

Laser Engraver Upgrade Pack for XY Plotter Robot Kit V2.0 User Guide

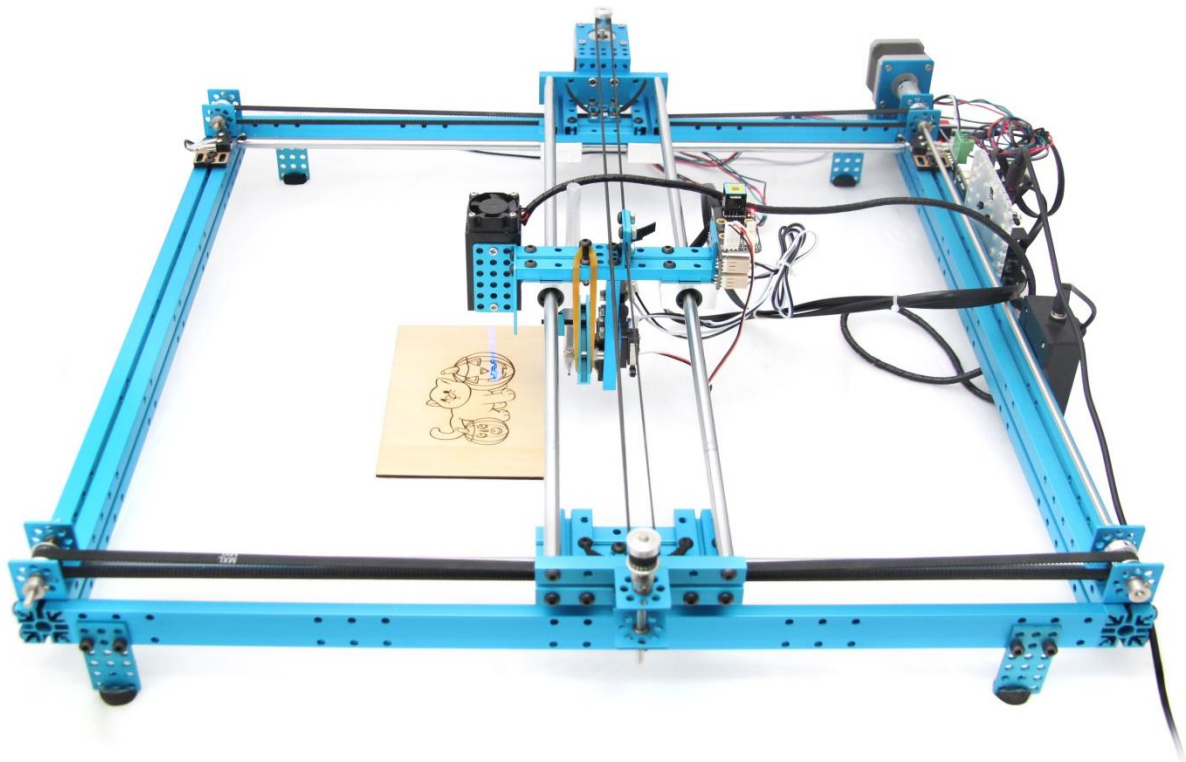


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Laser Use Instructions



WARNING:

Wavelength= 405nm blue-violet diode laser

Don't directly irradiate eye or skin by the laser beam

WARNING:As laser energy has higher density, make sure corresponding protection measures are taken while using.

- ◆ No direct eye-contact with the laser light path;
- ◆ DO NOT irradiate others by the laser;
- ◆ Keep it away from children and other people who are not familiar with laser usage;

a). Specifications

laser engraver pack (500mW)		Remark
Wavelength	405nm	
Power	500mW	
W/ Voltage Conversion Box	Input DC 12V 1.5A	+
W/O Voltage Conversion Box	Input DC 5V±0.2V 200mA	-
Operating Temperature	0°C-50°C	
Storage &Transport Temperature	-40°C-85°C	

b). ProcessableMaterial

Material	Cut	Engraver
Paper	YES	YES
Cardboard	up to 1.5mm	YES
Wood Board	up to 1.5mm	YES
Rubber Sheet	up to 0.5mm	YES
Foam Paper	up to 2.5mm	YES
Dark color cloth (jean cloth, cotton cloth and linen)	up to 0.5mm	YES
Non-transparent ACRYL	Up to 0.5mm (※ 1)	YES
Plastic Sheet	Up to 0.25mm (※ 2)	YES
Urethane Sheet	up to 2mm up	YES
Mirror	NO	NO
Glass	NO	NO
Ceramic	NO	NO
Aluminum	NO	YES (※ 3)
Steel	NO	NO
Stainless	NO	NO

※1. Opaque black acrylic only, ※ 2.Gray plastic plate only, ※ 3.Peeling of anodized only

c). Engraving rendering demonstration



Note:

When the laser is used, take eye protecting measure. When a specific material is cut by the laser, it is possible to produce toxic smoke, so take ventilation measure. The children or the person unfamiliar with the laser are not allowed to independently touch or use the laser device.

Laser Engraver Upgrade Pack instruction

I. What is laser engraver upgrade pack

Laser engraver upgrade pack is a kind of upgrade package based on XY plotter V2.0. The upgrade package provides one version to upgrade, with 405nm wavelength blue-violet 450-500mW laser light components.

This blue-violet laser is a kind of semiconductor diode laser, and features stable performance and long life. Its power supply is DC12V, and it can continue to work for more than 100h under operating conditions of 500mW. Due to differences of laser production process, the life difference is relatively large. However, it can operate at least more than 100h at the full power of 500mW.

The laser module kit is mainly matched with XY plotter V2.0. As long as you install the laser module to the assembled XY plotter V2.0 according to the installation instructions, and then burn the software provided to the motherboard (such as Orion), use the developed laser control software, you can engrave or cut the beautiful graphics.

The maximum engraving area of the laser engraver is 300mmx350mm. Engraving accuracy can reach 0.1mm or more. Operating voltage is 12V. It can engrave wood, colored paper cards, dark opaque acrylic and other materials, even can cut color paper card, paper foam material.



II. XY plotter V2.0 laser engraving upgrade package mechanical structure description

a). XY plotter V2.0 mechanical installation instruction download address.

<http://learn.makeblock.cc/learn/resources/XY-plotter-V2.02-full-package/XY-Plotter-V2.02-Assembly-instructions.pdf>

b). Install four foot pads to the four jacks of XY plotter V2.0 (Note: if previous XY plotter V2.0 already installed foot pads, please skip this step).

c). Please install the laser module as illustrated.

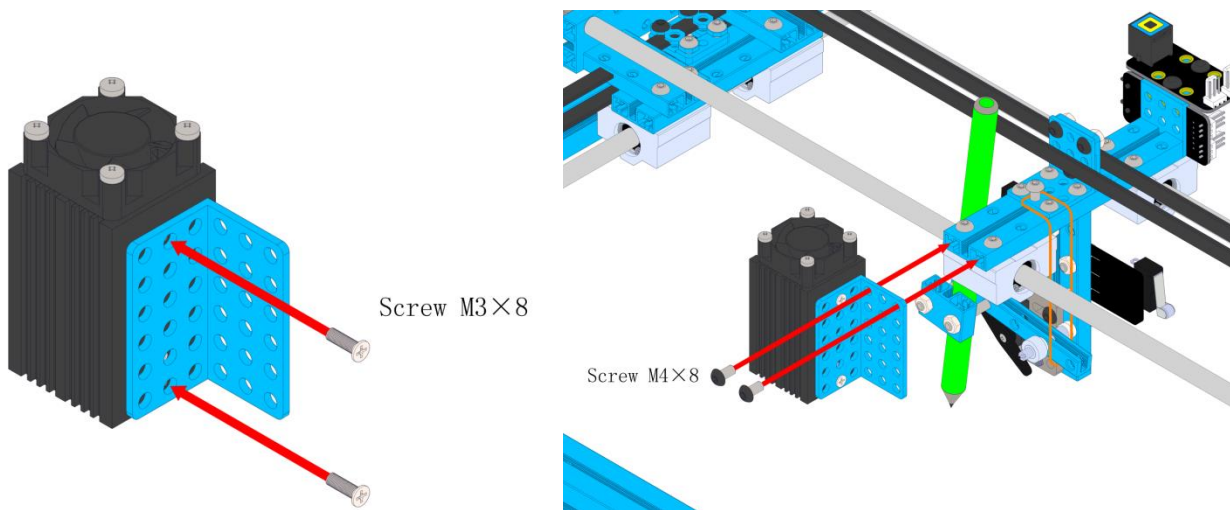


Figure 1

Figure 2

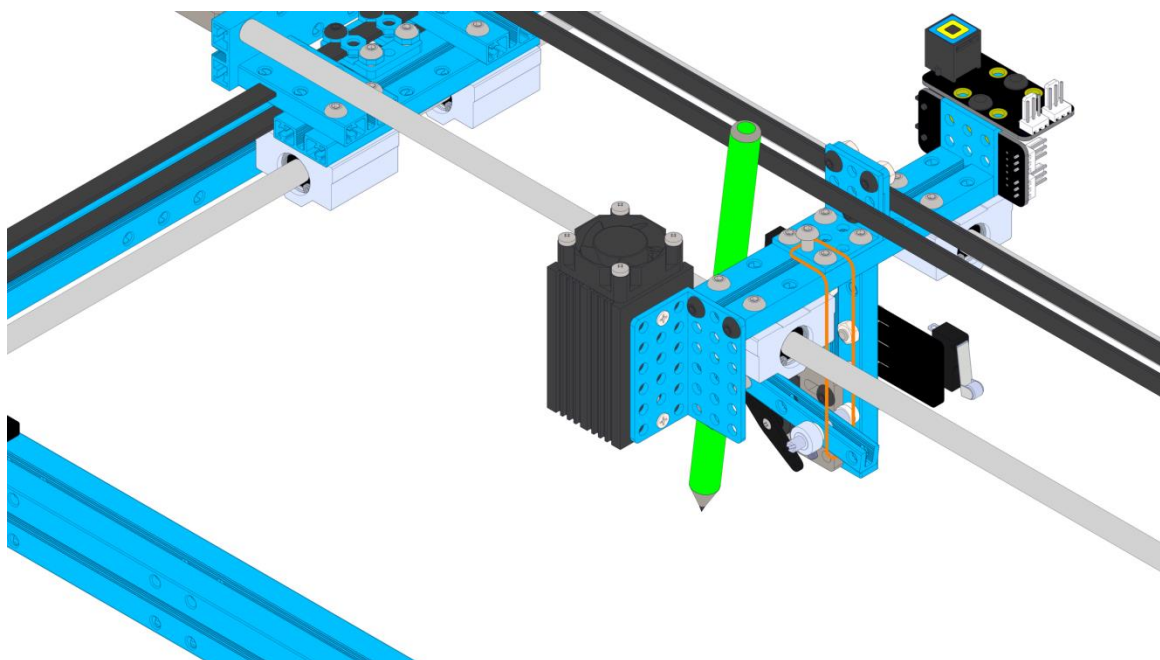


Figure 3

d). Install laser module power converter box

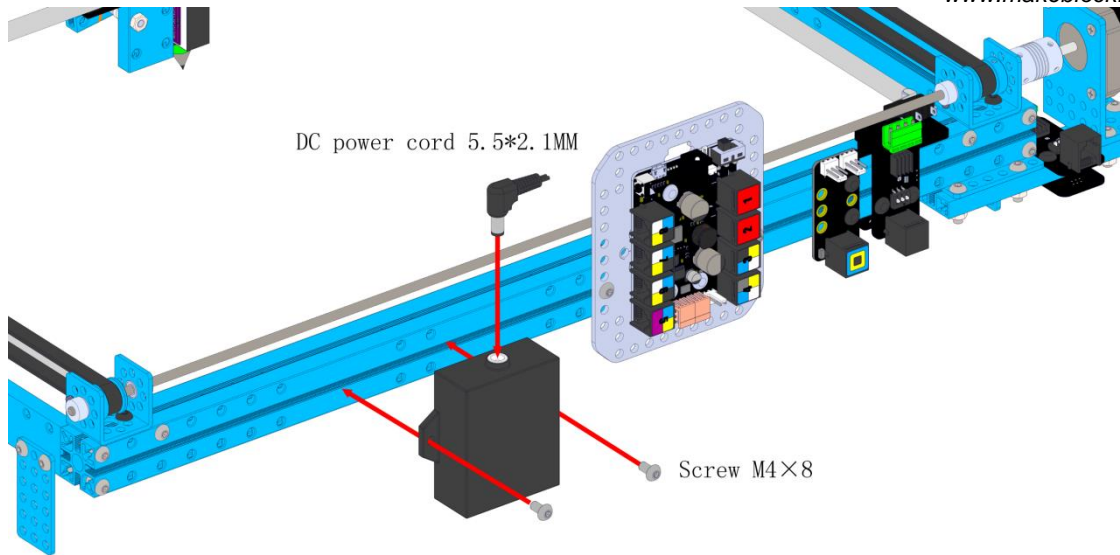


Figure 4

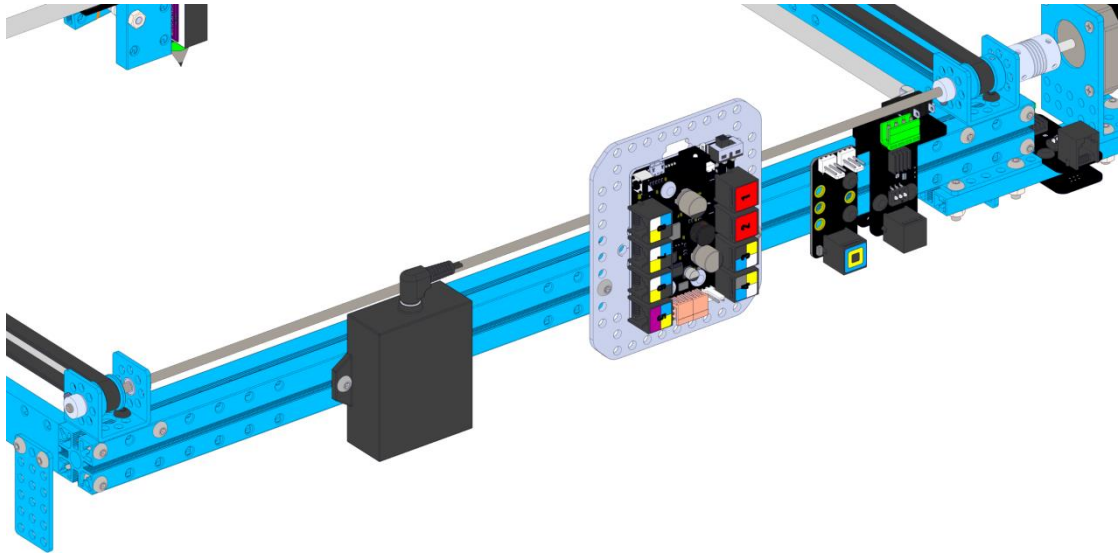


Figure 5

III. Electronic line connection

As shown in Figure, connect the laser to the circuit board M2 interface (Note: it shall be M2).

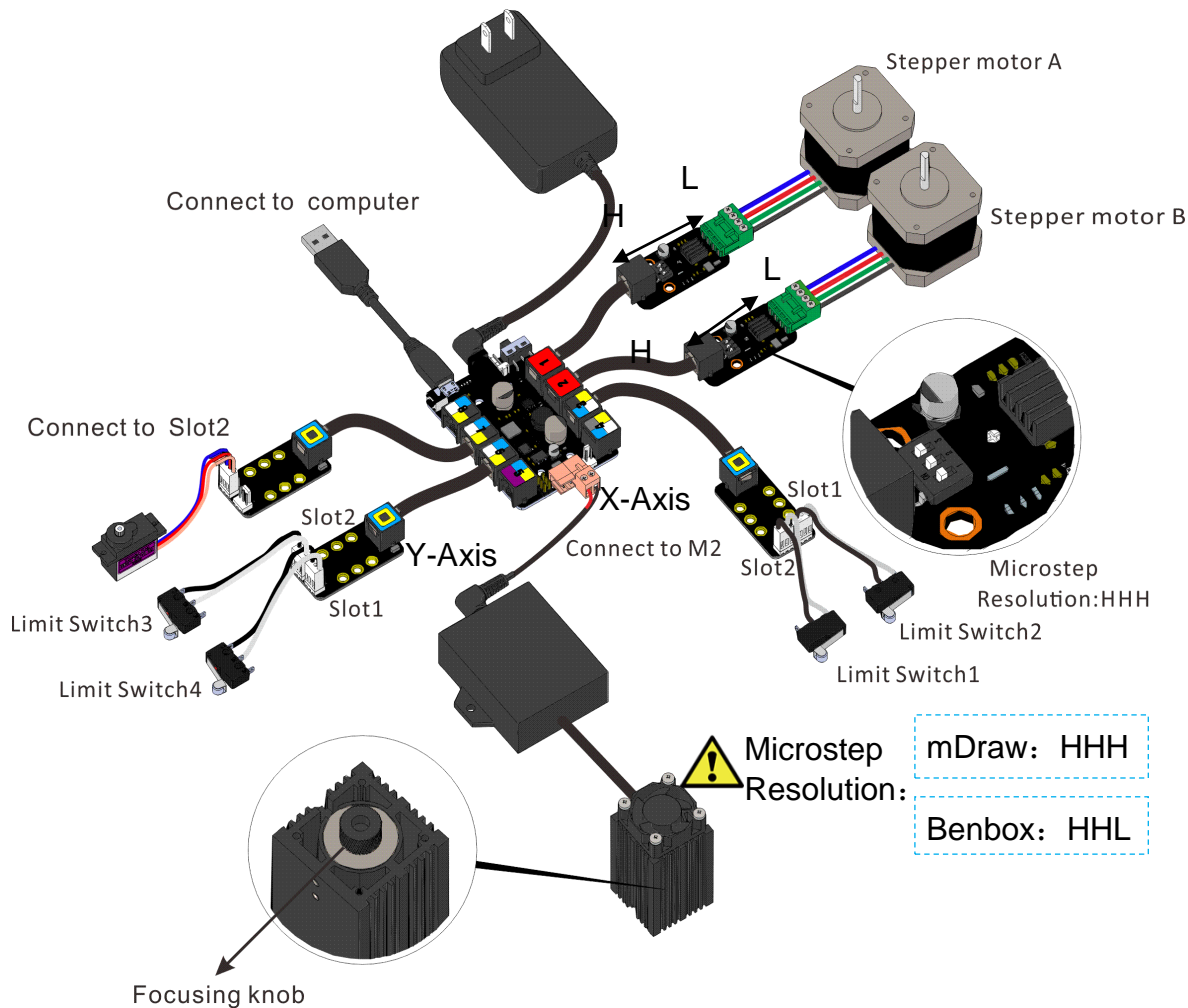
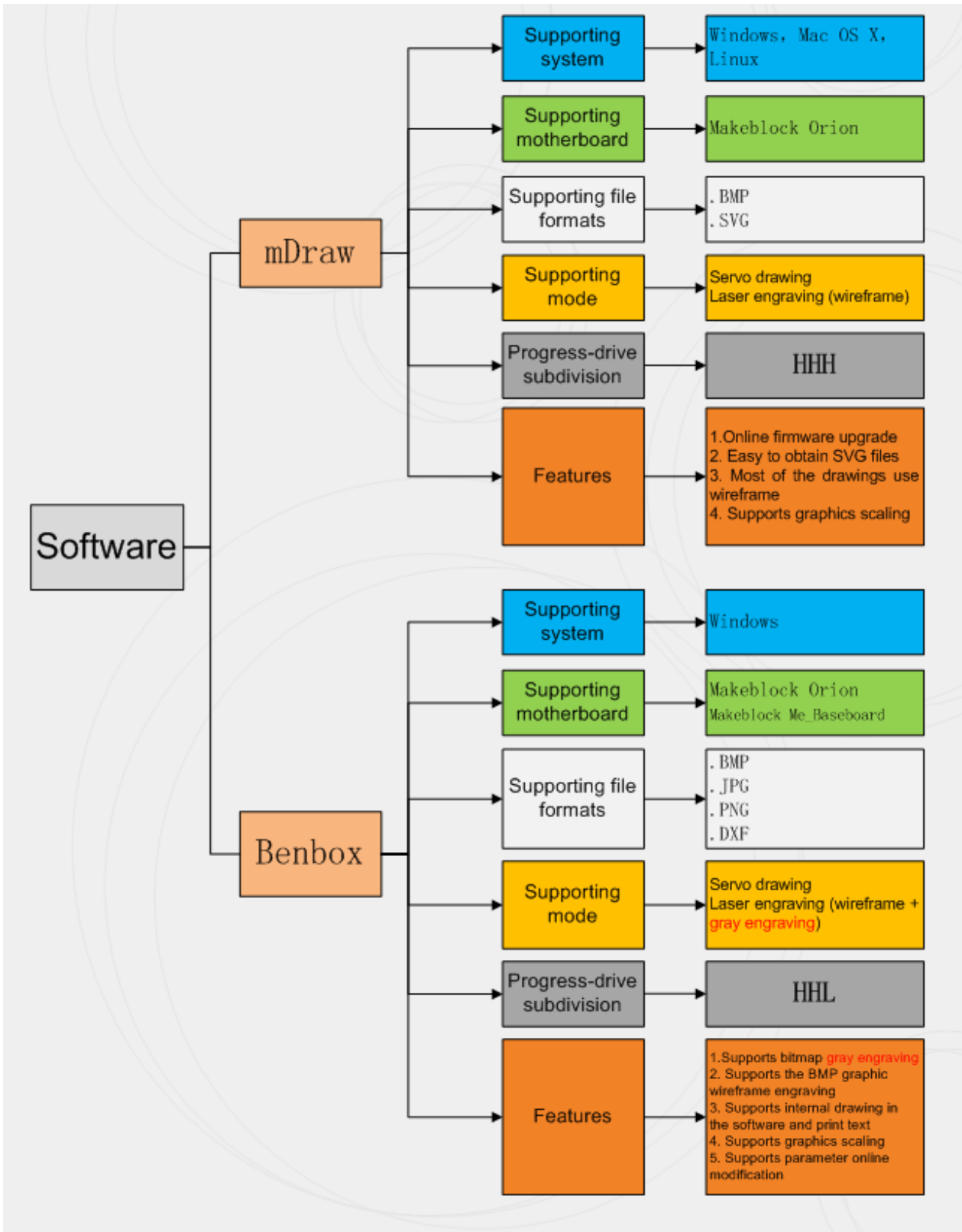


Figure 6

IV. Software

After the V2.0 XY plotter is upgraded to laser engraver, you can use two softwares to control. mDraw and Benbox.



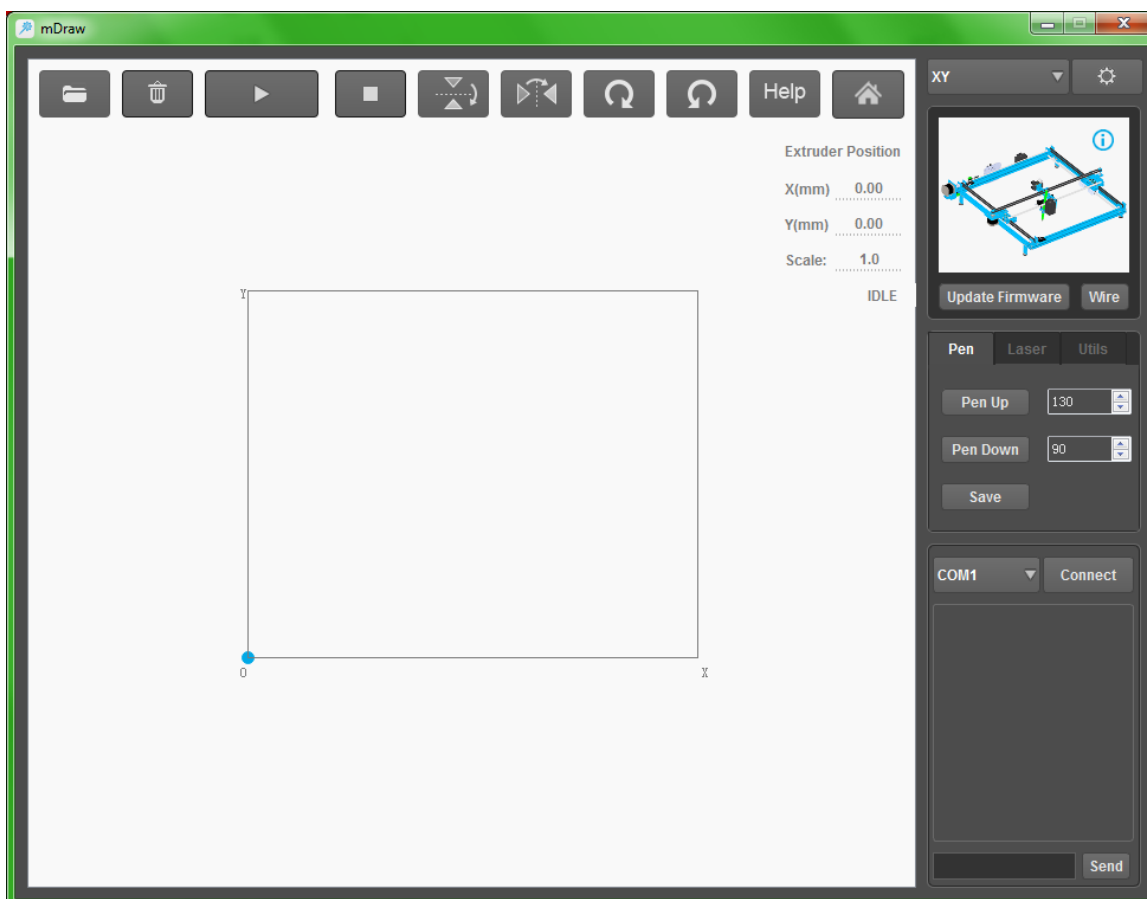
Compared to above figure, the main differences between software mDraw and Benbox are: Benbox software supports laser grayscale engraving, while mDraw has relative poor function, with easy and simple operation. Depending on your engraving requirements, please select the software on your own.

V. Use mDraw Software

a). mDraw feature introduction

mDraw is a kind of open source cross-platform software developed by Makeblock, which supports Windows systems, Mac systems, Linux systems, fully supports mDrawBot suite, and also supports servo mode and laser mode of Makeblock XY plot robot kit V2.0.

Supported formats: SVG, BMP turn SVG



b). Software installation

mDraw software is the green package, which does not need to install, and can run by directly opening it. (The download address:

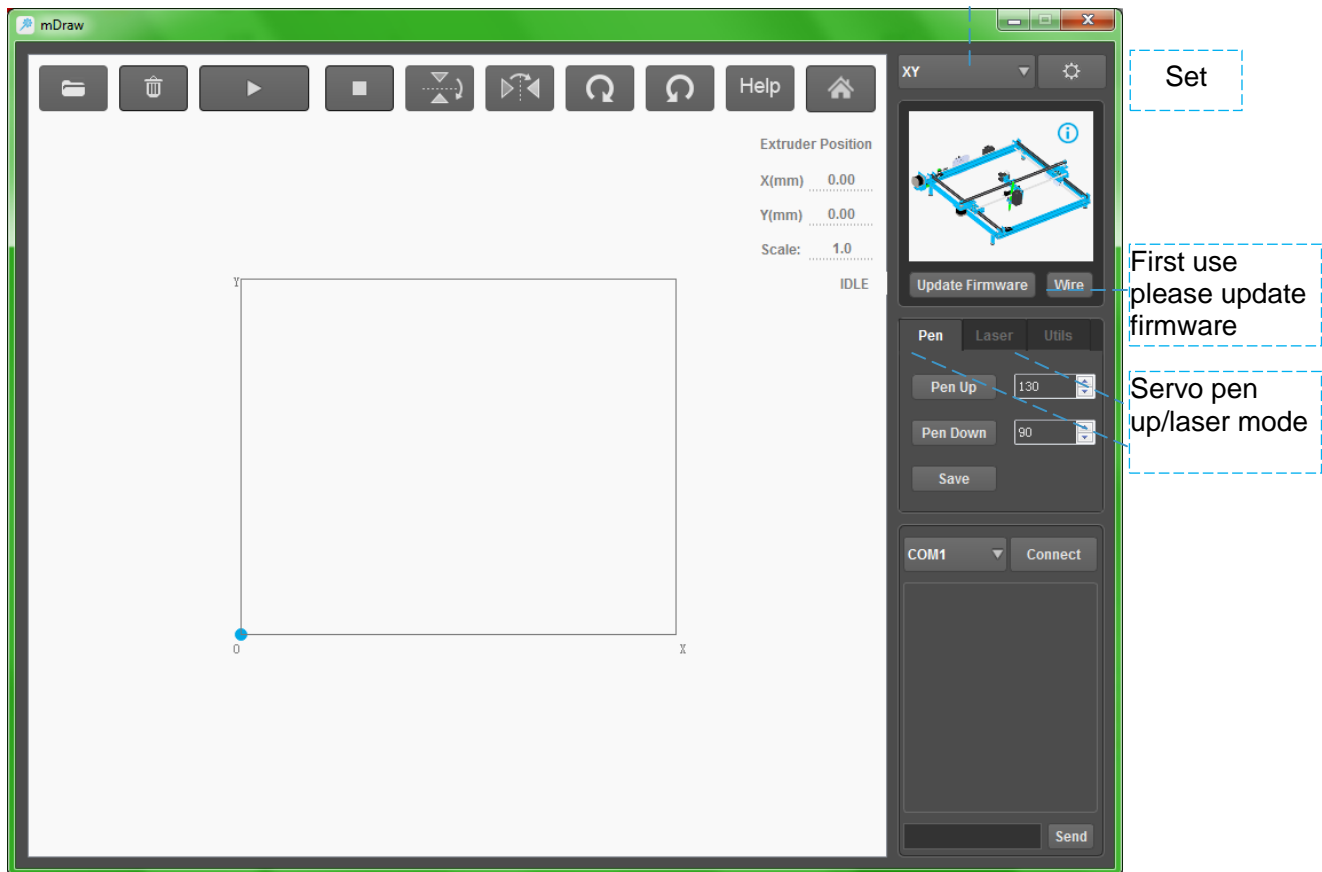
<https://www.dropbox.com/s/dszcqaea3901403/mDraw%20V1.1%2020150709.zip?dl=0>)

icuc53.dll	2014/9/23 1:23	Application extens...	1,054 KB
libusb0.dll	2014/2/22 1:11	Application extens...	43 KB
mCar.hex	2015/7/4 10:49	HEX File	45 KB
mDraw.exe	2015/8/3 16:40	Application	8,633 KB
mDraw.log	2015/7/14 10:27	Text Document	1 KB
mEggBot.hex	2015/8/3 16:39	HEX File	33 KB
mkbitmap.exe	2013/2/19 22:47	Application	59 KB
mScara.hex	2015/7/4 10:50	HEX File	44 KB
mSpider.hex	2015/7/4 10:51	HEX File	36 KB

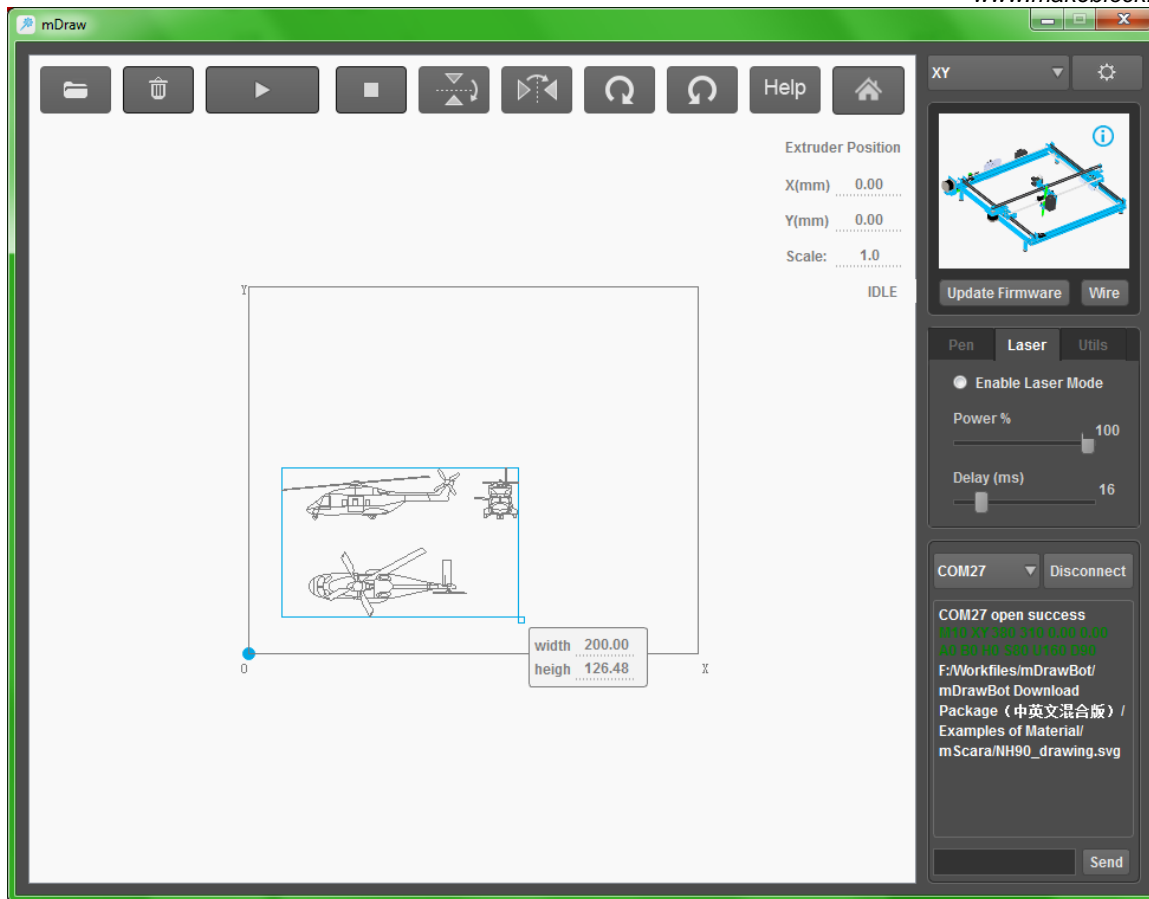
c). Software interface button function

Select the software in the form of XY, select the laser mode. Double-click the main interface, the robot will follow the movement. Drag the imported SVG format, you can change the size and location of the SVG drawing, and also can input the value in the lower right of picture to change the size of drawing.

Reset Switching the form of software

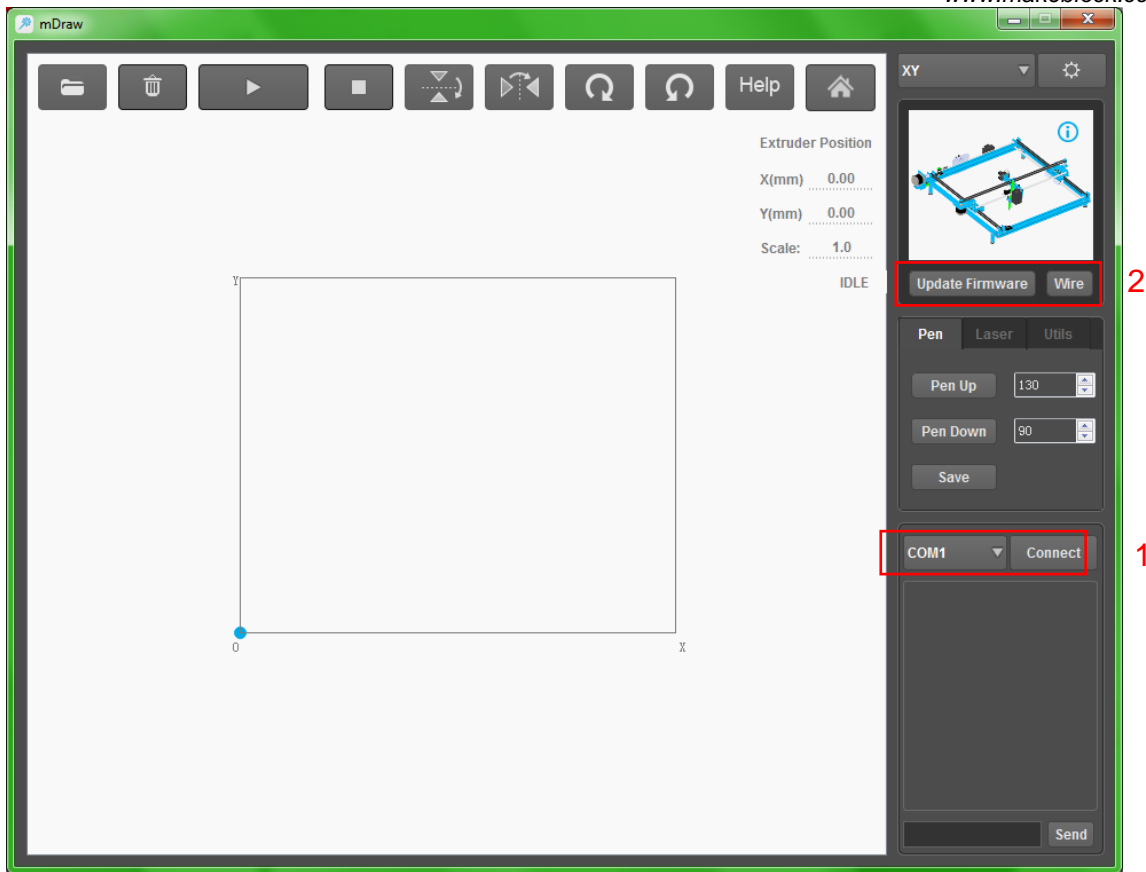



Import BMP files, the software will automatically pop up SVG file dialog box. You can follow the prompts to calibrate the parameters, and then convert to SVG format file. Import wireframe sketch, and the rendering effect shown as follows.

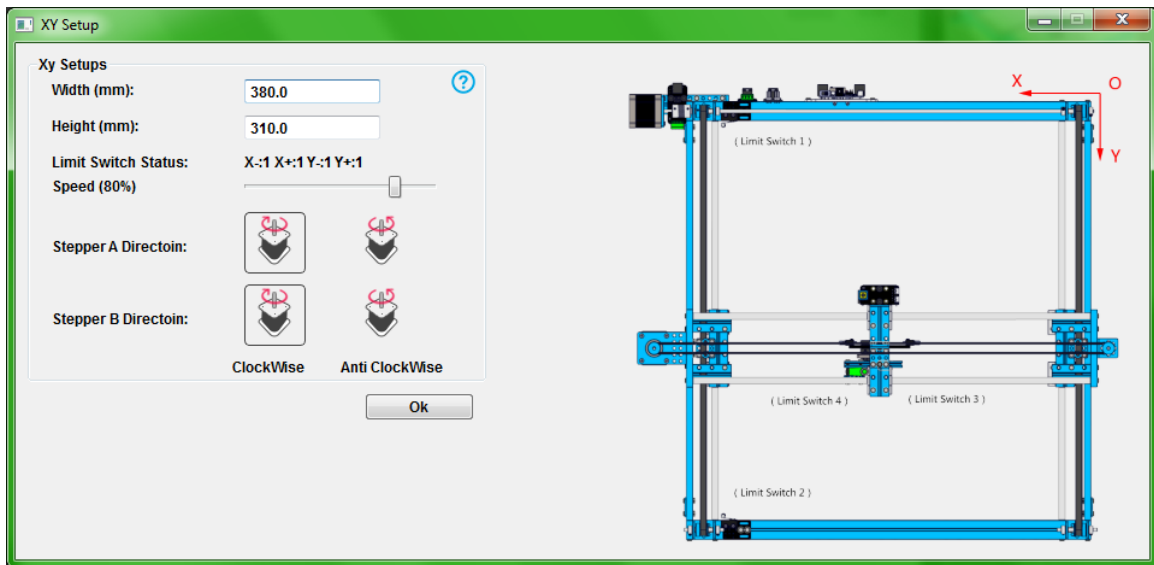


d). Software Settings

- a. Check that the wiring is correct. Use USB to connect computer (Note: If you use Bluetooth, please install the Bluetooth receiver driver on your computer, please use Port 5 for Bluetooth).
- b. Switch child software to XY, select the correct COM port and connect, and then click Burn firmware (Note: when you use for the first time, you need to click Update Firmware to update and ensure the normal operation of XY Plotter V2.0.)

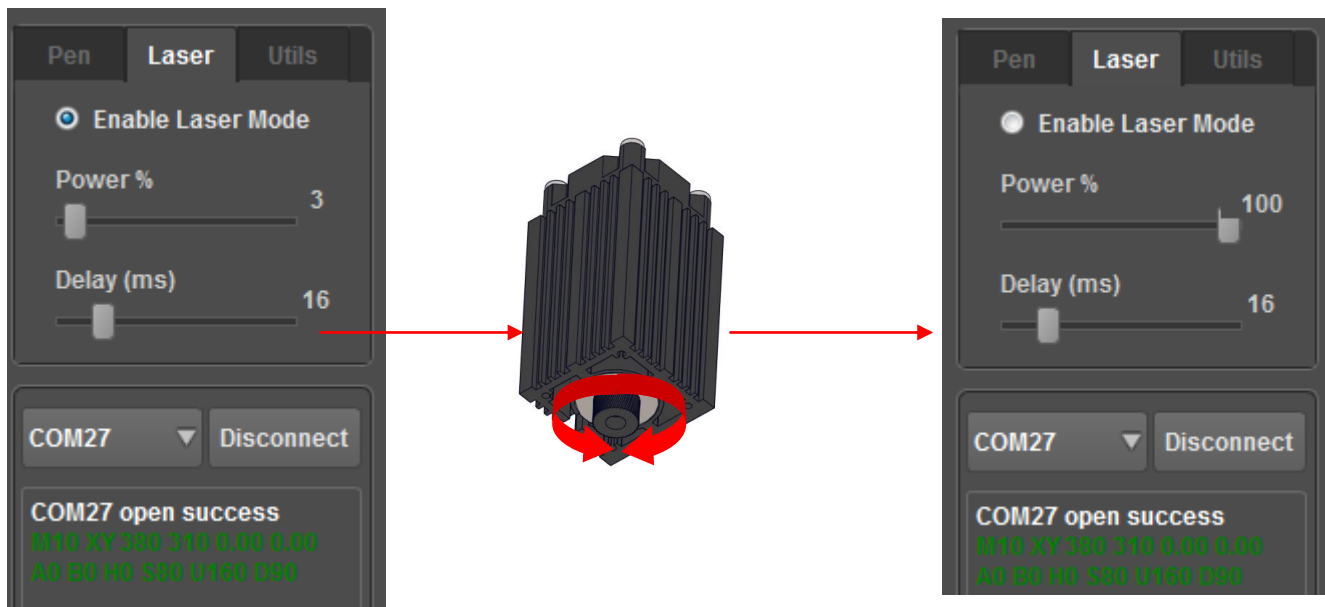


- c. Click  icon to enter the setting interface. Under normal circumstances, the default settings will be OK. If you need to change one of the values, please set as required.

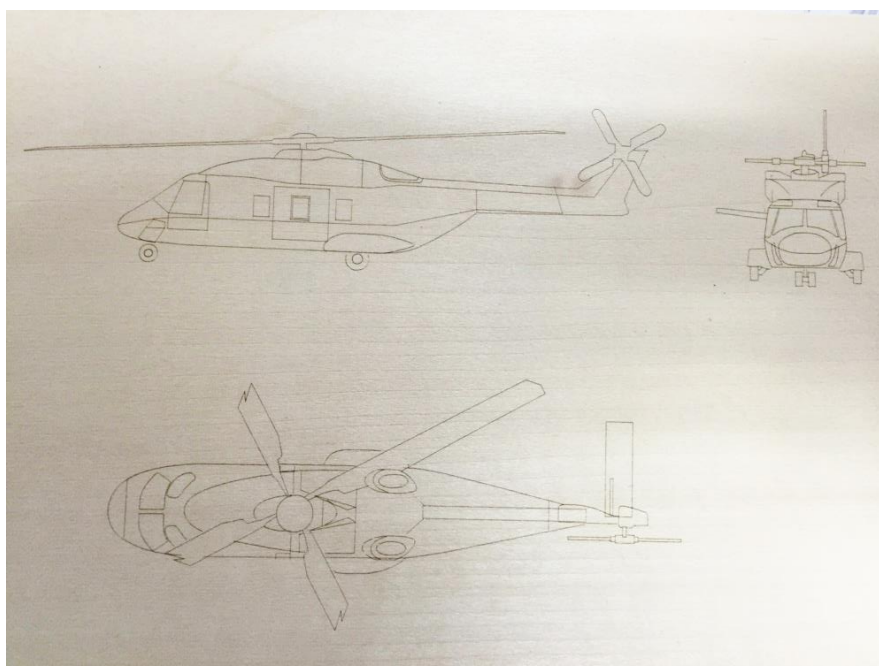


- d. Click Laser button to switch to laser mode, Power represents the output intensity of laser, Delay represents setting of the burn time of laser (unit: ms). For the laser intensity and burning time, please calibrate according to the requirement.

- e. Before engraving, please make focus calibration setting. Please enable laser (click Enable laser Mode), and set the laser intensity to 3-5, wear goggles and observe the laser spot. Calibrate the focus with the knob under the laser module. Key points for calibrating laser focus: first calibrate knob clockwise, observe the changes of spot on the board, and then calibrate the knob counterclockwise and observe the changes of spot on the board. Please repeat several times until the spot on the board becomes the minimum one, then you can turn off the laser (Turn off Enable laser Mode). Set the laser intensity to 90-100%. The specific calibration process is shown as below.



- f. Please put the imported graphics files in the rectangular area, and will show abnormal if it exceeds the scope of the drawing.
- g. Click icon before making the drawing, and reset to zero.
- h. When everything is ready, you can import graphics in SVG format, calibrate the position. Set laser parameters shown in the upper right, then click Start to start engraving. The engraving results are shown as below



VI. Use Benbox Software

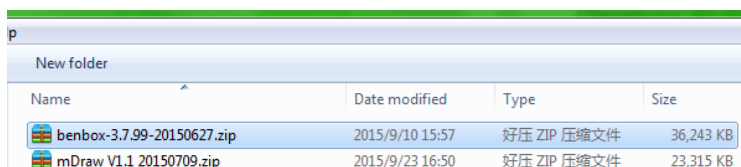
a). Benbox features introduction

The current Benbox software version only supports Windows systems. It also supports servo mode and laser mode. The prominent feature contains supporting grayscale engraving, and you can edit graphics and text within the software.

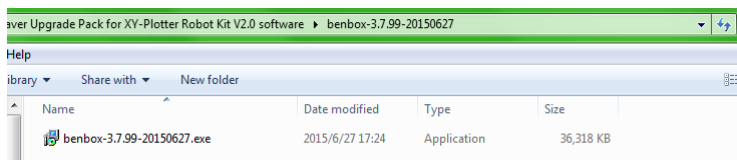
VII. Software downloading.

The address of downloading the software in the file software package

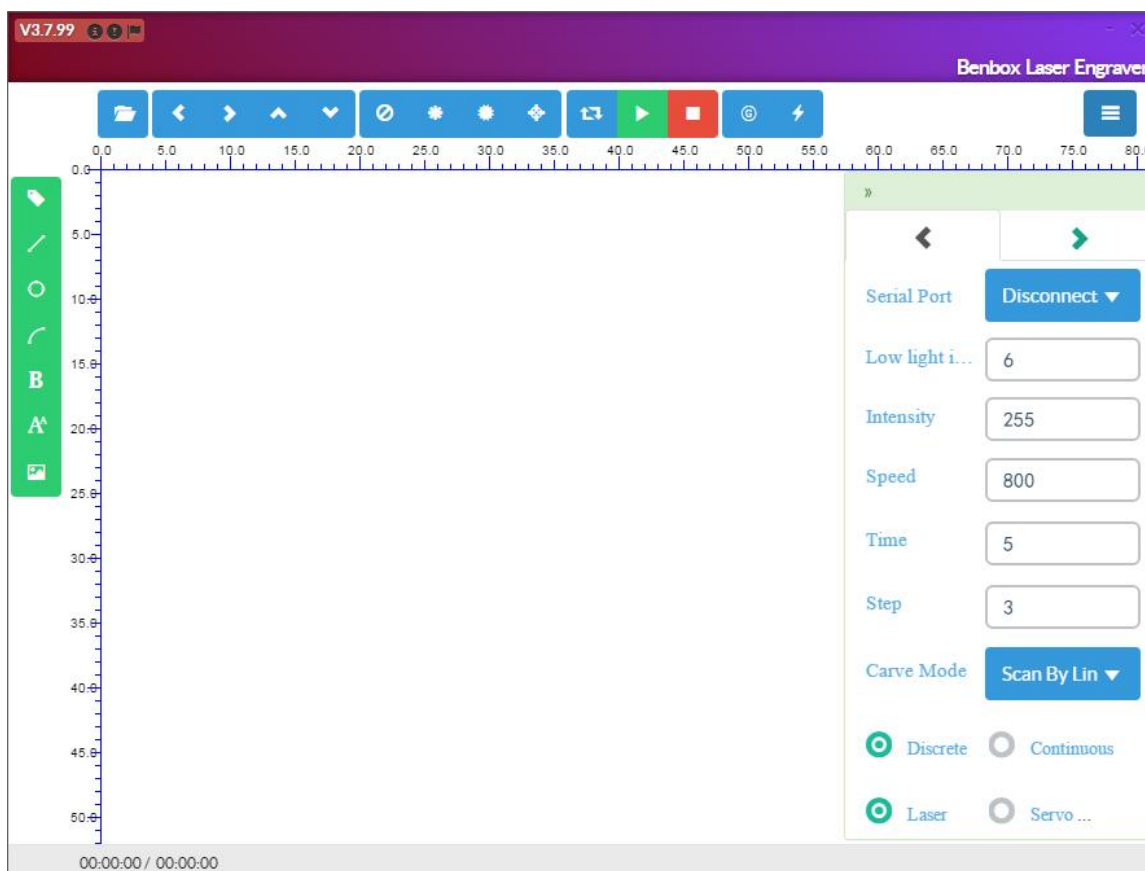
(download address: <https://www.dropbox.com/s/32fi2imemn4tpw0/benbox-3.7.99-20150627.zip?dl=0>)



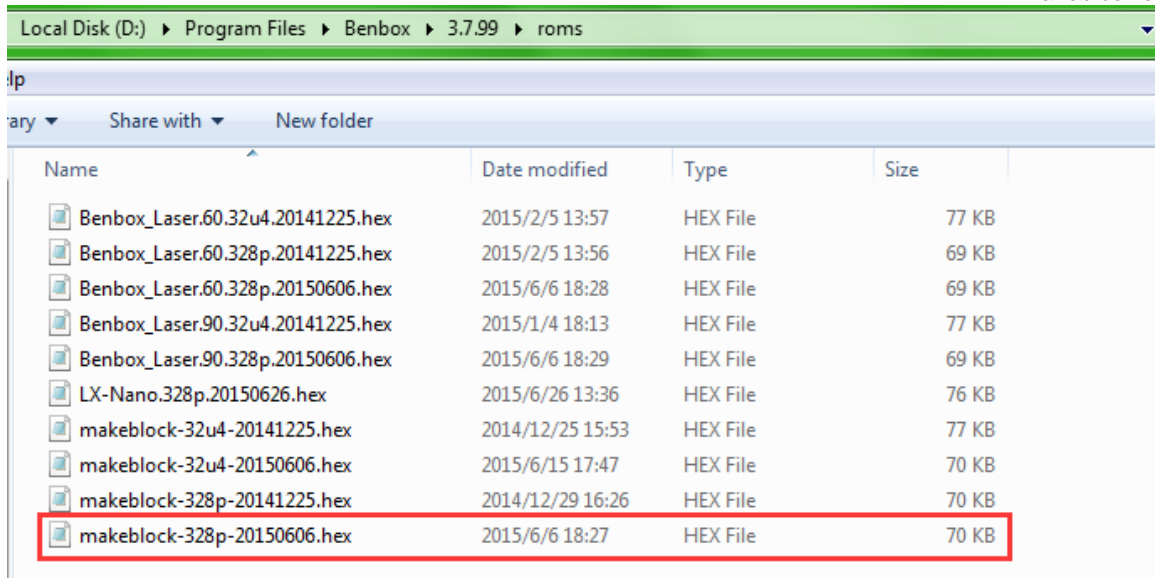
a). Benbox software installation



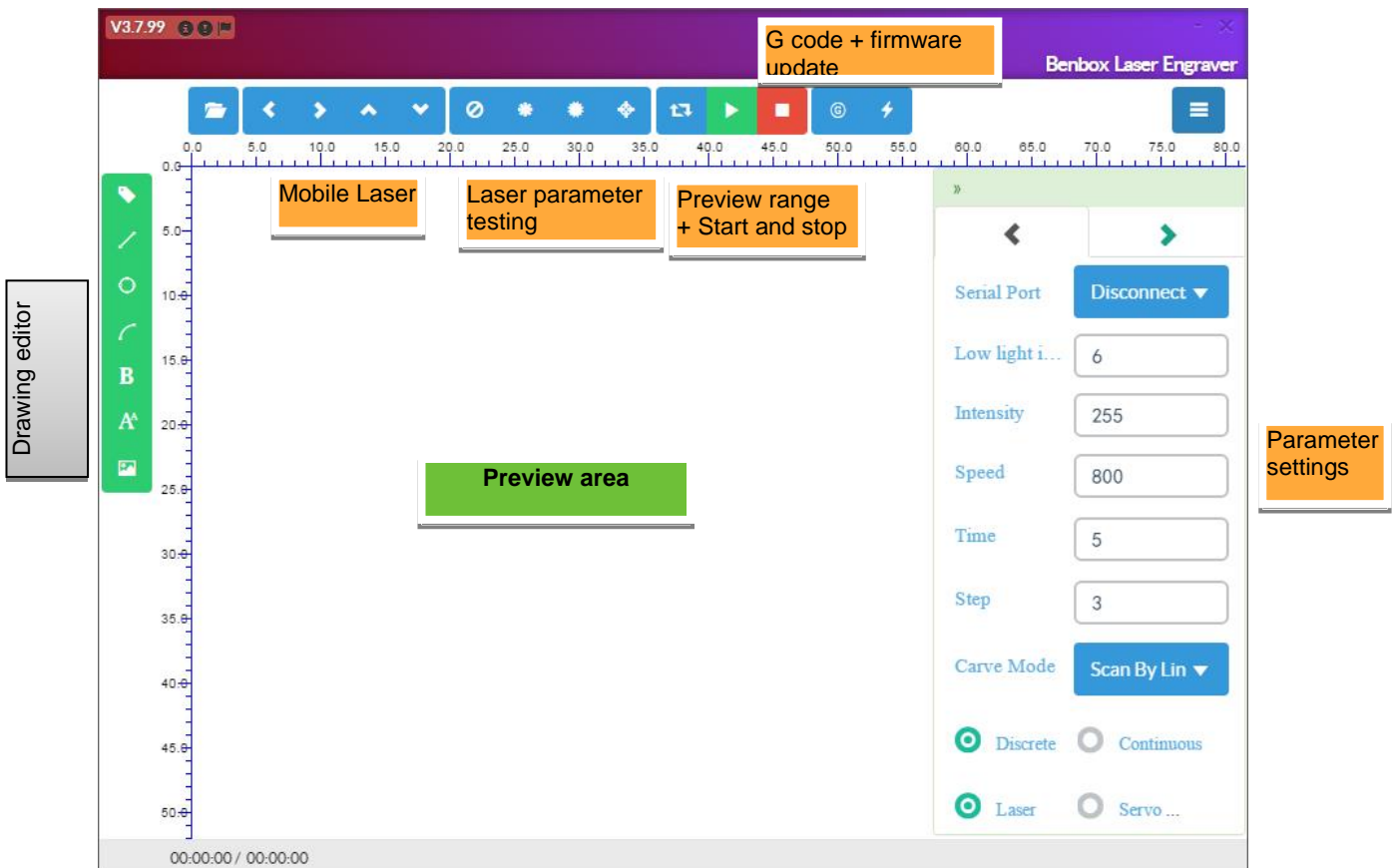
- (1). Follow the prompts to install the software, the interface is shown as below after completing the installation.



- (2). The firmware used by Makeblock Orion motherboard is located under the installation directory address. We will use it later.



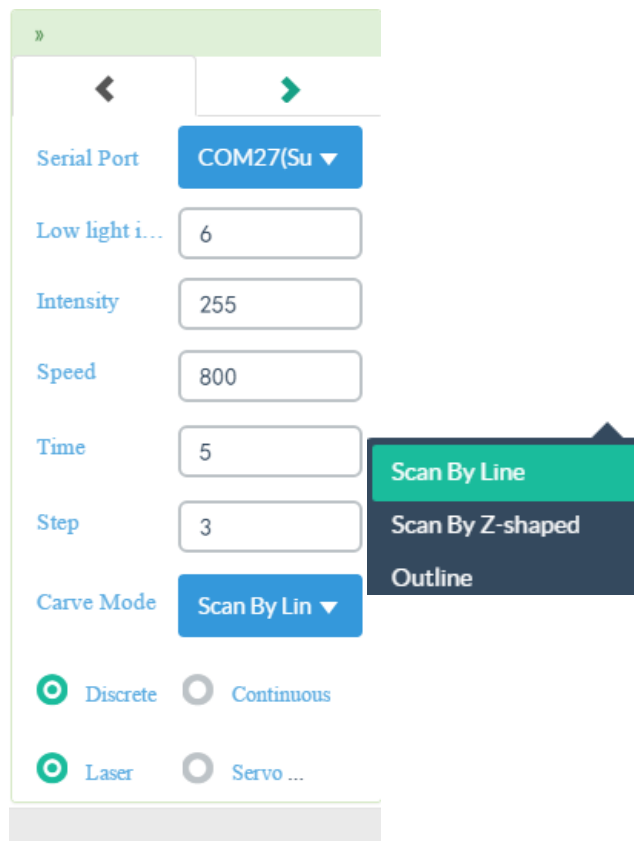
b). Main interface function of software



VIII. Meaning of each parameter in the Benbox software.

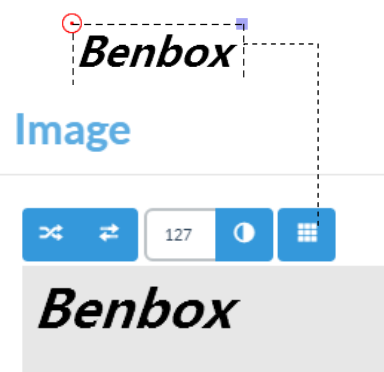
a). Parameter setting area

1. The low light intensity: minimum is 0, maximum is 255. Under normal circumstances, the default size is 16.
2. The laser intensity: minimum is 0, maximum is 255. Under normal circumstances, the default size is 255.
3. The step speed (mm / min): Step speed. The minimum is 0 and the maximum is 3000. You can set the speed of engraving grayscale bitmaps to a little higher, and the speed can be set to 3000, and the burn time is set to 5ms; the vector engraving speed shall be set to a little lower, which can be set to 800, and the burning time can be set to 5ms.
4. The burn time (ms): the engraving time unit of each pixel.
Step number: the number of step in a displacement.
5. Engraving mode: progressive scan, Z character scanning, contour scanning (Note: contour scanning only supports BMP format and DXF format)
6. Non-continuous, continuous, laser and servo mode (The differences among above modes are nuances, and you can understand its functions after you have tried multiple times)



b). Drawing editing area

1. Define origin location
2. Draw straight line
3. Insert round
4. Insert arc
5. Insert bezier curve
6. Insert text
7. Inserting graphic
8. For the inserted graphic elements, you can edit them after selecting, and use Delete key to delete the graphic elements.
9. Click Purple box in the upper right corner of inserted graphics to pop up the editing dialog box of graphics, and perform inverting color and direction operation, calibrate color and weathering.



c). Operating Area



1. Open file: the supporting bitmap file formats are JPG, PNG, GIF, BMP and other formats; the supporting vector formats are DXF, which are vector engraving mode. (Notes: BMP format also can recognize the outline, and the vector sculpture mode can be used.)
2. : Move the laser head up and down and right and left, but the moving distance shall set the number of stepping
3. Close Laser
4. Open weak laser, which is used to calibrate the laser focus
5. Open glare
6. Laser light intensity, and test the lighting time setting
7. Walking frame, which is used to preview and test the size and position of engraving image
8. Start/Pause engraving
9. Stop engraving
10. G-code control, and ordinary users will not use it
11. Upgrading firmware

d). Preview area

1. You can view engraved graphical and progress of engraved graphical in preview area in real-time
2. **Zoom up and down the graphics with scroll wheel. Click middle mouse button to restore the default size and position of graphics.**
3. **You can zoom in and out the graphic by dragging the graphic.**
4. Left-click anywhere in the graphic and locate the engraving origin. **The default processing origin is located at the top left corner**
5. When the machining origin is the motherboard power button, the stopping position of the laser is the machining origin. If you do not change the default processing origin, the origin of the machine is processing origin.

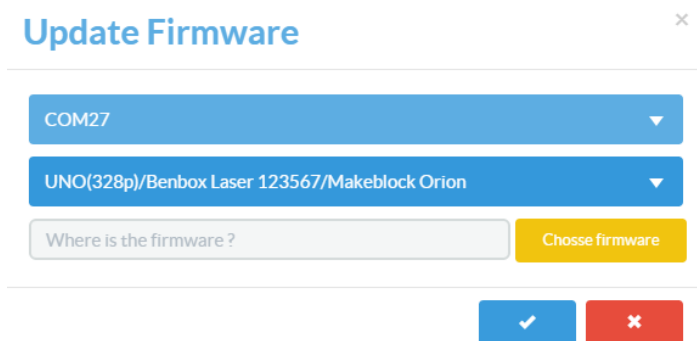
IX. Calibrate the focus of the laser module

a). Check connections

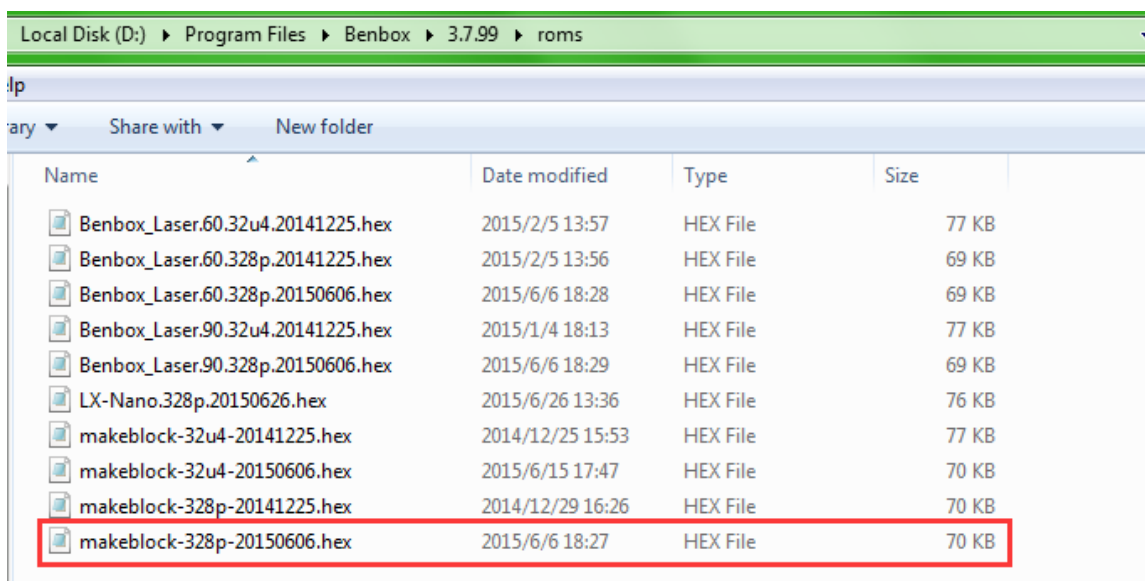
1. **Refer to the electronic circuit connection section.** Note: Two stepper drives are subdivided into: **HHL**

a). Upgrade the firmware (Require to burn when using for the first time)

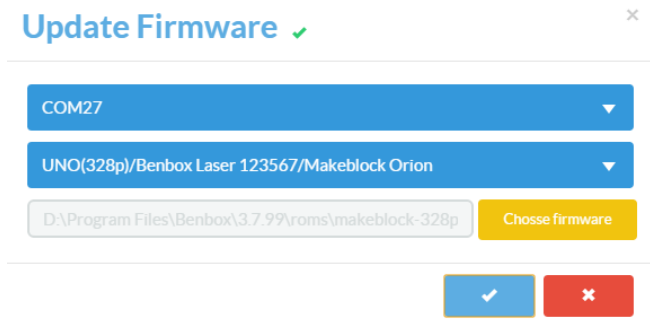
1. Click icon to display the following interface




2. Select the correct serial port, here is COM27.
3. Select board model. Makeblock Orion motherboard chip is UNO (328p) [If you are using a MakeblockMe_Baseboard motherboard, the chip model is Leonardo (32u4)].
4. Select the firmware, enter the installation address to search [my installation address is the D drive, so the location of firmware address is D drive. D:\Program Files\Benbox\3.7.99\roms].

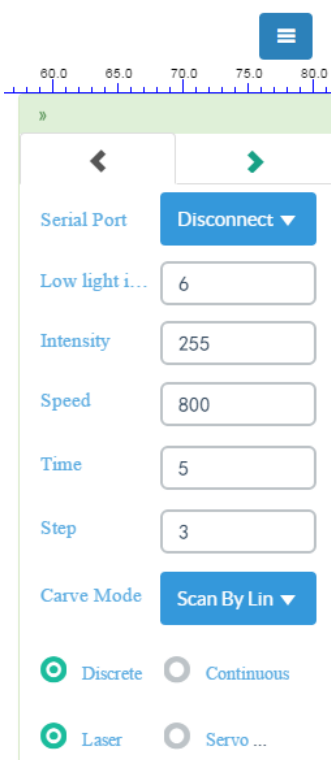


5. Click to begin updating the firmware. If update success symbol appears, it indicates that the update is successful. (If it fails, check the serial port)

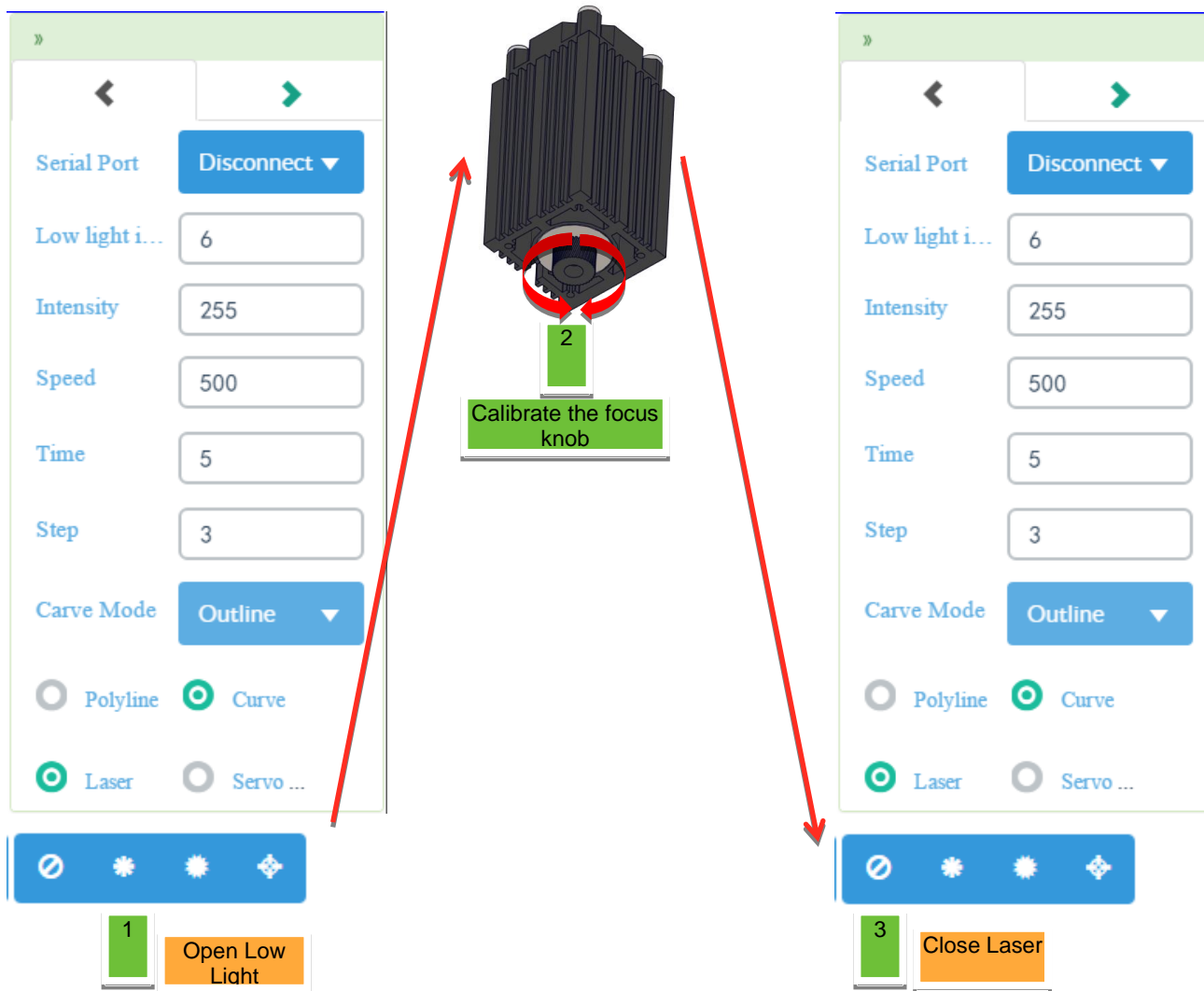


b). Calibrate laser focus

1. Move the laser head to the right position, open the motherboard power.
2. Click the button  to enter the parameter setting area. Make the setting according to the following parameters. The low light shall be calibrated relatively small when adjusting Focus, here it is eight.



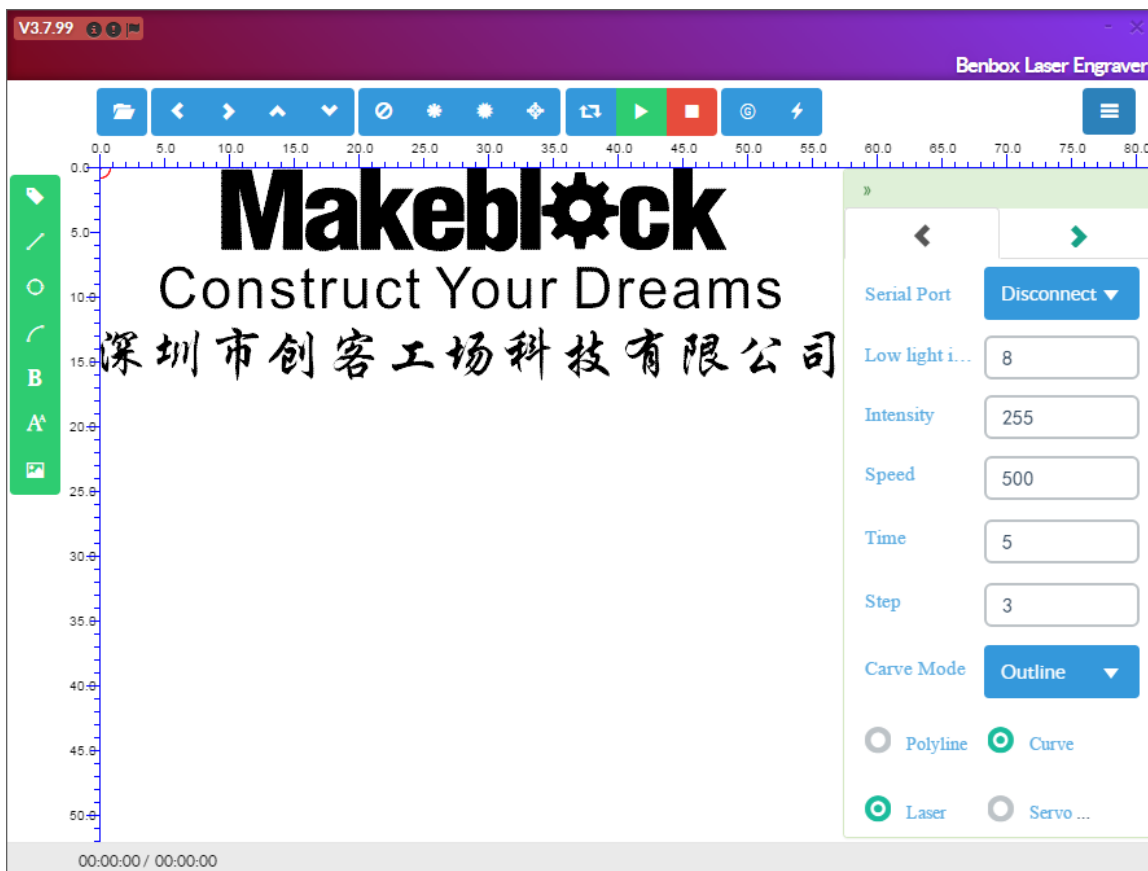
- Please calibrate according to the following procedure, and calibrate the focus with the knob under the laser module. Key points of calibrating laser focus: place a piece of wood or dark paper just below the laser head. Then calibrate the knob clockwise, observe the changes of spot on the board, and then calibrate the knob counterclockwise and observe the changes of spot on the board. Please repeat several times until the spot on the board becomes the minimum one. (All engravings should calibrate their focuses, otherwise they may not be engraved)



- After performing above steps, the focus calibration is complete. The later section will describe how to engrave formally, which requires you to use cardboard or wood with relative thicknesses and re-calibrate the focus.

X. Bitmap engraving Example 1 - Makeblock company logo vector engraving

1. Open Directory ... and find the Logo.BMP file in the \ Laser upgrade pack download \ Examples of material, and set the following parameter.

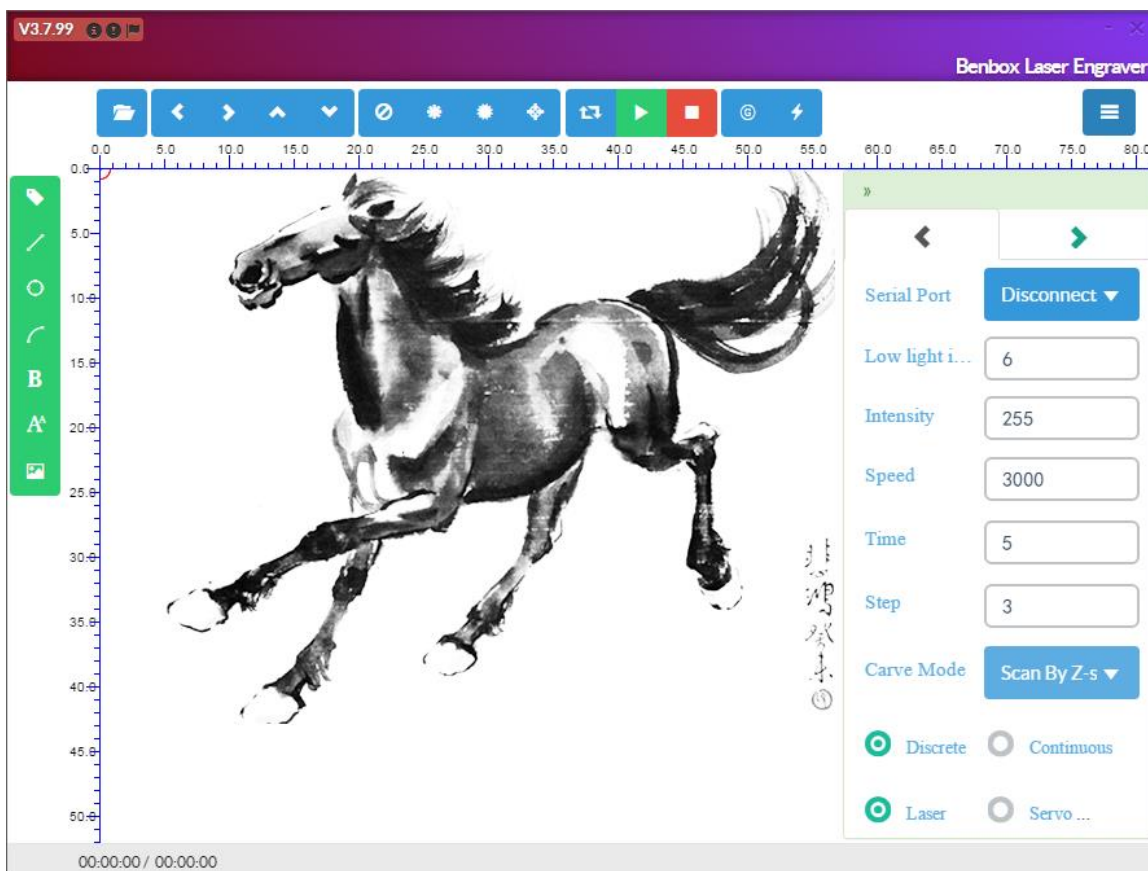


2. Check the power, focal length, serial port settings, click function, observe engraving range and calibrate the position.
3. Click to start engraving.
4. The engraving renderings are shown as below.



XI. Bitmap engraving Example 2 - scanning and engraving of horse drawn by Xu Beihong

1. Open Directory ... and find Horse.bmp file in the \ Laser upgrade pack download \ Examples of material, and set the following parameter. (Note: please use Scan By Z-s)

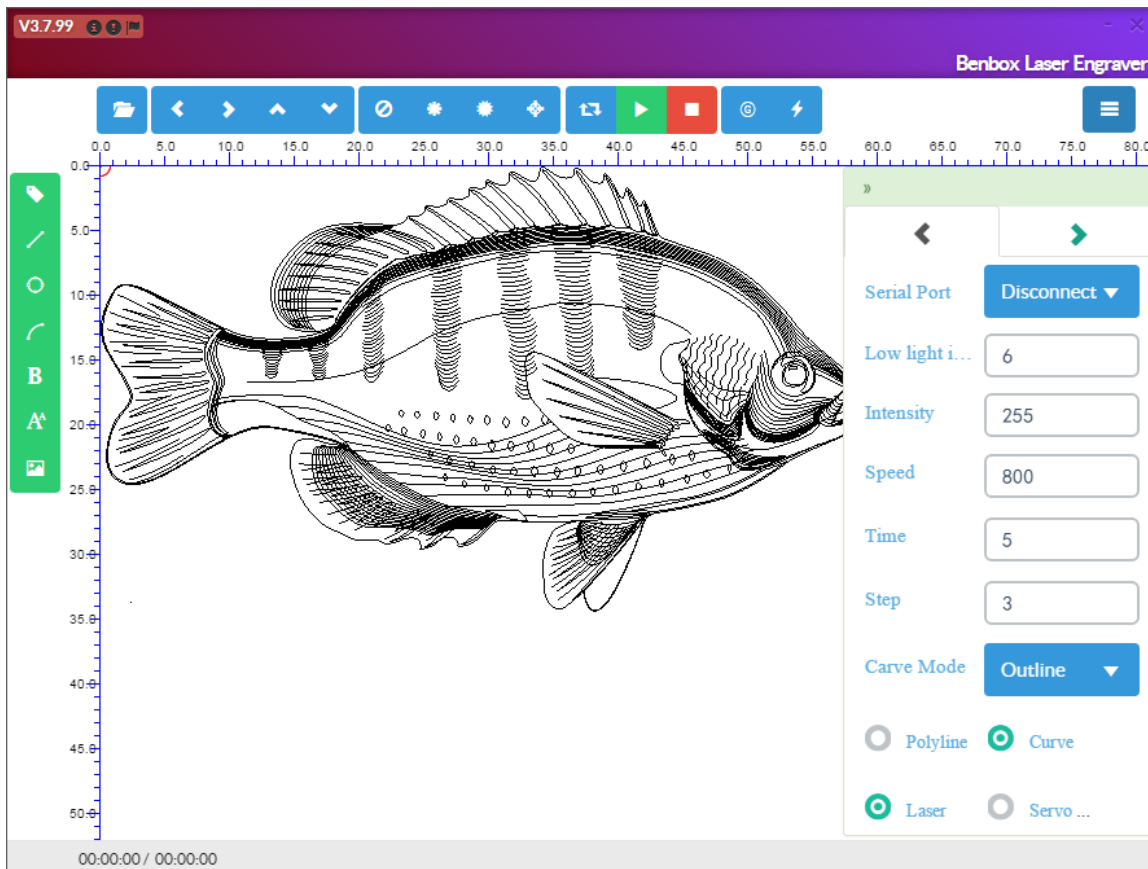


2. Check the power, focal length, serial port settings, click ↻ function, observe engraving range and calibrate the position.
3. Click ▶ to start engraving.
4. The engraving renderings are shown as below.



XII. Vector DXF engraving example - fish engraving

1. Open Directory ... and find Horse.bmp file in the \ Laser upgrade pack download \ Examples of material, and set the following parameter. (Note: Please use Outline)

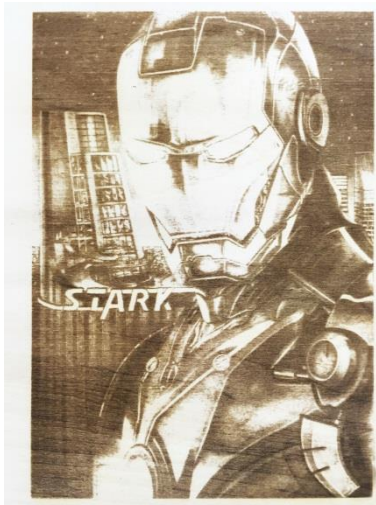


2. Check the power, focal length, serial port settings, click ↻ function, observe engraving range and calibrate the position.
3. Click ▶ to start engraving.
4. The engraving renderings are shown as below.



XIII. More engraving graphics display and appreciation







XIV. FAQs

Q1. Why my PC can't install the driver of the Makeblock Orion successfully?

A: If your PC can't install the driver for Makeblock Orion automatically, please manually download it and install.

Download link: http://learn.makeblock.cc/driver_installation/

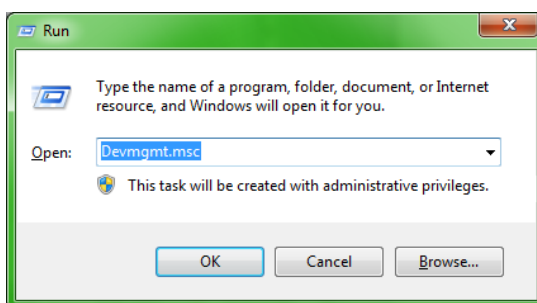
Drivers Download:

[Windows] [Driver Installer](#)

[Mac OSX] [Me Baseboard](#) / [Makeblock Orion](#)(for Yosemite User:link) / [Arduino Uno](#)

To check whether the driver has been installed successfully:

1. Open Run dialog (win + r)
2. Input `devmgmt.msc` to open the Device Management.



3. Check the "COM X" (X=2.3.4...). If the driver hasn't been installed successfully, you will see a question mark or an exclamatory mark.



Question 2. Why control software sometimes fails to respond or crash?

A: Currently supported platforms contain WINDOWS system. If the software crashes or fails to respond, please restart the software. For image that its resolution exceeds 96PPI, the software will respond very slowly or does not respond, please use image processing software to reduce the resolution. If the image is too large, it will also cause the software to respond very slowly, please try not to engrave the bitmaps with large size. If you need to engrave relatively large or complex images, please be patient to wait for software response, and its response time is 10min-30min. The maximum engraving area of laser engraver is 300mm × 350mm.

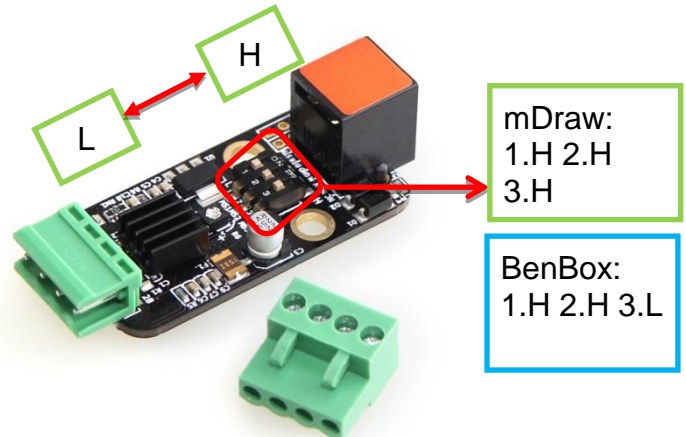
Question 3. Why it takes much longer time to open DXF?

A: Because the algorithm is more complex, and curve resolving will take much longer time, so it takes a long time to open the file, please be patient until progress bar is finished.

Question 4. What is the default setting of mDraw and BenBox software stepper driver module?

A: The following settings will ensure better accuracy, and the size of setting drawn graphics is the actual graphics size.

	1	2	3
Full speed	L	L	L
1/2 Subdivision	H	L	L
1/4 Subdivision	L	H	L
1/8 Subdivision	H	H	L
1/16 Subdivision	H	H	H



Question 5. How to download data and 3D models?

Answer: You can get the appropriate information download address via visiting link interface of our official website www.makeblock.cc.

1. <http://learn.makeblock.cc/>
2. <http://bbs.makeblock.cc/forum.php>
3. <https://grabcad.com/makeblock-1/projects>



Question 6. How to share your work?

Answer: You can upload and share your work here.

<http://forum.makeblock.cc/category/showcase>

Question 7. how to contact us?

Answer: You can contact our team via the following contact method.

www.makeblock.cc

https://www.facebook.com/Makeblock?ref=br_tf

<https://plus.google.com/102486511775733872783/posts>

<https://twitter.com/Makeblock>

<https://www.youtube.com/channel/UC8Du3ES62iGgeckG4W9jC9w>

Makeblock! Construct Your Dreams!

XV. Thanks!

Thanks to the software provided by our Partner Benbox companies, we can quickly launch this XY plotter V2.0 platform-based laser engraving upgrade package. We welcome all companies and individuals to developing products in our platform, including software, electronics, mechanical parts, kits etc. If you have any good ideas, please contact us.

Our E-mail:support@makeblock.cc

Makeblock, Construct Your Dreams!