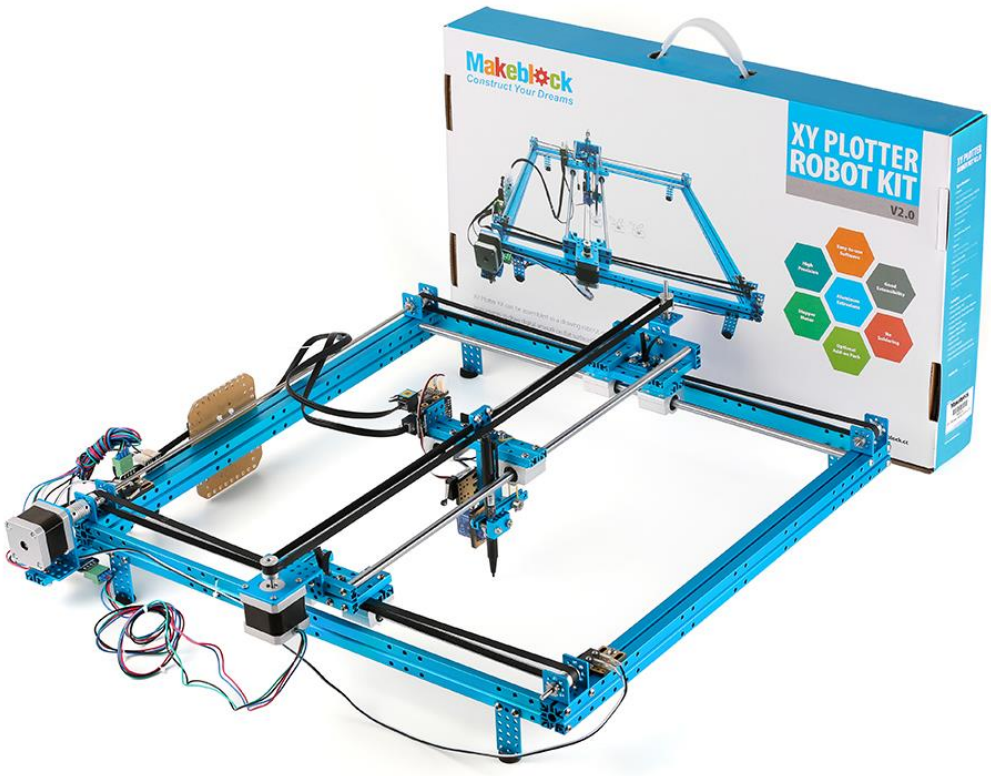
XY Plotter V2.0 User Guide

– mDraw Version 1.1&Benbox 3.7.99



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I. Before Get Start

1. Hardware：

XY Plotter V2.0 Kit

2. XY Plotter V2.0 Assembly instructions

3. Software:

a. Must have：

mDraw for Windows

mDraw for Mac

Benbox 3.7.99

Inksape

b. Optional：

Arduino IDE

Makeblock Windows Mainboard Driver*(PS: Please download driver for Mac OS system at our website)*

Note:mDraw is best for Makeblock Orion mainboard, it also supports Arduino Leonardo/Uno mainboard, for which need to upload firmware by Arduino IDE firstly. Please download the firmware at Here.

Tip 1

For the accuracy of your XY Plotter V2.0, please strictly follow the assemble instruction, and carefully adjust your robot. Please pay attention to the position of axles, transmission parts, servo arm, and the levelness of robot.

Tip 2

Pictures in this article is only for reference. Specifications and software are subject to change without notice, please pay attention to our website http://www.makeblock.cc.

II. Part List

XY Plotter V2.0 Part lists

1	Beam 0824-16	1		30	Wrench 7mm&5mm	1
2	Beam 0824-48	4		31	Screw M4x8	36
3	Beam 0824-80	1		32	Screw M4x14	30
4	Beam 0824-96	4		33	Screw M4x16	28
5	Beam 0824-112	2		34	Screw M4x22	12
6	Beam 0824-496	2		35	Screw M4x30	18
7	Beam 0808-072	1		36	Countersunk Screw M3x8	10
8	Beam2424-504	2		37	Headless Set Screw M3x5	26
9	Plate 3x6	5		38	Nut M4	50
10	Belt Connector	3		39	Plastic Rivet R4060	16
11	Cuttable Linkage 3	6		40	Plastic Rivet R4100	6
12	Bracket 3x3	2		41	Plastic Ring 4x7x2mm	20
13	Bracket U1	5		42	Nylon Cable Ties	30
14	42BYG Stepper Motor Bracket	2		43	Rubber band	5
15	9g Micro Servo Pack	1		44	Gasket	4
16	42BYG Stepper Motor	2		45	Me Baseboard 1.0	1
17	Timing Pulley18T	6		46	Me Stepper Motor Driver	2
18	Open-end Timing Belt (1.3m)	3		47	Me Micro Switch B	4
19	Threaded Shaft 4x39mm	1		48	Me RJ25 Adapter	3
20	D Shaft 4x56mm	2		49	Wall Adapter Power Supply - 12VDC	1
21	Linear Motion Shaft D4x80mm	1		50	6P6C RJ25 cable-20cm	2
22	Linear Motion Shaft D4x512mm	1		51	6P6C RJ25 cable-35cm	1
23	Linear Motion Shaft D8X496mm	4		52	6P6C RJ25 cable-50cm	2
24	Shaft Collar 4mm	10		53	USB 2.0 A-Male to Micro B-Male Cable	1
25	Flexible coupling 4x4mm	1		54	Micro Switch Cable-90cm	1
26	Linear Motion Slide Unit 8mm	6		55	Base Bracket B	1
27	Flange Bearing 4x8x3mm	10		56	XY QR Code Card	1
28	Cross &2.5mm HEX Screwdriver	1		57	Packing Case	1
29	HEX Allen Key 1.5mm	2				

III. Introduction

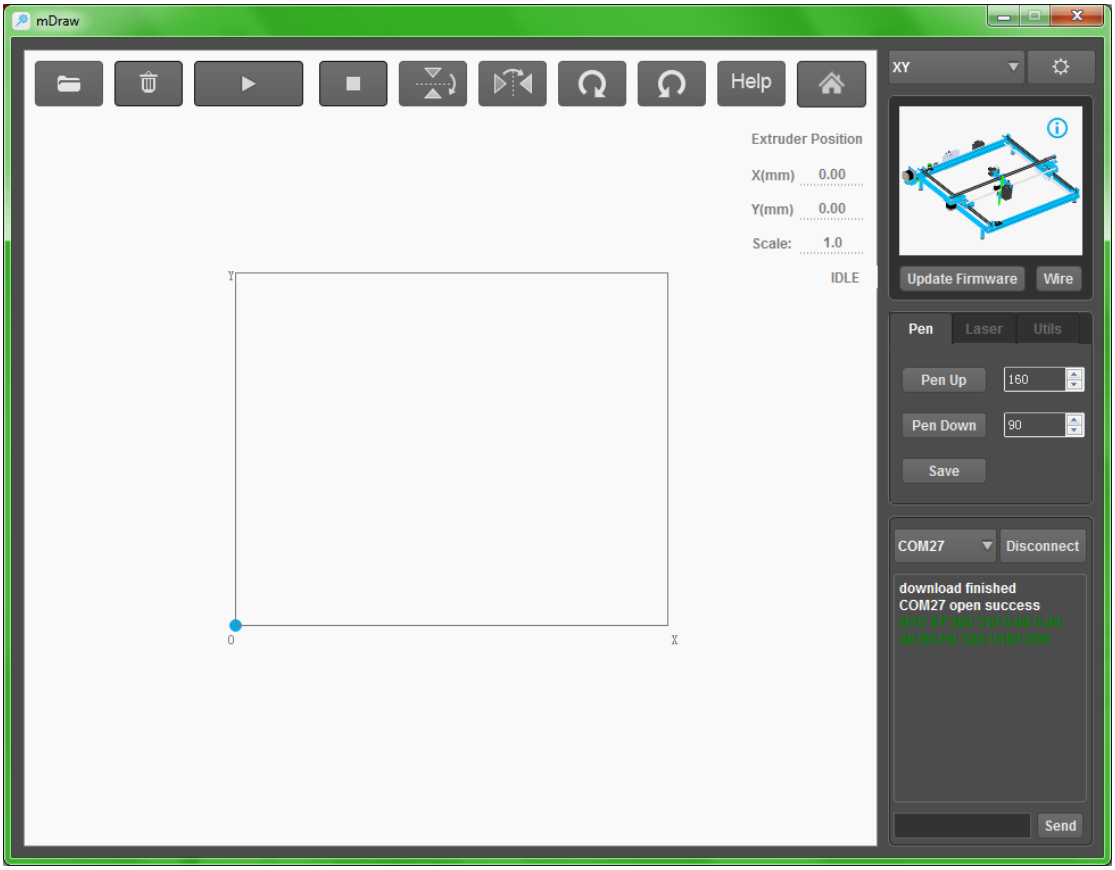
1. XY Plotter V2.0

XY Plotter is a drawing robot based on Makeblock platform, precision is 0.1mm, working area is 310mm×390mm. Besides the well-designed hardware, we designed a software for XY Plotter 2.0 – mDraw.

2. mDraw

mDraw is a host computer software originally designed for 4-in-1 drawing robot mDrawBot, we developed the compatibility with XY Plotter 2.0 Servo mode and Laser mode.

mDraw Main UI



IV. How to Assemble XY Plotter V2.0

Step 1

2×Beam 0824 496

2×Beam 2424-504

2×Linear Motion Shaft D8X496mm

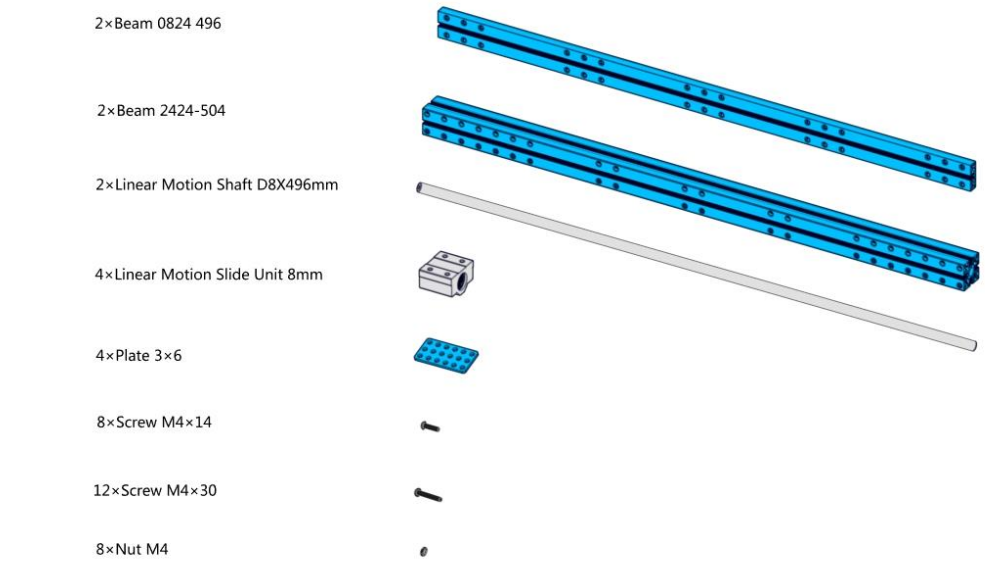
4×Linear Motion Slide Unit 8mm

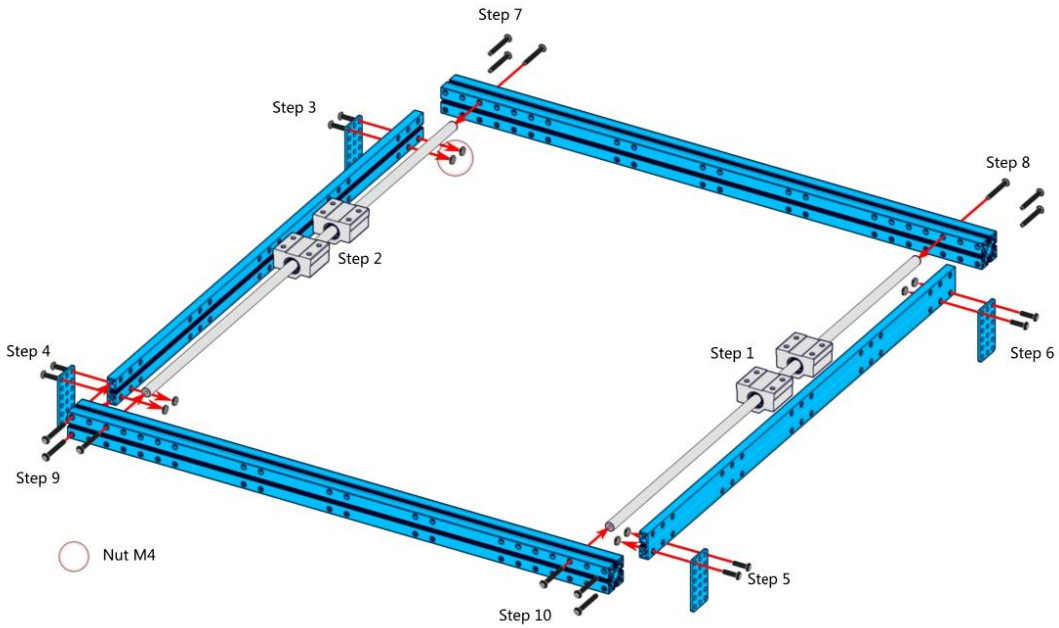
4×Plate 3×6

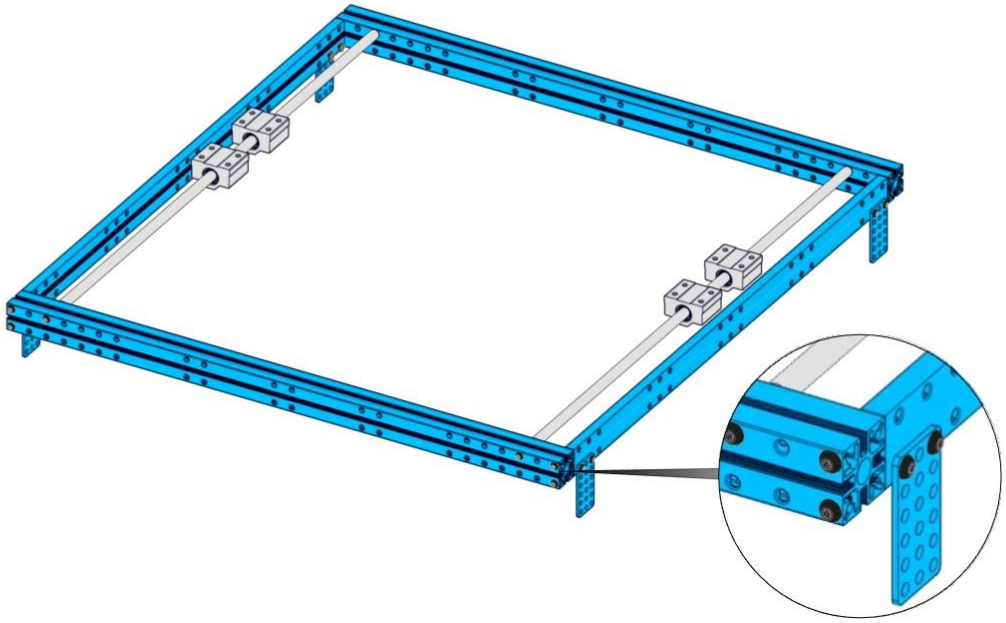
8×Screw M4×14

12×Screw M4×30

8×Nut M4





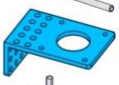


Step 2

2×Linear Motion Shaft D8X496mm

1×Linear Motion Shaft D4x80mm

1×42BYG Stepper Motor Bracket V2.1

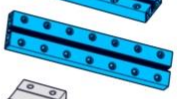


1×42BYG Stepper Motor

4×Beam 0824 48

4×Beam 0824 96

1×Beam 0824 112



2×Linear Motion Slide Unit 8mm

2×Flange Bearing 4x8x3mm

4×Headless Set Screw M3x5

2×Nut M4

5×Screw M4×8

16×Screw M4×14

2×Screw M4×16

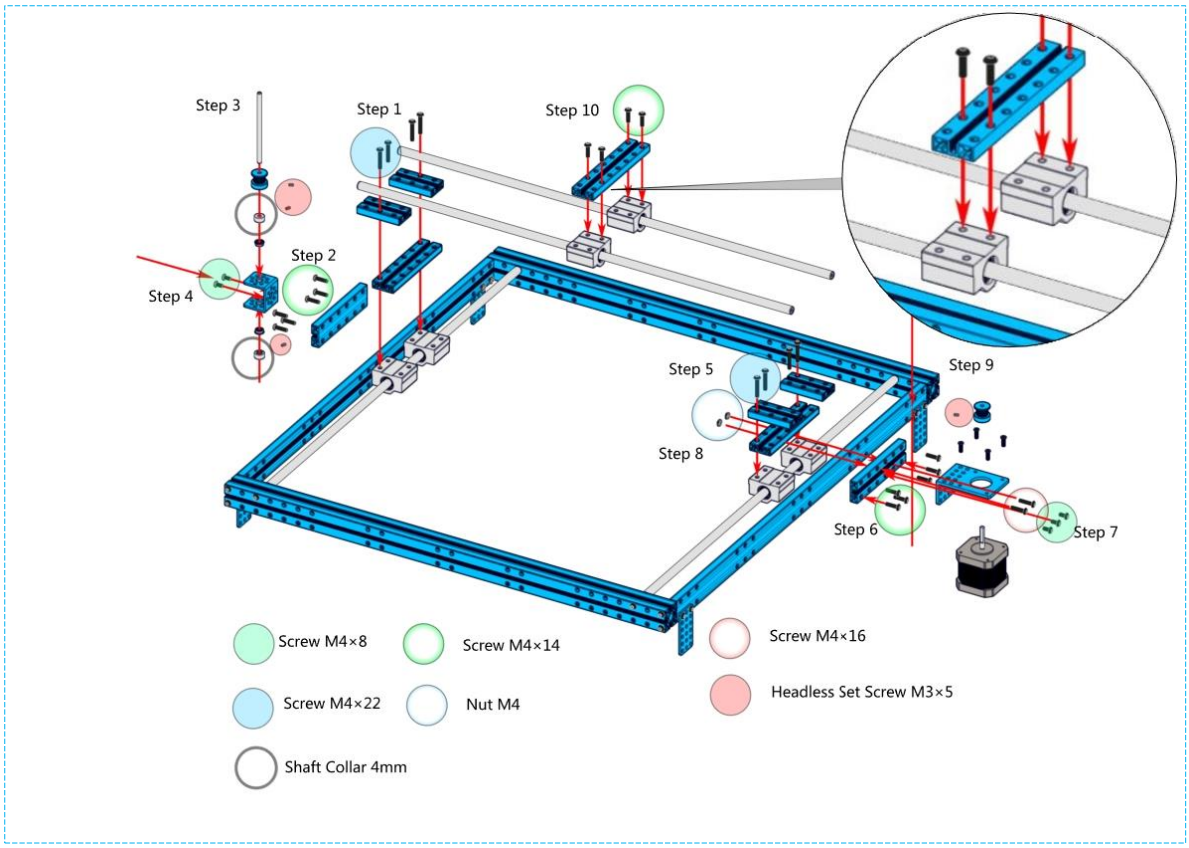
8×Screw M4×22

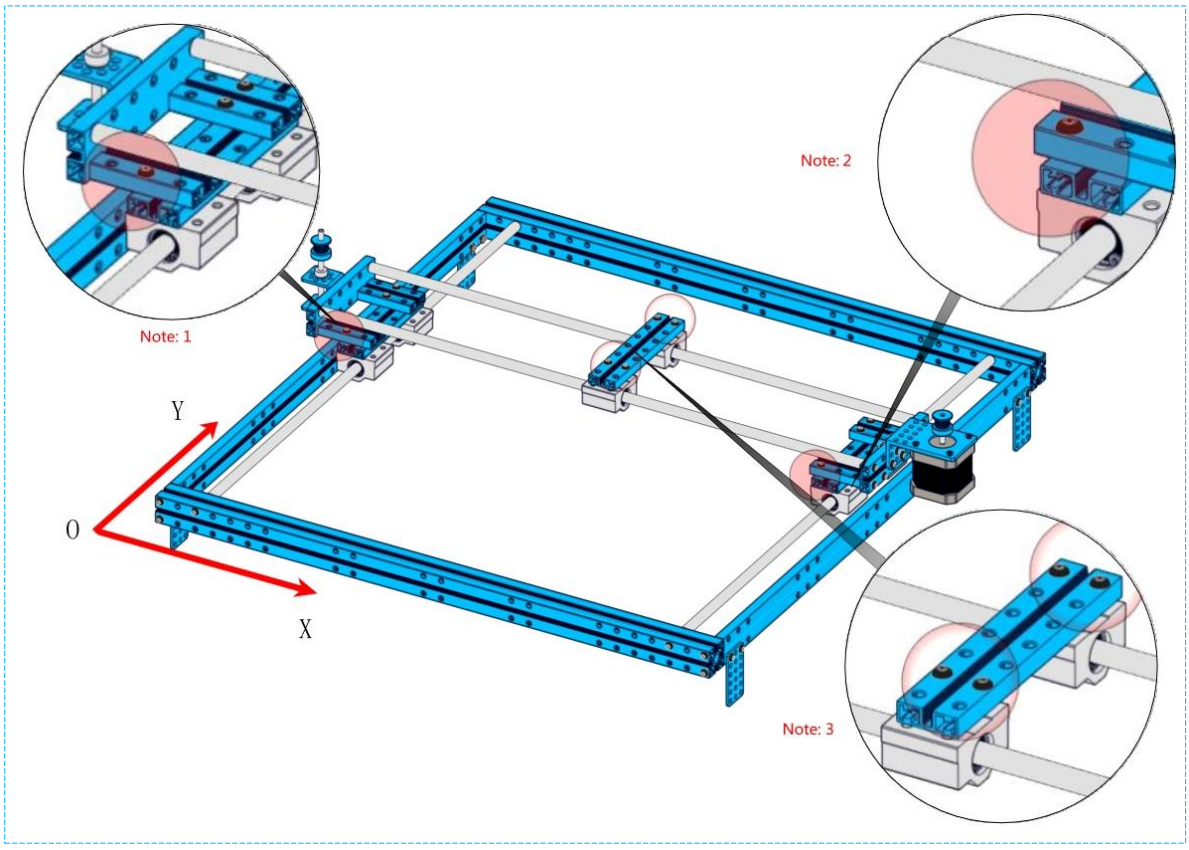
4×Countersunk Screw M3x8

2×Shaft Collar 4mm

2×Timing Pulley 18T

1×Bracket U1

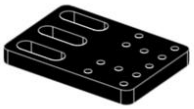

Step 3
Step 1
Step 10
Step 2
Step 4
Step 5
Step 9
Step 8
Step 6
Step 7
Screw M4×8
Screw M4×14
Screw M4×16
Screw M4×22
Nut M4
Headless Set Screw M3×5
Shaft Collar 4mm


Note: 2
Note: 1
Y
0
X
Note: 3

Step 3

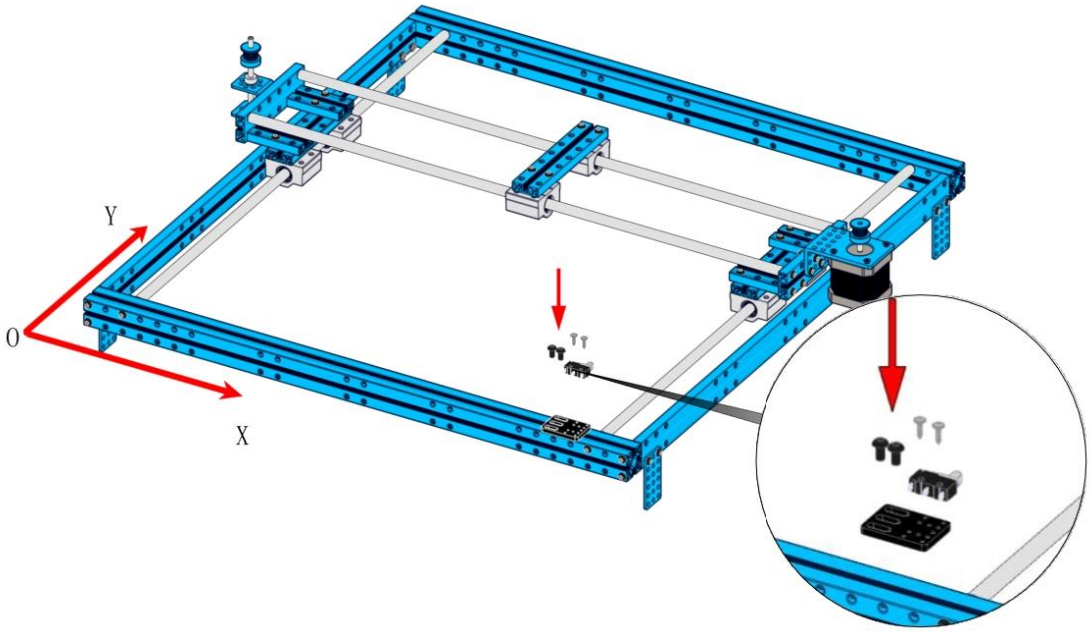
1×Micro Switch Button

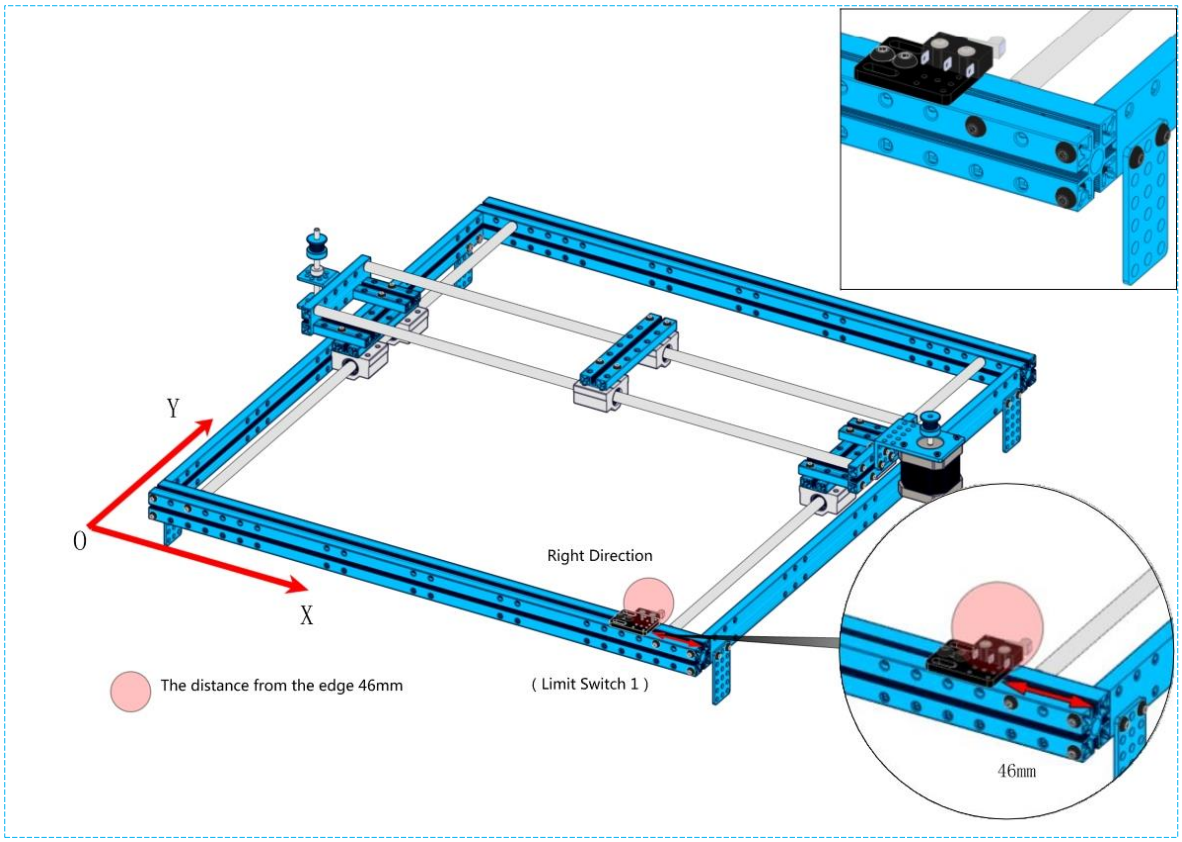
1×LS Bracket



2×Cross Recessed Pan Head Tapping Screws ST2.2×9.5

2×Screw M4×8



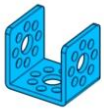


Step 4

1×Linear Motion Shaft D4x512mm

2×D Shaft 4x56mm

4×Bracket U1



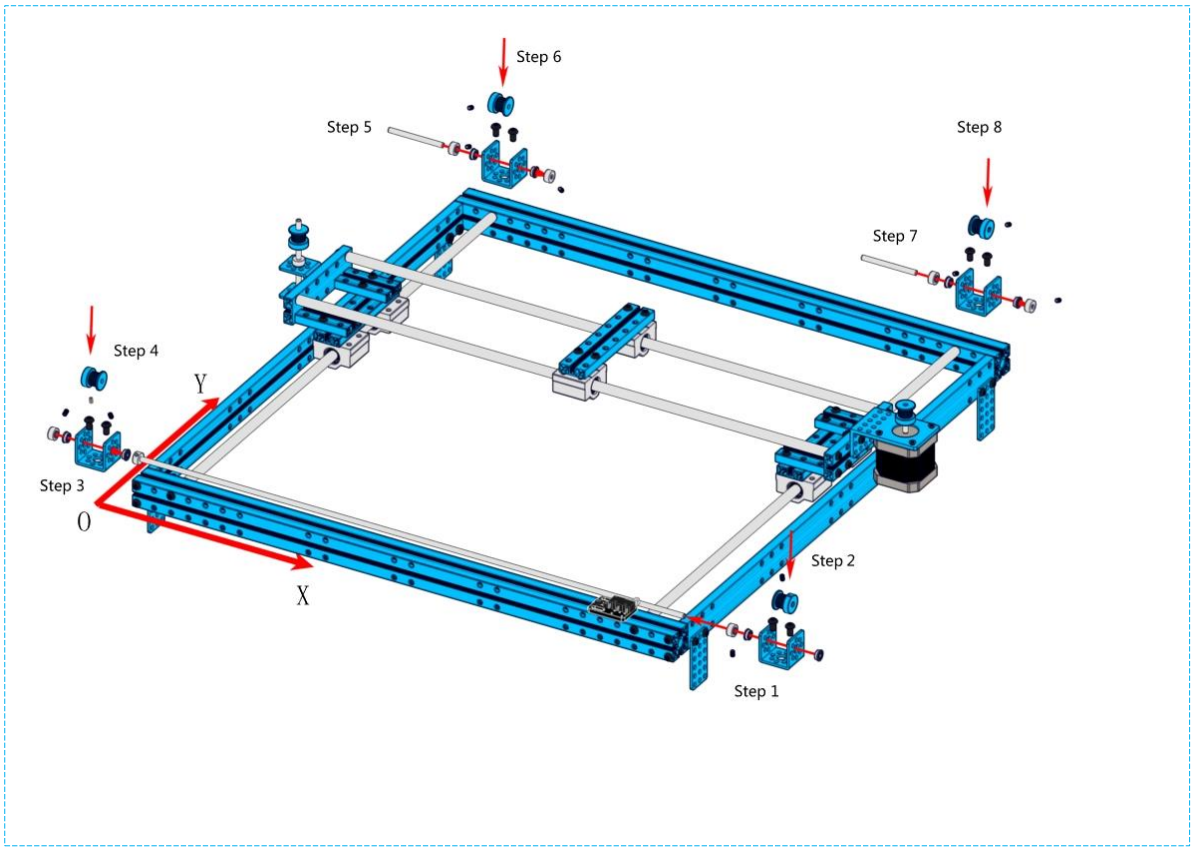
4×Timing Pulley18T

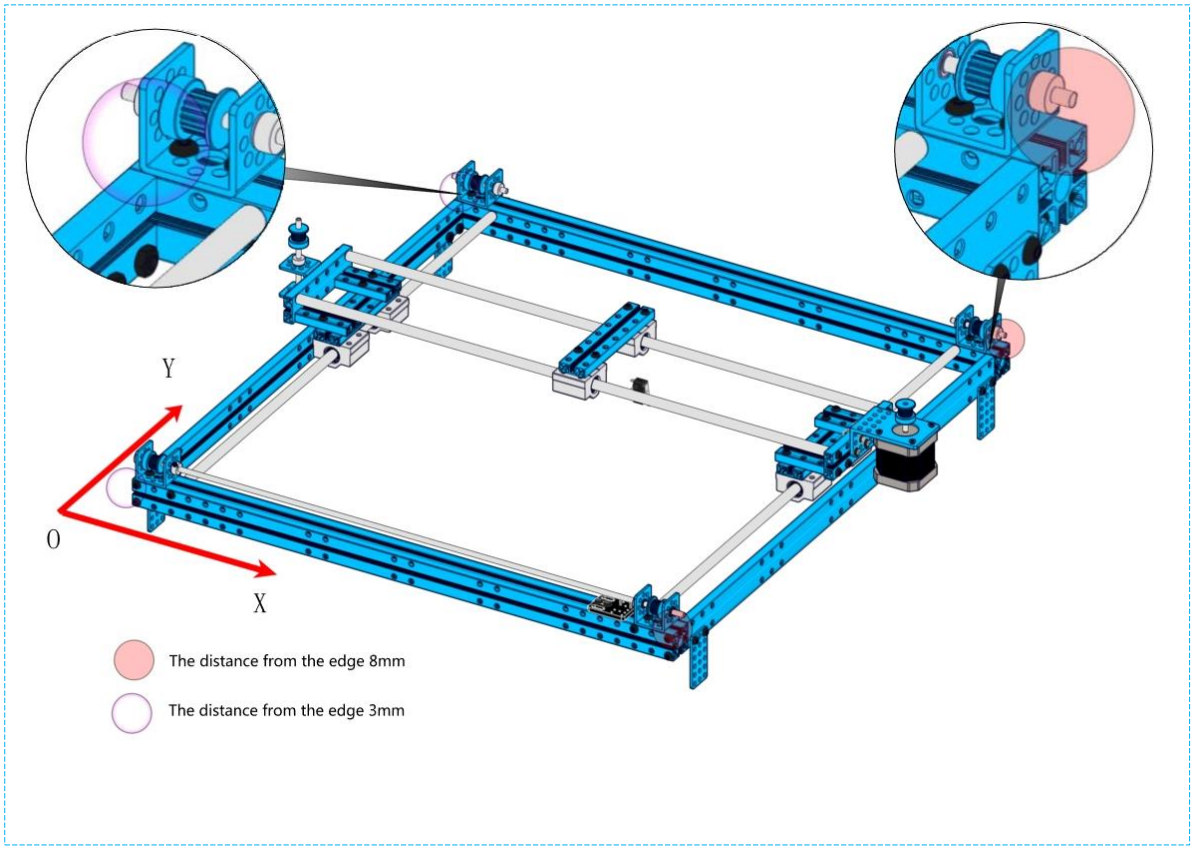
7×Shaft Collar 4mm

8×Flange Bearing 4x8x3mm

11×Headless Set Screw M3x5

8×Screws M4×8


Step 6
Step 5
Step 8
Step 7
Step 4
Y
Step 3
0
X
Step 2
Step 1


Y
0
X
The distance from the edge 8mm
The distance from the edge 3mm

Step 5

2×Open-end Timing Belt (1.3m)

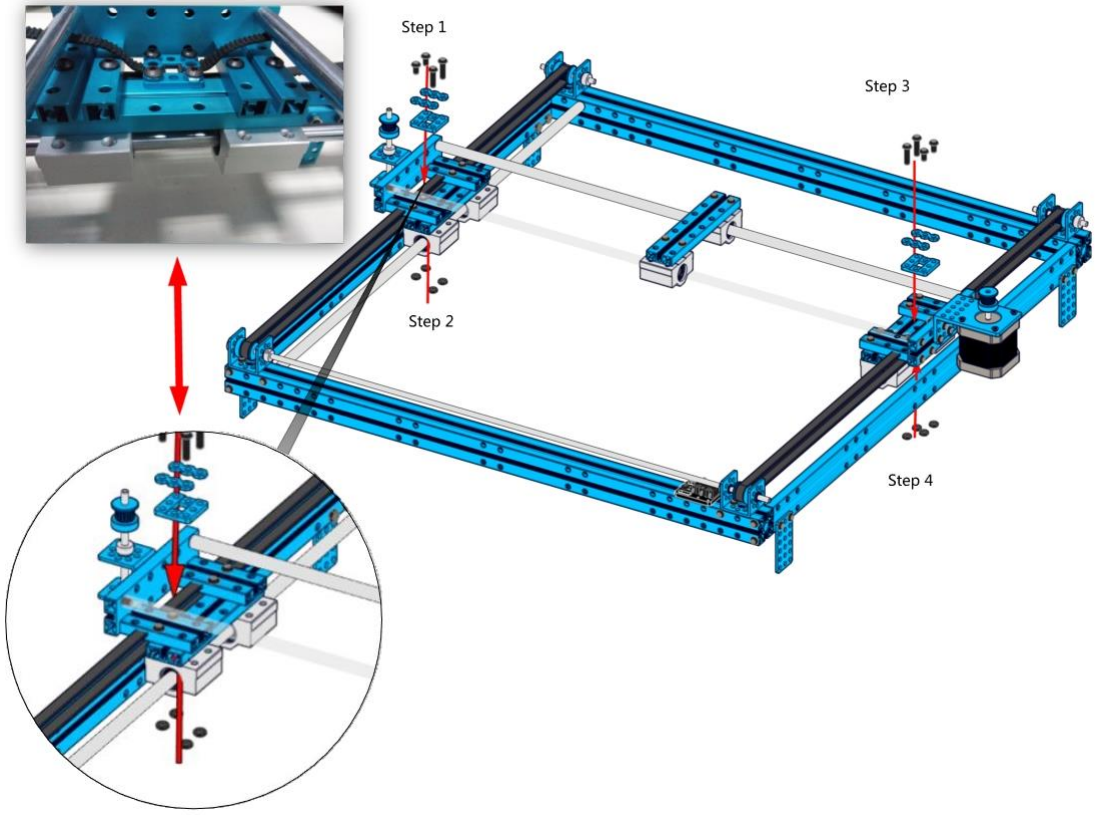
2× Belt Connector

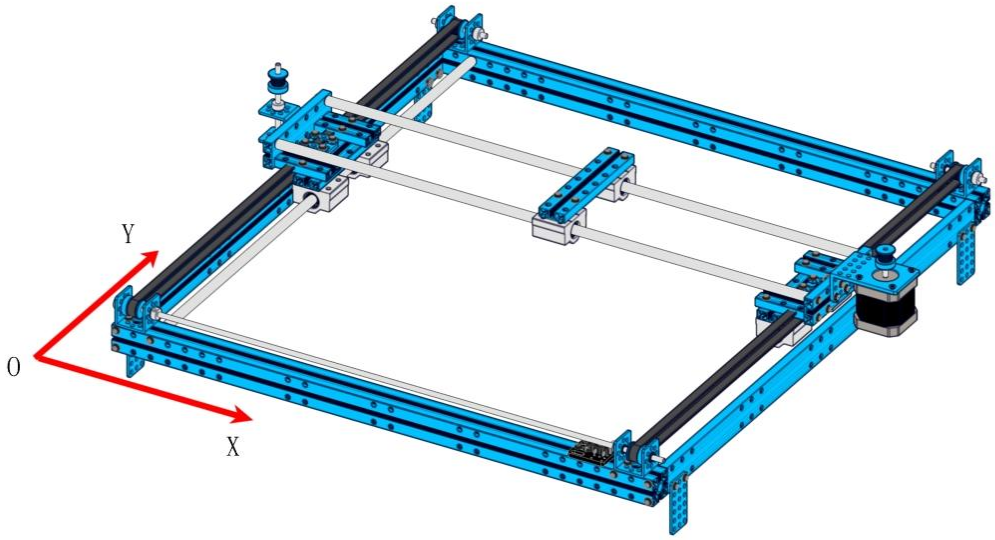
4×Cuttable Linkage 3

4×Screw M4×16

4×Screw M4×8

8×Nut M4





Step 6

1×Bracket 3×3

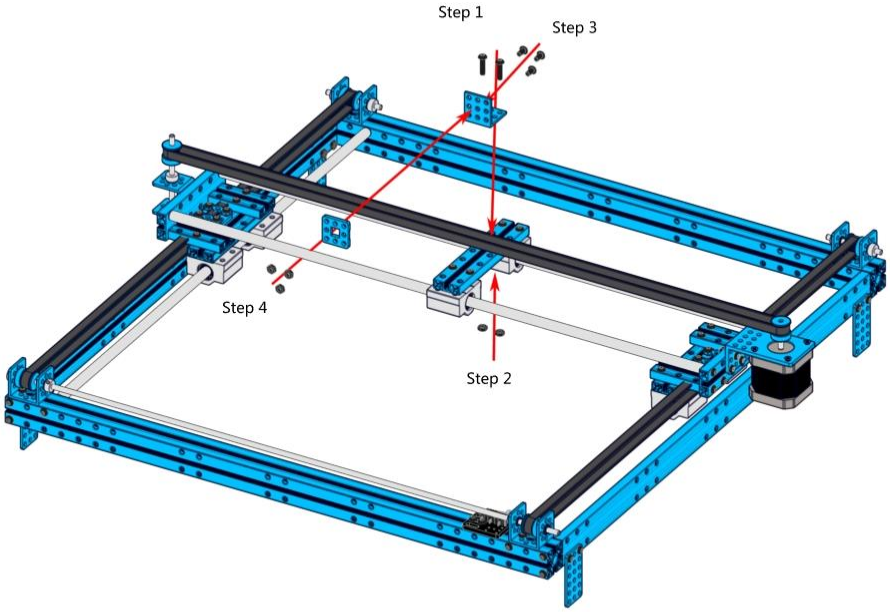
1× Belt Connector

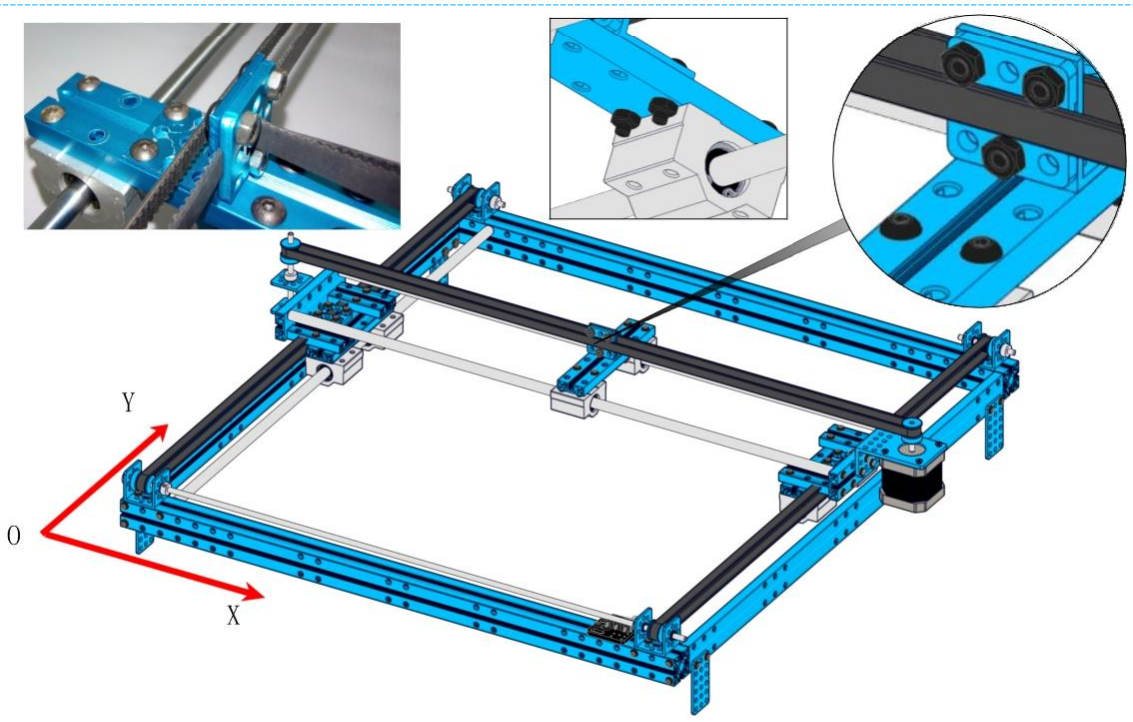
1×Open-end Timing Belt (1.3m)

2×Screw M4×16

3×Screw M4×8

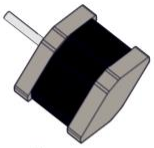
5×Nut M4


Step 1
Step 3
Step 4
Step 2

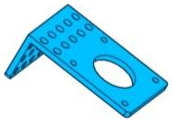

Y
0
X

Step 7

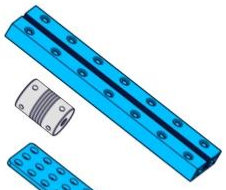
1×42BYG Stepper Motor



1×42BYG Stepper Motor Bracket V2.1



1×Beam 0824 112



1×Flexible coupling 4x4mm

1×Plate 3×6

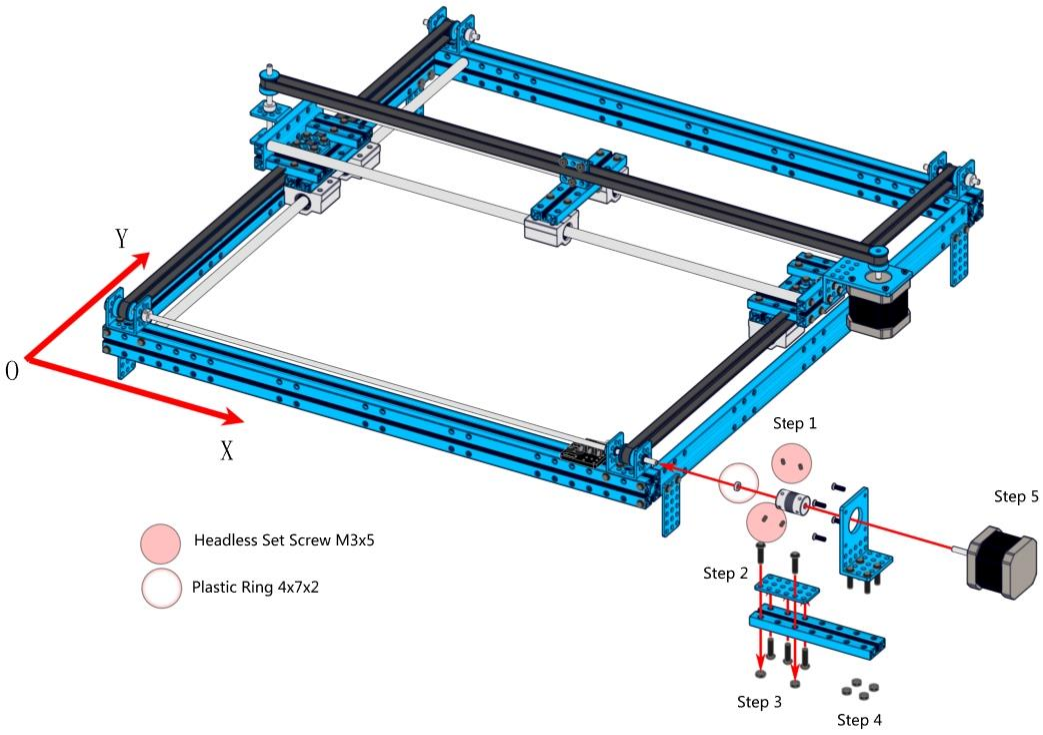
9×Screws M4×16

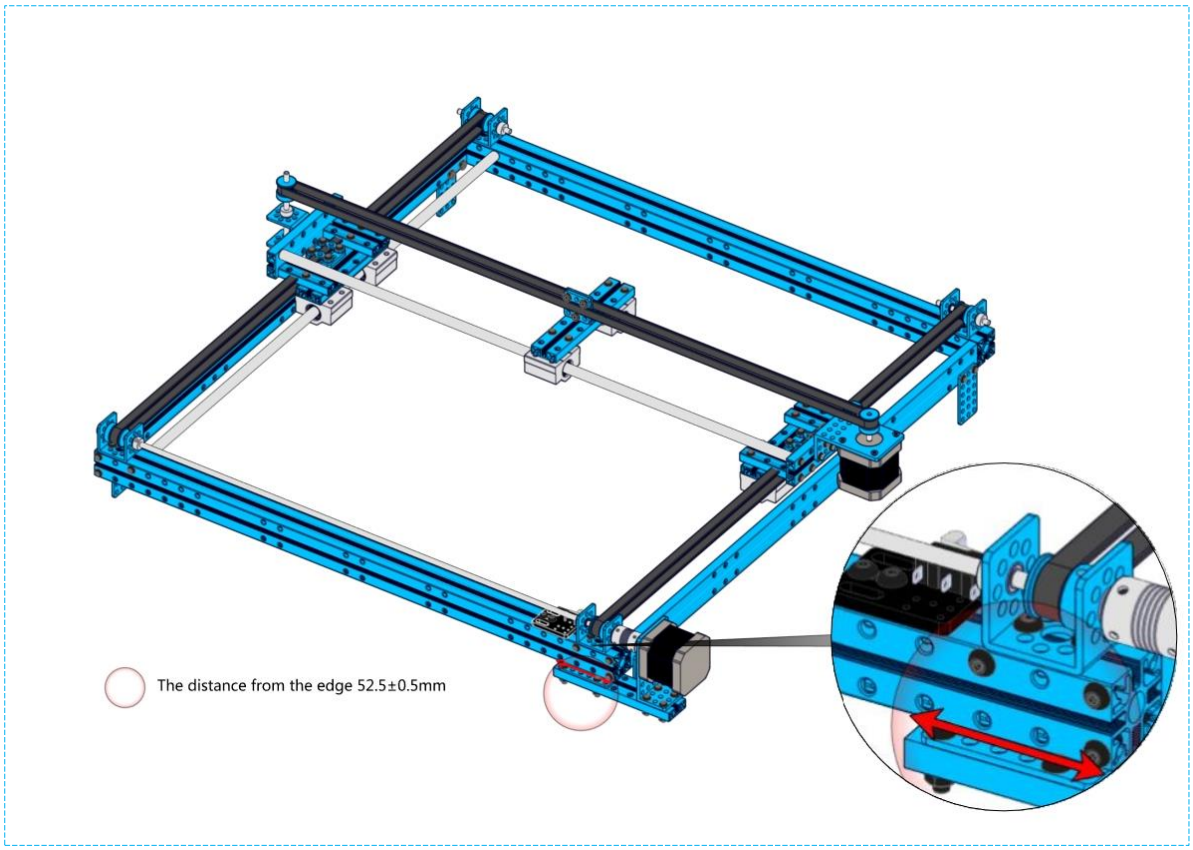
6×Nut M4

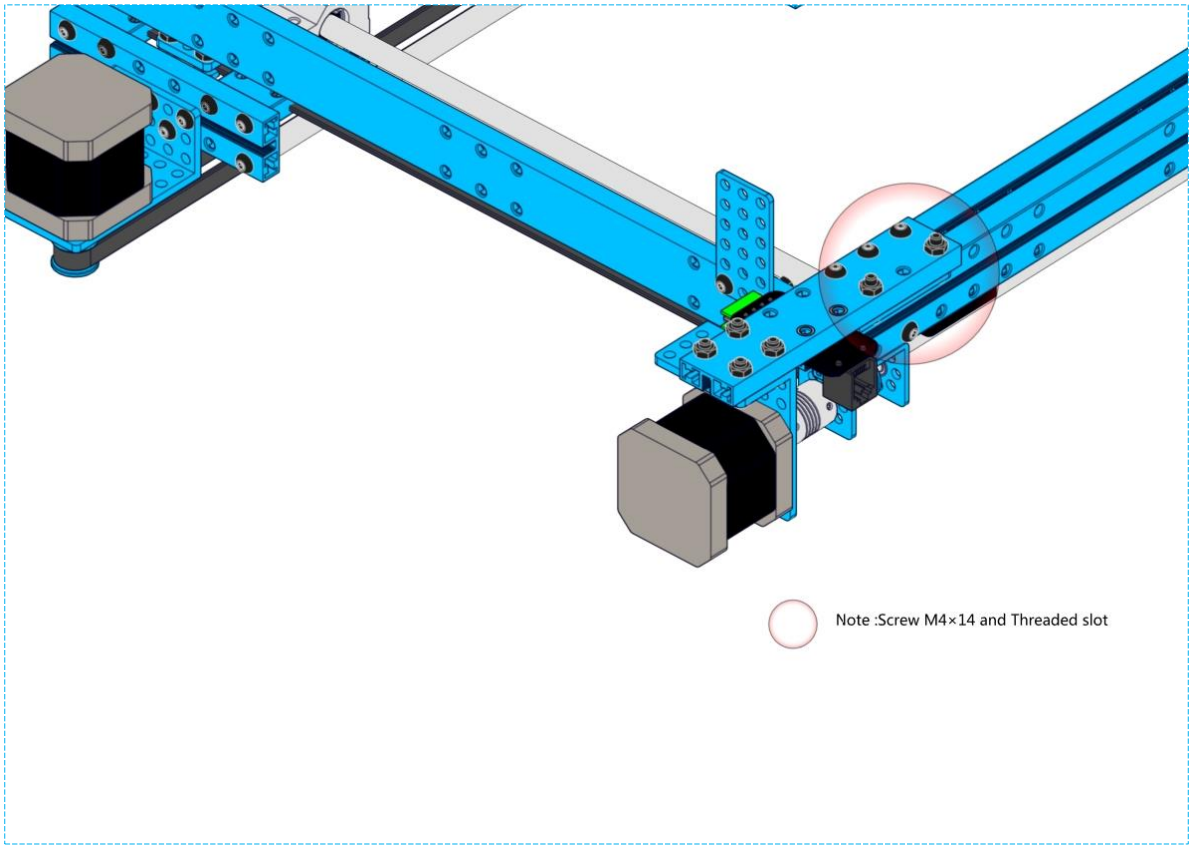
4×Screw Countersunk M3x8

4×Headless Set Screw M3x5

1×Plastic Ring 4x7x2

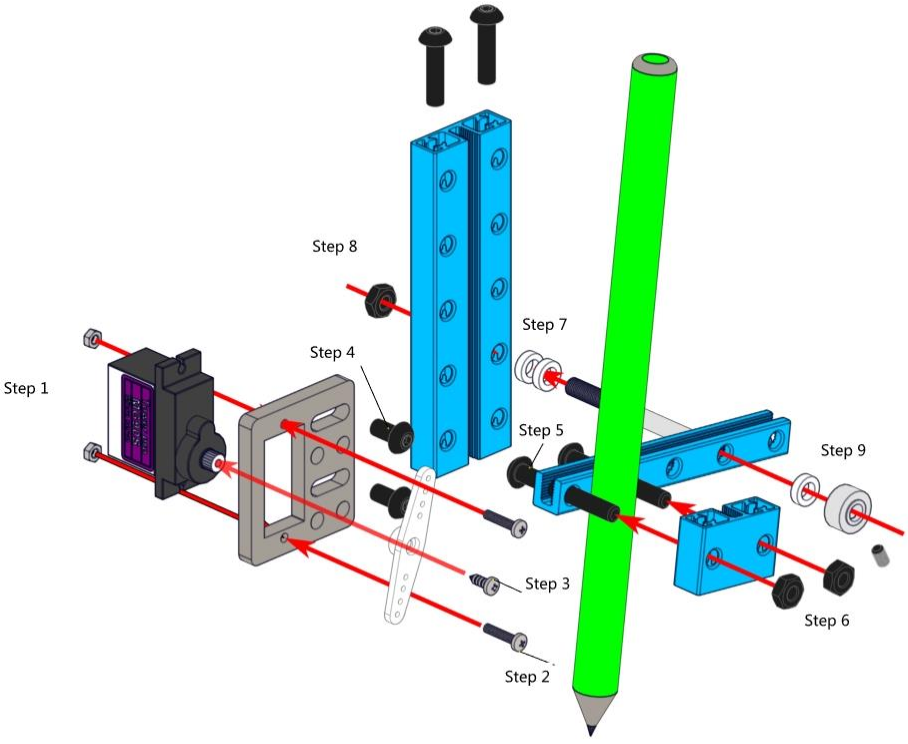


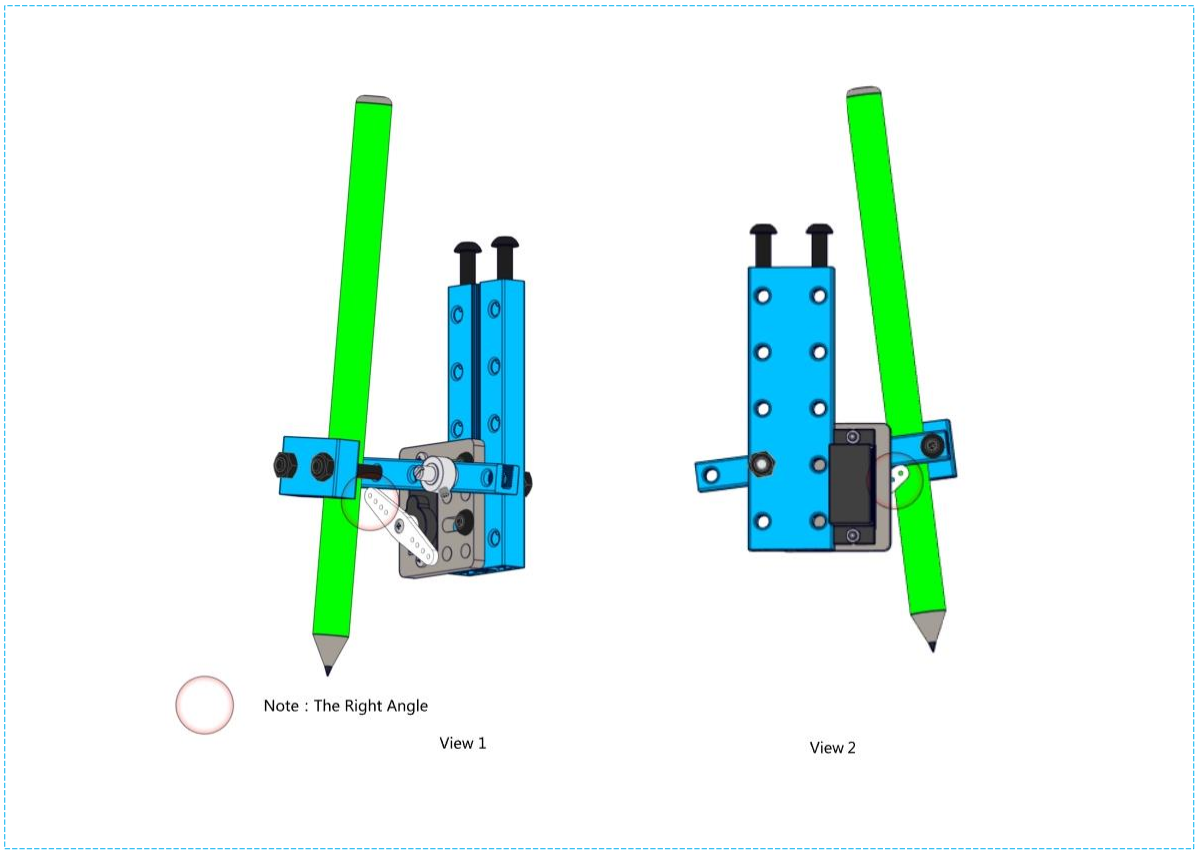

The distance from the edge 52.5±0.5mm

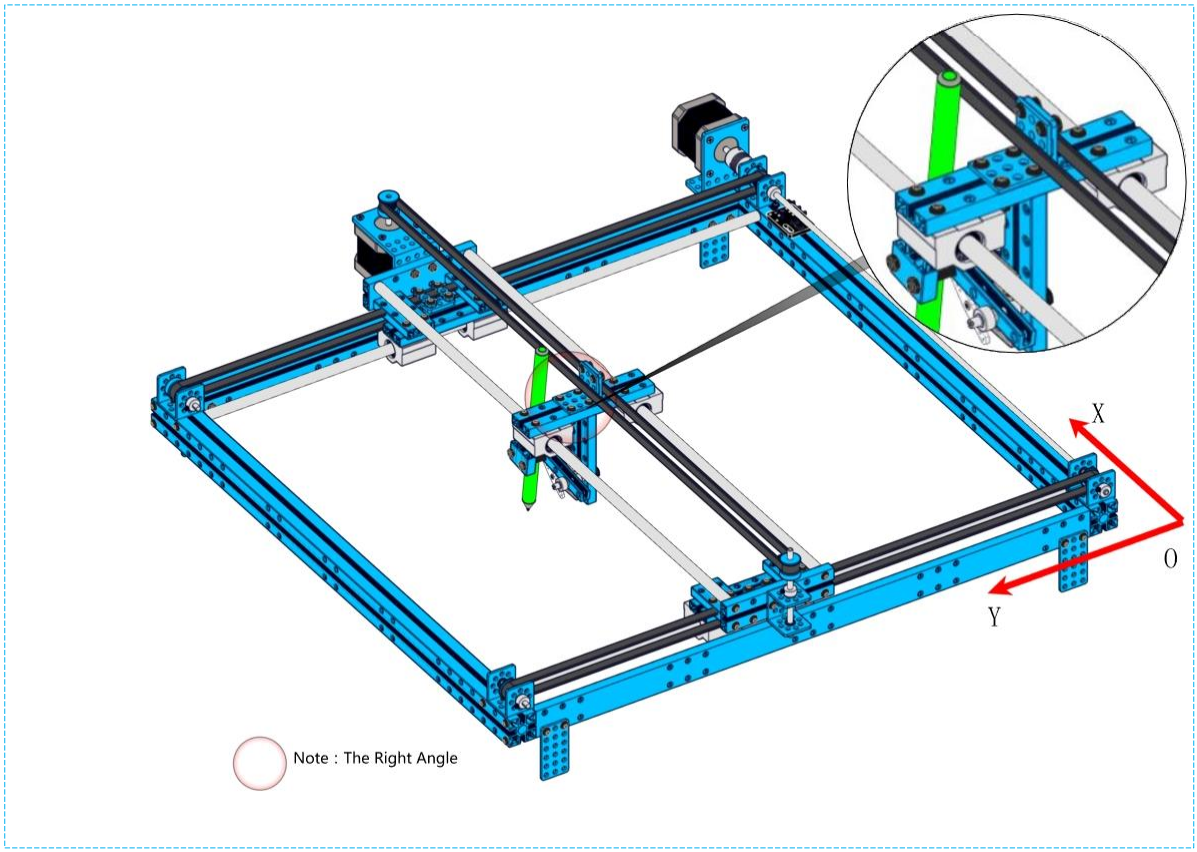

Note :Screw M4×14 and Threaded slot

Step 8

1×Pencil,etc(provide for oneself)
1×Beam 0824 80
1×Beam 0828 16
1×Beam 0808 72/80
1×Micro Servo Fixed Slices
1×9g Micro Servo
1×Threaded Shaft 4x39mm
2×Screw M4×30
2×Screw M4×16
2×Screw M4×8
2×Screw M2×10
3×Nut M4
2×Nut M2
1×Screw Headless M3×5
1×Shaft Collar 4mm
3×Plastic Ring 4x7x2



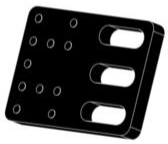

Note : The Right Angle
View 1
View 2


X
0
Y
Note : The Right Angle

Step 9

3×Micro Switch Button

3×LS Bracket

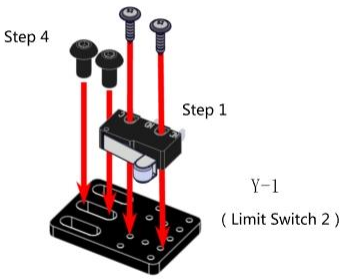


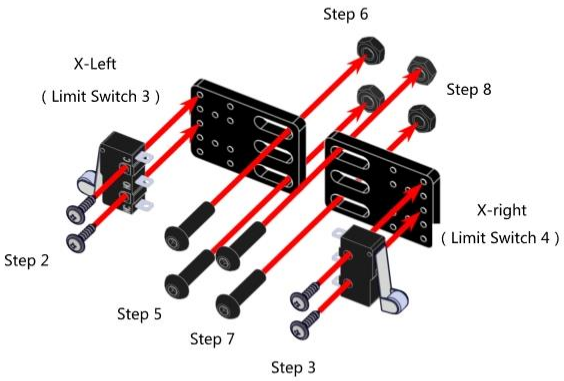
6×Cross Recessed Pan Head Tapping Screws ST2.2×9.5

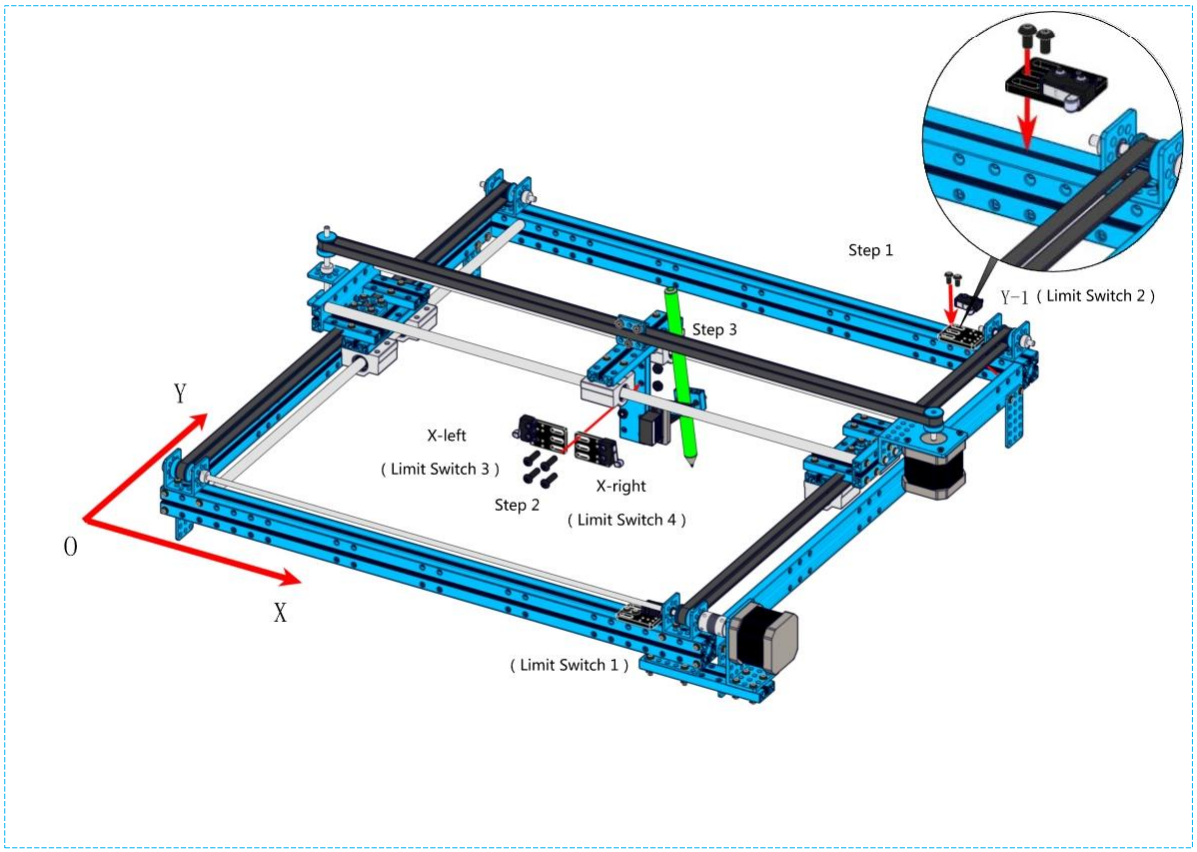
2×Screw M4×8

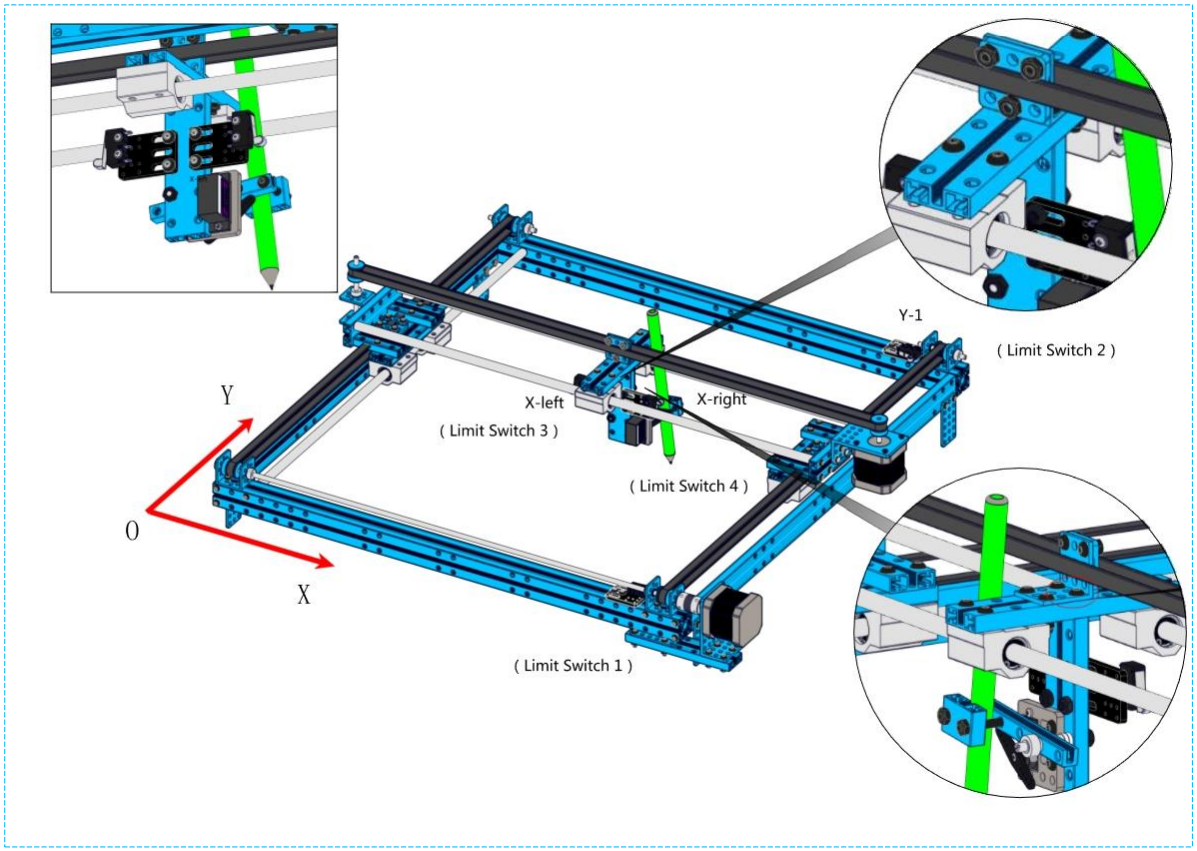
4×Screw M4×16

4×Nut M4





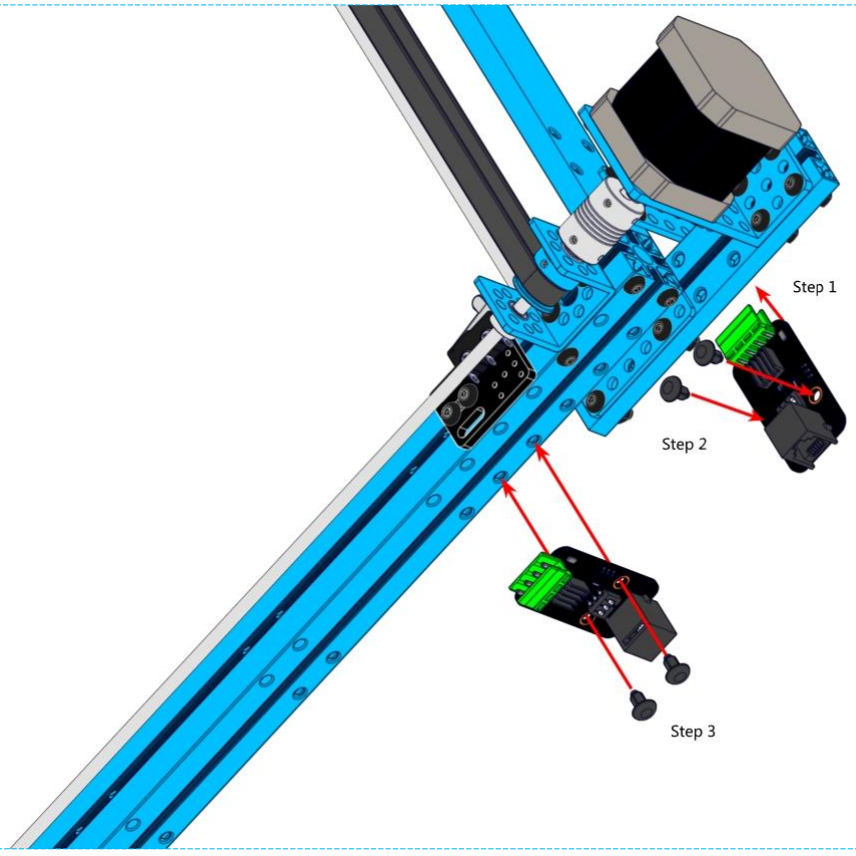

Step 1
Y-1 (Limit Switch 2)
Step 3
Y
X-left
(Limit Switch 3)
X-right
Step 2
(Limit Switch 4)
0
X
(Limit Switch 1)

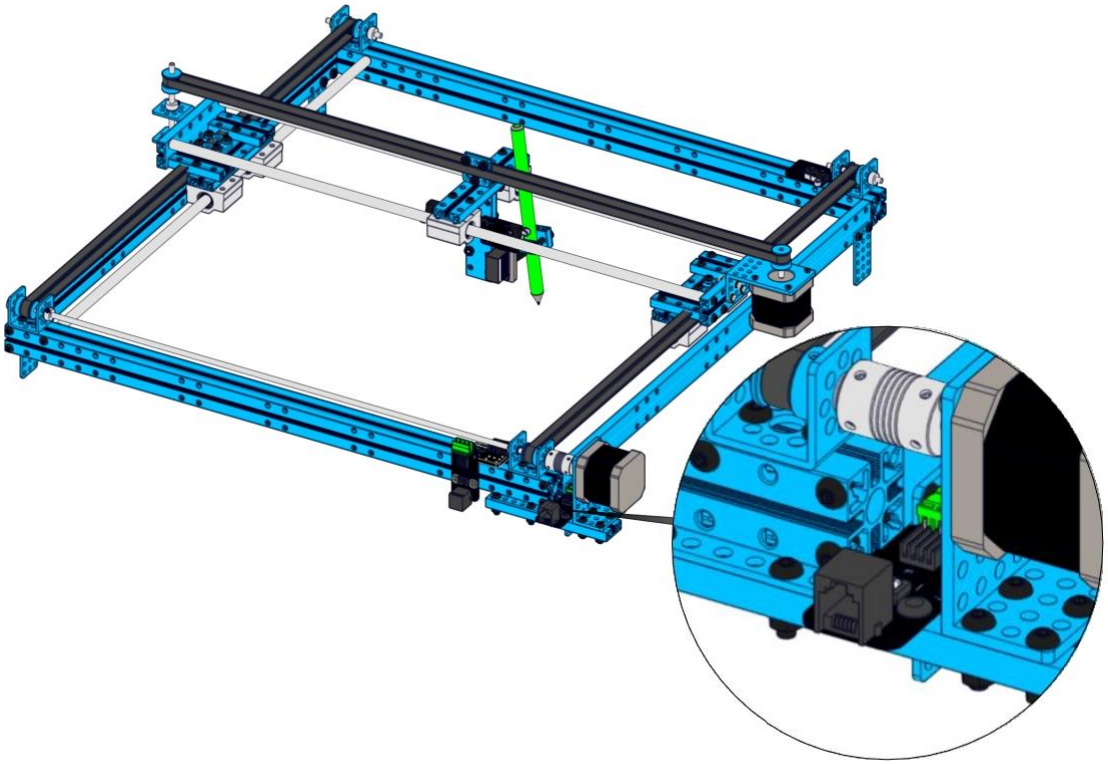

Y-1
(Limit Switch 2)
Y
X-left
(Limit Switch 3)
X-right
(Limit Switch 4)
0
X
(Limit Switch 1)

Step 10

2×Me Stepper Driver V1.0

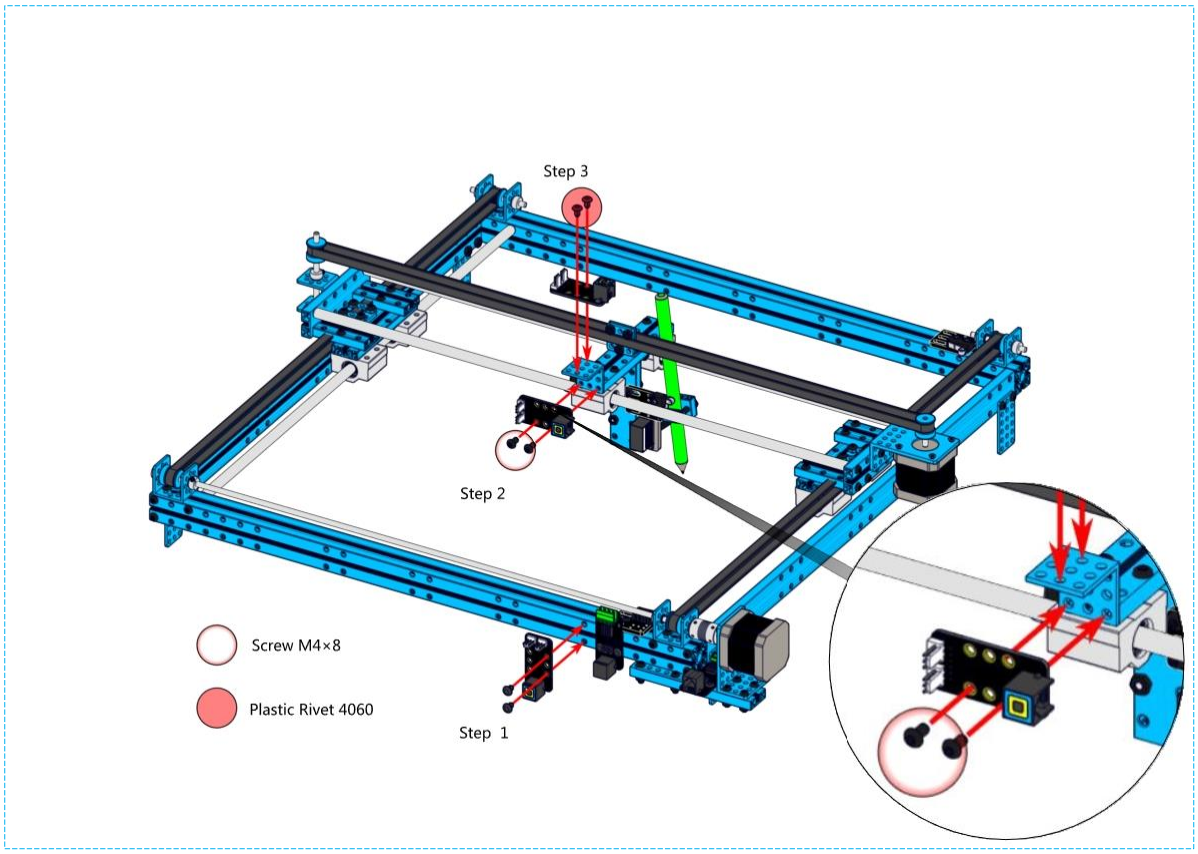
4×Plastic Rivet 4060

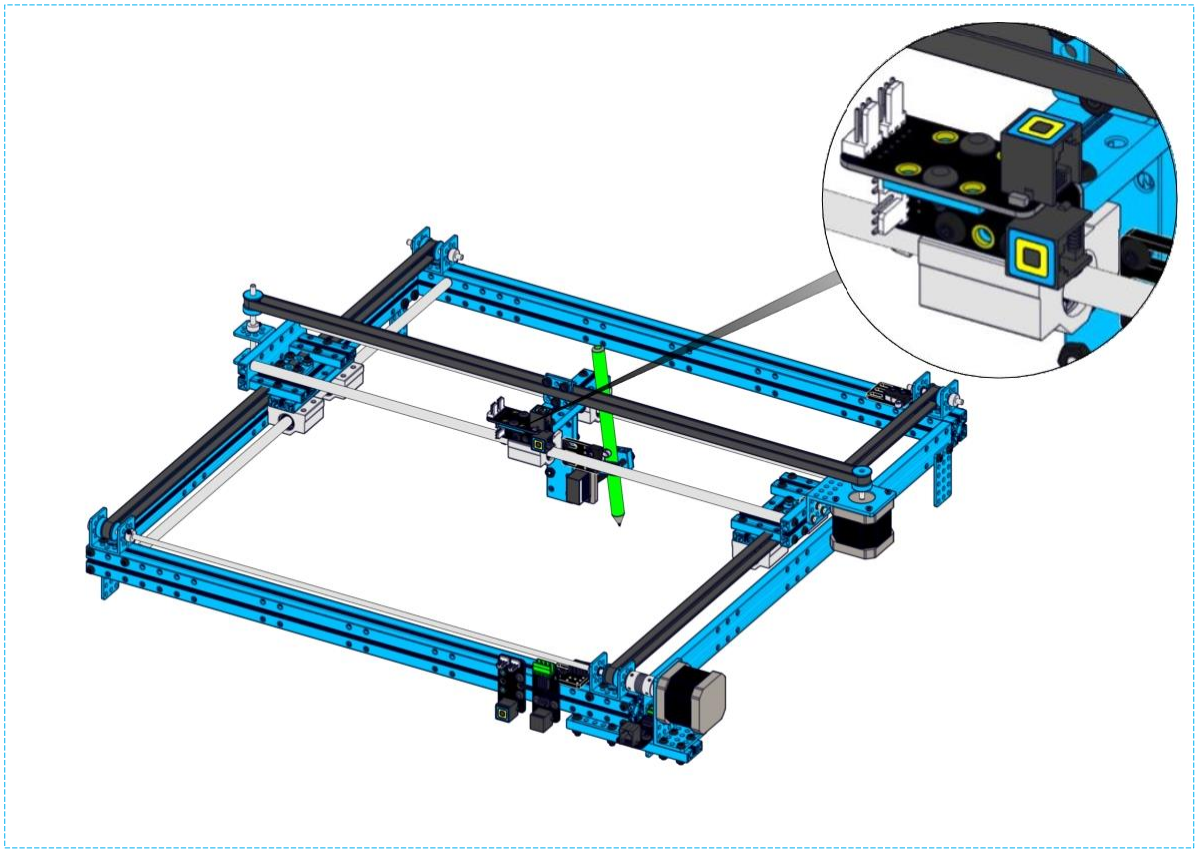




Step 11

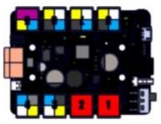
3×Me RJ25 Adapter	
1×Bracket 3×3	
2×Screw M4×8	
4×Plastic Rivet 4060	


Step 3
Step 2
Screw M4×8
Plastic Rivet 4060
Step 1

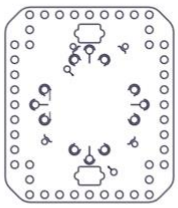


Step 12

1×Me Baseboard

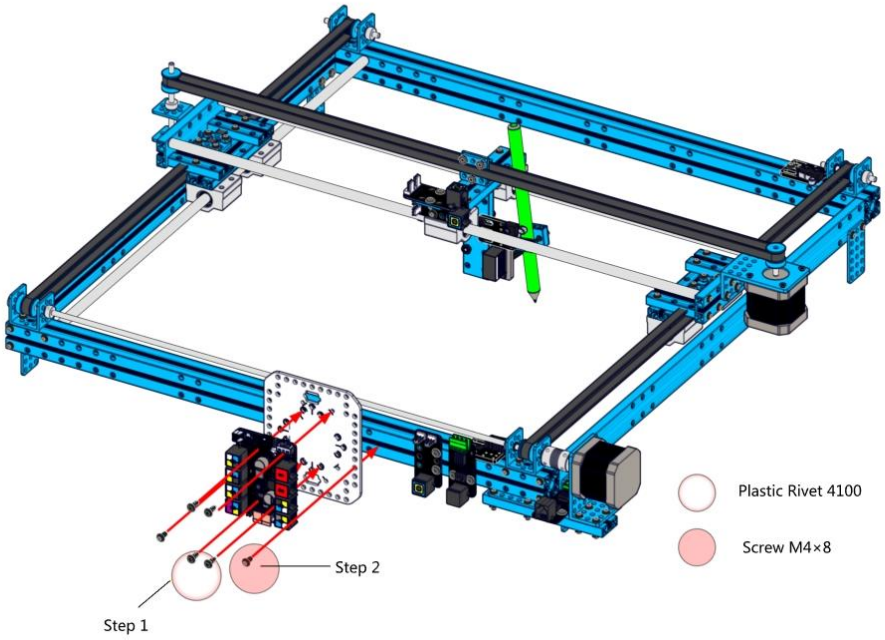


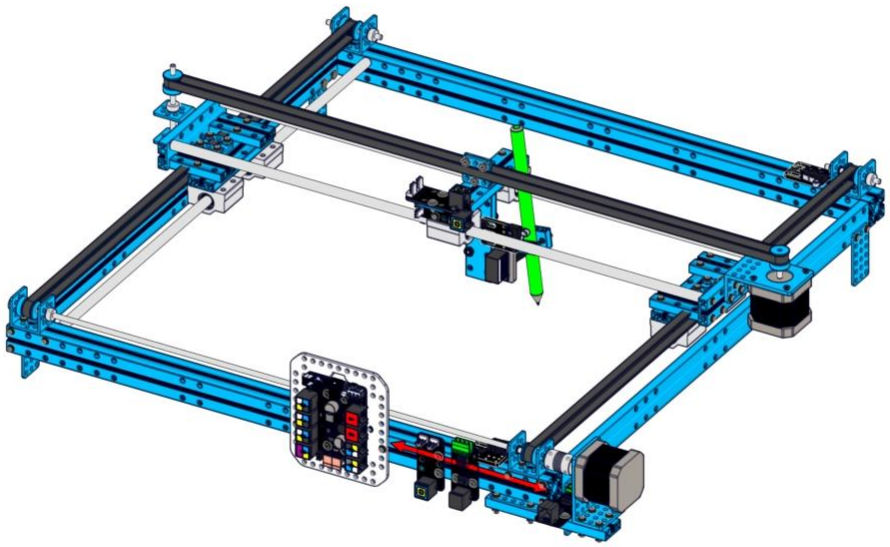
1×Base Board Plate



2×Screw M4×8

4×Plastic Rivet 4100



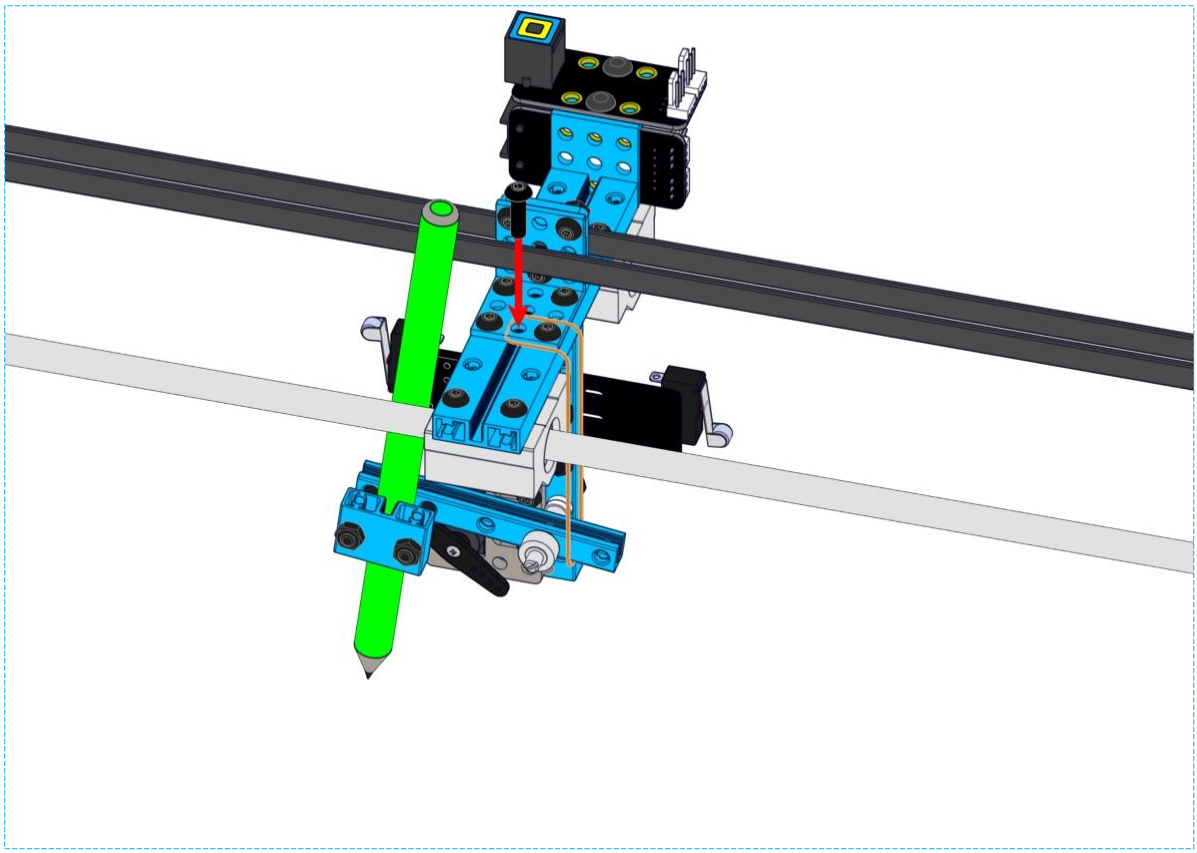


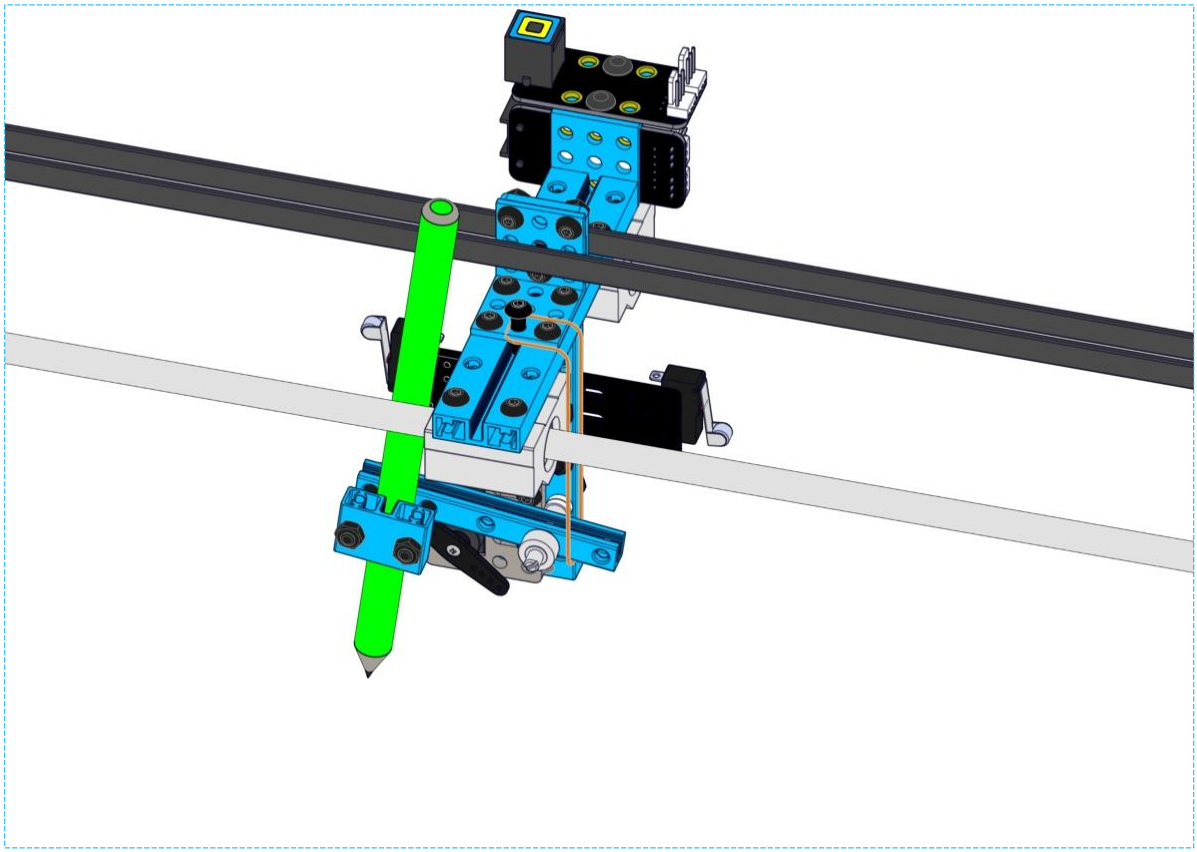
The distance from the edge 142±3mm

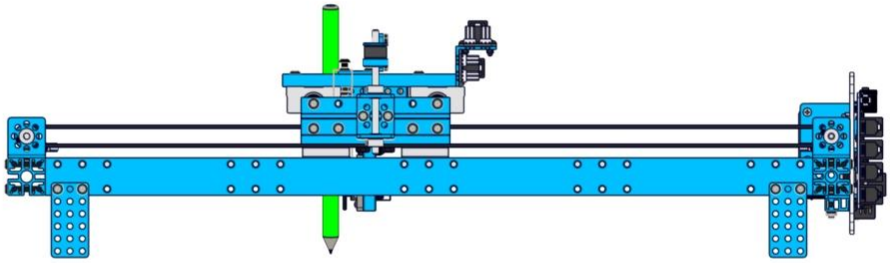
Step 13

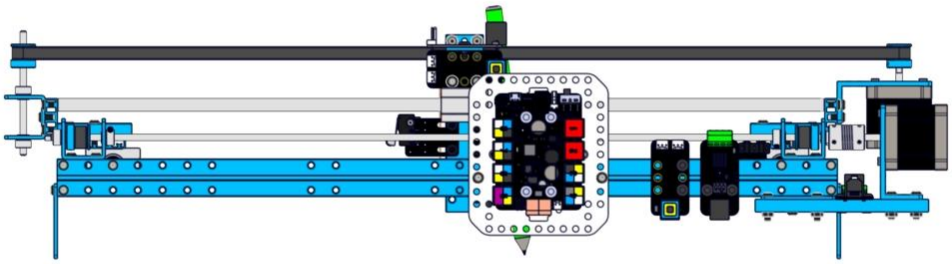
1×Screw M4×14

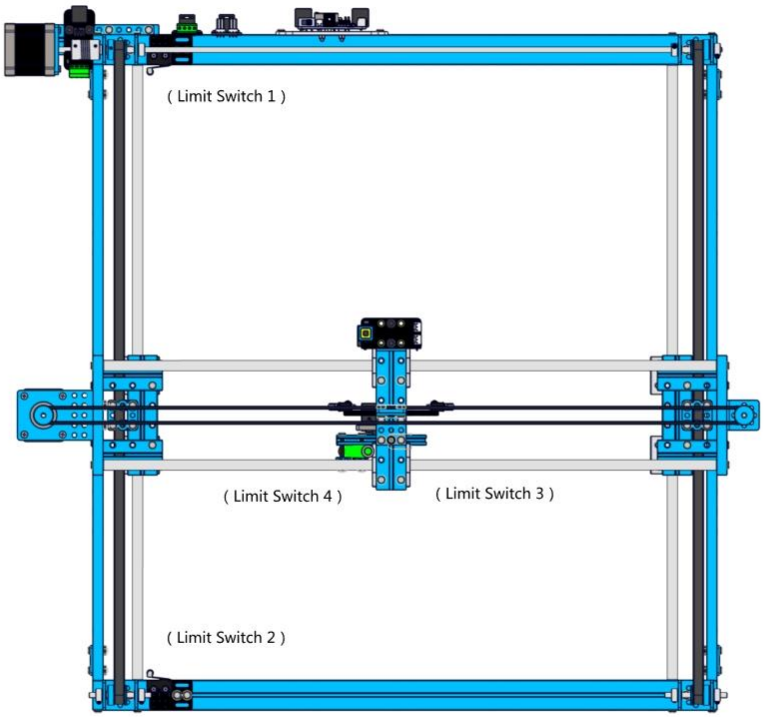
1×Rubber band











Step 14

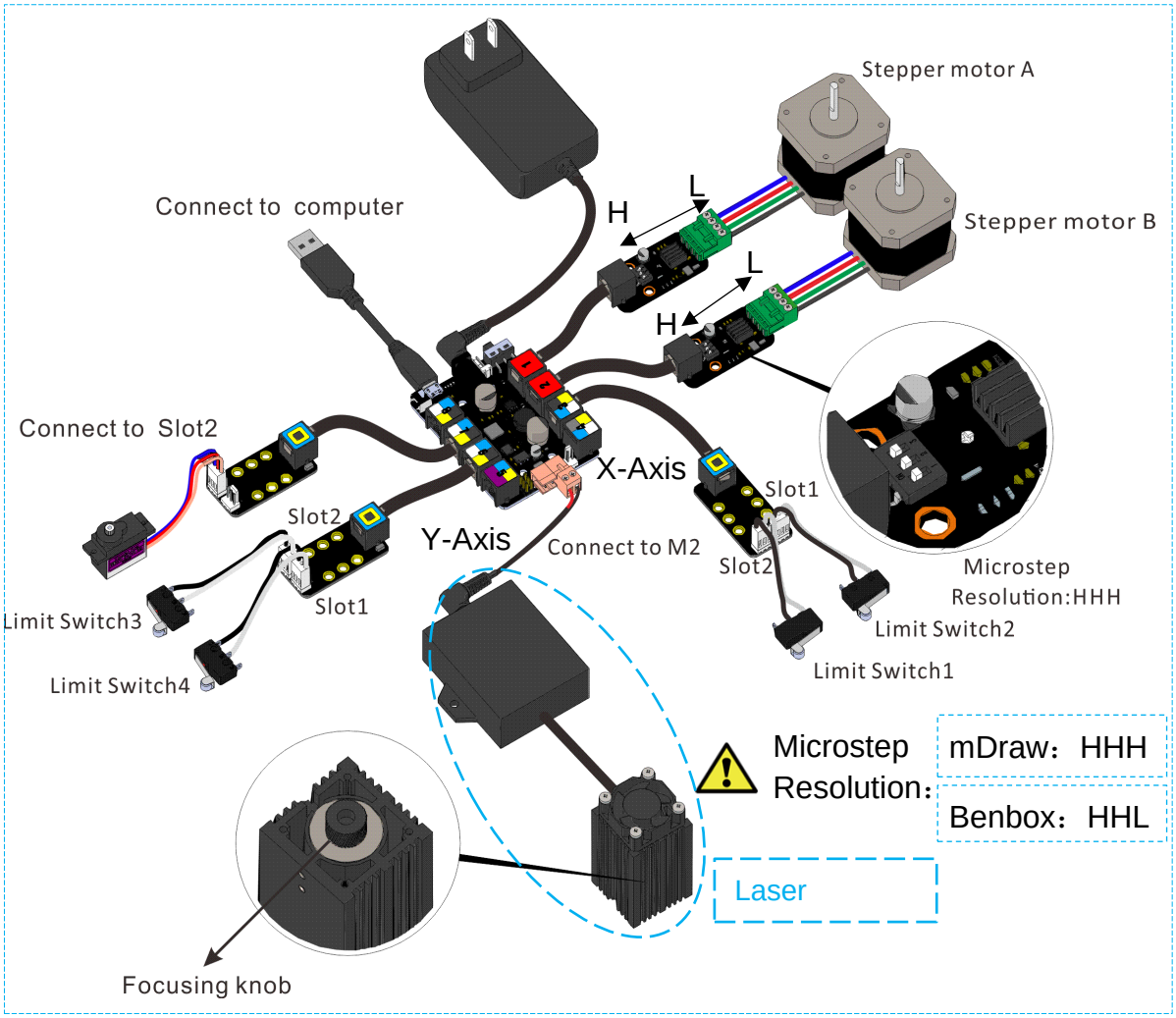
Limit Switch 1 → Slot2 on Me RJ 25 Adatpter 1
Limit Switch 2 → Slot1 on Me RJ 25 Adatpter 1
6P6C RJ25 Cable-20cm → Me Baseboard Port3

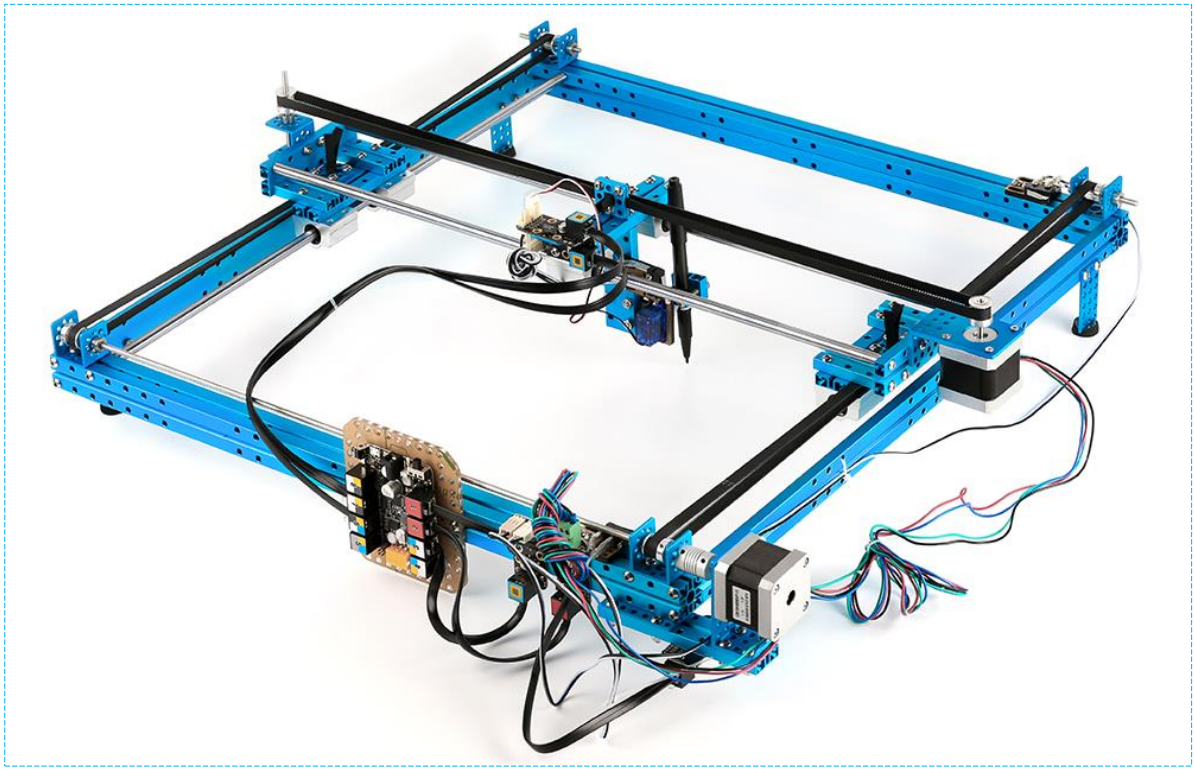
Limit Switch 3 → Slot2 on Me RJ25 Adatpter 3
Limit Switch 4 → Slot1 on Me RJ25 Adatpter 3
6P6C RJ25 Cable-50cm → Me Baseboard Port6

9g Micro Servo → Slot2 on Me RJ25 Adatpter 2
6P6C RJ25 Cable-50cm → Me Baseboard Port7

42BYG Stepper Motor A (X-Axis) → Me Stepper Driver 1
6P6C RJ25 Cable-35cm → Me Baseboard Port1

42BYG Stepper Motor B (Y-Axis) → Me Stepper Driver 2
6P6C RJ25 Cable-20cm → Me Baseboard Port2

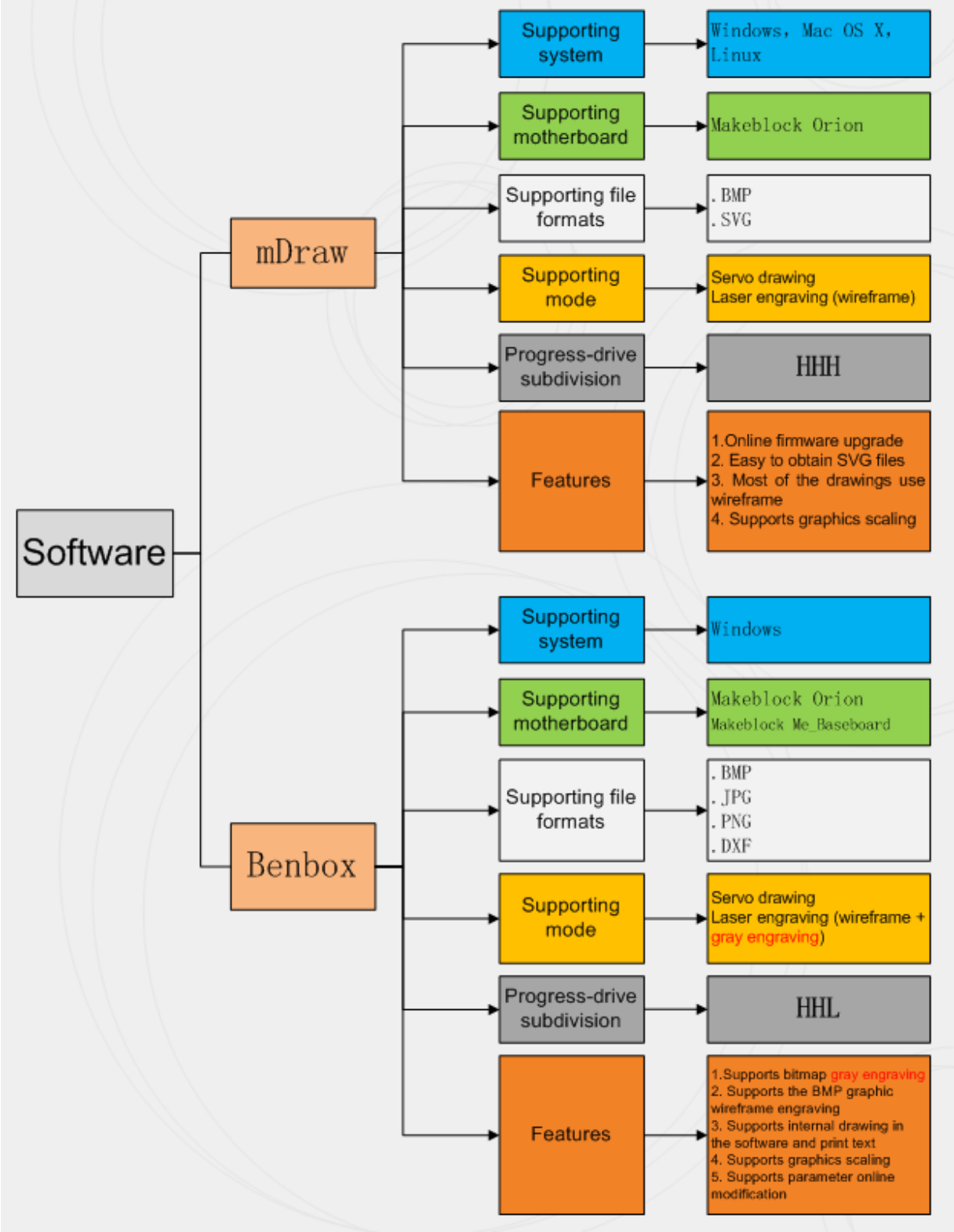

Stepper motor A
Stepper motor B
Connect to computer
H
L
H
L
Connect to Slot2
X-Axis
Slot1
Slot2
Y-Axis
Connect to M2
Slot2
Slot1
Microstep
Resolution:HHH
Limit Switch3
Limit Switch4
Limit Switch2
Limit Switch1
Microstep
Resolution:
mDraw：HHH
Benbox：HHL
Laser
Focusing knob



After you finishing this step, congratulations! You can move forward to the next stage – using mDraw or Benboxto control your robot. Here you go the introduction of software mDraw and Benbox.

V. Software

XY plotter V2.0 can be controlled with two software: 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 the operation. Depending on your drawing requirements, please select the software on your own.

VI. Use mDraw Software

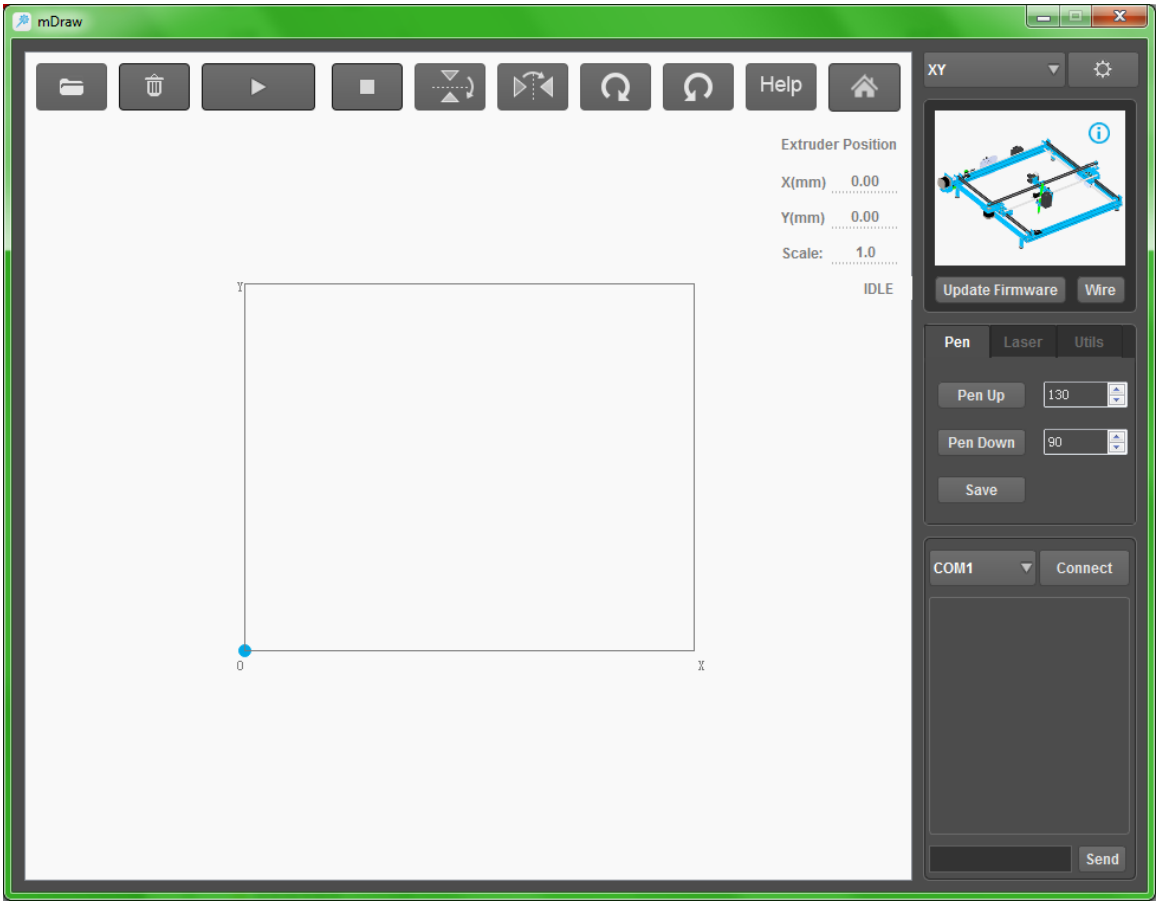
a). Introduction to mDraw

mDraw is an cross-platform open-source software developed by Makeblock.

Compatibility: mDrawBot (mScara, mCar, mEggBot, mSpider), XY Plotter kit (servo mode, laser mode)

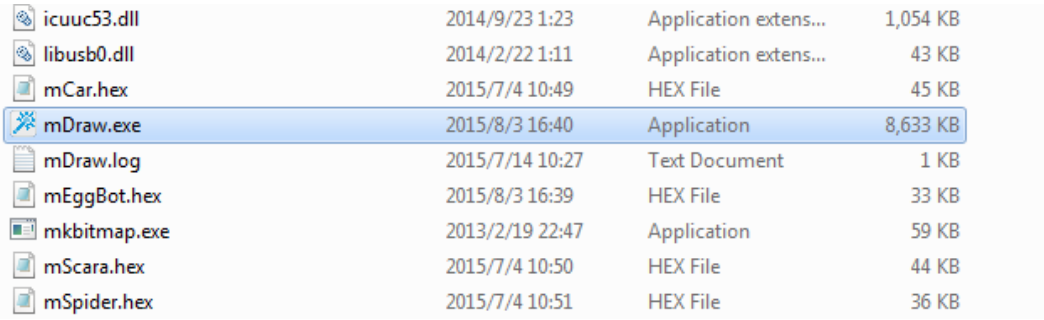
OS Environment: Windows, Mac, Linux

Supported File Type: *.svg, *.bmp (convert to *.svg)



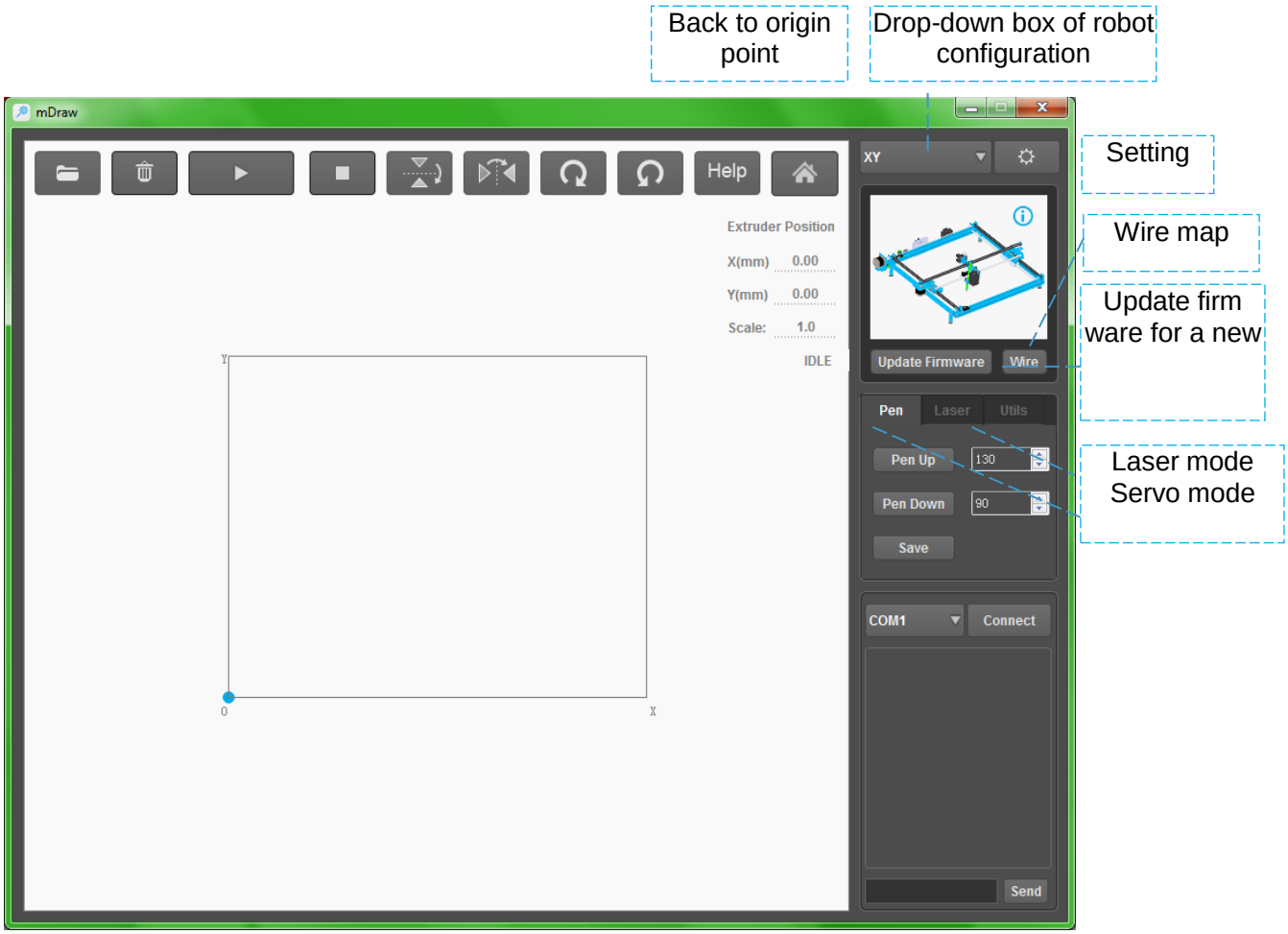
b). Installation

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)



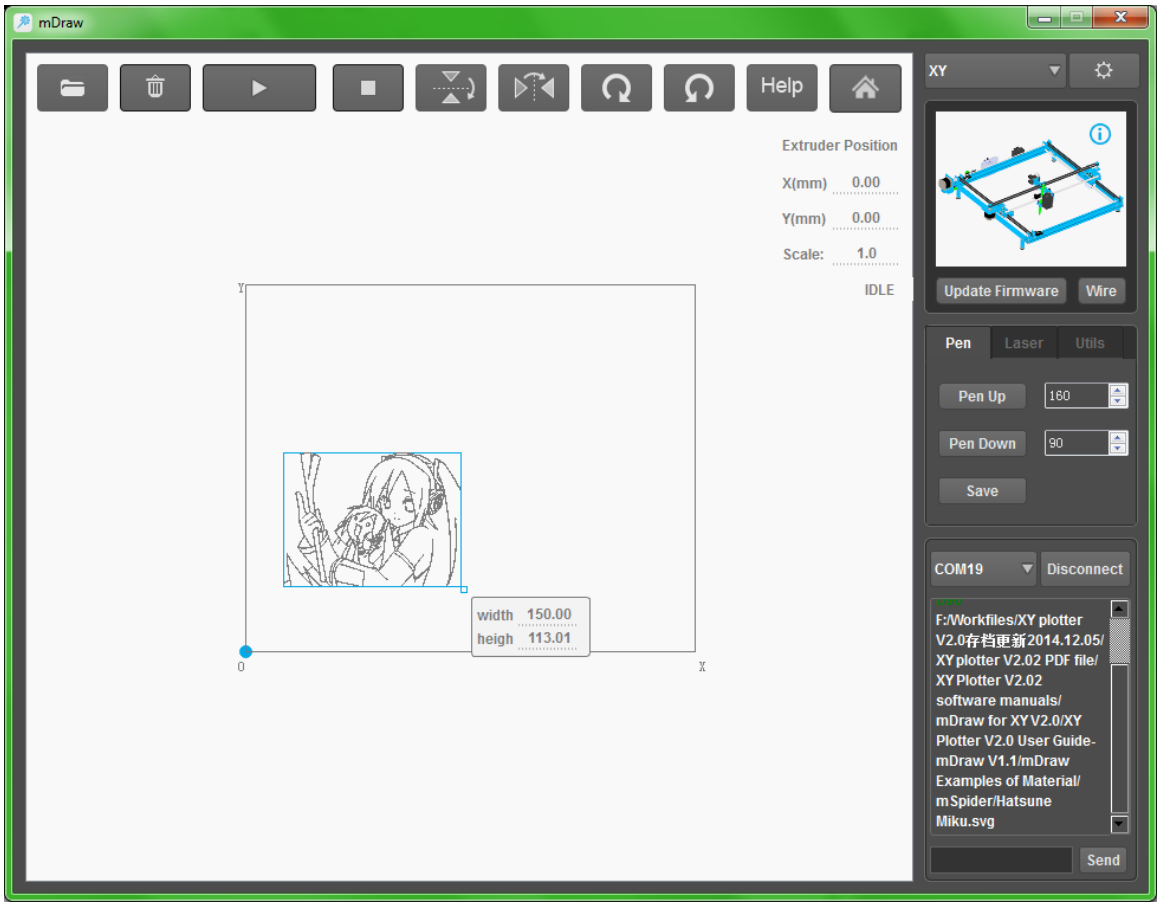
c). Button Function in Main UI

Click in the Drawing zone, robot will move accordingly. Drag the loaded SVG graphics in drawing zone could adjust the size and position of graphics. Size can be adjusted by inputting values in the right-down window directly.



Load in BMP file, mDraw will pop out a dialogue for converting SVG file. Follow the prompts, BMP file can be converted into SVG file.

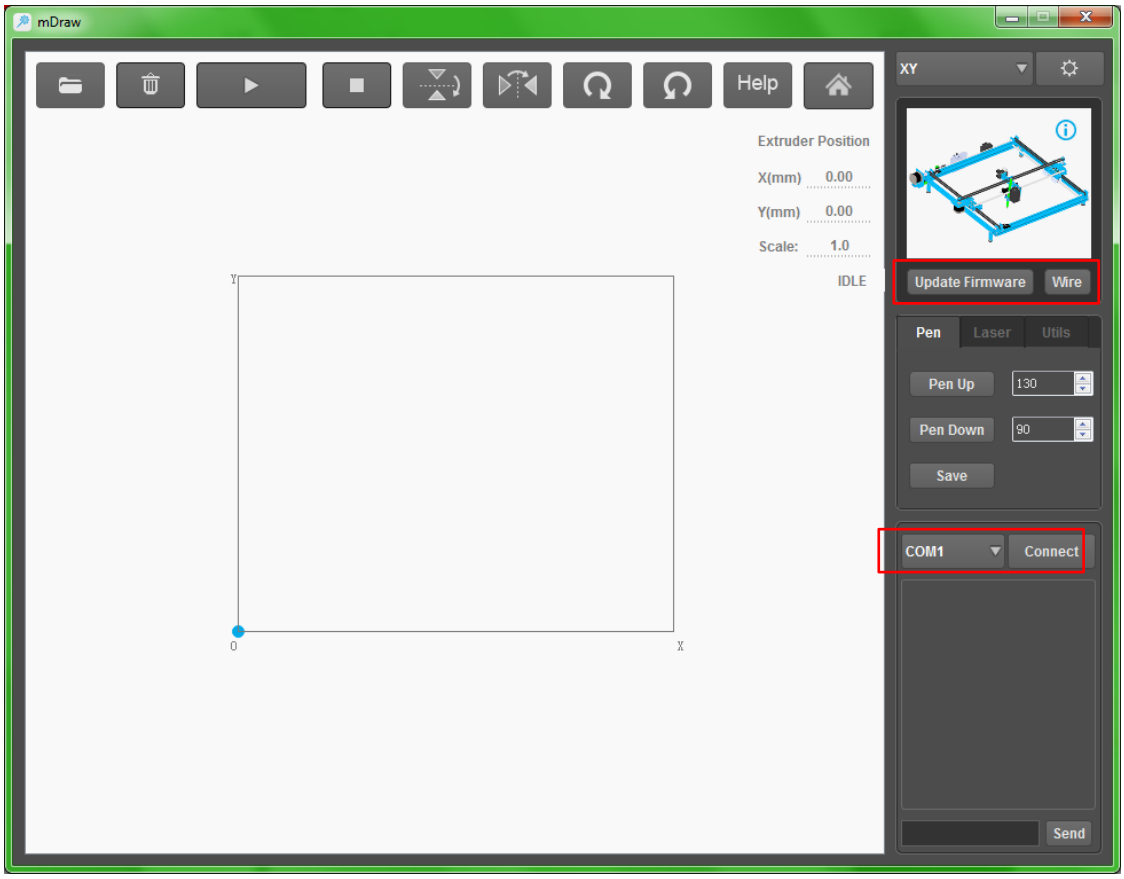
Load in SVG file(…\mDraw Examples of Material\mSpider\HatsuneMiku.svg), drawing is as follows.



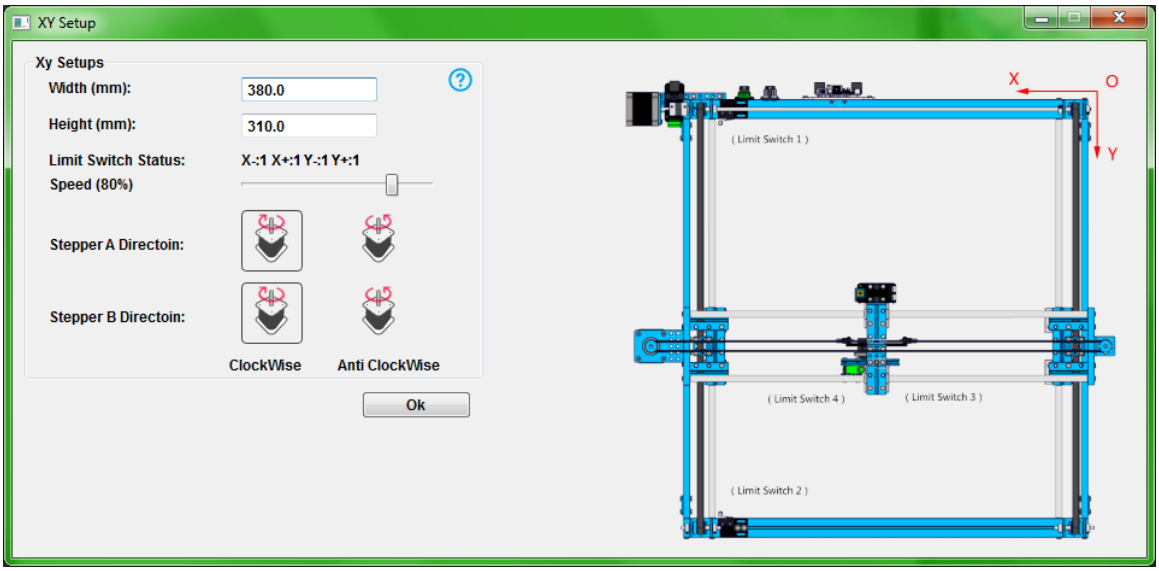
d). Setting

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 upgrade and ensure the normal operation of XY Plotter V2.0.)

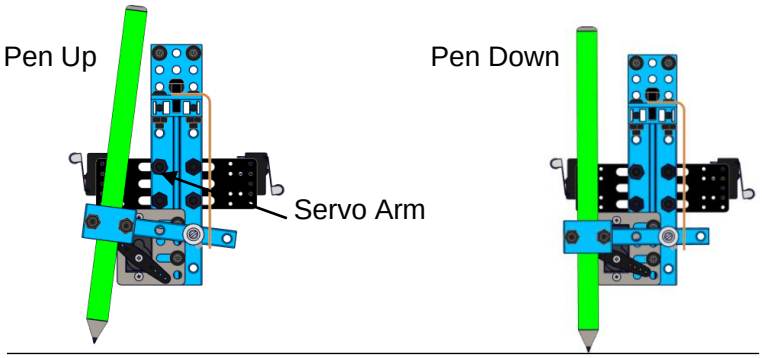


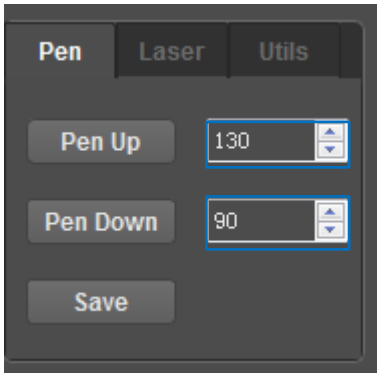
c. Click button ☼ to enter the setup window. Generally default value is fine, you can revise parameters per your own necessary.



d. Click Pen button to switch to the servo pattern, and then calibrate Pen Down and Pen Up parameters.

Input value of Pen Up and Pen Down in mDraw, and observe the movement of mDrawBot. If the feedback is correct as below, that means your settings are correct.[1]。





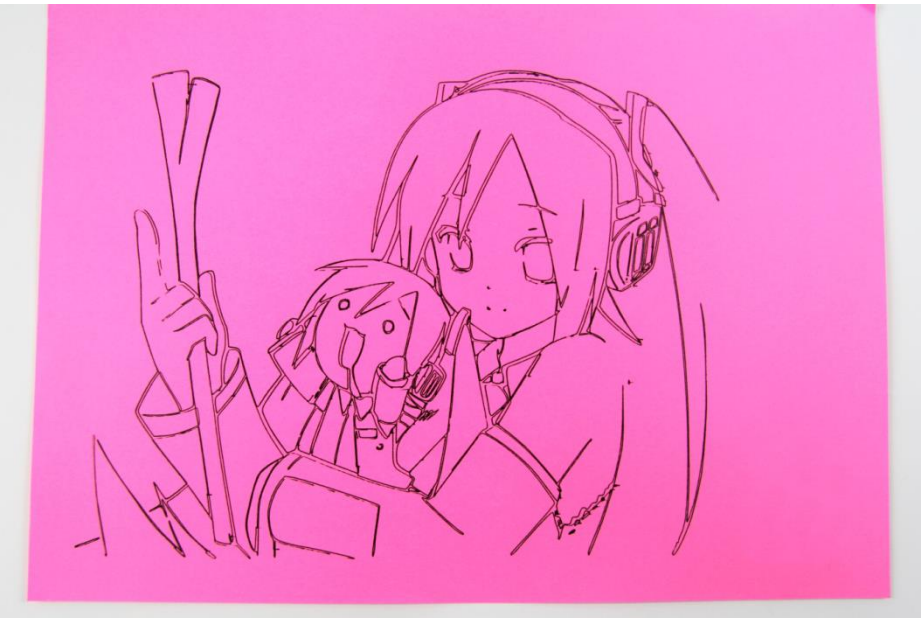
Note: the default value here is only for reference. In actual use please apply the value you got after adjusting the servo arm.

e. Please put the imported graphics files in the rectangular area, and will show abnormal if it exceeds the scope of the drawing.

f. Click icon before making the drawing, and reset to zero.

g. When everything is ready, you can import graphics in SVG format (… \ mDraw Examples of Material \ mSpider \ HatsuneMiku.svg), adjust the position. Set servo pen up parameters shown in the upper right, then click Start to start drawing. The rendering results are shown as below

[1]If the servo arm cannot reach to below angle, please uninstall the servo arm to re-adjust the installation angle. Please adjust the tightness of rubber band if necessary.



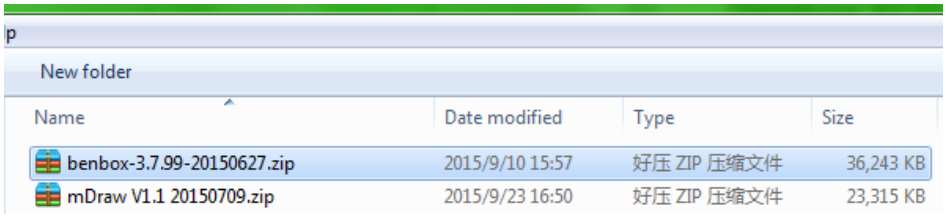
VII. Use Benbox Software

a). Benbox features introduction

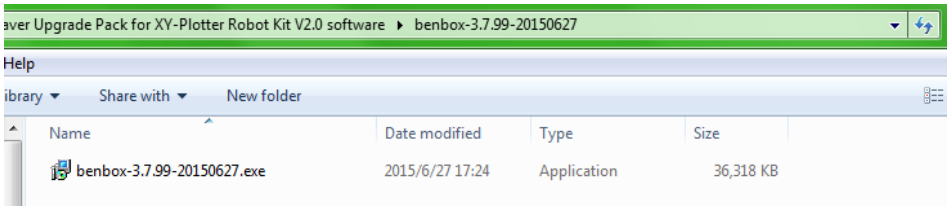
The current Benbox software version only supports Windows systems. It also supports servo mode and laser mode. The prominent feature contains supporting gray engraving, and you can edit graphics and text within the software.

VIII. Software downloading.

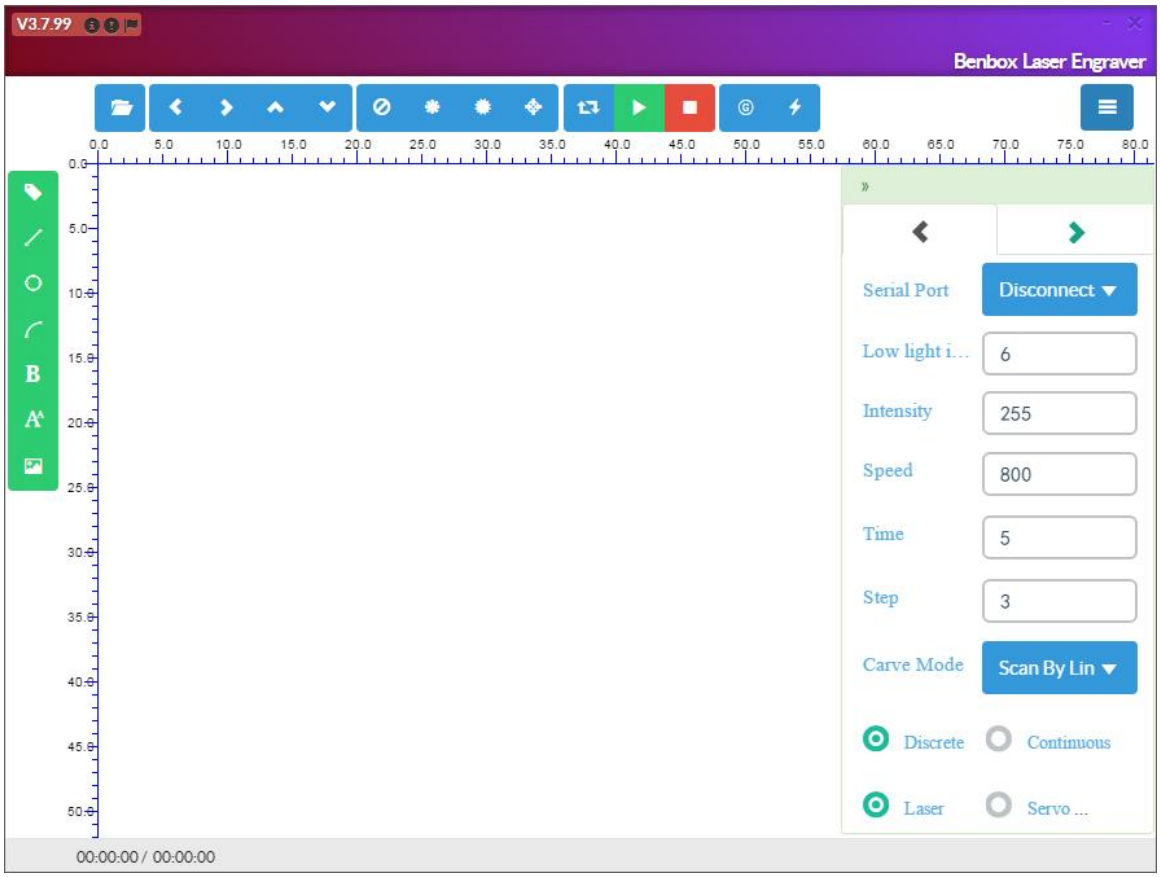
Download address for software package (online download address:https://www.dropbox.com/s/32fi2imemn4tpw0/benbox-3.7.99-20150627.zip?dl=0)



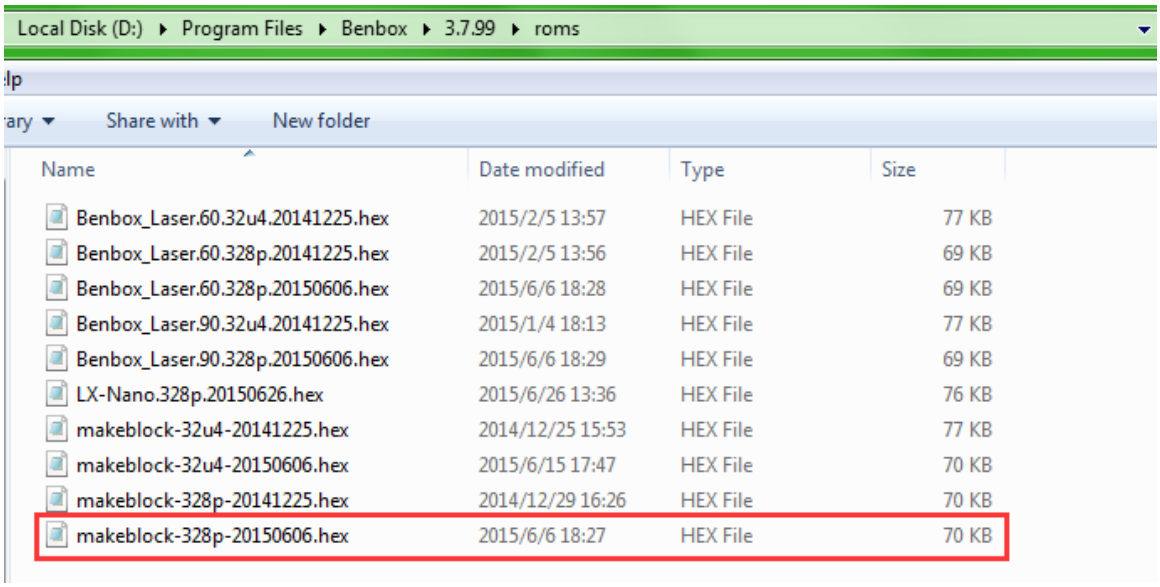
a). Benbox software installation



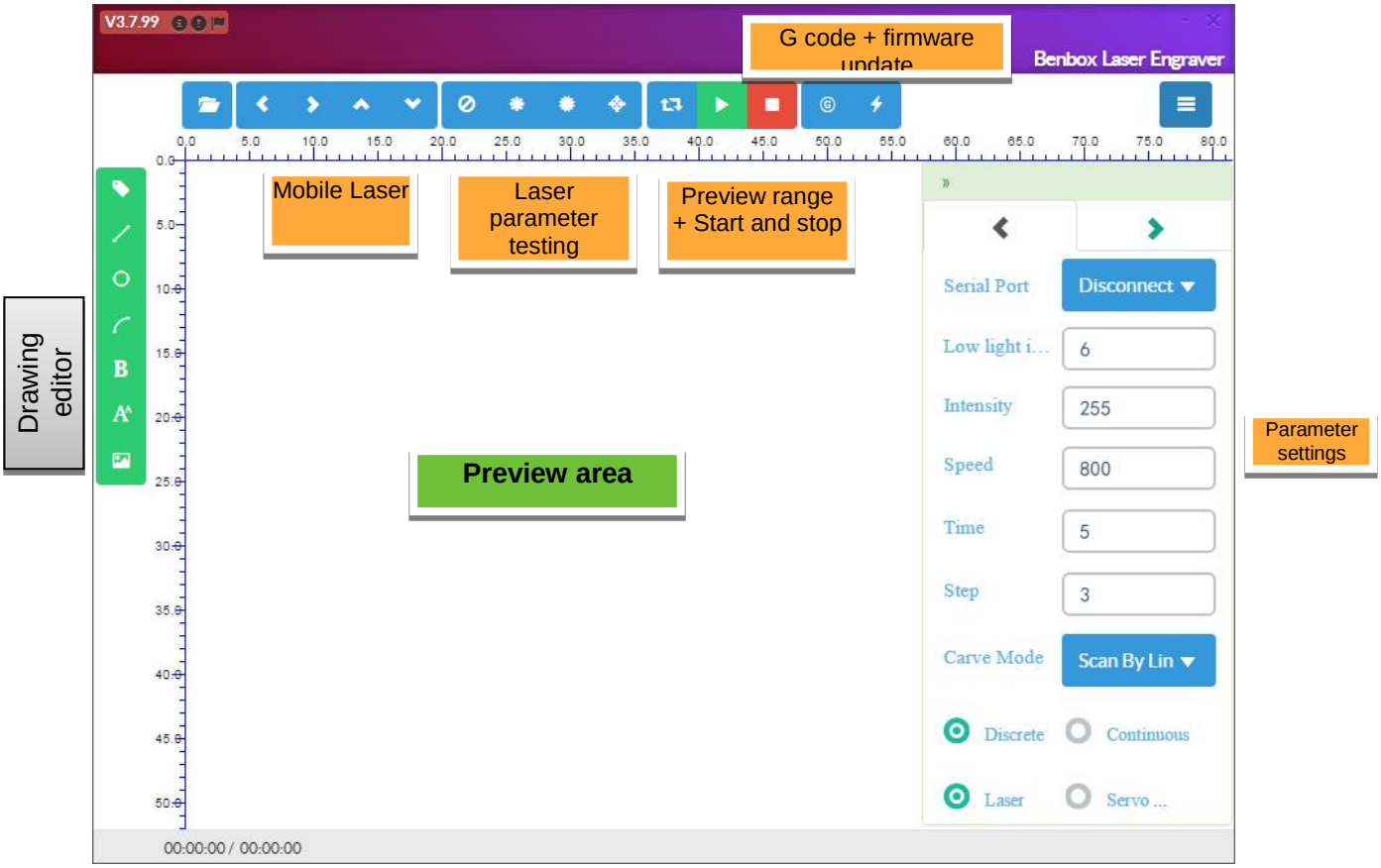
(1) Follow the prompts to install the software, the interface is shown as below after completing the installation.



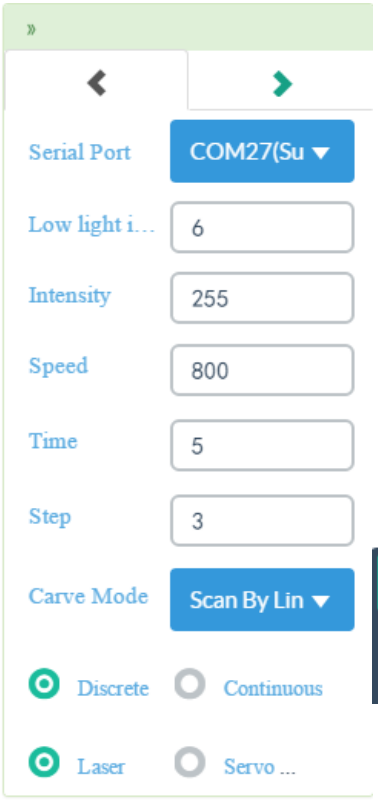
(2) The firmware used by Makeblock Orion motherboard is located under the installation directory address. We will use it later

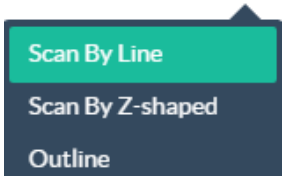


b). Main interface function



IX. 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): Stepping speed. The minimum is 0 and the maximum is 3000. If the vector drawing speed sets to 1500-3000, the waiting time for penup and down can be set to 50-250ms.

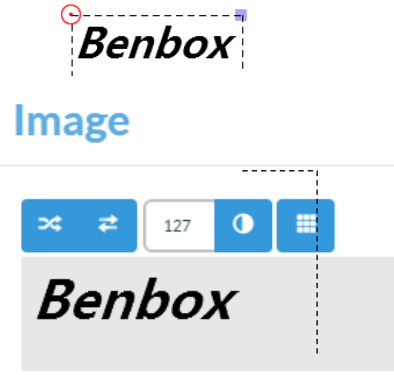
4.Wait time (ms): waiting time for penup and down.

5. Drawing 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, adjust 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 drawing mode. (Notes: BMP format also can recognize the outline, and the vector drawing mode can be used.)
2. ： Move the pen holder up and down and right and left, but the moving distance shall set the number of stepping
3. Pen up rendering preview
4. Pen down rendering preview
5. Servo parameter setting test
6. Walking frame, which is used to preview and test the size and position of drawing image
7. Start/Pause drawing
8. Stop drawing
9. G-code control, and ordinary users will not use it
10. 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 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 drawing 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.

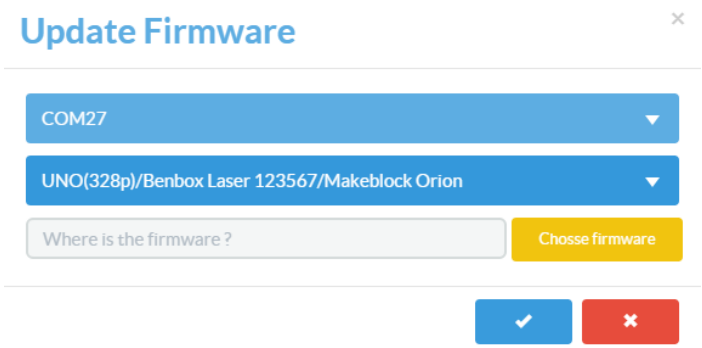
X. Software initialization setting

a). Check connections

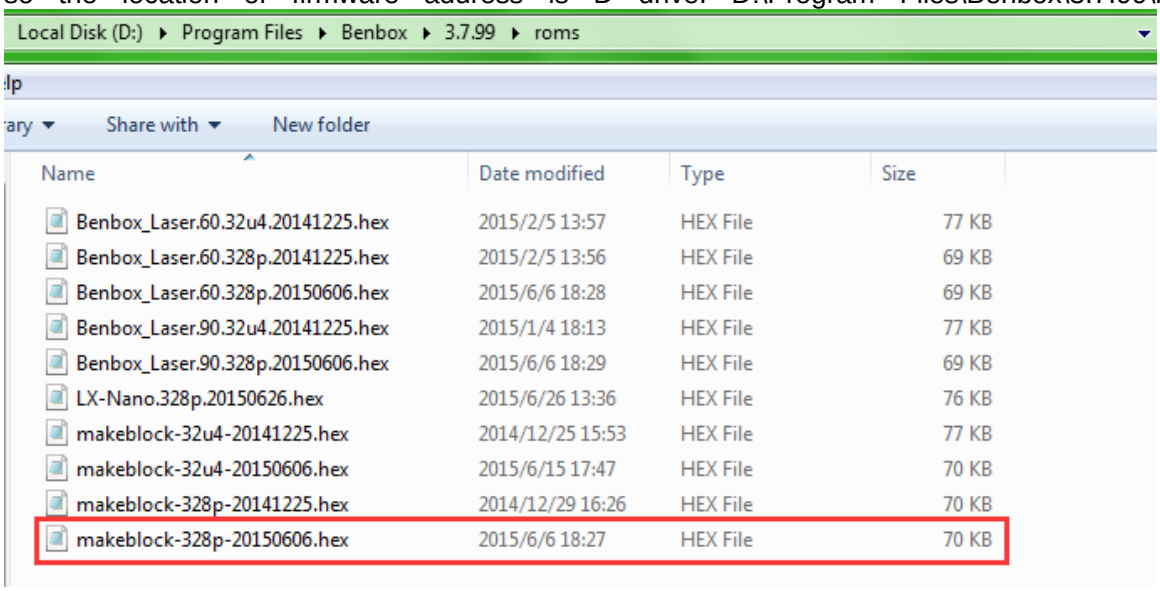
1. ***Refer to the electronic circuit connection section.*** Note: Two stepper drives are subdivided into: HHL

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

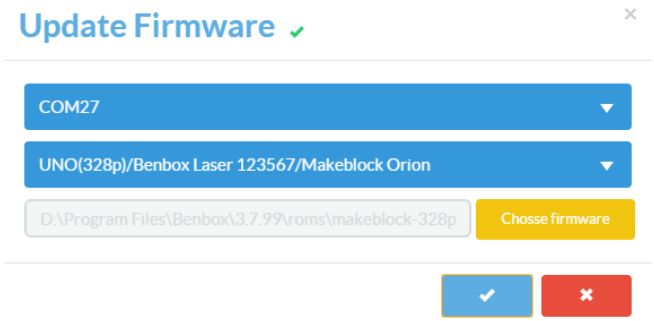
1. Click icon to display the following interface



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)



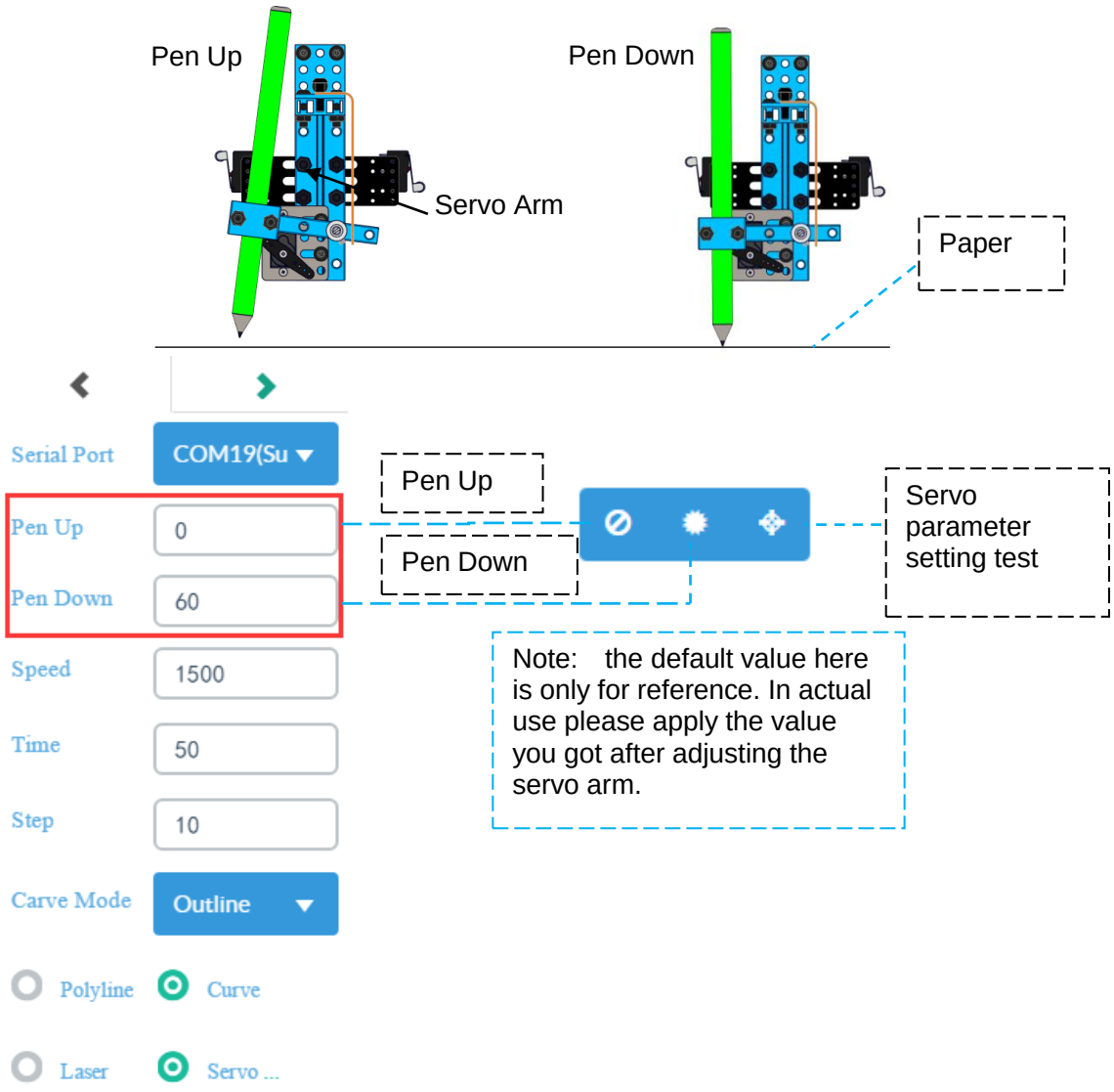
c). Calibrate the setting of pen-agency and pen up and down parameters

1. Move the pen 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, and click Servo ... to enter the Servo mode.

3. Enter 0 in the Pen Up (or 30 or 60, the size range is 0-180), and then click to observe whether the pen is lifted off the paper I've found that the value 0 meets the penlift requirements, so it is set to 0.

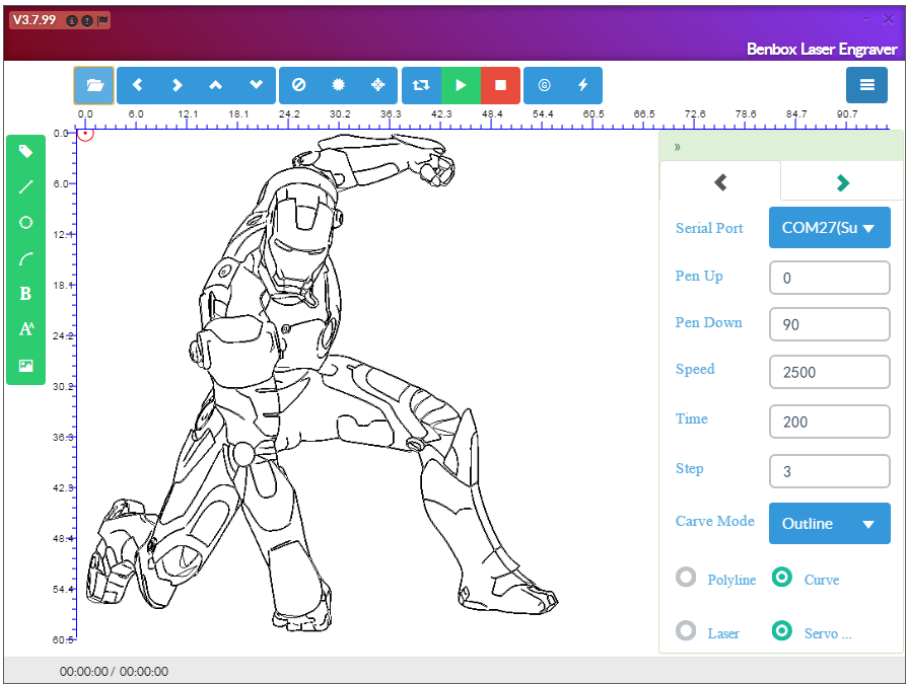
4. Similarly, Enter 0 in the Pen down (or 30 or 60, the size range is 0-180), and then click to observe whether the pen is located under the paper, I've found that the value 60 meets the requirements of placing pen, so it is set to 60.

5. Click to test the result of pen up and down. If you find that the pen up and down do not meet the requirement, please change the parameters. While the servo response time may be extended, it can be set to 50-250ms. (Time 50 - Time 250)

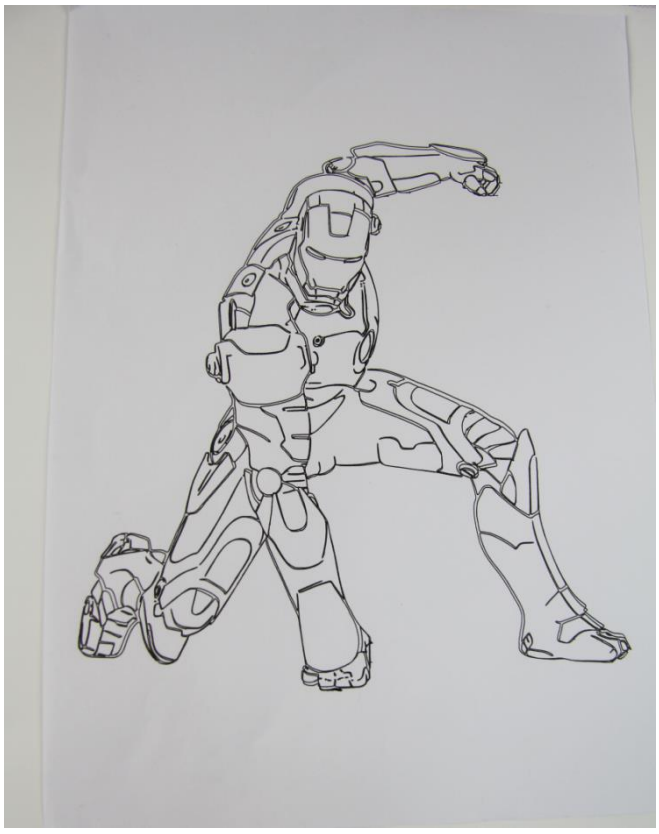


XI. Vector DXF drawing example - Iron Man Drawing

1. Open Directory ⋯ and find Man.bmp file in the \Laser upgrade pack download\BenBoxExamples of material, and set the following parameter. The PenUp and PenDown are used for reference, the value for each machine will be different. (Note: please use Outline)



2. Check the power, penup setting, serial port settings, click function, observe drawing range and adjust the position.
3. Click to start drawing.
4. The drawing renderings are shown as below.



XII. 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.

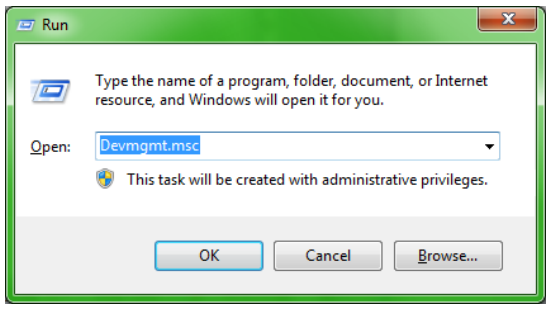
Dowonload link: http://learn.makeblock.cc/driver_installation/

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 draw the bitmaps with large size. If you need to draw relatively large or complex images, please be patient to wait for software response, and its response time is 10min-30min. The largest drawing area of this drawing machine is 310mm × 390mm.

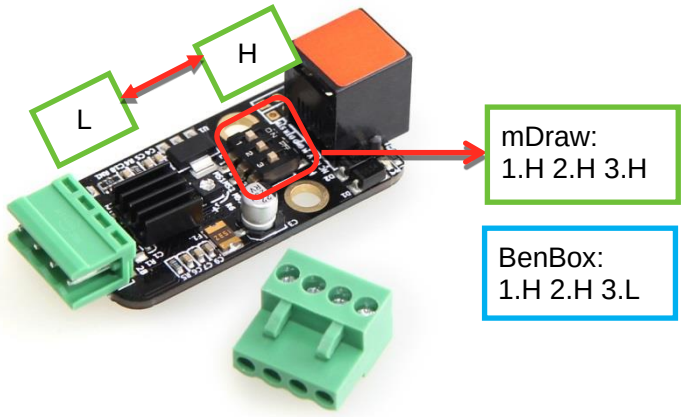
Question 3. Why it takes much longer time to open DXF?

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 websitewww.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 5. 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

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XIII. Thanks!

Thanks to the software provided by our Partner Benbox companies, we can quickly launch this XY plotter V2.0 platform-based laser engraver upgrade pack. 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

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