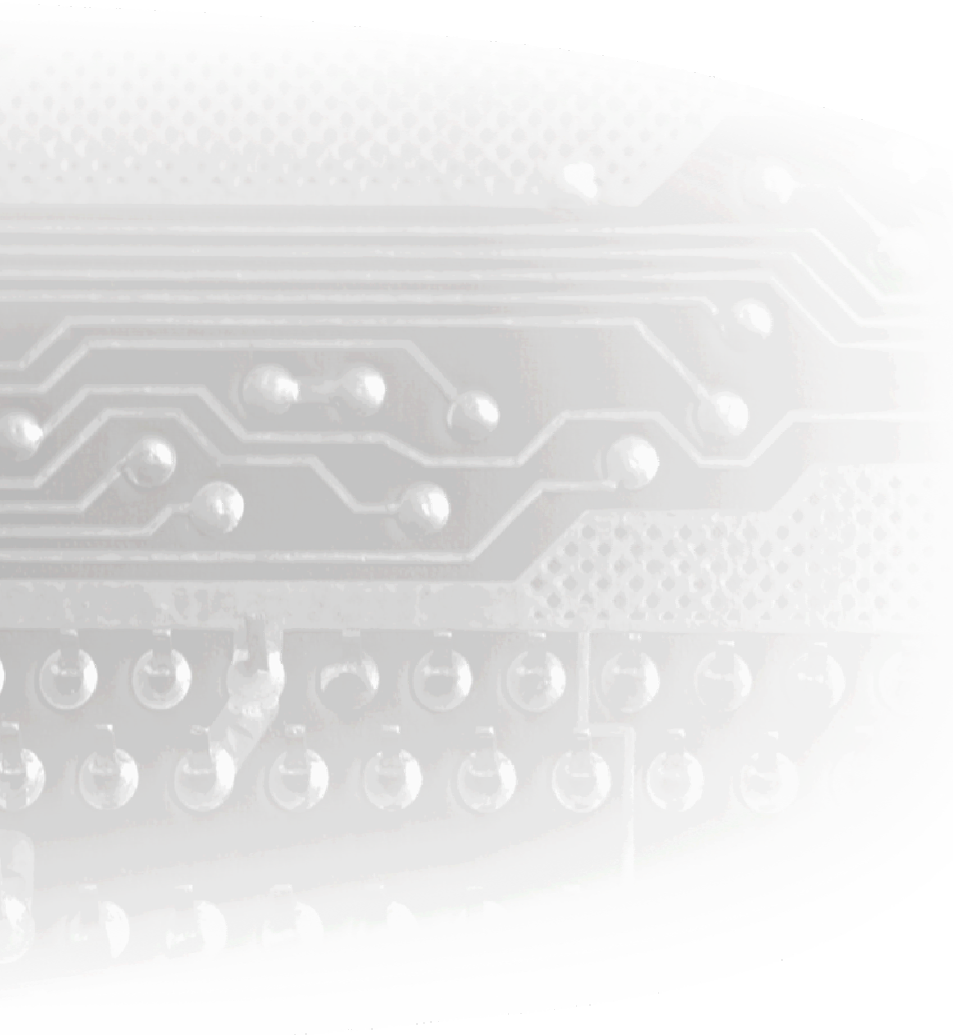


ADT-HC6500

Flame/Plasma Cutting machine CNC System

User's Manual



ADTECH 众为兴

ADTECH (SHENZHEN) TECHNOLOGY CO., LTD

5th Floor, 27-29th Building, Tianxia IC Industrial Park, Yiyuan road, Nanshan District, Shenzhen

Post code: 518052

Tel: 0755-26099116 Fax: 0755-26722718

E-mail: export@adtechen.com <http://www.adtechen.com>

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Precautions and Notes

※Transport and storage

- ☞ Do not exceed six layers for products packing cases piling
- ☞ Forbid to climb, stand, or place heavy items on products packing cases
- ☞ Do not use the cable connecting with the product to drag or move products
- ☞ Non-collision, non-scratching on the panel and display screen
- ☞ Prevent the moisture, exposure and rain affected packing cases

※Open Package Inspection

- ☞ Confirm products after opening package
- ☞ Check whether damages exist during the transportation
- ☞ Confirm whether parts are complete or have damages by comparison with list
- ☞ Contact us promptly if products models are inconsistent, parts are missed, or damages during shipping are found etc.

※Wiring

- ☞ Professional personnel with corresponding capability is must for participation in wiring and inspection
- ☞ Reliable grounding is must for products, with less than 4Ω ground resistance, and neutral wire (zero value wire) is not allowed to substitute grounding wire
- ☞ Wiring should be correct and secure, to avoid the consequences of product failure or unexpected outcome
- ☞ Surge absorption diode connecting with product should be linked upon the stipulated direction; otherwise the product may be damaged
- ☞ The power supply of the product should be cut before plug-in & plug-out or opening the cabinet.

※Overhauling

- ☞ Power off prior to overhauling or replacement of components
- ☞ Check defects when short circuit or overload occur, and restart it after troubleshooting
- ☞ Do not connect power frequently and at least 1 minute interval after power-off for re-connection of power.

※Miscellaneous

- ☞ Do not open the cabinet without permission
- ☞ Disconnect the power when long term stand-by
- ☞ Avoid dust and iron powder into controller
- ☞ If non-solid-state relay is used as output relay, freewheel diode should be connected in parallel on the relay coil. Check whether connected power satisfies the requirement, in order to avoid burning the controller
- ☞ The life span of controller is associated with environmental temperature; install cooling fan in the over-heat processing field. The working temperature range is between 0℃~60℃
- ☞ Avoid to be used in the environments with high temperature, humidity, dust, or corrosive gas.
- ☞ Provide rubber rails for buffering in the place with strong vibration.


※Maintenance

The following items can be conducted for daily and regular inspection, under the general usage condition (environmental conditions: daily average temperature: 30℃, load-carry duty: 80%, and operational rate: 12 hours per day)

| | | |
|--------------------|----------|---|
| Daily inspection | Daily | <ul style="list-style-type: none"> ● Confirm environmental temperature, humidity, dust and foreign matter; ● check whether there are abnormal vibration and sounds ● Check whether vents are be blocked by yarns |
| Regular inspection | One year | <ul style="list-style-type: none"> ● Check whether solid components are loose ● Check whether terminal blocks are damaged |

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Section I: Connection

Chapter I: Function Introduction

➤ 1.1 System description

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.

HC-6500 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. In the following we are going to introduce the hardware functions of HC6500-B series.

➤ 1.2 Features

| | |
|----------------|---|
| CPU | SANSUNG series S3C2410A processor (ARM9), primary frequency: 200MHz Adopt the super large programmable FPGA, real time multitask control technology and hardware interpolation technology, ensuring a high stability during the operation; |
| Memory | With 64M SDRAM; With 64M Nand FLASH ROM (50M can be simulated as USB disk) |
| Display | Adopt 10.4" true color LCD display |
| Input control | HC6500-A series include 44-channel DI; HC-6500 B series include 60-channel DI |
| Output control | HC6500-A series include 16-channel DO; HC-6500 B series include 36-channel DO |
| Pulse control | Four-channel pulse photovoltaic isolation output, maximum frequency 2MHz. Any 2-4 axes linear interpolation; Frequency error of pulse output is less than 0.1%; |
| Pulse mode | pulse + direction or pulse+ pulse |
| Communication | Support USB1.1 equipment interface, RS232 communication interface, support USB host-port interface (capable of reading USB disk) Support TCP/IP network interface |
| Extension | Capable of connecting external keyboard |

➤ 1.3 Specifications

| Classification | Specification |
|----------------|--|
| Digital input | Channel: 44, all photovoltaic isolation Input voltage: 12-24V High level>4.5V Low level<1.0V Isolation voltage: 2500V DC Optocoupler input delay time≤0.1mS |

| | |
|------------------------|--|
| Counting input | Channel: 4-axis Z-phase coding input, all photovoltaic isolation Maximum counting frequency: 2MHz Input voltage: 5V (If you use 24V, the internal current limiting resistance should be changed to 2K) High level >1.5V Low level <1.0V Isolation voltage: 2500V DC |
| Pulse output | Channel: 4-axis pulse, 4-axis directions, all photovoltaic isolation Maximum pulse frequency: 2MHz Output type: 5V differential output Output mode: Pulse + Direction, or Pulse + Pulse |
| Digital output | Output channel: 16 channels, all photovoltaic isolation Output type: NPN open-collector output 5-24VDC, rated current 0.5A, maximum current of single channel can reach 1A |
| RS-232 baud rate (bps) | 1200、2400、 4800、9600、19200、38400、57600、115200 |

➤ 1.4 Application environment

- Power supply: 88 ~ 264VAC, 125 ~ 373VDC, frequency: 47 ~ 63Hz,
- Typical value: AC220V 50HZ
- Power consumption: No-load power consumption <15W
- Operating temperature: -10°C ~ 50°C
- Storage temperature: -20°C ~ 80°C
- Operating humidity: 20% ~ 95%
- Storage humidity: 0% ~ 95%

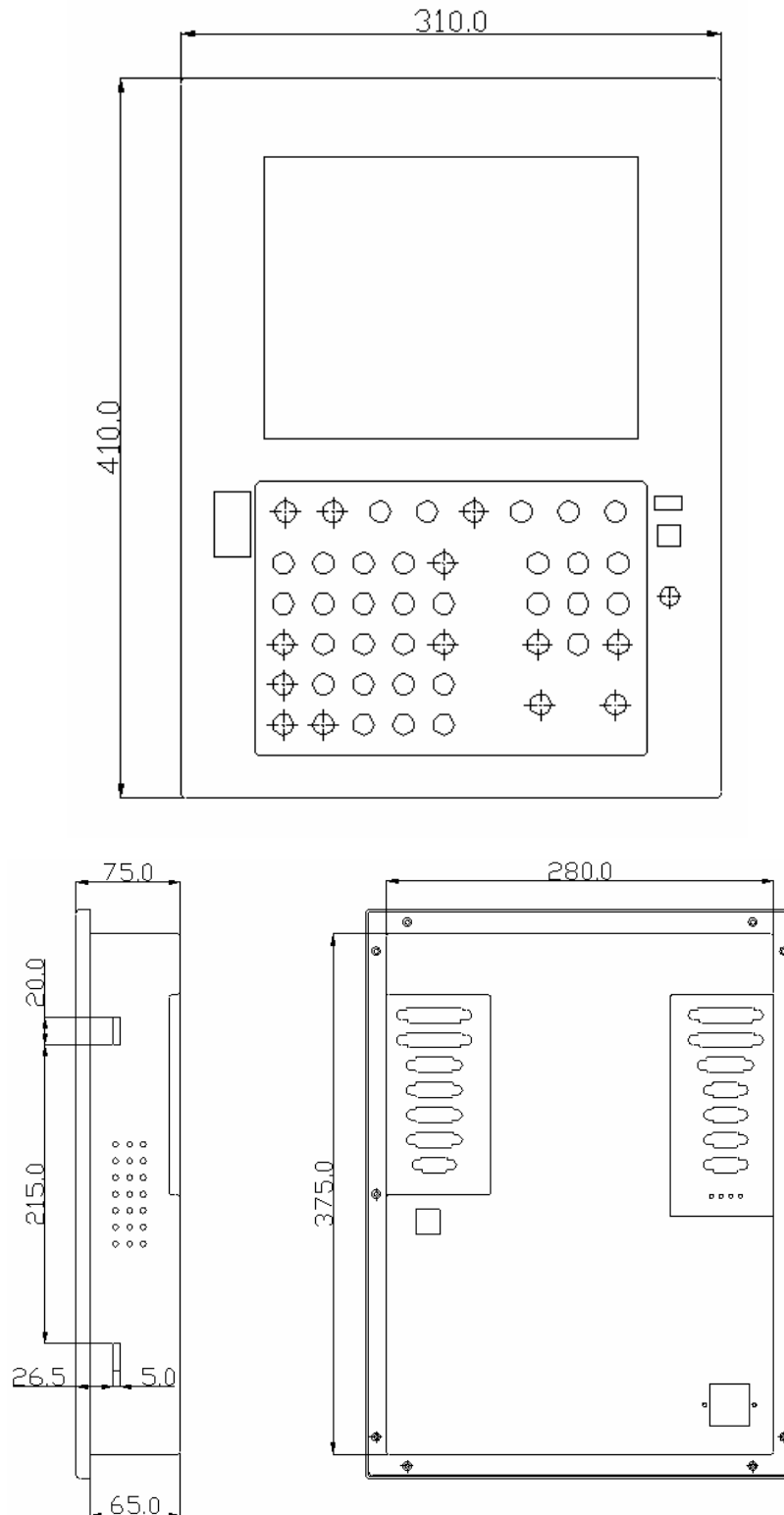
➤ 1.5 Scope of application

1~4 axis flame cutting and plasma cutting

1~4 stepping/servo motor control

Chapter II Product Description

➤ 2.1 Diagram of overall dimension



➤ **2.2 Guide of controller type selection**

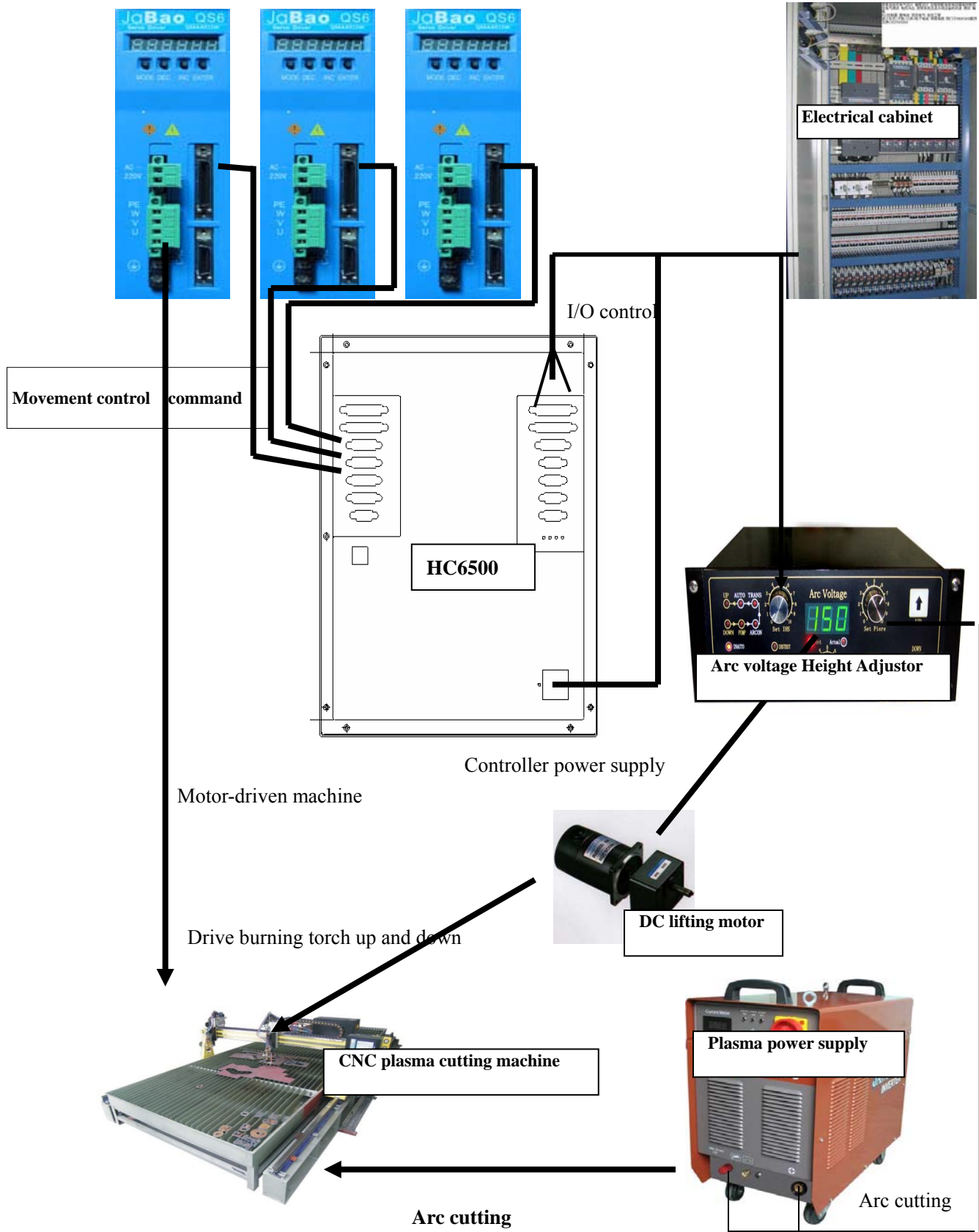
According to the interface, HC6500 can be divided into two types, function A and function B, in order to satisfy the demand of different customers. Customers can custom-tailor different models according to their different requirements. Interfaces of function A and B may be different (subject to the actual objects), and the silk-screen is alike. For details, see the table below:

| Hardware | Function A | Function B |
|--------------------|--|---|
| Input | 16 inputs +16 extended inputs +10 handheld box inputs | 60 inputs: 16 inputs +16 extended inputs +4 alarm inputs +12 coder feedback inputs +10 handheld box inputs +2 hand wheel inputs |
| Output | 16-channel output | 36-channel output: 16 outputs +16 extended outputs (need external power supply) +4 axis standby outputs |
| Pulse output | 4-axis pulse and direction output (featuring true/false bilateral drive interface) | 4-axis pulse and direction output |
| Communication port | Keyboard, USB (Primary and secondary), RS232 | Keyboard, USB (Primary and secondary) RS232, standard network output |
| Coder | | 4-axis ABZ-phase coder feedback input |
| Analog output | | 2-channel analog voltage output |

Table I: Comparison of function A and B of HC6500 flame cutting system

Chapter III Electrical connection

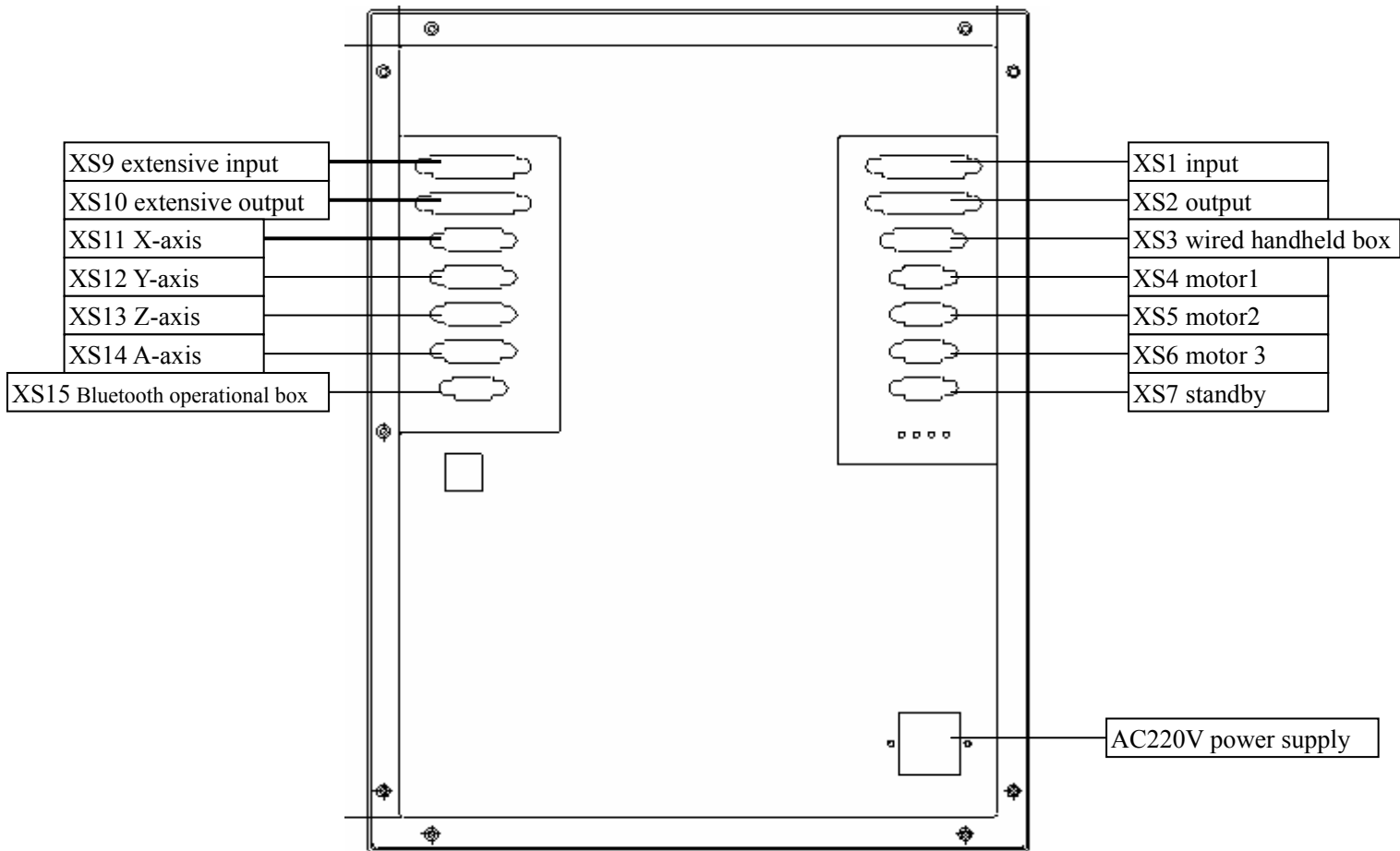
➤ 2.3 General drawing



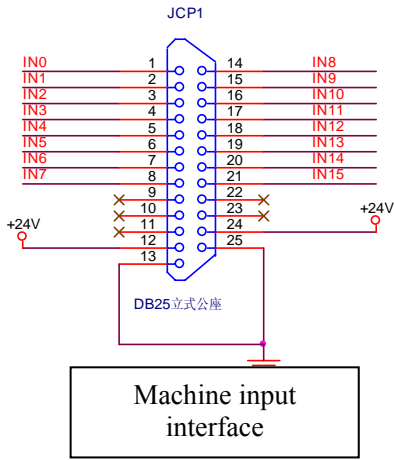
➤ **2.4 Definition**

HC6500 interface has two optional types for customers upon the specific situation:

1. XS11、XS12、XS13、XS14 on the left column are the axis control signal lines, with servo alarm and servo enable signal for each axis. Refer to interface definition for details.
2. XS4、XS5、XS6 on the right column are also the axis control signal lines, without servo alarm and servo enable signal. Refer to interface definition for details.

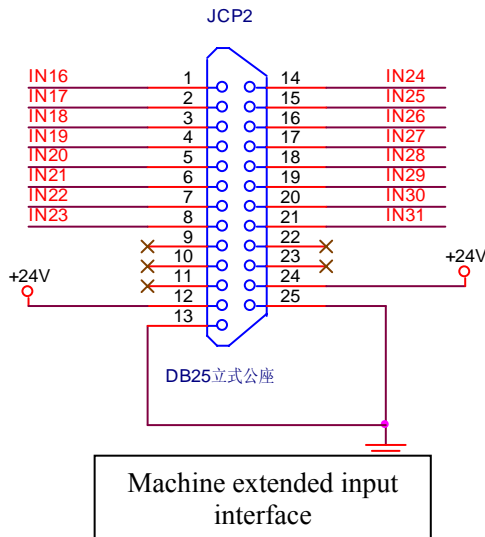


➤ 2.4.1 JCP1 Line S/N description (16-channel input)



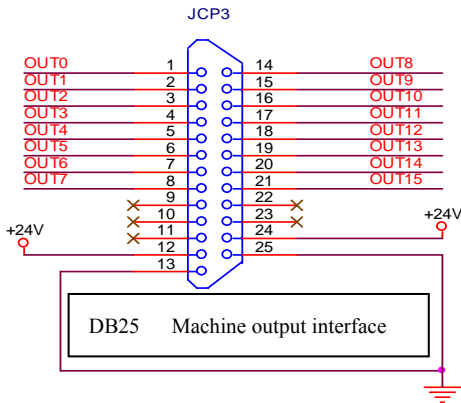
| Line S/N | Name | Function | Line S/N | Name | Function |
|----------|------|------------------------------------|----------|------|----------------------------|
| 1 | IN0 | X positive limit | 13 | GND | 24V power supply grounding |
| 2 | IN1 | Y positive limit | 14 | IN8 | X negative limit |
| 3 | IN2 | Arc voltage detection | 15 | IN9 | Y negative limit |
| 4 | IN3 | Manual pause (for anti-collision) | 16 | IN10 | Manual emergency stop |
| 5 | IN4 | Manual X positive | 17 | IN11 | Manual start |
| 6 | IN5 | Manual Y positive | 18 | IN12 | Manual X negative |
| 7 | IN6 | Manual acceleration | 19 | IN13 | Manual Y negative |
| 8 | IN7 | Initial positioning | 20 | IN14 | Manual deceleration |
| 9 | NC | Not connected | 21 | IN15 | Back to machine ref. point |
| 10 | NC | | 22 | NC | Not connected |
| 11 | NC | | 23 | NC | |
| 12 | +24V | External +24V power supply | 24 | +24V | External +24V power supply |
| | | | 25 | GND | 24V power supply grounding |

➤ 2.4.2、XS9 JCP2 Line S/N description (16 –channel extended input)



| Line S/N | Name | Function | 13 | GND | 24V power supply grounding |
|----------|------|---------------------------|----|------|----------------------------|
| 1 | IN16 | Z positive limit | 14 | IN24 | Z negative limit |
| 2 | IN17 | A positive limit | 15 | IN25 | A negative limit |
| 3 | IN18 | X axis zero | 16 | IN26 | General IN |
| 4 | IN19 | Y axis zero | 17 | IN27 | General IN |
| 5 | IN20 | Z axis zero | 18 | IN28 | General IN |
| 6 | IN21 | A axis zero | 19 | IN29 | General IN |
| 7 | IN22 | Back to the origin | 20 | IN30 | General IN |
| 8 | IN23 | GeneralIN | 21 | IN31 | General IN |
| 9 | NC | Non connected | 22 | NC | Non connected |
| 10 | NC | | 23 | NC | |
| 11 | NC | | 24 | +24V | External +24 power supply |
| 12 | +24V | External +24 power supply | 25 | GND | 24V power supply grounding |

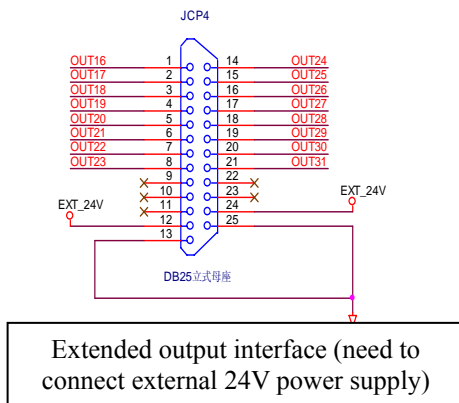
➤ 2.4.3 XS2 JCP3 Line S/N description (16-channel input)



| Line S/N | Name | Function | Line S/N | Name | Function |
|----------|------|----------------------------|----------|-------|-----------------------------|
| 1 | OUT0 | Gas control | | | |
| 2 | OUT1 | Cutting torch rising | 14 | OUT8 | Cutting oxygen/arc |
| 3 | OUT2 | Ignition | 15 | OUT9 | Burning torch falling |
| 4 | OUT3 | High preheating oxygen | 16 | OUT10 | Grade 3 perforation oxygen |
| 5 | OUT4 | Grade 1 perforation oxygen | 17 | OUT11 | Preheating oxygen |
| 6 | OUT5 | Flame increase | 18 | OUT12 | flame plasma switch |
| 7 | OUT6 | General valve | 19 | OUT13 | Height adjusting control |
| 8 | OUT7 | None | 20 | OUT14 | Blowing control |
| 9 | NC | Non connected | 21 | OUT15 | Grade 32 perforation oxygen |
| 10 | NC | | 22 | NC | Non connected |
| 11 | NC | | 23 | NC | |
| 12 | +24V | External +24V power supply | 24 | +24V | External +24V power supply |
| 13 | GND | 24V power supply grounding | 25 | GND | 24V power supply grounding |

➤ 2.4.4 XS10 JCP4 Line S/N description (16 extended output)

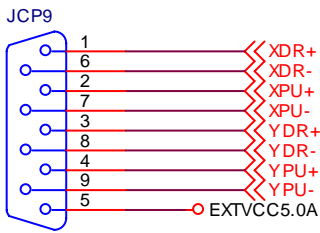
This interface should be connected to the external 24V power supply.



| Line S/N | Name | Function | Line S/N | Name | Function |
|----------|--------|----------------------------------|----------|--------|----------------------------------|
| 1 | OUT16 | General output | 13 | GND | External +24V grounding |
| 2 | OUT17 | | 14 | OUT24 | General output |
| 3 | OUT18 | | 15 | OUT25 | |
| 4 | OUT19 | | 16 | OUT26 | |
| 5 | OUT20 | | 17 | OUT27 | |
| 6 | OUT21 | | 18 | OUT28 | |
| 7 | OUT22 | | 19 | OUT29 | |
| 8 | OUT23 | | 20 | OUT30 | |
| 9 | NC | Non connected | 21 | OUT31 | |
| 10 | NC | | 22 | NC | Non connected |
| 11 | NC | | 23 | NC | |
| 12 | EXT24V | External +24V power supply input | 24 | EXT24V | External +24V power supply input |
| 13 | GND | 24V power supply grounding | 25 | GND | 24V power supply grounding |

Restricted by the machine size, the capacity of internal switching power supply is limited. To ensure the stable operation of system, you should add an external 24V DC power supply when using the extended 16-channel output of OUT16—OUT31. Connect the 24V power supply to pin 12 and 24, and the power supply grounding to pin 13 and 25.

➤ 2.4.5 XS4 JCP9 Line S/N description (X, Y motor drive port)

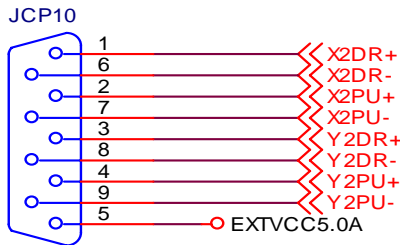


DB9立式母座

| Line S/N | Name | Function |
|----------|------------|--|
| 1 | XDR+ | X axis direction + |
| 6 | XDR- | X axis direction - |
| 2 | XPU+ | X axis pulse + |
| 7 | XPU- | X axis pulse - |
| 3 | YDR+ | Y axis direction + |
| 8 | YDR- | Y axis direction - |
| 4 | YPU+ | Y axis pulse + |
| 9 | YPU- | Y axis pulse - |
| 5 | EXTVCC5.0A | Provide external +5V power supply A, especially used for the common-anode connection of driver |

Motor X, Y

➤ 2.4.6 XS5 JCP10 Line S/N description (Motor Y2)

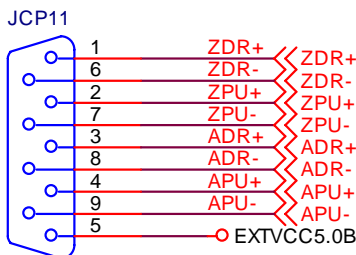


DB9立式母座

| Line S/N | Name | Function |
|----------|------------|---|
| 1 | X2DR+ | The definitions of these interfaces are the same as those of JCP9, but without electrical connection. |
| 6 | X2DR- | |
| 2 | X2PU+ | |
| 7 | X2PU- | |
| 3 | Y2DR+ | |
| 8 | Y2DR- | |
| 4 | Y2PU+ | |
| 9 | Y2PU- | |
| 5 | EXTVCC5.0A | |

Motor Y2

➤ 2.4.7 XS6 JCP11 Line S/N description (Z, A motor drive port)

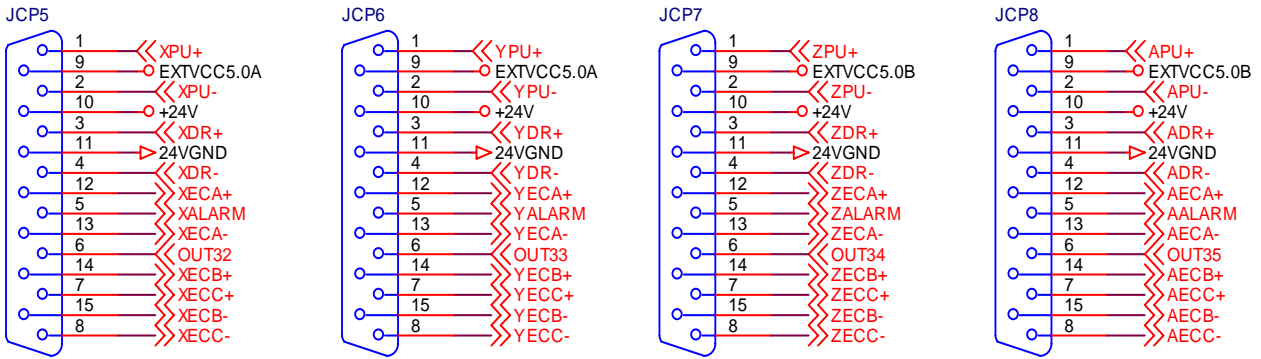


DB9立式母座

| Line S/N | Name | Function |
|----------|------------|--|
| 1 | ZDR+ | Z axis direction + |
| 6 | ZDR- | Z axis direction - |
| 2 | ZPU+ | Z axis pulse + |
| 7 | ZPU- | Z axis pulse - |
| 3 | ADR+ | A axis direction + |
| 8 | ADR- | A axis direction - |
| 4 | APU+ | A axis pulse + |
| 9 | APU- | A axis pulse - |
| 5 | EXTVCC5.0B | Provide external +5V power supply B, especially used for the common-anode connection of driver |

Motor Z, A

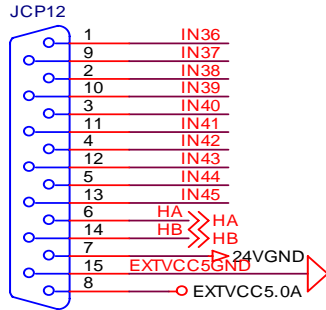
➤ 2.4.8 XS11, XS12, XS13, XS14 JCP5, JCP6, JCP7, JCP8 Line S/N description (X, Y, Z, A-axis motor control)



| | | | |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| DB9 stand-type header X axis | DB9 stand-type header Y axis | DB9 stand-type header Z axis | DB9 stand-type header A axis |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|

| Line S/N | Name | Function |
|----------|--------|---|
| 1 | nPU+ | Pulse signal + |
| 2 | nPU- | Pulse signal - |
| 3 | nDR+ | Direction signal + |
| 4 | nDR- | Direction signal - |
| 5 | IN | Used as servo alarm input (X-32 Y-33 Z-34 A-35) |
| 6 | OUT | Servo enable output (X-32 Y-33 Z-34 A-35) |
| 7 | nECZ+ | Coder Z-phase input + |
| 8 | nECZ- | Coder Z-phase input - |
| 9 | PUCOM | Used for driver with single-end input |
| 10 | +24V | Provide external 24V power supply |
| 11 | 24VGND | |
| 12 | nECA+ | Coder A-phase input + |
| 13 | nECA- | Coder A-phase input - |
| 14 | nECB+ | Coder B-phase input + |
| 15 | nECB- | Coder B-phase input - |

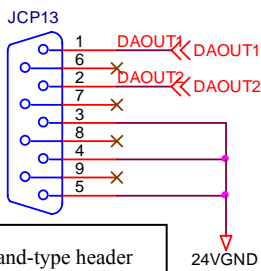
➤ 2.4.9 XS3 JCP12 Line S/N description (Hand-held box interface)



DB15 stand-type header
Hand-held box interface

| Line S/N | Name | Function |
|----------|---------|--|
| 1 | IN36 | Digital input |
| 2 | IN38 | Digital input |
| 3 | IN40 | Digital input |
| 4 | IN42 | Digital input |
| 5 | IN44 | Digital input |
| 6 | HA | Hand wheel input (+5V power supply) |
| 7 | 24VGND | 24V common grounding |
| 8 | EXT_VCC | Isolated +5V power supply for hand wheel |
| 9 | IN37 | Digital input |
| 10 | IN39 | Digital input |
| 11 | IN41 | Digital input |
| 12 | IN43 | Digital input |
| 13 | IN45 | Digital input |
| 14 | HB | Hand wheel input (+5V power supply) |
| 15 | EXT_GND | Isolated +5V power supply grounding |

➤ 2.4.10 XS7 JCP13 Line S/N description (analog voltage output)

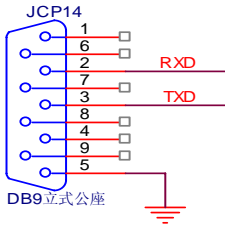


DB stand-type header

DB9 stand-type header
Analog voltage output interface

| Line S/N | Name | Function |
|----------|---------------|---------------------------------|
| 1 | DAOUT1 | Analog voltage output (0V—10V+) |
| 2 | DAOUT2 | Analog voltage output (0V—10V+) |
| 3 | 24VGND | Provide internal 24V grounding |
| 4 | | |
| 5 | | |
| 6 | Not connected | |
| 7 | | |
| 8 | | |
| 9 | | |

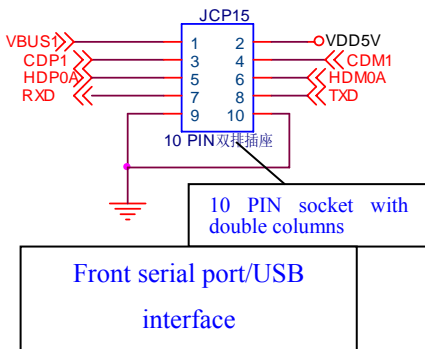
➤ 2.4.11 XS15 JCP14 rear serial port



Rear serial port

| Line S/N | Name | Function |
|----------|---------------|-------------------------------|
| 1 | | Not connected |
| 2 | RXD | Receiving serial port data |
| 3 | TXD | Transmitting serial port data |
| 4 | | Not connected |
| 5 | GND | Signal grounding |
| 6 | Not connected | |
| 7 | | |
| 8 | | |
| 9 | | |

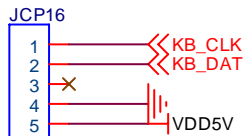
➤ 2.4.12 JCP15 front serial port/USB interface



Front serial port/USB interface

| Line S/N | Name | Function |
|----------|-------|---|
| 1 | VBUS1 | Secondary VBUS |
| 2 | VDD5V | Primary VCC |
| 3 | CDP1 | Secondary D+ |
| 4 | CDM1 | Secondary D- |
| 5 | HDP0A | Primary D+ |
| 6 | HDM0A | Primary D- |
| 7 | RXD | Receiving serial port data (connected with rear serial port RXD) |
| 8 | TXD | Transmitting serial port data (connected with rear serial port TXD) |
| 9 | GND | Signal GND |
| 10 | GND | Signal GND |

➤ 2.4.13 JCP16 internal keyboard interface

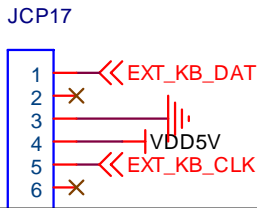


5 PIN socket with single column

Internal keyboard interface

| Line S/N | Name | Function |
|----------|--------|------------------------|
| 1 | KB_CLK | Clock |
| 2 | KB_DAT | Data |
| 3 | NC | Not connected |
| 4 | GND | Power supply grounding |
| 5 | VDD5V | +5V power supply |

➤ 2.4.14 XS8 JCP17 101-key standard keyboard interface

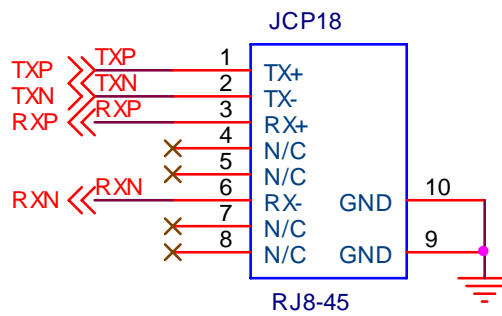


Standard keyboard interface

External 101-key standard keyboard interface

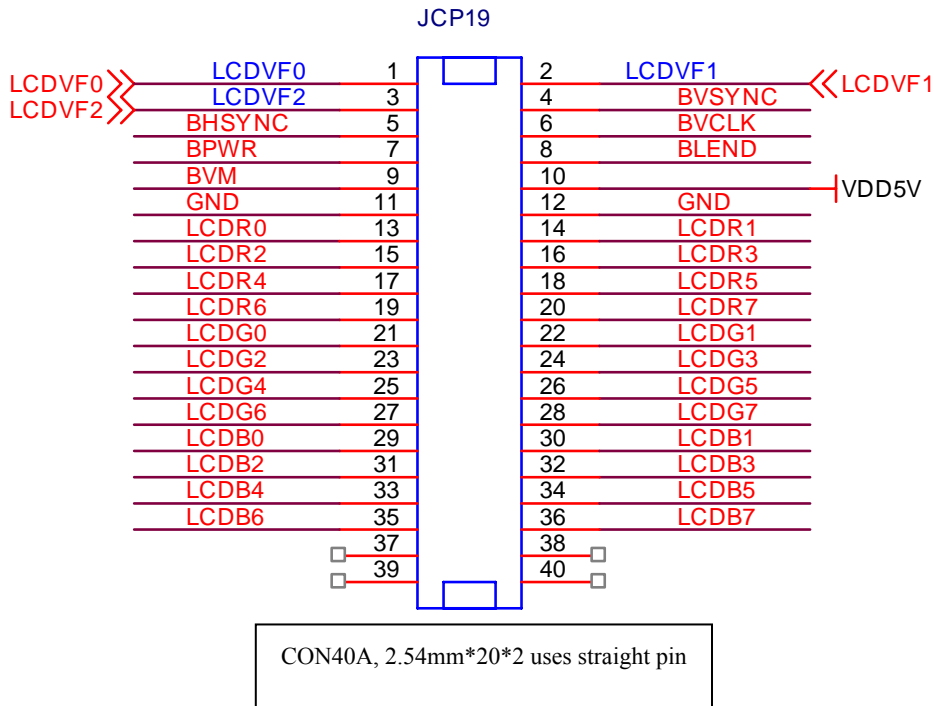
| Line S/N | Name | Function |
|----------|--------|------------------------|
| 1 | KB_DAT | Data |
| 2 | NC | Not connected |
| 3 | GND | Power supply grounding |
| 4 | VDD5V | +5V power supply |
| 5 | KB_CLK | Clock |
| 6 | NC | Not connected |

➤ 2.4.15 XS16 JCP18 standard network interface



Standard network interface

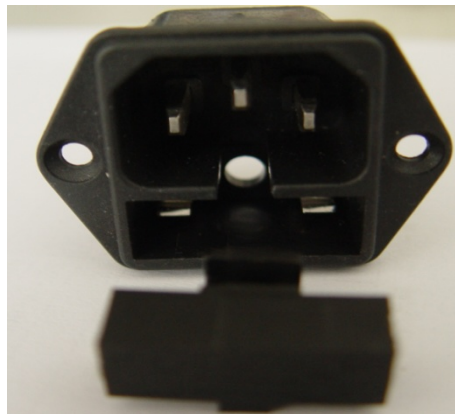
➤ 2.4.16 JCP19 10.4” LCD interface



➤ 2.5 Power supply

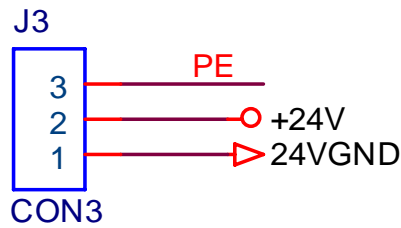
This system is powered by 220V municipal power supply directly. The zero line and front line are connected according to the electrical specifications standard, L represents the front line and N represents the zero line. If the applied voltage is not 220V AC, you need to re-evaluate the specifications of fuse.

Interface of internal power supply:

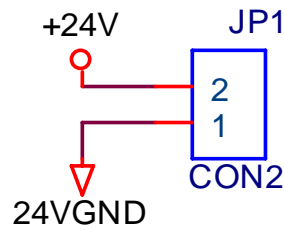


J3: Lead-in interface of system 24V power supply, the wiring is defined as follows: (Refer to the silk-screen on PCB)

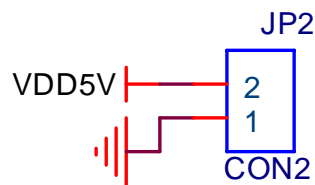
Pay attention to the specifications of fuse at S11 on the PCB. Please use the 250V, 4A fuse.



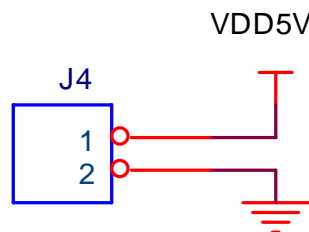
JP1: Input interface of switching power supply for converting 24V to 5V, the wiring is defined as follows: (Refer to the silk-screen on PCB)



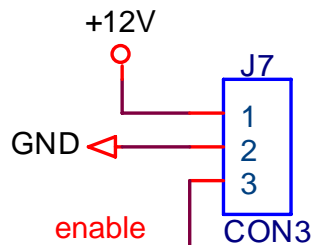
JP2: Output interface of switching power supply for converting 24V to 5V, the wiring is defined as follows: (Refer to the silk-screen on PCB)



J4: 5V power supply interface for downloading program, the wiring is defined as follows: (Refer to the silk-screen on PCB)

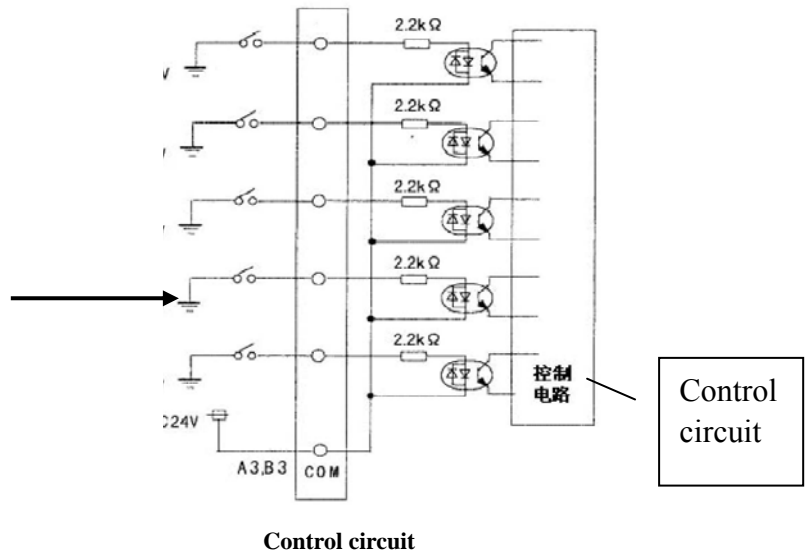
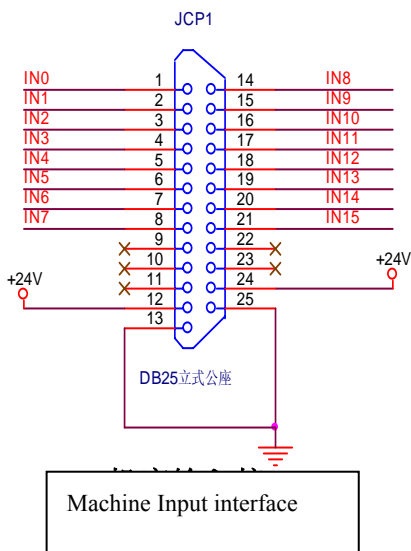


J7: Interface of backlight power supply, the wiring is defined as follows: (Refer to the silk-screen on PCB)



➤ 2.6 Connection mode of interface and description

1) Connection mode of input signal

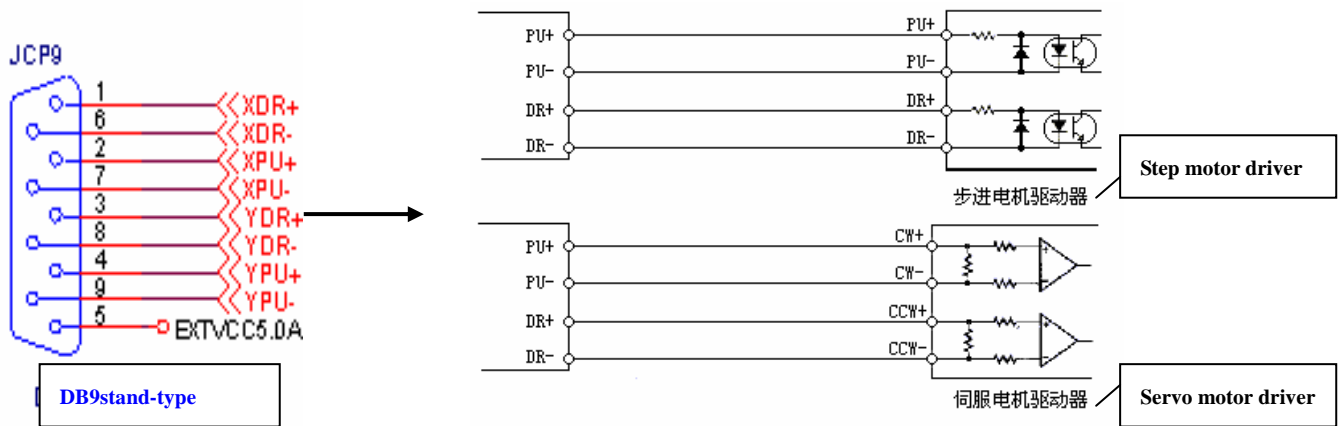


The common end of HC6500 input signal is connected to the positive terminal of system +24V power supply, and the input point is connected to the corresponding terminal. The input points are all low level effective. The current of single input could not exceed 15mA or less than 5mA.

2) Connection mode of pulse output signal

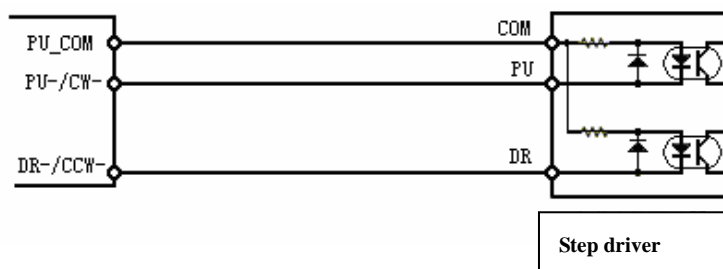
Differential mode:

For stepper motor driver with individual pulse and direction input, and most of servo motor driver, it is recommended to use this mode to get the better anti-interference performance.



Single-end mode:

It is applicable to the earlier stepper motor driver whose pulse and direction anodes are connected together.



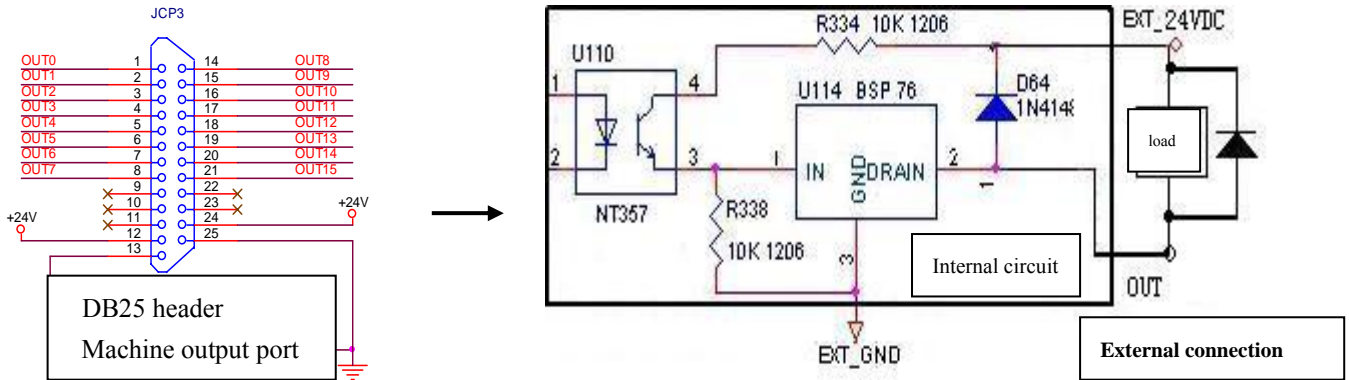
Note: It is not applicable to the some stepper motor drivers whose pulse and direction cathodes are connected together.

Especially note that the 5th pin EXT VCC5.0A is exclusively used in non-differential connection of motor pulse. It

should not be used for other purposes, or it may damage the internal circuit of controller. Any two pins of PU+, PU-, DR+ and DR- cannot be connected together or used in parallel; otherwise, it may damage the internal circuit.

4) Connection mode of output signal

The digital output of this control system is the open-collector output. The common end should be connected with GND of external power supply, and the output point is low level effective. Connect the load between +24V power supply and output point. The internal output circuit has complete protecting measures, including over-current protection, over-voltage protection, short-circuit protection, and follow current protection. However, if an external inductive load such as relay is used, please connect a freewheeling diode at the two ends of relay coil as follows:

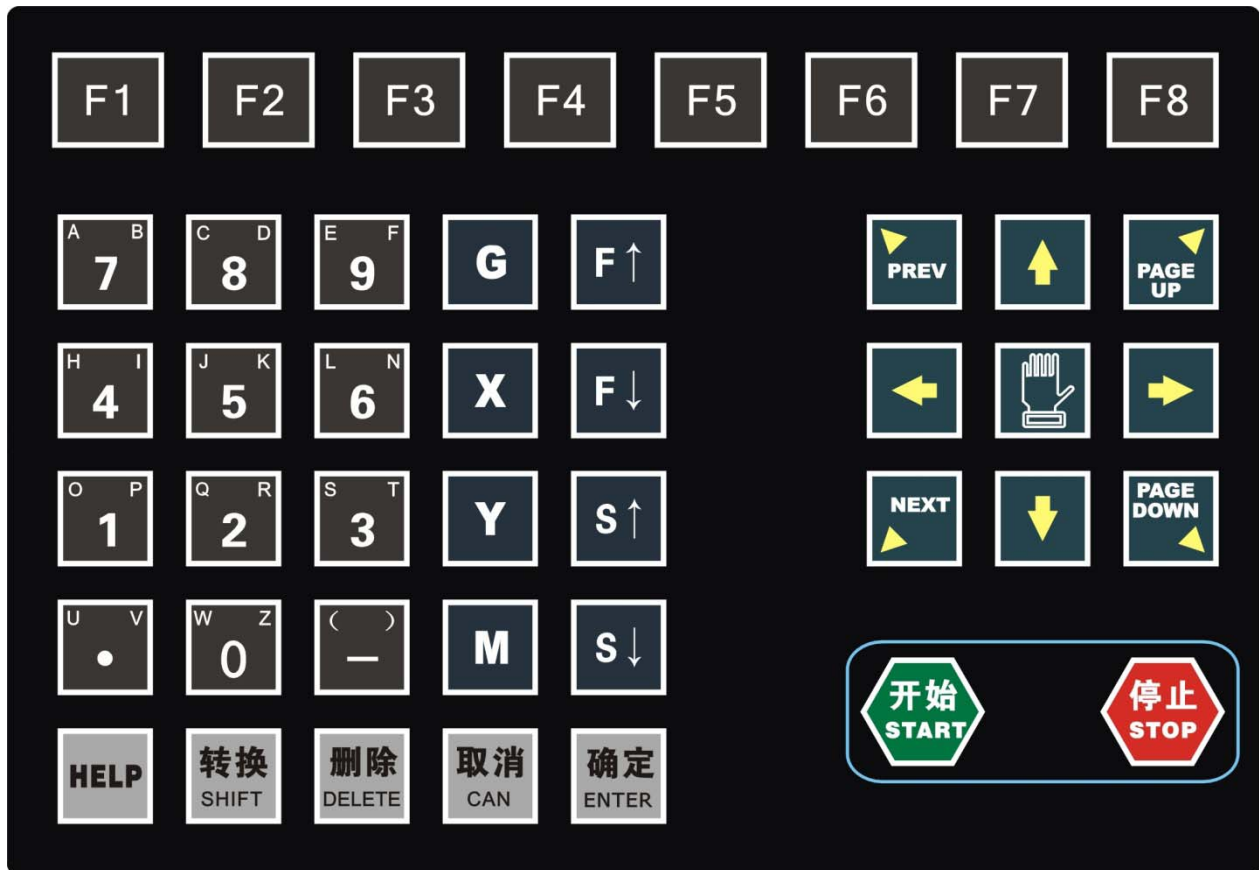


It is suggested that the supply voltage be < 24V; it is better not to exceed 30V. Positive and negative poles should not be connected reversely and the load should not be in short circuit; otherwise, it may cause unexpected damage.

Chapter VI: Annex

➤ 4.1 Keyboard

HC6500 control system has self-contained keys, and the standard PC keyboard interface is also supported. Here we are going to introduce the corresponding relationship between standard PC keyboard and the keyboard of control system.



Picture ① Controller keyboard

The above picture shows the keyboard of cutting control system HC6500. For detailed functions, please refer to the software user manual.

The following picture shows the standard PC keyboard:



Picture ② Standard PC keyboard (Optional)

Comparison of keys on optional standard PC keyboard and controller keyboard is listed as below:

Comparison of standard PC keyboard and controller keyboard

| S/N | Standard PC keyboard | Controller keyboard |
|-----|----------------------|---------------------|
| 1 | F1-F8 | F1-F8 |
| 2 | F9 | START |
| 3 | F10 | STOP |
| 4 | F11 | Manual |
| 5 | F12 | Help |
| 6 | Direction key | Direction key |
| 7 | HOME | PREV |
| 8 | END | NEXT |
| 9 | ESC | CANCEL |
| 10 | DELETE | DELETE |
| 11 | [| S↑ |
| 12 |] | S↓ |
| 13 | ; | F↑ |
| 14 | ' | F↓ |
| 15 | 26 letters | 26 letters |
| 16 | Number keys | Number keys |

Numbers and letters of controller keyboard adopt the compound key. For detailed input methods, please refer to the user manual on software.

➤ **4.2 Remote controller**

Special ADTECH remote controller is optional to match HC6500, to provide easy on-site operation to the customer.



Picture 1: Handheld Remote Control Box

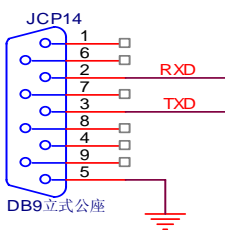


Picture 2: Remote Signal Receiver

The specific operation is as follows:

1. The remote signal receiver is plugged into XS 15 JCP14 port, and the indicator should be on.
2. Four AA size batteries are placed into handheld remote control box, and the indicator should be on.
3. Frequency adjustment knobs on handheld remote control box and signal receiver are be set on the same shift.

Pin assignment definition



Rear serial port

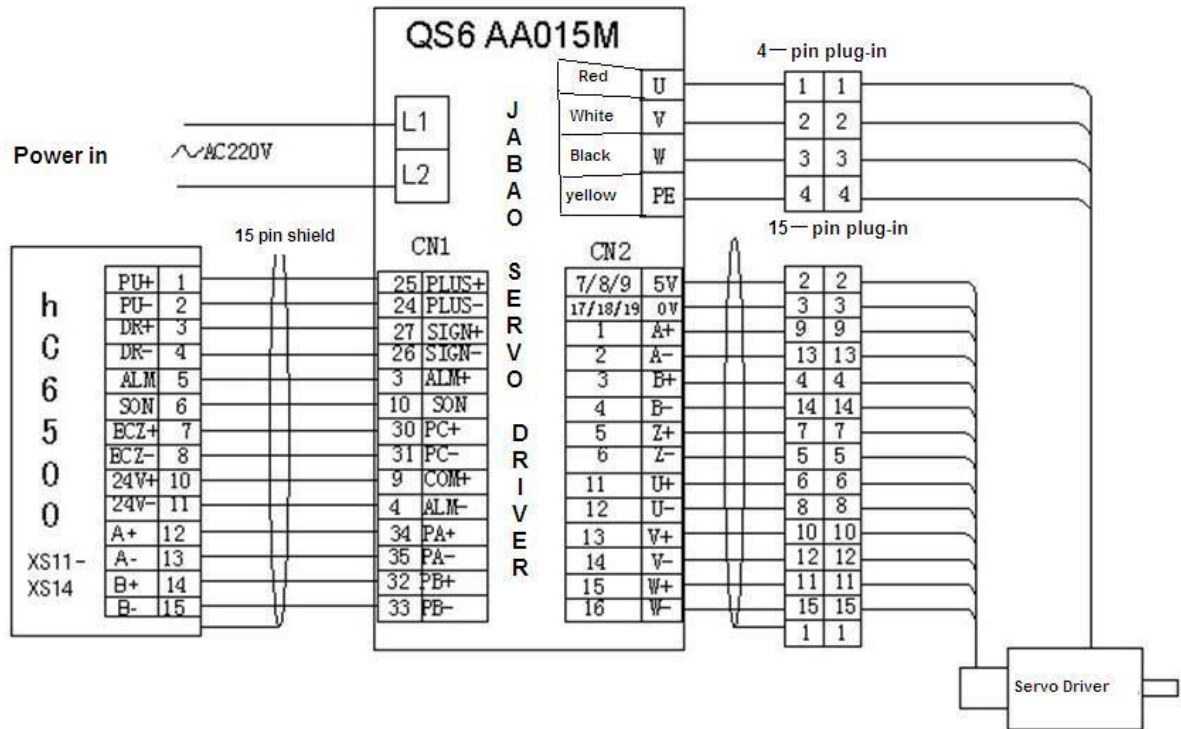
| Line S/N | Name | Function |
|----------|---------------|---|
| 1 | | Not connected |
| 2 | RXD | Receiving serial port data |
| 3 | TXD | Transmitting serial port data |
| 4 | | Not connected |
| 5 | GND | Signal grounding |
| 6 | Not connected | |
| 7 | +5V | 5V power supply output (Supply power by receiver) |
| 8 | 5V | 5V power supply output (Supply power by receiver) |
| 9 | | |

Chapter IV: Examples of Connection

➤ Example 1

Connecting ADTECH JaBao servo motor driver:

The following diagram shows the connection of controller with ADTECH JaBao servo motor driver and match ACH AV servo motor:

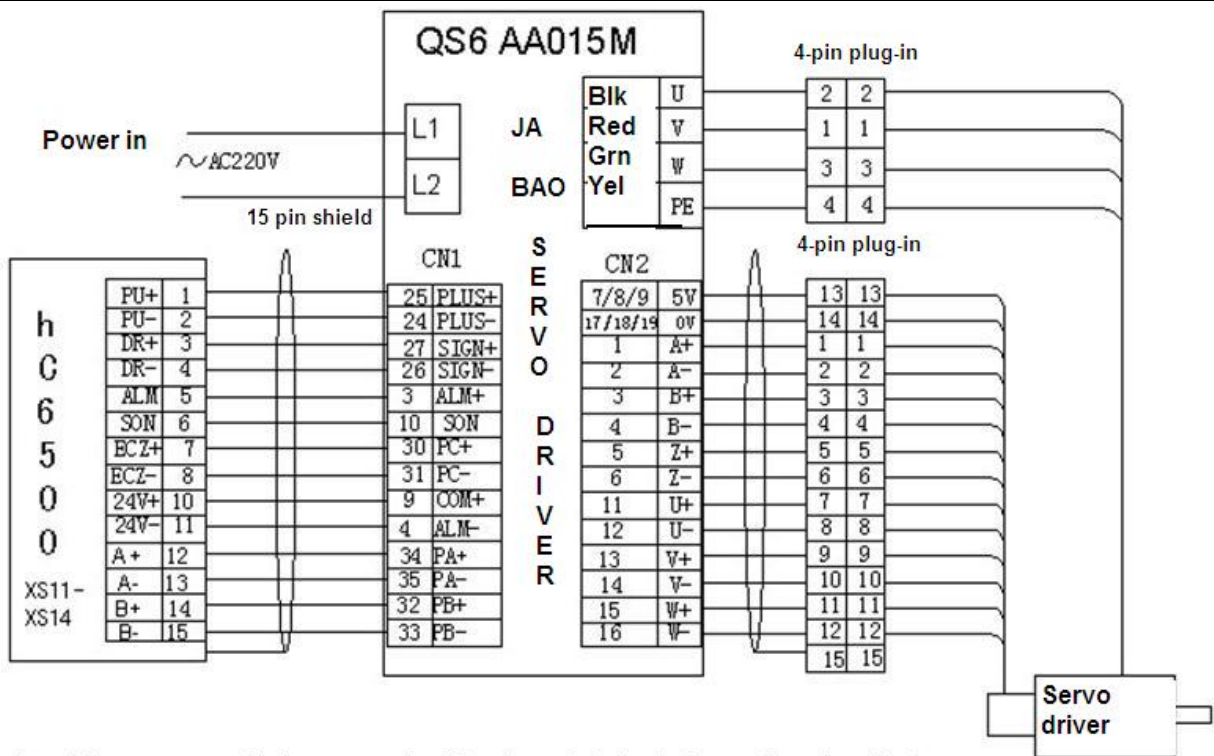


Note: Please connect with the ports on the left column of the back of controller, when Y axis intends to connect with dual-driver with servo alarm signal. The same connection method as above can be used, when Z axis substitutes Y2 axis. Only YZ coaxial setting is conducted in the system parameters.

➤ Example 2

Connecting ADTECH JaBao servo motor driver:

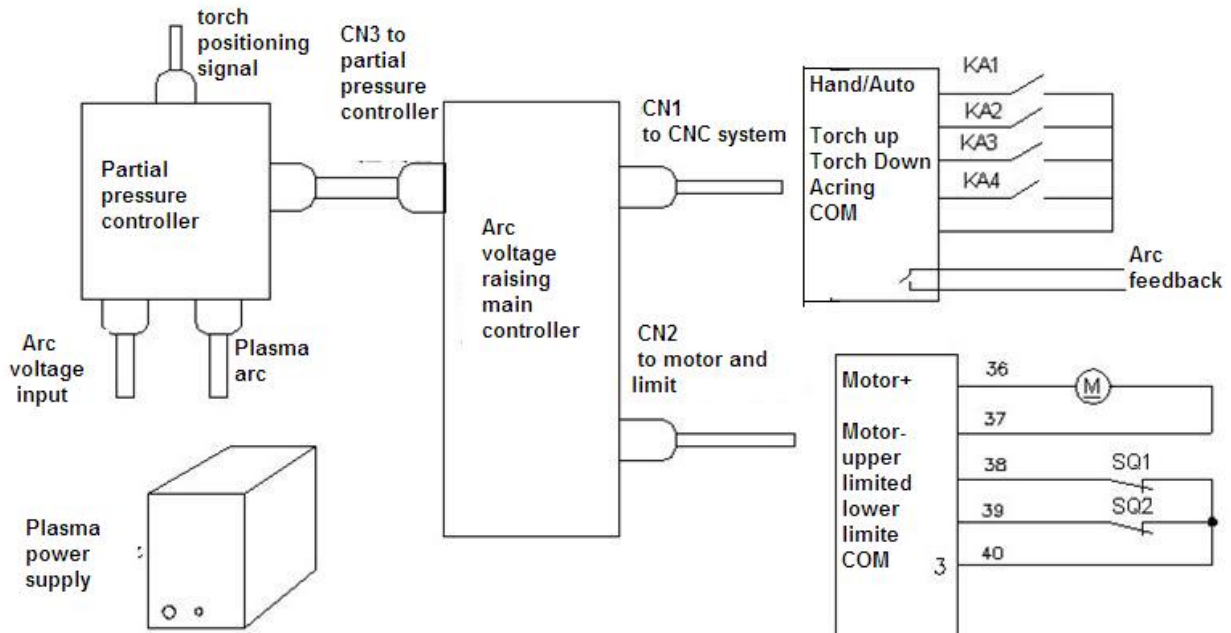
The following diagram shows the connection of ADTECH JaBao QS6AA015M series servo motor driver, and match ACH AC servo motor:



Note: Please connect with the ports on the left column of the back of controller, when Y axis intends to connect with dual-driver with servo alarm signal. The same connection method as above can be used, when Z axis substitutes Y2 axis. Only YZ coaxial setting is conducted in the system parameters.

➤ Example 3


Connecting arc voltage height adjustor

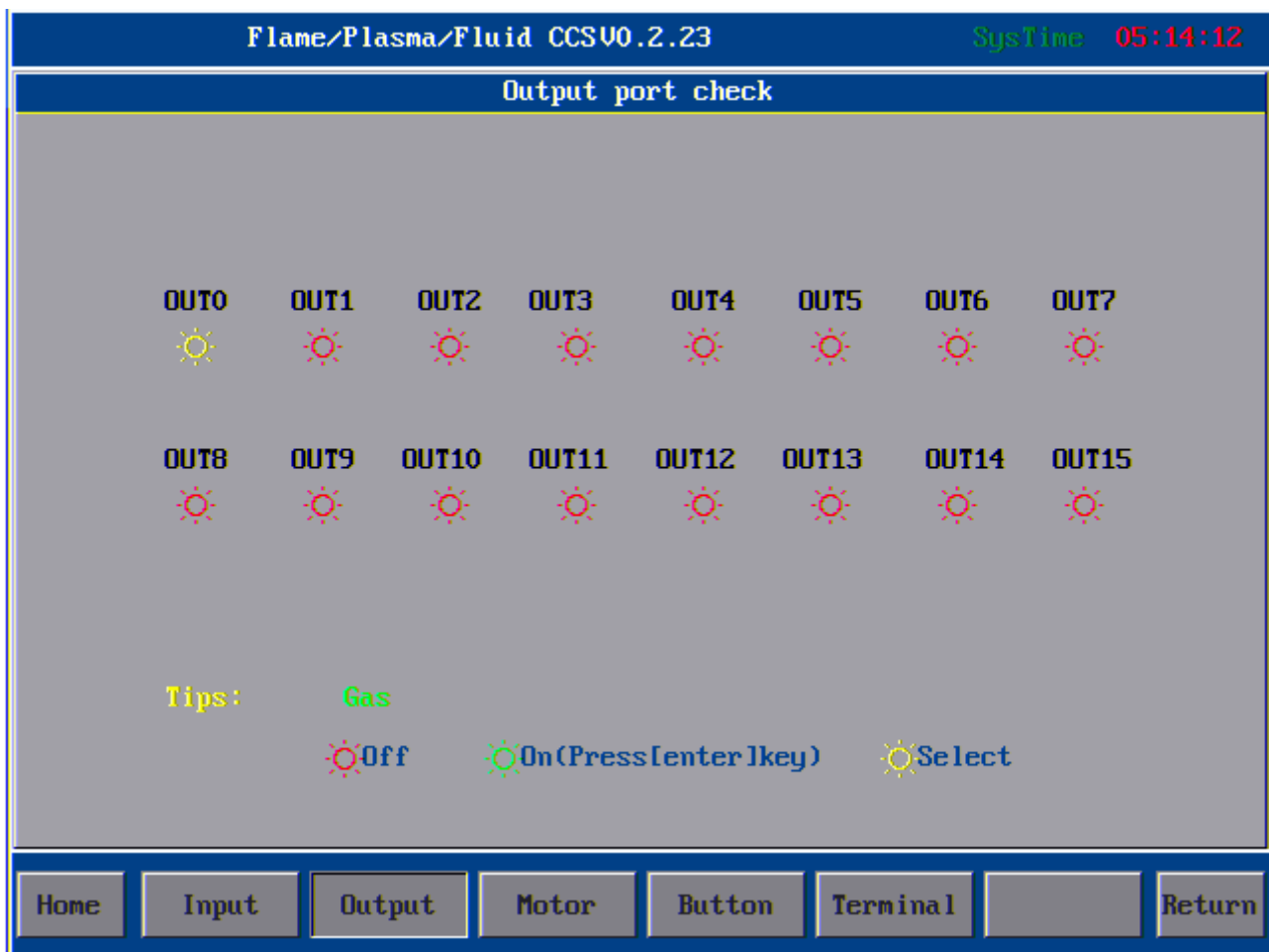







Section II: Adjustment

Chapter I: Electronic Circuit Diagnosis and Adjustment

➤ 1.1 Output signal diagnosis

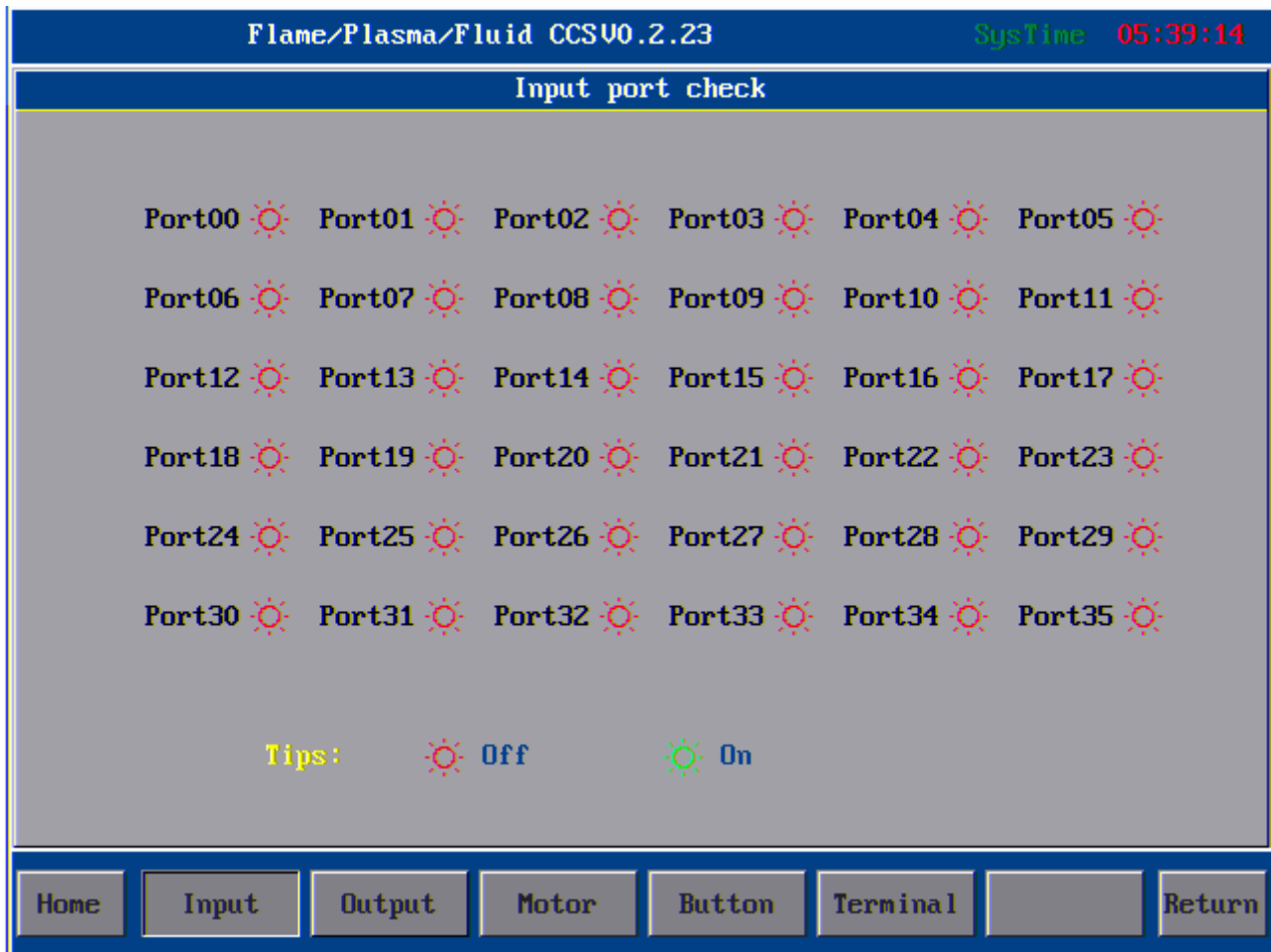
On the interface of cut setting, press  key to “Button”(button diagnosis) as the following picture showing the **output diagnosis**.



On the interface of output diagnosis, press     keys to move the cursor to the corresponding output. Then press  key, and if connection is correct, the output corresponding to the burning torch will produce level output; if connection is wrong, the incorrect output corresponding to it will be shown.

➤ 1.2 Input signal diagnosis

The following picture shows the **input diagnosis**:



The logic of output is just the opposite of input. When the input exists on the corresponding port, the green analog light will be shown on the corresponding port to indicate OFF. Please refer to the above picture, and if connection is wrong, the connected information will be shown on the wrong position.

➤ 1.3 Motor diagnosis

It is used to confirm whether the motor connection is right, and the interface is as follows:



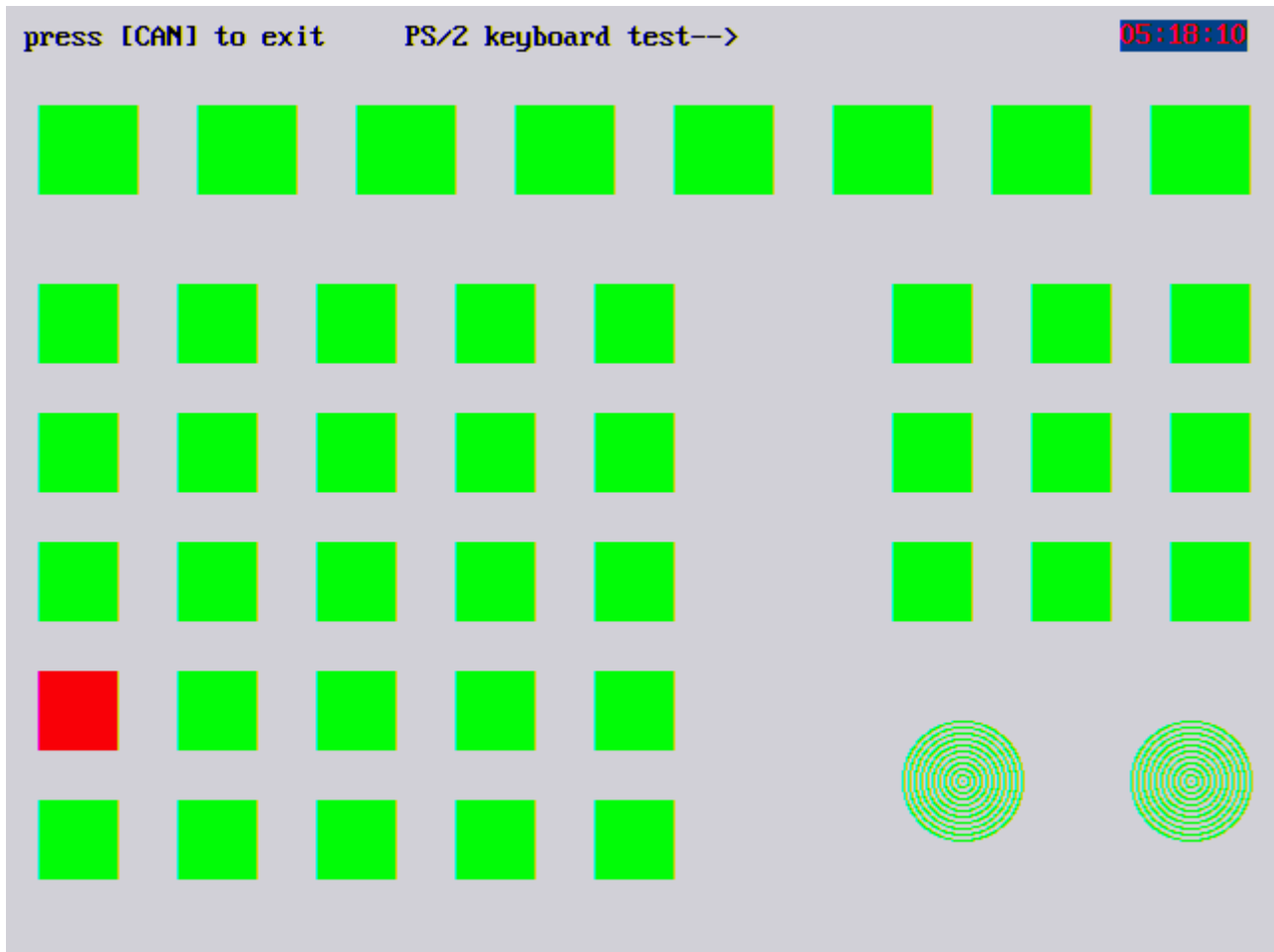
Press these keys to move the cursor to the corresponding motor axis. Then press



key, and the corresponding motor axis will rotate after receiving the command. If the wrong axis exists, the connecting line of axis should be changed; if incorrect direction exists, the line of axis should be changed, until it is accurate.

➤ 1.4 Key diagnosis

It is used to detect whether the key is malfunctioned, which is shown in the following picture:



Press the key on the corresponding position of keypad, and reaction will be shown on the interface. If pressed repeatedly without any reaction, this key is mal functional.

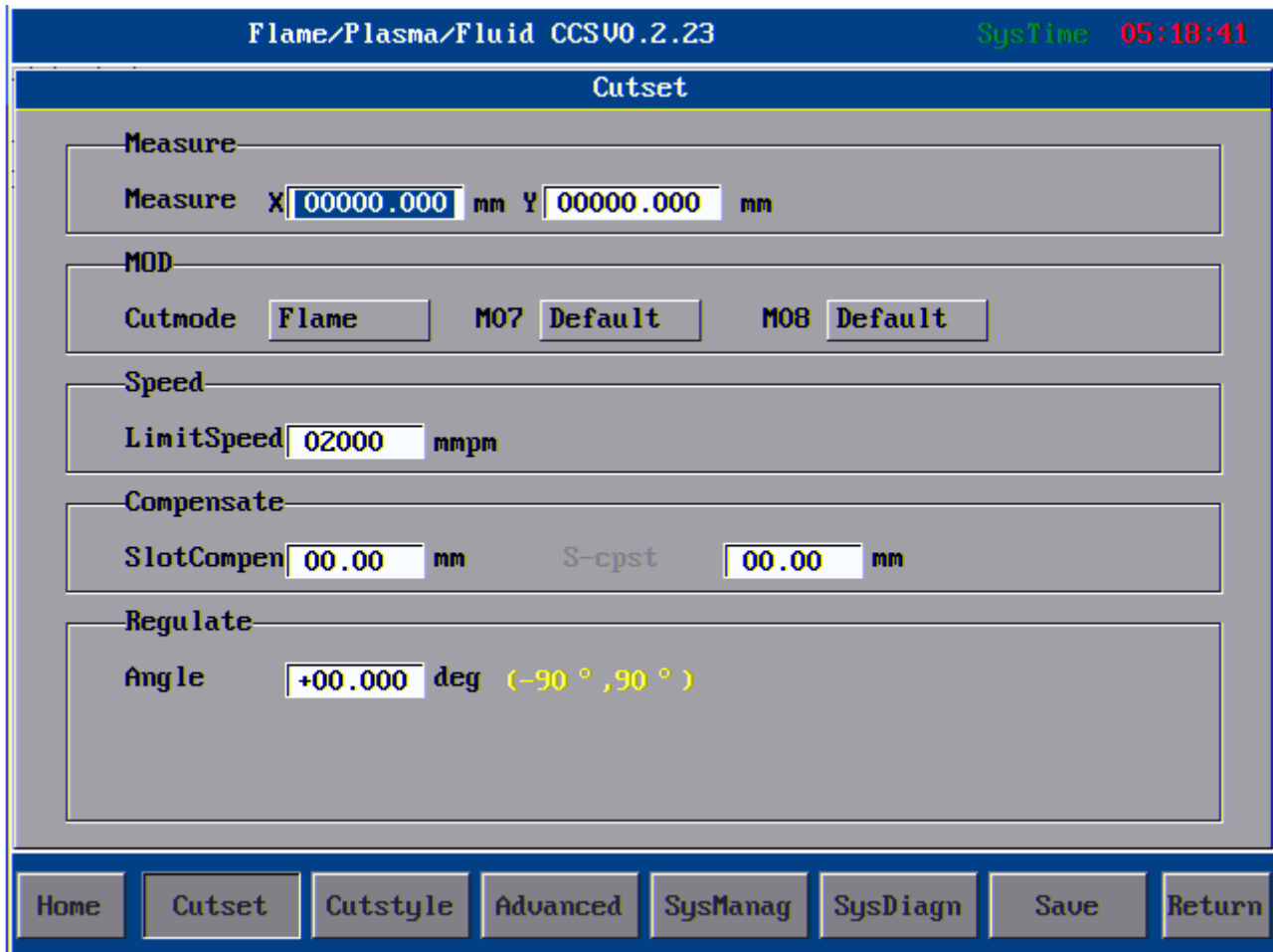
Until now, system I/O diagnoses have completed.

Chapter II: Parameter Testing

Settings:

Main interface for parameter settings and main parameters settings entry for system are as follows:

➤ 2.1 Parameters for cut setting




The above picture shows the functions on the main interface of parameter settings


“Measure” refers to the Measure of processed plate, to verify whether the plate is on the working table, and whether the graph exceeds the Measure of plate. This function cannot work without setting.

“MOD” is divided into cutting mode, M07 mode, and M09 mode etc. Cutting mode refers to the cutting technique of machine with current following cutting modes on the machine: flame, plasma, and preview modes. M07 mode and M08 mode are the M07 and M08 method for burning torch action, with the following two types: User-defined method and default method. Generally default method is ok. Under the special requirement, User-defined method can be used.

Note: all of parameters are separated to be saved on the basis of cutting modes, to avoid mixing up. The parameters which were seen before are only under the current cutting mode, without mutual interference; however, system parameter is exceptional.

“Speed” here refers to the processing speed limit, with actual speed of processing is smaller than this speed. Thus

the speed multiplied by the speed ratio, which exists under the automatic interface of . Meanwhile,

 is adjustable, with value more than 0 but less than 1.

“**Compensate**”: values of cutting gap compensation and mark compensation (this function temporarily can't be used) can be set in the compensation.

“**Angle**” can receive the calibration angle for modified plate, to use the system auto calibration function to obtain the angle. Cancellation of plate angle only set the value to be 0.



After whole parameters are set in the parameters setting interface, when these settings need to save, press **F5**, system will prompt “Parameters are saved, and press any key to return”. Then press any key with parameters saved successfully.

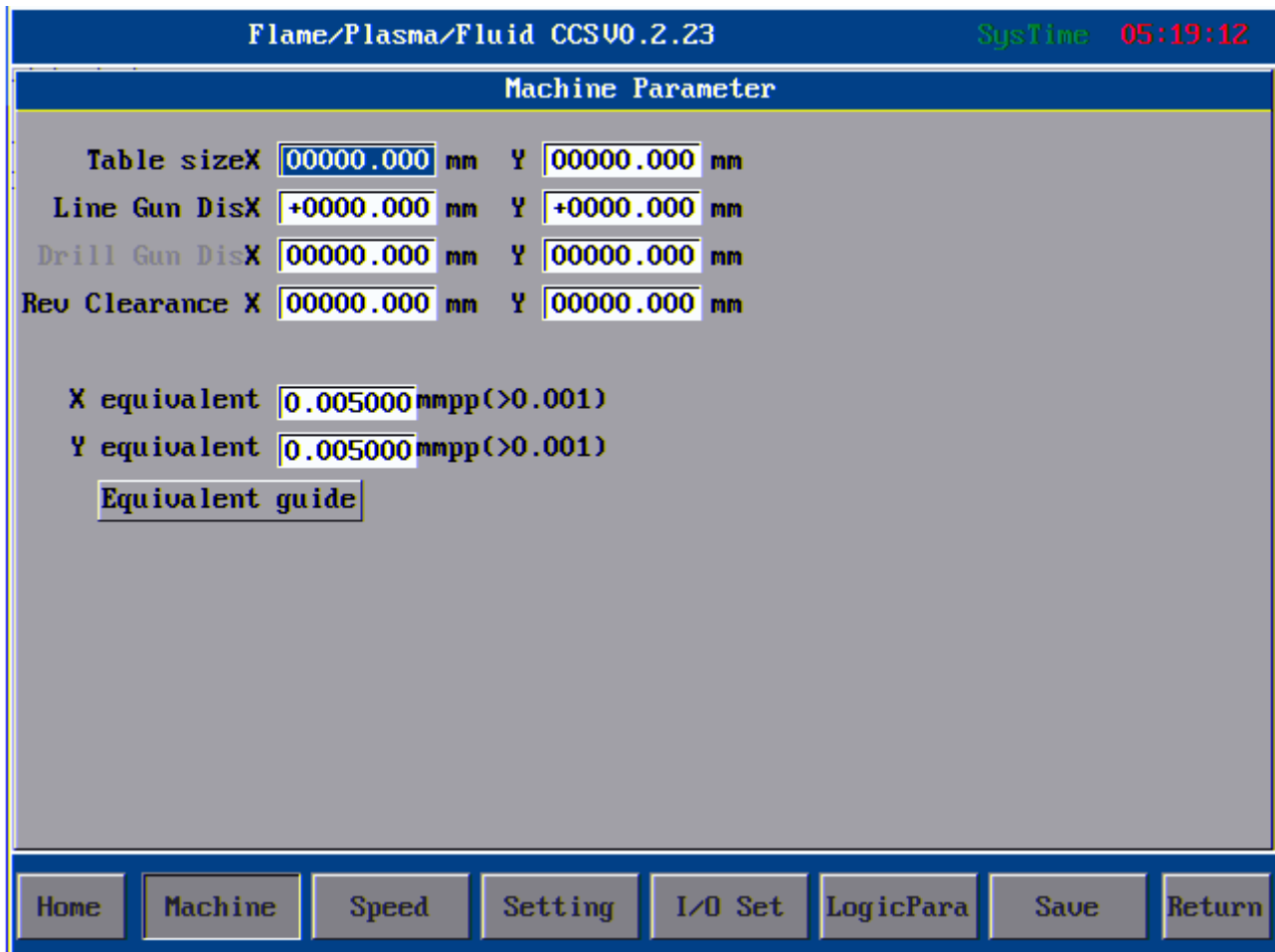
➤ 2.2 Machine parameters



Press **F4** in the interface of main parameters, input password "360" or "361", and then the parameters in this interface will not be changed easily. Therefore password is necessary for entering this function interface. After



inputting the right password, press **CONFIRM** key to enter the interface as follows:



Interface after successfully inputting password

Machine settings:


1. **Table size**: the machine's working table size is set; thus the system will easily prompt whether the plate and graph exceed the allowed size of table. If there is no table parameter, 0 can be selected.
2. **Line Gun Dist X** is used to confirm the distance between scribing gun and burning torch (this



function temporarily is unavailable).


3. **Rev Clearance** is used to set backlash compensation of shaft X and shaft Y;
4. **X / Y equivalent** is a bridge of system and exterior, and this value should be adjusted cautiously. It should be measured many times to make effort to be accurate. There are two modes in the system for impulse equivalent setting: manual mode and wizard mode. Here the manual mode shall be introduced firstly.

➤ **2.3 Machine accuracy setting (impulse equivalent setting):**

1. Manual mode:

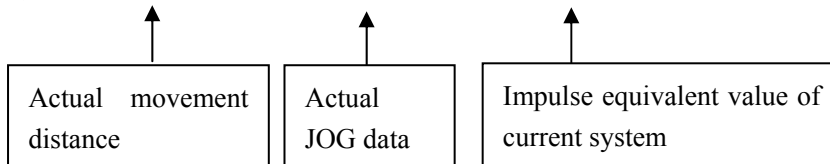
1) X / Y equivalent in the interface are set to be 0.010000 (then control system will generate an impulse equivalent motor movement 0.01MM). Then after setting, press  to save, and then return to the main interface.



2) Press  to enter manual interface, and press  key to set shaft X movement distance. Then input the length of JOG. It is presumed that the JOG unit is 1000MM.

3) Press  to start to JOG, with the presumption of 978MM actual movement distance.

The calculation formulation is as follows:

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





5) Return to the main interface and press  and press  to move cursor to an accurate position. Input 0.009780 into impulse equivalent coefficients respectively, and then it is ok.

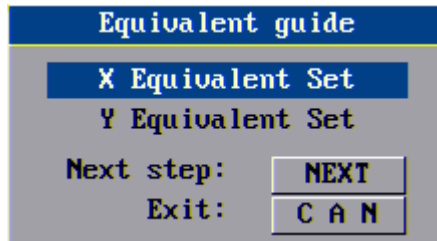
Note: Usually a little tolerance exists between the impulse equivalents of shaft X and shaft Y on a machine. Thereby, their values should be respectively set during the commissioning (it is strongly recommended that impulse equivalents are adjusted to be same).



2. Setting wizard method with system impulse equivalent


The use and operation of impulse equivalent setting wizard are as follows:

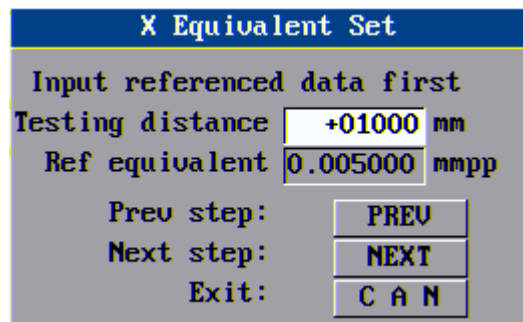
Press  key in the parameters interface, and move cursor to the position of

impulse equivalent setting wizard, and then press  key to show the following interface:





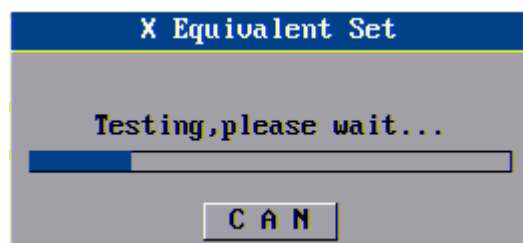
Press  key to set impulse equivalents of shaft X and shaft Y in this interface. Then keyboard sets impulse equivalents of shaft X and shaft Y respectively. Here “Impulse equivalents setting of shaft X” is selected as example: when cursor moves to “Impulse equivalents setting of shaft X”, if  key is pressed, upon the prompt,


the setting is cancelled; if  is pressed, the next step setting will be shown with the interface as follows:

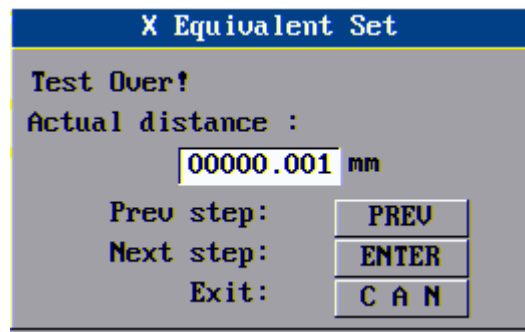





Here it is ok to use the default value; however, the matching with actual working table should be considered for “Movement distance setting of shaft X”, to prevent the burning torch to move out of working table, or collide other positions. If default 1000mm length is not used, other appropriate lengths can be set by you own. If necessary, press

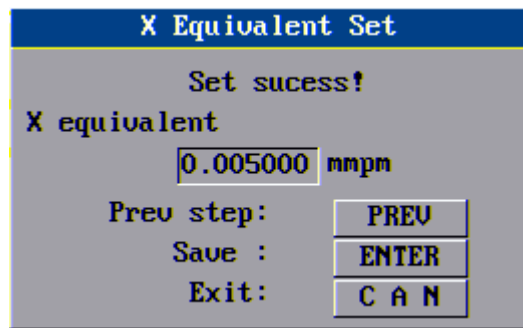
number keys directly; if cancellation, press  key directly. After setting, press  key, and then system starts to move. Refer to the following picture.



Now if pressing  key, the setting is cancelled, with original impulse equivalents reservation; if waiting system,




By this time,  key can be pressed, to raise burning torch, and press  key to move away torch in favor of measurement. Then use the caliper to measure the torch distance. Input the measured value to the prompt box, and press  key, and then system will prompt that the setting of impulse equivalent is successful as follows:



Press Confirm key to complete the system impulse equivalents setting, and shown on the column of parameters impulse equivalents automatically. Likewise, Impulse equivalents setting of shaft Y can be set with the same method.


Note: Usually a little tolerance exists between the impulse equivalents of shaft X and shaft Y on a machine. Thereby, their values should be respectively set during the commissioning (it is strongly recommended that impulse equivalents are adjusted to be same).



After completion of whole parameters settings in the parameter setting interface, press  to save settings, and prompt appears in the system: “Parameters are saved and press any key to return”. Then press any key with successful saving of parameters. Until now, parameter setting in the main interface has been completed.

➤ **2.4 Functional parameters testing:**



After the parameters are saved, press  to continue setting speed parameters as follows: Only start speed, the first section acceleration: processing speed limit (same as the processing limit speed in parameters setting main interface), manual speed limit (the maximum movable speed at the time of manual movement), creep speed, and plasma HI/LO speed should be set upon the graphic representation. Among them, start speed and the first section acceleration should be tested repeatedly after setting, until the vibration of machine reduces to the minimum or none. Here the start speed can be set to be 400mpm, and the first section acceleration can be set to be 50mG. Please refer to the following picture.

| Flame/Plasma/Fluid CCSU0.2.23 | | SysTime 05:20:23 |
|-------------------------------|-------|-------------------|
| Speed parameterFlame | | |
| Start-up/Corner speed | 00600 | mmpm |
| First sect Acc | 00100 | mG |
| First sect speed | 00000 | mmpm |
| Second sect Acc | 00000 | mG |
| LimitSpeed | 02000 | mmpm |
| Manual speed limit | 02000 | mmpm |
| Free Speed | 03000 | mmpm |
| Back Para Speed | 03000 | mmpm |
| Low speed | 030 | mmpm |
| Least corner speed | 00000 | mmpm |
| Fast R-zero speed | 00000 | mmpm |
| Slow R-zero speed | 00000 | mmpm |
| crawling speed | 025 | Per cutting speed |
| Hi/Lo speed | 080 | Per cutting speed |
| In-corner distance | 00000 | mm |
| Out-corner distance | 00000 | mm |

Home Machine Speed Setting I/O Set LogicPara Save Return

Parameters explanation:

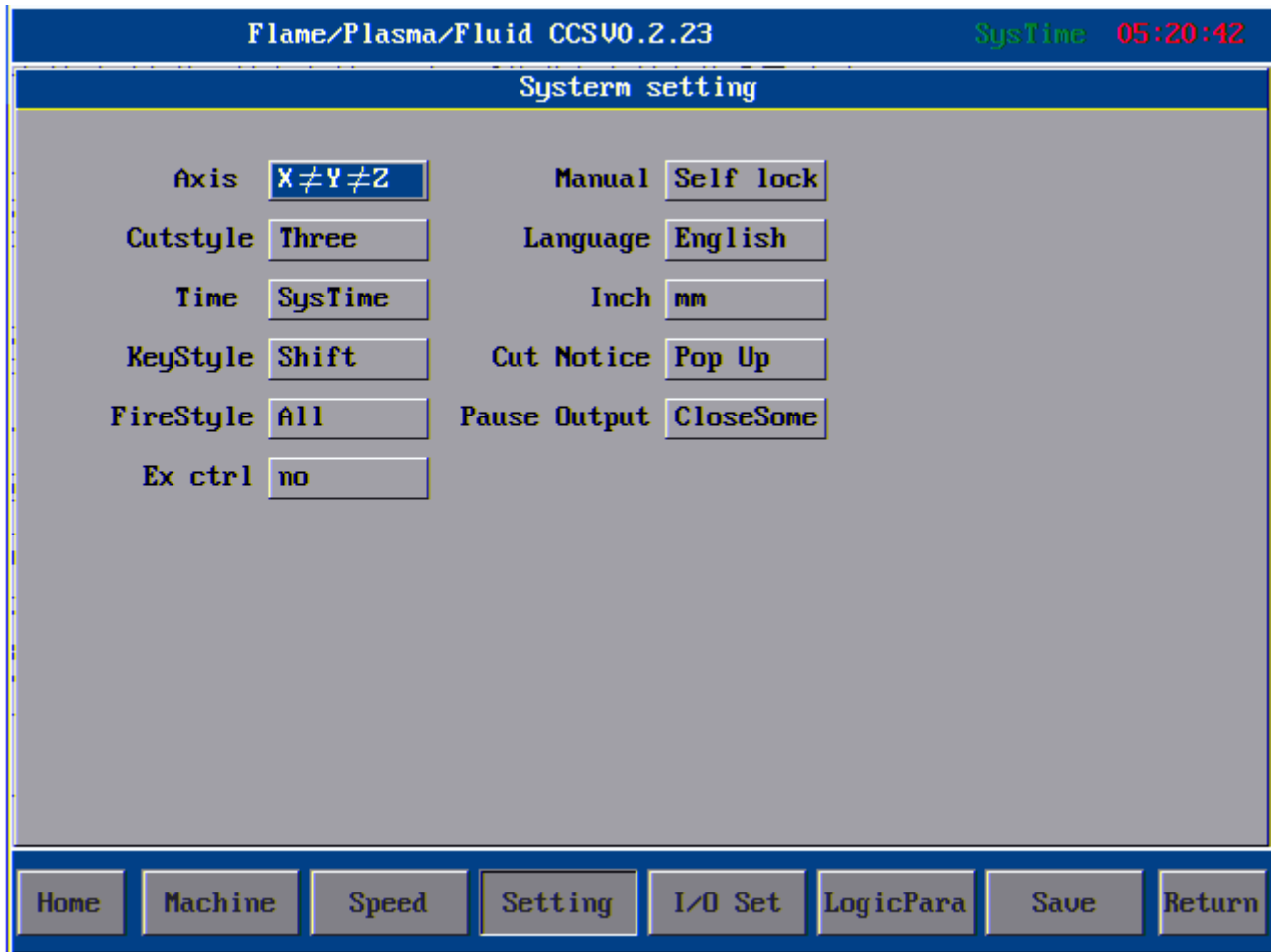
1. **Start speed/corner speed:** the speed of the earliest start to set burning torch;
2. **First sect Acc:** the first acceleration in the system, and generally when the linear acceleration is adopted, it is ok to only set this parameter;
3. **First sect speed:** the acceleration is set to the first speed point, and generally it supports the first section acceleration (currently this function is unavailable);
4. **Second sect Acc:** the second section acceleration is set. Now the first section acceleration is its start speed (currently this function is unavailable).
5. **Limit Speed:** The max. speed which can be reached by machine when setting process, and the actual speed is equal with this speed multiplied by speed ratio.
6. **Manual speed limit:** The max. speed which can be reached by machine when setting manual operation, and the actual speed is equal with this speed multiplied by speed ratio.
7. **Free speed:** The automatic idle motion speed in the system during the processing.
8. **Back Para speed:** The speed back to the processing start points.
9. **Fast R- zero speed:** When returning to zero speed, firstly fast return to zero speed is used for movement, and then stop after touching the switch. Later slow return to zero speed can be used to leave until the signal disappears. It is different with “Back to the reference speed”.
10. **Crawling speed:** the slow forward movement of machine tools when punching. Now this confirmed speed parameter can be used with expression in percentage.
11. **Hi/Lo speed:** A speed limit is confirmed for this parameter. When cutting speed reduces to the lower than this speed limit, output burning torch height prohibits this signal; when cutting speed accelerates to a higher than this speed limit, output height allows this signal.

Plasma into / out of the corner distances: This parameter is used to confirm the distance range. Under the situation of not using cutting gap, when machine enters into this range, output height prohibition and allowance signals are set and it is ok to set the system to be zero.

The above parameters adopt default values without setting.

Until now, speed parameters and relevant parameters are set completely.

12. After setting, press **F7** to save data, and after it, continue pressing functional key **F4** to conduct the system-related setting, and then enter into the interface as follows:



Other setting interface

Parameters explanation:

- Axis:** it is used to set the coaxial function of machine, for using two motor controlling one shaft. Uncoaxiality refers to the situation of one same motor controlling shaft X and shaft Y respectively. “XZ coaxiality” refer to the situation of shaft X controlled with two motors, and another motor of shaft X controlled by shaft Z output; “YZ coaxiality” refer to the situation of shaft Y controlled with two motors, and another motor of shaft Y controlled by shaft Z output;
- Manual:** A method is adopted when the burning torch is moved under the manual operation situation. Self-locking means that burning torch starts to move with eight directions, when



are pressed in the manual operation



interface. After releasing, the torch still keeps moving. Then press these directional keys or **STOP**, it will stop moving. “JOG” means that torch starts to move with these eight directions, when these eight directional keys are press to move it; it will stop after release.

- Cut style:** Switchable cutting types. Currently only three types are available: “One” means only one cutting type default; “Two” means two switchable cutting type in the system – “Flame” and “Plasma”; “Three” means three switchable cutting type - Flame”, “Plasma”, and “Preview” three functions.
- Language:** Two default languages: Chinese and English. If other languages are required, access “system/ADT/File folder” to decentralize U16.bin and mult.txt two configuration files.

5. **Input method:** Two methods: switch input and multiplex input. It is recommended to use switch input method.
6. **Fire style:** Three modes: once ignition, ignition for every time, and non-ignition with control of ignition signal.
7. **Cut Notice:** Select whether the cutting needs to confirm to be started. If pop-up prompt is selected, the prompt box will pop up after pressing Start key.
8. **Pause out put port:** After Pause is selected, totally off or partial off can be confirmed.

I/O setting

Flame/Plasma/Fluid CCSU0.2.23
SysTime 06:25:36

I/O setting

| Input | IN(0~59) | Input | IN(0~59) | Output | OUT(0~35) | Output | OUT(0~35) |
|-------------|----------|-----------|----------|-------------|-----------|-------------|-----------|
| limit X+ | 0 | Fast Stop | 10 | Gas | 0 | All Control | 6 |
| limit X- | 8 | Pause | 3 | Torch up | 1 | | |
| limit Y+ | 1 | Manual X+ | 4 | Torch down | 9 | | |
| limit Y- | 9 | Manual X- | 12 | Fire | 2 | | |
| limit Z+ | 16 | Manual Y+ | 5 | Cutting | 8 | | |
| limit Z- | 24 | Manual Y- | 13 | Preheat | 11 | | |
| limit A+ | 17 | Manual F+ | 6 | 3-peroxy | 10 | | |
| limit A- | 25 | Manual F- | 14 | H-preheat | 3 | | |
| X stop | 18 | Start | 11 | Height Ctrl | 13 | | |
| Y stop | 19 | | | 1-peroxy | 4 | | |
| Z stop | 20 | | | 2-peroxy | 15 | | |
| A stop | 21 | | | Blow Ctrl | 14 | | |
| ArcV detect | 2 | | | Cutstyle | 12 | | |
| Init Local | 7 | | | Fram H Ctrl | 5 | | |

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Setting
I/O Set
LogicPara
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Return

I/O function allows you to set the input and output of the system by own; however, it is required to match with cutter's external interface. The mark numbers here are not line number (i.e. socket no.), but IN number and OUT number. Please refer to the hardware instruction for the corresponding relation between line number and OUT/IN numbers. Currently system input supports 36 terminals, and output supports 16 terminals; when terminal number setting exceeds the range, a prompt will pop up on the down right. Press "Save setting" to save the changed settings, and the changed interface can be used. This function is produced for future maintenance; if one interface is broken, it can be repaired here, instead of returning the all machine for repair.

Note: It is recommended to not repair the interface under the situation of interface in good condition, to avoid creating confusion under the situation of not knowing the whole cutter. Certainly, if you totally understand this mechanism and cutter, you can set it at random upon the requirement.

Logic parameters:


| Flame/Plasma/Fluid CCSV0.2.23 | | SysTime 06:25:41 | | | |
|-------------------------------|--------------------------------|------------------|--------------------|--------------------------------|----------|
| Logic setting | | | | | |
| X stop | <input type="text" value="0"/> | 0-off, 1-on | Arc detect level | <input type="text" value="0"/> | 0-L, 1-H |
| X stop level | <input type="text" value="0"/> | 0-L, 1-H | Init local level | <input type="text" value="0"/> | 0-L, 1-H |
| Y stop | <input type="text" value="0"/> | 0-off, 1-on | Urgent stop level | <input type="text" value="0"/> | 0-L, 1-H |
| Y stop level | <input type="text" value="0"/> | 0-L, 1-H | Pause stop level | <input type="text" value="0"/> | 0-L, 1-H |
| Z stop | <input type="text" value="0"/> | 0-off, 1-on | Servo Alarm levelX | <input type="text" value="0"/> | 0-L, 1-H |
| Z stop level | <input type="text" value="0"/> | 0-L, 1-H | Servo Alarm levelY | <input type="text" value="0"/> | 0-L, 1-H |
| A stop | <input type="text" value="0"/> | 0-off, 1-on | Servo Alarm levelZ | <input type="text" value="0"/> | 0-L, 1-H |
| A stop level | <input type="text" value="0"/> | 0-L, 1-H | Servo Alarm levelA | <input type="text" value="0"/> | 0-L, 1-H |
| X limit signal | <input type="text" value="1"/> | 0-on, 1-off | 1 | | |
| X limit level | <input type="text" value="0"/> | 0-L, 1-H | | | |
| Y limit signal | <input type="text" value="1"/> | 0-on, 1-off | | | |
| Y limit level | <input type="text" value="0"/> | 0-L, 1-H | | | |
| Z limit signal | <input type="text" value="1"/> | 0-on, 1-off | | | |
| Z limit level | <input type="text" value="0"/> | 0-L, 1-H | | | |
| A limit signal | <input type="text" value="1"/> | 0-on, 1-off | | | |
| A limit level | <input type="text" value="0"/> | 0-L, 1-H | | | |
| Input level | <input type="text" value="0"/> | 0-L, 1-H | | | |
| Output level | <input type="text" value="1"/> | 0-L, 1-H | | | |

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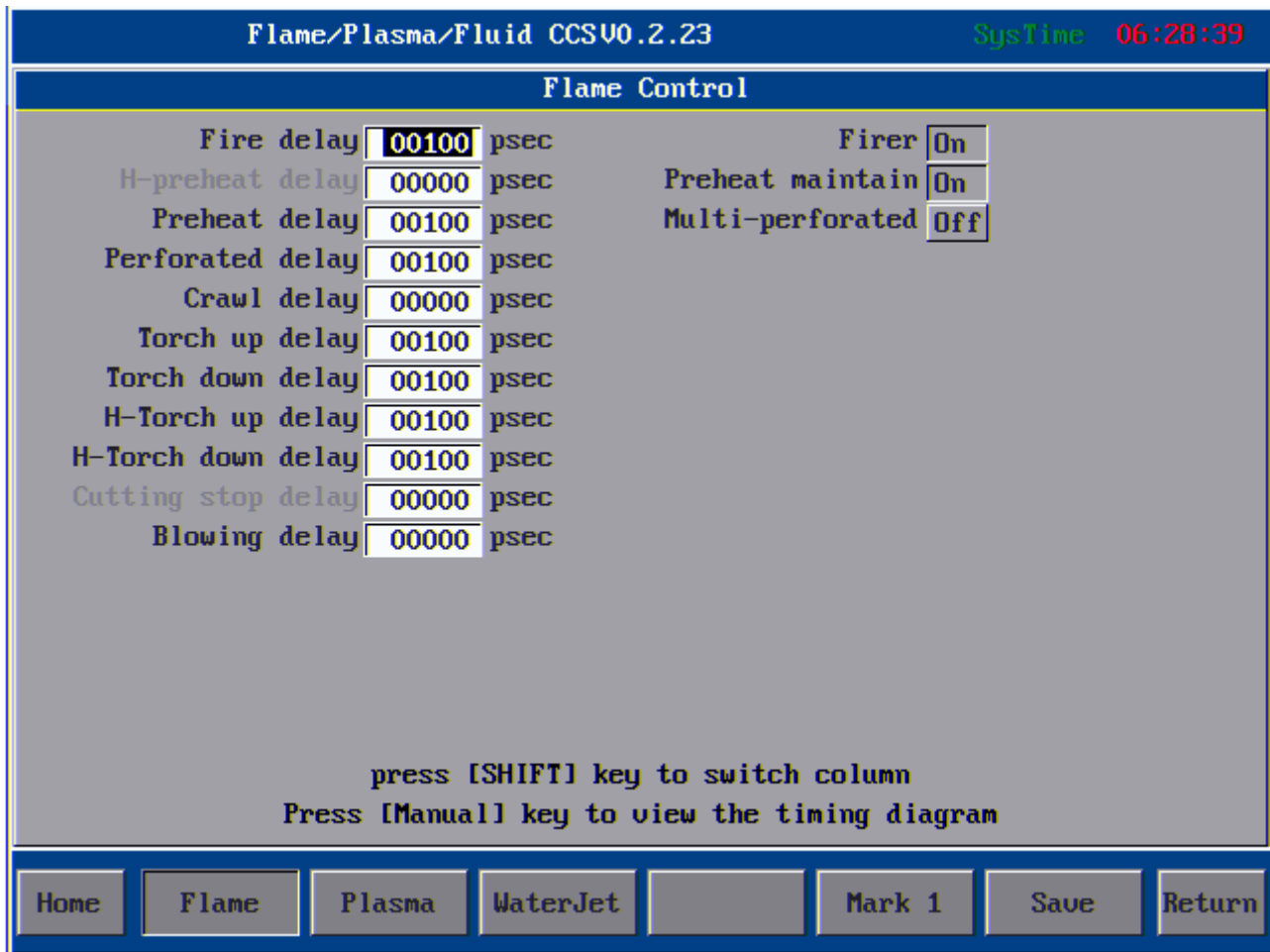
- The limit, logic level, and valid signal in the machine are set here, to be capable to use in terms of the instruction.
- X stop** (Whether STOPO signal of Shaft X is valid): When STOPO signal is connected with machine, and it is valid, the machine will send a signal of hardware stop; if this signal is not applicable, this can be set as 0. Shaft Y, Z, and A are same as the above instruction. (this functional system is temporally shielded).
 - X stop level**: (Shaft X stop logic level): the logic level is stopped by Shaft X; 0 – low level stop, and high level under the normal situation; 1- high level stop, and low level under the normal situation. Shaft Y, Z, and A are same as the above instruction. (This functional system is temporally shielded).
 - X limit level**: (Whether Shaft X limit is valid): here it refers to whether hardware limit is valid. 0 – valid; 1 – invalid. Shaft Y, Z, and A are same as the above instruction.
 - X limit signal** (Shaft X limit logic level): it refers to the limit logic level. 0 – low level valid; 1- high level. Shaft Y, Z, and A are same as the above instruction.
 - Input/output level** (Input and output valid logic level): It refers to general input and output ports (IN and OUT numbers) and input and output level. When 0 represents low level valid, 1 represents high level valid.
 - Arcs detect level** (Arc voltage detection level): Arc voltage detection enable port is set as low level, normal ON, and valid or low level, normal OFF, and valid.
 - Init local level**: Initial positioning level port is set as low level, normal ON, and valid or low level, normal OFF, and valid.
 - Urgent stop level**: Emergency input port is set as low level, normal ON, and valid or low level, normal OFF, and valid.
 - Pause signal level**: Pause signal port is set as low level, normal ON, and valid or low level, normal OFF, and valid.
 - Servo alarm level**: Servo alarm signal is set as low level, normal ON, and valid or low level, normal OFF, and valid.

➤ 2.5 Cutting process parameters test





Return to Parameter setting main page after settings, and press functional key  to enter the process parameter setting interface as follows. Currently two cutting modes are available in the system - flame cutting process and plasma cutting process. (Water cutting is a system reserved option, and is not available for the moment).

Flame:




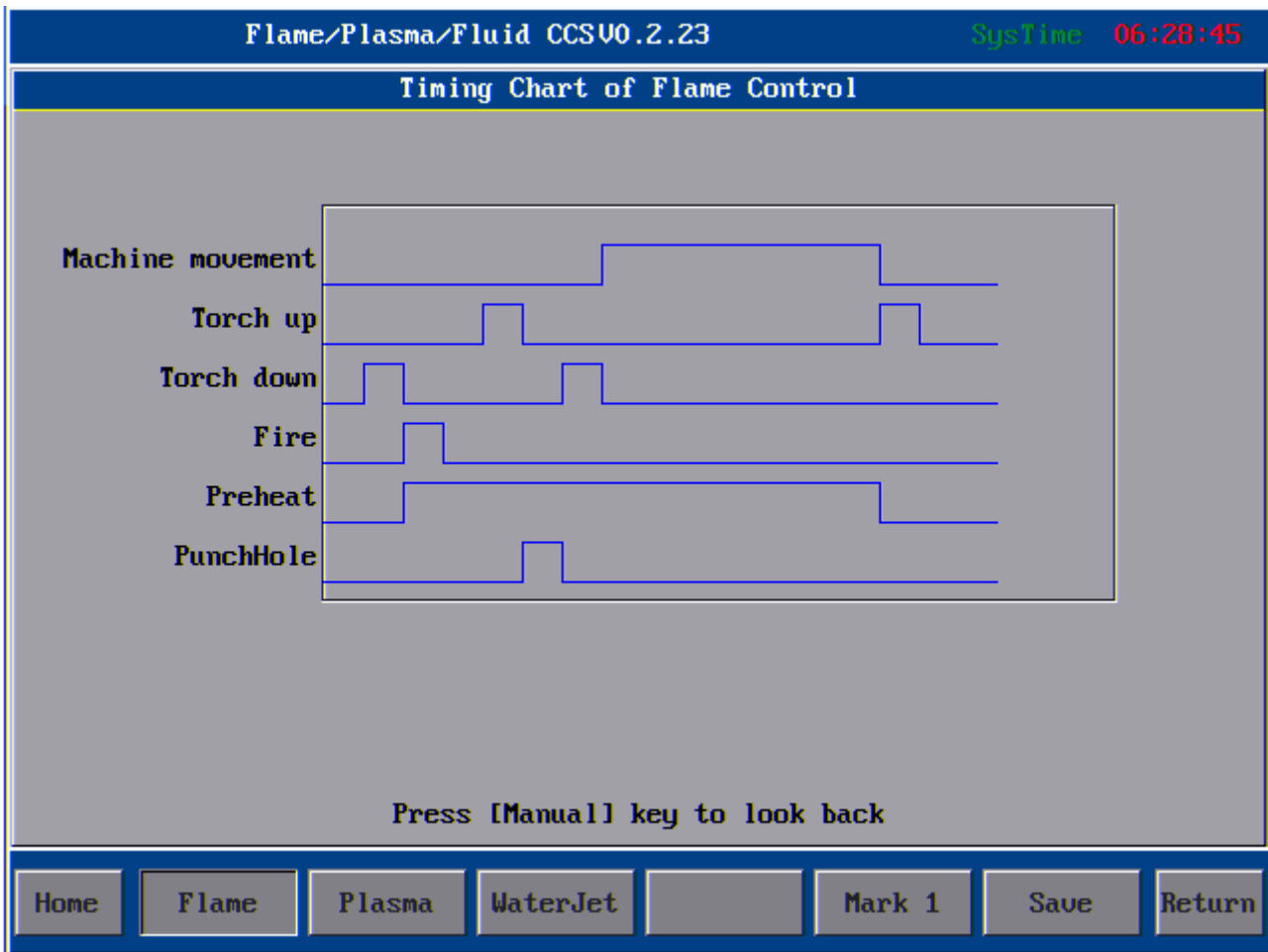
Parameters explanation:


1. Fire delay: This output signal keeps valid time for every ignition;
2. Preheat delay: For the machine with low preheats function, this parameter setting output low preheat signal time prior to high preheat setting.
3. H-preheat delay: Output the high preheat signal time before setting every perforation.  key can be pressed to extend preheat time at the time of high preheat, and press  key to stop preheat and start to process.
4. Perforated delay: Delay duration before burning torch descending to cutting height, after setting cutting oxygen.
5. Crawl time: Operational time after setting perforation at the creep speed, which is set in the speed parameter interface, to be expressed by cutting speed percentage. Machine accelerates to the set cutting speed after creep time, and creep process can heat cutting surface and make perforation to be more thorough.

6. Torch up delay: Valid time to be kept for burning torch ascending signal after setting every cutting.
7. Torch down delay: Valid time to be kept for burning torch decanting signal before setting every start cutting.
8. H-Torch up delay: Valid time to be kept for burning torch ascending signal during setting perforation.
9. H-Torch down delay: Valid time to be kept for burning torch descanting signal during setting perforation.
10. Cutting stop delay: Valid time to be kept for cutting control signal after setting every cutting, and generally it can be set as 0.
11. Blowing delay: The time of burning torch pause and blowing after setting every cutting.
12. Multi-perforated: Set whether the perforation mode will select multi-perforated mode. This function can be used for general cutting thick plate with low preheat units in the system. If the cutting plate is thin, it is ok to use general perforation; if there is no preheat units, please do not use this function.

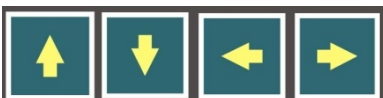


Press  key to view timing diagram as follows:



If the right parameters need to set, press  key to move cursor to the right parameter box, and then press



 to select. When the key is pressed down, it means this is selected, and then save the parameter after setting.


Plasma:

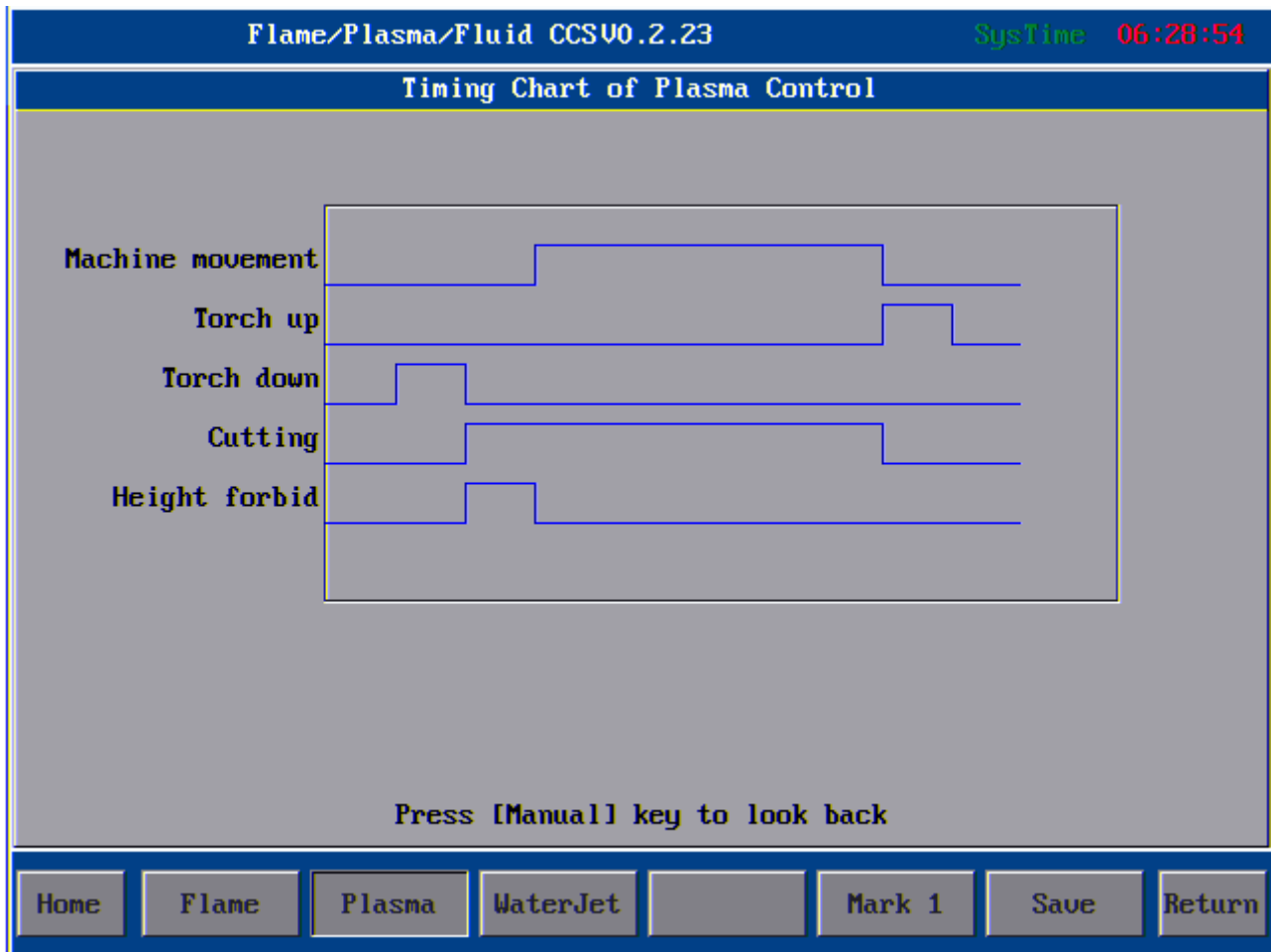
| Flame CCSU1.0 | | SysTime 00:17:59 |
|---|------------------------------------|------------------|
| Plasma Control | | |
| Blowing delay | <input type="text" value="00000"/> | psec |
| Perforated delay | <input type="text" value="00100"/> | psec |
| Crawl delay | <input type="text" value="00000"/> | psec |
| Cutting stop delay | <input type="text" value="00000"/> | psec |
| Torch 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="00100"/> | psec |
| H-Torch down delay | <input type="text" value="00100"/> | psec |
| Start arc delay | <input type="text" value="00100"/> | psec |
| Dis befor close-up | <input type="text" value="00000"/> | mm |
| Dis Lag open | <input type="text" value="00000"/> | mm |
| ArcV detect | <input type="text" value="On"/> | |
| Adjustment enable | <input type="text" value="Off"/> | |
| Init Local | <input type="text" value="Off"/> | |
| Torch up with punch | <input type="text" value="Off"/> | |
| press [SHIFT] key to switch column Press [Manual] key to view the timing diagram | | |
| Home | Flame | Plasma |
| WaterJet | | Mark 1 |
| | Save | Return |

Parameters explanation:


- Blowing delay** : The blowing time between cutting action completion to burning gun ascending;
- Perforated delay** (Perforation time): Set the time between burning torches descanting completion to machine movement, to ensure perforation to be finished completely.
- Crawl time** (Creep time): Set the time of machine at the creep speed after perforation, and creep speed can be set in the speed parameter interface with the expression by percentage. Machine will accelerate to the set cutting speed after creep time.
- Cutting stop delay** (cutting OFF time): Set the valid time to be kept for cutting control signal after setting every cutting. Negative number is used to represent that closed cutting control signal can be maximally set -1 second before cutting. When the cutting is completed, cutting arc will continue keeping due to cutting gas lag and stop, to make cutting path to be wide. Thus this parameter is used to compensate the gas lag and stop, and generally it can be set as 0.
- Torch local up delay** (Burning torch positioning ascending time): Set the time of positioning ascending at the time of initial positioning.
- Torch up delay** (Burning torch ascending time): It is used to confirm the time of torch ascending. If auto height regulation control system is used, this parameter can be set as 0.
- Torch down delay** (Burning torch descanting time): It is used to confirm the time of torch descanting. If auto height regulation control system is used, this parameter can be set as 0.
- H-torch up delay** (Perforation burning torch ascending time)
- H-torch down delay** (Perforation burning torch descanting time)
- Start arc delay** (Arcing time): The time between arcing time signaling setting to arcing success. Under the situation of auto height regulation control system, this parameter can be set as 0.
- Dis before close-up** (Increase distance of early closing): Increase the distance of early closing for a system during cutting a part;
- ArcV detect** (Arc voltage detection): Whether arc feedback signal mark is allowed.
- Adjustment enable** (Burning torch height permit): "On" need to set for the system with auto height

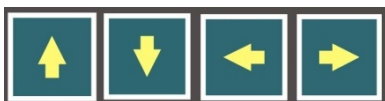
regulation control system; “Off” need to be set for the system without auto height regulation control system, or system preferring not to use height regulation control system.

Press  key to view timing diagram.



Plasma cutting timing diagram

If the right parameters need to set, press  key to move cursor to the right parameter box, and then press



to select. When the key is pressed down, it means this is selected, and then save the parameter after setting.

Parameters for flame/plasma require to be considered overall upon field situation, steel plate and plate thickness etc., which will be specified in the following chapters. Now, relevant process parameters have been completely set.

Chapter III: Drive and Motor Startup

➤ 3.1 Stepper drive startup

Example ADTECH Q2BYG808M

1.1 Setup breakdown:

Set a dip switch combination state to correspond to the number of segmentation and pulses per revolution

| Segmentation | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 | 5 | 10 | 25 | 50 | 125 | 250 |
|--------------|-----|-----|------|------|------|-------|-------|-------|------|------|------|-------|-------|-------|
| P/r | 400 | 800 | 1600 | 3200 | 6400 | 12800 | 25600 | 51200 | 1000 | 2000 | 5000 | 10000 | 25000 | 50000 |
| SW1 | ON | ON | ON | ON | ON | ON | ON | ON | OFF | OFF | OFF | OFF | OFF | OFF |
| SW2 | ON | OFF | ON | OFF | ON | OFF | ON | OFF | ON | ON | OFF | OFF | ON | OFF |
| SW3 | ON | ON | OFF | OFF | ON | ON | OFF | OFF | ON | OFF | ON | OFF | ON | ON |
| SW4 | ON | ON | ON | ON | OFF | OFF | OFF | OFF | ON | ON | ON | ON | OFF | OFF |

1.2 Working current selection

Set a dip switch combination state to correspond to the current values in the following table. Generally motor rated current is set to be 1.2 times.

Please note that do not set current when drive is power-on.

Working current selection:

| Working current | 2. 8A | 3. 5A | 4. 2A | 4. 9A | 5. 7A | 6. 4A | 7. 0A | 7. 7A |
|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|
| SW6 | ON | OFF | ON | OFF | ON | OFF | ON | OFF |
| SW7 | ON | ON | OFF | OFF | ON | ON | OFF | OFF |
| SW8 | ON | ON | ON | ON | OFF | OFF | OFF | OFF |

1.3 Half current /full current setup:

| | |
|-----|--------------|
| SW5 | |
| ON | Half current |
| OFF | Full current |

Dip switch is shown as follows:

Correspond to SW1 ~ SW8 in the table to dip up in terms of the following picture, which refers to OFF state, and dip down to refer to ON state.



Figure 1: Toggle switch

➤ 3.2 Servo drive startup

The examples for JIABAO QS6 and Japanese Panasonic servo:

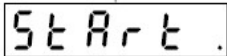
| | JIABAO QS6 | | PanasonicA5 | |
|---------------------------------|---------------|--------------------------------------|--------------------------|--|
| | Parameter No. | Ref. value | Ref. No. | Ref. value |
| Parameter password | P1 | 1 | 无 | |
| Enable method | P5 | 0 external 1 internal | | External enable is used. |
| Numerator of electronics gear | P12 | 1 | Pr0.08 | 10000P/r (combination of pr0.08\pr0.09 \pr0.10 Three parameters set the pulses per revolution) |
| Denominator of electronics gear | P13 | 1 | | |
| Position loop gain | P16 | 100 | Pr1.01 | When PR0.02 is 1, it plays the role to adjust rigidity. |
| Velocity loop gain | P21 | 100 | Pr1.00 | |
| Rotation direction setup | P11 | 0 not negated 1 negated | Pr0.00 | 0 |
| Command mode | P10 | 0 pulse + direction | Pr0.07/Pr006 combination | 0 |
| Control mode | P4 | 0 position | Pr0.01 | 0 (Position control) |
| Alarm mode | P9 | 0 normal OFF type 1normal ON type | | Normal OFF type |
| | | | | |
| | | | | |

Parameters save procedure for QS6:

Press “MODE” to enter parameter writing mode “EP-“ in the normal display mode, and then press “ENTER” for three seconds to write parameters into EEPROM.

Parameters save procedure for Panasonic A5:

Press “MODE” to enter “EE-SET” mode in the normal display mode, and press “S” to switch to execute display

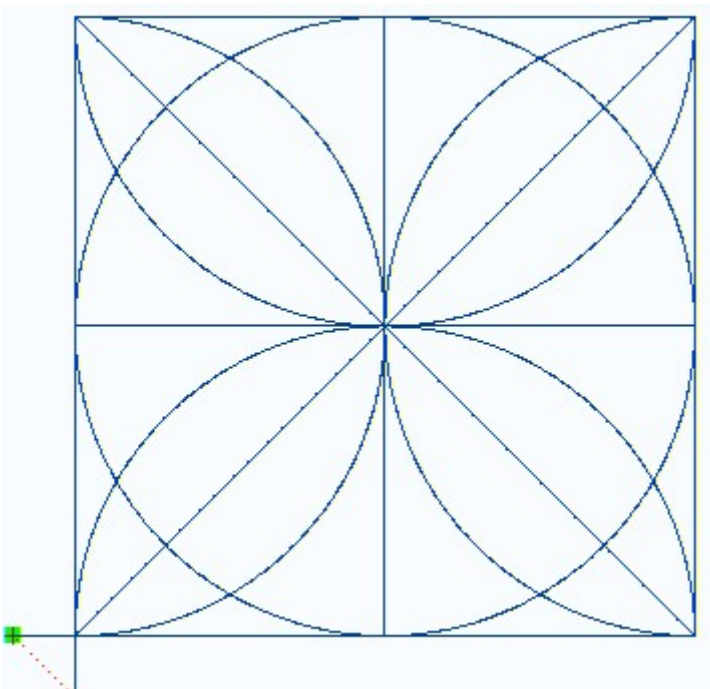
“EEP-“, and then press UP key until  appears.

Chapter IV: Draw line Detection

1. Please prepare the drawing pin as follows:



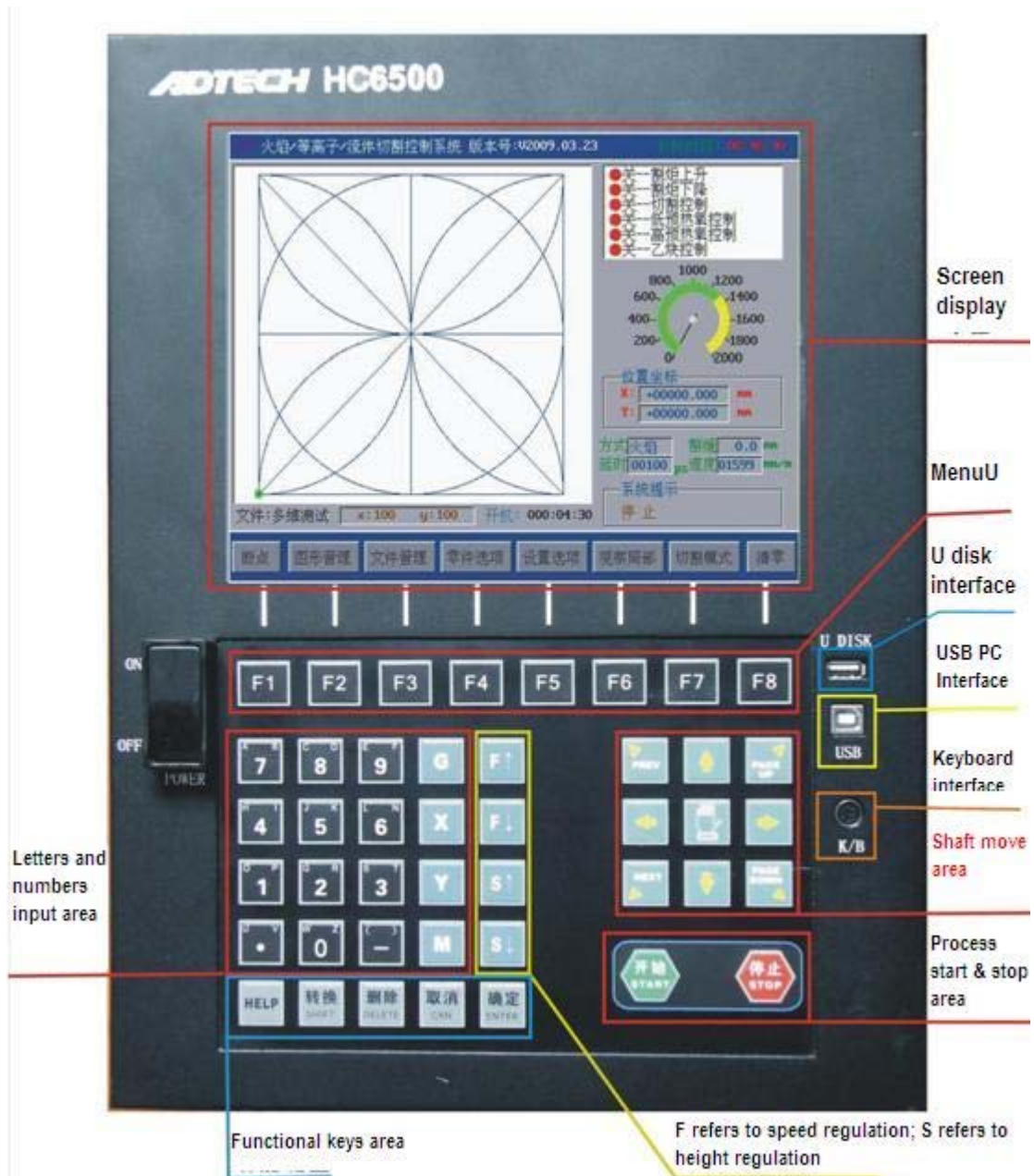
3. Prepare glass plate or other plates, on which white powder is applied.
Draw the lines on the plate upon the “multidimensional test” in the graphic library.
Measure the square side length, to verify whether precision parameter is correct;
Measure diagonal line length, to verify the verticality of horizontal and vertical shafts;
Detect the machine’s performance and circle effect at the time of corner turning.



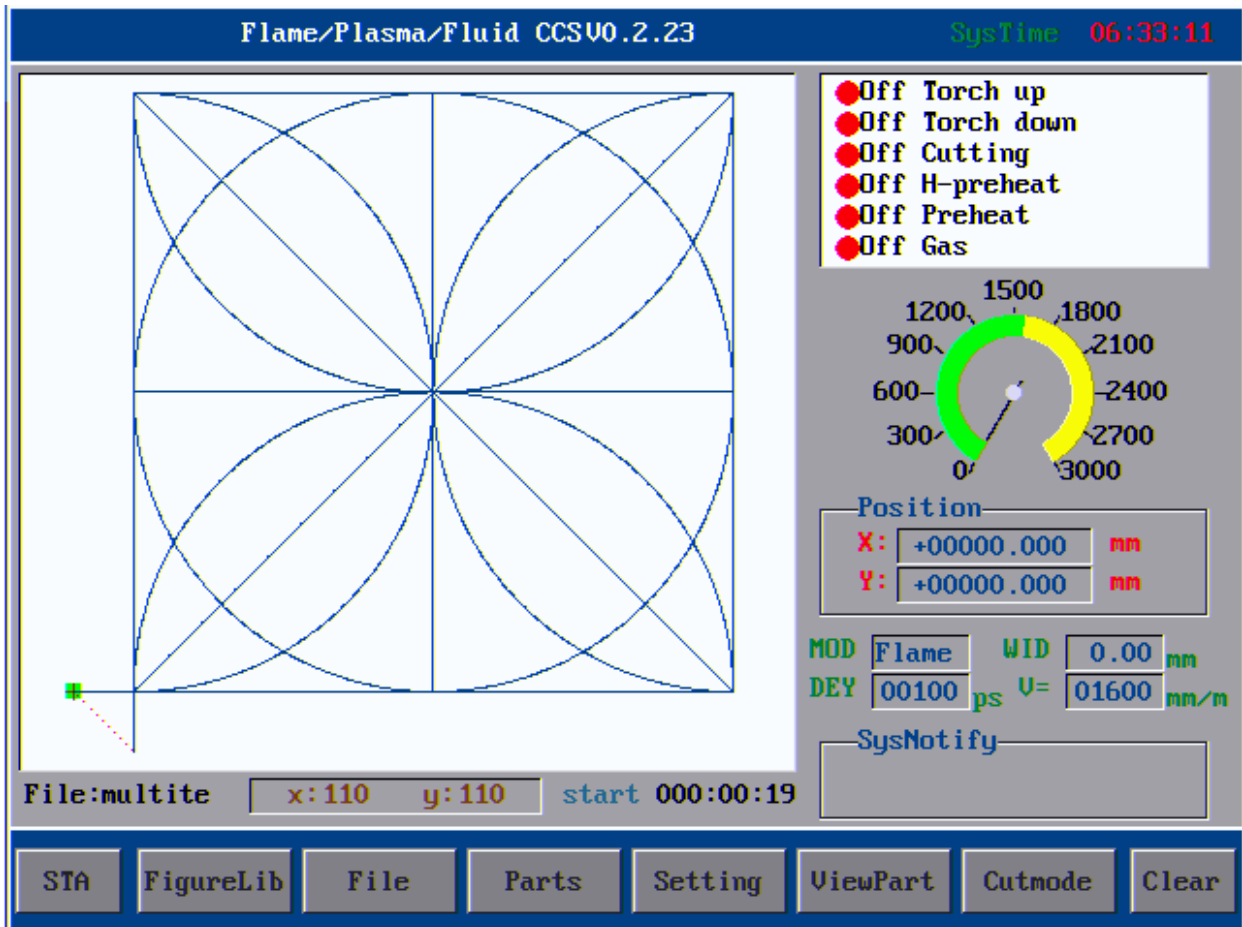
Section III: Software

Chapter I: Introduction of Operational Panel and Main Interface

➤ 1 Introduction of panel




➤ 2. LCD main screen introduction




The above picture is the main screen of HC6500 software, and the following functions can be done here:

1. Switch cutting mode;
2. Real-time display cutting track;
3. Zoom in and out the current processing graph.

This function is used to view parts locality, and under the situation of locality, press  to move graph around, and press the corresponding numbers on the keyboard, to multiply zoom in graph etc.;


Under the situation of the overall part graph, press  key to correspond to burning torch moving

around, and extend other four directions  movement feature. Under the situation to view the overall graph, it is invalid to press number keyboard, as it has other function to be introduced later.

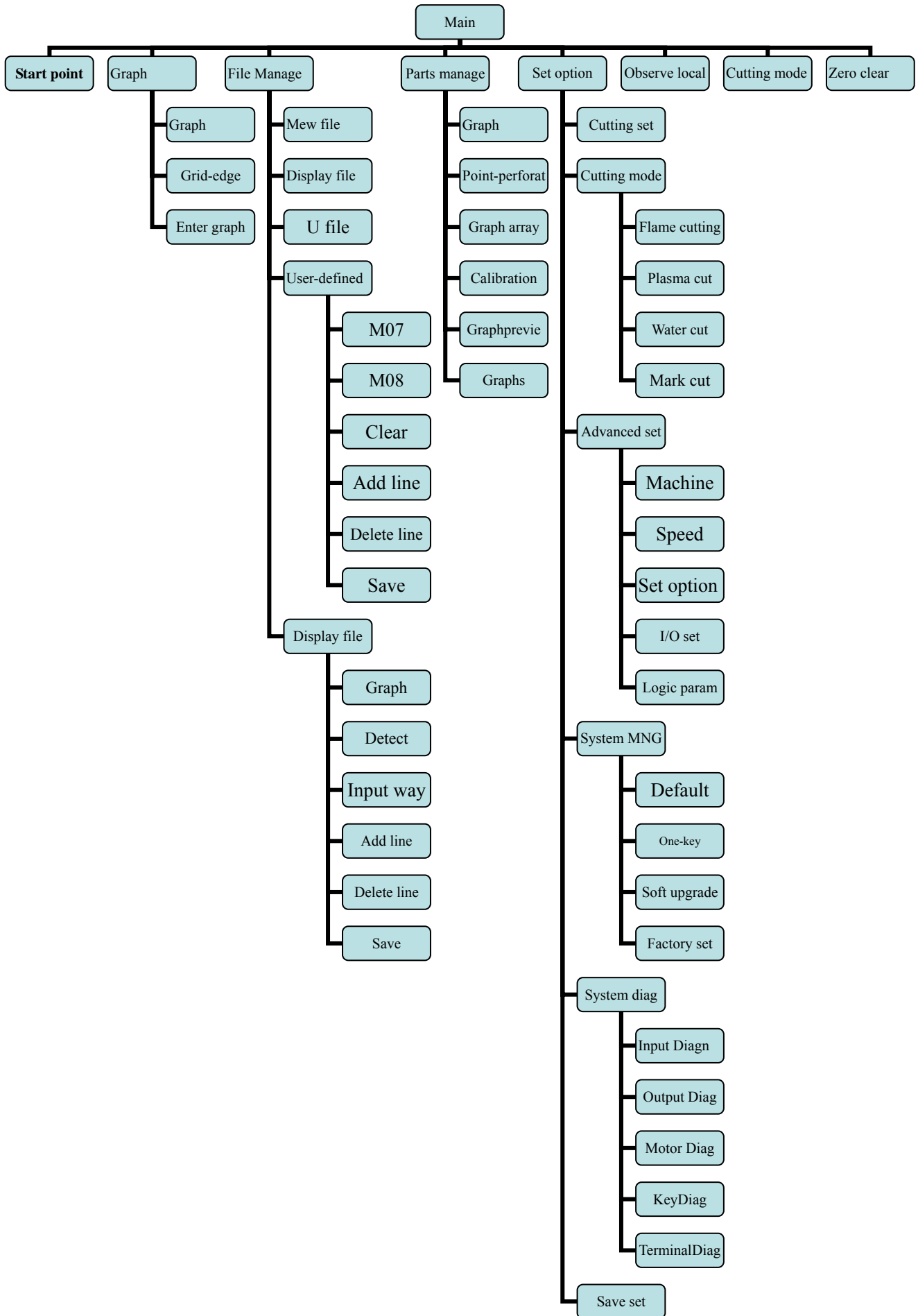
4. Capable to clear the current postion;
5. Capable to facilitate to switch processing start position;

Start point function: the corresponding position of positioning burning torch before processign start when calling the graph. Continue pressing F1 key to switch the corresponding position of cutting start point, with five points: graphic start point, upper left, upper right, lower left, and lower right.

6. Capable to set cutting speed.

Press  to quickly set the cutting speed in the main interface.

Chapter II Software Menu Structure



The cascading menu structure is adopted for HC6500. Press menu key to correspond to menu with the following operations through system menu:



When entering the menu in a certain interface, press **F1** to return to the movement main page or press **F8** to return to the previous menu.

Chapter III: Software Function and Technical Parameters

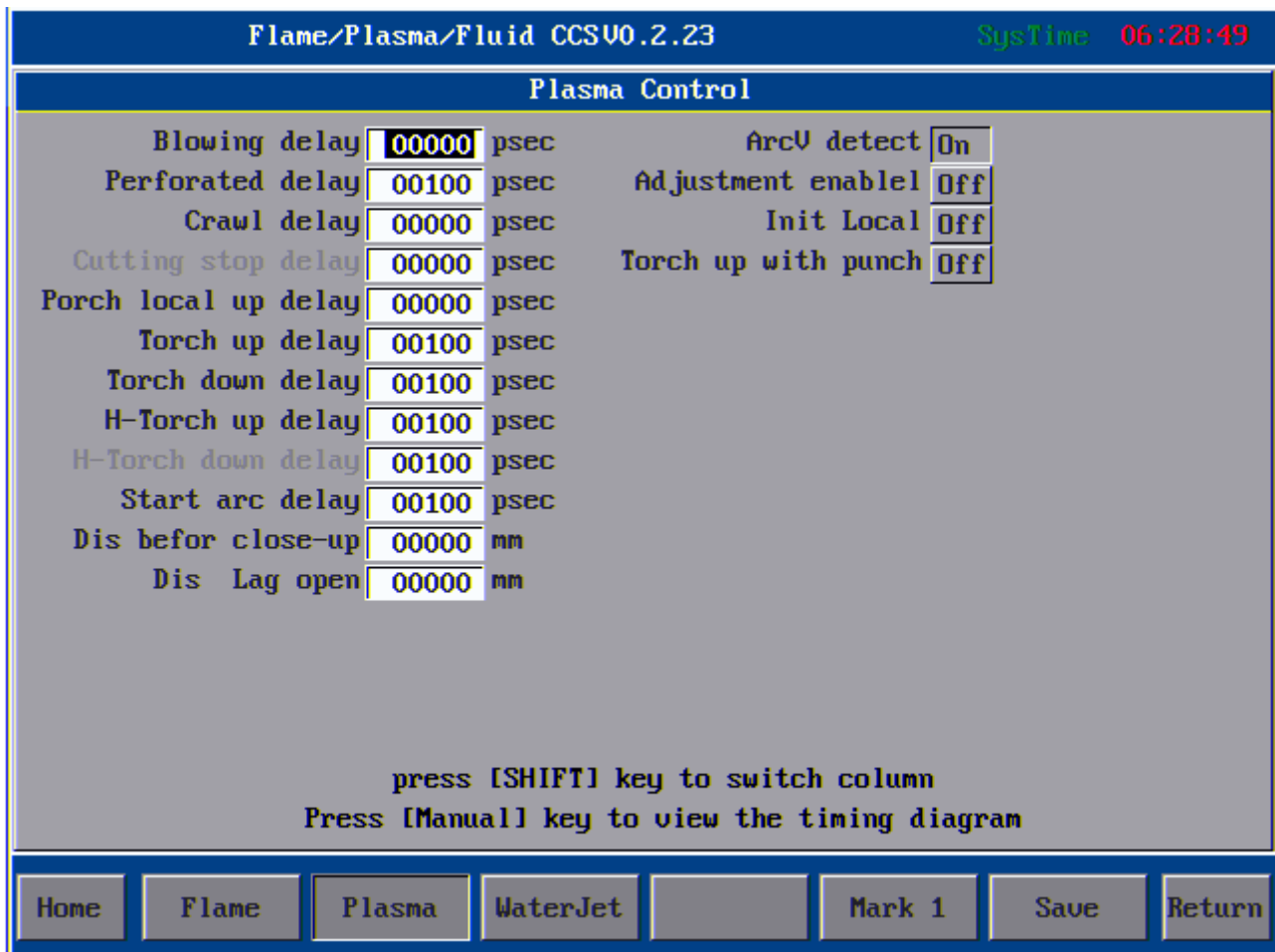
➤ 3.1 Software menu

| Function | Details | Spec. |
|---|--|-------|
| Technology type | Plasma, flame, powder, and water cuttings | With |
| Graphic library feature | With plenty of parts graphs, to do the edition and automatically generate program | With |
| rectangle edge-shared feature | Edge-shared cutting | With |
| Perfect cutting gap compensation feature | Apply for a variety of shaped graph compensation with wide adaptability | With |
| Breakpoints recovery feature | Cutting data protection when power-off during processing | With |
| Graphic processing feature | Processing graphic rotation and X, Y mirror images, line selection, point selection, steel plate calibration, size, array, mal-position arrangement, and zoom etc. | With |
| Real-time track display feature | Real-time track display | With |
| Plasma arc detection, initial positioning, and corner signal control features | Stable and reliable process control with more reasonable corner cutting | With |
| Track continuous back-off feature | Facilitate return along the route for cutting repair after flame off | With |
| Pause feature | Capable to return Pause position when translocation generates after Pause, to continue implementing program | With |
| Perforation point selection feature | Cutting can be conducted from start point to leap into the specified perforation point | With |
| Diagnosis feature | Help the customer to rapidly troubleshoot machine problems | With |
| User-friendly USB connection feature | Read file directly by U disk with file folder feature and convenient field operation | With |
| Parameters backup and restore feature | System default setting and restore features to better protect system parameters | With |
| User-defined input and output ports feature | Achieve arbitrary designations on the software for all of ports. | With |
| User-defined M Complex instruction code | User-defined M Complex instruction code to extend system processing technology | With |

| | | |
|-------------------------------------|---|------|
| Free switch for Shaft X and Shaft Y | Complete horizontal and vertical switch on the software | With |
| Self-locked JOG flexible switching | Correct point positions easily and accurately by JOG; Facilitate long distance movement by self-locking | With |
| Multi-language display support | Support English and Chinese | With |
| Multi-language input method support | Better identify the file name | With |

➤ **3.2 Particular introduction for features**

➤ **3.2.1 Technology type**



There are four cutting technologies in HC6500:

1. Flame cutting
2. Plasma
3. Water Jet

4. With powder scribing supporting function to satisfy powder spraying offset requirement.

The flows of various technologies are as follows:

1. Flame cutting

Refer to User Manual page 75 ~ 76 for details;

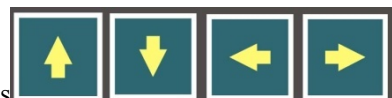
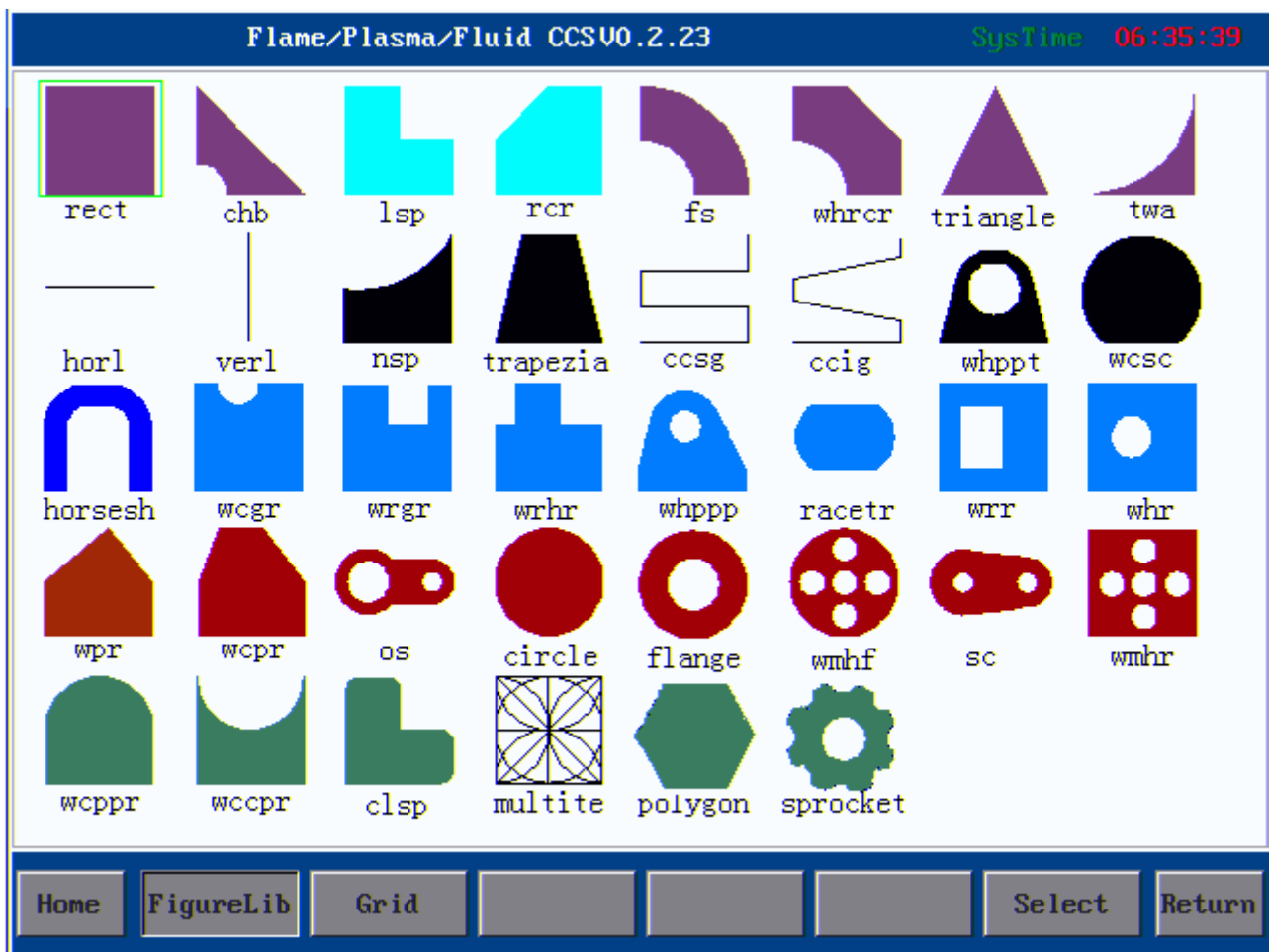
2. Plasma cutting

Refer to User Manual page 75 ~ 76 for details;

3. Mark 1(Powder scribing)

With powder scribing supporting function, powder spraying offset function, and parameters setup.

➤ 3.2.2 Graphic library function



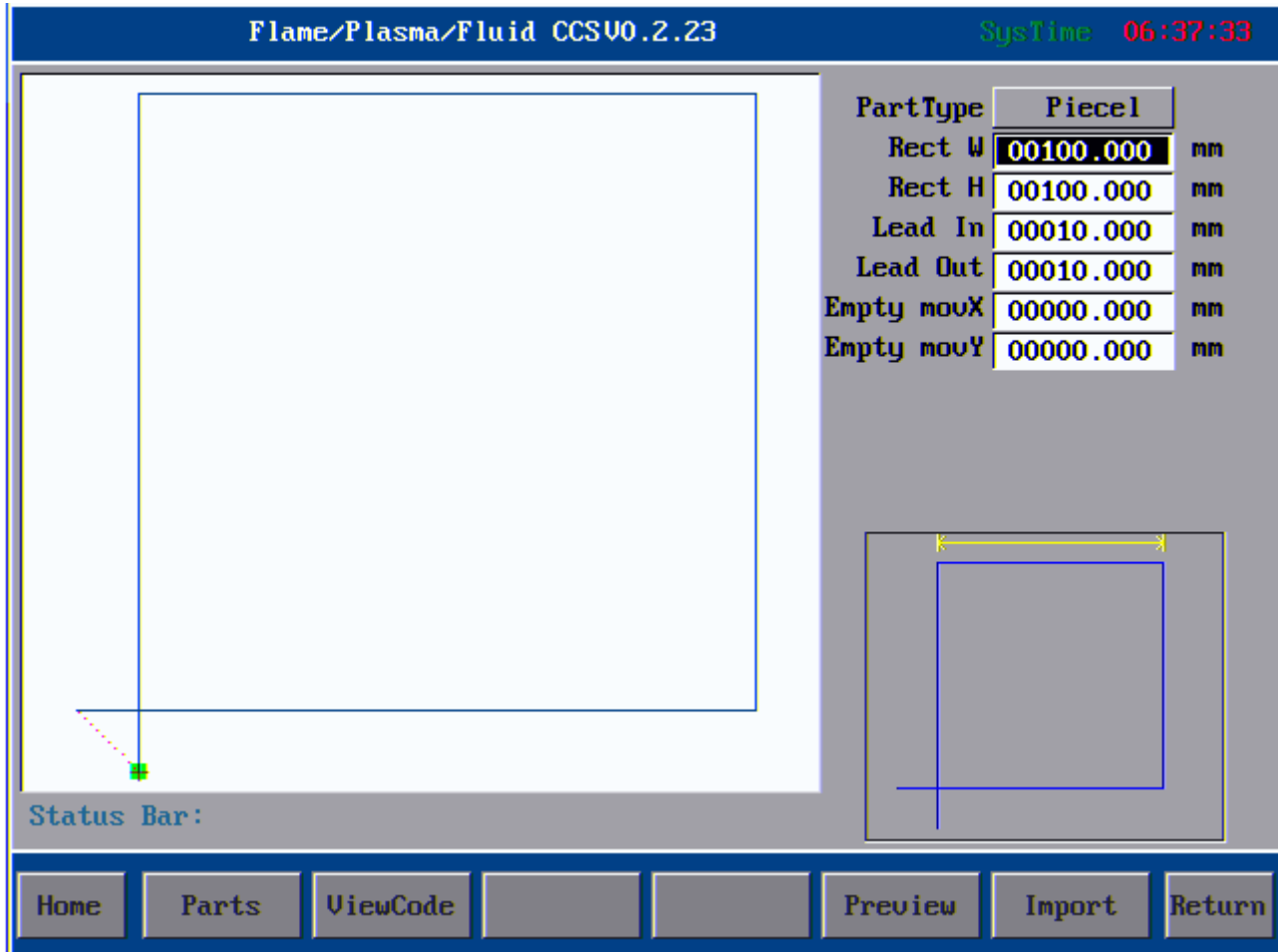
There are 35 part figures and one testing figures available. You can press these keys to

move cursor to select the corresponding figures. When you have selected the rectangle, you can press **F7** or

确定
CONFIRM

key to switch to the rectangle parameters setup interface, for rectangle processing.

Here we take a figure as an example as follows:



F6

This is the rectangle setup parameters interface. After setting part width, height and type, press

F7

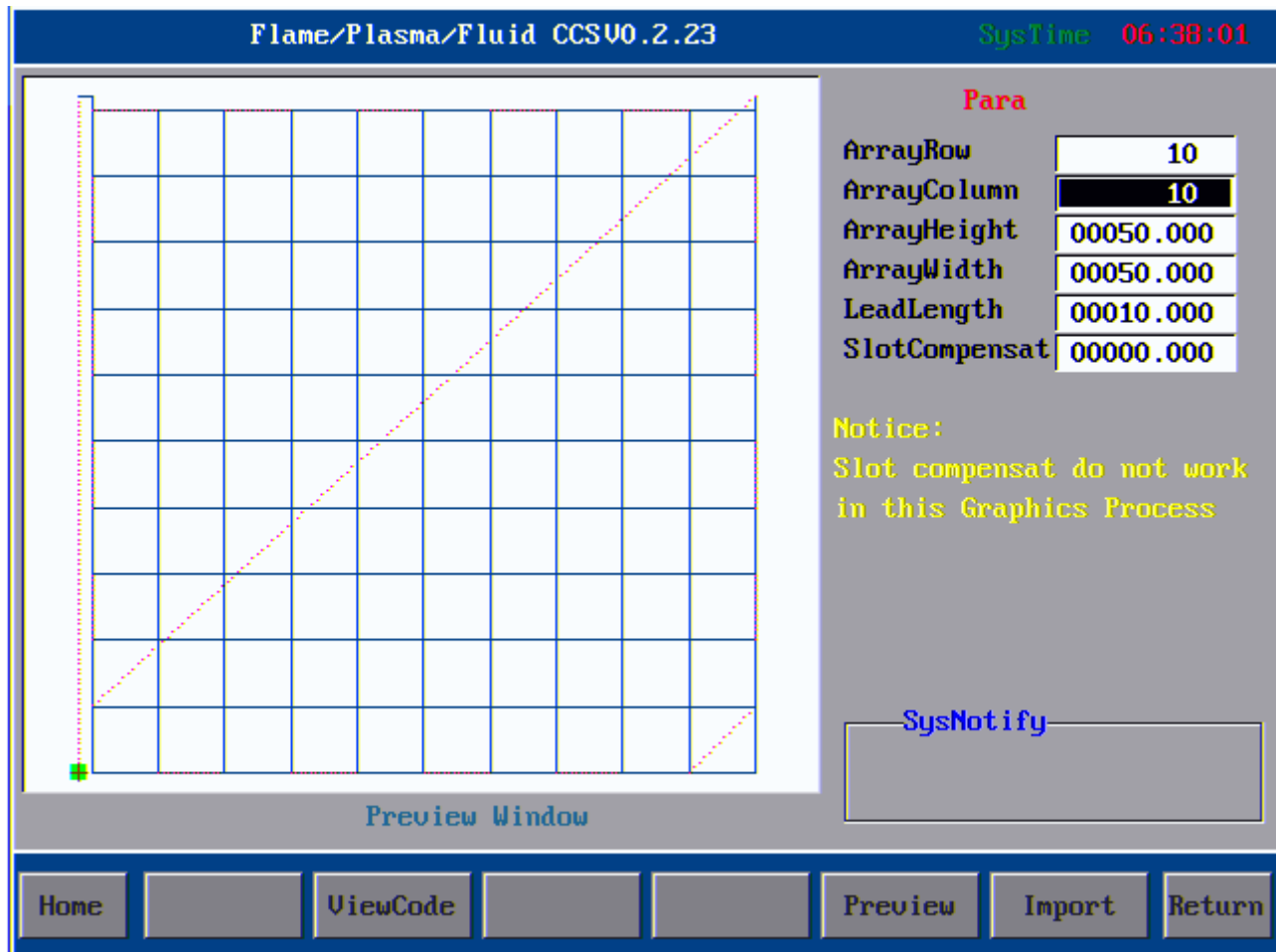
to preview graph. When the graph is confirmed, press

to import this graph and system will automatically jump into main processing interface. Under the mode of flame cutting, press START key to conduct flame cutting. Under the situation of plasma cutting mode, plasma cutting shall be executed.

➤ 3.2.3 Rectangle edge-shared feature

Grid cutting is a special cutting mode, also called as grid edge-shared cutting, to be able to maximally save plate material and time. However, it is different with other parts, and generally used as the cutting material of square plate, whose parameter setup and compensation method are different with general graph, similar with parts array,

with a little distinctions. Press **F3** key in the graphic management interface, to enter grid cutting interface as follows:



As the picture to show:

Array Row: how many rectangles on every column of grid;

Array Column: how many rectangles on every line of grid;

Array Height: net width of grid, that is, rectangle size without cutting gap compensation;

Array Width: the lengths of lead-in and lead-out wires, and these two lengths generally are same.

Slot Compensate: Grid is a particular graph requiring the special processing, whose compensation is different with the compensation principle of system setup. Therefore, if cutting gap compensation parameters need to set here, the compensation in the system parameters setup is invalid for it. If its compensation is forcibly added on it, the error will produce. Thus, the compensation parameters in system automatically shield should be disregarded by the user.

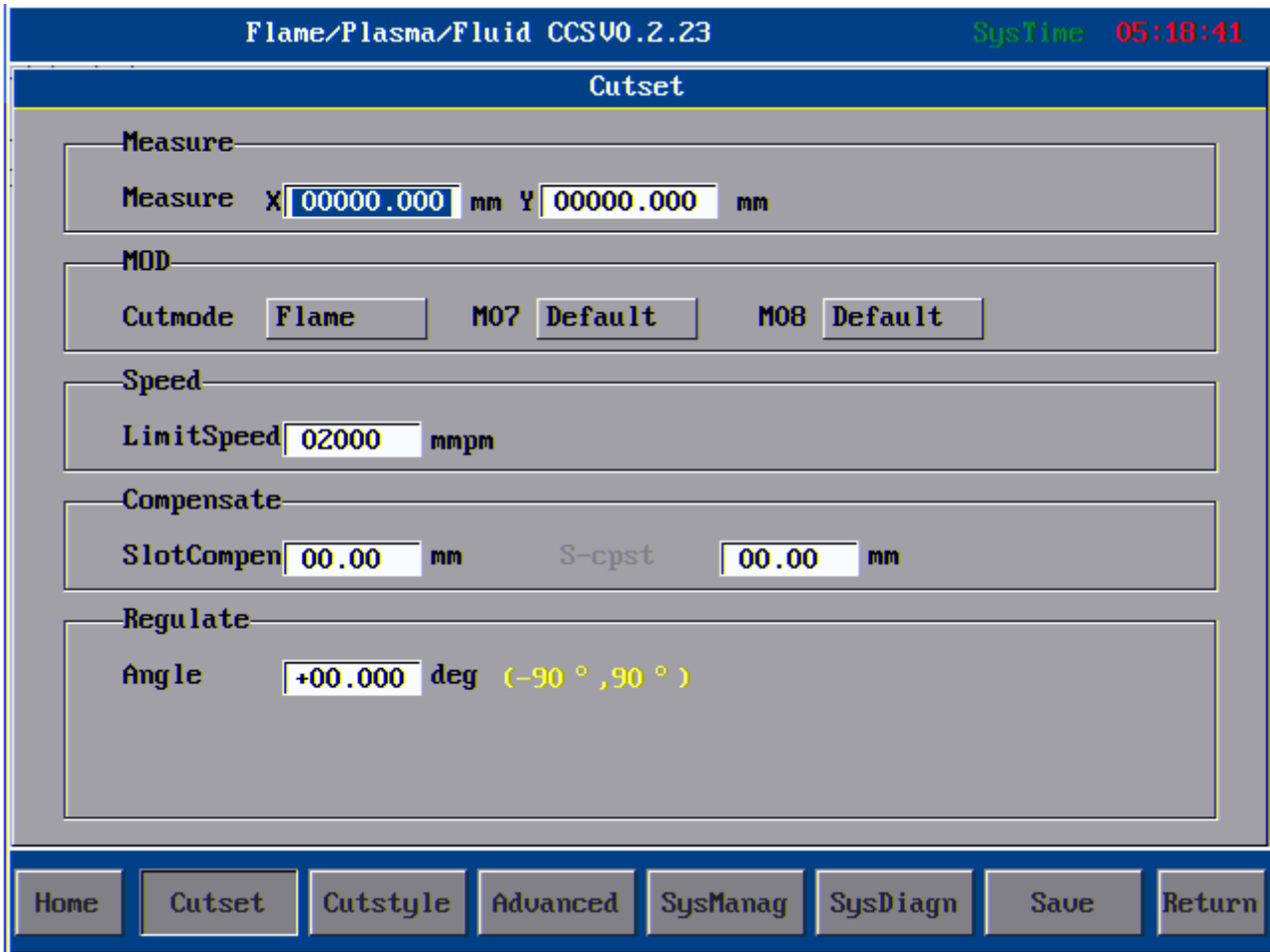
After setting, press [Import], the graph will automatically return to the main processing interface of system. Meanwhile, press [Viewcode] to see the current graphic processing code, which is identical with the graph in graphic library.

➤ **3.2.4 Perfect cutting gap compensation feature**

HC6500 has cutting gap compensation feature. The size deviation resulted from compensation cutting gap.

The setup procedure for cutting gap is as follows:

Enter setting option – input compensation values in the corresponding cutting gap compensation option box, and save them.



➤ **3.2.5 Breakpoints (Spot) recovery feature**

Automatic save and automatic restore modes are adopted for breakpoints recovery feature of HC6500:

1. Power supply is able to memorize automatically cutting breakpoints data in the image of movement cutting;
2. Previous coordinate prior to power-off will be restored automatically after re-connection of power, to provide the convenience to the user.

➤ **3.2.6 Graphic processing feature**

Graphic processing feature is composed of graphic rotation, mirroring, array, and plate calibration processing, with details as follows:

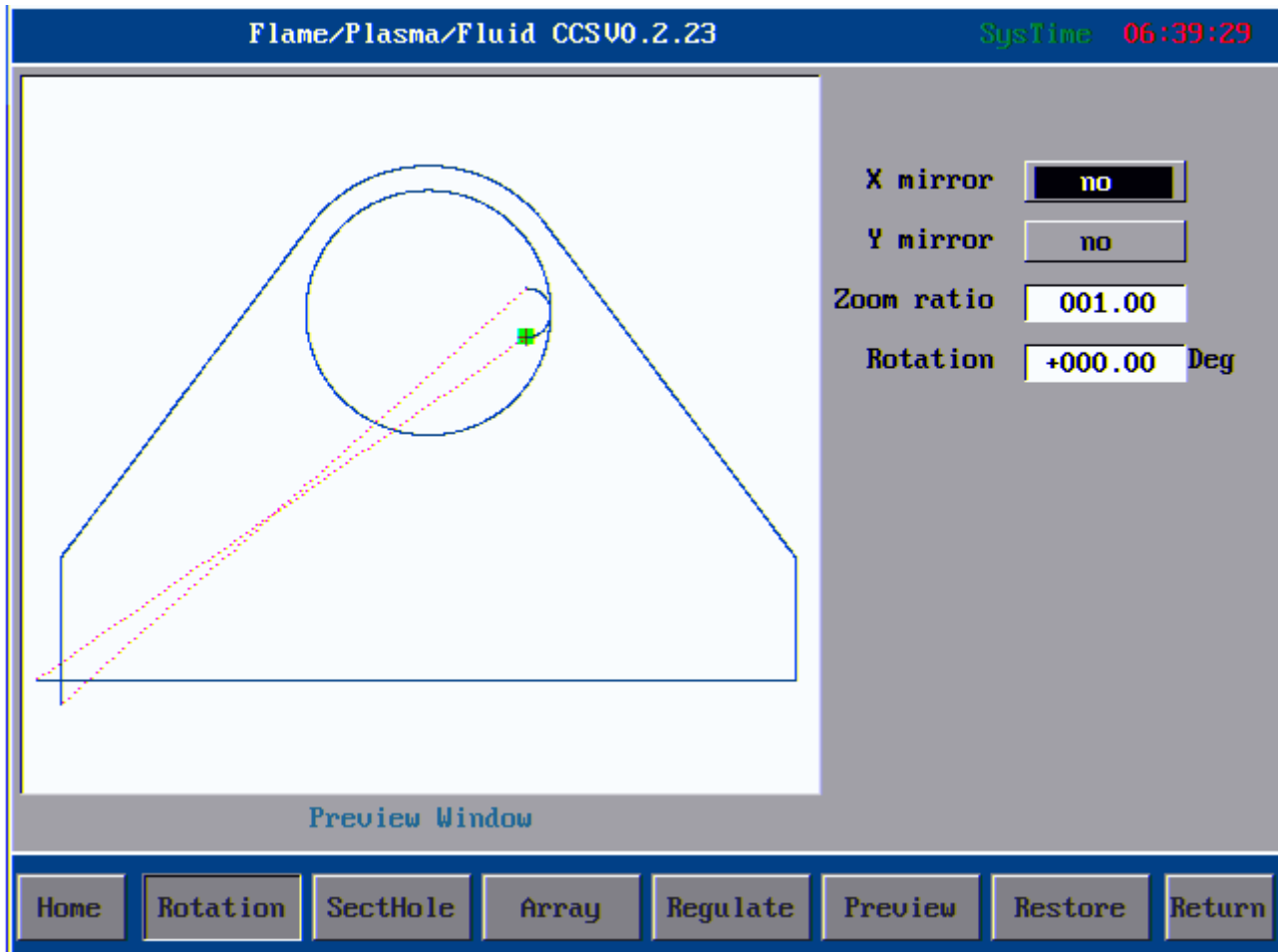
3.2.6-1 Graphic rotation

Graphic rotation feature refers to the following operations: rotate graph, mirror, and zoom etc. and their functions are introduced as follows:

In **mirroring**, X mirror is a duplicated copy on the symmetric direction with Shaft Y as baseline; likewise, Y mirror is a duplicated copy on the symmetric direction with Shaft X as baseline; XY mirror is a duplicated copy on the

symmetric direction with Shaft Y or Shaft X forming 45° angle straight line as baseline. **Rotation** is a rotated angle on the clockwise or counter-clockwise direction for processing graph, where system defaults positive angle as counter-clockwise, and negative angle as clockwise. Zoom is zoom in and zoom out the graph upon the actual size; when its value >1, it means zoom in; when 0 < its value < 1, it means zoom out. Other values are pointless.

The following picture to show the overall interface:



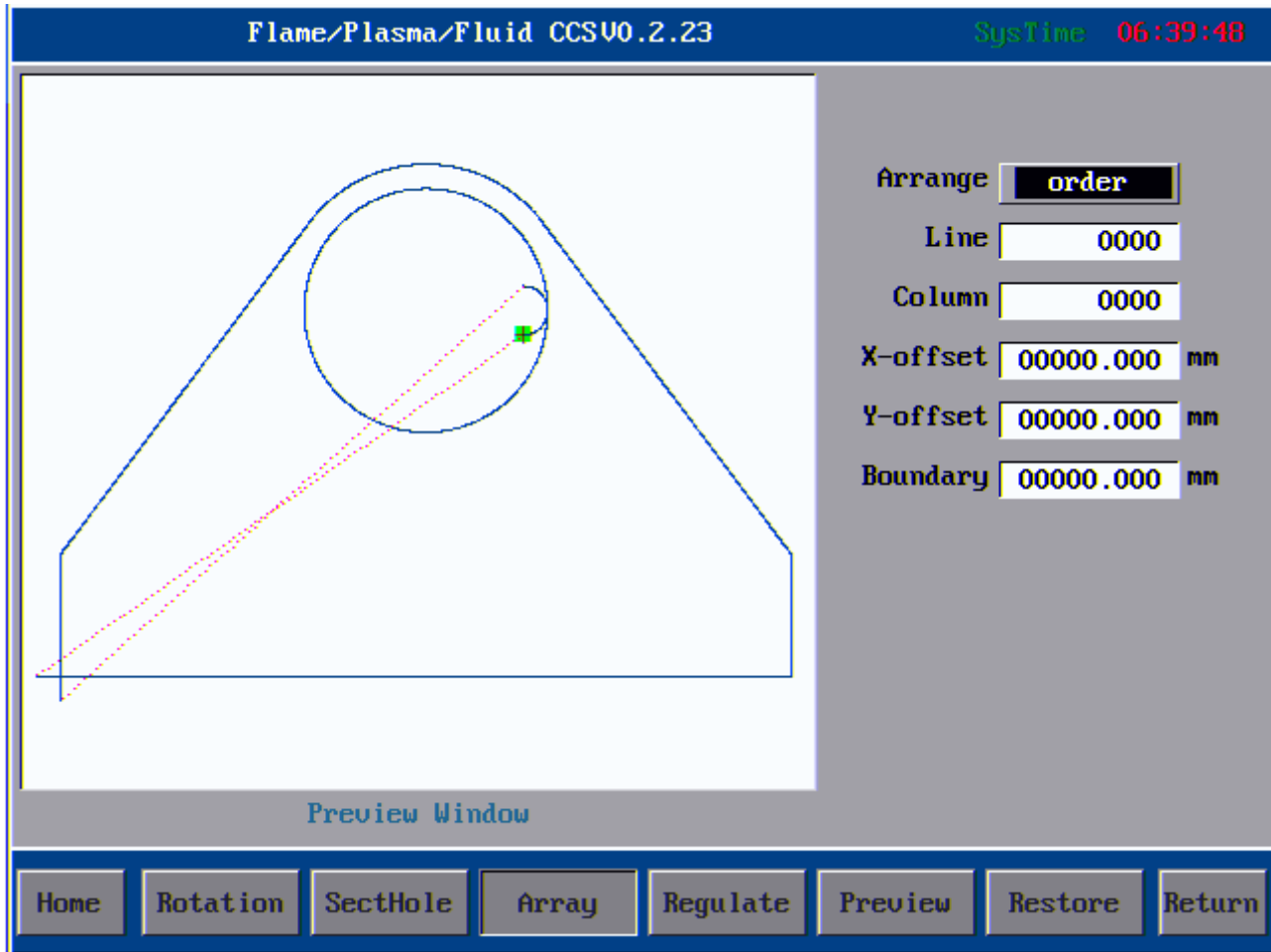
Graphic rotation

After inputting every parameter, under the situation of non-mirror selection, press CONFIRM key and the graph shall conduct mirror, zoom, and rotation processing in terms of parameters simultaneously. When inputting wrong or invalid parameters, there is prompt to appear on the preview interface, or restore the part.

3.2.6-2 Graphic array

Press key to enter the graphic array functional interface. There are two methods: vertical array and staggered array. Vertical array is to arrange every graph with the method of justify full; however, staggered array is not a justified arrangement, but with a certain method, to meet different processing requirements. Of course, array only can arrange graph in a simple way, and definitely fails to achieve the whole needs of customers. If complete array is required, the professional nesting software should be prepared. After line number, column number, spacing,

and offset are input in terms of prompt, press CONFIRM to show the following picture.



Graphic Array Interface

Basic operation:

You have to select one of the array methods, either vertical array or staggered array, 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- offset: It is the offset distance between two lateral figures. If you do not input any offset value (that is, the offset value is 0), the system will calculate the offset value as the figure width (unit in MM) automatically. If you have entered an offset 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 offset value carefully to satisfy the processing requirement of lateral distance between two figures.

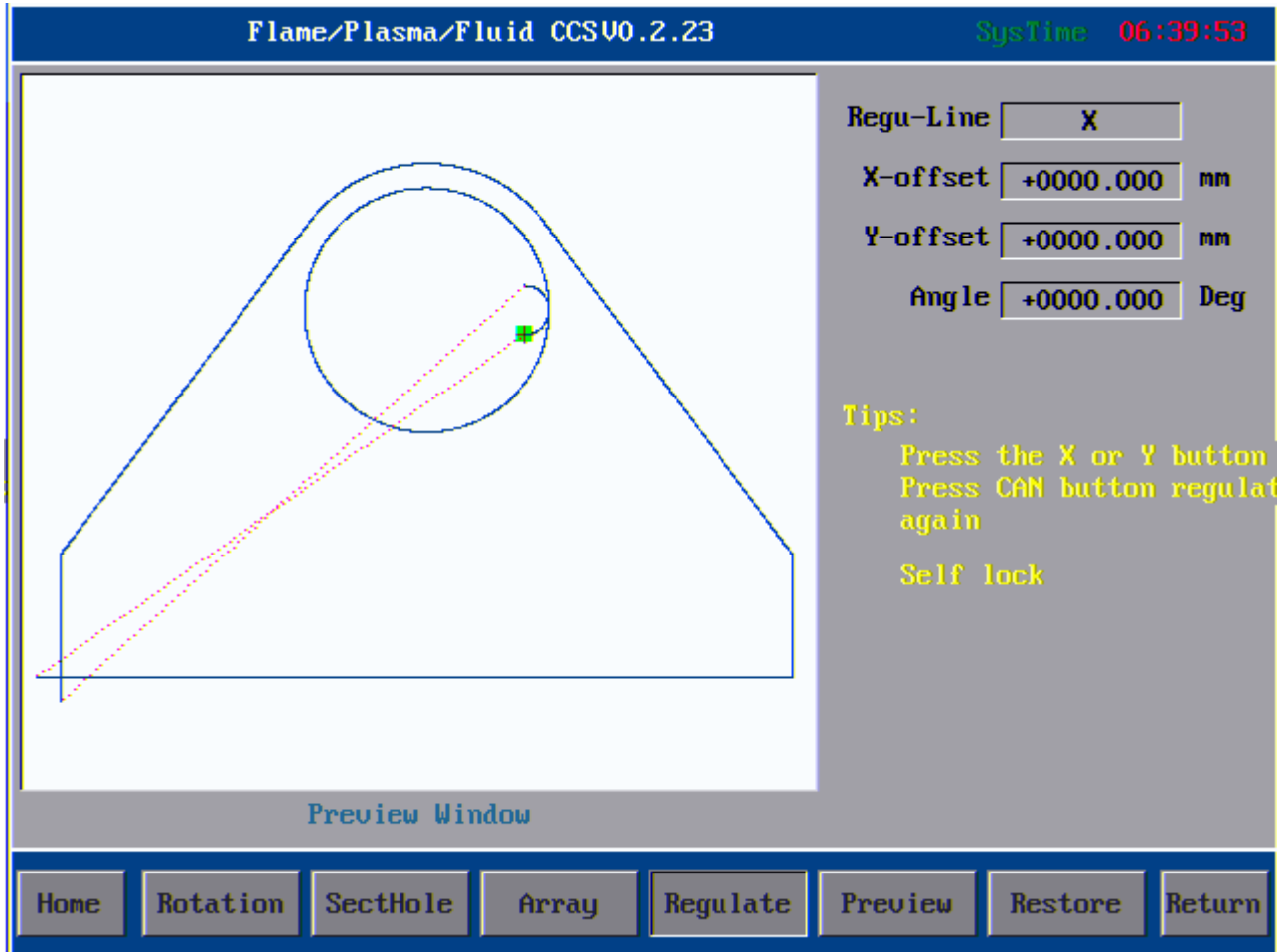
Y- offset: It is the offset distance between two longitudinal figures. If you do not input any offset value (that is, the offset value is 0), the system will calculate the offset value as the figure height (unit in MM) automatically. If you have entered an off-set value, even 0.01MM, the system will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

Boundary: 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.

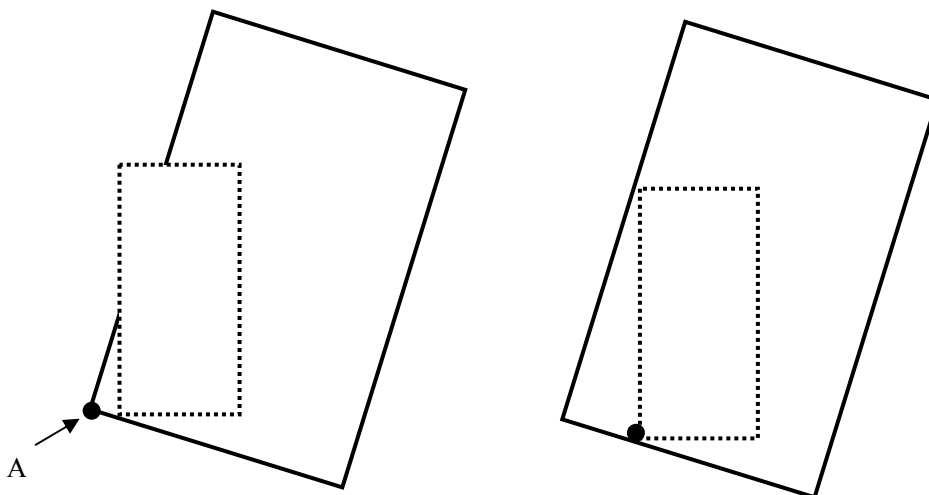
We should note that figure rotating and array functions cannot be used at the same time. Array should be done before the rotating. This operation could only be done once when you are using the resume function.

Calibration 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:

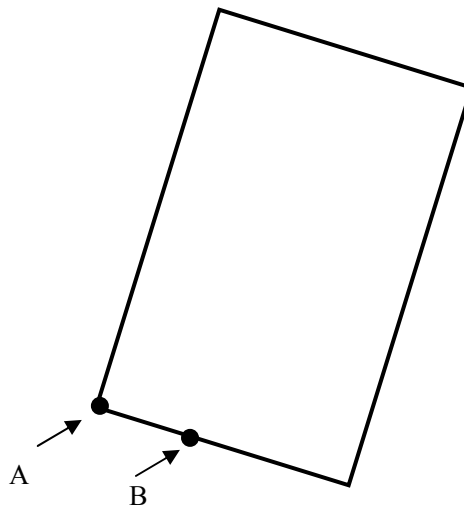


Picture 1






Picture 2

- 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.

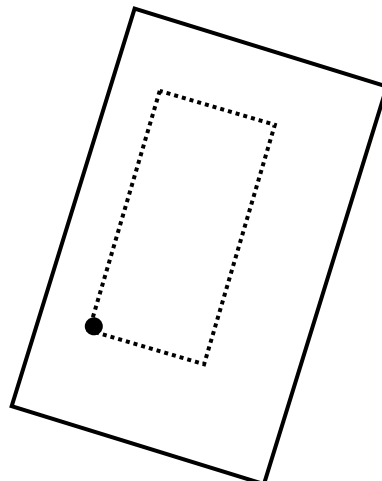
The first Way of calibrating the steel plate: Shaft X is calibration reference edge



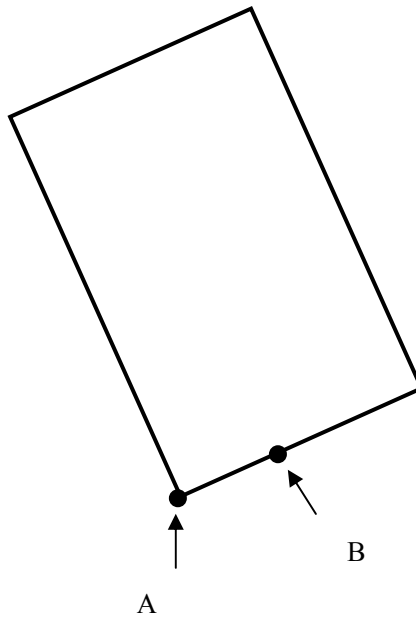
- 1) As above picture, point A is the start point of burning torch. You can figure out the slope angle of the

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

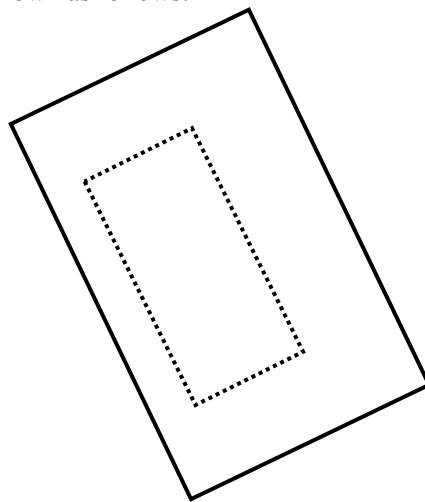
- 2) Then, the figure displayed on the controller will be rotated at a certain degree. The position of figure to be processed and the steel plate is shown as follows:



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





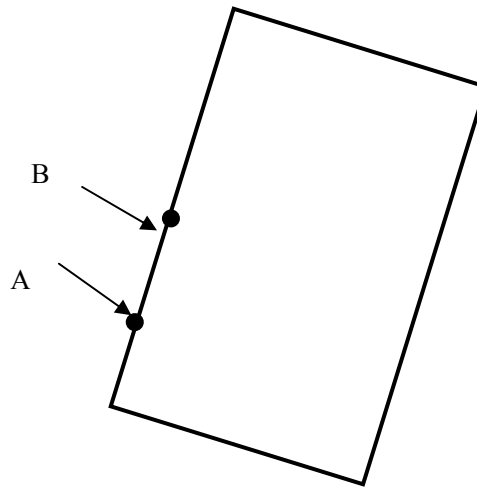
Press  → , or  → , then, press  to confirm. The position of figure to be processed and the steel plate is shown as follows:



The second Way of calibrating the steel plate: Shaft Y is calibration reference edge

The principle of this way is same as the first way, with only difference for calibration reference shaft. Sometimes steel plate on the Shaft X is too short, and therefore we can select the calibration based on Shaft Y.


Press  before calibration; thus Y will be shown within the calibration reference frame, and burning torch is moved from Point A to Point B upon the method, and then press  key to confirm.



After calibration, a message box will pop up to ask whether needing to return the start point, i.e. Point A position when calibration. To avoid multiple calibrations, the calibration angle system after it shall always be kept. If it is necessary to cancel calibration angle or re-calibration, please press “Cancel” key, or manually set the calibration angle to be 0 in the setting option.

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.

➤ 3.2.7 Real-time track display feature

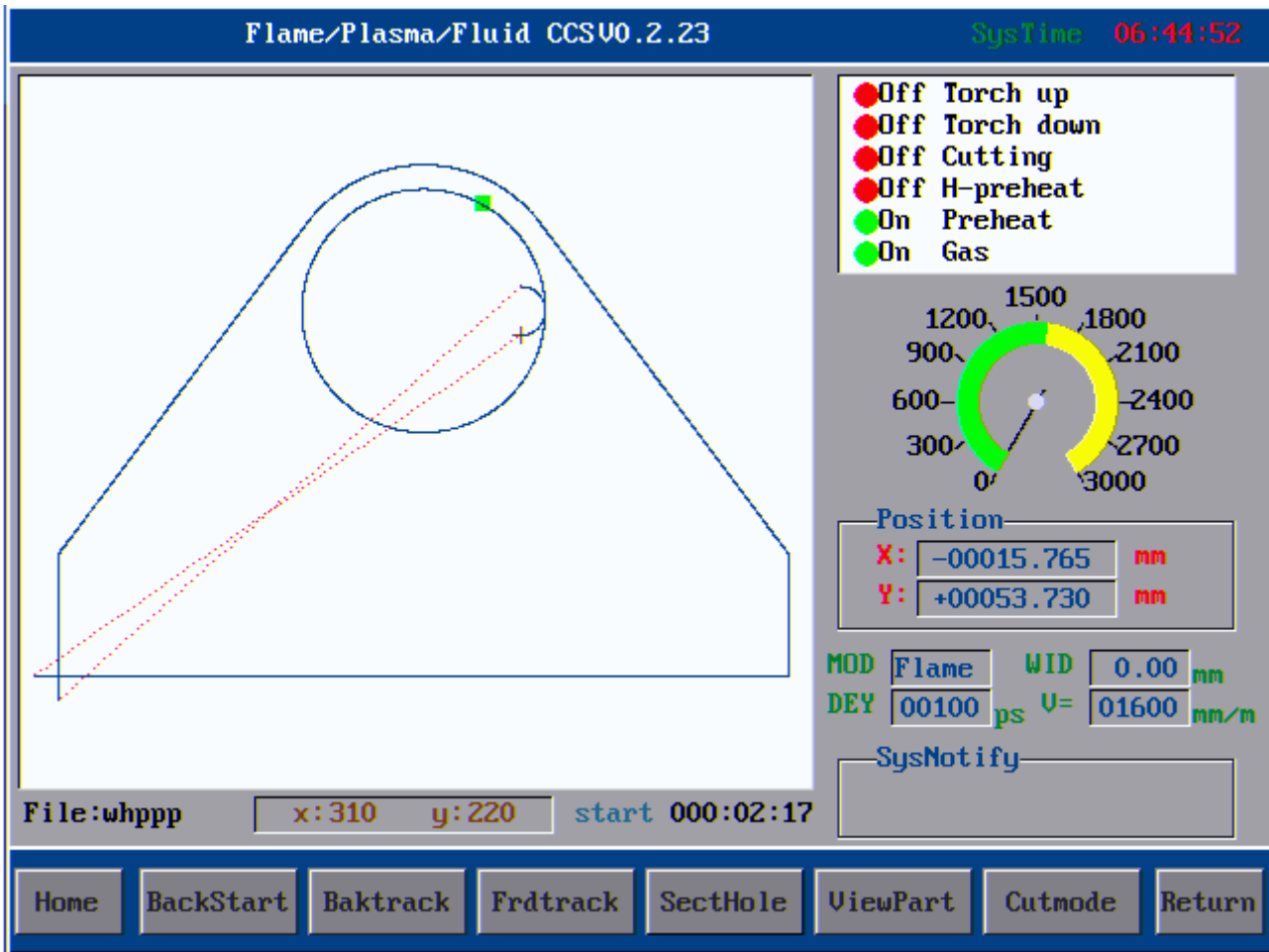
It is able to real-time display track of graphic running, with graphic zooming and other functions.

➤ 3.2.8 Plasma arc detection, initial positioning, and corner signal control features


It is capable to support most CNC plasma cutting system and meet the requirement of height regulation system, with perfect plasma technology, plasma arc detection, initial positioning, and corner signal control features.

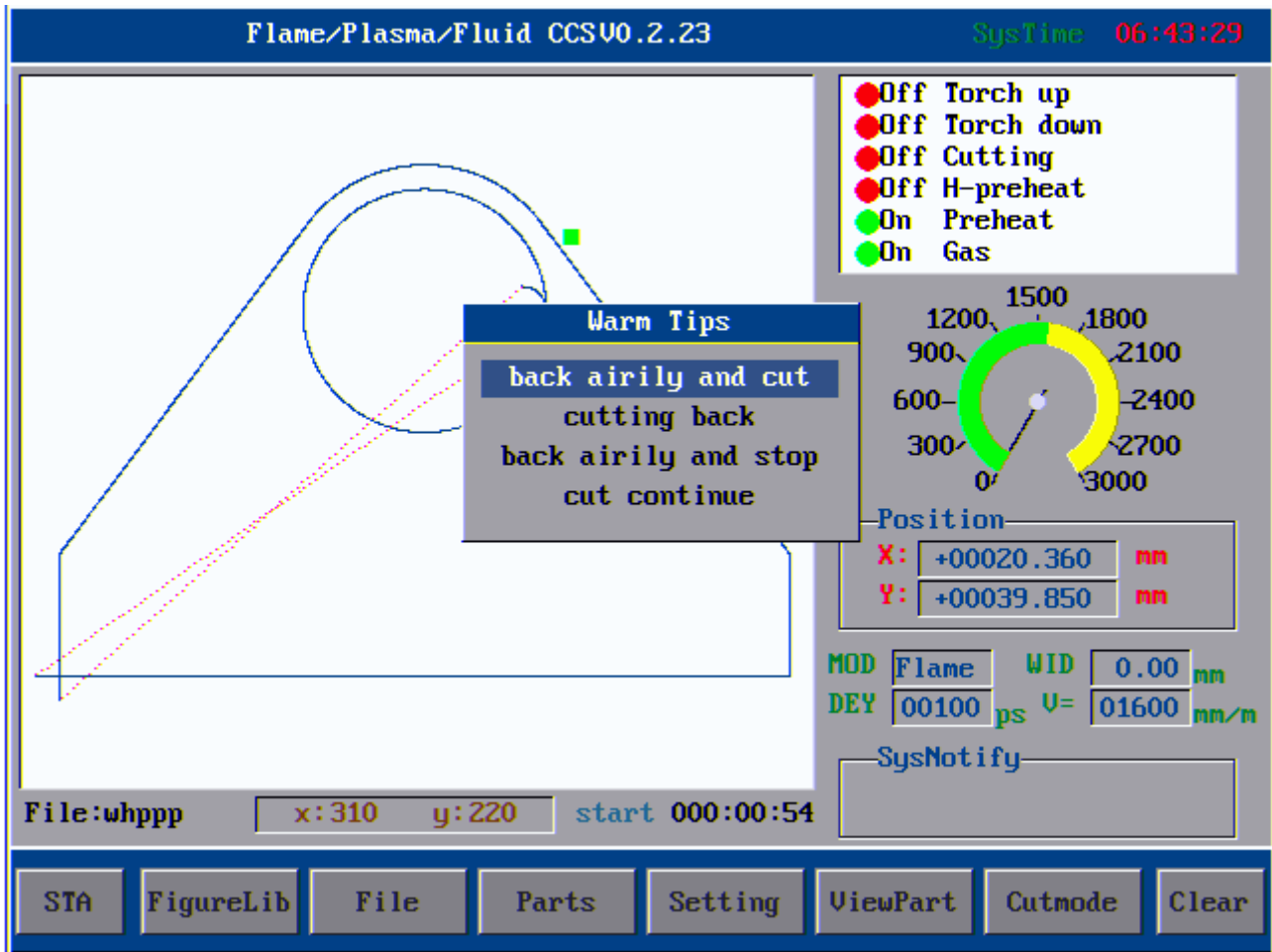
➤ 3.2.9 Track continuous back-off feature

During the practical cutting, disruption in combustion exists due to the impact of other factors, resulted in cutting incompleteness for cutting track. After pause, it should return to disruption point to resume ignition and start cutting, to ensure the completion of cutting. Thereby, forward along the route and return along the route are developed in this system as follows:



➤ 3.2.10 Pause feature

When the burning torch is on the movement route, press  key to start cutting along the route; when pause torch is moved out of route, press  key to pop up the following prompt box:



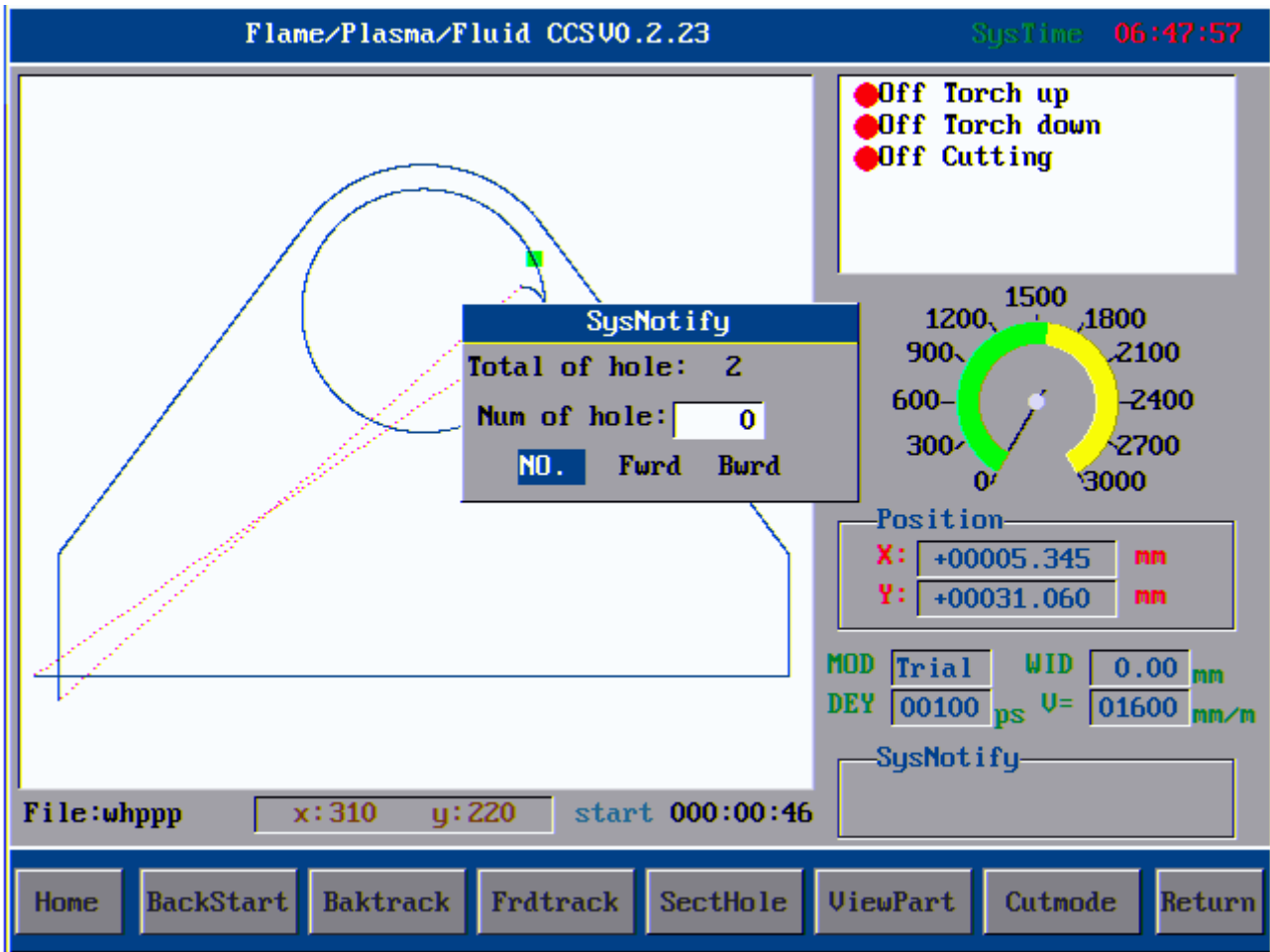
Press these keys to move cursor to the specified interface.

As the picture shown, the explanation of menu is as follows:

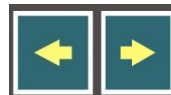
- “Idle stroke back and cut”, which means the cutting torch will return to the cutting track automatically and start perforating and cutting.
- “Cut directly and return” means to perforate at the current position and cut.
- “Idle stroke back and stop” means the cutting torch will stop when idling traveling 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.

➤ 3.2.11 Perforation point selection feature

Refer to the following picture for the selections of perforation points, back-off perforation point number, forward perforation point number, and perforation point number chosen upon the serial number:




Perforation Point Selection



The above picture shows the number of perforation points. Press   keys to select “SN”, “Forward”,



“Back-off” three modes. After data is input, press  key, and the prompt “Burning torch positioned in the original point”, “Burning torch positioned in the current point” and other functions will come out. Move the cursor to the corresponding item to select perforation point.


Note: “Burning torch positioned in the original point” refers to the burning torch is positioned in the original point; when perforation point is selected, cutting point and burning torch will move to the perforation point selected currently.

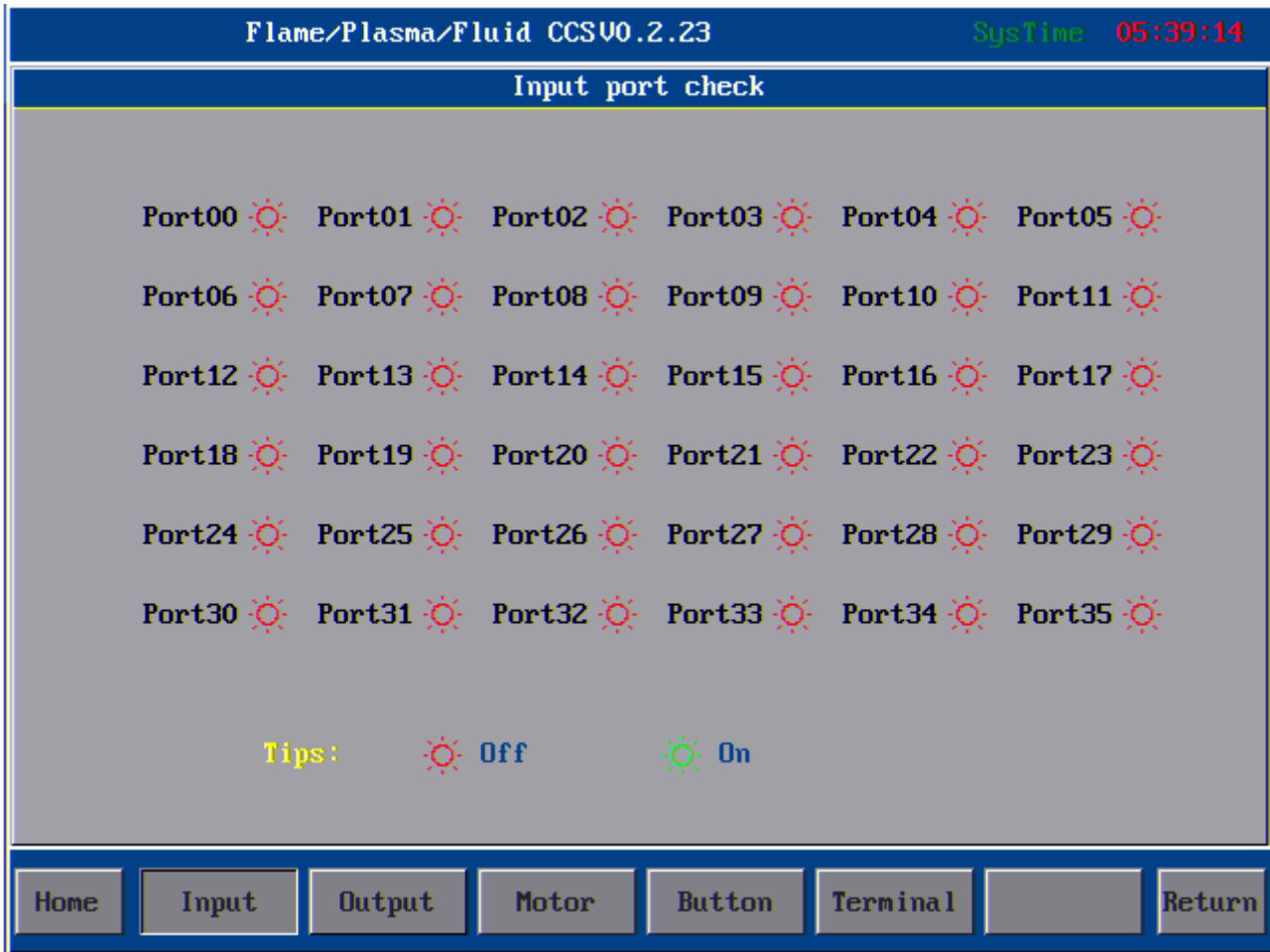
“Burning torch positioned in the current point” refers to the burning torch stays still in the current position; when perforation point is selected, the burning torch keeps still, but cutting point on the graph still moves; when processing or other operations start, the burning torch will move forward or backward from the current position.

➤ 3.2.12 Diagnosis feature

System diagnosis



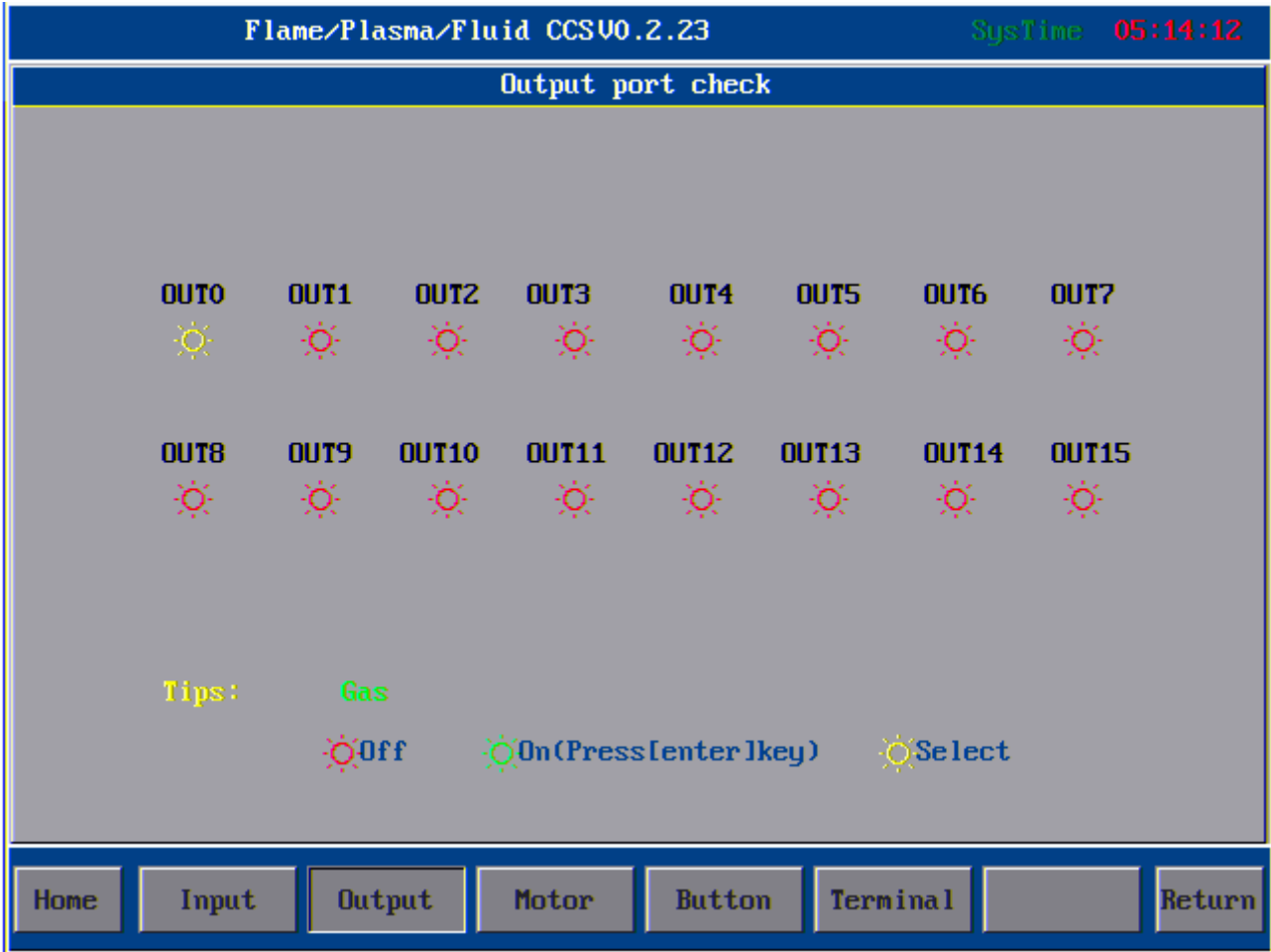
Press  key to enter port diagnosis interface, and test input ports. Red light: Disconnected. Green light: Closed. Meanwhile, the system will prompt the name of this terminal. As shown below:









Interface of input port diagnosis

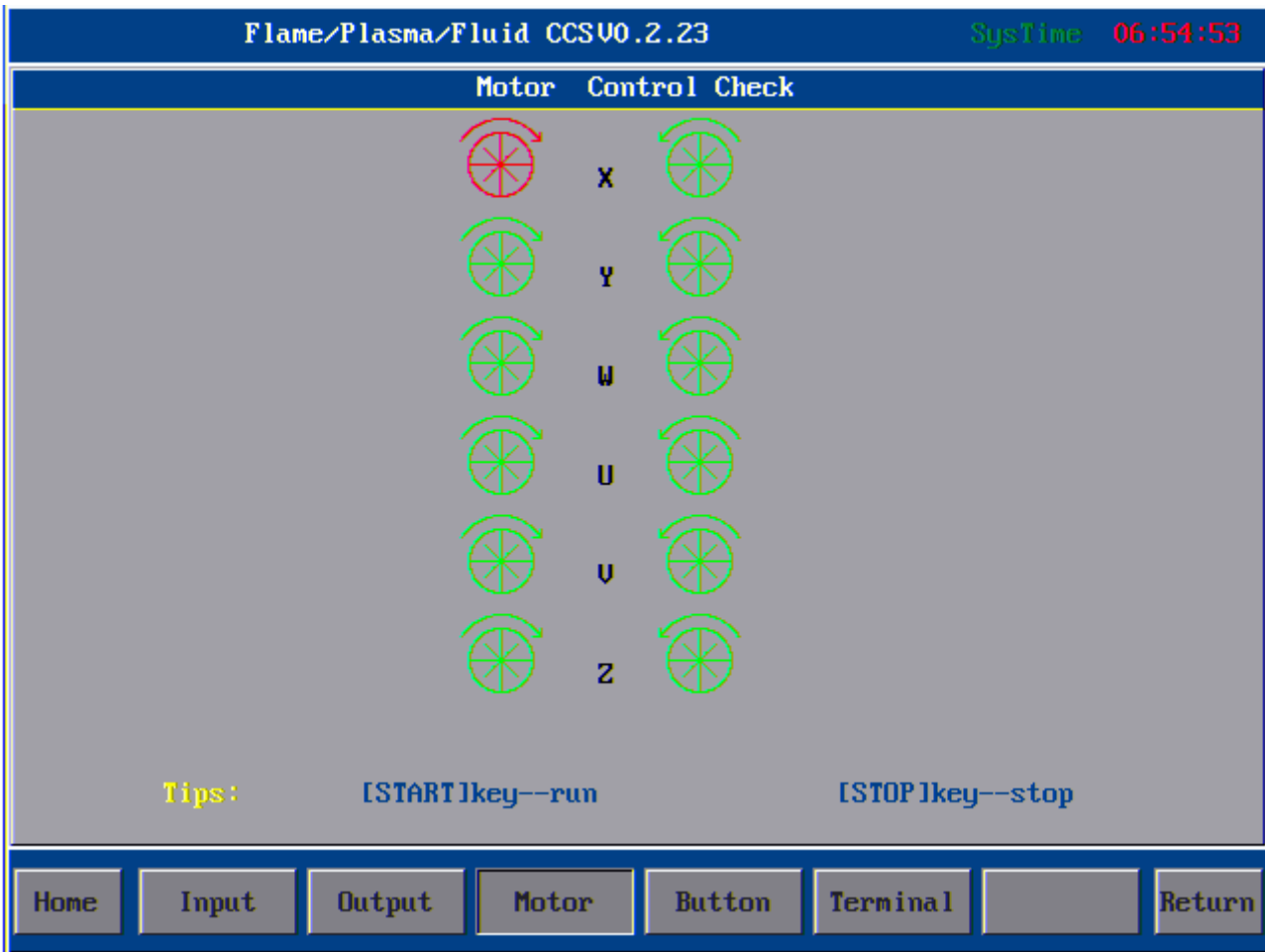
F3

Press **F3** 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 prompt the name of this port while selecting the port. (Corresponding to previous I/O setup)



Interface of output port diagnosis

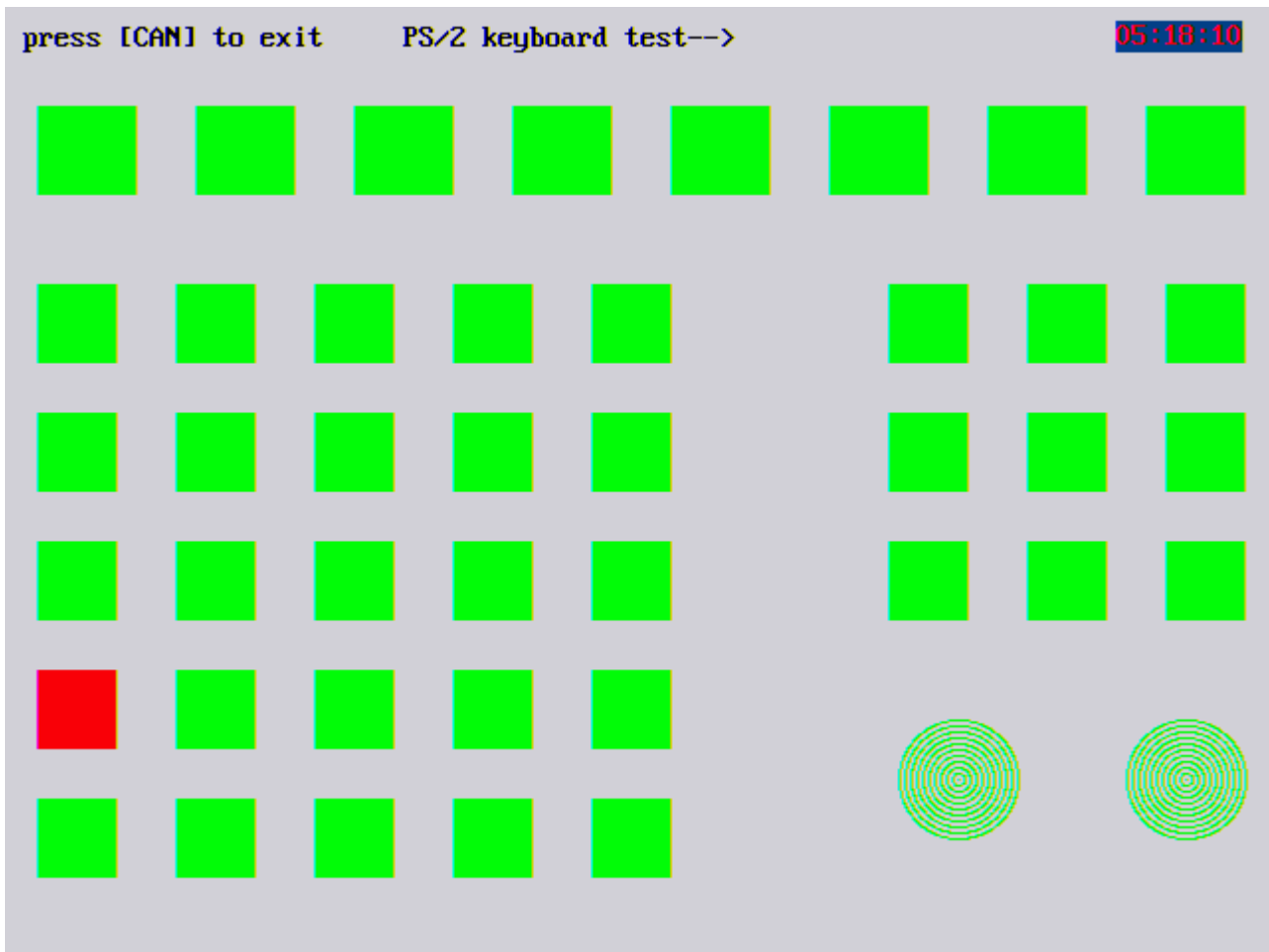
You can press  key to enter the interface of motor control diagnosis. Yellow words with orange lake bottom indicate that the direction of this axis is selected. Press  key and the motor will start to run. You can press  key any time to stop the motor. As the following picture shows, the x-axis will be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








F5

You can press **F5** 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

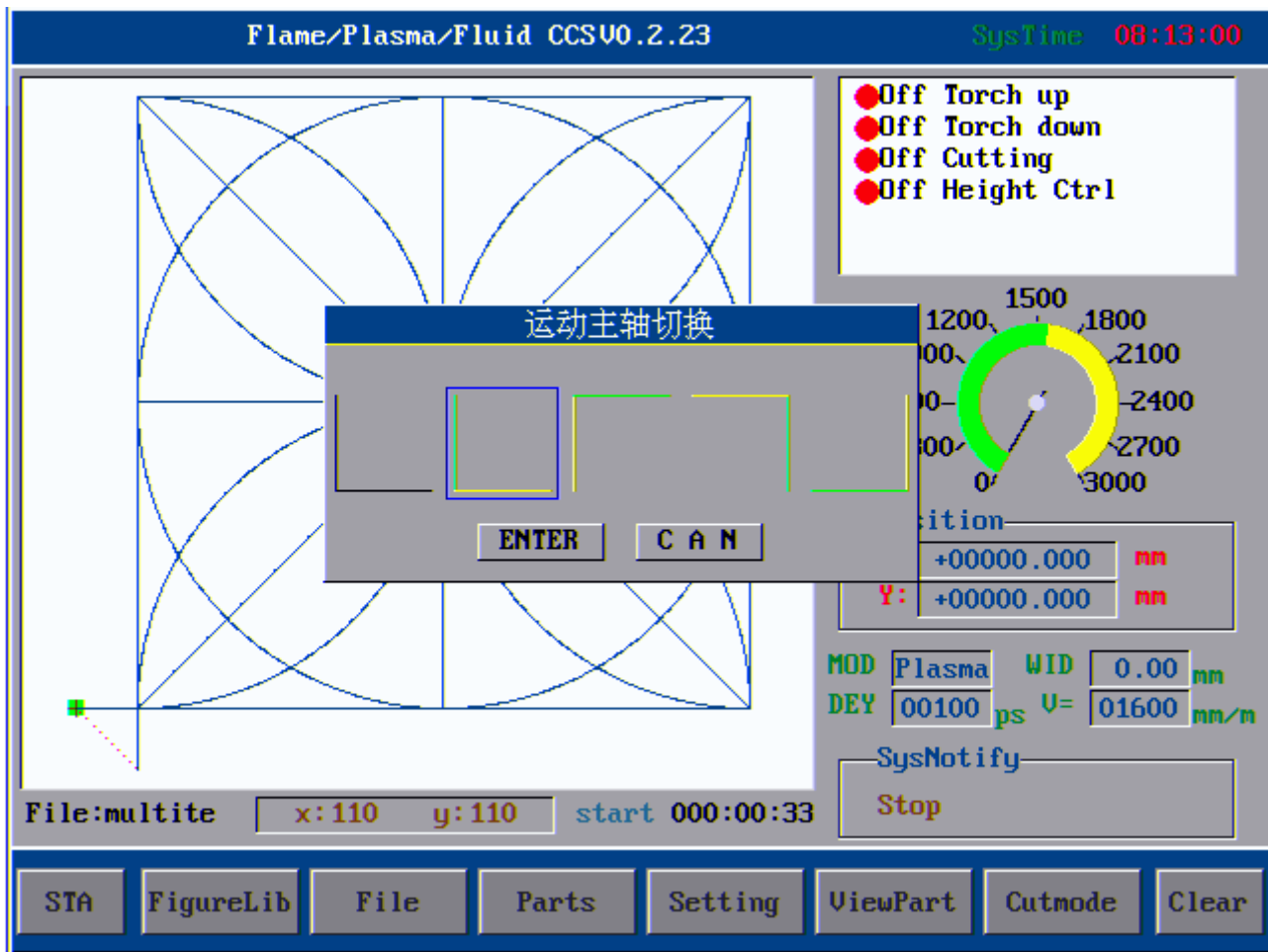
The system diagnosis shows the open hardware resource of the system. In system diagnosis window, you can check the following interfaces:

- 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.

➤ 3.2.13 Free switch for Shaft X and Shaft Y

Quick switch of Shaft X and Shaft Y:


To facilitate the system to keep the consistence of cut shape and system screen on the either side of machine, main shaft switch can be selected. In the interface of movement after start, long press “Cancel” key and pop up movement main shaft switch message box from the system.



The first mode is defaulted by the system. Light green is Y direction; yellow line is X direction; and original point is on the lower left corner of machine. If the second mode is selected, the original point is on the upper left corner of the machine, as so on, original points of other two modes are respectively on the upper right and lower right corners.

Note: Pulse equivalent of Shaft X and Shaft Y should be regulated under the default mode, before main shaft switch.

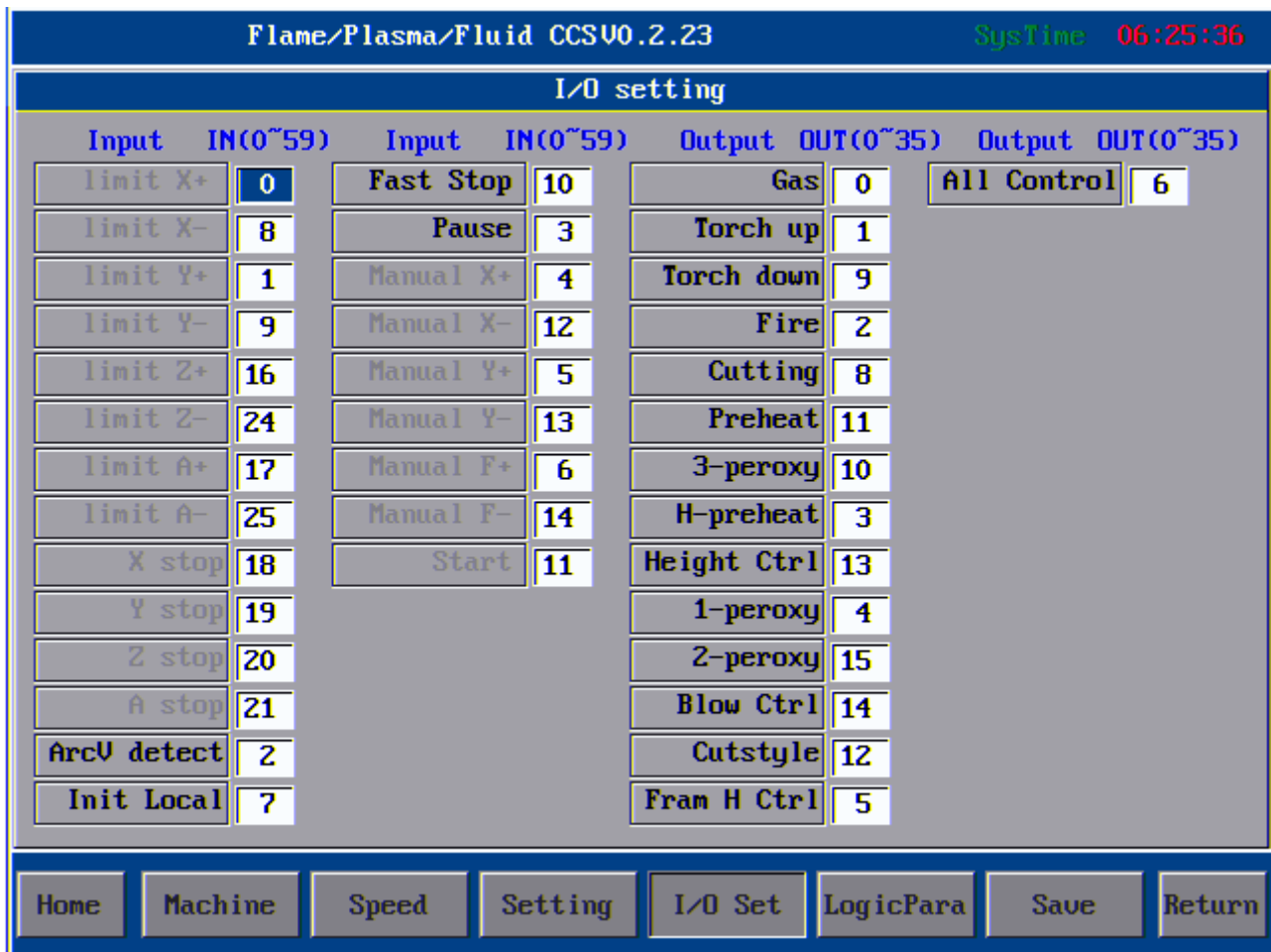
➤ 3.2.14 Self-locked JOG flexible switching

JOG and manual methods can be selected when manually moving each shaft in HC6500, with  key for switch.

This function will be used in three positions of HC6500:

1. Manually operate the screen;
2. Main interface;
3. Steel plate calibration screen.

➤ 3.2.15 User-defined input and output ports feature



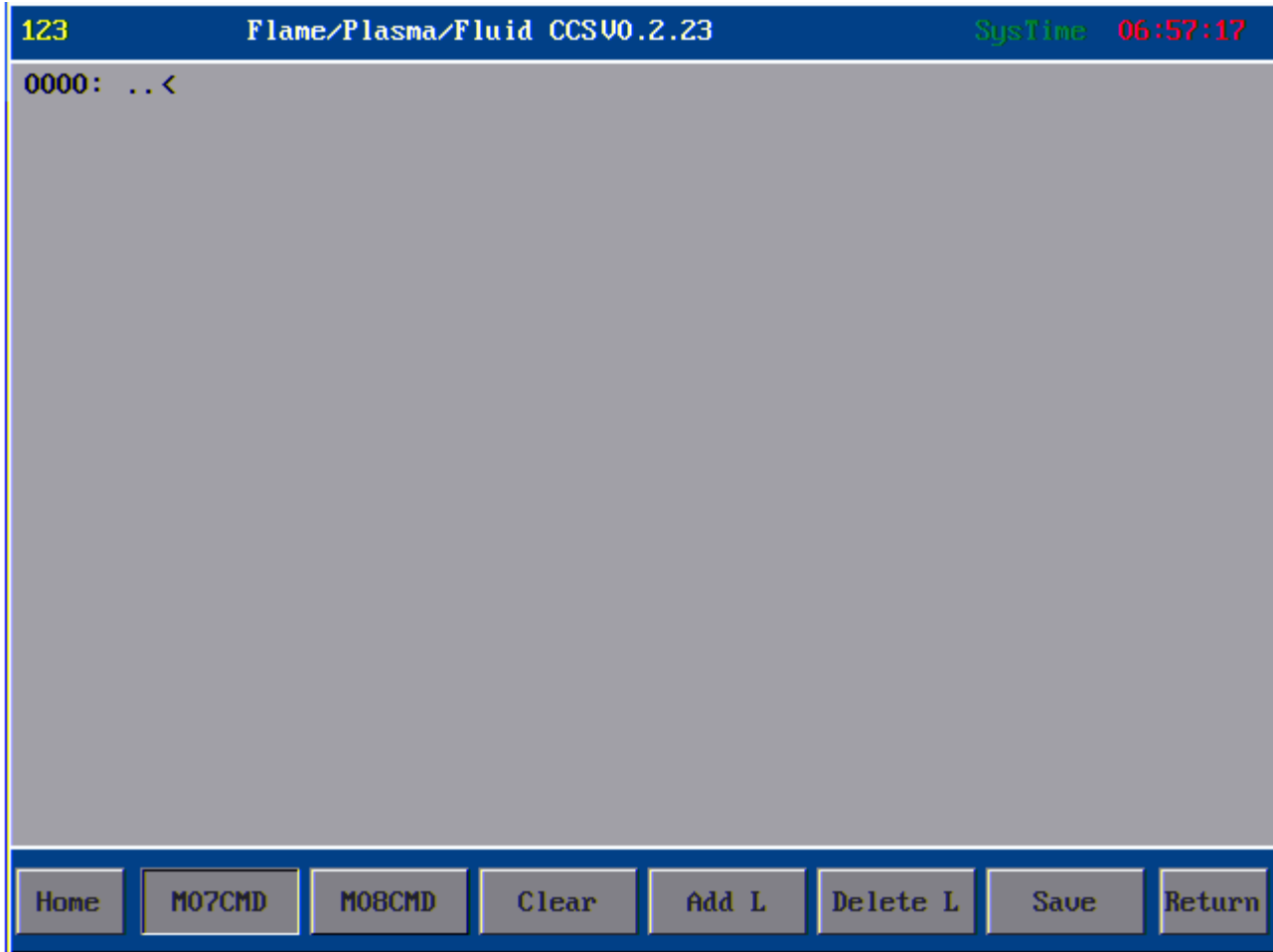
I/O setup allows you to set the input and output of the system on the condition that they should match the peripheral interface of cutting machine. The marked numerical symbols is not the line number (socket number) but the IN and OUT numbers. For the relationship between line number and OUT/IN number, please refer to the hardware user manual. 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.

➤ 3.2.16 User-defined M complex instruction

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 motion. In edition interface, press F5 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 Burning torch falling (Fixed Cycle), M71
- ③ Preheating on (Fixed Cycle), M74
- ④ Perforating burning torch rising (Fixed Cycle), M72
- ⑤ Cutting oxygen on, M12
- ⑥ perforating burning torch falling (Fixed Cycle), M73

Plasma:

A. With height regulation system:

- ① Enable M22
- ② Arcing M12
- ③ Waiting for arc voltage detection signal (IN0)

After arcing, the height regulator 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:

- ① Arcing, arcing delay M12
 - ② 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 Burning torch rising (Fixed Cycle), M70

Plasma:

- ① Close striking arc M13
- ② Close the height regulation 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.

[Add 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.

➤ 3.2.17 Perfect and stable file system

Directly read the file through U disk, file folder function, and convenient on-site operation.

File management

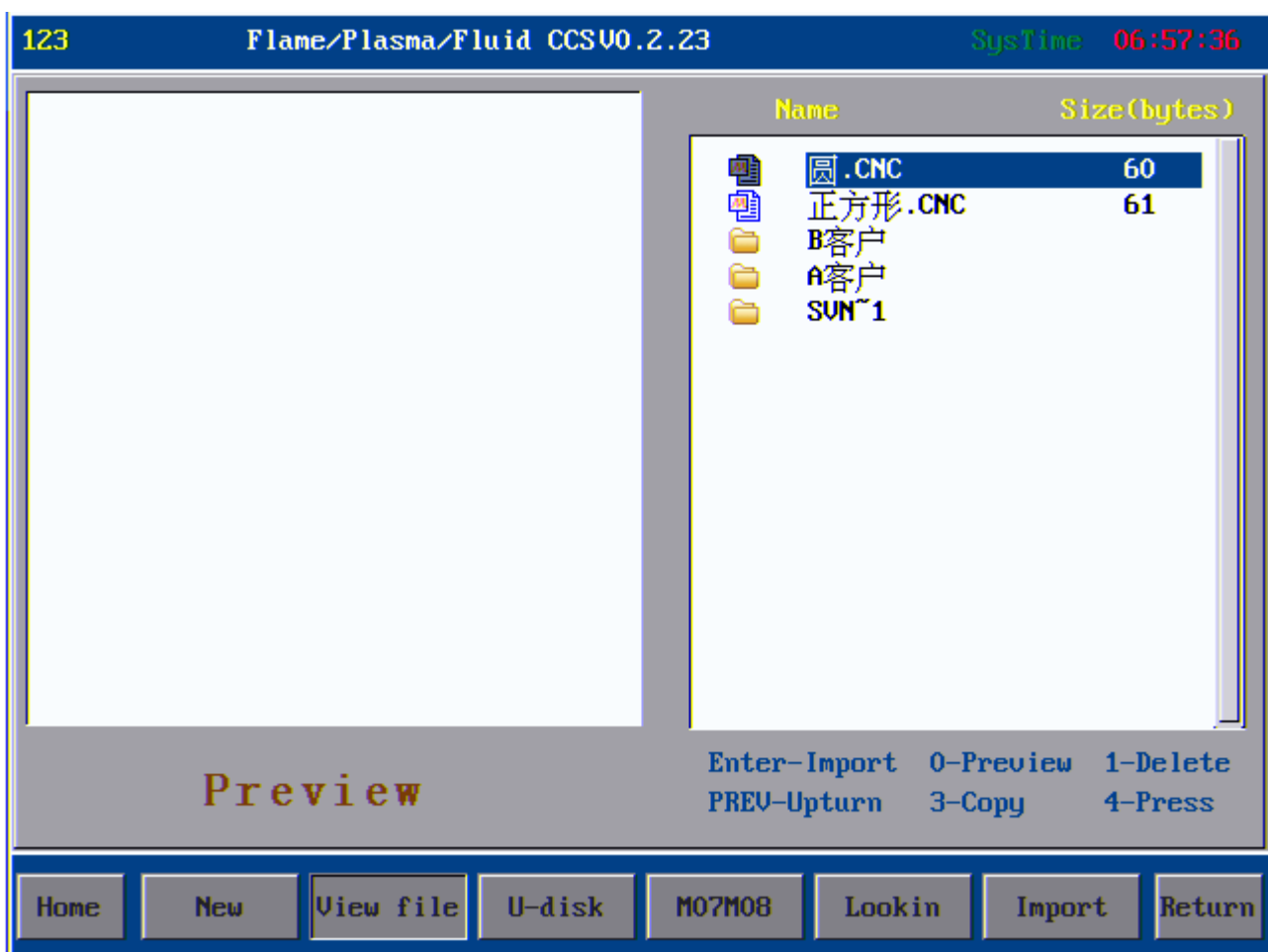
Content display



Press **F3** key in main window to enter the file management interface as follows. The left side is the preview window for graphs in current file, and the right side shows the names of processing files. If a file has several pages,



you can press **PAGE UP** or **PAGE DOWN** to page up or down.



Interface of File Management

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



Load file: You can press **F7** or **确定 CONFIRM** 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 **F6** 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 **PREV** key to go back to previous directory until the root directory. Please note that 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.

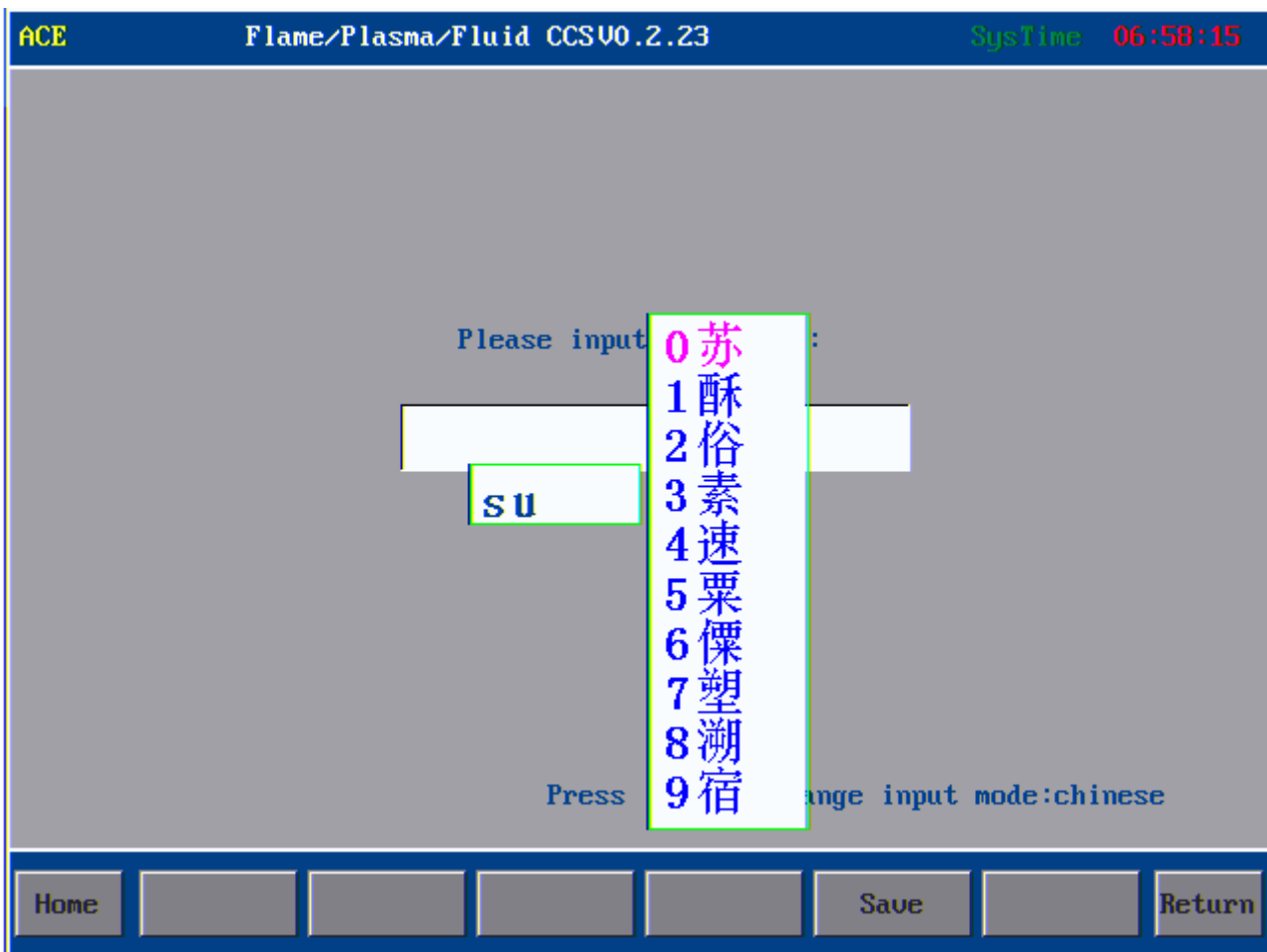
Copy: Number key “3”; copy the files or folder in the current interface at a fast speed

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

New file



Press **F2** 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 **F6** 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:




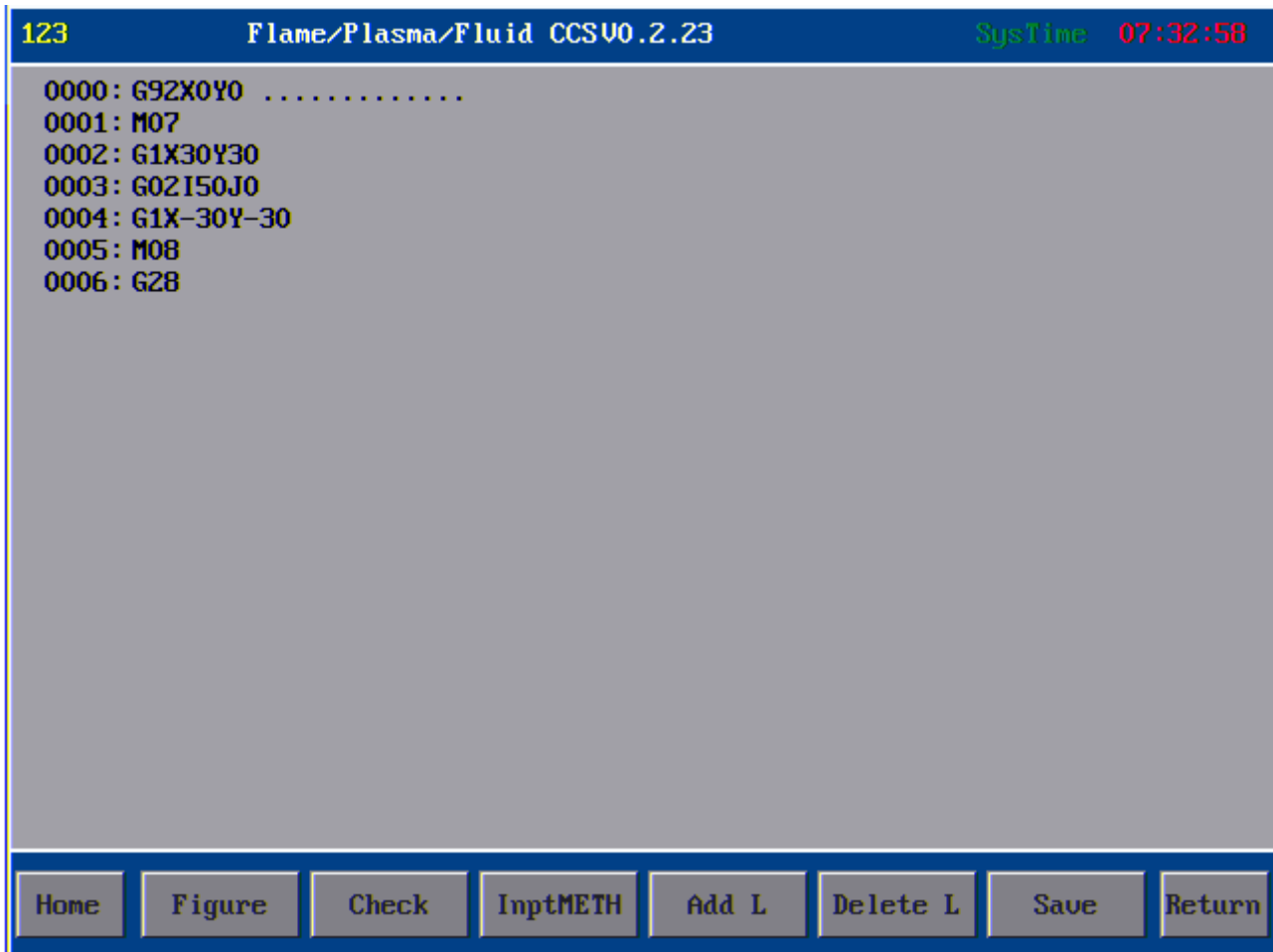
Keyboard layout



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 after pressing . Carry out the operation according to the relevant prompt.



Interface of editing new file

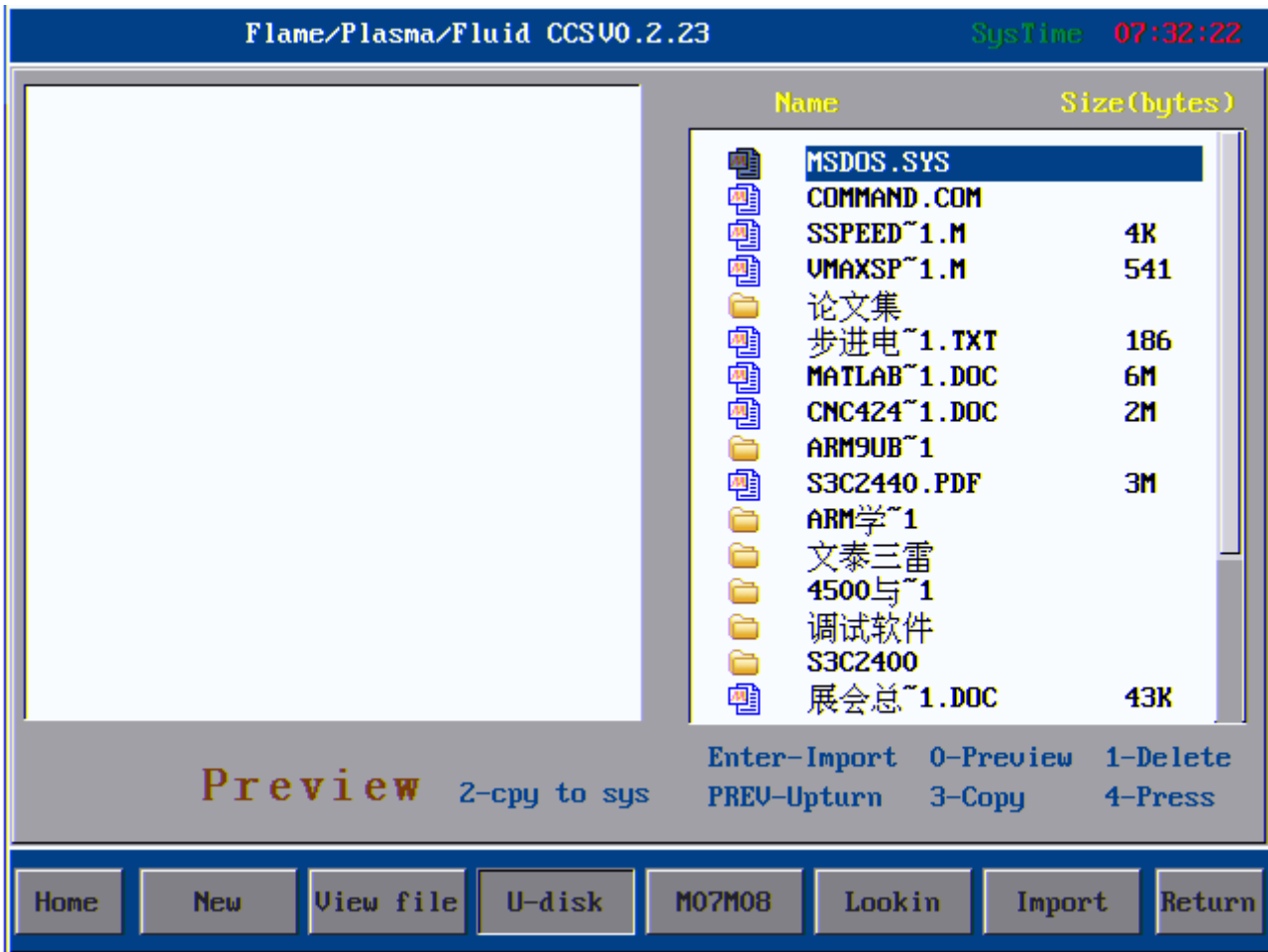
Once a new processing file is created, you can edit the required codes of processing files in the edition area.

USB Files



Press **F4** 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 **F4** 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

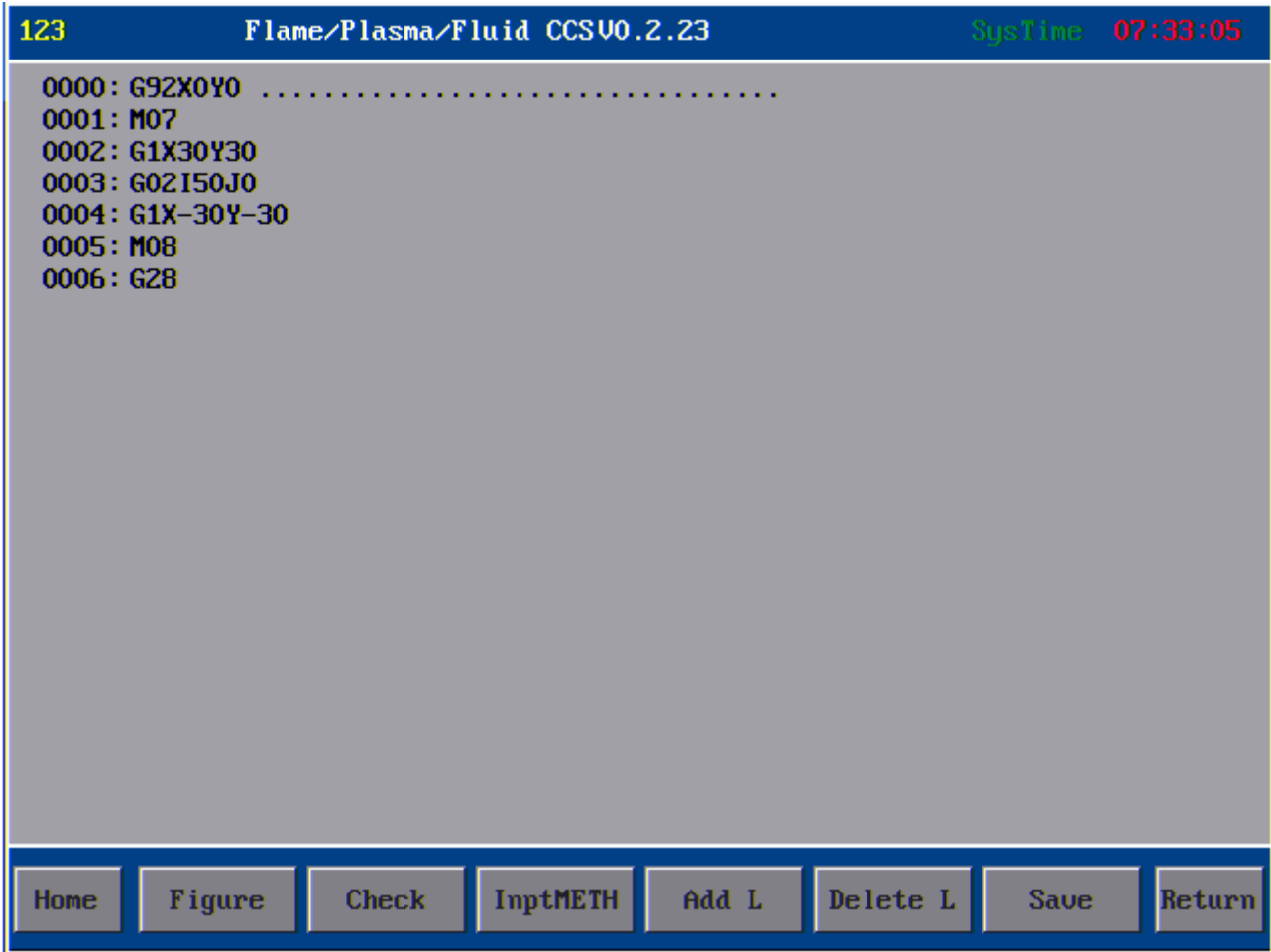
Press   to select the processing files you want to copy, and press number key “2” to copy them to controller. A prompt “Data copy complete, press any key to return” will pop up when the copy is complete. You can then press any key to exit.

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.

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 these arrows to move the cursor to a certain line or column



within an interface, or press these buttons to switch among pages. There are two ways to input G code in the interface, shift input and surrogate input.



1. Shift input: Press the 'NEXT' button to shift, which would be prompted on the top left corner of the screen. You are




entering the “ACE” input if you press this button. You are entering the “BDF” input after pressing





this button again.



You are returning “123” input after pressing this button the third time. If it shows “123”, and you press the key at this time, the number indicated on the key will show on the cursor position of the screen; 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. For example, if you press number key , 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  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, and set upon personal habit. If a key only has one letter, you can use any input method to enter this letter.

Graph

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

Detection

When you have entered codes of processing file or loaded nest software codes, you can press  to detect 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.

Add 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.

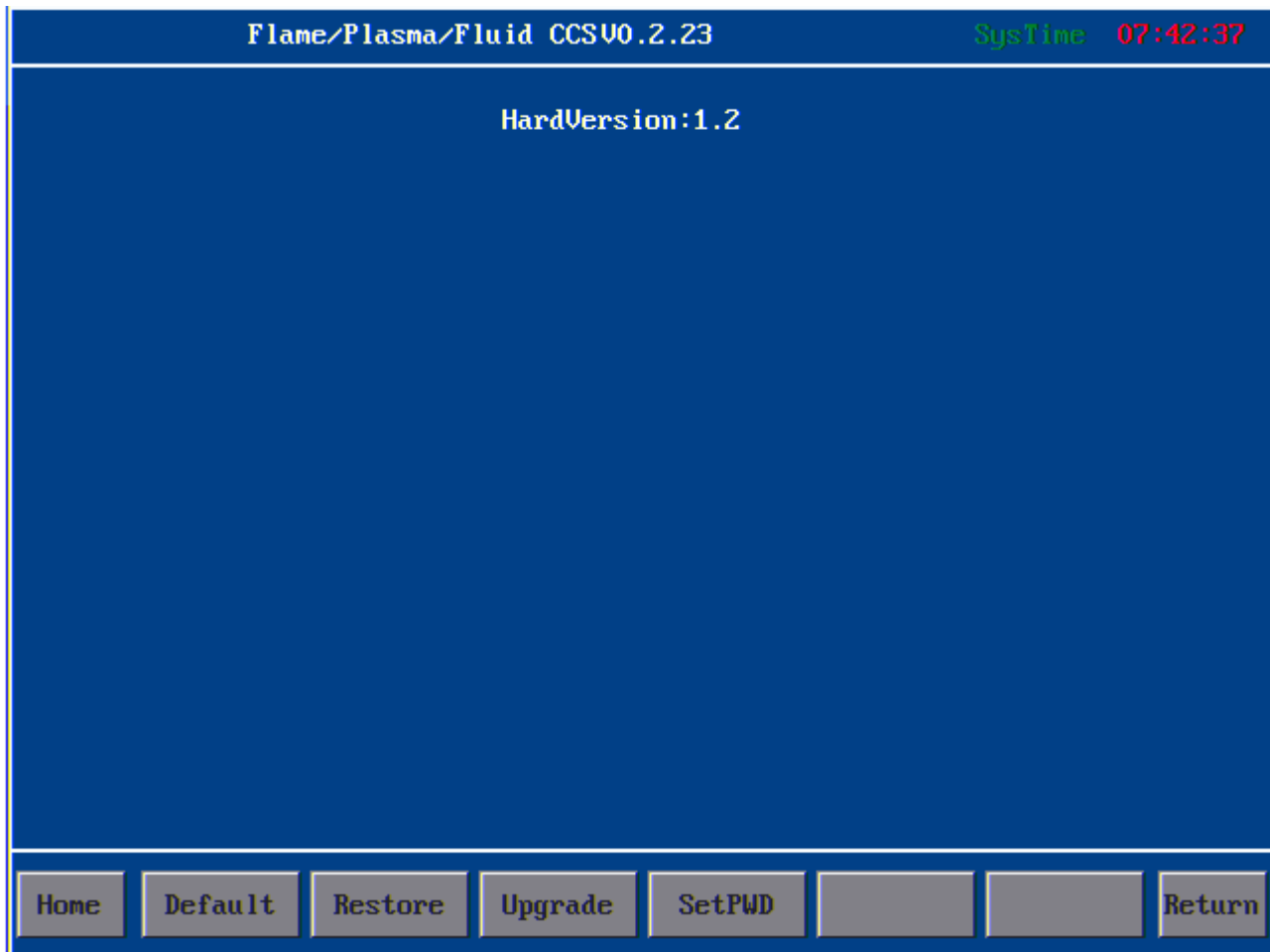
4) You can press  key on panel to delete a character of the current instruction.

5) Press  key to delete the current line.

➤ 3.2.18 Parameters backup and restore feature


System management


Interface of system management comprises default, one-key recovery, software upgrade, and factory setup as follows:





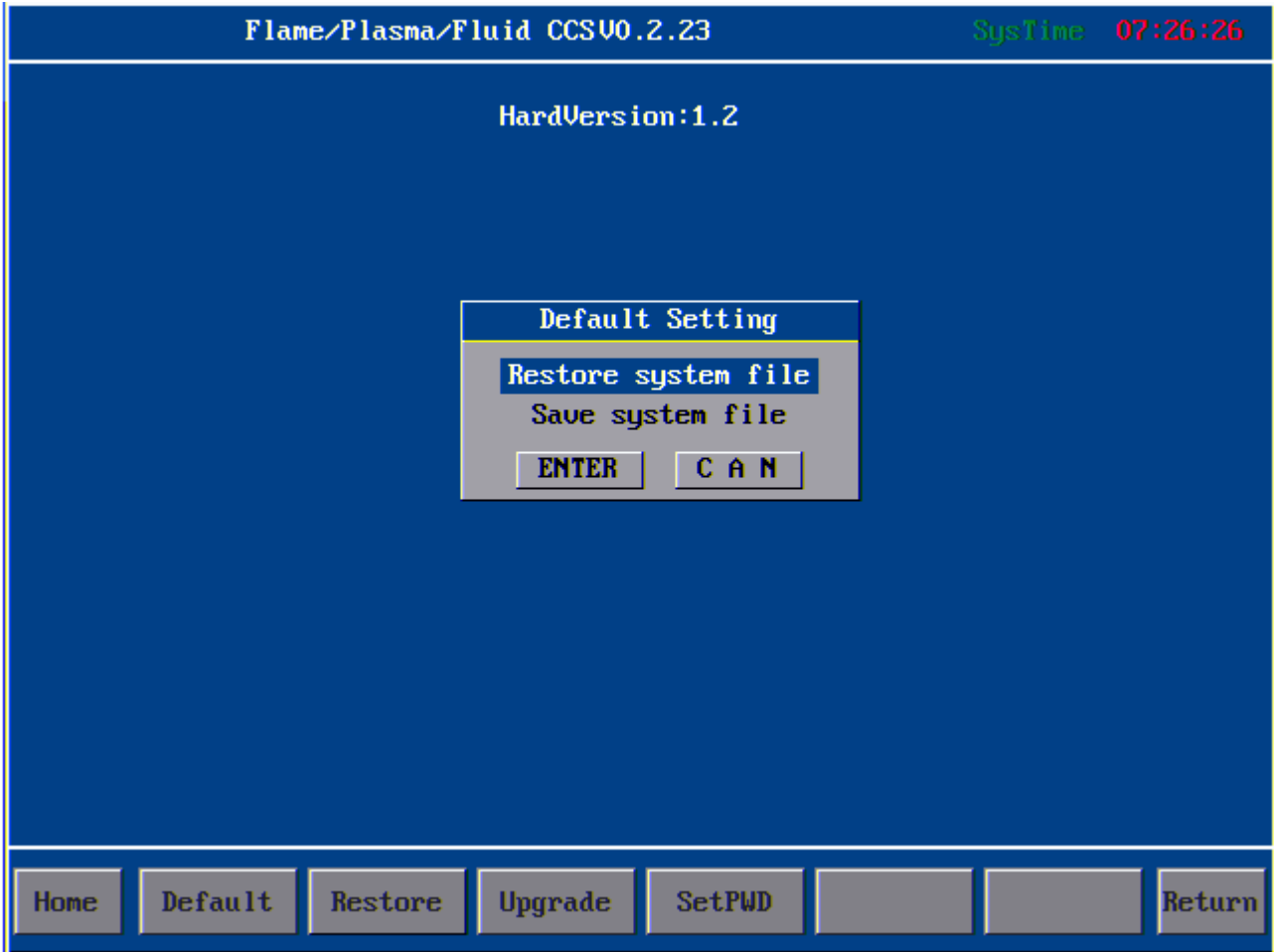
System management

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  at this time or press  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 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.

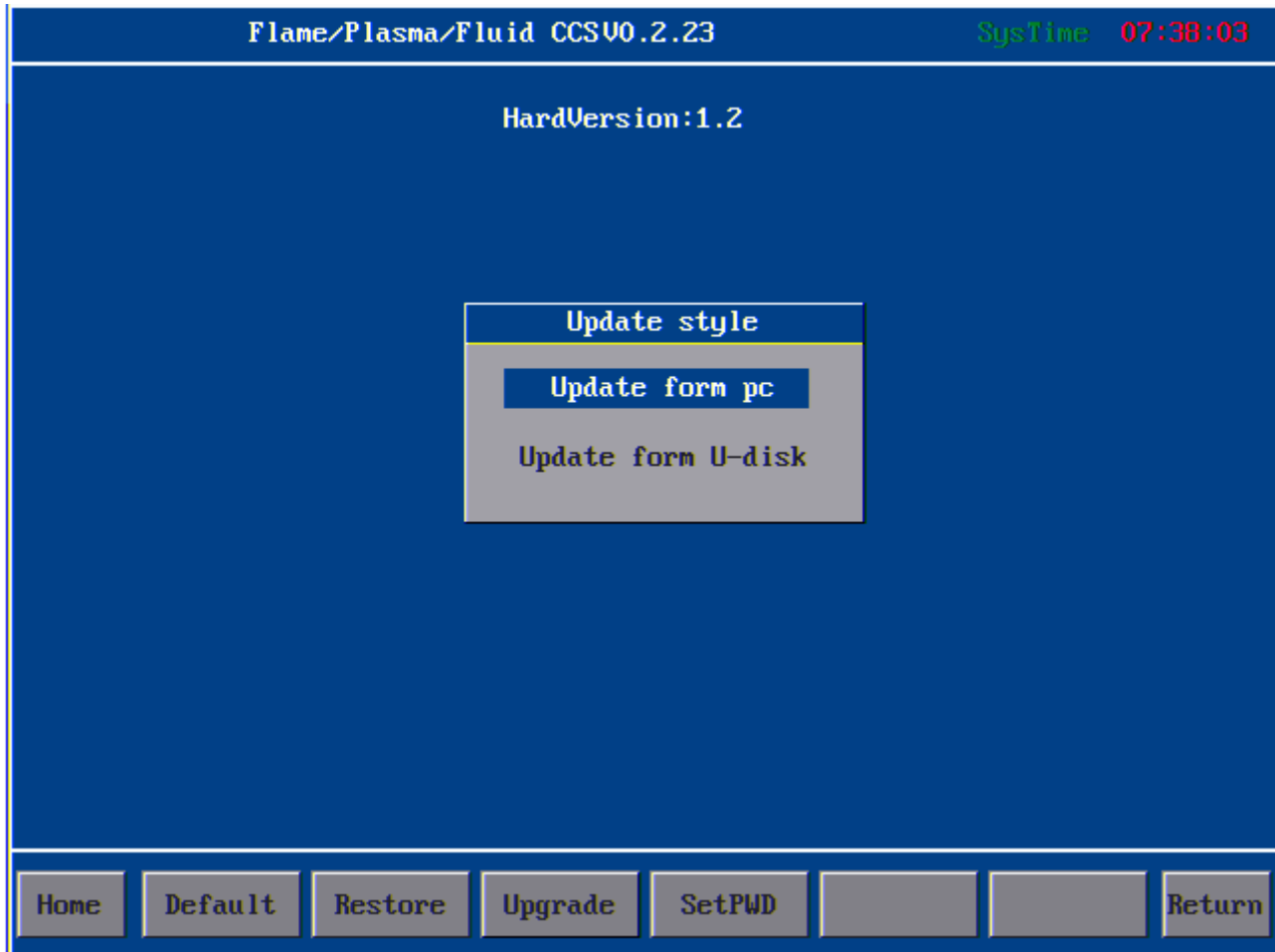
➤ **3.3 Software upgrade**

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

F4

management interface, press **F4** 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.

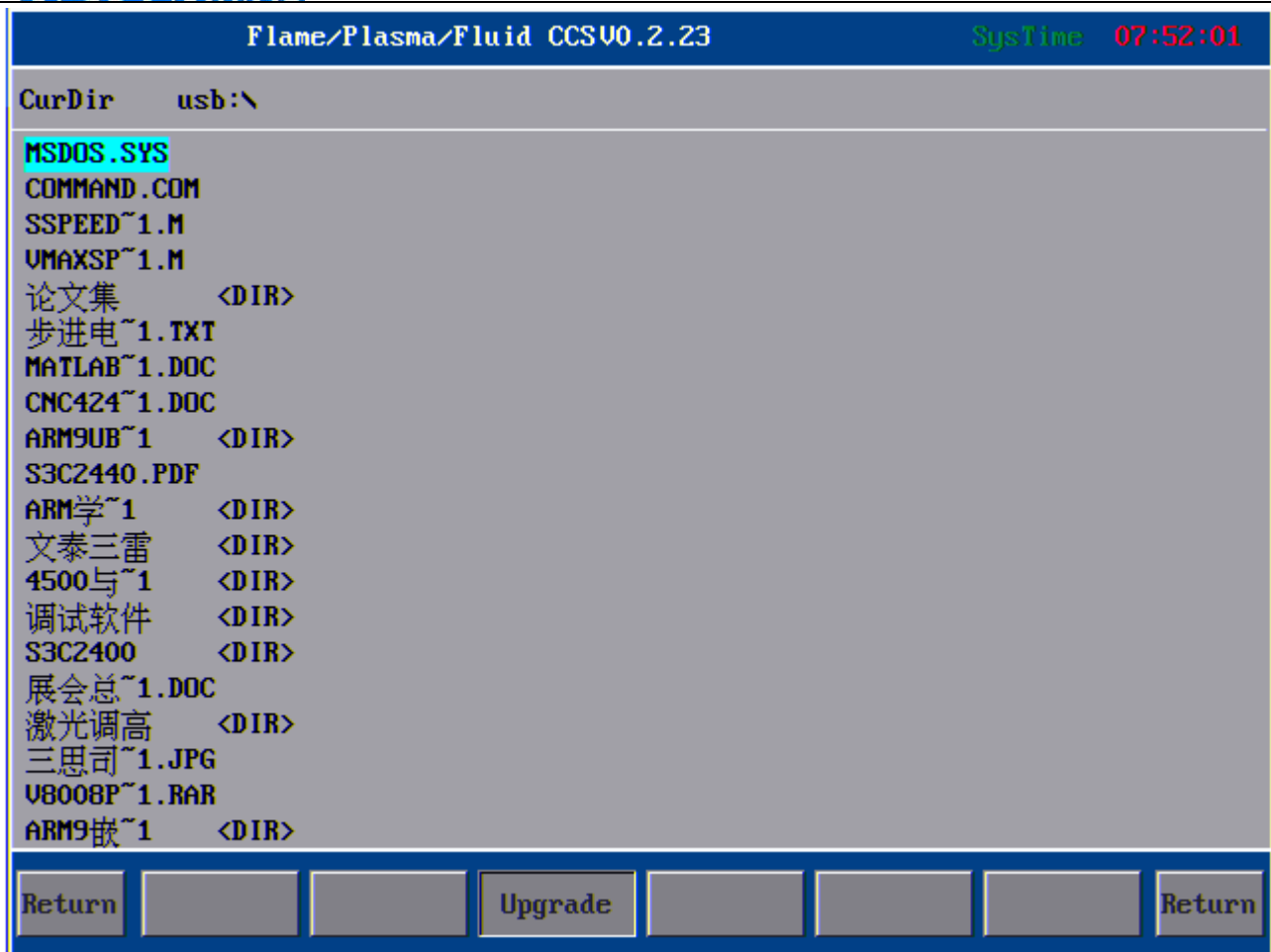
As the following picture show:




Choose the upgrade mode

USB disk connected

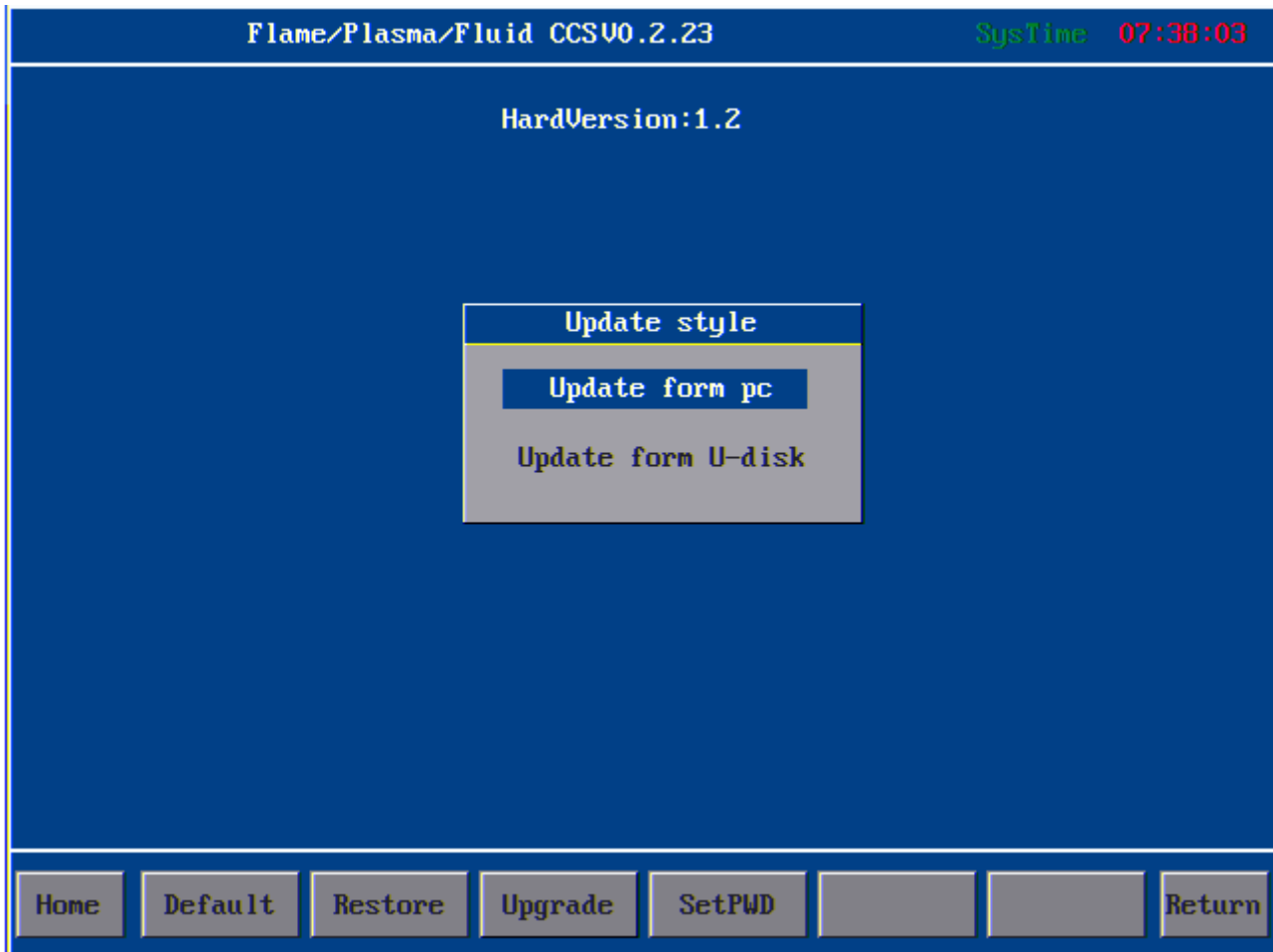
When the cursor is moved to “Upgrade via USB disk”, the system will start the USB disk function. If the system finds the USB disk, it means the USB disk is connected successfully. As the following picture shows:



USB disk connected




Once the USB disk is connected, move the cursor to “ADTROM.BIN” and press  (确定), 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.

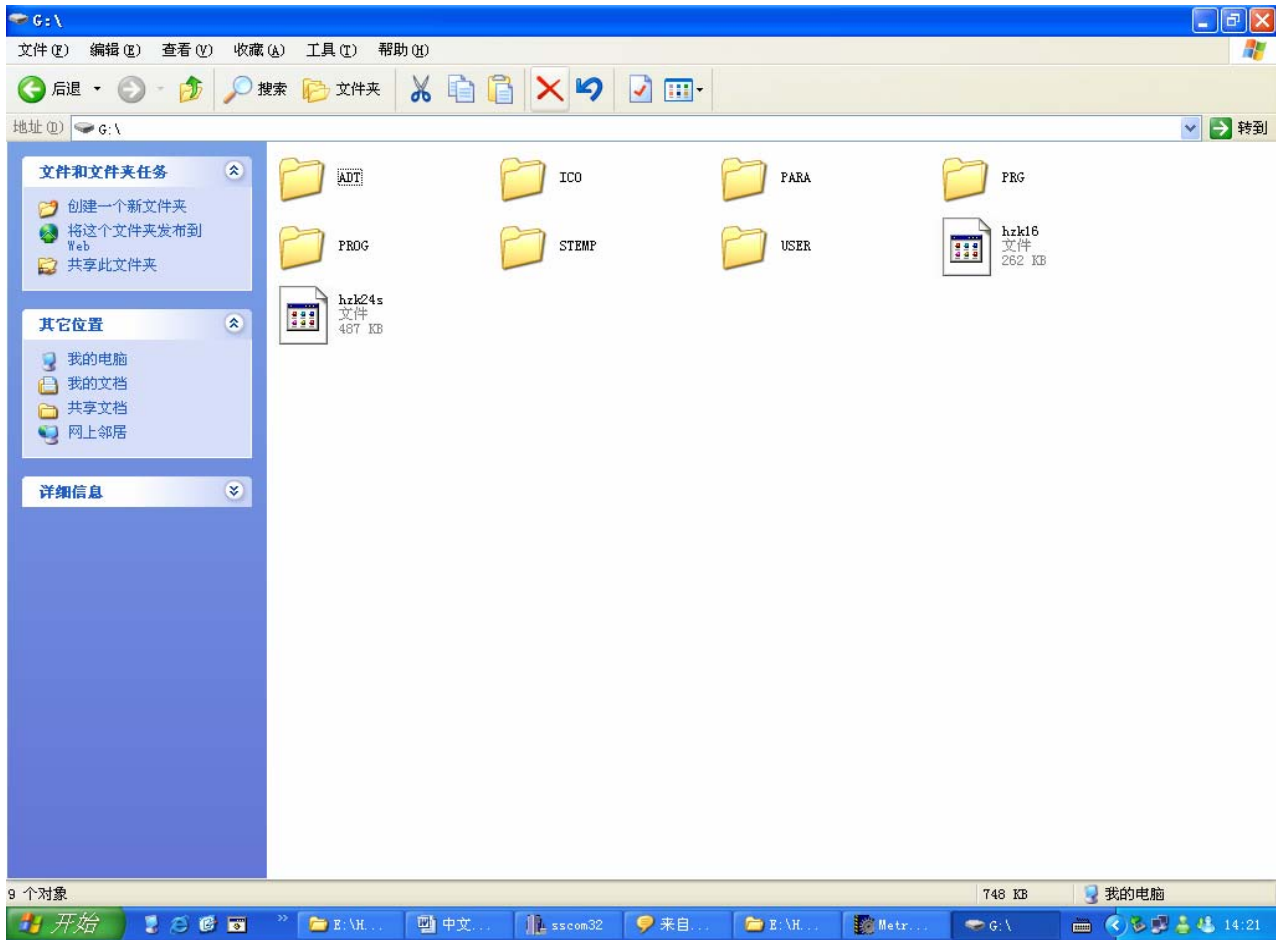
Upgrade via PC





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.

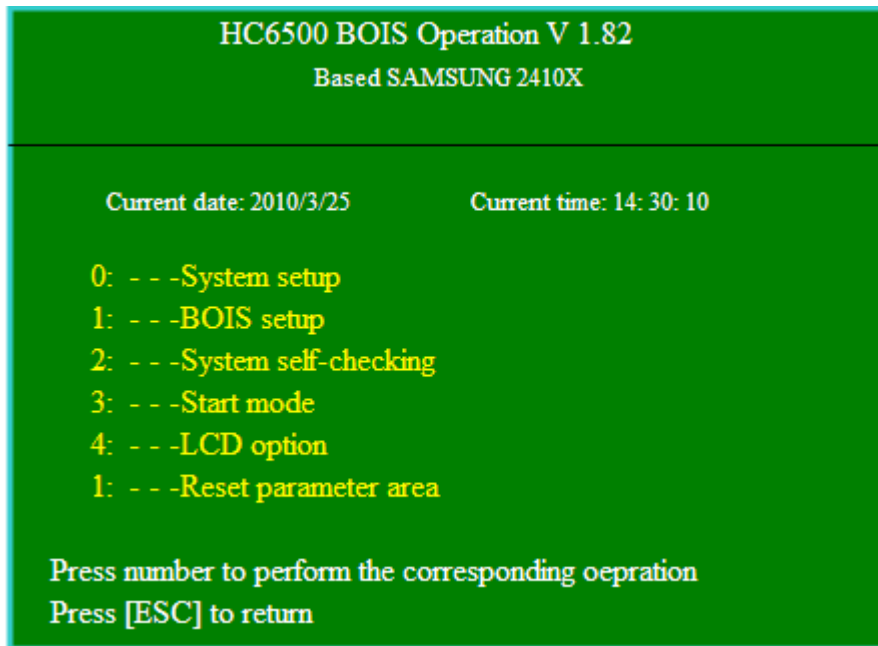
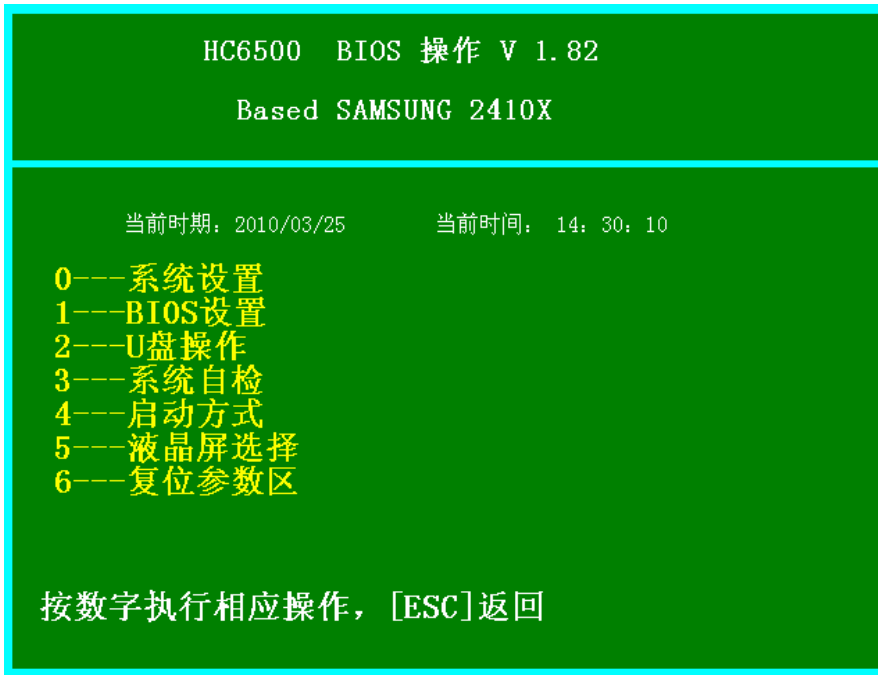


Then, double click  to open this folder, copy the software named “adtrom.bin” to “ADT” folder in the following picture to cover the original “adtrom.bin” file. After the copy, press  key on controller, and the system will restart automatically to record the latest program to BIOS chip.

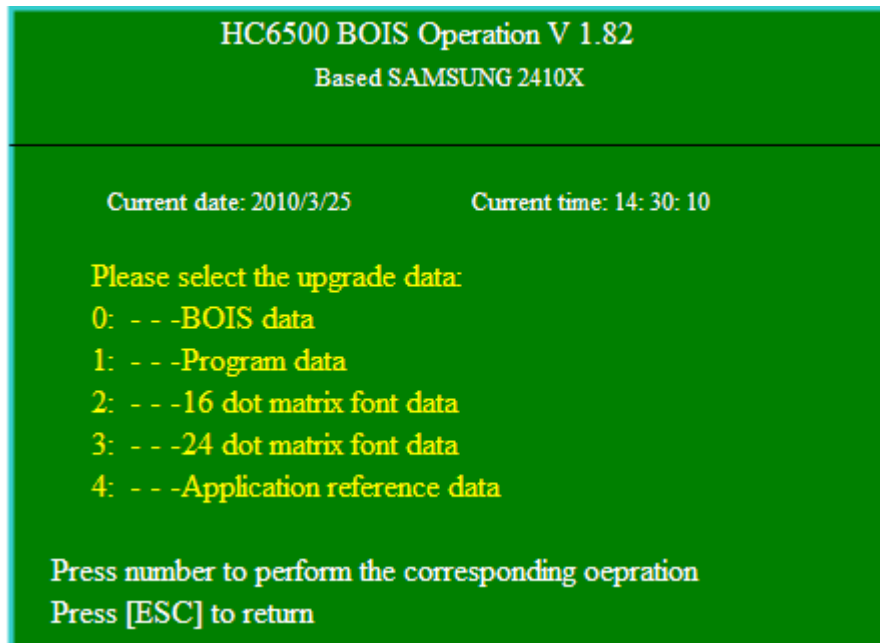
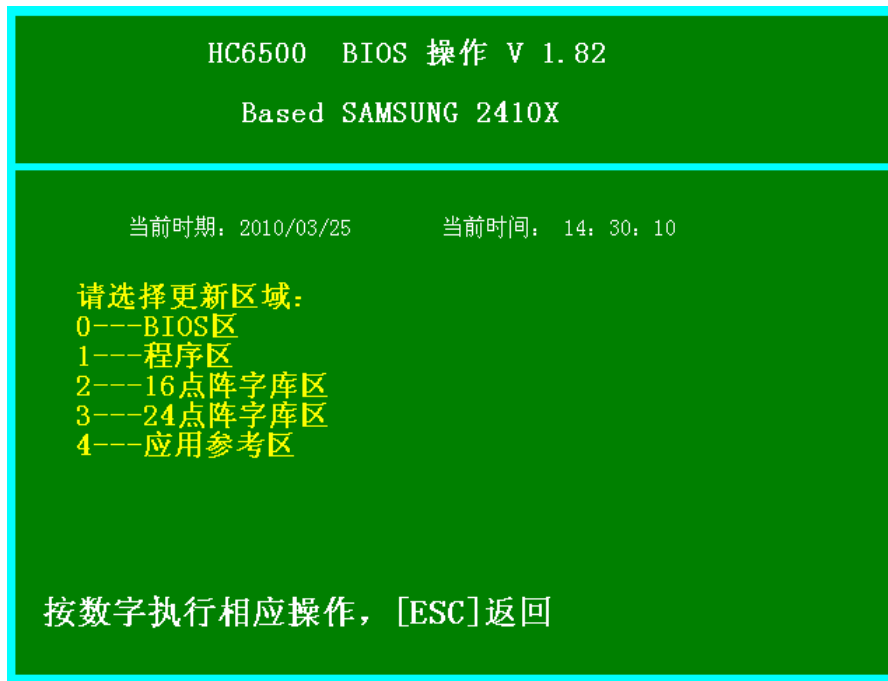
Recording program

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:

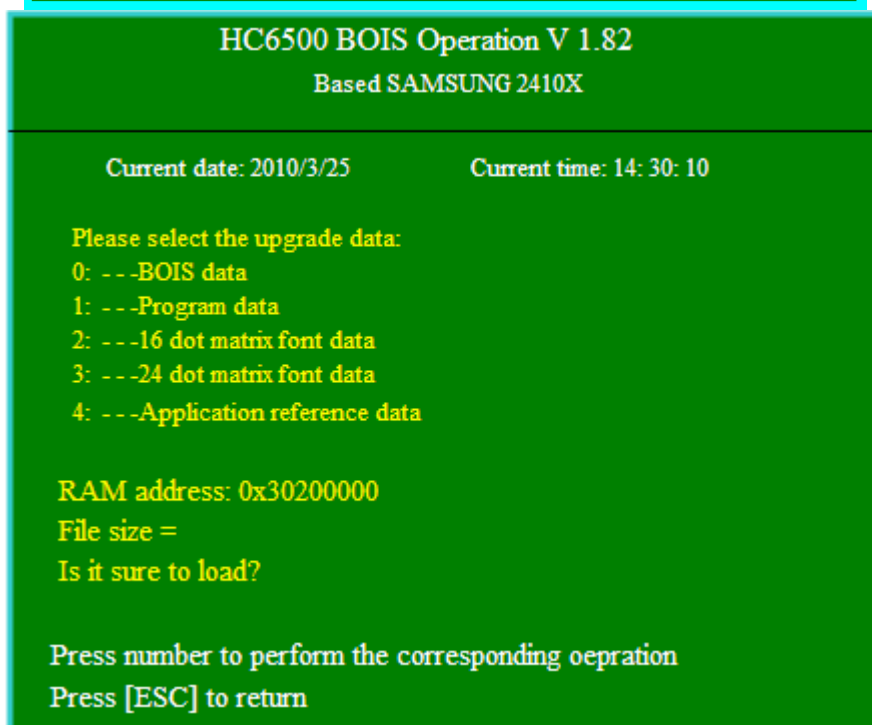
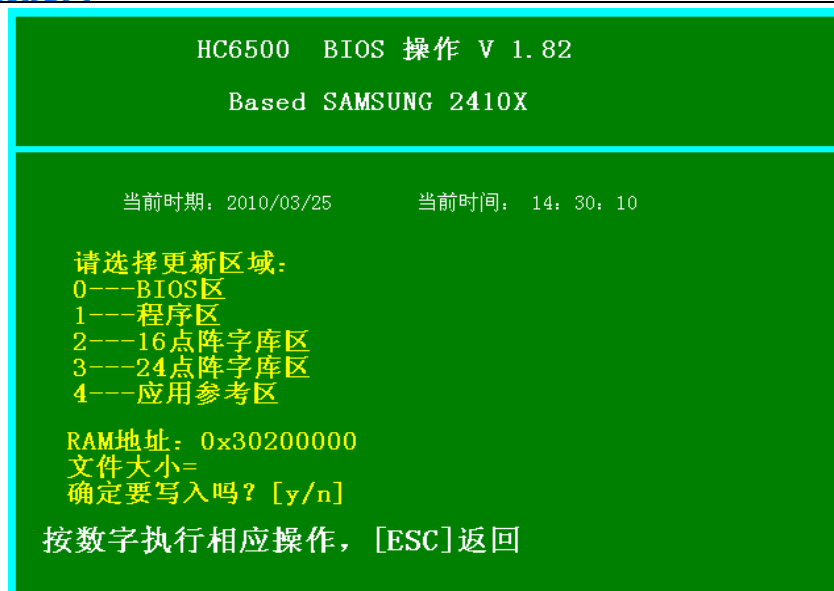


Press number key "1" to "BIOS setup" with the following interface.




Press [ESC] to return

Press 1 again to upgrade program data. Then “adtrom.bin” file which was copied in system ADT file folder via PC or U disk will be searched automatically by the system. When the file is found, the interface is shown as follows, and then upgrade and load need to confirm.

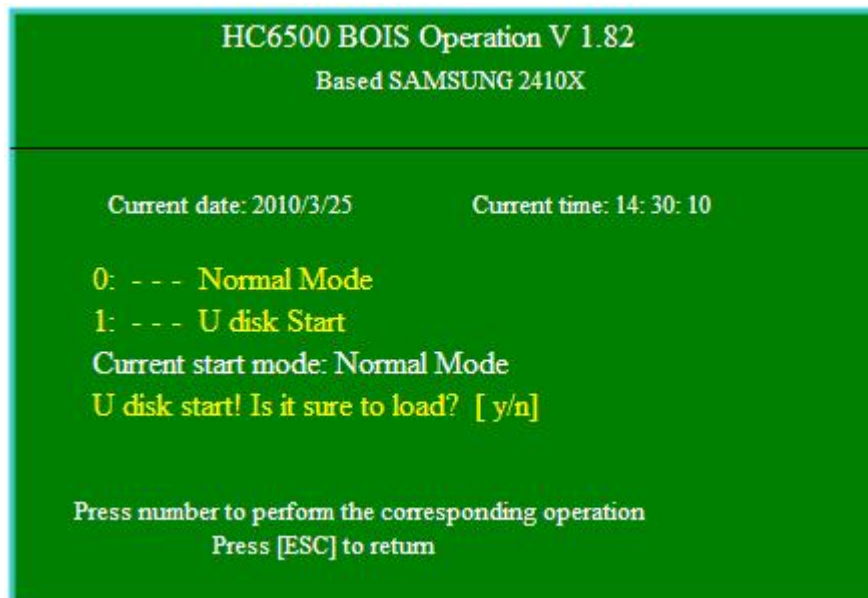
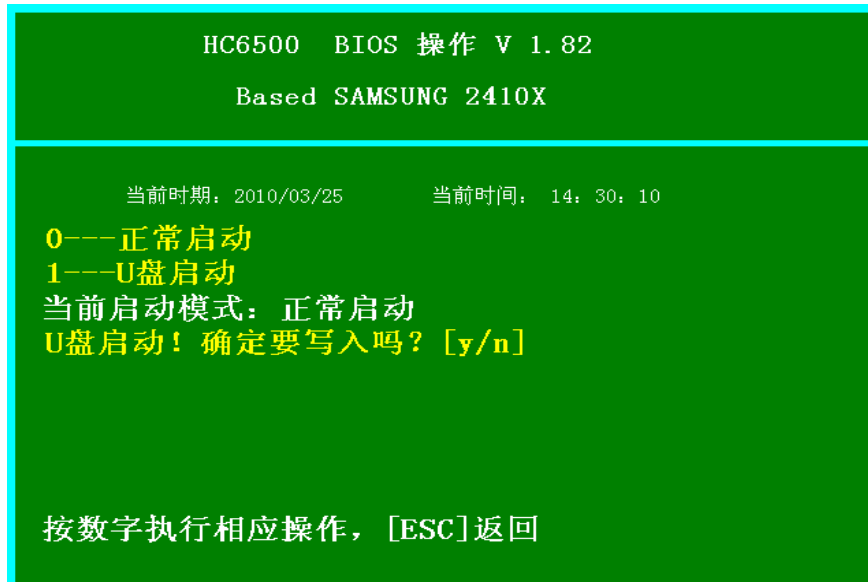


Press [ESC] to return



Press  key, and upgrade is complete after prompt cancellation.

After upgrading program, start mode should be checked whether it is "Normal start" mode. Press "Cancel" to enter the first BIOS interface. Select "4 Start mode" as follows:



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 **Y** to set the system to “Normal start”.

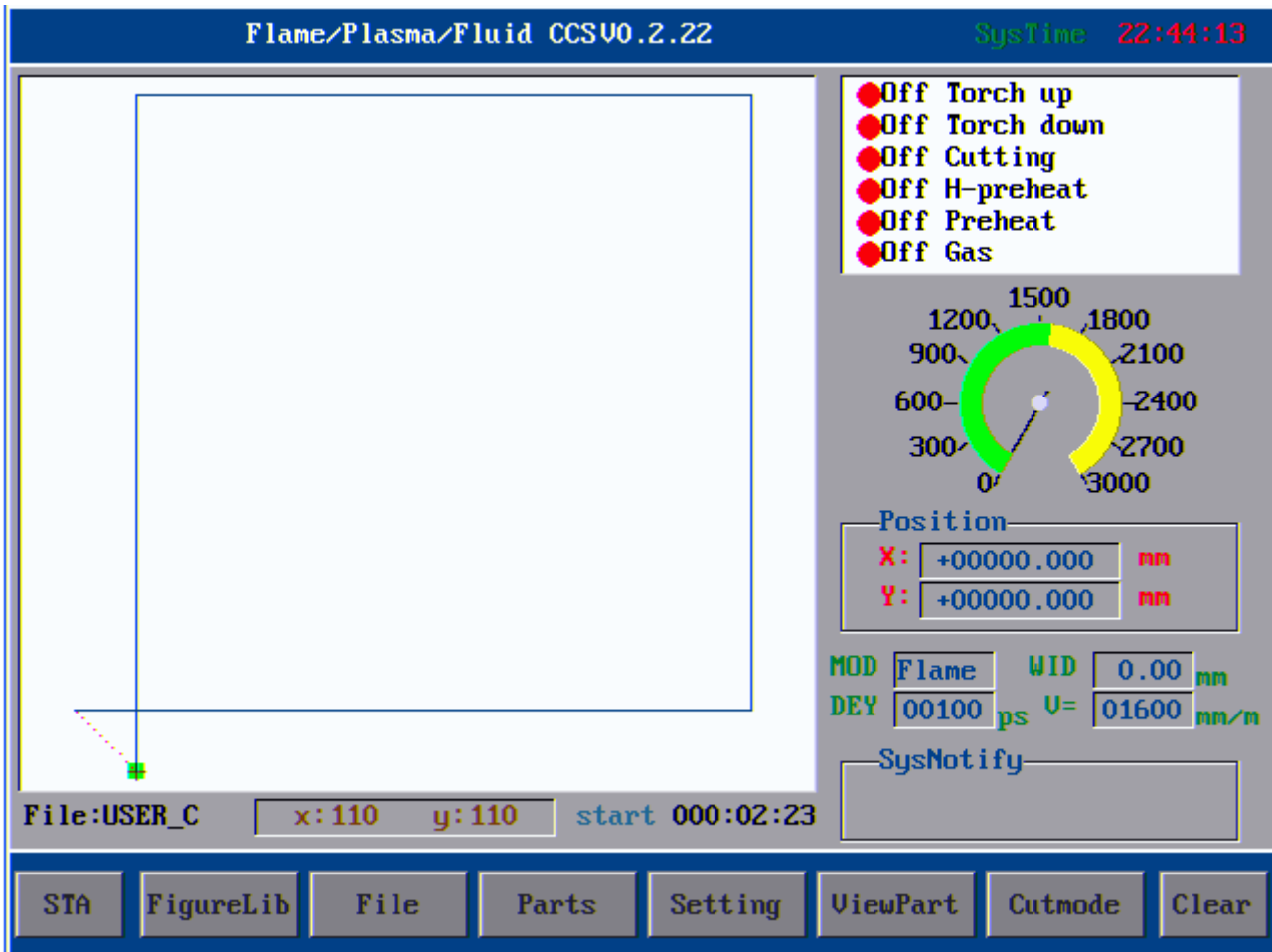
Power-off and restart system after upgrade completion.

3.2.19 Multi-language display support

HC6500 is a system with bilingual, Chinese and English, with the language shift steps as follows:

Setting option --- Advanced setup --- Input “360” password --- Setting option --- Press “Confirm” key in the “Language” column to select the language type to be displayed --- Save setting.

The following picture shows English interface:



HC6500 has French, Russian, Polish, and Turkish etc for displays other than English display.

3.2.20 Multi-language input method support

Please kindly Contact to ADTECH directly for details operation way

Chapter IV Instruction System

➤ 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.

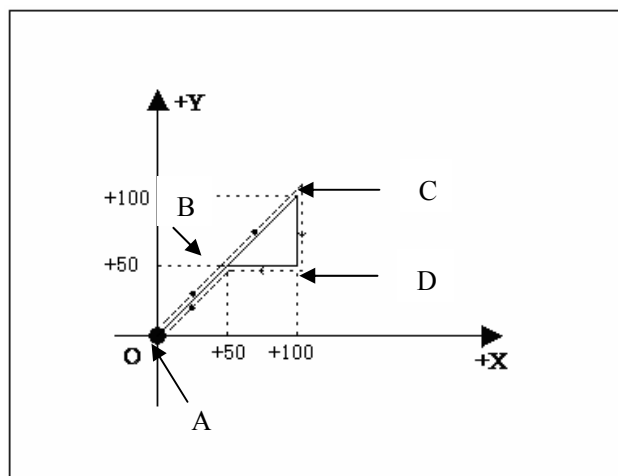
Definition of function word:

- G Preparatory function
- M Miscellaneous function
- L Cycle number 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

➤ Coordinate explanation

➤ 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:



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;

➤ **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);

➤ **G instruction explanation**

➤ **G92 reference point setup**

When program running is set, the coordinate of processing origin (reference point) of program should be put at the beginning of program.

Format: G92 X0 Y0

If G92 is not followed with X/Y content, 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.

➤ **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.

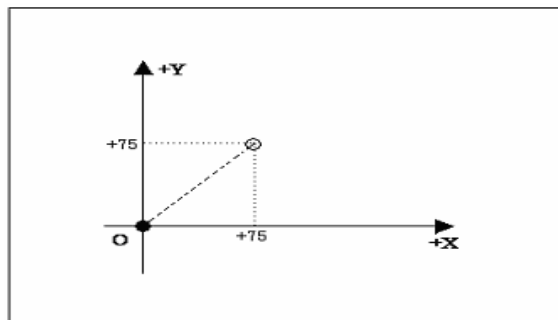
Format: G00 Xn Yn

For example: G92 X0 Y0

G00 X75 Y75

M02

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



➤ **G01 linear cutting**

This instruction enables you to feed the burning torch 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

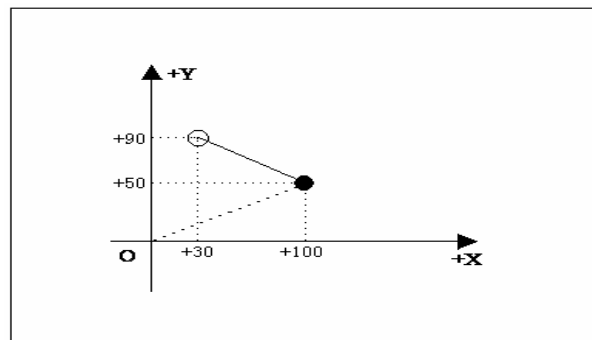
G90

G00 X100 Y50

M07

G01 X-30 Y90

M08



M02

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

➤ **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

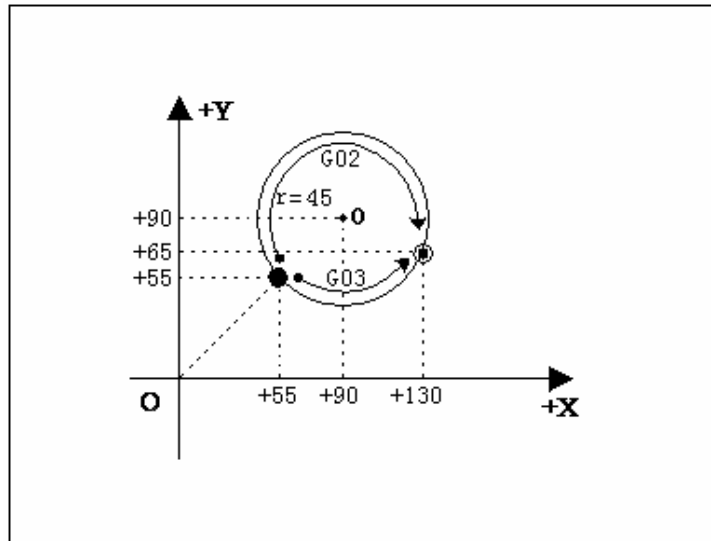
For example (G02):

```
G92 X0 Y0
G00 X55 Y55
M07
G03 X75 Y10 I35 J35
M02
```

Note: Cut a section of circular arc clockwise

For example (G03):

```
G92 X0 Y0
G00 X55 Y55
M07
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.

➤ **G04 Pause/Delay instruction**

This instruction is used to set the time delay. When the program performs this instruction, the time will delay upon the L defined 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.

➤ **G26, G27, G28 Back to reference point**

This instruction allows the burning 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)

➤ **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

➤ **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

➤ **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 burning gun;
4. Open the preheating valve and start preheating;
5. Lift the perforating burning gun;
6. Open cutting oxygen valve;
7. Drop the perforating burning 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 burning gun.

Plasma:

①

A). with height regulation system:

- ① Enable height regulation M22
- ② Arcing M12
- ③ Waiting for arc voltage detection signal (IN0)

After arcing, the height regulation 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 regulation system:

- ① Arcing, arcing delay M12
- ② Perforating, perforating delay
- C). Start the following actions

②




1. Close striking arc M13
2. Close the height regulation control M23

③ M02 program end instruction

2) other M instructions:

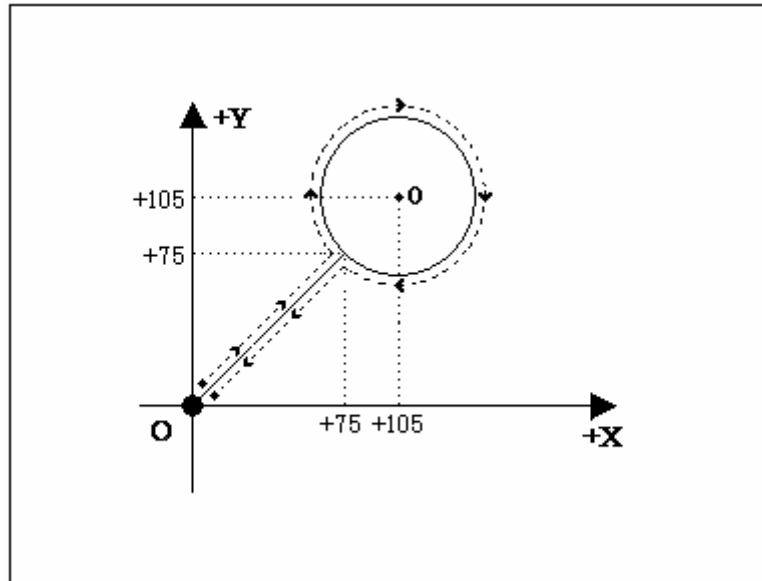
- ① M10/M11 switch of acetylene valve, M10 (Open), M11 (Closed)
- ② M12/M13 switch of cutting control valve, M12 (Open), M13 (Closed)
- ③ M14/M15 switch for controlling the rise of burning gun, M14 (Open), M15 (Closed)
- ④ M20/M21 ignition switch, M20 (Open), M21 (Closed)
- ⑤ M24/M25 switch of preheating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

➤ 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;

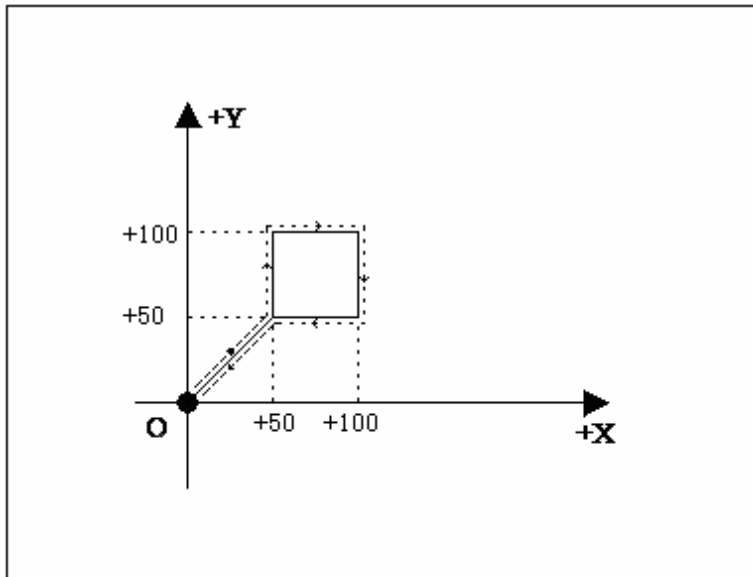
0006: G00 X-75 Y-75——travel to the origin at the highest manual speed;

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

0008: G80——cycle ends;

0009: M02——processing ends

➤ 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;

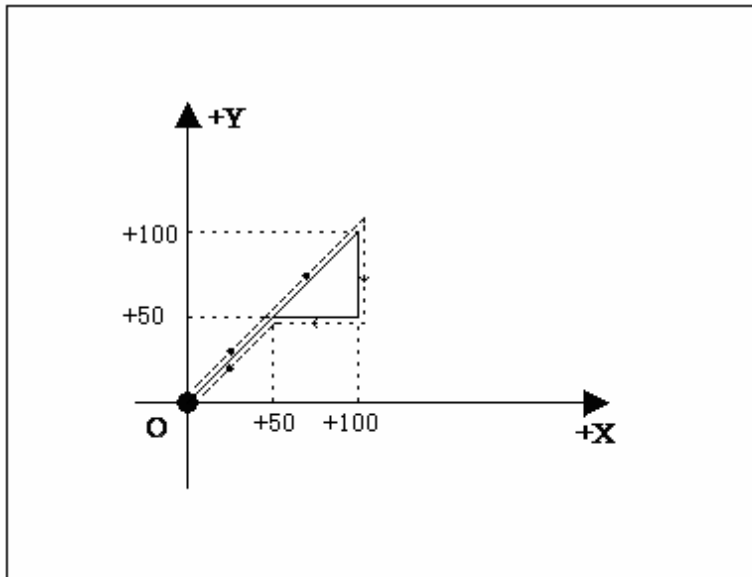
0006: X-50——the four side;

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

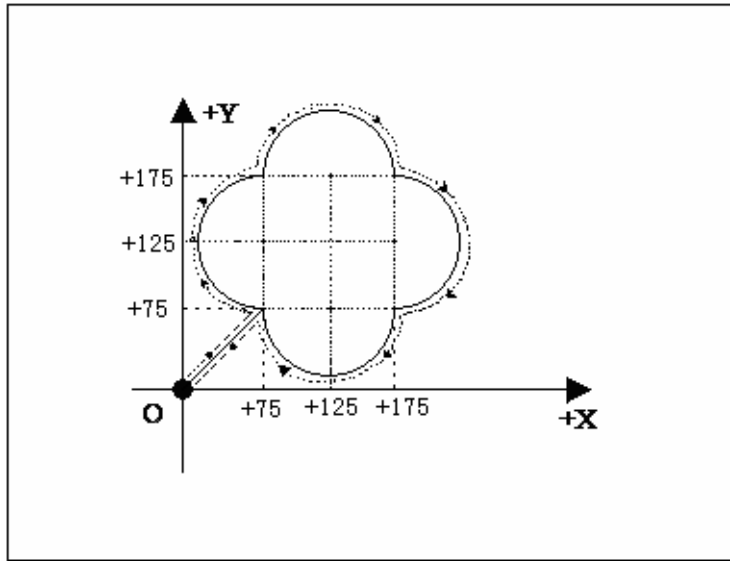
➤ Triangle



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
```

➤ **Quincunx**

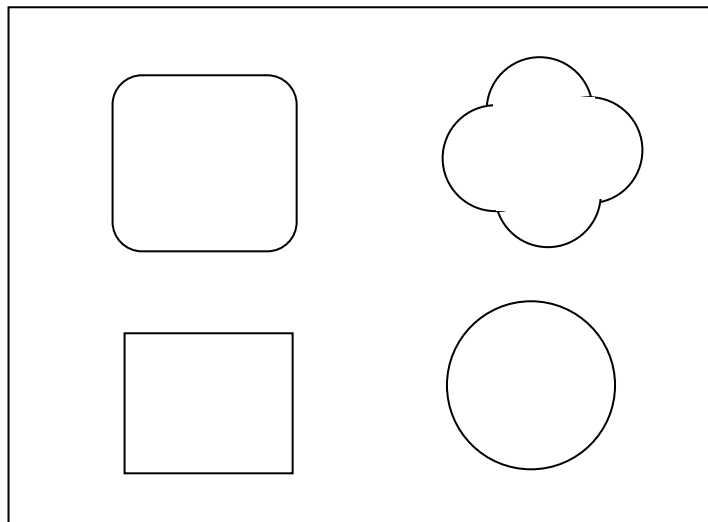


1) Relative coordinate programming

```

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
    
```

➤ **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 burning 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 burning gun rising (controlled by time in "Cutting type") |
| 11 | M71 | fixed cycle of burning gun falling (controlled by time in "Cutting type") |
| 12 | M72 | fixed cycle of perforating burning gun rising (controlled by time in "Cutting type") |
| 13 | M73 | fixed cycle of perforating burning 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 burning 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. |

Record modification (I)

| | | | | | |
|---------------------|--|---------------|----|----------------------------|---------|
| Feedback person | No | Feedback date | No | Current version/total page | V0.2.21 |
| Problem description | 1. User manual modification resulted from software change; 2. User manual modification upon new template. | | | | |

| | | | | |
|------------------------|--|---------------------------|--|------------|
| Engineer Confirm | | | | |
| After revision Version | | After revision Total page | | Revised by |

Record modification (II)

| | | | | | |
|---------------------|---|---------------|----------|----------------------------|--|
| Feedback person | No | Feedback date | 20110614 | Current version/total page | |
| Problem description | Add the content; Change the wiring to allow the user to be easier for understanding. | | | | |

| | | | | |
|------------------------|--|---------------------------|--|------------|
| Engineer Confirm | | | | |
| After revision Version | | After revision Total page | | Revised by |