

**Flame/Plasma CNC Cutting System**  
SF-2200H-QG  
(V2.1)

**Operating Manual**

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\* **Please read carefully this manual before use the system.**



**Attention:**

- 1) After open the packing case, please check the goods and whether accord with the list.
- 2) This manual is only for Portable Flame/Plasma cutting machine system
- 3) Operating environment temperature is 0-40℃. Relative humidity should be controlled in 0-85%. Under high-temperature, high-humidity, caustic gas, must adopt special defend measure.
- 4) In order to ensure control system working normally and improve system reliability and ensure the operator's safety; cutting machine tools and control system all should be well earthed.
- 5) Control system should be insulated from outside to avoid dirt and powder entering and result in control system working abnormally, system parts damaged, etc.
- 6) The system operator should be well-trained and familiar with the system before operating special operator.

- 7) The inside power source of CNC system does not allow connecting with other electric apparatus.
- 8) Toward some area that power supply is nonstandard (such as zero line and earth wire sharing or no zero line), in order to ensure control system working normally and improve system reliability and sure operator's safety, you must use isolation transformer that three-phase/two-phase AC380V transfer to two-phase AC220v between electric network and control system.
- 9) If problem existed, please contact our company. If don't familiar with system, are not allowed to take down system.
- 10) Output voltage for the control system is suitable only for use of the USB Disk; and is not supposed to connect with other USB devices to avoid unexpected damages.
- 11) Power of the system must be turned off while switching between touchpad keyboard and exterior keyboard.
- 12) This operating manual is the property of our company. The final explanation right of this manual belongs to Beijing Microstep Control Technology.

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## Section 1 System Overview

### 1.1 System Function

SF-2200H-QG Flame/Plasma CNC cutting machine system is a desirable control system suits the needs of both flame and plasma cutting. The operating display by system adopt windows hint step by step under main menu, after press one function key, system will display the sub-menu.

According to the hint and press **【F1】** to **【F6】** to select. Press ESC to quit and return to back menu.

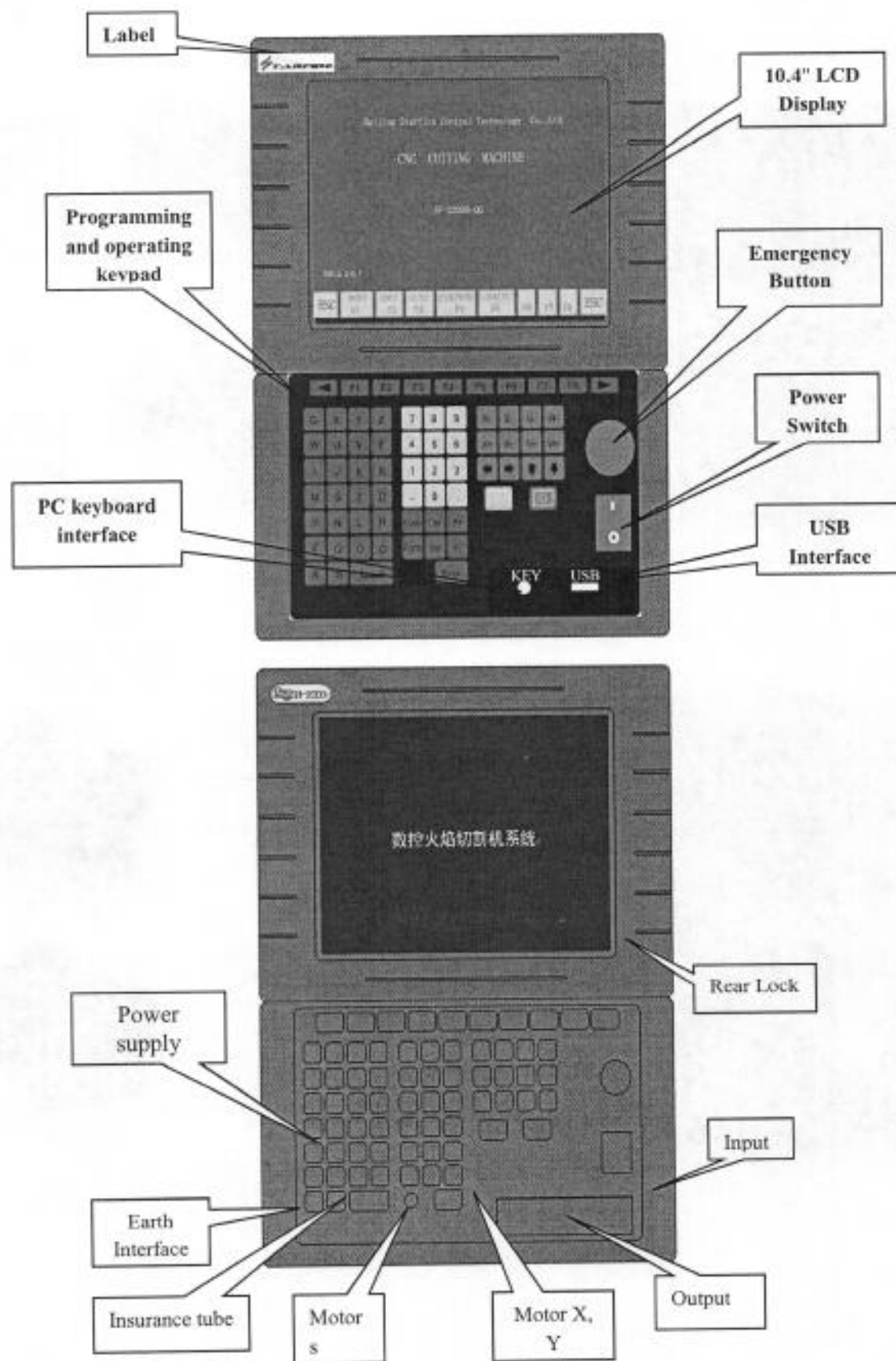
### 1.2 System Feature

- ✓ High-reliability, Prevents system from strong plasma disturbs and lightning strike etc;
- ✓ 32MB storage space, the cutting program can have 10000 lines;
- ✓ Chinese and English can switch easily, can execute, display and save Chinese file name;
- ✓ Rich software function, embedded cutting technique, specialty is dealing with little line, it is used widely in Ad, Iron technique etc;
- ✓ Can extend to 4 axes synchronized function;
- ✓ Dynamic shape attach 10.4 LCD display;
- ✓ Adopt USB disk to Read/Write program to upgrade software.

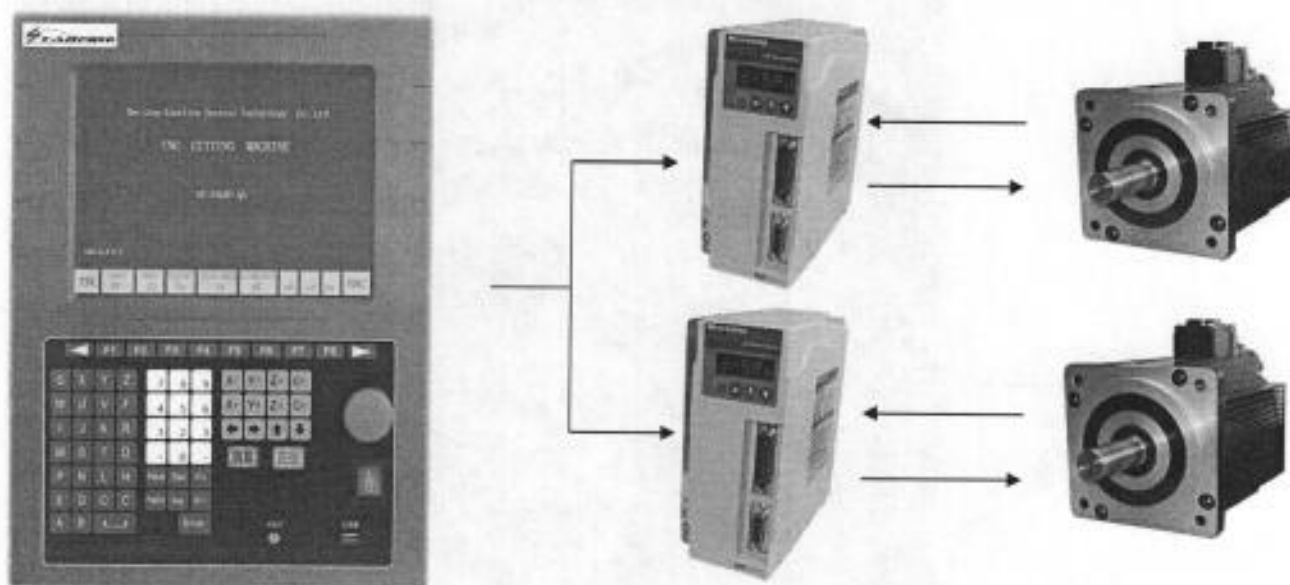
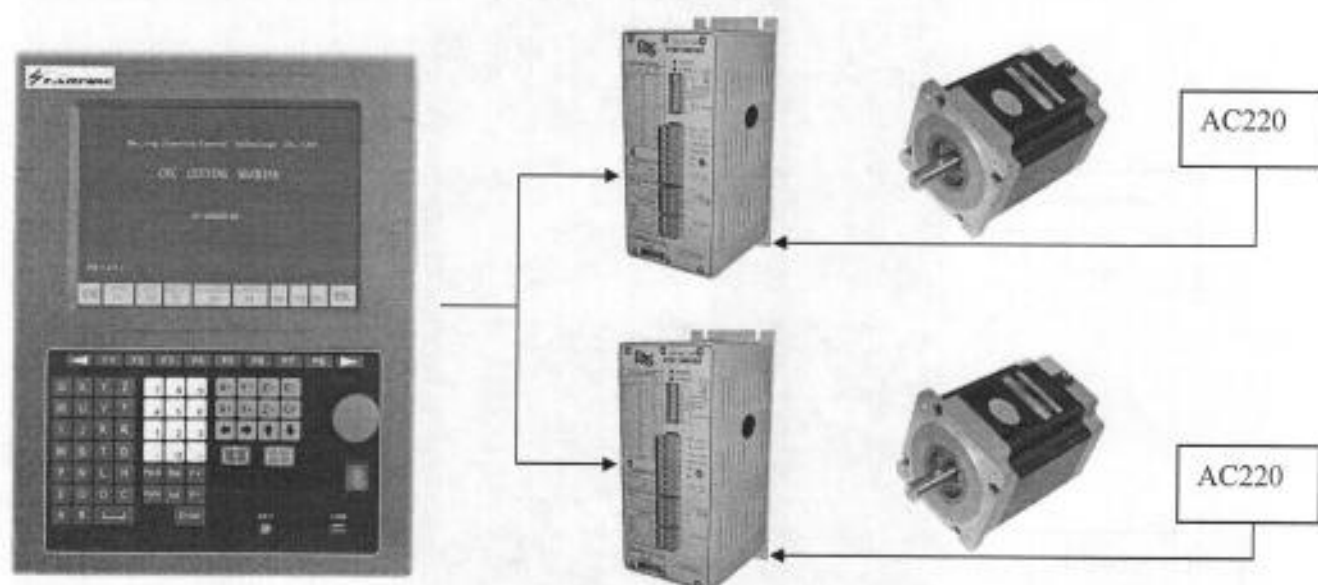
### 1.3 Hardware Specifications

- 1) Industrial grade ARM7 chip;
- 2) System offers: Input 16 ports, output 14 ports;
- 3) Synchronization: Two axes, can extend to Four axes;
- 4) Pulse Equivalence: Electronic gear, numerator and denominator can reach to 1-65535.
- 5) Max speed: When the Pulse Equivalence is 1 $\mu$ , max speed is 6m/minute;
- 6) User's program space: 16-32M;
- 7) Size: 410\*310\*119 (mm) ;
- 8) Work Temperature: 0 $^{\circ}$ C – +40 $^{\circ}$ C Storage Temperature: – 40 $^{\circ}$ C -- +60 $^{\circ}$ C

## 1.4. System Panel Instruction



## 1.5、 Connection Instruction





## Section 2 Main Menu

### 2.1、Menu Features

Menu display applies step-by-step hint style. Under the main menu, system loads all the available functions after entering the sub-menu. Follow the hints that windows displays, press 【F1】 to 【F8】 to choose desired functions, press ESC to abort and return to upper level menu.

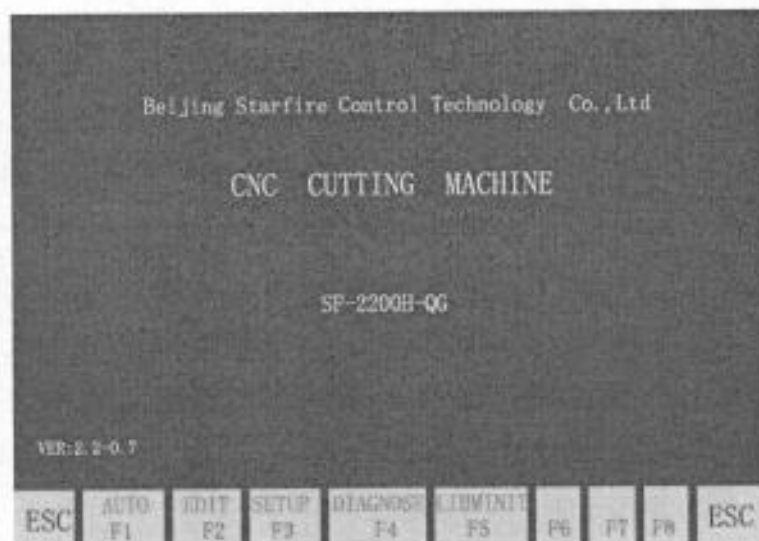


图 2.1 系统开机菜单界面

### 2.2、Main Menu Function

**Version Number:** Under left bottom corner, info about software version is displayed.

**[F1] Auto:** For cutting operations using a stored program or straight cutting

**[F2] Edit:** Edit/Change/Save files/Load files

**[F3] Para:** Set or modify cutting parameters

**[F4] Diag:** Diagnose Input / Output ports

**[F5] lib:** Shape Library offers existing standard figures

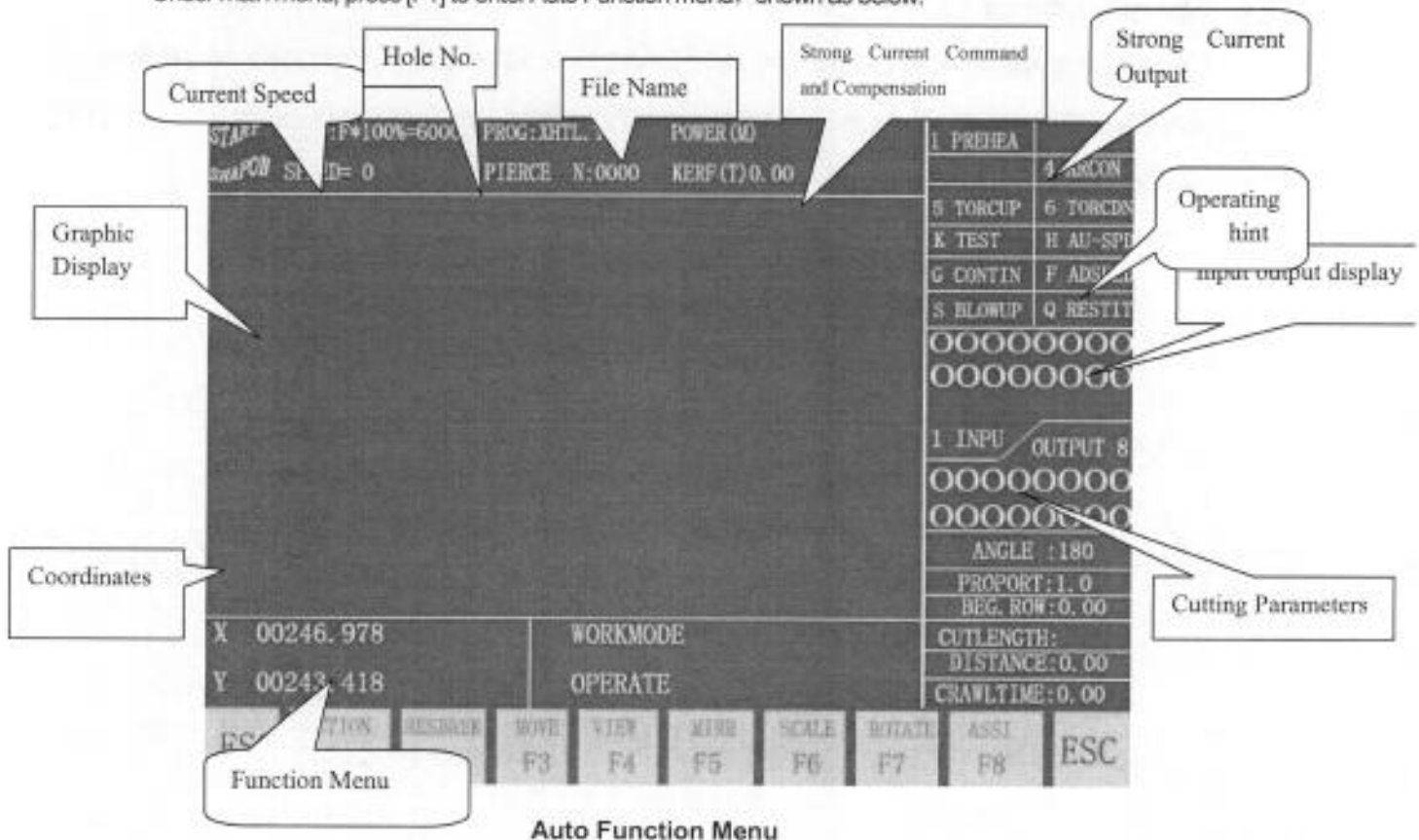
**[G] [G] [3] Initialize:** A hint is shown as below;



File Format——Format the user's program area;  
Parameter——Initialize original parameters  
中文方式——Select between Chinese and English.

## Section 3 Auto Function

Under main menu, press [F1] to enter Auto Function menu, shown as below:



### 3.1. Auto menu instruction

#### 3.1.1 Speed Setting

- 1) After pressed **【H Cutting Speed】** button, left top corner displays  $F \times (\text{Speed Ratio}) = \text{Pre-set cutting speed}$
- 2) When **【H Cutting Speed】** button is not pressed, left top corner displays  $F \times (\text{Speed Ratio}) = \text{Manual Cutting Speed}$ .
- 3) SPEED is the current speed, use **【F+】** and **【F-】** to adjust speed ratio.
- 4) Under this function menu, press **【F】** to make quick speed adjustment
- 5) **CAUTION:** Speed displayed could be either in inch or millimeter depends on the parameters setting in the system

Function Options under Auto Cutting

**【F1】 SECTION:** Assign system to cut from any part of the program.

**【F2】 RESBREK:** Find breaking point to resume work.

**【F3】 MOVE:** Manually move one axis each time.

**【F4】 VIEW:** Check whether the graphic program loaded is correct.

**【F5】 MIRR:** Program runs as mirror image, default is non-mirror mode.

**【F6】 SCALE:** Enlarge or reduce the display size of cutting shape.

**【F7】 ROTATE:** Rotate the angle of cutting.

**【F8】 ASSI:** Assist users to perform additional functions.

### 3.2.1 【F8】 ASSI

Press **【F8】** to enter the next level of control functions. 如下图 3.2

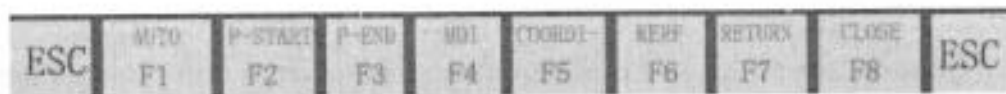


图 3.2 Accessibility menu

- 1) **【F1】 AUTO**, press this button to return back to main menu.
- 2) **【F2】 Test Beginning point**, related with ROTATE function in upper level control menu
- 3) **【F3】 Test ending point**, related with ROTATE function in upper level control menu
- 4) **【F4】 MDI**. Currently not applicable, reserved for future uses.
- 5) **【F5】 Set coordinates**. set X/Y as any desired number.
- 6) **【F6】 Set compensation**, press this to set compensation width, if compensation is not needed, insert 0
- 7) **【F7】 Return to reference point**, enable users to return to original starting point (position of G92 is commonly (0,0)).
- 8) **【F8】 Turn off each I/O port in order**

## 3.3、 Speed Mode (SCALE) and auto cutting ignition

### 3.3.1 Moving Speed

In no-load moving mod, torch is moving at the maximum moving speed X speed ratio. User should only adjust to speed ratio to change speed of cutting machine.

### 3.3.2 Cutting Speed

In cutting mode, actual speed is cutting speed limit X cutting ratio auto ratio adjustment can be achieved by F+/F- during cutting. Under non-cutting mode, press **【H】cutting speed** to adjust ratio by pressing F+/F-.

### 3.3.3 Backing Speed

Under backing mode, backing speed is cutting speed X backing ratio, Backing ratio can be adjusted by F+/F-.

**Once all three-speed settings are finished, speed properties will be saved automatically, and not affected by powering off the machine.**

### 3.3.4. Auto Mode Ignition

#### 1) Before auto cutting starts

To select proper cutting program, choose the suitable cutting speed ratio. Put torch on the cutting position (Torch will be lifted up after program initializes (executes M70)), after other preparation works are done, the program may start auto mode execution.

#### 2) Two ways to initialize auto mode:

a) Green **【START】** button on control panel;

b) Press exterior "START" button

### 3.4 Under following operations, torch can be moved in order to change positions.

(1) Pause, (2) Backing, (3) Piercing, (4) Select (5) Find breaking point.

Under above conditions, users could press **【↑】【↓】【←】【→】** directly to change torch position (**Current system speed ratio is manual adjustable**). After moving to desired position, press **【START】** button, display is shown as below.



图 3.3 position adjustment dialogue

#### 1) Return to origin point

Suggestion, press **【PIERCE】** after pre-heating, thus, system starting cutting from the origin point.

#### 2) Return to previous cutting point

Pierce first, applying cutting speed to return to original point, keeping cutting following the previous track.

#### 3) Pierce under current hole

Pierce first, take present coordinates as "adjusting point"

### Leaving cutting mode

When in pause, press **【ESC】** to return main menu.

## 3.5、 Break point processing

### 3.5.1. Break point resume

- 1) When system is in pause or accidentally power off; system saves current torch position as a break point. The break point is permanent whether system is turned off or not.
- 2) Under auto mode, as long as the cutting program does not change, press **【F2】** select break point function, then press **【START】** button, system resumes working from break point.
- 3) If the torch position did not change, system would call attention to BRK point after system finds the break point.
- 4) If the torch position changed (not on break point), system would display following three options after system finds break point.



图 3.5 system pause, finds break point then resumes cutting dialogue

- a) Back to original
- b) Back to cutting point
- c) Pierce at current position

**HINT:** Press **【PIERCE】** after pre-heating, then system would resume cutting from break point.

Press **【ESC】**, system leaves cutting mode.

### 3.5.2 ATTENTION:

Once the cutting program is changed, **BREAK POINT** will be eliminated from system cache, thus the system would not be able to find **BREAK POINT** and would not resume working.

## 3.6、 SELECT MODE

### 3.6.1、 START SELECT MODE

Select to cut from any section of the cutting program then press **【START】**.

Press **【F1】** to choose SELECT function, the system will be shown as below:

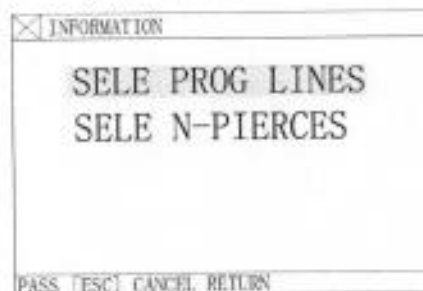


图 3.5 selections Menu

Meanwhile: use **【↑】【↓】** to move the cursor to choose either **SELECT** mode to cut  
According to the choice, system would choose order number to process.

### 3.7、Edge piercing of thick sheet

In auto mode, edge piercing is more suitable for thick sheet.

- 1) Solution of edge piercing: Move the torch to sheet edge before piercing.
- 2) Start pre-heating. Press **【START】** button after pre-heat ends. Torch moves linear distance at pre-set speed to the piercing position, resumes cutting.
- 3) In edge piercing, select figure from control menu to set "edge piercing" to 1, means such function is enacted. Thus every time before piercing, system would display following options.

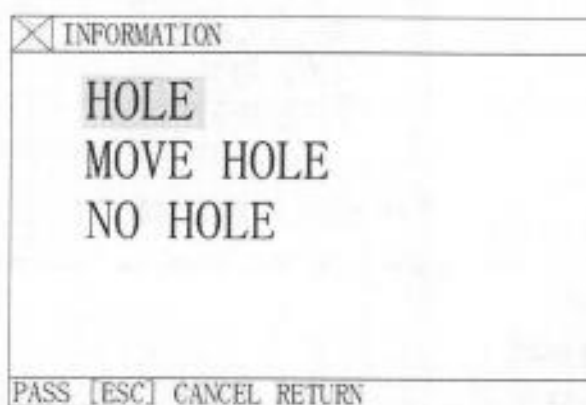


图 3.7 Option dialogue after choosing edge piercing function

#### 3.8.1 Pierce on current position

System starts piercing, usually on internal holes.

#### 3.8.2 Choose edge piercing

- 1) Users could press **【↑】【↓】【←】【→】** button, move torch to the sheet edge, starts pre-heating.
- 2) Press **【START】** button after pre-heat ends. Torch moves linear distance at pre-set speed to the piercing position, resumes cutting.

## SECTION 4 Edit Function

- 4) Under system main menu, press **【F2】** to enter Edit mode. System displays the following picture.

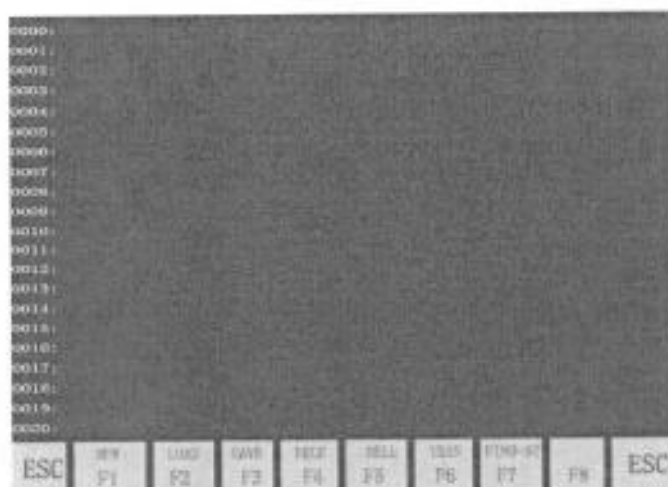


图 4.1 Edit mode main menu

### 4.1、 Edit Mode Menu

#### 4.1.1 **【F1】** New

Create new program, clear out cutting edit area and starting editing a new cutting program.

#### 4.1.2 **【F2】** Load

Load in any existing cutting program into the system, press **【ESC】** to give up load function.

#### 4.1.3 **【F3】** SAVE

Saving cutting program, system would pop up a hint. For example:

Choose the file name: 1234.TXT

File name should not contain more than 12 letters.

#### 4.1.4、 **【F4】** Delete file

Choose to delete the program saved to system.

#### 4.1.5、 **【F5】** Delete lines

Delete entire line under edit mode to increase editing speed.

#### 4.1.6、 **【F6】** File transfer

Transfer file, this system supports removable disk file transfer, press **【F6】** to enter next level menu.

System should be shown as below.

ESC	INPUT F1	OUTPUT F2
-----	-------------	--------------

图 4.2 Removable disk option menu

【F1】 Load program file from removable disk to system;

【F2】 Load program file from system to removable disk

#### 4.1.7. 【F7】 Find Parameters

This function is currently unavailable, saved for future upgrades.



## SECTION 5 Commanding System

### 5.1、 Programming symbol

Every action of CNC machine running according to regulate program, every machine program be composed of some **instruction segment**, and every instruction segment be composed of some **Function word**, **each function word must start by letter, parameter follow.**

#### Definition of function word:

**N**--The No of instruction segment

**G**--Prepare function

**M**--Assistant function

**S**--Main axis function

**L**--Cycle times or delay time

**X**--X axis absolute coordinate value

**Y**--Y axis absolute coordinate value

**U**--The increment that X axis relative to current position

**V**--The increment that Y axis relative to current position

**I**--When cutting arc, the value that the coordinate of the circle centre subtract X axis start value

**J**--When cutting arc, the value that the coordinate of the circle centre subtract X axis start value

**R**--Specified arc radius

**F**--Specified moving speed, used for G01,G02 and G03

Note 1: There are some appointments:

X[U]n -- It can be X or U, n express a value, but only appear once.

Y[V]n -- It can be Y or V, n express a value, but only appear once also.

PPn -- It can be assembled random axis, at least include one axis ,also can include two axis.

**Note 2:** The instruction execute order is sequence (except transfer and call sub program instruction); In same

program the M,S and T will be executed before G instruction.

## Section 6 Parameter Setting

Under system main menu, press **【F3】** to enter display interface as below:

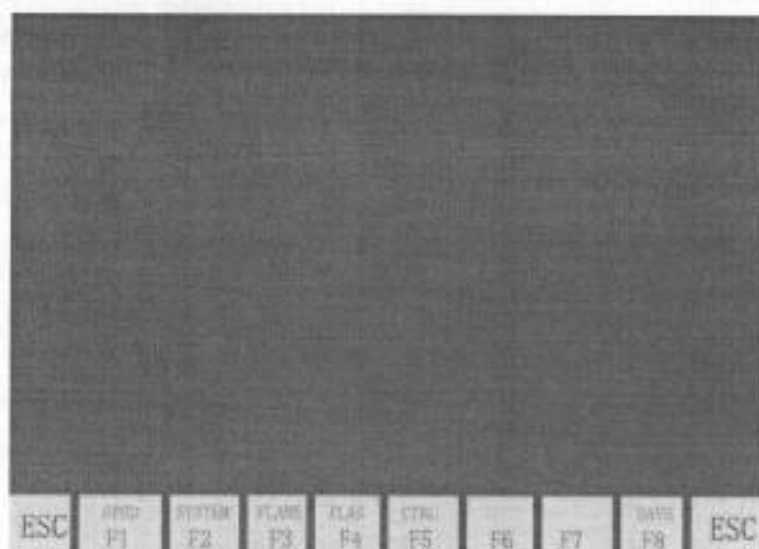


图 6.1 Parameter setting main menu

### 6.1、Parameter Setup

Including:

**SPED**--- Speed parameters, including **STARTUP**(start speed),**TIMING**( Adjust time) and **HIGH SPD**(Max limit speed);

**SYST**---System parameters, including **NUMERATOR**, **DENOMINA**-(electronic gear numerator/denominator), **MA-ORIGIN**(machine tool origin), **REFERENCE**(reference point), **CLEARANCE**, **OFFSET**, **SOFTLIMI+**, **SOFTLIMI-**;

**FLAME**--- Flame parameters, including **IGNITION**(ignition time), **HOTUP TIME**(preheat time), **TORCHUP TIME**(torch up time),**TORCHDN TIME**( torch down time), **PIERCEUP**(pierce torch up time), **PIERCEDN TIME**(pierce torch down time);

**PLAS** --- Plasma parameters, including torch locate time, Arc on M order, Arc off M order, Arc-feedback, Locate check, Locate Logic, Pierce time;

**CTRL** ---Control parameters, including flame/plasma mode select, cutting limit speed, Extend pierce, Shape Max point etc.

**SAVE** ---Save function, save the amended parameters.

Attention: Want to make the amended parameters enable, press **【F6】** to save.

Under **PARA** menu, input "1928" command, system will hint:

#### **NOTIC: SETUP FACTORY PARAMS**

This moment, The amended parameters will be saved to "Factory parameters", that is When you press "GG3" and

- 1) select "PARAMETER", it will initialize parameters by amended value.

### 6.2、Figure Setting

## 6.2.1、Speed Figure

Including:

1. **STARTUP**——Start speed, the speed that X and Y axis start and stop(unit mm/minute);
2. **TIMING**—— Adjust time, the time that system from start speed to Max speed needs.
3. **HIGH SPD**—— The max limit speed, it is the max speed when manual cutting and execute G00

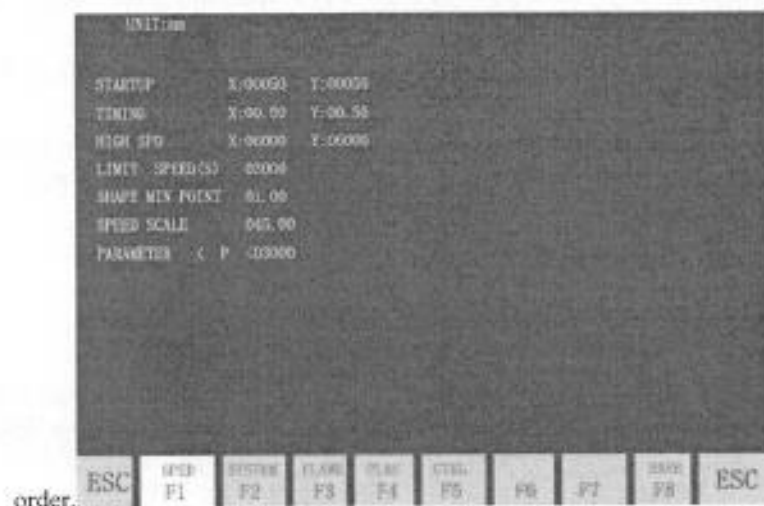


图 6.2 速度参数设置

## 6.2.2、System Parameter:

Under PARA menu, press **【F2】**, displayed as below



图 6.3 System parameter setting

1. **NUMERATOR/DENOMINA-** ---- The ratio that electronic gear numerator and denominator is Pulse Equivalent\*1000. Example: System's Pulse Equivalent is 0.008mm, the electronic gear

numerator/denominator  
=8/1.

**Electronic gear ration formula:  $N/M = \text{Lead Screw Pitch} * 1000 / (360 * \text{Detail Segment} / \text{Stepping angle} * \text{Gear Ratio})$**

2. **MA-ORIGIN** ---- Machine tool origin, it is a special point that set by approach switch. When the machine tool don't set **Mechanical Home Position**, you can set the **Machine tool origin** is zero.

3. **REFERENCE**---- Reference point, Defined as cutting start point, it is specified by G92 order.

4. **CLEARANCE** ---- Reverse Clearance compensation, as the machine have reverse clearance, when system move ,want to change direction, this clearance should be compensated. The value should be measured to get unit:

mm;

5. **OFFSET** ----Marker Offset. The offset between the marker and torch axis;

6. **SOFT LIMH+/SOFT LIMH-** --- Soft Positive Limit and Soft Negative Limit, when the program's coordinates are over the set value, system will alarm. If don't use, the parameters set over actual used value

### 6.3、 Flame cutting parameter

Under para setting, press **【F3】** to enter flame cutting parameters, display is shown as below:

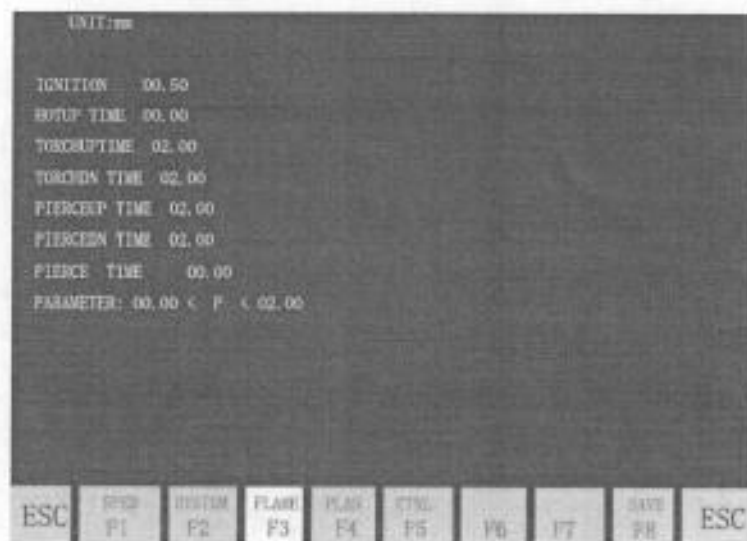


图 6.4 Flame Parameter Setting

1. **IGNITION**----Ignition time. Flame cutting, when execute M20, it is the time that open High Voltage Ignite switch delay; Plasma cutting, it is the time that open Arc Voltage delay;

2. **HOTUP TIME**----The time pierce preheat(unit: s), when pierce preheat, start preheat time delay, if the preheat time isn't enough, press **【PAUSE】** ,The preheat time will be extended to 150s, if preheat finished, press **【START】** , the delay time will be saved to **HOTUPTIME** parameter automatically;

3. **TORCHUP TIME**---- Torch up delay time, it is the delay time that execute M70 ,refer 5.4 (unit: s);

4. **TORCHDN TIME**----- Torch down delay time, it is the delay time that execute M71, refer 5.4 (unit: s);
5. **PIERCEUP TIME**----- Pierce torch up delay time, it is the delay time that execute M72, refer 5.4(unit: s);
6. **PIERCEDN TIME**----- Pierce torch down delay time, it is the delay time that execute M73, refer 5.4 (unit: s);
7. **PIERCE TIME** -----Pierce delay time, when flame cutting pierce, execute M07, open CUTOXY, after delay, torch down.

## 6.4. Plasma Parameter Setting

Under system menu, press F4 to enter plasma setting.

1. **TORCH LOCATE TIME**-----When plasma torch locates, first torch down until encounters down-limit switch, torch fall stop. Then open torch up, after a **TORCH LOCATEING TIME**, stop torch up. (unit: s)
2. **ARC ON M ORDER** -----Set the ARC ON output port, default is M12;
3. **ARC OFFM ORDER**----- Set the ARC OFF output port, default is M13;

**Note:** When the subtract value that ARC OFF M Order and ARC ON M Order is 1, indicate that they use same output port (even is open, add one is close). This moment system use electric level to control ARC ON switch; if the M orders all even and unequal, indicate that they use different output ports to control open and close. This moment system use pulse to control ARC ON switch, The width of pulse is 0.5s;

4. **ARC-FEEDBACK** -----Plasma cutting, this value decides whether check Arc Voltage or not. When the value is 1(enable), when ARC ON, it will check the Arc Voltage feedback and when cutting, it will watch the Arc Voltage Feedback. When the feedback be cut, system will deal with as PAUSE, and have hints. It is usually be used for deep board. When the value is 0 (disable), after open ARC ON switch, delay "Ignition" time, start to cutting, during cutting don't check Arc Voltage Feedback.
5. **LOCATE CHECK** -----When execute M07, select whether execute TORCH LOCATE operation.
6. **LOCATE LOGIC**----- It is test logic that Torch Locate Time selects down-limit,
  - 0: Low enable(Normal open);
  - 1: High enable(Normal close)
7. **PIERCE TIME**----- After ARC ON succeed, after pass **PIERCE TIME**, system cutting normally

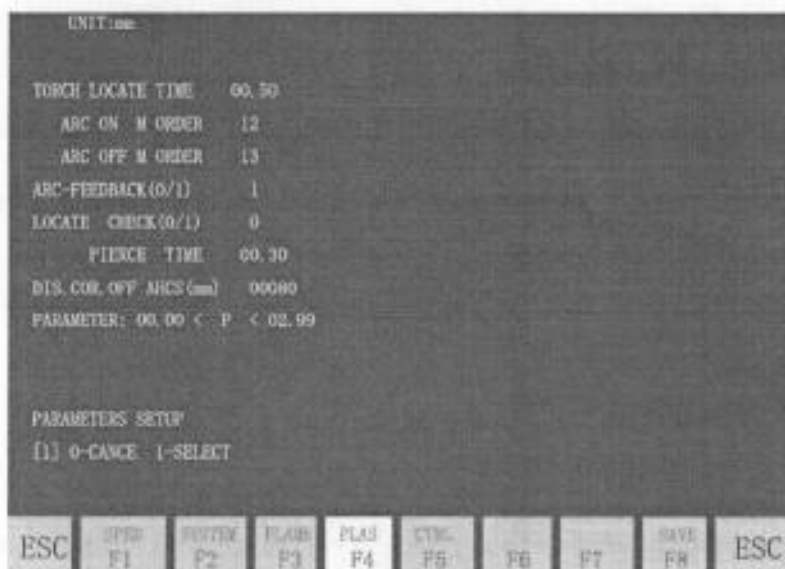


图 6.5 Plasma parameter setting

## 6.5、 Control Parameter Setting

Under PARA menu, press F5 to enter control parameter setting mode

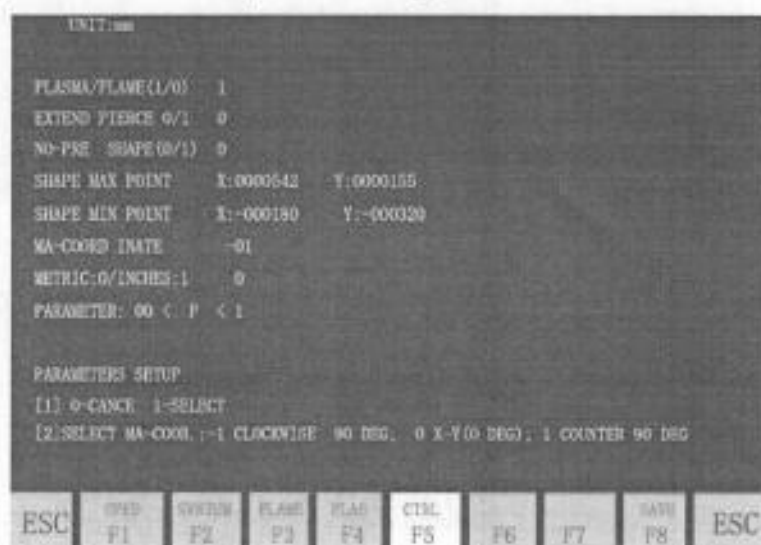


图 6.6 Control Parameter Menu

1. **PLASMA/FLAME (1/0)** -----Flame cutting,1:Plasma cutting;
2. **LIMIT SPEED**-----The max speed during cutting;
3. **EXTEND PIERCE**-----Extend pierce select, 0: disable, 1: enable;
4. **NO-PRE SHAPE**----Do not deal with shape previously.0: disable, 1: enable;
5. **SHAPE MAX/MIN POINT**---The max /min value of shape;

6. **SYNCHRO**—Select driver synchronization.0: X and Z; 1: Y and Z..

**CAUTION: Please pay special attention when changing parameters if users were not familiar with parameter applications!**

## Section 7 Diagnose Function

Under system main menu, press F4 to enter Diagnose function menu, shown as below:

OUT:	M10	M12	M14	M16	M20	M18	M22	M24
	0	0	0	0	0	0	0	0
	M32	M34	M36	M38	M40	M42	M44	M46
	0	0	0	0	0	0	0	0
INPUT:	X>+	-<X	Y>+	-<Y	DLZ	STO	PAS	STA
	1	1	1	1	1	1	1	1
	SX+	SX-	SY+	SY-	SP+	SP-	DUP	DDN
	1	1	1	1	1	1	1	1

图 7.1 Diagnose function menu

The system diagnose function can check the signal of input/output whether normal or not.

1. OUTPUT: There are 16 output ports, move cursor and change the value( from '0' to '1' or '1' to '0') to change the level state:

1: high level;

0: low level.

2. INPUT: There are 16 input ports. 1: enable, 0: disable. About the input ports' definition, please refer 9.3.



## Section 8 Shape Library Function

### 8.1. Library Setting:

Under main menu, press F5 to enter Library Mode:

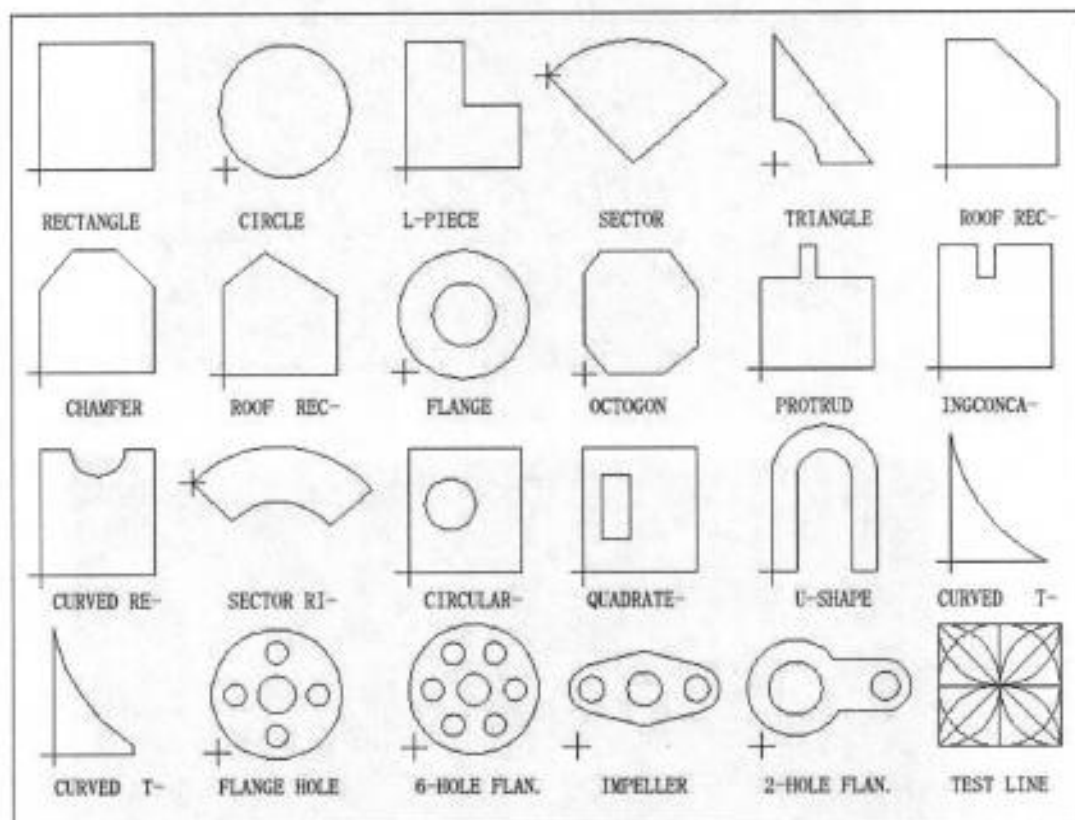


图 7.1 Library Function

### 8.2. Shape Selection

SF-2200H presently provides 24 standard shapes (extendable upon request) Press direction button **【↑】****【↓】****【←】****【→】** to move the cursor, select desired shape and press ENTER to confirm.

### 8.3. Shape setting and nesting

After selecting shape parts on previous step, system would display shape' s parameters to users.

**【F1】** : Hold the inside part when cutting

**【F2】** : Hold the exterior part when cutting

**【F3】** : Press **【F3】**, then the system will give you a hint to input a revolving angle. Press **【ENTER】**, and then press **F6** to confirm.

**【F4】** : Press the key **【F4】** to enter into the nesting mode and input the number of rows, columns and

the value of H-BETWEE, W-BETWEE and OFFSET.

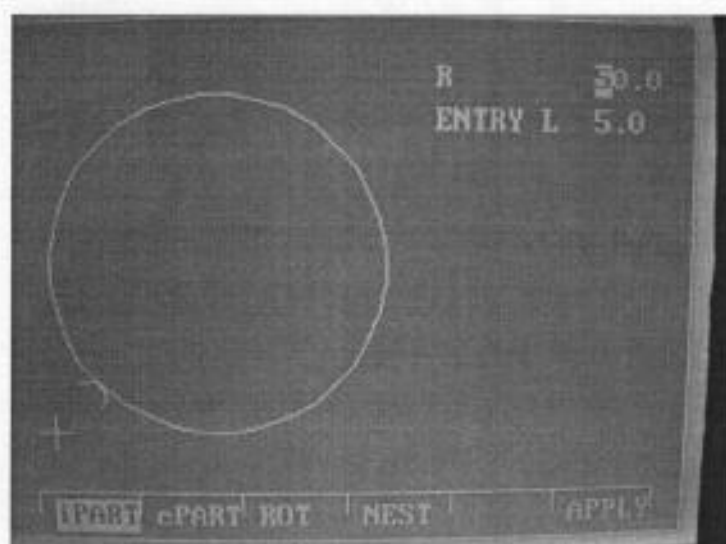


图 8.2 Shape Parameter Menu

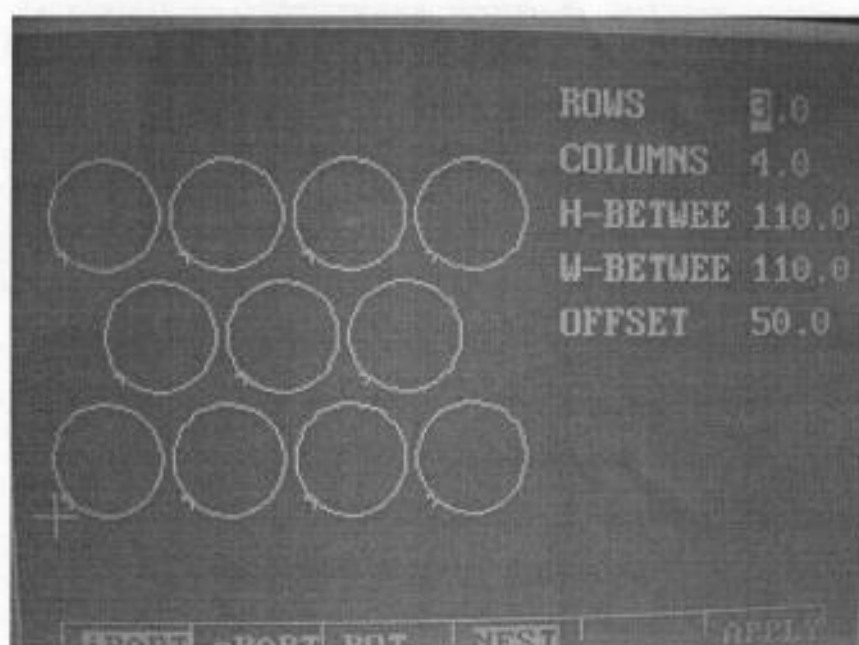
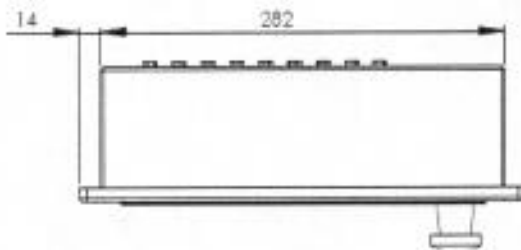
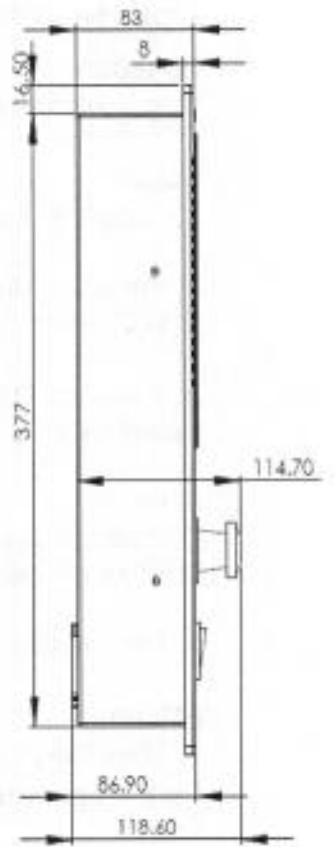
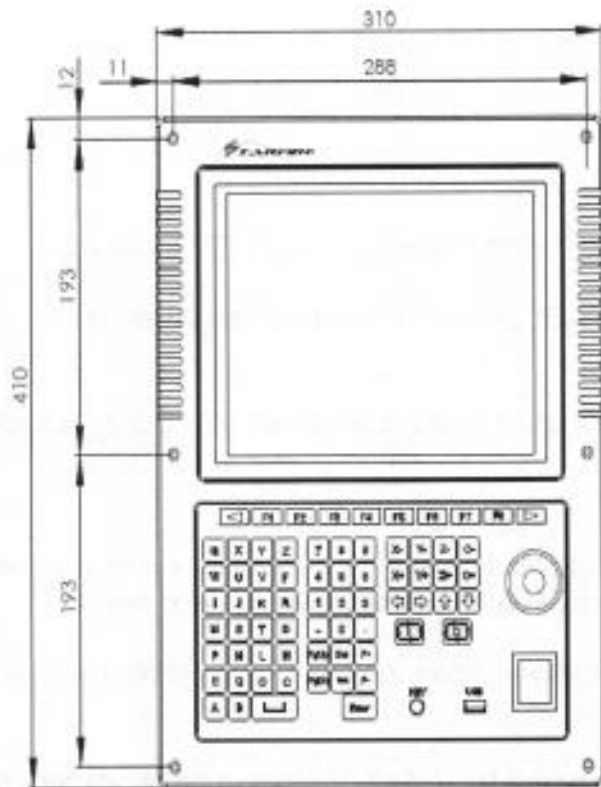


图 8.3 Nesting Illustration

**【F8】 Apply:** Press this button to create cutting program after setting up all parameters.

# APPENDIX 1: EXTERIOR DIMENSION



## APPENDIX 2

### Update software instruction

**Function:**

Upgrade software by U disk.

**Step:**

1. Copy the upgrade file to U disk. Attention: The file name only is STARTCNC.EXE.
2. Press the Button "START"(Green) and "STOP"(Red) at one time when power on the system until the upgrading interface appears
3. Insert the U Disk, press F1, system will complete upgrade automatically. During upgrading system will hint some information.
4. Finish  
If operation succeed, it will display succeed information and the beep will have one sound; If failed, it will display failed information and the beep will sound all the while to alarm.
5. Turn off power source, pull out U disk. When you power up again, it is the new software.

**Attention:**

1. The reason of upgrade failed more is caused by U disk, if system have not hint the U Disk's operation course, please instead U disk and try again.

APPENDIX 3 G-CODES

CODE	FUNCTION
G00	Fast positioning point to point
G01	Linear cutting
G02	Circular cutting clockwise
G03	Circular cutting anti-clockwise
G04	Dwell (stop-delay)
G20	Inch
G21	Metric
G26	Back to reference point axis X
G27	Back to reference point axis Y
G28	Back to reference point axis X and Y
G40	Cancel compensation
G41	Compensation left
G42	Compensation right
G90	Absolute distance mode
G91	Incremental distance mode
G92	Reference point set-up

APPENDIX 4 M CODES

CODE	FUNCTION
M00	Stop program
M02/M30	Program ended
M07/08	Cutting oxygen valve ON/OFF Plasma cutter ON/OFF
M80	Power OFF(all output after M80 will be shut down)

APPENDIX 5 ERROR CODE LIST

ERROR CODE	Description
01H	Overflow/illegal character(s) in program
20H	Division Overflow
21H	Error Starting/ending point of arc
22H	Error radius of arc
24H	Error condition of arc
2AH	Overflow program lines. No torch movement of this line
34H	Illegal Operation
40H	Emergency stop pressed
41H	Limit X+
42H	Limit X-
43H	Limit Y+
44H	Limit Y-
45H	Negative limit of software coordinates
46H	Positive limit of software coordinates