

# FC3920K and FC5539K Automatic Foam Cutting CNC Machines

## Disclaimer

You accept all risks and responsibilities for losses, damages costs and other consequences resulting directly or indirectly from using the automatic foam cutter. FoamLinux is not responsible for any damage or injury caused by the foam cutter or its parts during the assembly or the operation of the foam cutter. FoamLinux designed the machine to be as safe as possible, as long as you follow the assembly, operations instructions and common sense.

If you find anything missing, please contact us immediately at [info@foamlinux.com](mailto:info@foamlinux.com) or call us at 408 838 0698

- Always keep away from all moving parts
- Never touch the hot wire, it may be hot and may also cause electrical shock
- Foam fumes are toxic – always work in a well ventilated area

## Parts

Most parts are exclusively fabricated for FoamLinux including metal parts and electronics. We try our best to keep the price of our machine to a minimum. In order to accomplish this task we sometime use excess inventory parts – some motors may be used. All motors are fully tested prior to being packaged

## Warranty

FoamLinux provides 3 months warranty on electronics and motors and life time warranty on all mechanics

## Training

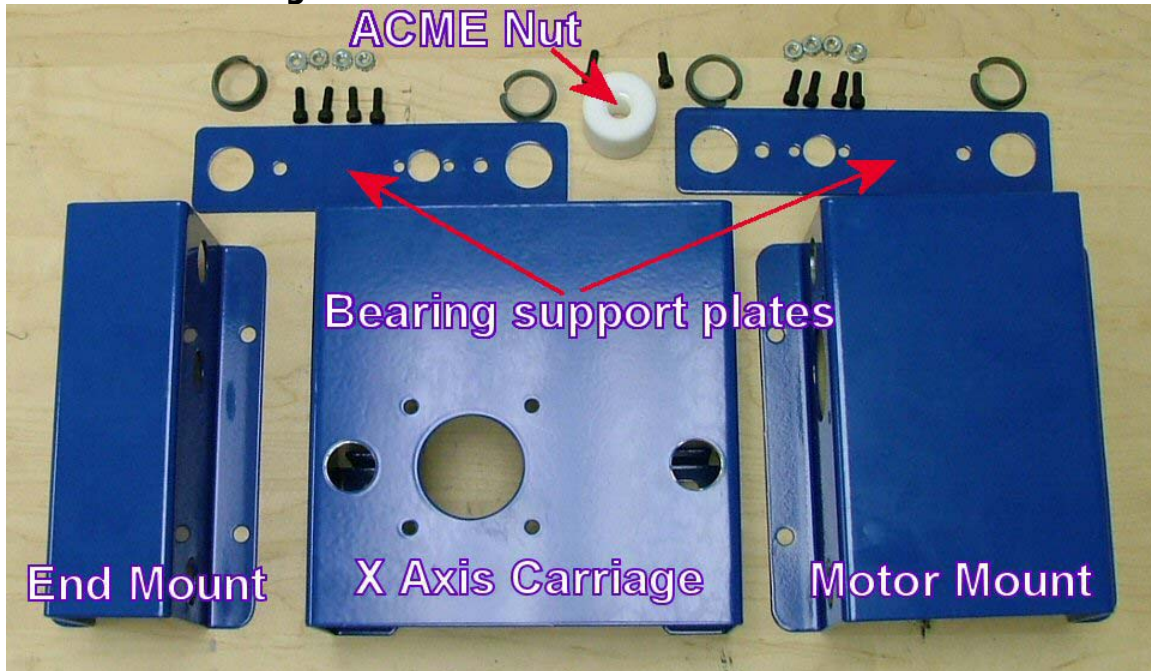
On-site training is available, for more information contact us at [info@foamlinux.com](mailto:info@foamlinux.com)

## FC3920 Foam Cutting CNC machine Parts list

### FC3920 - Foam Cutting CNC machine

Units	Part Name	
2	X axis motor mounts	
2	X axis carriage	
2	Y axis carriage	
4	End mounts	
8	Bearing support plates	
4	ACME nuts	
2	Spring	
16	Washers	
32	10/32 socket screw	
16	10/32 nut	
20	8/32 socket screw	
16	8/32 nut	
16	3/4" bearing	
4	1/2" bearing	
2	Eye hooks + 4 eye hook nuts	
2	Alligator clips and cables	
4	Motor couplers	
4	Board spacers	In Case
1	Electronic board	In Case
1	4 wire cable	In Case
4	High torque motors	
1	Electronics power supply	In Case
1	Electronics power supply cable	In Case
1	Hot wire power supply - 250W	In Case
1	Hot wire power supply cable	In Case
1	Hot Wire	
1	D25 cable	
1	FoamWorks CD - www.foamwork.net	Download
1	FoamLinx assembly manual CD - Jan 2005	Download
1	Temperature controller - 250W	In Case
4	X axis rods - 55" long	In Tubes
4	Y axis rods - 36" long	In Tubes
2	X axis ACME threads	In Tubes
2	Y axis ACME threads	In Tubes
FoamLinx assembly manual		
<a href="http://www.cnclinx.com/FoamlinxInstructions-kit2.pdf">http://www.cnclinx.com/FoamlinxInstructions-kit2.pdf</a>		

### Left X axis and Right Axis slides

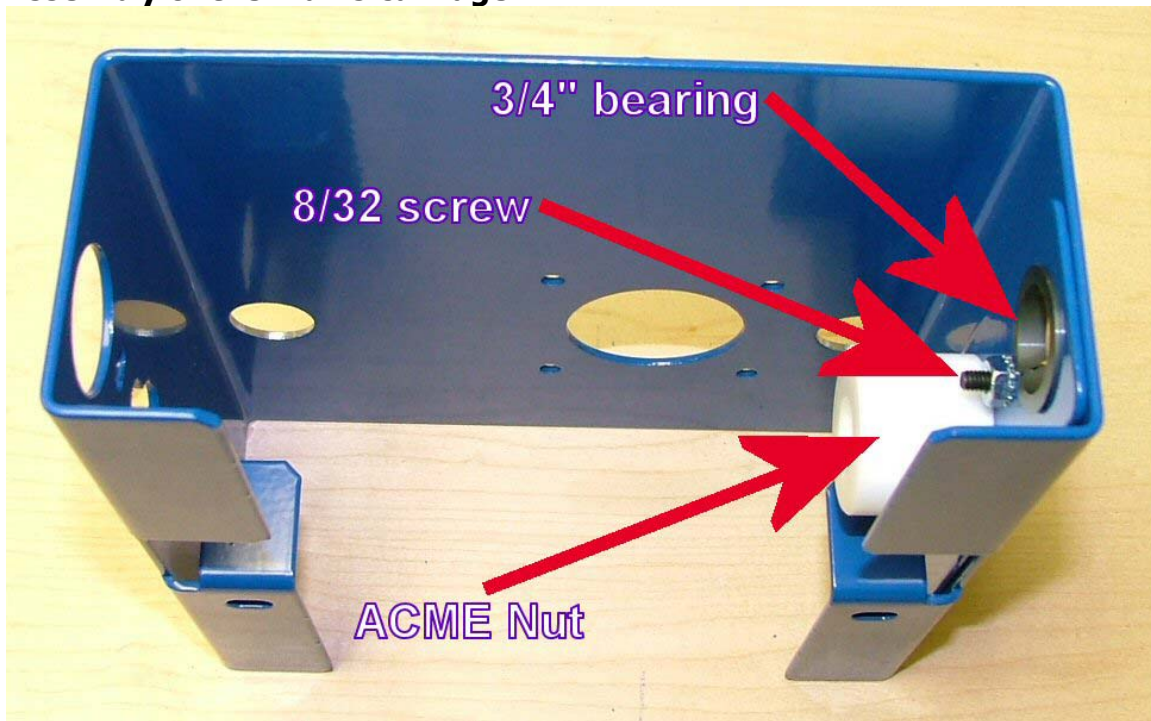


Locate the above parts needed for the right (or left) X axis slide

The following parts are needed for the left X axis slide (same for the right slide)

Number of parts	Description	Remarks
4	$\frac{3}{4}$ " Bearing	
1	$\frac{1}{2}$ " Bearing	Placed on the End Mount
2	Bearing support plates	
1	End Mount	
1	Motor Mount	
1	Acme Nut	
10	8/32 Socket cap screws	2 for the Acme nut
8	8/32 Nuts	

### Assembly of the X axis carriage

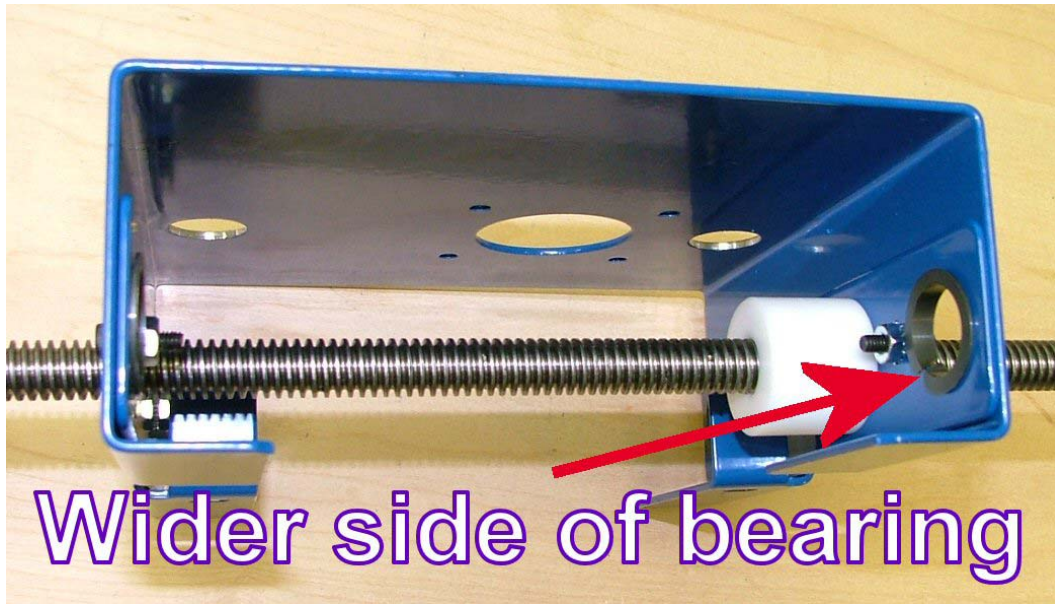


Screw in the ACME nut to one of the bearing support plates using the two 8/32 screws

Screw in the bearing support plate to the X axis carriage with two 8/32 screws



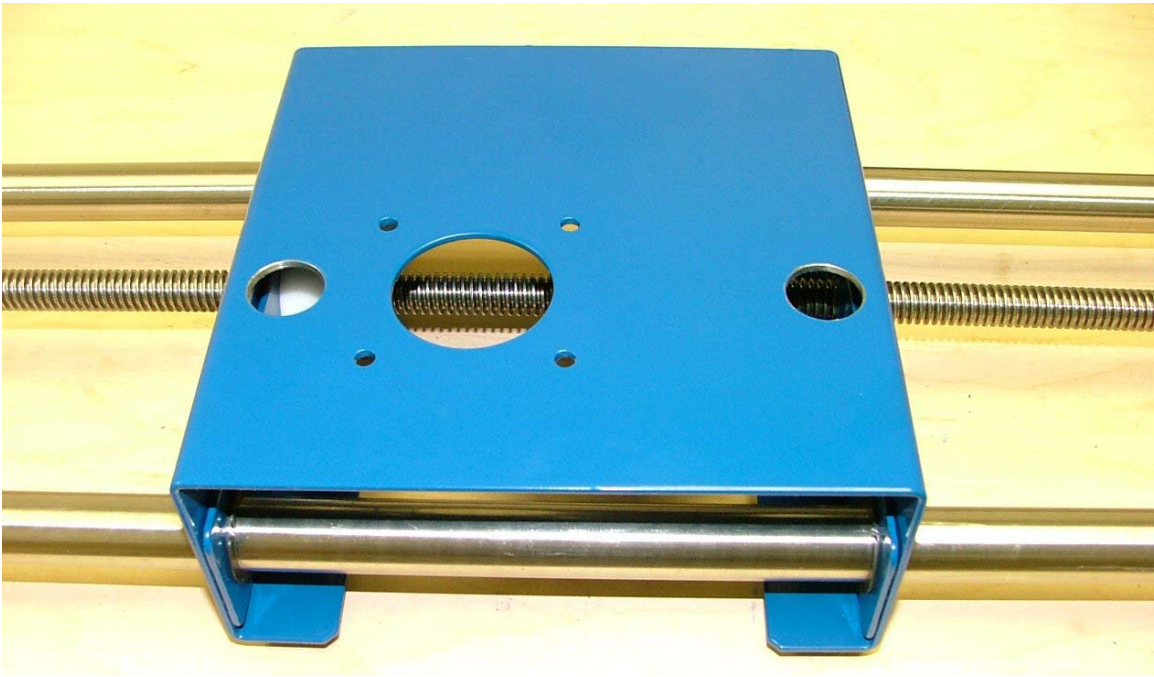




Make sure that the wider side of the bearings face inward to the carriage as shown above.



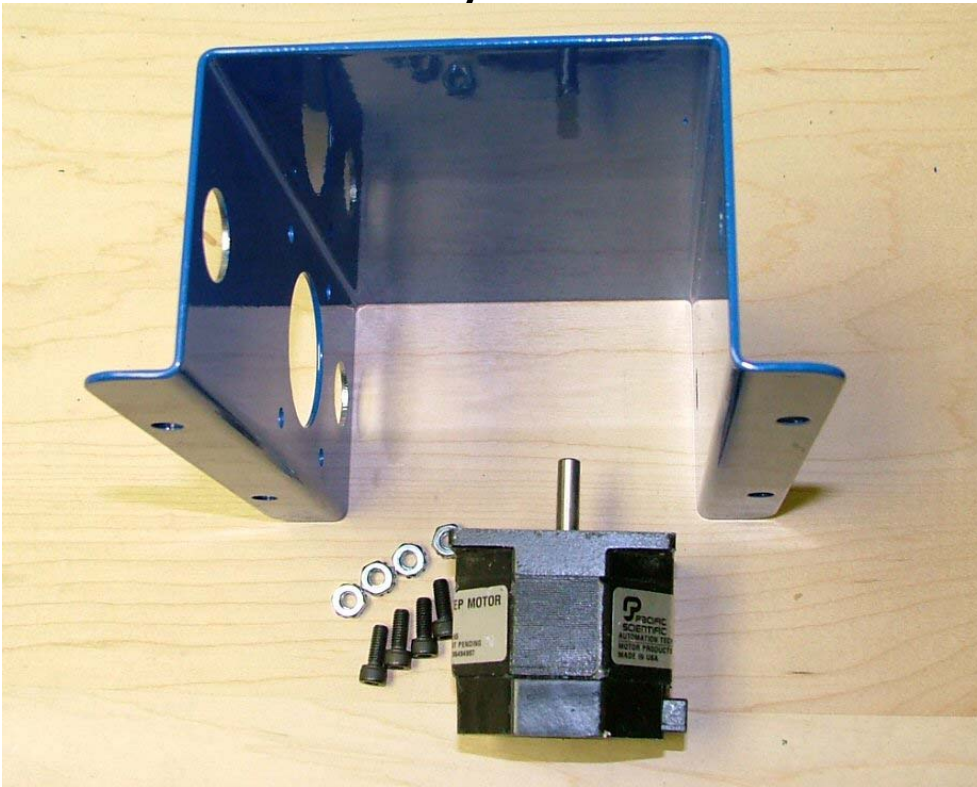
Insert the rods and make sure they slide freely.



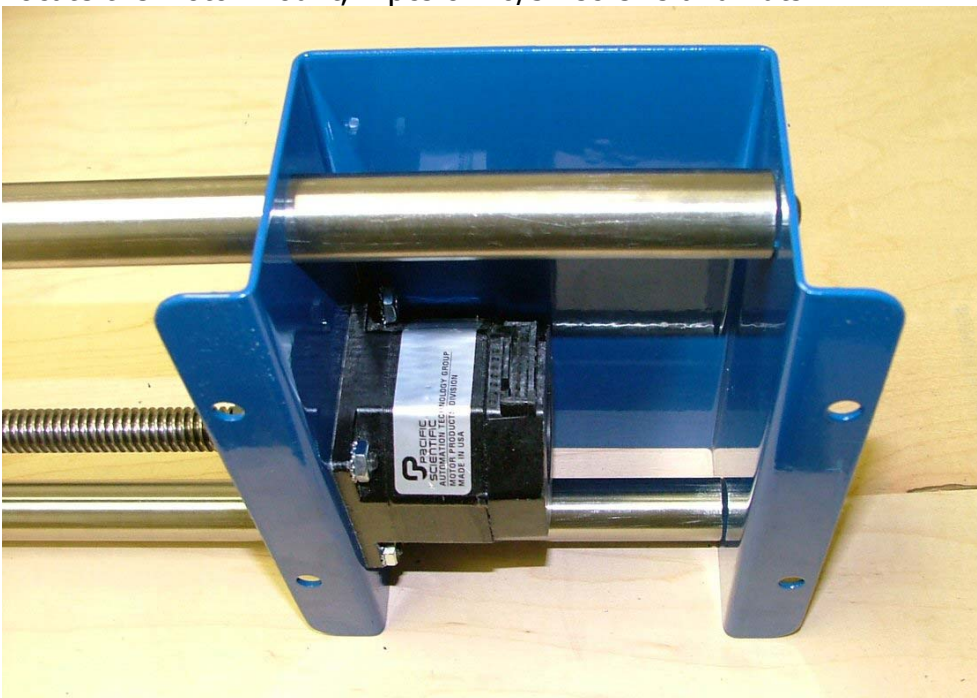
Bottom view of the X axis carriage



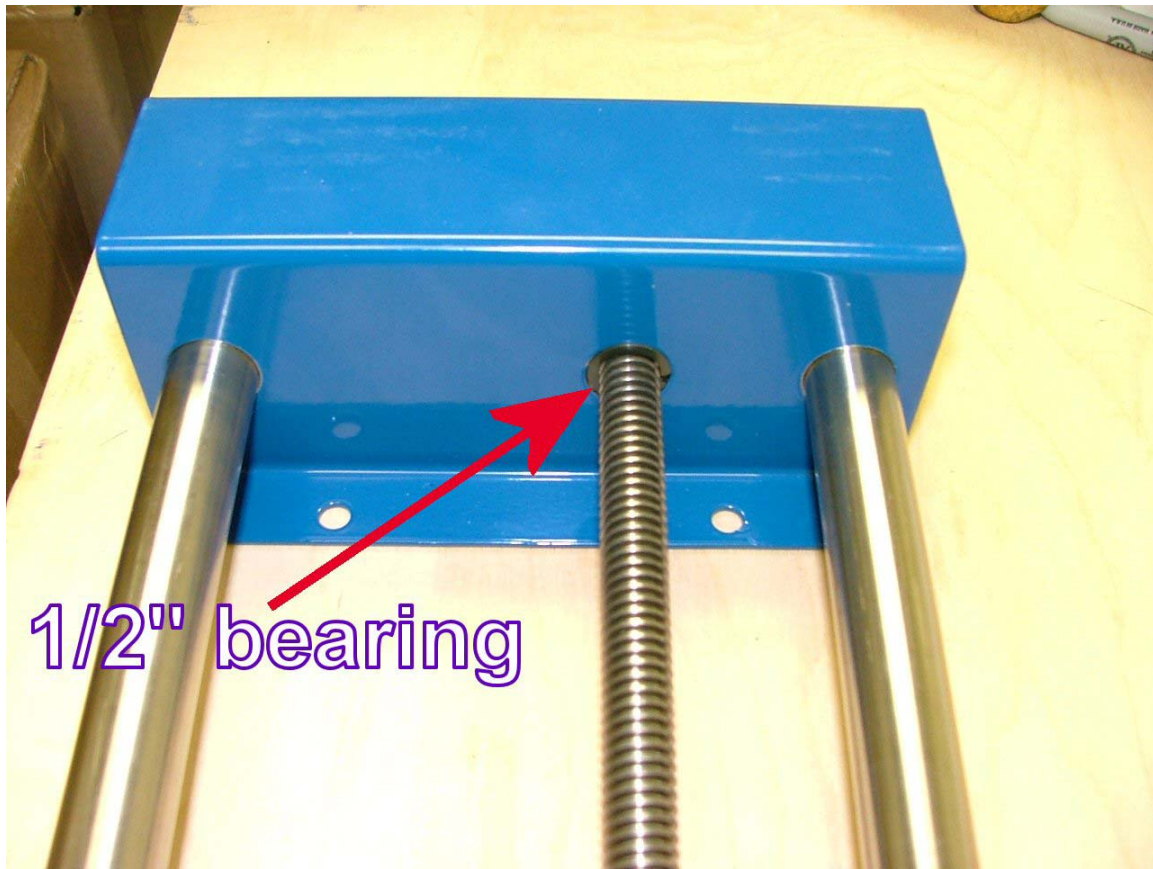
## X Axis motor mount assembly



Locate the Motor Mount, 4 pcs of 10/32 screws and nuts



Mount the stepper motor inside the Motor Mount using 4 10/32 screws



Locate the End Mount and insert the 1/2" bearing as shown above.

At this point the slide should be assembled.

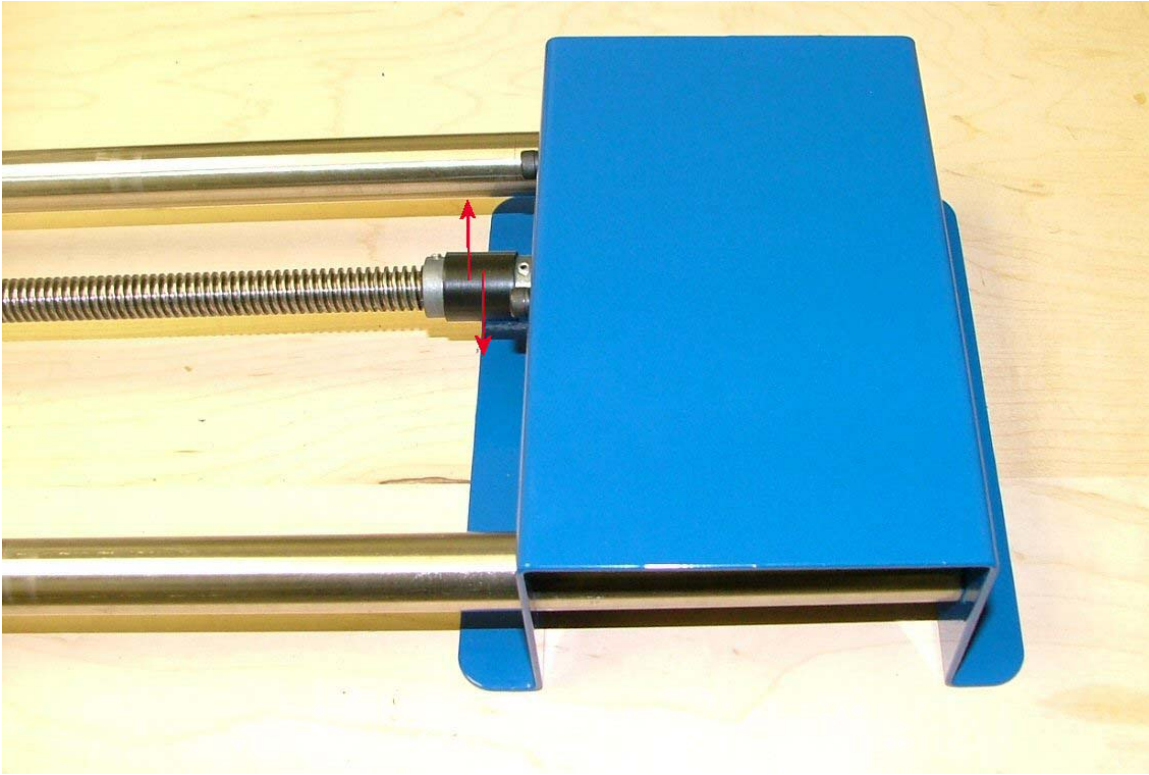
**Adjustments:**

In order for the machine to reach highest cutting speeds, adjustments of the bearing support plates may be needed.

The goal is to reach a point where the friction on the bearings is minimal.

The lower the friction, the faster the machine can cut.



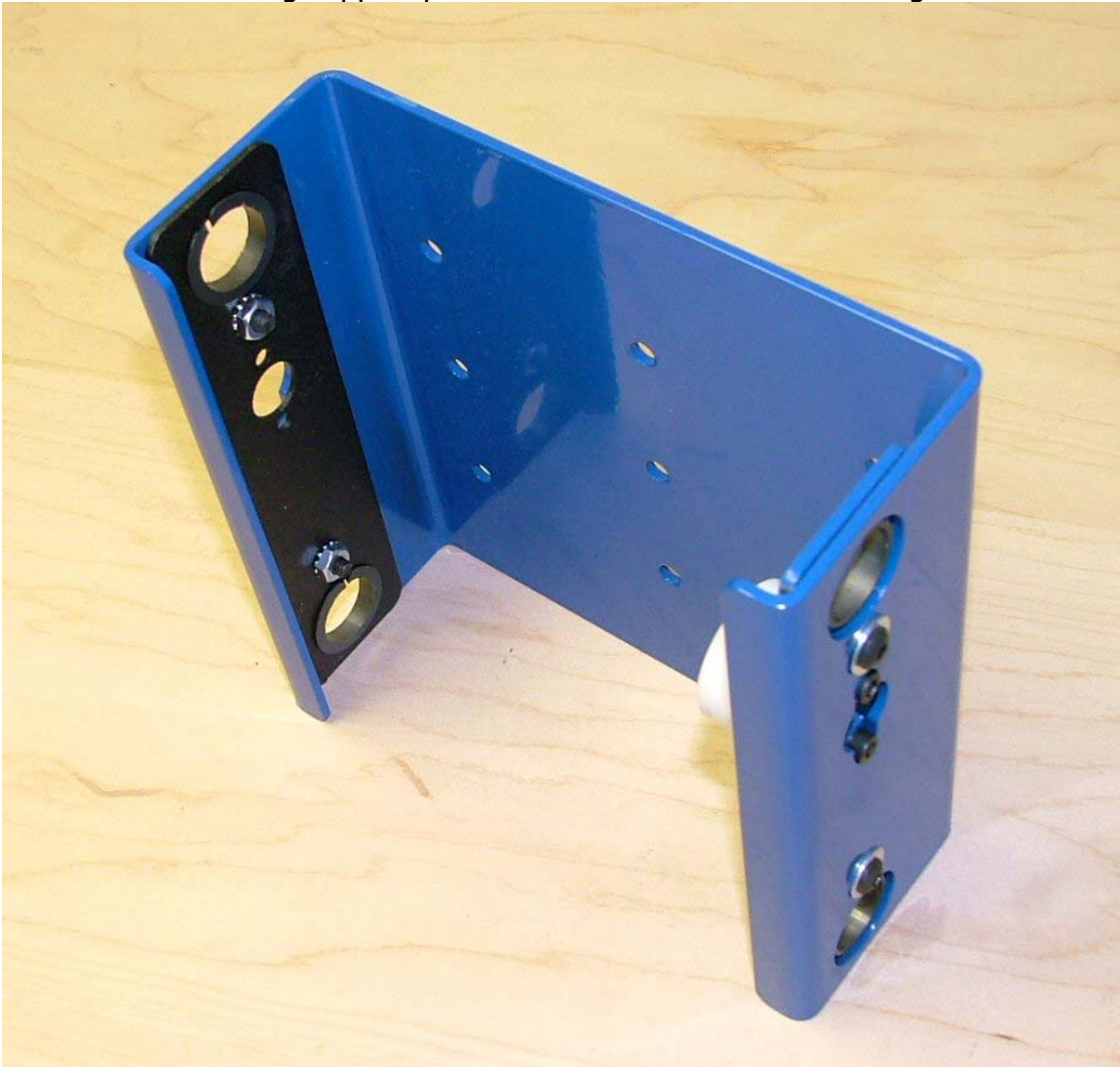


Using your fingers, move the coupler back and forth as shown in the red arrows above. The movement should be smooth.

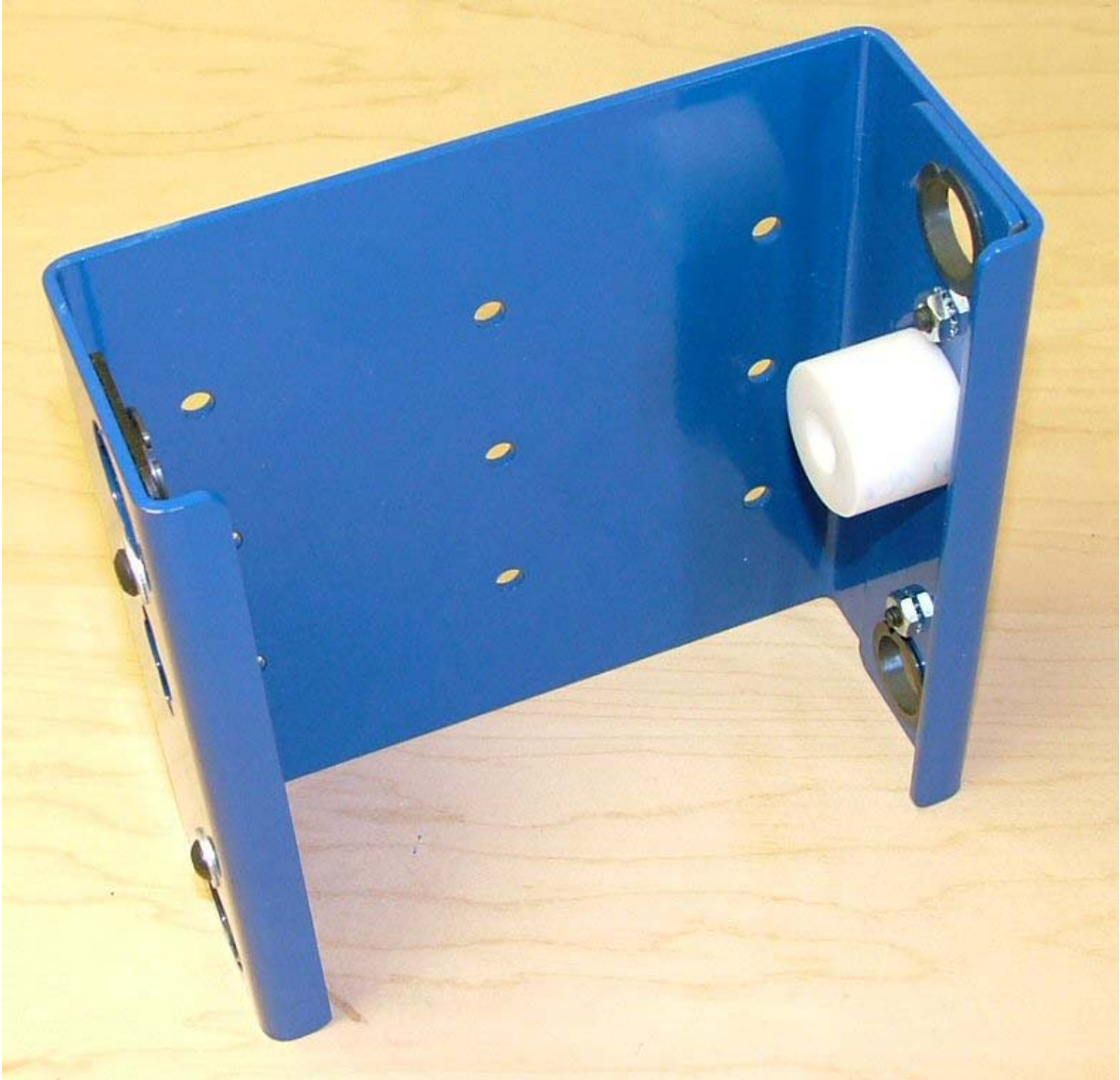
If the movement is not smooth, loosen the 4 bearing support plate screws and try moving the coupler. While moving the coupler, tighten the screws one by one, making sure the movement continues to be smooth.

### Y-axis Carriage assembly

Locate the Y-axis carriage (it should have 9 holes on its front face)  
Assemble the bearing support plates same as for the X-axis carriage.



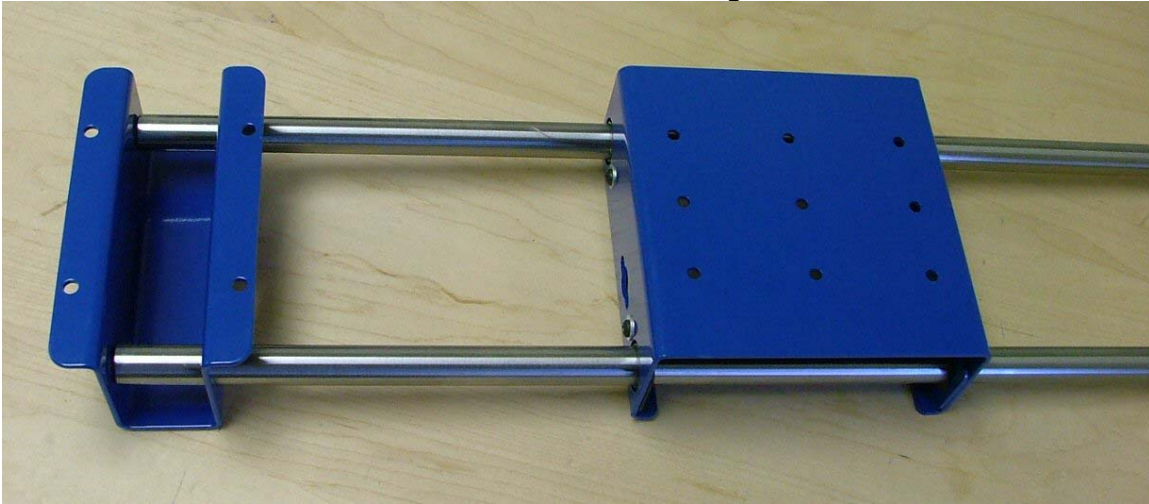
Note: the plastic bearings have a larger side, this side faces the inside of the carriage



Another view of the Y axis carriage – this time showing the ACME nut

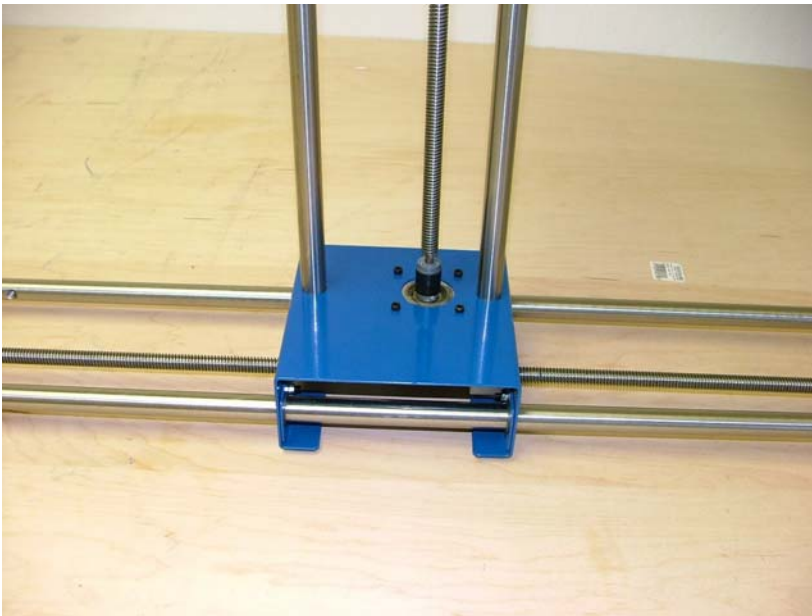


Locate the End mount shown on the left of the image below



Insert the two shafts through the Y-axis carriage.

Screw in the ACME screw as shown below

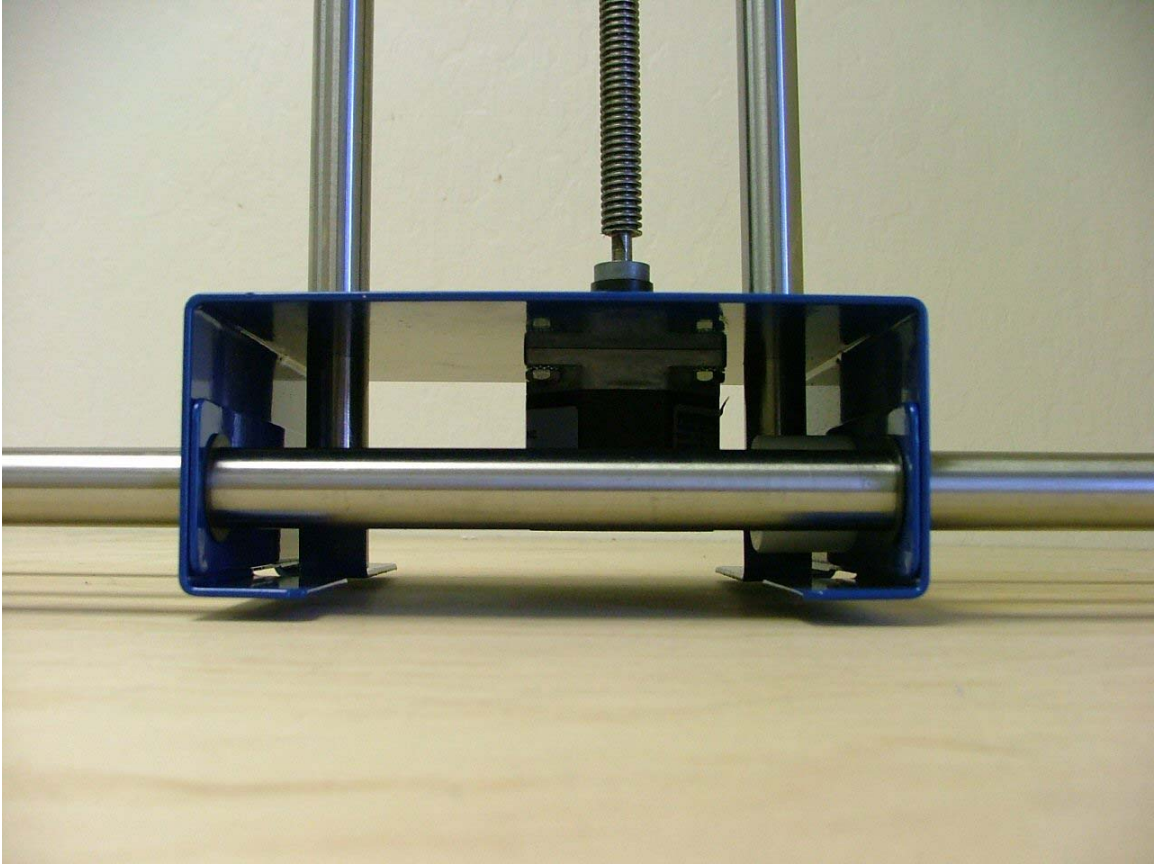


Mount the new slide on top of the X-axis carriage as shown above



The ACME nut can be at the top of the carriage as well, both locations will work.

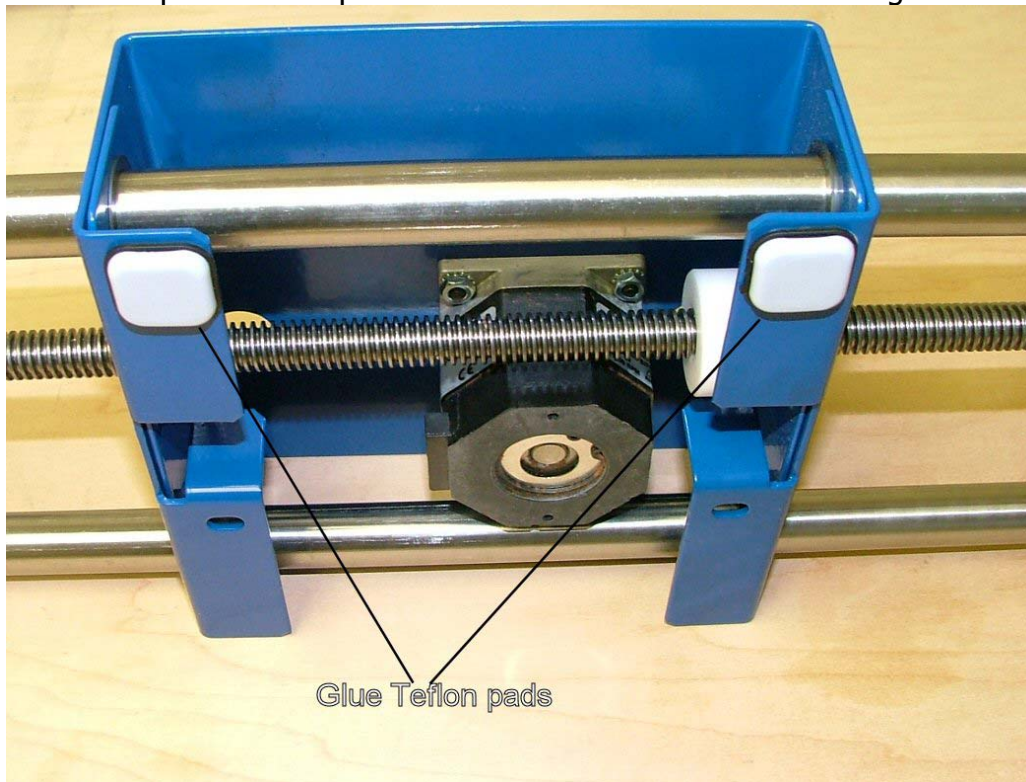




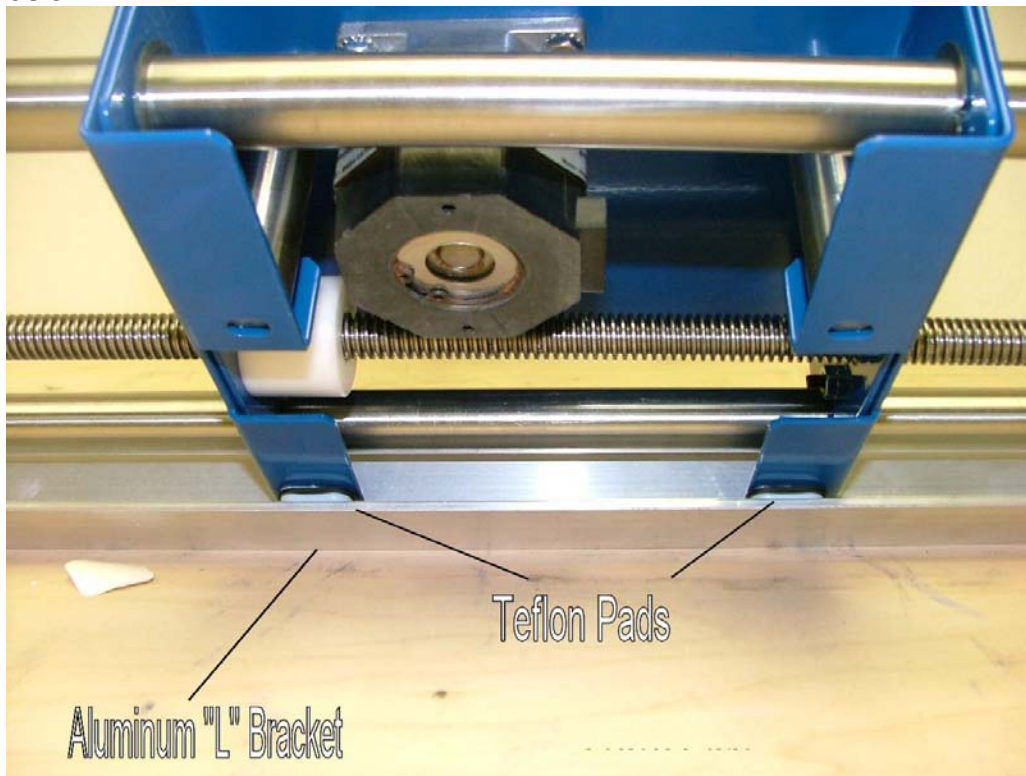
Side view of the Y-axis slide mounted on top of the X-axis carriage.  
At this point, tighten the two screws on the top (on the End Mount)  
And at the bottom  
Assemble the 2<sup>nd</sup> XY system same as the 1<sup>st</sup>.



Glue the square Teflon pads to the bottom of the X-axis carriage



The Teflon pads "glide" on top of the "L" shape Aluminum channel as shown below





## Foamworks Software setup

Download and install 2 programs from <http://www.foamwork.net/download.htm>

#1 – CadWorks, #2 – FoamWorks

**\*\*Restart computer\*\***

Open FoamWorks. Click on “Setup Machine” (on the left side)

Set Lead-in Cut Options>Amount – Inches to “0”

Set Stepper Motor Options to 2400.

Check Reverse X1 Direction

Check Reverse X2 Direction

Under Machine Setup set the Pins as follows. (Assume 1 designates LEFT and 2 designates RIGHT, ie X1 = X Left, X2 = X Right )

X1 Direction = Pin 4, X1 Step = Pin 5, Y1 Direction = Pin 2, Y1 Step = Pin 3,

X2 Direction = Pin 8, X2 Step = Pin 9, Y2 Direction = Pin 6, Y2 Step = Pin 7,

Click DONE (top of screen)

**\*\*Plug in the Controller’s Power Supply cord\*\***

Look at “Manual Control” (on the left side). This gives you several manual modes to run the X and Y axis for testing and adjusting the support plates on the X and Y Carriages.

Confirm that the commands drive the hot wire in the correct direction by using the Single Axis control. “Forward: drives the wire away from you and “Back” drives the wire back toward you.



## **TUTORIAL**

**The following tutorial will lead you through cutting your first shape.**

Cut a 4 foot tapered architectural column, with a 6" d top and 8" d bottom.

This exercise assumes you start with an 4' tapered rectilinear cube of foam, one end 6" x 6" on the left, the other 8" x 8" on the right, positioned left to right between the left and right X/Y towers. You have also used FoamWorks to drive the hot wire into position along its length touching the foam at a 3:00 position looking at the left 6" x 6" end.

### **Open CadWorks**

**1 - File>New (starts a new drawing)**

**Draw a circle of any diameter (select circle icon in left menu)**

**2 - CNC Tools>Prep Drawing**

**3 - CNC Tools>Generate DAT File from Sequential Drawing**

**4 - File>Save>DAT File (save as circle.dat)**

### **Open FoamWorks**

Prepare the Machine

Manually drive the hot wire to a position midway top to bottom and about 10" back from the front of the machine.

**1 - Foam Cutter>Generate Cut File (bottom left of window)**

Locate and load circle.dat for both Left and Right Cutting Towers.

Set Left Horizontal Size to 6 (inches), Set Right Horizontal Size to 8 (inches)

**2 - Generate Cut File (press generate button, top left of window)**

**3 - Save Cut File (Circle.ct1)**

**4 - Done (top right hand corner)**

**5 - Foam Cutter>Start Cut, Cutting Speed Adjustment (Move slider half way to the right)**

## **6 - Begin Cut (upper left hand corner)**

**Note:** You can visualize the cutting action of any item you draw by walking around to the left hand side of the machine and by looking at the X/Y axis. This is the view that will be represented in the FoamWorks cutting window.

Watch as the line segments turn red indication cutting progress.

## DeskCNC software

DeskCNC software enables the user to get more out of the machine

- Higher speeds
- Multiple shapes on one piece of foam
- Cuts directly from DXF

DeskCNC can be downloaded from this link:

<http://www.deskcnc.com/download.html>

To run DeskCNC you will need the 2<sup>nd</sup> generation controller board.

The board connects to the PC via the serial cable (9 pin cable)

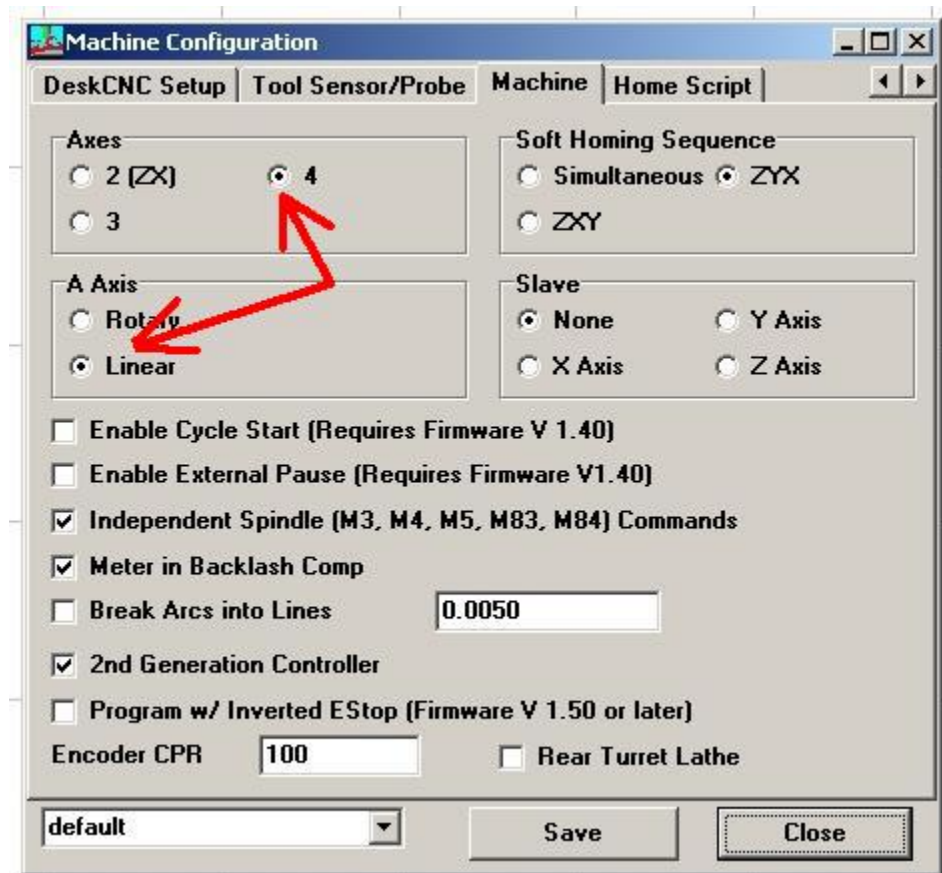
On the other side of the board, a 25-pin cable hooks up to the PC.

It doesn't matter which software you use, the 25-pin cable is always connected to the "Blue" box.

DeskCNC is set by default to run a 3-axis CNC router table. In order to set it for a 4-axis foam cutter please follow the steps below

Click on "Setup", then "Machine"

1. Click on the 4 Axis



2. Click on the Linear A Axis

3. Click "Save"



The image shows a 'Machine Configuration' dialog box with four tabs: 'Axes Setup', 'DeskCNC Setup', 'Tool Sensor/Probe', and 'Machine'. The 'Axes Setup' tab is active, showing settings for four axes: X, Y, Z, and A. Each axis has a 'Home Position' field set to 0.000, a 'Steps per In.' field set to 4000.0000, a 'Max Vel (SPS)' field set to 45000, and a 'Backlash (Steps)' field set to 0. The 'Reverse Homing Direction' checkbox is checked for X, Y, and Z axes, but unchecked for the A axis. Red arrows point to the 'Steps per In.' field for each axis, indicating that all four axes should be set to 4000 steps per inch. At the bottom, there is a dropdown menu set to 'default', a 'Save' button, and a 'Close' button.

Axis	Home Position	Steps per In.	Max Vel (SPS)	Backlash (Steps)	Reverse Homing Direction
X Axis	0.000	4000.0000	45000	0	<input checked="" type="checkbox"/>
Y Axis	0.000	4000.0000	45000	0	<input checked="" type="checkbox"/>
Z Axis	0.000	4000.0000	45000	0	<input checked="" type="checkbox"/>
A Axis	0.000	4000.0000	45000	0	<input type="checkbox"/>

To Reverse Direction, Make Steps per Unit Negative.

default Save Close

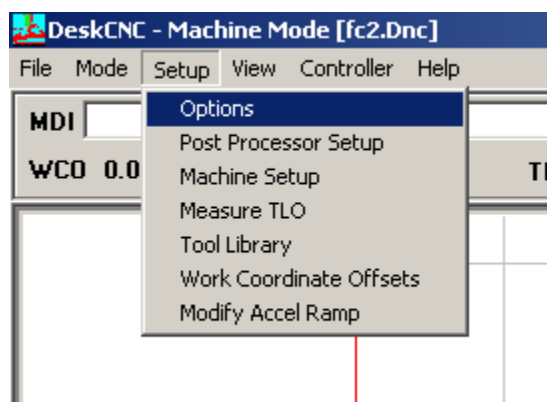
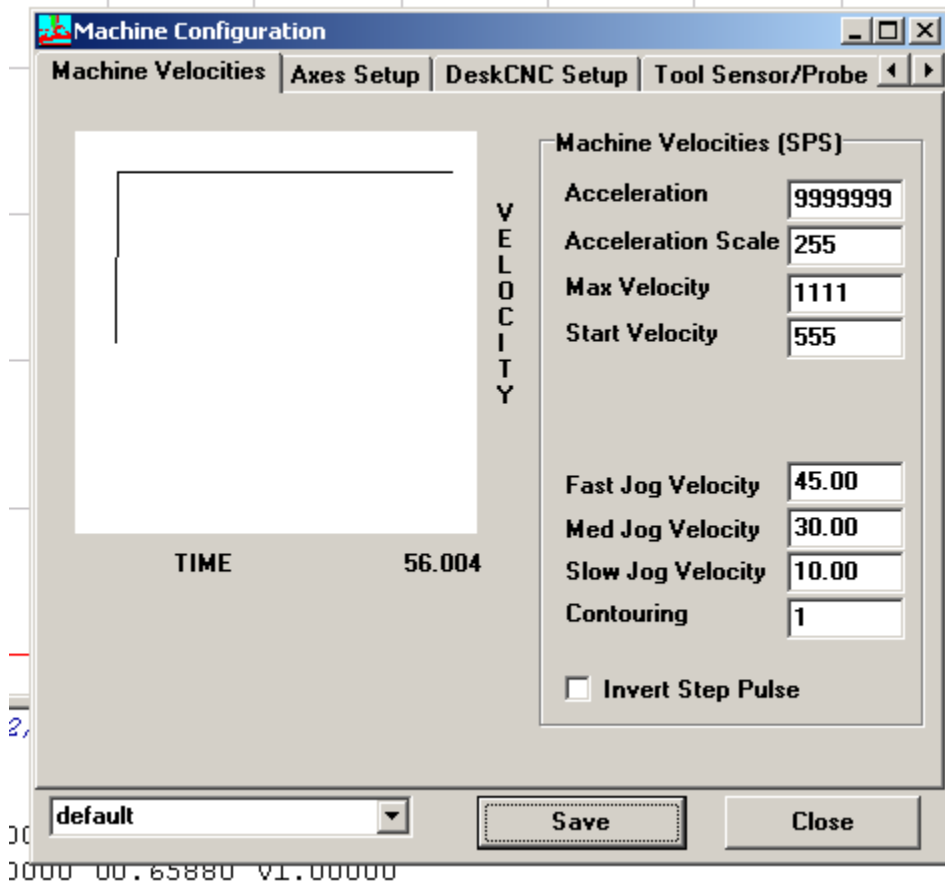
Make sure that all 4 axis are set to 4000 steps per inch

Click "Save"

At this point the machine should be 4 axis operational.

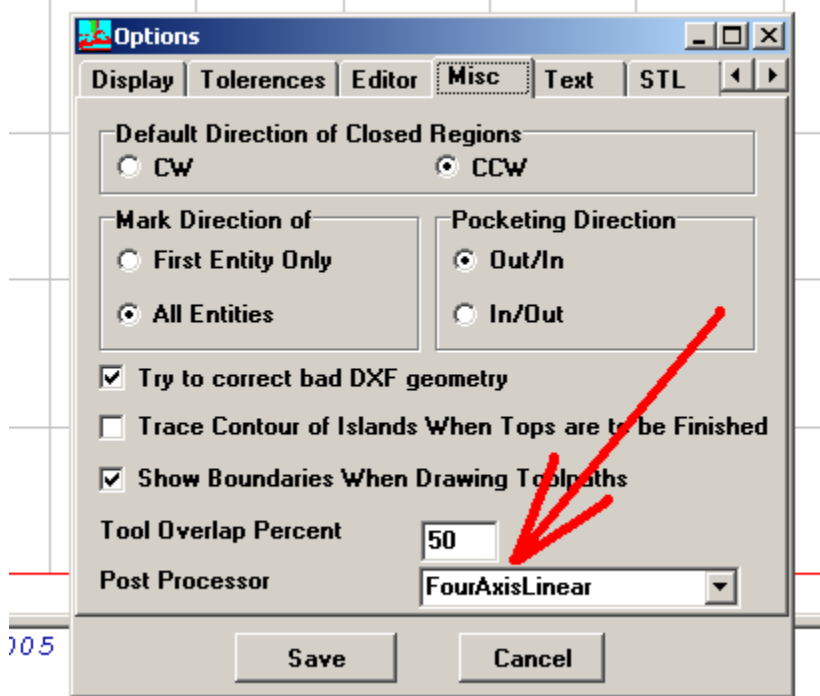
In order to test all 4 axis you will need to manually control each axis.

Make sure that acceleration is set to max and follow the same values as in the screen shot below



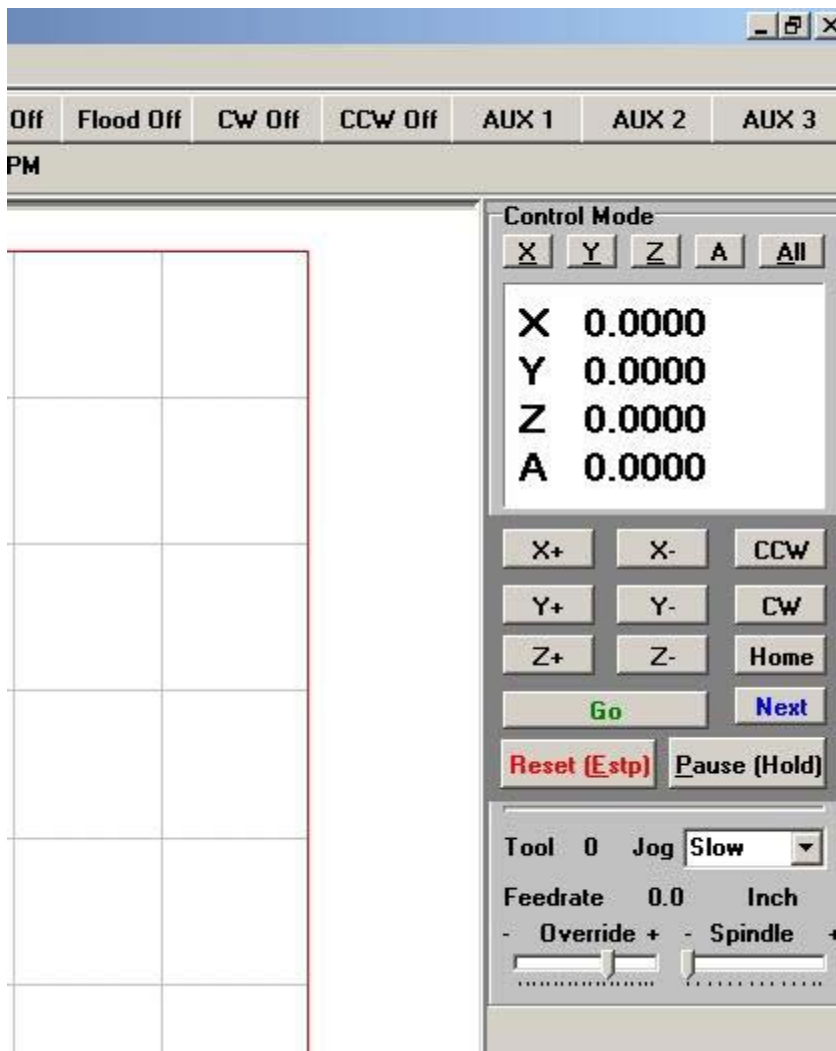
Click on Setup and choose the Options as shown above

In the Options window click on the Misc tab and choose the FourAxisLinear Option for the Post processor as indicated by the red arrow above.



Click on save





Click on “machine” and you should see the screen above.

X and Y are Left X and left Y

Z is really Right X

A is really Right Y

Click on the “Reset” button and you are now ready to move each axis.

Click on the X+ button and the X motor should move.

To run the motor faster, click on the “Jog” -> “Slow” pull down menu

And change it to “medium”, then click on the X+ button

Below are a few tutorials from the DeskCNC web site

[http://www.desknc.com/Wheel\\_Tutorial.html](http://www.desknc.com/Wheel_Tutorial.html)

[http://www.desknc.com/Airfoil\\_Tutorial.html](http://www.desknc.com/Airfoil_Tutorial.html)