

User's Manual for TL-B1 Laser Engraving & Cutting Control System V1.0

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Versions

Version No.	Revision Record
V1.0	Initial.

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Part I Overview

1.1 System Overview

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

This system is a multi-head laser engraving and cutting control system.

The main features of the Control System:

- Power supply of DC24V/2A;
- 32-bit high-performance floating point embedded ARM+FPGA architecture, 128M Flash, 32M RAM, 12 general outputs, 20 general inputs, TTL electrical level;
- Equipped with 4.3", 480×272 LCD;
- 7-axis motor control can be realized, in which X (head 1), Y (beam), Z (head 2), V (head 3), W (head 4), U (feeding or platform lifting), and A axis is standby; The pulse frequency of motor shaft can be as high as 1MHZ;
- Support 4 lasers' control, TTL electrical level, adjustable output voltage of laser control: 0~5V, adjustable PWM output: 1K~100K, adjustable duty cycle: 0~100%;
- Support USB2.0 interface, support computer USB communication, support U disk to read and write files;
- Support 100Mbps network transmission rate;
- Support 4-head mutual movement and 3-head mutual movement models;
- Support automatic blowing, automatic focusing, foot switch, cover protect, processing statistics, etc.; in the run of equipment, the power-off cutting restoration ensures the flexible settings of large file processing.
- Support the languages of Chinese (simplified), English, Traditional Chinese, Korean, Russian, Italian, Spanish, Portuguese, Vietnamese and etc.

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.

The company will not be responsible for any consequences due to any unauthorized change with the product!

Warnings

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

Prohibit

- ✓ **Prohibit touching any motion parts or opening the control equipment when the machine is working, or it may be 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 may be cause the electrical shock or fire!**

1.3 Work Environment

Good 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

Power: DC24V/2A.

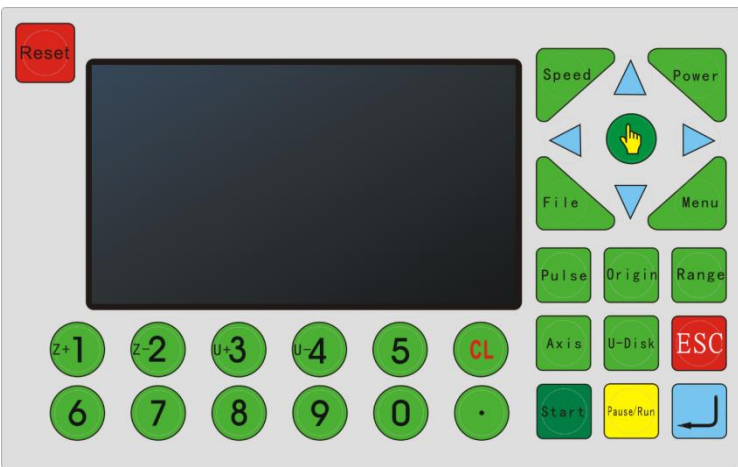
1.4.2 Grounding Requirements

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

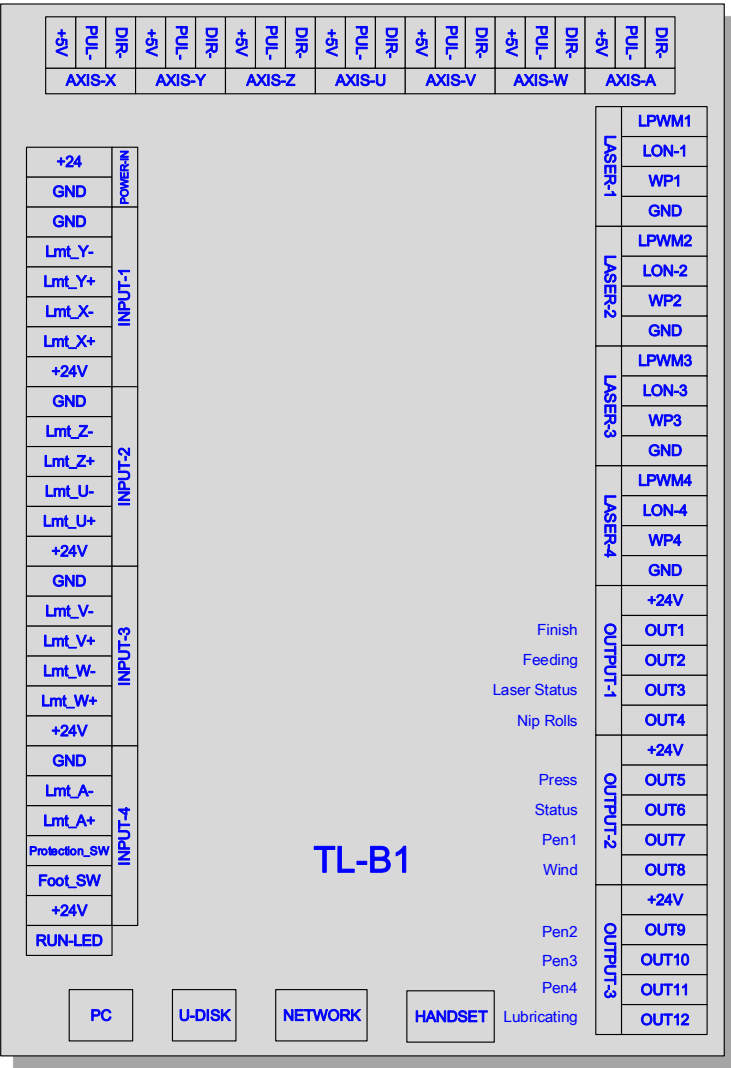

Grounding resistance is less than 100 ohms; the length of wire cable is within the 20meters, the cross-sectional area of the wire cable is larger than 1.0 mm².

1.5 Accessory List




The Laser Engraving Control System TL-B2 contained the accessories as below:

Name	Quantity	Introduction	Photo
Operation panel	1	For user operation	



Contr oller	1	The Motion Control Card	
Conn ection cable/ USB comm unicat ion cable	3	1. Panel Connection cable for connecting controller and panel 2. USB communicati on cable for connecting controller and PC 3.USB communicati on extended cable	

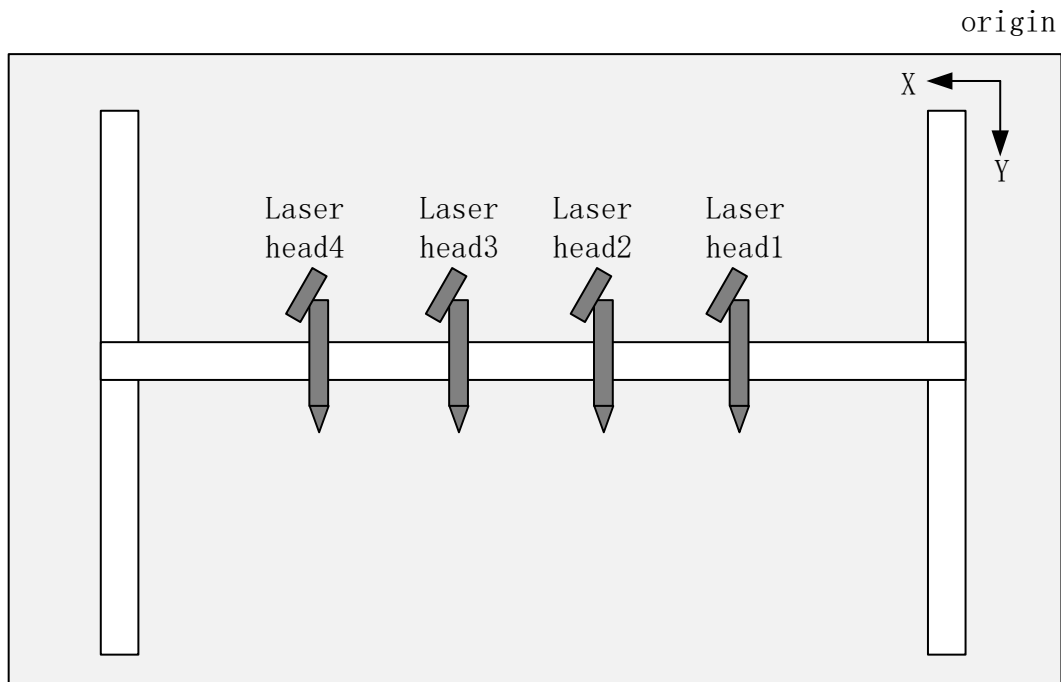


			
Cross over Ethernet cable/ Switching cable	2	For the direct communication between PCB and computer	 

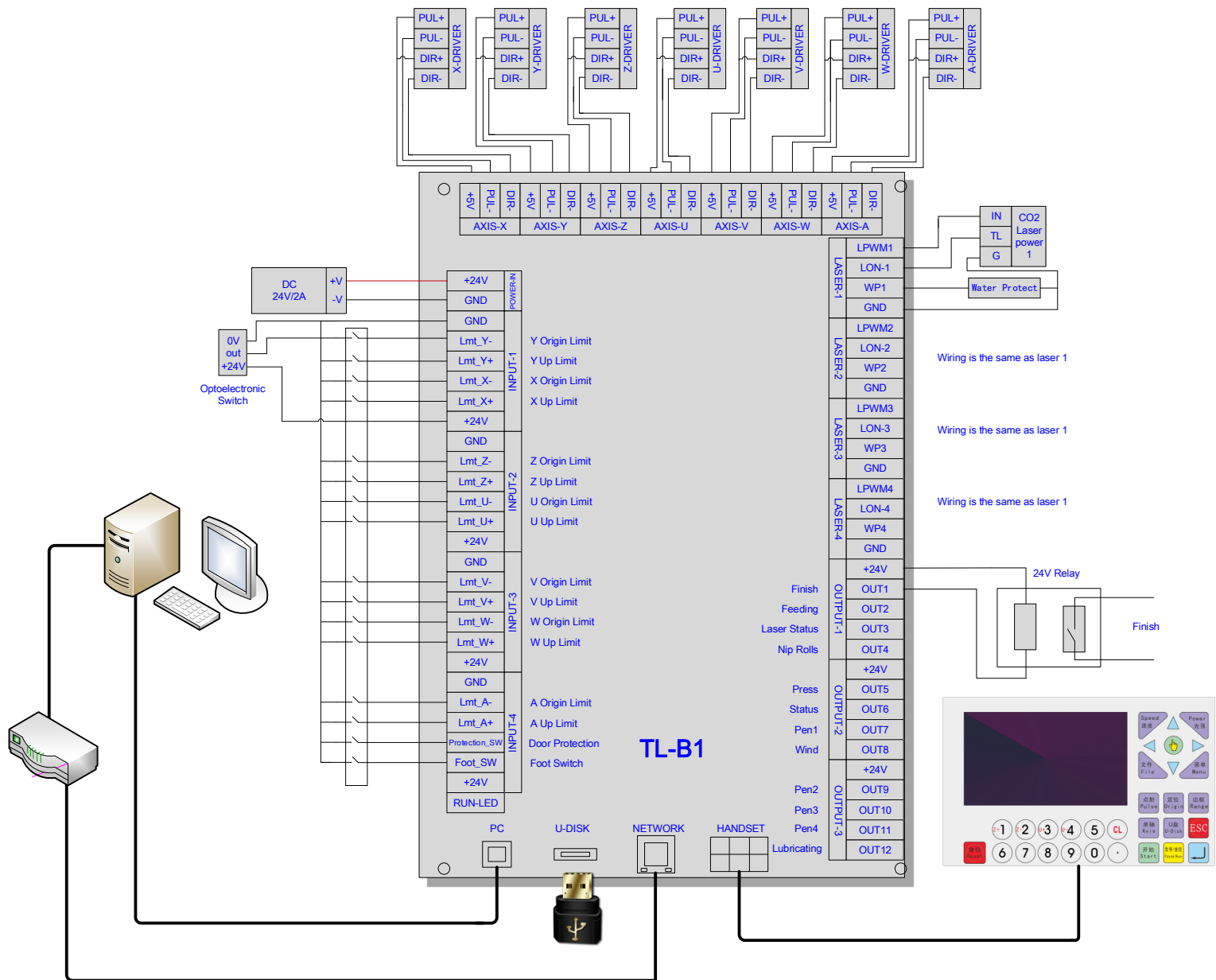
Part II Wiring Installation Instruction

2.1 System Conventions

1. The laser head near the origin of the machine is laser 1
2. X (head 1), Z (head 2), V (head 3), W (head 4), connect the corresponding motor according to the corresponding laser head;
3. Set the distance between the two ends.



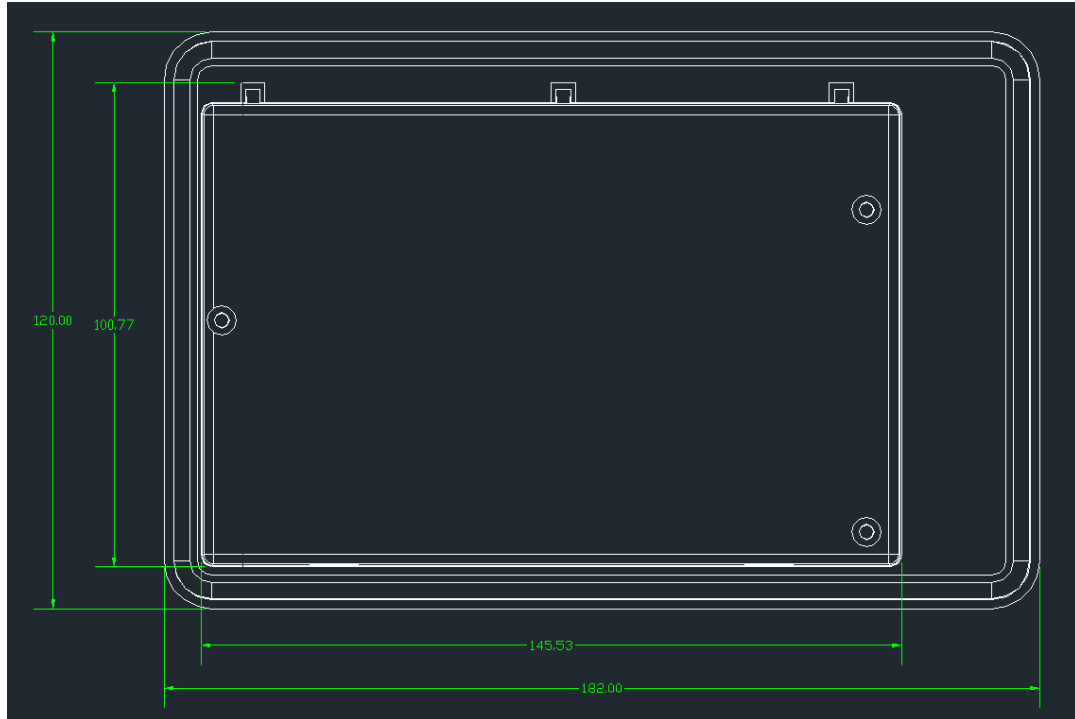
2.2 System Wiring Diagram



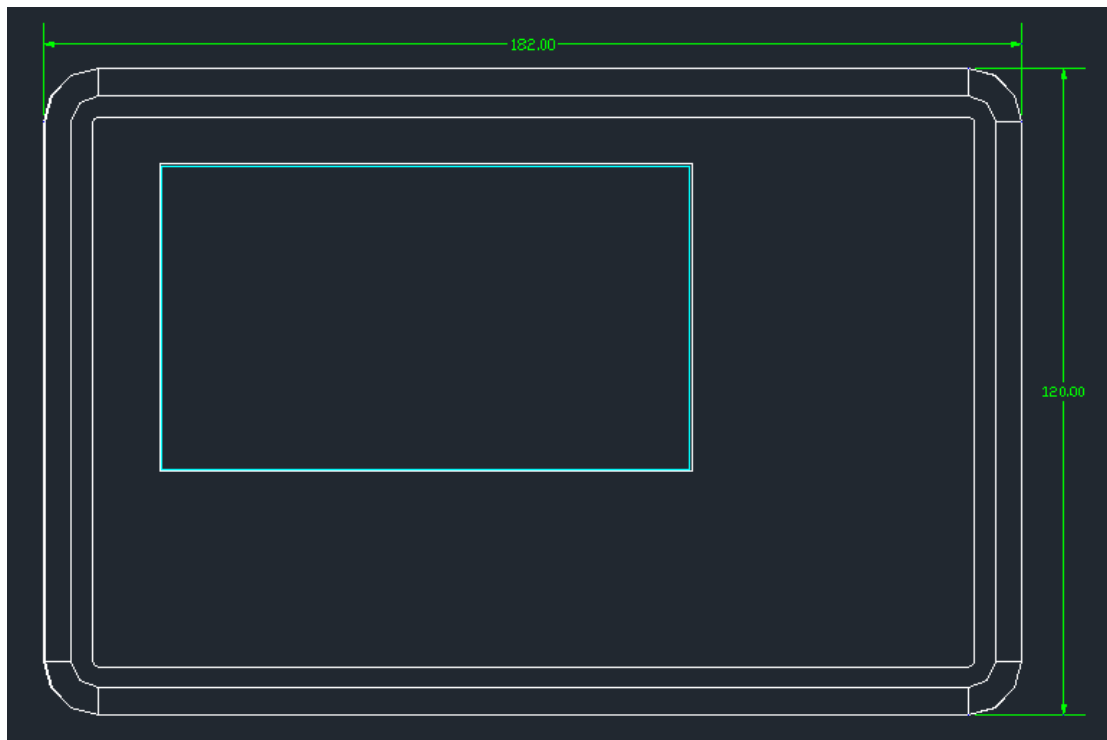
2.3 Installation Dimension

2.3.1 Panel

Note: the unit is mm.



Back



Front



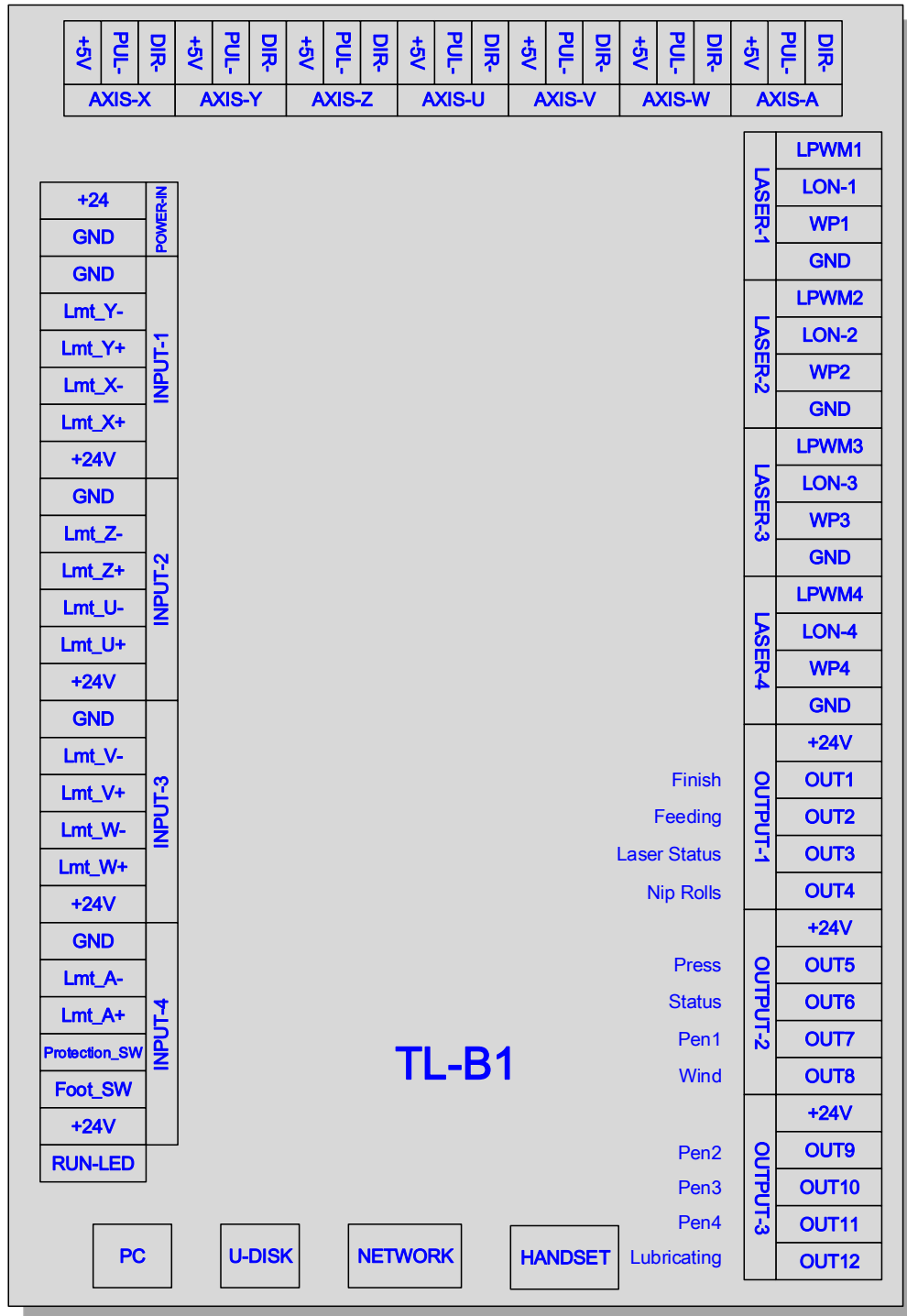
2.3.2 Main Board

Note: the unit is mm.



2.4 Wiring Instruction

2.4.1 Interface Diagram

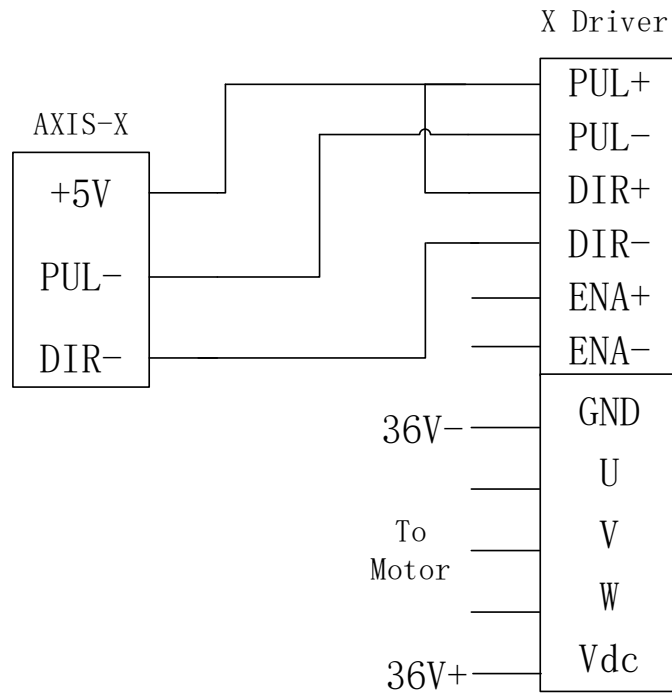


2.4.2 Wiring Diagram

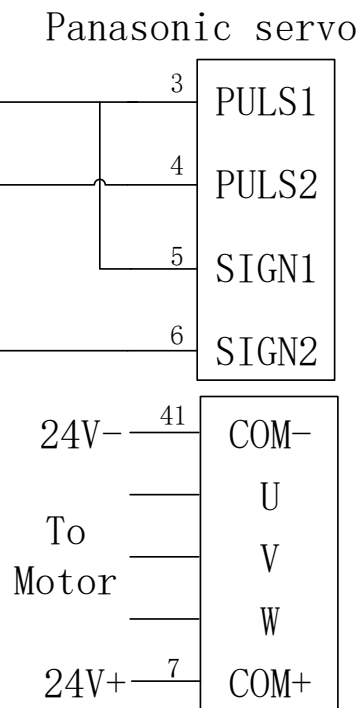
2.4.2.1 Motor Wiring

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

1. Step Motor Wiring

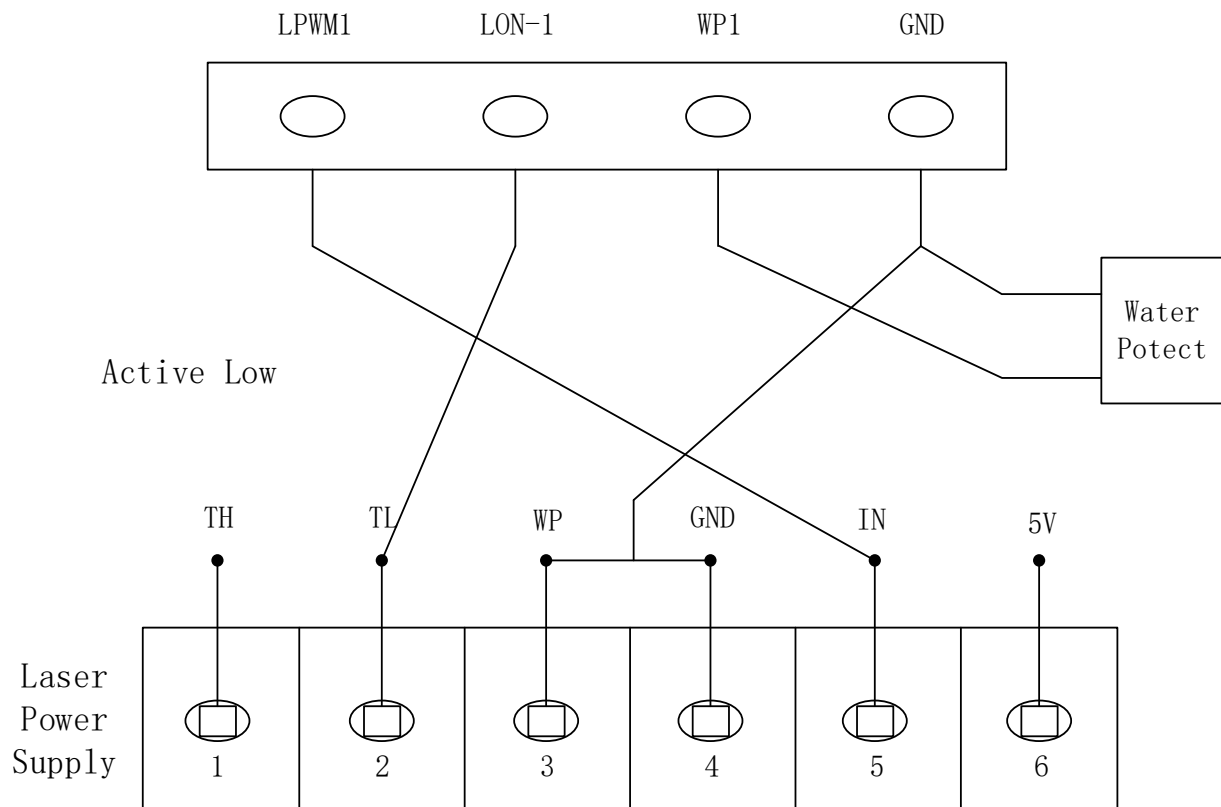


2. Panasonic Servo Wiring

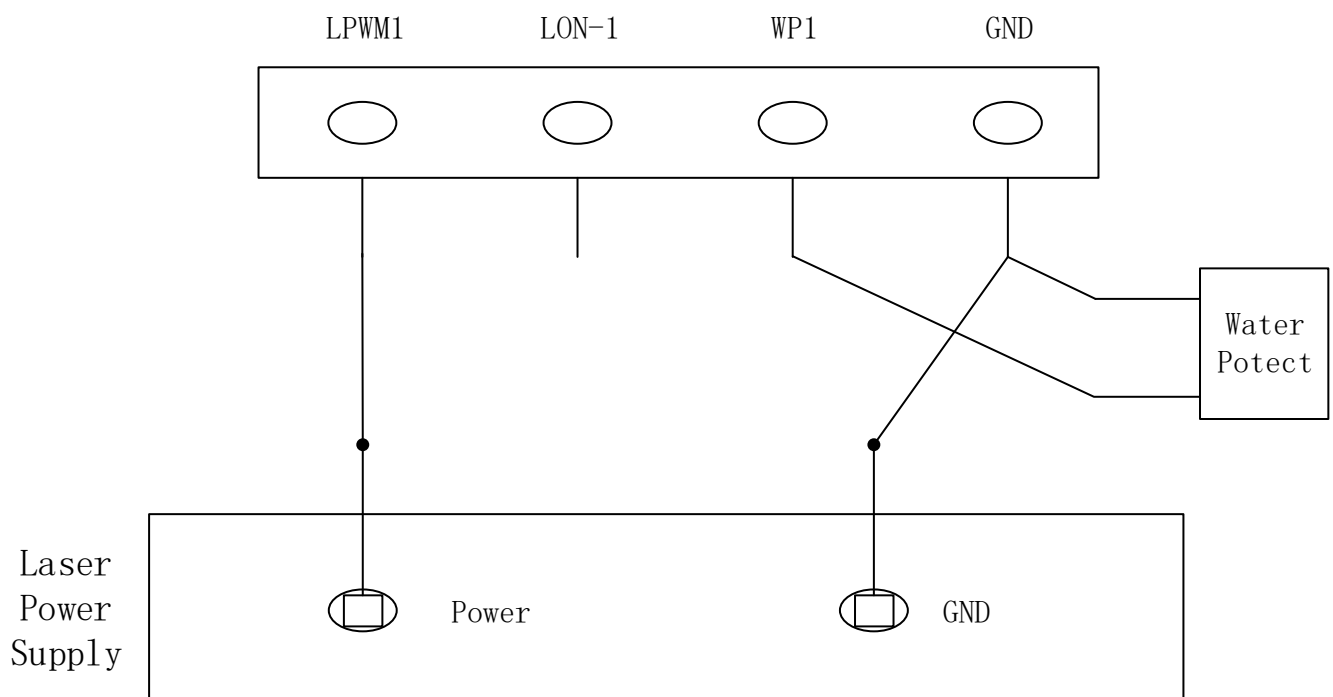


2.4.2.2 Laser Power Supply Wiring

1. CO2 Laser Power Supply Wiring



2. RF Laser Wiring

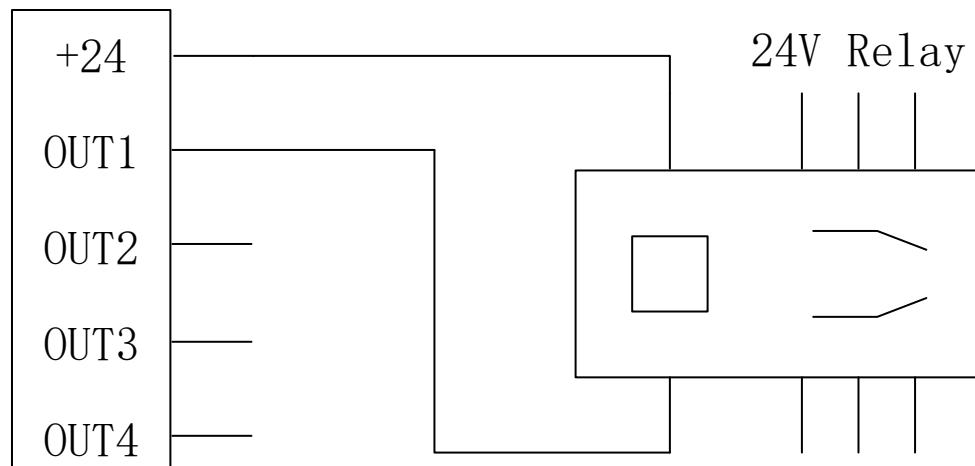


The wiring of laser 2,3,4 is similar.

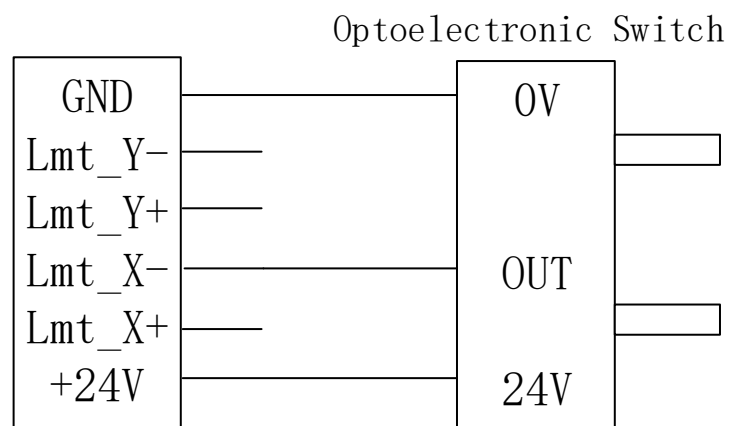
Note: When "RF or RF (Pre-ignition)" is selected, please set the PWM Frequency according to the data sheet of the laser. Generally, PWM Frequency is 5000Hz. And set the Laser Max parameter not larger than 95%, especially not to set as 100%, otherwise it works improperly.

2.4.2.3 General Output Signal Wiring Diagram

The following is OUT1 wiring, others are similar.

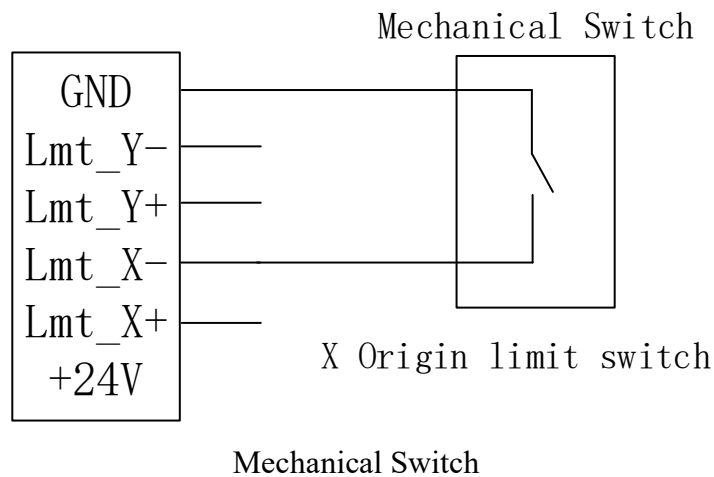


2.4.2.4 Input Wiring



X Origin limit switch

NPN Optoelectronic Switch



Other inputs are similar.

2.5 Interface Instruction

2.5.1 Power Signal

The system is 24V power supply interface (switching power interface)

Pin	Definition
1	+24V 24V power source positive (Input)
2	GND 24V power source grounding (Input)

2.5.2 PC Connection Port

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

2.5.3 U-DISK Port

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

2.5.4 NETWORK Port

Label NETWORK. Can connect PC to read and write by network.

2.5.5 HANDSET Port

Label HANDSET. Connect Panel

2.5.6 Motor Axis Interface

The motor driver includes axis interface of X, Y, Z, U, V, W and A, only supportive of common anode connection. Among them:

- X: X-axis motor of Laser 1
- Y: Y-axis motor (beam)
- Z: Laser 2 X direction motor
- U: Feeding motor or platform lifting motor
- V: Laser 3 X direction motor
- W: Laser 4 X direction motor
- A: Standby

Pin	Definition
1	+5V DC5V output, connect PUL+ and DIR+ of step motor driver
2	PUL- Step pulse, connect to the PUL- of step motor driver
3	DIR- Direction signal, connect to the DIR- of step motor driver

2.5.7 Laser Power Interface

The panel has 4 laser interfaces, among which

- Laser-1: laser Power Interface 1
- Laser-2: laser Power Interface 2
- Laser-3: laser Power Interface 3
- Laser-4: laser Power Interface 4

Pin	Definition
1	LPWM Be used to control the laser power When the laser is RF laser, used to control the power intensity and On/Off of the laser When the laser is CO2 laser, used to control the power intensity
2	LON Laser enable control. When the laser is CO2 laser, used to control laser On/Off
3	WP Water protection input, active at low level, the corresponding LED light will be on When the laser is RF laser, used to input of laser state When the laser is CO2 laser, used to input of water protection state (active at low level)
4	GND Power source grounding (Output)

2.5.8 General Output Interface

All the general output signals are only supportive of common anode connection. It is active



when there is 24V power output between +24V and OUT

OUTPUT1

Pin	Definition
1	+24V DC24V Output
2	OUT1 Work completion signal, output 1" low pulse width after the work is completed
3	OUT2 Feeding signal, output when feeding, active at low level
4	OUT3 Laser status signal, low output when the light is ON, and high output when the light is OFF.
5	OUT4 Press signal, for control of press roller of rotary cutter, active at low level

OUTPUT2

Pin	Definition
1	+24V DC24V Output
2	OUT5 Feeding/pressing signal, synchronous pressing signal at Y axis and U axis when feeding, active at low level
3	OUT6 Working status signal, output low level at work state, output high level at standby or pause state
4	OUT7 Pen signal 1, for the pen signal of the head 1, low output when dropping the pen, high output when lifting the pen
5	OUT8 Blowing signal 1 or spindle 1 signal, the signal is multiplex, used for the blowing signal of the asynchronous head 1 in case of a normal model; used as start and stop signal for the spindle motor 1 in case of rotary cutting model, active at low level

OUTPUT3

Pin	Definition
1	+24V DC24V Output
2	OUT9 Pen signal 2, for the pen signal of the head 2, low output when dropping the pen, high output when lifting the pen
3	OUT10 Pen signal 3, for the pen signal of the head 3, low output when dropping the pen, high output when lifting the pen
4	OUT11 Pen signal 4, for the pen signal of the head 4, low output when dropping the pen, high output when lifting the pen
5	OUT12 Lubricant output signal, when valid, output low level, otherwise output high level

2.5.9 Input Interface

INPUT1

Pin	Definition
-----	------------



1	GND	Power source grounding
2	Lmt_Y-	Y origin limit, axis movement to the minimum coordinate (0) limit sensor input
3	Lmt_Y+	Y upper limit, axis movement to the max coordinate limit sensor input
4	Lmt_X-	X origin limit, axis movement to the minimum coordinate (0) limit sensor input
5	Lmt_X+	X upper limit, axis movement to the max coordinate limit sensor input
6	+24V	DC24V Output

INPUT2

Pin	Definition	
1	GND	Power source grounding
2	Lmt_Z-	Z origin limit, axis movement to the minimum coordinate (0) limit sensor input
3	Lmt_Z+	Z upper limit, axis movement to the max coordinate limit sensor input
4	Lmt_U-	U origin limit, axis movement to the minimum coordinate (0) limit sensor input
5	Lmt_U+	U upper limit, axis movement to the max coordinate limit sensor input
6	+24V	DC24V Output

INPUT3

Pin	Definition	
1	GND	Power source grounding
2	Lmt_V-	V origin limit, axis movement to the minimum coordinate (0) limit sensor input
3	Lmt_V+	V upper limit, axis movement to the max coordinate limit sensor input
4	Lmt_W-	W origin limit, axis movement to the minimum coordinate (0) limit sensor input
5	Lmt_W+	W upper limit, axis movement to the max coordinate limit sensor input
6	+24V	DC24V Output

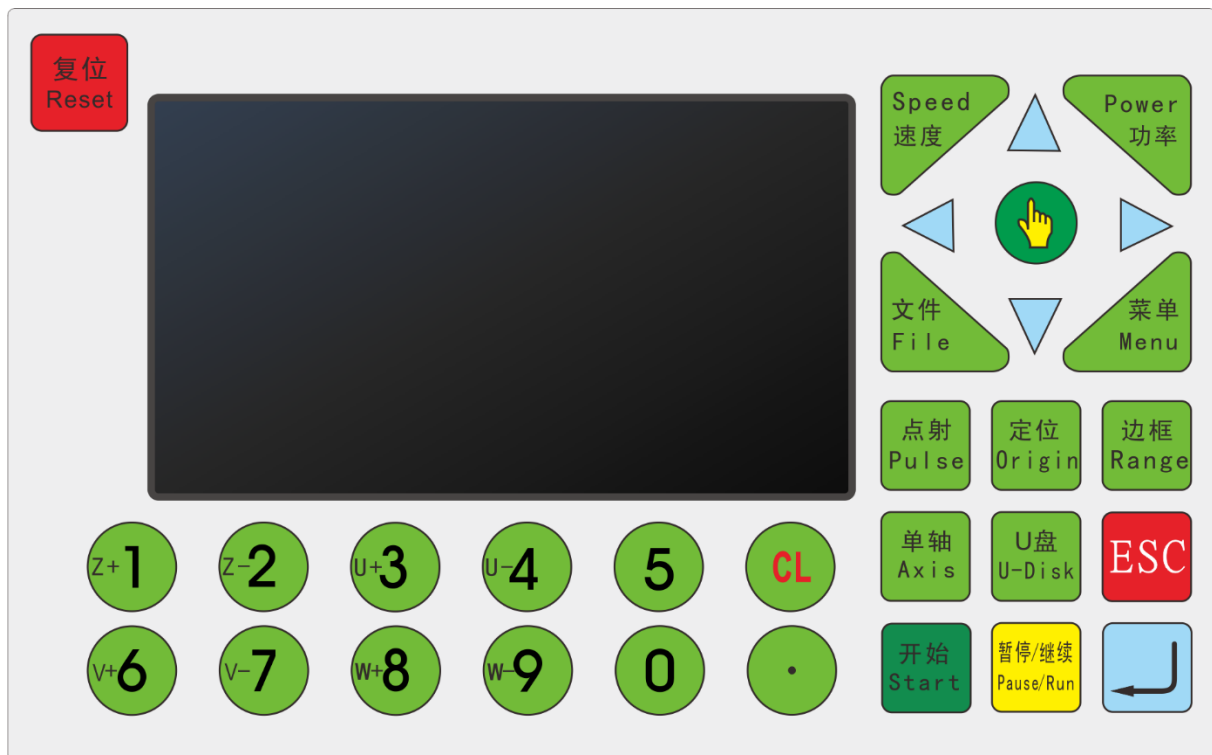
INPUT4

Pin	Definition	
1	GND	Power source grounding
2	Lmt_A-	A origin limit, axis movement to the minimum coordinate (0) limit sensor input
3	Lmt_A+	A upper limit, axis movement to the max coordinate limit sensor input
4	Protection_SW	Protection signal input, connecting to cover protection and other signals
5	Foot_SW	Foot switch signal input, active on the rising edge, with pulse width not less than 100ms
6	+24V	DC24V Output




Part III The Operation Panel

3.1 The Panel Operation and Buttons Function Introduction












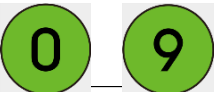
3.1.1 The Panel















3.1.2 Buttons Function Introduction

1.  "Reset" key: no matter what state the machine, press this key, it'll go into reset state, and then return to the regression point.
2.  "Speed" key: set the work speed and idle speed.
3.  "Power" key: set the laser powers.



4.  "Menu" key: press the key and go into the main menu interface.
5.  "File" key: go into the memory file selection interface.
6.  "U-Disk" key: go into the U disk file selection interface.
7.  "Range" key: go into the range previewed interface.
8.  "Pulse" key: use to test. Press one time, light one time. It is used to test the optical path and light power intensity.
9.  "Origin" key: can set the start point from which the machine runs.
10.  "Axis" key: go into the single axis movement interface.
11.  "Enter" key: agree to the current operation; used to switch asynchronous double-head in the standby interface.
12.  "ESC" key: used to cancel the operation and return to the previous interface.
13.  "Start" key: start processing the current file.
14.  "Pause/Run" key: press the key to pause at the working state, or press again, it'll go on running. In the pause state, move the X or Y axis, then press this button, it'll automatically return to the break point to continue working. On the Stop state, press the key, the laser head will automatically return the anchor point.
15.  Number keys: change the data in the selected area. Also it can directly

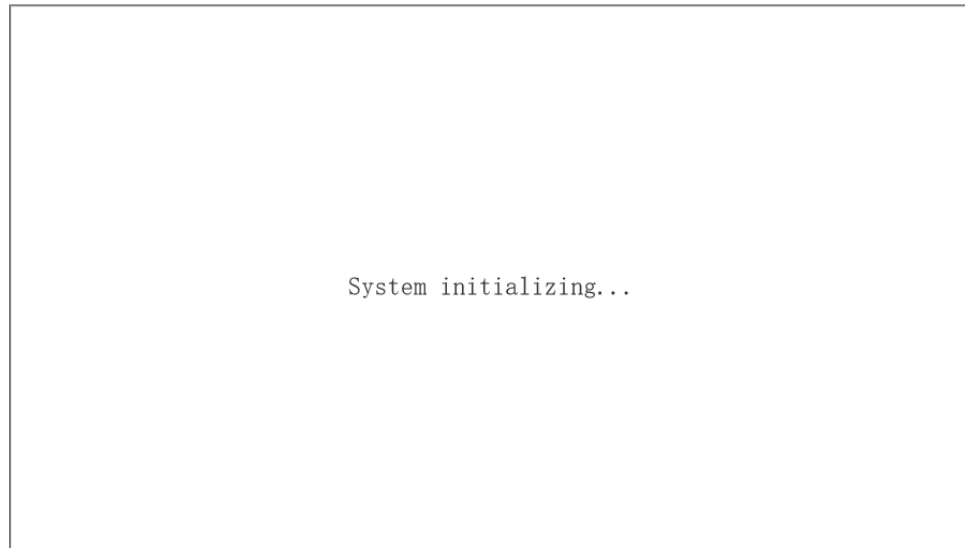
press the key to choose the item.

16.  Decimal key. Or for Auto Focus function.
17.  Delete key.
18.   Z axis manual moving key, moving Z axis in main interface.
19.   U axis manual moving key, moving U axis in main interface.
20.   V axis manual moving key, moving V axis in main interface.
21.   W axis manual moving key, moving W axis in main interface.
22.  Direction key: used to move the X, Y axis, in the other interfaces, used to move the curse to choose menu.
23.  Select 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

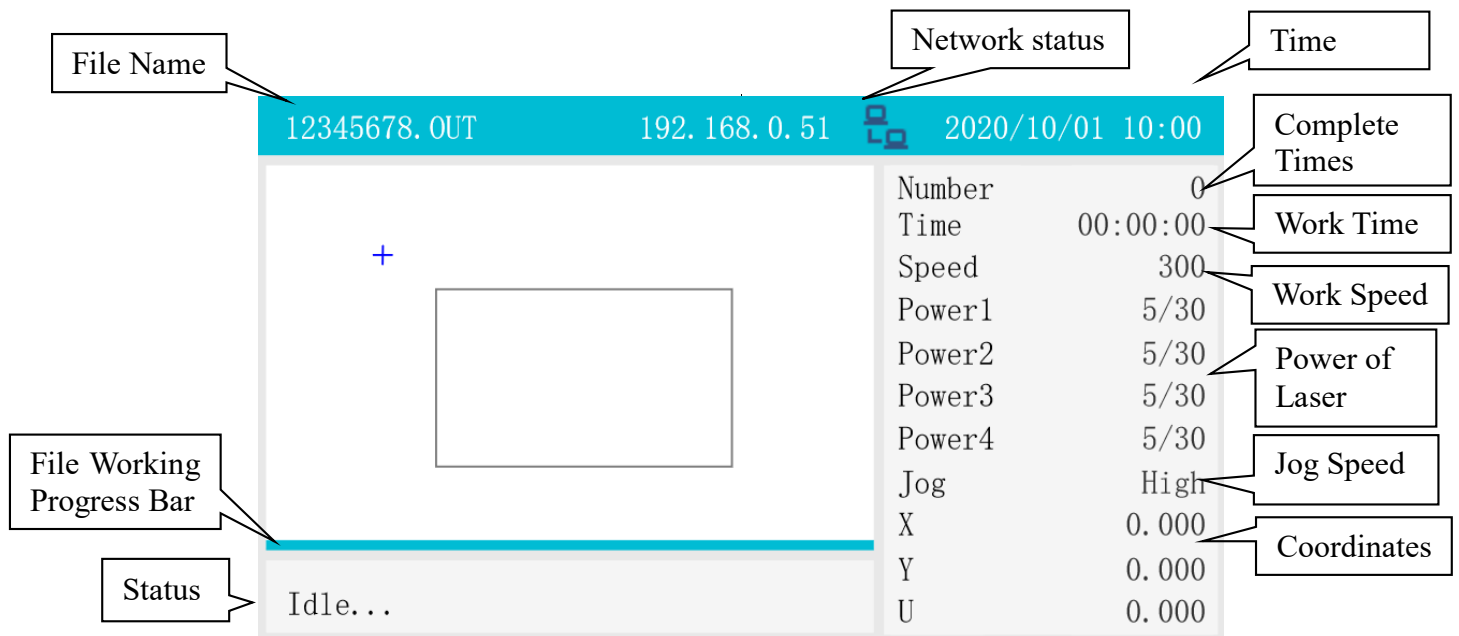
3.2.1 Power Interface

The power interface is as show:



3.2.2 Standby Interface

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



The top of the interface shows the file name, network status, the date and time. When the network connection is successful, the IP address will be displayed. The white area shows the preview of the selected file, the water protection status. And at the bottom left of the interface, it show the machine status and the last working time. When there is no work, the status displays "Idle...", while "Working..." when it is at work, and "Pause" when being paused. And the right side of the main interface shows the complete times, default power, speed of the machine, the

speed of key moving, and the position of axis x, axis y, axis z and axis u, etc. The parameters are described below:

Number: the complete times of the selected file.

Power 1: the power of Laser 1. The left value is min power value. The right value is the max power value.

Power 2: the power of Laser 2. The left value is min power value. The right value is the max power value.

Power 3: the power of Laser 3. The left value is min power value. The right value is the max power value.

Power 4: the power of Laser 4. The above value is min power value. The following value is the max power value.

Speed: the working speed.

Jog Speed: manually move axis speed, can press the "Select" key to change the speed, there are "High" or "Slow". The "High" is default Jog Speed set by user, and the "Slow" is half of the Jog Speed.


Notes:

- **X, Y, Z, V, W, U:** the coordinate in the current place in X axis, Y axis, Z axis and U axis.
- When there is no file Selected, it displays the default power and speed. When selecting the file, it shows the power and speed in the first layer of the file. When processing, it shows the power and speed of the current processed layer.
- When the machine is processing, if you want to modify the speed of the current layer, press the pause button, then press speed button, you can modify the speed of the current layer. In the same way, press power button to modify the min/max power. If machine is processing, press "Left/Right" button, can immediately reduce or increase the laser power. Press once, plus or minus 1%. Left for reduce, Right for increase. When changed the speed of power during working operation, after the completion of processing, it prompts whether to save the changes of the speed and power value.



- In the standby interface, press  to switch to display XYZUVW coordinates..



- In the standby status, when the processing file is selected, press  to clear the number of completions of the current file.

- When the machine has autofocus function, it can be set through the lifting the U-axis control platform (cutting head), and the focal length is set in the laser parameters, press



to perform autofocus.

3.2.3 Speed Settings

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

Cancel	Parameter		Save
	Layer Paramter	1	
	Work Speed (mm/s)	500	
	Idle Speed (mm/s)	500	
	Speed Factor	2	
	Speed Mode	Fast	

- Layer Parameter:** when one file is selected, press button, to choose the layer number.
- Work Speed:** when one file is selected, it shows the work speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.
- Idle Speed:** the default move speed when laser is off. When one file is selected, it shows the idle speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.
- Speed Factor:** it is applied to improve the smoothness of movement. The range is 0.00-5.00. The bigger the factor, the faster of planned speed of lines in work file, and the stronger jitter of motion. The smaller the factor, the slower of planned speed of lines in work file, and then longer the work time and the jitter of motion. Normally it is set to 2. If the smoothness is high demanded (i.e. above 2500mm/s), set the factor to less than 1. The jitter reduces obviously. In a need for acceleration, set the speed factor to 3 or above.
- Speed Mode:** in the normal mode, the shaking and impact of the machine are reduced,

the processing effect is good with gentle turning, but the processing time is increased. In the fast mode, the machine turns quickly and the shaking and impact increase, but the processing time is short and the efficiency is high.

3.2.4 Laser Power Settings

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

Cancel	Parameter		Save
	Layer Paramter	1	
	Power Min1 (%)	5	
	Power Max1 (%)	30	
	Power Min2 (%)	5	
	Power Max2 (%)	30	
	Power Min3 (%)	5	

Cancel	Parameter		Save
	Power Max3 (%)	30	
	Power Min4 (%)	5	
	Power Max4 (%)	30	

1. **Layer Parameter:** when one file is selected, press "Select" button, to choose the layer number.
2. **Power Min:** when stroking curves, this power intensity applied for line start and the corner of the curve. Or it applied for the top depth when gradient carving. The range is 0.00~100.00%.

3. **Power Max:** when stroking curves, this power intensity is applied as the work speed was reached. Or it applied for the bottom depth when gradient carving. The range is 0.00~100.00%.

Power Min1 the min light power of LASER-1. Power Max1 is the max light power of LASER-1. It is the same as Power Min2 and Power Max2 of LASER-2, Power Min3 and Power Max3 of LASER-3, Power Min4 and Power Max4 of LASER-4. When there is no file selected, it displays the default power. The pulse power is the max light power currently displayed on the standby interface.

3.2.5 Range Preview Interface

On standby interface, press the "Range" button to preview the border directly. If you need to modify the border preview parameters, you can go to the panel "Menu" - "Range" to modify. After modification, press the "Range" button to preview the border, as shown in the figure below:

ESC	Range		OK
Laser On	<	NO	>
Run Speed (mm/s)	<	200	>
Power Min1 (%)	<	5	>
Power Max1 (%)	<	30	>
Power Min2 (%)	<	5	>
Power Max2 (%)	<	30	>



ESC	Range			OK
Power Min3 (%)	<	5	>	
Power Max3 (%)	<	30	>	
Power Min4 (%)	<	5	>	
Power Max4 (%)	<	30	>	

1. **Laser On:** there are two kinds of frame preview, one is cutting the frame; One is the



walking frame. Press the " " button to change the two preview modes. Select "Yes" to cut the border, and select "No" to walk the border to see the working range. After selection, press "Range" to perform the operation.

2. **Run Speed (mm/s):** the speed of running scale, unit is mm/s.
3. **Power:** when cutting the scale, it uses the system default power which is shown here. The min power intensity applied for line start and the corner of the curve. The max power intensity is applied as the run speed was reached.

3.2.6 Single Axis Movement Interface

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



ESC	Run		
Laser On	<	NO	>
X Axis Setting	<	0	>
Y Axis Setting	<	0	>
Z Axis Setting	<	0	>
V Axis Setting	<	0	>
W Axis Setting	<	0	>

ESC	Run		
U Axis Setting	<	0	>


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

1. **Laser On:** select "Yes" or "No". When selecting "Yes", the light is on along the single axis movement, otherwise, the light is off.
2. **X Axis Setting:** press "Right/Left" key to move X axis, when it stops, it'll show the current coordinate. The other axis operation is similar. Input the coordinate value, and press enter key can move to setting position. It is able to input the X/Y coordinates together.

When Laser On parameter is set as Yes, it uses the system default power to cut. No file is selected and press Power button to modify the system default power.

3.2.7 Memory File

Press "File" key in the standby interface, or directly select "File/ Memory File" to enter, show as:

ESC	Memory File
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	
010:12345678. OUT 1K	
	Total File 500 Select File 1 Number 1 Time 00:00:04

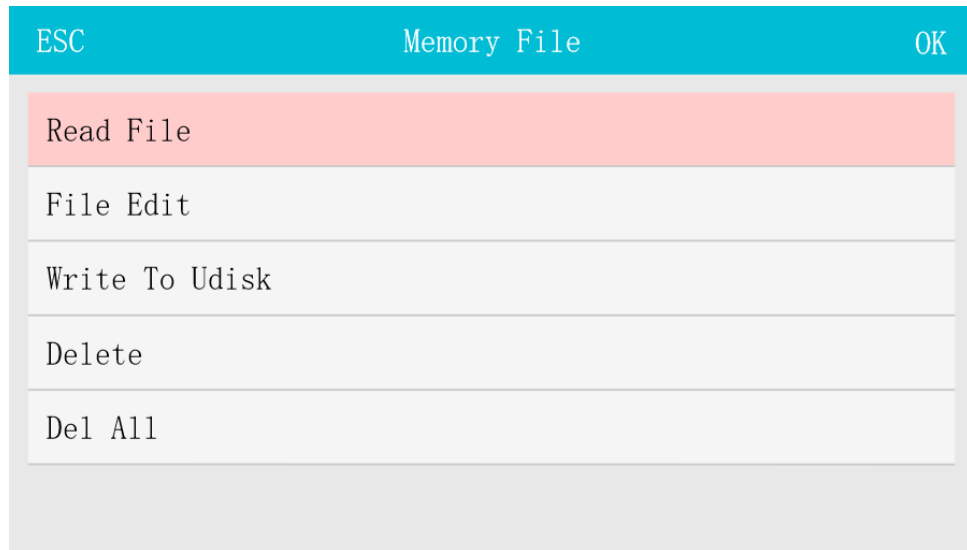
The list of files is displayed on the left side of the interface, the preview image in the upper right area, and the file information in the lower right area.

1. **Total File:** the total number of files, up to 500 files.
2. **Selected File:** the currently selected file.
3. **Number:** the completion times of the selected file.
4. **Time:** the previous processing time of the selected file.

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

1. **Read File:** select this file to work.
2. **File Edit:** edit the file parameters like speed and power.
3. **Write to U Disk:** copy the file into U disk
4. **Delete:** delete the current file
5. **Delete All:** delete all memory files.

Press "Enter" to confirm the operation, press "ESC" to quit and return to the original interface.



Under File Edit, the layer parameter and file parameter can be set, as shown in the Fig. Press “Enter” to enter into the next interface.



In Layer Parameter interface, set the parameters of each layer such as Blowing, Light Power, Speed, Laser On/Off Delay, etc. In particular before the processing, first smooth the equipment to reduce jitter, set the Open Delay to 0.05, and Drill Power to 0. Laser Open/Close Delay: the unit is second.













ESC	Layer Parameter	OK
	Layer Parameter	1
	If Open Air	Yes
	Power Min1 (%)	5
	Power Max1 (%)	30
	Power Min2 (%)	5
	Power Max2 (%)	30

ESC	Layer Parameter	OK
	Power Min3 (%)	5
	Power Max3 (%)	30
	Power Min4 (%)	5
	Power Max4 (%)	30
	Work Speed (mm/s)	500
	Idle Speed (mm/s)	500


ESC	Layer Parameter	OK
	Open Delay	0
	Close Delay	0
	Drill Power (%)	0

Set the feeding times and length in the File Parameter, the unit is mm.

ESC	File Parameter			OK
Work Start Position		Setpoint		
Rows Space		100		
Columns Space		100		
Feeding Times		0		
Feeding Length		0		

3.2.8 U Disk File

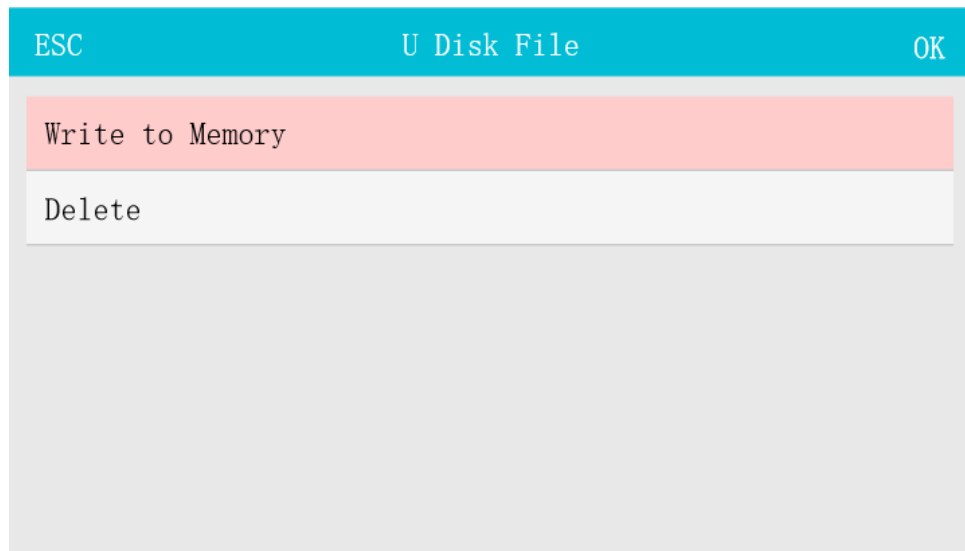
Press "Menu" key into the main menu, and select the U Disk File. Also can directly press "U Disk" to enter, show as:

ESC		U Disk File	
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		
010:12345678. OUT	1K		
		Total File	500
		Select File	1

The left area of the interface displays the file list, and the low right area displays the file information.

1. **Total File:** the number of files processed in U disk.
2. **Selected File:** the currently selected file.

Press "Down/Up" to choose the file, and press "ESC" to quit the interface. Click "Enter" key to quit the operation of the file, show as:

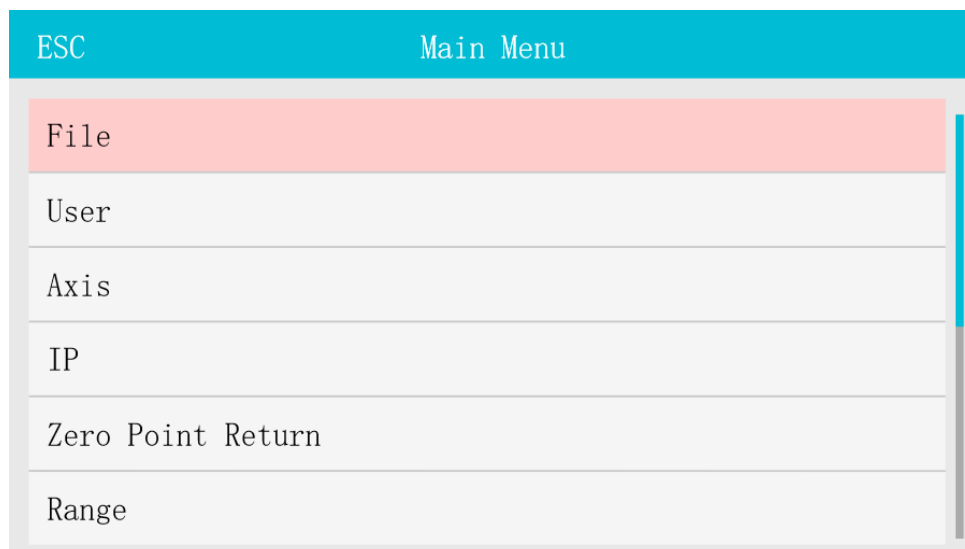


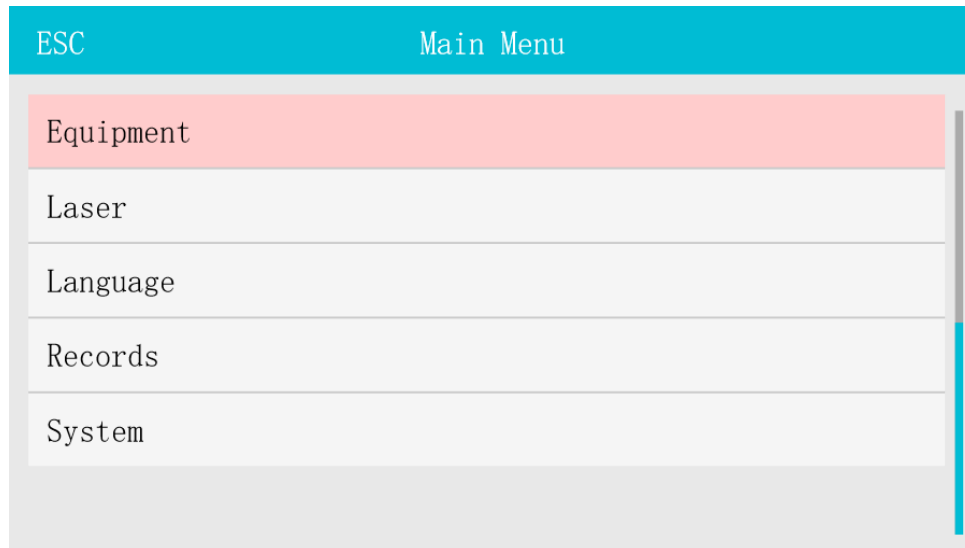
1. **Write To Memory:** copy file from U Disk to control card.
2. **Delete:** delete the current file.

Press "Enter" to confirm the operation, press "ESC" to quit and return to the original interface.

3.2.9 The Main Menu Setting

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

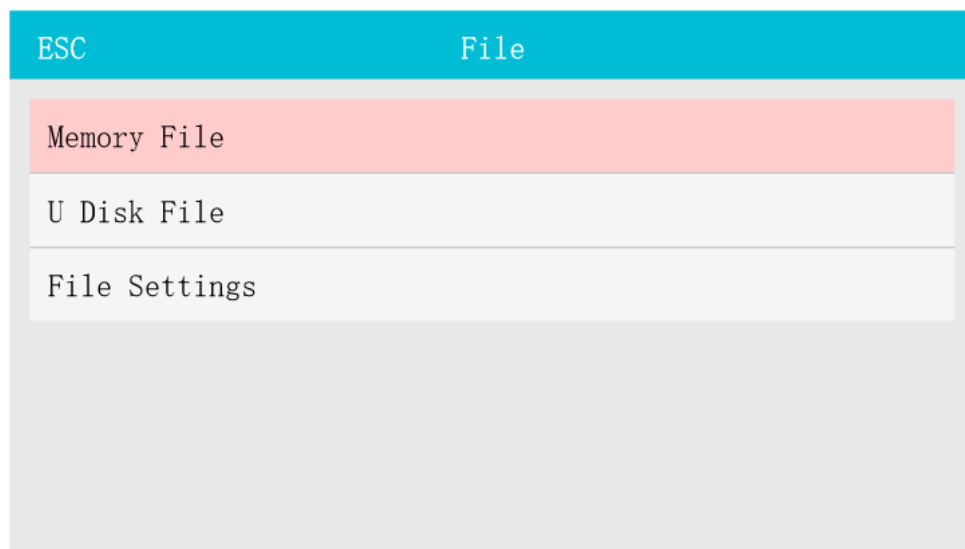




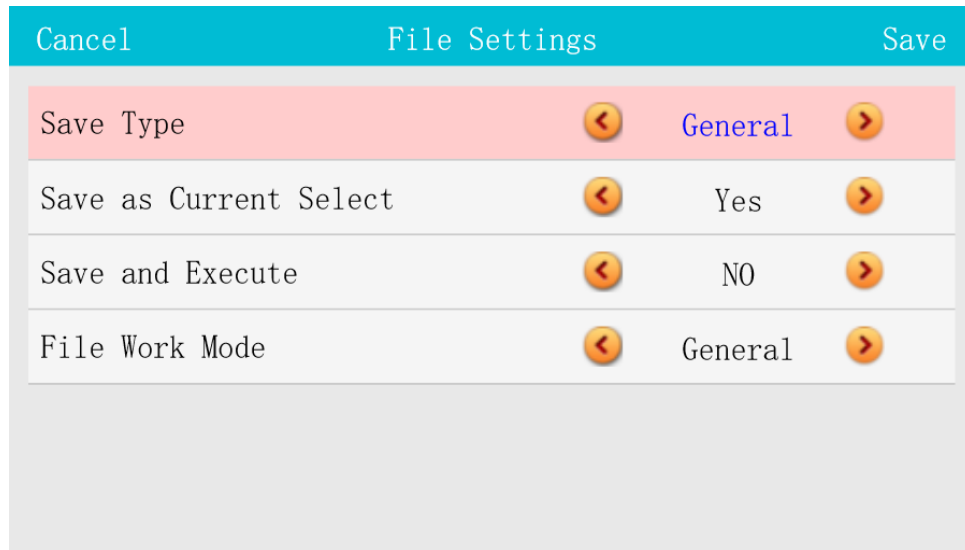
Press the "Up/Down/Left/Right" key to choose the needed setting, Press "Enter" to show the current operation interface.

3.2.10 File Settings

In the Main Menu interface, choose "File" to go to the "Memory File", "U Disk File", "File Settings" interfaces:



The file setting is as shown:



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

1. **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, like copying from the U disk.
2. **Save as Current Select:** once a file is finish downloading, it will be select as current file. That is, once received, press "Start" to start engraving the current file. Select "No" to save the received files orderly in the system.
3. **Save and Execute:** once a file is finish downloading it will be executed.
4. **File Work Mode:** General or Cycle. Cycle means all the files will be executed one by one in cycle. Otherwise, select "General".

3.2.11 User Settings

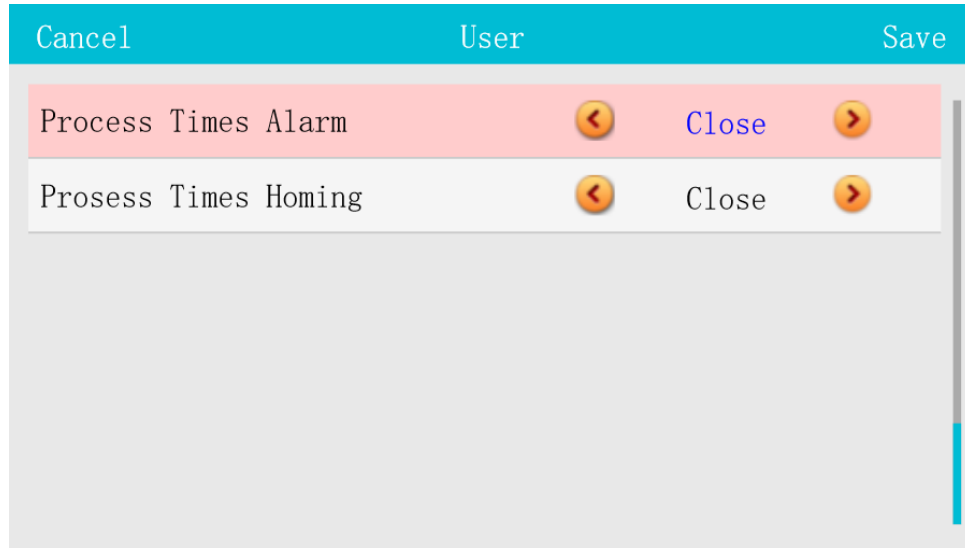
In the Menu interface, select the "User", press "Enter" key to go into User Set Interface as show below.



Cancel	User	Save
Protection	Close	
Protection Input Polarity	Negative	
Return Point	Setpoint	
Jog Continue Mode	Open	
Jog Step Distance (mm)	1.5	
Jog Speed (mm/s)	200	

Cancel	User	Save
Zero Point Return Speed (mm/s)	20	
Pulse Time (ms)	500	
Feeding Delay (ms)	500	
Min Acc (mm/s ²)	400	
Default Idle Speed (mm/s)	500	
Idle Acc (mm/s ²)	1500	

Cancel	User	Save
Idle Jerk (mm/s ³)	60000	
Idle Delay (ms)	0	
Laser Protection	Close	
Pulse Blowing	Close	
Homing Protection	Close	
Speed Limit Mode	Work Speed	



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

1. **Protection:** when it is ON, system will detect the cover protect switch signal. While the signal is valid it would stop the working.
2. **Protection Input Polarity:** change the parameter while the protection switch working in wrong way. ("Negative" is "active at low level", "Positive" is active at high level).
3. **Return Point:** the position which the system back to while work is finishing. Origin, None, Set Point, Separation. Select "None" to stop at the work completion position. When selecting "Separation" the asynchronous double head is separated after the system is powered on, LASER-1 to the Origin, and the LASER-2 is at the maximum position.
4. **Jog Continue Mode:** when it is Open, Press the "UP/Down/Left/Right" arrow key or "Z+/Z-/U+/U-" to move the axis, Release these key to stop moving. When it is Close, and if Jog Step Distance is set, press the key to move the axis with the distance set.
5. **Jog Step Distance:** when the "Jog Continue Mode" is Close, the "UP/Down/Left/Right" arrow key to move the axis with the distance set. Note: the unit is mm.
6. **Jog Speed:** the single axis move speed.
7. **Zero Point Return Speed:** the homing speed, the unit is mm.
8. **Pulse Time:** the time of laser is on when "Pulse" is press, the unit is ms.
9. **Feeding Delay:** the delay time after feeding, the unit is ms.
10. **Min Acc:** the min acceleration for start moving or stop moving. The less this value, the smoother the movement, the longer the working time, vice versa. Normally, it is set to 400mm/s², if a shorter work time is demanded, set the value no less than 850 mm/s² (Set

this value according to the actual situations of the machine). The unit is mm/s².

11. **Default Idle Speed:** if processing the file at the default speed, it is the idle speed of X, Y axis when the Light OFF. The unit is mm/s².
12. **Idle Acc.:** the acceleration speed of X, Y Axis when when the Light OFF. The unit is mm/s². The bigger the value is, the faster the acceleration, and the stronger jitter of motion. Otherwise, the smoother the working is.
13. **Idle Jerk:** the acceleration speed of X, Y Axis when the Light OFF. The unit is mm/s³. The bigger the jerk, the stronger the jitter of motion. Otherwise, the smoother the acceleration and deceleration is.
14. **Idle Delay:** the delay waiting time after the XY moves to the position without emitting light, which is used to optimize the jitter before cutting starts, the unit is ms.
15. **Laser Protection:** enable or disable detecting the status of laser water cooling valve. "Open" means detect, "Close" means NOT detect.
16. **Pulse Blowing:** whether there is blowing when pulsing.
17. **Homing Protection:** when it is open and the Protection parameter is set to open, during the return to the machine origin, if the protection input is valid, the regression stops. If the signal is invalid, and the regression continues.
18. **Speed Limit Mode:** Work Speed limits the working speed of the small figure; End Speed limits the end speed of the small figure. If you need to limit the speed when cutting large arcs, set it as the end speed.
19. **Process Times Alarm:** when it is open, set the work times. Then when the finish times reaches to the setting number. It will beep 5 times for alarm.
20. **Process Times Homing:** when it is open, set the work times. Then when the finish times reaches to the setting number. It will home to the machine origin automatically.

3.2.12 Axis Settings

In the Main Menu interface, choose "Axis" to enter, show as:



ESC	Axis
	X Axis
	Y Axis
	Z Axis
	V Axis
	W Axis
	U Axis

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

Cancel	X Axis Setting			Save
	Resolution (um)	<	10	>
	Max Speed (mm/s)	<	500	>
	Corner Speed (mm/s)	<	10	>
	Acceleration (mm/s ²)	<	12000	>
	Jerk (mm/s ³)	<	480000	>
	Max Range (mm)	<	500	>

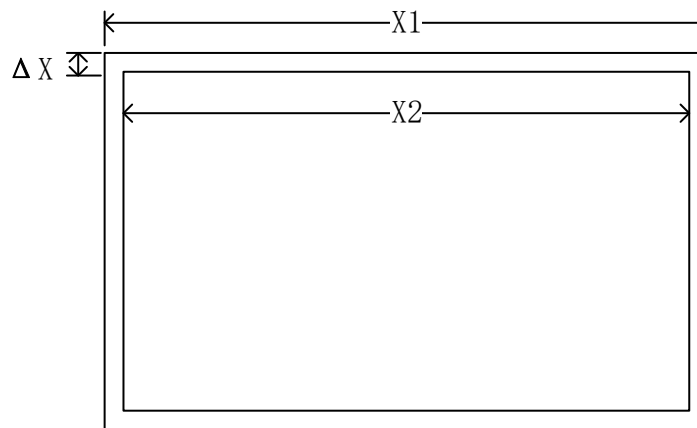


Cancel	X Axis Setting		Save
	Backlash(mm)	0	
	Origin Offset(mm)	0	
	Direction Polarity	Negative	
	Limit Polarity	Negative	
	Jog Polarity	Negative	
	Limit Protection	Close	

- Resolution:** $\text{Resolution} = \text{Length that the laser head moves when the motor rotates for one cycle} \times 1000 / \text{Pulses that the driver output when the motor rotates for one cycle}$. Press the "Select" button here to leave the input box for Set Value and Actual Value. The Set Value is displayed on the machine. The Actual Value needs to be measured by the ruler. Press the key to move the laser head, input the corresponding lengths into the options. Press "OK", the system automatically calculates the correct resolution.

About measurement:

The user can draw a rectangle, so that the side length of the rectangle can be measured to calculate the resolution, and the diagonal of the rectangle can also be measured to check whether the beam is perpendicular to the trolley. When measuring, the width of the laser beam should be considered, that is, the machine actually draws two rectangles when drawing rectangles, and the user measures the lengths of the two rectangles respectively when measuring, and the average value of the two lengths is the actual length. The length of diagonals only needs to compare whether the diagonals of the same rectangle are equal. For example, measure the length of a rectangle, where X represents the width of the laser beam, measure the lengths of X1 and X2 in the figure respectively, and take the average value. The longer the line length, the more accurate the measurement is.

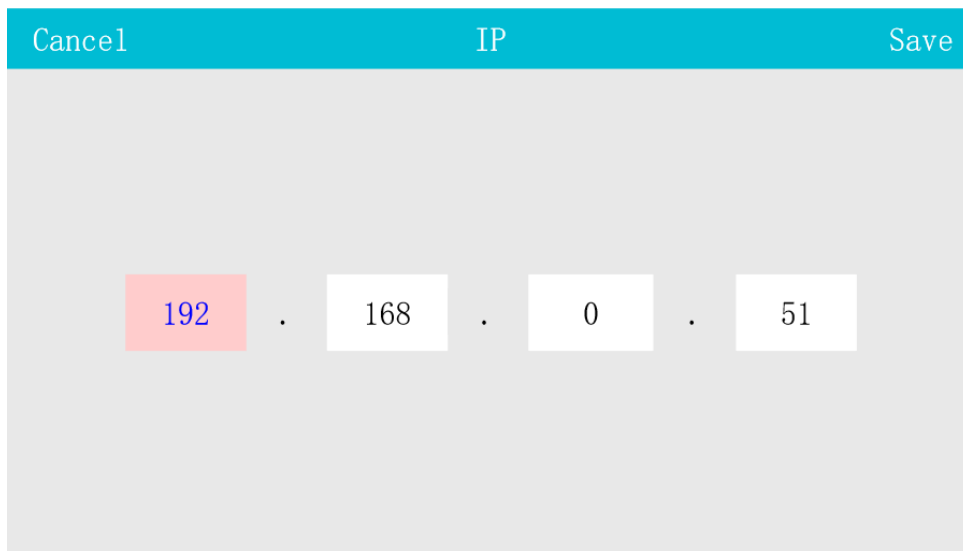


2. **Max Speed (mm/s):** the maximum speed allowed for single-axis movement. This value decides the max. Engraving speed and cutting speed.
3. **Corner Speed (Stop Speed) (mm/s):** the speed of start or stop during single-axis motion, i.e., the motion stops speed.
4. **Acceleration (mm/s²):** the Max acceleration of this axis, the bigger the acceleration, the shorter the work time, and the stronger jitter of motion.
5. **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.
6. **Max Range (mm):** maximum distance for axis can move.
7. **Backlash:** the allowance for machine to move in the reverse direction. It is used to compensate the cutting dislocation.
8. **Origin Offset:** after returning to zero, the axis moves in the reverse direction to offset the origin, the unit is mm.
9. **Direction Polarity:** when the motor cannot return to the original position, change the polarity to make it normal.
10. **Limit Polarity:** classified into positive and negative. When it is positive, the limit signal is active at high level; when it is negative, the limit signal is active at low level.
11. **Jog Polarity:** when the motion direction of the axis motor disaccords with the direction control buttons on the keyboard, you can change the polarity to make them consistent with each other.
12. **Limit Protection:** enable or disable detecting the axis limit switch. When it is opened and the limit switch is on, it will stop the motion.

13. **Pulse Edge Trigger (Reverse the polarity of the pulse):** Rising or falling edge. Depending on the drive settings, it is usually set the Rising edge. If the axis repeatedly moves, and there is always dislocation in one direction, and reverse the polarity of the pulse.

3.2.13 IP Settings

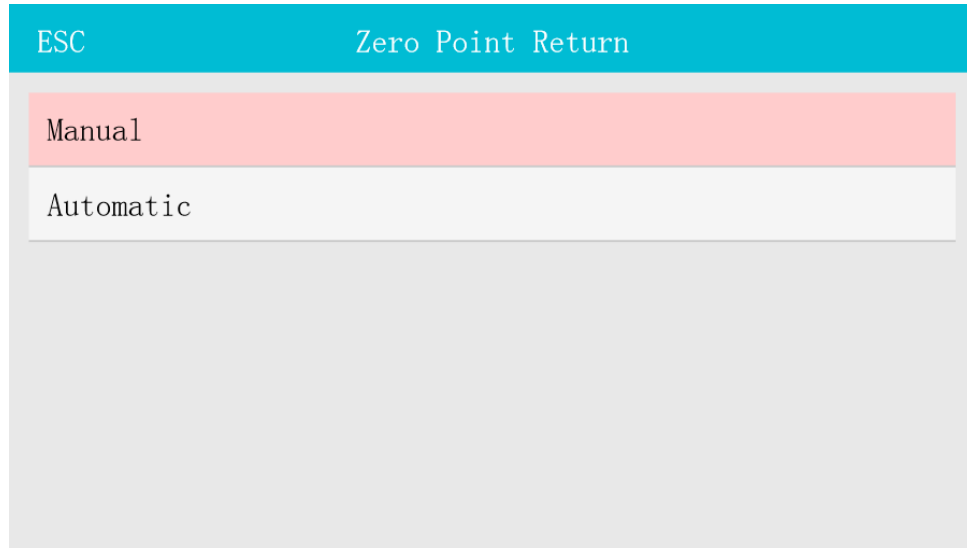
In the Menu interface, select the "IP", press "Enter" key to set the network IP address, but it requires to be on the same network segment as the computer. As shown below:



Cancel	IP	Save
192 . 168 . 0 . 51		

3.2.14 Zero Point Return Settings

In the Menu interface, choose "Zero Point Return" to enter, show as:



1. **Manual:** manually set single axis back to origin.
2. **Automatic:** set which axis goes back to origin after power up.

Press "Up/Down" key to select the needed operation, click on the "Enter" to set one axis back to origin, and "ESC" to quit.





Cancel	Automatic	Save
X Return to Zero	 Open 	
Y Return to Zero	 Open 	
Z Return to Zero	 Open 	
V Return to Zero	 Open 	
W Return to Zero	 Open 	
U Return to Zero	 Close 	

Cancel	Automatic	Save
ZVW Return at Last	 Close 	

When the parameters are set to Open, the axis automatically moves back to origin after machine powers up, and the coordinates will get back to zero. When close, the axis moves none, and the stop position will be the origin of axis. **ZVW Return at Last:** When the parameters are set to "Open", the ZVW axis starts resetting after the X, Y axis, which is generally used for the synchronous double model. Press "Enter" to save the setting, and click "ESC" to quit.

3.2.15 Equipment Settings

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



Cancel	Equipment Parameter		Save
Table Mode	<	General	>
Laser Config	<	Four Head 1	>
Equipment Type	<	Common	>
U Axis Option	<	Feeding	>
Feeding First	<	NO	>
Buzzer Setting	<	3	>

Cancel	Equipment Parameter		Save
Power Off Delay(ms)	<	700	>
Lubraicating Stroke(m)	<	0	>
Lubraication Time(s)	<	0	>
Two Head Spacing 1(mm)	<	100	>
Two Head Spacing 2(mm)	<	100	>
Two Head Spacing 3(mm)	<	100	>

1. **Table Mode:** 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 U axis, keep a table on the working position; and another one turn in there on the both sides of machine, so as to carry out the work without delay and further increase the work efficiency (The function is only available in those models with such part). After choosing double table model, and every time after the work is completed, the U axis will move for the set double platform distance once.
2. **Laser Config:** Three Heads 1, Three Heads 2, Fixed Three, Four Heads 1, Four Heads 2, Fixed Four.
 - Three Heads 1: a single-belt three-head mutual shift model.



- Three Heads 2 and three-end mutual shift model.
- Fixed Three: The three heads are not moved mutually by electric, but can only be moved manually. At this time, the X-axis format should be set to 1/3 of the machine format.
- Four Heads 1: a single-belt four-head mutual shift model.
- Four Heads 2: multi-belt four-end mutual shift model.
- Fixed Four: The four heads are not moved mutually by electric, but can only be moved manually. At this time, the X-axis format should be set to 1/4 of the machine format.

When shifting the model, you need to set the minimum distance between the two heads. The minimum distance between the two heads is the distance when the two laser heads are close together. The parameter "**Two Head Spacing 1 (mm)**" is to set the distance between laser 1 and laser 2, " "**Two Head Spacing 2 (mm)**" sets the spacing between laser 2 and laser 3, and "**Two Head Spacing 3 (mm)**" sets the spacing between laser 3 and laser 4. The maximum stroke of the X axis is set to the maximum width that the machine can process, and the maximum stroke of the Z, V, and W axis is set to the maximum stroke of the X axis minus 3 pitches.

3. **Equipment Type:** Common, Round (machine with wheel).
4. **U Axis Option:** Feeding for the feeding motor; Lifting, for platform lifting or auto focus.
5. **Feeding First:** indicates whether feeding action is needed before the laser machine starts cutting.
6. **Buzzer Setting:** press the "number" key to directly set the number of buzzers when the work is finished.
7. **Power Off Delay:** when the laser head is used for cutting after power off, the backstopping is insufficient, which results in the graphics interface is not closed. This parameter can be used to make appropriate compensation adjustment. The units are ms.
8. **Lubricating Stroke:** the distance traveled during lubrication. The units are m.
9. **Lubrication Time:** the continuous time of oil pump during lubrication. The units are s.

About Equipment Type:




- 1) When choose the **Round (machine with wheel)**, two parameters need to set: **Reference Diameter and Reference Resolution**. 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. The current diameter of the wheel and the exact resolution corresponding to the current wheel can be entered as the Reference Diameter and Reference Resolution.

Reference Resolution instructions:

- a. Menu/Equipment: set the Equipment to Round. The "Reference Diameter" and "Reference Resolution" are used as a pair of Reference Parameters.

Reference Diameter (mm)		100	
Reference Resolution		10	

- b. Reference Parameters

- ✓ Because cylindrical materials with different diameter, the range and the resolution of Y axis are different, the control card provides a Reference Diameter and Reference Resolution for convenience to calculate.
- ✓ After the reference diameter and reference resolution are 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.
- ✓ Set the laser max power low, to draw out one 50mm length line on the surface of material. Measure the real length of the line, 55mm etc. Go into the Menu/Axis set/Y Axis interface, set the resolution of Y Axis to reference resolution value. Press "Select" key and a window to calculate the resolution. Set the "Set Value" to 50, "Actual Value" to 55 in the resolution window. Press "Enter" key to calculate the right resolution. Then set the actually calculated resolution reference as Reference Resolution.
- ✓ Next time you replace the new material with different diameter, just set the "Diameter" parameter in Menu/Diameter interface. At this time, the Y axis



resolution automatically calculates the resolution and maximum range of the current object based on the reference diameter and reference resolution.

Diameter (mm)



100



Calculation Formula:

Real resolution of Y axis = Wheel Diameter / Reference Diameter * Reference Resolution

Real range of Y axis = Wheel Diameter * π

3.2.16 Laser Settings

In the Main Menu interface, choose "Laser" to enter, show as:

Cancel	Laser Parameter	Save
	Laser Type	< C02 >
	PWM Frequency (HZ)	< 20000 >
	Laser Min(%)	< 3 >
	Laser Max(%)	< 100 >
	PWM DIR	< Negative >
	X Compensation Mode 1	< Positive >

Cancel	Laser Parameter	Save
	X Direction Compensation 1(%)	< 0 >
	X Compensation Mode 2	< Positive >
	X Direction Compensation 2(%)	< 0 >
	X Compensation Mode 3	< Positive >
	X Direction Compensation 3(%)	< 0 >
	X Compensation Mode 4	< Positive >



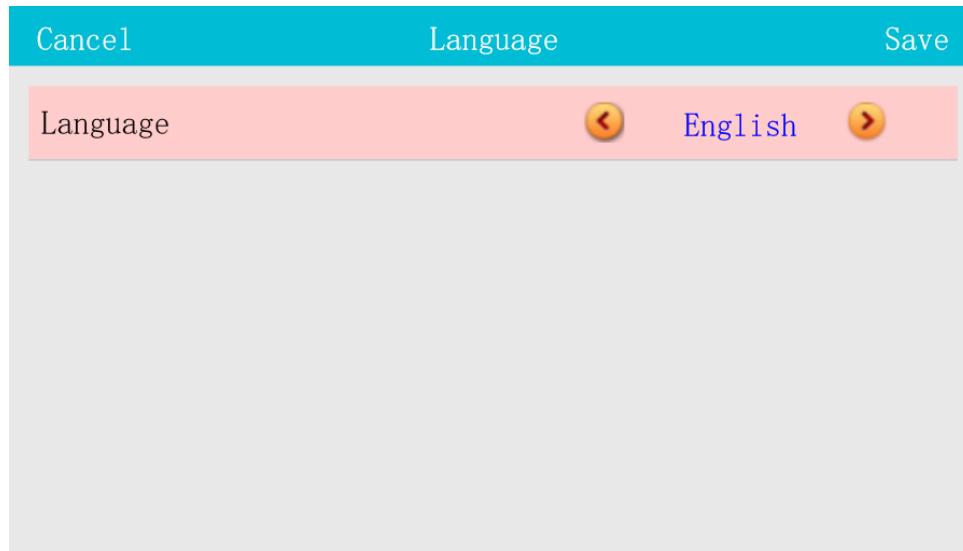
Cancel	Laser Parameter		Save
X Direction Compensation 4(%)	<	0	>
Y Compensation Mode 1	<	Positive	>
Y Direction Compensation 1(%)	<	0	>
On Delay(ms)	<	0	>
Off Delay(ms)	<	0	>
Focus Length(mm)	<	0	>

1. **Laser Type:** the common laser (CO2 glass tube), RF, and the RF (Pre-ignition). when the laser is one without pre-ignition, choose the laser type; when the laser is one with pre-ignition, choose the type of RF (pre-ignition) (Under such circumstance, as the control card is be in the standby state, it outputs a 1us pulse signal to the laser to make it pre-ignite.)
2. **PWM Frequency (HZ):** according to the laser Manual, set the laser tube PWM waveform frequency. Generally, 20000 for the CO2 tube and 5000 for the RF tube.
3. **Laser Min:** the minimum duty ratio of the PWM waveform. It is the minimum power when the laser light is OFF.
4. **Laser Max:** the maximum duty ratio of the PWM waveform. It is the rated maximum power of the laser. The range set: $0 \leq \text{the min duty ratio} \leq \text{the max duty ratio} \leq 100$. If the maximum duty ratio is equal to the minimum duty ratio, the light intensity is not adjustable.
5. **PWM DIR:** press "Select" to change the PWM DIR. If you found when you set power bigger, the intensity of laser beam is stronger. Then you should press "Select" to change the PWM DIR.
6. **Focus Length (mm):** press the "Number" keys to change the focus length. When this parameter is set, press decimal point "." in standby interface, a message box will pop up showing that focus length is reset. If press "Enter", the laser head will go down and be controlled by U Axis. When sensors are close to the material surface and reach the designated position, a signal is output to controller, then it controls the laser head move up to the focus position.

Attention: if laser type is RF or RF (Pre-ignition), set the PWM Frequency to 5000, Laser Max Duty Ratio to 95%, not to 100%, otherwise the laser would always be on or off.

3.2.17 Language

In the Main Menu interface, select "Language": switch between the displayed languages: Chinese, English, Traditional Chinese, Korean, Russian, Italian, Spanish, Portuguese, Vietnamese and etc.



3.2.18 Statistical Information

In Main Menu interface, select "Records" to view the statistical Information. Statistical Information includes: Time of Power On, Laser On Time, Total Work Time, Total Process Times, X Travel and Y Travel. On the statistics page, press the "CL" button on the panel and enter the password "12344321" to enter the delete statistics page. Press the up and down keys to select the option you want to delete. Then press the enter key to delete. Press the number "0" key to enter the same password and delete all the information with one click.



ESC	Records
1.Time of Power On:	0:00:00
2.Laser On Time:	0:00:00
3.Total Work Time:	0:00:00
4.Total Process Times:	0
5.X Total Travel:	0
6.Y Total Travel:	0

ESC	Records	OK
1.Clear Time of Power On		
2.Clear Laser On Time		
3.Clear Total Work Time		
4.Clear Process Times		
5.Clear X Travel		
6.Clear Y Travel		

3.3 System Settings

In Main Menu, select "System", and press "Enter" key to enter the system set interface.



ESC	Sytem
Version	V. L022. 004
System Upgade	
Administrator	
System Test	
Factory Data Reset	

1. **Version:** the version of control system.
2. **System Upgrade:** we support an update file for user to update their system. Before update, copy the update file TZD_L022.TFL into the U Disk, and insert the U Disk to Card. Select the "System Upgrade" item then press "Enter" key to upgrade your system. During the update, it is forbidden to cutting off the power.
3. **Administrator:** enter the administrator settings interface.
4. **System Test:** enter the system test interface.
5. **Factory Data Reset:** enter the password 12344321, can restore the factory parameter Settings.

3.3.1 Administrator

When entering the administrator interface, you need to enter the Admin password first. The default password is 00000000 (8 zeros). In the administrator interface, you can set lock of the system.

Steps for lock setting:

- Set the date and time of the system.
- Set the ID of the machine.
- Change the administrator password.
- Turn the Password Status "Open".
- In the First Lock Date, set the date to start the lock. For example, if set January 1st, 2021, when it reaches January 1st, 2021, it prompts to enter the 1st periodic password. Repeat

same operation for other passwords.

- In Password Times, set the times of periodic lock.
- In the Password Preview, checks whether the settings are correct.
- At the end, insert the USB flash drive and export the lock password.

Parameters Instruction:

1. **Time Set:** set the date and time.
2. **ID:** press "Number" key to set the equipment number for convenient management. When a USB is used for communication, the equipment number will be display on the software port. **The machine number is displayed when the password expires.**
3. **Administrator Password:** enter the Admin Password, and then you can modify it. If you need to set the lock, you need to change the Admin password. Otherwise, after locking the machine, you could also enter the system after entering the Admin password.
4. **Password Status:** when the time limit is set to "Open", the periodic passwords start working.
5. **First Lock Date:** The periodic password starts on the lock date, and the setting range is 1~31 days.
6. **Password Times:** set the times of periodic passwords, one period for one month.
7. **Password Preview:** shows the periodic passwords for the lock.
8. **Export Password:** insert a USB flash drive into the system and click Password Export. You can export the Periodic Passwords to a text file on the USB flash drive. The file name is the device ID.

The time base is subject to the time set by the system.

Note: 7 days before the system is locked, the system will prompt the remaining days of the lock to remind the user to unlock in time.



ESC	Administrator
Time Set	
ID	
Administrator Password	
Password Status	
Password Preview	
Export Password	

ESC	Administrator
Factory Data Backup	

3.3.2 System Test

Select "System Test", press “Enter” key to go into the interface, show as:



ESC	Sytem Test
I0 Input	
I0 Output	
TFRAM	
Clock	
SDRAM	
Flash	

ESC	I0 Input				
1.	<input checked="" type="checkbox"/>	2.	<input type="checkbox"/>	3.	<input type="checkbox"/>
4.	<input type="checkbox"/>	5.	<input type="checkbox"/>	6.	<input type="checkbox"/>
7.	<input type="checkbox"/>	8.	<input type="checkbox"/>	9.	<input type="checkbox"/>
10.	<input type="checkbox"/>	11.	<input type="checkbox"/>	12.	<input type="checkbox"/>
13.	<input type="checkbox"/>	14.	<input type="checkbox"/>	15.	<input type="checkbox"/>
16.	<input type="checkbox"/>	17.	<input type="checkbox"/>	18.	<input type="checkbox"/>
19.	<input type="checkbox"/>	20.	<input type="checkbox"/>		

ESC		IO Output									
1.	<input type="checkbox"/>	2.	<input type="checkbox"/>	3.	<input type="checkbox"/>	4.	<input type="checkbox"/>	5.	<input type="checkbox"/>	6.	<input type="checkbox"/>
7.	<input type="checkbox"/>	8.	<input type="checkbox"/>	9.	<input type="checkbox"/>	10.	<input type="checkbox"/>	11.	<input type="checkbox"/>	12.	<input type="checkbox"/>
13.	<input type="checkbox"/>	14.	<input type="checkbox"/>	15.	<input type="checkbox"/>	16.	<input type="checkbox"/>	17.	<input type="checkbox"/>	18.	<input type="checkbox"/>
19.	<input type="checkbox"/>	20.	<input type="checkbox"/>	21.	<input type="checkbox"/>	22.	<input type="checkbox"/>	23.	<input type="checkbox"/>	24.	<input type="checkbox"/>
25.	<input type="checkbox"/>	26.	<input type="checkbox"/>	27.	<input type="checkbox"/>	28.	<input checked="" type="checkbox"/>	29.	<input type="checkbox"/>	30.	<input checked="" type="checkbox"/>
31.	<input type="checkbox"/>	32.	<input checked="" type="checkbox"/>	33.	<input type="checkbox"/>	34.	<input checked="" type="checkbox"/>	35.	<input type="checkbox"/>	36.	<input type="checkbox"/>

1. **IO Input/Output Test:** corresponding to IO input/output test, when the pin is active at low level, it'll display from off to on. As shown in IN-1 above, press the number key on the output test interface to manually output the signal. For example, 1-9 corresponds to OUT1-9, 0 corresponds to OUT10. Press the "Select" key to switch between the 4 groups of output, which are 1-10, 11-20, 21-30, 31-40. After pressing the SELECT button, press the number button to output. Press the Enter key to test all outputs with one click.
2. After finishing the testing **TFRAM, Clock, SDRAM** and **Flash**, a dialog box will pop up to will show the result.
3. **Pin Description**

INPUT

Pin number	Description
INPUT1 = Lmt_Y-	Lmt_Y- Y origin limit, axis movement to the minimum coordinate (0) limit sensor input
INPUT2 = Lmt_Y+	Lmt_Y+Y upper limit, axis movement to the max coordinate limit sensor input
INPUT3 = Lmt_X-	Lmt_X- X origin limit, axis movement to the minimum coordinate (0) limit sensor input
INPUT4 = Lmt_X+	Lmt_X+X upper limit, axis movement to the max coordinate limit sensor input
INPUT5 = Lmt_Z-	Lmt_Z- Z origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT6 = Lmt_Z+	Lmt_Z+Z upper limit, axis movement to the max coordinate limit sensor input
INPUT7 = Lmt_U-	Lmt_U- U origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT8 = Lmt_U+	Lmt_U+ U upper limit, axis movement to the max coordinate limit sensor input
INPUT9= Lmt_V-	Lmt_V- V origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT10 = Lmt_V+	Lmt_V+ V upper limit, axis movement to the max coordinate limit sensor input
INPUT11 = Lmt_W-	Lmt_W- W origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT12 = Lmt_W+	Lmt_W+ W upper limit, axis movement to the max coordinate limit sensor input
INPUT13 = Lmt_A-	Lmt_A- A origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT14 = Lmt_A+	Lmt_A+ A upper limit, axis movement to the max coordinate limit sensor input
INPUT15 = Protection_SW	Protection_SW Protection signal input, connecting to cover protection and other signals
INPUT16 = Foot_SW	Foot_SW Foot switch signal input, active on the rising edge, with pulse width not less than 100ms

INPUT17 = WP1	WP1	Water protection 1 input, active at low level
INPUT18 = WP2	WP2	Water protection 2 input, active at low level
INPUT19 = WP3	WP3	Water protection 3 input, active at low level
INPUT20 = WP4	WP4	Water protection 4 input, active at low level

OUTPUT

Pin number	Description
OUT1 = Finish	Work completion signal, output 1" low pulse width after the work is completed
OUT2 = Feeding	Feeding signal, output when feeding, active at low level
OUT3 = Laser Status	Laser status signal, low output when the light is ON, and high output when the light is OFF
OUT4 = Nip Rolls	Press signal, for control of press roller of rotary cutter, active at low level
OUT5 = Press	Feeding/pressing signal, synchronous pressing signal at Y axis and U axis when feeding, active at low level
OUT6 = Status	Working status signal, output low level at work state, output high level at standby or pause state
OUT7 = Pen 1	Pen signal 1, for the pen signal of the asynchronous head 1, low output when dropping the pen, high output when lifting the pen
OUT8 = Wind	Blowing signal, active at low level
OUT9 = Pen 2	Pen signal 2, for the pen signal of the head 2, low output when dropping the pen, high output when lifting the pen
OUT10 = Pen 3	Pen signal 3, for the pen signal of the head 2, low output when dropping the pen, high output when lifting the pen
OUT11 = Pen 4	Pen signal 4, for the pen signal of the head 2, low output when dropping the pen, high output when lifting the pen
OUT12 = Lubrication signal	After setting the lubrication distance, when the accumulated working stroke reaches the lubricating distance, the lubrication signal will continue to be output during the movement, and the accumulated output time is the lubrication time.

OUT13 = X-PUL	PUL-driver	X Step pulse, connect to the PUL- of step motor
OUT14 = X-DIR	DIR-driver	X Direction signal, connect to the DIR- of step motor
OUT15 = Y-PUL	PUL-driver	Y Step pulse, connect to the PUL- of step motor
OUT16 = Y-DIR	DIR-driver	Y Direction signal, connect to the DIR- of step motor
OUT17 = Z-PUL	PUL-	Z Step pulse, connect to the PUL- of step motor driver
OUT18 = Z-DIR	DIR-driver	Z Direction signal, connect to the DIR- of step motor
OUT19 = U-PUL	PUL-driver	U Step pulse, connect to the PUL- of step motor
OUT20 = U-DIR	DIR-driver	U Direction signal, connect to the DIR- of step motor
OUT21 = V-PUL	PUL-driver	V Step pulse, connect to the PUL- of step motor
OUT22 = V-DIR	DIR-driver	V Direction signal, connect to the DIR- of step motor
OUT23 = W-PUL	PUL-driver	W Step pulse, connect to the PUL- of step motor
OUT24 = W-DIR	DIR-driver	W Direction signal, connect to the DIR- of step motor
OUT25 = A-PUL	PUL-driver	A Step pulse, connect to the PUL- of step motor
OUT26 = A-DIR	DIR-driver	A Direction signal, connect to the DIR- of step motor
OUT27 = LPWM1	LPWM1	Be used to control the laser 1 power
OUT28 = L-ON1	LON1	Laser 1 enable control
OUT29 = LPWM2	LPWM2	Be used to control the laser 2 power
OUT30 = L-ON2	LON2	Laser 2 enable control
OUT31 = LPWM3	LPWM3	Be used to control the laser 3 power
OUT32 = L-ON3	LON3	Laser 3 enable control
OUT33 = LPWM4	LPWM4	Be used to control the laser 4 power
OUT34 = L-ON4	LON4	Laser 4 enable control

Part IV The Frequently Asked Question

4.1 Power-on Reset Question

1. Q: The system does not reset, buttons have no response, and LCD doesn't display.

A: The system reset error.

- Check whether the 24V power supply is normal.
- Remove all the wiring of the Main Board, except the power supply. Power on and check whether it can enter the homing interface.
- If it can enter homing interface, the Main Board is short-circuited, causing abnormal power supply and test wiring.
- If it cannot enter the homing interface, the main board is damaged.

2. Q: After powering on, the X axis and Y axis don't move, the LCD displays the main interface, but the axis can be manually moved.

A: The power back to origin error. Go into the "Zero Point Return Set" interface, set the X, Y axis as Opening. Or the Limit Polarity goes wrong, or the limit switch is damaged.

3. Q: After powering on, the X, Y axis returns the origin, the LCD still shows "system initialization".

A: The power back to origin error. Go into the "Zero Point Return Set" interface, set the U axis as Close.

4. Q: after powering on, X, Y axis slow-move a short distance, but cannot reach to the limit point or complete the reset.

A: The Limit Polarity error. Go into the "Limit Polarity" interface, and change the X, Y polarity.

5. Q: after powering on, X, Y move to the opposite direction of limit switch,

A: The direction polarity error. Go into the "Direction Polarity" interface, change the X, Y polarity.

6. Q: press directional button for moving, but X, Y moving to the opposite direction against the button.

A: The button polarity error. Go into the "Jog Polarity" interface, and change the X, Y polarity.

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

A: The regression point setting error. Go into the "Return Point" interface, set the regression

point as mechanism origin point.

4.2 The Laser Light Question

1. Q: The light lasts on for a long time after powering on.

A: View how the enable signal of laser power is wired

2. Q: When the light power intensity is big, the light turns out to be few; when the light power intensity is small, the light turns out to be more.

A: The PWM polarity setting error. Go into the laser parameter setting interface, changes the PWM polarity.

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

A: Check the laser power supply model, whether it's controlled by 5V rather 3.3V.

4. Q: Water protection is invalid.

A: Please check whether the water protection directly shorted. If not, please send it back to us for hardware testing.

4.3 The PC Connection Question

The Questions:

1. When reading the parameters, cannot open the port.
2. Cannot read the parameters.
3. Transfer the file invalid.

The Solutions:

1. Check whether the USB line is connected correctly. Check whether the USB port is connected the PC.
2. Check whether the USB driver is installed correctly, reload the driver.
3. Whether output port shown in the software is the current device number. If the device number is 00000000 while the port displayed in the software is TL_00000000.
4. If there are multiple machines connected to one computer, various machines are respectively numbered for easy distinction.
5. Change to another USB port on your computer for connection.
6. Restart the computer, to ground the equipment and the computer.
7. Replace a computer.

4.4 The Reading and Writing of U Disk Question

1. Q: Click the U disk file, showing "U disk is empty or error".

A: U disk error.

First, check whether the U disk port is correct.

Second, format the U disk into one of the FAT 32 type;

Third, change to another type of U disk

2. Q: Click the U disk file, showing "U disk reading...please wait", and the indicator is off.

A: Replace the U disk extension line.

5.5 Ineffective water protection and over-range issues

1. Click to start the job, and it displays "The Laser 1 protection is alarm"

Answer: Water protection is invalid.

(1) Check the laser output port to see if the WP and GND are connected to the laser water cooling device interface correctly;

(2) The water cooling protection detection is turned off, and in the user parameters, set the "Laser Protection" to close.

2. Display "Outrange, whether to continue?"

Answer: beyond the range.

(1) Set the Autolaser range parameters according to the worktable size, set the required processing positioning method, and check whether the graphic size exceeds the maximum XY stroke;

(2) The processing starting point is improper, press the positioning key again at the appropriate position.