FICHA TÉCNICA

Cortadora CNC Oxicorte o Plasma
Carbone Professional Welding

DESCRIPCIÓN

Cortadora CNC Oxicorte o Plasma, realiza cualquier corte y diseño. Pantalla gráfica, fácil de usar trae cortes prediseñados en el sistema donde solo debe introducir los valores. Desarmable y fácil de transportar y de almacenar y de bajo costo, No incluye cortadora Plasma. Puede convertir archivos de CAD y pasarlos a el software de corte fastcam que se encuentra traducido al inglés, español, italiano, alemán y francés.

CÓDIGO

M-ZZ1230H

VOLTAJE 220V 50/60Htz

GARANTÍA 1 AÑO — Servicio Técnico Carbone · Repuestos y partes en stock permanente

Marca: Carbone Professional Welding	**Control automático de Altura (THC):** Puede cortar láminas irregulares y con inclinación.
Alimentación: 220 +- 10%V AC 50/60 Htz 220W	
Modos de corte: Plasma y acetileno	**Compatibilidad plasma:** Carbone (Digicut 70 CNC), Hypertherm (Powermax 65), Thermaldinamics (Cutmaster)
Rango de corte: 4 x 10 pies	
Velocidad de corte : 0 - 3000 mm/min (max.4000)	**Incluye:** Cortadora Portátil CNC (THC) con rieles y computadora central, Dos mesas de corte desarmables de 1,5 m x 1,5m, todo el sistema para oxicorte, Fastcam Sofware de corte, Manual y USB.
Espesor del corte con plasma: según especificaciones del plasma	
Espesor del corte con acetileno: 5 - 100 mm	
Precisión: +- 0.2%	**Procedencia:** Importado
Tipo de gas: oxígeno+acetileno/ oxígeno+propano	

Proceso de operación FastCAM

AutoCAD → FastCAM → 2GB (USB) → (controlador CNC)

M-ZZ1230H *Operation and Installation*

Manual

Host side panel:

Temperature controlled fan. It will turn on when the temperature reach 45°

Power plug seat and fuse. There is a spare fuse inside.

Arc feedback input port (THC)

Plasma arc control port

Beam control wire port

Power switch

Emergency stop switch

Arc adjust button. Used for adjust the height of torch when cutting. (THC)

Offline switch (gear-rack clutch switch)
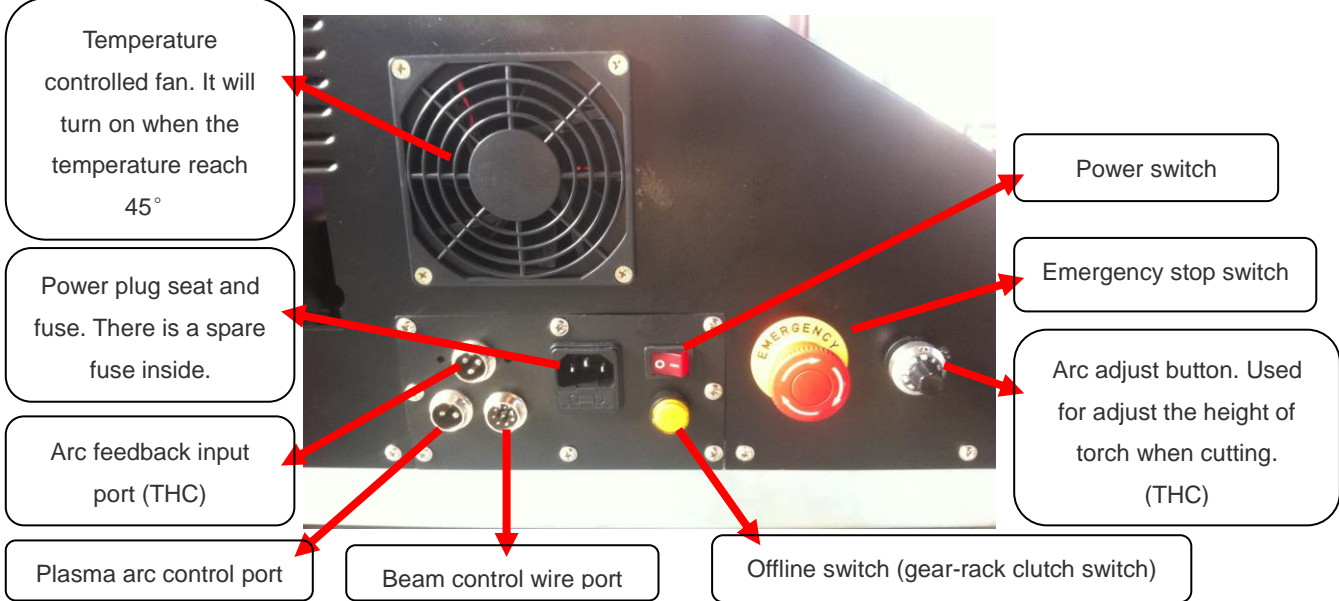
Plasma arc insulate and voltage divider (THC)

100:1 insulate and voltage divider output port. Connect arc feedback input port

Black wire connect torch output plug of plasma generator (-)

Yellow-green wire connect work piece

Torch holder:

Solenoil operatde air valves:

Automatic plasma torch height control holder（THC）

Approach switch（THC）

Holder of flame torch and plasma torch (without THC)

Cutting oxygen SOAV（C）

Preheat oxygen SOAV（P）

Gas SOAV
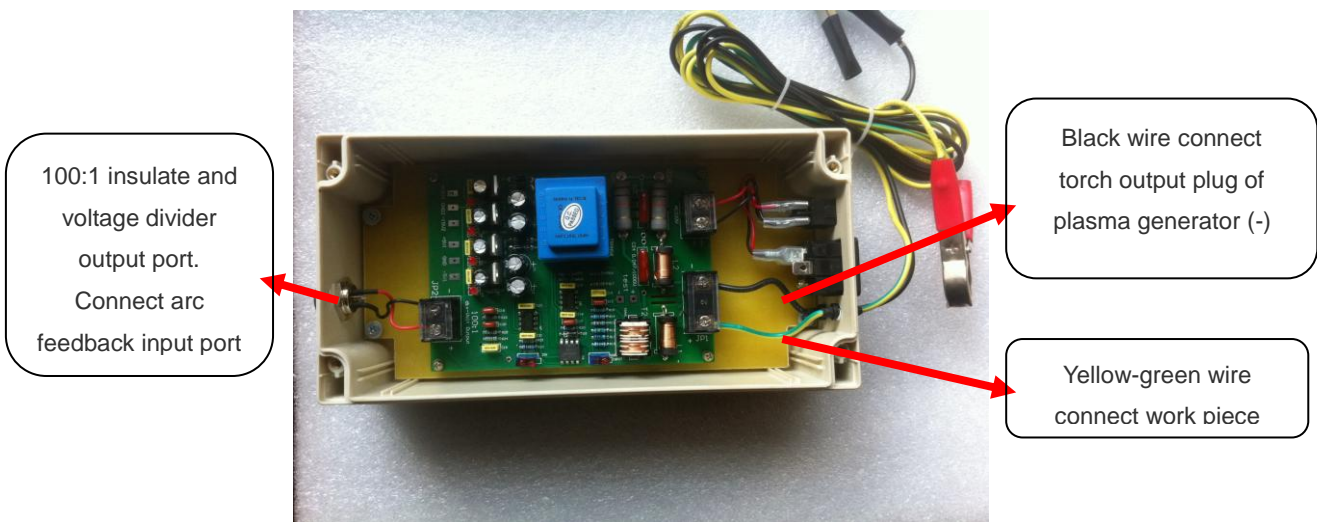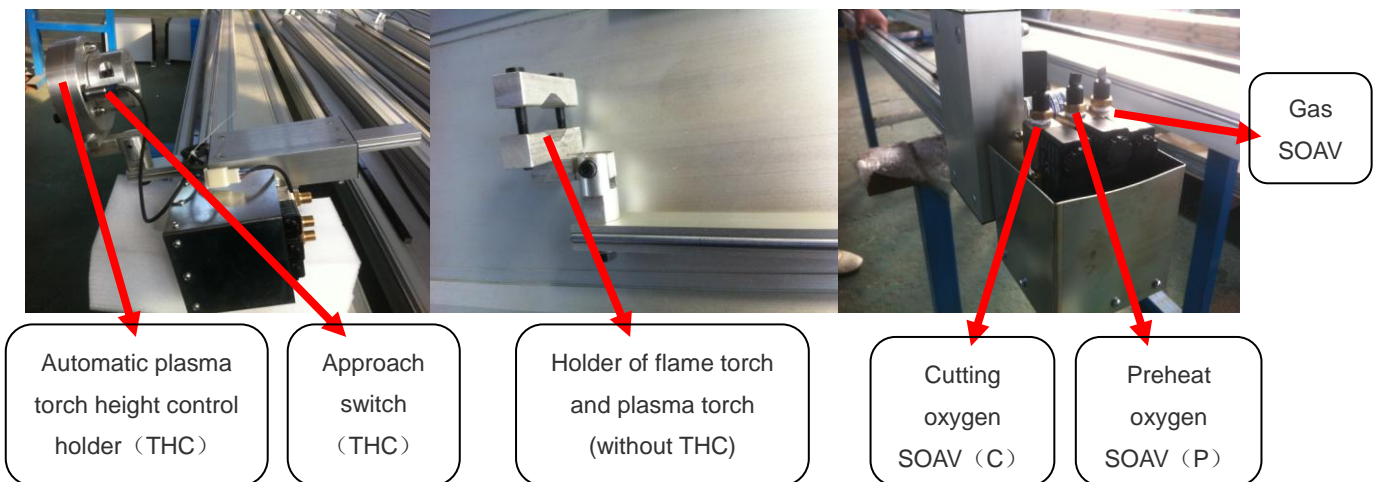
※
It is suggested that all operators should carefully read and understand these items before operating the equipment. Repeatedly mentioned content in the manual should be grasped importantly and paid more attention to.

Examine packing carton if there is any damage during transportation after receiving the equipment. After packing carton, examine equipment component if there is any damage during transportation; examine if the articles in the cartons correspond with which are listed in the packing list (if ordering more than 1 sets, please according to the tags on packing carton, grouping and matching to use).

Know Related Knowledge

The operators must be familiar with the cutting elements and related practice regulations of oxy-gas and plasma. The performance and parameter also need griping before operating. The machine can not be disassembled by unprofessional person. Refer to the manual and consult the technicians if there comes to problems.

Installation and Use

The user is responsible for installing and using the equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing the casing, see *Earthing of Work piece*.
In other cases of using plasma cutting machine, it could involve constructing an electromagnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Using Environment

System allowable working environment temperature is 0℃-60℃, relative humidity is 0-85%.
Don't make dust and iron powders enter system interior, especially don't make liquid enter host.
In such environment as high temperature, high wet many dusts and causticity gas to work, need taking special protection.

Assessment of Area

Before using the equipment to cut, the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

1. Using oxygen and gas cutting:
    a. Time of day that cutting or other activities are to be carried out.

2. Before using plasma cutting equipment, potential electromagnetic problems in the surrounding area:
    a. Other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the cutting equipment.
    b. Radio and television transmitters and receivers.
    c. Computer and other control equipment.
    d. Safety critical equipment, for example guarding of industrial equipment.
    e. Health of the people around, for example the use of pacemakers and hearing aids.

f. Equipment used for calibration or measurement.

g. Immunity of other equipment in the environment. User shall ensure that other equipment being used in the environment is compatible .This may require additional protection measures.

Consider time of day that cutting or other activities, flammable materials and the size of the surrounding area. The surrounding area may extend beyond the boundaries of the premises.

Maintenance of Cutting Equipment

The cutting equipment must be routinely maintained according to the manufacturer's recommendations. When the cutting equipment is in operation, the cutting equipment should not be modified. In particular, the gear and rack meshing clearance should be adjusted and maintained according to the manufacturer's recommendations.

Plasma Cutting Question
●Method of Reducing Emission
Mains Supply   The equipment must be connected to the mains supply according to the manufacture's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed cutting equipment, in metallic conduit or equivalent. The shielding should be connected to the cutting mains supply so that good electrical contact is maintained between the conduit and equipment enclosure and the cutting power source enclosure.

●Equipotential Bonding

Bonding of all metallic components in the cutting installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

●Earthing of Work Piece
Where the work piece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, a connection bonding the work piece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the work piece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the work piece to earth should be made by a direct connection to the work piece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitances selected according to national regulations.

Note: The cutting circuit may or may not be earthed for safety reasons. Changing the earthing arrangements should only be authorized by a person who is competent to assess.

●Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire plasma cutting installation may be considered for special applications.**Guarantee**

Genuine   parts are the factory-recommended replacement parts for your   system. Any damage caused by the use of other than genuine   parts may not be covered by the   warranty.

Warning

You have the responsibility to safely use the product. For safe use in your working environment, cannot give any guarantee or warranty.

General

warrants that products shall be free from defects in materials and workmanship for following warranty period, under proper and normal use, (i) host within one year; (ii) track and beam within six months; (iii) torch within three months. , at its sole option, shall repair, replace, or adjust, free of charge, any Products covered by this warranty which shall be retuned with 's prior authorization (which shall not be unreasonably withheld), properly packed, to 's place of business, all costs, insurance and freight prepaid, and which examination proves not to be free from defects in materials and workman-ship. shall not be liable for any repairs, replacements, or adjustments of Products covered by this warranty, except those made pursuant to this paragraph or with 's written consent. This warranty shall not apply to any product which has been mishandled, incorrectly installed, modified or assembled by you or any other person. shall be liable for breach of this warranty only if it receives written notice of such breach within the applicable warranty period specified herein above.

Distributor and OEM can provide different or complementary guaranty, but they provide those for you not to be authorized, which cannot mean Company gives you any guaranty.

Guarantee not Included:
(i) any accident violating using requirement; (ii) damage caused by natural scourge; (iii) unload, remodel and repair if not allowed.

Warranty Period:
From distributor and OEM delivery date for users, but store in them not beyond three months, if beyond the period, only extend three months warranty period.

Indemnity Limit

In any case, won't compensate any personal or team accident, consequence, indirect or punitive loss (including not limited loss profit), whatever compensation is according to violate contract, civil infringement, strict responsibility, violate guarantee, main use failure or other cases, even have been told appearing the loss.

Indemnity Utmost Limit

In any case, compensation of lawsuit caused by using related product (whatever compensation is according to violate contract, civil infringement, strict responsibility, violate guarantee, main use failure or other cases), cannot go beyond cumulative total of causing compensated product.

Insurance

In any case, you must have and keep the insurance, when appearing any lawsuit, to protect from loss.

National and Local Codes

National and local codes governing plumbing and electrical installation shall take precedence over any instructions contained in this manual. IN NO EVENT shall be liable for incidental or consequential injury to persons or property damage by reason of any code violation or poor work

practices.

Equity Transfer

Only when selling all or most assets or capital stock, but inheritors agree with the term, you can transfer equity.

Chapter One

Safety

In This Section:

⚠ Recognize Safety Information

The symbols shown in this section are used to identify potential hazards. When you see a safety symbol in this manual or on your machine, understand the potential for personal injury, and follow the related instructions to avoid the hazard.

Follow Safety Instructions

Read carefully all safety messages in this manual and safety labels on your machine.
· Keep the safety labels on your machine in good condition. Replace missing or damaged labels immediately.
· Learn how to operate the machine and how to use the system properly. Do not let anyone operate it without instruction.
· Keep your machine in proper working condition. Unauthorized modifications to the machine may affect safety and machine service life.
Danger, Warning, Caution
A signal word DANGER or WARNING is used with a safety symbol. DANGER identifies the most serous hazards.
· DANGER and WARNING safety labels are located on your machine near specific hazards.
· WARNING safety messages precede related instructions in this manual that may result in injury or death if not followed correctly.
· CAUTION safety messages precede related instructions in this manual that may result in damage to equipment if not followed correctly.

Cutting Can Cause Fire or Explosion

Fire Prevention, Explosion Prevention
· Be sure the area is safe before doing any cutting. Keep a fire extinguisher nearby.
· Remove all flammables within 35 feet (10m) of the cutting area.
· Quench hot metal or allow it to cool before handling or before letting it touch combustible materials.
· Never cut containers with potentially flammable materials inside-they must be emptied and properly cleaned first.
· Ventilate potentially flammable atmospheres before cutting.
· When cutting with oxygen as the plasma gas, an exhaust ventilation system is required.
· Do not use the equipment if explosive dust or vapors may be present.

⚠ **Warning**
Explosion Hazard
Argon-Hydrogen and Methane
Hydrogen and methane are flammable gases that present an explosion hazard. Keep flames away from cylinders and hoses that contain methane or hydrogen mixtures. Keep flames and sparks

away from the torch when using methane or argon-hydrogen plasma.

⚠️ **Warning**

Hydrogen Detonation with Aluminum Cutting

・When cutting aluminum underwater, or with the water touching the underside of the aluminum, free hydrogen gas may collect under the work piece and detonate during plasma cutting operations.

・Install an aeration manifold on the floor of the water table to eliminate the possibility of hydrogen detonation.

⚠️ **Incorrect Operation can Cause Accident**

Incorrect operation can cause equipment damage. If seriously mistake operation happens, it can make inflammable gas outside cause explosive possibility. Moreover, suffer electric shock and burn danger.

・When using, ensure the connection line and appendix well.

・When flame cutting, follow welding and cutting accident precaution measure.

・Don't let cloth and body twist into moving equipment, cause body injury.

・When moving equipment, host can move on track, so does beam, avoid host slipping outside track, beam outside host.

・Any parts including with track and beam, cannot be hit.

・Equipment surrounding avoids strong shake.

・Don't allow to change safe device, but after insurance pipe damages, no connection with wire or other conductor, no change original device parameter, cause lose protection effect.

⚡ **Electric Shock can Kill**

Touching live electrical parts can cause a fatal shock or severe burn.

・Operating and maintaining the equipment exits potential danger, according to installing program and specification manual, safely install and operate the equipment. Open the equipment by trained maintaining person.

・Operating the plasma system completes an electrical circuit between the torch and the work piece. The work piece and anything touching the work piece are part of the electrical circuit.

・Never touch the torch body, work piece or the water in a water table when the plasma system is operating.

⚡ **Electric Shock Prevention**

Usually plasma systems use high voltage in the cutting process (200 to 400VDC are

common).Take the following precautions when operating this system::

· Wear insulated gloves and boots, and keep your body and clothing dry.

· Do not stand, sit or lie on – or touch – any wet surface when using the plasma system.

· Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground. If you must work in or near a damp area, use extreme caution.

· Don't round or avoid safe switch. Provide a disconnect switch close to the power supply with properly sized fuses. This switch allows the operator to turn off the power supply quickly in an emergency situation.

· When using a water table, ensure that it is correctly connected to earth ground.

· Install and ground plasma equipment according to the instruction manual and in accordance with national and local codes.

· Inspect the input power cord frequently for damage. Replace a damaged power cord immediately.

· Inspect and replace any worn or damaged torch leads.

· Do not pick up the work piece, including the waste cutoff, while you cut.

· Before checking, cleaning or changing torch parts, disconnect the main power or unplug the power supply.

· Before removing any power supply or system enclosure cover, disconnect electrical input power. Wait 5 minutes after disconnection the main power to allow capacitors to discharge.

Never operate the plasma system unless the power supply covers are in place. Exposed power supply connections present a severe electrical hazard.

· When making input connections, attach proper grounding conductor first.

 Cutting can Cause Poisonous Smog

Cutting can produce toxic fumes and gases that deplete oxygen and cause injury or death.

·Keep the cutting area well ventilated or use an approved air-supplied respirator.

·Do not cut in locations near degreasing, cleaning or spraying operations. The vapors from certain chlorinated solvents decompose to form phosgene gas when exposed to ultraviolet radiation.

·Do not cut metal coated or containing toxic materials, such as zinc(galvanized),lead, cadmium or beryllium, unless the area is well ventilated and the operator wears an air-supplied respirator. The coatings and any metals containing these elements can produce toxic fumes when cut.

·This product, when used for cutting equipment, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and ,in some cases, cancer.

 Plasma Arc can Cause Injures and Burns

Plasma arc comes on immediately when the torch switch is activated.

The plasma arc will cut quickly through gloves and skin.

Keep away from the torch tip.

• Do not hold metal near the cutting path.
• Never point the torch toward yourself or others.

Arc Rays can Burn Eyes and Skin

Eye Protection: Plasma arc rays produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin.
• Use eye protection in accordance with applicable national or local codes.
• Wear eye protection (safety glasses or goggles with side shields, or a welding helmet)with appropriate lens shading to protect your eyes from the arc's ultraviolet and infrared rays.

Skin Protection: Wear protective clothing to protect against burns caused by ultraviolet light, sparks and hot metal.
• Gauntlet gloves, safety shoes and hat.
• Flame-retardant clothing to cover all exposed areas.
• Cuffless trousers to prevent entry of sparks and slag.
• Remove any combustibles, such as butane lighter or matches, from your pockets before cutting.
Cutting Area: Prepare the cutting area to reduce reflection and transmission of ultraviolet or light:
• Paint walls and other surfaces with dark colors to reduce reflection.
• Use protective screens or barriers to protect others from flash and glare.
• Warn others not to watch the arc. Use placards or signs.

Grounding Safety

Work Cable: Attach the work cable securely to the work piece or the work table with good metal-to-metal contact. Do not connect it to the piece that will fall away when the cut is complete.
Worktable: Connect the worktable to an earth ground, in accordance with appropriate national or local electrical codes.
Input Power
• Be sure to connect the power cord ground wire to the ground in the disconnect box.
• If installation of the plasma system involves connecting the power cord to the power supply, be sure to connect the power cord ground wire properly.
• Place the power cord's ground wire on the stud first, then place any other ground. Fasten the retaining nut tightly.
• Tighten all electrical connections to avoid excessive heating.

Compressed Gas Equipment Safety

Compressed gas bottle when blowing up, transporting and reserving, exists some danger, can cause explosion and fire.

• Never lubricate cylinder valves or regulators with oil or grease.
• Use only correct gas cylinders. Regulators, hoses and fittings designed for the specific application.
• Maintain all compressed gas equipment and associated pares in good condition.
• Before gas cylinder, open its valve, after blow thin power or dirty, close it. Then use after connecting decompression.
• Open valve, operator should stand gas jet side and slowly start it, avoid gas towards body.
• Prohibit on stressed gas bottle, remove leak using screw down valve and washer nut ways.
• Never touch gloves oil and fat, cotton yarn and tools with gas bottle, valve, decompression and pipeline.
• When operating, gas bottle is from away open flame or heat source beyond 5m.
• Don't place gas bottle on passage (elevator room, stairs), prevent from hitting. If having any difficulties, take proper protection measure.
• Never using oxygen to replace compression air to blow clear work cloths, gas pipeline, or use pressure test and air-powered tool air source.
• Label and color-code all gas hoses to identify the type of gas in each hose. Consult applicable national or local codes.

Gas Cylinders can Explore if Damaged

Gas cylinders contain gas under high pressure. If damaged, a cylinder can explode • Handle and use compressed gas cylinders in accordance with applicable national or local codes.
• Never use a cylinder that is not upright and secured in place.
• Keep the protective cap in place over valve except when the cylinder is in use or connected for use.
• Never allow electrical contact between the plasma arc and a cylinder.
• Never expose cylinders to excessive heat, sparks, slag or open flame.
• Never use a hammer, wrench or other tool to open a stuck cylinder valve.

Gas Cutting Safety

Read and understand cutting machine operation and uses safety requirements. If users have any requirements, please consult distributors and manufacturers.
• Oxygen and gas hose cannot use each other, never replace with other hose.
• Torch no staining oil.
• When gas cutting ignition, using firing gun.
• When gas cutting, appearing cracking and backfire, immediately close preheated oxygen and cutting oxygen valve, then close gas valve, finally clear dirt in gas channel with needle.
• Finish working, decompression unload pressure order: close high pressure gas bottle valve, let off all remaining gas in decompression, release pressure adjuster to make watch hand to Zero.
• When gas source pressure is low, need exchanging gas, first close all valve switches, then exchange gas, when operating, do it according to dangerous gas safe operation rules.

Noise Protection

Prolonged exposure to noise from cutting or gouging can damage hearing.
· Use approved ear protection when using plasma system.
· Warn others nearby about the noise hazard.

Pacemaker and Hearing Aid Operation

Pacemaker and hearing aid operation can be affected by magnetic fields from high currents.
Pacemaker and hearing aid wearers should consult a doctor before going near any plasma arc cutting and gouging operations.
To reduce magnetic field hazards by following ways:
· Keep both the work cable and the torch lead to one side, away from your body.
· Route the torch leads as close as possible to the work cable.
· Do not wrap or drape the torch lead or work cable around your body.
· Keep as far away from the power supply as possible.。

Warning Label

This warning label is affixed to some equipment. It is important that the operator and maintenance technician understand the intent of these warning symbols as described. The numbered test corresponds to the numbered boxes on the label.

1. Cutting sparks can cause explosion or fire.
   Keep flammables away from cutting.
   Keep a fire extinguisher nearby, and have a watchperson ready to use it.
3. Electric shock from torch or wiring can kill. Protect
3.1 Wear insulating gloves. Do not wear wet or damaged gloves.
4. Breathing cutting fumes can be hazardous to your health.
4.1 Keep your head out o the fumes.
4.2Use forced ventilation or local exhaust to remove the fumes.
4.3 Use ventilating fan to remove the fumes.
5. Arc rays can burn eyes and injure skin.
5.1 Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection.
6. Become trained and read the instructions before working on the machine or cutting.
7. Do not remove or paint over (cover) warning labels

Chapter Two

Technical Regulations

In This Section:

2.1 Introduction

Product Introduction:

The product is of the characteristics of saving space, high producing efficiency and facility to take, and can cut automatically, with high cutting precision and material utility. It is well-designed, with light weight and small measurement, easy to be moved, fitting indoor and outdoor working environment. It can help all sized enterprises to improve producing efficiency and reduce producing cost. It can be widely used in cutting and using material working procedure of carbon steel (flame cutting), stainless steel, aluminum (plasma cutting) and other metal material, and especially in single and batch production of various parts.

Product Characteristic:

Portable CNC Flame/Plasma Cutting Machine can program to cut any parts of plane graphs making of straight lines and arcs, as large gantry cutting machine.
It configures 7 inch color LCD, dynamic and static graphic display, which makes it intuitionistic and easy to learn. You can either program directly on the machine, or directly transform program files with CAD files on computer, and transmit into the machine by USB interface to cut.
All-steel and antimagnetic outside frame of host ensures reliable and stable operation of CNC system.

Product Highlight：

1. 7 inch high-resolution color LCD.
2. Chinese/English menu
3. 45 categories different graphics (including grid pattern), chip part and hole part are alternative
4. Support the EIA code (G code) and various FastCAM software
5. Graphics have some operations such as Proportion, Rotate, Mirror, Array
6. Steel plate adjust
7. Provide a front USB interface for the transfer of code and system upgrade
8. Import and export documents by a single or all files
9. Display time, week and clock
10. Parameters backup and online upgrade
11. Support the Flame, Plasma, Dusting draw and Demonstration four kinds of mode
12. Including various types of processing parameters to meet the needs of different processes
13. Flame and Plasma are separated in the control IOs
14. Support edge cutting
15. Movement can be real-time acceleration, deceleration
16. According to plate thickness, in the corner speed is automatically restricted by a speed limit , have been effective in preventing burn
17. select row and column
18. Dynamic/static illustration of the process, graphics zoom in / out, dynamically tracking cut-off point under zooming state

19. electricity protective function of memory

20. "Cutting offset" function can be avoided waste due to calculated errors when nesting of the plate

2.2 Main Technical Specifications and Parameters

Models		ZZ-1020	ZZ-1225	ZZ-1525
Input power source		220V±10%　50Hz　220W		
LCD		7 Inch color LCD		
Effective cutting range X×Y(mm)		1000×2000	1225×2500	1500×2500
Beam section size (mm)		50×60mm		
Beam length (mm)		1530	1780	2030
Beam weight (kg)		11.2	12.4	13.9
Track length (mm)		2500	3000	3000
Track weight (kg)		33.6	40.5	40.5
Cutting speed (mm/min)		50-3000		
Cutting thickness (Flame) (mm)		5-120mm		
Cutting thickness (Plasma)(mm)		According to customer's plasma power supply		
Gas pressure (Mpa)		0.01—0.3		
Oxygen pressure (Mpa)		0.3—0.7		
Types of gas		Propane or Acetylene		
Measurement (mm)	Host	460×330×260		
	Track	2500×273×60	3000×273×60	3000×273×60
Packing measurement (mm) Weight	Host	L 545×W 460×H 520　29.1kg		
	Track	L 2620×W 390×H 220　87.8kg	L 3120×W 390×H 220　101.3kg	L 3120×W 390×H 220　111.8kg
Host weight (kg)		19		

*Standard configuration is acetylene nozzle if no special requirement.

2.3 Outside Measurement
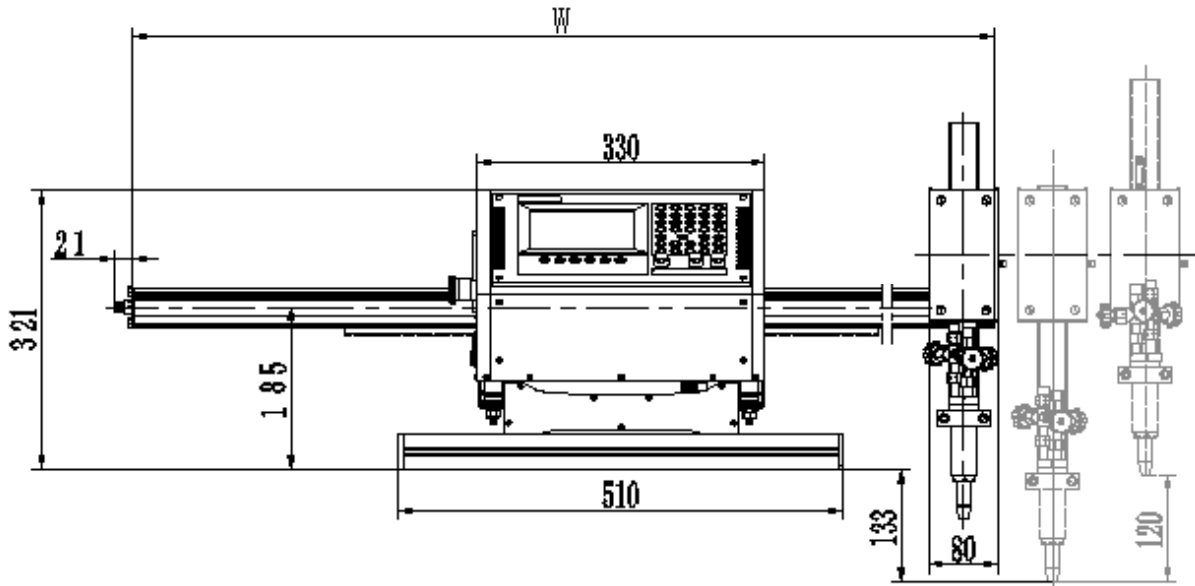
Model	ZZ-1020	ZZ-1225	ZZ-1525
Beam W (mm)	1530	1780	2030
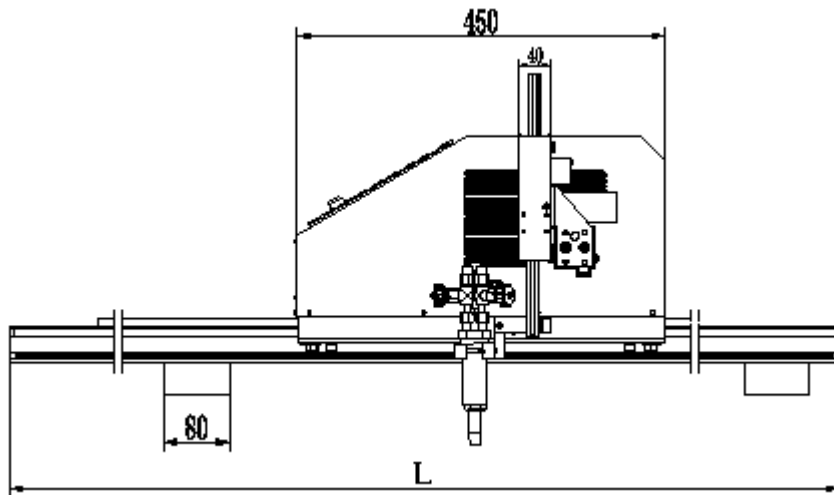
Model	ZZ-1020	ZZ-1225	ZZ-1525
Track L(mm)	2500	3000	3500

2.4 Sign

Following signs can appear on panel, tag and switch.

↓	Start	○	Stop(Pause)
○	Off	|	On
⚡	Strong Electricity	⏚	Protect Earthing
⚠	Offline On-Off(Emergency)		

Chapter Three

Setup

In This Section:

3.1 Receipt and Carrying Equipment

⚠ 🏃	**Warm**
• **Equipment weight can reach 60kg，when installing and carrying, two people finish it.**	

1. Verify that all parts and items on your order have been received. Alert your distributor if any parts or items are damaged or missing.
2. If there is evidence of damage, refer to the *Claims* section below. All communications regarding this equipment must include the model number and equipment number.
3. Before setting up and operating the system, read the Safety section of this manual.

3.2 Claims

Claims for damage during shipment: If your unit was damaged or lost during shipment, you must file a claim with the carrier.
Claims for defective parts: If any of the parts are defective, please contact your distributor.

3.3 Packing List

Examine parts, contrast with icon description.
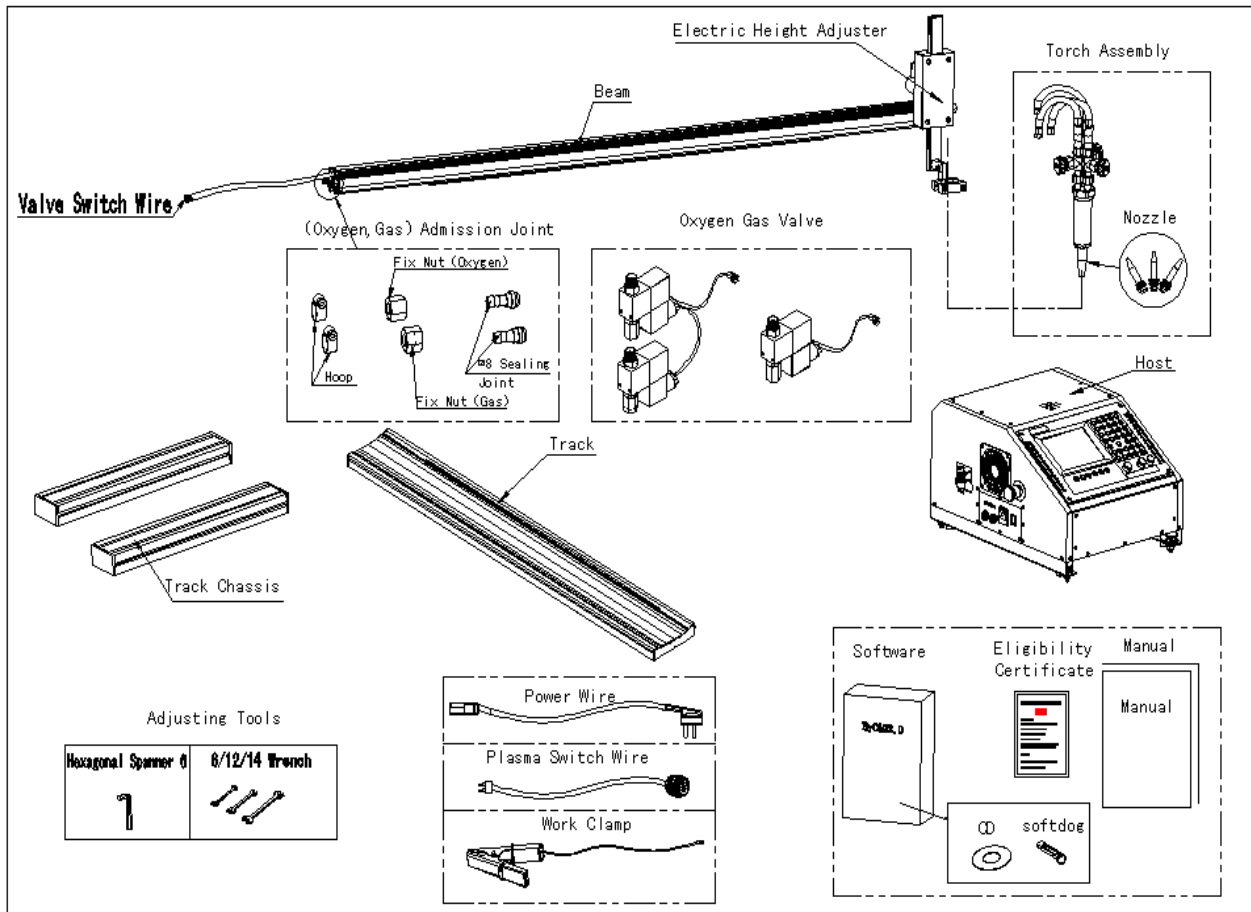
3.4 Equipment Appearance
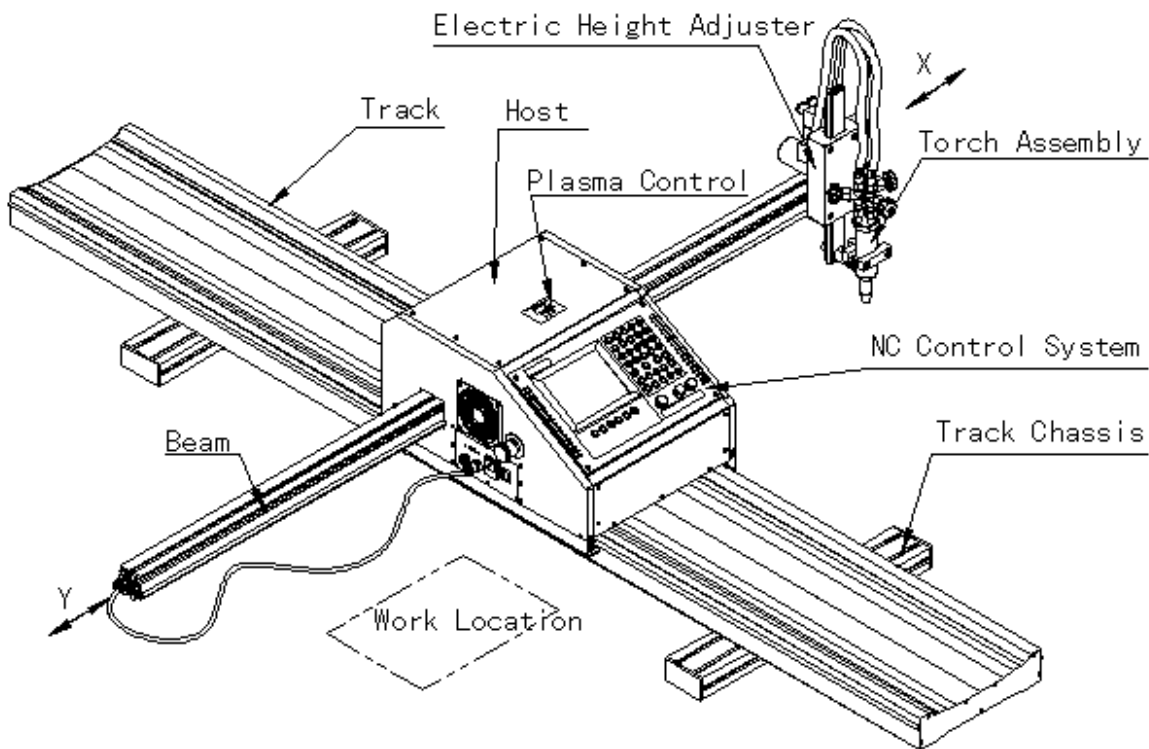
3.5 Equipment Assembly

⚠️ This portable NC cutting machine is decompounded transporting and needs assembling by the consumer.

Please assemble the machine strictly according to the following procedures and be careful to avoid damage to the component, which can help to guarantee the cutting quality and performance.

※ **When assembling many sets, matching to use. Because the clearance of gear and rack has been adjusted better before leaving factory.**

⚠️	⚠️	⚠️	**Warm** Assembling incorrectly or inappropriately can harm your body.

3.5.1 The Connection between Host and Track

Before assembling, the chassis and the track are packed separately in the carton. There is a fixing hole in the chassis and an installation bolt is also embedded into the aperture in the supporting chassis. Connect the chassis and the track with the enclosed nut. Then align the pulley on the slide of the chassis and the orbit on two sides of the track. Push as the aspect of arrowhead horizontally until the body inserts into the orbit.
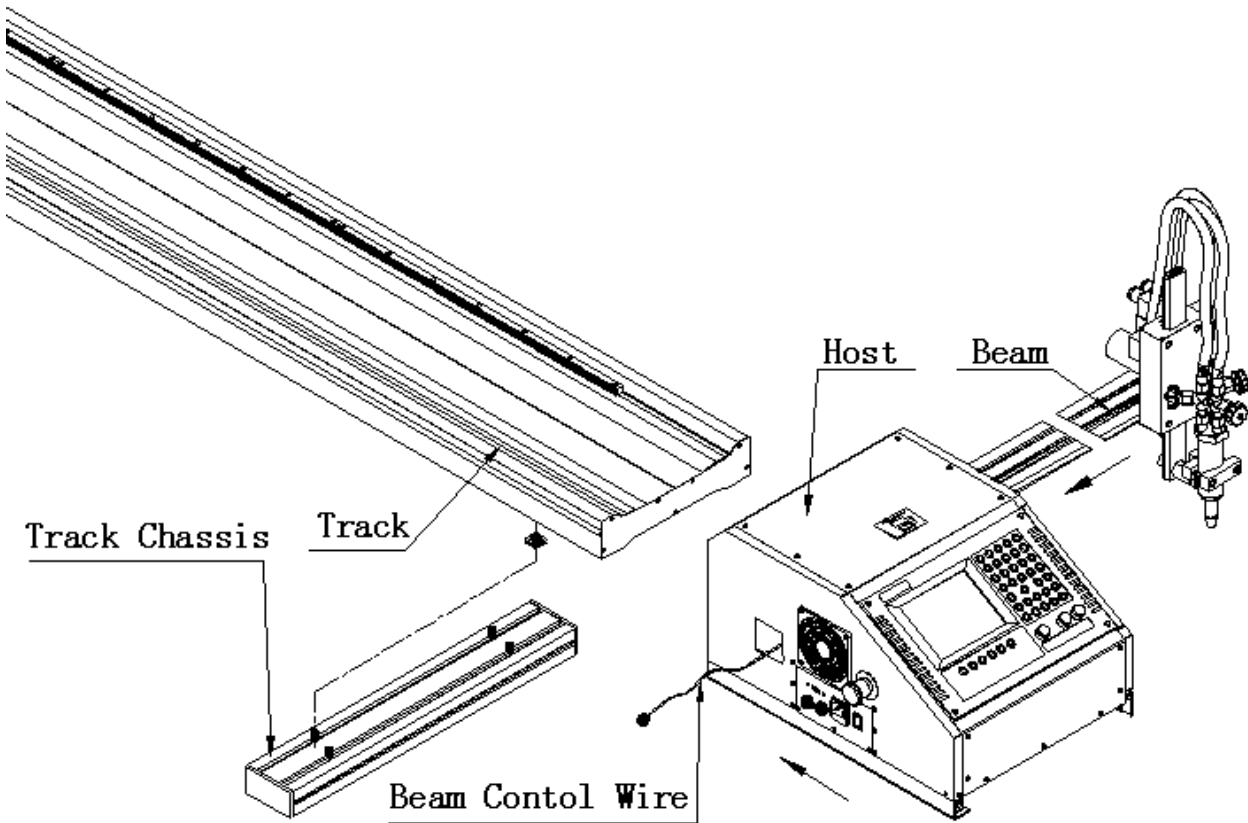
Pull on the control line of the beam through the nick on the side of the machine in advance. Then push the beam as the aspect shown in illustration. Pay attention to the cooperation between track and pulley.

3.5.3 Assemble Torch

Fix up the cutting torch and keep it upright to the horizontal level. The holder should also be fixed up with the beam with connection bolt. Connect the interface of preheating oxygen, cutting oxygen with solenoid valve and gas tube to the equipment. Wind up each plug's nut, and the screw of
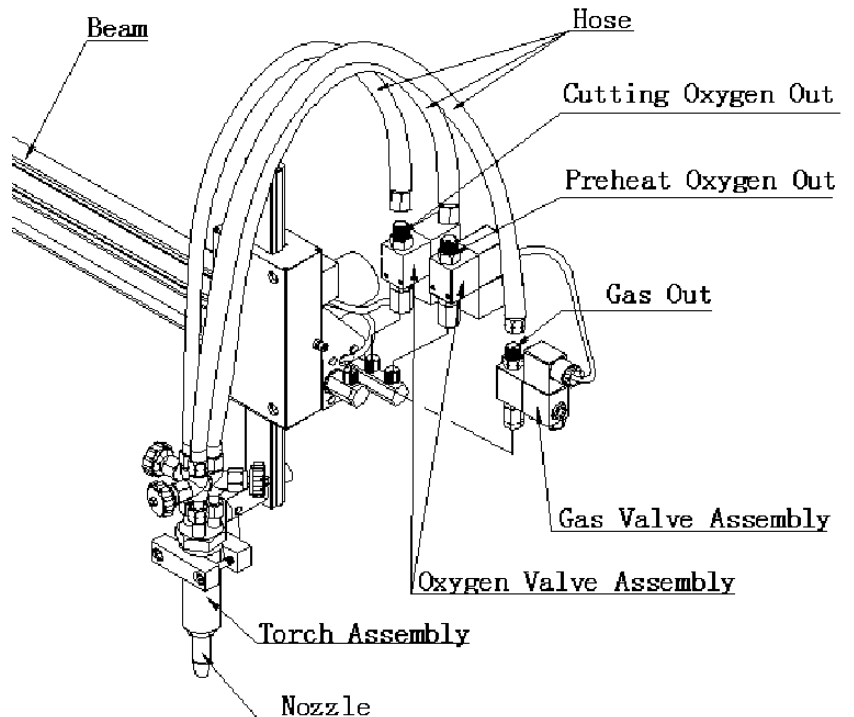
gas-run plug is levorotatory with the marks on the nut. Pay attention to the direction while connecting as well as the color of gas tube. The red one is gas, and the black stands for oxygen. The tie-in is marked.

3.5.4 Gas Tightness Check

Examine the gas tightness of the gas circuit by the soap solution method under the working pressure. The equipment can put into use after affirm that there is not any leakage.

3.5.5 The Connection between Power and Control Line

		Warm Electrocution can harm body safety.
		Before maintaining, cut off power.

The equipment configures standard 3m power cable, directly plugs into Multi-plug Socket;
Beam control line connects power panel plug on equipment back, and revolve tight.

3.5.6 Earthing

Using the equipment must comply with national or local electrical requirement, correctly grounded through the power cord. Also see in Earthing in the Safety section of this manual.

3.5.7 Atmogenic Assembly

		Warm Gas pressure can not exceed rating pressure equipment requires. If pressure is too high, air pipe can burst.。

About atmogenic assembly of oxygen, propane, or acetylene, carry out it according to concerned local and country regulations.
●Supply tie-in and hoop of oxygen and gas respectively, connect and revolve tight respectively.
●When supplying, tie-in and hoop of oxygen and gas are in packing.
●Oxygen pressure can not exceed rating pressure equipment technical parameters; otherwise, valve can not open. When needing use pressure of big flow and exceed rating value, please contact the manufacturer.

3.5.8 Torch Adjustment

When assembling torch, vertical with work piece, to gain vertical cut. With square, make torch aim the position of 0 ° and 90 °.

Torch

0° 90°
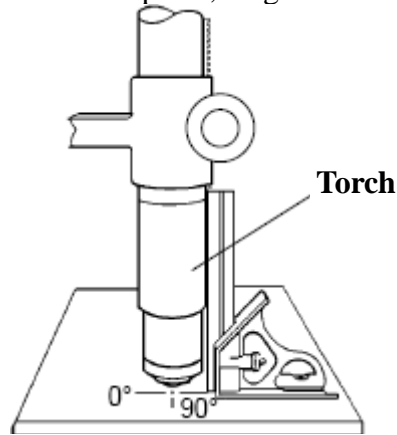
3.5.9 Equip Plasma User with Plasma Cable Bracket Assembly (Option)

· Assemble every component and fix up the plasma cable with tighten wire. Insert the plasma cutting gun into the holder.

Attention: Refer to plasma cutting machine manual, grounding plasma power groundwire with equipment casing.

M8 Square Nut Set in Beam

Rail

Holder
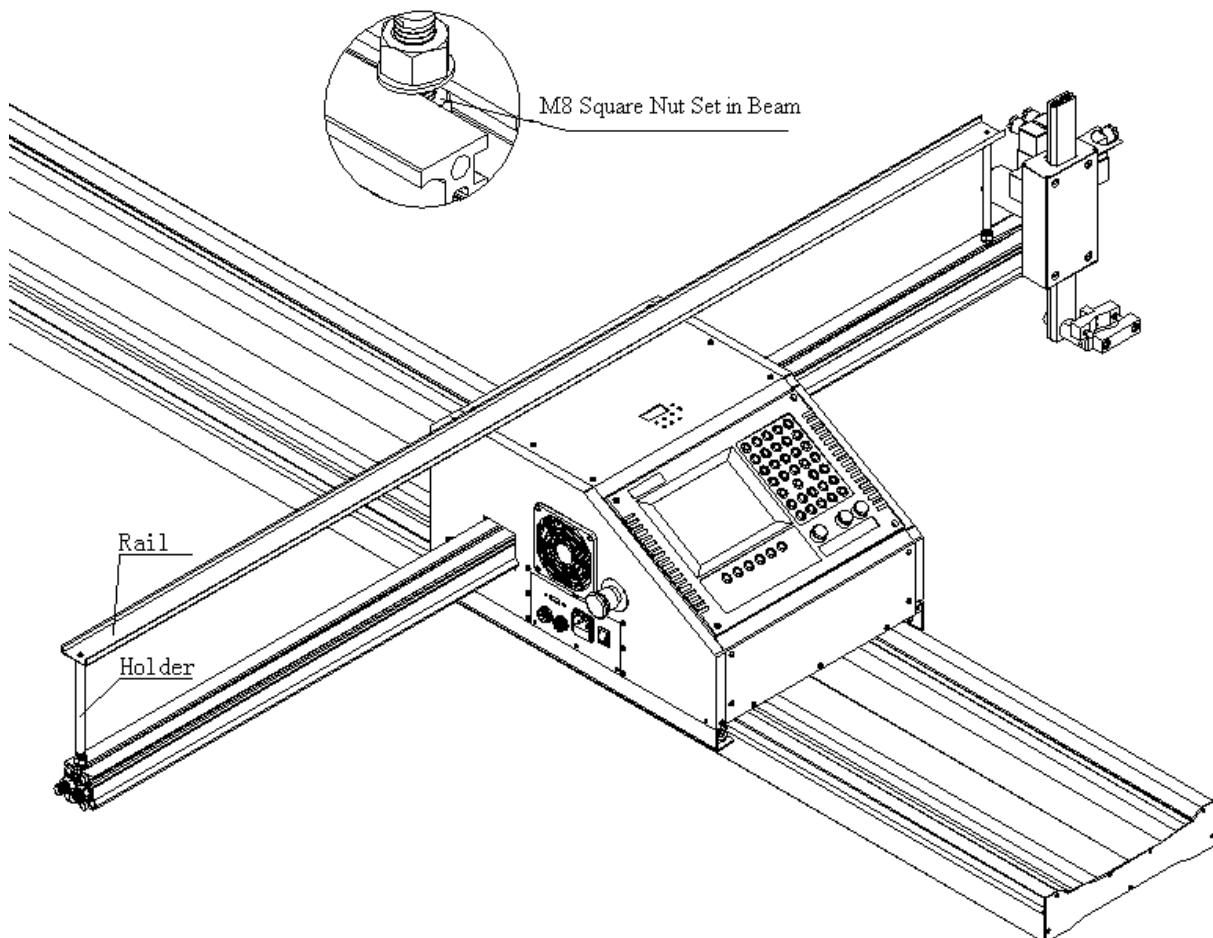
Chapter Four

Use and Operate

In This Section:

4. 1 Summarize

4.1.1 Brief Introduction

The digital controller F2100B is a new production, which is integrated many merits of the same productions at home and aboard. The controller can control the motion of two axis, which is apt to the application of flame or plasma cutting. This controller is very light and handy and it is very easy to operate. The controller provides menu or illustration for all the operations for the convenience of users. All key switches are human oriented designed, and they are very convenient and comfortable.

The controller chooses high speed DSP and ARM as its core to assure the cutting process to be more stable. The motion control algorithm is optimized so that the machine can move more stale and reliable, and it can save the life of the motor and the mechanical parts.

Fig1.2 F2100BB

4.1.2 Characteristics Of System

1） 7 inches 800*680 dots color LCD.
2） Chinese/English file system and menu, and the menu can be switched only by one key.
3） 45 categories different graphics (including grid pattern), chip part and hole part are alternative.
4） Support the EIA code (G code) and various FastCAM、FreeNest、SmartNest、IBE softwares.
5） compact keyboard design and easy to input files.
6） Graphics have some operations such as Proportion, Rotate, Mirror.
7） Graphics can be arrayed in matrix, interaction, stacked modes.
8） Steel plate can be adjusted according any steel side.
9） Coordinate system can be customized to support the two-dimensional coordinates of all eight kinds.
10） All input and output port type and the number can be customized (normally open or normally closed)
11） Self-diagnostic function, to diagnose the key status and all the IO status, facilitate inspection and debug
12） Provide a front USB interface for copying files.
13） system can be upgraded by USB interface easily, and we provide lifetime free upgrade service.
14） all functions and techniques can upgrade online and don't worry about the after sale service.
15） Import and export files by single or all files.

16) Display time, week and clock.

17) Parameters backup and online upgrade.

18) Support the Flame, Plasma, Dusting draw and Demonstration four kinds of mode.

19) Including various types of processing parameters to meet the needs of different processes.

20) Flame and Plasma are separated in the control IO ports.

21) Support THC, two level preheat, three level pierce in flame mode.

22) Plasma arc feedback, positioning feedback, automatically shut down the arc at the corner.

23) Support edge cutting. It can save the preheat time for the thick steel plate.

24）Movement speed can be real-time acceleration, deceleration.

25）According to plate thickness, the cutting speed is automatically restricted by a speed limit in the corner, effectively preventing over burn.

26）select row and column manually.

27）Dynamic/static illustration of the process, graphics zoom in / out, dynamically tracking cut-off point under zooming state.

28）DSP as core can control the machine move in high speed accurately, stability and in low noise.

29）Starting speed and acceleration can be set by your convenience.

30）Automatically memorize the working situation and the last cutting point when power off.

31）"Cutting offset" function can avoid waste the steel plate when the nesting of the plate is calculated wrong.

32）set up different administration authority and the corresponding password to safeguard the interests of managers.

33）Long-distance remote control can control the machine to move forward ,backward, left, right and cutting start, stop and so on （optional configuration）.

4.1.3 Technical Standard

1）Control Axis：2

2）Control accuracy ：+/-0.001mm

3）Coordinate range：+/- 99999.999mm

4）Max pulses : 200kHz   Max speed：15000 mm/m

5）Max lines of code：10000lines

6）Max size of single code file：1M

7）Time resolution ：10ms

8）Working Voltage：DC 24V in put

9）Working Temperature：-10℃-60℃. Relative Humidity, 0-95%.

4.1.4 System Interface

1) 15 pins interface of 2 axis of motor drive.

2) 25 pins interface of 16 channels optical couple output ports，max back flow current 300mA.

3) 25 pins interface of 16 channels optical couple input ports，max output current 300mA.

4) USB interface on the front panel.

5) Extend IO input/output ports, PWM input ports, analog input ports.

4.1.5 Hardware Configuration

1) Monitor:15 inch, 1024*768, high definition 16 million colors and high brightness LCD or 10.4 inch 800*600, 26 million color LCD.

2) Memory: 64M SDRAM

3) Memory available for user: 256M or 1G electronic hard disk

4) System master frequency: 400MHz

5) USB: USB 1.1 front interface

6) Keyboard: electronic PCB foil keyboard(one machine) or standard industrial keyboard(split type machine)

7) Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity.

4.2 System Board and Main Interface

4.2.1 Introduction of Operating Board

Fig 2.1   board and keys

【F1】-【F8】:   Function key in different interface

【S↑/PgUP】:   page-up key of code interface or Torch up in other interface

【S↓/PgDn】:   page-down key of code interface or Torch down in other interface

【F＋/HOME】:   Accelerate or skip to the head of code line

【F－/END】:   Decelerate or skip to the tail of code line

【1】–【9】:   during the cutting process, change the cutting speed to ratio of the speed limit you have
                        set, for example press 【1】, change the cutting speed to 10% of the speed limit you have
                        set, press 【2】, change the cutting speed to 20% of the speed limit you have set

4.2.2 Power on Process and Main Interface

When power just on, the system will go for the process of self scan：

```
Press F2 to run BIOS
Auto boot after: 3
```
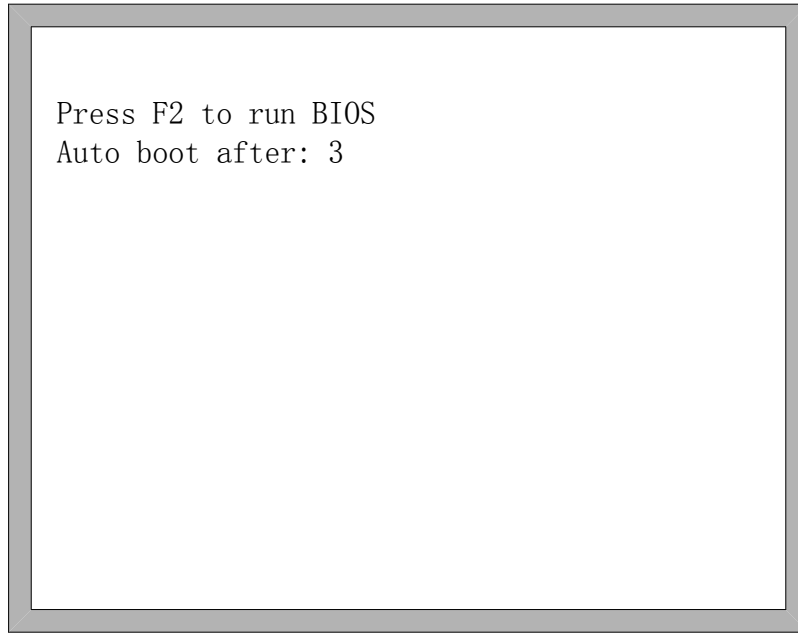
Fig 2.2 system self scan

In the starting process, there is 3 seconds to countdown, before the countdown is over, if pressing 【F2】, it will enter the bios starting interface shown as Fig2.3 (please take the reference of the appendix 2 to run bios). If pressing any other key, it will jump over the countdown and directly enter the welcome interface. If pressing no key, it will countdown to 0 and then enter the welcome interface shown as Fig2.4.

F1 - 系统升级(System software update)

F2 - 欢迎界面升级(Welcome picture update)

F3 - 运动控制升级(Motion update)

F4 - 系统备份(System backup)

F5 - 系统还原(System recovery)

F6 - 启动系统(Start system)

Fig 2.3 bios interface

In the welcome interface, press any key to enter the main interface automatically shown as Fig2.5:
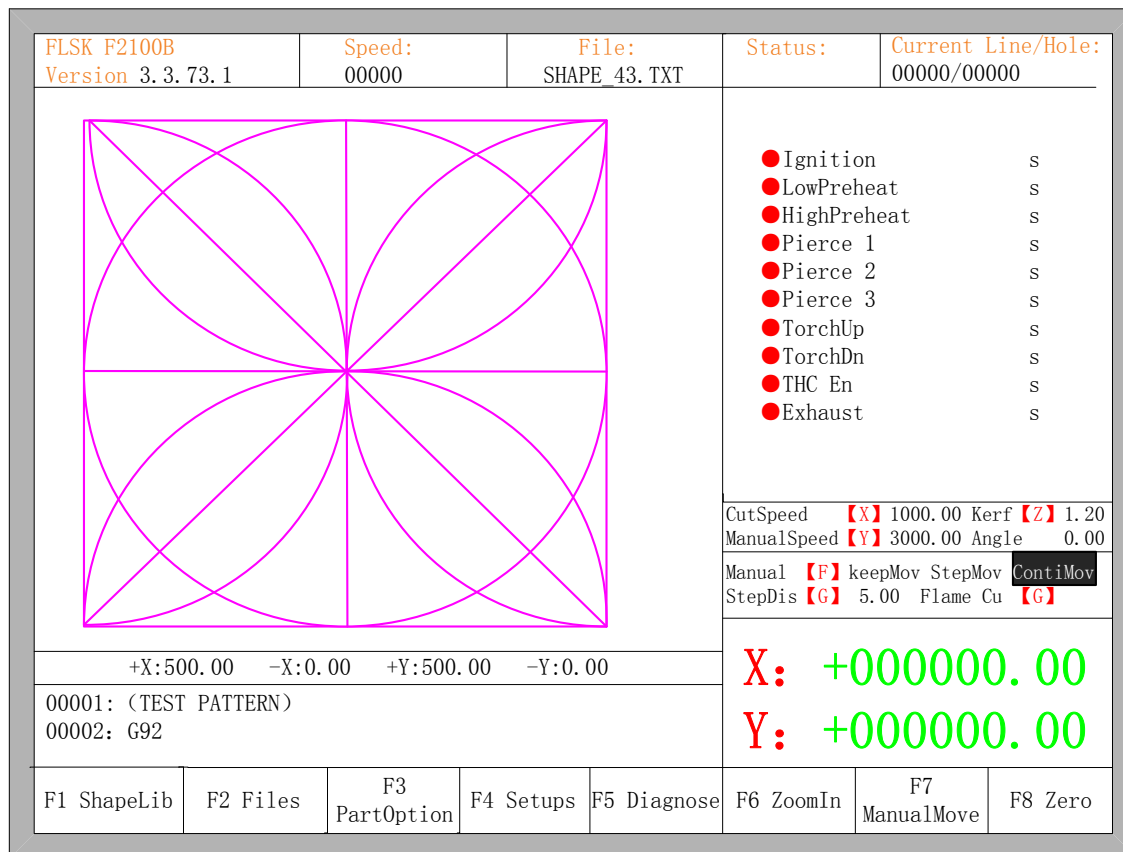
Fig 2.5 the main interface

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

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

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

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

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

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

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

【F7】: **Manual Move:** Manually move the machine.

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

【X】: **Cut Speed:** Setting the cutting speed.

【Y】: **Manual Speed:** Setting the manual moving speed.

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

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

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

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

4.2.3 Function index of main interface

Main Interface

- **F1 ShapeLib**
  - F8 OK
- **F2 Files**
  - F1 Disk File
  - F2 U Disk
  - F3 Search
  - F4 Edit File
  - F5 Del File
  - F6 Copy to U
  - F7 Preview
  - F8 OK
- **F3 Part Option**
  - F1 Mirror
  - F2 Angle
  - F3 Array
  - F4 Scale
  - F5 Select line and pierce
  - F7 Revert
  - F8 OK
- **F4 Setups**
  - F1 common
  - F2 Flame
  - F3 Plasma
  - F5 System
  - F6 Import Parameters
  - F7 Export Parameters
  - F8 Save
- **F5 Diagnose**
  - F1 Input Diagnose
  - F2 Output Diagnose
  - F3 Open Output
  - F4 Close Output
  - F5 Keyboard Diagnose
  - F6 System Self-check
  - F7 Date time
  - F8 System Definition
    - F1 Parameter Recovery
    - F2 Parameter Backup
    - F3 Definition
      - F1 Input
      - F2 Output
      - F3 Coordinate
      - F8 Save
    - F4 Encryption
    - F5 Decryption
    - F6 Language
    - F8 Update
- **F6 Zoom In**
- **F7 Manual Move**
  - F1 keep moving
  - F2 continue moving
  - F3 step moving
  - F4 Speed-Down
  - F5 Speed accelaration
  - F7 Recovery
- **F8 Zero**

4.3 Cutting Function

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

Fig 3.1   cutting function interface

Show the current work piece's cutting path, including the slotted value.

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

Show the current cutting speed, during processing, you can press the keyboard's number keys 【1】 - 【9】 to achieve quick speed regulation. For example, press the number 【3】, the speed is automatically adjusted to 30%; press the number 【8】 the speed is automatically adjusted to 80%.

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

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

In the cutting interface:

● Press 【X】: Modify the current maximum cutting speed.

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

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

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

●【START】(【F9】): Start cutting.

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

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

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

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

● 【F4】: Decrease the cutting speed, each decrease of 1% click rate.

● 【F5】: Increase the cutting speed, each 1% increase in click rate.

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

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

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

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

4.3.1 Cutting Operation Index

```
                ┌─────────────────┐
                │    Cutting      │
                │   Interface     │
                └─────────────────┘
                         │
                         │      ┌─────────────────┐
                         ├──────│       F1        │
                         │      │    Backward     │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│   F2 Forward    │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│   F3 Back to    │
                         │      │   reference     │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│    F4 Speed     │
                         │      │     Down        │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│    F5 Speed     │
                         │      │      Up         │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│   F6 Preheat    │
                         │      │     Down        │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         ├──────│   F7 Preheat    │
                         │      │      Up         │
                         │      └─────────────────┘
                         │      ┌─────────────────┐
                         └──────│   F8 Jump to    │
                                │     pierce      │
                                └─────────────────┘
```
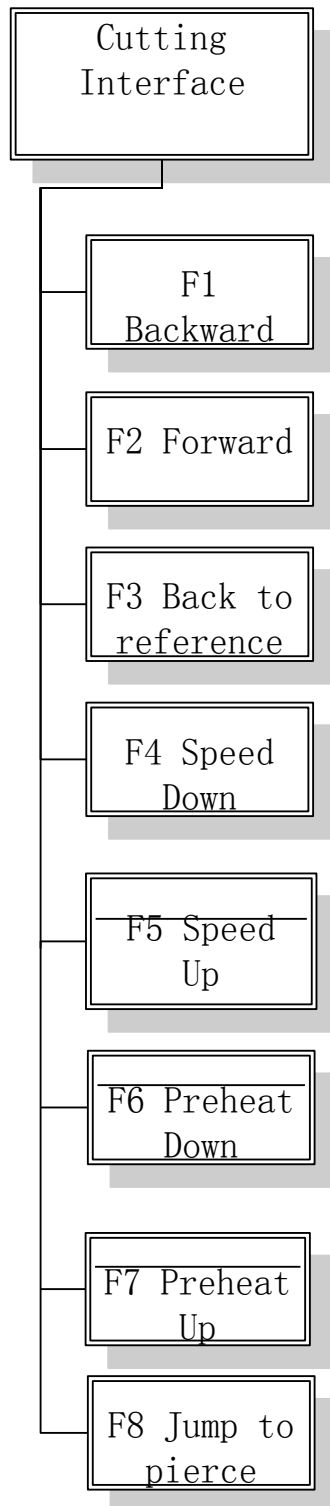
Automatic operation index

4.3.2 Speed Regulation

3.2.1 Normal Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can regulate speed.

The operation panel, press 【F5】 or 【PRE】, increasing at a rate per click rate of 1%.Hold the 【F5】 or 【PRE】, then the rate will continuously increase to 100%.Increased to 100%, the speed is "common parameters" in the "cutting speed."

The operation panel, press 【F4】 or 【NEXT】, each click rate of speed reduced by 1%.Hold the 【F4】 or 【NEXT】, then the rate will be continuously reduced to1%. Reduced to a very slow speed when running in order to ensure the accuracy requirements, the system may auto-adjust the speed based on the size of "horizontal pulses" and "vertical pulses", actual speed may not be the "cutting speed" of 1% is greater than 1%.

3.2.2 Quick Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can carry out quick speed regulation.

In the cutting interface, on the operation panel, press the number keys 【1】 - 【9】, the speed will quickly adjust to the corresponding percentage figures 10 times, for example press 【3】, adjust to 30% of the speed limit you have set, press 【8】, adjust to 80% of the speed limit you have set.

4.3.3 Forward

In the automatic function interface, press key 【F1】, the machine start to move without real cutting. The process does not include any ignition, perforation and any other I/O working. The machine just moves the torch according to the graphic figure.

The function can be used to check the trail and code before you start the real cutting process, or can also be used when the process needs through the gun. Press the red "STOP" key to stop the null cutting process if you want.

4.3.4 Backward

During the running process, if you want to go backward according to the origin trail to (maybe the iron board was not cut through), you can follow the following direction:

● First, press "STOP" key to set the machine at pause status.

● In the automatic function interface, press key【F3】(Back) to make the machine go backward along with the original trail. When the torch reaches the position you need, press "STOP" key to stop it. You may press key 【F2】 to go forward if the machine just went back too much.

Notice: Go backward or forward function can be used repeatedly to make the machine reach an ideal position.

● When the torch reaches the position you need, press "START" key again, if the current cutting code is G01, G02 or G03, system will automatically perforate before performing these procedures, and then continue the current program, if the current row is not G01, G02 or G03, the system will directly continue the current line program.

4.3.5 Edge Cutting / Offset Cutting / Return

When the torch is not on the actual path of the current work piece, it will prompt as follows:

```
┌─────────────────────────────────────────────────────────────────────────┐
│ FLSK F2100B        Speed:        File:         Status:  Current Line/Hole:│
│ Version 3.3.71.1   00000     SHAPE_43.TXT      Pause    00000/00000        │
│                                                                           │
│                                          ●Ignition            s           │
│                                          ●Lowheat             s           │
│          [G]Cutting return               ●HighPreheat         s           │
│          [X]Offset cutting               ●Pierce 1            s           │
│                                          ●Pierce 2            s           │
│          [Y]only return                  ●Pierce 3    0.1     s           │
│                                          ●TorchUp             s           │
│                                          ●TorchDn             s           │
│                                          ●THC En              s           │
│                                          ●Exhaust             s           │
│                                                                           │
│                                    CutSpeed  【X】1000.00 Kerf【Z】1.20    │
│                                    ManualSpeed【Y】3000.00 Angle   0.00    │
│                                    Manual 【F】keepMov StepMov ContiMov    │
│                                    StepDis【G】5.00 Flame Cu 【M】         │
│     +X:500.00  -X:0.00  +Y:500.00  -Y:0.00    X: +000000.00               │
│  00001:（TEST PATTERN）                        Y: +000000.00               │
│  00002：G92                                                                │
│                                     F4              F6      F7      F8     │
│  F1 Back  F2 Forward  F3 GoBack  SpeedDown F5 SpeedUp PreheatDown PreheatUp JumptoPierce│
└─────────────────────────────────────────────────────────────────────────┘
```

Fig. 3.2 edge perforation

There are two reasons led to this situation:

(1) When the common parameter "edge perforation" selects "Yes" and the next processing line G-code is M07, the system will be automatically suspended. At this time, the torch can be manually moved to any edge of the plate, press the "start" button, the system will prompt as above

(2) When the processing is paused, due to mechanical failure or other reasons, it needs to move the torch out of the actual path of the workpiece, the above prompt will appear.

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

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

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

4.3.6 Back to Reference Function

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

Fig. 3.3 return reference prompt

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

Fig. 3.4 main process interface

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

4.3.7 Oxygen Gas Preheat Time Regulation

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

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

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

For example: the original system sets the preheat time of 60 seconds after null cutting, when preheat needed, the interface will count down, under normal circumstances, till 0, the system begins the next step of cutting, but if the system has the remaining 10 seconds of countdown time, press F6, then the system immediately stops preheat to begin the next step of cutting, and records the preheat time of 50 seconds, the system automatically thinks that users need preheat time of 50 seconds, the next preheat after the null cutting when the preheat time becomes 50 seconds.

● In the preheat process, each press the F7 key, preheat time increases by 15 seconds, and the preheat time maintains the increased value.

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

4.3.8 Perforation Point Selection

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

```
┌──────────────────────────────────────────────────────────────────────────┐
│ FLSK F2100B        Speed:          File:         Status:   Current Line/Hole:│
│ Version 3.3.71.1   00000        SHAPE_43.TXT     Pause     00000/00000      │
│                                                                             │
│                                                 ●Ignition           s       │
│                                                 ●Lowheat            s       │
│              ┌─────────────────────────────┐    ●HighPreheat        s       │
│              │                             │    ●Pierce 1           s       │
│              │                             │    ●Pierce 2           s       │
│              │    Jump to new pierce?      │    ●Pierce 3    0.1    s       │
│              │                             │    ●TorchUp            s       │
│              │    ENTER: Sure  ESC: Cancel │    ●TorchDn            s       │
│              │                             │    ●THC En             s       │
│              │                             │    ●Exhaust            s       │
│              │                             │                                │
│              └─────────────────────────────┘  CutSpeed  【X】1000.00 Kerf【Z】1.20│
│                                               ManualSpeed【Y】3000.00 Angle  0.00│
│                                               Manual 【F】keepMov StepMov ContiMov│
│                                               StepDis【G】 5.00  Flame Cu 【M】   │
│   +X:500.00  −X:0.00  +Y:500.00  −Y:0.00      X: +000000.00                 │
│ 00006: G01 X0 Y500.00                                                       │
│ 00007: G01 X500.00 Y0                         Y: +000000.00                 │
│ ┌────────┬───────────┬─────────┬───────┬──────────┬─────────┬────────┬──────┐│
│ │F1 Back │F2 Forward │F3 GoBack│  F4   │F5 SpeedUp│   F6    │  F7    │  F8  ││
│ │        │           │         │SpeedDown│        │PreheatDown│PreheatUp│JumptoPierce││
│ └────────┴───────────┴─────────┴───────┴──────────┴─────────┴────────┴──────┘│
└──────────────────────────────────────────────────────────────────────────┘
```

Fig. 3.5 select new pierce

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

```
FLSK F2100B          Speed:          File:           Status:     Current Line/Hole:
Version 3.3.71.1     00000        SHAPE_43.TXT       Pause       00000/00000

                                                        ●Ignition           s
                                                        ●Lowheat            s
                                                        ●HighPreheat        s
        Input No. of pierces:                           ●Pierce 1           s
        Press <- -> select No. of pierce               ●Pierce 2           s
        0                                               ●Pierce 3    0.1   s
                                                        ●TorchUp            s
                                                        ●TorchDn            s
                             F8:OK                       ●THC En             s
                                                        ●Exhaust            s

                                                  CutSpeed   【X】1000.00 Kerf【Z】1.20
                                                  ManualSpeed【Y】3000.00 Angle    0.00
                                                  Manual 【F】keepMov StepMov ContiMov
                                                  StepDis【G】 5.00  Flame Cu  【M】

     +X:500.00   -X:0.00   +Y:500.00   -Y:0.00    X: +000090.20
  00006: G01 X0 Y500.00
  00007: G01 X500.00 Y0                            Y: +000024.10

  F1 Mirror  F2 Angle  F3 Array  F4 Scale  F5       F6 EditFile F7 Revert  F8 OK
                                           SelLinePierce
```
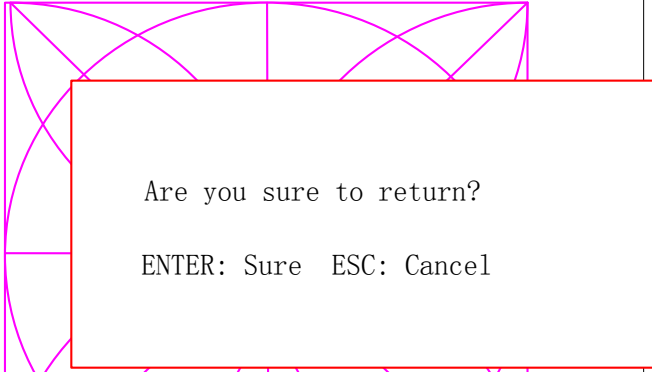
Fig. 3.6 pierce prompt

pierce point can be input manually at this time. You can also press ESC to exit without manual input perforation point, and then press the left and right arrow keys to select the perforation point.

4.3.9 Dynamic Amplification

After the start of cutting, the F8 in the cutting interface will become "dynamic amplification", then press the F8 key, full-screen amplify the processing graphic , and dynamically tracking.

```
F1 Back  F2 Forward  F3 GoBack  F4        F5 SpeedUp  F6          F7         F8 ZoomIn
                                SpeedDown              PreheatDown PreheatUp
```
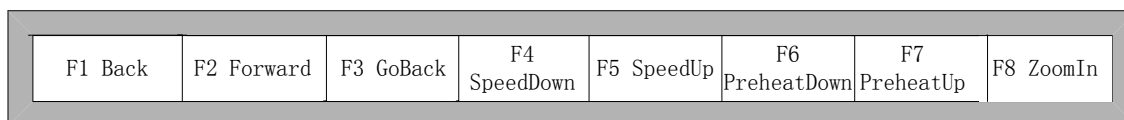
● Press the F8 key continuously, the system will progressively amplify graphic.
● Press ESC to exit the amplified display, back to the cutting interface.

4.3.10 Cutting Exit

When the cutting operation does not get finished, and the cutting machine also being in the pause condition, if press 【Esc】, the system will query whether quit the cutting operation. If pressing 【Enter】, the system will exit, and if pressing 【Esc】the system will not exit, get into the automatically interface and go on with the cutting operation at the current place.

Fig. 3.7 Quit of cutting

4.4 Part Options

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

Fig 4.1 Part options

4.4.1 XY mirror

Press F1, the system will prompt:

```
F1 Xmirror
F2 Ymirror
```

- Press F1 to mirror along the horizontal axis(X axis)
- Press F2 to mirror along the vertical axis(Y axis)

● Press ESC to exit mirror operation

4.4.2 Angle adjustment

Press F2, the system will prompt:

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

● Press F1 to adjust steel plate
● Press F2 to enter angle directly
● Press ESC to exit angle adjusting

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

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

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

And then manually move along the cutting tip, as long as moving to the edges of the side. After ensuring the two points far enough and two points at the same side of the plate in the same line and press 【Y】. The system will automatically calculate the current offset angle of plate, and then automatically rotate graphics.
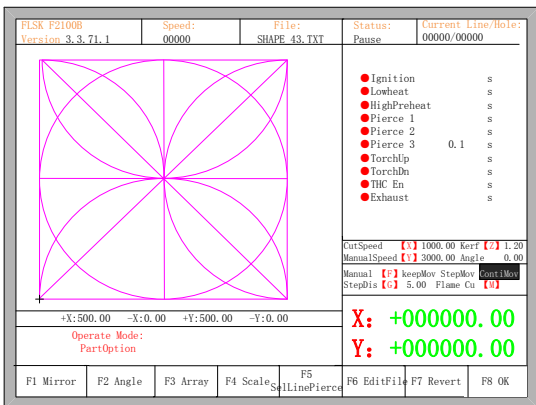
Before adjusting   After adjusting
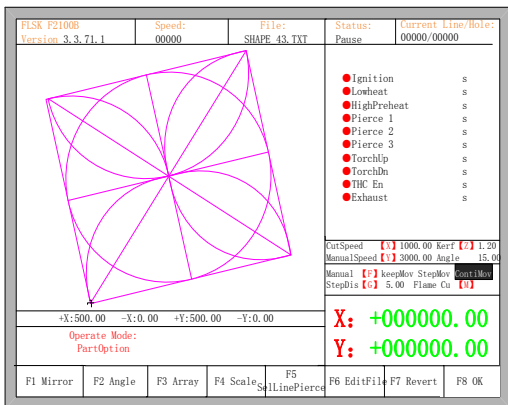
After adjusting, the system will ask whether to return to the start point, if press [ENTER],the system will back to the start point of the operation, if press [ESC], the system will do nothing but go back to the graphic interface.

```
FLSK F2100B        Speed:        File:          Status:    Current Line/Hole:
Version 3.3.71.1   00000         SHAPE_43.TXT   Pause      00000/00000

                                              ● Ignition              s
                                              ● Lowheat               s
                                              ● HighPreheat           s
                   ┌──────────────────────┐   ● Pierce 1              s
                   │                      │   ● Pierce 2              s
                   │ ENTER: Return back   │   ● Pierce 3      0.1     s
                   │ ESC:   Don't move back│  ● TorchUp              s
                   │                      │   ● TorchDn              s
                   │                      │   ● THC En               s
                   │                      │   ● Exhaust              s
                   │                      │
                   │                      │
                   └──────────────────────┘   CutSpeed   【X】1000.00 Kerf【Z】1.20
                                              ManualSpeed【Y】3000.00 Angle    0.00
                                              Manual 【F】keepMov StepMov ContiMov
                                              StepDis【G】 5.00  Flame Cu 【M】

     +X:500.00   -X:0.00   +Y:500.00   -Y:0.00    X： +000090.20
  00006: G01 X0 Y500.00                           Y： +000024.10
  00007: G01 X500.00 Y0

  F1 Mirror   F2 Angle   F3 Array   F4 Scale  F5        F6 EditFile F7 Revert   F8 OK
                                             SelLinePierce
```
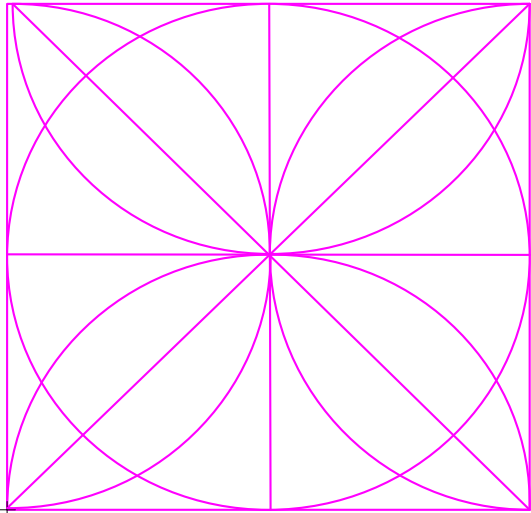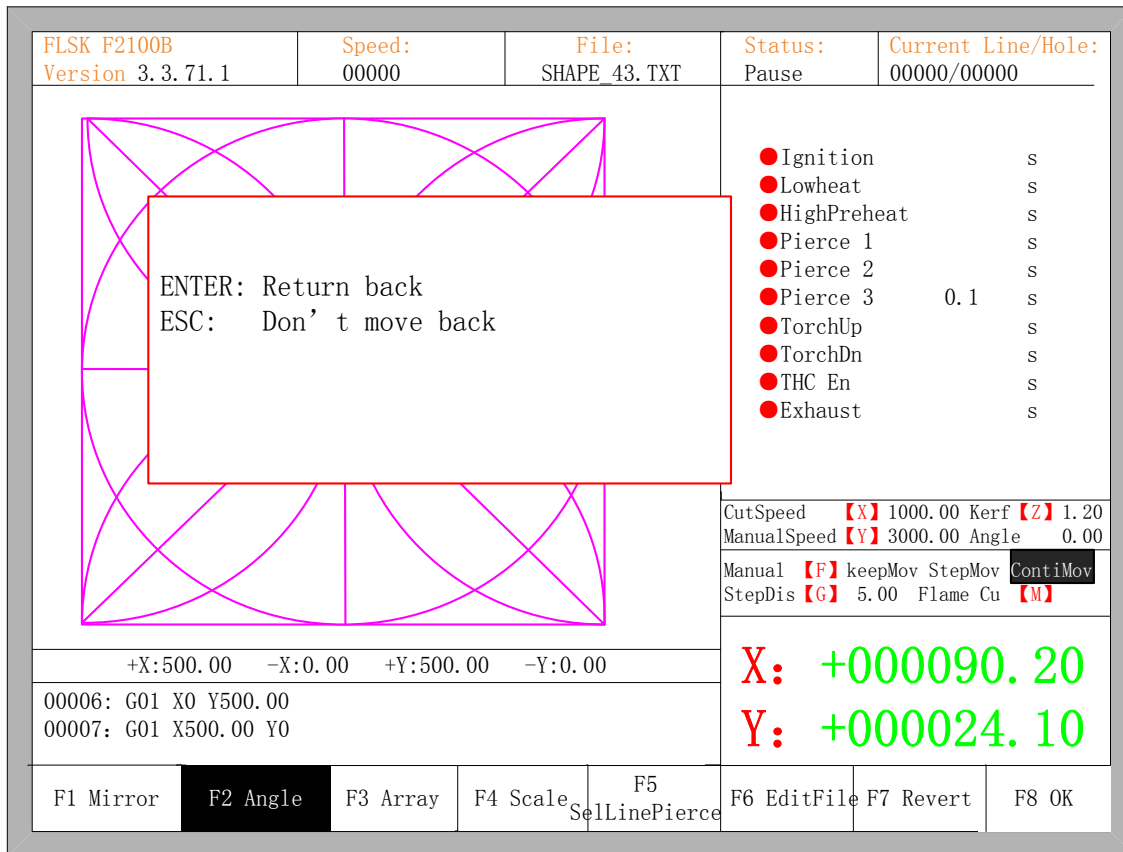
<p align="center">Fig 4.2 Return to the start point after adjusting</p>

4.2.2 Enter angle

When the angle of the current work piece is known, you can enter the angle:
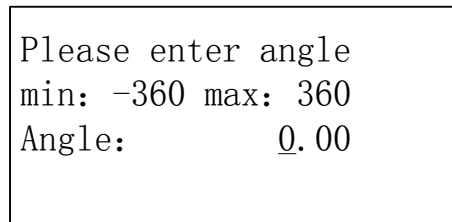
```
┌─────────────────────────┐
│ Please enter angle      │
│ min: -360 max: 360      │
│ Angle：        0.00     │
│                         │
│                         │
└─────────────────────────┘
```

<p align="center">Enter angle</p>

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

4.4.3 Array

In the part options menu, press [F3], the system will prompt as Fig 4.3, there are three ways to arrange, arrange in matrix, staggered arrange, arrange in stack.
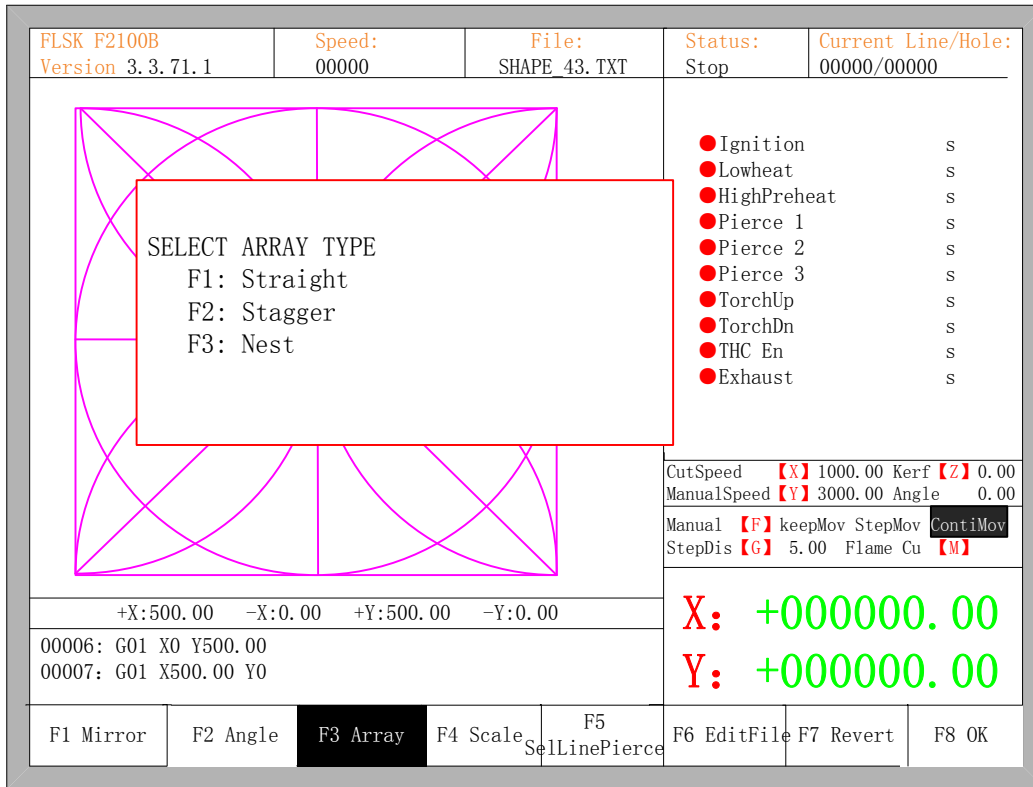
Fig 4.3 chooses arrange method

Press [F1] to carry on arranging in matrix:
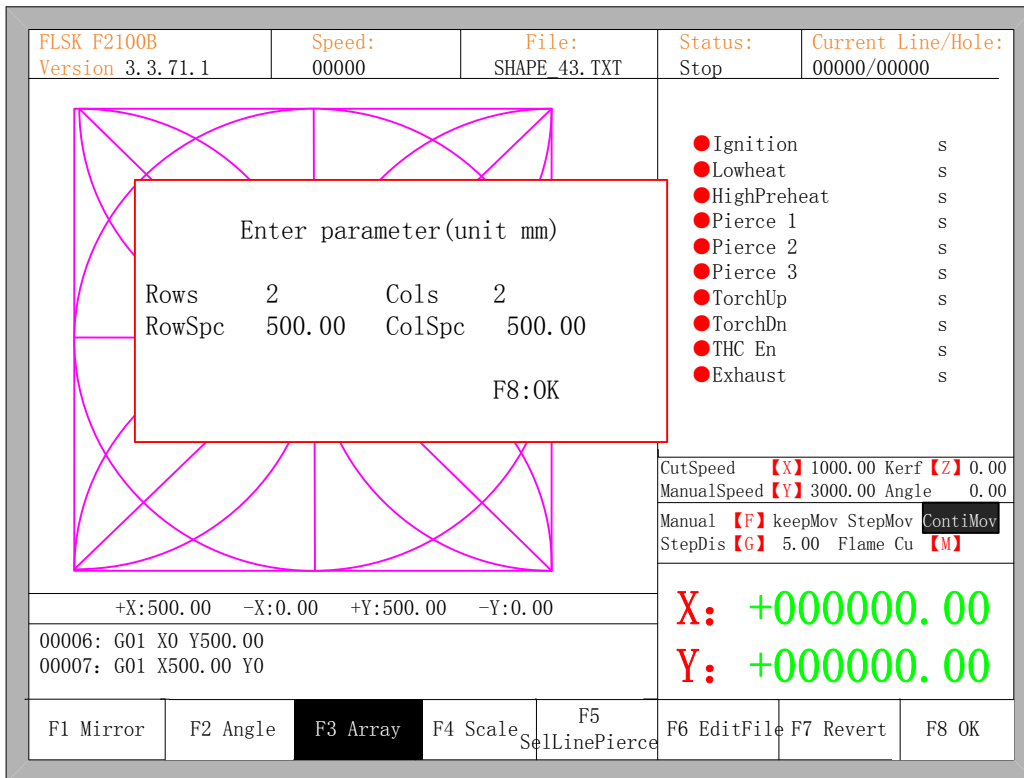
Fig 4.4 arrange in matrix

The result is shown in fig 4.5

Fig 4.5 result of arranging in matrix

Press [F2] to enter staggered arrangement:

Fig 4.6 staggered arrange

The result is shown in figure 4.7:

Fig 4.7 result of staggered arrangement

Press [F3] to enter arrangement in stack:

Fig 4.8 arrange in Nest

The result is shown in figure 4.9:

Fig 4.9 result of arrangement in nest

4.4.4 Zoom in/out

In the part options menu, press [F4] (zoom in/out),the system prompt as figure 4.10:

| FLSK F2100B | Speed: | File: | Status: | Current Line/Hole: |
| Version 3.3.71.1 | 00000 | SHAPE_43.TXT | Stop | 00000/00000 |

● Ignition   s
● Lowheat   s
● HighPreheat   s
● Pierce 1   s
● Pierce 2   s
● Pierce 3   s
● TorchUp   s
● TorchDn   s
● THC En   s
● Exhaust   s

Enter proportion
1.00

CutSpeed   【X】1000.00 Kerf【Z】0.00
ManualSpeed【Y】3000.00 Angle   0.00
Manual 【F】keepMov StepMov ContiMov
StepDis【G】 5.00 Flame Cu 【M】

+X:500.00   −X:0.00   +Y:500.00   −Y:0.00

Operate Mode:
PartOption

X: +000000.00
Y: +000000.00

| F1 Mirror | F2 Angle | F3 Array | F4 Scale | F5 SelLinePierce | F6 EditFile | F7 Revert | F8 OK |

Fig 4.10 set scale

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

4.4.5 Select row/number

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

| FLSK F2100B | Speed: | File: | Status: | Current Line/Hole: |
| Version 3.3.71.1 | 00000 | SHAPE_43.TXT | Stop | 00000/00000 |

●Ignition   s
●Lowheat   s
●HighPreheat   s
●Pierce 1   s
●Pierce 2   s
●Pierce 3   s
●TorchUp   s
●TorchDn   s
●THC En   s
●Exhaust   s

F1   Select Line
F2   Select pierce

CutSpeed   【X】1000.00 Kerf【Z】0.00
ManualSpeed【Y】3000.00 Angle   0.00
Manual 【F】keepMov StepMov ContiMov
StepDis【G】 5.00 Flame Cu 【M】

X: +000000.00
Y: +000000.00

+X:500.00   −X:0.00   +Y:500.00   −Y:0.00

Operate Mode:
PartOption

| F1 Mirror | F2 Angle | F3 Array | F4 Scale | F5 SelLinePierce | F6 EditFile | F7 Revert | F8 OK |

Fig 4.11 select Line/Pierce

4.4.5.1 Select row

Press [F1] to select the number of row to start cutting with, the system prompts:
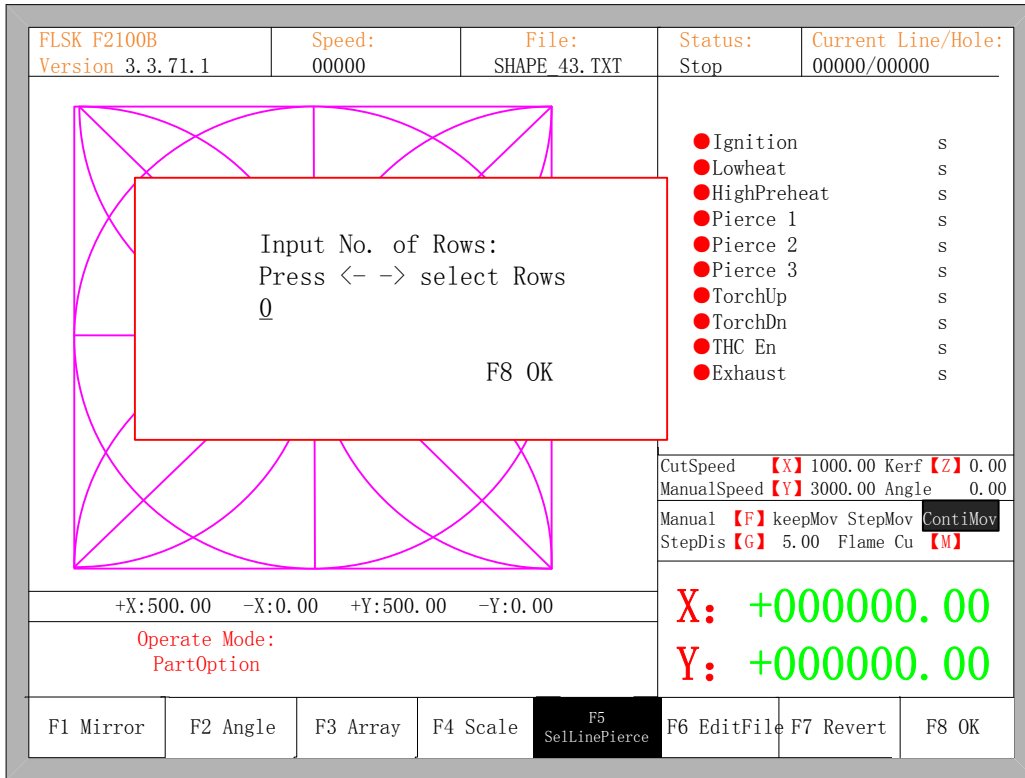
Fig 4.12 prompt to select row

Here , you can directly enter the row number or press ENTER to enter the interface and press ←or→to select row.
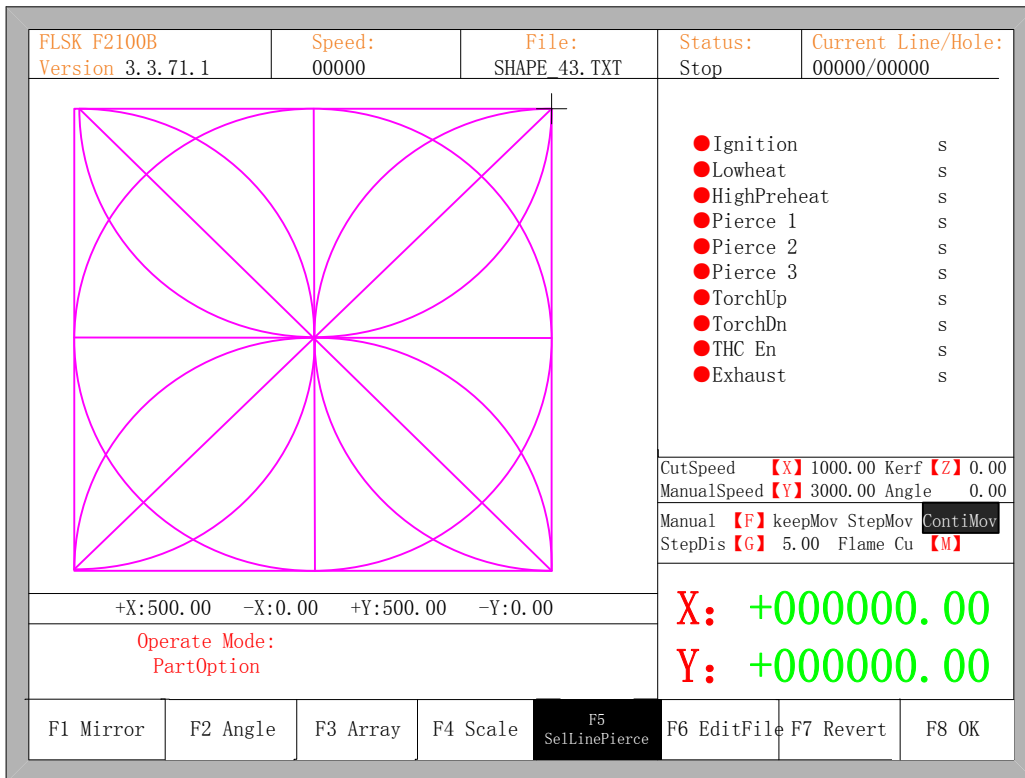
Fig 4.13 select row

After selecting row, press F8 to confirm.

4.4.5.2 select number

The operation is similar to the choosing row operation.

4.4.5.3 operation after select row/number

After selecting row or number, press F8 continuously to exit to the main interface. Press SPACE to enter the cutting interface, there are two kind of operation:
1 move from current position to the new position and then cutting
- Press F1 in the cutting interface, the system will directly run to the position of the selected row or number without cutting, then pause and wait for the next operation.

F1 Back	F2 Forward	F3 GoBack	F4 SpeedDown	F5 SpeedUp	F6 PreheatDown	F7 PreheatUp	F8 ZoomIn

- Press START in the cutting interface, the system will prompt:
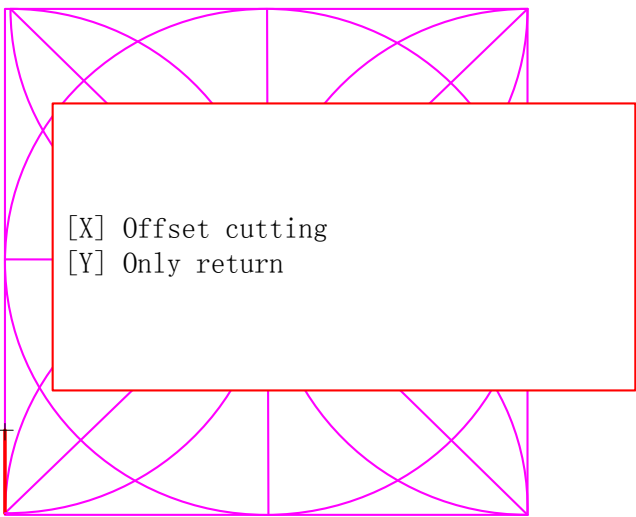
FLSK F2100B Version 3.3.71.1	Speed: 00000	File: SHAPE_43.TXT	Status: Pause	Current Line/Hole: 00000/00000

●Ignition   s
●Lowheat   s
●HighPreheat   s
●Pierce 1   s
●Pierce 2   s
●Pierce 3   0.1   s
●TorchUp   s
●TorchDn   s
●THC En   s
●Exhaust   s

[X] Offset cutting
[Y] Only return

CutSpeed 【X】1000.00 Kerf【Z】1.20
ManualSpeed【Y】3000.00 Angle 0.00
Manual 【F】keepMov StepMov ContiMov
StepDis【G】 5.00 Flame Cu 【M】

+X:500.00 −X:0.00 +Y:500.00 −Y:0.00

00006: G01 X0 Y500.00
00007: G01 X500.00 Y0

X: +000000.00
Y: +000048.70

F1 Back	F2 Forward	F3 GoBack	F4 SpeedDown	F5 SpeedUp	F6 PreheatDown	F7 PreheatUp	F8 JumptoPierce

Fig 4.14 operation after selecting row/number

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

56

2 Cutting from the current position

After the prompt of Fig 4.14, press X, then the system will start cutting from current position.

4.4.6 Restore

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

4.5 Manual Function

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

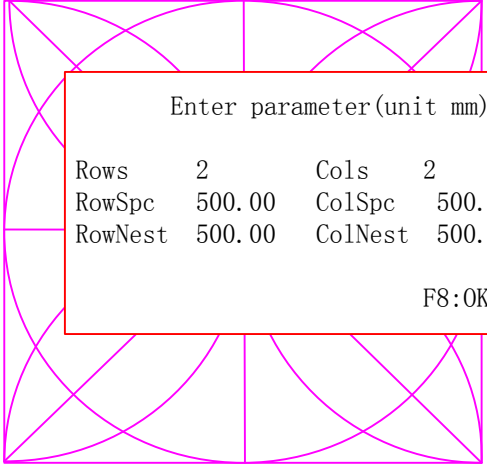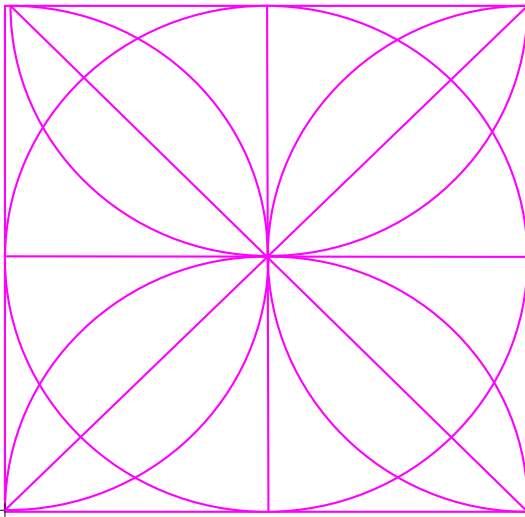| FLSK F2100B Version 3.3.71.1	Speed: 00000	File: SHAPE_43.TXT	Status: Stop	Current Line/Hole: 00000/00000

●Ignition   s
●Lowheat   s
●HighPreheat   s
●Pierce 1   s
●Pierce 2   s
●Pierce 3   s
●TorchUp   s
●TorchDn   s
●THC En   s
●Exhaust   s

CutSpeed   【X】1000.00 Kerf【Z】0.00
ManualSpeed【Y】3000.00 Angle   0.00
Manual 【F】keepMov StepMov ContiMov
StepDis【G】 5.00 Flame Cu 【M】

+X:500.00   −X:0.00   +Y:500.00   −Y:0.00

00006: G01 X0 Y500.00
00007: G01 X500.00 Y0

X： +000000.00
Y： +000000.00

| F1 KeepMov | F2
ContiMove | F3 StepMove | F4
SpeedDown | F5 SpeedUp | | F7
Recover | |

Fig 5.1   manual function interface

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

4.5.1 Fixed Moving Function

When you enter into the manual interface, the default option is continuous moving function. Press key 【F1】 to go for the fixed moving function. At this moment, the system will move toward the specified direction if any directory key is pressed, and when the directory key is released, the system will stop.

4.5.2 Continuous Moving Function

When in the manual interface, press F2 to enter the continuous-moving function interface. At this moment, the system will move toward the specified direction if any directory key is pressed and then released, and when the directory key or stop key is pressed the system will stop.

4.5.3 Fixed-length moving

In the manual interface, press F3 to enter the interface of fixed-length moving,. The system prompts to input the fixed length:

| FLSK F2100B | Speed: | File: | Status: | Current Line/Hole: |
| Version 3.3.71.1 | 00000 | SHAPE_43.TXT | Stop | 00000/00000 |

● Ignition   s
● Lowheat   s
● HighPreheat   s
● Pierce 1   s
● Pierce 2   s
● Pierce 3   s
● TorchUp   s
● TorchDn   s
● THC En   s
● Exhaust   s

Input the step distance

5.00

CutSpeed 【X】 1000.00 Kerf 【Z】 0.00
ManualSpeed 【Y】 3000.00 Angle 0.00
Manual 【F】 keepMov StepMov ContiMov
StepDis 【G】 5.00 Flame Cu 【M】

+X:500.00   −X:0.00   +Y:500.00   −Y:0.00

X： +000000.00
Y： +000000.00

00001: (TEST PATTERN)
00002：G92

| F1 KeepMov | F2 ContiMove | F3 StepMove | F4 SpeedDown | F5 SpeedUp | | F7 Recover | |
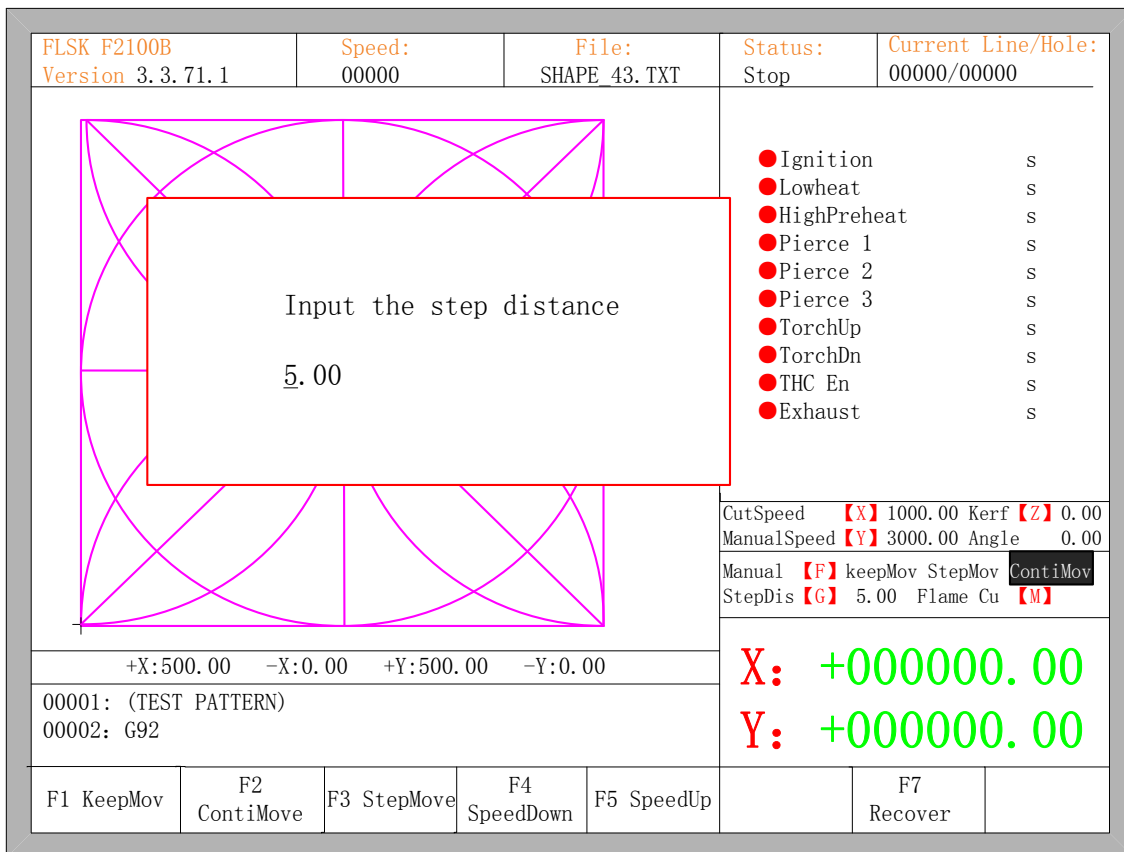
Fig 5.2 Input the fixed length

After inputting the fixed length, press ENTER. Press any direction key and then release, the system will move the fixed length toward the direction, in the process of moving, when any direction key or stop key is pressed, the system will stop moving.

4.5.4 Breakpoint Recovery

To guarantee that the breakpoint could work correctly, you need to satisfy the following conditions:

1. When the system is paused, the system will automatically regard the paused point as the current breakpoint and remember it.

2. When the system is in the process of incising, the breakpoint signal is connected with the urgent alarm input, when power is off, the system will regard the power-off point as the breakpoint and remember it.

When you need to process after the breakpoint, after the system powers on, don't move the torch, press F7 in the main interface to enter the manual function interface, then press F7 to recover the breakpoint. After recovering it, if the torch hadn't been moved and is on the position when the power is off, press START keyboard, the system will process directly.

After the breakpoint is recovered, if the position is off from the original one, you could move the torch to the original point manually, or realizing it through choosing rows or numbers. (Please refer to chapter 4.5 Row and number Selection). The method is : choose stopping incising, move the torch to the original point manually, choose the nearest row through choosing the row selection(or number selection), press "START", then the system will show in Fig 5.3:

Fig 5.3 restore breakpoint

- Press G, the system will start incising from point which is after moving, and after returning to the position before the torch moves, it will process according to the normal curve.
- Press X, regarding the position after moving as the position before moving, and then process.
- Press Y, move from the position after moving to the position before moving, then wait for the next operation.

4.6 File Operation

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

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

```
1:   SHAPELIB/SHAPE_18.TXT
2:   SHAPELIB/SHAPE_00.TXT
3:   SHAPELIB/SHAPE_01.TXT
4:   SHAPELIB/SHAPE_43.TXT
5:   SHAPELIB/SHAPE_.TXT
6:   SHAPELIB/UsedPart.abs
7:   SHAPELIB/UsedNoKf.abs
```

F1 DiskFile	F2 UDisk	F3 Search	F4 EditFile	F5 DelFile	F6 CopyToU	F7 Preview	F8 OK
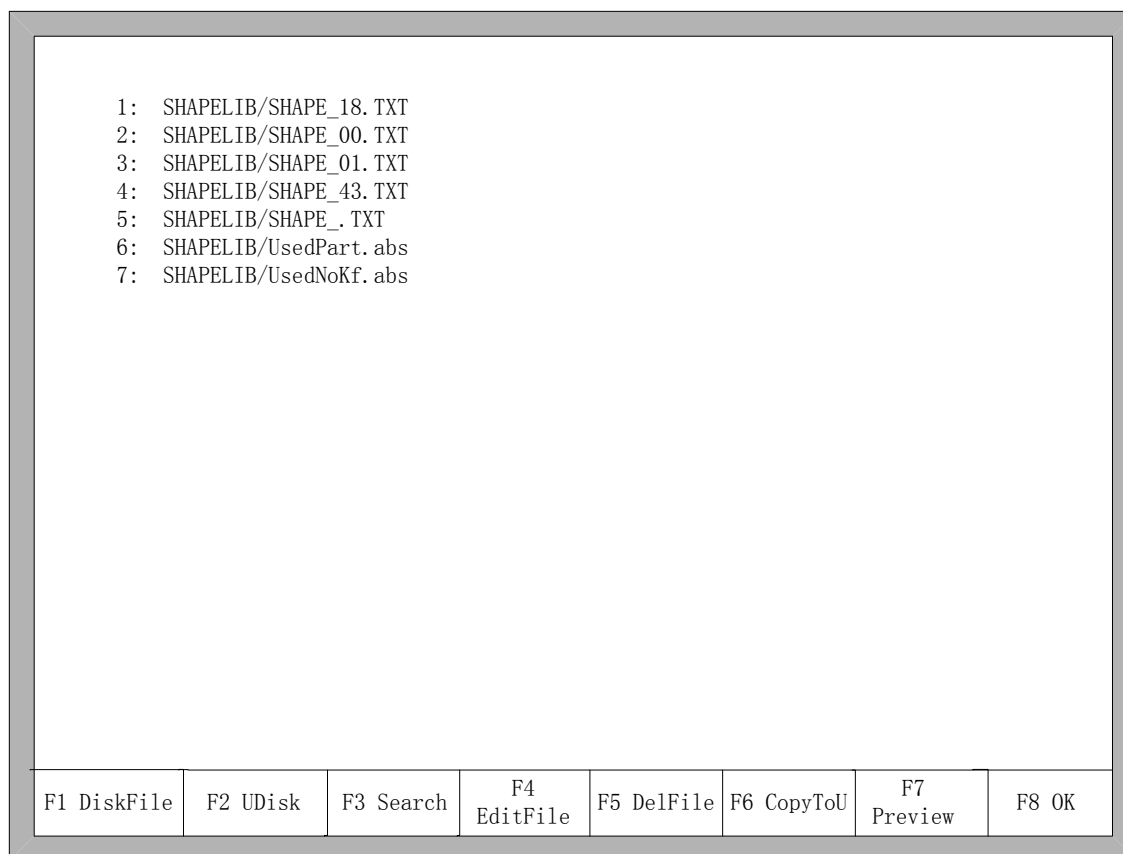
Fig 6.1 code interface

4.6.1 Files in the Hard Disk

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

- Press F4, if the current position of the cursor is txt file or cnc file, you could edit them. Please refer to chapter 6.5 on how to edit files.
- Press F5, if the current position of the cursor is txt file or cnc file, you could delete them.
- Press F6, if the current position of the cursor is txt file or cnc file, you could copy the current file to the flash disk when it is connected to the USB interface.
- Press F7, if the current position of the cursor is txt file or cnc file, you could preview the current graphic.

```
1:   SHAPELIB/SHAPE_18.TXT
2:   SHAPELIB/SHAPE_00.TXT
3:   SHAPELIB/SHAPE_01.TXT
4:   SHAPELIB/SHAPE_42.TXT
5:
6:
7:
```

| F1 DiskFile | F2 UDisk | F3 Search | F4 EditFile | F5 DelFile | F6 CopyToU | F7 Preview | F8 OK |

Fig 6.2 Graphic preview

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

4.6.2 Files in the U Disk

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

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

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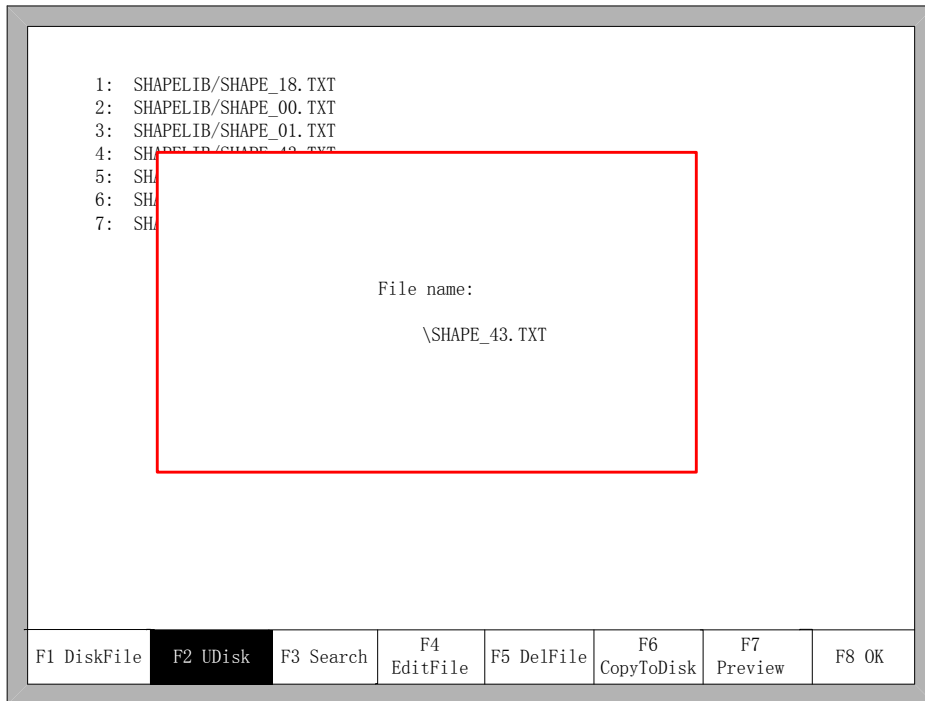
Fig 6.3 save U disk files

When input file name, if you do not want to change the file name,   you can be directly press   【Enter】
to preserved; or modify the file name and then press   【Enter】   to save. If the same named file has already
exited, the system prompts:
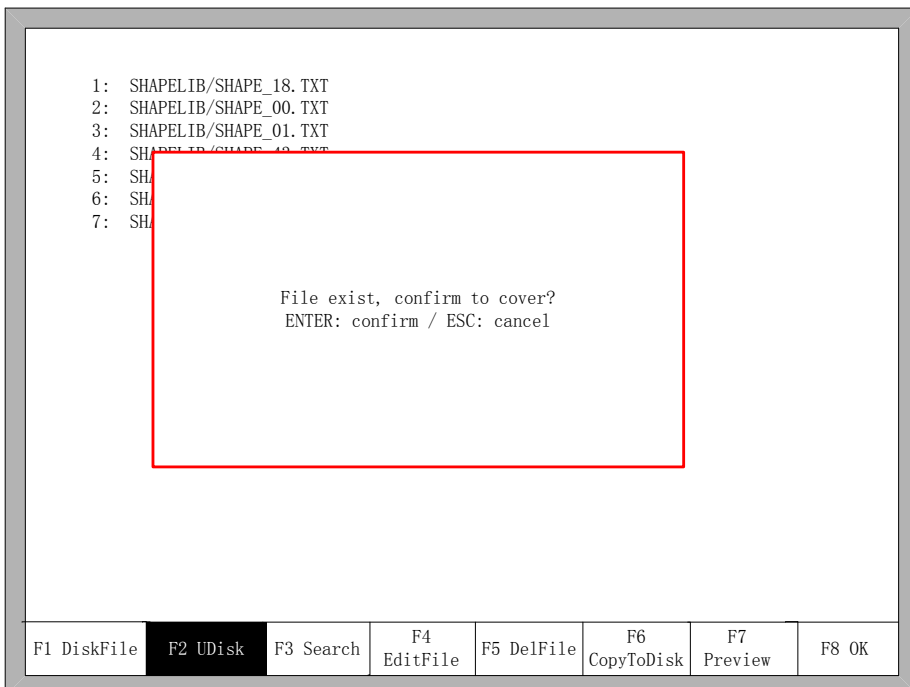
Fig 6.4 Replacement documents

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

4.6.3 Search File

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

```
 1:   SHAPELIB/SHAPE_18.TXT
 2:   SHAPELIB/SHAPE_00.TXT
 3:   SHAPELIB/SHAPE_01.TXT
 4:   SHAPELIB/SHAPE_43.TXT
 5:   SHAPELIB/SHAPE__TXT
 6:   SHAPELIB/U
 7:   SHAPELIB/U


              Input searched string


              _
```

| F1 DiskFile | F2 UDisk | F3 Search | F4 EditFile | F5 DelFile | F6 CopyToDisk | F7 Preview | F8 OK |
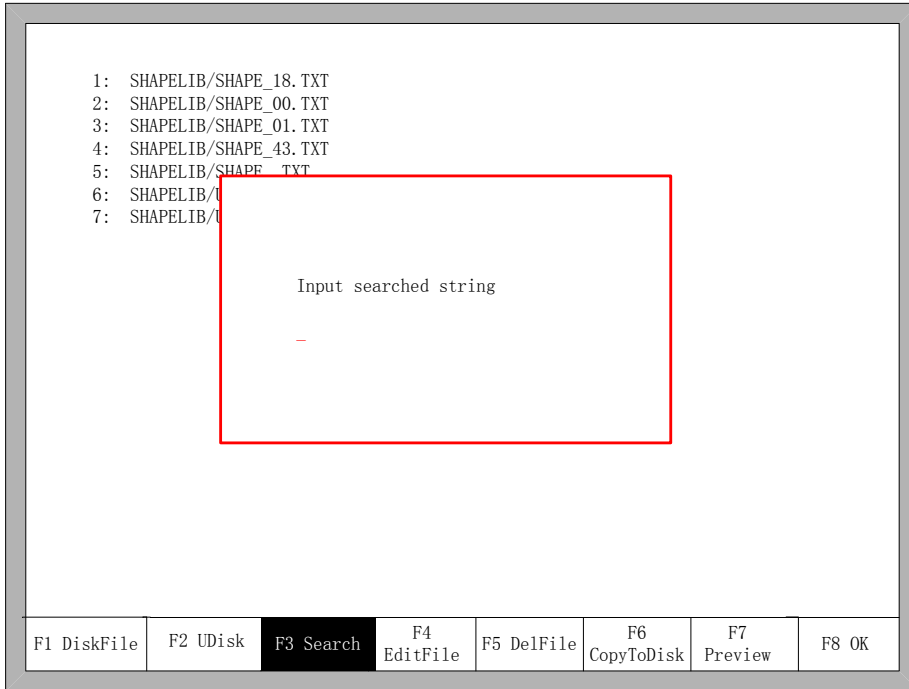
Fig 6.5 search file

4.6.4 Edit Code

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

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

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

Each edit line supports 128 characters maximum.

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

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

4.6.5 New Code

In the editing code interface (reference 6.4 edit code), you can press key【F4】to create an new file to input your own code, shown as Fig 6.5.

```
      1:  G21
      2:  G91
      3:  _
```

| F1 compile | F2 AddRow | F3 Del Row | F4 NewFile | | | | F8 save |
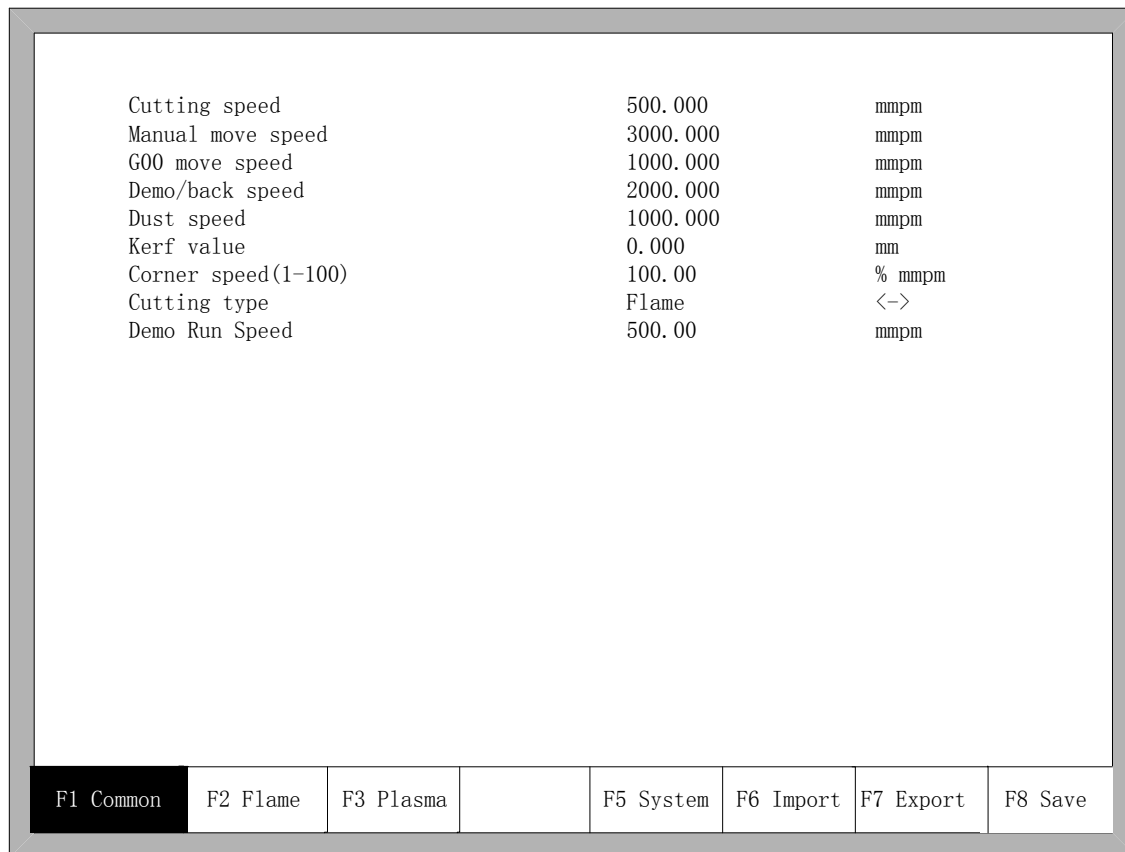
Fig 6.6 new code

4.6.6 Compile Code

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

4.7 Parameter Setting

In the main interface, you can get the parameter interface by pressing key 【F3】 (Para). The parameter function interface is showed in Fig 7.1

```
Cutting speed                 500.000        mmpm
Manual move speed             3000.000       mmpm
G00 move speed                1000.000       mmpm
Demo/back speed               2000.000       mmpm
Dust speed                    1000.000       mmpm
Kerf value                    0.000          mm
Corner speed(1-100)           100.00         % mmpm
Cutting type                  Flame          <->
Demo Run Speed                500.00         mmpm
```

F1 Common	F2 Flame	F3 Plasma		F5 System	F6 Import	F7 Export	F8 Save

Fig7.1   Parameter Interface

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

1) Common parameters: cutting speed, manual move speed, G00 move speed, the size of kerf gap, corner speed, cutting type, edge cut enable, hold preheat.

2) Flame parameters: all the parameters used in oxygen gas cutting

3) Plasma parameters: all the parameters used in plasma cutting

4) Maring parameters: ignition, perforation cycle parameters, dry dusting offset

5) System parameters: you can set system pulses, maximum speed limit, motor parameters and soft limit parameters.

4.7.1 Common parameters

It is the favorite's parameters in Fig7.1.
- **Cutting Speed**: the maximum cutting speed, unit is mm/m.

- **Manual Move Speed**: the moving speed of cutting torch in manual, unit is mm/m.
- **G00 Move Speed**: the cutting torch speed when G00 is executed or the cutting torch go back to the reference or some other occasion, unit is mm/m.
- **Kerf:** According to the cutting gap width, users set Kerf Gap compensation(the value should be half of the cutting gap) to ensure the dimensional precision, the system will generate a new path automatically to make compensation to work piece. Before cutting a work piece, you can modify kerf gap value, once begin to cut, you are not permitted to modify the value.
- **Corner speed**: Plate thickness affect the cutting tip's ac/dc rate when it moving. The angle between the end of a cut-point line's tangential direction and the direction of the tangent line of the beginning of next cutting point, and the thickness of plate determines cutting tip speed at the transition.

   If the normal cutting speed is V, angle is α, plate thickness is h, then cutting tip speed in at the time of intersection is V_x

$$V_x = \frac{\alpha h}{50\pi} V$$

   Notice: The unit is mm**.** The max thickness of plate is 100 mm, if more than 100mm also are considered to be 100mm

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

4.7.2 Flame Parameters

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

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




  F1 Common    F2 Flame   F3 Plasma           F5 System  F6 Import  F7 Export   F8 Save
```

Fig7.2 Flame Parameters

- **Ignition Time**: the time delay of opening ignition I/O.
- **Low Preheat Time**: The preheating time before perforating the steel plate. Enter any positive number ,unit is s. During the low pressure preheating process, you can prolong the preheating time by pressing "stop" key, then the preheating time will delay until you press the "start" key to start to high pressure preheat delay.
- **High Preheat Time:** Like **Low Preheat Time** except open different IO.
- **Pierce 1 time:** Perforation time with low pressure fuel gas. Enter any positive number ,unit is s.
- **Pierce 2 time:** Perforation time with middle pressure fuel gas. Enter any positive number ,unit is s.
- **Pierce 3 time:** Perforation time with high pressure fuel gas. Enter any positive number ,unit is s.
- **Exhaust Time:** The delay of turned off oxygen gas to open the exhaust. Enter any positive number ,unit is s.
- **Torch Up Time**: When oxygen gas is turned off, the time for the torch to lift up. Enter any positive number ,unit is s.
- **Torch Down Time**: When oxygen gas is turned off , the time for the torch to put down. Enter any positive number ,unit is s.
- **Pierce Up Time**: Time for the torch to lift up during perforating. The difference between **Torch Up Time** and **Pierce Up Time** is that: **Torch Up Time** means the time that the torch needs to lift up when it needs to move to another place after the current cutting is over; while the **Pierce Up Time** means the time that the torch needs to lift up after preheating in the fixed cycle of perforation.
- **Pierce Down Time**: Time for the torch to put down in the perforation. The difference between **Torch Down Time** and **Pierce Down Time** is that: **Torch Down Time** means the time that the torch

needs to put down before preheating; while the **Pierce Down Time** means the time that the torch needs to put down after finishing **Torch Up Time** and opening cutting oxygen in the fixed cycle of perforation.

- **THC Adjustment:** According to the user device configuration, choose whether or not to use high adjustment box.

4.7.3 Plasma Parameters

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

```
Arc time                    0.00            s
Pierce time                 0.00            s
Torch up time               0.00            s
Arcing check time           0.00            s
Position check time         0.00            s
Position up time            0.00            s
Close arc                   0.00            mmpm%
Distance to close Arc       0.00            mm
Lose arc delay              0.00            s
Watch arc enable            No              <->
```

| F1 Common | F2 Flame | F3 Plasma | | F5 System | F6 Import | F7 Export | F8 Save |

Fig 7.3 plasma parameters

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

torch to lift up.

- **Close arc:** In setting the rate of X%, open the output port, close the arc press signal, to prevent the steel melting under low-speed cutting tip due to temperature is too high.
- **Distance to close arc**: in the minimum distance of the cutting line of the initial segment or end segment, close the arc voltage increases.
- **Lose arc delay:** detect the delay time of the feedback of the broken arc, if there's still no arc voltage input, the situation is considered to be broken arc. This parameter can effectively avoid the arc broken alert because of the sensitivity of the broken arc detection in the cutting methods with lead, this guarantees the continuousness of the cutting and avoid the interrupt of frequent alert .
- **Watch arc enable:** Real-time detection of arc voltage signal in cutting process.

If setting "yes", in the cutting process, the system detects he real-time arc voltage feedback signal. If do not detect the signal, the system terminates the current work of cutting, according memory breakpoints to withdraw from the program.

If installing a "No", then in the cutting process does not detect arc voltage feedback signal.

4.7.4 System parameters

The system parameters, as showed in Fig 7.5, are related with the precision of transmission shaft of the machine.

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

F1 Common	F2 Flame	F3 Plasma		F5 System	F6 Import	F7 Export	F8 Save

Fig 7.4   System Parameters

- **Horizontal Axis Pulse**: The number of pulse that system needs to generate when the machine

move1mm towards X axis, maintaining 3 digits at most after decimal point.

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

Small arc definition:

0   mmpm< cutting speed <2000mmpm   small arc=5mm

2000 mmpm< cutting speed <4000mmpm   small arc =10mm

4000 mmpm< cutting speed <6000mmpm   small arc =15mm

6000 mmpm< cutting speed <8000mmpm   small arc =20mm

8000 mmpm< cutting speed <10000mmpm   small arc =25mm

10000mmpm< cutting speed <12000mmpm   small arc =30mm

12000mmpm< cutting speed <15000mmpm   small arc =35mm

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

4.7.5 Parameter import

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

1. The parameters exported from the incising machine control system(refer to 7.7 Parameter Export) should satisfy the specified format. The file format is F2300.DAT

2. The file should be stored under the root folder of flash disk which is connected to the USB interface.

When the above condition is satisfied, in the Fig 7.6, press Enter to confirm, and then you could import the backup parameters to the system.

```
    Horizontal Axis Pulse              125.000          n/mm
    Vertical Axis Pulse                125.000          n/mm
    Max cutting speed                  2000.000         mmpm
    Max G00 speed                      6000.000         mmpm
    Max Manu                                            mmpm
    Small a                                             mmpm
    Flame ac                                            s
    Plasma                                              s
    Emergen                                             s
    Start sp          Sure to import Parameter?         mm
    Max +X                                              mm
    Max +Y            Parameter file is F2300D.DAT      mm
    Min -X                                              mm
    Min -Y                                              mm




    F1 Common   F2 Flame   F3 Plasma        F5 System  F6 Import  F7 Export   F8 Save
```
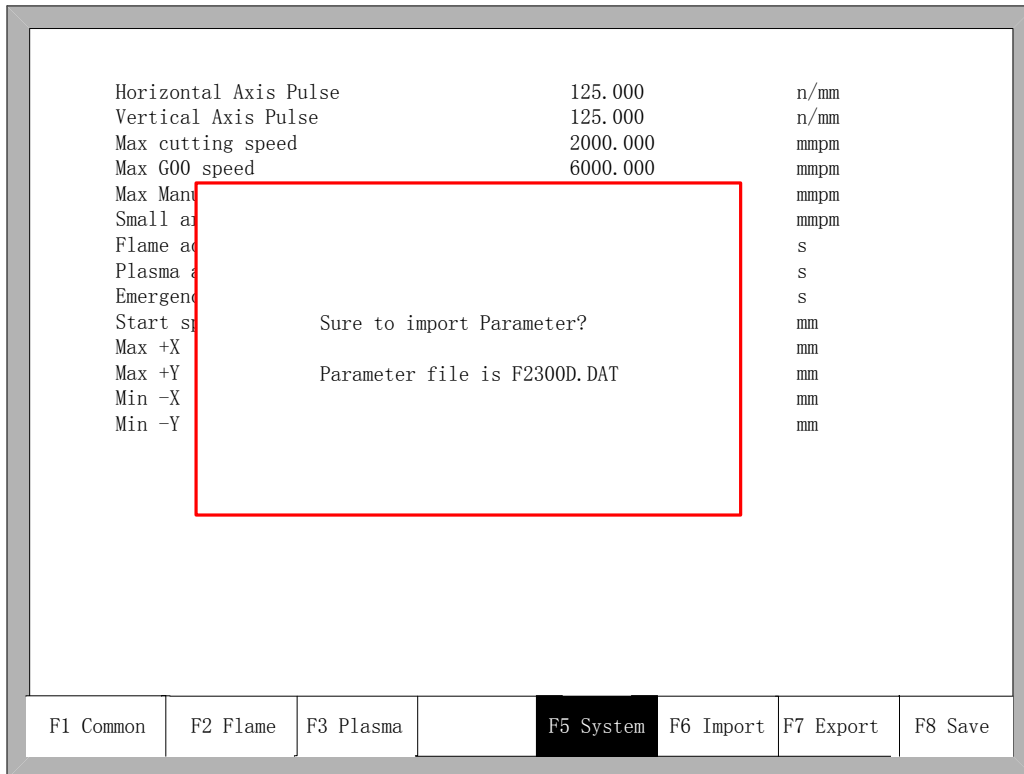
Fig 7.5 Parameter import

4.7.6 Parameter export

After the parameter configuration is over, press F7 in the parameter configuration interface to export the parameters, you should connect the flash disk to the USB interface before exporting.

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

```
┌─────────────────────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────────────────────┐  │
│  │                                                           │  │
│  │    Horizontal Axis Pulse            125.000        n/mm   │  │
│  │    Vertical Axis Pulse              125.000        n/mm   │  │
│  │    Max cutting speed                2000.000       mmpm   │  │
│  │    Max G00 speed                    6000.000       mmpm   │  │
│  │    Max Manu┌──────────────────────────────────┐   mmpm   │  │
│  │    Small a │                                  │   mmpm   │  │
│  │    Flame a │                                  │   s      │  │
│  │    Plasma  │                                  │   s      │  │
│  │    Emergenc│                                  │   s      │  │
│  │    Start s │       Sure to export Parameter?  │   mm     │  │
│  │    Max +X  │                                  │   mm     │  │
│  │    Max +Y  │                                  │   mm     │  │
│  │    Min -X  │                                  │   mm     │  │
│  │    Min -Y  │                                  │   mm     │  │
│  │            │                                  │          │  │
│  │            │                                  │          │  │
│  │            └──────────────────────────────────┘          │  │
│  │                                                           │  │
│  │                                                           │  │
│  ├──────────┬──────────┬──────────┬─────┬─────────┬─────────┤  │
│  │F1 Common │F2 Flame  │F3 Plasma │F5 System│F6 Import│F7 Export│F8 Save│
│  └──────────┴──────────┴──────────┴─────┴─────────┴─────────┘  │
└─────────────────────────────────────────────────────────────────┘
```

Fig 7.6 Parameter export

4.7.7 Save parameters

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

```
┌─────────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────────┐  │
│  │                                               │  │
│  │                                               │  │
│  │          Parameter saved successfully          │  │
│  │                                               │  │
│  │                                               │  │
│  │                                               │  │
│  │                                               │  │
│  ├───────┬───────┬───────┬───┬───────┬───────┬──────┬──────┤
│  │F1 Common│F2 Flame│F3 Plasma│   │F5 System│F6 Import│F7 Export│F8 Save│
│  └───────┴───────┴───────┴───┴───────┴───────┴──────┴──────┘
└─────────────────────────────────────────────────────┘
```
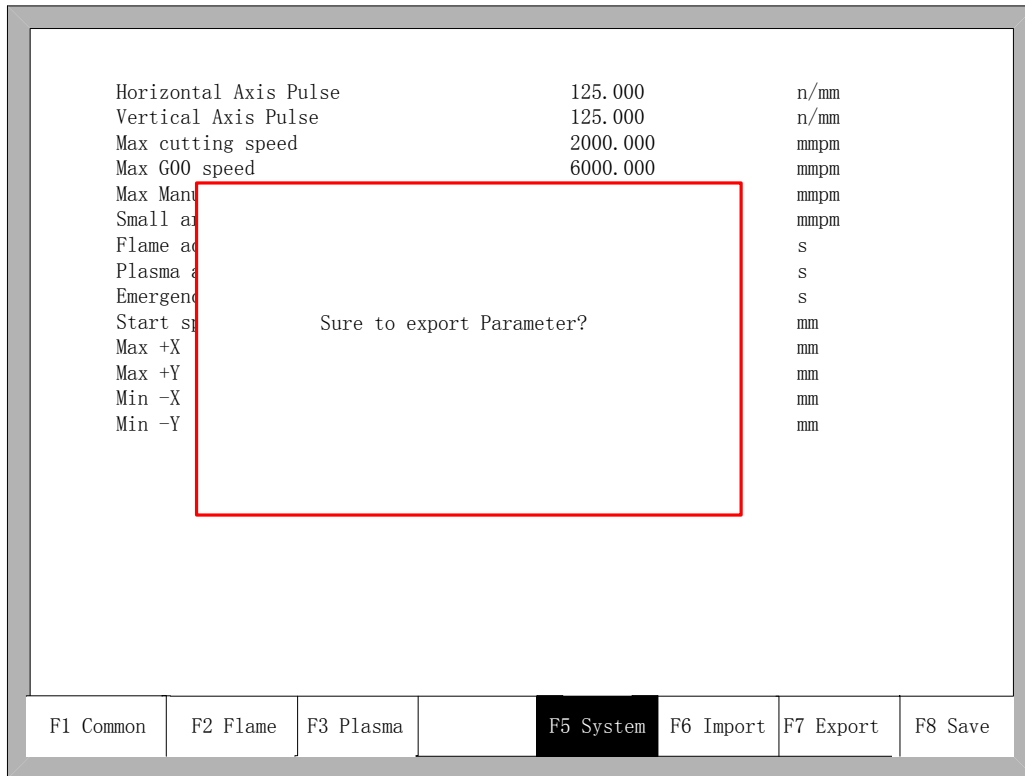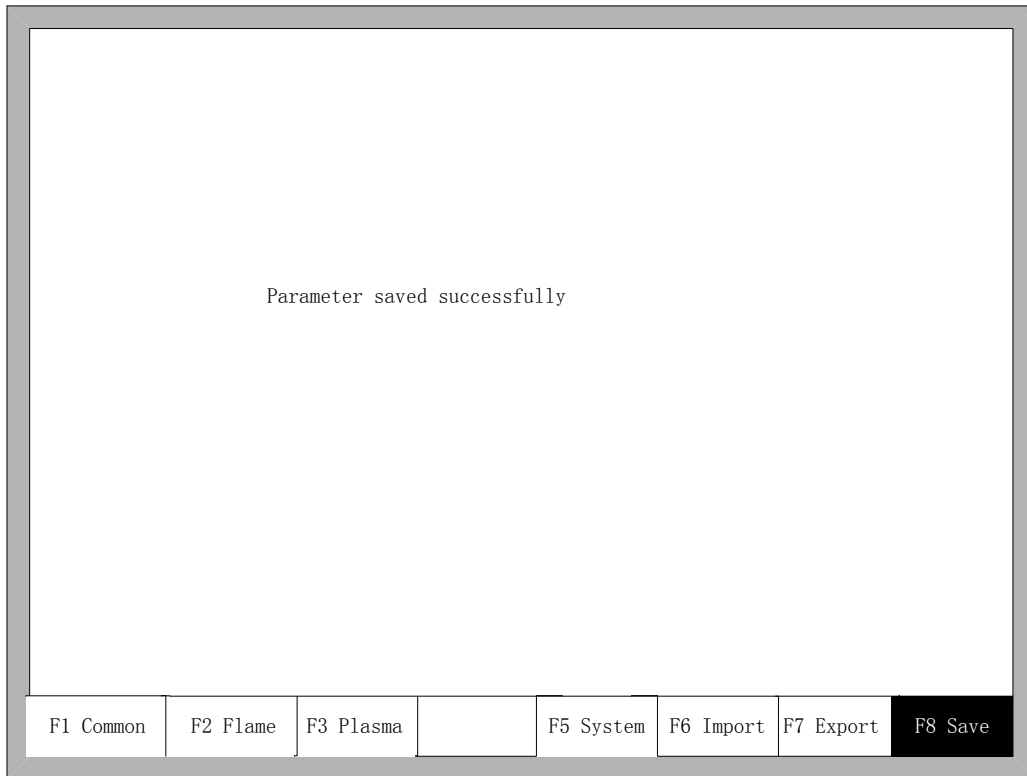
Fig 7.7 System Parameters

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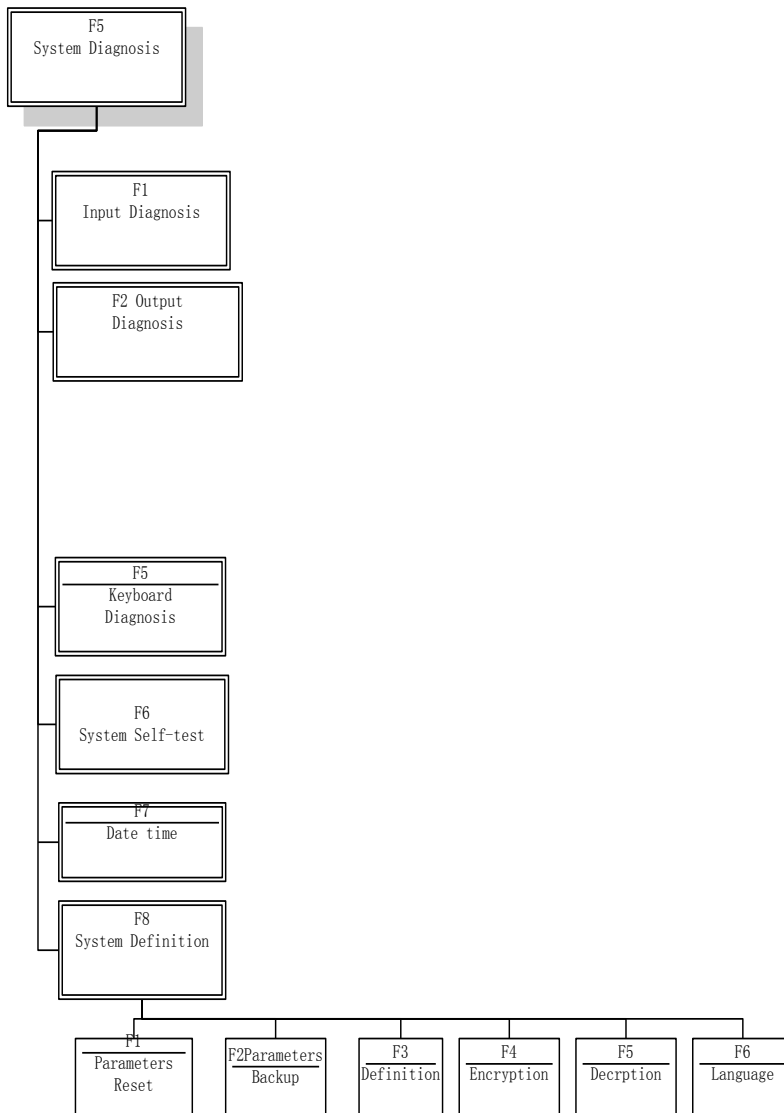
4.8 Diagnosis Function

```
 input

    Forward limit          ●    Up move input            ●
    Back limit             ●    Down move input          ●
    Right limit            ●    Left move input          ●
    Left limit             ●    Right move input         ●
    Emergency stop         ●    Acceleration input       ●
    Arcing feedback        ●    Deacceleration input     ●
    Position detect        ●    Torch up input           ●
    Plasma crash           ●    Torch down input         ●
```

| F1 Input | F2 Output | | | F5 KeyBrd | F6 SelfCheck | F7 DataTime | F8 SystemDef |

Fig8.1 Diagnostic interface

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

4.8.1 Diagnosis interface index

```
┌─────────────────┐
│       F5        │
│ System Diagnosis│
└─────────────────┘
        │
        │   ┌─────────────────┐
        ├───│       F1        │
        │   │ Input Diagnosis │
        │   └─────────────────┘
        │
        │   ┌─────────────────┐
        ├───│    F2 Output    │
        │   │    Diagnosis    │
        │   └─────────────────┘
        │
        │   ┌─────────────────┐
        ├───│       F5        │
        │   │    Keyboard     │
        │   │    Diagnosis    │
        │   └─────────────────┘
        │
        │   ┌─────────────────┐
        ├───│       F6        │
        │   │ System Self-test│
        │   └─────────────────┘
        │
        │   ┌─────────────────┐
        ├───│       F7        │
        │   │    Date time    │
        │   └─────────────────┘
        │
        │   ┌─────────────────┐
        └───│       F8        │
            │ System Definition│
            └─────────────────┘
                    │
   ┌──────┬──────┬──────┬──────┬──────┬──────┐
 ┌────┐┌────┐┌────┐┌────┐┌────┐┌────┐
 │ F1 ││F2Parameters││ F3 ││ F4 ││ F5 ││ F6 │
 │Parameters││Backup││Definition││Encryption││Decrption││Language│
 │Reset│
 └────┘└────┘└────┘└────┘└────┘└────┘
```

4.8.2 Input Diagnosis

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

4.8.3 output Diagnosis

In diagnosis interface ,press 【F2】to enter output diagnosis interface，shown as Fig8.2

```
 Output


     Ignition                          ●        exhaust                           ●
     Low preheat                       ●        THC enable                        ●
     High preheat                      ●        Position detect                   ●
     Low Oxygen                        ●        Arc starting                      ●
     Medium Oxygen                     ●        HoldTorch                         ●
     High Oxygen                       ●        Dust spray                        ●
     Torch up                          ●        Raise dust                        ●
     Torch down                        ●        Dust preheat                      ●












  F1 Input    F2 Output   F3 OpenOut F4 CloseOut F5 KeyBrd F6 SelfCheck   F7         F8
                                                               DataTime  SystemDef
```

Fig 8.2 Output diagnosis

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

4.8.4 Key-press Diagnosis

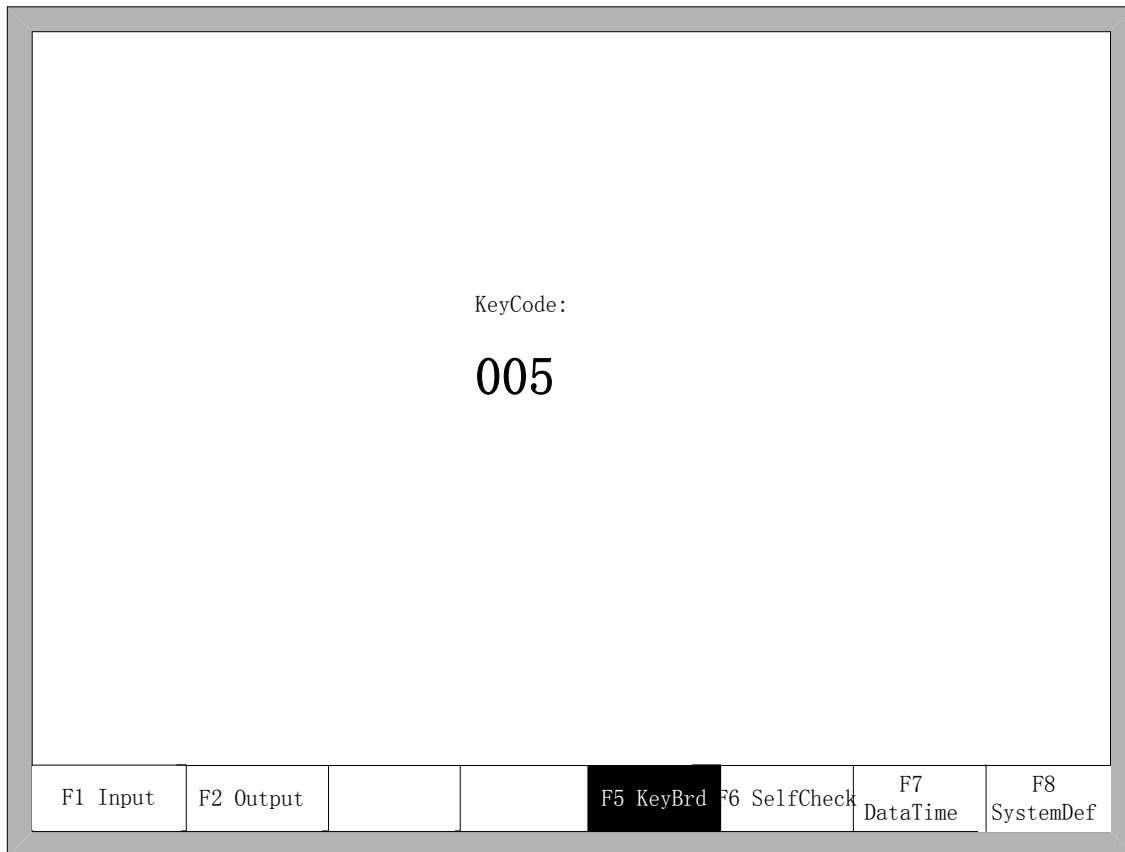In the diagnostic interface, a key value will be displayed behind "KEY:", whenever the key is pressed.

| F1 Input | F2 Output | | | F5 KeyBrd | F6 SelfCheck | F7 DataTime | F8 SystemDef |

Fig 8.3 Keyboard Diagnosis

4.8.5 System self-check

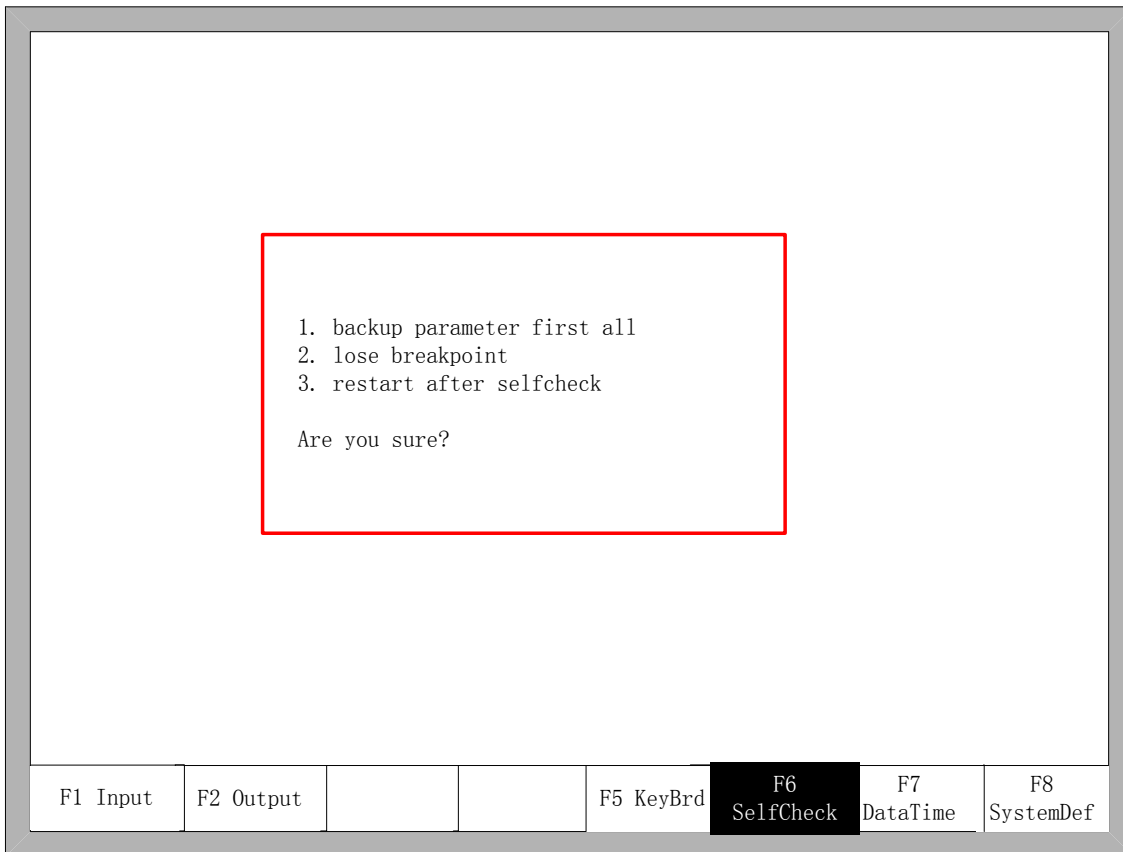In the system diagnosis interface, press F6 to enter the system self-check interface.

```
┌─────────────────────────────────────────────────────┐
│ ┌─────────────────────────────────────────────────┐ │
│ │                                                 │ │
│ │                                                 │ │
│ │        ┌──────────────────────────────┐         │ │
│ │        │                              │         │ │
│ │        │  1. backup parameter first all│        │ │
│ │        │  2. lose breakpoint          │         │ │
│ │        │  3. restart after selfcheck  │         │ │
│ │        │                              │         │ │
│ │        │  Are you sure?               │         │ │
│ │        │                              │         │ │
│ │        └──────────────────────────────┘         │ │
│ │                                                 │ │
│ ├───────┬────────┬──────┬──────┬────────┬────┬────┤ │
│ │F1 Input│F2 Output│     │      │F5 KeyBrd│ F6 │ F7 │ F8 │
│ │       │        │      │      │        │SelfCheck│DataTime│SystemDef│
└─────────────────────────────────────────────────────┘
```

Fig 8.4 System self-check

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

```
┌──────────────────────────────────┐
│                                  │
│                                  │
│       Self check pass            │
│                                  │
│                                  │
│                                  │
└──────────────────────────────────┘
```
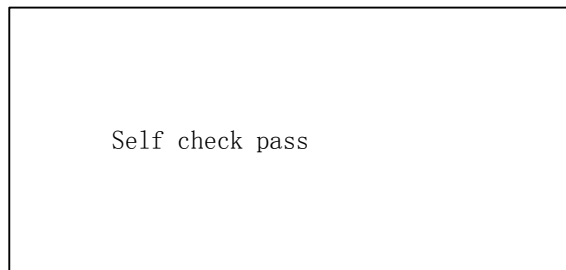
Fig 8.5 Self-check pass

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

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

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

4.8.6 date and time

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

```
┌─────────────────────────────────────────────────────────────┐
│  ┌───────────────────────────────────────────────────────┐  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │         2010-08-21  15:51:37  Sun                     │  │
│  │                                                       │  │
│  │         Up or down to modify                          │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  │                                                       │  │
│  └───────────────────────────────────────────────────────┘  │
│  ┌────────┬─────────┬─────┬─────┬──────────┬──────────┬──────┤
│  │F1 Input│F2 Output│     │     │F5 KeyBrd │F6 SelfChec│ F7   │ F8
│  │        │         │     │     │          │           │DataTime│SystemDef
└─────────────────────────────────────────────────────────────┘
```
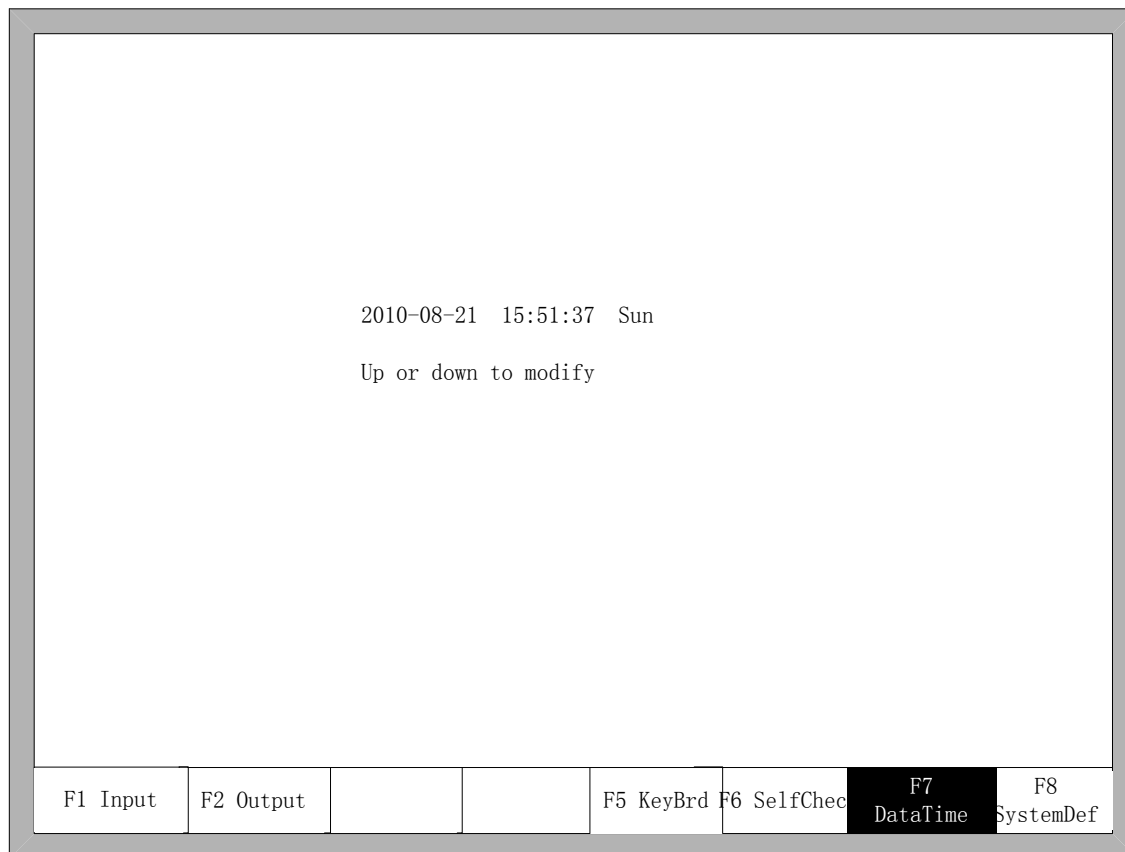
Fig 8.6 System time

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

4.8.7 System Definition

In the system diagnosis interface, press F8 to enter the system custom definition interface, in the interface, you could set the input IO, output IO or system coordinate, also reset or backup the parameters and one key switch between English or Chinese.

4.8.7.1 Parameter backup and restore

Parameter Backup: The process of parameter backup is, in the main interface press F5(System Diagnosis), F8(System Definition), F2(Parameter Backup). The system will need code, after inputting the code "1396", press Enter, the system will import the default parameters. In the following process, if the parameters is modified or some of them is broken, reset the parameters.

Warning: after adjusting the equipment, please backup the parameters.

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

Warning: After resetting successfully, please restart the system.

4.8.7.2 Input definition

The controller could change the IO definition, including changing the order of IO number, the type of IO(normally open or closed) according to the user's need. In the system custom definition interface, press F3 to enter the definition interface, press F1 to enter the input definition interface. As shown in fig 8.7.

```
                          Definition of input

                     Port   Type                          Port   Type
   Forward limit      02     ●     Up move input           09     ●
   Back limit         15     ●     Down move input         10     ●
   Left limit         14     ●     Left move input         07     ●
   Right limit        01     ●     Right move input        08     ●
   Sharpstop          03     ●     Acceleration input      16     ●
   ArcFeedback        04     ●     Deacceleration input    17     ●
   PosFeedback        05     ●     Torch up input          18     ●
   PlasmaCrash        06     ●     Torch down input        19     ●


   Port- Press PgUp/PDn          Type-Press Enter




   F1 Input   F2 Output   F3 Axes   F4 Motor                        F8 Save
```

Fig 8.7 input definition

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

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

4.8.7.3 Output definition

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

```
┌─────────────────────────────────────────────────────────────┐
│  ┌────────────────────────────────────────────────────────┐  │
│  │                   Definition of output                 │  │
│  ├────────────────────────────────────────────────────────┤  │
│  │              Port   Type                  Port   Type   │  │
│  │  Ignition     03     ●    Exhaust         06     ●      │  │
│  │  LowPreheat   01     ●    THC             08     ●      │  │
│  │  HighPreheat  17     ●    PosDetect       19     ●      │  │
│  │  LowOxygen    04     ●    ArcStart        16     ●      │  │
│  │  MidOxygen    05     ●    LowSpdInCorner  18     ●      │  │
│  │  HighOxygen   14     ●    Dust spray      07     ●      │  │
│  │  TorchUp      02     ●    Raise dust      20     ●      │  │
│  │  TorchDown    15     ●    Dust preheat    21     ●      │  │
│  └────────────────────────────────────────────────────────┘  │
│                                                               │
│     Port- Press PgUp/PDn        Type-Press Enter              │
│                                                               │
│  ┌────────┬──────────┬─────────┬─────────┬──┬──┬──┬─────────┐ │
│  │F1 Input│F2 Output │F3 Axes  │F4 Motor │  │  │  │F8 Save  │ │
│  └────────┴──────────┴─────────┴─────────┴──┴──┴──┴─────────┘ │
└─────────────────────────────────────────────────────────────┘
```

Fig 8.8 output definition

In the interface press 【↑】、【↓】、【←】、【→】, move the cursor to the position that needs changing, press 【PageUp】或【PageDown】to change the number of the Output, press 【Enter】to change the type of the Output.

The output type is open drain transistor output type.

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

4.8.7.4 Coordinate definition

The system could provide IO definition for the user. As shown in Fig 8.9

```
                    Press Enter to change coordinate


                                  +Y
                                  ↑
                        −X   ←      →    +X
                                  ↓
                                  −Y




    F1 output  F2 output   F3 Axes   F4 Motor                              F8 save
```
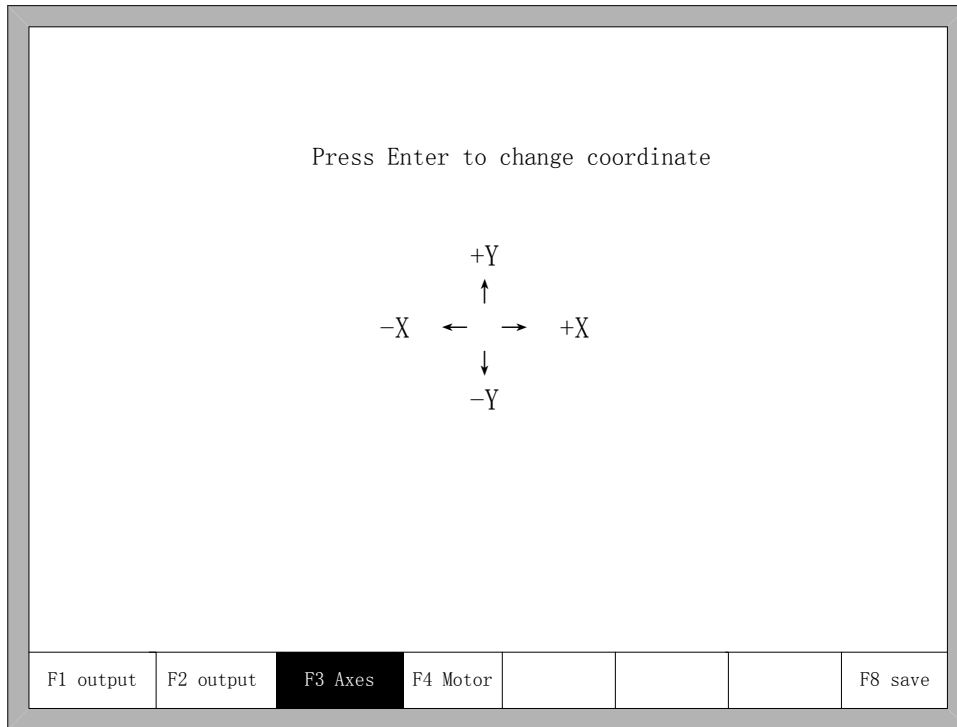
Fig 8.9 Coordinate Definition

In the interface, press Enter repeatedly to change among 8 type of coordinates. Press F8 to save.

4.9   Graph

In the main interface, press【F1】(ShapeLib) to enter graph interface，shown as follows:
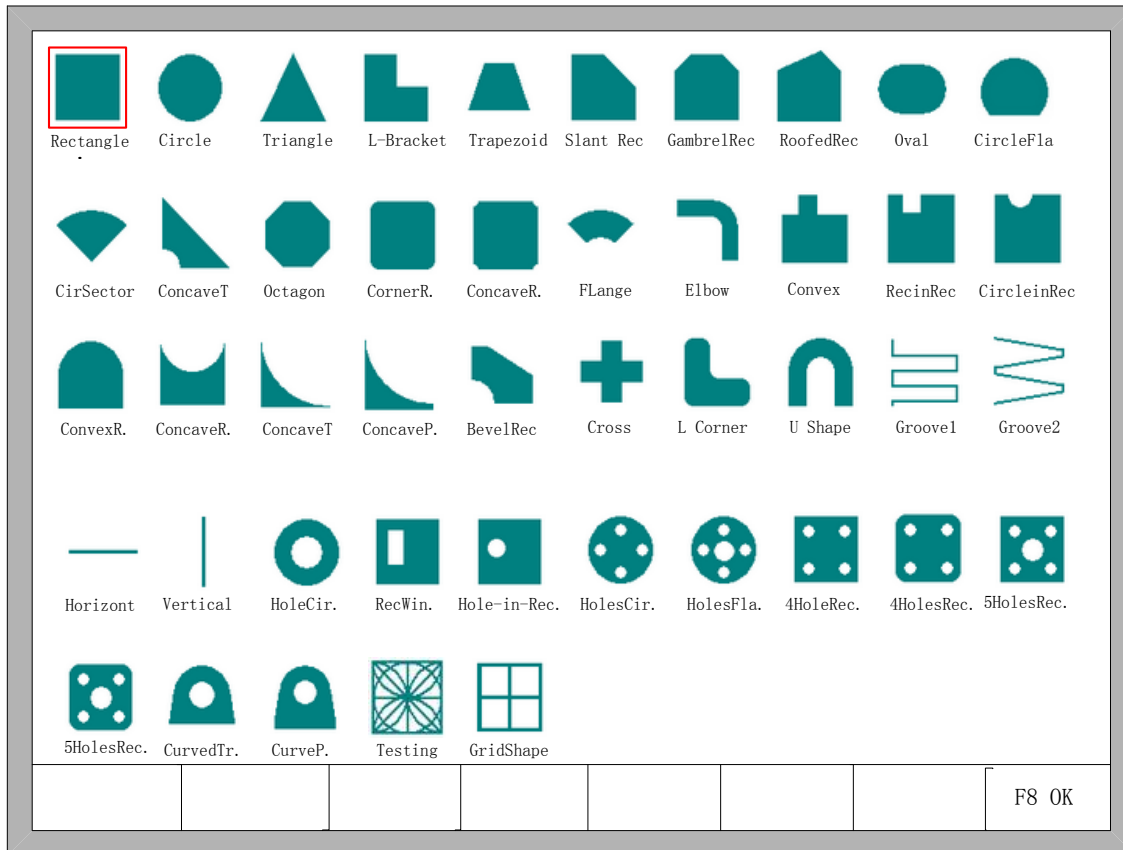
Fig 9.1 first page of graph

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

4.9.1 Choose Graph

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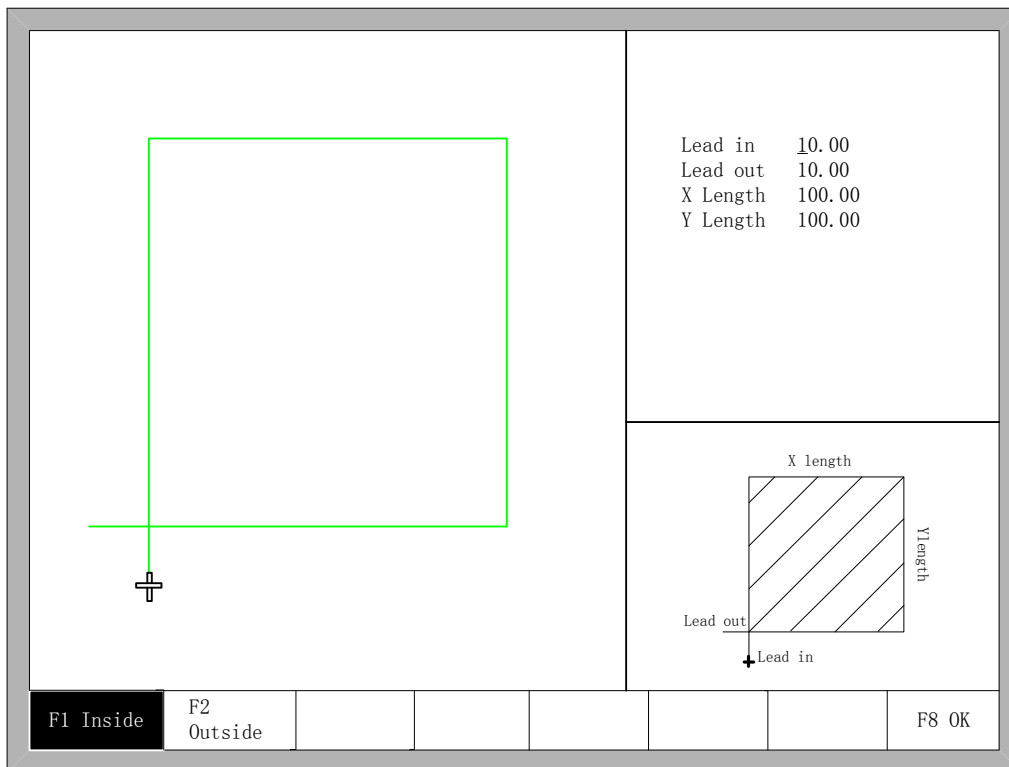
Fig 9.2 Chip size interface

You can press【 ↑】、【↓】、【←】、【→】to modify sizes, after modification ， press 【F8】 to confirmed. Press any key to return to graphics processing interface as shown in Fig3.3.

4.9.2 Film/Hole Size

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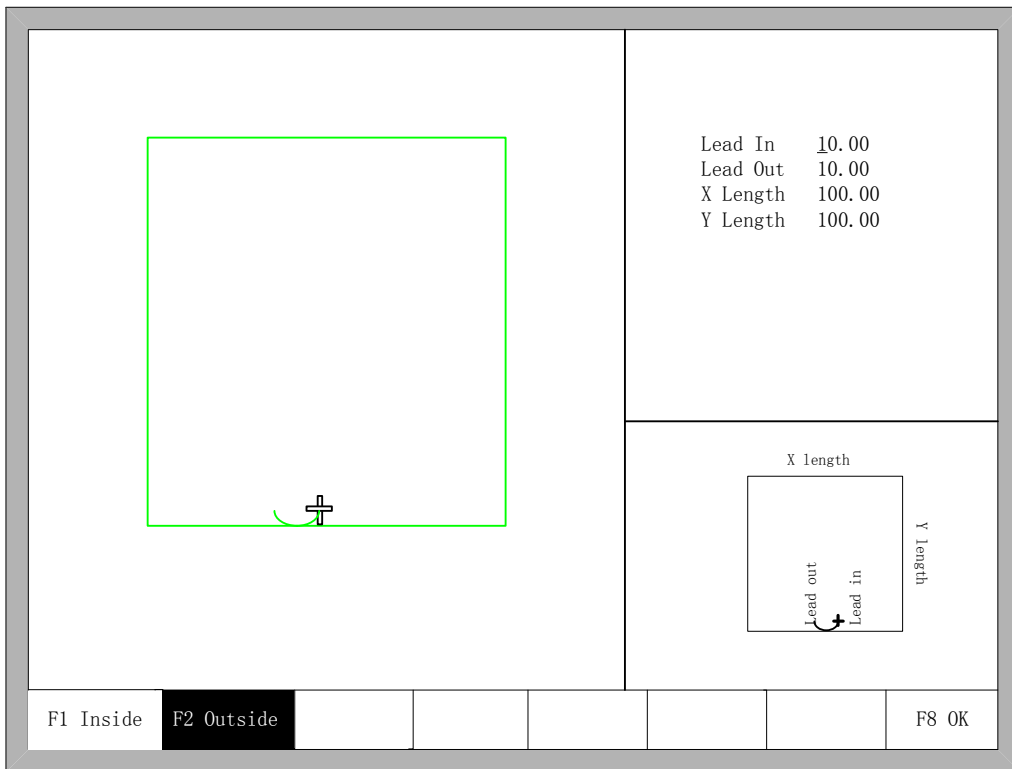
Fig 9.3 hole size

Modify sizes like modify chip sizes.

After modification , press 【F8】 to confirmed.

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

Note:

The following graphics don't have hole sizes:

Straight line groove, Bevel groove, Straight line kerf, Vertical kerf, Hole-in- Rotundity, Rectangle window, Hole-in-Rectangle, Four-holes in Rotundity, Holes in flange, Four-holes in rec, Four-holes in Filleted corner rec, Five-holes in rec, "Five-holes in Filleted corner rec, Curved trapezoid, Curved polygon, Testing Shape, Grid Shape.

Appendix 1 G、M code rapid consult

Serial number	order	function
1	G99	rotation、proportion、mirror image
2	G92	reference coordinate
3	G91	Relative coordinate system
4	G90	Absolute coordinate system
5	G20	English unit
6	G21	Metric unit
7	G41	Left kerf gap compensation
8	G42	Right kerf gap compensation
9	G40	Cancel kerf gap compensation
10	G00	Quickly move
11	G01	Liner cutting
12	G02	Clockwise arc cutting
13	G03	Anticlockwise arc cutting
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end

Chapter Five
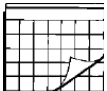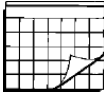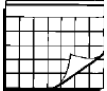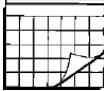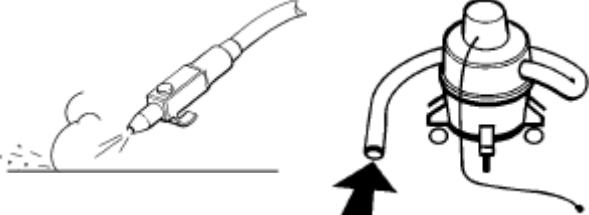
Maintenance & Parts

In This Section:

The environment for the portable NC cutter is relatively execrable and full of metal dust. The machine should be cleaned and maintained entirely.

5.1 Routine Maintenance

	Warning **Electric shock can kill**
	Disconnect electrical power before performing any maintenance. All work requiring removal of the power supply cover must be performed by a qualified technician.

  Each Use	1.Check gas pressure if within stated range，pipeline、valve、air pipe tie-in if loose or leak gas，hope if damage, gas safe device if effective，when necessary, tightening or replacing. 2. Check torch if loose, nozzle if damage. 3. Clear track and rack surface, don't permit kernel and splash keeping on rack，keep smooth.
  Every Week	1. Orbit and trolley smooth. 2. Check main gas-in if have rubbish, each valve and pressure meter if working normally.

  Every 3 Months	 Replace damaged labels.		 Replace damaged power line or plug.
	Check all driving parts whether loose or not，check gear and rack, when necessary, adjust it.	Check track and each screw whether loose or not，check control line connection whether loose or not.	Check all press button and choose switch performance, replace damaged parts.
  Every 6 Months			Clean the inside of the power supply with air pressure or vacuum.

5.2 Basic Troubleshooting

Error	Cause
1、LCD no show when normally starting machine.	1.1Check 220V power，fuse on socket; 1.2Open the machine case，then check the wire of socket and switch if fall off; 1.3Check input power of ring transfer if 220V; 1.4 Check if the fuse of power board burned out，or if the 9 core plugs on the back of 5V power and system loose or fell off.
2、The machine shows a blue screen or color fault or no system interface.	2.1Check system back LCD readjust resistor, left and right full travel route adjust and watch.
3、When cutting, cursor normally follow graph on LCD, but host no move or a direction no move.	3.1Check step motor drive and R transformer if connect power; 3.2 Check step motor drive plug and connect line, driver and step motor if fall off host; 3.3Check axle end gear of step motor if loose.
4、Disk U file error, messy code or no read file.	4.1Confirm Disk U OK; 4.2 Disk U if FAT16(FAT) or FAT32(FAT) form, no format NTFS form; 4.3 If build hycut.cn directory under Disk U root directory, and program files are in this directory. 4.4 Open the machine case to check if USD wire fell off 4.5 Insert the disk U to the back of the system directly
5、After starting machine, press keys without action or parts without reaction.	5.1Confirm press keys if damage by using press keys diagnosis function; 5.2Check host and keyboard line if loose or fall.
6、Valve or motor no motion.	6.1Confirm valve or motor if damage. 6.2 Confirm press keys if damage by using press keys diagnosis function; 6.3 Check power panel 8 cores socket, cable on beam and connect insert parts on end if have output when press button; 6.4Switch 24V if normal, plug if fall off; 6.5Check host and function panel line connect if loose or fall off; 6.6Check system main board if indicator light on in press key.
7、When equipment moves, shake strongly.	7.1Motor gear and rack clearance irrelevancy, adjust it; 7.2Beam and host or host and track clearance irrelevancy, adjust it. 7.3 Check the driver if normal

More Technical Questions

If you are unable to fix the problem with your system by following this basic troubleshooting guide, please contact distributor or manufacturer.

5.3 System   Circuity
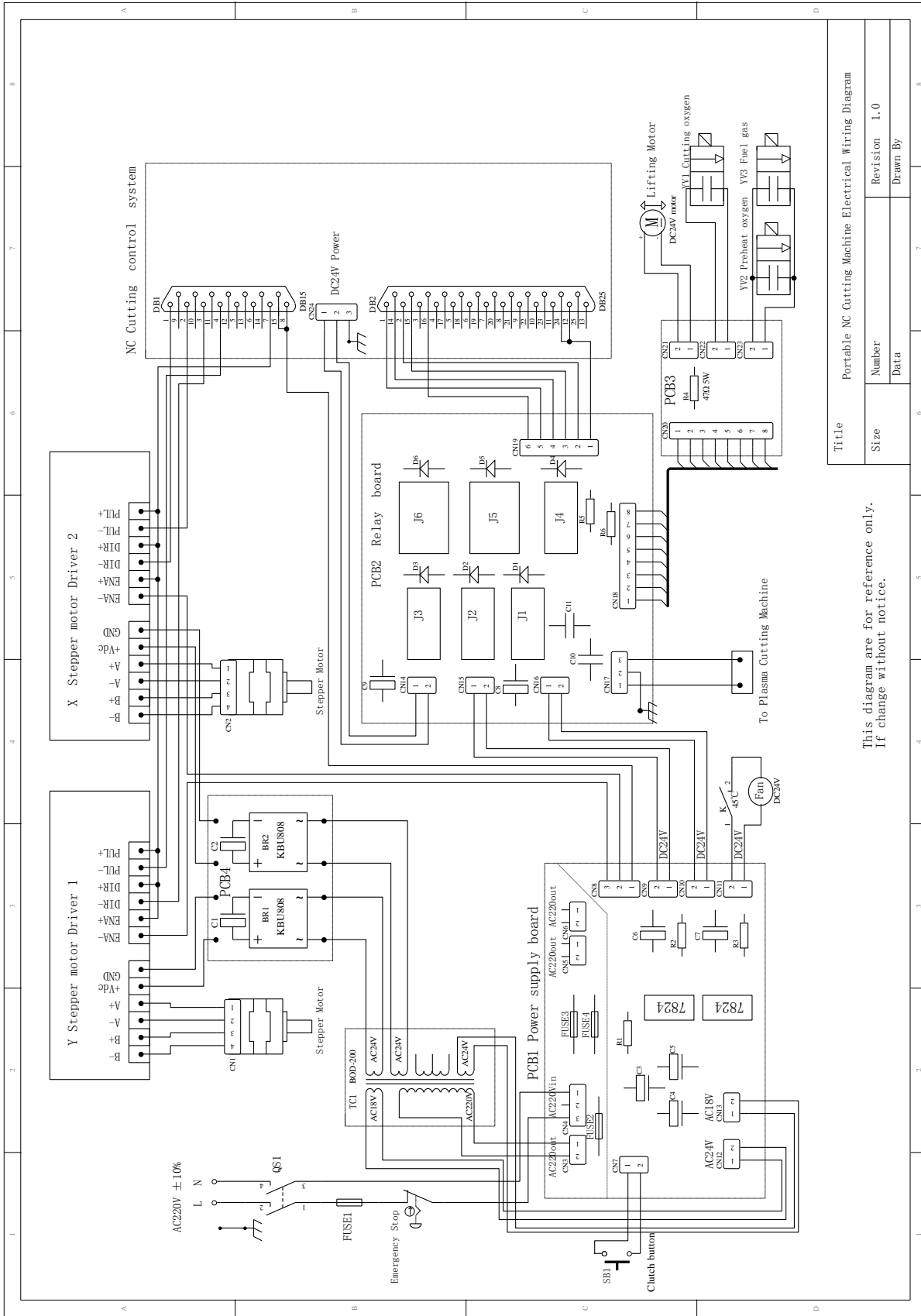
Portable NC Cutting Machine Electrical Wiring Diagram

91

5.4 Consumable Parts

5.4.1 Cutting Nozzles

Propane Nozzle NO.	Cutting Oxygen Hole Diameter	Cutting Thickness
	mm	mm
0	0.7	5~10
1	0.9	10~20
2	1.2	20~35
3	1.5	35~60
4	1.8	60~90
5	2.1	90~130

Acetylene Nozzle NO.	Cutting Oxygen Hole Diameter	Cutting Thickness
	mm	mm
00	0.8	5~10
0	1.0	10~20
1	1.2	20~30
2	1.4	30~50
3	1.6	50~70
4	1.8	70~90
5	2.0	90~120

5.5 Gas Cutting Technics Reference

5.5.1 Propane+Oxygen

	Cutting Oxygen Hole Diameter	Cutting Thickness	Cutting Speed	Gas Pressure MPa		Gas Consumption		Remarks
	mm	mm	mm	Oxygen	Propane	Oxygen m³/h	Propane l/h	
00	0.7	5~10	600~450	0.2~0.3	>0.03	0.9~1.3	340	
0	0.8	10~20	480~380	0.2~0.3	>0.03	1.3~1.8	340	
1	1.0	20~30	400~320	0.25~0.35	>0.03	2.5~3.0	470	
2	1.2	30~50	350~280	0.25~0.35	>0.03	3~4	470	
3	1.4	50~70	300~240	0.3~0.4	>0.04	4.5~6	620	
4	1.6	70~90	260~200	0.4~0.6	>0.04	5.5~7	620	
5	1.8	90~120	210~170	0.4~0.6	>0.04	8.5~10.5	620	
6	2.0	120~160	180~140	0.5~0.8	>0.05	12~15	780	
7	2.4	160~200	150~110	0.6~0.9	>0.05	21~24.5	1000	

5.5.2 Acetylene+Oxygen

Nozzle NO.	Cutting Oxygen Hole Diameter	Cutting Thickness	Cutting Speed	Gas Pressure MPa		Gas Consumption		Remarks
	mm	mm	mm	Oxygen	Propane	Oxygen m³/h	Acetylene l/h	
00	0.8	5~10	600~450	0.2~0.3	>0.03	0.9~1.3	340	
0	1.0	10~20	480~380	0.2~0.3	>0.03	1.3~1.8	340	
1	1.2	20~30	400~320	0.25~0.35	>0.03	2.5~3	470	
2	1.4	30~50	350~280	0.25~0.35	>0.03	3~4	470	
3	1.6	50~70	300~240	0.3~0.4	>0.04	4.5~6	620	
4	1.8	70~90	260~200	0.3~0.4	>0.04	5.5~7	620	
5	2.0	90~120	210~170	0.4~0.6	>0.04	8.5~10.5	620	
6	2.4	120~160	180~140	0.5~0.8	>0.05	12~15	780	
7	2.8	160~200	150~110	0.6~0.9	>0.05	21~24.5	1000	
8	3.2	200~270	120~90	0.6~1.0	>0.05	26.5~32	1000	

Note: cutting condition in the chart:
1. Oxygen purity is no less than 99.5%.
2. Cutting steel carbon content ≤0.45%.
3. Cutting way is vertical.
4. Oxygen pressure is cutting oxygen pressure in front of cutting torch.

EC DECLARATION OF CONFORMITY

CE

According to the following EC Directives
- Machinery Directive   : 2006/42/EC
- Low Voltage Directive : 2006/95/EC
- Electromagnetic Compatibility Directive : 2004/108/EC

The undersigned, _Martin Miao_, representing Shanghai Automation Equipment Co., Ltd. / No.18 Hangfan Road, Damaiwan Industrial Zone, Hangtou, New Pudong District, Shanghai, China. manufacturer, declares that the machine described hereafter:

Portable NC Flame/ Plasma Cutting Machine

Model: ZZ-1020, ZZ-1025, ZZ-1030, ZZ-1055, ZZ-1220, ZZ-1225, ZZ-1230, ZZ-1255, ZZ-1520,

ZZ-1525, ZZ-1530, ZZ-1555

This is hereby declared that following designated product meet the essential safety and health requirements of the Machinery Directive 2006/42/EC , Low Voltage Directive 2006/95/EC, this declaration applies to all specimens manufactured identical to the model submitter for testing/evaluation. assessment of compliance of the product with the requirement relating to safety standards listed above was performed by manufacturer.

APPLICABLE STANDARDS
• EN ISO 12100-1: 2003 / Safety of Machinery - Basic concepts, general principles for design
  Part 1: Basic terminology, methodology.
• EN ISO 12100-2: 2003 / Safety of Machinery - Basic concepts, general principles for design
  Part 2: Technical principles and specifications.
• EN 294: 1992 / Safety of machinery - Safety distance to prevent danger zones being reached by the upper limbs
• EN 349: 1993 / Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
• EN 414: 2000 / Safety of machinery - Rules for the drafting and Presentation of safety standards
• EN 418: 1992 / Safety of machinery - Emergency stop equipment, functional aspects - Principles for design
• EN 953: 1997 / Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
• EN 954-1: 1996 / Safety of machinery - Safety-related parts of control systems -
  Part 1: General principles for design
• EN 983: 1996 / Safety of machinery - Safety requirements for fluid power systems and their components -
  Pneumatics
• EN 1037: 1995 / Safety of machinery - Prevention of unexpected start-up
• EN 14121-1/-2: 2007 / Safety of machinery - Principles for risk assessment
• EN ISO 14122-2:2001 "Safety of machinery - Permanent means of access to machinery –
  Part 2: Working platforms and walkways"
• EN ISO 14122-3:2001/ Safety of machinery - Permanent means of access to machinery –
  Part 3: Stairs, stepladders and guard-rails
• EN ISO 14122-4:2004 "Safety of machinery - Permanent means of access to machinery –
  Part 4: Fixed ladders"
• EN 60204-1: 2006 / Safety of machinery - Electrical equipment of machines - Part 1: General requirements.
  Industrial electrical device.

Authorized representative

NAME: SMULDERS DUSCON BV

ADD: INDUSTRIEWEG, 75531 AB BLADEL HOLLAND   VAT NO. NL 005117690B01

To hold technical file on behalf of manufacture above.

Date:_____2010/9/20_____
Place:_____Shanghai China_____

Signature:_____
Qualification :_____General Manager_____

Packing List of Portable NC Cutting Machine

Product Model：ZZ1020E .ZZ1225E. ZZ1525E   Ex-factory Number：

Number	Name	Quantity	Unit	Remarks
1	Host	1	Set	
2	Aluminum Alloy Track	1	Set	T2500,T3000,T3000
3	Aluminum Alloy Beam	1	Set	B1530,B1780,B2030 With Gas Route and Torch Control Line
4	Track Chassis	2/3/3	Sets	With End Cover and Fixed
5	Torch Assembly	1	Set	With Electric Height
6	Valve	3	Pieces	Configure Route3
7	Acetylene Nozzle	3	Pieces	No.0，No,1，No.2
8	Φ8mm Qxygen Input Joint,Fixed Nut ,and	1	Set	Provide for Oneself 8mm Rubber Hose
9	Φ8mm Gas Input Joint,Fixed NutAnd Hoop	1	Set	
10	Plasma Interface Wiring	1	Set	
11	Ground Clamp	1	Piece	3M
12	Power Wiring	1	Piece	3M
13	Hexagonal Spanner	1	Piece	6
14	Wrench	3	Pieces	6/10/14 Respectively
15	FASTCAM Software	1	Set	With USB Softdog
16	Packing List	1	Piece	
17	Eligibility Certificate	1	Piece	
18	Operator Manual	1	Piece	
19	USB	1	Piece	

Packing Member：   Inspector：   Date：

- Loose fitting clothing or ties may become entangled in the machinery. These items should not be worn while operating the machine.
- This controller should only be operated by trained service person.
- Do not open the controller unless obtaining the authorization.
- Do not let any acid or alkalescency substance to corrode the controller.

High Voltages

- Electric shock can kill. Be sure this equipment is safely installed in accordance with enclosed procedures and specifications.
- Avoid contact with electrical wires and cabling while power is on.
- Only trained person can operate this controller.

Catalog

Chapter 1 F2000 Series Control System Introduction

1.1 System Brief Introduction

The numerical control system F2000 series is a new production, which is integrated many merits of the same productions at home and aboard. The controller can control the motion of two axes, which is apt to the application of flame, plasma or laser cutting. This controller is very light and handy and it is very easy to operate. The controller provides menu or illustration for all the operations for the convenience of users. All key switches are human oriented designed, and they are very convenient and comfortable.

The controller chooses high speed DSP and ARM as its core to assure the cutting process to be more stable. The motion control algorithm is optimized so that the machine can move more stale and reliable, and it can save the life of the motor and the mechanical parts.

The numerical control system of F2000 series consists of F2100B/T, F2200B/T, F2300A/B、F2300T A、F2300T B、F2500A/B、F2500T A、F2500T B and F2600/T system.
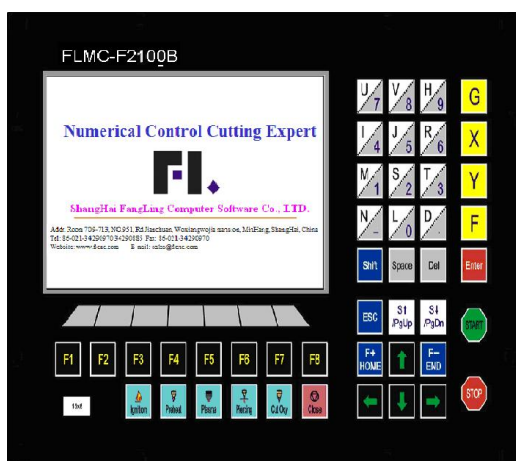
1.1.1 F2100B/T System

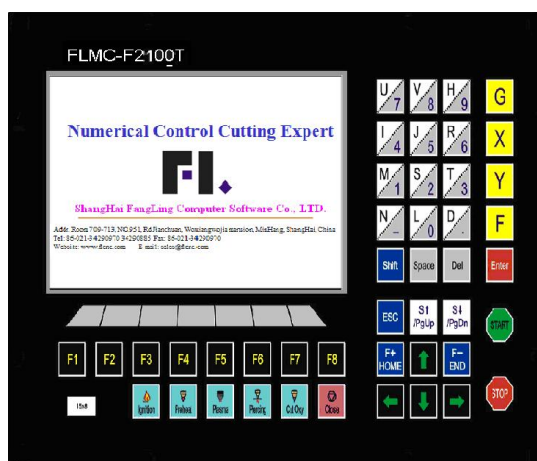

Fig 1.1 F2100B   Fig 1.1 F2100T

1.1.2 F2200 B/T System

Fig 1.2 F2200B
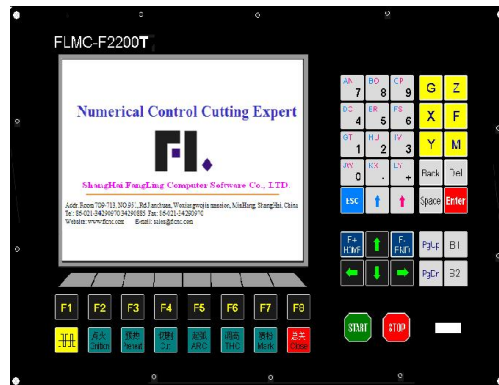
Fig 1.2 F2200T

1.1.3 F2300A/B/T (A)/(B) System
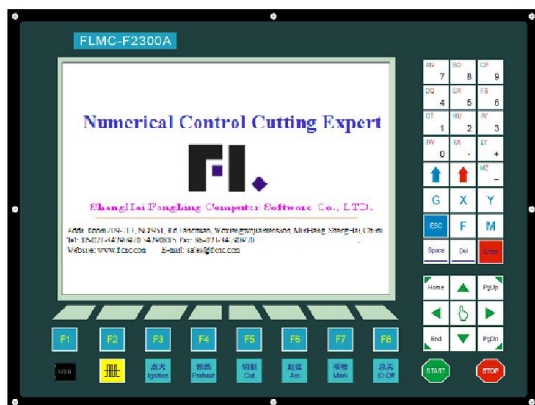
Fig 1.3 F2300A
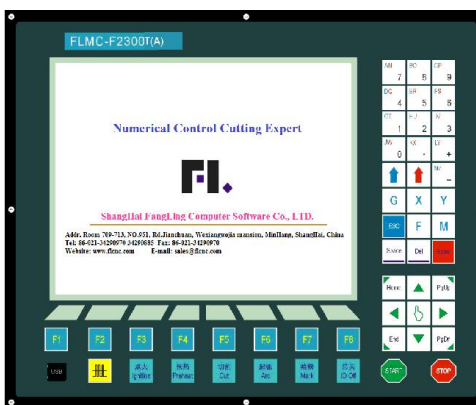
Fig 1.3 F2300T(A)
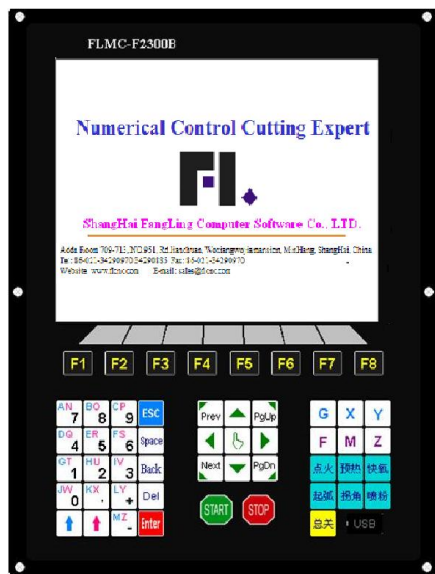
Fig 1.4 F2300B
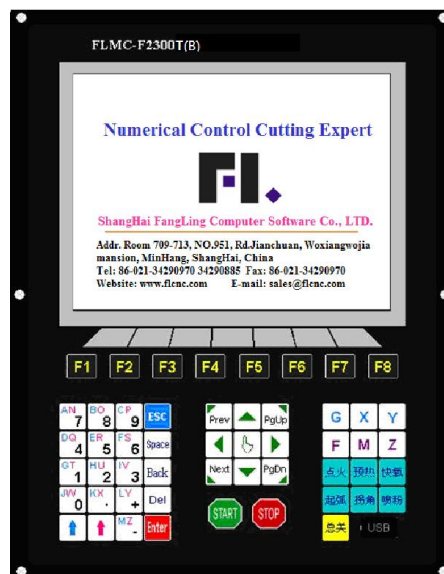
Fig 1.4 F2300T (B)

1.1.4 F2500A/B/T (A)/ (B) System
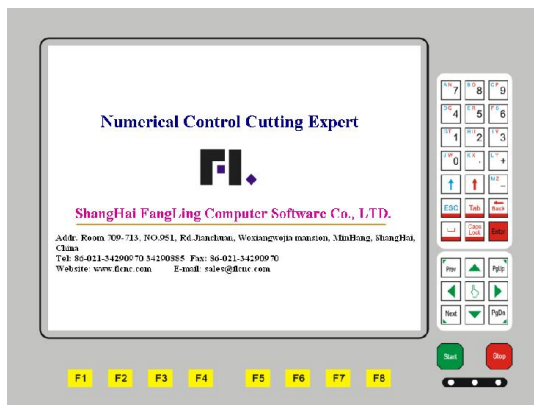
Fig 1.5 F2500 A/T (A)   Fig 1.6 F2500 B/T (B)

1.1.5 F2600/T System

Fig 1.7   F2600/T

1.2 Characteristics of System

1) Chinese/English/French/Portuguese/Russian/Denmark/Korean language menu, the menu can be switched only by one key.

2) 47 categories different graphics (including grid pattern), chip part and hole part are alternative.

3) Support the EIA code (G code) and various FastCAM、FreeNest、SmartNest、IBE software.

4) Compact keyboard design and easy to input files.

5) Graphics have some operations such as Proportion, Rotate, and Mirror.

6) Graphics can be arrayed in matrix, interaction, stacked modes.

7) Steel plate can be adjusted according any steel side.

8) Coordinate system can be customized to support the two dimensional coordinates of all eight kinds.

9) All input and output port type and the number can be customized (normally open or normally closed).

10) Self-diagnostic function, to diagnose the key status and all the IO status, facilitate inspection and debug.

11) Provide a front USB interface for copying files.

12) System can be upgraded by USB interface easily, and we provide lifetime upgrade service.

13) All functions and techniques can upgrade online and don't worry about the after sale service.

14) Import and export files by single or all files.

15) Display time, week and clock.

16) Parameters backup and online upgrade.

17) Support the Flame, Plasma, Dusting draw and Demonstration four kinds of mode.

18) Including various types of processing parameters to meet the needs of different processes.

19) Flame and Plasma are separated in the control IO ports.

20) Support THC, two-level preheat, three-level pierce in flame mode.

21) Plasma arc feedback, positioning feedback, automatically shut down the arc at the corner.

22) Built-in plasma arc auto/manual turn high function: display actual arc pressure and set arc pressure, set THC parameter, check for collision/position successful signal,

control arcing signal, check for location.

23) Plasma arc controlling supports two close arc THC ways of speed and distance to make the machine more stable and safer.

24) Support edge cutting. It can save the preheat time for the thick steel plate.

25) Movement speed can be real-time acceleration, deceleration.

26) According to plate thickness, the cutting speed is automatically restricted by a speed limit in the corner, effectively preventing over burn.

27) Select row and column manually.

28) Dynamic/static illustration of the process, graphics zoom in / out, dynamically tracking cut-off point under zooming state.

29) DSP as core can control the machine move in high speed accurately, stability and in low noise.

29) Starting speed and acceleration can be set by your convenience.

30) Automatically memorize the working situation and the last cutting point when power off.

31) "Cutting offset" function can avoid waste the steel plate when the nesting of the plate is calculated wrong.

32) Set up different administration authority and the corresponding password to safeguard the interests of equipment manufacturers.

33) Long-distance remote control can control the machine to move forward, backward, left, right and cutting start, stop and so on (optional configuration).

34) Plasma arc controller support two modes of close arc THC: rate and distance, making machine more stable and safer.

1.3 Technical Indicator

1) Control Axis: 2 axis linkage(3 axis customizable)

2) Control accuracy: +/-0.001mm

3) Coordinate range: +/- 99999.99mm

4) Max pulses: 200 kHz.　　Max speed: 15,000 mm/m

5) Max lines of code: 150,000lines

6) Max size of single code file: 4M

7) Max power of drive arc THC motor: 45W

8) Time resolution: 10ms

9) Working Voltage: DC +24V direct-current power input, power > 80W。

10) Working Temperature: -10℃~+60℃．Relative Humidity, 0~95%.

1.4 System Interface

a)   15 pins SMA Male interface of 2 axes of motor drive.

b)   25 pins SMA Female interface of 16 channels optoelectronic isolation output ports max back flow current 300mA.

c)   25 pins SMA Male interface of 16 channels optoelectronic isolation input ports，max output current 300mA.

d)   5 cores THC motor output and limit input ports.

e)   7 cores arc pressure and position input port, arcing signal output port.

f)   Selection of partial pressure proportion of arc input: 1:50 or 1:100

g)   USB interface on the front panel, for the convenience of transmitting cutting code.

h)   Extend IO input/output ports, PWM input ports, analog input ports.

1.5 Hardware Configuration

1.5.1 F2100 B/T Hardware Configuration

1.   Monitor:7 inch, 800*480, high definition 16 million colors and high brightness LCD

2.   Memory: 64M SDRAM

3.   Program space available for user: 256M electronic hard disk

4.   System master frequency: 400MHz

5.   USB: USB 1.1 front interface, at least 16GB U disk supportable

6.   Keyboard: electronic PCB foil keyboard

7.   Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.2 F2200 B/T Hardware Configuration

1.   Monitor: 8 inch, 800*600, high definition 16 million colors and high brightness LCD

2.   Memory: 64M SDRAM

3.   Program space available for user: 256M

4. System master frequency: 400MHz

5. USB: USB 1.1 front interface

6. Keyboard: electronic PCB foil keyboard(one machine) or standard industrial keyboard(split type machine)

7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.3 F2300 A/B/T Hardware Configuration

1. Monitor: 10.4 inch 800*480, high definition 16 million colors and high brightness LCD

2. Memory: 64M SDRAM

3. Program space available for user: 256M electronic hard disk

4. System master frequency: 400MHz

5. USB: USB 1.1 front interface, at least 16GB U disk supportable

6. Keyboard: electronic PCB foil keyboard

7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.4 F2500 A/B/T Hardware Configuration

1. Monitor : 17 inch high brightness LCD with industrial VGA interface

2. Memory: 64M SDRAM

3. Program space available for user: 256M

4. System master frequency: 400MHz

5. USB: USB 1.1 front interface, at least 16GB U disk supportable

6. Keyboard: PCB foil keyboard

7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

1.5.5 F2600/T Hardware Configuration

1. Monitor : No, but standard monitor with VGA interface supportable

2. Memory: 64M SDRAM

3. Program space available for user: 256M

4. System master frequency: 400MHz

5. USB：USB 1.1 front interface, at least 16GB U disk supportable

6. Keyboard: no, but standard keyboard with PS2 interface supportable

7. Chassis: full-steel structure completely shielded which defends electromagnetic radiation, interference and static electricity

Chapter 2 Starting up of System

2.1 Introduction of System Operation Board
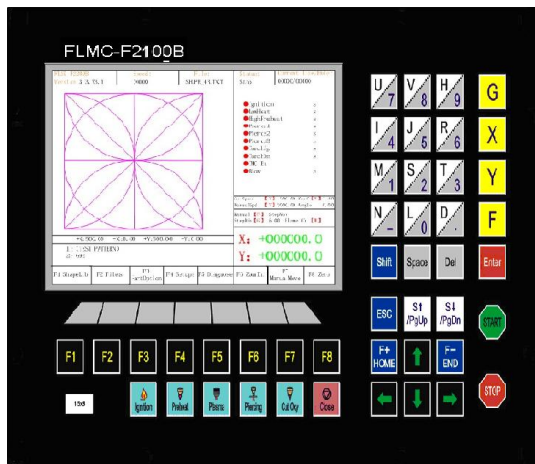
Fig 2.1 F2100 B system board
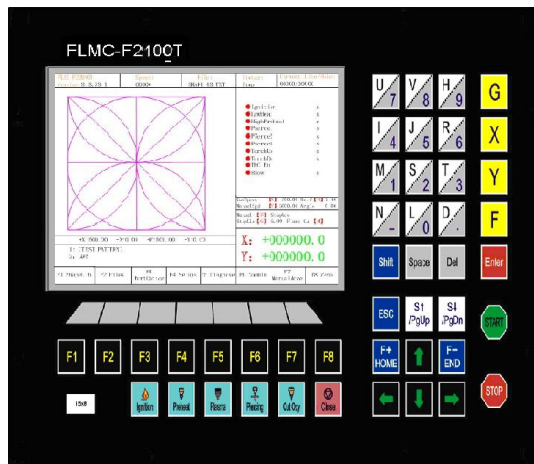
Fig 2.1 F2100 T system board
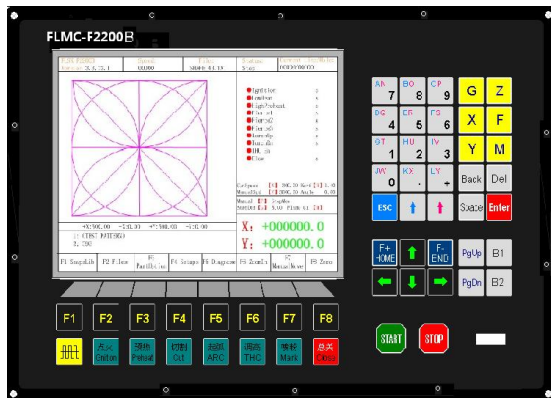
Fig 2.2 F2200 B system board
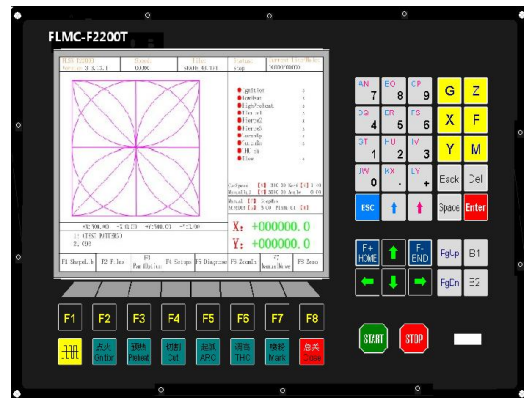
Fig 2.2 F2200 T system board
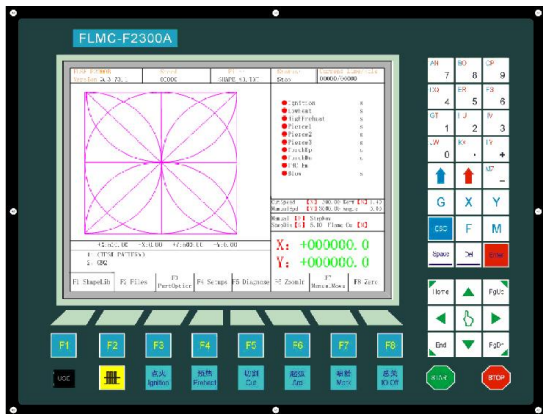
Fig 2.3 F2300 A/T(A) system board   Fig 2.3 F2300 B/T(B) system board
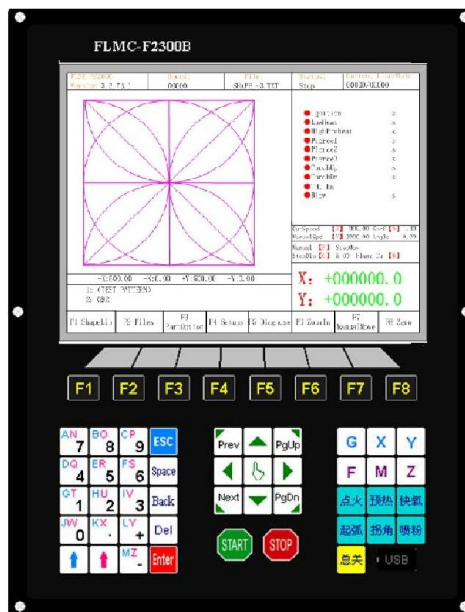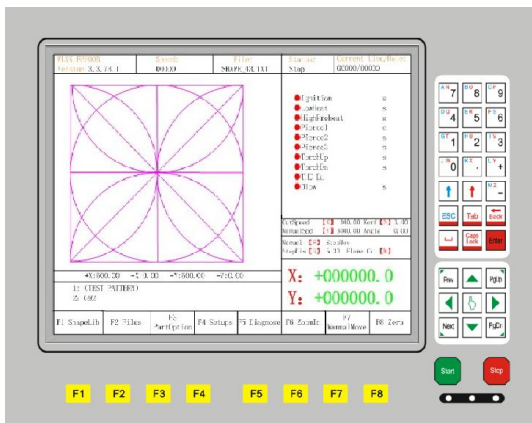
Fig 2.4 F2500A/T(A) system board   Fig 2.4 F2500B/T(B) system board
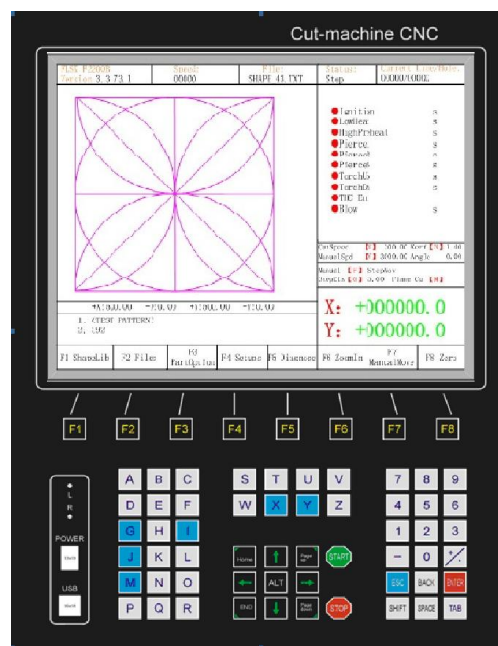
【F1】-【F8】   Function key in different interface

【S↑/PgUp】   page-up key of code interface or Torch up in other interface

【S↓/PgDn】   page-down key of code interface or Torch down in other interface

【F+/HOME】   Accelerate or skip to the head of code line

【F-/END】   Decelerate or skip to the tail of code line

【1】-【9】   During the cutting process, change the cutting speed to ratio of the speed limit you have set, for example press【1】, change the cutting speed to 10% of

the speed limit you have set, press 【2】, change the cutting speed to 20% of the speed limit you have set

【G】、【X】、【Y】、【F】   Frequently-used keys in operation box can quickly modify the parameters in the main interface.

2.2 Power on Processing and Main Interface

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


```
Press F2 to run BIOS
Auto boot after: 3
```
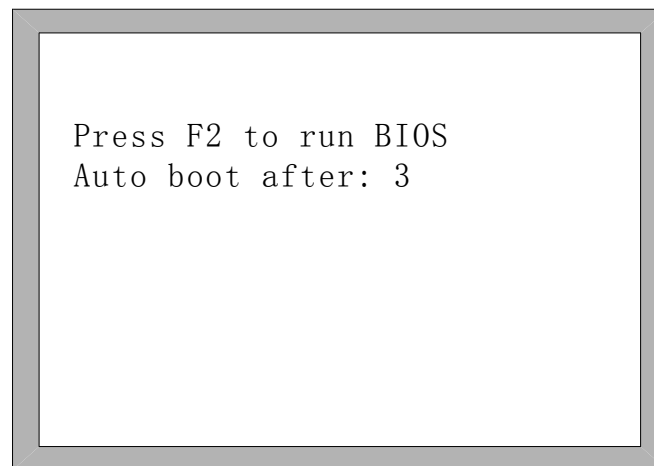
Fig 2.5 System self-check interface

In the starting process, there is 3 seconds to countdown, before the countdown is over, if pressing 【F2】, it will enter the BIOS (please take the reference of the chapter 12 to run bios). If pressing any other key, it will jump over the countdown and directly enter the welcome interface. If pressing no key, it will countdown to 0 and then enter the welcome interface shown as Fig 2.6. In the welcome interface, press any key to enter the main interface automatically shown as Fig2.7.
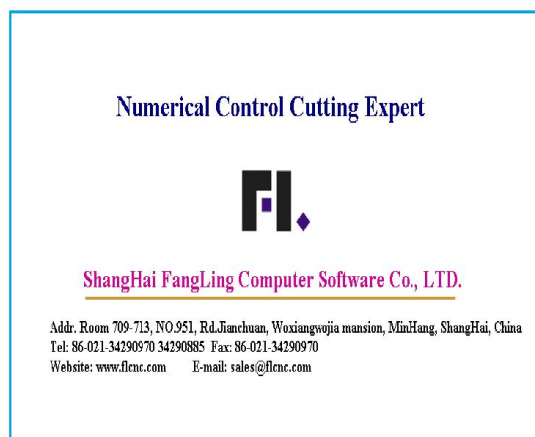
Fig 2.6 welcome interface
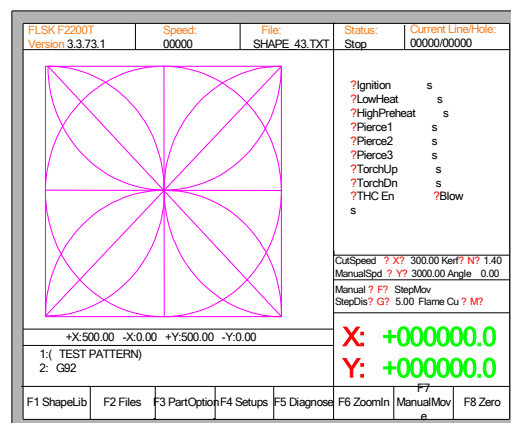
Fig 2.7 the main interface

Note: the system type "F2200T" shown in "FLSK F2200T" at the left and up corner of above figure shows different contexts, the following is the same, it will not be interpreted repeatedly. For example, it will show "FLSK F2100T" in the system of F2100T.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

● 【START】Begin to cut

● 【SPACE】 Enter cutting interface

2.3 Function Index of Main Interface

```
┌─────────────────────────────────────────────────────────────────────────────────────────┐
│  ┌────────────┐                                                                           │
│  │   Main     │                                                                           │
│  │ Interface  │                                                                           │
│  └────────────┘                                                                           │
│                                                                                           │
│  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐  ┌──────┐          │
│  │  F1  │  │  F2  │  │  F3  │  │  F4  │  │  F5  │  │  F6  │  │  F7  │  │  F8  │          │
│  │ShapeLib│ │Files │  │ Part │  │Setups│  │Diagnose││Zoom In││Manual│  │ Zero │          │
│  │      │  │      │  │Option│  │      │  │        ││       ││ Move │  │      │          │
│  └──────┘  └──────┘  └──────┘  └──────┘  └──────┘  └──────┘  └──────┘  └──────┘          │
└───────────────────────────────────────────────────────────────────────────────────────────┘
```

F1 ShapeLib
- F1 Film size
- F2 Hole size
- F8 OK

F2 Files
- F1 Disk File
- F2 U Disk File
- F3 Search File
- F4 Edit File
- F5 Del File
- F6 Copy to U
- F7 Preview Graph
- F8 OK

F3 Part Option
- F1 Origin select
- F2 Angle
- F3 Array
- F4 Scale
- F5 Select line and pierce
- F6 Code edit
- F7 Revert
- F8 OK

F4 Setups
- F1 common
- F2 Flame
- F3 Plasma
- F4 Dusting
- F5 System
- F6 Import Parameters
- F7 Export Parameters
- F8 Save

F5 Diagnose
- F1 Input Diagnose
- F2 Output Diagnose
- F5 Keyboard Diagnose
- F6 System Self-check
- F7 Date time
- F8 System Definition

F7 Manual Move
- F1 Point moving
- F2 continue moving
- F3 step moving
- F4 Speed-Down
- F5 Speed-Up
- F7 Recovery

F8 System Definition
- F1 Parameter Recovery
- F2 Parameter Backup
- F3 Definition
- F4 Encryption
- F5 Decryption
- F6 Language
- F7 Empty File
- F8 System Update

F3 Definition
- F1 Input
- F2 Output
- F3 Coordinate
- F4 Dynamo
- F5 Option
- F8 Save

Fig 2.8 Function index of main interface

Chapter 3 Cutting Function

In the main interface, press the 【SPACE】to enter the cutting interface, shown as follows:
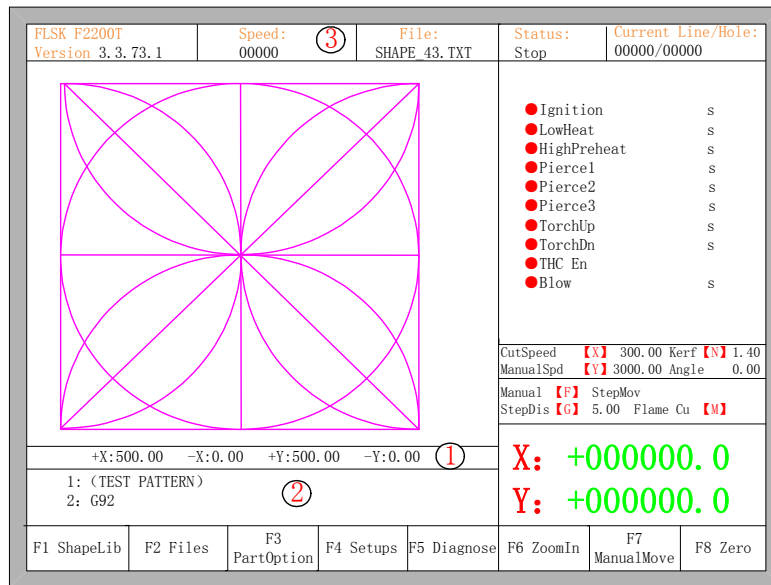
Fig 3.1   cutting function interface

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

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

③Shows the current cutting speed, during processing, you can press the keyboard's number keys 【1】- 【9】 to achieve quick speed regulation. For example, press the number 【3】, the speed is automatically adjusted to 30%; press the number 【8】 the speed is automatically adjusted to 80%.

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

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

In the cutting interface:

- Press 【X】: Modify the current cutting speed.
- Press 【Y】: Modify the current speed manual shift car.
- Press 【F】: Change the current manual method.
- Press 【G】: Modify the current fixed-length fixed long-distance move.
- 【START】(【F9】): Start cutting.
- 【STOP】(【F10】): Parking, the system can suspend all ongoing actions.
- 【F1】:The torch move back along the cutting path(I / O port closed)
- 【F2】: The torch forward along the path (I / O port closed).

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

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

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

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

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

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

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

3.1 Cutting Operation Index

```
┌─────────────────┐
│    Cutting      │
│   Interface     │
└─────────────────┘
         │
         ├──┌─────────────────┐
         │  │    F1 Back      │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │    F2 Demo      │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │ F3 GoBack/Frame │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │  F4 Speeddown   │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │   F5 Speedup    │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │ F6 Preheat down │
         │  └─────────────────┘
         │
         ├──┌─────────────────┐
         │  │  F7 Preheat up  │
         │  └─────────────────┘
         │
         └──┌─────────────────┐
            │  F8 Jump to     │
            │  pierce/ZoomIn  │
            └─────────────────┘
```
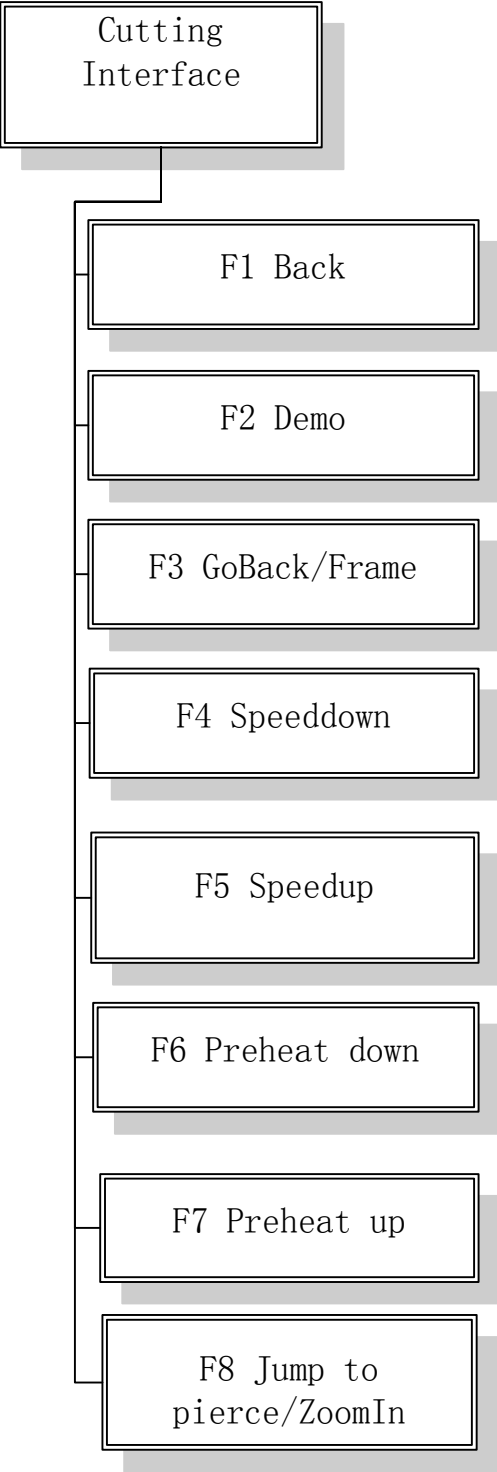
Fig 3.2 Cutting operation index

3.2 Speed Regulation

3.2.1 Normal Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can regulate speed.

In the operation panel, press 【F5】, 【PRE】 or【HOME】, increasing 3% of current rate with per click. Hold the 【F5】, 【PRE】or【HOME】, then the rate will continuously increase to the maximal cutting rate.

In the operation panel, press 【F4】, 【NEXT】or【END】, decreasing 3% of current rate with per click. Hold the 【F4】,【NEXT】or【END】, then the rate will be continuously reduced to 0.5% of maximal cutting rate.

3.2.2 Quick Speed Regulation

In automatic operation, or when the system is suspended, in the cutting interface the system can carry out quick speed regulation.

In the cutting interface, on the operation panel, press the number keys 【1】 - 【9】, the speed will quickly adjust to the corresponding percentage figures 10 times, for example press 【3】, adjust to 30% of the speed limit you have set, press 【8】, adjust to 80% of the speed limit you have set.

3.3 Forward

In the automatic function interface, press key【F2】, the machine start to move without real cutting. The process does not include any ignition, perforation and any other I/O working. The machine just moves the torch according to the graphic figure. Press 【F2】again, the system stops running.

The function can be used to check the trail and code before you start the real cutting process, or can also be used when the process needs through the gun. Press the red "STOP" key to stop the null cutting process if you want.

Forward speed and cutting speed are provided separately. Forward speed is defined by the "empty / backward speed" in the common parameters.

3.4 Backward

During the running process, if you want to go backward according to the origin trail to (maybe the iron board was not cut through), you can follow the following direction:

● First, press "STOP" key to set the machine at pause status.

● In the automatic function interface, press key【F1】(Back) to make the machine go backward along with the original trail. When the torch reaches the position you need, press "STOP" key to stop it. You may press key 【F2】 to go forward if the machine just went back too much.

Notice: Go backward or forward function can be used repeatedly to make the machine reach an ideal position.

● In the backward process, press 【F1】 again, the system stops running.

● When the torch reaches the position you need, press "START" key again, if the current cutting code is G01, G02 or G03, system will automatically perforate before performing these procedures, and then continue the current program, if the current row is not G01, G02 or G03, the system will directly continue the current line program.

Same as the forward speed, backward speed and cutting speed are also provided separately. Backward speed is also defined by the "empty / backward speed" in the common parameters.

3.5 Edge Cutting / Offset Cutting / Return

When the torch is not on the actual path of the current work piece, it will prompt as follows:
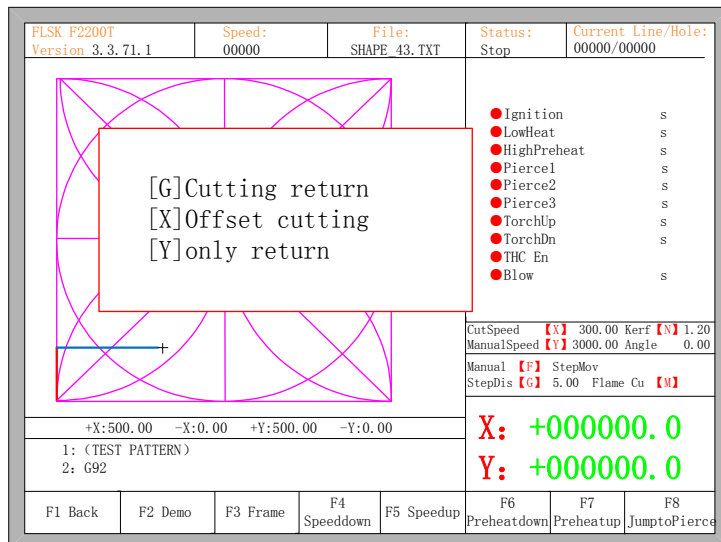
Fig. 3.3 edge perforation

There are two reasons led to this situation:

1) When the common parameter "edge perforation" selects "Yes" and if G-code of the next processing line is M07, the system will be automatically suspended. At this time, the torch can be manually moved to any edge of the plate, press the "start" button, the system will prompt as above

2) When the processing is paused, due to mechanical failure or other reasons, it needs to move the torch out of the actual path of the work piece, the above prompt will appear.

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

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

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

3.6 Back to Reference Function

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

Fig. 3.4 Return reference prompt

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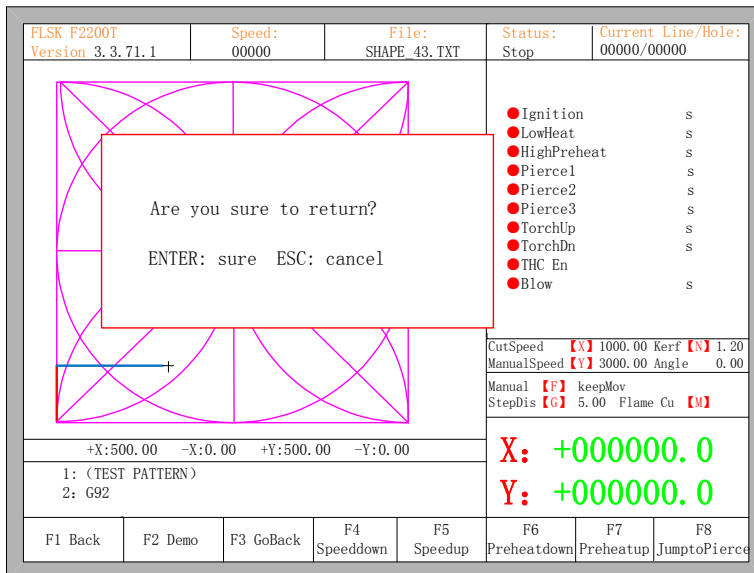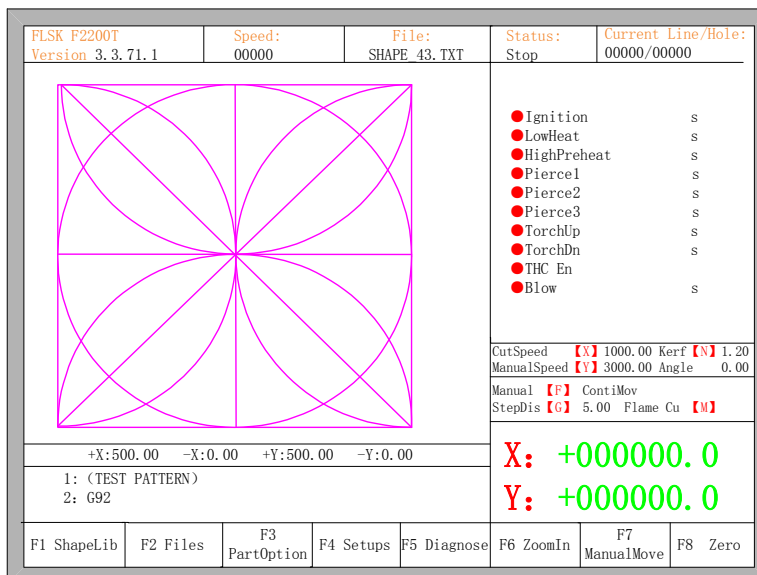

Fig. 3.5 main process interface

During the return process, the user can press the "Stop" button to stop the operation, and can continue to return operation after pressing of 【F3】. Number of

back to reference and stop has no limit.

3.7 Oxygen Gas Preheat Time Regulation

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

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

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

For example: the original system sets the preheat time of 60 seconds, when preheat needed, the interface will count down, under normal circumstances, till 0, the system begins the next step of cutting, but if the system has the remaining 10 seconds of countdown time, press 【F6】, then the system immediately stops preheat to begin the next step of cutting, and records the preheat time of 50 seconds, the system automatically thinks that users need preheat time of 50 seconds, the next preheat after the null cutting when the preheat time becomes 50 seconds.

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

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

3.8 Perforation Point Selection

Before you start cutting or cutting is paused, the function key prompt F8 is "select new pierce", then press F8, the system will prompt:
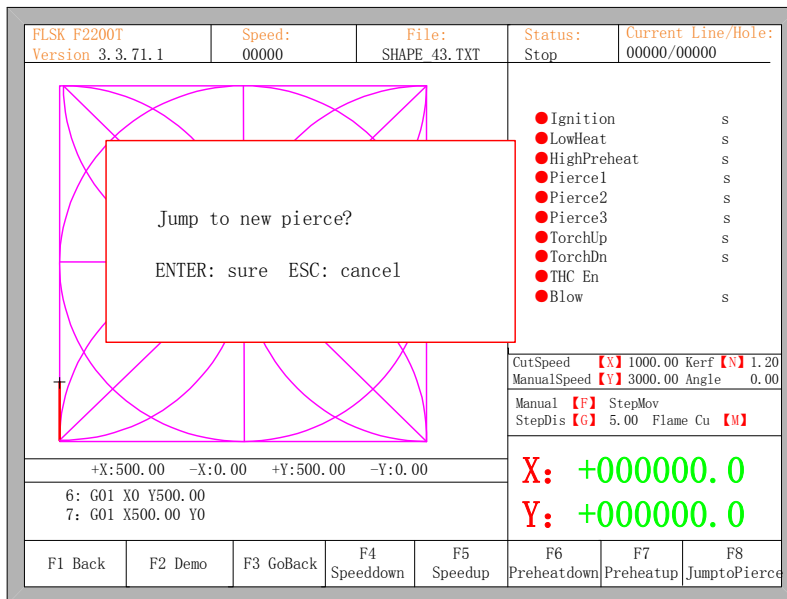
Fig. 3.6 select new pierce

If you press ESC, the system will then return the cutting interface. If you press ENTER, the system will again prompt:
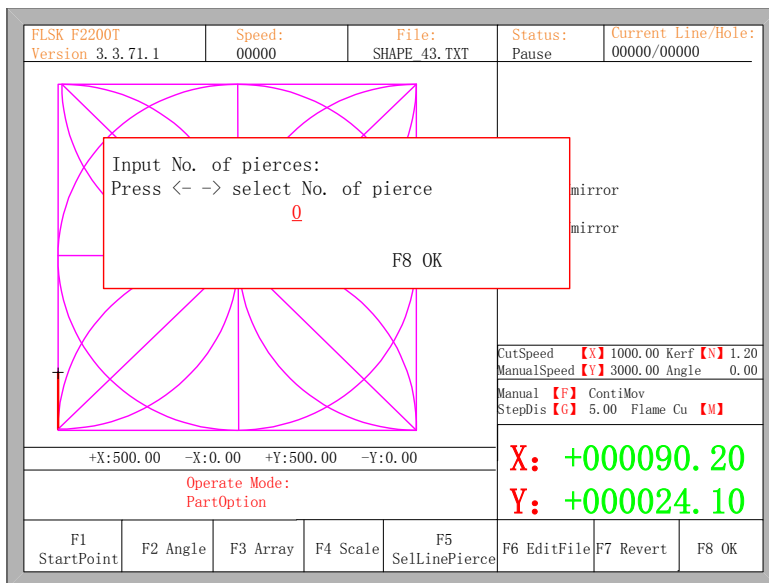
Fig. 3.7 pierce prompt

Pierce point can be input manually at this time. You can also press ESC to exit without manual input perforation point, and then press the left and right arrow keys to select the perforation point.

3.9 Dynamic Amplification

After the start of cutting, the F8 in the cutting interface will become "dynamic amplification", then press the F8 key, full-screen amplify the processing graphic , and dynamically tracking.

F1 Back	F2 Demo	F3 GoBack	F4 Speeddown	F5 Speedup	F6 Preheatdown	F7 Preheatup	F8 ZoomIn
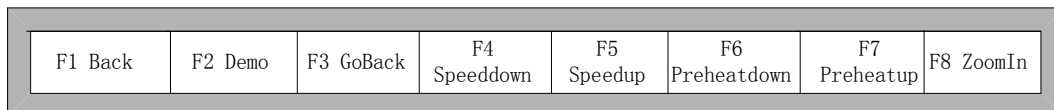
Fig 3.8 Function key of cutting interface

- Press the F8 key continuously, the system will progressively amplify graphic.
- Press ESC to exit the amplified display, back to the cutting interface.

3.10 Cutting Exit

When the cutting operation does not get finished, and the cutting machine also being in the pause condition, if press 【Esc】, the system will query whether quit the cutting operation. If pressing 【Enter】, the system will exit, and if pressing 【Esc】 the system will not exit, get into the automatically interface and go on with the cutting operation at the current place.
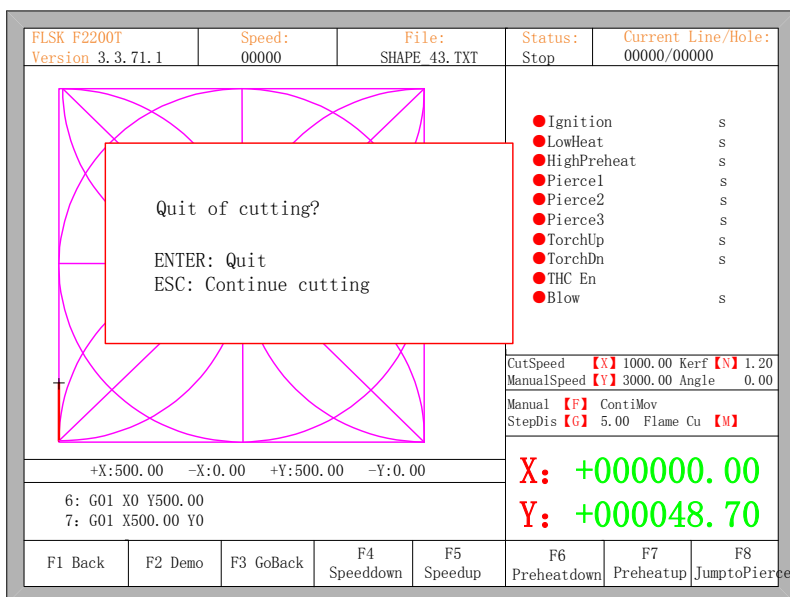
Fig. 3.9 Quit of cutting

3.11 Frame
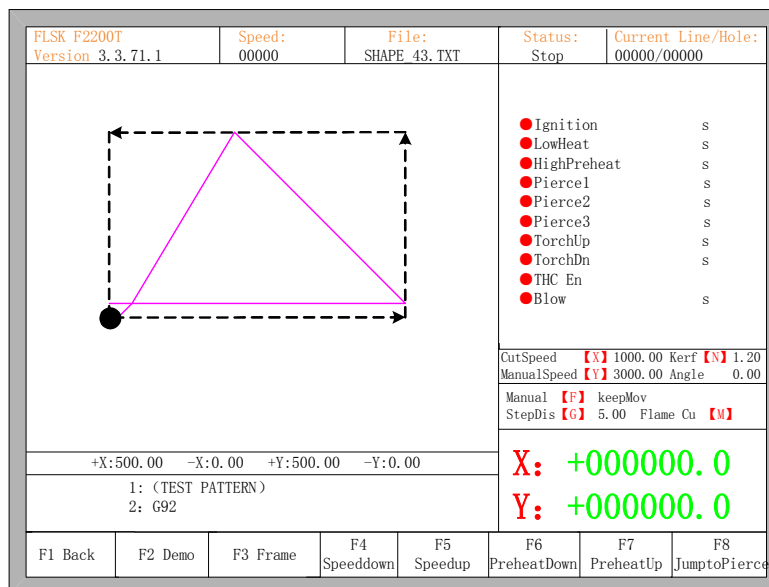
Fig. 3.10 Walk along frame

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

In the process of walking along frame, press STOP, the system suspends operation, and press START, the system resumes walking. Press 【F3】again, the system   returns to the starting point.

3.12 Arc THC Instruction (typical of the "T" in F2000 series CNC system)

3.12.1 Wiring Instruction

F2100T System links with location proximity switch, arcing signal of plasma power and arc interface of partial pressure circuit board by 7 cores socket, links with lifting motor (limiting switch) by 5 cores socket. Pins interpretation schematic shows

as follows:
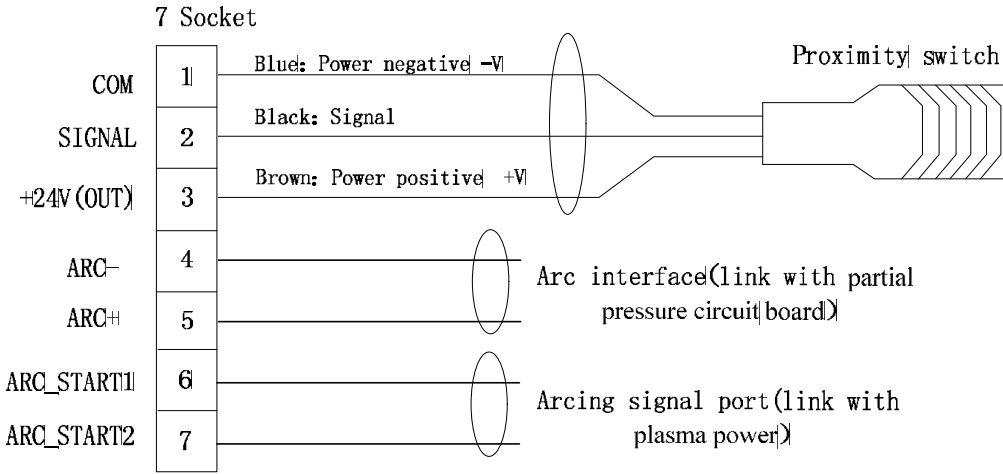
Fig.3.11 Arc and location signal wiring schematic

Fig.3.12 Interfaces of arc partial pressure circuit board schematic
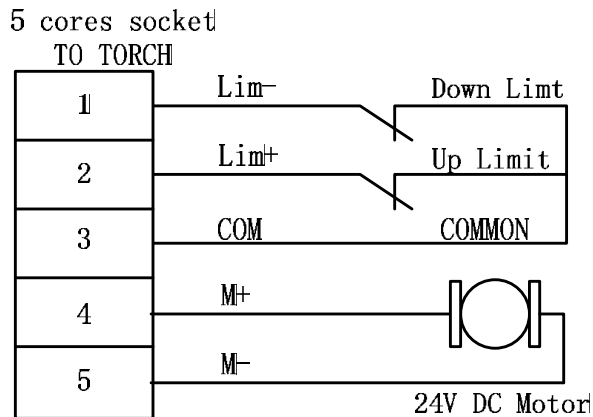
Fig.3.13 Lifting body monitor and limit switch wiring

Interpret: specific system wiring interpretation with arc THC module, please reference to the section of 11.4.4.

3.12.2 Arc Setting and Actual Arc Displaying

In the main interface or auto interface, display the arc setting and actual arc. Auto interface is shown as the figure 3.14.
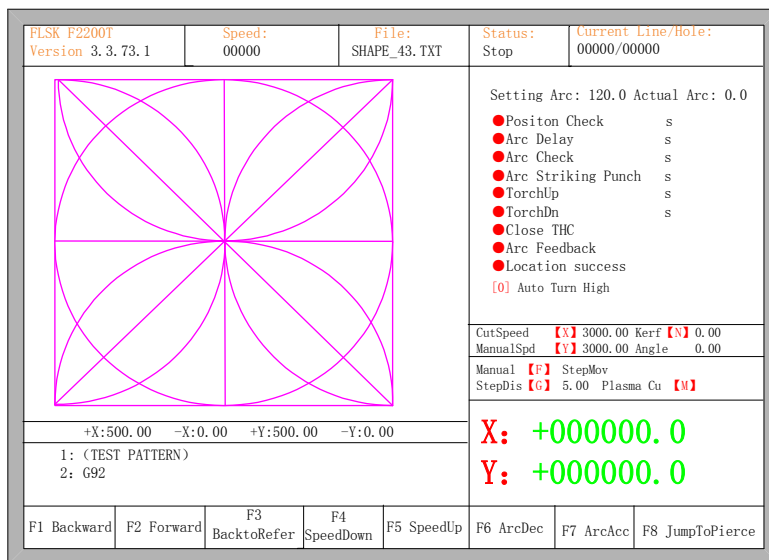
Fig.3.14 Auto interface with arc THC setting

3.12.3 Location Check

◆ Locate with F2100T system: several settings needed to be done.

26

1. Location check signal outside inputs to location successful import.(the fifth pin of CN1）

2. When torch has not touched with steel panel, in the system diagnosis(Chapter 8) , location successful feedback signal display　"●". When torch has touched with the steel panel, location successful feedback signal display　"●".

3. In the figure.7.4, Location check time must be more than the time of which torch drops down from the highest point to the steel panel.

4. In the figure.7.4, location ascend time should be the time of which torch ascends from steel panel touch point to cut running height.

When the running status is in the stop and suspend mode, press【.】 into location check status, torch descend down (the longest time of which is location check time), when check for the location successful signal, torch ascend up(the time of which is location up time), location check ends. Torch descend time exceed over the location check time while the location successful signal hasn't been checked for, at this time, stop the torch descending and alarm to notify.

3.12.4 Set Arc / Adjust Arc While Running

Arc can also be set in the plasma parameter setting page.

In the auto interface with Plasma cutting status, press 【F6】 to reduce arc value, press 【F7】 to increase arc value, the stride of decreasing or increasing is the manual adjusting stride of setting arc, it can be set in the plasma parameter interface.

3.12.5 Auto / Manual Turn High

In the plasma cutting status, press 【0】 to switch the two statuses of auto turning high and manually turning high.

In the manual turning high status, press【PgUp】to ascend the torch (full speed) and press 【PgDn】to descend the torch (full speed).

In the automatically turning high status, press【PgUp / PgDn】also to ascend or descend the torch, when release【PgUp / PgDn】, it will enter into the automatically turning high status. Until the ascending torch touch with upper limit and the descending torch touch with lower limit, it will automatically stop.

3.12.6 Crash / Position Successful Signal Check

◆ In the non plasma cutting status, punch occurs to crash and crashing signal or location successful signal is available, torch automatically ascending time is location up time. Refer to location up time in the figure 7.4.

◆ In the plasma cutting status, punch occurs to crash and crashing signal or location successful signal is available, it will automatically stop and the torch will automatically ascend, the time of which is the torch ascend time. Refer to torch ascend time in the figure 7.4.

◆ In the process of ascending, press【STOP】or torch up and down body touch with the upper limit status, it will stop ascending.

Chapter 4 Part Option

Before starting cutting, you can use "F3 Part Option" in the main interface. Press F3 to enter part options menu：
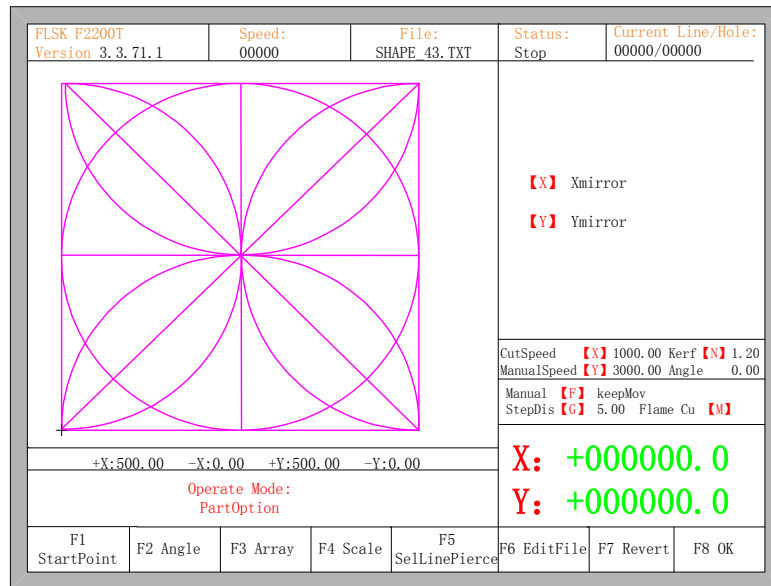
Fig 4.1 Part options

4.1 XY Mirror

In the interface of part option, the system will prompt:
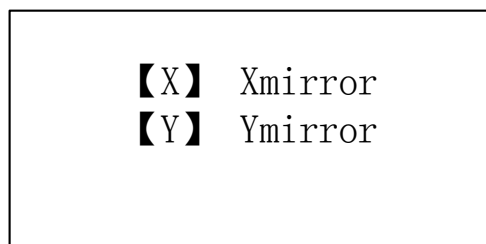
- Press X to mirror along the horizontal axis(X axis)
- Press Y to mirror along the vertical axis(Y axis)

4.2 Start Point Selection

After press 【F1】, System will prompt to select start point:

29

```
F1 Center
F2 L&B
F3 L&T
F4 R&B
F5 R&T
```

At this time, press 【F1】-【F5】, the starting point of cutting part automatically jump to relevant location. For example, press 【F4】, the part of start point will automatically jump to lower right corner. As the following figures show:
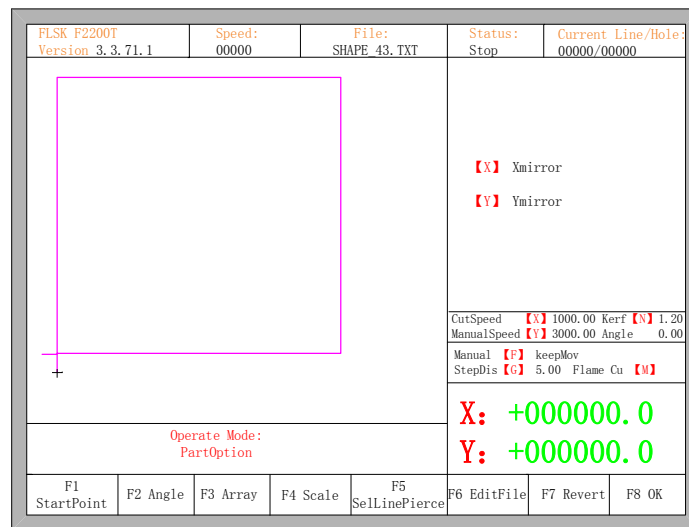
Fig 4.2 before press F4, start point is at original point
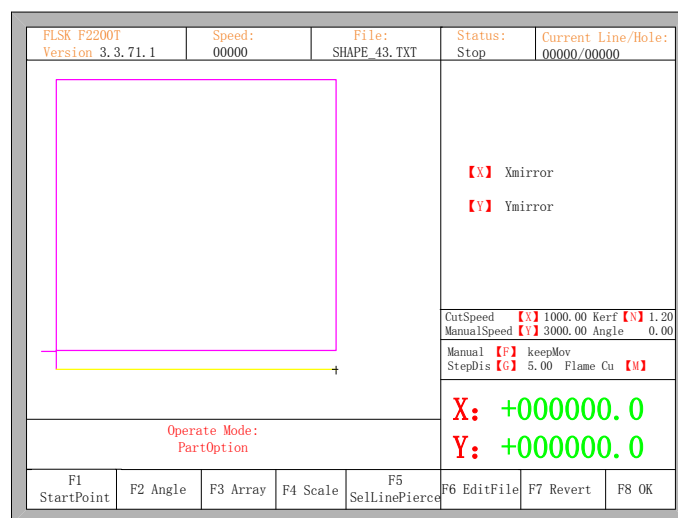
Fig 4.3 after press F4, start point is at lower right corner

4.3 Angle Adjustment

Press F2, the system will prompt:

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

● Press F1 to adjust steel plate
● Press F2 to enter angle directly
● Press ESC to exit angle adjusting

4.3.1 Steel Plate Adjustment

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

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

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

And then manually move along the cutting tip, as long as moving to the edges of the side. After ensuring the two points far enough and two points at the same side of the plate in the same line and press 【Y】. The system will automatically calculate the current offset angle of plate, and then automatically rotate graphics.
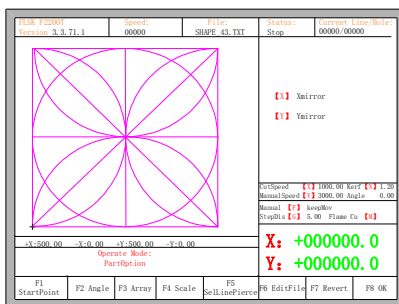
Fig 4.4 before adjusting　　　　Fig 4.5 after adjusting
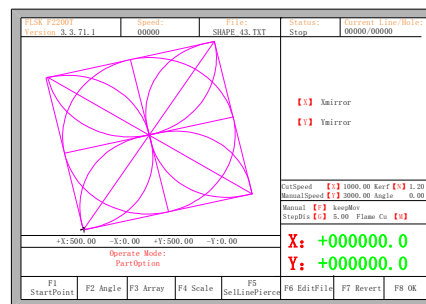
After adjusting, the system will ask whether to return to the start point, if press

【ENTER】, the system will back to the start point of the operation, if press 【ESC】, the system will do nothing but go back to the graphic interface.
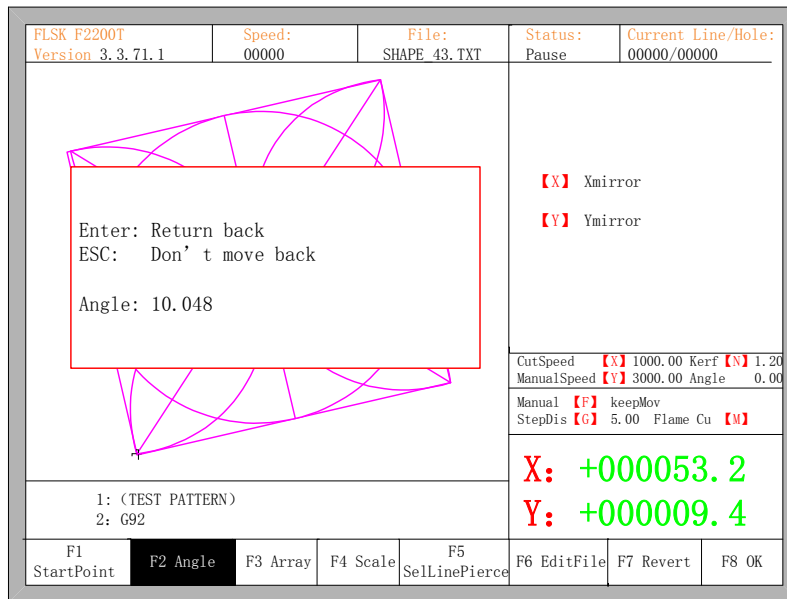
Fig 4.6 Return to the start point after adjusting

4.3.2 Steel Plate Adjust Angle Memory Function

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

4.3.3 Enter Angle

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

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

Enter angle

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

Illustration: when enter angle 0, process graph will restore to the location of 0°, at

32

this time, the system will clear the angle of steel plate adjusting or manual entering. In the general condition, the angle entered is not as the angle of steel plate adjusting. If the angle entered here needs to be as the angle of steel plate adjusting, please refer to section 8.7.6.8.

4.4 Array

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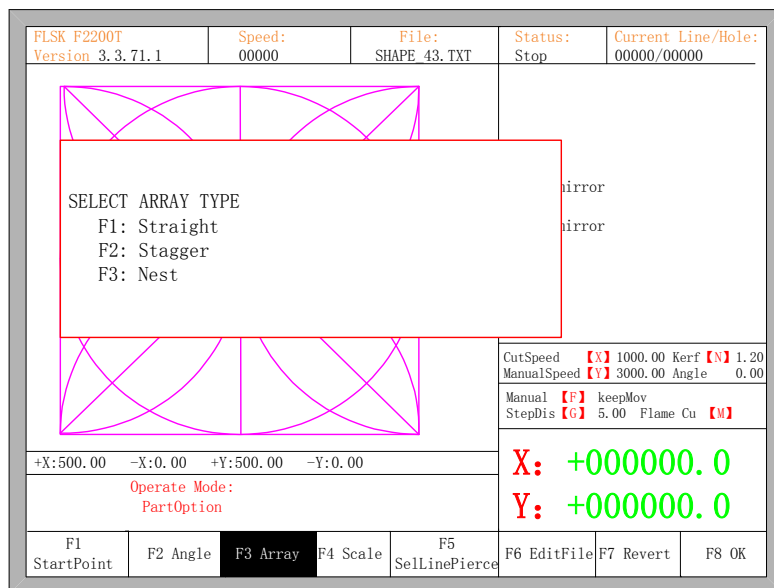
Fig 4.7 Chooses arrange method

Press【F1】 to carry on arranging in matrix:
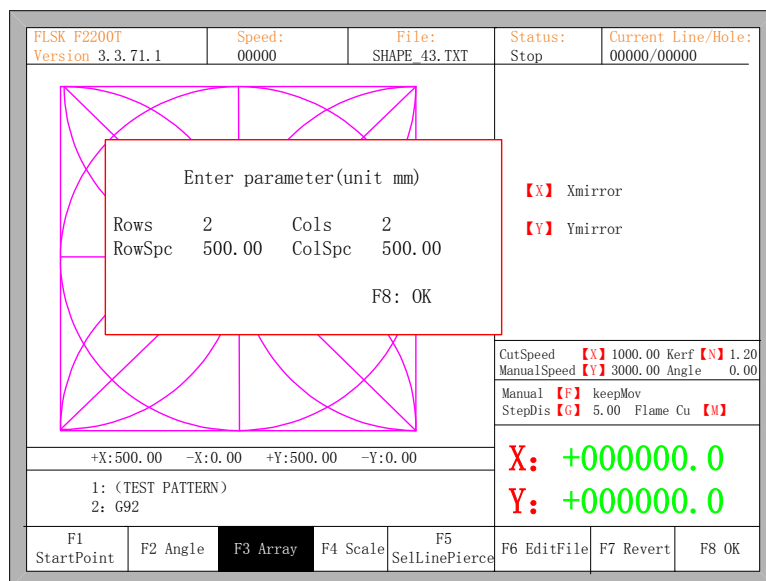
Fig 4.8 Arrange in matrix

The result is shown in fig 4.9
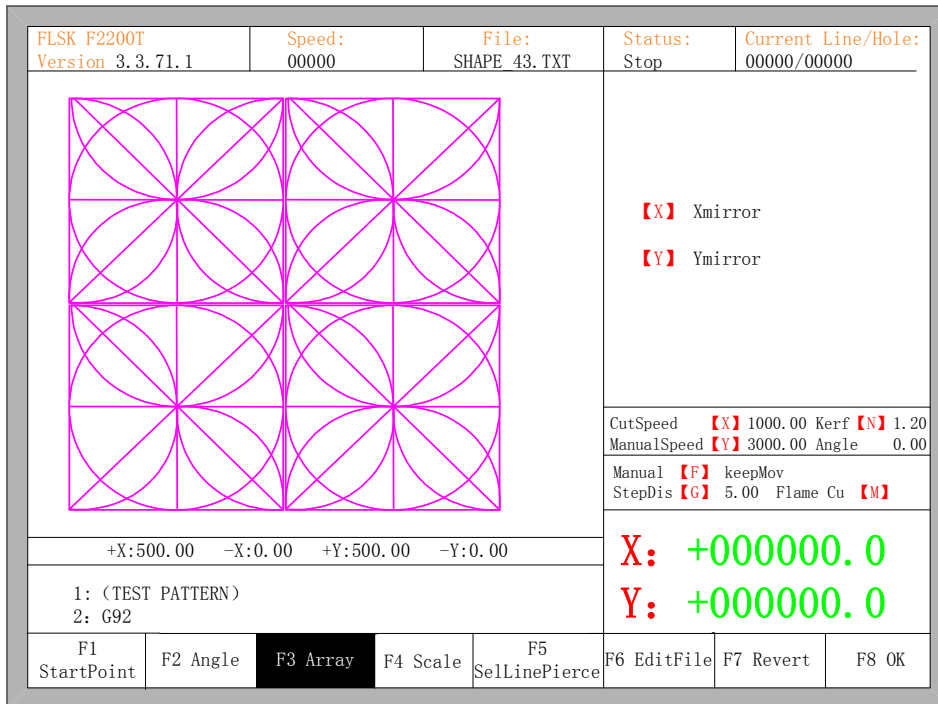
Fig 4.9 Result of arranging in matrix

Press [F2] to enter staggered arrangement:
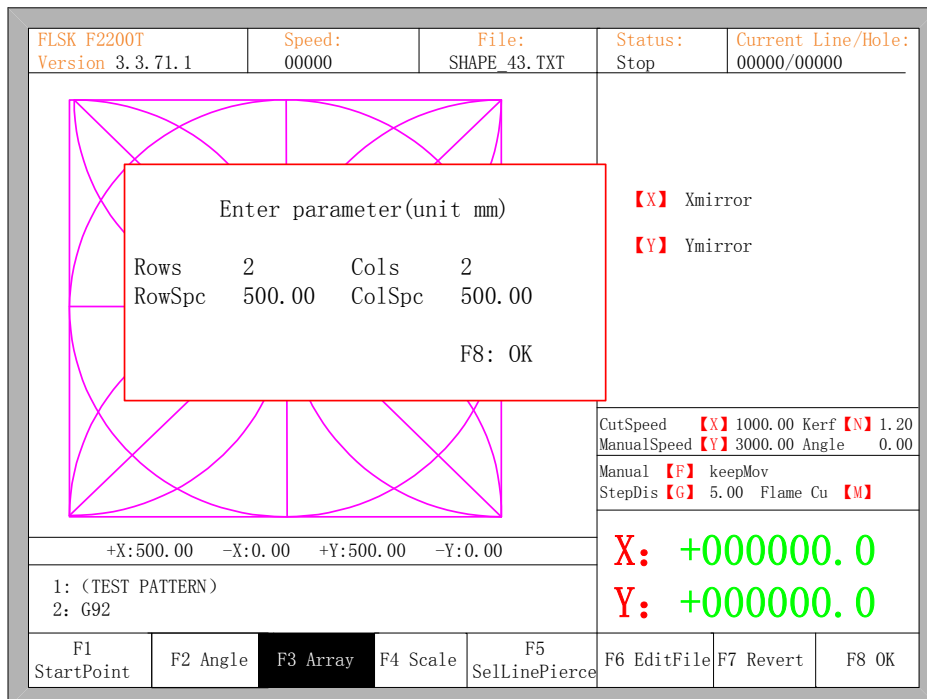
Fig 4.10 Staggered arrange

The result is shown in figure 4.11:
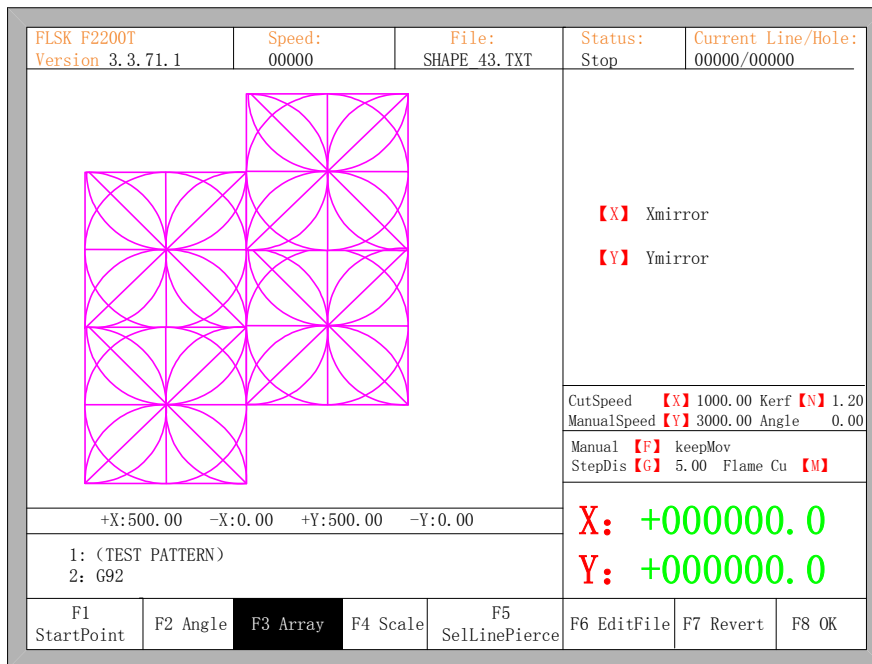
Fig 4.11 Result of staggered arrangement

Press [F3] to enter arrangement in stack:
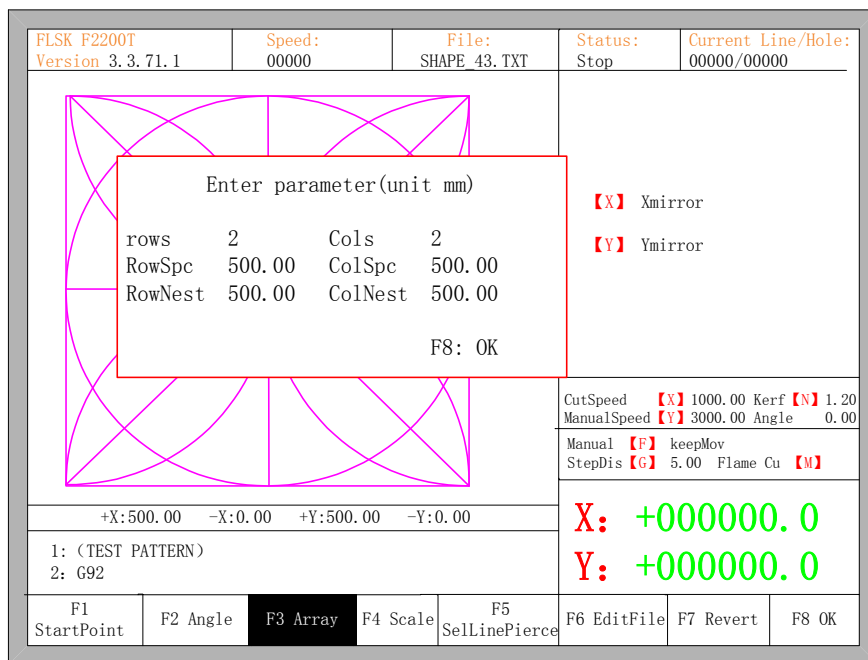
Fig 4.12 Arrange in Nest

The result is shown in figure 4.13:
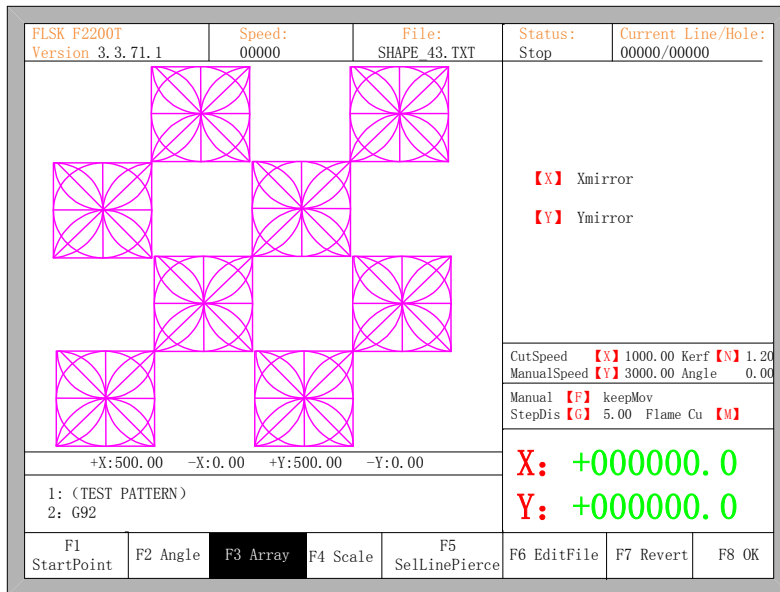
Fig 4.13 Result of arrangement in nest

4.5 Zoom in/out

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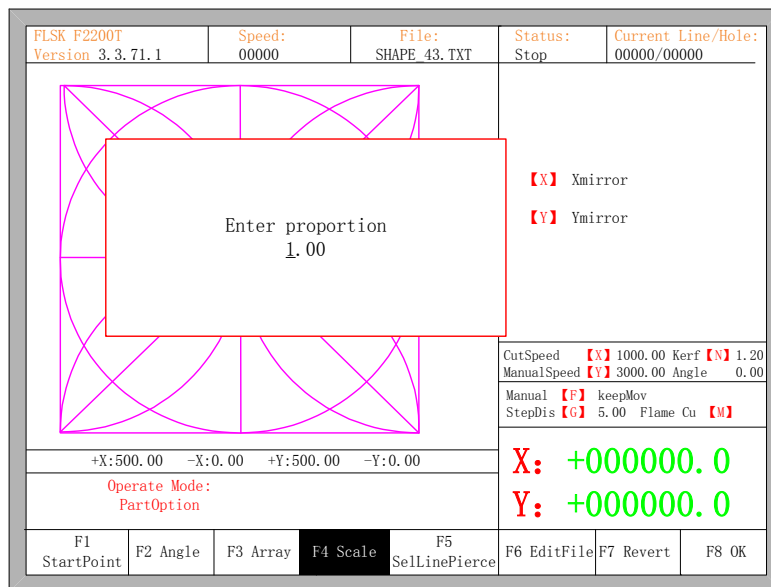
Fig 4.14 Set scales

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

4.6 Select Row/Number

In part options menu, press【F5】to enter selecting row/number, the system will prompt:
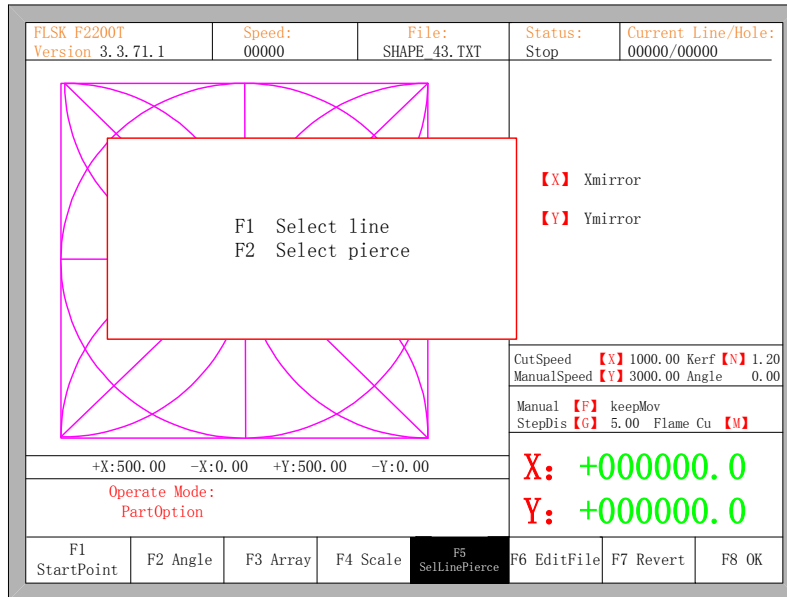
Fig 4.15 Select Line/Pierce

4.6.1 Select Row

Press【F1】to select the number of row to start cutting with, the system prompts:
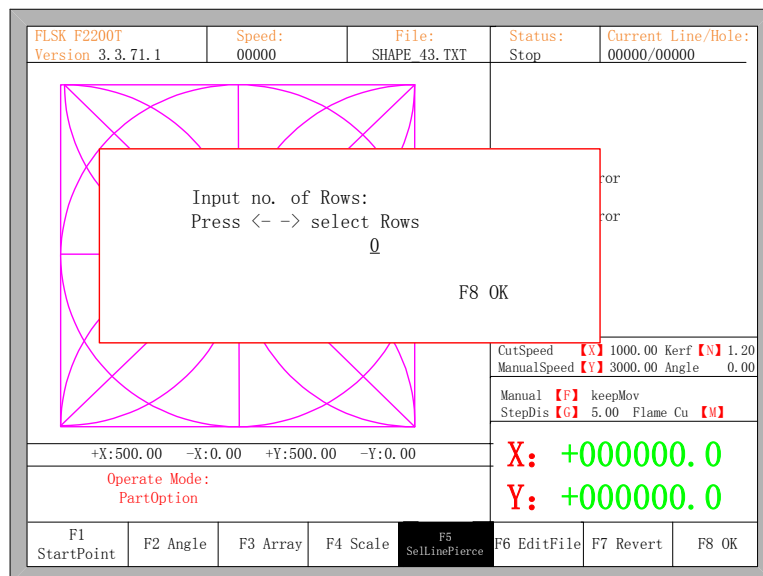
Fig 4.16 Prompt to select row

Here, you can directly enter the row number or press 【ENTER】 to enter the interface and press 【←】 or 【→】 to select row.
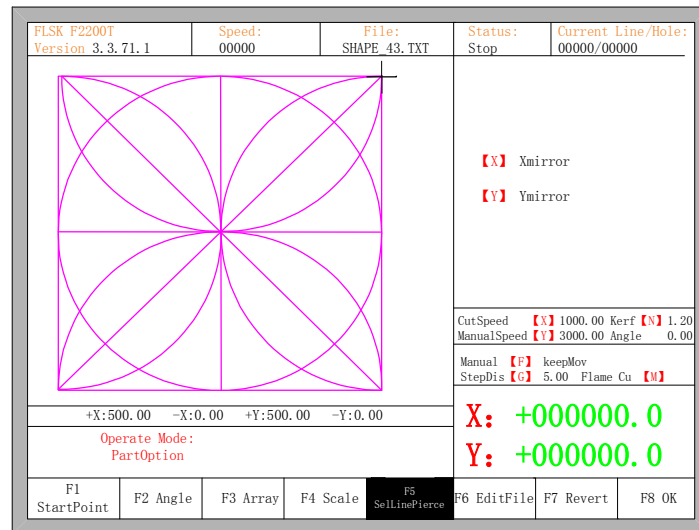
Fig 4.17 Select row

After selecting row, press【F8】 to confirm.

4.6.2 Select Number

The operation is similar to the choosing row operation.

4.6.3 Operation after Select Row/Number

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

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

● Press 【F1】 in the cutting interface, the system will directly run to the position of the selected row or number without cutting, then pause and wait for the next operation.
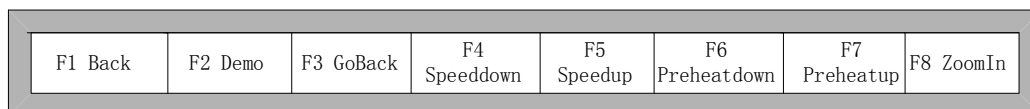
Fig 4.18 Function key of cutting interface

● Press 【START】 in the cutting interface, the system will prompt:
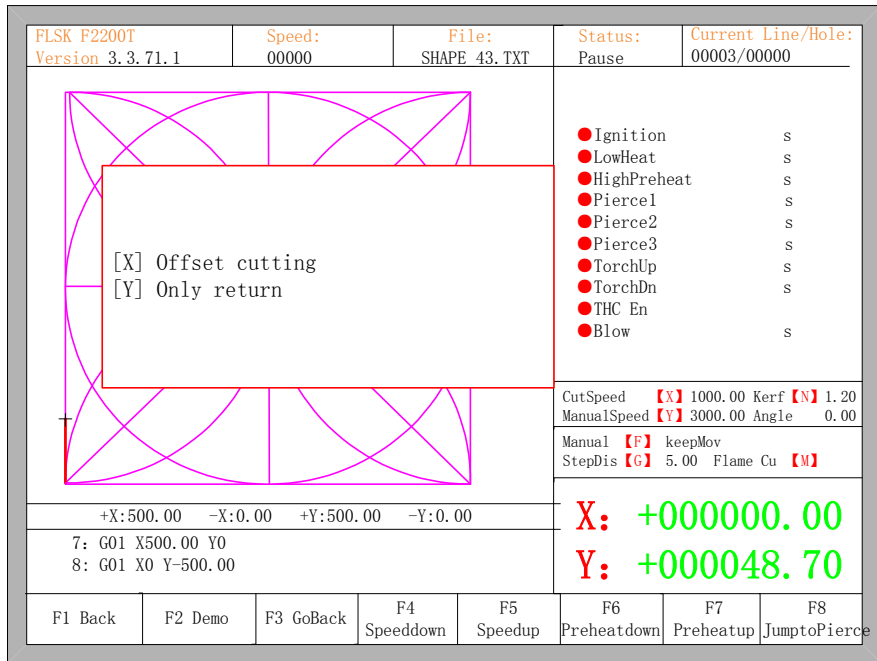
Fig 4.19 Operation after selecting row/number

2．Cutting from the current position

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

4.7 Restore

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

Chapter 5 Manual Function

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

Fig 5.1 Manual function interface

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

5.1 Fixed Moving Function

When you enter into the manual interface, the default option is continuous moving function. Press key 【F1】 to go for the fixed moving function. At this moment, the system will move toward the specified direction if any directory key is pressed, and when the directory key is released, the system will stop.

5.2 Continuous Moving Function

When in the manual interface, press 【F2】to enter the continuous-moving function interface. At this moment, the system will move toward the specified direction if any directory key is pressed and then released, and when the directory key or stop key is pressed the system will stop.

5.3 Fixed-length Moving Function

In the manual interface, press 【F3】 to enter the interface of fixed-length moving,. The system prompts to input the fixed length:
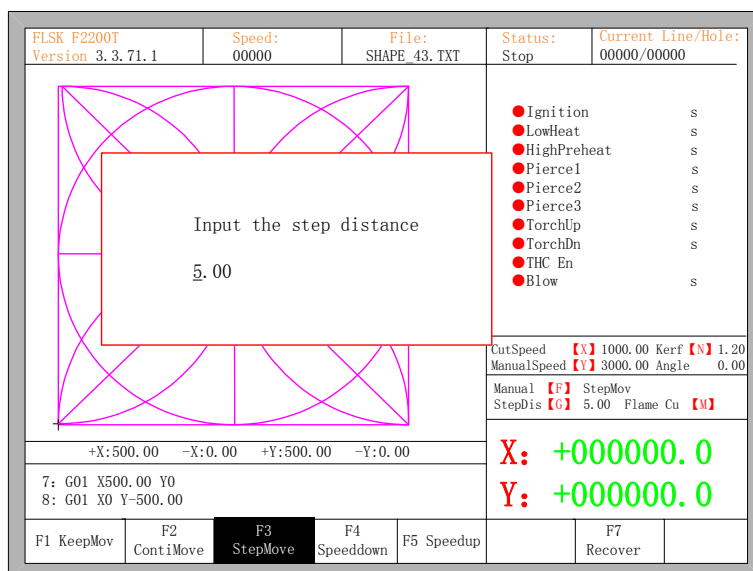
Fig 5.2 Input the fixed length

After inputting the fixed length, press 【ENTER】. Press any direction key and then release, the system will move the fixed length toward the direction, in the process of moving, when any direction key or stop key is pressed, the system will stop moving.

5.4 Breakpoint Recovery

To guarantee that the breakpoint could work correctly, you need to satisfy the following conditions:

1) When the system is paused, the system will automatically regard the paused point as the current breakpoint and remember it.

2) In the process of incising, when power is off, the system will regard the power-off point as the breakpoint and remember it.

When you need to process after the breakpoint, after the system powers on, don't move the torch, press 【F7】 in the main interface to enter the manual function interface, then press【F7】 to recover the breakpoint. After recovering it, if the torch hadn't been moved and is on the position when the power is off, press 【START】 keyboard, the system will process directly.

After the breakpoint is recovered, if the position is off from the original one, you could move the torch to the original point manually, or realizing it through choosing rows or numbers. (Please refer to chapter 4.6 Row and number Selection). The method is: choose stopping incising, move the torch to the original point manually, choose the nearest row through choosing the row selection (or number selection), press 【START】, then the system will show in Fig 5.3:

Fig 5.3 Restore breakpoint

- Press 【G】, the system will start incising from point which is after moving, and after returning to the position before the torch moves, it will process according to the normal curve.
- Press 【X】, regarding the position after moving as the position before moving, and then process.
- Press 【Y】, move from the position after moving to the position before moving, then wait for the next operation.

Chapter 6 File Operation

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

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

```
Work folder:/flash

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

F1 DiskFile	F2 UDisk	F3 Search	F4 EditFile	F5 DelFile	F6 CopyToU	F7 Preview	F8 OK
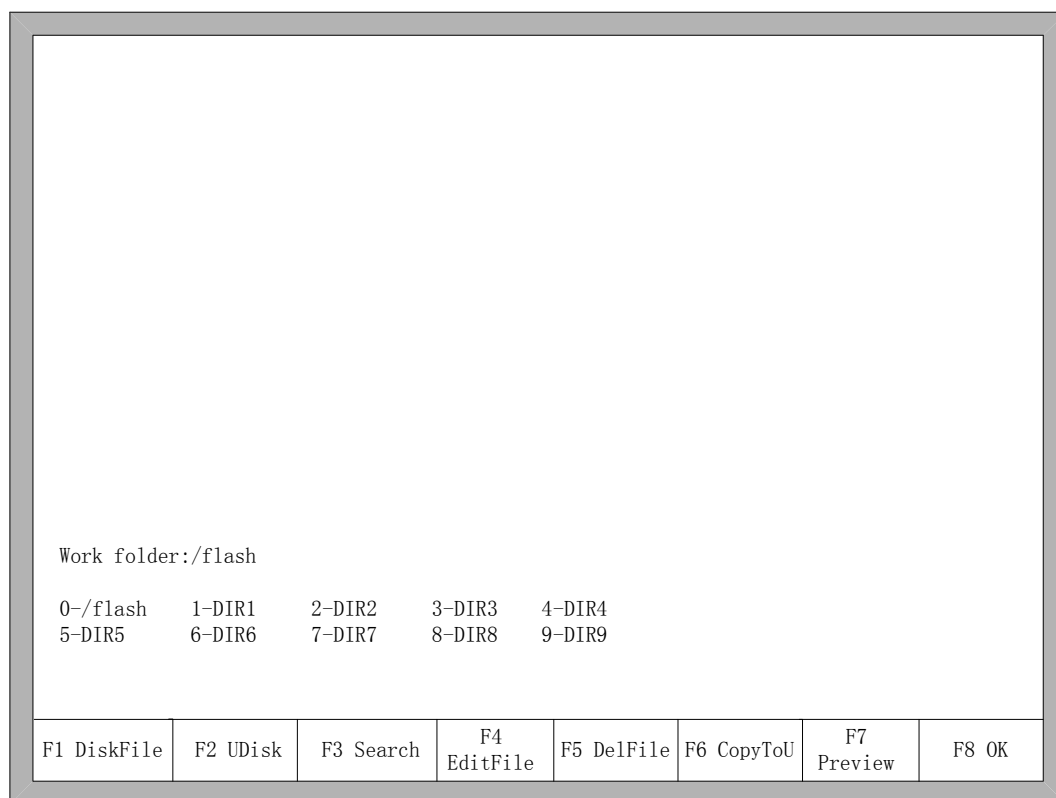
Fig 6.1 code interface

6.1 Files in the Hard Disk

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

● Press F4, if the current position of the cursor is txt file or CNC file, you could edit them. Please refer to chapter 6.5 on how to edit files.

● Press F5, if the current position of the cursor is txt file or CNC file, you could delete them.

● Press F6, if the current position of the cursor is txt file or CNC file, you could copy the current file to the flash disk when it is connected to the USB interface.

● Press F7, if the current position of the cursor is txt file or CNC file, you could preview the current graphic.


```
1:  SHAPELIB/SHAPE_18. TXT
2:  SHAPELIB/SHAPE_00. TXT
3:  SHAPELIB/SHAPE_01. TXT
4:  SHAP
5:  SHAP
6:  SHAP
7:  SHAP
```

| F1 DiskFile | F2 UDisk | F3 Search | F4 EditFile | F5 DelFile | F6 CopyToU | F7 Preview | F8 OK |

Fig 6.2 Graphic preview

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

6.2 Files in the U Disk

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

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

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

```
1:   SHAPELIB/SHAPE_18.TXT
2:   SHAPELIB
3:   SHAPELIB
4:   SHAPELIB
5:   SHAPELIB
6:   SHAPELIB
7:   SHAPELIB

                              File:
                           \SHAPE_43.TXT




F1 DiskFile   F2 UDisk   F3 Search    F4      F5 DelFile    F6         F7      F8 OK
                                    EditFile             CopyToDisk  Preview
```

Fig 6.3 save U disk files

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

```
1:   SHAPELIB/SHAPE_18.TXT
2:   SHAPELIB/SHAPE_00.TXT
3:   SHAPELIB/SHAPE_01.TXT
4:   SHAPELIB/
5:   SHAPELIB/
6:   SHAPELIB/
7:   SHAPELIB/



                    file exist, confirm to cover?
                    Enter: confirm / ESC: cancel





F1 DiskFile   F2 UDisk   F3 Search    F4      F5 DelFile    F6         F7      F8 OK
                                    EditFile             CopyToDisk  Preview
```

Fig 6.4 Replacement documents

If you want to replace the internal documents, press 【Enter】 key, if you want to

change the file name, press 【Esc】, change the file name and then save.

6.3 Search File

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

```
1:   SHAPELIB/SHAPE_18.TXT
2:   SHAPELIB/SHAPE_00.TXT
3:   SHAPELIB/SHAPE_01.TXT
4:   SHAPELIB/SHAPE_43.TXT
5:   SHAPELIB/SHAPE_.TXT
6:   SHAPELIB/
7:   SHAPELIB/

                Input searched string

                _


Work folder:/flash

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

F1 DiskFile	F2 UDisk	F3 Search	F4 EditFile	F5 DelFile		F7 Preview	F8 OK
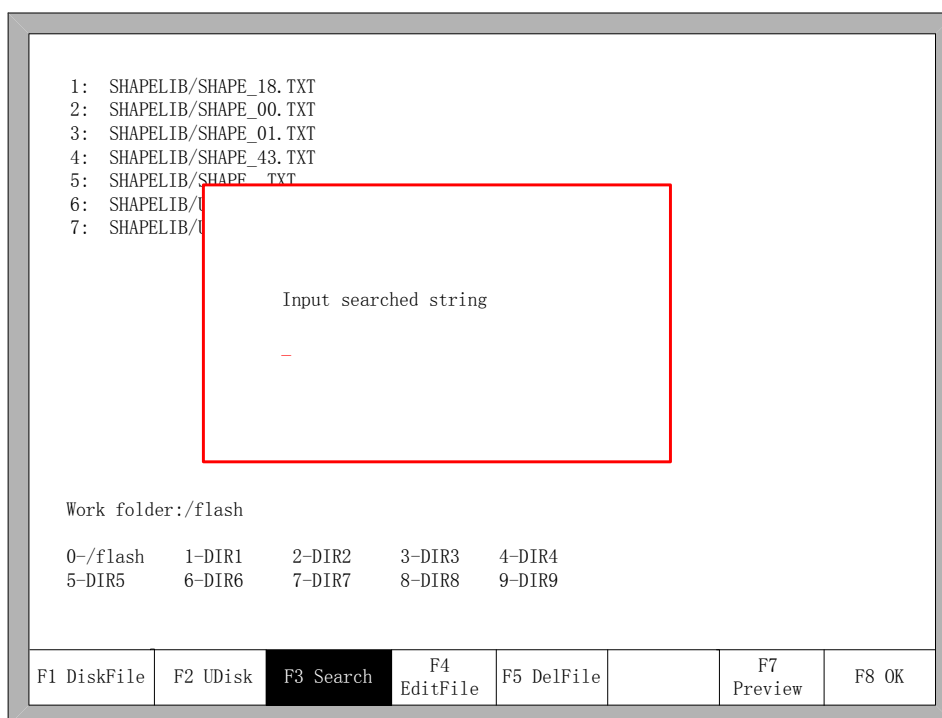
Fig 6.5 search file

6.4 Edit Code

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

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

When editing the code, press 【F2】 can insert a new line after the current line, and

press 【F3】 to delete the current line. Press 【F】 + 【Home】 key, the cursor automatically moved to the first character of the current editing line, press the 【F】 + 【End】, the cursor automatically moved to last character of the current line.

Each edit line supports 128 characters maximum.

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

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

6.5 New File

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

6.6 Compile Code

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

6.7 Folder Manager

6.7.1 Select Work Folder

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

Work folder: current work folder's name.

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

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

```
1:    SHAPELIB/SHAPE_18.TXT
2:    SHAPELIB/SHAPE_00.TXT
3:    SHAPELIB/SHAPE_01.TXT
4:    SHAPELIB/SHAPE_43.TXT
5:    SHAPELIB/SHAPE_.TXT
6:    SHAPELIB/UsedPart.abs
7:    SHAPELIB/UsedNoKf.abs
```

| F1 DiskFile | F2 UDisk | F3 Search | F4 EditFile | F5 DelFile | F6 CopyToU | F7 Preview | F8 OK |
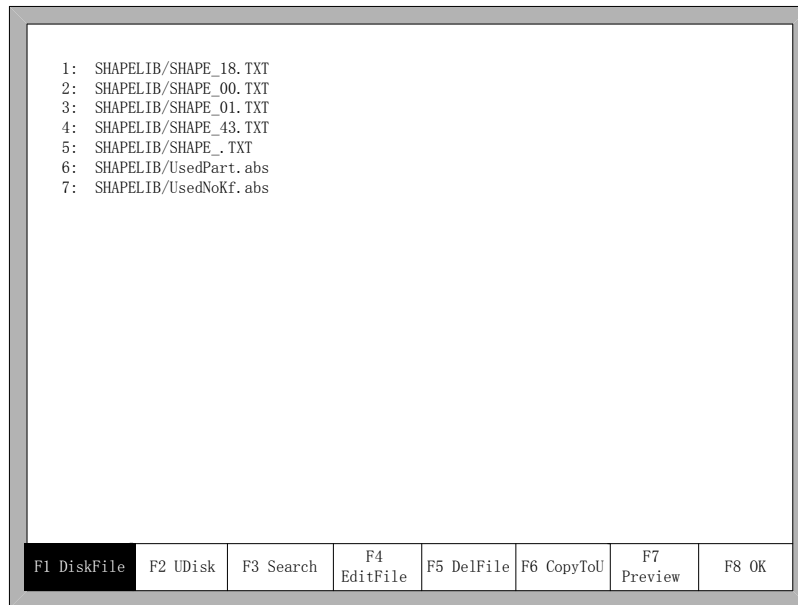
Fig 6.6 Folder 1

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

6.7.2 New Folder

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

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


```
0001:SHAPELIB
0002:2O1MB.TXT
0003:REC_1.TXT
0004:CIRCLE_2.CNC
```

```
Work folder:/flash

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

| F1 DiskFile | F2 UDisk | F3 Search | F4 EditFile | F5 DelFile | F6 CopyToU | F7 Preview | F8 OK |
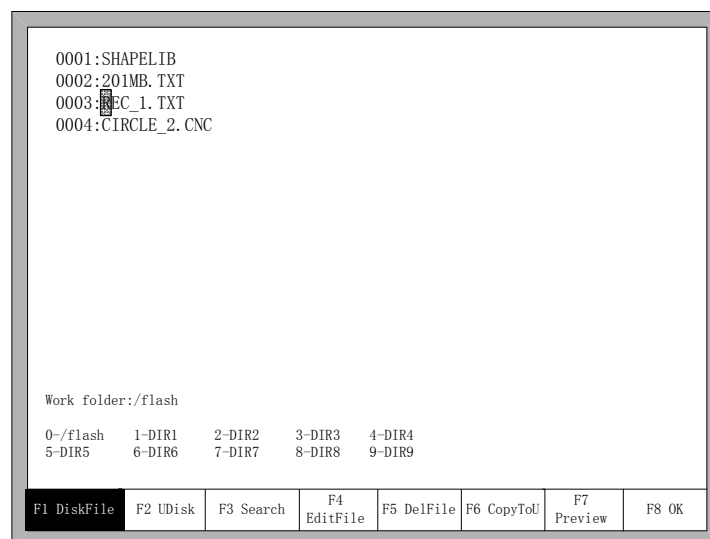
Fig 6.7 cursor moves to G code file name

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

F1Compile	F2AddRow	F3Del Row	F4NewFile	F5NewFolder			F8Save

Fig 6.8 Edit file interface

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

```
Pls input folder name:
▓
```

Illustration: the system supports only 10 folders, after more than 10 folders, the new folder will replace the second folder, successively the third folder, the forth file and so on. The first folder /flash is reserve folder, this folder can neither be replaced nor be modified.

6.8 Clear File

Refer to the explanation about clear files in the section of 8.7.8.

Chapter 7 Parameter Setting

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

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

| F1 Common | F2 Flame | F3 Plasma | F4 Powder | F5 System | F6 Import | F7 Export | F8 Save |

Fig7.1　Parameter Interface

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

1) Common parameters: cutting speed, manual move speed, G00 move speed, the size of kerf gap, corner speed, cutting type, edge cut enable, hold preheat.

2) Flame parameters: all the parameters used in oxygen gas cutting

3) Plasma parameters: all the parameters used in plasma cutting

4) Powder parameters: ignition, perforation cycle parameters, dry dusting offset

5) System parameters: you can set system pulses, maximum speed limit, motor parameters and soft limit parameters.

7.1 Common Parameters

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

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

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

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

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

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

  If the normal cutting speed is V, angle is α, the proportion of corner speed is h, then cutting tip speed in at the time of intersection is V_x.

$$V_x = \frac{\alpha h}{50\pi} V$$

  Notice: The unit is %mmpm. The max thickness of plate is 100, if more than 100mm also are considered to be 100.

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

7.2 Flame Parameters

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

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




   F1 Common   F2 Flame   F3 Plasma   F4 Power   F5 System   F6 Import  F7 Export   F8 Save
```

Fig 7.2 Flame Parameters

- **Ignition Time**: the time delay of opening ignition I/O.

- **Low Preheat Time**: The preheating time before perforating the steel plate. Enter any positive number, unit is s. During the low pressure preheating process, you can prolong the preheating time by pressing "stop" key, then the preheating time will delay until you press the "start" key to start to high pressure preheat delay.

- **High Preheat Time:** Like **Low Preheat Time** except open different IO.

- **Pierce 1 Time:** Perforation time with low pressure fuel gas. Enter any positive number, unit is s.

- **Pierce 2 Time:** Perforation time with middle pressure fuel gas. Enter any positive number, unit is s.

- **Pierce 3 Time:** Perforation time with high pressure fuel gas. Enter any positive number, unit is s.

- **Exhaust Time:** The delay of turned off oxygen gas to open the exhaust. Enter any positive number, unit is s.

- **Torch Up Time**: When oxygen gas is turned off, the time for the torch to lift up. Enter any positive number, unit is s.

- **Torch Down Time**: When oxygen gas is turned off, the time for the torch to put down. Enter any positive number, unit is s.

- **Pierce Up Time**: Time for the torch to lift up during perforating. The difference between **Torch Up Time** and **Pierce Up Time** is that: **Torch Up Time** means the time that the torch needs to lift up when it needs to move to another place after the current cutting is over; while the **Pierce Up Time** means the time that the torch needs to lift up after preheating in the fixed cycle of perforation.

- **Pierce Down Time**: Time for the torch to put down in the perforation. The difference between **Torch Down Time** and **Pierce Down Time** is that: **Torch Down Time** means the time that the torch needs to put down before preheating; while the **Pierce Down Time** means the time that the torch needs to put down after finishing **Torch Up Time** and opening cutting oxygen in the fixed cycle of perforation.

- **THC Enable:** According to the user device configuration, choose whether or not to use high adjustment box.

- **Hold Preheat**：If this parameter is set as "yes", in the process of cutting, before complete cutting (before M02 code has occurred), Low Heat IO port is on the open status all the time. If set the parameter as "no", in the process of cutting, M08 or M02 code has occurred, it will close Low Heat IO port.

- **Edge Cutting Enable：press 【←】 or 【→】** to use or not use edge cutting. When use edge cutting, the cutting system will automatically stop whenever M07 code has occurred. When it stops, user can manual operate to move the torch to the edge of steel panel, then press start button, the system will notify:
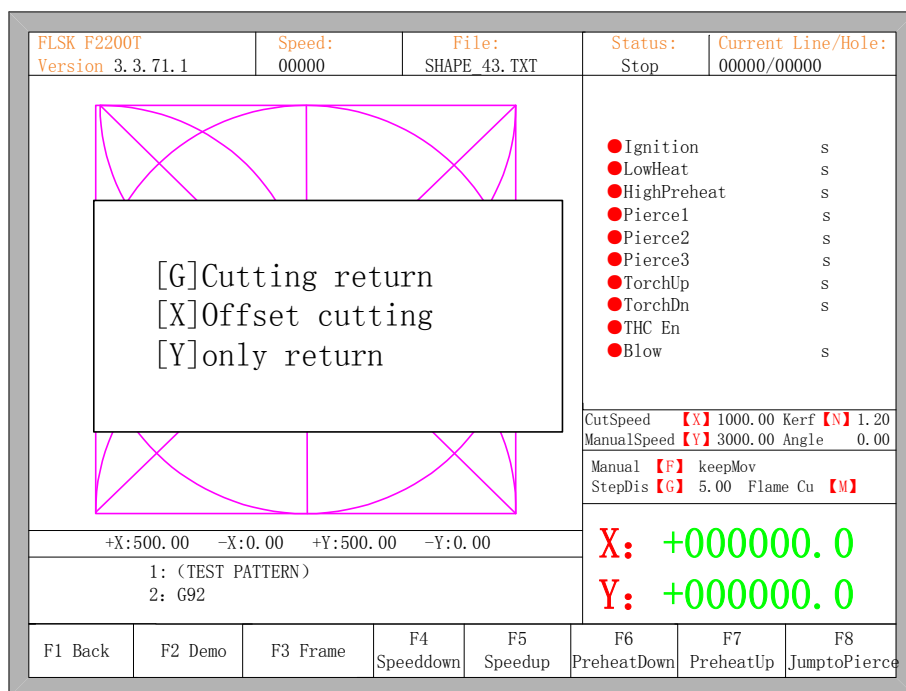
Fig.7.3 Edge cutting

When press　【G】, after the system ignites to punch hole and continues to cut to the suspend point, it will continue to cut. This should be the function of edge cutting hole.

This function will be especially useful when cut the thick steel plate. Thick steel plate is hard to be punched holes and the punched hole will be also larger. If directly punch hole in the cutting path, it will maybe affect the final production quality. Using edge cutting can may accelerate the efficiency of punch holes, save cutting time and improve production quality.

Of course, don't use edge cutting, punch hole with lead-in is also a more effective method.

7.3 Plasma Parameters

As shown in the figure 7.4, these are Plasma Parameters, which are related with the precision of transmission shaft of the machine.

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

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save

Fig 7.4 plasma parameters

- **Arc time**：Before the arc starting, the system time to wait. At this point, all output I /O are turned off. Enter any positive number, unit is s.
- **Pierce time**: Perforation time. Enter any positive number, unit is s.

- **Torch Up Time:** When arc press is turned off, the time for the torch to lift up. Enter any positive number, unit is s.

- **Arcing Check Time:** Enter any positive number, unit is s. If not detected any feedback signal of success arc starting within the detection time, the system prompts an error message and terminates the current work of cutting, according memory breakpoints to withdraw from the program. If detected feedback signal of success arc starting within the detection time, the system stops detecting and cutting.

- **Position check Time:** Enter any positive number, unit is s. Delay time of the success of position check. If not detected any signal of success of position check within the detection time, the system thinks that the position check is unsuccessful and sends out an alarm. Otherwise, the system finishes the position check and starts position up.

- **Position up Time:** Enter any positive number, unit is s. Before positioning check, the time for the torch to lift up.

- **Close arc:** In setting the rate of X%, open the output port, close the arc press signal, to prevent the steel melting under low-speed cutting tip due to temperature is too high.

- **Distance to close arc:** in the minimum distance of the cutting line of the initial segment or end segment, close the arc voltage increases.

- **Lose arc delay:** detect the delay time of the feedback of the broken arc, if there's still no arc voltage input, the situation is considered to be broken arc. This parameter can effectively avoid the arc broken alert because of the sensitivity of the broken arc detection in the cutting methods with lead, this guarantees the continuousness of the cutting and avoid the interrupt of frequent alert.

- **Time to Lock THC before M08:** broken arc check delay is independent of auto turning high, it's normally default value. Unit: s.

- **Watch arc enable: whether real-time detection of arc voltage signal in cutting process or not.**

  If setting "yes", in the cutting process, the system detects he real-time arc voltage feedback signal. If do not detect the signal, the system will stop the current work-piece cutting and transmit alarm signal.

  If installing a "No", then in the cutting process does not detect arc voltage feedback signal.

(The following is typical of the "T" in F2000 series CNC system)

- **Set Arc**：set the arc while cutting, the range of value is 50.00-300.00。Unit: V

- **Arc Protection Value: When actual arc value** ≥ (arc value setting + protection value over arc), the system will give an alarm of breaking arc and stop cutting, the range of the value is 5.00-100.00. Unit: V。

    Notice: actual arc value is less than 30 V, system will also give the alarm of breaking arc. This 30 V is fixed value and not modified.

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

- **Set Arc Manual Adjustment of Step:** press F6 and F7 in auto interface, reduce or increase the stride of setting arc, the range of value is 0.10-10.00. Unit: V。

- **Fast Location Time**：This is the time of full speed decline in the step of location check decline, the range of which is more than or equal to 0.00, Unit: s.

    Notice: Fast position time cannot be more than position check time.

7.4 Powder Parameters

As the figure 7.5 shows, it is powder parameters of system about the powder paint line.

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




    F1 Common   F2 Flame  F3 Plasma         F5 System  F6 Import  F7 Export  F8 Save
```

Fig 7.5 powder parameters

- **Marker Ignition Time**：Input ≥0 arbitrary value, unit: s.

- **Marker Preheat Time**：Input ≥0 arbitrary value, unit: s.

- **Mix powder Open/Close Time**：Delay time of scatter powder mouth relative to spurt powder mouth open/close, input ≥0 arbitrary value, unit: s.

- **Marker Up Time**：The time of powder torch going up. Unit: s.

- **Marker Down Time**：The time of powder torch going down. Unit: s.

- **Marker Horizontal Offset**：Horizontal offset of powder gun relative to cutting torch. Unit: mm.

- **Marker Vertical Offset**：Vertical offset of powder gun relative to cutting torch. Unit: mm.

7.5 System Parameters

The system parameters, as shown in Fig 7.6, are related with the precision of driver shaft of the cutting machine, coordinate axis, increase/decrease of rate and little arc processing limited parameter.

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

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save

Fig 7.6   System Parameters

- **Horizontal Axis Pulse:** The number of pulse that system needs to generate when the machine move1mm towards X axis, maintaining 3 digits at most after decimal point.

- **Vertical Axis Pulse:** The number of pulse that system needs to generate when the machine move 1mm towards Y axis , maintaining 3 digits at most after decimal point.

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

- **Max G00 speed:** the allowable maximum speed when cutting tips idling.

- **Small Arc Limit:** Maximum speed at cutting a small arc.
  Small arc definition:

  $$0 \text{ mmpm} < \text{cutting speed} < 2000 \text{mmpm} \quad \text{small arc}=5\text{mm}$$
  $$2000 \text{ mmpm} < \text{cutting speed} < 4000 \text{mmpm} \quad \text{small arc}=10\text{mm}$$
  $$4000 \text{ mmpm} < \text{cutting speed} < 6000 \text{mmpm} \quad \text{small arc}=15\text{mm}$$
  $$6000 \text{ mmpm} < \text{cutting speed} < 8000 \text{mmpm} \quad \text{small arc}=20\text{mm}$$
  $$8000 \text{ mmpm} < \text{cutting speed} < 10000 \text{mmpm} \quad \text{small arc}=25\text{mm}$$
  $$10000 \text{mmpm} < \text{cutting speed} < 12000 \text{mmpm} \quad \text{small arc}=30\text{mm}$$
  $$12000 \text{mmpm} < \text{cutting speed} < 15000 \text{mmpm} \quad \text{small arc}=35\text{mm}$$

- **Flame adjusts time:** the whole time for the system accelerates from its start speed to the expected cutting speed.

- **Plasma adjust time:** when plasma cutting , from the time the motor starts to the time

when the motor is up to the cutting speed.

● **Emergency STOP Time**: When encounter Emergency Stop input, the time for dropped from the current speed to zero.

● **Start Speed**: the system's speed when it began to start. Generally do not have to start from 0 , motor will allow a start speed.

● **Max Coordinate**: The maximum positive coordinate which the machine can reach horizontally. Its unit is mm (millimeter). If current coordinate exceeds the value, the system will stop running.

● **Min Coordinate**: The minimum negative coordinate which the machine can reach horizontally. Its unit is mm (millimeter). If current coordinate is less than the value, the system will stop running

7.6 Parameter Import

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

1. The parameters exported from the incising machine control system(refer to 7.7 Parameter Export) should satisfy the specified format. The file format is F2300.DAT

2. The file should be stored under the root folder of flash disk which is connected to the USB interface.

When the above condition is satisfied, in the Fig 7.7, press Enter to confirm, and then you could import the backup parameters to the system.

```
        Horizontal Axis Pulse              125.000              n/mm
        Vertical Axis Pulse                125.000              n/mm
        Max cutting speed                  2000.000             mmpm
        Max G00 speed                      6000.000             mmpm
                                                                mmpm
                                                                mmpm
                                                                mm
            Sure to import Parameter?                           s
                                                                s
            Parameter file is F2300D.DAT                        s
                                                                mm
                                                                mm
        Max +Y                             100000.000           mm
        Min -X                             -100000.000          mm
        Min -Y                             -100000.000          mm
```

F1 Common	F2 Flame	F3 Plasma	F4 Powder	F5 System	F6 Import	F7 Export	F8 Save

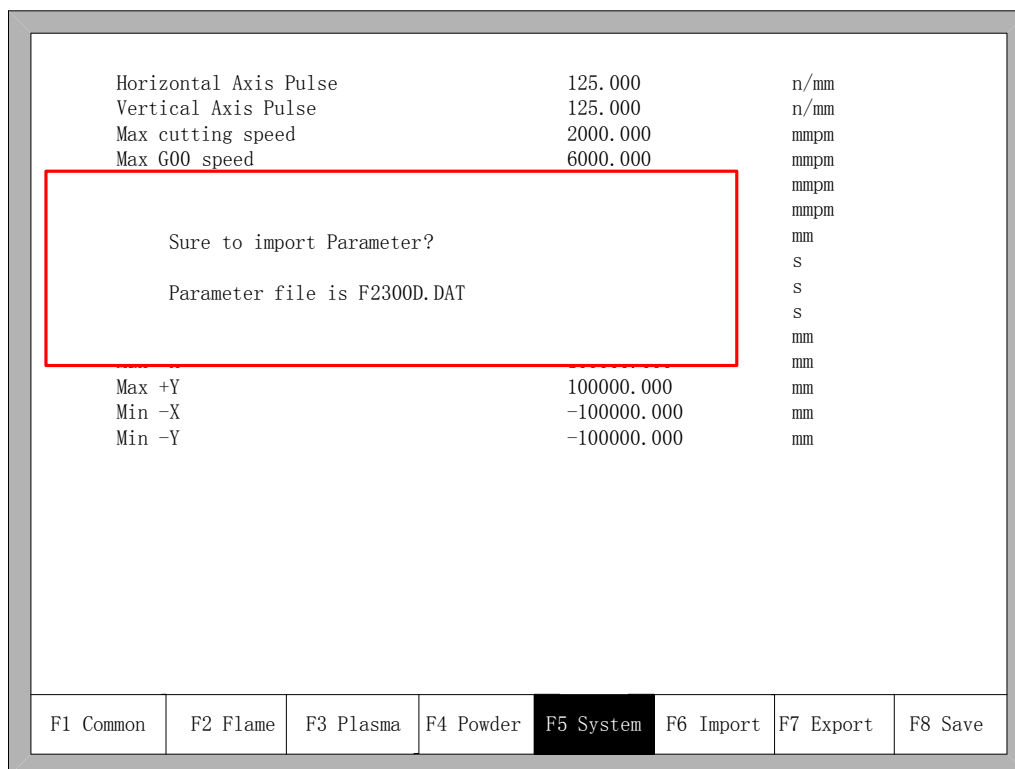Fig.7.7 Parameter import

7.7 Parameter Export

After the parameter configuration is over, press F7 in the parameter configuration interface to export the parameters, you should connect the flash disk to the USB interface before exporting.

In the interface shown in Figure 7.8, after pressing Enter, the parameters will automatically be saved in the root folder of flash disk, the file name is F2300.DAT

```
      Horizontal Axis Pulse              125.000          n/mm
      Vertical Axis Pulse                125.000          n/mm
      Max cutting speed                  2000.000         mmpm
      Max G00 speed                      6000.000         mmpm
                                                          mmpm
                                                          mmpm
              Sure to export Parameter?                   mm
                                                          s
                                                          s
                                                          s
                                                          mm
      Max  X                                              mm
      Max +Y                             100000.000       mm
      Min -X                            -100000.000       mm
      Min -Y                            -100000.000       mm




  F1 Common   F2 Flame   F3 Plasma  F4 Powder  F5 System  F6 Import  F7 Export  F8 Save
```
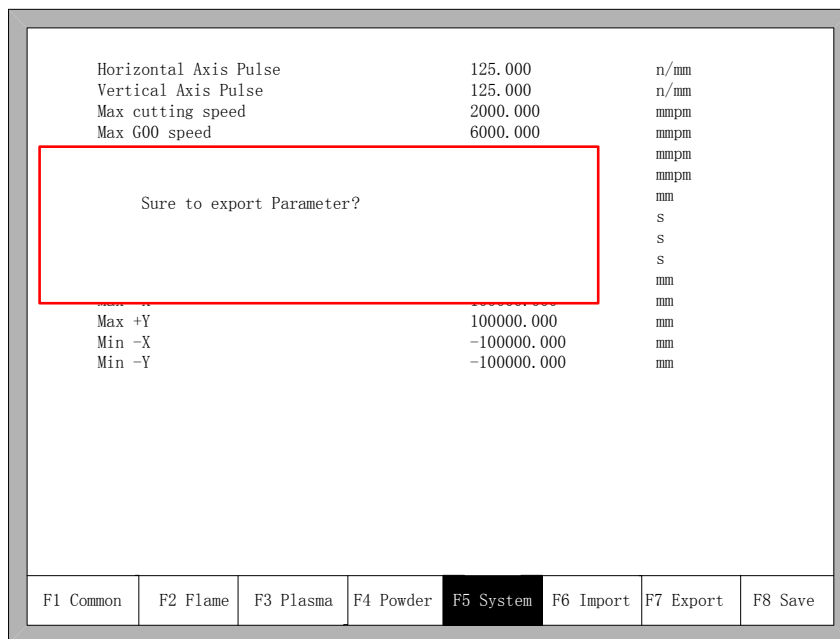
Fig.7.8 Parameter export

7.8 Save Parameters

After parameter modification, press 【F8】 to save, shown in Figure 7.9.

```
              Parameter saved successfully




  F1 Common   F2 Flame   F3 Plasma  F4 Powder  F5 System  F6 Import  F7 Export  F8 Save
```

Fig.7.9 System Parameters

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

Chapter 8 Diagnosis Function

Fig 8.1 Diagnostic interface

In the main interface, you can press 【F5】 to enter the system diagnosis interface, as shown in Fig 8.1.

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

8.1 Diagnosis Interface Index

```
        ┌─────────────────────┐
        │         F5          │
        │  System Diagnosis   │
        └─────────────────────┘
             │
             │    ┌─────────────────────┐
             ├────│         F1          │
             │    │   Input Diagnosis   │
             │    └─────────────────────┘
             │
             │    ┌─────────────────────┐
             ├────│         F2          │
             │    │  Output Diagnosis   │
             │    └─────────────────────┘
             │
             │    ┌─────────────────────┐
             │    │         F5          │
             ├────│      Keyboard       │
             │    │     Diagnosis       │
             │    └─────────────────────┘
             │
             │    ┌─────────────────────┐
             ├────│         F6          │
             │    │  System SelfCheck   │
             │    └─────────────────────┘
             │
             │    ┌─────────────────────┐
             ├────│         F7          │
             │    │     Date Time       │
             │    └─────────────────────┘
             │
             │    ┌─────────────────────┐
             └────│         F8          │
                  │      System         │
                  │    Definition       │
                  └─────────────────────┘
```
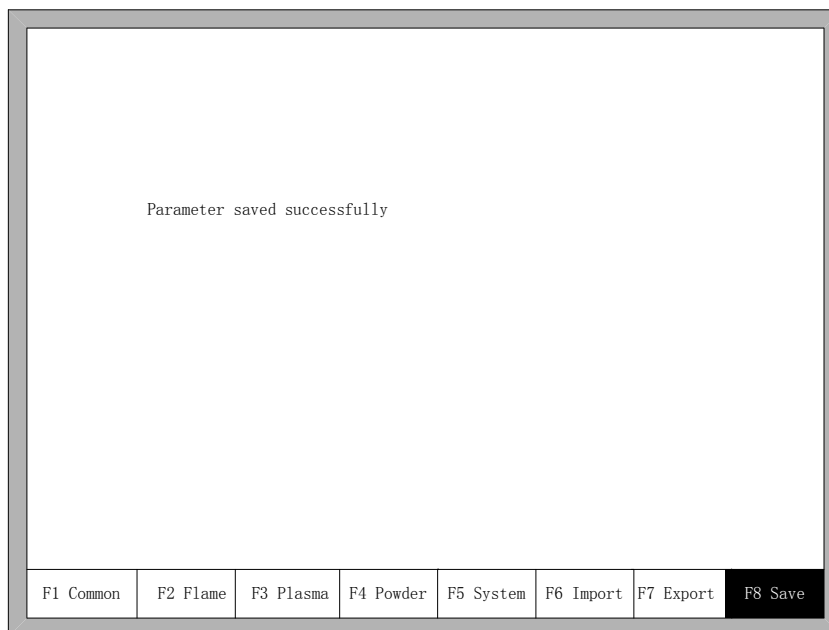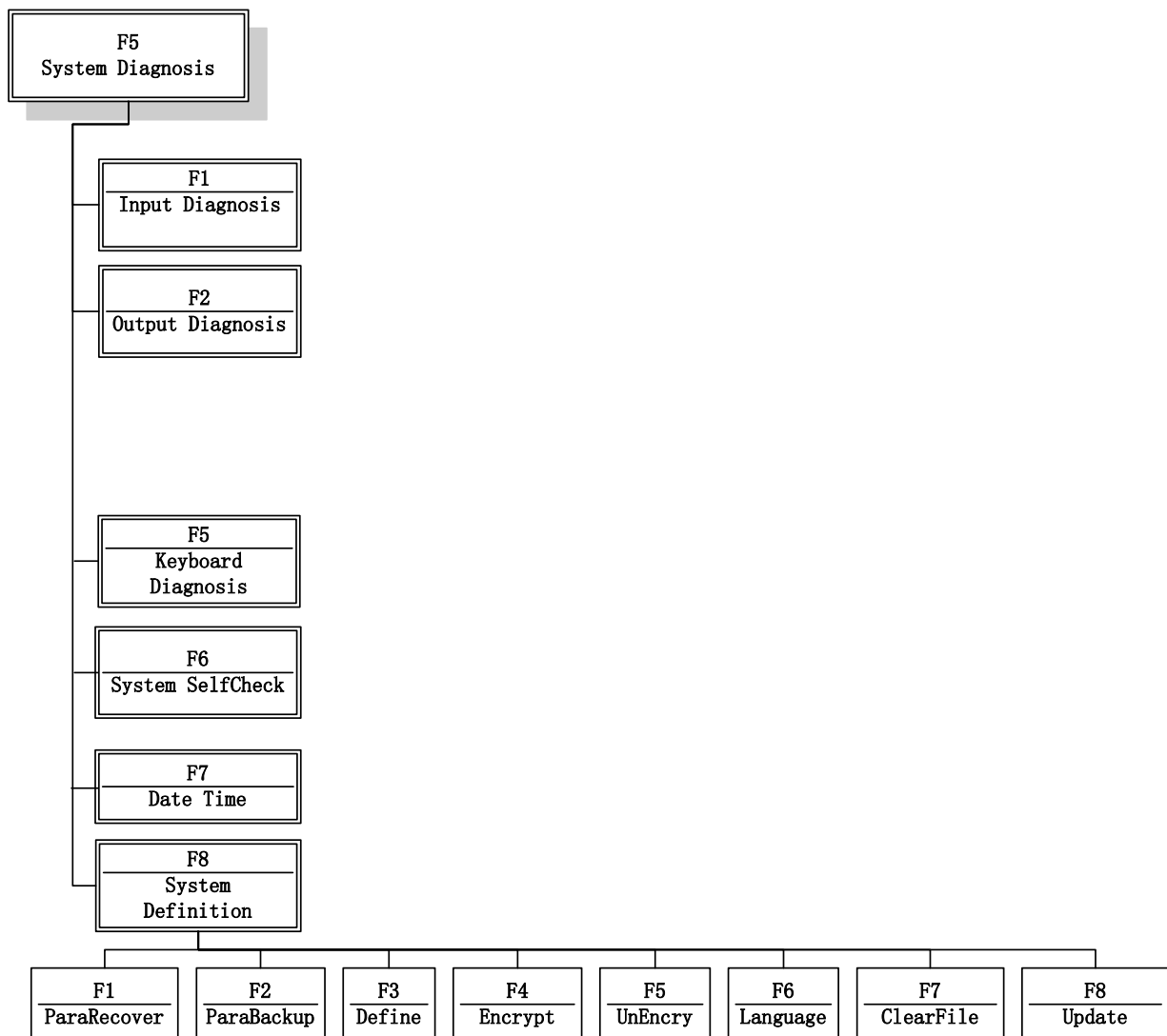
F1	F2	F3	F4	F5	F6	F7	F8
ParaRecover	ParaBackup	Define	Encrypt	UnEncry	Language	ClearFile	Update

Fig 8.2 Diagnosis interface index

8.2 Input Diagnosis

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

8.3 Output Diagnosis

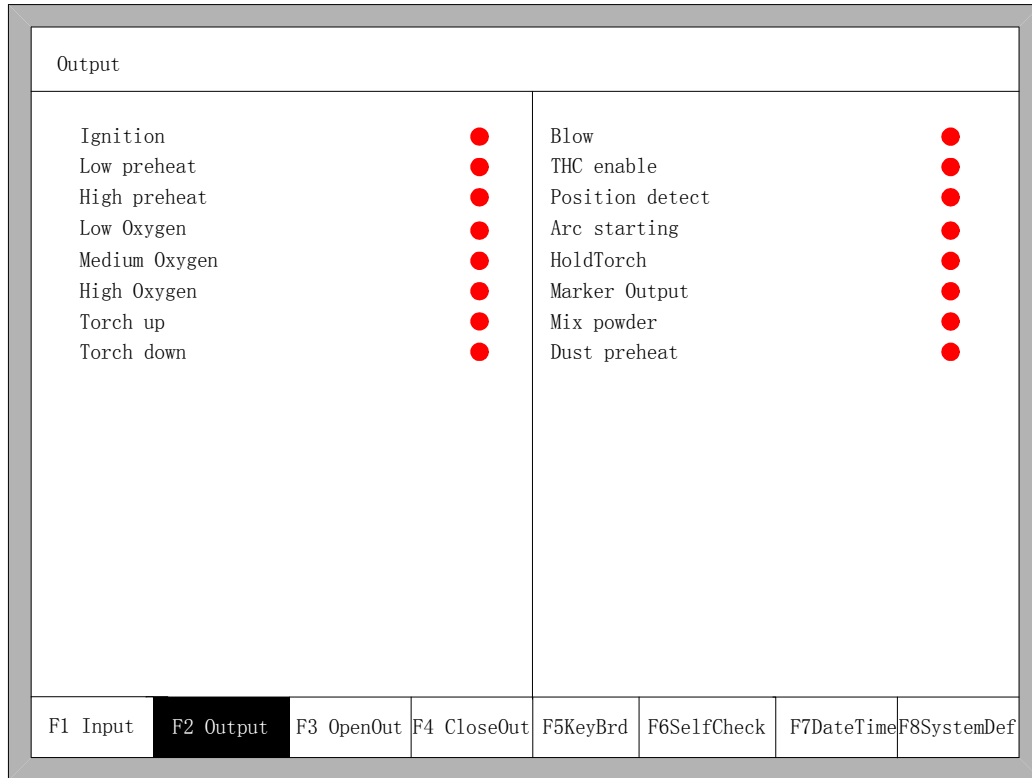In diagnosis interface ,press 【F2】to enter output diagnosis interface，shown as Fig 8.3

Fig 8.3 Output diagnosis

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

8.4 Keyboard Diagnosis

In the diagnostic interface, a key value will be displayed behind "KEY:", whenever the key is pressed.
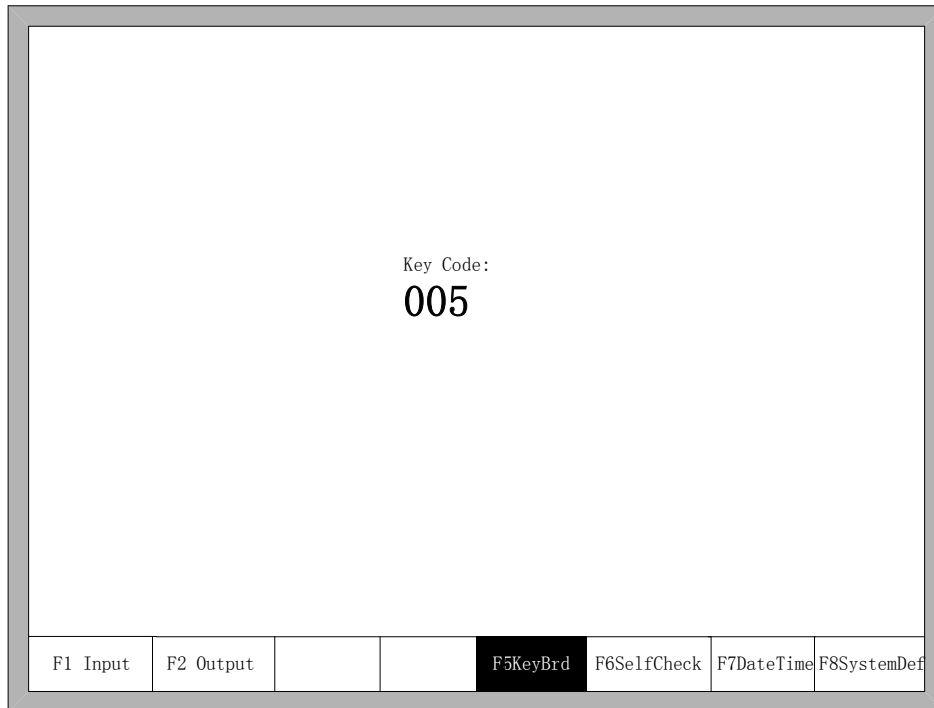
```
                          Key Code:
                           005
```

| F1 Input | F2 Output | | | F5KeyBrd | F6SelfCheck | F7DateTime | F8SystemDef |

Fig 8.4 Keyboard Diagnosis

8.5 System Self-check

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

```
    1. backup parameter first all
    2. lose breakpoint
    3. restart after selfcheck
    Are you sure?
```

| F1 Input | F2 Output | | | F5KeyBrd | F6SelfCheck | F7DateTime | F8SystemDef |

Fig 8.5 System self-check

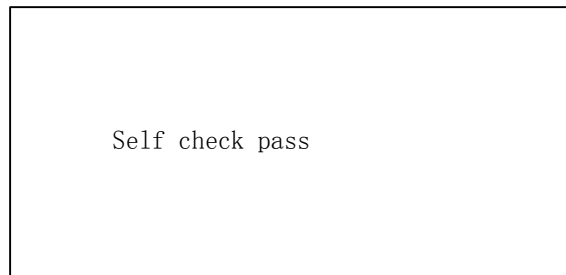If the self-check is OK, the system will show:

```
Self check pass
```

Fig 8.6 Self-check pass

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

● DSP Dual ram is error

● ARM Dual RAM is error

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

8.6 Date and Time

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

```
         2013-05-22  15:51:37  Wen


         Press up or down to modify




 F1 Input  F2 Output           F5KeyBrd  F6SelfCheck  F7DateTime  F8SystemDef
```

Fig 8.7 System time

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

8.7 System Definition

In the system diagnosis interface, press F8 to enter the system custom definition interface, in the interface, you could set the input IO, output IO or system coordinate, also reset or backup the parameters and one key switch between English or Chinese.

8.7.1 Parameter Backup and Restore

Parameter Backup: The process of parameter backup is, in the main interface press 【F5】 (System Diagnosis), 【F8】(System Definition), 【F2】(Parameter Backup). The system will need code, after inputting the code "1396", press【Enter】, the system will import the default parameters. In the following process, if the parameters are modified or some of them is broken, reset the parameters.

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

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

Warning: After resetting successfully, please restart the system.

8.7.2 Input Definition

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

Fig 8.8 input definition

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

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

8.7.3 Output Definition

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

Fig 8.9 output definition

In the interface press 【↑】、【↓】、【←】、【→】, move the cursor to the position that needs changing, press 【PgUp】or【PgDown】to change the number of the Output, press 【Enter】to change the type of the Output.

The output type is open drain transistor output type.

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

8.7.4 Coordinate Definition

The system could provide IO definition for the user. As shown in Fig 8.10

```
              press Enter to change coordinate


                            +Y
                            ↑
                  −X    ←   →    +X
                            ↓
                            −Y




  F1 Input  F2 Output              F4 Motor  F5 Option                    F8 Save
```
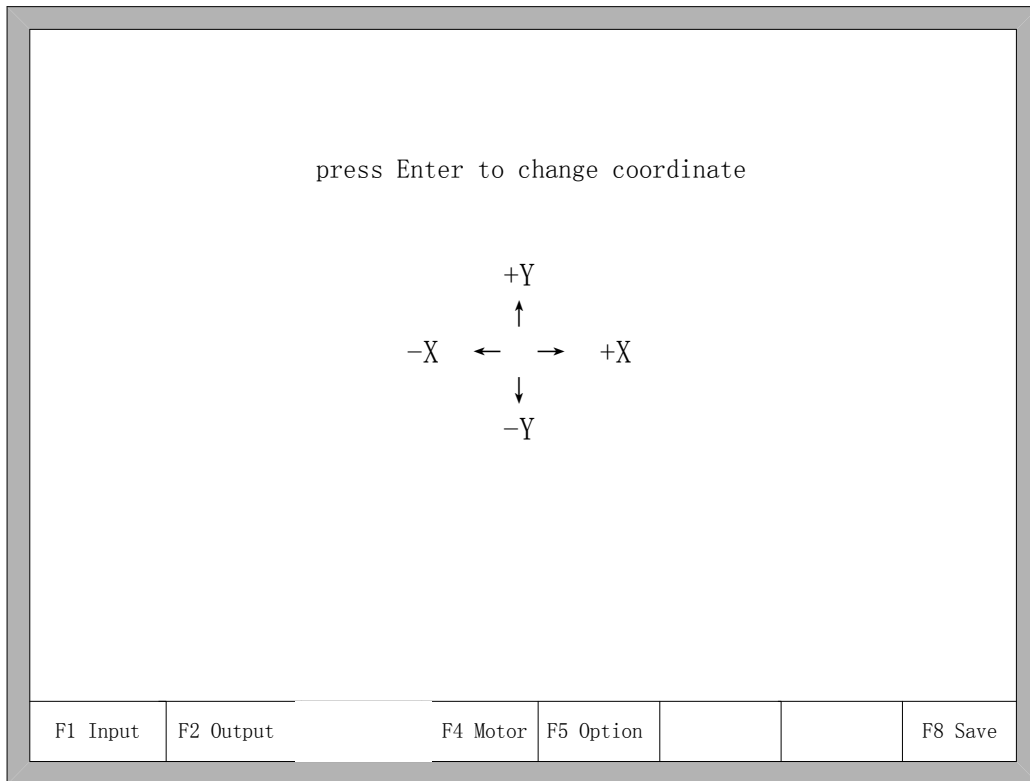
Fig 8.10 Coordinate Definition

In the interface, press Enter repeatedly to change among 8 type of coordinates. Press 【F8】 to save.

8.7.5 Motor

```
        Horizontal direction    CW        █
        Vertical direction      CCW
        XY exchange             No


        Press Enter to change.
```

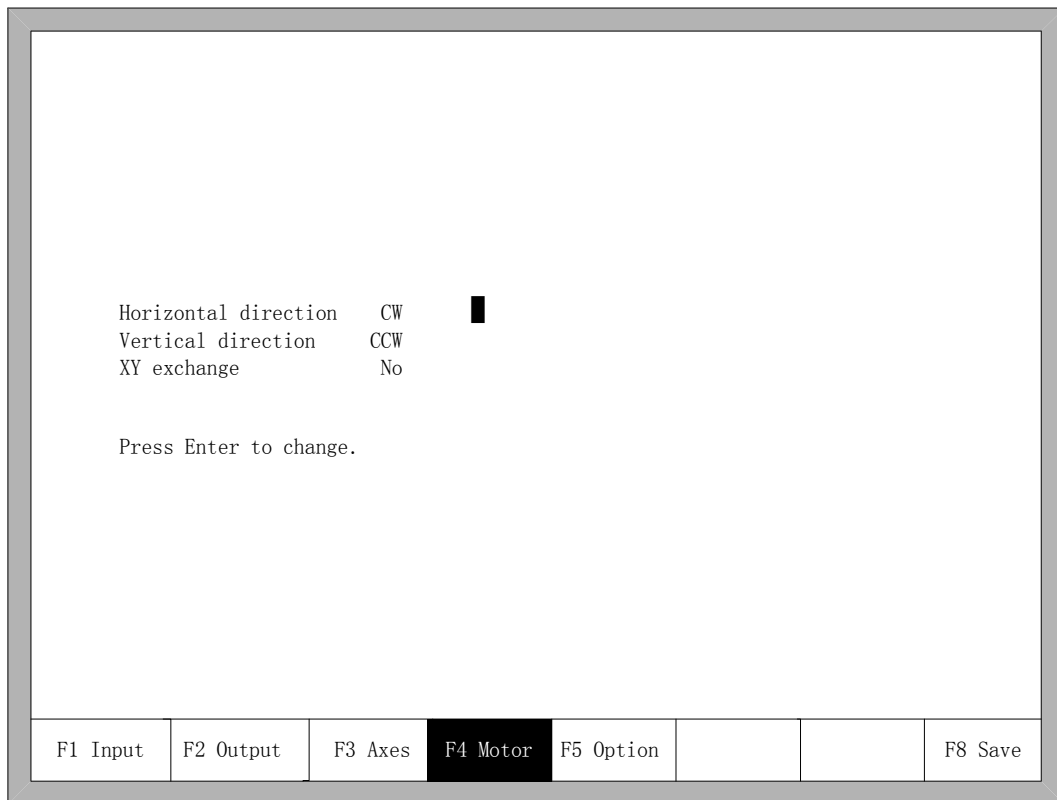| F1 Input	F2 Output	F3 Axes	F4 Motor	F5 Option			F8 Save

Fig 8.11 Motor direction

Press up or down key, move the cursor █ to the axes of which needs to change motor rotation direction, then press 【Enter】, the motor direction can switch between positive and reversal.

XY exchange: if this function is "YES", output pulse of X axis and Y axis exchange each other, in other words, horizontal axis and vertical axis exchange each other.

71

8.7.6 Option

8.7.6.1 Remote Controller

```
Remote Controller Type    █  No <>
Corridate Type:              Relative
IJ coordinate type           Relative
Default unit                 Metric
Fitting short line           No
Steel angle remember         No
F forbidden                  No
Save input angle as steel angle No


Press ←→ to change
Restart after change default unit
```

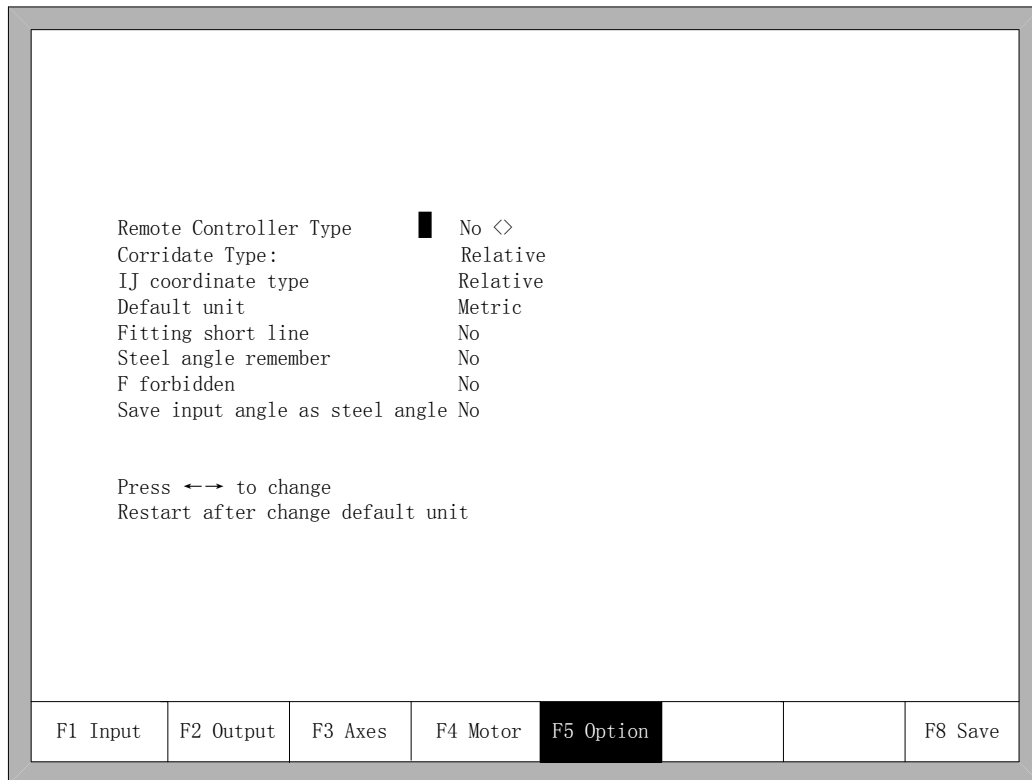| F1 Input	F2 Output	F3 Axes	F4 Motor	F5 Option			F8 Save

Fig 8.12 Option

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

● NO type: no input of remote controller.

● P2P type: reference the section 11.1.2 Remote input.

● 8421 type: reference the section 11.1.2 Remote input.

8.7.6.2 Default Coordinate

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

8.7.6.3 Default IJ Coordinate

As the figure 8.12 shows, in the G code of G02 or G03, I or J parameter after the

code is relative coordinate or absolute coordinate. Under the general circumstance, the arc's IJ coordinate is relative coordinate, only minority several G code of arc's IJ coordinate is absolute coordinate.

8.7.6.4 Switch between Metric and Inches

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

8.7.6.5 Short Line Fitting

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

8.7.6.6 Steel Plate Angle Memory

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

8.7.6.7 F Instruction Forbidden

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

8.7.6.8 Manual Angle Input to Adjust Steel Plate

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

8.7.7 Language Switch

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

8.7.8 Add a Language File

From the company get the language pack file and copy it into the USB. Insert the USB into the system USB port. In the main interface, move the cursor to add language file, press 【Enter】. There will be a introduction appearing to show the result. This system can support most of the national language files, can also be customized language file. Please contact the company demand.

8.7.9 Clear File

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

8.7.10 System Update

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

```
F1: Function Update
F2: Welcome Update
F3: Motion Update
F4: System recovery
```

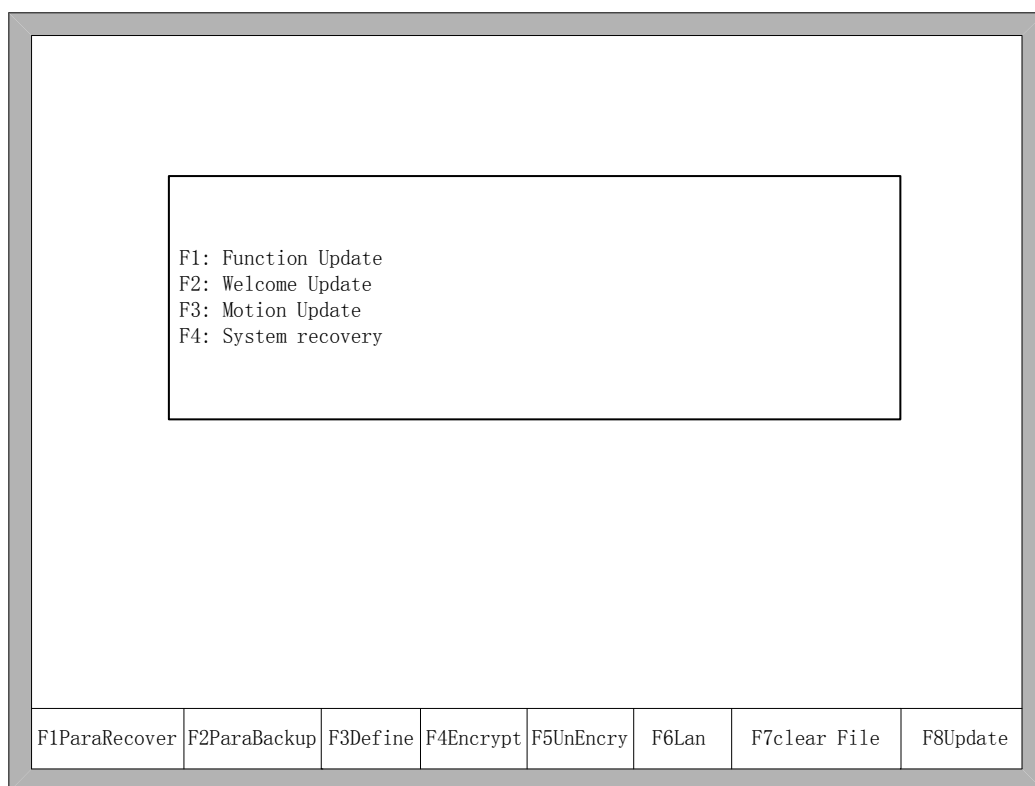| F1ParaRecover | F2ParaBackup | F3Define | F4Encrypt | F5UnEncry | F6Lan | F7clear File | F8Update |

Fig 8.13 the prompt of system update

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

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

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

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

Chapter 9 Graph Management

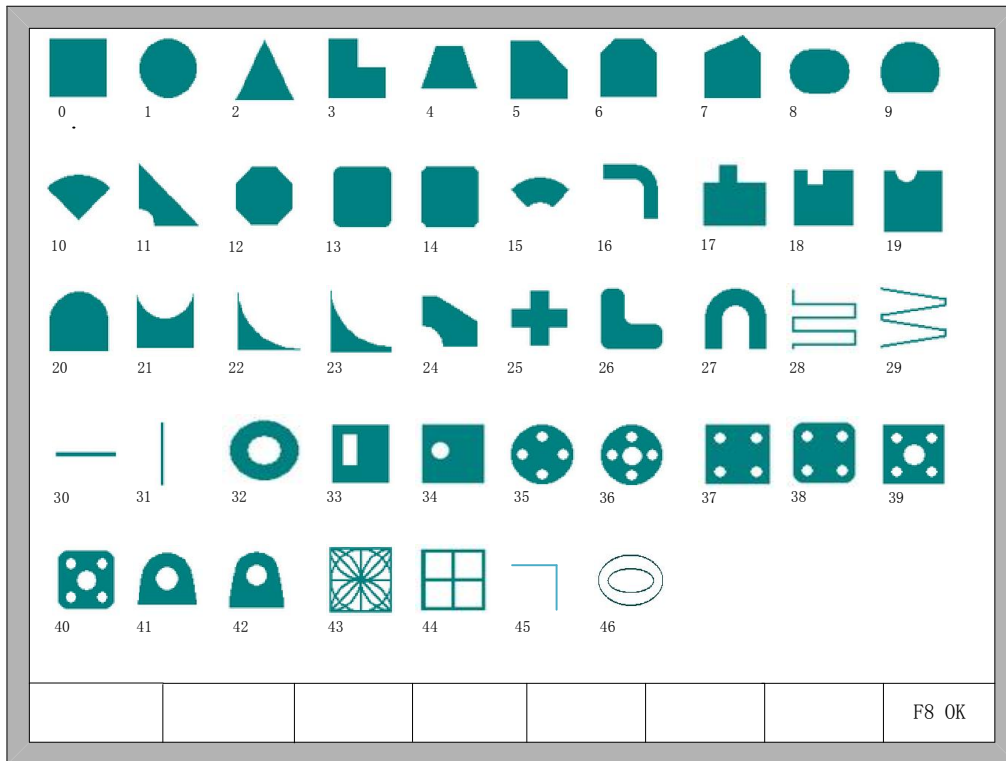In the main interface, press【F1】(Shape Lib) to enter graph interface，shown as follows:

Fig 9.1 Page of graph Library

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

9.1 Choose Graph

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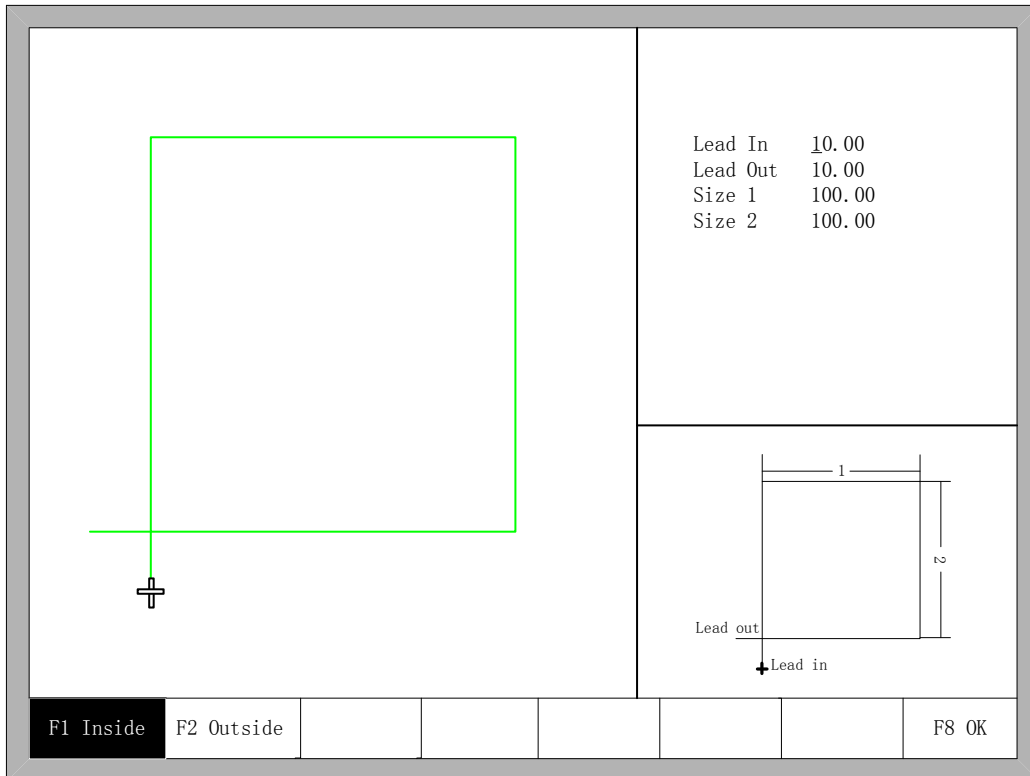
Fig 9.2 Chip size interface

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

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

9.2 Film/Hole Size

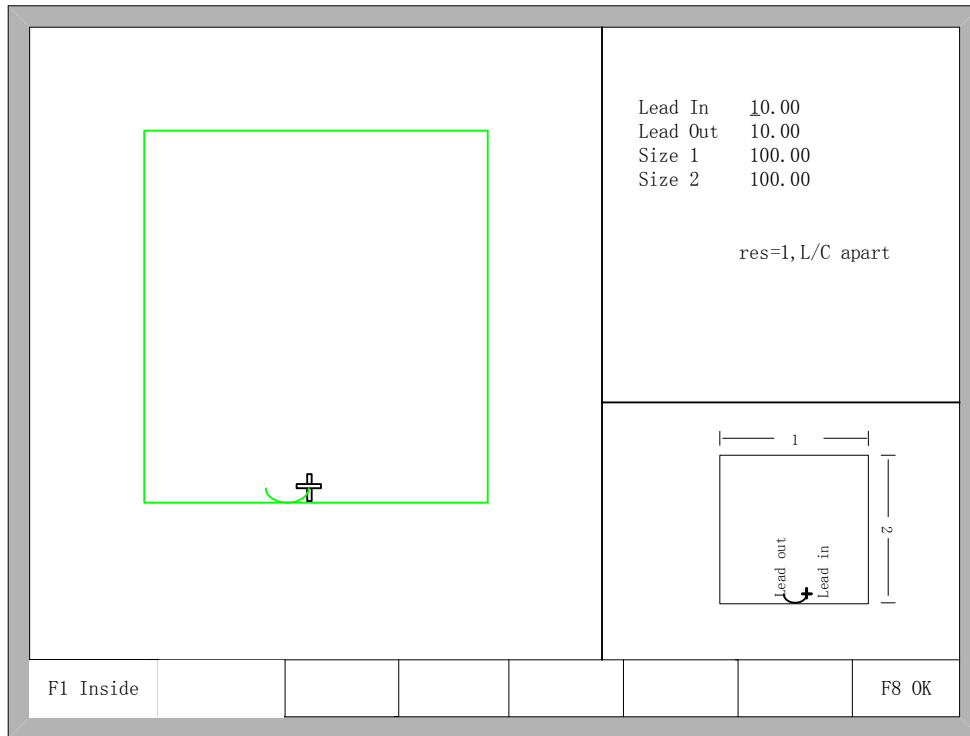In Fig 9.2 interface, you can press【F2】to choose hole size, shown as Fig 9.3:

Fig 9.3 Hole size

Modify sizes like modify chip sizes.

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

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

Chapter 10 Code Explanation

10.1 Code Symbol and Interpretation

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

Table 10.1 Programming symbols interpretation

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

● In the following context, all the symbol "/" is the relationship of OR. For example, X/U represents that the result is either X or U, both of which cannot simultaneously be. N represents parameter value, for example, Xn expresses that n is the following parameter. [] means optional context, which can be selected or not.

10.2 Coordinate System

This system uses right-hand Descartes coordinate system acquiescently, as the figure 10.1 shows.
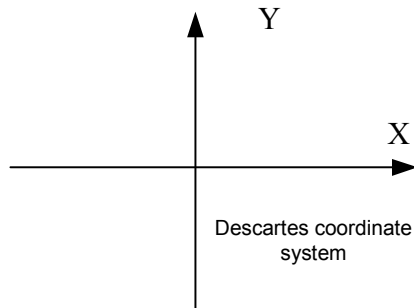
Fig 10.1 Descartes coordinate system

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

10.3 G Code Explanation

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

Table 10.2 Common G code table

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

1. G92 Reference point setting

Format:

G92 【Xn】 【Yn】

Parameters meaning:

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

Note:

After input this code, coordinate of reference point to be set by G92 can be saved automatically. Before new cutting code hasn't been inputted, the coordinate of this reference point is always available, whether system is power off or not. After input a new cutting code, if new code has G92 instruction, the coordinate of this reference point is the context after G92, if no G92, the reference point is default (0, 0). In one code file, G92 only appears once.

Example:

a.   G92 X0 Y0

Take (0,0) as reference coordinate, when press "go back" function key, the machine tool goes back to coordinate point (0, 0).

b.   G92 X20 Y0

Take (20,0) as reference coordinate, when press "go back" function key, the machine tool goes back to coordinate point (20,0).

2.   G90/G91

Format:

G90/G91

G90: absolute coordinate. X/Y in the code means absolute coordinate value; U and V mean relative coordinate value.

G91: relative coordinate. X/Y in the code means relative coordinate value; U and V also mean relative coordinate value.

Example：

a.   G90 usage


```
G92  X0 Y0        // Reference point (0,0)
G90               // Absolute coordinate
G00 X20 Y0   // Rapidly moving tool to (20,0)
M07              // Cutting device on
G01 X120 Y100   //Cutting to (120,100)
M08              //Cutting device off
M02              // End of program
```
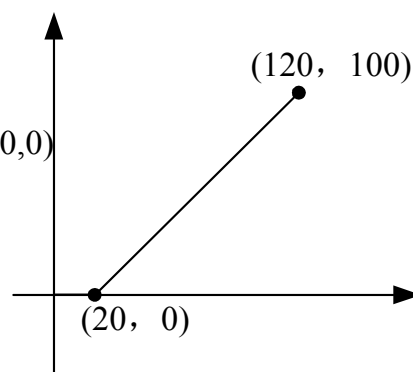
Fig 10.2 G90 usage

b.   G91 usage

```
G92  X0 Y0      // Reference point (0,0)
G91             // Relative coordinate
G00 X20 Y0   //Rapidly moving gun to (20,0)
M07             //Cutting device on
G01 X120 Y100 //Cutting to(140,100)
M08             //Cutting device off
M02             // End of program
```
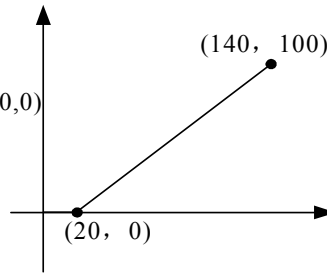

Fig 10.3 G91 usage

3.   G20/G21

Format:

G20/G21

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

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

Note:

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

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

4.   G00 Traverse rapidly

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

Format:

G00 X/Un Y/Vn 【Fn】

Parameters meaning：

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

   (In the relative coordinate system):

- Xn – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);
- Yn – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);

   (In the absolute coordinate system):

- Xn – displacement of endpoint's X coordinate relative to working start point,

unit(mm);

● Yn – displacement of endpoint's Y coordinate relative to working start point, unit(mm);

Example:

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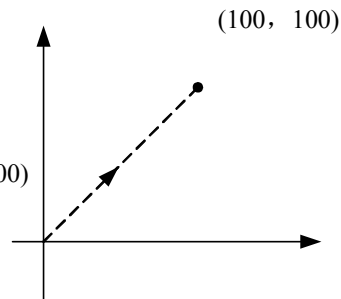
(100，100)

Fig 10.4 G00 usage

5.　G01 Linear Interpolation(at cut speed)

　　This instruction expresses that linearly incise to specific location, which the system will cut to at the rate of "incise speed* time ratio" from start point of current segment.

Format:

　　G01 X/Un Y/Vn　【Fn】

Parameters meaning：

　　The same to the meaning of G00 code, the difference of them is only that G00 expresses linearly walking(meaning: output ports are all closed), but G01 expresses linearly incising.

6.　G02 Clockwise Circular Interpolation

　　This instruction expresses that incise clockwise arc (clockwise interpolation) to specific location, which the system will cut to at the rate of "incise speed* time ratio" from start point of current segment.

Format:

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

Parameters meaning：

● Fn – incise at limited rate;

● Un – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);

● Vn – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);

● In – displacement of circle centre's X coordinate relative to start point of current segment, unit(mm);

- Jn – displacement of circle centre's Y coordinate relative to start point of current segment, unit(mm);

- R[-]n – the radius of arc, when the angle of arc <=180°, R is positive. Otherwise, it's negative, unit(mm);

    (In the relative coordinate system):

- Xn – displacement of endpoint's X coordinate relative to start point of current segment, unit(mm);

- Yn – displacement of endpoint's Y coordinate relative to start point of current segment, unit(mm);

    (In the absolute coordinate system):

- Xn – displacement of endpoint's X coordinate relative to working start point, unit(mm);

- Yn – displacement of endpoint's Y coordinate relative to working start point, unit(mm);

Example:


```
Example 1:  B->A
G92  X0 Y0      // Reference point (0,0)
G91             // Relative coordinate
G00 X60 Y100    //Rapidly move tool to B
G02 X-40 Y-40 I0 J-40 //The arc 1
/(G02 X-40 Y-40 R-40)
M02
Example 2:  A->B
G92  X0 Y0      //  Reference point (0,0)
G91             // Relative coordinate
G00 X20 Y60     //Rapidly move tool to A
G02 X40 Y40 I40 J0 //The arc 2
/(G02 X40 Y40 R40)
M02
```
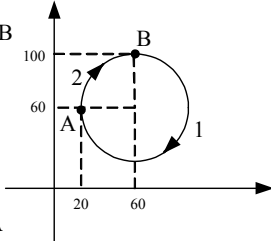
Fig 10.5 G02 usage

7.   G03 Counterclockwise Circular Interpolation

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

8.   G40/G41/G42 Kerf Compensation

These functions are used for kerf compensation. Because flame incision and plasma incision both finally have the existence of kerf when incise route expressed by code is only actual size of work piece, the actual incision work piece without regard to the effect of kerf isn't needed size. After set the kerf compensation, the system will automatically work out the effect of kerf and incise work piece with actual size.

G41/G42 must match with G40 to be used. If G41/G42 is ignored, the default kerf compensation is zero; if G40 is ignored, kerf compensation is available.

Format:

    G41 //Enable Left Kerf Compensation

    …… // incision code

    G40 //Disable Left Kerf Compensation

    G42 // Enable Right Kerf Compensation

    …… // incision code

    G40 // Disable Right Kerf Compensation

Example:

    (Convex Roof Trapezoid w/Hole)

    G21   /* metric unit */

    G91   /* relative coordinate */

    G99 X1 Y0 I0 J0   /*proportion factor is 1, rotate angle is 0, no mirror image*/

    G00 X44.45 Y41.275   /* Rapidly moving to (44.45, 41.275)*/

    G41   /* Left Kerf Compensation */

    M07   /* Incision beginning*/

    G03 X0 Y0 I19.05 J0   /*Counterclockwise Circular Interpolation */

    M08   /* Incision ending */

    G40   /* Disable Left Kerf Compensation */

    G00 X-44.45 Y-41.275   /* Rapidly moving to (-44.45, -41.275) */

    G41   /* Right Kerf Compensation */

    M07   /* Incision beginning */

    G01 X25.779438 Y58.031634   /*Linear Interpolation */

    G02 X75.441125 Y0 I37.720562 J-16.756634   /* Clockwise Circular Incision*/

    G01 X25.779438 Y-58.031634   /* Linear Interpolation */

    G01 X-127 Y0   /* Linear Interpolation */

    M08   /* Incision ending */

    G40   /* Disable Right Kerf Compensation */

    M02   /* End of program */

Note:

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

9.   G99 proportion、rotate、image

Format:

    G99 Xn Yn In Jn

Parameters meaning：

●   X – proportion factor, can be set from 0.001 to 1000.

- Y – rotate angle, can be set from -360° to 360°.

- I – image of X axis, make image along X axis, 1 expresses that there is image, 0 expresses that there is no image.

- J –image of Y axis, make image along Y axis, 1 expresses that there is image, 0 expresses that there is no image.

Note:

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

10. Program notice items

- The program must contain the instruction of G92 (reference point setting) and M02(end of program).

- G41/G42 must match with G40 to be used. If G41/G42 is ignored, the default kerf compensation is zero; if G40 is ignored, kerf compensation is available.

- If G20 / G21 is ignored, the system will execute G21 (metric unit).

- If G90 / G91 is ignored, the system will execute G91 (relative coordinate).

- M07 and M08 can't be neglected.

- When there is one parameter in the code of G00、G01、G02、G03 is ignored, if this parameter is absolute coordinate, the system will set it G code coordinate value of last row; If it's relative coordinate, the system will set it 0.

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

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

10.4 M Code Explanation

Table 10.3 Common M code

M07	No parameter	Cutting device on
M08	No parameter	Cutting device off
M00	No parameter	End of instruction
M02/M30	No parameter	End of program

- M07   Cutting device on

Please refer to Appendix 2 I/O Timing Sequence Figure of F2000 Series Numerical Control System.

- M08   Cutting device off

Please refer to Appendix 2 I/O Timing Sequence Figure of F2000 Series Numerical

Control System.

● 　M00　 End of instruction

　　In the processing of incision, the system will stop the machine tool with the M00 instruction, waiting for the next operation.

● 　M02/M30　 End of program
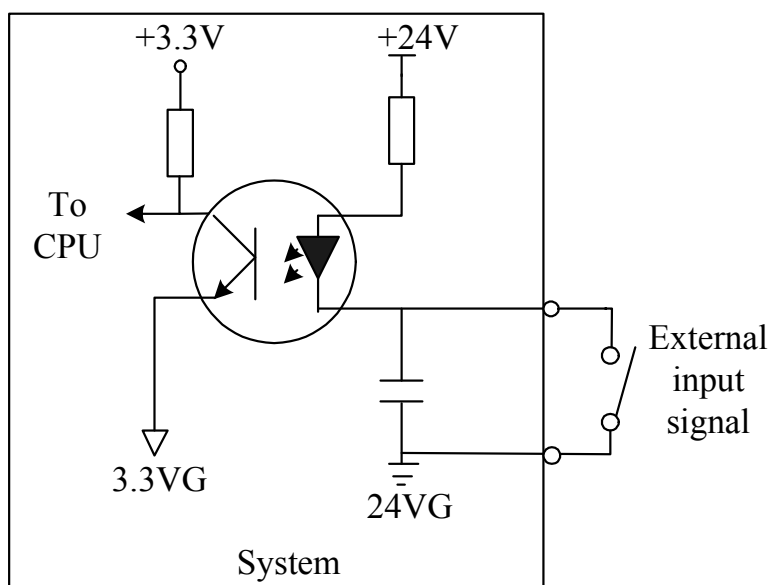
Chapter 11 Port Explanation

11.1 Input Port

Fig11.1 input port circuit

- Input signal is a mechanical contact switch, normally open type and closed type are all supported, it is effective when it is connected to 24VG，and it is ineffective when it is float or connected to 24V. Com-port of switch outside is connected 24VG. The other port is connected to corresponding IO port.
- 16 channel input ports totally
- Input signal definition

Table 11.1 Input port definition

Pin number	Signal name	remark
1	X+ limit	X+ stop input，float it if not use, this is horizontal
14	X- limit	X-　stop input，float it if not use, this is horizontal
2	Y+ limit	Y+ stop input，float it if not use, this is vertical
15	Y- limit	Y- stop input，float it if not use, this is vertical

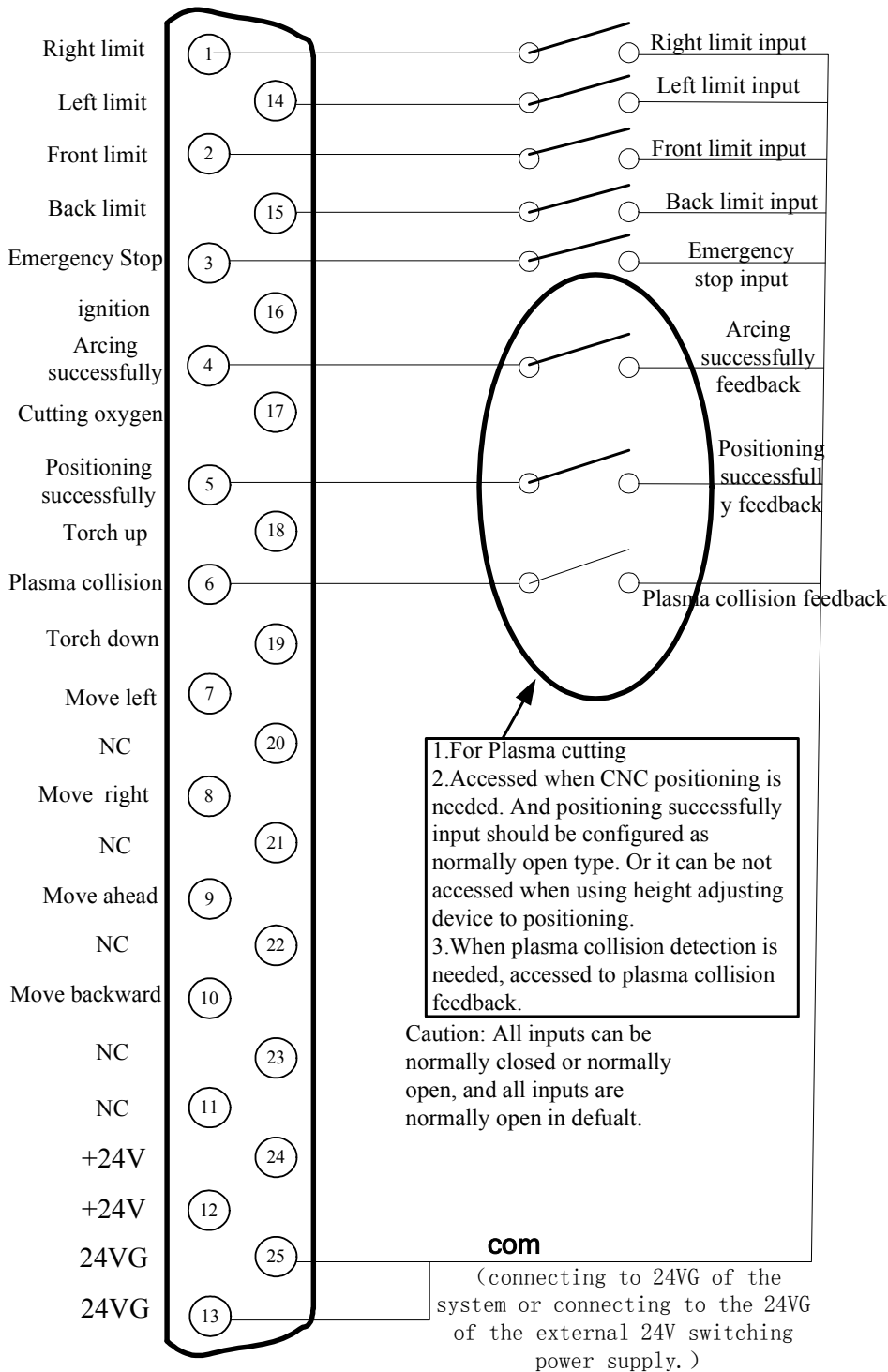| 3	Emergency stop	Emergency stop input, float if not use
4	Arcing successfully	
5	Positioning successfully	
6	Plasma collision	
7	Move left/C	Remote control input
8	Move right/D	Remote control input
9	Move forward/A	Remote control input
10	Move backward/B	Remote control input
11,20-23	Spare	
12,24	+24V	+24V/3A　Power output
13,25	24VG	+24V Ground
16	Firing	Remote control input
17	Oxygen cutting	Remote control input
18	Cutting torch up	Remote control input
19	Cutting torch down	Remote control input

11.1.1 Input Wiring Instructions

Right limit   ①   Right limit input

Left limit   ⑭   Left limit input

Front limit   ②   Front limit input

Back limit   ⑮   Back limit input

Emergency Stop   ③   Emergency stop input

ignition   ⑯

Arcing successfully   ④   Arcing successfully feedback

Cutting oxygen   ⑰

Positioning successfully   ⑤   Positioning successfully feedback

Torch up   ⑱

Plasma collision   ⑥   Plasma collision feedback

Torch down   ⑲

Move left   ⑦

NC   ⑳

Move right   ⑧

NC   ㉑

Move ahead   ⑨

NC   ㉒

Move backward   ⑩

NC   ㉓

NC   ⑪

+24V   ㉔

+24V   ⑫

24VG   ㉕

24VG   ⑬

1.For Plasma cutting
2.Accessed when CNC positioning is needed. And positioning successfully input should be configured as normally open type. Or it can be not accessed when using height adjusting device to positioning.
3.When plasma collision detection is needed, accessed to plasma collision feedback.

Caution: All inputs can be normally closed or normally open, and all inputs are normally open in defualt.

com
（connecting to 24VG of the system or connecting to the 24VG of the external 24V switching power supply.）

Fig 11.2 External input wiring

11.1.2 Remote Controller Input

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

➢ Line Input Type

The pin 7, 8,9,10 of input port represents left, right, forward, backward, when inputting   valid signal ,   the machine can move toward   the corresponding   direction, when   the input signal is invalid, the machine stop moving.

When the input signal of pin 16 is valid, the system will ignite the torch , the ignition time is   the setting value in system   parameters, please take the reference of part of "ignition time " in "7.2 oxygen gas parameters " .

When the input signal of pin 17 is valid, the system will turn on or off the cutting oxygen. When the cutting oxygen is on, the system cut off the oxygen, when the cutting oxygen is off, open the cutting oxygen system.

When the input signal of pin 18 is valid, the system will raise the cutting torch, when the signal invalid, the torch stops.

When the input signal of pin 19 is valid, the torch goes down, when the signal invalid, the cutting torch stops.

The external switches of line input are designed by the user..

➢ 8421(BCD) code input

Input pin 9, 10, 7, 8 is the A, B, C, D bits of the 8421 code. Functions are shown in Table 11.2

Table 11.2 Function of 8421 code input

Decimal	8421 code(DCBA)	Function
0	0000	No Input
1	0001	Turn on or off the cutting oxygen
2	0010	Go back according to the original track
3	0011	Move forward according to the original track
4	0100	Left lateral movement
5	0101	Ignite Input
6	0110	Start
7	0111	Slow down
8	1000	Accelerate
9	1001	Move for the negative direction vertically
10	1010	Move forward vertically
11	1011	Pause
12	1100	cutting torch

13	1101	raise the cutting torch
14	1110	Move toward right horizontally
15	1111	Start

8421-type remote control input is designed by the user; the user can also use the company's wireless remote control module.
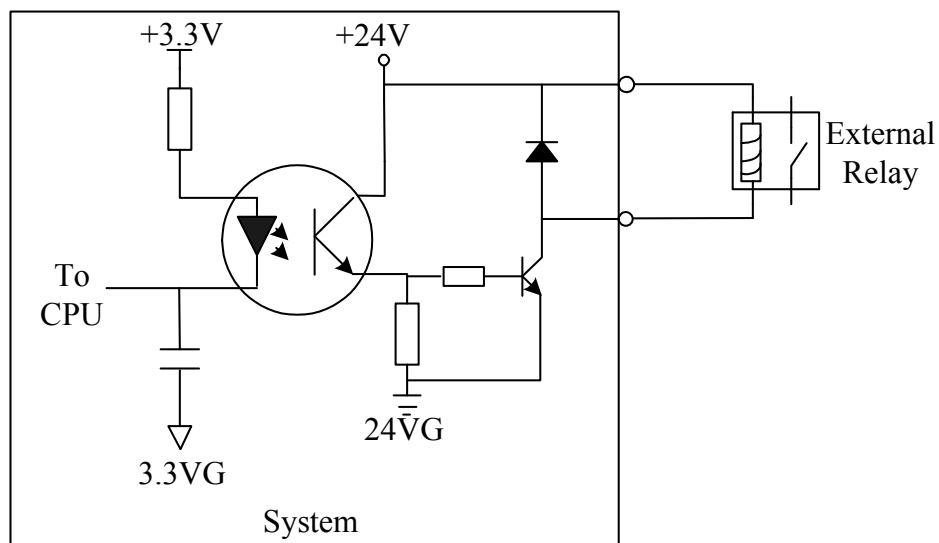
11.2 Output Port

Fig11.3 output port circuit

● Output voltage is 24VDC，low level is effective；

● Maximum output current $I_{max} = 300mA$；

● 16 output ports total

Table 11.3 Output port definition

25 interface Pins No.(Main connector)	Signal	Remark
3	Ignite	
1	Low pressure preheat	
17	High pressure preheat	
4	Low pressure cutting oxygen	
5	Medium pressure cutting	

	oxygen	
14	High pressure cutting oxygen	
2	Torch up	
15	Torch down	
6	Exhaust	
8	Enable high adjusting　box	
19	Plasma locating	
16	Plasma arc starting	
18	Corner low-speed output Or automatic / manual	
7	Spray dust	
20	Raise dust	
21	Dusting Preheat	
9，10，22，23	Not used	
11,12,24	+24V	+24V/3Aoutput
13,25	24VG	+24Vground

11.2.1 Output Wiring Instructions

11.2.1.1 Oxygen Gas Typical Connection
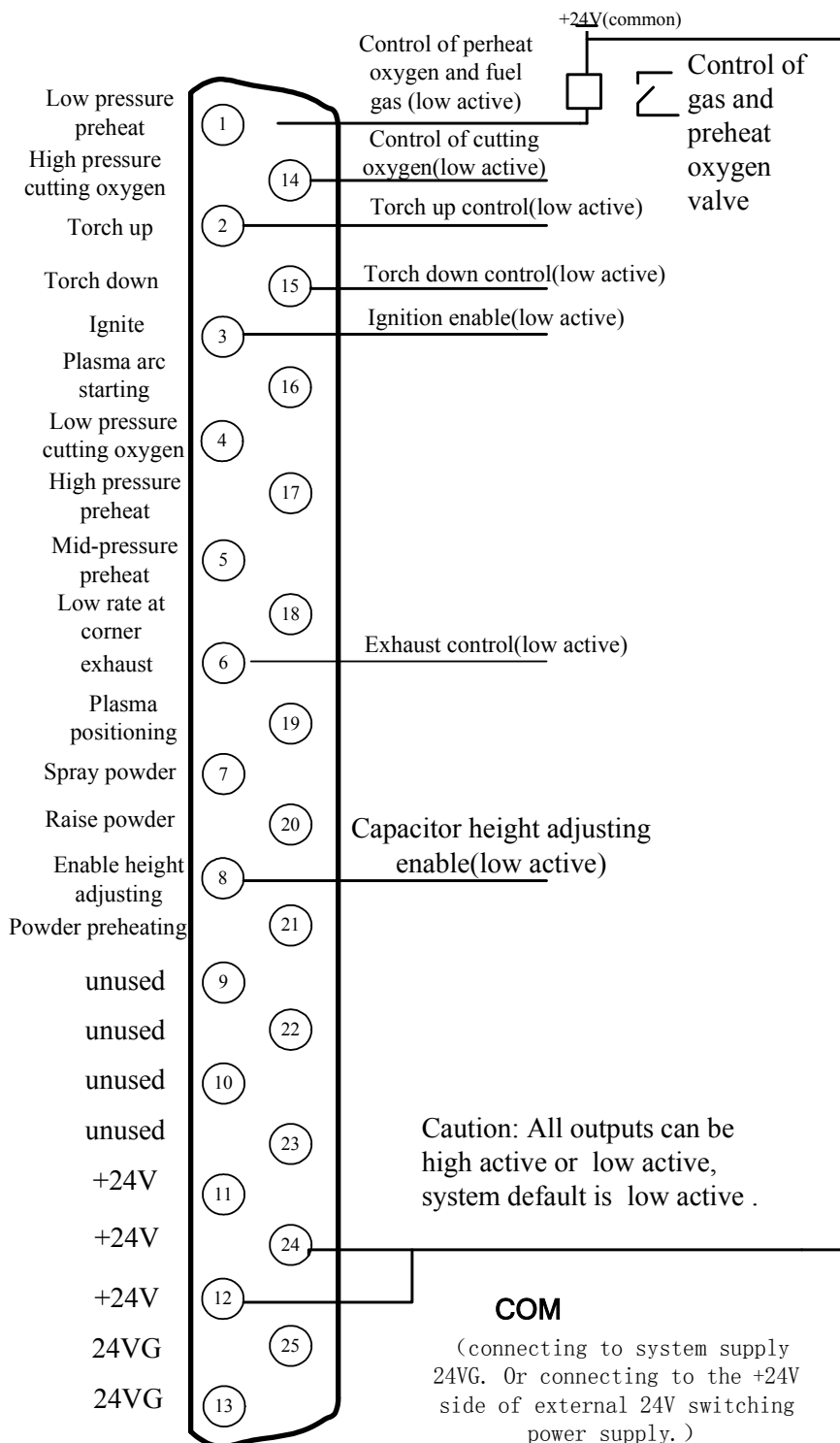
Fig 11.4 Oxygen gas typical connection

11.2.1.2 Three Level Perforation Circuit
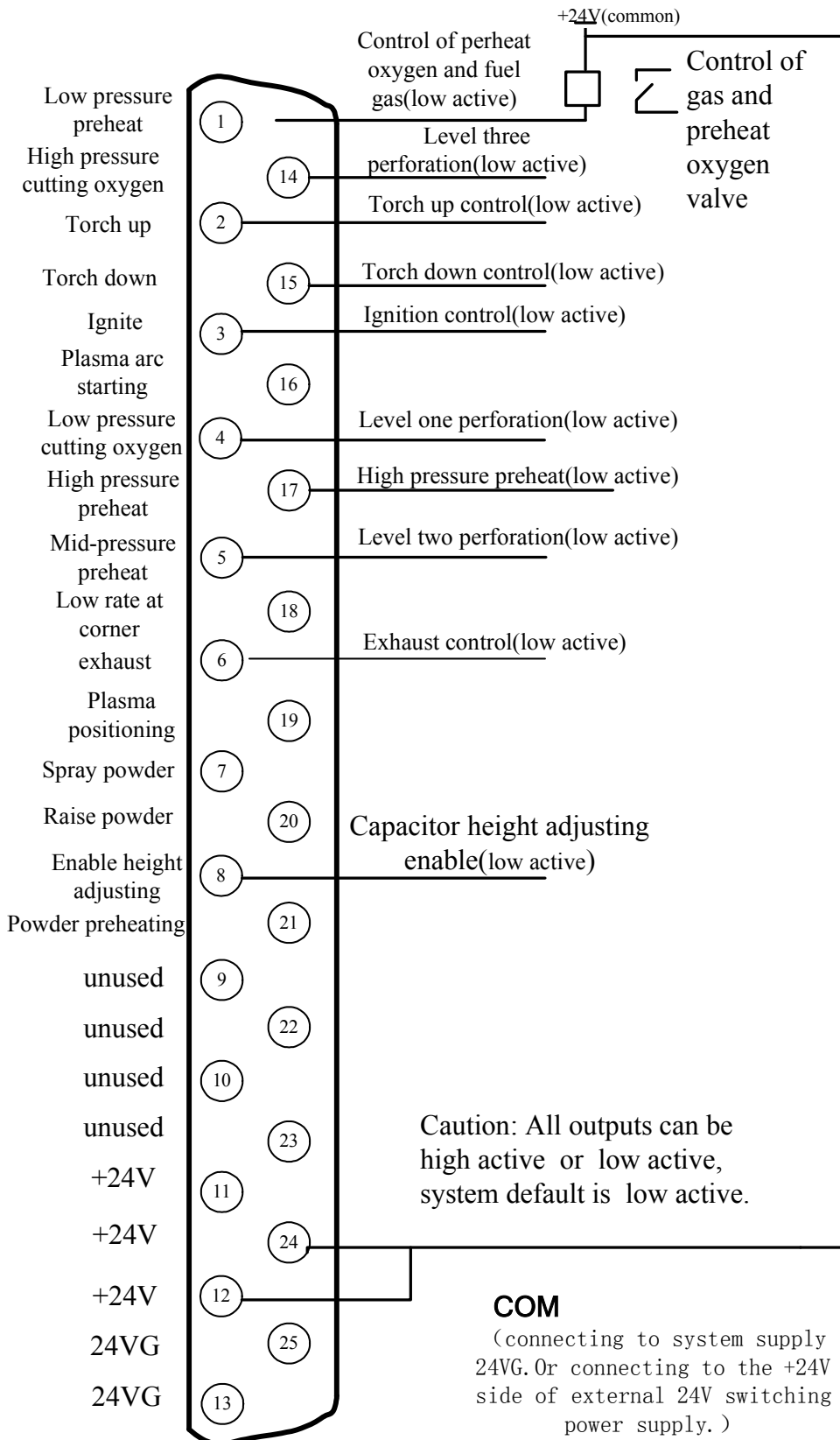
Fig 11.5 Three level perforation circuit

11.2.1.3 Typical Circuit of Using Powder
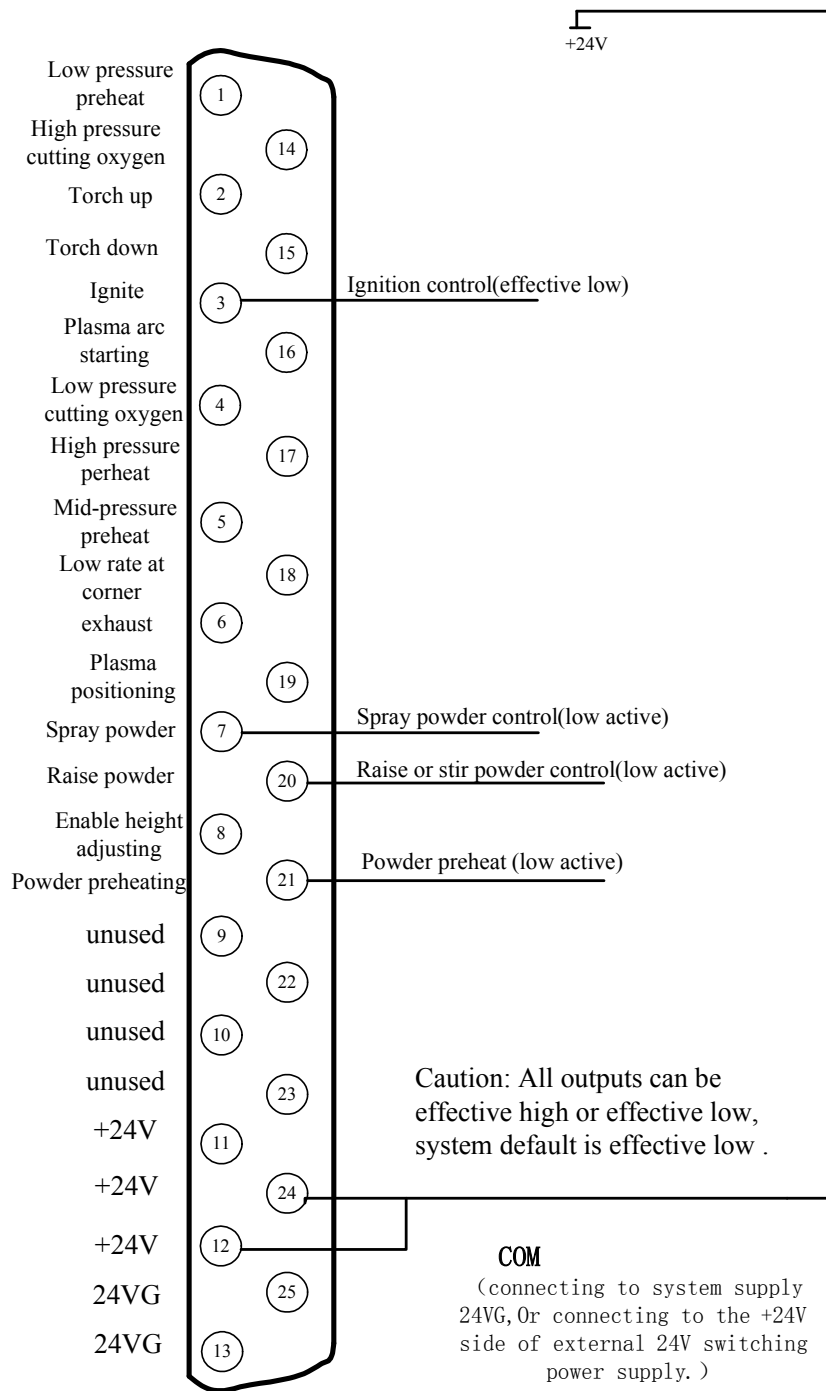
Fig 11.6 powder typical connection

96

11.2.1.4 Typical Circuit of Using Plasma Cutting

+24V(common)

Low pressure preheat

High pressure cutting oxygen

Torch up — Torch up control （Low active）

Torch down — Torch down control （Low active）

Ignite

Plasma — Connect to high adjusting device's arc starting input or arc starting delay （Low active）

Low pressure cutting oxygen

High pressure preheat

Medium pressure cutting oxygen

Corner low speeed — Connect to high adjusting device's corner low speed or automatic / manual （Low active）

Exhaust

Plasma locating — Connect to the locating input of lifting device when CNC locating is needed （Low active）

Spray dust

Raise dust

Enable high adjusting box

Dusting preheat

Not used

Not used

Not used

Not used

+24V

+24V

+24V

24VG

24VG

Note: All outputs are low active or high active, the system takes low active as default.

COM
(Connecting to the system's +24V supply, also external 24VSwitch supply +24V port allowed)

Fig 11.7 Typical wiring diagram of the plasma

Instruction：

➢ **Height-adjusting device wiring with corner low-speed**

When the height-adjusting device takes corner low-speed input control signal, the system's "corner low speed" output signal is used to control the height-adjusting device's corner low-speed input. The system takes an open-collector transistor output, with the default active low signal. Reference section 8.7.3, set the output port type of close THC (corner signal) "●". CNC system needs to output low electrical lever signal with this

THC during decreasing rate and this signal should be broken off at normal cutting time.

➢ **Height-adjusting device wiring with automatic / manual**

When the height-adjusting device takes automatic / manual control function instead of corner low-speed input, the system needs to use the "corner low-speed" output to control the height-adjusting device's automatic / manual signal. The system takes an open-collector transistor output, with the default active low signal. Meanwhile, it needs to change the type of corner low speed from normally-open to normally-closed in the output port configuration interface (Section 8.7.3), i.e. from "●" to "●". CNC system needs to break off this signal with this THC during decreasing rate and this signal should output low electrical lever at normal cutting time.

➢ **Using height-adjusting device locating**

When using the locating function of the height-adjusting device, the locating function of numerical control should be closed. The approach is to change the input type of successful locating from normally-open to normally-closed in the input port configuration interface (Section 8.7.2), i.e. from "●" to "●". There are two types of locating:

The first: locating controlled by the plasma arc starting. CNC emits the plasma arc starting, the height-adjusting device starts arc after locating, and sends signal of arc starting successful feedback to CNC after starting arc successfully. After CNC system has received signal of arc starting successful feedback, it will begin to incise immediately. Such devices available in the market include AngTai, HongYuDa, HaiSi and other brands. Such devices can connect the "plasma arc starting" output of CNC system to the " starting arc with locating" input of the height-adjusting devices, and at the same time in the plasma parameters (refer to section 7.3 plasma parameters) set the arc detecting time to the value that allows for completing the testing and starting arc.

The second: finish position from the decline of the cutting torch . Before issuing the command of starting arc, first issue the command of declining the height adjust device, then issue the command of starting arc. These kind of height adjust devices could be SiDaTe, HongYuDa in markets. When using these kind of height adjusting device, transfer to the interface of plasma parameters (refer to section 7.3 plasma parameters), set the location detecting time as the time of location of touch.

➢ **Using CNC system locating**

When using the location function of digital control system, firstly enter into the input configuration interface, set the input type of successful location from normally closed to normally open type, i.e. from "●" to "●". At the same time, return the signal of successful location to the input port of the successful location of the digital controller. In

the plasma parameter interface (refer to section 7.3 plasma parameters), set the location detecting time and locating up time to needed values.
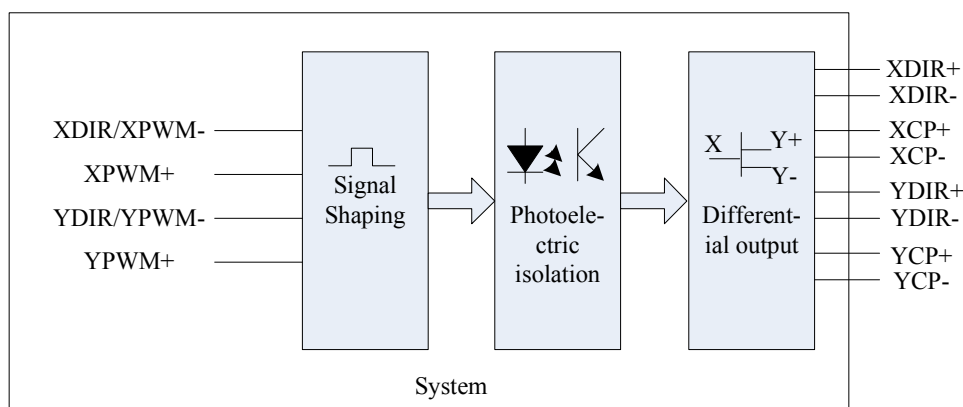
11.3 Motor Port

Fig11.8 motor port schematic diagram

● Signal definition table

Number of the 15 pin interface	signal	Remarks
1	XDIR+	Positive at the horizontal axis
9	XDIR-	Negative at the horizontal axis
2	XCP+	Positive pulse at the horizontal axis
10	XCP-	Negative pulse at the horizontal axis
3	YDIR+	Positive at the vertical axis
11	YDIR-	Negative at the vertical axis
4	YCP+	Positive pulse at the vertical axis
12	YCP-	Negative pulse at the vertical axis
5,13,6,14		Not used
7	+5V	+5V/500mA Power output
15,8	5VG	5V Power Ground

99

11.3.1 Typical Wiring Diagram of the Motor Interfaces

11.3.1.1 Connection Methods for Differential Stepper Driver
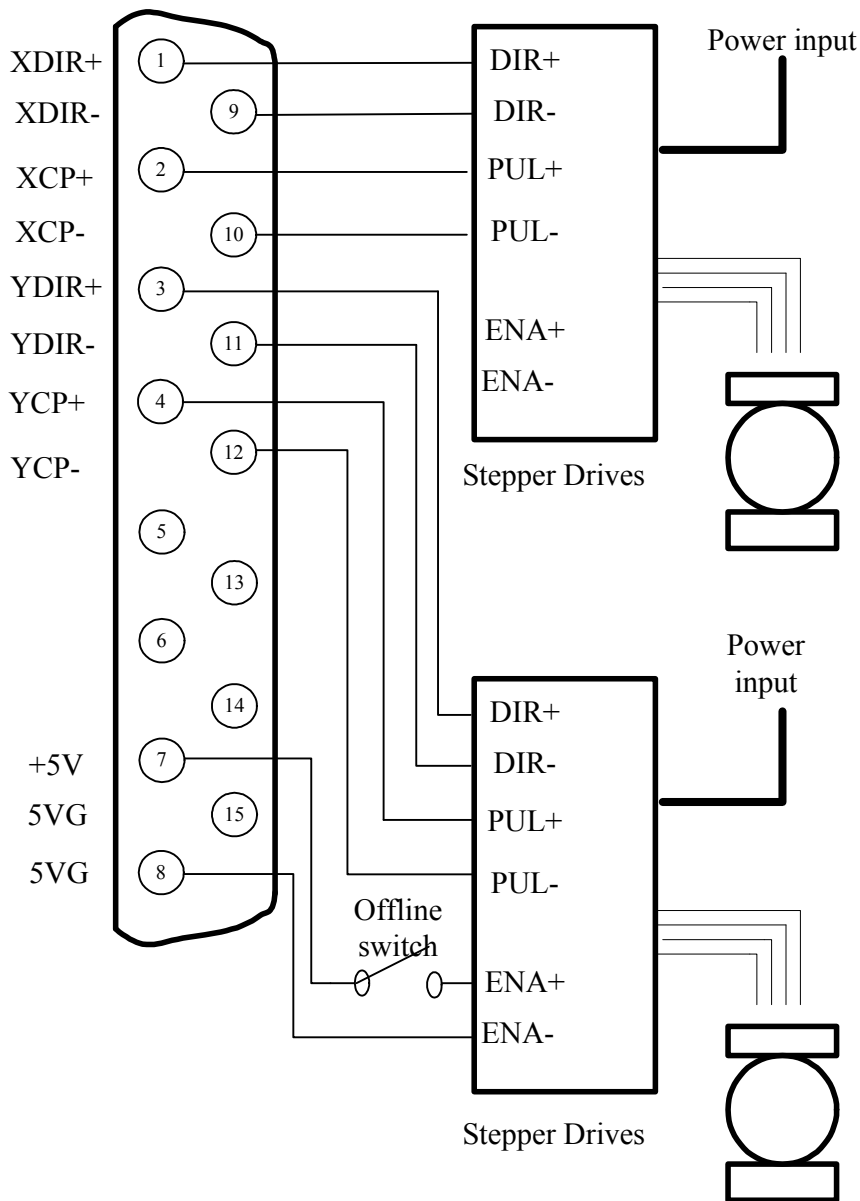
Fig 11.9 connection methods for differential stepper driver

11.3.1.2 Com-anode Connection Methods for Stepper Driver
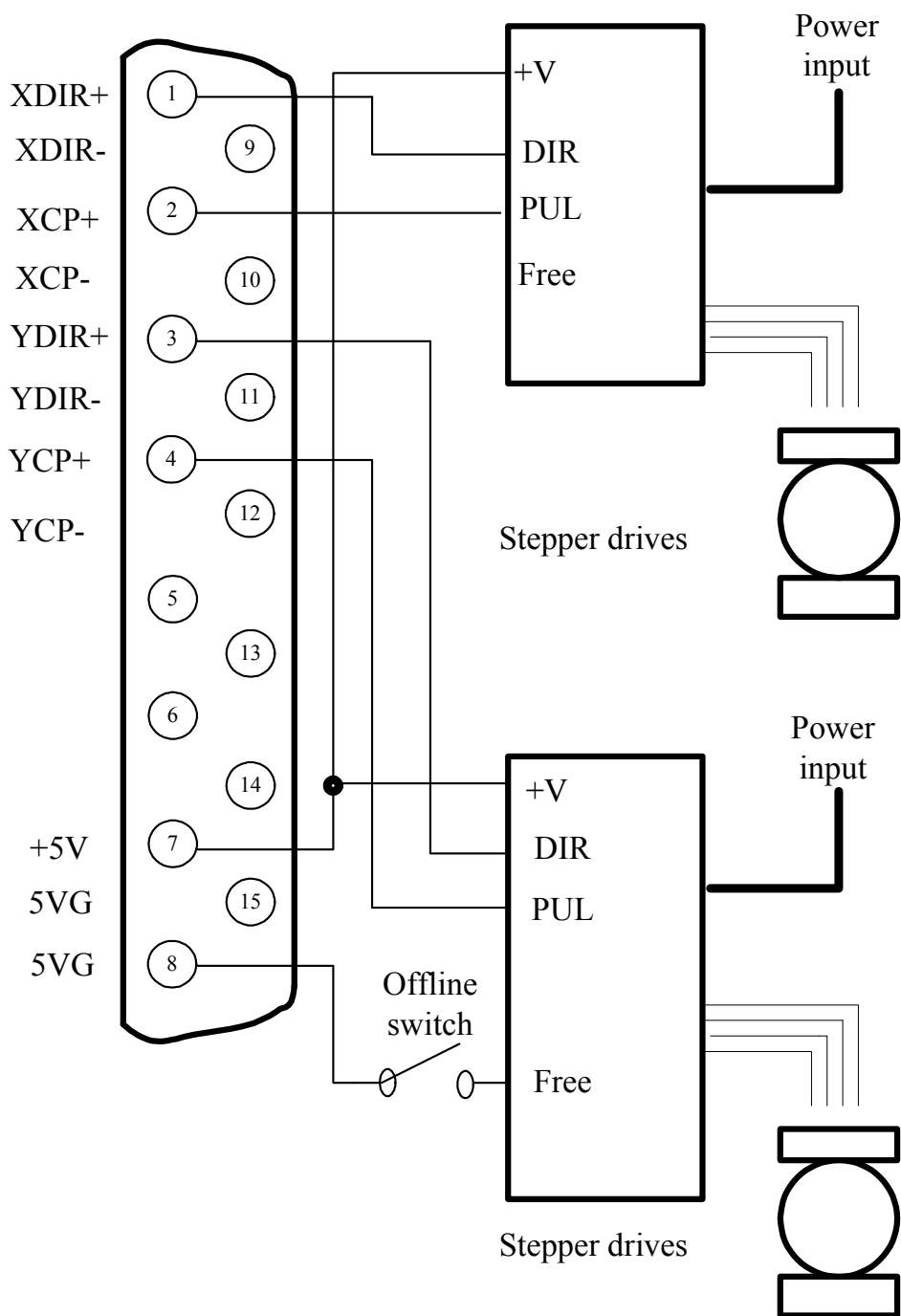
Figure 11.10 com-anode connection methods for stepper driver

11.3.1.3 Connection Methods of Servo Driver of Panasonic Company
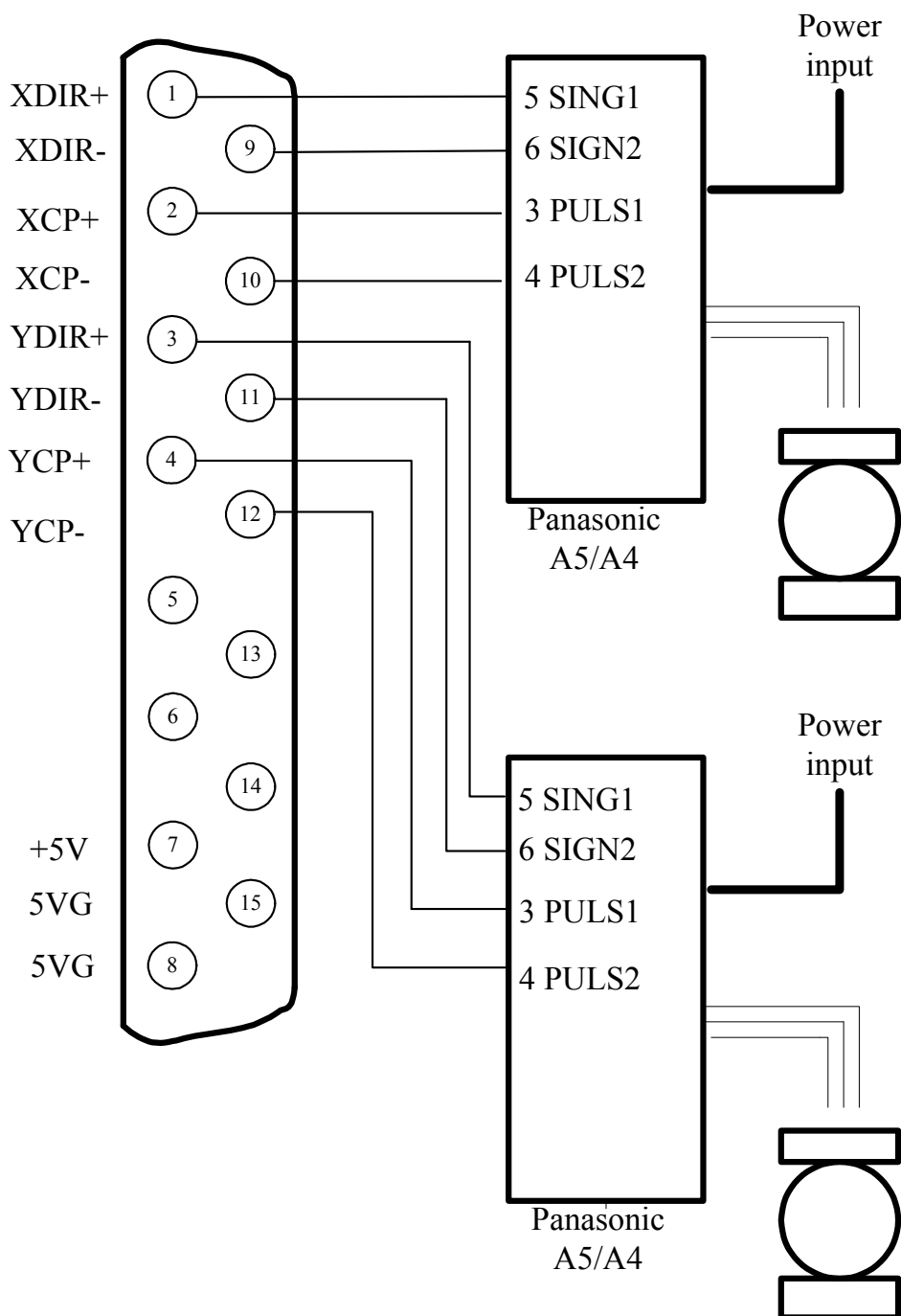
Figure 11.11 Connection methods of Servo driver of Panasonic Company

11.4 Arc THC Module Interface (THC) (typical of the "T" in F2000 series CNC system)

Compare to common F2000 series CNC system without arc THC, F2000T CNC system adds the interface of arc THC as the red frame area in following figure based on the original system.
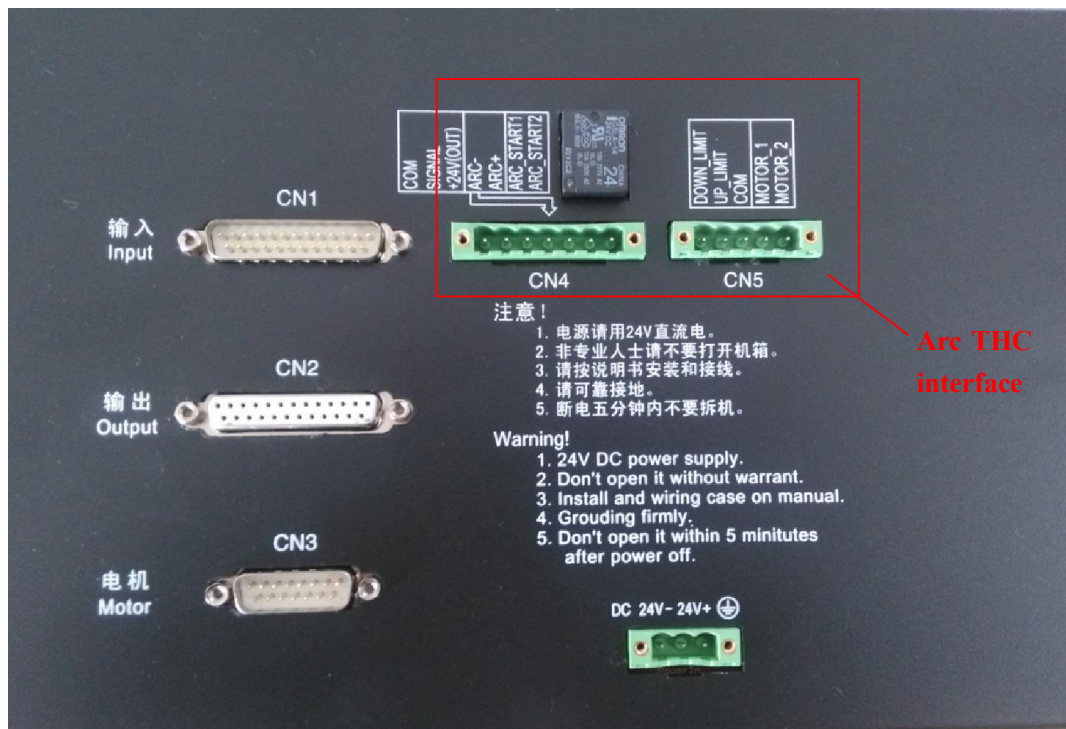
Fig.11.12 F2100T system interface schematic diagram

11.4.1 DC MOTOR Interface Instruction

M+、M- are DC MOTOR export pins, LIM+、LIM- are import pins, COM is public ground。M+、M- link with DC motor, LIM+、LIM- link with upper limit and lower limit switch of torch.

Interpret: when lifting motor limiting isn't used, user needs to short COM and LIM+, short COM and LIM-.

The maximum power of Lifting motor: 45W.

Table 11.4 Motor Interface Signal Definition of Arc THC Module

5 Cores Interface Pin Number	Signal Name	Comment
1	LIM-	Lower limit
2	LIM+	Upper limit
3	COM	+24V power ground
4	M+	Motor + for THC
5	M-	Motor - for THC

11.4.2 Arc Import Instruction

Arc import pins are ARC+、ARC-. ARC+ link with positive pole of arc output of partial pressure panel. ARC- link with negative pole of arc output of partial pressure panel.

Table 11.5 Arc Interface Signal Definition of Arc THC Module

7 Cores Interface Pin Number	Signal Name	Comment
4	ARC-	negative pole of arc output of partial pressure panel
5	ARC+	positive pole of arc output of partial pressure panel

Interpret: input and output proportion of partial pressure panel is default 100: 1.

If user needs 50：1 partial pressure proportion, open the system box, find the dial switch showing as the figure 11.13. When this switch is on, partial pressure proportion input is 50：1, otherwise 100: 1. Default position of dial switch is OFF。
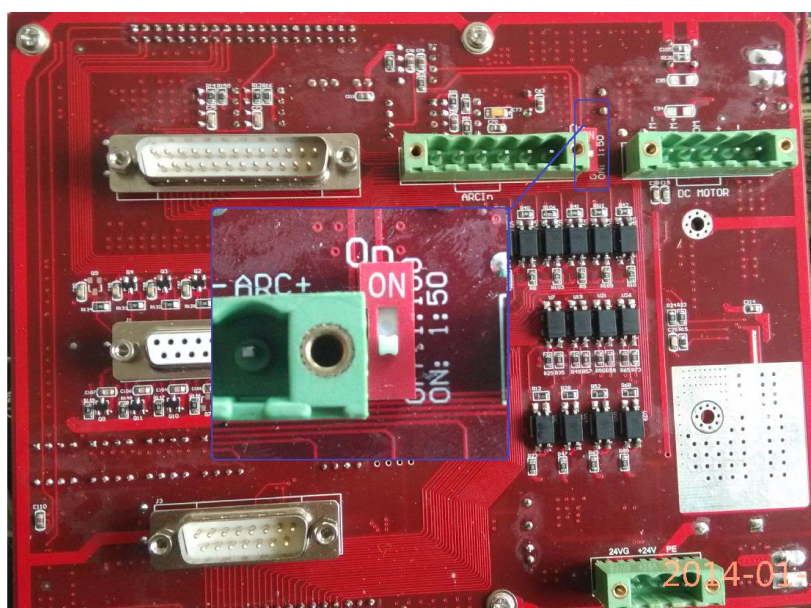
Fig.11.13 Arc input partial pressure proportion

11.4.3 Position Interface (PS) Instruction

Position interface (PS) is also in the 7 pins interface like arc import. Input pins are +24V(OUT), SIGNAL,COM. +24V(OUT) links with the positive pole of location approach switch, SIGNAL links with the signal of NPN approach switch, COM links with the negative pole of location approach switch.

Interpret：Approach switch is NPN type with DC24V.

Table 11.6 Position Interface Signal Definition of Arc THC Module

7 Cores Interface Pin Number	Signal Name	Comment
1	COM	Negative pole of approach switch
2	SIGNAL	NPN approach switch signal
3	+24V(OUT)	Positive pole of approach switch

11.4.4 Arcing interface (ARC_START) instruction

Arcing interface (ARC_START) is also in the 7 pins interface like arc import. Output pins are ARC_START1、ARC_START2 linking with plasma power arcing port.

Table 11.7 Arcing port Signal Definition of Arc THC Module

7 Cores Interface Pin	Signal Name	Comment
6	ARC_START1	plasma power arcing port
7	ARC_START2	plasma power arcing port

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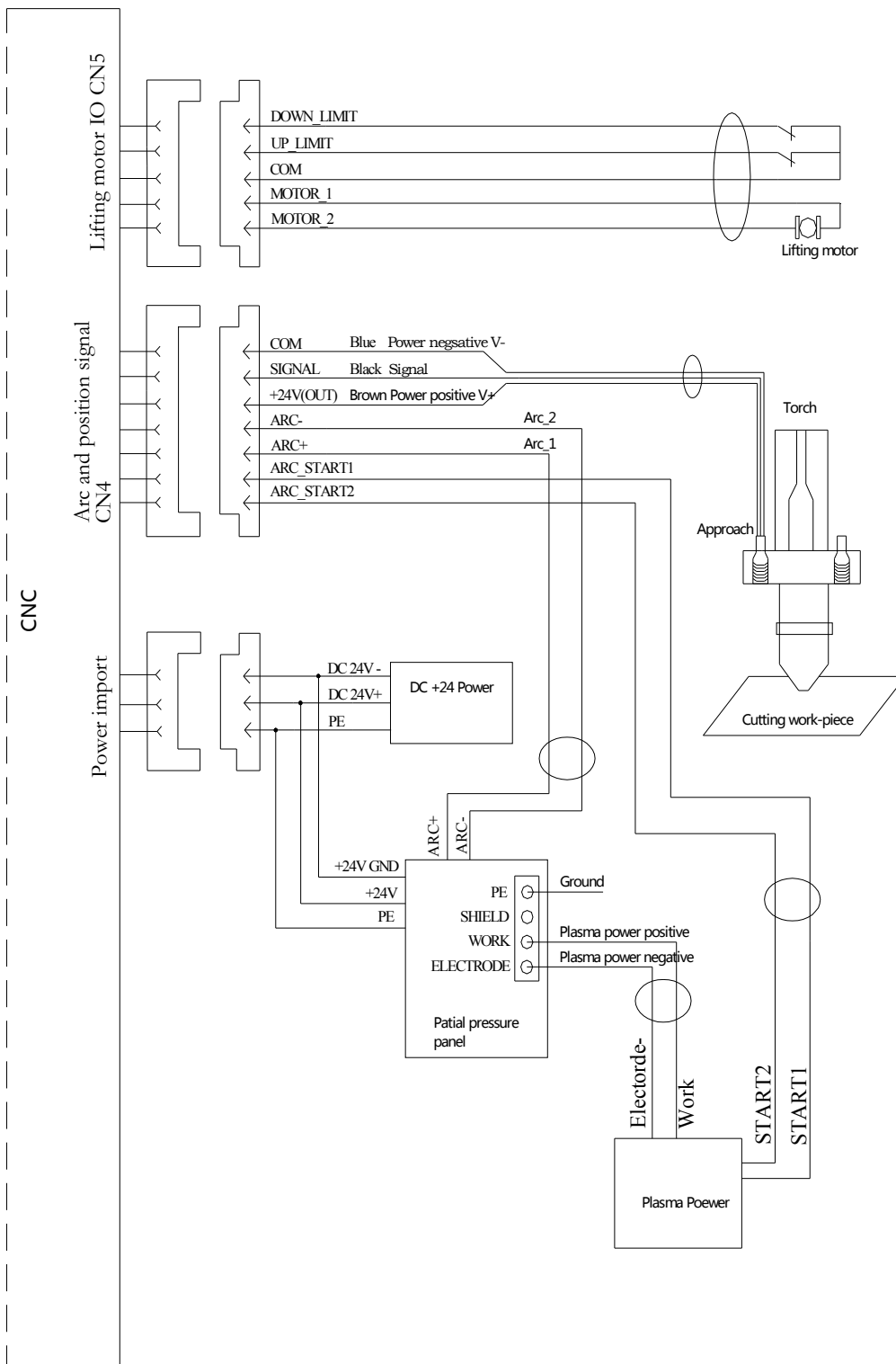
Fig.11.14 Wiring Diagram of F2100T system with Arc THC Module

11.4.6 Wiring Diagram of double approach switch

Two NPN-style approach switches are used for location, which can either be linked with the parallel mode or be linked with series mode. To make the location more accurate and stable, we recommend using series mode to link the two switches. The specific wiring mode is shown as the figure 11.15. With this link-mode, any one action of approach switch can emit the collision signal.
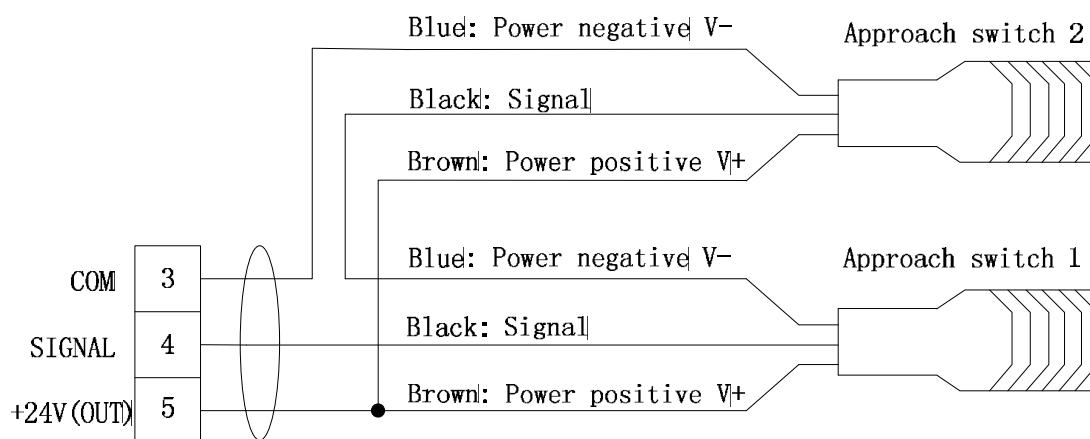
Fig.11.15 Wiring Diagram of double approach switch

11.5 Power Input Instruction

Power input: 24V-、24V+、PE。

Table 11.8 Power Interface Signal Definition

3 Cores Interface Pin Number	Signal Name	Comment
1	24V-	24V Power -
2	24V+	24V Power +
3	PE	Ground

Chapter 12 Use of BIOS

When the system powers on, it will display as shown in Fig 12.1.

```
Press F2 to run BIOS
Auto boot after: 3
```
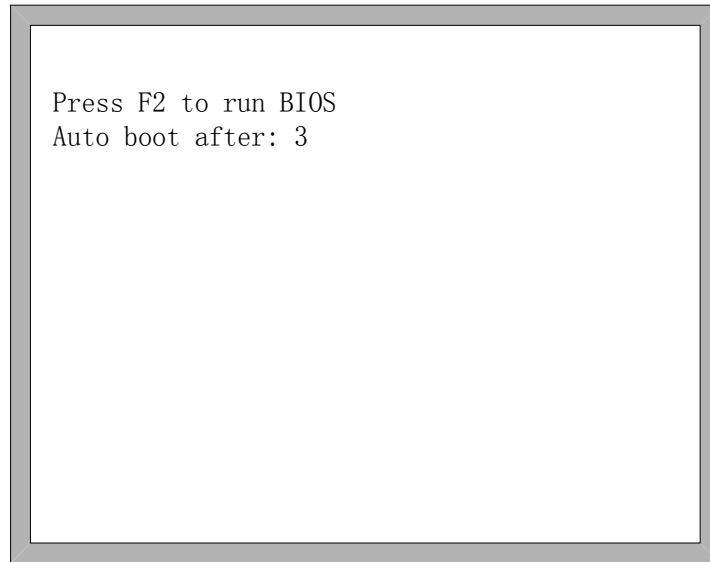
Fig 12.1 Power on

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

```
F1 - System software update(系统升级)
F2 -Welcome picture  update (欢迎界面升级)
F3 -Motion update (运动控制升级)
F4 -System backup (系统备份)
F5 - System recovery(系统还原)
F6 -Start system (启动系统)
```
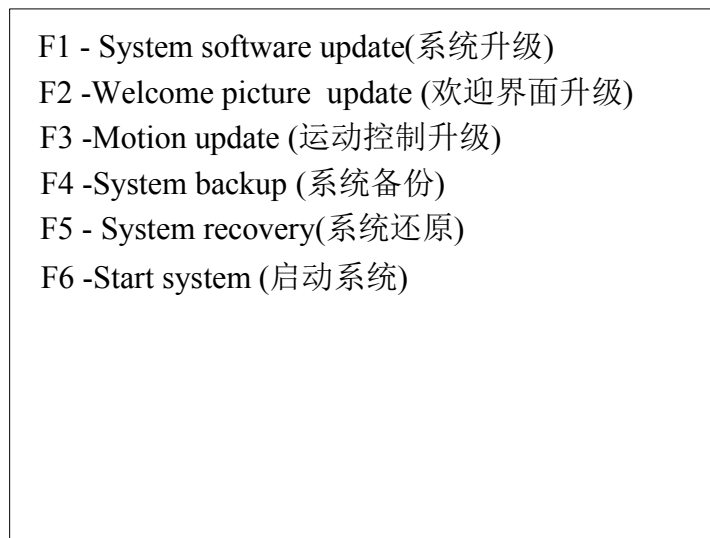
Fig 12.2 BIOS interface

12.1 System Upgrade

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

● Flash Disk is connected to the system.

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

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

12.2 Welcome Interface Upgrade

After entering BIOS, press 【F2】to upgrade the welcome interface completely, it should satisfy the following conditions:

● Flash Disk is connected to the system.

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

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

12.3 Movement Control Upgrade

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

● Flash Disk is connected to the system.

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

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

12.4 System Backup

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

12.5 System Reset

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

Chapter 13 Installation and Debugging

13.1 Horizontal / Vertical Pulses Number Setting

● Horizontal / vertical pulses number setting

Here, horizontal / vertical pulses number is also introduced in the section of 7.5 system parameter. It's easy to set the number of horizontal (vertical) pulses. Before drawing a line, assume one value of horizontal pulses XPls and one value of vertical pulses YPls, set these two parameters and then save the settings. Enter the manual interface, choose fixed moving function. Assume the fixed distance is Amm. Move A mm horizontally, and the actual length of the line is B mm (which is generally not equal to A), then we can calculate the horizontal pulses number. The equation is

$XPls \bullet \dfrac{A}{B}$. After calculating, replace the outcome with the assumptive Xpls(take three decimal places at most). Similarly, move C mm vertically, the actual length is D mm,

then the vertical pulses number is $YPls \bullet \dfrac{C}{D}$.

● Requirement of pulses number：

The maximum frequency of output pulses from the system is 160 KHz. It is not possible to work properly according to the order if the pulse frequency is higher than 160KHz. Assume the pulse number is x, the highest speed is M_v (mm/min), then $(M_v*x/60)$ should be less than 160000.

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

While in principle the number of pulses can be set to a large value, in fact it should be set between 150 and 1200. Because the frequency is too high, some drives can't work very well, the motor sometimes will be out of synchronism. On the other hand, the performance of anti-jamming is of foreign interference is poor and the external interference is strong.

Note: The most reasonable number of pulses is between 150 and 1200. The number of pulses exceeds this range, please refer to the interpretation of driver and modify subdivision number of stepper driver and denominator of Servo driver.

Chapter 14 Shanghai FangLing F1500 Remote Controller

## 14.1 Wireless Remote Control Module Performance and Characteristic

- 433MHz free ISM frequency channel, free license on trial
- Remote controlling distance > 30m，at least not below 0.5m
- Hardware test error code, software optimizing algorithm, bi-direction communication, insure the communication stable and reliable
- Send module matches address with receive module, the address can be set manually, at most 128 supportable addresses
- Wireless remote controlling send module is supplied power by dry battery, at least working more than 6 months service time
- Receiver module is set into 8421 port mode or P2P mode，at most 16 output ports

14.2 The Layout of Remote Controller

Fig.14.1 layout of remote controller

14.3 The Output Port of Receiver
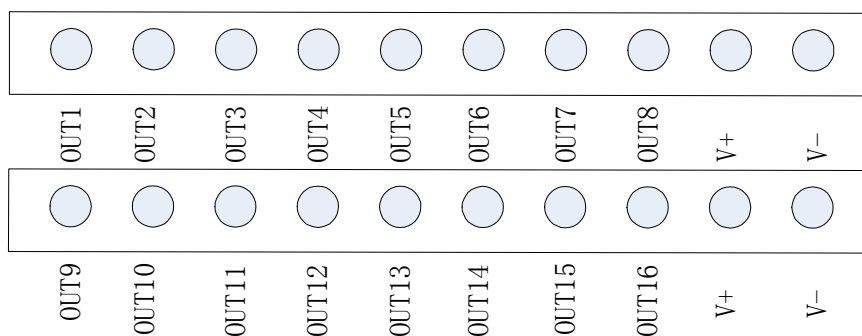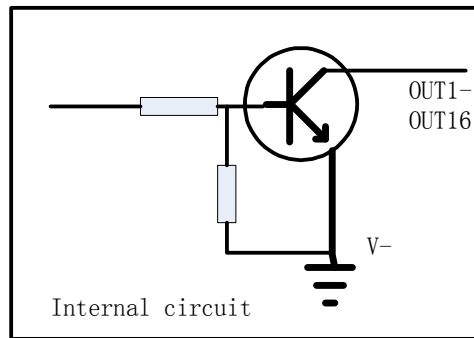
Fig.14.2 The output port of receiver

Note：Receiver will pull down the IO ports which are relative of Out1-Out8 according to code value of different button which is transmitted by sender. Specific corresponding relationships of sender and receiver reference the content of the 14.4 section.
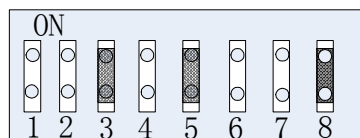
14.4 Interpretation of Jumper Switch

Fig 14.3 Jumper switch

1.   Address segment

The first seven bits of jumper switch (No.1 -7) are address codes; the status of this seven bits requires that sender and receiver must be same. If they are different, receiver cannot reply.

Note：if open the sender, there is also a 8-bit jumper switch inside. Therefore in the same time, 128 pairs of sender and receiver can simultaneously work at most.

2.   Function select segment

The first bit of jumper switch is function select segment. When it is set to short circuit, select 8421 code receive mode. When it isn't set to short circuit, select independent IO port (P2P) receive mode.

Table 14.1：8421 code receive mode (the 1st bit of jumper switch has jumper cap)

Sender Key	OUT1-OUT4 OUT9-OUT16	OUT5	OUT6	OUT7	OUT8
S+/Speed	Off	On	Off	Off	Off
S-/Speed	Off	Off	On	On	On
↑	Off	On	Off	On	Off
↓	Off	On	Off	Off	On
←	Off	Off	On	Off	Off
→	Off	On	On	On	Off
Mode	Off	On	On	On	On
T↑	Off	On	On	Off	On
T↓	Off	On	On	Off	Off
Start	Off	Off	On	On	Off
Stop	Off	On	Off	On	On
Back	Off	Off	Off	On	Off
Foward	Off	Off	Off	On	On
Ignition	Off	Off	On	Off	On
CutOxy	Off	Off	Off	Off	On

Table 14.2: Independent IO mode (P2P mode, the 8th bit doesn't have jumper cap)

Sender key	Open output port	Close output port
→	OUT1	Other output ports
←	OUT2	Other output ports
↑	OUT3	Other output ports
↓	OUT4	Other output ports
S-/Speed	OUT5	Other output ports
S+/Speed	OUT6	Other output ports
Start	OUT7	Other output ports
Stop	OUT8	Other output ports
Mode	OUT9	Other output ports
T↑	OUT10	Other output ports
T↓	OUT11	Other output ports
Foward	OUT12	Other output ports
Back	OUT13	Other output ports
Ignition	OUT14	Other output ports
CutOxy	OUT15	Other output ports

14.5 Wiring Connection Figure of F1500 and FangLing Numerical Control System
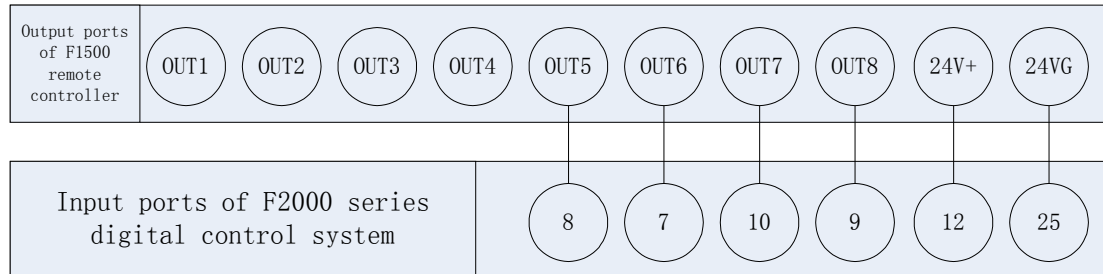

Fig 14.4 Wiring connection interpret of F2000 series numerical control system and remote controller

Note：wiring connection of F1500 remote controller and F2000 series remote controller please refer to "11.1.2 Remote controller input" section，type setting of remote controller please refer to "8.7.6 Option" section.

Appendix 1 G、M Code Rapid Consult

Serial number	order	function
1	G99	rotation、proportion、mirror image
2	G92	reference coordinate
3	G91	Relative coordinate system
4	G90	Absolute coordinate system
5	G20	English unit
6	G21	Metric unit
7	G41	Left kerf gap compensation
8	G42	Right kerf gap compensation
9	G40	Cancel kerf gap compensation
10	G00	Quickly move
11	G01	Liner cutting
12	G02	Clockwise arc cutting
13	G03	Anticlockwise arc cutting
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end
14	G04	Program delay
15	M07	Start cutting cycle
16	M08	Stop cutting cycle
17	M02	Program end

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

A2.1 Flame Cutting Timing Sequence
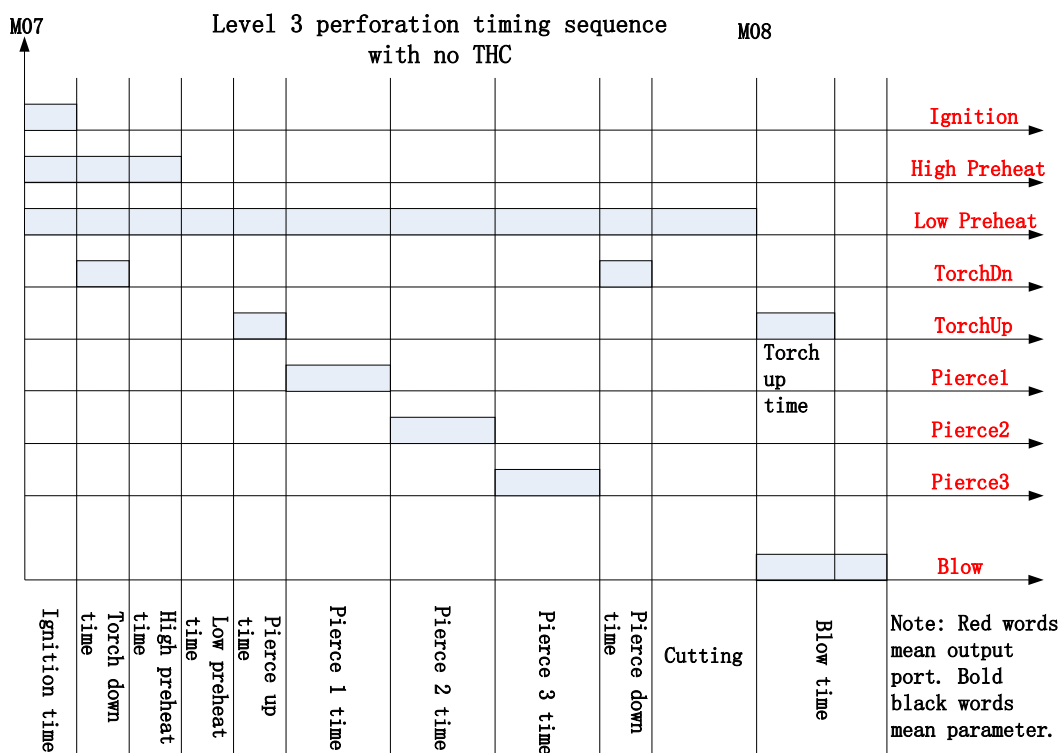
Appendix fig 2.1 Flame cutting timing sequence (Level 3 perforation with no THC)
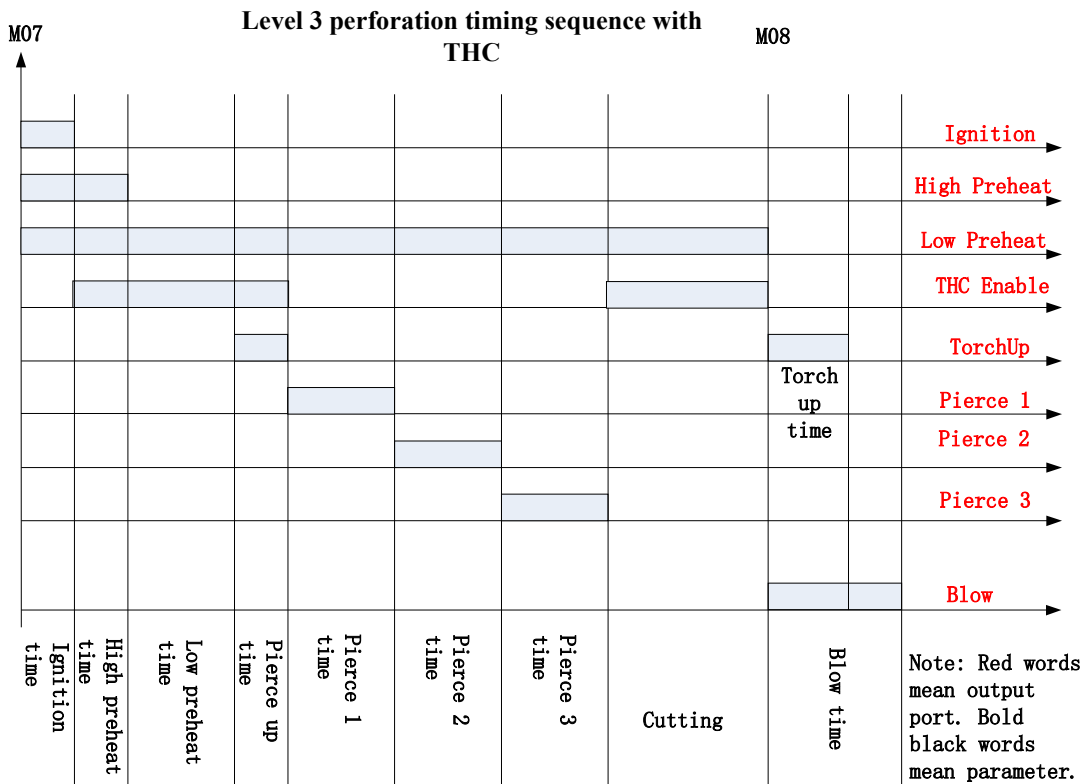
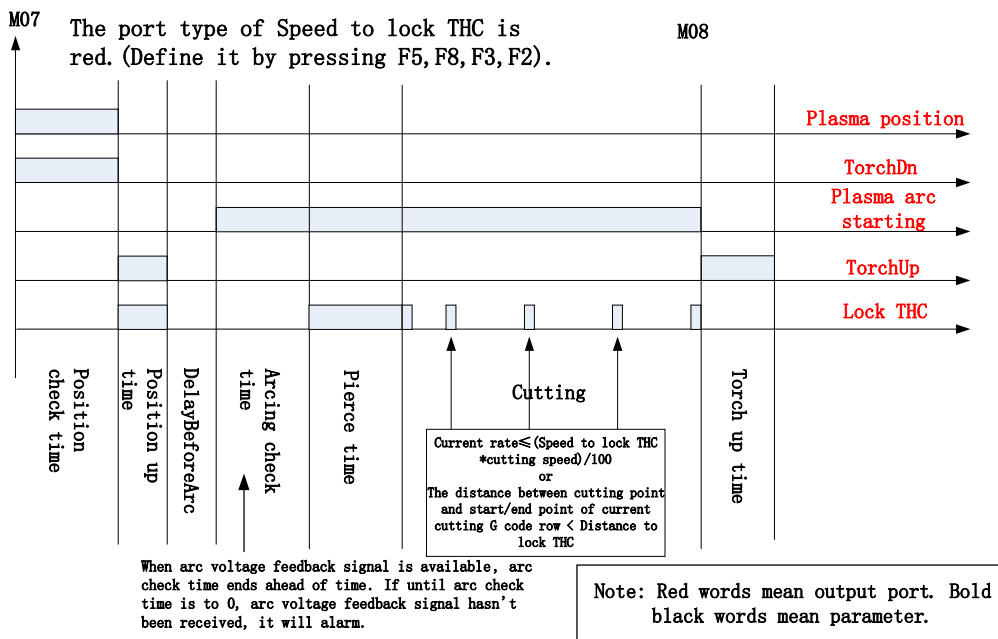Appendix fig 2.2 Flame cutting timing sequence (Level 3 perforation with THC)
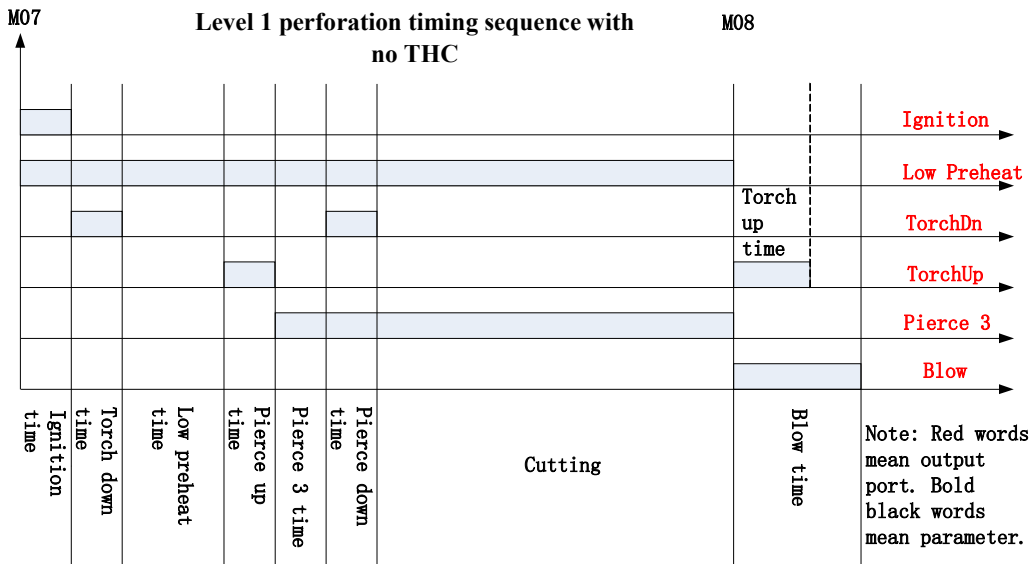
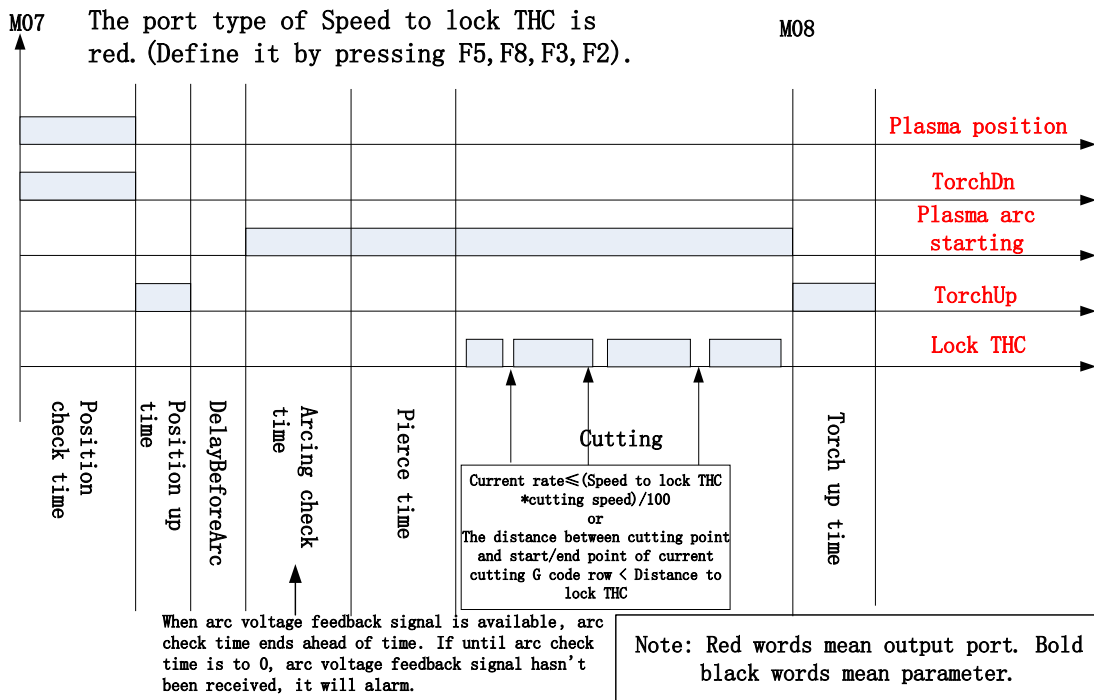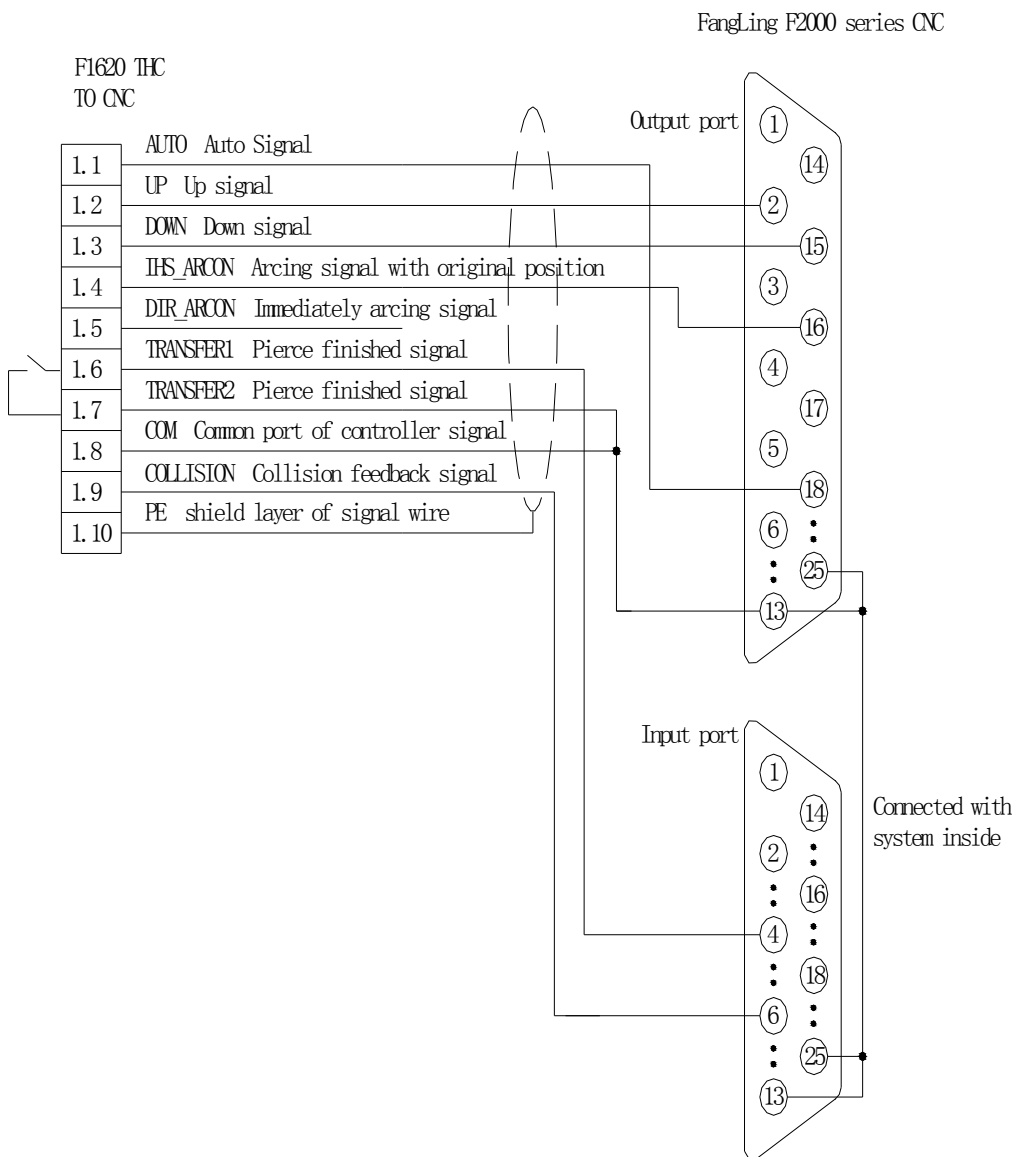Appendix fig 2.3 Flame cutting timing sequence (Level 1 perforation with no THC)
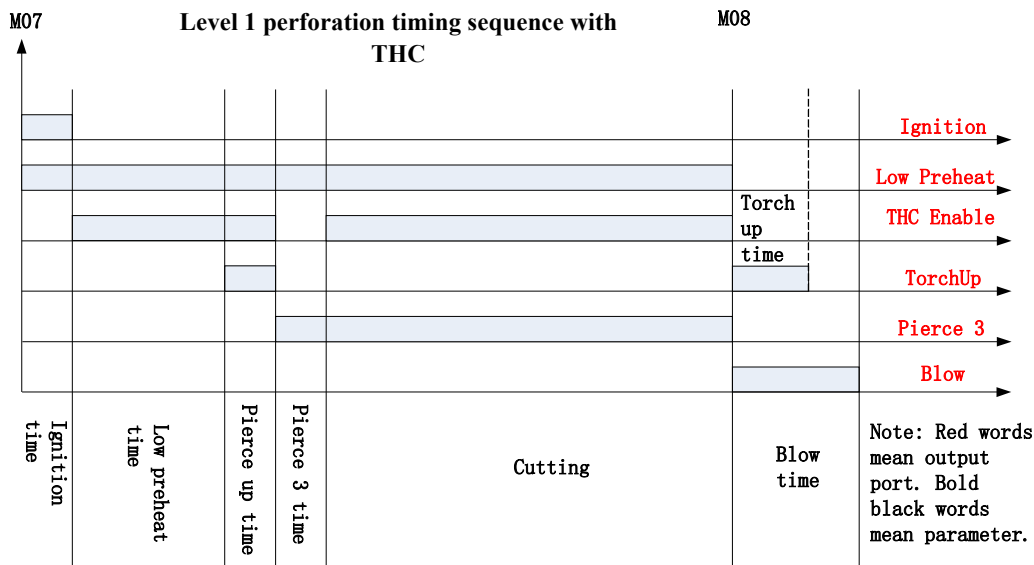
Appendix fig 2.4 Flame cutting timing sequence (Level 1 perforation with THC)

A2.2 Plasma IO Timing Sequence
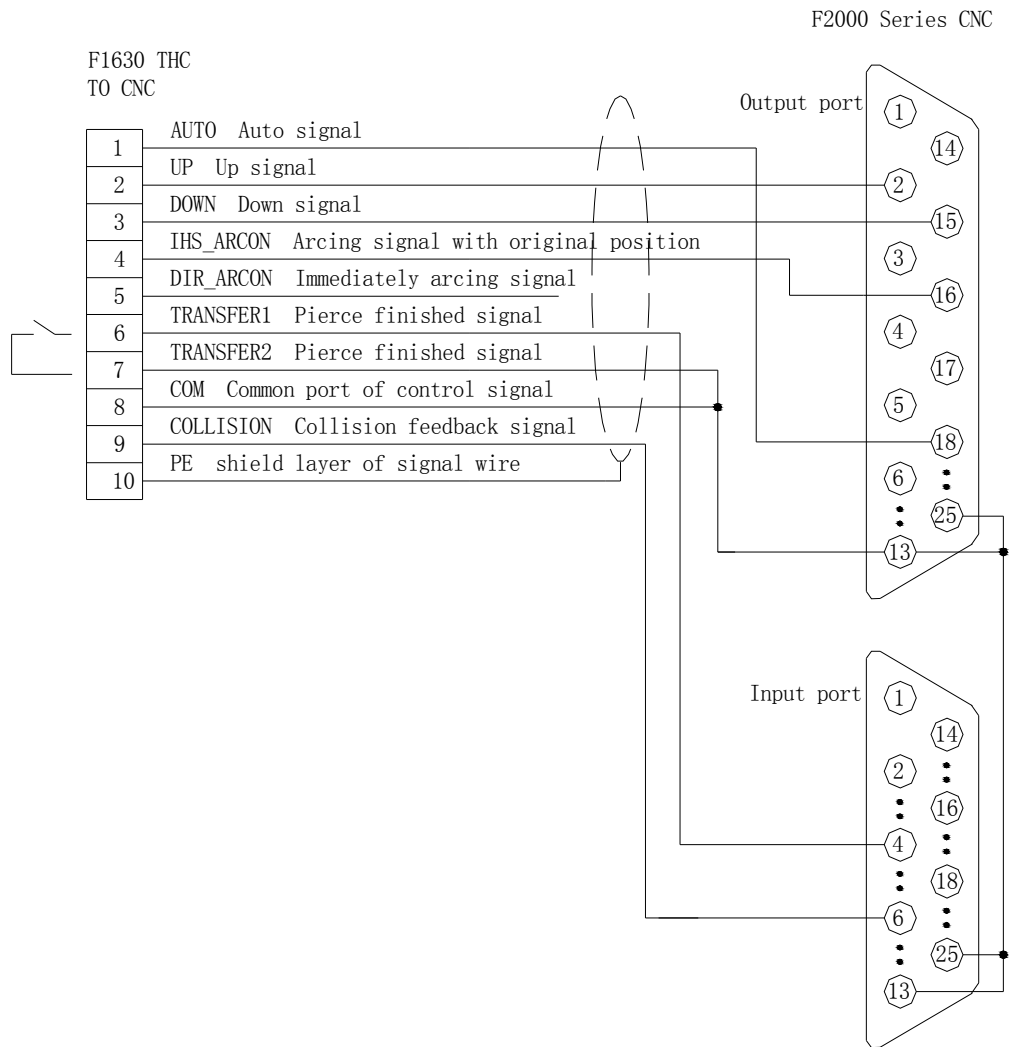

Appendix fig 2.5 Plasma IO timing sequence 1

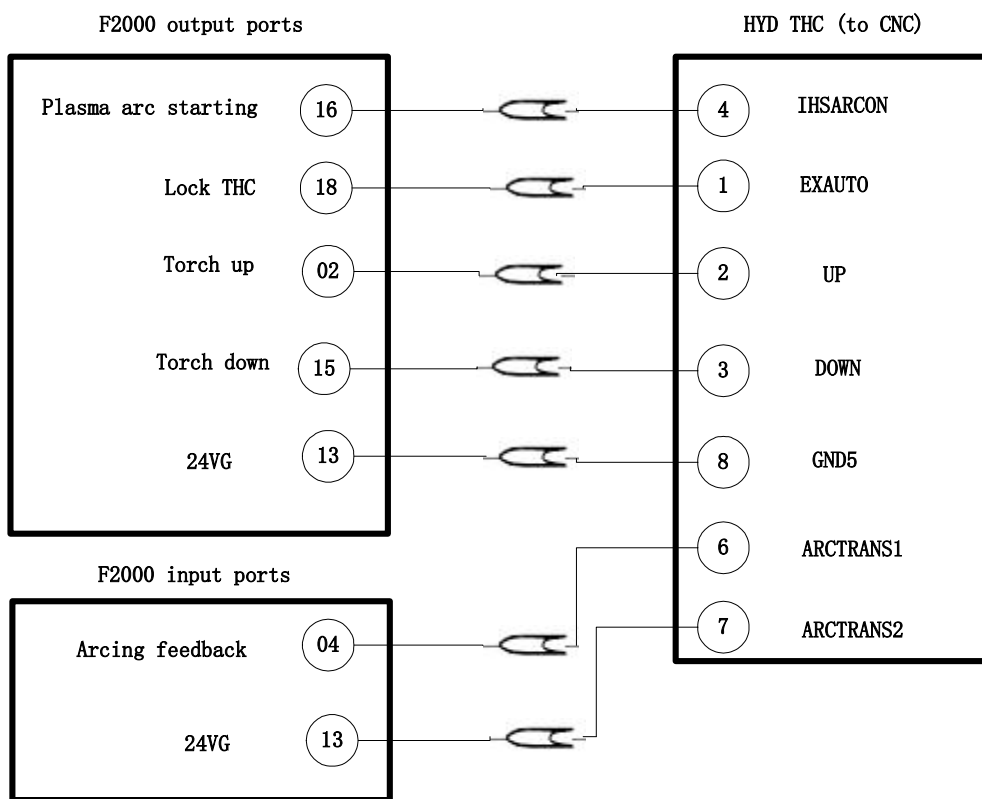Appendix fig 2.6 Plasma IO timing sequence 2

Appendix 3 Interpretation of Wiring Connection between F2000 Series and Common THC

A3.1 Connection with F1620/F1630 THC

F2000 Series CNC

F1630 THC
TO CNC

1	AUTO Auto signal
2	UP Up signal
3	DOWN Down signal
4	IHS_ARCON Arcing signal with original position
5	DIR_ARCON Immediately arcing signal
6	TRANSFER1 Pierce finished signal
7	TRANSFER2 Pierce finished signal
8	COM Common port of control signal
9	COLLISION Collision feedback signal
10	PE shield layer of signal wire

Output port

Input port

A3.2 Connection with HYD THC

F2000 output ports   HYD THC (to CNC)

Plasma arc starting	16	—	4	IHSARCON
Lock THC	18	—	1	EXAUTO
Torch up	02	—	2	UP
Torch down	15	—	3	DOWN
24VG	13	—	8	GND5
			6	ARCTRANS1
			7	ARCTRANS2

F2000 input ports

| Arcing feedback | 04 | — |
| 24VG | 13 | — |

Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100T, F2200T, F2300T (A/B), F2500T (A/B), F2600T:

F4 (Setups),　F3 (Plasma).

Input definition

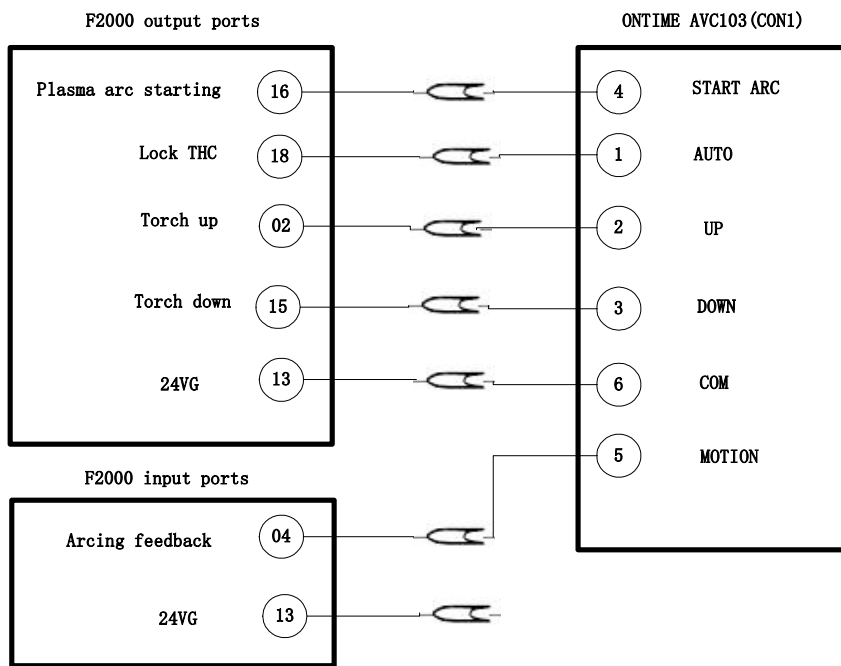|	Port	Type
Position detect	05	🟢

Output definition

	Port	Type
Lock THC	18	🔴

The method of definition:

F2100T, F2200T, F2300T (A/B), F2500 T (A/B), F2600T:

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

A3.3 Connection with SH-HC30 THC
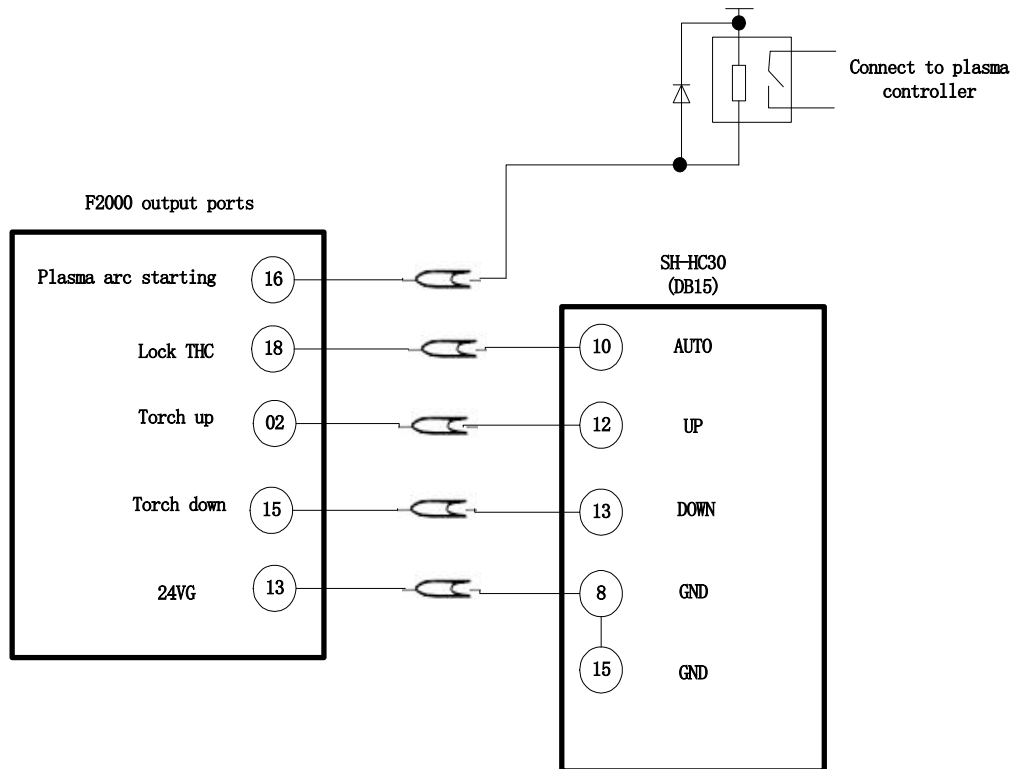
Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0-3	According to thickness of plating
Torch up time	0-3	3
Arcing Check Time:	0	0
Position check Time:	3-30	15
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	No	No

The method of setting parameter:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

F4 (Setups),   F3 (Plasma).

Input definition

	Port	Type
Position detect	05	🟢

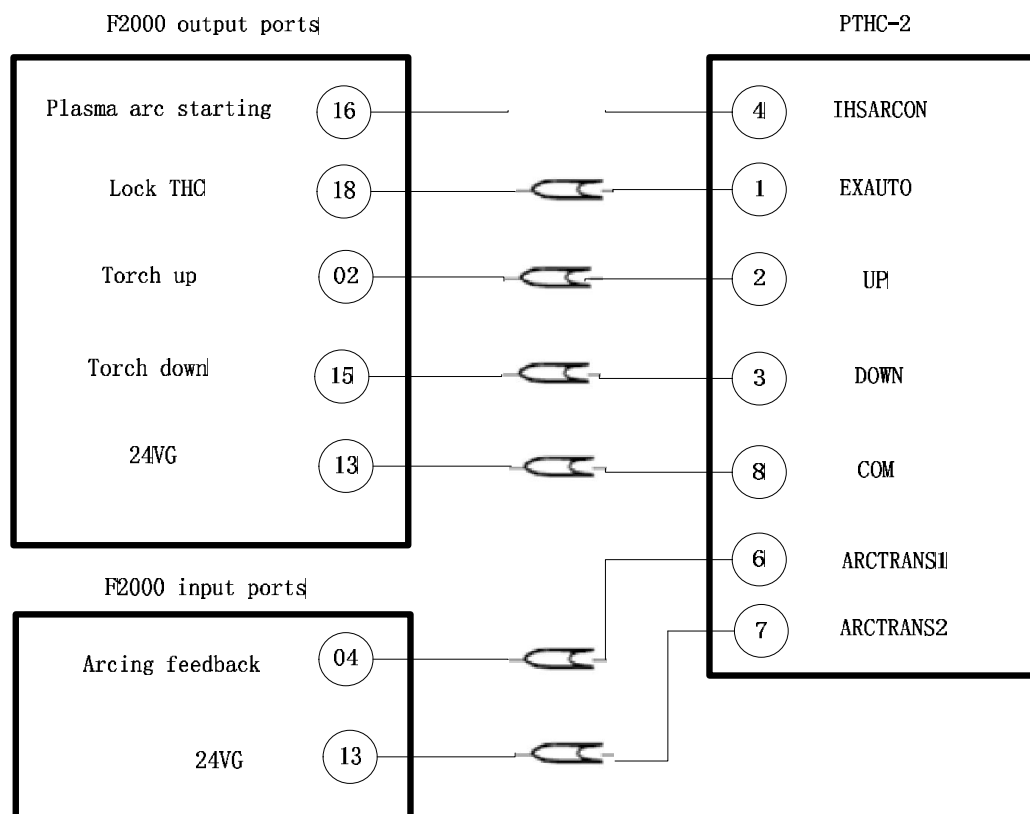Output definition

	Port	**Type**
Lock THC	18	🟢

The method of definition:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

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

A3.4 Connection with ONTIME THC

Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

F4 (Setups),　F3 (Plasma).

Input definition

	Port	Type
Position detect	05	🟢

Output definition

|	Port	Type
Lock THC	18	🔴

The method of definition:

F2100T, F2200T, F2300 T (A/B), F2500 T (A/B), F2600T:

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

A3.5 Connection with PTHC-2

Plasma parameter	Range of value	Recommended value
Delay Before Arc	0	0
Pierce time	0	0
Torch up time	0-3	3
Arcing Check Time:	5-30	30
Position check Time:	0	0
Speed to lock THC	90-100	95
Distance to lock THC	0-15	10
Lose arc delay	0-1	0.5
Watch arc enable	Yes	Yes

The method of setting parameter:

F2100B, F2200B, F2300 A/B, F2500 A/B, F2600:

F4 (Setups),   F3 (Plasma).

Input definition

	Port	Type
Position detect	05	🟢

Output definition

	Port	Type
Lock THC	18	🔴

The method of definition:

F2100B, F2200B, F2300 A/B, F2500 A/B, F2600:

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

Appendix 4 Interpretation of F2000 Full Series System Install Size
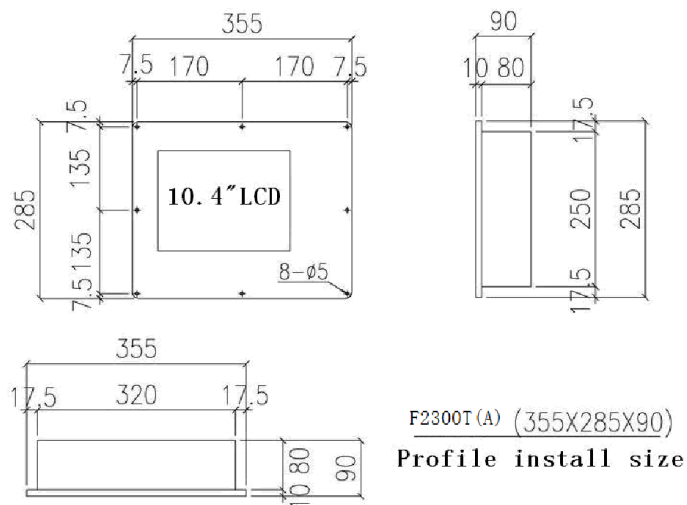
A4.1 F2100B/T Profile Install Size
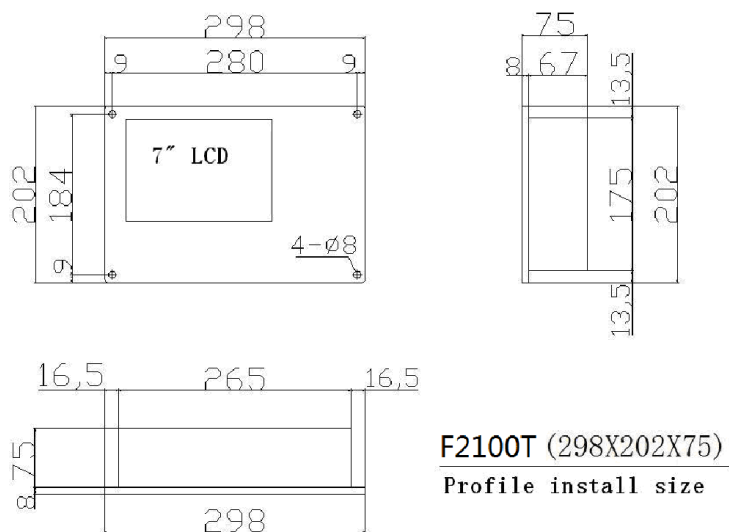
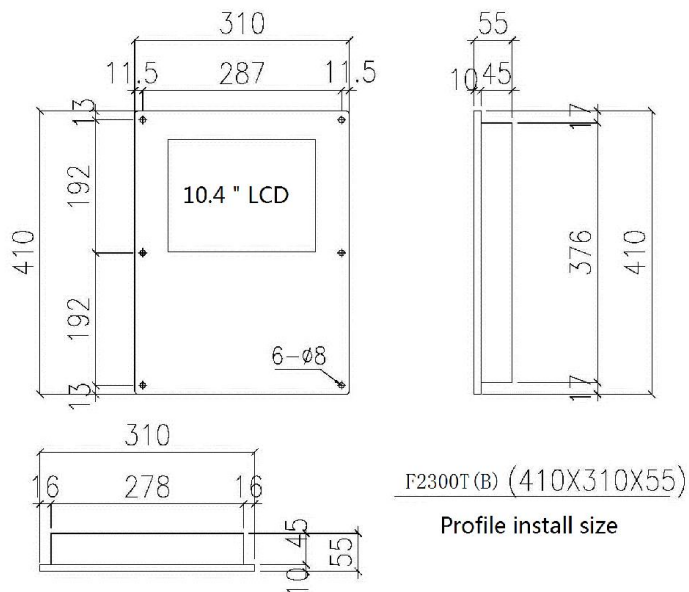Appendix fig.4.1 F2100T installation size

A4.2 F2200B/T Profile Install Size
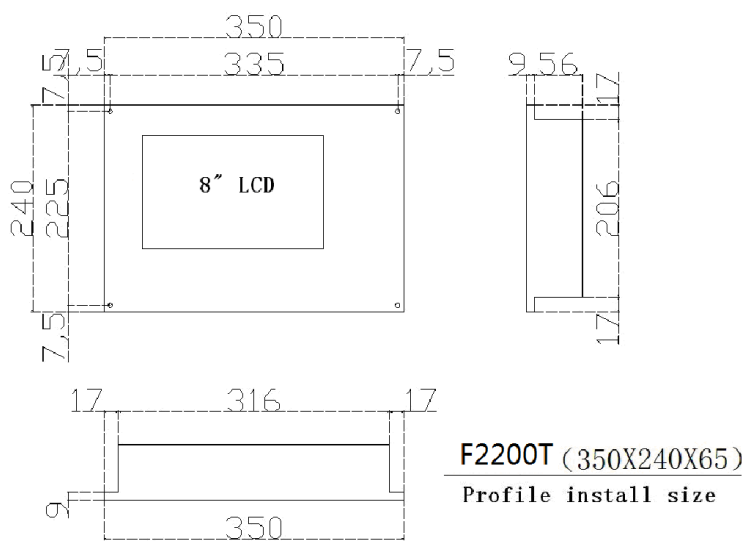
Appendix fig.4.2 F2200T installation size
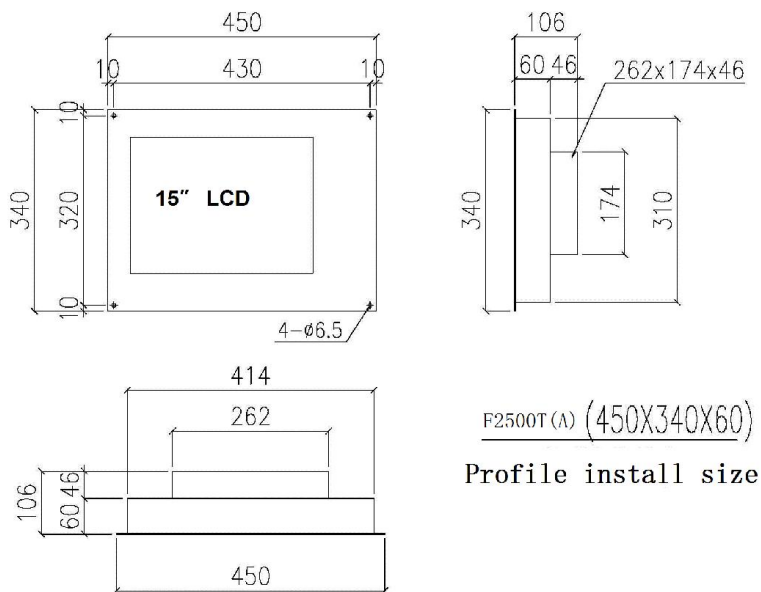
A4.3 F2300A/B/T Profile Install Size

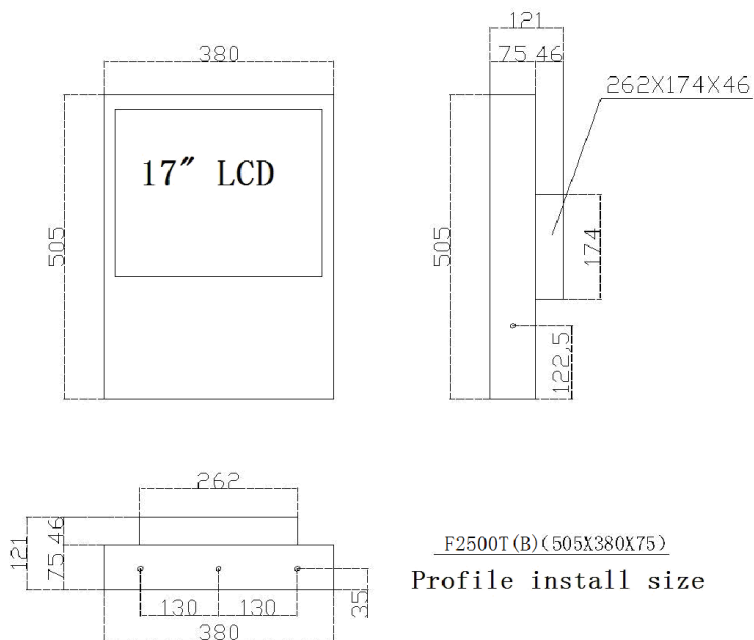Appendix fig.4.3 F2300T(A) installation size

Appendix fig.4.4 F2300T (B) installation size

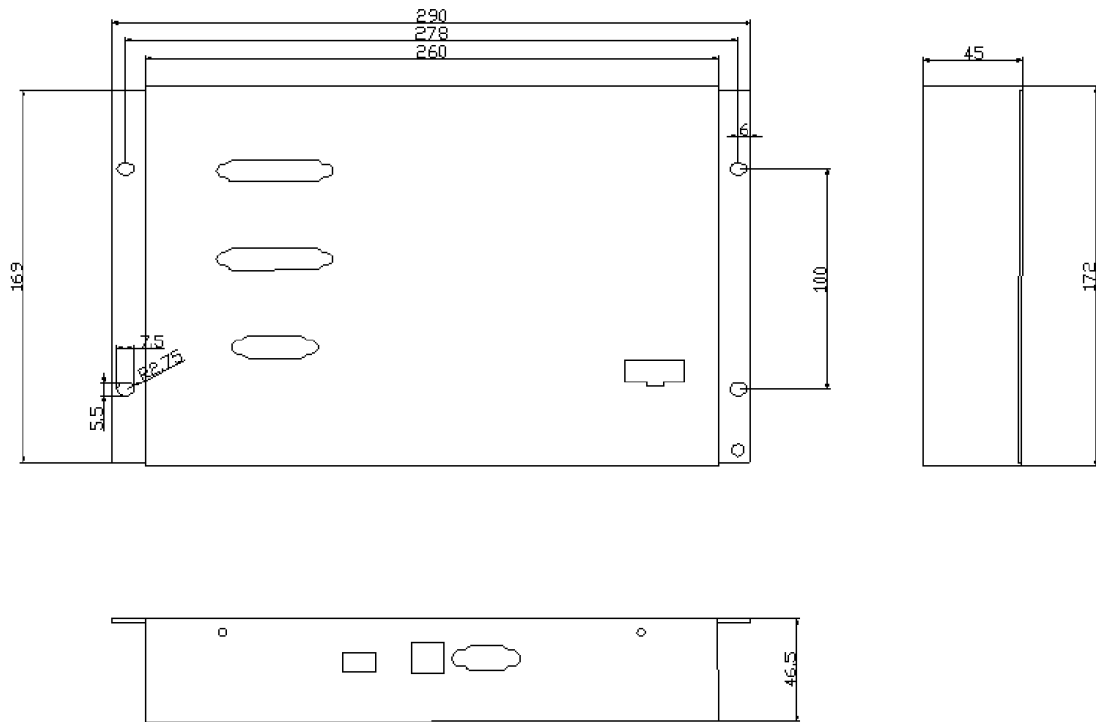## A4.4 F2500A/B/T Profile Install Size

Appendix fig.4.5 F2500T (A) installation size

Appendix fig.4.6 F2500T (B) installation size

A4.5 F2600/T Profile Install Size

Appendix fig.4.7 F2600T installation size