

CNC hot wire foam cutter detailed build and plans

The build of the CNC hot wire foam cutting machine isn't difficult just measure twice and cut once as the saying goes. This page has the build instructions, plans and main parts you'll need as well as the cutting lists. The controller board and the stepper I'd recommend you buy as a kit including the power supply. Loads on Ebay, just search for a 4 axis CNC kit. I've included all the details of my machine so if you follow this you should be able to build your own. All my dimension are in Inches but you can convert to millimeters if you prefer.

If you have a pillar drill its very useful and ensures holes are drilled straight. I used cross dowels to join the majors parts and these are available at most DIY stores. I used M6 cross dowels with socket/Allen key heads.

For my machine I used RJ-45 sockets and cables to connect the the TB6560. This is optional but allows me to disassemble the machine very easily when not it use. It you have lots of space then you can wire it directly

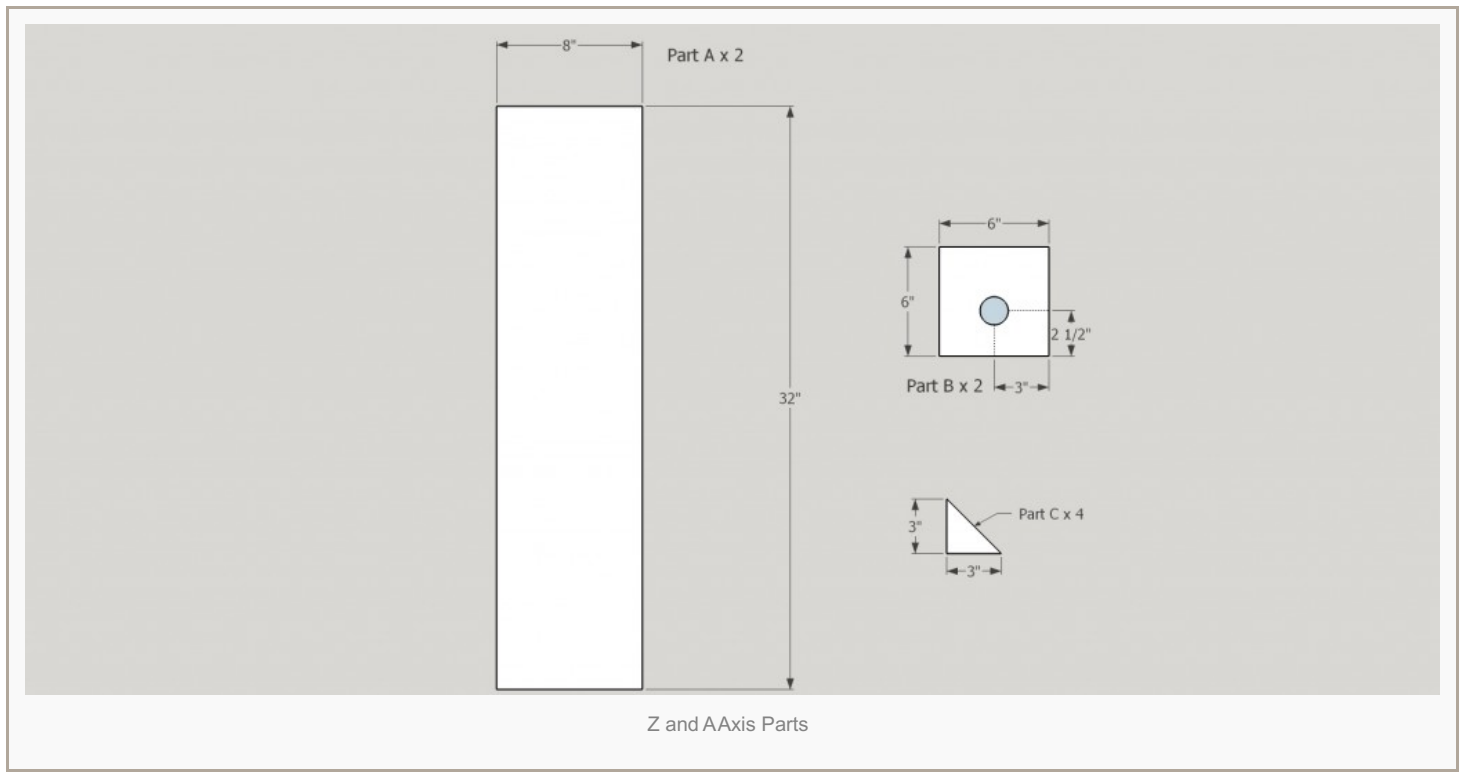
You may wish to build the main machine before getting the electronics and motors.. To save yourself time and some expense take the cutting list to local DIY store and get them to cut all the parts. My local store does this and you only pay for what you need and you'll get them cut to the correct size with square cuts.

Main Parts List

Qty	Item	Source
4	57BYGH56-401A stepper motors NEMA 23	www.ebay.com
4	M10 x 1000mm Threaded Rod	www.Screwfix.com
2	24" (600mm) Drawer Slide – 4 required usually come in pairs	www.google.com
2	18" (450mm) Drawer Slide – 4 required usually come in pairs	www.google.com
1	4 Axis Tb6560 CNC Stepper Motor Driver Controller Board and power supply	www.ebay.com www.amazon.com
4	M10 4 Prong Tee Nuts	www.diy.com
4	6.35 x 10mm D25mm L30mm Flexible Coupling CNC Motor Shaft Coupler	www.google.com
4	RJ45 Wall Sockets	www.google.com
4	Cat5 patch cable – length to suite your layout	www.google.com
1	3/4" or 18 mm MDF Sheet – probably 1/2 a sheet.	Local hardware store

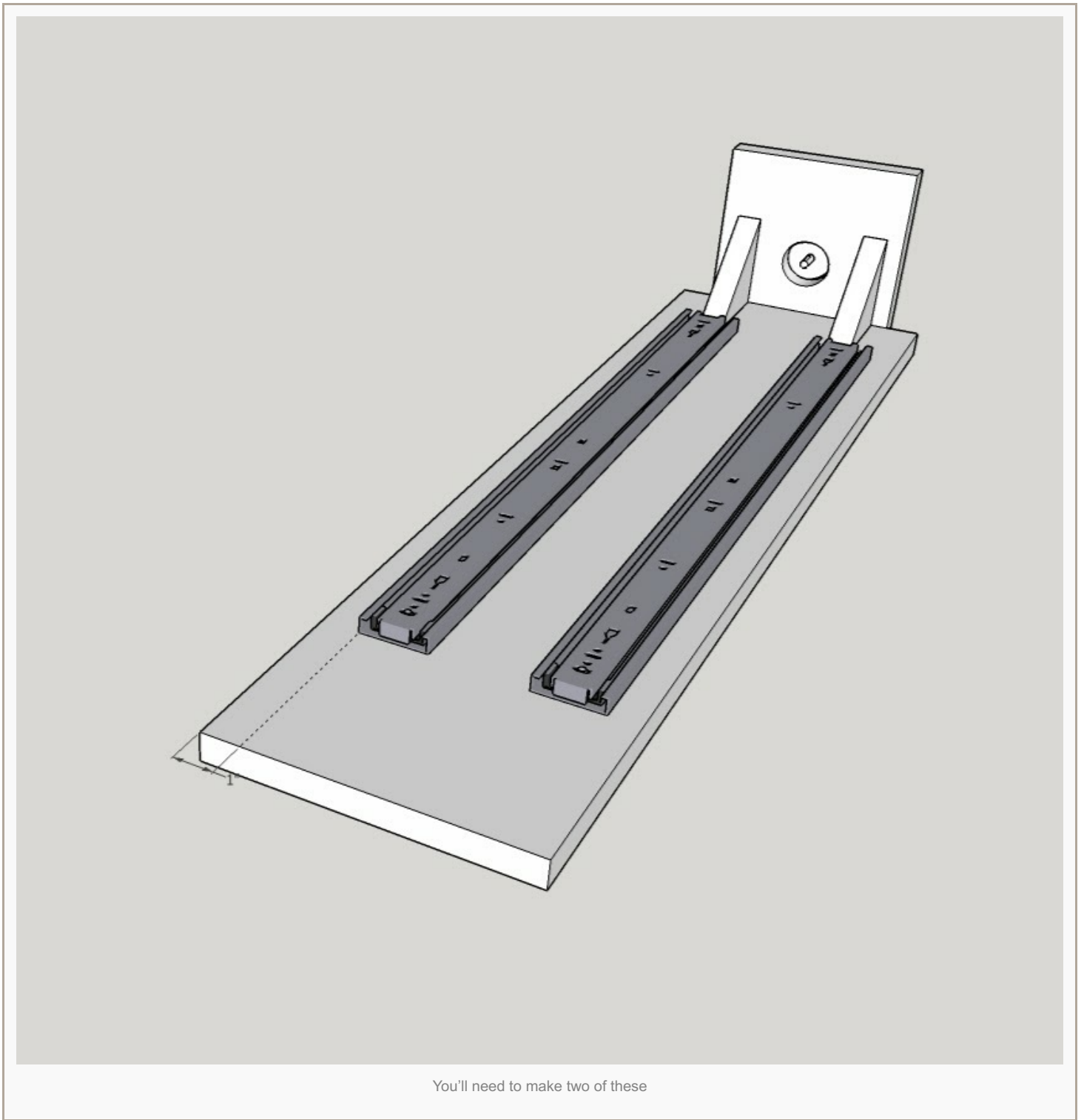
Cutting List Z and A axis

QTY	Name	Inches
2	Part A	32 x 8
2	Part B	6 x 6



The drawer slides are the 24" ones set 1" from the edge and butted up against the triangle pieces. The hole for the stepper motor needs to be 1 1/2" in diameter. Just check you motors first as there is usually a raised section on the mounting end that fits into the hole. Make sure the drawer slides are set parallel to each other so that the X-Y axis when attached will run freely. I used a spacer between them to make this was correct.

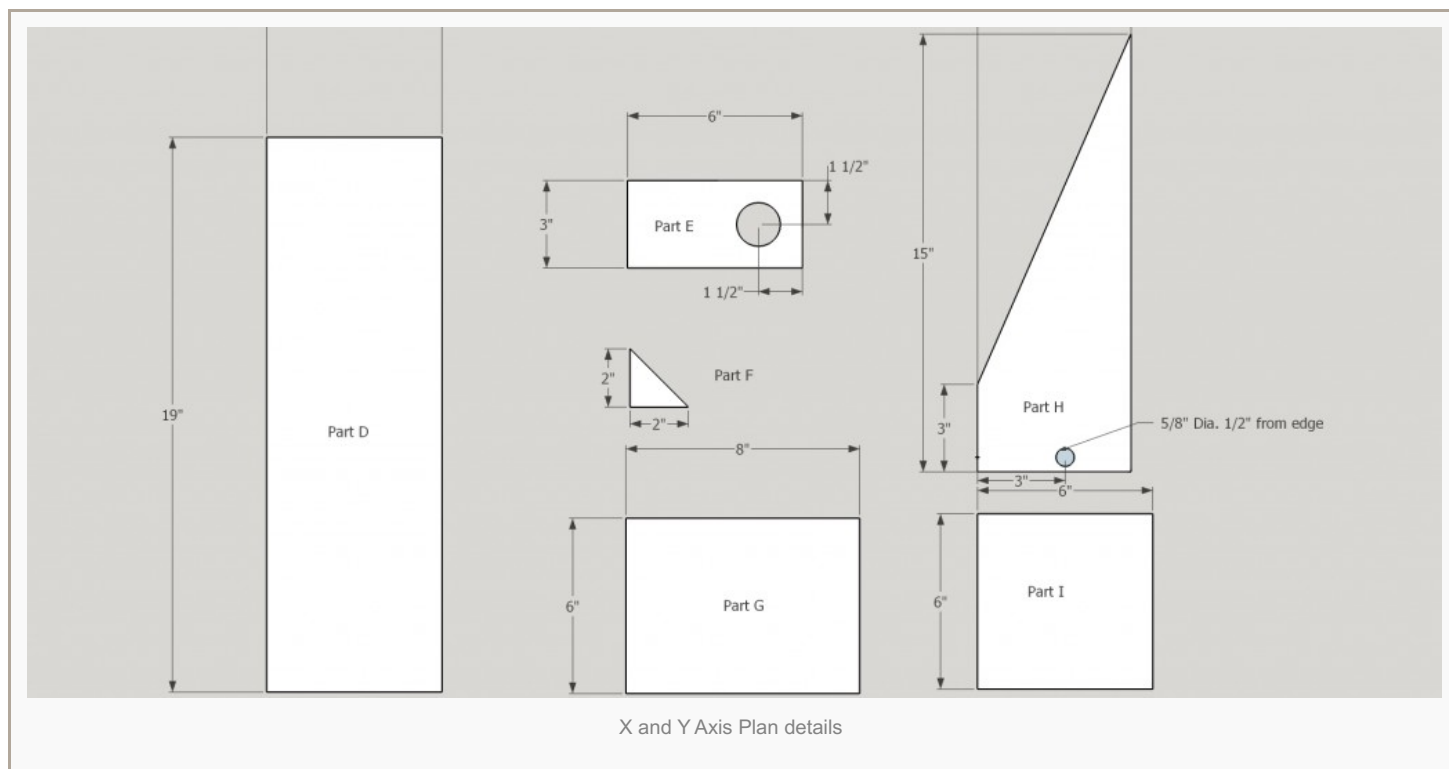
You'll need to make two of these



Cutting List X and Y axis

QTY	Name	Inches
2	Part D	19 x 6
2	Part E	6 x 3
2	Part F	2 x 2
2	Part G	8 x 6

2	Part H	15 x 5 1/4
2	Part I	6 x 4



The drawer slides on the X and Y axis are the 18" and are set flush with the long and bottom edge. Do this first so you can get them set parallel to each other, Much easier before you attach the other parts. Attach the 6" x 6" Part I to the drawer slides.

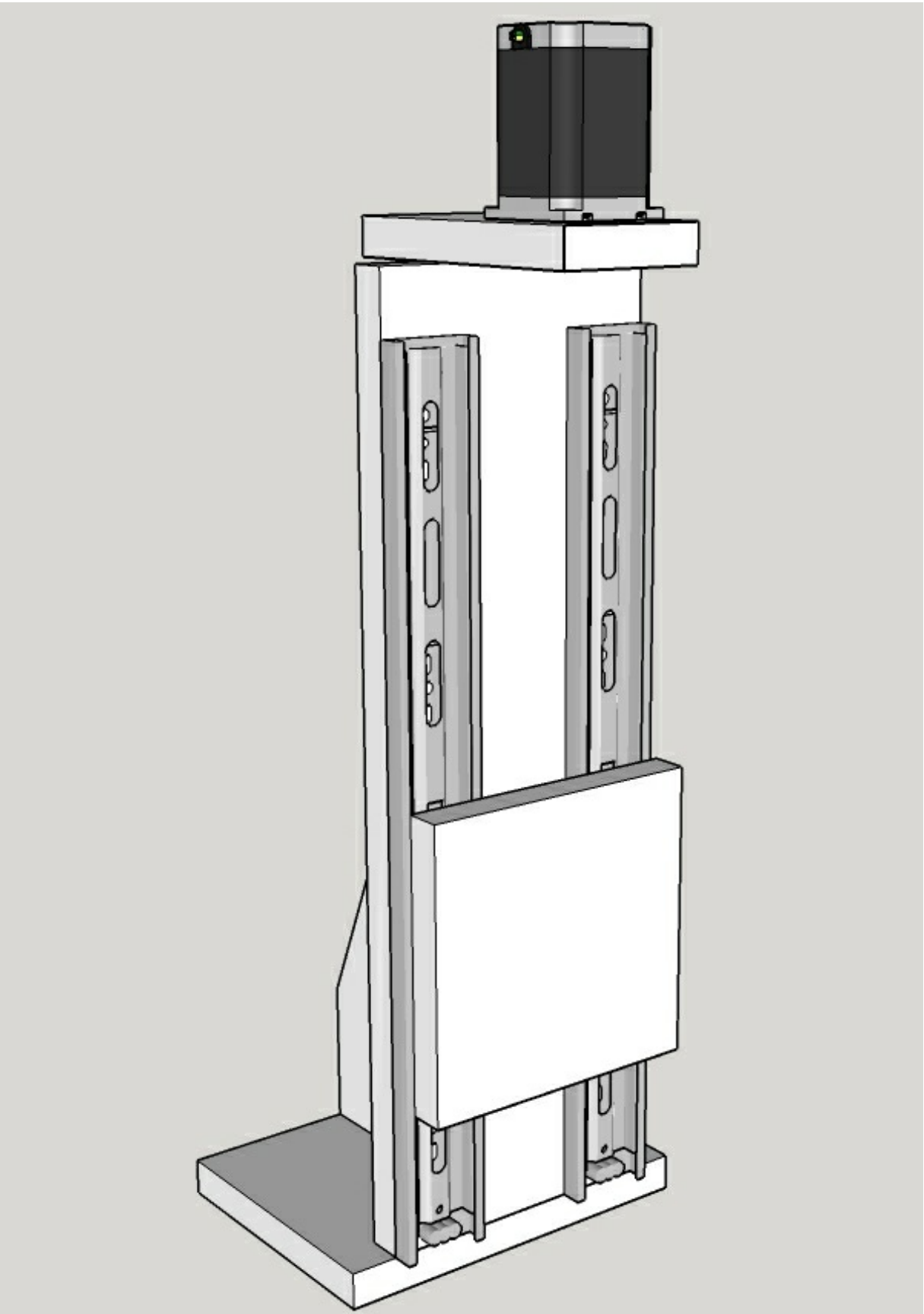
With the slides attached offer Part I so its flush with the end of the slides at the bottom and make some marks on the slides and Part I, used a fine Sharpie for this. Now to attach Part I to the slides, you'll have to take the slides apart to attach Part I from the back. Put the slides back together and check the the slides move very freely. If they are tight its probably the slide are out of alignment on Part I. Adjust the slide on Part I until it moves very smoothly. If it binds the the steppers may struggle and loose steps.

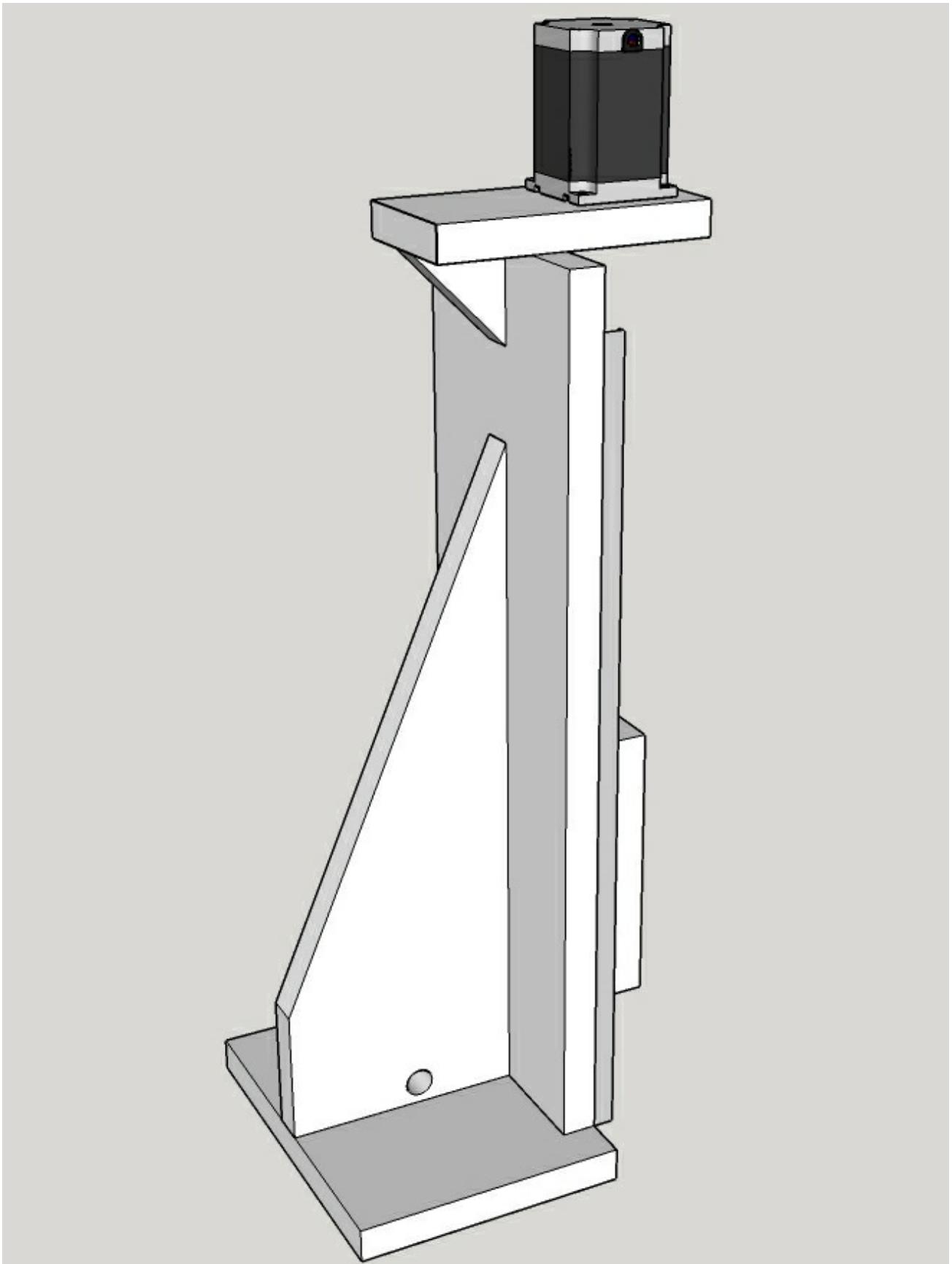
Now attach Part H the gusset as shown in the diagrams below to Part D in the center and flush the the bottom, then attach Part G, the wider edge (8") is attached to the upright Part D see diagrams below.

Now cut a 1 1/2" hole in Part E the stepper mount. Set the triangle piece Part F flush and centred on the opposite end to the stepper. Now mount this on top of Part D and centred. The triangle piece give this extra support.

The threaded rod needs to attach to Part I so you'll need something with a M10 thread. I've used T nuts and some aluminium blocks. I had the blocks kicking around so I drilled and tapped them with a M10 thread. You can see my configuration on this page <http://www.rckeith.co.uk/cnc-hot-wire-foam-cutter/> I used the T-Nuts on the Z and A axis.

I initially used rubber hose and clamps to attach the steppers to the threaded rod and these worked OK for a while bit I found that sometimes the X and Y axis would drop off due to its pulling against gravity as well, the Z and A were OK. So I decided to purchase some couplers which fitted the steppers and the M10 threaded rods perfectly. These have some flex in as well which will allows for small misalignment, no issues since I swapped to these.

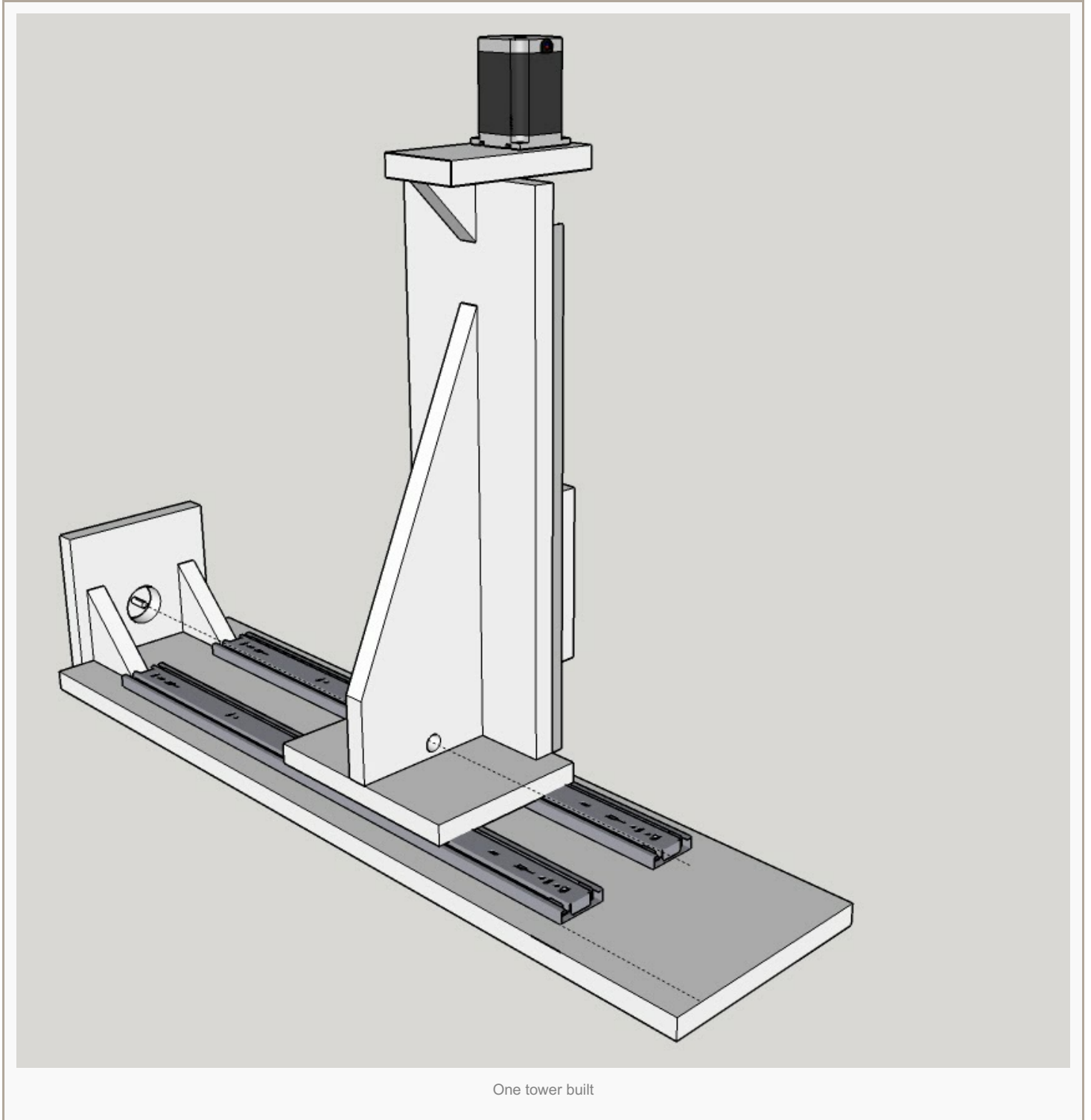




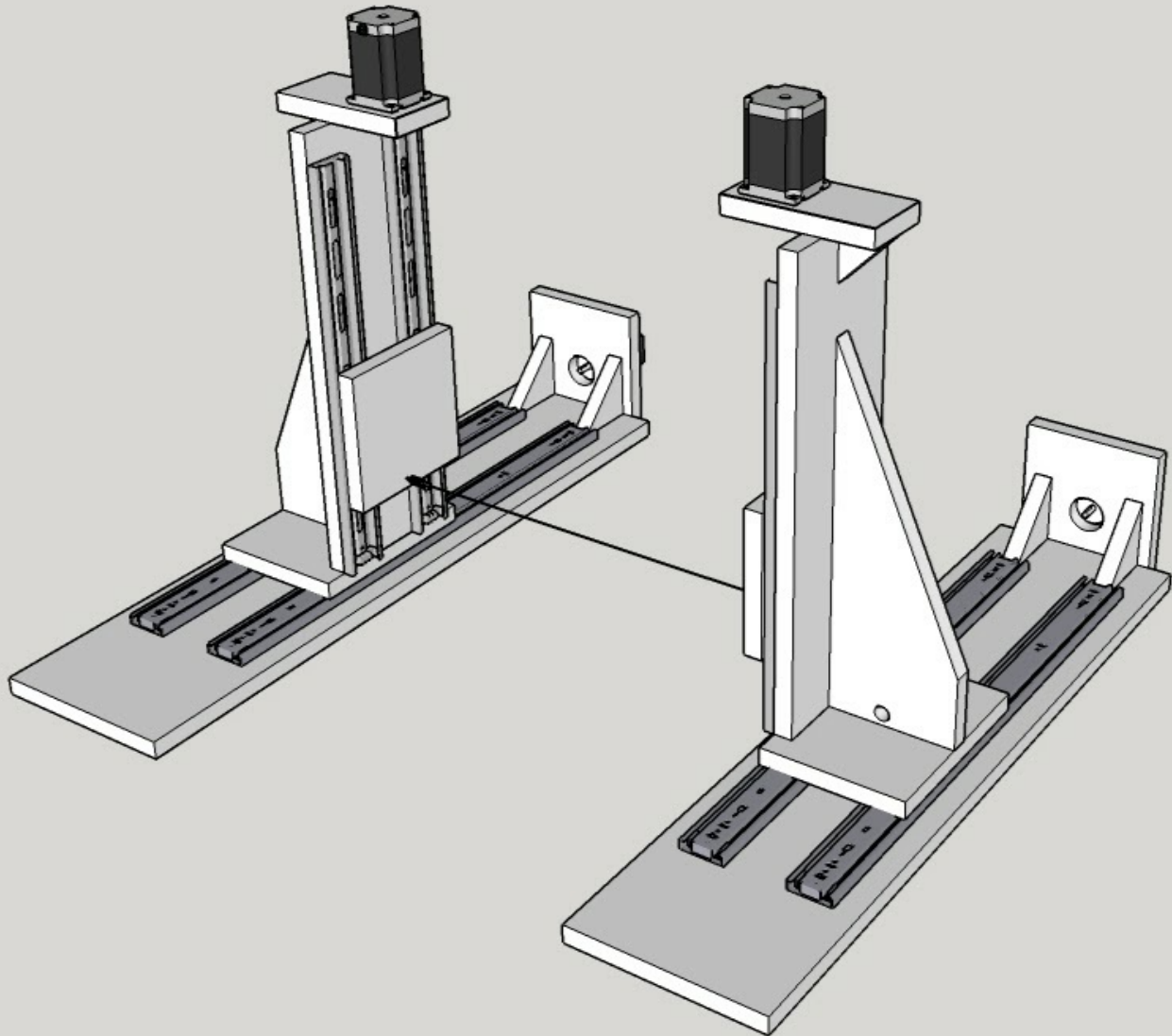
Attaching the X/Y to the Z/A axis

This needs to be done the same way as joining Part I to the smaller slides. Just make sure it all runs very smooth again.

To allow me to get the thread rod aligned correctly going into the upright tower I made the hole in Part H larger than required and then attached a T-nut to a small block of wood which then attached to part H. This allows for some adjustment if the rod feels to bind up. See mi picture on the main page.



Make sure you assemble a left and right



Hot wire is attached via a spring to allow towers to move independently for tapered wings

Mach 3/TB6560 and the printer port

Mach3 is the software that interprets the g-codes and via the controller board moves the stepper motor. Mach 3 has been around for a while and is extremely well documented with some good tutorial videos on their website. Although not specifically for a hot wire machine they are worth watching. I've watched them several times

<http://www.machsupport.com/help-learning/videos-tutorials/>

Mach3 is designed to use the old parallel printer port which is now legacy which modern PC's don't have. You have two options. Get hold of a older PC with a printer port or install a add-on card The link below shows how to get Mach 3 working with card.

<http://www.jcopro.net/2012/07/10/use-a-pci-parallel-port-with-a-tb6560-cnc-control-board/>

I used a old Dell GX 620 ussf running Windows XP with 2GB of RAM. Mach3 will only work on a 32 bit version of Windows, I used Windows XP. Don't use a laptop ArtSoft doesn't recommend it due to the power saving features used on laptops, which can cause missed steps. My PC was a fresh install and nothing else on it. Its not connected to the internet so I have no need for anti-virus and updates. I've even switched lots of unnecessary services off. I get the g-code on by USB memory sticks.



That completes the main build for the configuration of Mach3 with the TB6560 and all my setting go to this page <http://www.rcketh.co.uk/4-axis-cnc-hot-wire-configuration-for-tb6560-and-mach3/> includes setting home and limit switches. If you have any question first check the FAQ page <http://www.rcketh.co.uk/hot-wire-cnc-faq/> and if that doesn't answer it then contact me from the contact page on this site. Good luck with your build, its a real buzz when you see it it all working. If I can do it then anyone can.

Alternatives to TB6560 and Mach 3

As parallel printer ports are now obsolete, it may become more difficult to use Mach 3 and the TB6560 and with the recent developments in 3D printer more controllers and software are becoming available. I've not used any of these listed below but they all will use the g-code from Profili2 and Dev Fus Foam. Checkout the links for more information

- [Planet CNC USB](#) have 4 Axis controller and seems to get very good reviews. Pricing is around £100 and comes with their software.
- [TinyG](#) controller which is also USB and usually run with [Chilipeppr](#) software.