Very cheap Delta 3D Printer (about 150€)

by **Francisco Javier Ruiz Racero** on September 25, 2015

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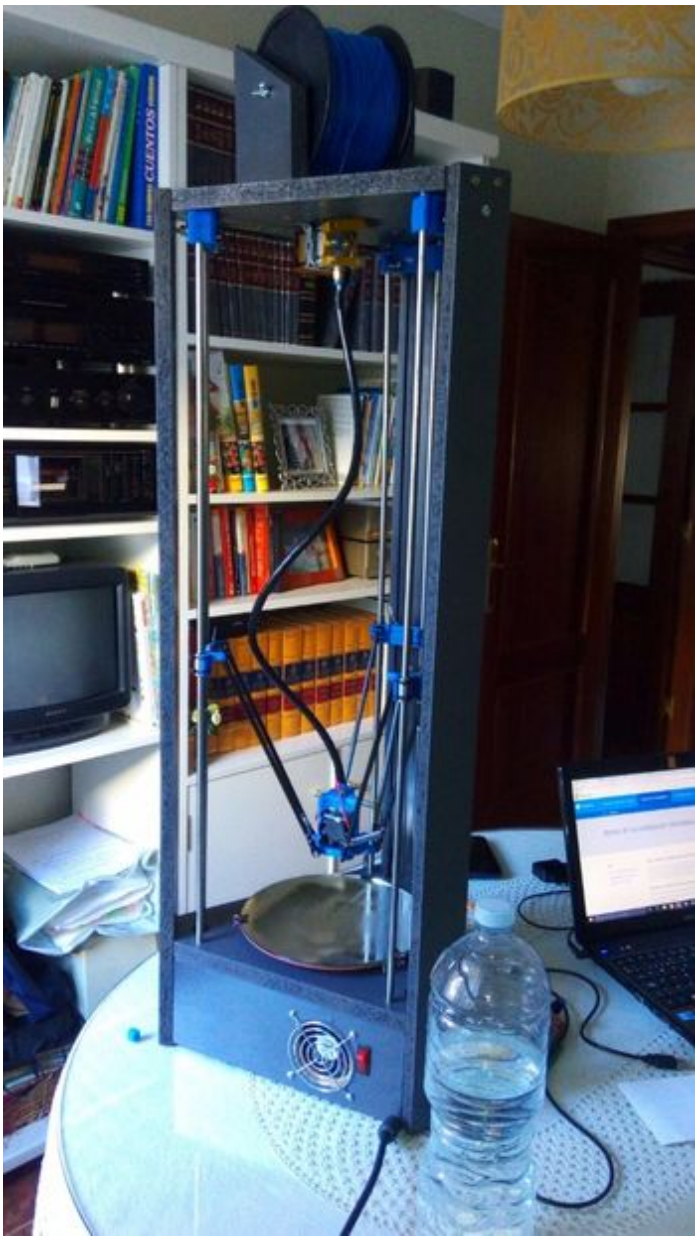
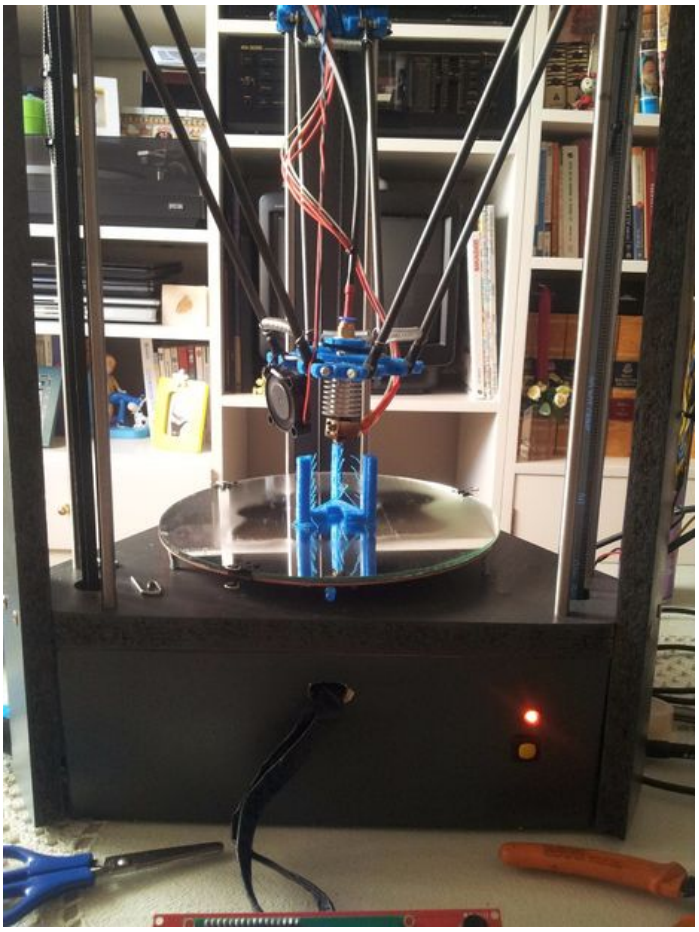
Intro: Very cheap Delta 3D Printer (about 150€)

A year or so, i began to interested about 3D Printers. Then, i started to look for information about this, how they are working, how they are made…

When i was prepared, i started to buy the pieces for to do my own 3D printer, it should be a delta type, because i like how it moves, but the downside of this is the calibration…





Step 1: Buy the pieces:

The materials needed are:

4 stepper motors NEMA17 42HS40-1504A05-D20 (8,20€ each, joint purchase)

1 electronics kit (Arduino Mega, RAMPS 1.4, 5 Pololus A4988, RepRapDiscount LCD Panel) (26€ Aliexpress)

1 e3d v5 hotend (7€ Aliexpress)

1 ptfe tube (3€ Aliexpress)

1 aluminium extruder (7€ Aliexpress)

3 transmission belts (with pulleys) (about 3€ each, Aliexpress)

1 circular heatbed (7,50€ Aliexpress)

1 traxxas (8€ USA)

1 6 mm carbon fiber tube (4€ Decathlon)

6 8 mm smooth steel rods (18€/six, 3€ each)

6 8 mm linear bearings (0,83€ each)

Planks

Wires

Old pc ATX Power Supply

Nuts and bolts

Fans of old cooling table pc

3 Endstops (0,60€ each)

3 springs (free)

Circular mirror 22 cm diameter (4€)

Interrupt

Some pieces of Rostock 3D printer (a friend made me it)

Filament (20€)

The total cost is about 150€, looking for offers and buying to China and USA.

©Trade Flair


2*4mm
Store No: 737829


SATA

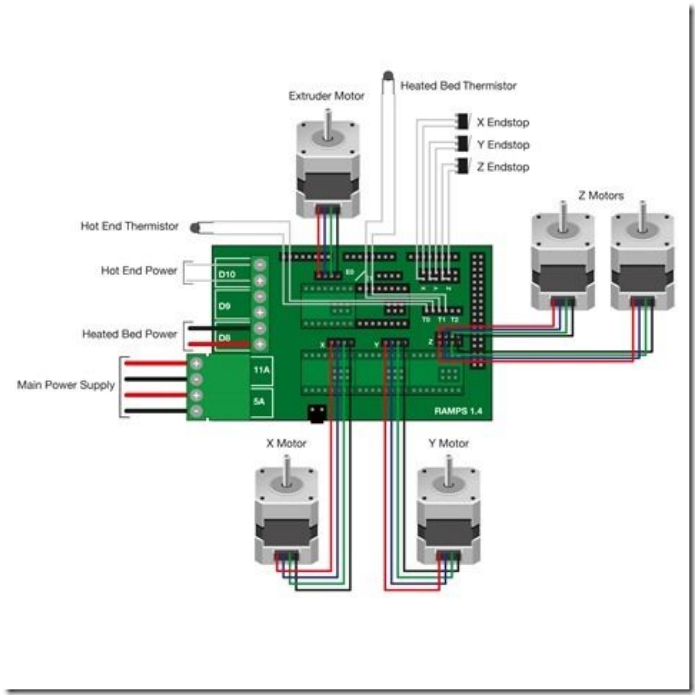
Step 2: Calibrate Electronic:

For to calibrate the intensity step motors, i conected the RAMPS 1.4 to Arduino Mega, i put the Sprinter firmware, because it haven't got protections of temperature, etc, it doesn't work for print, but is really good for to adjust the electronics, it's need a old version of arduino IDE, for to compilate it. Put the drivers Pololu A4988, one by one for to calibrate the motors. All the electronics are in the kit.

Conect the multimeter in series between the RAMPS and the power supply, and at moment only conect a motor whenever, like the diagram. Click to Pronterface for move the motors and adjust the potentiometer for to have 200 mA at each motor, but the extruder needs to have 400 mA.

Finally, after adjust all drivers, the total intensity must to be about 0.8 or 0.9 A.

Like operation example the execute on it the song Gcode by Pronterface.



File Downloads

SONG.gcode (57 KB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'SONG.gcode']

Printrun.zip (24 MB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'Printrun.zip']

Sprinter.zip (81 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'Sprinter.zip']

arduino-0022.zip (85 MB)
[NOTE: When saving, if you see .tmp as the file ext, rename it to 'arduino-0022.zip']

Step 3: Building the structure:

the base is a triangle, the smooth steel rods are 2 in each vertex, separated 6,3 cm each other and perpendicular to the line of center, at 15,7 cm of this. I needed to do 2 equal parts, one upper and other lower. The upper haves a central hole for to pass the filament (the filament is of 1,75 mm). And the lower haves a central hole for to pass the heatbed wires and 3 smaller holes between the bars for to pase the belts.

I needed 3 tables to support the structure, measures 92 x 6 cm.

Other 3 tables for to close the sides of the base, 29 x 11 cm. One of this haves a hole for a fan to draw heat and other for an interrupt, other of this have 2 holes too, one for the LCD wires and other for a led and interrupt.

Finally, i need 2 small tables more and a wooden stick for support the filament's coil, and it is screwed to the upper base by the top.

Step 4: Painting the structure:

I bought spray paint and painted the structure, because the pieces had got differents colours and i dislike it.

Step 5: Doing the diagonal rods:

Put on a table two separate screws 25 cm between them. Moun the traxxas and introduce of them a piece of threaded rod of same diameter, then, put two traxxas on the screws and cut the carbon fiber tube to unite it. On this way, all rods will have the same measures. 6 rods are necessary.

Step 6: Mounting the printer:

First i put the axis motors at lower base, inside of box. After i put the electronic and conected it, this time i connect all the components.

The next i put the power supply between te motors, at center of lower box, i put the fan, the interrupt and the LED, and closed the box with the others tables.

Put smooth steel rods and screw the heatbed at top of lower box, with the springs between the heatbed and the box, for to can regulate the height of it.

Mount the carbon fiber and the e3d hotend at piece of center and join them to the carriages pieces, with linear bearings attached to them, and introduce smooth steel rods at bearings.

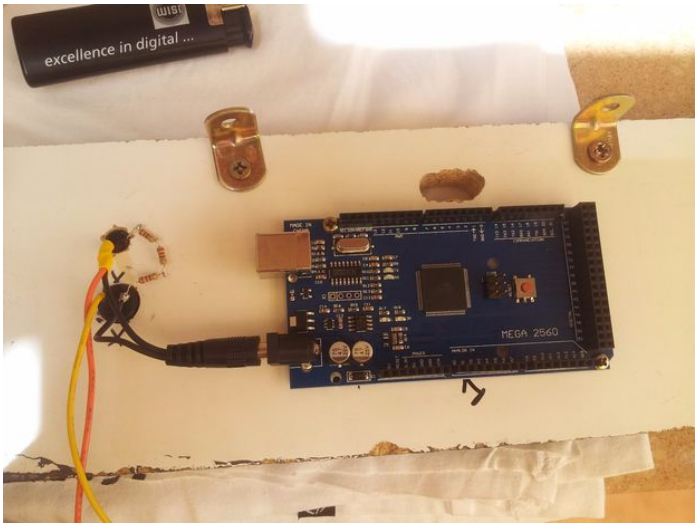
Put the lateral tables for support the structure and the upper base with the clamping filament.

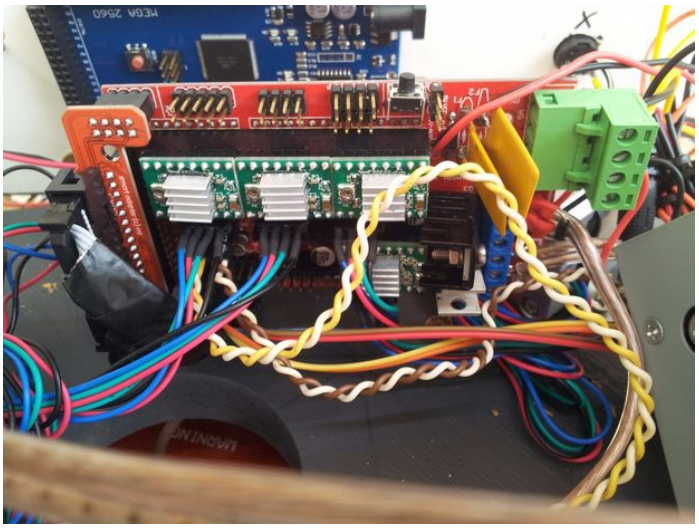
Put the piece that holds the pulley above the plain rod and put on it the endstop.

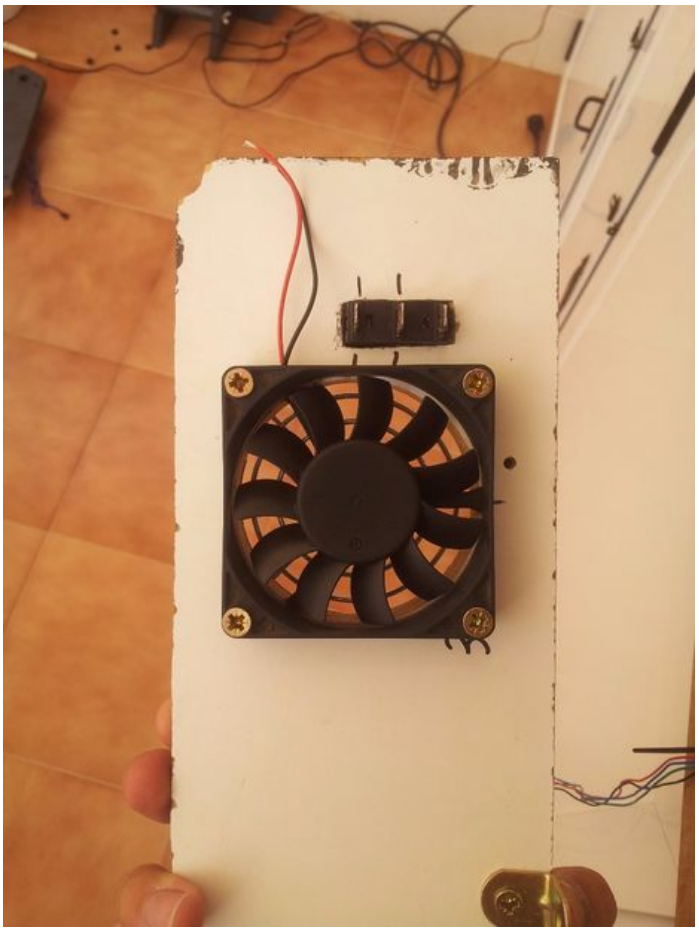
Connect and tighten the belt between each motor axis and the upper pulley.

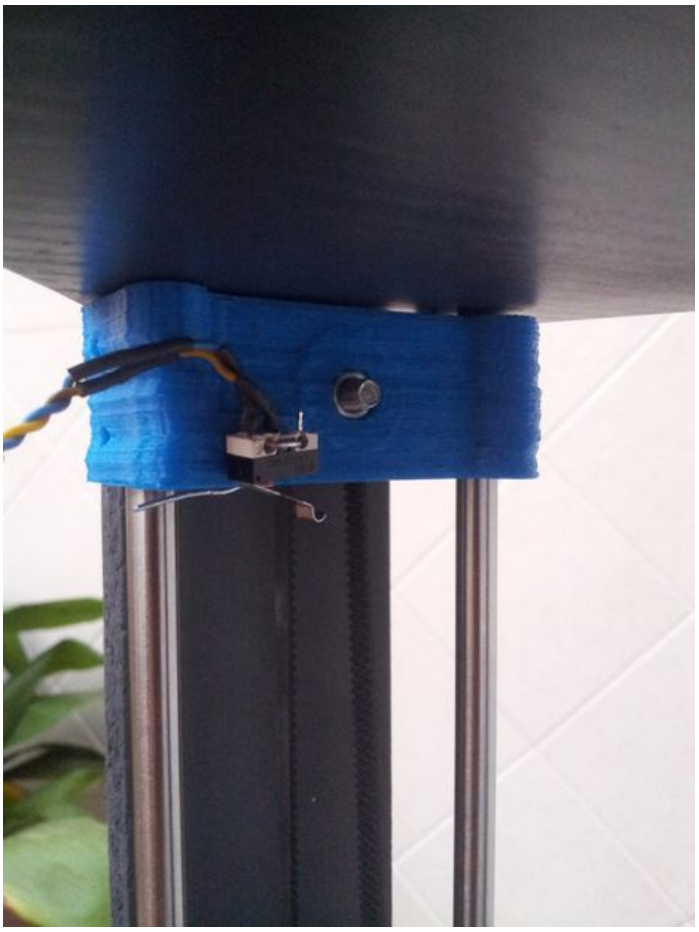
Finally put the extruder motor below the upper base, to the next the hole center and wire all.

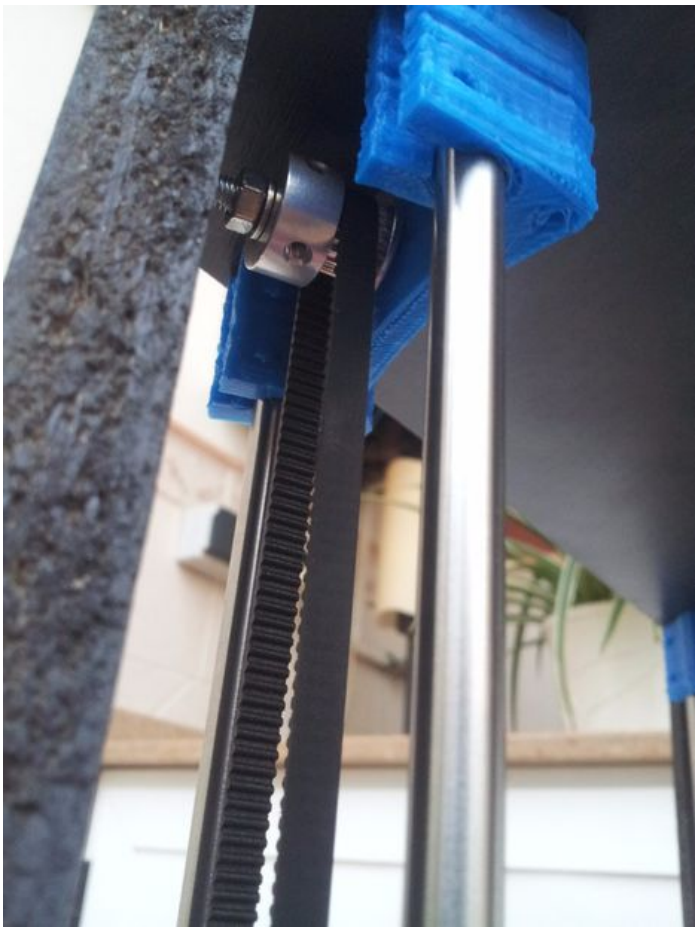
Put up the filament, and done!

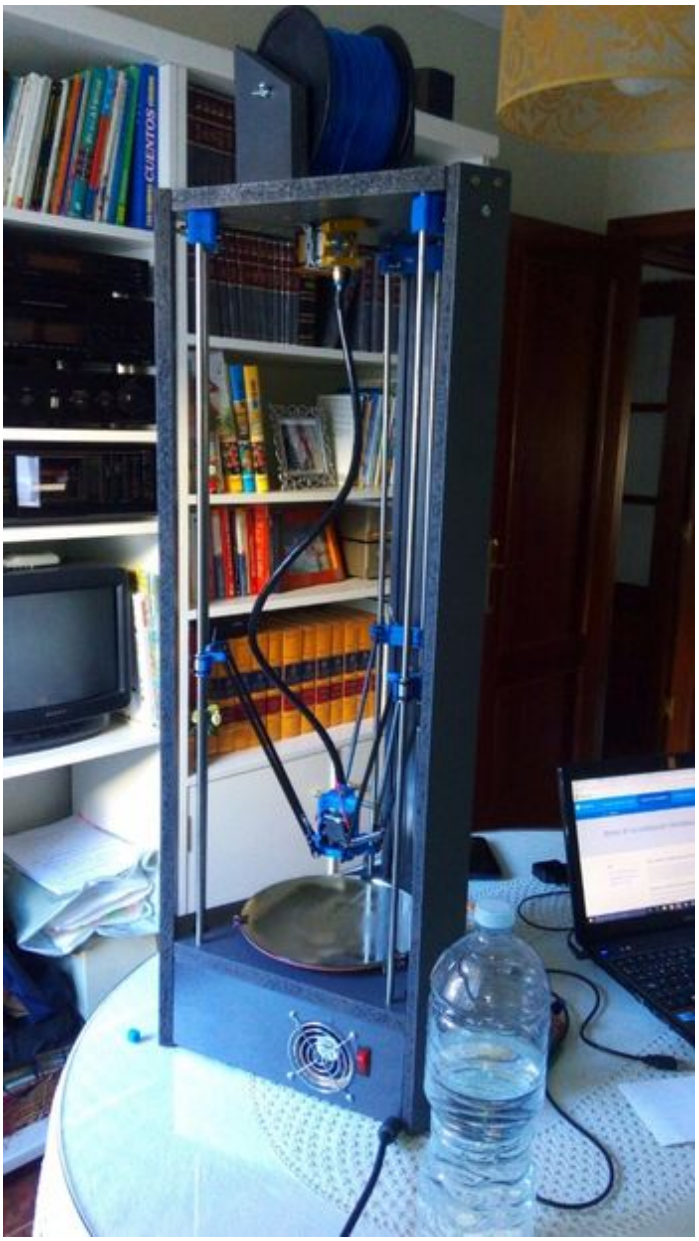

excellence in digital ...
MEGA 2560











Step 7: Configure firmware and calibrate the printer:

The firmware used is the Marlin's lastest version, it's freeware and it's in google, for configure it, is necessary to do the next steps:

1. Open the lastest version of Arduino IDE and open the Marlin.ino

2. At file configuration.h, put your printer's parameters:

2.1. #define MOTHERBOARD 33 (33 is the RAMPS 1.4 used with 1 extruder)

2.2. #define DELTA (to specify delta printer)

2.3. #define DELTA_DIAGONAL_ROD 250.0 (measures of carbon fiber rods in mm)

2.4. #define DELTA_SMOOTH_ROD_OFFSET 157 (distance between the center of printer and the center of smooth steel rods in mm)

2.5. #define DELTA_EFFECTOR_OFFSET 33.0 (distance between the carbon fiber diagonal rod and the hotend tip)

2.6. #define DELTA_CARRIAGE_OFFSET 22 (distance between the diagonal rod and the center of smooth steel rods in mm)

2.7. #define TEMP_SENSOR_0 1

#define TEMP_SENSOR_1 0

#define TEMP_SENSOR_2 0

#define TEMP_SENSOR_BED 1 (to specify 1 extruder and heatbed)

2.8. #define INVERT_X_DIR true

#define INVERT_Y_DIR true

#define INVERT_Z_DIR true

#define INVERT_E0_DIR false (if is inverted, change true by false, its depends of side of attach the belt to carriage)

2.9 #define X_MAX_POS 90

#define X_MIN_POS -90

#define Y_MAX_POS 90

#define Y_MIN_POS -90

#define Z_MAX_POS 400

#define Z_MIN_POS 0 (to specify the printer's limit's moves after homming)

2.10. #define MANUAL_X_HOME_POS 0

#define MANUAL_Y_HOME_POS 0

#define MANUAL_Z_HOME_POS 475 (the max distance between the noozle and the heatbed)

2.11. #define DEFAULT_AXIS_STEPS_PER_UNIT {80,80,80,153.3414046} (steps for mm of each motor)

Finally, for calibrate it open the Repetier-Host and configure the printer on program, by manual handling, move it, it's will be calibrate when the distance between the noozle and the mirror is like a sheet of paper's thickness, that is, the Z = 0 hight parameter in all heatbed's area must be the same.

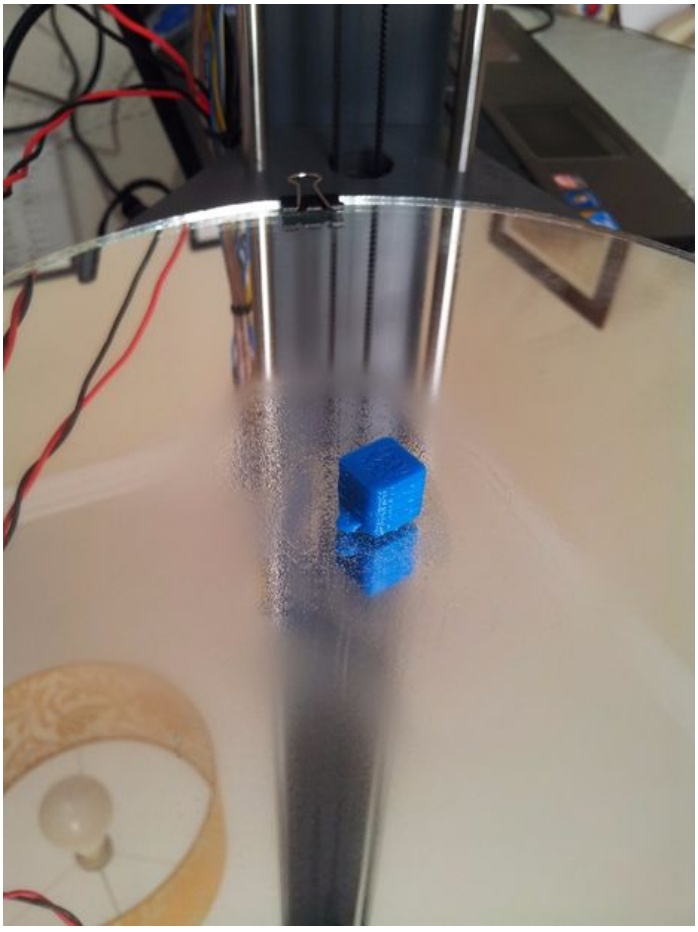
This step requires patience and time, and never ends, because it can always be better calibration.

Step 8: First impression:

The first impression was a 10mm calibration cube, but it wasn't 10mm, the measures are incorrect... There is to change parameters and better calibrate the printer...

At this link there is a very good manual for to better calibration of printer:

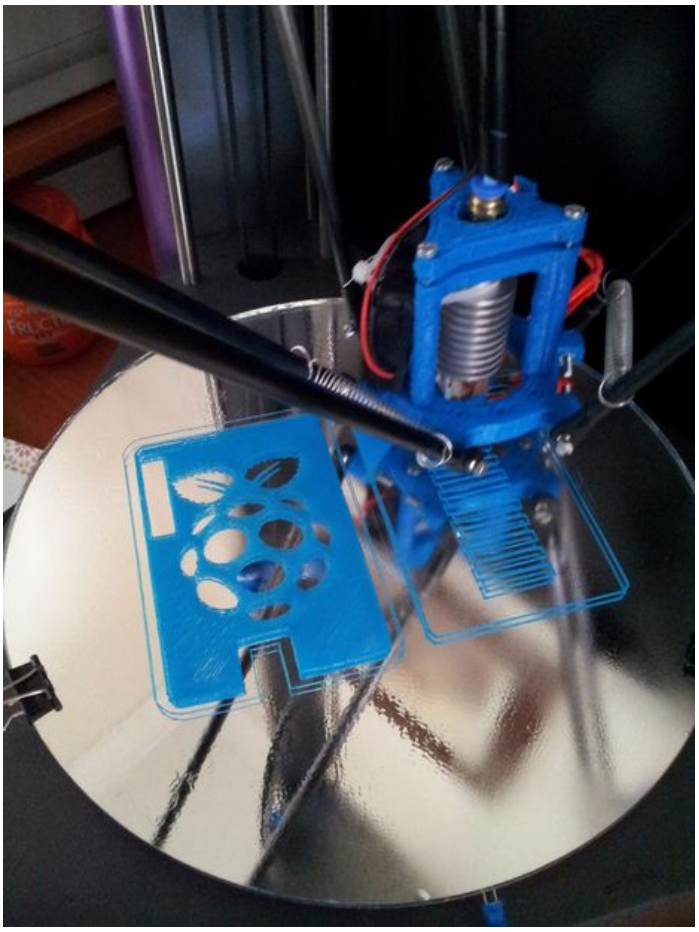
http://builda3dprinter.eu/build-manuals/kossel_min...



Step 9: More advanced impressions:

After better calibration, i got a very good impressions, for example, a Raspberry Pi Case, a pen holder, and a better pieces for my printer. However, there is still much for calibrate for the machine works perfect.

I have added some videos about the printer printing.



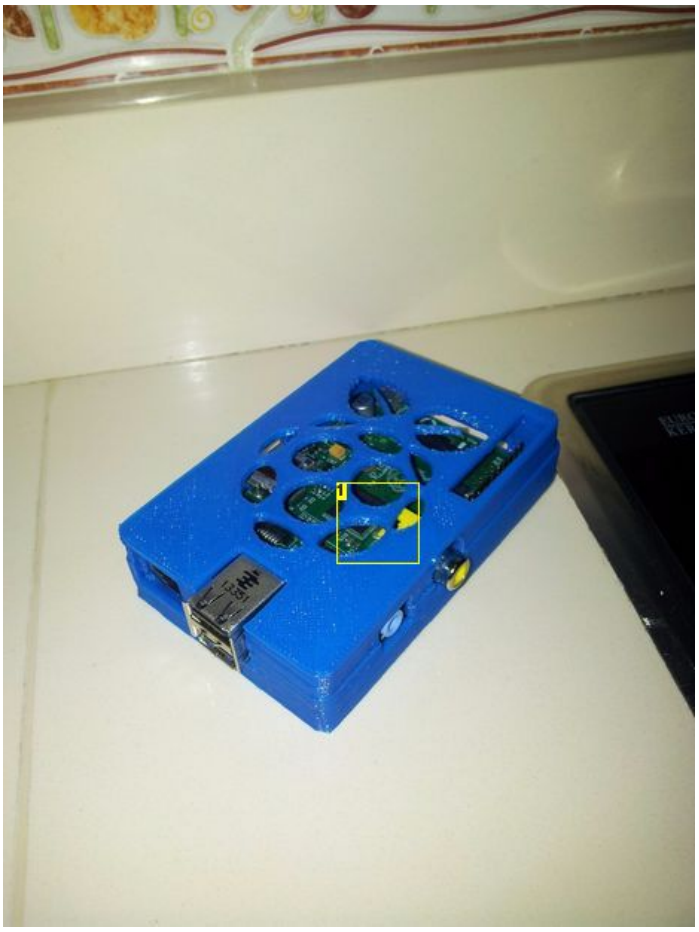


Image Notes
1. Raspberry Pi case

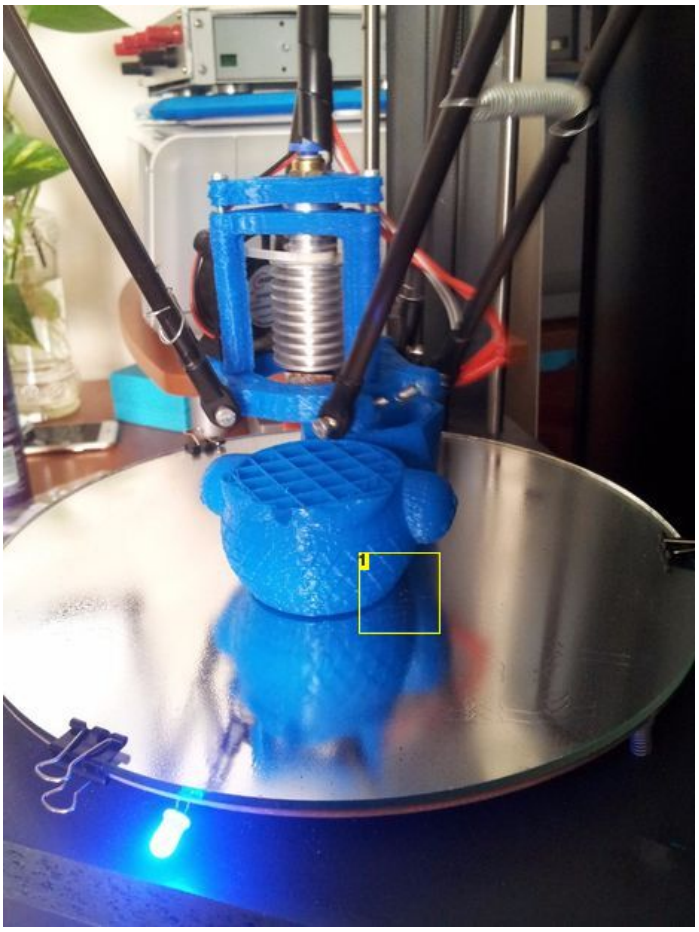


Image Notes
1. Printing Pen holder

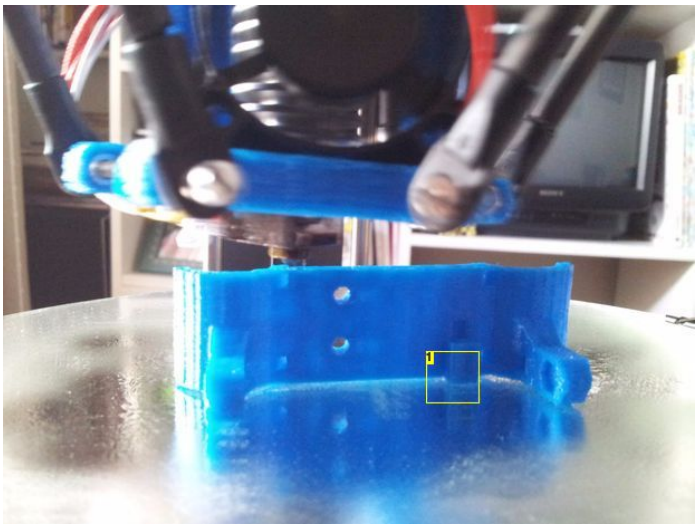


Image Notes
1. Printing new cadrriage

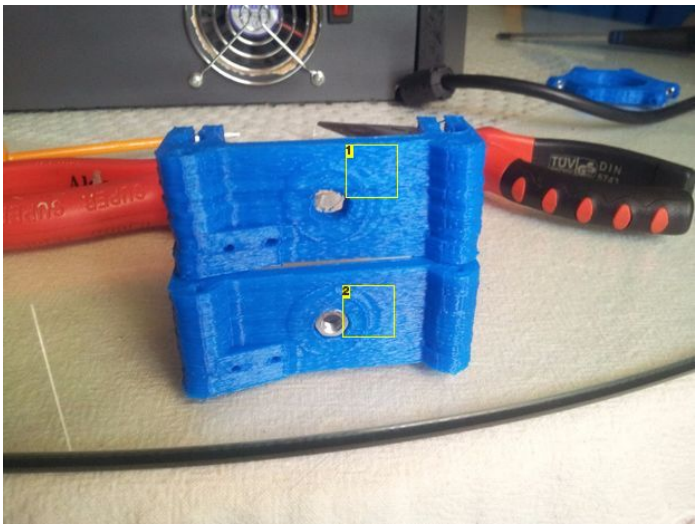


Image Notes
1. bad piece
2. Better piece

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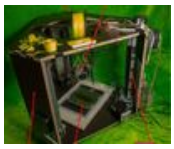
6x6x6 3D print: Delta CNC by RTegelbeckers

Stratum Networks Delta Robot by MaxandTaylor



DIY delta 3D printer using low cost recycled parts by hesamh

Delta Robot to Sla Printer (Top Down) by sirocco

Using Repetier Host to Set Up Your Auto-Leveling Probe and Create Your First Print with Delta rostock mini by KantZ1

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