KOSSEL

Pulley   Linear Plus   Linear

Think big, make bigger.

Safety Instructions

Please read the safety instructions carefully before get started.

ANYCUBIC 3D printer generates high temperature. Do not reach inside of the printer during operation. Allow time for the printer to cool down after printing. Contact with the extruded material may cause burns. Wait for printed objects to cool before removing them from the build platform.

ANYCUBIC 3D printer includes moving parts that can cause injury.

Vapors or fumes may be irritating at operating temperature. Always use the **ANYCUBIC** 3D printer in an open, well ventilated area.

Be cautious when using the scraper. Never direct the scraper towards your hand.

The **ANYCUBIC** 3D printer MUST NOT be exposed to water or rain.

The **ANYCUBIC** 3D printer is designed to be used within ambient temperature ranging 8 ℃-40 ℃, and humidity ranging 20%-50%. Working outside those limits may result in low quality printing.

In case of emergency, immediately turn off the **ANYCUBIC** 3D printer.

It is recommended to use protection glasses when cleaning/sanding printed models to avoid small particles contacting eyes.

Never leave the **ANYCUBIC** 3D printer unattended during operation.

Technical Specification

PRINTING

Printing Technology:	FDM (Fused Deposition Modeling)
Build Size:	Ø180×300 mm (Ø230×300 mm for Linear Plus)
Layer Resolution:	0.1-0.4 mm
Positioning Accuracy:	X 0.01mm
	Y 0.01mm
	Z 0.01mm
Extruder Quantity:	Single
Nozzle Diameter:	0.4 mm
Print Speed:	20~80mm/s
Travel Speed:	150mm/s
Supported Print Materials:	PLA, ABS, HIPS, Wood

TEMPERATURE

Ambient Operating Temperature:	8℃ - 40℃
Operational Extruder Temperature:	275℃
Operational Print Bed Temperature:	N/A

SOFTWARE

Slicer Software:	Cura
Cura Input Formats:	.STL, .OBJ, .DAE, .AMF
Cura Output Formats:	GCode
Connectivity:	SD Card, USB Port (expert users only)

ELECTRICAL

Input Rating:	100-240V AC, 50/60Hz, 1.5A

PHYSICAL DIMENSIONS

Printer Dimensions:	315mm (Δ) × 680mm (Height)
	380mm (Δ) × 680mm (Height) for Linear Plus.
Weight:	~5kg-Pulley, ~6kg-Linear, ~6.8kg-Linear Plus

Assembly Instructions

If you have any question or suggestion, please contact us on james@anycubic3d.com or leafy@anycubic3d.com.

Parts List

No.	Items/Quantity	No.	Items/Quantity
A01	Top triangle ×3	B01	XYZ Motor ×3 (with wire)
A02	Bottom triangle ×3	B02	Print head set ×1
A03	Effector ×1	B03	4010 fan ×1 (with wire & end)
A04	Horseshoe fixture ×1	B04	4010 air blower ×1 (with wire & end)
A05	Radiator cover ×1	B05	Limit switch ×3
A06	Air nozzle ×1	B06	Wire for limit switch×3 pairs
A07	Belt tensioner ×3	B07	Wire terminal for limit switch ×3
A08	Stop blocks ×6 (Pulley×3)	B08	Extrusion motor ×1
A09	Carriage ×3 (Pulley only)	B09	ANYCUBIC mainboard ×1
A10	Extrusion bearing holder ×1	B10	Al-fin ×5
A11	Extrusion fixture ×1	B11	A4988 driver ×5
A12	Extruder rack ×1	B12	LCD 2004 ×1 (with pin board & wire)
A13	Shaft sheath ×1	B13	USB wire ×1
A14	Mainboard holder ×1	B14	Power adaptor ×1
A15	LCD cover ×1	B15	SD card ×1
A16	Limit blocks for print platform ×6		
C01	M5*25 screw ×9 (Pulley only)	D01	240mm Al-extrusion ×9 (300mm for Linear Plus)
C02	M3*20 screw ×9	D02	680mm Al-extrusion ×3
C03	M3*16 screw ×17	D03	Idler wheel ×3
C04	M3*12 screw ×1 (Pulley ×14)	D04	Synchronizing wheel ×3
C05	M3*10 screw ×8	D05	Carbon fiber tube set ×6
C06	M3*8 screw ×50 (Pulley ×20)	D06	450mm Linear rail ×3 (Linear only)
C07	M2.5*12 screw ×11	D07	Pulley wheel (Bearing) ×9 (Pulley only)
C08	M2*5 screw ×8	D08	4.5m Synchronous belt ×1
C09	Ø4-7-0.5 washer ×2	D09	Belt tension spring ×3
C10	M3 flange nut ×18 (Linear only)	D10	Extrusion wheel ×1
C11	M4 square nut ×67 (Pulley ×64)	D11	Extrusion bearing ×1
C12	M5 hex nut ×9 (Pulley only)	D12	Extrusion spring ×1
C13	M4 hex nut ×3	D13	M6 Quick connector ×1
C14	M3 hex nut ×16 (Pulley ×19)	D14	0.6m PTFE feeding pipe ×1
C15	M4*8 screw ×6	D15	0.8m Strap ×1
C16	M4*10 screw ×59 (Pulley ×56)	D16	PTFE washer ×4
C17	M4*12 screw ×1	D17	Ø200mm Glass plate ×1 (Ø240mm for Linear Plus)
C18	M4*25 screw ×3		
Other			
Hex key set (1.5/2/2.5/4mm) ×1		Rubber glove ×1 pair	
Test filament ×1			

Mechanics

Fasteners Listing

C01. # M5×25

C02. # M3×20

C03. # M3×16

C04. # M3×12

C05. # M3×10

C06. # M3×8

C07. # M2.5×12

C08. # M2×5

C09. Ø4 washer

C10. M3 flange nut

C11. M4 square nut

C12. M5 hex nut

C13. M4 hex nut

C14. M3 hex nut

C15. * M4×8

C16. * M4×10

C17. * M4×12

C18. * M4×25

#Hexagon socket head cap screw
*Hexagon socket button head screw

Note: A flat surface is recommended for the assembly. Hex keys are available within the package. Take care of the scrap when unpack Al-extrusions and keep it away from children.

1. Top and bottom triangle

Step 1. Firstly, hang but not tighten 5 pairs of C16 and C11 onto A01 as shown in Fig 1. Then push an Al-extrusion (D01) through two screws along A01 and tighten the corresponding screws. Lastly, fix one pair of C13 and C18 onto A01 as shown in top-left.

Back side

5×C16

5×C11

C13+C18

A01

D01

Tightening after Al-extrusion slide in.
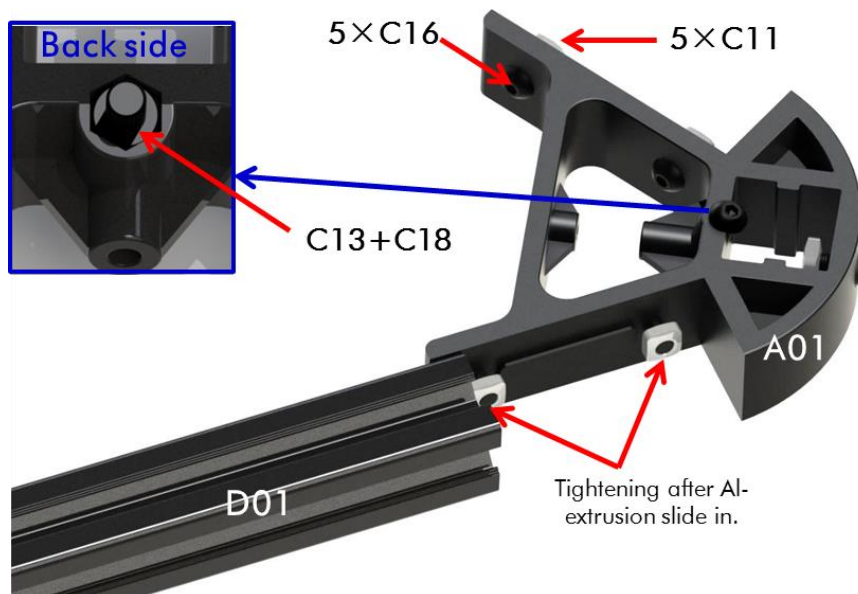
Fig 1

Step 2. Place 3 pieces of assembled A01 and D01 on a flat surface with back side face down, as shown in Fig. 2. Then, follow the blue arrows, slowly push forward those 3 parts to

form a triangle and tighten the corresponding screws (red arrows).
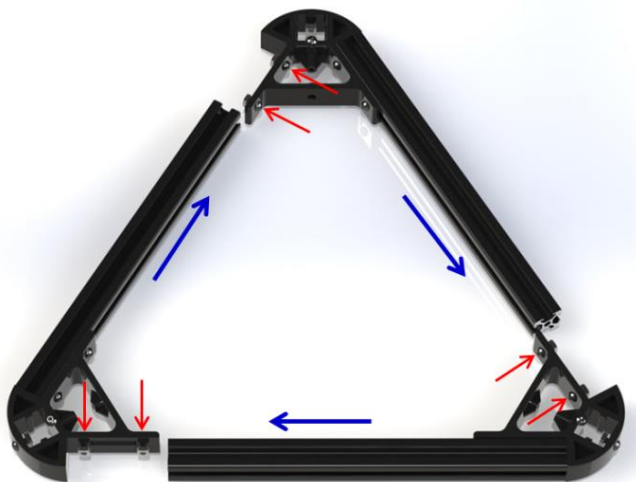
Fig. 2

Step 3. Fig. 3 shows the assembly details of one of the three corners of the top triangle.
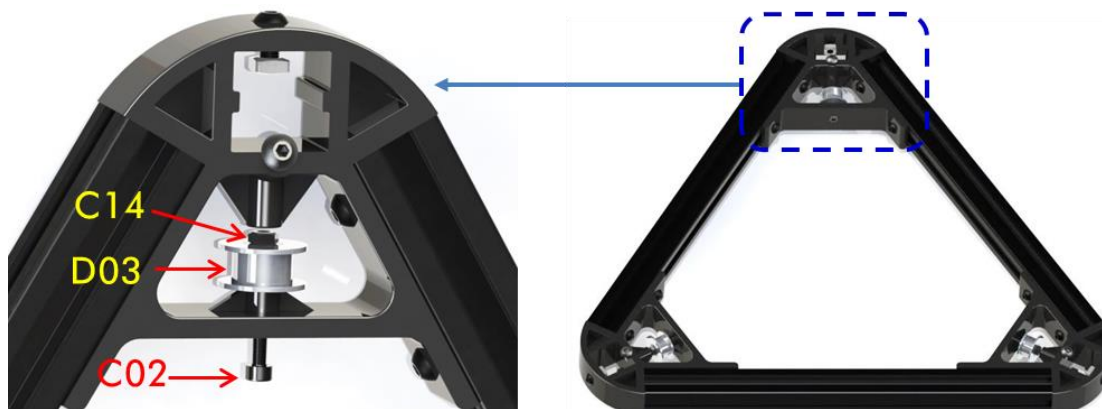

C14

D03

C02

Fig. 3

Step 4. The assembly of bottom triangle is the same as the top, except 10 pairs of C16 and C11 and 2 pairs of short Al-extrusion are used for A02, which is show in Fig. 4.

A02

The bottom side is defined by this hole, which is for the wiring of limit switch.

Fig. 4

Step 5. After 3 pieces of assembled A02 are ready, push them forward simultaneously to form the bottom triangle and then tighten the corresponding screws, just as Fig. 5 shows.
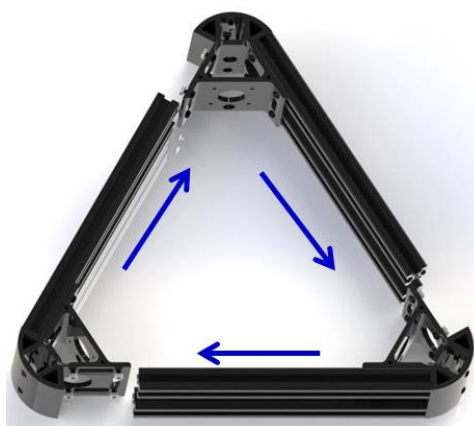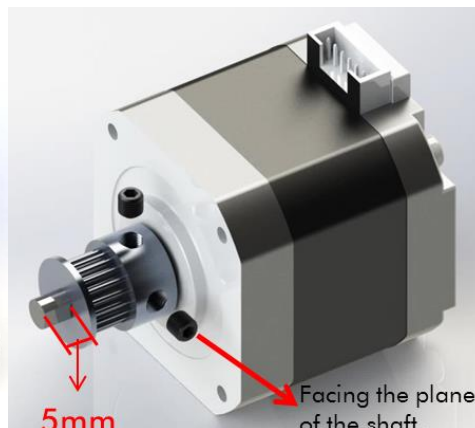
Fig. 5   Fig. 6

Step 6. Fig.6 shows the assembly of 3 stepper motors. After assembly, using C06 to fix those motors to each corners of the bottom triangle as demonstrated in Fig. 7. Make sure the sockets of the motors face up.

Fig. 7

2. Effector

Step 1. Before installation, detach the heat rod and thermistor from the hot end set. Then install the Hot End to the radiator cover (A05) by a horseshoe (A04), as shown in Fig 8. Leave the C06 screws untightened in order to adjust the hot end angle later if necessary.

4×C05 (3)   4×C08 (4)

A03   A06

(5)   (6)

4×C05   4×C08

B03 →   B04
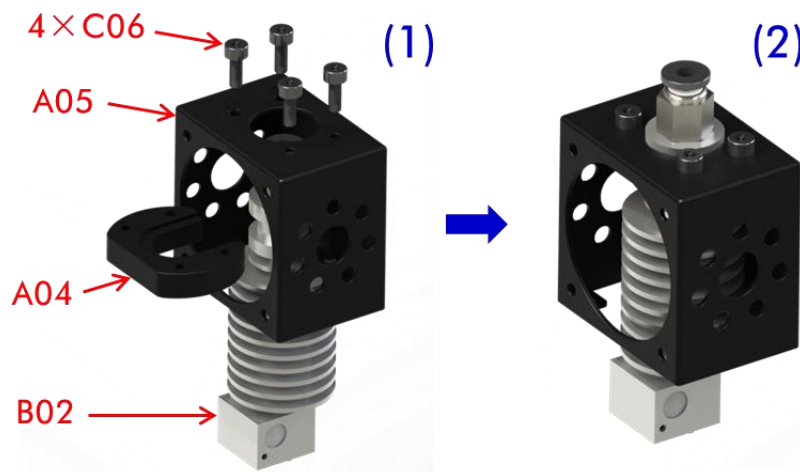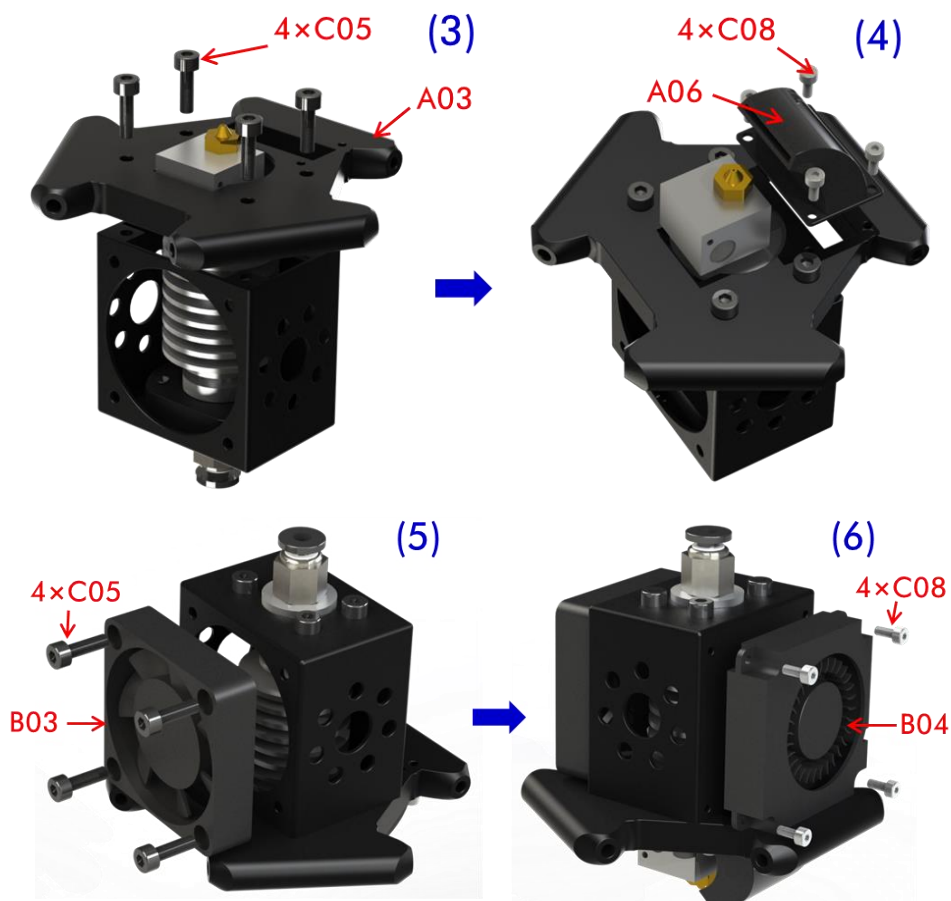
Fig. 8

Step 2. As shown in Fig. 8 (3) and (4), find the suitable angle to fix the Hot End into A03. Then fix the heat rod and thermistor back. After, use 4 pieces of C08 to fix the air nozzle (A06). Lastly, fix B03 and B04 (fans) to the correct side of the radiator cover.

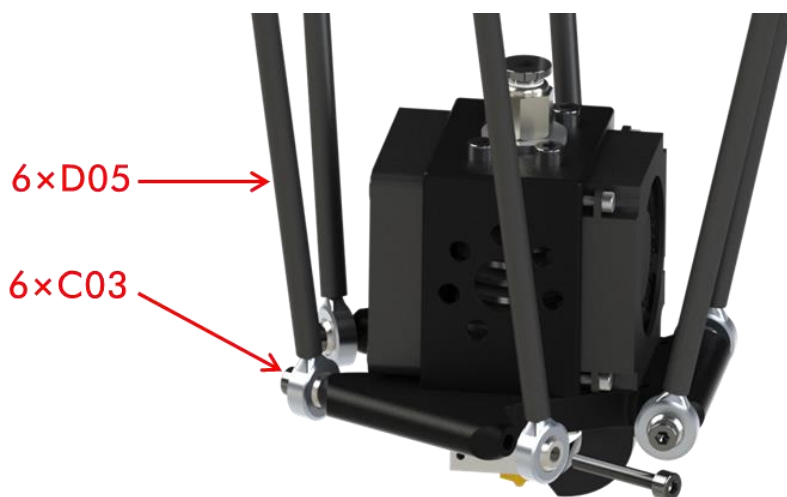**Step 3.** Fix 6 carbon fiber tubes (CFT, D05) onto A03 using C03 screws, as shown in Fig. 9.

6×D05 ——→

6×C03 ——→

Fig. 9

Step 4. Fig. 10 shows the assembly of 3 belt tensioners which connected to the CFTs. Please note the suggested height of the top screws (C07) is 8mm.

Fig. 10

3. Slide guide (Linear and Pulley)

The operation of effector depends on the linear motion of each belt which is connected to stepper motor. The type of motion guide is divided into Linear and Pulley. The assembly of those two types will be introduced in the following section.

First of all, find 3 pieces of long Al-extrusions and fix them from the upper side to the bottom triangle as shown in Fig. 11. If choose the wrong side, the Al-extrusion would not fit in. Next, tighten the corresponding screws at each corner which is shown by red arrows.

Fig. 11

The following section is interpreted based on two different types, Linear and Pulley.

(1) Linear Version

Step 1. Firstly, hang 6 pairs of C06 and C10 with proper interval onto the linear rail (D06) as demonstrated in Fig. 12. In total there are 3 rails and the assembly is the same.
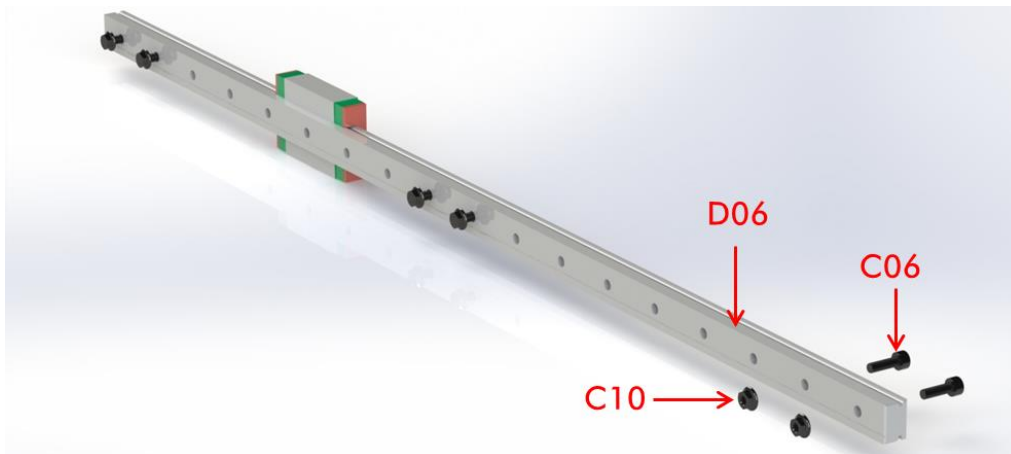
5

Fig. 12

Step 2. Prepare 2 pieces of stop blocks (A08) with C16 and C11. Then push down one of the stop blocks, the linear rail, and the other stop block sequentially along with the long Al-extrusion as shown in Fig. 13. The suggested distance between the stop block and the top of the long Al-extrusion is 30mm. Do the same to the rest of the 2 long Al-extrusions.
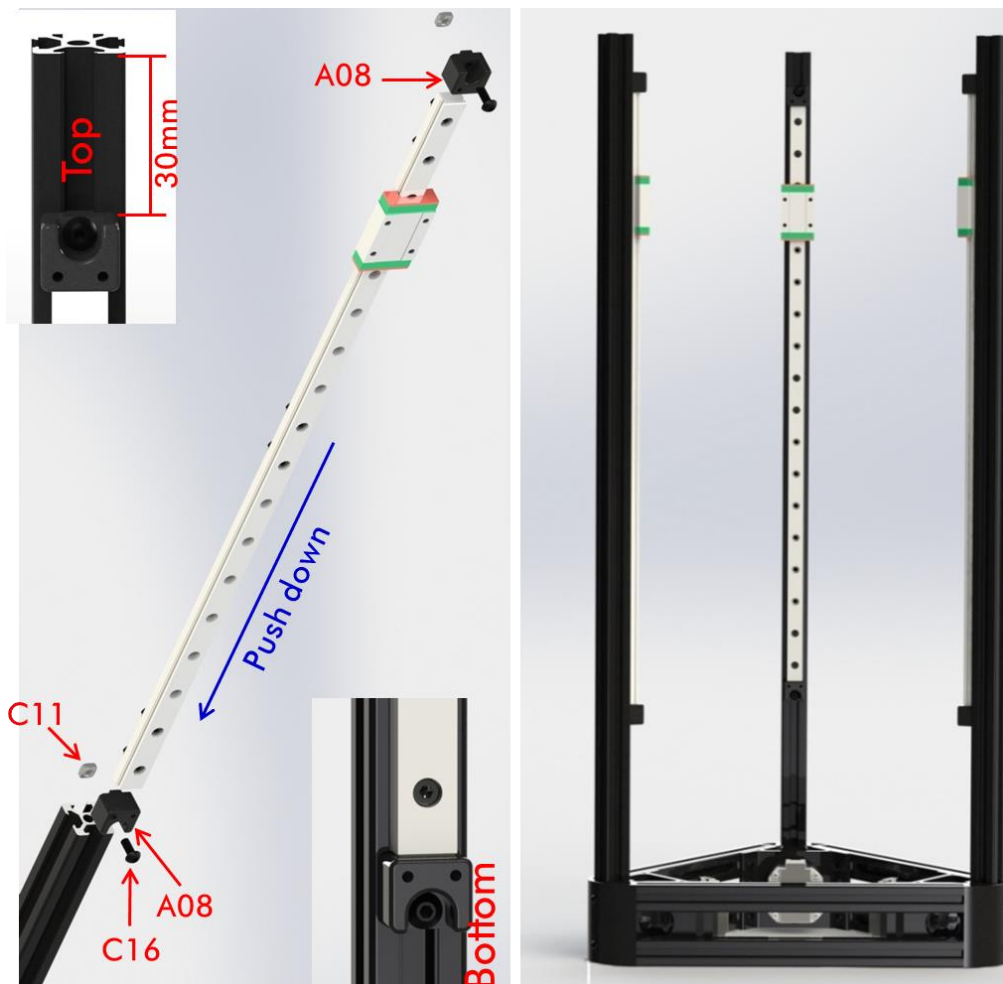

Fig. 13

Step 3. Use 4 screws (C06) to fix belt tensioner onto the linear rail as shown on the left of Fig. 14. Then do the same to the rest as shown on the right side of Fig. 14.

Fig. 14

(2) Pulley Version

Step 1. As shown in Fig. 15, fix 3 pulley wheels (D07) to the carriage (A09) using 3 pairs of C01 and C12. Insert C14 into the dash-circle area and fix a C04 screw from the side. Do not over tighten or twisting the carriage. Do the same to the rest of 2 carriages.
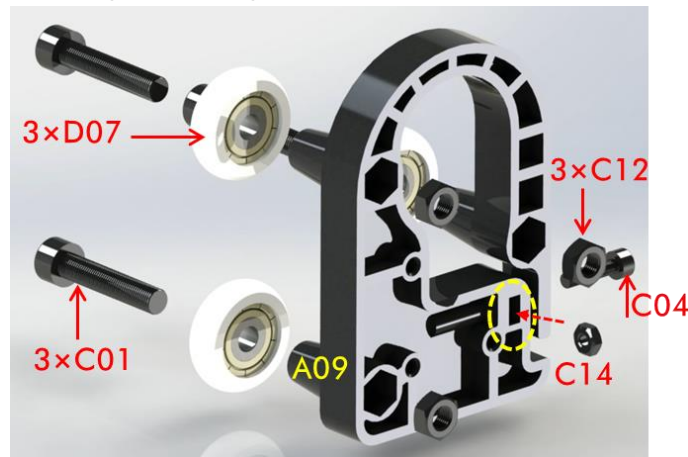

Fig. 15

Step 2. As shown in Fig. 16, fix the prepared belt tensioners to the carriage sets using C04.

Fig. 16

Step 3. Slide down those 3 carriages along with each Al-extrusion. Then fix 3 stop blocks using C16 and C11 and the suggested distance from the stop block to the top is 30mm.

Fig 17

4. Main frame

The assembly of main frame and limit switches is the same for both Linear and Pulley version. Here we take Linear version for example.

Step 1. Fix the limit switches (B05) to each of the stop blocks as shown in Fig. 18.
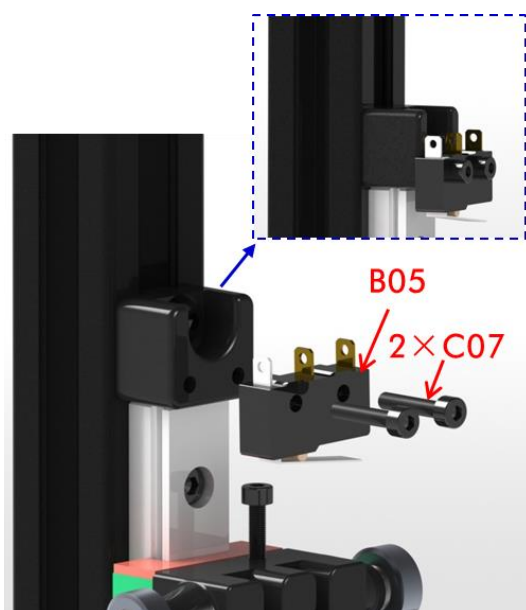

Fig. 18   Fig. 19

Step 2. As shown in Fig. 19, install the top triangle frame to the main structure. Meanwhile adjust the screws (red arrows) to level the upper surface of the triangle frame with the top of each Al-extrusion. Fasten the 3 screws on the side (green arrow) after leveling.

Step 3. Install one end of the wire (B06) to the limit switch through the top triangle frame (no positive and negative). Lead the other end of the wire passing through the hole of the Al-extrusion and the holes of the bottom triangle, which is shown in Fig. 20. After that, fix

8

the bottom end of B06 into the terminal of B07. Do the same to the rest of limit switches.

Fig. 20

5. Belts

The assembly of belt is the same for both Linear and Pulley version. We take the Linear version for example. Divide the belt into 3 equal parts. Fix one end of a belt onto the belt tensioner as shown in Fig. 21-1. Thread the belt through the top guiding wheel, then the bottom synchronizing wheel, and lastly fix the other end of the belt back to the belt tensioner, Fig. 21-4. Do the same to the rest of 2 belt parts. If necessary, use the belt tension spring (D09) to adjust the tightness of the belts.
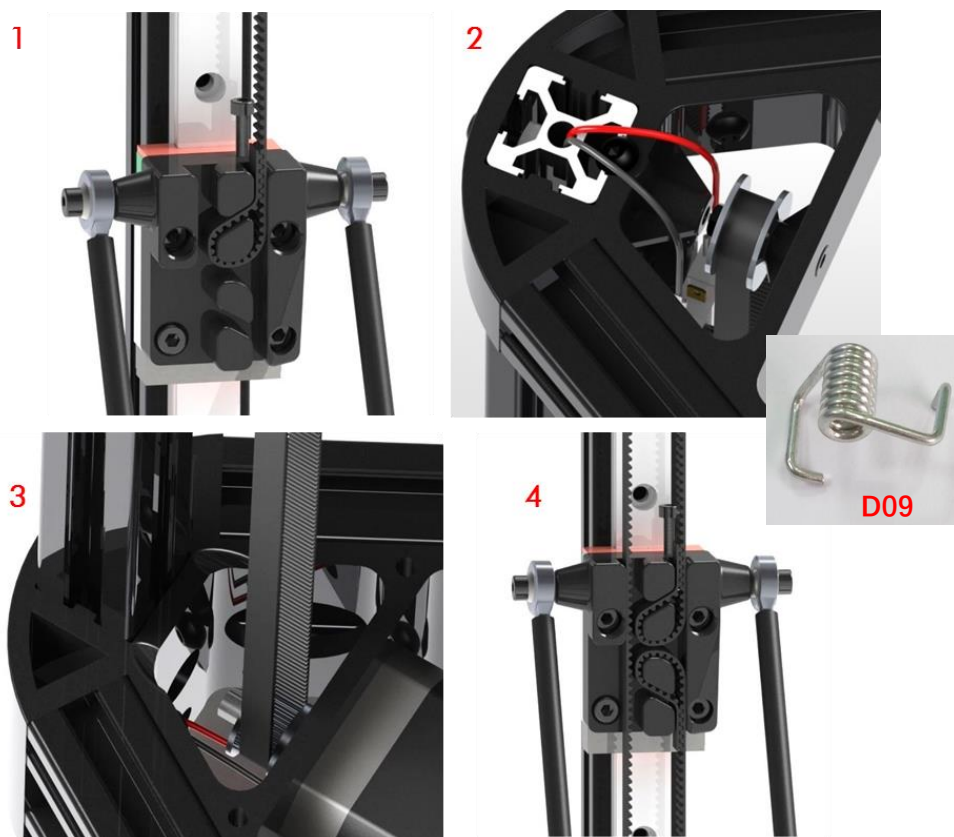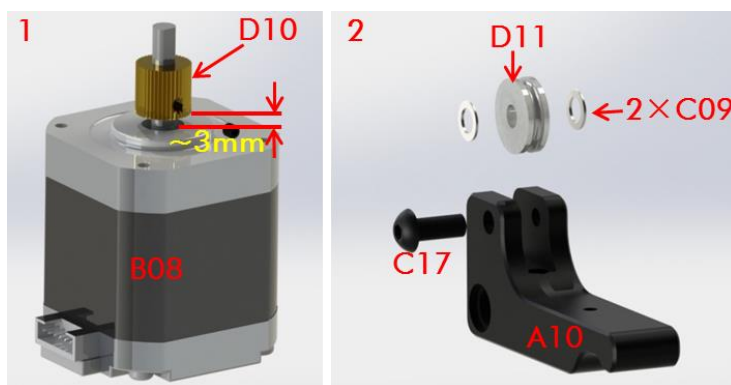

Fig. 21

6. Extrusion system

Fig. 22

Step 1. As shown in Fig. 22, firstly fix the extrusion wheel (D10) onto the shaft of the extrusion motor (B08). Make sure the fastening screw is facing the plane of the shaft. Notice the distance between the extrusion wheel and the motor is about 3mm. Next, install the extrusion bearing with 2 washers onto the bearing holder as shown on the right of Fig. 22.

Step 2. The assembly details (from right to left) of the extruder are shown in Fig. 23. The socket of the extrusion motor is suggested to face down (blue dash circle).
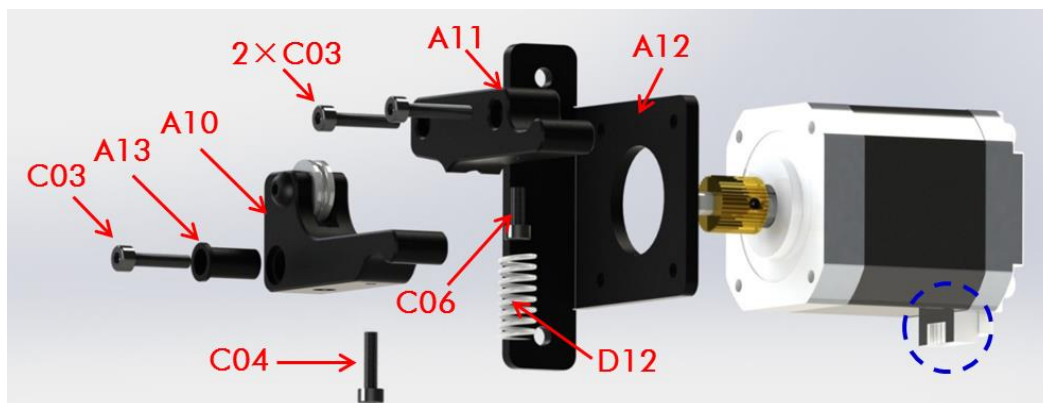

Fig. 23

Step 3. As shown in Fig. 24, lie down the main frame and choose one of the 3 long Al-extrusions to fix the extruder on by using 2 pairs of C15 and C11. The position of the extruder should be a bit lower from the middle, which could be seen in the cover page. Next, find the quick connector (D13) and the feeding pipe (D14) and fix them onto extruder.
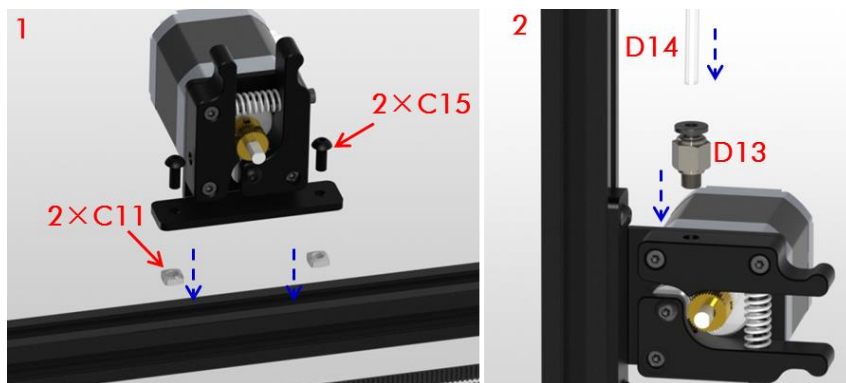

Fig. 24

Step 4. Insert the other end of the feeding pipe to the other quick connector on the effector. If you wish to pull out the feeding pipe, please press down the black plastic ring then release the pipe. Do not force the pipe out by twisting or tearing.
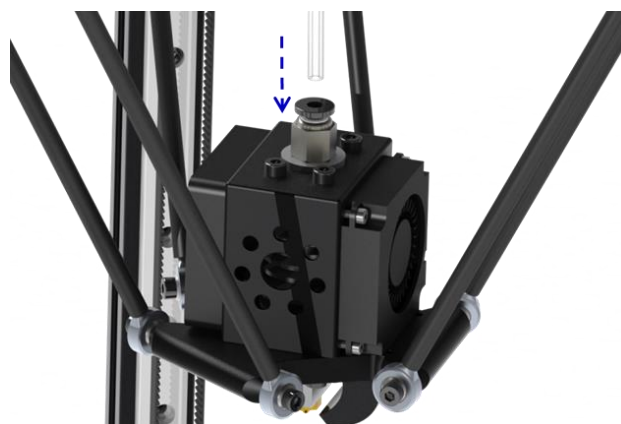

Fig. 25

Circuit

7. Mainboard

Step 1. Fix ANYCUBIC mainboard (B09) to the holder (A14) using 3 pairs of C06 and C14.
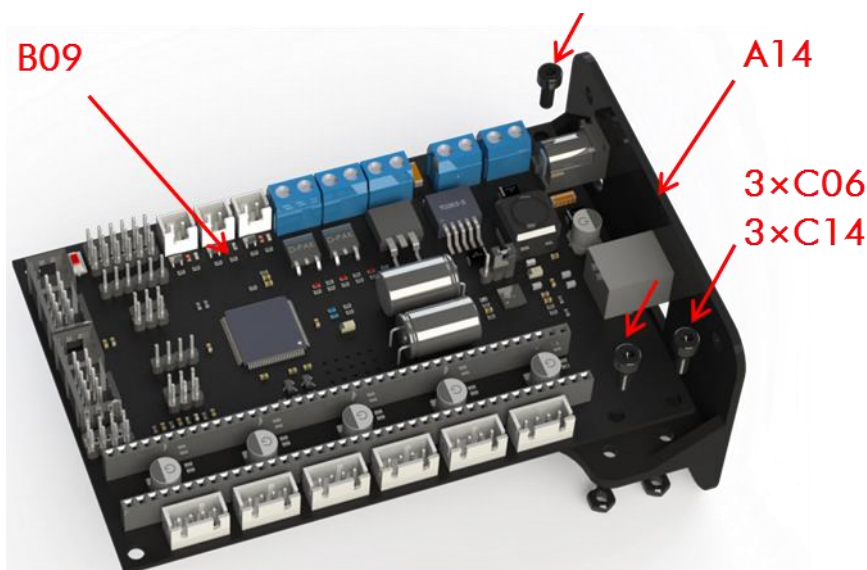

Fig. 26

Step 2. There are 5 pieces of A4988 (B11) in the package. Prepare 4 pieces (the rest is for backup) of A4988 with Al cooling fin, as Figure 27 shows. Make sure the Al fin does not touch the pin on A4988 to avoid any short passing.

*A method to calculate the drive current of A4988: use a multimeter to test the voltage between the two points on A4988, which is pointed out by two red arrows as shown in Fig. 27; then the current (I) can be calculated by the equation of I=U/0.8. Normally the voltage ranges from 0.75 to 1V, so the current should be in the range of 0.94~1.25A.
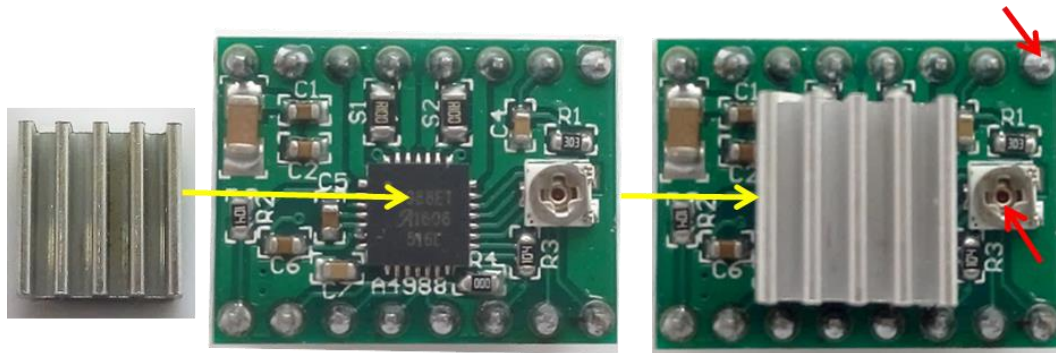
Fig. 27

Step 3. As shown in Fig. 28, mount 4 pieces of square nuts (C11) into the corresponding position on bottom Al extrusion, and fix ANYCUBIC mainboard using 4 pieces of C15. Note: in Fig. 28, 3 motors are named as X, Y, Z respectively in order to make the wiring/interpretation clearer in the following paragraph. The assembly position of ANYCUBIC mainboard could be referred to those 3 motors.
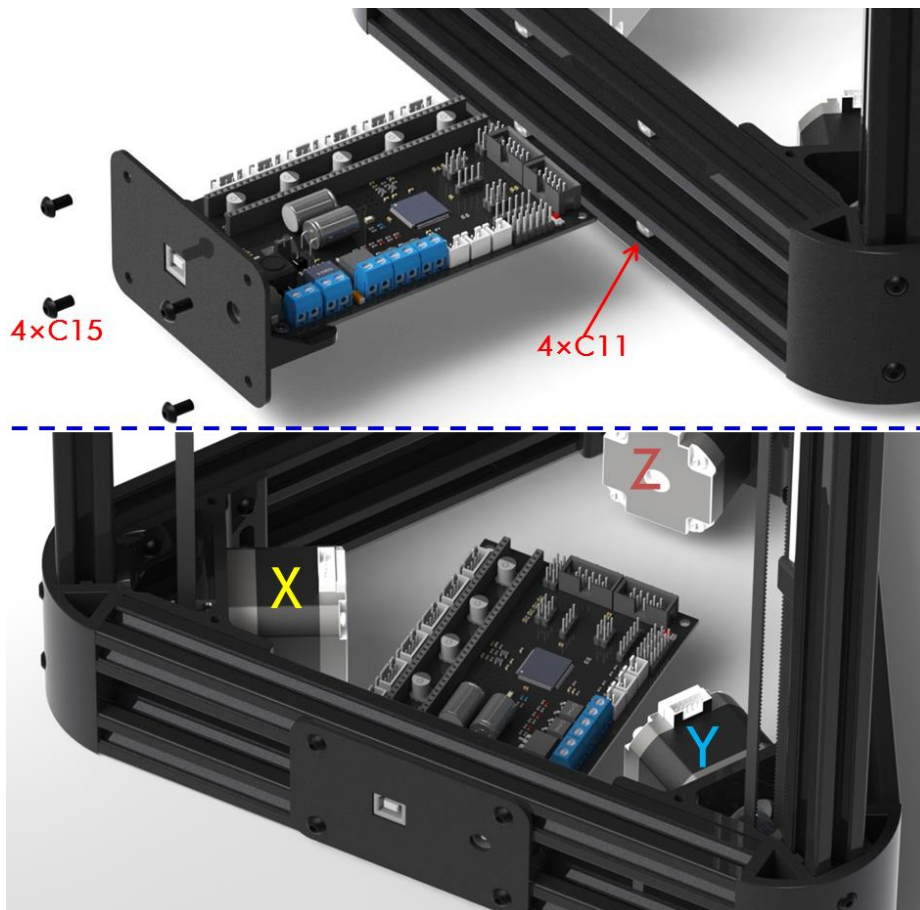

Fig. 28

Step 4. Next, as shown in Fig. 29, fix 4 pieces of A4988 onto ANYCUBIC mainboard. Pay closely attention to the configuration and direction of the drivers and board to avoid any unnecessary problem/damage during use.
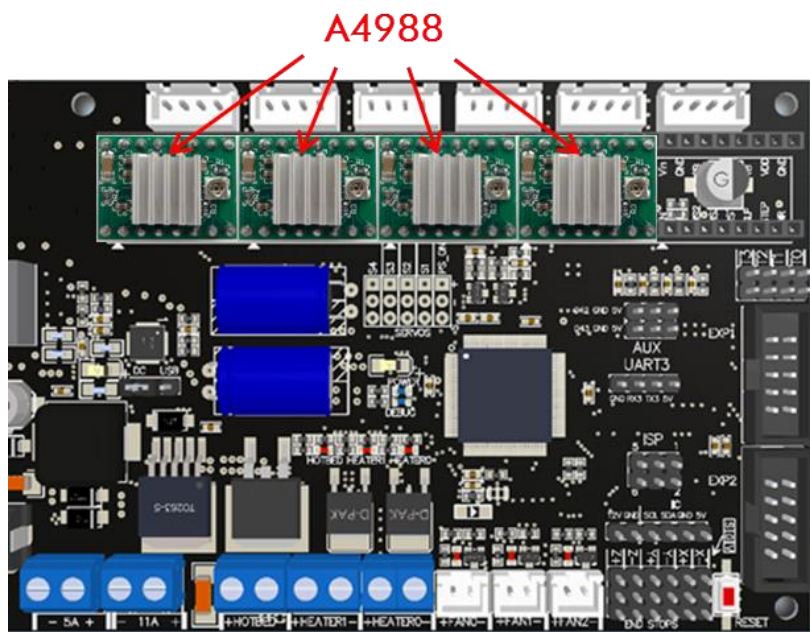
A4988

Fig. 29

Step 5.

The wiring of the mainboard is explained as follows (Figure 30). Before wiring on ANYCUBIC mainboard, please make sure the wires on effector passing through the carbon fiber tubes, as shown in Figure 31.
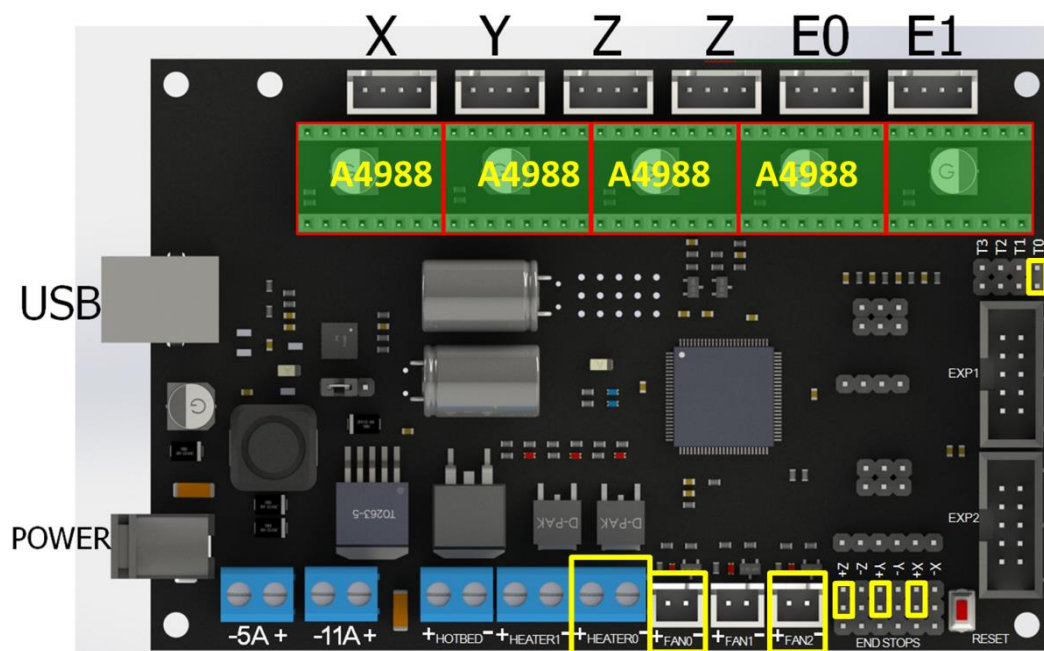

Fig. 30

a. The assembly of A4988 has been mentioned previously.

b. **Limit switches (ENDSTOPS):** please see the bottom right in Fig. 30. 1. X+ wire to X motor limit switch; 2 Y+ wire to Y motor limit switch; 3. Z+ wire to Z motor limit switch.

c. **Thermistor:** wire the thermistor terminal from the printing head to T0.

d. **Motors:** X, Y, Z slots are for X, Y, Z motors respectively. There are 2 slots for Z motor, please choose any one of them. E0 is for extrusion motor. (E1 is for expansion function such as two extruders).

e. **Heat rod:** wiring from printing head to Heat 0 port (without positive and negative).

f. **Fan:** connect the 4010 cooling fan to FAN 2 slot, while connect the 4010 blower fan (for model cooling) to FAN 0 slot. Red line wires to positive terminal and black one wires to negative terminal.

g. **Power and USB:** when everything is ready, connect power supply to the power port and USB line to the USB port.

When wiring is finished, use straps (D15) to arrange the wires from printing head, as shown in Fig. 31. The wire-cluster could be fixed to one of the carbon fiber tubes by ribbon, but do not let it to restrict or interfere with the motion of the printing head.

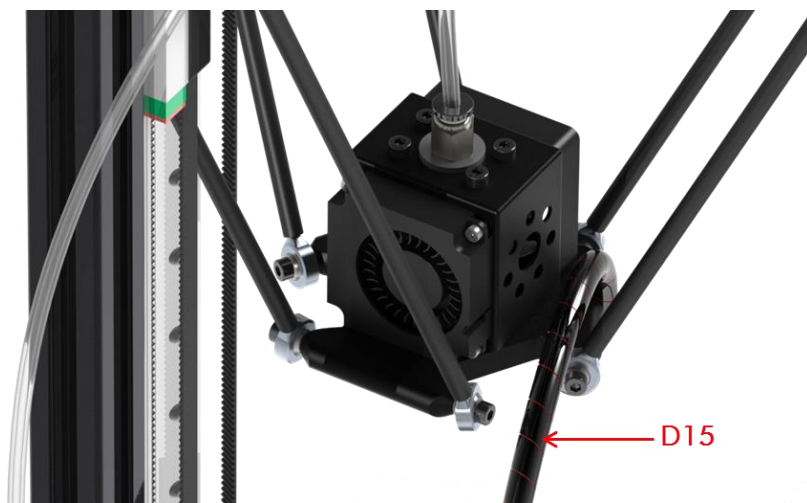Fig. 31

8. LCD

Firstly prepare the LCD with the LCD cover (A15) and other fasteners as shown in Fig. 32. Then use the cables to wire EXP1 and EXP2 from mainboard to LCD. Lastly, fix the LCD to the bottom Al-extrusions, just as shown in Fig. 32.

9. Platform

As shown in Fig. 33, install 6 pieces of limit-blocks (A16, including right and left parts) onto the bottom triangle frame using 6 pairs of C16 and C11. Then put the glass platform onto A16 and adjust its position accordingly. Lastly, fasten those screws to fix the platform. Then you could fix the ANYCUBIC platform sticker onto the glass platform.
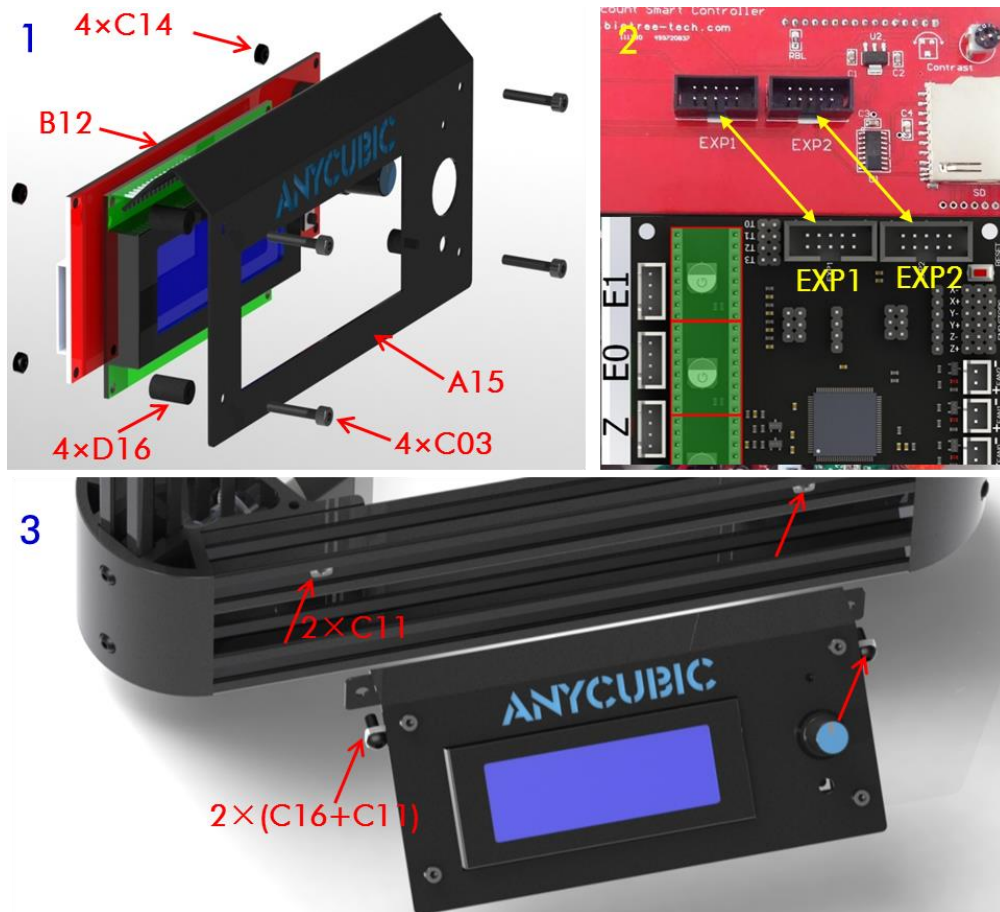
Fig. 32

Fig. 33

Till now, the assembly is finished and next we will show how to setup the machine.

Setup

1. Driver Installation

*Note: there is a gift SD card contains the files for setup.

ANYCUBIC mainboard uses CP2012 chip for communication. Normally, when printer connects to PC via USB for the first time, the PC will automatically install the driver for CP2102. The corresponding port name will appear in Device Manager of the PC. The port number is random but it keeps the same if using the same mainboard and USB port.

If auto installation fails, the reason could be that the PC system is a simplified version or has been modified. Please unzip the file "Drivers for CP2102" from the SD card, and install the driver manually.

2. Firmware uploading

Step 1. The installation of Arduino is shown in Figure 34, double click 'arduino - 1.6.4 - windows.exe', then click 'I Agree' in the installation dialogue and click 'Next' and choose the 'installation path' if necessary till finally see the 'Install' button then click it to start. When installation finished, close the dialogue interface and a shortcut of 'Arduino' would appear on PC desktop, which means it has been successfully installed.
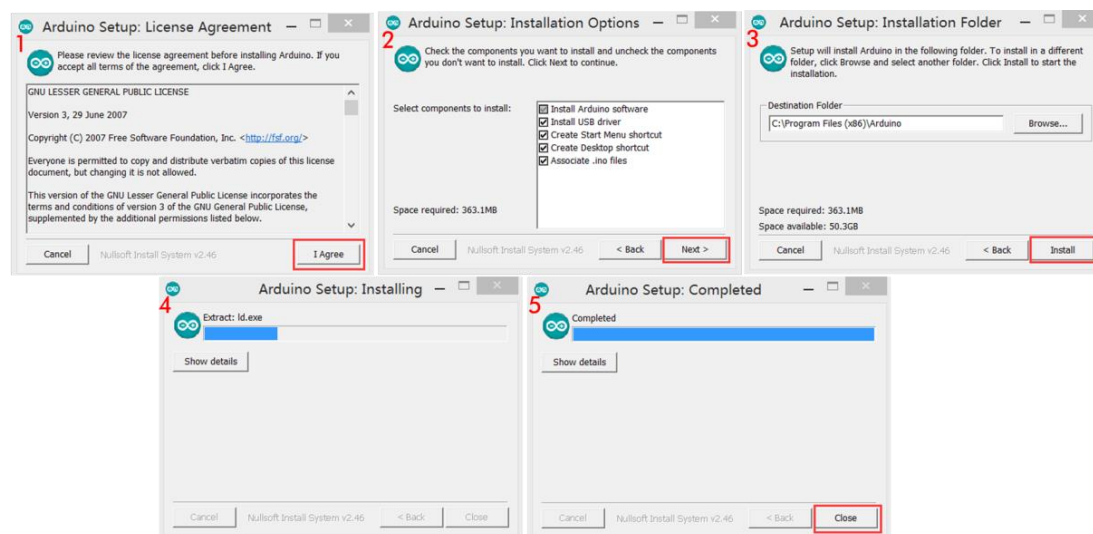

Fig. 34

Step 2. Uploading the firmware to ANYCUBIC mainboard. After the installation of 'Arduino', unzip the 'Firmware for ANYCUBIC Kossel 3D printer' in SD card, and find 'Marlin.ino' or 'Marlin.pde' then double click it.

Next, as Fig. 35 shows when the interface appears, please do as the follows: (1) click 'Tools'-'Board', and then select 'Arduino Mega or Mega 2560'; (2) select 'Tools'-'Processor'-'ATmega 2560(Mega 2560)'; (3) select 'Tools'-'Port'-'COM4 (Arduino Mega or Mega 2560)' (the same as ANYCUBIC Mainboard Port number).
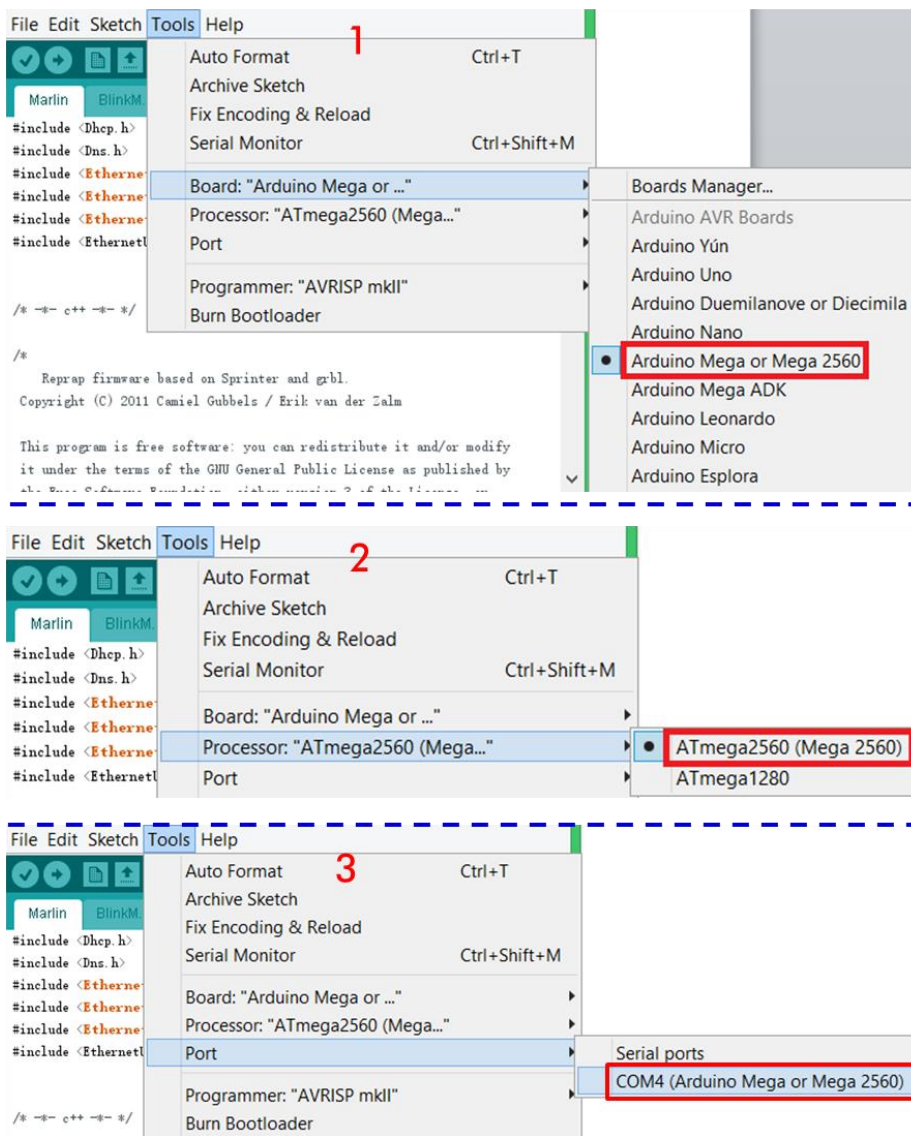
Fig. 35

Lastly, click the upload icon ![icon] to upload the firmware, as Fig. 36 shows. The uploading status will show at the bottom as 'Compiling sketch', 'Done Compiling', 'Uploading', and 'Done uploading'. After that, the LCD starts to display the information as shown in Fig. 37.
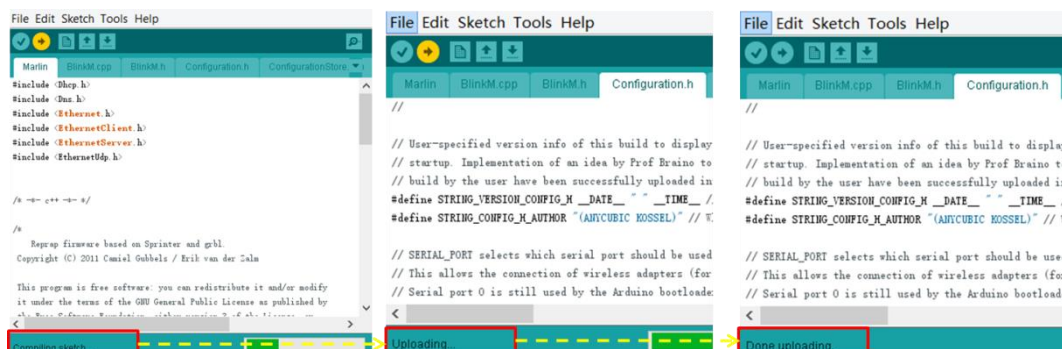

Fig. 36

Nozzle temperature → | ← Hot bed temperature
Nozzle coordinates → | ← Height of Z axis
Print speed/progress → | ← Time of printing
Machine name → |

Fig. 37

3. Parameter settings

The provided firmware has been generally debugged and modified. But inevitably there are some small deviations still. So some critical parameters that affect the printing quality need to be adjusted on a case-by-case basis. Before start, connect the printer with the power (B14), the 4010 radiator cooling fan should be on, otherwise, check the wiring and fix it. This fan is important for eliminating the possibility of nozzle clogging.

Step 1. Heights

First, install the 'Printrun' software. Upzip the 'Printrun-Win-Slic3r-03Feb2015' (or 'Printrun-Mac-03Feb2015'), and double click the 'pronterface.exe' to enter the dialogue which is shown in Fig. 38 Choose the correct port and baud rate (red square) then click connect (green square) to control the 3D printer via computer. You could disconnect it using the same button.
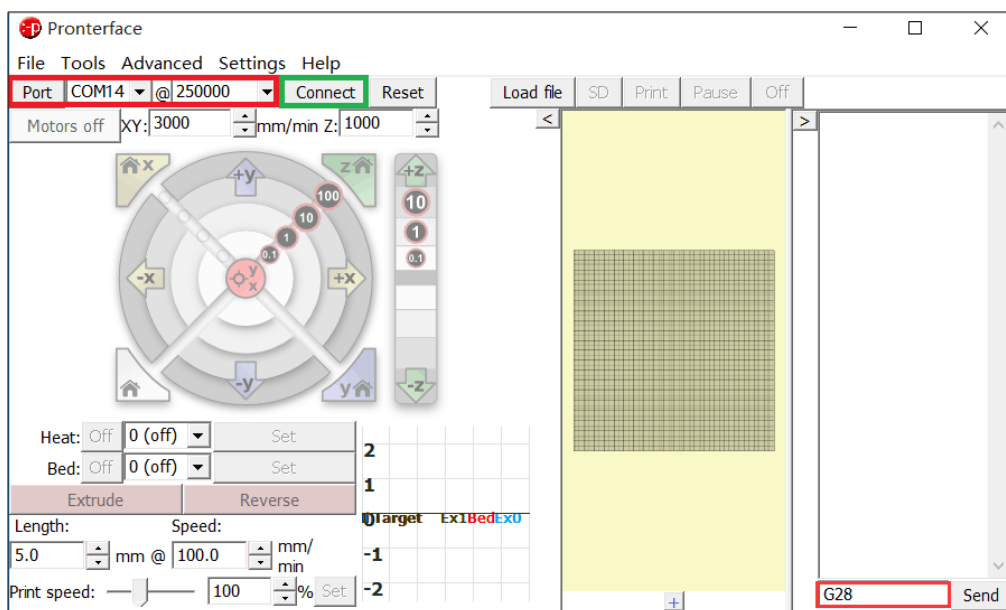

Fig. 38

Second, auto-home. As shown in the bottom right of Fig. 38, enter 'G28' (the code for auto-home) then click 'send' to return the nozzle home (back to top). If the nozzle heading to the opposite direction, that means the wiring of X, Y and Z motors on Ramps 1.4 board is opposite.

Third, adjust the height parameters in firmware. After auto-home, place a piece of paper to the center of the print platform, enter the code of 'G1Z100' in Printrun dialogue then click 'send' to move the nozzle to the Z axis position of height=100mm (the distance between the

18

nozzle and the print platform). Next, on the one hand observe the actual heights of Z axis, on the other hand, carefully reduce the heights value step by step, such as G1Z50, G1Z30, G1Z10, G1Z3, G1Z2.5, G1Z2.3… to slowly move the nozzle close to the platform. (Note: if the value is set too large, the nozzle may knock at the platform. If so, immediately cut off the power, then plug in again and enter G28 for auto home and do the adjustment again.)

If everything goes fine, when the nozzle touches the paper and a bit resistance could be felt if pulling the paper, it means the height is OK. Now, check the value of G1Z# (or directly check the Z# from LCD). # is the actual height value (which theoretically should be zero when nozzle touching the paper). For example, if Z value on LCD is Z001.2, it means that the difference between the actual height and the set height in firmware is 1.2mm, so the height in firmware should be reduced by 1.2mm. (Given the height in the firmware is 300mm, now it should be changed into 300-1.2=298.8mm, then uploading the firmware again). On the other side, if Z value on LCD is Z-002.3, then the height in firmware should be changed into 300+2.3=302.3mm and re-upload the firmware.

The code for height in firmware could be located by quick searching in Arduino:

#define MANUAL_Z_HOME_POS 300   // the 300 here is the height parameter.

After re-upload the firmware, it is necessary to open the Printrun software and debug again following previous steps to verify the result.

Step 2. Size of the print model

When the height setup is OK, it is suggested to print a test cubic model (20×20×10). 'How to print' could be referred to the next section, 'Printing'.

When the print job finished, check the actual size of the model. If it is smaller than 20×20×10, then it is suggested to reduce the value of 'DELTA_DIAGONAL_ROD' (default value=216) by 1~3 step by step until the actual size matches to 20×20×10.

Step 3. Leveling

There are two ways for leveling, auto-leveling and manual leveling. The auto-leveling is discarded in this version due to its relative large errors and repeated adjustment before every print.

For manual leveling, a circle model is provided in SD card. When it prints the first layer of this circle, please observe the nozzle height and position towards X, Y and Z motors, and the height of the nozzle can be adjusted by changing the tightness of the screw on the top of the corresponding belt tensioners (refer to Fig. 10). Because the tightness of this screw can lead to distance change between limit switches and effector, thereby changing the nozzle height. Specifically, tighten this screw when nozzle is too high, and loose this screw when nozzle is low. Using this method, the machine does not need leveling again in a relative long time.

Step 4. Eliminating concave and convex

When printing a model with large size, it may produce concave-convex on the model. In order to tackle this problem, the value of 'DELTA_SMOOTH_ROD_OFFSET' in the firmware

should be changed by 1~3 step by step (default value =151) and then re-upload the firmware. It is suggested to increase this value if the resulting model has a convex surface, while decreasing this value if the resulting model has a concave surface.

Step 5. Extrusion output

Open 'Printrun', and preheat the nozzle temperature to 190 degree C and set the extrusion length as 100mm long. At the same time, mark the filament in order to see the actual extrusion length. If the actual extrusion length is 100±2mm then it is fine. If the actual extrusion length is 80mm for example, then the corresponding parameter in firmware should be modified. The default value of this parameter in firmware is 150, so if the actual extrusion value is 80mm, this parameter should be changed into 150×(100/80)=187.5.

The corresponding code in firmware could be located by searching:

#define DEFAULT_AXIS_STEPS_PER_UNIT {XYZ_STEPS, XYZ_STEPS, XYZ_STEPS, 150} where the 150 here is the length parameter.

4. Printing

Step 1. Installation of the slicing software. Cura is used for example. Double click 'Cura_15.04' to proceed with the installation. When the dialogue appears you may tick all the boxes as shown in Fig. 39.
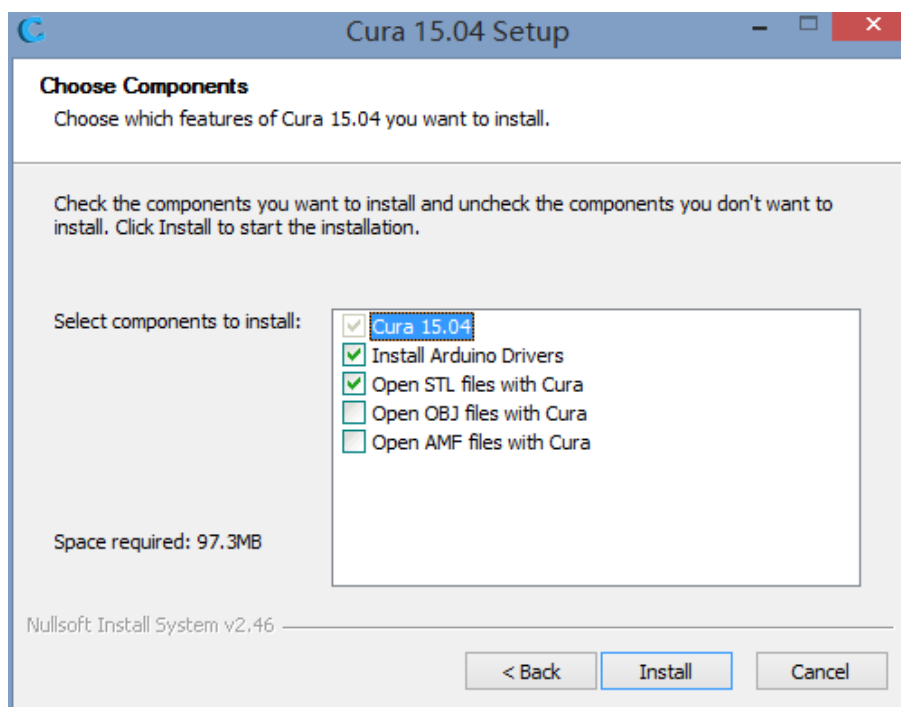

Fig. 39

Step 2. Configuration. When finishing the installation and opening 'Cura' for the first time, a configuration dialogue would appear. Choose the 'language' that suits you and click 'Next' if necessary. When come across 'Select your machine', please choose 'Other' and hit 'Next' and choose 'DeltaBot' in the following dialogue, which is shown step by step in Fig. 40. Lastly, click 'Finish' to complete the configuration and enter the home interface of Cura.
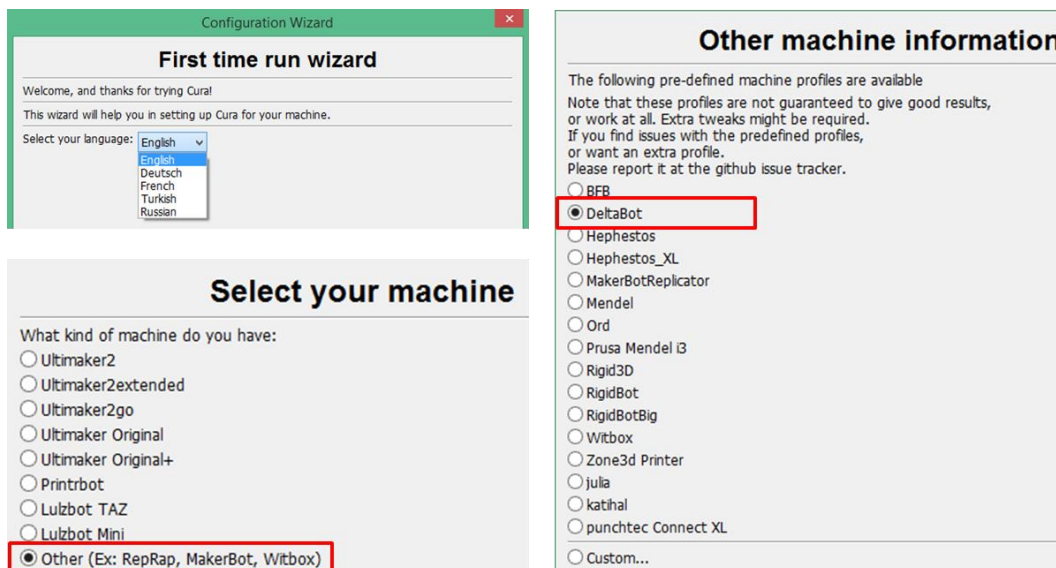
Fig. 40

Step 3. Printing parameter settings. At the home interface of Cura, click 'Machine' and in the drop-down menu choose 'Machine settings' to open the setting interface as Fig. 41 shows. Change the maximum width, maximum depth and maximum height into 180, 180 and 300 respectively (those values should be 230, 230 and 300 if you are setting up the ANYCUBIC Kossel Plus). Leave the 'Heated bed' box empty to suit the current machine version. The serial port can be AUTO, or choose the right port when you have several devices connected. The baud rate is suggested to be 250000. Then click 'OK' at the bottom left to return to home interface.
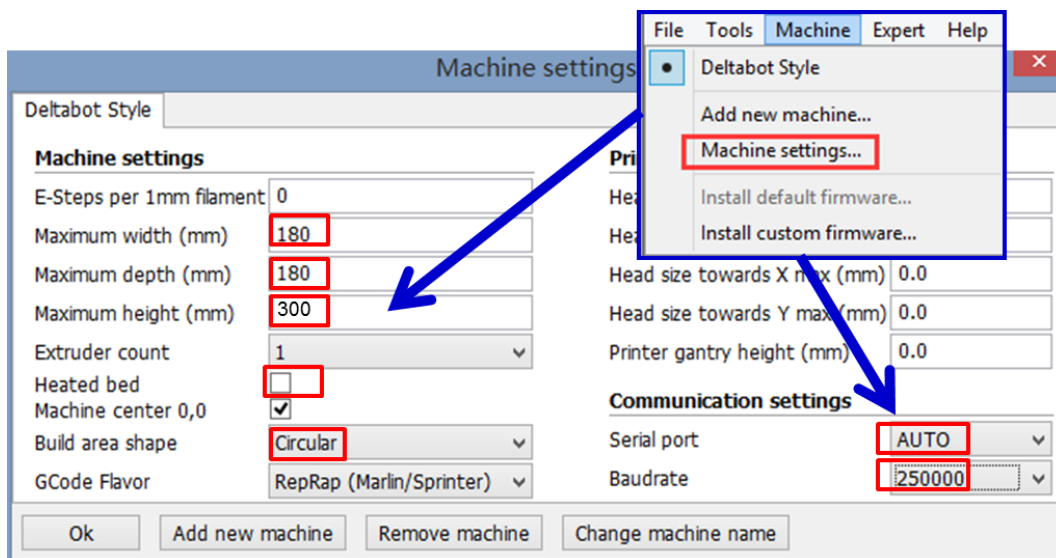

Fig. 41

Next, as shown in Fig. 42, click 'Basic' and 'Advanced' respectively on the top left in home interface of Cura to change the parameters to suitable values one by one. Note: the suggested parameters in Fig. 42 may be varying depend on different models.
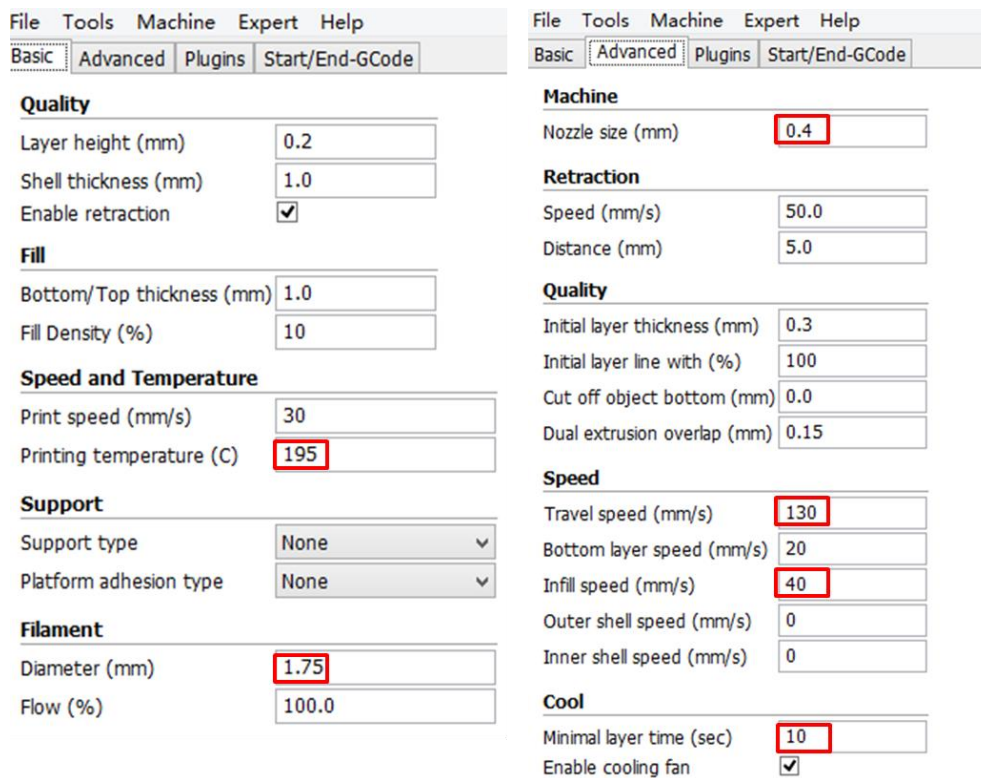
21

Fig. 42

Step 4. Print. To experience the very first print, please load the test model '20×20×10' and then click the 'Print with USB' icon on top, as shown in Fig. 43. In order to minimize the instability from the PC and USB port, it is suggested to save the model in Cura as Gcode file into a SD card and insert the SD card to 3D printer to print offline.
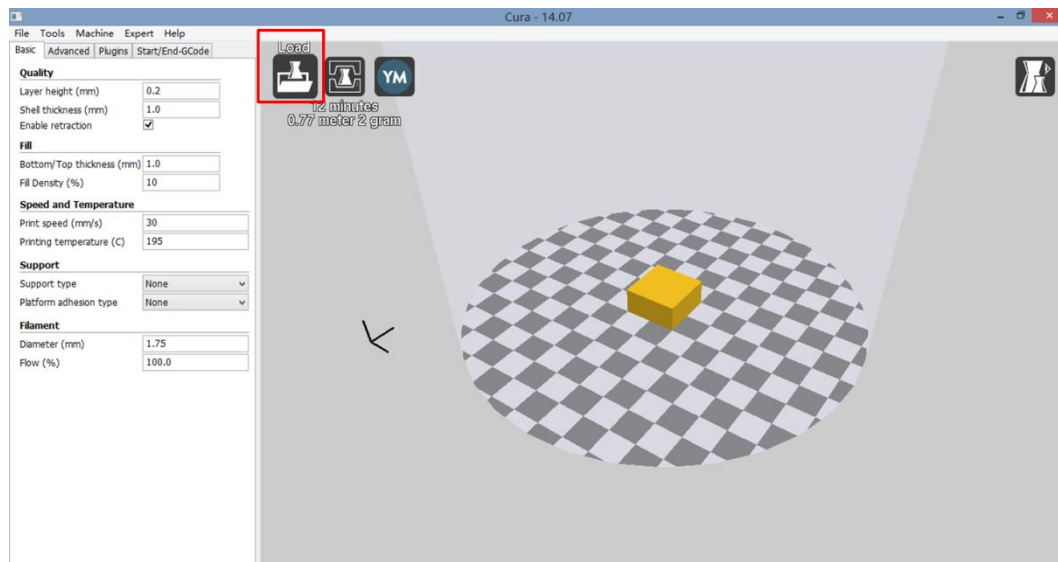

Fig. 43

FAQ

1. LCD malfunction (no power/blank)
   a. Ensure the machine is well connected to the power/PC.
   b. Ensure the wiring of LCD is correct (EXP1 to EXP1; EXP2 to EXP2).
   c. Ensure the firmware has been uploaded. If not, LCD would show blank.
   d. Adjust the brightness by rotate the small 'contrast' knob on the back of LCD.
2. Motor malfunction (shaking/run opposite)
   a. Please check with the A4988 driver to see if the Al cooling fin contacts with the pins. In this case A4988 is very likely damaged and need change.
   b. Reverse the wiring of motor or change the firmware code (true ↔ false).
      #define INVERT_X_DIR true;   #define INVERT_Y_DIR true;   #define INVERT_Z_DIR true
      #define INVERT_E0_DIR true;   #define INVERT_E1_DIR false;   #define INVERT_E2_DIR false
3. Off-line print abnormal
   a. Check according to Question 1.
   b. Ensure the read/write of SD card is OK.
   c. Ensure the file format in SD card is Gcode instead of STL, and file name should be in English instead other languages.
4. Print head malfunction (block/leakage)
   a. Block at the nozzle. Two possible causes: (1) low quality filament and (2) metal scrap inside the nozzle. Please clean the nozzle using cleaning screw or contact us.
   b. Block at the throat. Two possible causes: (1) insufficient cooling. Check the cooling fan; and (2) careless assembly. Ensure the tube has been well screwed down.
   c. Block between the quick connector and the Al radiator. The reason is most likely insufficient cooling, so please check the cooling fan.
   d. Leakage. The very likely reason is careless sealing. Please ensure each part is well assembled or contact us for help.
5. Filament output abnormal
   a. No output. Two possible causes: (1) refer to Question 4; (2) insufficient heating for filament. Normally the printing temperature range of PLA and ABS is 180-200 and 210-240 degree C, respectively. Try to increase the printing temperature or improve the heat insulation of the printing head.
   b. Rough output. (1) Check with Question 4; (2) check with the extruder, especially the extrusion wheel and the extrusion bearing. Clean and adjust them if necessary.
6. Print head shaking
   a. Ensure the screws on carbon fiber tubes are well connected.
   b. Ensure the clamp to fix the Al radiator is well fixed.
   c. Check belt tensioners, pulley carriages/linear rails and the corresponding screws.
7. Print head suspending or knocking toward platform
   Please refer to Parameter settings, Step 1.
8. Abnormal extrusion
   Please refer to Parameter settings, Step 5.