User's Manual for

TL-403 Laser Engraving and Cutting Control System

Content

Part 1 Overview

1.1 System Overview

Thank you very much for using laser engraving control system of our company!

This system can be used with various types of laser engraving cutting machine, meets your different requirements for processing.

- Use High-Performance 64-Bit CPU with Single-Precision Floating-Point Unit (FPU), the main frequency is up to 150MH. Setting device parameter out of PC completely. All coupler completely isolated from outside interference, the system is reliable.

- Support USB3.0 port, U disk reading and writing, support U disk system upgrade;

- Support network , PC-communication is more convenient, safe, and reliable.

- With 64MB storage, work independently form PC, which is useful for the quantities of engraving and cutting production.

- Support 5 axises motion control(X Y Z U V, XY is for laser cutting control, Z is feeding axis, U is lift axis, V is for the second laser cutting head).

- Support double laser head cutting, support leftover cutting. Each laser power is able to be control independently.

- Support feeding, lifting, rotating engraving, metal cutting, scale cutting, automatic blowing, automatic focusing, foot switch, cover protect, power-off cutting restoration, system lock, device management.

- S-shape acceleration and deceleration and adjustable velocity profile, meet the demand of smooth cutting and high speed working.

Before using, please read our manual carefully, ensure to operate our system correctly.

Please keep the manual well, and it's convenient for your future references.

Because of different configuration, some devices have not some of the functions listed in the manual, the details subject to appropriate operation functions.

1.2 Notes and Warning

- Prohibit the non-professionals to maintenance and debug the electrical system, if

not, this will reduce device's safety performance, and expand failure, even cause accident and property loss.

- Please do not piles up debris on the control box, and in the course of using, regularly remove the dust of the control box surface and filters, to keep good ventilation.

- When users have to open the cover of the control box, must cut off the power after 5minutes and under the professorial guidance, only can be allowed to touch the components in the electrical control box!

- Prohibit touching any motion parts or opening the control equipments when the machine is working, or it maybe bring about the accident and machine can't work.

- Prohibit using the electrical equipment in the damp, dust, corrosive gas, flammable gas area, or it maybe cause the electrical shock or fire!

1.3 Work Environment

- Ventilation, sanitation, and less dust

- Storage temperature: 0-50℃

- Work temperature: 5-40℃

- Work relative humidity: 30%-90%(no condensation)

1.4 Power Supply and Grounding

1.4.1 Power supply requirements

- Core power supply: DC 5V, 3A; External power supply: DC 5V, 3A

- According to different machine configurations, power consumption is between 0.1-0.2KW

1.4.2 Grounding requirements

- In order to prevent electrical equipment due to leakage, over-voltage, insulation etc causes of the electrical shock or fire, please make the electrical control reliable grounding.

Grounding resistance is less than 100 ohms; the length of wire cable is within the 20meters, the cross-sectional area of the wire cable is larger than 1.0 mm^2.

1.5 Accessory List

The Laser Engraving Control System-TL-403 contained the accessories as below:

Name	Qty	Introduction	Photo
Operation Panel	1	For user operation	
Controller	1	The Motion Control Card	
Connection cable	3	1.Panel Connection cable for connecting controller and panel. 2.USB communication cable for connecting controller and PC 3.USB communication	

		extended cable	
Crossover Ethernet Cable	2	1. Crossover Ethernet Cable 2. Network communication extended cable	

Part 2 Wiring Installation Instruction

2.1 System Wiring Diagram
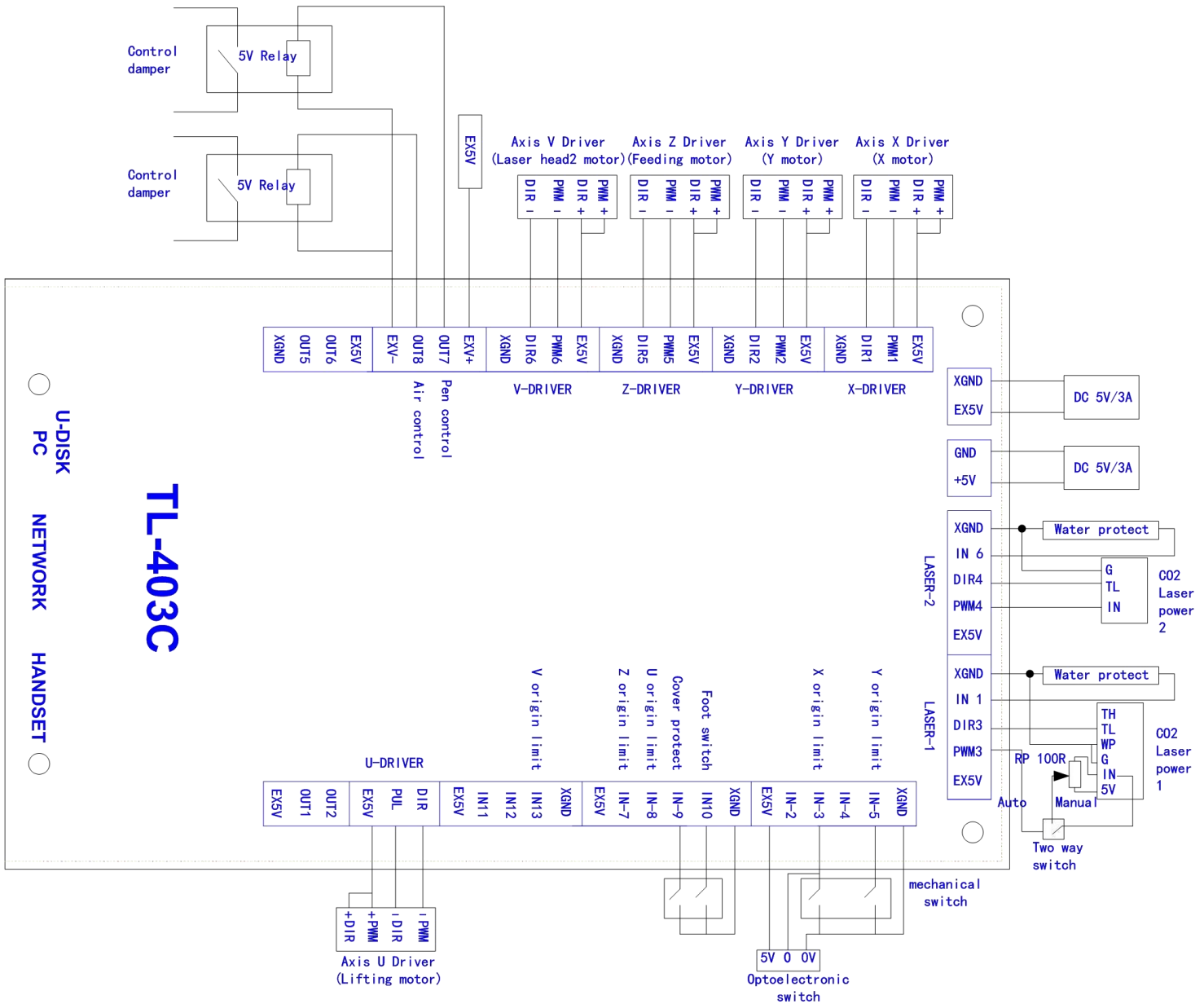
Fig. 2-1

2.2 Installation Dimension

2.2.1 Panel

The installation dimension of operation panel (the unit is MM):
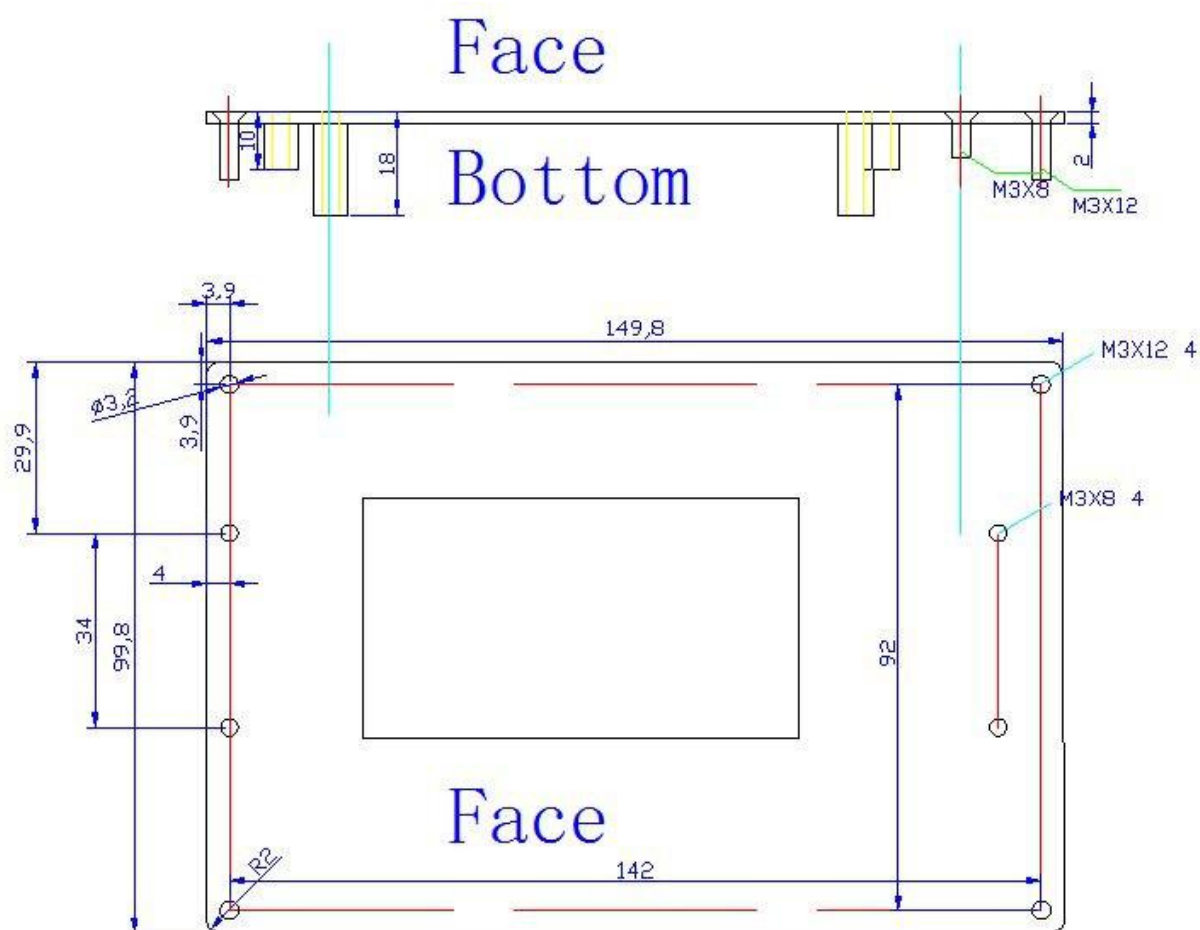
Face:

Fig. 2-2

Bottom:
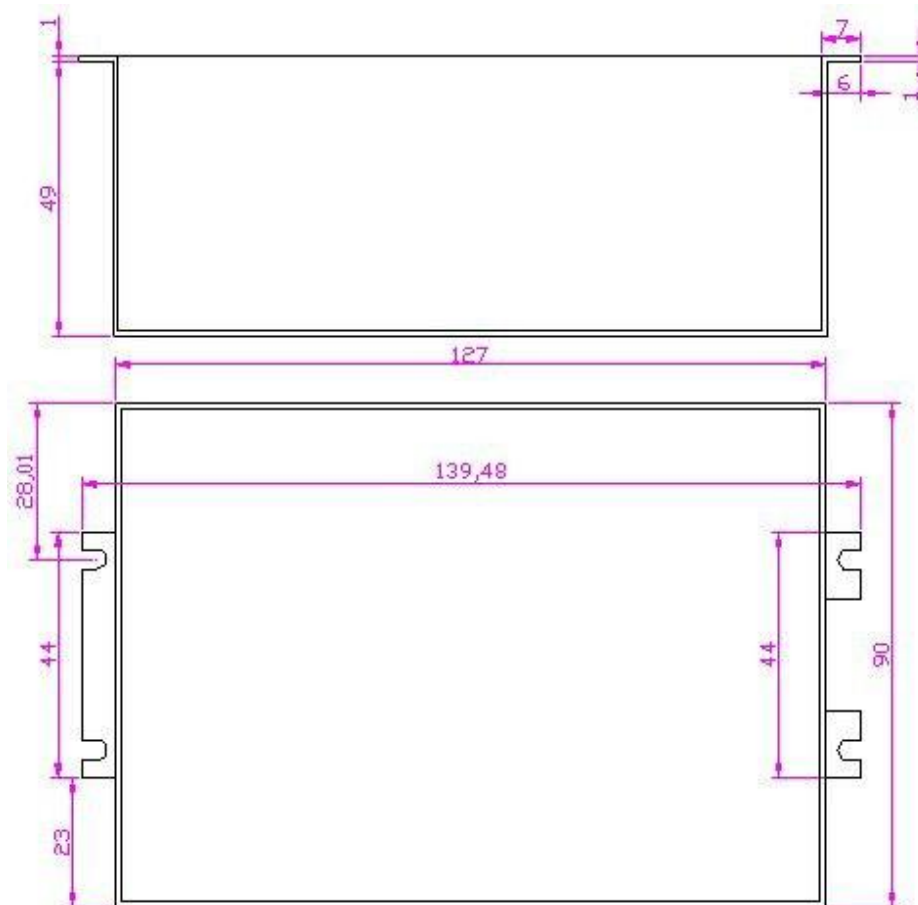
Fig. 2-3

2.2.2 Mainboard

The installation dimension of mainboard (the unit is MM):
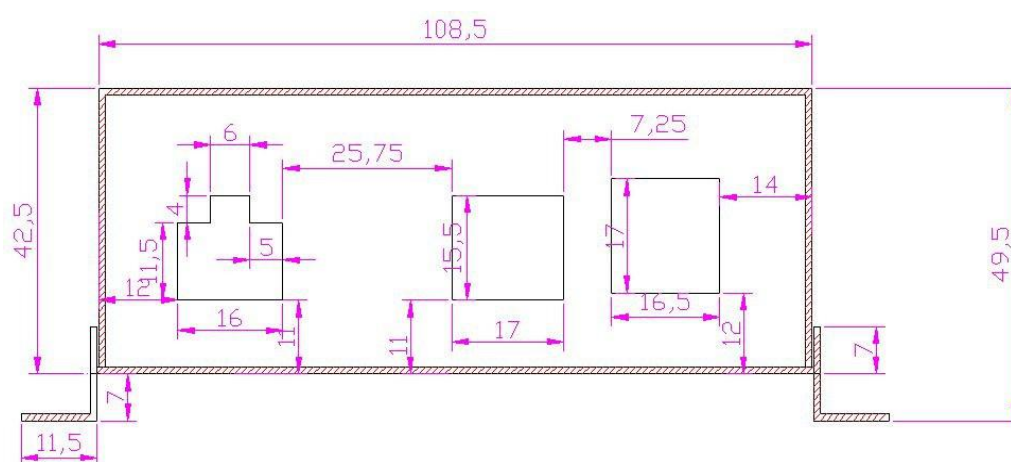
Fig.2-4
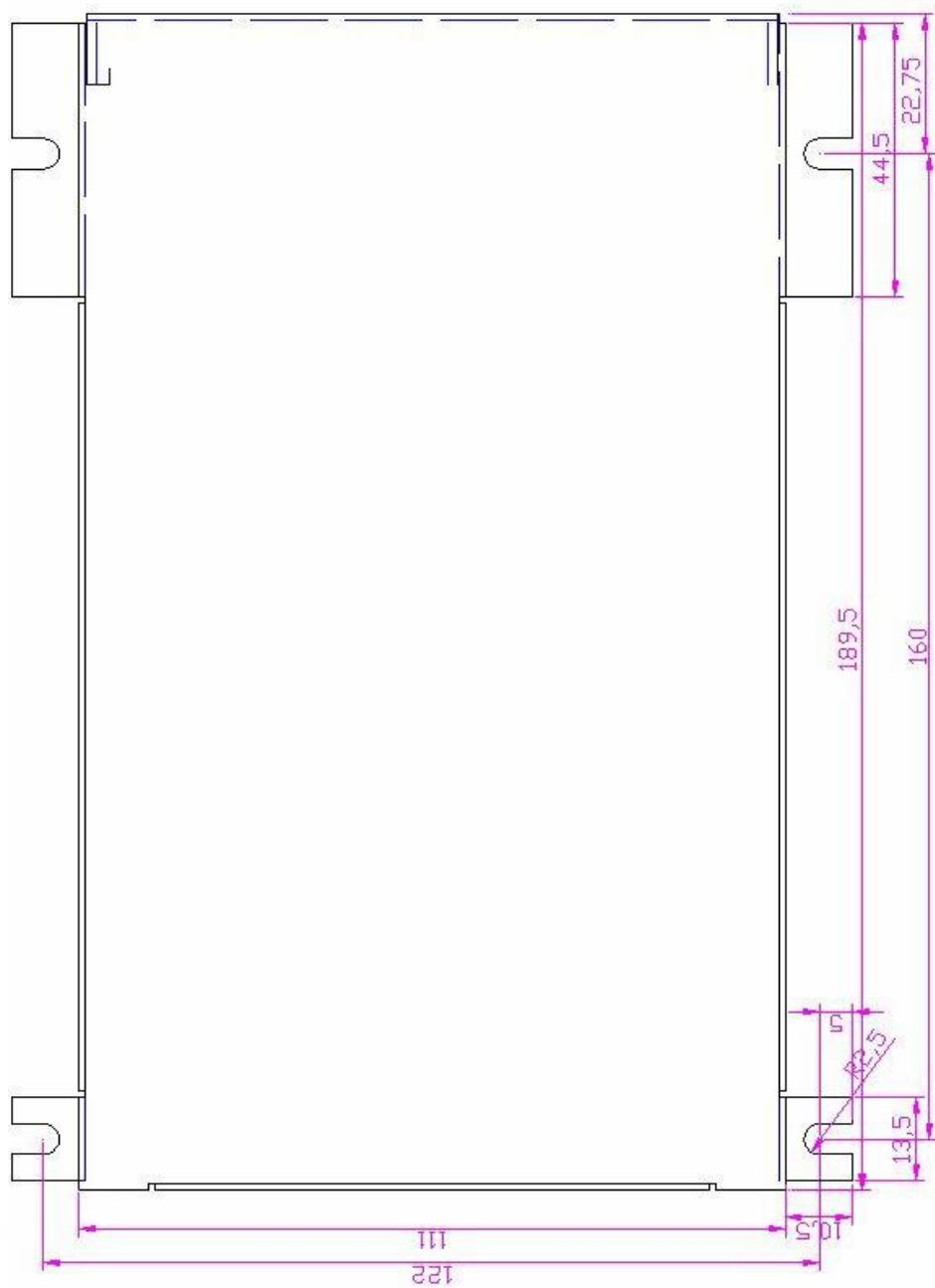
Fig.2-5

2.3 Wiring Instruction

2.3.1 Interface Broad
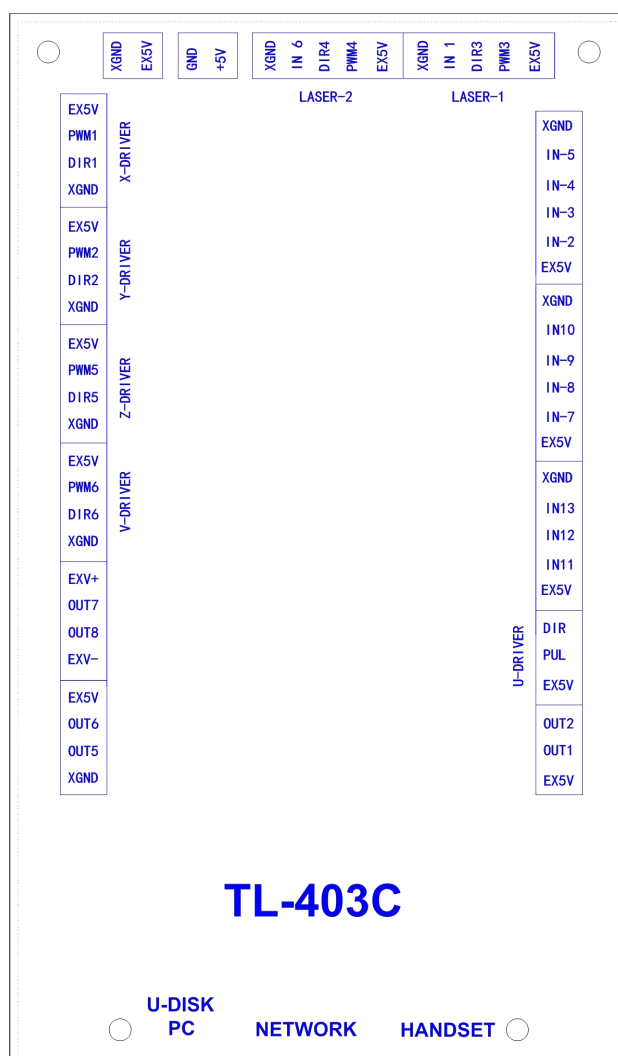
Fig. 2-6

2.3.2 Wiring Diagram

2.3.2.1 Motor Wiring

The following is X axis motor wiring, other axis are similar.

1. Step Motor Wiring

J20		X Driver
GND		PUL+
DIR1		PUL-
PWM1		DIR+
+5V		DIR-
		ENA+
		ENA-

36V-		GND
		U
To		V
Motor		W
36V+		Vdc
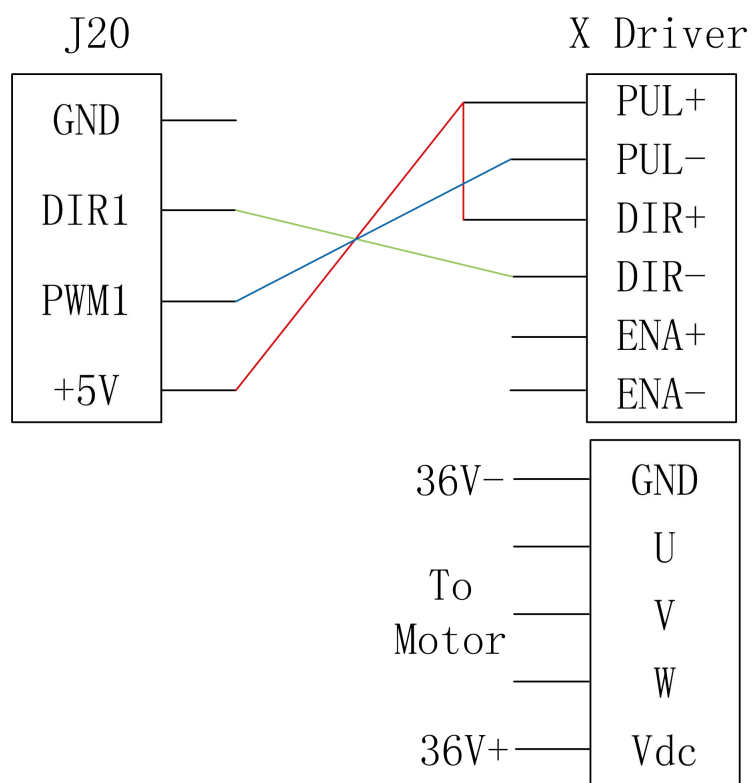
Fig. 2-7

2. Panasonic Servo Wiring

J20		Panasonic servo	
GND		3	PULS1
DIR1		4	PULS2
PWM1		5	SIGN1
+5V		6	SIGN2

24V-	41	COM-
		U
To		V
Motor		W
24V+	7	COM+
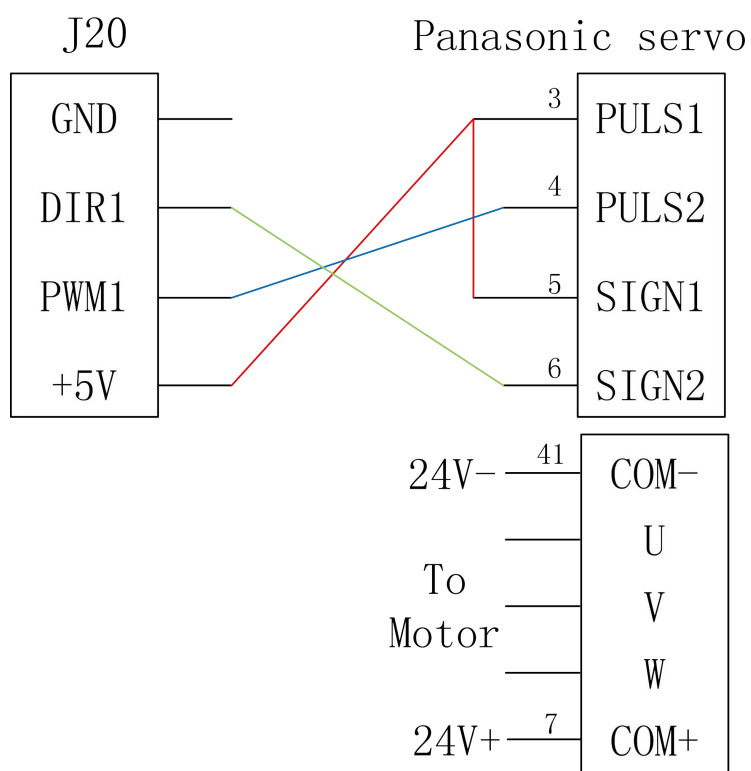
Fig. 2-8

2.3.2.2 Laser Power Supply Wiring

1. CO2 Laser Power Supply Wiring
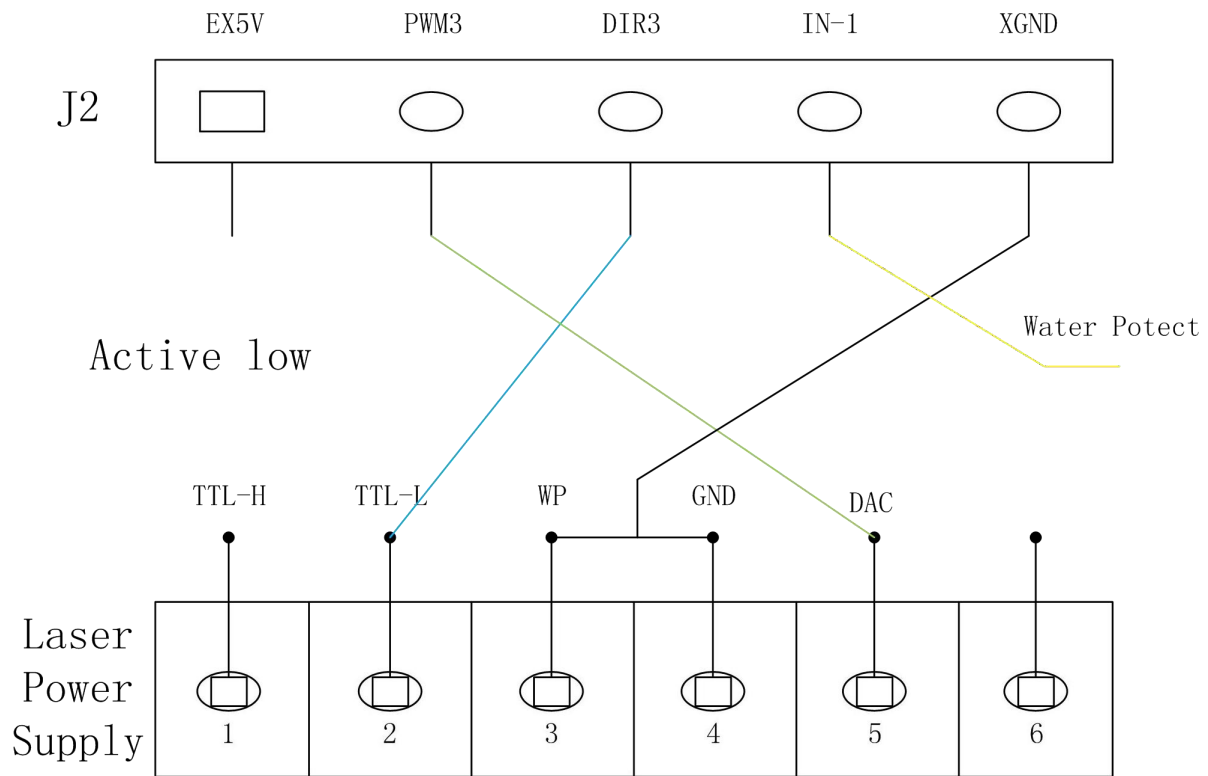
Fig. 2-9

2. RF Laser Wiring
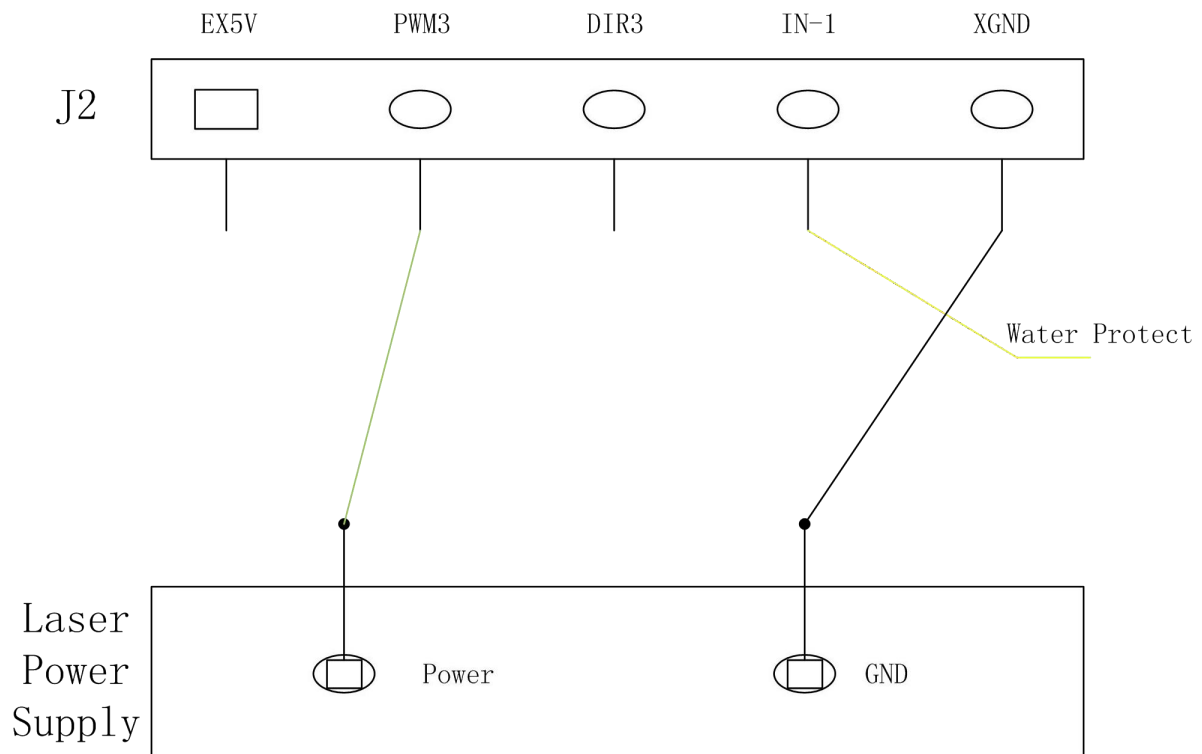
Fig. 2-10

The wiring of laser 2 is similar.

Note：When "RF1 or RF2" is selected, please set the PWM Frequency according to the data sheet of the laser. Generally, PWM Frequency is 5000Hz. And set the Laser Max parameter not larger than 95%, especially not to set as 100%, otherwise it works improperly.

2.3.2.3 Inflatable Signal Wiring
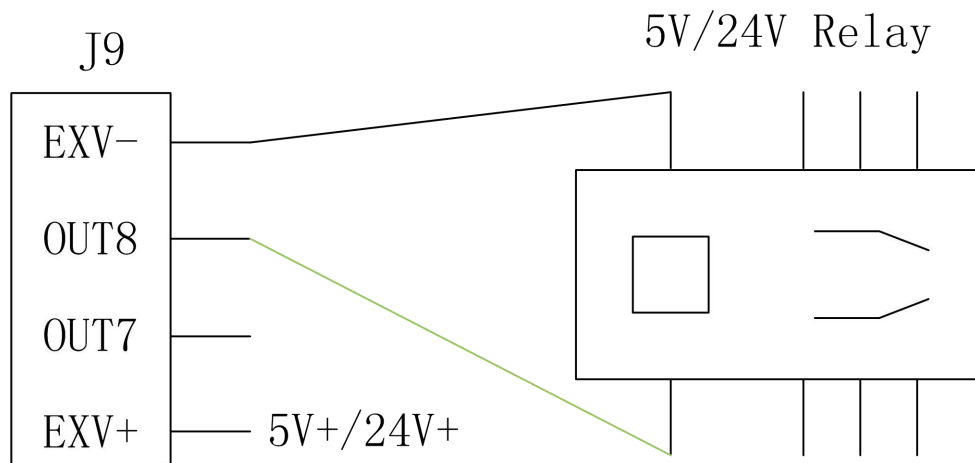
Fig. 2-11

2.3.2.4 Pen UP/Down Signal Wiring
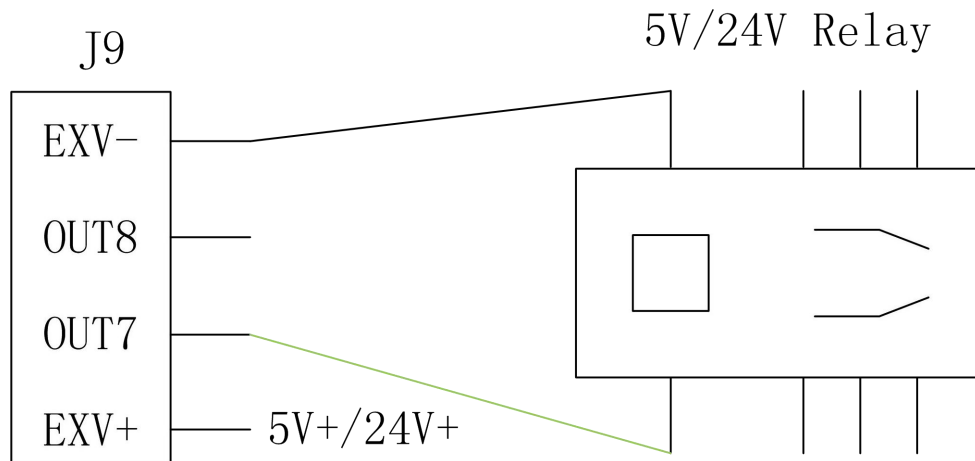
Fig. 2-12

● **2.3.2.5** Pen UP/Down Signal Wiring

J3   Photoelectric limit switch

XGND	0V
IN-5	
IN-4	
IN-3	OUT
IN-2	
EX5V	5V

X Origin limit switch
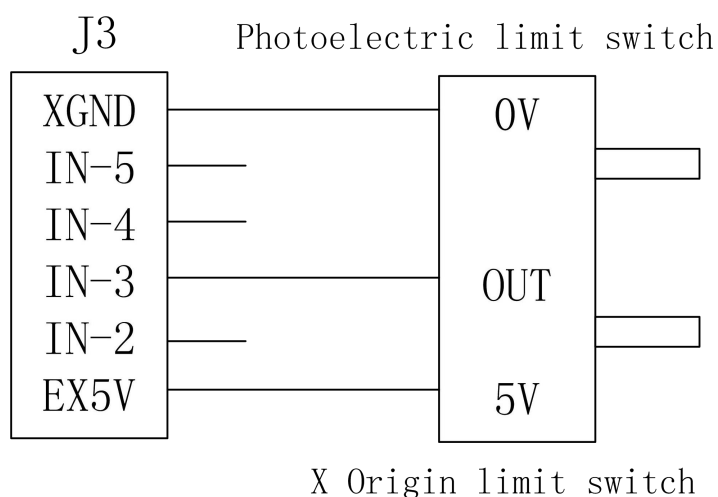
Fig. 2-13

Other limit switch wirings are similar.

2.4 Interface Broad Signal Instruction

2.4.1 Power Signal

- The system is dual 5V power supply

- The system internal 5V power interface J24 (switching power interface)

Pin	Definition
1	+5V Internal 5V power source positive (input)
2	GND Internal 5V power source grounding (input)

- The system external power interface J23 (switching power interface)

Pin	Definition
1	EX5V External 5V power source positive (output)
2	XGND External 5V power source grounding (output)

2.4.2 U-DISK Port

Label U-DISK, can directly insert the U disk to read and write.

2.4.3 PC Connection Port

Label PC connection port, can connect PC to read and write with USB.

2.4.4 NETWORK Port

Label NETWORK, can connect PC to read and write by network.

2.4.5 Output

The driver interface

● X axis interface J20

Pin	Definition	
1	EX5V	External 5V power source positive (output) PUL+, DIR+
2	PWM1	Step pulse (output) PUL-
3	DIR1	Direction signal (output) DIR-
4	GND	External 5V power source grounding (output)

● Y axis interface J18

Pin	Definition	
1	EX5V	External 5V power source positive (output) PUL+, DIR+
2	PWM2	Step pulse (output) PUL-
3	DIR2	Direction signal (output) DIR-
4	GND	External 5V power source grounding (output)

● Z axis interface J21

Pin	Definition	
1	EX5V	External 5V power source positive (output) PUL+, DIR+

2	PWM5	Step pulse (output) PUL-
3	DIR5	Direction signal (output) DIR-
4	GND	External 5V power source grounding (output)

- V axis interface J22

Pin	Definition	
1	EX5V	External 5V power source positive (output) PUL+, DIR+
2	PWM6	Step pulse (output) PUL-
3	DIR6	Direction signal (output) DIR-
4	GND	External 5V power source grounding (output)

- U axis interface J11

Pin	Definition	
1	EX5V	External 5V power source positive (output) PUL+, DIR+
2	OUT3	Step pulse (output) PUL -
3	OUT4	Direction signal (output) DIR--

The general output interface

- The general IO output interface J17

Pin	Definition	
1	EX5V	External 5V power source positive (output)
2	OUT1	Work finish output signal
3	OUT2	Reserved

- The general IO output interface J10 (expansion port)

Pin	Definition	
1	EX5V	External 5V power source positive (output)
2	OUT5	Automatic following signal (metal cutting)
3	OUT6	The rising signal (metal cutting)
4	XGND	External 5V power source grounding (output)

The relay control signal interface J9

Pin	Definition	
1	EXV+	Connect to pin 1 of J10 or external 5V/24V power source
2	OUT7	In the brush mode, lifting signal, relay output signal pin 1
3	OUT8	Blow air signal, relay output signal pin 1
4	EXV-	Connect relay output signal pin 2

The input voltage of relay has many kinds, such as 5V, 12V, 24V, but the 5V is the best.

2.4.6 Laser Power Interface

- The interface of laser power 1 – J2

Pin	Definition	
1	EX5V	External 5V power source positive (output)
2	PWM3	Be used to control the laser When the laser is RF laser, used to control the power intensity and light of the laser. When the laser is domestic glass tube, used to control the electric current.
3	DIR3	Laser enable control (DIR3 jumper to H, the signal is high and effective, to L, the signal is low and effective.) When the laser is RF laser, used to control the enable function of laser. When the laser is domestic glass tube, used to control laser On/Off.
4	IN-1	Laser status, the corresponding instruction is LED D1 When the laser is RF laser, used to the state input of laser. When the laser is domestic glass tube, used to the state input of water conservation (active low).
5	XGND	External 5V power source grounding(output)

● The interface of laser power 2 – J5

Pin	Definition
1	EX 5V External 5V power source positive (output)
2	PWM4 Be used to control the laser When the laser is RF laser, used to control the power intensity of the laser. And Put the Jumper of s2/s4 to far away to battery. When the laser is domestic glass tube, used to control the electric current.
3	DIR4 Laser enable control (DIR3 jumper to H, the signal is high and effective, to L, the signal is low and effective.) When the laser is domestic glass tube, used to control laser On/Off.
4	IN-6 Laser status, the corresponding instruction is LED D6 When the laser is RF laser, used to the state input of laser. When the laser is domestic glass tube, used to the state input of water conservation (active low).
5	XGND External 5V power source grounding(output)

2.4.7 Input

The limit interface

● X, Y axis limit interface J3

Pin	Definition
1	EX 5V External 5V power source positive (output)
2	IN-2 X upper limit, axis movement to the max coordinate limit sensor input
3	IN-3 X origin limit, axis movement to the minimum coordinate(0)limit sensor input
4	IN-4 Y upper limit, axis movement to the max coordinate limit sensor input

Pin	Definition	
5	IN-5	Y origin limit, axis movement to the minimum coordinate(0)limit sensor input
6	XGND	External 5V power source grounding (output)

- Z, U axis limit interface J7

Pin	Definition	
1	EX 5V	External 5V power source positive (output)
2	IN-7	Z origin limit, axis movement to the minimum coordinate(0)limit sensor input
3	IN-8	U origin limit, axis movement to the minimum coordinate(0)limit sensor input
4	IN-9	Opening protection signal input
5	IN-10	Foot switch signal input
6	XGND	External 5V power source grounding (output)

The general input interface

- Input interface J4

Pin	Definition	
1	EX 5V	External 5V power source positive (output))
2	IN-11	U axis upper limit switch input
3	IN-12	U axis lower limit switch input
4	IN-13	V origin limit, axis movement to the minimum coordinate(0)limit sensor input
5	XGND	External 5V power source grounding (output)

- When using the single laser control, the water protection signal of another laser must be shorted with XGND, otherwise, the machine don't work.

The connection ways of switch input signal:

- When using approaching switch, the corresponding parameters of upper PC must be set as "Negative" by NPN; the corresponding parameters of upper PC must be set as "Positive" by PNP.

- When using straight or magnetic induction switch, the corresponding parameters

of upper PC must be set as "Negative" while receiving signal + XGND ； the corresponding parameters of upper PC must be set as "Positive" while receiving signal + EX5V.
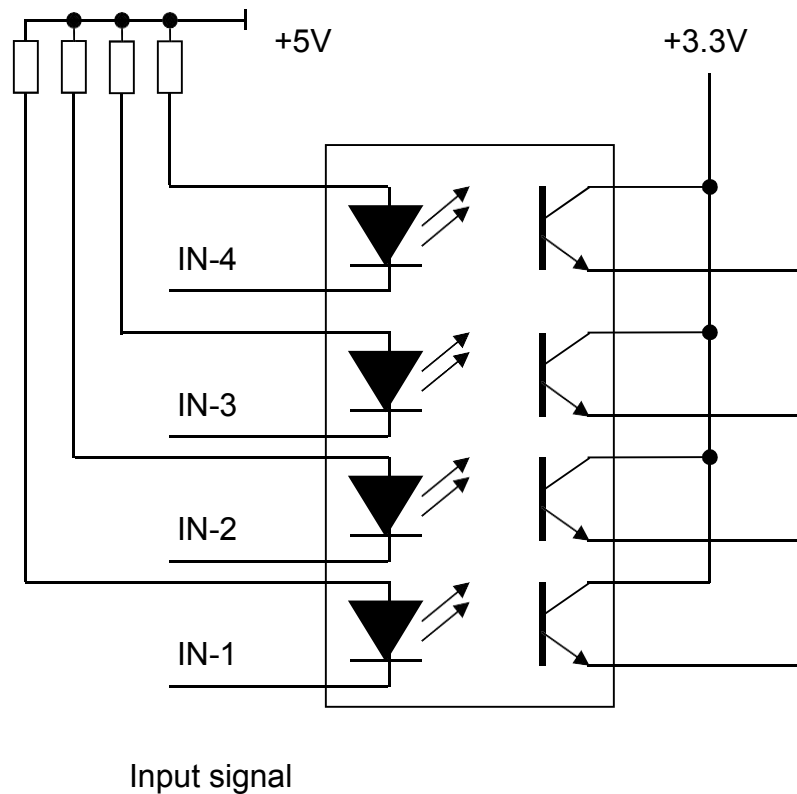
2.4.8 Input Signal Diagram

Input signal

Fig 2-14

Part 3The Operation Panel

3.1 The Panel Operation and Buttons Function Introduction

3.1.1 The Panel

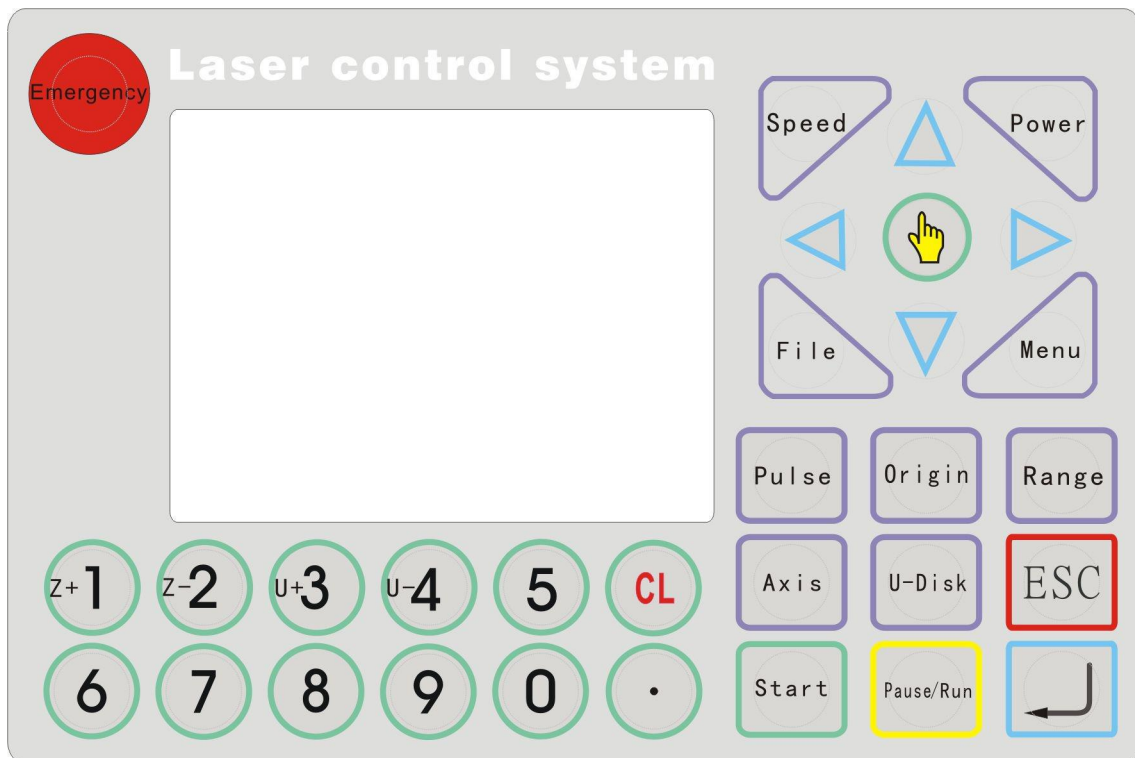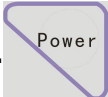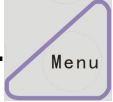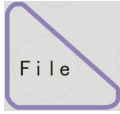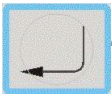Fig. 4-1

3.1.2 Buttons Function Introduction

1. "Emergency Stop" key: no matter what state the machine, click the key, it'll be into reset state, then return the origin point.

2. "Speed" Key: Set the speed.

3. "Power Light Intensity" Key: Set the laser powers.

4. Menu "Menu" Key: Press the key into the main menu interface.

5. File "File" Key: Into the memory file selection interface.

6. U-Disk "U Disk" Key: Into the U disk file selection interface.

7. Range "Range (frame)"Key: The range previewed interface.

8. Pulse "Pulse" Key: Use to test, touch a time, light a time, used to test the optical

path.

9. Origin "Origin" Key: Can set the start point from which the machine runs. The "Origin" can be freely chosen on the Machine setting parameters. If choose the "Mechanical Origin", after the machine reset, it'll return the origin, the coordinate is "0, 0". If choose the "Regression Point", after resetting, it'll return the current coordinate that machine operated last time.

10. Axis "Single Axis" key: into the single axis movement interface.

11、 ↵ "Enter" Key.

12. ESC "ESC" Key.

13. Start "Start" Key.

14. Pause/Run "Pause/Run" Key: press the key to pause at the working state, again press, it'll go to running. On the Pause state, after moving the X or Y axis, touch a

time, it'll be automatically return the origin to continue working. On the Stop state, press the key, the laser head will automatically return the regression point.

15. **0** — **9** Number Keys, change the data the selected area, also can directly press the key to choose the current menu.

16. **·** Decimal Key.

17. **CL** Delete key.

18. **z+1** **z-2** Z axis moving key, in the Processing and Event into interface to move the Z axis.

19. **u+3** **u-4** U axis moving key, in the Processing and Event into interface to move the U axis

20. △ ▽ ◁ ▷ Direction key, used to move the X, Y axis, in the other interfaces, used to move the curse to choose menu.

21. Choose key, change the axis speed in the standby interface, in the other interface, used to change the parameters besides the numbers.

3.2 The Main Interface Introduction

3.2.1 Power Interface
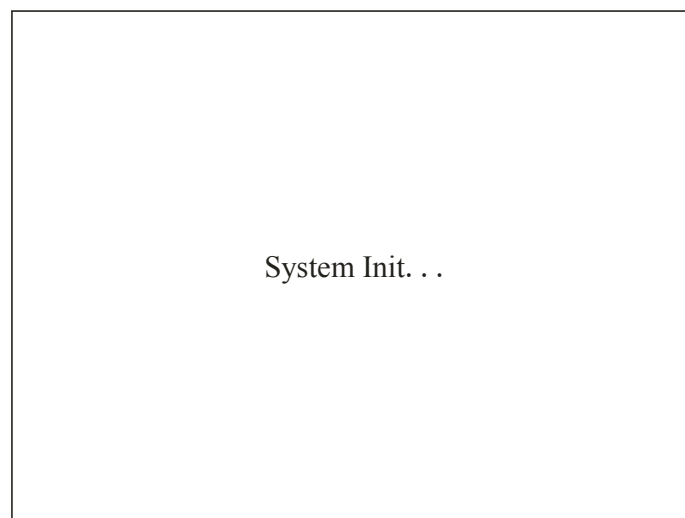
System Init. . .

Fig.5-2

The system is initializing, please wait…

3.2.2 Standby Interface

After initialization, it'll into the standby interface, show as:

File

12345678 . OUT   Network Disconnect 2014- 03- 10 10: 58

Time

File working

The current

status

Idle. . .   00: 00: 00

Complete: 1
Power1:   5
            30
Power2:   5
            30
Speed: 200
Valid: 1V: 2X
KeySpeed: Middle
PX: 0. 000
PY: 0. 000

The number of completed file

The default power light

The default working speed
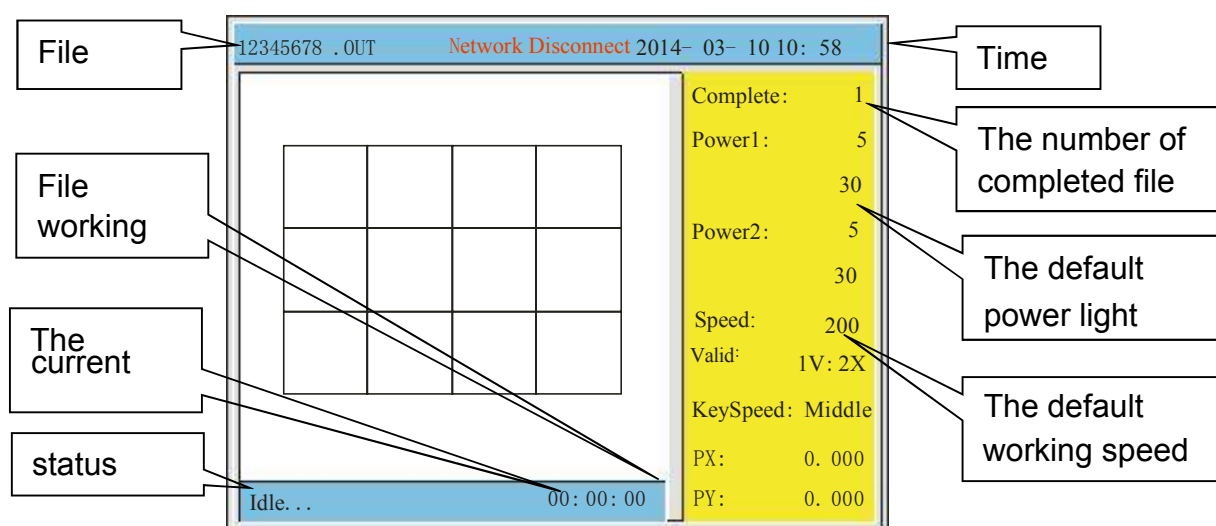
Fig. 5-3

The top of the interface shows the file name, network status, the date and time. The white area shows the preview of the selected file. And the yellow area shows the
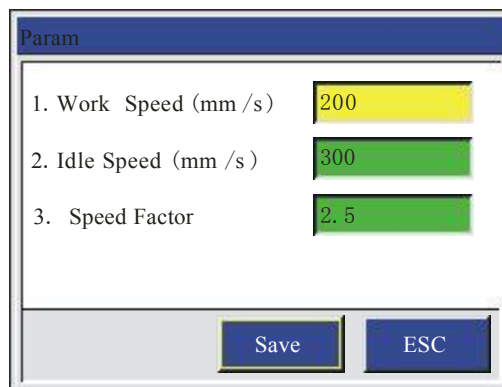
complete times, default power ,speed of the machine., the water protect status ,the speed of key moving, and the position of axis x and axis y. And at the bottom left of the interface, it show the machine status and the last working time.

The parameters are described below:

- **Network status:** If connect the network, it'll show the IP address196.168.0.100. Otherwise, it shows Network disconnect.

- **Complete:** The complete times of the selected file.

- **Power:** Power1 is default value of the laser 1 saved in the machine. The upper number is the min power, the lower value is max power. Power2 is default value of the laser 2 saved in the machine. When you click the default check box in CorelDRAW of CAD Output software in Parameters Setting page, these powers are the file work power.

- **Speed:** Speed is default value of the speed saved in the machine. When you click the default check box in CorelDRAW of CAD Output software in Parameters Setting page, this speed is the file work speed.

- **Valid:** The water protection status. In the figure, the water protection is 1X: 2X, 1X means water protection 1 not connected, 2X means water protection 2 not connected. If connect, it'll show 1V:2V.

- **Key Speed:** Manually move axis speed, can press the "Select" key to change the speed, there are "fast", "middle", "slow".

- **PX, PY:** The coordinate in the current place.

3.2.3 Speed Setting Interface

After initialization, press the "Speed" key, show as:

Fig. 5-4

This shows the speed setting is effective when the speed of working file set as defaulted.

- **Work Speed:** The system default work speed (when laser is on). It is valid when the default check box is enabled in parameters setting page of the CorelDRAW of CAD output software. The unit is mm/s.

- **Idle Speed:** The default move speed when laser is off. The unit is mm/s.

- **Speed Factor:** It is applied to improve the smoothness of movement. The range is 0.00-5.00. The smaller the factor, the slower of planned speed of lines in work file, and then the smoother of movement when turning corner. Normally it is set to 2.5. If the smoothness is high demanded, set the factor to less than 1.

3.2.4 Power Light Intensity Interface

After initialization, press the "Power" key, show as:

Fig. 5-5

The light powers are default, and there are 3 cases:

- At the time of pulse, the Power Max1/2 will be used;

- When moving axis and cutting scale with laser on, the Power Max1/2 will be used.

- The selected file's power is default that means it uses the default power here.

Power Min1 is the min light power of LASER-1. Power Min1 is the max light power of LASER-1.It is the same as Power Min2 and Power Max2.

5.2.5 Range Preview Interface

After initialization, press "Range" key, show as:

Range

1. If Laser On	NO	▼
2. Run Speed（mm／s）	200	

OK   Cancel
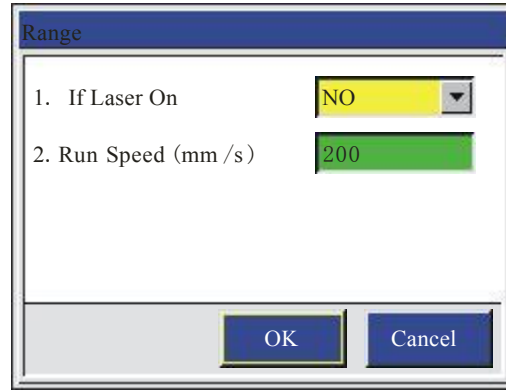
Fig. 5-6

- **If Laser On:** Set run scale with or without laser on. Press "Choose" key to set the value.

- **Run Speed (mm/s):** The speed of running scale, unit is mm/s.

3.2.6 Single Axis Movement Interface

After initialization, press "Axis" key, show as:

Run

1. KeySpeed	Middle	▼
2. If Laser On	N O	▼
3. X Axis Setting	0	
4. Y Axis Setting	0	
5. Z Axis Setting	0	
6. U Axis Setting	0	
7. V Axis Setting	0	

ESC
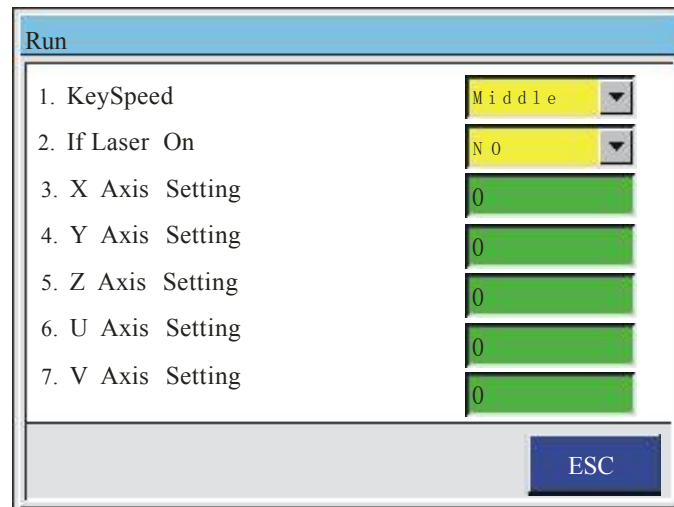
Fig. 5-7

Press the "Up/Down" key to choose the needed operation:

- **Key Speed:** fast, middle, slow.

- **If Laser On:** Yes or No?

- **X Axis Setting:** Press "Right/Left" key to move X axis, when stop, it'll show the current coordinate. The other axis operation is similar.

3.2.7 File Selection Interface

Press "Menu" key into the main menu, and select the Memory File button. Also can directly press "File" to enter, show as:

Memory File   Network Disconnect   2014-03-10 11:00
001:12345678.OUT   1K
002:12345678.OUT   1K
003:12345678.OUT   1K
004:12345678.OUT   1K
005:12345678.OUT   1K
006:12345678.OUT   1K
007:12345678.OUT   1K
008:12345678.OUT   1K
009:12345678.OUT   1K   No Sel. File
010:12345678.OUT   1K
Total File:25   Select File :20
ESC
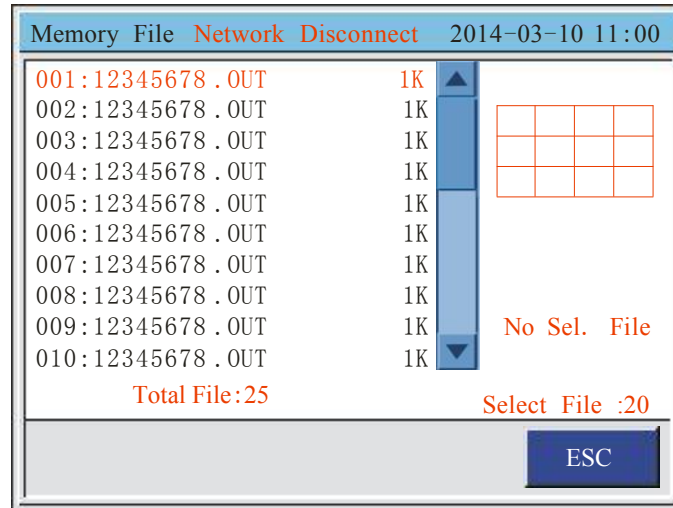
Fig. 5-8

Press "Down/Up" to choose the file, press "Select" key to find the current file, press "ESC" to quit, press "Enter" to operate, show as:

Memory File
1.   Read   File
2.   File   Edit
3. Write to Udisk
4.Delete
5.Delete All
OK   ESC
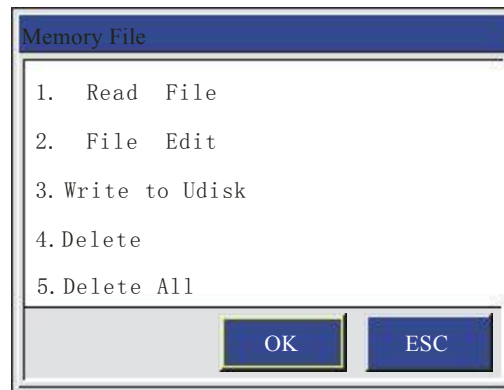
Fig. 5-9

- **Reading File:** Select this file to work.

- **File Edit:** Edit the file parameters like speed and power.

- **Write to U Disk:** Copy the file into U disk

- **Delete:** Delete the current file

- **Delete all:** Delete all memory files.

3.2.8 U disk File Interface

Press "menu" key into the main menu, and select the U Disk file. Also can directly press "U disk" to enter, show as:
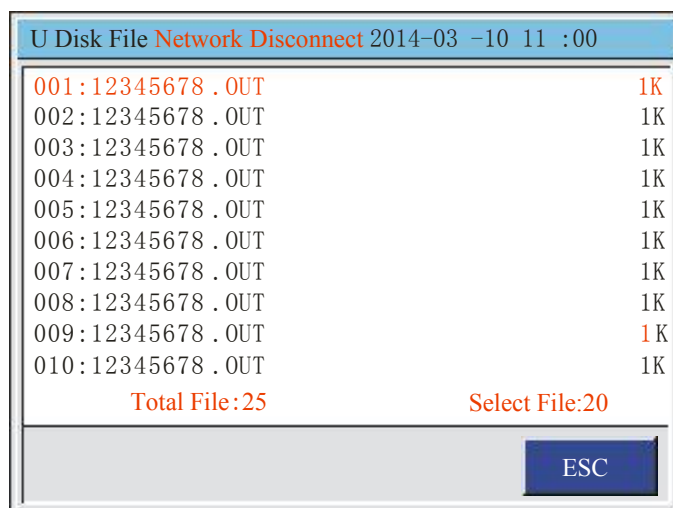
Fig. 5-10

Press "Down/Up" to choose the file, and press "Select" key to point the current file, then click "Enter" key or "ESC" to quit, show as:
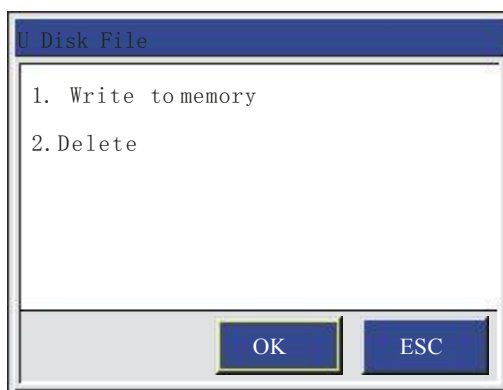
Fig. 5-11

- **Write into memory**: Copy file from U Disk to control card.
- **Delete**: Delete file.

3.2.9 The Main Menu Setting

Press "Menu" into the main menu, show as:

Main Menu Network Disconnect 2014−03 −10 11：00

U Disk File	Memory File	Sys. Info.
File Set	Integrate	System Test

OK
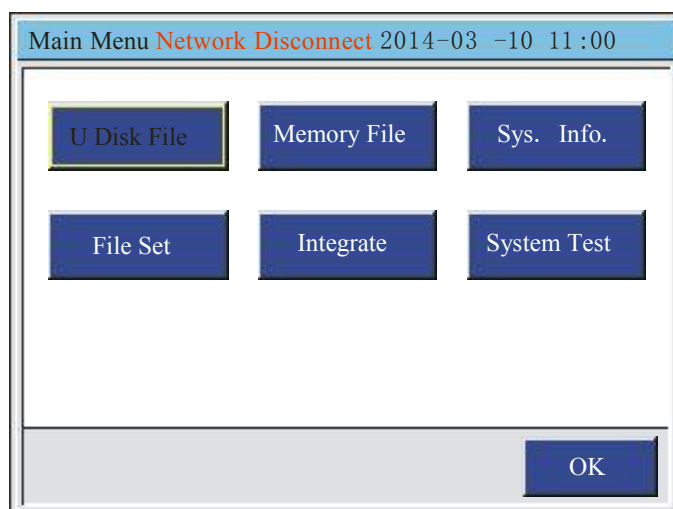
Fig. 5-12

Press the "Up/Down/Left/Right" key to choose the needed setting, "Enter" to operate, and "ESC" to quit.

3.3 File Setting

After starting, press "menu" into the main menu, choose the "File Set", then press "Enter", show as:

File Set	
1. Save Type	General ▼
2. Save as CurSel	Yes ▼
3. Save and Execute	Yes ▼
4. File Work Mode	General ▼

Save   ESC
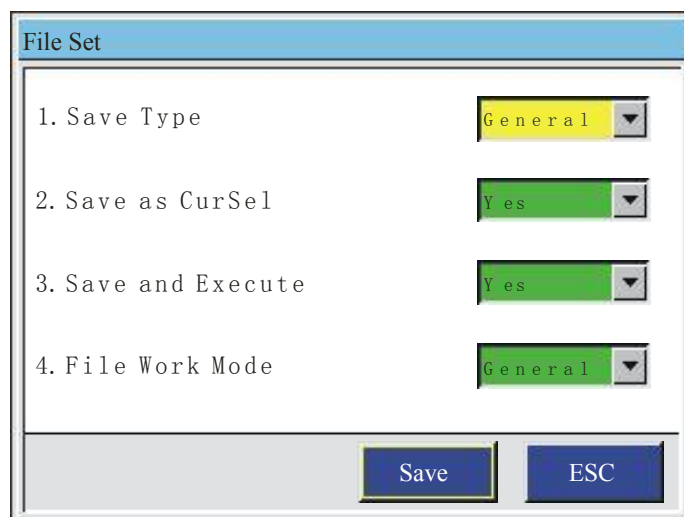
Fig. 5-13

Press "Up/Down" to choose the required operation, click "Select" key to change setting, press "Enter" to save the setting, click "ESC" to quit.

● **Save Type:** General or Temp Save. Temp Save means the received file is temporary file. It will be replaced by the new received file. General means the received files will be saved one by one, not be replaced.

- **Save as CurSel:** Once a file is finish downloading, it will be select as current file.

- **Save and Execute:** Once a file is finish downloading it will be executed.

- **File Work Mode:** General or Cyc. Cyc means All the Files will be executed one by one in cycle.

3.4 The Integrate Settings

After finishing the start, press "Menu" key into the main menu interface, choose "Integrate", then press the "Enter" to enter, show as:
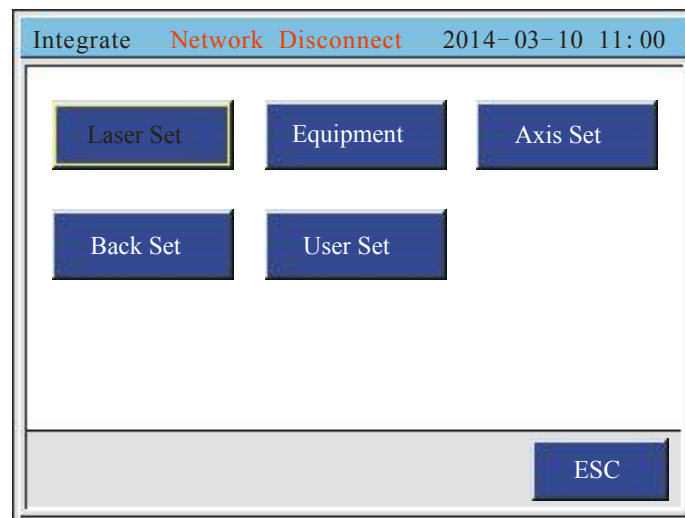
Fig. 5-14

Press the "Up/Down, Right, Left" to select the needed operation, click "Enter" to enter, click "ESC" to quit.

3.4.1 Laser Set

In the Integrate Setting interface, choose "Laser Set" to enter, show as:

Fig. 5-15

Press the "Up/Down" key to select the needed operation. Press the "Choose" key to change setting, "Number" keys to set the value.

- **Laser Type:** The common laser (CO2 glass tube), RF1, and the RF2. RF1 is for RF laser without pre-ionize. RF2 is for RF laser with pre-ionize that will output 1us tickle pulse.
- **PWM Frequency (HZ):** Press the "Number" keys to change the PWM.
- **Laser Min/Max (%)**: Range: $0 \leqq$ the min duty ratio $\leqq$ the max duty ratio $\leqq 100$.
- **PWM DIR:** Press "Choose" to change the PWM DIR. If you found when you set power bigger, the intensity of laser beam is stronger. Then you should change the PWM DIR.
- **Focus Length (mm):** Press the "Number" keys to change the focus length. When this parameter is set. Press "." Dot key in standby interface, a message box will be shown that if reset focus length. If press "Enter", the laser head will go down controlled by U Axis. When sensors close to the material surface, reach the designated position, a signal is given to controller, then it controls the laser head move up to the focus position.

Attention: if laser type is RF1 or RF2, set the PWM Frequency to 5000, Laser Max to 95%, not to 100%, otherwise the laser would always be on or off.

3.4.2 Equipment Set

In the Integrate interface choose "Equipment" to enter, show as:

Equipment Param	2014-03-10 11:00
1. Table Mode	General ▼
2. LaserCar Mode	Single ▼
3. Equipment Type	Common ▼
4. Buzzer Setting	1

Save   ESC
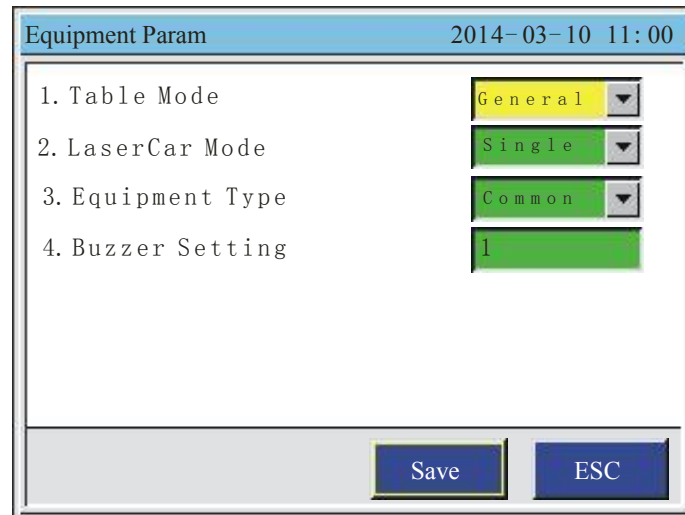
Fig. 5-16

Press the "Up/Down" key to select the needed operation. Click on the "Choose" key to change setting, "Number" keys to set the value.

● **Table model:** General or Double. After choosing double table model, and set the **Table Size** parameter–the distance of double table model, the distance subjects to the two upper left corner of table model. The machine on double table has two tables: to go back and forth by Z axis, keep a table on the working position; and another one turn in there on the both sides of machine.

● **LaserCar Mode:** Single, Double1, Double2. Single means it just has one laser head. Double1 means it has two laser heads on one belt. Double2 means it has two laser heads with two belts. After choosing Double1 or Double2, need to set the **Double Head Intv.** parameter—which is the origin points between the two laser head. The X axis and V axis are used to control the two laser head movement. The X axis control the laser head near the origin of the machine, V axis control the laser head away from the origin of the machine. The X axis range is set to the maximum width of the machine can be processed. V axis range is set to X axis range minus the distance between two laser head. When it's even column, the two head will work at the same time; when it's odd column, one head on the last column work.

● **Equipment Type:** Common, Metal Cut (metal cutting), Round (machine with wheel).

   a. When choose the metal cutting device, need to set **Down Delay, Up Delay, Long Size.**

   ■ **Down Delay:** It's the delay time when laser head move down to the focus position .After the delay, the machine starts to cut.

   ■ **Up Delay**: It's the delay time when laser head move up to the standby position after cutting.

   ■ **Long Size:** If needs to cut more than two graphic, Define the distance that

the previous graphic's end point to the following graphic's start point as A. If A is greater than the Long Size parameter, the laser head will move up after finish cutting first graphic. And then move to position of the next graphic's starting point. And then move down to the focus position to cut the second graphic.

b. When choose the wheel device, need to set the parameters: Reference Diameter and Reference Resolution.

Reference Resolution instructions:

a. Menu/Integrate/Equipment: Set the Equipment to Round. The "Reference Diameter" and "Reference Resolution" are used to calculate the actual resolution with the different cylindrical materials.

b. Reference Parameters

■ Because cylindrical materials with different diameter, the range and the resolution of Y axis is different. So the controller provides a reference diameter and reference resolution for convenience to calculate.

■ After the reference diameter and reference resolution set correctly, each time replace material, it just needs to set the "Diameter" parameter in main menu interface. Then the resolution and the max range of Y axis will be recalculated according to the "Reference Diameter" and "Reference Resolution". It means you just need to set the new material diameter.

c. The Modification of Reference Parameters

■ Set the Equipment to Round. You will see the Reference Diameter and Reference Resolution have a default value. Measure the diameter of a material for processing. Input this diameter into the "Reference Diameter" parameter. The Reference Diameter can remain as default value or input the estimate value to it, 10um for example.

■ Set the laser max power low to draw out one 50mm length line on the surface of material. Measure the actual length of the line, 55mm etc. Go into the Menu/Integrate/Axis set/ Y Axis interface, set the resolution of Y Axis to reference resolution value. Then follow the normal steps to modify the resolution. Press "Choose" key to display a window to calculate the resolution. Set want size to 50, real size to 55 in the resolution window. Press "Enter" key to calculate the right resolution as 11um, etc. Then Set the "Reference Resolution" to 11um. Finish setting.

d. Next time you replace the new material with different diameter, just set the "Diameter" parameter in Main Menu interface.

● **Buzzer set:** Press "Number" keys to set the times.

3.4.3 Axis Set

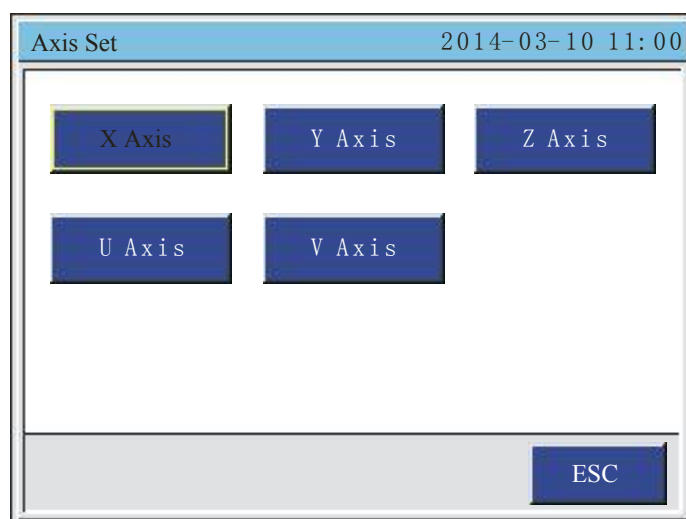In the Integrate Setting interface, choose "Axis Set" to enter, show as:

Fig. 5-17

Press the "Up/Down" key to select the needed operation, for example, the X axis setting:
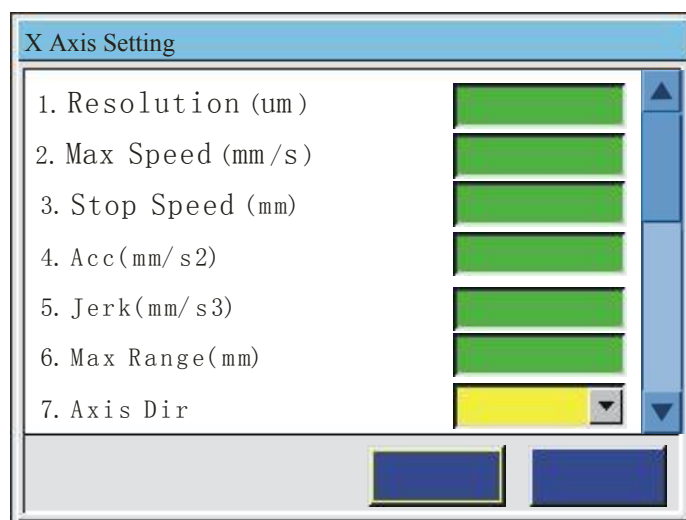
2014-03-10 11: 00

10. 0

500

15

6000

12000

880

Negative

Fig. 5-18

X Axis Setting	2014-03-10 11:00
8. Limit PN	Negative ▼
9. Key Dir	Negative ▼

OK   ESC
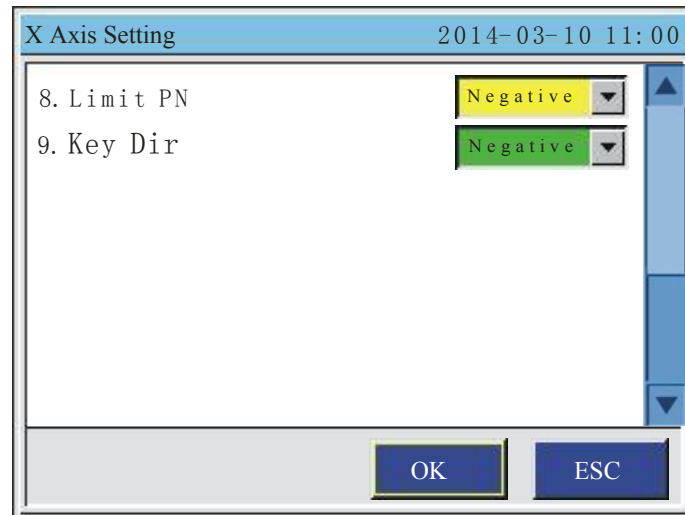
Fig. 5-19

Press the "Up/Down" key to select the needed operation. Click on the "Choose" key to change setting, "Number" keys to set the value.

● **Resolution:** the resolution = the length that the laser head moving when the motor rotate a cycle × 1000 / the pulses that the driver output when the motor rotate a cycle.

About measurement:

Draw a 30*30 rectangle to calculate the resolution. When measuring, the width of the laser beam needs to be considered. The processed rectangle is as shown in figure below. Take the measured value of the X axis 34mm, and input 34 into the Want Size edit box and 30 into the Want Size edit box. Click ok the program will calculate out the right resolution. Other Axis is similar. When calculate the resolution of Y, the Real Size is the length of trace the beam moved.

X=34mm
Y=35
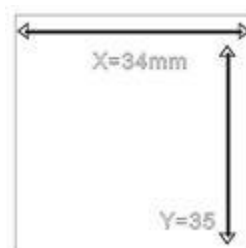
Fig. 5-20

● **Max Speed (mm/s):** The maximum speed allowed for single-axis movement. This value decides the max. Engraving speed and cutting speed.

● **Stop Speed (mm/s):** The speed of start or stop during single-axis motion, i.e., the motion stops speed.

● **Acc (mm/s2):** The Max acceleration of this axis, the bigger the acceleration, the shorter the work time, and the stronger jitter of motion.

- **Jerk (mm/s3):** The acceleration of the acceleration change from the minimum acceleration to upgrade to the maximum acceleration—Or the changed from the maximum acceleration reduce to minimum acceleration during slowdown..The smaller the jerk, the weaker the jitter of motion, the slower of acceleration and deceleration. Otherwise, the jitter is stronger, the accelerating and decelerating is the faster.

- **Max Range (mm):** Maximum distance for axis can move.

- **Direction Polarity**: Classified into positive and negative, when the motion direction of the motor disaccords with the direction control buttons on the keyboard, you can change the direction polarity to make them consistent with each other.

- **Limit Polarity**: Classified into positive and negative, when the motor cannot return to the original position, you can change the limit polarity to make it normal.

- **Key Polarity**: The buttons on the control panel correspond to directions of the motion of the axes, if it moves to the right when you press the left, change the polarity.

- **Reverse the polarity of the pulse:** In the Axis Set, press "12344321" to display the setting window of the polarity of the pulse. Press "Enter" to reverse. Otherwise, press "ESC".
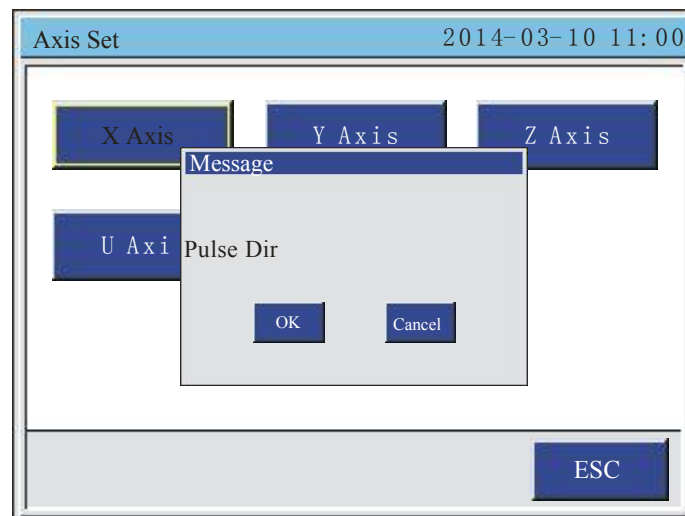
Fig. 5-21

3.4.4 Back Set

In the Integrate Setting interface, choose "Back Set" to enter, show as:
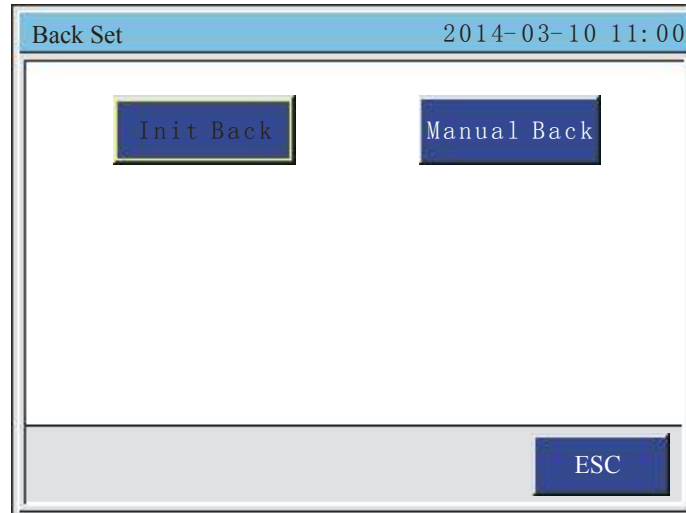
Fig. 5-22

- **Init Back:** Set which axis goes back to origin after power up.

- **Manual Back:** Manually set single axis back to origin.

In initialization back operation interface, press "Up/Down" key to select the needed operation, "Choose" key to change setting. If the parameter set to Open, the axis automatically move back to origin after machine power up, and the coordinate will back to zero. If close, the axis moves none, and the stop position will be the origin of axis. Press "Enter" to save configuration, "ESC" to quit.
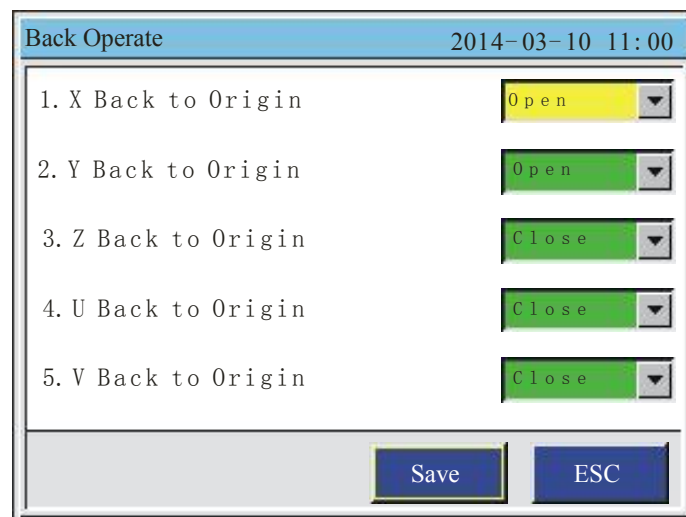
Fig. 5-23

In Manual Back interface, Press the "Up/Down" key to select the needed operation. Click on the "Enter" to set one axis back to origin.

Manual Back	
1X X Back	
2Y Y Back	
3. Z Back	
4U U	
	OK ESC
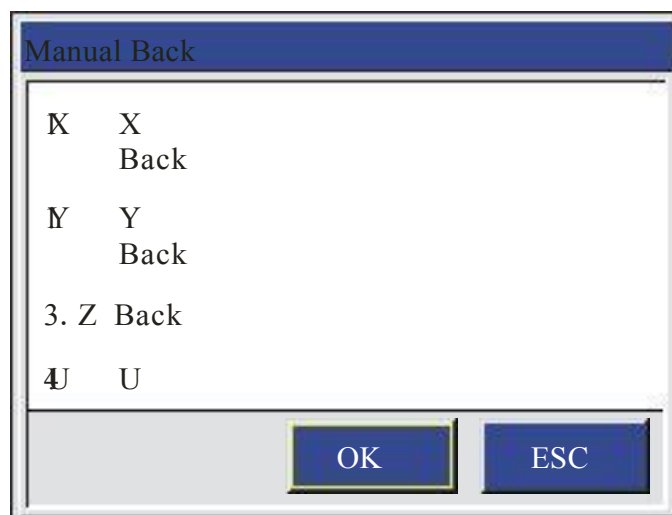
Fig. 5-24

3.4.5 User Set

In the Integrate Setting interface, press "Up/Down" key to select the "User Set" item. Press "Enter" key to go into User Set Interface as show below.

User Set	2014-03-10 11:00
1. Cover Protect	NO
2. Key Move Continue	Open
3. Key Move Dist. (mm)	1.5
4. Return Point	None
5. Laser On/Off Delay	Open
6. Back Speed(mm/s)	0
7. Pulse Time(ms)	0
	Save ESC

Fig. 5-25

User Set

8. Feeding Delay(ms)

9. Door Polarity 10. OUT7 Polarity

11. Min Acc(mm/s2)

2014-03-10 11: 00

   5 00

   0

   P o s i t i v e

   400

Fig. 5-26

Press "Up/Down" key to select the items, press "Choose" key to change the Combo Box, press the "Number" key to edit the value, press "Enter" to save the setting, press "ESC" to back.

- **Cover Protect:** When it is ON, system will detect the cover protect switch signal. While the signal is valid it would stop the working.

- **Key Move Continue:** When it is ON, Press the "UP/Down/Left/Right" arrow key or "Z+/Z-/U+/U-" to move the axis, Release these key to stop moving.

- **Key Move Dist.(mm):** When the "Key Move Continue" is OFF, the "UP/Down/Left/Right" arrow key or "Z+/Z-/U+/U-" to move the axis with the distance set by the "Key Move Dist".

- **Return point:** Origin, None Set Point. The position which the system back to while work is finishing.

- **Laser On/Off Delay:** Turn this ON for take the Laser On/Off Delay effect.

- **Back Speed (mm/s):** The homing speed.

- **Pulse Time (ms):** The time of laser is on when "Pulse" is press.
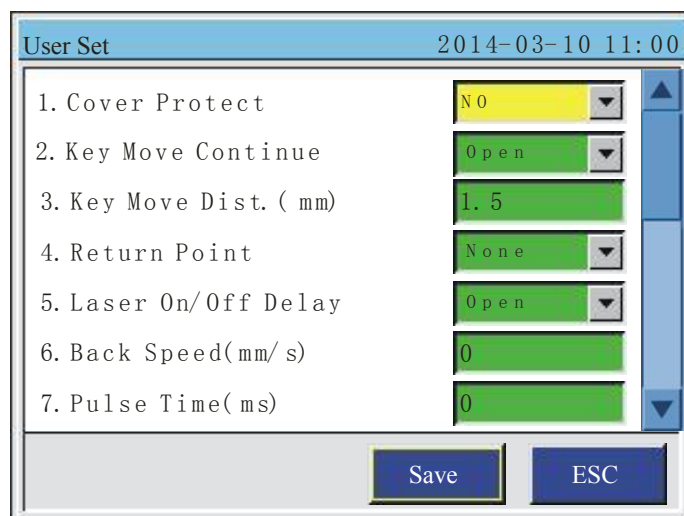
- **Feeding Delay (ms):** The delay time after feeding.

- **Door Polarity:** Change the parameter while the Cover Protect switch working in wrong way.

- **OUT7 Polarity:** Change the OUTPUT7 electrical level. Negative is low level. Positive is high level.

- **Min Acc.(mm/s2):** The min acceleration for start moving or stop moving. The less this value, the smoother the movement, the longer the working time. Normally, it is set to400mm/s2, if a shorter work time is demanded ,set the value no less than 850 mm/s2(According to the actual machine to set this value).

3.5 System Information

Press "Menu" button into Main Menu, then select Sys. Info, press "Enter" key to enter system set interface.

System Set Network Disconnect 2014-03 -10 11 :00

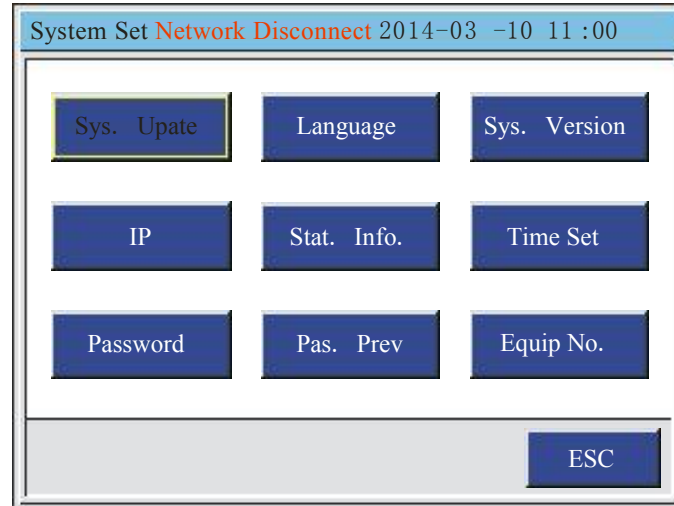| Sys. Upate	Language	Sys. Version
IP	Stat. Info.	Time Set
Password	Pas. Prev	Equip No.

ESC

Fig. 5-27

Press "Up/Down/Left/Right" key to select item. Press "Enter" key to select.

● **Sys. Update:** We support an update file for user to update their system. Put the update file in the root directory of U Disk, and insert the U Disk to Card. Select the "Sys. Update" item then press "Enter" key to upgrade your system. If updated successfully, the system would reset. Otherwise an error would prompt up. **Attention: MAKE SURE NOT DO ANY OPERATION DURING UPDATING AND THE CONTROL CARD POWER IS STABLE. IF A FATAL ERROR HAPPENED, PLEASE CONTACT THE FACTORY**.

● **Language:** Chinese, English, Italian, Korean is available. Press "Choose" to edit.

● **Sys. Version:** The version of control system.

● **IP:** The IP address of the control card. Press "Num" to edit. Press "Enter" to save. The IP of control card and the IP of connected PC must be in the same net section. For example, 192.168.0.xxx(x is number in 0-255). And the IP of control card must not be different from the IP of connected PC.

● **Stat. Info.:** Statistical Information includes:

   ■ **Uptime:** The power on time of the machine.

   ■ **Laser On Time:** The time of laser is on.

   ■ **Work Time:** The total work time.

   ■ **Process Times:** The total process times.

   ■ **X Travel:** The total distances axis X has moved.

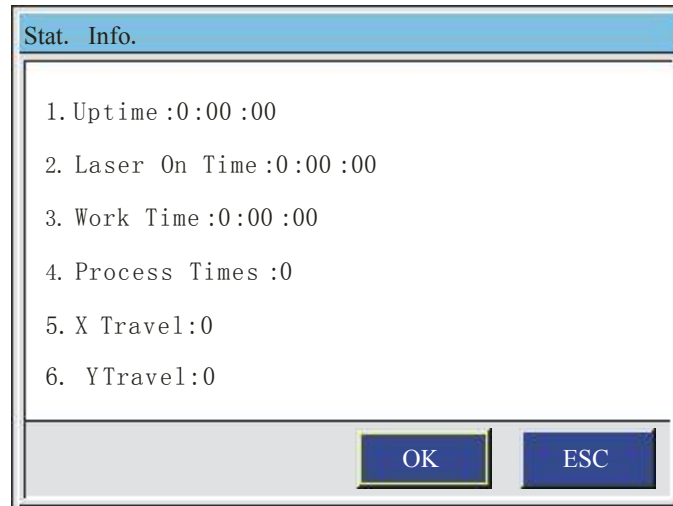   ■ **Y Travel:** The total distances axis Y has moved.

```
Stat.  Info.

  1.Uptime:0:00:00

  2.Laser On Time:0:00:00

  3.Work Time:0:00:00

  4.Process Times:0

  5.X Travel:0

  6. YTravel:0


                      [  OK  ]     [  ESC  ]
```

Fig. 5-28

In the Statistical Information interface, press "CL" key to go into Information Delete interface. Press "Up/Down" to select the item. Press "Enter" to delete.

● **Time Set:** Manage password is required. The default manage password is 00000000. In time set interface, it is able to set the date and time.

● **Password:** Manage password is required. Set the manage password and enable machine lock function if it is required.

● **Pas. Prev:** Manage password is required. After enable machine lock function, select "Pas. Prev" item to preview the passwords to unlock the machine.

● **Equip No.:** Manage password is required. Press "Number" key to set the equipment number for convenient management. If the machine is locked(The locked date was reached), the equipment number will be display. You should find the right unlock password to unlock the machine according to the equipment number.

3.5.1 The Password Setting

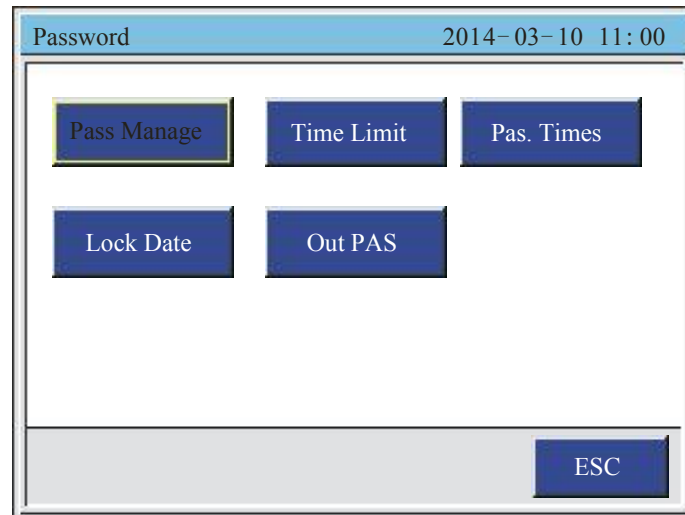Choose "Password" to enter machine lock setting, show as:

Password	2014-03-10 11:00
Pass Manage	Time Limit	Pas. Times
Lock Date	Out PAS	
	ESC

Fig. 5-29

Press the "Up, Down, Left, Right" key to select the needed operation.

● **Pass Manage:** To modify the manage password.

● **Time Limit:** When it starts, the staging password is working.

● **Password Times:** Set the password phases, a phase a month.

● **Lock Date:** The phase password is from the lock the date, the day range is 1-28.

● **Output Password:** Insert a U-Disk to the controller, click the "Out Pass" button to save the password to the U-Disk. The file name is the equipment number.

The lock Date must be set according to the system time.

3.6 System Test

After the starting, press "Menu" key into the main menu interface, choose "System Test" to enter, show as:
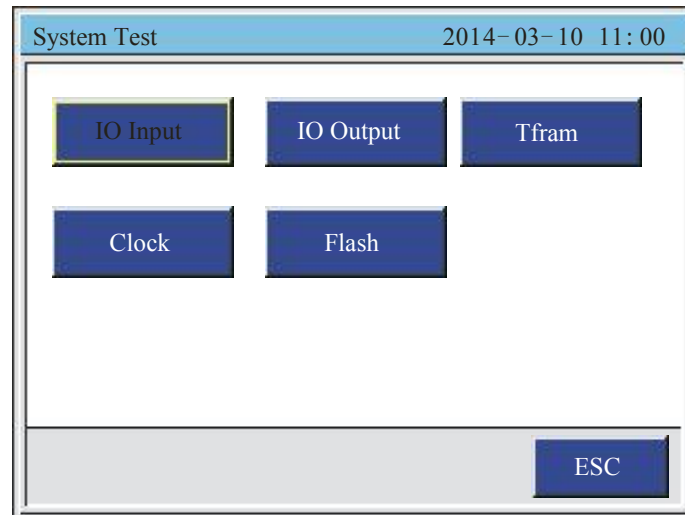
Fig. 5-30

Press the "Up, Down, Left, Right" key to select the needed operation.

1. IO Input: corresponding to the IO input low power, it'll display from Green to Red.
2. IO Output: connect the IO test board, can see all the output signals corresponding LED turn off.
3. After finishing the testing Tfram, Timer, Flash, it will show the result.

Part4 the Frequently Asked Question Help

4.1 Power-on Reset Question

Q: the system does not reset, buttons no response, and LCD no display.

A: the system reset error, the solution is:

    First, click the "Emergency Stop" on the panel, and check the button normal.

    Second, check the external 5V and internal 5V are within the normal.

Q: opening, the X, Y axis not move, the LCD display the main interface, can manual move the axis.

A: the power back to origin error. Into the "Power back to Origin" interface, set the X, Y axis as Opening.

Q: opening, the X, Y axis returns the origin, the LCD still shows "system initialization".

A: the power back to origin error. Into the "Power back to Origin" interface, set the Z, U axis as Close.

Q: opening, X, Y slow-move a short distance, not reach to the limit point, and complete the reset.

A: the Limit Polarity error. Into the "Limit Polarity" interface, change the X, Y polarity.

Q: opening X, Y move to the opposite direction of limit switch,

A: the direction polarity error. Into the "Direction Polarity" interface, change the X, Y polarity.

Q: button moving, X, Y moving direction is opposite to the button moving.

A: the button polarity error. Into the "Button Polarity" interface, change the X, Y polarity.

Q: after the completion of reset, X, Y fast automatically moving.

A: the regression point setting error. Into the "Regression Point Setting" interface, set

the regression point as mechanism origin point.

Q: the setting of power back to origin is close, after power, X, Y still automatically moving.

A: the regression point setting error. Into the "Regression Point Setting" interface, set the regression point as mechanism origin point.

4.2 The Laser Light Question

Q: Long light after power on.

A: view the enable signal of laser power is wiring, and see the jumpers of interface broad DIR3 and DIR4, check whether they e keep the consistency.

Q: When the light power intensity is big, the idemitsu is small; when the light power intensity is small, the idemitsu is big.

A: the PWM polarity setting error, into the button polarity setting interface, changes the PWM polarity.

Q: PWM frequency is correct, light power intensity can be changed by line within 10% - 60%.

A: check the laser power supply model, it's 5.5 voltage, not 3.3V.

Q: Water protection invalid.

A: check the laser type, there are 3 types: 0 is CO_2 glass tube; 8 is coherent glass tube; 16 is RF tube. If the laser type is correct, please check the water protection directly shorted.

4.3 The PC Connection Question

The Questions:

- Reading the parameters, can't open the port.
- Can't read the parameters.

- Transfer the file invalid.

The Solutions:

- Check whether the USB line is connected correctly, and the USB port is connected the PC.

- Check the USB driver is installed correctly.

- Check the USB port numbers on the device management, if it's more than 9, please change it within 3 – 9.

- The software output port need to be same with COM port.

- Insert a new and good port on the computer.

- Close the equipment power supply 3 minutes, than open again.

- Restart the computer, to ground the equipment and the computer.

- Replace a computer.

4.4 The Reading and Writing of U disk Question

Q: click the U disk file, show as "U disk is empty or error".

A: U disk error. Check the U disk port is correct. Replace a U disk.

Q: click the U disk file, show as "U disk reading…please wait", the indicator is off.

A: replace the U disk cable.