

# Easy to Build Desk Top 3 Axis CNC Milling Machine

by **Tom McWire** on August 14, 2007

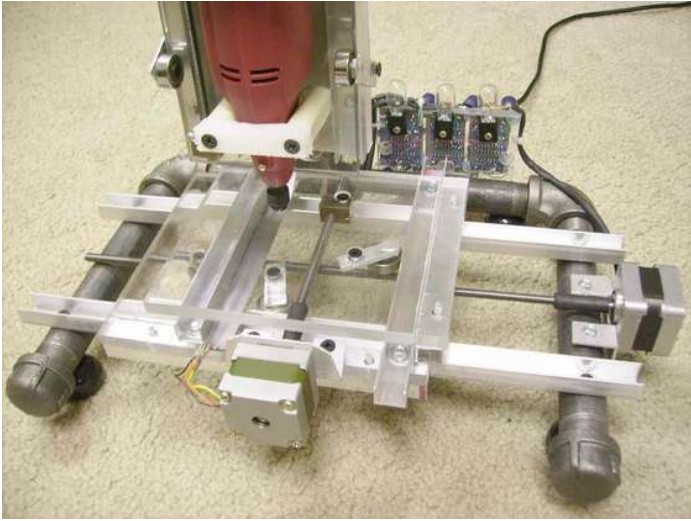
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## intro: Easy to Build Desk Top 3 Axis CNC Milling Machine

Here is a way to make a computer controlled milling machine. That puts the real power of a computer control machining into the hands of the average human. Small enough to set on the desk but scalable to any size. As inexpensive as possible without sacrificing accuracy (too much). All most all the parts can be purchased in local retail stores. And above all CHEAP you can be up and running for well under \$200. With it you can do 2 Dimentional engraving and PC board etching and 3D milling and modeling in Foam, Wood, Plastic and other soft materials. Also try watching the YouTube movie at the end (the last frame).

New information on the Motor Driver Circuit is [HERE\(\)](#).



## step 1: The Frame

The frame needs to be a flat base that you can mount everything on horizontally and a goose neck of some kind to hold the Z axis (the up and down part with the motor tool)firmly in place. I used one inch pipe just for fun but as it turned out it was pretty handy too. When I needed to make adjustments I could just tap it with a hammer. As you can see the post that holds the Z axis doesn't have to be in the center. It just needs to be firm and the water pipe does a good job of that. Later, after you are sure all the pipe joints are in the right place, you can add a drop of thread sealer to the joints and it will be a good solid structure.



## step 2: The X Stage Rails and Motor

Next its time to add the rails for the X axis stage. These rails are 3/4 inch U chanel aluminum that you can get from the hardware store. Put a washer under each end to space the rail off the pipe just a bit. Don't worry about the rails being perfectly parallel. You'll see why later. Now mount the stepper motor with a bracket like you see here. Connect a length of 1/4 by 20 threaded rod to the motor shaft with a short piece of rubber hose (1/4 inch fuel line). Now your ready to set the movable part of the X axis(the stage).



## step 3: X it Stage right

Take a piece of plastic(I used Plexiglas) or metal, something strong and flat and mount a piece of the U channel to it. Now the tricky part. The round thing is a bearing. You can get them out of motors or buy them at a hardware store. Mount it to a short piece of aluminum like so. Then take a 1/4 in. coupling nut(a long nut) and wrap it with aluminum like so(see pic.) The bearing will hold the X stage to the X rail and the coupling nut will allow the motor to run the satge back and forth. It wouldn't hurt to grease the skids a little and the nut too.

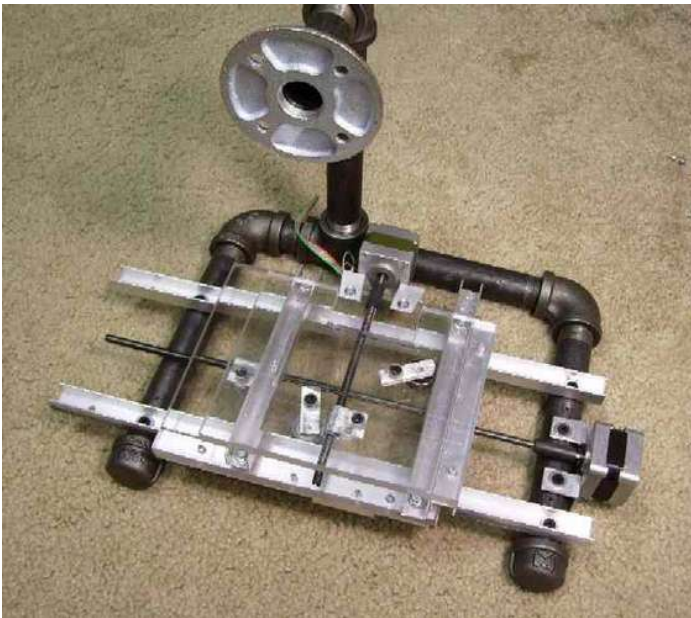
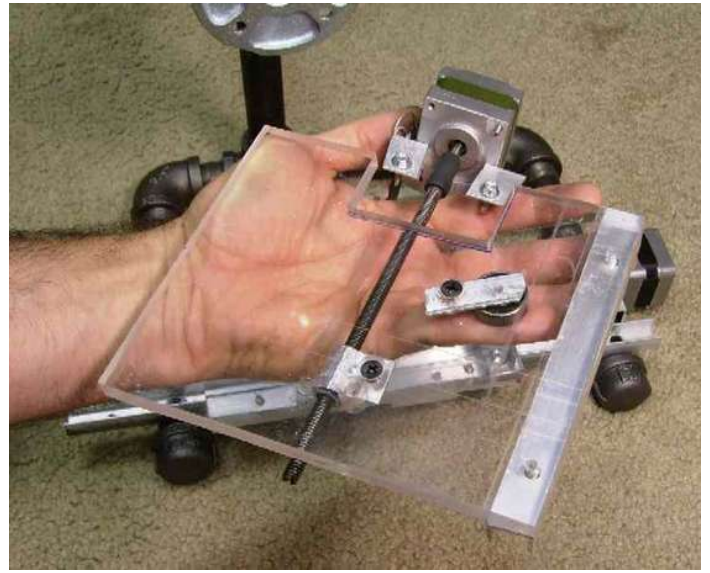
Here's a video on making the bearing fixture.





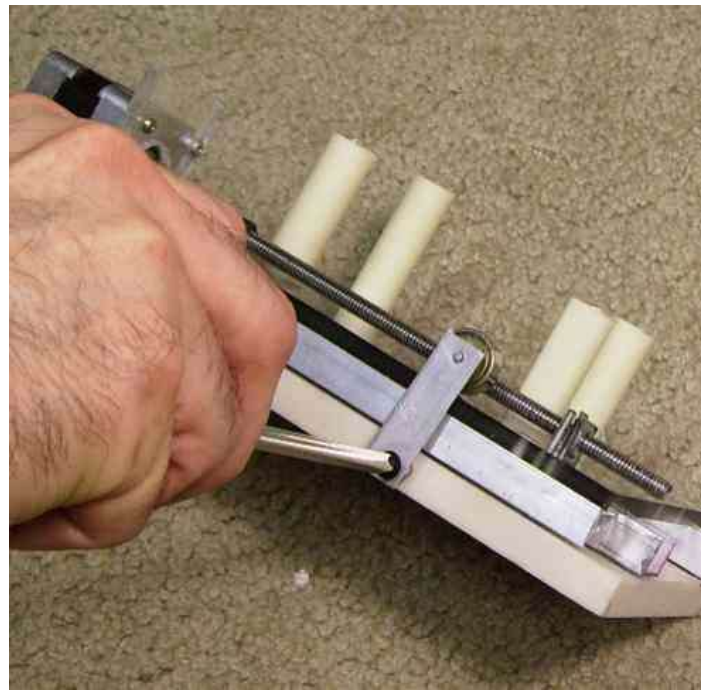
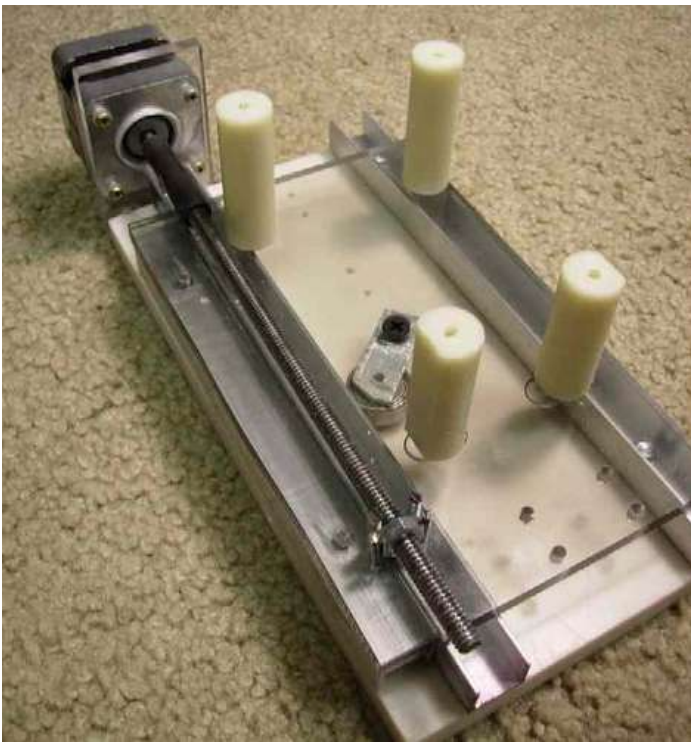
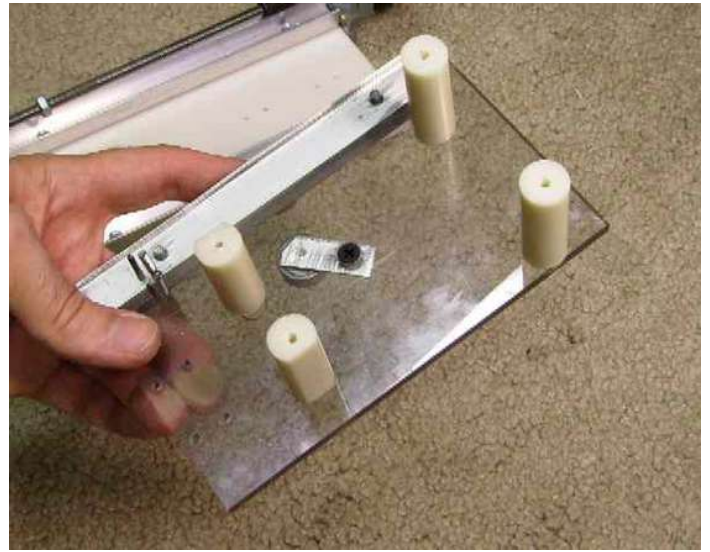
#### step 4: The Y stage

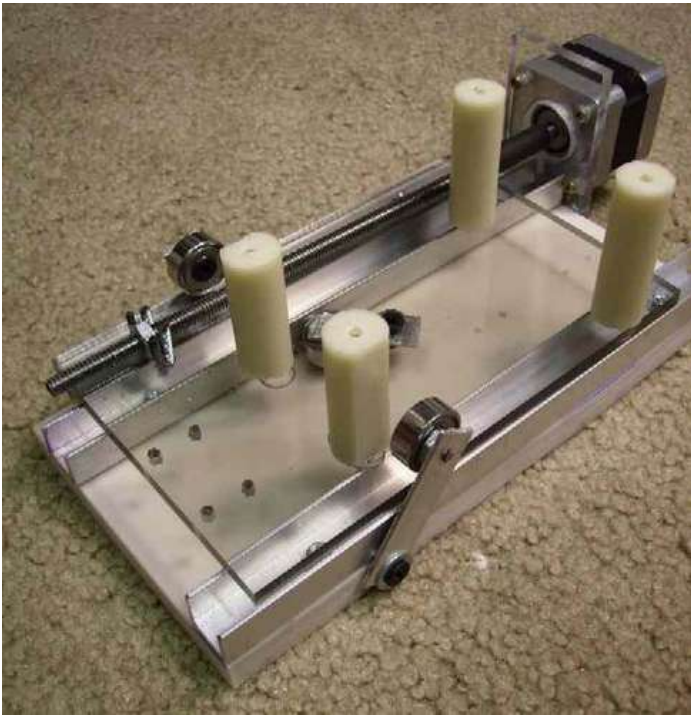
The Y stage is just like the X stage but turned 90 degrees. Mount two rails and a motor on the X Stage and then take another piece of flat material and a U channel and make the moving Y stage. Make the little bearing thing and a coupling nut for it too. When your done it should look like this.



### step 5: Zee Z Axis

Again we are going to reproduce the X and Y Stage to create the Z axis stage. Take a flat piece, here I used a piece of white Plexiglas. Mount some rails and a Motor to it. Then make a moving stage piece with a u channel and a roller bearing. We'll do something a little different with the nut(see picture). The four posts you see on the stage will hold the motor tool. Now since this stage is going to move up and down the weight of the motor tool will make it want to come off of the rails so lets add a few more roller bearings to each side to keep it together.

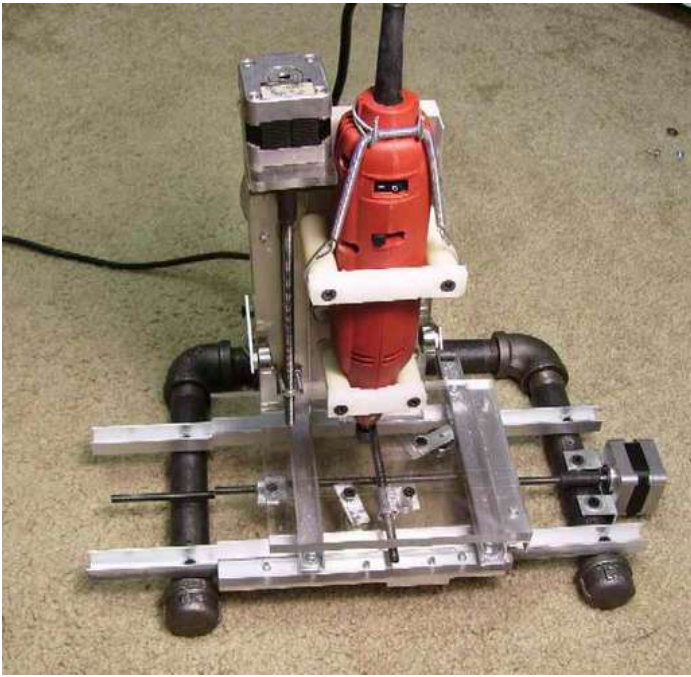




### step 6: Get it together

Now we slap the motor tool into the Z stage. Then its time to mount the stage to the frame. And there you have it. This is the mechanical structure. From here we will need to hook up the stepper motors to a controller and get some software running on the computer but I'm going to save that for future artikals.





### step 7: What's it Do

If you were interested in this project it's likely you have already seen what can be done with an 3 axis(XYZ) computer controlled milling machine. What is suprising is what kind of accuracy you can get out of this thing after you tinker with it a little bit. Make sure all the rails are held firm and straight. Tighten the roller bearings so the stage doesn't shift.

I used it to make PC boards. It's real good for engraving name tags and signs. And it's pretty exciting to see it carve a 3D object out of a block of foam or plastic. WARNING there's a lot to learn about the software. Some venders offer package deals of motors, drivers, and software. That makes it easier but you pay for it. I'll add more to this later. Send me comments and questions.





## step 8: Easy Mill the movie

If the literal instructions are confusing try watching the YouTube movie:  
<http://www.youtube.com/watch?v=6drMZqmyXQc>



Also check out the follow up instructions on Stepper Motor Control: Easy Mill Stepper Motor Controller

## step 9: Engraving

Now that I got the machine back together after making the instructable and I did some engraving and made a PC board. Cutting plastic is no problem but doing the PC board the bit went a little too deep on the left side of the board and took out all the finer traces. This is when you start tweaking on it. Just take some aluminum foil and put it under the rail of the Y axis. So as the stage travels left to right the height of the bit should stay the same. Notice I'm just holding the material down with masking tape. What I like about this thing is, it's easy to fix these kinds of problems because it's all made from simple elements.

Here's the new video:

<http://www.youtube.com/watch?v=LcdozYDpzjU>



Also check out the follow up instructions on Stepper Motor Control: Easy Mill Stepper Motor Controller

## Related Instructables



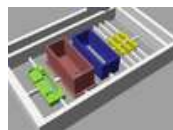
**CNC Stomp Pad Project | CNC Programming | G-Code Programming | CNC Plasma Cutting** by ivanirons



**Make your own cnc controller** by charcoal999



**Send an NC file to your HURCO mill** by geo



**make plastic 3D models from CAD designs using an automated "milling machine"** by leevonk



**making vise clamps on the milling machine** by Doc Workingday



**Make a Ball Mill in 5 Minutes** by Biotele



**Poor Man's (not so rapid) Prototyping Method for the Fabber-less** by xeijix



**A small low profile machine vise** by threesixesinarow



## Comments

50 comments [Add Comment](#)

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**HankMcSpank** says:

Aug 20, 2008. 12:07 PM [REPLY](#)

What are the dimensions of the bearings you are using please? (ie inner hole diameter, overall bearing diameter & bearing width)...even better if you have them in metric!



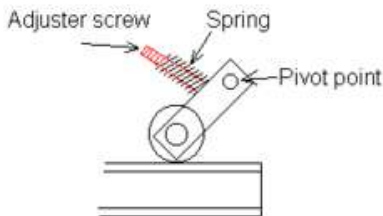
**Dodgy** says:

Nov 2, 2008. 7:15 AM [REPLY](#)

Hank, I think the GREAT thing about this CNC mill as opposed to other designs on the net, including this site, is that it's freely adjustable in all terms. You can make the bearings what ever size you wish, from the 5mm OD ones to the 4 inch wide ones. So long as it all comes together nicely. You also can place 1 or 2 or 3 of them if you want. And you don't have to measure their positions accurately, just judge it by eye. The leadscrew does all the accuracy setting for you.

I suggest though, you 2 coupling nuts for each threaded rod (leadscrew) one on each end of the plexglass (or what ever you choose to use) stage. This way, you can get more stability.

Even the placement of the rails isn't critical, as they're just guides. If you make the holes in the U channels a bit bigger than the screws that pass through them, you can adjust it if need be, then tighten them up for stability.



**christophor** says:

Nov 8, 2008. 6:05 PM [REPLY](#)

Dodgy, relax. Enthusiasm is great, but you're participating all alone. lol

I have ADHD so I had trouble following all of your posts. But based on what I think you said, I think you should check this out. I think you're going to like it.

These guys took what Tom did here and expanded on it in a good way. They implemented springs. They also put in some other cool upgrades.

In some ways, I like Tom's way better. The RepStrap version is slightly more complicated and I'm not sure if all of the 'improvements' add much value.

[http://reprap.org/bin/view/Main/McWire\\_Cartesian\\_Bot\\_1\\_2](http://reprap.org/bin/view/Main/McWire_Cartesian_Bot_1_2)

I hope you get something you can use out of it like I did. Good luck.



**Dodgy** says:

Nov 2, 2008. 7:04 AM [REPLY](#)

What keeps constant pressure on the ball bearing race to press it against the rail ?

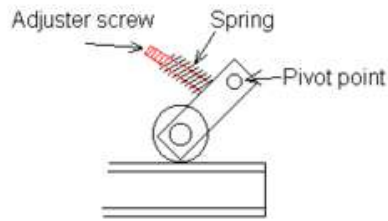
I would use an adjusting screw thru the middle of a compression spring.


How does that sound ?


I've made a simple diagram to illustrate what I mean.


But damn, it's wrong... incomplete and I'm not sure how to do it.


I know that all the adjuster screw should do, is possibly keep the spring from bending outwards, but mainly it should increase or reduce the pressure on the spring, like squashing it harder or less.





 **Dodgy** says: Nov 2, 2008. 6:48 AM [REPLY](#)  
 Can we see a side view (cross section) to see how the 2 rails (U channel) , plastic & ball bearing race all come together?  
 Also, what stops the plastic nearest to the T piece from hitting the rail under it?  
 Shouldn't there be a ball bearing race going downwards, not just horizontally ?

 **Dodgy** says: Oct 31, 2008. 11:13 AM [REPLY](#)  
 re: the small metal strip that holds the ball bearing race.  
 What secures it tightly? Not just that screw ?  
 Surely it'd come loose and the ball bearing wouldn't be pressing against the clear plastic, right?

 **Dodgy** says: Oct 31, 2008. 11:05 AM [REPLY](#)  
 From this picture, it appears as though the clear stage has 2 rails screwed to it, which limits the size of objects you can mount to the stage. Am I right in guessing this?  
 Also, does one aluminum rail rub against another when the stage slides left & right ?

 **Dodgy** says: Oct 31, 2008. 10:55 AM [REPLY](#)  
 does the far end of the threaded rod (left, on picture) just hang/sit/rub on the steel pipe? Should/can you support it somehow?

 **Dodgy** says: Oct 31, 2008. 10:27 AM [REPLY](#)  
 It says here "500 comments" even after I posted mine.  
 Is that the limit per instructable ?  
 If so, are all the oldest ones getting discarded ?  
 Has anyone archived them ?  
 Because some of the early questions may be very relevant, and haven't been asked/answered more recently!  
 Tom: instead of the aluminum U sections, can I use steel ones ?  
 I guess this would be more stable, less flexible over a larger span, as I plan on making mine about 2 or 2.5times as big.  
 And as for the threaded drive rod, can I use any size ?  
 I was hoping for a 3/8 inch or similar, even metric, I don't mind, but as fine a thread as I can find, without spending \$120 on a super fine one.  
 Would it be difficult to add a gear, so that it could turn a 0.8degree/step motor into the equivalent of a 0.08 degree/step motor ?  
 If so, would something like that have the accuracy/resolution to make a hemispherical dome, like a large ball bearing/pinball ball ?  
 Has anyone ever milled a steel sphere, that looks like a mirror finish 1" ball bearing ?  
 Or even a plastic trackball ball?  
 Would a 1cm thick aluminium sheet make a good stage ?  
 Is there an advantage of using plexiglas/perspex for the stage ?  
 Isn't it a bit too flexible over a larger span ?  
 How would this device go, if it were give a ball point pen, and a pad of paper on the stage. And you program it (with minor Z axis ups & downs) to reproduce someone's (your own?) signature!?  
 I'd love a concrete engraver (no stage, as the concrete footpath/sidewalk is your stage - the whole upper part moves X, Y & Z), for when I see fresh concrete that has already set, and I missed out writing my name & the date in it for all to see, many years later!  
 I like when I see old concrete, and someone has written the date in it, that it was poured, and it was in the 70's or something decades ago!  
 For this, I think the rotary tool of choice would be a die grinder or a mini (plunge) router without the bottom guard.

 **Dodgy** says: Oct 31, 2008. 10:06 AM [REPLY](#)  
 Nice project Tom!  
 I tried designing my own CNC mill, similar to yours, but different. Apart from the usual making of things, I was intending it to operate different tools, one at a time.  
 A pair of wire cutters/diagonal nippers, and a soldering iron.  
 That way, it could cut the hundreds of wires of PCBs I used to wave solder, at my job. And for another job, that required a lot of hand soldering, it could do this very speedily, and with repeatable accuracy, plus a wire feeder, like a MIG welder uses, but for solder.  
 I ended up never getting around to it, but your design is no simple.  
 I'm gonna go to my local Bunnings warehouse &/or plumbing shop 2day, and buy the iron tubing to get started.  
 I plan on making it much bigger, so that I can engrave/mill much larger items.  
 One money saver would be to make my own replacement parts for my motorbikes. When Honda want \$50 for a chunk of steel, or zinc, or aluminium, I think it's a bit of a ripoff.  
 Or a brake lever, which DAMN! keeps breaking on me, when my bike falls

over! Even yesterday, the bike fell over at home, on the grass, with c.7 milk crates worth of stuff on the back.

It landed on the ground, and still broke the brake lever, where it counts, never the pivot.

\$15 for a new one, and that's not even OEM!

A steel or SS replacement wouldn't break. May be a little heavier, but I don't think my fuel efficiency will notice. At least... If it's made of some kind of steel, it'll never break again!

How good is your design, for milling steel/stainless steel ?

Is it a matter of simply taking it slowly?

If you advance the table too quickly, thru software, does that simply snap the milling bit?

What did you make out of frozen cheese ?!

Could you make a working 1:1 scale replica of a typical Lego brick ?

Out of the usual ABS, or wood, or concrete, or rubber, or acrylic/perspex, or stainless steel, Hmmm: 24Ct gold!!!

Sell that, to the head of Lego!

Can you make coins/medalions with this!

Someone mentioned the bearings of a Dremel tool aren't that tight. As in, the chuck can move up and down, not just round and round.

Have you found this with yours?

How can this be overcome?

Thanks!



**Dodgy** says:

sorry, didn't proof read my post till now:

here are some typo corrections:

0>your design is no simple.

1>your design is so simple.

0>where it counts, never the pivot.

1>where it counts, near the pivot.

Oct 31, 2008. 10:10 AM [REPLY](#)



**wpflum** says:

Doh!!! For everyone who like me wondered why Tom's original design had the vertical pipe offset instead of in the middle allow me to post the obvious, albeit, late, reason; the motor mount!!!! I originally ASSuMED that it was just because he had had the pipes already and just used them. All it took to beat me over the head with the obvious was to assemble mine with a centered column and realize that I'd lose a couple of inches of table travel if I mounted the motor to the pipe like Tom did. Unfortunately I've already 'fixed' my pipes as not to allow any disassembly, I tack welded them to keep the alignment I fought hard to obtain so a longer pipe was out. What I did is find a piece of 1/2 inch thick aluminum bar stock I had from many years earlier (NEVER THROW ANYTHING OUT!!) and attached it on the bottom of the pipes parallel to the channel and protruding out 4 inches to one side. now all I have to do is make a face plate to mount the motor on and attach it to the end and I'll have my 9 inches of travel I originally needed. In case you're wondering I am using rubber feet I got from the same place I bought the motors from which are slightly thicker than the bar so it doesn't interfere with the stability of the frame.

Oct 11, 2007. 6:26 PM [REPLY](#)



**Nuno** says:

It's relative. You don't have to mount the vertical block centered on the vertical pipe, and I think it's actually undesirable; you should mount the block in such a way as to have the drill centered on the vertical pipe, because of force balancing.

Oct 11, 2007. 10:51 PM [REPLY](#)



**gus\_452000** says:

Hi all, just getting ready for the day shift here :o((

Just wondering what sort of sizes your machines cutting tables will be mine should jave a 8 1/2" x 6" which I think is quite good.

Got the X and Y-axis completely finished now just the Z-axis and the interface to build, keep up the excellent work and keep posting.

Right off to work :o(((

regards

Gus

Oct 11, 2007. 11:11 PM [REPLY](#)



**wpflum** says:

Mine has a 12 x 9 inch table, mainly because I used a 12 x 18 inch plastic cutting board ripped in half. I needed about 7 or so inches by at least three to be able to do pinewood derby cars but I figured if I go as big as possible I'll leave more room for future projects.

One thing I am considering strongly is after I get the initial machine built and functioning is that I'd like to add a 4th axis, basically a 4th stepper/gearbox mounted to the y table that will let me turn the blank horizontally letting me machine all but the ends.

Oct 12, 2007. 6:56 PM [REPLY](#)



**rahmansaid** says:

Pls give an update on your 4th axis. I'm very interested.


Oct 26, 2008. 8:52 AM [REPLY](#)





**Nuno** says:


I'm aiming for at least around 10x6x2.5 cm (3.93x2,36x1 inches). I want this machine for PCB making.


Oct 11, 2007. 11:34 PM [REPLY](#)


 **rrsquez** says: Oct 24, 2008. 1:16 AM [REPLY](#)  
Wow! Great project! What software do you use to "isolate" the traces? I know they can cost a lot. I have some experience with PCB layout. Generating a gerber file is easy. Cutting the "reverse" out is not.  
This tool is \$6000 to buy, but this includes the software (LPKF is the MFR.). I think that it's worth buying if one can spend far less than \$6000.


 **Javier001** says: Oct 1, 2008. 1:15 PM [REPLY](#)  
Hello tom, i was very impress from your video and this was great, now i'm very interesting on making one my self, but this is the kicker, i want to make a guitar body usualy guitar blocks are mesure by 13-3/4" x 20" x 1-3/4". now i want to make a machine big enough so a can start my proyect. can you help me with this?  
  
Thanks & Regards  
  
J


 **imprez55** says: Oct 22, 2008. 11:59 PM [REPLY](#)  
At that size this design is starting to see limits. Its a great design, don't get me wrong, it's just better suited for smaller jobs on a tight budget (the main purpose it was created for).  
  
A better design for the larger projects (such as your guitar body) would be gantry style. It can be accomplished a few different ways. One way, that the X,Y, and Z axes are all moving one part, is already described on [here](#). The other common style I have seen combines these two. The look is near identical to the other machine. The only difference is the Y axis is the base. So the part moves up and down like on tom's, but the rotary tool (and consequently the Z-axis) move side to side to form the X-axis. This makes the X and Z axes more stable because they are bolted to a solid base. The Y axis (and consequently the part) "float" on that bolted base, also giving it independent stability. (CNCzone.com has some good examples of this design)  
  
Ultimately it's a decision left up to you. As has been said many times, this was meant as a desktop cnc machine, not table top. Meaning you can set it right next to your 24/7 computer. Again, I feel that size is pushing this design's limits. creed4545 was able to have his measure 9x11 (right on this page) and others have gotten similar sizes. I will leave you as tom would have liked, to solve the challenge of this build, that is the reason he did not give measurements.


 **rahmansaid** says: Oct 16, 2008. 6:03 PM [REPLY](#)  
Can you do work on small wooden cylinders (handles)? What changes need to be made? Sorry, I know zilch about CNCs.

 **imprez55** says: Oct 22, 2008. 11:39 PM [REPLY](#)  
You could do it on a 3-axis machine such as this, but you would mill one side then manually flip it 180 degrees to mill the other side. So no real changes, just do it in two separate parts. This limits you just a little it what designs you could actually put on the handles, but its better than he alternative. (eg. example of 3-axis in two parts )  
  
The alternative would be a 4-axis machine such as a converted mill/lathe combo, but then it violates the "easy", "desktop", and "3-axis" parts of the title. example of 4-axis()

 **arun5679** says: Oct 9, 2008. 10:12 PM [REPLY](#)  
can u tell the dimensions and the explanations tom .. it would be much helpful for doing my project

 **Tightwad** says: Oct 6, 2008. 9:02 PM [REPLY](#)  
On the Z axis, why didn't you use a coupler nut like you did on the rest? I was just working to finish mine, and I noticed that was the case, but couldn't figure out the reason for it  
  
Joshua

 **Tom McWire** says: Oct 9, 2008. 8:17 PM [REPLY](#)  
Gravity pulls the Z axis down. So I just made this holder for the nut. This way if things get out of hand when your milling a piece you can just reach over and lift up the Z axis and then stop the process.  
Tom

 **Tightwad** says: Oct 9, 2008. 9:48 PM [REPLY](#)  
That makes sense, I shoulda waited a bit before I finalized my Z axis. Thanks

 **bluumax** says: Oct 8, 2008. 11:57 PM [REPLY](#)  
Oopsy, I killed the original Rail post I think.  
Channel & rod Rail setup.



**blumax** says:  
(removed by community request)

Sep 24, 2008. 4:38 PM



**reido** says:

Oct 8, 2008. 10:15 PM **REPLY**

Very attractive alternative! I'm going to try this out since I am having some problems sourcing retail plexiglass/perspex in my location and I already have several stainless steel rods from big old dot matrix printers. A few questions, if I may =)

Are the top and bottom pieces of aluminum u-channel the same dimensions? It looks like the top one is narrower, but that might just be the depth of the photograph.

Do you know the ideal u-channel internal width to rod ratio to maximise stability while not introducing flexing of the u-channel? I have 11.5mm diameter steel rods and can get 10mm u-channel so I'm hoping this will work out.

What is fixing the rod in position so it doesn't move, or does it just stay fixed naturally because it's easier for the table to move without the rod moving as well?

Also @Tom: thanks heaps for the project details and all your hard work. Great stuff!



**blumax** says:

Oct 8, 2008. 11:51 PM **REPLY**

Hi.

I tore down that machine a while ago, but I've got the rails right here so...

I used the same, stainless rods from printers.

11.5mm diameter and 10mm u-channel would probably work fine.

Just take a rod with you to check.

Rod Dia is 3.74" / 9.5MM Channels is 1/2" 12MM.

I chamfered the rod ends to reduce binding.

I just added dimensions to the pic.

I used screws through the bottom & threaded the hole in the bottom of the channel.

I just glued the rod to the channel (the shorter pieces) they're still glued today.



**Tom McWire** says:

Sep 24, 2008. 8:38 PM **REPLY**

That looks good. I imagine it would not add much to the cost either.



**Tightwad** says:

Oct 8, 2008. 8:55 PM **REPLY**

Well, the part I consider "Hard" is done. I have already wired the board (bought a kit for it....I cheated) and tested my motors off the mill.

The pipes measure 17"wide x 14"deep x 14" high

Overall measurement to the ends of everything is 22"x20"x25"

Usable bed space is 11"x9"x5"

I don't figure I will get far from center, as I am not confident in the squareness. The nylon board was nice to work with, all cuts were done on the table saw, but it is a bit more flexible than I would like. I used 1 and a half of the biggest boards I could find, 11x18 but with a groove in them.

I have not yet attached the Rotary tool, as I am not 100% willing to use my only one on this...still looking for a deal. That will be the last step I imagine, after I calibrate most of it and figure it all out.

For power for the board I am using a Laptop battery charger....16.5V and 4amps if needed. I was going to use an ATX powersupply and combine +12v and -12v to have a 24v supply, but I scored this charger and it is smaller and easier to work with (quieter as well). I just need to make a control panel and box for the electrics to go in.



**Almaz** says:

Oct 6, 2008. 11:30 PM [REPLY](#)

Which threaded rod would you recommend for higher precision 1/4 28 or 1/4 20? I have them both in local hardware store.



**creed4545** says:

Aug 3, 2008. 5:15 PM [REPLY](#)

Hey Tom, great project! I had a lot of fun building this and as soon as I can scavage a DB25 cable, i will be able to use it. Here are some of my pictures. The table is 9"x11". I added a simple fish tank pump to blow off the dust. The plexiglass extenders allow the router to utilize the full 9" x11". I will be posting pictures of my slightly modified circuit board.



**Tightwad** says:

Sep 30, 2008. 4:35 PM [REPLY](#)

Wouldn't the extenders flex and cause the table to move? Either up/down flex due to the weight of the Stepper, or torsional flex as the motor moves the table?



**creed4545** says:

Sep 30, 2008. 5:06 PM [REPLY](#)

the weight of the table itself, the anchoring provided by the x axis motor provide stability and prevent wobbling of it.



**altomic** says:

Sep 16, 2008. 4:10 AM [REPLY](#)

fish tank pump- sweet.



**liny** says:

Jun 23, 2008. 7:36 PM [REPLY](#)

what programs do you use to transfer the image from the computer to the actual product. Is it any type of CAD CAM program such as Techsoft or Prodesktop or did you just calculate where you wanted it to drill.

Thanks, Cool project by the way - my school has two engravers and one laser cutter and i am impressed someone could actually make their engraver that way.



**snosheu** says:

Sep 28, 2008. 5:55 PM [REPLY](#)

i use deskart to convert the pictures to gcode and then use ez cnc to carve in 3d it uses win 98 but it is easy to use



**KraftyRhino** says:

Sep 15, 2008. 9:20 PM [REPLY](#)

WoW thats all I can say! I have been gutting out 2D wood works for years now and the only reason we have not taken our product to the next level is the fact that we could never keep up with large volumes of orders without the hire of a new woodworker. Something we just can not afford!! We have played with the idea of an automated machine but the cost always made it nothing more then shop talk. " Man we need a machine to do this for use" After finding this in a search I think our dreams are about to come true. I just have a few noobish questions.

In our shop I am sure we can build the rig but when I showed this to the shop guys they asked.

What kind of stepper motor and what are those? Threader robs or something?

Question 2 was how do we convert our paterns to something that this KCam program can use?

I am sure with the staff we have we can build this and the stepper controls in <http://www.instructables.com/id/Easy-to-build-CNC-Mill-Stepper-Motor-and-Driver-ci/>

Any help on teaching us old folks would be great!



**Tom McWire** says:

Sep 17, 2008. 8:12 PM [REPLY](#)

I'm afraid I haven't had the time to address many of the concerns of my readers but I'll do what I can. Many times other readers will give help. I think that's great.

Even if you build this thing and later find out you need something more you haven't really invested a lot of money in it and the parts you have are still usable. I think it's a great project to start learning CNC.

Tom



**Randy Lahey** says:

Sep 17, 2008. 6:33 PM [REPLY](#)

Maybe this machine might fit in a little better in a wood shop.

<http://www.instructables.com/id/How-to-Make-a-Three-Axis-CNC-Machine-Cheaply-and-/>



**marcwolf** says:

Sep 17, 2008. 6:10 AM [REPLY](#)

Thats is truly brilliant

I like the way you held the tables on using ball wheels. And also using a piece of rubber to stop vibrations between the table and the motor is good too.

Looking forward to more of your examples

Dave



**quadomatic** says:

Sep 13, 2008. 7:48 PM [REPLY](#)

I saw this and I am very amazed! It look really great. Just wondering about 2 things (pretty n00bish questions actually).

1st, if you etch PCBs from copper clad boards with this, what do you do to get rid of the copper outside of the etched traces?

2nd, can anyone who built this tell me how much all the parts costs (stepper motor driver and mill, not including the cost of the dremel/drill tool)? I don't have a whole lot of funds, but I think I'd be willing to save up.

Thanks



**quadomatic** says:

Sep 13, 2008. 9:54 PM [REPLY](#)

Also, would either of these rotary tools work fine? (my dad probably has others I could use, but I'd just like to know);

[http://www.target.com/Durabuilt-Elect-Rotary-Tool-Accessories/dp/B000SU3YVO/sr=1-2/qid=1221367920/ref=sr\\_1\\_2/602-4028756-3597446?ie=UTF8&index=target&field-browse=3151061&rh=k%3Arotary%2Cp\\_36%3A%2425-%2449&page=1](http://www.target.com/Durabuilt-Elect-Rotary-Tool-Accessories/dp/B000SU3YVO/sr=1-2/qid=1221367920/ref=sr_1_2/602-4028756-3597446?ie=UTF8&index=target&field-browse=3151061&rh=k%3Arotary%2Cp_36%3A%2425-%2449&page=1)

[http://www.target.com/Black-Decker-3-Speed-Rotary-Spring/dp/B0001GUDRI/sr=1-5/qid=1221367875/ref=sr\\_1\\_5/602-4028756-3597446?ie=UTF8&index=target&field-browse=3151061&rh=k%3Arotary&page=1](http://www.target.com/Black-Decker-3-Speed-Rotary-Spring/dp/B0001GUDRI/sr=1-5/qid=1221367875/ref=sr_1_5/602-4028756-3597446?ie=UTF8&index=target&field-browse=3151061&rh=k%3Arotary&page=1)



**viacin** says:

Sep 13, 2008. 5:34 AM [REPLY](#)

I like this design...simple, cheap, easy. I program and run cnc's for a living, and I'm very satisfied with this little gem. If you're into PCB work, this sure beats drilling 100-200 holes on a drill press.



**Darkstar64** says:

Sep 11, 2008. 1:33 PM [REPLY](#)

srry for the double comment but I would really like to know if you are able to CNC a model just downloaded from the Internet from like free model site's etc just because I know MasterCam X is no able to do it because its not made in a CAD program but in a Blender or 3DSMAX just because there are some things ive been looking to cut but have been unable to do it and I have 4 CNC machines at my disposal plus this one 3 of them are not DIY but are store bought and then the 4th is this one



**Tom McWire** says:

Sep 11, 2008. 8:01 PM [REPLY](#)

Moving from 2D to 3D can be tricky. Check out this site <http://www.stlwork.com/> Your files need to be converted to stl format then a routing path can be determined to cut the shape out of a solid chunk of material.

Tom



**Darkstar64** says:

Sep 11, 2008. 1:29 PM [REPLY](#)

Hey tom I see you have done some 3D CNC ive been looking into that for awhile now is there a way to take a 3D model that you download and CNC it ? ive tried but all I get is that there are no surfaces or solids so im not sure if that's what you did is just download the person or did you make it ? anyways if so can you tell me how you went about doing it ?



**recon506** says:

Sep 8, 2008. 6:43 PM [REPLY](#)

Hey Tom, you seem to know your stuff. I have been working lately on a Dyna 2100 CNC cutter/router. It's an ok machine, but my question to you is whether you know of any compatible CAM software for it? I googled it, but didn't find anything. I need this CNC to be PC controlled to mill extra-precise parts for my battlebot and your help would be much appreciated.

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