



CULTIVATE3D.COM

# THE BEAST

## KIT BUILD MANUAL



CULTIVATE 3D

THE BEAST

## CREDITS

"The Beast" would not be possible without the relentless efforts of the Open Source 3D Printer Community.

Particular respect to:

Josh Mamo : Cultivate 3D

Dan Herlihy : Cultivate 3D

Airtripper : Extruder Design

Repetier : 3D Printer Firmware and Software

Makerslide : Barton Dring

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## about this build

Building a 3D Printer can be an incredibly satisfying endeavor, made more so by the knowledge "The Beast" is one of, if not the most versatile production FDM machines on the market. With your printer, you will be able to achieve 4x the production rate of standard FDM 3D Printers while maintaining very high quality print output.

Buying a ready made 3D Printer is simple. Learning how to use it effectively is something which can only occur if you truly understand the underlying technology. This build process will give you the tools and understanding to command the printing process and therefore get the most of out all 3D Printers, not just "The Beast".

Don't be afraid of the apparent complexity of all the wires, tubes and electronics. Building a 3D Printer looks allot more complex than it is. The Beast has 4x this apparent complexity. Getting it to work well will require dedication and an aptitude to learn. The theory is simple, feed Plastic filament into a heater block, it melts and electronics control how much to melt, and where to put it down. We're sharing with you the sum of our knowledge about this technology however this build manual can only provide some of the answers, the rest will be best answered through your own experimentation and ability to think outside of the box.

We know "The Beast" will prove to be a solid production workhorse. If you follow these instructions, you'll be left in a perfect position to truly understand the FDM printing process and what makes these machines work for *you* to produce reliable, perfect prints.

Cultivate 3D: Imagine Your Future.

DAN HERLIHY

*General Manager*



# how to use this manual



This manual is intended to be used a visual reference. Many of the concepts herein are difficult to explain without images. Pay particular attention to "notes" depicted by the symbol above. These notes should not be ignored as they are critical to the construction and or function of the final product.



Look for part names and important information in **BOLD**.

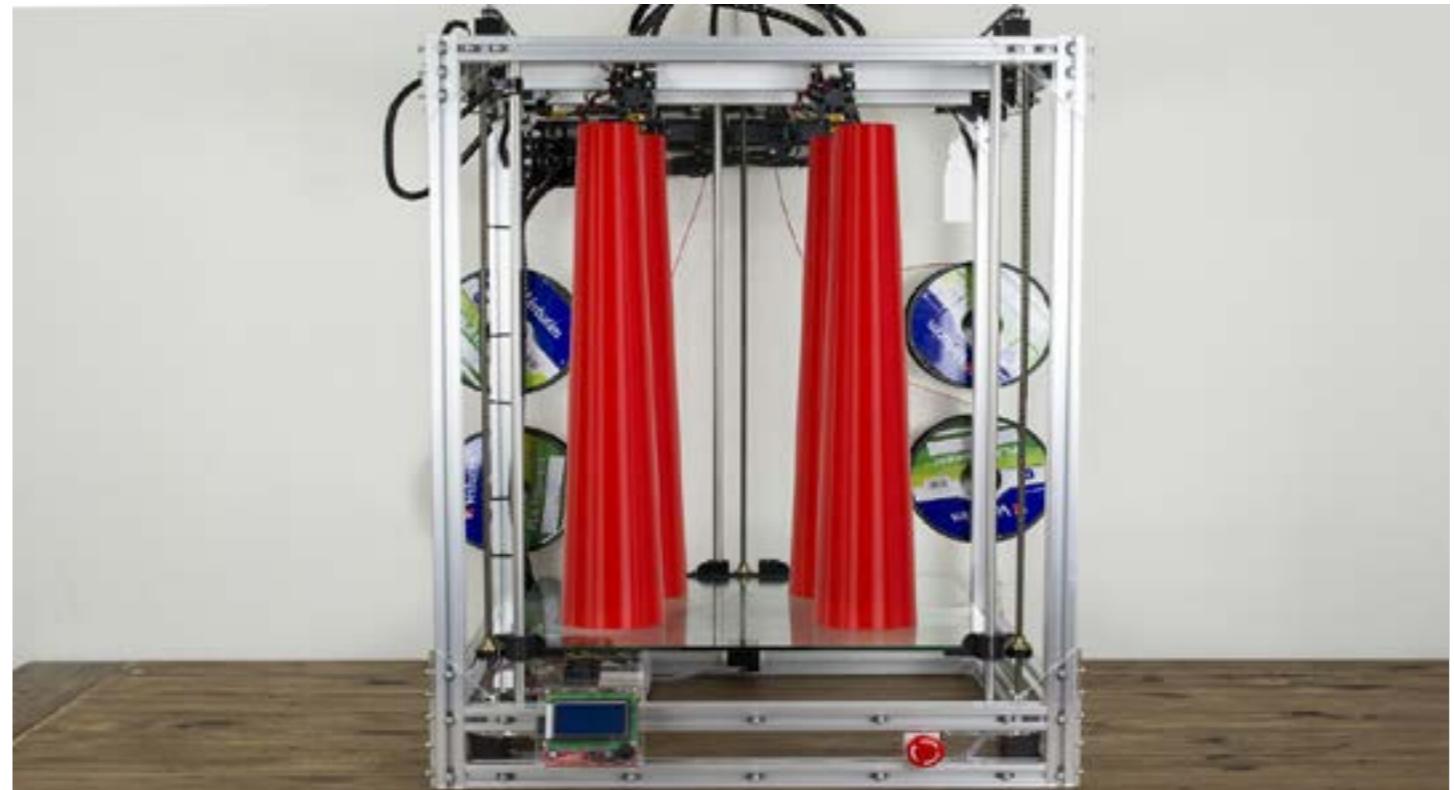
All references to "Captive Nuts" will be documented, **but not instructed**. These nuts MUST be pressed into their respective holes with pliers. You may need to clean printing artifacts from these holes in order to press the nut into its captive space.

Some printed parts may need to be "Finished" before use. This may involve cleaning printed artifacts from the part or drilling out holes to size prior to use in your printer.



## tools required

- Hex Socket driver set to suit M3 and M5 Socket Screws
- Small and Medium Philips and Flat head screw driver
- Scalpel or craft knife
- Electric Drill with 3mm and 5mm Philips and Hex Bits
- Small and Large Long Nose Pliers
- Wrench and Socket set to suit M3 and M5 nuts
- Small Side Cutters
- Soldering Iron (Optional)
- Cigarette Lighter
- Set Square
- Set of Allen Keys



## Space to work

Ensure you have enough space to complete the Build. "The Beast" is a very large printer. We estimate you will need **atleast 2 cubic meters** to build and store your printer. Bear in mind, you may want to access the rear of the printer on a regular basis. You may also need extra space to be able to remove and clean your print bed or to change filament.

## Build Time

Building a 3D Printer is simple, as long as you have time, patience and the ability to learn. Although this build can be completed in 48 hours, we recommend first timers give themselves atleast a few weeks (on and off) to complete the build. It is far better to take your time with the knowledge everything is done right, than to rush the job and regret the painful prospect of having to partially disassemble the printer to fix something you missed.



ASSEMBLY NAME▶

## Y-Idler

The Y Idler will eventually fix to the top of the printer and acts as a pulley for the 2x Y Belts.

### Parts Required



- 1x Y Idler Plastic Parts
- 2x F605ZZ Bearings
- 1x M5 x 35mm Screw
- 1x M5 Hex Nut
- 2x M5 x 25mm Screw



ASSEMBLY NAME▶

## Y-Idler

Insert M5 nut into the Y-Idler Plastic part as shown. The nut should be flush to the Y Idler.

Insert 2x F605ZZ Bearings onto M5 35mm screw as shown – take note of the orientation of the bearing flanges.

Insert each M5 25mm Screw into the 2 holes in the Y-Idler ensuring the caps are flush with the part.



NOTE: The screw caps should fit flush with the recessed holes as pictured.

Use a hex driver to screw the M5 25mm Screws into the 2x T-Slot Nuts as shown.

Screw the 2x Flange assemblies to the Y Idler a few turns only as shown. Do not tighten all the way.

Put the 2x Y Idler assemblies aside for later use.

PART / SUB ASSEMBLY NAME ▶

Y-IDLER



ASSEMBLY NAME▶

## Lead Screw Idler

The 3 x Lead Screw Idlers provide stability to the lead screws which raise and lower the bed. They also incorporate a top mounting position for the Smooth rods which act as a guide.

### Parts Required



2x M5 T-Slot Nuts  
2x M5 x 10mm Screws

1x Lead Screw Idler / Rod Holder Plastic Parts



ASSEMBLY NAME▶

## Lead Screw Idler

Insert 608ZZ Bearing into the Lead Screw Idler / Rod Holder Plastic Part as shown. Bearing should fit flush with plastic part.

Insert 2x M5 10mm Screws into the Lead Screw Idler / Rod Holder Plastic Part in the direction shown, then loosely fit a T-Slot nut onto each of the M5 Screws as shown.

Repeat to create 3x Lead Screw Idler Assemblies and set aside for later use.



ASSEMBLY NAME▶

## 12mm Rod Holder

### Parts Required



2x 10mm M5 Screw  
2x T-Slot Nut

1x 12mm Rod Holder Plastic Part

Insert 2x 10mm M5 Screws into 12mm Rod Holder plastic part as shown.

Loosely fit a T-Slot nut onto each of the M5 Screws as pictured.

Repeat to make 3x 12mm Rod Holder assemblies and set aside for later



PART / SUB ASEMBLY NAME ▶

Lead Screw Idler / 12mm Rod Holder



ASSEMBLY NAME►

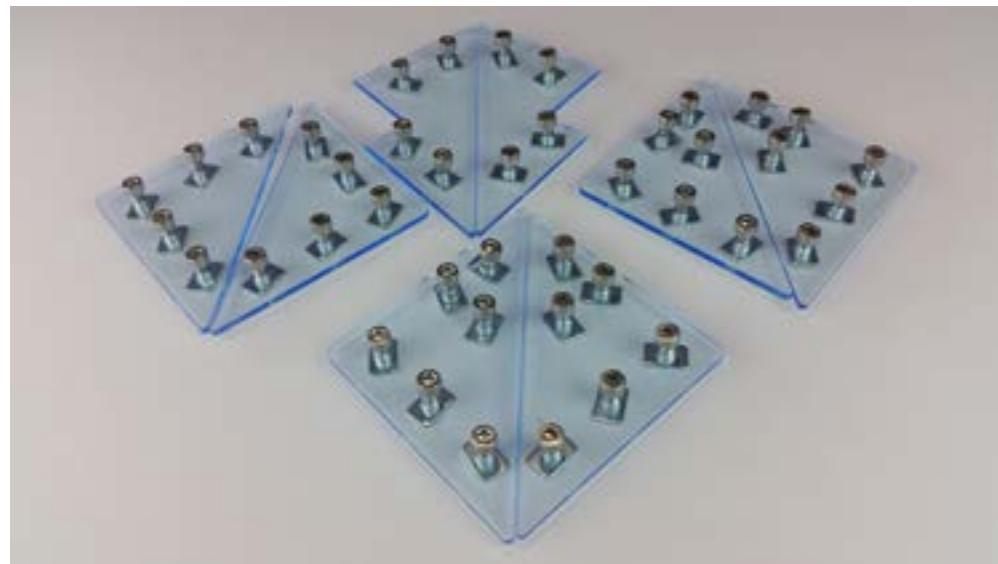
# Printer Frame

## Parts Required

M5 10mm screws  
M5 T-Slot Nuts  
M5 Washers  
4x 897mm 3030 Extrusion  
10x 600mm 3030 Extrusion  
4x Acrylic Lower Plates  
2x Acrylic Front Braces  
2x Acrylic Y Motor Mount  
4x Acrylic Y Motor Mount Brace  
1x Acrylic Extruder Panel  
2x Acrylic Rear Braces  
2x Acrylic Side Braces  
2x 3030 Corner Bracket (Plastic Part)  
1x Left Lead Screw Idler (Plastic Part)  
1x Right Lead Screw Idler (Plastic Part)  
2x Acrylic Front Z-Motor Mount  
1x Acrylic Rear Z-Motor Mount



Upper and Lower Acrylic Plates



2x Corner Braces (Left) - 2x Rear Braces (Top) - 4x Side Braces (Lower and Right)



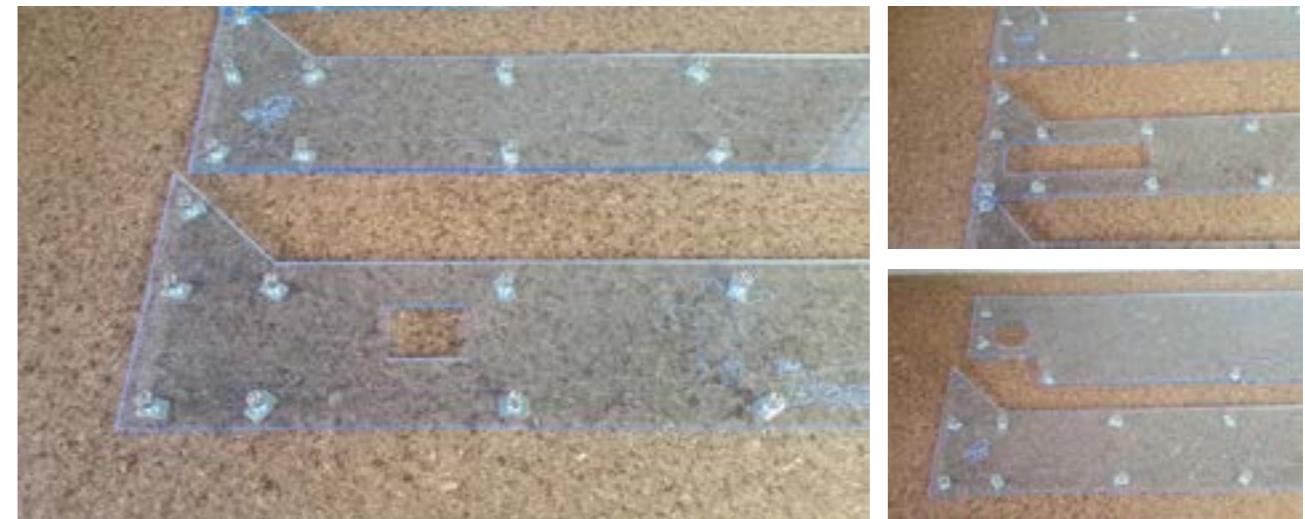
ASSEMBLY NAME►

# Printer Frame

The Printer Frame as the name suggests, the printer frame holds the entire build together. This part will require patience to square up each corner. Getting this part square is very important for later print reliability.

Put washer on each m5 10mm screw and insert into each hole of each Acrylic plate, then screw on a T-Slot nut **1.5 turns only** as pictured, leaving screw and bolt loose on the acrylic plate.

Take note of the orientation of the screw head – all etching should be on the Nut side, further take note of orientation for parts which are not etched. Repeat for all 16 holes in each of the upper and lower Acrylic plates as well as **corner and rear braces** – see pictures (previous page). Take special note of the orientation of left and right Side Braces. If you put the T-Slot nut on the wrong way, it will not fit into the Extruded Rail to which it attaches later.



Check the orientation of the screw heads and etching

Install 7 x T-Slot Nut Assemblies in the positions shown on the extruder panel as done previously – make sure the T-Slot nuts are installed on the correct side of the extruder panel as shown.

PART / SUB ASEMBLY NAME ▾

Printer Frame - Acrylic Plate Screw Population



ASSEMBLY NAME▶

## Printer Frame

Slide 1x 600mm 3030 extrusion onto the top row of T-Slot nuts of the extruder panel and set aside for later use. See picture.



Extruder Panel with 3030 extrusion attached

ASSEMBLY NAME▶

## Parts Required

M3 16mm Screws  
M5 16mm Screws  
M3 Nuts  
T-Slot Nuts

2x Acrylic Rear Z Motor Mount Braces

1x Acrylic Rear Z Motor Mount

## Rear Z Motor Mount



The 2 parts are attached with a captive nut and 16mm screw



ASSEMBLY NAME▶

## Rear Z Motor Mount

Insert captive M3 nuts into the **Rear Z-Motor Mount Braces**. Insert the **Rear Z Motor Mount Braces** into the **Rear Motor Mount** using the locating holes as shown. Secure and tighten the **Rear Z Motor Mount Braces** to the **Rear Z Motor Mount** with M3 16mm Screws with washers. Secure the Z-motor mount to a length of 600mm 3030 extrusion 4x M5 16mm screws. Centre the part with a ruler or tape measure and firmly tighten screws. For the next step, this part will be used as the Upper 3030 extrusion for the lower rear plate. SEE PICTURES (TO BE TAKEN)



ASSEMBLY NAME▶

## Printer Frame (Cont.)

Slide each of the 7 x 3030 600mm extrusions into position on each of the lower acrylic plates as shown. Do not tighten any screws at this stage.



Take note, the 600mm 3030 length with the **Rear Z Motor mount** (assembled in the previous step) **MUST** be used in the **upper position** on the Rear Lower Acrylic panel. **See Pictures - To be taken.** GENTLY tighten screws enough so that the 3030 extrusion can still slide freely. You will align these properly later.



Note :It is important you **DO NOT USE AN ELECTRIC SCREW DRIVER** when fastening the acrylic to the frame. Doing so may crack the acrylic which will not be covered under warranty. Hand tighten only.

PART / SUB ASEMBLY NAME ▶

Printer Frame - Rear Z Motor Mount



ASSEMBLY NAME▶

## Printer Frame

Lay Left Panel down flat on table (Acrylic Side down) and gently slide 1x vertical 897mm 3030 extrusion into place as shown, slide horizontal 3030 extrusions until they butt up flush against the vertical extrusion, then finger tighten screws.

Repeat this process for the second, third and fourth vertical 897mm 3030 extrusion and lower Acrylic panels, until you have assembled an open topped cube. Again, to not fully tighten screws.



Slide each of the Front Braces onto a length of 600mm 3030 extrusion and lightly finger tighten, leaving a vertical row of T-Slot nut assemblies on each brace as shown.



ASSEMBLY NAME▶

## Printer Frame

Gather both Y-Idler assemblies, and temporarily remove the center M5 Bolt with flanged bearings from the 2 assemblies.

Attach 2x T-Slot nuts onto each of the M5 25mm screw on each of the Y-Idler assemblies and slide both Y-Idler assemblies onto the Top Slot of the 3030 extrusion of the Top Brace Assembly (from the previous step) as shown. Lightly tighten M5 25mm screws to secure Y Idler assemblies in place as shown – do not tighten.

Replace the Y-Idler Assembly Center M5 Bolts and Bearings which were removed earlier.



Turn over Top Front Brace assembly and slide 1x Left 12mm Rod Holder / lead screw idler Assembly and 1x Right 12mm Rod Holder / lead screw idler Assembly onto the Rear Slot of the Top Brace Assembly as pictured.



Slide the Completed Top Front Brace assembly onto the Front of the Printer frame by lining up each of the vertical rows of T-Slot nuts with the 3030 vertical slots as shown.

PART / SUB ASEMBLY NAME ▾

Printer Frame - Top Front Brace Assembly



ASSEMBLY NAME▶

## Printer Frame

Lightly tighten the 4 horizontal screws on the Top Brace assembly and 3 vertical screws either side and adjust the height of the Top brace assembly to make flush with the top of the vertical 3030 extrusions.



It is important not to fully tighten any of the Printer frame screws at this stage as you will need to square everything up later in the process. Screws should be tightened just enough to prevent the vertically mounted parts from falling out of place.

### Parts Required

M3 16mm Screws  
M3 Nuts  
M5 25mm Screws  
T-Slot Nuts

4x Acrylic Y Motor Mount Braces

2x Acrylic Y Motor Mounts

Slide 2 x Y-Motor Mount Braces on each side of the Extruder panel as shown. Check the orientation.



ASSEMBLY NAME▶

## Rear Lead Screw Idler

### Parts Required

1x Pre Assembled RIGHT HAND Lead Screw Idler

Slide one of the RIGHT HAND Lead Screw Idlers / 12mm Rod Holders (with Bearing on the left - assembled earlier) onto the inward facing slot of the 3030 extrusion on the Extruder Panel Assembly. Center this part exactly using a tape measure and secure the screws firmly to hold the part in position.



ASSEMBLY NAME▶

### Parts Required

2x Pre Assembled Rear Braces

Slide the left and right Rear Braces onto the inward facing T-Slot of the 3030 extrusion on the Extruder Panel Assembly (Pictured above - check the orientation of each part). Lightly tighten screws to prevent the parts falling out of place.

PART / SUB ASEMBLY NAME ▾

Printer Frame - Lead Screw Idler and Rear Braces



ASSEMBLY NAME ▾

## 3030 Corner Braces

### Parts Required

M5 10mm Screws

M5 T-Slot Nuts

2x 3030 Corner Braces (Plastic Part)

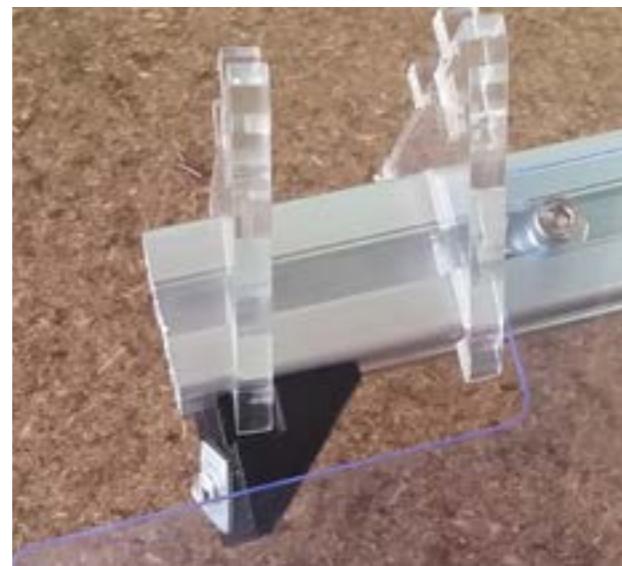


It is important to take note of the orientation of the notch which is cut out of the 3030 Corner bracket. The notch must face the rear of the printer as shown. (The Y Motor Mount Braces protrude towards what will eventually be the back of the printer).



Assemble 2x 3030 Corner Braces with 1x M5 x 10mm screw and 1x M5 T-Slot Nut as shown.

Slide each of the 3030 Corner brackets into the each end of the underside T-Slots of the extruder panel assembly and secure lightly as shown to prevent the part from falling out, but loose enough that part can still move.



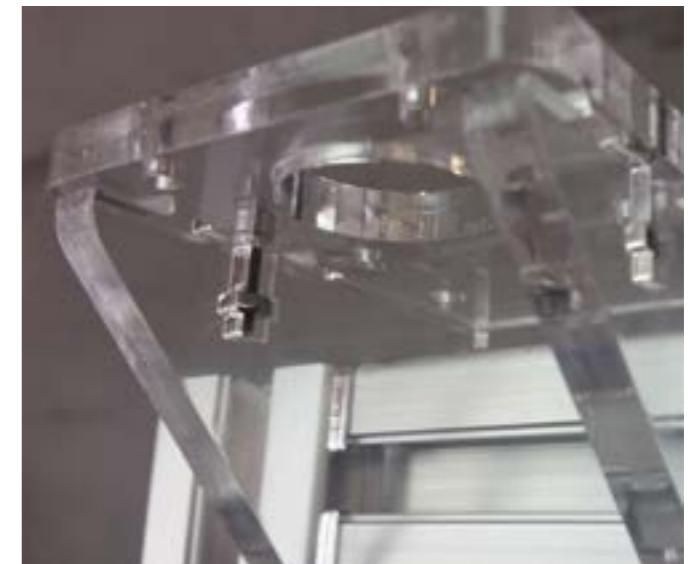
ASSEMBLY NAME ▾

## Printer Frame (Cont.)



Slide extruder panel assembly into position as shown. It is important to locate the outer most Y Motor Mounts in the notch of the 3030 corner bracket. Once in position, align the horizontal extrusion with the top of the vertical extrusion and lightly tighten the all screws to secure the extruder panel in place.

Insert M3 nut in each of the Y-Motor Mount braces as shown and place the Y Motor Mount over the Y mount braces and use the locating holes to align the Y Motor Mount position as shown. Insert an M3 16mm screw into each of the holes in the top of the Y Motor mount and screw down through the M3 captive nuts inserted just prior.



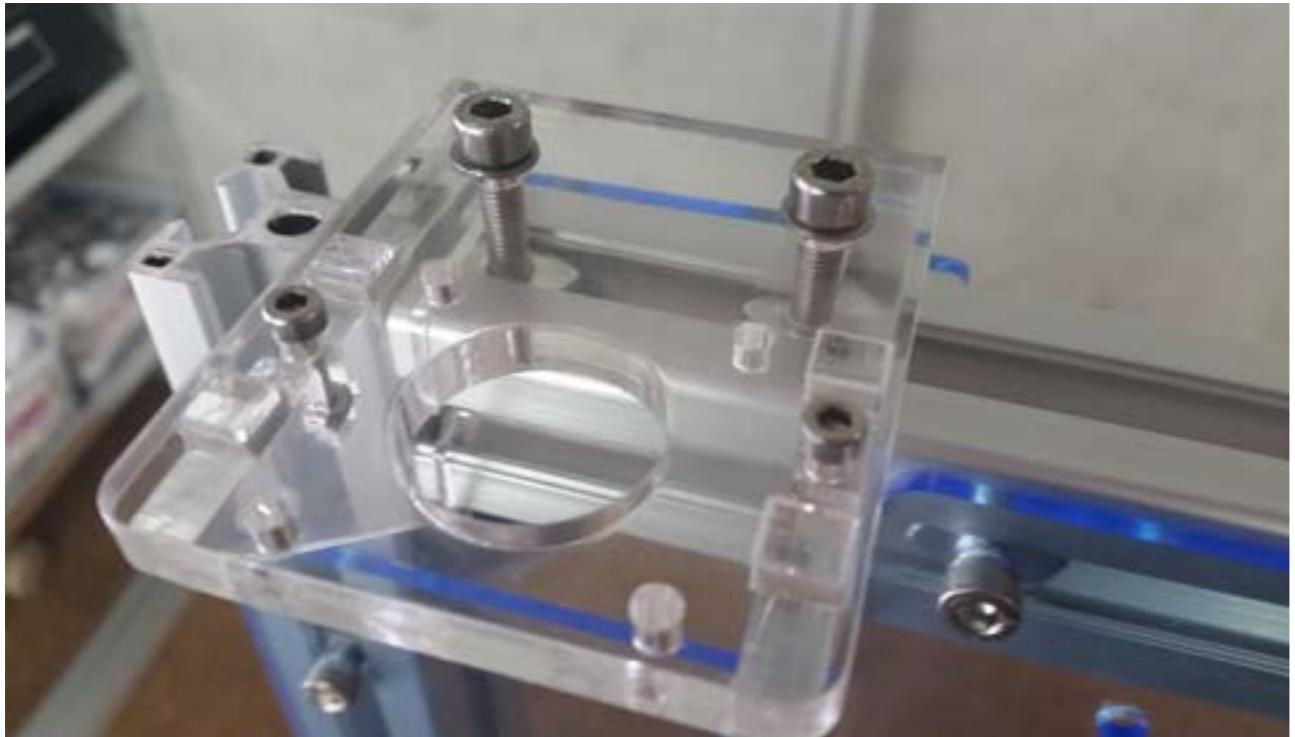
PART / SUB ASEMBLY NAME ▾

Printer Frame - Extruder Panel to Printer Frame



## Y Motor Mounts (Cont.).

ASSEMBLY NAME▶



Insert 2x T-Slot nuts into each end of the top slot of the extruder panel 3030 extrusion and use a cable tie or similar flexible poking tool (Cable Tie) to locate the T-Slot nuts underneath the corresponding holes in the Y Motor Mount as pictured.



T-Slot Nuts to secure the Y Motor Mount assembly as shown. This should be positioned as far to the side of the printer as possible.



ASSEMBLY NAME▶

## Side Braces

### Parts Required

4 x Side Braces (Assembled Earlier)  
2x 597mm Extruded Rail



Identify and slide each pre-assembled Side Braces into the 600mm Extruded rail t-Slots as pictured. Take note that the assembly is mirrored for the front and back of the machine, be mindful of the orientation during assembly. If in doubt, refer to the pictures. Finger tighten the screws to hold the side braces in position, leaving space at each end to slide the Side braces onto the vertical 3030 extrusions.

ASSEMBLY NAME▶

## Printer Frame (Cont.).

Now take the 2x completed Side Extruded rail assemblies and slide onto the Printer Frame's vertical 3030 extrusions, each Extruded Rail Assembly spanning front to back, with the Acrylic side on the outside of the printer to complete the frame. Flush the flat of the Extruded rail assembly with the top of the vertical 3030 extrusions ensuring the peak of the rail itself sits above the printer frame as shown and lightly tighten the screws to hold in place.

PART / SUB ASEMBLY NAME ▾

Printer Frame - Y Motor Mounts and Side Braces



ASSEMBLY NAME▶

# Printer Bed Holders

## Parts Required

M3 16mm Screws  
M3 Nuts  
M3 Washers

1x Printer Bed Holder Front (Plastic Part)  
1x Printer Bed Holder Right (Plastic Part)  
1x Printer Bed Holder Rear (Plastic Part)



Line up the 4 holes of the each TR8 Nut with the 4 matching holes in left, right and rear Printer Bed Holder. Insert 4x M3 16mm screws into each hole and secure with M3 nuts, washers and tighten.

For each of the printer bed holders, use a flathead screwdriver to pry apart the housing for the linear bearing and drop the linear LM12UU bearing fully into it's housing so it fits flush with the part.



ASSEMBLY NAME▶

# Couple Lead Screw

## Parts Required

3x Lead Screws  
3x Aluminium Coupling  
3x Lead Screw Locator Cap (Plastic Part)

Before you begin, loosen screws for the Lead Screw Idlers/Smooth rod holders (Installed earlier) enough so they can slide freely.



Insert the M8-M5 Flexible coupling onto a lead screw as far as it goes. Tighten the 2x different sized grub screws closest to the Lead screw to attach the coupling firmly in place.

Screw the Left, Right and Rear Printer Bed Holders onto each Leadscrew as shown at least 150mm down the rod make sure the base of the Bed Holder is facing the Coupling as pictured.

Insert a lead screw locator cap over top end of each lead screw.

PART / SUB ASEMBLY NAME ▶

Printer Bed Holders / Couple Lead Screw to Z Motors  
Install Z Motors



The Beast ASSEMBLY NAME▶

# Couple Lead Screw (Cont.)



Slide the Leadscrew up through the Lead Screw idler (You will need to temporarily remove the 608ZZ Bearing to do so) and then the coupling down back over the Motor Shaft ensuring the flat on the shaft lines up with the smaller grub screw on the coupling.



Also check to make sure the coupling slides as far down the shaft as possible and tighten both grub screws to secure. Repeat this for the Left, Right and Rear Leadscrew assemblies as pictured (Top).



Check the picture to ensure the correct orientation of each of the Left, Right and Rear Printer Bed Holders before beginning.

Ensure the remaining (lower) grub screws on each of the M8-M5 Couplings are loose enough to facilitate insertion onto the motor shaft.



ASSEMBLY NAME▶

# Insert Smooth Rods

## Parts Required

3 x Smooth Rods

1 x Z Endstop Holder



Loosen the screws for the Lead Screw Idlers/Smooth rod holders to ensure they slide freely.

Slide a 12mm Smooth rod down from the top of the Print Frame, through each Lead Screw Idler/ 12mm Smooth rod holder.



Do not slide it all the way down yet. You need to install a Z-Endstop Holder:

Now slide the Z-Endstop holder onto the Smoothrod as shown and Continue to slide it down through both the left Printer Bed Holder and finally down through the corresponding bottom Smooth rod locating hole in the Z-Motor Mount.

Insert 2x M3 12mm Screw into each Lead Screw Idler/Smooth rod holder and tighten with an M3 nut to secure the vertical position of the smooth rod. Repeat this process for the all 3 smooth rod assemblies as pictured. (Note : the Right and Rear smooth rods do not require Z-End Stop Holders).



Use your Handy Dandy alignment tool as pictured to align the Both the left and right Lead Screw Idlers/Smooth rod holders. Once in position, secure both screws tightly. Note: You may require an allen key to tighten the screw inside the Lead Screw Idlers/Smooth rod holders.

PART / SUB ASEMBLY NAME ▶

Couple Lead Screws / Insert Smooth Rods

Install Z Motors



# Quick Release Y Belt Clamp

ASSEMBLY NAME▶

## Parts Required

M3 Nuts  
M3 20mm Screws  
M3 12mm Screws

1x Quick Release Y Belt Clamp Part A (Plastic Part)  
1x Quick Release Y Belt Clamp Part B (Plastic Part)

Use Pliers to press a captive M3 Nut into each Quick Release Y Belt Clamp B. Preassemble Quick Release Y Belt Clamps as shown with captive M3 nut and M3 Screw as shown. Set assembly aside for later use.



REPEAT x2



ASSEMBLY NAME▶

# X Axis Assembly

## Parts Required

M5 35mm Screw  
M5 16mm screws  
M5 10mm Screws  
M3 16mm Screws  
M5 nuts  
T-Slot Nuts



### Note for repetition

Follow the procedure below for the front X Axis with the following differences for the rear X Axis:

The Rear X Axis uses a quick release Y Belt clamp on both sides, substitute the Standard Y Belt Clamp with the Quick Release Y Belt Clamp for the **Front X Axis**.

Also note the Rear X Axis is constructed otherwise the same, but installed on the printer with the motor on the **RIGHT** if viewing from the front. This results in greater print area when using 4 print heads at the same time. See following pictures.

1x X Axis (580mm) Extruded Rail  
1x X End Bracket Left (Plastic Part)  
1x X End Bracket Right (Plastic Part)  
1x Acrylic Left X End Plate  
1x Acrylic Right X End Plate  
2x Y Belt Clamp (Quick Release for Rear X Axis) (Plastic Part)  
1x X Motor Mount (Plastic Part)  
1x Acrylic X Idler Brace  
2x F605ZZ Bearings  
1x X Idler Spacer  
24x 625-2RS bearings  
12x Delrin V-Groove Wheel  
4x Aluminium M5 Short V Wheel Spacer  
2x Eccentric V Wheel Spacer  
1x Nema 17 Motor

PART / SUB ASSEMBLY NAME ▶

Quick Release Y Belt Clamp / X Axis Assembly



ASSEMBLY NAME ▶

# X Axis Assembly



REPEAT x2



Slide each of the Left X End Brackets onto their side of each X Axis Extruded rail ensuring that the flat surface of each of the X End Brackets is facing outwards. See pictures.

Slide 1x T-Slot Nuts into the bottom slot and 1x T-Slot Nuts into front slot of the X axis extruded rail.

Line up the T-Slot Nuts with the screw holes on the left X end Bracket and loosely secure front and bottom T-Slot nuts with an M5 10mm screw and washer, you will need to adjust the position of each End Bracket at a later stage.

Insert 2 T-Slot nuts in both the Rear upper and Rear lower T Slots to facilitate attachment of the X Motor Mount.



Use M5 10mm screws to secure the X Motor Mounts as shown.



Note the orientation and position of each X Motor Mount – they are lined up opposite.

Needs new picture showing both braces attached



ASSEMBLY NAME ▶

# X Axis Assembly



REPEAT x2



Insert 2 T-Slot nuts in the top slot to facilitate attachment of the Y Idler braces. Use M5 12mm screws with washer to secure each X Idler brace. Ensure the orientation and position is as pictured.



Also note the direction of the brace in respect to the number of channels on the front of the extrusion.

Insert 1 additional T-Slot nut in both the front and bottom Slots to facilitate attachment of the right X end Bracket and secure as you did with the Left X End Bracket.

You should now have 2 slightly different (opposite) X Axis assemblies. See picture (Lower Right).



Identify the left and right X End Plates. Insert 2x M5 16mm screws with washer into 2 holes shown on the Left X end **Bracket**, through the rectangle slots on Left X End **Plate** and secure tightly with M5 Nuts / washers as shown. Repeat this process for the Right X End bracket as shown. Be sure to orient the X End Plates as pictured. The largest hole should be on the underside of each X Axis.

PART / SUB ASEMBLY NAME ▶

X Axis Assembly

Needs new picture Showing rectangle holes



ASSEMBLY NAME ▾

# X Axis Assembly



Identify the Y Belt clamps. Label one of your X Carriage's "Master", the other "Slave".



This will be the main X Carriage which will be at the front of your printer. It is not intended that this carriage will ever be removed from the printer, so its belt clamps are slightly different.



Insert 2x M3 16mm screws and washers into each mounting hole of 2 Y Belt Clamps, then through the corresponding holes on the Master X Carriage Left and Right X End Plates as shown then secure tightly with M3 Nuts / washer.



**(For the second repeat)** Use the pre assembled **Quick release Belt clamps** in place of the Standard **Y Belt Clamps**. Secure both quick release belt clamps to the Slave X Carriage Left and Right End Plates with M3 16mm Screws / Nuts and Washer as done in the previous step.

Insert an 625-2RS Bearing into each side of each of the 12 x Delrin V-Wheels as shown ensuring they are pushed in as far as they can go.

(You might as well do this for the remaining 12 Delrin V-Wheels at this stage).



ASSEMBLY NAME ▾

# X Axis Assembly



Insert an M5 35mm screw and washer into both of the top V-Wheel Holes on the Left and Right X End Plates as shown. Do this for both sides on the master and slave assemblies.



Read the following carefully! Take special note of the order of components.

Insert an M5 V Wheel Spacer, followed by a V-Wheel and M5 Nylon lock nut onto each screw as pictured. It is important not to tighten the Nylon Nut too tight on the bearing. Doing so will restrict free bearing movement. Ensure the lock nut is tight enough only so all lateral bearing movement (slop) is eliminated.



PART / SUB ASEMBLY NAME ▾

X Axis Assembly



ASSEMBLY NAME ▾

# X Axis Assembly



REPEAT x2

Insert 1x M5 35mm Screw up through the hole in each Y-Idler brace. Secure an M5 Nut onto the M5 35mm screw, followed by 2x F605ZZ Flanged bearings installed front-to-front, a washer and another M5 nut as shown below.



Lower the complete X Axis assemblies into position on the printer frame as shown. Ensure the motor mount is on the left side of the printer. Both motor mounts should be on the inside side of the X Axis assemblies (ie. both motors should be directly in front, facing one another).



Check that each of the V-Wheels is seated snugly over the rail on each side of the printer. This is very important. If it is not, you can rectify this by loosening the screws and repositioning the X end brackets until the V Wheel is positioned correctly on top of the rail. After you have verified the wheel alignment, tighten the screws securing the **X End Bracket to the X Axis Extruded Rail and X End Plate**. You may need to adjust this again during the calibration phase.



ASSEMBLY NAME ▾

# X Axis Assembly



REPEAT x2



Insert an M5 35mm screw and washer into the lower hole on each of the X Left and Right End Brackets.

Insert an Eccentric spacer ensuring end with the smaller diameter is seated flush into X End Plate hole as shown.



(Take special note of the order the following components are installed on the screw)

Next attach a washer (very important), V Wheel and Nylon Lock Nut to the M5 35mm Screw, doing so will straighten the lower V-Wheel assembly and press the three wheels against the Extruded Rail. Rotating the Eccentric spacer will draw the wheel closer to the extruded rail and hence tighten the carriage assembly to the rail. Do not over tighten as this may increase rolling resistance.

All 3 Wheels should make good contact with the Extruded Rail at all times. If they do not, rotate the Eccentric nut to tighten or loosen the bottom V Wheel. Running the X Axis back and forth, you should be able to feel a minimum level of resistance and no vertical slop when the optimum tightness is achieved.

PART / SUB ASSEMBLY NAME ▾

X Axis Assembly



## X Axis Assembly

If you haven't already done so, ensure X Motor Mounts are Butt up against the X End Plates and tighten Screws to secure firmly in place.

Align the Nema 17 Motor with the 4 Holes in the X Motor Mount. Secure with 1 x M3 10mm screw and washer in each hole as pictured. Note: Ensure the cables are coming out of the motor towards the center of the machine.



## Hotend Carriage Assembly



Using Pliers, press 2x M3 Captive nuts into rear and 1x M3 Captive Nut into underside of Hotend mount B as shown.

Fit Hotend mount A to extruder plate front with M3 16mm screws and M3 Nuts.



Slide the Hotend Mount B onto the the Hotend Mount A as shown and ensure it slides with minimum resistance vertically. If it does not, use a knife or rotary tool to trim the edges off the Hotend mount A and B until the part slides up and down with a small amount (some) resistance. Graphite powder can help you get the right fit. The parts should fit snugly with no lateral movement, but slide reasonably smoothly vertically.

## Hotend Carriage Assembly



### Parts Required

M3 Nut  
M5 60mm Screws  
M5 Washers  
M5 Nuts

### Parts Required

1x Extruder Plate Front  
1x Extruder Plate Rear  
1x Hotend Mount A  
1x Hotend Mount B  
3x Delrin V-Groove Wheel  
2x M5 Short V Wheel Spacer  
3x M5 Long V Wheel Spacer  
1x Eccentric V Wheel Spacer  
1x M3 x 40mm Screw  
1x Spring



**Be careful:** If you shave too much, you will introduce slop and need to contact us to have new parts supplied. Insert M3 40mm screw and spring as shown between the 2 mounts and secure through to the captive nut in the underside of Hotend Mount B.

Set aside all four Hotend Mount A/B Assemblies for later use.

PART / SUB ASEMBLY NAME ▾

X Axis Assembly / Hotend Carriage Assembly



# Upper Wheel Assembly

ASSEMBLY NAME▶



REPEAT x8

Use the following parts **in order** to assemble the wheel assembly as shown. Note : Each Hotend plate has **2 x Upper Wheel Assemblies**. You will need to construct **8 of wheel assemblies for 4 Hotend Carriages n total –**

## Parts Required

- M5 60mm Screw
- Hotend Plate Front Assembly
- Small Aluminium Spacer
- M5 Washer
- Pre Assembled Delrin Wheel
- Long Spacer (Plastic Part)
- M5 Nut



Insert an M5 60mm screw into the Hotend Plate Front, followed by (in order) an Aluminium Spacer, M5 Washer, Delrin V-Wheel, Plastic Long Spacer and M5 Nut. **Ensure the order of parts is correct.** Finger tighten the nut. Ensure the wheels spin smoothly. If not, Loosen the M5 Nut half a turn. See Picture.

# Lower Eccentric Wheel Assembly

ASSEMBLY NAME▶

Use the following parts **in order** to assemble the **lower eccentric wheel assembly** as shown.

Note : Each Hotend plate has 1 x lower eccentric Wheel Assemblies

## Parts Required

- M5 60mm Screw
- Pre Assembled Delrin Wheel
- Hotend Plate Front Assembly
- Long Spacer (Plastic Part)
- Eccentric Nut
- M5 Nylon Lock Nut
- M5 Washer



REPEAT x4



# Lower Eccentric Wheel Assembly

ASSEMBLY NAME▶



REPEAT x4

Insert an M5 60mm screw into the Hotend Plate Front, followed by (**in order**) an Eccentric Nut (ensuring the small shaft points towards the hole in the Hotend Plate), M5 Washer, Delrin V-Wheel, Plastic Long Spacer and M5 Nut. Ensure the order of parts is correct. DO NOT tighten the nut – leave the lower wheel assembly loose to facilitate installation later. See Picture.



# X Belt Clamp

ASSEMBLY NAME▶



REPEAT x4

Insert M3 16mm screw into each X Belt Clamp A as shown (Next Page).

## Parts Required

- M3 Nut
- M3 16mm Screw
- M3 25mm Screw
- M3 Nylon lock Nut
- M3 Washer

1x Hotend Plate Rear Assembly.

1x X Belt Clamp A

1x X Belt Clamp B

Use pliers to press a captive nut into the front and rear side of each X Belt Clamp A – ensure captive nut fits flush with back of part. (See Pictures - next page).

PART / SUB ASSEMBLY NAME ▾

X Axis Assembly / Hotend Carriage Assembly



ASSEMBLY NAME►

## X Belt Clamp

BE CHANGED WITH ONES THAT REPRESENT CAPTIV NUT IN FRONT AND REAR OF



Take note of captive Nut in rear of X Belt Clamp A (Above Right). M3 16mm Screw should be installed prior to assembling X Belt Clamp A and B together as follows.

Attach the Belt Clamp B to Belt Clamp A using 1x M3 25mm screw / Nylon lock nut. See picture (Above Right).



Using 1x M3 16mm screw and lock nut, attach the Belt Clamp Assemblies to each Hotend plate rear as shown.

Secure an M3 16mm Screw through the hole in the back of the Hotend Plate Rear, into the captive nut in the X Belt Clamp A

Note: When attaching X Belt Clamp to Extruder Plate Rear Assembly, ensure M3 Nylon lock nut is tight.

ASSEMBLY NAME►  
*The Beast*

## Hotend Carriage Assembly (Cont)



Insert M3 40mm screw and spring as shown between the Hotend Mount Part A and B and secure through to the captive nut in the underside of Hotend Mount B. This creates a spring loaded, adjustable height hotend which can be varied by tightening or loosening the 40mm M3 screw.



Attach each of the Hotend Mount assemblies to each Hotend Plate Front using 2x M3 20mm screws and M3 Nylon Lock nuts for each. Tighten firmly in place.

Position each of the Hotend plate front assemblies in position on the X Rails as shown and lightly tighten THE M5 nut on the Lower V-Wheel to secure in place.



Ensure nut is not too tight to prevent smooth wheel operation. Do not worry about the horizontal position of each just yet, we can adjust that later. Do not tighten the Eccentric nuts FULLY just yet.



Ensure the Shaft of the Eccentric Nut is seated into the hole on the Hotend plate front and attach the Hotend plate rear to each of the Hotend plate front assemblies with M5 Nylon Lock Nuts ensuring the Belt clamps are facing the middle of the printer and that the Notches on the side of the Hotend Plate Fronts are also pointing towards the middle of the printer. Secure each with 3x M5 Nylon Lock nuts. See pictures.

PART / SUB ASSEMBLY NAME ▾

X Belt Clamp / Hotend Carriage Assembly



ASSEMBLY NAME▶

## Fit GT2 Pulleys

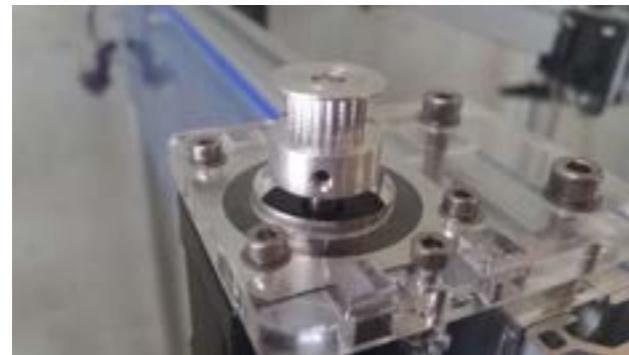


REPEAT x4

### Parts Required

4x GT2 Pulley

Fit a GT2 Pulley to each of the X and Y Motor Shaft's and secure with a single grub screw. Ensure Grub screw secures to the flat of the motor shaft.



ASSEMBLY NAME▶

## Fit GT2 Belts



Fit the X Belt around the X Idler and GT2 Pulley, with both ends meeting back at the X Belt Clamp as shown. Tightening the belt can be difficult with one set of hands, this may be a good time to enlist some extra help. Basically the teeth of the front overlap need to lock into the opposing teeth on the X Belt clamp, the other end of the belt is then free to slide behind the front overlap in the X Belt Clamp as shown.

Loosely tighten the securing screw and pull on the end of the belt which is not locked into the teeth of the X Belt clamp to tighten, as you are tensioning the belt, tighten the securing screw to hold the tension.



The belt should be tight enough so that the carriage cannot move independently of the GT2 Pulley. After tightening ensure both the X and Y Axis move freely without any slop. Too tight, and the axis will not move freely, too loose and slop will be introduced. This may require some tweaking later during the calibration phase. Attach the other X Belt clamp (on the same X Carriage) to the belt and secure **loosely** with an M3 16mm screw..



Don't worry if your Dual X Axis's are skewed and not perpendicular to what will eventually be our print bed. We will adjust this once the print bed is attached.

PART / SUB ASEMBLY NAME ▶

Fit GT2 Pulleys / Fit GT2 Belts

### Parts Required

M3 16mm Screws

Small Cable Ties

2x X Axis GT2 Belts (Shorter)

2x Y Axis GT2 Belts (Longer)

Insert an M3 16mm screw (2-3 turns only) into the front of each X Belt clamp A. Do not secure this all the way through, this should leave the X Belt Clamps in an OPEN position.

Now is a good time to align and tighten the Y Idlers. Align both so the shaft of the each idler is inline with the shaft of each Y Motor.



ASSEMBLY NAME▶

## Fit GT2 Belts

Attach Y Axis belts to each side of the Y Axis securing both ends in the Y Belt clamp as shown.

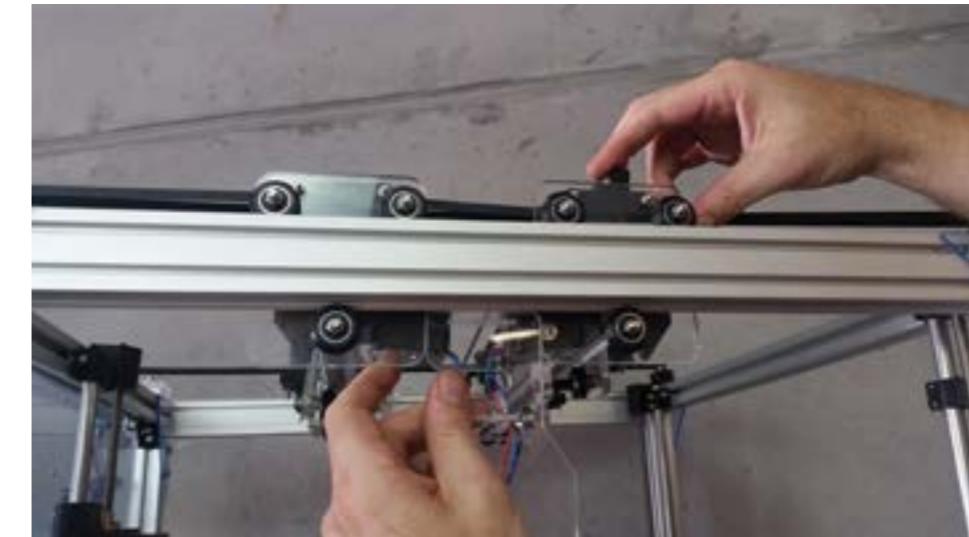
After using a cable tie to firmly secure one end to the clamp, tension enough so that the belt has no slack and the Y carriage cannot move independently of the belt. Once satisfied with the tension, use another cable tie to secure the remaining end of the belt to the clamp. Repeat this process for the other Y motor Belt ensuring both belts are roughly the same tension (don't worry if they are slightly different, just get them as close as you can).



ASSEMBLY NAME▶

## Separation of X Axis's

Use the Handy Dandy Tool as pictured to set the separation of the X-Axis's as pictured. When in place, rotate the Quick release Y Belt clamp and tighten it's screw to secure the X Axis to the Belt. Repeat this process for the other side.



ASSEMBLY NAME▶

## Separation of Hotend Carriages

Use the Handy Dandy Tool as pictured to set the separation of the Hotend Carriages as shown. When in Place, secure the remaining moveable Hotend Carriage to the belt / belt clamp using an M3 16mm screw as pictured. Repeat this for the other X Axis.



PART / SUB ASEMBLY NAME ▾

Fit GT2 Belts / Separation of Carriages



## Airtripper Bowden Extruder

ASSEMBLY NAME▶

### Parts Required

M3 30mm screws  
M3 20mm screws  
M3 16mm screws  
Nylon lock nut

1x Extruder Brace  
1x Extruder Idler  
1x Idler Shaft  
1x Tension Brace  
1x Fan Mount  
1x Nema 17 Stepper Motor  
2x Springs  
1x 608ZZ Bearing  
1x MK7 Drive Gear  
1x Grub Screw  
1x Push Fit Adaptor  
1x 40mm Cooler Fan



Install Nema 17 Motor into Extruder brace with 3x M3 30mm screws as shown. 2 of the M3 30 mm screws go through the Extruder strut, into the brace, the other fits directly into the brace. Take note of the direction the motor cables are protruding – on the same side as the filament input (the smaller input hole).

Insert Idler shaft into 608ZZ bearing as shown then clip into the extruder idler.



REPEAT x4



Install MK7 drive gear as shown and secure loosely with grub screw just enough so that the MK7 drive gear can slide along the motor shaft. (Take note of the way the drive gear is installed on the shaft and ensure grub screw fits to the flat of the motor shaft).



## Airtripper Bowden Extruder

ASSEMBLY NAME▶



Clip the Extruder idler onto the exposed screw as shown.



REPEAT x4



Install the Extruder fan mount onto the Extruder assembly using an M3 20mm screw and secure with a nylon lock nut.



Install (screw in) a push fit adapter into tapped hole in each Extruder Brace. Do not overtighten.



Fit the cooler fan to the Extruder fan mount using 2x M3 16mm screws and nuts as shown.

PART / SUB ASSEMBLY NAME ▶

X Belt Clamp / Hotend



## Airtripper Bowden Extruder

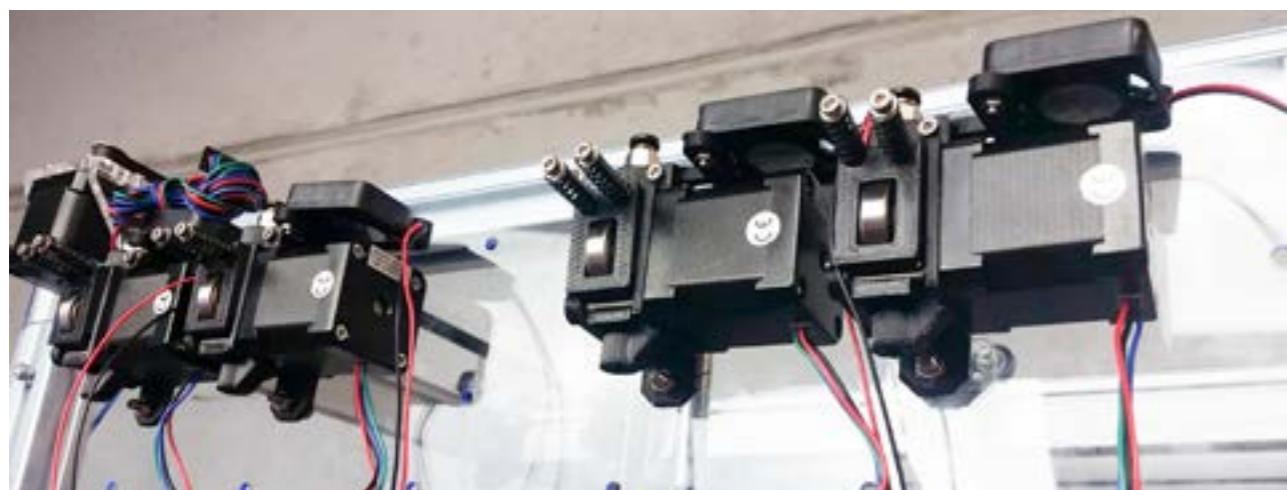
ASSEMBLY NAME▶

Insert a washer then spring onto each of the M3 50mm screws as shown.

Insert 2x Screw / spring assemblies into each of the tensioner holes on each of the extruders and secure with an M3 Nut. Only tighten the M3 Nut 2-3 turns on the 50mm screw. Once complete, you should be able to pull the spring back and over the lip of the Extruder idler to tension the idler against the hobbed gear. See pictures.



Fit each of the complete extruders to the Extruder panel at the rear of the printer with M5 16mm screws and Nylon Lock Nuts. Take note of the alignment and position of the extruders as shown. The Nylock Nut should be on the Extruder side to make it easier to fit the extruder to the extruder panel. Also take note the gap between sets of 2 extruders.



ASSEMBLY NAME▶

## Spool Holders

### Parts Required

M3 Nuts  
M3 16mm screws  
M5 20mm Screw  
M5 10mm Screw  
M5 T-slot Nut

Spool Holder Part A  
Spool Holder Part B  
Spool Holder Part C



Insert M3 Captive nuts into countersunk holes in Spool Holder Part A. Align Spool holder Part A and B as shown and secure together with 2x M3 16mm screws as shown.



Screw M5 20mm screw 3-4 turns into hole in Spool holder B as shown.

Slide Spool holder part B into the Toothed slot in spool holder part A as shown. Ensure the M5 20mm screw on spool holder part B is towards the outside of the spool holder.

PART / SUB ASEMBLY NAME ▶

Airtripper Bowden Extruder / Spool Holders



The Beast

ASSEMBLY NAME▶

## Spool Holders

Spoolholder part B is designed to be moveable so that thinner spools be pressed against the back of the spool holder to restrict “overspooling” of filament spools. When installing spools, push spoolholder part B against the spool, it should lockin place. Ensure this part is not too tight to restrict all movement, but tight enough to prevent free spooling (overspooling) of the filament.



Insert (twist in) each spoolholder into the rear vertical 3030 extrusions, 2 per side. Use a T-Slot nut and M5 10mm screw to secure the underside of the spool holder in the verticle 3030 extrusion as shown. Repeat this for all 4 spool holders.



Don't worry too much about the spacing of the spool holders, just leave enough clearance for 2 spool holders to move without obstructing each other on each side.

ASSEMBLY NAME▶

## Install Hotends and Fans

### Parts Required

M3 40mm screws  
M3 16mm Screws  
M3 Nuts

Pushfit Mount  
Hotend Fan Mount  
40mm Hotend Fan  
Merlin Hotend Kit (E3d optional)



The Beast

ASSEMBLY NAME▶

## Install Hotends and Fans

Check the thermistor to ensure the PTFE tubes are pushed as far down towards the thermistor end as possible. The function of these tubes is to prevent the wires leading to the thermistor from making contact with each other and metal surfaces on the hot end itself. Once the PTFE Tubes are in place, use a drop of super glue to temporarily secure the PTFE tubes in place, so that they do not move during assembly of the hotend.



Insert the heater cartridge into the heater block as shown and secure with the grub screw.



Fill the remaining threaded hole with thermal paste and insert the thermistor as far into the hole as possible then secure both with Kapton tape as pictured. It may be necessary to put another drop of superglue on the kapton to prevent it from unravelling.



To each Hotend, screw a .5mm nozzle to start with. We do not recommend starting the calibration phase with smaller nozzles. If using pliers to tighten nozzle in place, be very careful not to slip and squash the nozzle. Tighten nozzle firmly to squash the rubber grommet against the heater block.



PART / SUB ASEMBLY NAME ▾

Spool Holders / Install Hotends and Fans



ASSEMBLY NAME▶

## Install Hotends and Fans



Position each hotend and Insert 2x M3 40mm screws into the Top screw holes into a 40mm hotend fan, then through the Hotend Mount Clamp and finally secure to the Hotend Mount B captive screws as shown making sure the sticker on the front of the fan is on the side opposite to the screw heads and the fan wires are protruding from the t. This ensures the fan is pointed in the correct direction. See pictures.



Ensure screws are tightened equally to apply even pressure around the hotend. Also, ensure (if looking from the front) that cables for the front two hotends protrude to the right and cables on the back two hotends protrude to the left. This will ensure there is adequate space for flashing to be installed later.

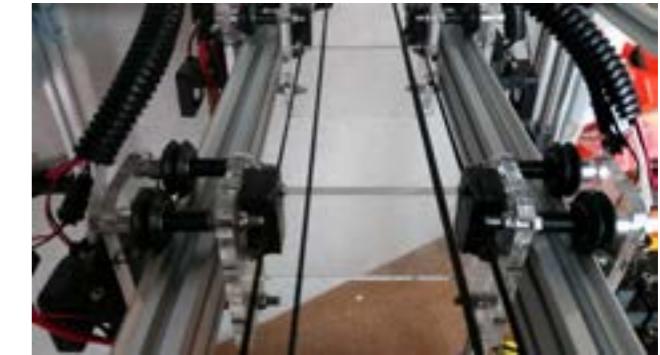


Screw a pushfit adapter into tapped hole in the Pushfit mount and secure the Pushfit mount to the Hotend Mount B and Hotend Mount Clamp with 2x M3 16mm screws / nuts as shown (tighten this firmly).



ASSEMBLY NAME▶

## X Axis Braces



### Parts Required

M3 16mm Screws

M3 Nuts

2x Acrylic X Axis Brace



Use M3 16mm screws and captive nuts to brace both X Axis together with the 2x X Axis braces as shown.



These braces may NOT be necessary with certain hotends, however are essential when printing with Merlin Hotends or any hotend with a nozzle that has a propensity to "catch" on printed artifacts. Having the braces attached increases the accuracy and reliability of the printer.

PART / SUB ASEMBLY NAME ▾

Install Hotends and Fans / X Axis Braces



# Electronics Enclosure

ASSEMBLY NAME▶

## Parts Required

M3 12mm Screws

M3 16mm screws

M4 12mm screws

M3 Washers

M3 Nuts

EE PSU Front

EE PSU Top

EE PSU Side

EE Bottom

EE Front

EE Top

EE Side

2x EE Foot

PSU (Power Supply Unit)

2x Terminal Blocks

3x 40mm Fans



# Electronics Enclosure

ASSEMBLY NAME▶



PART / SUB ASSEMBLY NAME ▶

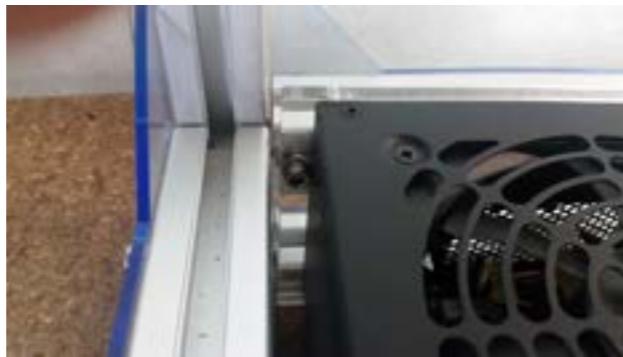
Electronics Enclosure



# Electronics Enclosure

ASSEMBLY NAME▶

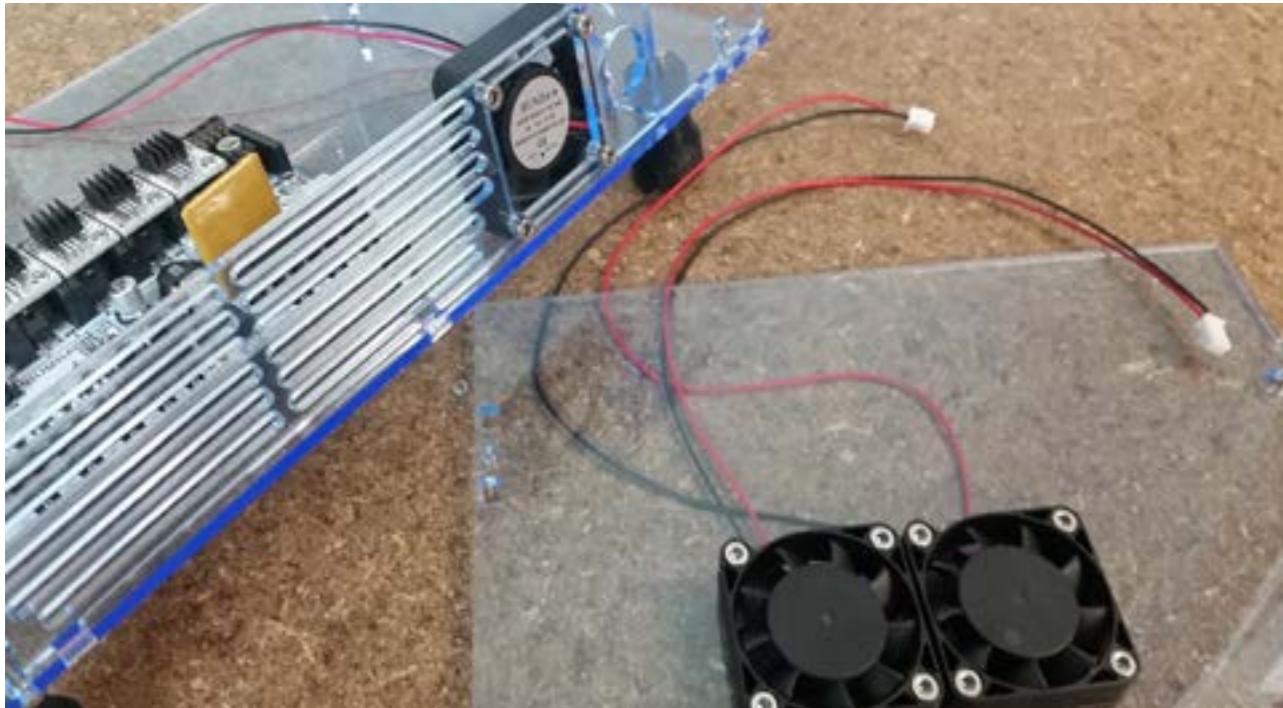
Secure the PSU flush to the lower rear, left hand corner of the printer as shown with M5 16mm screws with washer and T-Slot Nuts. It may be easier to attach the T-Slot Nuts to the Screws before inserting the entire PSU assembly onto the T-Slot – Do this at a 45 degree angle and the T-Slot nuts should push into the slot and then be tightened fully.



Attach the 2 electronic enclosure fans to the EE top plate with 4x M3 12mm screws and Nuts as pictured – ensure the fans are installed sticker side down

Ensure all screws are firmly tightened to prevent them from working loose and landing on the printer control board.

Attach the exhaust fan to the EE side with 4x M3 16mm screws and nuts incl, ensuring the air flow (sticker side) is facing outward.



# X and Y and Z Endstops

ASSEMBLY NAME▶

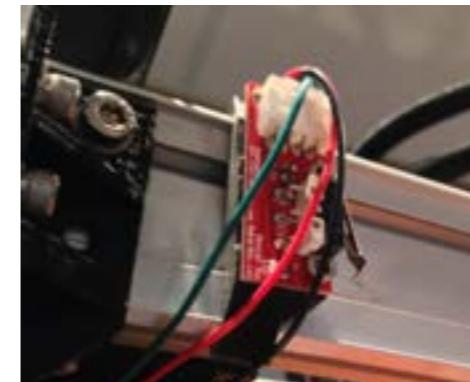
## Parts Required

M3 10mm Screws  
M3 16mm Screws  
M3 25mm Screws  
M3 Nuts  
2x Standard Mechanical Endstop  
1x Z Mechanical Endstop (see picture)  
1x X Endstop Holder  
1x X Endstop extension wire  
1x Y Endstop holder  
1x Y Endstop Extension wire  
1x Y Alignment Stop  
1x Z Endstop extension wire.  
Endstop Holder.

Insert 2x captive nuts into the X Endstop Holder and Y Endstop Holder as shown.



Gently bend up the connector for all three Mechanical Endstops as shown. This is to allow space for a screw to secure the Endstop to the



Insert an M3 10mm screw into each of the holes shown, Insert the assembly into position on the X Endstop Holder and secure with M3 10mm screws to the captive nuts.



Clip the X Endstop assembly to the front left / front side of the front X Axis Rail as shown. Note ensure the shorter side of the Endstop holder clips onto the bottom rail first, this will allow the top longer clip to flex and clip over the top rail. The X End stop should be positioned to maximise print area without any mechanical components coming into contact with anything BUT the X Endstop itself.

PART / SUB ASEMBLY NAME ▾

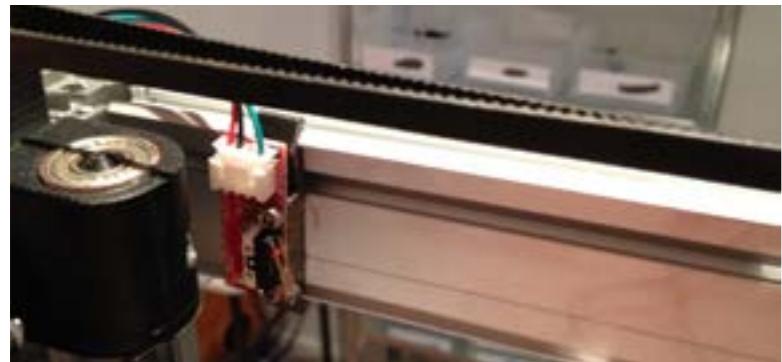
Electronics Enclosure / X Y and Z Endstops



# X and Y and Z Endstops

ASSEMBLY NAME ▾

Extend the X Endstop wires with the X Endstop extension wire and label the extended end.



Repeat this process to construct the Y Endstop assembly and clip onto the front of the left Y Extruded rail as pictured. Again make sure maximum travel is achieved without any component coming into contact with anything other than the endstop itself.

Insert 2x M3 16mm screws through 2 holes at the end of the last remaining mechanical endstop.

Screw 2x m3 nuts onto the back of the endstop, these will act as spacers for the endstop. See pictures.

Secure the Mechanical Endstop to the Z Endstop Holder with another 2x m3 nuts as shown ensuring the button is facing down.



Insert 1x M3 25mm screw (TO be used as Z Adjustment) into the Left Front Bed Holder and another nut to secure the Z adjustment without slop. This screw should line up with the Z Endstop switch. It is important this screw is tight and has no slop. See pictures



Connect the endstop wires for each endstop and Extend the X, Y and Z Endstop wires with the Endstop extension wires and label each wire.



# Wiring

ASSEMBLY NAME ▾

Note, the following steps require electrical common sense. Do not connect any component to any form of electrical supply while performing the following steps.

## Parts Required

1x Emergency Stop Button  
1x 900mm Red Wire  
1x 900mm Black Wire



Motor Extension Wires  
Extruder Fan Extension Wires  
Terminal Blocks  
1x 600mm Channel Conduit  
1x 500mm Channel Conduit  
Double Sided Foam Tape



Cut and strip 1cm off all 4 wires (2 yellow and 2 black) close to the connector as shown.

Separate both pairs of black and yellow cables (on some PSU's the colour may be brown and yellow) and twist the exposed wires from each pair together forming 1 yellow twisted pair and 1 black twisted pair. This is done to double the amperage available to the printer control board. Each yellow wire carries 12v+ and each Black wire is connected to common earth. The wires will be used to provide power to the printer control board. Do not connect them to the control board yet.

PART / SUB ASSEMBLY NAME ▾

X Y and Z Endstops / Wiring



# Wiring

ASSEMBLY NAME▶

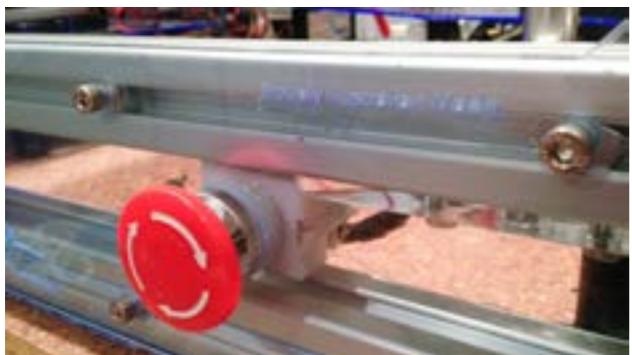


Identify the red and black 900mm wires and strip one end of each. Loosen the screw terminals on the emergency stop button and secure the stripped end of the black wire to one side and the red to the other. It does not matter which side of the Emergency stop button the red and black wires are connected, but ensure both black and white are connected to the orange terminals.

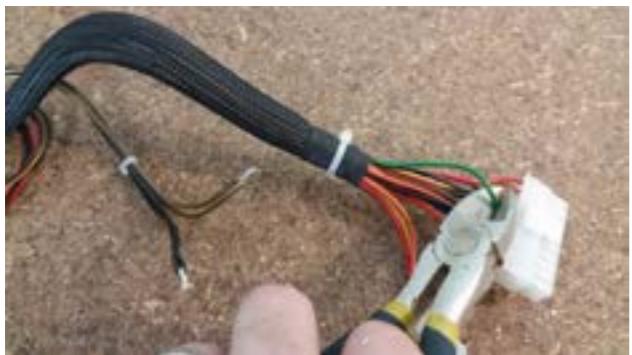


Ensure there is no exposed (stripped) See picture.

Unscrew the red twist end and chrome collar from the Emergency stop button as pictured.



Position the body of the emergency stop button in place as shown. Secure the Emergency stop button body to the printer with the chrome collar as shown. Complete the assembly by screwing the red twist end onto the Emergency Stop Button body.



Identify the green wire leading from the ATX PSU and cut and strip the wire as close to the connector as possible as shown. This wire will be used as a trigger to power on / off the printer. Trim a 20mm length of shrink wrap and feed this over the green wire you have just stripped.



Connect this wire to the black wire leading from the Emergency Stop Button by twisting the exposed wire ends together and soldering the connection. If you do not have a soldering iron, simply twisting these wires and covering in heat shrink will suffice.

Twist and or solder the red cable from the Emergency Stop Button and to the BLACK Pair of Common earth cables you twisted previously. See picture. Insulate this connection with heatshrink.



The previous 2 connections carry very low amperage. Soldering both connections is optional - insulating them is not.



Gather the cables for the front right Z motor and emergency stop button and wrap with plastic spiral wrap. One wrapped, cables should fit neatly inside the top slot of the lower 3030 extrusion, running back towards the left front of the printer across the outside of the motor, and down the left side of the printer where the electronics enclosure will be installed. See picture.



Cut the terminal block into 2x2 sections. Trim and strip 1cm from another 1x Black and 1x Yellow wire behind the 6 Pin connector coming from the PSU (close to the connector) and screw into each side of a Terminal Block as shown. This will be used as a connection point for the hotend / extruder fan wires later.

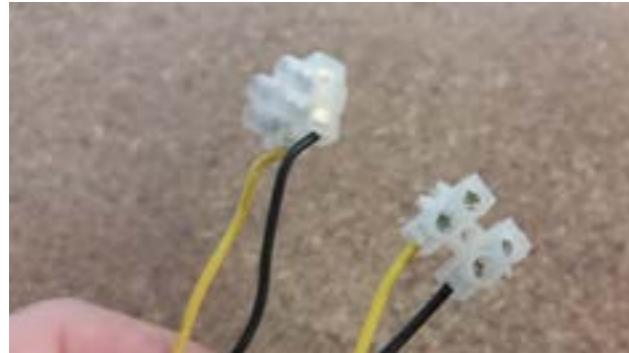
PART / SUB ASSEMBLY NAME ▶

Wiring



# Wiring

ASSEMBLY NAME▶

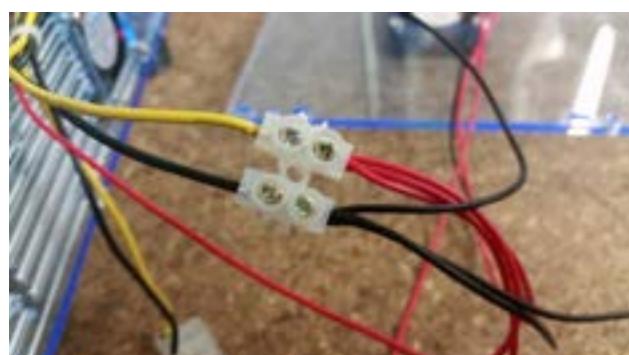


Trim and strip 1cm from **another** 1x Black and 1x Yellow wire behind the 6 Pin connector coming from the PSU (close to the connector) and screw into each side of another 2x2 Terminal Block as shown. This will be used as a connection point for the electronics enclosure fan wires later. See pictures.

You should now have 2 terminal blocks wired with yellow and black wires leading to each terminal block.

Position the Electronic Enclosure (EE) as shown and secure with with 2 M5 10mm screws / T-Slot Nuts in the top extrusion and 1x M5 nut in the bottom. In this case ONLY, Flip the T-Slot nuts upside down to ensure the screws have enough thread to grab. Ensure the Tab at the rear of the EE Enclosure locks into the corresponding hole in the PSU Mounting plate.

You may need a flexible poking tool (Cable tie) to position the T-Slot nuts.



Trim and Strip 1cm from the ends of all 3 40mm fans on the EE Enclosure. Twist together the 3 red wires of each fan and the 3 black wires of each fan. Connect to the second terminal block you prepared earlier by connecting the group of twisted red wires inline with the yellow wires and the twisted group of black to black. See pictures. Ensure no exposed wire protrudes either side of the terminal block.



# Wiring

ASSEMBLY NAME▶



Separate the Printer control board power cables and the green / soldered emergency stop cable from the excess cables on the ATX Power supply. Gather excess cables and tidy them up using a cable tie as pictured. Push this group of excess cables in behind the EE Rear plate.



Unwrap the wires for each of the printer motors and label each set of wires as follows :

X Motor A (Make this the X Motor closest to the FRONT LEFT of the machine, )  
X Motor B  
Y Motor A (Make this the Y Motor on the RIGHT hand side of the printer)  
Y Motor B  
Z Motor A (It does not matter which Z Motor is labelled A/B/C)  
Z Motor B (It does not matter which Z Motor is labelled A/B/C)  
Z Motor C (It does not matter which Z Motor is labelled A/B/C)  
Extruder 1 (Label these from left to right if looking from the front)  
Extruder 2  
Extruder 3  
Extruder 4

Use the corresponding extension wires to extend each of the motor wires you labelled in the previous step. Make sure the colour of the cables are matched. Ie don't plug them in backwards **with the following exceptions.**



**Connect the front X Motor BACKWARDS and the Left Y Motor Backwards.** This is to ensure all motors pull their Axis in the correct direction.

It may be a good idea to move the labels to the end of the extended cables as you connect them. Note : The Z Motors do not need to be extended. You will however need to trim these wires to length and strip the ends – save that for when you connect them to the Printer Control Board.

PART / SUB ASSEMBLY NAME ▶

Wiring



Connect the Extruder Fan extension wires to each of the extruder fans, again making sure the cables are not plugged in backwards. Once all the fan wires are extended, gather them all together and label them (towards the end of the extended wires) "Extruder fans".



Wrap the X Endstop and X Motor A and B wires in Split Tube wrap, leaving enough slack to facilitate a full range of movement of the X and Y Axis. Wrap these wires together in towards the back of the printer. Cables should run around the outside of the rear 3030 extrusion and back into the hole at the rear of the extruder plate, then down into the conduit installed in the previous step. See picture below.



## Wiring

ASSEMBLY NAME ▾



Wrap in Spiral wrap and run the Z Endstop and Y Endstop wires together down the front left vertical 3030 extrusion, then back towards the electronics enclosure, dropping down into the electronics enclosure mid way as shown. See picture.



Attach double sided foam tape to the rear side of the 600mm channel conduit and adhere to the rear left vertical 3030 extrusion as shown.

Attach double sided foam tape to the rear side of the 500mm channel conduit and adhere to the rear of the Extruder Panel, approximately 30mm below the extruder motors



Use extension cables to extend the cable length of the Hotend Fans, Thermistors and heater Cartridges (Group each set for each hotend and label the group hotend 1,2,3..etc. Hotend 1 Should be Front Left, 2- front right, 3-rear Left, 4-Rear right). Please note: The heater cartridges need to be extended twice, first with the short length, then with the long. This is to reduce the waste of cables supplied by our hotend supplier. Ensure black wires line up with black wire and red to red.



Cut 4x approximately 1000mm length of PTFE Tube for each hotend and connect to the corresponding extruder by pushing each end into the appropriate push fit adapter. Again the LEFT Front Hotend should connect to the LEFT most Extruder and so on. When connecting, trim each PTFE length only long enough so that there is enough slack for the **all printheads to move in a full range of motion** while maintaining **a smooth arc**. This basically means each PTFE tube will be a slightly different length. See pictures.

PART / SUB ASSEMBLY NAME ▾

Wiring



# Wiring

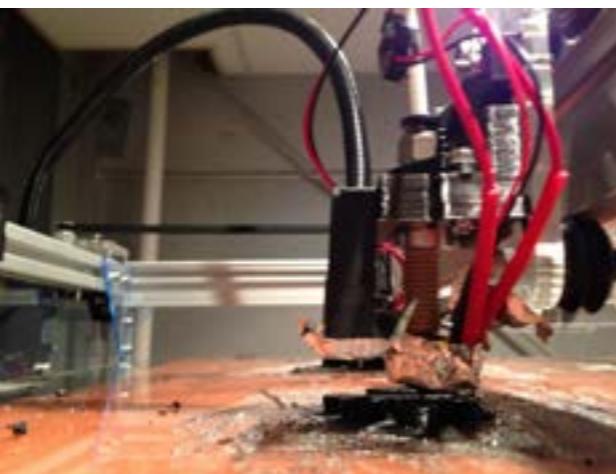
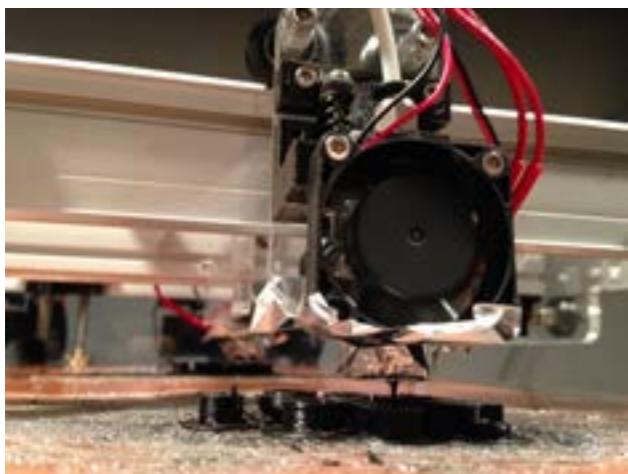
ASSEMBLY NAME ▾

For each Hotend, Group the hotend, thermister and fan wires with each PTFE tube and wrap in Split Tube which has been cut to length. See pictures. Once complete you should have 4 groups of wires/tubes for 4 extruder groups.



Cut 4x 5cm lengths of Aluminium tape and wrap each length over each Hotend as pictured. This is to insulate the hotend (to a small degree) as well as make it easy to clean the hotend from molten plastic debris. When necessary, simply replace the Aluminium tape.

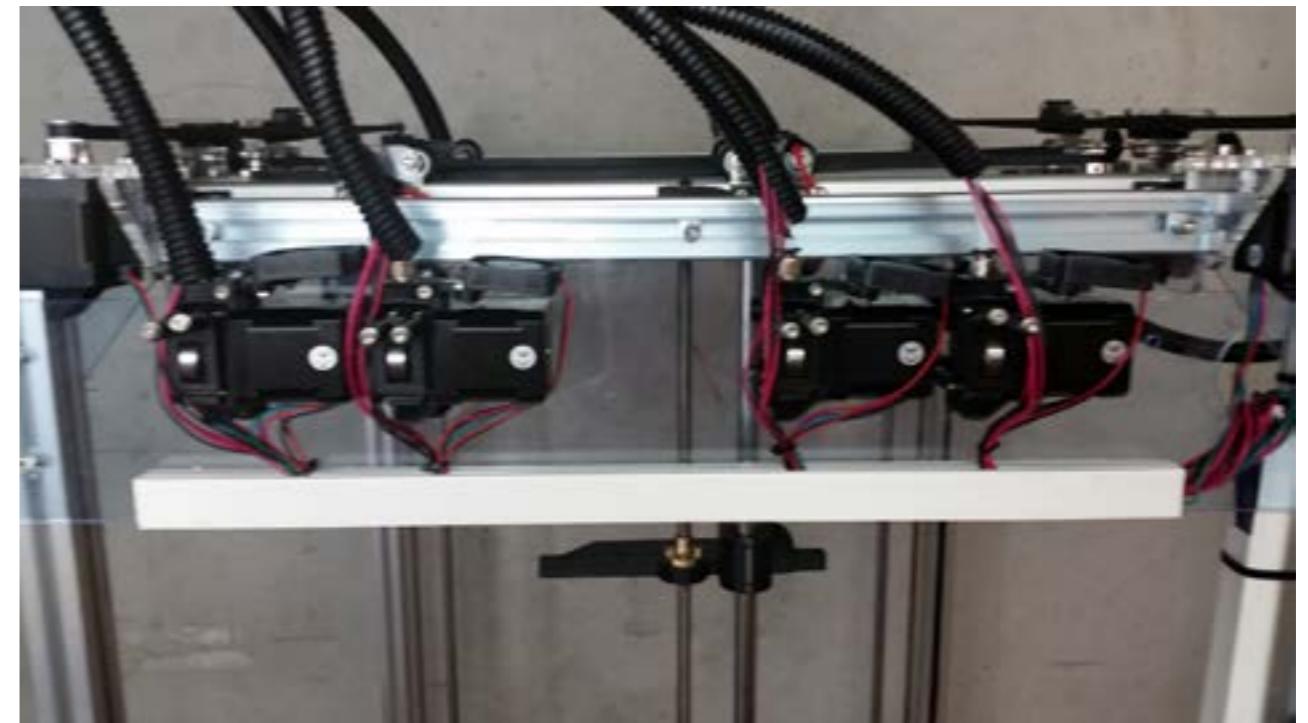
Cut another 4x 2cm lengths of aluminium tape and attach each between the underside of the hotend fan to the top of the hotend's heater block. This is to direct airflow off the heaterblock.



# Wiring

ASSEMBLY NAME ▾

Measure and cut notches to facilitate the entry of Extruder / hotend wires in the 500mm length of channel conduit and neatly run cables down into these notches then right (if looking from the back) towards the vertical conduit. See pictures.



All wires when exiting the horizontal length of conduit should then run through the holes in the extruder panel and down into the vertical conduit, where they exit and run back in towards the electronics enclosure via the hole to the right of the PSU, in the corner of the printer.

PART / SUB ASEMBLY NAME ▾

Wiring



## Parts Required

M3 x 35mm screws  
M3 x 30mm screws  
M3 x 25mm Screws  
M3 10mm Screws  
M3 Washers  
M3 Nuts  
M3 Nylon Lock Nuts  
M5 x 25mm Screws

1x LCD Controller  
1x LCD Mount Part 1  
1x LCD Mount Part 2  
1x LCD Mount Part 3  
1x Acrylic LCD Mount Plate  
1x Acrylic LCD Face Plate  
4x LCD Spacer (Plastic Part)

Insert captive nuts into the LCD Mount part 3 and secure the LCD Mount part 3 to the LCD Mount Plate with 2x M3 10mm screws.



Remove the rotart encoder knob from the LCD display, then align the LCD Controller with the LCD Front Panel by inserting 4x M3 35mm screws through the LCD front and LCD controller as shown making sure you place the LCD button in place as you assemble the components. Insert an LCD spacer onto the rear side of each screw followed by the LCD Mount plate assembled earlier. Tighten with 4x M3 Nuts, replace the encoder knob and check to ensure LCD Encoder rotates and clicks correctly (if you push it in, it will click like a button). See pictures.



Notice the plastic part in the hole for the "reset" button!

## LCD Display

ASSEMBLY NAME▶



## Wiring

ASSEMBLY NAME▶

Insert a captive M3 Nylon lock nut into the captive nut space in the base of LCD Mount #1. Assemble LCD Mount #2 with LCD Mount #1 by aligning the corresponding circular locator in both parts and securing through the center with an M3 35mm screw as shown.



Insert 2x M5 25mm screw and washer into the 2 holes in the LCD Mount, then on the other side, screw 2 T-Slot nuts 2-3 turns each. Gently wiggle (on an Angle) the T-Slot nuts directly into the T-Slot in the opening for the LCD controller as shown – this may be tricky.

Next finger tighten these screws as far as you can and use long nose pliers with a hex bit to tighten securely.



Attach the LCD Controller assembly to the LCD Mount Part 2 as shown and secure with an M3 25mm screw and lock nut. Ensure the LCD Mount Part 2 is installed with the circular face down.

Insert an M3 35mm screw through LCD Mount Part 2, then through part 1 into the captive screw installed earlier.

Connect both LCD Wires as shown with the Red wire on the RIGHT hand side, and feed the cables through to the electronics enclosure.

PART / SUB ASSEMBLY NAME ▶

LCD Display

