ARES All-in-one 3D Printer by *EasyArts*

USER MANUAL

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Part 1 Introduction

1.1 Acknowledgement

Thank you for using **Ares all-in-one 3D printer** by ***EasyArts*** (making arts easy for you). Ares is a luxury version in terms of its functions but at civilian price. We hope that this affordable printer can meet most of your daily requirements in creation and innovation. Ares is especially suitable for fans, enterprise, homes, educational institutions or any other interested in 3D printer. Now enjoy your life with Ares by following this instructions.

1.2 Warning

For the sake of your safety, please carefully operate Ares under the guidance of this manual, also with good awareness of following **warnings**.

1) **Without guardianship, always keep Ares out of reachable range of kids or pets when it works. Remember: never touch the print bed, models or any other moving parts, both for your safety and precision.**

2) **In 3D Printing, never touch print nozzle until Ares has finished working and it cools down.**

3) **In 3D Scanning, never look straightforward to laser beams for long time in spite of low power.**

4) **In Laser Engraving, never enable laser power unless you have worn goggles and Ares has been interlocked with safety cover. Never remove the safety cover when engraving.**

5) **In CNC Engraving, ensure the motor has been firmly fixed. Never touch the motor when engraving. Do not engrave hard material to prevent possible damage of milling cutters and other parts.**

6) **Please follow the instructions carefully during operation unless you have been familiar with it.**

1.3 Profile

1.3.1 Basic principle

Ares is based on **Fused Deposition Modeling (FDM)**. FDM is an additive manufacturing technology commonly used for modeling, prototyping, and production applications. It is one of the techniques used for 3D printing. FDM works on an "additive" principle by laying down material in layers; a plastic filament or metal wire is unwound from a coil and supplies material to produce a part.

1.3.2 Main features

[1] Hardware: **Arduino** + **Marlin** and **Raspberry-Pi**. Thanks to the hard work of contributors all over the world in terms of hardware (**Arduino**) and firmware (**Marlin**), Ares is very stable with high efficiency during work. **Raspberry-Pi**, an open source hardware built in Ares, is the central processing unit, much like the brain of Ares.

[2] Software: **C/S mode** based on **browser**. This is a very convenient control mode, as you can gain control of Ares provided that you have a browser, no matter what kind of OS you use, for instance, Windows, Mac OS, Linux and even Android.

[3] Machinery: **Full-metal body**. Metal body is a major feature of Ares, making it low profile and steady, but also luxurious. Moreover, **more than 90%** of the load-bearing parts are made by metal and processed by CNC. In addition, the driving belt is made of polyurethane and steel wire to avoid deformation. It is worth mentioning that the full-metal body contributes to minimize the gap between the parts, and thus to prevent any possible distortion during printing.

[4] Control: **Wireless** or **Cable**. WiFi or Internet access is one of our featured functions for Ares in view of convenience. Thanks to the support of WiFi, **Raspberry-Pi** makes it possible to achieve remote control on mobile devices and real-time monitoring of your printer just with a webcam, much easier than ever before.

[5] Consumption: **PLA filaments**. Polylactic acid or polylactide (PLA, Poly) is a biodegradable thermoplastic aliphatic polyester derived from renewable resources. In addition, many colors for PLA filaments are available now, such as **Black**, **Orange**, **Gold**, **White**, **Yellow**, **Pink**, **Purple**, **Red**, **Blue**, **Silver** and so on, as well as **gradually changed colors**.

[6] Extensions: **3D Scanning**, **Laser Engraving**, **CNC Engraving**. Firstly, 3D scanning can offer your much more creation. As laser engraving is very popular to DIY makers, Ares series can also be equipped with laser kits. Besides, now 3D pictures are available for you by CNC engraving patterns on the cork and wood. In addition, we really encourage you to design your own extensions if you are able to DIY.

Part 2 Specifications

2.1 Printer

Printer Model	**Ares**
Overall Size	**360 * 360 * 670 mm^3**
Assembly Weight	**15 kg**
Input Voltage	**AC 110-250 V**
Power Consumption	**60 W**
Interface Language	**English / Chinese**
Working Parts	**Industrial linear guides**
Exterior Color	**Black**

2.2 Modules

2.2.1 3D Printing

Printing Volume	**Φ180 * 220 mm^3**
X-Y-Z Precision	**0.1 - 0.2 mm**
Nozzle Diameter	**0.3 / 0.4 (default) mm**
Nozzle Temperature	**170 - 280 ℃**
Layer Thickness	**0.05 - 0.3 mm**
Travelling Speed	**20 - 300 mm/s**
File Format	**STL / Gcode**
WiFi Access	**Yes**
Consumption Material	**PLA (Φ1.75 mm)**

2.2.2 3D Scanning

Scanning Resolution	**≥ 0.3 mm**
Scanning Speed	**> 12 min (relies on resolution)**
Laser Power	**5 mW (each)**
Digital Camera	**CMOS, 5 M pixels**
Color Mode	**16 bit (colorful)**
Open Source	**Yes**
Control Mode	**Wireless**
Output Format	**STL / PLY / XYZ / RGB (10 bit)**

2.2.3 Laser Engraving

Beam Diameter	**0.4 mm**
Travelling Speed	**≤ 200 mm/s**
Laser Power	**300 mW**
Wave Length	**405 nm**
File Format	**JPG / BMP**
Optional Material	**Wood / Plastic / Paper**

2.2.4 CNC Engraving

Cutter Diameter	**0.3 - 4 mm**
Rotating Speed	**4000 r/min**
Travelling Speed	**≤ 200 mm/s**
Milling Power	**6 W**
File Format	**JPG / BMP**
Optional Material	**Soft wood / Cysto-sepiment / Gypsum**

2.2.5 Effector models

For your convenience, we offer download link of the effector models for our available functional modules in case yours break down.

[1] **3D Printing**.
[2] **3D Scanning**.
[3] **Laser Engraving**.
[4] **CNC Engraving**.

2.3 PLA

Filament Diameter	**1.75 mm**
PLA Features	**Biodegradable / Thermoplastic / Environment friendly**
Available Colors	**Transparent, Primary color (semi-transparent), Green (fluorescent / emerald / grass, 3 colors), Black, Orange, Gold, White, Yellow, Pink, Purple, Red, Blue, Silver, Skin color and so on.**

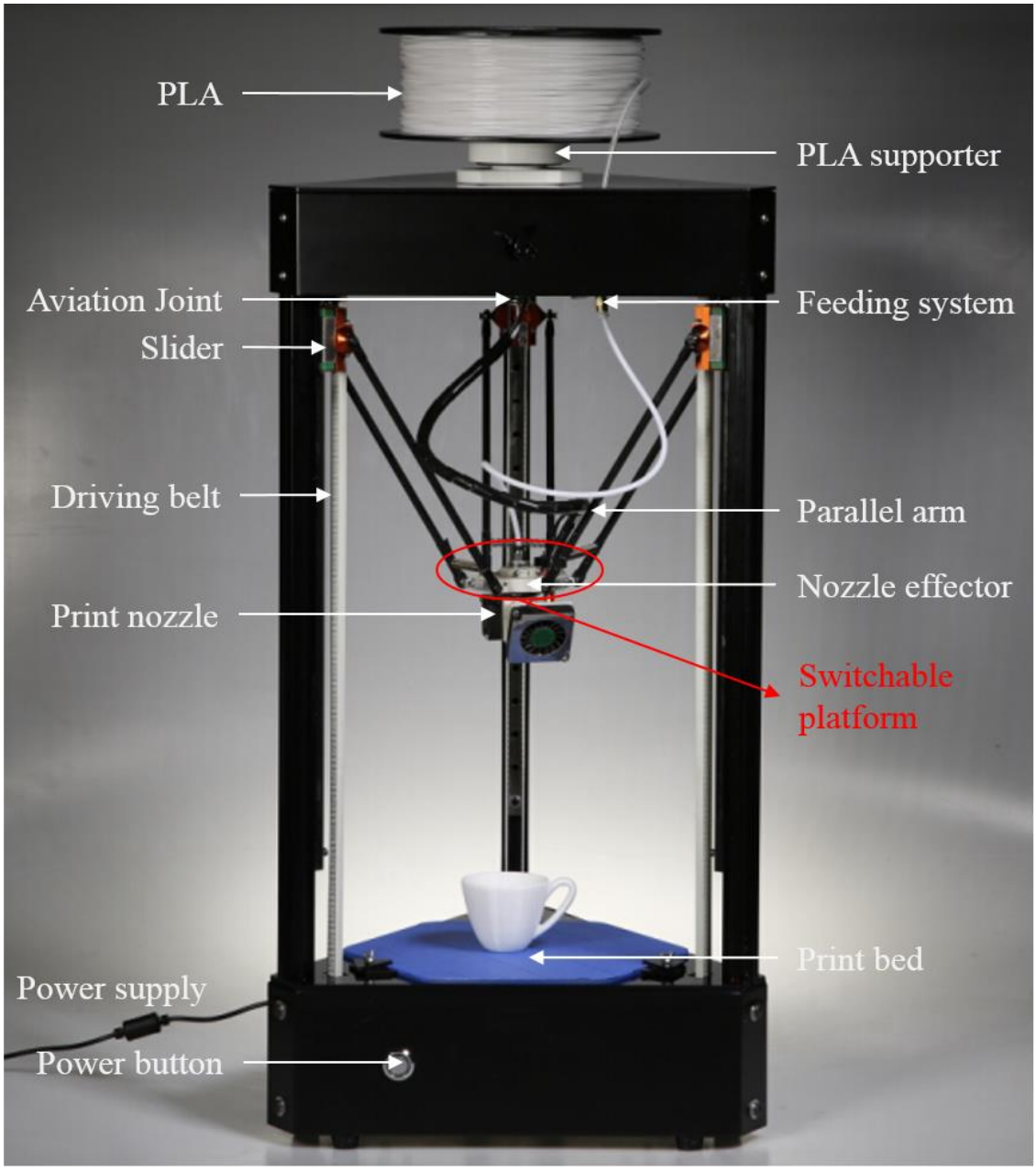
2.7 Software

Slicing Function	**ReplicatorG, Cura, Kisslicer, Slic3r, Skeinforge**
Printing Function	**OctoPrint**
Scanning Function	**FreeLSS**
Engraving Function	**EasyEngrave (self-developed)**
Control Function	**Web browser**
Connection Mode	**WiFi / Network cable**

Part 3 Function

3.1 Overview

The following picture shows the main components of Ares. As the core of this printer, the switchable platform plays a vital role. It allows users to take advantage of the reserved holes on it to adapt various nozzles, like laser transmitters, CNC cutters and so on. Besides, the aviation aluminium alloy connector, processed by surface adonization and CNC, is the privilege accessory for Ares to meet multi-functional connections.



Notes: There may be some difference for each component in different batches.

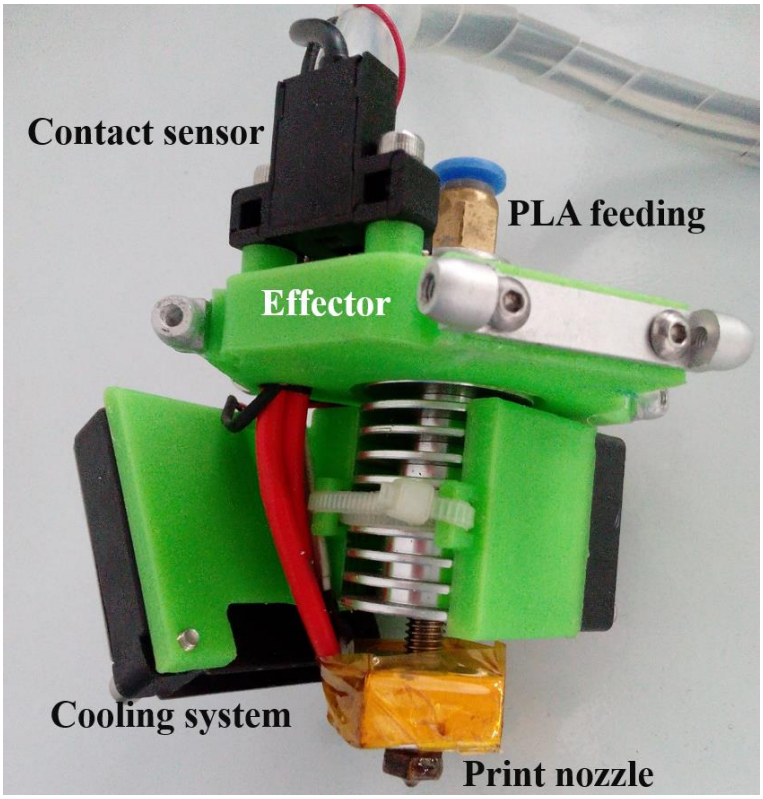
3.2 Modules

3.2.1 Available modules

Our available functional modules includes **3D Printing**, **3D Scanning**, **Laser Engraving** and **CNC Engraving**, as shown in the following.

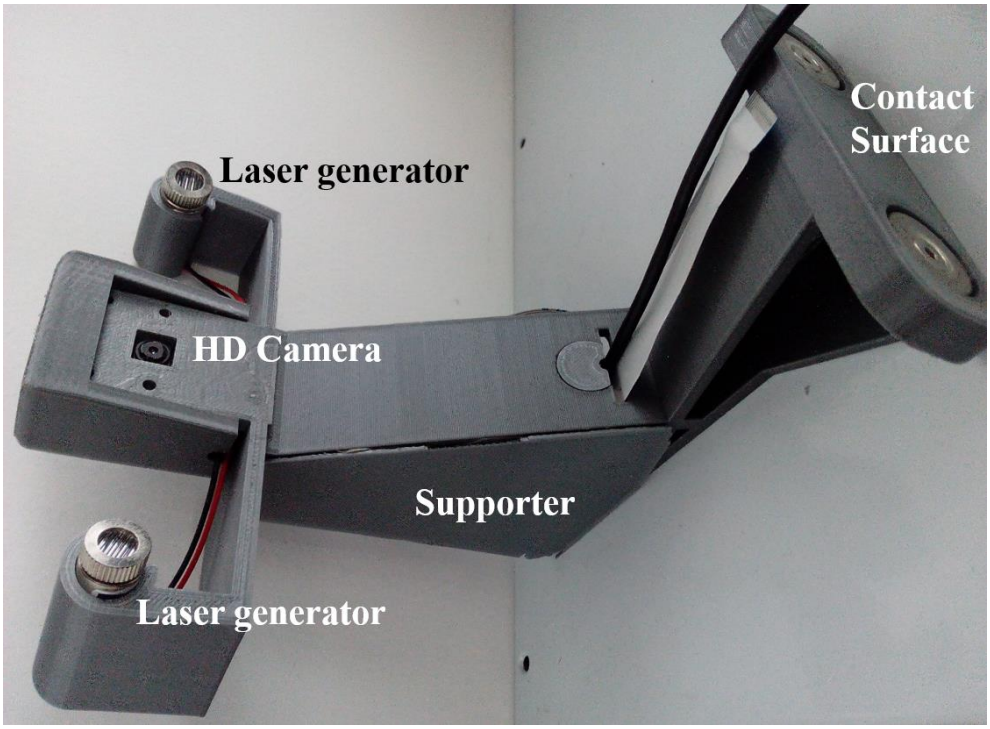
[1] 3D Printing

It mainly consist of **print nozzle**, **cooling system**, **feeding system**, **contact sensor** and **effector** for support. The print nozzle is renewable with availability for 0.3 and 0.4 mm (inner diameter).



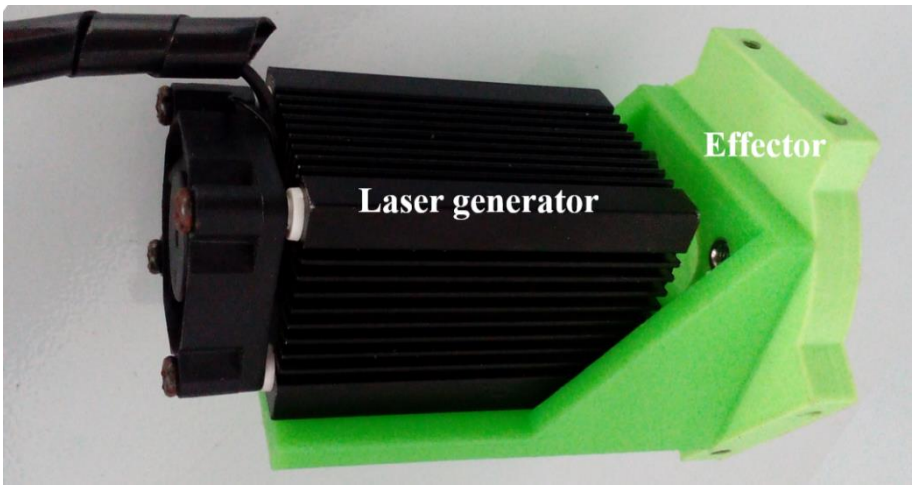
[2] 3D Scanning

It mainly consist of **HD camera**, two **laser generators**, two **contact magnets** for quick setup and **supporter**. The setup of 3D scanning module will be described in the "**Installation**" section in detail.



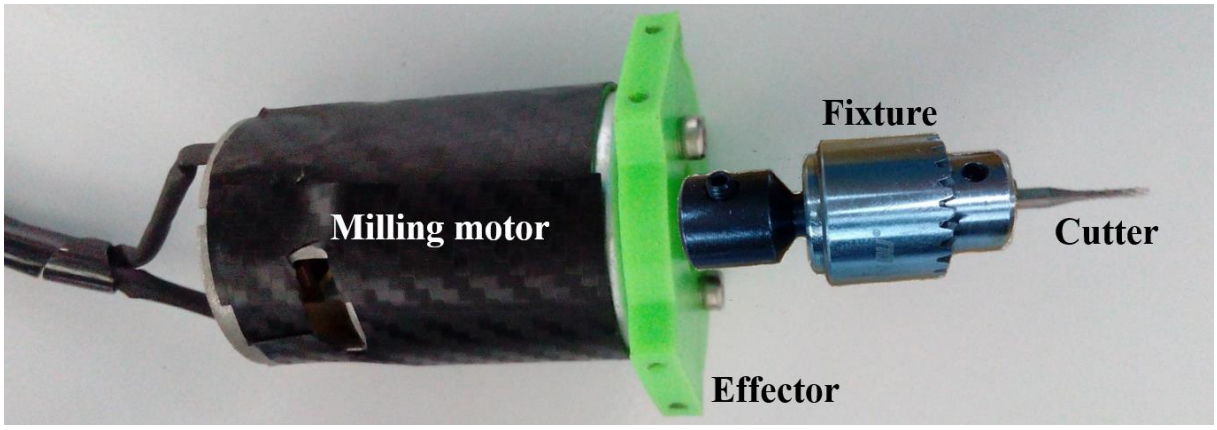
[3] Laser Engraving

It mainly consist of **laser generator** and **effector** for support. The highest power is about 300mW. **Therefore, do take care of safety protection during laser engraving**.



[4] CNC Engraving

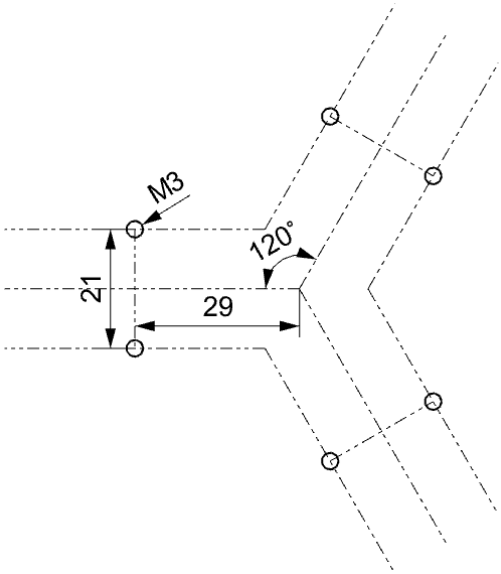
This module is still under development for better experience. It mainly consist of **milling motor**, **cutter**, cutter **fixture**, and **effector** for support. The cutter is renewable with various availability from 0.3 to 4 mm in diameter.



3.2.2 Standard for extended modules

You can design your own effectors to adapt your extended tools. The function of your 3D printer can be instantly upgraded and converted, as long as the adapter / effector matches the reserved holes. In addition, with up to 15 ports, the aerial socket for wiring provides possibilities for unlimited upgrade. So we really encourage you to do your extensions. Just follow the standard for your adapter(s) / effector(s), you will find it quite easy to develop your own module(s). Go ahead for your imagination and creation.

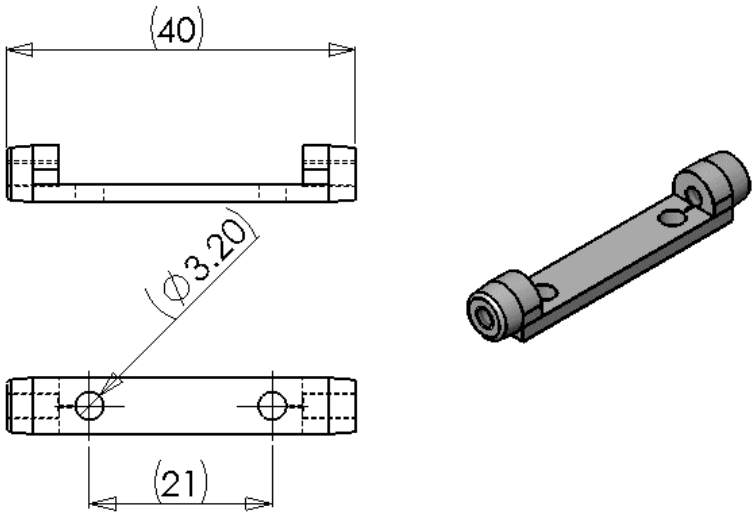
Here it comes the specific standard. To make it simple for description, LA, LB, DX and AX will be used.



LA = 21
LB = 29
DX = M3
AX = 120°

The actual standard of effectors / adapters mainly concentrates on the six holes (shown above picture) that you have to reserve for installation on the three connectors. The specification of a connector has been given.

So when designing your own modules, please follow our basic instructions below.

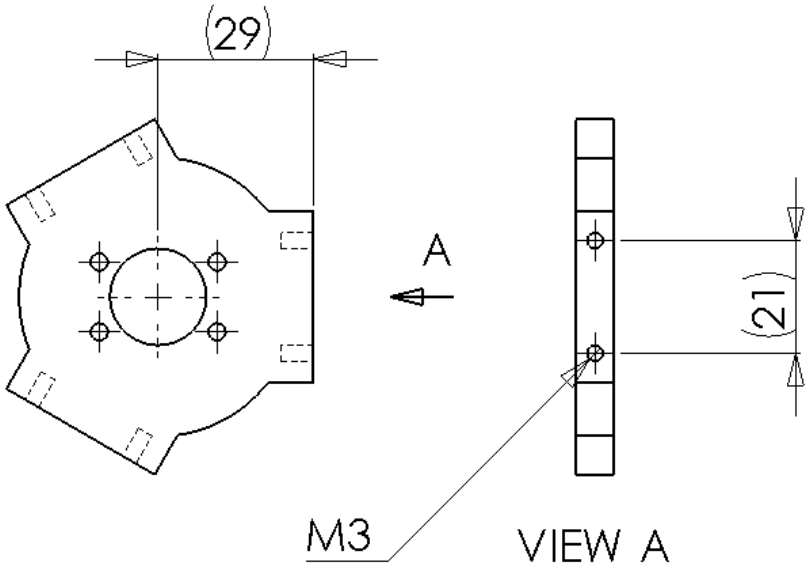


[I] The distance of 2 holes on the same plane (LA) must match that of connectors, i.e. 21mm, as well as the hole size (DX).

[II] Theoretically, the distance of installation contact plane and the effector center (LB) can be changed as long as Term [I] is satisfied. As you know, this parameter is very important for accurate positioning, so the value change of LB will result in requirements of rewriting Marlin firmware in order to ensure precision. In view of this trouble, you should better keep LB the same to our standard, if it doesn't matter too much. If you really have to change LB, please refer to our Advanced User Manual.

[III] The other 4 holes must be axisymmetric with an angle of 120 °(AX). In other words, basic parameters like LA, LB and DX must be the same.

To make sure you can understand our instructions, we will offer an example of effector for you, as shown in the following picture.



Part 4 Operation

4.1 3D Printing

You can make colorful and complex 3D samples and even products by 3D printing. Particularly, the minimized gap between the moving parts significantly prevents apparent staircase effect on the surface of printed models. Surprisingly, Ares can print tiny model even smaller than finger.

NOTE: If there is something wrong with your printing module, please refer to "Purchase" section in "Support" for renewal.

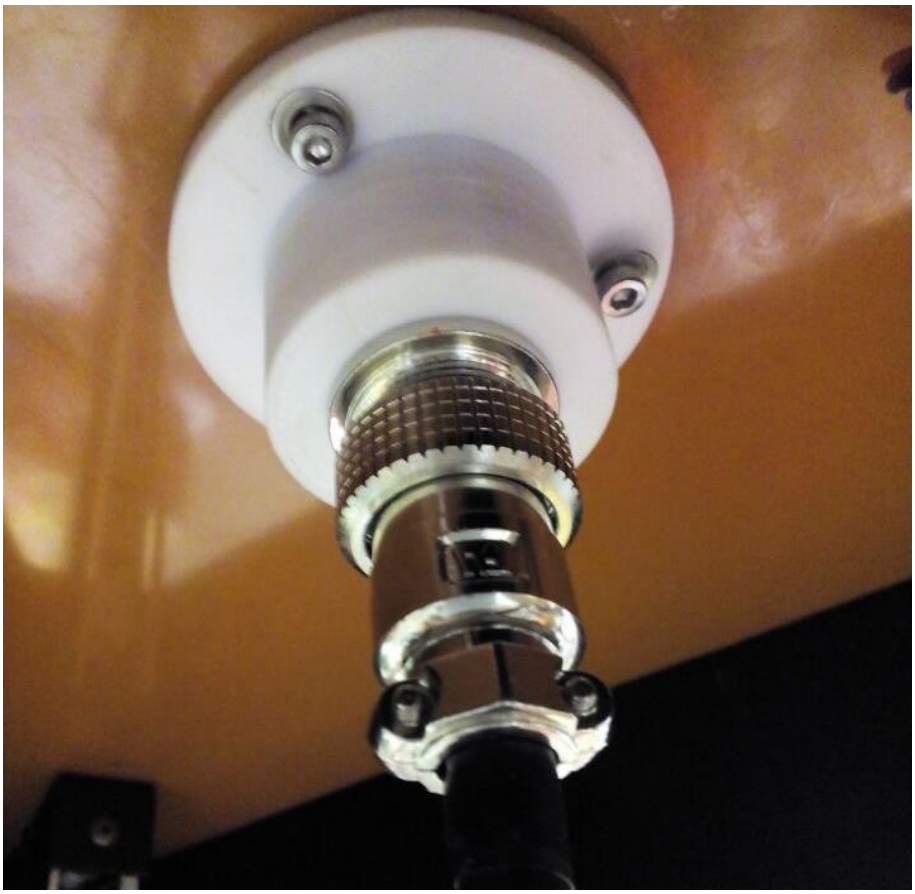
4.1.1 Preparation and setup

Before printing, you need conduct several normal checking: whether the nozzle and aviation joint are correctly installed, whether the nozzle works, whether auto-level LED is lighted (Red means normal).

[1] Installation of 3D Printing module.

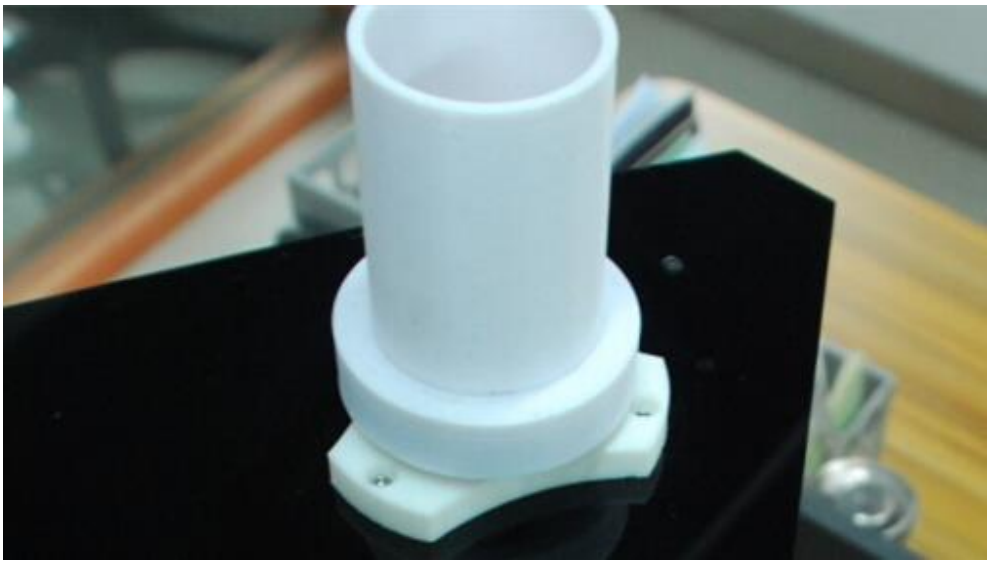
a) Take off the current module if it is not 3D Printing. Then fix the **print nozzle** (**with effector**) to **three connectors** with screws, **firmly and stably**.

b) Connect the **Aviation Joint** to the **Interface** on the top side of printable area. **Please refer to the overview of Ares if you cannot find the interface.**

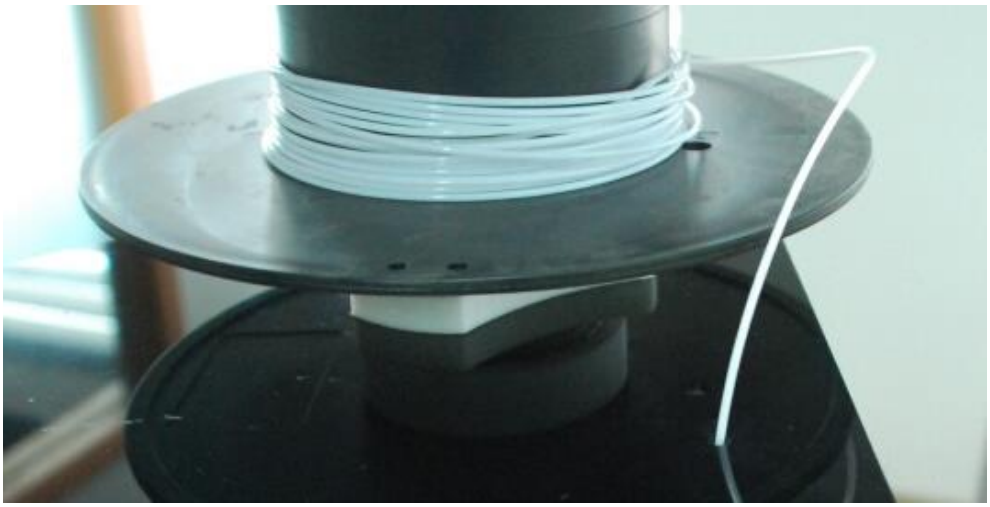


[2] Guidance of PLA filaments.

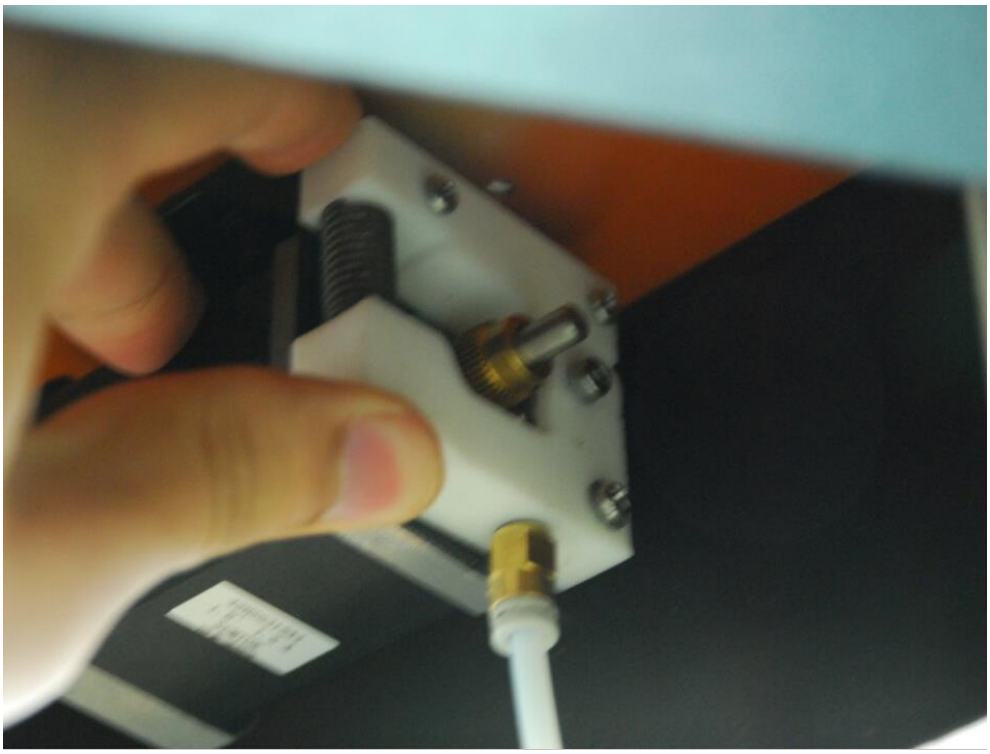
a) **Installation**: match the PLA roll barrel with the PLA supporter on the top of Ares.



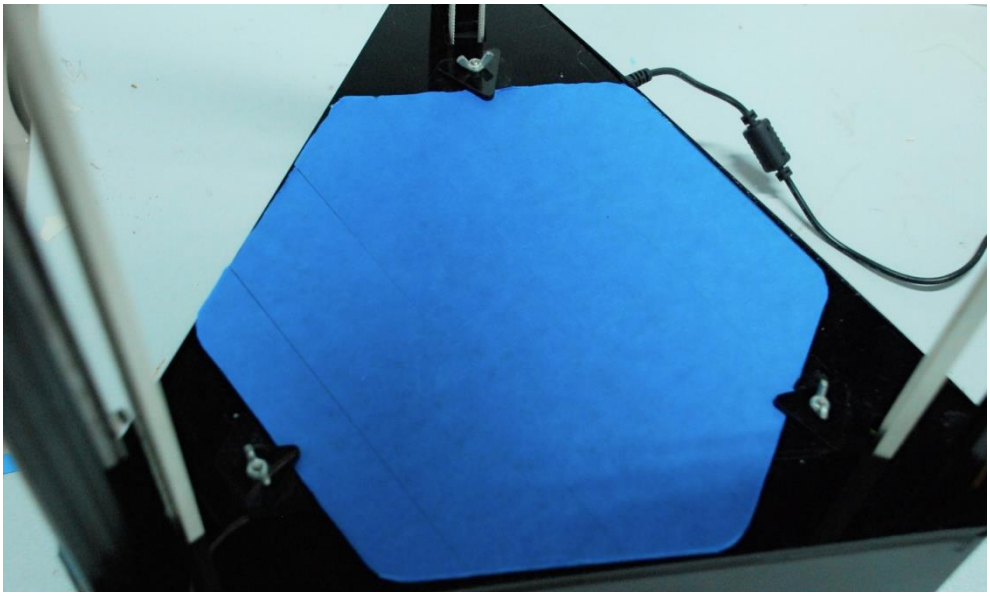
The following picture shows the completed installation.



b) Pass PLA into the extruder through the top hole, and then along the catheter into the nozzle. Next, let PLA go through the feeding gear by pressing a lock spring, until PLA reaches the **hotend** of print nozzle. **NOTE: Always make sure that PLA has been inserted into the nozzle firmly**.



c) If possibly, Heat the nozzle to check whether PLA can be deposited. If the tape on the print bed has been used out, you need to paste new tape. **Try your best to minimize the gap between each tape piece, without overlap and wrinkles**, and then carefully fix the print bed.

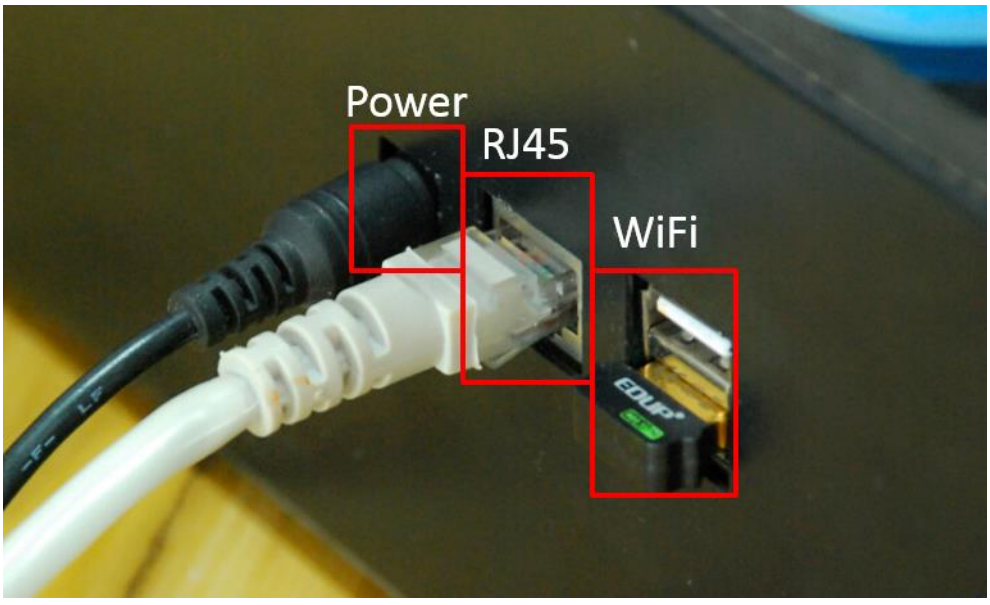


4.1.2 Connection to Ares

Given that the print bed is smooth and stable with completed feeding of PLA filaments, you can now enjoy Ares by connection through a computer or mobile devices like cell phone or tablet.

[1] Preparation for network configuration

For first time use, you need to setup the "**Configuration of connection**", both by **RJ45 cable** to PC or through **WiFi** access. As login of Ares is based on browser through network connection, instead of screen and control panel, you need to make sure that **at least one of RJ 45 cable and WiFi receiver** can be available. **Just turn to the "Connection to Ares" section, if you already finished the configuration of connection and got the valid IP address of Ares**.



[2] Configuration of connection

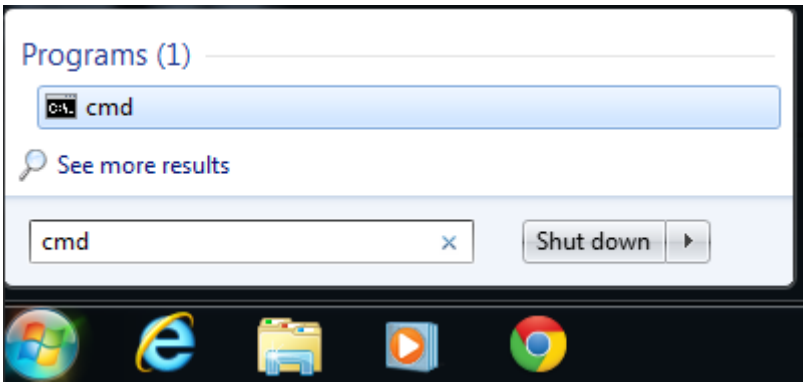
We will set up an example for you in Windows OS so that you can understand the configuration better. **Normally you can skip this step if you have configured the connection before. NOTE: the following several steps may have to be reconfigured if connection status has been changed, for instance, change of control PC, WiFi password or Router reset.**

For other operation system like MacOS, you may Google search for the request of IP address and remote desktop connection. You can also find detailed setup in https://github.com/foosel/OctoPrint/wiki.

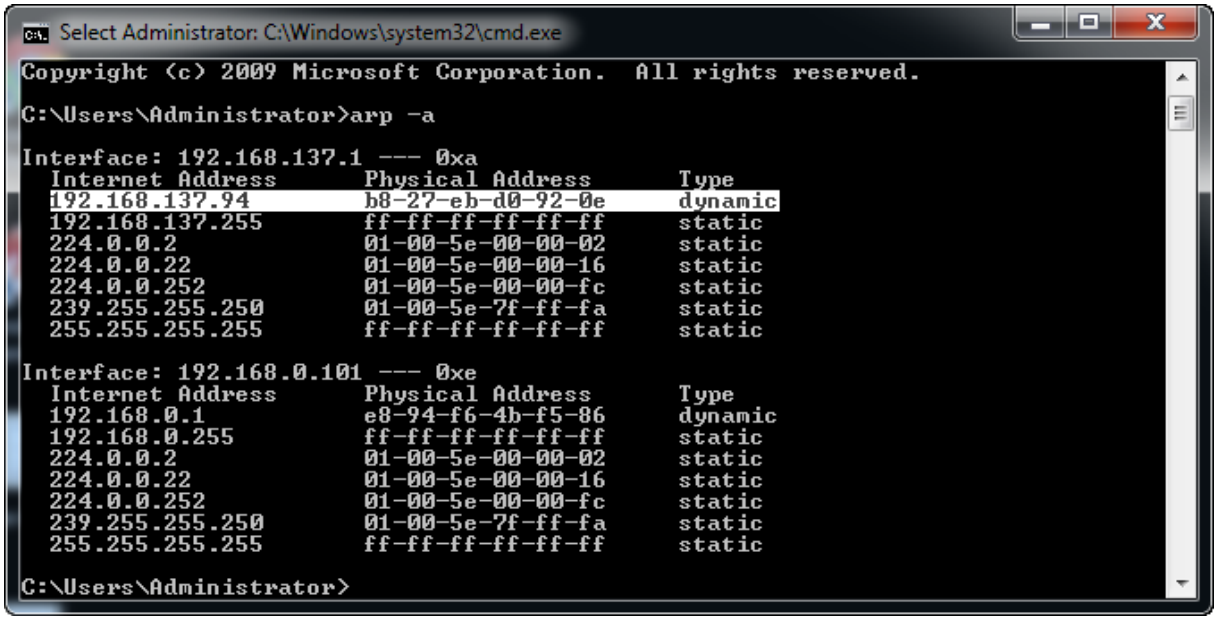
[3] Connection by RJ45 cable

In this case, RJ45 cable connection is a must.

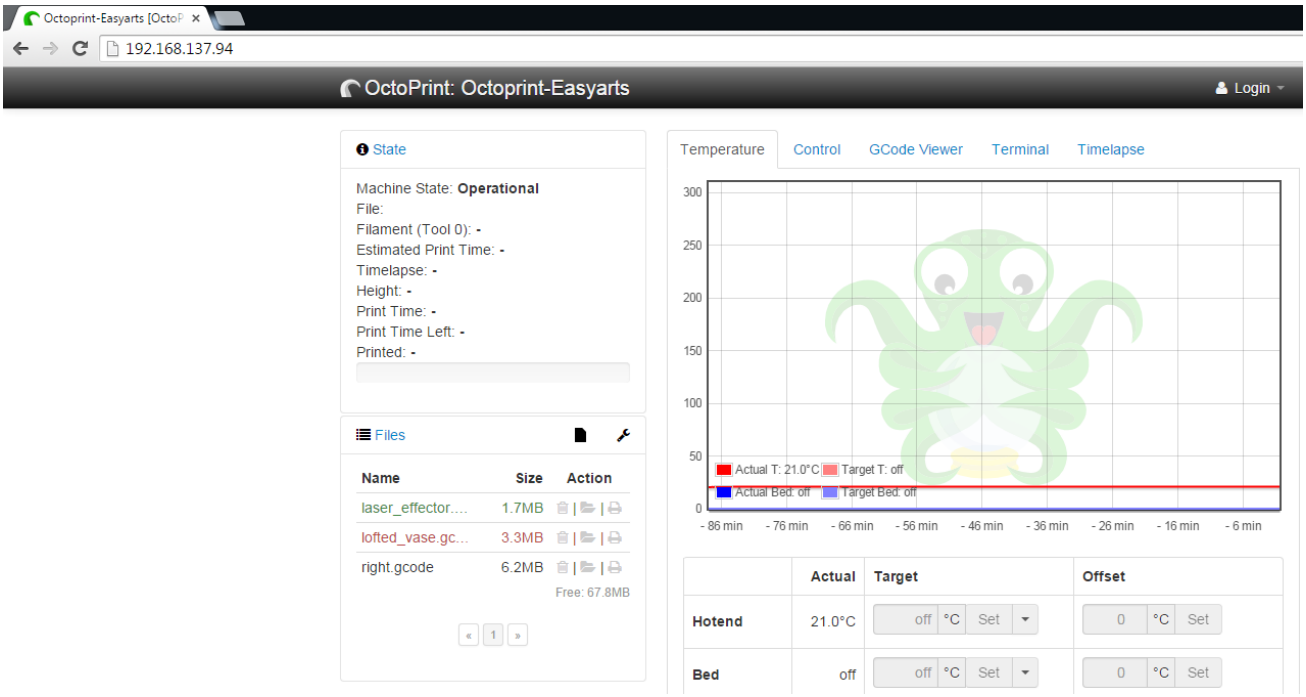
a) Search "**cmd**" in "**Start Menu**". Then click "cmd" to open it.



b) Input "**arp -a**" to request the information of network connection.

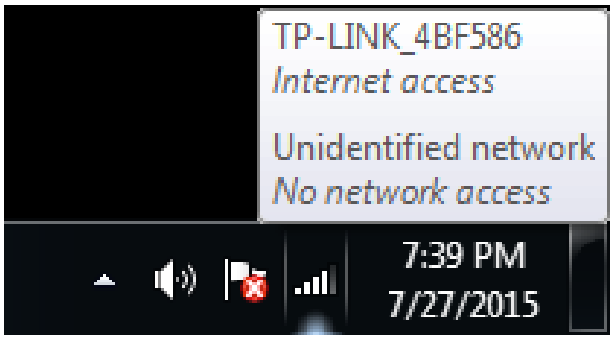


c) Normally, the IP address of Ares will be like "**192.168.137.X**". If there are many and you don't know which one exactly is Ares's, you can try one by one in the browser until you see the following page of "**OctoPrint**". In our example, the IP address is "**192.168.137.94**". **NOTE: Do remember to record the IP address of Ares**, so that you needn't request this next time as long as the control PC is the same.

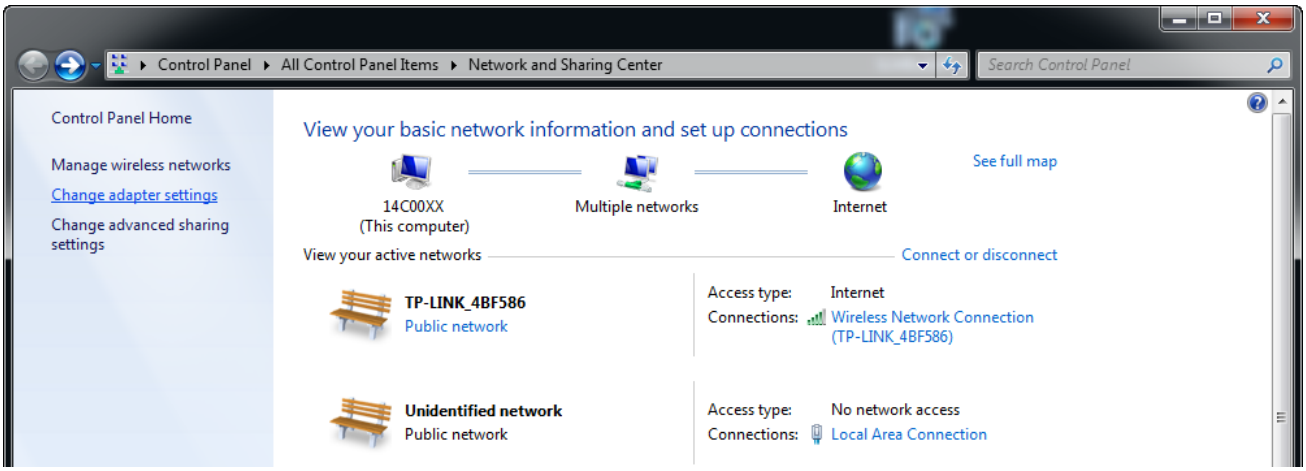


[4] Connection through WiFi

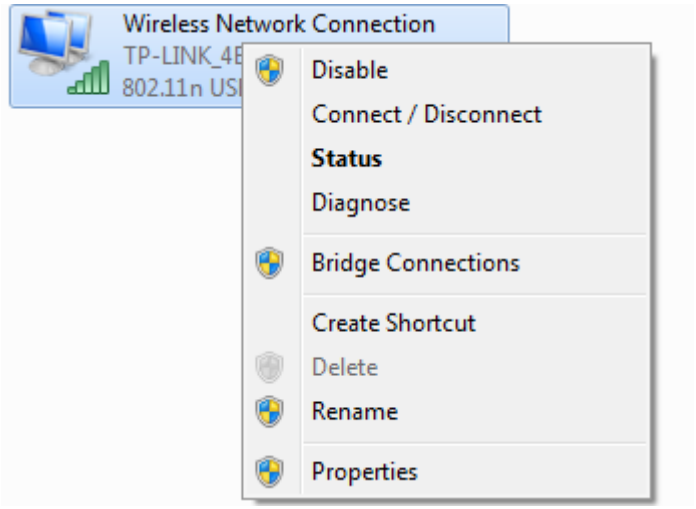
a) To setup WiFi configuration of Ares, **your control PC must have WiFi access and is connected with Ares by RJ45 cable**. In our example, the WiFi name is "**TP-LINK_4BF586**".



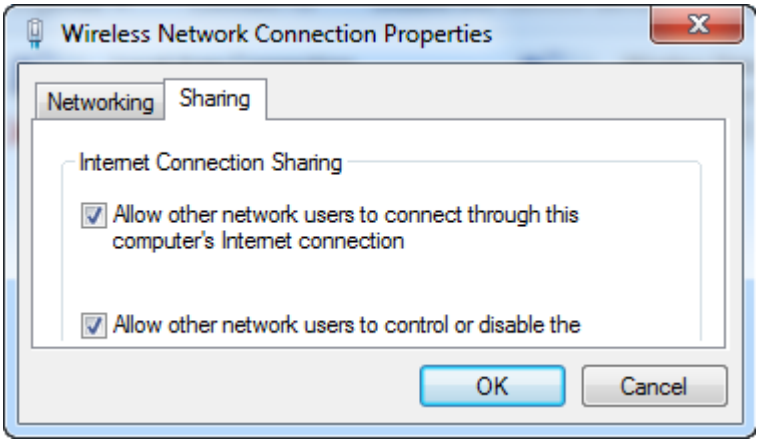
b) Open "**Network and Sharing Center**" in "**Control Panel**". Then click "**Change adapter settings**".



c) **Right** click your WiFi adapter to change the properties.

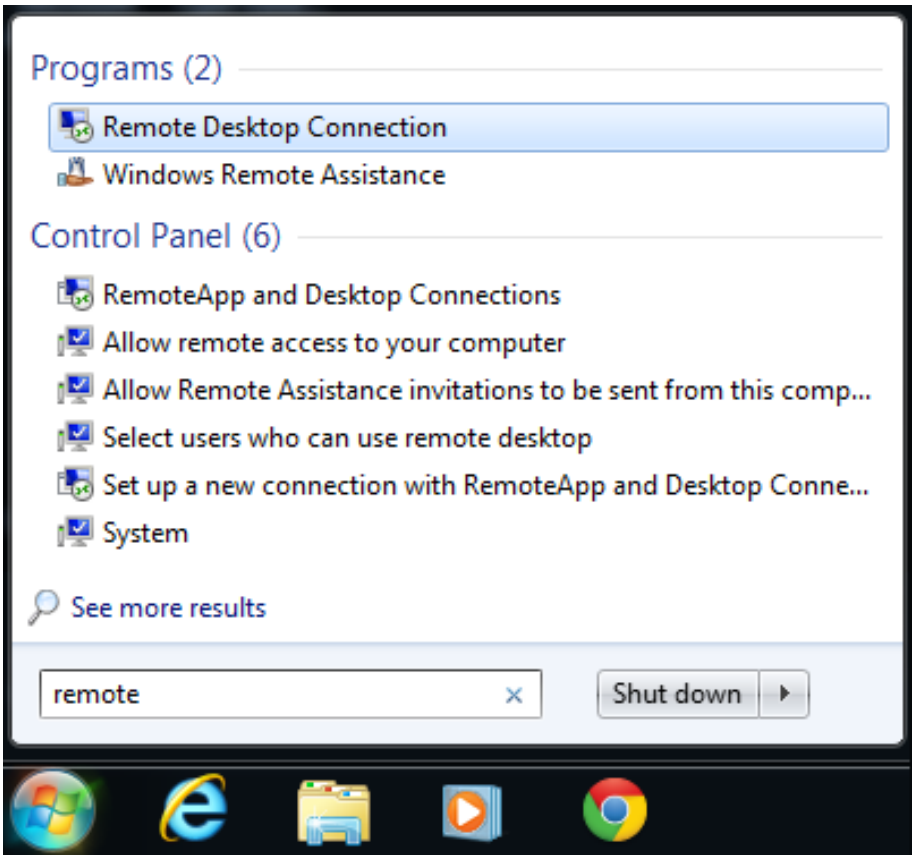


d) Turn to the "**Internet Connection Sharing**" tab and enable "**Allow other network users to connect through this computer's Internet connection**", then click "**OK**". You can determine whether to enable the other option or not.

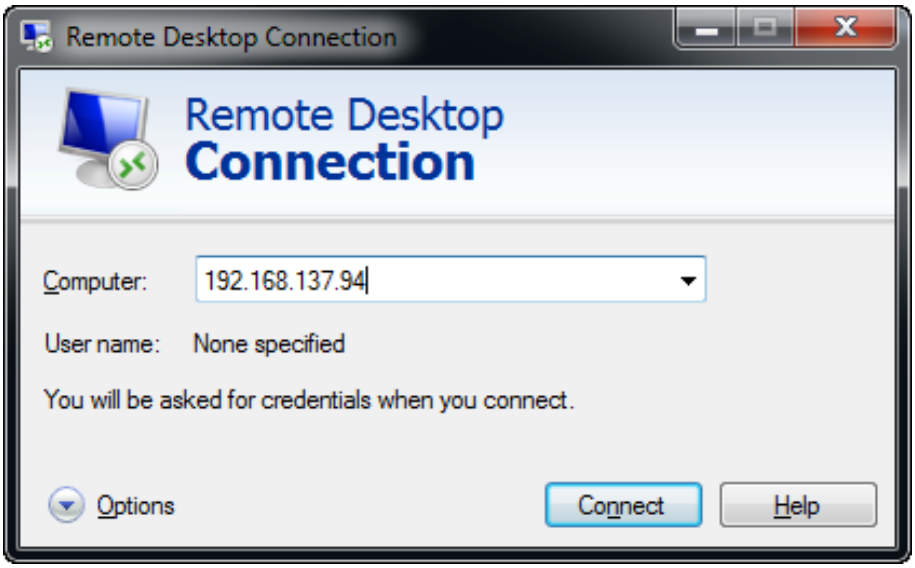


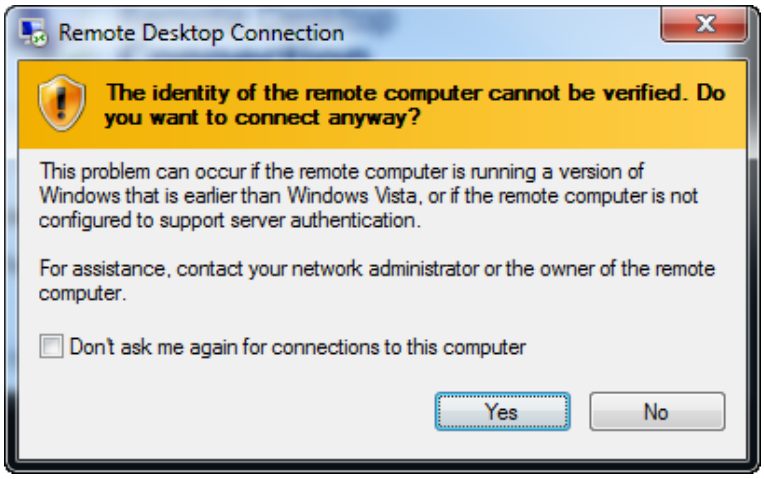
e) Request the IP address of Ares by following the step of "**Connection by RJ45 cable**" section.

Search "**Remote Desktop Connection**" in "**Start Menu**", and then click and open it.

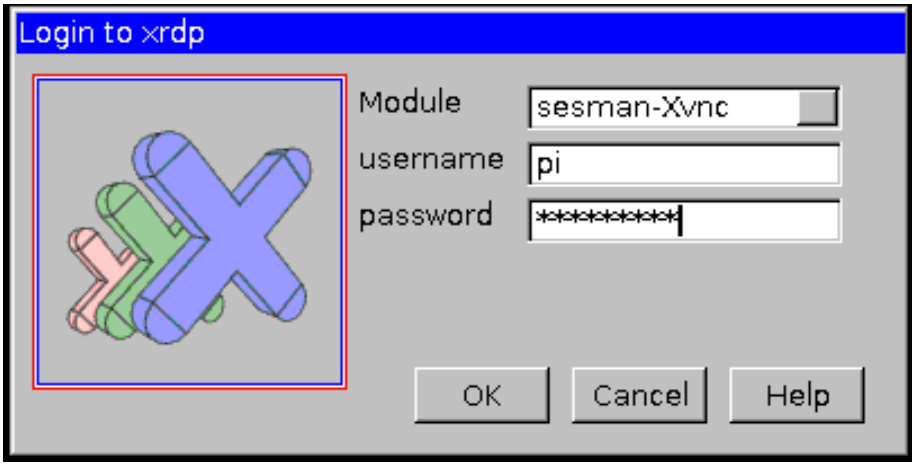


f) Input the **IP address** of Ares and then click "**Connect**". Just ignore the popup warning if it occurs as follows.

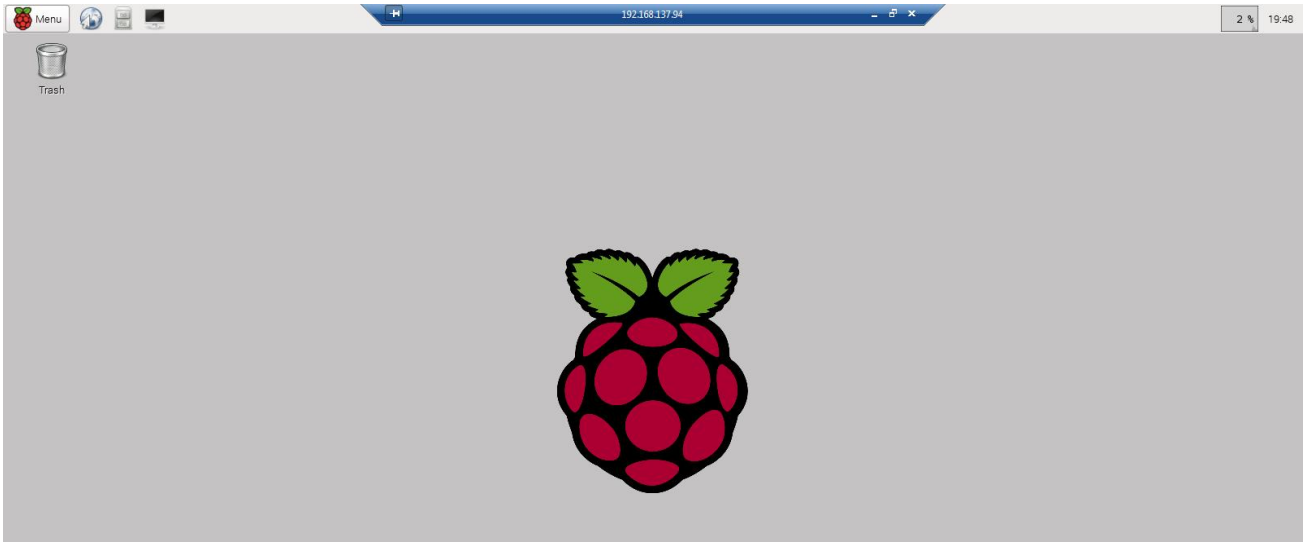




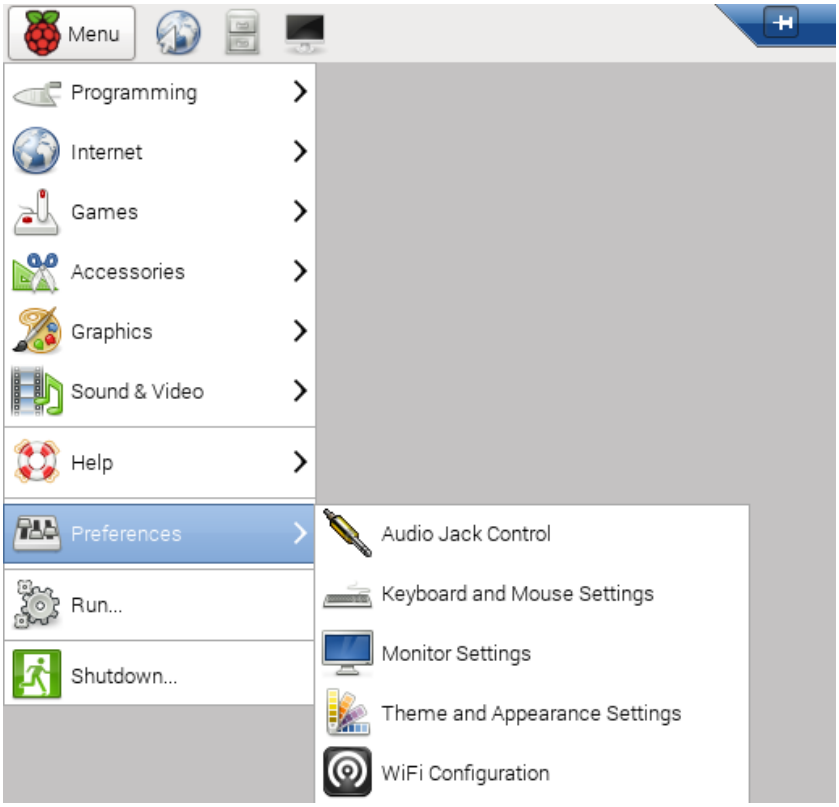
g) Now you can login to Ares by **Xrdp Interface**. Input the default login information, i.e. "username: **pi**" and "password: **raspberry**".



h) Congratulations to you if you successfully login to Ares. You can see that **Raspbian** (OS in Raspberry, based on Linux) is very friendly and easy to use.

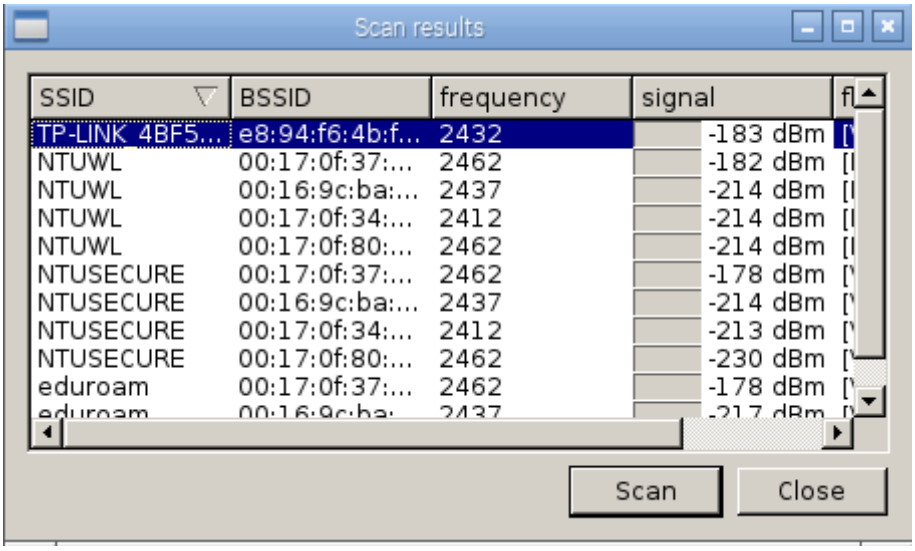


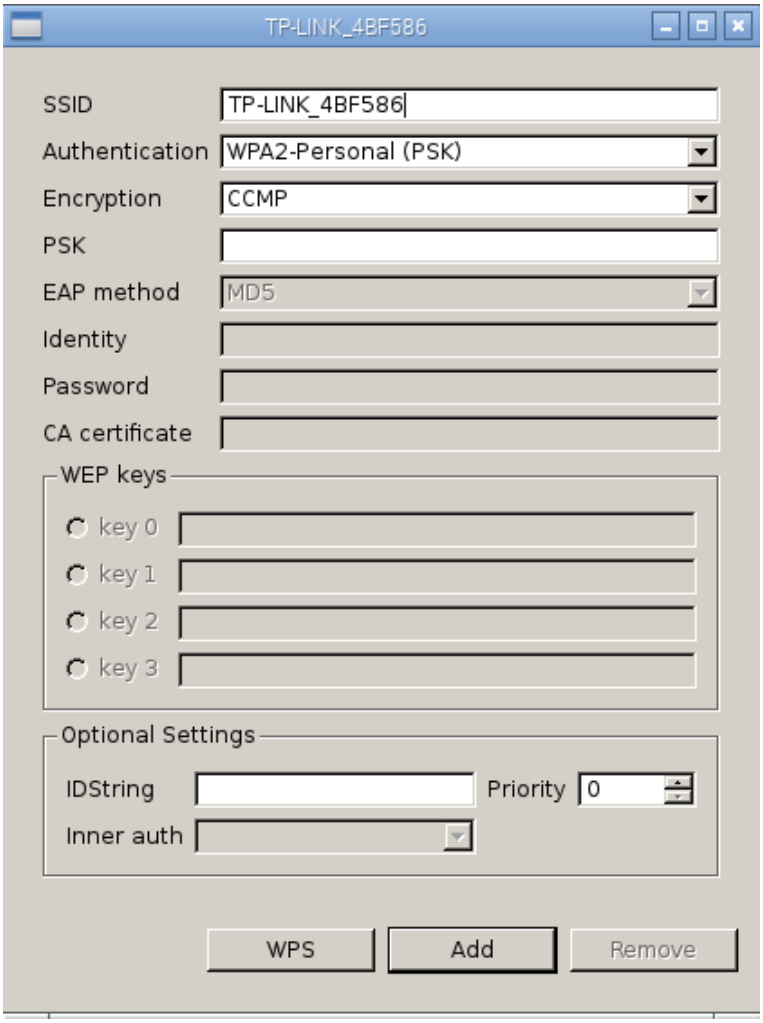
i) Click "**Menu**" button to setup "**WiFi Configuration**", as shown in following.



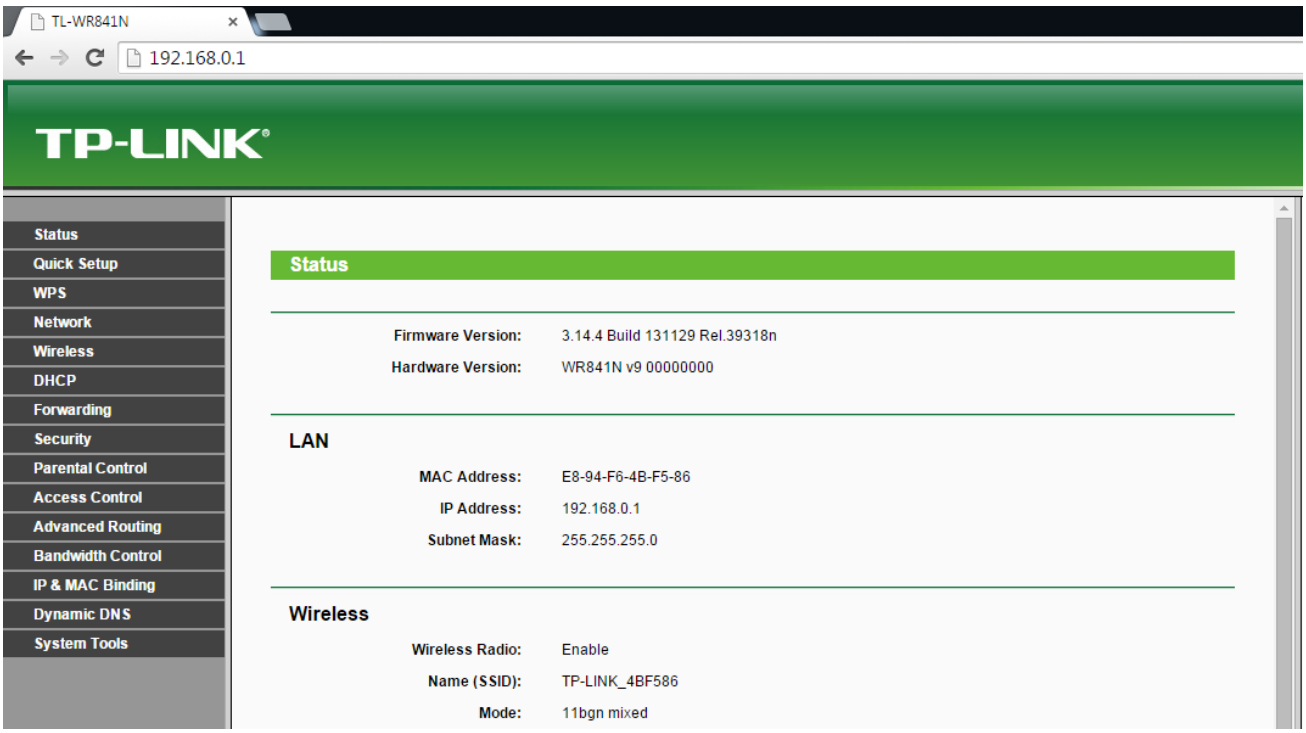
j) Once in "**wpa_gui**", if you cannot find your WiFi (ours is **TP-LINK_4BF586**) in the **Adapter** list, just click "**Scan**" to search it.

k) If the result is empty, "**Scan**" again and try to find your WiFi in the "**SSID**" list, and then **double click** to connect. "**PSK**" will be required for connection.

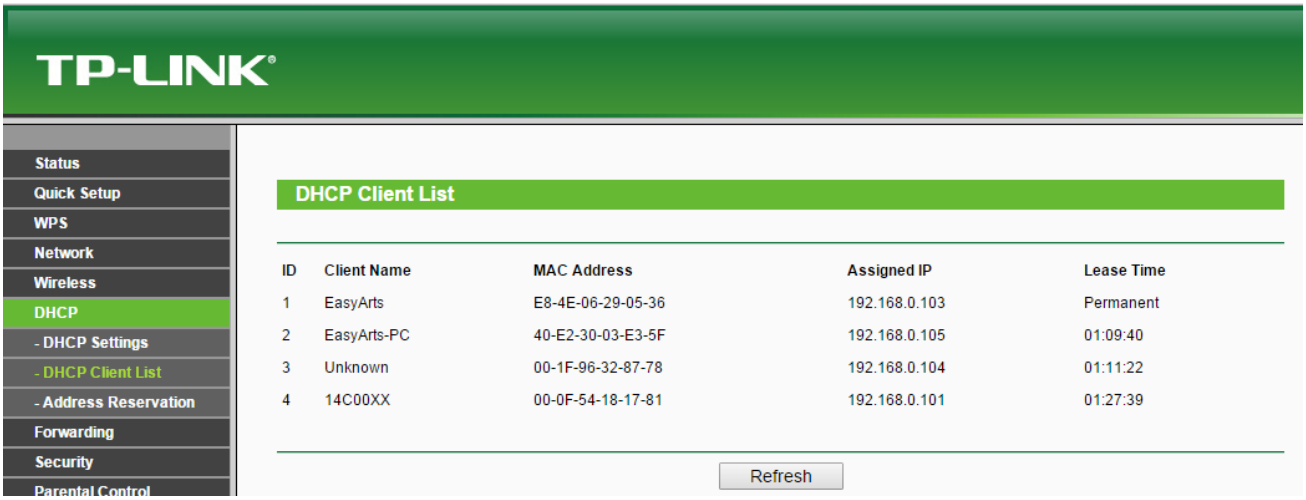




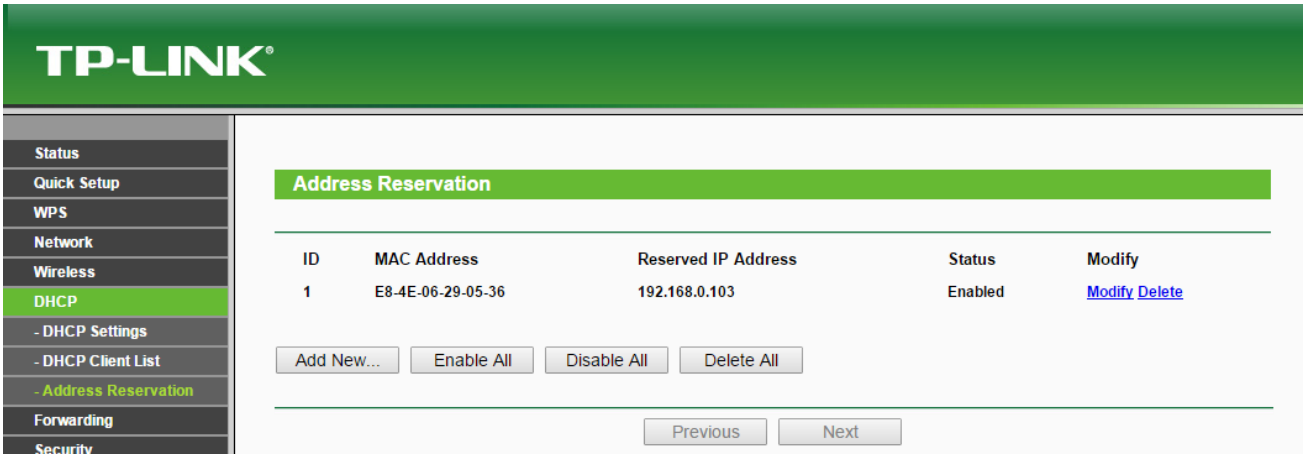
l) To make sure the IP address of Ares is **permanent**, you also need to configure the settings of router. Here we take **TP-LINK** as an example for you. For routers of other brands, you can refer to their user manuals. Search "**192.168.0.1**" in your browser to login the router, please note that **username** and **password** may be required.



m) Check the "**Lease Time**" of "**Assigned IP**" of Ares, with "**Client Name**" called as "**EasyArts**", which can be found in "**DHCP Client List**" of "**DHCP**" settings. If it is already "**Permanent**", you can skip the following few steps. **NOTE: Do remember to record the IP address of Ares if it is "Permanent".**



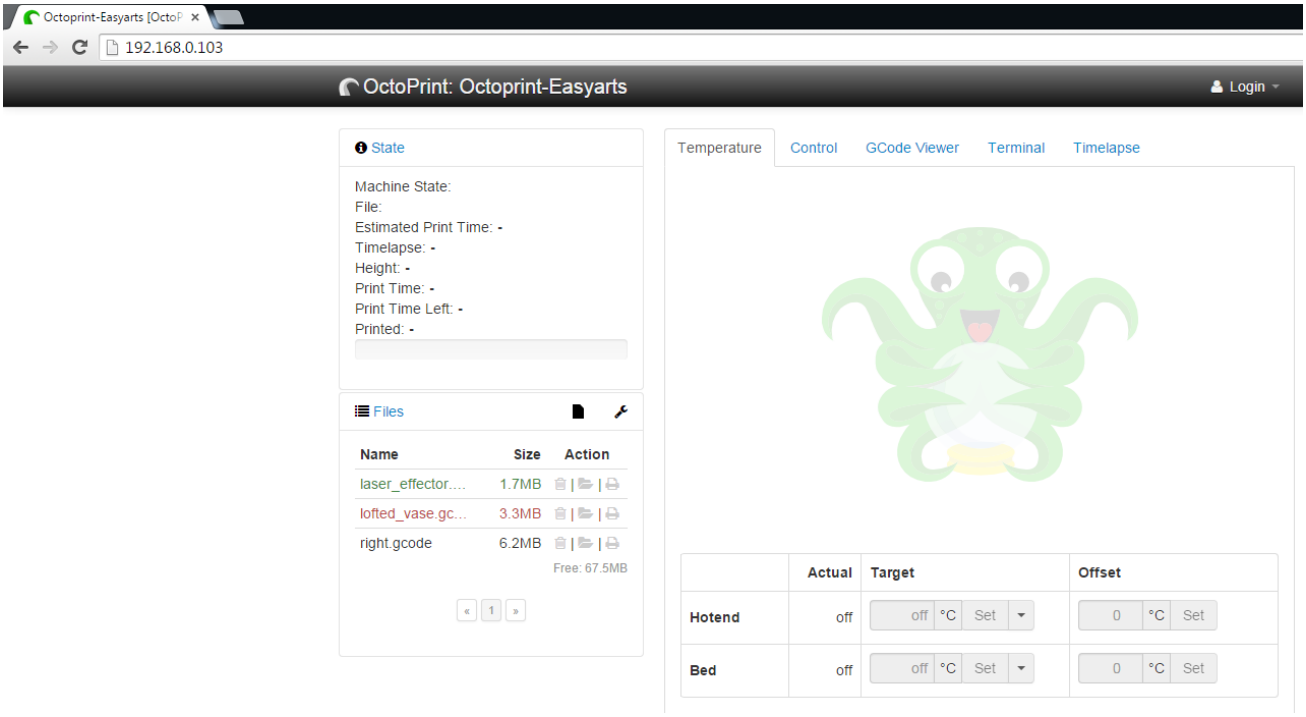
n) If the lease time of Ares IP is not permanent, you can turn to the "**Address Reservation**" in "**DHCP**" settings to change this property. Click the "**Modify**" button to make it "**Permanent**". **NOTE: Do remember to record the IP address of Ares if it is "Permanent".**



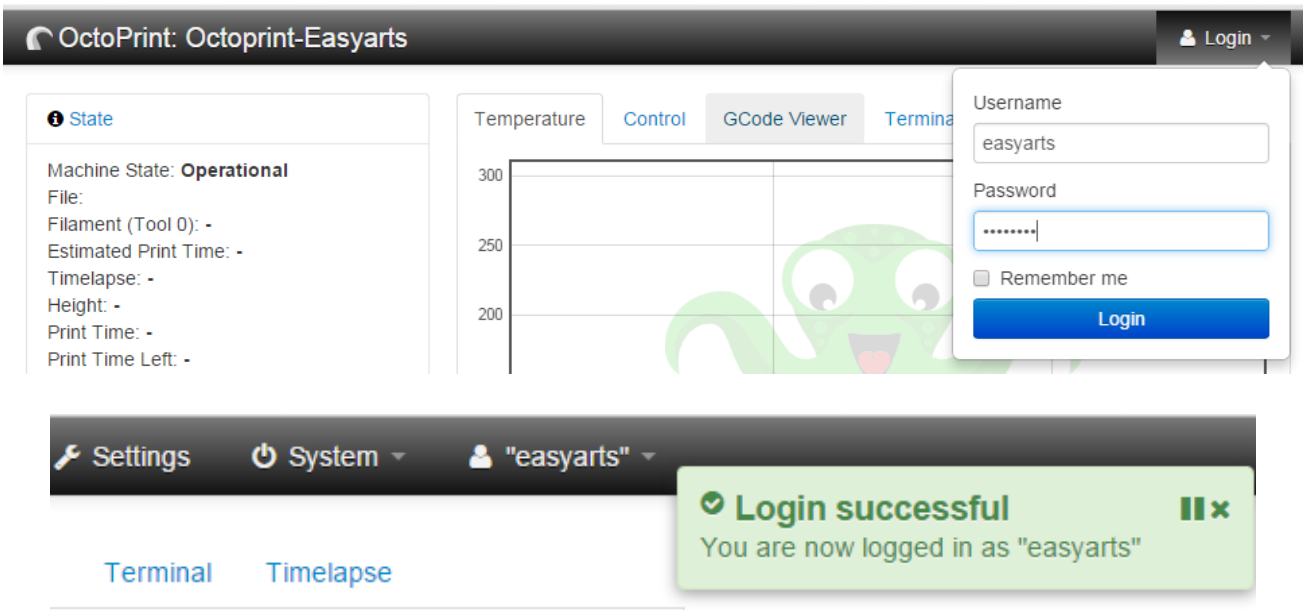
Now that we have finished the configuration of connection to Ares both by **RJ45 cable** and **WiFi** access. Please follow the instructions step by step if you are not familiar with the configuration.

[5] Connection to Ares

a) Given that you have the valid **IP address of Ares**, search it in your browser ("**192.168.0.103**" in our case), and you will see the main panel of **OctoPrint**.

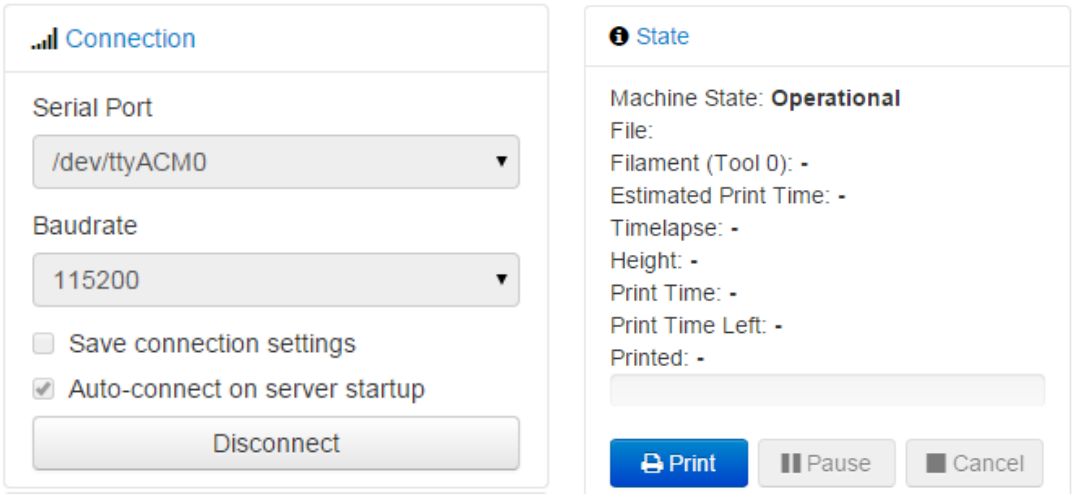


b) Find the "**Login**" in the top-right corner, then login with default settings, i.e. "**Username: easyarts**" and "**Password: easyarts**". OctoPrint will remind you if it is successful.



c) Click the "**Settings**" menu item as shown above to change "**OctoPrint Settings**". Find the "**Serial Connection**" in "**PRINTER**", then set the "**Serial Port**" to be "**/dev/tty/ACM0**" (or "**/dev/tty/USB0**" if **ACM0** is not applicable), as well as "**Baudrate**" to "**115200**". **Keep other settings as default**. If you want to know further settings, please refer to **OctoPrint official site**. "**Save**" the settings and click "**Connect**".

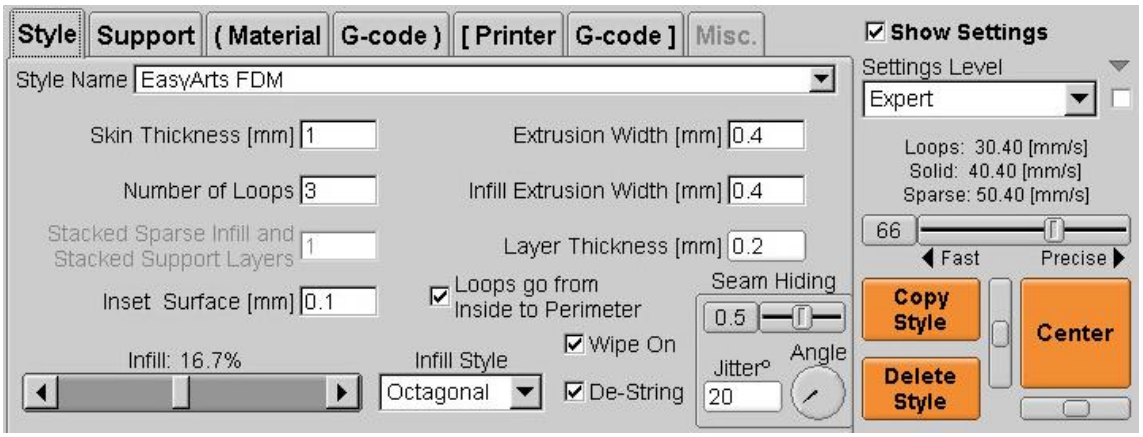
d) Do remember to tick "**Auto-connect on server startup**" for your convenience. In the "**State**" section, if "**Machine State**" is "**Operational**", **it means you have connected to Ares successfully**.



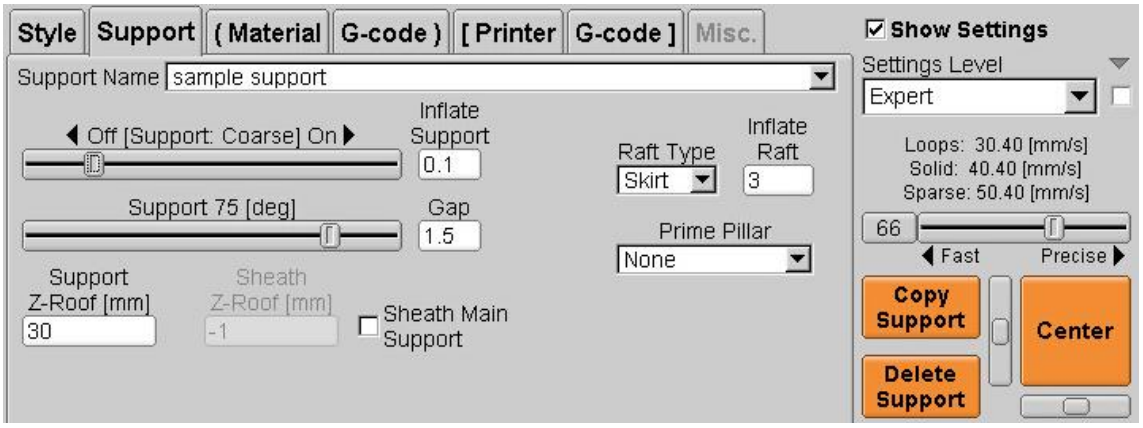
4.1.3 Model slicing

There are many nice software for slicing, and most of them are free. **Here we will show you our common settings for general 3D models in KISSlicer**.

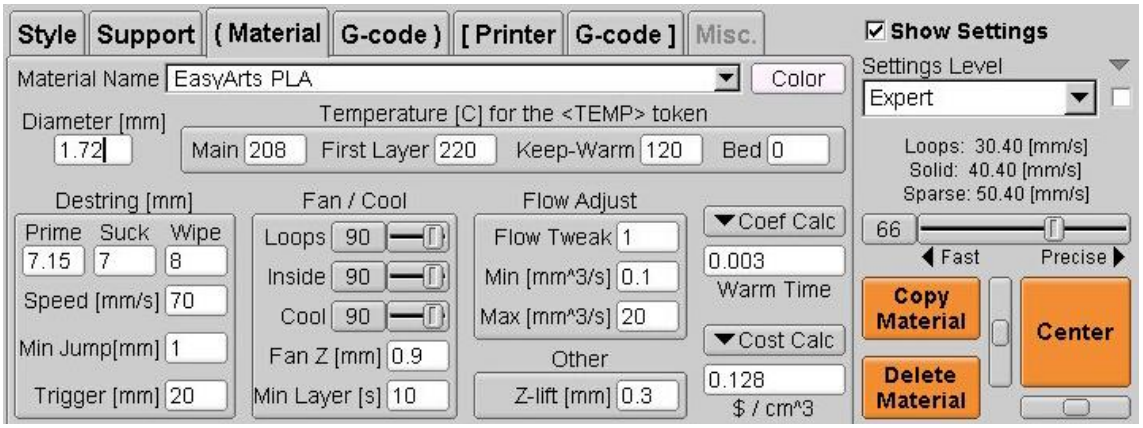
1) "**Style**" settings: select "**EasyArts FDM**". **NOTE: You should better keep the default settings if you are not confident in these parameters, and the same for the following settings.**



2) "**Support**" settings: select "**sample support**".

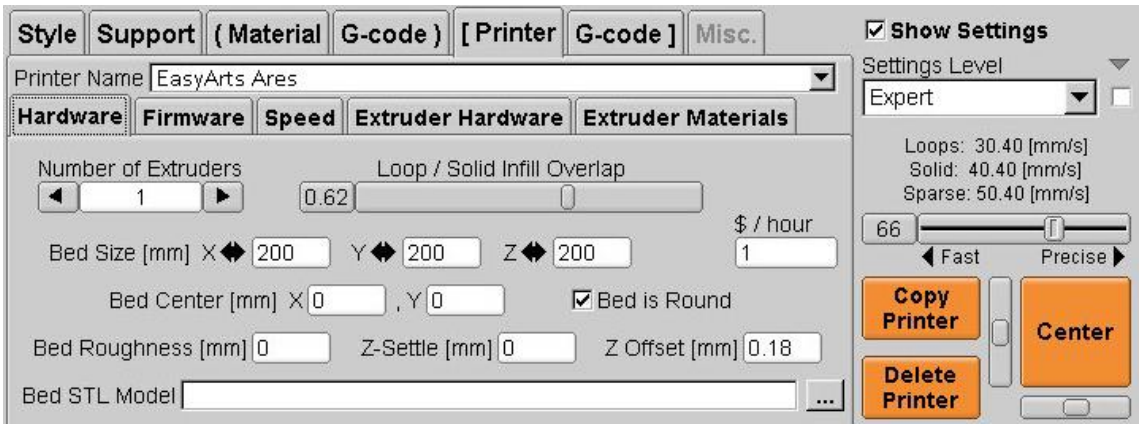


3) "**Material**" settings: select "**EasyArts PLA**".

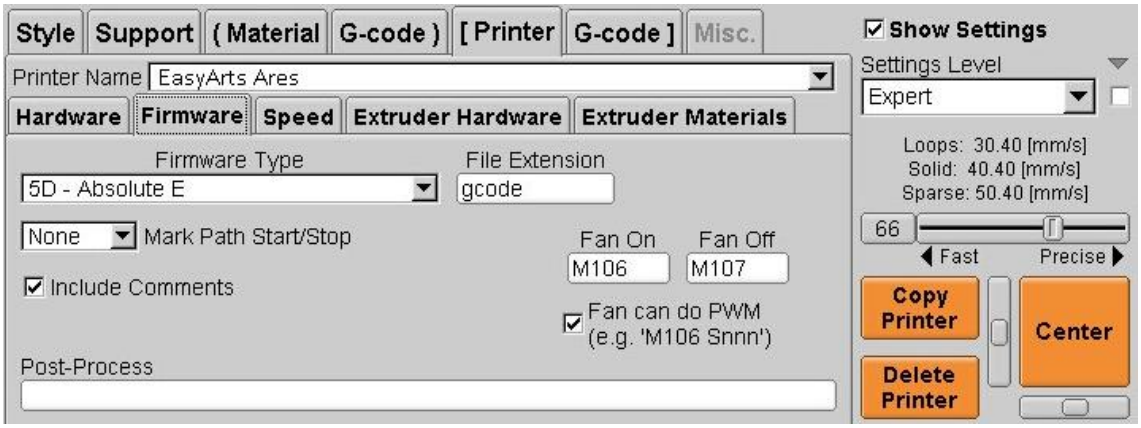


4) "**G-code**" for "Material" settings: **expert settings**.

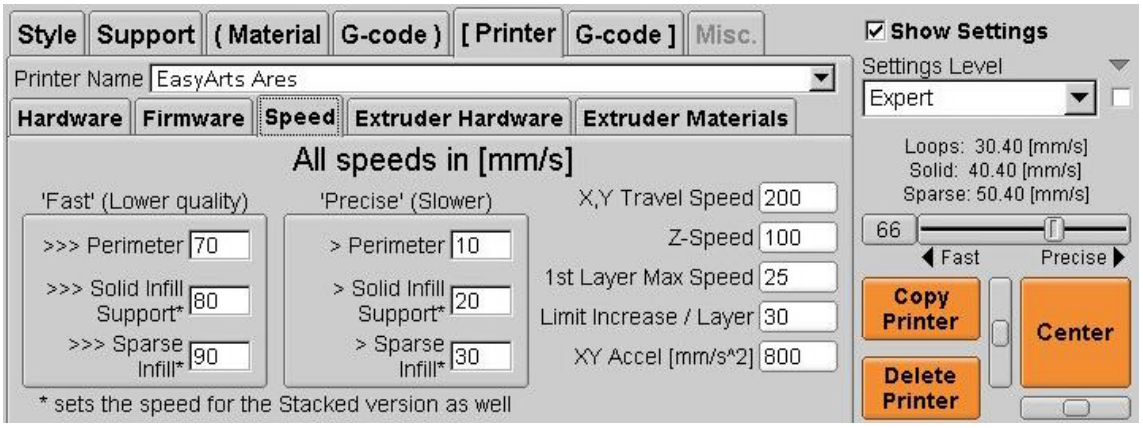
5) "**Printer / Hardware**" settings: select "**EasyArts Ares**".



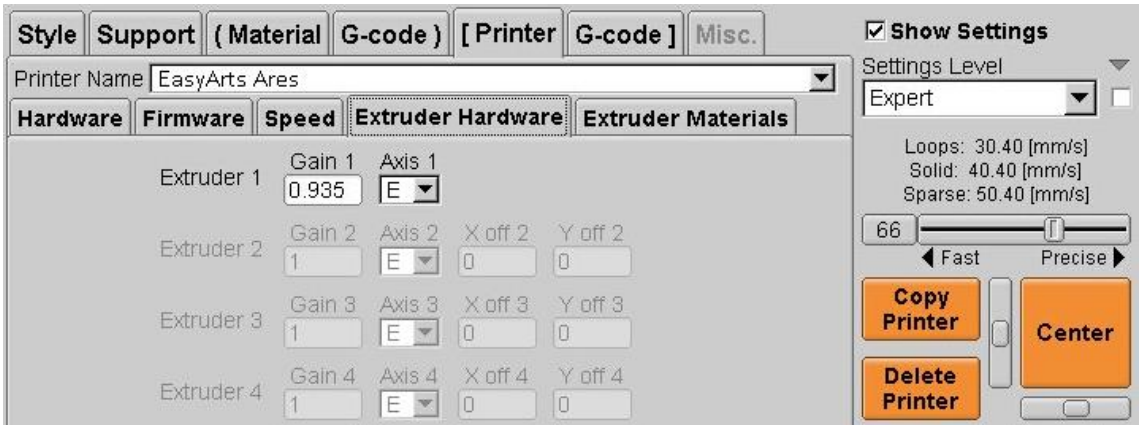
6) "**Printer / Firmware**" settings: select "**5D - Absolute E**".



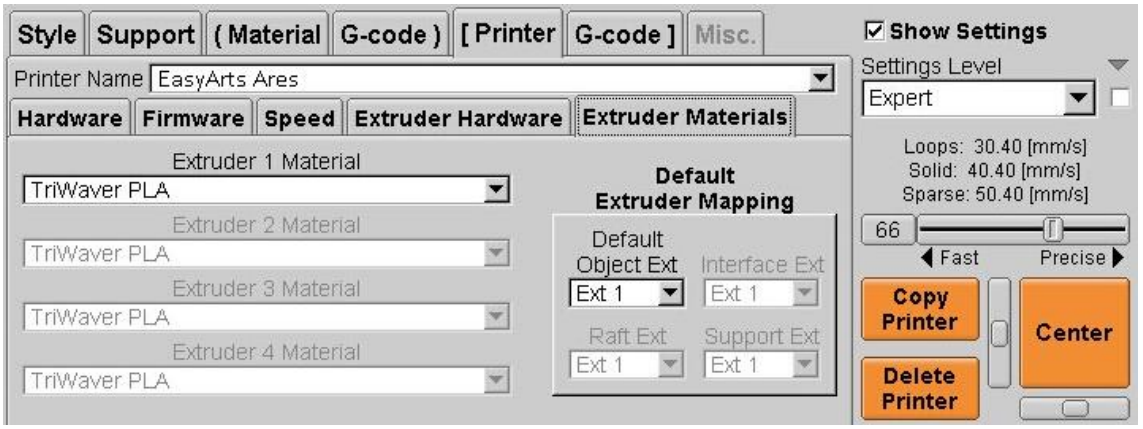
7) "**Printer / Speed**" settings.



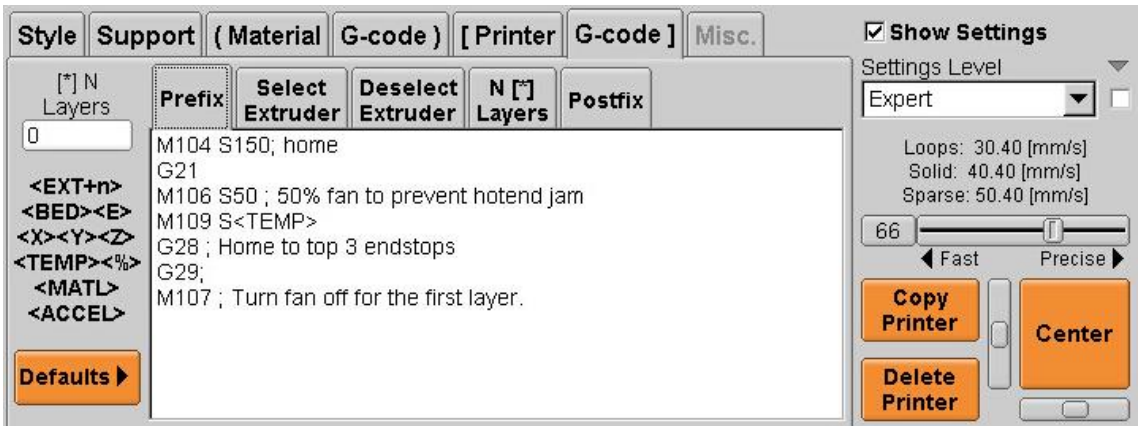
8) "**Printer / Extruder Hardware**" settings.



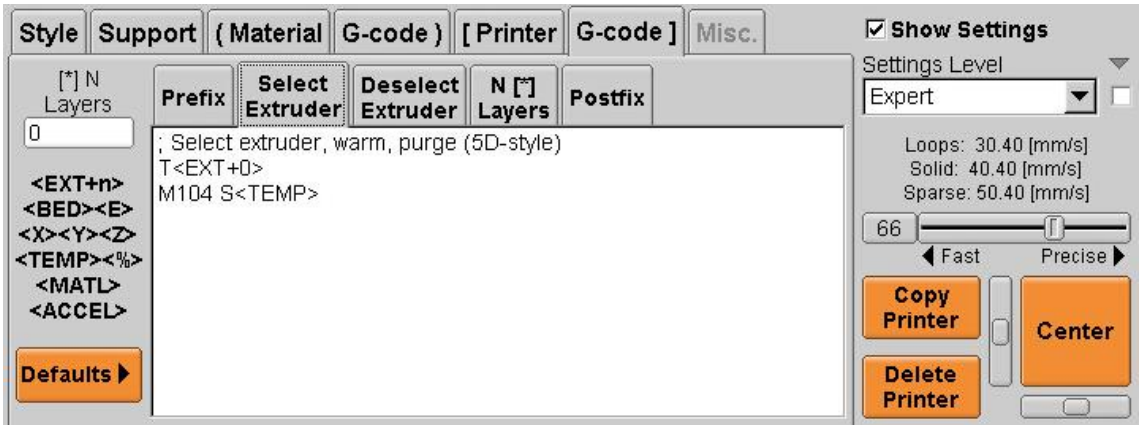
9) "**Printer / Extruder Materials**" settings.



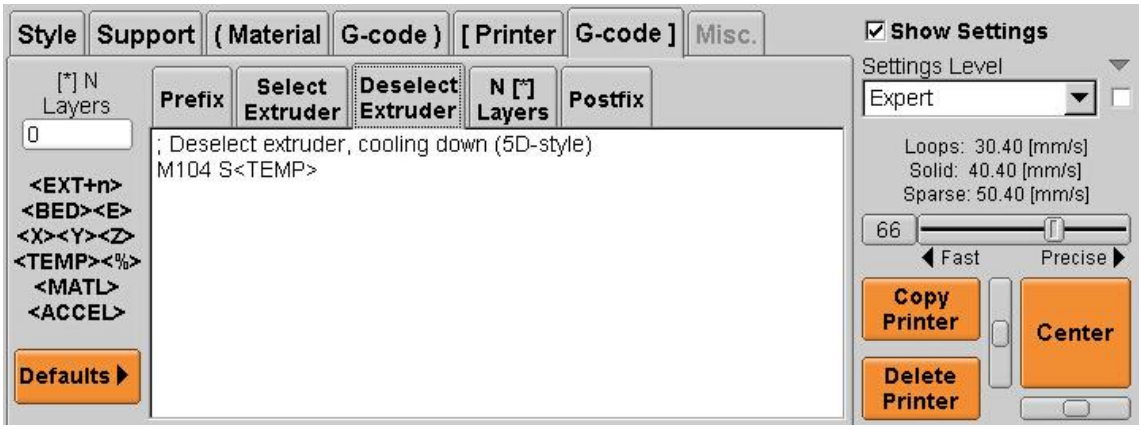
10) "**G-code / Prefix**" settings for "Printer".



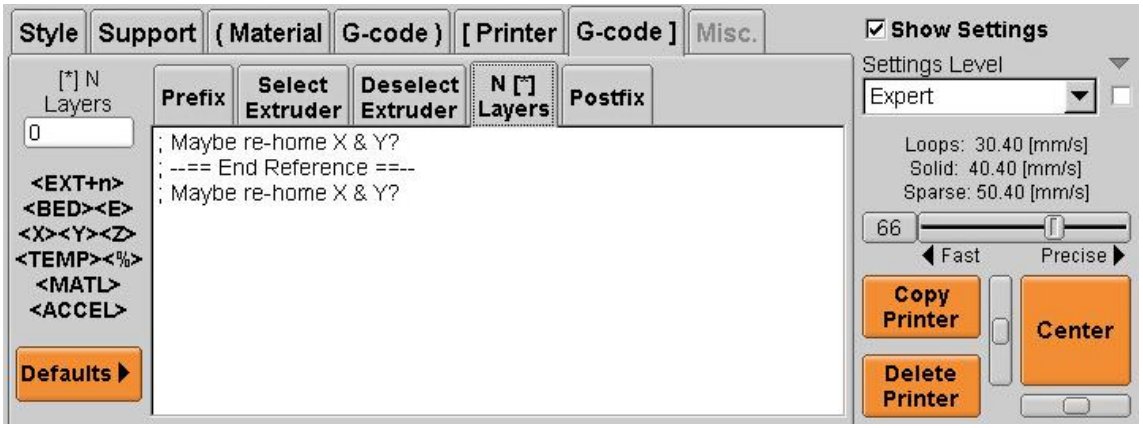
11) "**G-code / Select Extruder**" settings.



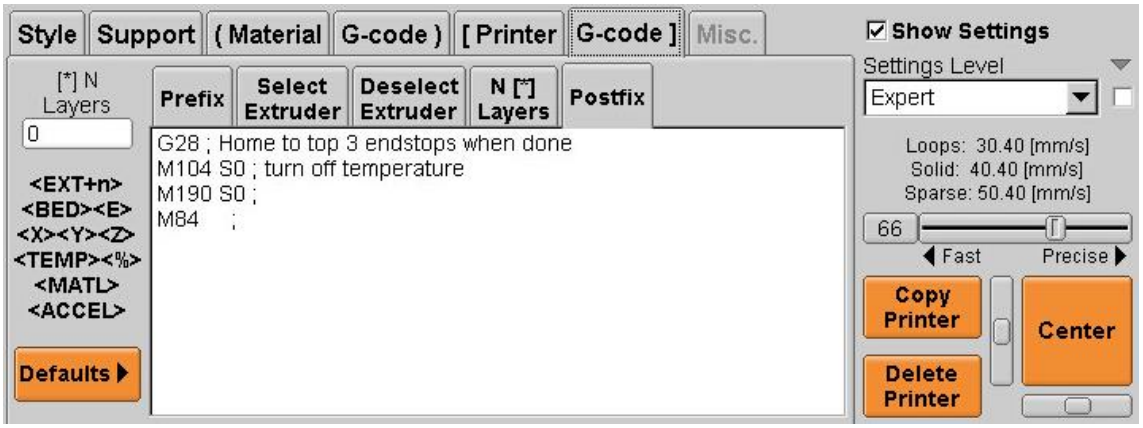
12) "**G-code / Deselect Extruder**" settings.



13) "**G-code / N [*] Layers**" settings.



14) "**G-code / Postfix**" settings.



15) Given that you have finished all settings of the parameters, go ahead to slice and generate gcode for your 3D models.

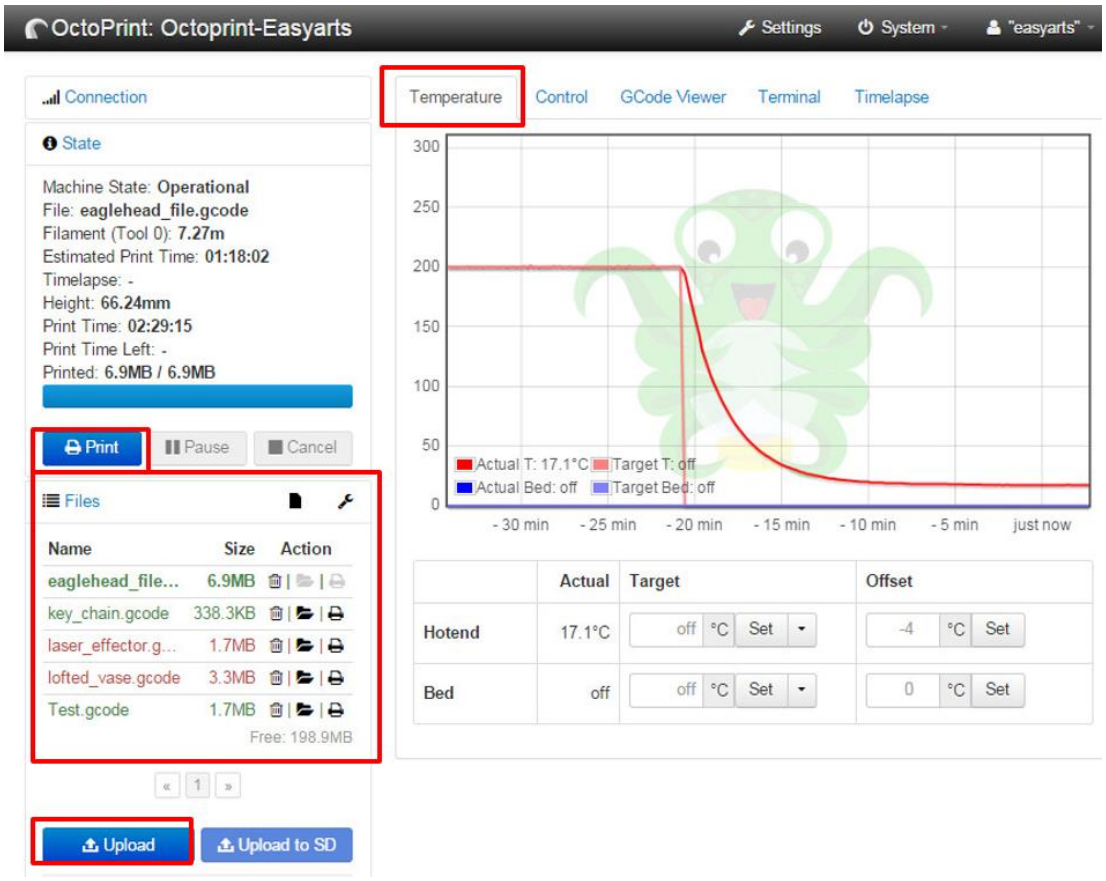
4.1.4 Start printing

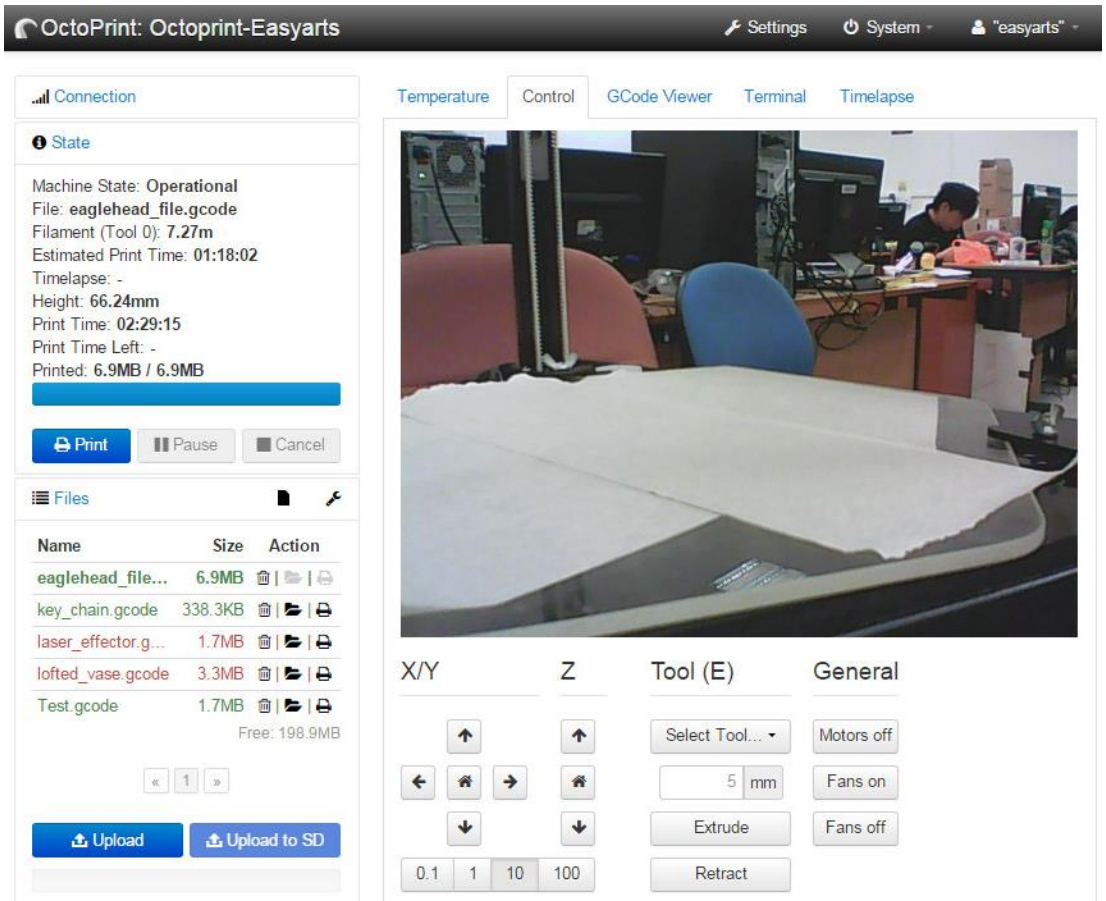
a) You can "**Upload**" newly generated gcode files or select one from the existed "**Files**" list to start printing (seen next page). If you can find your new gcode files in the list, it means upload is successful. Select your gcode files, click "**Print**" to start. It is so easy.

b) If you are already very familiar with OctoPrint, we suggest you to know some further operation. Here we go.

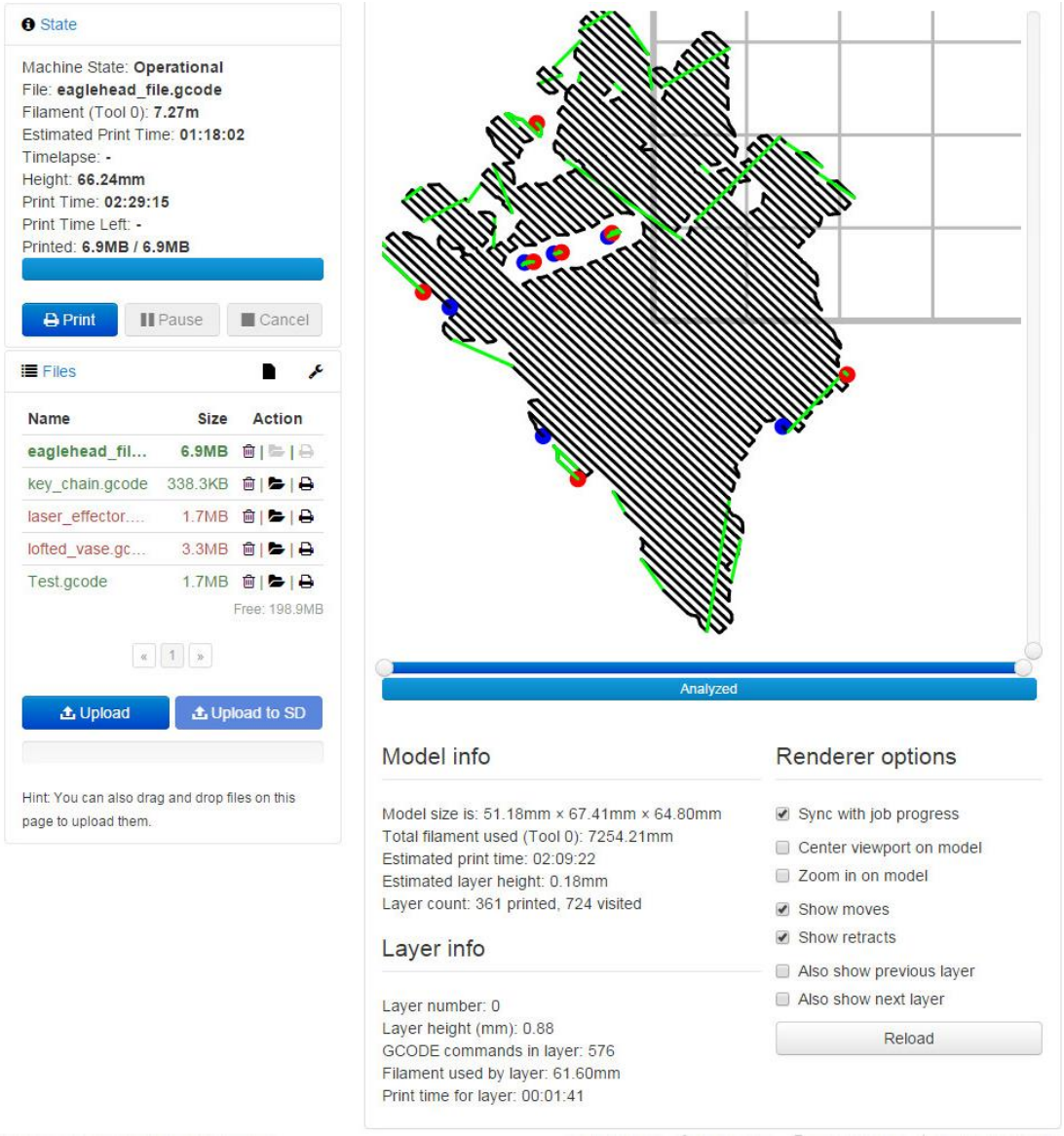
[I] Temperature: You can view the "**Temperature**" history of print nozzle (seen next page), from **just now** to **30 mins** ago, which will help for **expert settings** in terms of temperature.

[II] Control: In the "**Control**" panel (seen next page), you can control Ares even you are not beside, thanks to the help of **real-time monitoring** by webcam. It sounds so exciting. Please refer to "**Remote Control**" for detailed setup of real-time monitoring.



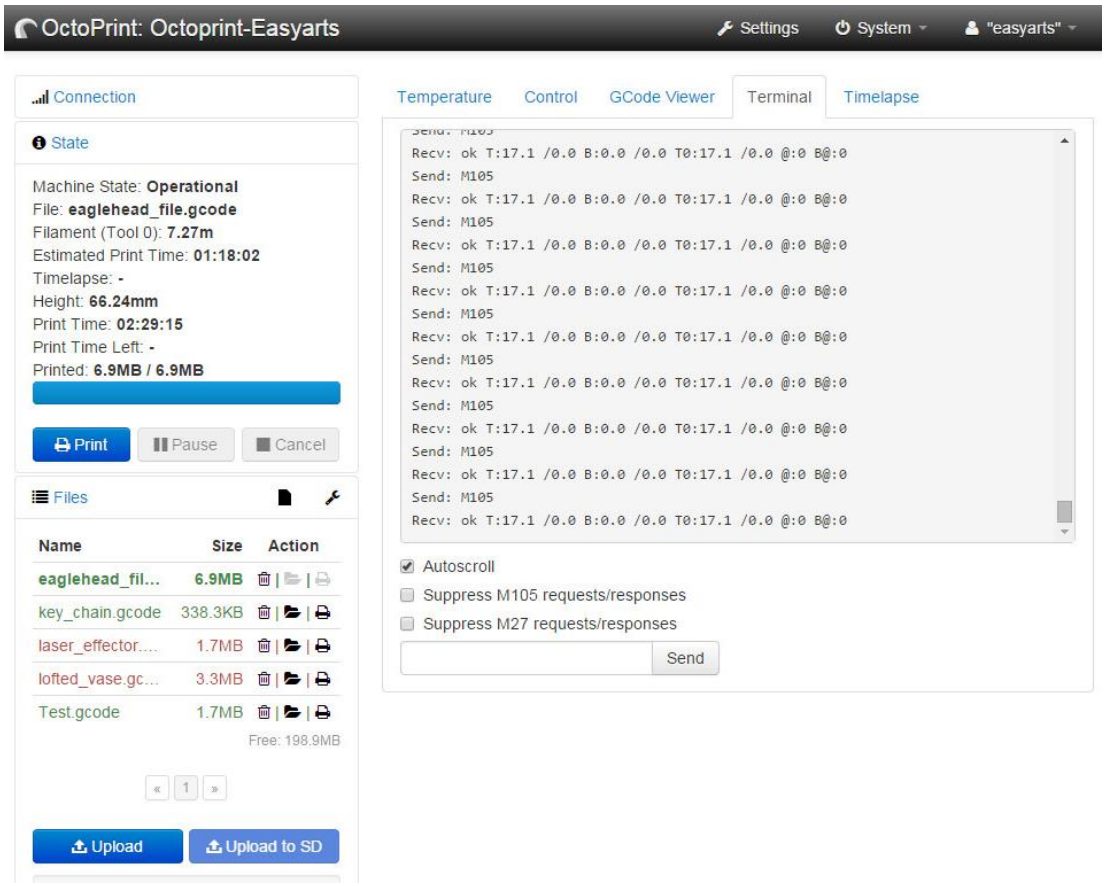


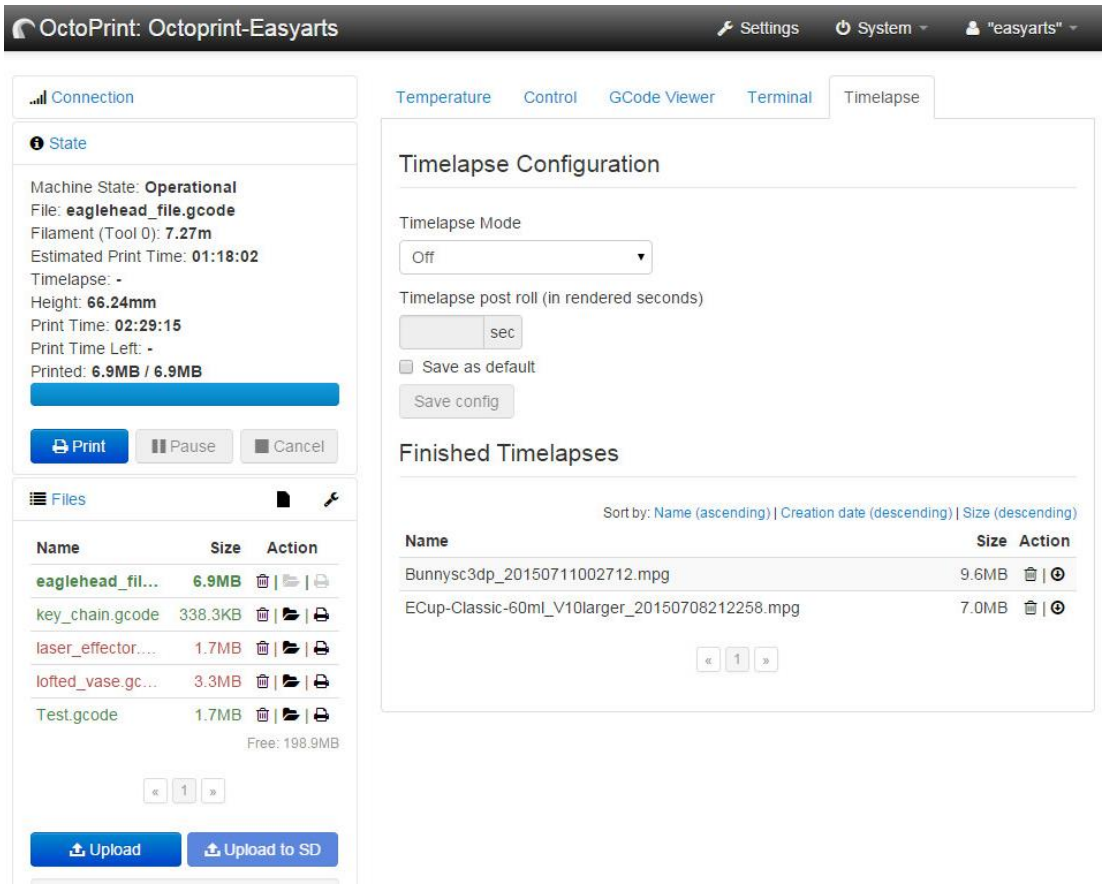
[III] GCode: You can view your gcode file during printing layer by layer. It will also show you some detailed information about your model and current layer. Professional knowledge may be required to understand gcode.



[IV] Terminal: The quickest and easiest way to control Ares is of course through terminal, just like in Linux, providing that you are familiar with it. We have listed almost all of supported commands in "**List of terminal commands**" section. And for the most commonly used ones, we have marked them as **RED**.

[V] Timelapse: If you want to save the exciting printing process as video, you can configure the settings of "**Timelapse**". **Please note that more storage space in SD card will be occupied with shorter timelapse**. So make sure your SD card is enough for storage, in case of unknown error during printing.





4.1.5 Final treatment

When your printing has been finished, Ares will stop automatically. However, you still need take care if you want to take your model.

[1] Make sure Ares is at HOME position so that you won't touch the print nozzle. If such touch is unavoidable, please wait until it cools down, so that you won't get burnt.

[2] You may take advantage of a small shovel or other tool to take your finished model easily off the print bed. If it is still difficult to do this, you can remove the print bed instead. After soaked in water for some while, the tape will turn soft and easy for separation.

[3] Carefully remove the model supports. Congratulations to you, and enjoy your 3D models. Do not forget to turn off Ares when you won't continue.

4.2 3D Scanning

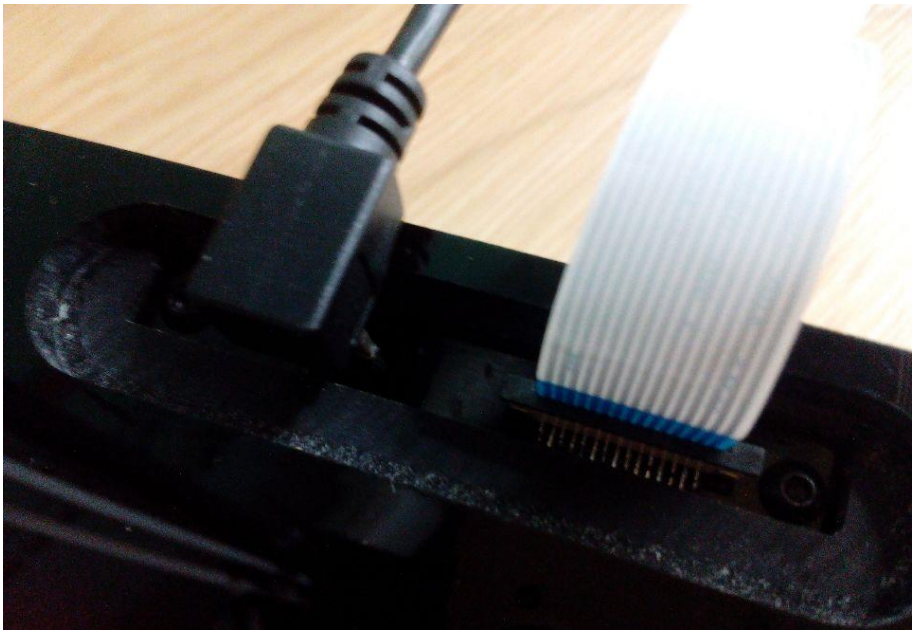
3D scanning, or 3D reversion, just makes your creation and extension simpler and easier. With laser line scanners, and **high-definition** cameras, Ares can deal with most of daily objects very well in high resolution. The design of quick setup makes 3D scanner portable and efficient for installation. In addition, you have many options to output the results, making it more convenient for modification and much more practical in DIY.

NOTE: If there is something wrong with your scanning module, please refer to "Purchase" section in "Support" for renewal.

4.2.1 Installation of 3D scanning

4.2.2 Preparation and setup

a)



4.2.3 Scanning parameters

4.2.4 Start scanning

4.2.5 Final treatment

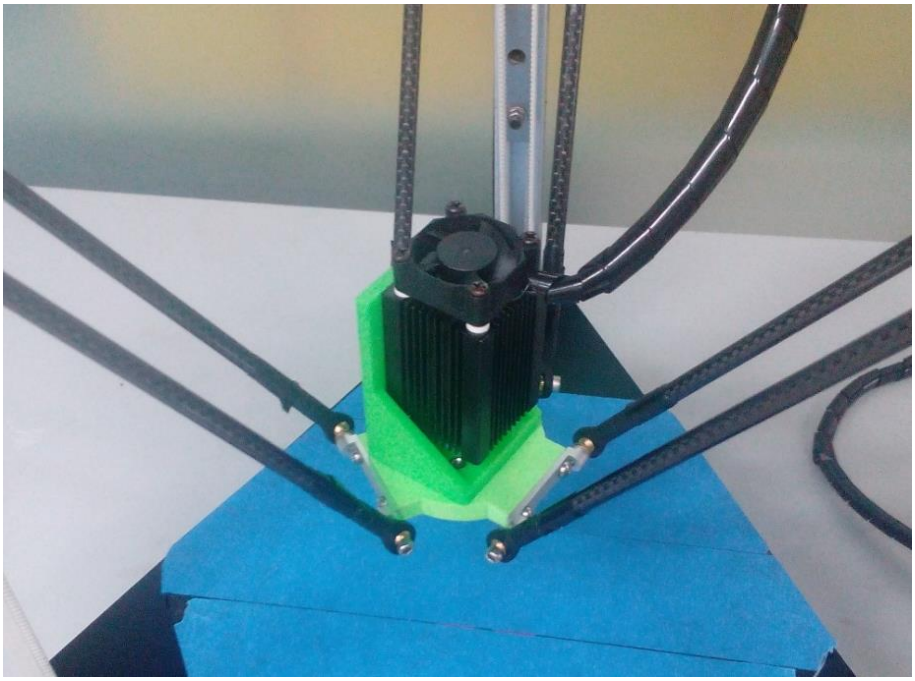
4.3 Laser Engraving

Laser engraving is very popular to DIY makers. In consideration of practicality and safety, we think **300mW** power will be enough for daily DIY. With this function, Ares can help engrave your logo or picture on a card, leather, or wood, and even cut the paper into your design.

NOTE: If there is something wrong with your laser module, please refer to "Purchase" section in "Support" for renewal.

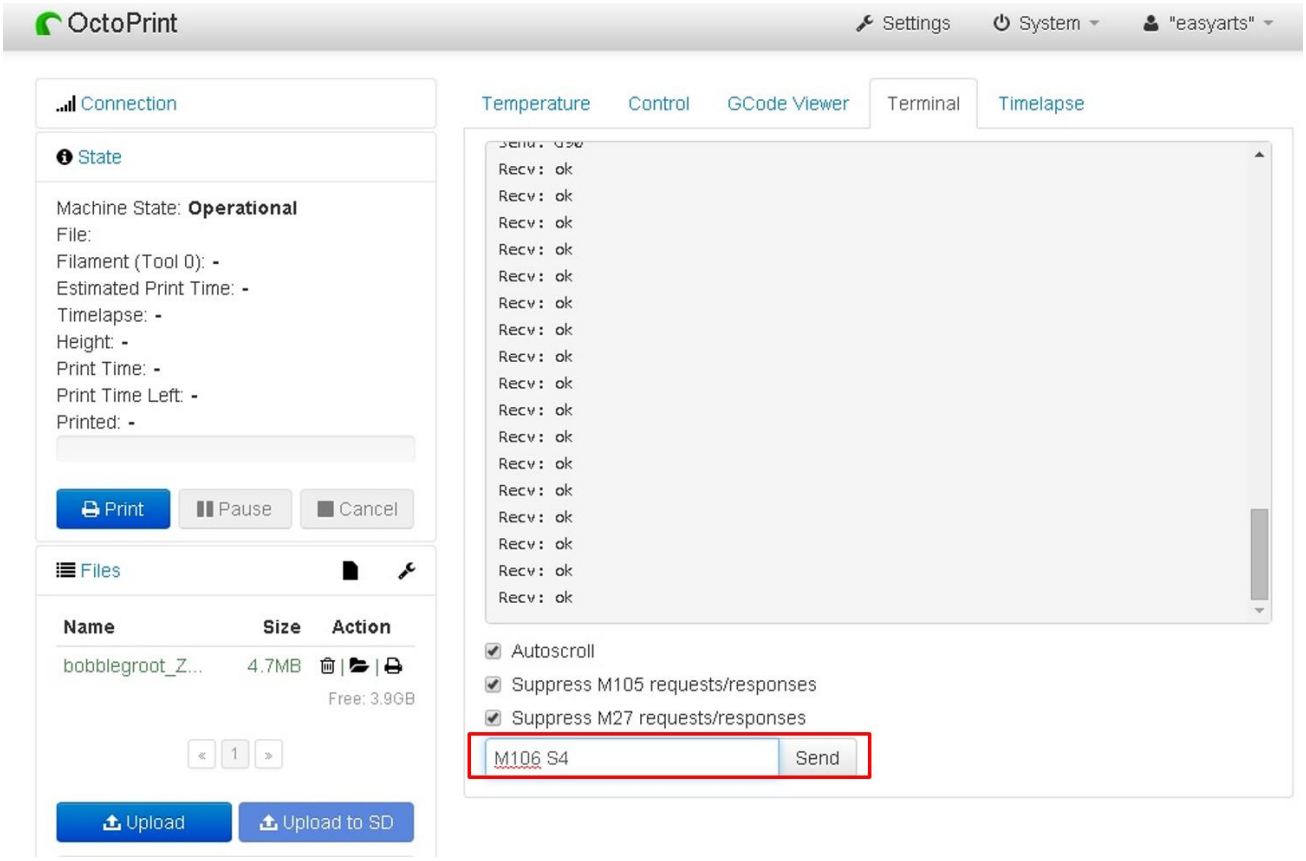
4.3.1 Preparation and setup

a) Take off the current module if it is not Laser Engraving. Then fix the **laser generator** (**with effector**) to **three connectors** with screws, **firmly and stably**.



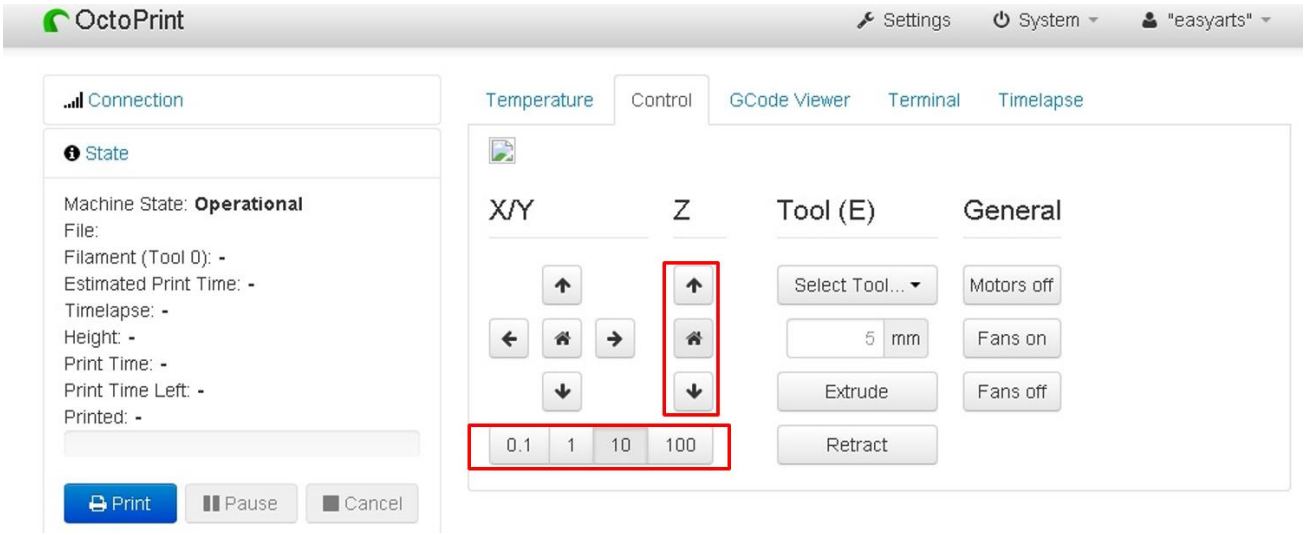
b) Connect the **Aviation Joint** to the **Interface** on the top side of printable area. **Please refer to the overview of Ares if you cannot find the interface.**

c) Then you need to find a suitable engraving height for laser generator. Here we will show you our solution, and of course you can use your own as long as it works. In OctoPrint control panel, turn to "**Terminal**". Input command "**M106 SX**", where X stands for **laser power in percentage**. For your safety, we recommend that X should better be **3 - 5** in terms of determining suitable height. In our case, it is "**M106 S4**".



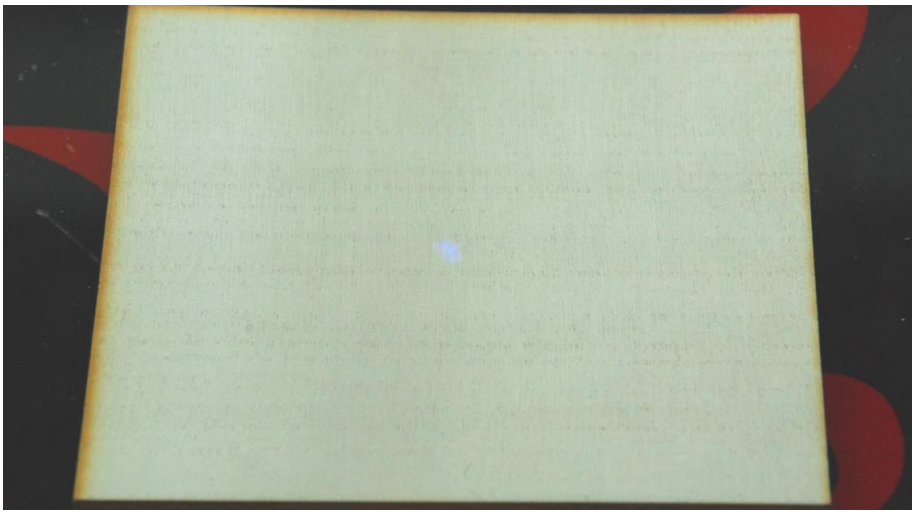
d) Remove the print bed if applicable and put your carving material on the workbench. **NOTE: Please wear the protective goggles (or dark sunglasses if applicable).**

e) Given that your laser is ready and safe for operation. Turn to the "**Control**" panel, you can manually control the X/Y/Z motors easily in all directions. The digitals below like 0.1, 1 are available **steps (mm)** for control. Click the "**Home**" button in the middle at first to find the home position.

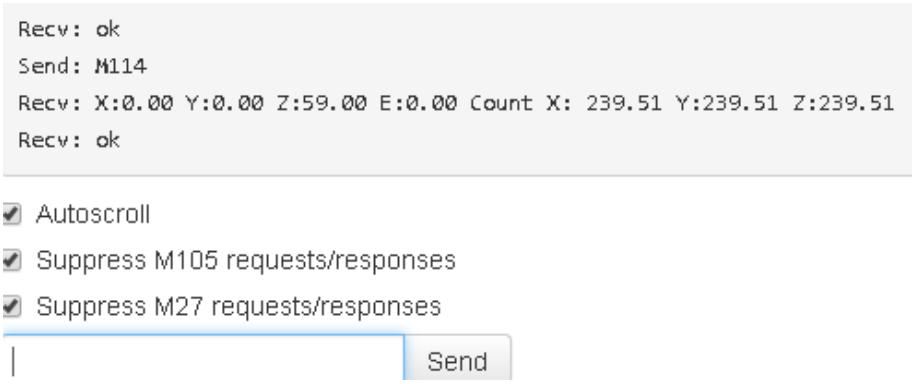


f) Change the position of laser generator by **up** and **down** to control motors with **suitable steps**

according to your specific situation, **until the laser beam can focus on the carving material**.



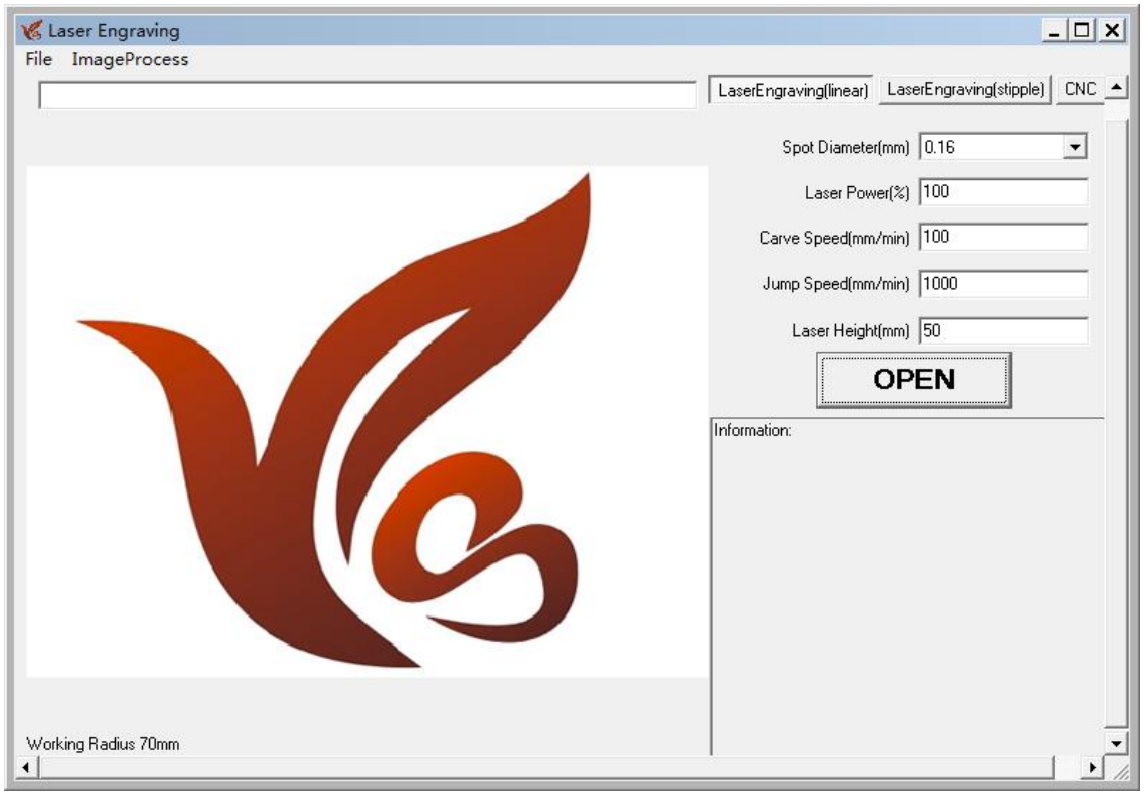
g) Send "**M114**" to obtain current information of position in "**Terminal**" panel. Record the **value of Z position**, which in our case it is "**59.00**".



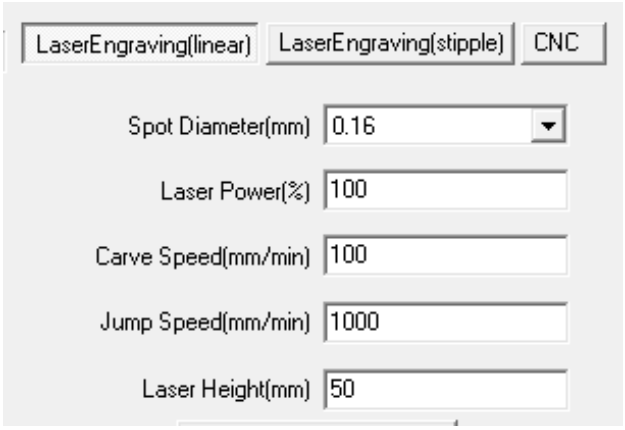
h) **Turn off the laser** by command "**M106 S0**" or "**M107**" for safety.

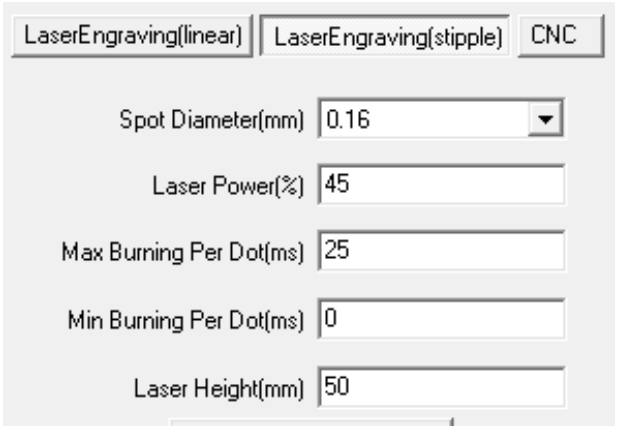
4.3.2 Image processing

a) We have developed a software to process your images for Laser Engraving and CNC Engraving. Here we can see the main panel.



b) Click "**OPEN**" or "**OpenPicture**" in "**File**" menu to start processing. For Laser Engraving, you have two options, i.e. **linear** (or continuous) mode and **stipple** mode.



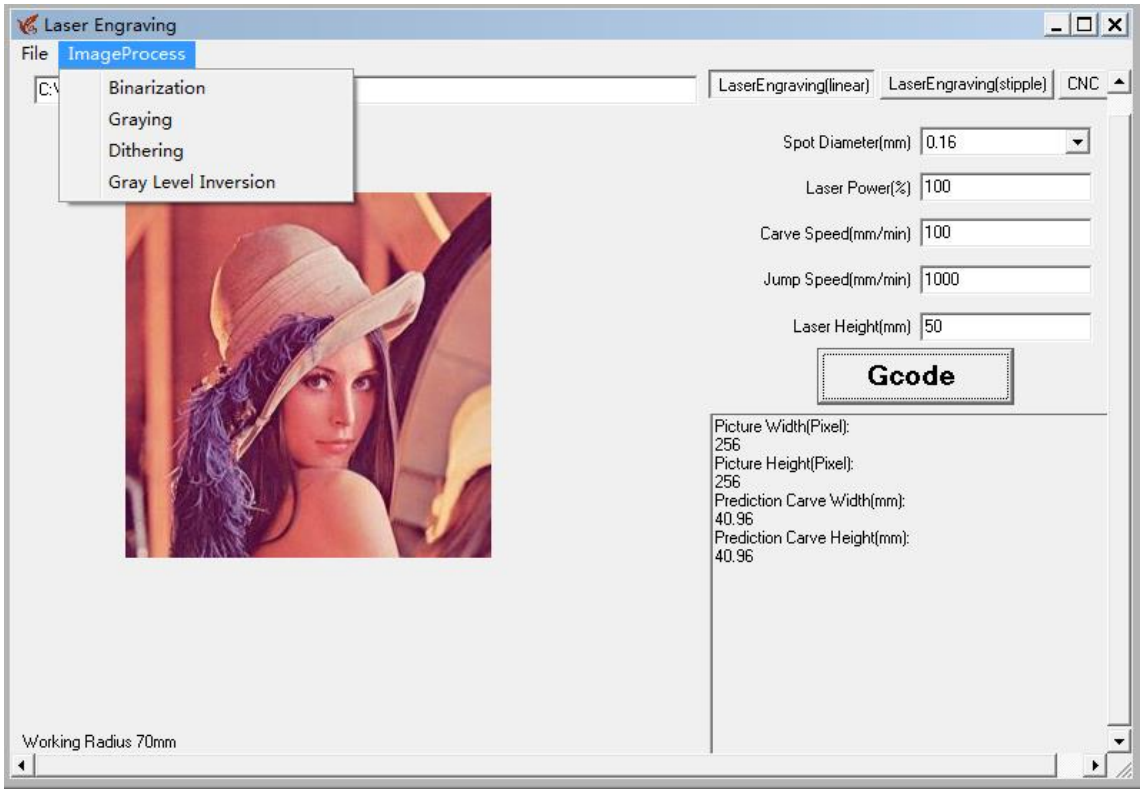


Here it comes the parameters that you need understand before start.

Spot Diameter: the diameter of laser beam (mm), larger diameter means lower precision. **Laser Power**: the percentage of highest power - 300mW (%). **Laser Height**: the height of laser generator (mm). The other parameters like **Carve** / **Jump Speed**, **Max** / **Min Burning per Dot** are quite easy to understand. **NOTE: For a specific carving, lower laser power may requires lower carve speed (linear) or longer max burning time (stipple), and vice versa, compared to our suggestion.**

c) For image processing, you have four options, **Binarization**, **Greying**, **Dithering** and **Grey Level Inversion**, as shown below. We will set an example for you to see how it works on different options.

NOTE: the process is irreversible, so you have to start over for any other option.



Binarization

Greying

Dithering

Grey Level Inversion

d) Change the parameters for engraving as you like. **NOTE: the "Laser Height" should be the value you got in preparation**. Then click "**Gcode**" to finish image processing. Open the gcode file by **text editor** to check if it is successful, especially the **laser height** (highlighted below).

```
; ****** G-code Prefix ******
;<Ares Laser Engraving>
;Linear Engraving
;Original Picture Path:D:\lena.bmp
;Spot Diameter(mm):0.16
;Laser Power(%):100
;Carve Speed(mm/min):100
;Jump Speed(mm/min):1000
;Laser Height(mm):59


; ****** Main G-code ******

M107
G28
G4 P2000
G1 Z59
M106 S2
G4 P10000
M106 S255
G1 X-15.52 Y20.48 F1000
G1 X-15.36 Y20.48 F100
G1 X-15.20 Y20.48 F100
G1 X-15.04 Y20.48 F100
G1 X-14.88 Y20.48 F100
G1 X-14.72 Y20.48 F100
G1 X-14.56 Y20.48 F100
G1 X-14.40 Y20.48 F100
G1 X-14.24 Y20.48 F100
G1 X-14.08 Y20.48 F100
G1 X-13.92 Y20.48 F100
G1 X-13.76 Y20.48 F100
```

4.3.3 Start laser engraving

a) **Make sure Ares is safe for engraving with safety protection, i.e. protective cover. You must wear the protective goggles and dark sunglasses if applicable.**

b) **Upload** your gcode file and start to carve. Please refer to the "**Printing**" section in "**3D Printing**" to find the specific operation, which is the same for all gcode files.

4.3.4 Final treatment

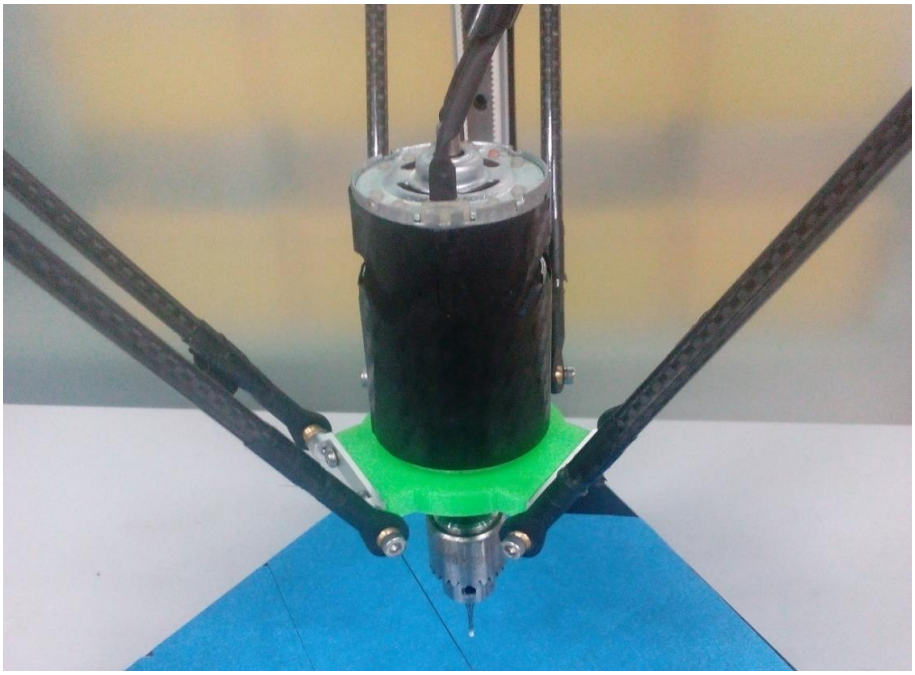
4.4 CNC Engraving

CNC is more and more popular recent years. In view of practicality and safety, the CNC kit consists of a motor (**max speed - 4000 rpm/min, max power - 40 W**) and milling cutters of various sizes for corn. So now 3D pictures are available for you by milling patterns on the cork and wood. Besides, you can design arbitrarily complex 3D models to form your exclusive wooden carvings in relief.

NOTE: If there is something wrong with your CNC module, please refer to "Purchase" section in "Support" for renewal.

4.4.1 Preparation and setup

a) Take off the current module if it is not CNC Engraving. Then fix the **milling motor** (**with effector**) to **three connectors** with screws, **firmly and stably**.



b) Connect the **Aviation Joint** to the **Interface** on the top side of printable area. **Please refer to the overview of Ares if you cannot find the interface.**

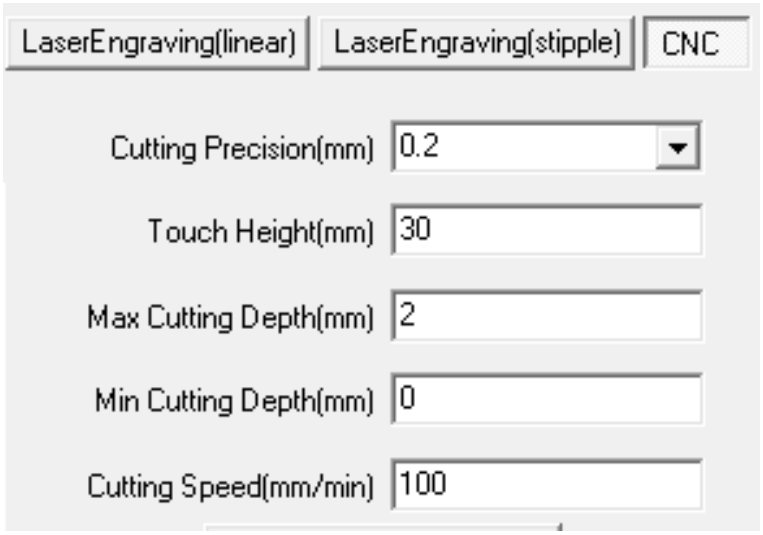
c) Remove the print bed if applicable and put your carving material on the workbench.

d) Then you need to find a suitable cutting height for milling cutters. In OctoPrint control panel, change the position of milling cutter by up and down with suitable steps according to your specific situation, **until the end of cutter just hits the carving material**. Then record the **value of Z position**. Please refer to the "**Preparation**" section in "**Laser Engraving**" for detailed operation guidance.

4.4.2 Image processing

The software for image process in absolutely the same to laser engraving. Please refer to the "**Image process**" section in "**Laser Engraving**" for detailed instructions of usage. Here we will show the difference in terms of CNC compared to laser.

a) Set the parameters for CNC. **Cutting Precision**: the precision of CNC milling (mm). **Touch Height**: the height of milling cutter at which it just hits carving material (mm). **It should be the value of Z position in "Preparation" section**. **Max / Min Cutting Depth**: the max / min depth during milling (mm). The actual cutting depth on carving material is **directly proportional to grey value**, i.e. **max for black and min for white**. **Cutting Speed**: the travel speed of milling cutter (mm/min).



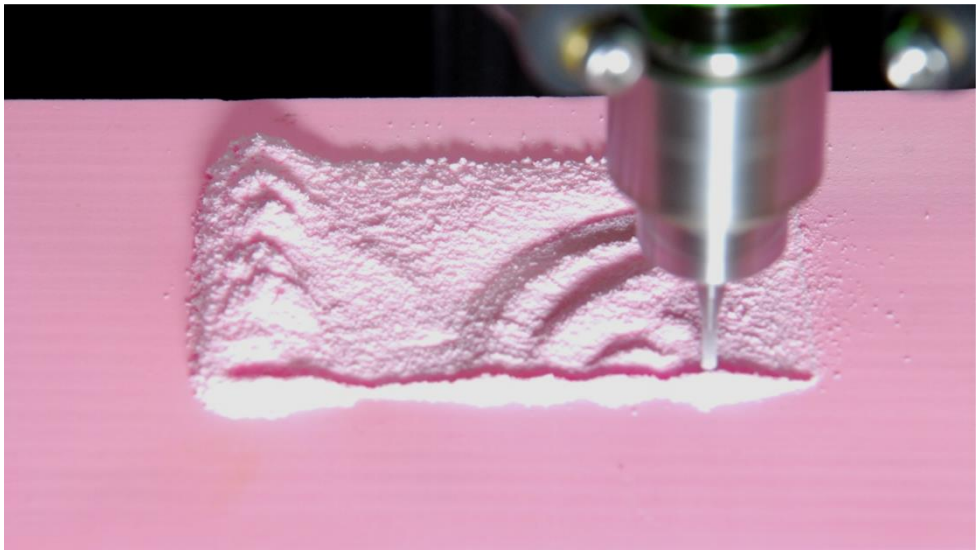
b) For image processing, you have **three** options, **Binarization**, **Greying**, and **Grey Level Inversion**, as **Dithering is not suitable to CNC processing**.

c) Then click "**Gcode**" to generate gcode file and open it by **text editor** to check if it is successful, especially the **touch height**.

4.4.3 Start CNC cutting

a) You can take some measures for safety protection before engraving if applicable. Generally it is safe for operation.

b) **Upload** your gcode file and start to carve. Please refer to the "**Printing**" section in "**3D Printing**" to find the specific operation.



4.4.4 Final treatment

4.5 Remote Control

Thanks to the support of WiFi, **Raspberry-Pi** makes it possible to achieve remote control and monitoring of your printer, much easier than ever before. Surprisingly, you even needn't purchase a monitor for this function, just unplug the webcam from your computer instead, if available. It is especially convenient for office workers.

NOTE: If there is something wrong with your remote control function, please refer to "Purchase" section in "Support" for renewal.

4.5.1 Preparation and setup

4.5.2 Wireless control

4.5.3 Real-time monitoring

Part 5 Fault

5.1 FAQ

Q1: Why I cannot connect Ares?
Solution: Check the IP address of Ares Printer, just go to **4.1.2 Connection to Ares**.

Q2: How to avoid the buckling deformation on the bottom surface of support during printing process, which results in unsatisfactory models?
Solution: This is because the distance between the nozzle and print bed is too large, resulting in bad

lamination of PLA filaments on bed when cooling. Reduce the distance by adjusting the **Z-offset** in slicing software, then the problem will be solved.

Q3: It turns out that the first layer is particularly thin, or even print nozzle scratches the tape on print bed. What is the problem?

Solution: This is the opposite of Q2. The distance of nozzle and print bed is too small, resulting in bad lamination of PLA filaments on bed when cooling. Increase the distance by adjusting the Z-offset in slicing software, then the problem will be solved.

Q4: What if the PLA cannot be extruded out or is not continuous?

Solution: Check the following step by step, until your problem is solved.

1. Whether the PLA feeding plate can turn around smoothly.
2. Whether the feeding pipe is bent or blocked with foreign matter.
3. Whether the temperature setting of nozzle is about 200 ℃.
4. Whether the PLA is stuck inside the feeding system.
5. Contact us if the above is useless to your situation.

5.2 Support

5.2.1 Purchase guidance for renewal

5.2.2 List of terminal commands

For your convenience, in the table list, we have marked the **most commonly used commands** as red, while blue for **command or syntax**.

Command	Comment
G0	Equals to **G1** command.
G1	Coordinated Movement X Y Z E.
G2	**CW ARC**.
G3	**CCW ARC**.
G4	Dwell **S**<seconds> or **P**<milliseconds>.
G10	Retract filament according to settings of **M207**.
G11	Retract recover filament according to settings of **M208**.
G28	Home all Axis.
G29	Detailed Z-Probe, probes the bed at 3 or more points. Fail if you haven't homed yet.
G30	Single Z Probe, probes bed at current XY location.

G31	Dock sled (**Z_PROBE_SLED** only).
G32	Undock sled (**Z_PROBE_SLED** only).
G90	Use Absolute Coordinates.
G91	Use Relative Coordinates.
G92	Set current position to coordinates given.
M0	Unconditional stop - Wait for user to press a button on the LCD (Only if **ULTRA_LCD** is enabled).
M1	Same as **M0** command.
M17	Enable/Power all stepper motors.
M18	Disable all stepper motors; same as “M84” command.
M20	List SD card.
M21	Init SD card.
M22	Release SD card.
M23	Select SD file (**M23** filename.g).
M24	Start/resume SD print.
M25	Pause SD print.
M26	Set SD position in bytes (**M26 S**12345).
M27	Report SD print status.
M28	Start SD write (**M28** filename.g).
M29	Stop SD write
M30	Delete file from SD (**M30** filename.g).
M31	Output time since last **M109** or SD card start to serial.
M32	Select file and start SD print (Can be used while printing from SD card files): **syntax** "**M32** /path/filename#", or "**M32 S**<start-pos in bytes> !filename#" Call gcode file: "**M32 P** !filename#" and return to caller file after finishing (similar to #include). The '**#**' is necessary when calling from within SD files, as it stops buffer pre-reading.
M42	Change pin status via gcode Use **M42 P**x **S**y to set pin x to value y, when omitting **P**x the onboard LED will be used.
M80	Turn on Power Supply.
M81	Turn off Power Supply.
M82	Set **E** codes absolute (default).
M83	Set **E** codes relative while in Absolute Coordinates (**G90**) mode.
M84	Disable steppers until next move, or use **S**<seconds> to specify an inactivity timeout, after which the steppers will be disabled. **S0** to disable the timeout.
M85	Set inactivity shutdown timer with parameter **S**<seconds>. To disable set zero (default)
M92	Set **axis_steps_per_unit** - same syntax as **G92**.

M104	Set extruder target temp.
M105	Read current temp.
M106	Fan on.
M107	Fan off.
M109	**S**xxx Wait for extruder current temp to reach target temp. Waits only when heating. **R**xxx Wait for extruder current temp to reach target temp. Waits when heating and cooling. IF **AUTOTEMP** is enabled, **S**<mintemp> **B**<maxtemp> **F**<factor>. Exit autotemp by any **M109** without F.
M112	**Emergency stop.**
M114	Output current position to serial port.
M115	Capabilities string.
M117	Display message.
M119	Output Endstop status to serial port.
M126	Solenoid Air Valve Open (**BariCUDA** support by jmil).
M127	Solenoid Air Valve Closed (**BariCUDA** vent to atmospheric pressure by jmil).
M128	EtoP Open (**BariCUDA** EtoP = electricity to air pressure transducer by jmil).
M129	**M129** - EtoP Closed (**BariCUDA** EtoP = electricity to air pressure transducer by jmil).
M140	Set bed target temp.
M150	Set **BlinkM** Color Output **R**: Red<0-255> **U**(!): Green<0-255> **B**: Blue<0-255> over i2c, **G for green does not work**.
M190	**S**xxx Wait for bed current temp to reach target temp. Waits only when heating. **R**xxx Wait for bed current temp to reach target temp. Waits when heating and cooling.
M200	**D**<millimeters>- set filament diameter and set E axis units to cubic millimeters (use **S0** to set back to millimeters).
M201	Set max acceleration in units/s^2 for print moves (**M201 X**1000 **Y**1000)
M202	Set max acceleration in units/s^2 for travel moves (**M202 X**1000 **Y**1000) **Unused in Marlin!**
M203	Set maximum feed rate that your machine can sustain (**M203 X**200 **Y**200 **Z**300 **E**10000) in mm/sec.
M204	Set default acceleration: **S** normal moves, **T** filament only moves (**M204 S**3000 **T**7000) in mm/sec^2, also sets minimum segment time in ms (**B**20000) to prevent buffer under-runs and **M20** minimum feed rate
M205	Advanced settings: minimum travel speed (**S**=while printing, **T**=travel only), **B**=minimum segment time, **X**= maximum XY jerk, **Z**=maximum Z jerk, **E**=maximum E jerk.
M206	Set additional homing offset.
M207	Set retract length **S**<positive mm> **F**<feed rate mm/min> **Z**<additional z-lift/hop>,

	stays in mm regardless of **M200** setting.
M208	Set recover=unretract length **S**<positive mm surplus to the **M207 S***> **F**<feed rate mm/sec>.
M209	**S**<1=true/0=false> enable automatic retract detect if the slicer did not support **G10/11**: every normal extrude-only move will be classified as retract depending on the direction.
M218	Set hotend offset (in mm): **T**<extruder number> **X**<offset of X> **Y**<offset of Y>.
M220	**S**<factor in percent>- set speed factor override percentage.
M221	**S**<factor in percent>- set extrude factor override percentage.
M226	**P**<pin number> **S**<pin state>- Wait until the specified pin reaches the state required
M240	Trigger a camera to take a photograph.
M250	Set LCD contrast **C**<contrast value> (value 0.63).
M280	Set servo position absolute. **P**: servo index, **S**: angle or microseconds.
M300	Play beep sound **S**<frequency Hz> **P**<duration ms>.
M301	Set PID parameters **P, I** and **D**.
M302	Allow cold extrudes, or set the minimum extrude **S**<temperature>.
M303	PID relay autotune **S**<temperature> sets the target temperature (default target temperature = 150 ℃).
M304	Set bed PID parameters **P, I** and **D**.
M350	Set microstepping mode.
M351	Toggle MS1 MS2 pins directly.
M360	**SCARA** calibration: Move to cal-position **ThetaA** (0 ºcalibration).
M361	**SCARA** calibration: Move to cal-position **ThetaB** (90 ºcalibration - steps per degree).
M362	**SCARA** calibration: Move to cal-position **PsiA** (0 ºcalibration).
M363	**SCARA** calibration: Move to cal-position **PsiB** (90 ºcalibration - steps per degree).
M364	**SCARA** calibration: Move to cal-position **PsiC** (90 ºto Theta calibration position).
M365	**SCARA** calibration: Scaling factor for X, Y, Z axis.
M400	Finish all moves.
M401	Lower **z-probe** if present.
M402	Raise **z-probe** if present.
M404	**N**<dia in mm> Enter the nominal filament width (3mm, 1.75mm) or will display nominal filament width without parameters.
M405	Turn on Filament Sensor extrusion control. Optional **D**<delay in cm> to set delay in centimeters between sensor and extruder.
M406	Turn off Filament Sensor extrusion control.
M407	Displays measured filament diameter.
M500	Stores parameters in **EEPROM**.
M501	Reads parameters from **EEPROM** (if you need reset them after you changed them

	temporarily).
M502	Reverts to the default "factory settings". You still need to store them in **EEPROM** afterwards if you want to.
M503	Print the current settings (from memory not from **EEPROM**).
M540	Use **S**<0|1> to enable or disable the SD card print on endstop hit (requires **ABORT_ON_ENDSTOP_HIT_FEATURE_ENABLED**).
M600	Pause for filament change **X**<pos> **Y**<pos> **Z**<relative lift> **E**<initial retract> **L**<later retract distance for removal>.
M605	Set dual x-carriage movement mode: **S**<mode> [**X**<duplication x-offset> **R**<duplication temp offset>].
M665	Set delta configurations.
M666	Set delta endstop adjustment.
M907	Set digital trimpot motor current using axis codes.
M908	Control digital trimpot directly.
M928	Start SD logging (**M928** filename.g) - ended by **M29**.
M999	Restart after being stopped by error.