

FangLing Shape Cutting Control System
Operation and Installation Manual
(Ver.2.1)

(Apply to F2000 series: F2100B/T、F2200B/T、F2300(A/B)、
F2300T(A/B)、F2500(A/B)、F2500T((A/B)、F2600T)

Shanghai FangLing Computer Software Co., LTD.
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REVISION HISTORY

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Spec.01	2011/8/10	All	New manual creation
Spec.02	2012/2/28		Add Section 8.7.4, 8.7.5, 8.7.6, and Chapter 14
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Spec.05	2013/5/20		Perfect chart and catalog, integrate F2000 series specification
Spec.06	2014/2/20		Add the section of arc THC module usage illustration, interface instruction. In appendix 3, add the interpretation of wiring with F1620/F1630 THC.
Spec.07	2014/4/15		Merge the F2000T into the F2000 series manual. In appendix 3, add the interpretation of wiring with PTHC-2.

User Guide

Read this Manual

This manual is used to the numerical control cutting machine system (F2000 series) produced by Shanghai FangLing Computer Software Co., Ltd.. Read and understand this instructional manual, the cutting machine manuals and local security regulation before use carefully.

Note: This product is not designed to be field serviceable. Please return back to the after-sales (service) center for any required service.

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Work Condition

- Working Temperature, 0°C~50°C. Relative Humidity, 5~95%.
- Operation Voltage: DC +24V.
- The controller should be installed in a cab which can provide protection from powder.
- The controller would be better used in the situation without high voltage radiation.

Maintenance

- KEEP HANDS CLEAR of dangerous moving machinery. All control action, including manual action, can be executed using the front panel keys or remote interface.

- Loose fitting clothing or ties may become entangled in the machinery. These items should not be worn while operating the machine.
- This controller should only be operated by trained service person.
- Do not open the controller unless obtaining the authorization.
- Do not let any acid or alkalescency substance to corrode the controller.

High Voltages

- Electric shock can kill. Be sure this equipment is safely installed in accordance with enclosed procedures and specifications.
- Avoid contact with electrical wires and cabling while power is on.
- Only trained person can operate this controller.

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Chapter 1 F2000 Series Control System Introduction

1.1 System Brief Introduction

The numerical control system F2000 series is a new production, which is integrated many merits of the same productions at home and aboard. The controller can control the motion of two axes, which is apt to the application of flame, plasma or laser cutting. This controller is very light and handy and it is very easy to operate. The controller provides menu or illustration for all the operations for the convenience of users. All key switches are human oriented designed, and they are very convenient and comfortable.

The controller chooses high speed DSP and ARM as its core to assure the cutting process to be more stable. The motion control algorithm is optimized so that the machine can move more stable and reliable, and it can save the life of the motor and the mechanical parts.

The numerical control system of F2000 series consists of F2100B/T, F2200B/T, F2300A/B、F2300T A、F2300T B、F2500A/B、F2500T A、F2500T B and F2600/T system.

1.1.1 F2100B/T System

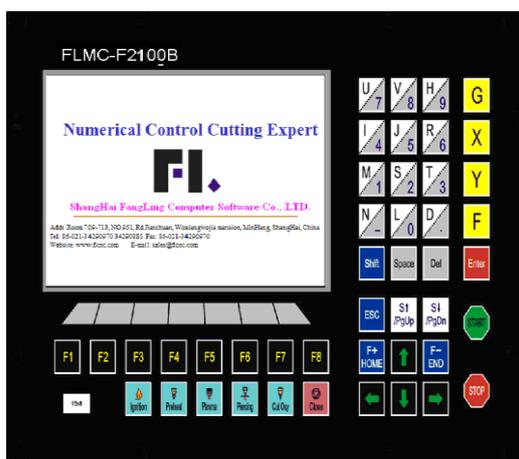


Fig 1.1 F2100B

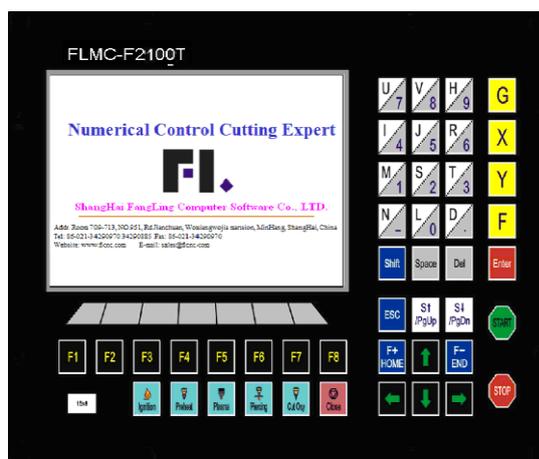


Fig 1.1 F2100T

1.1.2 F2200 B/T System

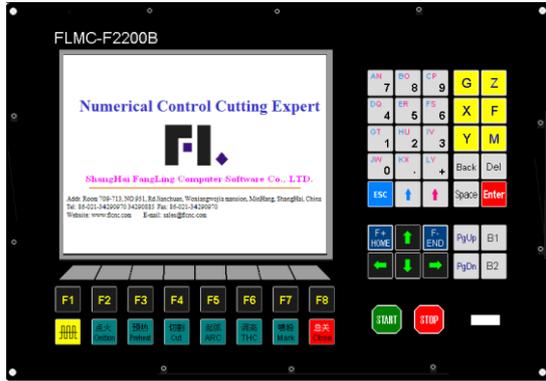


Fig 1.2 F2200B

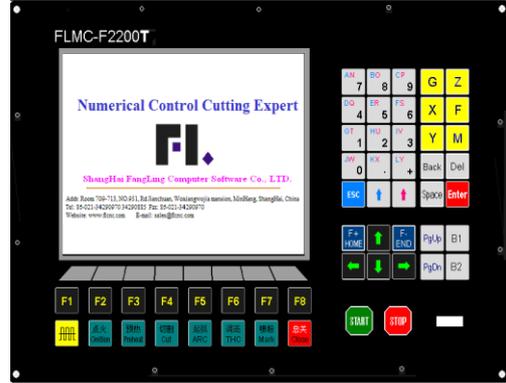


Fig 1.2 F2200T

1.1.3 F2300A/B/T (A)/(B) System

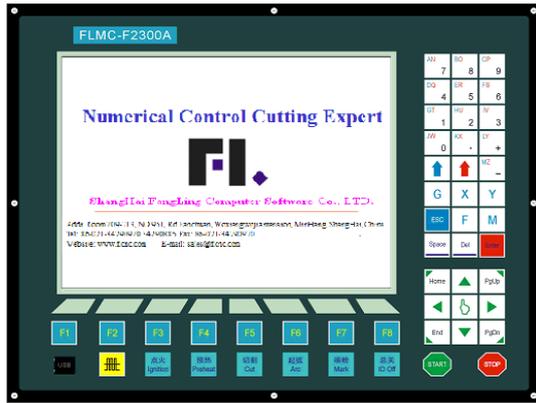


Fig 1.3 F2300A

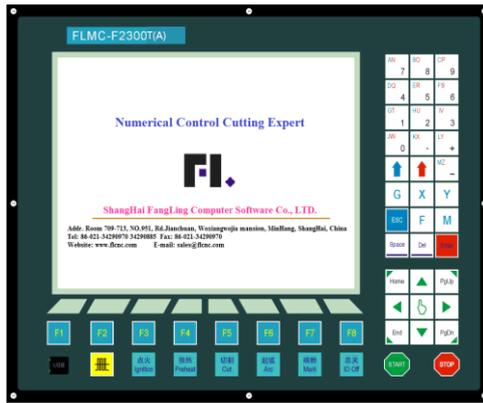


Fig 1.3 F2300T(A)



Fig 1.4 F2300B



Fig 1.4 F2300T(B)

1.1.4 F2500A/B/T (A)/ (B) System



Fig 1.5 F2500 A/T (A)

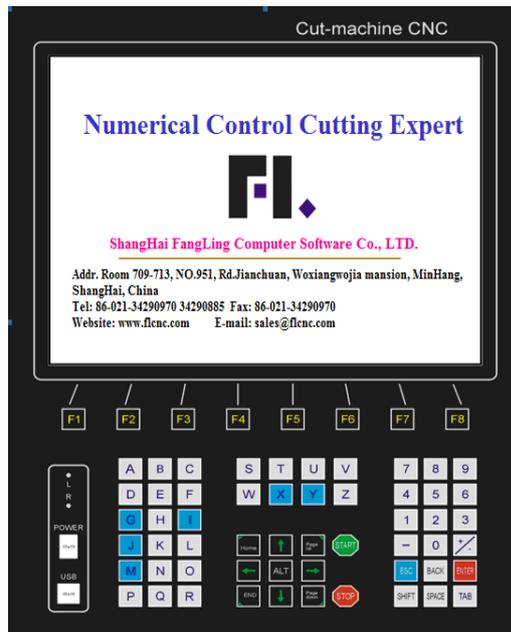


Fig 1.6 F2500 B/T (B)

1.1.5 F2600/T System



Fig 1.7 F2600/T

1.2 Characteristics of System

- 1) Chinese/English/French/Portuguese/Russian/Denmark/Korean language menu, the menu can be switched only by one key.
- 2) 47 categories different graphics (including grid pattern), chip part and hole part are alternative.
- 3) Support the EIA code (G code) and various FastCAM、FreeNest、SmartNest、IBE software.
- 4) Compact keyboard design and easy to input files.
- 5) Graphics have some operations such as Proportion, Rotate, and Mirror.
- 6) Graphics can be arrayed in matrix, interaction, stacked modes.
- 7) Steel plate can be adjusted according any steel side.
- 8) Coordinate system can be customized to support the two dimensional coordinates of all eight kinds.
- 9) All input and output port type and the number can be customized (normally open or normally closed).
- 10) Self-diagnostic function, to diagnose the key status and all the IO status, facilitate inspection and debug.
- 11) Provide a front USB interface for copying files.
- 12) System can be upgraded by USB interface easily, and we provide lifetime upgrade service.
- 13) All functions and techniques can upgrade online and don't worry about the after sale service.
- 14) Import and export files by single or all files.
- 15) Display time, week and clock.
- 16) Parameters backup and online upgrade.
- 17) Support the Flame, Plasma, Dusting draw and Demonstration four kinds of mode.
- 18) Including various types of processing parameters to meet the needs of different processes.
- 19) Flame and Plasma are separated in the control IO ports.
- 20) Support THC, two-level preheat, three-level pierce in flame mode.
- 21) Plasma arc feedback, positioning feedback, automatically shut down the arc at the corner.
- 22) Built-in plasma arc auto/manual turn high function: display actual arc pressure and set arc pressure, set THC parameter, check for collision/position successful signal,

control arcing signal, check for location.

- 23) Plasma arc controlling supports two close arc THC ways of speed and distance to make the machine more stable and safer.
- 24) Support edge cutting. It can save the preheat time for the thick steel plate.
- 25) Movement speed can be real-time acceleration, deceleration.
- 26) According to plate thickness, the cutting speed is automatically restricted by a speed limit in the corner, effectively preventing over burn.
- 27) Select row and column manually.
- 28) Dynamic/static illustration of the process, graphics zoom in / out, dynamically tracking cut-off point under zooming state.
- 29) DSP as core can control the machine move in high speed accurately, stability and in low noise.
- 29) Starting speed and acceleration can be set by your convenience.
- 30) Automatically memorize the working situation and the last cutting point when power off.
- 31) "Cutting offset" function can avoid waste the steel plate when the nesting of the plate is calculated wrong.
- 32) Set up different administration authority and the corresponding password to safeguard the interests of equipment manufacturers.
- 33) Long-distance remote control can control the machine to move forward, backward, left, right and cutting start, stop and so on (optional configuration).
- 34) Plasma arc controller support two modes of close arc THC: rate and distance, making machine more stable and safer.

1.3 Technical Indicator

- 1) Control Axis: 2 axis linkage(3 axis customizable)
- 2) Control accuracy: +/-0.001mm
- 3) Coordinate range: +/- 99999.99mm
- 4) Max pulses: 200 kHz. Max speed: 15,000 mm/m
- 5) Max lines of code: 150,000lines
- 6) Max size of single code file: 4M
- 7) Max power of drive arc THC motor: 45W
- 8) Time resolution: 10ms
- 9) Working Voltage: DC +24V direct-current power input, power > 80W。

10) Working Temperature: $-10^{\circ}\text{C}\sim+60^{\circ}\text{C}$. Relative Humidity, 0~95%.

1.4 System Interface

- a) 15 pins SMA Male interface of 2 axes of motor drive.
- b) 25 pins SMA Female interface of 16 channels optoelectronic isolation output ports max back flow current 300mA.
- c) 25 pins SMA Male interface of 16 channels optoelectronic isolation input ports, max output current 300mA.
- d) 5 cores THC motor output and limit input ports.
- e) 7 cores arc pressure and position input port, arcing signal output port.
- f) Selection of partial pressure proportion of arc input: 1:50 or 1:100
- g) USB interface on the front panel, for the convenience of transmitting cutting code.
- h) Extend IO input/output ports, PWM input ports, analog input ports.

1.5 Hardware Configuration

1.5.1 F2100 B/T Hardware Configuration

- 1. Monitor: 7 inch, 800*480, high definition 16 million colors and high brightness LCD
- 2. Memory: 64M SDRAM
- 3. Program space available for user: 256M electronic hard disk
- 4. System master frequency: 400MHz
- 5. USB: USB 1.1 front interface, at least 16GB U disk supportable
- 6. Keyboard: electronic PCB foil keyboard
- 7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.2 F2200 B/T Hardware Configuration

- 1. Monitor: 8 inch, 800*600, high definition 16 million colors and high brightness LCD
- 2. Memory: 64M SDRAM
- 3. Program space available for user: 256M

4. System master frequency: 400MHz
5. USB: USB 1.1 front interface
6. Keyboard: electronic PCB foil keyboard(one machine) or standard industrial keyboard(split type machine)
7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.3 F2300 A/B/T Hardware Configuration

1. Monitor: 10.4 inch 800*480, high definition 16 million colors and high brightness LCD
2. Memory: 64M SDRAM
3. Program space available for user: 256M electronic hard disk
4. System master frequency: 400MHz
5. USB: USB 1.1 front interface, at least 16GB U disk supportable
6. Keyboard: electronic PCB foil keyboard
7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.4 F2500 A/B/T Hardware Configuration

1. Monitor : 17 inch high brightness LCD with industrial VGA interface
2. Memory: 64M SDRAM
3. Program space available for user: 256M
4. System master frequency: 400MHz
5. USB: USB 1.1 front interface, at least 16GB U disk supportable
6. Keyboard: PCB foil keyboard
7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.5 F2600/T Hardware Configuration

1. Monitor : No, but standard monitor with VGA interface supportable
2. Memory: 64M SDRAM
3. Program space available for user: 256M
4. System master frequency: 400MHz
5. USB: USB 1.1 front interface, at least 16GB U disk supportable

6. Keyboard: no, but standard keyboard with PS2 interface supportable
7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

Chapter 2 Starting up of System

2.1 Introduction of System Operation Board

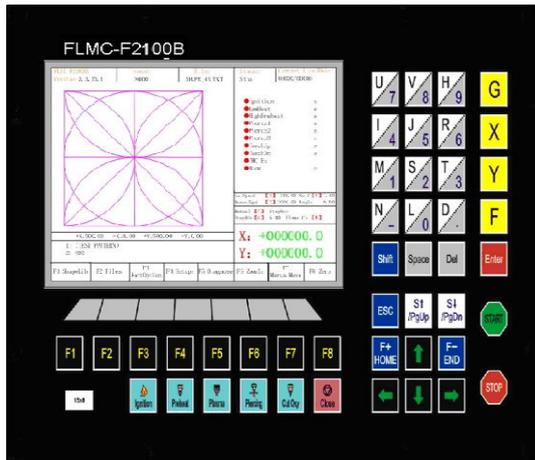


Fig 2.1 F2100 B system board

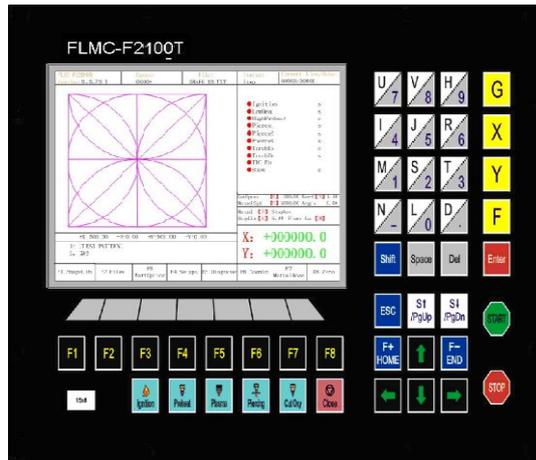


Fig 2.1 F2100 T system board

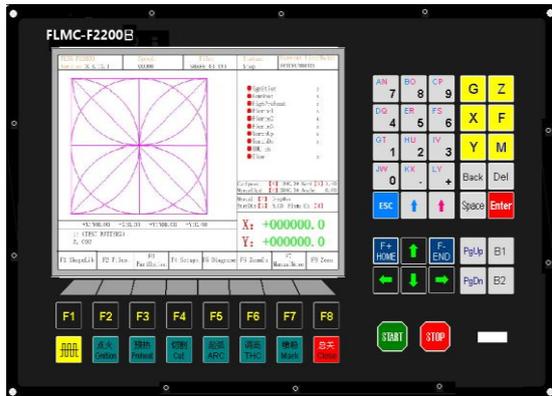


Fig 2.2 F2200 B system board

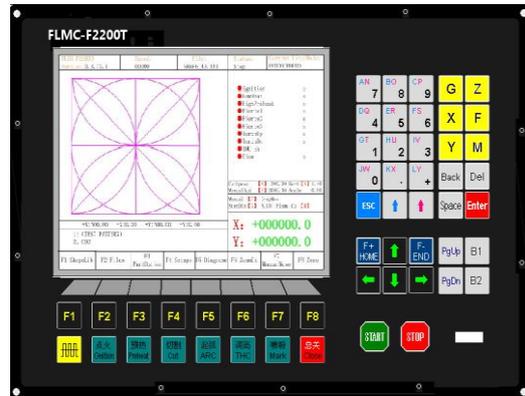


Fig 2.2 F2200 T system board

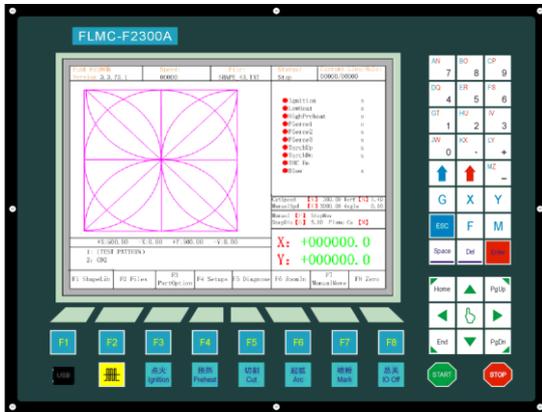


Fig 2.3 F2300 A/T(A) system board

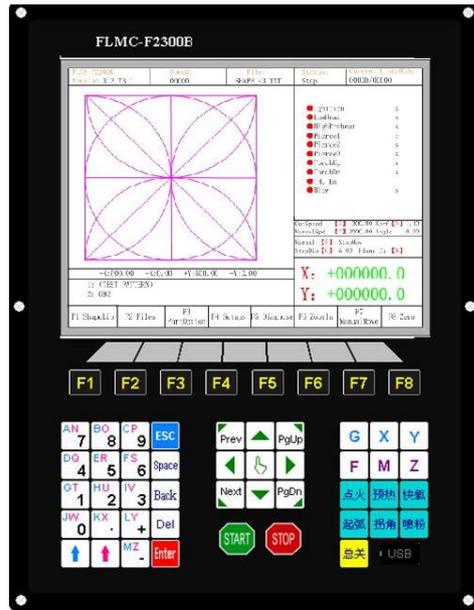


Fig 2.3 F2300 B/T(B) system board

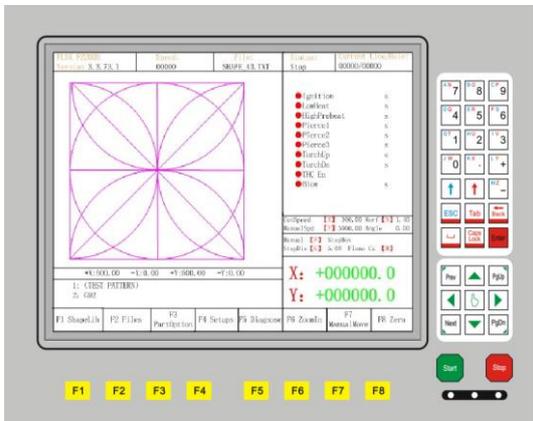


Fig 2.4 F2500A/T(A) system board

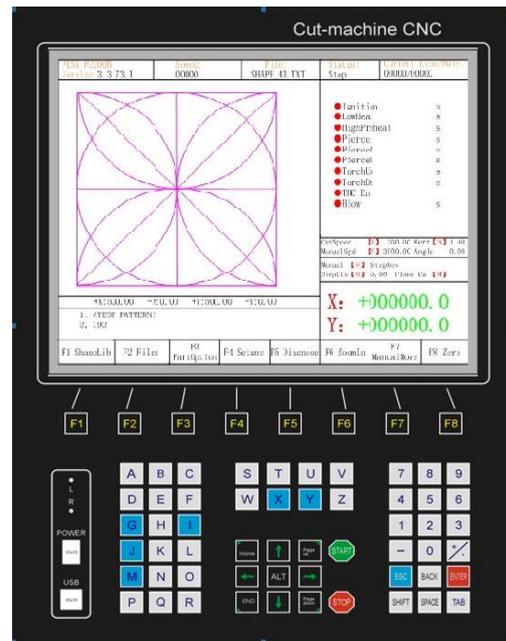


Fig 2.4 F2500B/T(B) system board

- 【F1】 - 【F8】** Function key in different interface
- 【S↑/PgUp】** page-up key of code interface or Torch up in other interface
- 【S↓/PgDn】** page-down key of code interface or Torch down in other interface
- 【F+/HOME】** Accelerate or skip to the head of code line
- 【F-/END】** Decelerate or skip to the tail of code line
- 【1】 - 【9】** During the cutting process, change the cutting speed to ratio of the speed limit you have set, for example press **【1】** , change the cutting speed to 10% of

the speed limit you have set, press **【2】** , change the cutting speed to 20% of the speed limit you have set

【G】、**【X】**、**【Y】**、**【F】** Frequently-used keys in operation box can quickly modify the parameters in the main interface.

2.2 Power on Processing and Main Interface

When power just on, the system will first go into the interface of starting up:

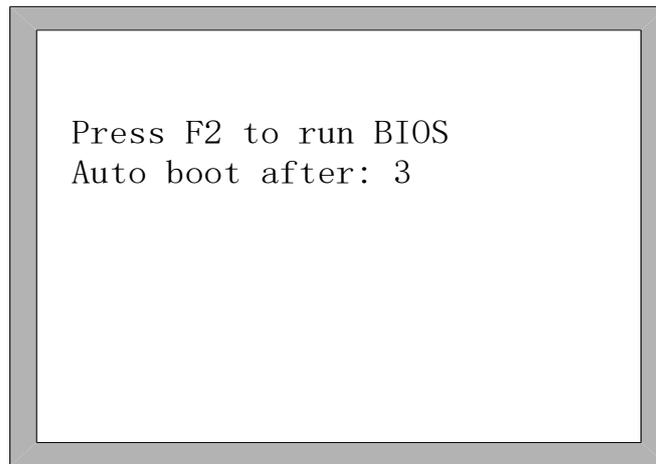


Fig 2.5 System self-check interface

In the starting process, there is 3 seconds to countdown, before the countdown is over, if pressing **【F2】**, it will enter the BIOS (please take the reference of the chapter 12 to run bios). If pressing any other key, it will jump over the countdown and directly enter the welcome interface. If pressing no key, it will countdown to 0 and then enter the welcome interface shown as Fig 2.6. In the welcome interface, press any key to enter the main interface automatically shown as Fig2.7.

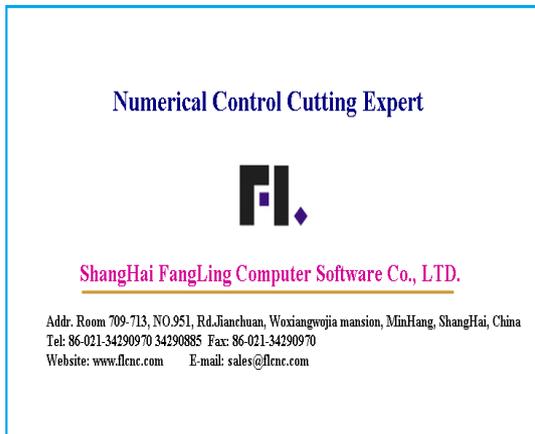


Fig 2.6 welcome interface

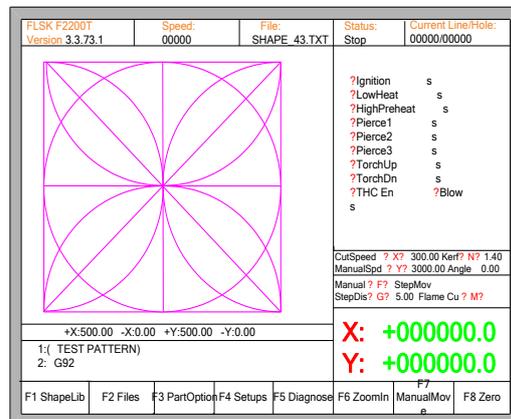


Fig 2.7 the main interface

Note: the system type “F2200T” shown in “FLSK F2200T” at the left and up corner of above figure shows different contexts, the following is the same, it will not be interpreted repeatedly. For example, it will show “FLSK F2100T” in the system of F2100T.

In the main interface, press **【F1】** - **【F8】** for the following functions:

- **【F1】 ShapeLib:** Pressing F1 to enter the Shape Library including 45 common shape, and most of them have plate size and hole size.
- **【F2】 Files:** You can load local files, U disk files or edit, import, export and delete codes.
- **【F3】 PartOption:** Make actions of mirroring, rotation, plate adjusting, plate arraying, selecting row and hole or code edition etc.
- **【F4】 Setups:** Setting all parameters.
- **【F5】 Diagnose:** Including input ports diagnosis, output ports diagnosis, keyboard diagnosis, system self check, date setting and system self defines.
- **【F6】 ZoomIn:** Zoom in the shape in full screen.
- **【F7】 ManualMove:** Manually move the machine.
- **【F8】 Zero:** Clear the coordinate of X and Y before starting cut or after cutting over.
- **【X】 CutSpeed:** Setting the cutting speed.
- **【Y】 ManualSpeed:** Setting the manual moving speed.
- **【Z】 Kerf:** Setting the kerfs' compensate value.
- **【F】 Manual:** Setting the mode of manual movement including keepMov(keep movement), StepMov(step movement), ContiMov(continue movement). The selected mode is black background.
- **【G】 StepDis:** Setting the distance of the fixed-length.
- **【N】** Before the cut running starts, set kerf's size
- **【M】** Selecting the cutting mode including Flame Cu(flame cutting), Plasma Cu(plasma cutting), Demo run.
- **【START】** Begin to cut
- **【SPACE】** Enter cutting interface

2.3 Function Index of Main Interface

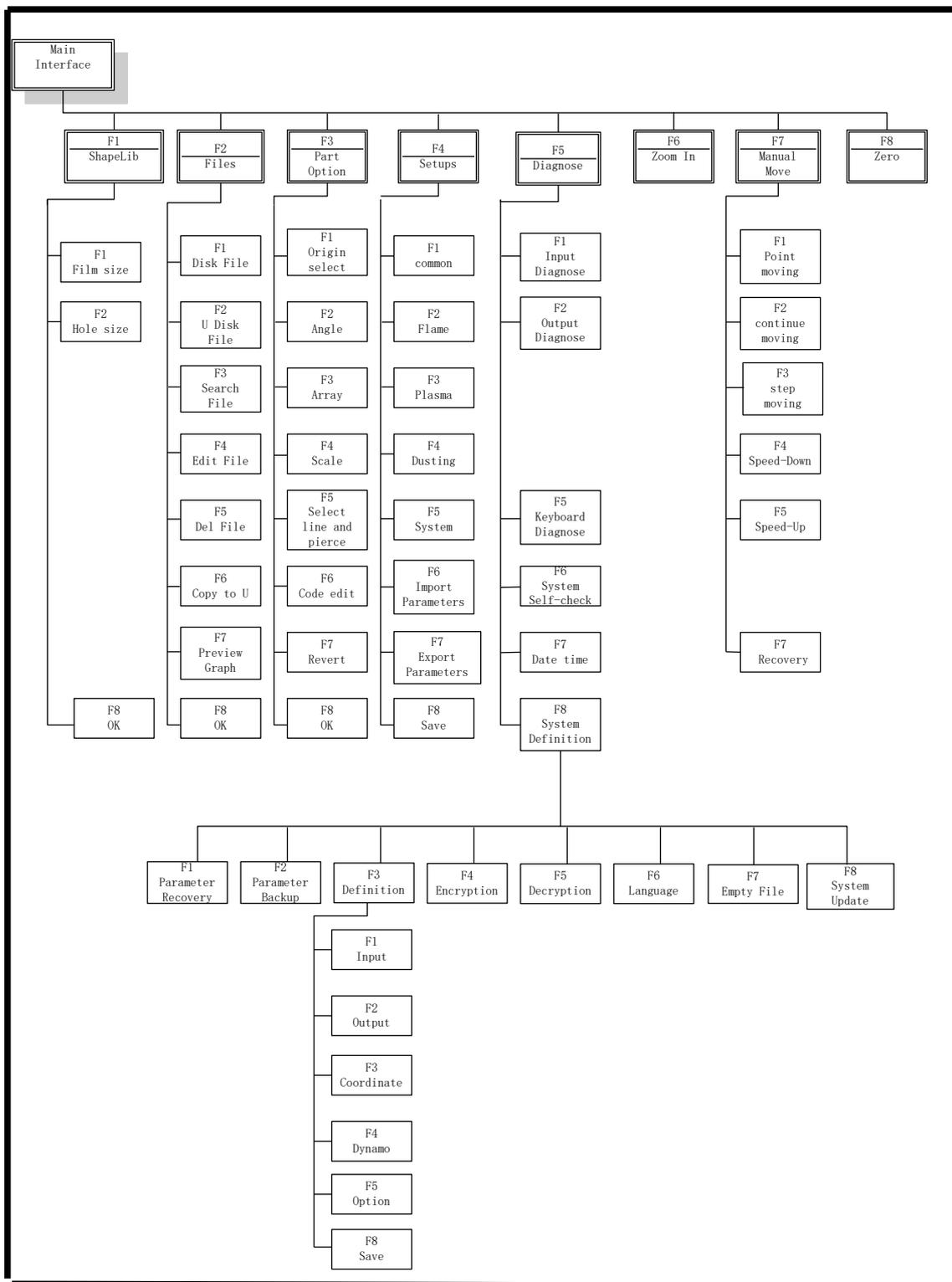


Fig 2.8 Function index of main interface

Chapter 3 Cutting Function

In the main interface, press the **【SPACE】** to enter the cutting interface, shown as follows:

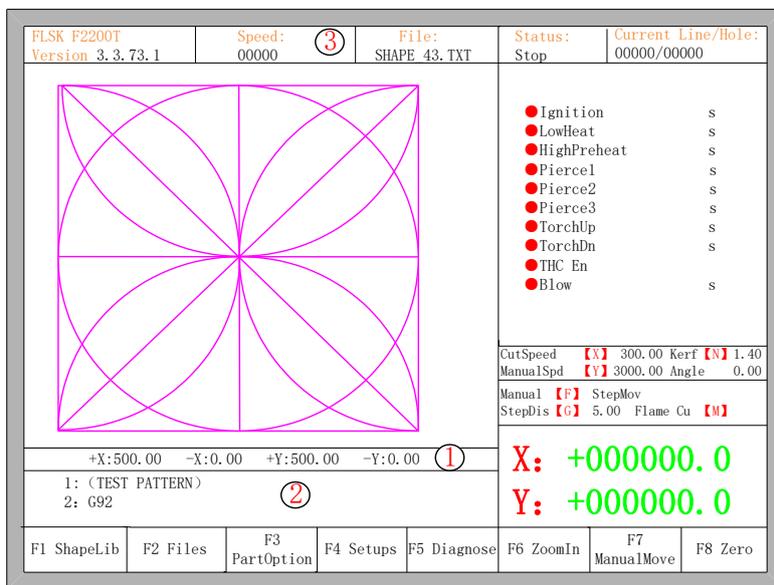


Fig 3.1 cutting function interface

- ① Shows the current workpiece's cutting path, including the slotted value.
- ② Shows the G-code being processed, shows the current and next line.
- ③ Shows the current cutting speed, during processing, you can press the keyboard's number keys **【1】** - **【9】** to achieve quick speed regulation. For example, press the number **【3】**, the speed is automatically adjusted to 30%; press the number **【8】** the speed is automatically adjusted to 80%.

X shows the absolute coordinate of the torch in X direction.

Y shows the absolute coordinate of the torch in Y direction.

In the cutting interface:

- Press **【X】** : Modify the current cutting speed.
- Press **【Y】** : Modify the current speed manual shift car.
- Press **【F】** : Change the current manual method.
- Press **【G】** : Modify the current fixed-length fixed long-distance move.
- **【START】** (**【F9】**): Start cutting.
- **【STOP】** (**【F10】**): Parking, the system can suspend all ongoing actions.
- **【F1】** :The torch move back along the cutting path(I / O port closed)
- **【F2】** : The torch forward along the path (I / O port closed).

- **【F3】** : Return to the starting point of cutting torch, i.e. the starting point of the current work piece.
- **【F4】** : Decrease the cutting speed, each decrease of 1% click rate. Decrease the rate of manual moving machine in manual mode.
- **【F5】** : Increase the cutting speed, each 1% increase in click rate. Increase the rate of manual moving machine in manual mode.
- **【F6】** : Reduce the preheat time, skip the remaining preheat time, and the system automatically records preheat time.
- **【F7】** : Increase the preheat time once 15 seconds.
- **【F8】** : When the system is suspended, for selecting perforation point; when the system begins to move, for the dynamic amplification.
- Four direction keys (Up, down, left and right): When the gun through, manually move the torch.

3.1 Cutting Operation Index

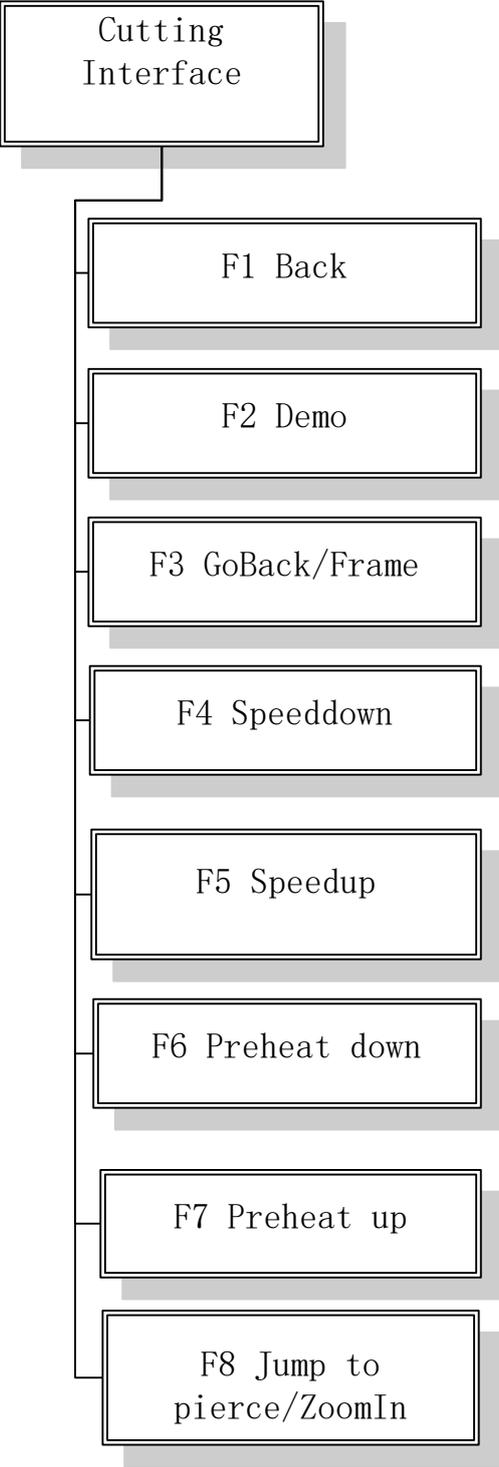


Fig 3.2 Cutting operation index

3.2 Speed Regulation

3.2.1 Normal Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can regulate speed.

In the operation panel, press **【F5】**, **【PRE】** or **【HOME】**, increasing 3% of current rate with per click. Hold the **【F5】**, **【PRE】** or **【HOME】**, then the rate will continuously increase to the maximal cutting rate.

In the operation panel, press **【F4】**, **【NEXT】** or **【END】**, decreasing 3% of current rate with per click. Hold the **【F4】**, **【NEXT】** or **【END】**, then the rate will be continuously reduced to 0.5% of maximal cutting rate.

3.2.2 Quick Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can carry out quick speed regulation.

In the cutting interface, on the operation panel, press the number keys **【1】** - **【9】**, the speed will quickly adjust to the corresponding percentage figures 10 times, for example press **【3】**, adjust to 30% of the speed limit you have set, press **【8】**, adjust to 80% of the speed limit you have set.

3.3 Forward

In the automatic function interface, press key **【F2】**, the machine start to move without real cutting. The process does not include any ignition, perforation and any other I/O working. The machine just moves the torch according to the graphic figure. Press **【F2】** again, the system stops running.

The function can be used to check the trail and code before you start the real cutting process, or can also be used when the process needs through the gun. Press the red “STOP” key to stop the null cutting process if you want.

Forward speed and cutting speed are provided separately. Forward speed is defined by the "empty / backward speed" in the common parameters.

3.4 Backward

During the running process, if you want to go backward according to the origin trail to (maybe the iron board was not cut through), you can follow the following direction:

- First, press “STOP” key to set the machine at pause status.
- In the automatic function interface, press key【F1】(Back) to make the machine go backward along with the original trail. When the torch reaches the position you need, press “STOP” key to stop it. You may press key 【F2】 to go forward if the machine just went back too much.

Notice: Go backward or forward function can be used repeatedly to make the machine reach an ideal position.

- In the backward process, press 【F1】 again, the system stops running.
- When the torch reaches the position you need, press “START” key again, if the current cutting code is G01, G02 or G03, system will automatically perforate before performing these procedures, and then continue the current program, if the current row is not G01, G02 or G03, the system will directly continue the current line program.

Same as the forward speed, backward speed and cutting speed are also provided separately. Backward speed is also defined by the "empty / backward speed" in the common parameters.

3.5 Edge Cutting / Offset Cutting / Return

When the torch is not on the actual path of the current work piece, it will prompt as follows:

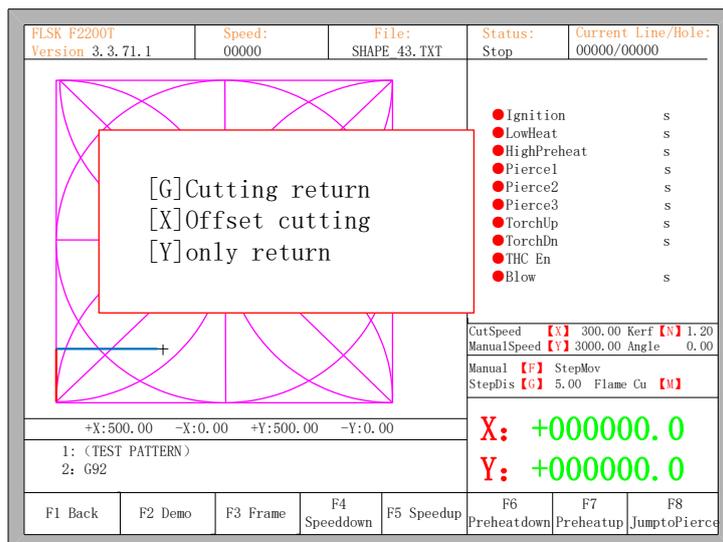


Fig. 3.3 edge perforation

There are two reasons led to this situation:

- 1) When the common parameter "edge perforation" selects "Yes" and if G-code of the next processing line is M07, the system will be automatically suspended. At this time, the torch can be manually moved to any edge of the plate, press the "start" button, the system will prompt as above
- 2) When the processing is paused, due to mechanical failure or other reasons, it needs to move the torch out of the actual path of the work piece, the above prompt will appear.
 - If press **[G]** , the system cutting returns back to the paused point, continue to cut it. This feature is particularly useful for thick steel plate, it can reduce the preheat time and increase cutting efficiency. This function is the commonly-used edge perforation function.
 - If press **[X]** , the system considers current point is the paused point, it will continue cutting it. That is, the system offsets the cutting point. When the cutting machine paused or a power outage, if the cutting tip or steel plate with the pan has been offset or the user would like to think that is offset cutting, you can press this button.
 - If press **[Y]** , The system only return to the paused point quickly, and then break off. During the cutting process, if discovering cutting torch malfunction or other issues, system needs to move the cutting tip out of cutting region to overhaul. When return to breakpoint after the maintenance, this key can be pressed. Then return to the paused point, press the **[start]** button, the system automatically continues to cutting.

3.6 Back to Reference Function

Pause in the processing, if press the **【F3】** , then the system will prompt:

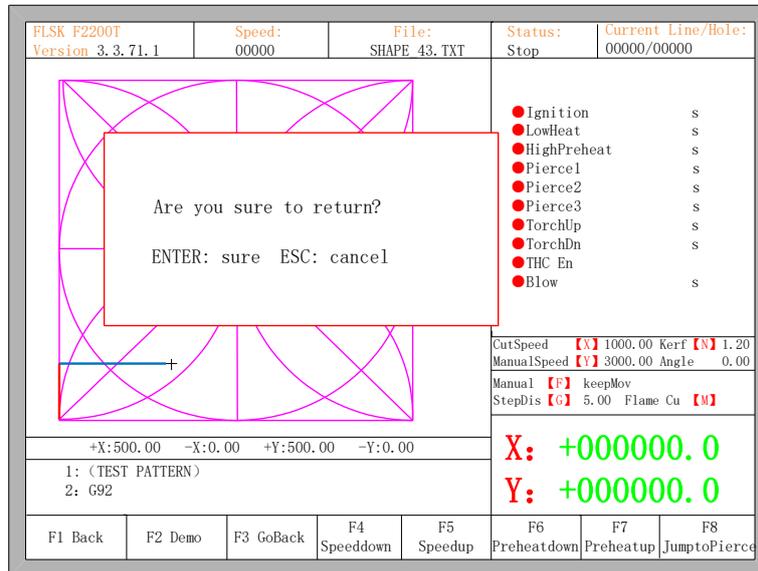


Fig. 3.4 Return reference prompt

Press the Enter key, the system will automatically return to the starting point of the work piece, and then the system automatically switches to processing the main interface, and waits for further user action.

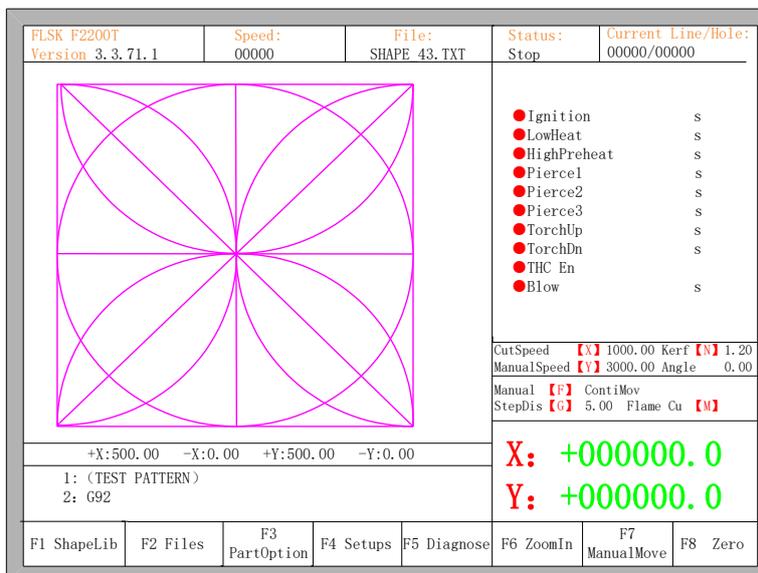


Fig. 3.5 main process interface

During the return process, the user can press the "Stop" button to stop the operation, and can continue to return operation after pressing of **【F3】** . Number of

back to reference and stop has no limit.

3.7 Oxygen Gas Preheat Time Regulation

- In the preheat process, press the START (F9) key to skip the process of preheat and perforation delay, and immediately open the perforation signal then begin to cut.
- In the preheat process, press the STOP (F10) key to stop preheat, waiting for the F9 key is pressed again.
- In the preheat process, press the **【F6】** key then the preheat time will be reduced to the current preheat time spent, and skip the process of preheat and perforation delay, and open the perforation signal then begin to cut.

For example: the original system sets the preheat time of 60 seconds, when preheat needed, the interface will count down, under normal circumstances, till 0, the system begins the next step of cutting, but if the system has the remaining 10 seconds of countdown time, press **【F6】**, then the system immediately stops preheat to begin the next step of cutting, and records the preheat time of 50 seconds, the system automatically thinks that users need preheat time of 50 seconds, the next preheat after the null cutting when the preheat time becomes 50 seconds.

- In the preheat process, each press the F7 key, preheat time increases by 15 seconds and the preheat time maintains the increased value till incision ending of this time.

For example: The original system sets the preheat time of 60 seconds after the null cutting, during the system countdown, each press **【F7】**, on the interface the countdown increases by 15 seconds, and the next time you need to preheat, the initial preheat time be 75 seconds.

3.8 Perforation Point Selection

Before you start cutting or cutting is paused, the function key prompt F8 is "select new pierce", then press F8, the system will prompt:

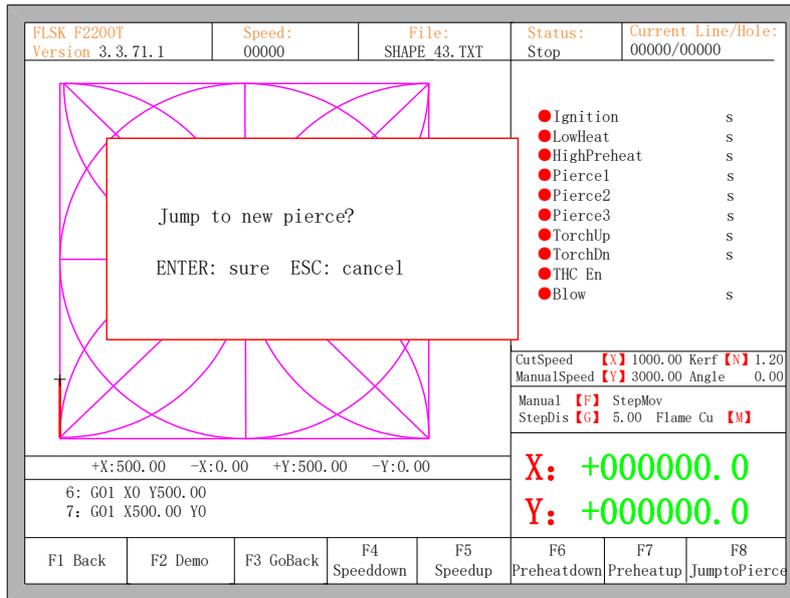


Fig. 3.6 select new pierce

If you press ESC, the system will then return the cutting interface. If you press ENTER, the system will again prompt:

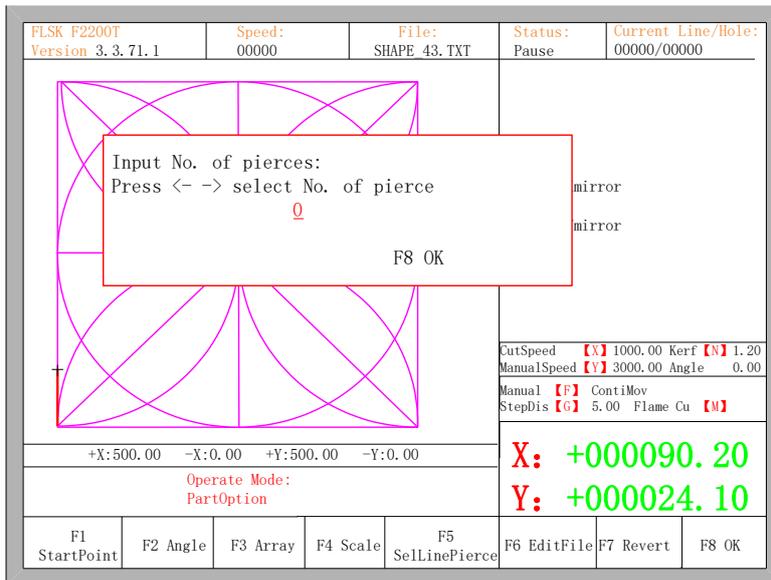


Fig. 3.7 pierce prompt

Pierce point can be input manually at this time. You can also press ESC to exit without manual input perforation point, and then press the left and right arrow keys to select the perforation point.

3.9 Dynamic Amplification

After the start of cutting, the F8 in the cutting interface will become "dynamic amplification", then press the F8 key, full-screen amplify the processing graphic , and dynamically tracking.

F1 Back	F2 Demo	F3 GoBack	F4 Speeddown	F5 Speedup	F6 Preheatdown	F7 Preheatup	F8 ZoomIn
---------	---------	-----------	--------------	------------	----------------	--------------	-----------

Fig 3.8 Function key of cutting interface

- Press the F8 key continuously, the system will progressively amplify graphic.
- Press ESC to exit the amplified display, back to the cutting interface.

3.10 Cutting Exit

When the cutting operation does not get finished, and the cutting machine also being in the pause condition, if press **【Esc】** , the system will query whether quit the cutting operation. If pressing **【Enter】** , the system will exit, and if pressing **【Esc】** the system will not exit, get into the automatically interface and go on with the cutting operation at the current place.

FLSK F2200T Version 3.3.71.1	Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<ul style="list-style-type: none"> ● Ignition s ● LowHeat s ● HighPreheat s ● Pierce1 s ● Pierce2 s ● Pierce3 s ● TorchUp s ● TorchDn s ● THC En s ● Blow s 				
			CutSpeed [X] 1000.00 Kerf [N] 1.20 ManualSpeed [Y] 3000.00 Angle 0.00 Manual [F] ContiMov StepDis [G] 5.00 Flame Cu [M]				
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00 6: G01 X0 Y500.00 7: G01 X500.00 Y0			X: +000000.00 Y: +000048.70				
F1 Back	F2 Demo	F3 GoBack	F4 Speeddown	F5 Speedup	F6 Preheatdown	F7 Preheatup	F8 JumptoPierc

Fig. 3.9 Quit of cutting

3.11 Frame

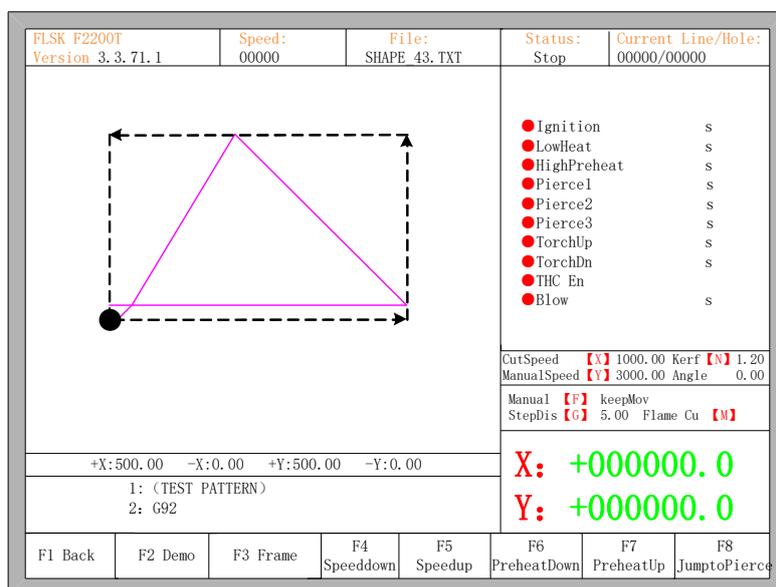


Fig. 3.10 Walk along frame

Before the beginning of the process, if press **【Space】** the system will enter into the interface of auto processing, at this time, **【F3】** is the function of walking along frame, after press **【F3】**, system will walk against the clock along the virtual frame as the figure 3.10 shows, the beginning point is the lower left corner. In the end of the walking, the system will prompt “Quit frame test? ENTER: Back, ESC: No Back”. At this time, press **【Enter】**, the system will automatically back to the process of beginning point of parts. If press **【ESC】**, the system will stop at current point.

In the process of walking along frame, press STOP, the system suspends operation, and press START, the system resumes walking. Press **【F3】** again, the system returns to the starting point.

3.12 Arc THC Instruction (typical of the "T" in F2000 series CNC system)

3.12.1 Wiring Instruction

F2100T System links with location proximity switch, arcing signal of plasma power and arc interface of partial pressure circuit board by 7 cores socket, links with lifting motor (limiting switch) by 5 cores socket. Pins interpretation schematic shows

as follows:

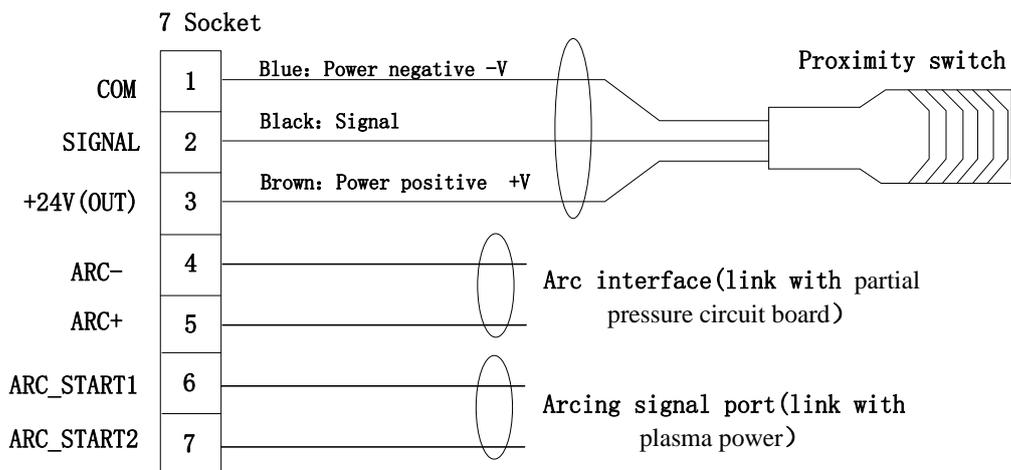


Fig.3.11 Arc and location signal wiring schematic

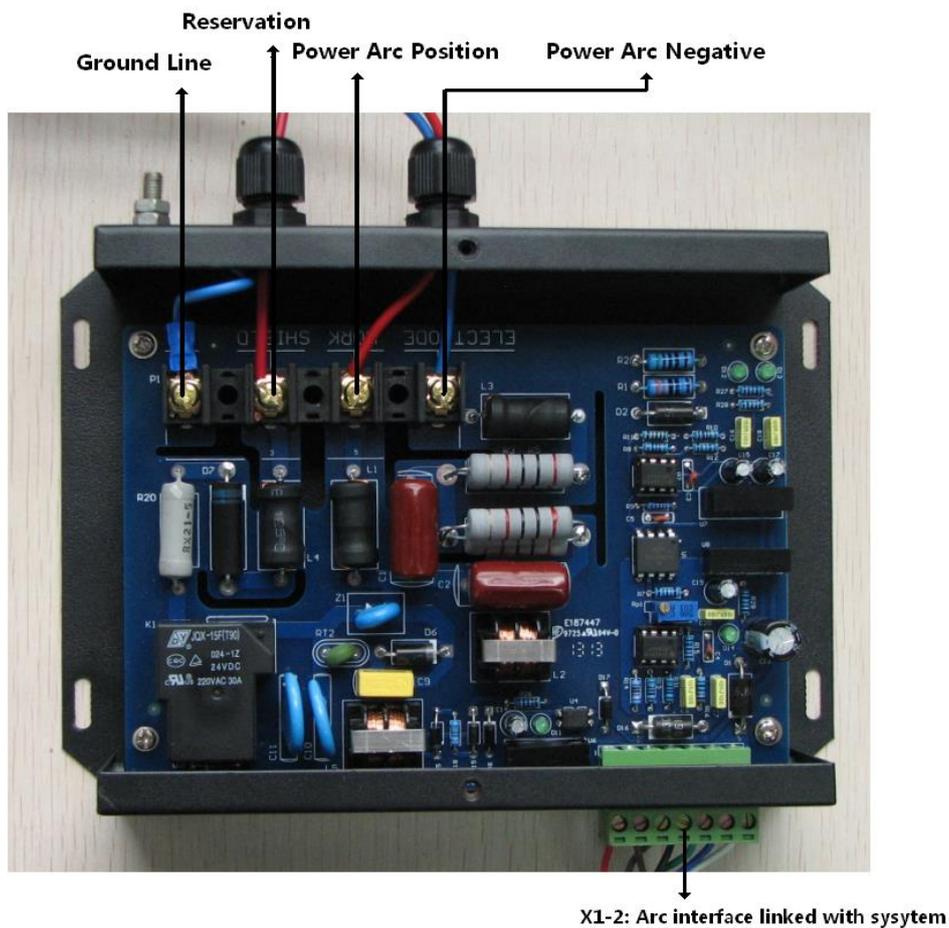


Fig.3.12 Interfaces of arc partial pressure circuit board schematic

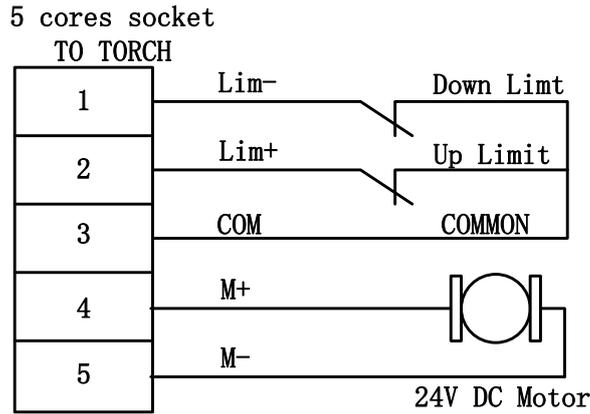


Fig.3.13 Lifting body monitor and limit switch wiring

Interpret: specific system wiring interpretation with arc THC module, please reference to the section of 11.4.4.

3.12.2 Arc Setting and Actual Arc Displaying

In the main interface or auto interface, display the arc setting and actual arc. Auto interface is shown as the figure 3.14.

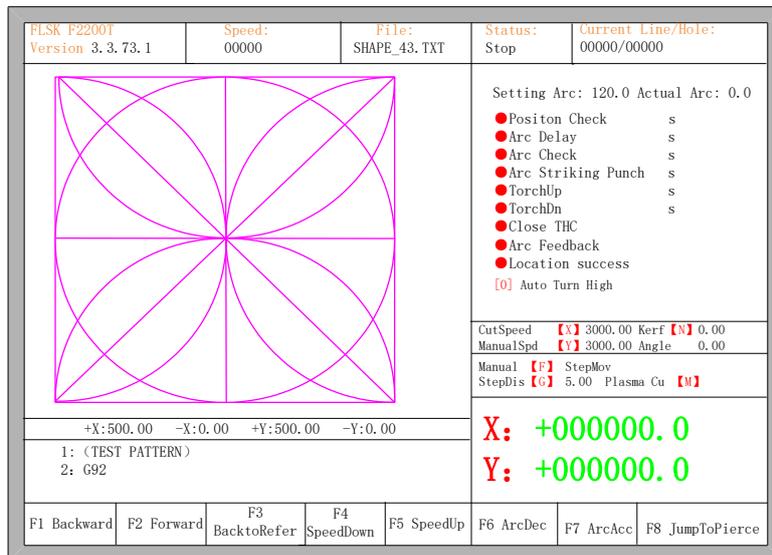


Fig.3.14 Auto interface with arc THC setting

3.12.3 Location Check

- ◆ Locate with F2100T system: several settings needed to be done.

1. Location check signal outside inputs to location successful import.(the fifth pin of CN1)
2. When torch has not touched with steel panel, in the system diagnosis(Chapter 8), location successful feedback signal display “●”. When torch has touched with the steel panel, location successful feedback signal display “●”.
3. In the figure.7.4, Location check time must be more than the time of which torch drops down from the highest point to the steel panel.
4. In the figure.7.4, location ascend time should be the time of which torch ascends from steel panel touch point to cut running height.

When the running status is in the stop and suspend mode, press **【.]** into location check status, torch descend down (the longest time of which is location check time), when check for the location successful signal, torch ascend up(the time of which is location up time), location check ends. Torch descend time exceed over the location check time while the location successful signal hasn't been checked for, at this time, stop the torch descending and alarm to notify.

3.12.4 Set Arc / Adjust Arc While Running

Arc can also be set in the plasma parameter setting page.

In the auto interface with Plasma cutting status, press **【F6】** to reduce arc value, press **【F7】** to increase arc value, the stride of decreasing or increasing is the manual adjusting stride of setting arc, it can be set in the plasma parameter interface.

3.12.5 Auto / Manual Turn High

In the plasma cutting status, press **【0】** to switch the two statuses of auto turning high and manually turning high.

In the manual turning high status, press **【PgUp】** to ascend the torch (full speed) and press **【PgDn】** to descend the torch (full speed).

In the automatically turning high status, press **【PgUp / PgDn】** also to ascend or descend the torch, when release **【PgUp / PgDn】**, it will enter into the automatically turning high status. Until the ascending torch touch with upper limit and the descending torch touch with lower limit, it will automatically stop.

3.12.6 Crash / Position Successful Signal Check

- ◆ In the non plasma cutting status, punch occurs to crash and crashing signal or location successful signal is available, torch automatically ascending time is location up time. Refer to location up time in the figure 7.4.
- ◆ In the plasma cutting status, punch occurs to crash and crashing signal or location successful signal is available, it will automatically stop and the torch will automatically ascend, the time of which is the torch ascend time. Refer to torch ascend time in the figure 7.4.
- ◆ In the process of ascending, press **【STOP】** or torch up and down body touch with the upper limit status, it will stop ascending.

Chapter 4 Part Option

Before starting cutting, you can use “F3 Part Option” in the main interface. Press F3 to enter part options menu:

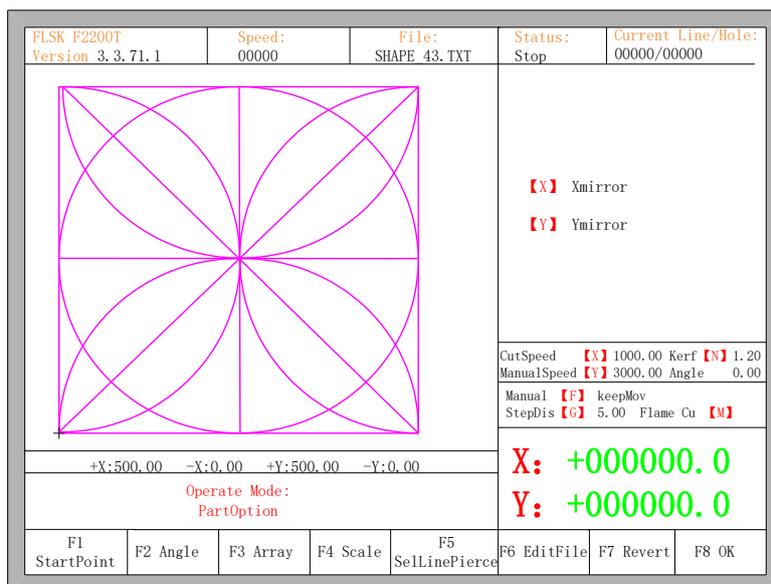
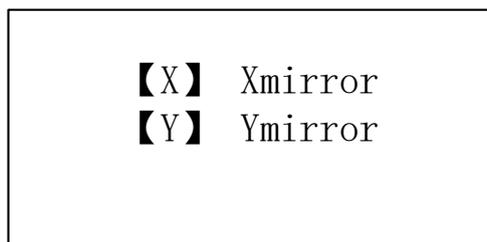


Fig 4.1 Part options

4.1 XY Mirror

In the interface of part option, the system will prompt:



- Press X to mirror along the horizontal axis(X axis)
- Press Y to mirror along the vertical axis(Y axis)

4.2 Start Point Selection

After press **【F1】**, System will prompt to select start point:

F1 Center
F2 L&B
F3 L&T
F4 R&B
F5 R&T

At this time, press **【F1】-【F5】**, the starting point of cutting part automatically jump to relevant location. For example, press **【F4】**, the part of start point will automatically jump to lower right corner. As the following figures show:

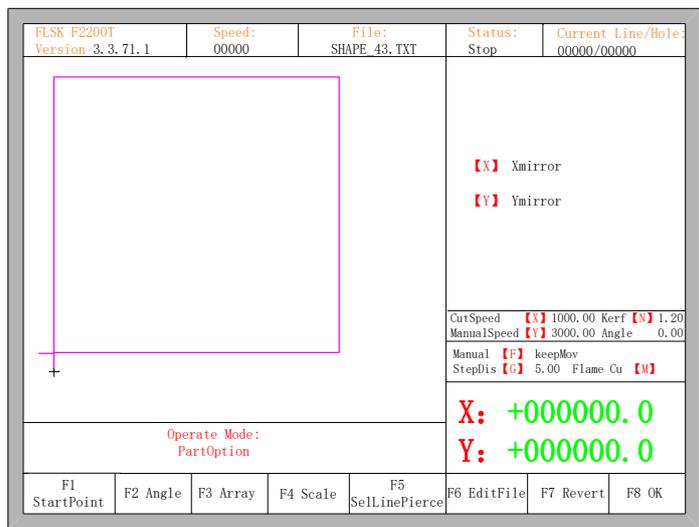


Fig 4.2 before press F4, start point is at original point

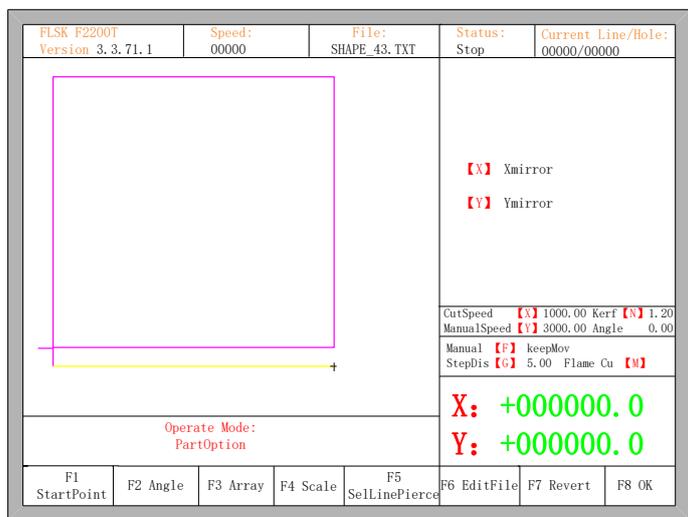


Fig 4.3 after press F4, start point is at lower right corner

4.3 Angle Adjustment

Press F2, the system will prompt:

```
F1- steel plate adjust
F2- enter angle
```

- Press F1 to adjust steel plate
- Press F2 to enter angle directly
- Press ESC to exit angle adjusting

4.3.1 Steel Plate Adjustment

After entering steel plate adjustment menu, the system will prompt:

```
X-start Y-OK ESC-exit
Adjust X: +00000.00
Adjust Y: +00000.00
Angle      +00000.00
```

Here, you can manually move the cutting tip to the edge of one side of steel plate or a corner of the plate. When the cutting tip moved to a good position, press **【X】** key to set the current point as the starting point of correction.

And then manually move along the cutting tip, as long as moving to the edges of the side. After ensuring the two points far enough and two points at the same side of the plate in the same line and press **【Y】**. The system will automatically calculate the current offset angle of plate, and then automatically rotate graphics.

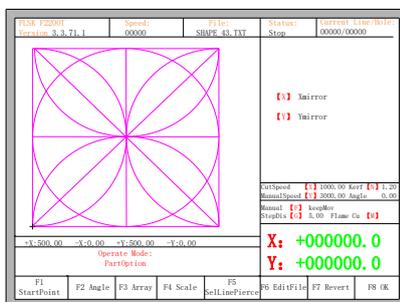


Fig 4.4 before adjusting

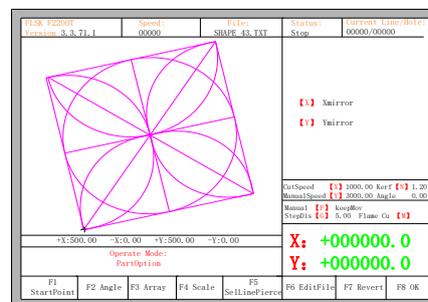


Fig 4.5 after adjusting

After adjusting, the system will ask whether to return to the start point, if press

【ENTER】 , the system will back to the start point of the operation, if press 【ESC】 , the system will do nothing but go back to the graphic interface.

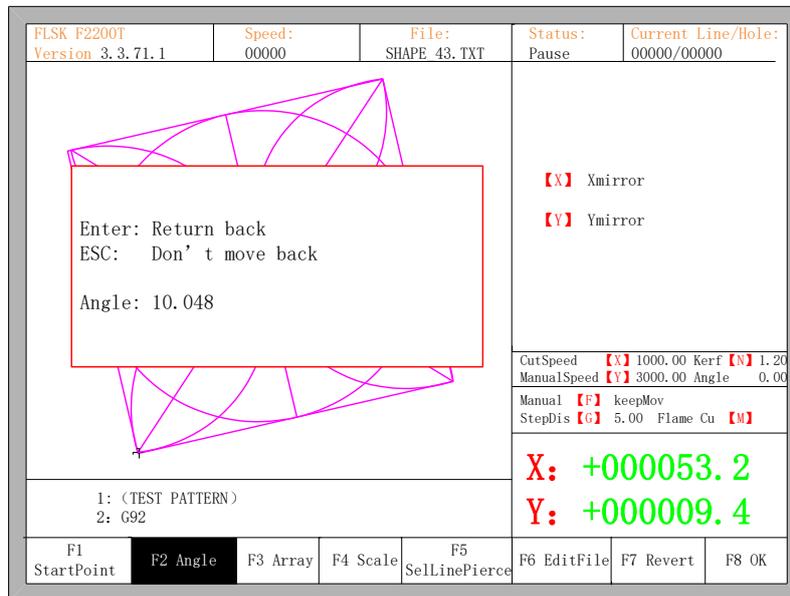


Fig 4.6 Return to the start point after adjusting

4.3.2 Steel Plate Adjust Angle Memory Function

About steel plate adjust angle memory, please refer to the section of 8.7.6.6.

4.3.3 Enter Angle

When the angle of the current work piece is known, you can enter the angle:

```

Please enter angle
min: -360 max: 360
Angle:      0.00
Note:
>0 Rotate CCW on the base of current
<0 Rotate CW on the base of current
=0 Reset the current part to 0 degree
  
```

Enter angle

After manually enter the angle, press 【ENTER】 to make sure, the graphic will be rotate with the corresponding angle. Positive angle means rotate in counterclockwise, while negative means clockwise. Press 【ESC】 to exit angle adjusting.

Illustration: when enter angle 0, process graph will restore to the location of 0° , at

this time, the system will clear the angle of steel plate adjusting or manual entering. In the general condition, the angle entered is not as the angle of steel plate adjusting. If the angle entered here needs to be as the angle of steel plate adjusting, please refer to section 8.7.6.8.

4.4 Array

In the part options menu, press **【F3】**, the system will prompt as Fig 4.7, there are three ways to arrange, arrange in matrix, staggered arrange, arrange in stack.

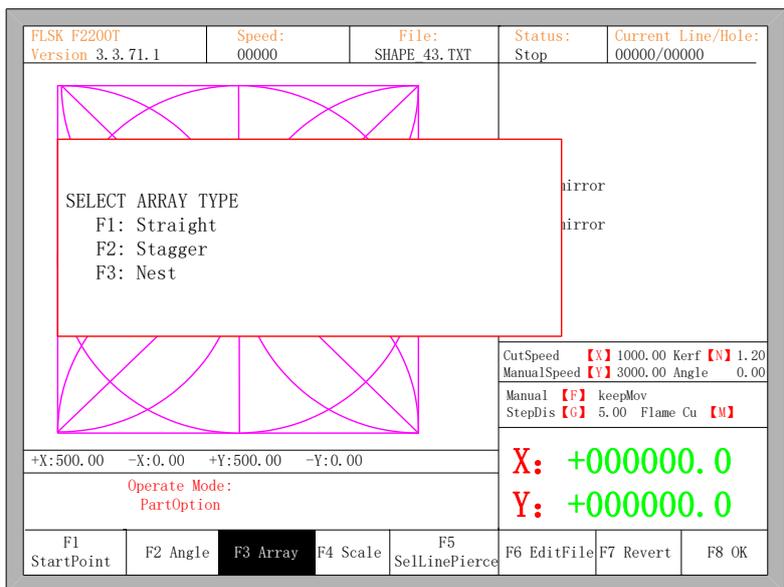


Fig 4.7 Chooses arrange method

Press **【F1】** to carry on arranging in matrix:

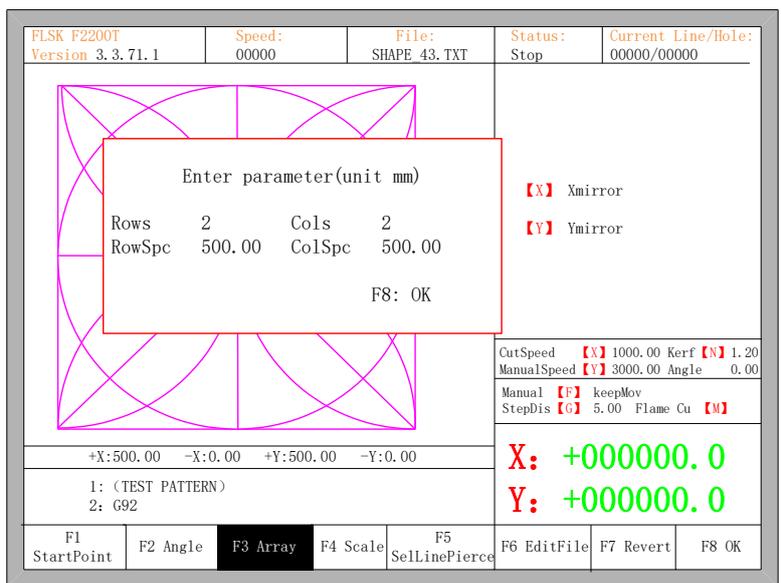


Fig 4.8 Arrange in matrix

The result is shown in fig 4.9

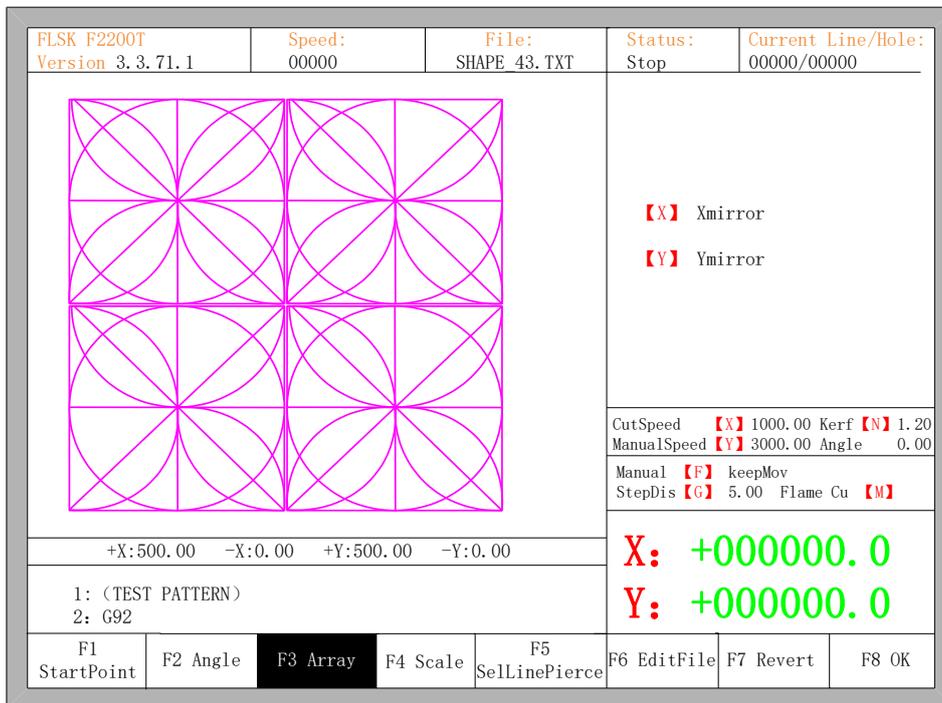


Fig 4.9 Result of arranging in matrix

Press [F2] to enter staggered arrangement:

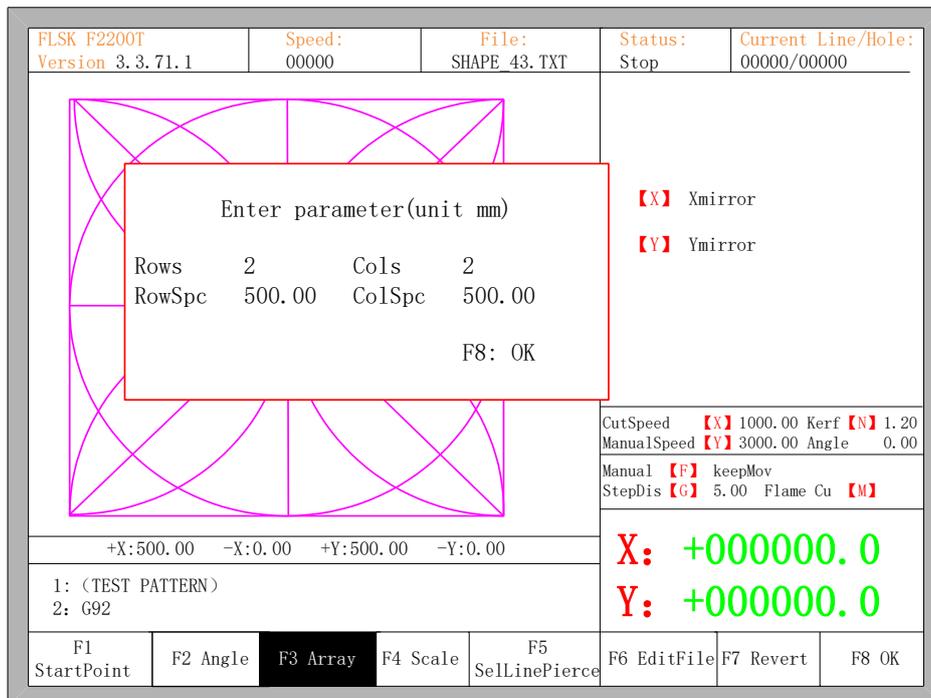


Fig 4.10 Staggered arrange

The result is shown in figure 4.11:

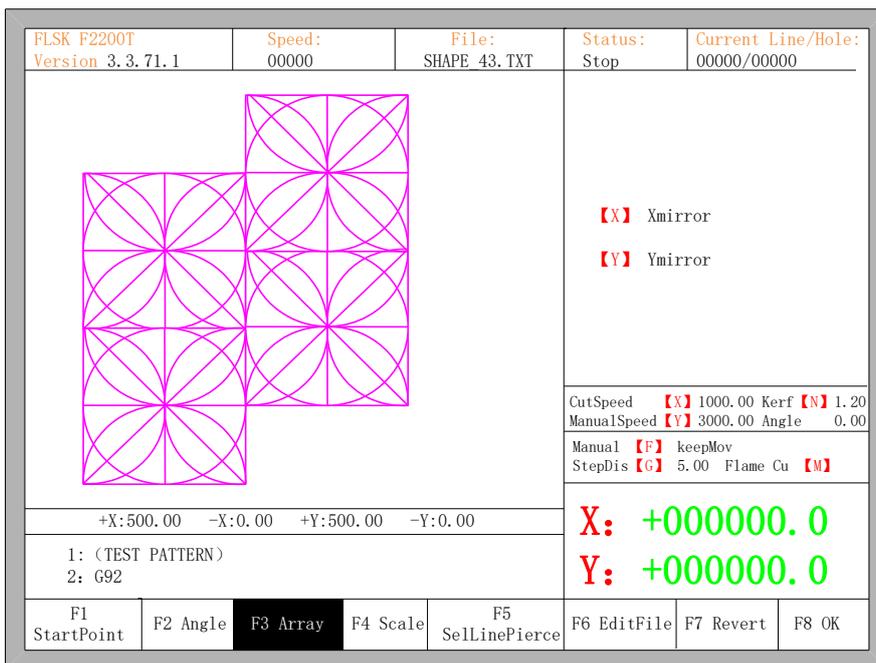


Fig 4.11 Result of staggered arrangement

Press [F3] to enter arrangement in stack:

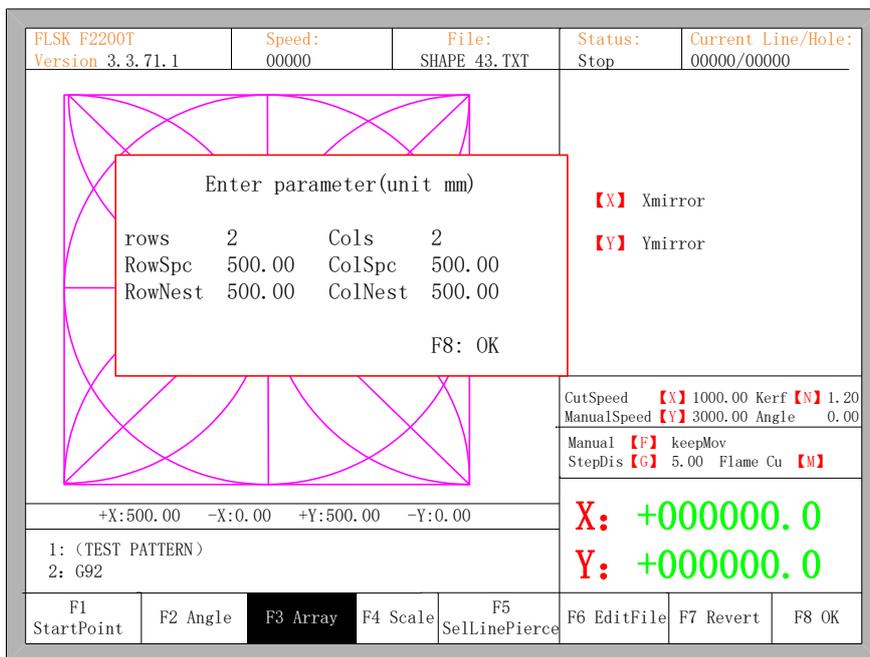


Fig 4.12 Arrange in Nest

The result is shown in figure 4.13:

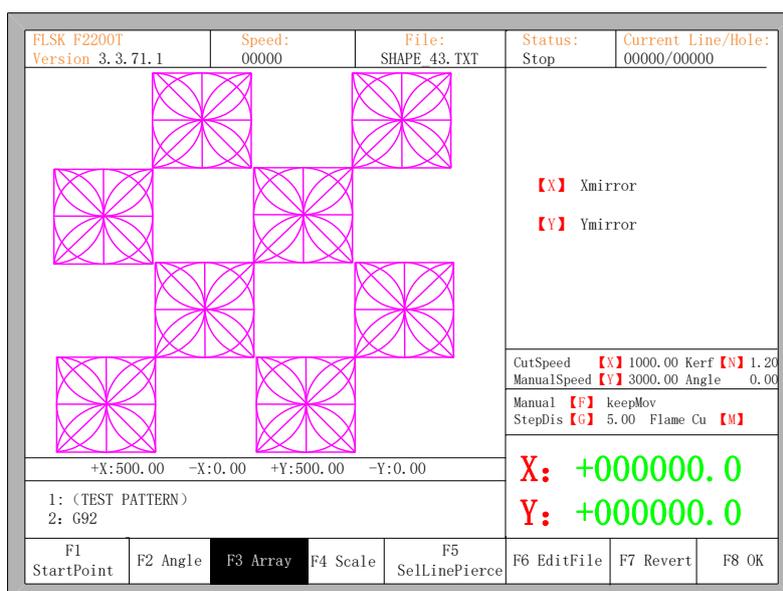


Fig 4.13 Result of arrangement in nest

4.5 Zoom in/out

In the part options menu, press [F4] (zoom in/out), the system prompt as figure 4.14:

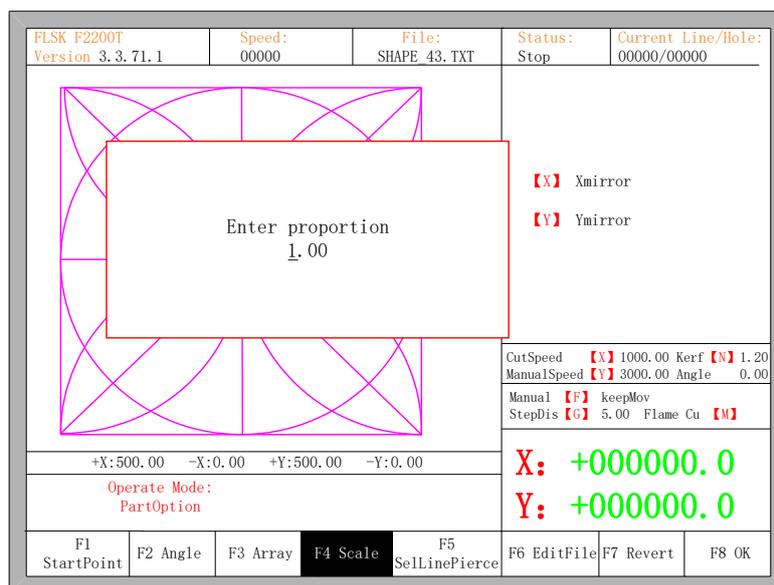


Fig 4.14 Set scales

After entering the scale, press **[Enter]**, then the system will automatically zoom in or zoom out the graphic when the parameter is checked to be correct.

4.6 Select Row/Number

In part options menu, press **[F5]** to enter selecting row/number, the system will prompt:

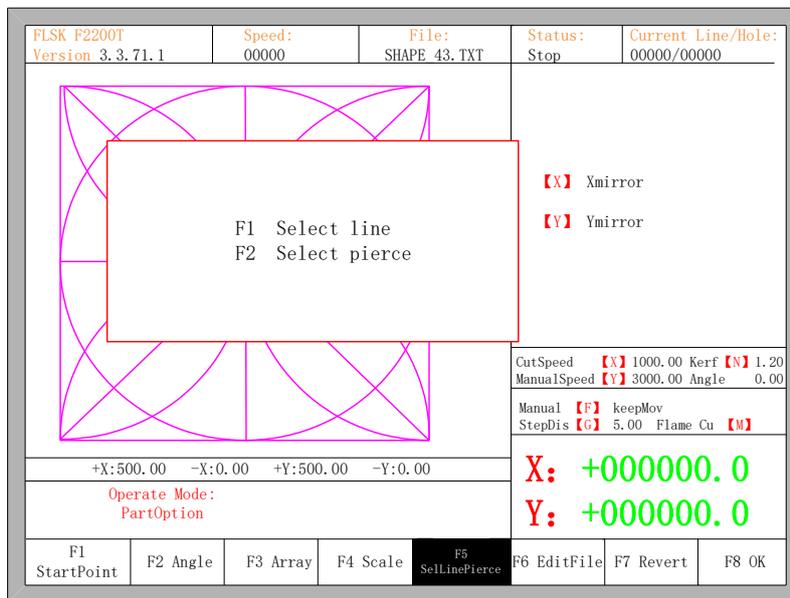


Fig 4.15 Select Line/Pierce

4.6.1 Select Row

Press **[F1]** to select the number of row to start cutting with, the system prompts:

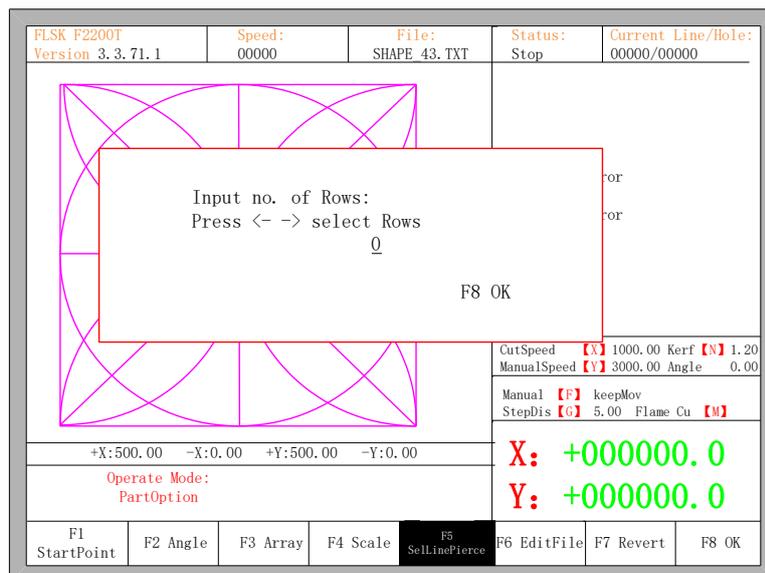


Fig 4.16 Prompt to select row

Here, you can directly enter the row number or press **【ENTER】** to enter the interface and press **【←】** or **【→】** to select row.

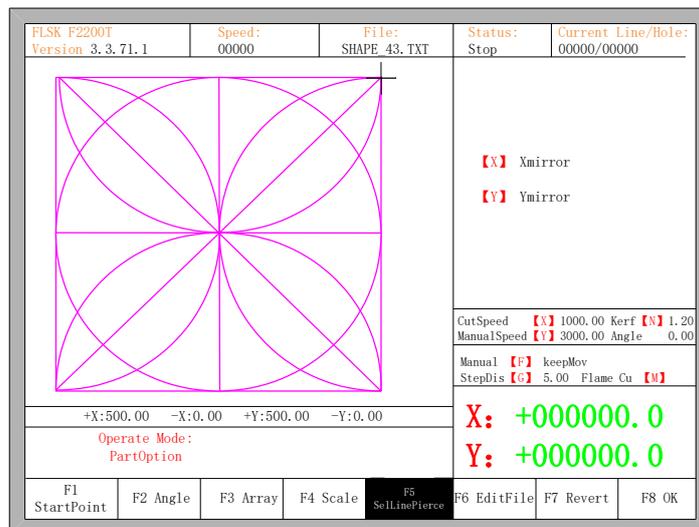


Fig 4.17 Select row

After selecting row, press **【F8】** to confirm.

4.6.2 Select Number

The operation is similar to the choosing row operation.

4.6.3 Operation after Select Row/Number

After selecting row or number, press **【F8】** continuously to exit to the main interface. Press SPACE to enter the cutting interface, there are two kind of operation:

1. Move from current position to the new position and then cutting
- Press **【F1】** in the cutting interface, the system will directly run to the position of the selected row or number without cutting, then pause and wait for the next operation.

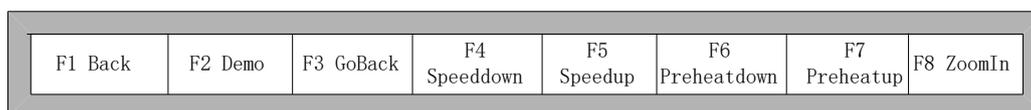


Fig 4.18 Function key of cutting interface

- Press **【START】** in the cutting interface, the system will prompt:

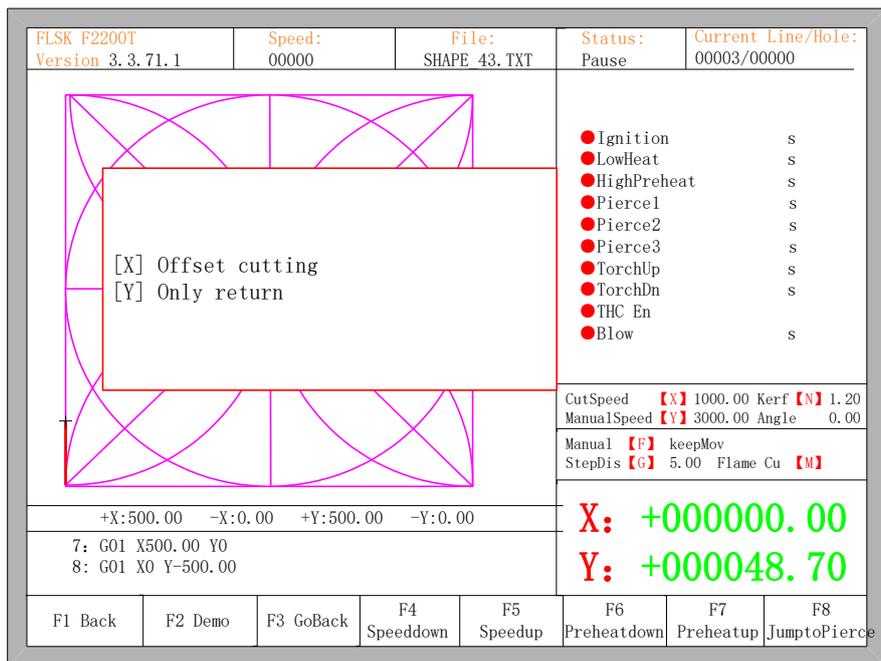


Fig 4.19 Operation after selecting row/number

2. Cutting from the current position

After the prompt of Fig 4.19, press **[X]**, then the system will start cutting from current position. Press **[Y]**, the system will also directly move to the selected row and number, then pause and wait for the next operation.

4.7 Restore

If you want to cancel all of operations with graphics including mirror, rotation, adjust, scale and array, press **[F7]** in the part options menu, the system automatically revert to original state of the graphics.

Chapter 5 Manual Function

In the automatic interface, press **【F7】** (Manual) to enter manual function interface, shown as Fig 5.1:

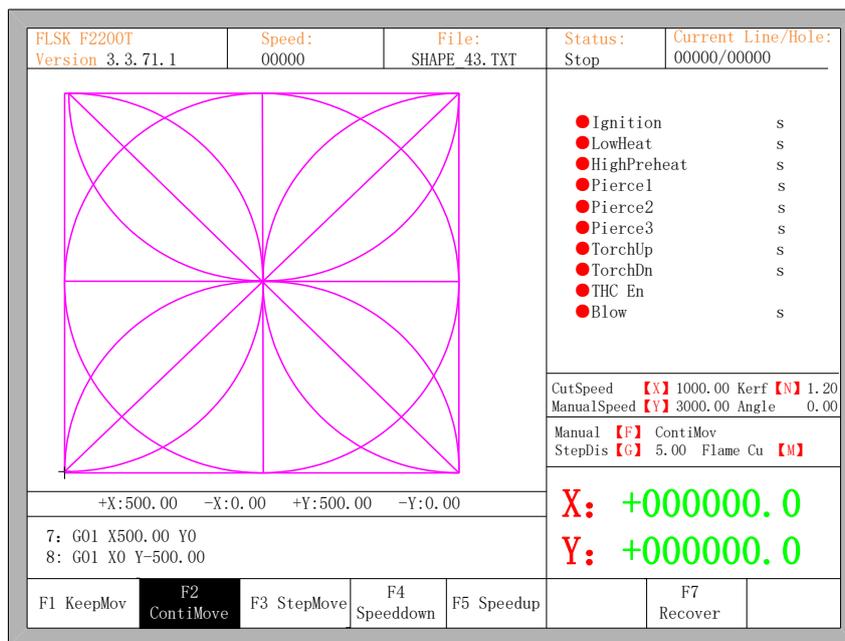


Fig 5.1 Manual function interface

The speed in the manual status is controlled by the manual moving parameters. During the process of fixed moving function, you can adjust speed by acceleration or deceleration key. In the manual interface, press numeric key, the cutting speed changes to ratio which is 10 times of the corresponding figure of the speed limit you have set, for example press **【3】**, change the cutting speed to 30% of the speed limit you have set, press **【8】**, change the cutting speed to 80% of the speed limit you have set.

5.1 Fixed Moving Function

When you enter into the manual interface, the default option is continuous moving function. Press key **【F1】** to go for the fixed moving function. At this moment, the system will move toward the specified direction if any directory key is pressed, and when the directory key is released, the system will stop.

5.2 Continuous Moving Function

When in the manual interface, press **【F2】** to enter the continuous-moving function interface. At this moment, the system will move toward the specified direction if any directory key is pressed and then released, and when the directory key or stop key is pressed the system will stop.

5.3 Fixed-length Moving Function

In the manual interface, press **【F3】** to enter the interface of fixed-length moving. The system prompts to input the fixed length:

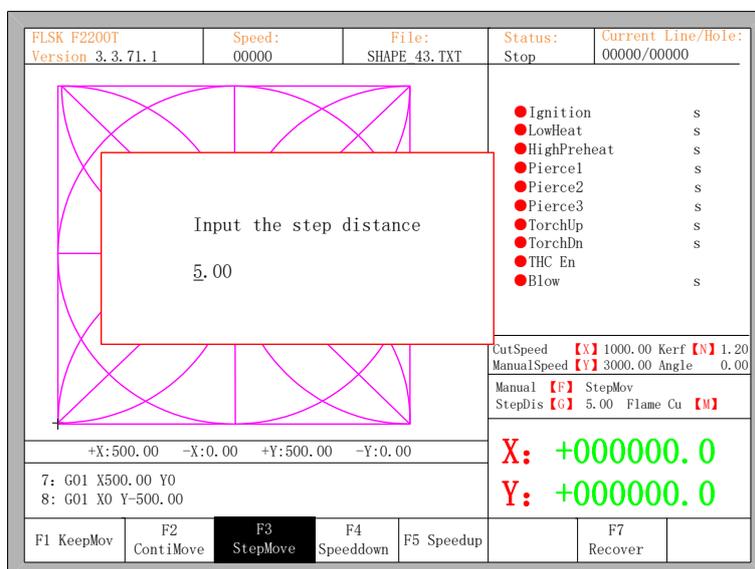


Fig 5.2 Input the fixed length

After inputting the fixed length, press **【ENTER】**. Press any direction key and then release, the system will move the fixed length toward the direction, in the process of moving, when any direction key or stop key is pressed, the system will stop moving.

5.4 Breakpoint Recovery

To guarantee that the breakpoint could work correctly, you need to satisfy the following conditions:

- 1) When the system is paused, the system will automatically regard the paused point as the current breakpoint and remember it.

- 2) In the process of incising, when power is off, the system will regard the power-off point as the breakpoint and remember it.

When you need to process after the breakpoint, after the system powers on, don't move the torch, press **【F7】** in the main interface to enter the manual function interface, then press **【F7】** to recover the breakpoint. After recovering it, if the torch hadn't been moved and is on the position when the power is off, press **【START】** keyboard, the system will process directly.

After the breakpoint is recovered, if the position is off from the original one, you could move the torch to the original point manually, or realizing it through choosing rows or numbers. (Please refer to chapter 4.6 Row and number Selection). The method is: choose stopping incising, move the torch to the original point manually, choose the nearest row through choosing the row selection (or number selection), press **【START】**, then the system will show in Fig 5.3:

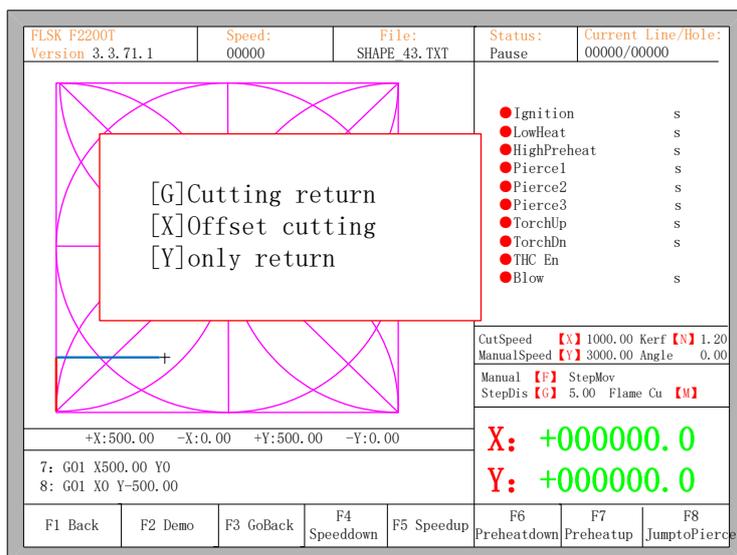


Fig 5.3 Restore breakpoint

- Press **【G】**, the system will start incising from point which is after moving, and after returning to the position before the torch moves, it will process according to the normal curve.
- Press **【X】**, regarding the position after moving as the position before moving, and then process.
- Press **【Y】**, move from the position after moving to the position before moving, then wait for the next operation.

Chapter 6 File Operation

The system supports cutting code which has txt and CNC postfix. The maximum capacity is 1M and the largest number of rows is 10000 lines. You can edit, compile, delete, export internal document, also you can import the file in the U disk into system.

In the main interface, press key **【F2】** (code) to enter local machine code interface, shown as follows:

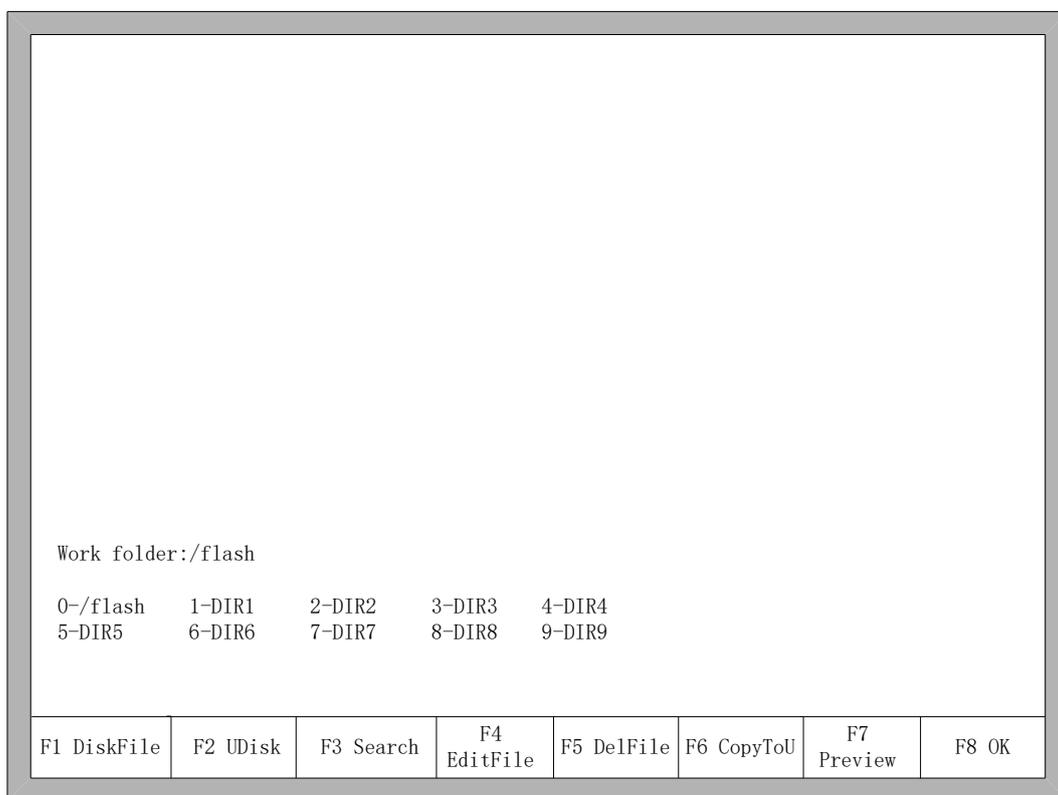


Fig 6.1 code interface

6.1 Files in the Hard Disk

In the file manage interface, press F1 to enter the hardware file list, as shown in Fig 6.1 the system only lists the folder, TXT file and CNC file.

- Press F4, if the current position of the cursor is txt file or CNC file, you could edit them. Please refer to chapter 6.5 on how to edit files.
- Press F5, if the current position of the cursor is txt file or CNC file, you could delete them.

- Press F6, if the current position of the cursor is txt file or CNC file, you could copy the current file to the flash disk when it is connected to the USB interface.
- Press F7, if the current position of the cursor is txt file or CNC file, you could preview the current graphic.

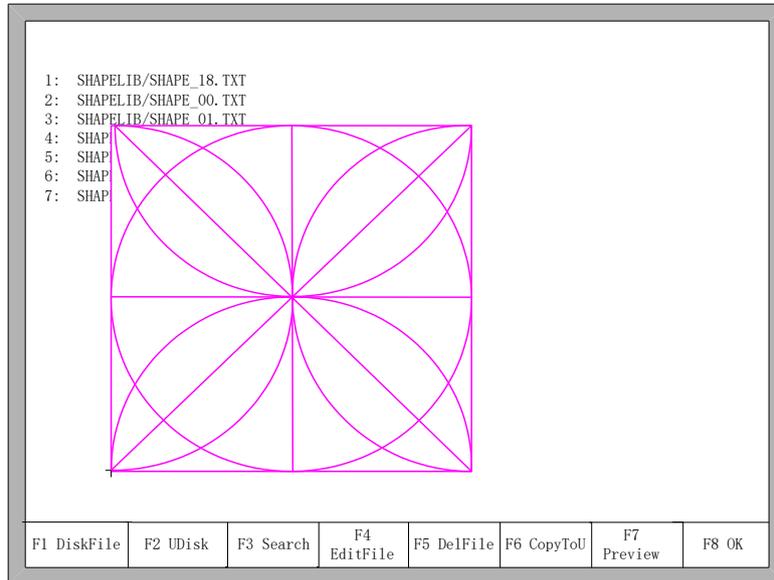


Fig 6.2 Graphic preview

- Press F8, if the current position of the cursor is txt file or CNC file, you could import the current file to the system, after importing, the system will return to the main interface.

6.2 Files in the U Disk

In the code interface, press key **【F2】** to go for U Disk interface.

In the U Disk interface, choose the corresponding cutting code, press **【F6】**, the system will save this code into the internal documents.

Note: When you open a file on U disk, you must save it as the local machine code before you start cutting. When saved the U disk documents, file name automatically memory, shown as Fig 6.3:

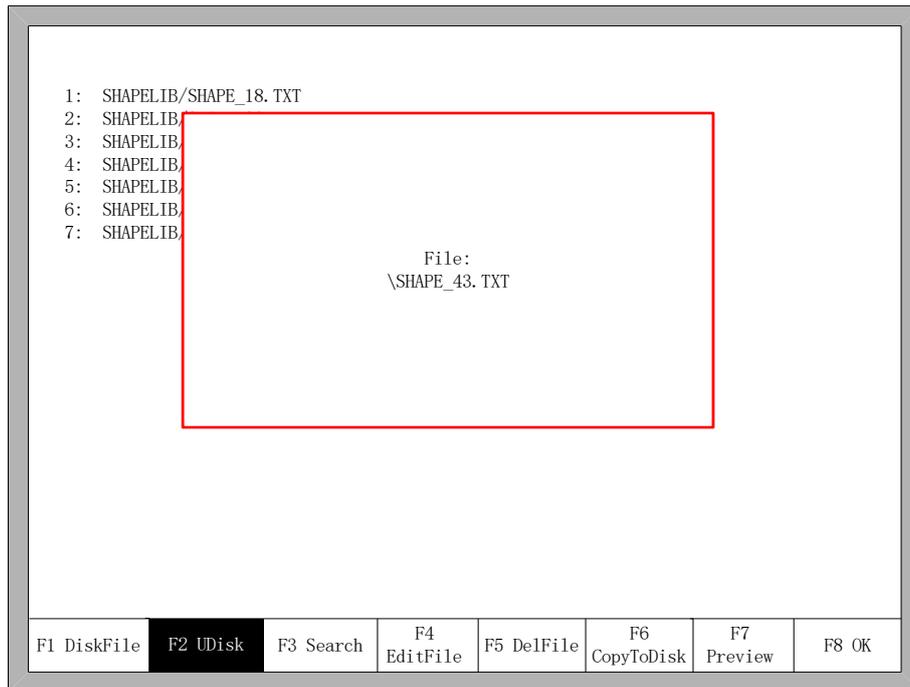


Fig 6.3 save U disk files

When input file name, if you do not want to change the file name, you can be directly press **【Enter】** to preserved; or modify the file name and then press **【Enter】** to save. If the same named file has already existed, the system prompts:

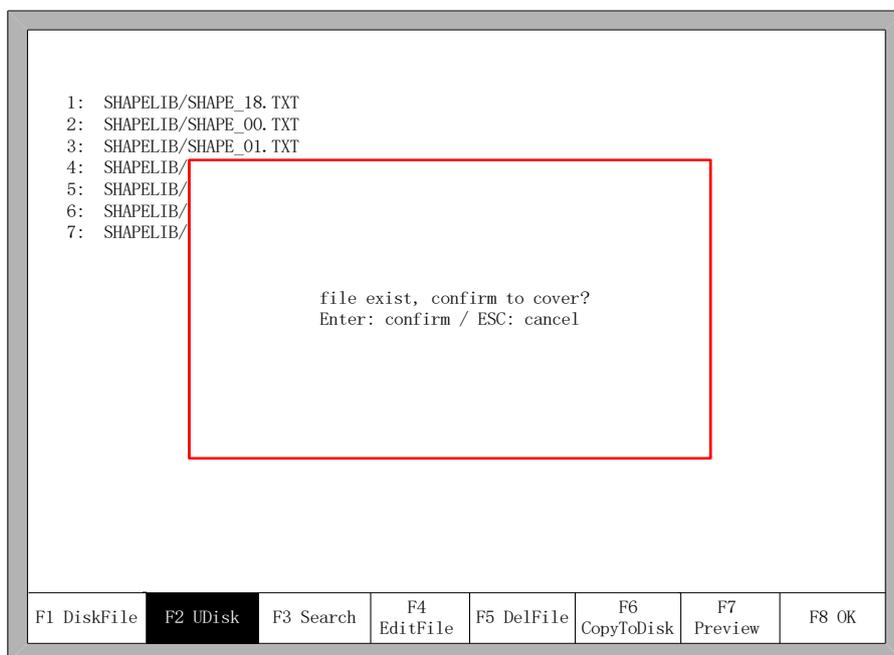


Fig 6.4 Replacement documents

If you want to replace the internal documents, press **【Enter】** key, if you want to

change the file name, press **【Esc】**, change the file name and then save.

6.3 Search File

In the file manage interface, press key **【F3】** to search a file. You can input all or part of the file name, then press **【Enter】**, and the system will list all the files that include the input word or file name.

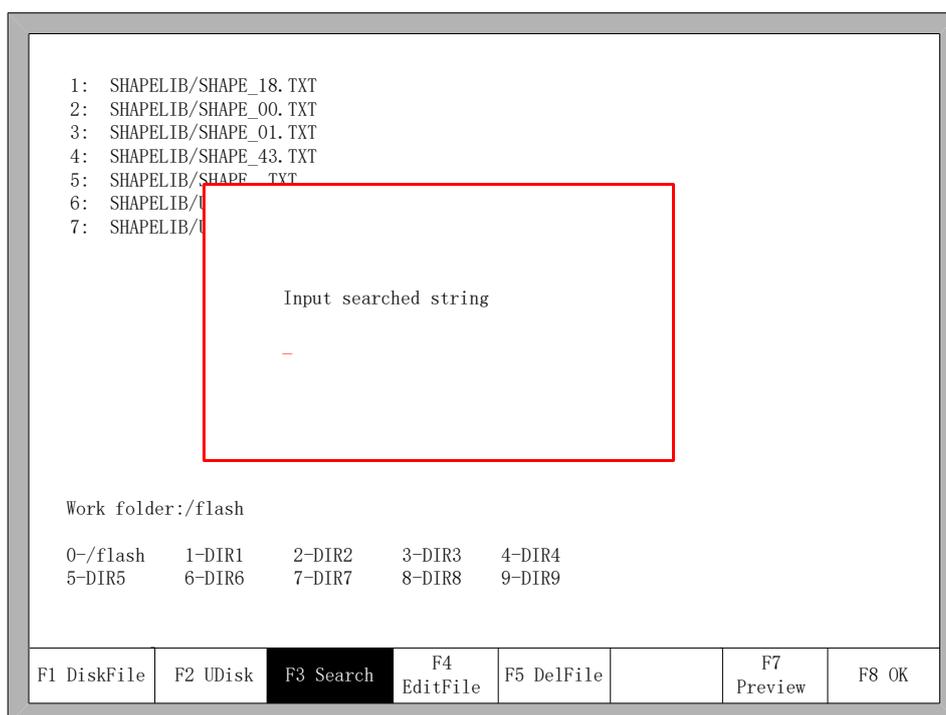


Fig 6.5 search file

6.4 Edit Code

In the local machine code interface, move the cursor to the file that you want to edit, then press **【F4】** to enter the edit interface.

When enter the characters, some keys are reuse keys. Press these keys directly, enter the characters under the button. If first press **【Shift】** key, release the **【Shift】** key and then press Shift Multiplexing button, then enter characters on the button. Or press both **【Shift】** and reuse keys, then enter characters on the button.

When editing the code, press **【F2】** can insert a new line after the current line, and

press **【F3】** to delete the current line. Press **【F】** + **【Home】** key, the cursor automatically moved to the first character of the current editing line, press the **【F】** + **【End】** , the cursor automatically moved to last character of the current line.

Each edit line supports 128 characters maximum.

When you open a file on U disk or new a code file, you must save it as the local machine code before you start cutting. Otherwise, you cannot make use of the breakpoint recovery function or power off protection function.

After edit the code , press **【F8】** to save the code.

6.5 New File

In the editing code interface (refer to 6.4 edit code), you can press key **【F4】** to create an new file to input your own code.

6.6 Compile Code

After create a new code or edit the code, if you want to know the code is valid or not , in the edit interface, press **【F1】** ,you can compile code to check whether the code is correct.

6.7 Folder Manager

6.7.1 Select Work Folder

The system supports 10 folders, as the figure 6.1 shows.

Work folder: current work folder's name.

0-/flash 1-DIR1 2-DIR2 3-DIR3 4-DIR4 5-DIR5 6-DIR6 7-DIR7 8-DIR8 9-DIR9

These 10 symbols interpret 10 folders' names. The number in the first stands for the short key, press the corresponding number, switch current work folder into corresponding folder. For example, press **【1】** , it will show as the figure 6.6.

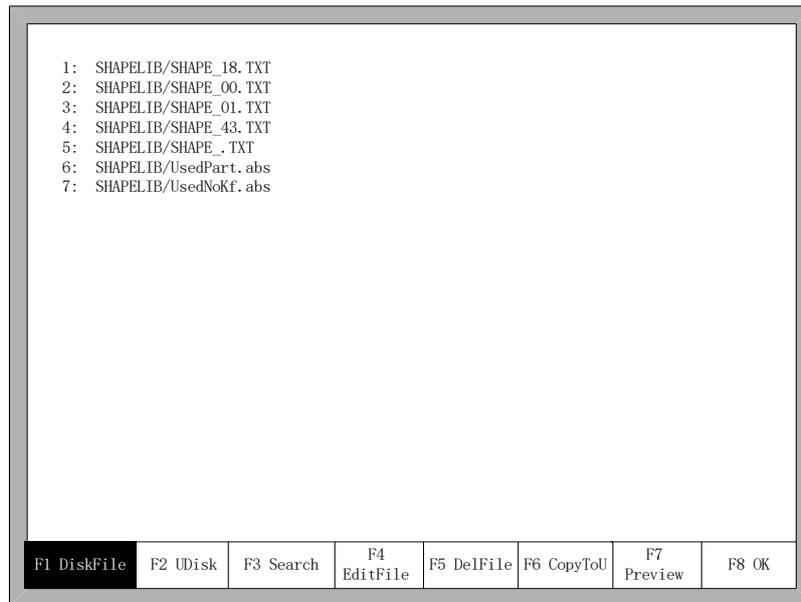


Fig 6.6 Folder 1

The current folder will switch into /flash/DIR1 and then all supported G code files under the current folder will be shown.

6.7.2 New Folder

It will be complex to new a folder. It needs to first enter into the edit file interface, then new a folder.

In the file of own system, move the cursor to G code file name, as the figure 6.7 shows.

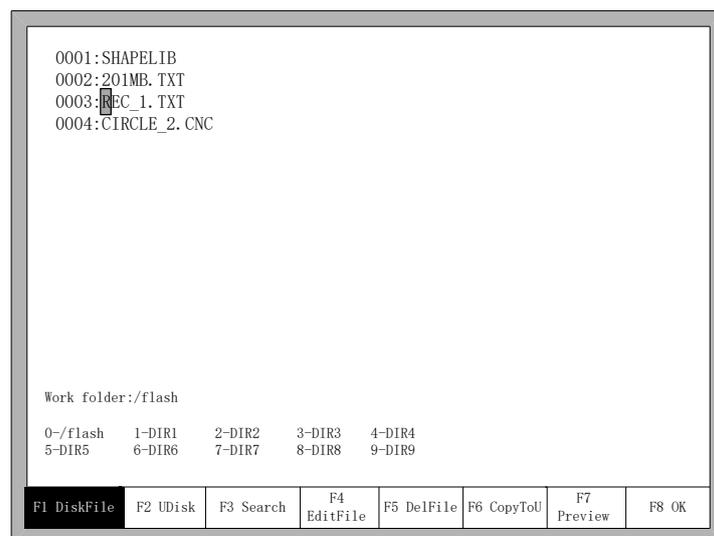


Fig 6.7 cursor moves to G code file name

Then press **【F4】** -- edit file, the function keys under the edit file show as figure 6.8.

F1Compile	F2AddRow	F3Del Row	F4NewFile	F5NewFolder			F8Save
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Fig 6.8 Edit file interface

At this time, press **【F5】** , input the folder's name in the prompting frame and then press **【Enter】** .

Pls input folder name:
█

Illustration: the system supports only 10 folders, after more than 10 folders, the new folder will replace the second folder, successively the third folder, the forth file and so on. The first folder /flash is reserve folder, this folder can neither be replaced nor be modified.

6.8 Clear File

Refer to the explanation about clear files in the section of 8.7.8.

Chapter 7 Parameter Setting

In the main interface, you can get the parameter interface by pressing key **【F4】** (Setups). The parameter function interface is showed in Fig 7.1

Max cutting speed	1000.000	mm/m
Manual move speed	3000.000	mm/m
G00 move Speed	1000.000	mm/m
Demo/back speed	2000.000	mm/m
Dust speed	1000.000	mm/m
Kerf value	1.000	mm
Corner speed (1-100)	100.000	% mm/m
Cutting type	Flame	<->
Demo Run Speed	1000.000	mm/m

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
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Fig7.1 Parameter Interface

You can set five kinds of parameter in the parameter interface:

- 1) Common parameters: cutting speed, manual move speed, G00 move speed, the size of kerf gap, corner speed, cutting type, edge cut enable, hold preheat.
- 2) Flame parameters: all the parameters used in oxygen gas cutting
- 3) Plasma parameters: all the parameters used in plasma cutting
- 4) Powder parameters: ignition, perforation cycle parameters, dry dusting offset
- 5) System parameters: you can set system pulses, maximum speed limit, motor parameters and soft limit parameters.

7.1 Common Parameters

It is the favorite's parameters in Fig7.1.

- **Cutting Speed:** the maximum cutting speed, unit is mm/m.
- **Manual Move Speed:** the moving speed of cutting torch in manual, unit is mm/m.
- **G00 Move Speed:** the cutting torch speed when G00 is executed or the cutting torch go back to the reference or some other occasion, unit is mm/m.
- **Kerf:** According to the cutting gap width, users set Kerf Gap compensation(the value should be half of the cutting gap) to ensure the dimensional precision, the system will generate a new path automatically to make compensation to work piece. Before cutting a work piece, you can modify kerf gap value, once begin to cut, you are not permitted to modify the value.
- **Corner speed:** Plate thickness affect the cutting tip's ac/dc rate when it moving. The angle between the end of a cut-point line's tangential direction and the direction of the tangent line of the beginning of next cutting point, and the thickness of plate determines cutting tip speed at the transition.

If the normal cutting speed is V , angle is α , the proportion of corner speed is h , then cutting tip speed in at the time of intersection is V_x .

$$V_x = \frac{\alpha h}{50\pi} V$$

Notice: The unit is %mmpm. The max thickness of plate is 100, if more than 100mm also are considered to be 100.

- **Cutting Type:** There are two cutting types: Oxygen fuel gas and Plasma parameters. You can press **【←】** or **【→】** to switch with them.

7.2 Flame Parameters

The oxygen fuel parameters, in Fig 7.2, control time delay in IO operation, and whether use high adjustment.

Ignition time	0.00	s
Low preheat time	10.00	s
High preheat time	0.00	s
Pierce 1 time	0.00	s
Pierce 2 time	0.00	s
Pierce 3 time	0.10	s
Blow time	0.00	s
Torch up time	0.00	s
Torch down time	0.00	s
Pierce up time	0.00	s
Pierce down time	0.00	s
THC enable	No	<->
Hold preheat	Yes	<->
Edge cutting enable	No	<->

F1 Common	F2 Flame	F3 Plasma	F4 Power	F5 System	F6 Import	F7 Export	F8 Save
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Fig 7.2 Flame Parameters

- **Ignition Time:** the time delay of opening ignition I/O.
- **Low Preheat Time:** The preheating time before perforating the steel plate. Enter any positive number, unit is s. During the low pressure preheating process, you can prolong the preheating time by pressing “stop” key, then the preheating time will delay until you press the “start” key to start to high pressure preheat delay.
- **High Preheat Time:** Like **Low Preheat Time** except open different IO.
- **Pierce 1 Time:** Perforation time with low pressure fuel gas. Enter any positive number, unit is s.
- **Pierce 2 Time:** Perforation time with middle pressure fuel gas. Enter any positive number, unit is s.
- **Pierce 3 Time:** Perforation time with high pressure fuel gas. Enter any positive number, unit is s.
- **Exhaust Time:** The delay of turned off oxygen gas to open the exhaust. Enter any positive number, unit is s.
- **Torch Up Time:** When oxygen gas is turned off, the time for the torch to lift up. Enter any positive number, unit is s.
- **Torch Down Time:** When oxygen gas is turned off, the time for the torch to put down. Enter any positive number, unit is s.

- **Pierce Up Time:** Time for the torch to lift up during perforating. The difference between **Torch Up Time** and **Pierce Up Time** is that: **Torch Up Time** means the time that the torch needs to lift up when it needs to move to another place after the current cutting is over; while the **Pierce Up Time** means the time that the torch needs to lift up after preheating in the fixed cycle of perforation.
- **Pierce Down Time:** Time for the torch to put down in the perforation. The difference between **Torch Down Time** and **Pierce Down Time** is that: **Torch Down Time** means the time that the torch needs to put down before preheating; while the **Pierce Down Time** means the time that the torch needs to put down after finishing **Torch Up Time** and opening cutting oxygen in the fixed cycle of perforation.
- **THC Enable:** According to the user device configuration, choose whether or not to use high adjustment box.
- **Hold Preheat:** If this parameter is set as “yes”, in the process of cutting, before complete cutting (before M02 code has occurred), Low Heat IO port is on the open status all the time. If set the parameter as “no”, in the process of cutting, M08 or M02 code has occurred, it will close Low Heat IO port.
- **Edge Cutting Enable:** press **【←】** or **【→】** to use or not use edge cutting. When use edge cutting, the cutting system will automatically stop whenever M07 code has occurred. When it stops, user can manual operate to move the torch to the edge of steel panel, then press start button, the system will notify:

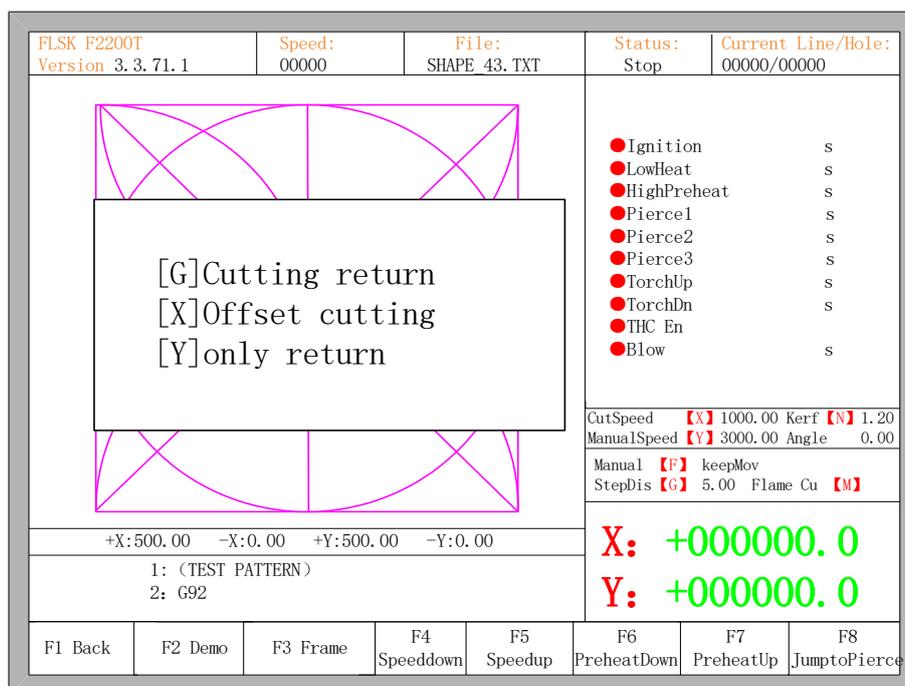


Fig.7.3 Edge cutting

When press **【G】** , after the system ignites to punch hole and continues to cut to the suspend point, it will continue to cut. This should be the function of edge cutting hole.

This function will be especially useful when cut the thick steel plate. Thick steel plate is hard to be punched holes and the punched hole will be also larger. If directly punch hole in the cutting path, it will maybe affect the final production quality. Using edge cutting can may accelerate the efficiency of punch holes, save cutting time and improve production quality.

Of course, don't use edge cutting, punch hole with lead-in is also a more effective method.

7.3 Plasma Parameters

As shown in the figure 7.4, these are Plasma Parameters, which are related with the precision of transmission shaft of the machine.

DelayBeforeArc	0.00	s
Pierce time	0.00	s
Torch up time	2.00	s
Arcing check time	15.00	s
Position check time	0.00	s
Position up time	0.00	s
Speed to lock THC	95.00	mmpm %
Distance to lock THC	5.00	mm
Lose arc delay	0.00	s
Watch arc enable	<input checked="" type="checkbox"/>	<->

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
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Fig 7.4 plasma parameters

- **Arc time:** Before the arc starting, the system time to wait. At this point, all output I/O are turned off. Enter any positive number, unit is s.
- **Pierce time:** Perforation time. Enter any positive number, unit is s.

- **Torch Up Time:** When arc press is turned off, the time for the torch to lift up. Enter any positive number, unit is s.
- **Arcing Check Time:** Enter any positive number, unit is s. If not detected any feedback signal of success arc starting within the detection time, the system prompts an error message and terminates the current work of cutting, according memory breakpoints to withdraw from the program. If detected feedback signal of success arc starting within the detection time, the system stops detecting and cutting.
- **Position check Time:** Enter any positive number, unit is s. Delay time of the success of position check. If not detected any signal of success of position check within the detection time, the system thinks that the position check is unsuccessful and sends out an alarm. Otherwise, the system finishes the position check and starts position up.
- **Position up Time:** Enter any positive number, unit is s. Before positioning check, the time for the torch to lift up.
- **Close arc:** In setting the rate of X%, open the output port, close the arc press signal, to prevent the steel melting under low-speed cutting tip due to temperature is too high.
- **Distance to close arc:** in the minimum distance of the cutting line of the initial segment or end segment, close the arc voltage increases.
- **Lose arc delay:** detect the delay time of the feedback of the broken arc, if there's still no arc voltage input, the situation is considered to be broken arc. This parameter can effectively avoid the arc broken alert because of the sensitivity of the broken arc detection in the cutting methods with lead, this guarantees the continuousness of the cutting and avoid the interrupt of frequent alert.
- **Time to Lock THC before M08:** broken arc check delay is independent of auto turning high, it's normally default value. Unit: s.
- **Watch arc enable: whether real-time detection of arc voltage signal in cutting process or not.**

If setting "yes", in the cutting process, the system detects the real-time arc voltage feedback signal. If do not detect the signal, the system will stop the current work-piece cutting and transmit alarm signal.

If installing a "No", then in the cutting process does not detect arc voltage feedback signal.

(The following is typical of the "T" in F2000 series CNC system)

- **Set Arc Voltage:** cutting arc voltage, the range of value is 50.00-300.00。 Unit: V
- **Arc Protection Value:** When actual arc value \geq (arc value setting + protection value over arc), the system will give an alarm of breaking arc and stop cutting, the range of the value is 5.00-100.00. Unit: V. Default 30。

Notice: if arc value is less than 30 V, system will also give the alarm of breaking arc. This 30 V is fixed value and not modified.

- **THC Sensitivity:** If the lifter motor runs too fast, the value should be decreased. In contrast , if the lifter motor runs too slow, the value should be increased. The value must be between 1 to 100. Default 40.
- **Arc Set Step Value:** In cutting interface, Increase or decrease the **Set Arc Voltage** value every time by pressing F7 or F6, the range of value is 0.10-10.00. Unit: V。
- **Fast IHS Time:** The lifter motor runs time in full speed when IHS(initial height sensing). Then the lifter motor runs the half speed until the torch contact the steel plate. Unit: s.

Notice: **Fast IHS Time** cannot be more than **Position Check Time**.

7.4 Powder Parameters

As the figure 7.5 shows, it is powder parameters of system about the powder paint line.

Marker Ignition Time	0.00	s
Marker Preheat Time	0.00	s
Mix powder Open Time	0.00	s
Mix powder Close Time	0.00	s
Marker Up Time	0.00	s
Marker Down Time	0.00	s
Marker Horizontal Offset	0.000	mm
Marker Vertical Offset	0.000	mm

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
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Fig 7.5 powder parameters

- **Marker Ignition Time:** Input ≥ 0 arbitrary value, unit: s.
- **Marker Preheat Time:** Input ≥ 0 arbitrary value, unit: s.
- **Mix powder Open/Close Time:** Delay time of scatter powder mouth relative to spurt powder mouth open/close, input ≥ 0 arbitrary value, unit: s.
- **Marker Up Time:** The time of powder torch going up. Unit: s.
- **Marker Down Time:** The time of powder torch going down. Unit: s.
- **Marker Horizontal Offset:** Horizontal offset of powder gun relative to cutting torch. Unit: mm.
- **Marker Vertical Offset:** Vertical offset of powder gun relative to cutting torch. Unit: mm.

7.5 System Parameters

The system parameters, as shown in Fig 7.6, are related with the precision of driver shaft of the cutting machine, coordinate axis, increase/decrease of rate and little arc processing limited parameter.

Horizontal Axis Pulse	125.000	n/mm
Vertical Axis Pulse	125.000	n/mm
Max cutting speed	2000.000	mmpm
Max G00 speed	6000.000	mmpm
Max Manual speed	3000.000	mmpm
Small arc limit	500.000	mmpm
Limit speed below radius	0.00	mm
Flame adjust time	0.40	s
Plasma adjust time	0.30	s
Emergency stop time	0.08	s
Start speed	250.000	mm
Max +X	100000.000	mm
Max +Y	100000.000	mm
Min -X	-100000.000	mm
Min -Y	-100000.000	mm

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
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Fig 7.6 System Parameters

- **Horizontal Axis Pulse:** The number of pulse that system needs to generate when the machine move 1mm towards X axis, maintaining 3 digits at most after decimal point.
- **Vertical Axis Pulse:** The number of pulse that system needs to generate when the machine move 1mm towards Y axis , maintaining 3 digits at most after decimal point.
- **Max Cutting Speed:** the maximum cutting speed, unit is mm./m.
- **Max G00 speed:** the allowable maximum speed when cutting tips idling.
- **Small Arc Limit:** Maximum speed at cutting a small arc.

Small arc definition:

0 mmpm < cutting speed < 2000mmpm	small arc = 5mm
2000 mmpm < cutting speed < 4000mmpm	small arc = 10mm
4000 mmpm < cutting speed < 6000mmpm	small arc = 15mm
6000 mmpm < cutting speed < 8000mmpm	small arc = 20mm
8000 mmpm < cutting speed < 10000mmpm	small arc = 25mm
10000mmpm < cutting speed < 12000mmpm	small arc = 30mm
12000mmpm < cutting speed < 15000mmpm	small arc = 35mm

- **Flame adjusts time:** the whole time for the system accelerates from its start speed to the expected cutting speed.
- **Plasma adjust time:** when plasma cutting , from the time the motor starts to the time

when the motor is up to the cutting speed.

- **Emergency STOP Time:** When encounter Emergency Stop input, the time for dropped from the current speed to zero.
- **Start Speed:** the system's speed when it began to start. Generally do not have to start from 0 , motor will allow a start speed.
- **Max Coordinate:** The maximum positive coordinate which the machine can reach horizontally. Its unit is mm (millimeter). If current coordinate exceeds the value, the system will stop running.
- **Min Coordinate:** The minimum negative coordinate which the machine can reach horizontally. Its unit is mm (millimeter). If current coordinate is less than the value, the system will stop running

7.6 Parameter Import

In the parameter configuration interface, press F6 to import the parameters. The parameters should satisfy two conditions:

1. The parameters exported from the incising machine control system(refer to 7.7 Parameter Export) should satisfy the specified format. The file format is F2300.DAT
2. The file should be stored under the root folder of flash disk which is connected to the USB interface.

When the above condition is satisfied, in the Fig 7.7, press Enter to confirm, and then you could import the backup parameters to the system.

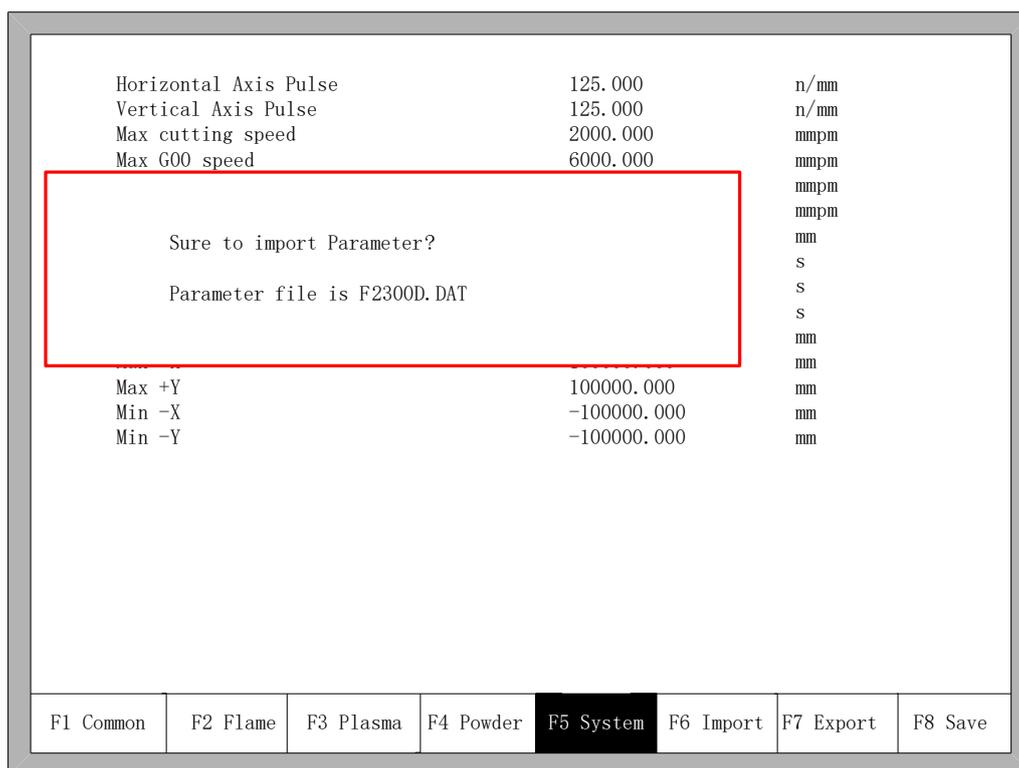


Fig.7.7 Parameter import

7.7 Parameter Export

After the parameter configuration is over, press F7 in the parameter configuration interface to export the parameters, you should connect the flash disk to the USB interface before exporting.

In the interface shown in Figure 7.8, after pressing Enter, the parameters will automatically be saved in the root folder of flash disk, the file name is F2300.DAT



Fig.7.8 Parameter export

7.8 Save Parameters

After parameter modification, press **【F8】** to save, shown in Figure 7.9.

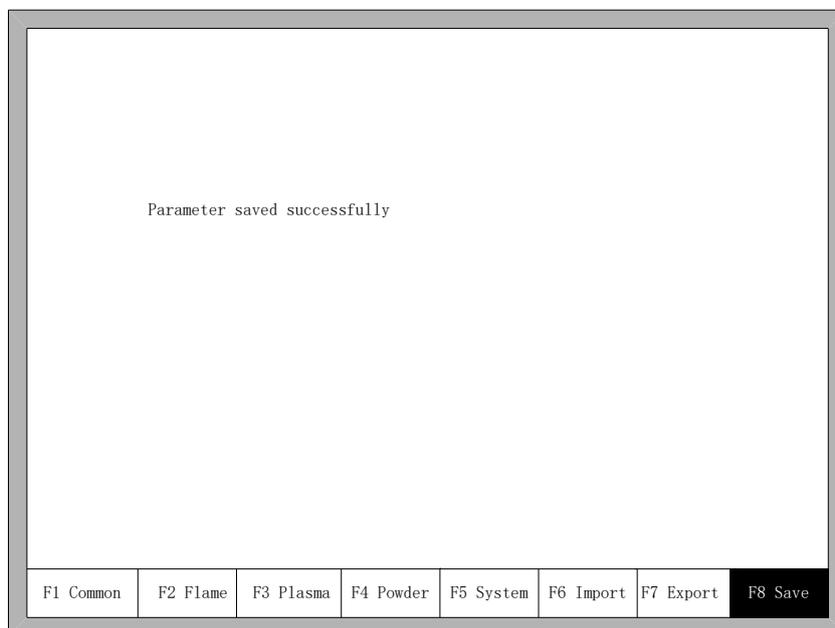


Fig.7.9 System Parameters

Note: when any parameter has been modified, you must take preservation operation to keep modification valid, or the system will take the original parameters.

Chapter 8 Diagnosis Function

input	
forward limit	●
back limit	●
right limit	●
left limit	●
emergency stop	●
arcing feedback	●
Position detect	●
Plasma Collision	●
Move up input	●
Move down input	●
Move left input	●
Move right input	●
Acceleration input	●
Deacceleration input	●
Torch up input	●
Torch down input	●

F1 Input	F2 Output			F5KeyBrd	F6SelfCheck	F7DateTime	F8SystemDef
----------	-----------	--	--	----------	-------------	------------	-------------

Fig 8.1 Diagnostic interface

In the main interface, you can press **【F5】** to enter the system diagnosis interface, as shown in Fig 8.1.

You can be diagnosing the I/O and keyboard in the interface.

8.1 Diagnosis Interface Index

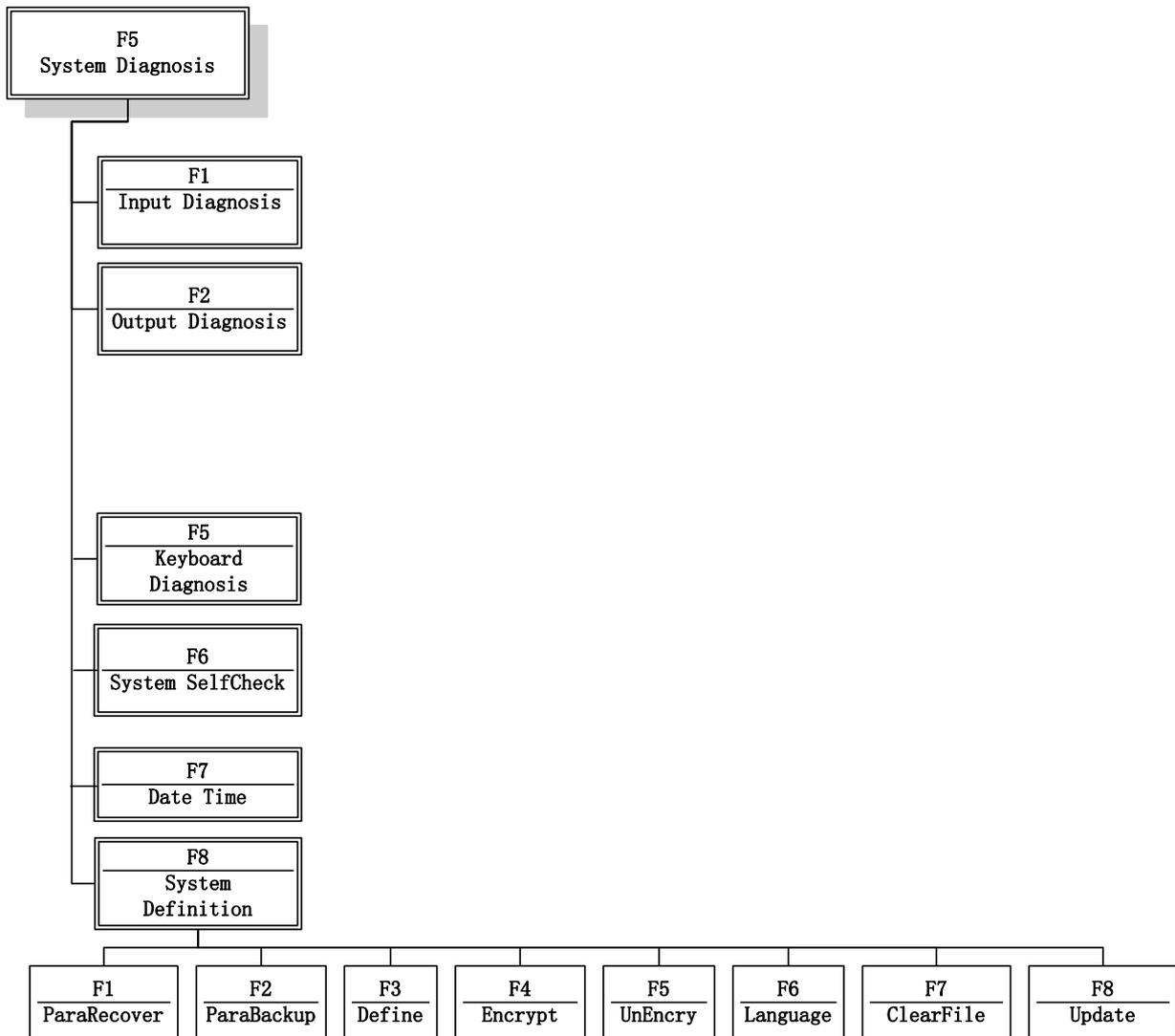


Fig 8.2 Diagnosis interface index

8.2 Input Diagnosis

The system will read current IO information when press **【F1】**(Refresh) to refresh the interface, and display all IO's status. The green “●” means the input is effective, and the red “●” means the input is ineffective.

8.3 Output Diagnosis

In diagnosis interface ,press **【F2】** to enter output diagnosis interface, shown as Fig 8.3

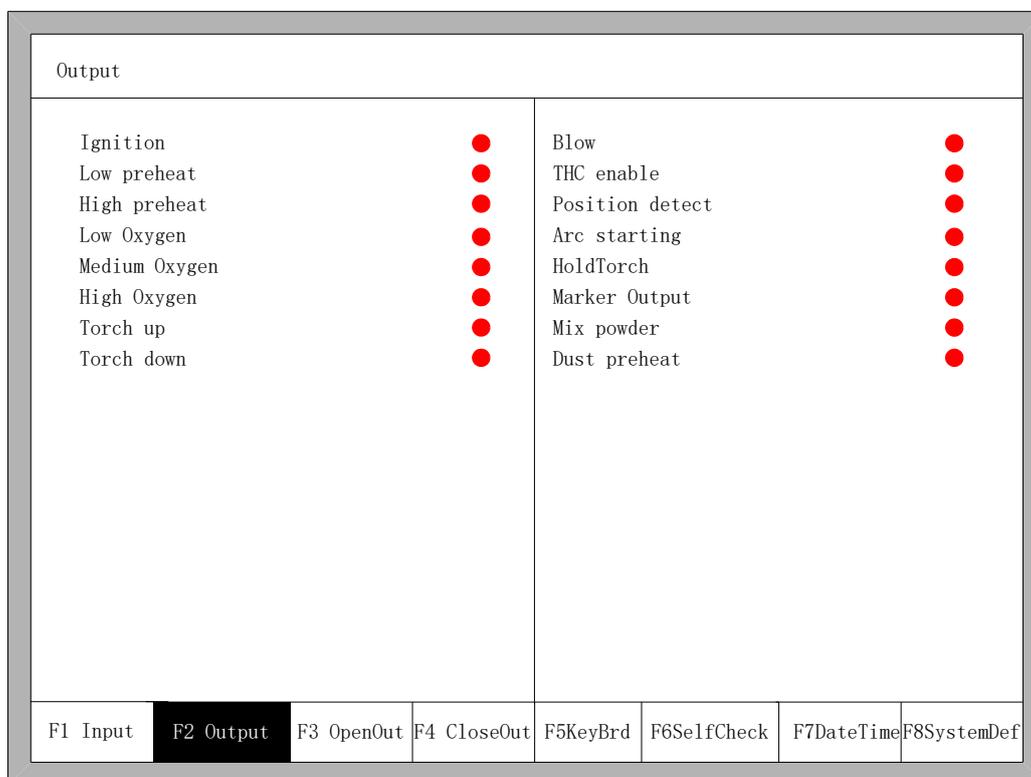


Fig 8.3 Output diagnosis

Press **【↑】**, **【↓】**, **【←】**, **【→】**, you can move the cursor to the corresponding output port, press **【F3】** to open the corresponding output port, press **【F4】** to close the corresponding output. ● represents the valid output, ● represents the invalid output.

8.4 Keyboard Diagnosis

In the diagnostic interface, a key value will be displayed behind “KEY:”, whenever the key is pressed.

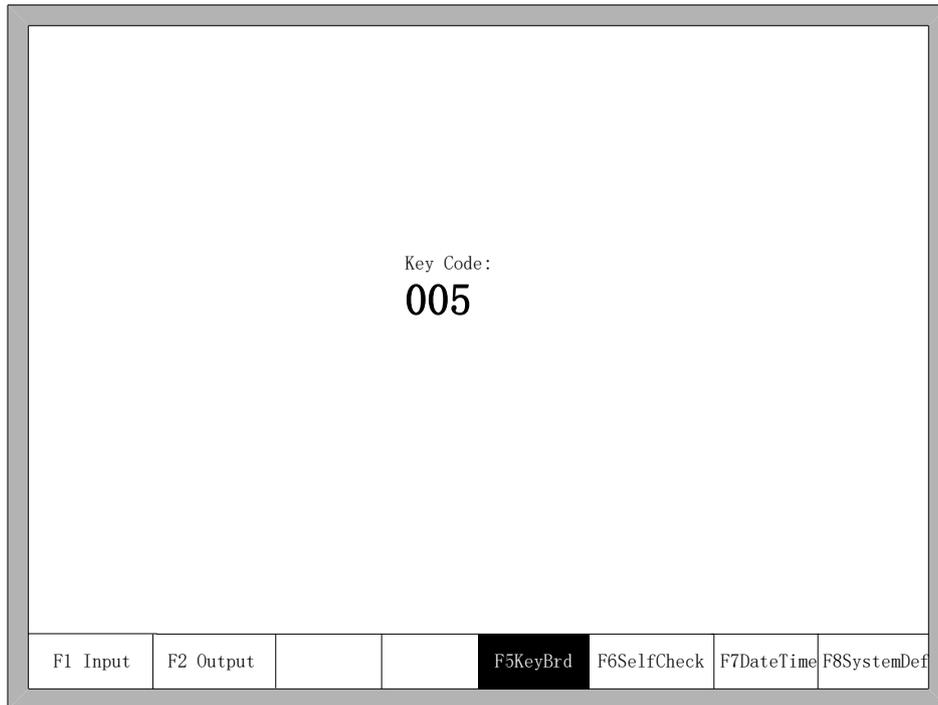


Fig 8.4 Keyboard Diagnosis

8.5 System Self-check

In the system diagnosis interface, press **【F6】** to enter the system self-check interface.

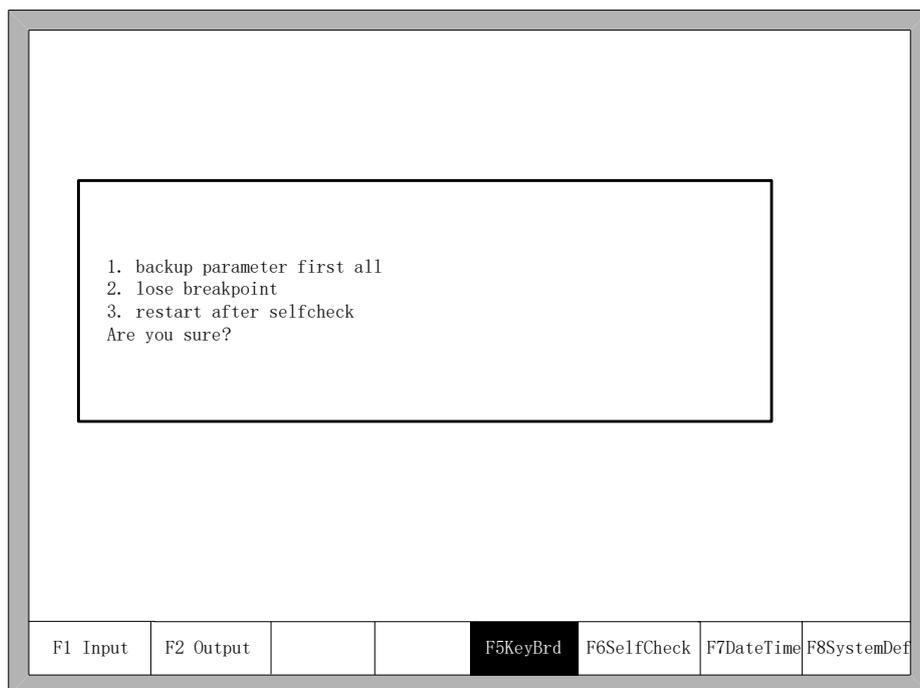


Fig 8.5 System self-check

If the self-check is OK, the system will show:

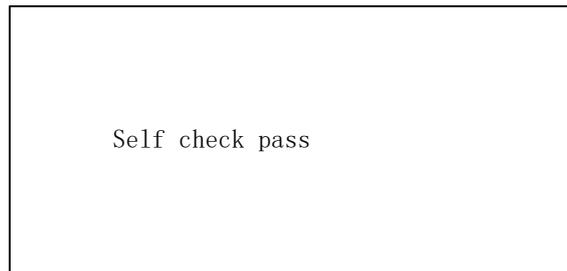


Fig 8.6 Self-check pass

If the self-test is down, there will be the following alarm type:

- DSP Dual ram is error
- ARM Dual RAM is error

When coming across these situations, please power off, reboot after about half minutes. If the situation happened on the machine which has been working for long time, please open the chassis and clean up the dust.

8.6 Date and Time

Press F7 in the system diagnosis interface to set the date and time

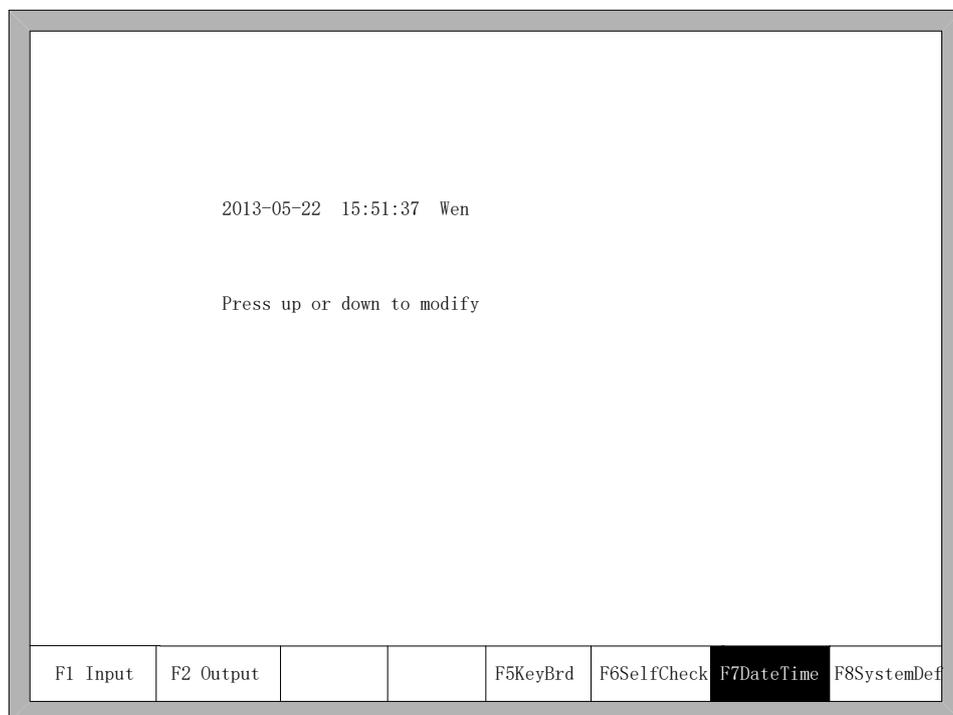


Fig 8.7 System time

Move the cursor to the corresponding date, time or week, press **【↑】** or **【↓】** to adjust the time.

8.7 System Definition

In the system diagnosis interface, press F8 to enter the system custom definition interface, in the interface, you could set the input IO, output IO or system coordinate, also reset or backup the parameters and one key switch between English or Chinese.

8.7.1 Parameter Backup and Restore

Parameter Backup: The process of parameter backup is, in the main interface press **【F5】** (System Diagnosis), **【F8】** (System Definition), **【F2】** (Parameter Backup). The system will need code, after inputting the code “1396”, press **【Enter】**, the system will import the default parameters. In the following process, if the parameters are modified or some of them is broken, reset the parameters.

Warning: after installing and debugging the complete equipment, equipment manufacturer please backup the parameters.

Parameter Reset: The process of reset the parameters is, press **【F5】** (System Diagnosis) in the main interface, **【F8】** (System Definition), **【F1】** (Parameter Reset).

Warning: After resetting successfully, please restart the system.

8.7.2 Input Definition

The controller could change the IO definition, including changing the order of IO number, the type of IO(normally open or closed) according to the user’s need. In the system custom definition interface, press **【F3】** to enter the definition interface, press **【F1】** to enter the input definition interface. As shown in fig 8.8.

definition of input					
	Port	Type		Port	Type
forward limit	02	●	Move up input	09	●
back limit	15	●	Move down input	10	●
left limit	14	●	Move left input	07	●
right limit	01	●	Move right input	08	●
emergency stop	03	●	Acceleration input	16	●
arcing feedback	04	●	Deacceleration input	17	●
Position detect	05	●	Torch up input	18	●
Plasma Collision	06	●	Torch down input	19	●

Port- press PgUp/PgDn Type-press Enter

F1 Input	F2 Output	F3 Axes	F4 Motor	F5 Option		F8 Save
----------	-----------	---------	----------	-----------	--	---------

Fig 8.8 input definition

In the interface press **【↑】**、**【↓】**、**【←】**、**【→】**，move the cursor to the position that needs changing, press **【PgUp】** or **【PgDown】** to change the number of the Input, press **【Enter】** to change the type of the input.

If the external type of input is normally closed, please set the IO type to ●, if the type is normally open, please set the IO type to ●.

8.7.3 Output Definition

The controller could change the IO definition, including changing the order of IO number, the type of IO(normally open or closed) according to the user's need. In the system custom definition interface, press **【F3】** to enter the definition interface, press **【F1】** to enter the input definition interface. As shown in fig 8.9.

definition of output					
	Port	Type		Port	Type
Ignition	01	●	Blow	01	●
Low preheat	01	●	THC enable	01	●
High preheat	01	●	Position detect	01	●
Low Oxygen	01	●	arc starting	01	●
Medium Oxygen	01	●	HoldTorch	01	●
High Oxygen	01	●	Marker Output	01	●
Torch up	01	●	Mix powder	01	●
Torch down	01	●	dust preheat	01	●

Port- press PgUp/PgDn Type-press Enter

F1 Input	F2 Output	F3 Axes	F4 Motor	F5 Option			F8 Save
----------	------------------	---------	----------	-----------	--	--	---------

Fig 8.9 output definition

In the interface press **【↑】**、**【↓】**、**【←】**、**【→】**，move the cursor to the position that needs changing, press **【PgUp】** or **【PgDown】** to change the number of the Output, press **【Enter】** to change the type of the Output.

The output type is open drain transistor output type.

Type ● means that if the output signal is effective, the transistor is on. Type ● means that is the output signal is effective, the transistor is off.

8.7.4 Coordinate Definition

The system could provide IO definition for the user. As shown in Fig 8.10

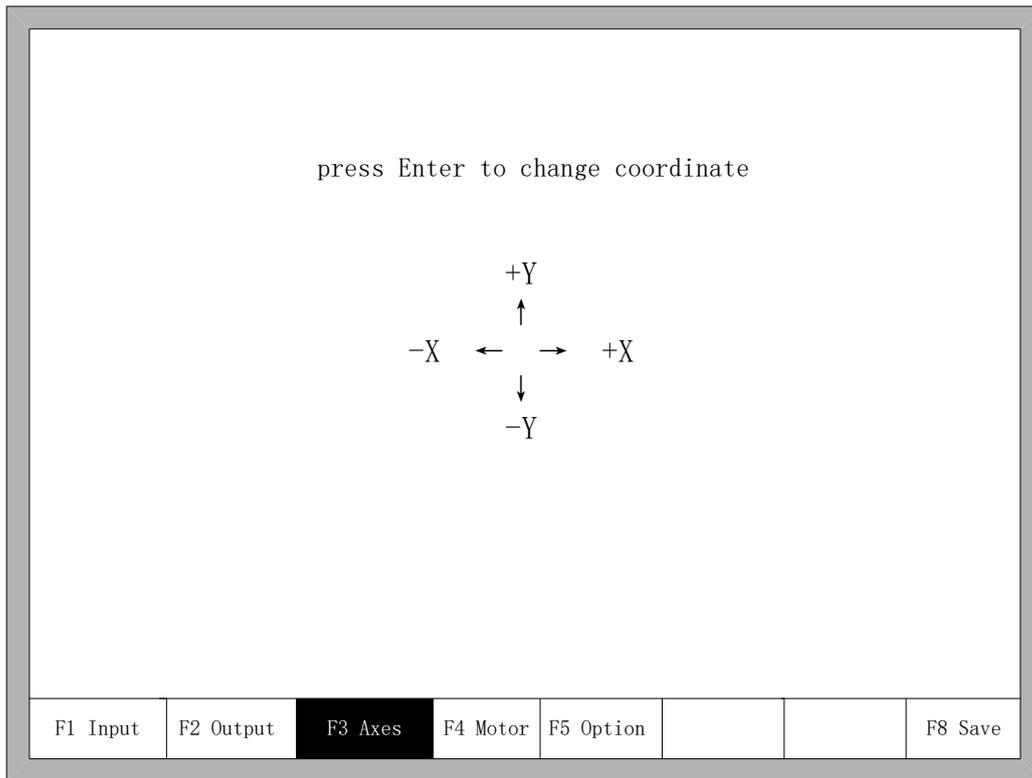


Fig 8.10 Coordinate Definition

In the interface, press Enter repeatedly to change among 8 type of coordinates. Press **【F8】** to save.

8.7.5 Motor



Fig 8.11 Motor direction

Press up or down key, move the cursor █ to the axes of which needs to change motor rotation direction, then press **【Enter】**, the motor direction can switch between positive and reversal.

XY exchange: if this function is “YES”, output pulse of X axis and Y axis exchange each other, in other words, horizontal axis and vertical axis exchange each other.

8.7.6 Option

8.7.6.1 Remote Controller

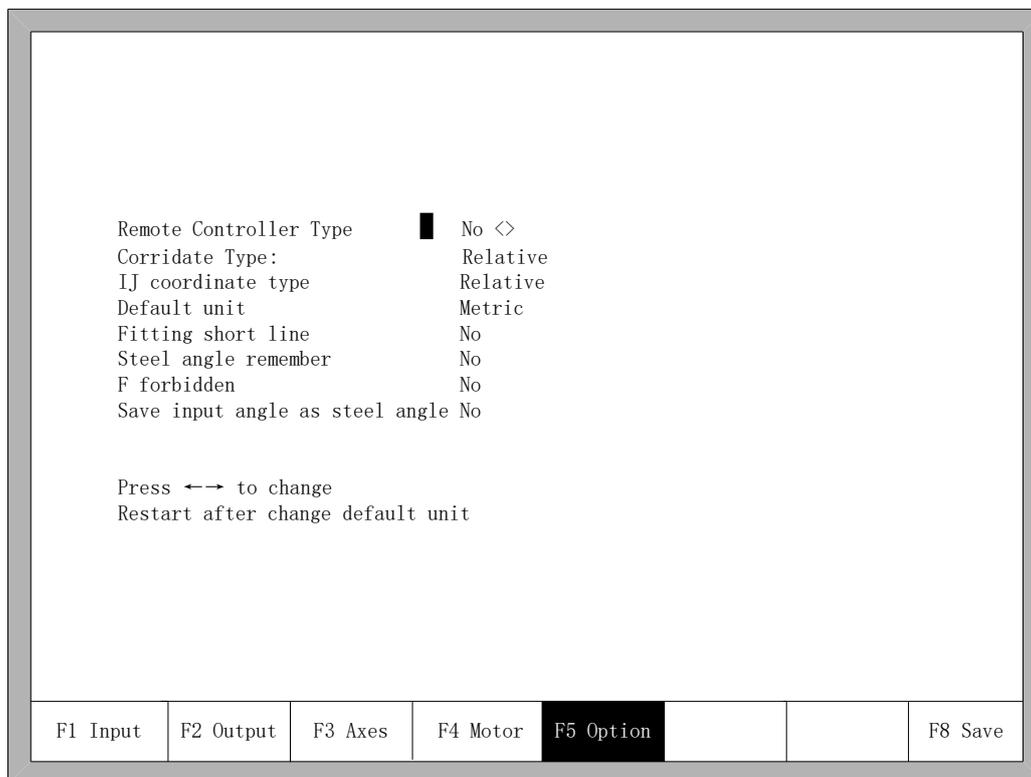


Fig 8.12 Option

Press left or right key in this interface, remote controller's type can be set arbitrarily one of the three types which are NO, P2P, 8421.

- NO type: no input of remote controller.
- P2P type: reference the section 11.1.2 Remote input.
- 8421 type: reference the section 11.1.2 Remote input.

8.7.6.2 Default Coordinate

As the figure 8.12 shows, the default coordinate can be set default relative coordinate or default absolute coordinate. The arc IJ coordinate can also set relative coordinate or absolute coordinate.

8.7.6.3 Default IJ Coordinate

As the figure 8.12 shows, in the G code of G02 or G03, I or J parameter after the

code is relative coordinate or absolute coordinate. Under the general circumstance, the arc's IJ coordinate is relative coordinate, only minority several G code of arc's IJ coordinate is absolute coordinate.

8.7.6.4 Switch between Metric and Inches

As the figure 8.12 shows, default unit can be switched to either the metric or the inches, after switching, the data's units about length are all switched.

8.7.6.5 Short Line Fitting

As the figure 8.12 shows, when short line segments in the G code are too many and continuous shake or shock occurs in the process of machine tool runs, set this parameter "Yes", in the general condition this parameter is set "No".

8.7.6.6 Steel Plate Angle Memory

In the default condition, the angle after steel plate is adjusted has no memory. After this parameter is set "Yes", steel plate angle memory will be automatically stored, until the steel plate is adjust again or the angle is cleared. As the figure 8.12 shows, when short line segments in the G code are too many and continuous shake or shock occurs in the process of machine tool runs, set this parameter "Yes", in the general condition this parameter is set "No".

8.7.6.7 F Instruction Forbidden

When this parameter is "Yes", F instruction after G code which is used for limited rate is ignored.

8.7.6.8 Manual Angle Input to Adjust Steel Plate

When this parameter is "Yes", the manual input angle in the section of 4.3.3 is also steel plate adjusting angle. This angle will be shown in the main interface, if open the function of steel plate angle memory, this angle is also add to the steel plate adjust angle and accordingly saved.

8.7.7 Language Switch

In the main interface, press **【F5 Diagnose】**, then press **【F8 System definition】**, then press **【F6 Language】**, it will select needed language interface.

8.7.8 Add a Language File

From the company get the language pack file and copy it into the USB. Insert the USB into the system USB port. In the main interface, move the cursor to add language file, press **【Enter】**. There will be a introduction appearing to show the result. This system can support most of the national language files, can also be customized language file. Please contact the company demand.

8.7.9 Clear File

In the main interface, press **【F5 Diagnose】**, then press **【F8 System definition】**, then press **【F7 Clear File】**, the system will clear all G code file of system.

8.7.10 System Update

In the main interface, press **【F5 Diagnose】**, then press **【F8 System definition】**, then press **【F8 System update】**, after press **【Enter】** and confirm, it will prompt to update as the figure 8.13 shows.

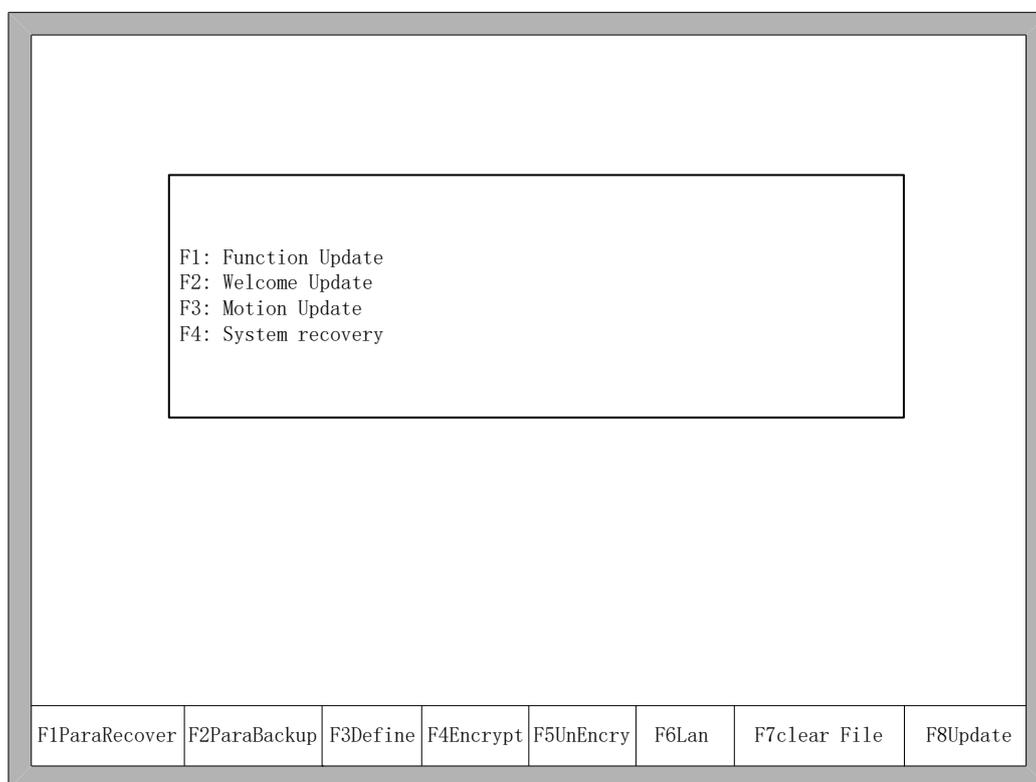


Fig 8.13 the prompt of system update

Function Update: after press **【F1】** , it will update function. The function update file is F2100B.exe or UserApp.exe.

Welcome Update: after press **【F2】** , it will update the welcome interface. This welcome interface is the first shown interface after power on. If you want to find the method of make new welcome interface, please contact with our after-sale service department.

Motion Update: after press **【F3】**, it will update the motion. The motion update file is MOTION.dsp.

System recovery: after press **【F4】** , it will recover the system. At this time, the system is exhaustively recovered back to the status before leaving factory, in other words, the parameters, IO ports configuration, coordinate direction definition and so on are all recovered back to the status before leaving factory. In the general condition, please don't use this function to recover this system.

Chapter 9 Graph Management

In the main interface, press **【F1】** (Shape Lib) to enter graph interface, shown as follows:

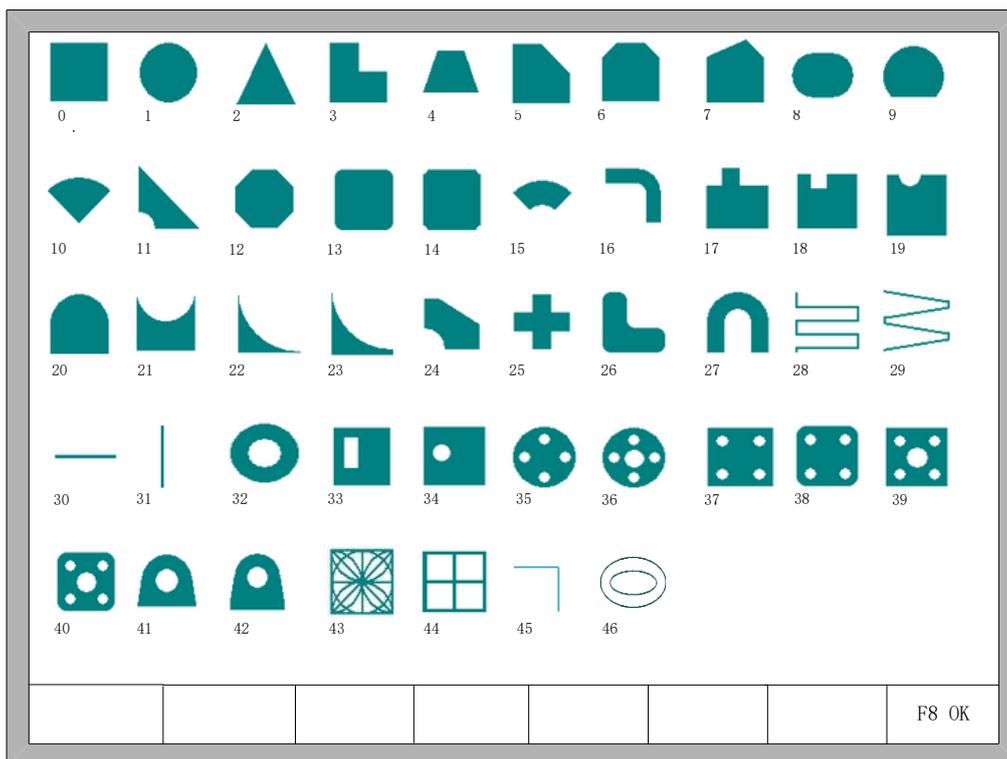


Fig 9.1 Page of graph Library

You can press **【↑】**, **【↓】**, **【←】**, **【→】** to choose different graph.

9.1 Choose Graph

In home interface of graph, move the cursor to the required graph, press **【F8】** to confirm, shown as Fig 9.2:

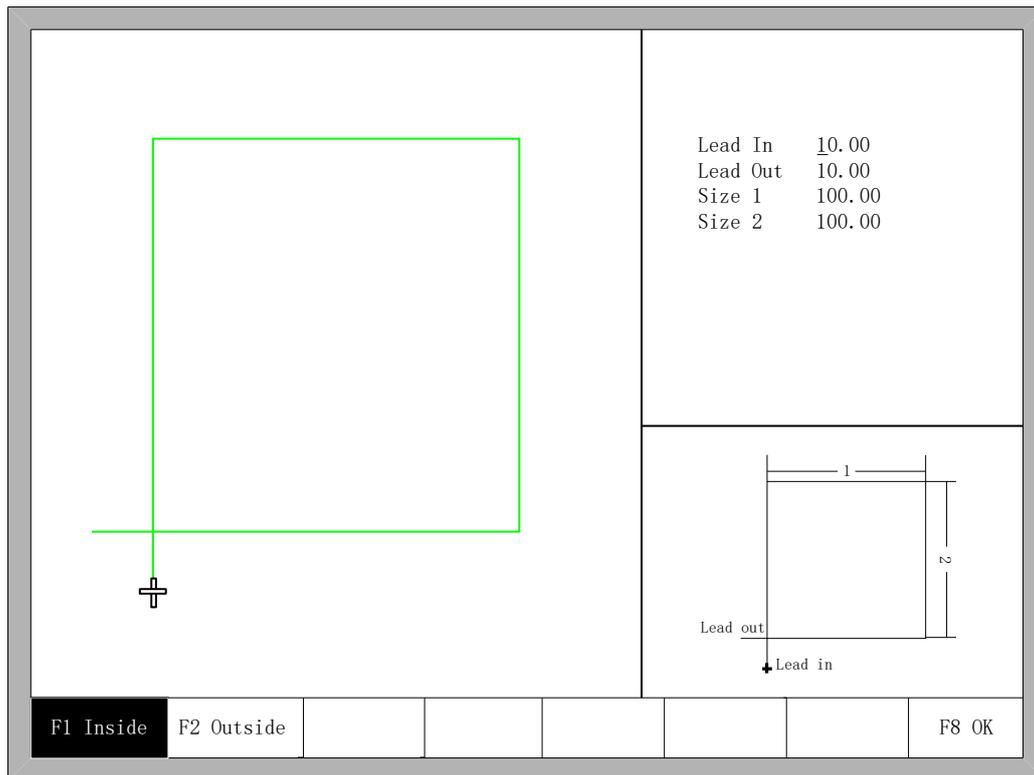


Fig 9.2 Chip size interface

You can press **【↑】**, **【↓】**, **【←】**, **【→】** to modify sizes, after modification, press **【F8】** to confirmed.

Press any key to return to graphics processing interface as shown in Fig3.3.

9.2 Film/Hole Size

In Fig 9.2 interface, you can press **【F2】** to choose hole size, shown as Fig 9.3:

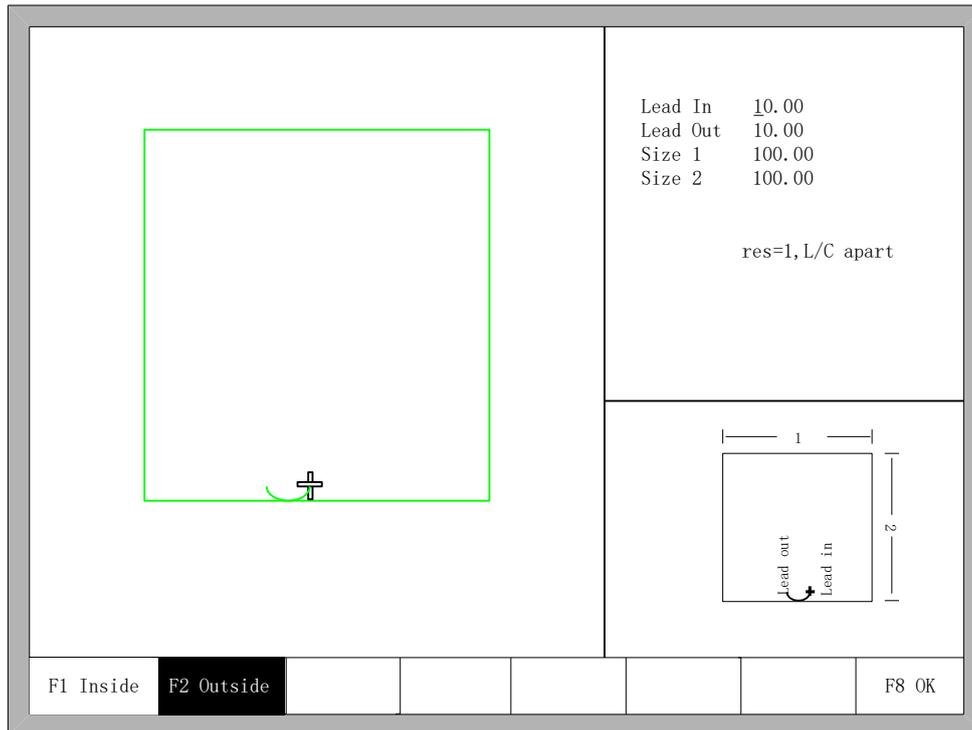


Fig 9.3 Hole size

Modify sizes like modify chip sizes.

After modification, press **【F8】** to confirmed, then enter into the interface of cutting as shown in Fig 3.1.

Note: The graphic after No.29 don't have hole size.

Chapter 10 Code Explanation

10.1 Code Symbol and Interpretation

- In the cutting machine programming, the following programming symbols are generally available, with corresponding parameter following it.

Table 10.1 Programming symbols interpretation

programming symbols	Function interpretation
N	Programming segment number
G	Code for ready
M	Auxiliary function
X	Relative coordinate or absolute coordinate of X axle
Y	Relative coordinate or absolute coordinate of Y axle
U	Relative coordinate of X axle
V	Relative coordinate of Y axle
I	Coordinate d-value of X axle between circle center and arc's start
J	Coordinate d-value of Y axle between circle center and arc's start
R	Arc's radius, when it's positive value, the arc $<180^\circ$; when it's negative value, the arc $>180^\circ$
F	Cutting rate, used for G01, G02, G03

- In the following context, all the symbol “/” is the relationship of OR. For example, X/U represents that the result is either X or U, both of which cannot simultaneously be. N represents parameter value, for example, Xn expresses that n is the following parameter. [] means optional context, which can be selected or not.

10.2 Coordinate System

This system uses right-hand Descartes coordinate system acquiescently, as the figure 10.1 shows.

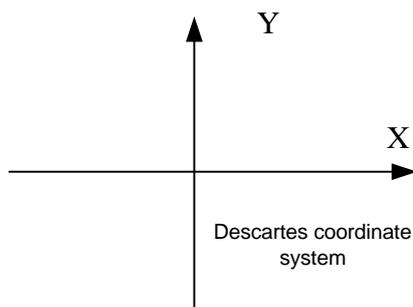


Fig 10.1 Descartes coordinate system

Of course, the system also can be defined coordinate system by user, referencing “8.7.4 Coordinate definition”.

10.3 G Code Explanation

The G code which this system supports for is shown as the table 10.2.

Table 10.2 Common G code table

G99	Parameter: X/U Y/V I J	Part option parameter
G92	Parameter: X Y	Reference point setting
G91 / G90	No parameter	Relative/Absolute coordinate
G20 / G21	No parameter	Inches/metric
G41 / G42	No parameter	Left/right Kerf compensation
G40	No parameter	Cancel Kerf compensation
G00	Parameter: X/U Y/V	straight line rapid moving tool
G01	Parameter: X/U Y/V	Straight line cutting
G02	Parameter: X/U Y/V I J	Clockwise arc cutting
G03	Parameter: X/U Y/V I J	Anticlockwise arc cutting

1. G92 Reference point setting

Format:

G92 **【Xn】 【Yn】**

Parameters meaning:

【Xn】 【Yn】 expresses absolute coordinate of reference point to be set and is also absolute coordinate of which machine tool goes back to. If no parameter after G92, the default reference point coordinate is (0, 0). Generally, while machine tool is taking (0,0) as reference point, this code can be ignored.

Note:

After input this code, coordinate of reference point to be set by G92 can be saved automatically. Before new cutting code hasn't been inputted, the coordinate of this reference point is always available, whether system is power off or not. After input a new cutting code, if new code has G92 instruction, the coordinate of this reference point is the context after G92, if no G92, the reference point is default (0, 0). In one code file, G92 only appears once.

Example:

a. G92 X0 Y0

Take (0,0) as reference coordinate, when press "go back" function key, the machine tool goes back to coordinate point (0, 0).

b. G92 X20 Y0

Take (20,0) as reference coordinate, when press "go back" function key, the machine tool goes back to coordinate point (20,0).

2. G90/G91

Format:

G90/G91

G90: absolute coordinate. X/Y in the code means absolute coordinate value; U and V mean relative coordinate value.

G91: relative coordinate. X/Y in the code means relative coordinate value; U and V also mean relative coordinate value.

Example:

a. G90 usage

```
G92 X0 Y0 // Reference point (0,0)
G90 // Absolute coordinate
G00 X20 Y0 // Rapidly moving tool to (20,0)
M07 // Cutting device on
G01 X120 Y100 //Cutting to (120,100)
M08 //Cutting device off
M02 // End of program
```

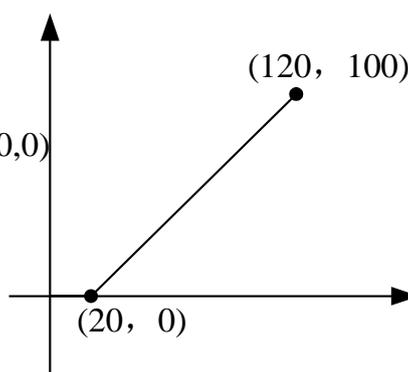


Fig 10.2 G90 usage

b. G91 usage

```

G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X20 Y0 //Rapidly moving gun to (20,0)
M07 //Cutting device on
G01 X120 Y100 //Cutting to(140,100)
M08 //Cutting device off
M02 // End of program

```

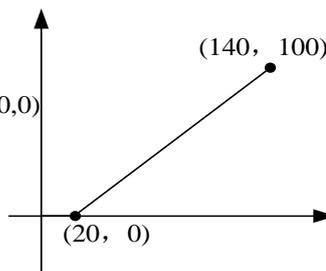


Fig 10.3 G91 usage

3. G20/G21

Format:

G20/G21

G20: inches unit. All of X, Y, I, J, R, U, V after G20 are inches unit.

G21: metric unit. All of X, Y, I, J, R, U, V after G21 are metric unit.

Note:

If no G20/G21 in the code, take the metric as data's unit.

The conversion formula of inches and metric: 1 inches \approx 25.4mm。

4. G00 Traverse rapidly

This instruction expresses that rapidly traverse to specific location, which the system will rapidly move to at the rate of “G00 move speed* time ratio” from start point.

Format:

G00 X/Un Y/Vn 【Fn】

Parameters meaning:

- Fn – rapidly moving to specific location at the limited rate;
- Un – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);
- Vn – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);
(In the relative coordinate system):
- Xn – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);
- Yn – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);
(In the absolute coordinate system):
- Xn – displacement of endpoint's X coordinate relative to working start point,

unit(mm);

- Y_n – displacement of endpoint's Y coordinate relative to working start point, unit(mm);

Example:

```
G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X100 Y100 //rapidly moving tool to (100,100)
M02
```

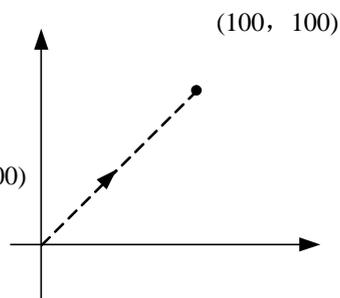


Fig 10.4 G00 usage

5. G01 Linear Interpolation(at cut speed)

This instruction expresses that linearly incise to specific location, which the system will cut to at the rate of “incise speed* time ratio” from start point of current segment.

Format:

G01 X/ U_n Y/ V_n 【 F_n 】

Parameters meaning:

The same to the meaning of G00 code, the difference of them is only that G00 expresses linearly walking(meaning: output ports are all closed), but G01 expresses linearly incising.

6. G02 Clockwise Circular Interpolation

This instruction expresses that incise clockwise arc (clockwise interpolation) to specific location, which the system will cut to at the rate of “incise speed* time ratio” from start point of current segment.

Format:

G02 X/ U_n Y/ V_n I_n J_n 【 F_n 】 or G02 X/ U_n Y/ V_n R[-] n 【 F_n 】

Parameters meaning:

- F_n – incise at limited rate;
- U_n – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);
- V_n – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);
- I_n – displacement of circle centre's X coordinate relative to start point of current segment, unit(mm);

- J_n – displacement of circle centre's Y coordinate relative to start point of current segment, unit(mm);
- $R[-]n$ – the radius of arc, when the angle of arc $\leq 180^\circ$, R is positive. Otherwise, it's negative, unit(mm);
(In the relative coordinate system):
- X_n – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);
- Y_n – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);
(In the absolute coordinate system):
- X_n – displacement of endpoint's X coordinate relative to working start point, unit(mm);
- Y_n – displacement of endpoint's Y coordinate relative to working start point, unit(mm);

Example:

```

Example 1: B->A
G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X60 Y100 //Rapidly move tool to B
G02 X-40 Y-40 I0 J-40 //The arc 1
//(G02 X-40 Y-40 R-40)
M02
Example 2: A->B
G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X20 Y60 //Rapidly move tool to A
G02 X40 Y40 I40 J0 //The arc 2
//(G02 X40 Y40 R40)
M02

```

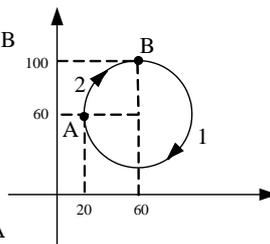


Fig 10.5 G02 usage

7. G03 Counterclockwise Circular Interpolation

The same as G02. The difference is that G02 is clockwise circular(clockwise arc), but G03 is counterclockwise circular(counterclockwise arc).

8. G40/G41/G42 Kerf Compensation

These functions are used for kerf compensation. Because flame incision and plasma incision both finally have the existence of kerf when incise route expressed by code is only actual size of work piece, the actual incision work piece without regard to the effect of kerf isn't needed size. After set the kerf compensation, the system will automatically work out the effect of kerf and incise work piece with actual size.

G41/G42 must match with G40 to be used. If G41/G42 is ignored, the default kerf compensation is zero; if G40 is ignored, kerf compensation is available.

Format:

```
G41 //Enable Left Kerf Compensation
..... // incision code
G40 //Disable Left Kerf Compensation
G42 // Enable Right Kerf Compensation
..... // incision code
G40 // Disable Right Kerf Compensation
```

Example:

```
( Convex Roof Trapezoid w/Hole )
G21                               /* metric unit */
G91                               /* relative coordinate */
G99 X1 Y0 I0 J0 /*proportion factor is 1, rotate angle is 0, no mirror image*/
G00 X44.45 Y41.275 /* Rapidly moving to (44.45, 41.275)*/
G41                               /* Left Kerf Compensation */
M07                               /* Incision beginning*/
G03 X0 Y0 I19.05 J0 /*Counterclockwise Circular Interpolation */
M08                               /* Incision ending */
G40                               /* Disable Left Kerf Compensation */
G00 X-44.45 Y-41.275 /* Rapidly moving to (-44.45, -41.275) */
G41                               /* Right Kerf Compensation */
M07                               /* Incision beginning */
G01 X25.779438 Y58.031634 /*Linear Interpolation */
G02 X75.441125 Y0 I37.720562 J-16.756634 /* Clockwise Circular Incision*/
G01 X25.779438 Y-58.031634 /* Linear Interpolation */
G01 X-127 Y0 /* Linear Interpolation */
M08                               /* Incision ending */
G40                               /* Disable Right Kerf Compensation */
M02                               /* End of program */
```

Note:

The value of Kerf Compensation should be half of actual kerf width.

9. G99 proportion、rotate、image

Format:

```
G99 Xn Yn In Jn
```

Parameters meaning:

- X – proportion factor, can be set from 0.001 to 1000.

- Y – rotate angle, can be set from -360° to 360° .
- I – image of X axis, make image along X axis, 1 expresses that there is image, 0 expresses that there is no image.
- J –image of Y axis, make image along Y axis, 1 expresses that there is image, 0 expresses that there is no image.

Note:

A code can have G99, also cannot. If there is G99, the parameter X, Y, I, J after code should not be ignored. Mirror image and rotation will take the origin (0, 0) of Descartes coordinate as reference point.

10. Program notice items

- The program must contain the instruction of G92 (reference point setting) and M02(end of program).
- G41/G42 must match with G40 to be used. If G41/G42 is ignored, the default kerf compensation is zero; if G40 is ignored, kerf compensation is available.
- If G20 / G21 is ignored, the system will execute G21 (metric unit).
- If G90 / G91 is ignored, the system will execute G91 (relative coordinate).
- M07 and M08 can't be neglected.
- When there is one parameter in the code of G00、 G01、 G02、 G03 is ignored, if this parameter is absolute coordinate, the system will set it G code coordinate value of last row; If it's relative coordinate, the system will set it 0.
- G00、 G01、 G02、 G03 can be simplified: G0、 G1、 G2、 G3.
- If there is contiguous G00 (or G01、 G02、 G03) around, the following G00 (or G01、 G02、 G03) can be ignored.

10.4 M Code Explanation

Table 10.3 Common M code

M07	No parameter	Cutting device on
M08	No parameter	Cutting device off
M00	No parameter	End of instruction
M02/M30	No parameter	End of program

- M07 Cutting device on

Please refer to Appendix 2 I/O Timing Sequence Figure of F2000 Series Numerical Control System.

- M08 Cutting device off

Please refer to Appendix 2 I/O Timing Sequence Figure of F2000 Series Numerical

Control System.

- M00 End of instruction

In the processing of incision, the system will stop the machine tool with the M00 instruction, waiting for the next operation.

- M02/M30 End of program

Chapter 11 Port Explanation

11.1 Input Port

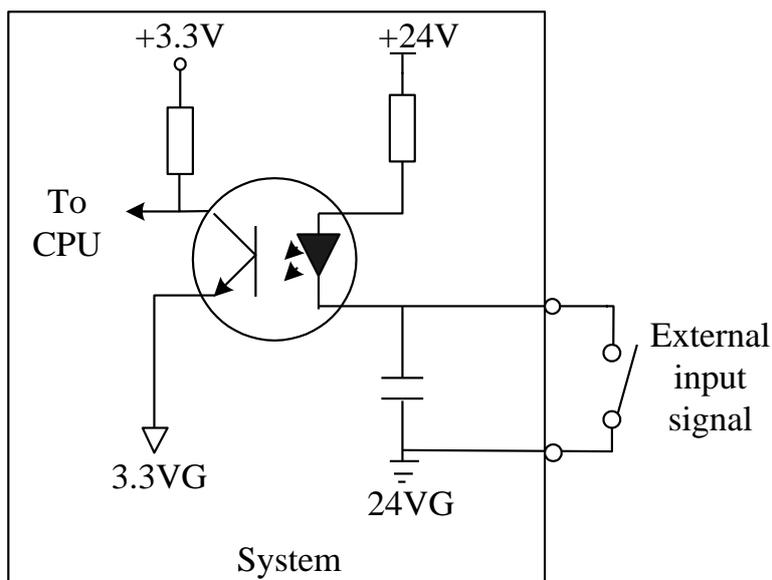


Fig11.1 input port circuit

- Input signal is a mechanical contact switch, normally open type and closed type are all supported, it is effective when it is connected to 24VG, and it is ineffective when it is float or connected to 24V. Com-port of switch outside is connected 24VG. The other port is connected to corresponding IO port.
- 16 channel input ports totally
- Input signal definition

Table 11.1 Input port definition

Pin number	Signal name	remark
1	X+ limit	X+ stop input, float it if not use, this is horizontal
14	X- limit	X- stop input, float it if not use, this is horizontal
2	Y+ limit	Y+ stop input, float it if not use, this is vertical
15	Y- limit	Y- stop input, float it if not use, this is vertical

3	Emergency stop	Emergency stop input, float if not use
4	Arcing successfully	
5	Positioning successfully	
6	Plasma collision	
7	Move left/C	Remote control input
8	Move right/D	Remote control input
9	Move forward/A	Remote control input
10	Move backward/B	Remote control input
11,20-23	Spare	
12,24	+24V	+24V/3A Power output
13,25	24VG	+24V Ground
16	Firing	Remote control input
17	Oxygen cutting	Remote control input
18	Cutting torch up	Remote control input
19	Cutting torch down	Remote control input

11.1.1 Input Wiring Instructions

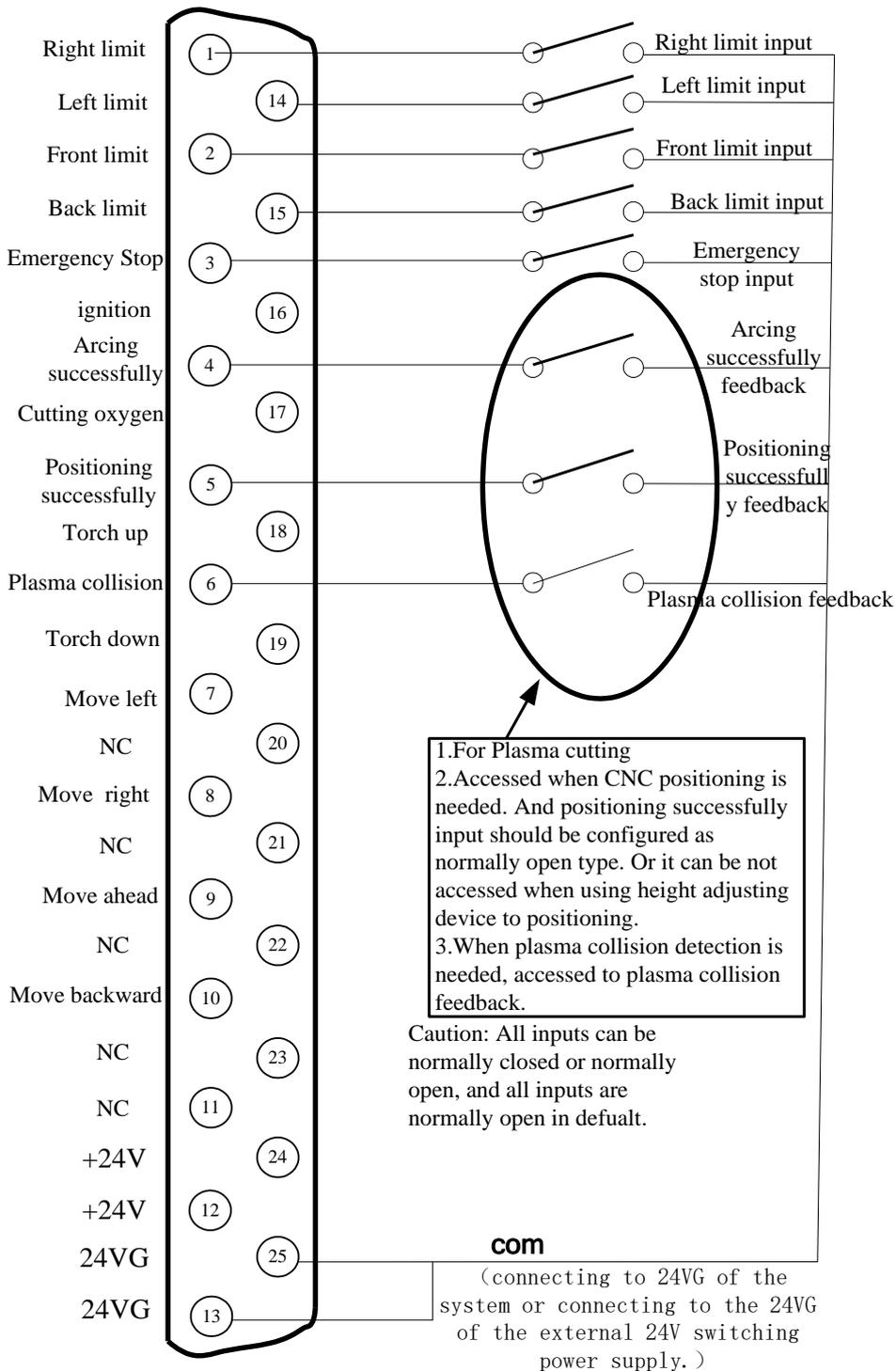


Fig 11.2 External input wiring

11.1.2 Remote Controller Input

The system supports two external remote control input, one for line input type, the other for 8421 encoded input type.

➤ Line Input Type

The pin 7, 8, 9, 10 of input port represents left, right, forward, backward, when inputting valid signal, the machine can move toward the corresponding direction, when the input signal is invalid, the machine stop moving.

When the input signal of pin 16 is valid, the system will ignite the torch, the ignition time is the setting value in system parameters, please take the reference of part of "ignition time" in "7.2 oxygen gas parameters".

When the input signal of pin 17 is valid, the system will turn on or off the cutting oxygen. When the cutting oxygen is on, the system cut off the oxygen, when the cutting oxygen is off, open the cutting oxygen system.

When the input signal of pin 18 is valid, the system will raise the cutting torch, when the signal invalid, the torch stops.

When the input signal of pin 19 is valid, the torch goes down, when the signal invalid, the cutting torch stops.

The external switches of line input are designed by the user..

➤ 8421(BCD) code input

Input pin 9, 10, 7, 8 is the A, B, C, D bits of the 8421 code. Functions are shown in Table 11.2

Table 11.2 Function of 8421 code input

Decimal	8421 code(DCBA)	Function
0	0000	No Input
1	0001	Turn on or off the cutting oxygen
2	0010	Go back according to the original track
3	0011	Move forward according to the original track
4	0100	Left lateral movement
5	0101	Ignite Input
6	0110	Start
7	0111	Slow down
8	1000	Accelerate
9	1001	Move for the negative direction vertically
10	1010	Move forward vertically
11	1011	Pause
12	1100	cutting torch

13	1101	raise the cutting torch
14	1110	Move toward right horizontally
15	1111	Start

8421-type remote control input is designed by the user; the user can also use the company's wireless remote control module.

11.2 Output Port

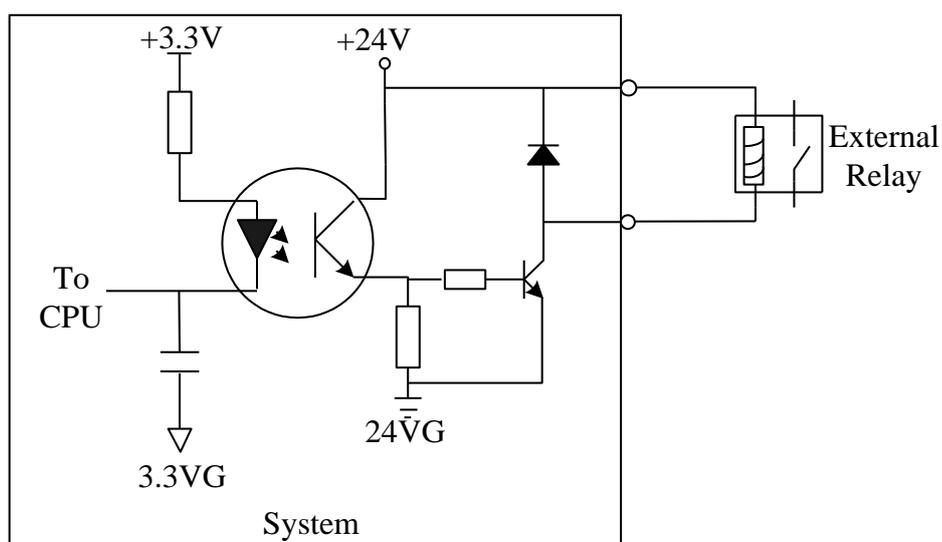


Fig11.3 output port circuit

- Output voltage is 24VDC, low level is effective;
- Maximum output current $I_{\max} = 300mA$;
- 16 output ports total

Table 11.3 Output port definition

25 interface Pins No.(Main connector)	Signal	Remark
3	Ignite	
1	Low pressure preheat	
17	High pressure preheat	
4	Low pressure cutting oxygen	
5	Medium pressure cutting	

	oxygen	
14	High pressure cutting oxygen	
2	Torch up	
15	Torch down	
6	Exhaust	
8	Enable high adjusting box	
19	Plasma locating	
16	Plasma arc starting	
18	Corner low-speed output Or automatic / manual	
7	Spray dust	
20	Raise dust	
21	Dusting Preheat	
9, 10, 22, 23	Not used	
11,12,24	+24V	+24V/3Aoutput
13,25	24VG	+24Vground

11.2.1 Output Wiring Instructions

11.2.1.1 Oxygen Gas Typical Connection

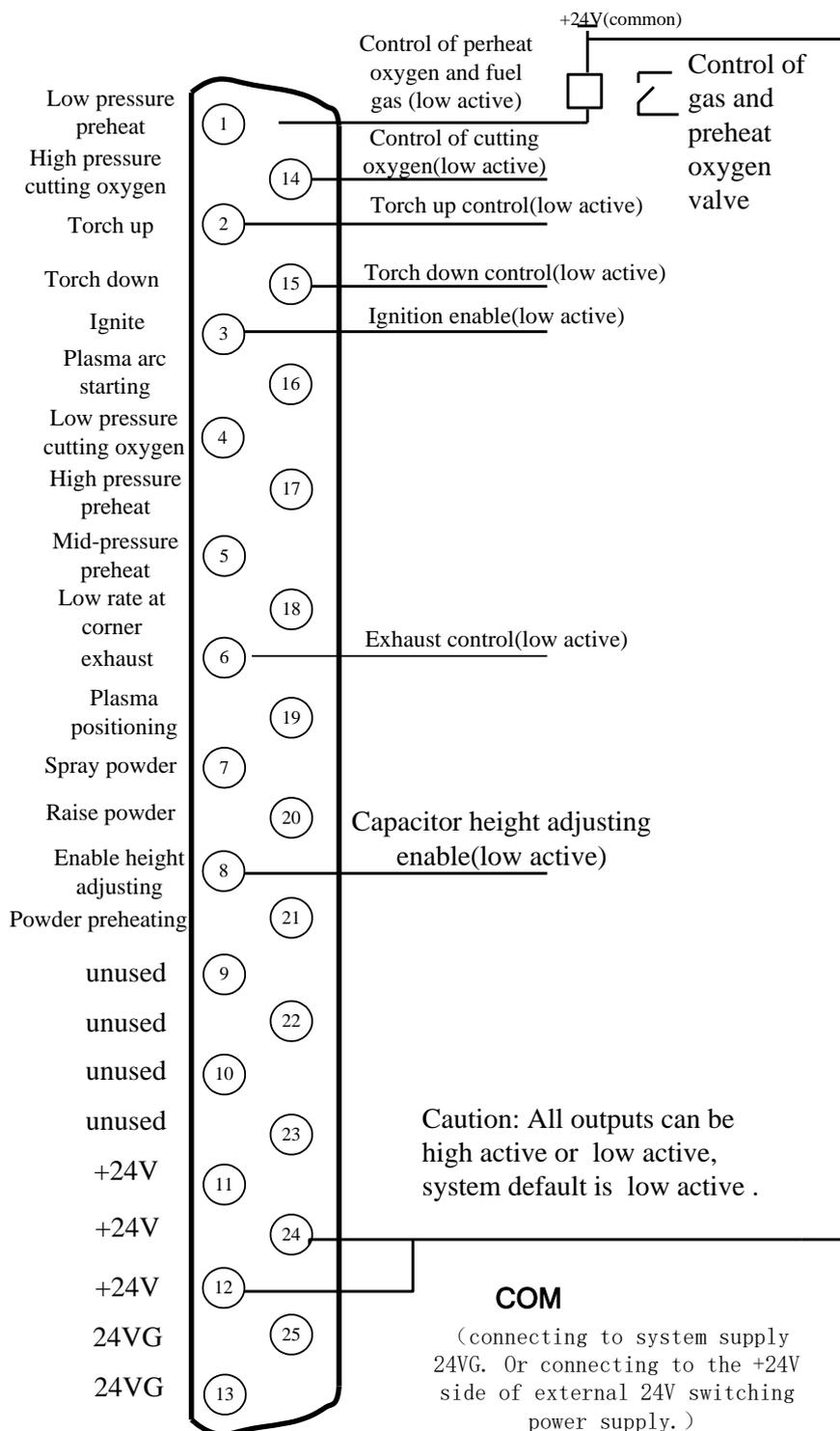


Fig 11.4 Oxygen gas typical connection

11.2.1.2 Three Level Perforation Circuit

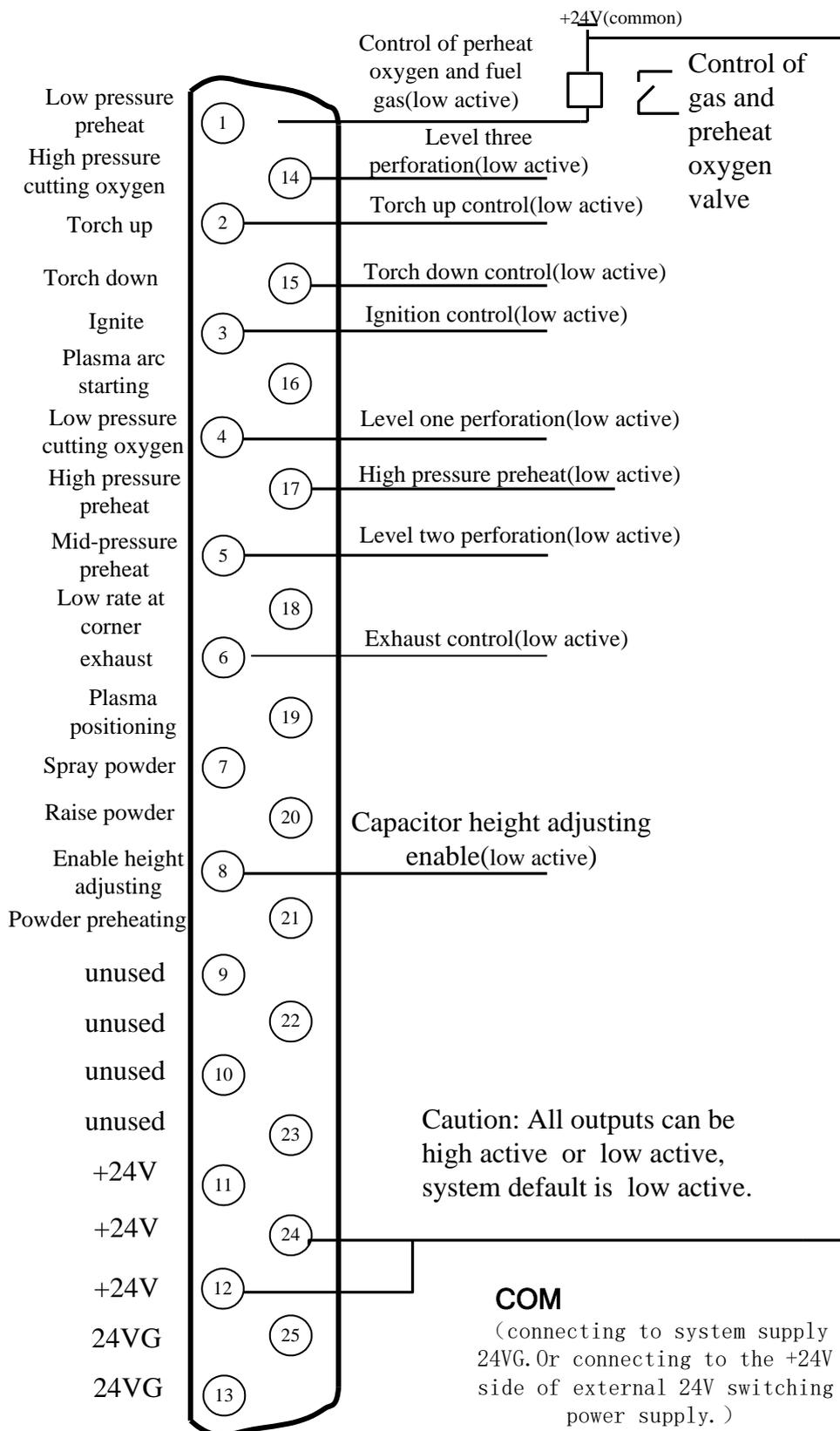


Fig 11.5 Three level perforation circuit

11.2.1.3 Typical Circuit of Using Powder

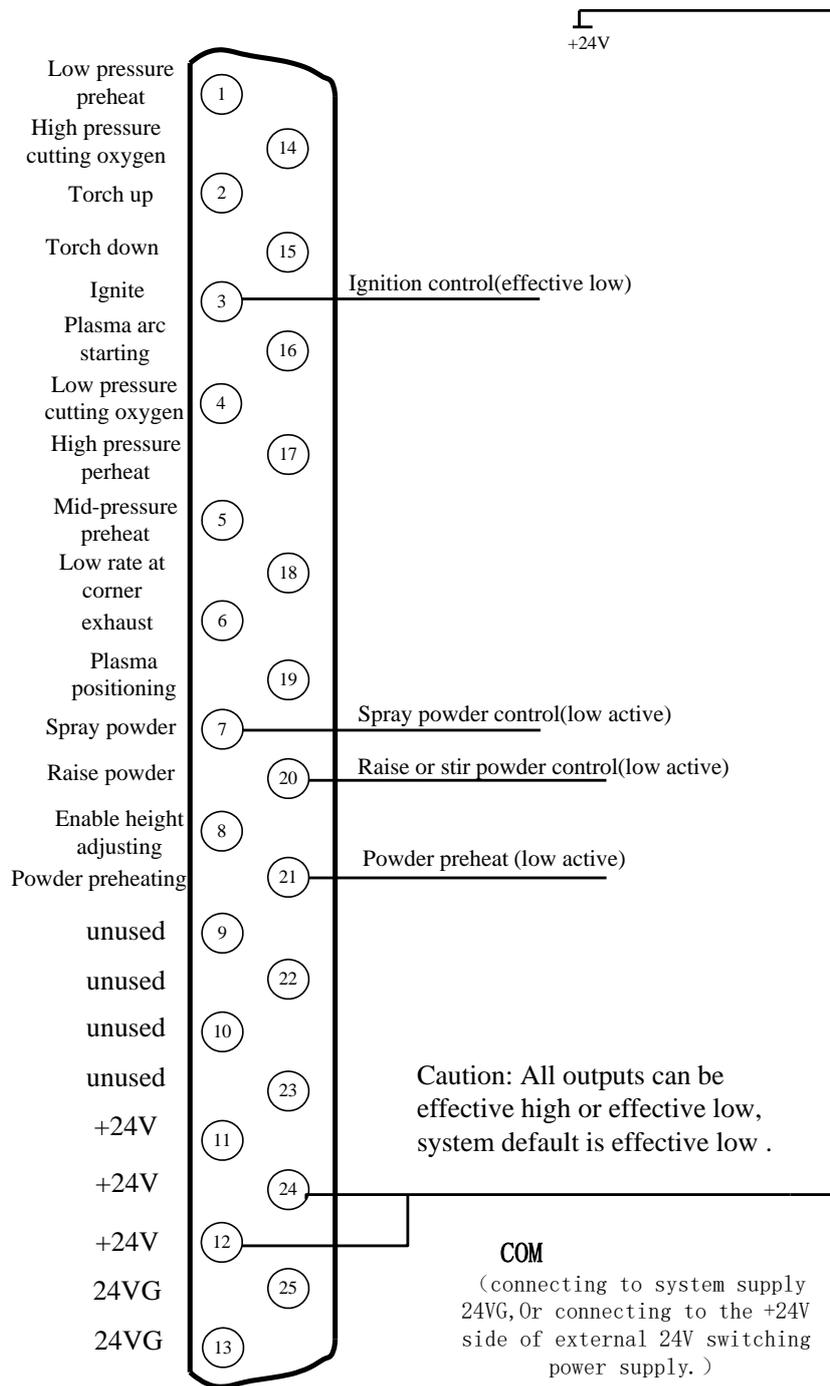


Fig 11.6 powder typical connection

11.2.1.4 Typical Circuit of Using Plasma Cutting

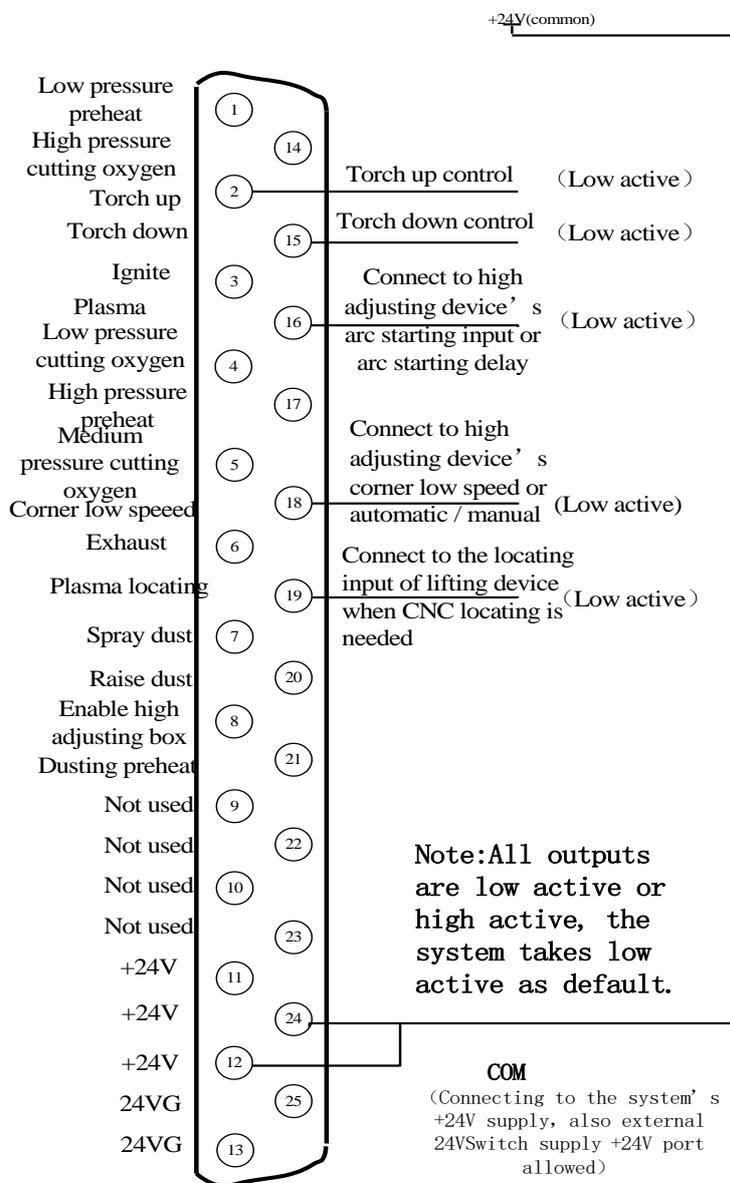


Fig 11.7 Typical wiring diagram of the plasma

Instruction:

➤ **Height-adjusting device wiring with corner low-speed**

When the height-adjusting device takes corner low-speed input control signal, the system's "corner low speed" output signal is used to control the height-adjusting device's corner low-speed input. The system takes an open-collector transistor output, with the default active low signal. Reference section 8.7.3, set the output port type of close THC (corner signal) “●”. CNC system needs to output low electrical lever signal with this

THC during decreasing rate and this signal should be broken off at normal cutting time.

➤ **Height-adjusting device wiring with automatic / manual**

When the height-adjusting device takes automatic / manual control function instead of corner low-speed input, the system needs to use the "corner low-speed" output to control the height-adjusting device's automatic / manual signal. The system takes an open-collector transistor output, with the default active low signal. Meanwhile, it needs to change the type of corner low speed from normally-open to normally-closed in the output port configuration interface (Section 8.7.3), i.e. from "●" to "●". CNC system needs to break off this signal with this THC during decreasing rate and this signal should output low electrical level at normal cutting time.

➤ **Using height-adjusting device locating**

When using the locating function of the height-adjusting device, the locating function of numerical control should be closed. The approach is to change the input type of successful locating from normally-open to normally-closed in the input port configuration interface (Section 8.7.2), i.e. from "●" to "●". There are two types of locating:

The first: locating controlled by the plasma arc starting. CNC emits the plasma arc starting, the height-adjusting device starts arc after locating, and sends signal of arc starting successful feedback to CNC after starting arc successfully. After CNC system has received signal of arc starting successful feedback, it will begin to incise immediately. Such devices available in the market include AngTai, HongYuDa, HaiSi and other brands. Such devices can connect the "plasma arc starting" output of CNC system to the "starting arc with locating" input of the height-adjusting devices, and at the same time in the plasma parameters (refer to section 7.3 plasma parameters) set the arc detecting time to the value that allows for completing the testing and starting arc.

The second: finish position from the decline of the cutting torch . Before issuing the command of starting arc, first issue the command of declining the height adjust device, then issue the command of starting arc. These kind of height adjust devices could be SiDaTe, HongYuDa in markets. When using these kind of height adjusting device, transfer to the interface of plasma parameters (refer to section 7.3 plasma parameters), set the location detecting time as the time of location of touch.

➤ **Using CNC system locating**

When using the location function of digital control system, firstly enter into the input configuration interface, set the input type of successful location from normally closed to normally open type, i.e. from "●" to "●". At the same time, return the signal of successful location to the input port of the successful location of the digital controller. In

the plasma parameter interface (refer to section 7.3 plasma parameters), set the location detecting time and locating up time to needed values.

11.3 Motor Port

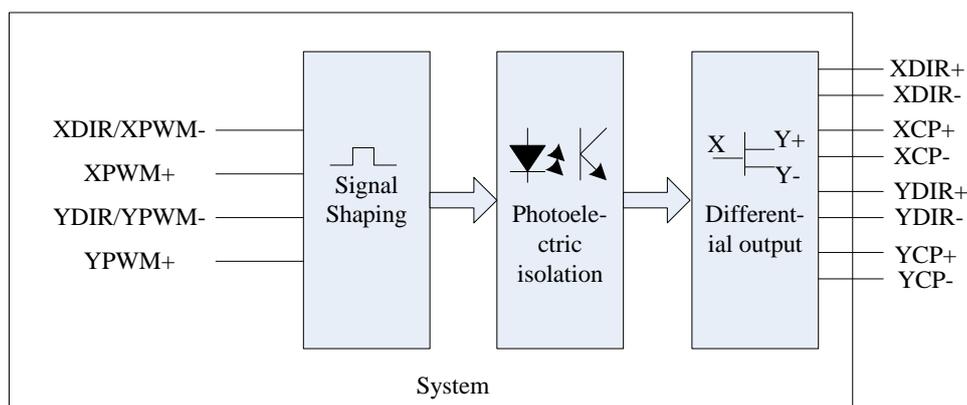


Fig11.8 motor port schematic diagram

- Signal definition table

Number of the 15 pin interface	signal	Remarks
1	XDIR+	Positive at the horizontal axis
9	XDIR-	Negative at the horizontal axis
2	XCP+	Positive pulse at the horizontal axis
10	XCP-	Negative pulse at the horizontal axis
3	YDIR+	Positive at the vertical axis
11	YDIR-	Negative at the vertical axis
4	YCP+	Positive pulse at the vertical axis
12	YCP-	Negative pulse at the vertical axis
5,13,6,14		Not used
7	+5V	+5V/500mA Power output
15,8	5VG	5V Power Ground

11.3.1 Typical Wiring Diagram of the Motor Interfaces

11.3.1.1 Connection Methods for Differential Stepper Driver

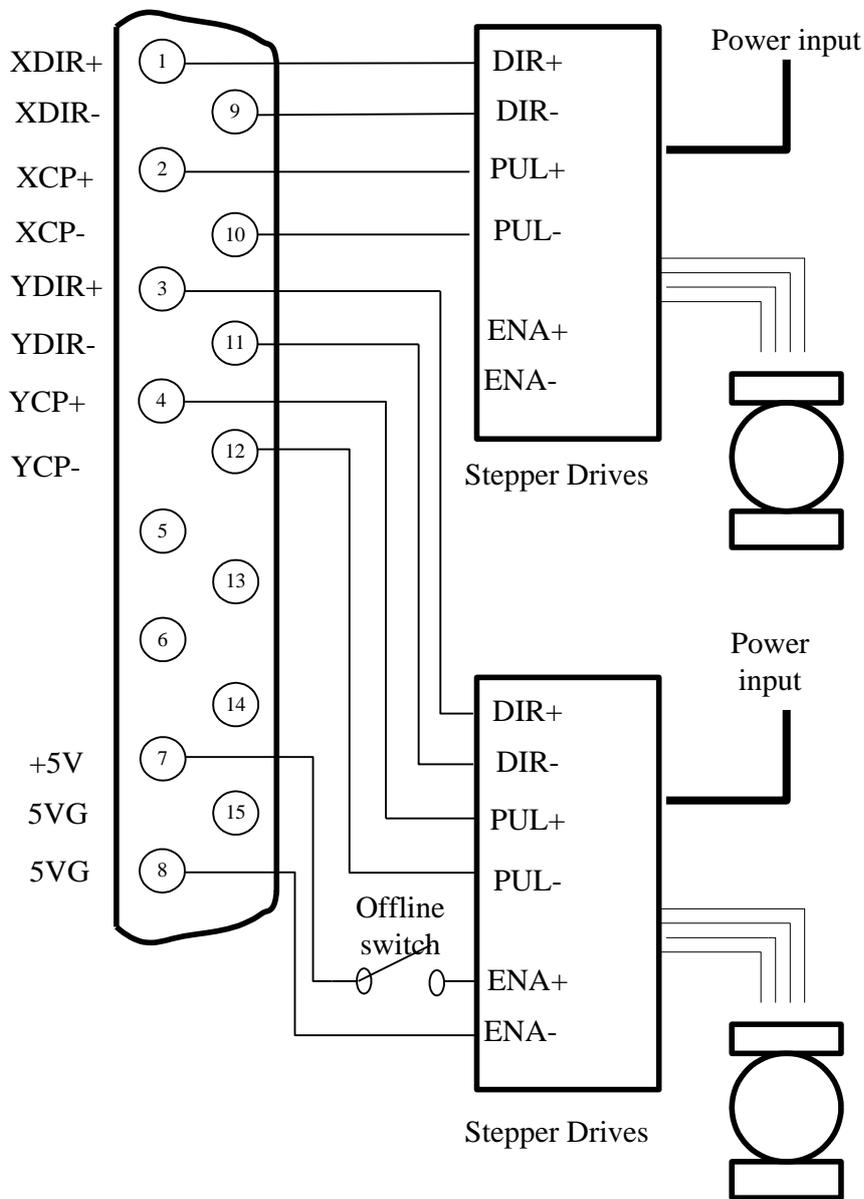


Fig 11.9 connection methods for differential stepper driver

11.3.1.2 Com-anode Connection Methods for Stepper Driver

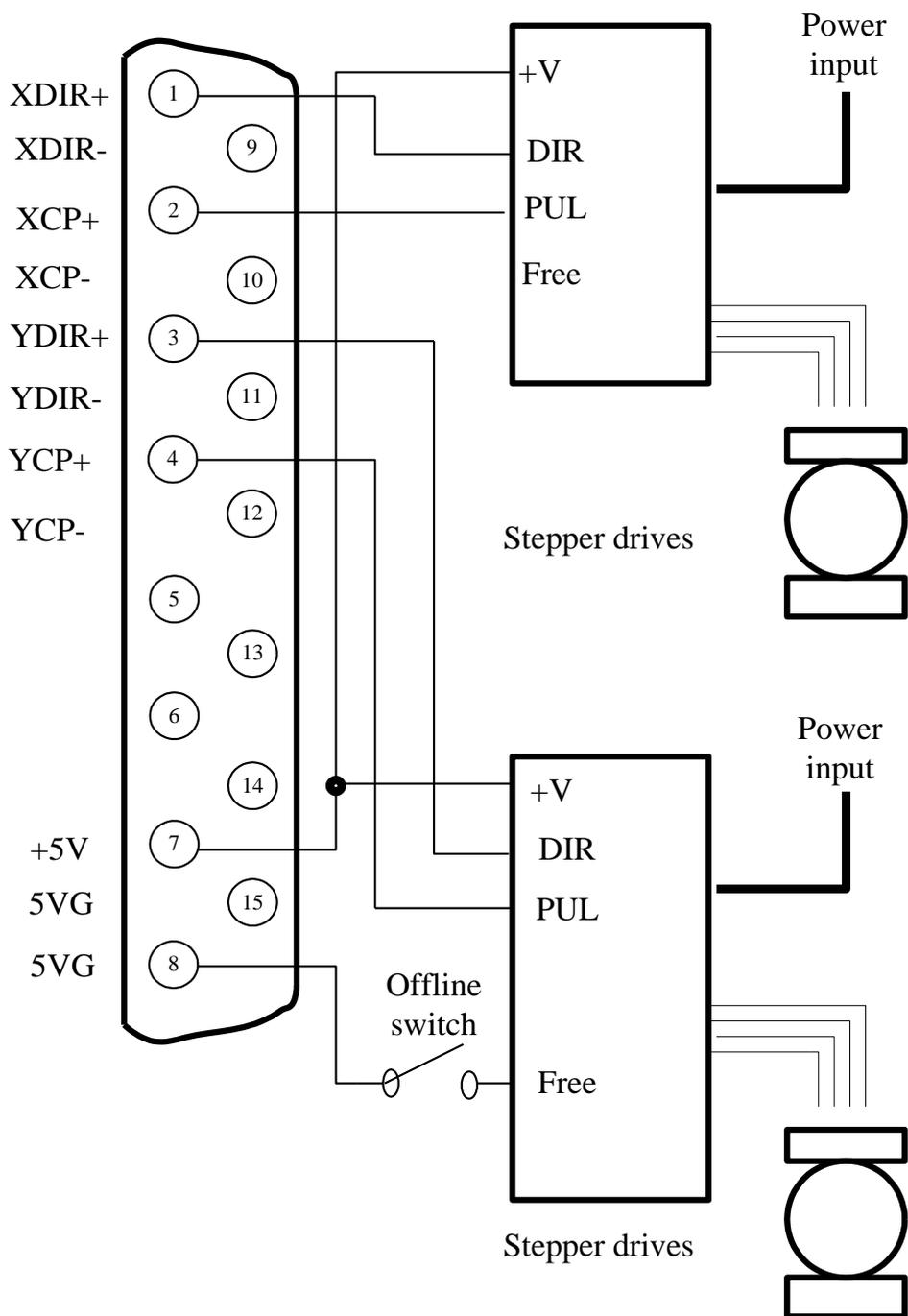


Figure 11.10 com-anode connection methods for stepper driver

11.3.1.3 Connection Methods of Servo Driver of Panasonic Company

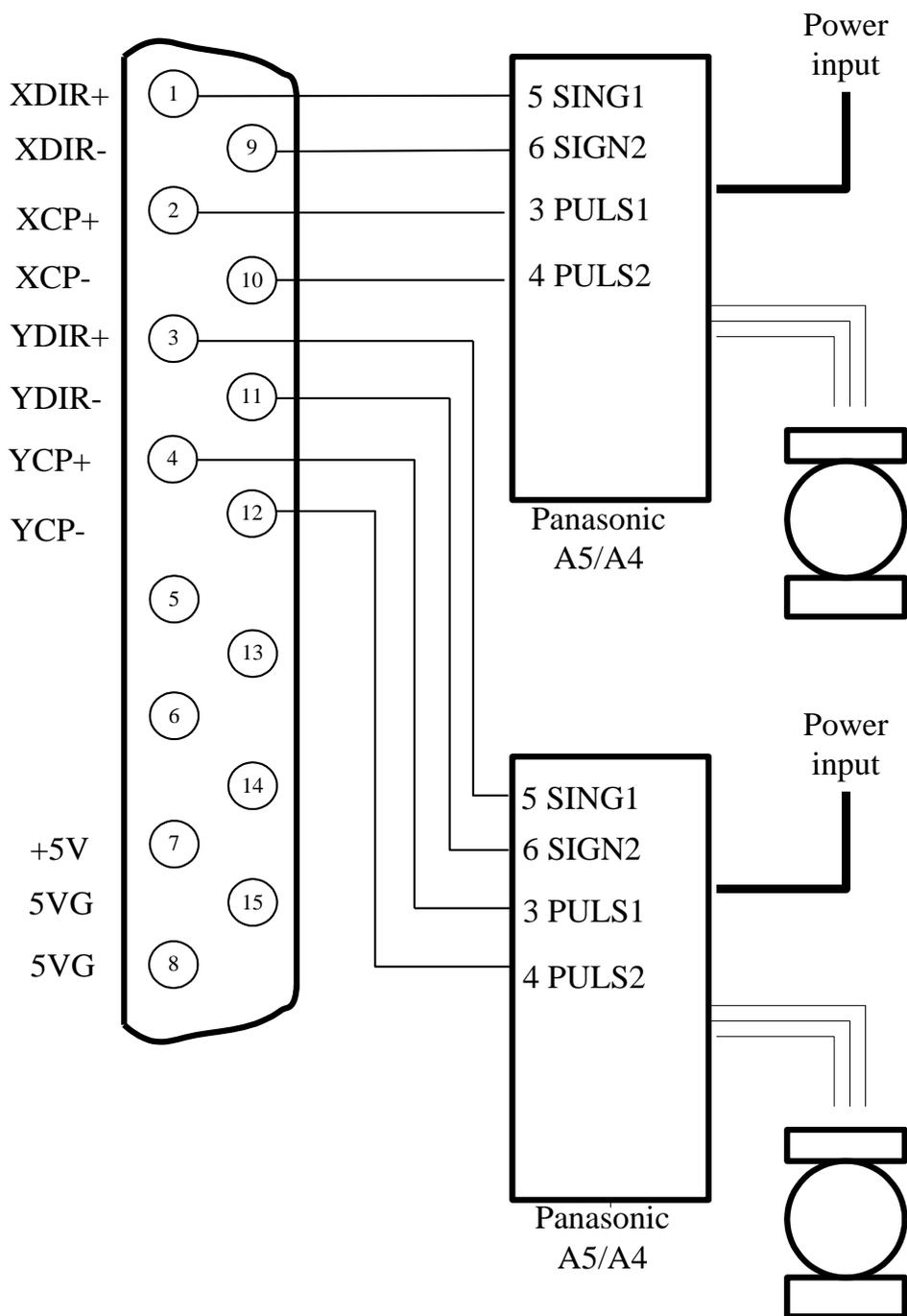


Figure 11.11 Connection methods of Servo driver of Panasonic Company

11.4 Arc THC Module Interface (THC) (suffixed with “T”)

Compare to F2000 series CNC system, F2000T CNC system adds the ports of arc

THC as the red frame area in following figure based on the original system.

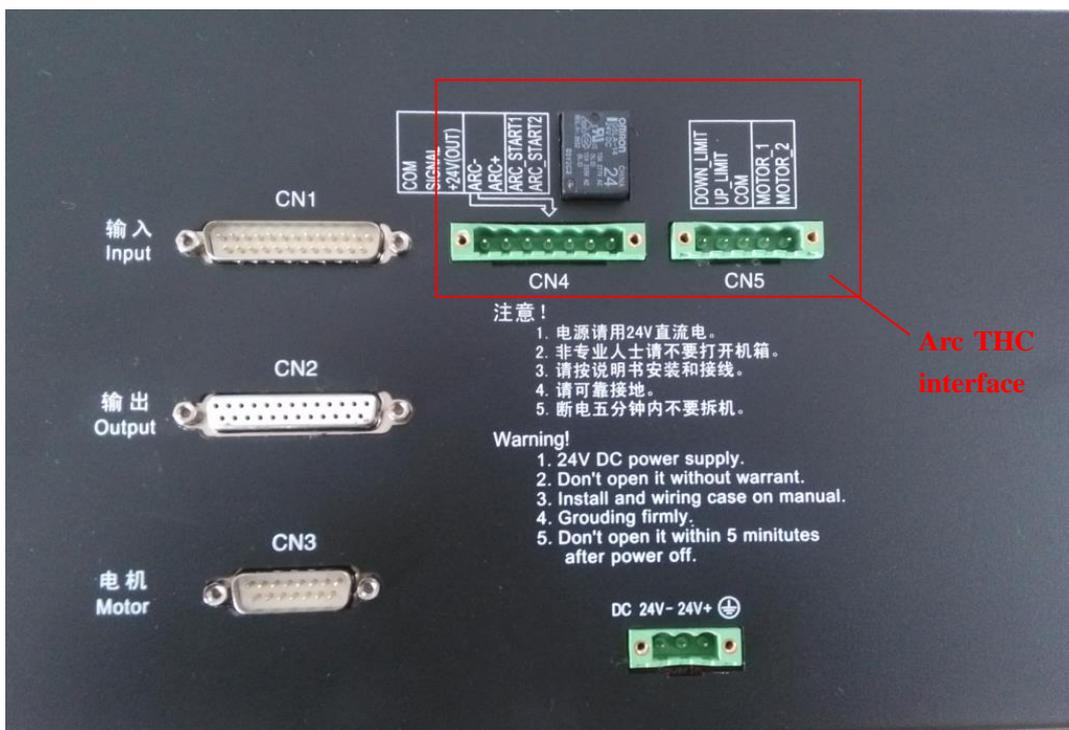


Fig.11.12 F2100T system interface schematic diagram

11.4.1 Torch Height DC MOTOR Port (CN5)

Table 11.4 Torch Height Motor Port

CN5	Signal Name	Comment
1	DOWN_LMT	Lower limit switch input
2	UP_LMT	Upper limit switch input
3	COM	Switch input common pin
4	MOTOR_1	DC Motor+
5	MOTOR_2	DC Motor-

Note:

1. DC motor is DC24V and less than 45W.
2. Short the DOWN_LMT and COM by an electrical wire, and short UP_LMT and COM, If don't use limit switches.

11.4.2 Arc Input

Arc input pins are ARC+ and ARC- in port CN4. ARC+ link with positive pole of arc output of arc

divider board. ARC- link with negative pole of arc output of arc divider board.

Table 11.5 Arc Input Signal

CN4	Signal Name	Comment
4	ARC-	negative pole of arc output of arc divider board
5	ARC+	positive pole of arc output of arc divider board

Note: By default, the controller use arc divider 100: 1. That is, the original arc voltage is divided 100 by divider board.

If use 50: 1 divider board, open the system box, find the switches showing as the figure 11.13. When this switch is on, divider board is 50: 1, otherwise 100: 1. Default position is OFF, 100:1.

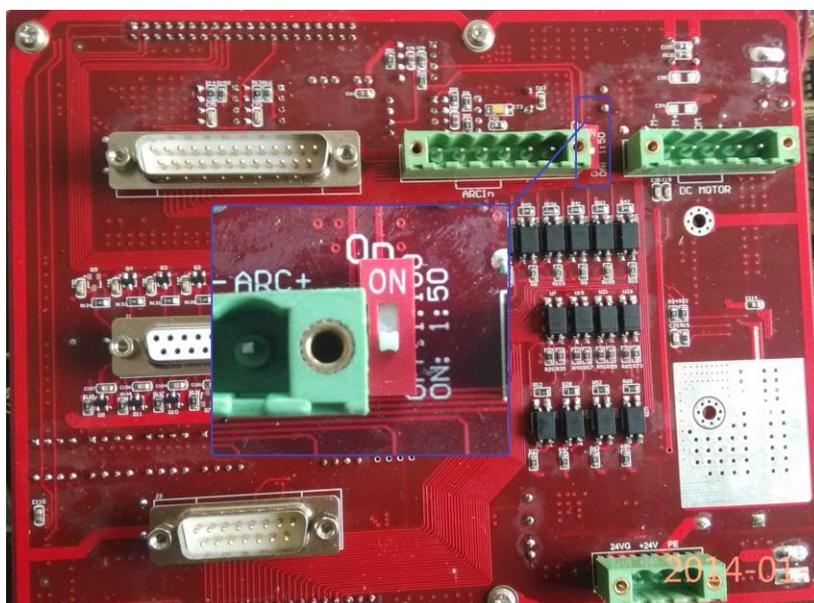


Fig.11.13 Arc input partial pressure proportion

11.4.3 IHS sensing port

Note: Approach switch is NPN type with DC24V.

Table 11.6 Position Interface Signal Definition of Arc THC Module

CN4	Signal Name	Comment
1	COM	Negative pole of approach switch
2	SIGNAL	NPN approach switch signal
3	+24V(OUT)	Positive pole of approach switch

11.4.4 Arc Start (ARC_START)

Table 11.7 Arcing port Signal Definition of Arc THC Module

CN4	Signal Name	Comment
6	ARC_START1	plasma power arcing port+
7	ARC_START2	plasma power arcing port-

Pin 6 and Pin 7 are relay output.

11.4.5 Wiring Diagram of F2000T CNC System with Arc THC Module

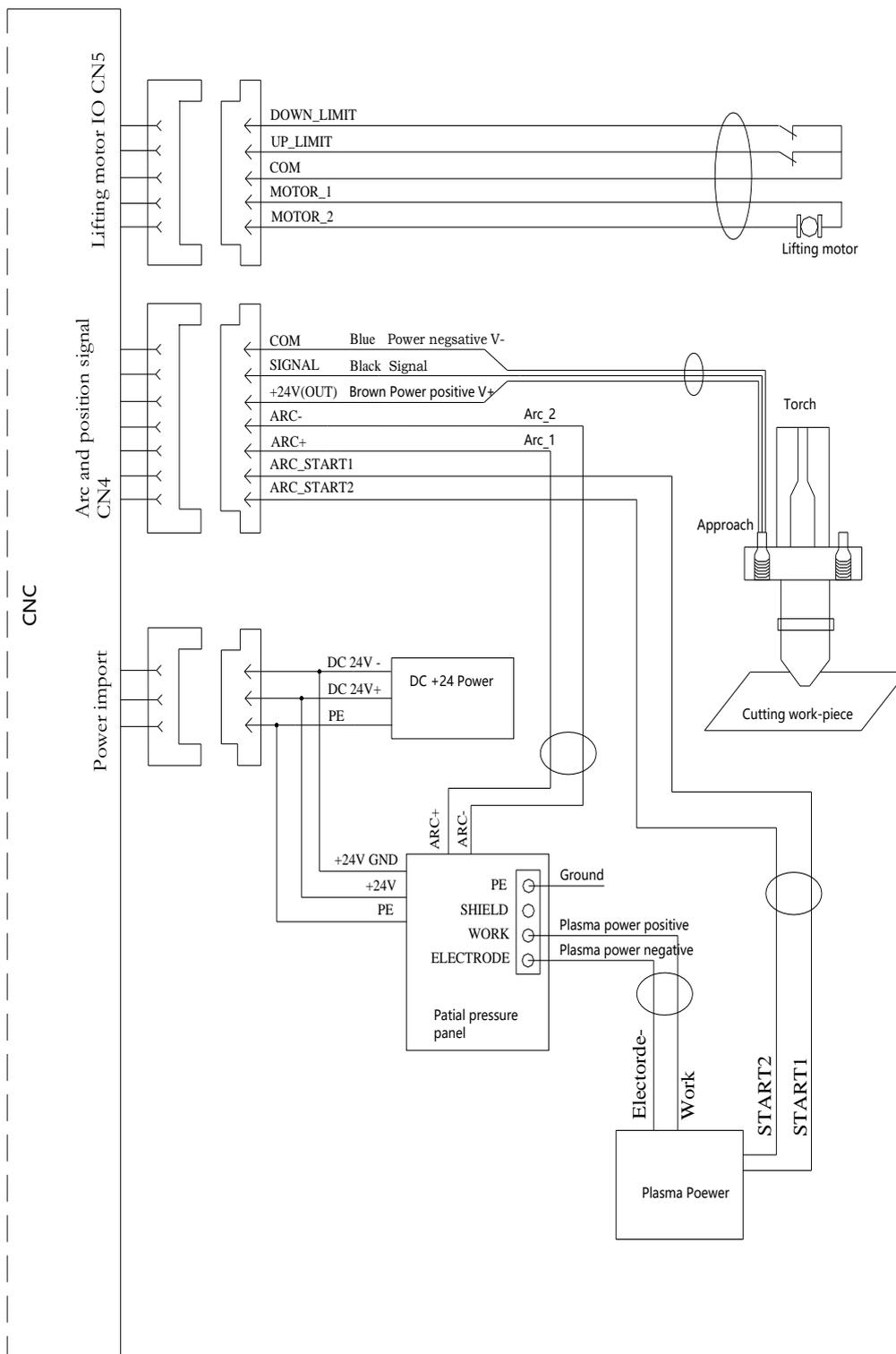


Fig.11.14 Wiring Diagram of F2100T system with Arc THC Module

11.4.6 Wiring Diagram of double approach switch

Two NPN-style approach switches are used for location, which can either be linked with the parallel mode or be linked with series mode. To make the location more accurate and stable, we recommend using series mode to link the two switches. The specific wiring mode is shown as the figure 11.15. With this link-mode, any one action of approach switch can emit the collision signal.

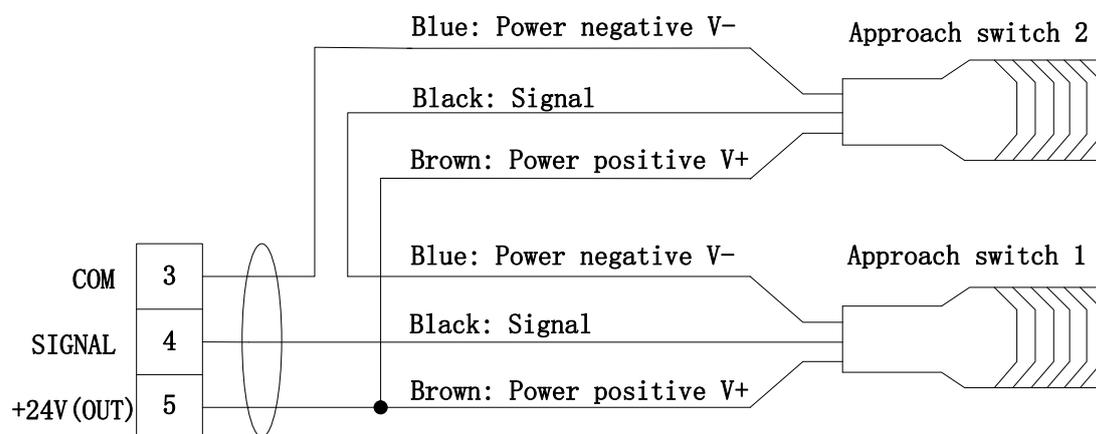


Fig.11.15 Wiring Diagram of double approach switch

11.5 Power Input

Power input: 24V-, 24V+, PE。

Table 11.8 Power Interface Signal Definition

3 Cores Interface Pin Number	Signal Name	Comment
1	24V-	24V Power -
2	24V+	24V Power +
3	PE	Ground

Chapter 12 Use of BIOS

When the system powers on, it will display as shown in Fig 12.1.

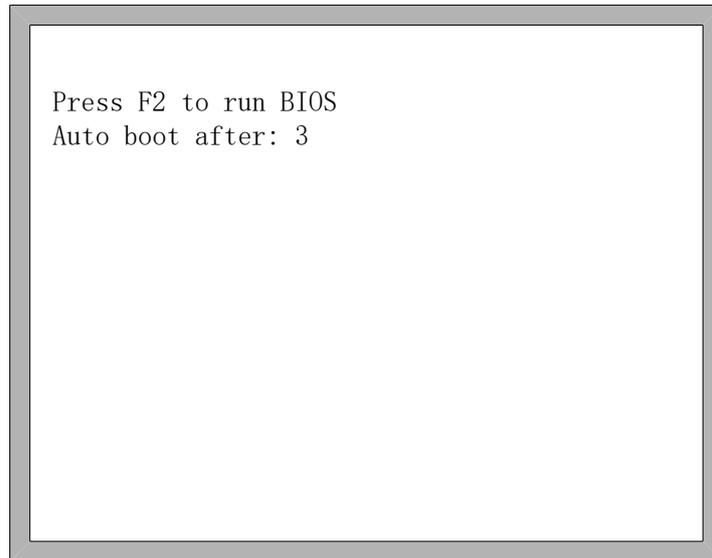


Fig 12.1 Power on

When press DEL before the system counts down to 0, the system will enter the BIOS. If other keys are pressed, the system will enter in before counting down to 0.

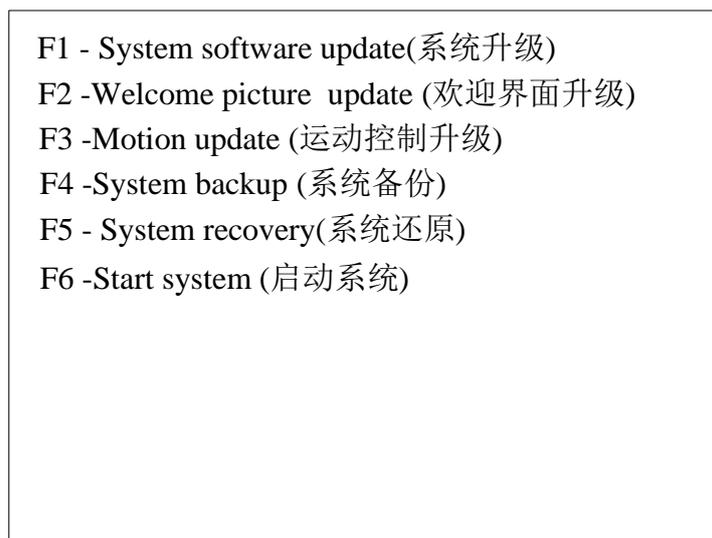


Fig 12.2 BIOS interface

12.1 System Upgrade

After entering BIOS, press **【F1】** to upgrade the system, it should satisfy the following conditions:

- Flash Disk is connected to the system.
- There should be the upgrade file UserApp.exe in the root folder of the flash disk.

Under the circumstance of above two conditions satisfied, Press **【F1】** to upgrade system, when completing the upgrading, press **【F6】** to reboot.

12.2 Welcome Interface Upgrade

After entering BIOS, press **【F2】** to upgrade the welcome interface completely, it should satisfy the following conditions:

- Flash Disk is connected to the system.
- There should be the upgrade file WELCOME.bmp in the root folder of the flash disk.

Press **【F2】** to upgrade when the conditions are satisfied, when completing the upgrading, press **【F6】** to reboot.

12.3 Movement Control Upgrade

After entering BIOS, press **【F3】** to upgrade the movement control completely, it should satisfy the following conditions:

- Flash Disk is connected to the system.
- There should be the MOTION.DSP upgrade file in the root folder of the flash disk.

Pressed **【F3】** to upgrade when the conditions are satisfied, when completing the upgrading, press **【F6】** to reboot.

12.4 System Backup

After entering BIOS, press **【F4】** to backup system. It only backups OS, but no parameter, IO ports configuration, coordination configuration and so on.

12.5 System Reset

After entering BIOS, press **【F5】** to return to the original system that has been backup.

Chapter 13 Installation and Debugging

13.1 Horizontal / Vertical Pulses Number Setting

- Horizontal / vertical pulses number setting

Here, horizontal / vertical pulses number is also introduced in the section of 7.5 system parameter. It's easy to set the number of horizontal (vertical) pulses. Before drawing a line, assume one value of horizontal pulses XPls and one value of vertical pulses YPls, set these two parameters and then save the settings. Enter the manual interface, choose fixed moving function. Assume the fixed distance is A mm. Move A mm horizontally, and the actual length of the line is B mm (which is generally not equal to A), then we can calculate the horizontal pulses number. The equation is

$XPls \cdot \frac{A}{B}$. After calculating, replace the outcome with the assumptive Xpls (take three decimal places at most). Similarly, move C mm vertically, the actual length is D mm,

then the vertical pulses number is $YPls \cdot \frac{C}{D}$.

- Requirement of pulses number:

The maximum frequency of output pulses from the system is 160 KHz. It is not possible to work properly according to the order if the pulse frequency is higher than 160KHz. Assume the pulse number is x, the highest speed is M_v (mm/min), then $(M_v \cdot x / 60)$ should be less than 160000.

For example, the pulse number is $x=2000$, the highest speed is $M_v=12000$ (mm/min). Because of $M_v \cdot x / 60 = 12000 \cdot 2000 / 60 = 400000 > 160000$, the speed of 12000(mm/min) is not reachable. If we set x to be 500, then $M_v \cdot x / 60 = 12000 \cdot 500 / 60 = 100000 < 160000$, at this time it can operate at the maximum rate of 12000mm/m.

While in principle the number of pulses can be set to a large value, in fact it should be set between 150 and 1200. Because the frequency is too high, some drives can't work very well, the motor sometimes will be out of synchronism. On the other hand, the performance of anti-jamming is of foreign interference is poor and the external interference is strong.

Note: The most reasonable number of pulses is between 150 and 1200. The number of pulses exceeds this range, please refer to the interpretation of driver and modify subdivision number of stepper driver and denominator of Servo driver.

Chapter 14 Shanghai FangLing F1500 Remote Controller

14.1 Wireless Remote Control Module Performance and Characteristic

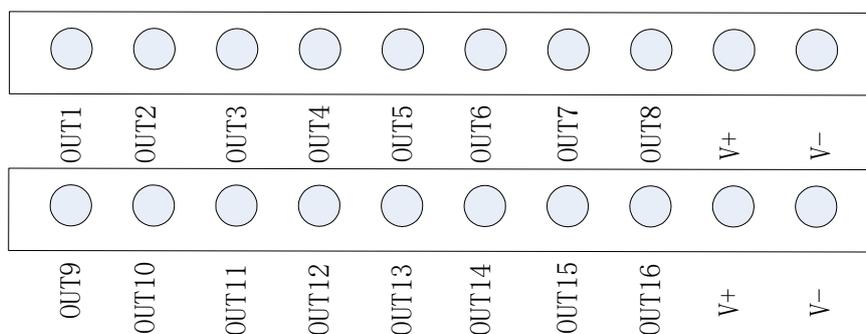
- 433MHz free ISM frequency channel, free license on trial
- Remote controlling distance > 30m, at least not below 0.5m
- Hardware test error code, software optimizing algorithm, bi-direction communication, insure the communication stable and reliable
- Send module matches address with receive module, the address can be set manually, at most 128 supportable addresses
- Wireless remote controlling send module is supplied power by dry battery, at least working more than 6 months service time
- Receiver module is set into 8421 port mode or P2P mode, at most 16 output ports

14.2 The Layout of Remote Controller



Fig.14.1 layout of remote controller

14.3 The Output Port of Receiver



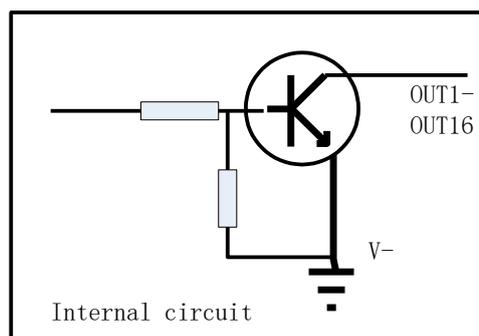


Fig.14.2 The output port of receiver

Note: Receiver will pull down the IO ports which are relative of Out1-Out8 according to code value of different button which is transmitted by sender. Specific corresponding relationships of sender and receiver reference the content of the 14.4 section.

14.4 Interpretation of Jumper Switch

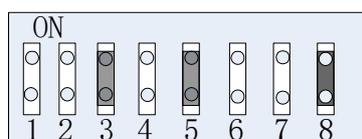


Fig 14.3 Jumper switch

3. Address segment

The first seven bits of jumper switch (No.1 -7) are address codes; the status of this seven bits requires that sender and receiver must be same. If they are different, receiver cannot reply.

Note: if open the sender, there is also a 8-bit jumper switch inside. Therefore in the same time, 128 pairs of sender and receiver can simultaneously work at most.

4. Function select segment

The first bit of jumper switch is function select segment. When it is set to short circuit, select 8421 code receive mode. When it isn't set to short circuit, select independent IO port (P2P) receive mode.

Table 14.1: 8421 code receive mode (the 1st bit of jumper switch has jumper cap)

Sender Key	OUT1-OUT4 OUT9-OUT16	OUT5	OUT6	OUT7	OUT8
S+/Speed	Off	On	Off	Off	Off
S-/Speed	Off	Off	On	On	On
↑	Off	On	Off	On	Off
↓	Off	On	Off	Off	On
←	Off	Off	On	Off	Off
→	Off	On	On	On	Off
Mode	Off	On	On	On	On
T↑	Off	On	On	Off	On
T↓	Off	On	On	Off	Off
Start	Off	Off	On	On	Off
Stop	Off	On	Off	On	On
Back	Off	Off	Off	On	Off
Foward	Off	Off	Off	On	On
Ignition	Off	Off	On	Off	On
CutOxy	Off	Off	Off	Off	On

Table 14.2: Independent IO mode (P2P mode, the 8th bit doesn't have jumper cap)

Sender key	Open output port	Close output port
→	OUT1	Other output ports
←	OUT2	Other output ports
↑	OUT3	Other output ports
↓	OUT4	Other output ports
S-/Speed	OUT5	Other output ports
S+/Speed	OUT6	Other output ports
Start	OUT7	Other output ports
Stop	OUT8	Other output ports
Mode	OUT9	Other output ports
T↑	OUT10	Other output ports
T↓	OUT11	Other output ports
Foward	OUT12	Other output ports
Back	OUT13	Other output ports
Ignition	OUT14	Other output ports
CutOxy	OUT15	Other output ports

14.5 Wiring Connection Figure of F1500 and FangLing Numerical Control System

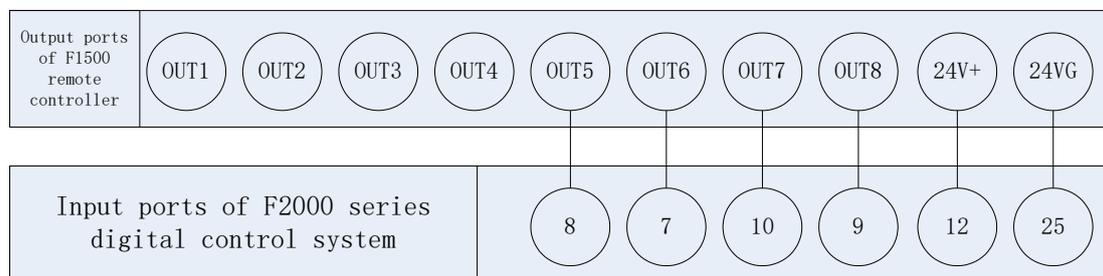


Fig 14.4 Wiring connection interpret of F2000 series numerical control system and remote controller

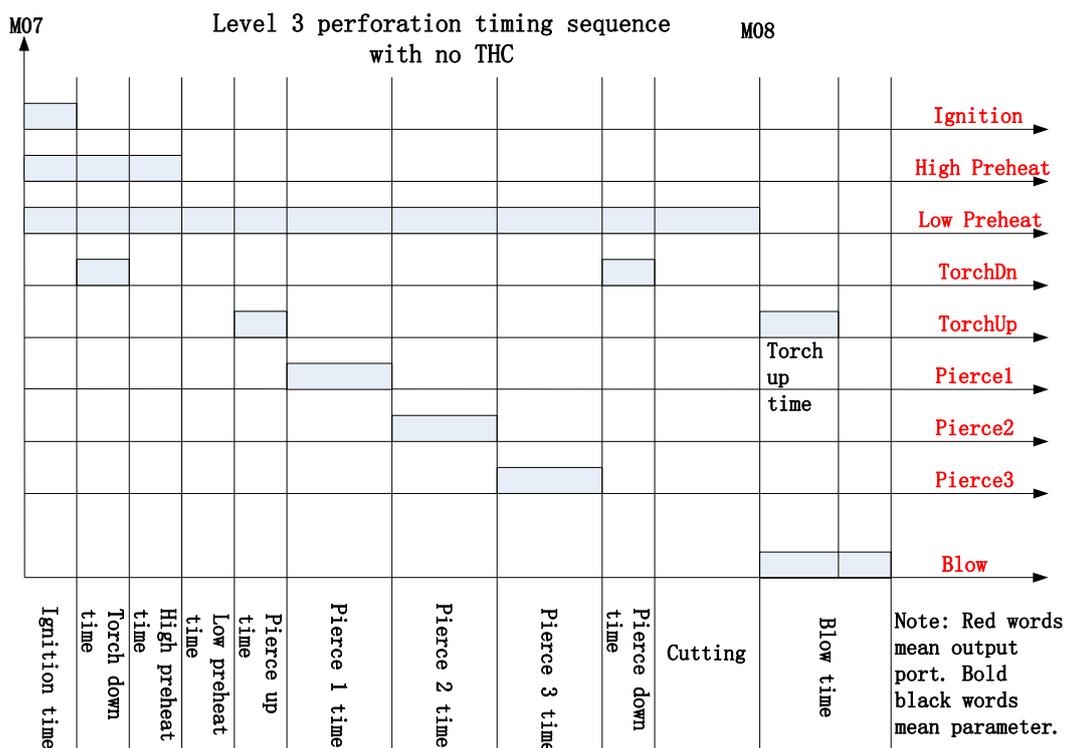
Note: wiring connection of F1500 remote controller and F2000 series remote controller please refer to “11.1.2 Remote controller input” section, type setting of remote controller please refer to “8.7.6 Option” section.

Appendix 1 G、M Code Rapid Consult

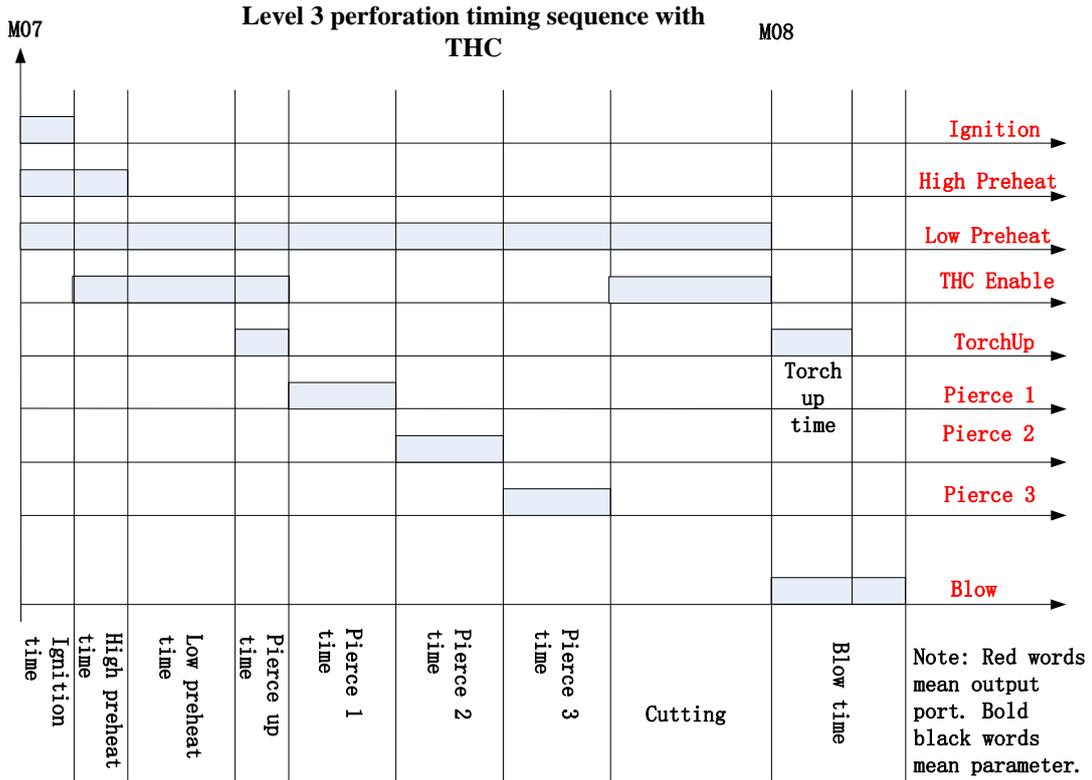
Serial number	order	function
1	G99	rotation、 proportion、 mirror image
2	G92	reference coordinate
3	G91	Relative coordinate system
4	G90	Absolute coordinate system
5	G20	English unit
6	G21	Metric unit
7	G41	Left kerf gap compensation
8	G42	Right kerf gap compensation
9	G40	Cancel kerf gap compensation
10	G00	Quickly move
11	G01	Liner cutting
12	G02	Clockwise arc cutting
13	G03	Anticlockwise arc cutting
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end

Appendix 2 IO Timing Sequence Figure of F2000 Series Numerical Control System

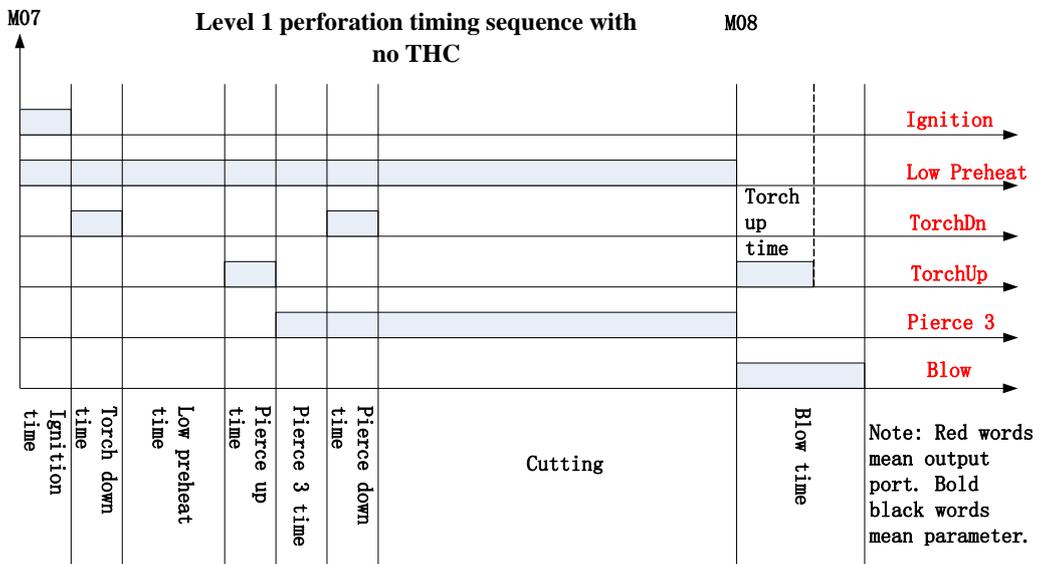
A2.1 Flame Cutting Timing Sequence



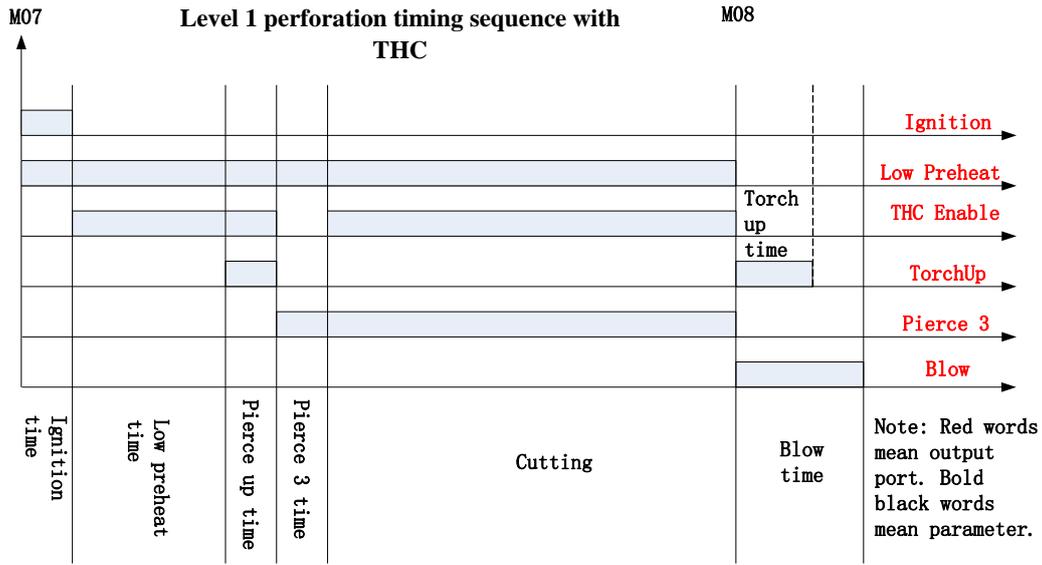
Appendix fig 2.1 Flame cutting timing sequence (Level 3 perforation with no THC)



Appendix fig 2.2 Flame cutting timing sequence (Level 3 perforation with THC)

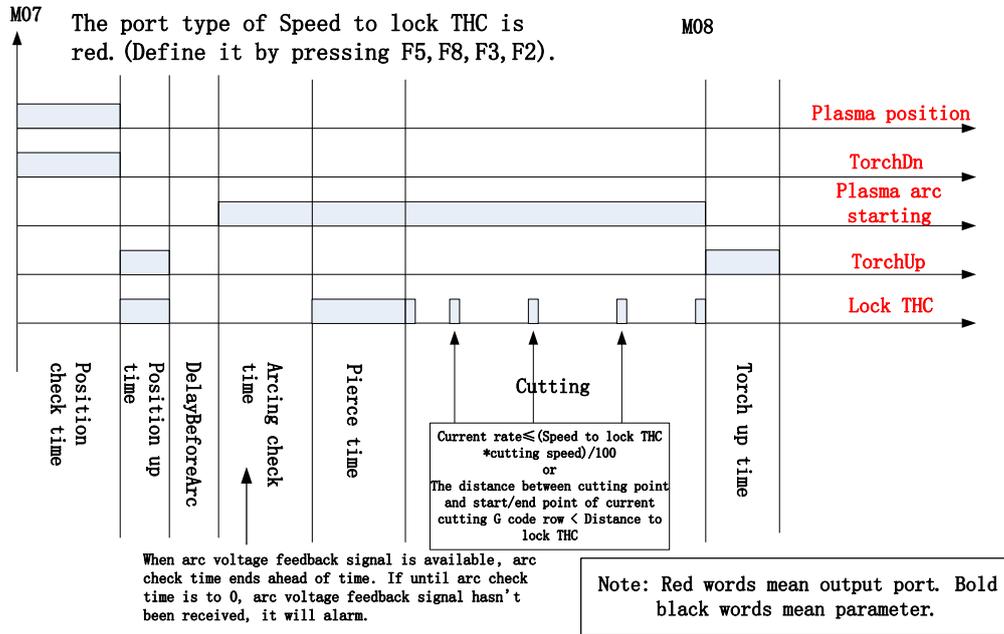


Appendix fig 2.3 Flame cutting timing sequence (Level 1 perforation with no THC)

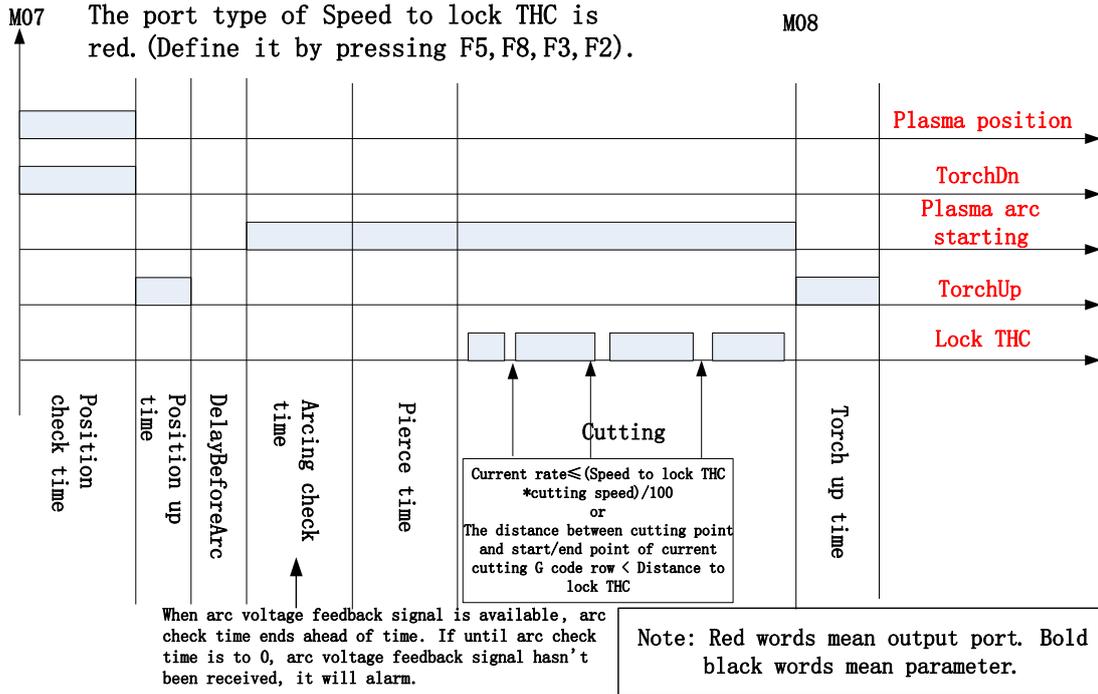


Appendix fig 2.4 Flame cutting timing sequence (Level 1 perforation with THC)

A2.2 Plasma IO Timing Sequence



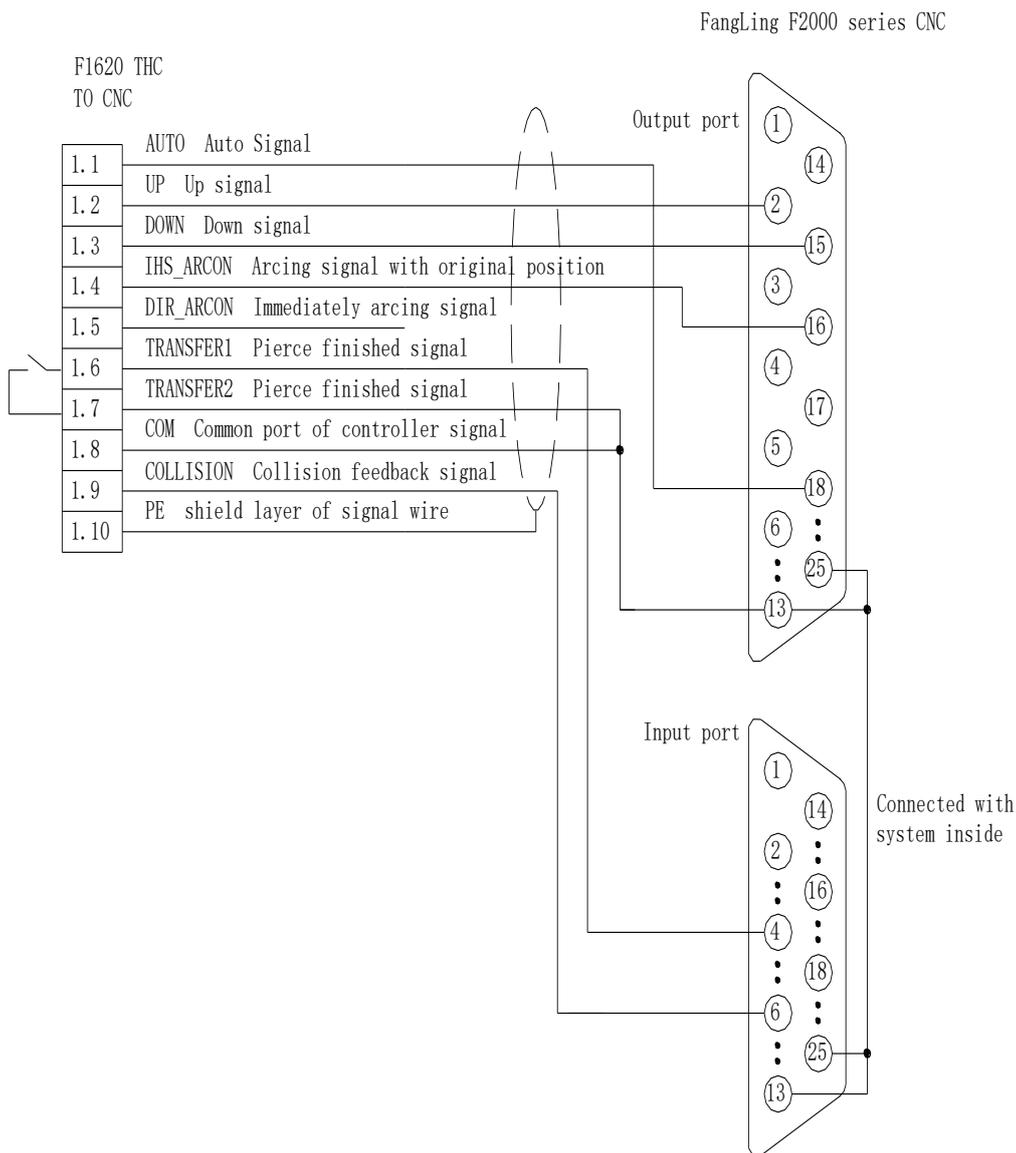
Appendix fig 2.5 Plasma IO timing sequence 1

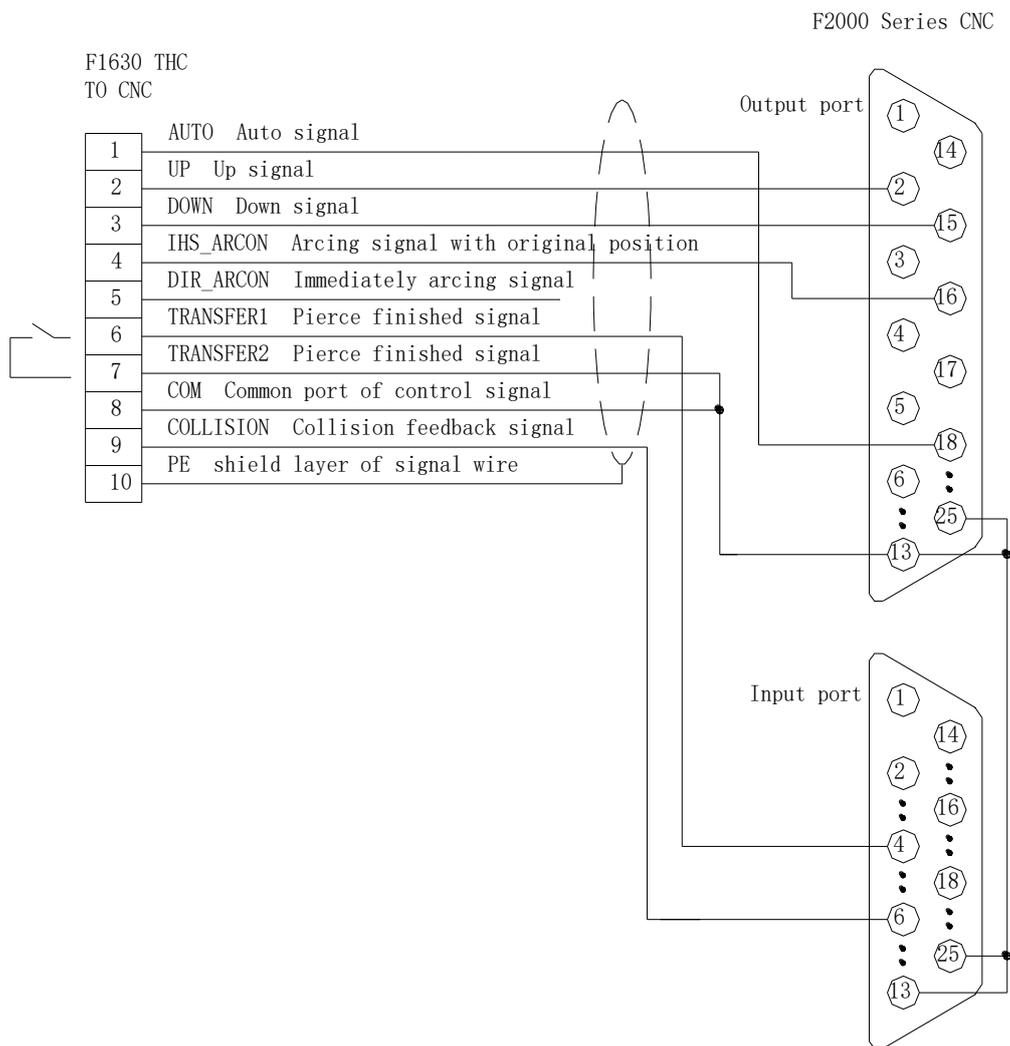


Appendix fig 2.6 Plasma IO timing sequence 2

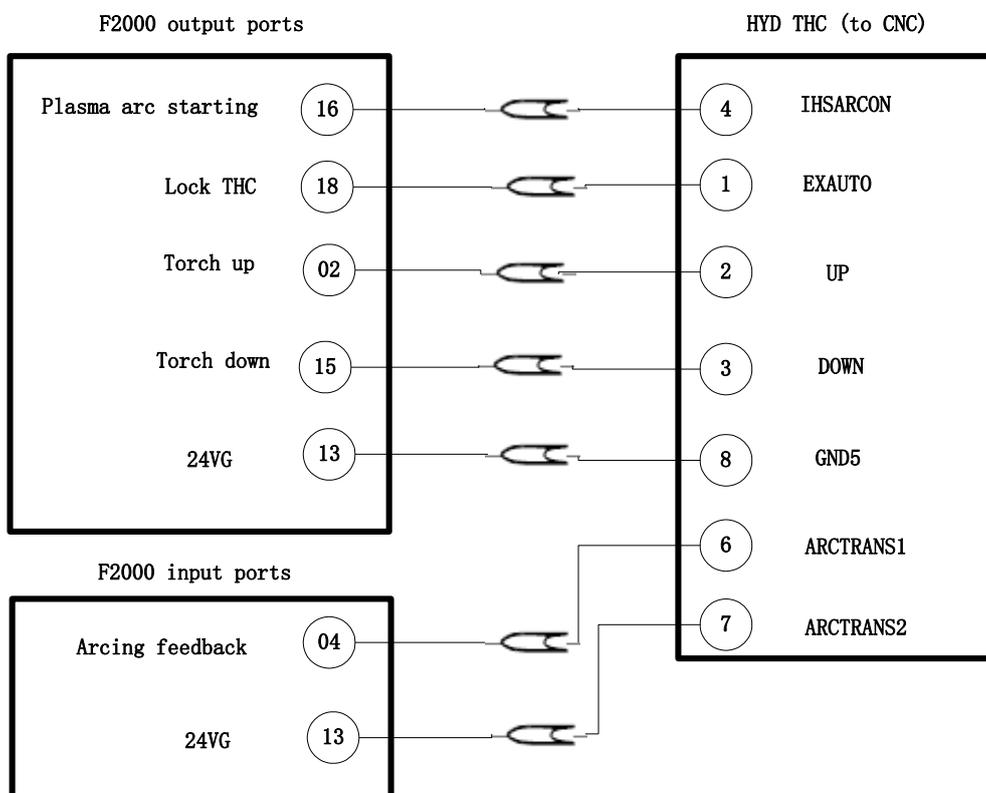
Appendix 3 Interpretation of Wiring Connection between F2000 Series and Common THC

A3.1 Connection with F1620/F1630 THC





A3.2 Connection with HYD THC



Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100T, F2200T, F2300T (A/B), F2500T (A/B), F2600T:

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

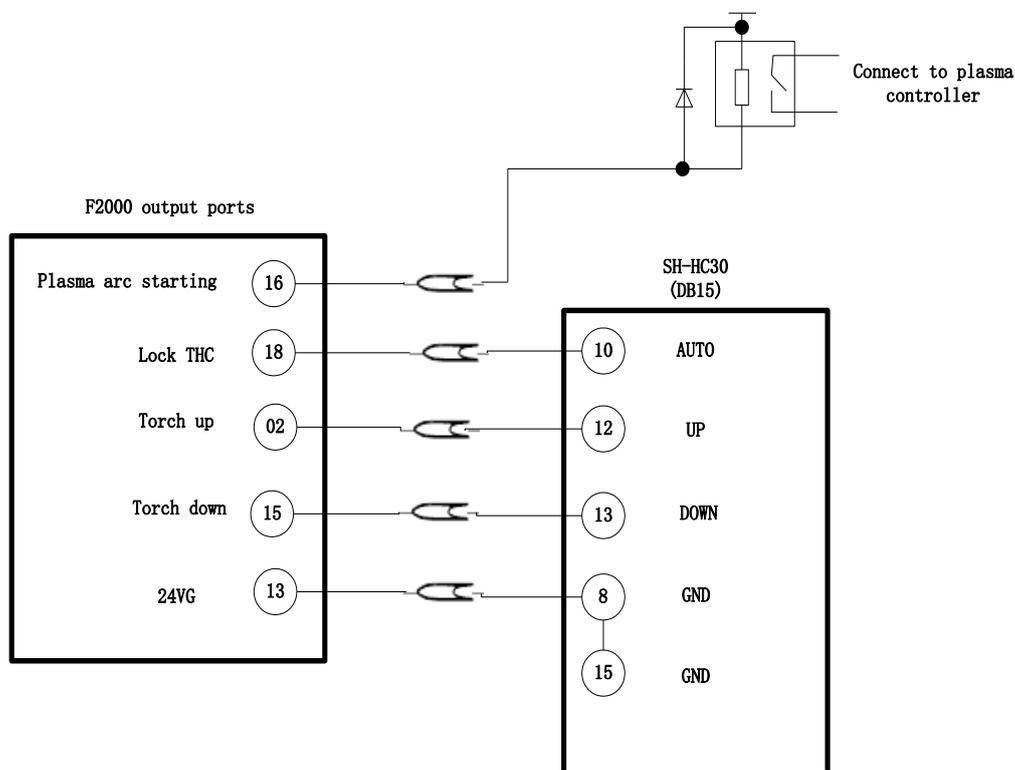
	Port	Type
Lock THC	18	●

The method of definition:

F2100T, F2200T, F2300T (A/B), F2500 T (A/B), F2600T:

F5(Diagnose), F8(System Def), F3(define), input password: 1396.

A3.3 Connection with SH-HC30 THC



Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0-3	According to thickness of plating
Torch up time	0-3	3
Arcing Check Time:	0	0
Position check Time:	3-30	15
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	No	No

The method of setting parameter:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

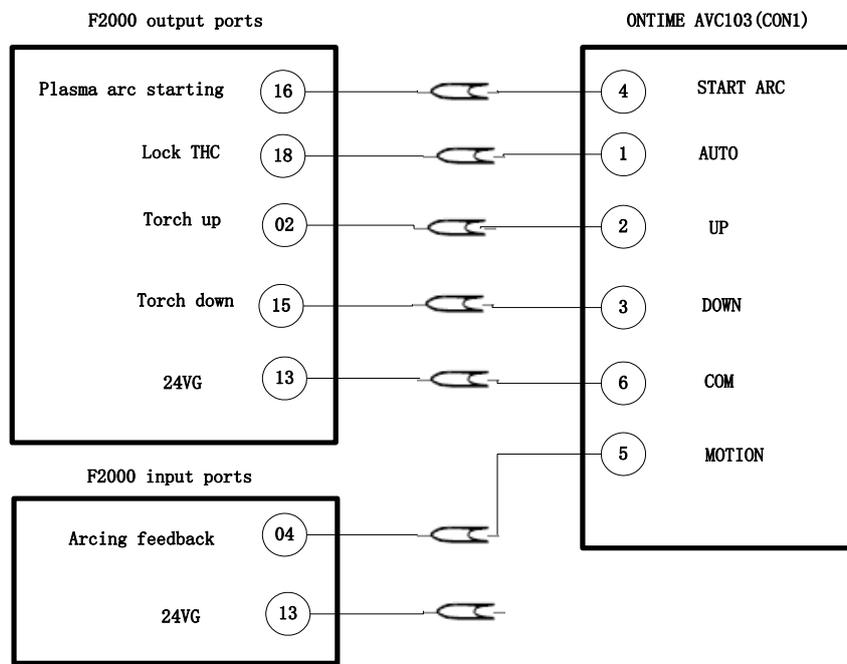
	Port	Type
Lock THC	18	●

The method of definition:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

F5 (Diagnose), F8 (System Def), F3 (define), input password: 1396.

A3.4 Connection with ONTIME THC



Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

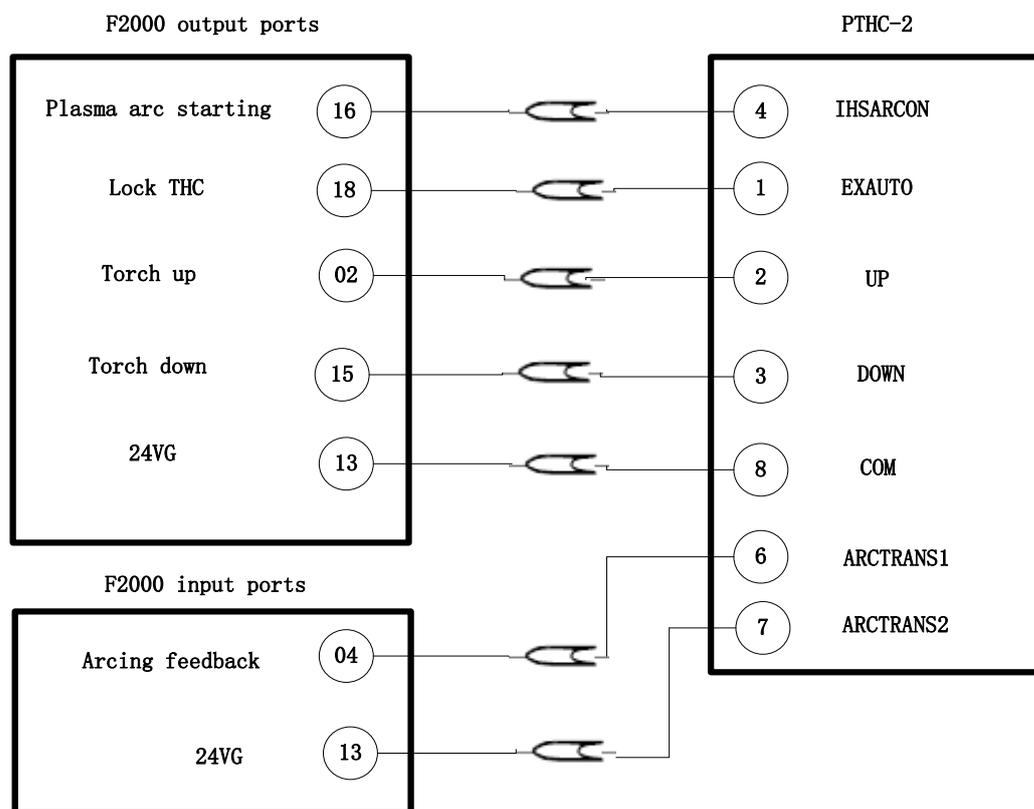
Output definition

	Port	Type
Lock THC	18	●

The method of definition:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:
 F5 (Diagnose), F8 (System Def), F3 (define), input password: 1396.

A3.5 Connection with PTHC-2



Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100B, F2200B, F2300 A/B, F2500 A/B, F2600:

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

	Port	Type
Lock THC	18	●

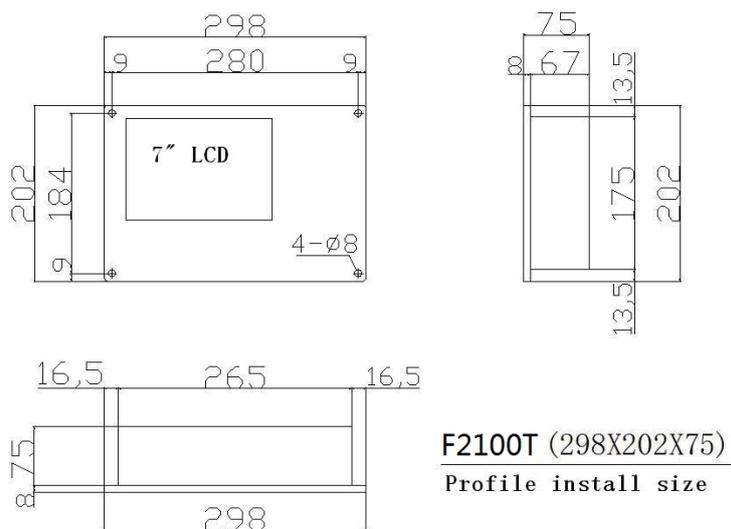
The method of definition:

F2100B, F2200B, F2300 A/B, F2500 A/B, F2600:

F5 (Diagnose), F8 (System Def), F3 (define), input password: 1396.

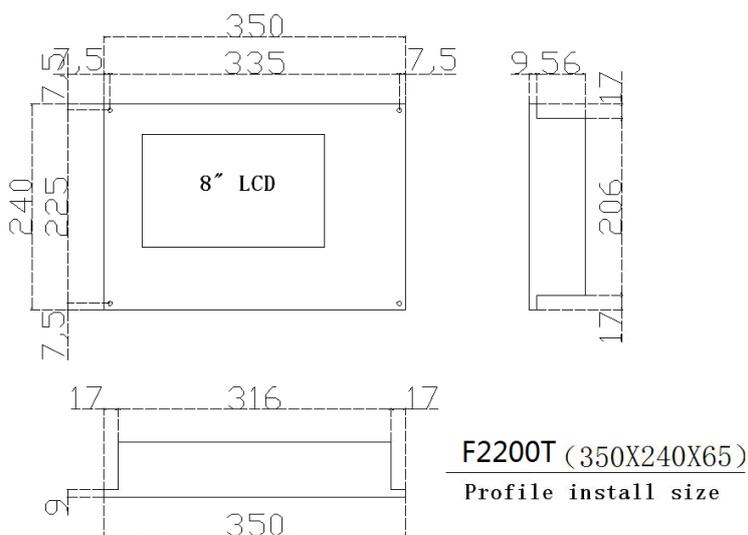
Appendix 4 Interpretation of F2000 Full Series System Install Size

A4.1 F2100B/T Profile Install Size



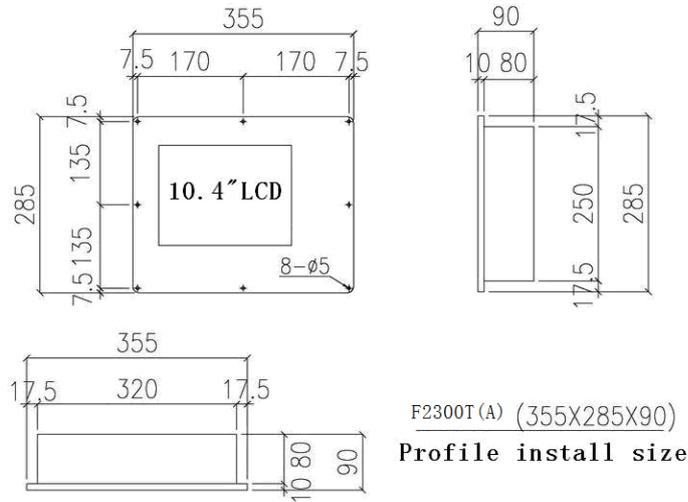
Appendix fig.4.1 F2100T installation size

A4.2 F2200B/T Profile Install Size

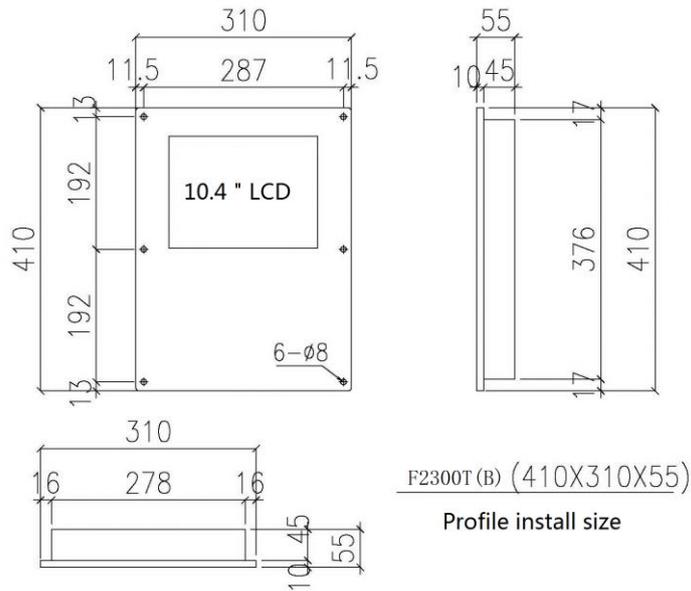


Appendix fig.4.2 F2200T installation size

A4.3 F2300A/B/T Profile Install Size

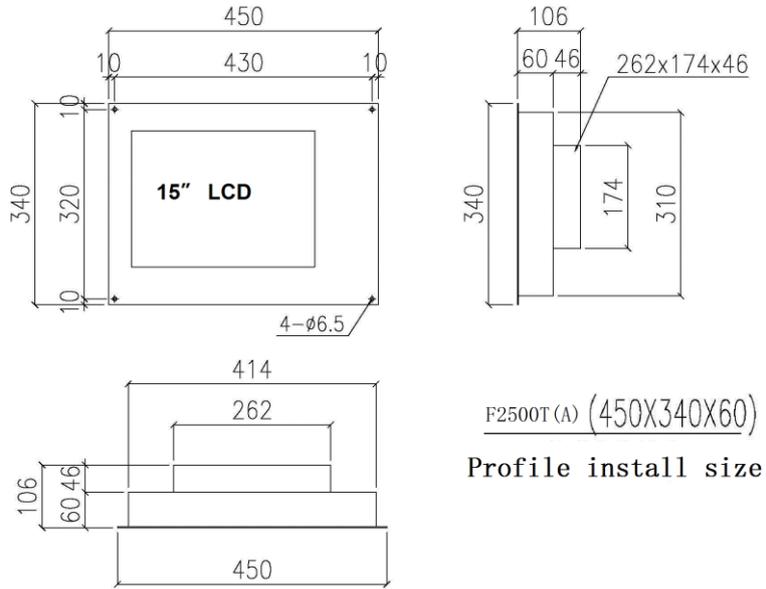


Appendix fig.4.3 F2300T(A) installation size

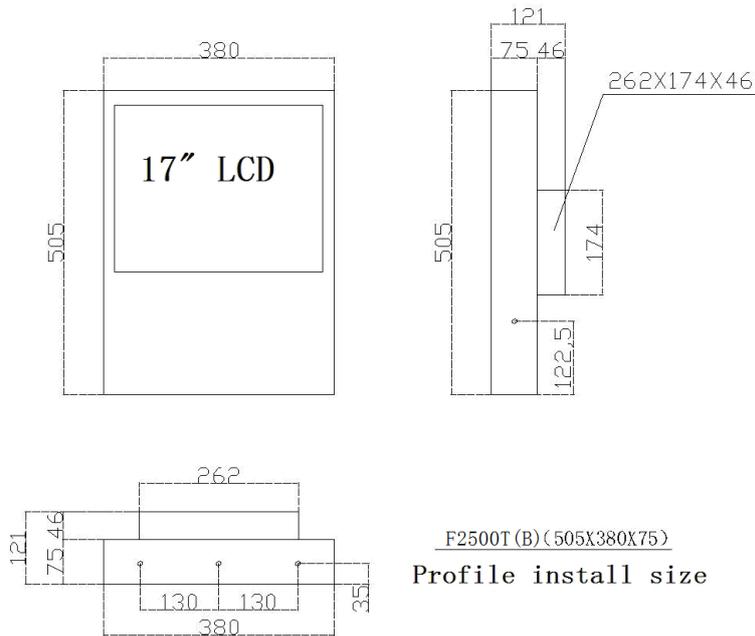


Appendix fig.4.4 F2300T (B) installation size

A4.4 F2500A/B/T Profile Install Size

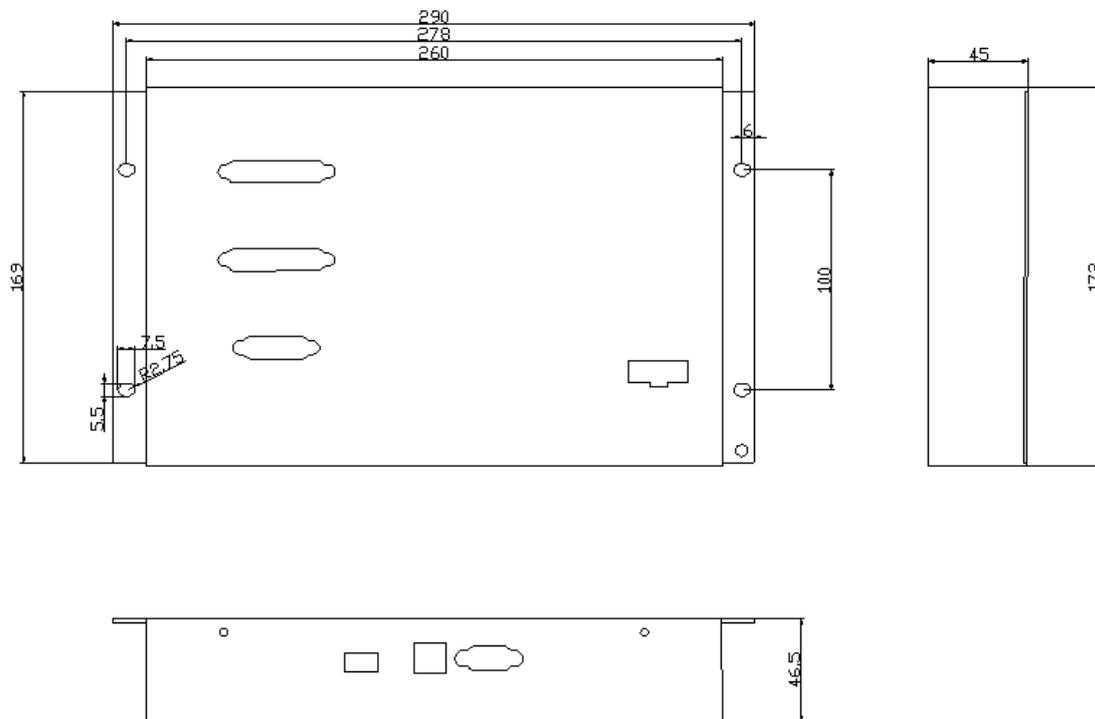


Appendix fig.4.5 F2500T (A) installation size



Appendix fig.4.6 F2500T (B) installation size

A4.5 F2600/T Profile Install Size



Appendix fig.4.7 F2600T installation size

Contact Information

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Fax: 86-021-34290970

Website: www.flcnc.com **E-mail:** sales@flcnc.com

The Route:

Route 1: Take the Metro Line 1 in the Shanghai Railway Station → Change the Metro Line 5 in the XinZhuang → Get off at the Jianchuan Road → Go east 100 meters along south Jianchuan Road.

Route 2: Take the HongQiao terminal 4 or 5 in the Shanghai HongQiao Railway Station or the Shanghai HongQiao Airport → Get off at the Jianchuan Road → Go east 100 meters along south Jianchuan Road.

Route 3: Take the Metro Line 2 in the Shanghai Pudong International Airport → Change the Metro Line 1 in the People's Square → Change the Metro Line 5 in the XinZhuang → Get off at the Jianchuan Road → Go east 100 meters along south Jianchuan Road.

Route 4: the Jianchuan Road Exit of Shanghai Jin Expressway → Go east to Cangyuan Road → Shanghai Cang Yuan Science and Technology Park.



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