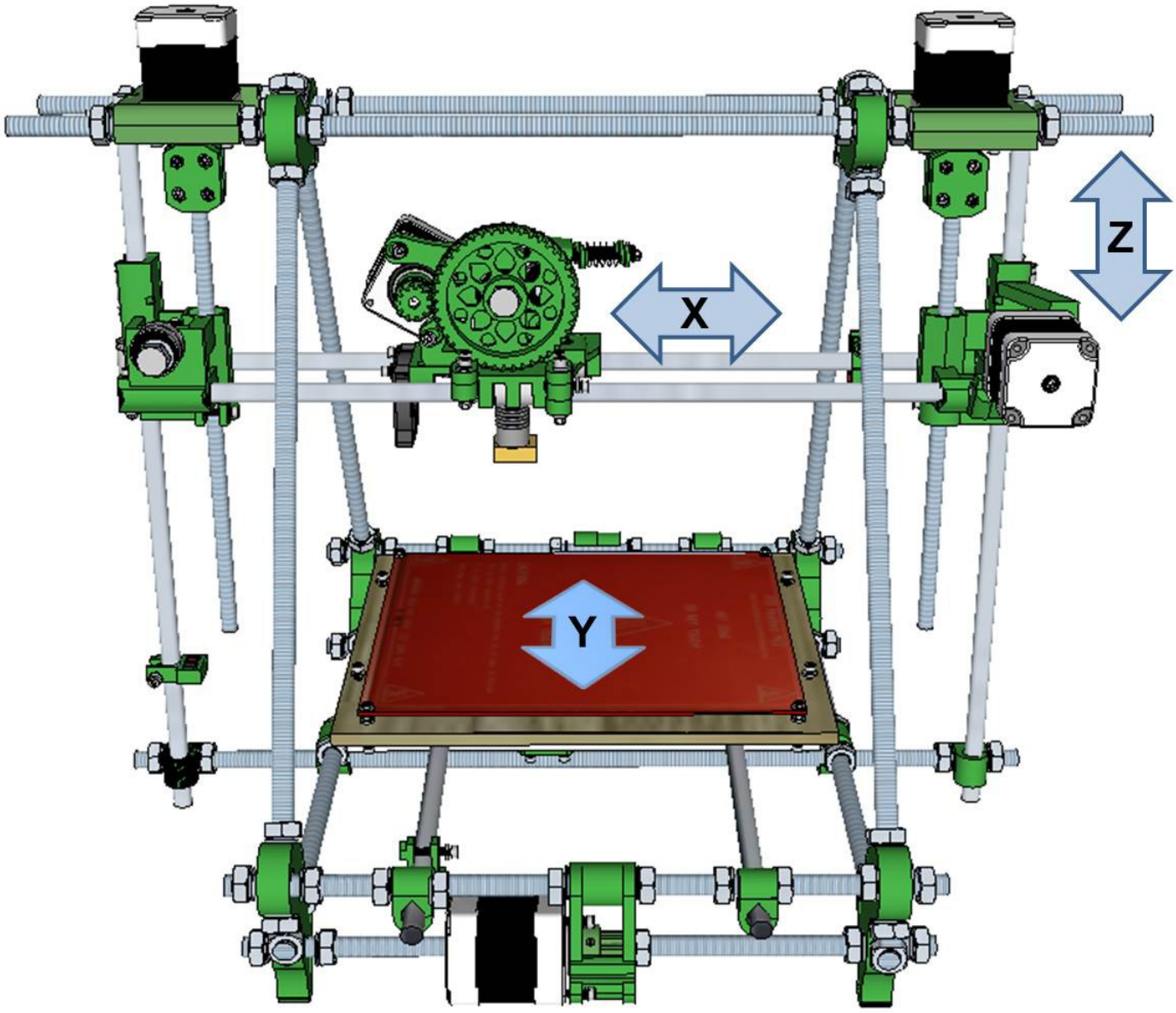
Part 8

Assembling the Z axis

The Z axis raises and lowers the x axis assembly.



Parts

You will need the following parts;

- 2 x 350mm M8 smooth rods
- 2 x 210mm M8 threaded rod
- 2 x printed smooth rod clamps
- 1 x printed end stop holder
- 4 x printed coupler halves
- 2 x printed zisolators
- 1 x micro switch
- 2 x 15mm Silicone tubing
- 6 x M3x25 cap screws
- 9 x M3x20 cap screw
- 8 x M3x10 cap screws
- x M8 nut
- 23 x M3 washers
-
- 15 x M3 nuts
-

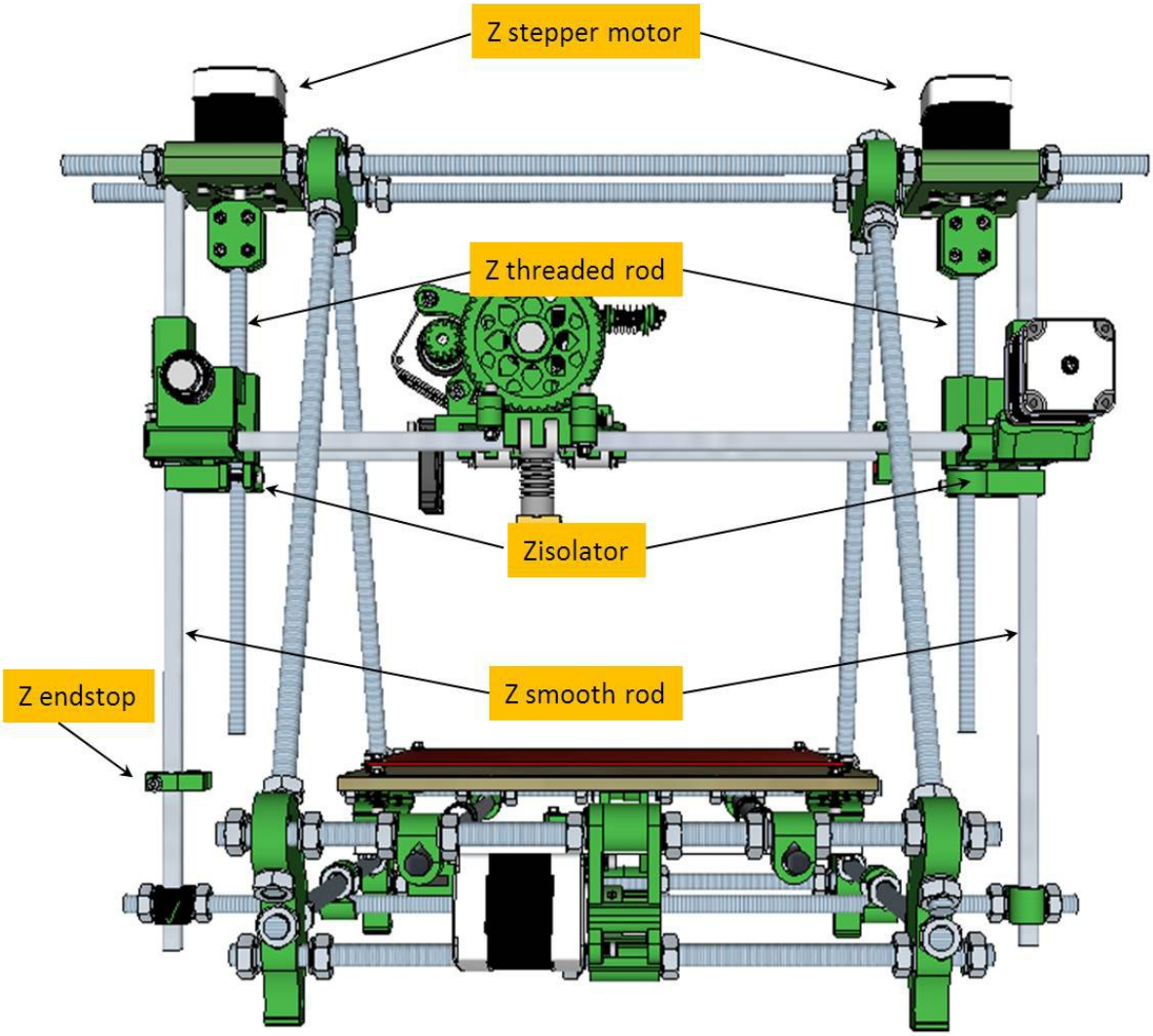
Preparation

The plastic parts have M3 holes, ease these for cap screws and rods as before using a file and/or drill bit.

This section describes the assembly of the Z axis elements and the incorporation of the X axis.

The Z axis comprises two identical sub-assemblies mounted left and right of the main frame;

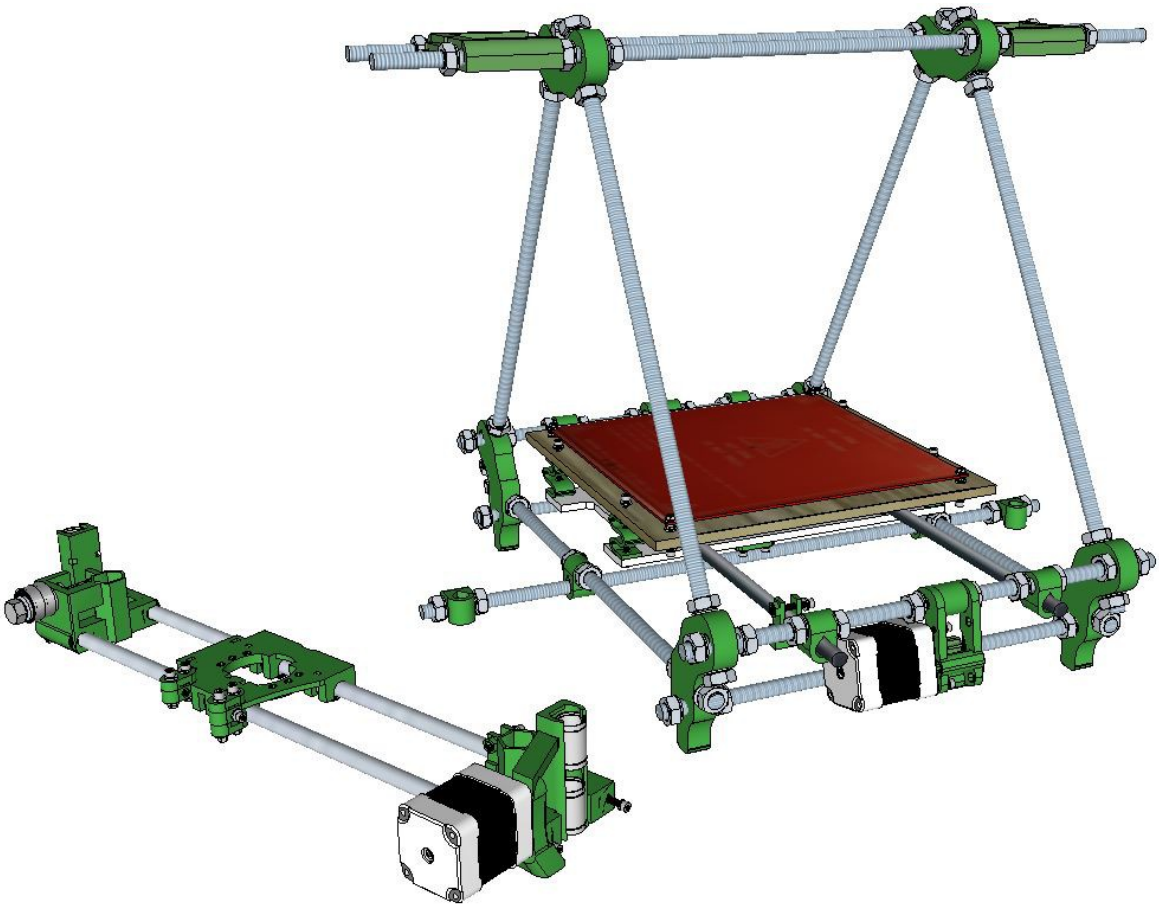
- A Z motor mount which carries the Z stepper motor
- A 350mmsmooth rod which acts as the Z axis guiding the X axis
- A 210mm threaded rod which raises and lowers the X axis on a zisolator



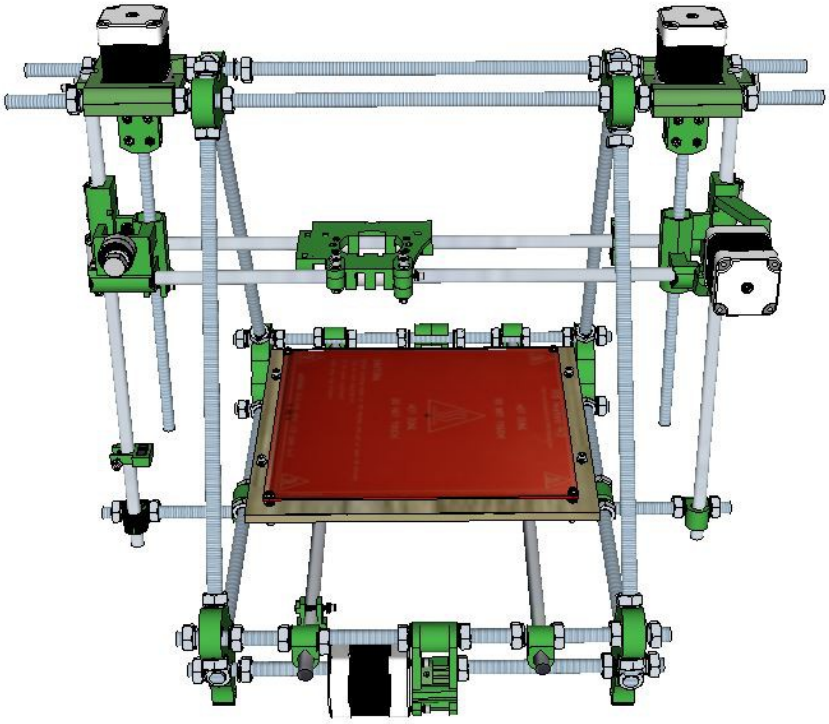
The X axis rides on the zisolator which is moved up and down the Z axis by the stepper motor. This approach is taken to ensure only vertical motion is transferred to the Z axis and prevents any imperfections in the Z axis threaded rod being translated into lateral movement of the X axis.

As with the X and Y axes there is an end stop. In the case of the Z axis this switch is used by the software to detect Z zero, or “home”, and prevent the extruder hot end being driven in to the heated bed. Such a “head crash” can damage the hot end nozzle so needs to be avoided - do not forget to fit the Z end stop.

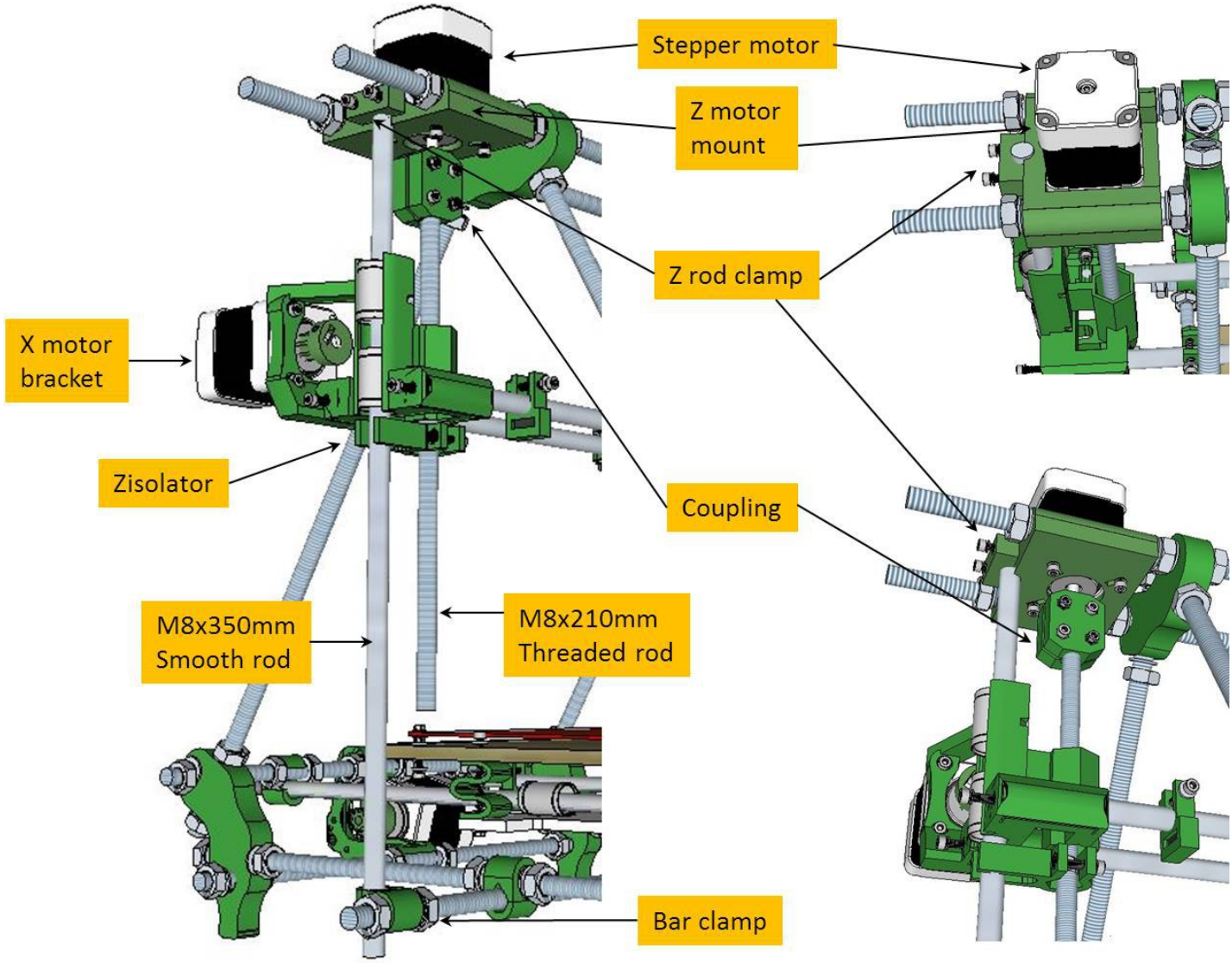
You start with these;



And you should finish with this;



The diagram below shows elements of the right hand Z axis, the left had Z axis is essentially the same but supports the X axis idler and has the Z end stop fitted to it's smooth rod.



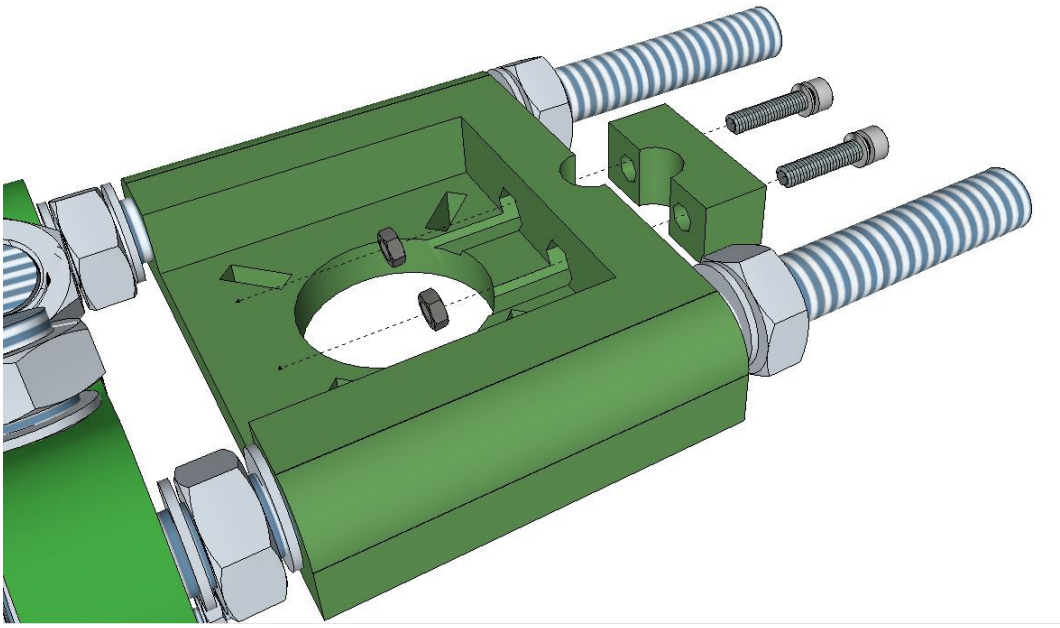
There are two tricky parts to this assembly;

- fitting the Z rod clamps so they fit properly but do not interfere with the stepper motor
- getting the z axis smooth and threaded rods perpendicular to the Y and Z axes.

1

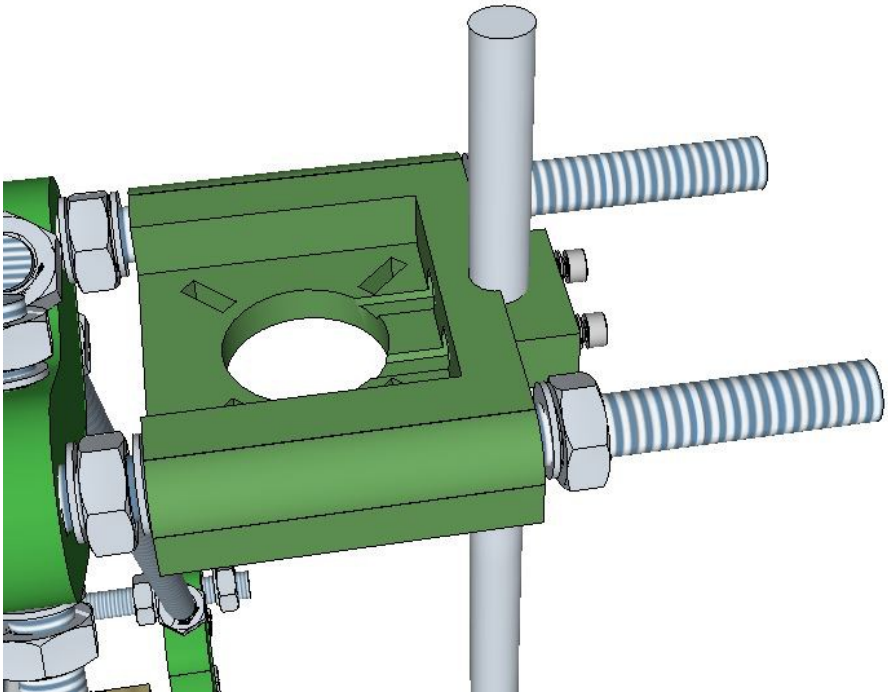
Start by positioning the front of the main frame with the Y motor facing you.

Attach a bar clamp to the right hand Z motor mount using two m3x25 cap screws nuts and washers leaving the cap screws and rod clamp slightly loose;



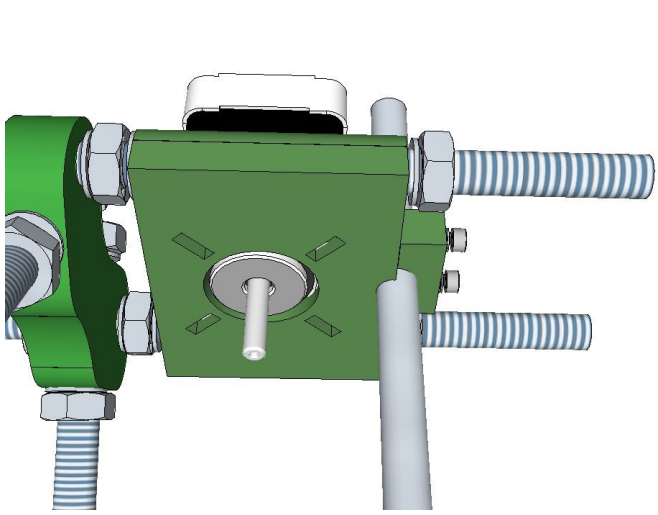
2

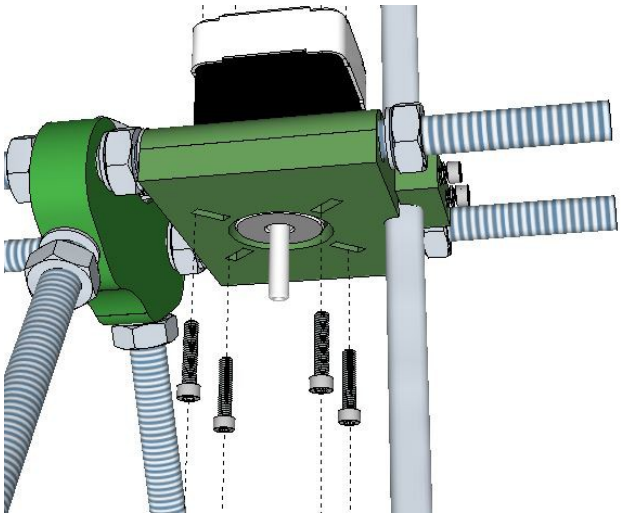
Insert an M8x350mm smooth rod in to the rod clamp and tighten the cap screws enough to hold the rod firmly, do not over tighten.



3

Check that the stepper motor fits properly, that the circular flange of the motor fits in to the circular hole of the motor mount and that the 4 motor screw holes are properly accessible through the 4 slots of the mount. If so then secure the motor to the motor mount using 4 M3x10 cap screws and washers;



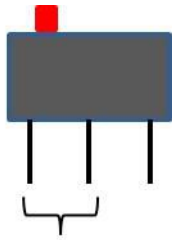


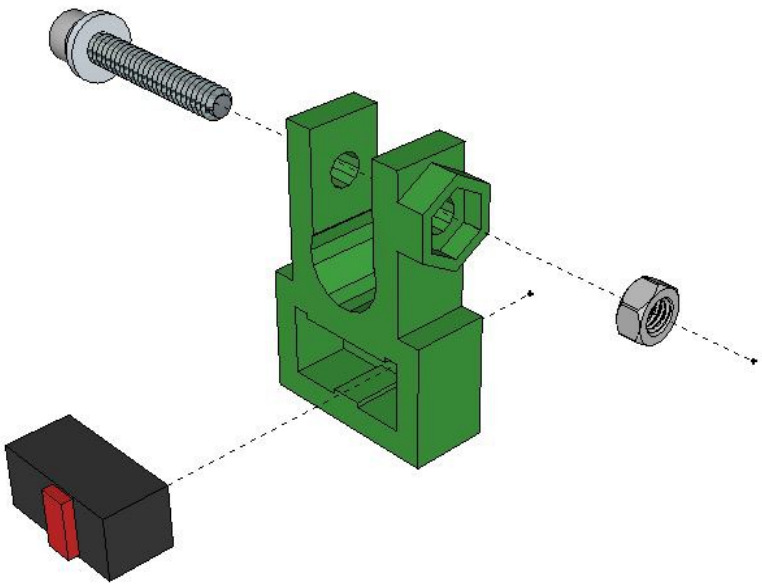
If the cap screw projects too much into the mount and obstructs the motor try using one or more extra washers on the cap screws until you can tighten the cap screw enough to prevent the smooth rod slipping and not prevent the motor flange from fitting in the circular hole of the motor mount.

Repeat steps 1 to 3 on the left hand side motor mount

4

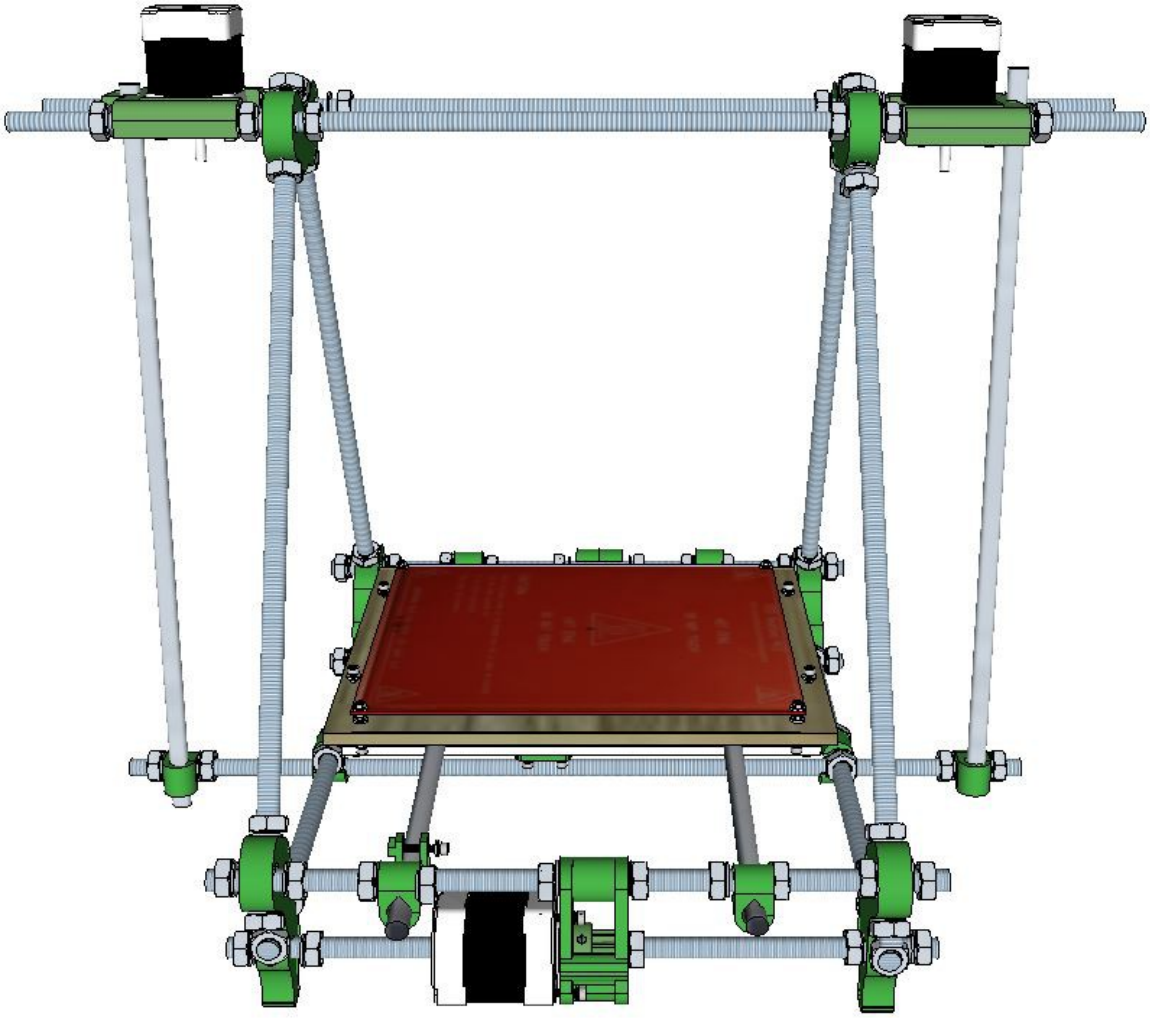
Assemble one of the end stops by inserting a wired micro switch into the slot as shown and insert a m3x20 cap screw, washer and nut. Do not tighten the nut yet. Note, ensure the middle terminal and the one at the same end as the red switch are wired (so the switch will make rather than break contact when the red button is pressed) and have heat shrink insulation.

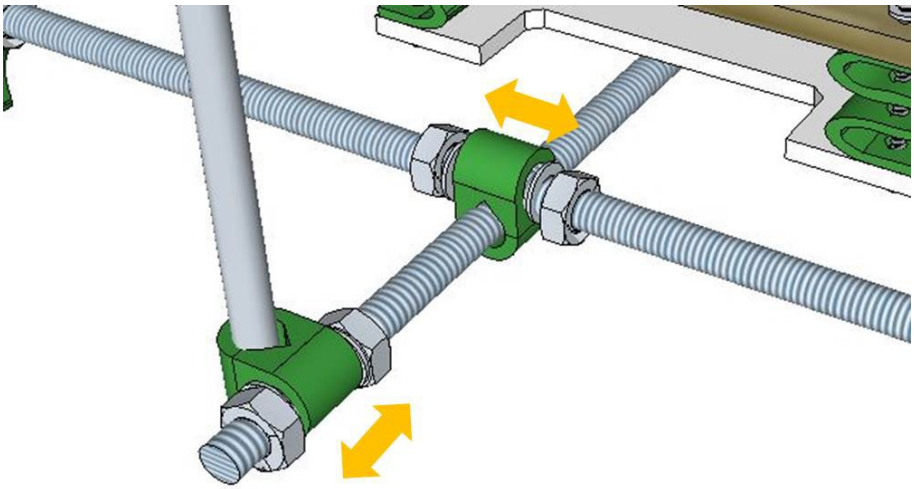




5

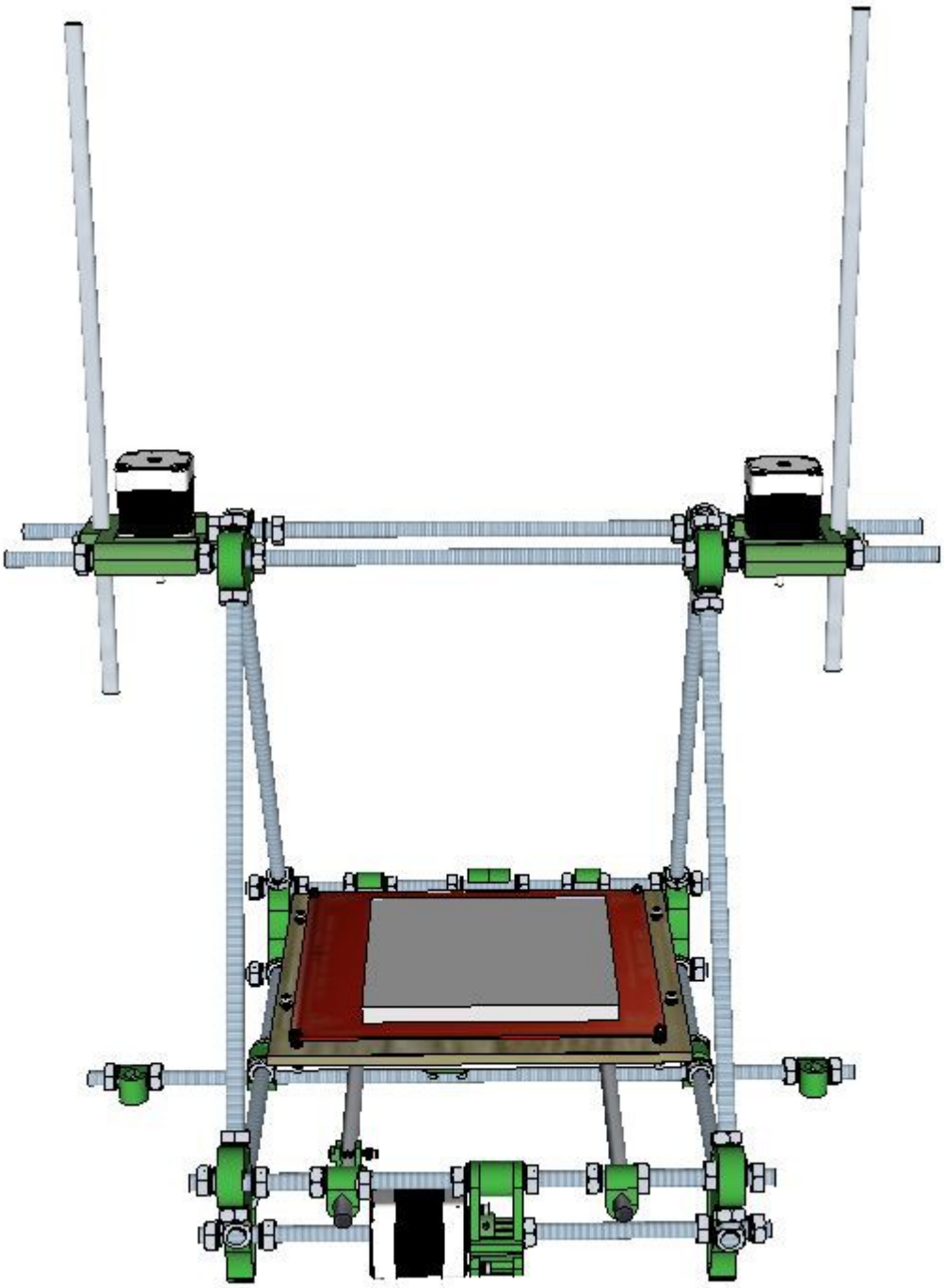
Lower the smooth rods in to the bar clamps on the bottom threaded rod, adjust the pair of bar clamps on each side so the rods are held vertical and perpendicular to the Y axis.





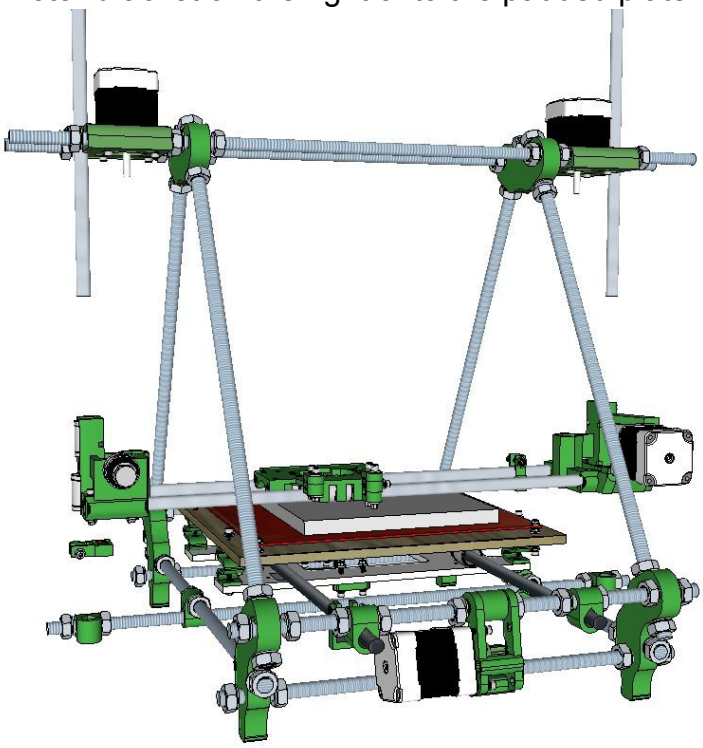
6

Place a book , padded envelope or something to cushion and protect the red PCB heated bed plate then raise the smooth rods out of the bar clamps.



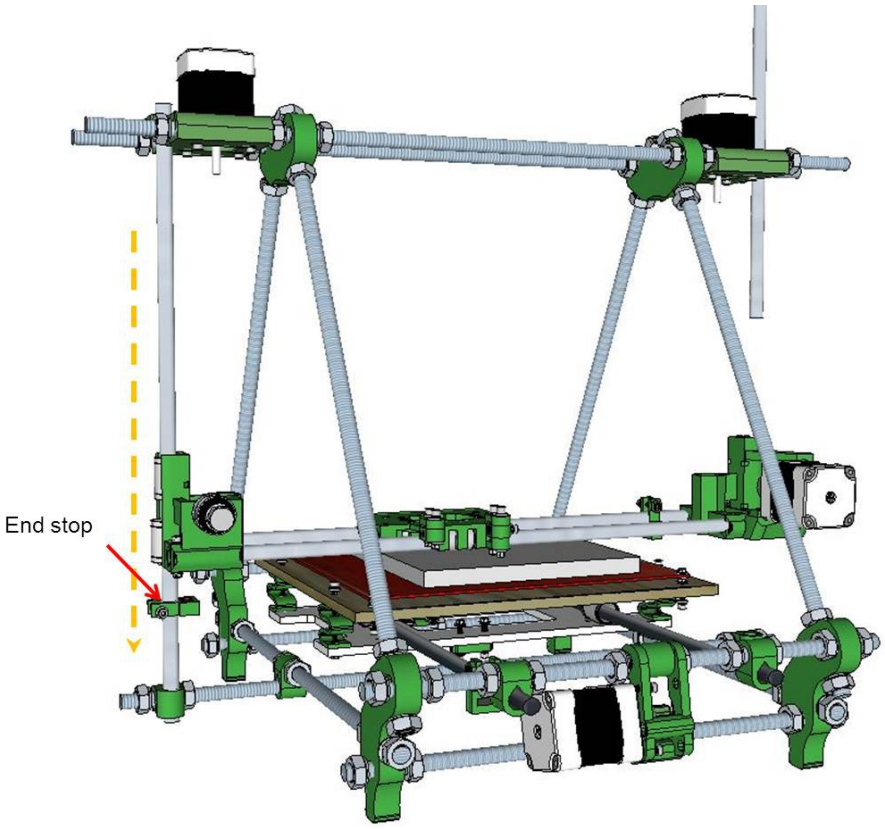
7

Place the completed X axis sub assembly with the x carriage bar clamps facing you and the x motor bracket on the right onto the padded plate.



8

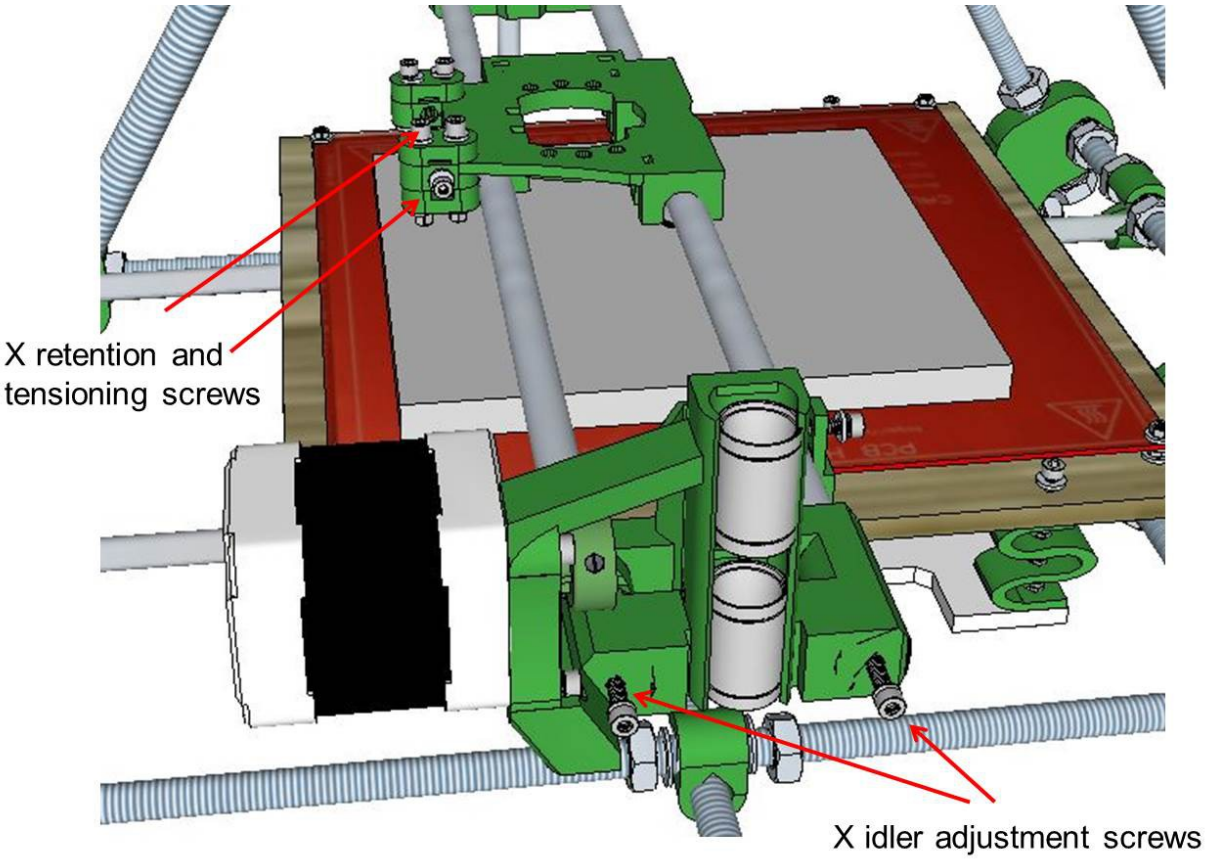
Lower the left hand smooth rod into the linear bearings of the X axis idler, slide through the end stop and into the bar clamp on the bottom threaded rod. Tighten the rod clamp cap screws at the motor mount and carefully finger tighten the nuts around the two bar clamps on the left hand lower threaded rods to secure the smooth rod.



9

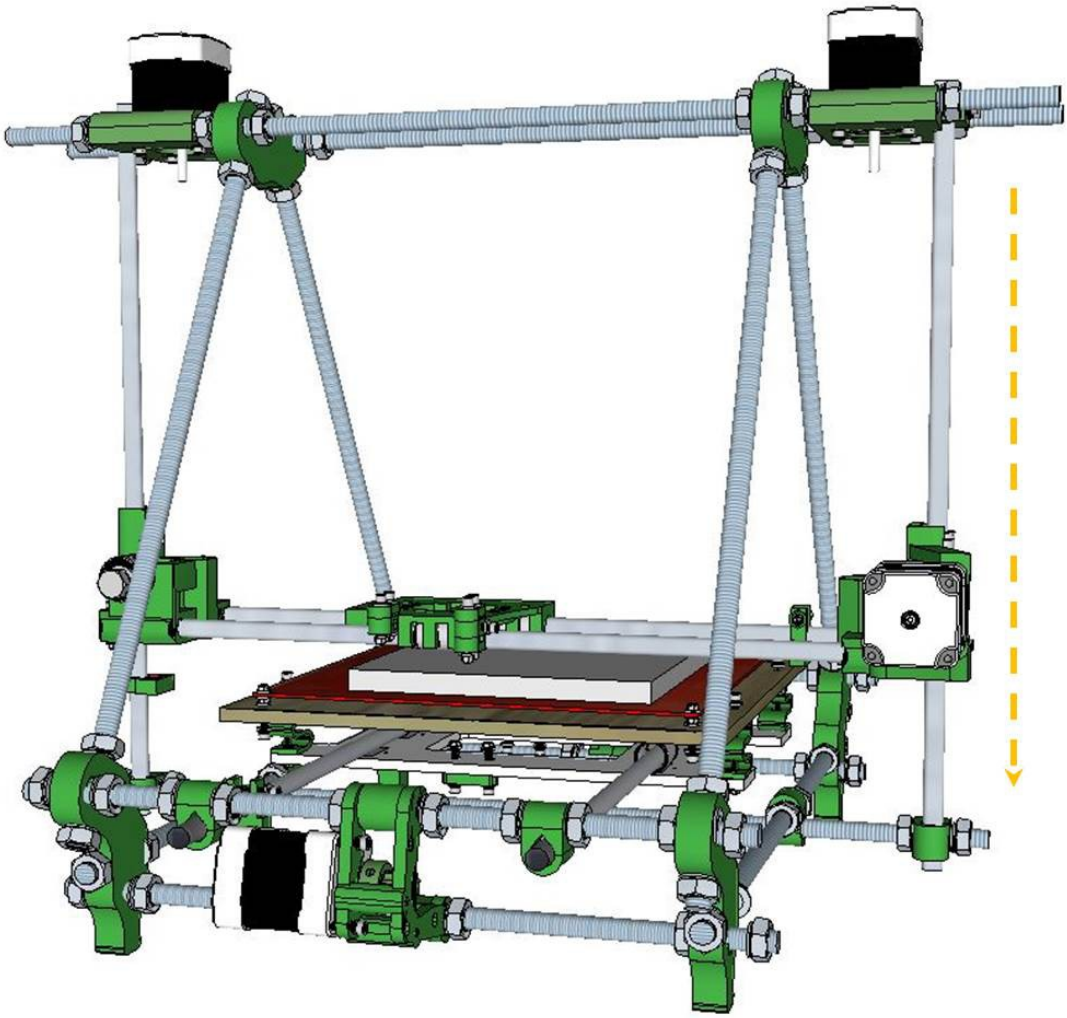
Your task now is to manoeuvre the X axis and motor bracket especially in such a way that you can slide the right hand smooth rod through it's linear bearings and engage in the bar clamp on the bottom threaded rod. Do this while not disrupting the vertical alignment of the smooth rod, there should be no lateral tension on the smooth rod by the x axis at this stage.

Start by loosening the belt retention and tension cap screws on the X carriage and the adjustment screws on the idler bracket as shown below.



10

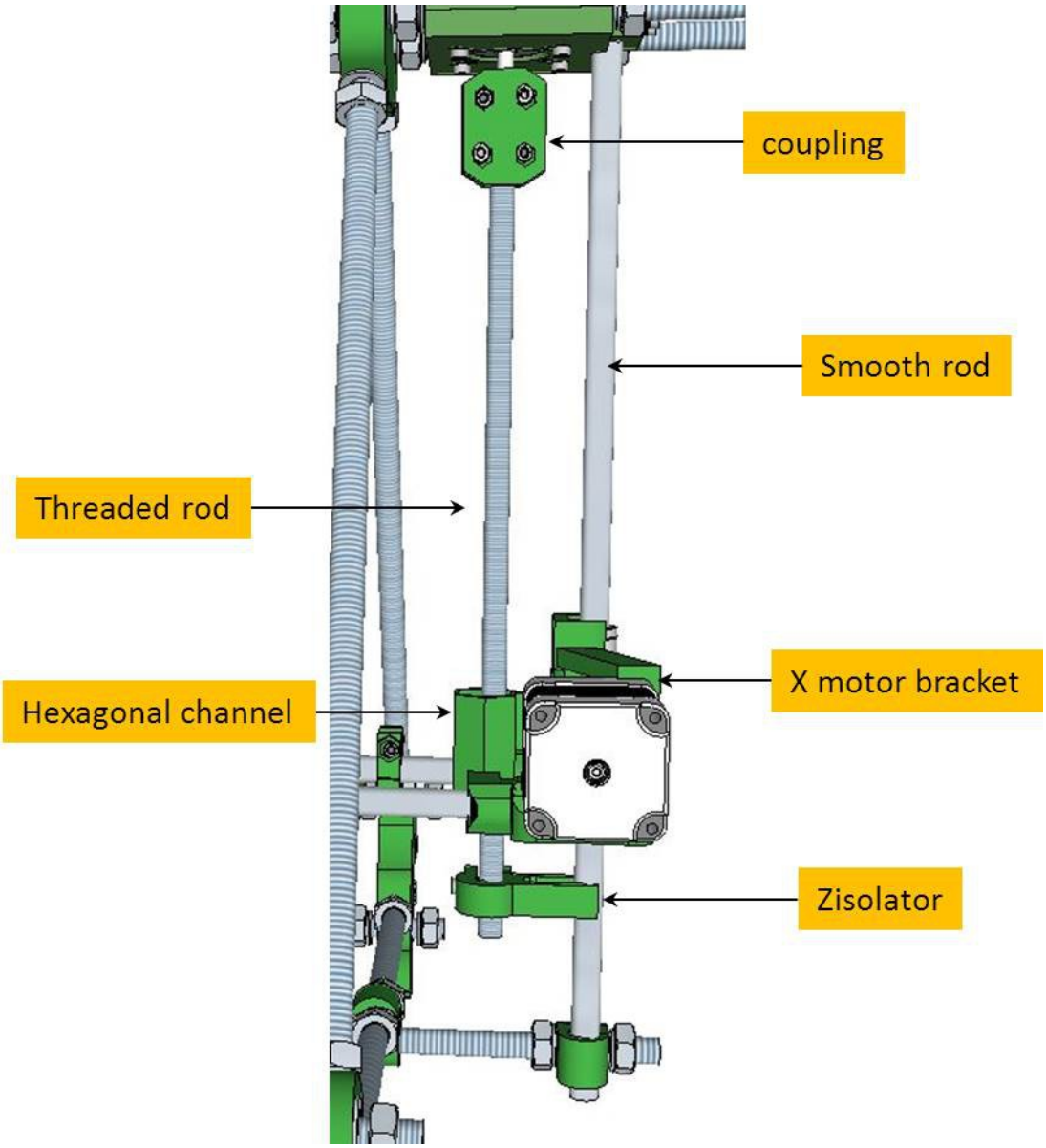
Lower the right hand smooth rod into the linear bearings of the X axis motor bracket, slide through and into the bar clamp on the bottom threaded rod. Tighten the rod clamp cap screws at the motor mount and carefully finger tighten the nuts around the two bar clamps on the left hand lower threaded rods to secure the smooth rod. You should be able to slide the X axis up and down on the Z axis smooth rods easily. There should be no excessive lateral tension on the smooth rods by the x axis. Do not tighten the X idler adjustment or belt retention and adjustment cap screws yet.



11

The next step is to install the Z axis threaded rods and Zisolators. These enable the Z stepper motors to raise and lower the X axis which is kept in place laterally by the Z axis smooth rods. The threaded rods are attached to the stepper motors by couplers pass through a hexagonal tube on the X brackets and have a zisolator nut threaded at the bottom.

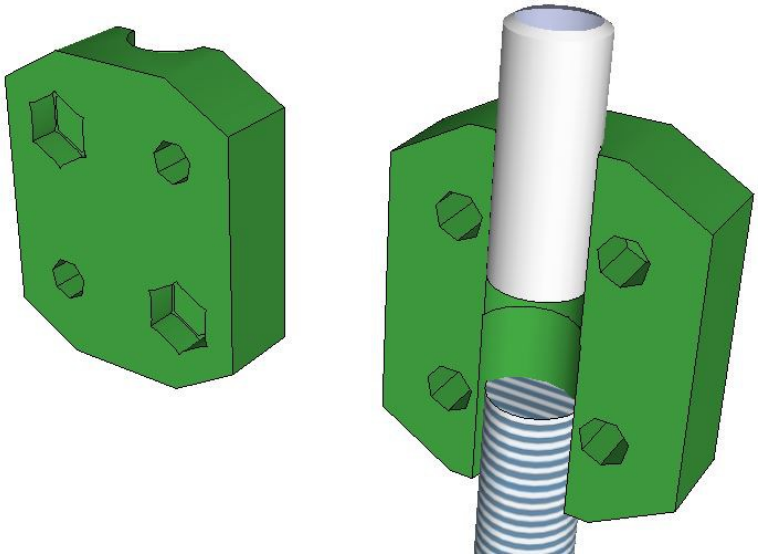
The picture below illustrates a completed assembly;



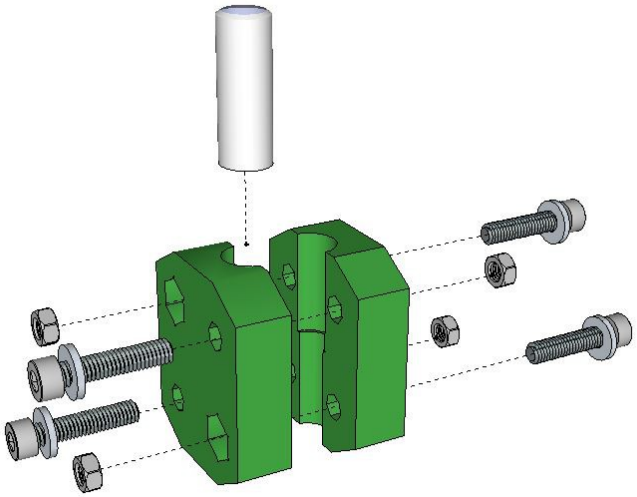
12

Start by assembling a coupler.

Each coupler half has a channel to receive the top of the 210mm M8 threaded rod and a 15mm section of silicone tubing which allows the coupling to grip the stepper motor shaft properly.

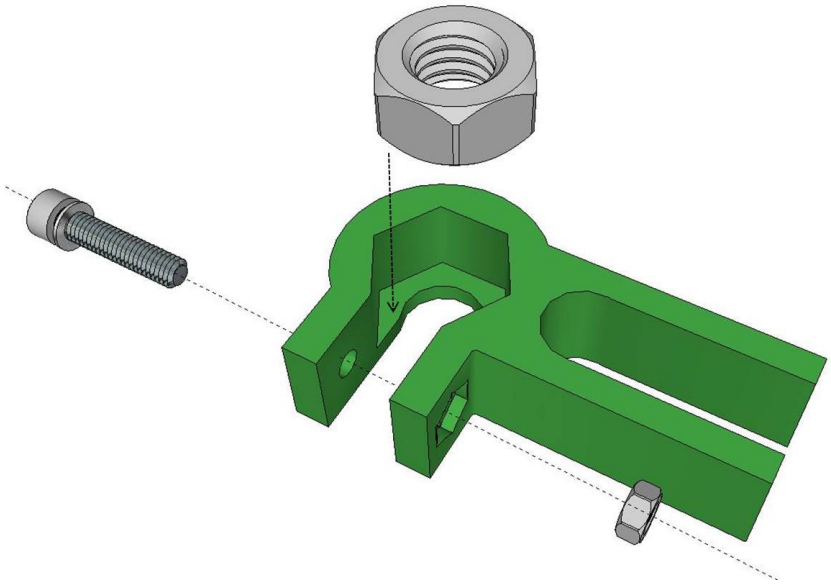


Combine two coupler halves about the silicone tubing and secure using 4 M3x20 cap screws, washers and nuts as shown below. The coupling halves should have clear sockets to act as nut keepers allowing a staggered arrangement of screws as shown. Screw the halves of each coupling toegther only loosely for now.

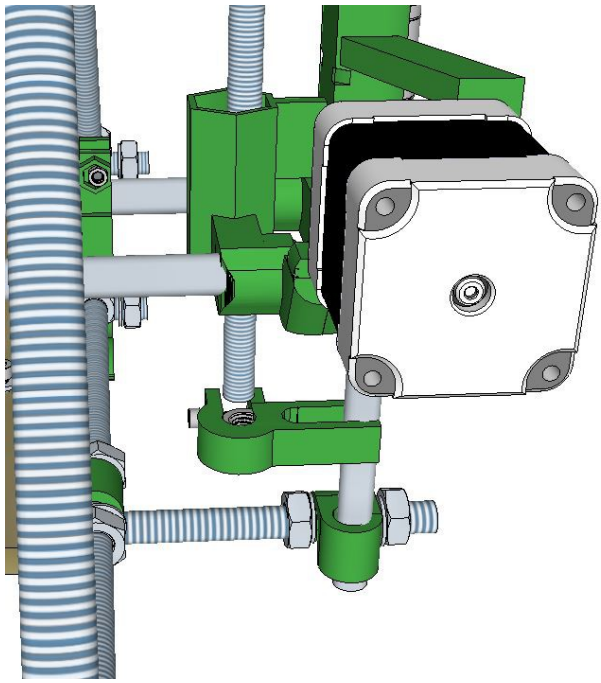


13

Assemble a Zisolator using an M8 nut, M3x25 cap screw, washer and nut as shown below .



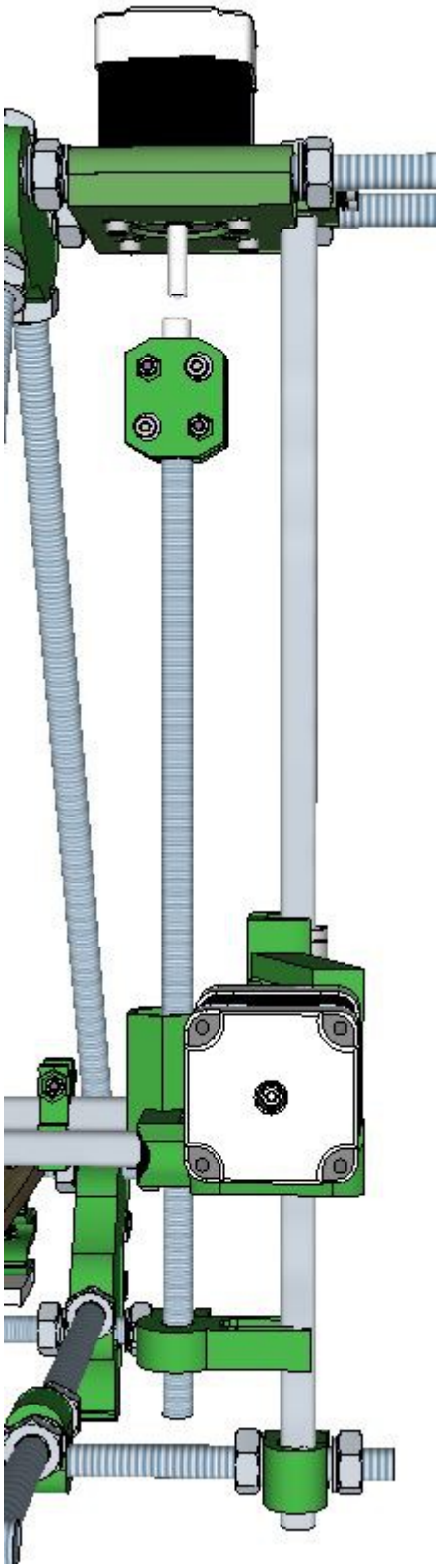
Slide a 210mm M8 threaded rod down through the hexagonal channel of the X motor bracket. Hold the assembled Zisolator so that the fork engages on the smooth rod as shown and screw the threaded rod into the Zisolator nut.

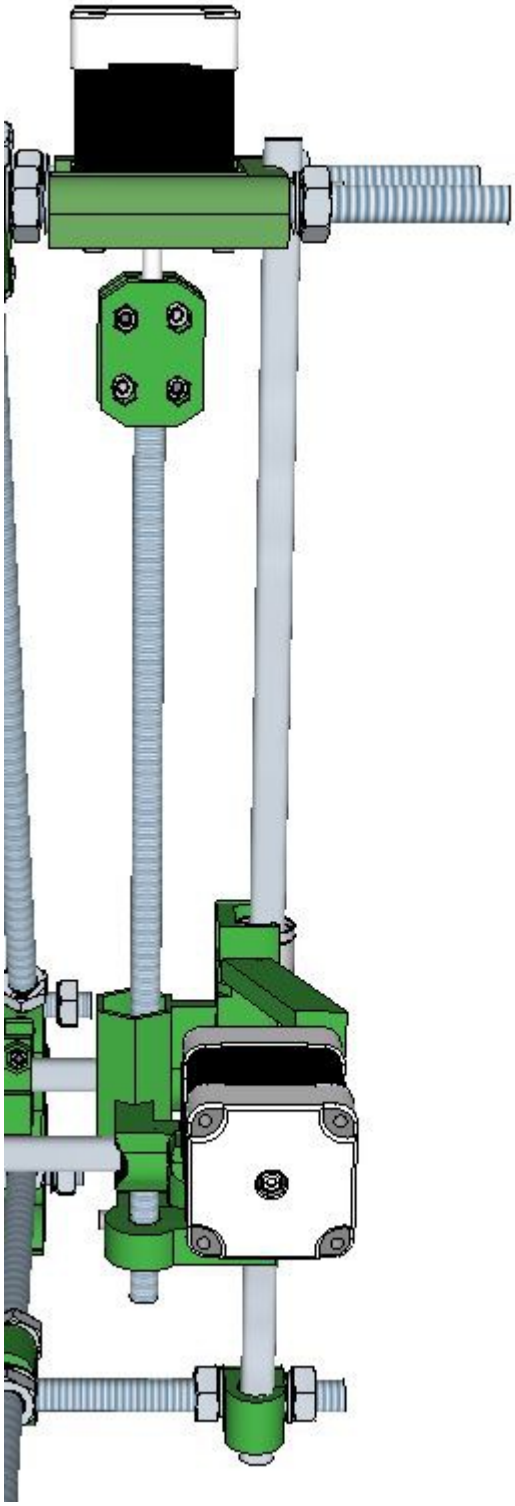


14

Slide the coupling on to the top of the threaded rod and tighten the lower pair of cap screws to retain the threaded rod in the coupling. Slide the coupling's silicone tube on to the stepper motor shaft and tighten the upper pair of screws.

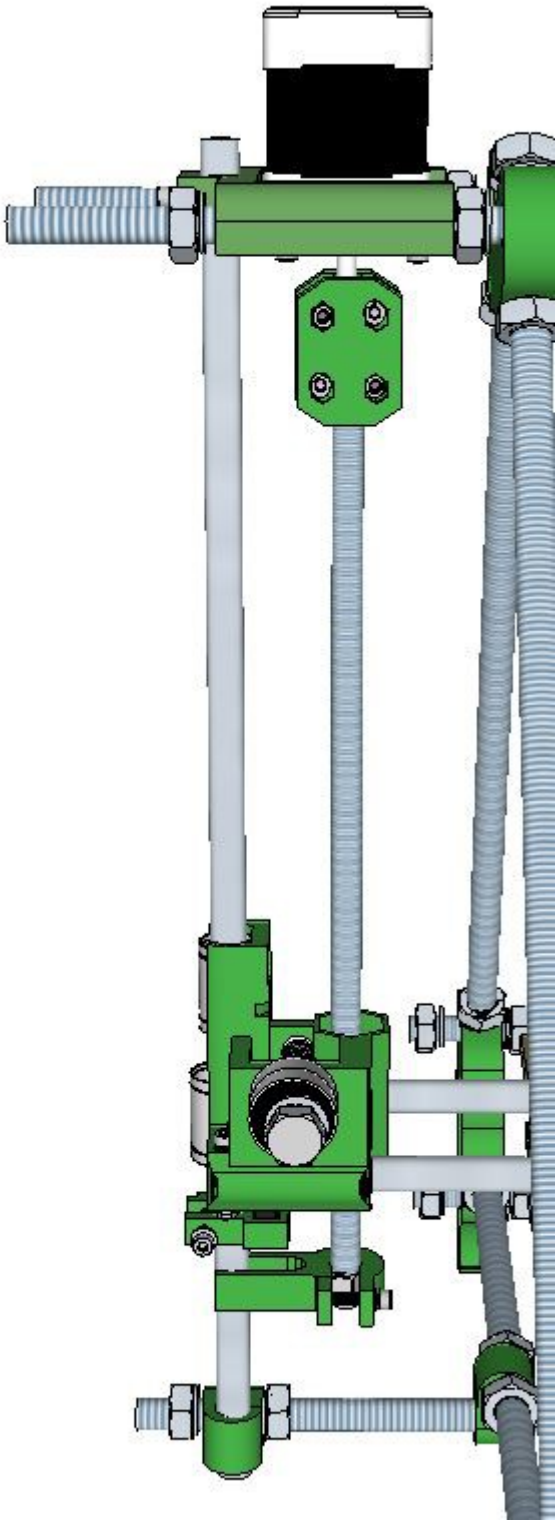
You have completed one side of the Z axis.





15

Repeat steps 12 – 14 for the other side of the Z axis supporting the X idler bracket part of the X axis.



You have completed the Z axis and integration of the X axis.