

User's Manual for TL-A3S 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

Welcome to use the laser engraving control system of our company!

The system is the laser engraving and cutting control system with 3 axes and 1 laser.

The main features of the Control System:

- Power supply of DC24V/2A;
- Use high-performance 32-Bit floating point ARM, 128M Flash, 512K RAM, 3 general outputs, 9 general inputs, TTL electrical level;
- Equipped with 4.3", 480×272 LCD;
- Support 3 axes motor control (X, Y axis used for horizontal motion, Z axis used for rotary cutter lift or synchronous double-head movement (double-head bidirectional movement model) , U axis for feeding or platform lift; Z/U axis is multiplexed port; motor shaft pulse frequency can be as high as 166KHz;
- Adopt 7-segment S-shape acceleration and deceleration and adaptive speed planning algorithm, and support speed parameter setting and small circle speed limit with one button; different cutting parameters available for different graphics; support backlash compensation;
- Support 1 laser 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 USB communication to computer, support reading and writing of U disk;
- Support 100Mbps network transmission rate;
- Support real-time clock, machine lock;
- Support rotary cutting, marked-positioning cutting, rotating cutting height compensation, pressure feeding roller control;
- Support track preview, continuous engraving after power off, real-time correction of power light intensity and speed during work, rotary engraving, switching of 2 platforms, split feeding, pressure feeding, automatic blowing, auto focus, foot switch, safety protection, upgrade, processing statistical information and other functions;
- 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°C.

Work temperature: 5-40°C.

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

1.4 Power Supply and Grounding

1.4.1 Power Supply Requirements

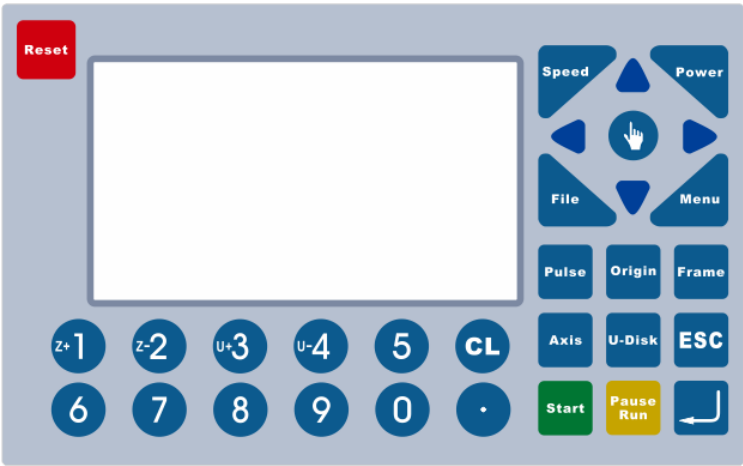
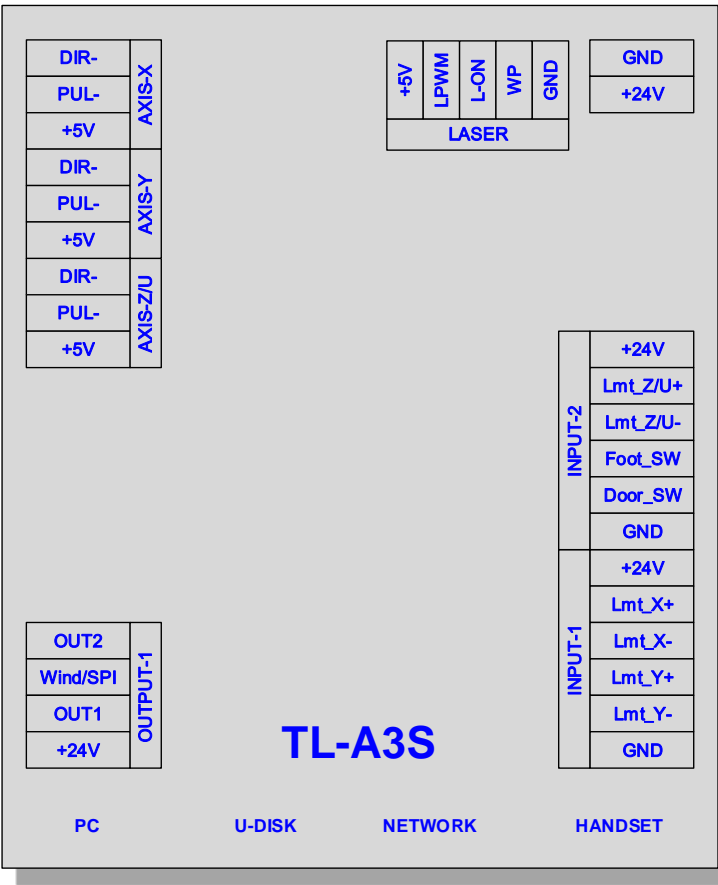
Power: DC24V/2A.

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 20 meters, the cross-sectional area of the wire cable is larger than 1.0 mm².

1.5 Accessory List

The Laser Engraving Control System TL-A3S contained the accessories as below:

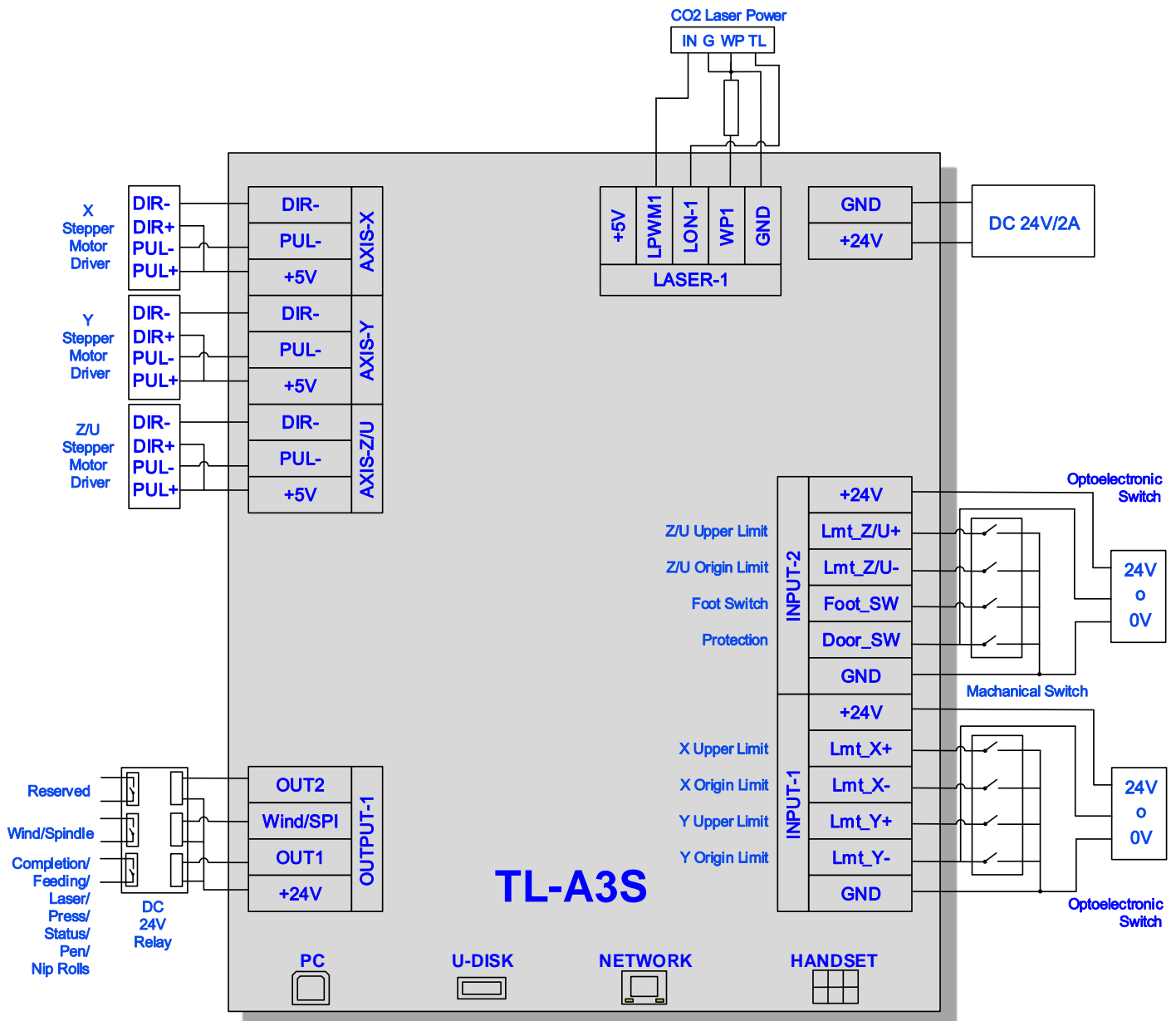
Name	Qty	Introduction	Photo
Operation panel	1	For user operation	
Controller	1	The Motion Control Card	



Connection cable/USB communication cable	3	<p>1. Panel Connection cable for connecting controller and panel</p> <p>2. USB communication cable for connecting controller and PC</p> <p>3. USB communication extended cable</p>	  
Crossover Ethernet cable/ Switching cable	2	<p>For the direct communication between controller and computer</p>	 

Part II Wiring Installation Instruction

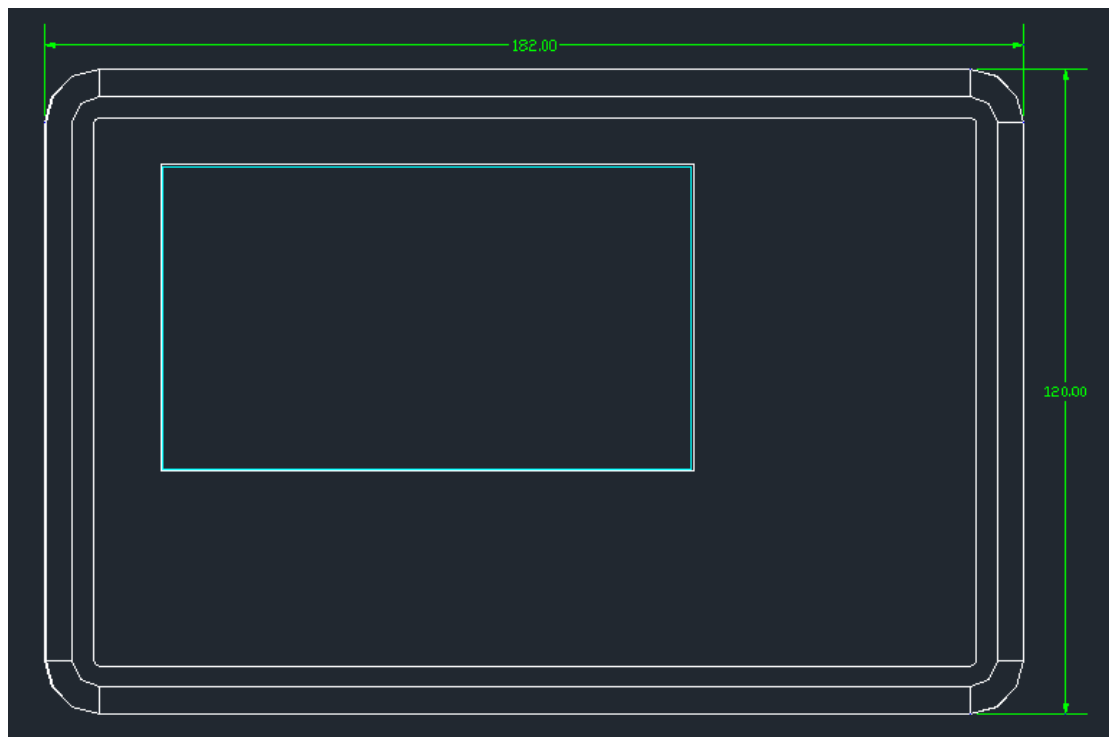
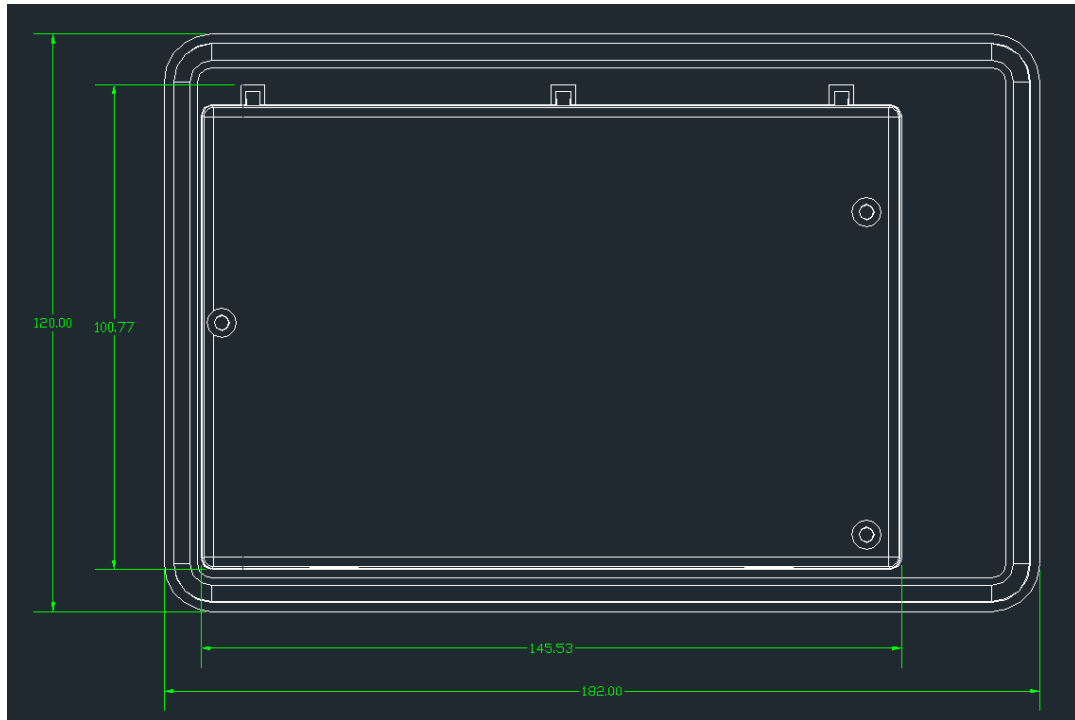
2.1 System Wiring Diagram



2.2 Installation Dimension

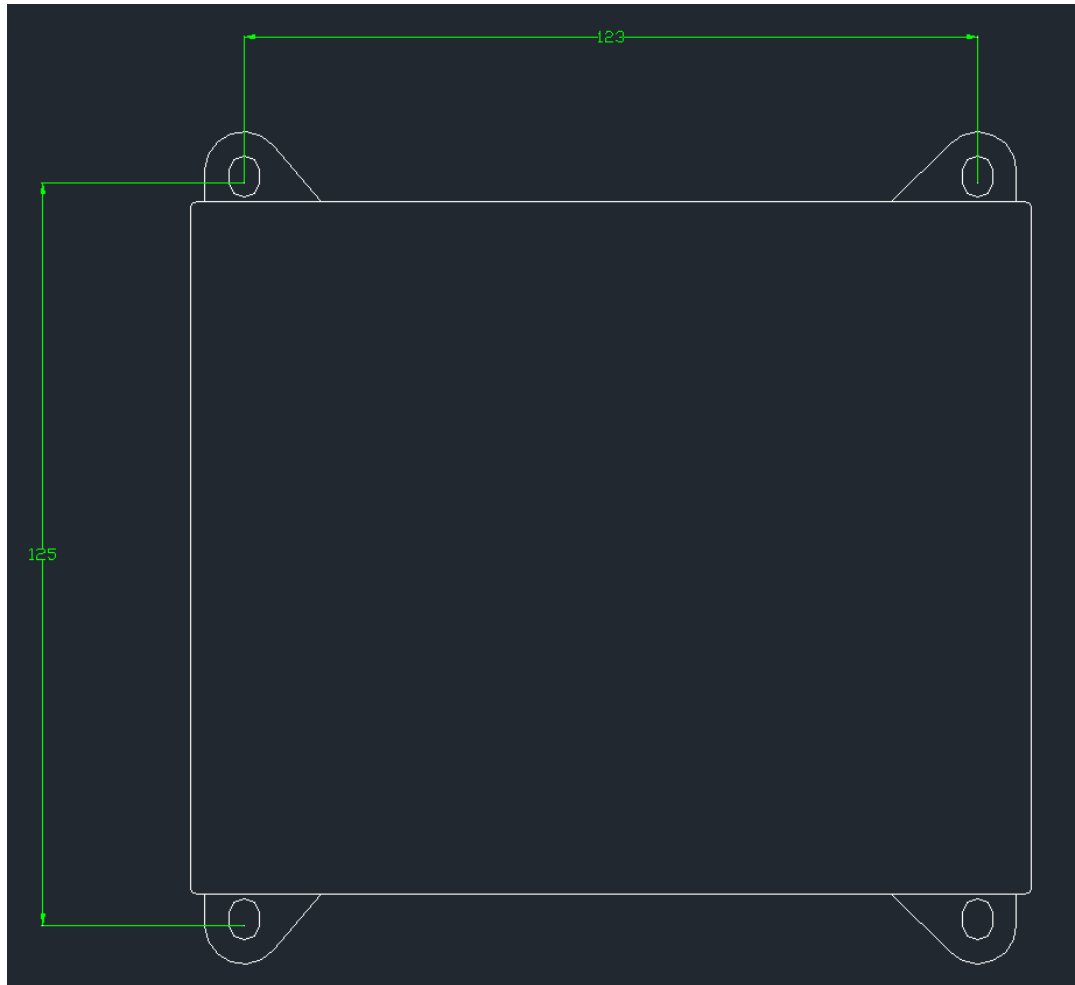
2.2.1 Panel

Note: the unit is mm.



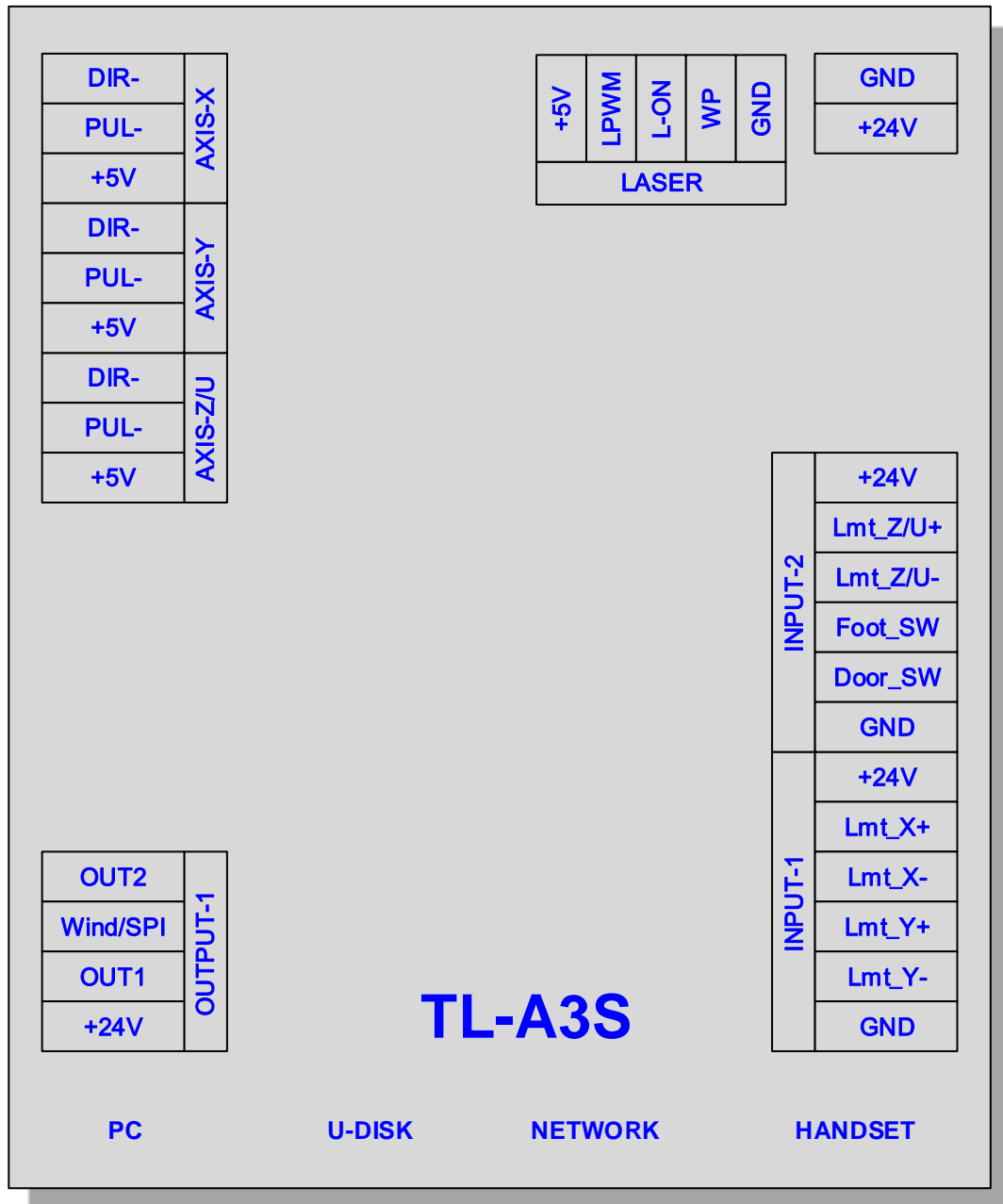
2.2.2 Main board

Note: the unit is mm.



2.3 Wiring Instruction

2.3.1 Interface Diagram

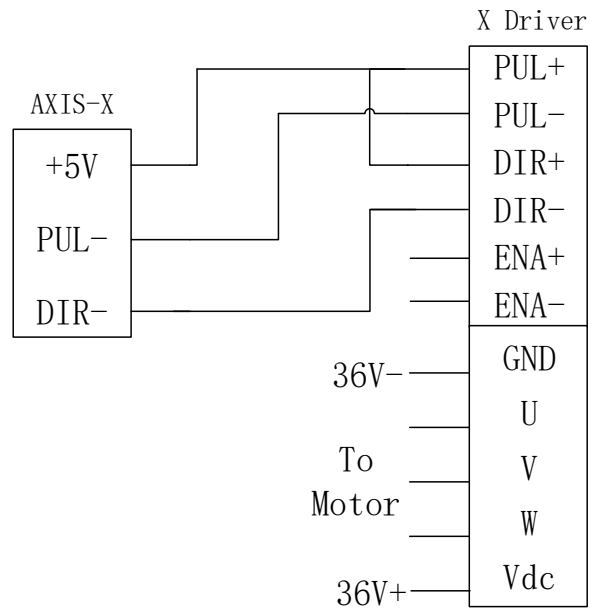


2.3.2 Wiring Diagram

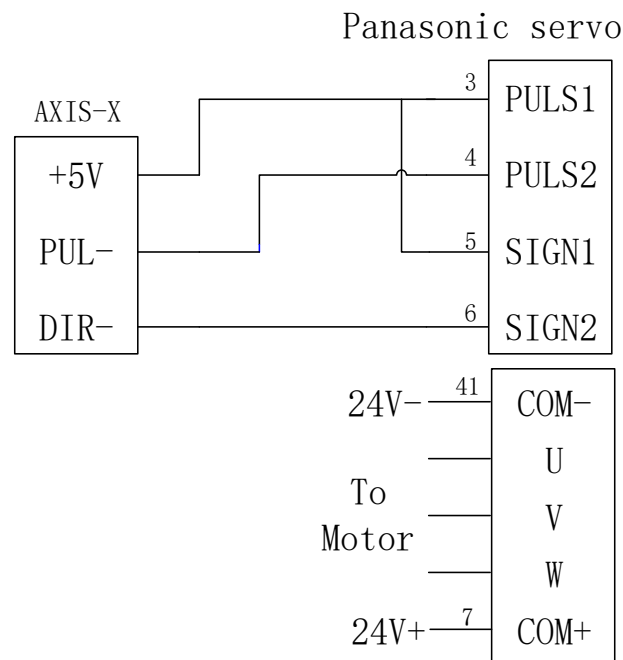
2.3.2.1 Motor Wiring

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

1. Step Motor Wiring

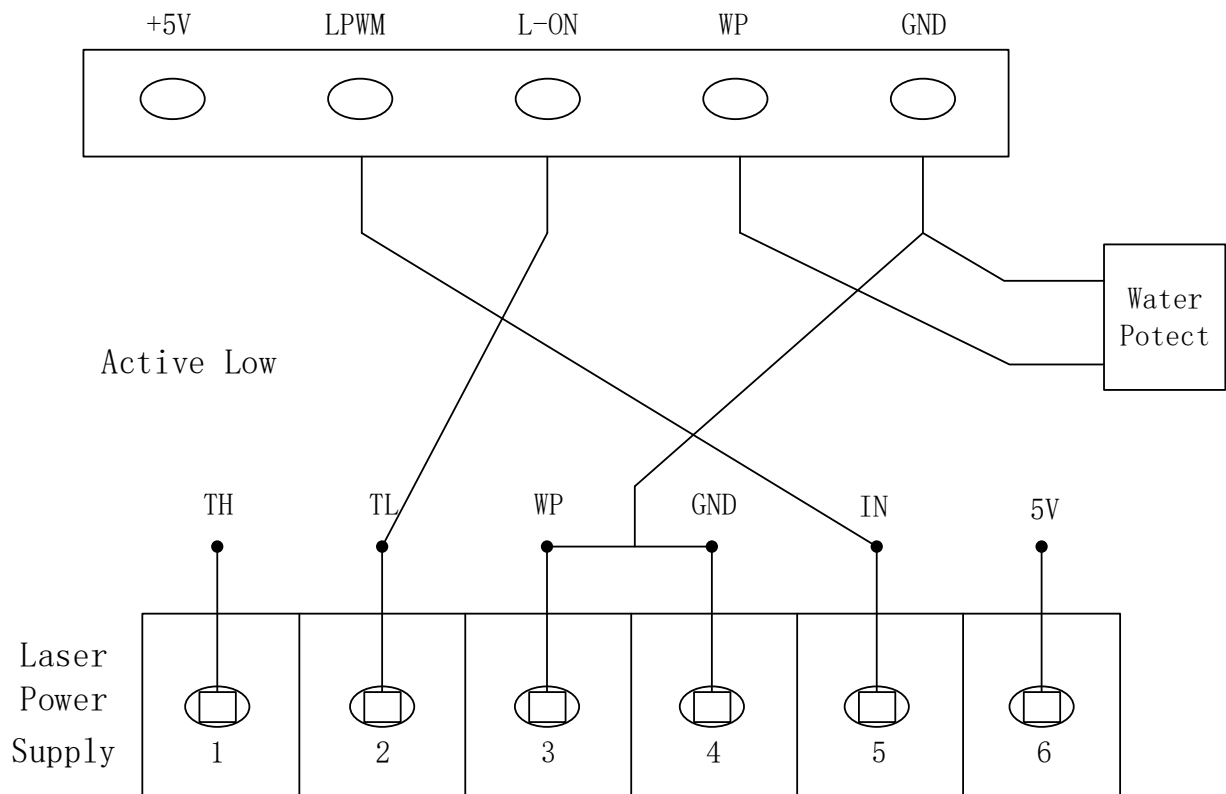


2. Panasonic Servo Wiring

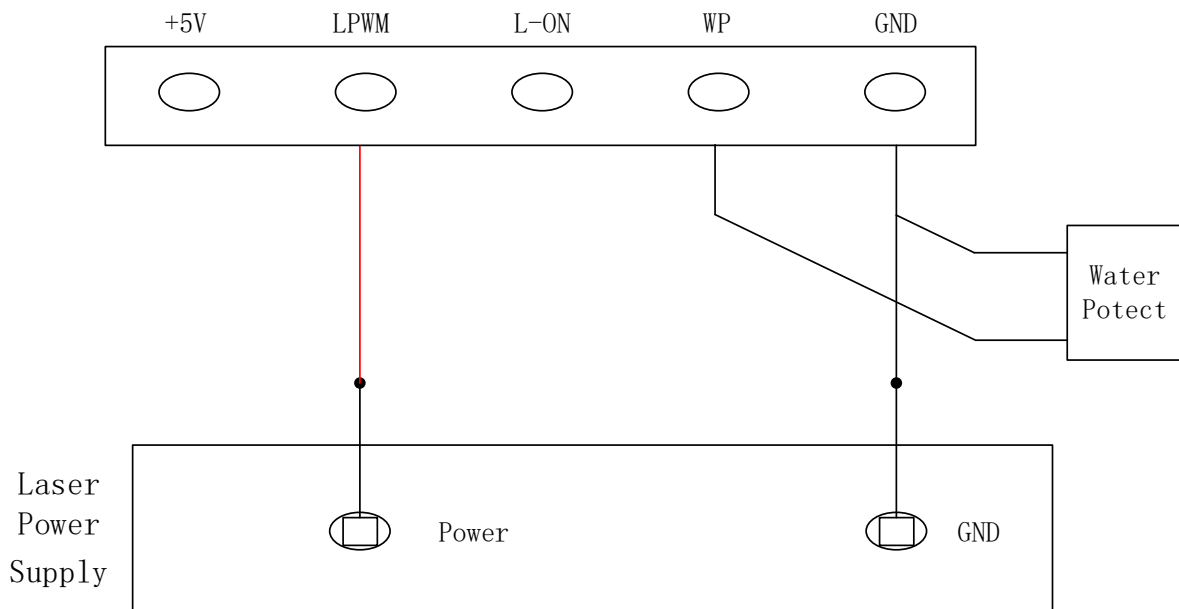


2.3.2.2 Laser Power Supply Wiring

1. CO2 Laser Power Supply Wiring



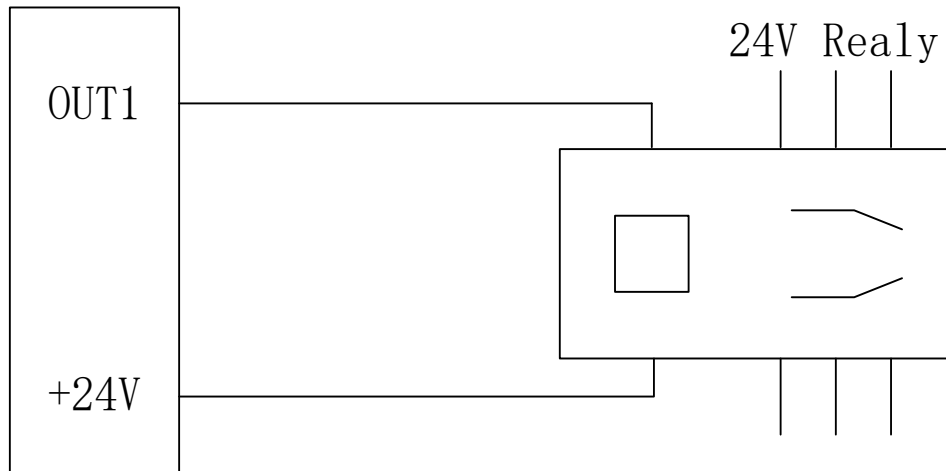
2. RF Laser Wiring



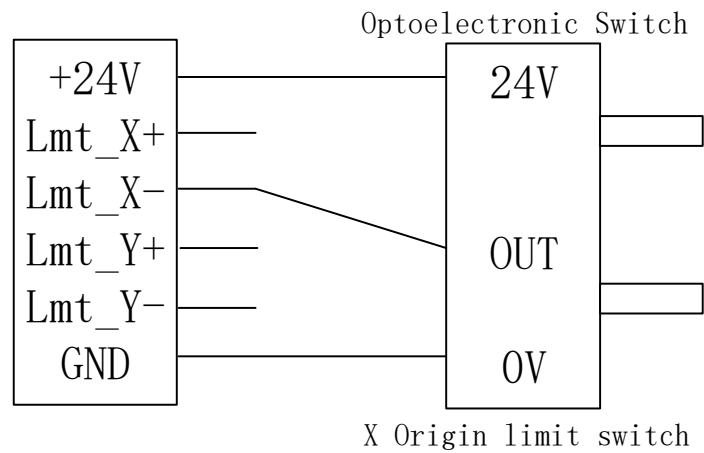
Note: When "RF or RF (Tickle)" is selected, please set the PWM Frequency according to the data sheet of the laser. Generally, PWM Frequency is 5000Hz. And set the Laser Max parameter not larger than 95%, especially not to set as 100%, otherwise it works improperly.

2.3.2.3 General Output Signal Wiring Diagram

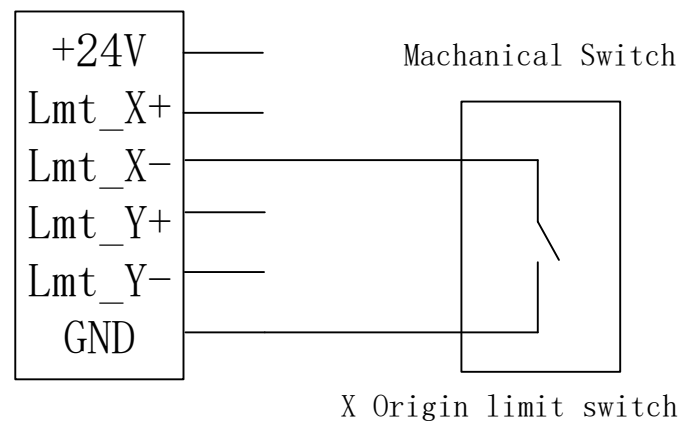
The following is OUT1 wiring, others are similar.



2.3.2.4 Input Wiring



NPN Optoelectronic Switch



Mechanical Switch

Other inputs are similar.

2.4 Interface Instruction

2.4.1 Power Signal

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

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

2.4.2 PC Connection Port

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

2.4.3 U-DISK Port

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

2.4.4 NETWORK Port

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

2.4.5 HANDSET Port

Label HANDSET. Connect Panel

2.4.6 Motor Axis Interface

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

- X: X axis motor
- Y: Y axis motor
- Z: lift motor of rotary cutting; or bidirectional laser motor in case of a double-head bidirectional mode
- U: Feeding motor or lifting motor

Note: The Z/U axis port is a multiplexed port. To change it, set the “Z/U Option” parameter in “Equipment Parameters”.

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

2.4.7 Laser Power Interface

The panel has 1 laser interfaces

- LASER: interface of LASER

Interface Instruction

Pin	Definition
1	+5V DC5V Output
2	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
3	L-ON Laser enable control. When the laser is CO2 laser, used to control laser On/Off
4	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)
5	GND Power source grounding (Output)

2.4.8 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

OUTPUT-1

Pin	Definition
1	OUT2 Reserved
2	Wind/SPI Blowing signal or spindle signal, the signal is multiplex, used for the blowing signal in case of a normal model; used as start and stop signal for the spindle motor in case of rotary cutting model, active at low level
3	OUT1 A generic output signal that defines its function in software: Completion Work completion signal, output 300ms low pulse width after the work is completed Feeding Feeding signal, output when feeding, active at low level Laser Laser on signal, output when laser on



	Press	Feeding/pressing signal, synchronous pressing signal at Y axis and U axis when feeding, active at low level
	Work Status	Working status signal, output low level at work state, output high level at standby or pause state
	Pen	Output low electrical level when dropping the pen, output high electrical level when lifting the pen
	Nip Rolls	For rotary cutting head, used for control of press feeding roller, active at low
4	+24V	DC24V Output

2.4.9 Input Interface

INPUT-1

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

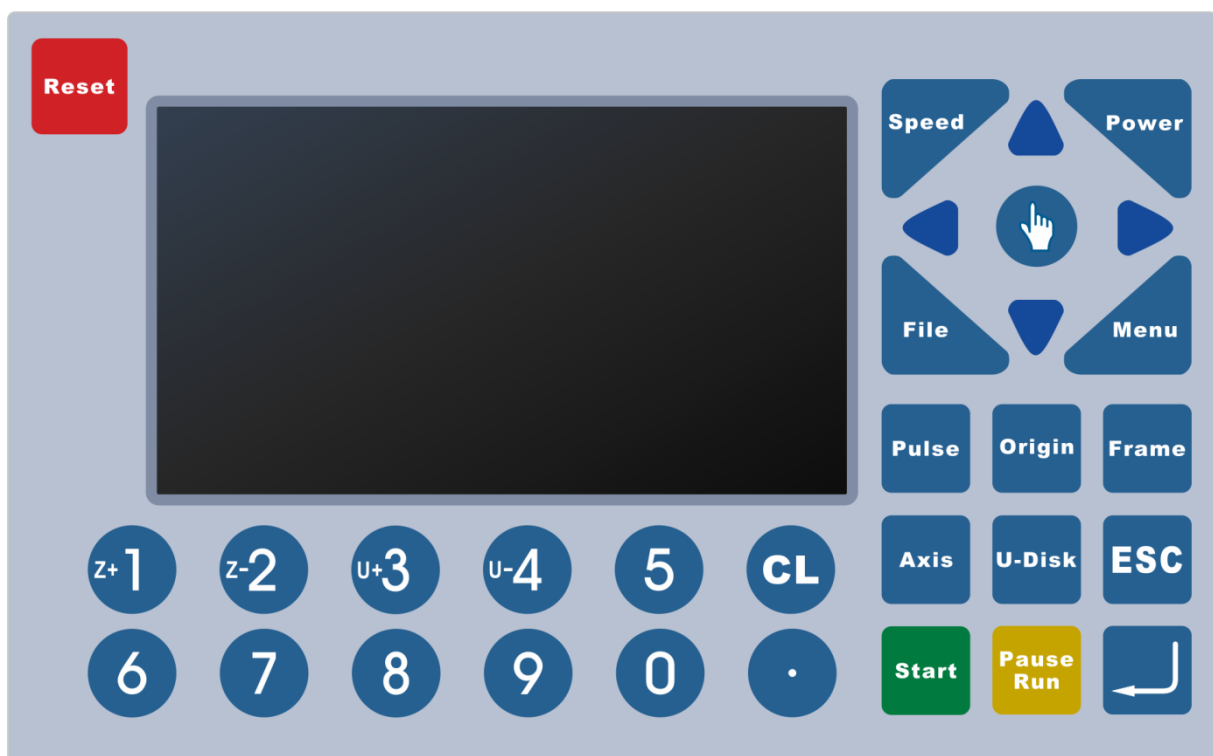
INPUT-2

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




Part III The Operation Panel

3.1 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.



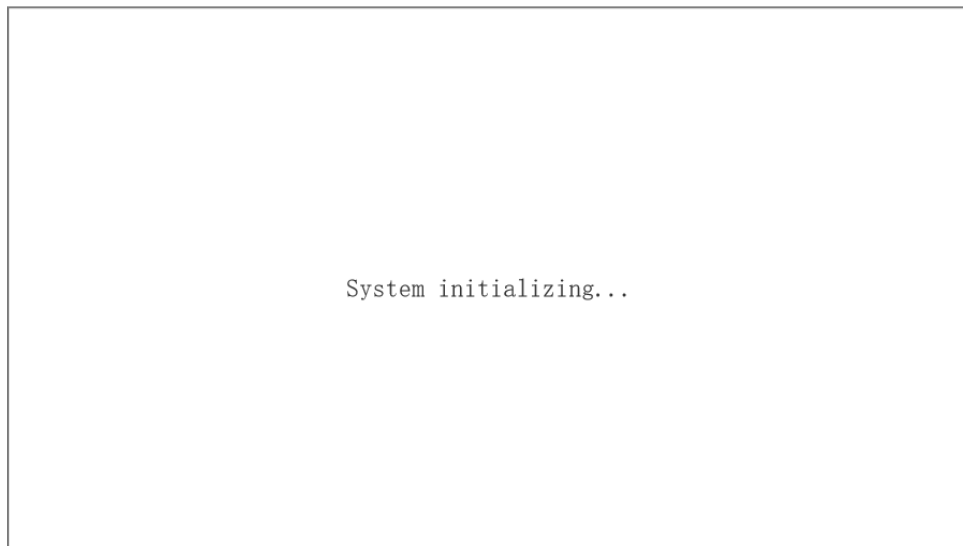
4.  "Menu" Key: press the key and go into the main menu interface.
5.  "File" Key: go into the memory file selection interface.
6.  "U-Disk" Key: go into the U disk file selection interface.
7.  "Frame" A: the range previewed interface.
8.  "Pulse" Key: use to test. Press one time, light one time. It 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.
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.  On the standby screen, press this number to enter the I/O output test screen
21.  Direction key, used to move the X, Y axis, in the other interfaces, used to move the curse to choose menu.
22.  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 Interfaces

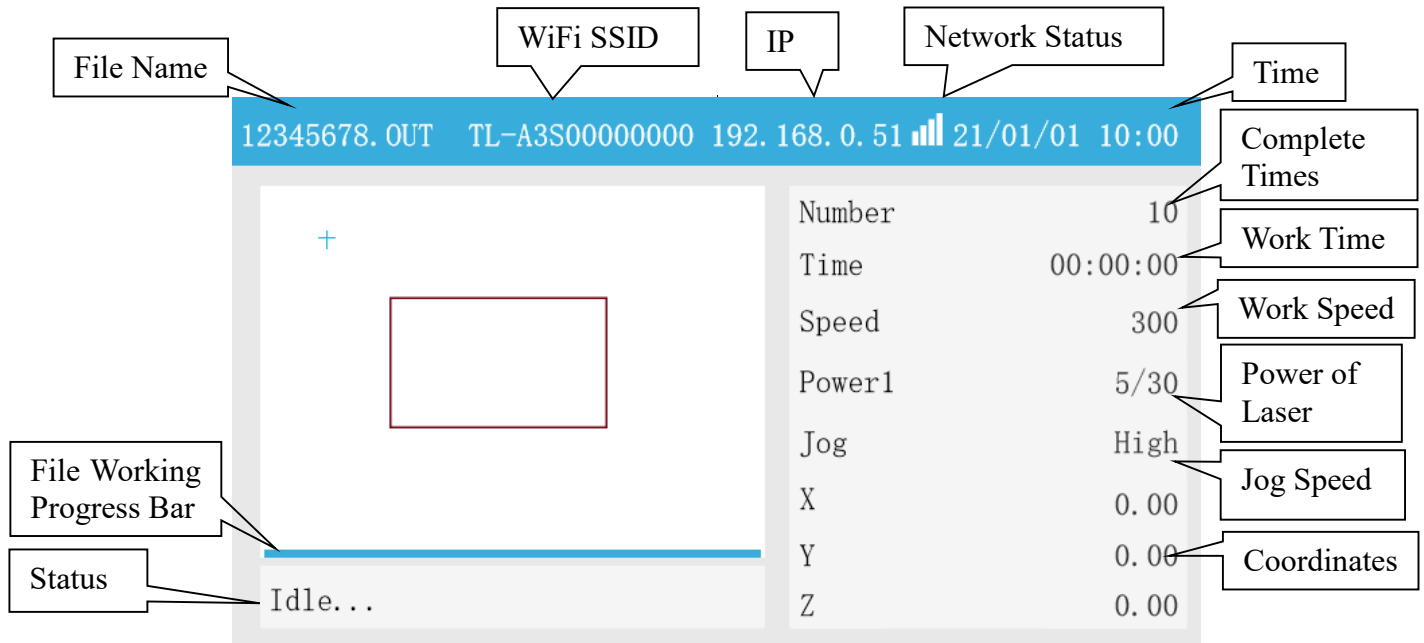
3.2.1 System Initialization Interface

The system initialization 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, WiFi SSID, IP Address, network status, the date and time. The white area shows the preview of the selected file. And at the bottom left of the interface, it shows the machine status. 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, working time, speed, power of the file, the speed of jog, 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.

Time: the work time.

Speed: the working speed.




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

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

X, Y, Z/U: the coordinate in the current place in X axis, Y axis, Z axis and U axis.

Notes:

- When the Z/U option parameter is set as Z Axis, displays the coordinates of Z axis, otherwise, it displays U.

- 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 status, when the processing file is selected, press  to clear the number of completions of the current file.
- When the machine has autofocus, it can be set through the lifting the U-axis control platform (or cutting head), and the focal length is set in the laser parameters, press  to perform autofocus.
- Press number key "6" to start the positioned cutting with the camera software.
- For the rotary cutting model press the key "5" to enter the interface of tool setting test, press key "7" to display the control interface of the rotary cutter, press key "9" to record the completion/stop position on Z axis, press key "0" to automatically set the tool and press  to manually set the tool.

3.2.3 Speed Settings

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



Cancel	Parameter	Save
	Layer Paramter	1
	Work Speed (mm/s)	400
	Idle Speed (mm/s)	400
	Speed Factor	2
	Speed Mode	Normal

1. **Layer Parameter:** when one file is selected, press "select" button, to choose the layer number.
2. **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.
3. **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.
4. **Speed Factor:** it is applied to improve the smoothness of movement. The range is 0.00-3.00. 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.
5. **Speed Mode:** under the same speed coefficient, the turning speed is divided into normal and fast speed modes. In the normal mode, the jitter and impact of the machine are reduced, and the machining effect is good when turning smoothly, but the machining time is increased. In the fast mode, the machine turns quickly, jitter 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 ▶	

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%.

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 (%)	◀	7	▶
Power Max1 (%)	◀	25	▶

1. **Laser On:** two range preview modes, one is for cutting range; the other for the running scale. Change the two preview modes by pressing the "Select", select "Yes" to cutting range, and select "No" to running scale to view the working range. Press OK to perform the operation after selection.
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	▶
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, 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.

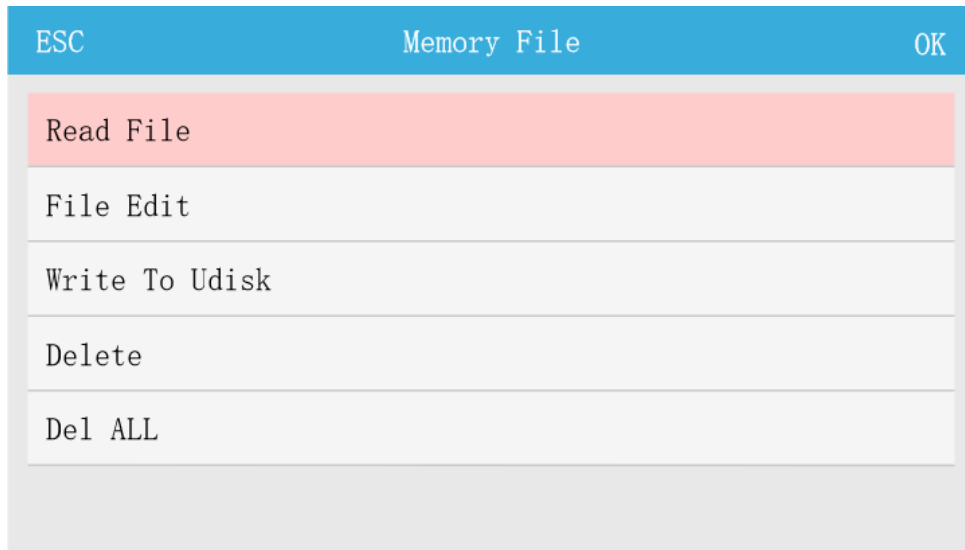
Press "Down/Up" to view the file, press "Select" key to find the current file, press "ESC" to quit.

Press "Enter" to operate, show as:

1. **Reading 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 On Delay to 0.05, and On Light Power to 0. Laser On/Off Delay: the unit is second.



Cancel	Layer Parameter	OK
	Layer Parameter ◀ 1 ▶	
	If Open Air ◀ Yes ▶	
	Power Min1 (%) ◀ 0 ▶	
	Power Max1 (%) ◀ 6 ▶	
	Work Speed (mm/s) ◀ 300 ▶	
	Idle Speed (mm/s) ◀ 300 ▶	

Cancel	Layer Parameter	OK
	Open Deelay ◀ 0 ▶	
	Close Delay ◀ 0 ▶	
	Drill Power (%) ◀ 0 ▶	

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

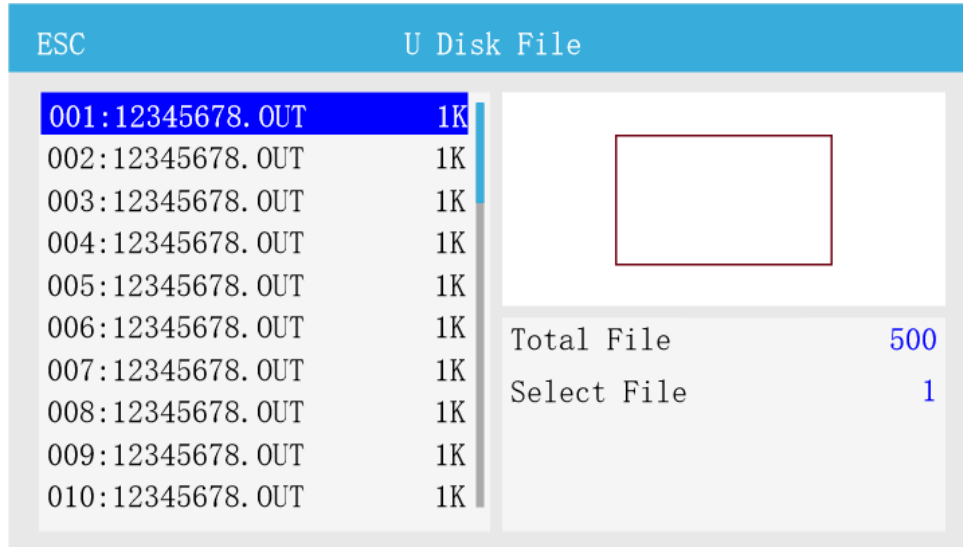


Cancel	File Parameter	OK
Work Start Position	◀ Septpoint ▶	
Rows	◀ 1 ▶	
Columns	◀ 1 ▶	
Rows Space	◀ 100 ▶	
Columns Space	◀ 100 ▶	
Feeding Times	◀ 0 ▶	

Cancel	File Parameter	OK
Feeding Length	◀ 0 ▶	

3.2.8 U Disk File

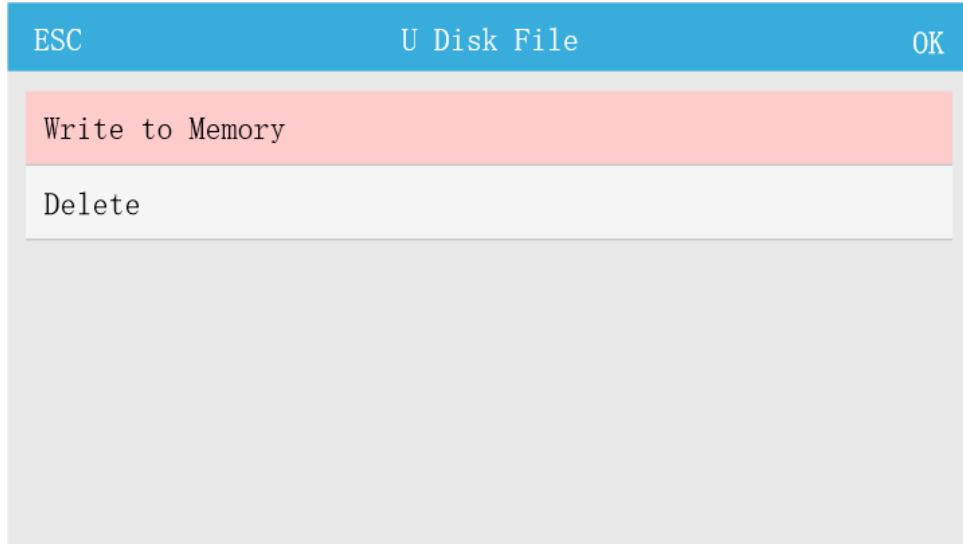
Press "Menu" key into the main menu, and select the U Disk file. Also can directly press "U Disk" to enter, show as:



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:

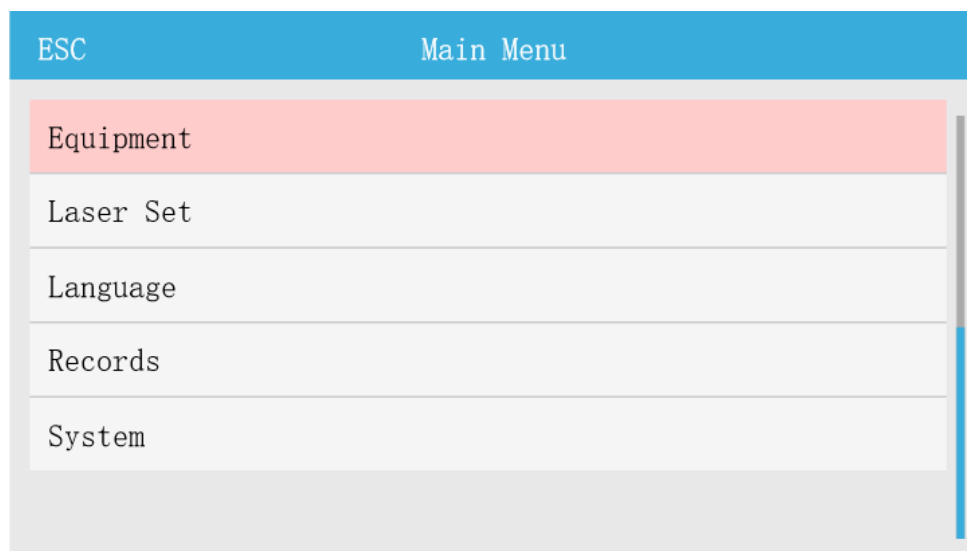
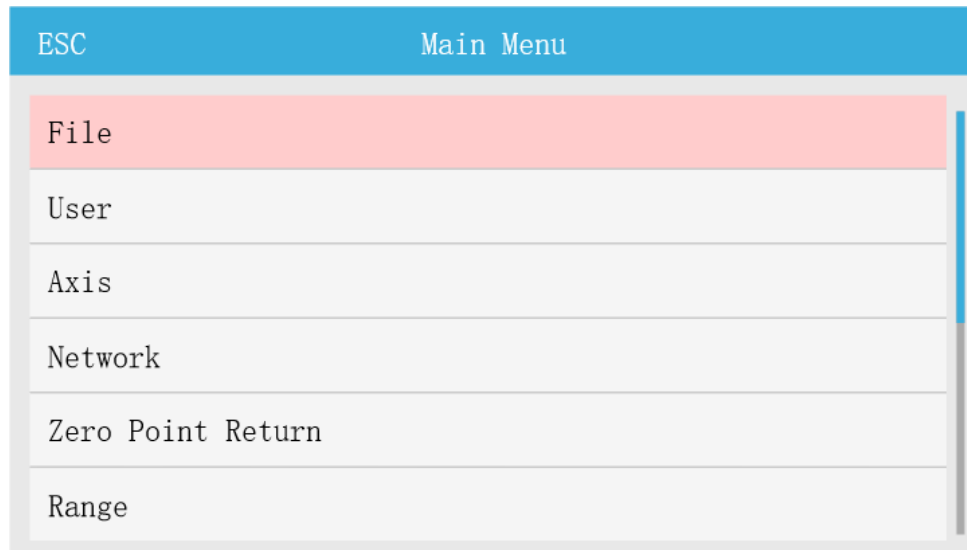


1. **Write to Memory:** copy file from U Disk to control card.
2. **Delete:** delete the current file.

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

3.2.9 The Main Menu Settings

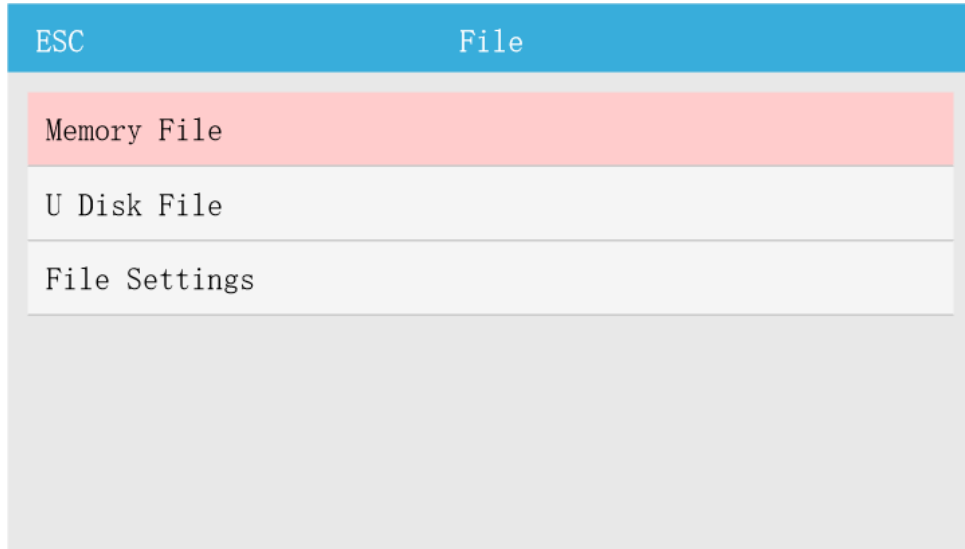
Press "Menu" into the main menu, show as:



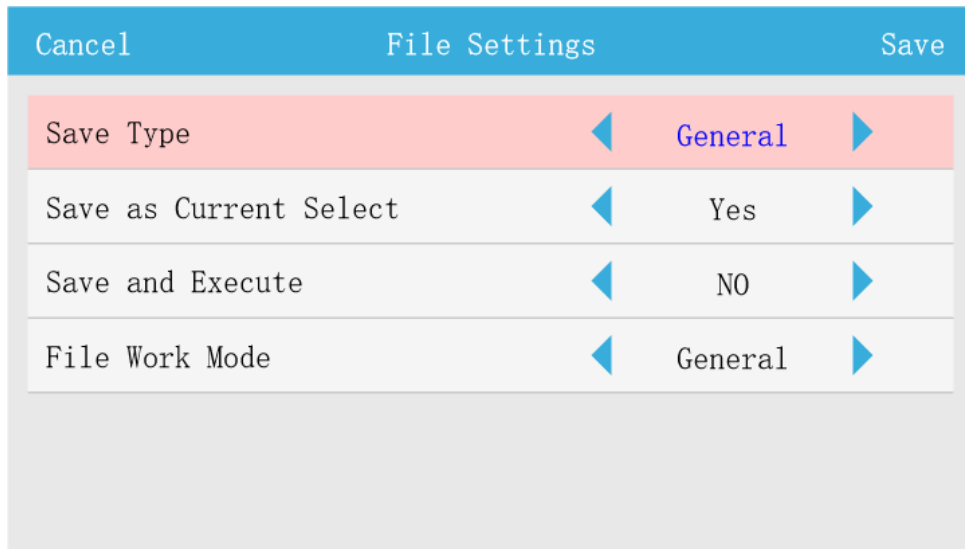
Press the "Up/Down/Left/Right" key to choose the needed setting, Press "Enter" to go in to the current operation interface.

3.2.10 File Settings

After starting, press "Menu/File" into 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 directly in the system.
3. **Save and Execute:** once a file is finish downloading it will be executed.
4. **File Work Mode:** General or Cyc. Cyc 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)	◀ 80 ▶	
Pulse Time (ms)	◀ 500 ▶	
Feeding Delay (ms)	◀ 500 ▶	
Min Acc (mm/s ²)	◀ 400 ▶	
Defaul Idle Speed (mm/s)	◀ 400 ▶	
Idle Acc (mm/s ²)	◀ 1200 ▶	



Cancel	User	Save
Idle Jerk (mm/s ³)	◀ 60000 ▶	
Idle Delay (ms)	◀ 0 ▶	
Water Protection	◀ Close ▶	
Pulse Blowing	◀ Close ▶	
Display Track	◀ Open ▶	
Homing Protection	◀ Close ▶	

Cancel	User	Save
Speed Limit Mode	◀ Work Speed ▶	
Restore Work Enable	◀ Open ▶	
Process Times Alarm	◀ Close ▶	
Prosess Times Homing	◀ Close ▶	

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 Open, 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 the system is reset or the work is finishing. Origin, None, Set Point. Select "None" to stop at the work completion 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 it is Jog Step Distance, press the key to move the axis with the distance set.
5. **Jog Step Distance:** when the "Jog Continue Mode" is Open, the "UP/Down/Left/Right"

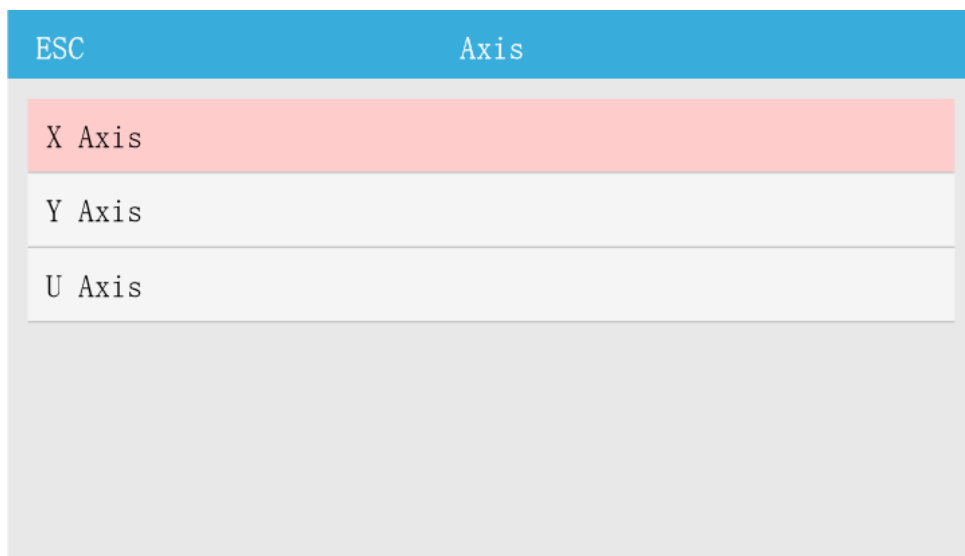
arrow key to move the axis with the distance set by the Jog step Distance. Note: the unit is mm.

6. **Jog Speed(mm/s):** set the inching speed of the key in mm/s.
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:** when the automatic feeding is set, the default time interval for automatic feeding of the system, in unit of 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. **Water 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. **Display Track:** whether displays working track simulation.
18. **Homing Protection:** when it is open and the cover protection is "Open", during the regression, if the protection input is valid, the regression stops. If the signal is invalid, and the regression continues.
19. **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.
20. **Restore Work Enable:** After opening, Can continue carving before shutdown processing files.

21. **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.
22. **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:



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



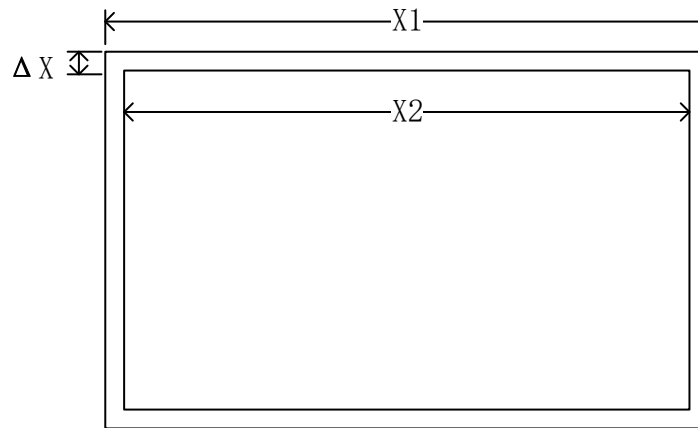


Cancel	X Axis Setting	Save
	Backlash (mm) ◀ 0 ▶	
	Direction Polarity ◀ Negative ▶	
	Limit Polarity ◀ Negative ▶	
	Jog Polarity ◀ Negative ▶	
	Limit Protection ◀ Close ▶	
	Pulse Edge Trigger ◀ Rising ▶	

- Resolution:** Resolution = Length that the laser head moves when the motor rotates for one cycle×1000 / 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.

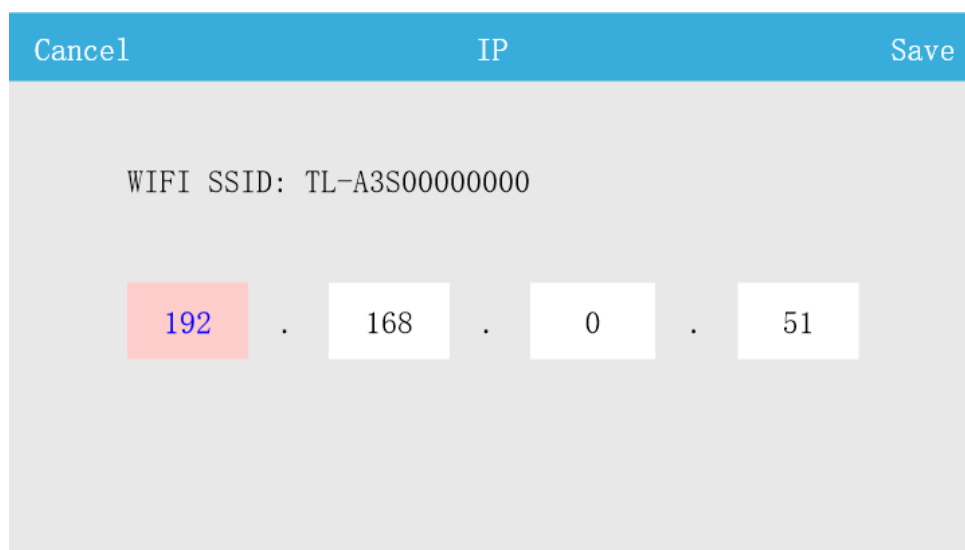
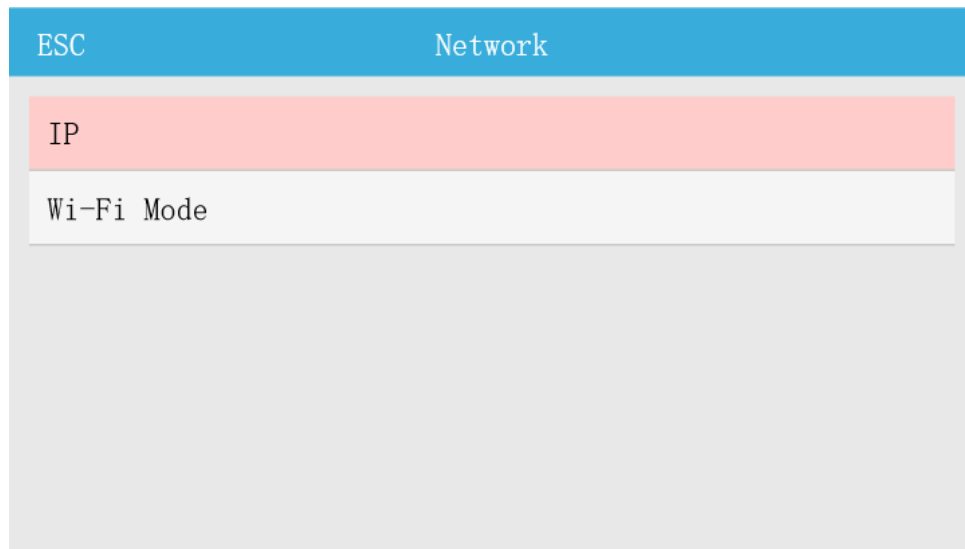


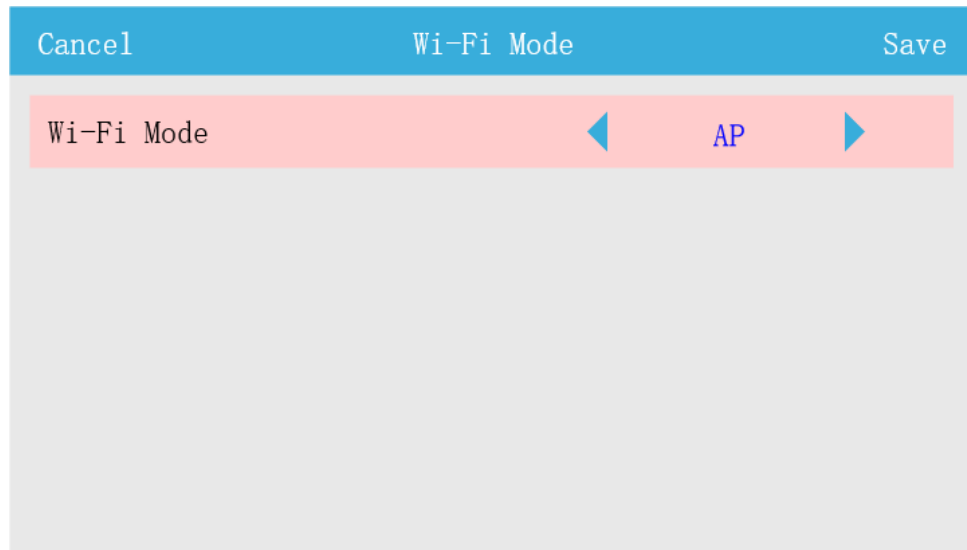
2. **Max Speed (mm/s):** the maximum speed allowed for single-axis movement. This value decides the max. Engraving speed and cutting speed.
3. **Corner Speed (Stop Speed) (mm/s):** the speed of start or stop during single-axis motion, i.e., the motion stops speed.
4. **Acceleration (mm/s²):** the Max 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. **Cutting Backlash:** the allowance for machine to move in the reverse direction. It is used to compensate the cutting dislocation.
8. **Direction Polarity:** when the motor cannot return to the original position, change the polarity to make it normal.
9. **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.
10. **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.
11. **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.
12. **Pulse Edge Trigger:** Rising or Falling. Depending on the drive settings, it is usually set the Rising. If the axis repeatedly moves, and there is always dislocation in one direction, and

reverse the polarity of the pulse.

3.2.13 Network

1. Select "Network" in the menu interface as shown in the following figure:





2. IP settings, IP address can use the default value, can also be changed according to user requirements!
3. Wi-Fi mode is divided into AP and Station. In AP mode, the control card is used as a WiFi access point, and the computer directly searches for the SSID of the control card through the wireless network and connects to the control card. When the computer is networked through a router, the control card selects the Station mode and searches for the connection to the router. In this way, the computer is connected to the control card through the router.

Note: The controller provides both wired and WiFi network connections. If WiFi connection is used for communication, the computer itself needs to have a wireless network card.

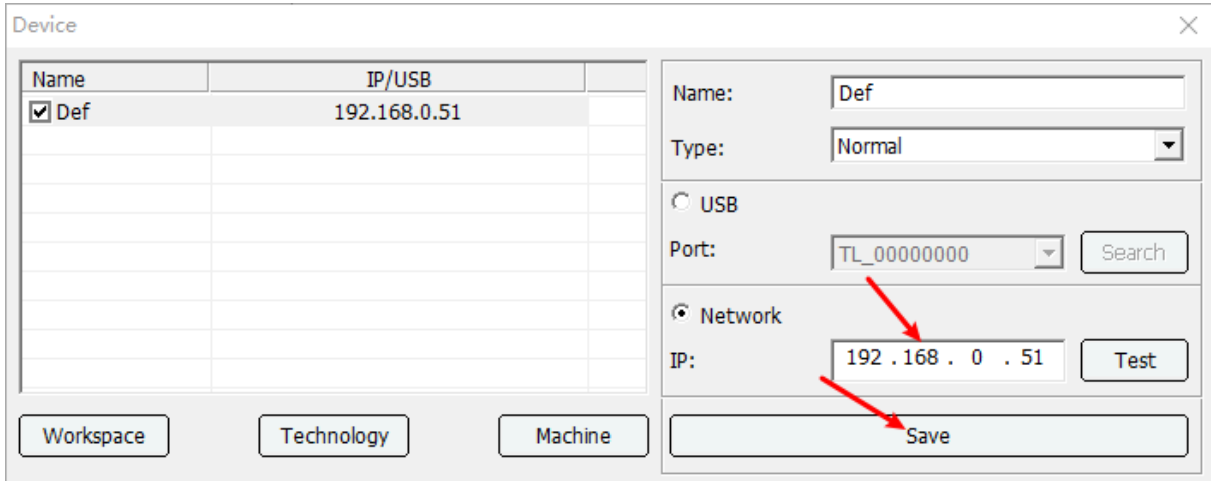
WiFi Connection Description: (Take the default IP address of the controller as an example).

1.AP Mode

First, change the controller WiFi mode to AP.

Second, set the IP address. If the IP address of the controller is 192.168.0.51, you need to set the device IP address in the AutoLaser software to be the same as the controller.

Software setting method: Open AutoLaser-Device-IP address, and click "Save" below after setting. As shown in the figure:



Name	IP/USB
<input checked="" type="checkbox"/> Def	192.168.0.51

Workspace Technology Machine

Name: Def
Type: Normal

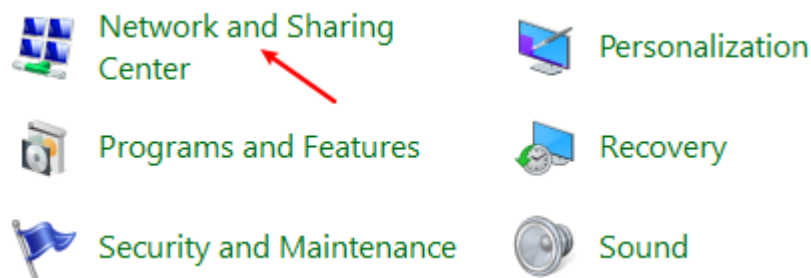
☐ USB
Port: TL_00000000 Search

☒ Network
IP: 192.168.0.51 Test

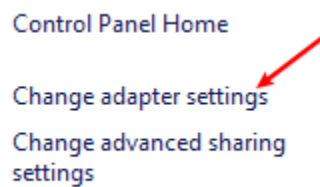
Save

Local Area Connection Settings:

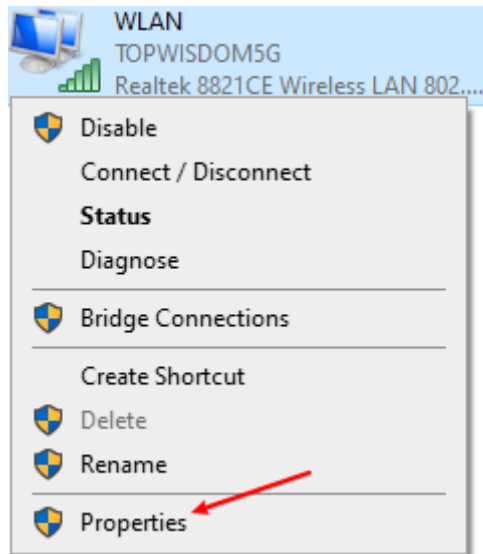
1). Open the Computer Control Panel and select Network and Sharing Center. As shown in the figure:



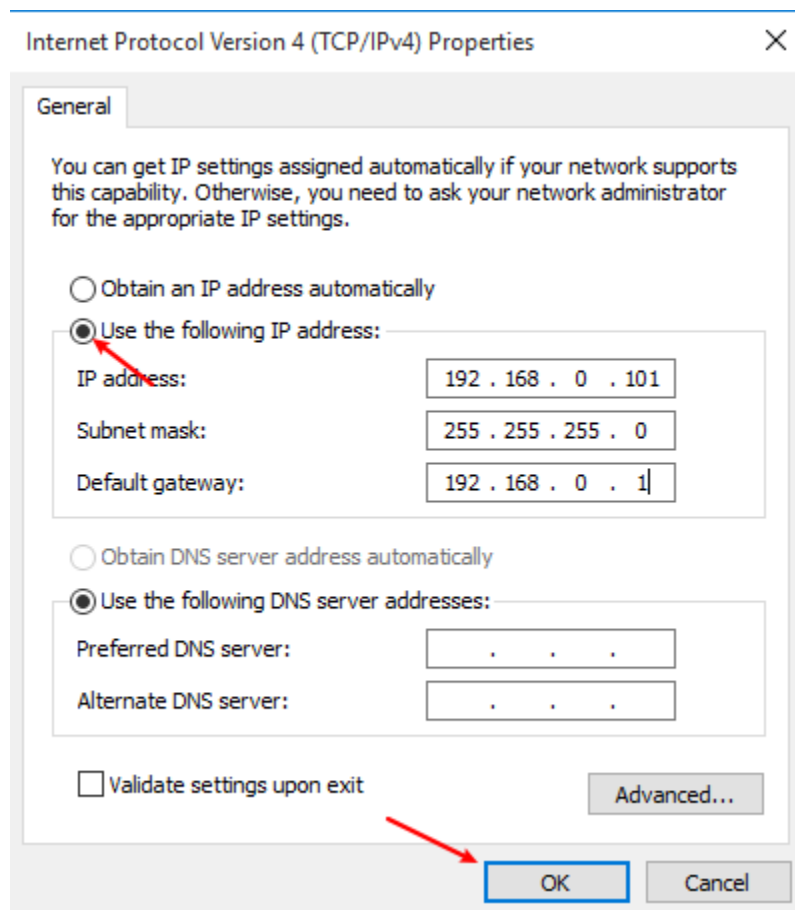
2). Select the Network Sharing Center and Change Adapter Settings. As shown in the figure:



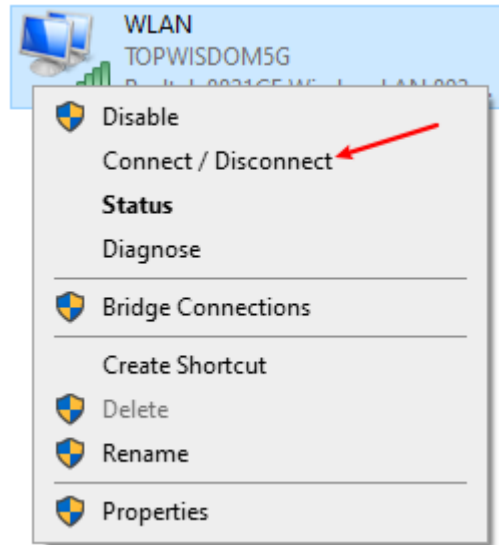
3). Click WLAN and right-click to select Properties.



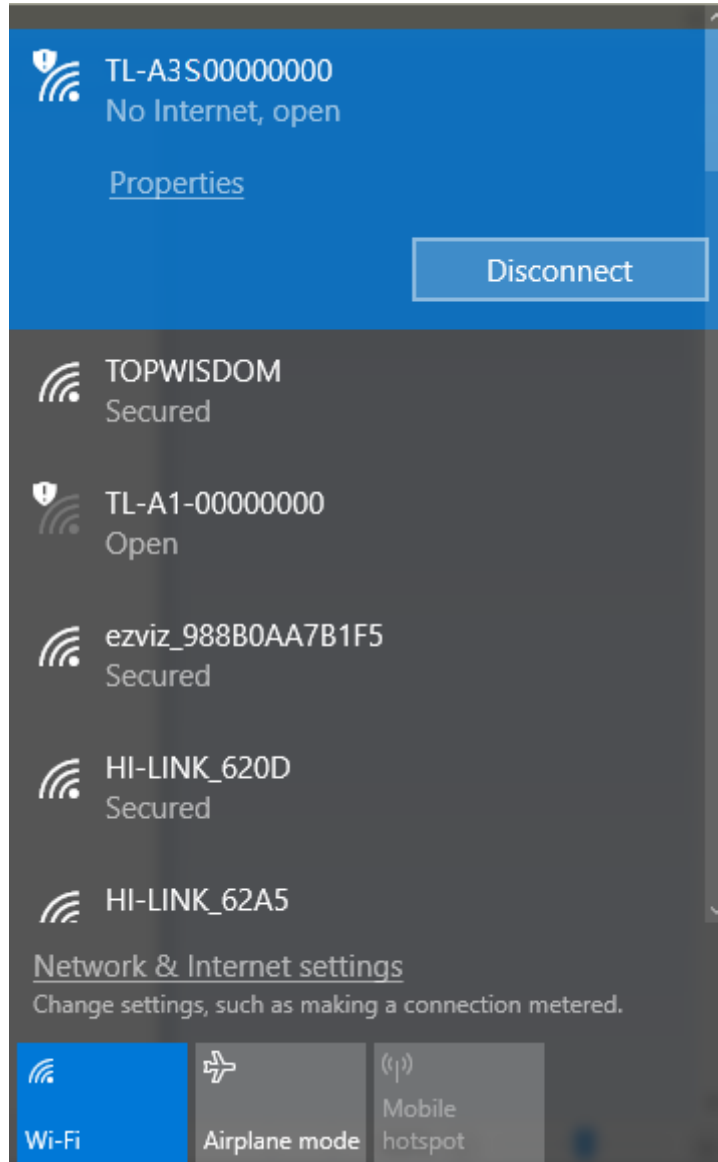
4). Then double-click "Internet Protocol Version 4 (TCP/IPv4)" to change "Automatically obtain IP address" to "Use the following IP address" and click "OK".



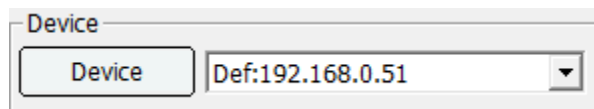
5). When the changes are complete, select Wireless Network Connection and right-click to select the Connect/Disconnect option



The computer will pop up the WiFi network that can be connected, select the WiFi network named TL-A3, and double-click to connect. As shown in the figure:

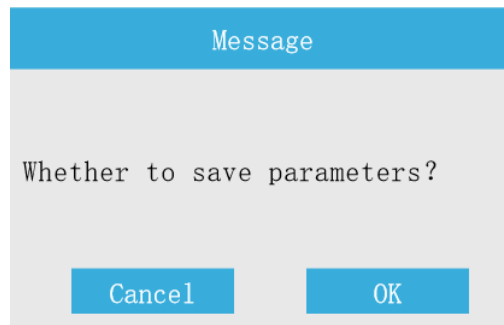
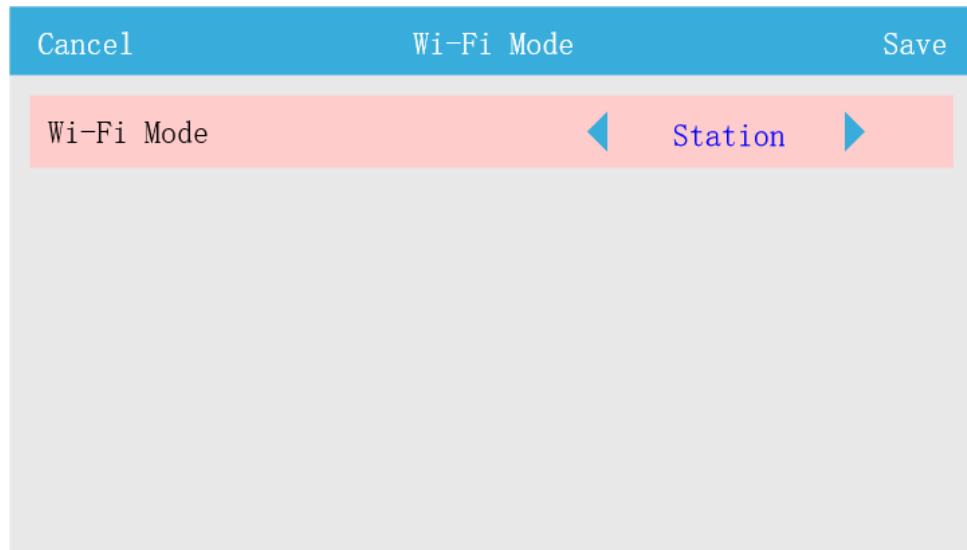


6). After successful connection, open AutoLaser and select the device for IP address in the device list.




2. Station Mode

Enter the Wi-Fi mode interface, select "Station", press "Enter" key, and the message box will pop up and press "Enter" to go it to "WLAN".



In the WLAN page, the available wifi ssid will be displayed, select the same wireless network

as the computer, click enter, enter the password input page, press  to enter the password and press the "Enter" button to save and connect. After the connection is successful, it will prompt that the connection is successful, and enter the IP address setting interface to set the address. Then set the computer IP and fill in the device IP address in AutoLaser, and select the device to communicate. For details, see the IP address settings in the AP mode.

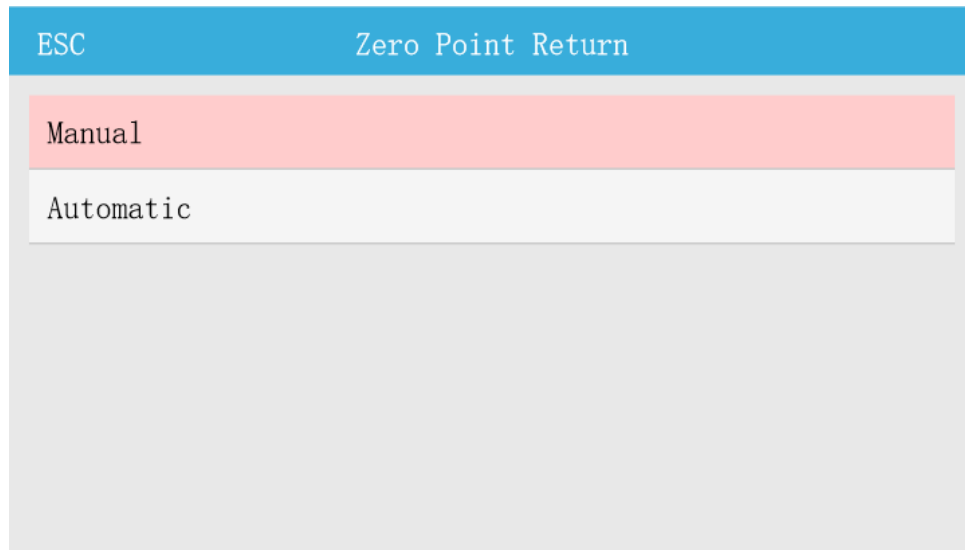


ESC	WLAN
001:TOPWISDOM	
002:TOPWISDOM-WIFI1	
003:TOPWISDOM-WIFI2	
004:TOPWISDOM-WIFI3	
005:TOPWISDOM-WIFI4	
006:TOPWISDOM-WIFI5	
007:TOPWISDOM-WIFI6	
008:TOPWISDOM-WIFI7	
009:TOPWISDOM-WIFI8	
010:TOPWISDOM-WIFI9	

Cancel	Input Password	Save
Input Password ◀ 12345678 ▶		

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.



1. Press "Up/Down" key to select the needed operation, click on the "Enter" to set one axis back to origin, press "Pause" to stop.



Cancel	Automatic	Save
X Return to Zero	◀ Open ▶	
Y Return to Zero	◀ Open ▶	
U Return to Zero	◀ 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.

3.2.15 Equipment Settings

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

Cancel	Equipment Parameter	Save
Table Mode	◀ General ▶	
Laser Config	◀ Single ▶	
Equipment Type	◀ Common ▶	
Z/U Option	◀ Lifting ▶	
OUT1	◀ Completion ▶	
Feeding First	◀ NO ▶	



Cancel	Equipment Parameter		Save
	Feed While Go to Origin	NO	
	Buzzer Setting	1	
	Power Off Delay(ms)	700	
	Lubricating Stroke(m)	0	
	Lubbrication Time(s)	0	

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:** Single.
3. **Equipment Type:** Common, Round (machine with wheel) and Knife (Rotary Cutting).
4. **Z/U Option:** Z Axis, the Z/U port is use as Z axis; Feeding, receiving the feeding motor, the Z/U Axis port is defined as Axis U; Lifting, for platform lifting or auto focus, the Z/U Axis port is defined as Axis U
5. **OUT1:** OUT1 is a multiplexed port:
 - ✓ **Completion:** work completion signal, output 300ms low pulse width after the work is completed
 - ✓ **Feeding:** feeding signal, output when feeding
 - ✓ **Laser:** laser on signal,output when laser on
 - ✓ **Press:** Feeding/pressing signal, synchronous pressing signal at Y axis and U axis when feeding, active at low level
 - ✓ **Work Status:** working status signal, output low level at work state, output high level at standby or pause state
 - ✓ **Pen:** output low electrical level when dropping the pen, output high electrical level when lifting the pen
 - ✓ **Nip Rolls:** for rotary cutting head, used for control of press feeding roller
6. **Beep:** press "Number" keys to set the times.
7. **Feed While Go to Origin:** After opening, feed at regression site.

8. **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.
9. **Lubricating Stroke:** the distance traveled during lubrication. The units are m.
10. **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.

Cancel	Equipment Parameter		Save
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 50 mm length line on the surface of material. Measure the real length of the line, 55 mm etc. Go into the Menu/Axis/ 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.

Reference Diameter (mm)



100



Calculation Formula:

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

Real range of Y axis = Wheel Diameter * π

2) Ribbon Cutter

Select "Ribbon Cutter" from the equipment type and press ok.

Equipment Type



Ribbon Cutter



Cutting instructions:

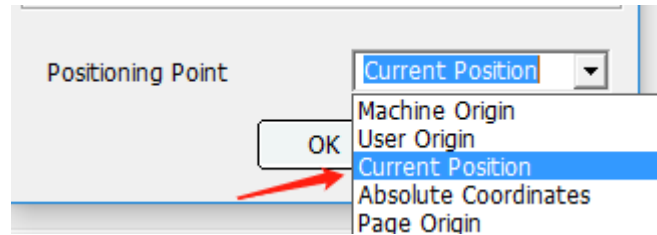
After selecting the function of ribbon cutting machine, the Y-axis will be used as the feeding axis for feeding cutting.

Turn off the power back function on the XY axis.

Since the XY axis is turned off to return to the origin, the current position coordinates of the laser head will automatically adjust to half of the maximum size of the XY axis after starting up.

Change the processing positioning mode on the software to "Current Position" and then send

the processing graphics to the cutting machine!



After the completion of cutting, the laser head will return to the place with the maximum size of the current cutting element as the origin position, and then conduct the next cutting.

3.2.16 Laser Settings

In the Main Menu interface, choose "Laser Set" 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 ▶	
	Y Compensation Mode	◀ Positive ▶	
	Y Direction Compensation (%)	◀ 0 ▶	
	On Delay (ms)	◀ 0 ▶	
	Off Delay (ms)	◀ 0 ▶	

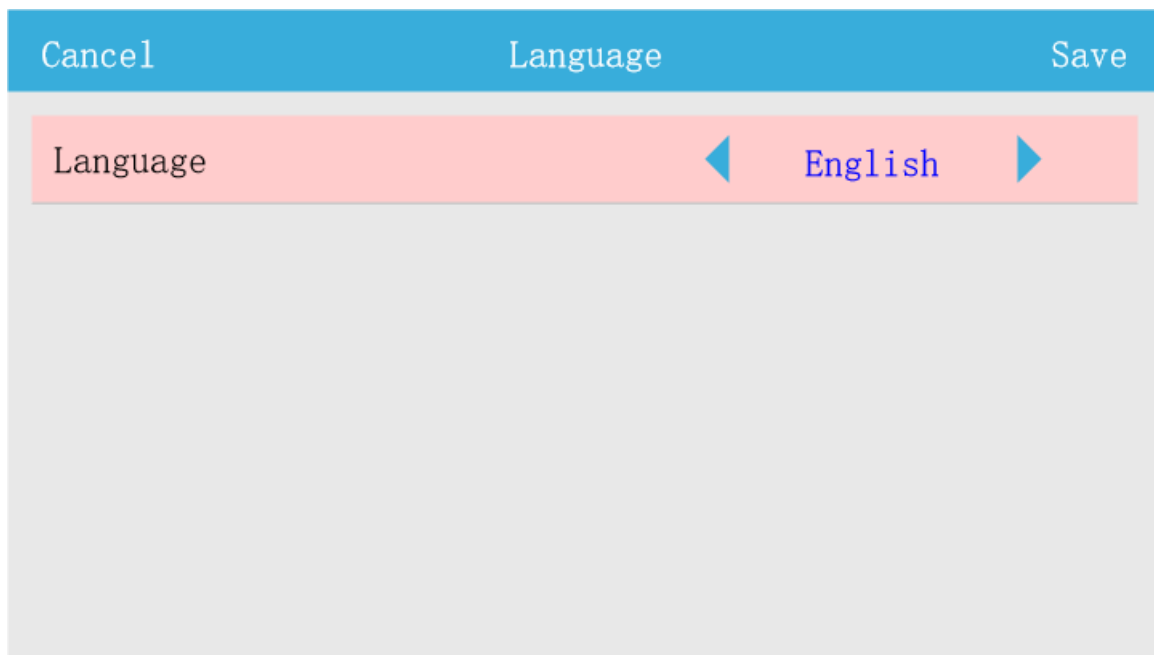
1. **Laser Type:** the common laser (CO2 glass tube), RF, and the RF (Pre-ignition). when the laser is one without pre-ignition, choose the laser type; when the laser is one with pre-ignition, choose the type of RF (pre-ignition) (Under such circumstance, as the control card is be in the standby state, 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. **X Compensation Mode 1:** the power compensation of laser head 1. When the origin is in the upper left corner, the compensation mode is positive pole. The laser light intensity will gradually increase as the X axis moves away from the origin. When the compensation is negative, the laser light intensity will gradually decrease as the X axis moves away from the origin.
7. **X Direction Compensation 1 (%):** set the intensity of light that needs to be compensated when the laser head 1 moves from the origin position to the maximum format in X direction.
8. **Y Compensation Mode:** the power compensation of y-direction laser, when the compensation mode is positive, the laser light intensity will increase slowly with the Y-axis away from the origin. When the compensation is negative, the laser light intensity will gradually decrease as the Y-axis moves away from the origin.
9. **Y Direction Compensation (%):** set the intensity of light that needs to be compensated when the laser head moves from the origin position to the y-direction maximum.
10. **On Delay(ms):** the initial delay time of the laser on. If the parameter setting of optoelectronic delay is too large, it will lead to the phenomenon that the initial segment is not closed
11. **Off Delay(ms):** the delay time of laser shutdown at the end. The non-closure phenomenon at the end of cutting can be removed by setting proper parameters of light delay.

12. **Focus Length(mm):** press the "Number" key to set the focal length. When setting the parameter in the standby screen, press "." decimal point key, if prompted to perform automatic focus, if so, U axis control laser head down (or up) platform, when sensors close to the material surface, reach the designated position signal is given, moving up the laser focal distance (or down) platform, to arrive at the focal length.

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 Total Travel and Y Total 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 Setting

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

ESC	System
Version	V. L031. 001
System Upgrade	
Administrator	
System Test	
License Key	
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_L021.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. **License Key:** enter the user authorization page and enter the authorization code.
6. **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 number of the machine.
- Change the Admin 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, check whether the settings are correcting.
- At the end, insert the USB flash drive and export the lock password.

Parameters Instruction:

1. **Time:** set the date and time.
2. **ID:** when a USB is used for communication, the equipment number will be display on the software port. **The machine ID is displayed when the password expires.**
3. **WIFI SSID:** modify the WIFI SSID. Press the select key to enter the key input dialog box, press the left and right keys to select numbers and letters, and press up and down to turn pages.
4. **Administrator Password:** enter the Administrator Password, and then you can modify it. If you need to set the lock, you need to change the Administrator password. Otherwise, after locking the machine, you could also enter the system after entering the Administrator password.
5. **Password Status:** when the time limit is set to "Open", the periodic passwords start working.
6. **First Lock Date:** the periodic password starts on the lock date, and the setting range is 1~31 days.
7. **Password Times:** set the times of periodic passwords, one period for one month.
8. **Password Preview:** shows the periodic passwords for the lock.
9. **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 number.
10. **Factory Data Backup:** backup the factory machine parameters.

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	
WIFI SSID	
Administrator Password	
Password Status	
Password Preview	

ESC	Administrator
Export Password	
Factory Data Backup	

3.3.2 System Test

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



ESC	System Test
	I/O Input
	I/O Output
	Clock
	SRAM
	Flash

ESC	I/O Input				
1.		2.		3.	
4.		5.		6.	
7.		8.		9.	
10.		11.		12.	
13.		14.		15.	
16.		17.		18.	
19.		20.			

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 **Clock**, **SRAM** and **Flash**, a dialog box will pop up to will show the result.



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

3. IO Input / Output Test Interface Description:

Input Test:

Pin No.	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 = Door_SW	Door_SW Protection signal input, connecting to cover protection and other signals
INPUT6 = Foot_SW	Foot_SW Foot switch signal input, active on the rising edge, with pulse width not less than 100ms
INPUT7 = Lmt_Z/U-	Lmt_Z/U- Z/U origin limit, axis movement to the minimum coordinate (0) limit sensor input
INPUT8 = Lmt_Z/U+	Lmt_Z/U+ Z/U upper limit, axis movement to the max coordinate limit sensor input
INPUT11 = WP1	WP1 Water Protect 1 Input, active at low level, LED is on



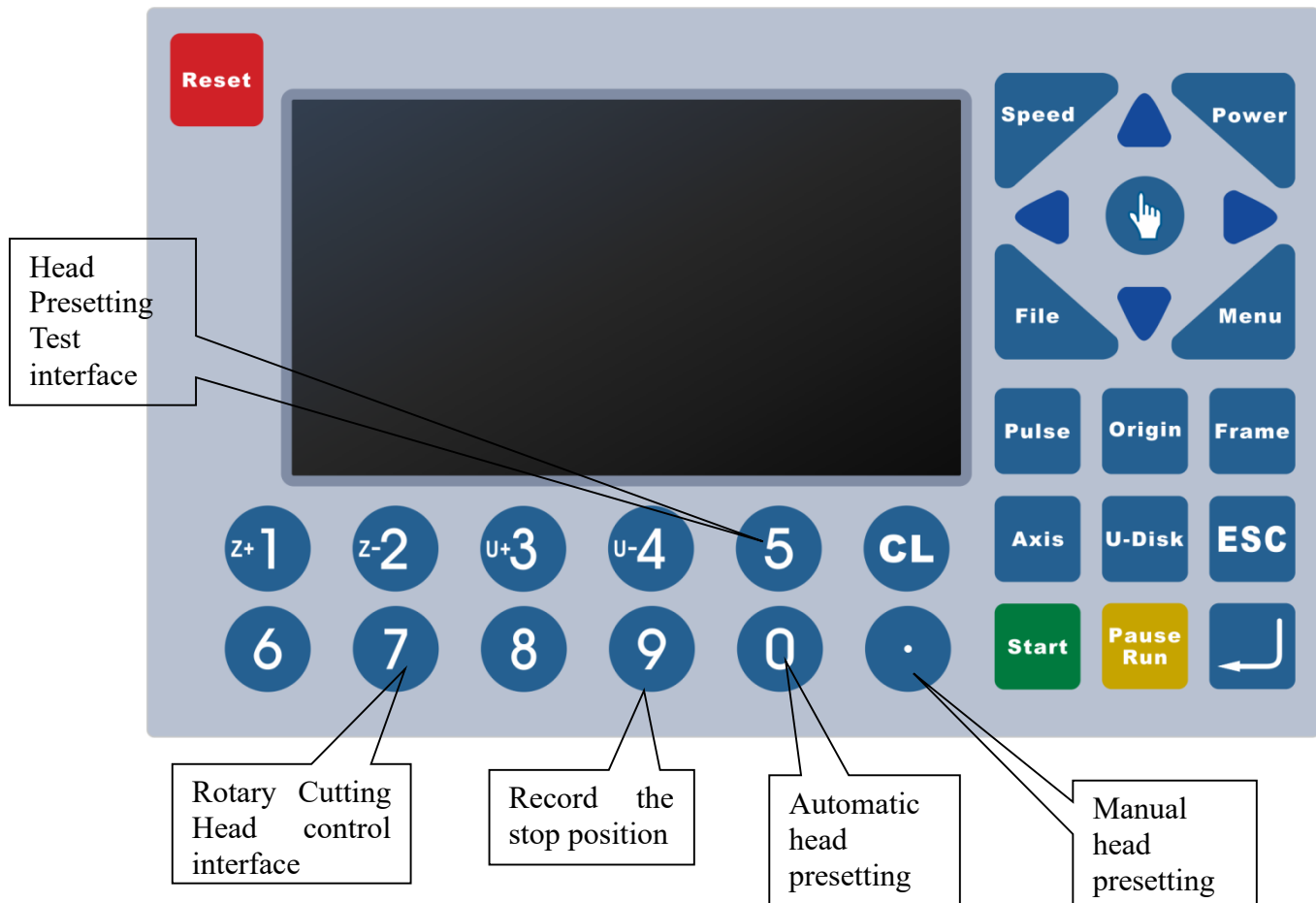
Output Test:

Pin No.	Description
OUT1 = Finish	<p>OUT1 A generic output signal that defines its function in software:</p> <p>Completion Work completion signal, output 300ms low pulse width after the work is completed</p> <p>Feeding Feeding signal, output when feeding, active at low level</p> <p>Laser Laser on signal,output when laser on</p> <p>Press Feeding/pressing signal, synchronous pressing signal at Y axis and U axis when feeding, active at low level</p> <p>Work Status Working status signal, output low level at work state, output high level at standby or pause state</p> <p>Pen Output low electrical level when dropping the pen, output high electrical level when lifting the pen</p> <p>Nip Rolls For rotary cutting head, used for control of press feeding roller, active at low</p>
OUT2	Reserved
OUT8 = Wind/SPI	Wind/SPI Blowing signal or spindle signal, the signal is multiplex, used for the blowing signal in case of a normal model; used as start and stop signal for the spindle motor in case of rotary cutting model, active at low level
OUT9 = X-PUL	PUL- X axis step pulse, connect to the PUL- of step motor driver
OUT10 = X-DIR	DIR- X axis direction signal, connect to the DIR- of step motor driver
OUT11 = Y-PUL	PUL- Y axis step pulse, connect to the PUL- of step motor driver
OUT12 = Y-DIR	DIR- Y axis direction signal, connect to the DIR- of step motor driver
OUT13 = Z/U-PUL	PUL- Z axis step pulse, connect to the PUL- of step motor driver
OUT14 = Z/U-DIR	DIR- Z axis direction signal, connect to the DIR- of step motor driver
OUT15 = LPWM	LPWM Be used to control the LASER power signal
OUT16 = L-ON	L-ON LASER enable control

Part IV Rotary Cutting Machine

4.1 Function Introduction

If rotary cutting machine is selected, the coordinates of Z Axis are shown on the bottom right. Press Number 5 key, open the interface of testing head presetting position; press Number 7 key, open the interface for control of rotary cutting, the start/stop of spindle, ascending/descending of pressure feeding roller, the switch between the cutting heads and height compensation for head presetting. Press the number 9 key to record the stop position. Press the number 0 key to execute the automatic tool setting. Press the decimal point "." to manually preset the heads and record the presetting position.



4.2 Rotary Device Parameters

Select the device parameters from the menu and change the equipment type to "Knife". After turning the page, the rotary knife parameters will be displayed.



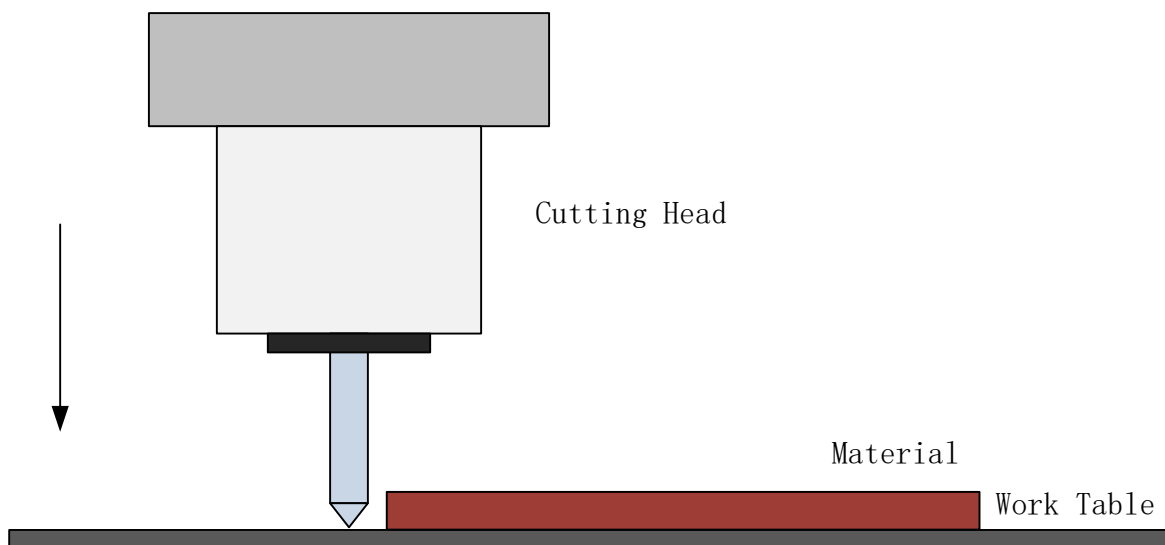
Cancel	Equipment Parameter		Save
Cutting Tool	◀	Knife	▶
Spindle Delay (ms)	◀	0	▶
Work Life Height (mm)	◀	0	▶
Docking Position	◀	0	▶
Z Axis Speed (mm/s)	◀	50	▶
Feeler Block (mm)	◀	0	▶
Feeler Block Polarity	◀	Negative	▶

- Cutting Tool:** Knife or Laser. When the knife is selected, the rotary cutter mode is used to activate the spindle rotation, and the cutting head automatically moves down for cutting and lifts when finishing. When the laser is selected, the cutting head does not lift or fall.
- Spindle Delay:** the time required for the spindle to run from standstill to the rated speed. It requires to be consistent with the settings of the inverter. If the spindle is not started but the control Card is On, turn on the spindle running signal first, then wait for the spindle start delay before cutting. Unit: ms.
- Work Lift Height:** when working, the lifting height of the cutting head before the starting of idle motion, in unit of mm.
- Docking Position:** the position where the cutting head stops after completion of the work, in unit of mm.
- Z Axis Speed:** the speed at which the cutting head descends or ascends during operation. In standby mode, when the key speed is "High", it means the same speed at which Z axis moves after pressing Z+/Z-. "Slow" is half of this speed. The head moving speed is no greater than the limit speed of the Z axis. Unit: mm/s.
- Feeler Block(mm)(Height of Presetting Block):** when the machine is equipped with the blocks for presetting the cutting heads, its height needs to be entered in unit of mm.
- Polarity of Feeler Block (Presetting Block):** the negative indicates that the presetting block input is active at low level; the positive indicates active at high level.

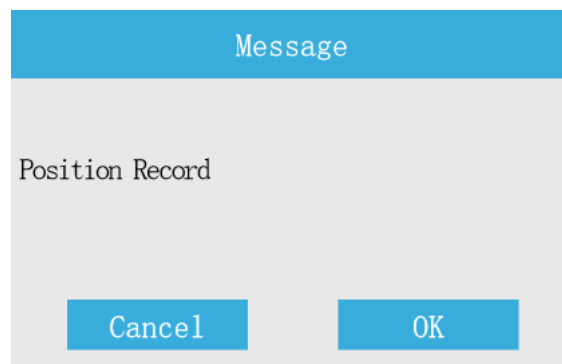
4.3 Head Presetting

4.3.1 Manual Head Presetting

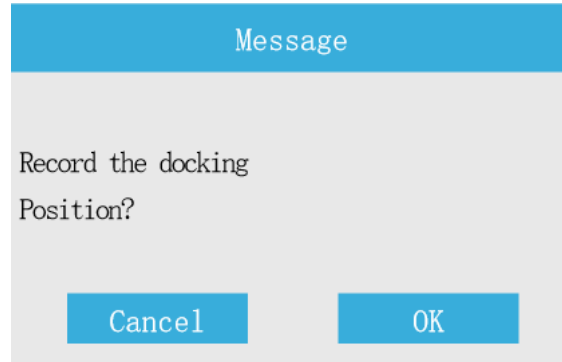
1. In the standby interface, press Z+, Z- to move the rotary cutting heads to the material cutting position, as shown.



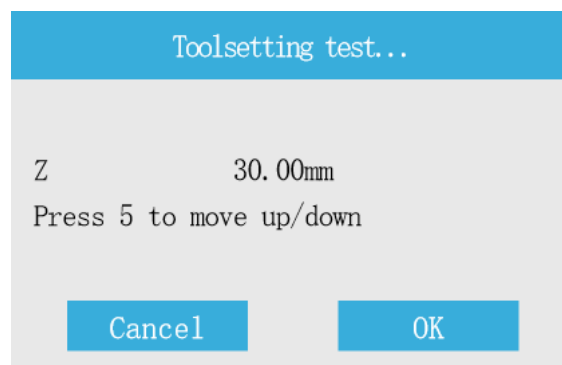
2. Press the decimal point key "." to pop up the position recording interface and press "OK" to record the position of the current rotary cutting head. This position is the position where the rotary cutting head is lowered during the processing.



3. Press Z+, Z- to move the rotary cutting head to the position where it stops after completion, then press the number "9" key and then OK to record the current stop position.

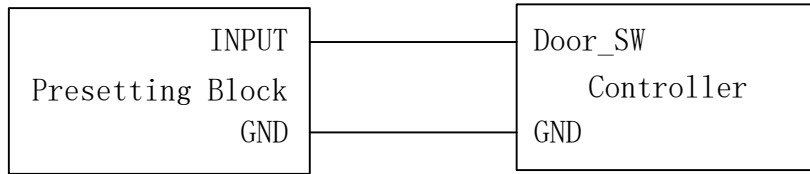


4. Press the number 5 key to test the head presetting. At this time, the interface pops up as shown in the figure. At this point, the cutting head will automatically drop to the present position recorded, and the coordinates of the current Z axis will be displayed in the interface. In this interface, press the number 5 key again, the cutting head can be lifted up to the position specified by the lifting height. For example, if the head presetting position is 30mm and the stop position is 10mm, when lifting up, it is 10mm. If an emergency stop is required during the test, press the Pause button to stop the motion. Repeat pressing the key 5 button to finish the descending and ascending test, and press the ESC to exit the test.

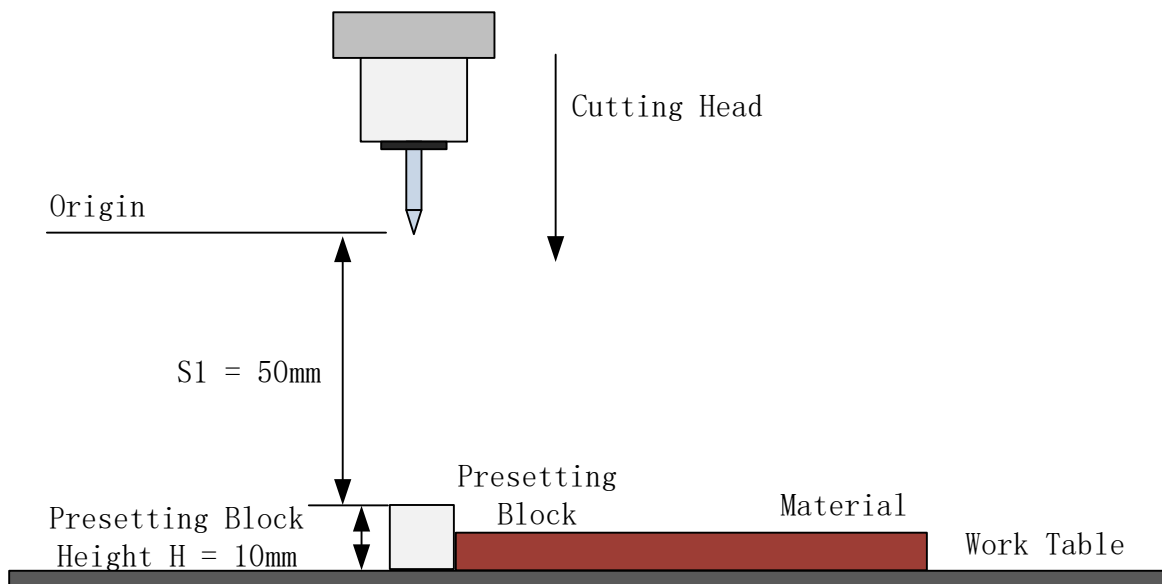
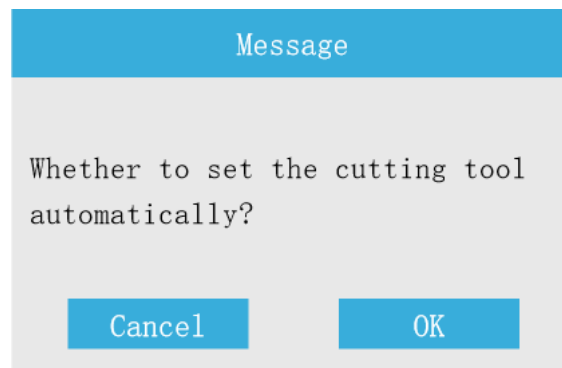


4.3.2 Automatic Head Presetting

1. Before the work, the head presetting blocks have been equipped, and the wiring is as follows (**the following wiring is active at low level**). If the head presetting block is active at high level, please refer to the wiring diagram of the specific presetting block. The presetting signal interface of the control card is the Door_SW terminal. Note that when it is active at high level, need to change the polarity of the presetting block in the Equipment Parameters to "positive".

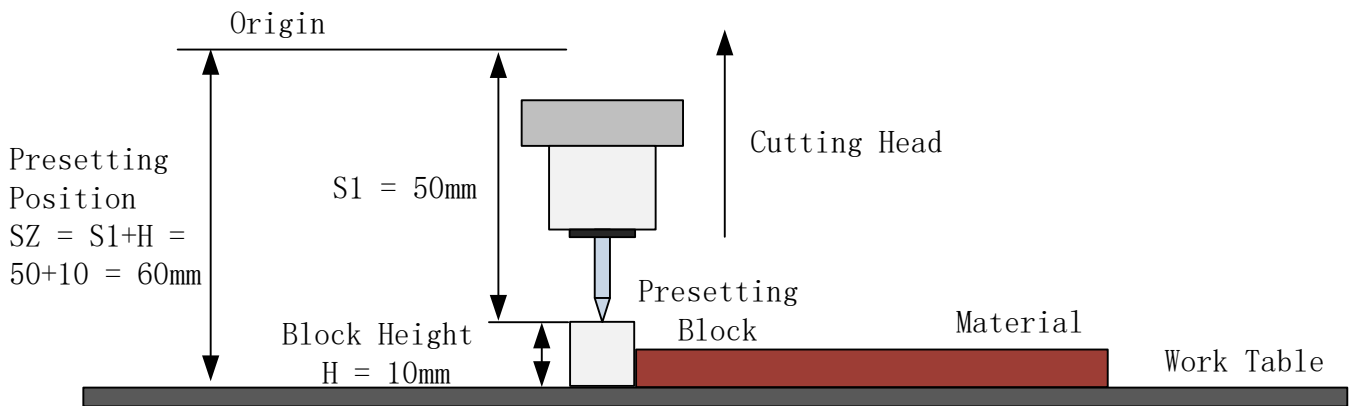


2. Set the "Feeler Block (Presetting Block Height) (mm)" H in the Equipment Parameters as shown in the figure below as H = 10mm.
3. Move the rotary cutting head to the top of the presetting block.
4. In the standby interface, press the number "0" key to start the automatic head presetting and press the Enter to execute. At this time, the rotary cutting head moves downward, and the moving speed is the Z-axis stop speed. As shown in below figures.

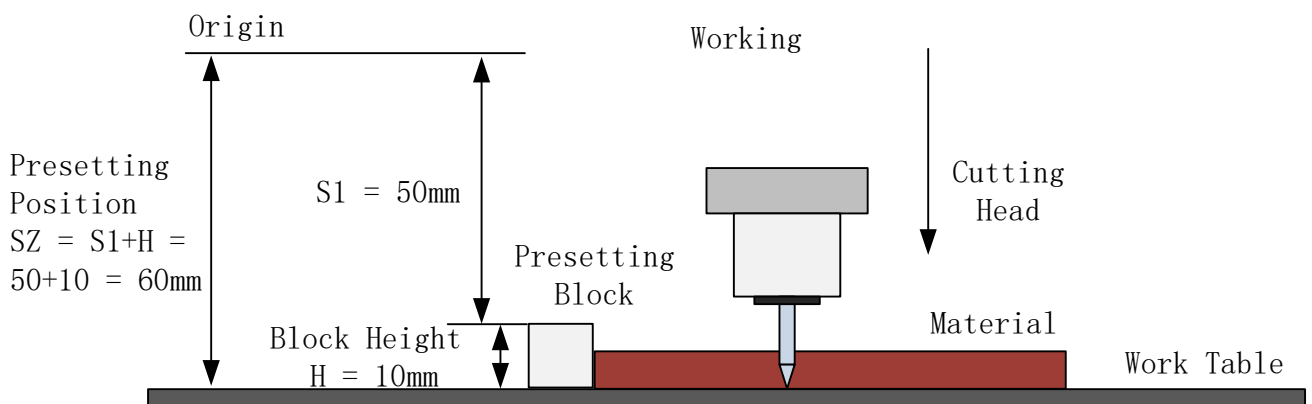


5. When the cutting head touches the presetting block, it stops and records the current coordinate of Z axis, as shown in the figure, $S1 = 50\text{mm}$. At this time, the actual head presetting position $SZ = S1 + H$ (the position where hitting the presetting block + the height of the presetting block) Record and save. In the end, the rotary cutting heads return to the

Set Point. So, the automatic head presetting is completed.



6. Assume that the height of the presetting block is $H = 10\text{ mm}$, then the head presetting position is $SZ = S1 + H = 50 + 10 = 60\text{ mm}$. The presetting position is range from the **bottom** of the material to the Set Point. When working, the rotary cutting heads automatically drop to a position of 60mm to perform the cutting. As shown:



7. After the head presetting is completed, press the number key "5" to test whether it is correct (same as step 4 of Manual Head Presetting).

Note that when testing, remove the cutting heads away from the presetting blocks, otherwise they will hit onto the blocks.

4.4 Spindle and Pressure Feeding Roller Control

In the standby interface, press the number key 7 to enter the control interface.

1. **Spindle:** if "Open" is selected, the spindle is started, and if "Close" is selected, the spindle is stopped;
2. **Nip Rolls (Pressure Feeding Roller):** if "Open" is selected, the feeding roller is lowered, and if "Close" is selected, the feeding roller is lifted;
3. **Cutting Tool:** if "Knife" is selected, it is on rotary cutting mode, if require laser cutting, select Laser;
4. **Tool Height Compensation (Compensation Mode):** if positive is selected, it indicates the head presetting position plus the compensation value, is the real head presetting position, otherwise, minus the compensation value.
5. **Compensation Value:** the compensation value of the tool height in mm. If the tool is re-aligned, the compensation value is cleared.
6. **Docking Position:** the position where the cutting head stops after completion of the work, in unit of mm.

ESC	Knife		
Spindle	◀	Close	▶
Nip Rolls	◀	Close	▶
Cutting Tool	◀	Knife	▶
Compensation Mode	◀	Positive	▶
Compensation	◀	0	▶
Docking Position	◀	0	▶

4.5 Tool Switch

In the standby interface, press the number key 7 to enter the control interface, select the rotary cutting head or laser. When the rotary cutting head is selected, the Control Card adopts cutting with the rotary cutting head. When working, turn on the spindle first, then after a delay, wait for cutting head of the spindle to run the rated speed, then precede cutting, and when in idle motion, lift it to the specified height. After completion, return to the specified stop position, then close the spindle and wait for the spindle to completely stop before exiting the machining. When laser is selected, cutting proceeds with the laser head. The spindle is not activated during operation,

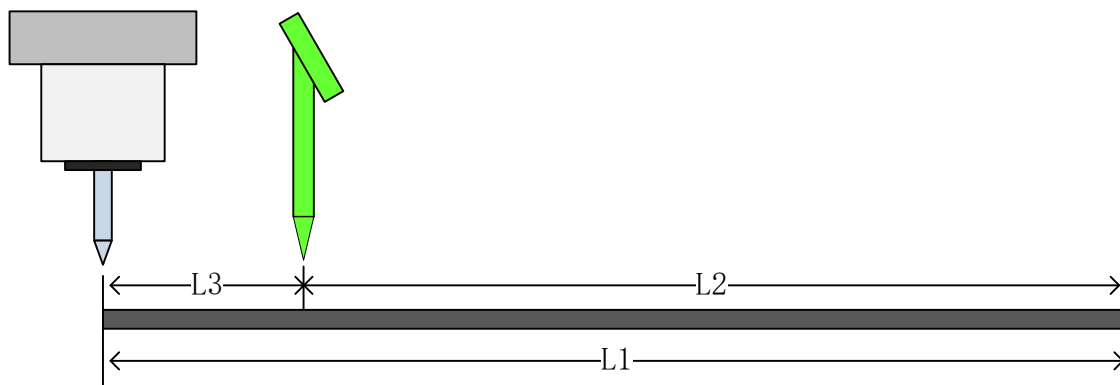
and no descending/ascending of the cutting head.

4.6 Processing Flow

1. When rotary cutting is required, select the rotary cutting head.
2. Place the material to be cut, then press the number key 7 to open the feeding roller to press.
(If there is a press device.)
3. Perform the head presetting and press the Z+/- key to move the cutting head to the cutting position of the material. Press the decimal point ". " to record the head presetting position.
4. If there is any head presetting block, perform the automatic presetting with reference to Section 4.3.2.
5. Press Z+/- key to move the cutting heads to the stop position when completion (Standby), press the number 9 key to record the stop position.
6. Press the number key 5 to test if the tool position is normal.
7. Move the X, Y axis, move the cutting heads to the Set Point, and press the Set Point key.
8. Press Start to begin cutting. When processing, first open the spindle, wait for the spindle to run to the rated speed, lower the cutting tool, and when it is idle, lift it to the specified height. After completion, return to the specified position, then close the spindle and exit the processing.
9. If you want to switch to the laser cutting, press the number key 7 in the standby interface to select the laser cutting. At this time, move the laser head to the place where it needs to be cut, press the Set Point key, and then press the start key to cut.

4.7 Notes and Warning

1. X axis direction range: when the machine is equipped with the rotary cutting and laser cutting at the same time, since the two cutting heads are arranged side by side in the X axis and the two heads are spaced apart with certain interval, each head can be cut in a smaller range than the machine. As shown in the figure, the actual range of each head is $L2 = L1$ (X axis direction machine range) - $L3$ (interval of double heads). In this case, you need to set the maximum coordinate of the X axis to $L2$. If there is only rotary cutting, the maximum coordinate of the X axis can be $L1$.



Part V The Frequently Asked Question

5.1 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, 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 / Automatic" interface, set the X, Y axis as Opening. Or the Limit Swtich 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 "Return zero posititon".

A: The power back to origin error. Go into the "Zero Point Return / Automatic" interface, set the Z, 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 "Axis / Limit" 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 "Axis / Direction" 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 "Axis / Jog" 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 "User / Return Point" interface, set the regression point as mechanism origin point (Origin).

5.2 The Laser 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 / PWM polarity 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 WP is connected properly, or turn off the water protection detection in the user settings, if the hardware is damaged, please send it back to us for repair.

5.3 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 line is connected correctly. Unload the driver and reload it.
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.

5.4 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 "Water 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.