
ADT-HC6500

Flame/Plasma Controller

User Manual (Software)



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Upgrade Information

| Item No. | Version No. | Revision Date | Remark |
|------------|-------------|---------------|-----------|
| XT20090305 | 3.0 | 2010-1-11 | Edition 3 |

Note: Meanings of the three numbers in version number are as follows:



Library main version No.

Library secondary version No.

Reserved

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Safety Notice

Read this safety notice before operating.

I. Notice

1. Notice on safety:

- n Original copy of safety notice should be dispensed to every operator.
- n Do not open the controller cover without permission; otherwise, it would be out of the range of guarantee.
- n Cut off the power supply in case the machine is not used for a long time.
- n Pay attention not to drop any dust or iron powder into the controller.
- n Do not pour any liquid into the controller.
- n Handle with care, and do not cause any damage.
- n Abide by the accident prevention provision and regulations.
- n Abide by the accident prevention provision and regulations on Oxygen cutting.
- n Wear the mask when performing the plasma arc cutting, for the plasma arc will generate UV-b radiation.

2. Notice on correct application:

- n Our control system is capable of anti-interfering, but it is still required that your plasma power supply have shielding function and the plasma controller have good grounding. Otherwise, it will bring serious result.
- n Please set all parameters of the controller strictly according to the user manual; otherwise, it may lead to failure of control system or even cause serious consequences.
- n The controller uses the 24V DC power supply. To avoid short circuit, please pay attention to the voltage, negative or positive electrode of power supply when installing.
- n Good grounding measures are required if the controller is used combining with plasma cutting machine.
- n Do not insert or pull out any output plug of controller while the power supply is connected; otherwise, it will damage the inside of controller.
- n If the output relay is non-solid-state relay, a freewheeling diode should be connected in parallel on relay coil. Check the applied power supply to see whether it is up to requirements, avoid burning out the controller.
- n Controller lifetime has a great relationship with ambient temperature. Install a cooling fan if the temperature in processing area is too high. The allowable ambient temperature of the controller is between 0°C and 60°C.
- n Do some protection measures if the machine is used in high temperature, damp, or dusty environment, or environment with corrosive gas.
- n In place with strong vibration, add a rubber anti-vibration pad to weaken the vibration.

II. Statement:

We offer one year factory warranty or lifetime maintenance for any malfunction arising under the normal use. In case of man-made damage or if the warranty expired, ADTECH will charge a certain cost price of parts. However, the warranty is not applied to the following conditions:

- n The label of serial number is torn down.
- n Any damage caused by personal factors
- n Any damage caused by natural disasters
- n Disassembly, modification, or repair without permission

III. Maintenance:

1. Notice for maintenance and inspection:

- n Cut off the power supply of major loop before maintaining or repairing the controller.
- n To prevent the accident, the operator should confirm the power supply is cut off.

2. Inspection item and period:

Under the general operating conditions (Daily average 30°C, load rate 80%, operating ratio 12 hours per day), carry out the following inspections to do the route and periodical inspections.

| | | |
|-----------------------|-------------|--|
| Route inspection | Daily | <ul style="list-style-type: none">● Check whether the ambient temperature, dust and foreign matters exceed the criteria● Check whether there is abnormal vibration or sound |
| Periodical inspection | Half a year | <ul style="list-style-type: none">● Check whether the firm parts are loosened● Check whether the terminal board is damaged |

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Chapter I. General

Ø Function introduction

HC6500 flame controller is a high performance, multi-functional motion controller, whose control circuit uses the high-speed microprocessor and large custom-tailor IC chip, featuring the multilayer printed board. The display is 10.4" color LCD screen, and the attached software integrates advantages from home and oversea factories. For this reason, the controller features stable hardware and perfect software, and is a reliable flame/plasma controller with high performance ratio. According to the customer's demand, HC6500 will be divided into A/B series:

HC6500-A series include 44-channel DI, 16-channel DO, 4-axis pulse/direction signal output, interface featuring true/false bilateral drive, external keyboard interface, USB port (principal and subordinate), and RS232 communication interface.

B series include 60-channel DI, 36-channel DO, 4-axis pulse/direction signal output, 4-axis ABZ-phase coder feedback input, 2-channel analog voltage output, external keyboard interface, USB port (principal and subordinate), RS232 communication interface, and standard network interface.

Ø System Functions

- 1) Perfect flame / plasma cutting processes
- 2) Support numerous functions, including time delay, preheating, perforating, changing nozzle, moving parts, lift adjustment, displacement perforating, partial image zoom-in, and view;
- 3) Perforation point selection is supported.
- 4) With suspended function; it can go back to the suspended position and continue carrying out the program if there is movement after the pause.
- 5) Track continuous backing function is provided.
- 6) With plasma arcing detection, initial positioning, and turning signal control functions;
- 7) Break point recovery function, featuring power-off protection during the processing
- 8) Graphic library contains a great number of part figures, which can be edited to generate programs automatically. Rectangle edge-sharing function is supported.
- 9) Figure processing functions enable it to carry out such functions on figure being processed as rolling, X and Y mirror, line selection, point selection, steel plate calibration, size, array, derangement, and zoom in/out.
- 10) Figure display function, capable of displaying real-time track
- 11) Capable of programming; nest processing files and writing G code are adopted.
- 12) Perfect and stable file system; the USB disk can read file or folder directly, featuring convenient on-scene operation

- 13) With diagnosis function, helping customers settle the machine problems quickly
- 14) Capable of controlling 4 stepping/servo motors at the same time, double axes can be synchronous, or the 3rd and 4th axis functions can be developed once again according to the actual demand.
- 15) System default setup and restore functions can better protect the system parameters.
- 16) Enable to custom the input and output terminals to improve the system performance, benefiting the future maintenance
- 17) User-defined M compound instruction code is supported to expand the processing technologies of the system.
- 18) Support input methods in many languages, which would be better to identify the file name
- 19) User-friendly operating interface with wizard or menu function is adopted.
- 20) Perfect gap compensation function
- 21) Flexible switching of locking and inching is supported.
- 22) 10.4" color LCD display, with user-friendly and easy-to-use operating interface

Ø Application environment

Power supply: 88 ~ 264VAC, 125 ~ 373VDC, frequency: 47 ~ 63Hz

Typical value: AC220V 50HZ

Power consumption: No-load power consumption <15W

Operating temperature: 0°C —60°C

Storage temperature: -20°C—80°C

Operating humidity: 20%—95%

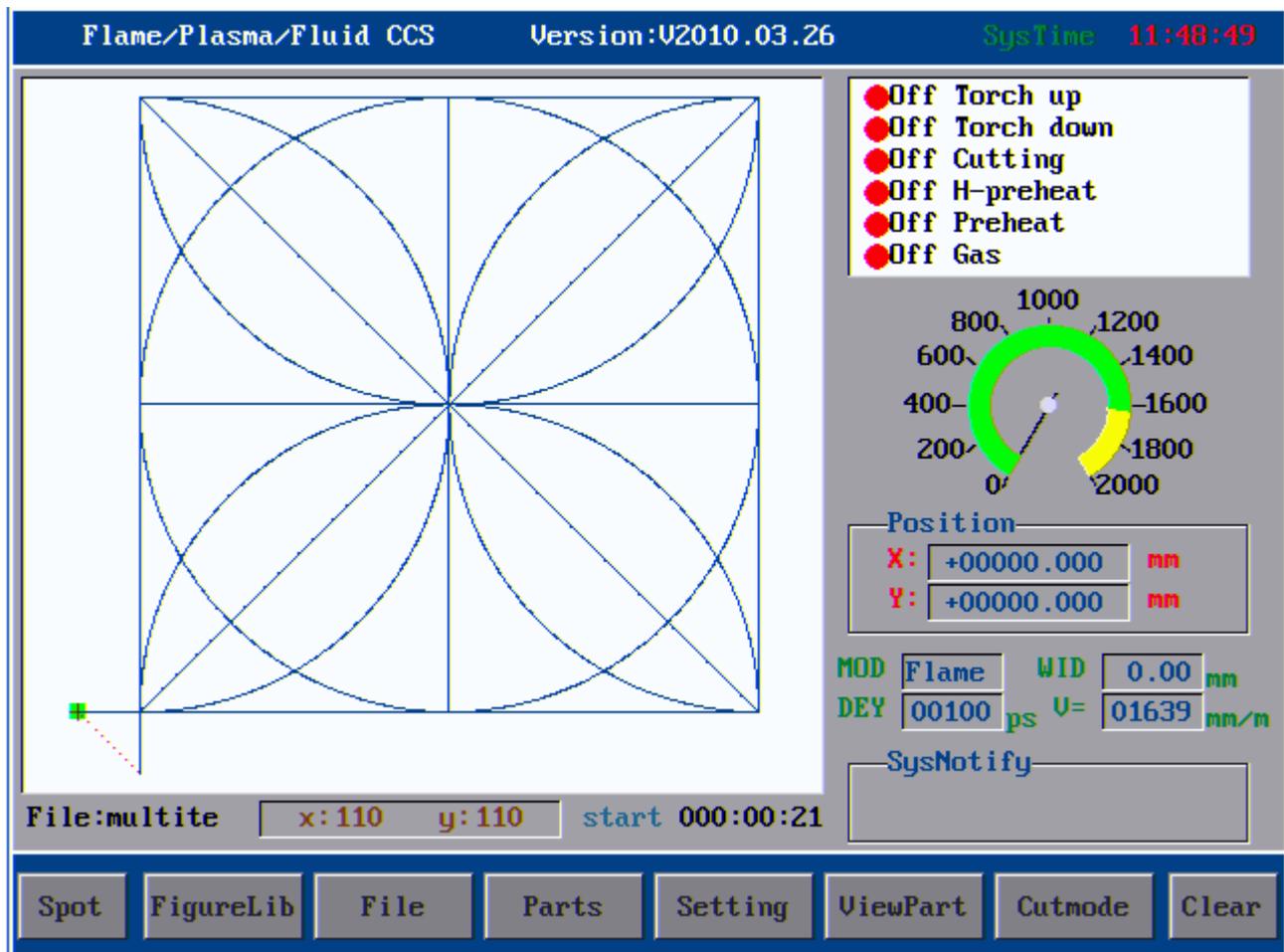
Storage humidity: 0%—95%

Chapter II Quick Start

This chapter will introduce the quick start to guide you to master basic skill in a short time. Included with basic processes of software operation, this chapter is not going to introduce why and how, for these will be mentioned in other chapters. For the operations, you should just follow the processes in this chapter. If you want to know every skill and detail, it is required to read through this user manual.

Ø Quick settings of parameters

HC6500 flame cutting control system will show the following start-up interface once started, which is also the main interface of system processing. For detailed functions, please refer to the future chapters.



Operation processes are demonstrated as follows:

Before processing, it is required to check the parameter settings and system. To set all basic parameters, you can press function key  in the main interface to enter parameter setting interface as follows:

| Flame/Plasma/Fluid CCS | | Version:U2010.03.26 | | SysTime 11:49:04 | |
|-------------------------------------|--|---|---|---|---|
| Cutset | | | | | |
| Measure | | | | | |
| Measure X | <input type="text" value="00000.000"/> | mm | Y | <input type="text" value="00000.000"/> | mm |
| MOD | | | | | |
| Cutmode | <input type="text" value="Flame"/> | M07 | <input type="text" value="Default"/> | M08 | <input type="text" value="Default"/> |
| Speed | | | | | |
| LimitSpeed | <input type="text" value="02000"/> | mm/mn | | | |
| Compensate | | | | | |
| SlotCompen | <input type="text" value="00.00"/> | mm | S-cpst | <input type="text" value="00.00"/> | mm |
| | | | | | |
| <input type="button" value="Home"/> | <input type="button" value="Cutset"/> | <input type="button" value="Cutstyle"/> | <input type="button" value="Advanced"/> | <input type="button" value="SysManag"/> | <input type="button" value="SysDiagn"/> |
| | | <input type="button" value="Save"/> | <input type="button" value="Return"/> | | |

You can set the parameters one by one in this interface according to the requirements. Pressing  on the

key panel is to select the parameter on which the cursor is located. Here we will explain these parameters respectively:

Board size: It is set to ensure that the cutting torch would not exceed the steel plate during the cutting. This parameter should be set if you use controller to load material by figure. If it is set to be 0, the system would not have restriction on the relation of steel plate size and cutting figure. Here we set X and Y both as 0.

Cutting mode: Plasma cutting and flame cutting are available at the moment. Here we set it as flame cutting.

M07, M08: It is the cutting process selection. Default refers to the default cutting mode provided by the system. If user-defined is selected, you can set the cutting processes as you like. Here, we set it as default.

Processing limit speed: It refers to the maximum speed of cutting during the processing. Practical processing speed=Limited speed*Speed percentage. Here we set it as 2000mm/minute.

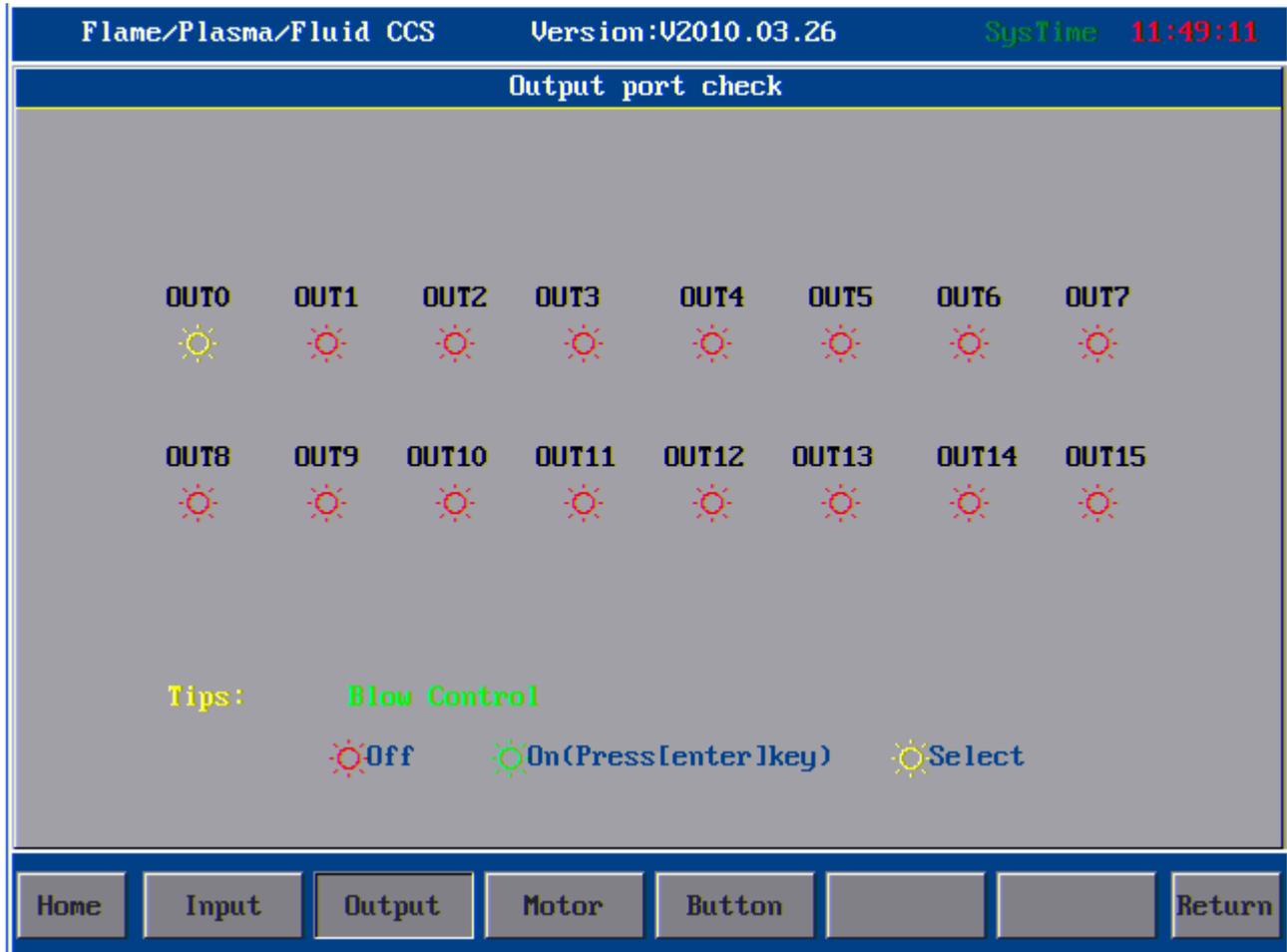
Gap compensation: It refers to the width of cutting gap. Here we set it as 1.5MM. Mark compensation (Not available) is set similar to the gap compensation, whose actual value needs to be measured.

If you want to save the settings once all parameters in the interface have been set, you can press  key, and the system will pop up a prompt indicating “Parameters are saved, press any key to return”. Press any key to return. At this time, the setting of parameters in main interface is finished.

Ø Quick I/Q Test

Next, we are going to test the system I/O. Press the  key in cutting setup interface to enter the interface of system diagnosis.

The following picture shows the interface of **output port diagnosis**:



In this interface, you can press  to move the cursor to the relevant output. You can setting Port No. in the “Advanced Setup”. When you choose the Ports, System will auto-remind the Port No. if the Ports had been set.

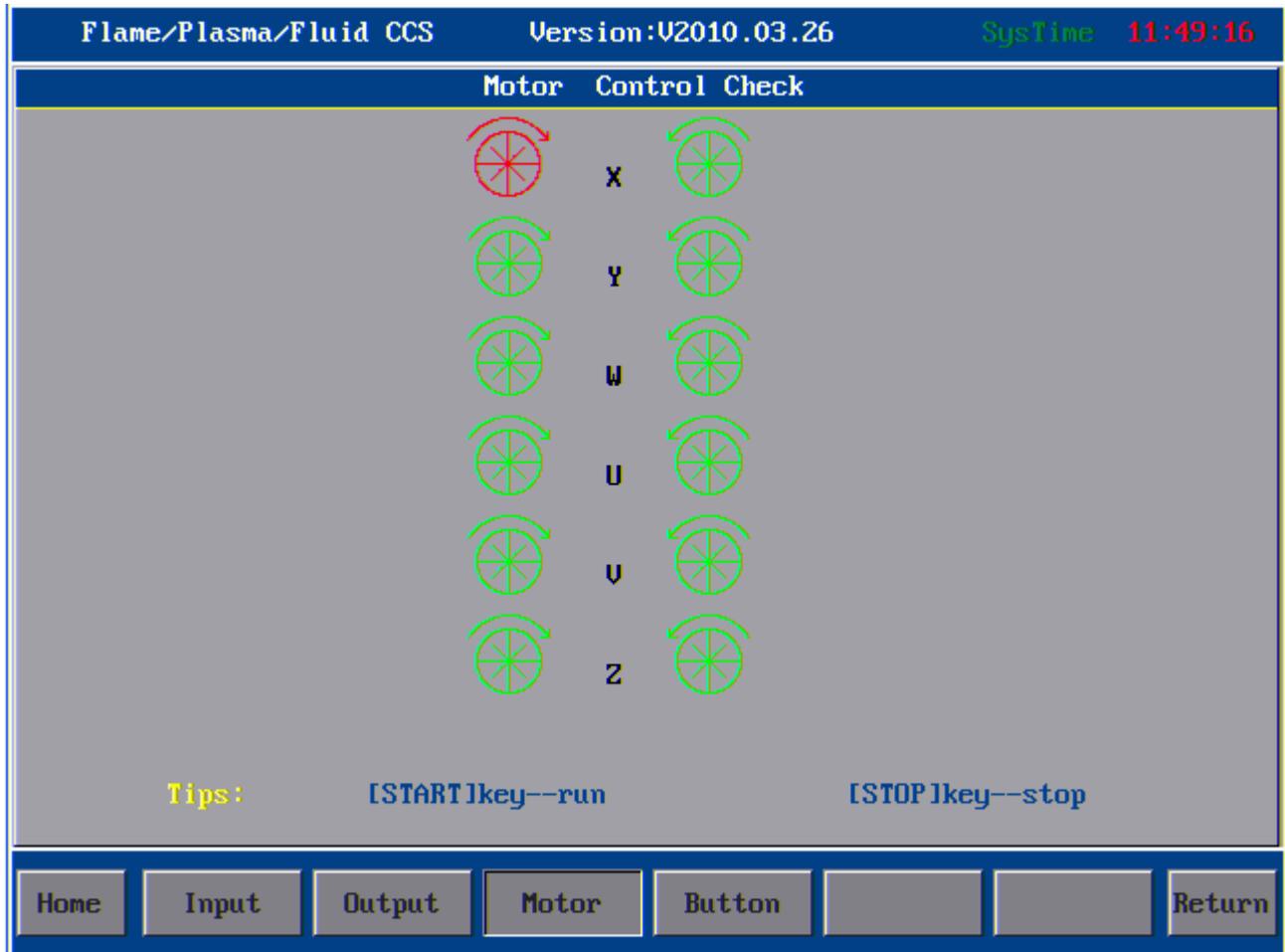
And press  to confirm. If the system wiring is in good condition, there will be a level output in the relevant output of cutter; and if the wiring is wrong, the level will be exported in a wrong output.

The following picture shows the interface of **input port diagnosis**:



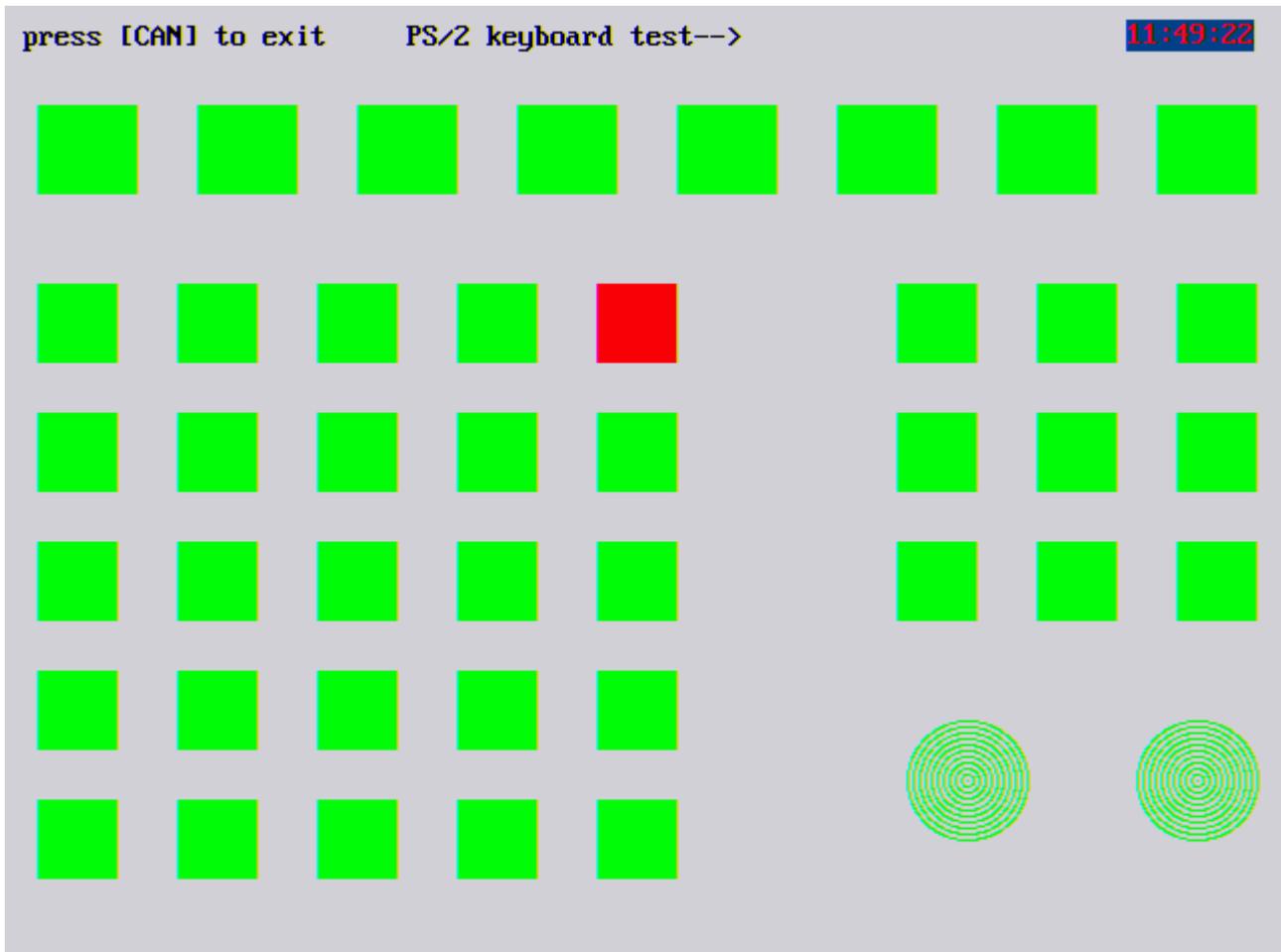
The logic of output is just opposite to that of input. When there is an input, a green analog light will be on in the relevant port indicating that it is closed, as the above picture shows. If the wiring is wrong, it will show the connection info in the wrong position.

Motor diagnosis: It is to check whether the wiring of motor is correct. The interface is shown as follows:



Press to move the cursor on the corresponding motor axis and press the key, the relevant motor will then receive the command and start rotating; CW (clockwise) is representative positive direction . If the rotation direction is wrong, you should change the wiring of this axis until there is no problem any more.

Key test: It is to check whether the system key is in good condition or not. The interface is shown as follows:

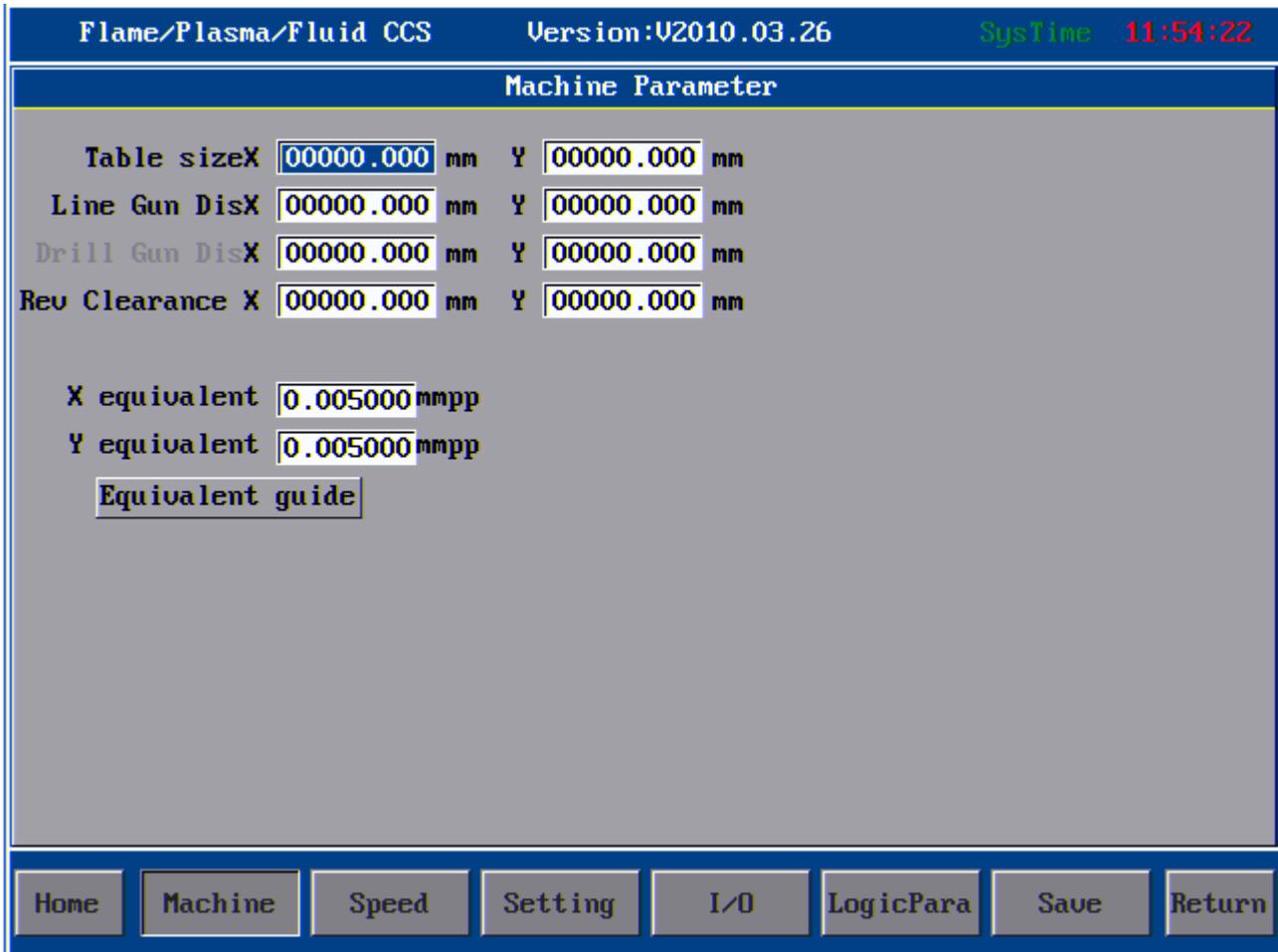


There will be a response relatively on the interface if you press a key on the panel. If there is no response when you press a key, it means this key is out of order.

Until now, the diagnosis of system I/O is finished.

Ø Speed setup

If the system wiring and diagnosis are in good condition, you can press  key to exit the cutting setup interface. You can press  key to enter the advanced setup. Input password “360” and press the  key to enter the interface of password parameters as follows:



The above is the interface of system parameter setup. Here, only direction clearance needs to be set, other parameters adopt the default value. If the system does not have clearance, for example the new machine, it can be set as 0. Here we set X and Y both as 0, the details introduction of impulse equivalent setting is in the behind section of advanced setup and press **F7** key to save the parameters. After that, you can press **F9** to set the speed parameters as follows. You just need to set the start-up speed, acceleration of 1st section, processing limit speed (the same as that in the main interface of parameter setup), manual limit speed (maximum speed for manual operation), creep speed, and plasma HI/LO speed. The start-up speed and acceleration of 1st section should be set time and time again until the machine has least or no vibration, and at the same time they should meet the demand of cutting processes. Here we set the start-up speed as 400mmpm, and the acceleration of 1st section as 50mG. See picture as below:

| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 11:54:46 | |
|------------------------|--------------------------------------|---------------------|--|------------------|--|
| System setting | | | | | |
| Axis | <input type="text" value="X≠Y≠Z"/> | Manual | <input type="text" value="Self lock"/> | | |
| Cutstyle | <input type="text" value="Three"/> | Language | <input type="text" value="English"/> | | |
| Time | <input type="text" value="SysTime"/> | Inch | <input type="text"/> | | |
| KeyStyle | <input type="text" value="Shift"/> | Help set | <input type="text" value="Copy lcd"/> | | |
| FireStyle | <input type="text" value="All"/> | Other Set | <input type="text"/> | | |

Home Machine Speed **Setting** I/O LogicPara Save Return

After the setup, you can press to save the data, and then press to set other settings of system as follows:

| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 11:55:04 | |
|---|------------------------------------|---------------------|------------------|----------------------------------|--------|
| Flame Control | | | | | |
| Fire delay | <input type="text" value="00100"/> | psec | Firer | <input type="text" value="On"/> | |
| H-preheat delay | <input type="text" value="00000"/> | psec | Preheat maintain | <input type="text" value="On"/> | |
| Preheat delay | <input type="text" value="00100"/> | psec | Multi-perforated | <input type="text" value="Off"/> | |
| Punch hole delay | <input type="text" value="00100"/> | psec | | | |
| Crawl delay | <input type="text" value="00000"/> | psec | | | |
| Torch up delay | <input type="text" value="00100"/> | psec | | | |
| Torch down delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch up delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch down delay | <input type="text" value="00100"/> | psec | | | |
| Cutting stop delay | <input type="text" value="00000"/> | psec | | | |
| Blowing delay | <input type="text" value="00000"/> | psec | | | |
| press [SHIFT] key to switch column Press [Manual] key to view the timing diagram | | | | | |
| Home | Flame | Plasma | WaterJet | | |
| | | | | Save | Return |

We take the parameters above as defaults.

Until now, the setting of speed parameter and related parameters is finished.

Ø Quick process setup

Back to the main interface after the above settings, and press to go to the process setup interface as below to set the process parameters. Flame cutting and plasma cutting processes are available (Water cutting is a system reserved option, and is not available for the moment).

Flame:

| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 11:55:08 | |
|---|------------------------------------|---------------------|---------------------|----------------------------------|-------------|
| Plasma Control | | | | | |
| Blowing delay | <input type="text" value="00000"/> | psec | ArcU detect | <input type="text" value="Off"/> | |
| Punch hole delay | <input type="text" value="00100"/> | psec | Gun height enable | <input type="text" value="Off"/> | |
| Crawl delay | <input type="text" value="00000"/> | psec | Init-local | <input type="text" value="Off"/> | |
| Cutting stop delay | <input type="text" value="00000"/> | psec | Torch up with punch | <input type="text" value="Off"/> | |
| Porch local up delay | <input type="text" value="00000"/> | psec | | | |
| Torch up delay | <input type="text" value="00100"/> | psec | | | |
| Torch down delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch up delay | <input type="text" value="00000"/> | psec | | | |
| Start arc delay | <input type="text" value="00100"/> | psec | | | |
| Dis befor close-up | <input type="text" value="00000"/> | mm | | | |
| press [SHIFT] key to switch column Press [Manual] key to view the timing diagram | | | | | |
| Home | Flame | Plasma | WaterJet | | Save Return |

Plasma:

| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 11:55:08 | |
|---|------------------------------------|---------------------|---------------------|----------------------------------|-------------|
| Plasma Control | | | | | |
| Blowing delay | <input type="text" value="00000"/> | psec | ArcU detect | <input type="text" value="Off"/> | |
| Punch hole delay | <input type="text" value="00100"/> | psec | Gun height enable | <input type="text" value="Off"/> | |
| Crawl delay | <input type="text" value="00000"/> | psec | Init-local | <input type="text" value="Off"/> | |
| Cutting stop delay | <input type="text" value="00000"/> | psec | Torch up with punch | <input type="text" value="Off"/> | |
| Porch local up delay | <input type="text" value="00000"/> | psec | | | |
| Torch up delay | <input type="text" value="00100"/> | psec | | | |
| Torch down delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch up delay | <input type="text" value="00000"/> | psec | | | |
| Start arc delay | <input type="text" value="00100"/> | psec | | | |
| Dis befor close-up | <input type="text" value="00000"/> | mm | | | |
| press [SHIFT] key to switch column Press [Manual] key to view the timing diagram | | | | | |
| Home | Flame | Plasma | WaterJet | | Save Return |

All parameters of flame/plasma process should be set considering various factors including field situation, thickness of steel plate and board, etc. We will discuss these matters in the coming chapter.

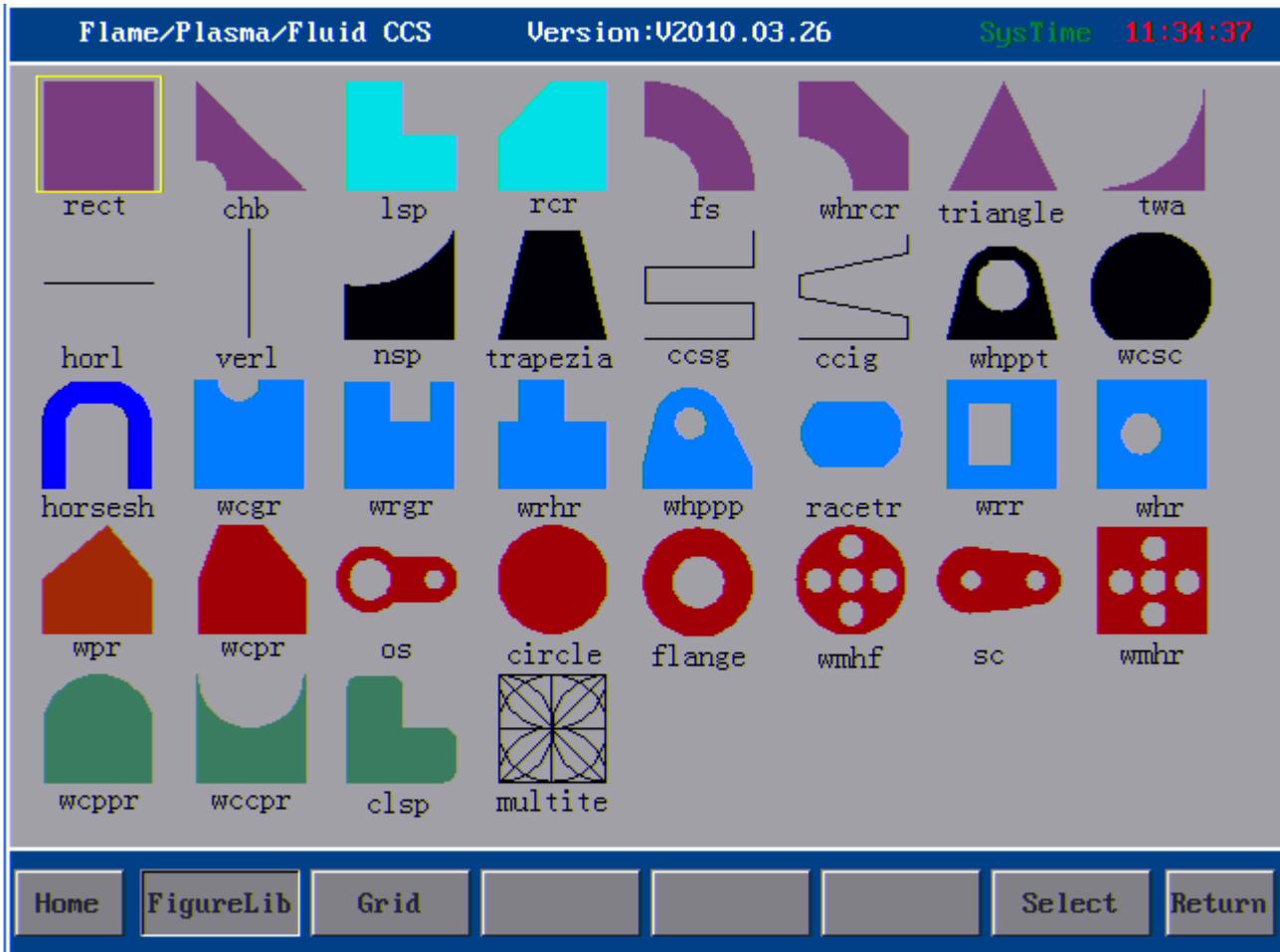
The setting of relevant process parameters is finished.

Ø Quick load of file for processing

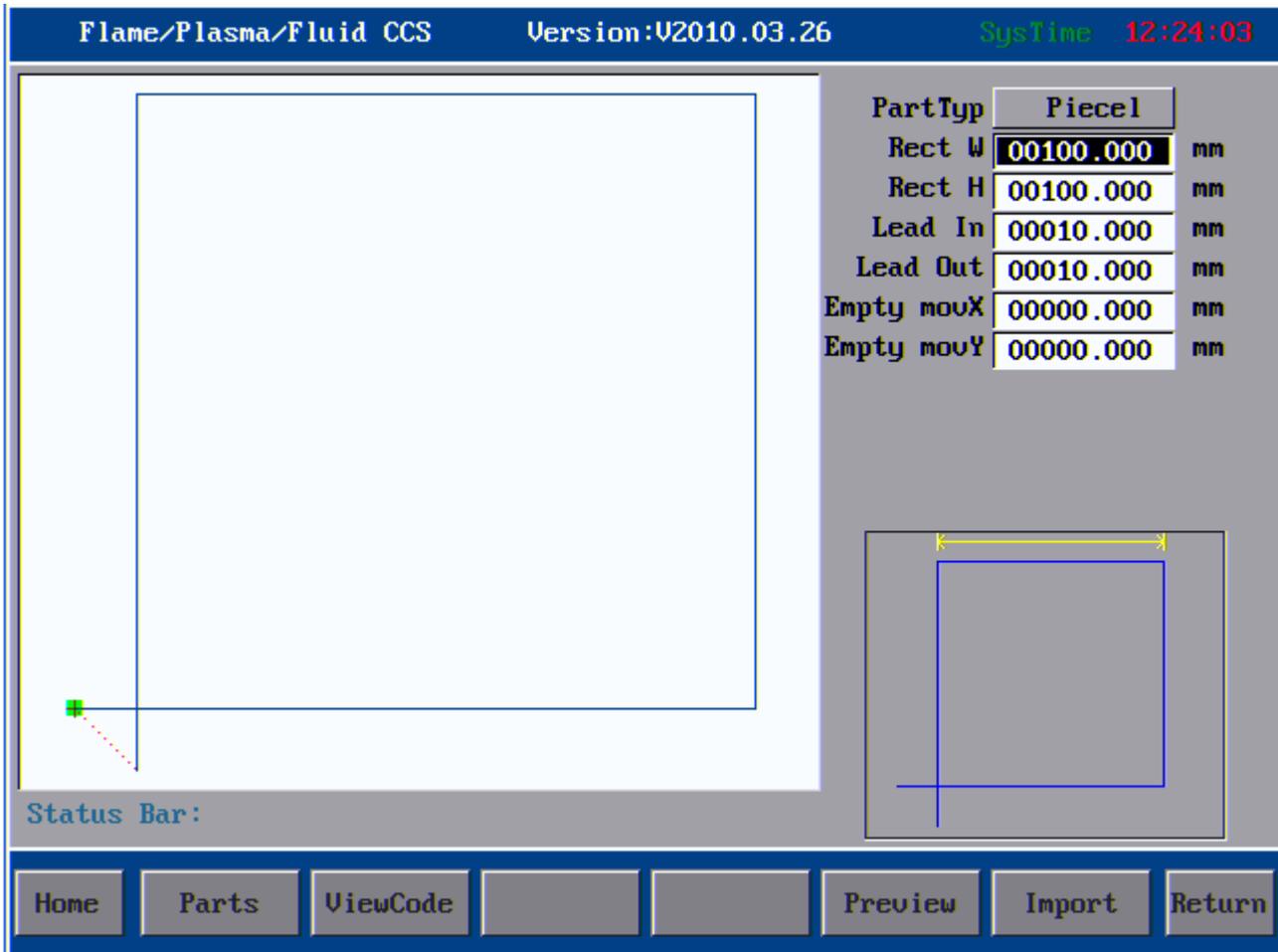
Three manners are available:

Manner 1: Load processing file from graphic library

Press in main interface to enter the interface of graphic library as follows:



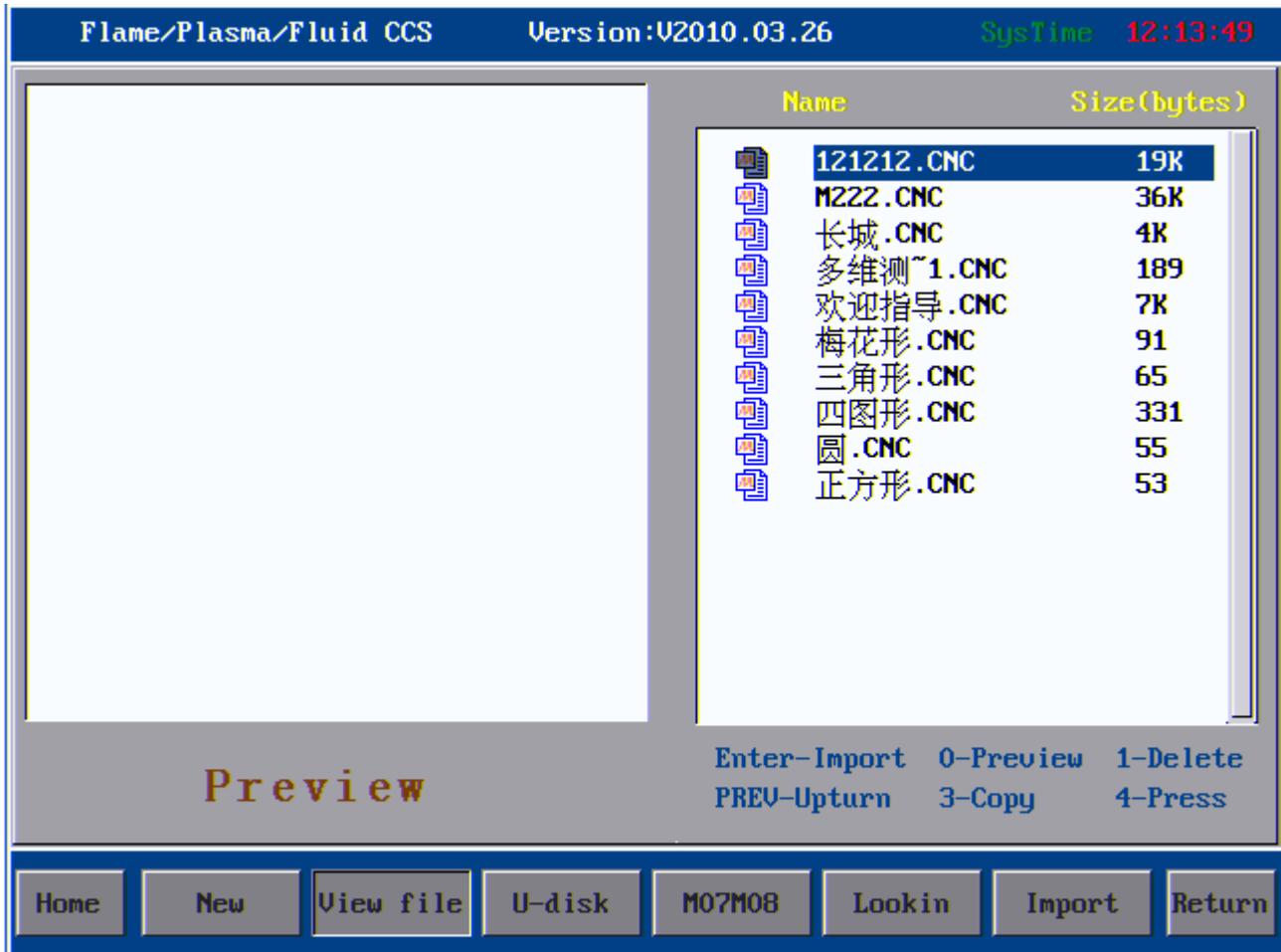
There are 35 applicable figures and 1 figure for testing in the figure interfaces. Press  key, and the cursor will be moved to the corresponding figure. If you want to process a rectangle, you can move the cursor to rectangle figure and press  or  key to confirm. Then, the system will be switched to parameter setup interface of rectangle as the following picture:



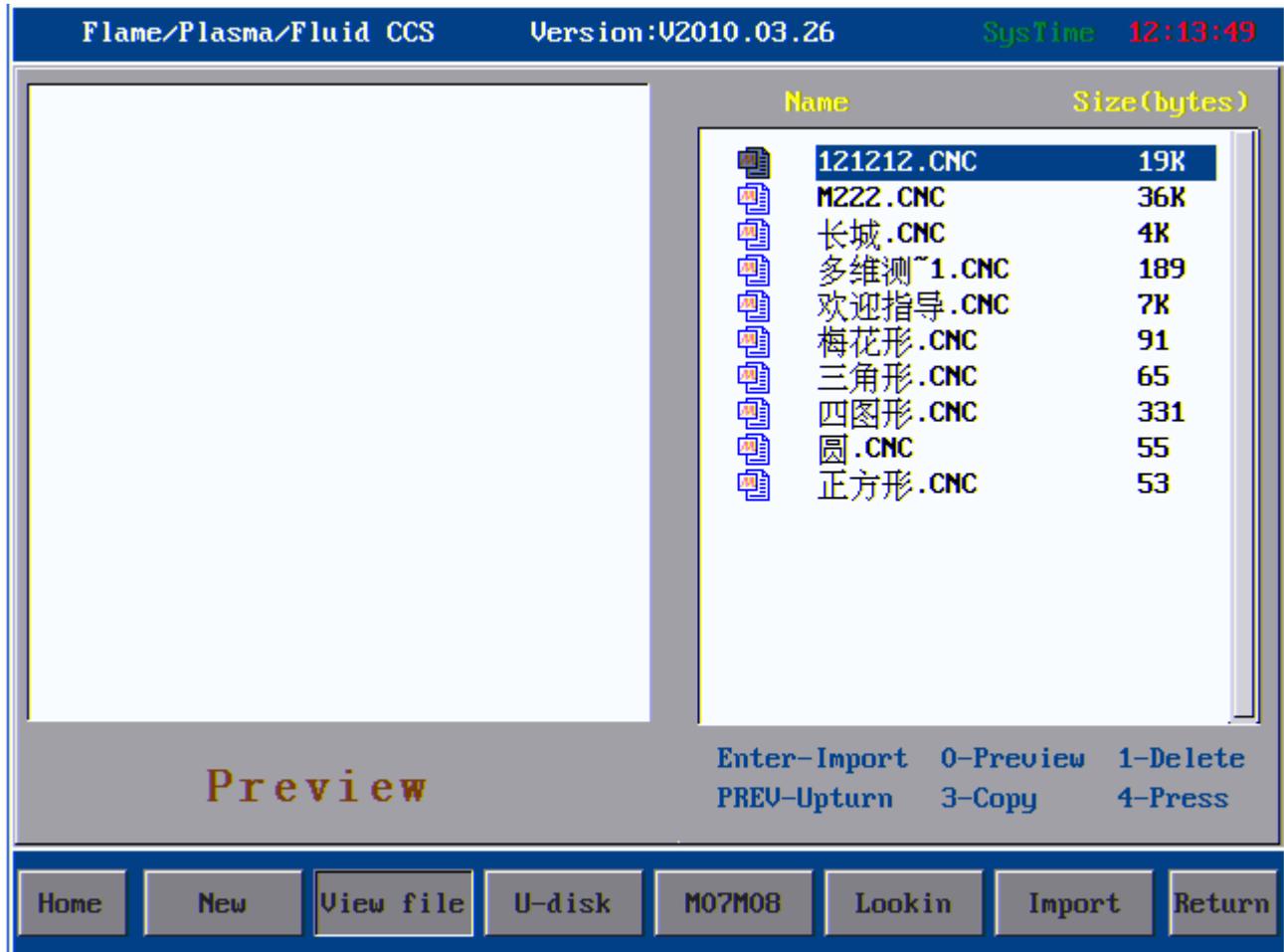
The above is the parameter setup interface of rectangle. When you have set the width, height part and type part, you can press **F6** to preview the figure. If the figure is confirmed correct, you can press **F7** to import the figure and the system will return to the main processing interface automatically. Press the start key in flame cutting mode to start the flame cutting, or in plasma cutting mode to start the plasma cutting.

Manner 2: Load files from USB disk

First, insert the USB disk contained with processing files into the USB port of controller, and press **F3** in the main interface to enter the file loading interface as follows:



Press key in this interface and the system will start reading the USB disk. After a while, the system will display all processing files of USB disk as follows:



You can press key to select in the current page, or key to page up/down. As soon as you have selected the required file, you can press number key “2” to copy it to the control system, and then load this file from the system. (Or you can press key directly to load the file. During this operation, the USB disk needs always to be connected with controller. To avoid bad contact, it is recommended not to do in this way.)

So far, we have finished introducing on how to copy the processing files in USB disk to control system.

Manner 3: Load files from control system

If you have copied files of USB disk to control system, you can then load processing files from the system. In main interface, press to enter file operating interface, and press to select items within page or to page up or down until you have found the processing files. If you are not sure about the file, you can press number key “0” to preview the figure. If you are sure, press key to load the processing file, and the system will jump to the main processing interface to pre-process the processing code. After that, press the start key in flame cutting mode to start the flame cutting, or in plasma cutting mode to start the plasma cutting.

Till now, you have known something about the system, and known how to operate a control system in a basic operation procedure. In the following chapter, we are going to introduce the skills and operating methods in detail.

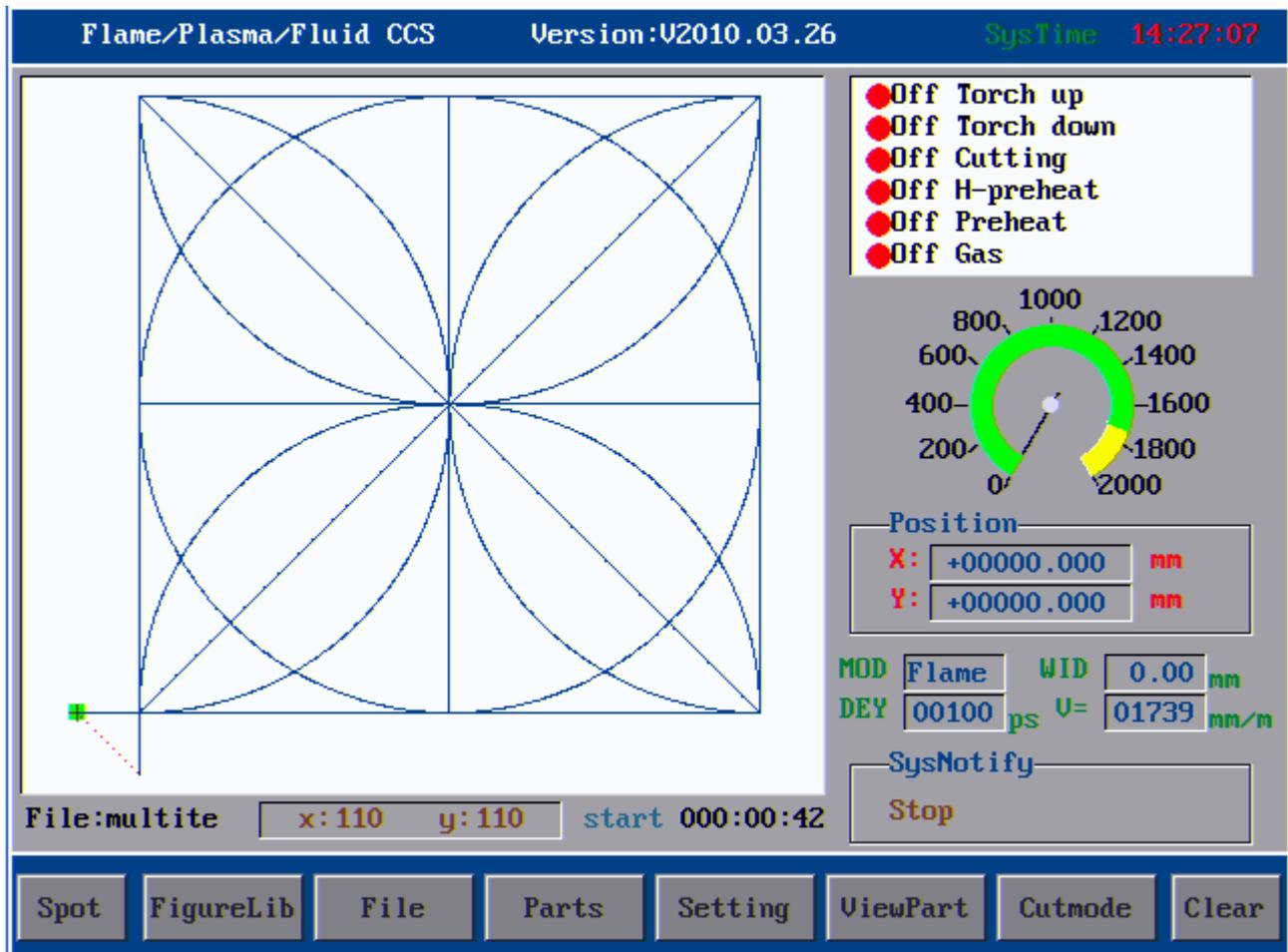
Chapter III System Operating Instructions & Skill

ADT-HC6500 flame/plasma/fluid cutting NCS can be used in machine tool to control flame/fluid or plasma to process the cutting. The system is displayed in the way of window prompt stage by stage. When entering into an interface menu, you can press **F2** **F3** **F4** **F5** **F6** **F7** to select the corresponding function, and press **F1** Key to return to the Main Menu or **F8** key to return to the previous menu.

Ø Auto

Main window

The first interface the system enters into is the main processing interface. As picture shown below:



Main window

Main window is the first window after the start-up, including two parts, menu and current interface function. We are going to introduce the menu and window below.

Break point

If the system encounters power failure during the processing, do not move the cutting torch, you can press break point key (or you need not pressing this key, the system will be restored automatically) to continue processing after the power restoration, reducing and saving the cutting board.

Graphic management

In the graphic management interface, you can select part from graphic library, edit part code, rotate the array of part, set the parameters, and carry out grid edge-sharing cut. For details, please refer to the coming chapter.

File management

In file management interface, you can read files from controller or USB disk, create new file, edit the file, test code, preview figure, and define M07 and M08 instructions. For details, please refer to the coming chapter.

Part options

This option enables you to mirror, rotate, array, calibrate, zoom in/out, and restore the processing part. For details, please refer to the coming chapter.

Setup options

You can press this key to set all control-related parameters, process, and other settings. For details, please refer to the coming chapter.

Partial view

This is to view the partial section of a part. In partial view, you can press  to move the figure up, down, left or right, or you can press the number key on keyboard to view the figure at the corresponding multiple. In overall view, you are going to move the cutting torch up, down, left or right if you press  key. In addition, other four direction moving functions  are extended. Number key is not available in overall view. For other application, please refer to the coming chapter.

Cutting mode

This is to switch the cutting mode. Currently, three cutting processes (flame cutting, plasma cutting and preview) are available.

Interface explanation

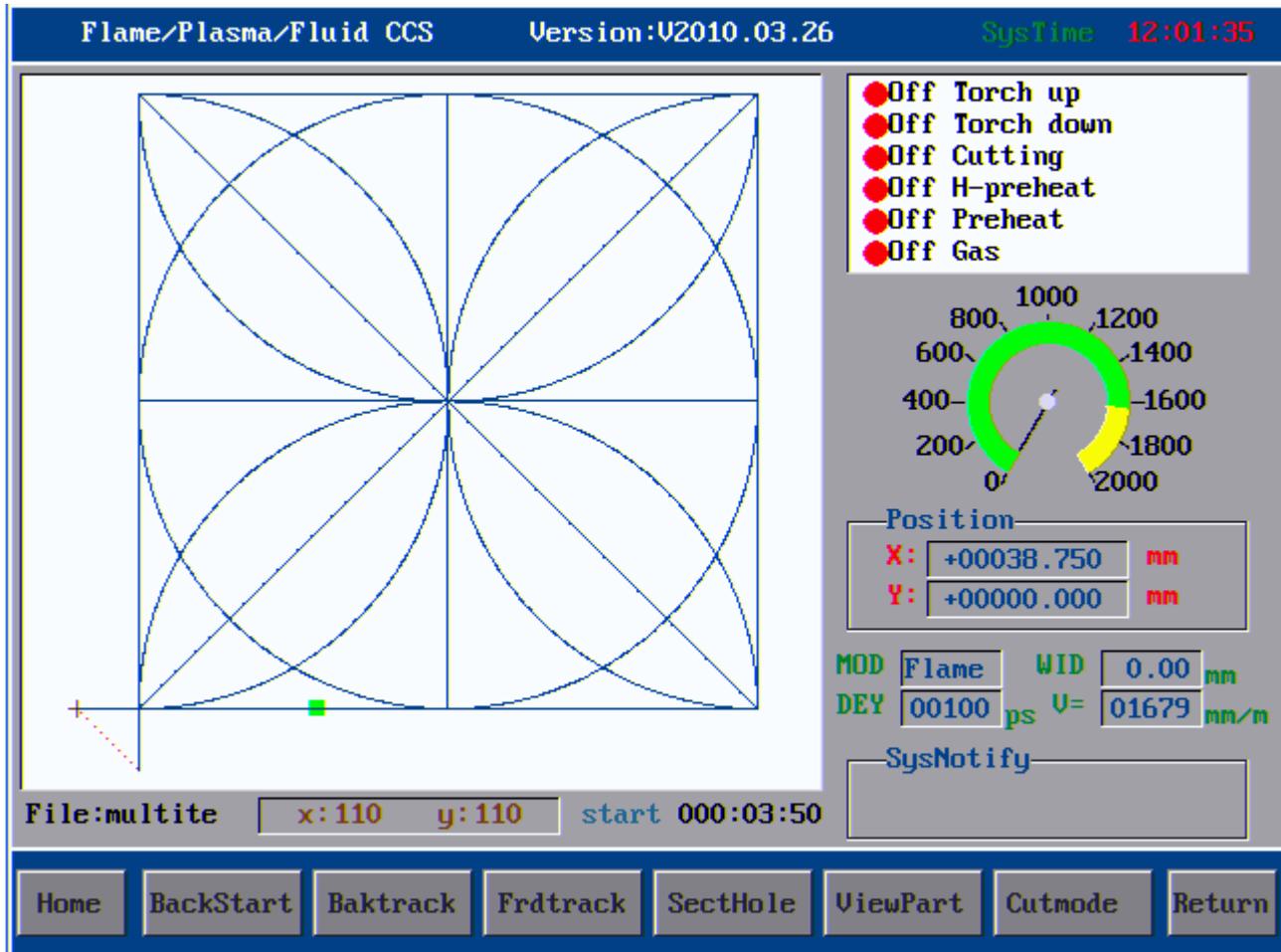
1. In preview interface, there will be a cutting figure, the relevant file name of current figure at the left bottom corner, next to which are width and height of part figure in unit “mm”.
2. The top right corner is the output control setting, indicating the control status of flame and plasma output. Red light indicates off, and green light indicates on.

3. Speedometer shows the instant travel speed of the cutting torch. The maximum value is the limited value of processing speed.
4. Position coordinate: It shows the relative coordinate of current position to origin.
5. Cutting mode: Flame, plasma, and preview are available. Gap: It indicates the current gap compensation value. Delay: It refers to delay during the cutting, such as preheating delay. Speed: Set the processing speed.
6. System prompt: Show all the current states.
7. Duration time shows the total time of your current application. The system time refers to the normal time.
8. You can set the speed, pre-heating time in the main interface. To do this, press  in main interface in standby mode, the cursor will jump to speed setup window when you can then set the speed and pre-heating delay. After the setting, press this key again, and the system will verify the rationality of parameter and save the data.

Note: The speed parameter is calculated in a certain rule according to the parameters you set, and the rationality of parameters is verified. If the speed parameter does not meet the system requirement, the system will adjust it according to your set value, which as a result that your set parameter may be different from the actual value. This is normal. You can also press  key to set the speed parameter by adjusting the speed percentage. Delay parameter can also be set in parameter setting other than in this way. This will be introduced in the coming chapter.

Pause

Another interface shows as you press pause key:



Interface after you have pressed pause key

Back to origin

Press this key, and the cutting torch will return to the processing starting point (relative origin of coordinates).

Back along route

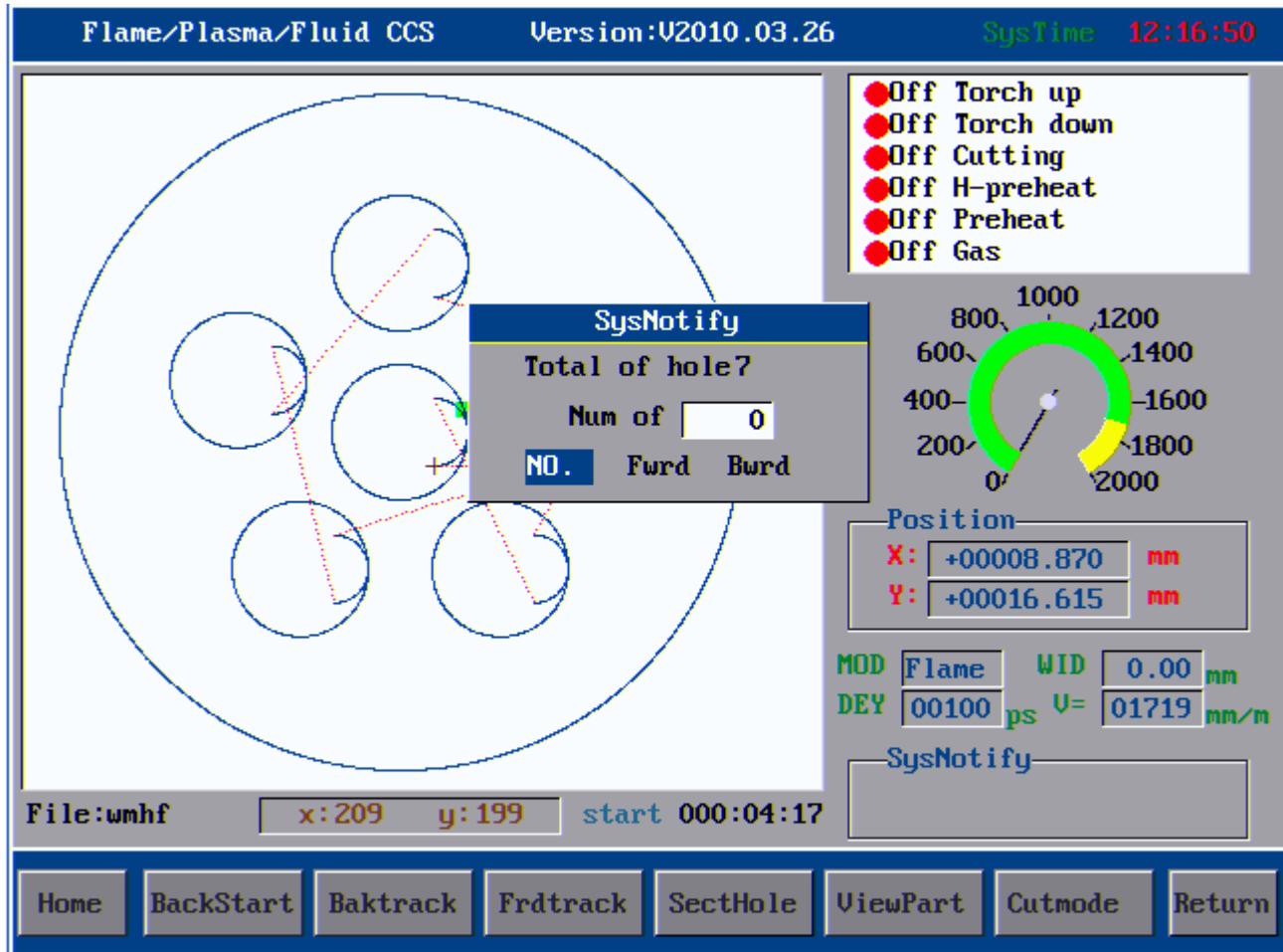
Return to processing starting point along the route. If you press  key or press this key again, the motion will be stopped or suspended.

Forward along route

Travel forward along the route. If you press  key or press this key again, the motion will be stopped.

Choose perforating point

Choose the perforating point, number of back-off perforating point, number of forwarding perforating point, and the number of perforating point selected following the SN. See picture as follows:



Choose perforating point

The above interface is to choose the numbers of perforating points. You can press key to choose from “SN”, “Forwarding”, and “Back-off”. Input the data and press key, the system will prompt to choose “Cutting torch located at origin” or “Cutting torch located at current point”. At this time, you can move the cursor to select the related option to choose the perforating point.

Note: “Cutting torch located at origin”—indicating the cutting torch is located at origin. When you have chosen the perforating point, the cutting point and cutting torch will be moved to the selected perforating point.

“Cutting torch located at current point”—indicating the cutting torch would stay at the current position. When you have chosen the perforating point, the cutting torch does not move but the cutting point moves. Once you start processing or other operations, the cutting torch will move forwards or backwards from the current position.

Basic operations

Preview: The system only runs X and Y tracks. The output switches, such as preheating oxygen or gas and cutting control, would not be opened. It is used to preview whether the track and the size of running

steel plate are correct.

Flame: The system is performing the flame cutting.

Plasma: The system is performing the plasma cutting.

In **Partial View** state, you can press  key to move the figure in eight directions, and press 0-9 number keys to zoom in figure at corresponding multiple. In **Overall View** state, you can press these eight keys to move the cutting torch in eight directions. The cutting torch stops when you lift your hands at the inching condition, or when you press this key again or press  key if it is at self-locking condition.

Press  key to increase or decrease the speed percentage by 1% for each time. If you press and hold the key, the speed will be increased or decreased by 1% without stop until you release the key. You can press and hold  key to lift up or drop the cutting torch.

Preheating delay

When you are performing the preheating, the total preheating time and elapsed time will be shown at the right bottom of the interface. If you press  key, the system will stop the preheating and perform the next act. If you press  key, the system will extend the preheating time without limit; and if the preheating time is long enough, you can press  to stop the preheating. If you press  key in the middle of direction keys, the system will save the current preheating time automatically as the future standards.

Clear: It is to set the current position as the reference origin, and you can then see the cursor position of preview window. It is used to get back the coordinate origin and clear the memory position of current processing.

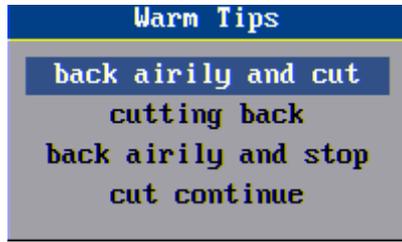
Back to origin: It allows the cutting torch line to get back origin. It can be used to quickly get back to the relative origin. You can press this key if you want to return to origin during the processing, or press  key if you want to stop.

Back along route: Back to origin relative to the straight line. It is a function for the cutting torch to return to the origin along cutting track. It is usually used if you want to return to cut again when the materials are not completely cut, or to get back to origin.

Forward along route: Travel forward along the processing route without performing cutting. It is usually used to skip the current track or preview.

Choose perforating point: It is used to skip one or several perforating points to cut directly.

Start: When the cutting torch is on moving track, you can press  key to start cutting along the track. If the cutting torch is out of track, press  key and a prompt box will be shown as follows:



Press key and the cursor will be moved to option as indicated in picture such as “Idle stroke back and cut”, which means the cutting torch will return to the cutting track automatically and start perforating and cutting. “Cut directly and return” means to perforate at the current position and cut. “Idle stroke back and stop” means the cutting torch will stop when idling traveling to part track. “Continue from the current point” means to cut the next figure from the track you are moving, but the reference point is no longer the original reference point.

Ø Manual

Press key in main interface, and the system will go to manual mode. The state window is as follows:

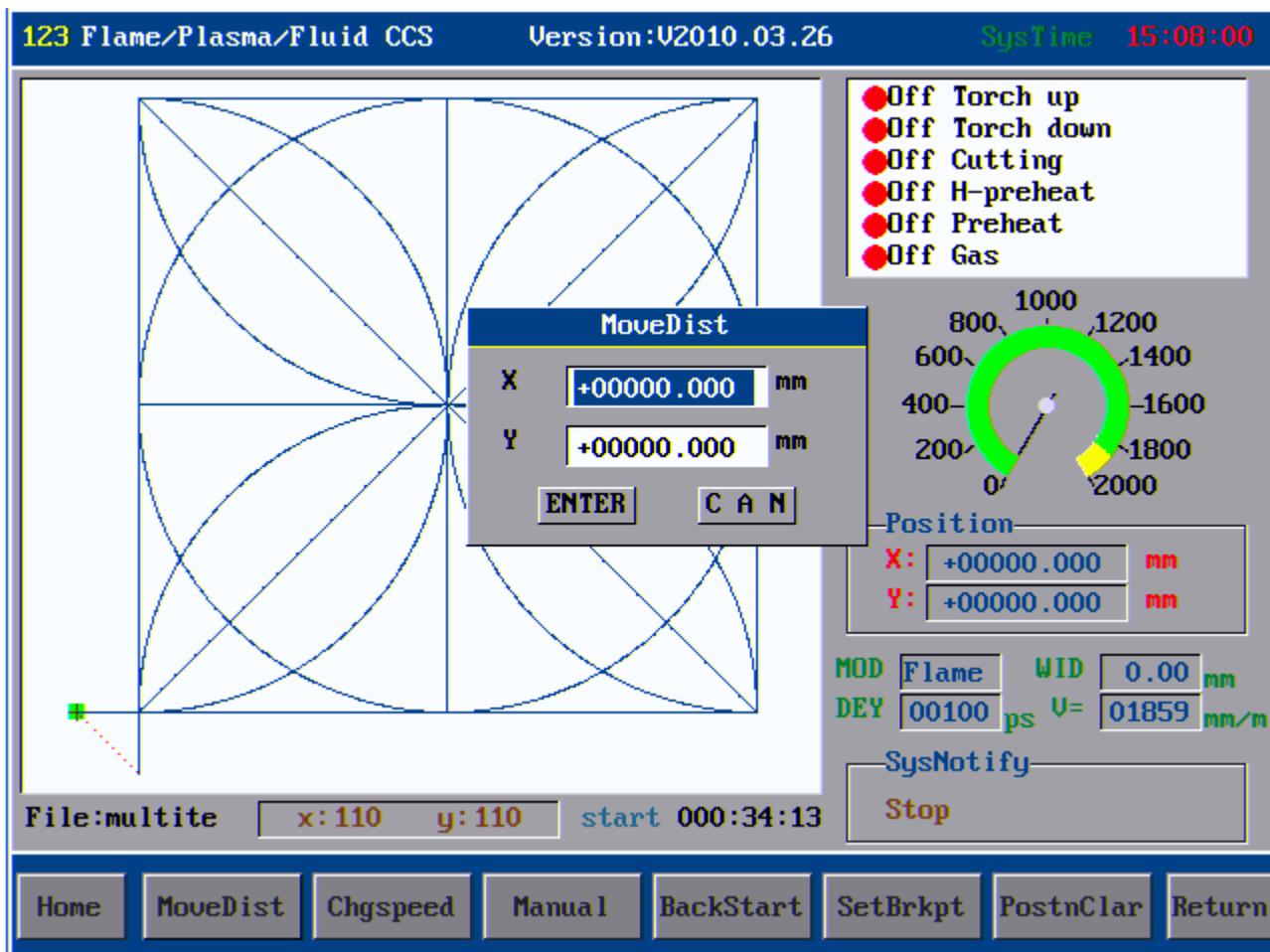
Interface of Manual Operation

Interface explanation

Apart from function keys on the bottom and the manual speed, the interface of manual mode is similar to that of auto mode.

Travel distance

The interface is as follows:



Interface of Travel Distance

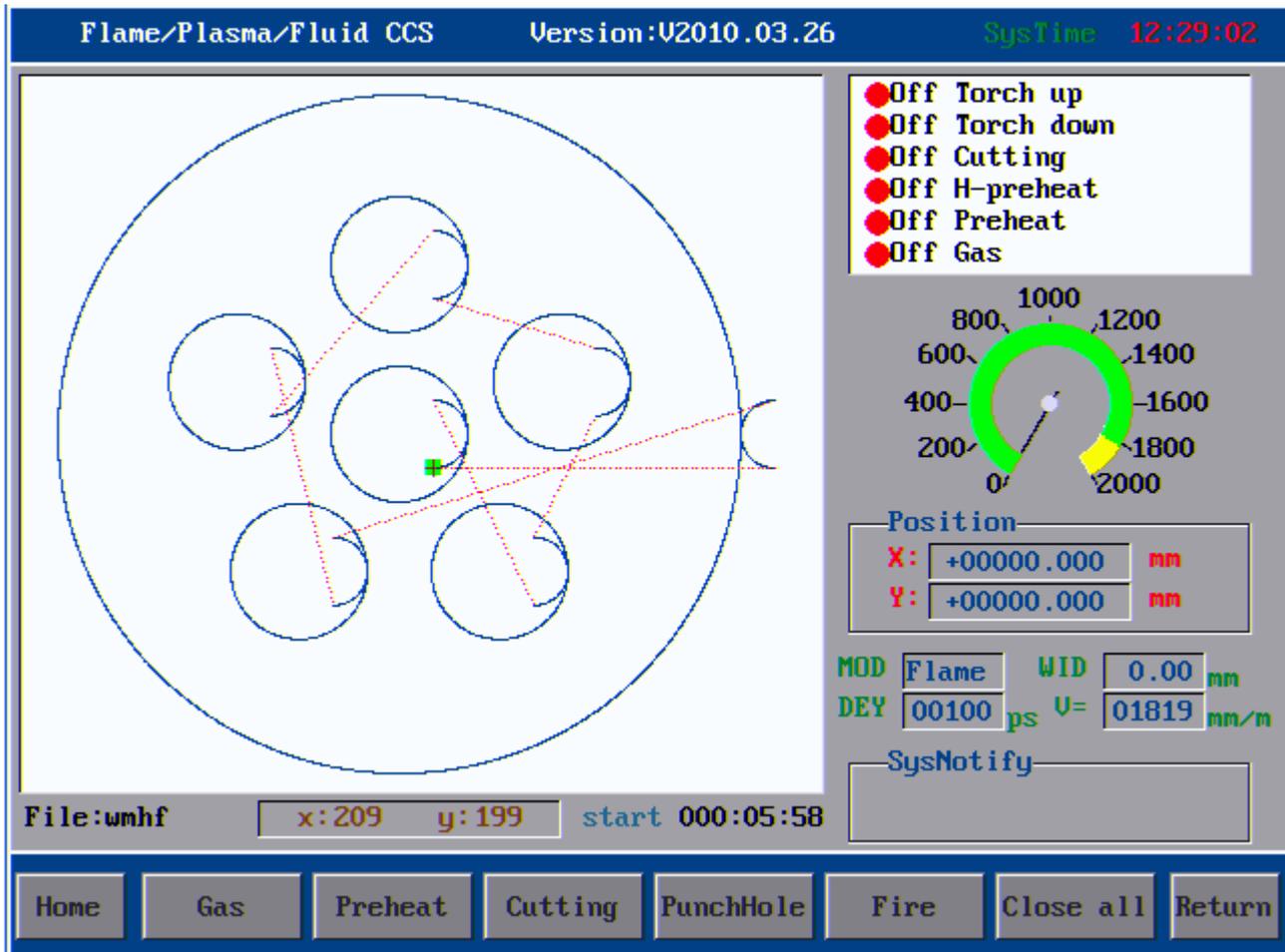
This function is to set the proper moving distance for the cutting torch. Use the number key to set the distance, and press key to confirm, the cutting torch will then travel the corresponding distance.

Speed shift: It is used to change the speed of manual travel quickly, which is divided into three grades, high, medium and low. These grades are defined in the speed settings, ranging at 30%, 60% and 90% of the limited manual speed. You can press key to quickly switch among these three grades.

Note: Because travel speed and the up/down/left/right moving speed in auto mode also use this speed, you have to

set the speed percentage in manual mode interface apart from setting the processing speed in auto mode interface. Generally, the travel speed is faster than the processing speed.

Manual options: It offers options for opening all output ports manually. For example, the corresponding output of cutting control will be opened if you press **F4** key (cutting control), or closed if you press it again. The interface of manual options is shown as follows:



Manual options

Back to origin: Press **F5** in the main interface of manual mode, and the cutting torch will return to reference origin of parts. It is used to get back to origin in auto mode.

Set breakpoint: When you pause in auto processing, enter the manual mode and press **F6** key, the system will save the current track (the current position of cutting torch) as a breakpoint automatically. This breakpoint is saved permanently no matter the machine is on or off. When you start the machine or enter the auto mode again, you can press **F6** key in manual mode to restore the breakpoint as long as the current program has not changed. Once you found the breakpoint, the system will prompt “Breakpoint memory function is enabled”, you can then switch to main interface and press key to go on processing from the breakpoint. This function is similar to the breakpoint function in auto

mode.

Clear coordinate: When you press  key, the X and Y coordinates will be cleared, that is, the current coordinate will be used as the origin. This function is similar to clear function in auto mode.

Basic operations

1. You can press  or  key to increase or decrease the cutting speed. The speed will be increased or decreased without stop if you press and hold the key in standby mode. If you press these keys during the processing, the speed will be increased or decreased by 1% each time.

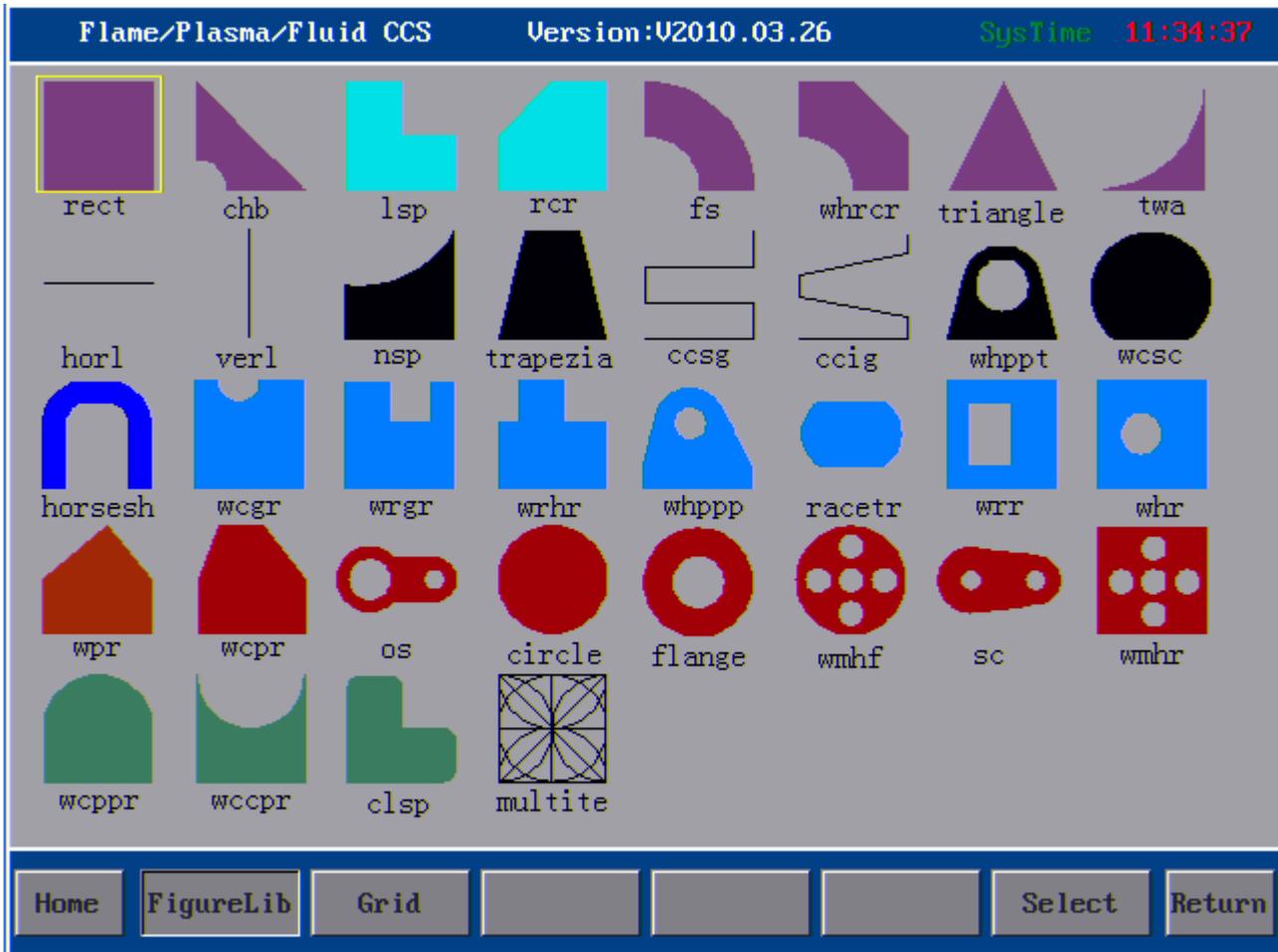
2. Press  or  key, the cutting nozzle will be traveled upwards or downwards. It will stop if you release the key.

3. You can press  to operate the cutting torch in eight directions.

Ø Graphic management

Graphic macro library

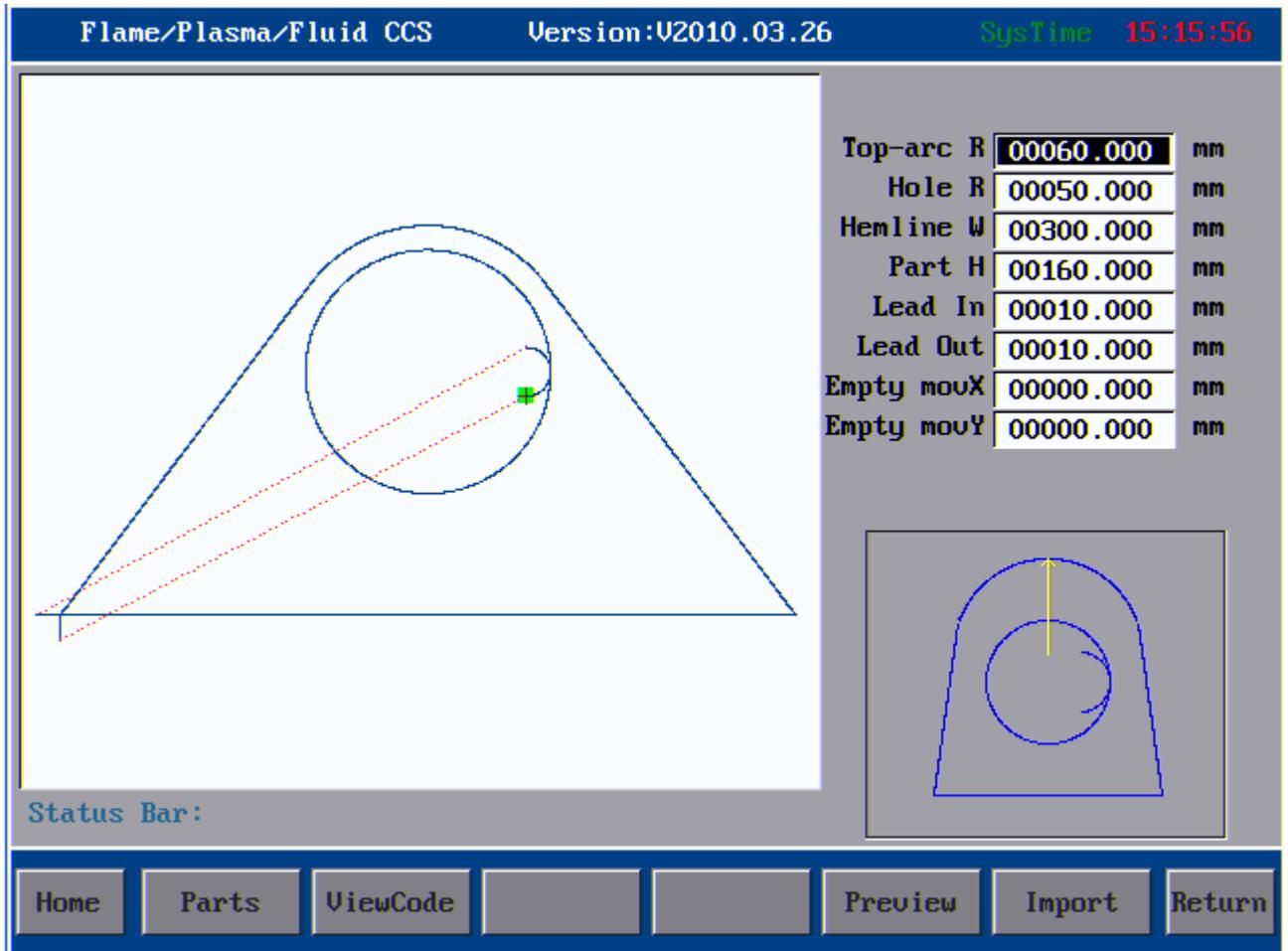
In main processing interface, you can press  key to enter graphic management interface, where there are 35 common figures and one testing figures, as shown below:



Main interface of Graphic macro library

In main interface, you can press **F2** key to enter graphic library interface, where there are 35 part figures and one testing figures. You can press to select the figures. When you have selected the figure, you can press key to set the graphic library.

Here we take a figure as an example as follows:



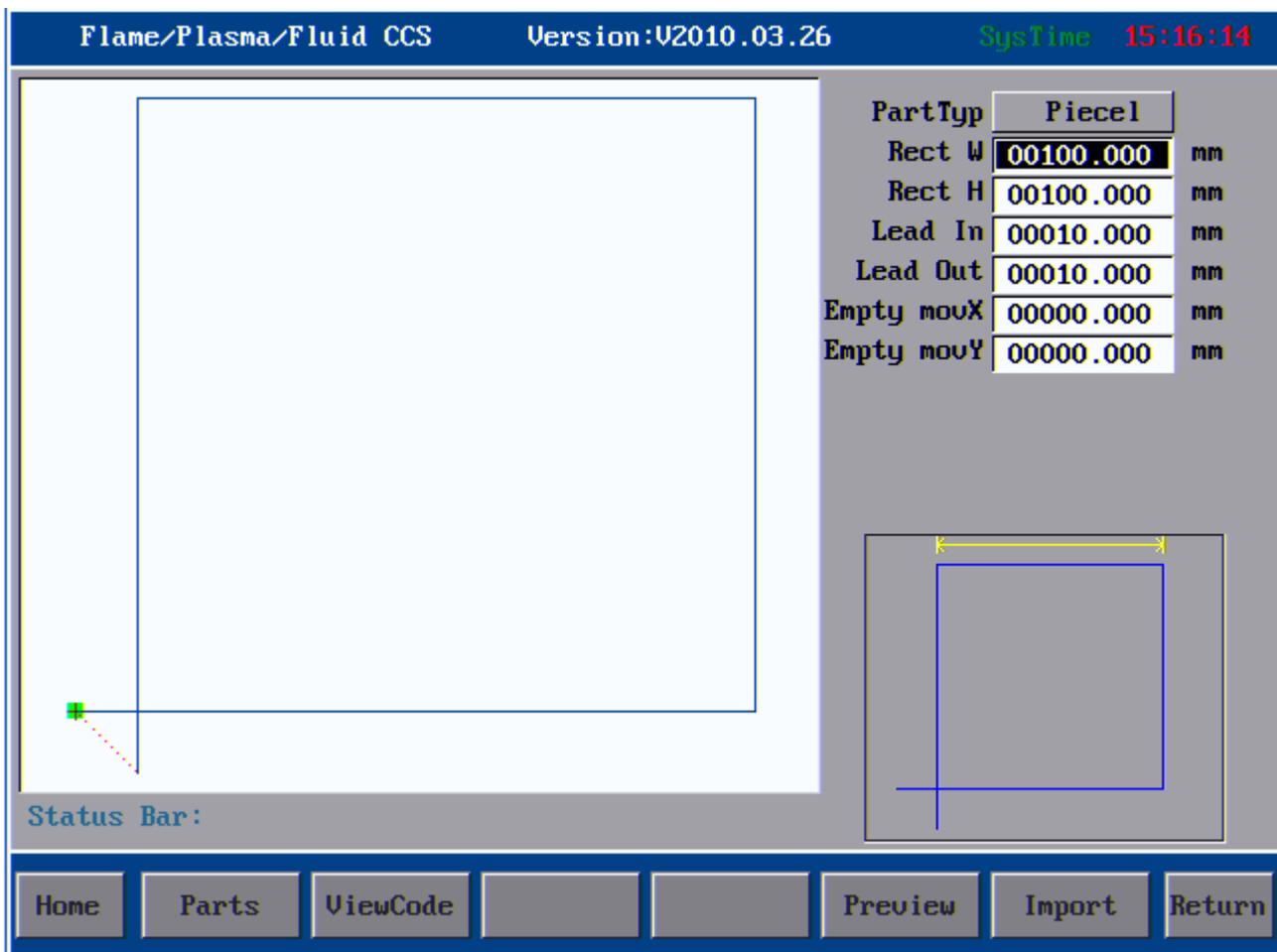
Convex polygon with hole

This figure can be regarded as consisting of half rectangle, an isosceles trapezoid, a section of circular arc, and a circle. Users can get different processing figure by setting different parameters. The radius of the circular hole can be set as zero if the hole is not demanded. If needed, the height of the bottom rectangle can also be set as zero. The radius of the top circle and the height to the center of the circular hole should be larger than the radius of the circular hole.

Press **F6** to preview when you have set the parameter. The system will pop out error information at the right bottom if the parameter is not correct, and reset the parameter. Press **F7** to save the setup if there is no mistake, and save the set processing file in the drive. This processing file can be used directly in the auto interface. If you press **F1** or **F8** key, the processing files in the system would not be changed. Press **F2** key in this interface, you will enter the part options interface where you can rotate the array, rotate or zoom in the figure. If you press **F3** key, you can view the code of this part, and the default file is the current file, on which you can edit, test, and preview figure, etc.

Plate & hole Cutting

Some simply graphs like Rectangular, Triangular, you will find an option “Parts” after you enter to the graph. There are two types cutting way: Plate & hole parts cutting. You can cut a rectangular hole in the big steel plate parts. (Punching inside of Rectangular); you also can cut a rectangular plate in the steel plate (Punching outside of Rectangular); Press changed to “Parts” option, press key is representative you choose it. Then, you will find the behind of parameters of graphic guide is changed, you can press key to confirm or key to preview, if you need preview the effect of parameter graph.



Operation skills

The parameter setup in graphic library is based on features of parts, and has a certain restriction. The radius of the circular hole should not be larger than the radius of the circular arc, and the height from the center of circular hole to the base line of the trapezoid. The length of the bottom line of trapezoid should not be smaller than twice of top arc radius. That is because these figures cannot form a correct figure combination if the parameter exceeds the set range.

Press  key to preview when you have set the parameter. The system will pop out error information if the parameter is out of range, and reset the parameter

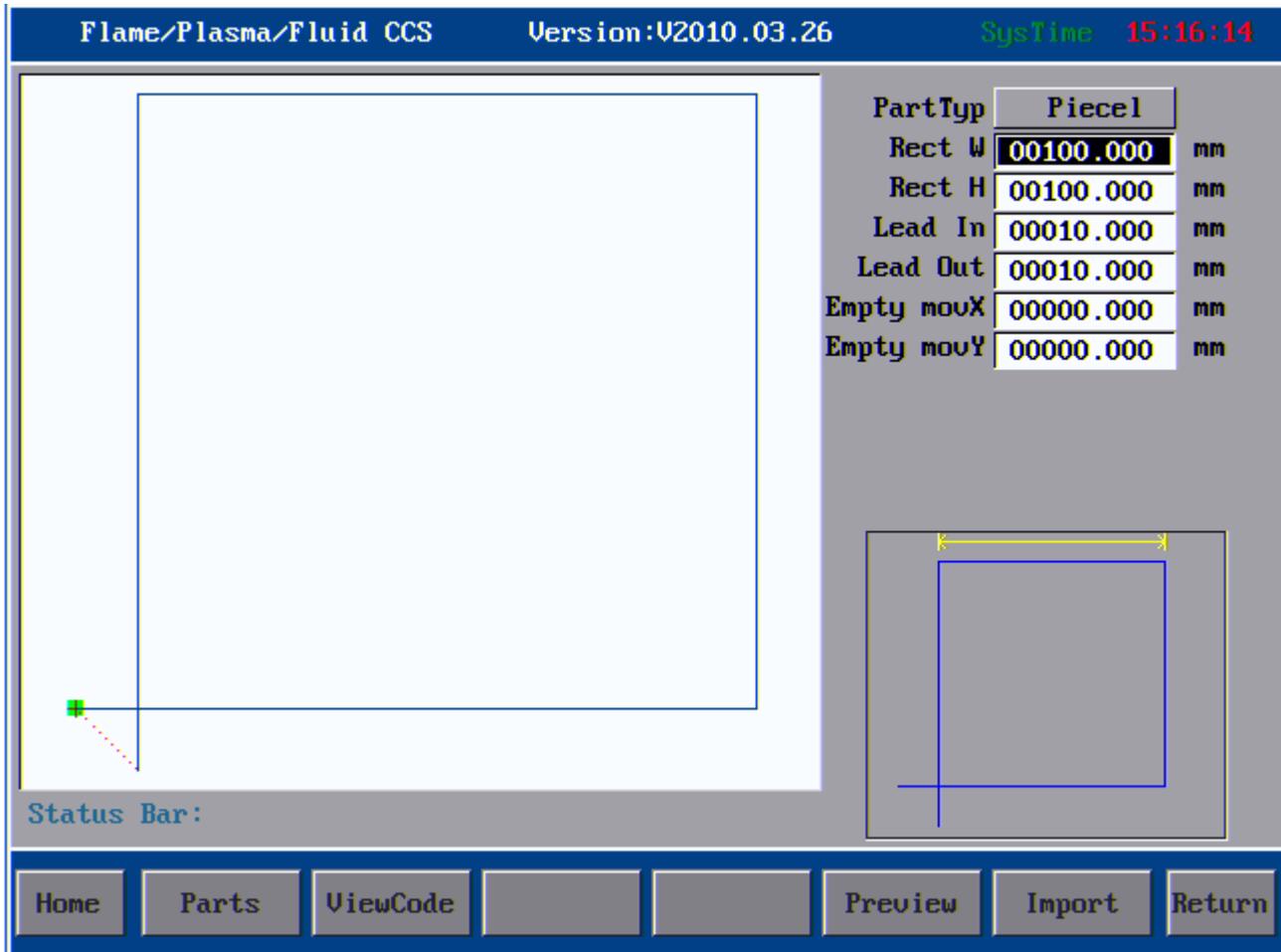
In case of “Convex polygon with hole” setup, we set the radius of the circular hole to be 00100.000 and press , then, the system pops out a dialogue box indicating “Radius of circular arc is too big”, and the parameter is restored to the original value.

“Radius of inlet arc” is added to prevent the perforating from affecting the processing quality at the edge. Some of the figures are inlet line. This is to consider the convenience of operations without affecting the cutting quality. “Idle move X” and “Idle move Y” are available for each figure to make it convenience for the users to set the original position of the cutting gun.

You can press  to delete the last digital number of the current parameter, and press number key to continue to set the parameter. Press  key to clear the parameter, and press  and  to select the setup parameter.

Grid-Cut

Grid-cut is a special type of cutting, also called grid edge-sharing cut, which can save board to the largest extend and the cutting time. Different from other parts, it is usually used to load the square board. The parameter setup and compensation manner are different from normal figure, similar to part array but have some differences with array. You can press  key in graphic management interface to enter grid-cut interface as follows:



As the picture shows:

Grid line—the numbers of rectangle in every column of the grid

Grid column—the numbers of rectangle in every line of the grid

Grid width—Net width of grid (size of rectangle without gap compensation)

Lead wire length—the length of lead-in and lead-out wires; they should be the same.

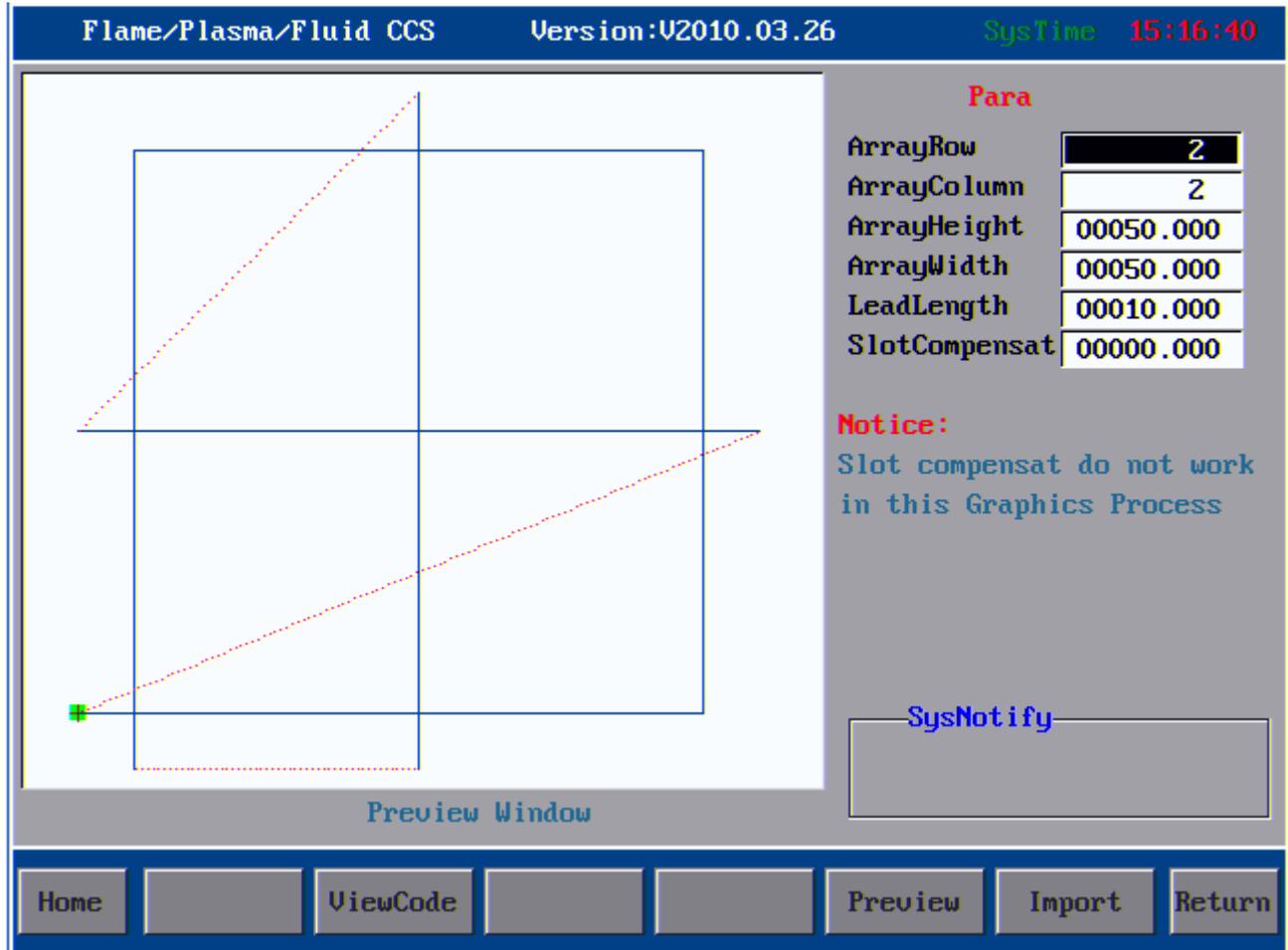
Gap compensation—Grid is a special figure that needs special process, so its compensation is different from that set in the system parameters. Here you we should set the parameters of gap compensation. The compensation in the system parameters is invalid that if you add it with force, the system will report the error. Therefore, users could neglect it if the system shields the compensation parameters automatically.

After the setup, press [Load figure] and the system will return to the main processing interface automatically. You can also press [View code] to view the processing code of current figure. It is the same as figures in graphic library.

Ø File management

Show Content

Press  key in main window to enter the file management interface as follows. The left side is the preview window for figures in current file, and the right side shows the names of processing files. If a file has several pages, you can press   to page up or down.



Interface of File Management

There is prompt info on the right bottom indicating how to operate.

- Load processing:** You can press  or  key to load the current file to processing interface and process.
- Note:** This key does not work when it is pressed under the catalog of folder, HD, or removable drive, for only a file other than a folder or HD can be operated; otherwise, the system will give an error prompt.
- Delete:** Number key “1”; delete the current selected processing files and the entire folder;
- Copy to system:** Number key “2”, copy the processing files or folders to memory of controller;

View content: You can press  key to view G code of selected files, when you can test, save or modify the code. In folder or under the HD root directory, you can press this key to go to the next lower directory.

Preview: You can press “0” to preview the selected figure with G code to see whether the figure is the part you want to load.

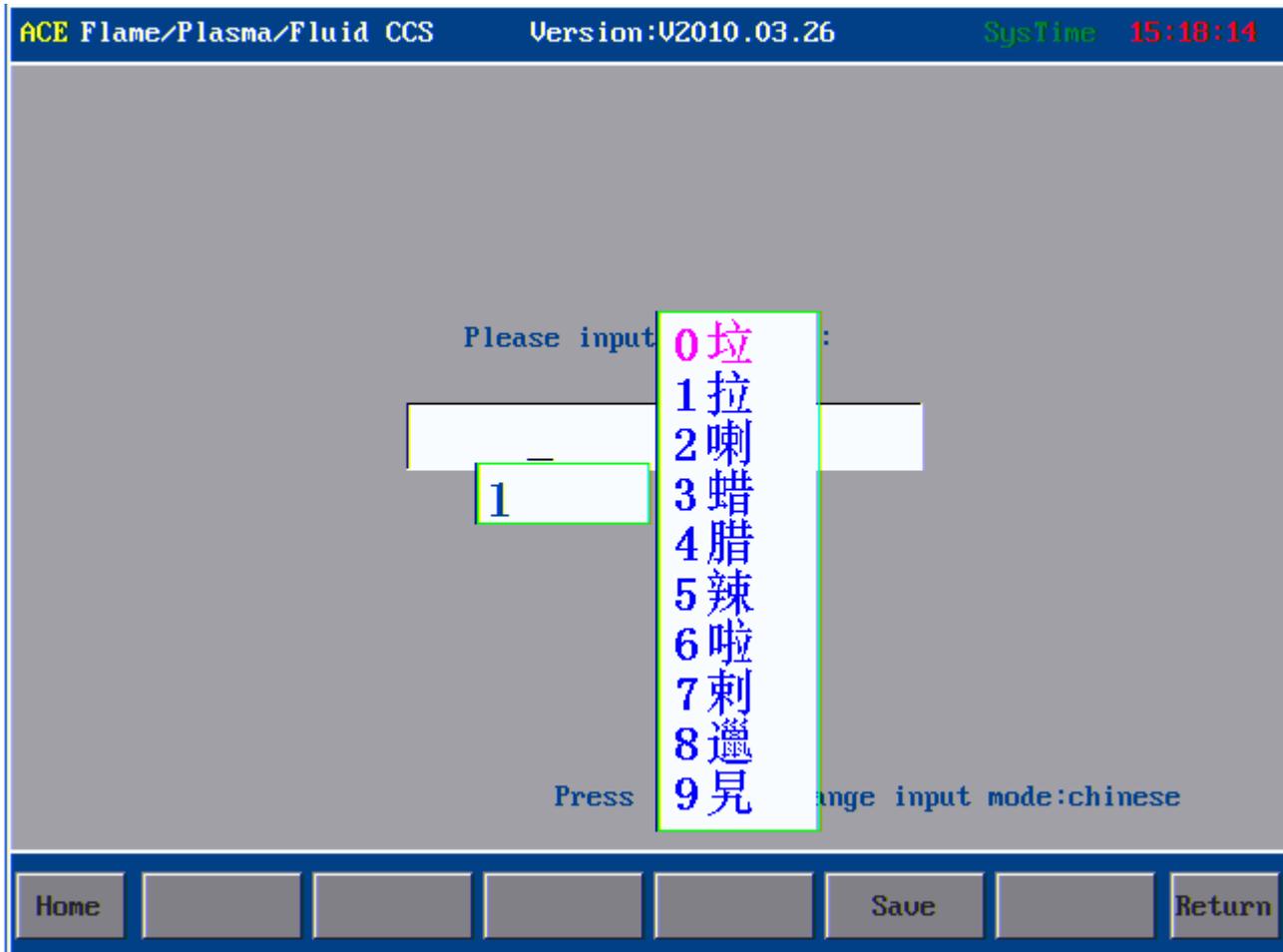
Previous: You can press  key to go back to previous directory until the root directory. Under the root directory, you can carry out limited operations if you are familiar with the system. If you are not familiar, do not add or delete any file or folder; otherwise, it will cause system crash or unexpected error, just like when you delete system files in Drive C of your personal PC.

Copy: Number key “3”; copy the files or folder in the current interface at a fast speed

Paste: Number key “4”; paste the files or folder to the current interface.

New file

Press  key in file management interface to enter new file interface as follows:



New file interface

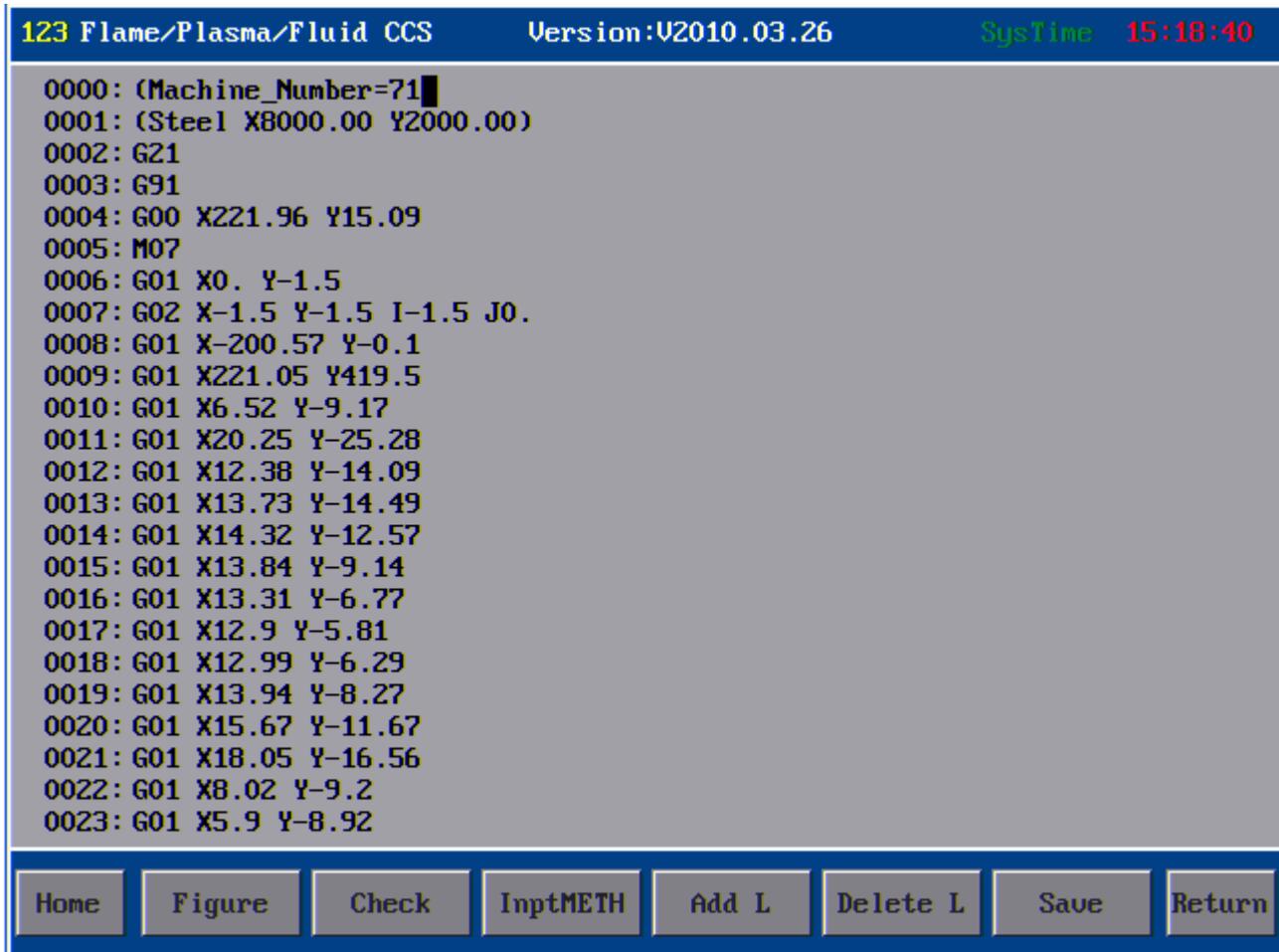
On key panel of controller, you can press the number keys to input numbers and edit file name, press  key after the edition to save, or press  key to shift the input methods between Chinese and Character, which would be displayed on the right bottom of the screen. Press  key to shift the letter on key. For example when the top left corner shows “123”, it means you are entering the corresponding number if you press a key. If it shows “ACE”, the letter you entered would be the first letter of the key. If it shows “BDF”, the letter you entered would be the second letter of the key.

Letter is entered as the following format. Press  key to shift the surrogate key. The layout is as follows:



Keyboard layout

After the input, press  key to save the file and go to the edition interface as follows. If the file name you entered exists, the system will prompt whether to cover the original file. Carry out the operation according to the relevant prompt.



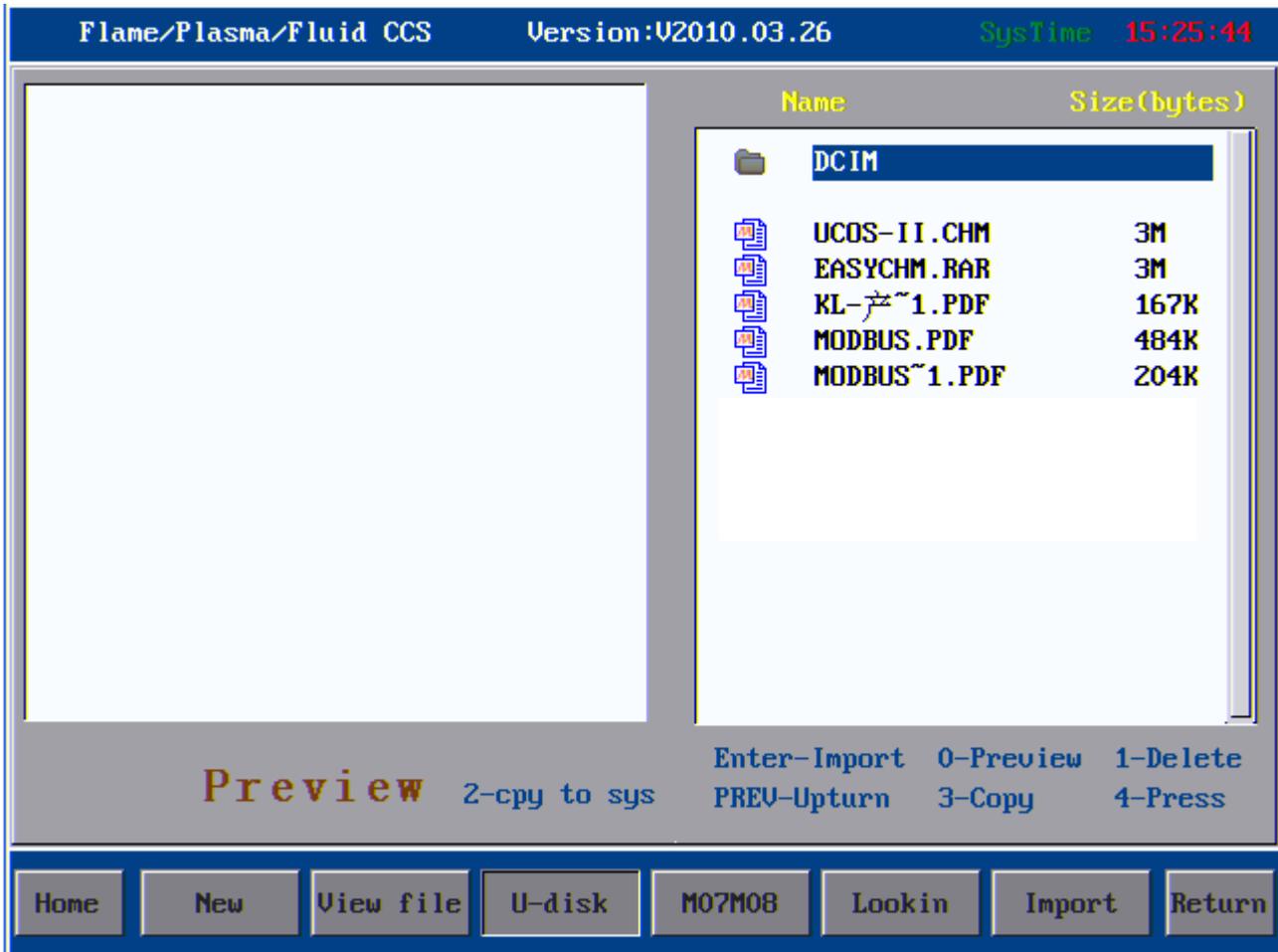
Interface of editing new file

Once a new processing file is created, you can edit the required codes of processing files in the edition area.

USB Files

Press  key to perform the USB disk connection. If the USB disk is not connected well or the format of USB disk is not compatible with system, the system will prompt "Could not find USB disk, press any key to return". Change a new USB disk if it is not compatible, or insert it again if it is compatible and then press  key.

If the USB disk is connected successfully, the interface will show the names of files stored in the USB disk as follows:



Interface after the USB disk is connected

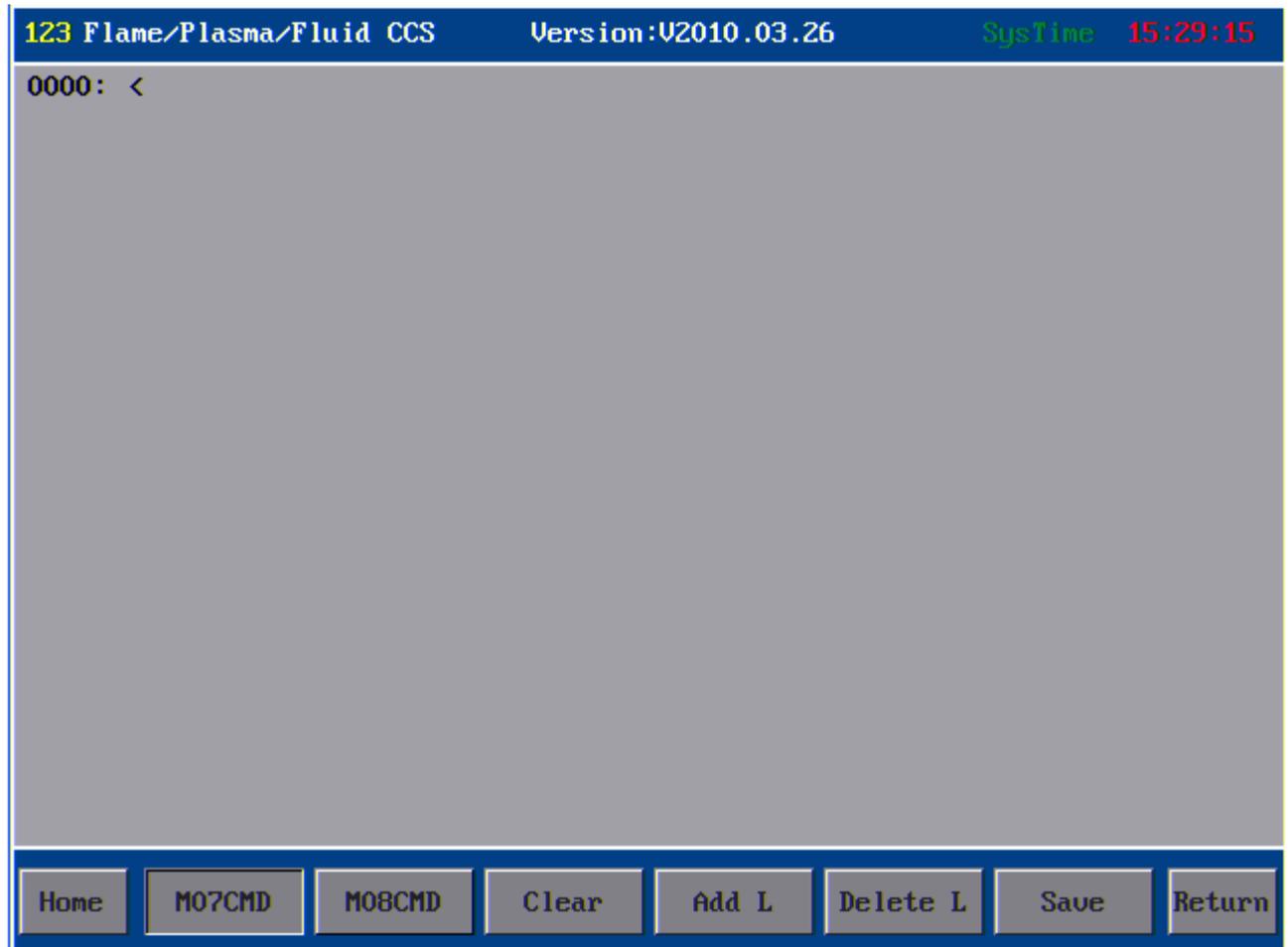
Press to select the processing files you want to copy, and press number key “2” to copy them to controller. A prompt “Data copy complete, press any key to return” will pop up when the copy is complete. You can then press any key to exit.

Press key to enter the interface of loading file, press key to switch the file within page, or press to page up or down. When the cursor is on file name, press key to select the file.

Note: When using USB disk to download processing files for the nest software, the file should be in ANSI format. UNICODE coding file is not recognizable.

User-defined

This function is mainly used in device with automatic igniter. You can custom the M08 into M80 (close all output) to save gas during the idle move. In edition interface, press  key to enter interface for user-defining M07 and M08 as follows:



Interface of user-defined functions

1) [M07 instruction] is user-defined M07 instruction. System default M07 perforating instruction is as follows:

Flame:

- ① Ignition Fixed Cycle, M52
- ② Cutting gun falling (Fixed Cycle), M71
- ③ Preheating on (Fixed Cycle), M74
- ④ perforating cutting gun rising (Fixed Cycle), M72
- ⑤ Cutting oxygen on, M12
- ⑥ perforating cutting gun falling (Fixed Cycle), M73

Plasma:

A. With height-adjusting system:

- Enable M22
- , Arcing M12
- f* Waiting for arc voltage detection signal (IN0)

After arcing, the height-adjusting control starts performing initial location (With initial location function), perforating and perforating delay automatically, and gives a signal of successful arc voltage detection to the controller.

B. Without height-adjusting system:

- Arcing, arcing delay M12
- , Perforating, perforating delay

Start the following actions

Users can define the functions of M07 according to their actual demand.

2) [M08 instruction] is user-defined M08 instruction. System default M08 instruction for closing cutting oxygen is as follows:

Flame:

- ① Cutting oxygen off, M13
- ② Cutting gun rising (Fixed Cycle), M70

Plasma:

- ① Close striking arc M13
- ② Close the height-adjusting control M23

Users can define M08 to M80 (close all output) according to their actual demand. All valves will be closed when performing M08 to save gas.

[Clear]: Clear the data of current line.

[New line]: Add a new line below the current line.

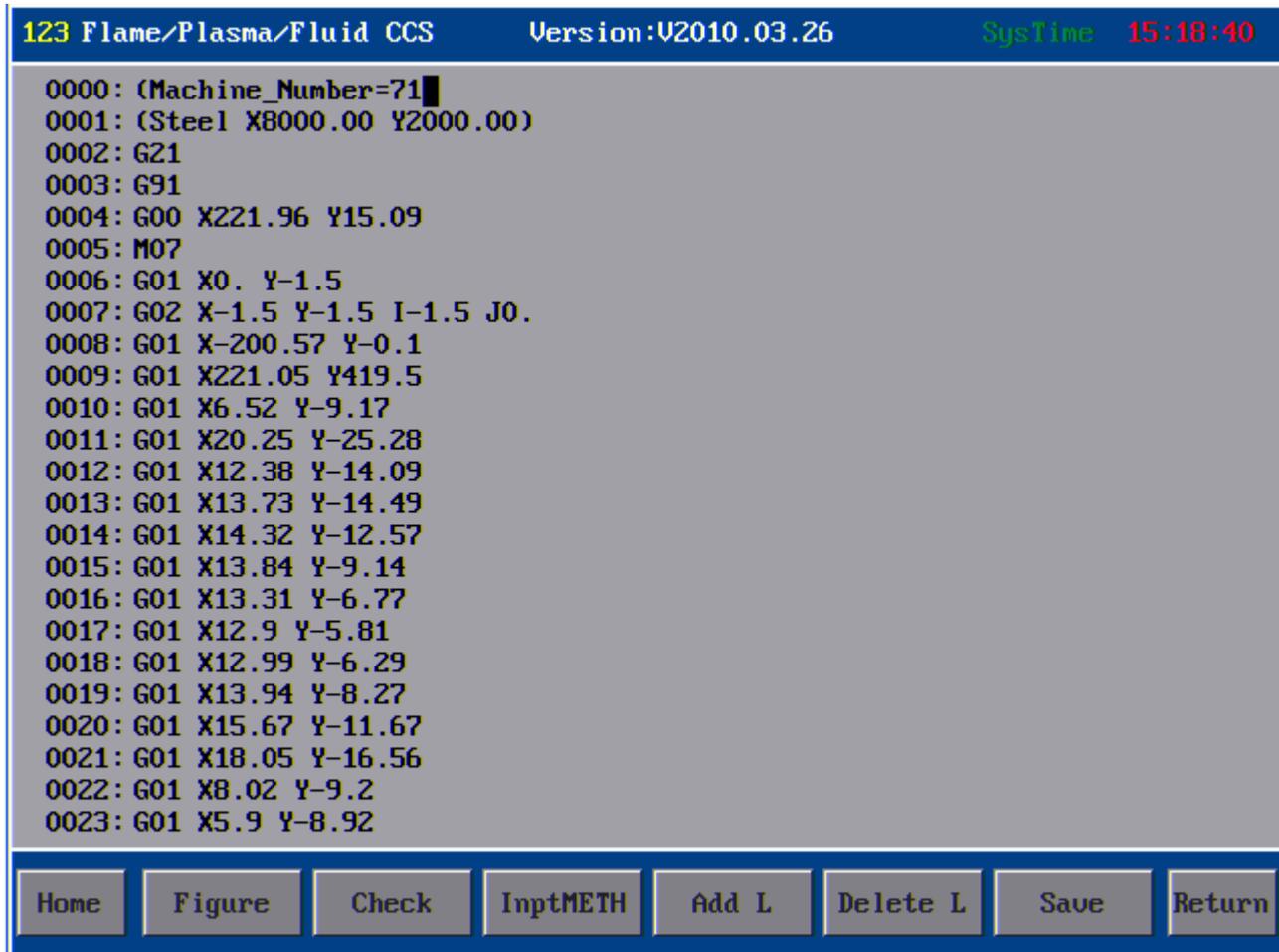
[Delete line]: Delete the current line.

[Save]: Save the content.

Note: After you have defined M07 and M08 instructions, you should set M07 and M08 in parameter setting as user-defined; otherwise, the instructions would not be effective.

Edit processing file

Create a new file or load a file, and enter the edition interface, you can then edit the processing file as follows:



Interface of file content

In edition interface, you can press to move the cursor to a certain line or column within an interface, or press to switch among pages. There are two ways to input G code in the interface, shift input and surrogate input.

1. Shift input: Press to shift among “ACE”, “BDF”, and “123” input methods, which would be prompted on the top left corner of the screen. When it shows “123”, you are entering the corresponding number if you press a key. If it shows “ACE”, the letter you entered would be the first letter of the key, and if it shows “BDF”, the letter you entered would be the second letter of the key. For example, if you press number key “7” when in “123” input method, you are entering number “7” in position where the cursor located, or letter “A” when in “ACE” input method, or letter “B” when in “BDF” input method.

2. Surrogate input: You do not have to press  key to switch the letter. You can press a key once in a certain time interval to enter the first letter, twice to enter the second letter, or three times to enter the third letter. For example, if you press number key “7” once in a certain time interval; you are entering number “7”. If you press this key twice or three times in a certain time interval, you are entering letter “A” and “B” respectively.

Note: Shift input and surrogate input methods are switched in password parameter. If a key only has one letter, you can use any input method to enter this letter.

Figure

Press  key and the interface will show the preview analog figure you are editing for your reference.

Test

When you have entered codes of processing file or loaded nest software codes, you can press F3 to test whether there is something wrong with the codes. If there is an error, the line with error will be displayed in reverse color and a prompt will be shown at the bottom indicating the type of error. In case of error, the system will report and stop the test; you just need to follow the instructions at the bottom of interface to figure it out.

Save

Save the modified processing file in memory of control system.

New line

During the editing, you can press  or  key to add a line of code under the cursor.

Delete line

During the editing, you can press  key to delete the code line where the cursor is located.

Operation

- 1) Up/Down of Cursor: The cursor is always located at the end of a program line when it is moving up/down. It shifts a line each time you press the key. When the cursor shifts out the first line, the screen will roll forward a line if there is a program line ahead. When the cursor shifts out the last line, the screen will roll downward a line if there is a program line below.
- 2) Page Up/Down: You can press  or  key to page up or down.

- 3) The line number of processing program is generated automatically.
- 4) You can press  key on panel to delete a character of the current instruction.
- 5) Press  key to delete the current line.

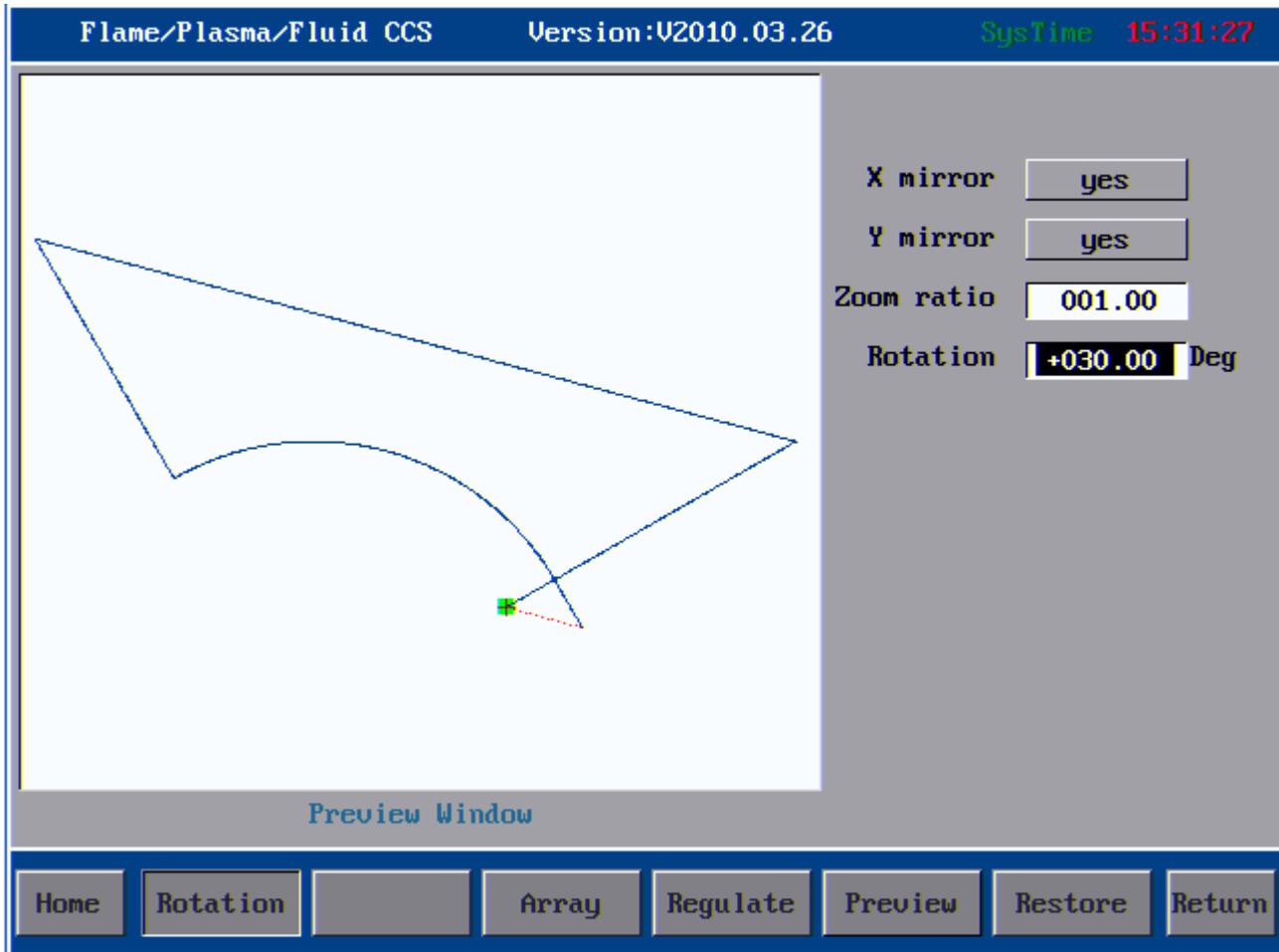
Ø Part options

This section is to process the machining parts.

Figure rolling

Figuring rolling functions enable you to Rotate, Mirror, and Zoom in/out the figure at the same time. Here we are going to introduce their functions respectively.

X Mirror is to make a copy in the symmetrical direction based on Y-axis. In a similar way, Y Mirror is to make a copy in the symmetrical direction based on X-axis, and XY Mirror is to make a copy in the symmetrical direction based on the line 45° to X or Y. **Rotation:** It is to rotate the process figure to a certain degree clockwise or anti-clockwise. The system default positive angle is anti-clockwise, while the negative angle is clockwise. **Zoom in/out:** It is to zoom in or out the figure basing on the actual size. It is to zoom in if the value is larger than 1, and zoom out if the value is larger than 0 but smaller than 1. Other values are invalid. For overall interface, see picture below:

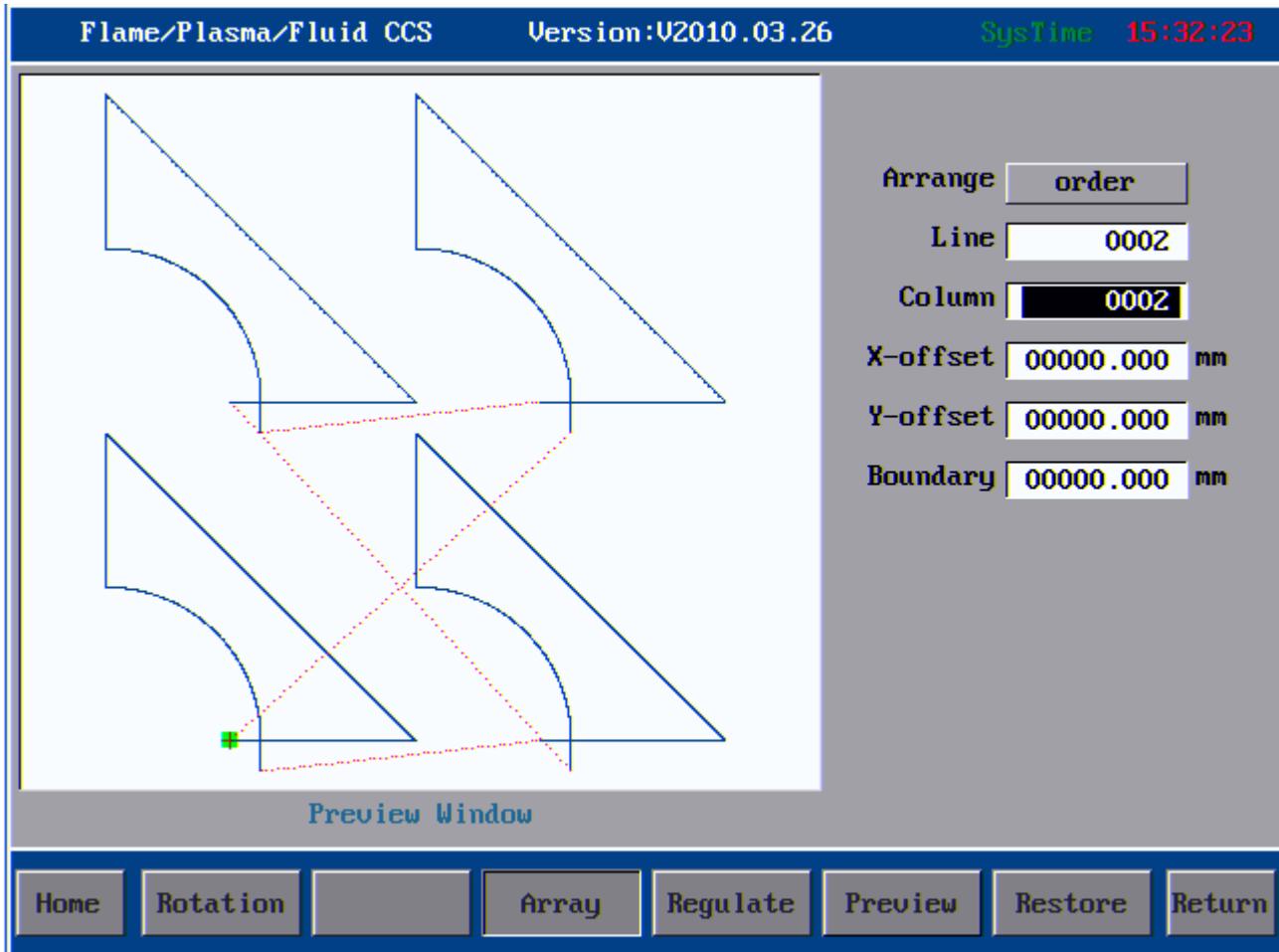


Figuring rolling

When you have entered all parameters, press  key with no mirror option selected, the figure will be mirrored, zoomed in/out, and rotated according to the parameters. If the parameters entered are wrong or invalid, the system will give a prompt in preview interface or restore the parts.

Figure array

Press  key to enter the figure array interface. There are two types of array, collinear array and stagger array. For collinear array, every figure is arranged in text-align way. For stagger array, figures are arrayed in a certain way to satisfy the demand of different processes. Array can only make some simple arrangements for figures, which could not satisfy all requirements of customers. In this way, professional nest software is demanded. Once you have entered the number of line, column, space, and offset according to the prompt, press [CONFIRM] and the interface will be shown as follows:



Interface of Figure Array

Basic operation

You have to select one of the array methods, and then enter the numbers of line and column. The limited numbers for line and column of the software are both 9999. You can set the numbers combining your actual processing demand and the size of part you are processing. This number is the limit value, and cannot be achieved in practical situation.

X Off-set: It is the off-set distance between two lateral figures. If you do not input any off-set value (that is, the off-set value is 0), the system will calculate the off-set value as the figure width (unit in MM) automatically. If you have entered an off-set value, even 0.01MM, the system will calculate according to this value instead of default figure width. In this situation, you have to calculate the lateral off-set value carefully to satisfy the processing requirement of lateral distance between two figures.

Y Off-set: It is the off-set distance between two longitudinal figures. If you do not input any off-set value (that is, the off-set value is 0), the system will calculate the off-set value as the figure height (unit in MM) automatically. If you have entered an off-set value, even 0.01MM, the system will calculate according to this

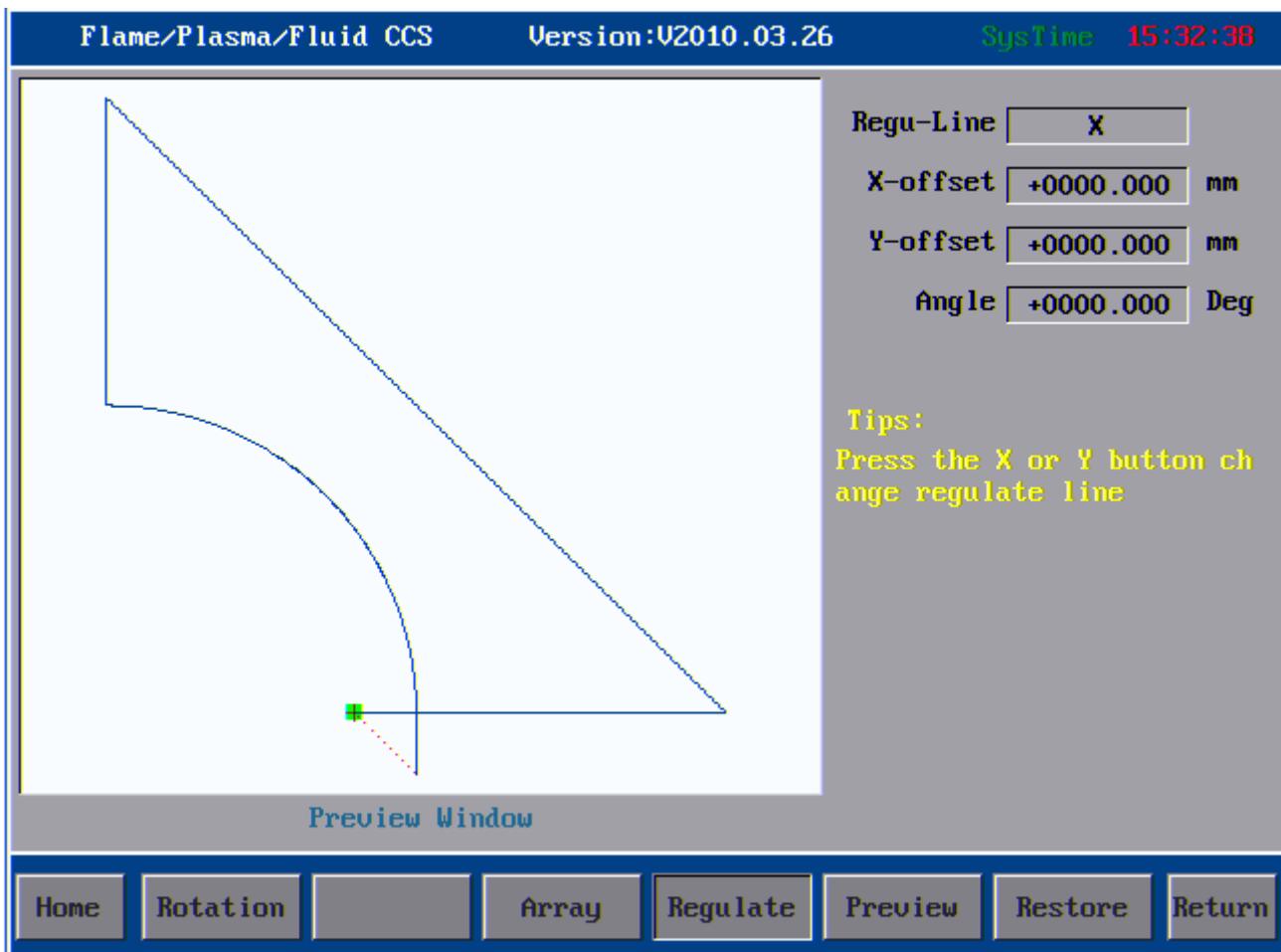
value instead of default figure height. In this situation, you have to calculate the longitudinal off-set value carefully to satisfy the processing requirement of longitudinal distance between two figures.

Waste boundary value: As the name implies, it refers to the width of board you would waste during the processing. For example during the normal processing, perforating, boundary perforating and lead-wire operations would waste some steel boards, which is called waste boundary value. During the arraying, you should calculate and input the value carefully to save the board to the largest extend.

We should note that figure rotating and array functions cannot be used at the same time. Array should be done before the rotating. This operation could only be done once when you are using the resume function.

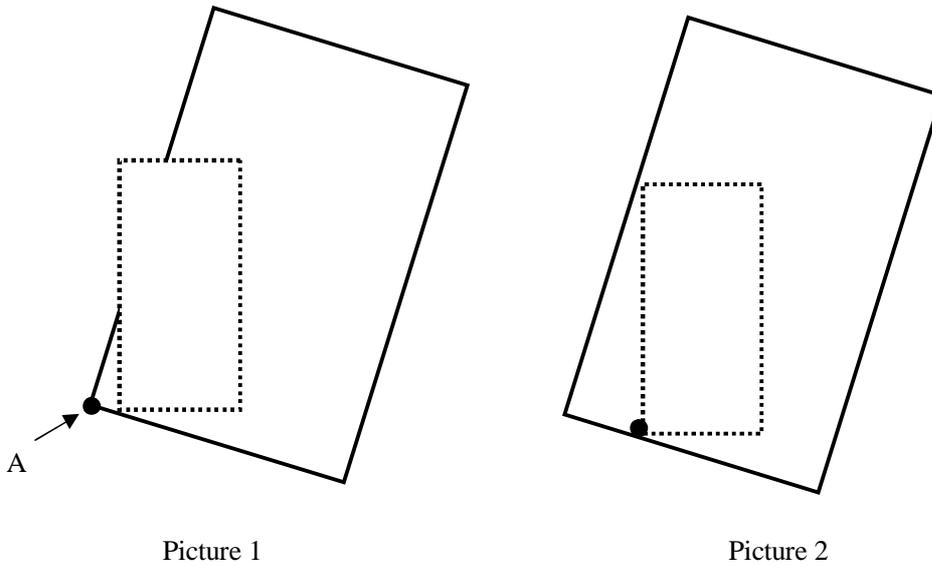
Calibration

Calibration function is to calibrate the position of figure and the steel plate to make them in a reasonable relative position. The calibration interface is as picture below.



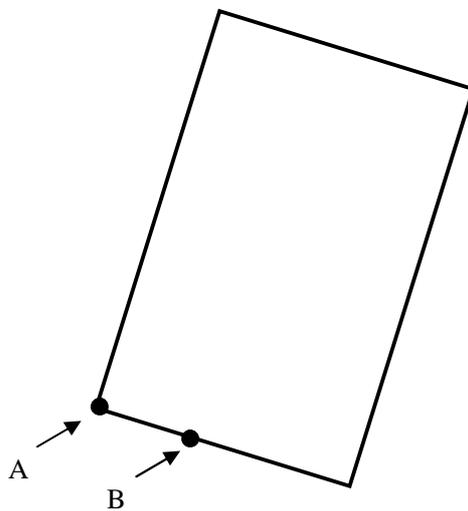
Calibration Interface

Calibration Principle:



- 1) In Picture 1, the large frame (Real line) is the steel plate, the small frame (Dashed line) is the figure to be cut, and point A is the start point of the cutting gun. If it is cut according to Picture 1, the figure outside may not be cut; and if it is cut when the start point is moved to the middle of the steel plate as Picture 2, obviously it will waste the steel plate.
- 2) At this point, without moving the steel plate, you just have to figure out the slope angle of the plate, and incline the figure to be processed at the corresponding angle before cutting effectively.

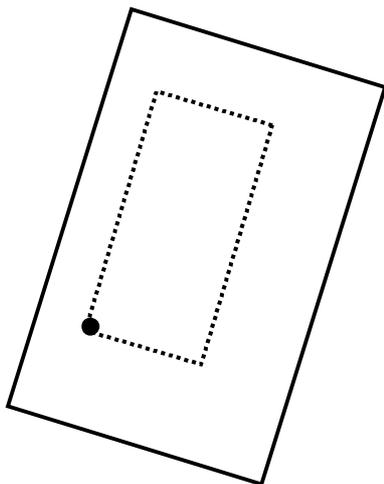
Method 1: Calibrate the reference side to X Axis



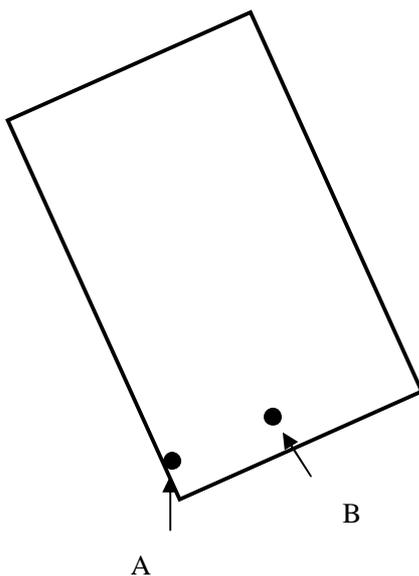
- 1) As above picture, point A is the start point of cutting gun. You can figure out the slope angle of the steel

plate by moving the cutting gun to any point of its base line. Press → , or → ; then, press to confirm.

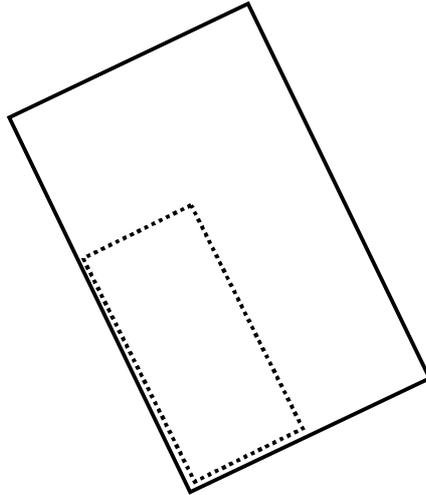
- 2) Then, the figure displayed on the controller will be rotated at a certain degree. The position of figure to be processed and the steel plate is shown as follows:



- 3) If the steel plate is inclined as follows, then, the calibration method is as below:



Press  → , or  → , then, press [OK] to confirm. The position of figure to be processed and the steel plate is shown as follows:



Method 2: Calibrate the reference side to Y Axis

The principle is same as the method 1, only calibrate the difference axis, sometimes the steel plate is too short for A axis, So, we can choose the Y axis to calibrate, press  before you ready to calibrating, it will be show “Y” in the inner border. Then Make the cut gun move from A to B point same as the Method 1, press  key can be finished.

Restore

Press  key to enter the restore function, and restore the current figure to original state. In this way, all figures changed by the array or rotation will be restored to the original shape.

Note: Pay attention to the operating sequence of figure array and rotation. You cannot array the figure after the rotation, but you can array the figure before rotation.

Ø Setup options

In main interface of parameter setup, the main system parameters are set as follows:

| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 16:41:52 | |
|-------------------------------------|--|---|---|---|---|
| Cutset | | | | | |
| Measure | | | | | |
| Measure X | <input type="text" value="00000.000"/> | mm | Y | <input type="text" value="00000.000"/> | mm |
| MOD | | | | | |
| Cutmode | <input type="text" value="Flame"/> | M07 | <input type="text" value="Default"/> | M08 | <input type="text" value="Default"/> |
| Speed | | | | | |
| LimitSpeed | <input type="text" value="02000"/> | mmpm | | | |
| Compensate | | | | | |
| SlotCompen | <input type="text" value="00.00"/> | mm | S-cpst | <input type="text" value="00.00"/> | mm |
| | | | | | |
| <input type="button" value="Home"/> | <input type="button" value="Cutset"/> | <input type="button" value="Cutstyle"/> | <input type="button" value="Advanced"/> | <input type="button" value="SysManag"/> | <input type="button" value="SysDiagn"/> |
| | | <input type="button" value="Save"/> | <input type="button" value="Return"/> | | |

Main interface of parameter setup

Ø Cutting setup

Size: It is the size of board being processed, used to check whether the board is on worktable and whether the figure is larger than the board. This function does not work if the option is not set.

Mode: Cutting mode, M07 and M08 modes are available. Cutting mode refers to the cutting process of machine, including flame, plasma, and preview cutting. M07 and M08 modes are usually used by cutting torch. User-defined or system default modes are provided. Usually, the default mode is used. For special condition, users can use their own mode.

Note: All process parameters are saved separately according to the cutting mode to avoid mixing up. Except the system parameters, all parameters you seen are parameters in the current cutting mode, and they do not interfere with each other.

Speed: It is the limit speed of processing. The practical processing speed is slower than this speed, which should multiply the speed percentage. The speed percentage can be adjusted by pressing and key in the auto interface,

ranging between 0 and 1.

Compensation: You can set the value of cutting gap compensation and mark compensation (Not available for the moment).

When all parameters are set, you have to save the settings. Press **F5** key, and the system will prompt “Parameters are saved, press any key to return”, you can then press any key to save the parameters and exit.

Ø Cutting type

Two cutting processes are available at the moment, flame cutting and plasma cutting.

Flame cutting

| Flame/Plasma/Fluid CCS | | Version:U2010.03.26 | | SysTime 15:45:30 | |
|---|------------------------------------|---------------------|------------------|----------------------------------|-------------|
| Flame Control | | | | | |
| Fire delay | <input type="text" value="00100"/> | psec | Firer | <input type="text" value="On"/> | |
| H-preheat delay | <input type="text" value="00000"/> | psec | Preheat maintain | <input type="text" value="On"/> | |
| Preheat delay | <input type="text" value="00100"/> | psec | Multi-perforated | <input type="text" value="Off"/> | |
| Punch hole delay | <input type="text" value="00100"/> | psec | | | |
| Crawl delay | <input type="text" value="00000"/> | psec | | | |
| Torch up delay | <input type="text" value="00100"/> | psec | | | |
| Torch down delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch up delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch down delay | <input type="text" value="00100"/> | psec | | | |
| Cutting stop delay | <input type="text" value="00000"/> | psec | | | |
| Blowing delay | <input type="text" value="00000"/> | psec | | | |
| press [SHIFT] key to switch column | | | | | |
| Press [Manual] key to view the timing diagram | | | | | |
| Home | Flame | Plasma | WaterJet | | Save Return |

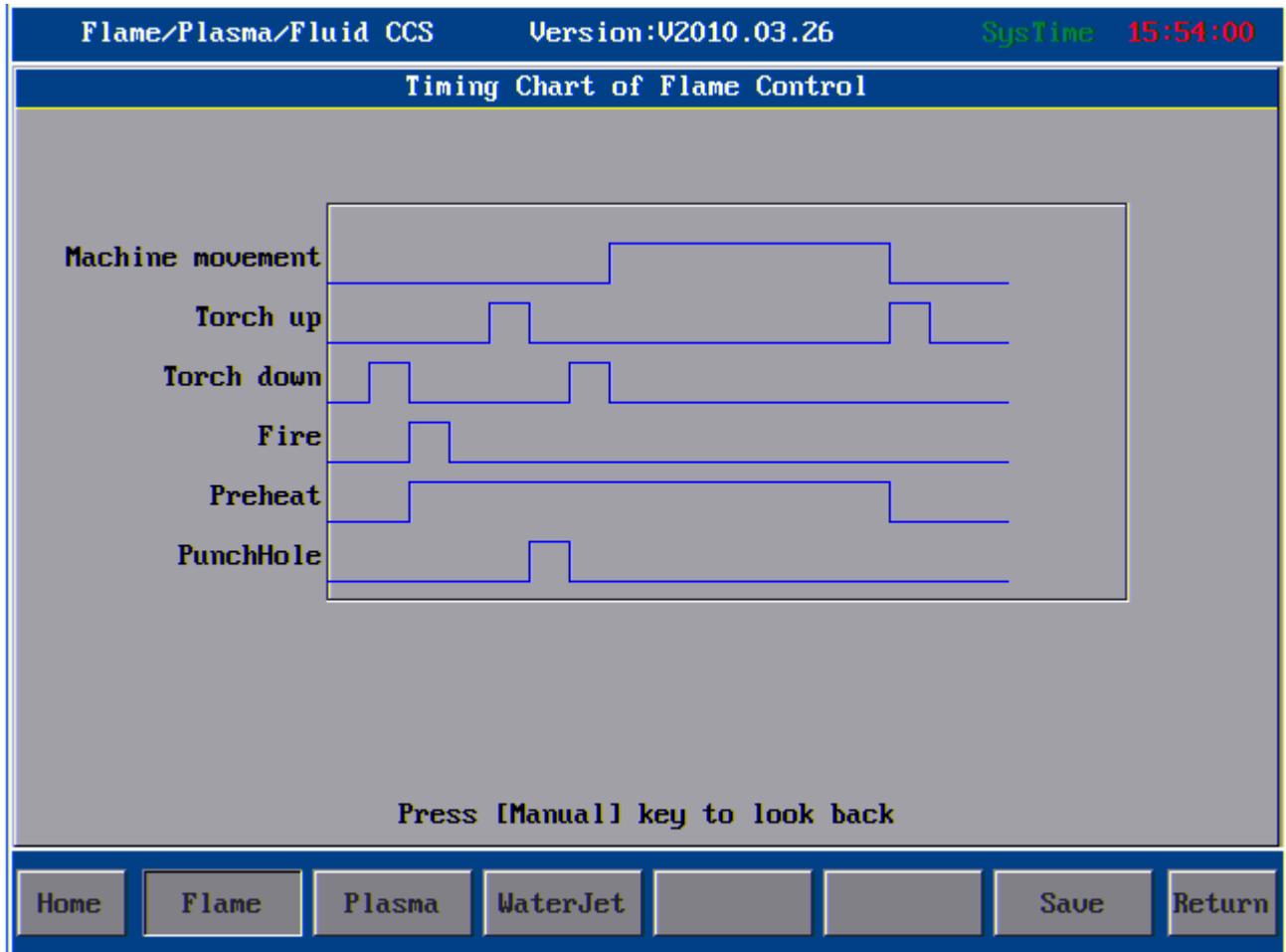
Flame cutting

1. Ignition time: It is the effective time of this output signal for each ignition.
2. Low pre-heating time: For machine with low preheating function, this is to set the time of exporting low preheating signal before the high pre-heating.
3. High pre-heating time: Set the time of exporting high pre-heating signal before each time of

perforating. During the high pre-heating, you can press  key to extend the time of pre-heating, and press  key to stop pre-heating and start processing.

4. Perforating time: set the delay time during the period after the cutting oxygen is opened and before the cutting torch is lowered to the cutting height.
5. Creep time: set the running time of machine at creep speed after the perforating. The creep speed is set in speed parameter interface, and displayed in the percentage of cutting speed. After the creep time, the machine will accelerate to the set cutting speed. During the creeping, cutting surface can be heated so that the perforating would be thorough.
6. Cutting torch rising time: set the effective time of cutting torch rising signal after each cutting
7. Cutting torch falling time: set the effective time of cutting torch falling signal before each cutting
8. Perforating cutting torch rising time: set the effective time of cutting torch rising signal during the perforating
9. Perforating cutting torch falling time: set the effective time of cutting torch falling signal during the perforating
10. Cutting close time: set the effective time of cutting control signal after each cutting. It is usually set as 0.
11. Air-blowing time: set the time of sending out air-blowing signal when the cutting torch paused after each cutting
12. Multilevel perforating: set whether the perforating mode uses the multilevel perforating mode. This function is usually used when cutting the thick board and the system is equipped with low preheating device. Common perforating is proper for cutting thin materials. Do not use this option if you do not have low preheating device.

You can press  key to view the sequence diagram as follows:



Sequence Diagram of Flame Cutting

To set the parameters at the right side, you need to press  key to shift the cursor to the right parameter box, and then press  to select. If a key is pressed down, it means the item is selected. After the setup, you should save the parameters.

Plasma cutting

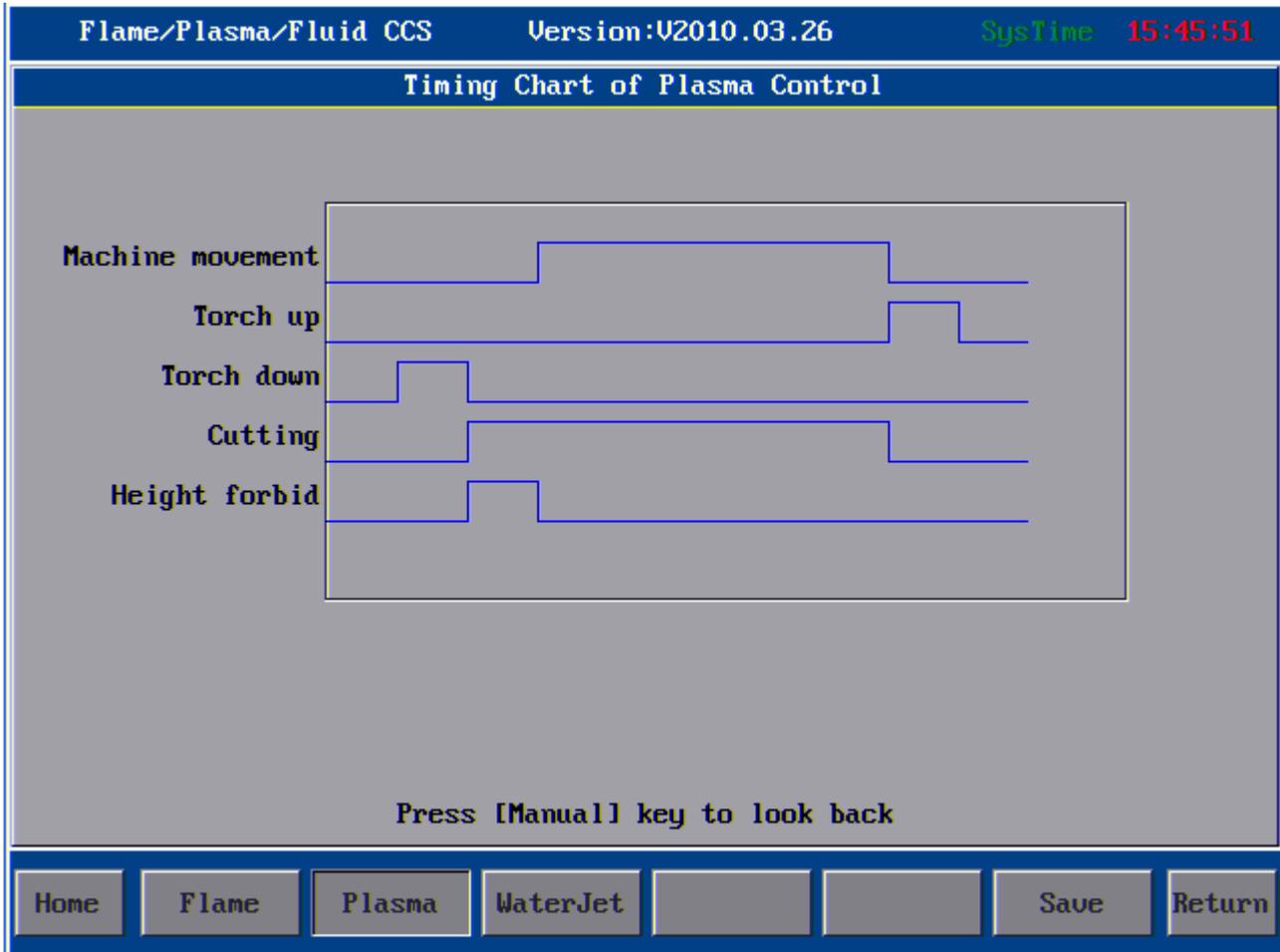
| Flame/Plasma/Fluid CCS | | Version:V2010.03.26 | | SysTime 15:53:56 | |
|------------------------|------------------------------------|---------------------|---------------------|----------------------------------|--|
| Plasma Control | | | | | |
| Blowing delay | <input type="text" value="00000"/> | psec | ArcV detect | <input type="text" value="Off"/> | |
| Punch hole delay | <input type="text" value="00100"/> | psec | Gun height enable | <input type="text" value="Off"/> | |
| Crawl delay | <input type="text" value="00000"/> | psec | Init-local | <input type="text" value="Off"/> | |
| Cutting stop delay | <input type="text" value="00000"/> | psec | Torch up with punch | <input type="text" value="Off"/> | |
| Porch local up delay | <input type="text" value="00000"/> | psec | | | |
| Torch up delay | <input type="text" value="00100"/> | psec | | | |
| Torch down delay | <input type="text" value="00100"/> | psec | | | |
| H-Torch up delay | <input type="text" value="00000"/> | psec | | | |
| Start arc delay | <input type="text" value="00100"/> | psec | | | |
| Dis befor close-up | <input type="text" value="00000"/> | mm | | | |

press [SHIFT] key to switch column
Press [Manual] key to view the timing diagram

| | | | | | | | |
|------|-------|--------|----------|--|--|------|--------|
| Home | Flame | Plasma | WaterJet | | | Save | Return |
|------|-------|--------|----------|--|--|------|--------|

1. Time of air-blowing: If arc feedback signal is not used, use this parameter to set the time between the ignition of cutting torch and the operating of machine. If arc feedback signal is used, this parameter should be set as 0.
2. Perforating time: set the time from the finish of cutting torch falling to the operating of machine, ensuring the perforating is done perfectly
3. Creep time: set the running time of machine at creep speed after the perforating. The creep speed is set in speed parameter interface, and displayed in the percentage of cutting speed. After the creep time, the machine will accelerate to the set cutting speed.
4. Cutting close time: set the effective of cutting control time after each cutting, expressed in negative number. The time for cutting control signal closed before the cutting can be set at most -1s. After the cutting, the machine will keep cutting the arc due to the lag stop of cutting gas, which makes the cutting route wider. In this way, this parameter is used to compensate this problem, and is usually set as 0.
5. Cutting torch locating and rising time: set the locating and rising time during the initial locating
6. Cutting torch rising time: It is used to confirm the rising time of cutting torch. If auto height control system is used, this parameter should be set as 0.
7. Cutting torch falling time: It is used to confirm the falling time of cutting torch. If auto height control system is used, this parameter should be set as 0.
8. Rising time of perforating cutting torch (Not available at the moment)
9. Arcing time: set the time from the delivery of arcing signal to the end of arcing. If auto height control system is used, this parameter should be set as 0.
10. Distance for closing height adjustment in advance: It refers to the distance for closing height adjustment in advance when cutting a part.
11. Arc voltage detection: whether to allow the arc feedback signal symbol
12. Cutting torch height allow: For control system with auto height control, it should be set as "On". If there is no auto height control system or if you do not want to use it, you can set this option as "Off".

You can press  key to view the sequence diagram as picture 42:

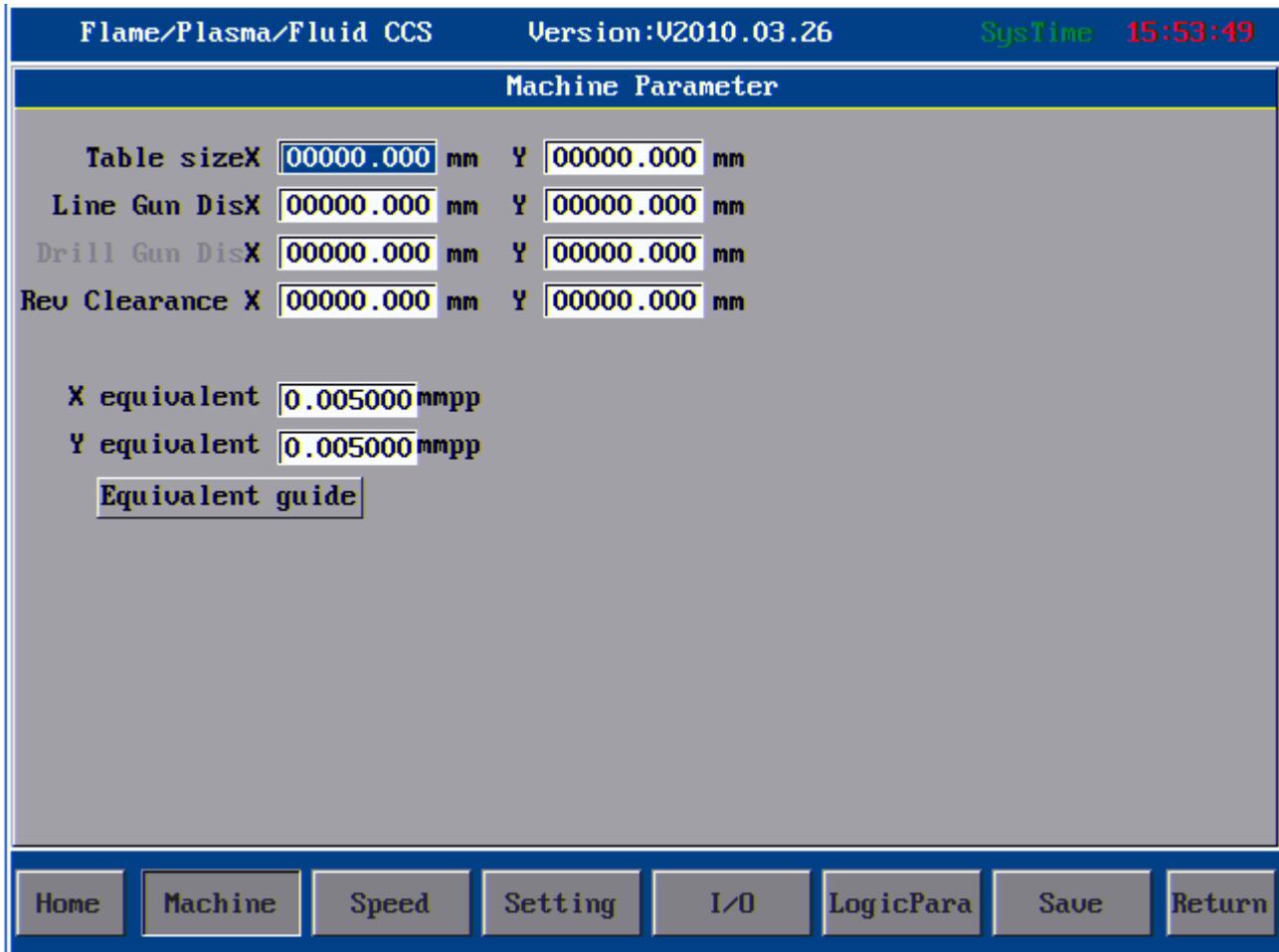


Sequence Diagram of Plasma Cutting

To set the parameters at the right side, you need to press  key to shift the cursor to the right parameter box, and then press     to select. If a key is pressed down, it means the item is selected. After the setup, you should save the parameters.

Ø Advanced setup

Press  in main parameter interface, and input the password "360" or "361". Parameters in this interface are not modified usually, so you have to input password to get in. If you enter the correct password and press  key, you will enter an interface as follows:



Interface after you have entered the correct password

Machine setup

1. Worktable size: Set the worktable size of the machine, so that the system will prompt whether the board or figure exceeds the allowable size of worktable. For system without worktable, it can be set as 0.
2. Scriber distance: Set the distance between scriber and cutting gun. (This function is not available for the moment)
3. Backlash: Set the backlash compensation of X axis and Y axis.
4. Pulse impulse equivalent: Set the pulse equivalent. The pulse equivalent is a bridge for the system to communicate with outside. It should be tested for several times to ensure the accuracy. To set the pulse equivalent, manual and wizard methods are available

1. Manual setup

- 1) Set the X and Y pulse equivalent as 0.010000 (The control system sends out a pulse, and the motor moves 0.01MM), then press  to save and exit to the main interface.
- 2) Press  to enter the interface of manual mode, and press  key to set the moving distance of X axis, and input your desired inching length. Suppose the unit of inching is 1000MM.

- 3) Press key to start inching. Suppose the actual moving distance is 978MM.

The calculation formula is as follows:

4)
$$978 \div (1000 \div 0.01) = 978 \div 100000 = 0.009780$$

Actual moving
distance

Actual inching
distance

Pulse equivalent of
current system

- 5) Back to the main interface, press and key to move the cursor to set the accuracy.

Input 0.009780 as the pulse equivalent of X and Y axes.

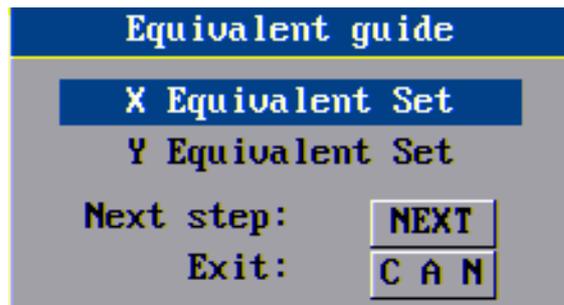
Note: Usually, there will be a minor error between the pulse equivalent of X and Y of the same device; therefore, they should be set respectively during the test. (It is recommended to set the pulse equivalent as the same value.)

2. Setup wizard of system pulse equivalent

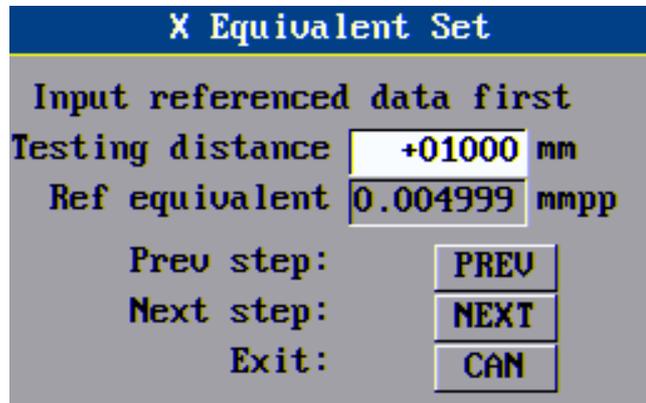
The application and operations of pulse equivalent setup wizard are as follows:

Press key in parameter interface to move the cursor to pulse equivalent setup wizard, and press ,

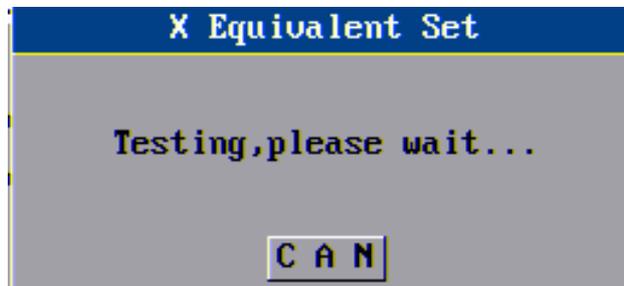
an interface is shown:



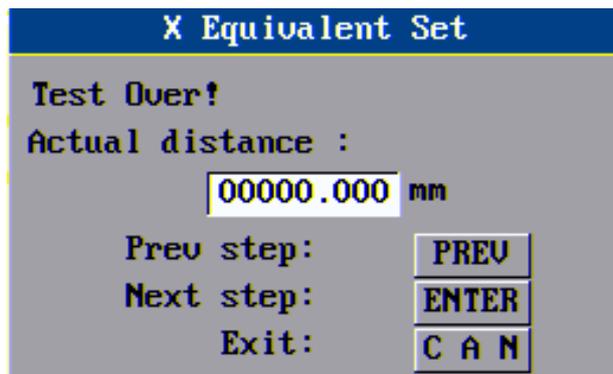
In this interface, you can press key to set the pulse equivalent of X and Y axes respectively. Here we take “X-axis pulse equivalent setup” as an example. When the cursor is on “X-axis pulse equivalent setup”, if you press key, the setup will be cancelled. Press to continue and then press , an interface as follows pops up:



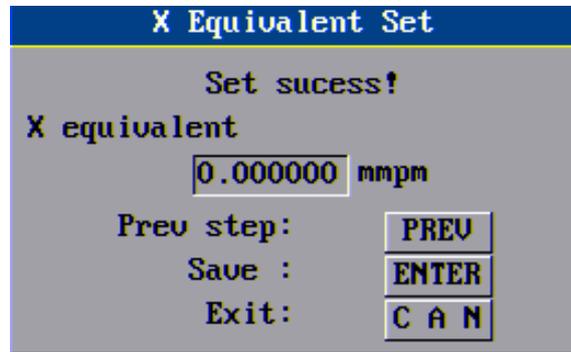
Here we take the default value. However, “Set the moving distance of X axis” should be set matching the practical worktable. The cutting torch should not be shifted out the worktable or touch other parts. If you do not use the default 1000mm, you can set the proper length as you like by just pressing the number keys. To delete, you can just press the Delete key directly. After the setup, press key and the system will start processing as the following picture shown:



At this point, you can press to cancel and reserve the original pulse equivalent.



When the test is complete, you can press key to lift the cutting torch and press to move it away for the convenience of measuring the moving distance with calipers. Then, Input the measured data into the prompt box and press key, the system will prompt the pulse equivalent setup is complete. As the picture shown:



Press confirm key to complete, and the value of pulse equivalent will be displayed in the pulse equivalent column automatically. You can set the pulse equivalent of Y axis with the same method.

Note: Usually, there will be a minor error between the impulse equivalent of X and Y of the same device; therefore, they should be set respectively during the test. (It is recommended to set the pulse equivalent as the same value.)

Speed parameter

1. Start-up speed: Set the speed of cutting torch at the beginning of start-up.
2. Acceleration of 1st section: Acceleration of the 1st section usually set when linear acceleration is adopted.
3. Speed of 1st section: Set to accelerate to the 1st speed point, usually set with the acceleration of 1st section (Not available at the moment)
4. Acceleration of 2nd section: Set the acceleration of 2nd section, and the speed of 1st section is taken as the start-up speed of 2nd section. (Not available at the moment)
5. Processing speed limit: Set the maximum speed during the processing. The practical speed equals to the result of this speed limit multiplying the speed percentage.
6. Manual speed limit: Set the maximum speed of machine in manual operation. The practical speed equals to the result of this speed limit multiplying the speed percentage.
7. High/Medium/Low speed: You can select different speed when you press  (Shift speed) in the interface of manual operation.
8. Minimum corner speed: It is usually set as 0.
9. Fast/Slow back-to-zero speed: Return back to zero in fast speed first until it stops when touching the switch, and then leave in reverse direction in slow back-to-zero speed until the signal disappears. This is different from back to origin.
10. Creep speed: The machine needs to move forward slowly when perforating, which is called creep. The speed, expressed in speed percentage and determined by this parameter, is used in this situation.
11. Plasma HI/LO speed: This parameter is to define a speed limit. When the cutting speed is reduced to be lower than this limit speed, an inhibiting signal on the height of cutting torch is exported. When the cutting speed is higher than this limit speed, a permit signal is exported.
12. Plasma in/out-corner distance: It defines a distance range, in which, when you are not using cutting gap, the machine will export height prohibit and height permit signal. Just set it as default 0.

Interface of speed parameter is shown as follows:

| Flame/Plasma/Fluid CCS | | Version:U2010.03.26 | SysTime 15:58:38 |
|------------------------|------------------------------------|---------------------|------------------|
| Speed parameter | | | |
| Start-up speed | <input type="text" value="00100"/> | mmpm | |
| First sect Acc | <input type="text" value="00100"/> | mG | |
| First sect speed | <input type="text" value="00000"/> | mmpm | |
| Second sect Acc | <input type="text" value="00000"/> | mG | |
| LimitSpeed | <input type="text" value="02000"/> | mmpm | |
| Manual speed limit | <input type="text" value="02000"/> | mmpm | |
| High speed | <input type="text" value="090"/> | Per limit speed | |
| Mid-range speed | <input type="text" value="060"/> | Per limit speed | |
| Low speed | <input type="text" value="030"/> | Per limit speed | |
| Least corner speed | <input type="text" value="00000"/> | mmpm | |
| Fast R-zero speed | <input type="text" value="00000"/> | mmpm | |
| Slow R-zero speed | <input type="text" value="00000"/> | mmpm | |
| crawling speed | <input type="text" value="025"/> | Per cutting speed | |
| Hi/Lo speed | <input type="text" value="080"/> | Per cutting speed | |
| In-corner distance | <input type="text" value="00000"/> | mm | |
| Out-corner distance | <input type="text" value="00000"/> | mm | |

Home
Machine
Speed
Setting
I/O
LogicPara
Save
Return

Interface of speed parameter

| Parameter | Explanation | Unit |
|-----------------------------|--|-----------|
| Start-up speed | Start-up speed of X/Y axis | Mm/Minute |
| Acceleration of 1st section | The value of each added speed from start-up speed to the maximum speed of X/Y axis | Mm/Minute |
| Manual speed | The speed of X/Y axis, G00 and returning speed in manual run | Mm/Minute |

Note:

In practical cutting, you need to perform acceleration/deceleration operations at the corner. Too fast an acceleration/deceleration at the corner would lead to halfway cutting or flame-out, and too slow the speed may not form a right angle at the corner or lead to circular arc. In this way, the “start-up speed” and “acceleration” in “Speed” setup should be set for several times according to the current pulse equivalent to the optimum state.

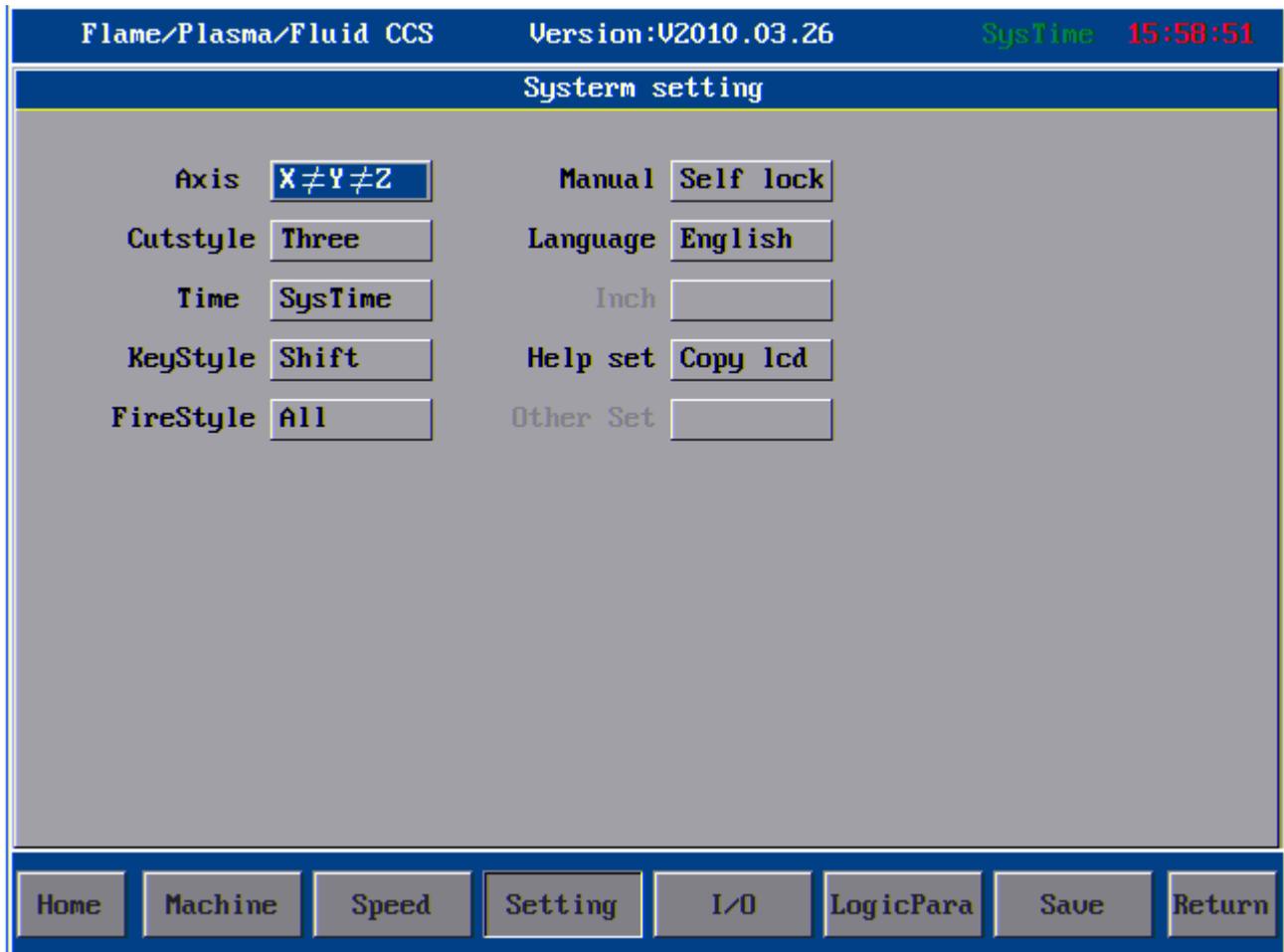
Reference value:

| Processing speed | Pulse equivalent | Start-up speed | Acceleration |
|------------------|------------------|----------------|---------------------------------|
| 500mm/Minute | 0.008000 | 300 | 80-100 (Adjusted with emphases) |
| 500 mm/Minute | 0.001000 | 300 | 5-15 (Adjusted with emphases) |

Note: In auto cutting, the processing speed is allowed to be slower than the start-up speed. However, in auto mode, if the processing speed is slower than start-up speed, the system will be run at start-up speed.

System setup

Other settings, including the settings on system control, are as follows:



Interface of other settings

1. On-axis setup: Set the on-axis function of the motor. This function can be enabled when using two motors to control an axis. “Non on-axis” means X-axis and Y-axis are controlled by a motor respectively. “XZ bonding” means that X axis is controlled by two motors and the other motor of X axis is controlled by Z-axis output. “YZ bonding” means that Y axis is controlled by two motors and the other motor of Y axis is controlled by Z-axis output.
2. Manual setup: Set the manner of moving cutting torch in manual mode. “Auto-lock” means that as you press



in the manual mode interface, the cutting torch will start moving at eight directions, and still when you release your hands until you press these direction keys again or the stop key. “Inching” means that as you press these eight keys, the cutting torch will start moving at eight directions and

- stop as you release your hands.
- Number of cutting type: It refers to the types of cutting available. Three options are provided. "1" means only one type, "Flame"; "2" means two cutting types, "Flame" and "Plasma", are available; "3" means three cutting types, "Flame", "Plasma" and "Preview", are available.
 - Language: Set the language of cutting system. To change the language, you just need to put the relevant translated files in "\LAN" folder of the system, and then set the corresponding language here. (Not available at the moment)
 - Input mode: Shift input or surrogate input is available. It is recommended to use the shift input.

I/O setup

| Flame/Plasma/Fluid CCS | | Version:U2010.03.26 | | SysTime 15:59:01 | |
|------------------------|----------|---------------------|----------|------------------|-----------|
| I/O setting | | | | | |
| Input | IN(0~35) | Input | IN(0~35) | Output | OUT(0~15) |
| limit X+ | 0 | Fast Stop | 10 | Gas | 0 |
| limit X- | 8 | Pause | 3 | Torch up | 1 |
| limit Y+ | 1 | | | Torch down | 9 |
| limit Y- | 9 | | | Fire | 2 |
| limit Z+ | 16 | | | Cutting | 8 |
| limit Z- | 24 | | | Preheat | 11 |
| limit A+ | 17 | | | L-preheat | 10 |
| limit A- | 25 | | | H-preheat | 3 |
| X stop | 18 | | | Height Ctl | 13 |
| Y stop | 19 | | | Low oxygen | 4 |
| Z stop | 20 | | | Mid oxygen | 15 |
| A stop | 21 | | | Blow Control | 12 |
| ArcU detect | 2 | | | | |
| Init-local | 7 | | | | |

Home Machine Speed Setting I/O LogicPara Save Return

I/O setup allows you to set the input and output of the system on the condition that they should match the peripheral interface of cutting machine. The marked numerical symbols is not the line number (socket number) but the IN and OUT numbers. For the relationship between line number and OUT/IN number, please refer to the hardware user manual. At present, system supporting input 36 ports, output 16 ports. System will remind in the look down Right if the ports setting exceed the range. After the modification, you can press [Save] to save the setup and use the interface you have modified. This function is provided for the convenience of future maintenance. If an interface is broken, you can just make a correction here rather than sending it back for maintenance.

Note: To avoid mix-up due to the lack of understanding on cutting machine, it is suggested not to modify the interface if there is no broken interface; otherwise. You can change the setup as you like if you are familiar with the cutting machine.

Logic parameter

Machine limit, logic level and effective signal are set here. You can use them following the instructions:

Whether X-axis STOP0 signal is effective: When the cutting machine receives STOP0 signal, it will give out a hardware stop signal if the STOP0 signal is effective. If this signal is not applicable, set this option as 0. This is also applicable to the YZA axes.

Logic level stopped by X-axis: 0—Low level stops, it is high level in normal condition; 1—high level stops, it is low level in normal condition. This is also applicable to the YZA axes.

Whether X-axis limit is effective: 0—effective, 1—ineffective; this is also applicable to the YZA axes

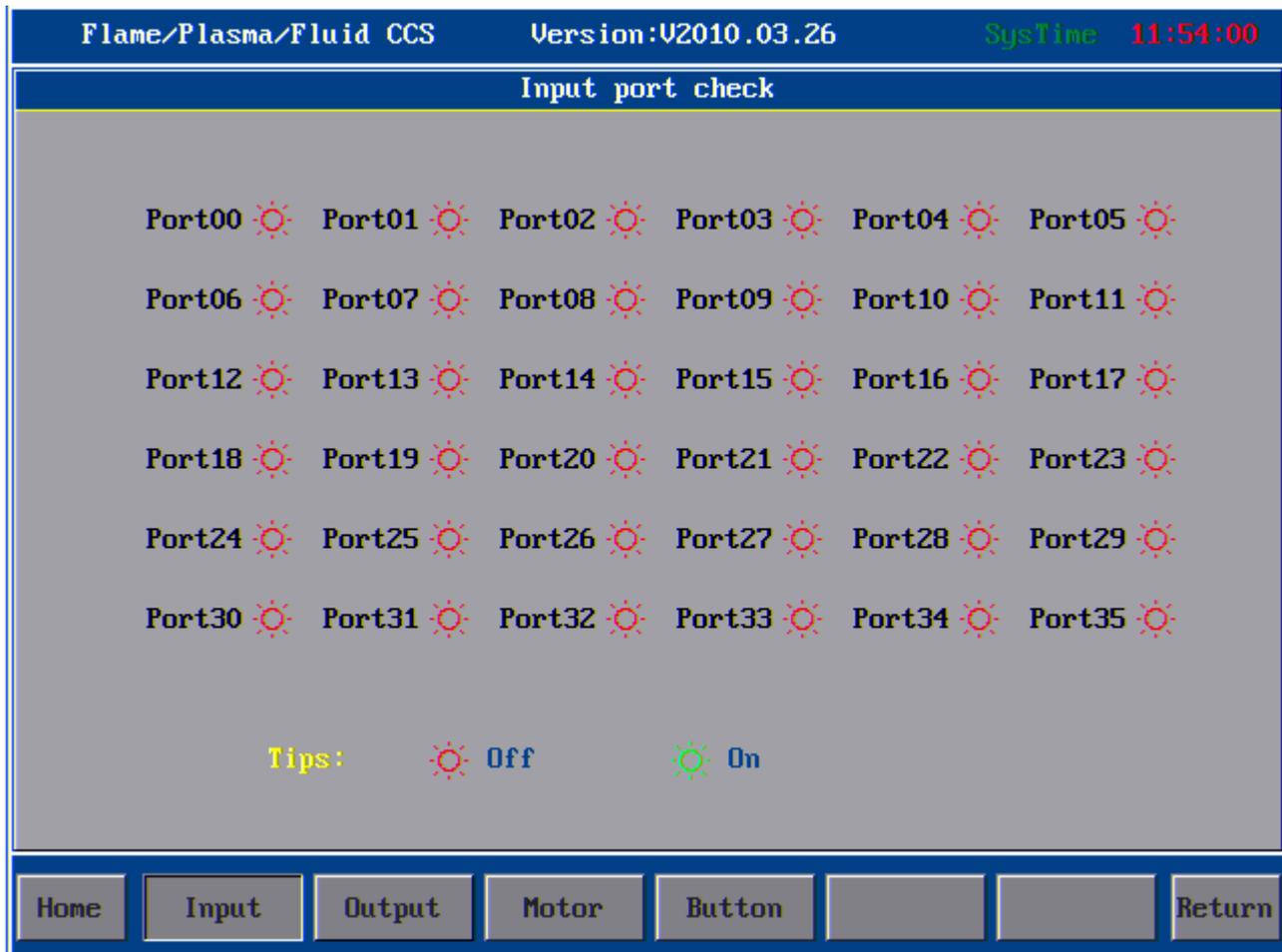
Logic level of X-axis limit: It refers to the logic level of limit. 0—low level effective, 1—high level. This is also applicable to the YZA axes.

I/O effective logic level: It refers to the I/O level of normal I/O port (IN, OUT number). 0—low level effective, 1—high level effective.

Ø System Diagnosis

Interface introduction

Press  key to enter the interface of port diagnosis to test the input ports. Red light: Disconnected. Green light: Closed. System will show the port No. simultaneously. As shown below:



Interface of input port diagnosis

Press key to enter the interface of output port diagnosis to test the output ports. Red light: Disconnected; Yellow light: Selected; Green light: Closed. System will show the port No. simultaneously, when you choose the ports. (Correspond with I/O setup on the front)



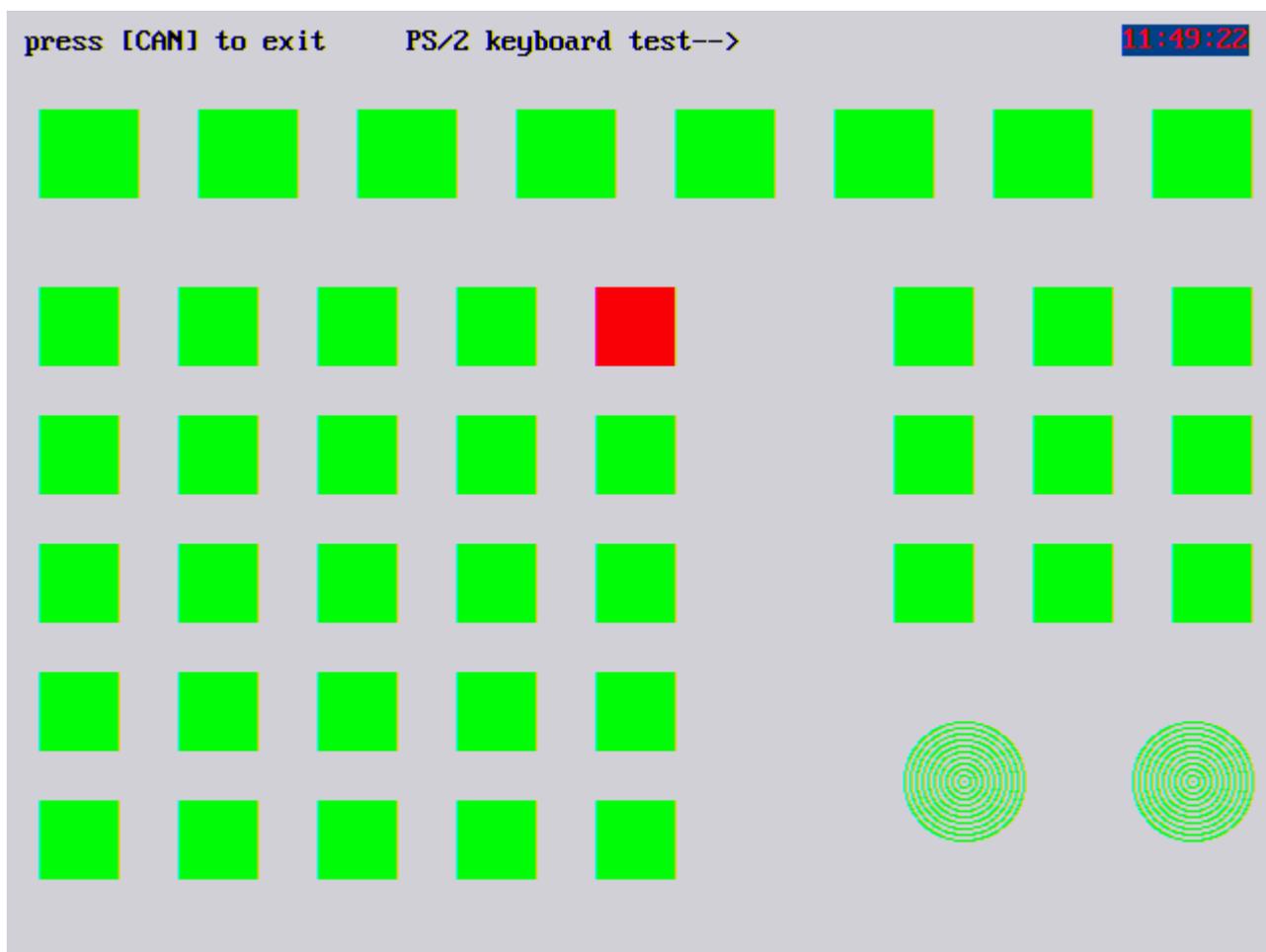
Interface of output port diagnosis

You can press key to enter the interface of motor control diagnosis. Yellow words with orange lake bottom indicate that the direction of this axis is selected. Press key and the motor will start to run. You can press key any time to stop the motor. As the following picture shows, the x-axis will be rotated in positive direction if you press key, and stop if you press . You can press keys to switch the direction of different axes.



Interface of motor control diagnosis

You can press key to enter the key test interface. The corresponding key will have an action and become the state of being pressed if you press a key. If there is no response when you have pressed a key for several times, it means the key is out of order.



Key test interface

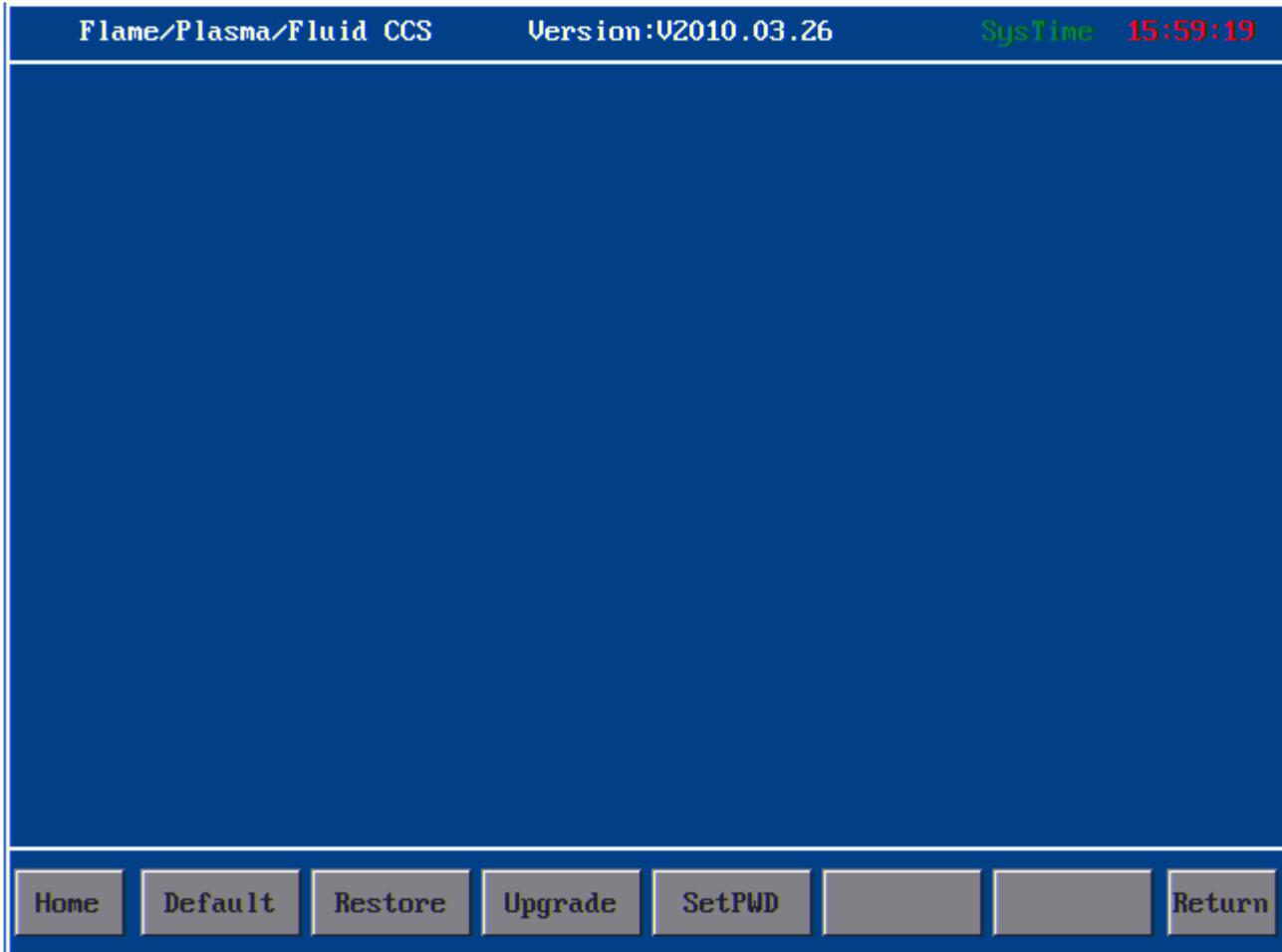
Basic operation

The system diagnosis shows the open hardware resource of the system. In system diagnosis window, you can check the following interfaces:

- 1) Output check: Press     key to move the cursor to any position of the 16 photovoltaic isolation outputs, and press [CONFIRM] to change the state of output level. For definitions of all output port symbols, please refer to hardware input/output (definition of output port).
- 2) Input check: It shows the state of the current 16 photovoltaic isolation inputs. Green “” indicates that the current port is detected with an input signal; red “” indicates that there is no set in this port; yellow “” indicates that this port is selected. For example, if “Port 00” is detected with an input signal, the red light behind will be changed to green. For definitions of all output port symbols, please refer to hardware input/output (definition of output port).
- 3) Keyboard check: Press any key on the key panel, and the corresponding key on the screen will have a response. If there is no response if you have pressed the key for several times, or if the key displayed is wrong, it means there is a problem with the system.

Ø System management

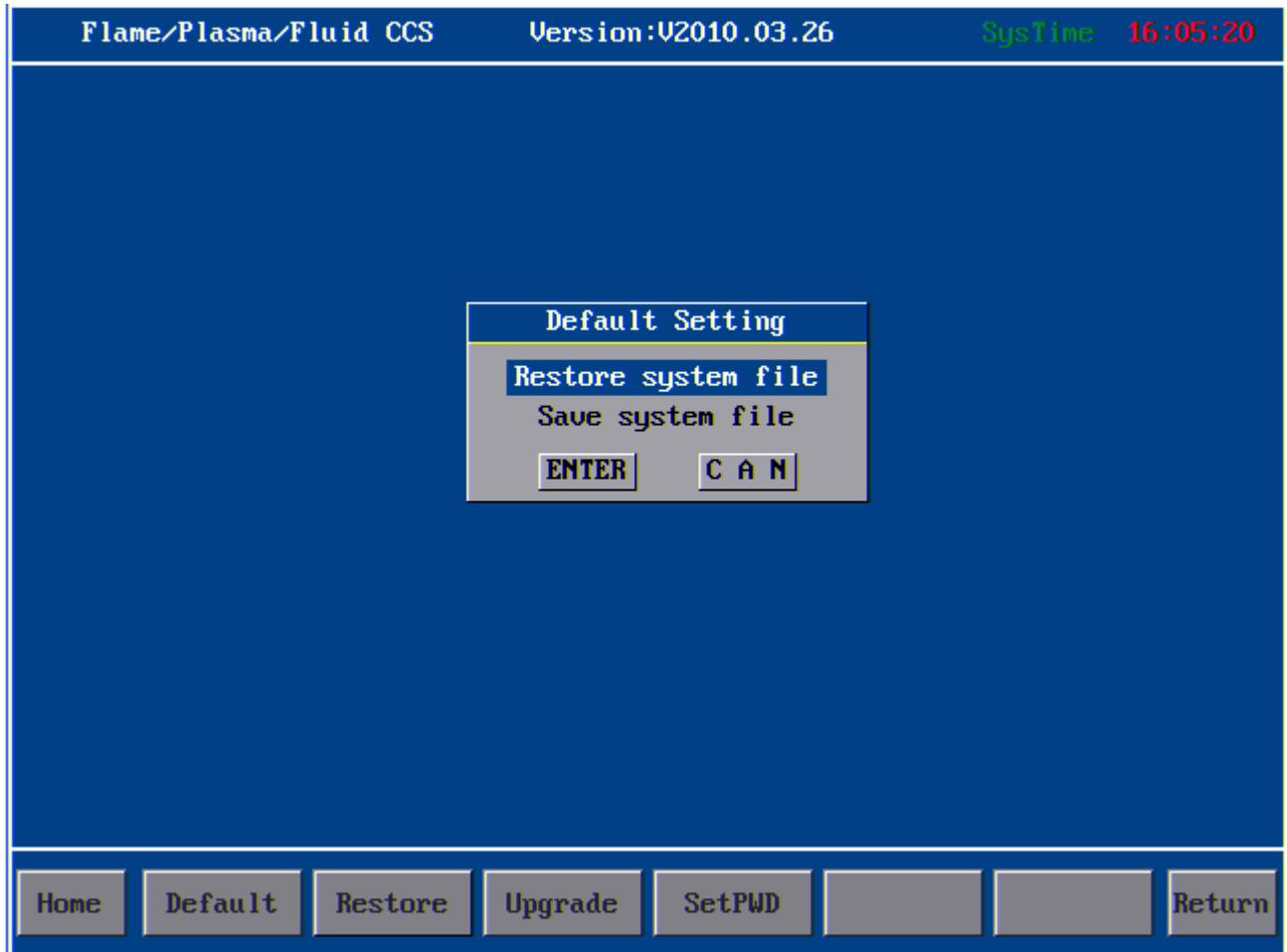
In system management interface as shown below, software upgrades, Standard value, Vista Ghost, Factory setting functions etc.



System management

Factory default

Press  (Factory default), and the interface is shown as follows. Choose “System parameters restore” and press  to go to the next step when the system will prompt you to enter password “360”. If the password is valid, it will go to the next interface. You can cancel at this time or press “CONFIRM” to restore the parameters of current cutting mode to the saved factory default. If the parameters have been restored, the interface will pause for 1 second and restart the system using the restored parameters. As the following picture shows:



Interface of factory default setup

“Save system parameters”: Press     to move the cursor to “Save the system parameters” and press  to go to the next step when the system will prompt you to enter password. Enter “361”, and press  to continue. If the password is invalid, the setup will exit; if the password is valid, it will go to the next step. Likewise, you can press  to cancel or press  to save the parameters of current cutting mode as the factory defaults. The setup method is the same as that of restoring the parameters.

One-Key Recovery

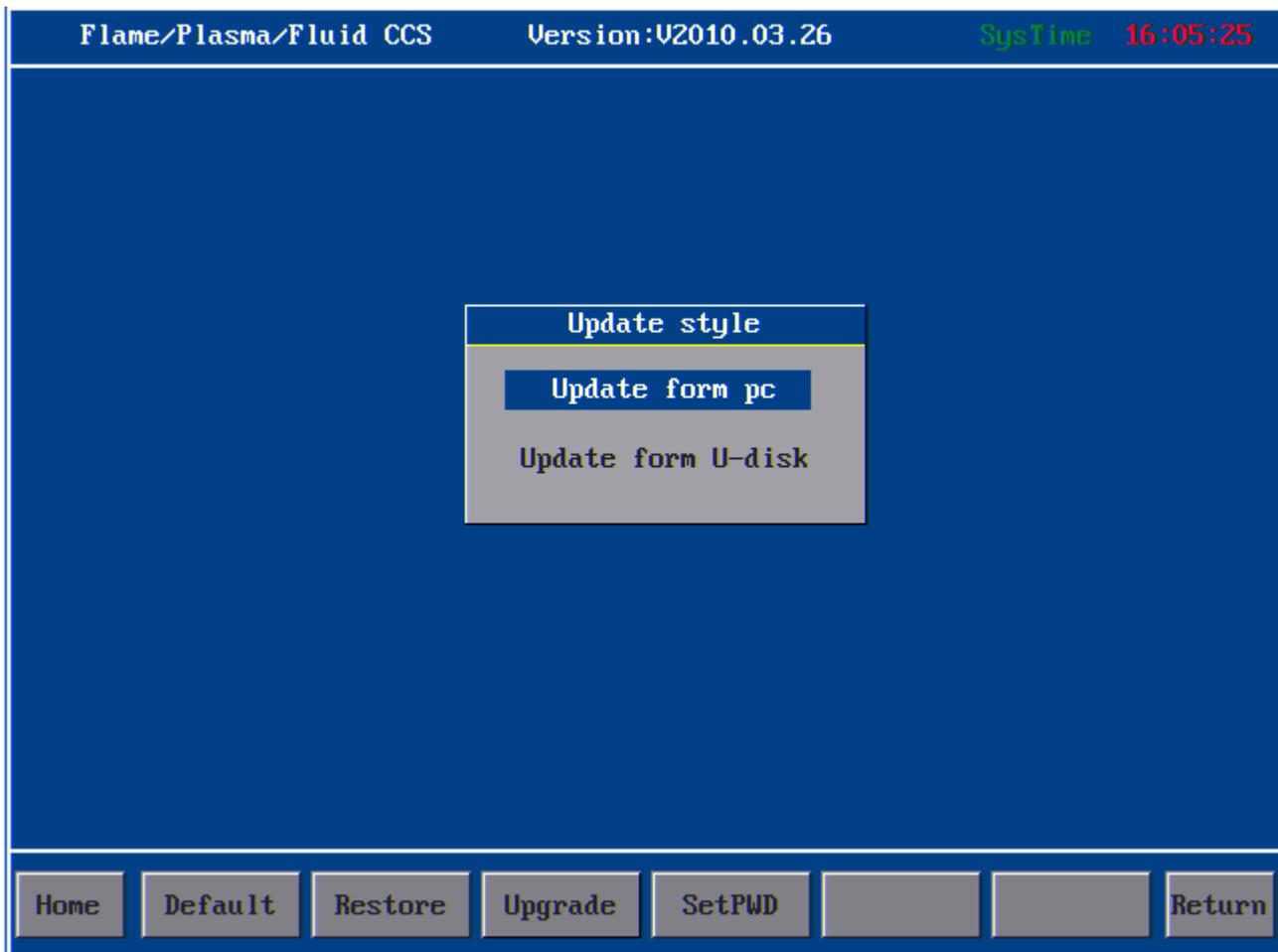
One-key recovery function is used to backup or restore the system files. It is designed for preventing the loss of system files caused by the formatting and error in operation. You need to backup the system files when initializing, so that when the system file lost, you can restore the files to recover the system.

Software upgrade

Upgrade function is provided for users to upgrade the application software to the latest version. In system management

interface, press  key and the interface of “Choose the upgrade mode” will show up. Two modes of upgrading are provided, upgrade via PC and upgrade via USB disk.

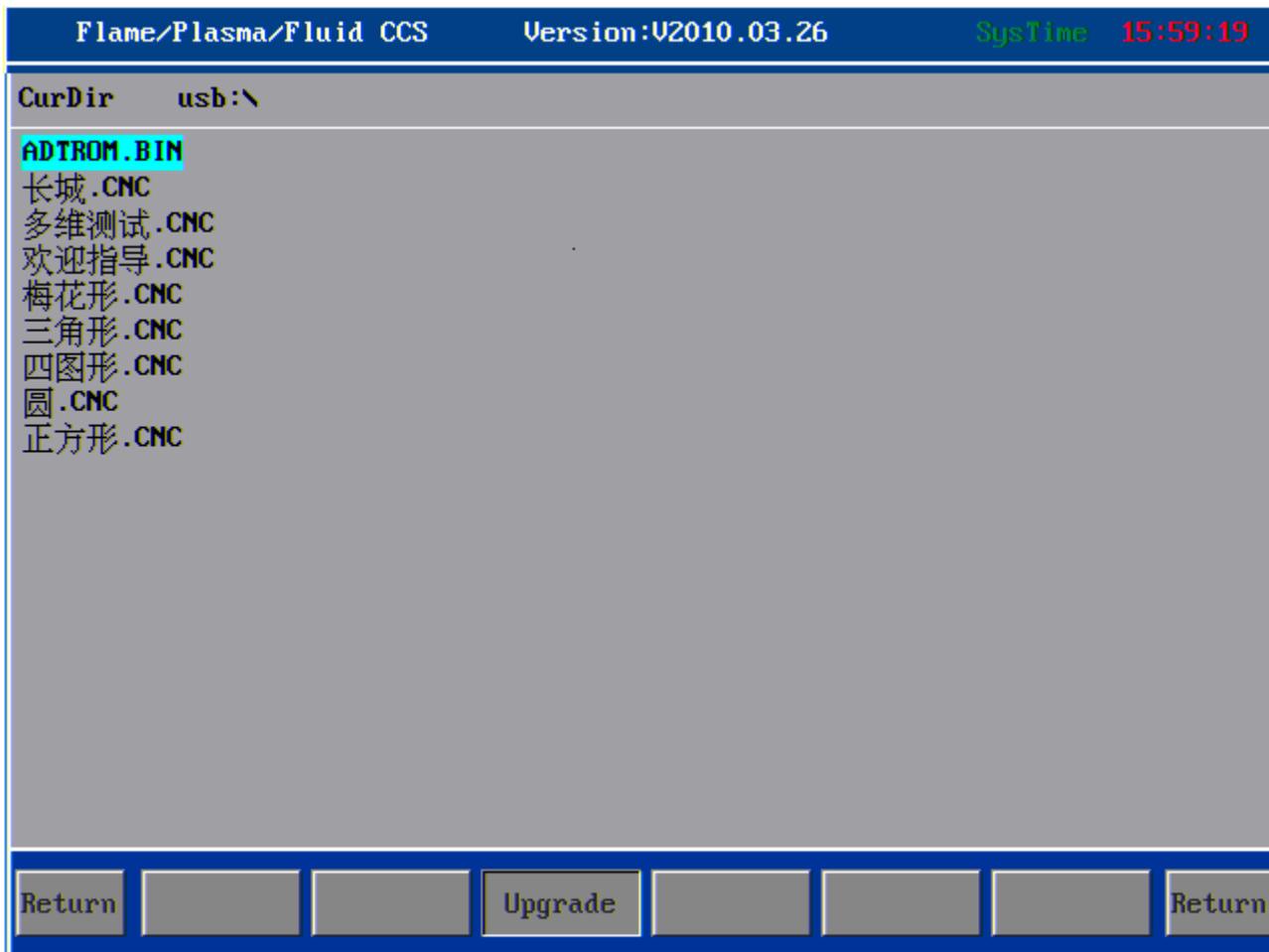
As the following picture show:



Choose the upgrade mode

USB disk connected

When the cursor is moved to “Upgrade via USB disk”, the system will start the USB disk function. If the system finds the USB disk, it means the USB disk is connected successfully. As the following picture shows:

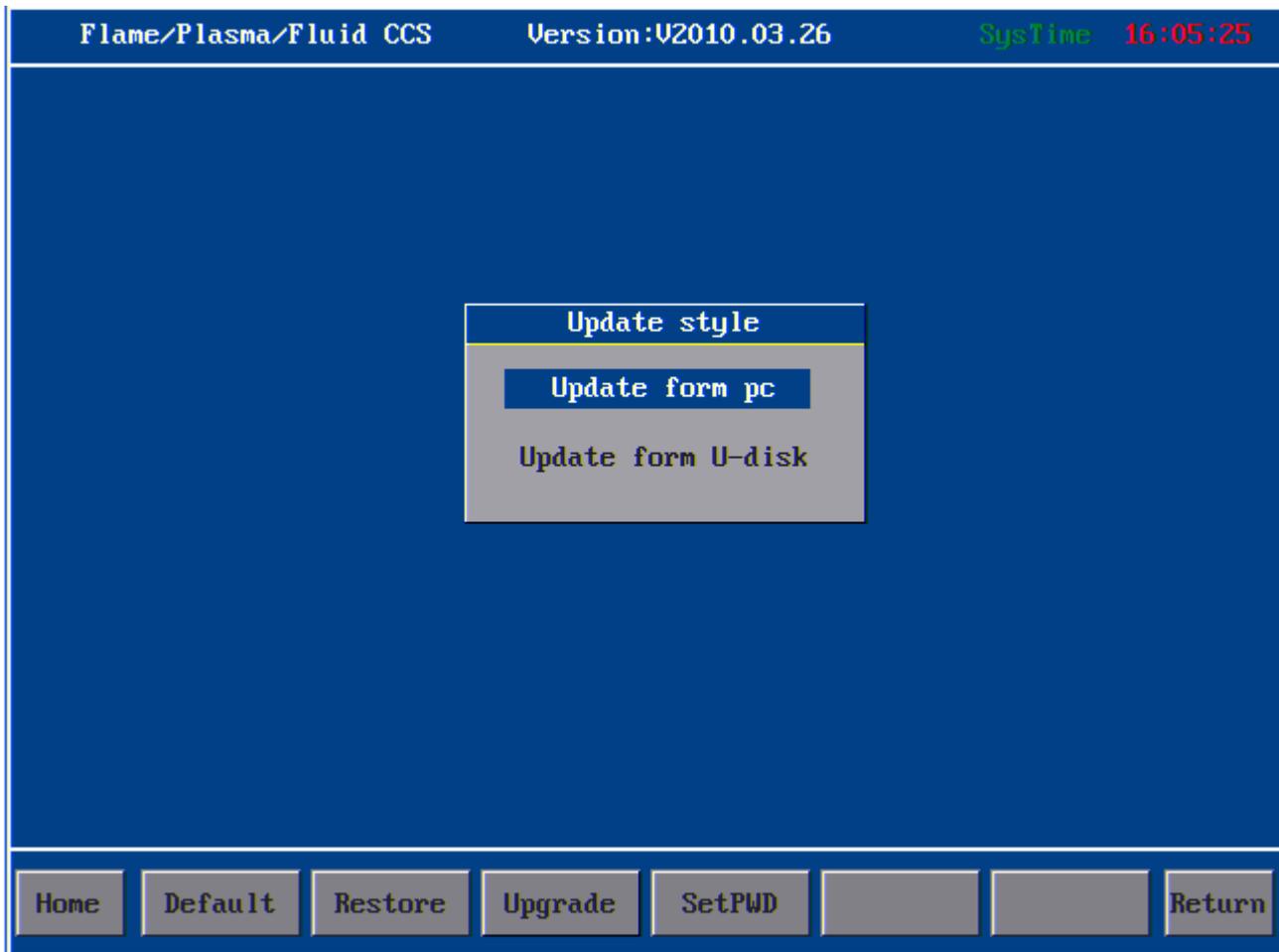


USB disk connected

Once the USB disk is connected, move the cursor to “ADTROM.BIN” and press , the system will then start upgrading automatically. After the upgrade, you need to restart the system and record the program. For program recording, please see the later chapter.

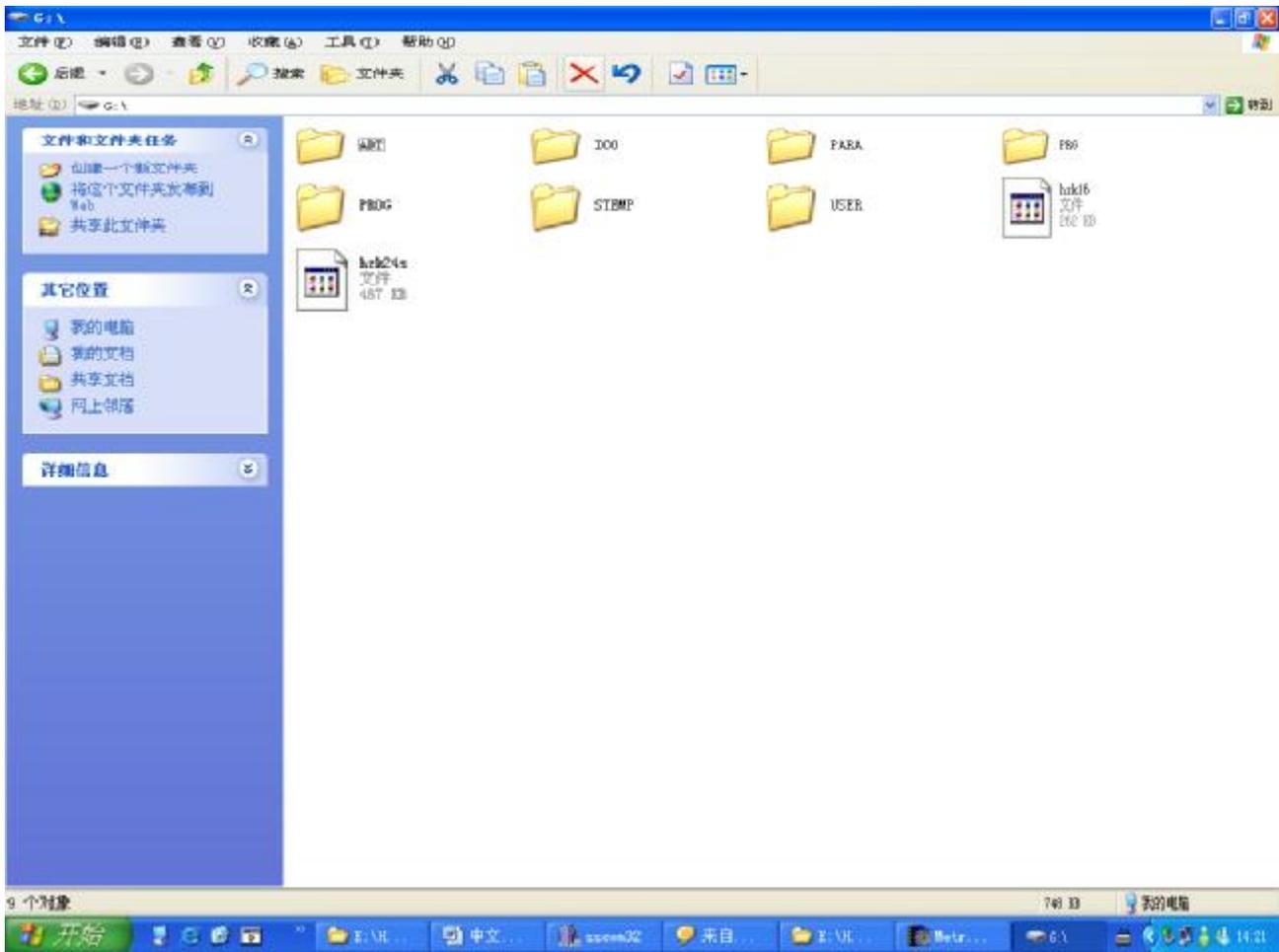
If the files selected are not the system files for upgrading, the system will give an upgrade failure prompt or other info.

Upgrade via PC



Connect the PC

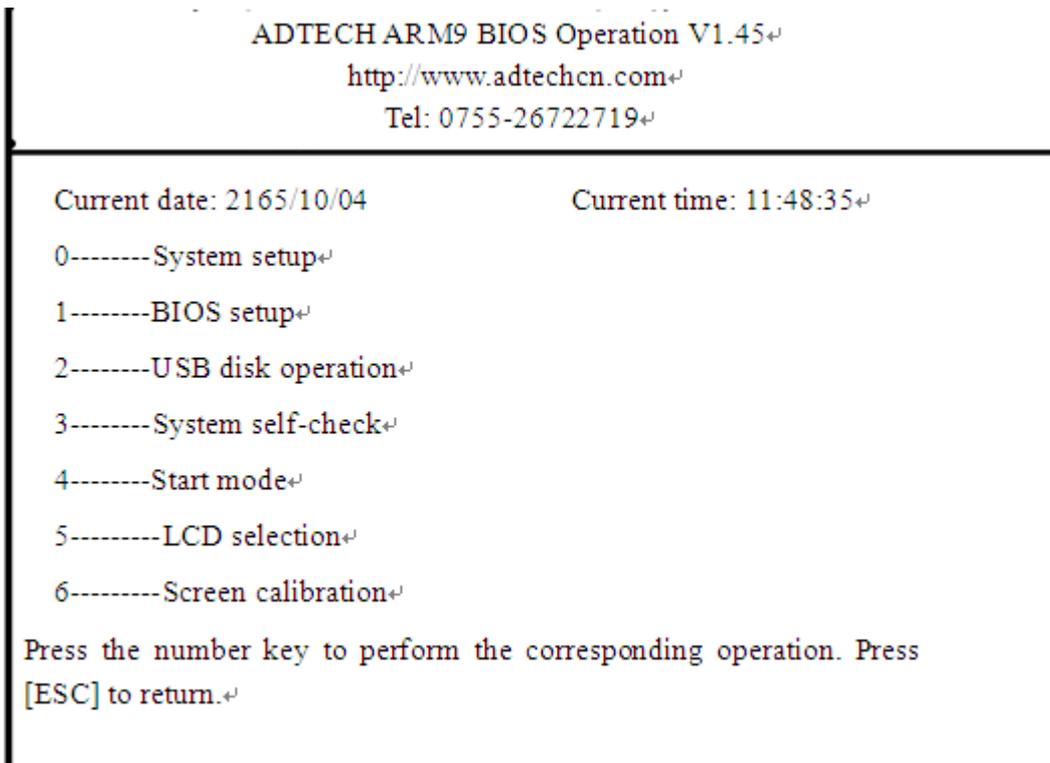
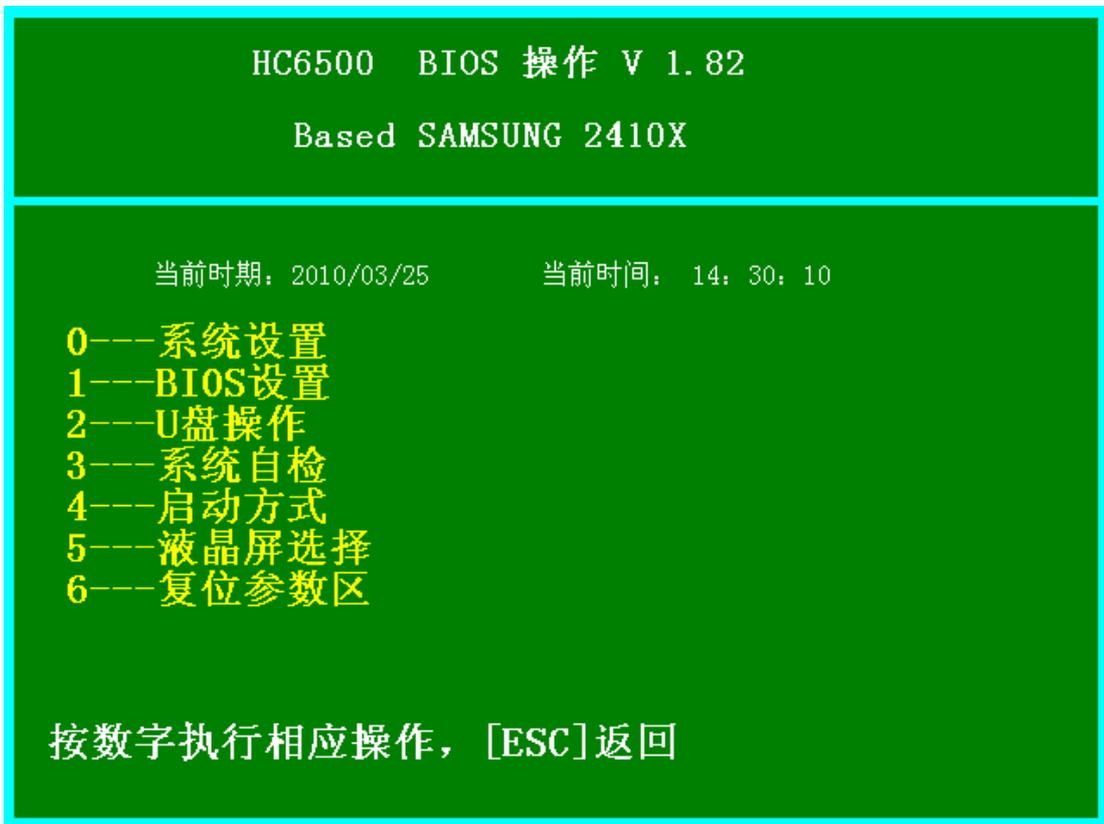
Connect one end of the USB line to PC and the other end to the interface of controller, and then press   to move cursor to “Upgrade via PC” and press . Open “My Computer” and the controller will be displayed as a 64M USB disk on the computer. Double click “Removable USB disk” and the following interface shows up, which include all system files of the controller.



Then, double click  to open this folder, copy the software named “adtrom.bin” to “ADT” folder in the following picture to cover the original “adtrom.bin” file. After the copy, press  key on controller, and the system will restart automatically to record the latest program to BIOS chip.

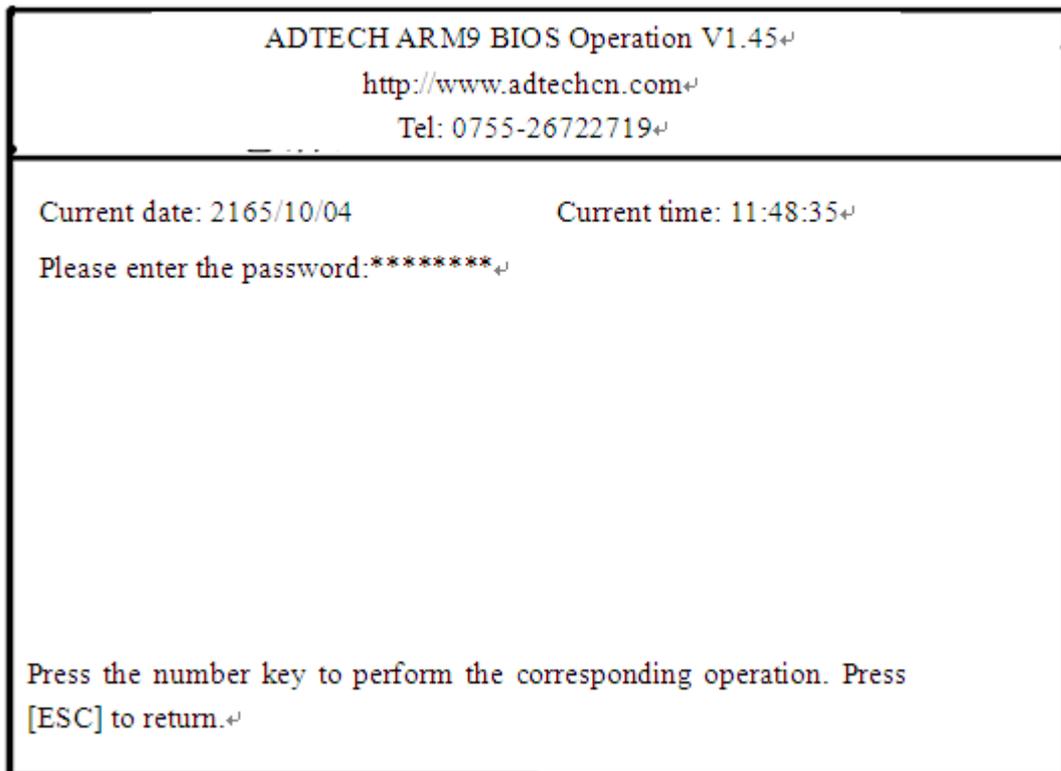
Ø Recording program

When you have copied the latest application software to controller, you need to save the software to the controller BIOS so that the controller can operate the software. To do this, you should cut the controller power supply first, press and hold  key when the controller is restarted. The BIOS setup interface is shown as follows:



Picture 60 BIOS setup interface

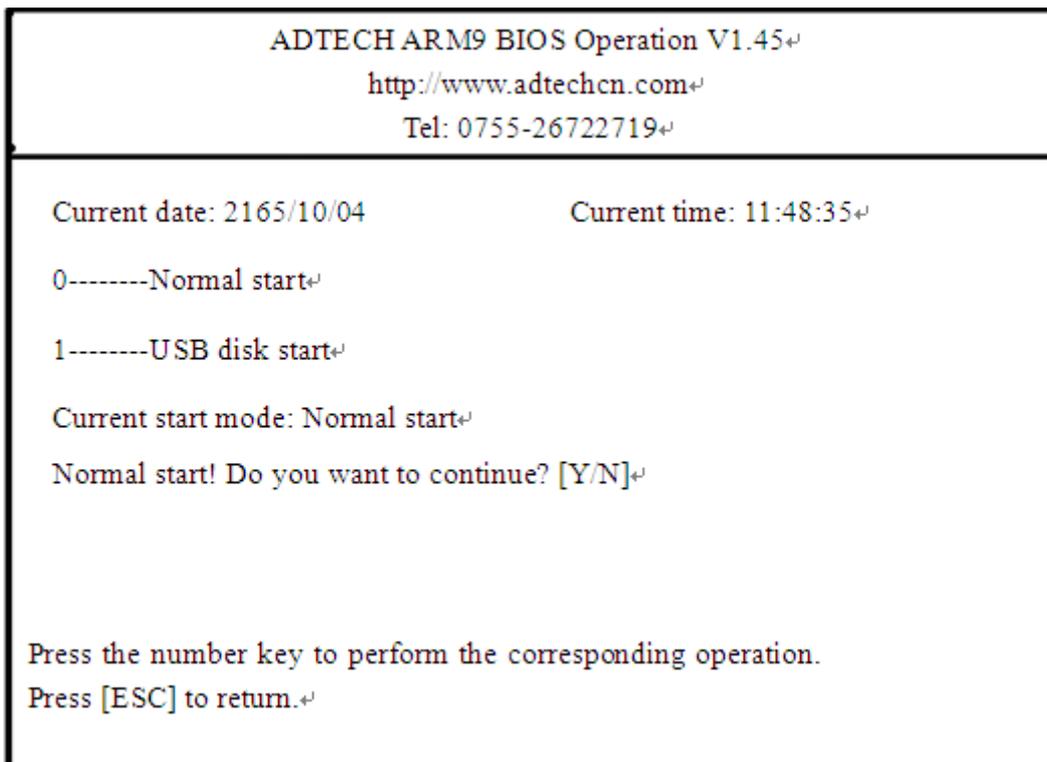
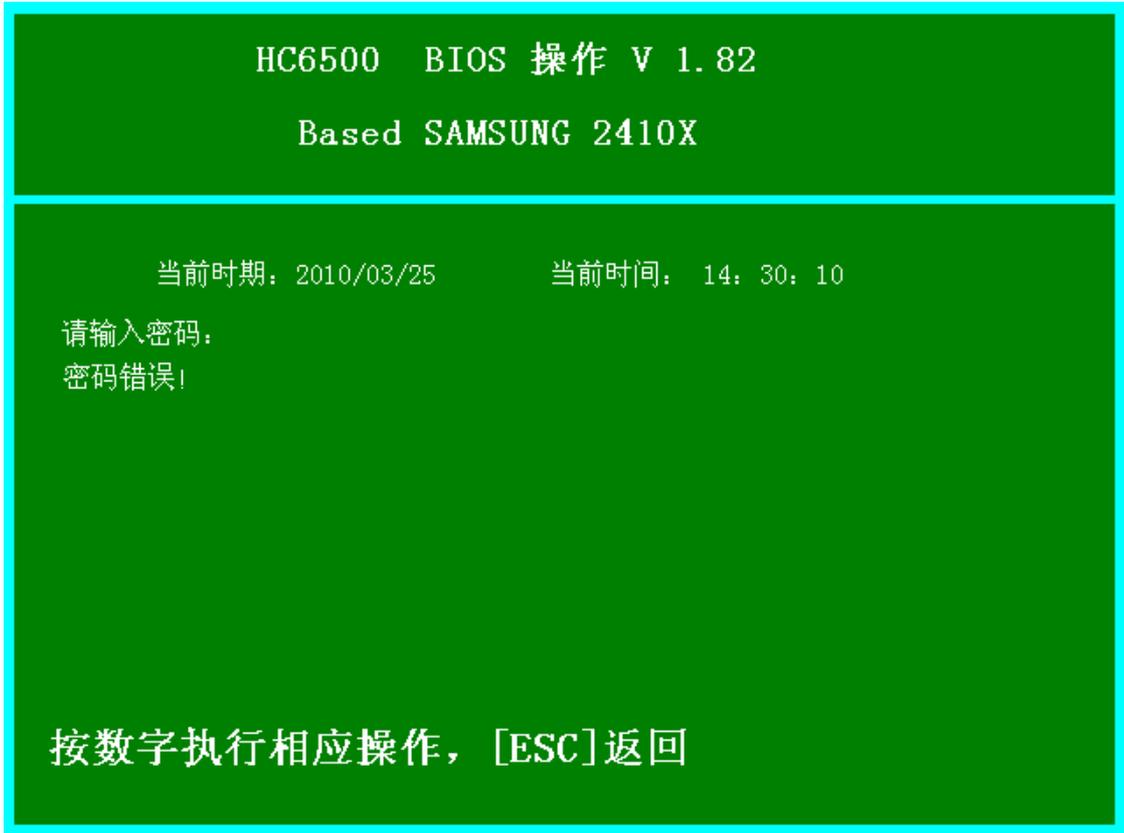
Press number key "1---BIOS setup" and the system will prompt you to enter the password. Please refer to the supplier for the password. Enter the password, and the interface is shown as follows:



Password entry interface of the BIOS interface

The system will enter the setup interface of the password is valid. Press the corresponding number key “Program upgrading” and the system will prompt “Sure to upgrade the program, Y/N?” Then, press **Y** key, and the system will indicate that the files are found, and start upgrading. After the upgrading, a prompt “Upgrade complete, please restart

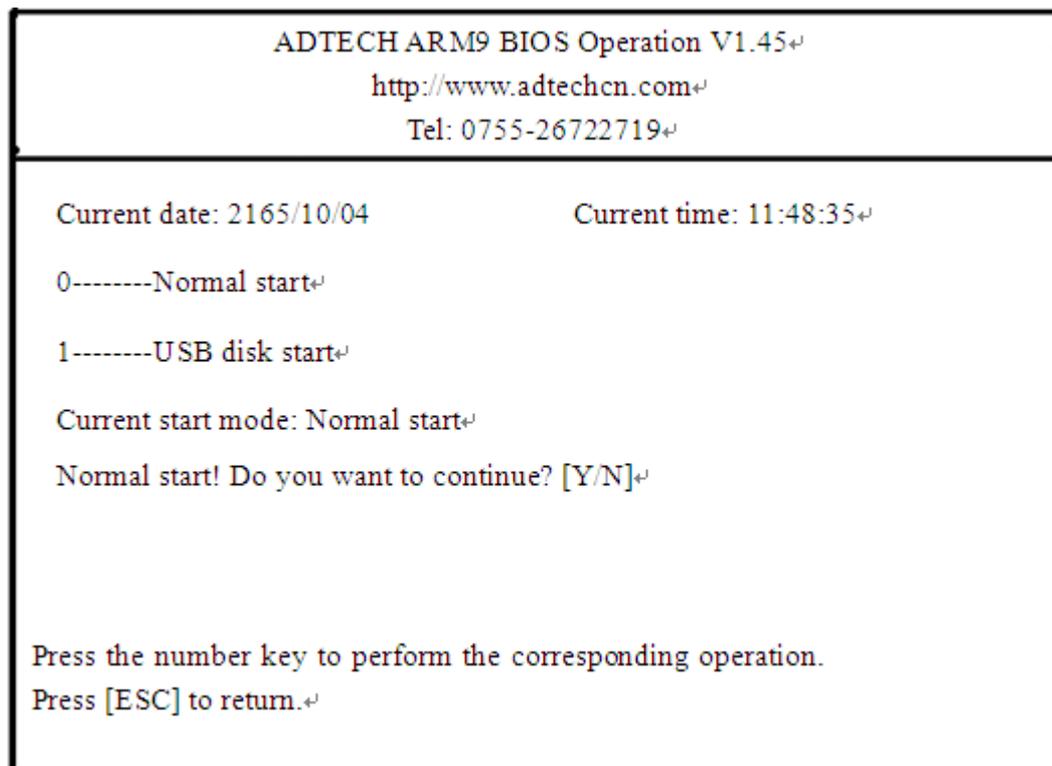
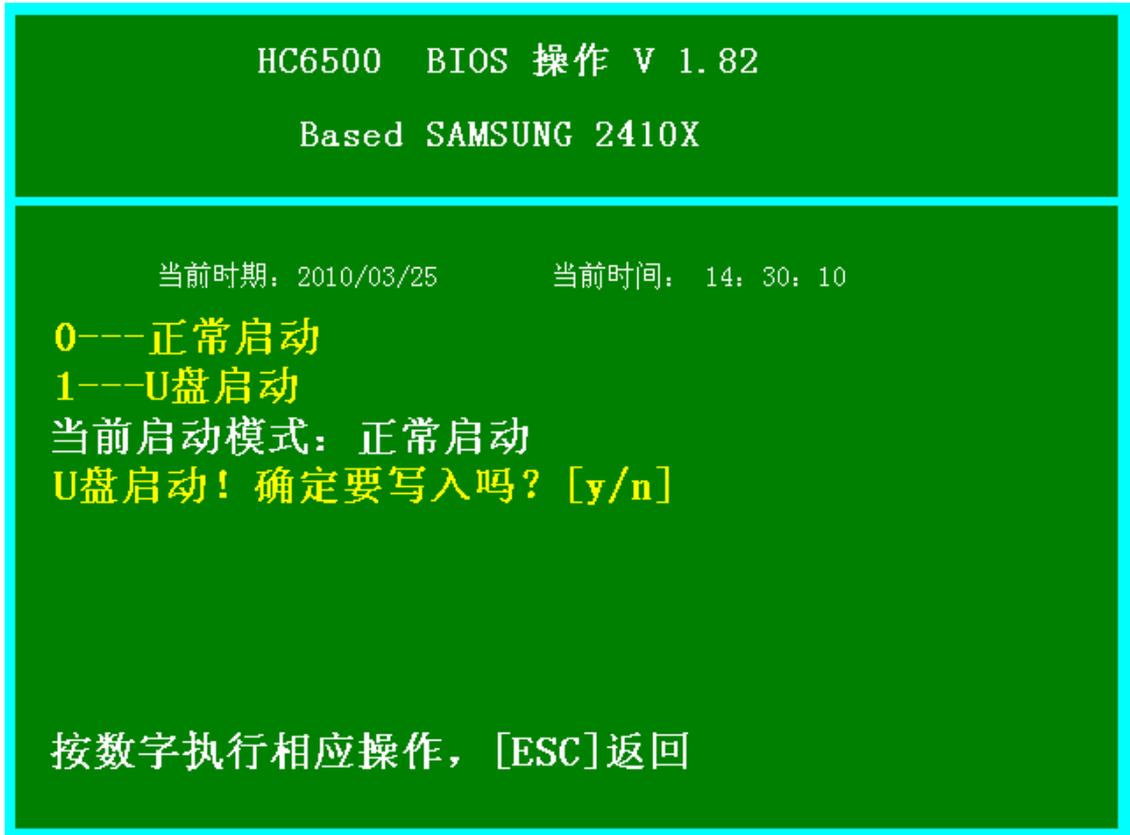
the machine” will show up. If the password is invalid, the interface will be shown as follows:



Picture63 Password error interface of BIOS interface

Enter the password again and repeat the operations above.

Check whether the start mode is “Normal start” after the upgrading.

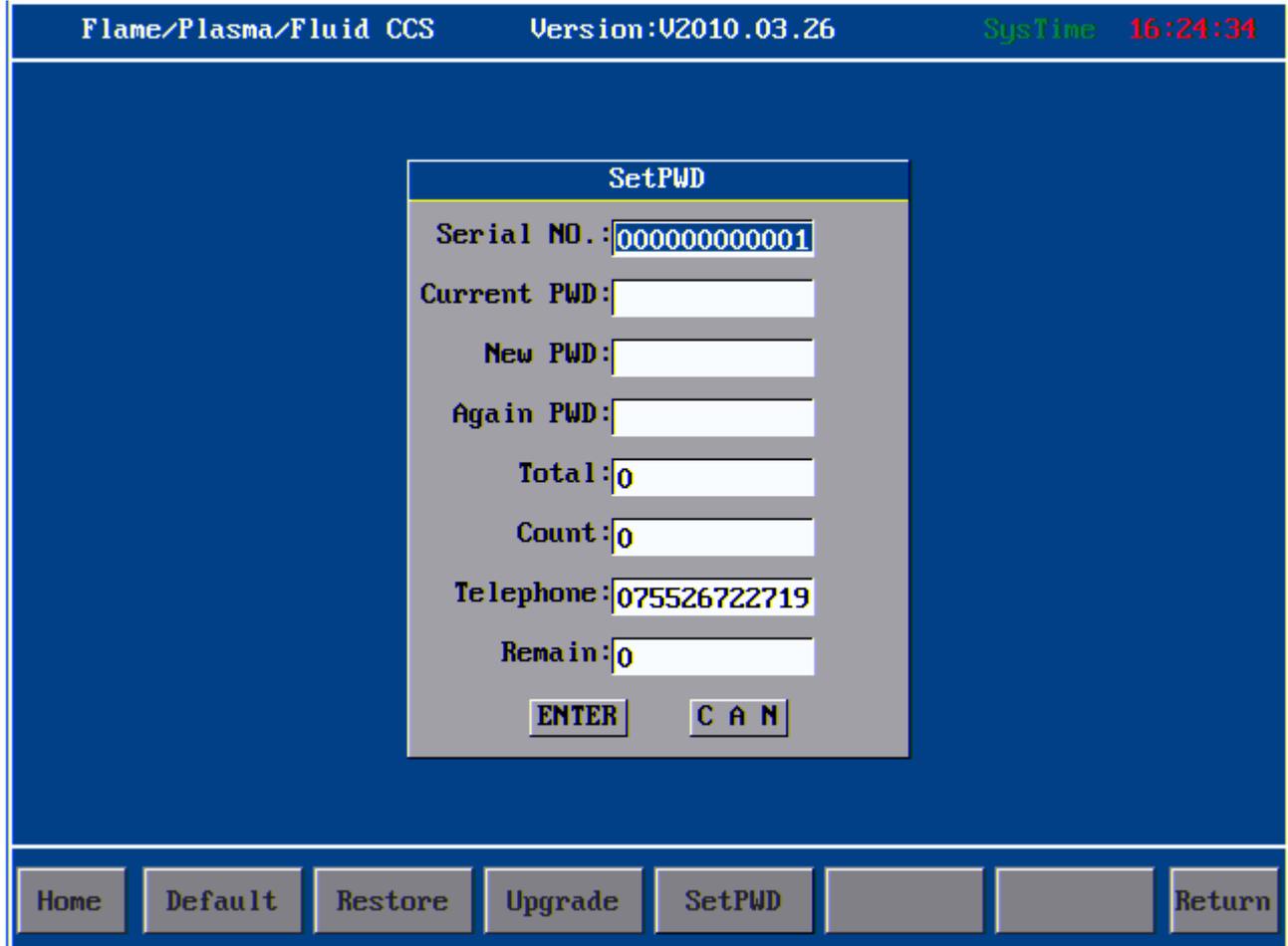


Picture64 Start Mode

Press the corresponding number key “1---Normal start”, and the system will prompt “Normal start! Do you want to continue? [y/n]”. Press  to set the system to “Normal start”.

Ø Manufactory Setup

In “Setup options” ->“System management”->“manufactory setup”, you can set several parameters, such as system S/N, password, the allowable times of boot-up, reminding times, etc. Here we are going to introduce these functions one by one:



The screenshot shows the 'SetPWD' (Set Password) menu. The top bar displays 'Flame/Plasma/Fluid CCS', 'Version:U2010.03.26', and 'SysTime 16:24:34'. The menu items are as follows:

- Serial NO.: 000000000001
- Current PWD: []
- New PWD: []
- Again PWD: []
- Total: 0
- Count: 0
- Telephone: 075526722719
- Remain: 0

Buttons: ENTER, CAN

Main Menu Buttons: Home, Default, Restore, Upgrade, SetPWD, [], [], Return

S/N: Mark of a control system. One control system has one exclusive S/N. It is a series of pure number, and can be changed if you enter a valid password.

Current password: It is the current system password. You should remember the new password if you have changed it. The default password of ADTECH control system is “26722719”.

New password: It is the new password you want to change to. You need not input any value in this item if you are not going to change the password.

Confirm the password: Check whether the two passwords you entered are consistent.

Total times: If it is empty, the system would not restrict the application times. If it is a number, the times of applying control system is restricted.

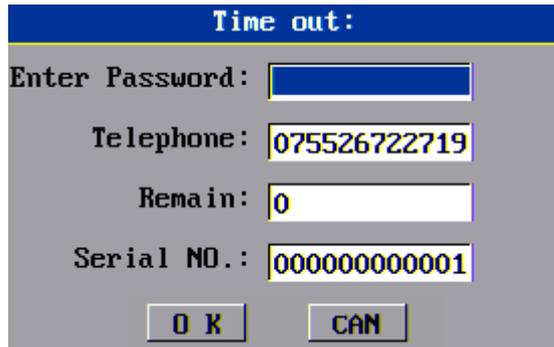
Reminding times: If restricted password is set for the system, a reminding time for payment should be set to remind user to contact system supplier in advance.

Contact number: It is a contact number of cutting machine supplier provided for the convenience of after-sale service. However, do not forget the password.

Remaining times: It indicates the remaining times of system application.

When the remaining time reaches the set number, the system will remind you as you start the system (as the

picture shows). If the remaining time is larger than 0, you can press cancel to go on using. If it is 0, you need to enter password and press [CONFIRM]. If the password is invalid, this dialogue box would not disappear and the system cannot be used until you enter a valid password. This prompt would not appear again until you reset the password and the remaining times.



Time out:

Enter Password:

Telephone:

Remain:

Serial NO.:

Note: For the application times, it counts once every time when the system is started.

Chapter IV Instruction System

Ø Explanation of programming symbol

Every motion of the CNC processing is done following the due process, every processing program is composed by several instruction segments, each instruction segment is composed by several function words, and each function word should be started with a letter following by the parameter value.

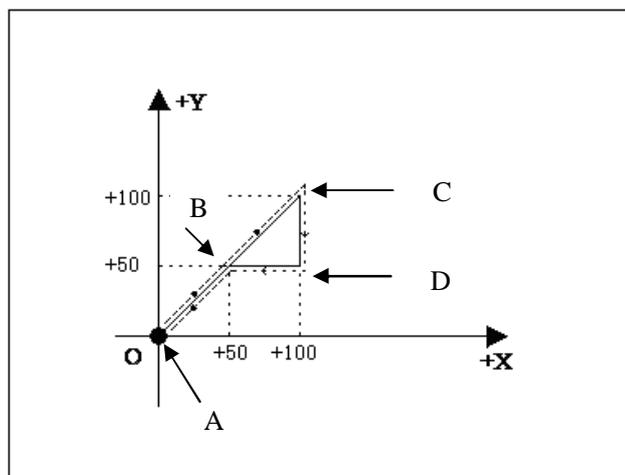
Definition of function word:

- G Preparatory function
- M M-function
- L Cycle index or delay time
- X Coordinate of X axis: It is relative coordinate in G91 (default), and absolute coordinate in G90.
- Y Coordinate of Y axis: It is relative coordinate in G91 (default), and absolute coordinate in G90.
- I during the circular arc processing, the center coordinate value minus the original value of X axis
- J during the circular arc processing, the center coordinate value minus the original value of Y axis
- R Specify the radius of circular arc

Ø Coordinate explanation

Ø Relative coordinate

In coordinate system, if the coordinate of current point is calculated from the previous coordinate, it is called relative coordinate. As the picture shows:



Picture 2.1

As the above picture, if calculated by relative coordinate, the coordinate of the points in picture are as follows:

1. Point A is the origin, the coordinate is (X0, Y0);
2. Point B is (X50, Y50) relative to point A;
3. Point C is (X50, Y50) relative to point B;
4. Point D is Y-50 relative to point C;
5. Point D returns to point B, and the coordinate is X-50;

Ø Absolute coordinate

In coordinate system, if the coordinate of current point is calculated from the origin, it is called absolute coordinate. As picture 2.1, if calculated by absolute coordinate, the coordinate of the points in picture are as follows

1. Point A is the origin, the coordinate is (X0, Y0);
2. Point B is (X50, Y50) relative to point A;
3. Point C is (X100, Y100) relative to point A;
4. Point D is (X100, Y50) relative to point A;
5. Point D returns to point B, and is (X50, Y50);

Ø G instruction explanation

Ø G92 reference point setup

Set the coordinate of processing origin (reference point) of program. It should be put at the beginning of program.

Format: G92 X0 Y0

If G92 is not followed with X/Y coordinate, the current coordinate (X, Y) is taken as the reference point. Usually, when locating using the machine origin, G92 would not have X and Y content.

Ø G00 idle motion

This instruction enables you to travel to the appointed position quickly. During the travel, the system moves from the starting point to end point in rectilinear motion at the manual limiting speed. G00 motion would not be influenced by the speed rate.

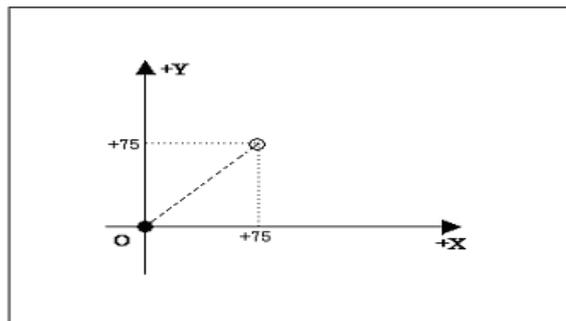
Format: G00 Xn Yn

For example: G92 X0 Y0

G00 X75 Y75

M02

- Current position of cutting gun
- Expected position of cutting gun



Ø G01 linear cutting

This instruction enables you to feed the cutting gun to the appointed position in linear way. As the cutting motion instruction, single-axis or dual-axis linear interpolation is available.

Format: G01 Xn Yn

For example:

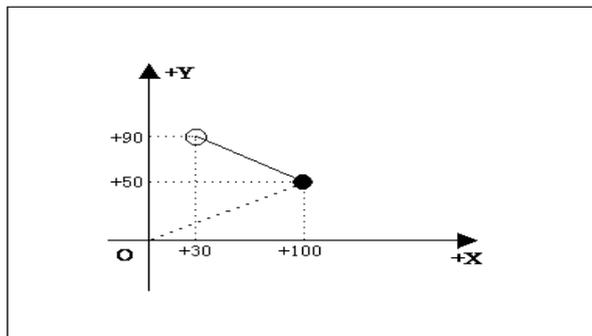
G92 X0 Y0

G90

G00 X100 Y50

G01 X-30 Y90

M02



- Current position of cutting gun
- Expected position of cutting gun

Ø G02/G03 circular arc cutting

This instruction is used to cut a circle or circular arc. The circle is divided into G02 (clockwise) and G03 (anti-clockwise).

Format: G02[03] Xn Yn In Jn

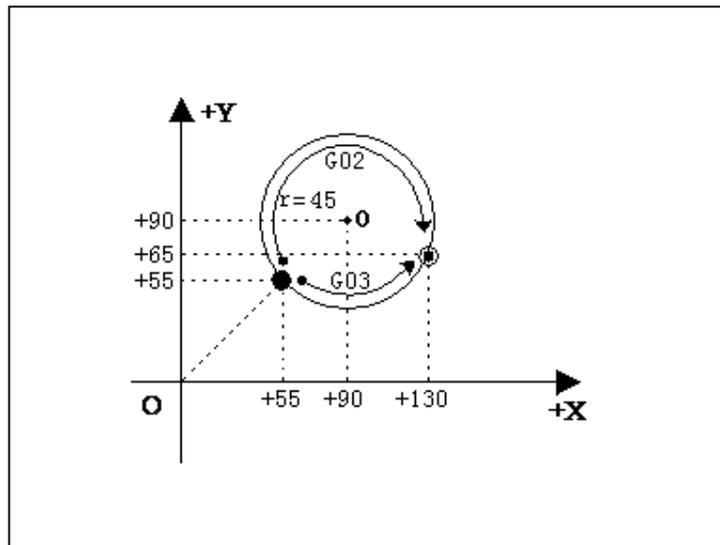
For example (G02):

```
G92 X0 Y0
G00 X55 Y55
G02 X75 Y10 I35 J35
M02
```

Note: Cut a section of circular arc clockwise

For example (G03):

```
G92 X0 Y0
G00 X55 Y55
G03 X75 Y10 I35 J35
M02
```



- Current position of cutting gun
- Expected position of cutting gun

Explanation:

I and J are the increment of center at X and Y-axis direction relative to the origin. When you are writing processing files, if you want to write a circle with a diameter of 100MM, to make it simple you can enter I50 J0 directly. If the circle diameter is 150MM, you can just enter I75 J0.

Ø G04 Pause/Delay instruction

This instruction is used to set the time delay. When the program performs this instruction, it will delay the stated time. The time unit is in second.

Format: G04 Ln

For example: G04 L3.6 (3.6s delay)

If G04 does not have Ln behind, the system will delay without time limit once G04 is performed until you press [Start] key.

Ø G26, G27, G28 Back to reference point

This instruction allows the cutting torch to return to reference point automatically.

Format:

G26: X axis back to reference point

G27: Y axis back to reference point

G28: X and Y axes back to reference point at the same time

For example: G28 (X and Y axes back to reference point at the same time, equal to run G00)

Ø G22/G80 cycle processing

This instruction can be used to perform cycle processing. G22 is the beginning of loop, and cycle time L is appointed. G80 is the end mark of loop. G22 and the nearest G80 below form a loop.

Format: G22 Ln_ (L specifies the cycle times)

Loop

G80 (End mark of loop)

For example: 0000 G92 X100 Y100

0001: G22 L10000 ——Cycle starts

0002: G00 X50 Y50

0003: G01 X80 Y80

0004: G80 ——Cycle ends

0005: M02

Ø G81 workpiece counting

This instruction is used by the system to count the total workpiece automatically.

Format: G81

For example: 0000 G92 X0 Y0

0001: G22 L3——Cycle starts

0002: G01 X50 Y50

0003: G81——Counting

0004: G80——Cycle ends

0005: M02

Ø Common M instructions

1) Common M instructions:

Users only need to know the functions of M07, M08, and M02 instructions. M07 refers to fixed cycle of preheating and perforating. When the track is processed and come to perform M08, the system will close all related valves. In the end, perform M02 to finish the processing. Detailed functions of codes are as follows:

Flame:

① M07 Fixed cycle of preheating and perforating, operating sequence is as follows:

1. Open acetylene valve;
2. Ignition on;
3. Drop the cutting gun;
4. Open the preheating valve and start preheating;
5. Lift the perforating cutting gun;
6. Open cutting oxygen valve;
7. Drop the perforating cutting gun;
8. Perforation complete, and go to the next motion.

② M08 Close the cutting fixed cycle. The operating sequence is as follows:

1. Close the cutting oxygen valve;
2. Lift the cutting gun.

Plasma:

①

A). with height-adjusting system:

- Enable M22

, Arcing M12

f Waiting for arc voltage detection signal (IN0)

After arcing, the height-adjusting control starts performing initial location (With initial location function), perforating and perforating delay automatically, and gives a signal of successful arc voltage detection to the controller.

B). without height-adjusting system:

- Arcing, arcing delay M12
- , Perforating, perforating delay

C). Start the following actions

②

1. Close striking arc M13

2. Close the height-adjusting control M23

- ③ M02 program end instruction

2) other M instructions:

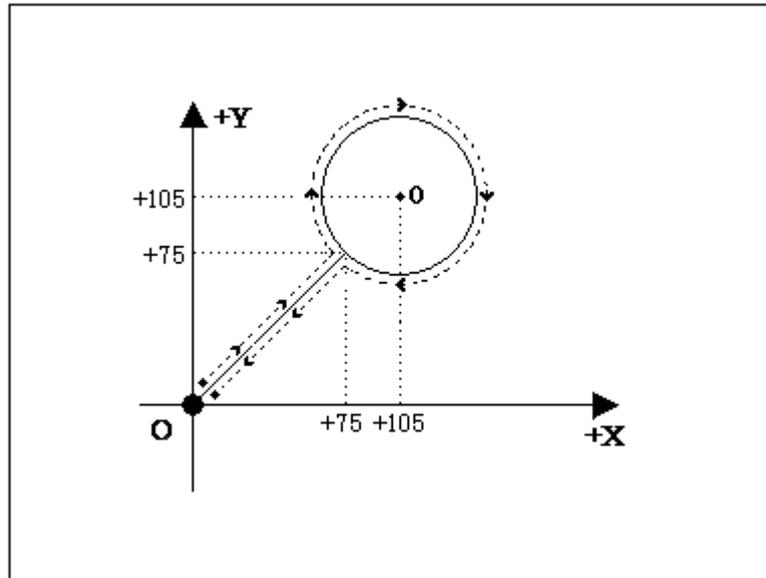
- ① M10/M11 switch of acetylene valve, M10 (Open), M11 (Closed)
- ② M12/M13 switch of cutting control valve, M12 (Open), M13 (Closed)
- ③ M14/M15 switch for controlling the rise of cutting gun, M14 (Open), M15 (Closed)
- ④ M20/M21 ignition switch, M20 (Open), M21 (Closed)
- ⑤ M24/M25 switch of preheating oxygen valve, M24 (Open), M25 (Closed)
- ⑥ M52 ignition fixed cycle (controlled by time in “Cutting type”)
- ⑦ M70 fixed cycle of cutting gun rising (controlled by time in “Cutting type”)
- ⑧ M71 fixed cycle of cutting gun falling (controlled by time in “Cutting type”)
- ⑨ M72 fixed cycle of perforating cutting gun rising (controlled by time in “Cutting type”)
- ⑩ M73 fixed cycle of perforating cutting gun falling (controlled by time in “Cutting type”)
- ⑪ M74 fixed cycle of preheating (controlled by time in “Cutting type”)
- ⑫ M80 main switch, all output ports are closed if M80 is performed.

Annex I. Illustration of edition and processing

Press  key in main interface to enter the edition option interface, where you can press  key to create a new processing file. Then, you can enter a file name and press  key to enter the file edition interface. In this chapter, we take cutting the following figure as an example. (Dashed line and arrow refer to the direction of motion, solid line refers to the track of cutting, and “●” is the starting point of cutting.)

Remark: Because absolute coordinate is not used often, we do not introduce it in this chapter. In this chapter, we use the relative coordinate.

Ø Standard circle



The program is as follows:

1) Relative coordinates programming and explanation of graph codes:

0000: G92 X0 Y0——set the reference point;

0001: G22 L3——L: set the processing loops; “3” means loop for 3 times;

0002: M07——It is the preheating perforating function. Prompt: Please set all the time parameters in flame or plasma control option in the parameter setup according to the actual demand.

0003: G01 X75 Y75——perforating and wire bonding;

0004: G02 I30 J0——Clockwise circle processing;

0005: M08——Preheating oxygen, acetylene, and cutting oxygen valves closed;

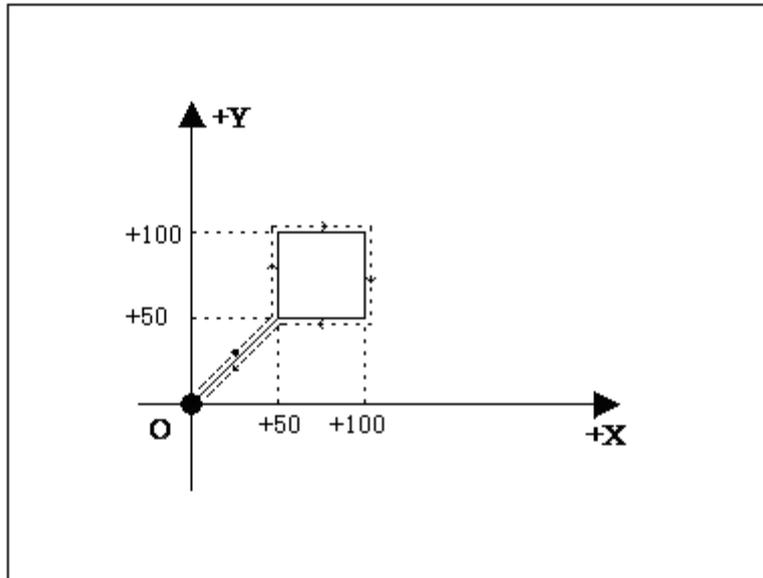
0006: G00 X-75 Y-75——travel to the origin at the highest manual speed;

0007: G81——Counting instruction, it counts once for each loop automatically;

0008: G80——cycle ends;

0009: M02——processing ends

Ø Square



1) Relative coordinates programming and explanation of graph codes:

0000: G92 X0 Y0

0001: M07—Perforating;

0002: G01 X50 Y50—Perforation and wire bonding;

0003: Y50—the first side, if the above instruction is G01, this G01 as well as X0 of this instruction cannot omitted for the convenience of editing codes manually.

0004: X50—the second side;

0005: Y-50—the third side;

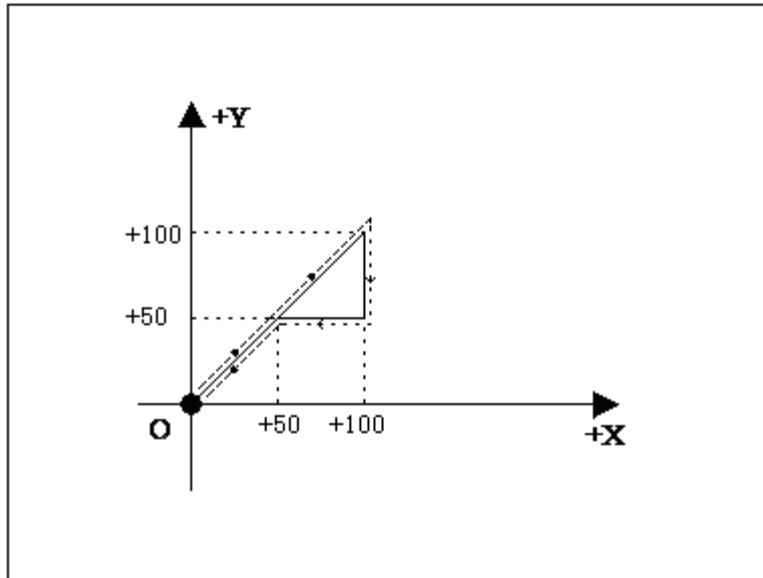
0006: X-50—the four side;

0007: M08—close the cutting oxygen

0008: G00 X-50 Y-50—travel to the origin at the highest manual speed;

0009: M02—processing ends

Ø Triangle

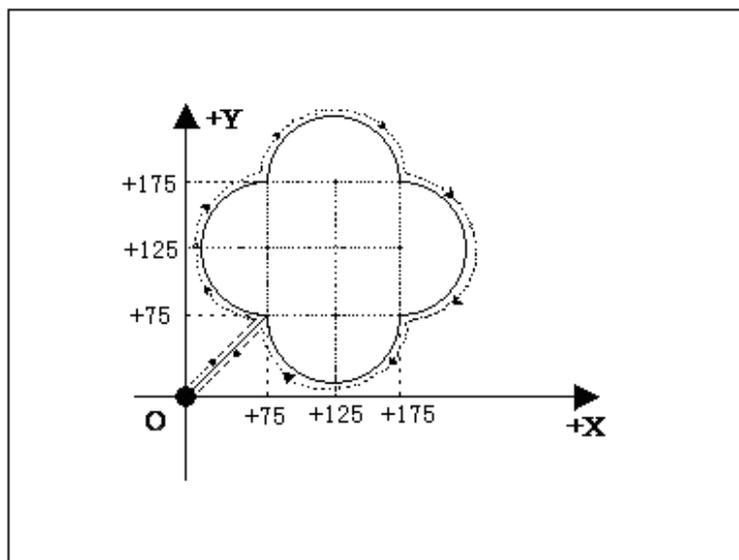


1) Relative coordinate programming

```

0000: G92 X0    Y0
0001: G01  X50   Y50
0002: X50  Y50
0003: Y-50
0004: X-50
0005: G00  X-50  Y-50
0006: M02
    
```

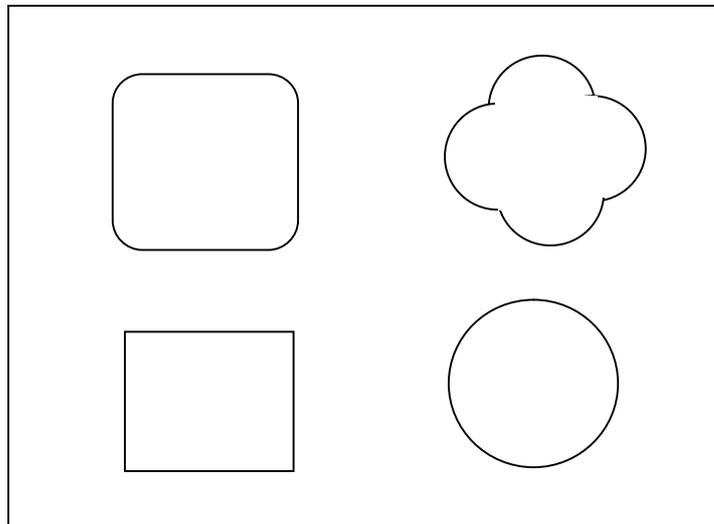
Ø Quincunx



1) Relative coordinate programming

```

0000: G92 X0    Y0
0001: G01  X75   Y75
0002: G02  Y100  I0  J50
0003: X100  I50  J0
0004: Y-100 I0  J-50
0005 : X-100 I-50  J0
0006 : G01  X-75   Y-75
0007 : M02
    
```

Ø Four figures


1) Relative coordinate programming

```

0000: G92X0Y0
0001: G22  L100
0002: G0 X50
0003: G1 Y200
0004 : X200
0005 : Y-200
0006 : X-200
0007 : G00 Y400
0008 : G1 Y50
    
```

0009 : G2 X50 Y50 I50 J0
0010 : G1 X100
0011 : G2 X50 Y-50 I0 J-50
0012 : G1 Y-100
0013 : G2 X-50 Y-50 I-50 J0
0014 : G1 X-100
0015 : G2 X-50 Y50 I0 J50
0016 : G1 Y50
0017 : G00 X400 Y50
0018 : G2 X100 Y0 I50 J0
0019: Y-100 I0 J-50
0020: X-100 I-50 J0
0021: Y100 I0 J50
0022 : G00 X-50 Y-350
0023 : G2 X0 Y0 I100 J0
0024 : G0 X-400 Y-100
0025 : G81
0026: G80
0027 : M02

Annex II. G Instruction Quick Reference

| S/N | Name of Instruction | Explanation |
|-----|---------------------|---|
| 1 | G00 | Quick point and position motion (Dry run) |
| 2 | G01 | Linear processing |
| 3 | G02 | Clockwise circle processing |
| 4 | G03 | Anti-clockwise circle processing |
| 5 | G04 | Pause/Delay |
| 6 | G26 | X axis returns to reference point |
| 7 | G27 | Y axis returns to reference point |
| 8 | G28 | X and Y axes return to reference point at the same time |
| 9 | G22 | Cycle starts (should be used combining G80) |
| 10 | G80 | Cycle ends (should be used combining G22) |
| 11 | G81 | Counting function |
| 12 | G92 | Set the reference point of processing |

Annex III. M Instruction Quick Reference

| S/N | Name of Instruction | Explanation |
|-----|---------------------|---|
| 1 | M02 | Program ends |
| 2 | M07 | Start the fixed cycle of preheating and perforating |
| 3 | M08 | Close the fixed cycle of cutting oxygen |
| 4 | M10/M11 | switch of acetylene valve, M10 (Open), M11 (Closed) |
| 5 | M12/M13 | switch of control valve, M12 (Open), M13 (Closed) |
| 6 | M14/M15 | switch for controlling the rise of cutting gun, M14 (Open), M15 (Closed) |
| 7 | M20/M21 | ignition switch, M20 (Open), M21 (Closed) |
| 8 | M24/M25 | switch of preheating oxygen valve, M24 (Open), M25 (Closed) |
| 9 | M52 | ignition fixed cycle (controlled by time in "Cutting type") |
| 10 | M70 | fixed cycle of cutting gun rising (controlled by time in "Cutting type") |
| 11 | M71 | fixed cycle of cutting gun falling (controlled by time in "Cutting type") |
| 12 | M72 | fixed cycle of perforating cutting gun rising (controlled by time in "Cutting type") |
| 13 | M73 | fixed cycle of perforating cutting gun falling (controlled by time in "Cutting type") |
| 14 | M74 | fixed cycle of preheating (controlled by time in "Cutting type") |
| 15 | M80 | main switch, all output ports are closed if M80 is performed |

Annex IV. Troubleshooting

| Failure | S/N | Failure description | Inspection item |
|--------------------|-----|---|--|
| Abnormal motion | 1 | The motor does not run, or goes to dead state during the auto processing | Check whether “Speed limit in auto mode” is set to the proper speed, and whether the manual processing percentage is low. |
| | 2 | The motor does not run, or goes to dead state during the manual operation | Check whether the manual speed limit is set to the proper speed, and whether the manual percentage is low. |
| | 3 | The processing code has instruction of back-to-reference, but the system does not go back to reference point after having finished the track. | Check whether the manual speed limit is set to the proper speed, and whether the manual percentage is low. |
| Cutting quality | 4 | There is error in accuracy. | Re-calibrate the “Accuracy” in “Parameter” |
| | 5 | The right angle of square being cut is out of the vertical | Re-adjust the start-up speed and acceleration in “speed” in “Parameter”. |
| | 6 | There is wave vibration in opposite angle when cutting the circle. | Please adjust the reversal clearance in “Adjustment” in “Parameter”. |
| Abnormal operation | 7 | The cutting torch does not move when you press  in the main interface. | Check whether the selected processing files have processing codes, or whether the system has resisted the limit. |
| | 8 | The air valve does not work or the external switch does not work. | Enter the “Diagnosis” interface and test the relevant items. |
| Others | 9 | The anti-interfere performance of plasma is poor. | Check whether the grounding is in good condition. |
| | 10 | USB disk cannot be detected. | Enter the USB disk formatting interface via PC and change the original format to “FAT32” or “FAT”, or change the USB disk. |