FangLing Shape Cutting Controller Manual

(Ver.2.2)

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

Shanghai FangLing Computer Software Co., LTD.

2016-1

REVISION HISTORY

Version	Date	Page	Description
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
Spec.03	2012/4/12		Add Section 8.7.6.1-8.7.6.3 and 3.11, modify Section 1.3
Spec.04	2012/8/8		Modify Section 4.1 and Chapter 14, add Section 6.7 and Appendix 2
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.
Spec.08	2014/12/11		1. Modify the operation manual for new remote controller F1510-T. 2. Add Fangcheng technology THC and F2000 series wiring instructions.
Spec.09	2016/1/5		1. Increase the laser offset function. 2. Increase cutting statistics information display function 3. Increase some common problems

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.

Address: Room 711, NO.955, Rd. Jianchuan, Woxiangwojia mansion, MinHang, Shanghai, China

Tel: 021-34290970

After-sales: 021-34121295 ***Fax:*** 021-34290970

E-mail: support@flcnc.com sales@flcnc.com

Website: www.flcnc.com

Work Condition

- Working Temperature, 0℃~50℃. 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, alkaline, corrosive and other items 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.

Catalog

Chapter 1 F2000 Series Control System Introduction

1.1 System Brief Introduction

F2000 series CNC system is a new product, absorbing the advantages of many domestic and foreign CNC system, combined with our own F2100B, F2300, F2500 and F2600, F3100, F5100 series CNC system, which is more user-friendly, more convenient and more cost-effective. The controller can control the motion of two axes, which is apt to the application of flame, plasma or laser cutting. This series is suitable for all two axis CNC machines which support position control mode.

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 high performance ARM chip and ultra large scale programmable device FPGA, runs multi task real-time operating system and adopts the method of combining software interpolation with hardware interpolation, making high-speed operation more stable and reliable. Reflect speed is very fast. Based on Fangling's research of CNC system for many years, the machines control is more stable and the protection mechanism is quite good.

The numerical control system of F2000 series consists of F2100B/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 1.2 F2100T

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

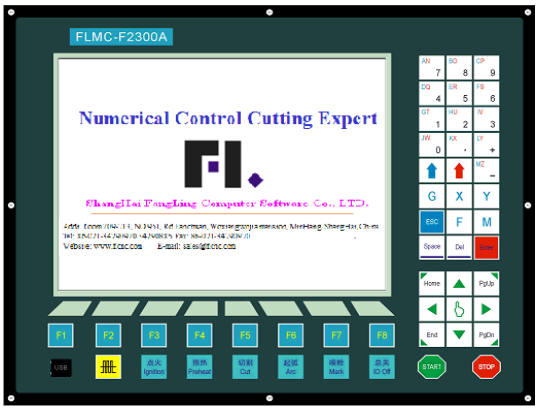


Fig 1.3 F2300A

Fig 1.4 F2300T(A)

Fig 1.5 F2300B

Fig 1.6 F2300T (B)

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

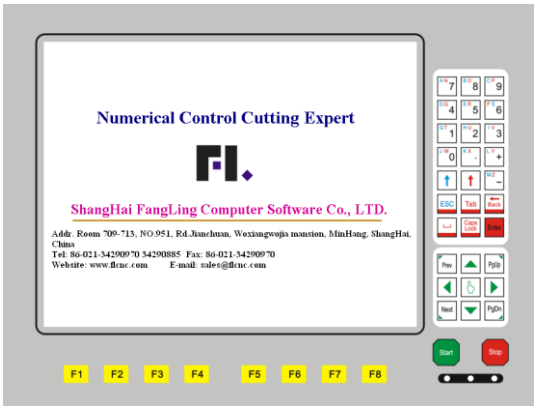


Fig 1.7 F2500 A/T (A)

Fig 1.8 F2500 B/T (B)

1.1.4 F2600/T System

Fig 1.9 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. In addition to Arabic, other languages are all available.
2) 48 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. Support G code with suffix such as TXT,CNC,NC,MPG,B3.
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 to 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 parameter restore.
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) Support P2P mode or BCD (8421) mode remote controller
34) The original size of the workpiece and size with kerf can simultaneously display, intuitive and convenient
35) Support system backup and system restore function, system restore can be restored not only to operating system but also to factory condition.
36) Support ESSI code commonly used instructions
37) Controller models with suffix “T” have integrated THC module
38) Support laser point function
39) Support plasma dynamic perforation function
40) Information statistics such as processing piece, operation time, perforation number and so on.

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) Time resolution: 10ms
8) Working Voltage: DC +24V direct-current power input, power > 80W。
9) Working Temperature: -10℃~+60℃. Relative Humidity, 0~95%.
10) Max power of drive arc THC motor: 45W (suitable for models with "T"). if need more power, can select maximum value: 200W.

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) USB interface on the front panel, for the convenience of transmitting cutting code.
e) Extend IO input/output ports, PWM input ports, analog input ports.

The following three interfaces are only suitable for models with "T":

f) Selection of partial pressure proportion of arc input: 1:50 or 1:100
g) 5 cores THC motor output and limit input ports.
h) 7 cores arc pressure and position input port, arcing signal output port.

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 F2300 A/B/T Hardware Configuration

1. Monitor: 10.4 inch 800*600, 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

1.5.3 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

1.5.4 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 2.2 F2100 T system board

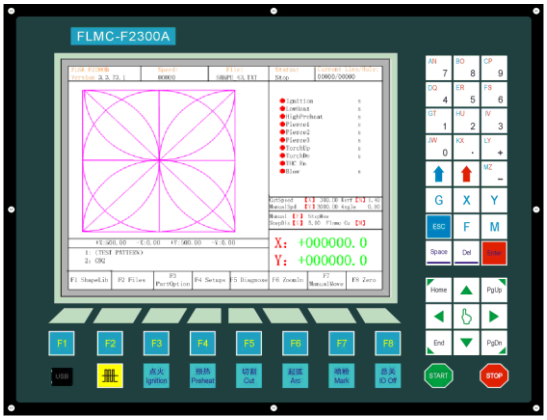


Fig 2.3 F2300A/T(A) system board

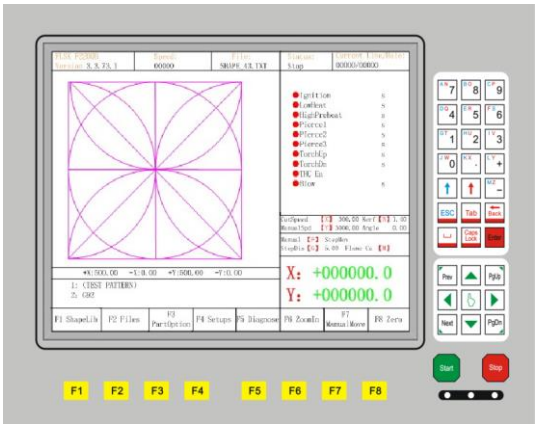


Fig 2.4 F2500A/T(A) system board

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

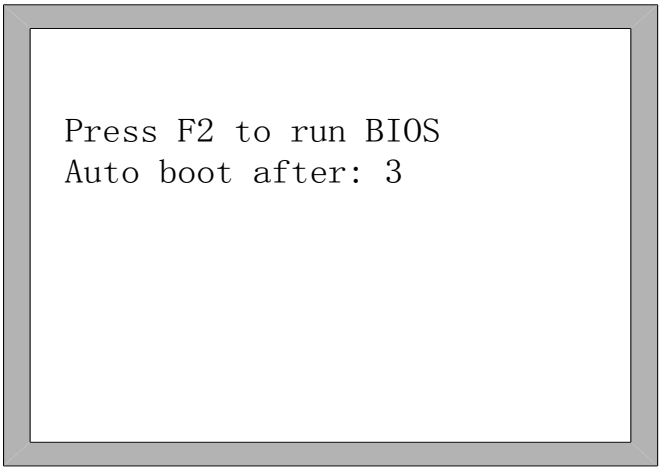


Fig 2.5 System self-check interface

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.

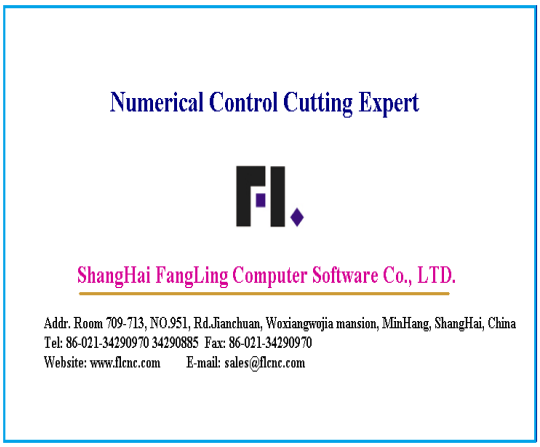


Fig 2.6 welcome interface

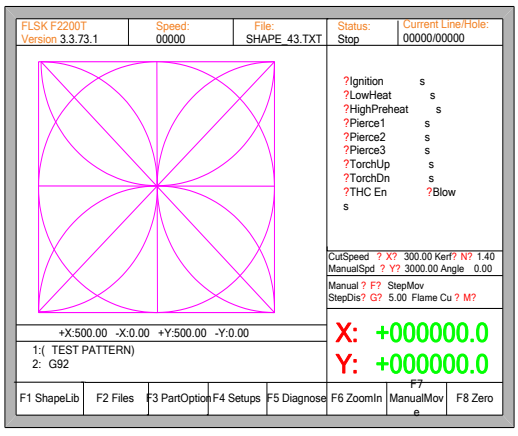


Fig 2.7 the main interface

Note: the system type "F2100T" shown in "FLSK F2100T" 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 F2300T" in the system of F2300T.

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

- 【F1】**ShapeLib:** Pressing F1 to enter the Shape Library including 48 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.
- 【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

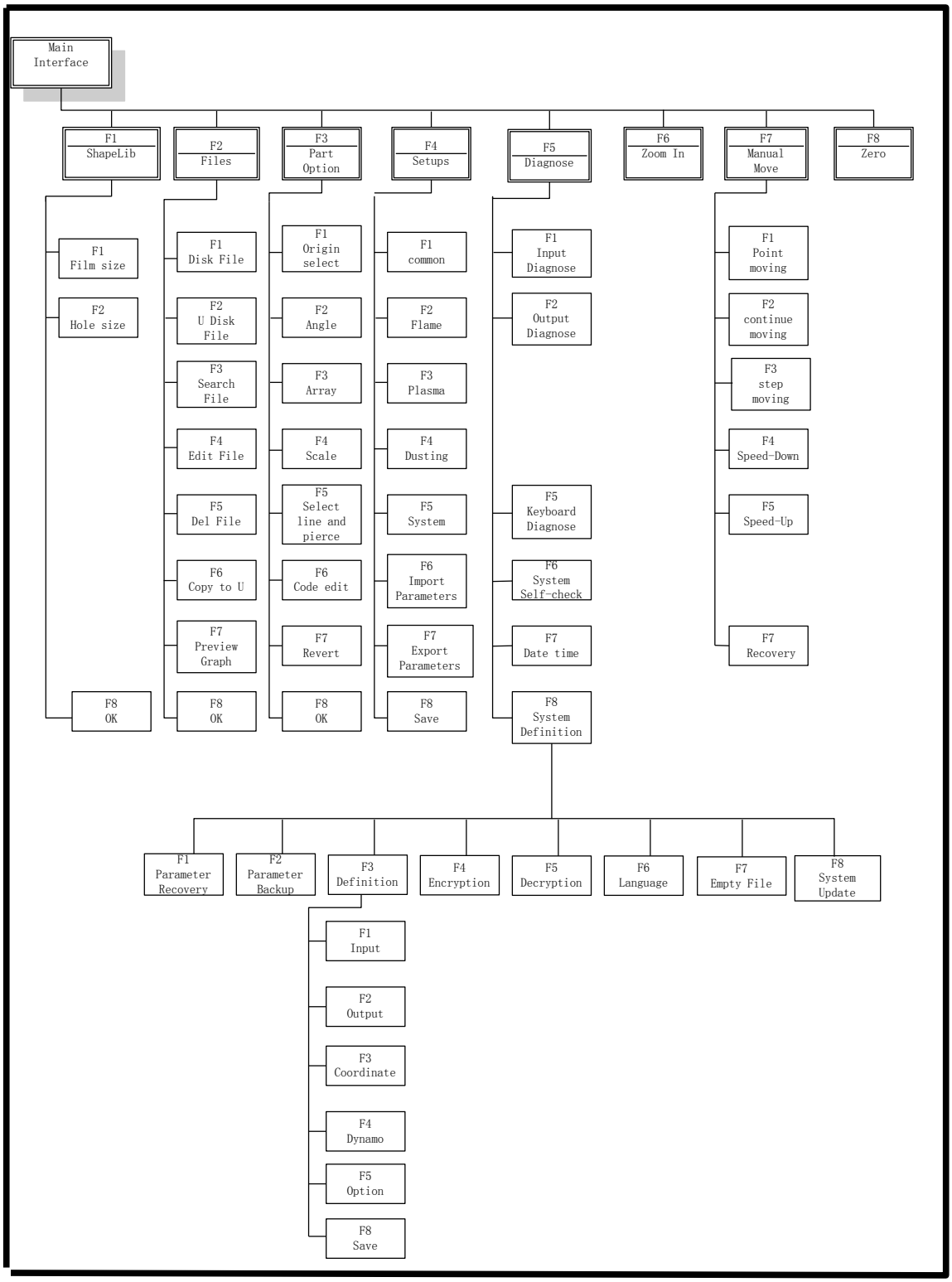


Fig 2.8 Function index of main interface

Chapter 3 Cutting Function

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

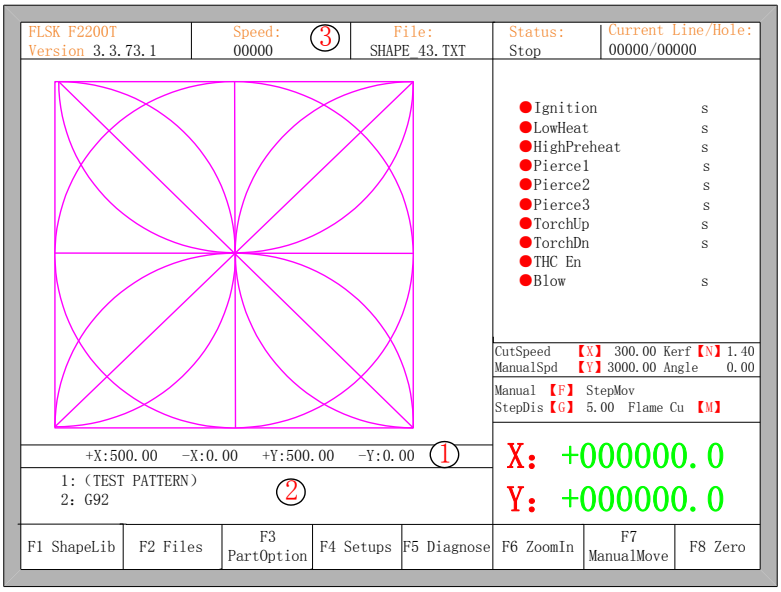


Fig 3.1 cutting function interface (改！)

①Shows the current workpiece's cutting path, including the slotted value.

②Shows the G-code being processed, shows the current and next line.

③Shows 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】: End key. Decrease the cutting speed, each decrease of 1% click rate. Decrease the rate of manual moving machine in manual mode.
- 【F5】: Home key. 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

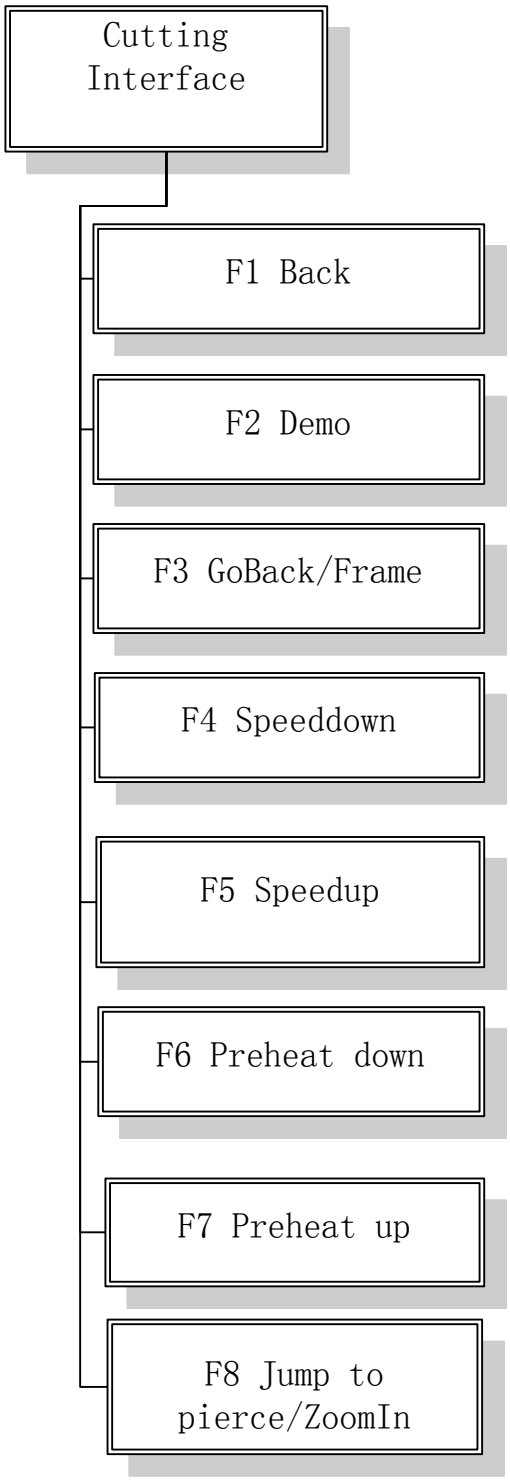


Fig 3.2 Cutting operation index

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:

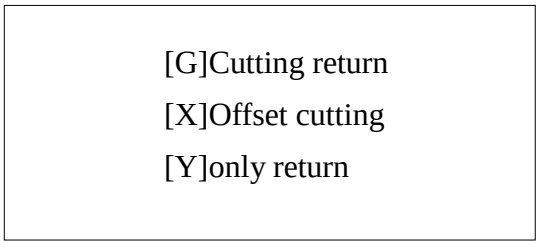


Fig. 3.3 edge perforation

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:

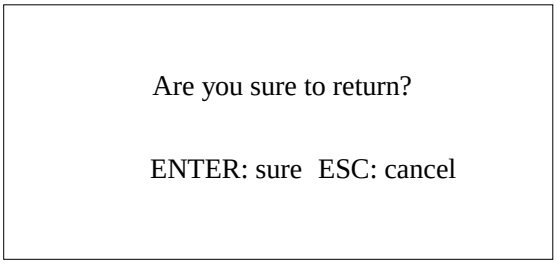


Fig. 3.4 Return reference prompt

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.

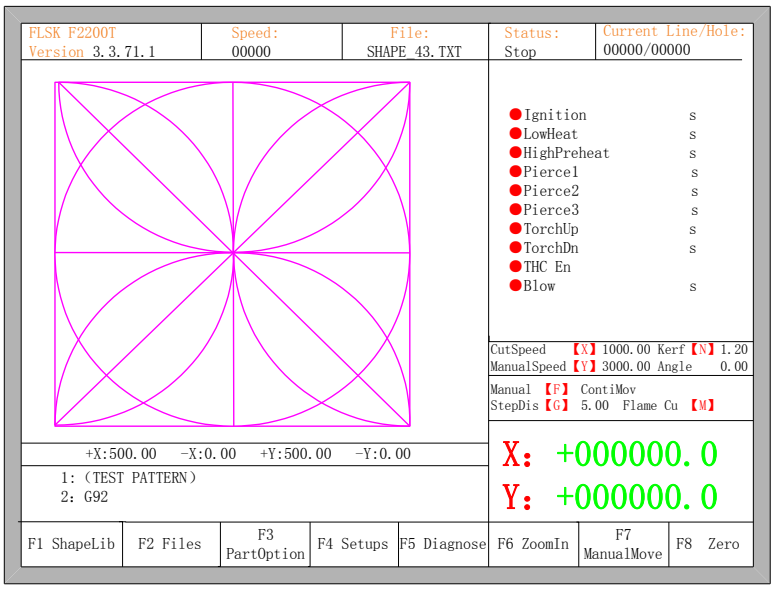


Fig. 3.5 main process interface（改!）

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", now press F8, the system will prompt:

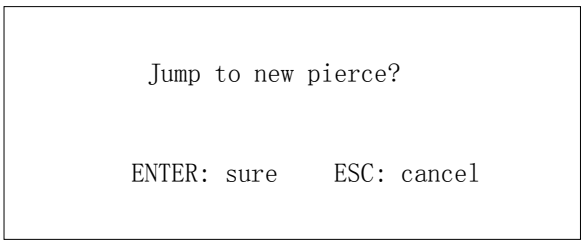


Fig. 3.6 select new pierce

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

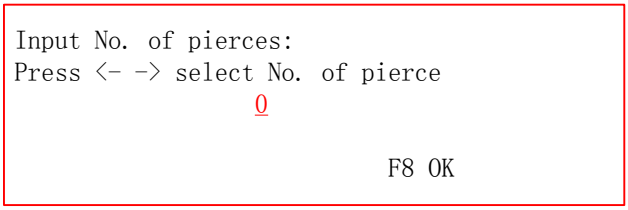


Fig. 3.7 pierce prompt

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.

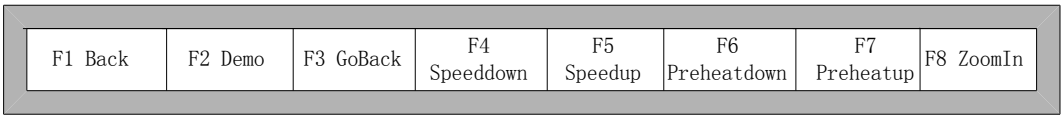


Fig 3.8 Function key of cutting interface

- 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.

Quit of cutting?

ENTER: Quit

ESC: Continue cutting

Fig. 3.9 Quit of cutting

3.11 Frame

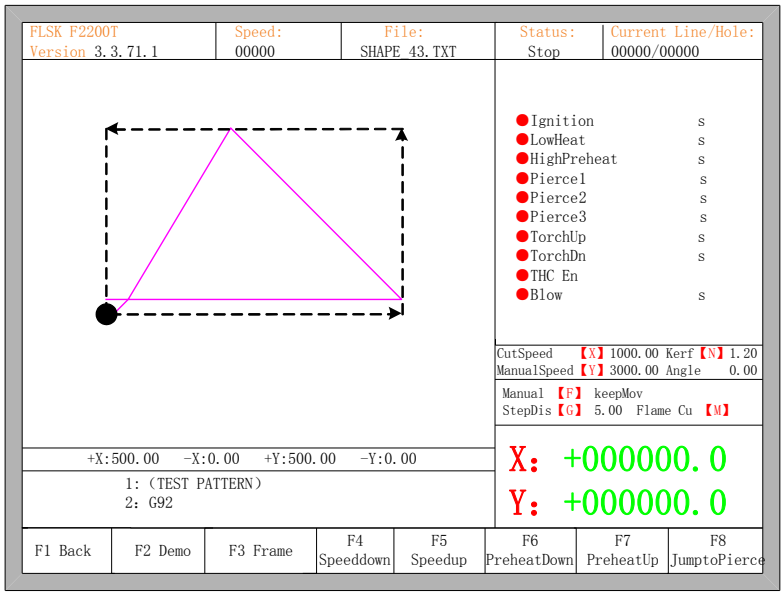


Fig. 3.10 Walk along frame（改!）

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" models of 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:

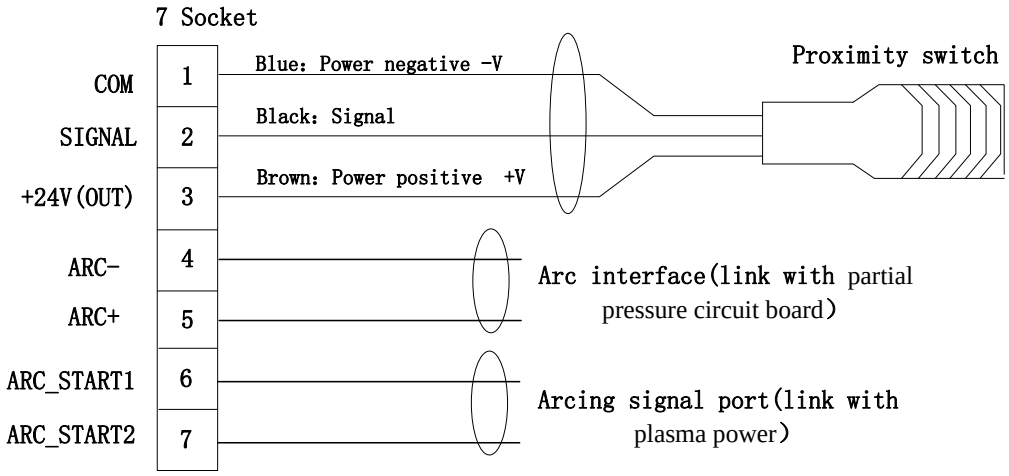


Fig.3.11 Arc and location signal wiring schematic

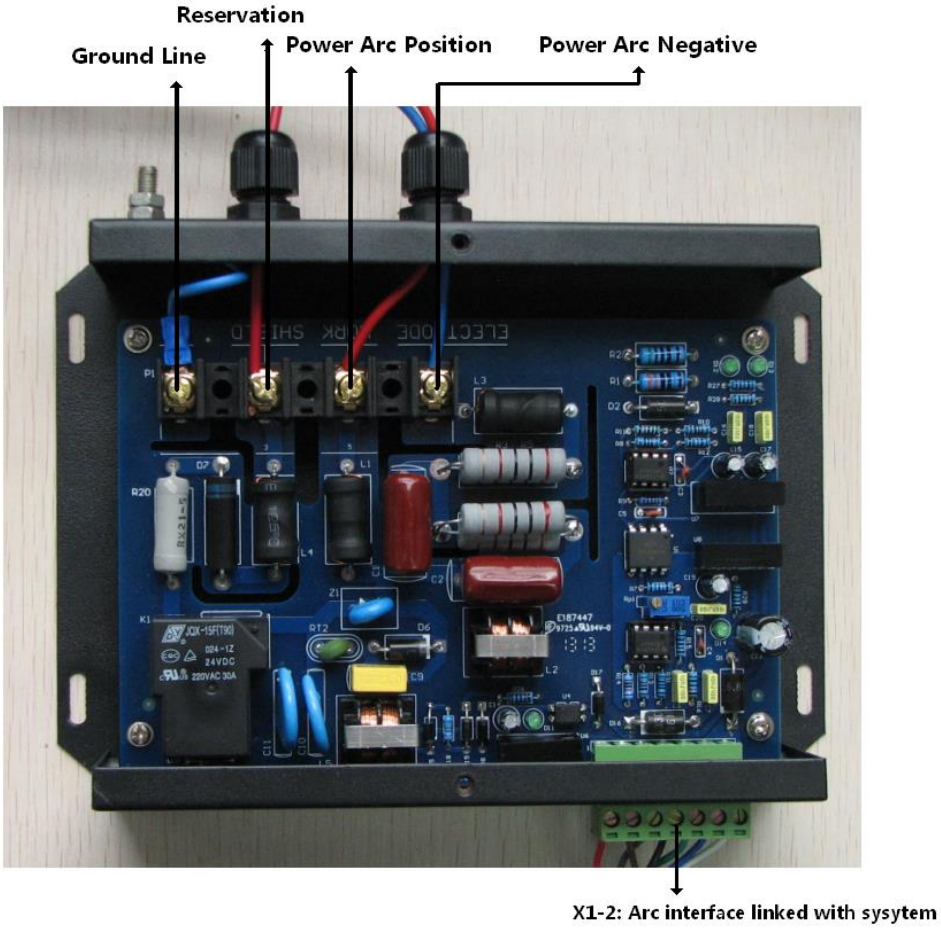


Fig.3.12 Interfaces of arc partial pressure circuit board schematic

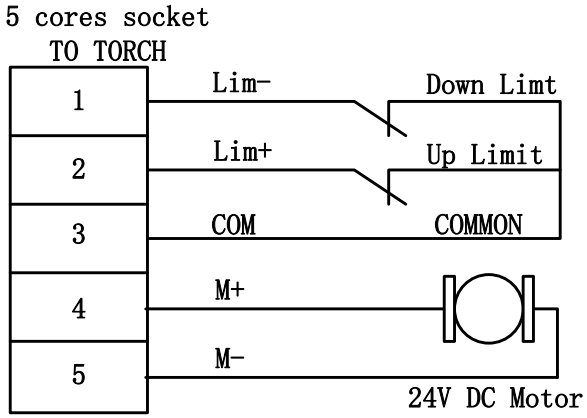


Fig.3.13 Lifting body monitor and limit switch wiring

Interpret: specific system wiring interpretation with arc THC module, please reference to the section of 11.4.5.

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.

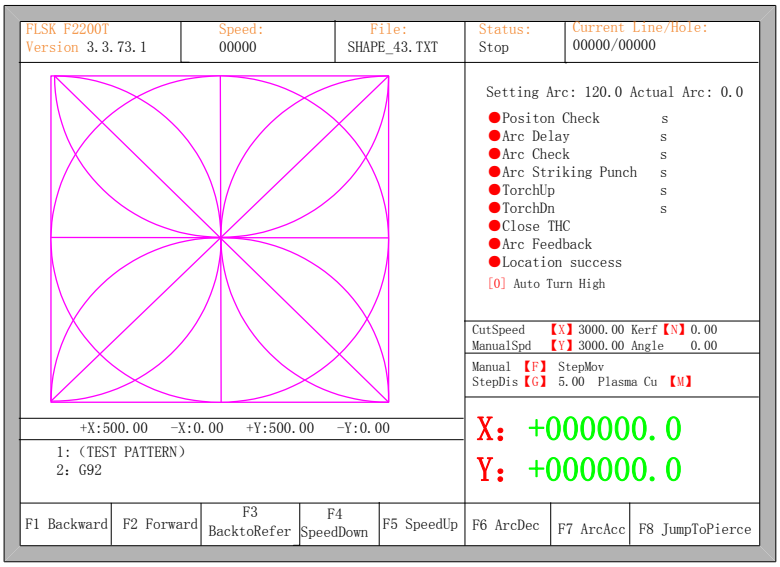


Fig.3.14 Auto interface with arc THC setting（改!）

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. (CN4_SIGNAL）
2. When torch has not touched with steel panel, in the system diagnosis(Chapter 8 Fig 8.1) , 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 Automatic / Manual Height Adjustment

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 (CN1_06) or location successful signal(CN1_05) 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.

3.13 Statistical Information Function

The function of statistical information is used to record the number of perforation, the number of the finished workpiece, the total cutting distance, the cutting time and the running time of the plasma and oxygen gas cutting. Plasma and oxygen gas are calculated separately.

3.13.1 Related Parameters

Number of Perforation: Record the number of perforation during cutting process.

Number of Piece: Record the number of finished workpiece.

Cutting Distance: Record total cutting distance. Unit: metric - meter, Inch - feet.

Cutting Time: Record the time during the cutting process.

Running Time: Record the sum of cutting time, empty state time and M07 state time.

3.13.2 Statistical Information Display

In oxygen gas cutting interface, the lower right corner will display real-time number of perforation, cutting distance(Unit: metric - meter, Inch - feet), the cutting time and the running time of oxygen gas cutting. As shown in figure 3.15.

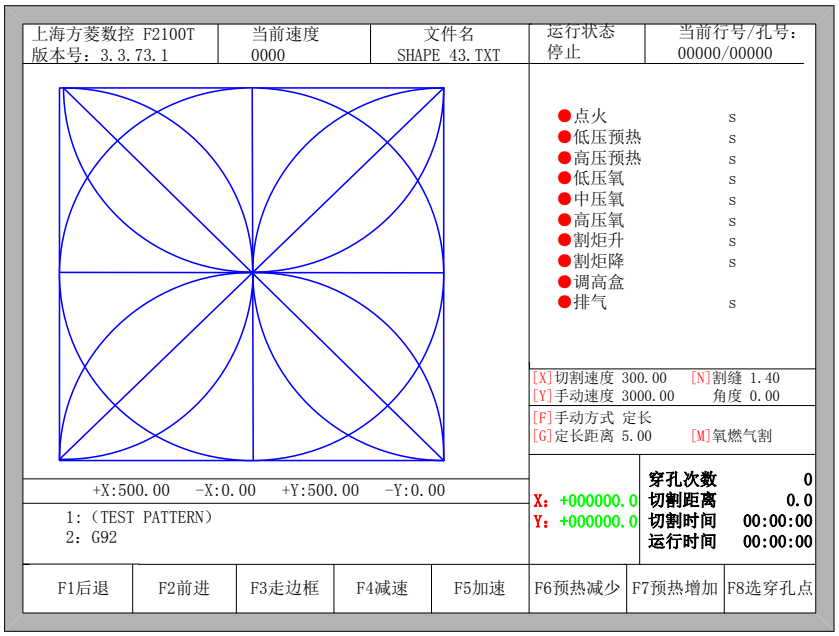


Fig.3.15 Oxygen gas cutting interface **(直接改！)**

In plasma cutting interface, the lower right corner will display real-time number of perforation, number of piece, cutting distance(Unit: metric - meter, Inch - feet), the cutting time and the running time of plasma cutting. As shown in figure 3.16.

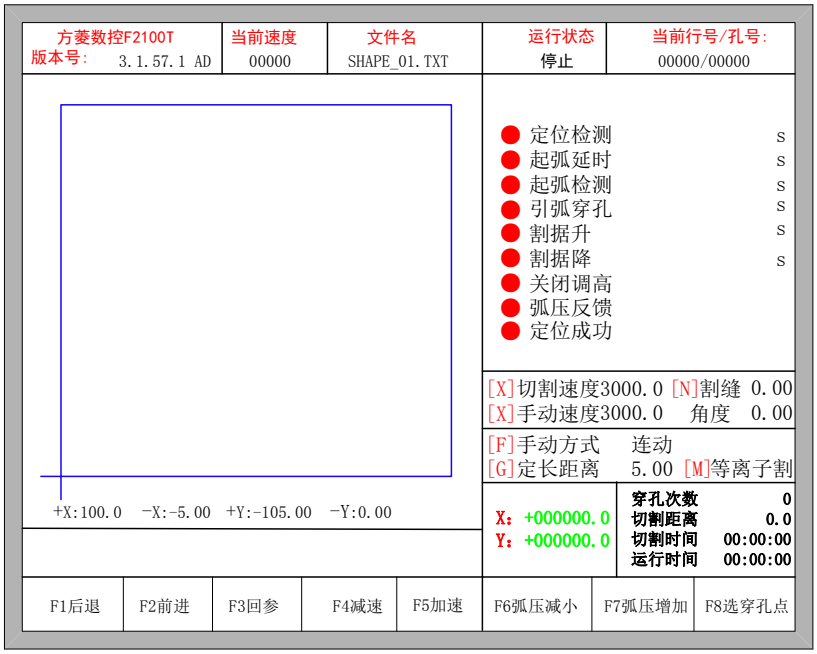


Fig.3.16 Plasma cutting interface **(直接改！)**

In the non plasma and oxygen gas cutting interface, it does not show any statistical parameters. As shown in figure 3.17.

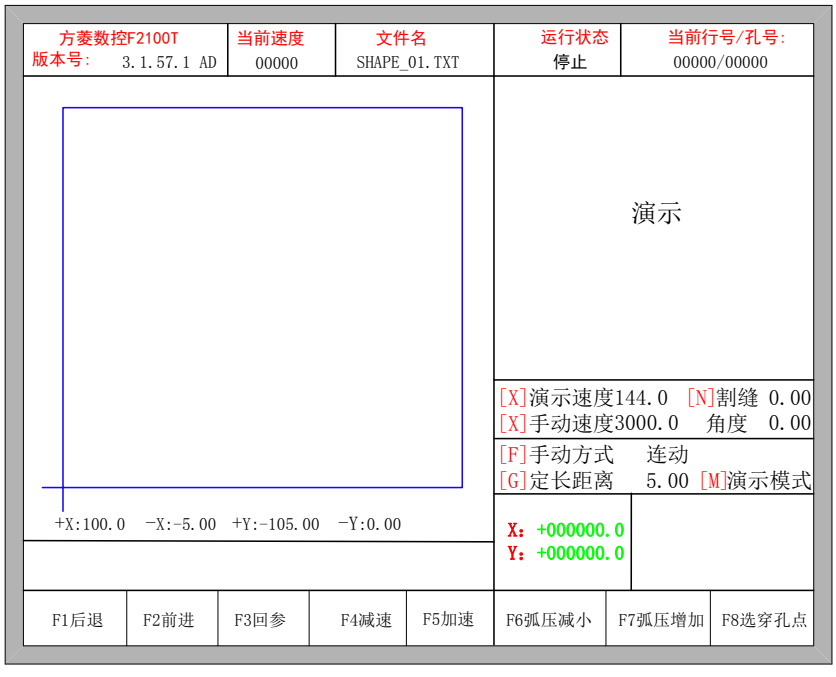


Fig.3.17 Non plasma and oxygen gas cutting interface **(直接改！)**

Chapter 4 Part Option

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

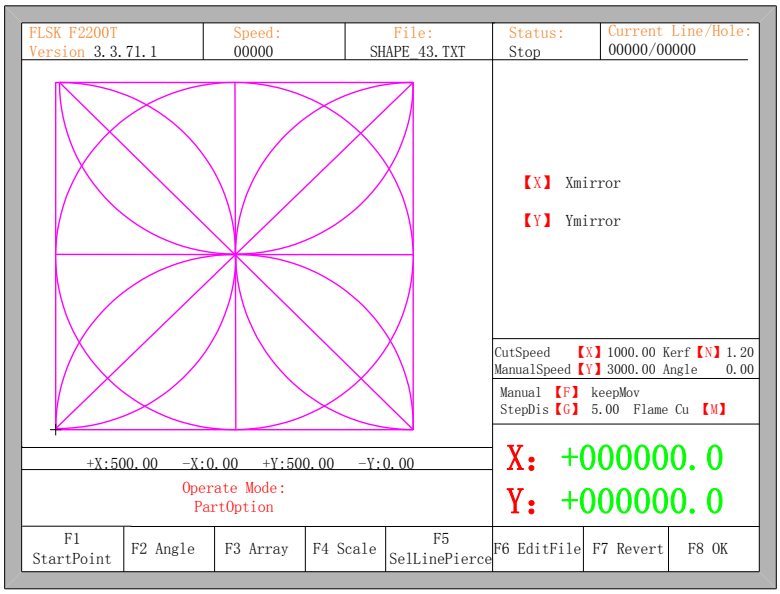
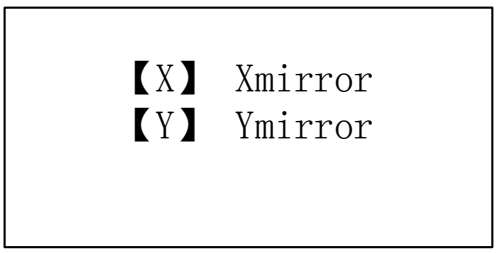


Fig 4.1 Part options（改!）

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 4.2 and 4.3 show:

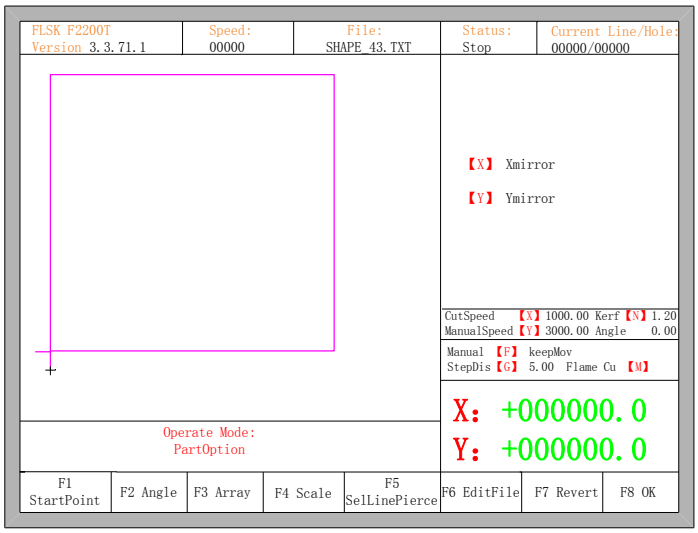


Fig 4.2 before press F4, start point is at original point（改!）

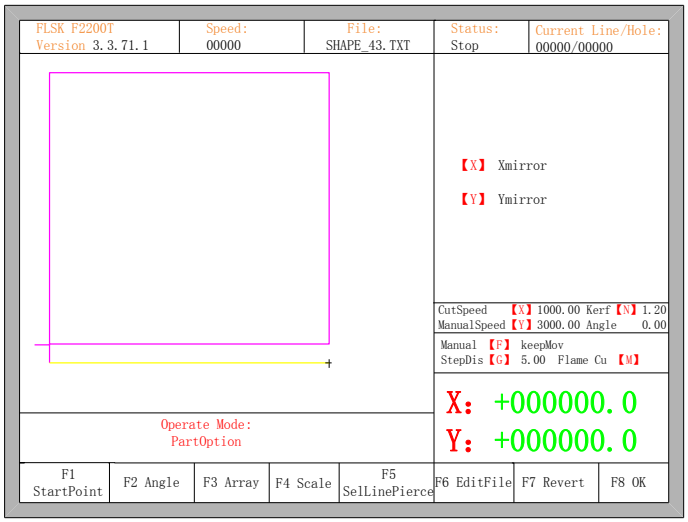
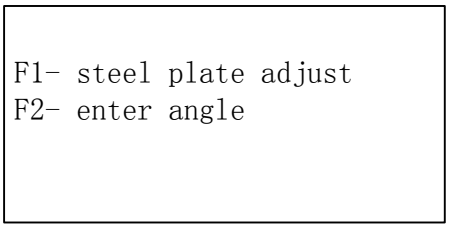


Fig 4.3 after press F4, start point is at lower right corner（改!）

4.3 Angle Adjustment

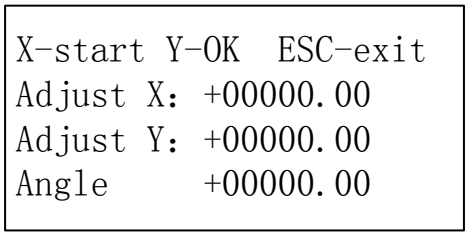
Press F2, the system will prompt:



- 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:



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.

Illustration: if use the laser gun to make adjustment, the laser point can be aligned to the edge of the plate correction, the specific use of the method can refer to section 5.5 laser offset function.

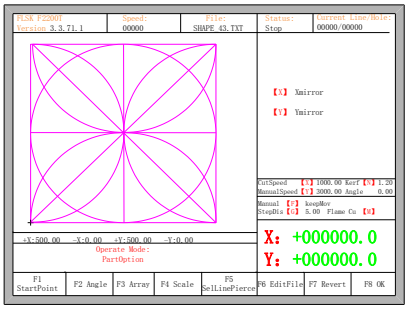


Fig 4.4 before adjusting（改!）

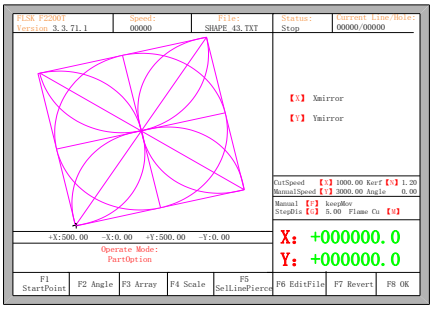


Fig 4.5 after adjusting（改!）

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.

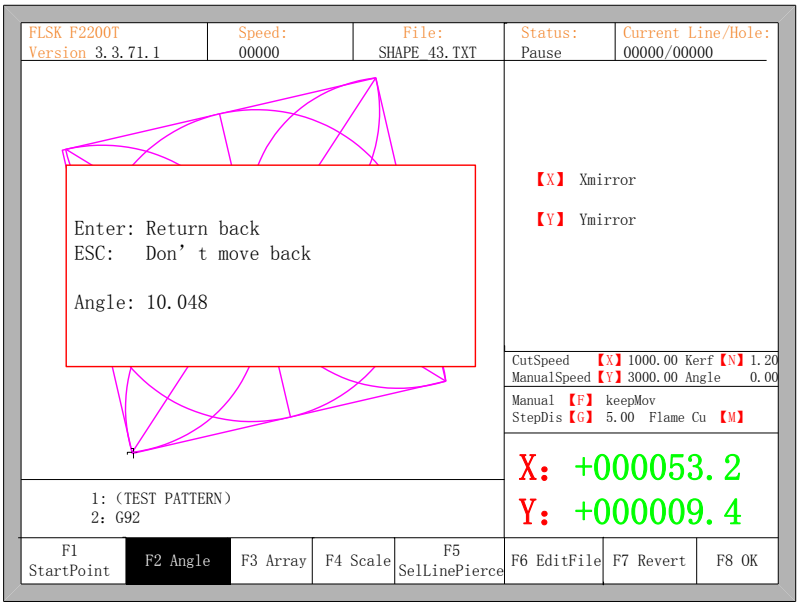


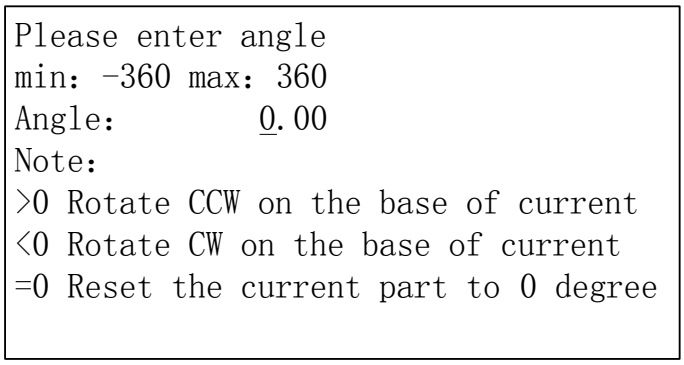
Fig 4.6 Return to the start point after adjusting（改!）

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 input the angle:



Enter angle

After manually input 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.

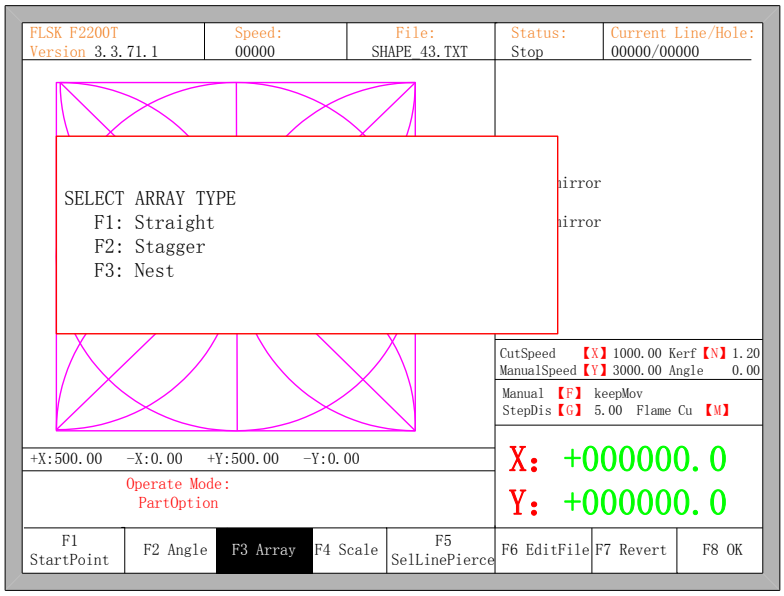


Fig 4.7 Chooses arrange method（改!）

Press【F1】 to carry on arranging in matrix:

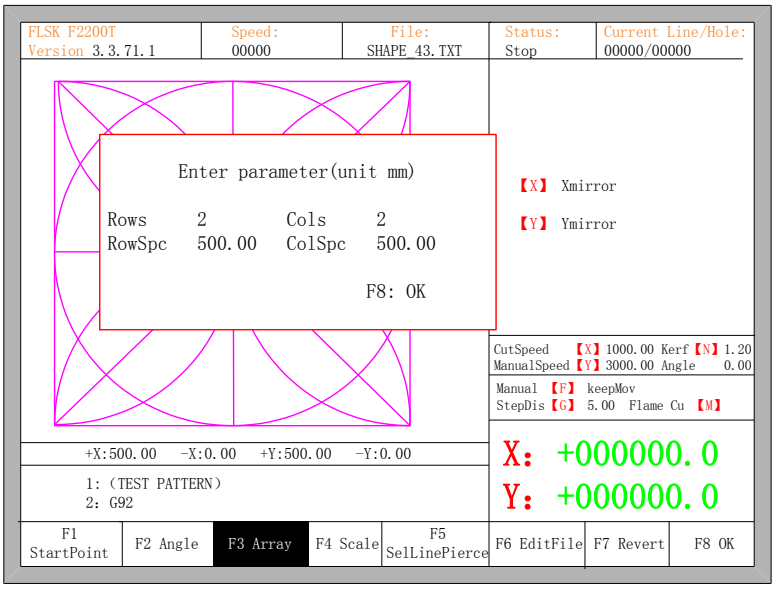


Fig 4.8 Arrange in matrix（改!）

The result is shown in fig 4.9

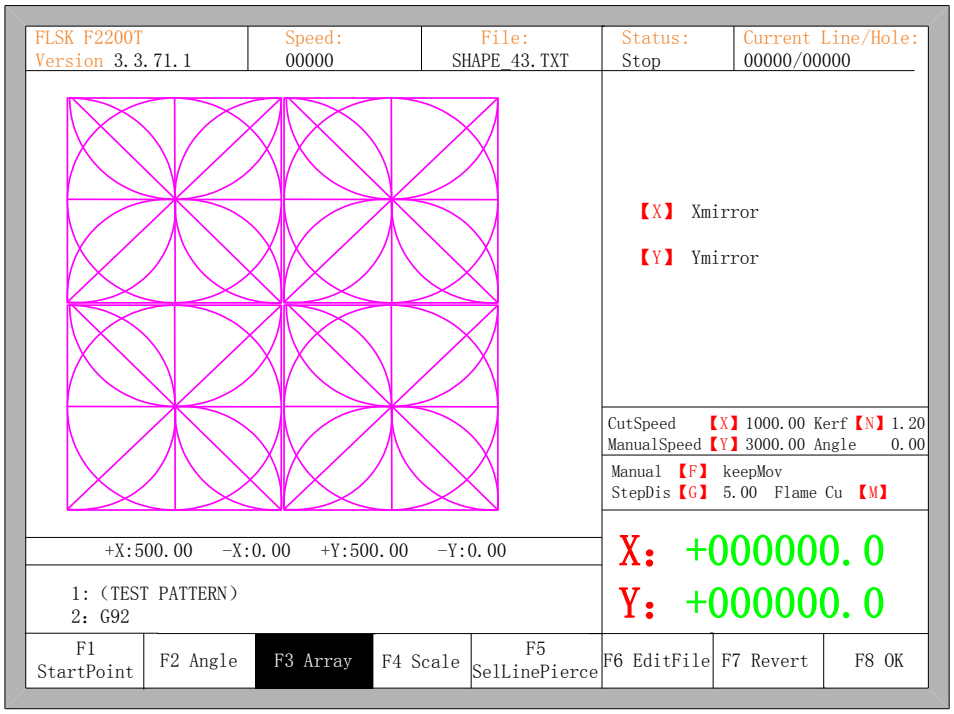


Fig 4.9 Result of arranging in matrix（改!）

Press [F2] to enter staggered arrangement:

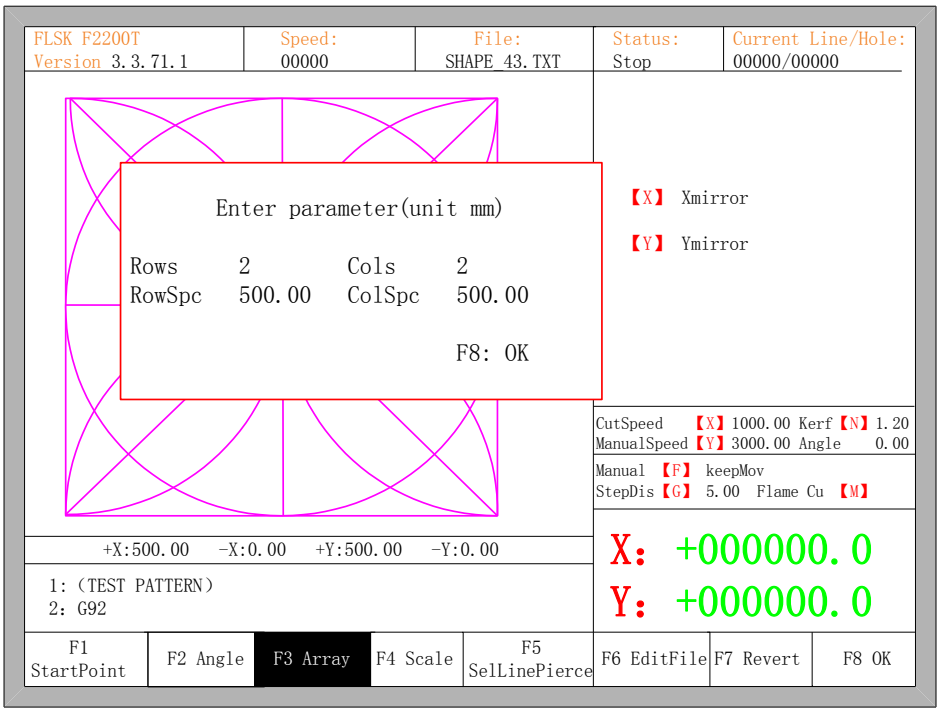


Fig 4.10 Staggered arrange（改!）

The result is shown in figure 4.11:

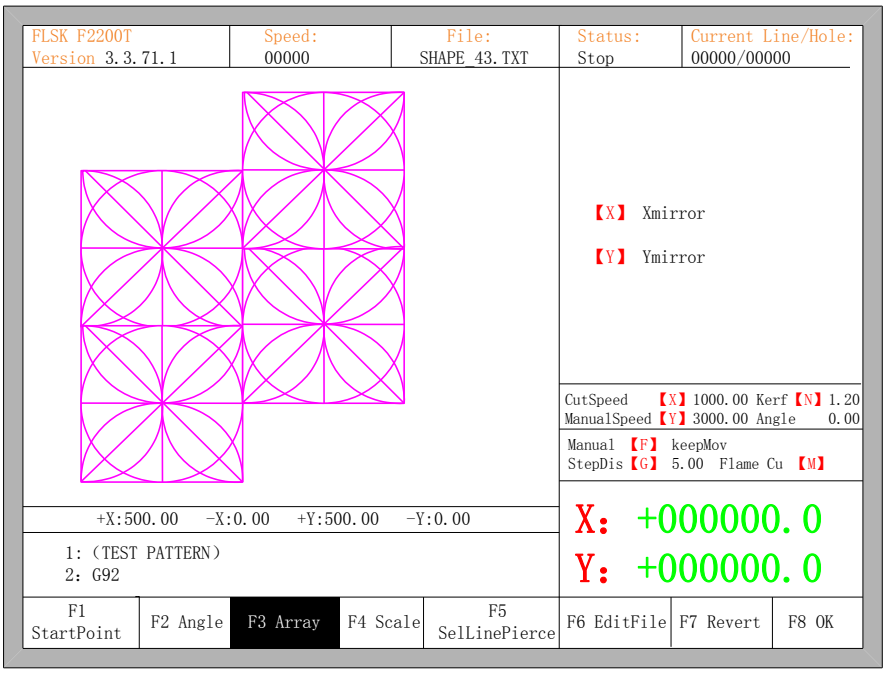


Fig 4.11 Result of staggered arrangement（改!）

Press [F3] to enter arrangement in stack:

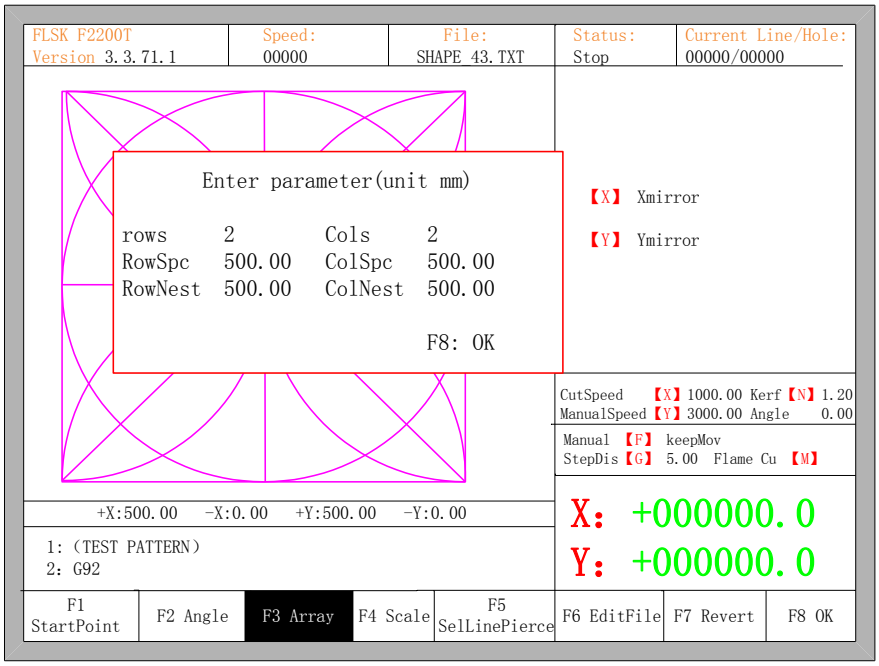


Fig 4.12 Arrange in Nest（改!）

The result is shown in figure 4.13:

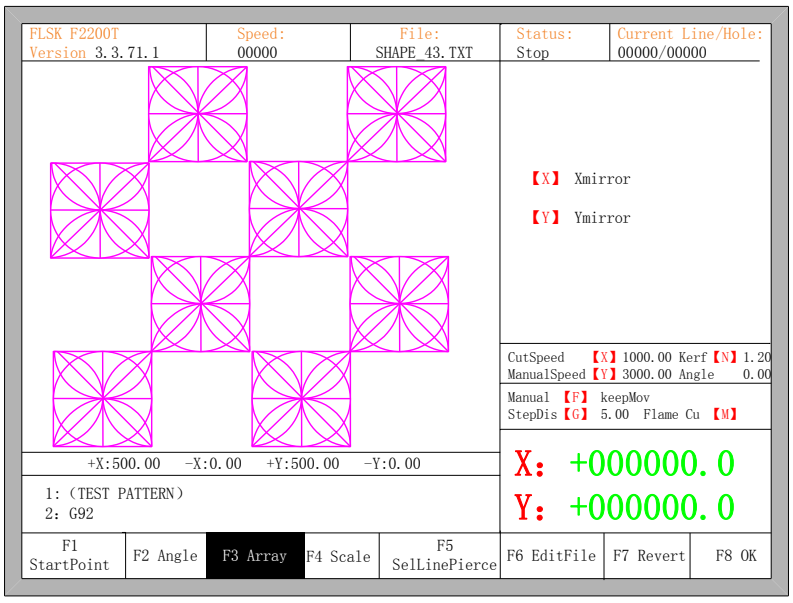


Fig 4.13 Result of arrangement in nest（改!）

4.5 Zoom in/out

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

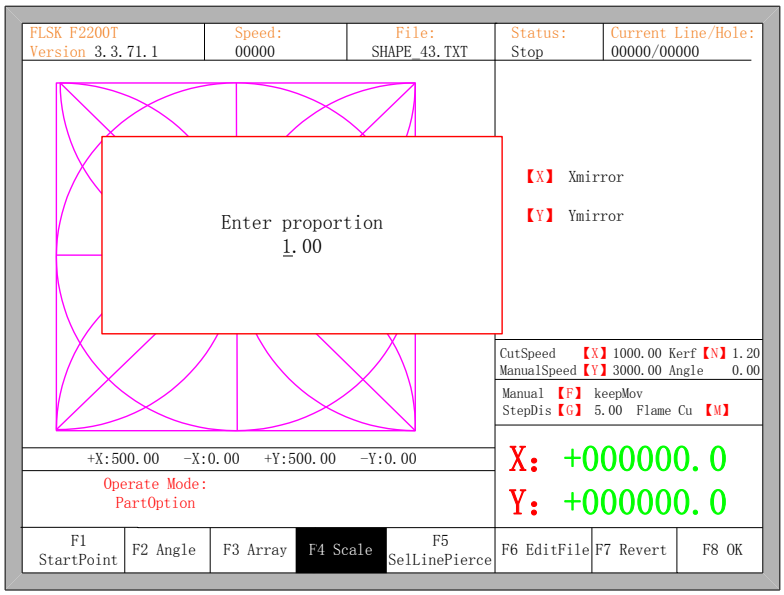


Fig 4.14 Set scales（改!）

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.

Note: Zoom in/out is also applied to lead in and lead out lines.

4.6 Select Row/Number

In part options menu, press【F5】to enter selecting row/number, the system will prompt:

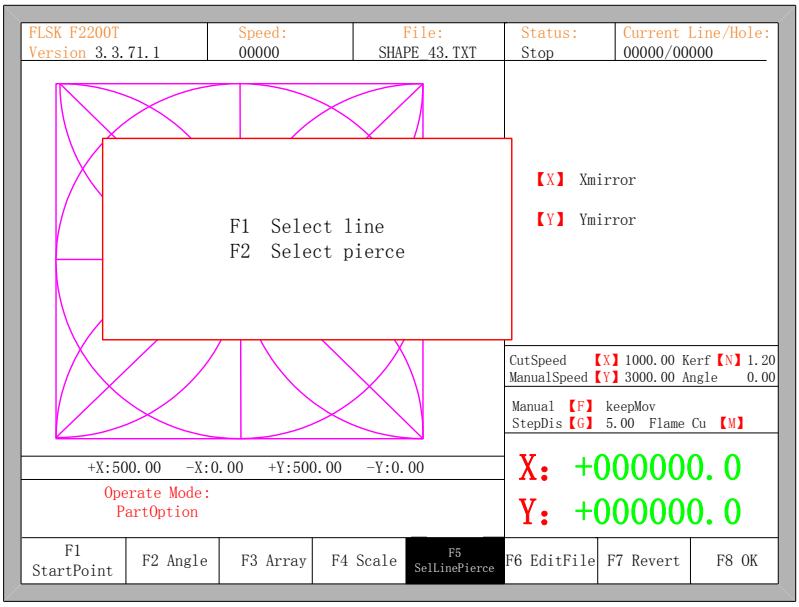


Fig 4.15 Select Line/Pierce（改!）

4.6.1 Select Row

Press【F1】to select the number of row to start cutting with, the system prompts:

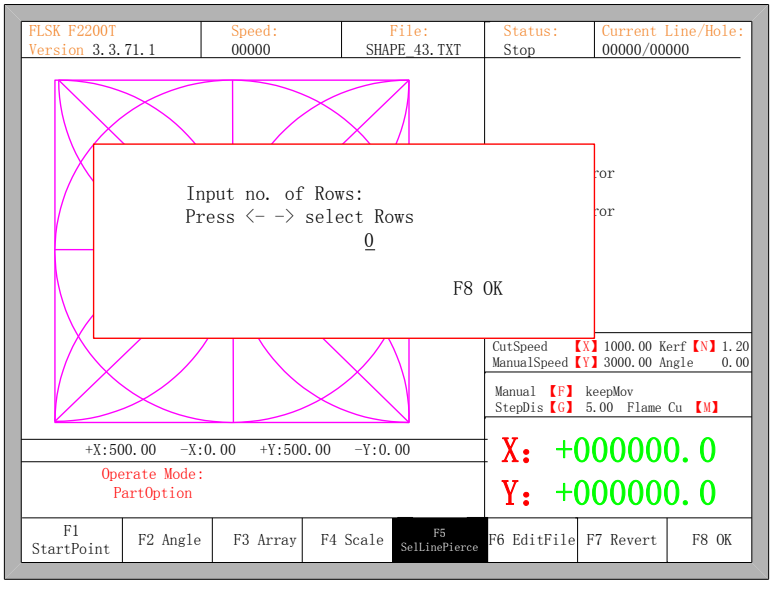


Fig 4.16 Prompt to select row（改!）

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

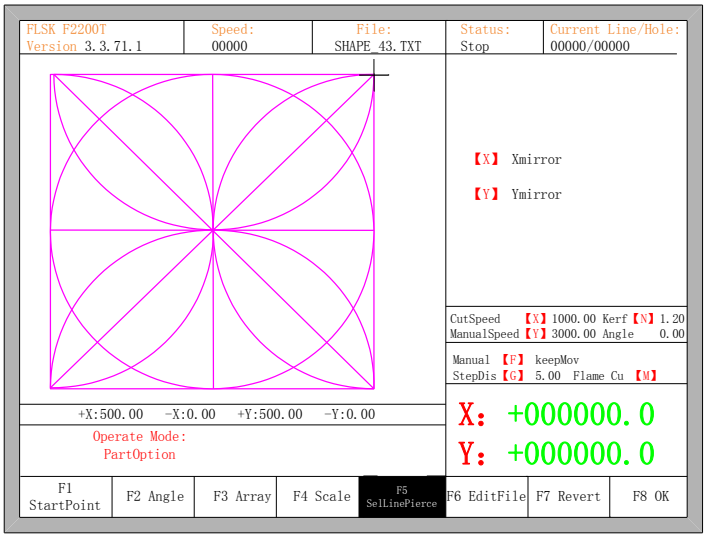


Fig 4.17 Select row（改!）

After selecting row, press【F8】 to confirm.

4.6.2 Select Number

The operation is similar to 4.6.1 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.

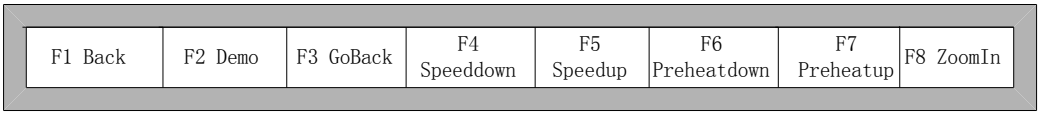


Fig 4.18 Function key of cutting interface

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

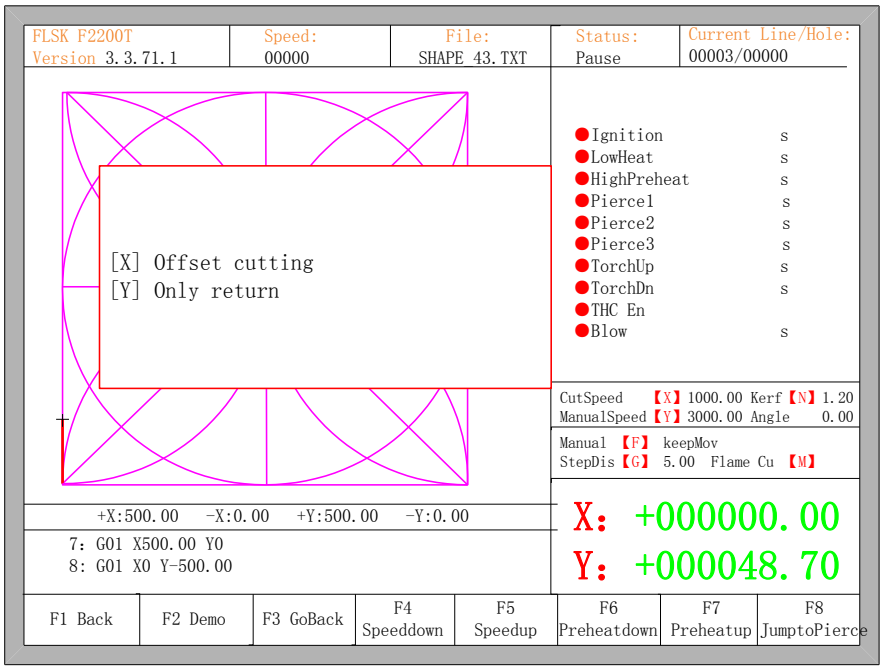


Fig 4.19 Operation after selecting row/number（改!）

Press 【Y】, the system will also directly move to the selected row and number, then pause and wait for the next operation.

2. Cutting from the current position

After the prompt of Fig 4.19, press 【X】, then the system will start cutting from current position.

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:

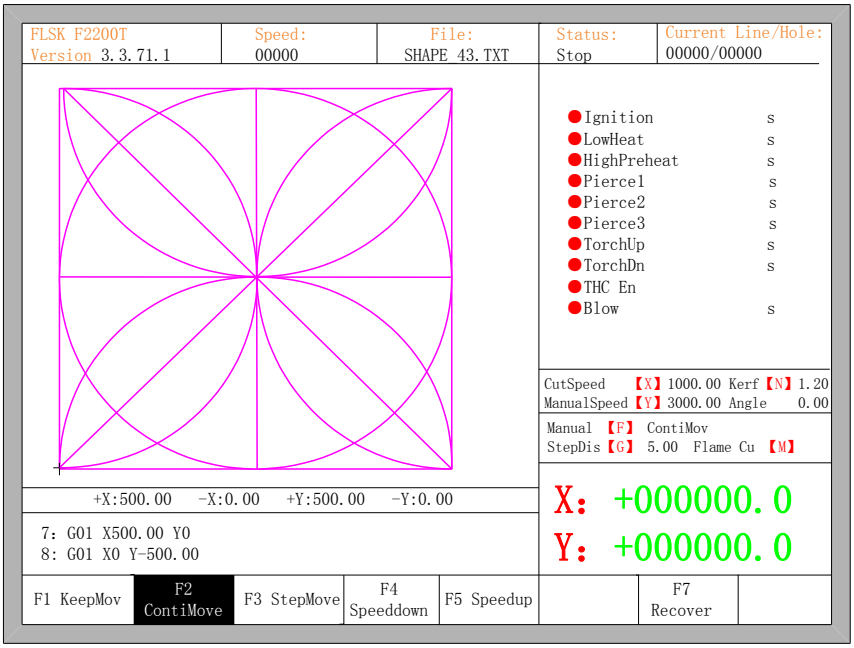


Fig 5.1 Manual function interface（改!）

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:

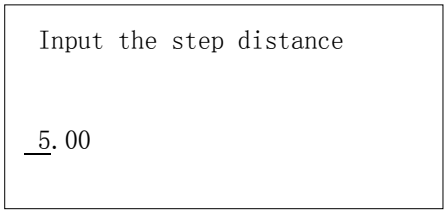


Fig 5.2 Input the fixed length

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:

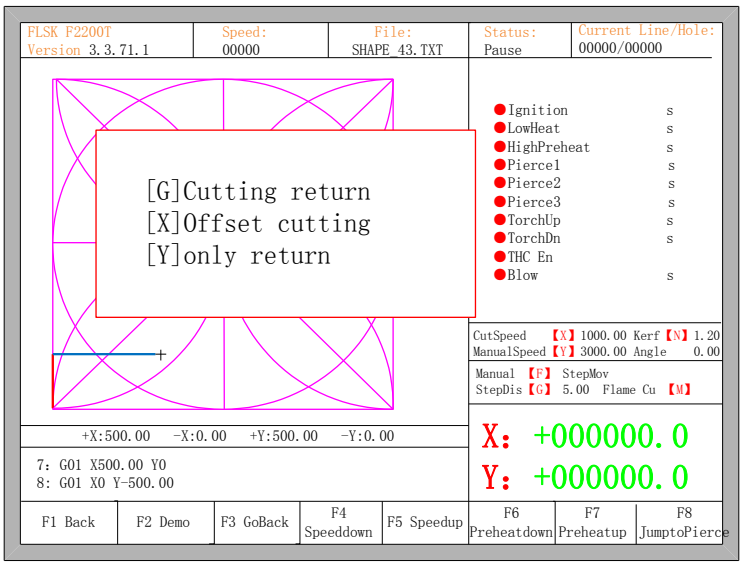


Fig 5.3 Restore breakpoint(改！)

- 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.

5.5 Laser Offset Function

Laser offset function refers to the user's installation of a laser cross location next to cutting torch. Distance between the cross and the cutting torch is fixed. After setting this offset distance(This parameter refers to section 7.4 powder parameters), user can use in 【F7】Manual Move interface:

- 【F4】Laser offset(??): can make the cross cursor move to the original position of the torch
- 【F5】Laser bias(??): can make the torch move to the position of the cross cursor

Using this function, the user can conveniently use positioning characteristics of the cross laser cursor. After the completion of the positioning, make the torch move back to the position point of the cross cursor. This function can be mainly used in steel plate correction, steel plate start point search, etc..

If user has customized the laser offset function, the previous acceleration and deceleration buttons in manual move interface will be replaced by buttons [F4] laser offset and [F5] laser bias, shown as fig 5.4:

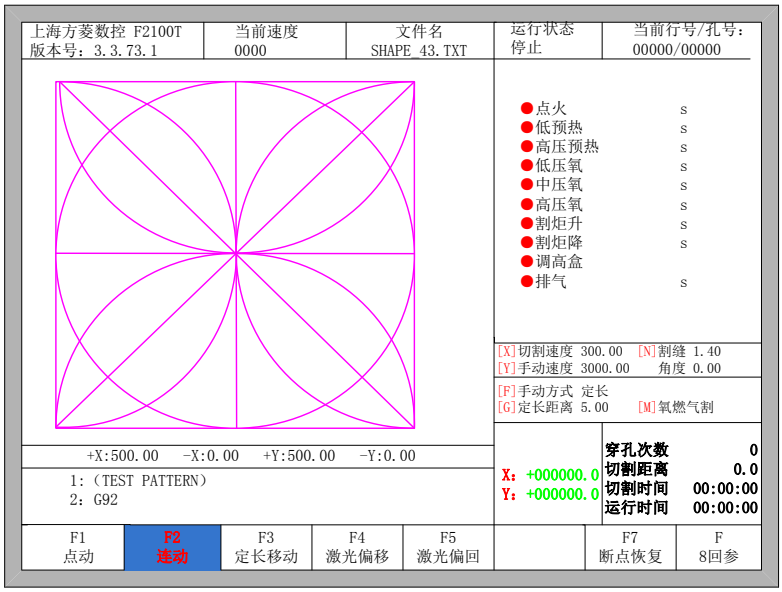


Fig 5.4 Laser offset and laser bias function(直接翻译！)

Chapter 6 File Operation

The system supports cutting code which has txt、cnc、nc、B3、MPG postfixes. The maximum capacity is 4M and the largest number of rows is 150000 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:

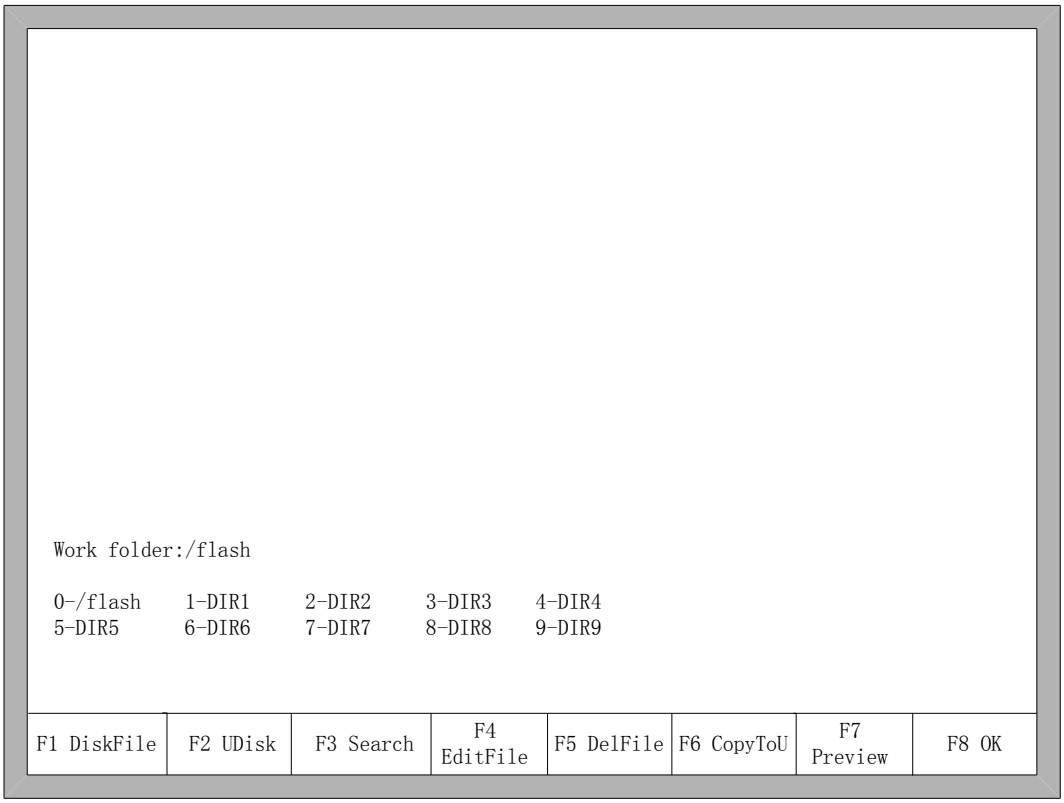


Fig 6.1 code interface

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 6.4 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.
- 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 6.2:

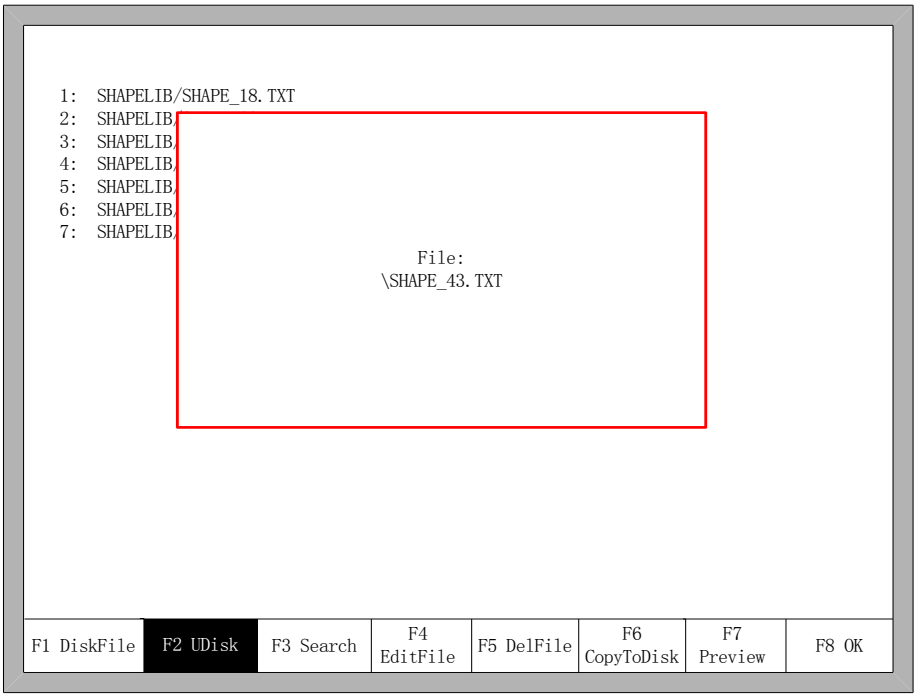


Fig 6.2 save U disk files

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 exited, the system prompts:

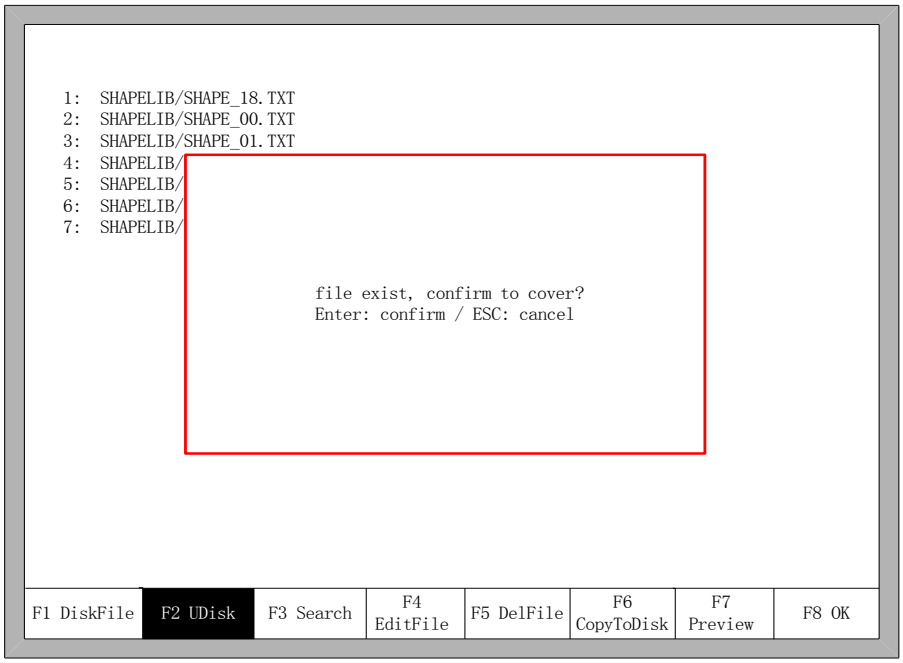


Fig 6.3 Replacement documents

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.

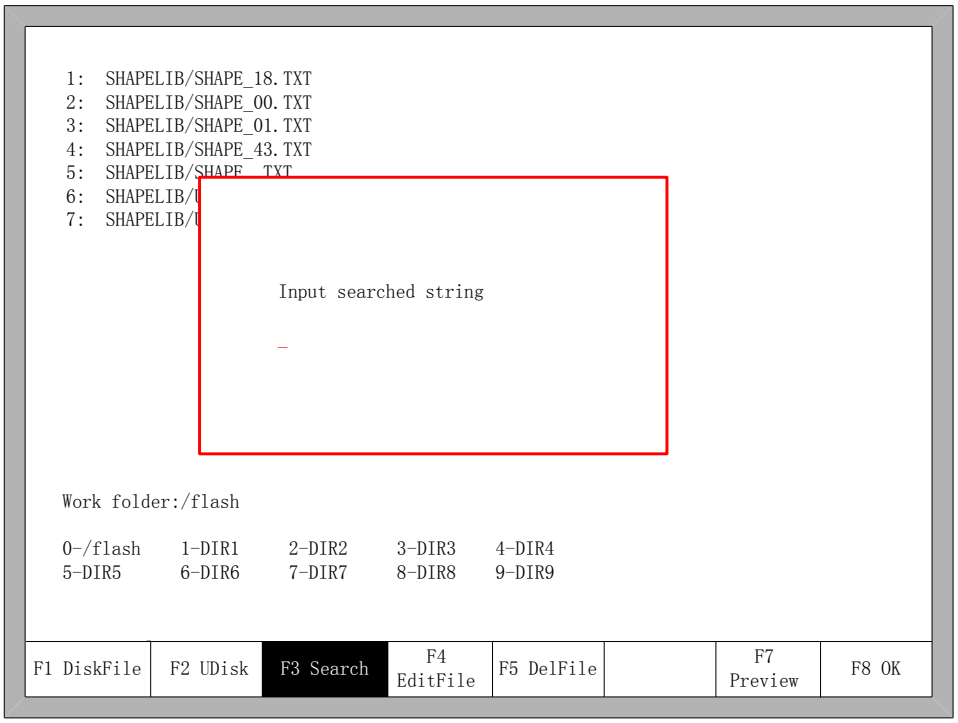


Fig 6.4 search file

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 Managerment

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 6.5.

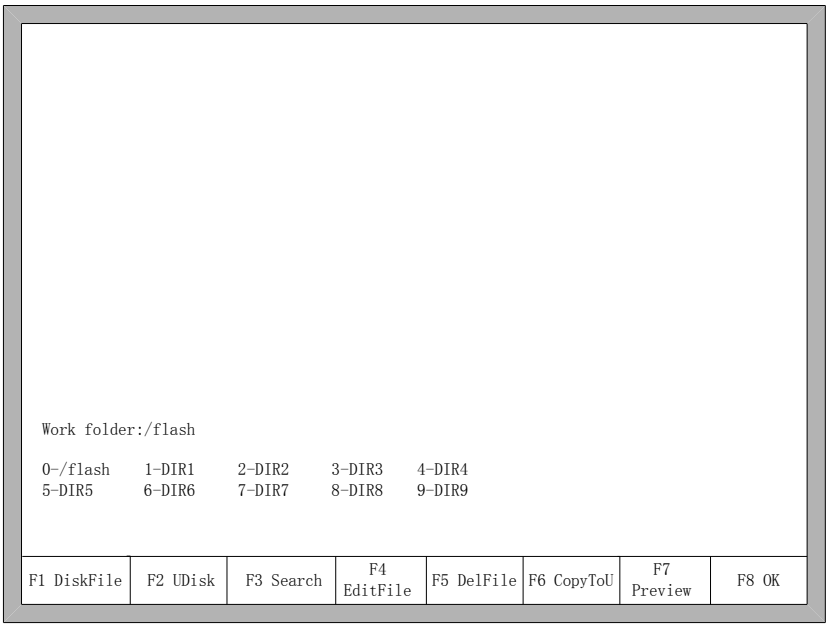


Fig 6.5 Folder 1

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 Creat New Folder

It will be complex to creat a new 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 6.6 shows.

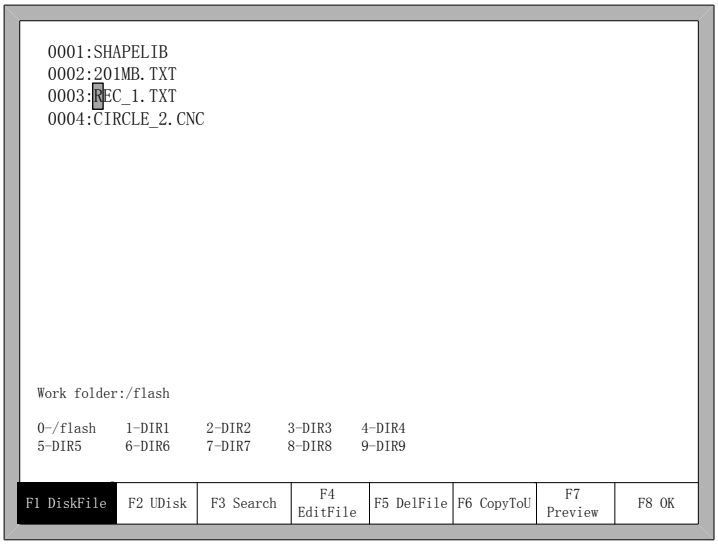


Fig 6.6 cursor moves to G code file name

Then press【F4】-- edit file, the function keys under the edit file show as figure 6.7.

F1Compile	F2AddRow	F3Del Row	F4NewFile	F5NewFolder			F8Save

Fig 6.7 Edit file interface

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

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 8.7.9.

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 as Fig 7.1

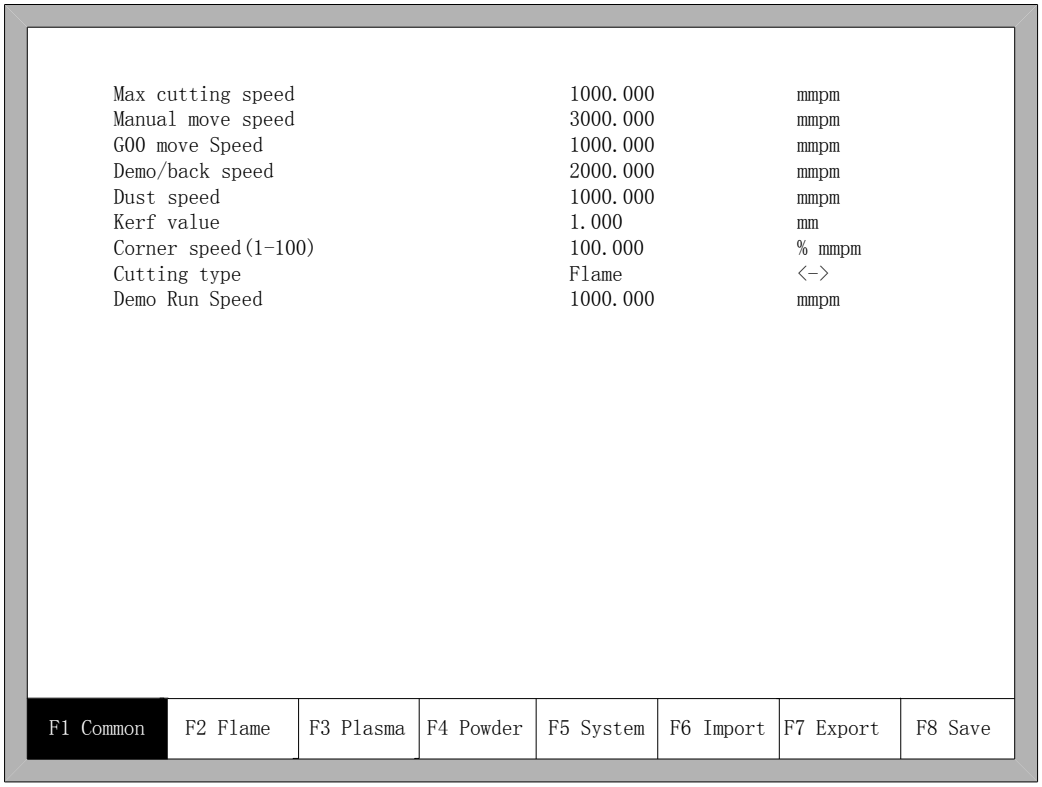


Fig7.1 Parameter Interface

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

There are the common 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: t**he cutting torch speed when G00 is executed or the cutting torch go back to the reference or some other occasion, unit is mm/m.
- **Demo/ back speed**: the speed of forward or backward along the path when it is suspended.
- **Dust speed**: the speed when executing powder.
- **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 three cutting types: Oxygen fuel gas, Plasma parameters and demonstration type. You can press 【←】or 【→】to switch with them.
- **Demo run speed**: the speed under demonstration.

7.2 Flame Parameters

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

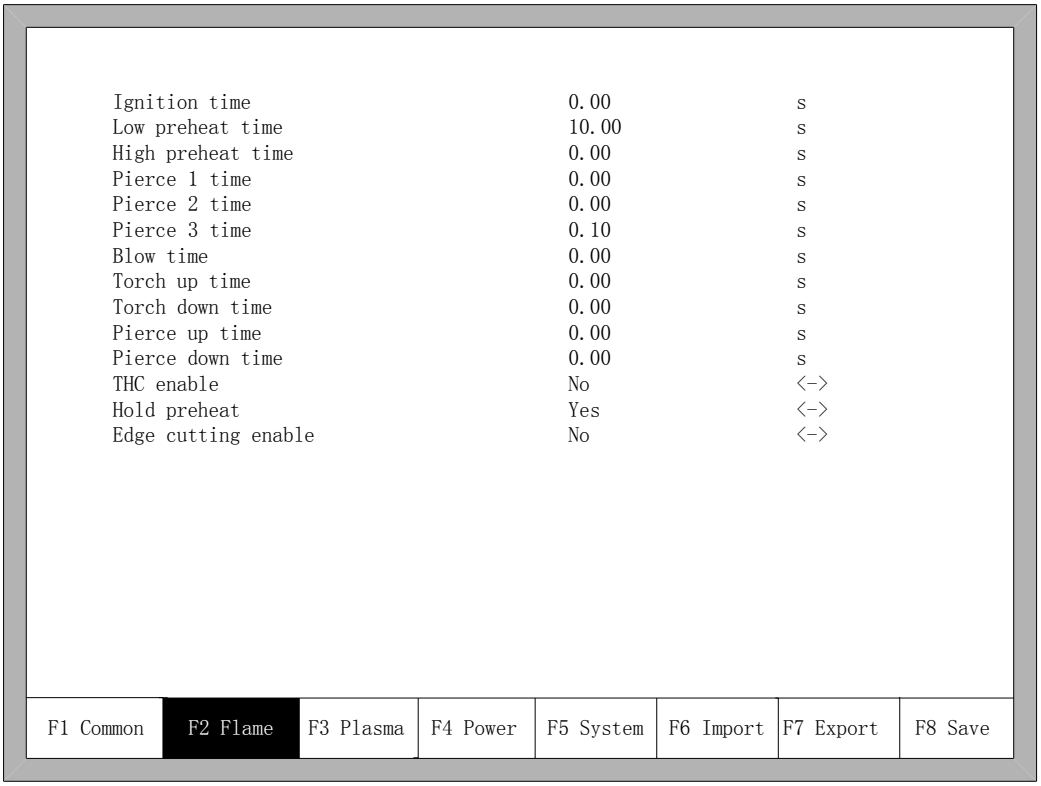


Fig 7.2 Flame Parameters(改!!)

- **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 or 【F7】 key. If you press “stop” key, the preheating time will delay until you press the “start” key to start high preheat time. If you press 【F7】key, the preheating time will automatically increase 15 seconds, and this time will be preserved by system.
- **High Preheat Time:** Like **Low Preheat Time. But** open different IO, high preheat time is before low preheat time.
- **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, working at M08 code or M02 code; while the **Pierce Up Time** means the time that the torch needs to lift up after preheating in the fixed cycle of perforation, working at M07code.
- **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:

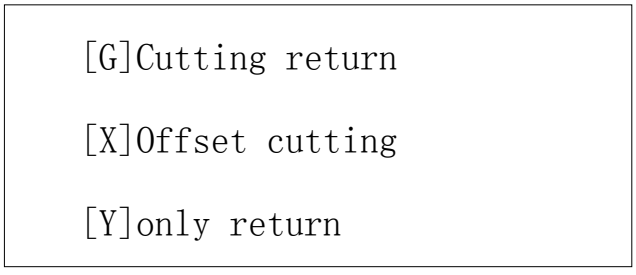


Fig.7.3 Edge cutting

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.

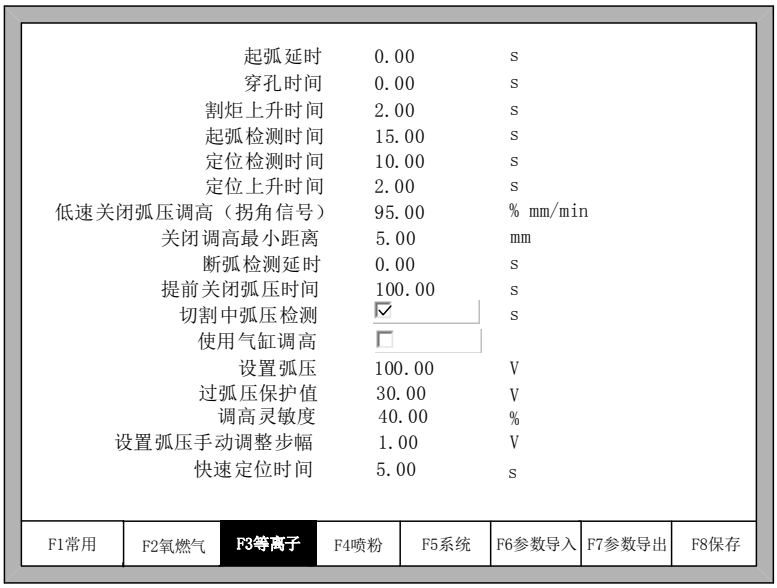


Fig 7.4 plasma parameters（改!!）

- **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. Unit is %.
- **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 he 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 for the "T" models 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** ≥ (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:** This is sensitivy reflected by THC motor. It turns larger, reflection of THC motor turns more sensitive, but could not exceed the range, otherwise in the process of motor turning high, it occurs wave phenomenon, it is normally set as 30-50, the range of which is 0.00-100.00. Unit: %. In the actual using, according to the cutting speed and inertia of lifting, it will stop adjusting motor until the motor can not shake and reach the level of turning high quickly.
- **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.

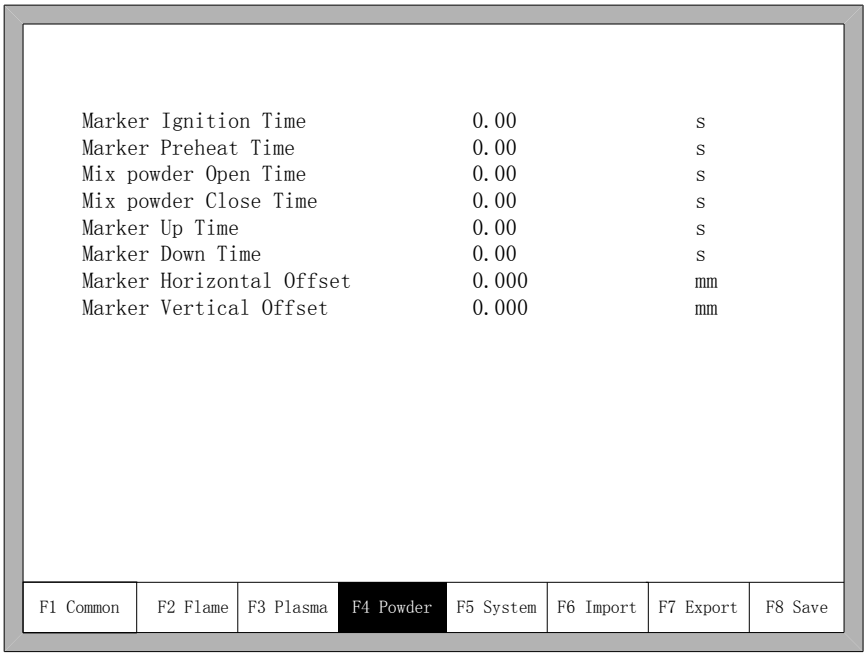


Fig 7.5 powder parameters（改!!）

- **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.

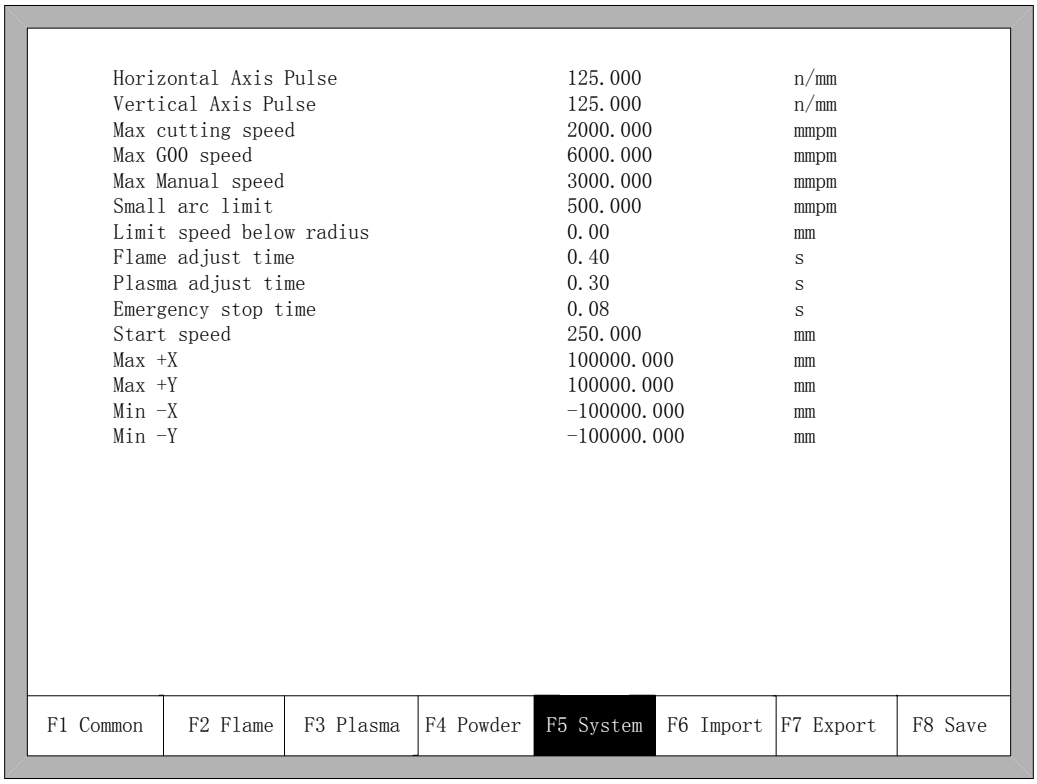


Fig 7.6 System Parameters（对照界面核对！）

- **Horizontal Axis Pulse:** The number of pulse that system needs to generate when the machine move1mm 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.
- Max Manual Speed: the maximum speed of manual move.
- **Small Arc Limit:** Maximum speed at cutting a small arc. Different cutting speed leads to different small arc limit. Refer to note 1.
- Small Arc Radius Limit: If the radius is less than or equal to the value of the circular arc, the running speed should be limited. Refer to note 1.
- **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.

Note 1:

Table 7.1 Small Arc Definition

Cutting Speed(mm/min)	Small Arc Radius(mm)
0-2000	5
2000-4000	10
4000-6000	15
6000-8000	20
8000-10000	25
10000-12000	30
>12000	35

The relationship between cutting speed and arc radius when cutting small arc

Small Arc Limit	Small Arc Radius	Cutting Speed
=0	=0	No limit
>0	=0	Follow table 7.1, for arc less than small arc radius, the running speed should be limited.
>0	>0	Cutting speed = small arc limit x (arc radius/ radius of small arc limit). When the result is less than the starting speed, the value is starting speed. When starting speed is less than cutting speed, the value is cutting speed.

Note: the modified small arc limit or radius of small arc limit will become effective only after reloading cutting files.

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. You can import the parameter file F2300.DAT to the system.

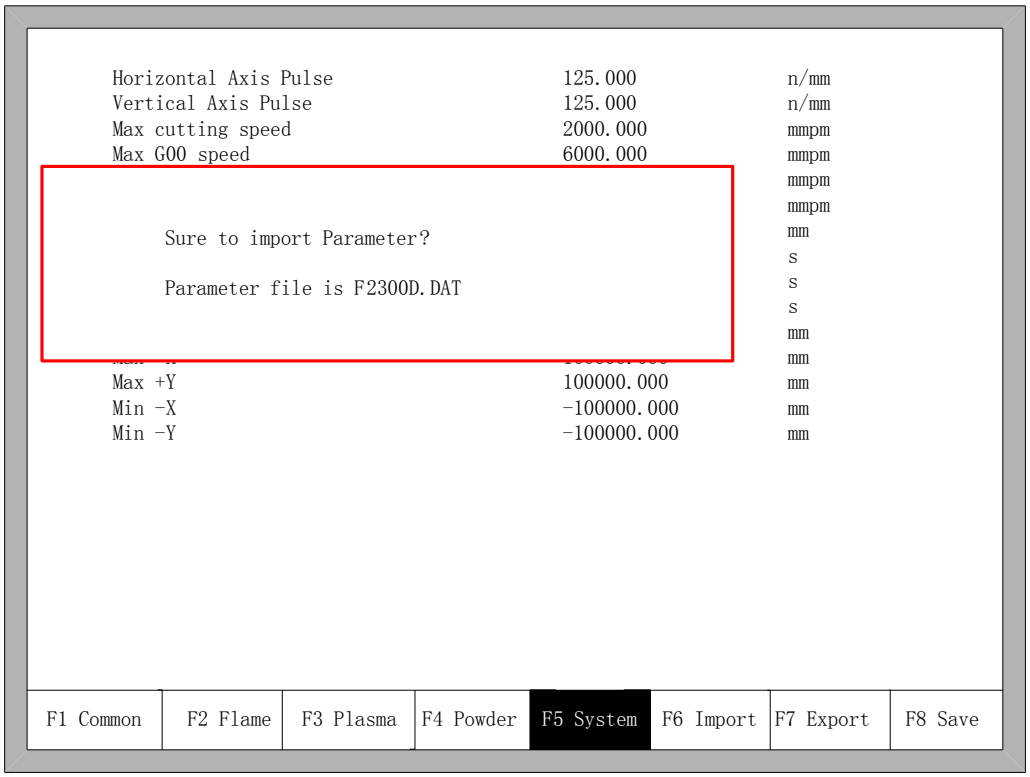


Fig.7.7 Parameter import

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

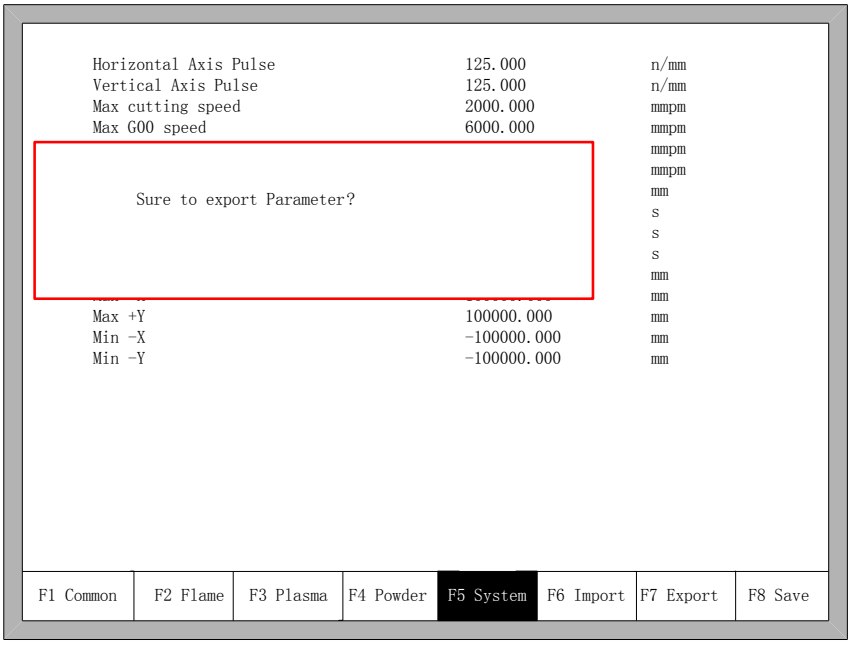


Fig.7.8 Parameter export

7.8 Save Parameters

After parameter modification, press 【F8】 to save.

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

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 this interface. System self-check can be made by this.

8.1 Diagnosis Interface Index

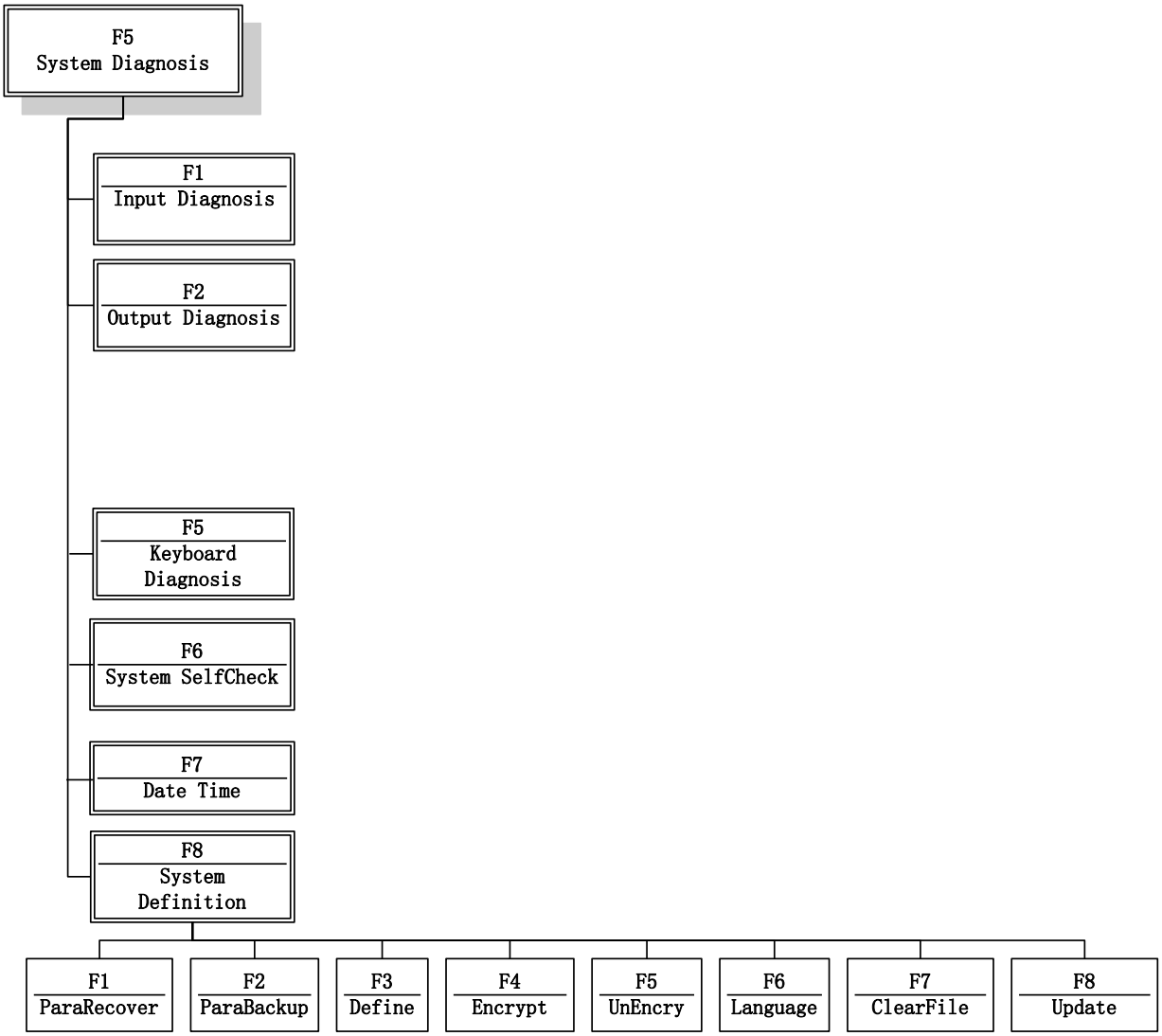


Fig 8.2 Diagnosis interface index

8.2 Input Diagnosis

The system will read current IO information when press 【F1】 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 diagnosis interface ,press 【F5】to enter okeyboard diagnosis interface，shown as Fig 8.4.

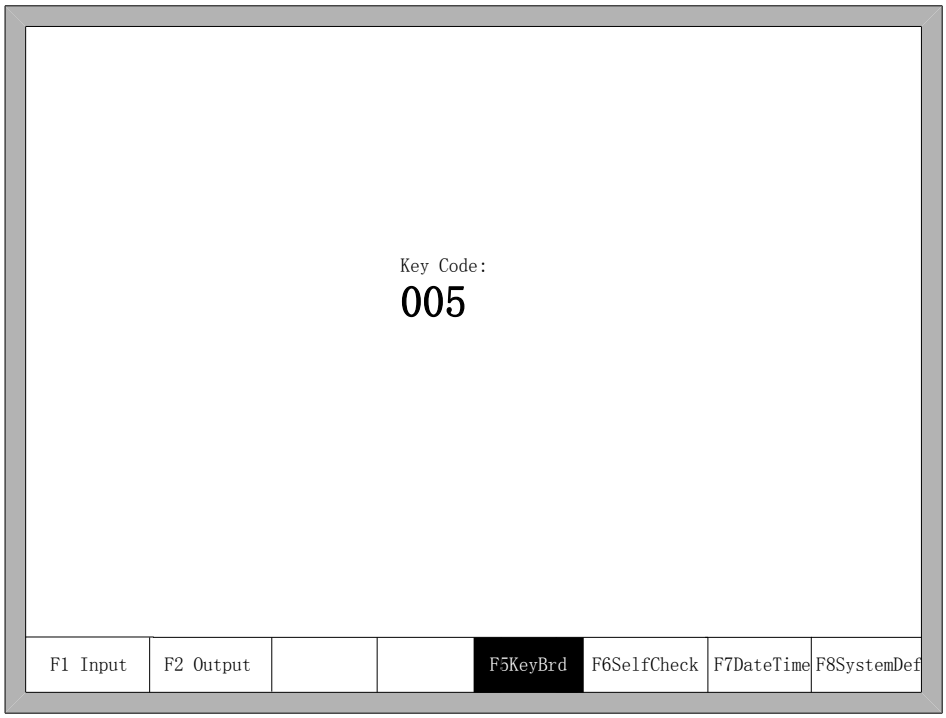


Fig 8.4 Keyboard Diagnosis

In this interface, press any key of the keyboard, there will be a corresponding keyboard encoding shown here. if there is no encoding shown, then this key is out of fault.

8.5 System Self-check

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

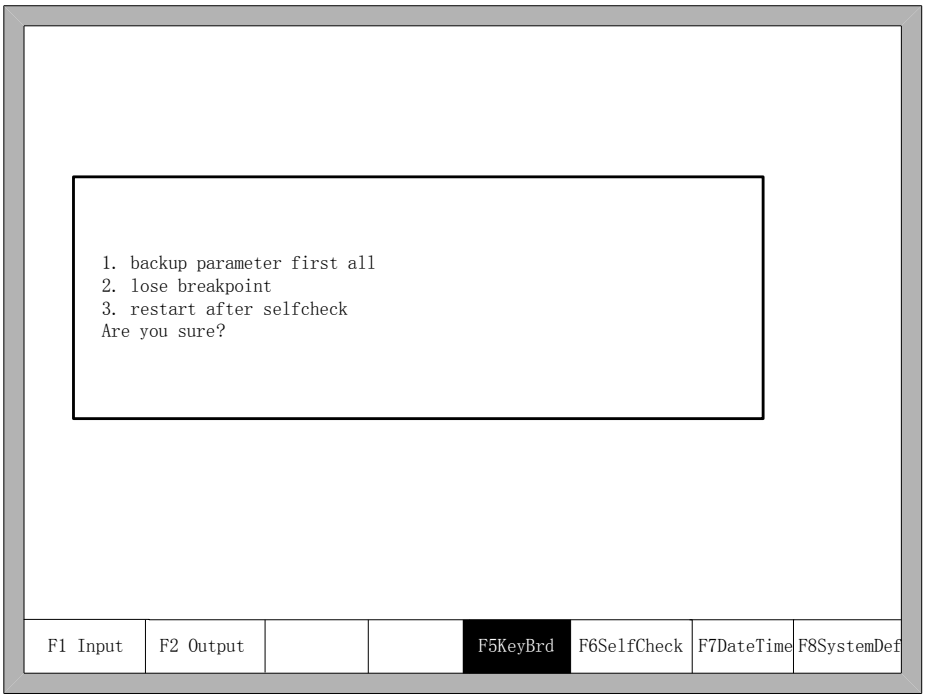


Fig 8.5 System self-check

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

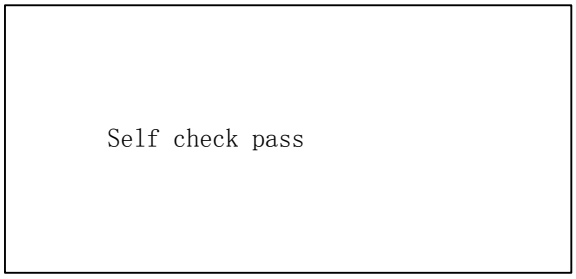


Fig 8.6 Self-check pass

If the self-test is not ok, there will be the following alarm types:

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

When coming across these situations, please power off, reboot after about half minute. 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.

Fig 8.8 input definition

In the interface press 【↑】、【↓】、【←】、【→】, move the cursor to the position that needs changing, press 【Enter】 to open the tab of the drop - down box at the location of the cursor, move the cursor by 【↑】、【↓】, press 【Enter】 to change the number of the Input, press 【Enter】to set the selected parameters.

Serial number: 01~10，14~22.

Type: NO (normally open), NC (normally closed)

Function: Move forward, move back, move left and move right, ignition input, oxygen cutting input, start input, stop input, gun rising input, gun down input, acceleration input, deceleration input, z axis upper limit position, z axis lower limit position, open drilling rig, drive no alarm situation, forward and backward.

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【F2】to enter the definition interface,, as shown

in fig 8.9.

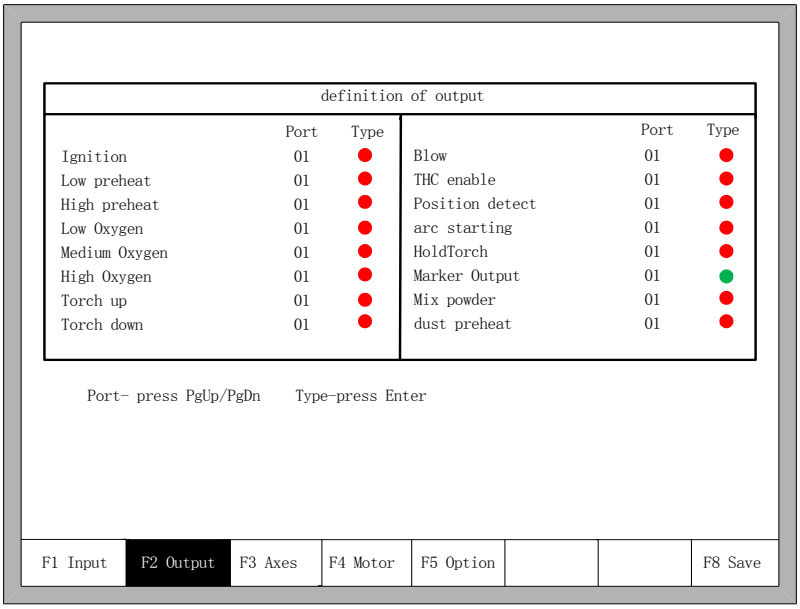


Fig 8.9 output definition

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

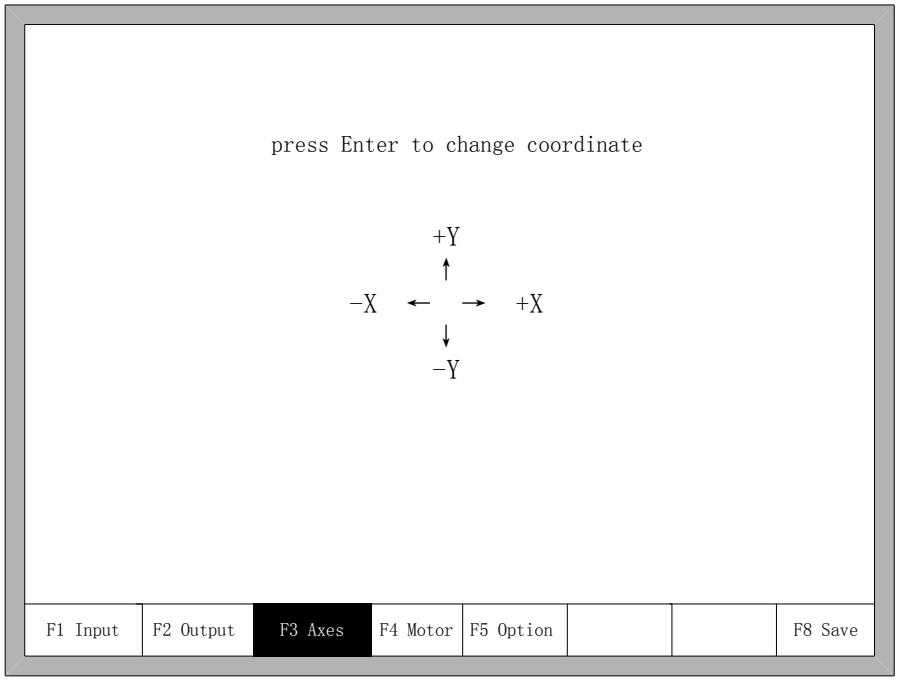


Fig 8.10 Coordinate Definition

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

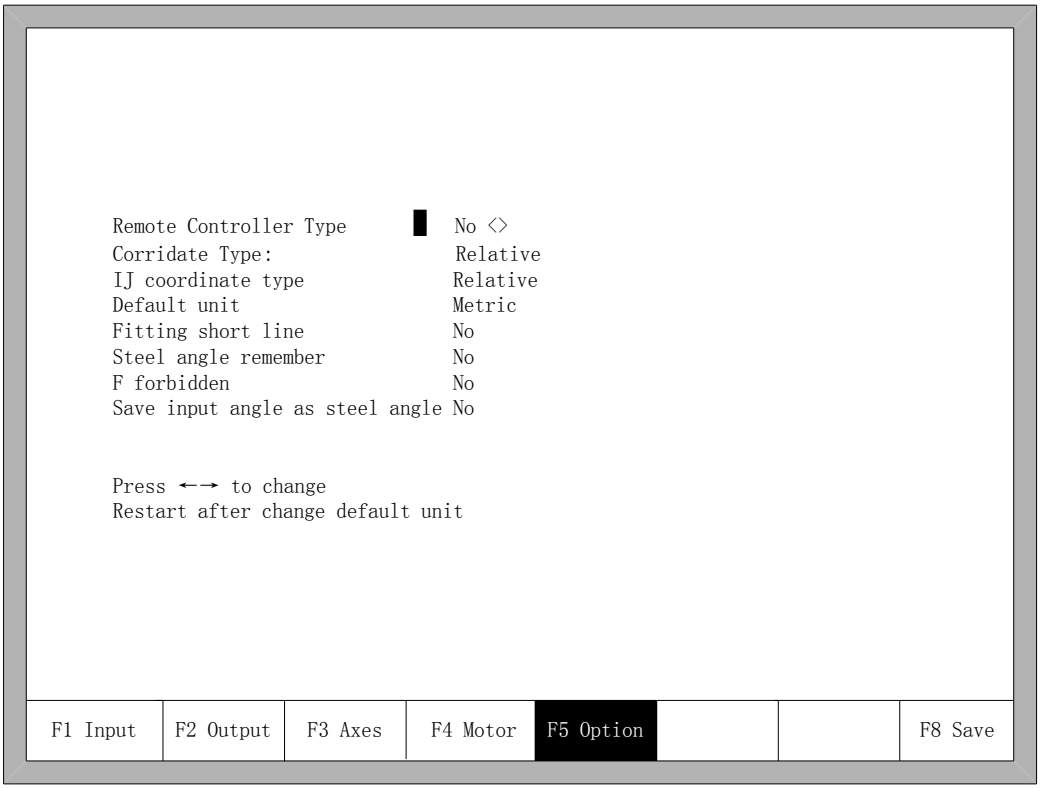


Fig 8.12 Option(改!!)

Press left or right arrow 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.

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 Inch

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.

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 Option 2

Description: tipical for the "T" models in F2000 series CNC system

Seen as figure 8.13, this option can be used to select the output port CN5 or DB25(CN2) to control the height of the flame gun.

Note: this option is only made for models with suffix "T", CN5 interface is unique to the "T" models.

Fig 8.13 Option 2

8.7.8 Language Switch

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

8.7.9 Add the 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 an 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.

8.7.10 Clear Files

In the main interface, press 【F5 Diagnose】,then press 【F8 System definition】,then press 【↓】 to make cursor above 【Clear File】 button and press 【ENTER】, the system will clear all G code files of system.

8.7.11 System Update

In the main interface, press 【F5 Diagnose】,then press 【F8 System definition】,then press 【F8 System update】, please ensure that you have inseted the U disk into system's USB interface, otherwise it will pop up a prompt box "please insert U disk". If U disk is okay, after press 【F8 System update】, it will pop up a dialog box as Fig 8.14. Press 【Enter】and confirm, it will prompt to update as the figure 8.15 shows.

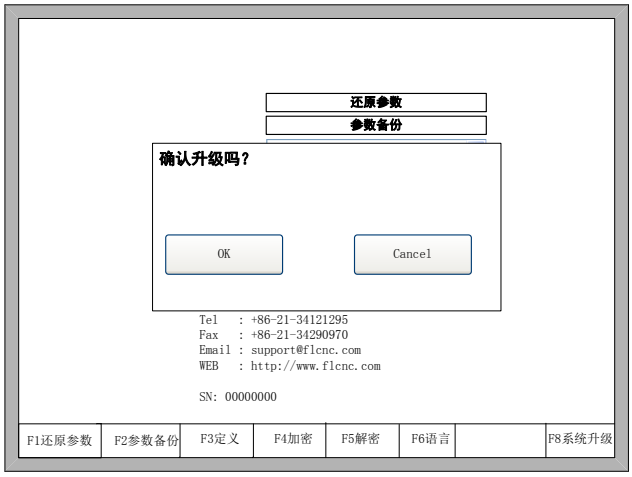


Fig 8.14 the prompt of update confirm

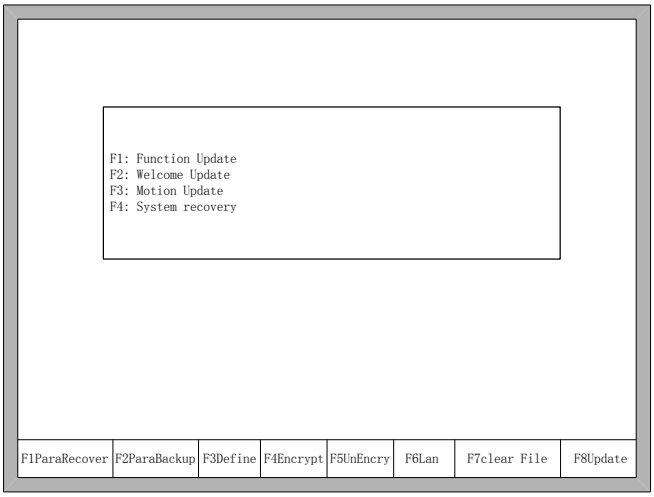


Fig 8.15 the prompt of system update

Function Update: after press 【F1】, it will update function. The function update file is F2000.exe or corresponding model upgrade file F2100BV4.exe, F2300V4.exe, F2500V4.exe.

Welcome Update: after press 【F2】, it will update the welcome interface. The interface upgrade file is named WELCOME.bmp, which should be put directly into the U disk but not in any folders. 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.

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 system.

Chapter 9 Graph Management

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

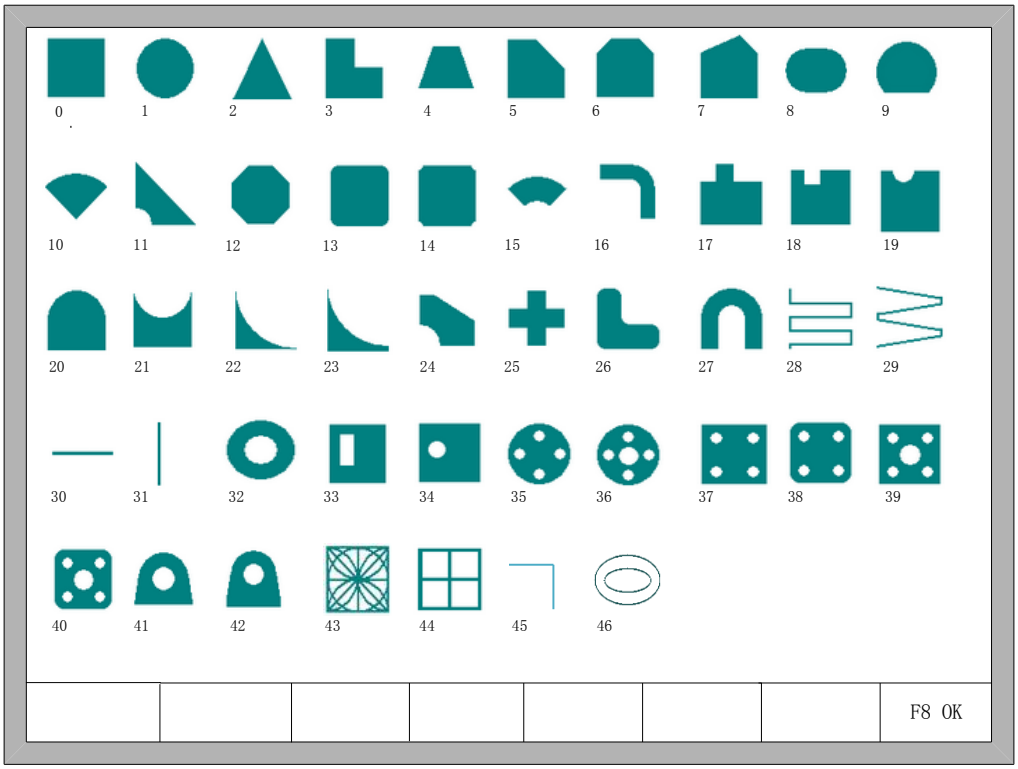


Fig 9.1 Page of graph Library

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:

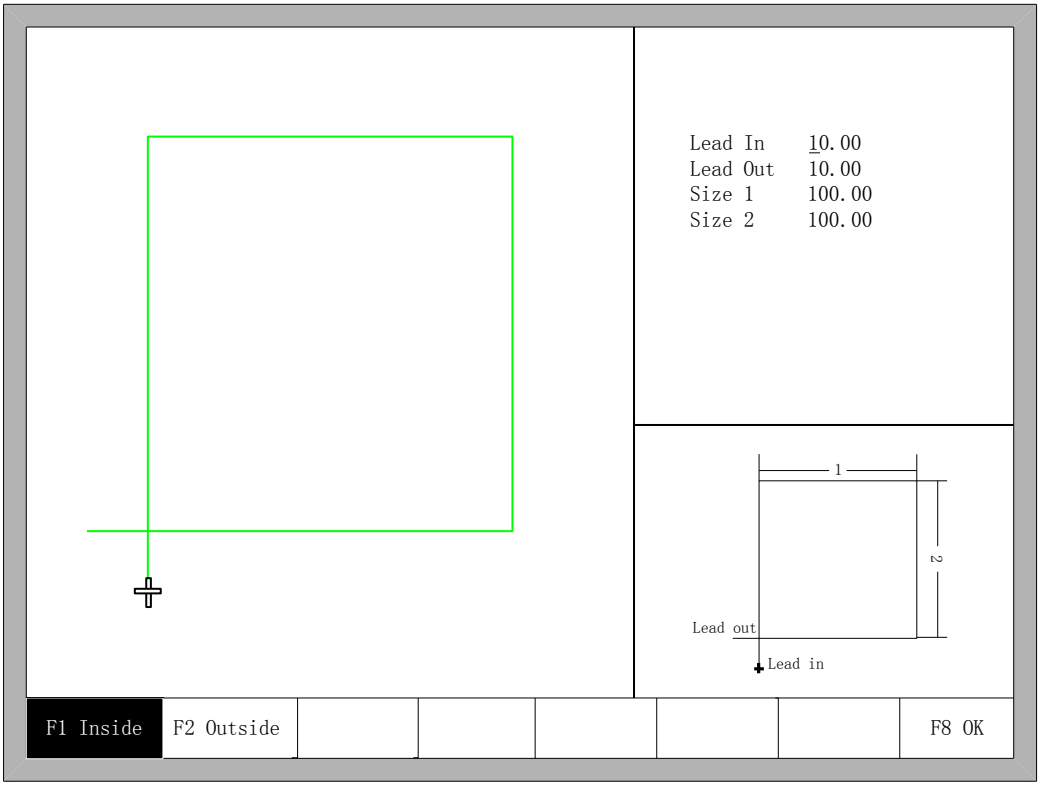


Fig 9.2 Chip size interface

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

Press any key to return to graphics processing interface as shown in Fig3.1.

9.2 Chip/Hole Size

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

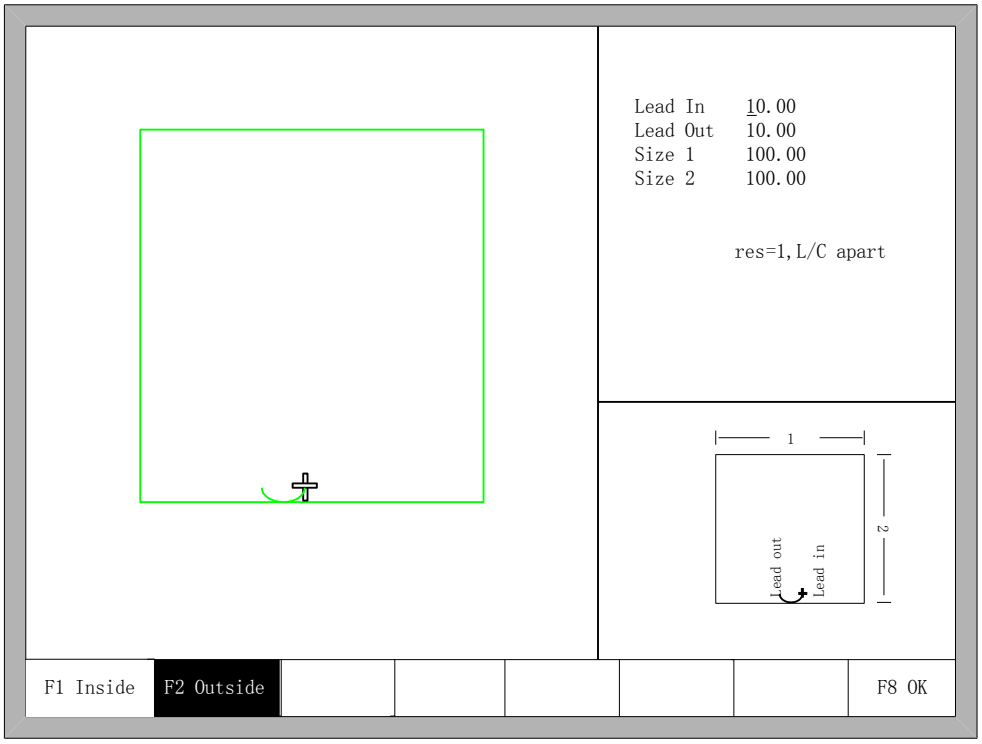


Fig 9.3 Hole size

Modify hole sizes is the same as 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°; when it's negative value, the arc >180°
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 appear. 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.

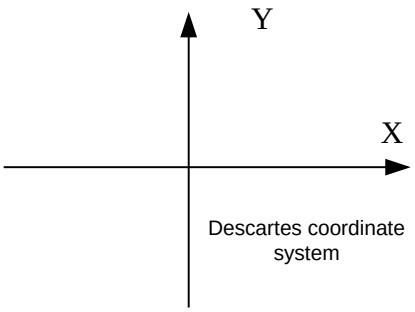


Fig 10.1 Descartes coordinate system

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 cuting
G04	Parameter: P	Time delay

1. G92 Reference point setting

Format:

G92 【Xn】 【Yn】

Parameters meaning:

【Xn】【Yn】 express 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 inputting 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
```

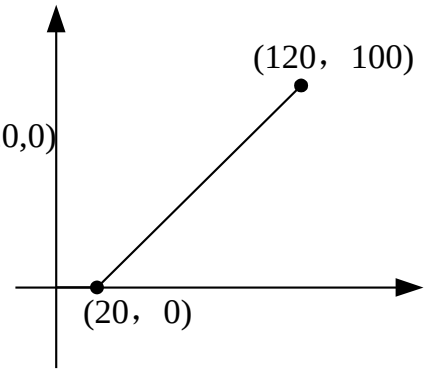


Fig 10.2 G90 usage

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
```

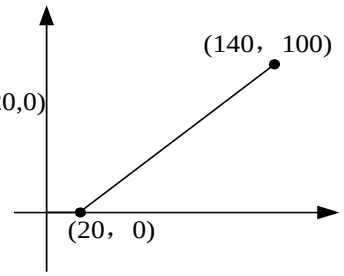


Fig 10.3 G91 usage

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 ≈ 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);
- Yn – 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
```

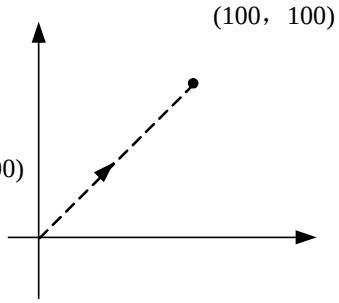


Fig 10.4 G00 usage

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/Un Y/Vn 【Fn】

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/Un Y/Vn In Jn 【Fn】 or G02 X/Un Y/Vn R[-]n 【Fn】

Parameters meaning:

- Fn – incise at 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 – displacement of circle centre's X coordinate relative to start point of current segment, unit(mm);
- Jn – 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 <=180°, R is positive. Otherwise, it's negative, 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);
- Yn – 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
```

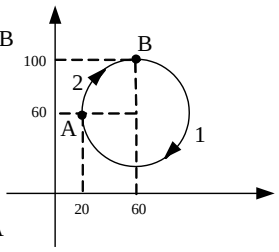


Fig 10.5 G02 usage

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、mirror (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. G04 Time delay

Format:

G04 Pn

Parameters meaning:

P- delay time, the following parameters are using 0.01 second as the unit, such as P100 means delay of 1 second.

11. 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
M11	No parameter	Dusting offset on
M12	No parameter	Dusting offset off
M09	No parameter	Open the dusting
M10	No parameter	End of dusting
M00	No parameter	Stop 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

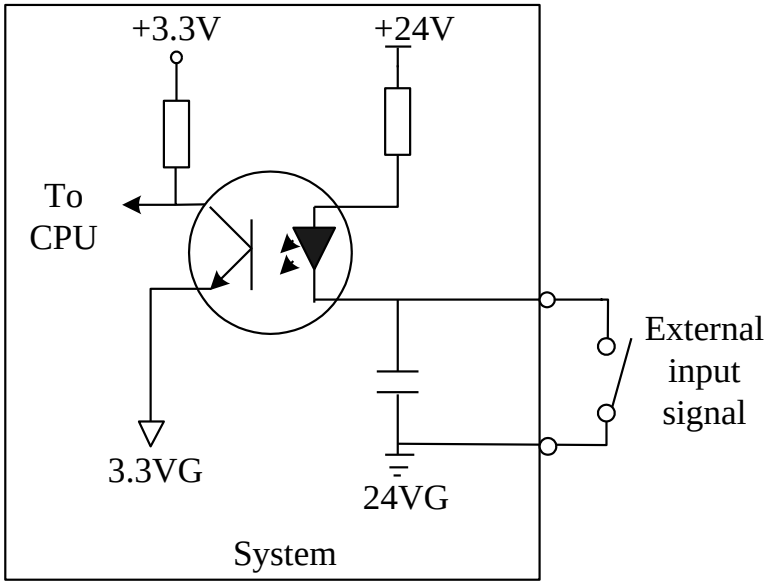


Fig11.1 input port circuit

- 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
2	X+ limit	X+ stop input，float it if not use, this is horizontal
15	X- limit	X- stop input，float it if not use, this is horizontal
14	Y+ limit	Y+ stop input，float it if not use, this is vertical
1	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	
11,20-23	Spare	
12,24	+24V	+24V/3A Power output
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
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
13,25	24VG	+24V Ground

11.1.1 Input Wiring Instructions

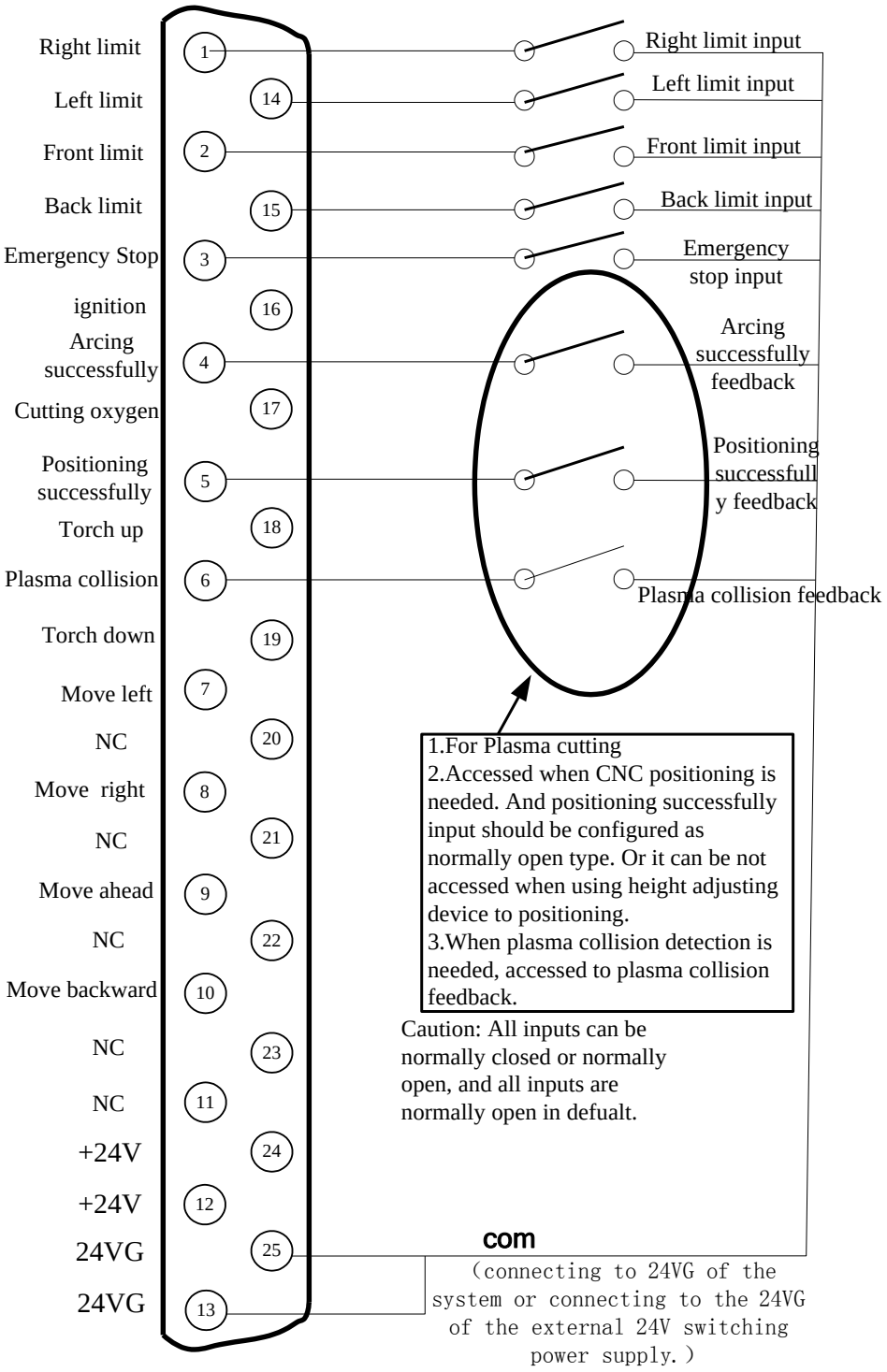


Fig 11.2 External input wiring

11.1.2 Remote Controller Input

The system supports two external remote control input, one for line input (P2P) type, the other for 8421 (BCD) encoded input type.

- **Line Input(P2P) 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.

Note: 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

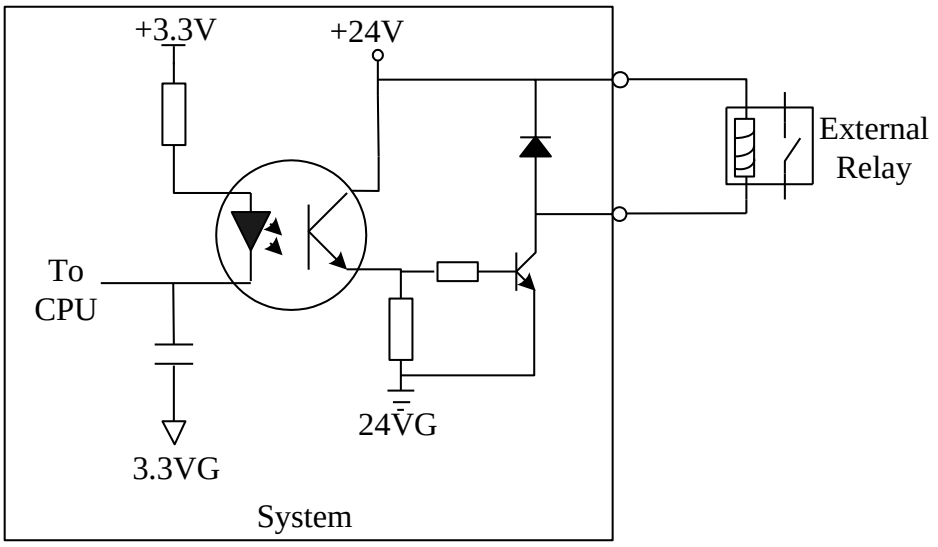


Fig11.3 output port circuit

- Output voltage is 24VDC，low level is effective；The common end of the external relay coil is connected with the 24V +, and the other end of the relay coil is connected with the corresponding IO port.
- Maximum output current $I_{\max} = 300mA$;
- 16 output ports in total
- Output signal definition

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	
9,10,11,22,23	Not used	
12,24	+24V	+24V/3Aoutput
13,25	24VG	+24Vground

11.2.1 Output Wiring Instructions

11.2.1.1 Oxygen Gas Typical Connection

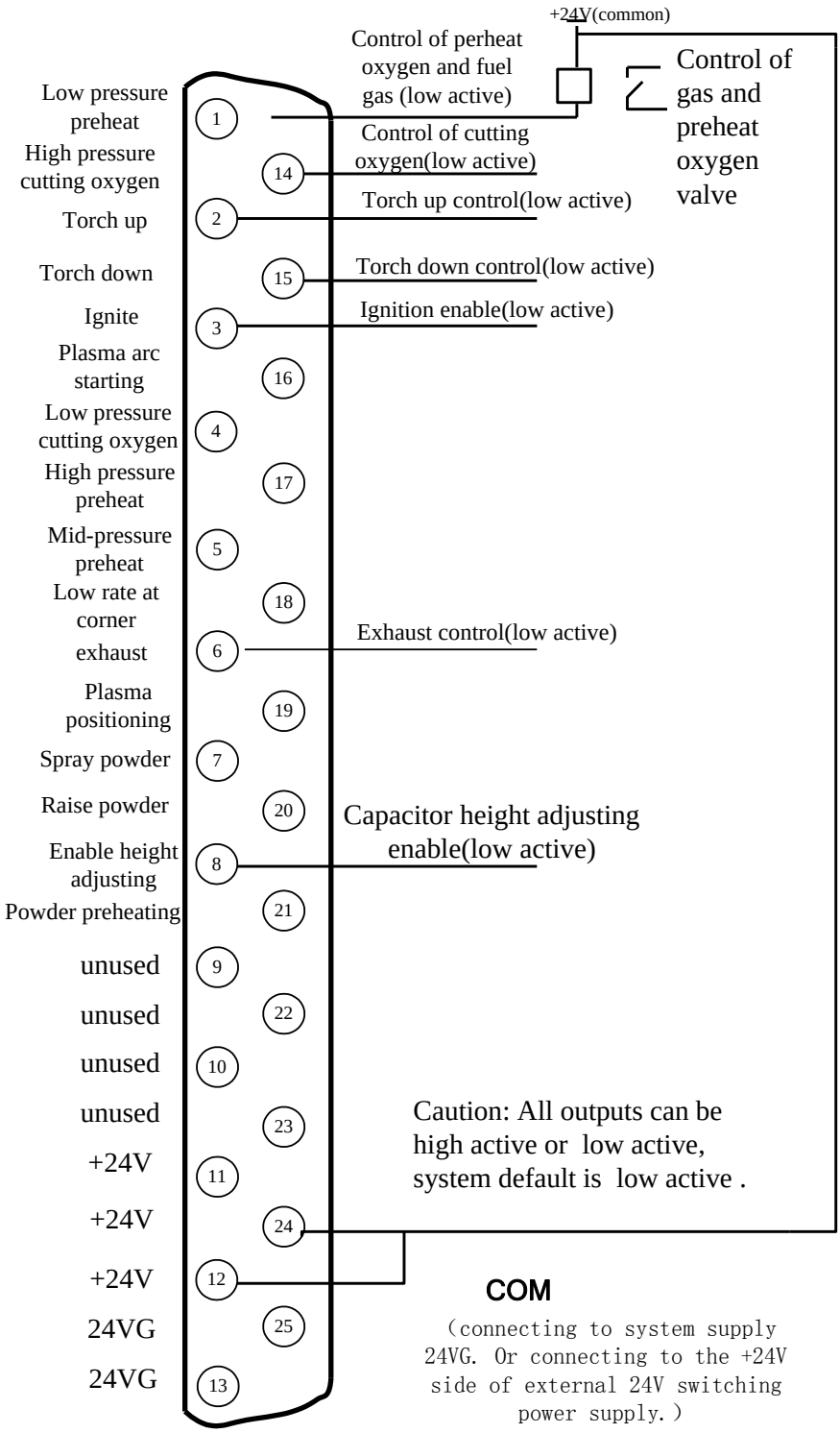


Fig 11.4 Oxygen gas typical connection

11.2.1.2 Three Level Perforation Circuit

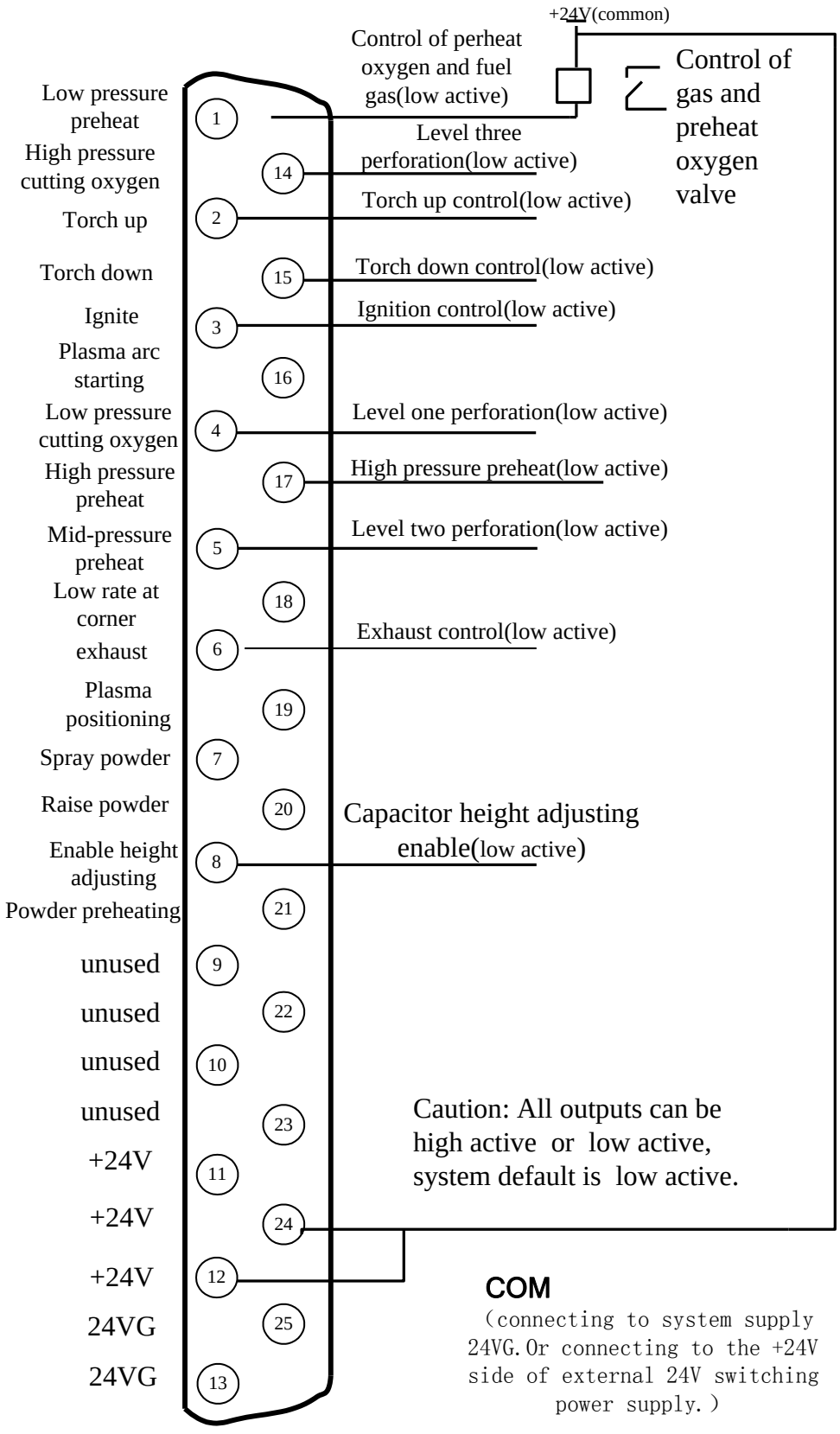


Fig 11.5 Three level perforation circuit

11.2.1.3 Typical Circuit of Using Powder

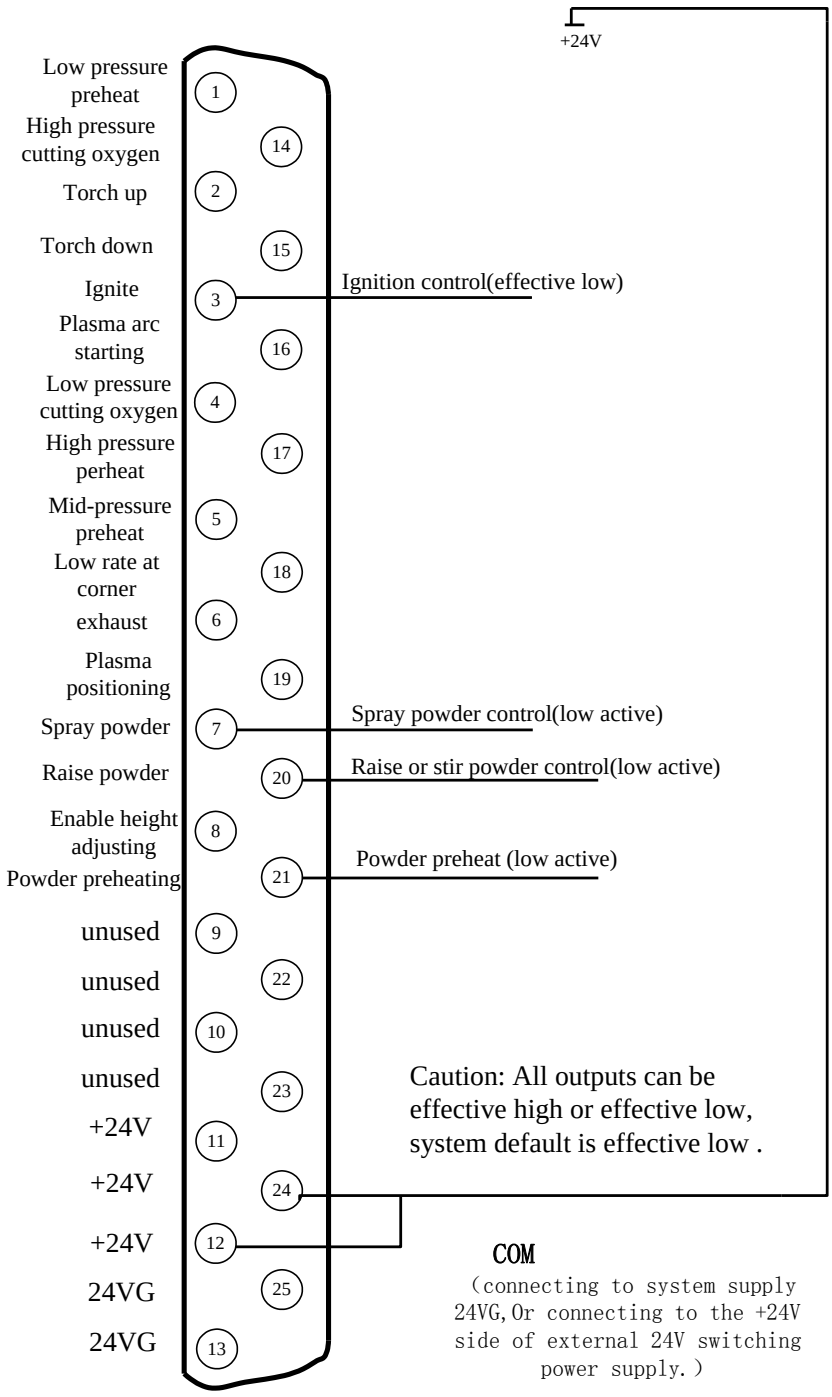


Fig 11.6 powder typical connection

11.2.1.4 Typical Circuit of Using Plasma Cutting

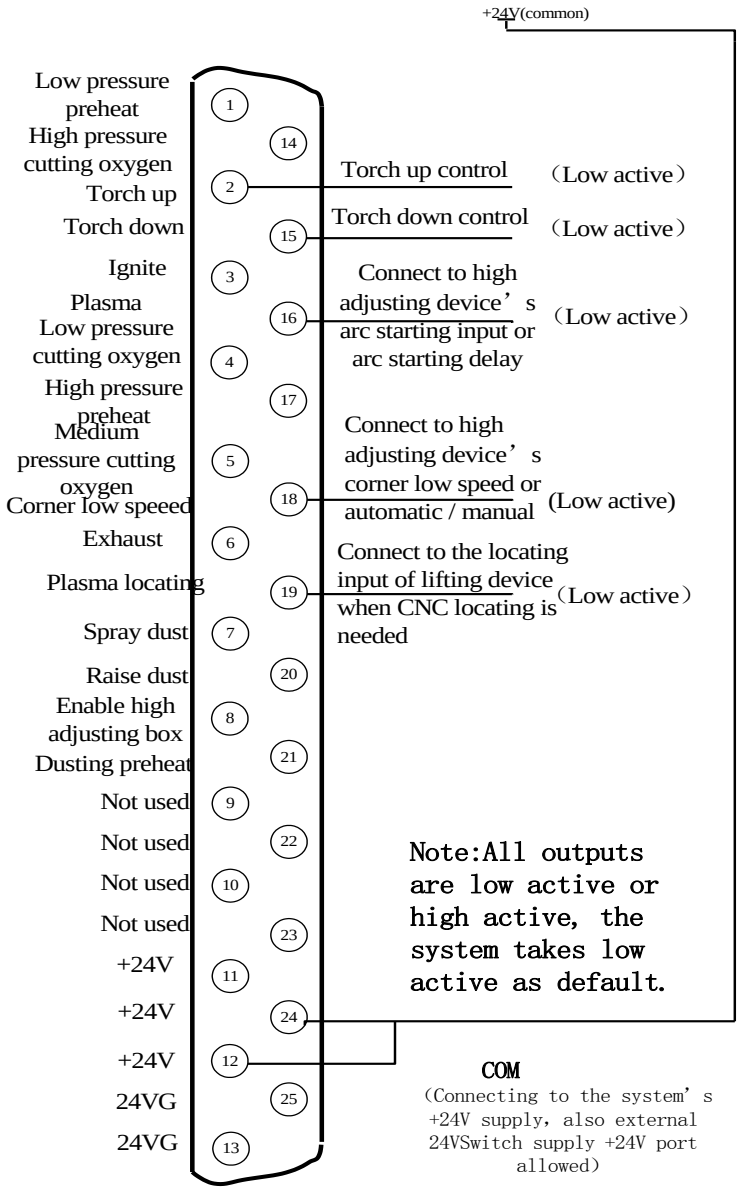


Fig 11.7 Typical wiring diagram of the plasma

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 lever 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 Ontime, HYD, Heavth 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 START, HYD 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

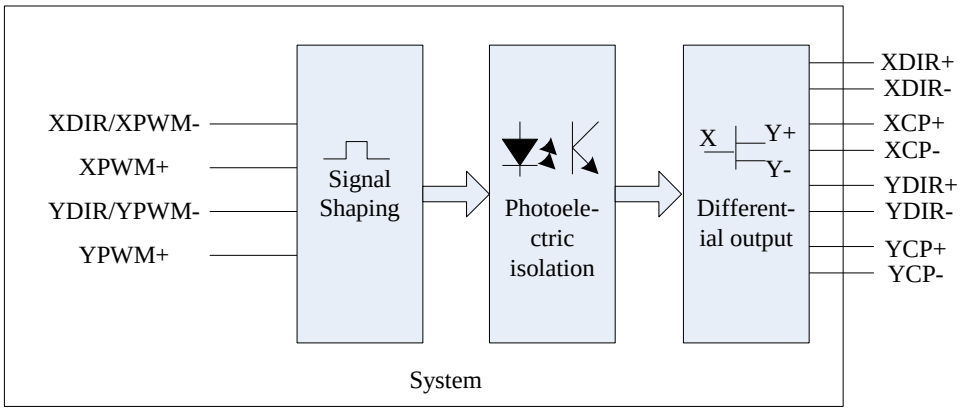


Fig11.8 motor port schematic diagram

- 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

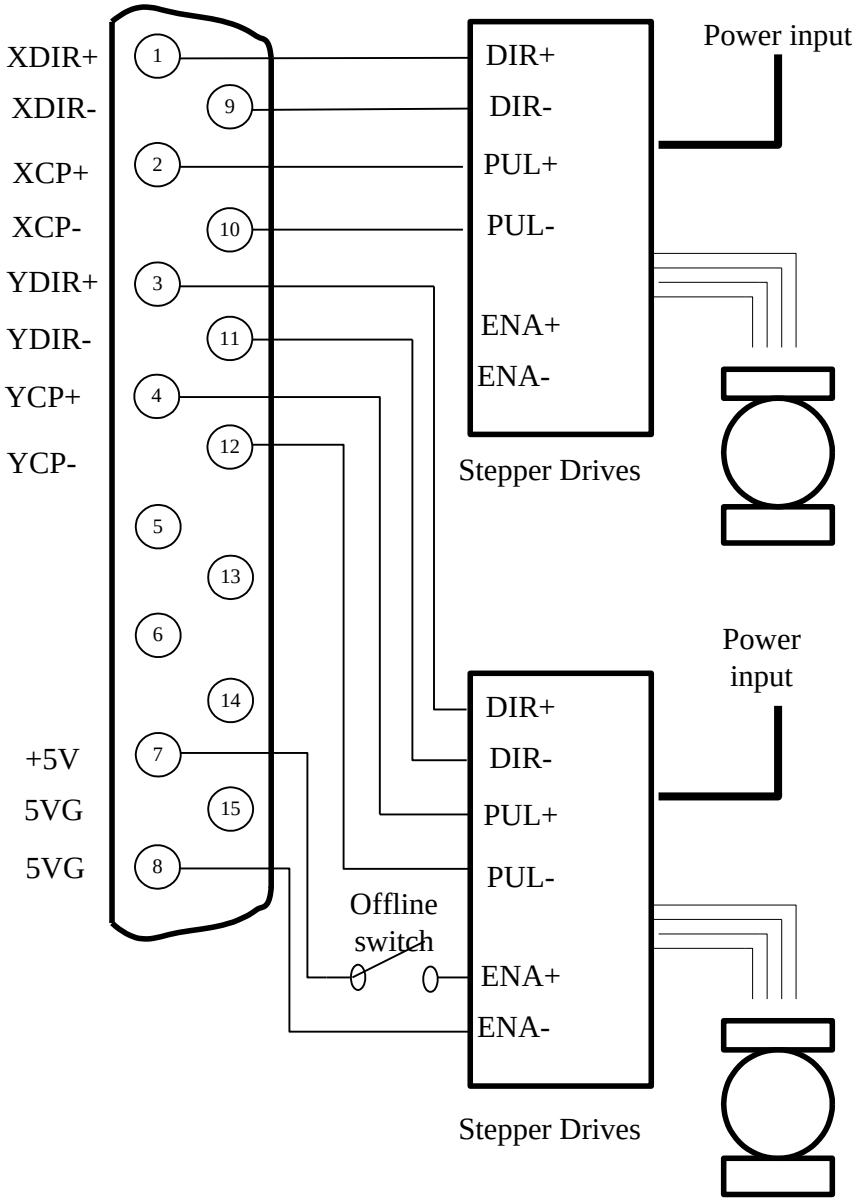


Fig 11.9 connection methods for differential stepper driver

11.3.1.2 Com-anode Connection Methods for Stepper Driver

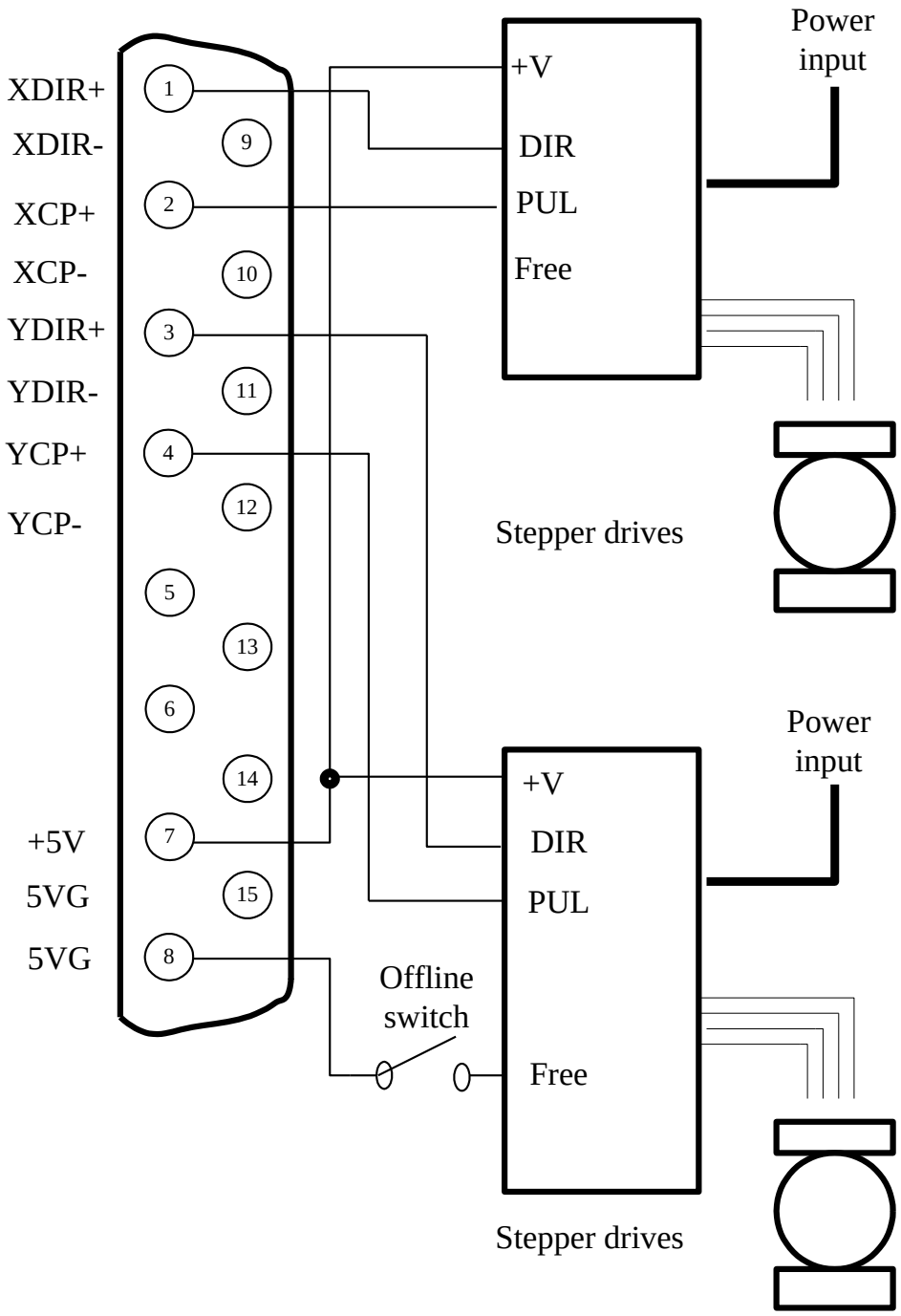


Figure 11.10 com-anode connection methods for stepper driver

11.3.1.3 Connection Methods of Servo Driver of Panasonic Company

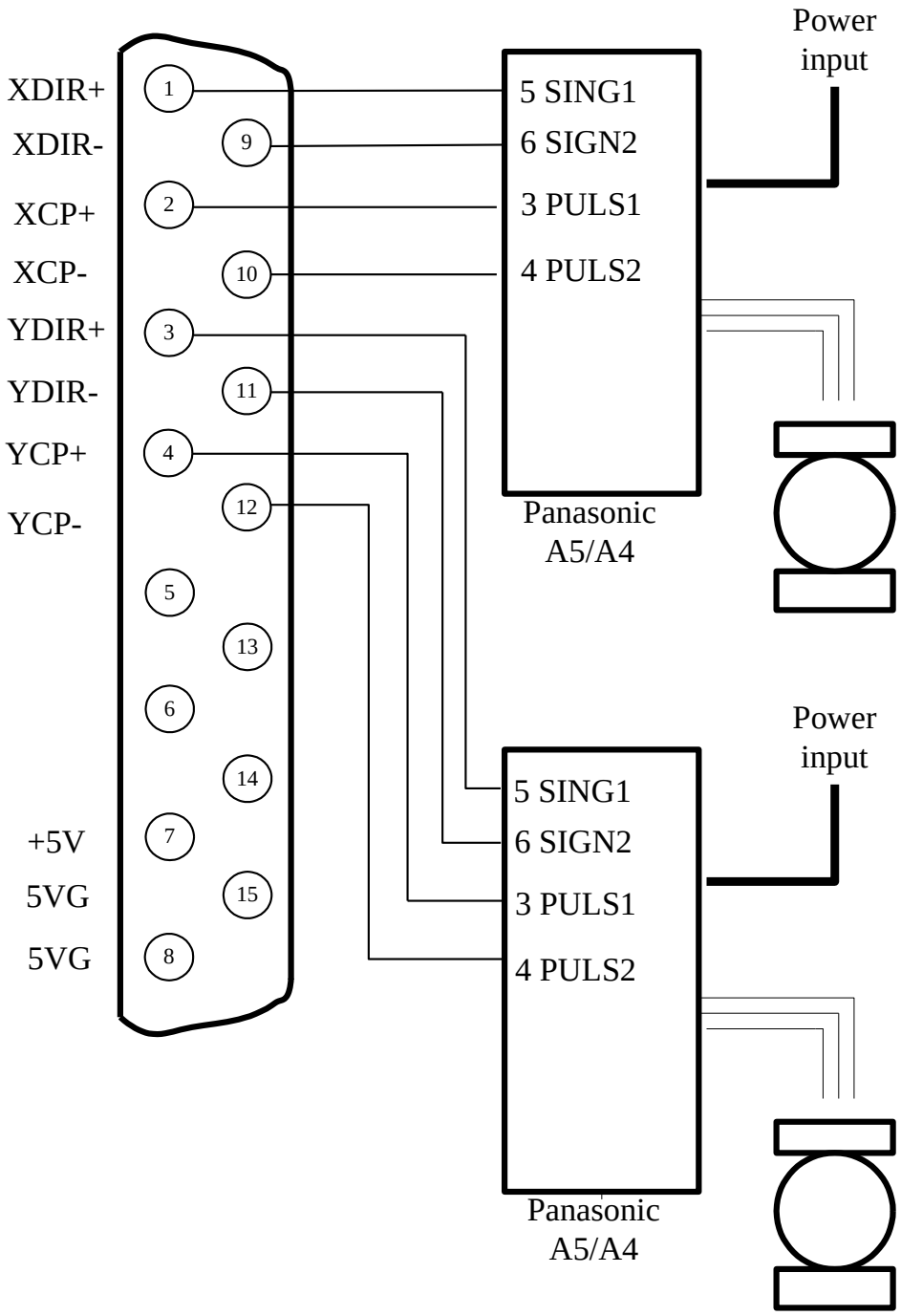


Figure 11.11 Connection methods of Servo driver of Panasonic Company

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

Compared 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.

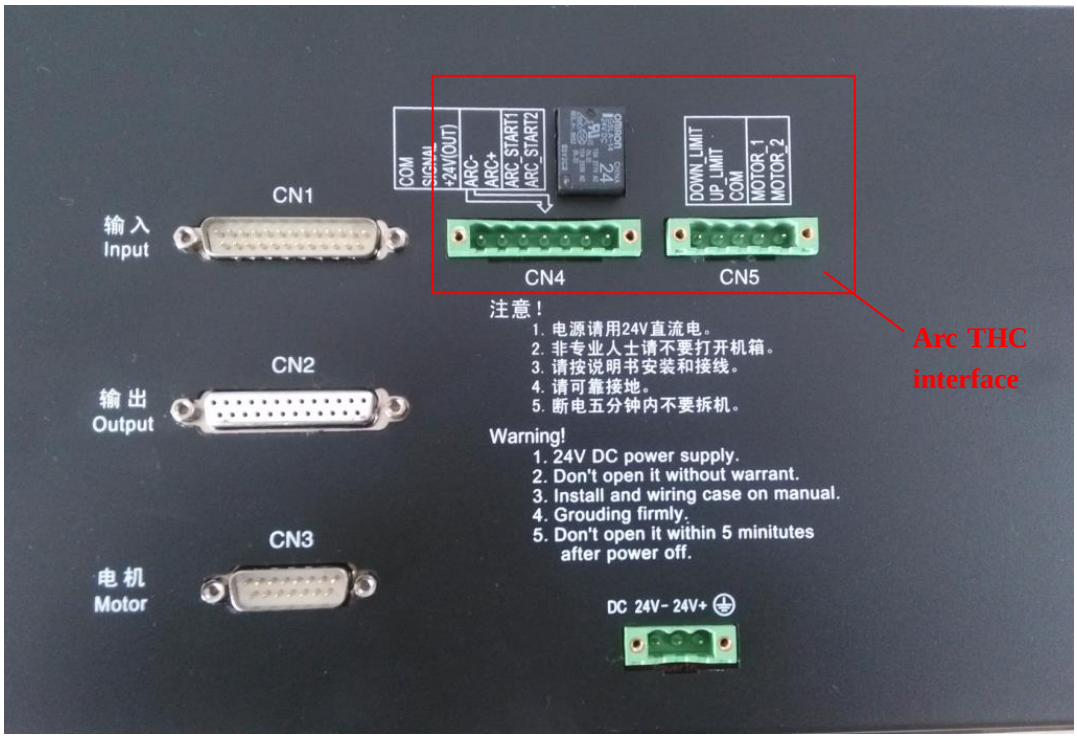


Fig.11.12 F2100T system interface schematic diagram

11.4.1 Torch Height DC MOTOR Port (CN5)

Motor port CN5 (DC MOTOR) output pin MOTOR_1, MOTOR_2, input pin UP_LIMIT, DOWN_LIMIT, common ground COM. connect MOTOR_1, MOTOR_2 to height adjustment motor, connect UP_LIMIT, DOWN_LIMIT to upper limit switch and lower limit switch.

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	+24V Power Ground
4	MOTOR_1	Height Adjustment Motor
5	MOTOR_2	Height Adjustment 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（ARCIn）

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。

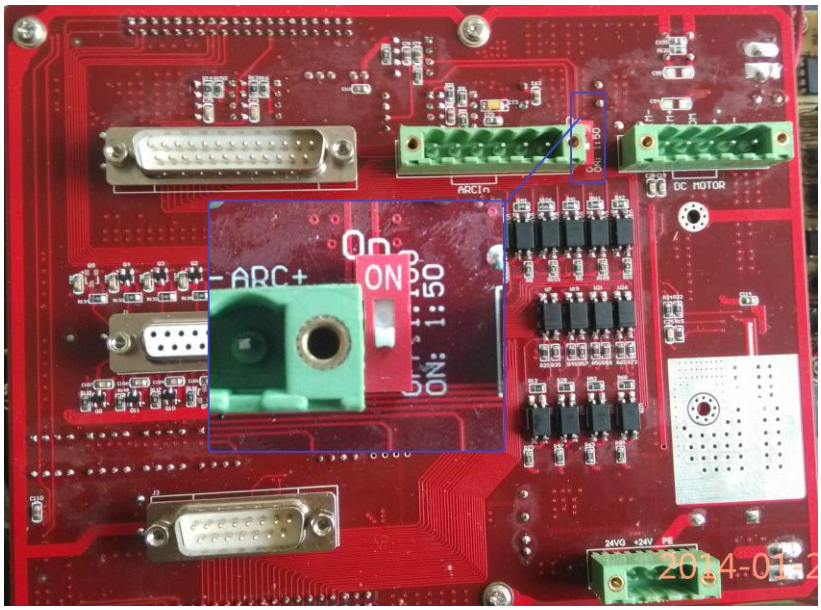


Fig.11.13 Arc input partial pressure proportion

11.4.3 IHS Sensing Port

The positioning port (PS) and the arc pressing port are in the same seven pin interface (CN4), the pins are +24V (OUT), SIGNAL, COM. The +24V (OUT) is connected with the positive electrode of the switch, and the SIGNAL is connected with the signal of the proximity switch, and the COM is connected with the negative electrode of the switch.

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)

The starting arc port (ARC_START) and the arc input port are in the same seven pin interface (CN4), the output pin is ARC_START1, ARC_START2, and connect to the arc port of the plasma power supply.

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-

11.4.5 Wiring Diagram of F2000T CNC System with Arc THC Module

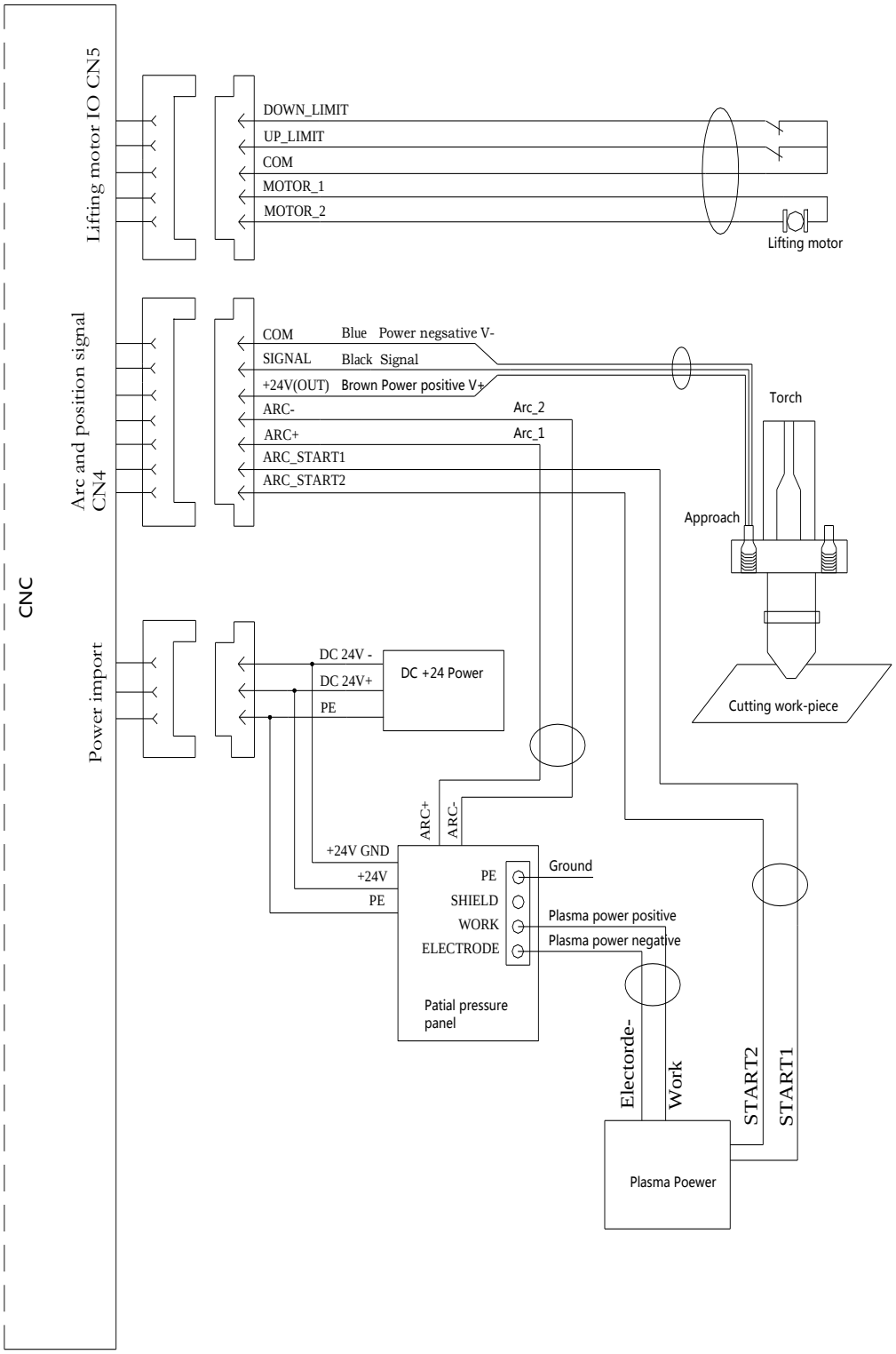


Fig.11.14 Wiring Diagram of F2100T system with Arc THC Module

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.

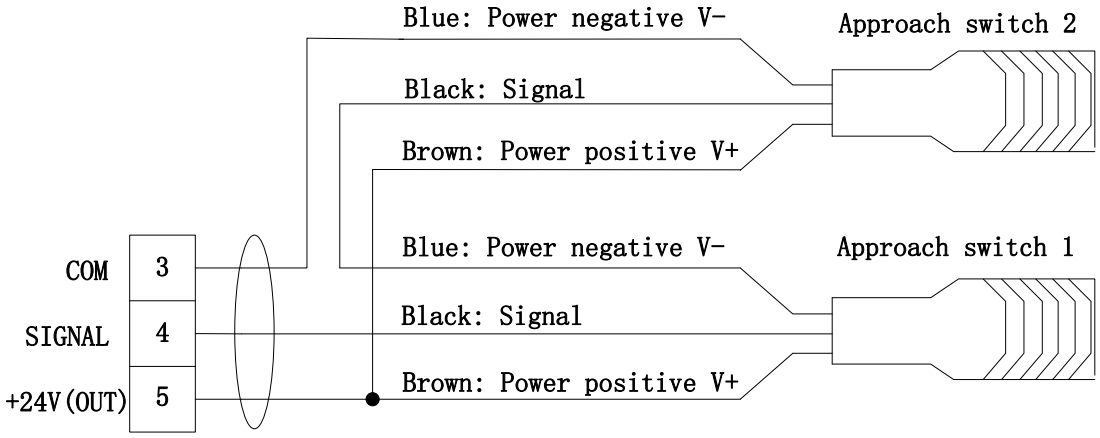


Fig.11.15 Wiring Diagram of double approach switch

11.4.7 Separate Control of Flame Cutting Torch and Plasma Cutting Torch

This function can achieve the separate control of flame cutting torch and plasma cutting torch. Plasma cutting torch can only be connected to CN5 motor interface, while flame cutting torch can select to be controlled by CN5 interface or DB25 interface by setting parameter “output port of the flame gun” (Please refer to section 8.7.7).

The connection method of the plasma gun is referenced to 11.4.1 Motor CN5 (MOTOR DC).

The connection method of the flame gun, if controlled by CN5 interface, is also referenced to 11.4.1 Motor CN5 (MOTOR DC). If controlled by DB25 interface, then please refer to section 11.2 output wiring instructions.

11.5 Power Input（Power In）

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

About system upgrade and system recovery function, the users can also refer to section 8.7.10, the function here is similar to that section. When the system powers on, it will display as shown in Fig 12.1.

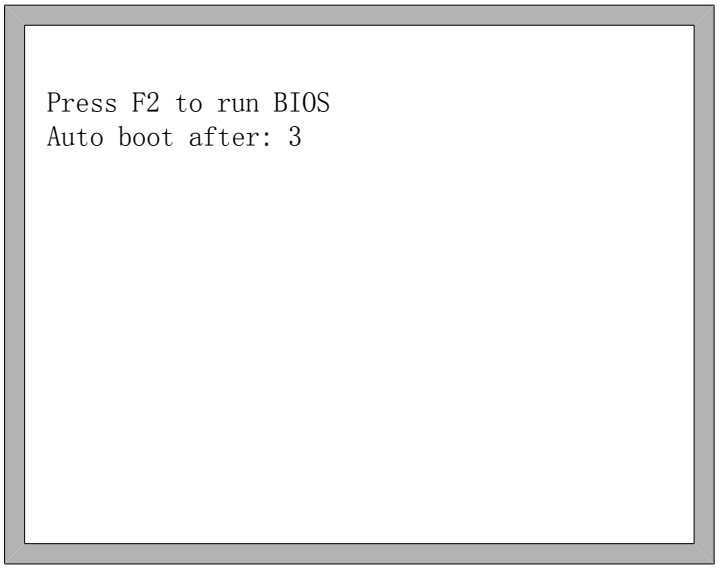


Fig 12.1 Power on

Before the screen number counts down to 0, if you press F2, the system will enter the BIOS interface. If you press other keys, the system will stop counting down and enters the main interface..

Fig 12.2 BIOS interface

12.1 System Upgrade

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

- U disk has been inserted into USB interface of CNC
- There should be the upgrade file F2000.exe in the root folder of the U disk..

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

12.2 System Backup

After entering BIOS, press 【F4】 to backup system. It only backup OP (operation system), but not backup parameter, IO ports configuration, coordinate configuration and so on.

12.3 System Recovery

After entering BIOS, press 【F5】 to return to the original system that has been backup. System recovery here does not affect the user's parameters, IO port configuration, coordinate configuration, etc., Recommend to use system recovery function here.

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 Amm. 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 $XPls \bullet \frac{A}{B}$. 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 $YPls \bullet \frac{C}{D}$.

- 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*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*x/60=12000*2000/60=400000>160000, the speed of 12000(mm/min) is not reachable. If we set x to be 500, then M_v*x/60 = 12000*500/60 = 100000<160000, at this time it can operate at the maximum rate of 12000mm/m.

While in principle the number of pulse 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 pulse is between 150 and 1200. The number of pulse 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 F1510-T 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
- Sending module matches address with receiving module, the address can be set manually, support 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 IO mode，at most 16 output ports

14.2 The Layout of Remote Controller

Fig.14.1 layout of remote controller

14.2.1 Transmitter Description

Keys：English and Chinese control keys, they are “启动(Start)、停止(Stop)、四个方向(↑ ↓→←)、1 个小手（Manual）、T↑、T↓、S+、S-、点火(Ignition)、预热(Preheat)、快氧(CutOxy)、起弧(Plasma)、前进(Forward)、后退(Back)、总关(Close)、手动速率(ManualRate)”. 19 keys in total.

Indicator: three manual modulation rate (5%, 50%, 100%) and 3 manual mode lamp (electric, interlock, fixed length). 1 sending signal indicator, 1 electric quantity indicator(or multiplexes with signal indicator)

Description: boot default rate is 50% manual lights, manual rate for the second state, manual rate in continuous is pressed, the manual speed change state machine manual rate twice (50% light) -> Manual rate three times (100% light) -> Manual rate once (5% light) -> Manual rate twice (50% light). When turned on, the default is inching bright Manual as a state, to move light, Manual changes state machine Manual once (Jog lights) -> Manual secondary (interlock lights) -> Manual three times (fixed length lights) - > Manual once (jog lights).

When all keys are pressed, it will issue OUT1-OUT8 signal as the following table, when the key is released, all outlets closed (OFF).

Transmitter Keys	P2P Output (description：0 means to determine the high level of output, the 1 means the low level output)	Encoding output OUT1,2,3,4,5,6,7,8 (description：0 means to determine the high level of output, the 1 means the low level output)	Remarks
S+/Speed	00001000	00001000	Speed up
S-/Speed	00000100	00000111	Speed down
↑	00100000	00001010	Up arrow
↓	00010000	00001001	Down arrow
←	01000000	00000100	Left arrow
→	10000000	00001110	Right arrow
Manual once (Boot default)		00001111	Manual cycles between once, twich and three times
Manual twice		00011111	
Manual three times		00101111	
T↑		000001101	Torch up
T↓		00001100	Torch down
Start	00000010	00000110	Start
Stop	00000001	00001011	Stop
Back		00000010	Back
Foward		00000011	Forward
Ignition		00000101	Ignition
CutOxy		00000001	Cutting oxygen
Preheat		00110000	Preheat oxygen
Plasma		01000000	Plasma arc

Manual rate once		01010000	Cycles between three types
Manual rate twice （Boot default）		01100000	
Manual rate three times		01110000	
Clsoe		11110000	

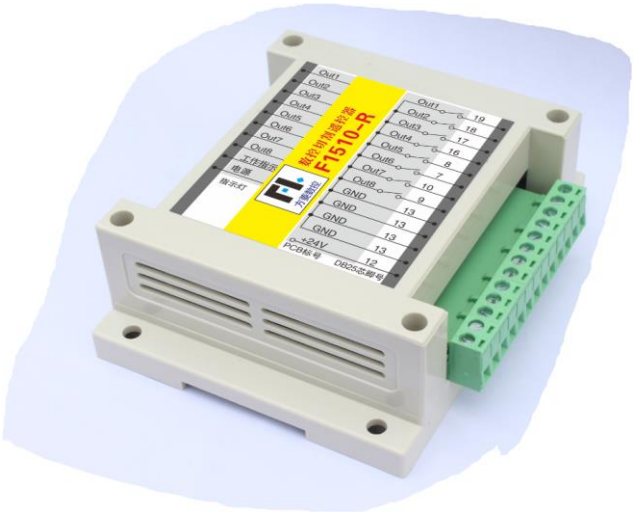
14.3 The Output Port of Receiver

Model: F1510-R

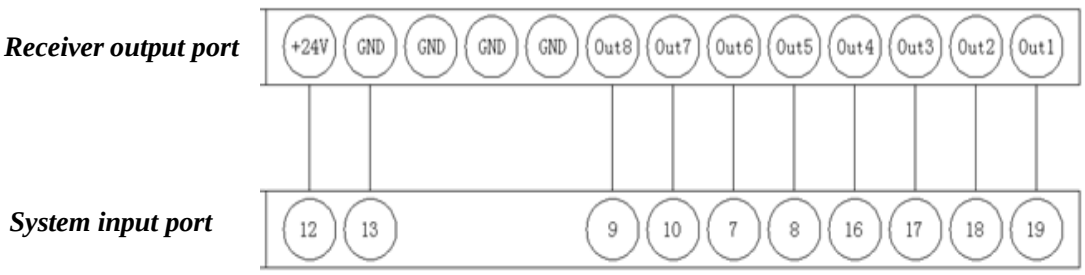
Output ports: 8

Power supply mode: 24VDC.

Each output port corresponds to a LED lamp to display IO port state, when it is ON, lamp lights, when it is OFF, lamp is off.

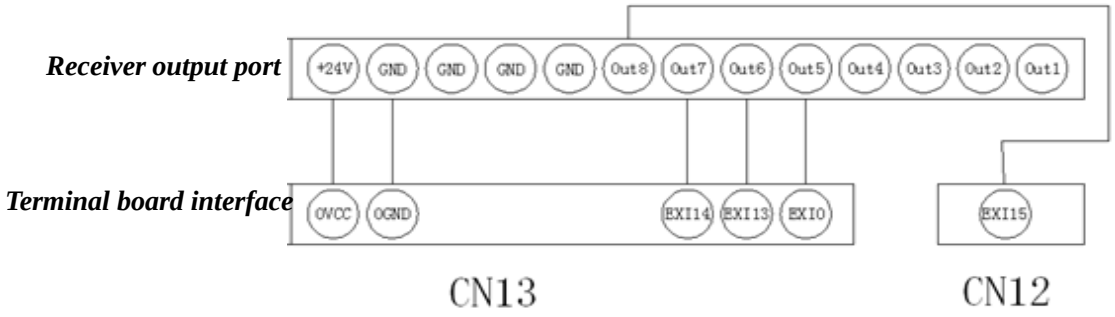


Wiring instructions for remote controller and F2000 series:



Description: all the buttons on the panel can be used. Press F5 diagnose, F8 system definition, F3 definition, F5 option, then set the remote controller type to 8421.

Wiring instructions for remote controller and F3000/5000 series:



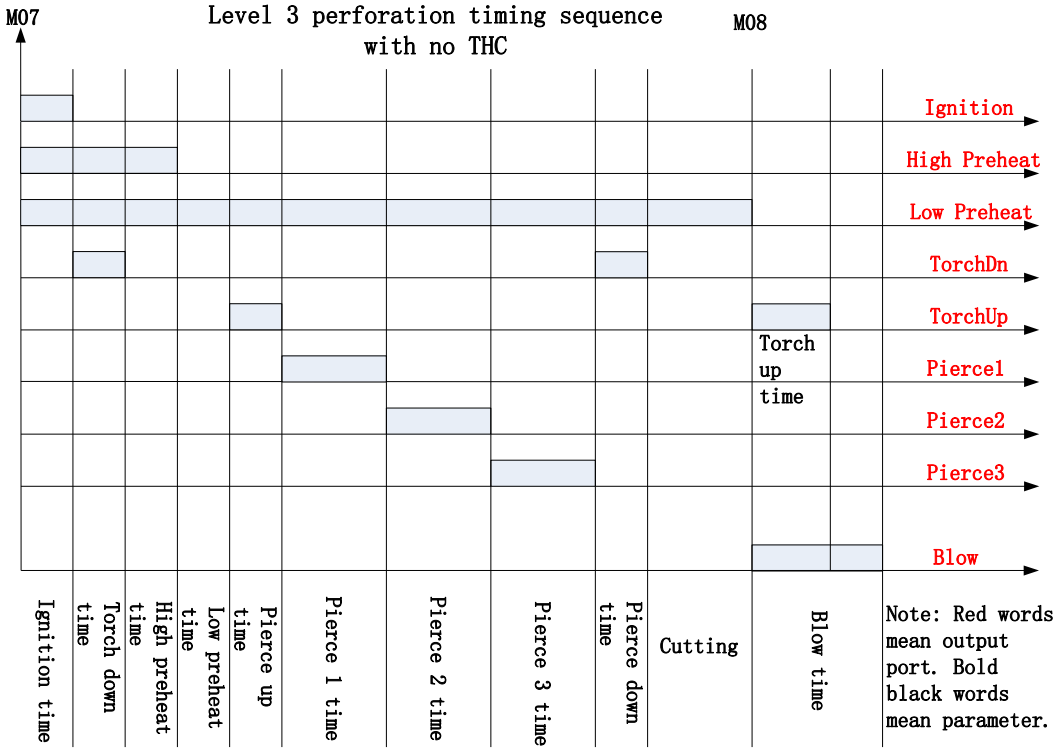
Note: There are four invalid keys when F1510-T connected to F3000/5000 series system: Preheat, Plasm, ManualRate and Close.

Appendix 1 G、M Code Rapid Consult

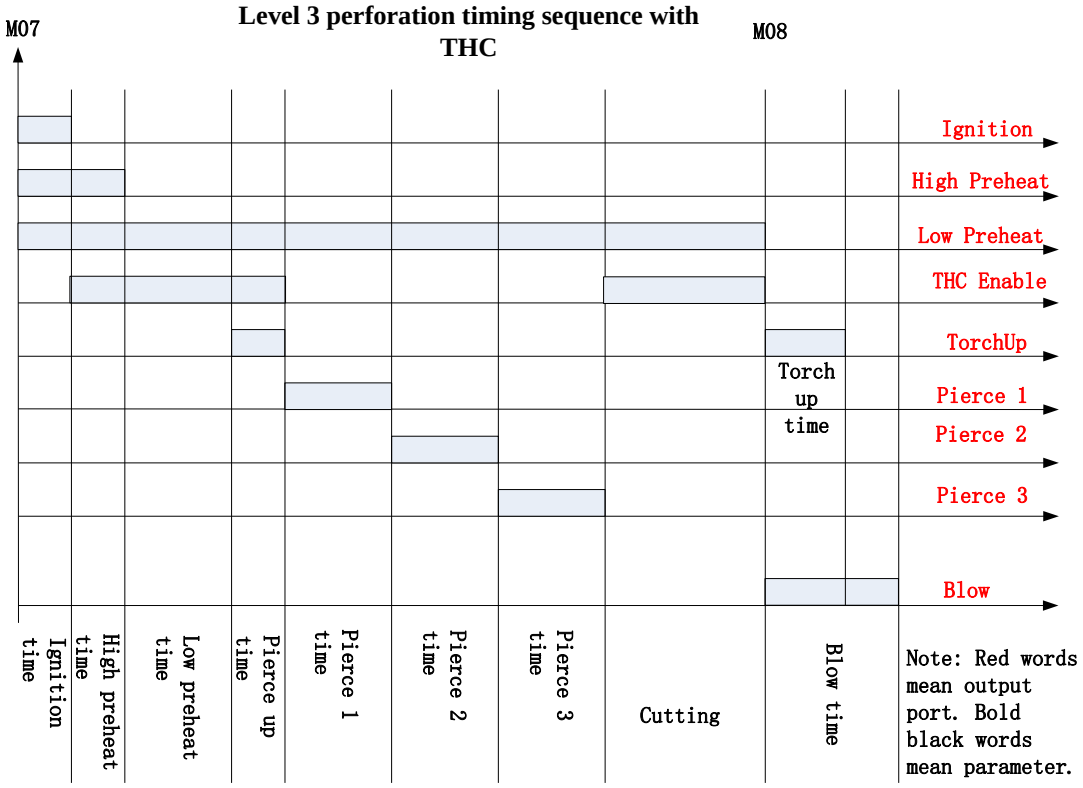
Serial number	Order	Function
1	G99	rotation、proportion、mirror image
2	G92	reference coordinate
3	G91	Relative coordinate system
4	G90	Absolute coordinate system
5	G20	English unit
6	G21	Metric unit
7	G26	X axis quick return reference point
8	G27	Y axis quick return reference point
9	G28	X, Y axis quick return reference point
10	G41	Left kerf gap compensation
11	G42	Right kerf gap compensation
12	G40	Cancel kerf gap compensation
13	G00	Quickly move
14	G01	Liner cutting
15	G02	Clockwise arc cutting
16	G03	Anticlockwise arc cutting
17	G04	Program delay
18	M07	Start cutting cycle
19	M08	Stop cutting cycle
20	M11	Dusting offset open
21	M12	Dusting offset off
22	M09	Open the dusting
23	M10	Stop of the dusting
24	M00	Pause
25	M02	Program end

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

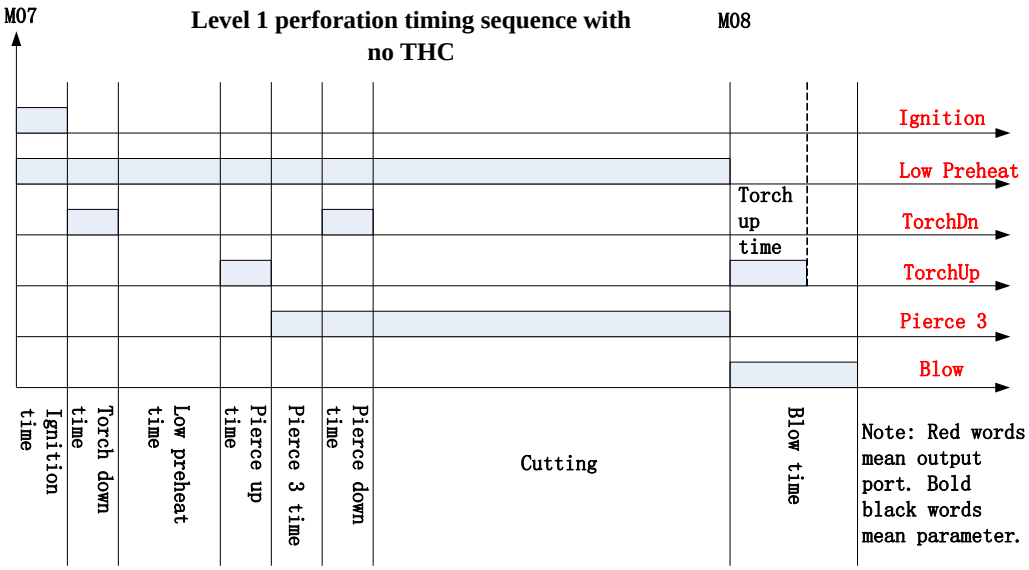
A2.1 Flame Cutting Timing Sequence



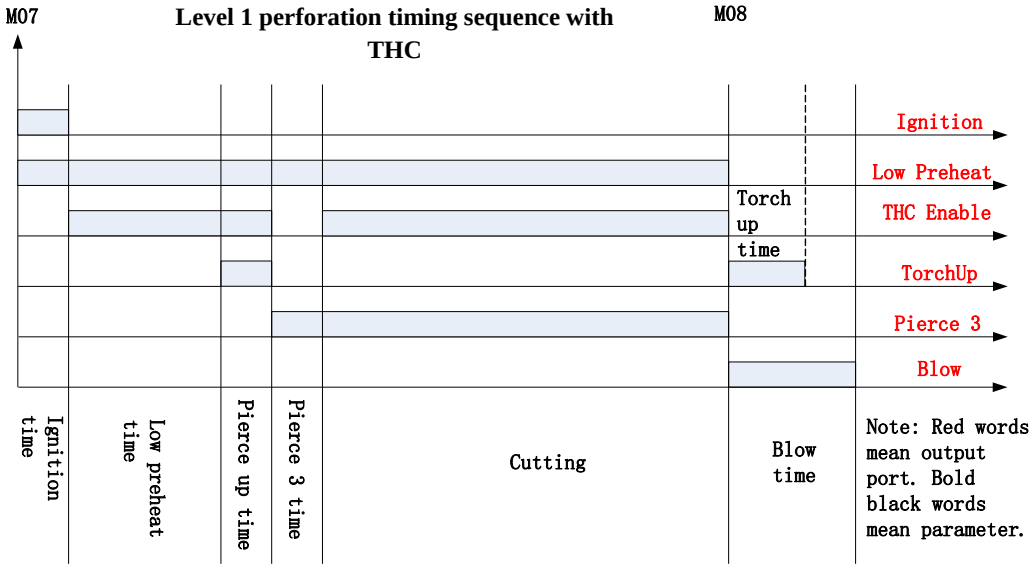
Appendix fig 2.1 Flame cutting timing sequence (Level 3 perforation with no THC)



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

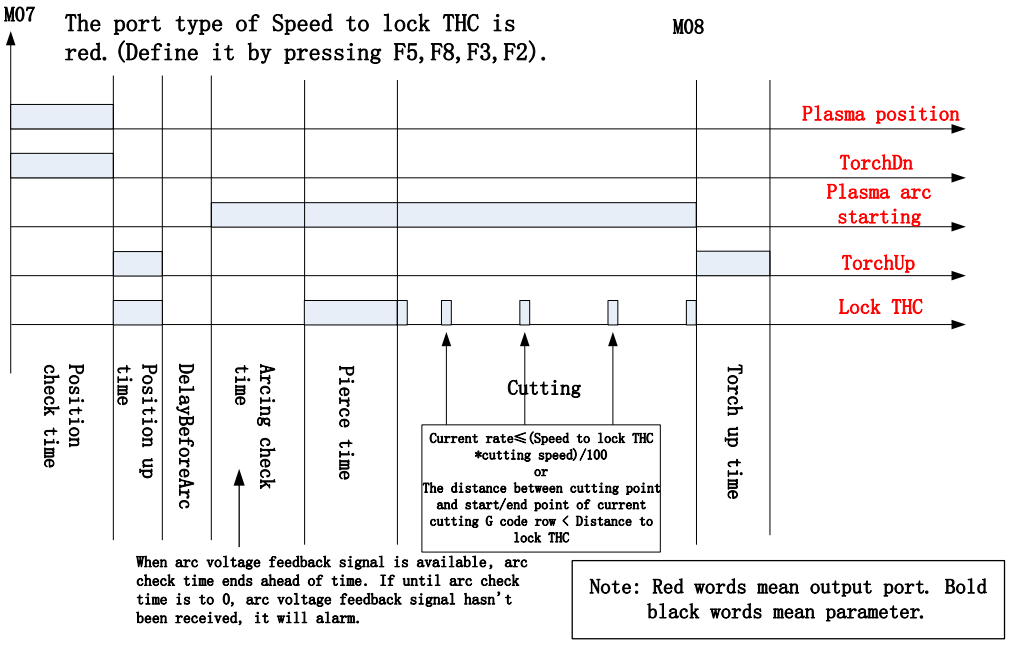


Appendix fig 2.3 Flame cutting timing sequence (Level 1 perforation with no THC)

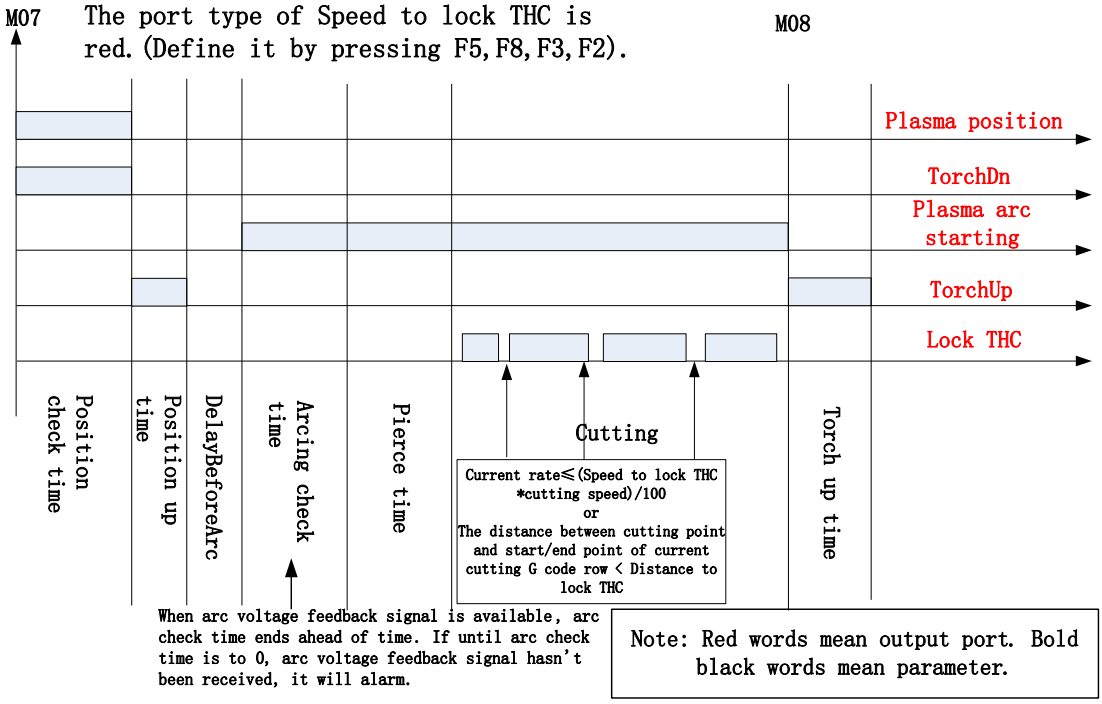


Appendix fig 2.4 Flame cutting timing sequence (Level 1 perforation with THC)

A2.2 Plasma IO Timing Sequence



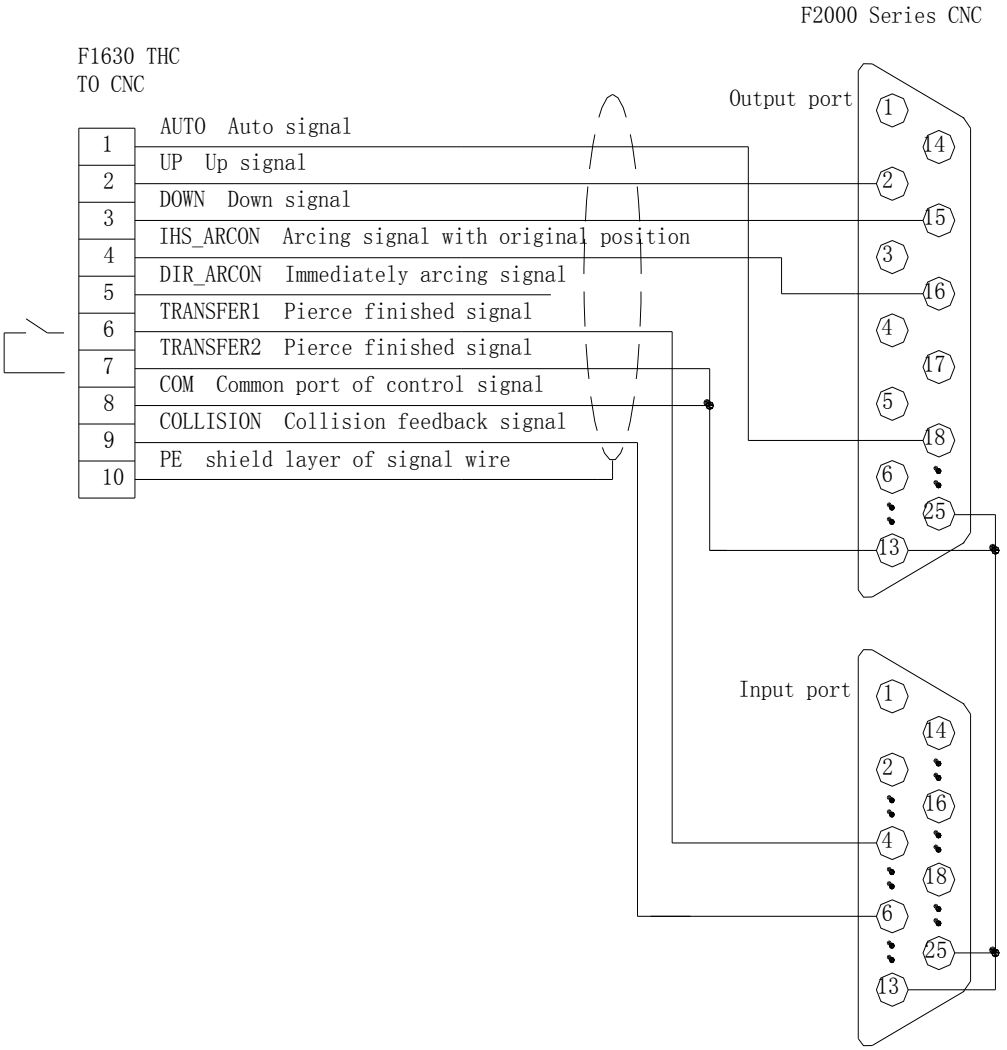
Appendix fig 2.5 Plasma IO timing sequence 1



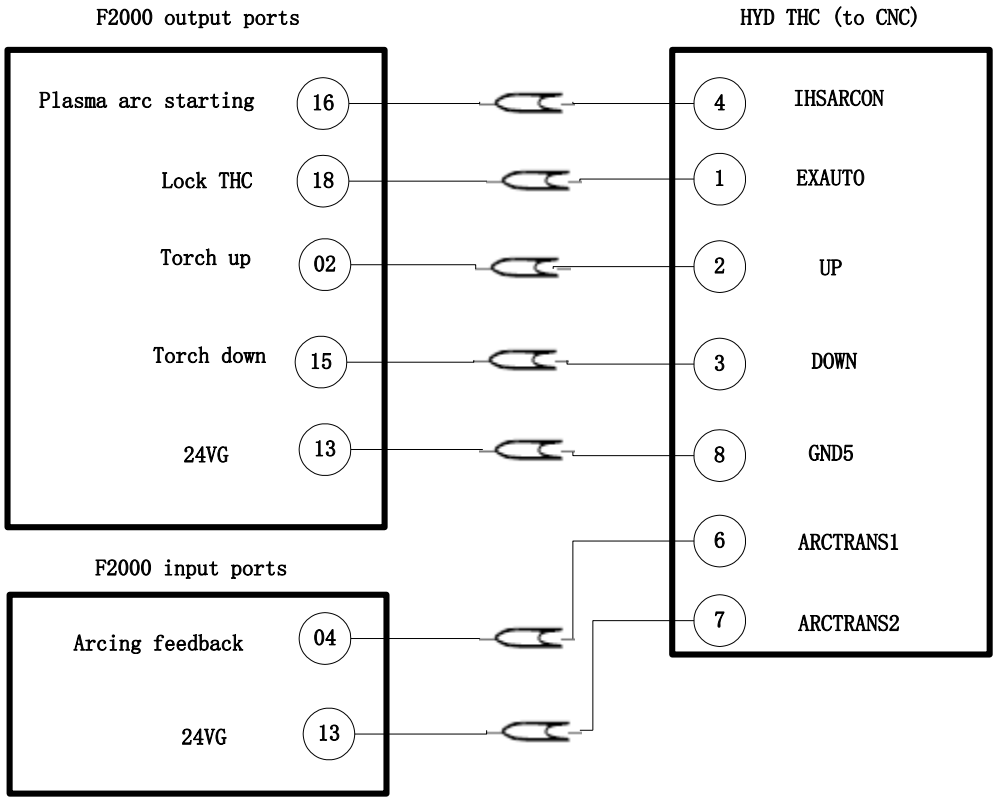
Appendix fig 2.6 Plasma IO timing sequence 2

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

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

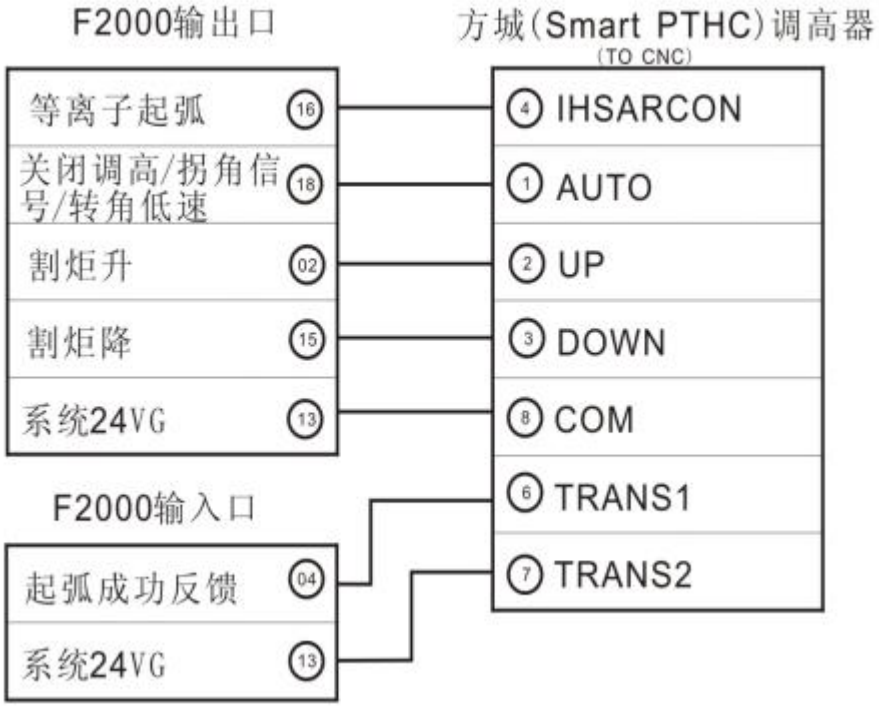
	Port	Type
Lock THC	18	●

The method of definition:

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

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

A3.3 Connection with Fangcheng Technology 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	5
Lose arc delay	0-1	1
Watch arc enable	Yes	Yes

The method of setting parameter:

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

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

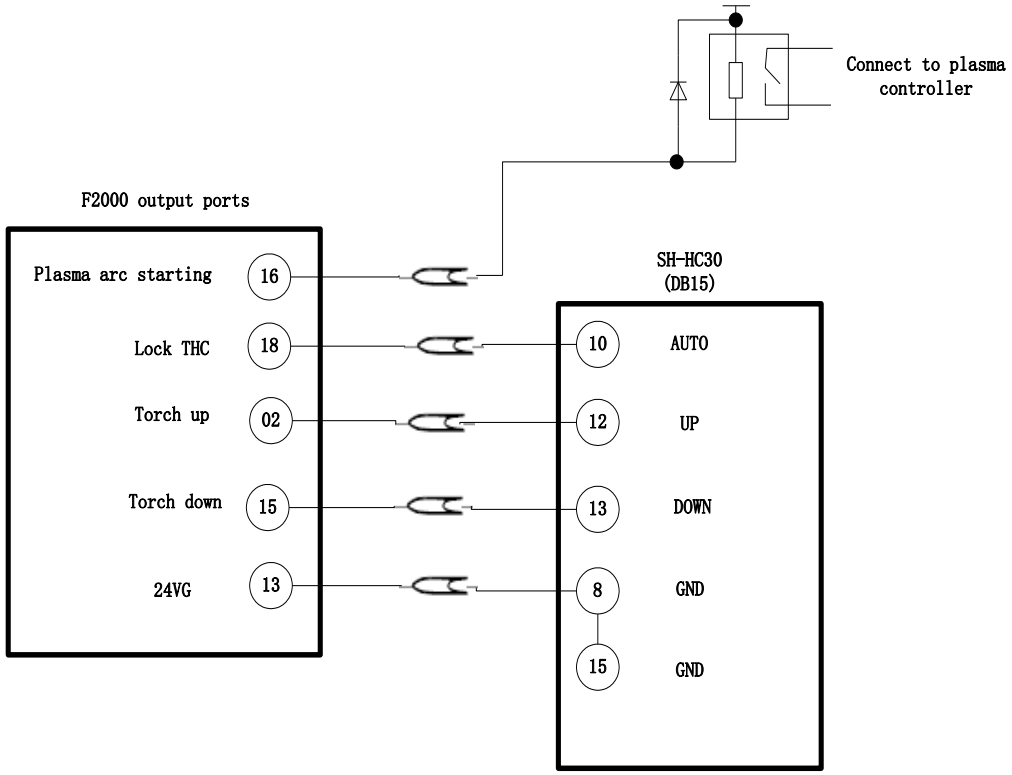
	Port	Type
Lock THC	18	●

The method of definition:

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

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

A3.4 Connection with START THC SH-HC30



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

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

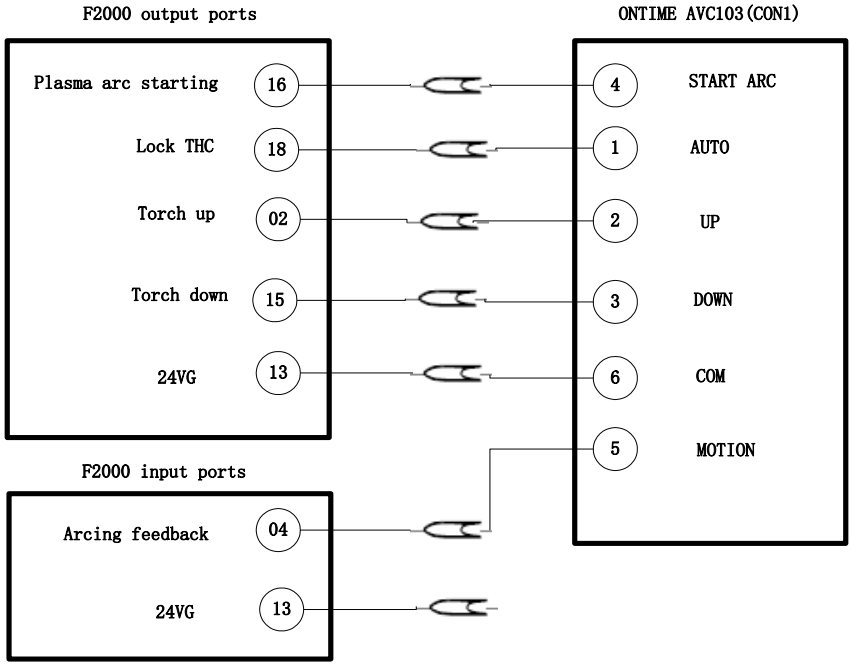
	Port	Type
Lock THC	18	●

The method of definition:

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

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

A3.5 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, F2300 T (A/B), F2500 T (A/B), F2600T:

F4 (Setups), F3 (Plasma).

Input definition

	Port	Type
Position detect	05	●

Output definition

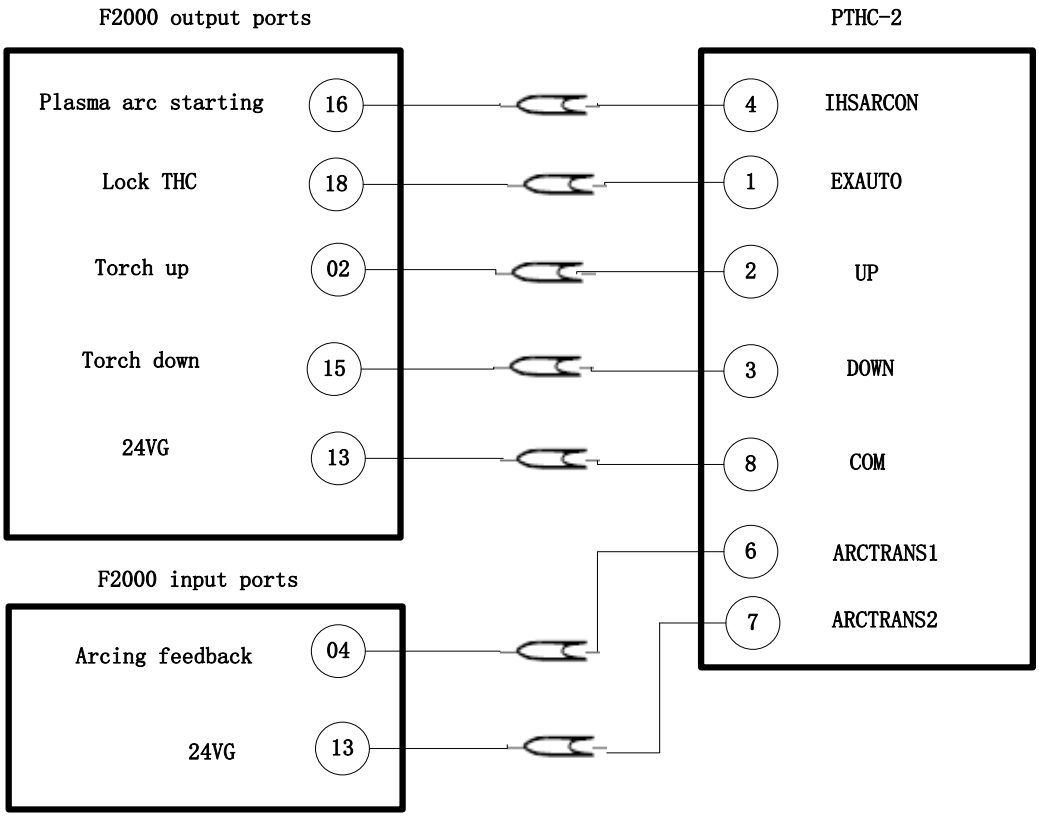
	Port	Type
Lock THC	18	●

The method of definition:

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

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

A3.6 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, 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	●

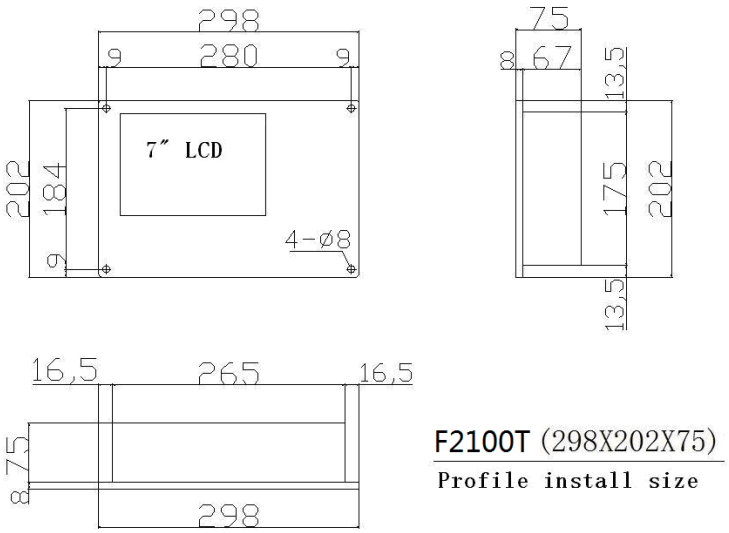
The method of definition:

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

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

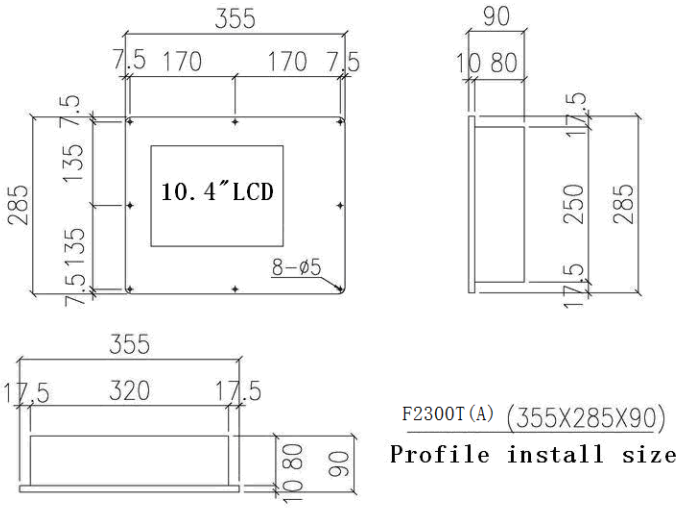
Appendix 4 Interpretation of F2000 Full Series System Install Size

A4.1 F2100B/T Profile Install Size

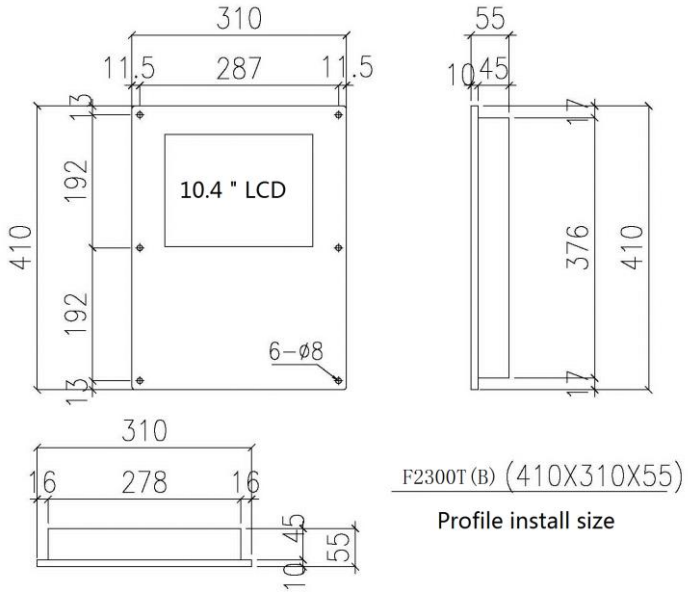


Appendix fig.4.1 F2100B/T installation size

A4.2 F2300A/B/T Profile Install Size

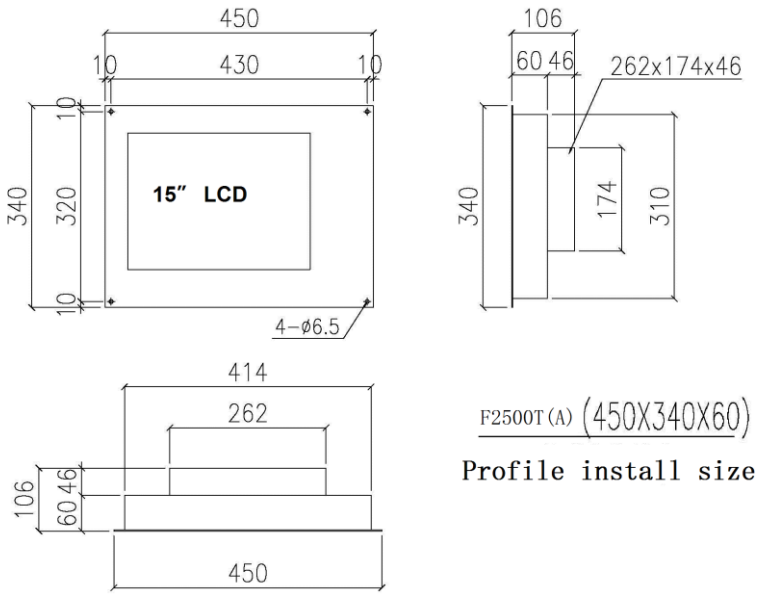


Appendix fig.4.2 F2300A/TA installation size

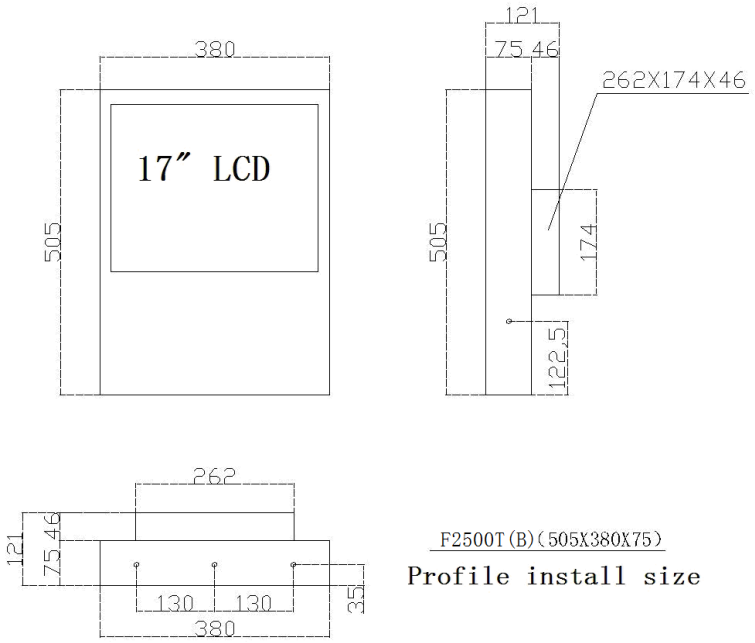


Appendix fig.4.3 F2300B/TB installation size

A4.3 F2500A/B/T Profile Install Size

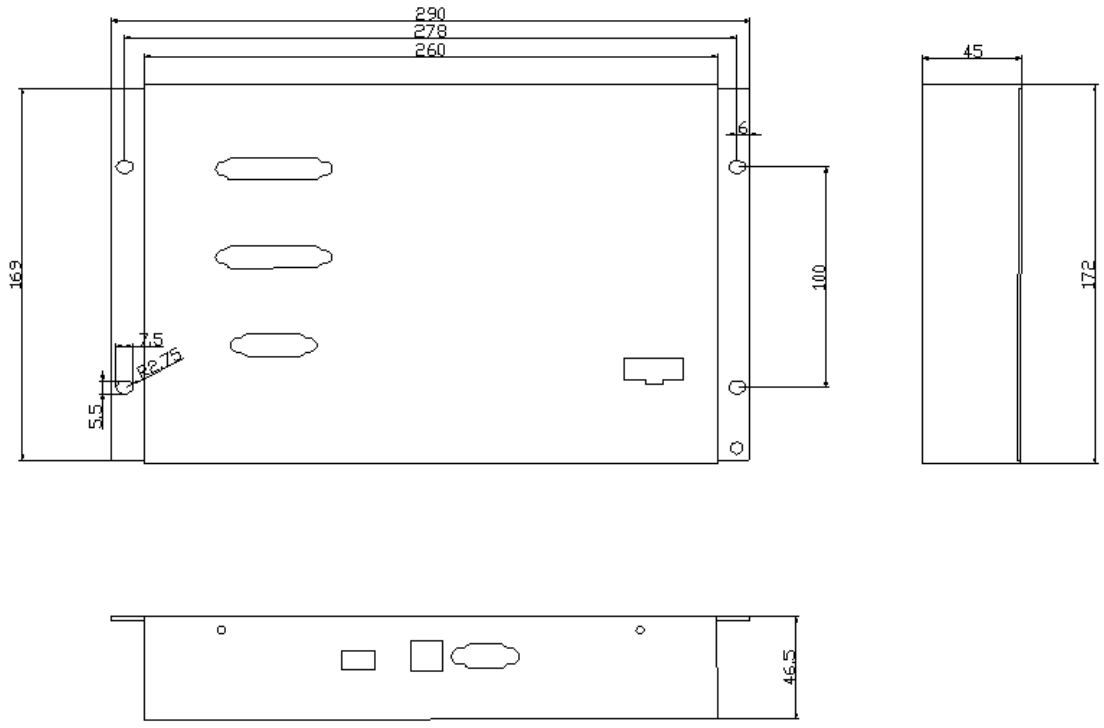


Appendix fig.4.4 F2500A/TA installation size



Appendix fig.4.5 F2500B/TB installation size

A4.4 F2600/T Profile Install Size



Appendix fig.4.6 F2600/T installation size

Appendix 5 Common Problems

Error Code	Fault performance	Reasons	Solutions
No	X, Y axis-motor not move	1. Wiring error 2. Motor chip is broken	1. Detection of wiring 2. Refer to A5.1
No	X, Y axis-move in opposite direction	1. Wiring error 2. Wrong parameter setting	1. Detection of external wiring 2. Refer to section 8.7.5, change motor direction
No	X, Y axis-move towards only one direction	1. Wiring error 2. Servo parameter setting is wrong 3. motor chip is broken	1. Detection of wiring 2. Detection of servo parameter setting: Is motor control mode set as pulse+direction 3. Refer to A5.1
No	X, Y axis interact	1. Wiring error 2. Wrong parameter setting	1. Detection of external wiring 2. Refer to section 8.7.5, set parameter "XY interchange" as "YES"
No	X, Y axis-motor sometimes turn, while sometimes not	1. system and motor plug contact undesirable 2. Motor chip is rosin joint	1. Plug the motor interface 2. Return to factory maintenance
No	Cutting graphics is smaller than normal	1. Pulse setting error 2. Mechanical problem	1. F5 system parameter of the pulse number is too small 2. Detection of mechanical
No	Cutting graphics is bigger than normal	1. Pulse setting error 2. Zero drift 3. Mechanical problem	1. Adjust the pulse number of F5 system parameter 2. Well grounding jacketed&magnetic ring

			3. Detection of mechanical
No	Cutting size of inner circle and outer circle size are not correct	The kerf setting is too large or too small	Reset the kerf value
No	Cutting parts size suddenly large and small	1. Mechanical problem 2. Electrical matching problem	1. Check gear, gear rack and the speed reducer 2. Pulse signal matching problem of system and driver, Parallel 4.7K-10K resistance at both ends of Pul+ and Pul-
No	All input ports have no response	Wiring error, public end is wrong	Check the wiring, input public end should be P13 or P15 of the CN1, Input power 24V-
No	Individual input port has no response	1. Wiring error, public end is wrong 2. Input port is broken	1. Check the wiring, input public end should be 0V 2. Read Appendix A5.2
No	Automatic interface crash after boot	1. File error 2. Parameter error	1. Boot to welcome picture, press DEL to enter 2. Parameter recovery (F5diagnose, F8definition, F1 recovery)
No	crash after entering file management	File system error	1. Factory settings (press F5, F8, F8, press F4 in pop-up window, password 6931) 2. Empty code (press F5, F8, F8, press F7 in pop-up window)
No	once boot on, it moves towards one direction	Eight remote control ports(NO and NC ports) on the right side of the input port are opposite	Refer to A5.3

No	Manual move tip: hard limit alarm	1. Four limit of input port NO&NC are opposite 2. Machine tool meet the hard limit	1. Read Appendix A5.4 2. Cancel the alarm limit
No	Manual move tip: emergency stop	1. Emergency stop button is pressed 2. Input port emergency stop NO&NC are opposite	1. Emergency stop button restoration 2. Refer to A5.5
No	No action after the start of plasma cutting	1. Positioning input signal back 2. Arc output port bad 3. Edge perforation setting 4. Arc time set to 0 5. DSP program missing	1. Refer to Appendix A5.6 2. Refer to Appendix A5.7 3. Change this parameter in the parameter settings 4. Set up arc time 5. Upgrade program
No	Collision tip, but no collision happens	1. Interference 2. Collision switch	1. Control jamming source 2. Detect collision switch
No	Collision warning tip	Cutting torch hit the plate	Improve the cutting torch position
No	All output ports can not open	1. Wrong connect of public output port end 2. U50/U51 chip burning	1. Check connection 2. Replacement chip
No	Individual output port can not open	Output port damage	Refer to Appendix A5.8
No	“Close the height adjust corner signal” not open at the corner	1. NO&NC are opposite for closing the height adjust corner signal 2. Wrong setting of speed shut down and closing height-adjust minimum distance in plasma parameter	1. Refer to Appendix A5.8 2. Recommend parameter speed closing height-adjust is set to 95% 3. The minimum distance is 5mm
No	Motor's four directions have no action	1. Motor or driver is bad 2. Wrong connection	1. Check motor and driver 2. Check connection

		from system to driver 3. Motor chip is bad 4. Speed is set to 0 5. DSP loss	3. Replace motor chip 4. Set speed 5. Upgrade program
No	Movement direction is opposite	1. Line pick reverse 2. Servo parameter error 3. System settings error	1. Check line 2. Adjust servo parameters 3. Refer to section 8.7.5 for modifying system parameters
No	Positive and negative poles of a certain axis go towards one direction	Motor chip destroy	Replace motor chip
No	Some axis only one button can move	1. Servo parameter 2. Motor chip destroy	1. Adjust servo parameter 2. Replace motor chip
No	Motor walk short	1. Pulse equivalent 2. Mechanical problem	1. Adjust precision 2. Adjust machinery
No	Motor walk more	1. Pulse equivalent 2. Zero drift 3. Mechanical problem	1. Adjust precision 2. Add magnet ring for servo encoder line 3. Adjust machinery
No	Fail to open file	1. Check file format 2. Version is old	1. Refer to the various formats of the instruction manual 2. Program upgrade
No	Edit file, can't edit file tip	No file in hard disk	Put at least one file in hard disk
No	Keyboard keys no action	1. Wrong interface 2. Keys destroy	1. Go to the right interface 2. Replace keyboard keys
No	Keyboard hang in the balance	Keyboard line loose	Plug keyboard line
No	Keyboard has no action	1. Code card damage 2. Keyboard wire loose 3. Foreign body stuck	1. Press DEL after boot to the welcome screen 2. Plug in keyboard line 3. Removal of foreign body
No	U disk insertion no	1. U disk is bad	1. Replace U disk

	response	2. USB interface is bad 3. USB connecting wire loose	2. Replace USB line 3. Plug in USB line
No	Tip open file failed	1. File format is incorrect 2. Folder deleted	1. Check if file format is TXT, CNC, NC, etc. 2. Make new folder
No	Tip no file	1. File format is incorrect 2. No file in U disk 3. U disk format is incorrect	1. Check if file format is TXT, CNC, NC, etc. 2. Check if there's a file in U disk, if the file is under root of U disk 3. Format the U disk into FAT or FAT32 format
No	Tip"can't edit file"	No file in hard disk, at least put one file in it	Copy one file from U disk to hard disk
No	Tip”cutting speed error”	Speed in common parameters exceed the max speed of system	Adjust the max cutting speed limit in system parameters
No	Tip “manual shift speed error "	Speed in common parameters exceed the max speed of system	Adjust the max speed limit of manual shift in system parameters
No	Tip "empty range shift car speed error"	Speed in common parameters exceed the max speed of system	Adjust the max speed limit of empty range shift car in system parameters
No	Tip "Cutting slot error, clear cutting slot"	The slot value exceeds the introduction of cutting graphics or the minimum radius of a circular arc in a graph	1. Modify the introduction of lead 2. Reduce the slotting compensation value 3. Delete the small arc inside the graphics
No	Tip "parameter import failed "	1. There is no parameter file in the U disk. 2. USB interface problem 3. U disc problem	1. Detection of U disk to find F2300.DAT file 2. Detection of USB interface 3. Replace U disk
No	Tip "parameter export failed "	1. U disk is not plugged well	1. Re plug U disk 2. Replace U disk

		2. U disc problem	
No	Tip “please insert U dick” when upgrading program	1. Not insert U disk when upgrading program 2. USB interface problem 3. U disc problem	1. Please insert the U disk before upgrading 2. Replace USB interface 3. Replace U disk
No	Tip “Upgrade file not found” when upgrading program	1. U disk has no upgrade file 2. The upgrade file is not on the root directory of U disk	1. Check if there’s upgrade file in U disk 2. Put the upgrade file on the root directory of U disk
No	Tip “upgrade fail”	Upgrade failed	Re upgrade after reboot
Error code 0	Tip ”error code 0”	Encryption time expires	Need to decryption
No	Blank screen after booting	1. The system is not powered 2. Insufficient supply voltage 3. 3A fuse is bad 4. Motherboard does not start	1. Test switch power supply 2. Detection of DC24V voltage 3. Replace fuse 4. Send back to replace motherboard
No	Appear white screen, flower screen, flash screen after booting	1. Drive plate destroy 2. Display destroy 3. Cable loosening	1. Replace drive plate 2. Change display screen 3. Re plug display cable

A5.1 Motor Chip Detection

1. X axis motor not move, you can test system CN3 socket according to the following four cases:

- The measurement of running state, the correct voltage for pins 1 and 9 should be DC 3V-3.5V
- The measurement of stop state, the correct voltage for pins 1 and 9 should be DC 3V-3.5V
- The measurement of running state, the correct voltage for pins 2 and 10 should be DC 0V
- The measurement of stop state, the correct voltage for pins 2 and 10 should be

DC 3V-3.5V

If one of the above four cases is not correct, motor chip is bad. Then it should be sent back to factory for maintenance.

2. Y axis motor not move can test system CN3 socket according to the following four cases:

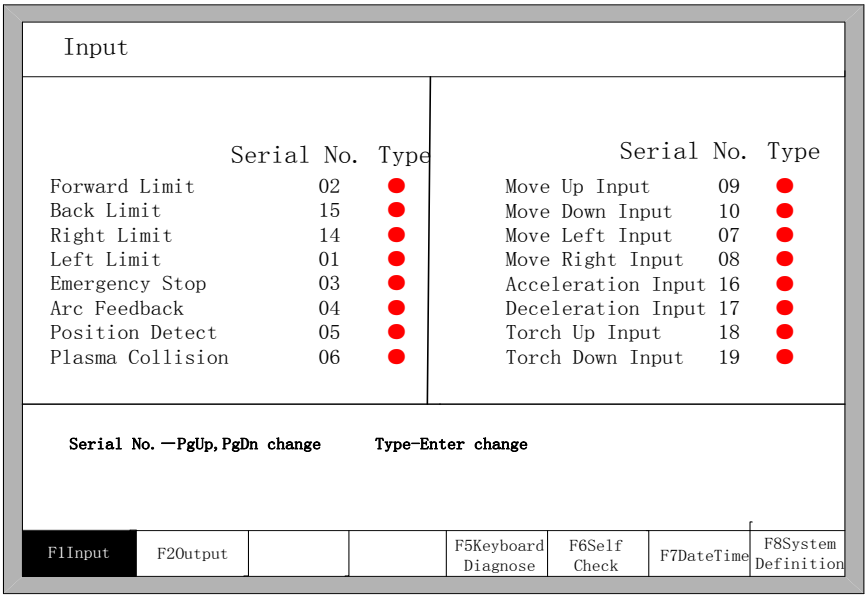
- The measurement of running state, the correct voltage for pins 3 and 11 should be DC 3V-3.5V
- The measurement of stop state, the correct voltage for pins 3 and 11 should be DC 3V-3.5V
- The measurement of running state, the correct voltage for pins 4 and 12 should be DC 0V
- The measurement of stop state, the correct voltage for pins 4 and 12 should be DC 3V-3.5V

If one of the four cases is not correct, motor chip is bad. Then it should be sent back to factory for maintenance.

A5.2 Input Port Detection

If individual input port has no response, please enter into input diagnose interface to check.

Press F5(system diagnose) to enter input diagnose interface



You can connect the input corresponding to CN1 pin number (such as the front limit of 02 foot) with 0V (CN1-13 number foot) to make short test:

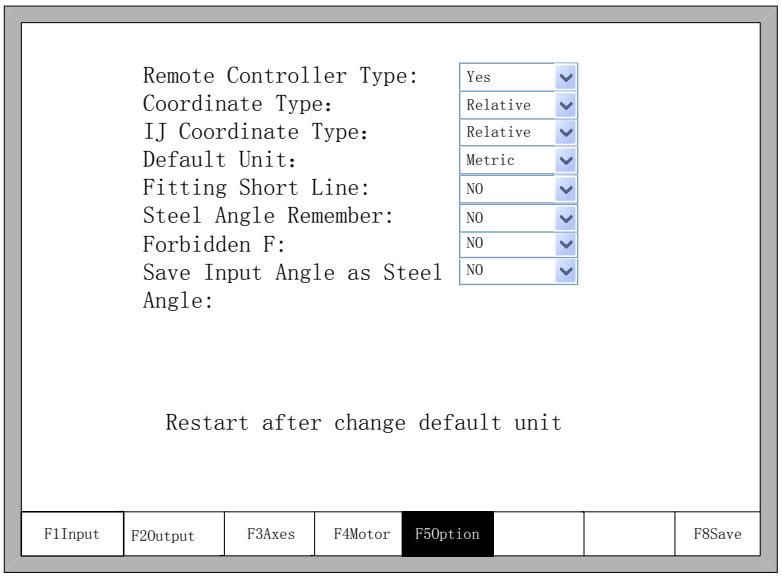
● If input the corresponding input port into the diagnose, with change of status indicator, then it is normal.

● If input the corresponding input port into the diagnose, with no change of status indicator, then it is abnormal.

Please redefinition of input port.(refer to operation manual V2.1, section 8.7.2)

A5.3 Remote Controller Type Problem

Machine walks on its own after powering to system, usually because of the incorrect settings of remote type by YES, and "forward" "back" "left" "right" all have signal.



Please set remote controller type to NO.

A5.4 Hard Limit Alarm Problem

Tip: hard limit alarm

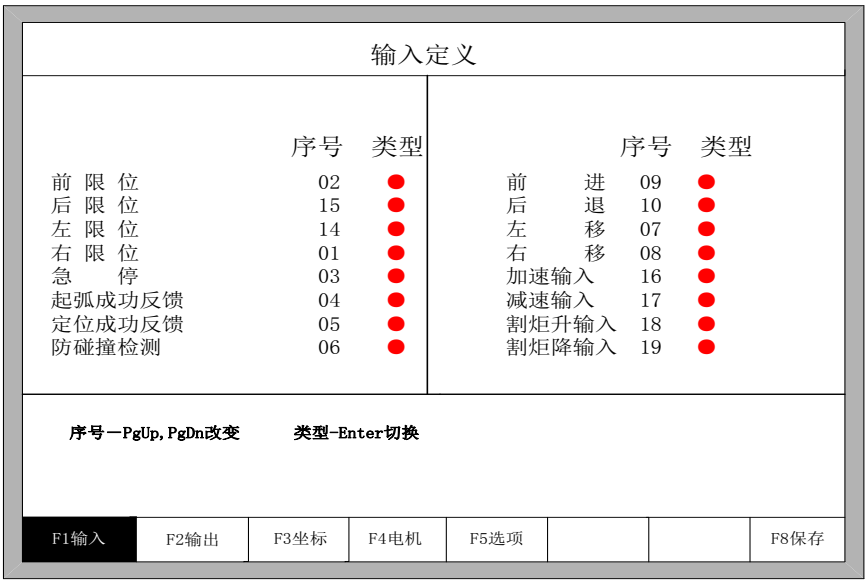
If machine doesn’t collide the limit, it’s usually caused by the opposite

connection of input port NO&NC. You can enter into system input definition to modify:

PressF5(System diagnose)

F8(system definition)

F3(definition) password：1396, modify the condition of input port NO and NC



Eg. If back limit has limit alarm, you can set “back limit” to the opposite side, that is, red to green or green to red.

A5.5 Emergency Stop Alarm Problem

Tip: emergency stop

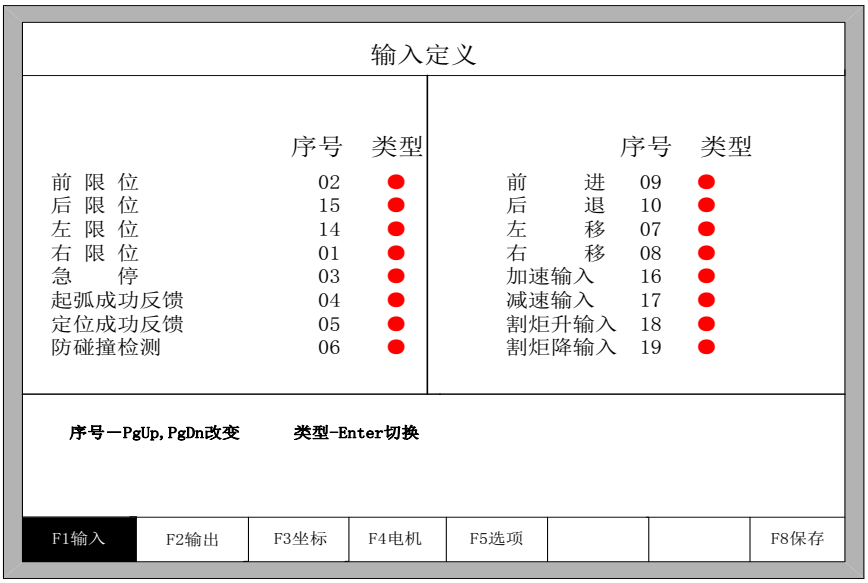
If the emergency stop button is not pressed down, it’s usually caused by the opposite connection of NO and NC for emergency stop alarm signal.

You can enter into system input definition to modify:

Press F5(System diagnose)

F8(system definition)

F3(definition) password：1396, modify the input type of emergency stop in system definition interface.



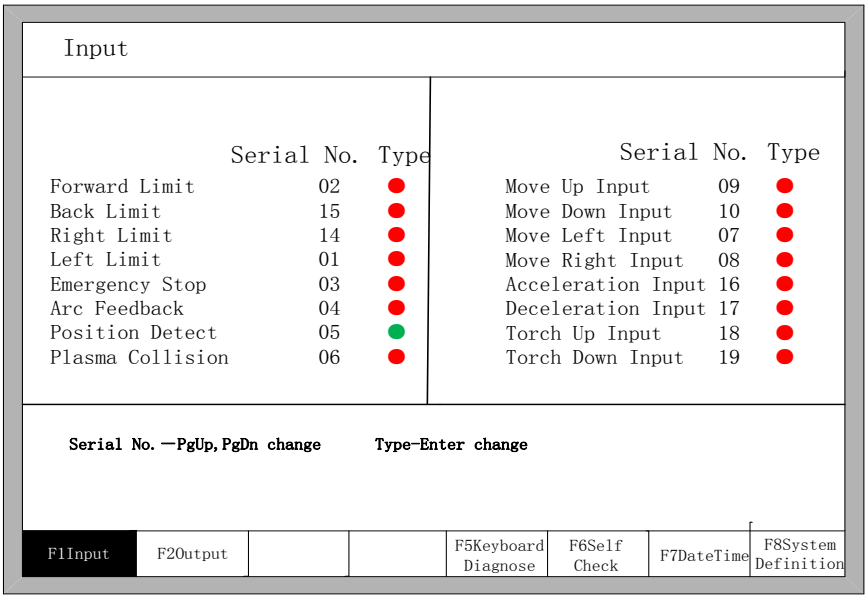
You can set “emergency stop”type to the opposite side, that is, red light to green, green light to red.

A5.6 THC Problem

Usually, common arc voltage THC has two types: with the initial positioning function and without initial positioning function.

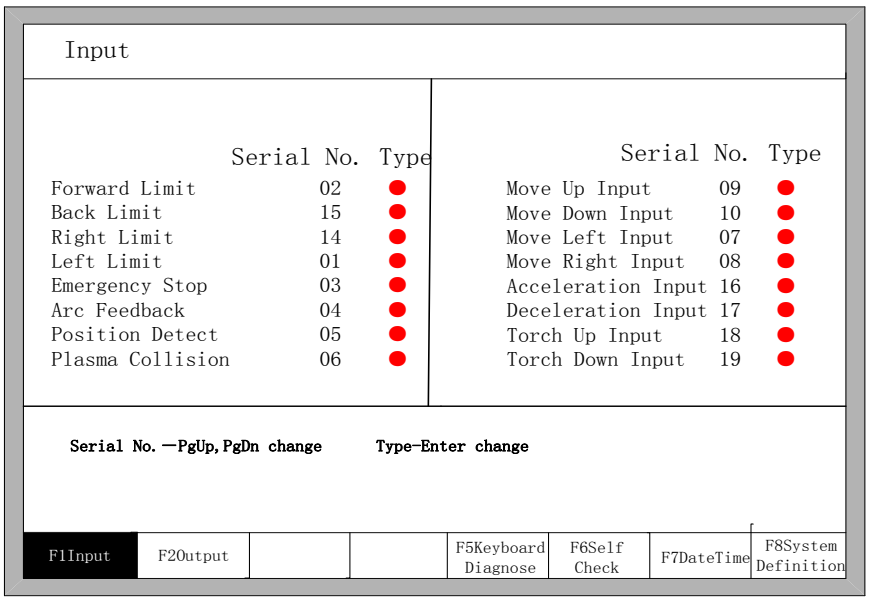
1. System plasma parameter settings for THC with initial positioning function are as follows:

- The detection time is set to 0
- The location rise time is set to 0
- The diagnosis successful feedback status indicator for input interface positioning must be green as the interface:



2. System plasma parameter settings for THC without initial positioning function are as follows:

- The detection time is set to 15S
- The location rise time is set to 0.8S
- The diagnosis successful feedback status indicator for input interface positioning must be green as the interface:



A5.7 Plasma Arc Starting Problem

The method of testing the normal working for plasma arc output is as follows:

1. Press F5(system diagnose)

F2(output) open plasma arc port

2. Plasma arc status indicator should be green after press “F3 open”

3. Test system's back output socket CN2 pin 16 foot and common end pin (12 or 24 foot) to see if there's DC24V voltage.

- If there’s DC24V voltage, plasma arc port is normal
- If there’s no DC24V voltage, plasma arc port is burnout. Please redefine the output port. ((refer to operation manual V2.1, section 8.7.3)

A5.8 Input/Output Problem

The method of testing the normal working of individual output port is as follows:

1. Press F5(system diagnose)

F2(output)

2. Open the output port for testing

Open system back output CN2's corresponding output pin number (e.g. "ignition switch" pin 03) and pubic port(12 or 24 feet) to check the correct voltage DC 24V.

- If there’s no voltage, output port is burnout.
- If it’s not correct, please redefine the output port. (refer to operation manual V2.1, section 8.7.3)