

User's Manual for TL-A1 Laser Engraving & Cutting Control System V1.1

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Versions

Version No.	Revision Record
V1.0	Initial.
V1.1	New parameters, interface modification.

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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, 2 general outputs, 9 general inputs, TTL electrical level;
- Equipped with 2.4", 320×240 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 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

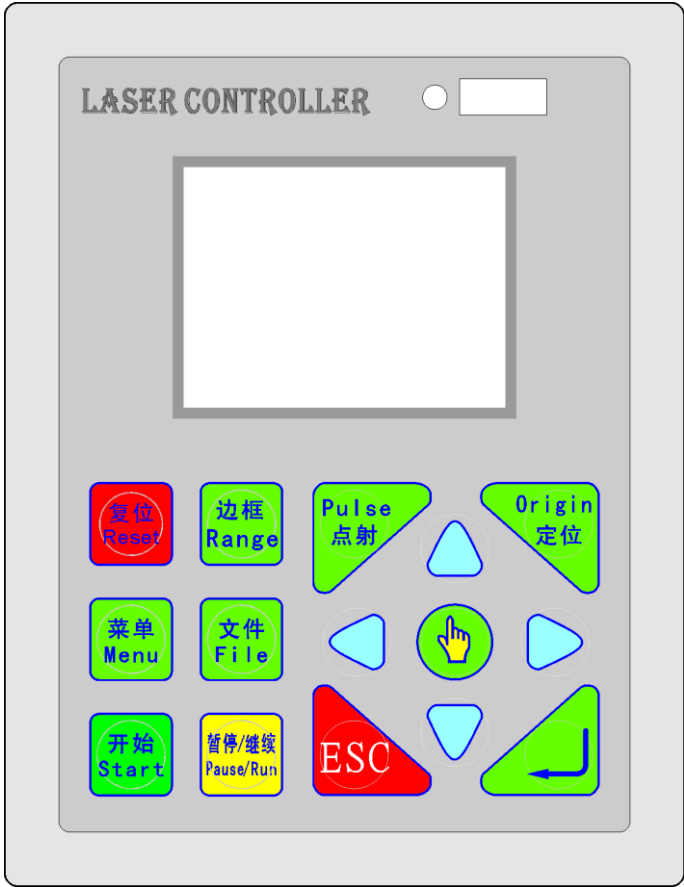

Power: DC24V/2A.

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.

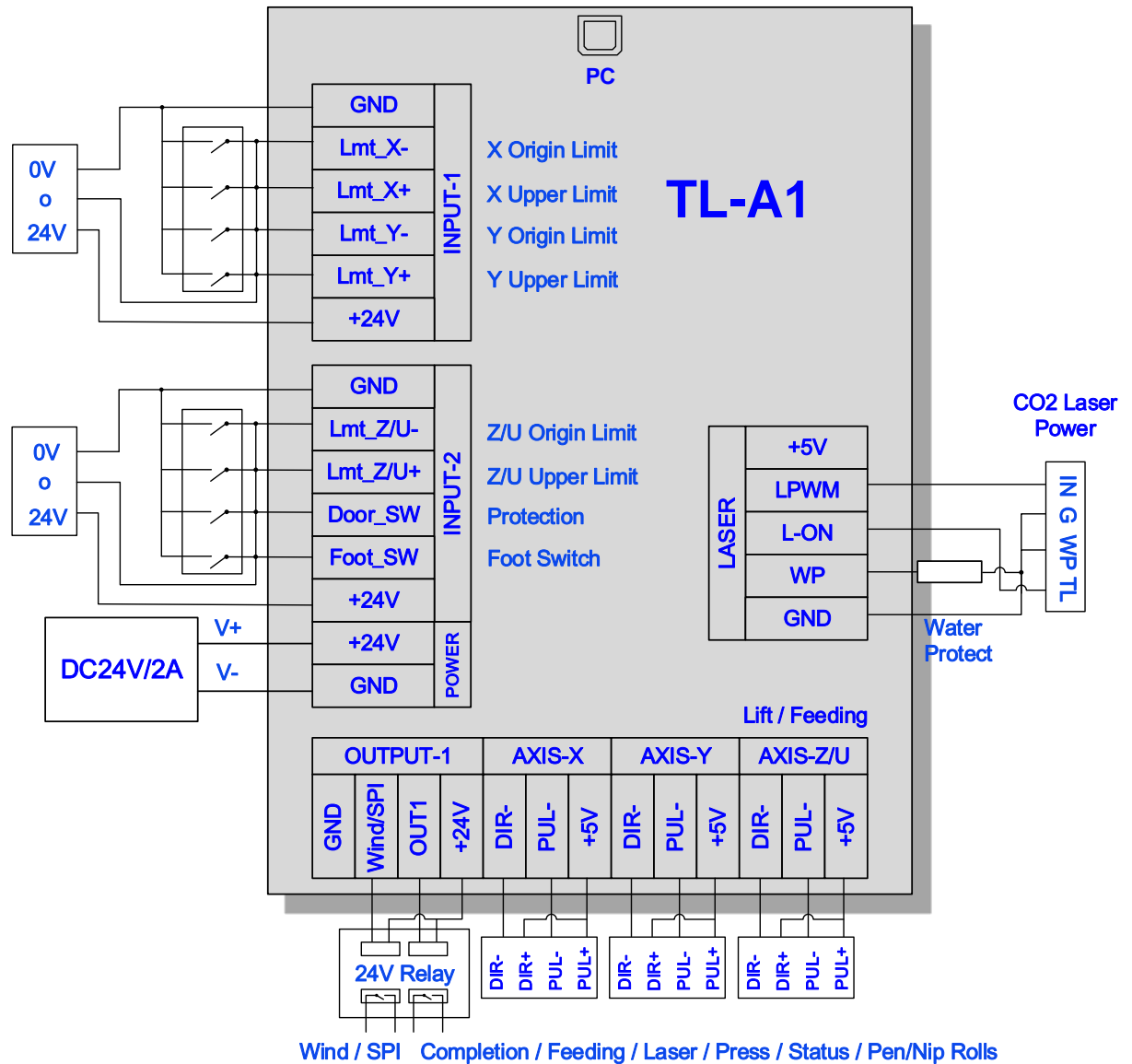
1.5 Accessory List

The Laser Engraving Control System TL-A1 contained the accessories as below:

Name	Qty	Introduction	Photo
Controller	1	The Motion Control Card	
Connection cable/USB communication cable	2	1. USB communication cable for connecting controller and PC 2. USB communication extended cable	

Part II Wiring Installation Instruction

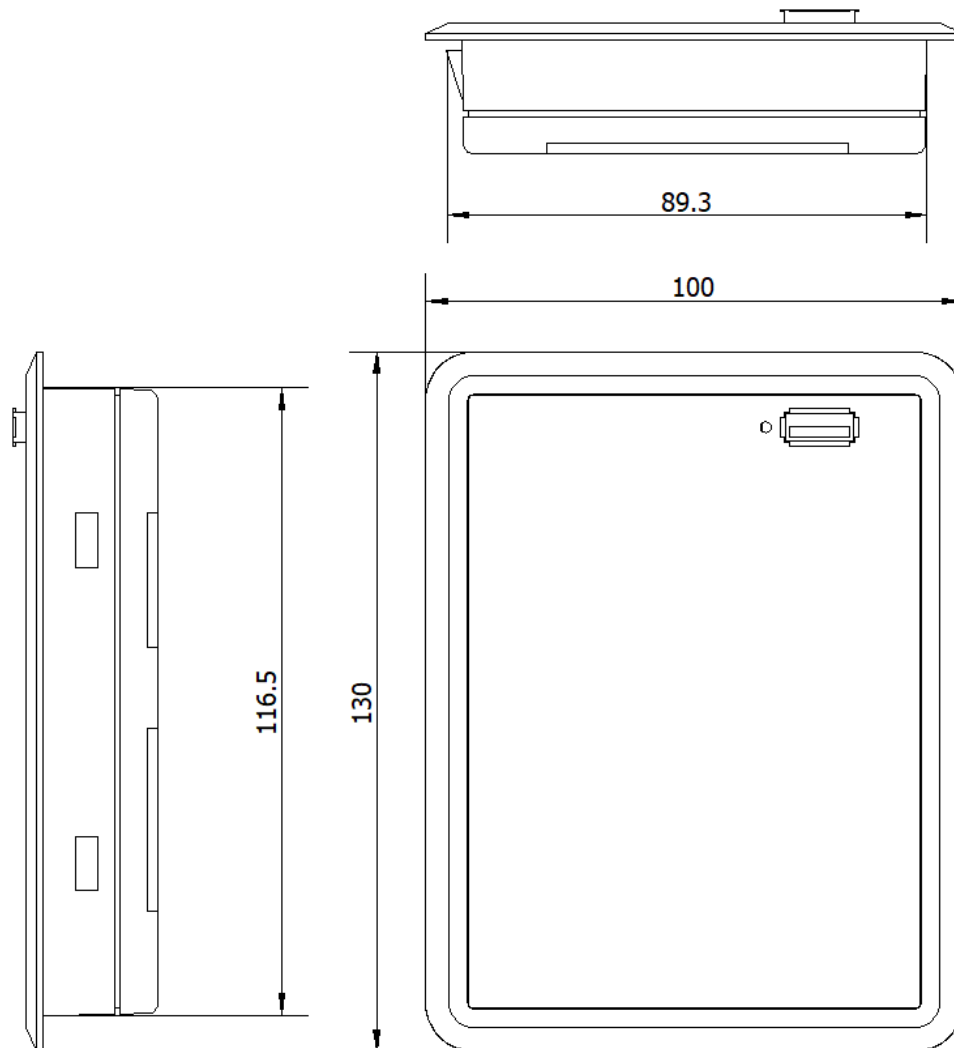
2.1 System Wiring Diagram





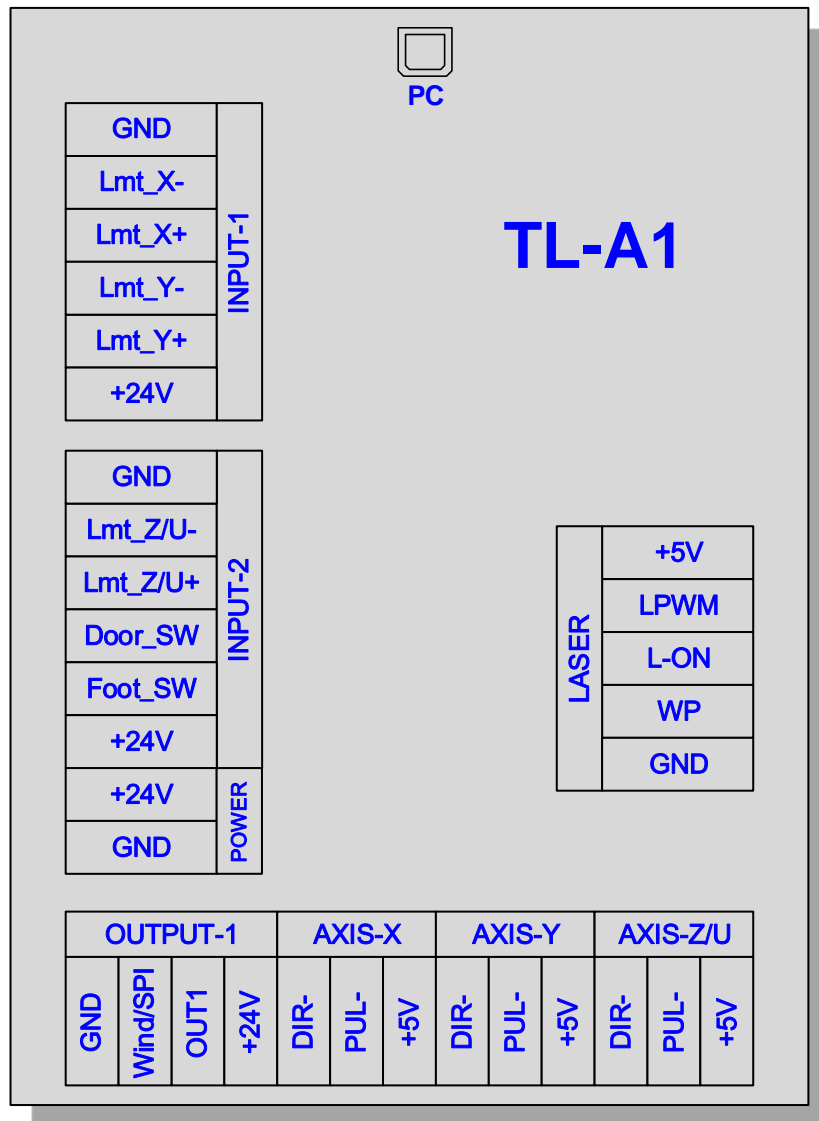
2.2 Installation Dimension

Note: the unit is mm.



2.3 Wiring Instruction

2.3.1 Interface Diagram

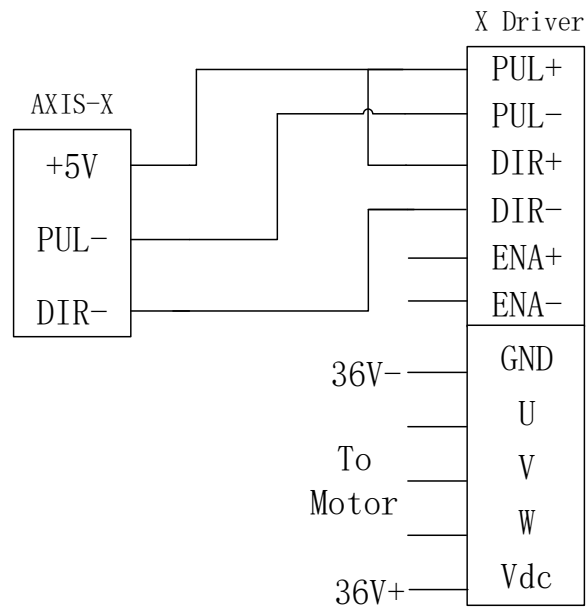


2.3.2 Wiring Diagram

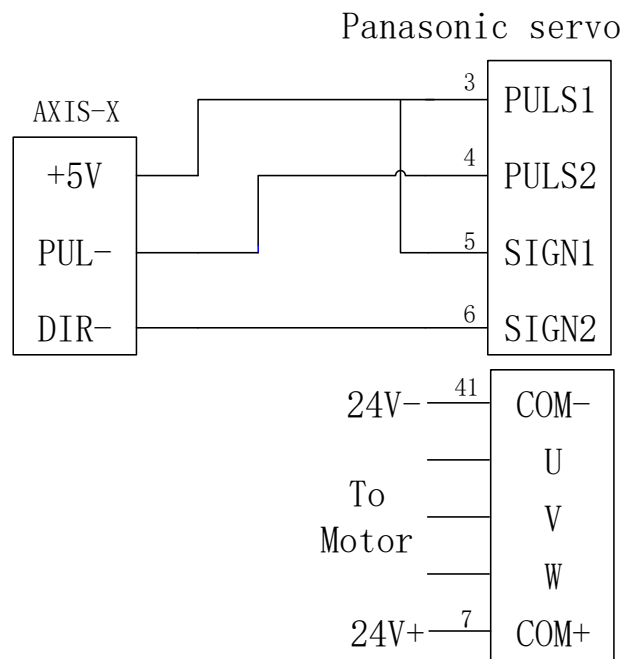
2.3.2.1 Motor Wiring

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

1. Step Motor Wiring

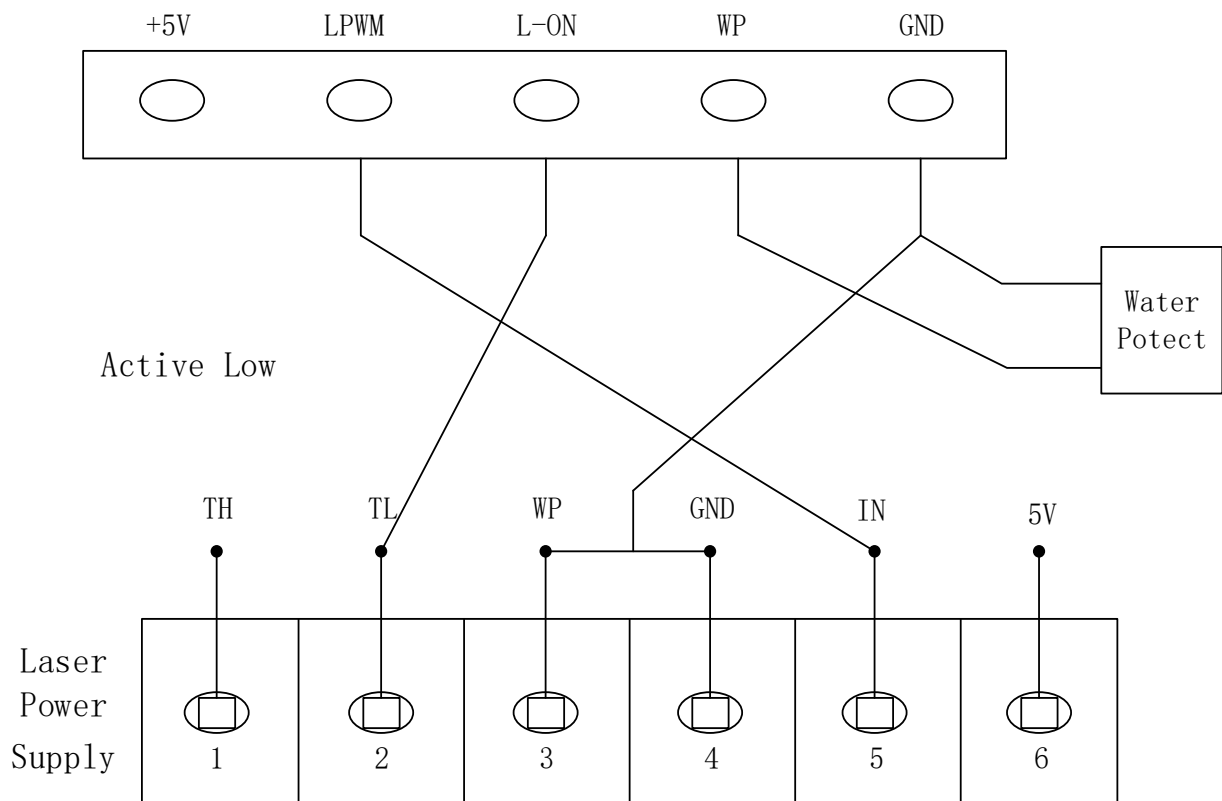


2. Panasonic Servo Wiring

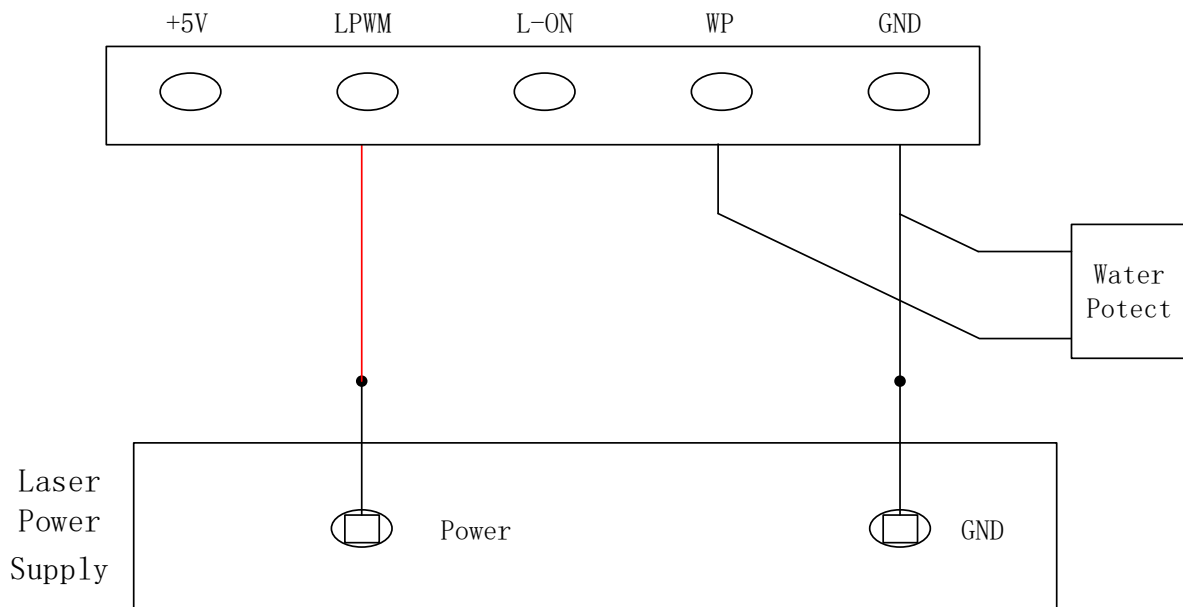


2.3.2.2 Laser Power Supply Wiring

1. CO2 Laser Power Supply Wiring



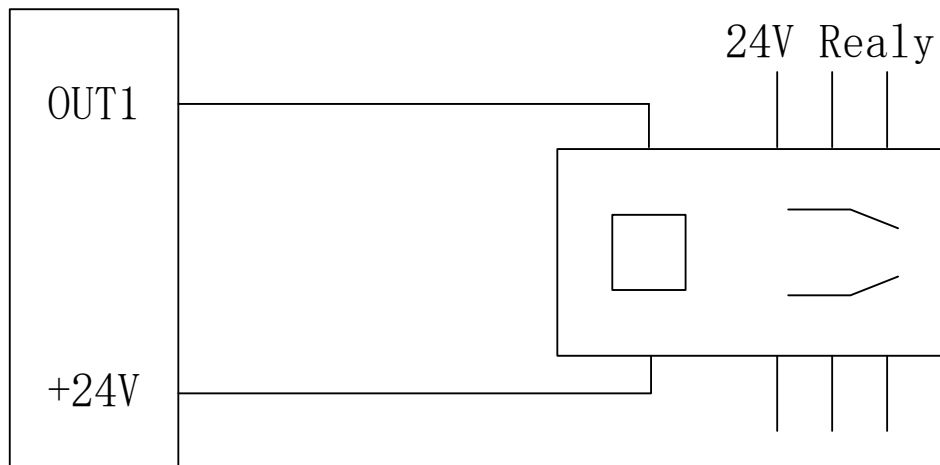
2. RF Laser Wiring



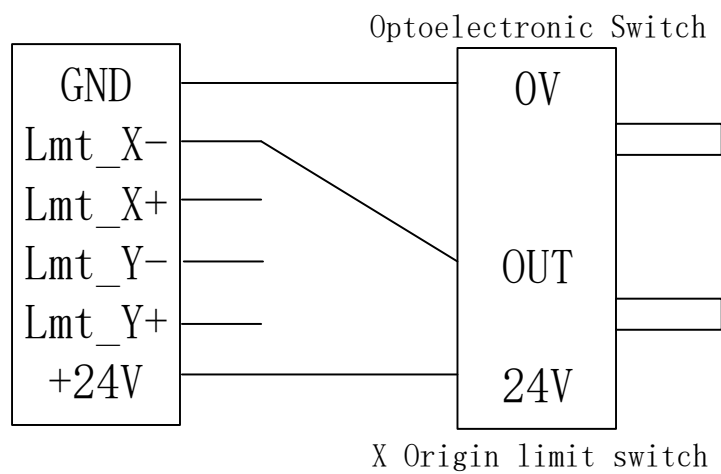
Note: When "RF or RF (Pre-ignition)" is selected, please set the PWM Frequency according to the data sheet of the laser. Generally, PWM Frequency is 5000Hz. And set the Laser Max parameter not larger than 95%, especially not to set as 100%, otherwise it works improperly.

2.3.2.3 General Output Signal Wiring Diagram

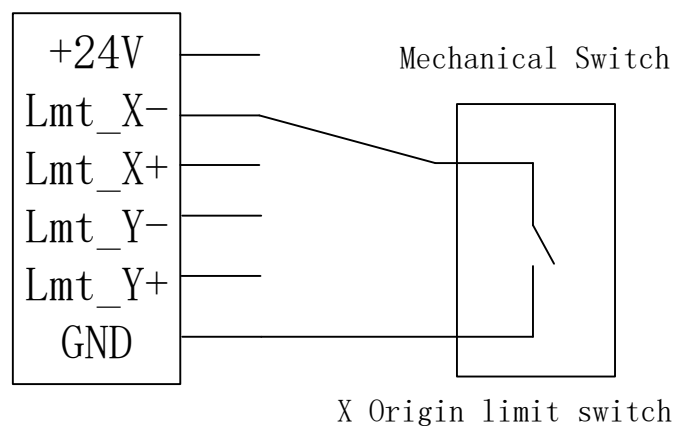
The following is OUT1 wiring, others are similar.



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

U-DISK port is on the top right of panel. It is able to directly insert the U disk to read and write.

2.4.5 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	LON Laser enable control. When the laser is CO2 laser, used to control laser On/Off
4	WP Water protection input, active at low level 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	+24V DC24V Output
2	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
3	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
4	GND Power source grounding

2.4.9 Input Interface

INPUT-1

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

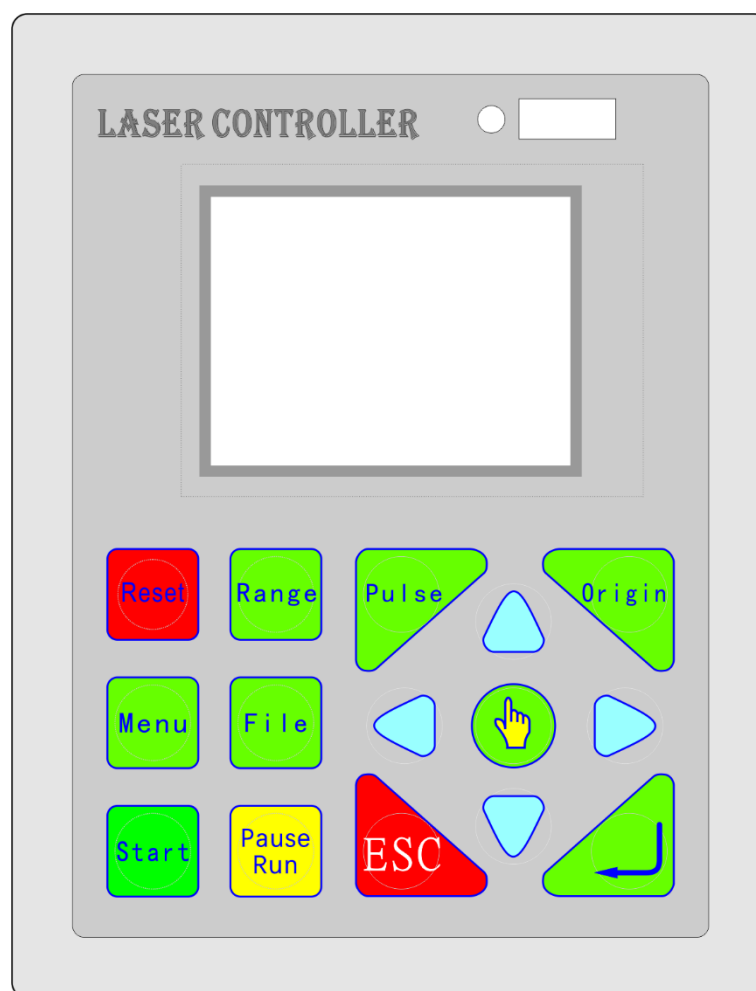
INPUT-2

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


Part III The Operation Panel

3.1 Function Introduction




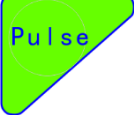
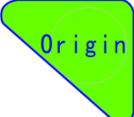
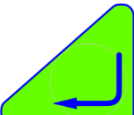



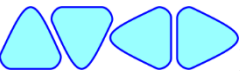

3.1.1 The Panel



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.

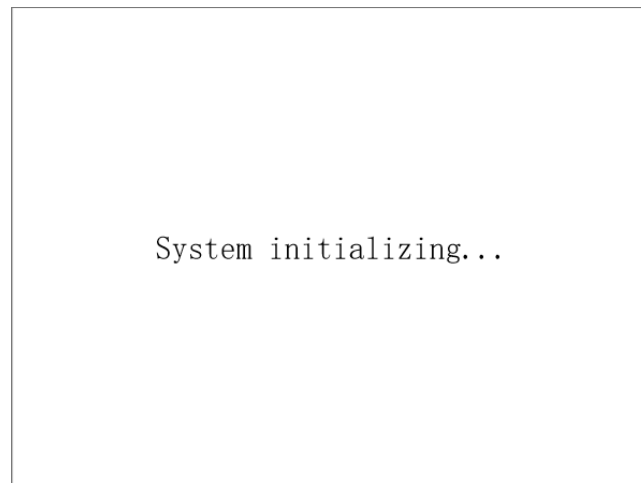


2.  "Menu" Key: press the key and go into the main menu interface.
3.  "File" Key: go into the memory file selection interface.
4.  "Range" Key: the range previewed interface.
5.  "Pulse" Key: use to test. Press one time, light one time. It is used to test the optical path and light power intensity
6.  "Origin" Key: can set the start point from which the machine runs.
7.  "Enter" Key: agree to the current operation. In standby Interface, press this key to go into parameter setting interface.
8.  "ESC" Key: used to cancel the operation and return to the previous interface.
9.  "Start" Key: start processing the current file.
10.  "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.
11.  Direction key, used to move the X, Y, Z, U axis, in the other interfaces, used to move the curse to choose menu.
12.  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

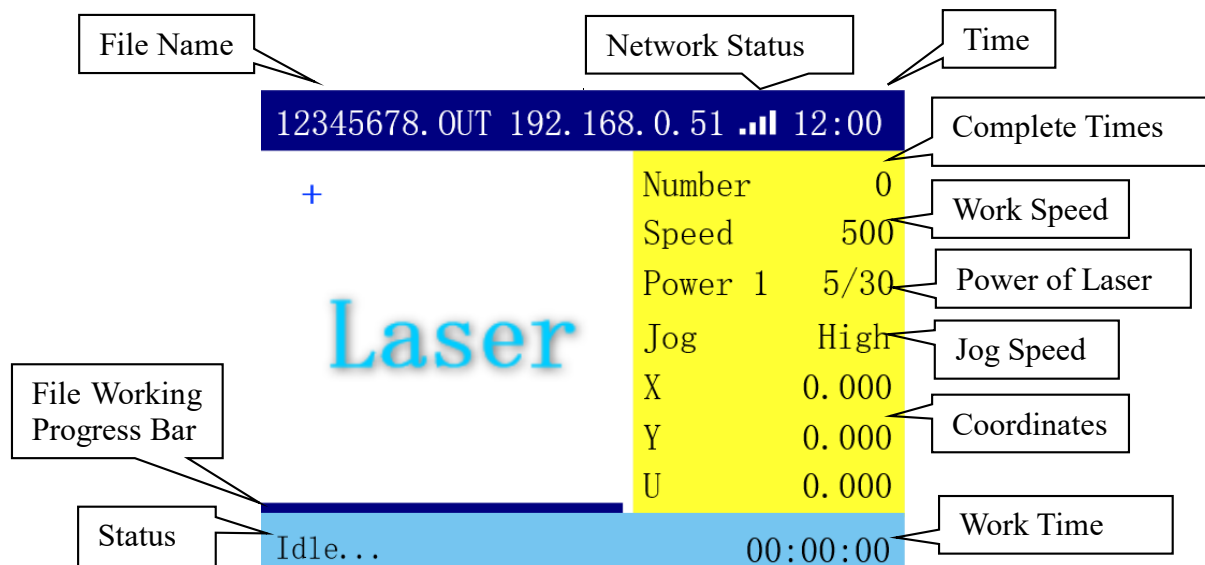
3.2.1 System Initialization Interface

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, IP address, network status 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 and the work 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, 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.



Speed: the working speed.

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

Jog: 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.

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 , and select "Clear" 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 , and select "Focus" to perform autofocus.

3.2.3 Input Interface

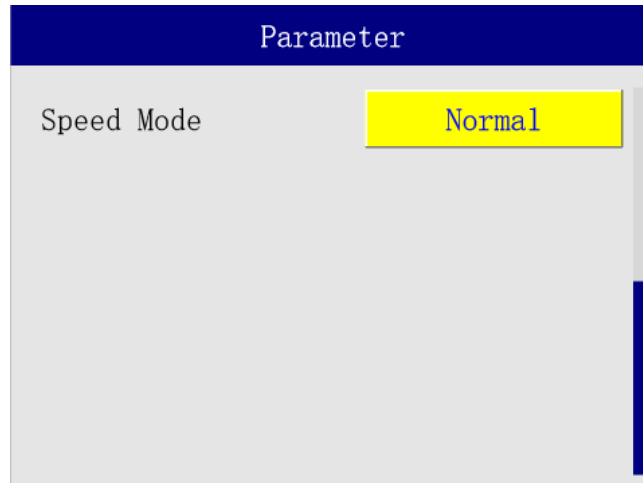
When it need to enter a number, select the parameter, and press "Enter" key, it shows the input dialog, show as follow. Press "Right/Left" to select a number, press "Select" key to select, press "Enter" to confirm the operation, press "ESC" to quit and return to the original interface.

Work Speed	
Old:	500
New:	500
<div>◀ 0123456789. ></div>	
Cancel	OK

3.2.4 Layer Parameter Settings




After initialization, press the "Enter" key, select Layer Parameter, show as:




Parameter	
Layer Parameter	0
Work Speed	500
Idle Speed	500
Power Min1 (%)	5
Power Max1 (%)	30
Speed Factor	2

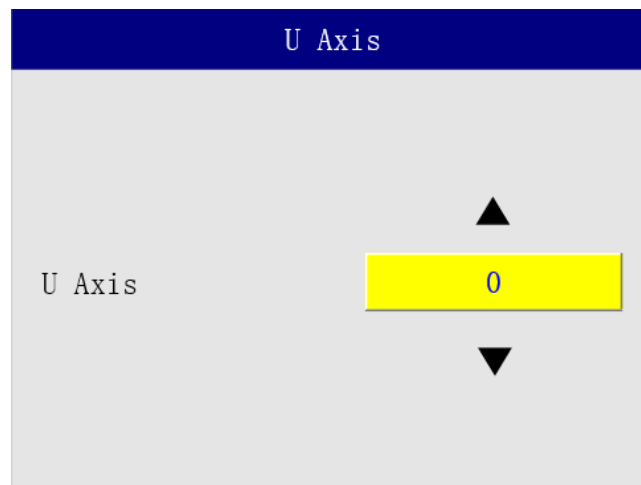


1. **Layer Parameter:** when one file is selected, press "select" button, to choose the layer number.
2. **Work Speed:** when one file is selected, it shows the work speed in current layer. Otherwise, it shows the system default speed value. The unit is mm/s.
3. **Idle Speed:** the default move speed 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. **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%.
5. **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%.
6. **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.
7. **Speed Mode:** in normal mode, the machine jitter and impact are reduced, and the processing effect is good, but the processing time increases. In fast mode, the machine turns fast, jitter and impact increases, but the processing time is short and the efficiency is high.

3.2.5 Z/U Axis Move Interface

In standby interface, press , shows Z/U Axis Move Interface. Press “Up/Down”   to Move Z or U Axis.

- In Menu/Equipment interface, When change the Z/U Option to "Z Axis", it displays coordinate of Z axis, then it is able to control Z movement, Otherwise, it displays U axis.
- For the rotary cutting model it displays coordinate of Z axis, press  to record the current position of Z as docking position when stop working; press  to record the position as working position when Z axis moving down during the processing; press  for head presetting test.



3.2.6 Range Preview Interface

On the standby interface, press the "Range" button to directly preview the frame. If you need to modify the range preview parameters, you can enter the panel "Menu"->"Range" to modify, after the modification is completed, directly press the "Range" key to preview the frame, as shown in the figure:

Range	
Laser On	NO
Run Speed	200
Power Min1 (%)	5
Power Max1 (%)	30

1. **Laser On:** border preview is divided into two types of preview, one is to cut the border; One is to take the border. You can press the "Select" key to change the two preview methods. Select "Yes" to cut the border, and select "No" to walk the border to view the working range. Press "Range" when the selection is complete to perform the movement. Press "Pause" to stop the movement.
2. **Run Speed (mm/s):** set the speed at which the border goes, in mm/s..
3. **Power:** the power of the trimming frame adopts the default power value of the machine. The minimum power represents the power value at starting and turning angle, and the maximum power represents the power value at reaching the frame speed

3.2.7 File Selection Interface

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

Memory File	
001:12345678. OUT	100K
002:12345678. OUT	100K
003:12345678. OUT	100K
004:12345678. OUT	100K
005:12345678. OUT	100K
Laser	Total 500
	Select 1
	Number 0
	Time 00:00:00

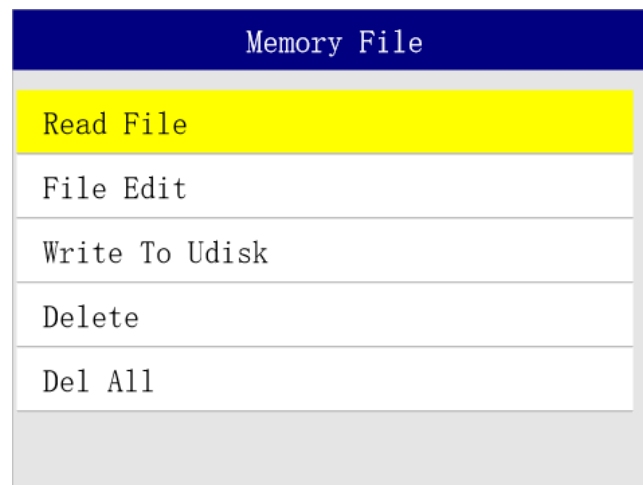
The list of files is displayed on the left side of the interface, the preview image in the upper right area, and the file information in the lower right area.

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:

5. **Reading File:** select this file to work.
6. **File Edit:** edit the file parameters like speed and power.
7. **Write to U Disk:** copy the file into U disk.
8. **Delete:** delete the current file.
9. **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.

File Edit	
Layer Parameter	
File Parameter	

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. Open Delay / Close Delay: the unit is second.

Layer Parameter	
Layer Parameter	1
Blow	Yes
Power Min1 (%)	5
Power Max1 (%)	30
Work Speed	500
Idle Speed	500

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

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

File Parameter	
Start Position	Setpoint
Rows	1
Columns	1
Rows Space	100
Columns Space	100
Feeding Times	0

File Parameter	
Feeding Length	0

3.2.8 The Main Menu Settings

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

Menu
File
Axis Move
User
Axis
Network
Zero Point Return

Menu
Range
Equipment
Laser
Language
Records
System

3.2.9 U Disk File

In the menu interface, select "File" to enter "Memory File", "U Disk File", "File Settings" and other interfaces.

File
Memory File
U Disk File
File Settings

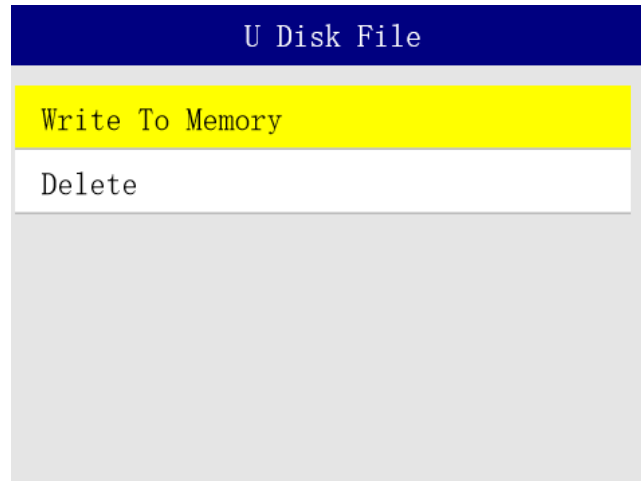
Select "U Disk File" to open U disk, show as:

U Disk File		
001:12345678. OUT	100K	
002:12345678. OUT	100K	
003:12345678. OUT	100K	
004:12345678. OUT	100K	
005:12345678. OUT	100K	
Total		500
Select		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.

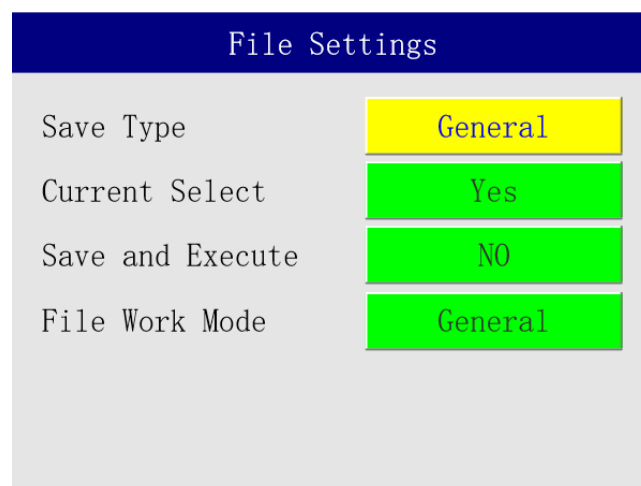
Click "Enter" key to perform the file operation, show as:



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

3.2.10 File Settings

Select "File Settings" to enter , show as:



1. **Save Type:** General or Temporary. Temporary 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. **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 Cycle. Cycle means all the files will be executed one by one in cycle. Otherwise, select "General".

3.2.11 Single Axis Movement Interface

In Menu interface, select "Axis Move", show as:

Axis Move	
Laser On	NO
X Axis	0
Y Axis	0
U Axis	0

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

1. **Laser On:** select "Yes" to move the single axis with light, and select "No" to not emit light.
2. **X Axis:** 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 and press "Enter" to move.

3.2.12 User Settings

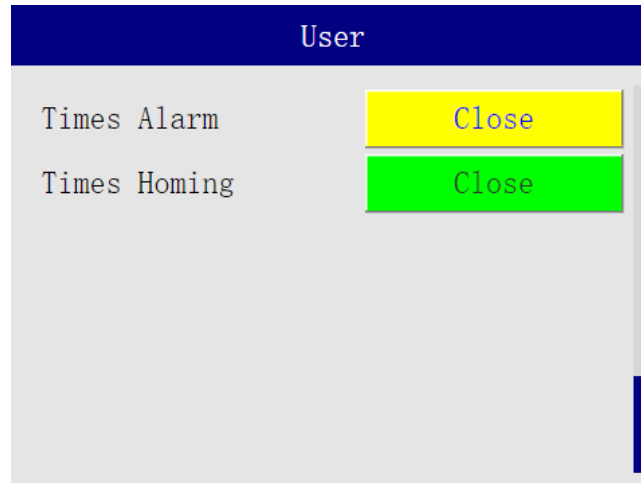
In the Menu interface, select the "User", press "Enter" key to go into User Settings Interface as show below.



User	
Protection	Close
Protection PN	Negative
Return Point	Setpoint
Jog Continue	Open
Jog Step	1.5
Jog Speed	200

User	
Return Speed	20
Pulse Time	500
Feeding Delay	500
Min Acc	400
Idle Speed	500
Idle Acc	1500

User	
Idle Jerk	60000
Idle Delay (ms)	0
Cooling Check	Close
Pulse Blowing	Open
Display Track	Open
Seed Limit Mode	Work Speed



1. **Protection:** in the open state, the system will detect the cover opening protection signal, and the system will not work in the open state.
2. **Protection PN:** the connection mode of cover opening protection switch is that the negative low level is effective and the positive one is high level.
3. **Return point:** the stop position of laser head after system reset and work. There are three options: mechanical origin, none and positioning point. If you select "None", the current position will be stopped after the work is completed.
4. **Jog Continue:** Open, continuous mode, press and hold the direction key, the axis moves, release the key, stop the movement; close, it is inching mode, press the key once, the axis will move the length specified by "inching distance".
5. **Jog Step:** when the key continuous mode is turned off, set the jog distance of each axis by pressing the direction key. Unit: mm. 5. Jog distance: when the key continuous mode is turned off, set the jog distance of each axis by pressing the direction key. Unit: mm.
6. **Jog Speed:** manual key frame moving speed, unit: mm / s.
7. **Return Speed:** the speed of the system returning to the origin, unit: mm / s
8. **Pulse Time:** the time, in MS, of the system to automatically light when the "dot" key is pressed.
9. **Feeding Delay:** default time interval of automatic feeding, unit: ms.
10. **Min Acc:** the corresponding minimum acceleration when starting and stopping. The smaller the value is, the smaller the start and stop jitter is, and the corresponding acceleration and deceleration time increases; the larger the value is, the greater the start and stop jitter is, and the faster the acceleration and deceleration is. Generally, it is 400mm / S². If faster processing speed is needed, the minimum acceleration should be set above 850mm / S². If accurate processing is needed, it should be set to 200mm / S² (according to the actual machine, here is the recommended value). Unit: mm / S².
11. **Idle Speed:** when the default speed is selected for the processing file, the XY axis idle speed when no light is emitted. Unit: mm / S².
12. **Idle Acc:** the acceleration of the XY axis in the absence of light. Unit: mm / S². The

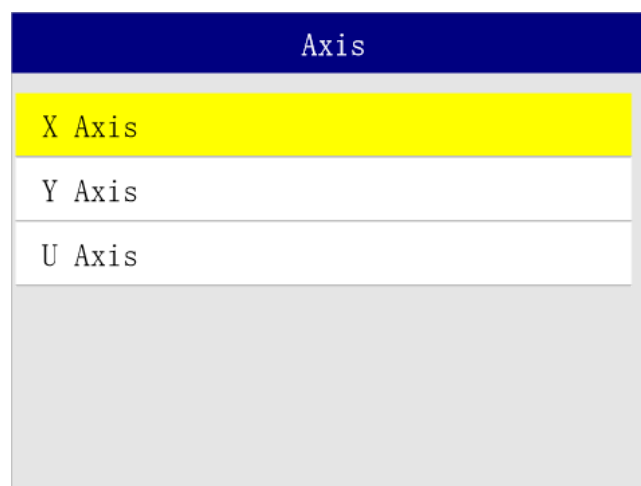


greater the acceleration, the faster the acceleration and the greater the relative jitter. On the contrary, acceleration and deceleration are smoother.

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. **Cooling Check:** 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. **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. **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. **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.

3.2.13 Axis Settings

In the 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.



X Axis	
Resolution(um)	10
Max Speed	500
Corner Speed	20
Acceleration	12000
Jerk	480000
Max Range	1200

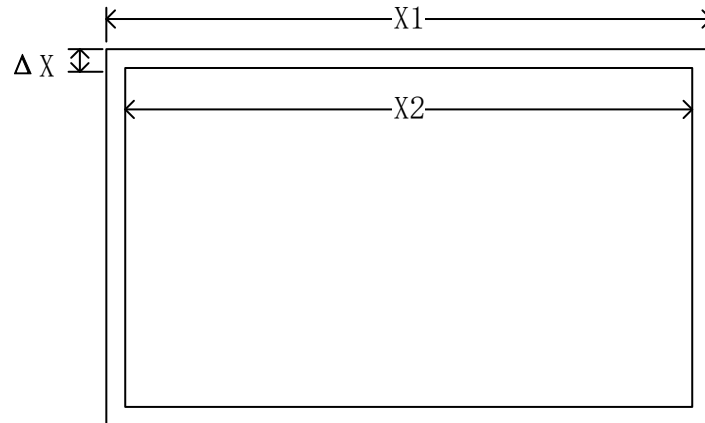
X Axis	
Backlash	0
Direction	Positive
Limit	Negative
Jog	Positive
Protection	Close
Trigger Edge	Rising

1. **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 “Menu” 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.



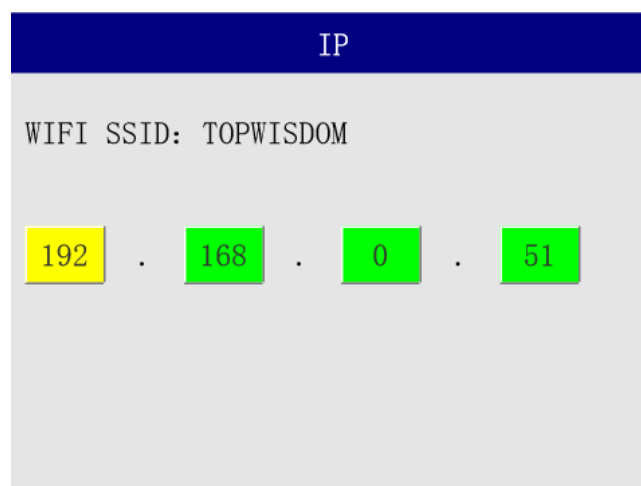
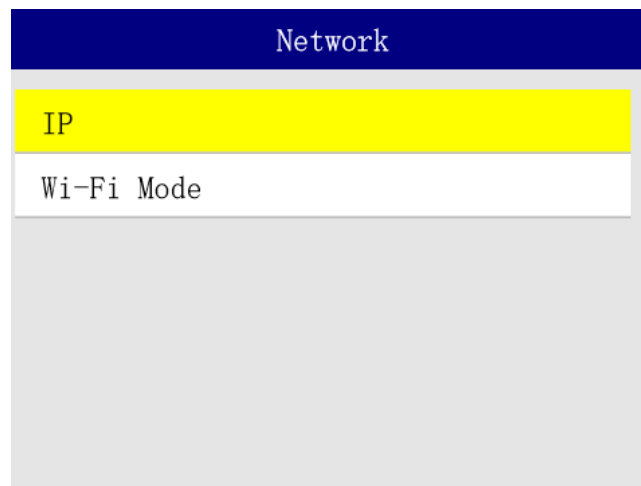
2. **Max Speed (mm/s):** the maximum speed allowed for single-axis movement. This value decides the max. Engraving speed and cutting speed.
3. **Corner Speed (Stop Speed) (mm/s):** the speed of start or stop during single-axis motion, i.e., the motion stops speed.
4. **Acceleration (mm/s²):** the Max 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. **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

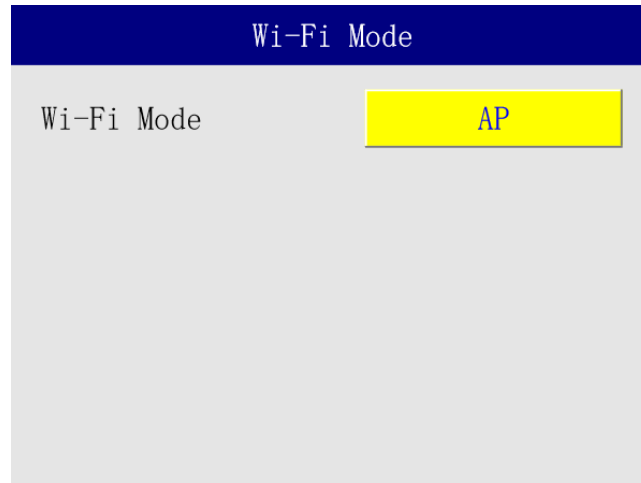
control buttons on the keyboard, you can change the polarity to make them consistent with each other.

11. **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. **Edge Trigger:** Rising or Falling. Depending on the drive settings, it is usually set the Rising. If the axis moves back and forth, it is always misaligned in one direction, and reverse the Edge Trigger.

3.2. 14 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.
4. Therefore, the WiFi network used by the controller, so the Ethernet cable cannot be used for direct connection, and the computer itself needs to have the function of wireless network card to communicate with the controller using this network.

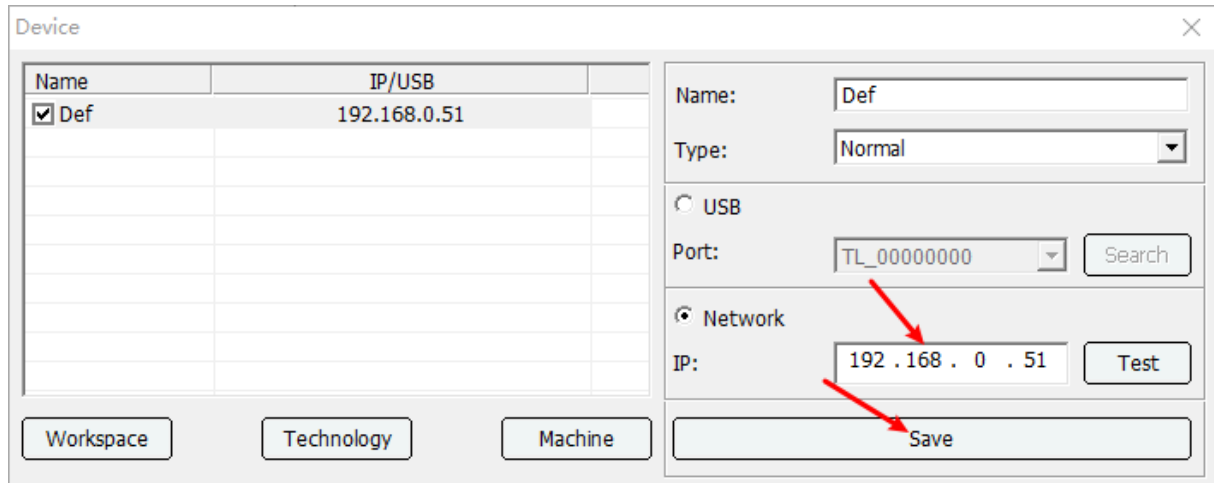
Connection Description: (Take the default IP address of the controller as an example).

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:



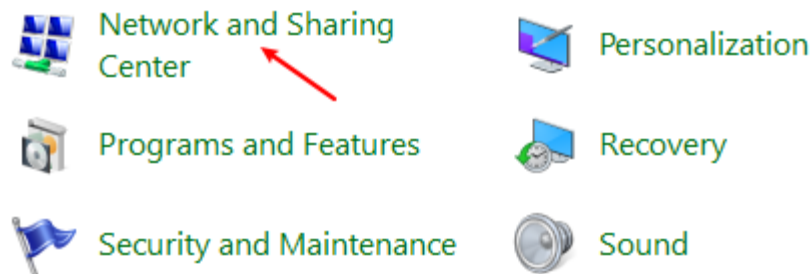
Name	IP/USB
<input checked="" type="checkbox"/> Def	192.168.0.51

Workspace Technology Machine

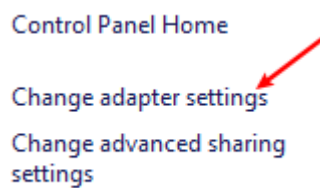
Name: Def
Type: Normal
☐ USB
Port: TL_00000000 Search
☒ Network
IP: 192.168.0.51 Test
Save

Local Area Connection Settings:

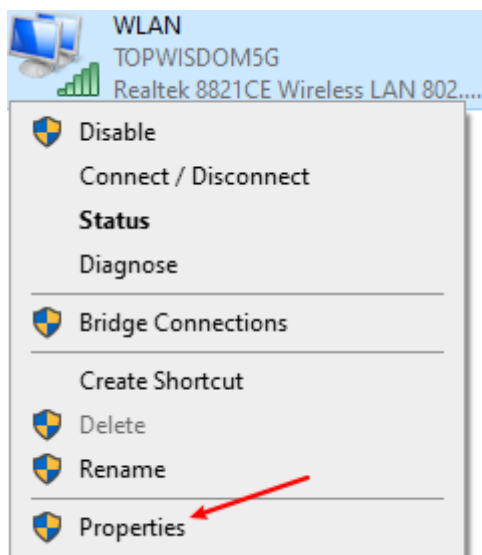
1). Open the Computer Control Panel and select Network and Sharing Center. As shown in the figure:



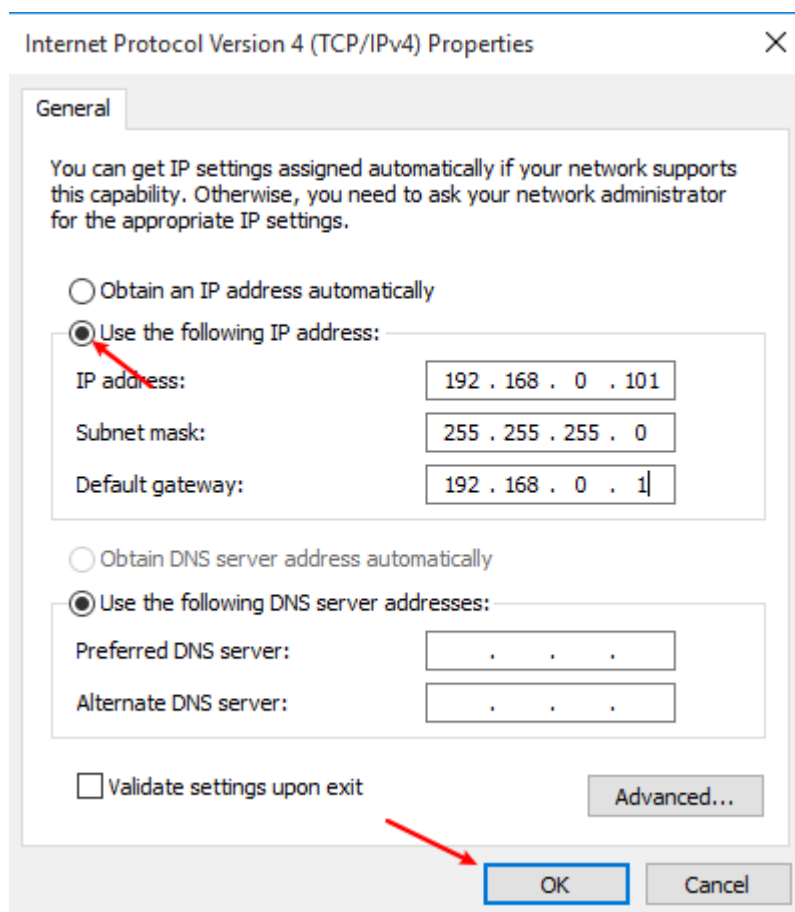
2). Select Change Adapter Settings. As shown in the figure:



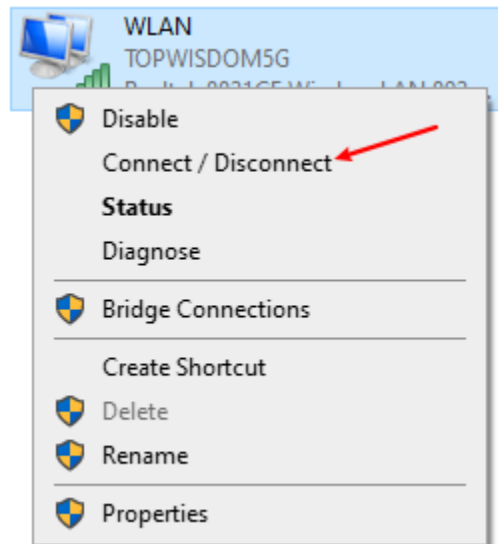
3). Click WLAN and right-click to select Properties.



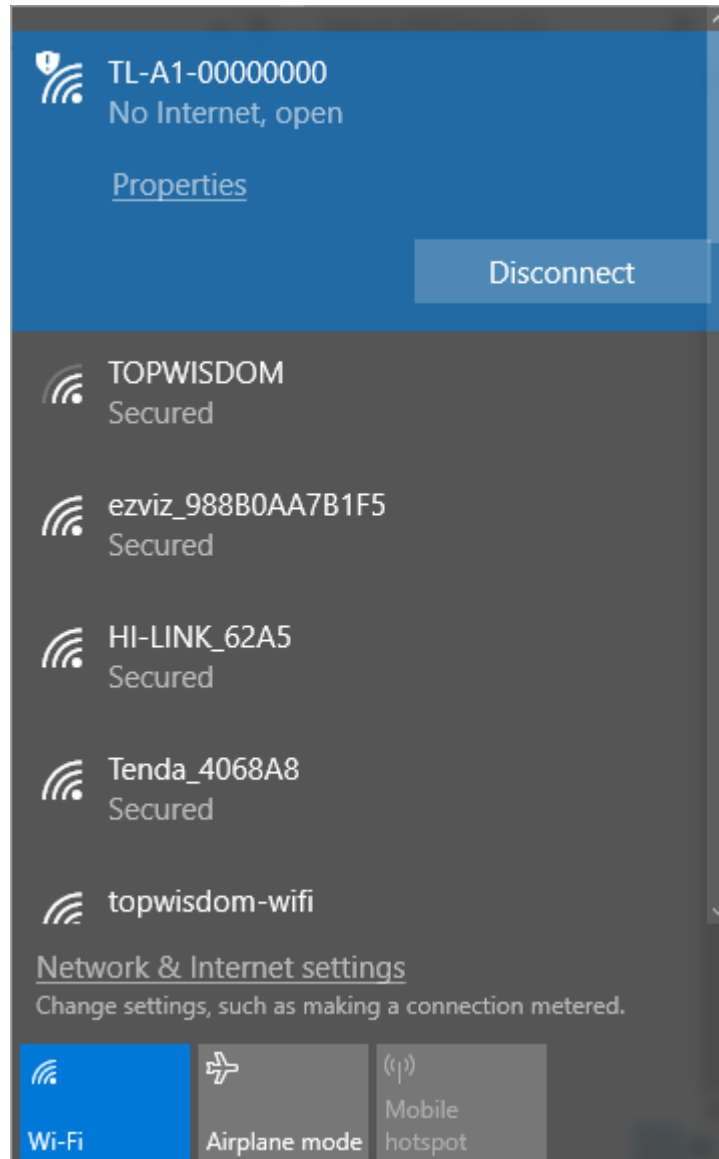
4). Then double-click "Internet Protocol Version 4 (TCP/IPv4)" to change "Automatically obtain IP address" to "Use the following IP address" and click "OK".



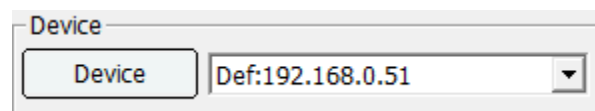
5). When the changes are complete, select Wireless Network Connection and right-click to select the Connect/Disconnect option



The computer will pop up the WiFi network that can be connected at present, select the WiFi network with the current WiFi name as the controller number, and double-click to connect. As shown in the figure:

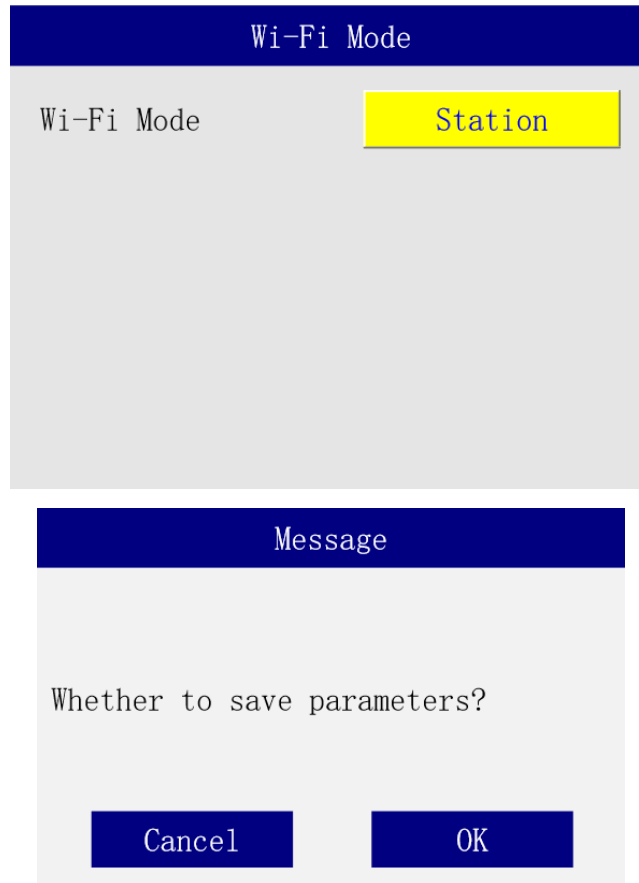



6). After successful connection, open AutoLaser and select the device for IP address in the device list.



2.Station Mode

In the Wi-Fi mode interface, select "Station", press "Enter" key, and the message box will pop up and Press Enter button to go in to "WLAN" page.



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.



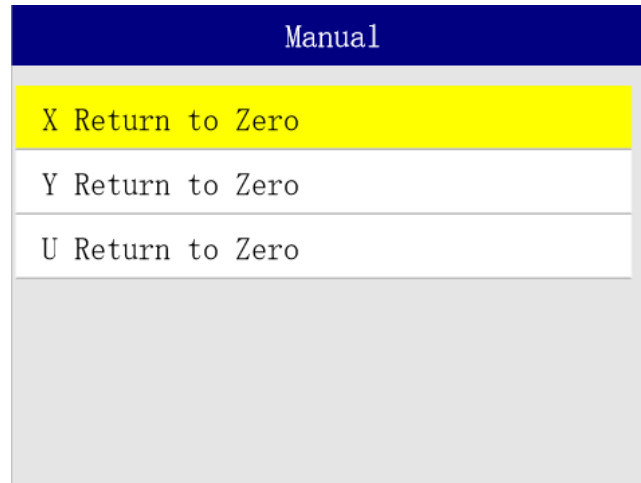
Password	
Password	12345678

3.2.15 Zero Point Return Settings

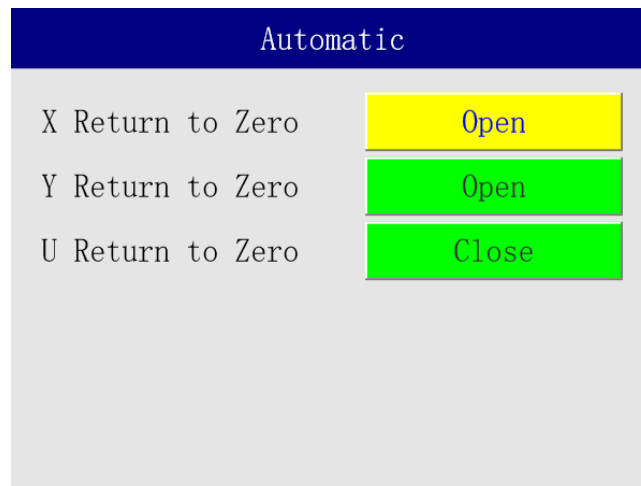
In the Menu interface, choose "Zero Point Return" to enter, show as:

Zero Point Return
Manual
Automatic

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, press "Pause" to stop.



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.

3.2.16 Equipment Settings

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

Equipment	
Table Mode	General
Laser Config	Single
Equipment Type	Common
Z/U Option	Lifting
OUT1	Completion
Feeding First	NO

Equipment	
Beep	100
Power Off Delay(ms)	700

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 port is use as Z axis; Feeding, receiving the feeding motor; Lifting, for platform lifting or auto focus.
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. **Feeding First:** whether the device will feed the material first before starting to cut.
 7. **Beep:** set the beep times when work is done.
 8. **Power off Delay (ms):** it is used when the laser head retreats insufficiently when the power is turned off to continue engraving, causing the graphic interface to not close. This parameter can be used to make appropriate compensation adjustments.

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.

Equipment	
Reference Diameter (mm)	100
Reference Resolution	700

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 /Y Axis interface, set the resolution of Y Axis to reference resolution value. Press "Menu" key and a window to calculate the resolution. Set 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.

Diameters (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**

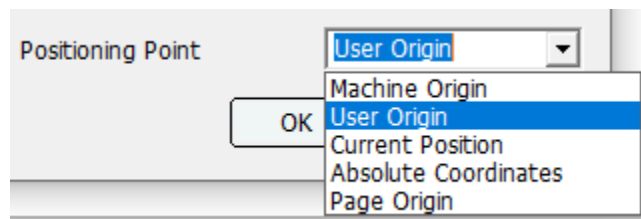
Select the Ribbon Cutter in the Equipment Type.

Equipment Type

Ribbon Cutter

Cutting instructions:

1. The Y-axis will be used as a feed shaft for feed cutting after selecting the ribbon cutter function.
2. Turn off the power-back-to-origin function on the XY axis.
3. Because the XY axis back to origin function is turned off, the current position coordinates of the laser head after power-on will automatically be adjusted to half the size of the XY axis's largest face.
4. Change the processing positioning method on the software to "current position" and then send the processing graphics to the cutting machine!



5. After cutting, the laser head returns to where the current cut figure is at its maximum size as the origin position, and then performs the next cut.

3.2.17 Laser Settings

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

Laser	
Laser Type	C02
Frequency	20000
Laser Min	3
Laser Min	100
PWM DIR	Negative
X Compensation 1	Positive

Laser	
X Compensation 1 (%)	0
Y Compensation	Positive
Y Compensation (%)	0
On Delay (ms)	0
Off Delay (ms)	0
Focus Length (mm)	0

1. **Laser Type:** there are common (CO2 glass tube), radio frequency, radio frequency (pre combustion) three kinds. When the laser is a RF laser that does not need to be pre ignited, select the RF type; if it is a RF laser that needs to be pre ignited, please select the RF (pre ignited) type (at this time, the control card will always send a pulse signal of 1 US width to the laser in standby mode, so that it can be pre ignited).
2. **Frequency:** 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 1:** power compensation of laser head 1. When the origin is in the upper left corner, the compensation mode is positive electrode, and the laser power will slowly increase as the X axis moves away from the origin. When compensated as negative electrode, the laser power will slowly decrease as the X axis moves away from the origin.
7. **X Compensation 1 (%):** set the power intensity to be compensated for the laser head 1 to move from the origin position to the X-direction maximum width.
8. **Y Compensation:** power compensation of Y-direction laser. When the compensation

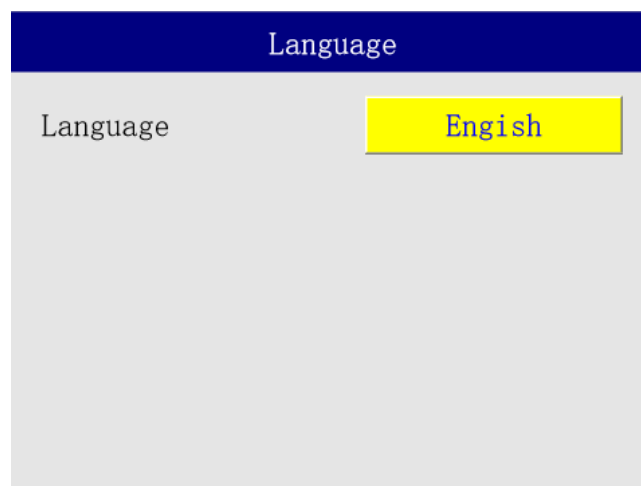
mode is positive electrode, the laser power will slowly increase as the Y axis moves away from the origin. When compensated as negative electrode, the laser power will slowly decrease as the Y axis moves away from the origin.

9. **Y Compensation (%)**: set the power intensity to be compensated for the laser head to move from the origin position to the Y-direction maximum width.
10. **On Delay (ms)**: The delay time for laser on at the beginning. If the opening delay parameter is set too large, the starting segment will not be closed.
11. **Off Delay (ms)**: The delay time of laser turn-off at the end. Setting appropriate off-light delay parameters can remove the non-closing phenomenon when cutting is finished.
12. **Focus Length (mm)**: change the focus length for AutoFocus. When this parameter is set, press "Enter" in standby interface and select "Focus", a message box will pop up showing that whether reset focus length. 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, and 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.

3.2.18 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.



3.2.19 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 "Enter" key to show the information, press the "Select" key and enter the password "12344321" to delete the selected information. Press the "Menu" key to enter the same password and delete all the information.

Records	
Time of Power On	
Laser On Time	
Total Work Time	
Total Process Times	
X Total Travel	
Y Total Travel	

3.3 System Settings

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

System	
Version	V. L020. 014
System Upgrade	
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_L020.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 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 corrects.
- 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.

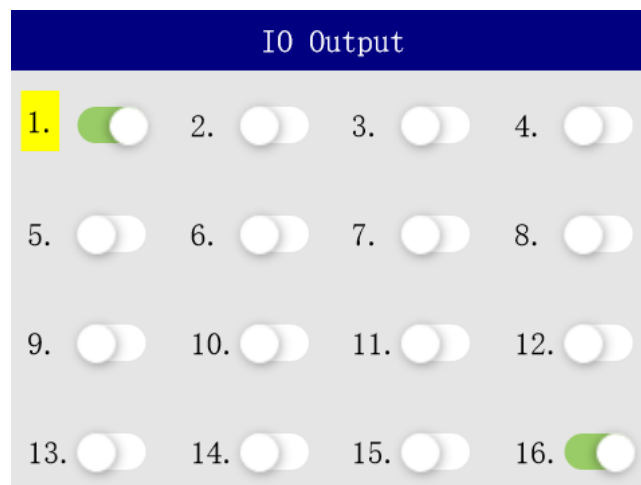
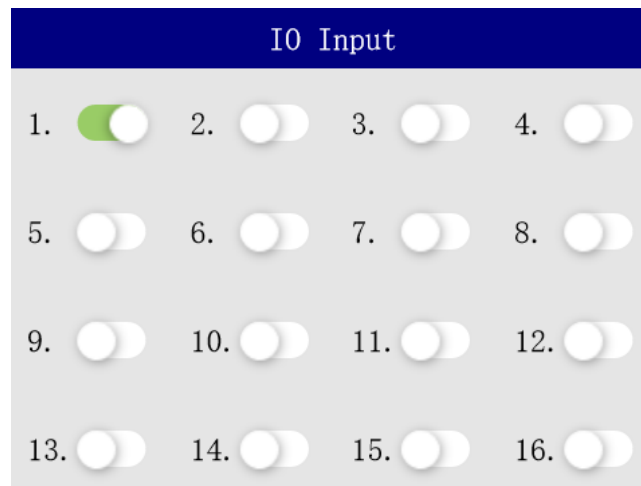
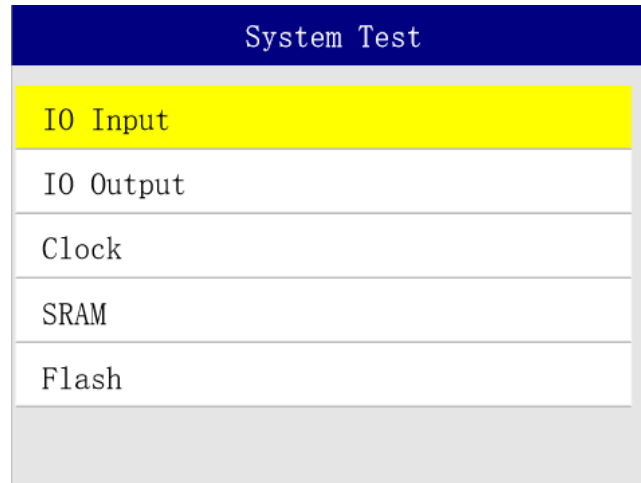
Note: 7 days before the system is locked, the system will prompt the remaining days of the lock to remind the user to unlock in time.

Administrator
Time
ID
WIFI SSID
Administrator Password
Password Status
Password Preview

Administrator
Export Password
Factory Data Backup

3.3.2 System Test

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



1. **IO Input / Output Test:** corresponding to IO input/output detection, when the pin is low,

the corresponding icon changes from white to green. In the output test interface, press the arrow keys to select the number, and press the select key to output the test. Press the enter key to test all outputs with one key.

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

3. IO Input / Output Test Interface Description:

Input Test:

Pin No.	Description
INPUT1 = Lmt_X-	Lmt_X- X origin limit, axis movement to the minimum coordinate (0) limit sensor input
INPUT2 = Lmt_X+	Lmt_X+ X upper limit, axis movement to the max coordinate limit sensor input
INPUT3 = Lmt_Y-	Lmt_Y- Y origin limit, axis movement to the minimum coordinate (0) limit sensor input
INPUT4 = Lmt_Y+	Lmt_Y+ Y upper limit, axis movement to the max coordinate limit sensor input
INPUT5 = Lmt_Z/U-	Lmt_Z/U- U origin limit, axis movement to the minimum coordinate (0) limit sensor input sensor input
INPUT6 = Lmt_Z/U+	Lmt_Z/U+ Z/U upper limit, axis movement to the max coordinate limit sensor input
INPUT7 = Door_SW	Door_SW Protection signal input, connecting to cover protection and other signals
INPUT8 = Foot_SW	Foot_SW Foot switch signal input, active on the rising edge, with pulse width not less than 100ms
INPUT9 = WP	WP Water Cooling Protect Input, active at low level

Output Test:

Pin No.	Description
OUT1	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

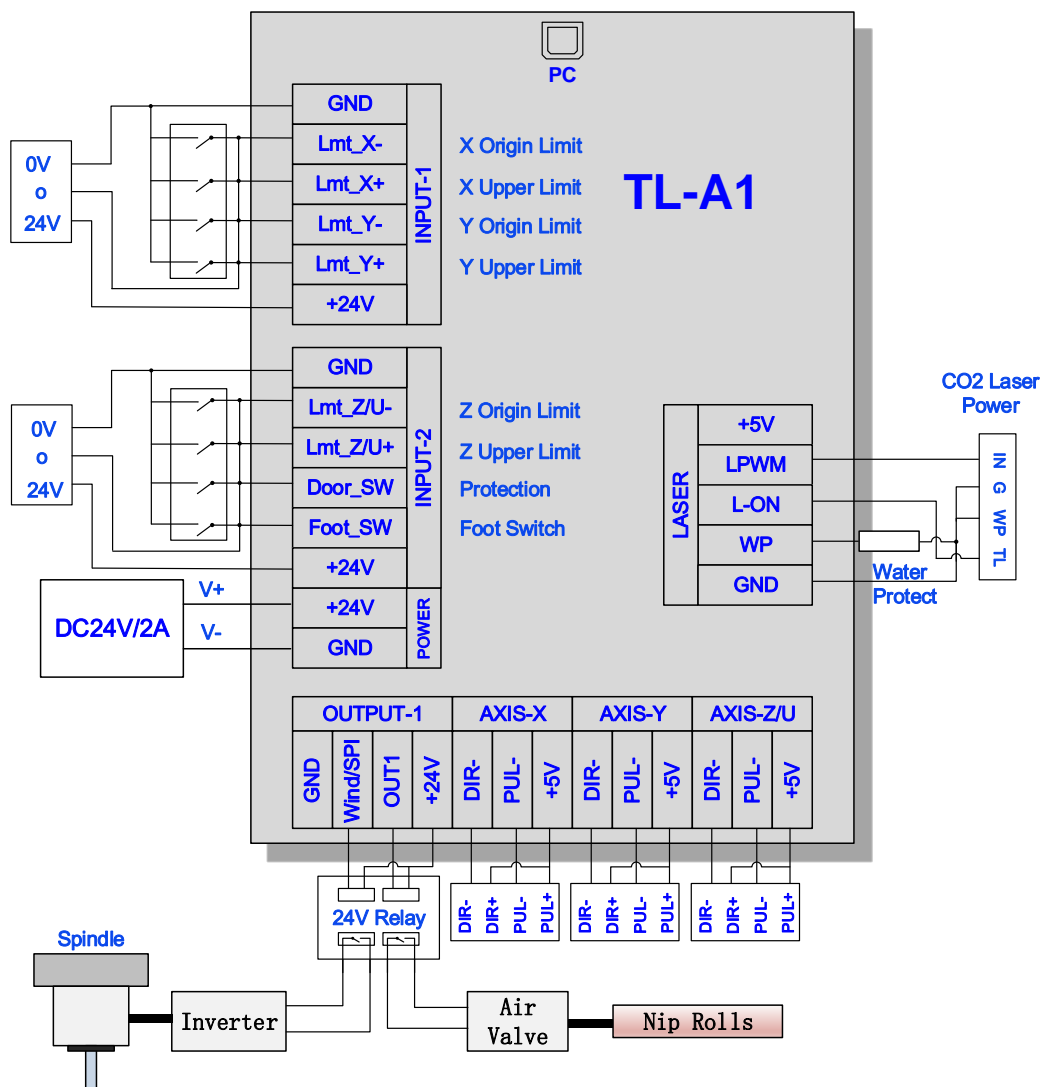


	feeding roller, active at low
OUT8 = Wind/SPI	Wind/SPI Blowing signal or spindle signal, the signal is multiplex, used for the blowing signal in case of a normal model; used as start and stop signal for the spindle motor in case of rotary cutting model, active at low level
OUT9 = X-PUL	X-PUL- X axis step pulse, connect to the PUL- of step motor driver
OUT10 = X-DIR	X-DIR- X axis direction signal, connect to the DIR- of step motor driver
OUT11 = Y-PUL	Y-PUL- Y axis step pulse, connect to the PUL- of step motor driver
OUT12 = Y-DIR	Y-DIR- Y axis direction signal, connect to the DIR- of step motor driver
OUT13 = Z/U-PUL	Z/U-PUL- Z/U axis step pulse, connect to the PUL- of step motor driver
OUT14 = Z/U-DIR	Z/U-DIR- Z/U 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. In standby interface, press Enter, and select "Knife / Knife", 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. Select "Knife / Manual" to manually preset the heads and record the presetting position. Select "Knife / Automation" to execute the automatic tool setting. Select "Knife / Record Docking Position" to record the stop position. Select "Knife / Toolsetting Test", open the interface of testing head 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.

Equipment	
Cutting Tool	Knife
Spindle Delay	5000
Lift Height	20
Docking	0
Z Axis Speed	50
Feeler Blcok	10

Equipment	
Feeler Input	Negative

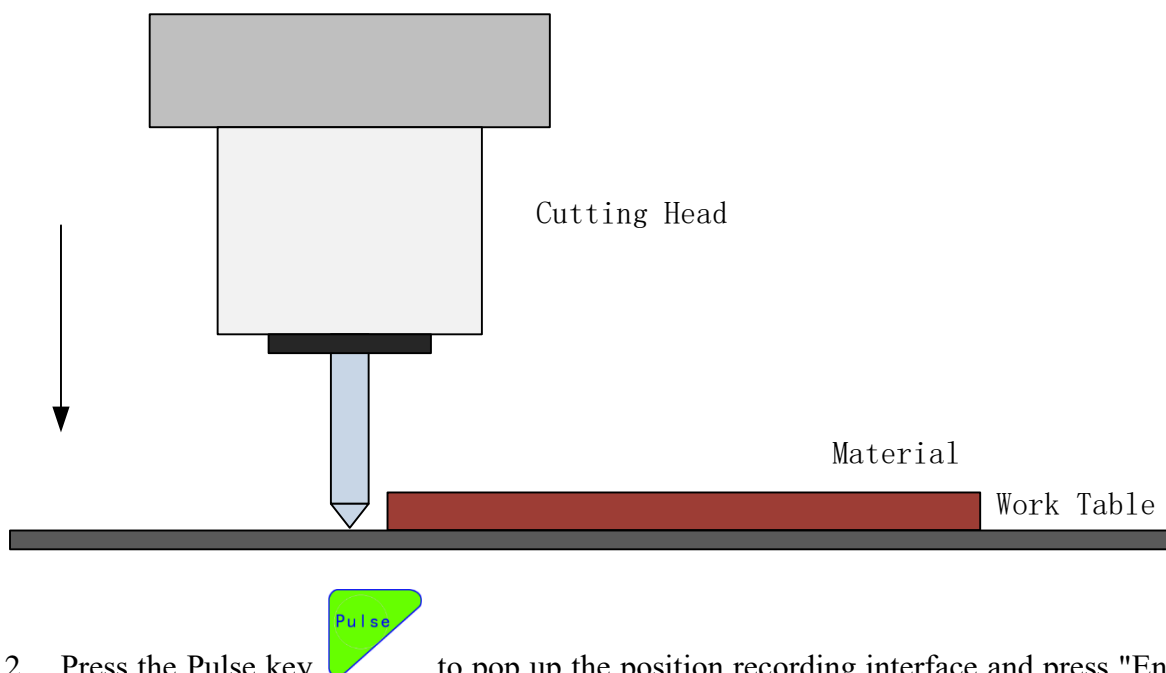
- Cutting Tool:** Knife or Laser. When the knife is selected, the rotary cutter mode is used to activate the spindle rotation, and the cutting head automatically moves down for cutting and lifts when finishing. When the laser is selected, the cutting head does not lift or fall.
- Spindle Delay:** the time required for the spindle to run from standstill to the rated speed. It requires being 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.
- Lift Height:** when working, the lifting height of the cutting head before the starting of idle motion, in unit of mm.


- d. **Docking:** the position where the cutting head stops after completion of the work, in unit of mm.
- e. **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.
- f. **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.
- g. **Feeler Input (Presetting Block Input):** the negative indicates that the presetting block input is active at low level; the positive indicates active at high level.

4.3 Head Presetting

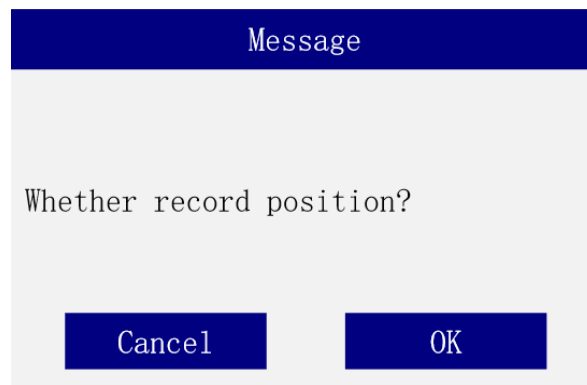
4.3.1 Manual Head Presetting


1. In the standby interface, press ESC, and press "Up/Down" to move the rotary cutting heads to the material cutting position, as shown.

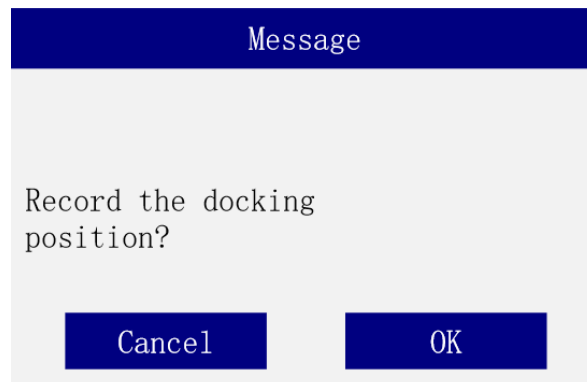



2. Press the Pulse key  to pop up the position recording interface and press "Enter" to record the position of the current rotary cutting head. It is the position where the rotary

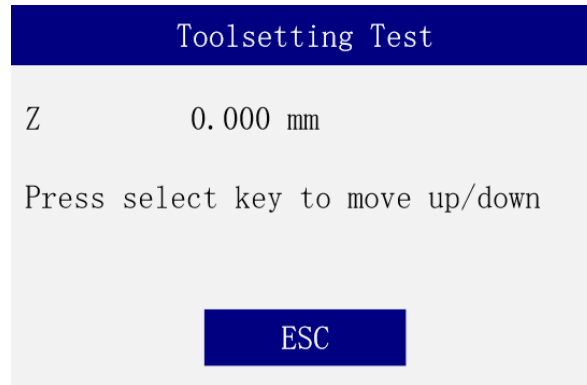
cutting head is lowered during the processing.



3. Press "Up/Down" to move the rotary cutting head to the position where it stops after completion then press the Range key  and then Enter to record the current stop position.

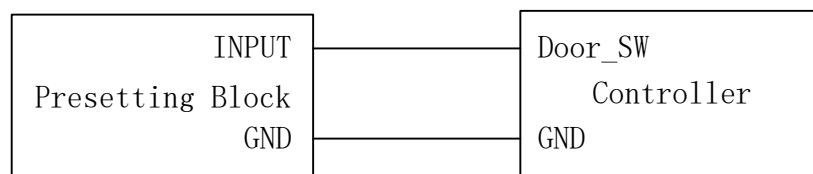


4. Press the Origin key  to test the head presetting. At this time, the interface pops up as shown in the figure. At this point, the cutting head will automatically drop to the present position recorded, and the coordinates of the current Z axis will be displayed in the interface. In this interface, press the Select 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 key to stop the motion. Repeat pressing the Select key to finish the descending and ascending test, and press the ESC to exit the test.

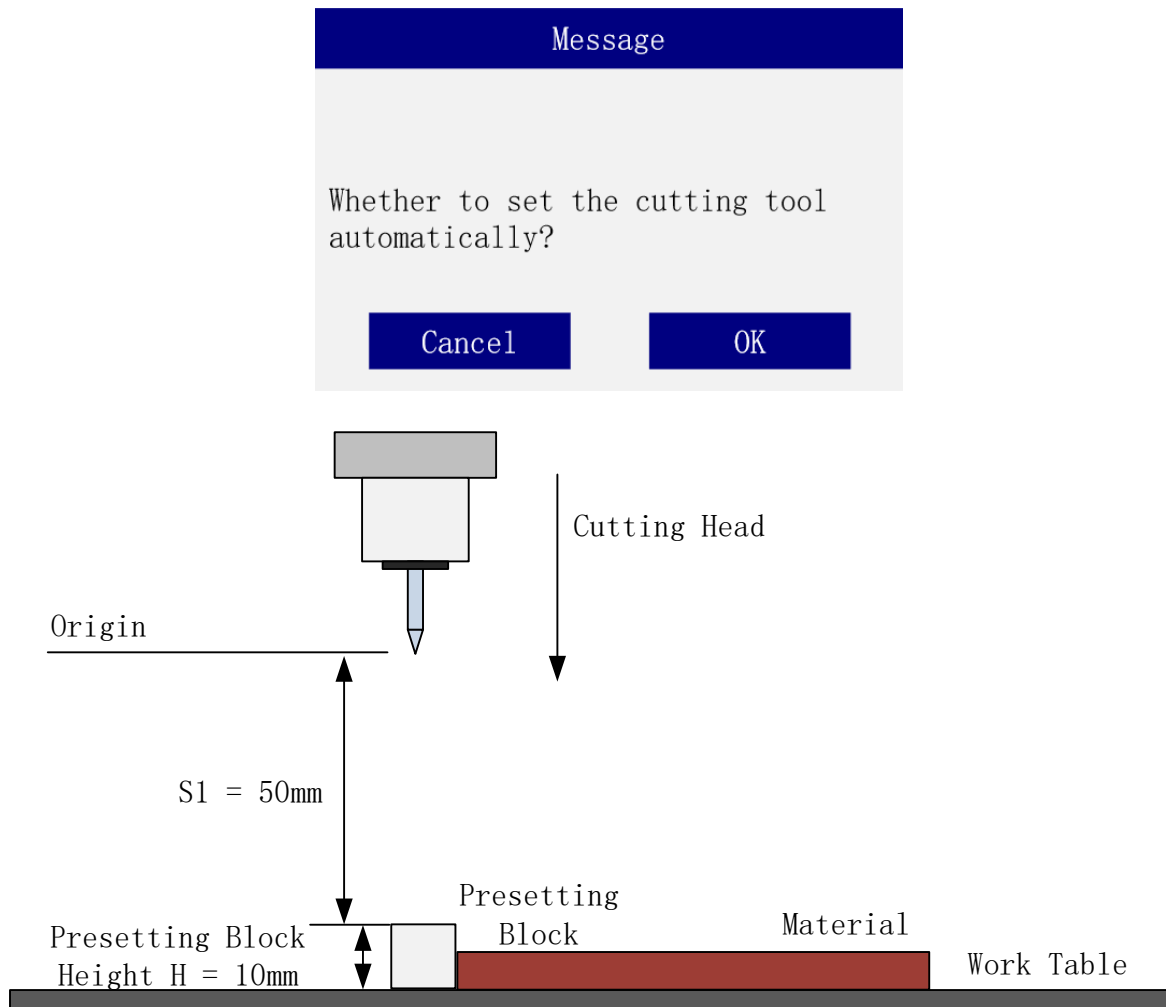


4.3.2 Automatic Head Presetting

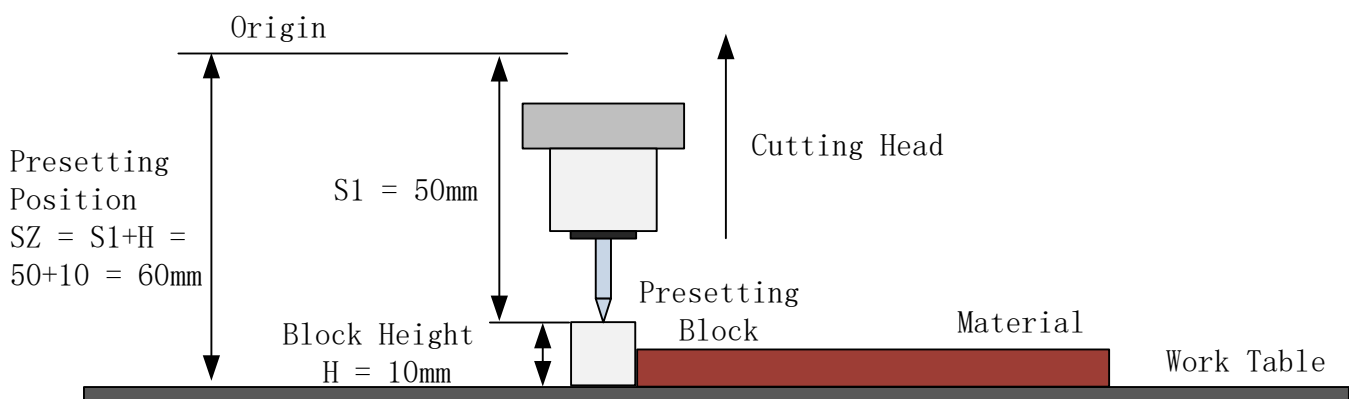
1. Before the work, the head presetting blocks have been equipped, and the wiring is as follows (**the following wiring is active at low level**). If the head presetting block is active at high level, please refer to the wiring diagram of the specific presetting block. The presetting signal interface 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".



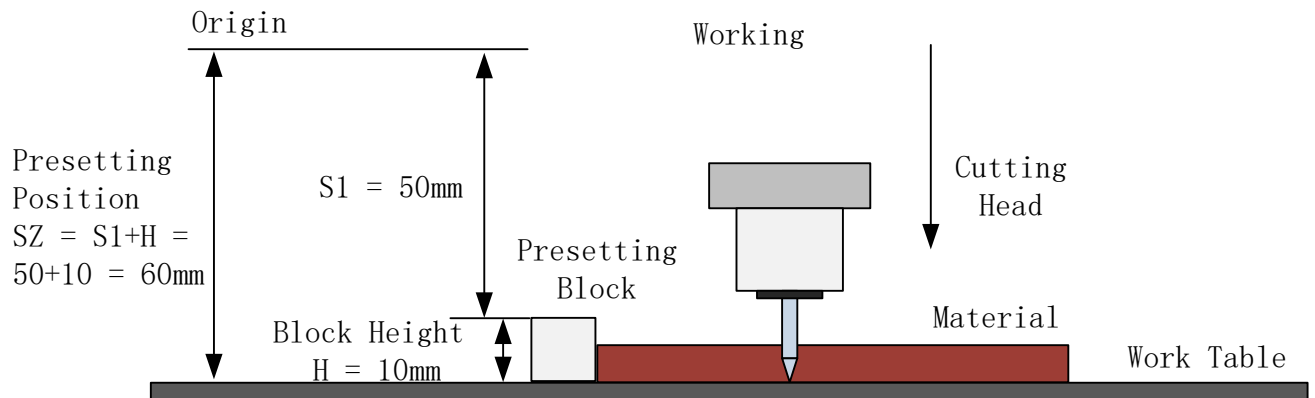
2. Set the "Feeler Block (Presetting Block Height) (mm)" H in the Equipment Parameters as shown in the figure below as H = 10mm.
3. Move the rotary cutting head to the top of the presetting block.
4. In the standby interface, press the number "Enter" key, and select "Knife/Automation" to start the automatic 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.



- 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:

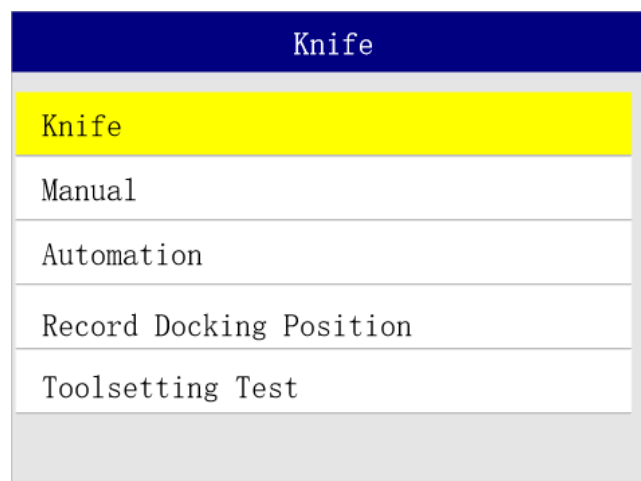


7. After the head presetting is completed, select "Knife / Toolsettings Test" to test whether it is correct (same as step 4 of Manual Head Presetting).

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 "Enter" key , and select "Knife" to enter the control interface.



1. **Knife:** go into rotaty cuting control interface.
2. **Manual:** manually preset the heads and record the presetting position. Select "Knife / Toolsetting Test", open the interface of testing head presetting position.
3. **Automation:** execute the automatic tool setting.
4. **Record Docking Position:** record the stop position.
5. **Toolsetting Test:** do testing head presetting position.

Select "Knife/Knife" 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.

Knife	
Spindle	Close
Nip Rolls	Close
Cutting Tool	Knife
Compensation Mode	Negative
Compensation	0
Docking	0

4.5 Tool Switch

In the standby interface, press the "Enter" key, and select "Knife/Knife" 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.

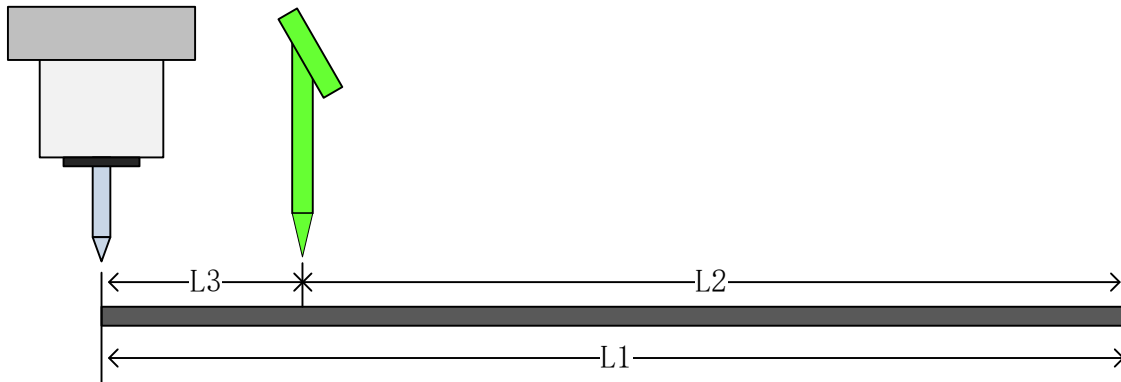
4.6 Processing Flow

1. When rotary cutting is required, select the rotary cutting head.
2. Place the material to be cut, then press the "Enter" key, and select "Knife/Knife/Nip Rolls" to open the roller to press. (If there is a press device.)
3. Perform the head presetting; in the standby interface, press ESC, open Z+/- movement interface, and press up/down key to move the cutting head to the cutting position of the material. Press the "Pulse" key 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 up/down key to move the cutting heads to the stop position when completion (Standby), press the "Range" key to record the stop position.
6. Press the "Origin" to test if the tool position is normal.
7. Back to standby interface, Move the X, Y axis, move the cutting heads to the Set Point, and press the Origin 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 "Enter" key, and select "Knife/Knife/Cutting Tool", then change it to Laser. At this time, move the laser head to

the place where it needs to be cut, press the "Origin" 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 "Cooling Check" 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.