

# ARCBRO®

## ARCBRO-F2000 Tube series CNC SYSTEM User's Manual



### Operator Manual

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Unique Solution

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## Technical Support

Thank you very much to choose **ARCBRO** product, our whole engineer department work for you since the day you receive machine. When you have any questions during assembling or operating, it is free to contact us by Call, Email, Online help 7x24 hours.

Wish you enjoy a wonderful CNC cutting travel.

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## 1. CNC-PIPE System Instruction

### 1.1 Module Brief Introduction

F2000X module is the pipeline cutting software function module based on the F2000/F7000 model digital control system produced by our company. Digital control system with F2000X module function can process various pipeline part. This function is based on the mature F2000 system, so this system is stable and reliable, easy to operate. The user can rapidly cut pipeline based on the initial operation.

This module can be applied to all F2000/F7000 series controller from our company, facing to different machine tool, various mating controller selection available.

Tube /Plate function auto switch.

### 1.2 Module Function

- ◆ Supporting 2 axes cutting tube machine with chuck mode.
- ◆ Supporting 2 axes cutting tube machine with friction disk mode.
- ◆ Supporting tube and plate all-in-one (chuck mode) cutting machine.
- ◆ Supporting tube and plate all-in-one (friction disk mode) cutting machine.
- ◆ Tube part processing with arbitrary tube's diameter.
- ◆ Tube part telos cutting off function, can arbitrarily set inclined cutting angle.
- ◆ Tube with equal radius process function (V-shaped saddle).
- ◆ Tube part telos slotting function can arbitrarily set slotting size and angle.
- ◆ Mitrer elbow cutting, can set pitch number, angle of bend.
- ◆ Saddle cutting, can arbitrarily set inclined angle.
- ◆ Eccentric saddle cutting.
- ◆ Main tube trepanning cutting, can mate with riding-type or plug-in branch pipe.
- ◆ Arbitrary shape trepanning cutting, can design profile hole by CAD.
- ◆ Multiple saddle branch pipe cutting.
- ◆ Kerf compensatory function.
- ◆ Full-automatic nesting function.

## Chapter 2 Operation Interface

### 2.1 Main Interface

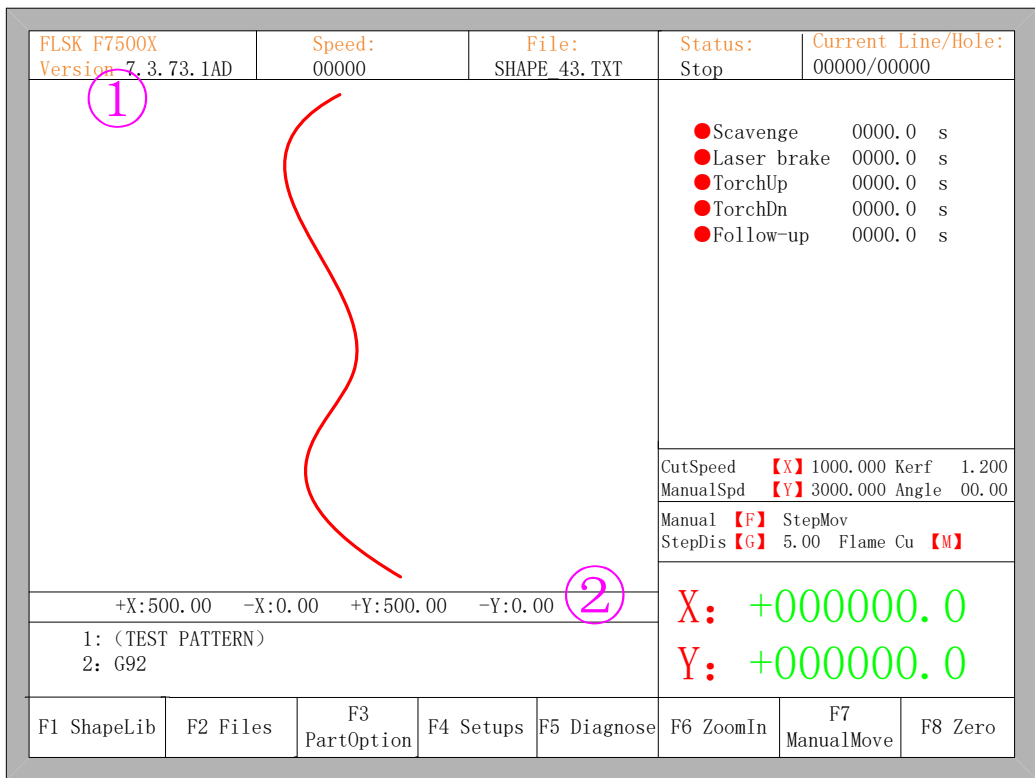


Fig 2.1 Tube/plate cutting main Interface

After use tube/plate cutting module, controller’s main interface is different from common version. The primary items are:

The end of controller’s model adds a “X”, for an example: “F7500X”.

Add the display of cutting diameter, for an example: “D:160.00”. It interprets that diameter is 160 mm.

But in the cutting plate interface, except the difference of controller model, the other items are the same to common model. It is shown as figure 2.2:

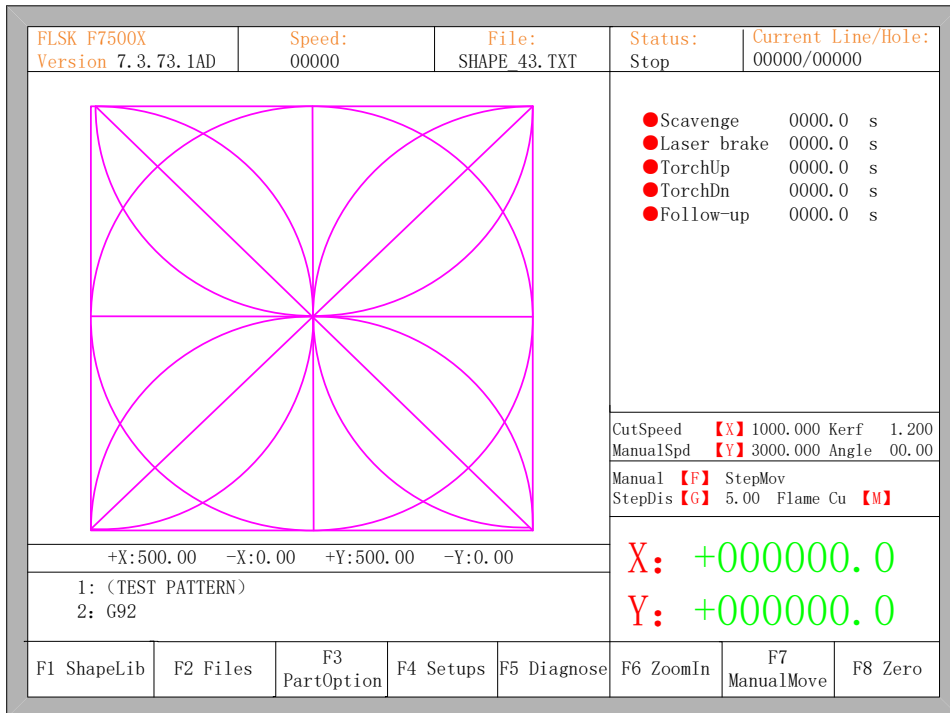


Fig 2.2 Cutting plate interface

## 2.2 Tube/Plate Cutting Switch

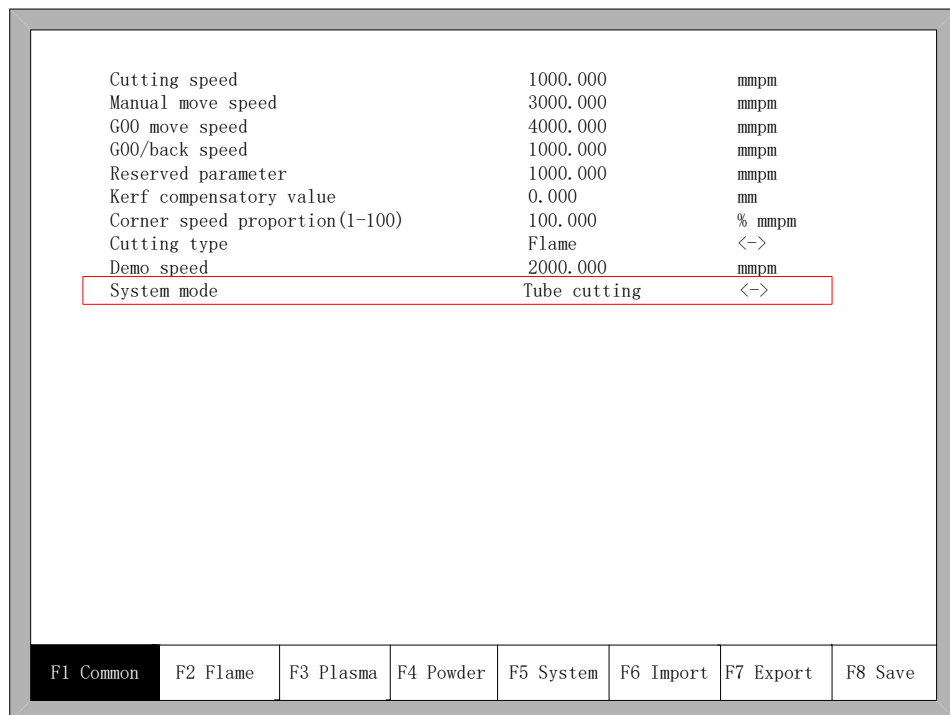


Fig 2.3 Tube/Plate Cutting Switch



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In the main interface, press **【F4】**, then enter into Setups interface. It will show **【F1 Common】** parameter function interface as figure 2.3.

Press down **【↑】** or **【↓】** to select parameter **【System mode】**, press down **【←】** or **【→】** to switch between two modes: **【Tube cutting】** and **【Plate cutting】**.

**Note:** after switch system mode, the user needs to save parameters and power off to restart system, then switches between tube cutting and plate cutting mode.

### 2.3 Chuck Pulse Number

Horizontal Axis Pulses	125.000	n/mm
Vertical Axis Pulses	125.000	n/mm
Max cutting speed	2000.000	mmpm
Max G00 speed	3000.000	mmpm
Small arc limit	1000.000	mmpm
Laser adjust time	0.40	s
Plasma adjust time	0.30	s
Emergency stop time	0.08	s
Start speed	250.000	mm
Max +X	100000.000	mm
Max +Y	100000.000	mm
Min -X	-100000.000	mm
Min -Y	-100000.000	mm
Chuck pulse number	125.000	n/deg

F1 Common	F2 YAG Laser	F3 Plasma	F4 Powder	<b>F5 System</b>	F6 Import	F7 Export	F8 Save
-----------	--------------	-----------	-----------	------------------	-----------	-----------	---------

Fig 2.4 Chuck Pulse Number

**【Chuck Pulse Number】**: This parameter sets that chuck needs how many pulses to rotate 1°. In the cutting tube mode, use **【Chuck Pulse Number】** to calculate chuck's position value.

## 2.4 Whether Use Chuck or not

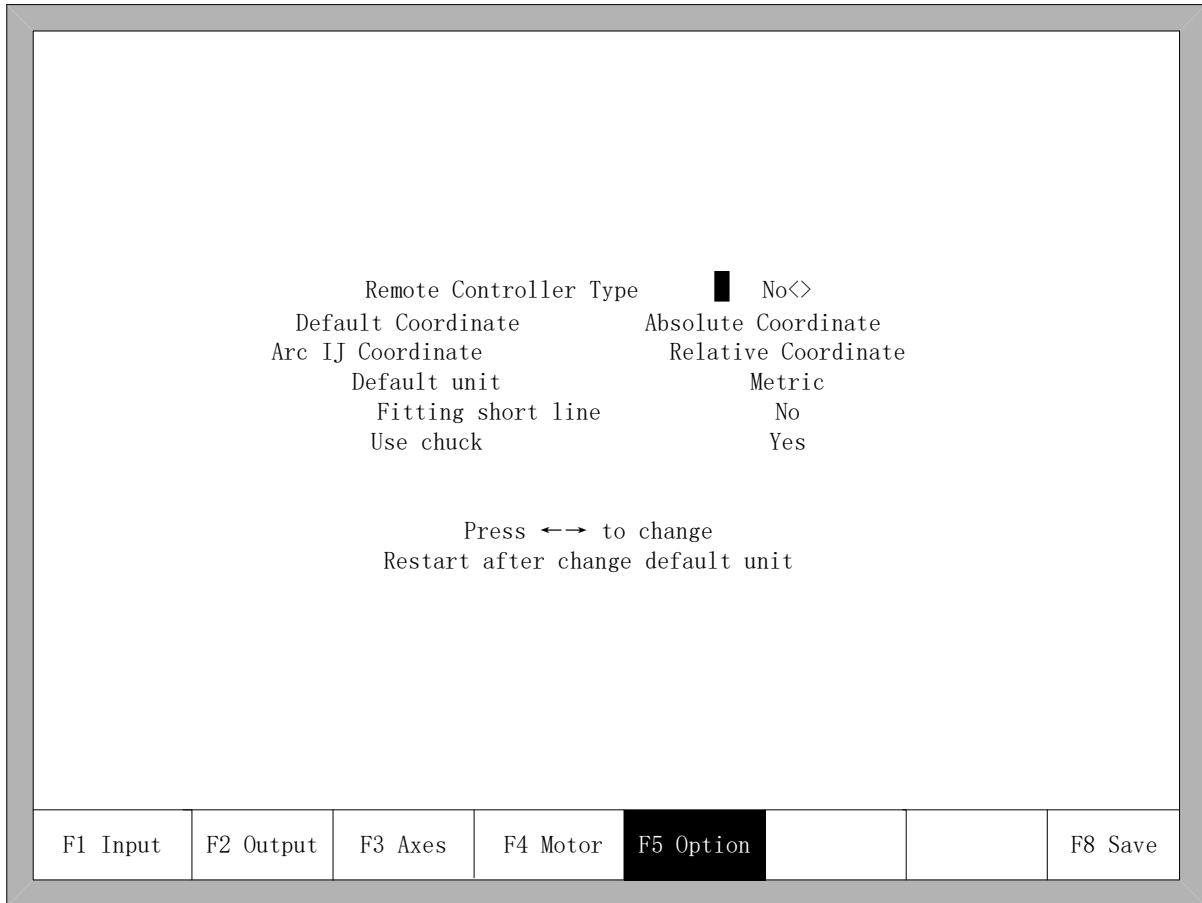


Fig 2.5 Option

**【Use chuck】** When this parameter is set “yes” , (Y) sets angle as unit in G codes; When this parameter is set “no” , (Y) sets length as unit in G codes.

### Chapter 3 Tube/plate All-in-one System

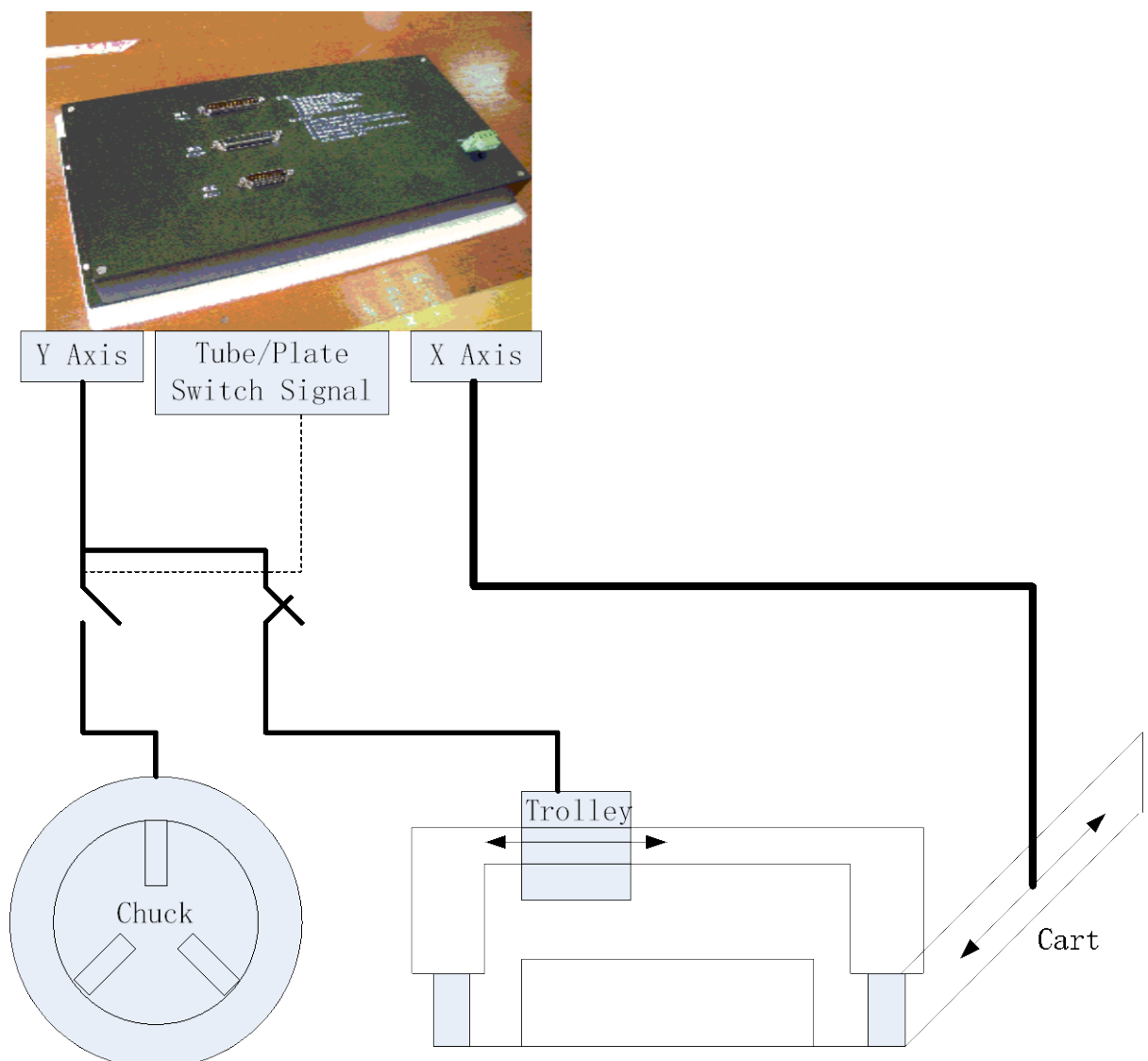


Fig 3.1 Tube/plate all-in-one system controller topology Schematic

As the above figure shows, the signal of X Axis is used for controlling cart 's motor; the signal of Y Axis is used for controlling chuck's or trolley's motor.

At the same time, only one of the chuck's and trolley's motor is always enable(Using the tube/plate switch signal by the system outputs).

## Chapter 4 IO Port



Fig 4.1 Output diagnosis

**【Cutting Tube Mode】** This port keeps open all the time in the mode of cutting tube, keeps closed in the mode of cutting plate. Using this signal, you can switch between trolley and chuck enable.

## Chapter 5 Code Explanation

### 5.1 Code Symbol

Cutting tube program code is the same as cutting plate code, between which the difference is as following:

- Using Letters and Units:  
 X: cart's axis, unit(mm)  
 Y: chuck(trolley in the mode of cutting plate), unit(°)  
 (When don't use chuck, unit(mm))

- Diameter Code

There is one line code in the front of the code of cutting tube as following(obligatory):(D=168),It interprets that the tube's diameter is 168 mm in this cutting program.

- Wall Thickness Code

There is one line code in the cutting tube code as following(omissible): (T=8)  
 It interprets that the tube's wall thickness is 8 mm in this cutting program.

- Annotation

The content contained within parentheses in the tube cutting program is annotation. Besides diameter annotation code, the rest annotations can all be neglected.

### 5.2 Typical Code

D=452)	G00 X0 Y-0.634 B0
(T=55)	M07
(M=Q235-A)	G01 X4.33 Y0 B0 F500
(F=1)	G01 X4.454 Y4 B0 F1000
G71	G01 X4.822 Y8 B0 F1000
G90	G01 X5.428 Y12 B0 F1000
G92X0Y0	M08
(Sit,90,-570.787,Sit,1200,50,90,0)	M02

## 2. CNC System Instruction

### 2.1 Introduction of System Operation Board



Fig 2.1 F2000 Series 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.

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## 2.2 Power on Processing and Main Interface

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



Fig 2.6 welcome interface

In the welcome interface, press any key to enter the main interface automatically shown as Fig2.7.

FLSK F2200B Version 3. 3. 73. 1	Speed: 00000	File: SHAPE 43. TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<ul style="list-style-type: none"> <li>● Ignition s</li> <li>● LowHeat s</li> <li>● HighPreheat s</li> <li>● Pierce1 s</li> <li>● Pierce2 s</li> <li>● Pierce3 s</li> <li>● TorchUp s</li> <li>● TorchDn s</li> <li>● THC En s</li> <li>● Blow s</li> </ul>				
			CutSpeed <b>[X]</b> 300.00 Kerf <b>[N]</b> 1.40 ManualSpd <b>[Y]</b> 3000.00 Angle 0.00 Manual <b>[F]</b> StepMov StepDis <b>[G]</b> 5.00 Flame Cu <b>[M]</b>				
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00 1: (TEST PATTERN) 2: G92			<b>X: +000000.0</b> <b>Y: +000000.0</b>				
F1 ShapeLib	F2 Files	F3 PartOption	F4 Setups	F5 Diagnose	F6 ZoomIn	F7 ManualMove	F8 Zero

Fig 2.7 the main interface

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

**【F1】 ShapeLib:** Pressing F1 to enter the Shape Library including 45 common shape, and most of them have plate size and hole size.

**【F2】 Files:** You can load local files, U disk files or edit, import, export and delete codes.

**【F3】 PartOption:** Make actions of mirroring, rotation, plate adjusting, plate arraying, selecting row and hole or code edition etc.

**【F4】 Setups:** Setting all parameters.

**【F5】 Diagnose:** Including input ports diagnosis, output ports diagnosis, keyboard diagnosis, system self check, date setting and system self defines.

**【F6】 ZoomIn:** Zoom in the shape in full screen.

**【F7】 ManualMove:** Manually move the machine.

**【F8】 Zero:** Clear the coordinate of X and Y before starting cut or after cutting over.

**【X】 CutSpeed:** Setting the cutting speed.

**【Y】 ManualSpeed:** Setting the manual moving speed.

**【Z】 Kerf:** Setting the kerfs' compensate value.

**【F】 Manual:** Setting the mode of manual movement including keepMov(keep movement), StepMov(step movement), ContiMov(continue movement). The selected mode is black background.

**【G】 StepDis:** Setting the distance of the fixed-length.

**【N】** Before the cut running starts, set kerf's size

**【M】**Selecting the cutting mode including Flame Cu(flame cutting), Plasma Cu(plasma cutting), Demo run.

**【START】** Begin to cut

**【SPACE】** Enter cutting interface



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## 2.3 Function Index of Main Interface

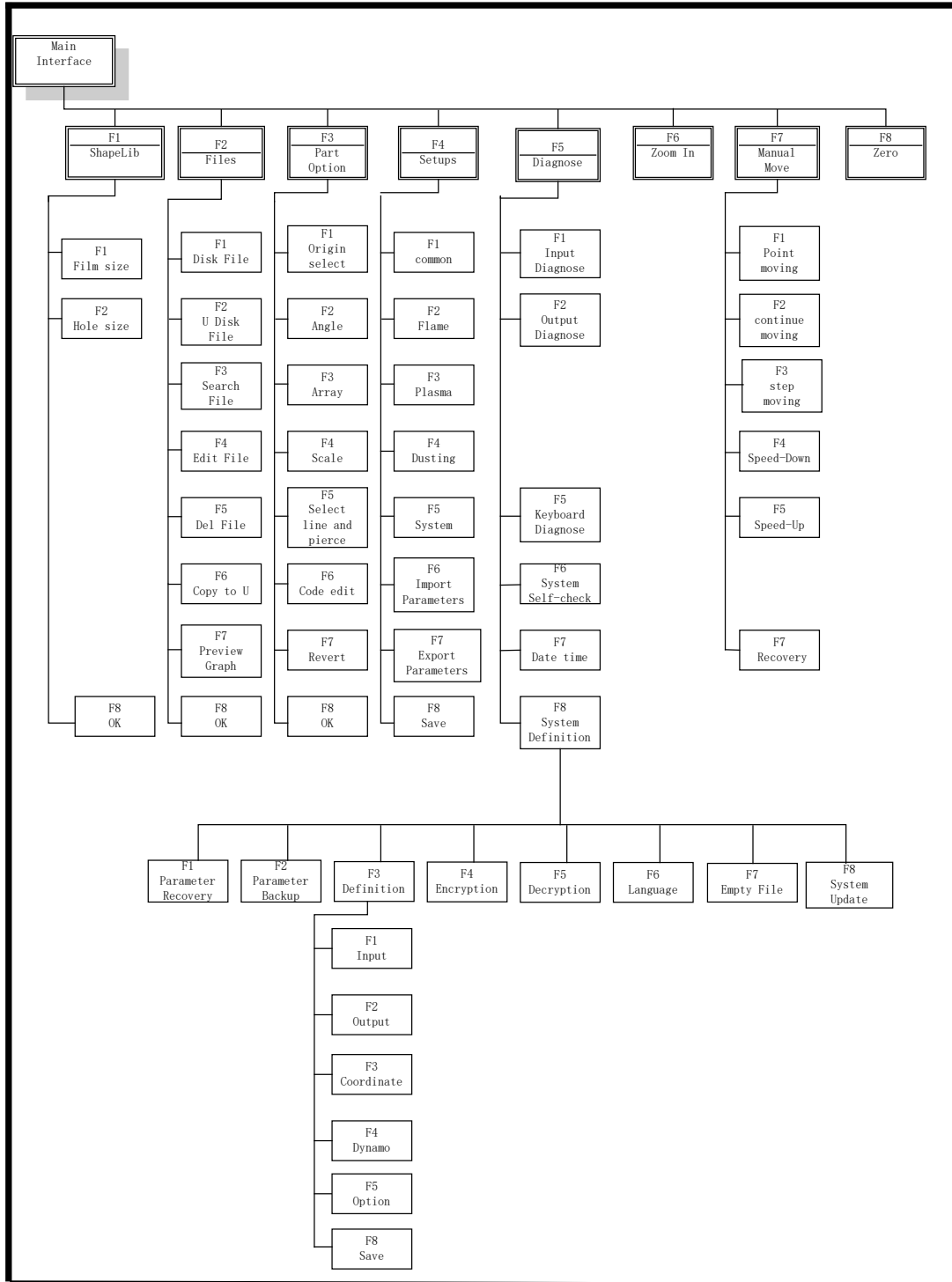


Fig 2.8 Function index of main interface

## Chapter 3 Cutting Function

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

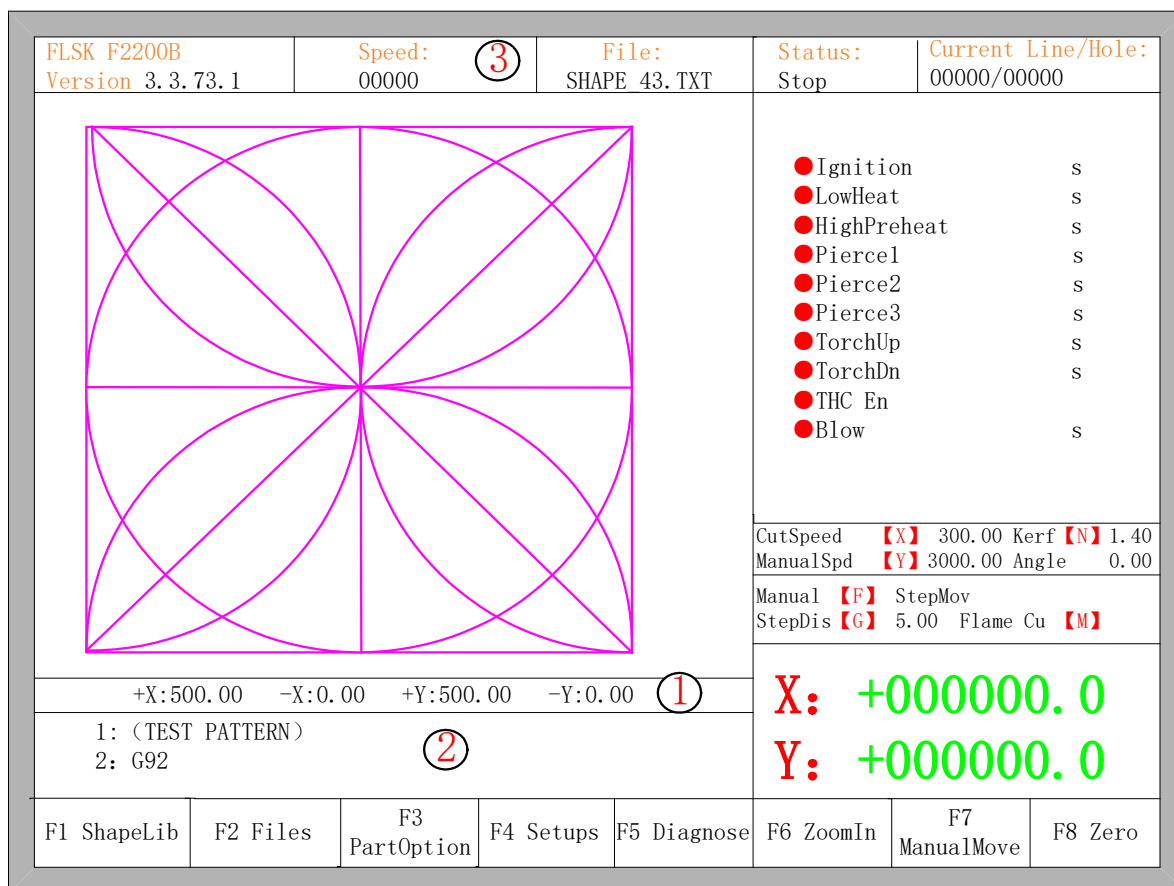


Fig 3.1 cutting function interface

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

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

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

In the cutting interface:

Press **【X】** : Modify the current cutting speed.

Press **【Y】** : Modify the current speed manual shift car.

Press **【F】** : Change the current manual method.

Press **【G】** : Modify the current fixed-length fixed long-distance move.

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**【START】 ( 【F9】 )**: Start cutting.

**【STOP】 ( 【F10】 )**: Parking, the system can suspend all ongoing actions.

**【F1】**: The torch move back along the cutting path(I / O port closed)

**【F2】**: The torch forward along the path (I / O port closed).

**【F3】**: Return to the starting point of cutting torch, i.e. the starting point of the current work piece.

**【F4】**: Decrease the cutting speed, each decrease of 1% click rate. Decrease the rate of manual moving machine in manual mode.

**【F5】**: Increase the cutting speed, each 1% increase in click rate. Increase the rate of manual moving machine in manual mode.

**【F6】**: Reduce the preheat time, skip the remaining preheat time, and the system automatically records preheat time.

**【F7】**: Increase the preheat time once 15 seconds.

**【F8】**: When the system is suspended, for selecting perforation point; when the system begins to move, for the dynamic amplification.

Four direction keys (Up, down, left and right): When the gun through, manually move the torch.

## 3.1 Cutting Operation Index

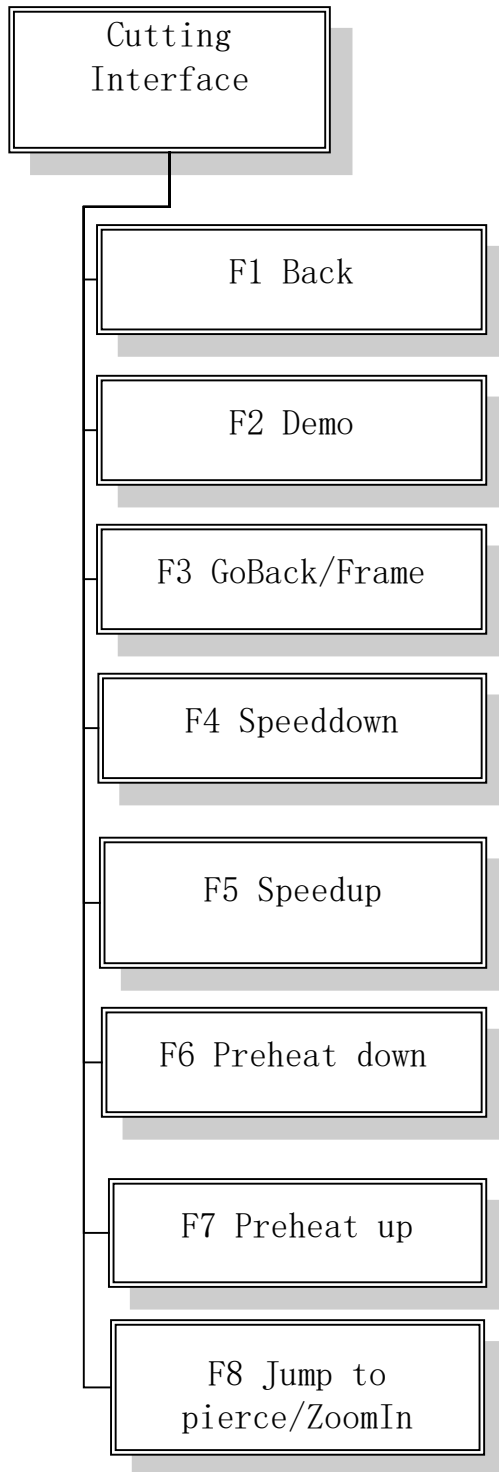


Fig 3.2 Cutting operation index

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### 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】 / 【HOME】** , increasing 3% of current rate with per click. Hold the **【F5】 / 【PRE】 / 【HOME】** , then the rate will continuously increase to the maximal cutting rate.

In the operation panel, press **【F4】 / 【NEXT】 / 【END】** , decreasing 3% of current rate with per click. Hold the **【F4】 / 【NEXT】 / 【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 **【F1】** , 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.

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.

### 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.

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↩ In the automatic function interface, press key **【F3】** (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.

↩ 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.

## 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:

FLSK F2200B Version 3.3.71.1	Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<ul style="list-style-type: none"> <li>● Ignition s</li> <li>● LowHeat s</li> <li>● HighPreheat s</li> <li>● Pierce1 s</li> <li>● Pierce2 s</li> <li>● Pierce3 s</li> <li>● TorchUp s</li> <li>● TorchDn s</li> <li>● THC En s</li> <li>● Blow s</li> </ul>				
[G]Cutting return [X]Offset cutting [Y]only return			CutSpeed <b>【X】</b> 300.00 Kerf <b>【N】</b> 1.20 ManualSpeed <b>【Y】</b> 3000.00 Angle 0.00 Manual <b>【F】</b> StepMov StepDis <b>【G】</b> 5.00 Flame Cu <b>【M】</b>				
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00 1: (TEST PATTERN) 2: G92			<b>X: +000000.0</b> <b>Y: +000000.0</b>				
F1 Back	F2 Demo	F3 Frame	F4 Speeddown	F5 Speedup	F6 Preheatdown	F7 Preheatup	F8 JumptoPierce

Fig. 3.3 edge perforation

There are two reasons led to this situation:

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- 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 workpiece, the above prompt will appear.  
If press **【G】** , the system cutting returns back to the paused point, continue to cut it. This feature is particularly useful for thick steel plate, it can reduce the preheat time and increase cutting efficiency. This function is the commonly-used edge perforation function.

If press **【X】** , the system considers current point is the paused point, it will continue cutting it. That is, the system offsets the cutting point. When the cutting machine paused or a power outage, if the cutting tip or steel plate with the pan has been offset, or the user would like to think that is offset cutting, you can press this button.

If press **【Y】** , The system only return to the paused point quickly, and then break off. During the cutting process, if discovering cutting torch malfunction or other issues, system needs to move the cutting tip out of cutting region to overhaul. When return to breakpoint after the maintenance, this key can be pressed. Then return to the paused point, press the **【start】** button, the system automatically continues to cutting.

## 3.6 Back to Reference Function

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

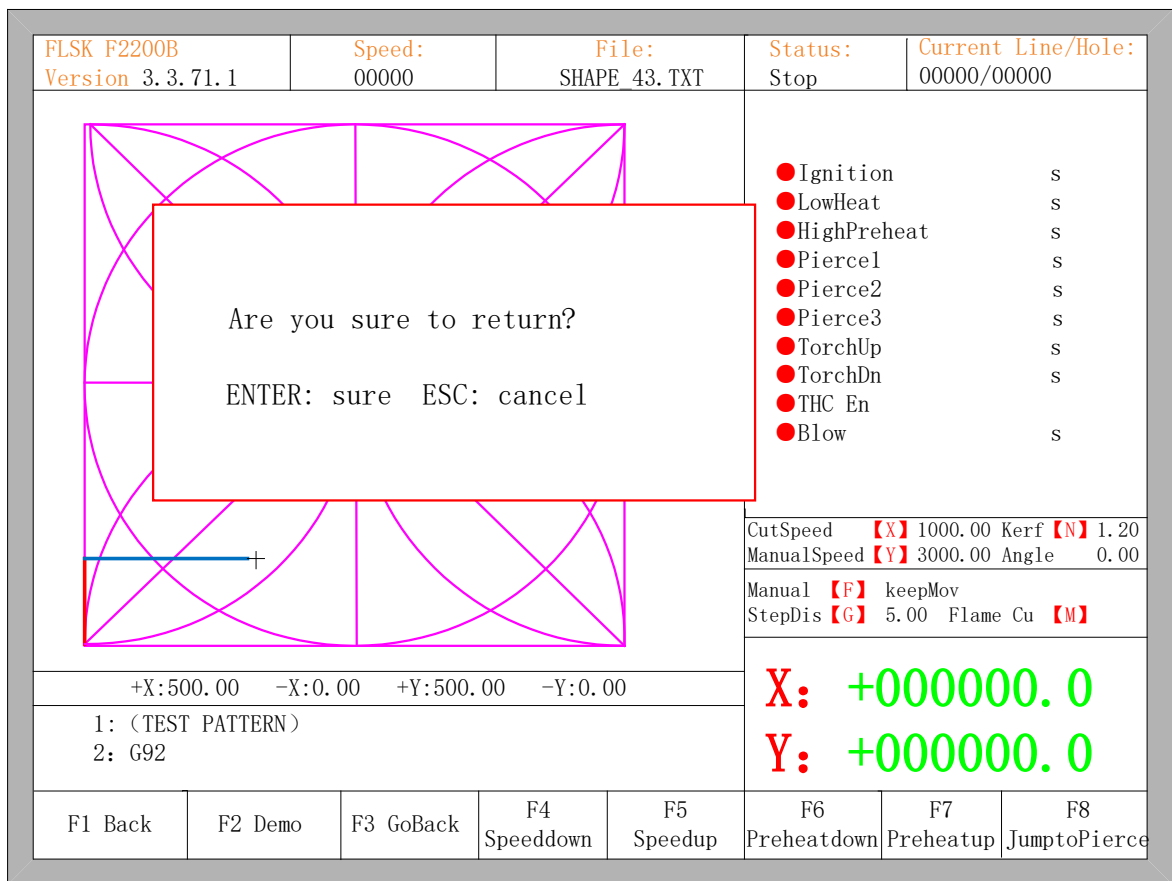


Fig. 3.4 return reference prompt

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



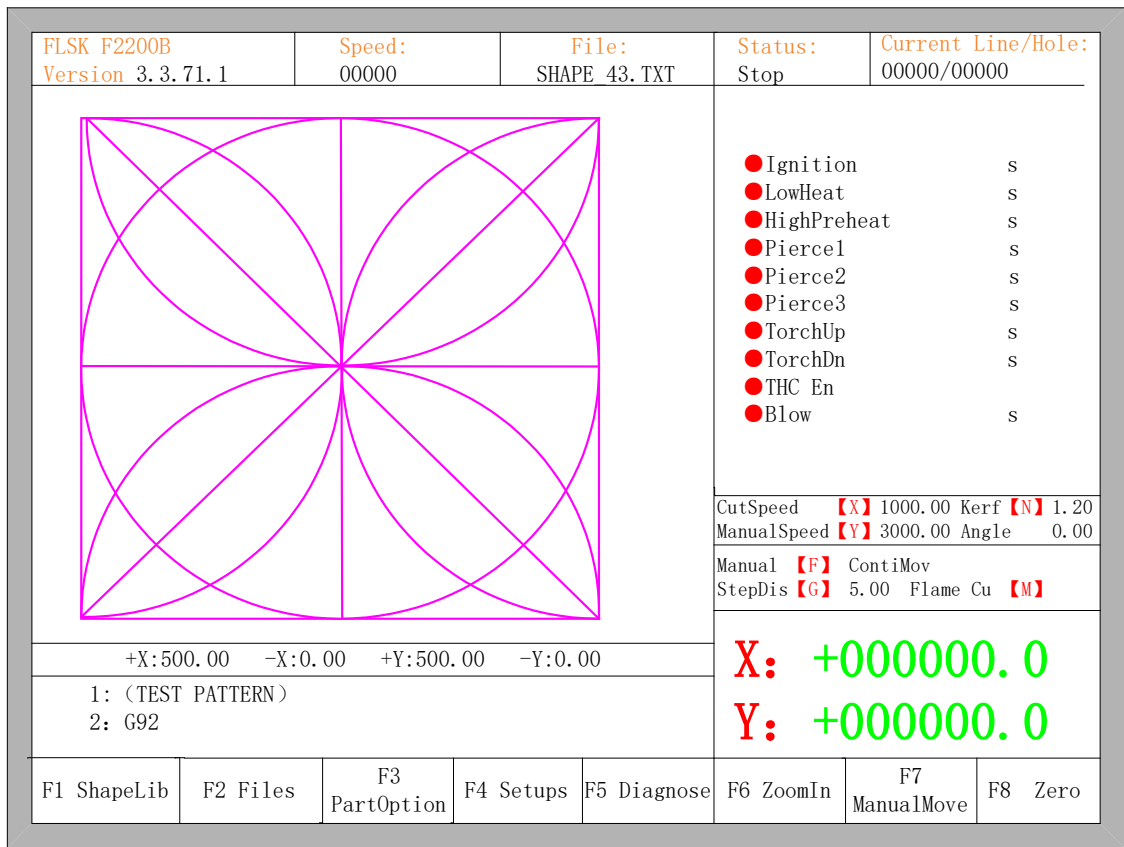


Fig. 3.5 main process interface

During the return process, the user can press the "Stop" button to stop the operation, and can continue to return operation after pressing of **【F3】**. Number of back to reference and stop has no limit.

### 3.7 Oxygen Gas Preheat Time Regulation

In the preheat process, press the START (F9) key to skip the process of preheat and perforation delay, and immediately open the perforation signal then begin to cut.

In the preheat process, press the stop (F10) key to stop preheat, waiting for the F9 key is pressed again.

In the preheat process, press the F6 key then the preheat time will be reduced to the current preheat time spent, and skip the process of preheat and perforation delay, and open the perforation signal then begin to cut..

For example: the original system sets the preheat time of 60 seconds, when preheat needed, the interface will count down, under normal circumstances, till 0, the system begins the next step of cutting, but if the system has the remaining 10 seconds of countdown time, press

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**【F6】**, then the system immediately stops preheat to begin the next step of cutting, and records the preheat time of 50 seconds, the system automatically thinks that users need preheat time of 50 seconds, the next preheat after the null cutting when the preheat time becomes 50 seconds.

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

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

## 3.8 Perforation Point Selection

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

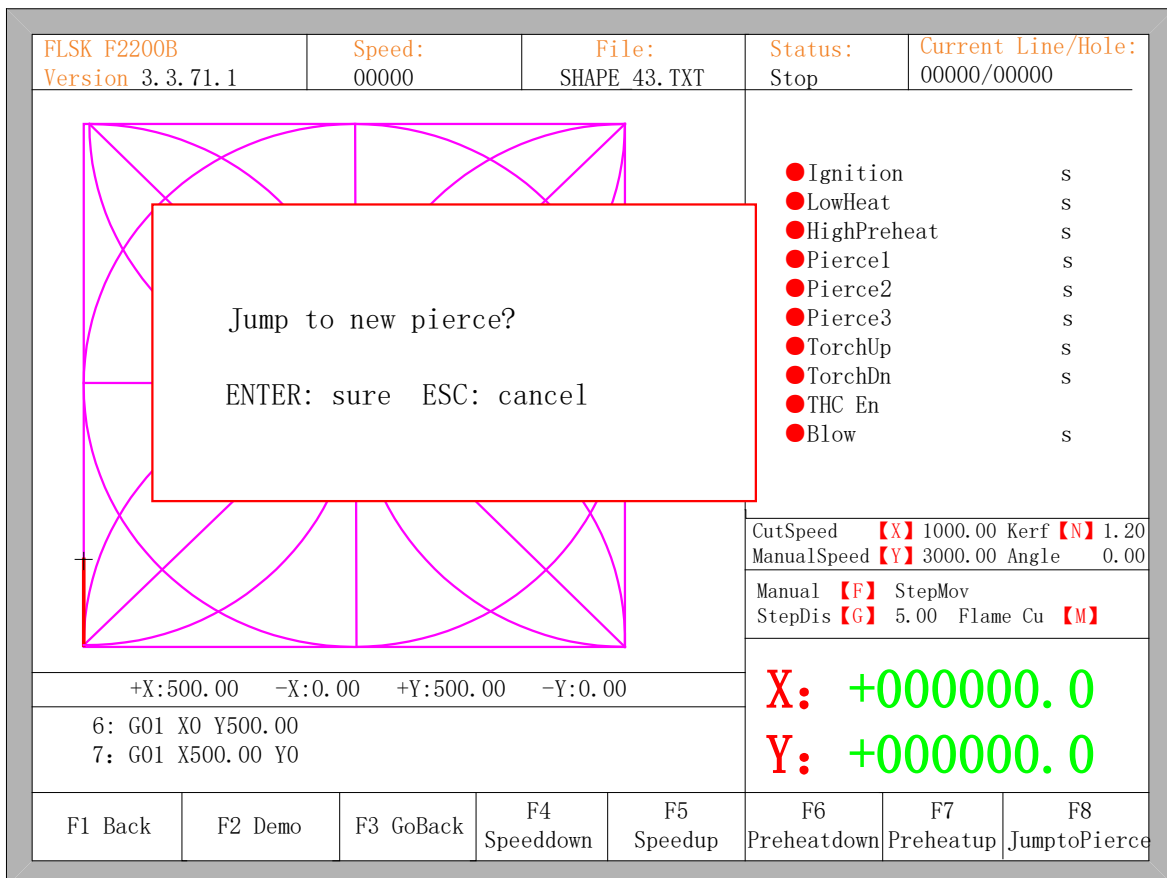


Fig. 3.6 select new pierce

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

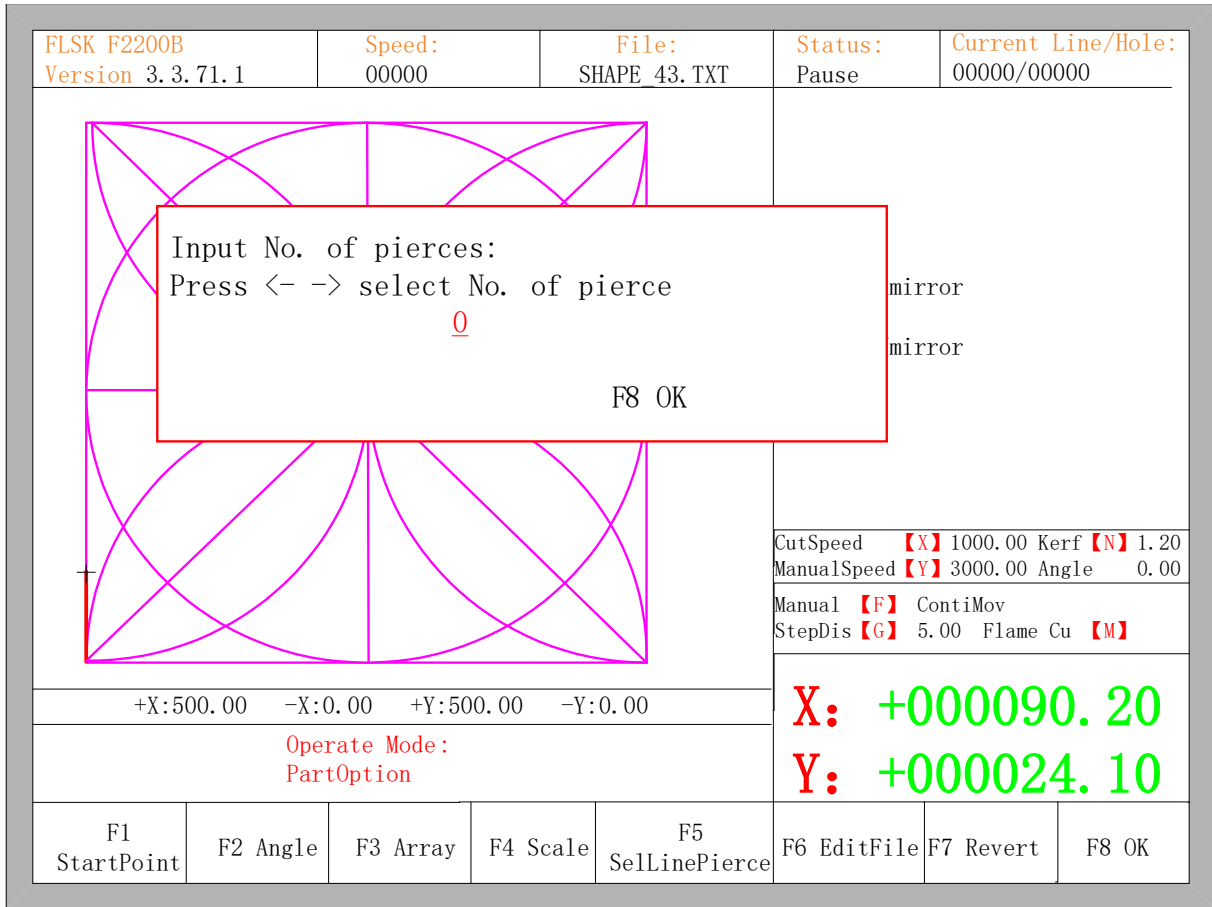


Fig. 3.7 piece prompt

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.

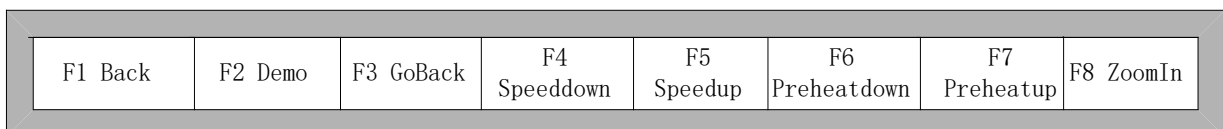


Fig 3.8 Function key of cutting interface

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.

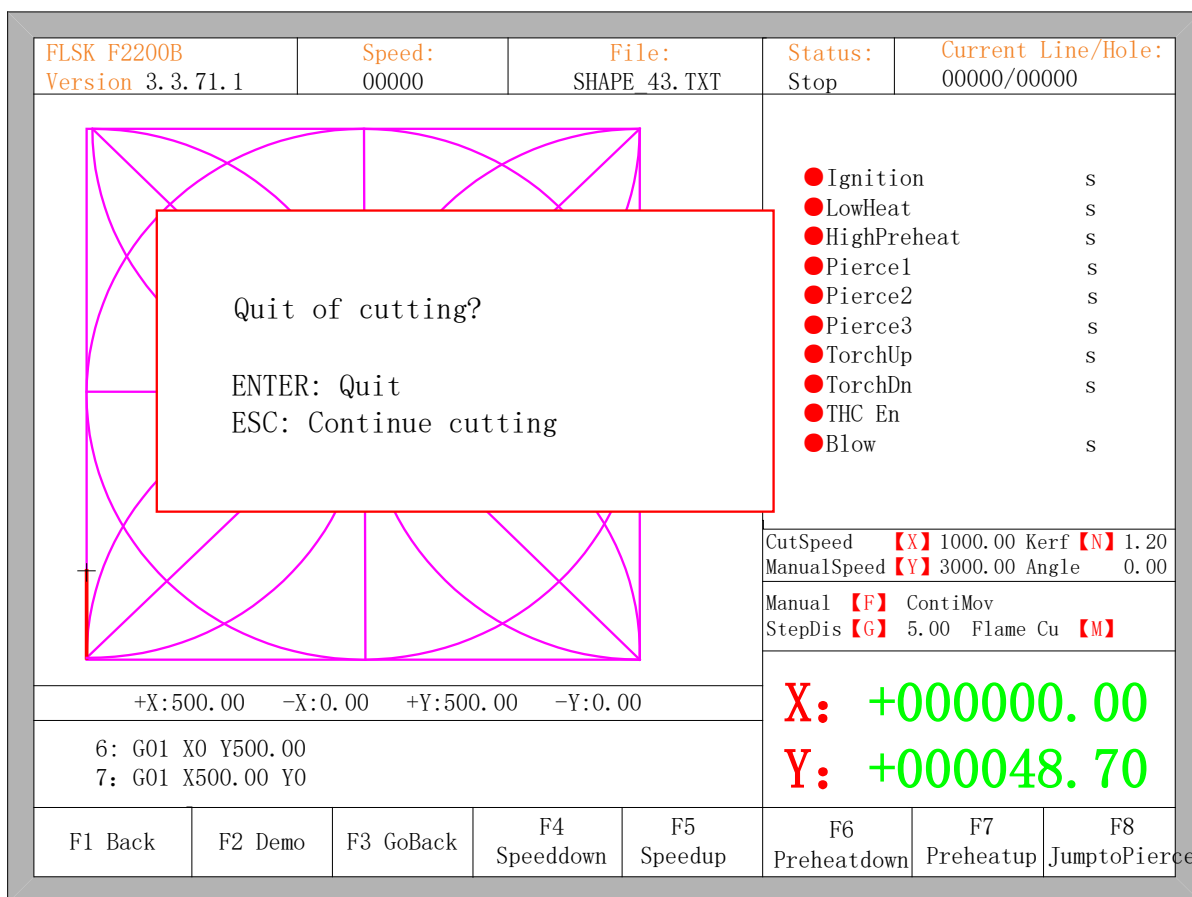


Fig. 3.9 Quit of cutting

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## 3.11 Frame

FLSK F2200B Version 3. 3. 71. 1		Speed: 00000	File: SHAPE 43. TXT	Status: Stop	Current Line/Hole: 00000/00000		
				<ul style="list-style-type: none"> <li>● Ignition s</li> <li>● LowHeat s</li> <li>● HighPreheat s</li> <li>● Pierce1 s</li> <li>● Pierce2 s</li> <li>● Pierce3 s</li> <li>● TorchUp s</li> <li>● TorchDn s</li> <li>● THC En s</li> <li>● Blow s</li> </ul>			
				CutSpeed <b>[X]</b> 1000.00 Kerf <b>[N]</b> 1.20 ManualSpeed <b>[Y]</b> 3000.00 Angle 0.00 Manual <b>[F]</b> keepMov StepDis <b>[G]</b> 5.00 Flame Cu <b>[M]</b>			
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00				<b>X: +000000.0</b> <b>Y: +000000.0</b>			
1: (TEST PATTERN) 2: G92							
F1 Back	F2 Demo	F3 Frame	F4 Speeddown	F5 Speedup	F6 PreheatDown	F7 PreheatUp	F8 JumptoPierce

Fig. 3.10 Walk along frame

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

## Chapter 4 Part Option

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

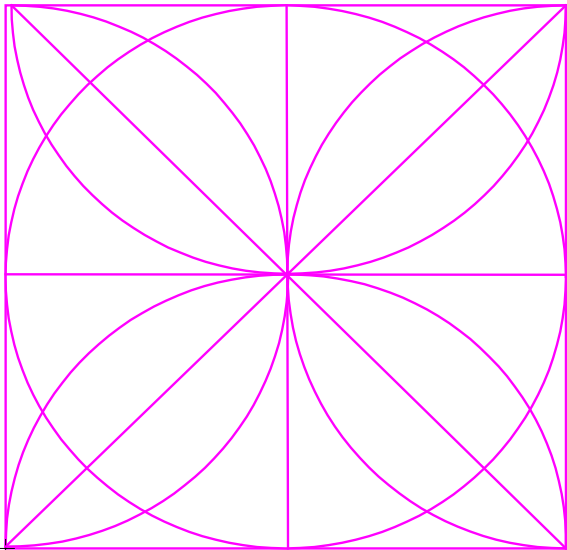
FLSK F2200B Version 3. 3. 71. 1		Speed: 00000	File: SHAPE 43. TXT	Status: Stop	Current Line/Hole: 00000/00000		
				<input checked="" type="checkbox"/> Xmirror <input checked="" type="checkbox"/> Ymirror			
				CutSpeed <input checked="" type="checkbox"/> 1000.00 Kerf <input checked="" type="checkbox"/> 1.20 ManualSpeed <input checked="" type="checkbox"/> 3000.00 Angle 0.00 Manual <input checked="" type="checkbox"/> keepMov StepDis <input checked="" type="checkbox"/> 5.00 Flame Cu <input checked="" type="checkbox"/>			
+X:500.00   -X:0.00   +Y:500.00   -Y:0.00				X: +000000.0 Y: +000000.0			
Operate Mode: PartOption							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SelLinePierce	F6 EditFile	F7 Revert	F8 OK

Fig 4.1 Part options

### 4.1 XY Mirror

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

Xmirror  
 Ymirror

# Service Support Spirit

- \* 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】** , part's start point will automatically jump to lower right corner. As the following figures show:

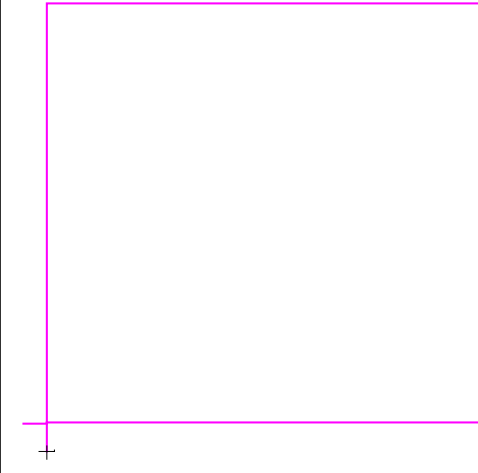
FLSK F2200B Version 3. 3. 71. 1	Speed: 00000	File: SHAPE_43.TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<p><b>【X】</b> Xmirror <b>【Y】</b> Ymirror</p> <hr/> <p>CutSpeed <b>【X】</b> 1000.00 Kerf <b>【N】</b> 1.20                  ManualSpeed <b>【Y】</b> 3000.00 Angle 0.00                  Manual <b>【F】</b> keepMov                  StepDis <b>【G】</b> 5.00 Flame Cu <b>【M】</b></p> <p style="font-size: large; color: green;"><b>X: +000000.0</b> <b>Y: +000000.0</b></p>				
Operate Mode: PartOption							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SellLinePierce	F6 EditFile	F7 Revert	F8 OK

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

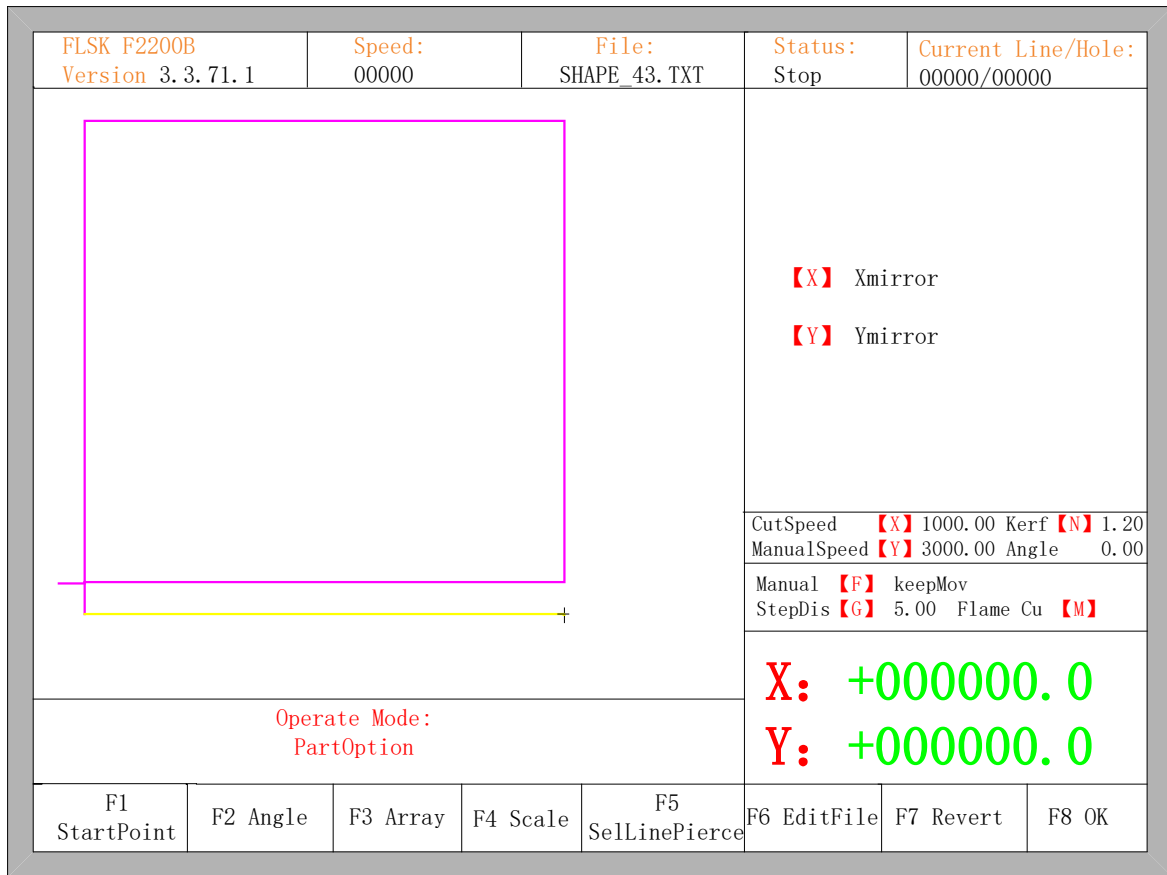


Fig 4.3 After press F4, start point is at lower right corner

## 4.3 Angle Adjustment

Press F2, the system will prompt:

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

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



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## 4.3.1 Steel Plate Adjustment

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

```

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

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

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

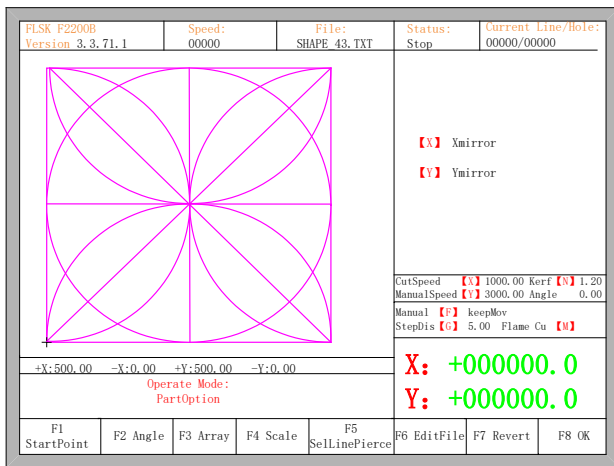


Fig 4.4 Before adjusting

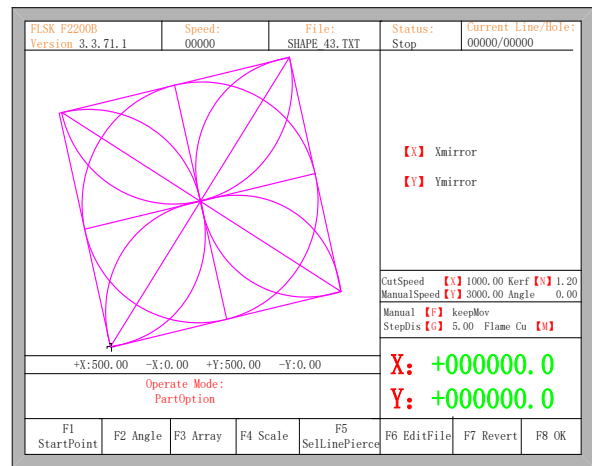


Fig 4.5 After adjusting

After adjusting, the system will ask whether to return to the start point, if press **[ENTER]**, the system will back to the start point of the operation, if press **[ESC]**, the system will do nothing but go back to the graphic interface.

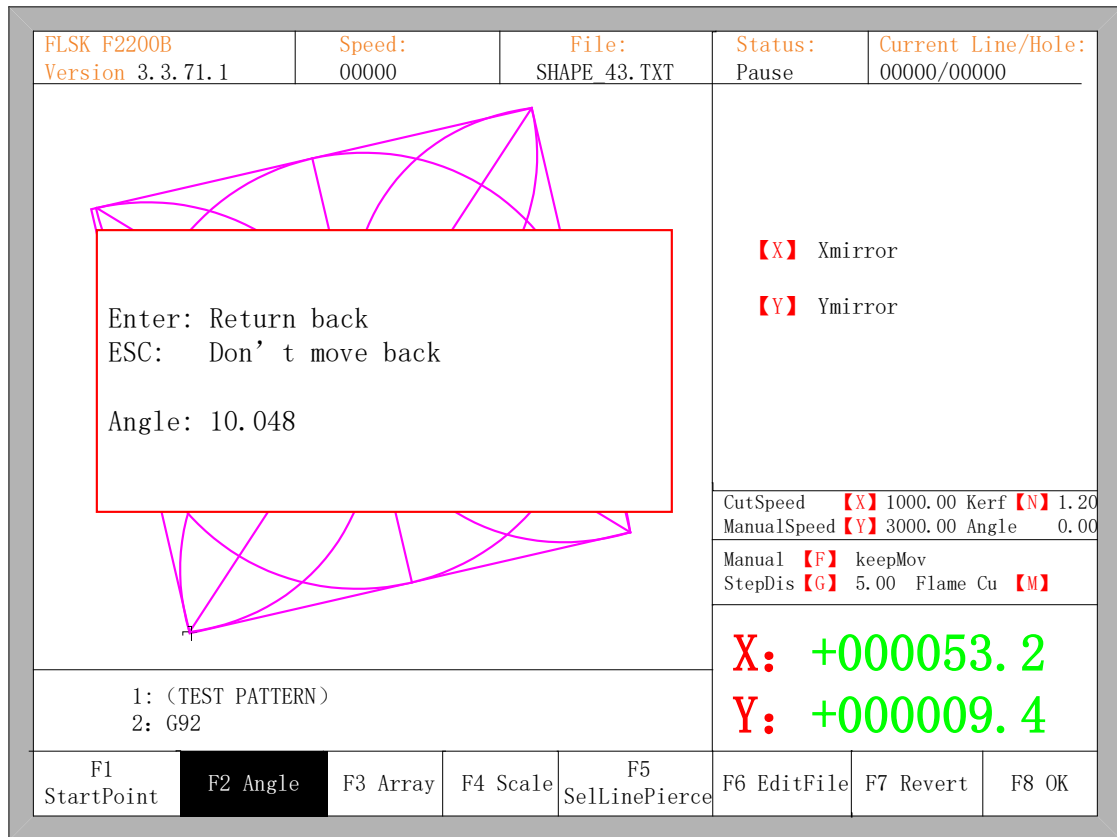


Fig 4.6 Return to the start point after adjusting

### 4.3.2 Steel Plate Adjust Angle Memory Function

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

### 4.3.3 Enter Angle

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

```

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

Enter angle

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

Illustration: when enter angle 0, process graph will restore to the location of 0°, at this time, the system will clear the angle of steel plate adjusting or manual entering. In the general condition, the angle entered is not as the angle of steel plate adjusting. If the angle entered here needs to be as the angle of steel plate adjusting, please refer to section 8.7.6.8.

## 4.4 Array

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

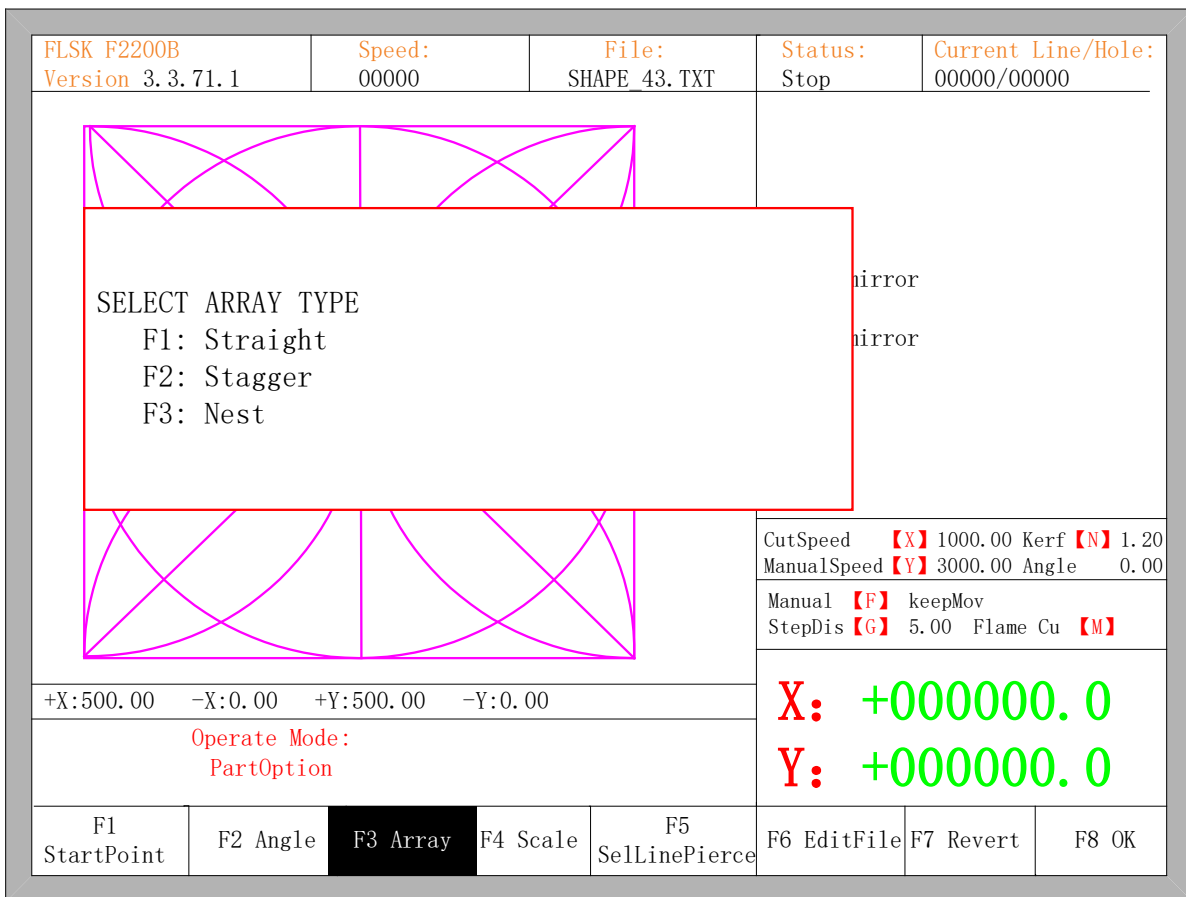


Fig 4.7 Chooses arrange method

Press [F1] to carry on arranging in matrix:

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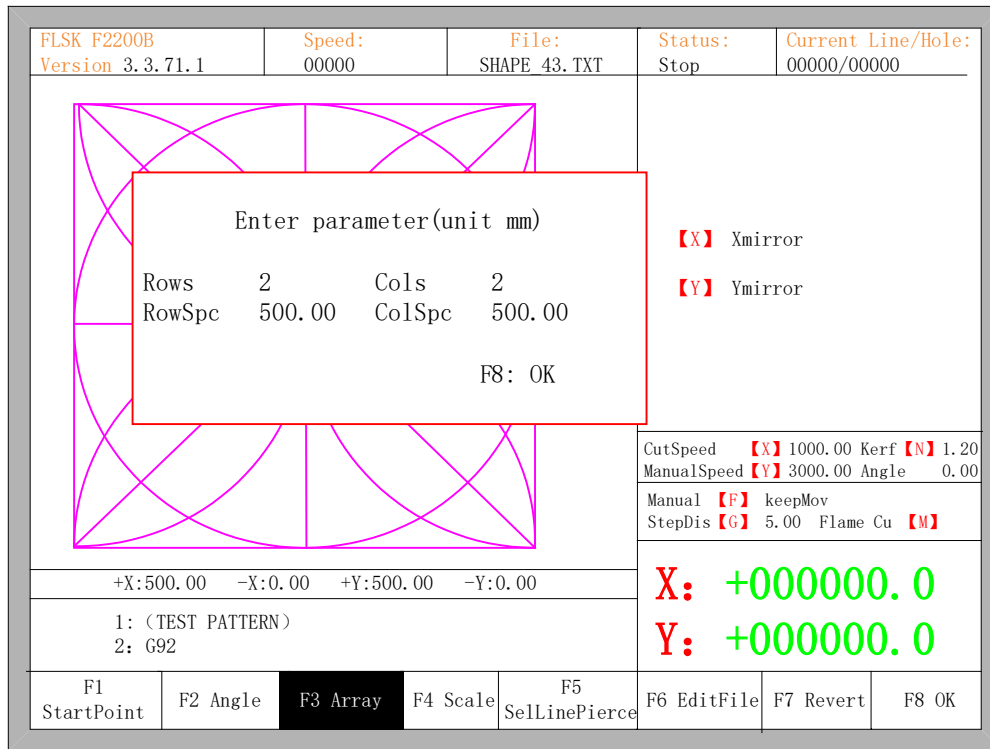


Fig 4.8 Arrange in matrix

The result is shown in fig 4.9

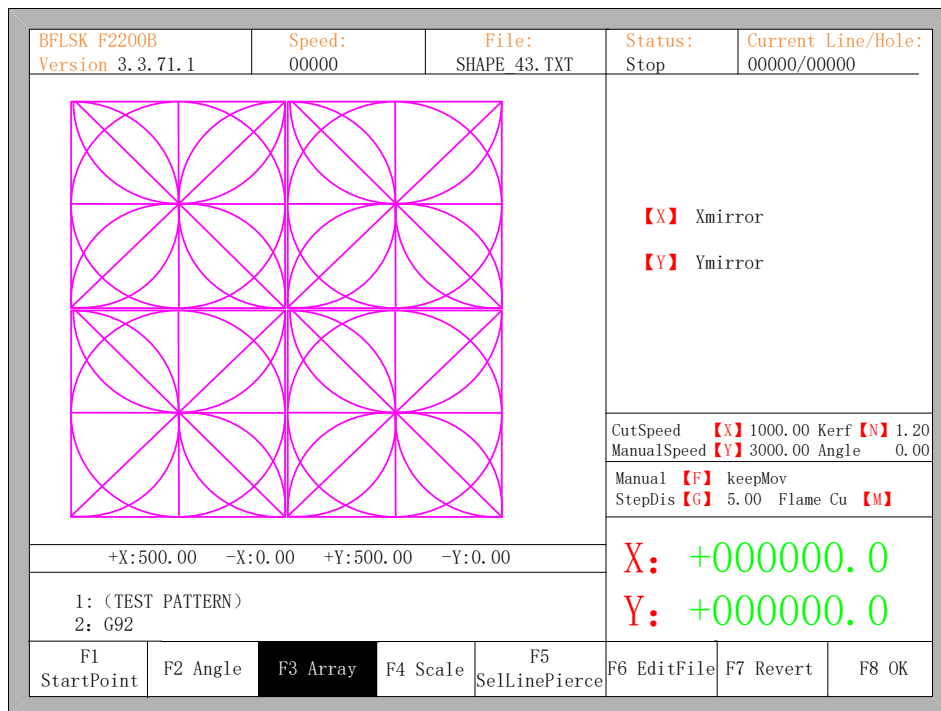


Fig 4.9 Result of arranging in matrix

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Press [F2] to enter staggered arrangement:

FLSK F2200B Version 3.3.71.1	Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<input checked="" type="checkbox"/> Xmirror <input checked="" type="checkbox"/> Ymirror				
			CutSpeed <input checked="" type="checkbox"/> 1000.00 Kerf <input checked="" type="checkbox"/> 1.20 ManualSpeed <input checked="" type="checkbox"/> 3000.00 Angle 0.00 Manual <input checked="" type="checkbox"/> keepMov StepDis <input checked="" type="checkbox"/> 5.00 Flame Cu <input checked="" type="checkbox"/>				
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00			X: +000000.0 Y: +000000.0				
1: (TEST PATTERN) 2: G92							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SellLinePierce	F6 EditFile	F7 Revert	F8 OK

Fig 4.10 Staggered arrange

The result is shown in figure 4.11:

FLSK F2200B Version 3.3.71.1	Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000			
			<input checked="" type="checkbox"/> Xmirror <input checked="" type="checkbox"/> Ymirror				
			CutSpeed <input checked="" type="checkbox"/> 1000.00 Kerf <input checked="" type="checkbox"/> 1.20 ManualSpeed <input checked="" type="checkbox"/> 3000.00 Angle 0.00 Manual <input checked="" type="checkbox"/> keepMov StepDis <input checked="" type="checkbox"/> 5.00 Flame Cu <input checked="" type="checkbox"/>				
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00			X: +000000.0 Y: +000000.0				
1: (TEST PATTERN) 2: G92							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SellLinePierce	F6 EditFile	F7 Revert	F8 OK

Fig 4.11 Result of staggered arrangement

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Press [F3] to enter arrangement in stack:

FLSK F2200B Version 3.3.71.1		Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000		
<div style="border: 1px solid red; padding: 5px; margin: 10px auto; width: 80%;"> <p style="text-align: center;">Enter parameter(unit mm)</p> <p>rows     2            Cols     2</p> <p>RowSpc  500.00    ColSpc  500.00</p> <p>RowNest  500.00    ColNest  500.00</p> <p style="text-align: right;">F8: OK</p> </div>				<input checked="" type="checkbox"/> Xmirror <input checked="" type="checkbox"/> Ymirror			
				CutSpeed <input checked="" type="checkbox"/> 1000.00 Kerf <input checked="" type="checkbox"/> 1.20 ManualSpeed <input checked="" type="checkbox"/> 3000.00 Angle 0.00 Manual <input checked="" type="checkbox"/> keepMov StepDis <input checked="" type="checkbox"/> 5.00 Flame Cu <input checked="" type="checkbox"/>			
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00				X: +000000.0 Y: +000000.0			
1: (TEST PATTERN) 2: G92							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SelLinePierce	F6 EditFile	F7 Revert	F8 OK

Fig 4.12 Arrange in Nest

The result is shown in figure 4.13:

FLSK F2200B Version 3.3.71.1		Speed: 00000	File: SHAPE 43.TXT	Status: Stop	Current Line/Hole: 00000/00000		
				<input checked="" type="checkbox"/> Xmirror <input checked="" type="checkbox"/> Ymirror			
				CutSpeed <input checked="" type="checkbox"/> 1000.00 Kerf <input checked="" type="checkbox"/> 1.20 ManualSpeed <input checked="" type="checkbox"/> 3000.00 Angle 0.00 Manual <input checked="" type="checkbox"/> keepMov StepDis <input checked="" type="checkbox"/> 5.00 Flame Cu <input checked="" type="checkbox"/>			
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00				X: +000000.0 Y: +000000.0			
1: (TEST PATTERN) 2: G92							
F1 StartPoint	F2 Angle	F3 Array	F4 Scale	F5 SelLinePierce	F6 EditFile	F7 Revert	F8 OK

Fig 4.13 Result of arrangement in nest

# Service Support Spirit

## 4.5 Zoom in/out

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

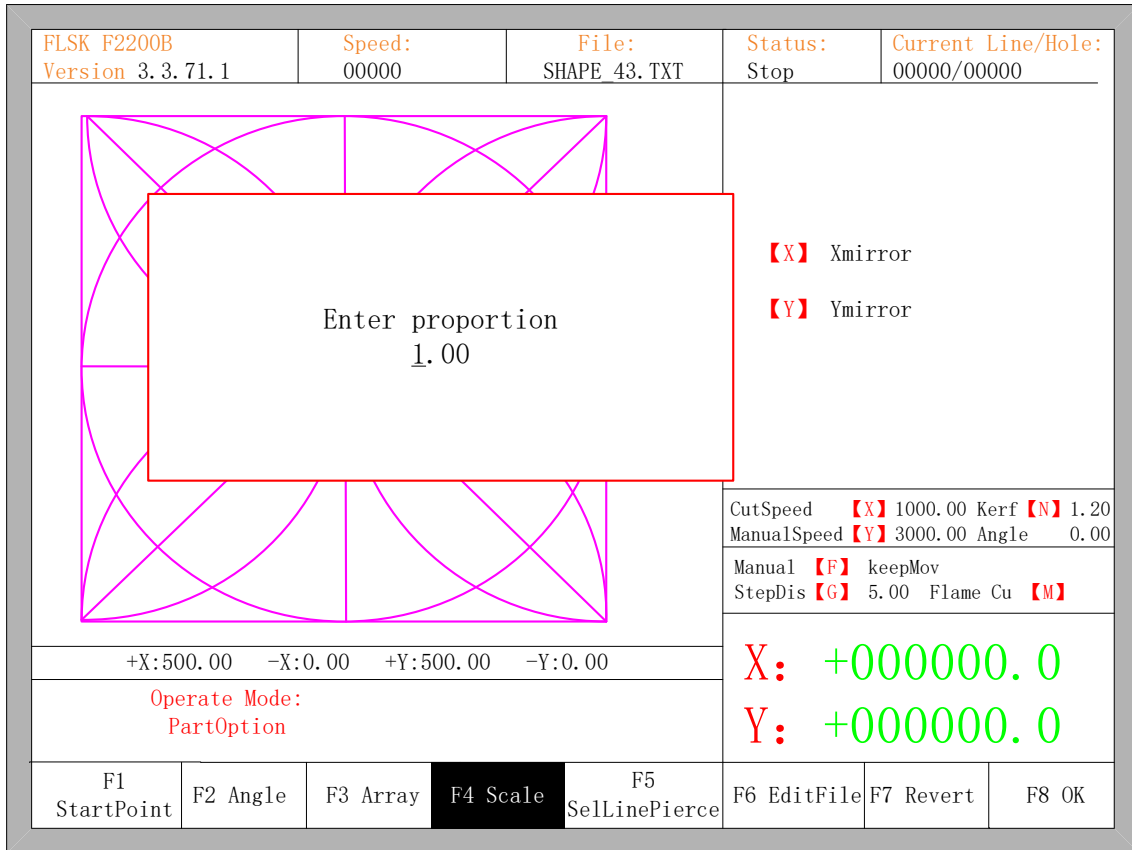


Fig 4.14 Set scale

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

## 4.6 Select Row/Number

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

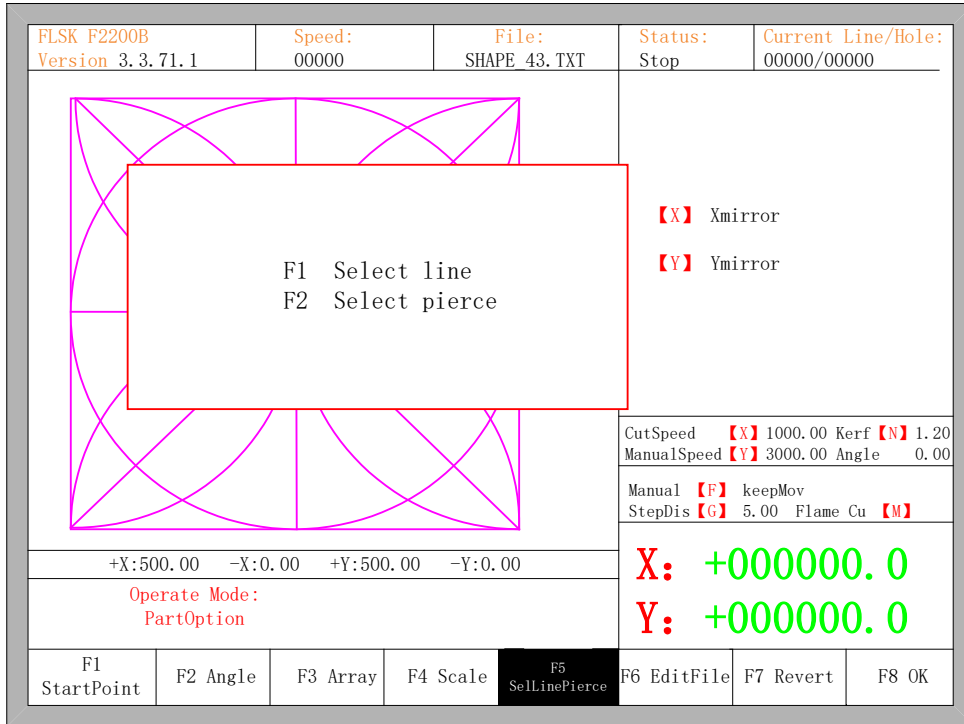


Fig 4.15 Select Line/Pierce

## 4.6.1 Select Row

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

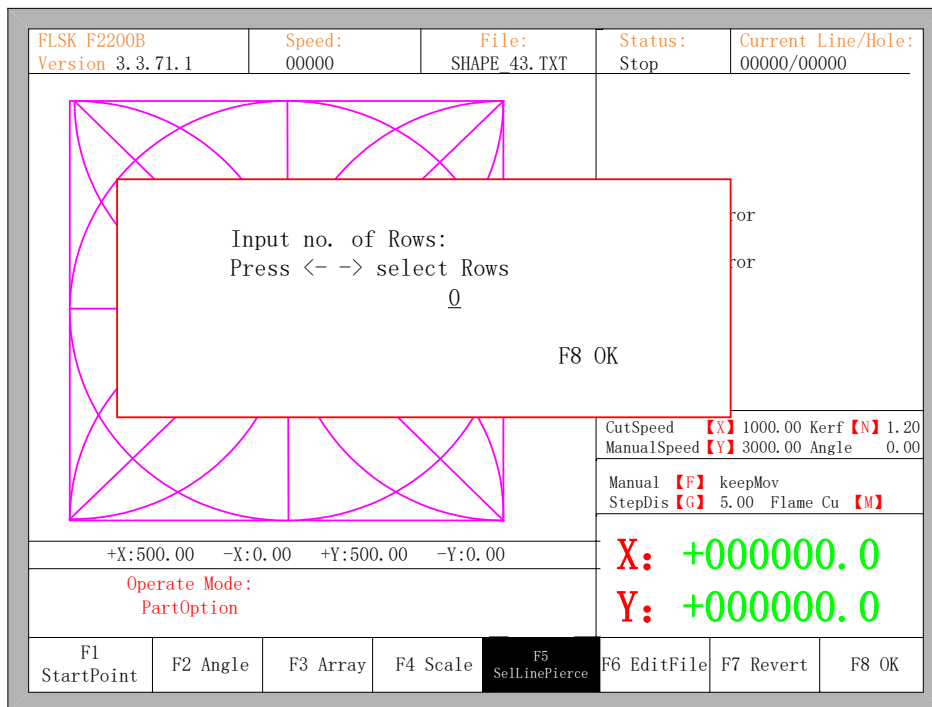


Fig 4.16 Prompt to select row



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

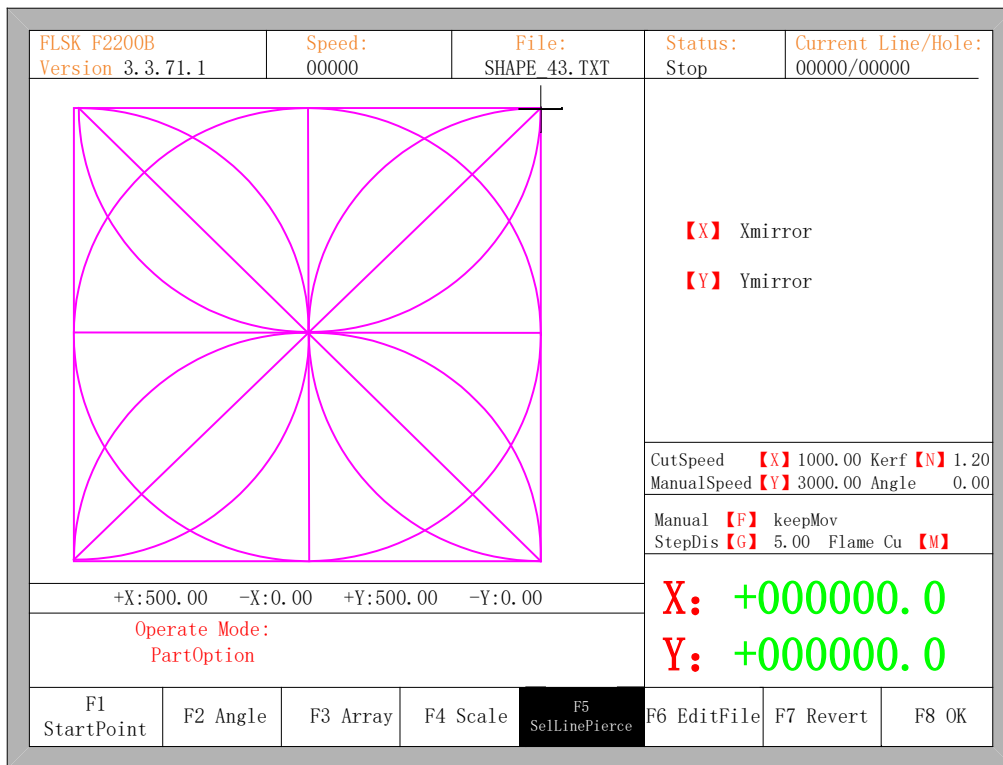


Fig 4.17 Select row

After selecting row, press F8 to confirm.

## 4.6.2 Select Number

The operation is similar to the choosing row operation.

## 4.6.3 Operation after Select Row/Number

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

1. Move from current position to the new position and then cutting

Press F1 in the cutting interface, the system will directly run to the position of the selected row or number without cutting, then pause and wait for the next operation.

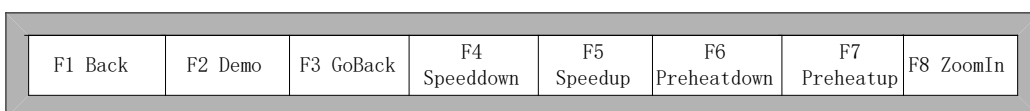


Fig 4.18 Function key of cutting interface

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Press START in the cutting interface, the system will prompt:

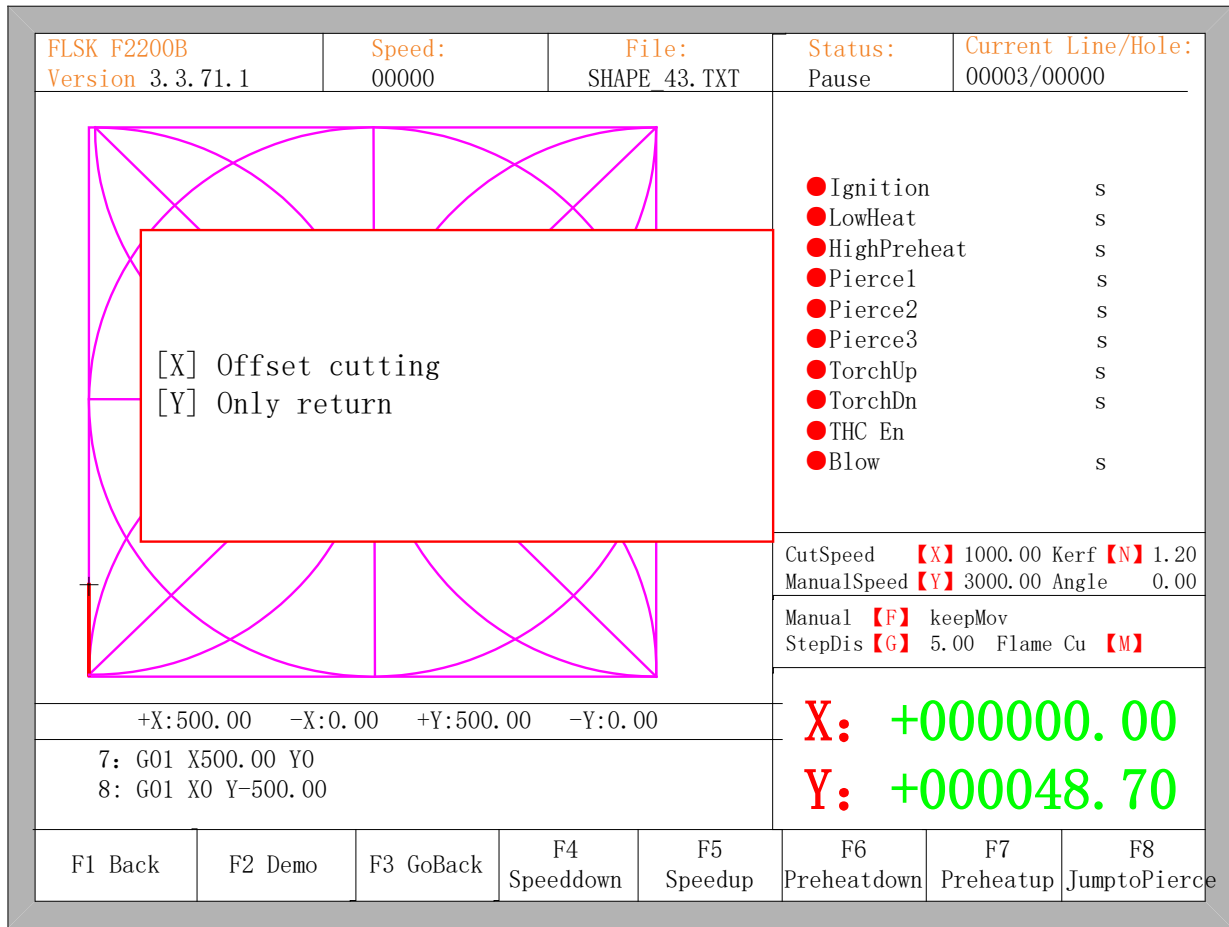


Fig 4.19 Operation after selecting row/number

## 2. Cutting from the current position

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

## 4.7 Restore

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

## Chapter 5 Manual Function

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

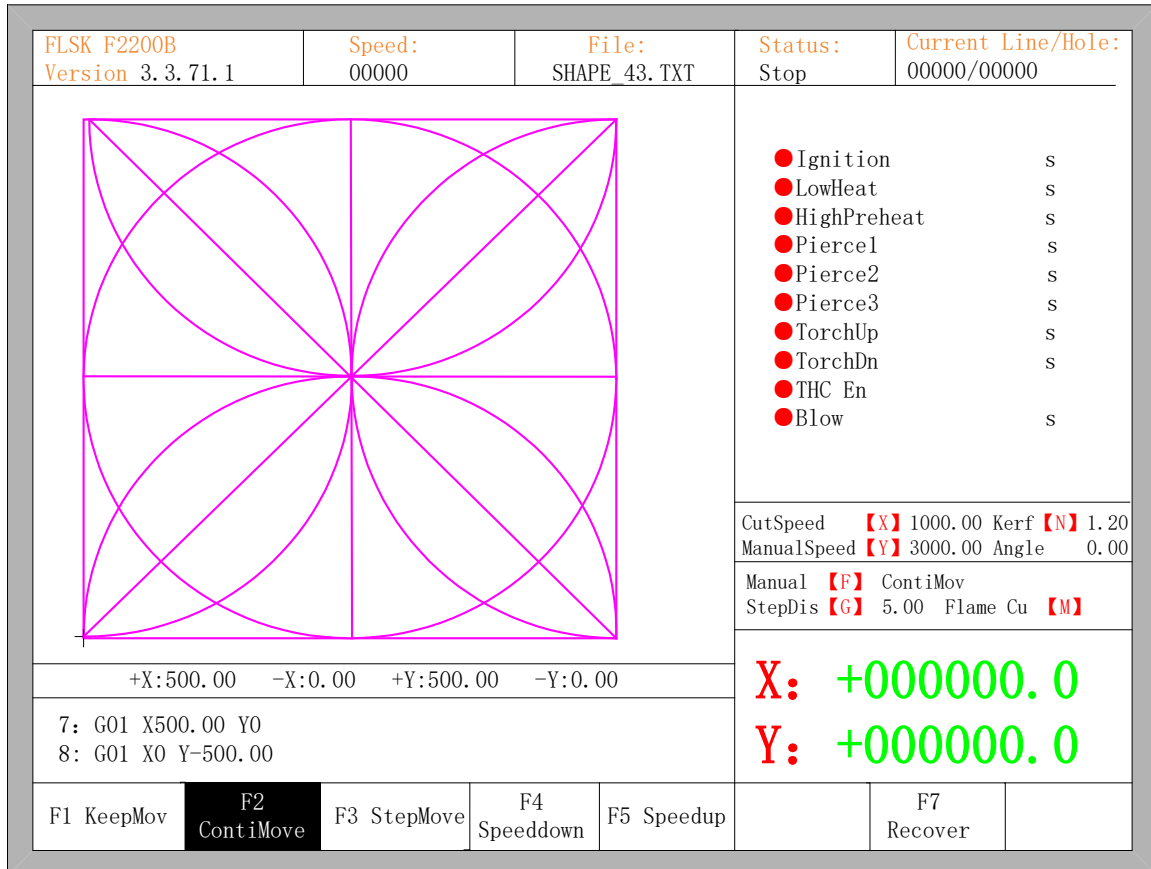


Fig 5.1 Manual function interface

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

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## 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:

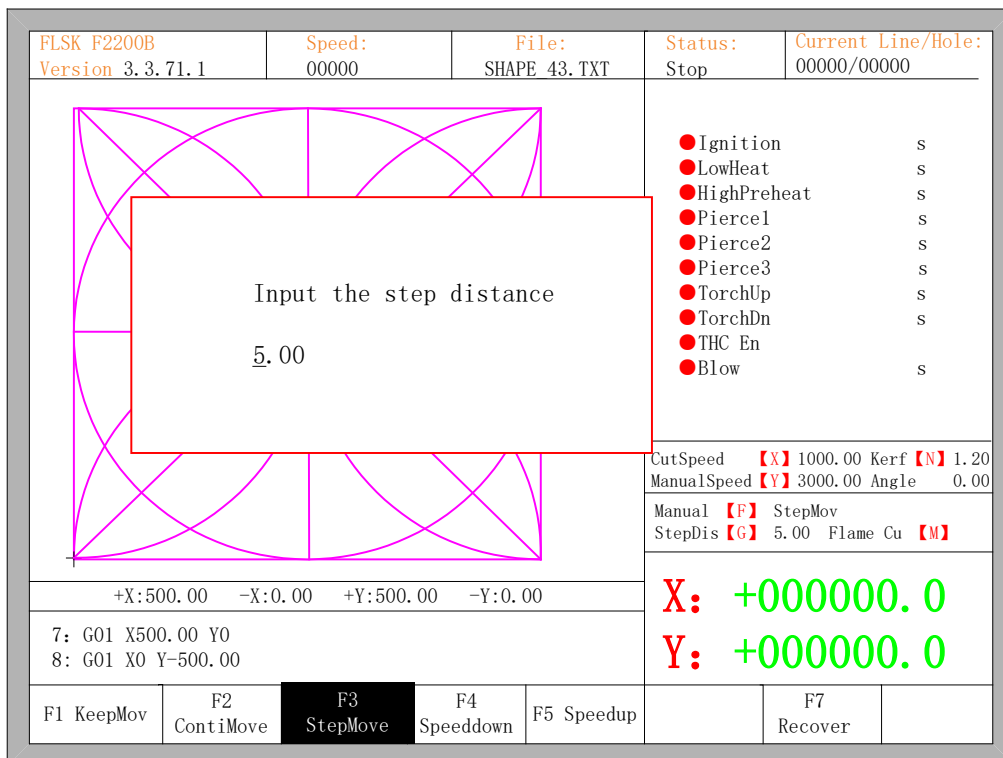


Fig 5.2 Input the fixed length

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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:

FLSK F2200B Version 3.3.71.1		Speed: 00000	File: SHAPE 43.TXT	Status: Pause	Current Line/Hole: 00000/00000		
				<ul style="list-style-type: none"> <li>● Ignition s</li> <li>● LowHeat s</li> <li>● HighPreheat s</li> <li>● Pierce1 s</li> <li>● Pierce2 s</li> <li>● Pierce3 s</li> <li>● TorchUp s</li> <li>● TorchDn s</li> <li>● THC En s</li> <li>● Blow s</li> </ul>			
				CutSpeed <b>[X]</b> 1000.00 Kerf <b>[N]</b> 1.20 ManualSpeed <b>[Y]</b> 3000.00 Angle 0.00 Manual <b>[F]</b> StepMov StepDis <b>[G]</b> 5.00 Flame Cu <b>[M]</b>			
+X:500.00 -X:0.00 +Y:500.00 -Y:0.00 7: G01 X500.00 Y0 8: G01 X0 Y-500.00				<b>X: +000000.0</b> <b>Y: +000000.0</b>			
F1 Back	F2 Demo	F3 GoBack	F4 Speeddown	F5 Speedup	F6 Preheatdown	F7 Preheatup	F8 JumptoPierce

Fig 5.3 Restore breakpoint

Press G, the system will start incising from point which is after moving, and after returning to the position before the torch moves, it will process according to the normal curve.

Press X, regarding the position after moving as the position before moving, and then process.

Press Y, move from the position after moving to the position before moving, then wait for the next operation.

## Chapter 6 File Operation

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

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

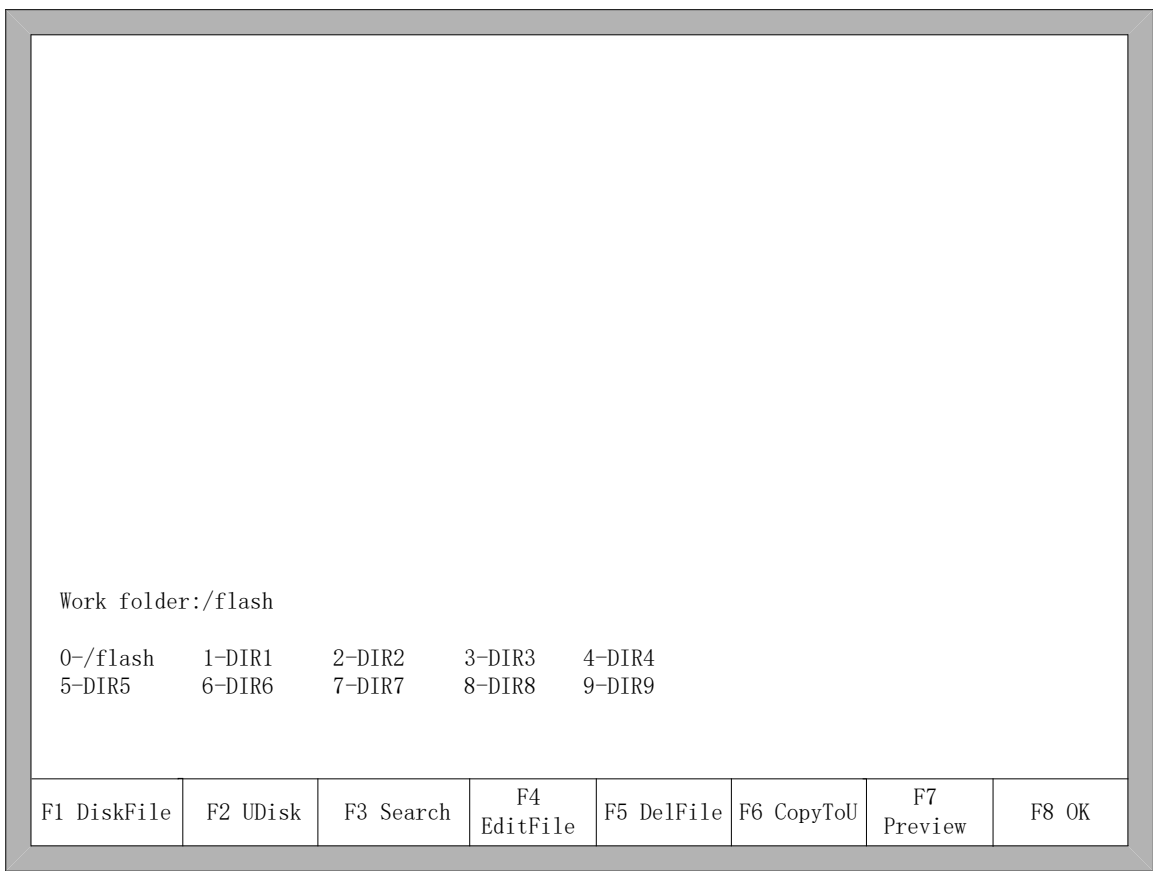


Fig 6.1 code interface

### 6.1 Files in the Hard Disk

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

✳ Press F4, if the current position of the cursor is txt file or cnc file, you could edit them.

Please refer to chapter 6.5 on how to edit files.

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- \* Press F5, if the current position of the cursor is txt file or cnc file, you could delete them.
- \* Press F6, if the current position of the cursor is txt file or cnc file, you could copy the current file to the flash disk when it is connected to the USB interface.
- \* Press F7, if the current position of the cursor is txt file or cnc file, you could preview the current graphic.

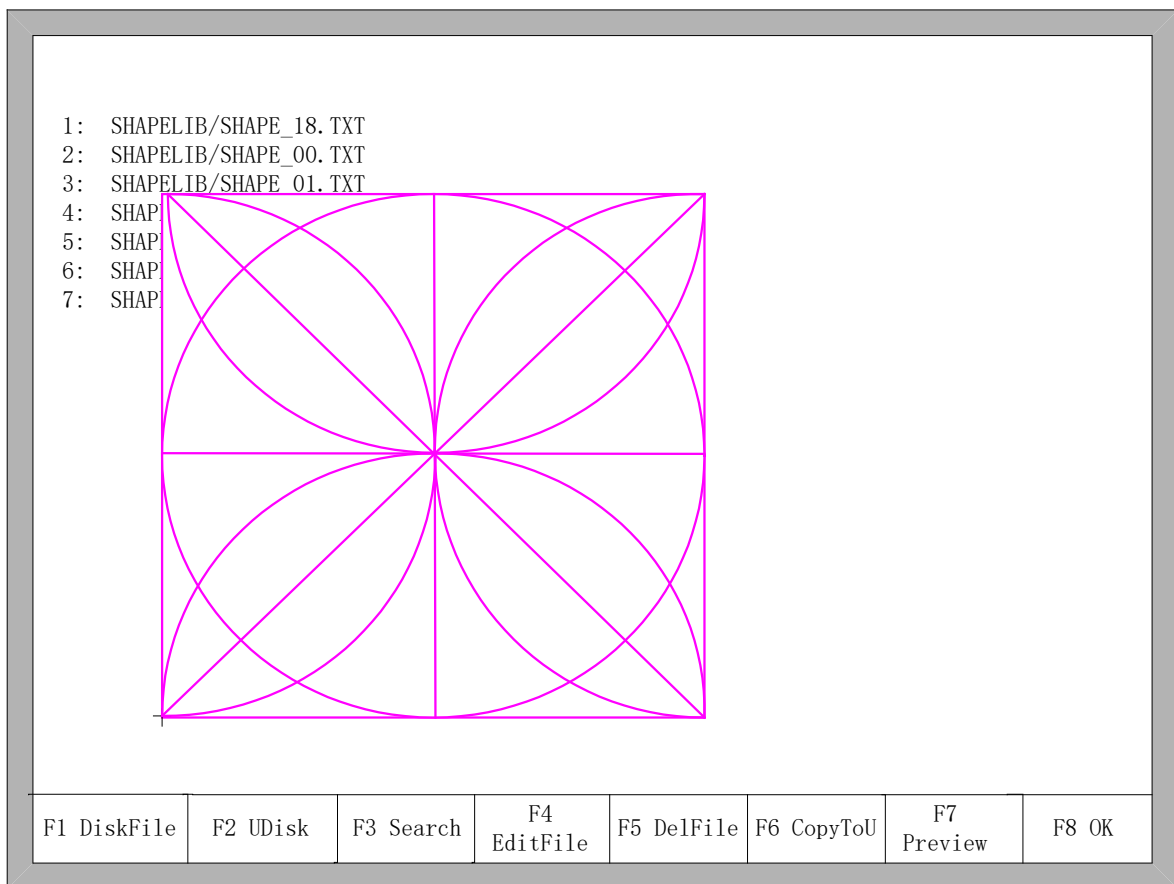


Fig 6.2 Graphic preview

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



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### 6.2 Files in the U Disk

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

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

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

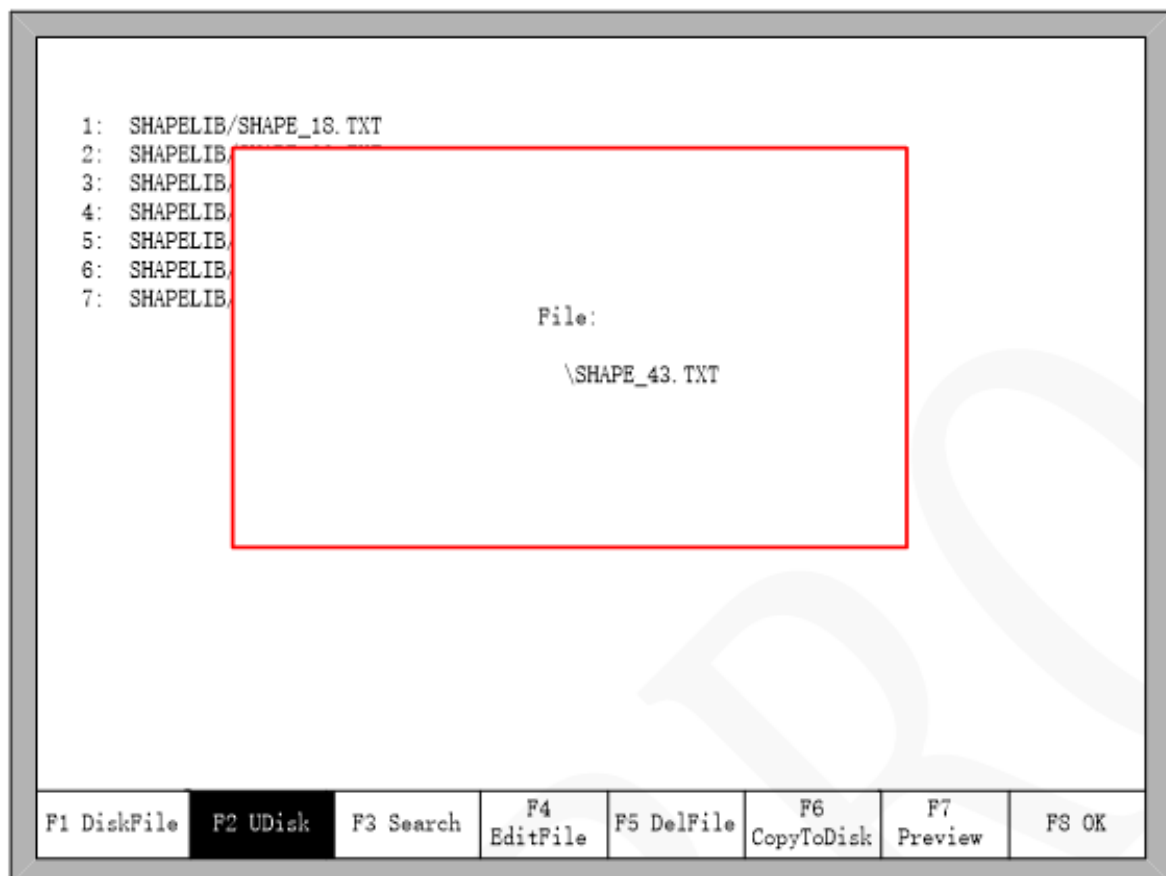


Fig 6.3 save U disk files

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

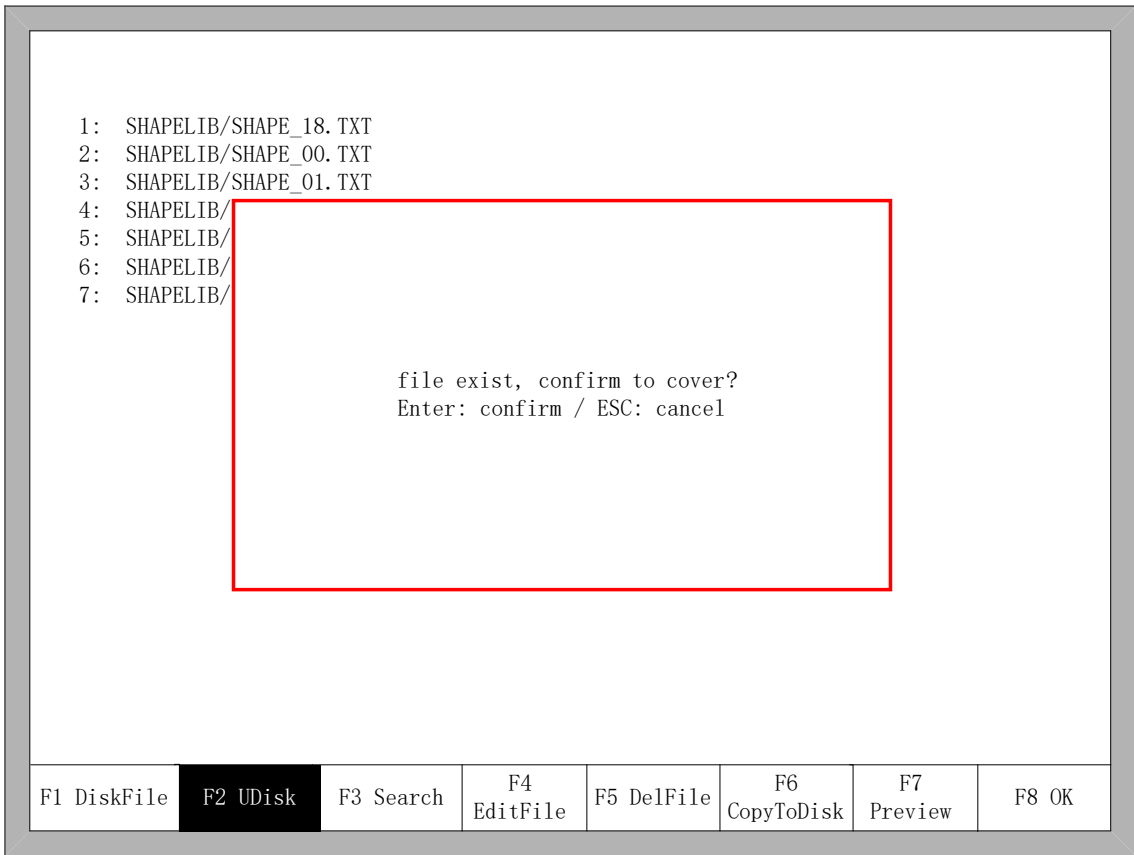


Fig 6.4 Replacement documents

If you want to replace the internal documents, press **【Enter】** key, if you want to change the file name, press **【Esc】**, change the file name and then save.

### 6.3 Search File

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

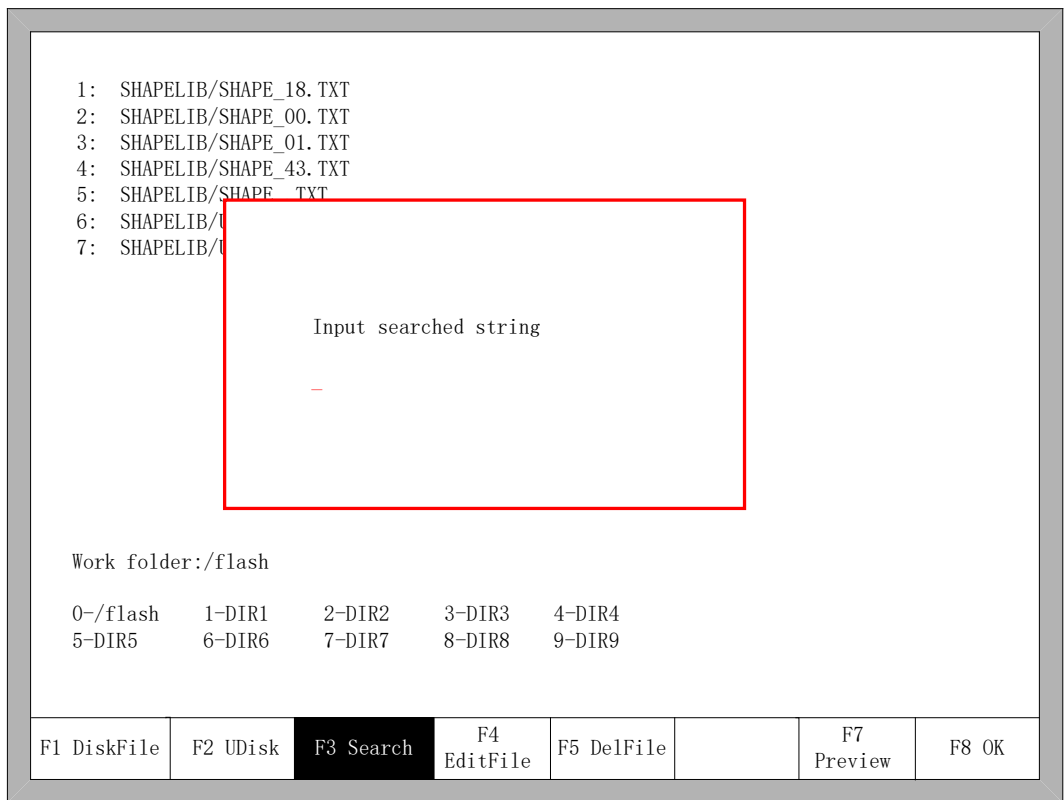


Fig 6.5 search file

## 6.4 Edit Code

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

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

When editing the code, press **【F2】** can insert a new line after the current line, and press **【F3】** to delete the current line. Press **【F + Home】** key, the cursor automatically moved to the first character of the current editing line, press the **【F-End】**, the cursor automatically moved to last character of the current line.

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Each edit line supports 128 characters maximum.

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

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

## 6.5 New File

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

## 6.6 Compile Code

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

## 6.7 Folder Manager

### 6.7.1 Select Work Folder

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

Work folder : current work folder's name.

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

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

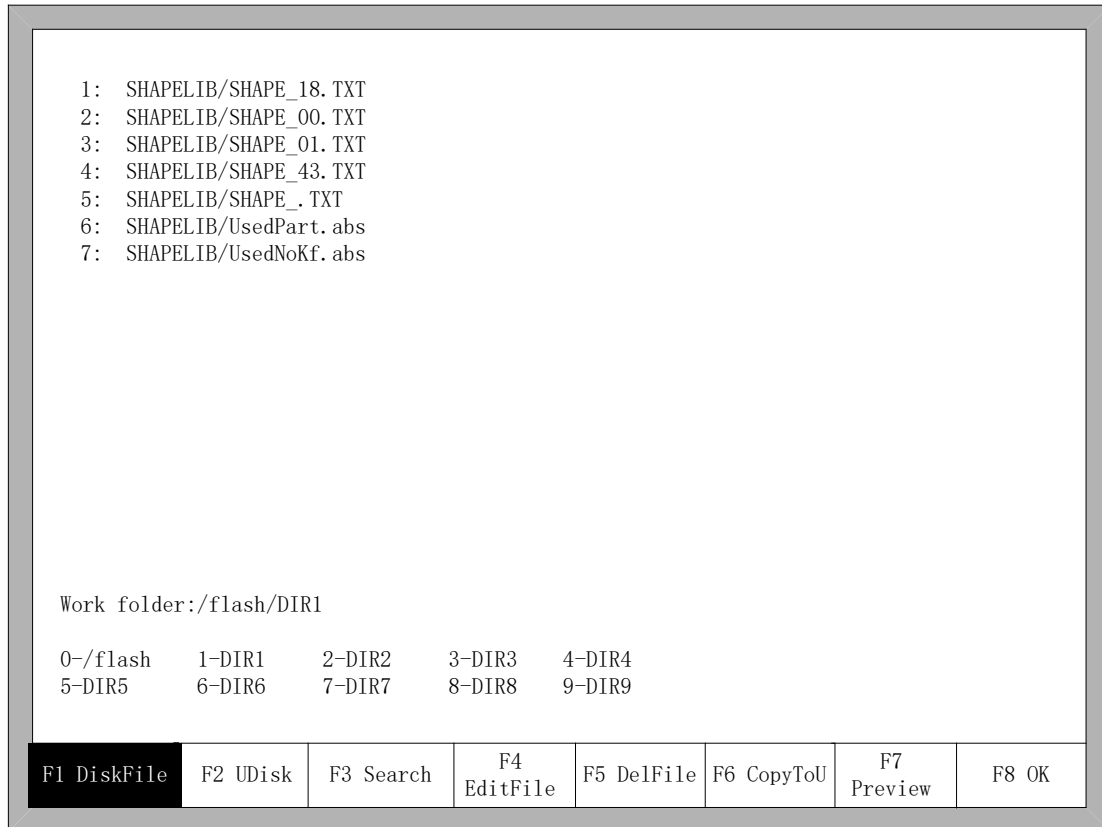


Fig 6.6 Folder 1

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

## 6.7.2 New Folder

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

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

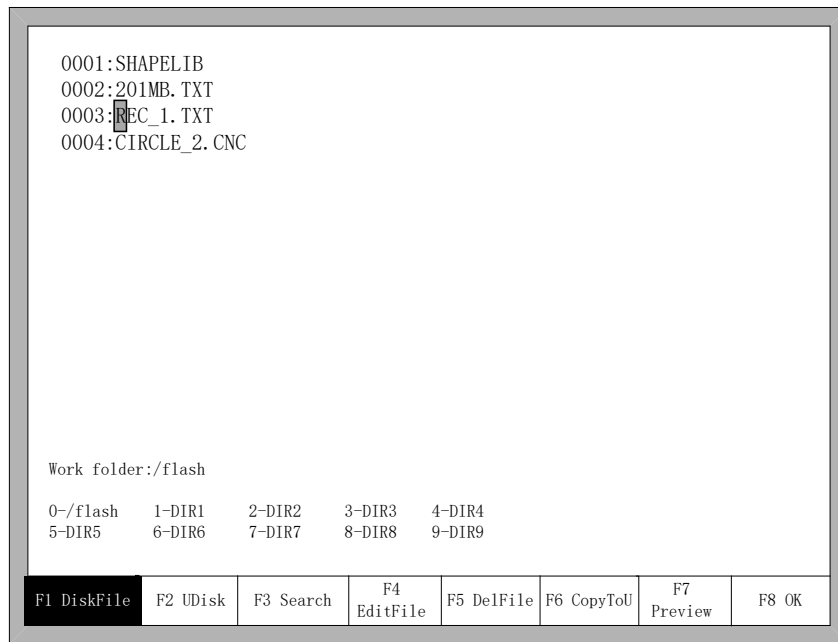


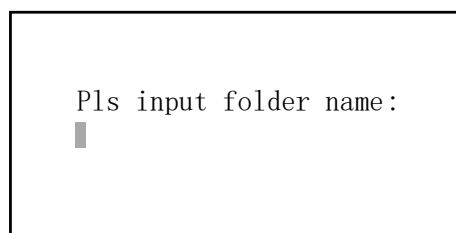
Fig 6.7 cursor moves to G code file name

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



Fig 6.8 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 8.7.8.

## Chapter 7 Parameter Setting

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

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

<b>F1 Common</b>	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
------------------	----------	-----------	-----------	-----------	-----------	-----------	---------

Fig7.1 Parameter Interface

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

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

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### 7.1 Common Parameters

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

**Cutting Speed:** the maximum cutting speed, unit is mm/m.

**Manual Move Speed:** the moving speed of cutting torch in manual, unit is mm/m.

**G00 Move Speed:** the cutting torch speed when G00 is executed or the cutting torch go back to the reference or some other occasion, unit is mm/m.

**Kerf:** According to the cutting gap width, users set Kerf Gap compensation(the value should be half of the cutting gap ) to ensure the dimensional precision, the system will generate a new path automatically to make compensation to work piece. Before cutting a work piece, you can modify kerf gap value, once begin to cut, you are not permitted to modify the value.

**Corner speed:** Plate thickness affect the cutting tip's ac/dc rate when it moving. The angle between the end of a cut-point line's tangential direction and the direction of the tangent line of the beginning of next cutting point, and the thickness of plate determines cutting tip speed at the transition.

- ◆ If the normal cutting speed is  $V$ , angle is  $\alpha$ , 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 %mm/pm. The max thickness of plate is 100, if more than 100mm also are considered to be 100.

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



## 7.2 Flame Parameters

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

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

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

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

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number unit is s.

- ↪ **Pierce 3 time:** Perforation time with high pressure fuel gas. Enter any positive number ,unit is s.
- ↪ **Exhaust Time:** The delay of turned off oxygen gas to open the exhaust. Enter any positive number ,unit is s.
- ↪ **Torch Up Time:** When oxygen gas is turned off, the time for the torch to lift up. Enter any positive number ,unit is s.
- ↪ **Torch Down Time:** When oxygen gas is turned off , the time for the torch to put down. Enter any positive number ,unit is s.
- ↪ **Pierce Up Time:** Time for the torch to lift up during perforating. The difference between **Torch Up Time** and **Pierce Up Time** is that: **Torch Up Time** means the time that the torch needs to lift up when it needs to move to another place after the current cutting is over; while the.
- ↪ **Pierce Up Time:** means the time that the torch needs to lift up after preheating in the fixed cycle of perforation.
- ↪ **Pierce Down Time:** Time for the torch to put down in the perforation. The difference between **Torch Down Time** and **Pierce Down Time** is that: **Torch Down Time** means the time that the torch needs to put down before preheating; while the **Pierce Down Time** means the time that the torch needs to put down after finishing **Torch Up Time** and opening cutting oxygen in the fixed cycle of perforation.
- ↪ **THC Adjustment:** According to the user device configuration, choose whether or not to use high adjustment box.

### 7.3 Plasma Parameters

As shown in the fig 7.3, these are Plasma Parameters, which are related with the precision of transmission shaft of the machine.

DelayBeforeArc	0.00	s
Pierce time	0.00	s
Torch up time	2.00	s
Arcing check time	15.00	s
Position check time	0.00	s
Position up time	0.00	s
Speed to lock THC	95.00	mmpm%
Distance to lock THC	5.00	mm
Lose arc delay	0.00	s
Watch arc enable	No	<->

F1 Common	F2 Flame	<b>F3 Plasma</b>	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save
-----------	----------	------------------	-----------	-----------	-----------	-----------	---------

Fig 7.3 plasma parameters

- ✦ **Arc time:** Before the arc starting, the system time to wait. At this point, all output I /O are turned off. Enter any positive number ,unit is s.
- ✦ **Pierce time:** Perforation time. Enter any positive number ,unit is s.
- ✦ **Torch Up Time:** When arc press is turned off, the time for the torch to lift up. Enter any positive number, unit is s.
- ✦ **Arcing Check Time:** Enter any positive number, unit is s. If not detected any feedback signal of success arc starting within the detection time, the system prompts an error message and terminates the current work of cutting, according memory breakpoints to withdraw from the program.
- ✦ **Position check Time:** Enter any positive number, unit is s. Delay time of the success of position check.

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- ✧ **Position up Time:** Enter any positive number, unit is s. Before positioning check, the time for the torch to lift up.
- ✧ **Close arc:** In setting the rate of X%, open the output port, close the arc press signal, to prevent the steel melting under low-speed cutting tip due to temperature is too high.
- ✧ **Distance to close arc:** in the minimum distance of the cutting line of the initial segment or end segment, close the arc voltage increases.
- ✧ **Lose arc delay:** detect the delay time of the feedback of the broken arc, if there's still no arc voltage input, the situation is considered to be broken arc. This parameter can effectively avoid the arc broken alert because of the sensitivity of the broken arc detection in the cutting methods with lead, this guarantees the continuousness of the cutting and avoid the interrupt of frequent alert .
- ✧ **Watch arc enable:** whether real-time detection of arc voltage signal in cutting process or not.
  - ◆ If setting "yes", in the cutting process, the system detects the real-time arc voltage feedback signal. If do not detect the signal, the system will stop the current workpiece cutting and transmit alarm signal.
  - ◆ If installing a "No", then in the cutting process does not detect arc voltage feedback signal.

### 7.4 Powder Parameters

As the figure 7.4 shows, it is powder parameters of system about the powder paint line.

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

F1 Common	F2 Flame	F3 Plasma	<b>F4 Powder</b>	F5 System	F6 Import	F7 Export	F8 Save
-----------	----------	-----------	------------------	-----------	-----------	-----------	---------

Fig 7.4 powder parameters

- ◆ **Marker Ignition Time:** input  $\geq 0$  arbitrary value, unit: s.
- ◆ **Marker Preheat Time:** input  $\geq 0$  arbitrary value, unit: s.
- ◆ **Mix powder Open/Close Time:** Delay time of scatter powder mouth relative to spurt powder mouth open/close, input  $\geq 0$  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 7.5, are related with the precision of driver shaft of the cutting machine, coordinate axis, increase/decrease of rate and little arc processing limited parameter.

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

F1 Common	F2 Flame	F3 Plasma	F4 Powder	<b>F5 System</b>	F6 Import	F7 Export	F8 Save
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Fig 7.5 System Parameters

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

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Small arc definition:

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

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

### 7.6 Parameter Import

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

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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 7.6, press Enter to confirm, and then you could import the backup parameters to the system.

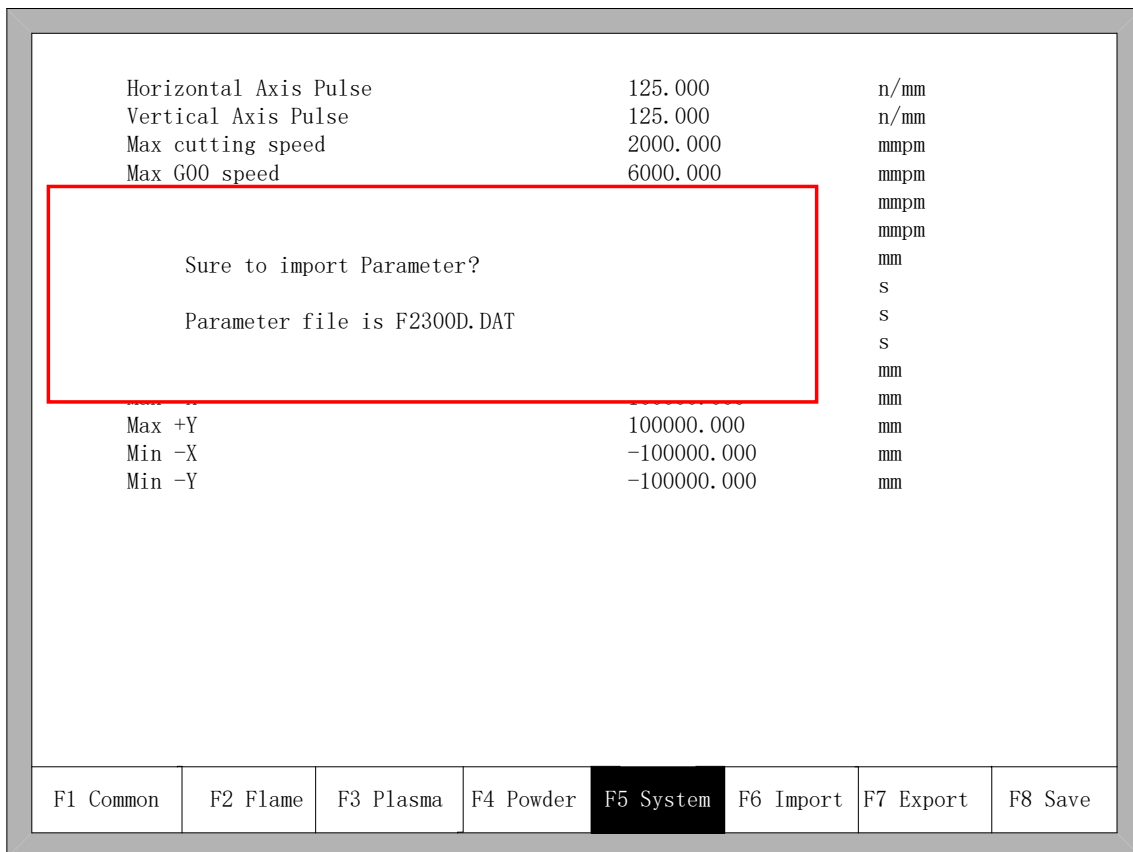


Fig 7.6 Parameter import

### 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 Fig 7.7, after pressing Enter, the parameters will automatically be saved in the root folder of flash disk, the file name is F2300.DAT

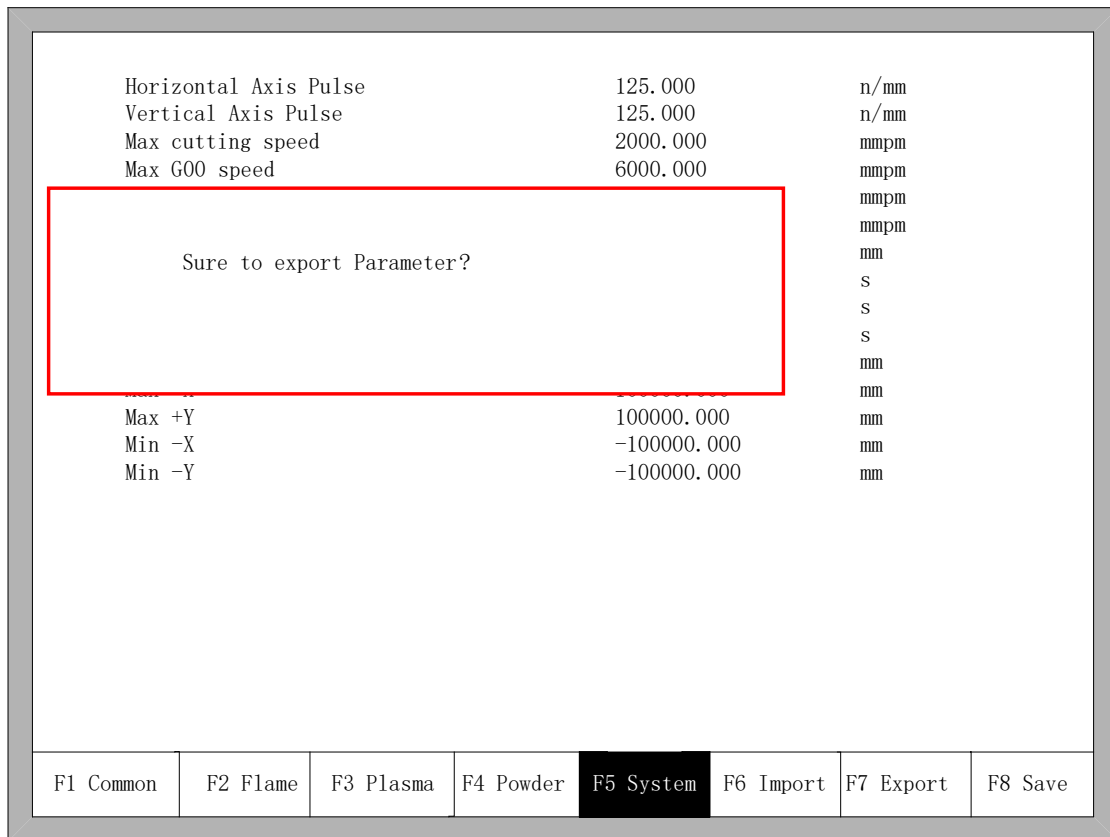


Fig 7.7 Parameter export

## 7.8 Save Parameters

After parameter modification, press **【F8】** to save, shown in Figure 7.8

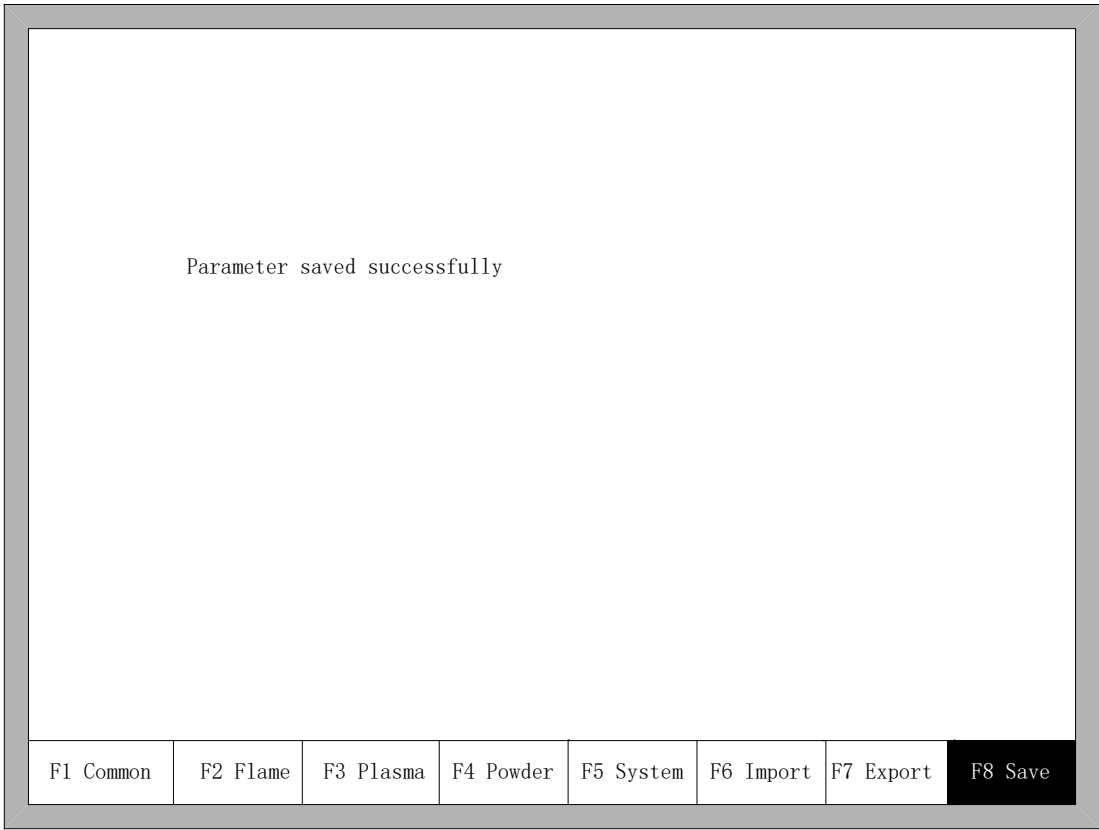


Fig 7.8 System Parameters

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

## Chapter 8 Diagnosis Function

Diagnostic interface



Fig 8.1 Diagnostic interface

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

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## 8.1 Diagnosis Interface Index

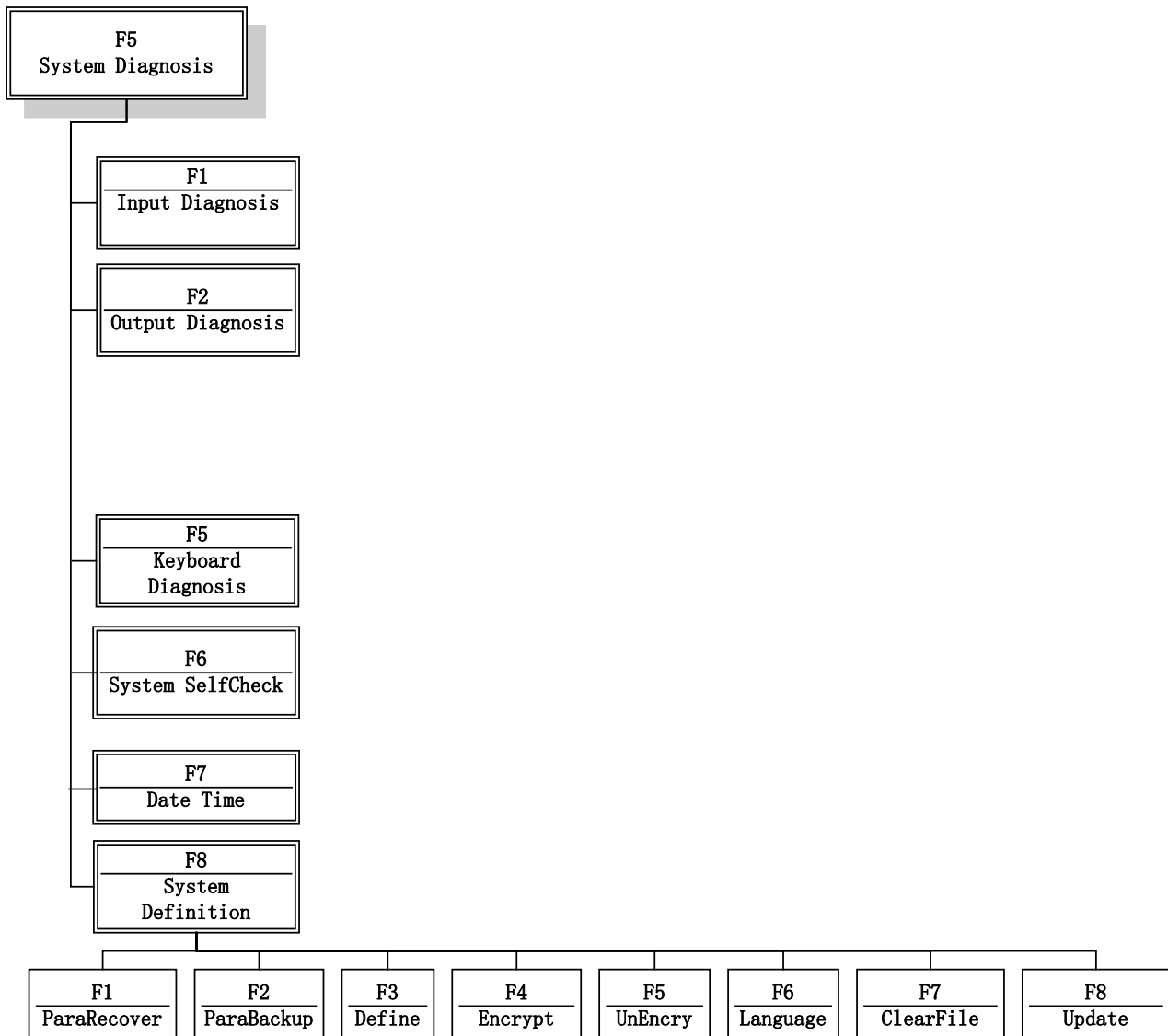


Fig 8.2 Diagnosis interface index

## 8.2 Input Diagnosis

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

## 8.3 Output Diagnosis

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

Output	
Ignition	●
Low preheat	●
High preheat	●
Low Oxygen	●
Medium Oxygen	●
High Oxygen	●
Torch up	●
Torch down	●
Blow	●
THC enable	●
Position detect	●
Arc starting	●
HoldTorch	●
Marker Output	●
Mix powder	●
Dust preheat	●

F1 Input	<b>F2 Output</b>	F3 OpenOut	F4 CloseOut	F5KeyBrd	F6SelfCheck	F7DateTime	F8SystemDef
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Fig 8.3 Output diagnosis

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

## 8.4 Keyboard Diagnosis

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

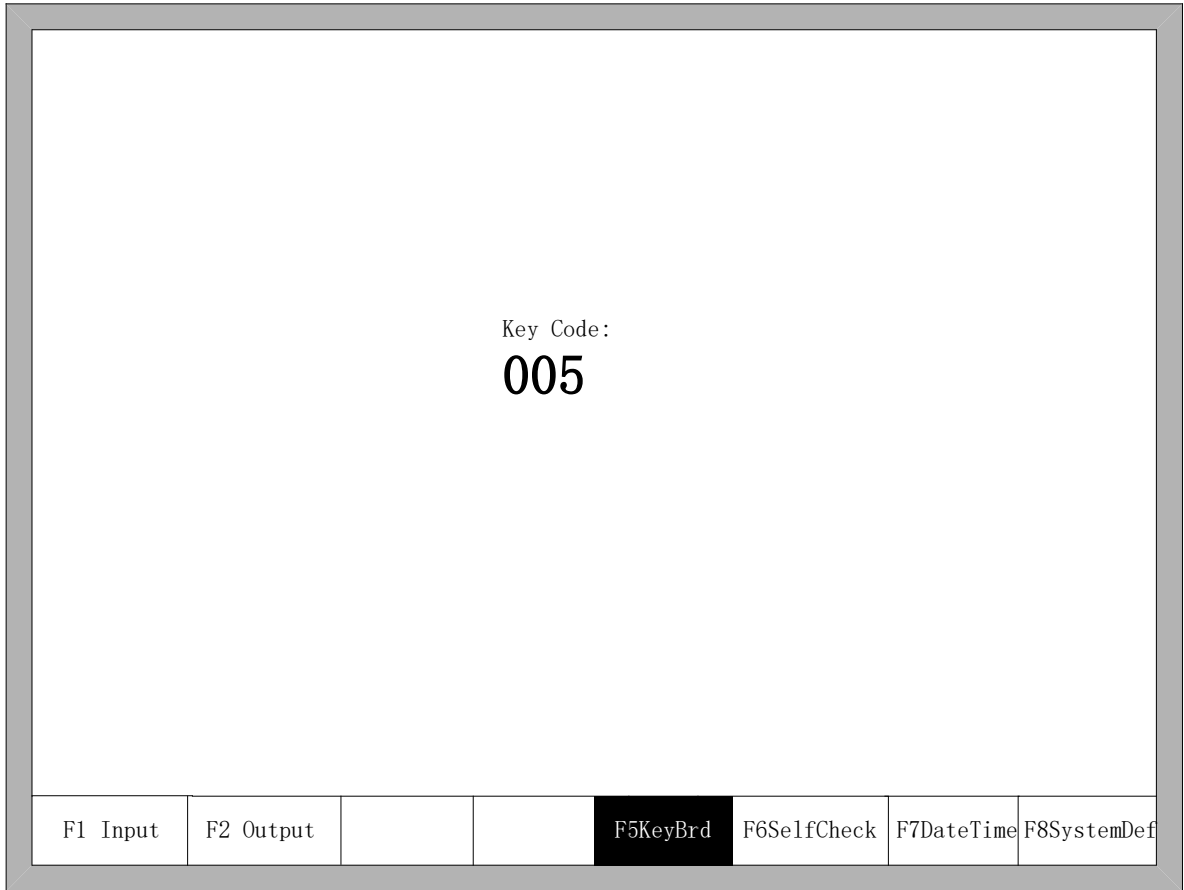


Fig 8.4 Keyboard Diagnosis

### 8.5 System Self-check

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



Fig 8.5 System self-check

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

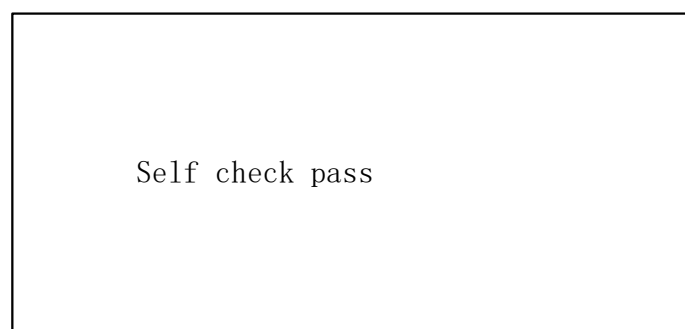


Fig 8.6 Self-check pass

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

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

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

## 8.6 Date and Time

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



Fig 8.7 System time

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



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## 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 is modified or some of them is broken, reset the parameters.

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

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

Warning: After resetting successfully, please restart the system.

## 8.7.2 Input Definition

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

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

Port- press PgUp/PgDn    Type-press Enter

F1 Input	F2 Output	F3 Axes	F4 Motor	F5 Option			F8 Save
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Fig 8.8 input definition

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

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

## 8.7.3 Output Definition

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

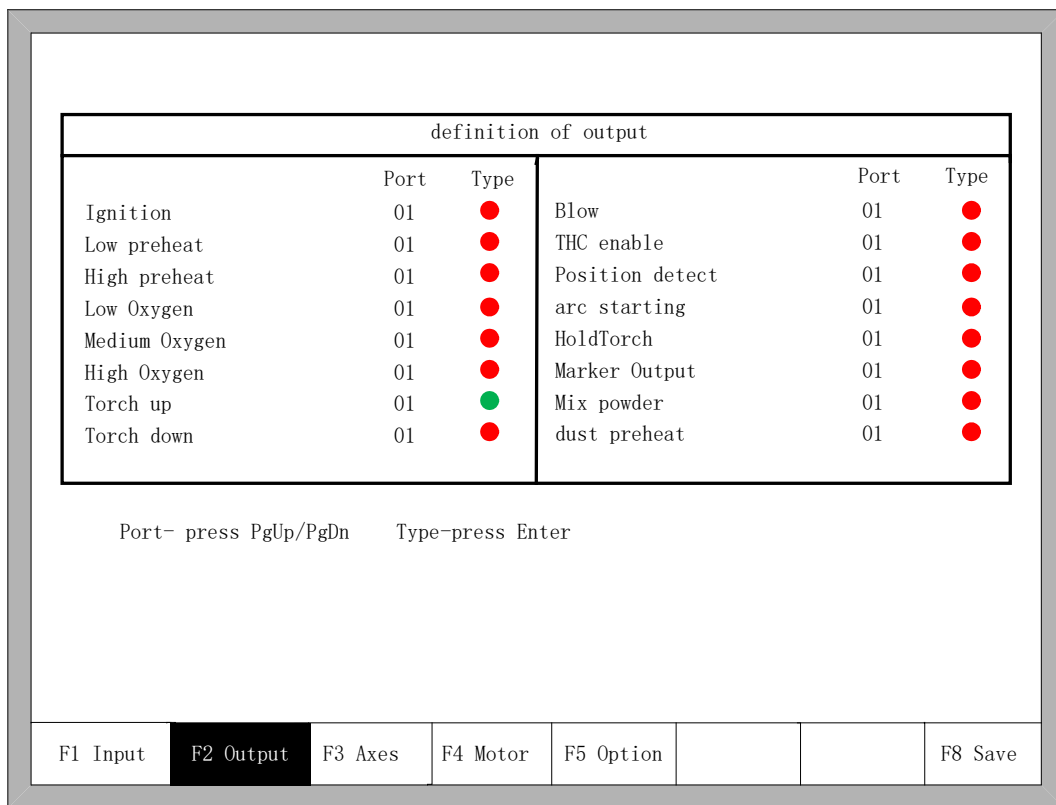


Fig 8.9 output definition

In the interface press **【 ↑ 】, 【 ↓ 】, 【 ← 】, 【 → 】,**  move the cursor to the position that needs changing, press **【 PageUp 】,or【 PageDown 】,** 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.

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

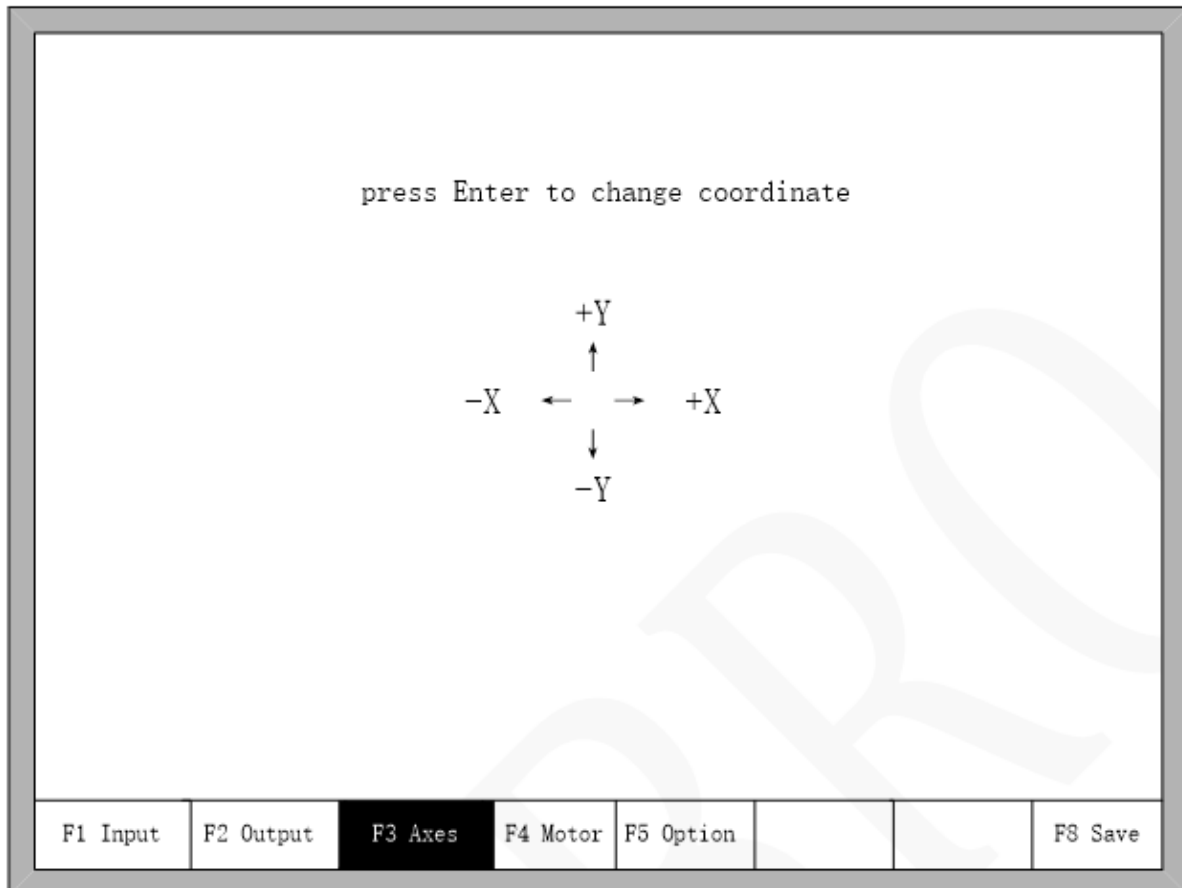


Fig 8.10 Coordinate Definition

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.

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### 8.7.6 Option

#### 8.7.6.1 Remote Controller



Fig 8.12 Option

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

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

#### 8.7.6.2 Default Coordinate

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

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### 8.7.6.3 Default IJ Coordinate

As the figure 8.12 shows, in the G code of G02 or G03, I or J parameter after the code is relative coordinate or absolute coordinate. Under the general circumstance, the arc's IJ coordinate is relative coordinate, only minority several G code of arc's IJ coordinate is absolute coordinate.

### 8.7.6.4 Switch between Metric and Inches

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

### 8.7.6.5 Short Line Fitting

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

### 8.7.6.6 Steel Plate Angle Memory

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

### 8.7.6.7 F Instruction Forbidden

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

### 8.7.6.8 Manual Angle Input to Adjust Steel Plate

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

### 8.7.7 Language Switch

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

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### 8.7.8 Clear File

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

### 8.7.9 System Update

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

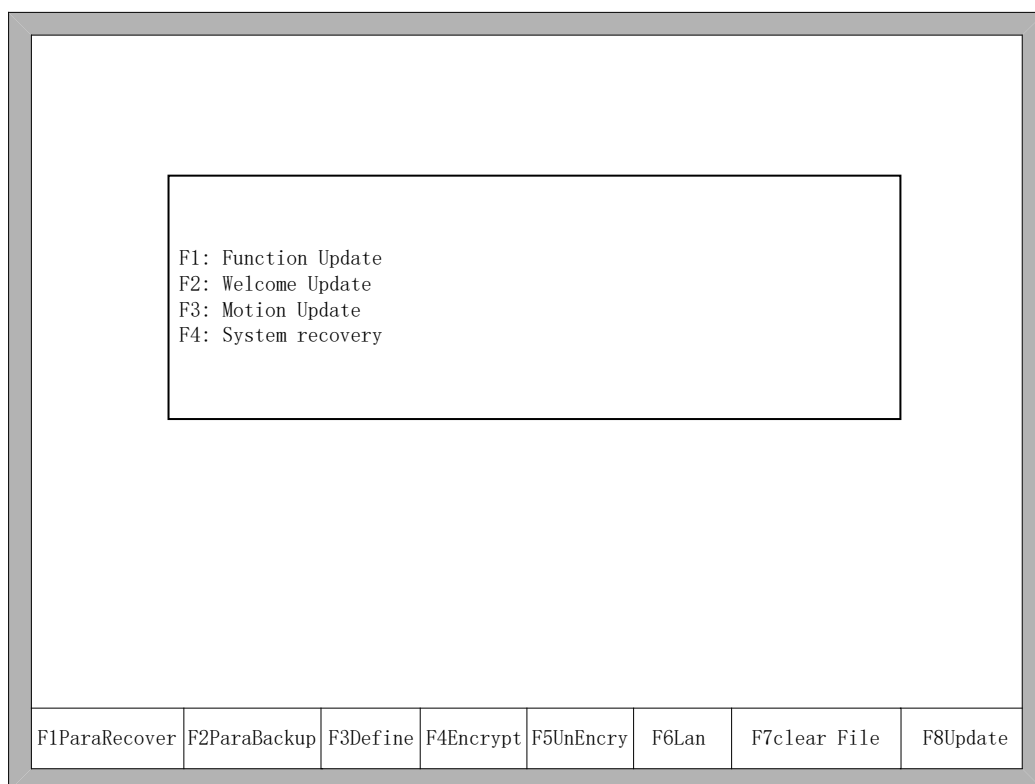


Fig 8.13 The prompt of system update

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

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

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

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



## Chapter 9 Graph Management

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

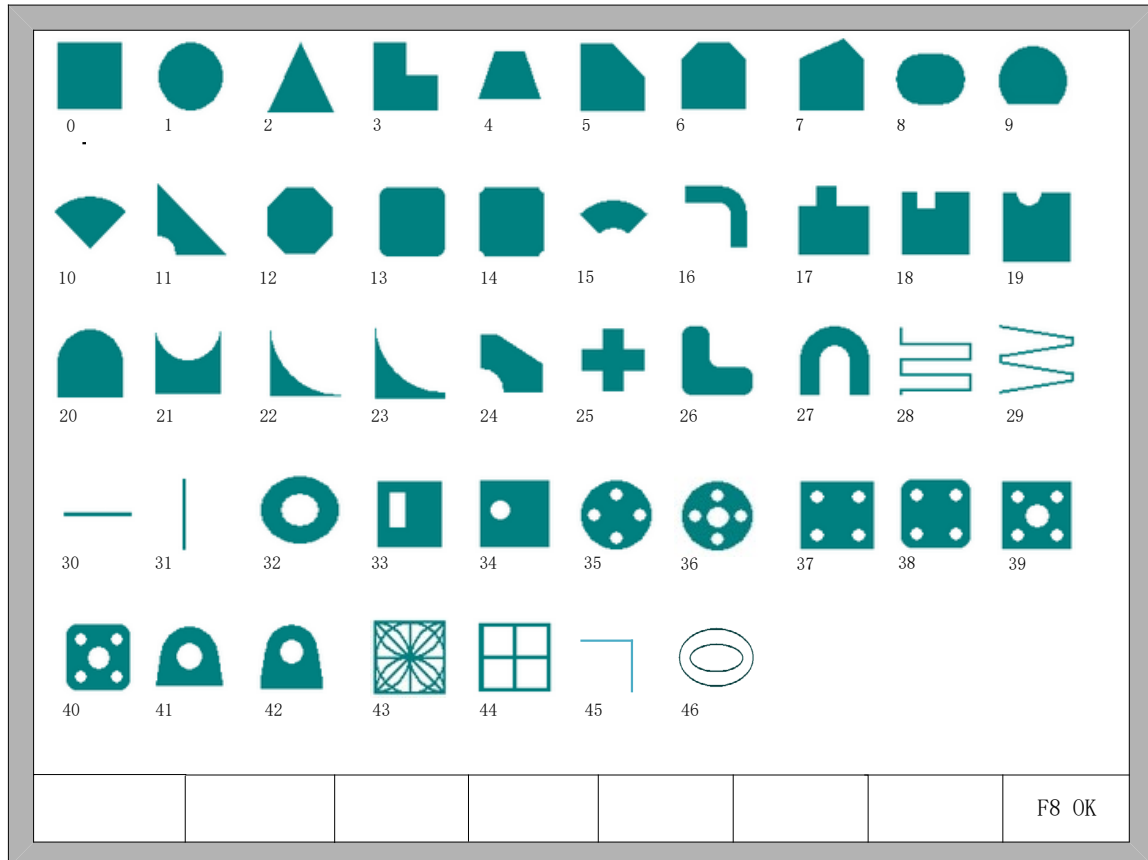


Fig 9.1 Page of graph Library

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

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## 9.1 Choose Graph

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

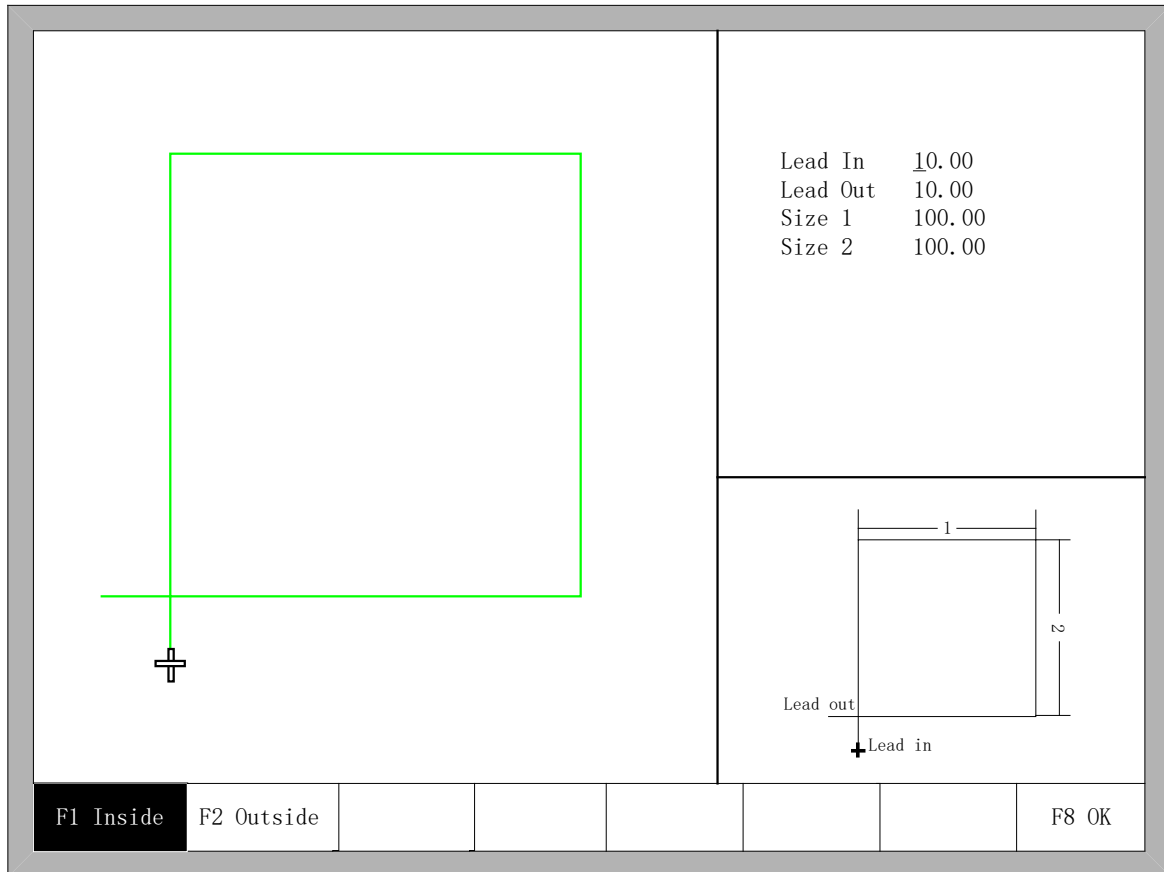


Fig 9.2 Chip size interface

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

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

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## 9.2 Film/Hole Size

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

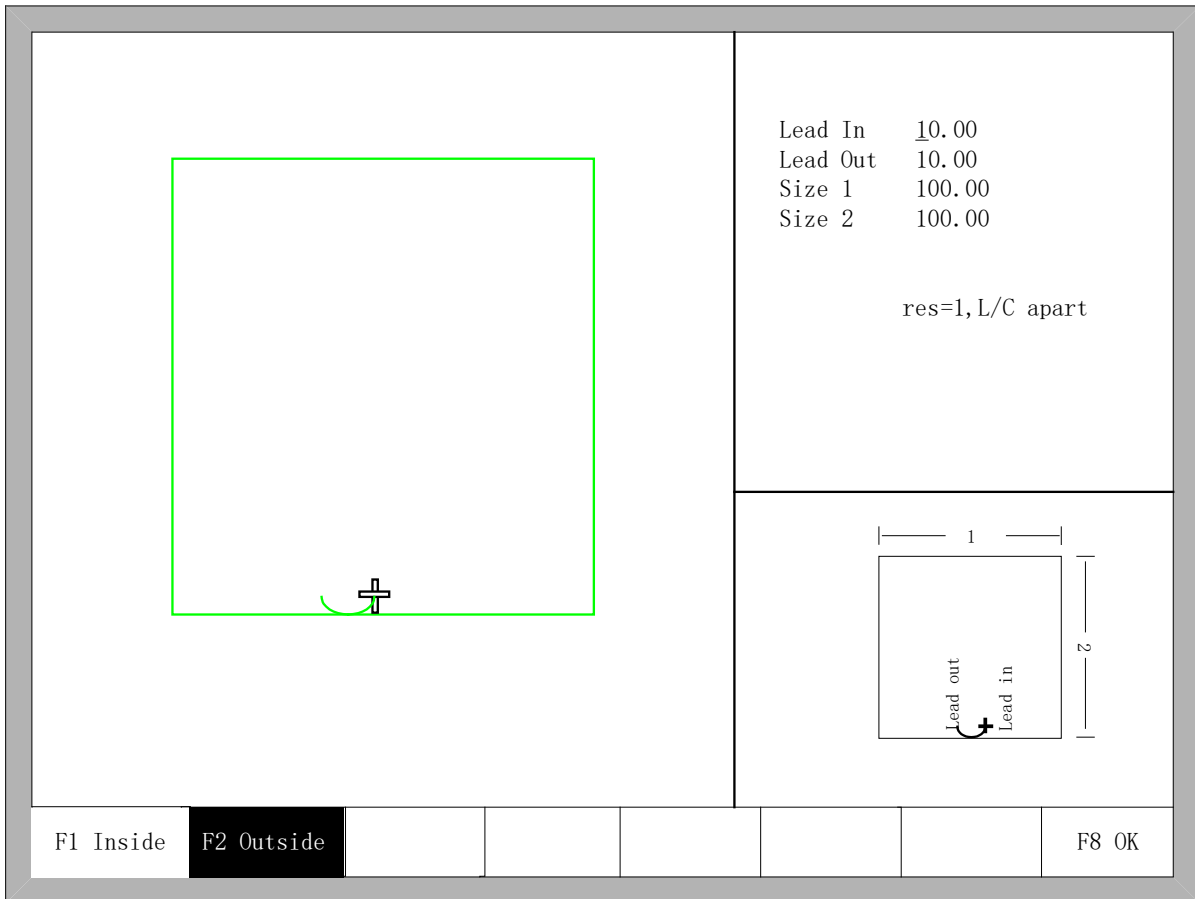


Fig 9.3 Hole size

Modify sizes like modify chip sizes.

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

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

## Chapter 10 Code Explanation

### 10.1 Code Symbol and Interpretation

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

Table 10.1 Programming symbols interpretation

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

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In the following context, all the symbol “/” is the relationship of OR. For example, X/U represents that the result is either X or U, both of which cannot simultaneously be. N represents parameter value, for example, X<sub>n</sub> 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.

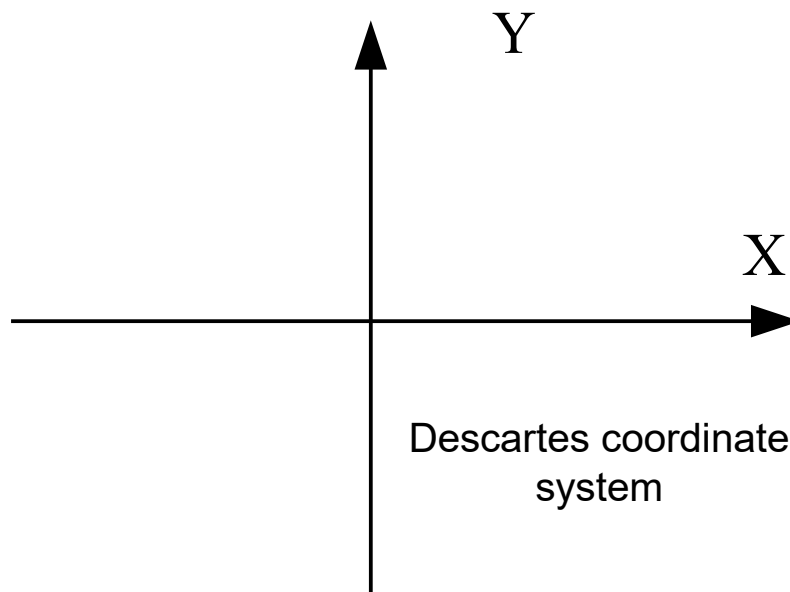


Fig 10.1 Descartes coordinate system

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

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### 10.3 G Code Explanation

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

Table 10.2 Common G code table

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

#### 1. G92 Reference point setting

##### Format:

G92 [Xn] [Yn]

##### Parameters meaning:

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

##### Note:

After input this code, coordinate of reference point setted 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

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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
```

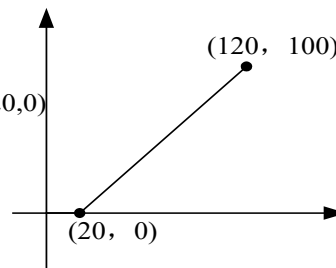


Fig 10.2 G90 usage

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
```

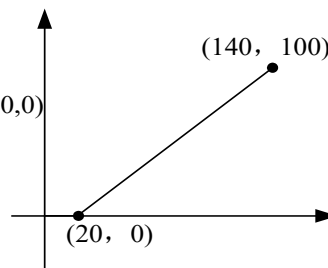


Fig 10.3 G91 usage

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### 3. G20/G21

#### Format:

G20/G21

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

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

#### Note:

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

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

### 4. G00 Traverse rapidly

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

#### Format:

G00 X/Un Y/Vn [Fn]

#### Parameters meaning:

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



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Example:

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

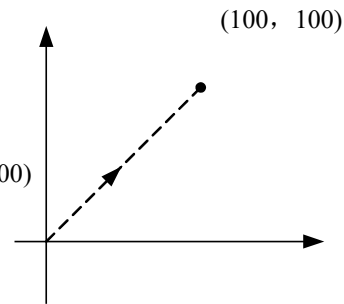


Fig 10.4 G00 usage

### 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);

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

### Example:

#### Example 1: B->A

```
G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X60 Y100 //Rapidly move tool to B
G02 X-40 Y-40 I0 J-40 //The arc 1
/(G02 X-40 Y-40 R-40)
M02
```

#### Example 2: A->B

```
G92 X0 Y0 // Reference point (0,0)
G91 // Relative coordinate
G00 X20 Y60 //Rapidly move tool to A
G02 X40 Y40 I40 J0 //The arc 2
/(G02 X40 Y40 R40)
M02
```

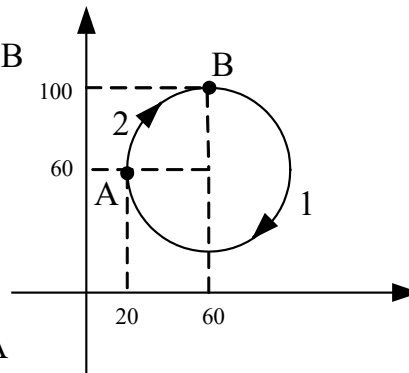


Fig 10.5 G02 usage

## 7. G03 Counterclockwise Circular Interpolation

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

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### 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 workpiece, the actual incision workpiece 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 workpiece 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 */
```

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G40 /\* Disable Right Kerf Compensation \*/  
 M02 /\* End of program \*/

### Note:

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

### 9. G99 proportion、rotate、image

#### Format:

G99 Xn Yn In Jn

#### Parameters meaning:

- ↪ X – proportion factor, can be set from 0.001 to 1000.
- ↪ Y – rotate angle, can be set from -360° to 360°.
- ↪ I – image of X axis, make image along X axis, 1 expresses that there is image, 0 expresses that there is no image.
- ↪ J –image of Y axis, make image along Y axis, 1 expresses that there is image, 0 expresses that there is no image.

### Note:

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

### 10. Programme 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

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coordinate, the system will set it 0.

↪ G00、G01、G02、G03 can be simplified: G0、G1、G2、G3.

↪ If there is contiguous G00 (or G01、G02、G03) around, the following G00 (or G01、G02、G03) can be ignored.

## 10.4 M Code Explanation

Table 10.3 Common M code

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

● M07 Cutting device on

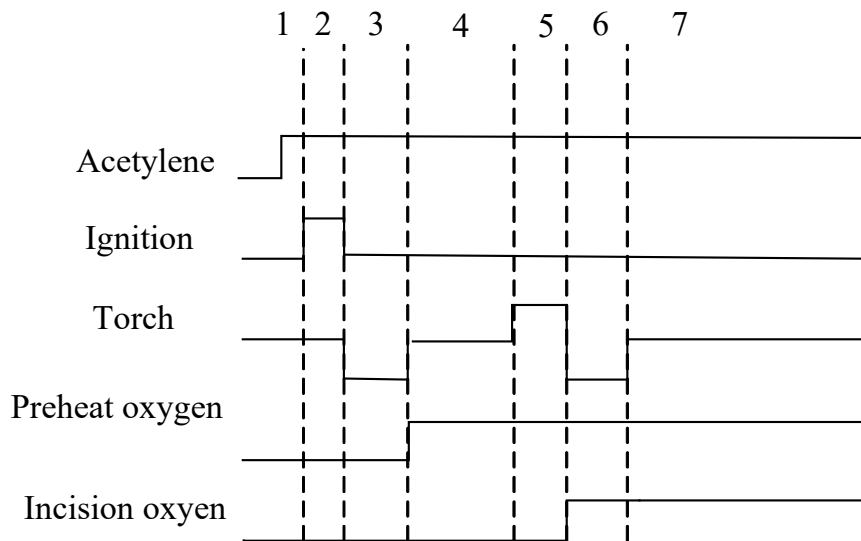


Fig 10.6 sketch map of cutting device on

1. If acetylene hasn't been open, open it.
2. Open ignition and delay "ignition delay time".
3. Open torch down and delay "torch down time".
4. Close torch down, open preheat oxygen and delay "preheat delay time". If in the processing of preheat, press "STOP" key, the preheat time will be automatically delayed.

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Finish preheat delaying until press “START” key again and save the time of preheat delaying automatically in the parameter.

5. Open torch up and delay “Perforation up time”.
6. Close torch up, open incision oxygen, open perforation down and delay “Perforation down time”.
7. Close torch down, begin to incise.

- **M08 Cutting device off**

1. Close incision oxygen;
2. Open torch up and delay “Torch up time”;
3. Close torch up.

- **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 End of program**

## Chapter 11 Use of BIOS

When the system powers on, it will display as shown in Fig 11.1.

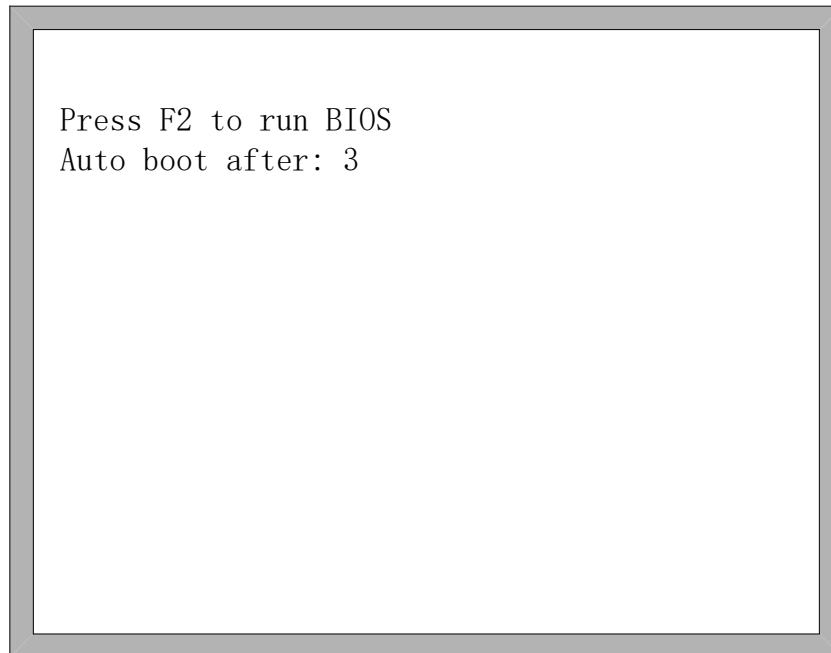


Fig 11.1 Power on

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



Fig 11.2 BIOS interface

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## 11.1 System Upgrade

After entering BIOS, press **【F1】** to upgrade the system, it should satisfy the following conditions: Flash Disk is connected to the system.

There should be the upgrade file UserApp.exe in the root folder of the flash disk.

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

## 11.2 Welcome Interface Upgrade

After entering BIOS, press **【F2】** to upgrade the welcome interface completely, it should satisfy the following conditions: Flash Disk is connected to the system.

There should be the upgrade file WELCOME.bmp in the root folder of the flash disk.

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

## 11.3 Movement Control Upgrade

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

Flash Disk is connected to the system.

There should be the MOTION.DSP upgrade file in the root folder of the flash disk.

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

## 11.4 System Backup

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

## 11.5 System Reset

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



