MKS LS ESP32 PRO Manual

Date：2023 -09

Directory

Overview and Features

LS ESP32 PRO V1.1 motherboard is specially developed for desktop engraving machines.

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

Integrated silent TMC2209 driver, the maximum working speed reaches 30000mm/min

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.

| Hardware parameters	
Board Module	LS ESP32 PRO V1.1
Power input	12V~24V 10A
Max Power	50W
CPU Module	ESP32
Main frequency	240M HZ
RAM	348KB
ROM	8M
Motor Drive	TMC2209 （Maximum current 1.5A）
WIFI-PC	Support
Bluetooth-APP	Support
WIFI-APP	Support
Roll axis	Support
Offline engraving	Support （work with 3.5inch touch screen）
Security door alarm	Support
Air assisted	Support
Laser stay alarm	Support
Laser tilt alarm	Support （External Gyroscope Module）
Smoke alarm	Support （External smoke detection module）
Buzzer expansion	Support
Emergency stop button extension	Support
Engraving speed	<=30000mm/min

Installation Dimensions
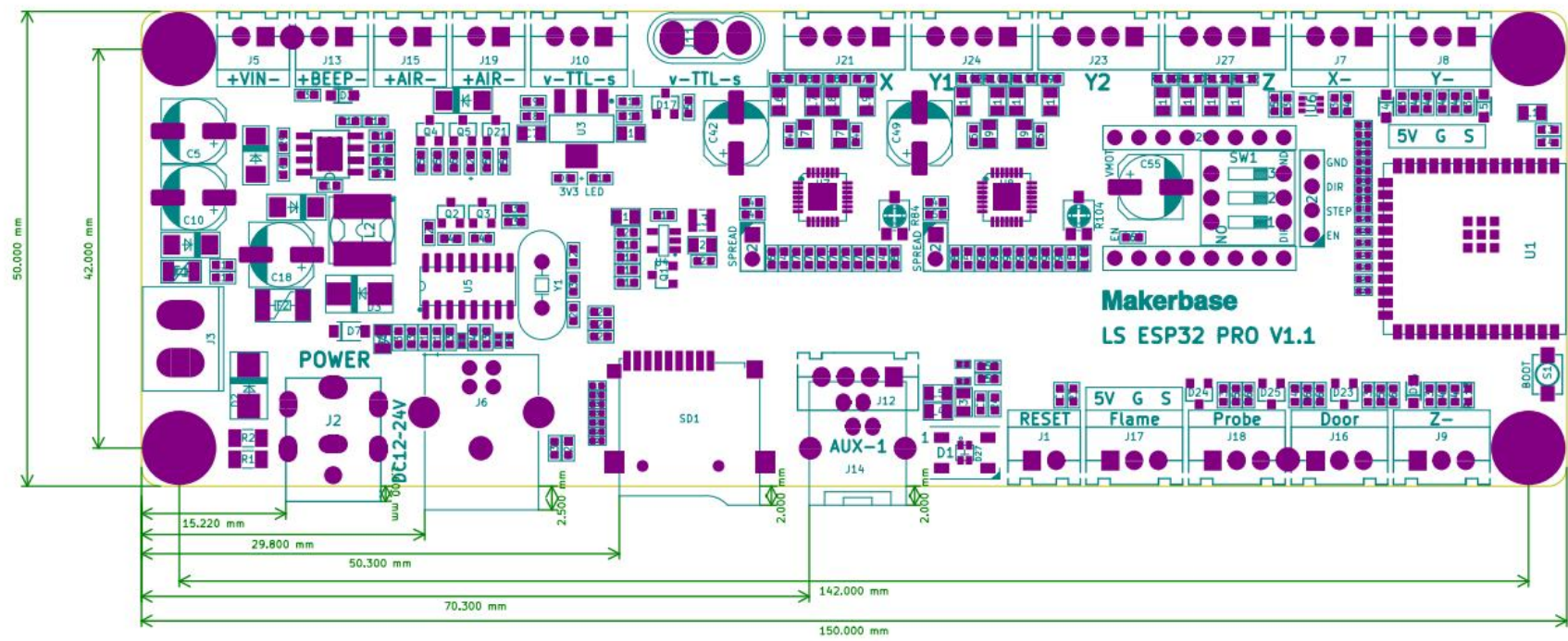
LS ESP32 PRO Operation

When you get the LS ESP32 PRO 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
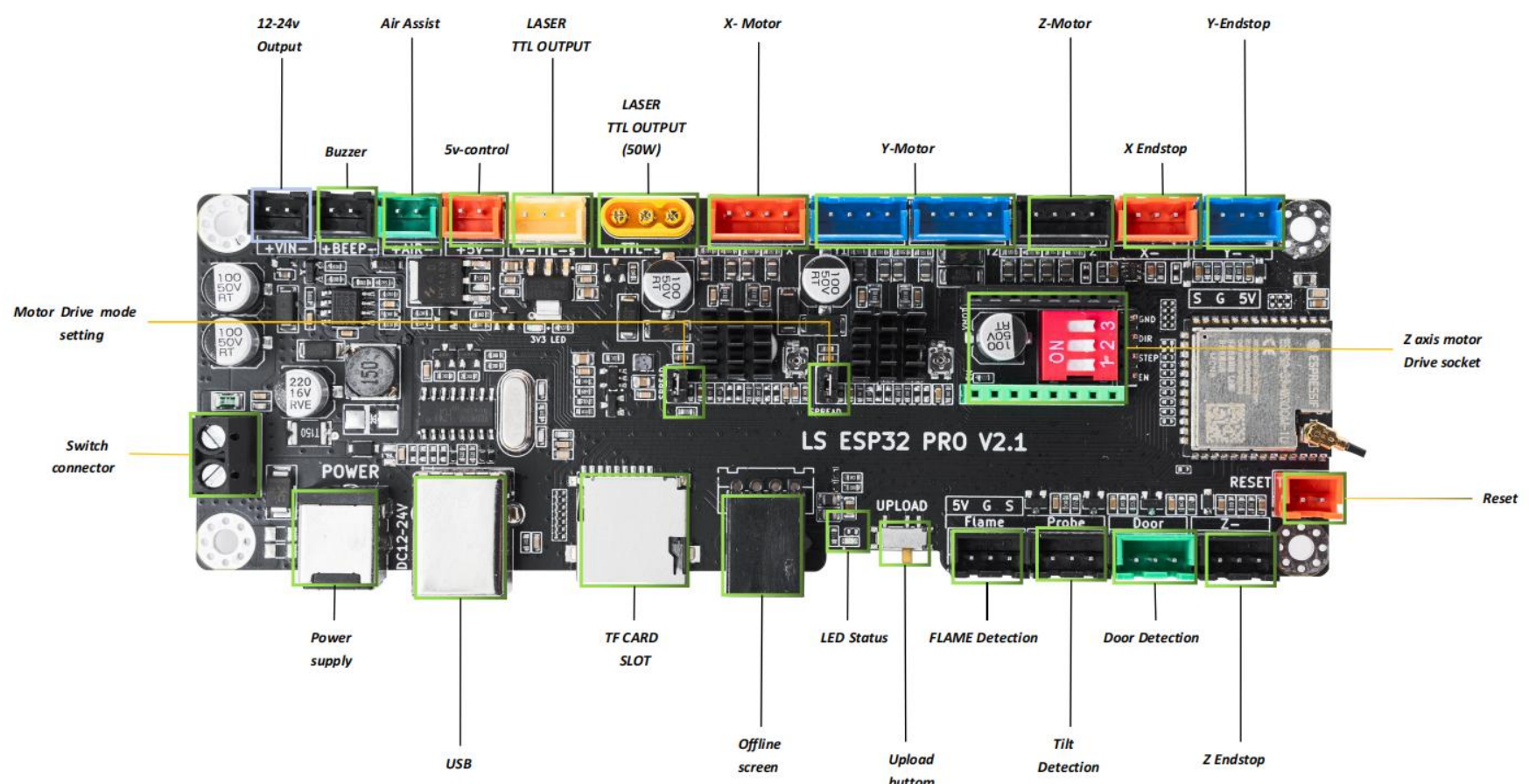
Power supply：Voltage 12-24v, maximum current **10A**, connector model: "**DC-007B-2.1mm**"

Switch connector：Used for external switches to control power on and off.
(Note: The default is disconnected. If the switch is not connected, please connect the + and - of the interface to ensure normal power supply.)

USB 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**

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

Led Staus：Reflect the current status of the motherboard
Red: alarm indicator
Yellow: fault indicator light

Green: Bluetooth status The device is working
Light blue Blue: WIFI-AP status The device is working
Dark blue blue: WIFI-STA status device is working

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.*

Tilt Delection：*Connect the tilt detection sensor. Features can be enabled in firmware.*

Door Delection：*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*

BOOT:*Press this button often, the motherboard will be forced into the programming mode. (Normally updating firmware doesn't need to use it). It can be used only when the motherboard cannot update the 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"
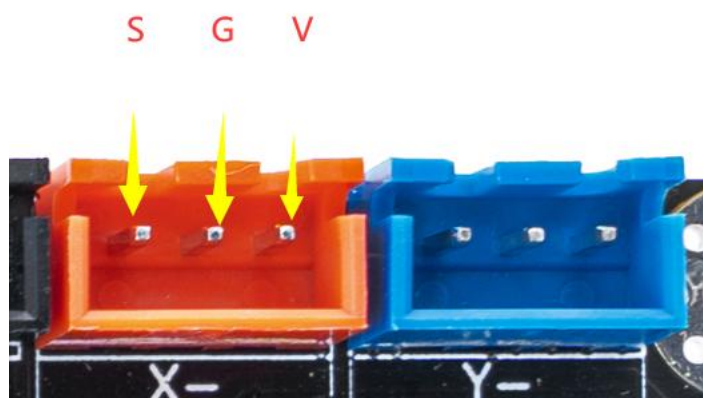
Z Motor socket：*If the machine needs to use the z-axis, please connect the motor drive to this socket. Drivers such as A4988, TMC2208, TMC2209 can be used. If the machine does not have a z-axis by default, it is not necessary to connect.*

X/Y/Z Motor interface：*For connecting stepper motors. The X and Y axes are driven by integrated tmc2209.*
*The default current is 1.2A, the calculation formula: I=V, **it is recommended not to exceed 1.6A***
There are two motor interfaces on the Y-axis, they are connected in parallel and share the same tmc2209 drive.
*Z-**axis motor/driver**: This axis can be used as a roller drive,*
$45:0 （normal mode）, $45:1 roller mode.
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.
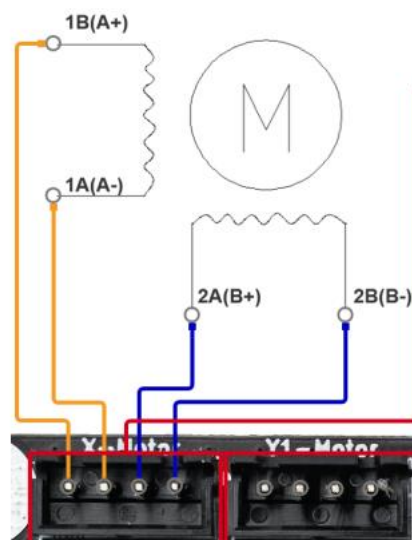
Laser TTL Output：*To connect the laser module, you need to pay attention to the corresponding connection of the signal.*
S----TTL of connecting laser
G----Connect to the gnd of the laser

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 **20-50W.** 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.
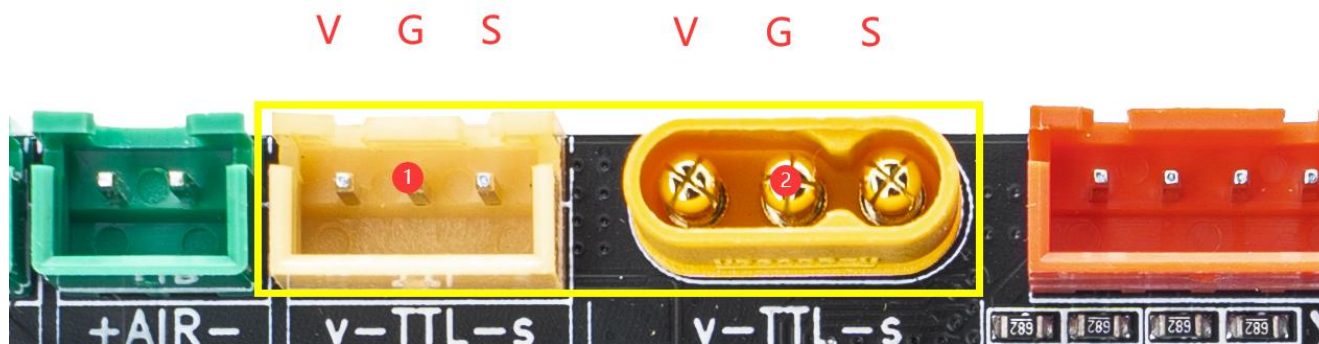
***Air assit**：Connect air-assisted equipment.*
BEEP: *Connect the buzzer*

Update the motherboard firmware.

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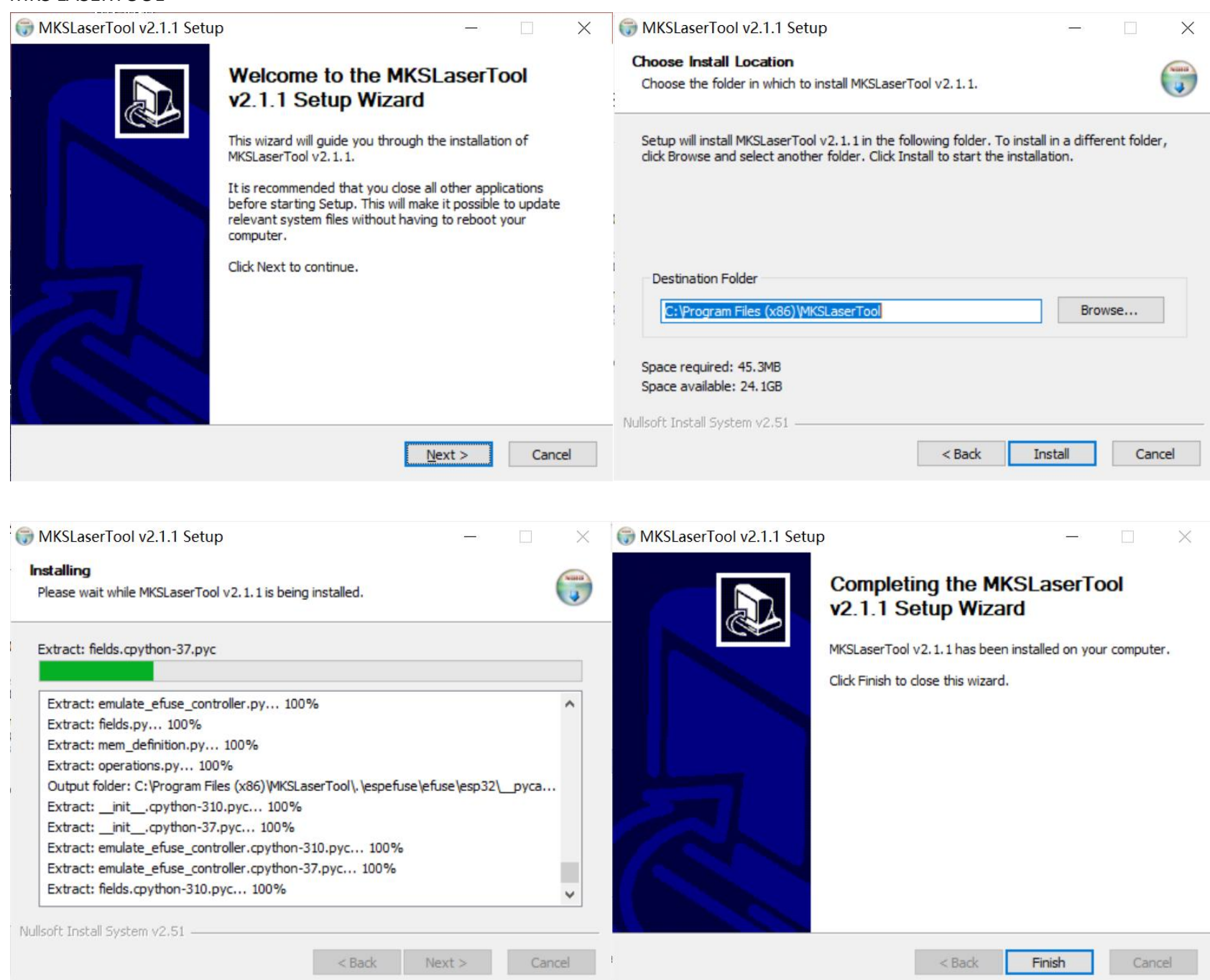
Firmware download address:

Firmware update tool download address:
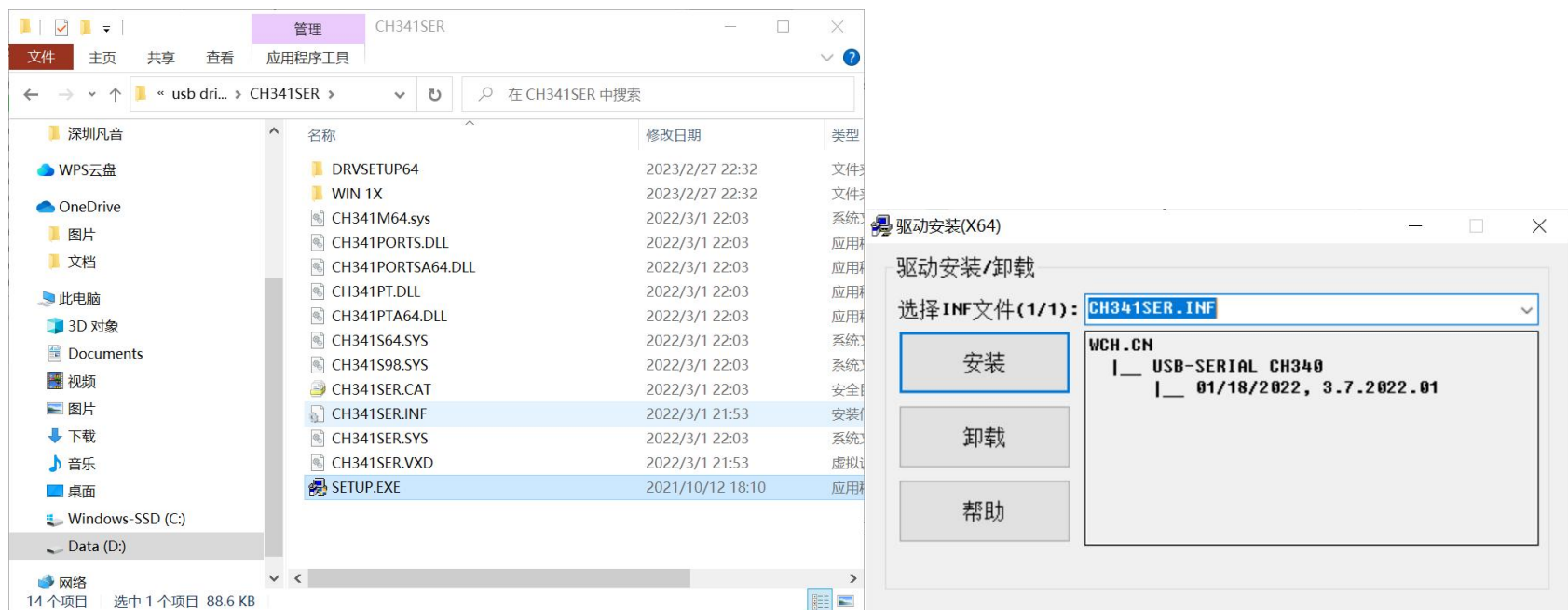
USB driver file download address:

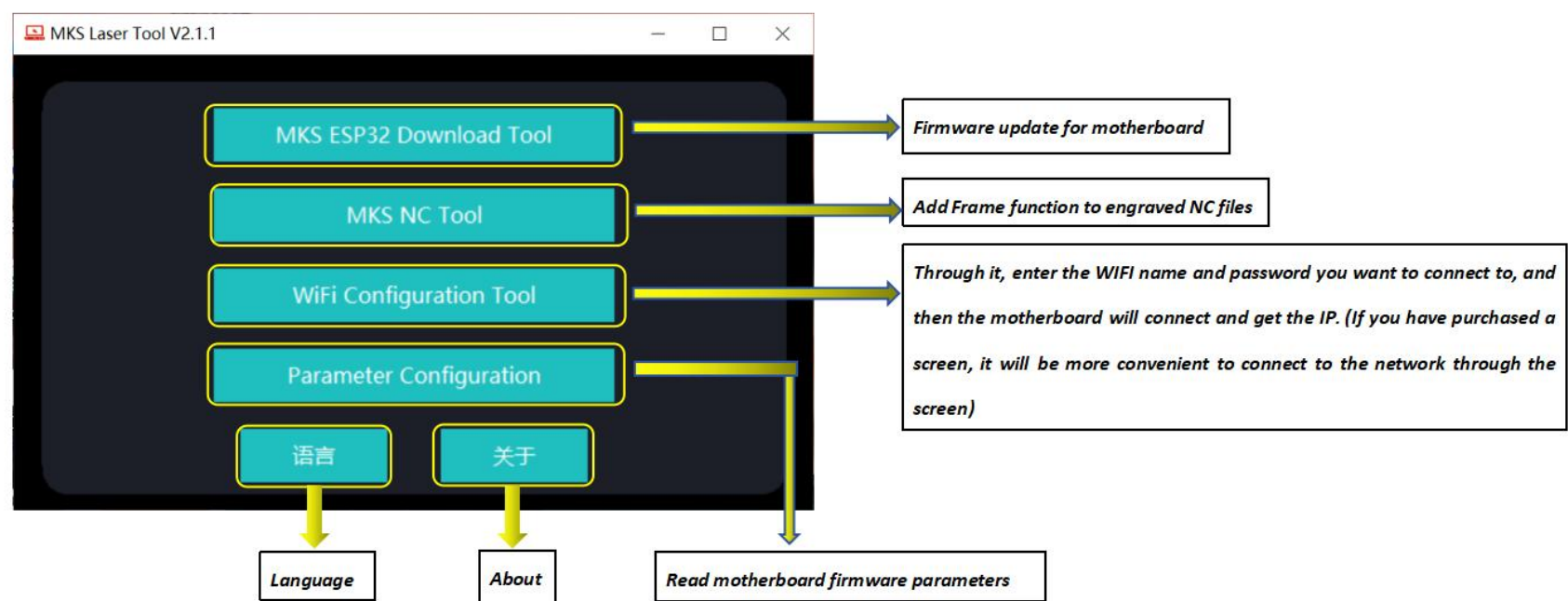## *Install MKS LASERTOOL and USB driver files (ch340)*

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 V2.0** and above. Version 1.0 cannot*

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** at the same time. The "switch interface" is disconnected by default, and a switch needs to be connected. If there is no switch, you can use a wire to short it, so that the motherboard will be powered on.
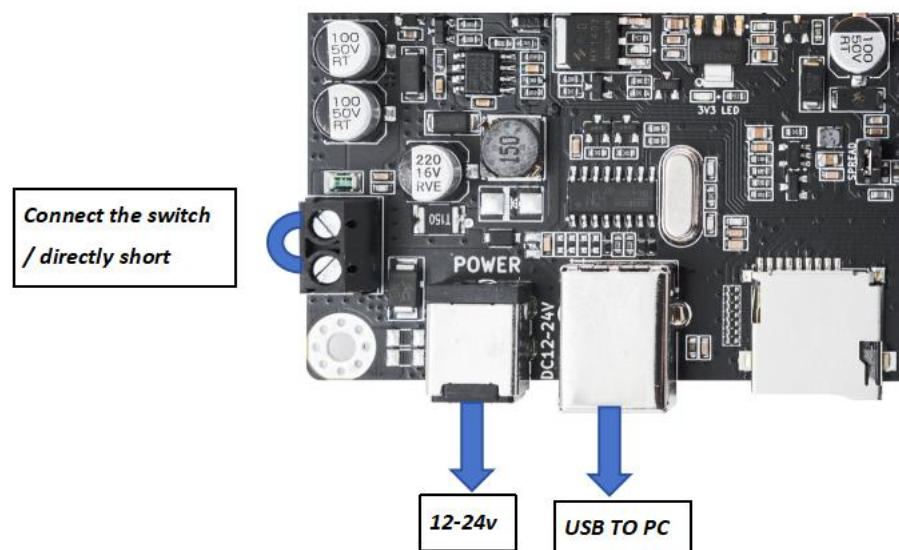
2, Open the MKS LASERTOOL software
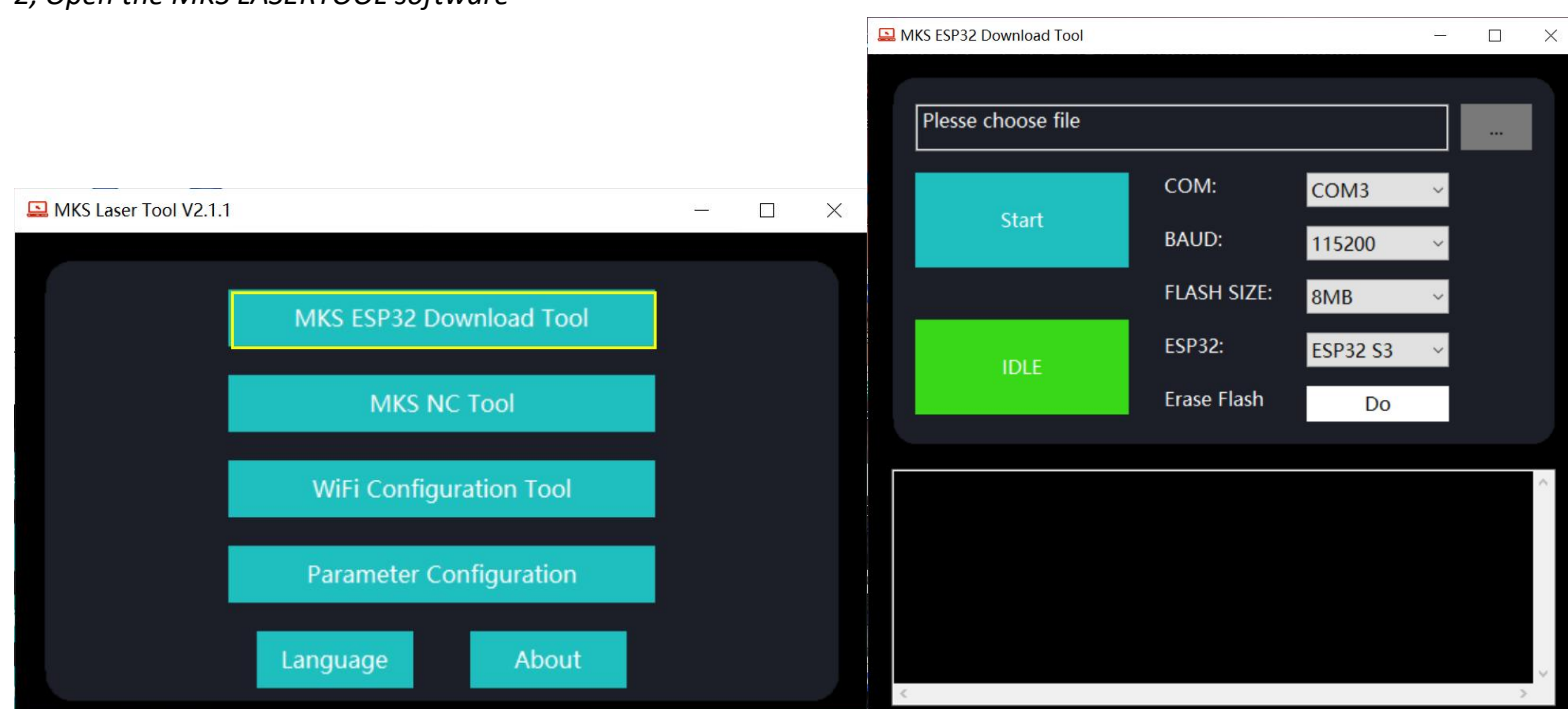
Please choose file: Select the bin file you downloaded corresponding to the mainboard from github

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.
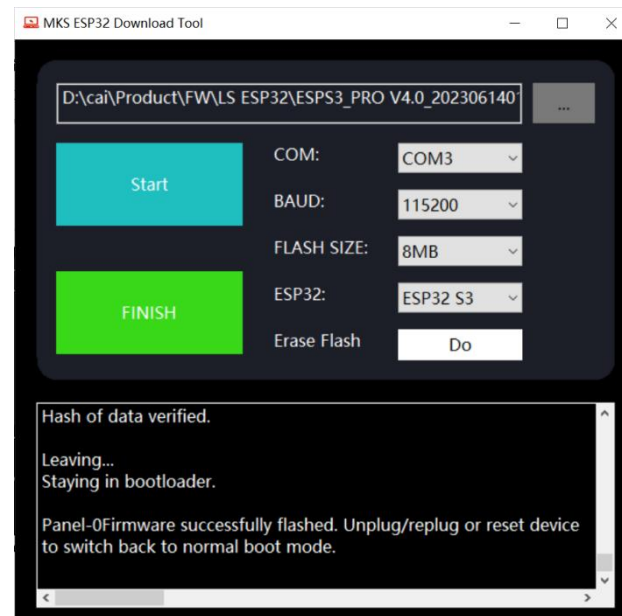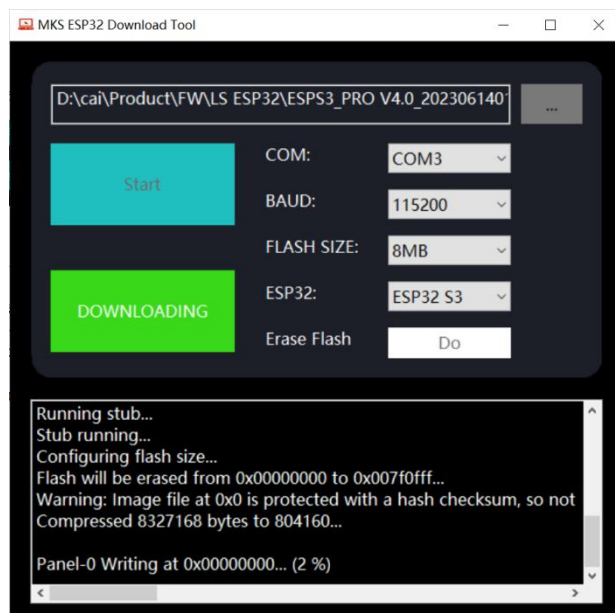
BAUD: Baud rate, recommended to choose 115200

FLASH SIZE: Select 8MB

ESP32: Select esp32 s3

Erase Flash: Do

After the setting is complete, click Start to start the update

MKS ESP32 Download Tool

D:\cai\Product\FW\LS ESP32\ESPS3_PRO V4.0_202306140

Start

DOWNLOADING

COM: COM3
BAUD: 115200
FLASH SIZE: 8MB
ESP32: ESP32 S3
Erase Flash Do

Running stub...
Stub running...
Configuring flash size...
Flash will be erased from 0x00000000 to 0x007f0fff...
Warning: Image file at 0x0 is protected with a hash checksum, so not
Compressed 8327168 bytes to 804160...

Panel-0 Writing at 0x00000000... (2 %)

MKS ESP32 Download Tool

D:\cai\Product\FW\LS ESP32\ESPS3_PRO V4.0_202306140

Start

FINISH

COM: COM3
BAUD: 115200
FLASH SIZE: 8MB
ESP32: ESP32 S3
Erase Flash Do

Hash of data verified.

Leaving...
Staying in bootloader.

Panel-0Firmware successfully flashed. Unplug/replug or reset device
to switch back to normal boot mode.

Use of mainboard control

MKS LS ESP32 PRO 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.
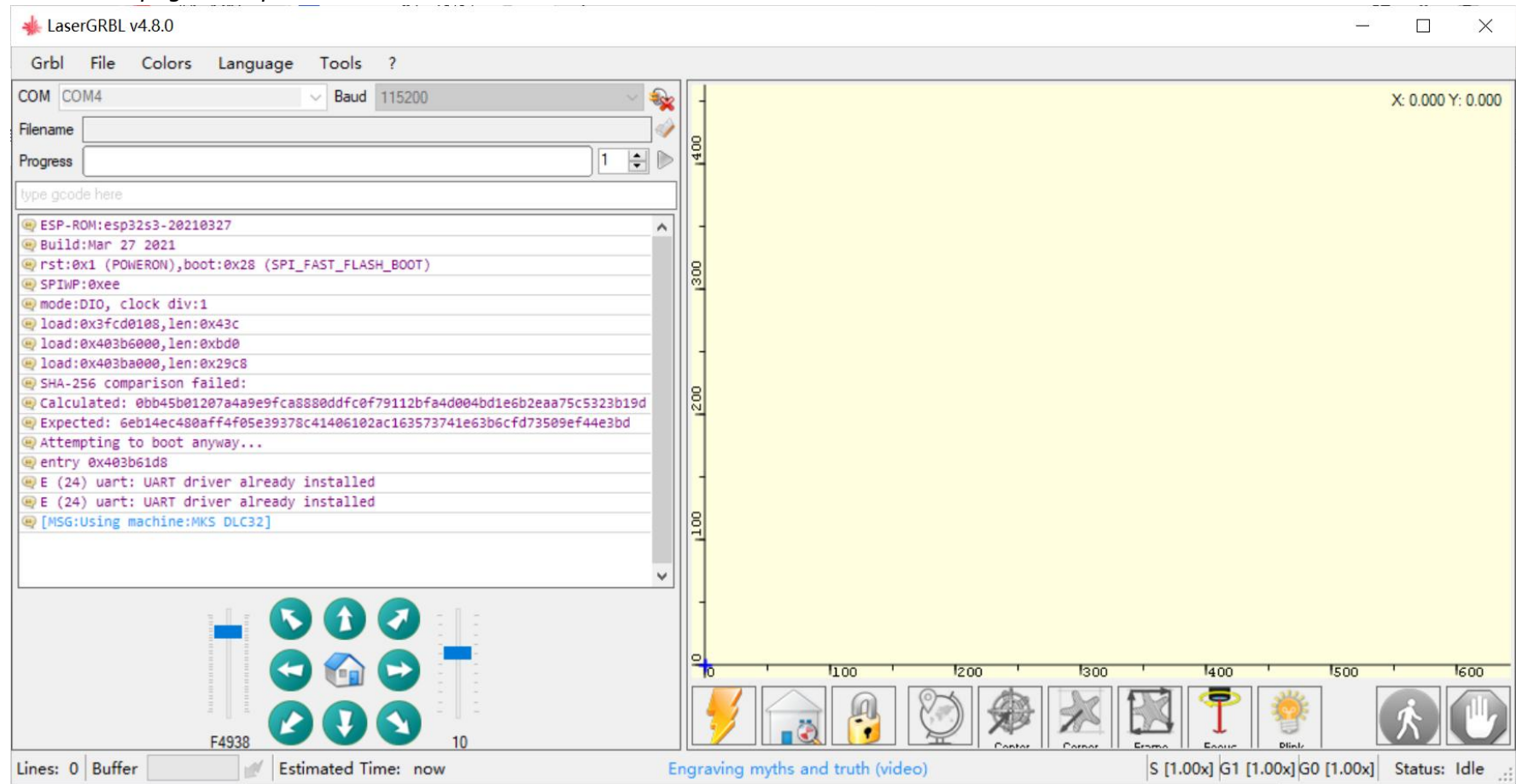
The picture uses Lasergrbl as an example,
com: Select the serial number assigned by the PC to the motherboard (it is the same as the COM for firmware update above, and will only be displayed after the ch340 driver file is installed).The baud rate is generally 115200
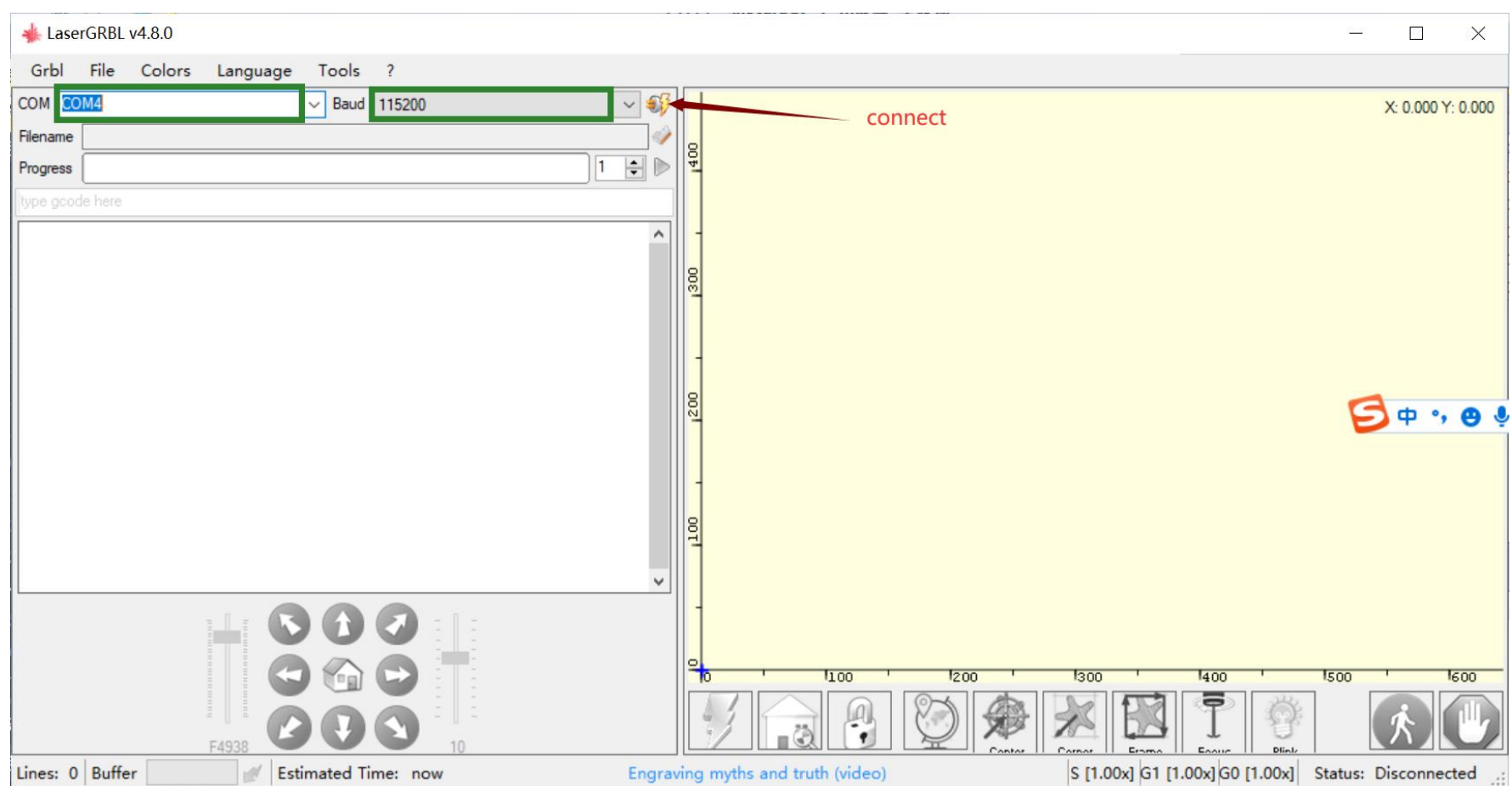
After the connection is successful, the interface
The control page can operate

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.
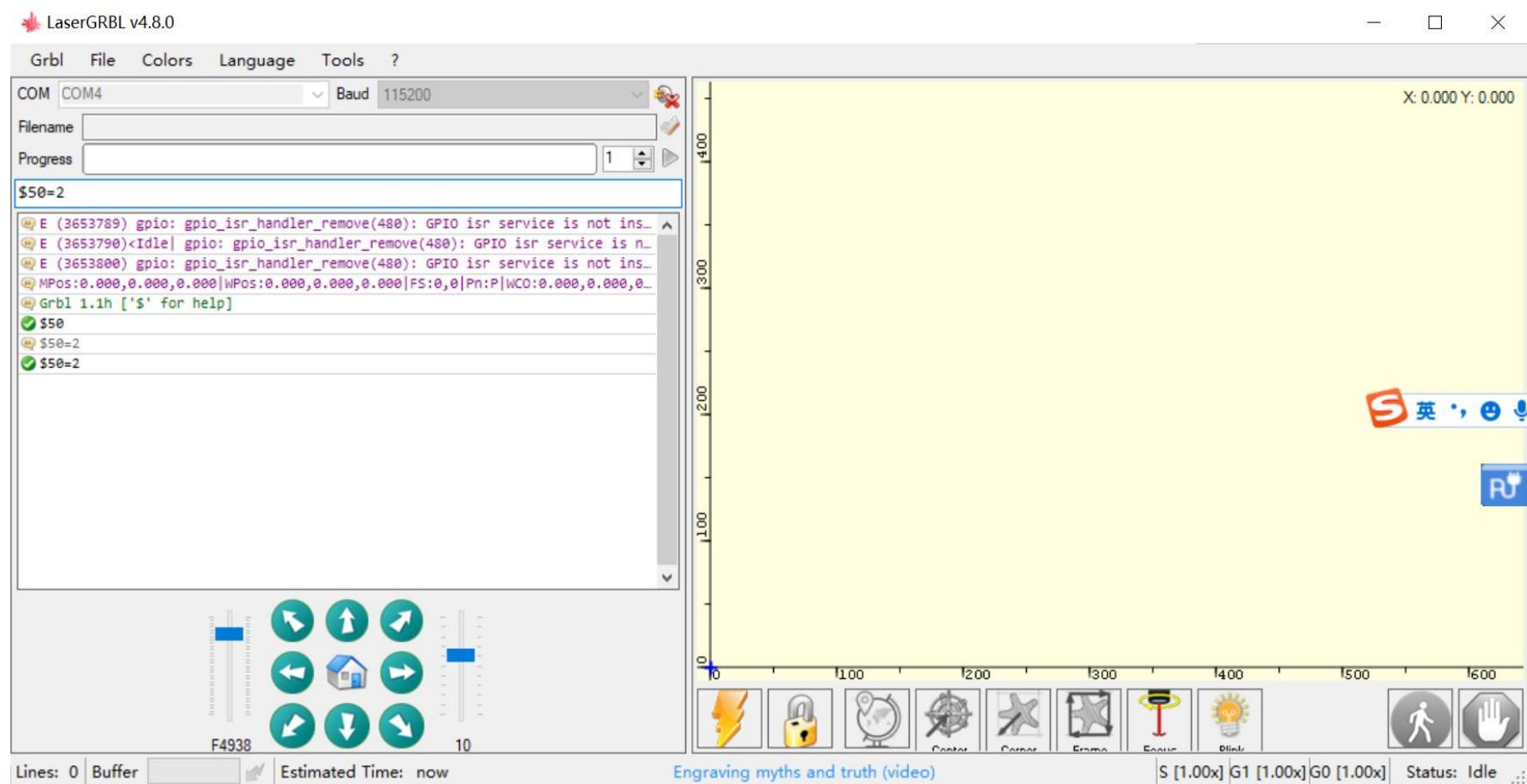
How to connect to the corresponding WIFI
1,Can be set up and connected by sending commands
$51   Set SSID for AP mode
$52   Set Password for AP mode
$53   Set SSID for STA mode
$54   Set Password for STA mode

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)
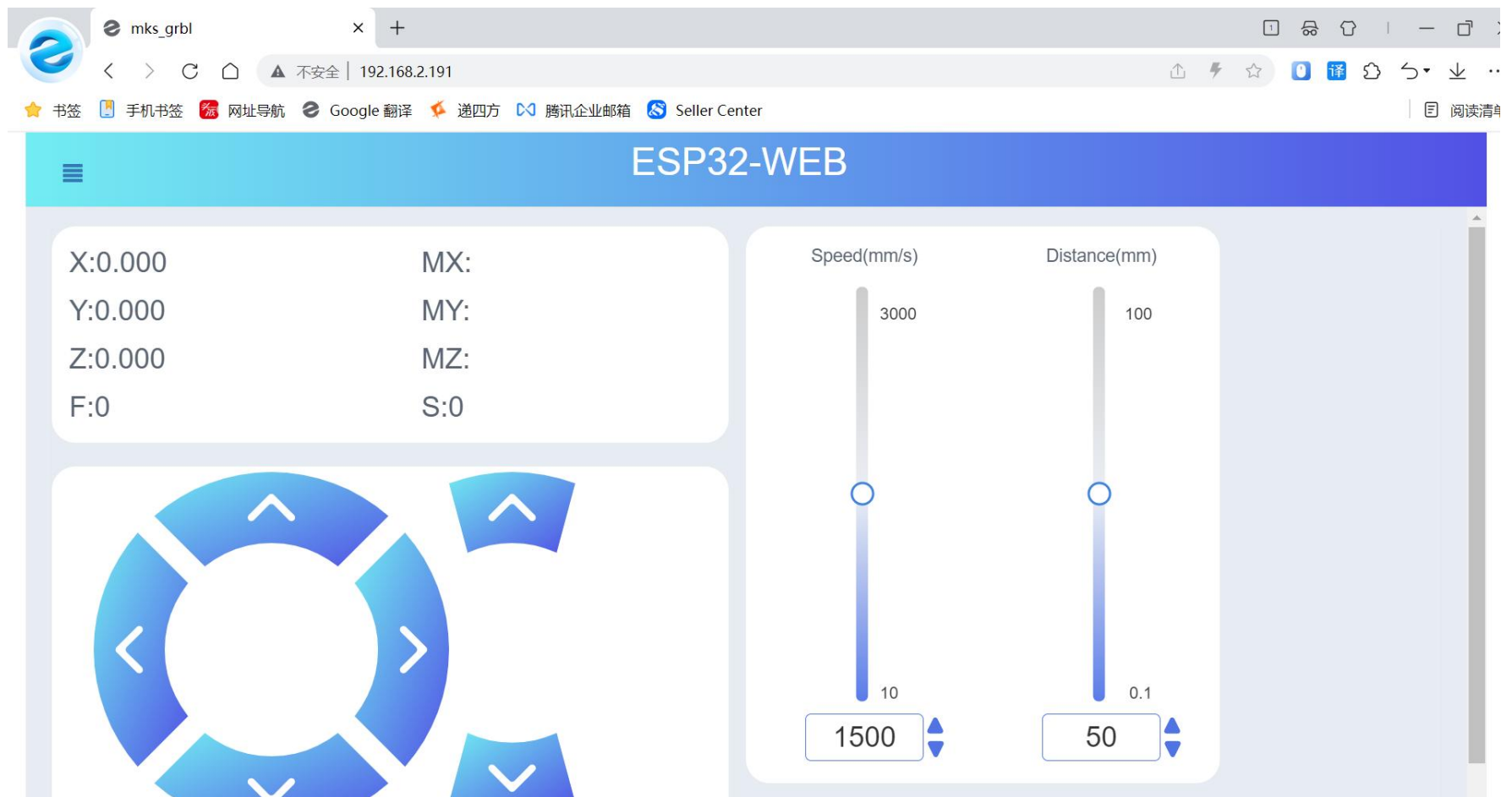
The motherboard can then be controlled and engraved.。

Another way to connect to the Internet and obtain an IP.
*Available via **MKS LASERTOOL.***
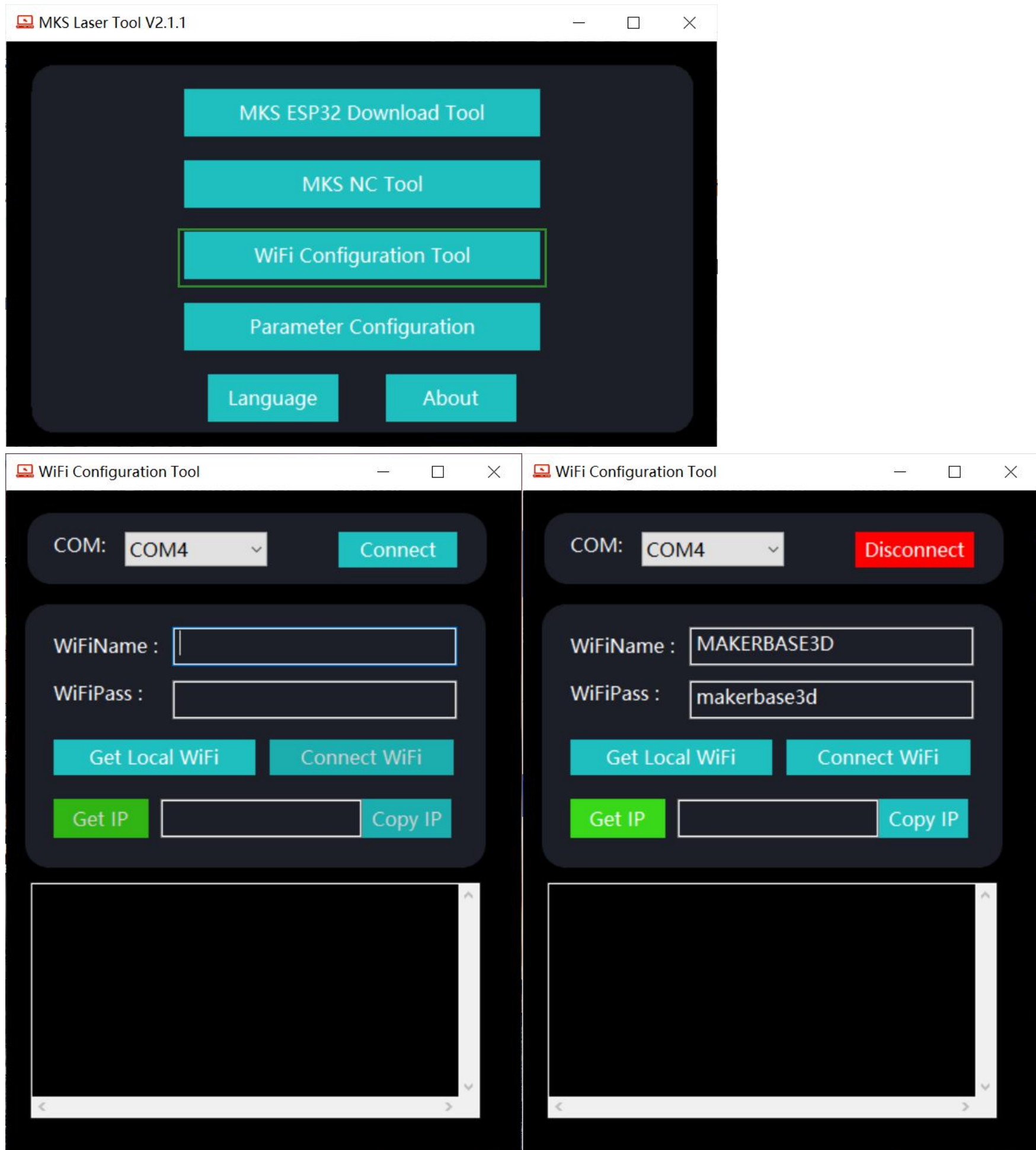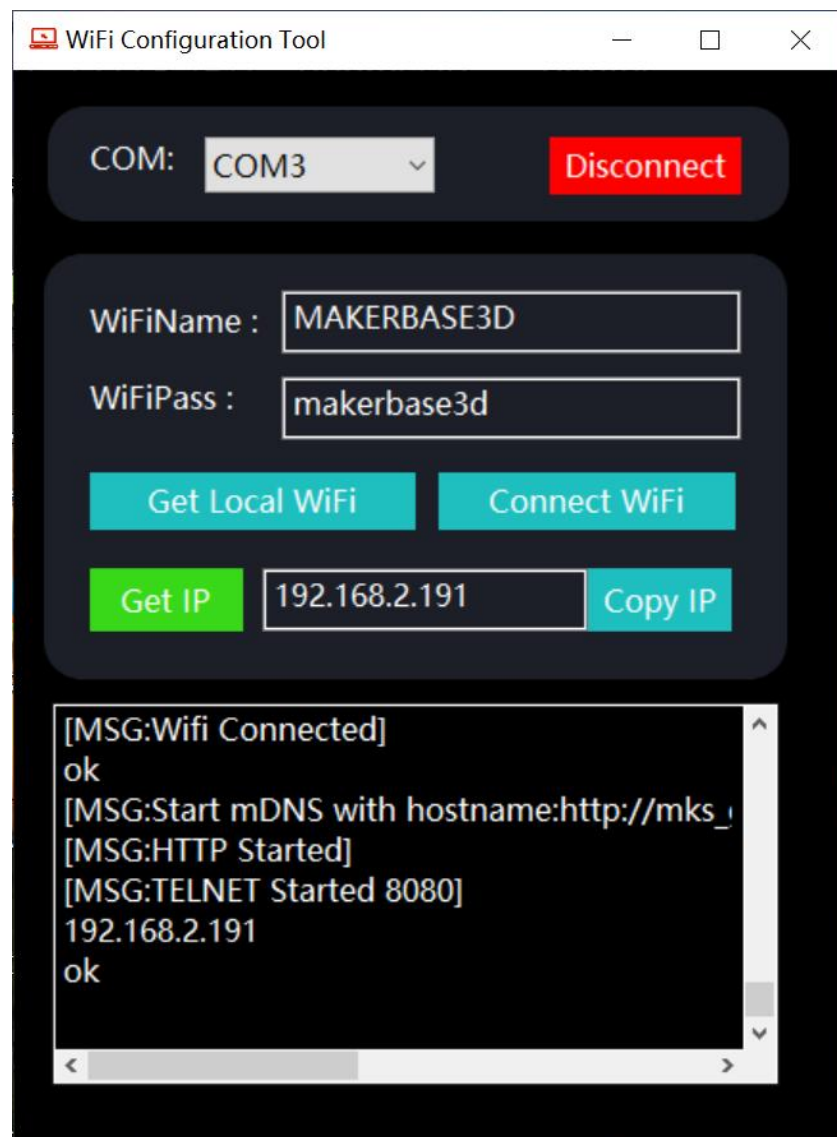
After setting up, click on the link wifi
After the command window below is connected, you can get the Get IP

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
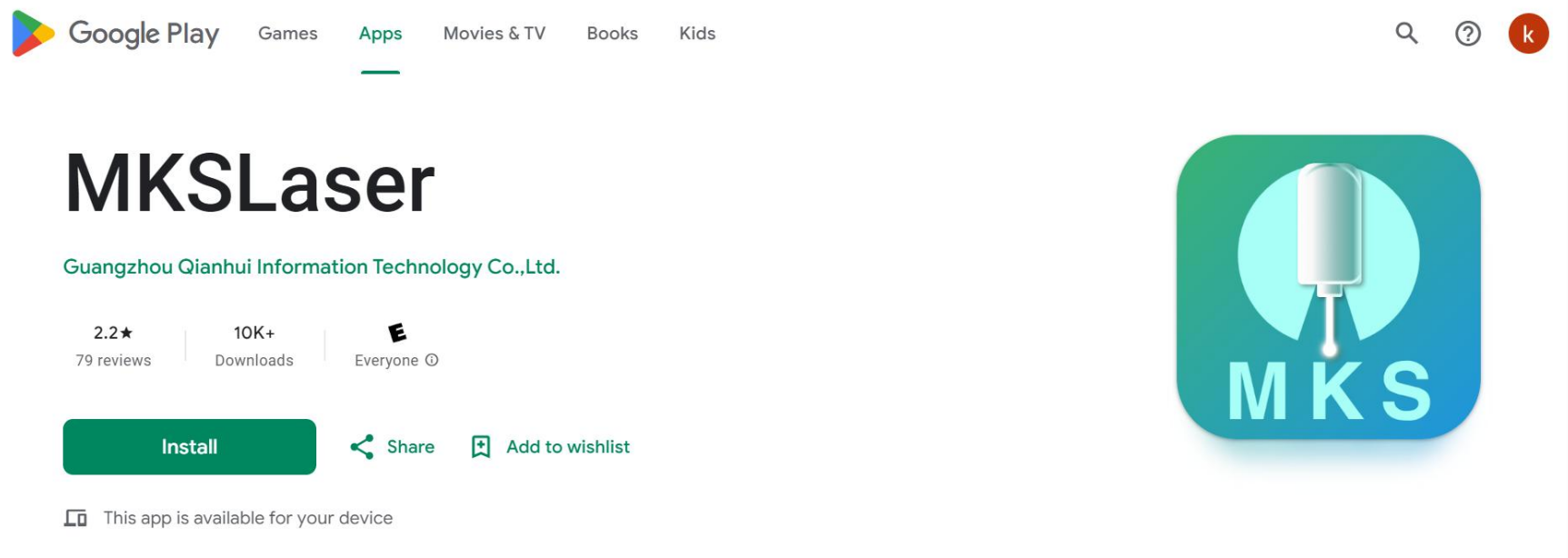
Open the APP and click the connect button in the upper left corner，Enter the IP and click Connect（The network connected to the mobile phone must be the same as the network connected to the motherboard.）
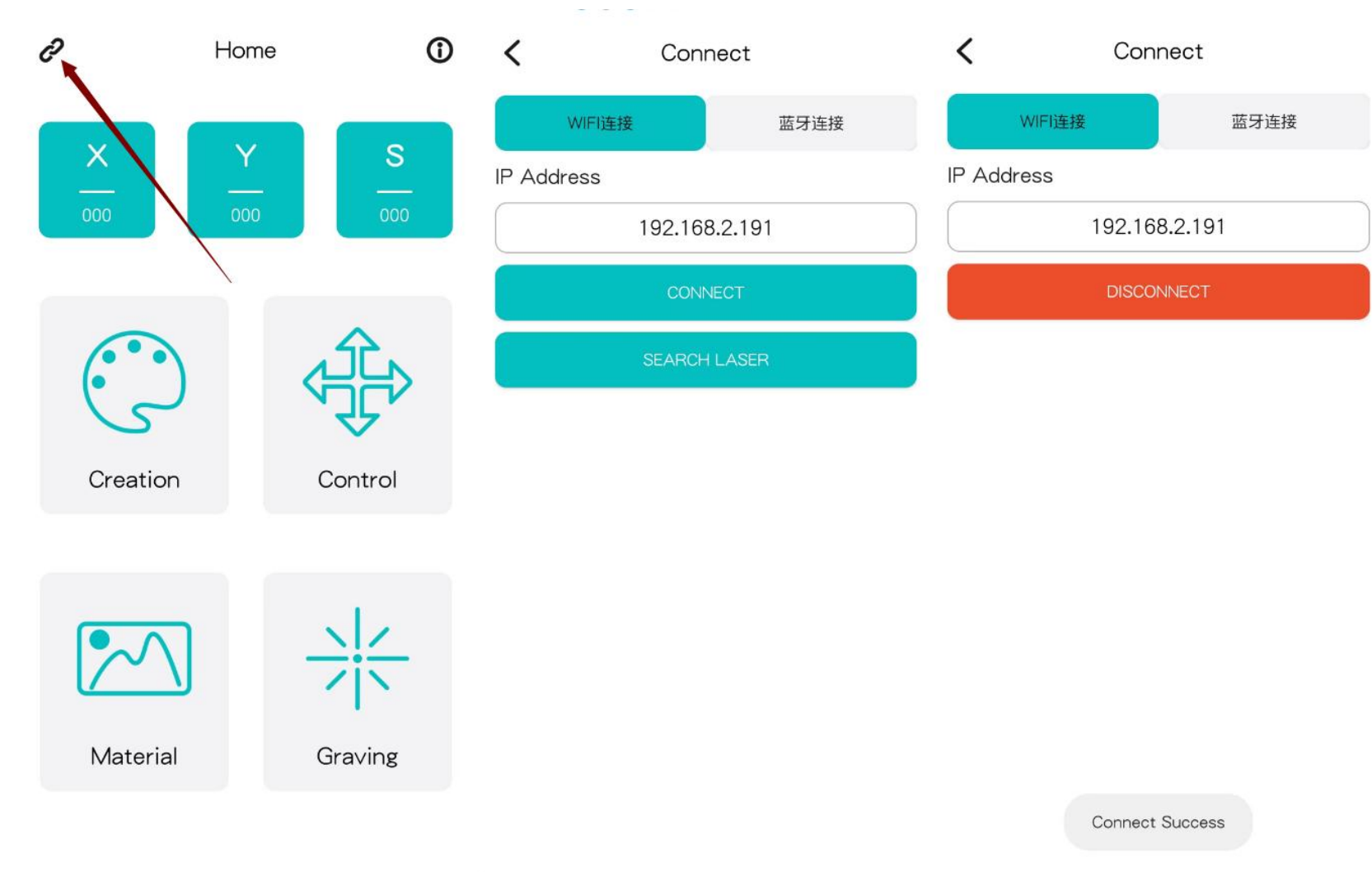
Then you can control it through the APP and engrave files.

Home

下午2:08 0.4K/s

X	Y	S
6.000	12.012	0

Creation

Control

Material

Graving

Control

下午2:09 0.6K/s

X	Y	S
000	000	000

Slow | Medium | Fast

1mm | 10mm | 50mm

Creation

下午2:08 0.1K/s

UNDO REDO CLEAR NEXT

Style Setting

下午2:09 0.2K/s

Gray | Strong | Sketch | Dither

☼ Brightness 100%
0% 200%

◑ Contrast 80%
0% 160%

Parameter Settings

下午2:09 3.0K/s

📄 File Name
DLC32001 .nc

📐 Size
169 🔒 169 mm

⊘ Work Speed
1000 mm/min

⋀ Laser Power
500 0-1000

Graving

下午2:08 0.5K/s

66%

DLC32001.nc

X	6.000	Y	12.012
F	100%	S	100%

MKS touch screen control

MKS LS ESP32 PRO can be used with a touch screen.
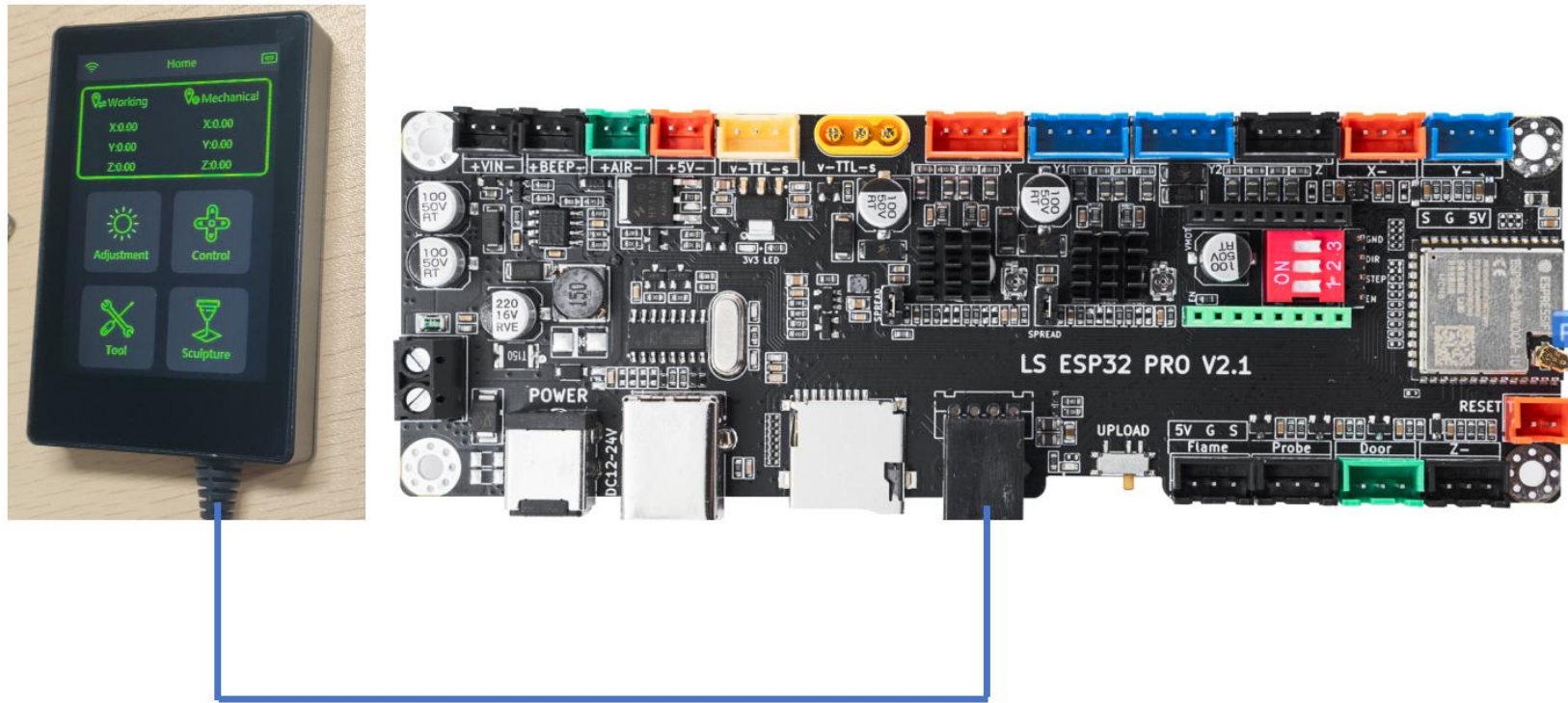If you purchased one without a touch screen, you can skip this chapter.

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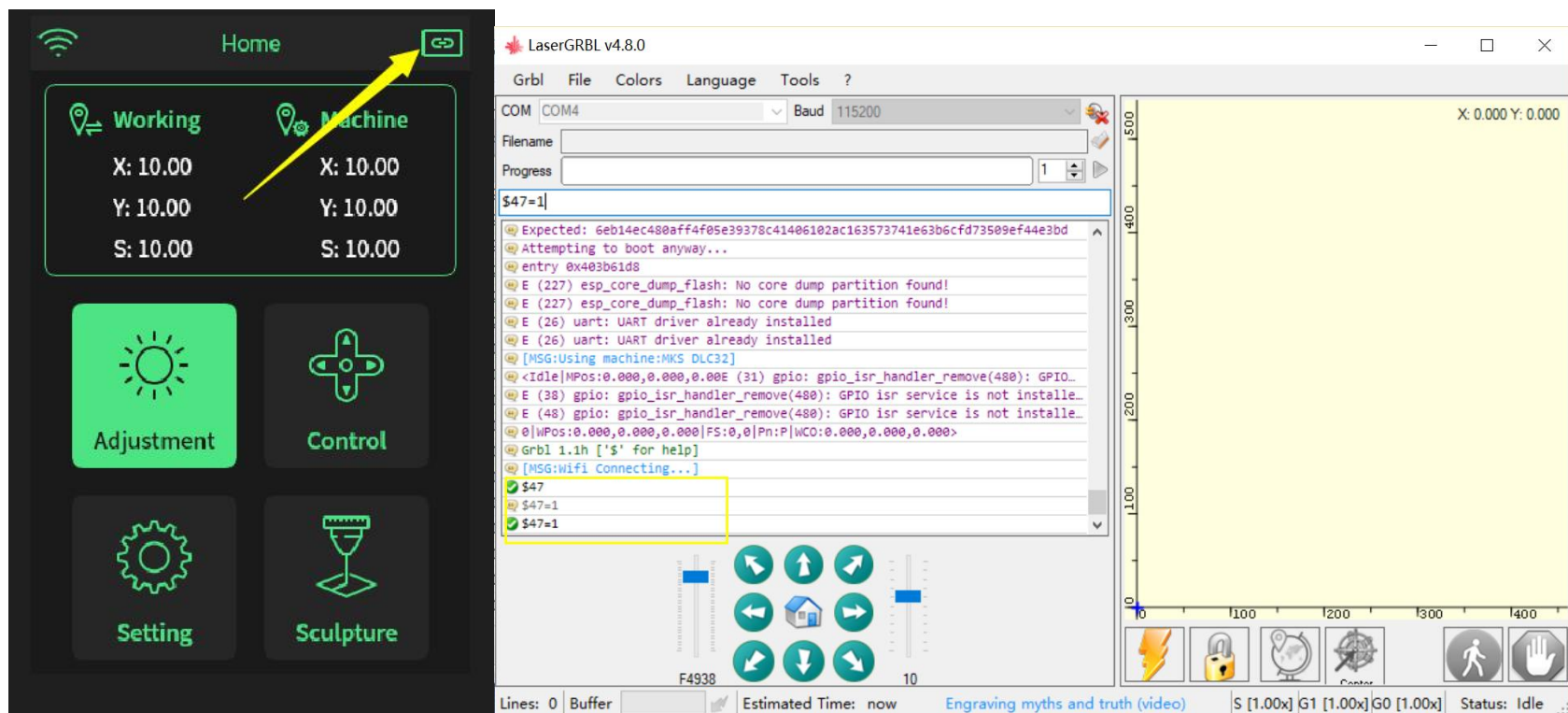The screen can be used

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

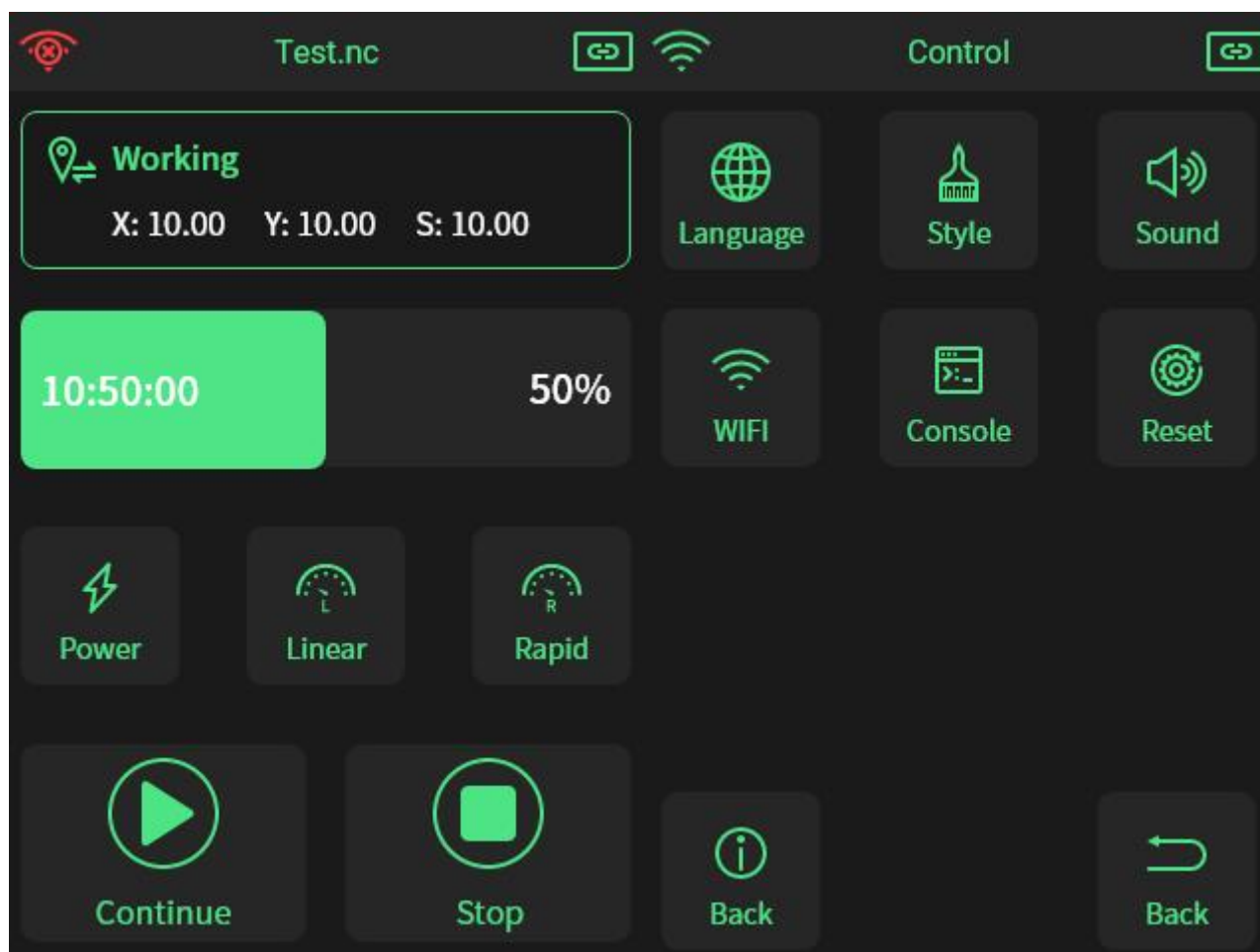*Main page*   *Motion page*
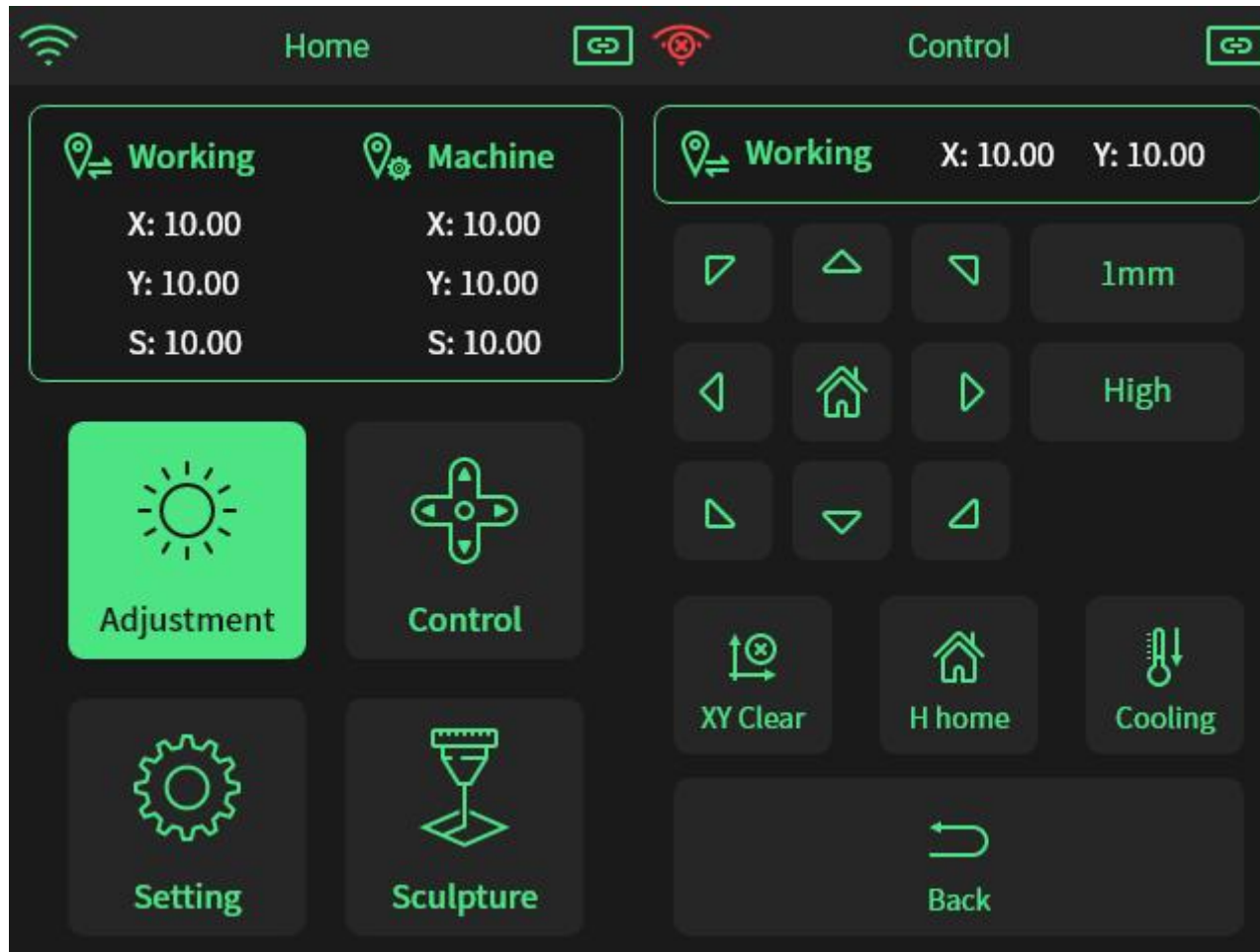
Engraving Work Page   *Setting Page*

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.)
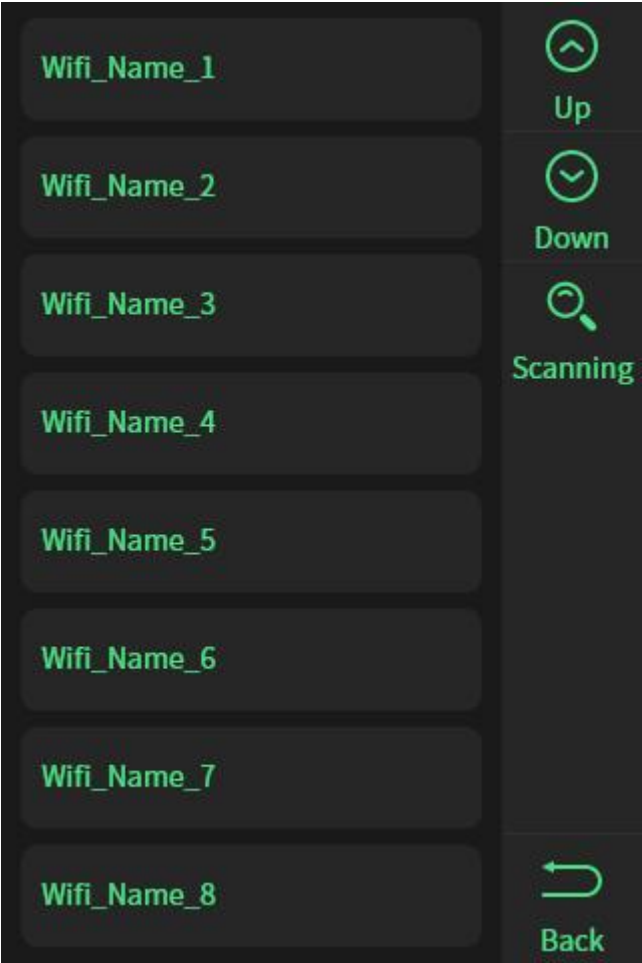
Modify the parameters of the motherboard.

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

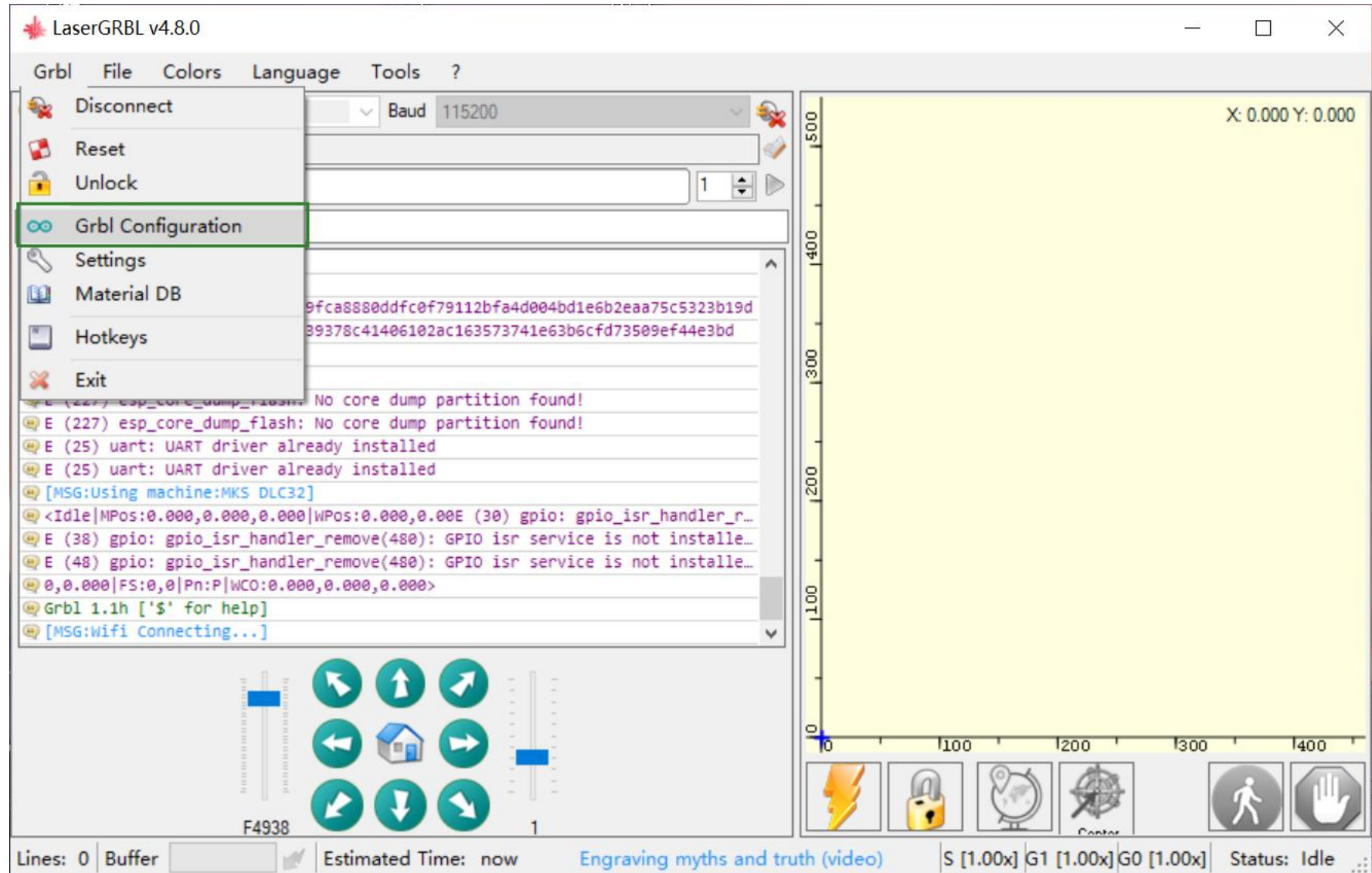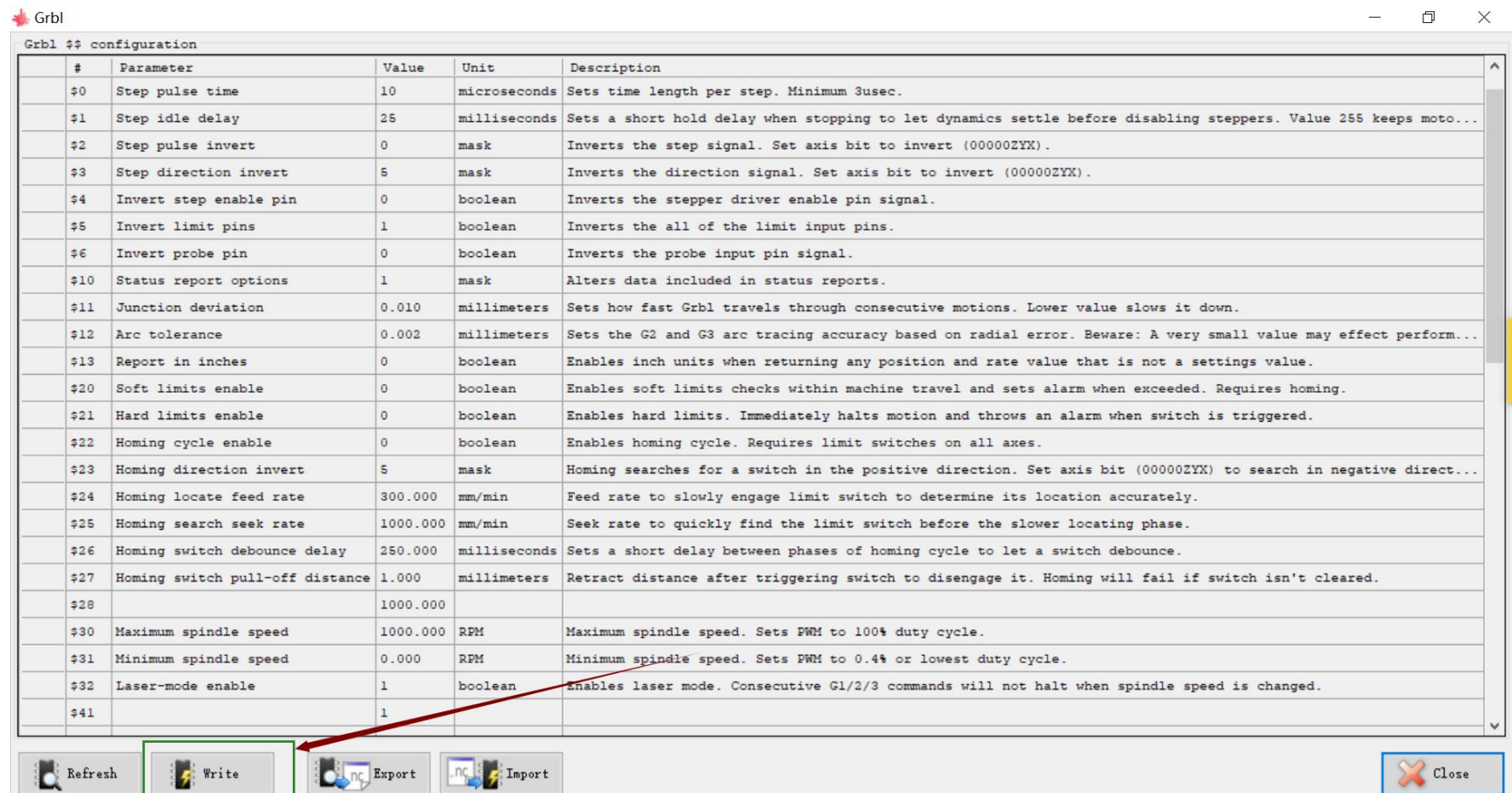*Modify according to the actual situation. After the modification is completed, you need to click "set" in front of the command to save the parameters.*

$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.

$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	Bard 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
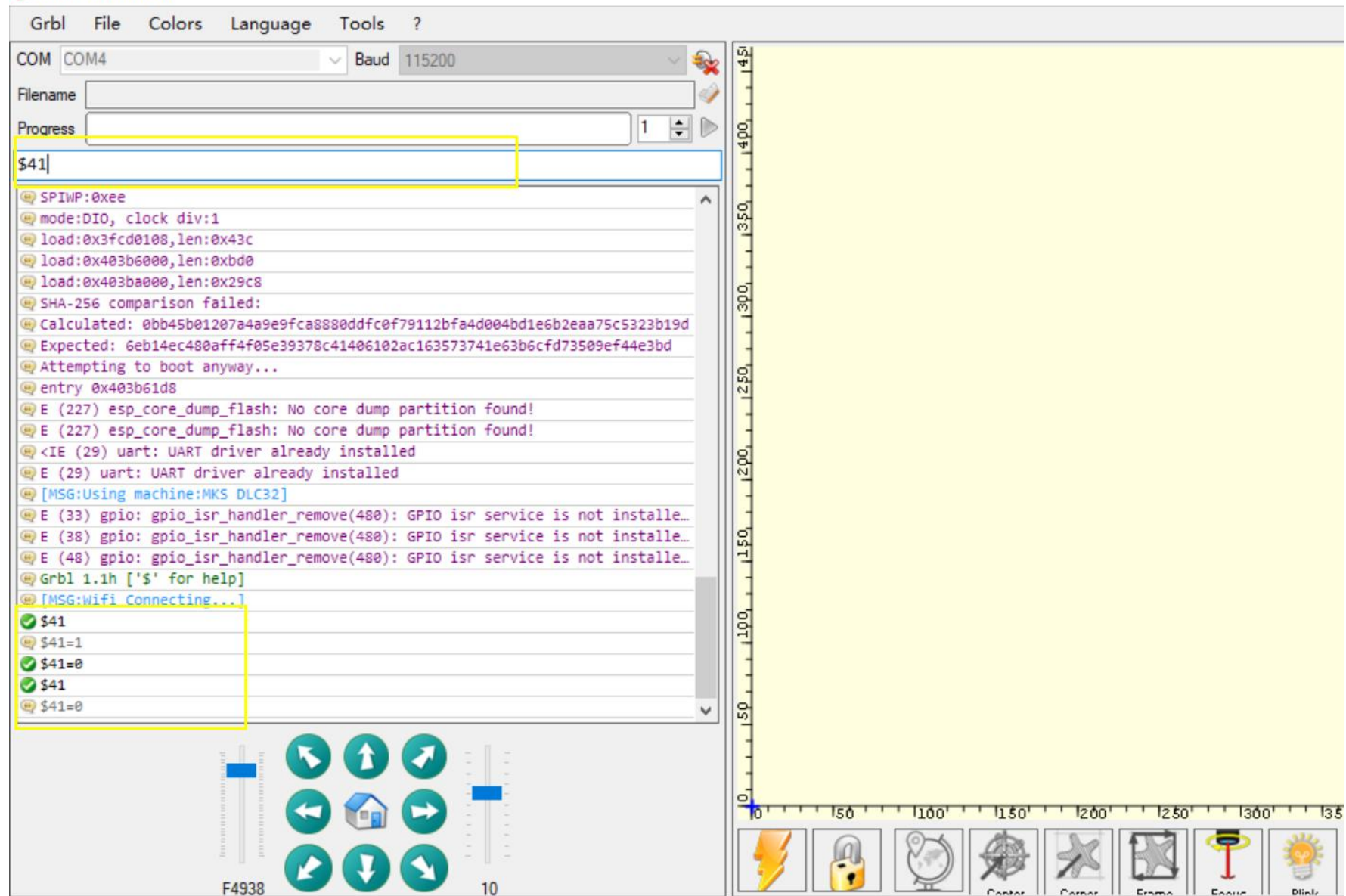
For this additional function (tilt detection, flame detection, door detection), they are disabled by default. If you need to use them, please enable them in advance.
Note:Connecting the module, please note that the signal sequence of the motherboard interface and the signal on the module must be connected 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)