installation position in floating-point probe mode

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  + , 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  +  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  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 2MMNEW.TAP file.

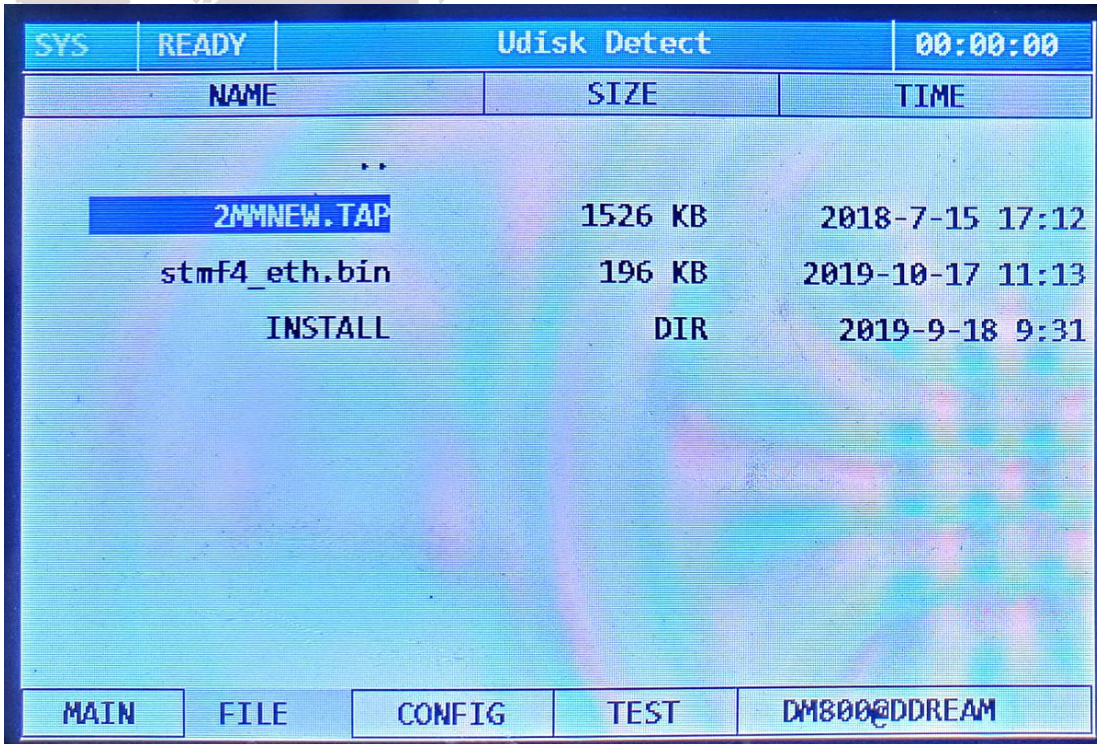


Figure4-9. select 2MMNEW.TAP file in management page

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 2MMNEW.TAP, indicating that the G code file is loaded successfully.

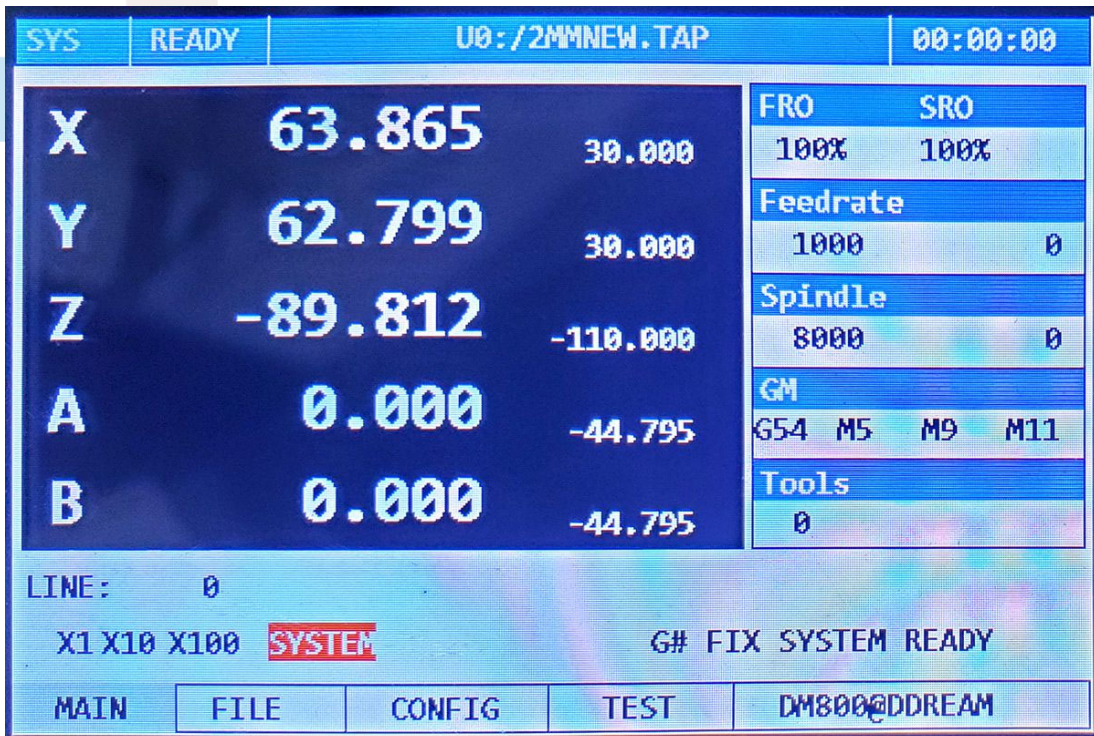


Figure4-10. Estop and Probe dialog

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	M50	Input switch related to M50 code
10	M51	Input switch related to M51 code
11	M52	Input switch related to M52 code
12	M53	Input switch related to M53 code
13	M54	Input switch related to M54 code
14	M55	Input switch related to M55 code

15	M56	Input switch related to M56 code
16	M57	Input switch related to M57 code
17	M58	Input switch related to M58 code
18	M59	Input switch related to M59 code
9	M60/M80	Open/Close Output related to M60
10	M61/M81	Open/Close Output related to M61
11	M62/M82	Open/Close Output related to M62
12	M63/M83	Open/Close Output related to M63
13	M64/M84	Open/Close Output related to M64
14	M65/M85	Open/Close Output related to M65
15	M66/M86	Open/Close Output related to M66
16	M67/M87	Open/Close Output related to M67
17	M68/M88	Open/Close Output related to M68
18	M69/M89	Open/Close Output related to M69
19	M70/M90	Open/Close Output related to M70
20	M71/M91	Open/Close Output related to M71
21	M72/M92	Open/Close Output related to M72
22	M73/M93	Open/Close Output related to M73

Table 5-2 M instruction supported




Chapter 6 | Question & Answer

6.1 Q&A for Hardware

6.2 Q&A for Software

Chapter 7. Contract us

 Support Email: support@ddcnc.com