

# MKS DLC32 MAX Manual



The MKS DLC32 MAX laser engraving control board, developed by Makerbase, is a high-performance, expandable, and smart control solution for engraving applications. Equipped with the ESP32-S3 series chip, it supports both CNC and laser engraving. The board accommodates the CNC A-axis and supports laser heads with up to 60W engraving power and speeds of up to 30,000mm/min, enabling efficient creation.

It is compatible with pluggable drivers, such as the ultra-silent TMC2209 and high-current TB67S109 driver modules. External drivers can also be connected. For safety, features like lid protection and flame detection can be equipped to ensure secure operation.

The board supports mobile app and local network remote control, allowing for independent operation without a long-term computer connection. Whether for laser engraving or CNC applications, the MKS DLC32 MAX is the ideal choice for unlocking unlimited creativity.

# Directory

<i>Overview and Features</i> -----	4
<i>Hardware parameters</i> -----	4
<i>Installation Dimensions</i> -----	5
<i>LS ESP32 PRO Operation</i> -----	6
<i>Connect the motherboard interface</i> -----	6
<i>Update the motherboard firmware.</i> -----	12
<i>Install MKS LASERTOOL and USB driver files (ch340)</i> -----	12
<i>Firmware update operation</i> -----	14
<i>Use of mainboard control</i> -----	16
<i>PC HOST-software control</i> -----	16
<i>Wireless connection control</i> -----	17
<i>APP CONTROL</i> -----	22
<i>Modify the parameters of the motherboard.</i> -----	27

# Overview and Features

*MKS DLC32 MAX motherboard is specially developed for desktop engraving machines.*

*Using ESP32 dual-core 32-bit super CPU, the main frequency is as high as 240MHz.*

*Replaceable drive interface. Different drives can be connected according to actual needs.*

*Reserved drive signal pin. Can be connected to external high current drive*

*3.5 inch screen offline engraving*

*Support WIFI, Bluetooth connection. It can be controlled by APP and PC-side WEB.*

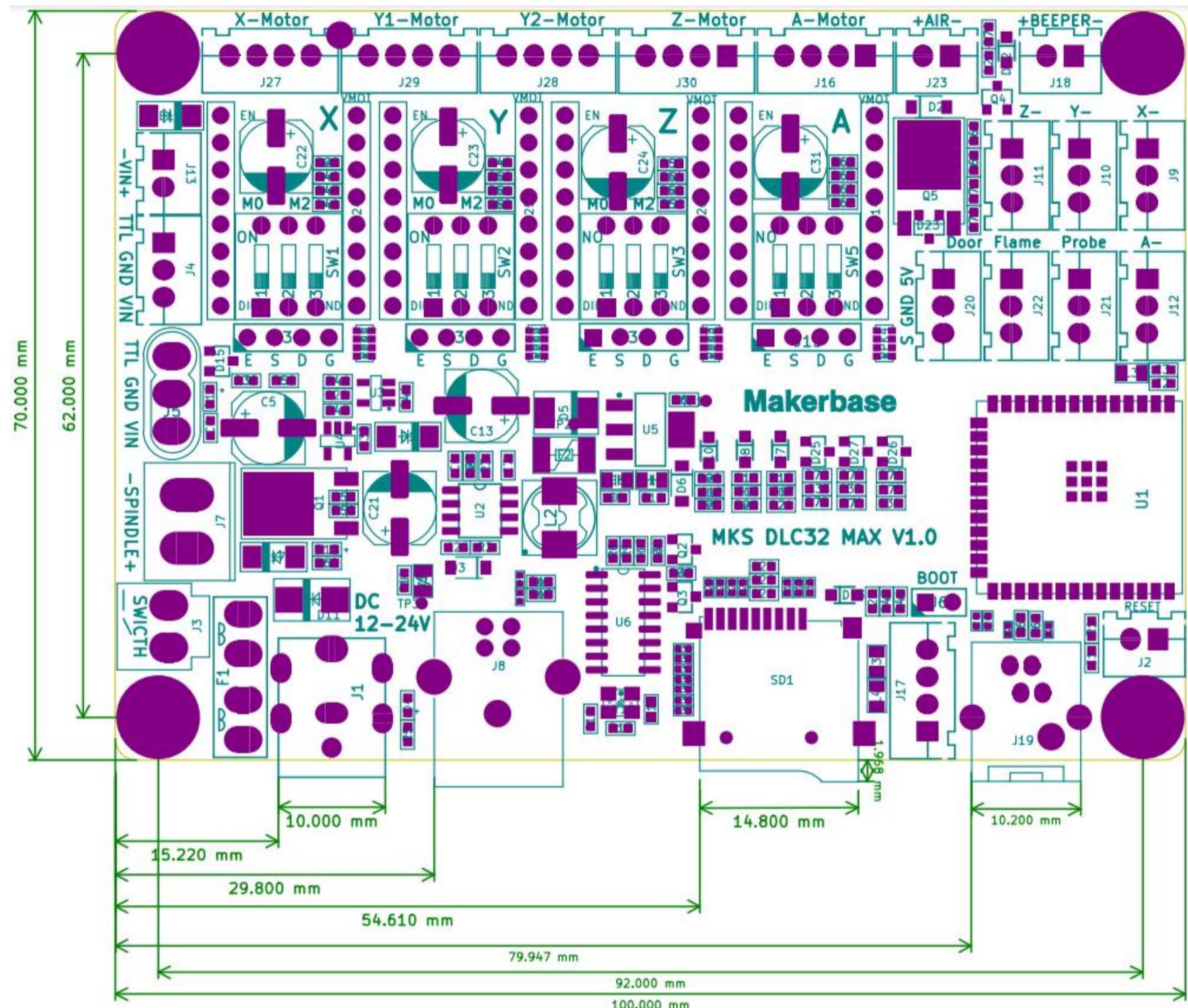
*Multi-link protection mechanism, laser stays at the same point for a long time, laser head tilt, flame detection, safety door and other multiple protections, very suitable for desktop engraving machines.*

*Add A-axis output to support CNC engraving*

## Hardware parameters

<b>Board Module</b>	<b>MKS DLC32 MAX</b>
<b>Power input</b>	<b>12V~24V 10A</b>
<b>Max Power</b>	<b>60W</b>
<b>CPU Module</b>	<b>ESP32 S3</b>
<b>Main frequency</b>	<b>240M HZ</b>
<b>RAM</b>	<b>348KB</b>
<b>ROM</b>	<b>8M</b>
<b>Motor Drive</b>	<b>Plug-in motor drive/external motor drive</b>
<b>WIFI-PC</b>	<b>Support</b>
<b>Bluetooth-APP</b>	<b>Support</b>
<b>WIFI-APP</b>	<b>Support</b>
<b>CNC and Laser firmware switching</b>	<b>Support</b>
<b>Offline engraving</b>	<b>Support (work with 3.5inch touch screen)</b>
<b>Security door alarm</b>	<b>Support</b>
<b>Air assisted</b>	<b>Support</b>
<b>Laser stay alarm</b>	<b>Support</b>
<b>Laser tilt alarm</b>	<b>Support (External Gyroscope Module )</b>
<b>Smoke alarm</b>	<b>Support (External smoke detection module )</b>
<b>Buzzer expansion</b>	<b>Support</b>
<b>Emergency stop button extension</b>	<b>Support</b>
<b>Engraving speed</b>	<b>&lt;=30000mm/min</b>

## *Installation Dimensions*

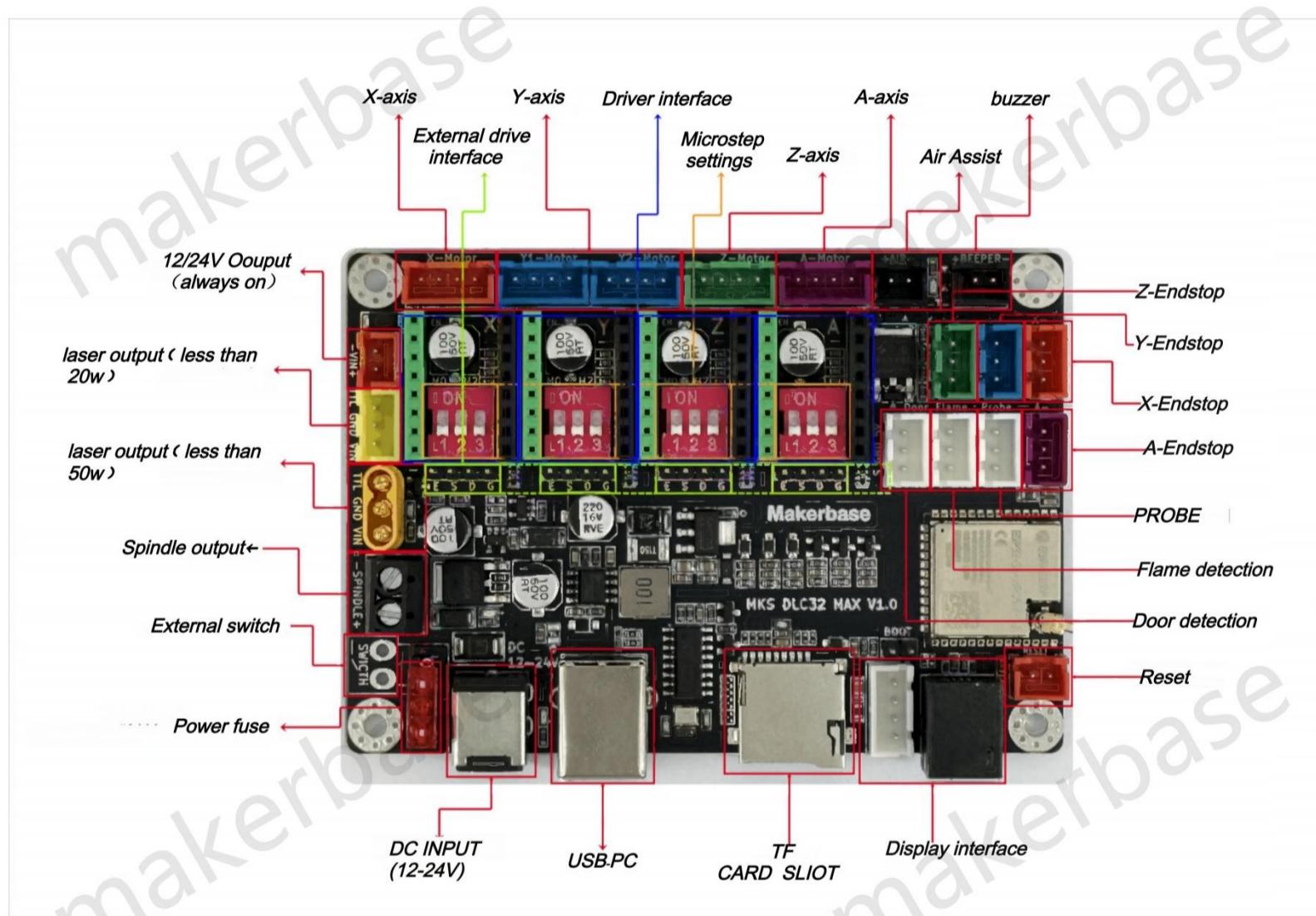


# MKS DLC32 MAX Operation

When you get the MKS DLC32 MAX motherboard.

The operation is divided into the following three parts.

1. Connect the motherboard interface.
2. Update the motherboard firmware.
3. Use of mainboard control.
4. Modify the parameters of the motherboard.



## Connect the motherboard interface

**Power supply:** Voltage 12-24v, maximum current **10A**, connector model: "**DC-007B-2.1mm**"

**External Switch:** Used for external switches to control power on and off.

(Note: If connect a switch, please unplug the power fuse of the motherboard in advance  
 This interface is not a power supply, please do not connect it to a 12-24v power supply..)

**USB-PC Port:** Connect to PC for firmware update and host computer control

(Note: The mainboard serial port chip is **CH340**. Before connecting to the PC, please **install the corresponding USB driver file** on the PC so that the mainboard can be recognized normally. The USB interface does not have a 5v power supply. When connecting to a PC, it is mainly necessary to **connect a 12-24v power supply** so that the PC can recognize the motherboard.)

**TF Card Slot:** Connect the TF card. Store engraving files. The recommended card type is: Class4 or Class10 speed; 4~16G memory; **Fat32** format. File format support: **.NC; .GC; .GCODE**

**Display interface:** Connect to MKS exclusive touch screen, control, engrave and other operations through the screen, Screen connector type is RJ11

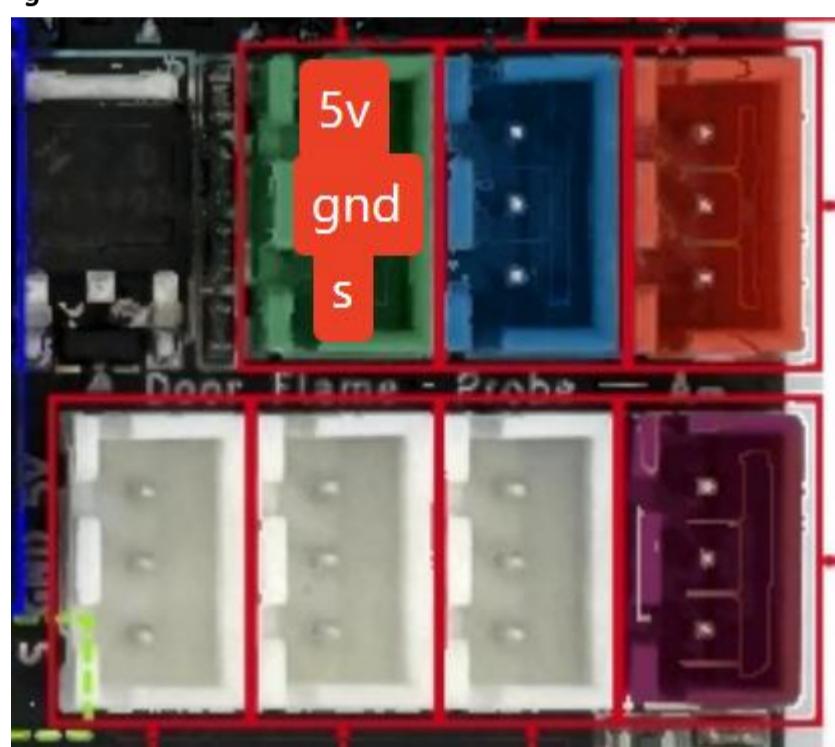
**Reset:** Used to reset the MCU or an external **emergency stop** button.

**Flame Detection:** Connect the flame detection sensor. Features can be enabled in firmware.

**Door Detection:** Connect the machine safety door switch, if the safety door is opened during the working process, the work will be suspended. Features can be enabled in firmware

**X/Y/Z endstop:** For connecting the endsop switch.

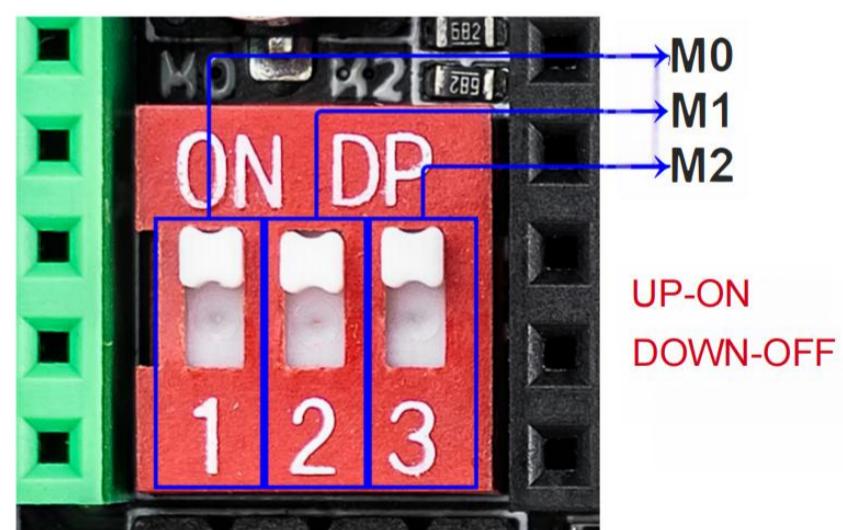
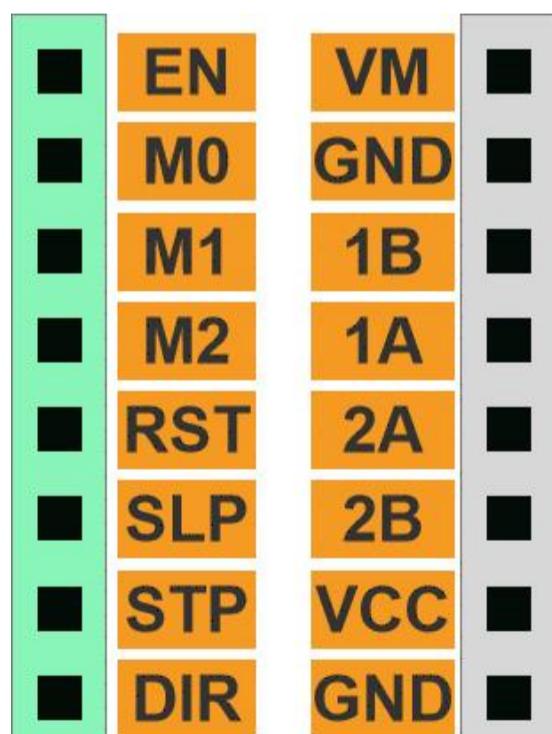
When connecting, pay attention to the corresponding signal. If your switch only has haul with two wires, then please connect "s" and "g"



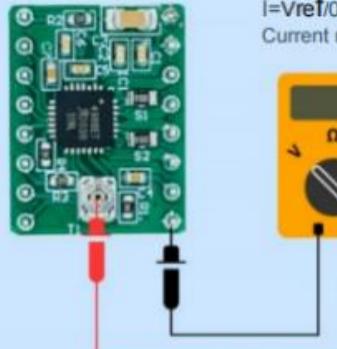
**Z Motor socket:** If the machine needs to use the z-axis, please connect the motor drive to this socket. Drivers such as A4988, TMC2208, TMC2209 can be used. If the machine does not have a z-axis by default, it is not necessary to connect.

**X/Y/Z/A Motor interface:** For connecting stepper motors.

**Driver interface:** When connecting plug-in motor drivers (TMC2209, A4988, etc.), pay attention to the direction of the driver when plugging in or out to prevent burning due to reverse connection.



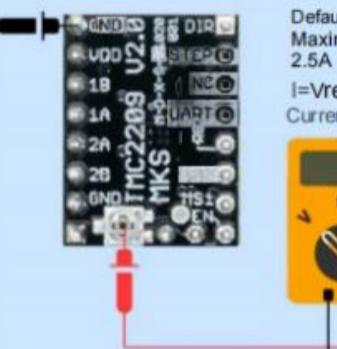
**A4988**



Default current:1A  
Maximum current:2A  
 $I = V_{ref} \cdot 0.8$ ; Current method:

M0	M1	M2	Microstep
OFF	OFF	OFF	Full Step
On	OFF	OFF	1/2 Step
OFF	On	OFF	1/4 Step
On	On	OFF	1/8 Step
On	On	On	1/16 Step

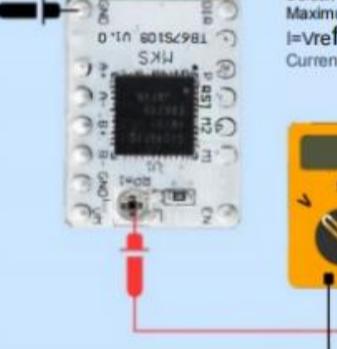
**MKS TMC2209**



Default current:1A  
Maximum current: 2.5A  
 $I = V_{ref}$ ; Current method:

M0	M1	M2	Microstep
OFF	OFF	-	1/8 Step
On	OFF	-	1/32 Step
OFF	On	-	1/64 Step
On	On	-	1/16 Step

**MKS TB67S109**



Default current:1.66A  
Maximum current:3.22A  
 $I = V_{ref} \cdot 2$ ; Current method:

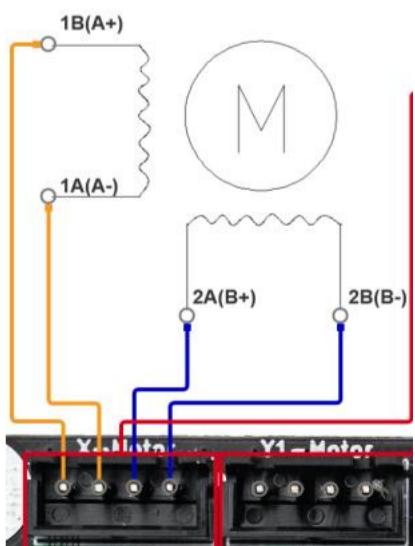
M0	M1	M2	Microstep
OFF	OFF	OFF	Standby
OFF	OFF	On	Full Step
OFF	On	OFF	1/2 Step(A)
OFF	On	On	1/4Step
On	OFF	OFF	1/2 Step(B)
On	OFF	On	1/8 Step
On	On	OFF	1/16 Step
On	On	On	1/32 Step

**The motor interfaces of xyz are 1A-1B-2A-2B.**

Among them, 1A-1B is one phase of the stepping motor, and 2A-2B is the other phase of the stepping motor.

(If the phase sequence of the motor connection is incorrect, the motor will not rotate normally)

**Note: Be sure to plug and unplug the driver or motor when the power is off to avoid burning the driver.**



**Laser Output:** To connect the laser module, you need to pay attention to the corresponding connection of the signal.

**S----TTL of connecting laser**

**G----Connect to the gnd of the laser**

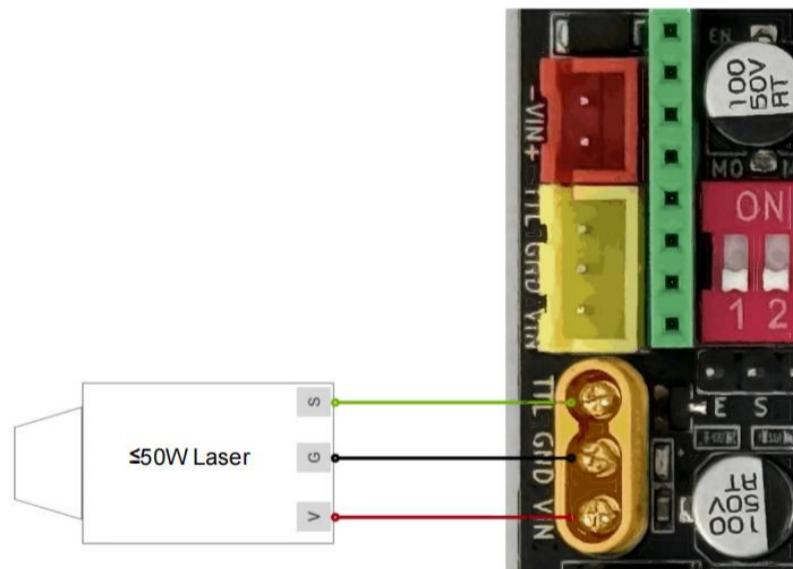
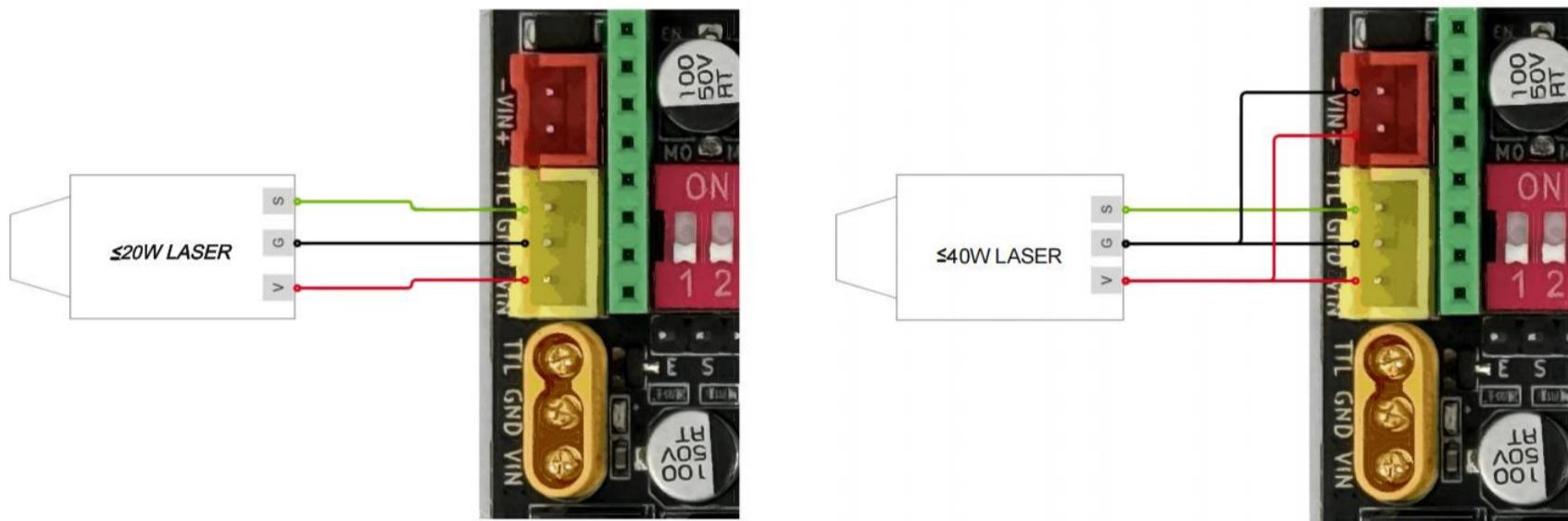
**V----connect to the Vin of the laser (12-24v)**

The signals of ports 1 and 2 in the picture are the same.

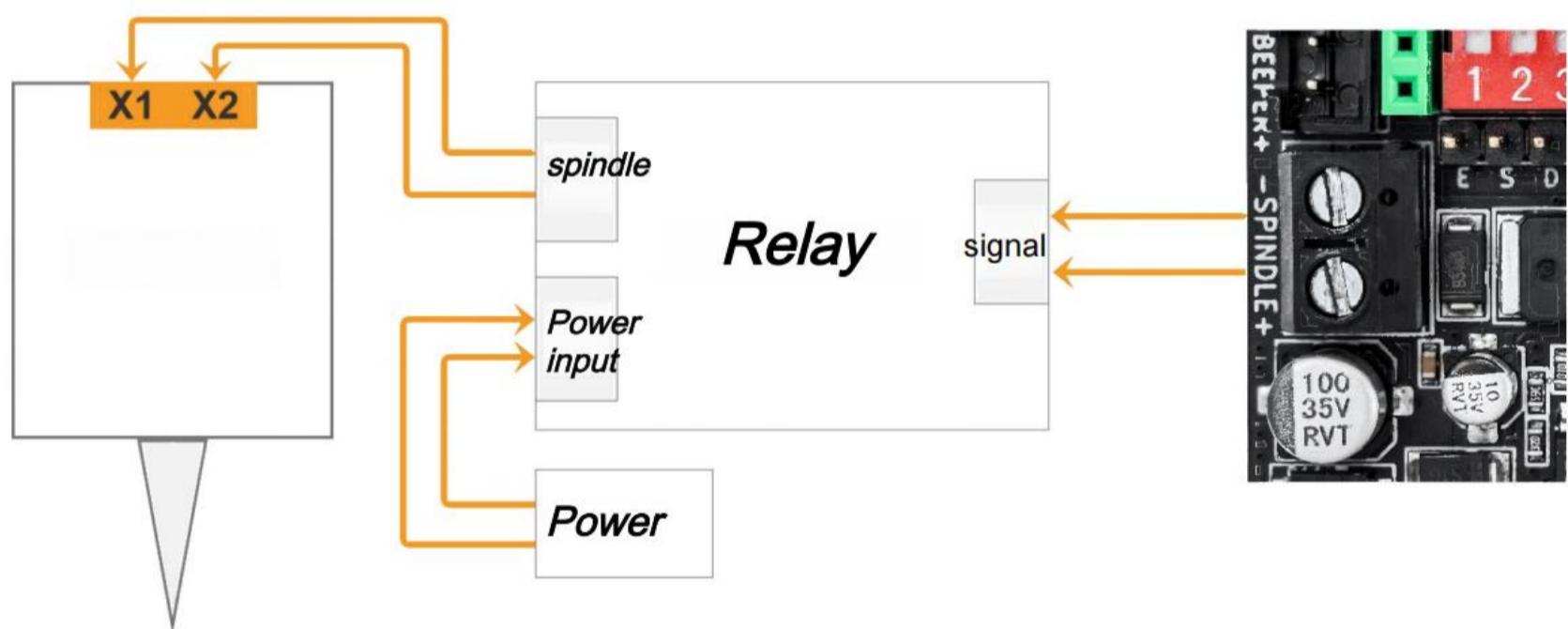
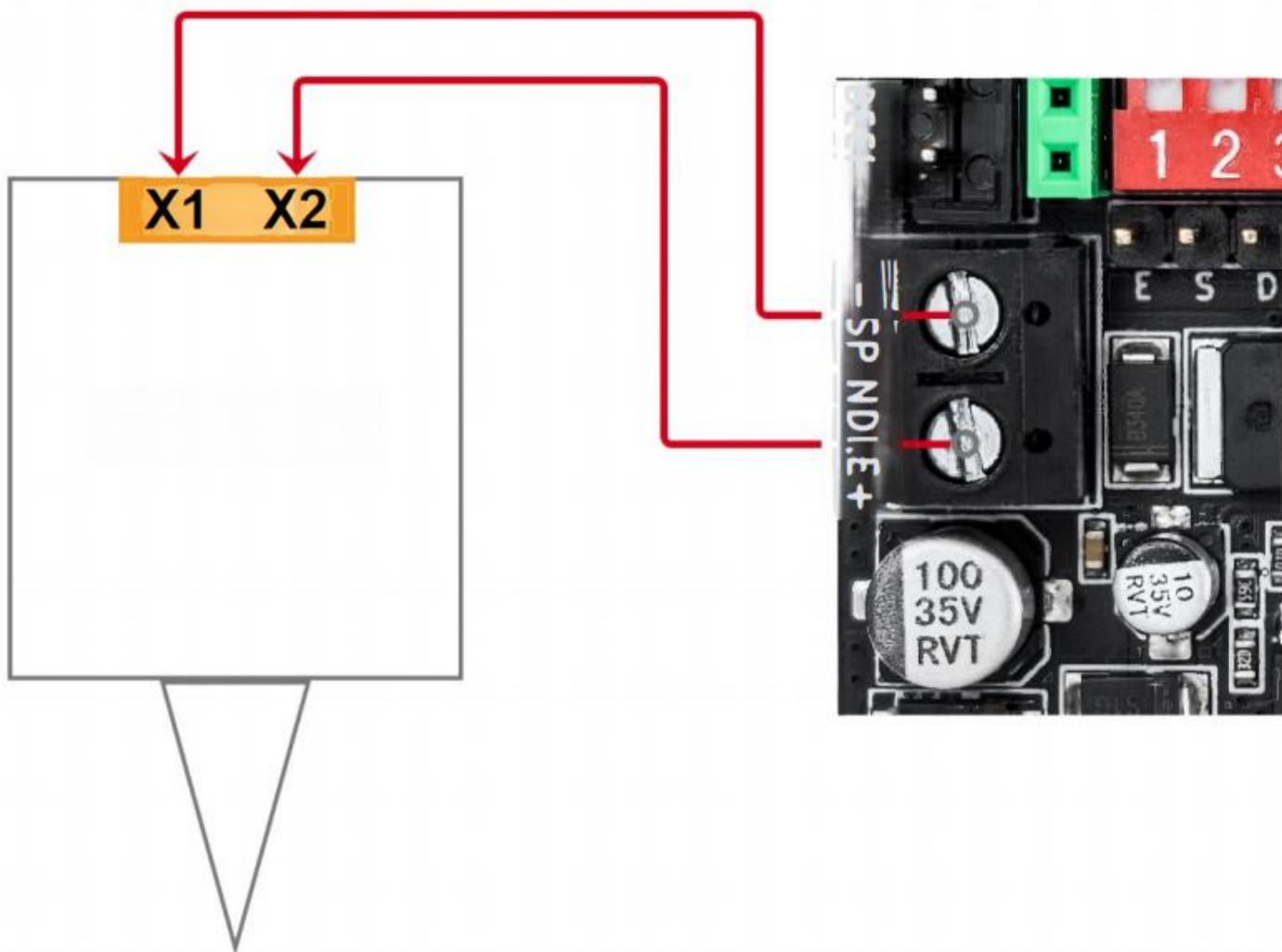
the power of the connected laser is **lower than 20W**. Can be directly connected to interface 1. (connection terminal model: XH2.54-3P)  
the power of the laser is connected to **20-90W**. It is recommended to connect to interface 2 (connection terminal signal: MR30PB-M)

If the power of the laser module used is greater than 50w, we recommend an **external power supply**.

The motherboard only connects "S" and "G" as control signals. Vin is externally powered separately, not connected to the "V" of the motherboard.



**SPINDLE interface:** connect the spindle (DC motor), this port is the output port, the output voltage is 0-12V or 0-24V, the maximum voltage depends on the input power voltage. If the input voltage of the power supply is 24V, the maximum output voltage of the SPINDLE interface is 24V. Currently, the maximum power supported by the spindle motor is: 10W at 12V and 20W at 24V.



**Air assit:** Connect air-assisted equipment.

**BEEP:** Connect the buzzer

## Update the motherboard firmware.

By default, the mainboard with firmware. If there is no special requirement, there is no need to update it repeatedly.

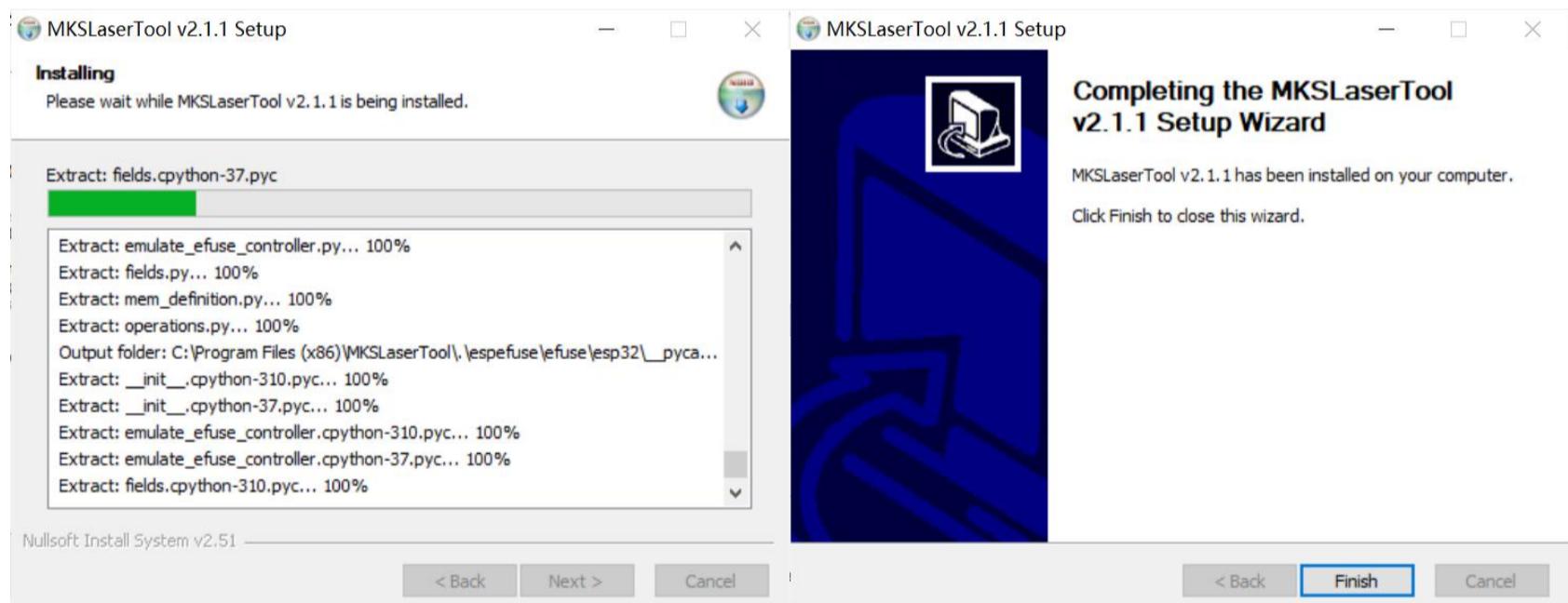
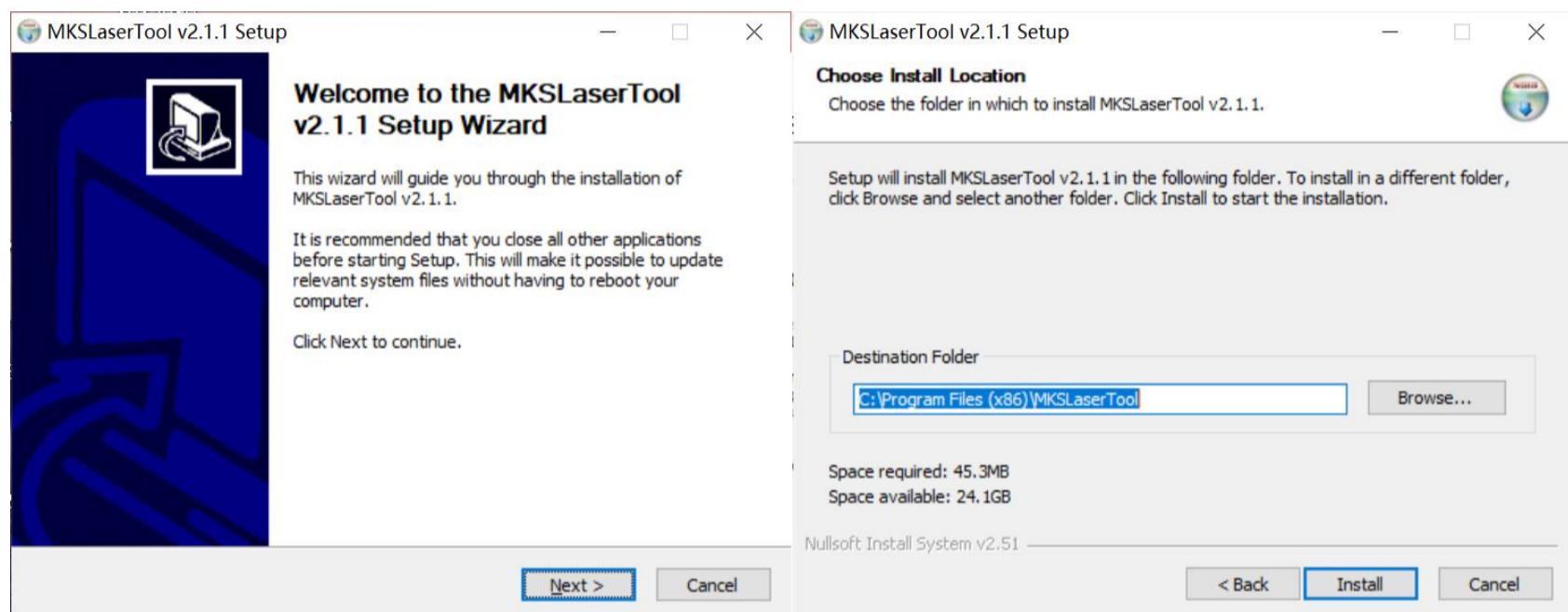
Firmware download address:<https://github.com/makerbase-mks/MKS-DLC32/tree/main/MKS--DLC32-MAX-main>

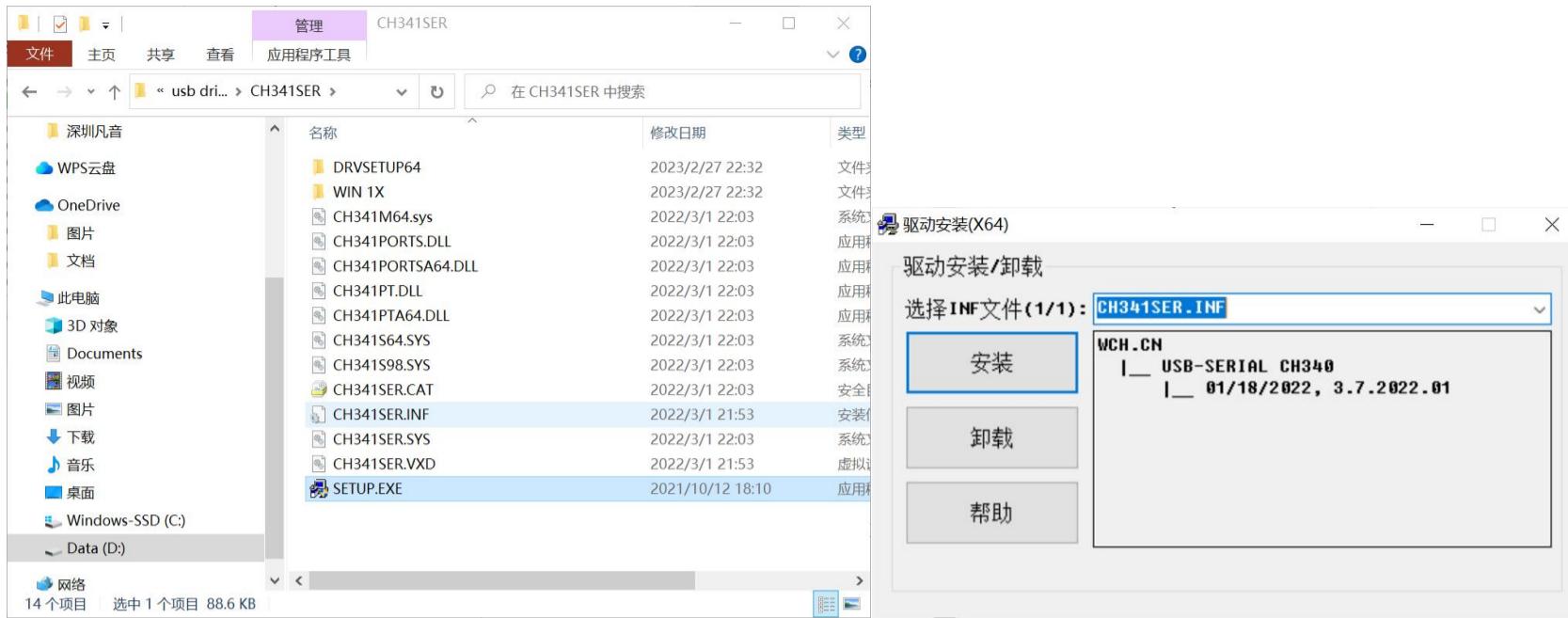
Firmware update tool download address:<https://github.com/makerbase-mks/MKS-DLC32/tree/main/MKS--DLC32-MAX-main/tool>

USB driver file download address:

## Install MKS LASERTOOL and USB driver files (ch340)

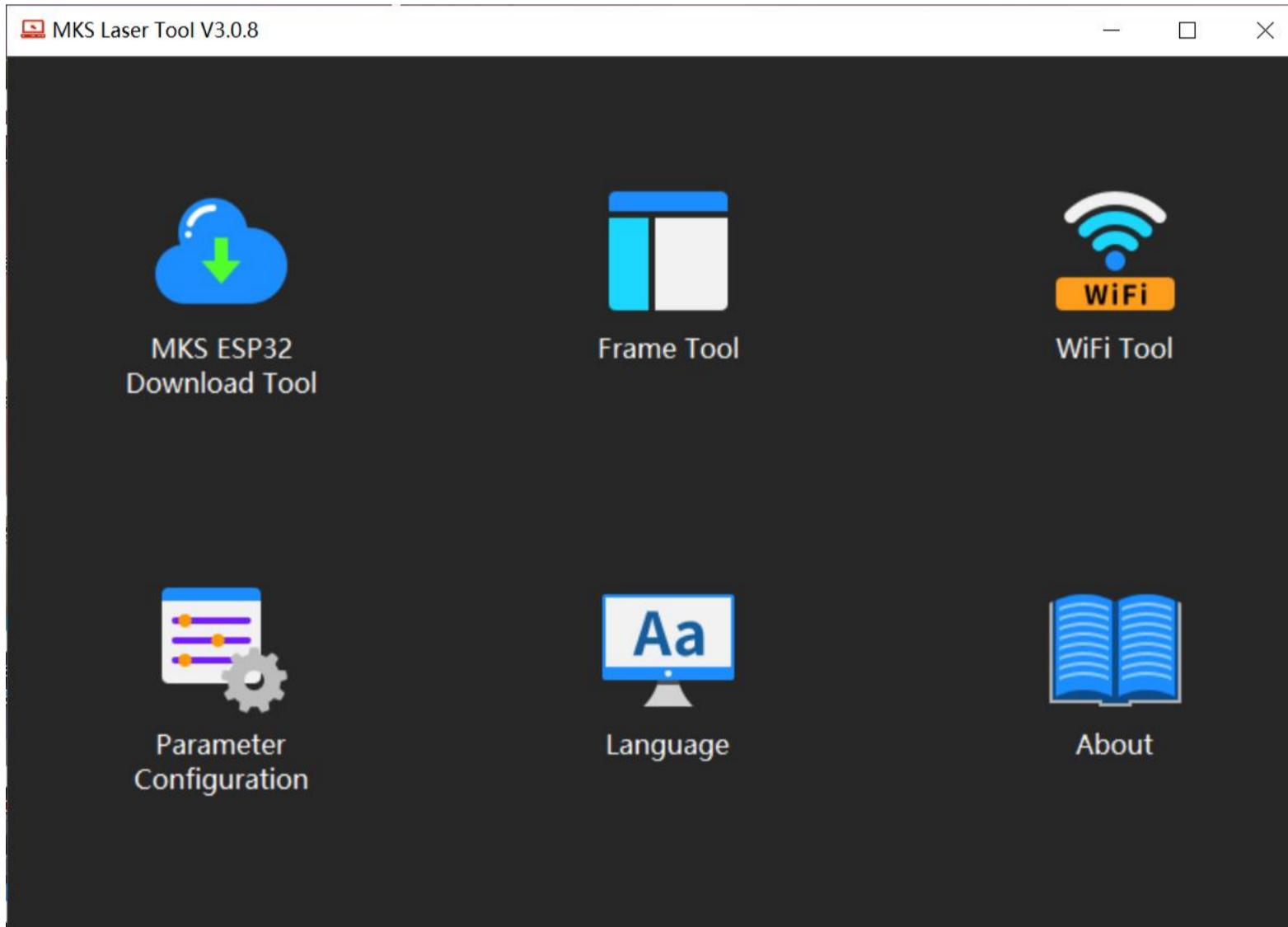
### MKS LASERTOOL



**CH340**

After the installation is successful, the motherboard can be recognized when it is connected to the PC.

The LS ESP32 PRO motherboard needs to use **MKS LASERTOOL V3.0** and above. Version 1.0 cannot Select the "MKS ESP32 DOWNLOAD TOOL"

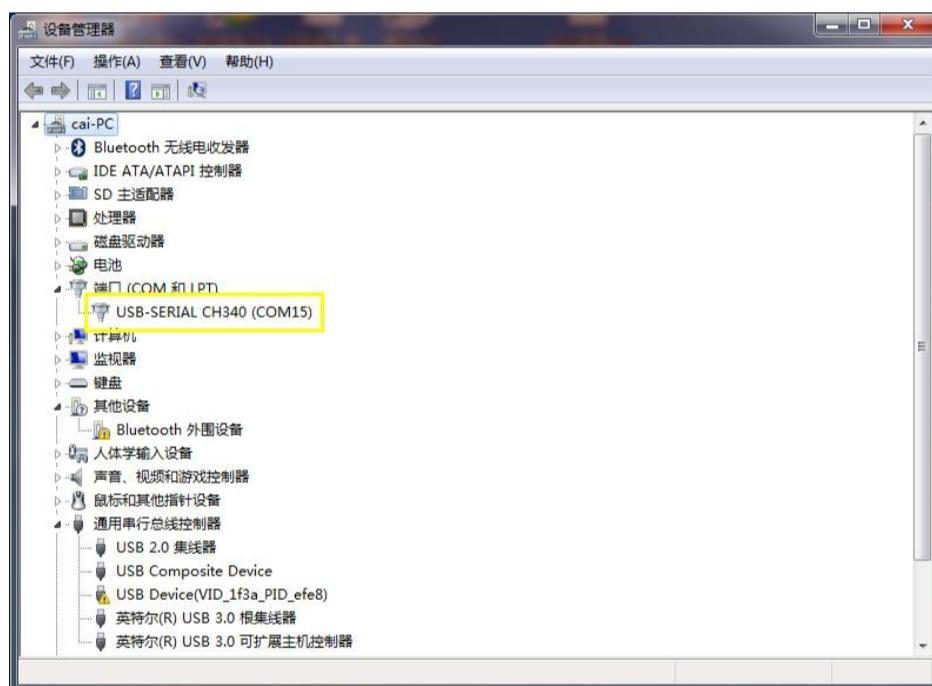
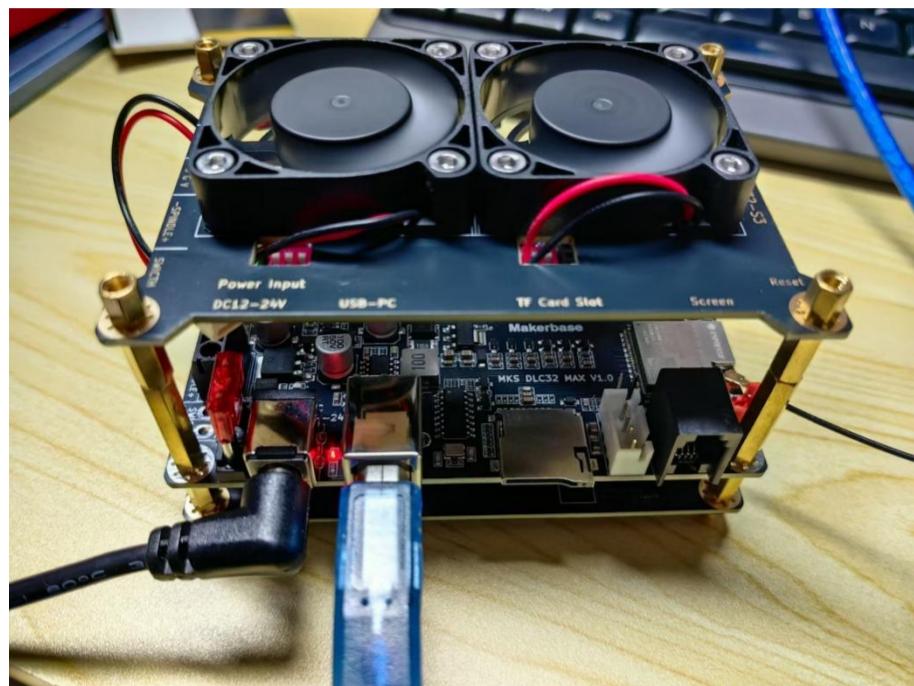


## Firmware update operation

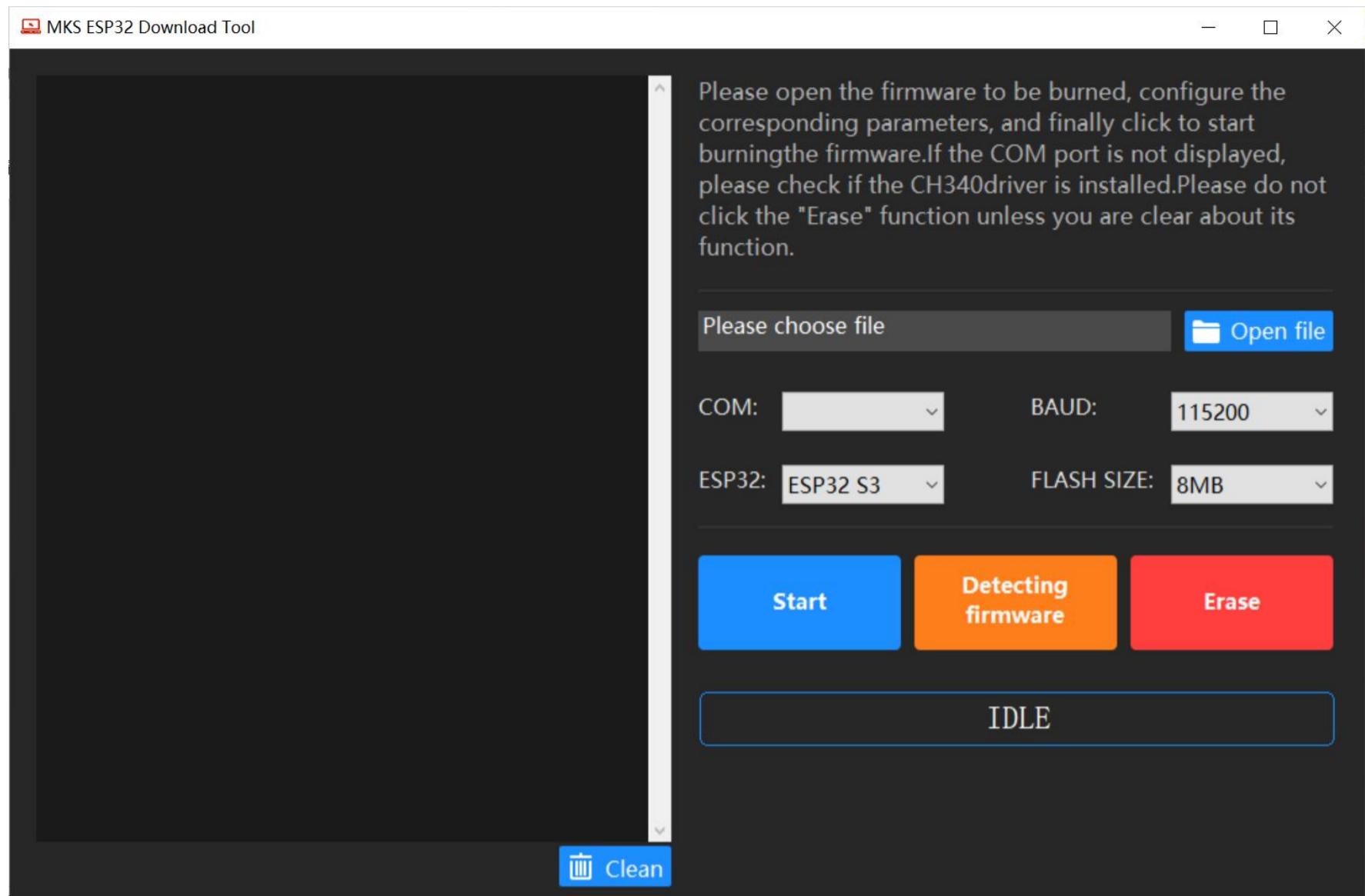
### 1. Connect the motherboard to the PC.

Note: The usb of the motherboard is only for communication and has no power supply function, so **connect 12-24v power supply**.  
**The device manager will recognize com.**

If not recognized, it may be because the ch340 driver is not installed



### 2, Open the MKS LASERTOOL software



**Please choose file:** Select the bin file you downloaded corresponding to the mainboard from github

**COM:** By default, it will be automatically recognized, and the drop-down option selects the COM corresponding to the motherboard. If there is no option in the pull-down menu, the possible reasons are: 1. The motherboard is not powered. 2. The USB cable of the motherboard is not connected properly. 3. The ch340 driver file is not installed.

**BAUD:** Baud rate, recommended to choose 115200

**FLASH SIZE:** Select 8MB

**ESP32:** Select esp32 s3

After setting it up, click "Start" to refresh the program

## Use of mainboard control

MKS DLC32 MAX has three control methods:

1. PC HOST-software control
2. Wireless connection control
3. APP control

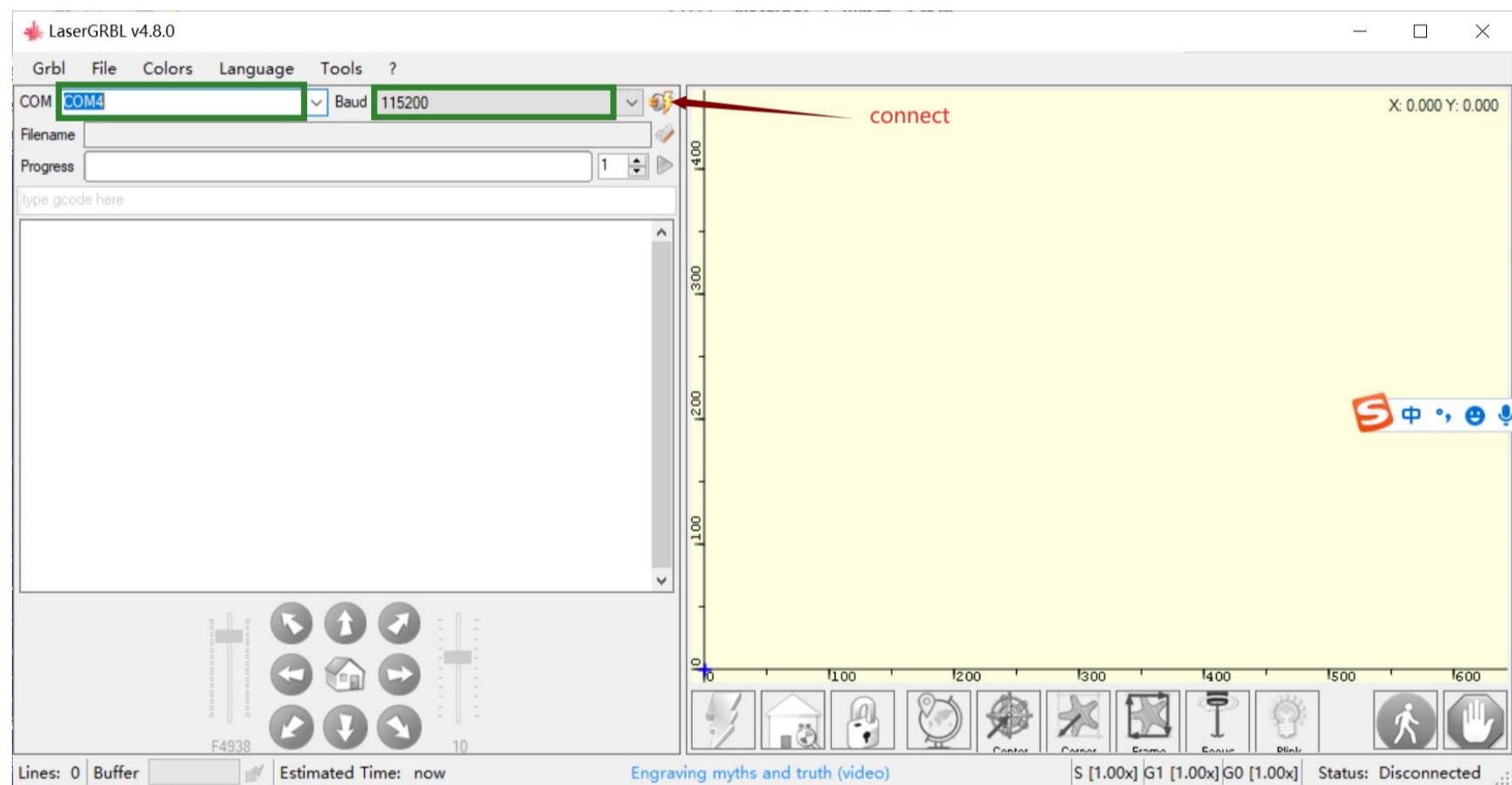
### PC HOST-software control

LS ESP32 PRO motherboard is used for LASER and CNC control.

Generally, it is recommended to use LASERGRBL, Lightburn, and other software on PC.

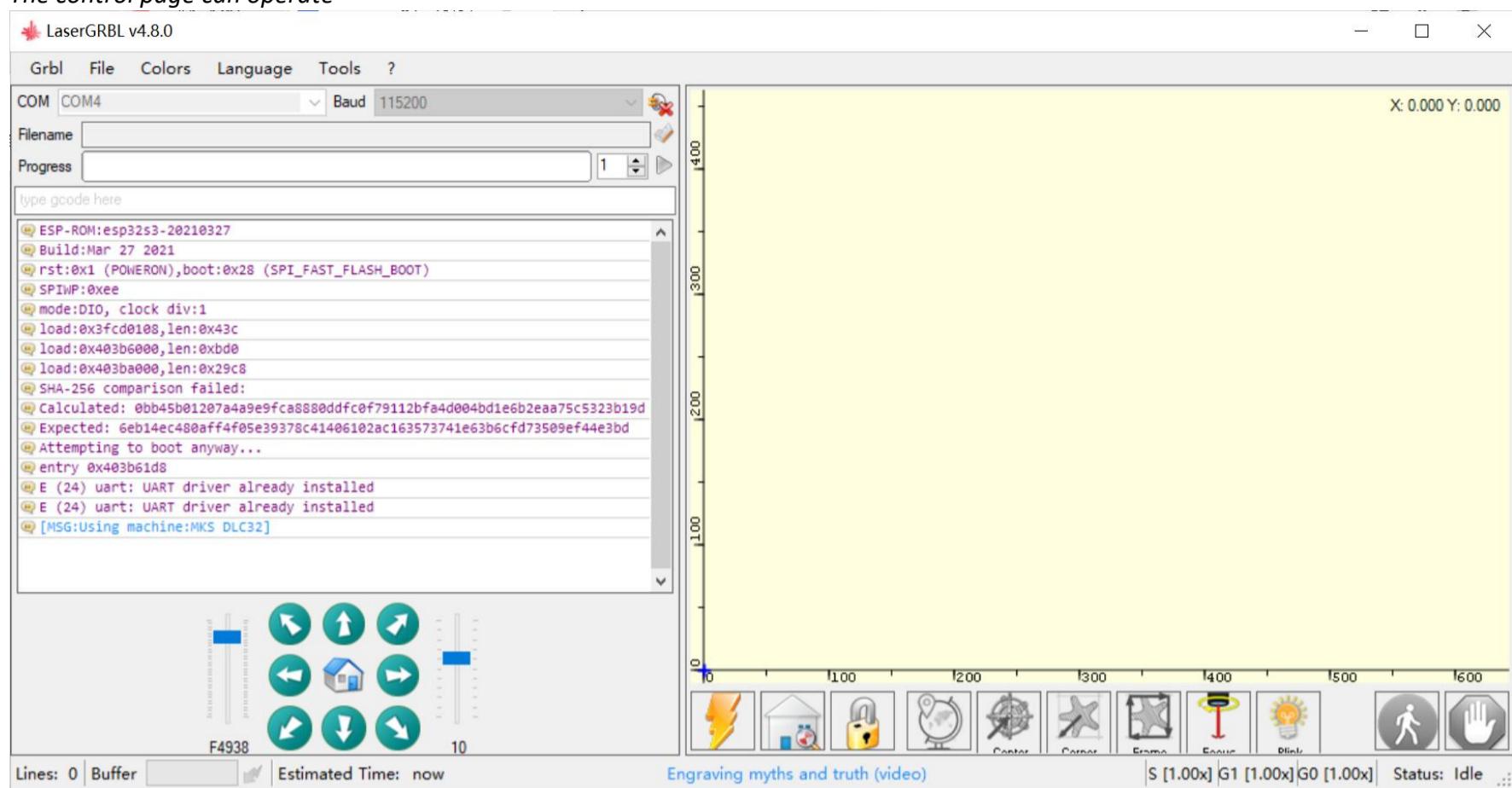
The picture uses Lasergrbl as an example,

com: Select the serial number assigned by the PC to the motherboard (it is the same as the COM for firmware update above, and will only be displayed after the ch340 driver file is installed). The baud rate is generally 115200



After the connection is successful, the interface

The control page can operate



Then you can control the machine and select files to work on.

## Wireless connection control

The motherboard mode can be configured through parameter settings (\$50)

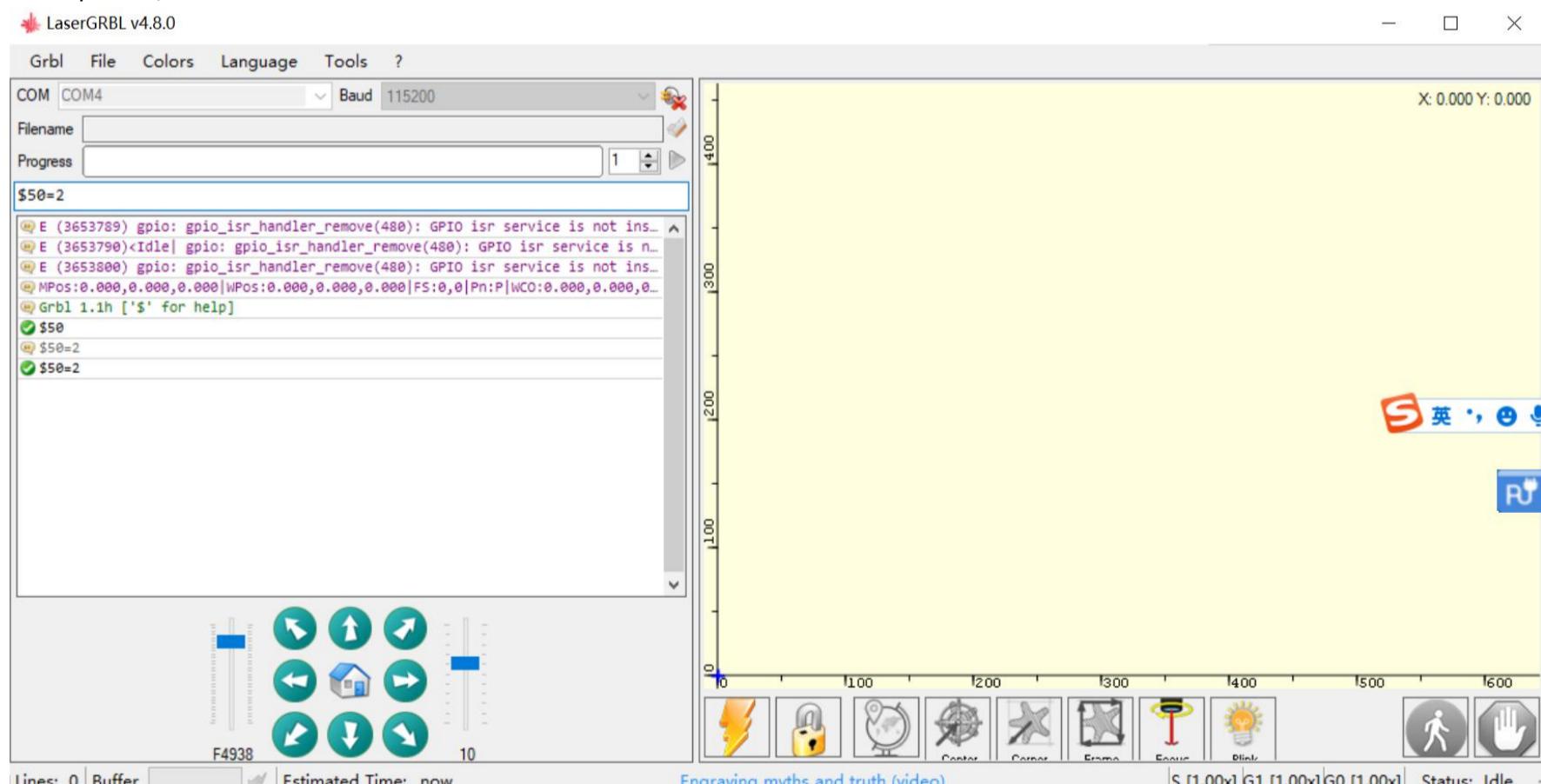
\$50 is set to different values to represent different modes

\$50=0 (disable wifi and Bluetooth functions)

\$50=1 (WIFI is AP mode)

\$50=2 (WIFI is in STA mode)

In the picture, it is set to STA mode.



How to connect to the corresponding WIFI

1, Can be set up and connected by sending commands

\$51 Set SSID for AP mode

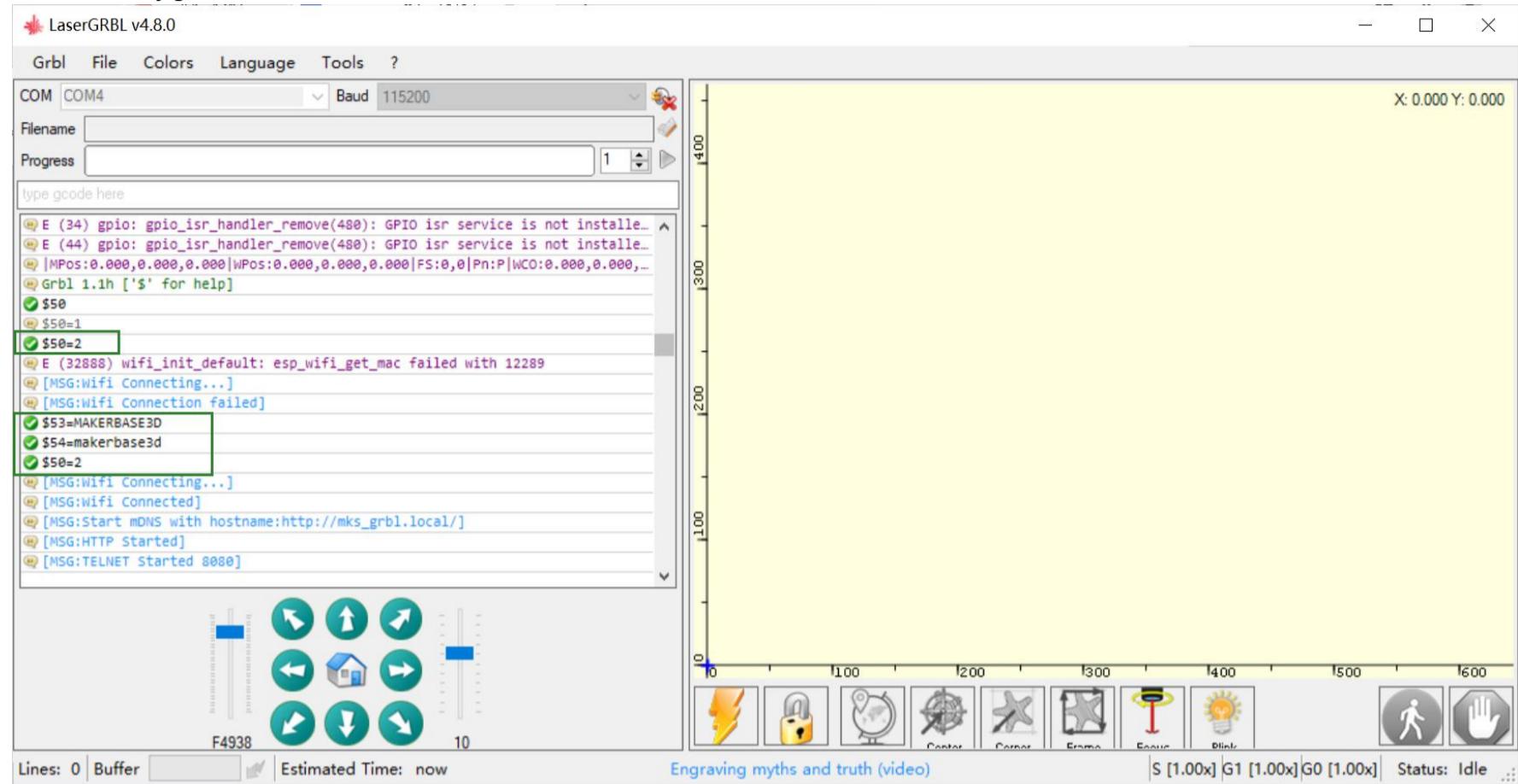
\$52 Set Password for AP mode

\$53 Set SSID for STA mode  
 \$54 Set Password for STA mode

You can set the wifi to STA mode first (\$50=2)

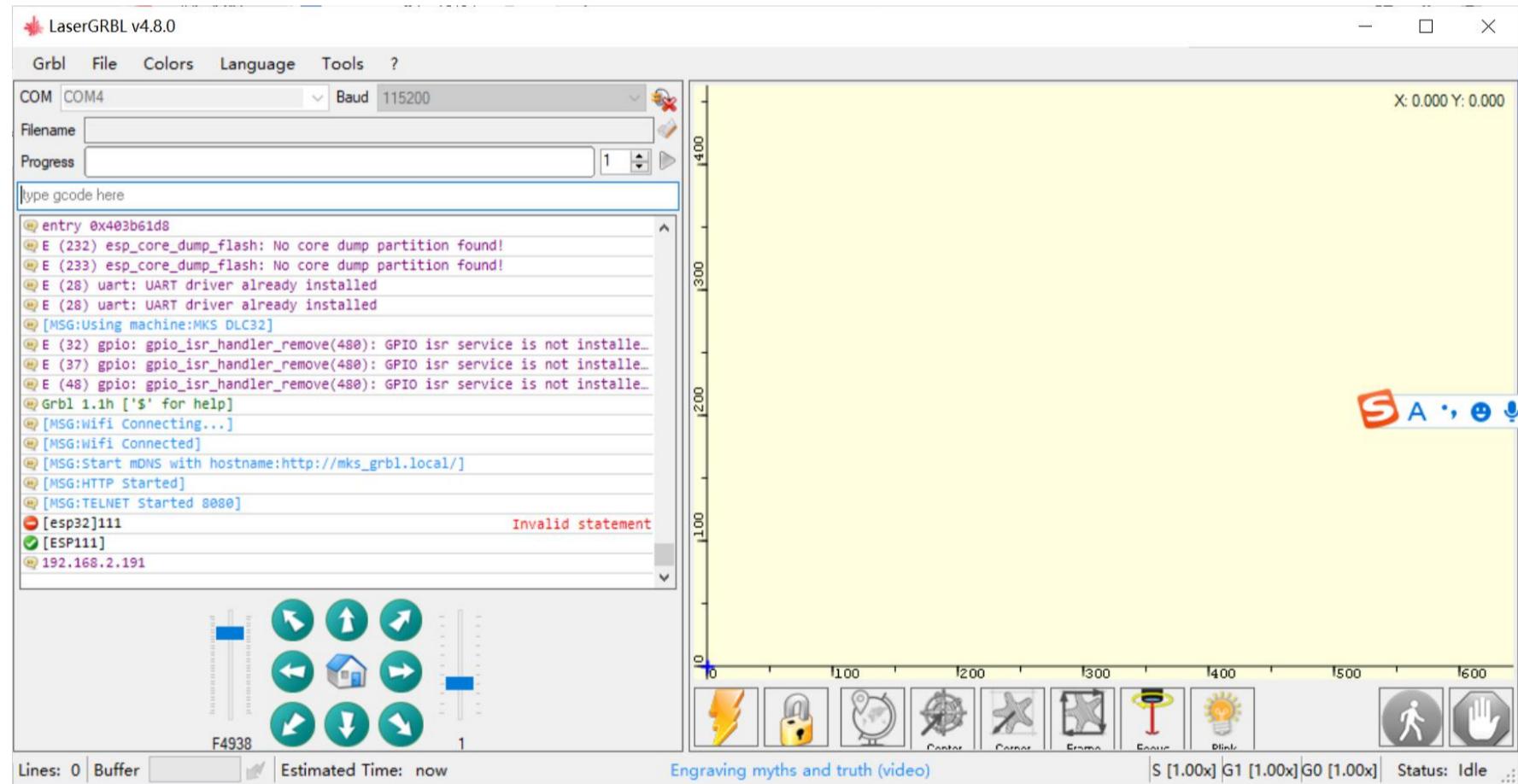
Then set up a wireless SSID and password for \$53 and \$54.

After the setting is completed, send \$50=2 once. If the network is normal and the password is correct, the connection will be made, as shown in the figure.

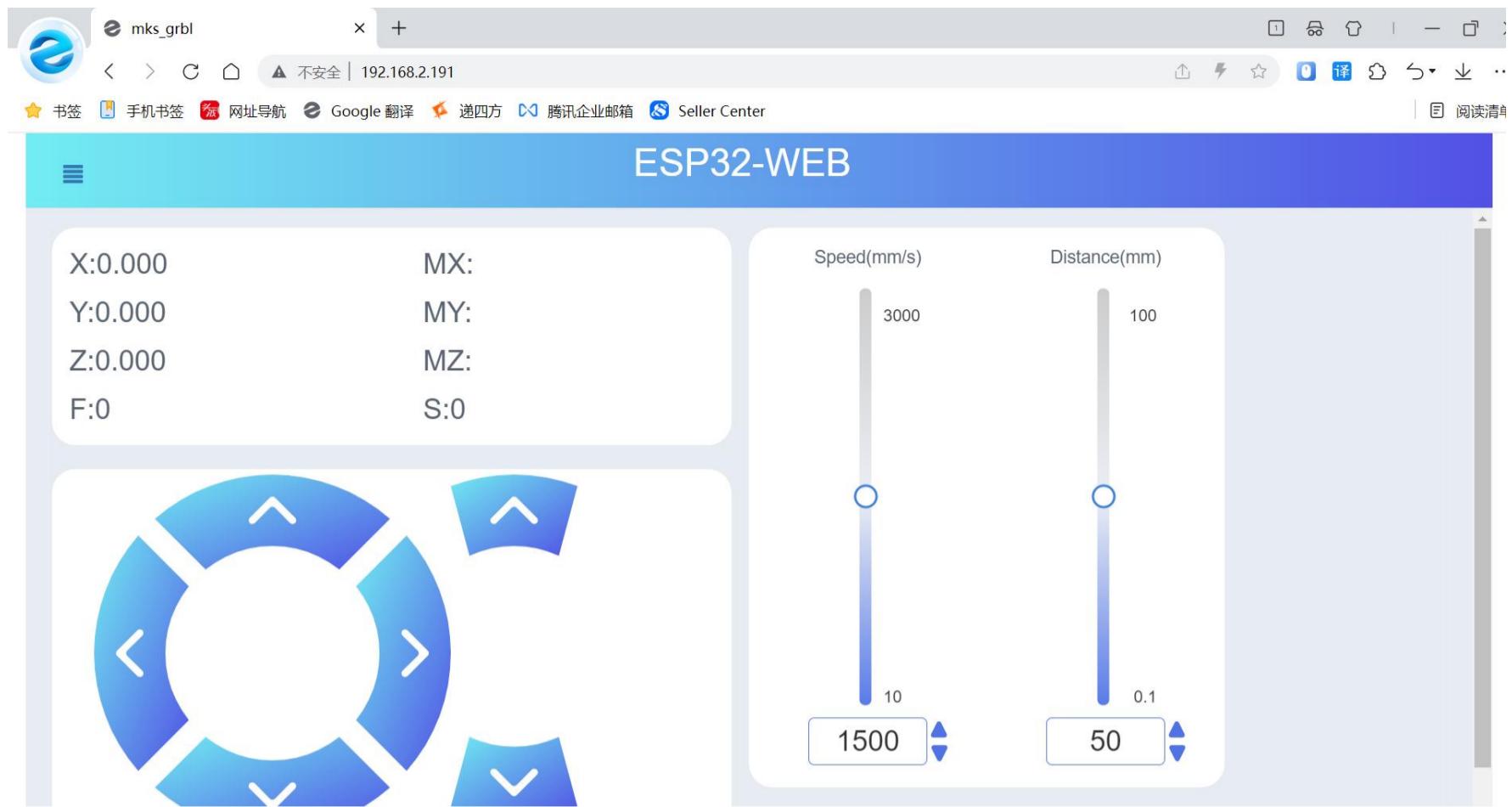


After the connection is successful, you can send [ESP111],

Get the IP of the motherboard



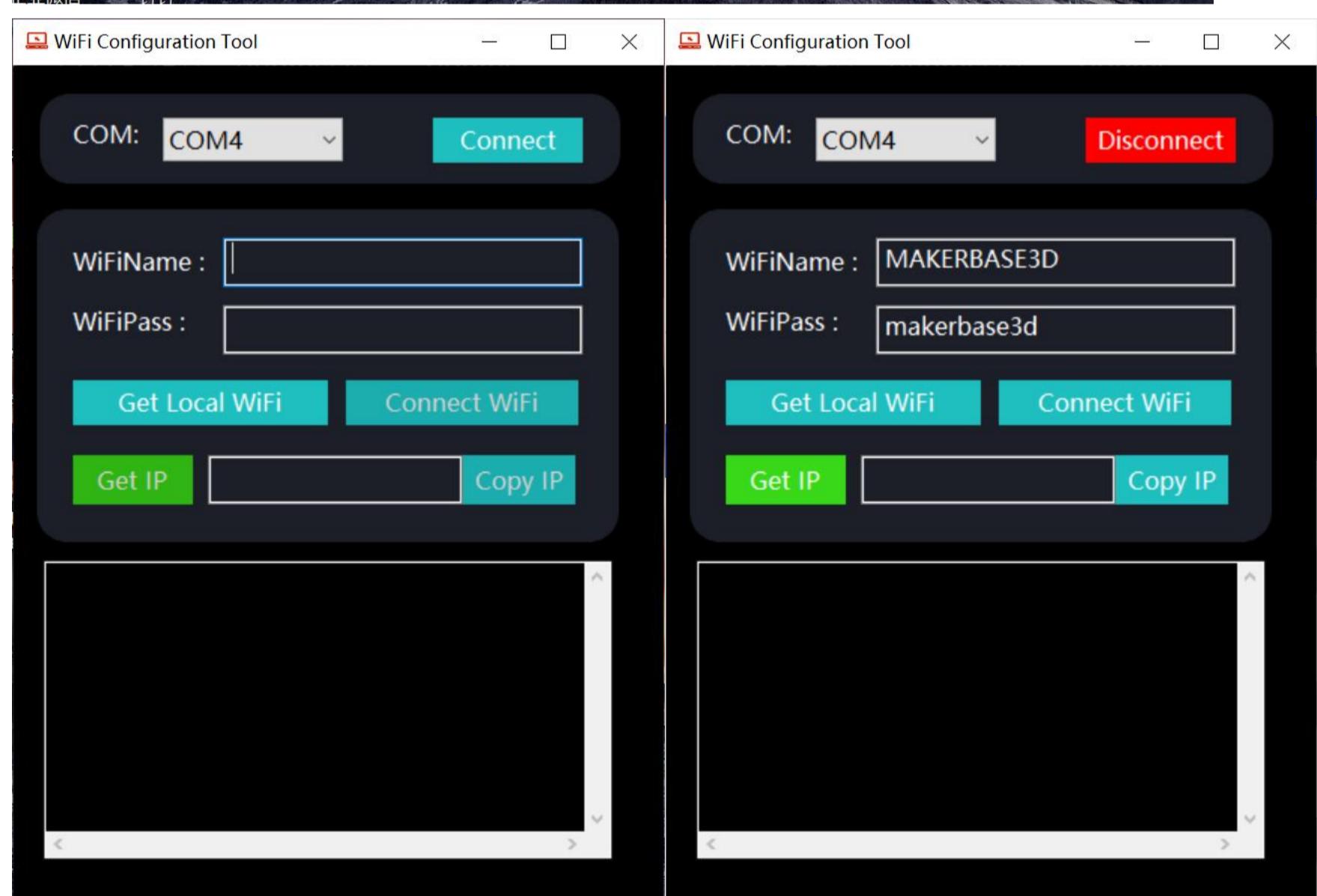
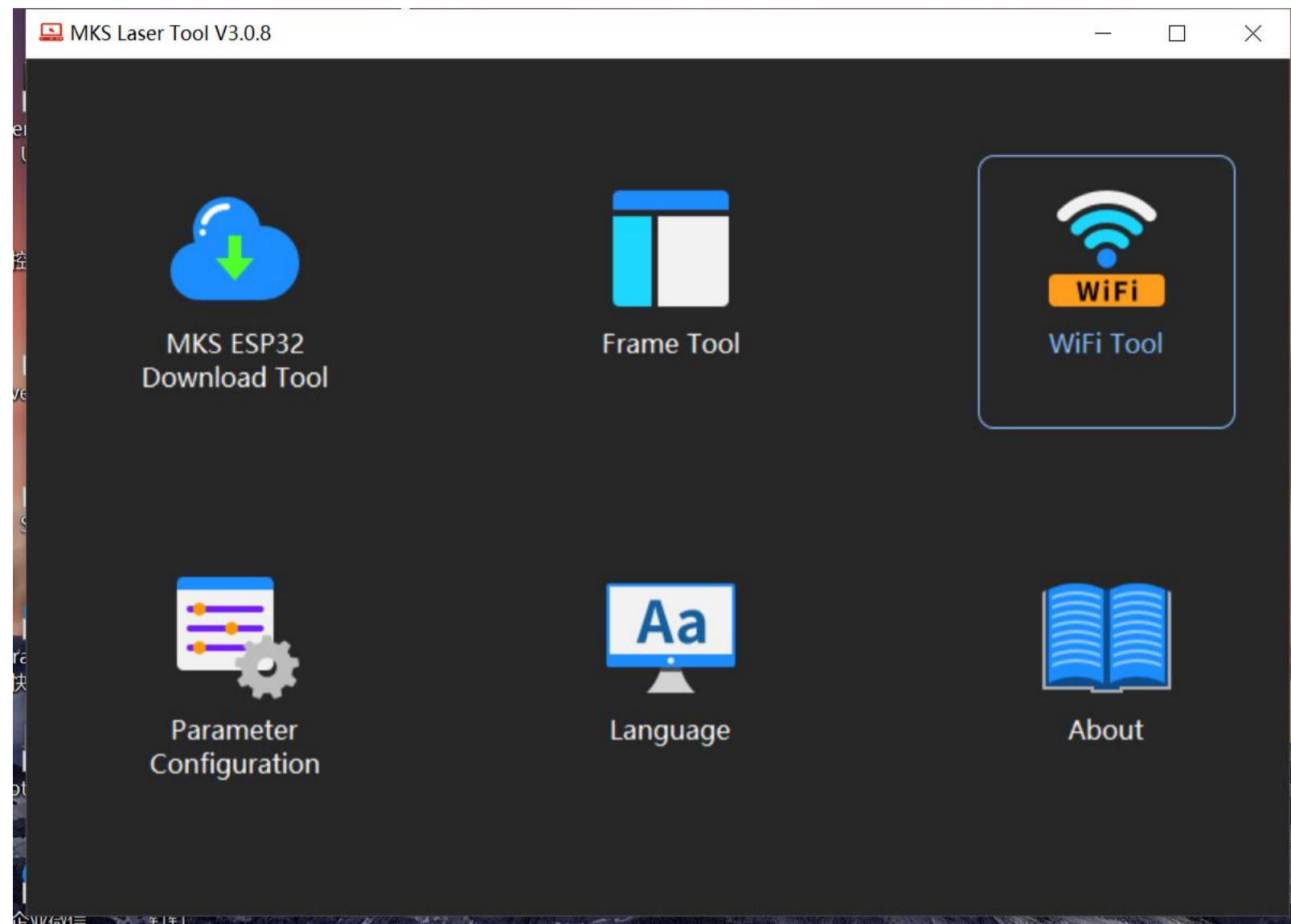
Then you can enter the obtained IP through the browser of your PC or mobile phone, and then you can enter the network control page. (Note that the PC or mobile phone must be connected to the same network as the motherboard before it can be connected. If it is a different network, it cannot be connected)

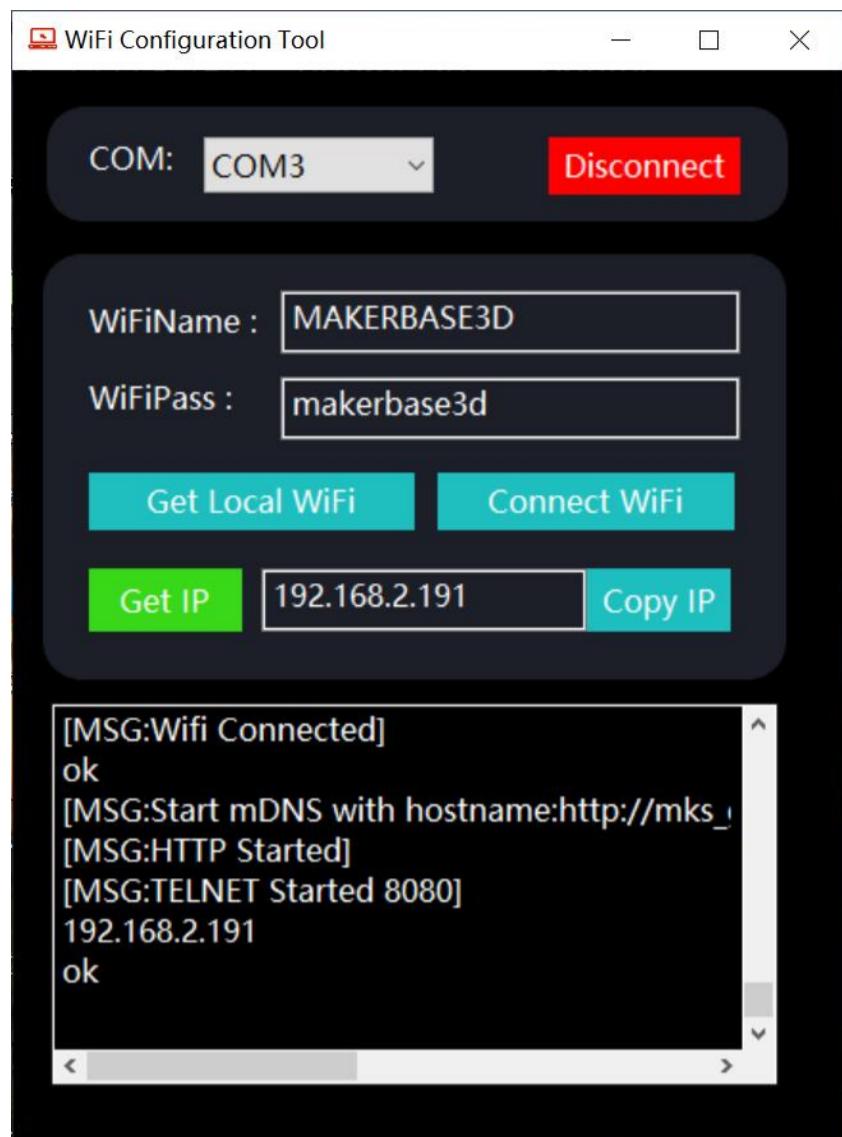


The motherboard can then be controlled and engraved.。

Another way to connect to the Internet and obtain an IP.

Available via **MKS LASERTOOL**.





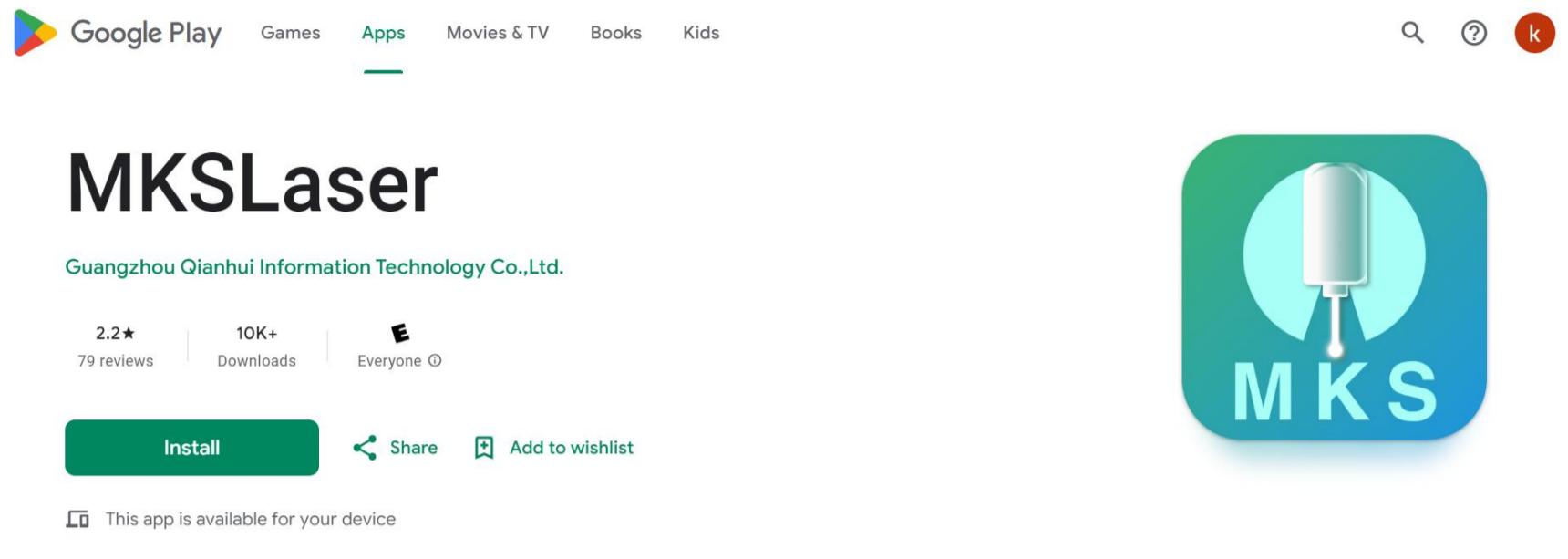
After setting up, click on the link wifi

After the command window below is connected, you can get the Get IP

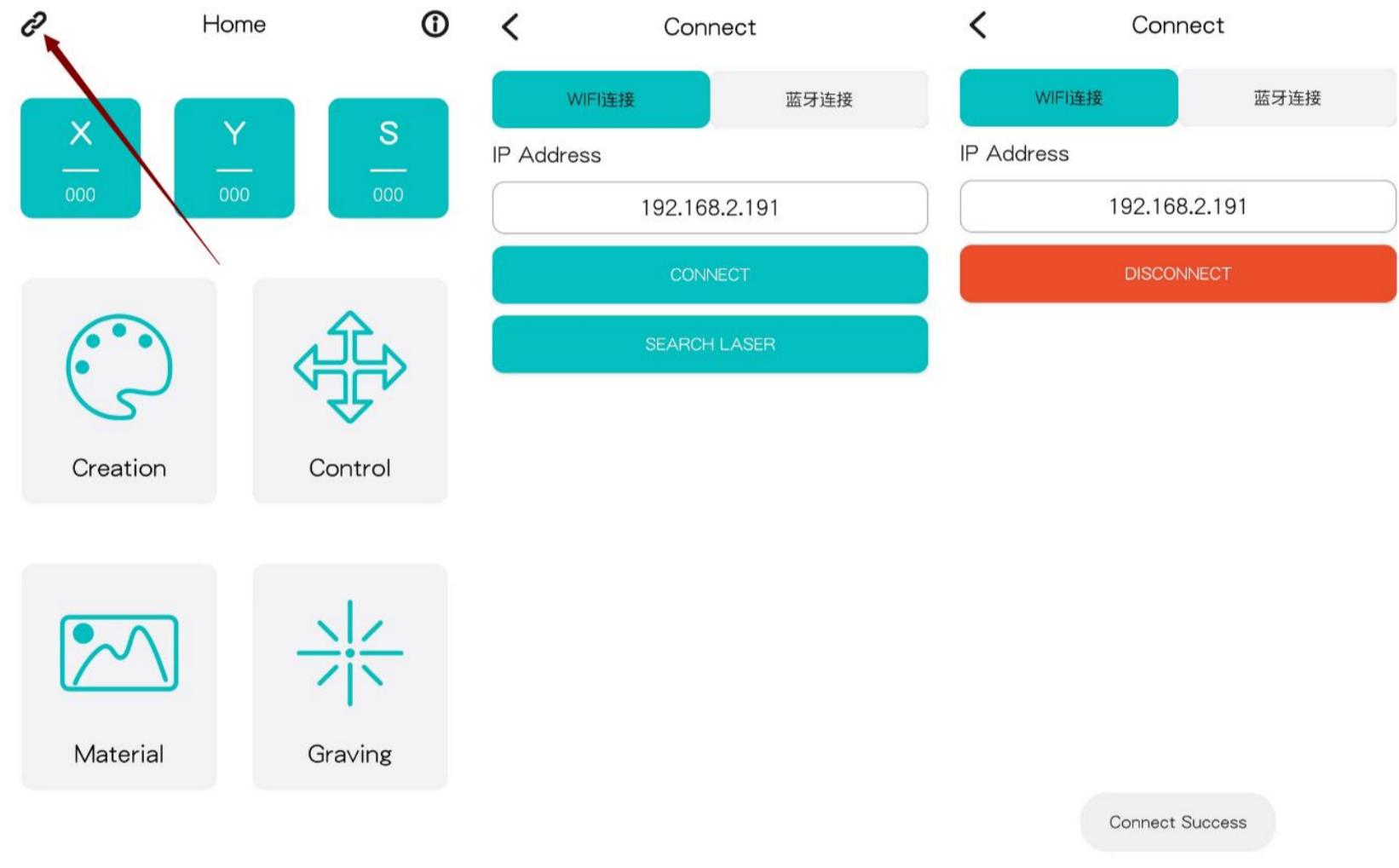
After obtaining the IP, you can enter the IP through the browser to control the web page as described above.

**APP CONTROL**

You can download our MKSLaser on the APP store or GOOGLE store



Open the APP and click the connect button in the upper left corner, Enter the IP and click Connect (The network connected to the mobile phone must be the same as the network connected to the motherboard.)



Then you can control it through the APP and engrave files.

This screenshot shows a mobile application interface for a CNC machine, divided into several functional sections:

- Top Bar:** Displays the time (下午2:09), signal strength, and battery level.
- Home Panel:** Shows current coordinates: X: 6.000, Y: 12.012, S: 0. It includes icons for Creation, Control, Material, and Graving.
- Control Panel:** Features a circular joystick-like control and buttons for Slow/Medium/Fast speeds and 1mm/10mm/50mm feeds. It also includes UNDO, REDO, CLEAR, and NEXT buttons.
- Bottom Control Buttons:** Includes icons for Home, Location, Power, Camera, Print, and a large circular arrow.
- Style Setting:** Shows a cartoon character in a light blue style. It includes options for Gray, Strong, Sketch, Dither, Brightness (100%), and Contrast (80%).
- Parameter Settings:** Shows the same cartoon character in a darker blue style. It includes File Name (DLC32001.nc), Size (169x169 mm), Work Speed (1000 mm/min), and Laser Power (500-1000).
- Graving Panel:** Shows the cartoon character again, indicating progress at 66%. It displays coordinates X: 6.000, Y: 12.012, Feed Rate F: 100%, and Spindle Speed S: 100%.

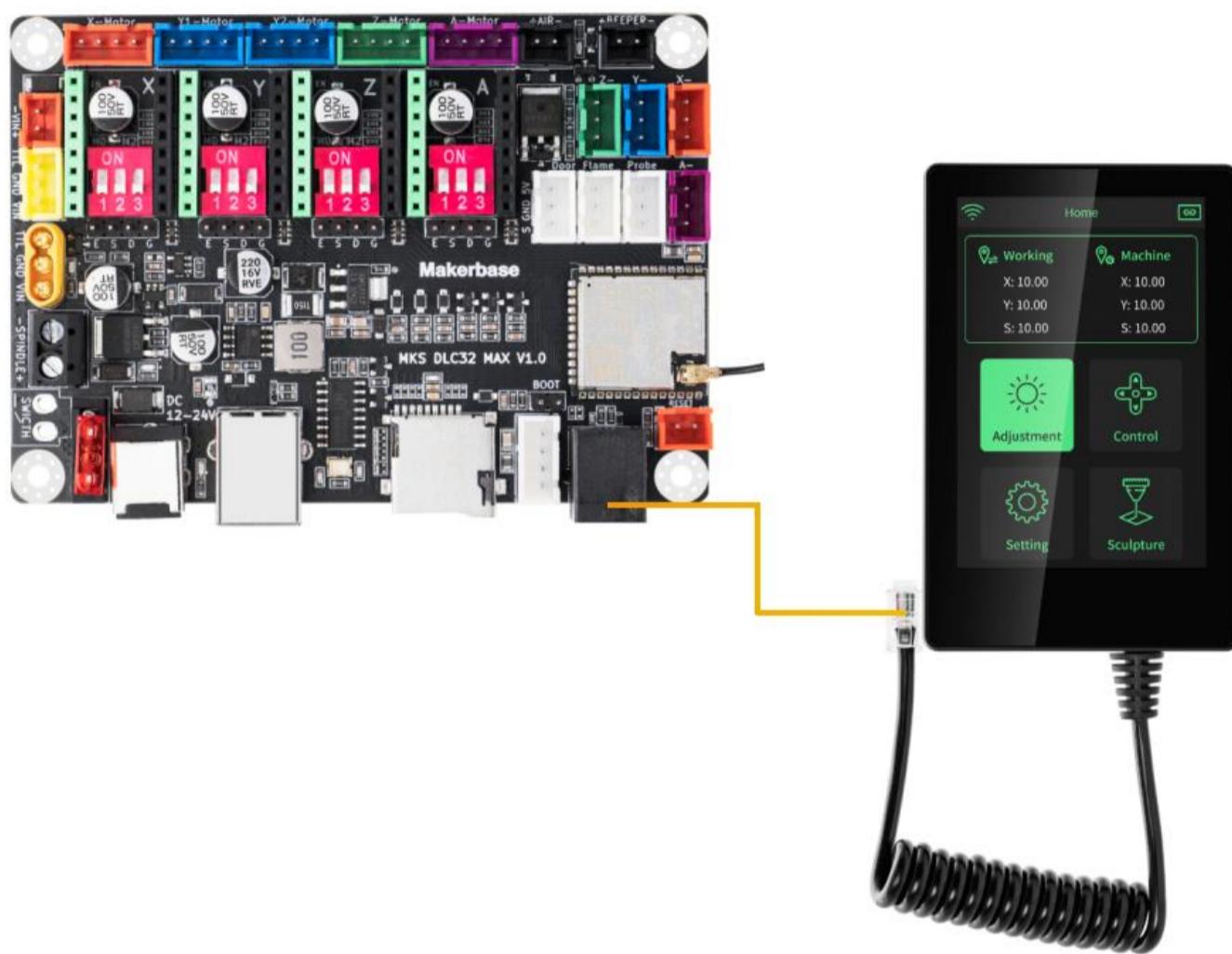
## MKS touch screen control

MKS LS ESP32 PRO can be used with a touch screen.

If you purchased one without a touch screen, you can skip this chapter.

The motherboard does not enable the screen by default. You can send the command `$47=1` through the host software (similar to `lasergrbl`).

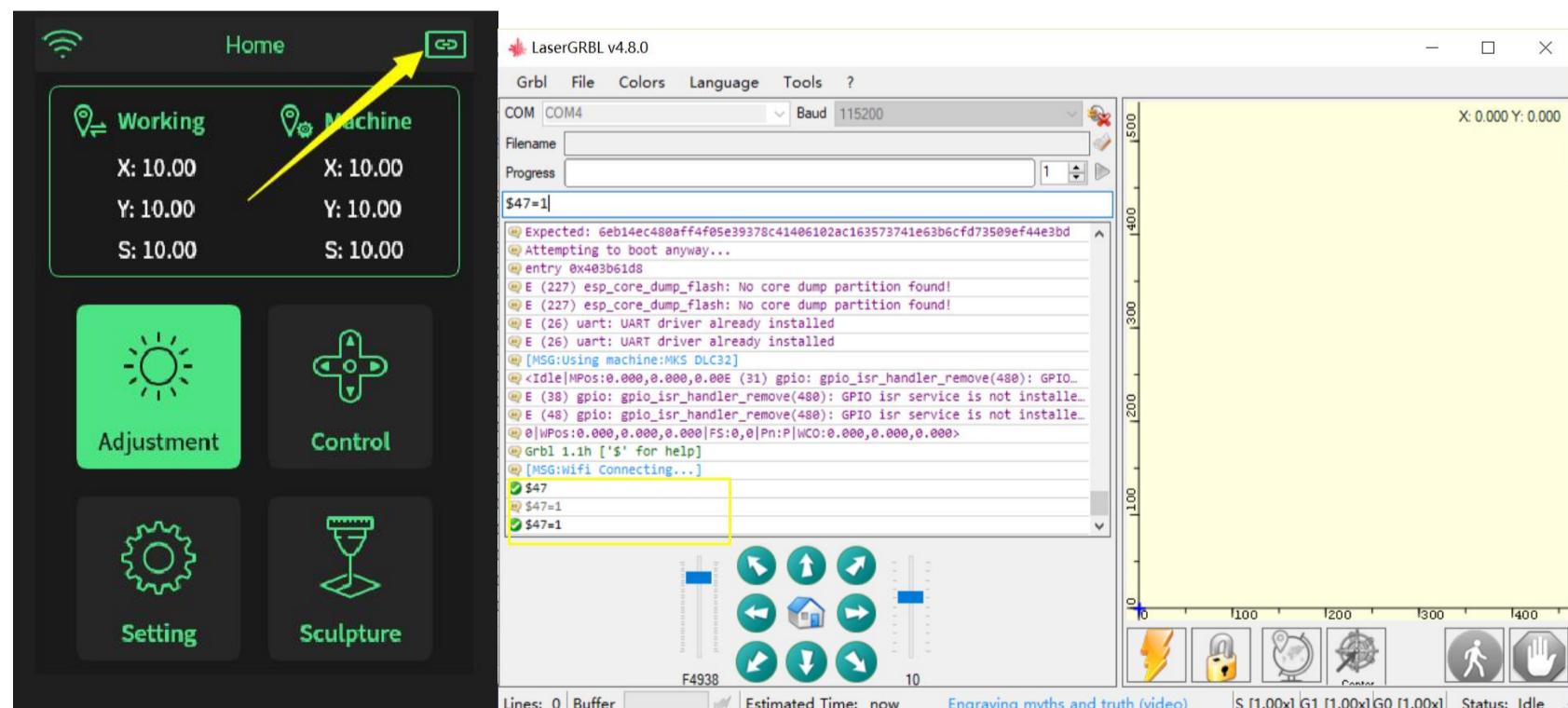
The screen can be used



After the connection is successful, there will be this icon in the upper right corner of the screen.

If there is no such icon, it means the screen is not connected successfully.

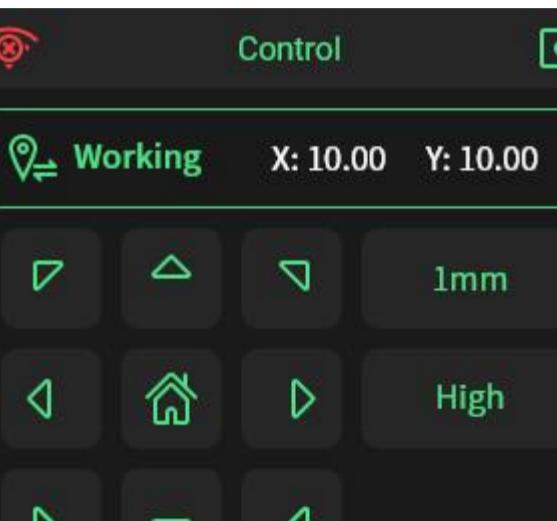
Please check if `$47` is enabled



Main page

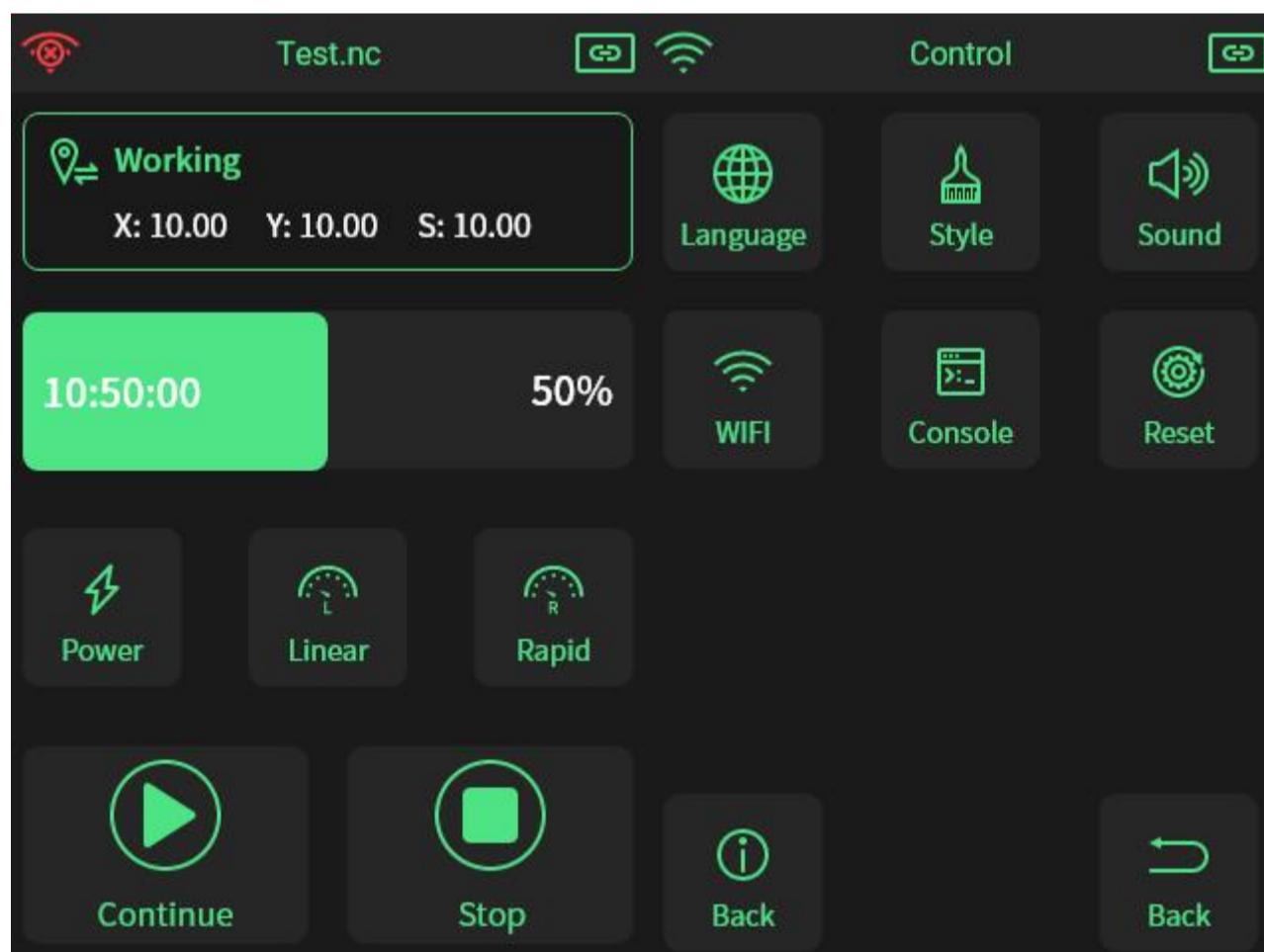


Motion page

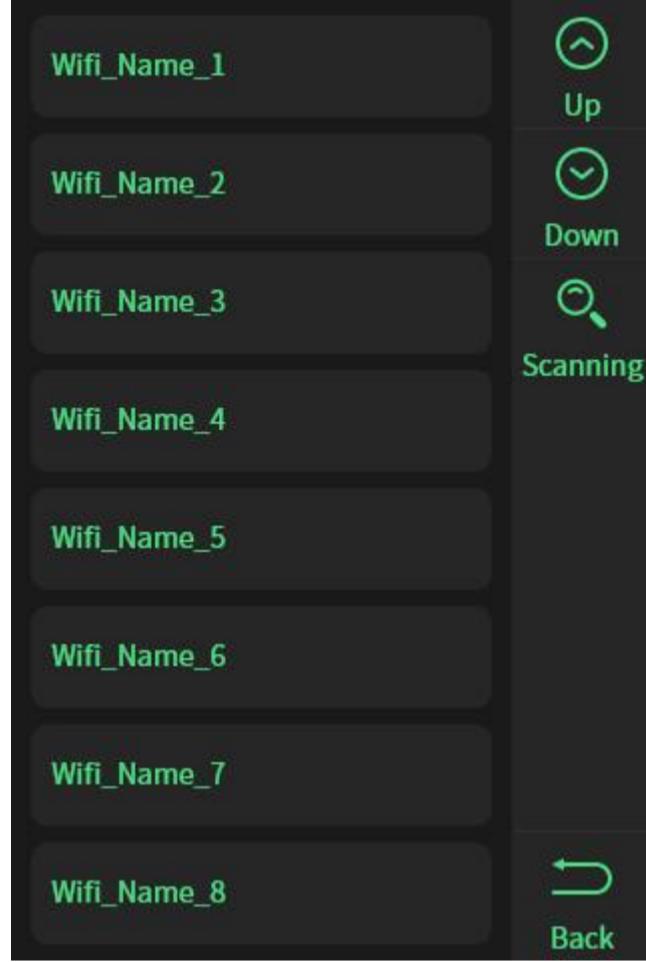


Engraving Work Page

Setting Page



If the motherboard has STA mode turned on, you can directly select the corresponding network on the screen and enter the password to connect.  
(If the display is empty, check the motherboard settings.)

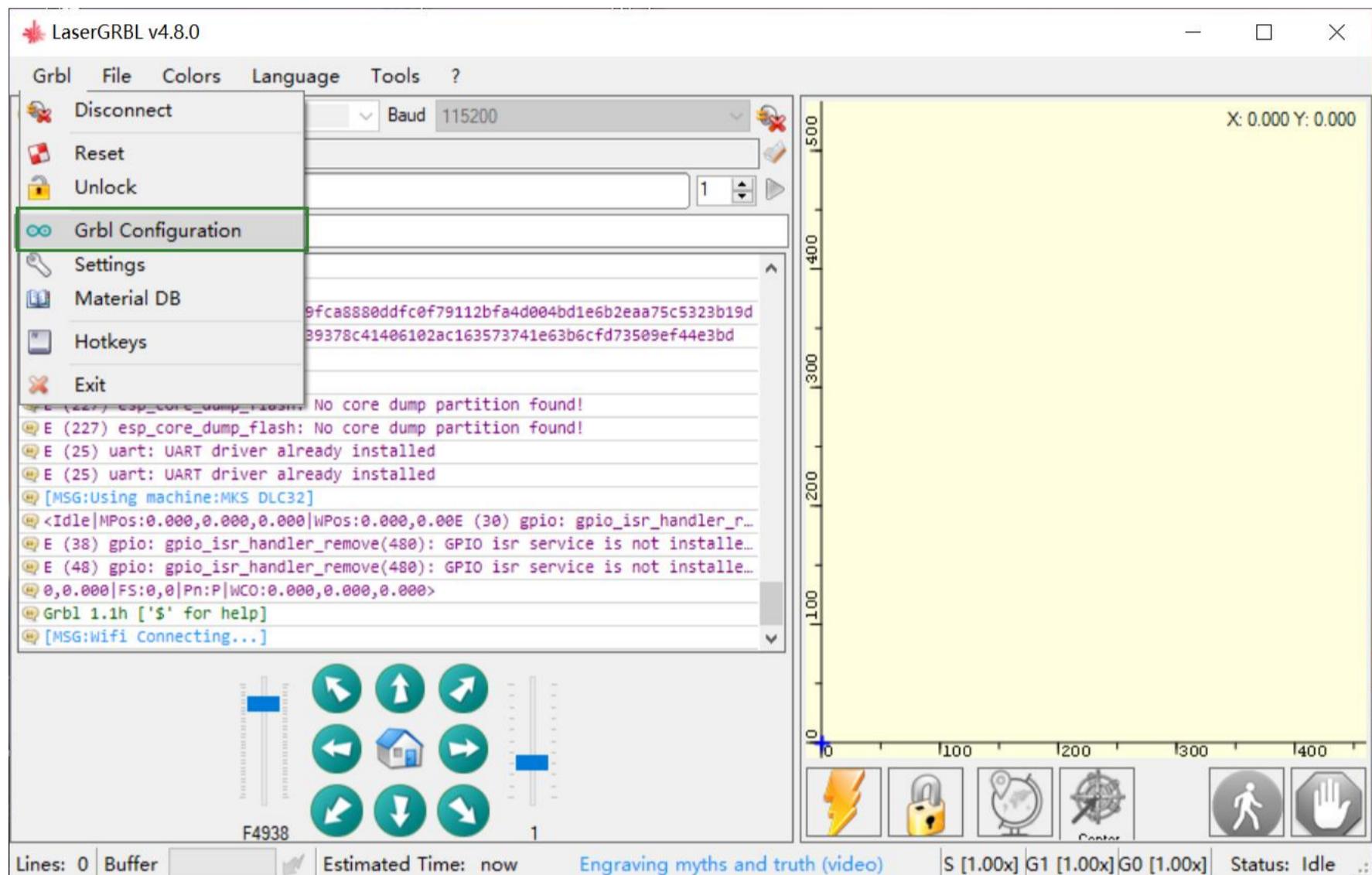


## Modify the parameters of the motherboard.

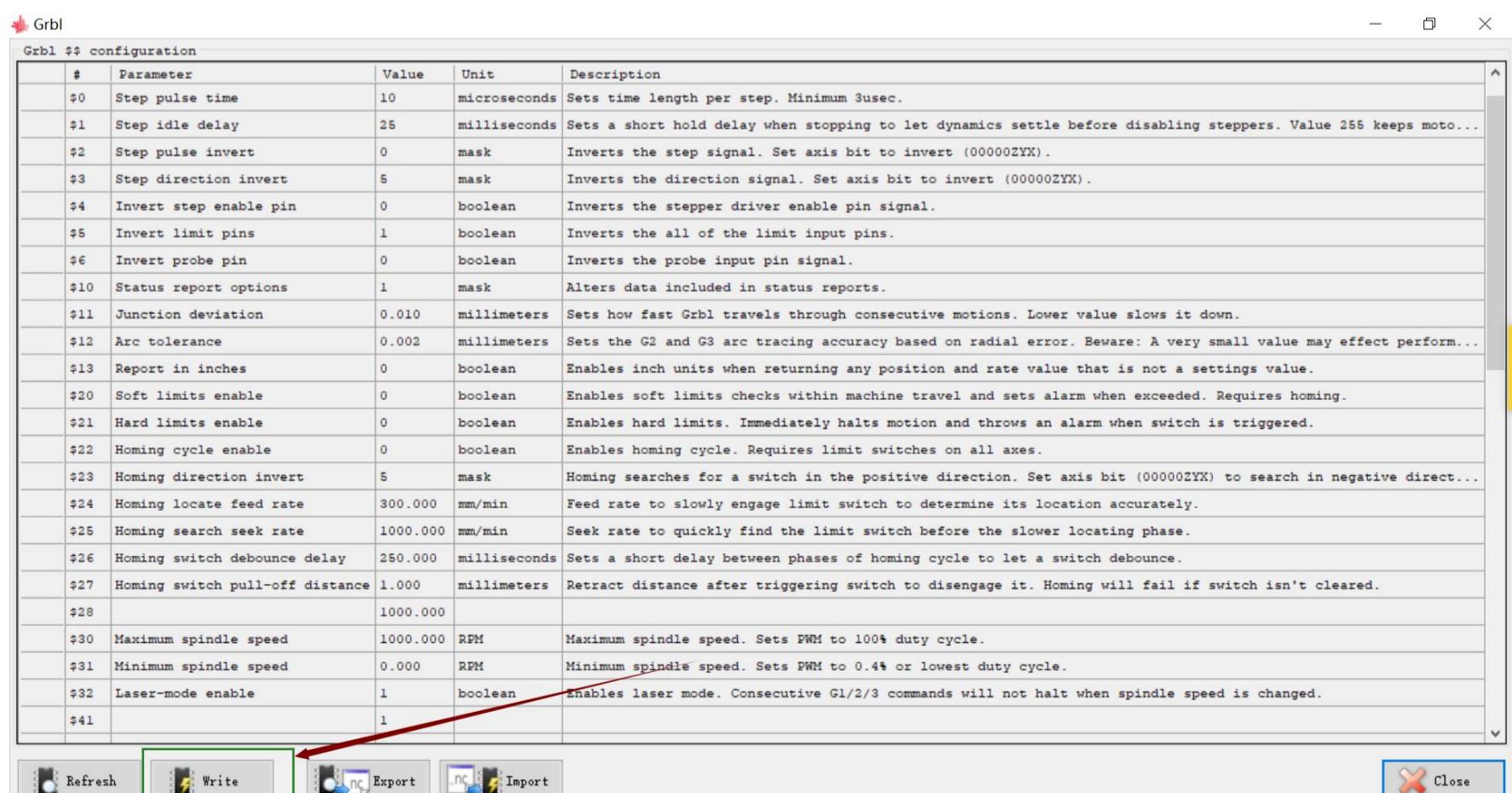
Under normal, the default parameters of the motherboard can run normally, if you want to adjust them according to your own machine.

The parameters of the firmware can be modified through HOST software such as LASERGRBL or through web control.

For LASERGRBL



After the modification is completed, you need to click the "Write Button" to save the parameters.



For Web control page



Modify according to the actual situation. After the modification is completed, you need to click "set" in front of the command to save the parameters.

	Set	Label	Value	Unit	Parameter	Description
Control	Set	\$0	10	microseconds	Step pulse time	Sets time length per step. Minimum 3usec.
SD File	Set	\$1	25	milliseconds	Step idle delay	Sets a short hold delay when stopping to let dynamics settle before disabling steppers. Value 255 keeps motors enabled with no delay.
Settings	Set	\$2	0	mask	Step pulse invert	Inverts the step signal. Set axis bit to invert (00000ZYX).
Language	Set	\$3	5	mask	Step direction invert	Inverts the direction signal. Set axis bit to invert (00000ZYX).
About	Set	\$4	0	boolean	Invert step enable pin	Inverts the stepper driver enable pin signal.
	Set	\$5	1	boolean	Invert limit pins	Inverts the all of the limit input pins.
	Set	\$6	0	boolean	Invert probe pin	Inverts the probe input pin signal.
	Set	\$10	1	mask	Status report options	Alters data included in status reports.
	Set	\$11	0.010	mm	Junction deviation	Sets how fast Grbl travels through consecutive motions. Lower value slows it down.
	Set	\$12	0.002	mm	Arc tolerance	Sets the G2 and G3 arc tracing accuracy based on radial error. Beware: A very small value may effect performance.
	Set	\$13	0	boolean	Report in inches	Enables inch units when returning any position and rate value that is not a settings value.

\$3 in the firmware parameters (setting the motor direction) is a parameter that sets the xyz direction. You can refer to the list below. (In fact, it is to convert the set decimal value into a binary value)

For example:

The default setting is \$3=0, (x+,y+z+)

If I update to the machine, find that the directions of x and y are opposite, so your correct direction should be (x-, y-, z+). So if you look it up in the table, the corresponding direction is 3.

So settings \$3=3, then save, so that the motor becomes the reverse direction you want.

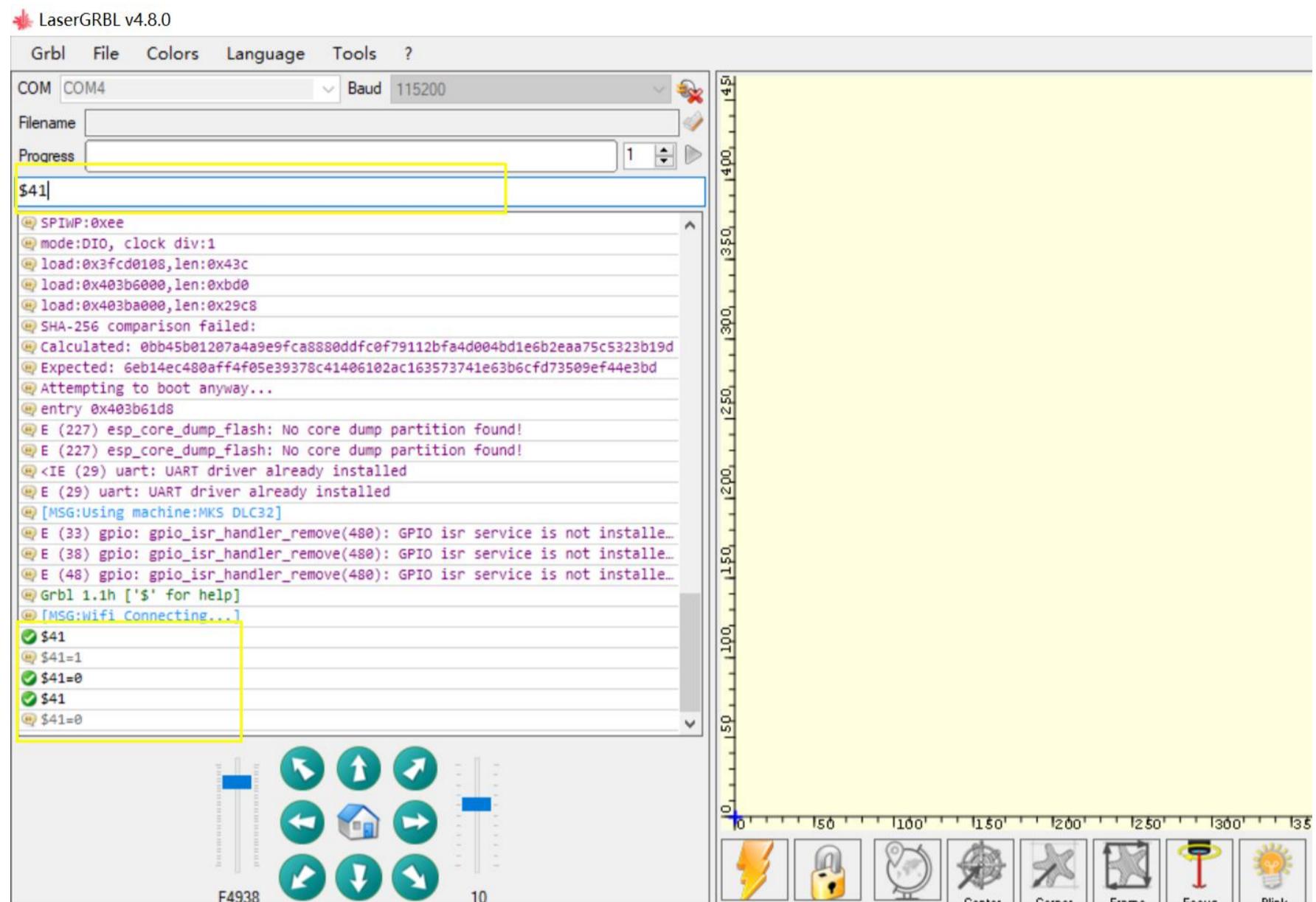
Directions	Parameters
X+ Y+ Z+	0
X- Y+ Z+	1
X+ Y- Z+	2
X- Y- Z+	3
X+ Y+ Z-	4
X- Y+ Z-	5
X+ Y- Z-	6
X- Y- Z-	7

The following table is a special function command, which is not displayed in the parameters of Lasergrbl or web page by default. If you need to use these functions, you can refer to the instructions in the table and send commands in lasergrbl similar to the host software to enable or disable them.

\$32	1	Work mode 0: cnc mode 1: laser mode
\$40	0	Motherboard controllable 5v interface 0:disable 1:enable
\$41	1	Buzzer settings 0:disable 1:enable
\$42	0	Probe(Tilt detection) 0:disable 1:enable(High sensitivity) 2:enable(Low sensitivity)
\$43	0	Flame detection setting 0:disable 1:enable(High sensitivity) 2:enable(Low sensitivity)
\$44	0	Air Assist 0:disable 1:enable(Minimum output 0%) 2:enable(Minimum output 5%)
\$45	0	Motion mode setting 0: XY axis mode 1: Roller mode (the z-axis of the motherboard is defined as the rolling axis) 2: xyz axis mode
\$46	1	Board rate 1:115200, 2:250000
\$47	0	Offline Display 0: disable 1:enable
\$48	0	Door detection Setting 0:disable 1:enable(High sensitivity) 2:enable(Low sensitivity)
\$50	0	WIFI mode setting, 0:disable, 1: AP Mode, 2: STA Mode, 3: Bluetooth
\$51	ESP_WIFI	AP Mode SSID
\$52	12345678	AP Mode Password
\$53	My_SSID	STA Mode SSID
\$54	My_password	STA Mode Password
[ESP111]		After the connection is successful, Query the IP address

The following picture uses \$41 as an example  
Send the command itself directly

\$41 (query the current settings of the command)  
sending means directly setting the corresponding status.  
\$41=0 disable buzzer  
\$41=1 enable buzzer



For this additional function (tilt detection, flame detection, door detection), they are disabled by default. If you need to use them, please enable them in advance.

Note: Connecting the module, please note that the signal sequence of the motherboard interface and the signal on the module must be connected accordingly. If the signals do not correspond, it may cause the module to not work properly.

The signals of the interface are all in this order. (You can look at the silk screen on the back when connecting)

