REPRAPWORLD

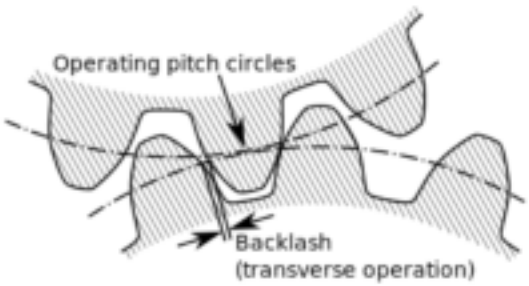
In this newsletter...

Next Beer & Pizza party the 6th July

New in stock: GT2 9mm Timing Belt and Pulley's

Backlash

In mechanical engineering, backlash, is a clearance or lost motion in a mechanism caused by gaps between the parts. When operating a 3D Printer your nozzle will move thousands of times in the X and Y direction. Each time the printer reverses direction the play between the parts will results in lost steps.

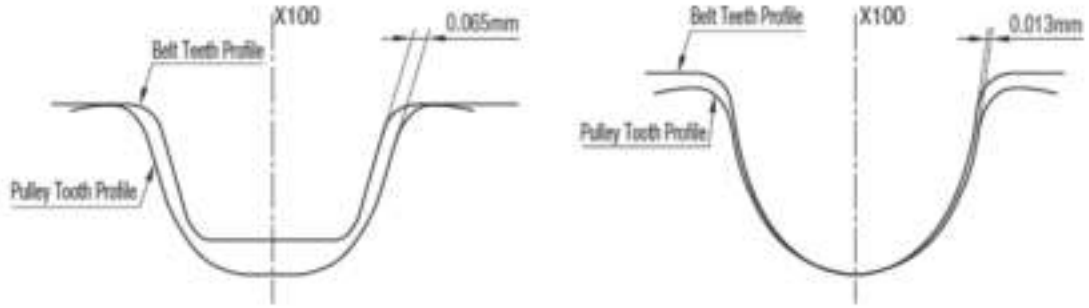


Looking at the picture to the left, when the cog reverses direction it first needs to bridge the gap between the teeth before it will engage the other cog.

Example: If your 3D Printer would need to print a single line of 50mm slicer would only move the nozzle in 1 direction. You could end up with a 48mm object because the motor gets a signal to only move 50mm and with each direction change

1mm is lost.

Timing belts are commonly used in 3D Printers. They are a low cost, low friction alternative to threaded rods, lead screws and precision ground ball screws. The timing belts engage pulleys and this operation has backlash. To enhance the workings of your 3D Printer the use of GT timing belts is advised!



A regular T timing belt has square or trapezium shaped teeth, these need to engage into the pulleys. Because of the shape of the teeth and the precision of the pulley a T timing belt will have more space (difference between the belt teeth profile and the pullet tooth profile).

GT belts have less backlash, meaning the gap between the tooth profile and the belt profile is a better fit. Resulting in a smaller gap to bridge and less loss of steps by the stepper motor while printing.

Now available; GT2 9mm Timing Belt and corresponding Pulley's

New at RepRapWorld are the GT2 9MM Pulley and Belts. These are part of the Pro Line and are specially selected for being high quality parts. The GT2 9mm allows for higher torque and longer life of the belt & pulley system.

The GT2 9mm belt is available per meter and with a maximum of 50 meters.

You can combine the belts with both driven and driver pulleys with inner diameters of 3mm, 5mm and 8mm. Allowing the use with standard Nema17 motors and diameter axis. The pulleys have 20 teeth which allows for maximum torque and prevents the loss of steps.

GT2 9mm Timing belt and Pulley's

RepRapWorld's Meet the maker wanted!

If you would like to participate in the Meet the maker section. Please use the button below to contact us. And share your story with thousands of like-minded-makers!

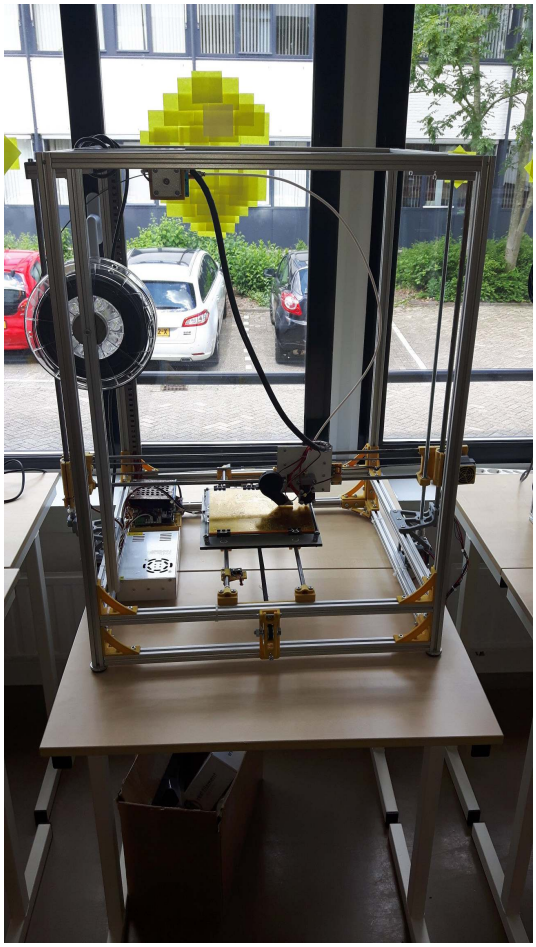
Want to pitch your project for the 'Meet the maker' section. Please click here!

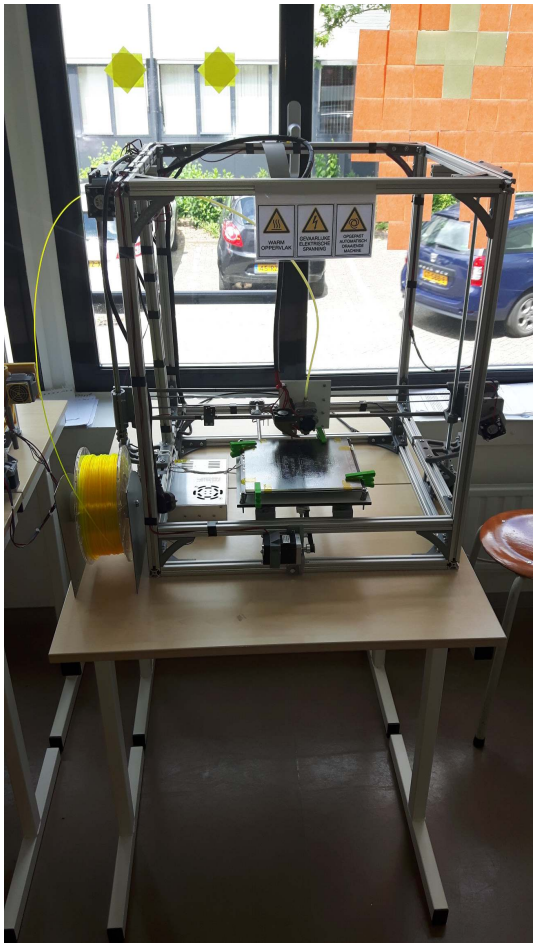
Megatronics, the Exam

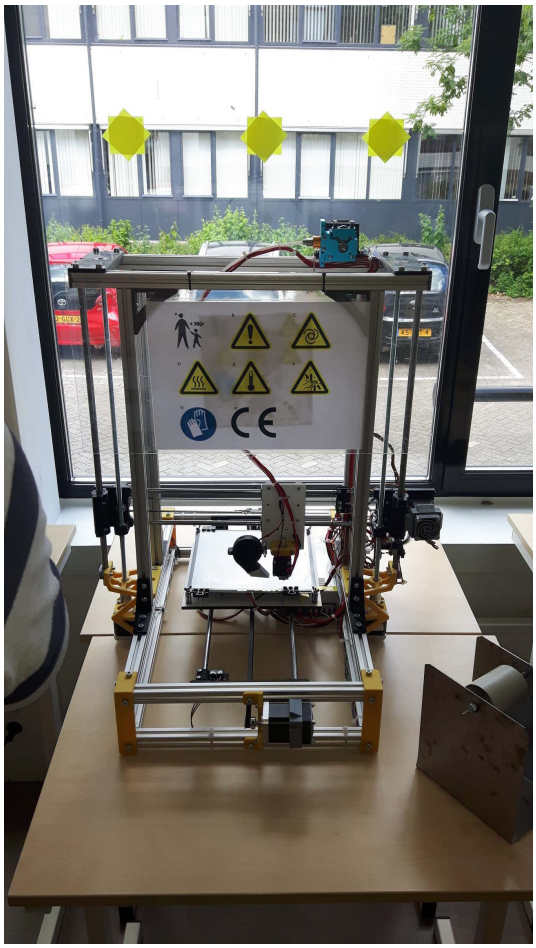
By Henk Schipper

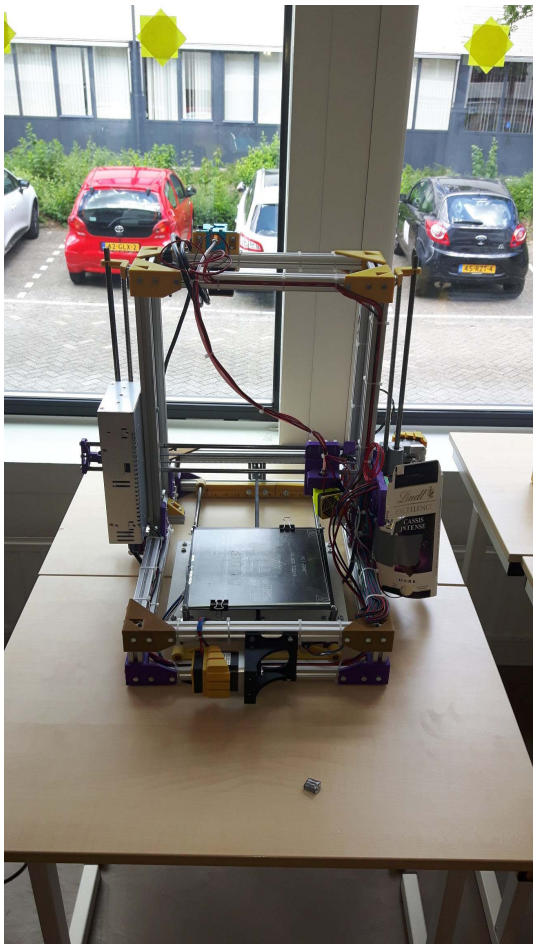
Sixteen students who follow the Mechatronics Mechanic education at the ID-college in Woerden (The Netherlands) were left without a practical exam. Henk Schipper, teacher in Mechatronics, came up with idea of building their very own 3D printer. This has every element of their education combined and therefor is the perfect practical exam. They were sent to the Internet to look up ideas and designs for their own custom designed 3D printer. The 16 students were divided in to 4 groups. All the materials that they used to build there printer was purchased at RepRapWorld.com. After five months of working on their printer it was time to test! They got lessons in Marlin on how to configure their printer to the specific needs. They then changed the settings themselves by uploading the Arduino software in the Megatronics mainboard. Being 3D printers, not everything went smooth but all the students managed to pass there practical exam. The end-result being four (different) 3D printers.

Wim de Graaf and Henk Schipper









How to solve a problem, 3d printer style

By Jaap van Wietmarschen

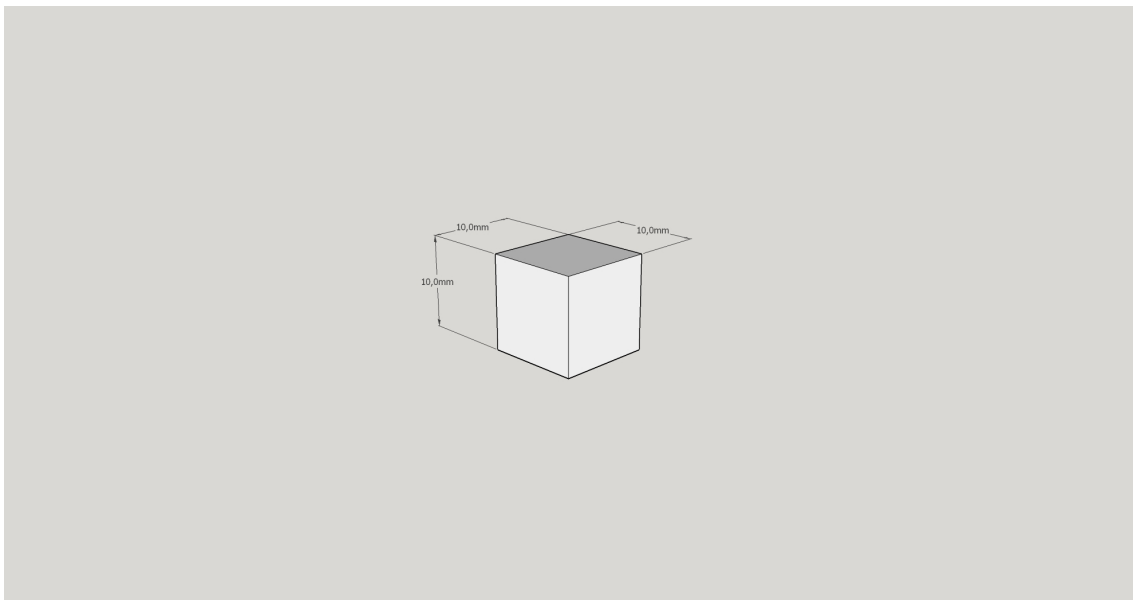
In the spirit of RepRap and DIY. A few years ago I bought a little fix-me-up apartment. And one of the things I changed was the kitchen. Not being a professional I ordered a countertop wih a build in sink with a 40mm hole for the tap. Later I found a nice tap on ebay and put that in. But this tap has a very tight fitting and when you swivel the tap left/right during use, you also undo the main nut underneath the counter top.

As you might have guessed, this is not a easy place to get to. I don't own a regular wrench which can fit the 38mm nut. You will not be able to get a adjustible wrench in there. And even if I could purchase a 38mm socket plug, the flexible hoses are in the way and prevent the use of one.

So thank god for 3D printing, or my wife will never let me hear the end of it.

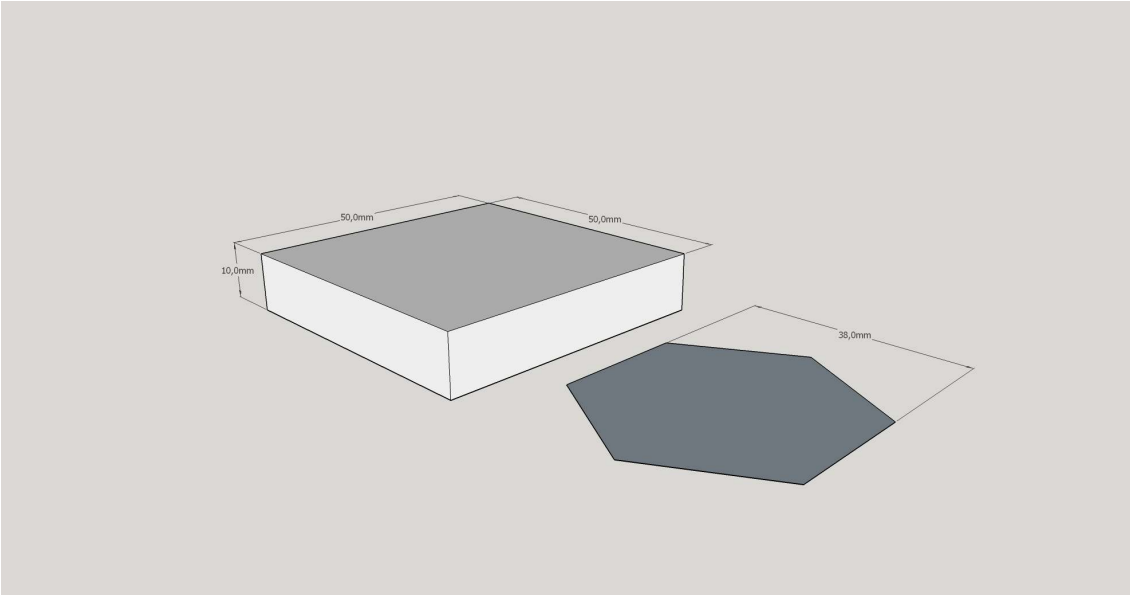
First stop is measuring. Then fire up the computer and start google sketchup. The paid version has some features available I love to use. But even with the non paid version you can model in 3d and export to a STL.

So we know from our measurement that the nut size is ~38mm.

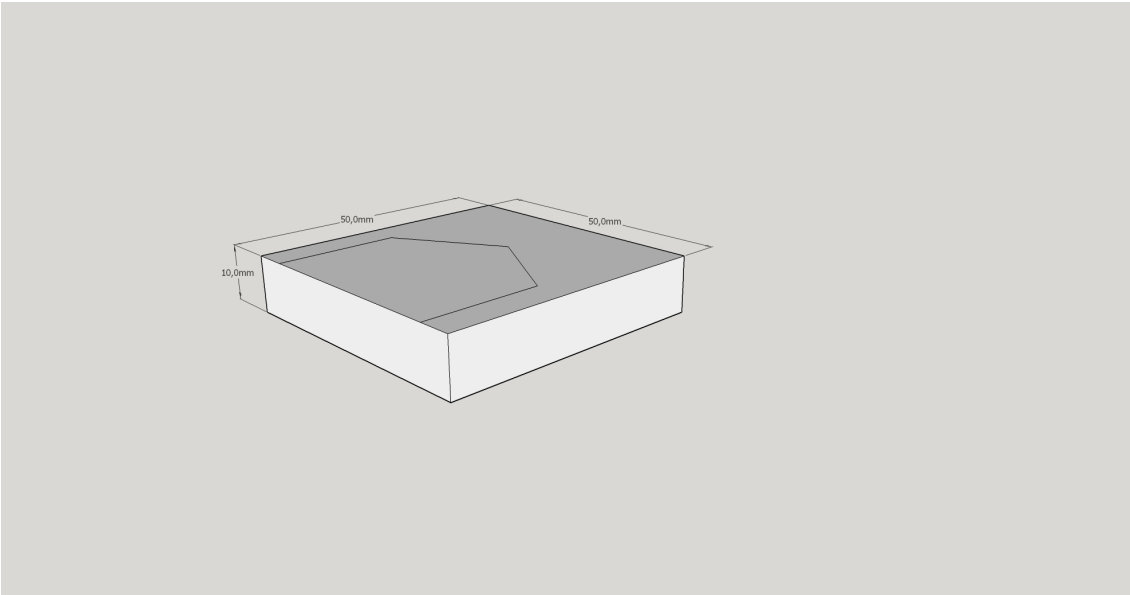


There are many ways to model in 3d. When I was getting lessons in Autocad, we always used coordinates and designed a model based on making a line of 0,0,0 - 10,0,0 and continue from there. Advancing we then started to used the offset tool. And I never stopped using that.

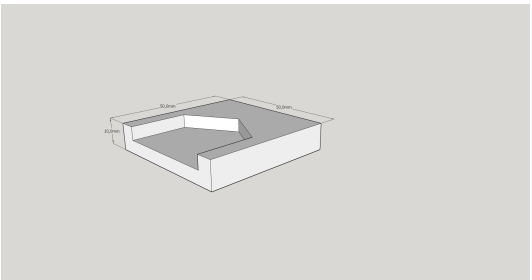
So I always just start by creating a random cube, I create a square of 10x10mm and then offset (or expand) it 10mm to a 10x10x10mm cube. I put in some reference measurements.

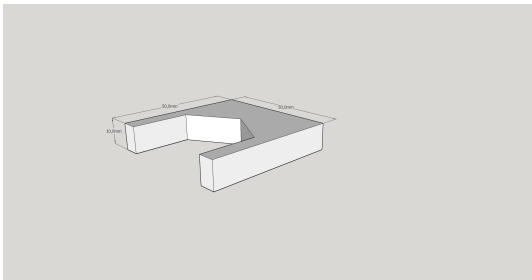


Selecting the sides I want expanded I just expand from 10x10x10mm to 50x50x10mm. Next to that I use the hex tool and create a 6 sided shape in the correct 38mm size.

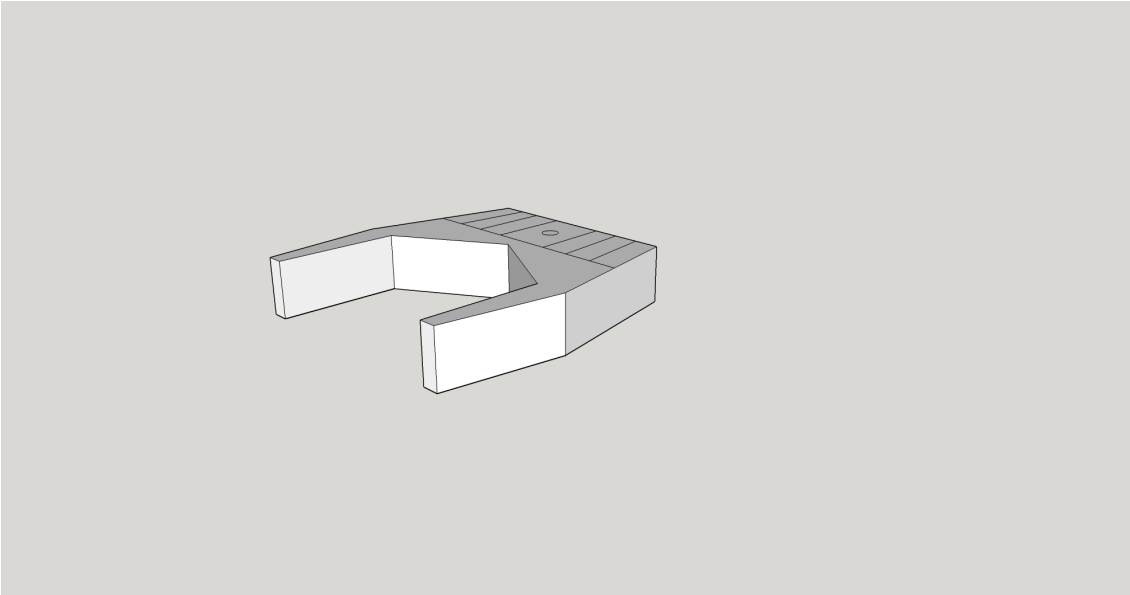


After this I overlap the basic hex shape on the 50x50x10mm cube and clean up the parts of the hex shape which are not needed.

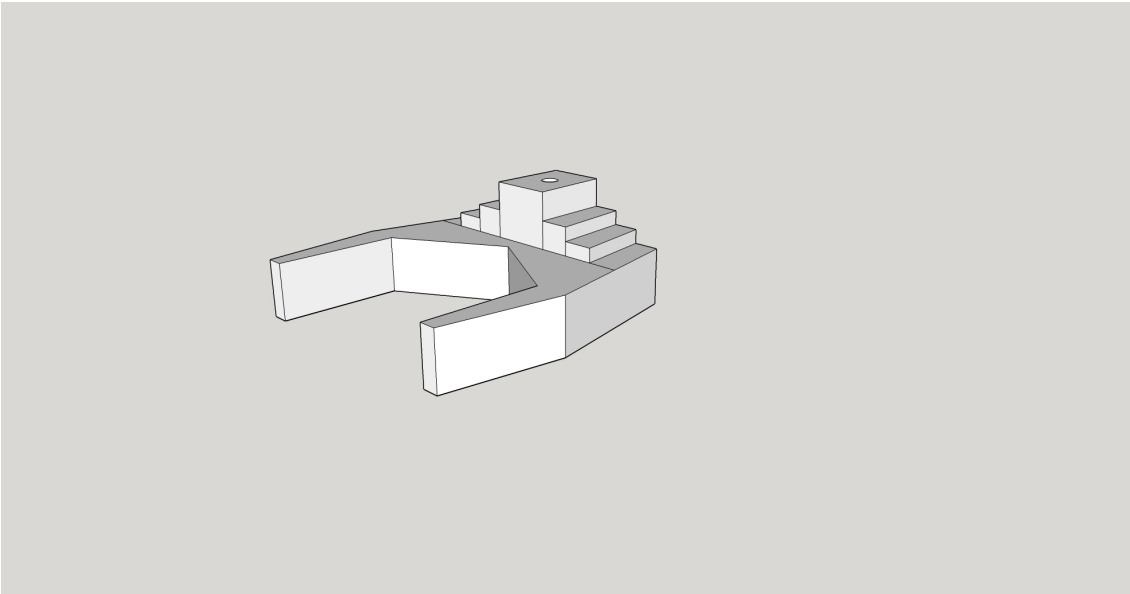




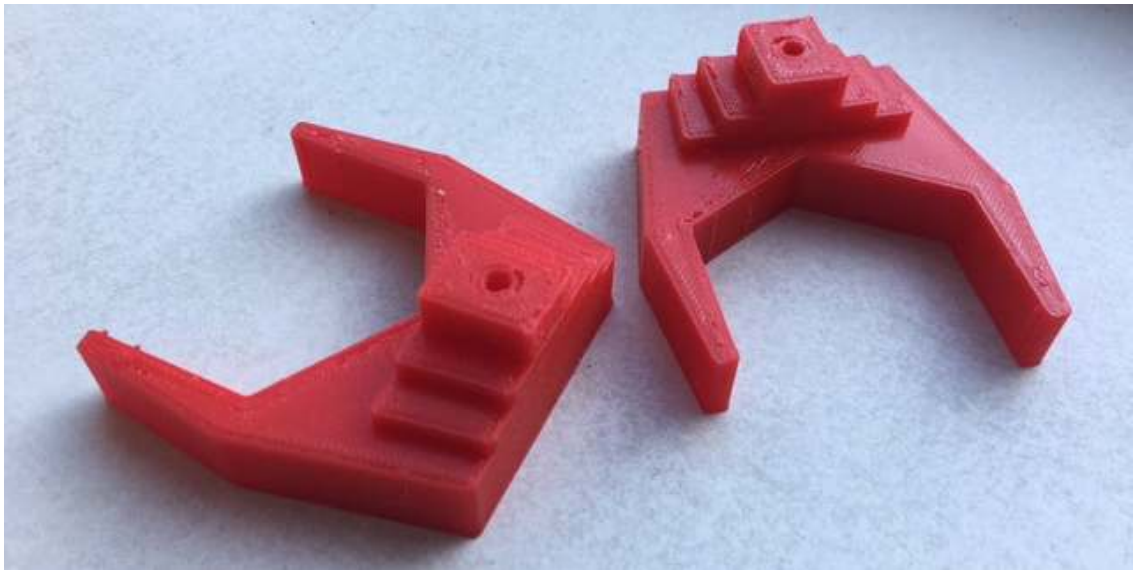
Using the expand tool I then negative extend into the 50x50x10mm cube and remove the basic shape of the hex nut. Creating the jaws of my tool.



From here I clean up the part, reducing the sides (less filament to print). On the end I put the basic shape of a 3mm hole so I can hold the tool in place using a basic wooden kitchen skewer. And some steps so I will be able to put a screwdriver on there to put force on the nut and be able to rotate and tighten the nut further.

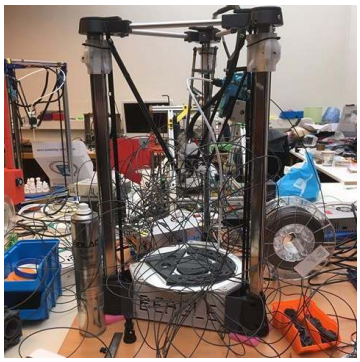


Using the extend tool again, the steps are created and the hole is formed. Last step is exporting to STL and kindly ask Russel to print the tool in his lab (and save my life).



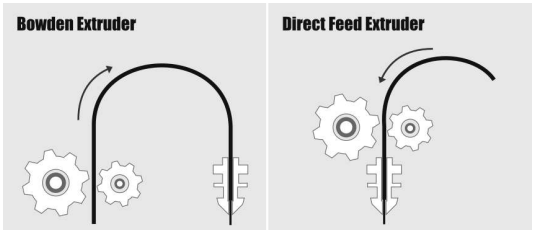
Russell's Printing Tips

By Russell Gulman



To Bowden or Not To Bowden, that is the Question...
... For this Month's Russell's Tips.

Chances are that if you own a classic Cartesian printer (or one of the many Mendel / Prusa variants), you have a direct mounted* extruder system, which is when the extruder motor(s) is integrated closely with the hot end to an axis carriage (typically X-axis).



The extruder motor(s) and surrounding casing can add a significant amount of weight and thus work by the X motor, which is compounded further if the X-frame (rather than the bed) is carried by the Y-axis motors (one motor is likely insufficient in this config).

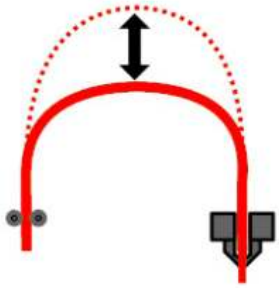
The alternative to a direct mounted extruder is a Bowden configuration, inheriting its name from "Bowden cables" that we are familiar with in other settings; most commonly as a bicycle's brake cable (a control wire inside a flexible, non elastic sheath). In the case of 3D printers, a bowden tube is most commonly a PTFE tubing that connects the extruder unit to the hot end, thus allowing these two components to be separated by sufficient distance to securely attach the offloaded extruder to the printer frame.

The benefits of a lighter hot-end carriage are significant and compounding. The lower the mass, the less

the inertia, which means higher accelerations, jerk speeds and maximum print speed with fewer visible vibration artifacts. The risk of skipped steps by the X-Y motors is reduced, as is the power needed for the X-Y step sticks.

So what's the flip side? As intrinsically slippery as PTFE happens to be, it is intuitive that any additional path that the filament has to travel is an added source of friction. Which means that the extruder has to work harder to push filament through the twists and turns of every cm of additional tubing.

- *New users of the Bowden configuration sometimes make the mistake of cutting the Bowden tube longer than it needs to be, before then compensating for the extra tube friction by over-tightening the extruder idler. This can have the effect of flattening the filament going into the tube (especially 1.75mm filament). Since the inner diameter of the tube is intended to be only slightly larger than the filament, the friction issue is greatly exacerbated and inevitably results in a jam. Bowden printers are therefore more sensitive to the "sweet spot" in extruder idler pressure, which should be just enough to securely grip the filament without deforming it.*



The other primary issue with a Bowden system is the compression of filament inside the tube, which creates a lag in responsiveness between the extruder side and the hot end, known as hysteresis. This is most commonly seen as "stringing" in the print, in which the compressed filament pressure is released during non-print moves. Most direct-extruder users are already familiar with using 1-2 mm of retraction to compensate for stringing, but a bowden tube requires a whole new level of retraction, sometimes as high as 8-9mm. The longer the retraction, the higher the delay in non-print moves and the higher the risk of filament grinding.

- *A good rule of thumb for Bowden-based retraction is the following formula: 1mm + 1mm / 10 cm tubing. (E.g.: 50 cm of bowden tube => 6mm retraction).***

PTFE tubes are tough, but over time, even they will wear out at the pneufit interfaces (and lower quality pneufits wear out as well).

- *When installing a new bowden tube, I like to give it about 3-4 cm of additional slack, so that rather than replacing the whole tubing, cut 1cm off the ends to change the pneufit gripping point.*

Lastly, Bowden tubes are _not_ friendly to most delicate (wood) or flexible filaments, especially those with additional elastic properties. 1.75mm flexible filaments especially tend to bunch themselves up in the PTFE tubing, resulting a much greater amount of friction and hysteresis that can only be compensated for with slooow speeds and high nozzle temps. Real Filament's Flex is one of the few flexible filaments that prints almost as quickly easily as other filaments, since it is primarily flexible with little to no elasticity. This greatly reduces the problem with hysteresis.

To recap, the Pros and Cons of switching to a Bowden-based Extruder are as follows:
PROS:

- Faster, more reliable, nicer looking prints
- Reduced motor / stepper wear and tear
NB: Due to the nature of its design, Delta-style printers all-but-necessitate a bowden extrusion system

CONS:
- Increased filament friction and extruder idler sensitivity
- Greater oozing due to hysteresis, longer retraction adds time penalty
- Very challenging to use for most soft, brittle or flexible 1.75mm filaments

While I was once among the Reprap enthusiasts hesitant to switch to Bowden due to the above Cons, I am now a Bowden convert. With patience and practice, the speed and quality benefits of being able to eliminate the mass of one or more heavy motors from the hot end carriage ends up outweighing the extrusion reliability of a direct mounted system. Conversely, those users who regularly work with TPE-based filaments, large nozzle printers, or other configurations in which the XY speed is not a limiting factor may find that the reduced carriage mass is of less value than the short travel path between extruder and hotend.

**Confusingly, due to the legacy of RepRap's early terminology, a direct carriage-mounted extruder is also commonly known as a "direct drive" extruder, not to be mixed up with direct drive extruders that attach a hobbed drive gear directly to the extruder motor's drive shaft rather than using a Wade-style down-gearing design.*

***PETG is slightly more "drippy" than PLA or ABS and typically requires an extra 1-2 mm retraction on top of the above calculated value*

Did you print something for one of our products? Let us know and we will put it in our next newsletter

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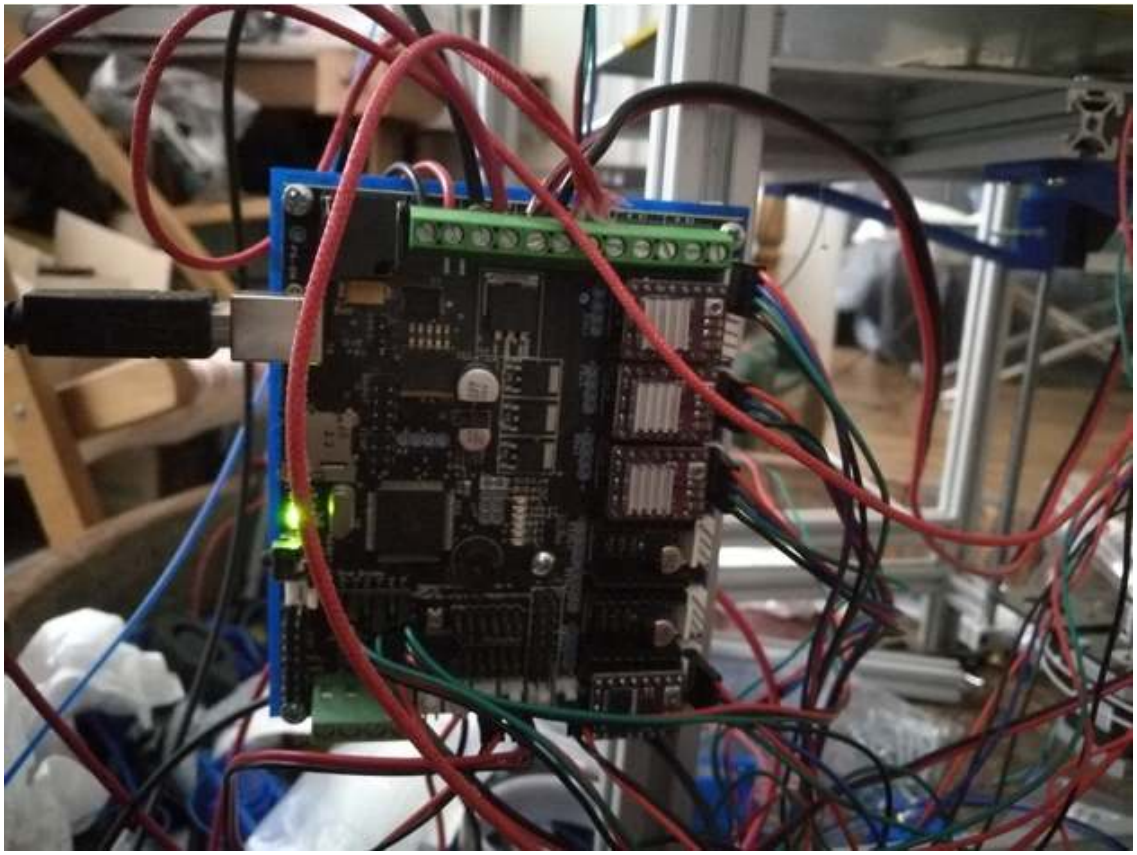
Thingiverse updates

Thingiverse

On Thingiverse you can find a lot of cool stuff to print. From Spinners to Pokemon. You can also find handy stuff to cover up electronics.

Maker Antoine Preteux
Did you buy a Megatronics to use with your Prusa i3 clone? And you have no idea on how to keep it safe? You can attach it to your frame with the design by Antoine! Just need to add some cable mounts :)

Find the Megatronics mainboard cardmount here.



Find your quality Real Filament here!

Exhibitions

26 - 28 September 2017
NEC, Birmingham, UK

Stand G56

RepRapWorld will be attending the TCT show 2017. And we would like to invite all of you to come visit us at the booth.

14 - 17 November 2017
Frankfurt, Germany
Messe Frankfurt Hall 3

Stand; not confirmed

RepRapWorld will also be attending the formnext show in the messe in Frankfurt.

See here our newest products, some promotions and order your Megatronics!

Power user?! New in stock: GT2 9mm

Do you need more power? GT2 9mm is the way to go!

GT2 Pulley (driven)
20 teeth/9mm/5mm
ID
Proline
€4.99

Buy Now

GT2 Belt
9mm/2mm pitch
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€5.00 per meter

Buy Now

GT2 Pullen (driver)
20 teeth/9mm/5mm
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Our newest Graphical LCD

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** All prices are excluding VAT and subject to change*