

## Easy to build CNC Mill Stepper Motor and Driver circuits

by [Tom McWire](#) on August 26, 2007

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## Intro: Easy to build CNC Mill Stepper Motor and Driver circuits

This is a follow up to the [Easy to Build Desk Top 3 Axis CNC Milling Machine](#) Once you get the machine all put together its time to make it go.

So it's time to drive the motors. And here I've put together a circuit that I think is the absolute cheapest and easiest way to control stepper motors with step and direction signals. It works with many of the free or low cost softwares that produce step and direction signals through the parallel printer port. I'll explain how it works but for those of you who just want to get on with it... [The\\_Next\\_Step](#)

But I would suggest for those of you who are unfamiliar with circuits to do it on a bread board (see pictures). This way you can easily correct any mistakes and try different things.

This schematic is just to control one motor so for the milling machine you need 3 of these circuits and 3 motors.

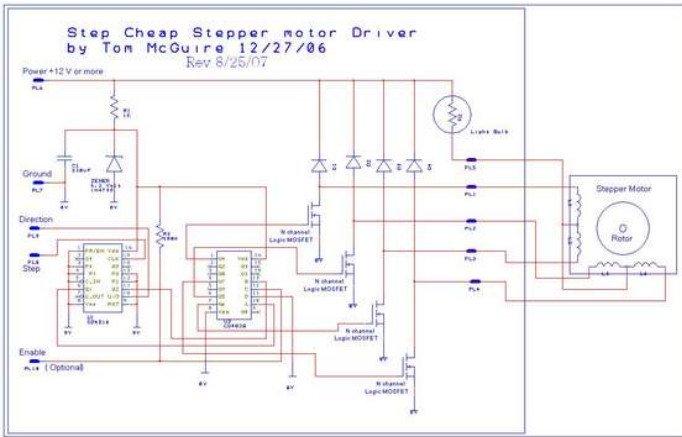
From Left to right and top to bottom. I try to draw schematics so that positive voltages are toward the top and ground or negative volge is toward the bottom. Inputs are to the left and outputs to the right. First off the voltage that you are going to use to run the motor needs to be stepped down and regulated for the logic chips. I used a 6.2 volt Zener to do this because it's low enough for the logic chips to receive the signals from your printer port and high enough for the outputs to drive many of the standard power FETs, so you may not have to use logic FETs like the schematic shows. So the resistor R1 drops the voltage, the Zener diode regulates it to 6.2 volts and the capacitor C1 filters out any noise from the motor, and this voltage powers the two IC's.

The first IC (CD4516) is called an up/down counter. One signal from the printer port will tell the counter if it will count up or down and the other signal, called step, will increment or decrement the counter by one count. Now were only going to use two outputs from the counter Q1 and Q2. With this binary counting method there are only 4 combinations of output from the counter: 00, 01, 10, and 11. These lines are fed to the A and B inputs of the other IC (CD4028) which decodes these combinations to 4 separate outputs.

I did a trick here using the C input to work as an Enable input. If the Enable(optional) is connected to the parallel port and the computer tells it to shut off all of the outputs to the FETs will go low(Off). So the four outputs of the decoder drive the FET transistors and the FETs drive the four poles of the motor.

Now everybody wants to know what the light bulb is for. Its not so much whether you use a bulb or a resistor, its that a bulb comes with a socket. You can get these wedge base light bulbs from 1 watt to 20 watts. Start with may be a 4 watt bulb and if you find you need a little more beef you just pull it out and put in a 10 watt bulb. It's really handy. And I found it's good to have some voltage drop there as kind of a ballast for the motor windings. The diodes catch some of the current that comes out of the motor each time the FET transistors turn off. The diode feeds this current back to the supply.

When you get the circuit up and running find a power supply that puts out more voltage than you really need and then change out light bulbs till you get it running smoothly. Some of my stepper motors are 5 or 6 volt and some are 12 volt but it all works out.



Parallel Port Pin	I/O	ADDRESS	BIT	STATE	STEPPER CONTROLS
1	O	PORT+2	0	INVERTED	SPINDLE RELAY
2	O	PORT	0	NORMAL	X-STEP
3	O	PORT	1	NORMAL	X-DIR
4	O	PORT	2	NORMAL	X-ENABLE
5	O	PORT	3	NORMAL	Y-STEP
6	O	PORT	4	NORMAL	Y-DIR
7	O	PORT	5	NORMAL	Y-ENABLE
8	O	PORT	6	NORMAL	Z-STEP
9	O	PORT	7	NORMAL	Z-DIR
10	I	PORT+1	6	NORMAL	NU
11	I	PORT+1	7	INVERTED	X-HOME SWITCH
12	I	PORT+1	5	NORMAL	Y-HOME SWITCH
13	I	PORT+1	4	NORMAL	Z-HOME SWITCH
14	O	PORT+2	1	INVERTED	Z-ENABLE
15	I	PORT+1	3	NORMAL	NU
16	O	PORT+2	2	NORMAL	M CODE FUNCTION
17	O	PORT+2	3	INVERTED	M CODE FUNCTION
18-25					GROUND

## File Downloads

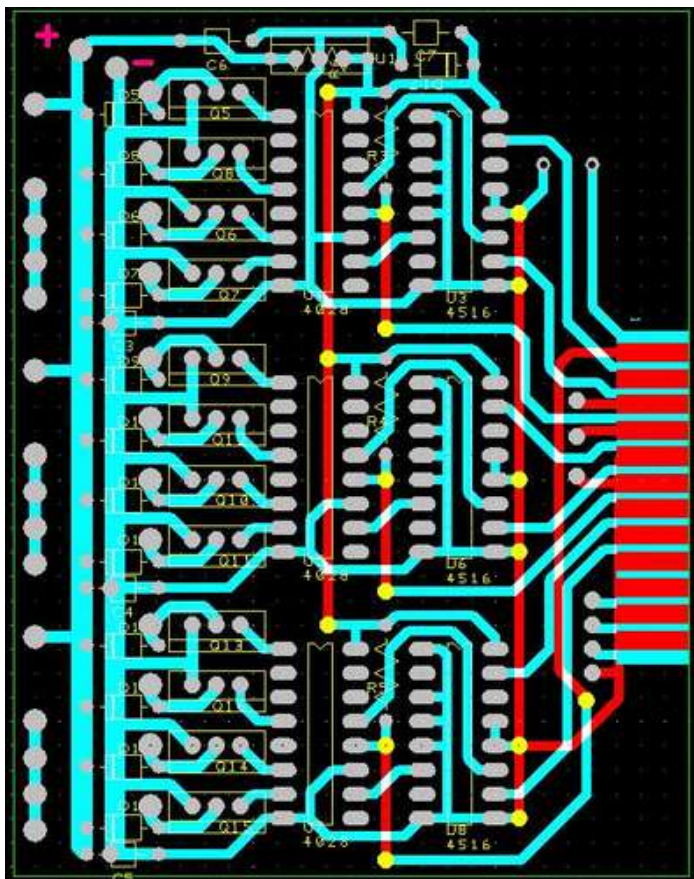
[C:\Projects\Milling\Mill\\_Drive\StepCheap1.pdf](#) (37 KB)  
 [NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\Milling\Mill\_Drive\StepCheap1.pdf']

[C:\Projects\StepCheap3D\\_PCB\\_GodeC.zip](#) (34 KB)  
 [NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\StepCheap3D\_PCB\_GodeC.zip']

[C:\Projects\StepCheapPartsList.rtf](#) (2 KB)  
 [NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\StepCheapPartsList.rtf']

## step 1: The Circuit Board of Appeals

OK here's what your all looking for. I made a simple PC board layout that includes 3 motor driver circuits connected to a 25 pin D sub Parallel printer port connector. Here's a picture of the layout. At the top of the picture you see a place for a voltage regulator. You can use that or you can put a resistor and Zener Diode in its place(like the schematic shows). On the right edge is a place for the 25 pin D-sub connector that connects to the parallel printer port. You just jam the PC board between the two rows of pins and solder it. On the left side are places for the lamp sockets. You need to look over the schematic to see where some of the parts go but it's all there.



## File Downloads



C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3D.zip (16 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3D.zip']



C:\Documents and Settings\Tom\Desktop\StepCheap3DBOT.pdf (30 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Documents and Settings\Tom\Desktop\StepCheap3DBOT.pdf']

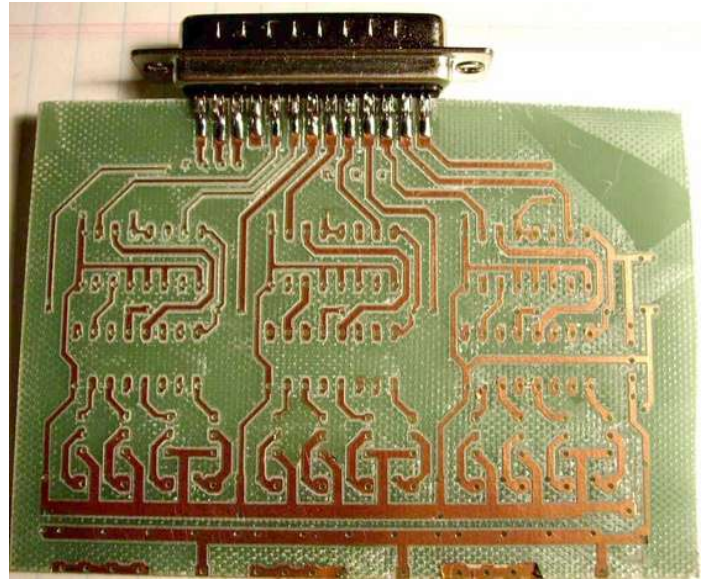
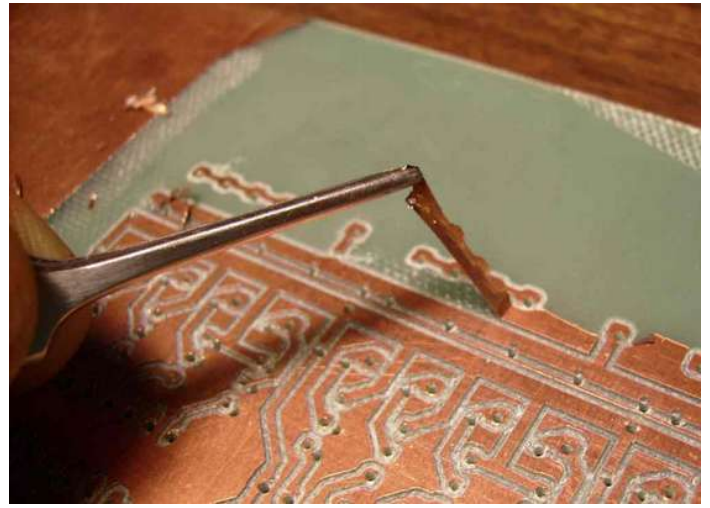
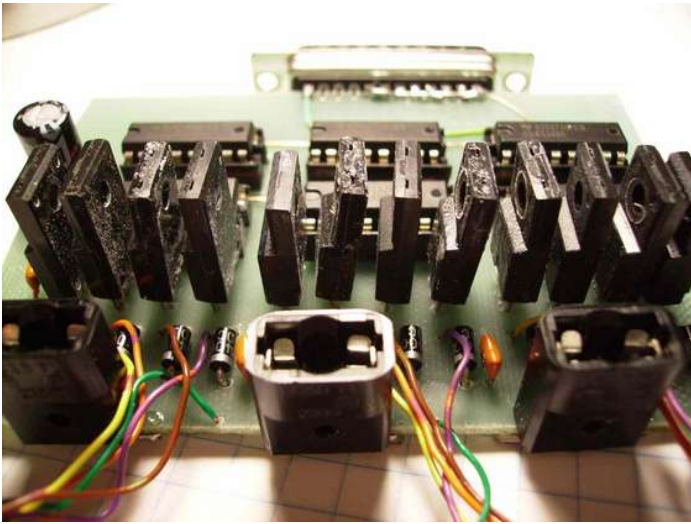


C:\Projects\StepCheap3D\_PCB\_GodeC.zip (34 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\StepCheap3D\_PCB\_GodeC.zip']

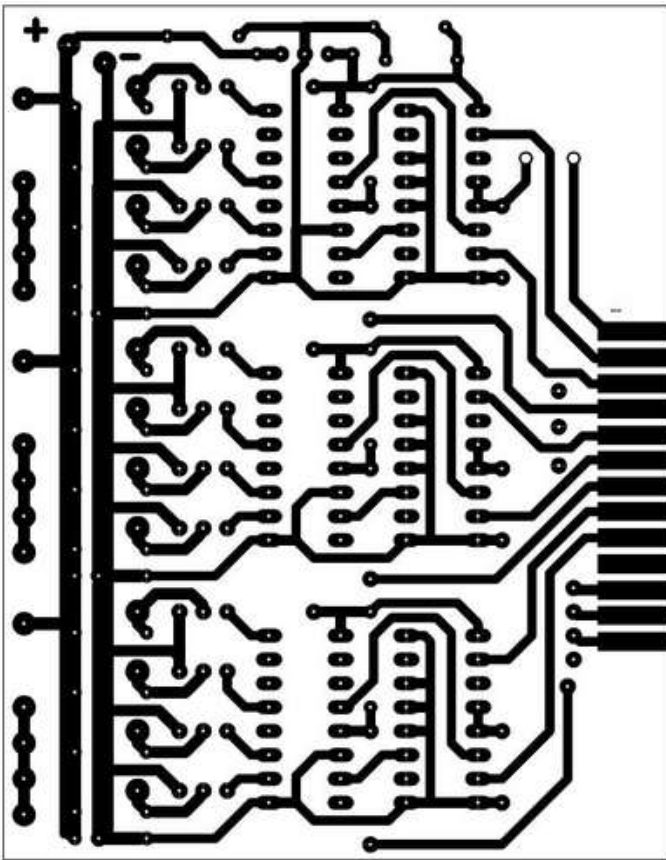
## step 2: Circuit Cloning

If you have a time machine you can go to the future and ask yourself to make the circuit board with the finished machine and then bring it back and finish building the machine. After a couple of tries I got the board to come out pretty good. The machine routes what are called isolation paths which means it separates the copper that is associated with a conductive path from all the other copper around it. This leaves some areas of the board that are not associated with a path still covered with copper. You could leave this extra copper on there but when your soldering it is easy to get solder bridges across the isolation paths and short circuit something. So I take the soldering iron and touch it on the excess copper and peel it up off the board. It makes the board more like what you would get if you chemical etched it or bought it from a board house(see below). Any way look over the schematic and place the parts accordingly. I added a few capacitors along the power lines just for general principals. There were so few traces on the top side of the board I didn't bother milling it. I just used jumper wires. See the pictures below of the populated board. All the little FETs lined up like marching soldiers.



### step 3: Photo Etching a Driver Board

OK, For all you chemistry majors who want to do something a little more professional here are some .pdf files you can print out and iron on or what ever you do to make an etched PC board. There's a Top Silk (just for reference), Top Copper, and Bottom Copper. If you want to go easy Just do the Bottom Copper. There's not that much on the top and you can just solder jumpers where you need to.



## File Downloads



C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3Dsilk.pdf (9 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3Dsilk.pdf']



C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3DTop.pdf (28 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3DTop.pdf']

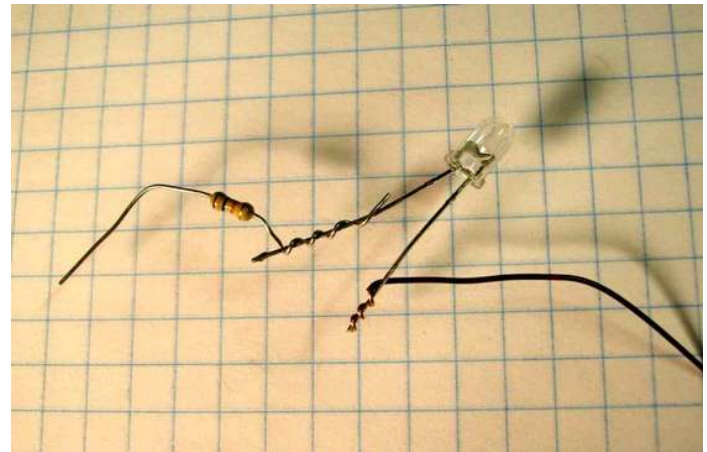
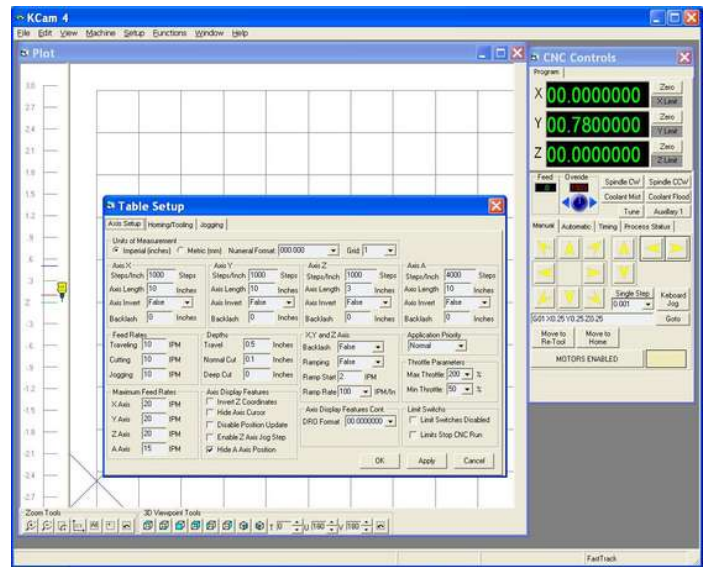
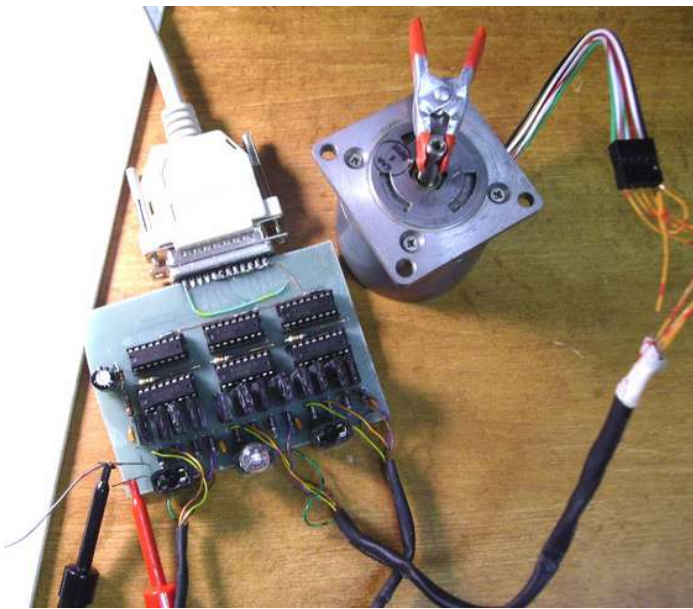


C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3DBot.pdf (30 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'C:\Projects\Milling\Mill\_Drive\Schem-PCB\StepCheap3DBot.pdf']

### step 4: TESTING..1..2..3

Don't be nervous. It's just a little electricity. First off it would be good to load up the KCAM (or what ever you plan on using) in your computer. Then when you feel comfortable that all the parts are in the right place plug the parallel port connector into the driver board(as shown below) and put a low wattage bulb in the socket for the motor. In this case I'm using middle, the Y axis driver. For power I like to use one of these universal power adapters with selectable voltage output. They're cheap and they don't put out a lot of current so if something goes wrong it's less likely to damage your circuit. Set the voltage low and see if you have some voltage on the power pins(16) of the CD4516 and the CD4028. If you don't have a volt meter just take an LED and tie a 10K(BRN,BLK,ORN) resistor to the positive(the long leg) and wire to ground tied to the negative(the short leg). Now you can use this as a probe to see where you have voltage. It will be very dim but we don't want to draw too much current away from the circuit. Now go into the computer program and find the Setup Table. Set the steps per inch to 1000. Then open the CNC control and set the single step for .001 inch and activate the single step mode. Now each time you click the yellow arrows (up and down for the Y axis) the computer will output one pulse to the stepper motor driver circuit. Put your LED probe on pin 10 of the CD4516. This is the up down input. When you click the up arrow the input will be low(LED off) and when you click the down arrow the input will be high(LED on). Pin 15 is the step input you will see a very short blink each time you click a n up or down arrow on this pin. Pin 6 is the Q1 output. It will change state(high/low) each time you click an arrow. And Pin 11 is the Q2 output. It will change state every other time you click an arrow. On the output side of things we should see some activity on the CD4028 chip. Putting your probe on any of the output pins 1,4,6,or 7. These outputs drive the FETs. You should see the output go high every 4th time you click the up or down arrow. If this all makes sense so far it's time to get the motor running. The common wire or wires of the motor which are the center tap of the windings should be connected to the light bulb. The other four wires should go to the four FETs on the circuit. If you are really lucky you will get the combination just right in the first couple of tries. Other wise just keep switching the wires around until the motor steps in the same direction each time you click the arrows. Watch the video in the next step. It may give you a better idea what to do.



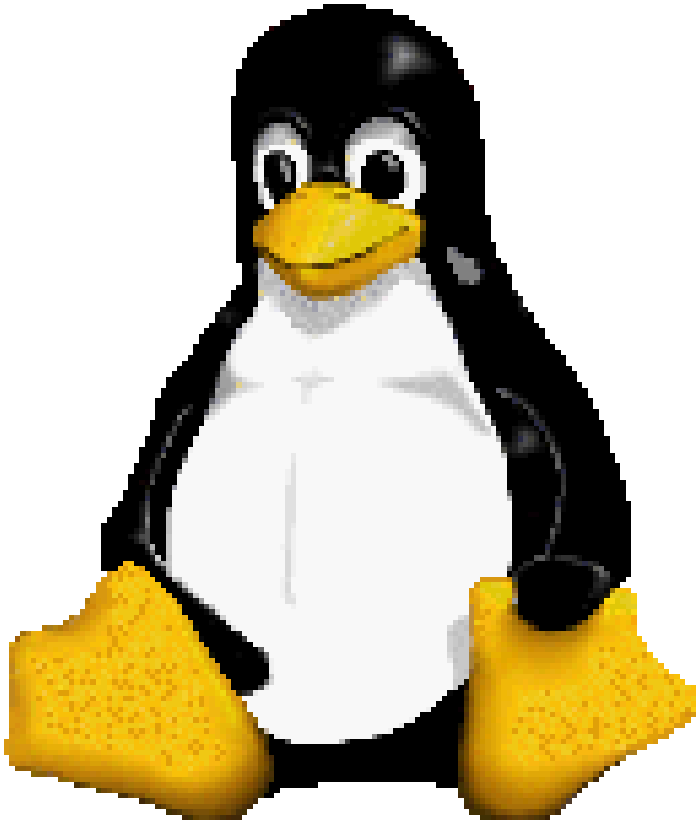
**step 5: Let's Watch it on TV**

I just like watching a video better than doing a bunch of reading. Hope this is helpful. Good luck with your projects. If the movie doesn't show past this link into your browser.

<http://www.youtube.com/watch?v=ZUyqscxLJ4k>

## step 6: Linux Users

I'm not a Linux user yet but I have played with it enough to be dangerous. But for you Linux users Chaddcurtis has contributed some setup files and information to help you use Linux CNC with the parallel port and this circuit board layout. Thanks a lot Chad and more power to you.



## File Downloads



Linux\_stepper.zip (7 KB)

[NOTE: When saving, if you see .tmp as the file ext, rename it to 'Linux\_stepper.zip']

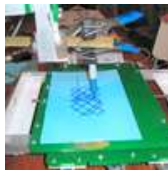
## Related Instructables



**Make your own cnc controller**  
by charcoal999



**CNC (guide)** by  
noahw



**Control a RepStrap (RepRap, CNC, Cartesian Bot) using Processing** by  
marc.cryan



**How to make a mini milling machine- manual or CNC!**  
by Honus



**Mostly self-reproducing 3-axis CNC milling machine(SHELVE PROJECT)** by  
ebidk



**Recycled Stepper Controller Followup (slideshow)** by  
OldVamp



**Easy To Build Stepper Controller from Recycled Materials** by  
murray484




**Make a CNC Hot Wire Foam Cutter from parts available at your local hardware store**  
by tbarnea

# Comments


50 comments [Add Comment](#)

[view all 651 comments](#)


---

 **amitsharma2904** says: Jun 6, 2009. 5:43 AM [REPLY](#)  
hi tom,  
i have constructed the circuite & am using a six wire stepper,as per the supplier the first coil is of brown-white-orange,second one is red-black-yellow ,according the circuite we have connected the brown with pin-1,red with pin-6,orange with pin-7 & yellow with pin-4.  
Still the motor is humming & just jumps forward & backward 1step.


---

 **paintballerf12p** says: Oct 7, 2009. 9:09 AM [REPLY](#)  
From what I have read it seems like you need to play around with the motor connections untill you get al forward or reverse movements. He says in the video your lucky if it goes forward every click the first time... hope that helps.


---

 **coolblue** says: Oct 7, 2009. 7:22 AM [REPLY](#)  
i have a unipolar motor.can someone send me a circuit for the unipolar motor with six wires? thanks

---

 **andymills** says: Oct 2, 2009. 2:47 PM [REPLY](#)  
Hi, I have got some step motors from an old xerox phaser 6250 printer, they say 2.2A 3.75 degree step on them but they only have three wires connected. Inside the casing there are 6 terminals and six coils. I have measured the resistance between each terminal and can't work out what type of motor it is. Heres what I got.  
  
0.5 ohm between 1+3,3+5,1+5  
1.1 ohm between 1+2,2+3,3+4,4+5,5+6,  
1.8 ohm between 4+2, 6+2,6+4  
  
I have spent hours trying to find datasheets with no luck. If anyone can help or point me in the right direction I will eventually be able to build this desktop CNC machine.  
  
Thanks  
Andy

---

 **Rick\_kap** says: May 10, 2009. 4:08 AM [REPLY](#)  
Hi,  
I'm just starting out wih building this circuitry, but i can't find the diagram for the connections to the parallel port.  
Am i missing something??  
Regards  
Rick


---

 **amitsharma2904** says: Jun 12, 2009. 8:36 PM [REPLY](#)  
Hi Rik,  
The x-step i.e 15th pin of ic4516 cable will go to pin-2 of parallel port,pin10of ic4516 to pin-3 of parallel port & pin12 of ic4028 to pin-4 of parallel port.  
Enjoy

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 **paintballerf12p** says: Sep 21, 2009. 10:28 AM [REPLY](#)  
Hey,  
Do you know what the pins are for the y-step and z-step?  
Thanks, Jason

---

 **amitsharma2904** says: Sep 27, 2009. 11:42 PM [REPLY](#)  
Hey Paintballer,  
There are two arrays/sets of 4516 & 4028 along with 4 mosfets for each axis are there, so on the copper side middle one is y & lest most is z.  
If face some other problem plz let me know.  
By



**paintballerf12p** says:

Sep 30, 2009. 11:49 AM [REPLY](#)

HEy, Thanks so much for the reply. I have been able to figure that part out!. I got everything together today to try it out. When i first plugged it in a got a slight humming noise from the x-axis motor, and then nothing again no matter what configuration or axis controller i used. I'm not sure where to go from here. when not plugged into anything besides the computer i'm getting a voltage of 3.35v off each pin of the parallel cable. This number does not change when I click x, y or z steps in kcam.... any ideas? Thanks, Jason



**amitsharma2904** says:

Sep 30, 2009. 12:21 PM [REPLY](#)

Hi Paintballer,

Friend seems like u r using a small motor or the wiring is not appropriate first tell me ur stepper description & wire colors ,after going through it i will try to help u.

Thanks//Amit



**paintballerf12p** says:

Oct 1, 2009. 11:12 AM [REPLY](#)

Hey, Yes, I am using a small motor. The rating is 4v and 1.2 A/phase. The wires are Black yellow green and red white Blue. Here is a link to the data sheet <http://tamagawa-seiki.com/pdf/1648n1ej.pdf>. If you do a search the motor is type number TS3617N2E4. All the specs along with wiring is shown there as well. Thanks so much for your help, Jason



**philwaud** says:

May 30, 2009. 4:16 AM [REPLY](#)

The connectors on the left hand side of the circuit are the parallel port. (ground, direction, step, enable)

Personally, I hooked it up to an Arduino and used that to drive it.



**paintballerf12p** says:

Sep 22, 2009. 6:14 PM [REPLY](#)

Yes, I understand that the connectors on the left side go to the parallel port. What I'm wondering is which connectors go to which pins on the parallel port. amitsharma2904 shared which pins are used for the x-axis. I'm looking for the connections for the y-axis and z-axis. Any help would be greatly appreciated. Jason



**amitsharma2904** says:

Sep 30, 2009. 12:31 PM [REPLY](#)

2,3,4 goes to x,5,6,7 to y



**amitsharma2904** says:

Sep 30, 2009. 12:27 PM [REPLY](#)

r u online???



**lidak4** says:

May 6, 2009. 11:00 AM [REPLY](#)

There is 25 pins on LPT , how can I know what pins numbers for step , direction and enable of the every axis.



**paintballerf12p** says:

Sep 27, 2009. 6:36 AM [REPLY](#)

I have the same question, have you found an answer? Does anyone know what the pin connections are? Thanks



**cassiorichiniti** says:

Jun 5, 2009. 10:51 PM [REPLY](#)

ehh . . . i googled KCAD and got a screensaver for liux and on wikipedia i got a country radio station can any one point me in the rigjt direction?



**paintballerf12p** says:

Sep 16, 2009. 6:09 AM [REPLY](#)

Its Kcam, should be the first google result. You can dl a trial for free or pay \$100 for the license.



**JohnnyVegas** says:

Sep 15, 2009. 7:47 AM [REPLY](#)



**JohnnyVegas** says:  
<http://www.rockstarcnc.com/>

Sep 15, 2009. 11:01 AM **REPLY**

If you go to the link above you can see pics of my version. It looks like a flag :). Flip through towards the middle.



**eaon** says:

Sep 14, 2009. 6:08 PM **REPLY**

has anyone has this problem with kcam

the motors all work fine forward and reverse but,  
when i jog on the diagonal for two of the angles the motors go the same direction.

ive tried playing with the true and false on the ports but that just moves the problem to a different angle

thanks



**Jahguleth** says:

Sep 14, 2009. 12:11 PM **REPLY**

If i want to run the motors manually (without a PC) do I just have to add switches to the Step and Direction pins on the 4516 and connect them to 5V? Or does the PC signal have a specific voltage/frequency required to run the 4516?



**JohnnyVegas** says:

Aug 4, 2009. 1:03 AM

(removed by author or community request)



**wlewis** says:

Aug 8, 2009. 9:35 PM **REPLY**

I forgot to mention in my previous post - To use MACH3 (WHICH IS EXCELLENT!) Connect each and all XYZ enables and accompanying resistors in parallel to pin 15. Lose the Caps.

Separately: Is anybody out there using AutoCad Inventor 2009 - Im extremely dissapointed with it - I couldnt find a most basic command which equivalent in 3ds Max is called GROUP allowing you to Group several objects and rotate them on a given axis. Then when I realized I could maybe design in ASSEMBLY mode I couldnt get extrude to work AT ALL. And this retails for \$999 bucks? Anyway, until I hear otherwise Im heading over to Solidworks. I'll try out inventor 2010 later on - I had to order trial by mail - one of the first things im gonna look for is GROUP. Hopefully Autodesk High Command Black Ops Division will have had the presence of mind (or what have you) to have included an angle option on the hole function.

I mean you have to ask yourself why if 3ds MAX and Inventor are made by the same company do they not take the best functions from 3ds Max and lob them into Inventor??? Or, for that matter, take the best stuff out of inventor put it in 3ds max and call that Inventor. Doesnt make sense AT ALL. The fact of the matter is that where 3dx Max fails miserably (like in Materials and Dimensioning) - Inventor excels at and VICE VERSA. Of course you dont find all this out until youve 4 DAYS DEEP INTO tutorials. Oh sure.. no doubt you CAN get that bearing onto its support but the solution is so circuitous with reference to the other functions it brings you to dead halt.

WILL SOMEONE PLEASE RECOMMEND A GOOD CAD PROGRAM.

Still.. despite CAD deficiencies Im so high from having gotten this driver running that Im on to the MILL "YIPPEE KIYAAAA MOFO'S".

THANKS AGAIN TOM.



**92zx6** says:

Sep 11, 2009. 7:48 PM [REPLY](#)

I would recommend Solidworks, Having used Autocad for the last 16 years, and solidworks for the last 5, what you can do and the quality of the information in solidworks is awesome, I use it at home on a regular basis also, there is not much that I can't design using it. Just my opinion...also with solidworks you also get their dwg editor thats almost exactly like autocad, it can do it all

John Perry



**Taylornator** says:

Aug 12, 2009. 12:03 PM [REPLY](#)

When you say connect the XYZ enables and resistors in parallel to Pin 15 do you mean Pin 15 on the printer port or pin 15 on one of the chips? Also after doing that what are the port settings in Mach3? Thanks



**JohnnyVegas** says:

Aug 4, 2009. 8:02 AM [REPLY](#)

So after some more testing and thought I have come to conclusion this circuit will not remotely begin to produce enough juice to power my motors.

I like do like the concept that TOM came up with. Really clever cheat.

I am moving on to a more beefy solution involving PIC's and LMD's more situated for my motors.

It was fun.



**wlewis** says:

Aug 8, 2009. 8:21 PM [REPLY](#)

Dude... TAKE HEART! YOU KNOW IT WORKS.

I had (UP UNTIL A FEW MOMENTS AGO) the exact same problems and system as you 12v 12A PC power supply / 3 NEMA 23 motors rated at 3A max no voltage rating though - had to find that trial & error. Then the bulbs would either flash and shut off or would light and motor wouldnt run. Translate to 1 whole day chasing down bulbs. Exhasperating!!!! If the motors got too little or too many amps it wouldnt work so I hooked up 2 x 4watts bulbs in parallel per channel and it worked - premise: bring the resistance down. Then I was confounded cause I could get 2 channels to work with 1 bulb hooked up in serial to x and y but no still no Z channel. So back to the drawing board. Upon inspection.. I realized "to my disbelief" I put the Z CHANNEL IC'S IN BACKWARDS! How the hell do you do that??? Ok.. took'em out put em back in figured I had to do that anyway.. I had uhmmm ehrrr accidentally drilled a hole into one of the IC'S - the 4028 to be exact. Anyway hooking up 4 watt bulbs in parallel brought the resistance down and it did the trick. Using a PC (computer) power supply rated at 12v 12amps was necessary. Using a 12v .5amp didnt get enough juice to the motors except for 1 channel. Furthermore, I was plagued by pcb problems cause I used hewlett-packard inkjet paper on a laser printer - wrong - this paper got spunk all over my neighbors iron - uncool. Also, when I went back to the copy center the laser machine they used to print the artwork on was "out of commission" Hmmm interesting... I managed to levitate and spin and got the hell out of there. By the way, I had to sand the spunk off my neighbors iron with at least a 60grit sandpaper but it was worth the expression on my neighbors face to see their iron looking so "oddly different": Chalk that up to Collateral Damage. Anyway.. despite this I managed to get most of the tracks on the board but had to use a permanent magic marker to make up for missing tracks. Note: Next time do the National Geographic trick. Ok then the problem was getting the motor cables in the right sequence. After hundreds of combinations owing TO LACK OF DATA!!!! I hooked up the cables so that IC4028's pin 1 and 4 (as if making a big loop) are connected to the outter ends of the motors A and A - Then B and B to pins 2 and 3. Referencing Bazooka's bipolar setup caused me some delays in my approach thinking it was 1234.. I had to go back to the schematic.. its definitely a 1-3 / 2-4 using unipolar motors or 1-4 / 2-3 setup which is how its working now. I'll try 1-3 / 2-4 again combo nonetheless. Keyword: Combo. Next... I couldnt get this driver working using KCAM v4. So I switched over to MACH3 and VOILA!!!! HAPPY JUMPING JESUS it ran like a chimp on steroids. HELL YES SHERLOCK!!! IT WORKS. Anyway.. seeing as how your pcb checks out and you evidently have enough power... your problem is either your bulbs or your cable combination.

STICK WITH IT.



**eaon** says:

Aug 14, 2009. 9:34 PM [REPLY](#)

i have a query.

i made the circuit and it works, but it only works with a PC power supply and using the 12v were its needed and replacing the 6vzenner part with the 5v from the power supply,

but the circulate need a little more power oomph for steppers so....

would it be best to get a.

24v - 5v dual output power supply that's around 120w - 4A

or

a new PC power supply with more Amps say the ones that have 2x 12v outputs that are 18Amps each

thanks



**JohnnyVegas** says:

Aug 15, 2009. 7:00 PM [REPLY](#)

This is the issue I had also. My mortors won't even begin to move till they recieve 24v and the ideal is 36v . When I pumped this into the first cuit it fried. I forgot to increase the wattage on the powerline resistor. So I built a second one to better spec but it's just not the best circuit for big steppers. My next test was going to do just that, direct feed the power to see what happens.



**eaon** says:  
the way i fixed mine was

Sep 11, 2009. 2:21 AM [REPLY](#)

i got a new pc power supply that's around 24amps  
and as pc power supplys only let out the amps being consumed i used 40watt bulbs which draws more juice into the motors :).



**eaon** says:  
has anyone has this problem with kcam

Sep 11, 2009. 2:16 AM [REPLY](#)

the motors all work fine forward and reverse but,  
when i jogg on the diagonal for two of the angles the motors go the same direction.

ive tried playing with the true and false on the ports but that just moves the problem to a different angle

thanks



**hanscordoba** says:

Aug 21, 2009. 8:24 AM [REPLY](#)

The concept is brilliant. However, my question is: how is the board connected to the pins of the 25 pins parallel plug? I would appreciate if you could answer as I'm a novice.

I'm using the IRFZ44 fets because of the very low Rds(on) of 16 mOhm

Thanks

Hans



**omnibot** says:

Sep 9, 2009. 1:43 PM [REPLY](#)

Hi,  
Step 1 says "You just jam the PC board between the two rows of pins and solder it."  
:)



**elnaz laklari** says:

Sep 7, 2009. 10:32 AM [REPLY](#)

hello  
Can someone tell me the values of those capacitor which are near diodes c6 and c5 and so on. Can't find them anywhere. please send to leila\_laklar@yahoo.com thanke alot.



**BigRedRocket** says:

Aug 13, 2009. 7:41 PM [REPLY](#)

I have an odd problem. I got the circuit built and the interface from KCAM works perfectly. I've checked all the pin outs throughout the circuit and everything seems to work great.

The problem is that the servo motor takes full steps when going in one direction and then when reversed it first takes a half step, then full steps. Strange. I am guessing it is a problem with the servo motor. Any Ideas?

The servo is 12V and it is only pulling .11 Amps. The lightbulb doesn't light.



**joro** says:

Aug 7, 2009. 7:57 AM [REPLY](#)

Hi, this schematic can we go without controller or he need a maxstep controller? Sorry for my bad english.



**terabyte000** says:

Jul 21, 2009. 2:10 AM [REPLY](#)

i first would like to thank you for posting a wonderful guide to cnc your Instructable is what first inspired me to make my own cnc, and i would like to say that guys like you are what makes Instructables such a good website. and lastly i had a question for you guys, i am new to building circuit boards so please forgive me if this is a stupid question, i am going to be using three 3.5v 1.5 amp six wire stepper motors. and i am not sure if i need to modify the circuit at all in order to support this much amperage as i believe this will draw a total of 4.5 amps. the other question i had is the light bulb socket is no longer stocked by digikey do i need it or can i just leave it out of the circuit?.

P.S i forgot to mention i am including a picture of the stepper motor i am not sure if it will be of any use but seemed appropriate.

Thank you in advance for taking the time to read this

Best regards Mike.



**JohnnyVegas** says:

Aug 4, 2009. 7:59 AM [REPLY](#)

I am using 3v - 3amp motors with no luck. I believe you would need to modify this circuit and also place proper "ballast" resistors in place of the light bulb.

This is for little motors. Nothing serious. Anyone correct me if I'm wrong.



**n9xwp** says:

Jul 22, 2009. 6:01 PM [REPLY](#)

mike,

Good looking motors. I am using motors of almost exact specs. Should work just fine. In answer to your question: If you are using a 12 volt dc supply as per schematic, then you do need the light bulbs to limit the current the motors can draw. I am using a 5volt supply for test purposes. When i go up to 12-13 volt I will add bulbs. The bulbs simply act as a big honking high wattage resistor. By using higher voltage but holding current within safe limits you increase rpm and torque without damage.

g



**terabyte000** says:

Jul 22, 2009. 8:34 PM [REPLY](#)

thanks for the help i think i understand how it works now :) . out of curiosity i have yet to find a data sheet for these motors fortunately the power requirements were printed on the bottom. do you have any idea what the torque/rpm output of these things are going to be?.

Thanks again.

Best regards Mike.



**hector1661** says:

Jul 29, 2009. 12:08 PM [REPLY](#)

Hi, im new at the forum and really liked this project. However i have 2 questions.

- 1) What are the technical characteristics of the step motors?
- 2) do u have a blueprint with the dimensions for the acutal tube frame?

If it helps im building this to help me cut balsa wood for rc airplanes

thks  
Ruben



**Asmodeo** says:

Jul 28, 2009. 8:06 AM [REPLY](#)

Excuse me for the question, but....which transistors (part number) and clamping diodes (D1 to D4) are You using ?

I have etched the board, an I'll buy the materials this saturday.

It'll be a test for some Stepper motors I have lying around.

If they succeed, well....perhaps another CNC router will be born!

Thanks a lot



**16zzundel5** says:

Jul 26, 2009. 6:51 AM [REPLY](#)

Futurlec has incredibly cheap components you just have to be patient!



**gtteclsf** says:

Apr 16, 2009. 10:50 PM [REPLY](#)

Hi, Please can someone tell me for the pcb 2 and 3, what pins to use on the printer port. I understand the first one as it is on the cct diagram but cannot find the table for the other (y, z axis pinouts)

Thank you



**16zzundel5** says:  
this is the whole pcb it controls all three steppers.

Jul 26, 2009. 6:07 AM [REPLY](#)



**paleltuma** says:  
Hi, I got now three bipolar stepper motors. I can't find good controller with D-sub... HELP?  
Motors are 12V, 1.8° and 7,5° steps

Jul 25, 2009. 3:33 AM [REPLY](#)



**paleltuma** says:  
would something like these work?  
<http://www.cs.mun.ca/~rod/Winter2007/4723/notes/motor/motor1.gif>  
<http://www.electro-tech-online.com/attachments/electronic-projects-design-ideas-reviews/30500d1245351513-help-me-bipolar-stepper-motor-stepperdriver.gif>

Jul 25, 2009. 5:10 AM [REPLY](#)



**paleltuma** says:  
hi i got parallel cort where another end is 36 pin and other 25.. Can i use this <http://www.cknow.com/cms/images/parallelcableends.gif>  
Or should I try to find 25-25? Anyways... if i can use 36-25 pin cort how that should be connected on circuit?

Jul 19, 2009. 6:24 AM [REPLY](#)

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