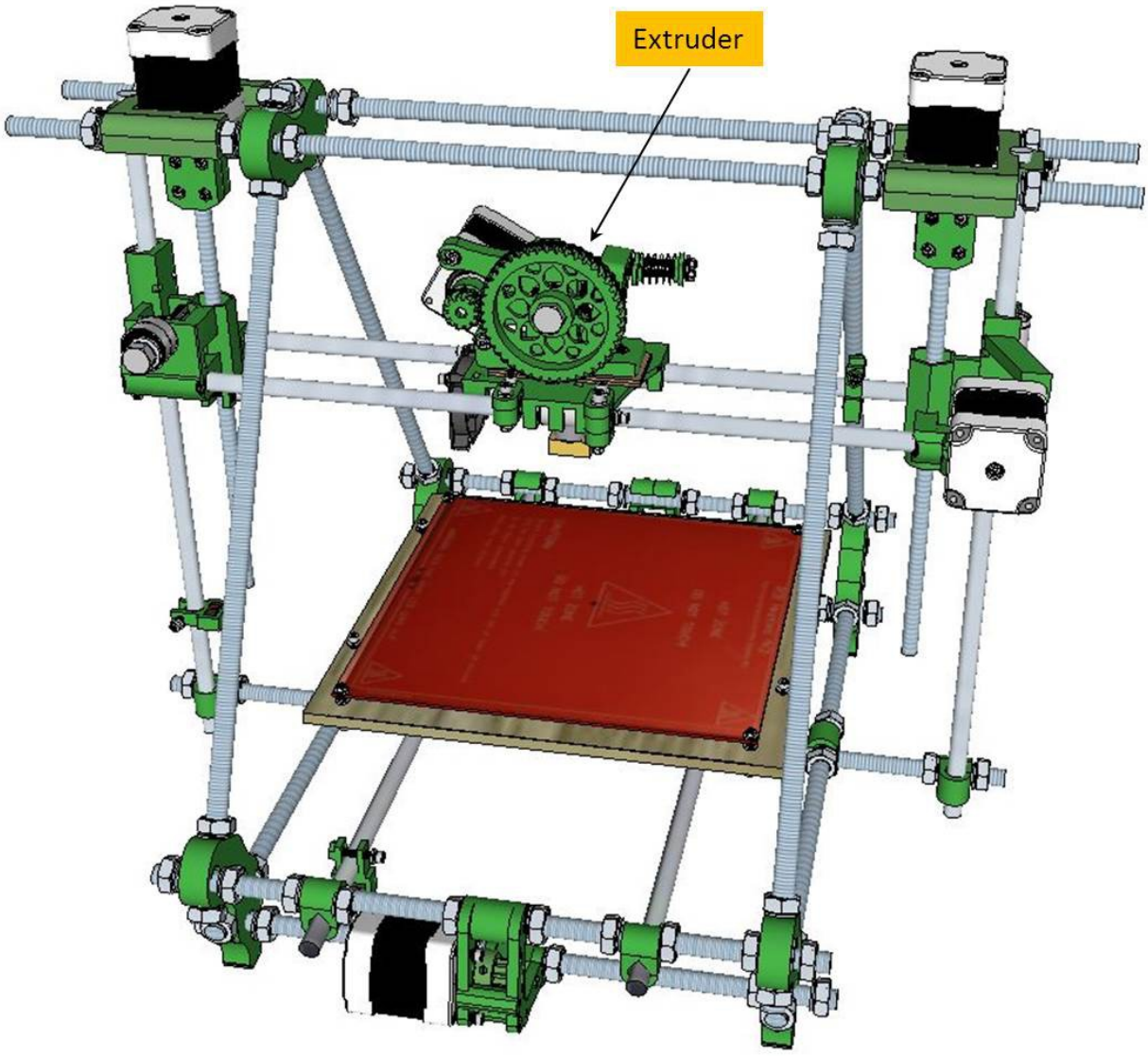
Part 9

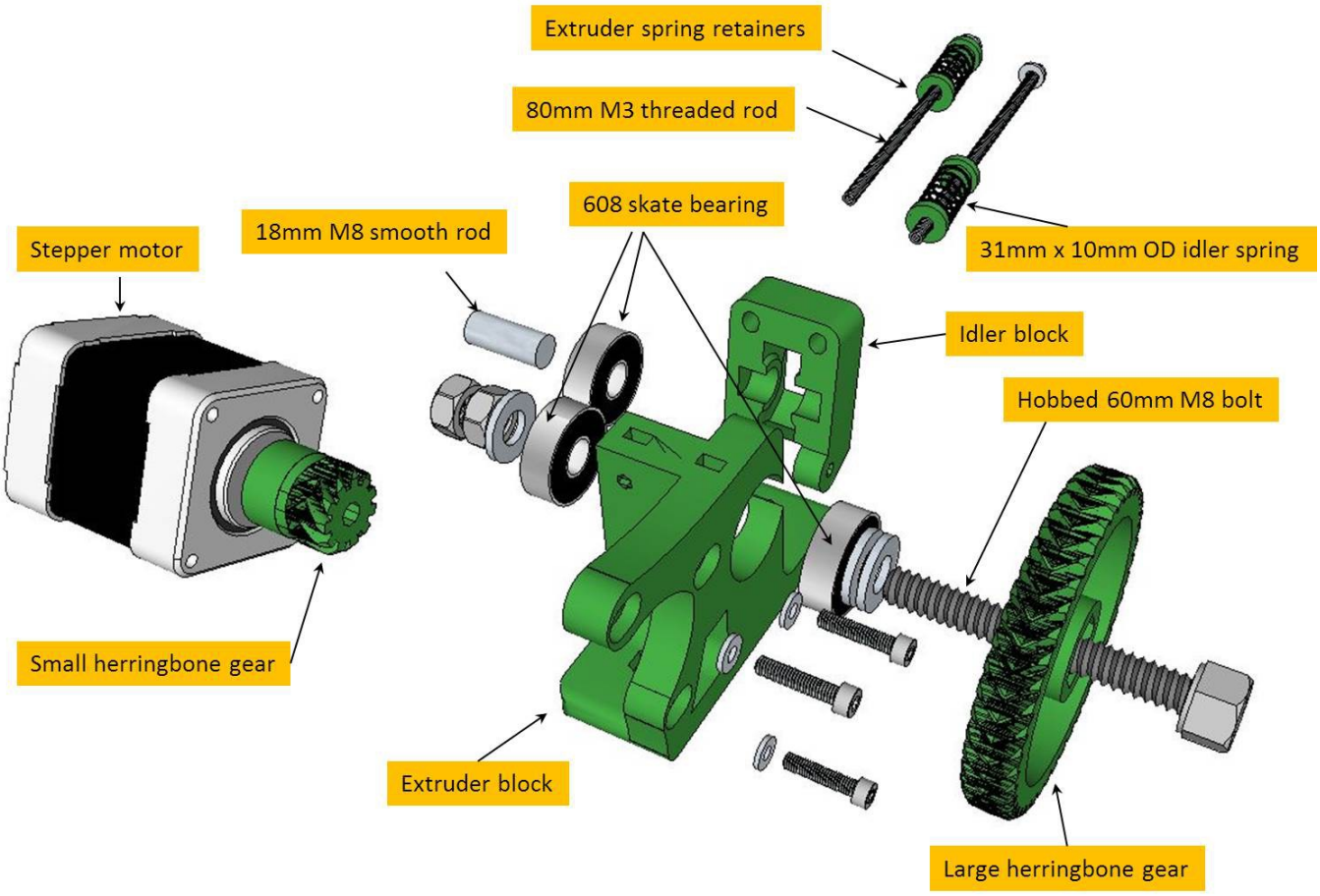
Assembling the extruder

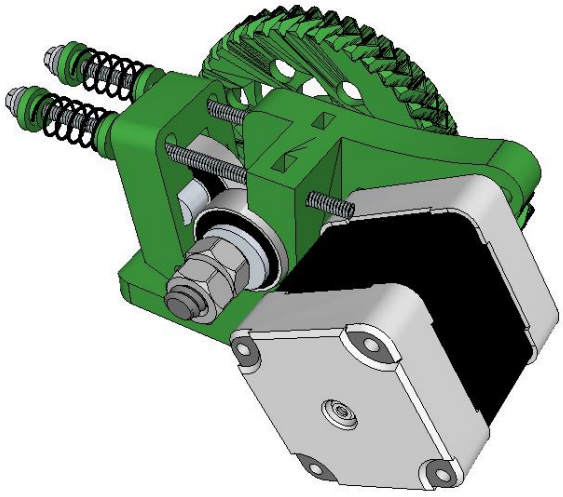
In this section you will assemble the extruder and complete the mechanical parts of the machine.

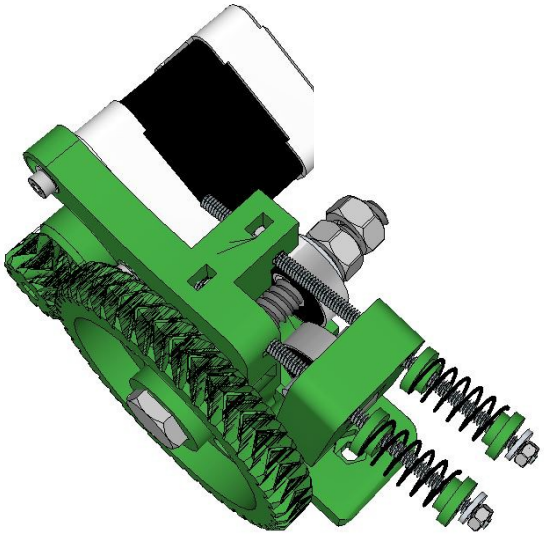
The extruder is the heart of the 3D printer, all the other components are concerned with moving the extruder about in 3D space and so form the object while it is the extruder's job to melt and accurately extrude the plastic.

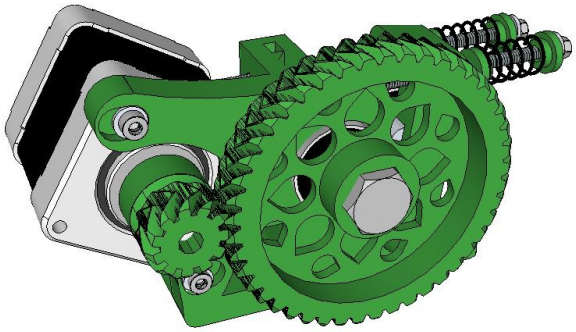


The following is an exploded view of the “cold” end of the extruder.









Parts

You will need the following parts;

- 1 x printed Wade extruder block
- 1 x printed Wade idler block
- 1 x MDF/Aluminium extruder plate (rounded slot)
- 1 x optional MDF plate (round hole)
- 1 x J-head hot end (black PEEK barrel is the critical element in this section)
- 1 x printed large herringbone gear
- 1 x printed small herringbone gear
- 4 x printed extruder spring retainers
- 2 x 10x31 idler springs
- 3 x 608 skate bearings
- 1 x 40mm fan
- 1 x 18mm M8 smooth rod
- 2 x M3x80 threaded rod
- 1 x M8x60 hobbed bolt
- 2 x M4x20 cap screws
- 3 x M3x12 cap screws
- 5 x M3 washers
- 2 x M4 washers
- 5 x M8 washers
- 1 x M8 nut
- 2 x M3 nuts
- 2 x M4 nuts
- 1 x M8 Nyloc nut
- 1 x M3 grub screw

Preparation

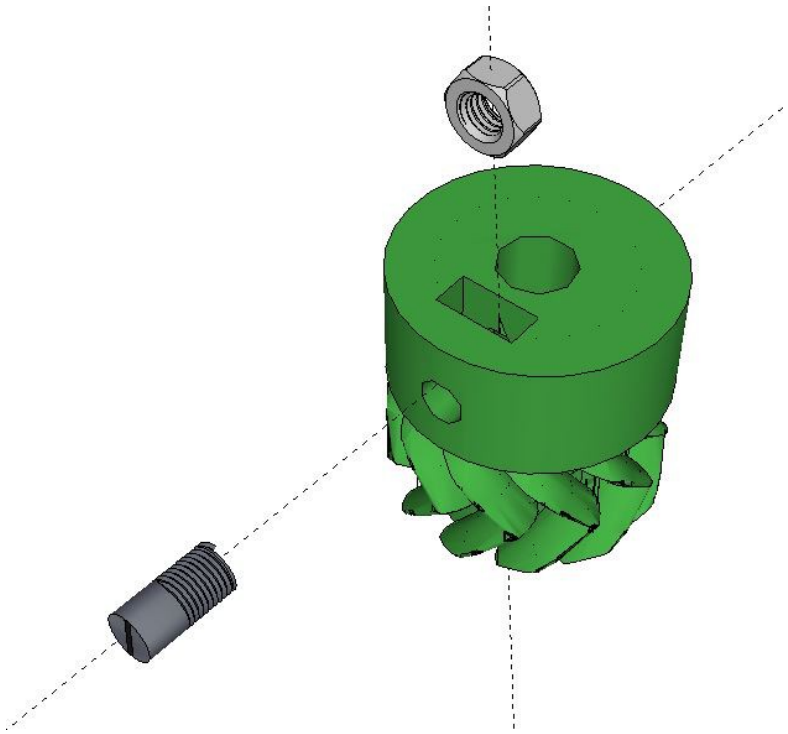
The plastic parts have M3 holes and M8 holes, ease these for cap screws, bolt and rods as before using a file and/or drill bit.

The extruder block has two round sockets for the 608 bearings which need to fit tightly but make sure the hob bolt can turn freely on the inner bearing surface. The idler block also holds a 608 bearing which runs on a short section of M8 smooth rod, the former needs to turn freely while the smooth rod is tightly held in the idler block. For both blocks use fiels and sandpaper to ease the parts for a tight fit.

The motor pulley has a nut trap into which an M3 nut must be slotted to support a grub screw.Ease this slot using a file or if brave you can use a soldering iron to heat and push a nut in to the slot. You must make sure the hole in the nut aligns with that in the plastic and that you are able to extract the nut if the fit isn't quite right.

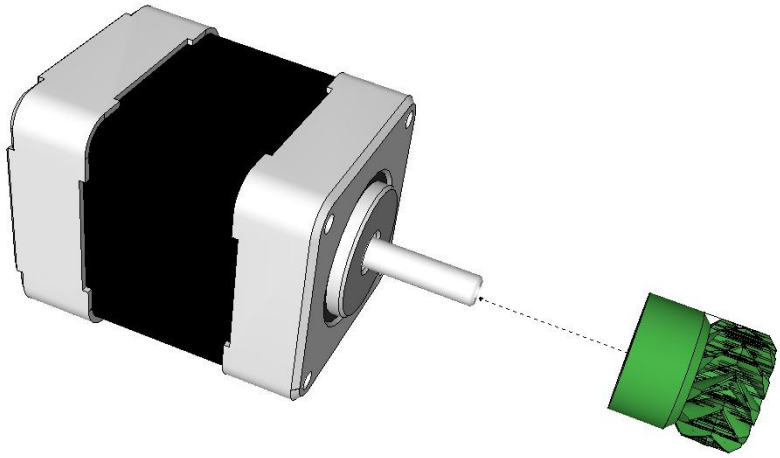
1

Prepare the small herringbone gear by inserting an M3 nut in to the captive slot in the base of the gear and introduce a grub screw into the nut.



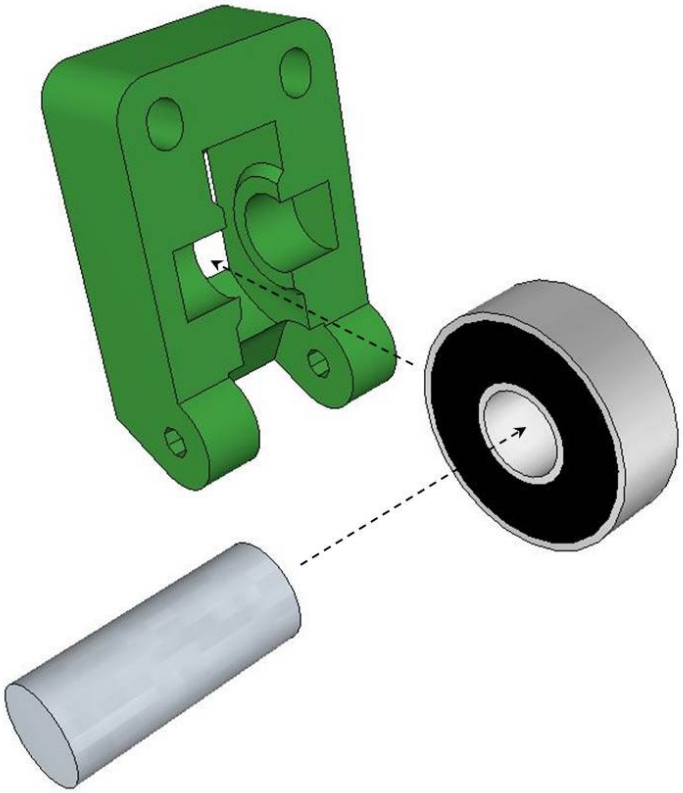
2

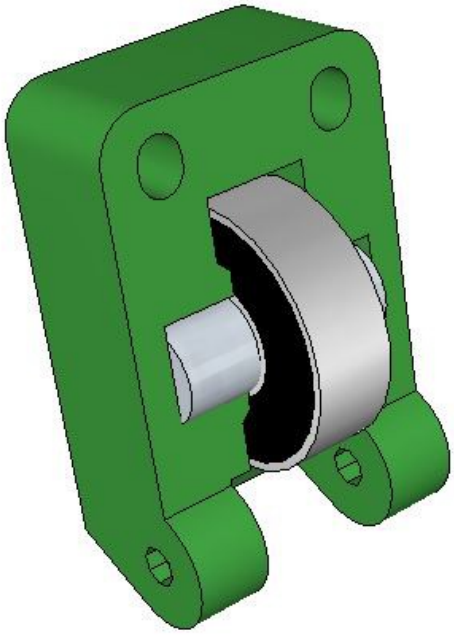
Mount the pulley on to the shaft of a stepper motor. Ensure the grub screw screws down perpendicular to the flattened section of the shaft and tighten the grub screw firmly. If the screw is not properly perpendicular or not screwed firmly it will loosen and the Y access will slip during operation causing inaccurate printing..



3

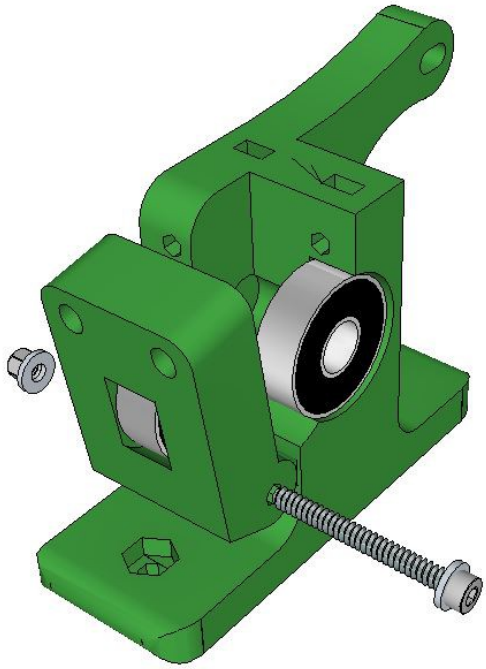
Prepare the Idler block by mounting the short (18mm) section of the M8 smooth rod and 608 bearing as shown below. The smooth rod should be gripped securely by the plastic block and the outer rim of the bearing must be free to turn.





4

Mount the idler block using an M3x30 cap screw, two washers and a Nyloc nut.

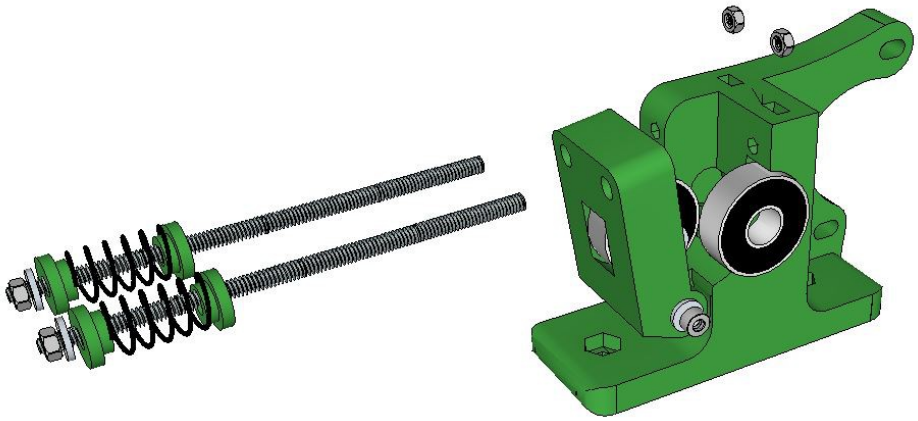


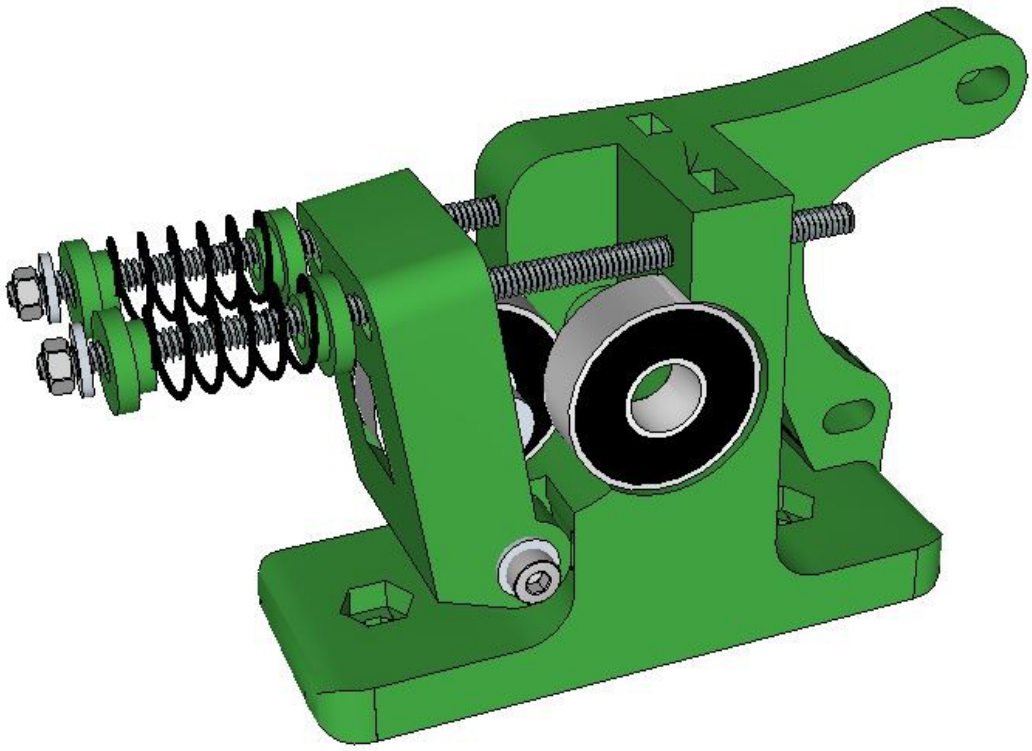
5

Prepare each of the two M3x80 threaded rods as shown below with an M3 nut, washer, spring retainer, 10x31 idler spring, and a spring retainer.

6

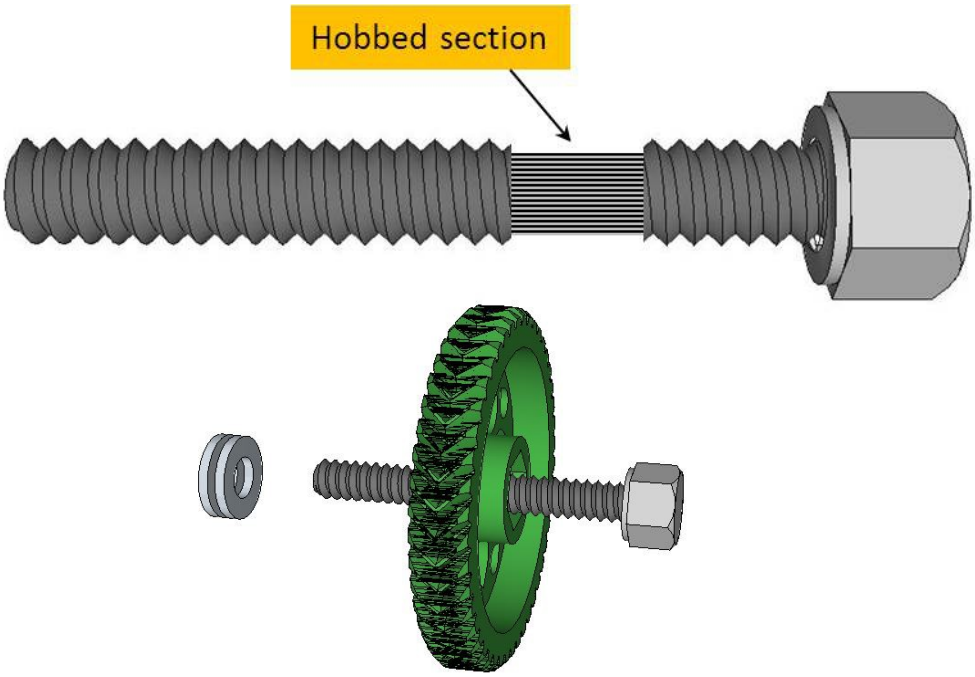
Insert two M3 nuts as shown then screw in the assembled M3x80 rods, do not tighten the free-end nuts yet.



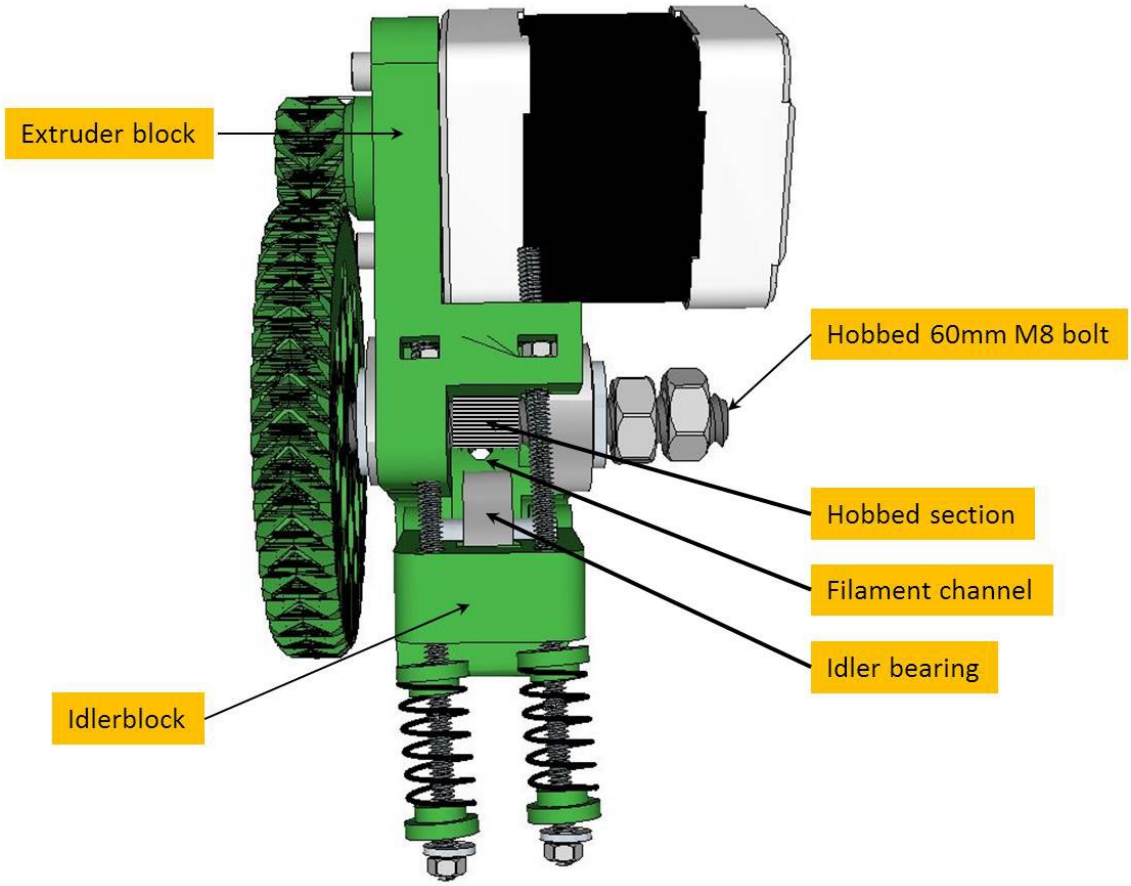


7

Prepare the large herringbone gear by inserting the M8x60 hobbed bolt with two washers or more as shown. The hobbing is a set of grooves cut along a section of the bolts length.

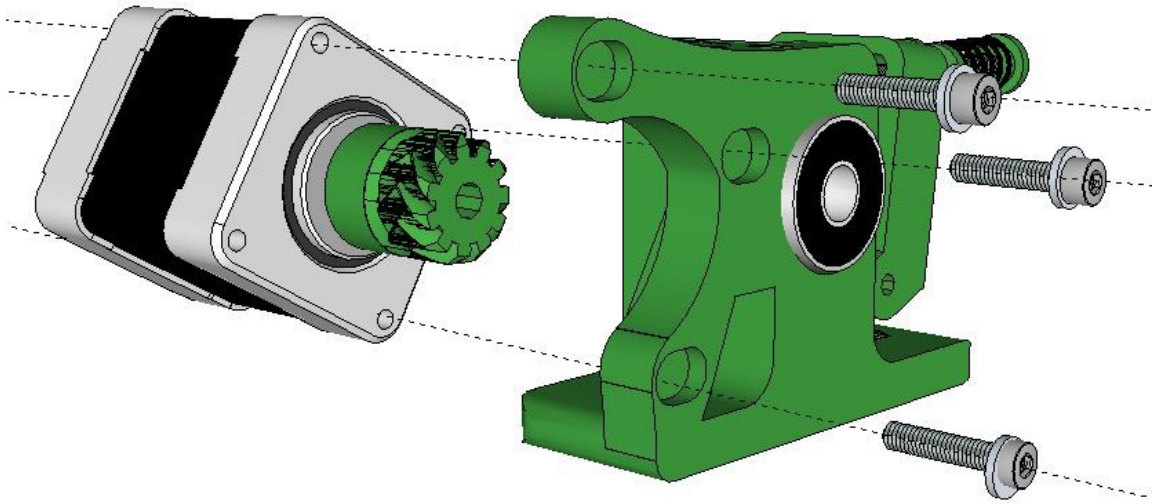


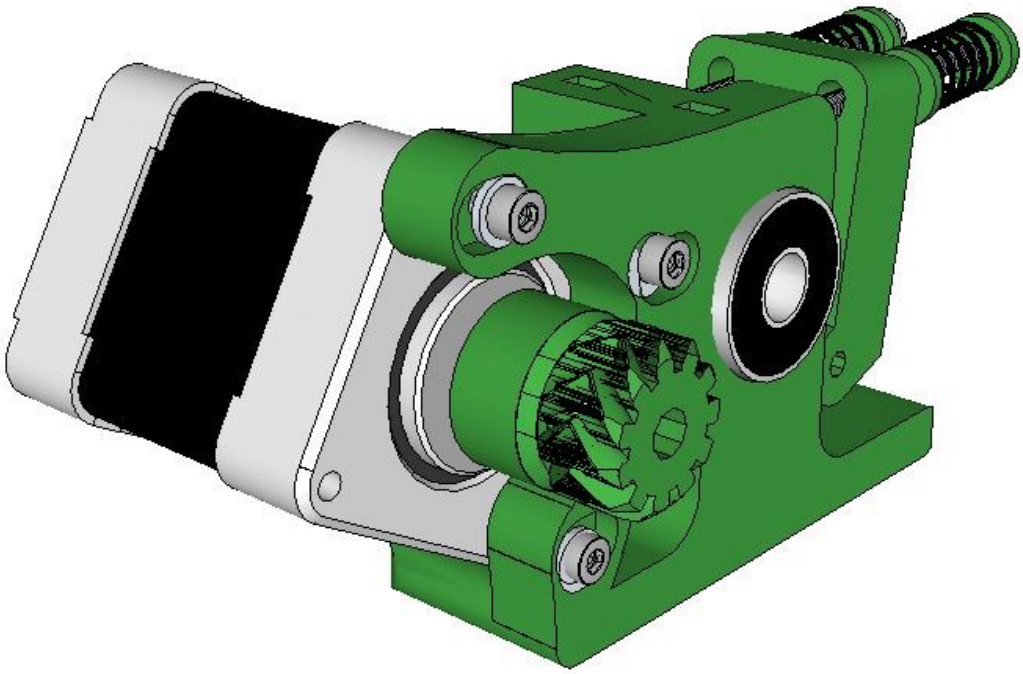
The aim is to achieve the alignment of filament channel, hobbed bolt and idler bearing as shown below. Adjust the number of M8 washers between the large herringbone gear and extruder block bearing to match this alignment.



8

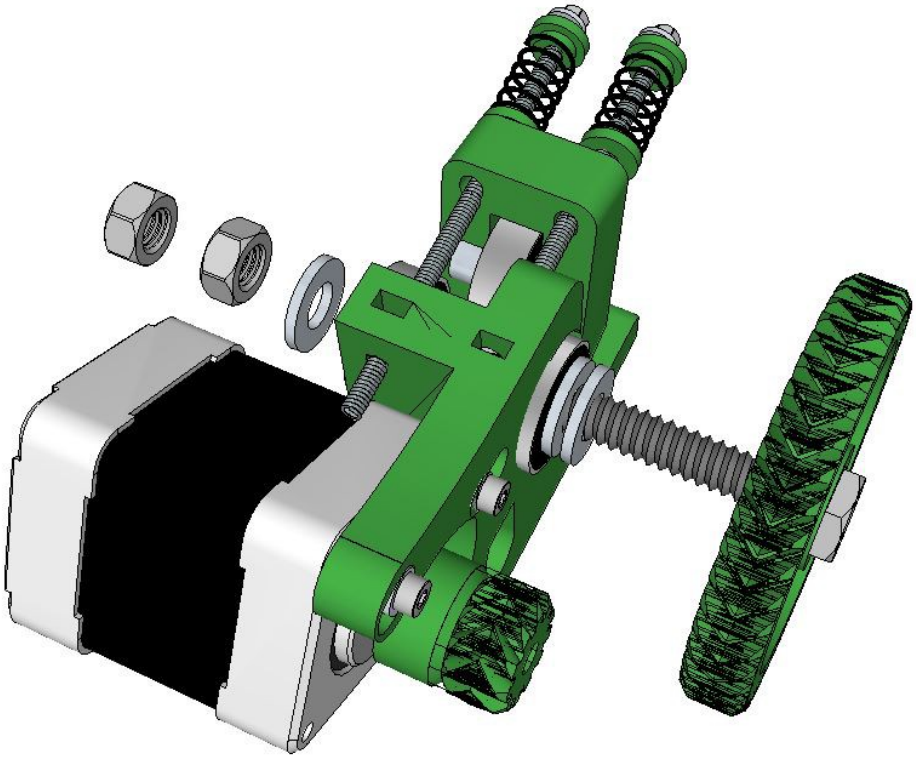
Mount the stepper motor with small herringbone gear using three M3x12 cap screws and washers as shown, do not tighten them but keep them loose so the motor can be slid away from where the large gear will be mounted, this will make it easier to mesh the gears.



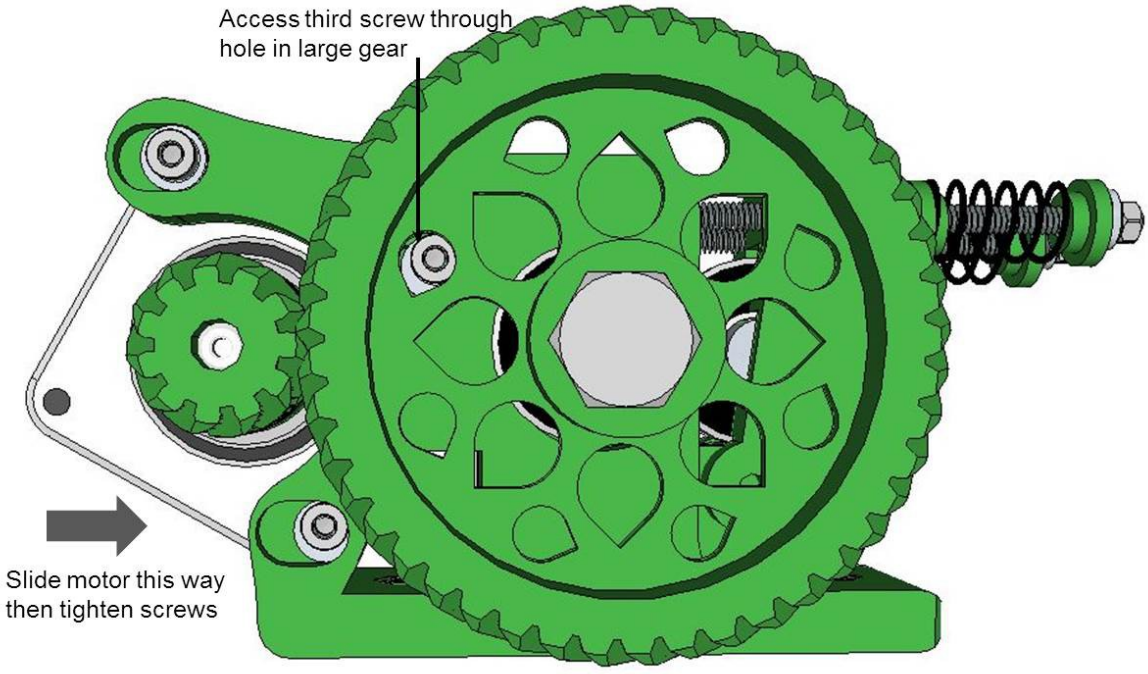


9

Mount the hobbed bolt and large herringbone gear meshing it with the smaller herringbone gear.

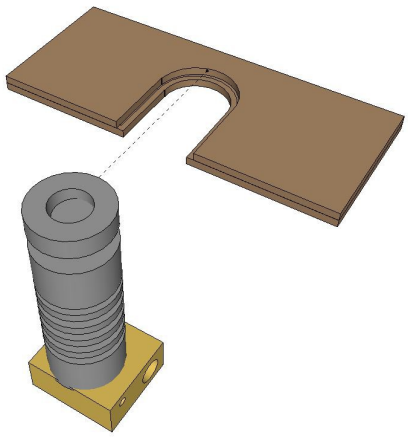


Slide the stepper motor towards the opposite end to fully mesh the gears and tighten all three screws. The third screw is accessed via one of the holes in the large herringbone gear.

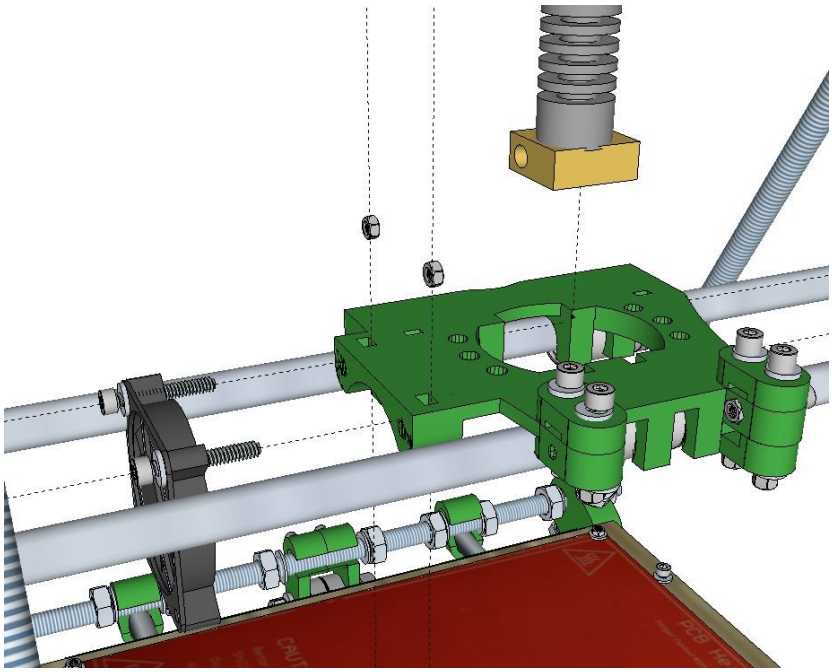


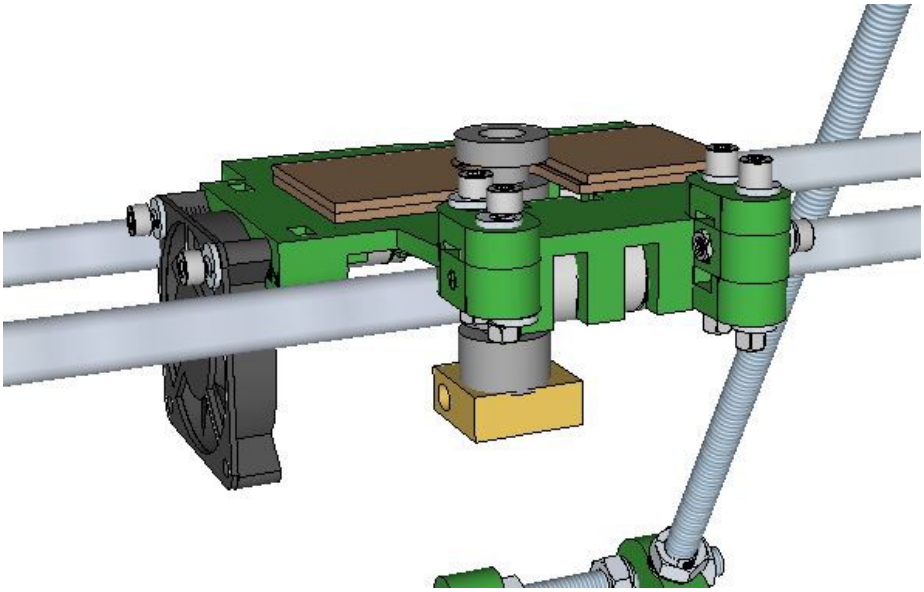
10

Slide the hot end in to the MDF/Aluminium plate.



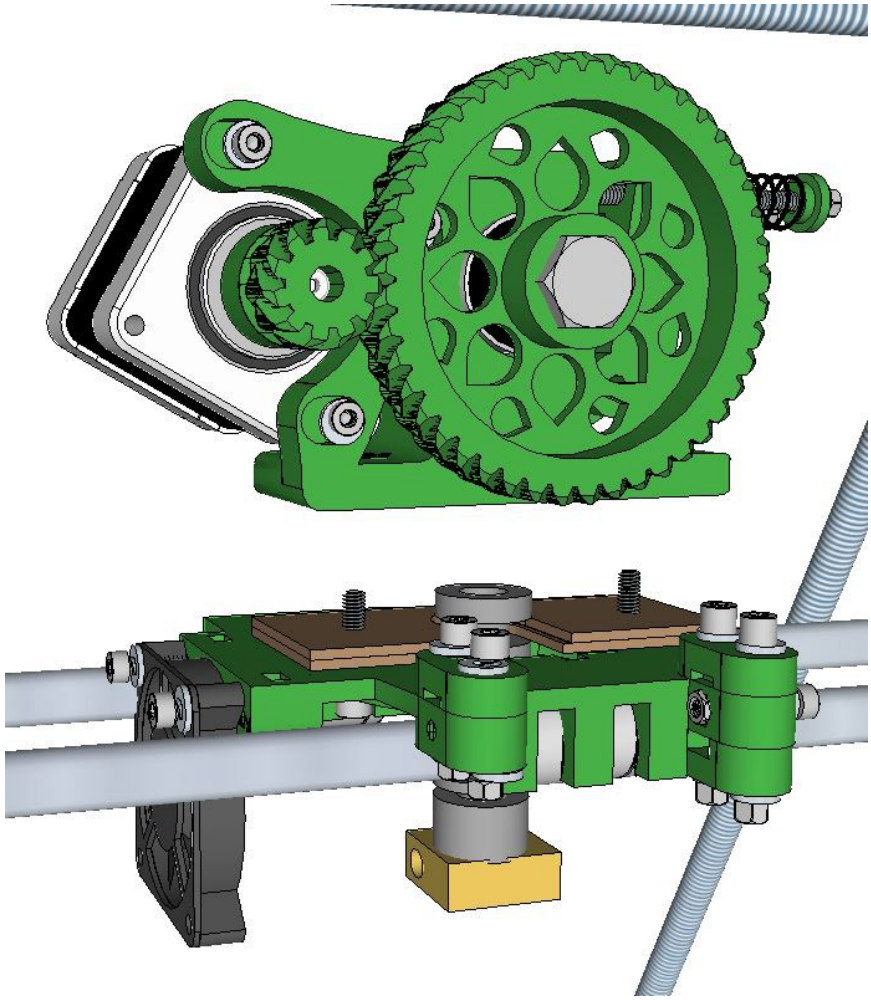
Mount the fan and hot end into the X carriage as before with the longer end of the plate next to the chamfered side of the carriage.

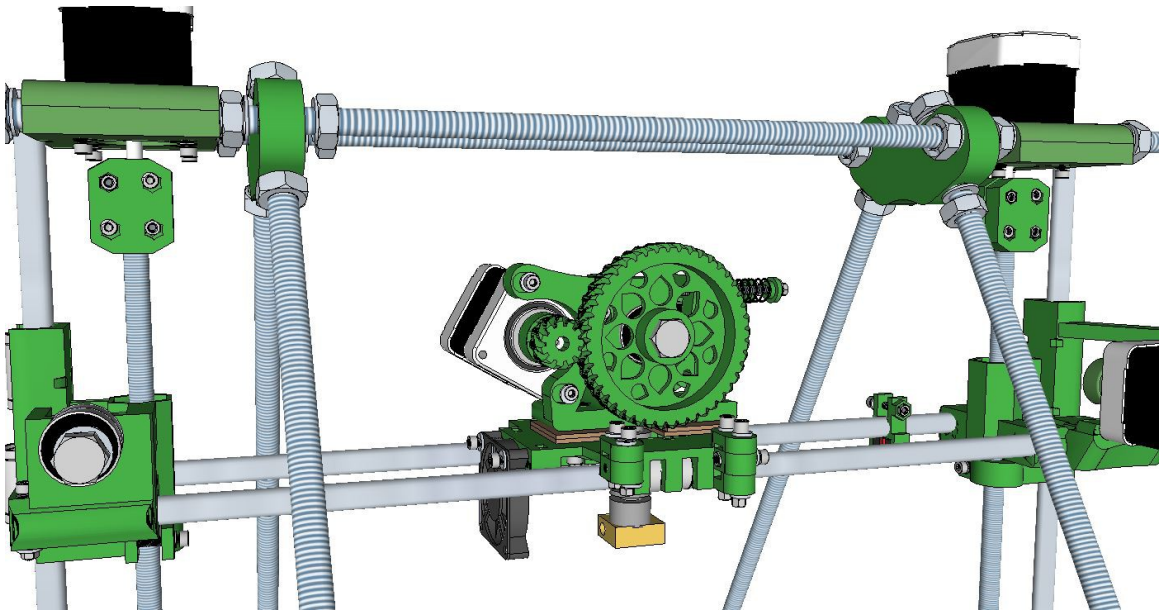




11

Finally, mount the assembled extruder on to the MDF/Al plate and carriage using two M4x20 bolts and nuts





You have finished assembling the mechanical parts of the TVRRUG Prusa 3D printer.

The next stage will be to integrate the electronics, wire everything up (including the end-stops and heated bed thermistor), install the software then calibrate the machine.

After that you can print objects