Design Details of My CNC Router Table

I began this project around the middle of October, 2008 after being “bitten by the CNC bug”. I had seen several home made routers, mills, etc. on U Tube videos and became inspired to build my own.

I started by researching the subject on the Internet, and learned quite a bit about the subject. Then I started shopping on E-bay for the controller/driver board, stepper motors, lead screws, bearings, aluminum, and cable tracks.

I began with NO specific plans on paper, but just a general desire to construct a table 24”x48” which I thought would be a good general size to allow the tool to be used for most small signs, etc.

I went shopping for my steel angle, and flat stock at places like Home Depot and Lowe’s. I also bought most of the nuts, bolts, and washers there as well.

I have in my home garage the following tools which I used to construct this project: metal lathe, drill press (with an X-Y mill table), drill press vises, bench vise, C-clamps, metal band saw, bench grinder, belt sander, metal chop saw, portable drill, and various end mills, drill bits, and cutters. Also, taps and dies and their holders.

Dial calipers are also an essential tool for precision measurements. Working with Hot-Roll Steel requires one to pay CLOSE attention to details, measuring EACH piece as you go. I was amazed at how much this type of material varies in size from one plane to another, or even one piece to another!

The base frame I started with, I happened to already have a stand constructed of 1”x1” tubular steel. These were from a store display given to me by a friend several years ago. I mounted the two 1.5”x1.5”x3/16”x48” steel angles to this stand, by drilling a single hole into the vertical plane of each end of the angles, and into the 1” frame. I bolted them all together, and naturally since there was no support along the bottom, the whole thing could tilt end to end until it fell over! (Think hinge assembly)

So, I next added two more pieces of angle steel to each side. One about 4” below the top piece of angle, and the other about 12” up from the floor. This made the whole structure very stable, but I still later added X-braces made of 1”x1”x1/8” angle, and 1”x1/5” flat stock for an absolutely RIGID base.

As the saying goes “A picture is worth a thousand words” I will dispense with all this writing, and present you with drawings of My CNC Router in the pages which follow. To answer the main question I am sure many of you will have, my cost (to date) has been about $1900.00 for everything I have purchased in building this machine.

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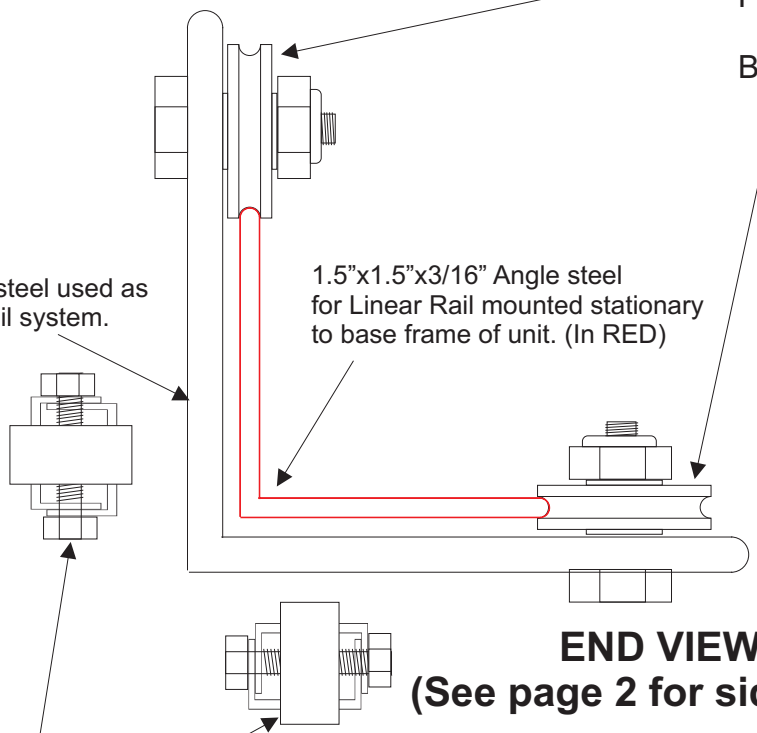
Bearings for sliding glass door tracks
Pulley dia 1.375” OD
1.250” ID
Bushing depth 0.375”

Locating the mounting holes for these Pulley bearings MUST BE EXACT! As there is no method for loading the Pulley bearings against the edges of the Linear Rail Angle. Do NOT assume that all Angle stock is created equal. When it comes to Hot Roll Steel, they are FAR from it! Measure EACH plane of the Linear Rail Angle TWICE, and drill the bearing mounting holes on the Truck ONCE! Be CERTAIN to accommodate for washer clearance between the Truck surface and the bearing hub bushing. These are needed to provide adequate clearance between the sharp outer corner of the bottom of the Linear Rail Angle, and the rounded Inner radius of the Steel Angle of the Trucks.

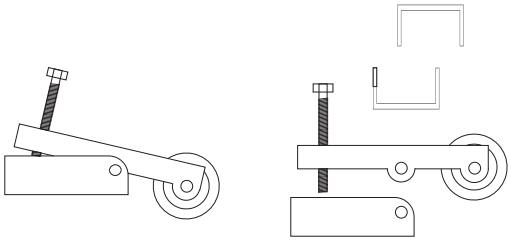
3”x3”x1/4” Angle steel used as Truck of Linear rail system.

1.5”x1.5”x3/16” Angle steel for Linear Rail mounted stationary to base frame of unit. (In RED)



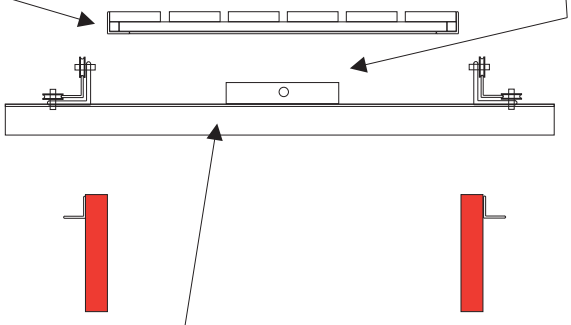
END VIEW
(See page 2 for side view)

Skate-wheel bearing assemblies I later added for bottom, and side support. (These mount to the bottom, and side of the Truck, and load against the bottom, and side of the Linear Rail Angle) These were constructed from small channel pieces (shelf bracket rails), with the bottom channel being mounted directly onto the Truck. A hole is drilled through the legs of these channels with a pivot bolt installed. The top channel piece has a threaded hole through the wide plane of the channel. A bolt is then threaded through this hole for loading the bearing against the Linear Rail Angle. The top channel is also notched out on the end, to accommodate the skate wheel bearing. These assemblies are mounted at the very ends of the Truck, so that (through a lever-action) they can reach over the edge of the Truck, and tilt the bearing against the surface of the Linear Rail Angle.



X-Axis Lead screw nut mounted in a through-hole of an Angle steel piece which is bolted to the Cross-Frame of the Gantry.

Table assembly



The cross-frame of the Gantry is also constructed of Angle steel, and mounted to the bottom of the Trucks. The Linear Rail Angles are mounted with the Horizontal Plane of the Angles facing Outward, to accommodate mounting the Vertical Plane of the Linear Rail Angles onto the Outside of the Base Frame. (Which is constructed of 1”x1” tubular steel and Pictured in RED above).

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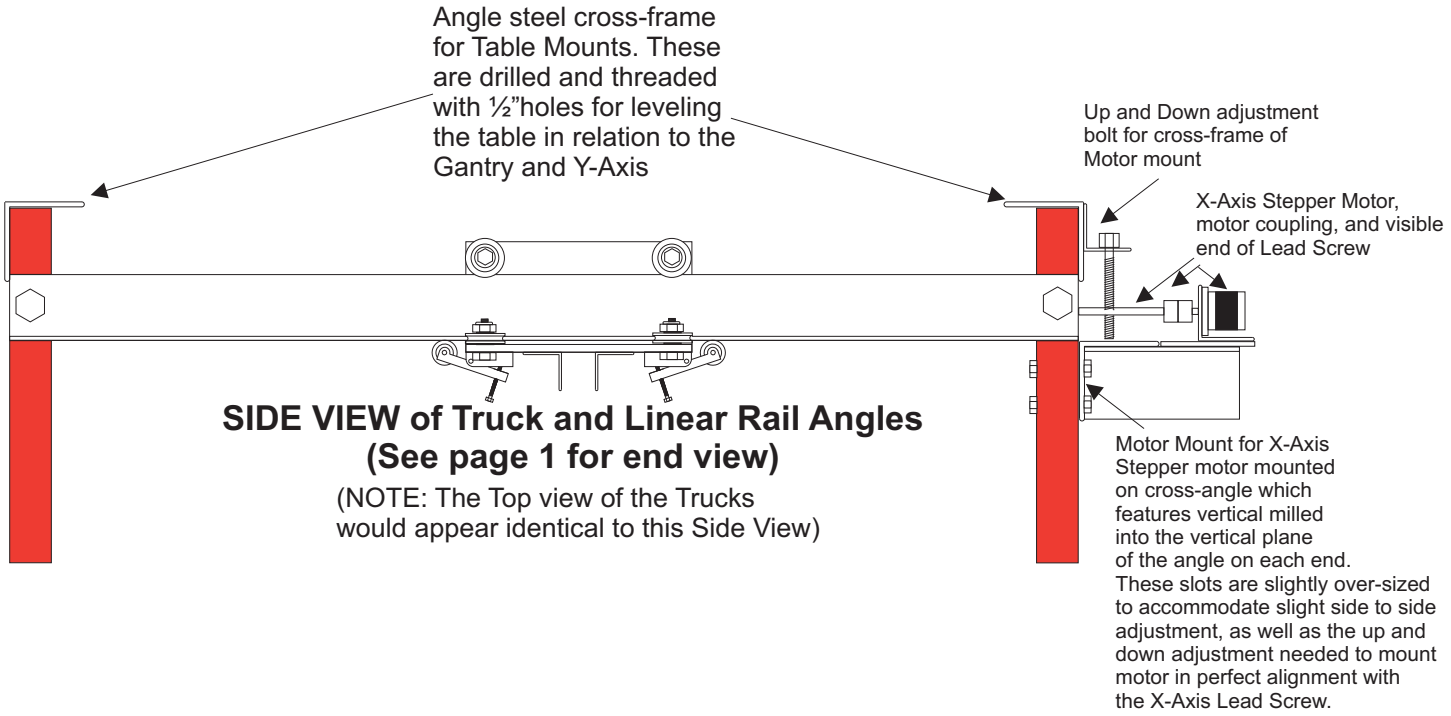
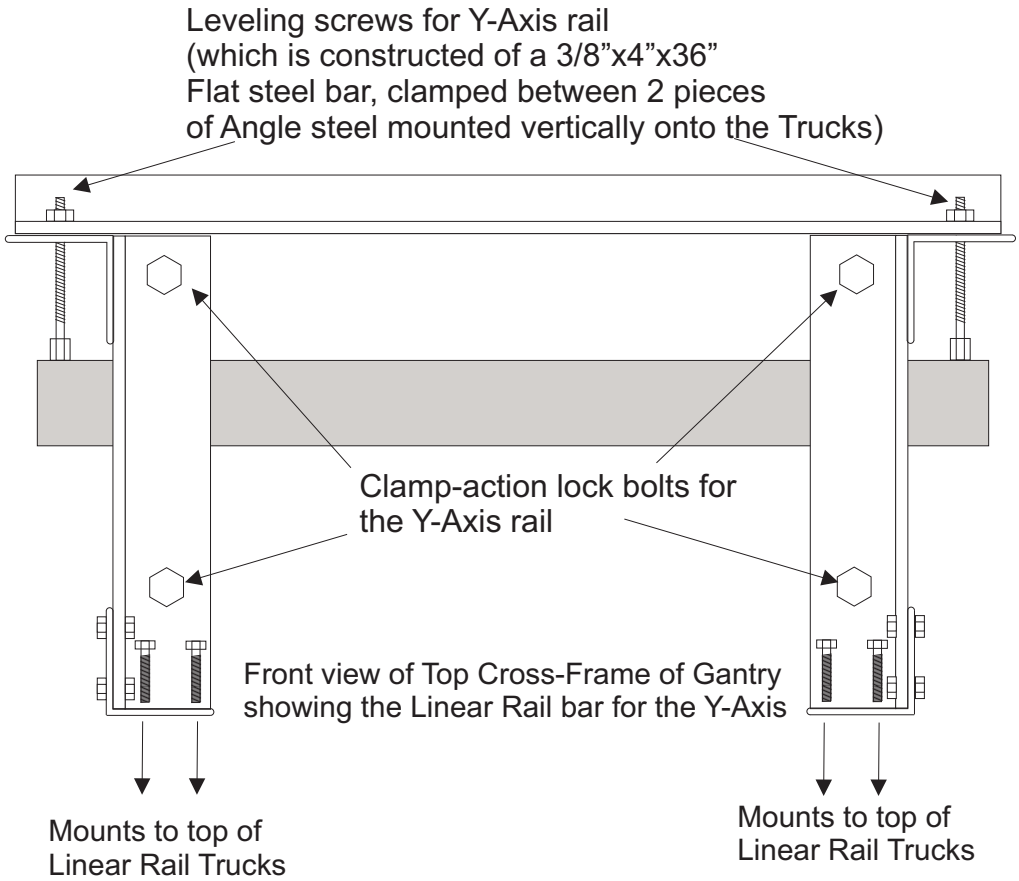
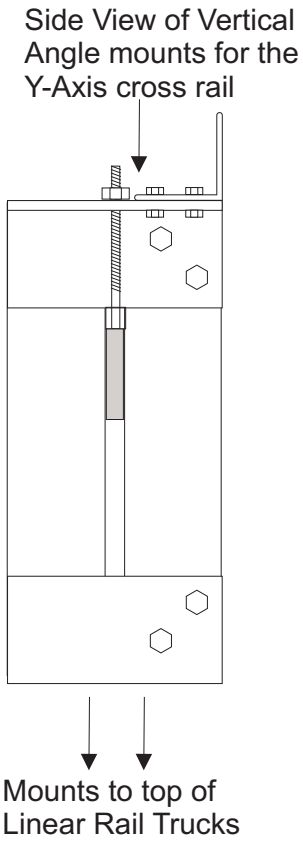


SIDE VIEW of Truck and Linear Rail Angles
(See page 1 for end view)

(NOTE: The Top view of the Trucks would appear identical to this Side View)





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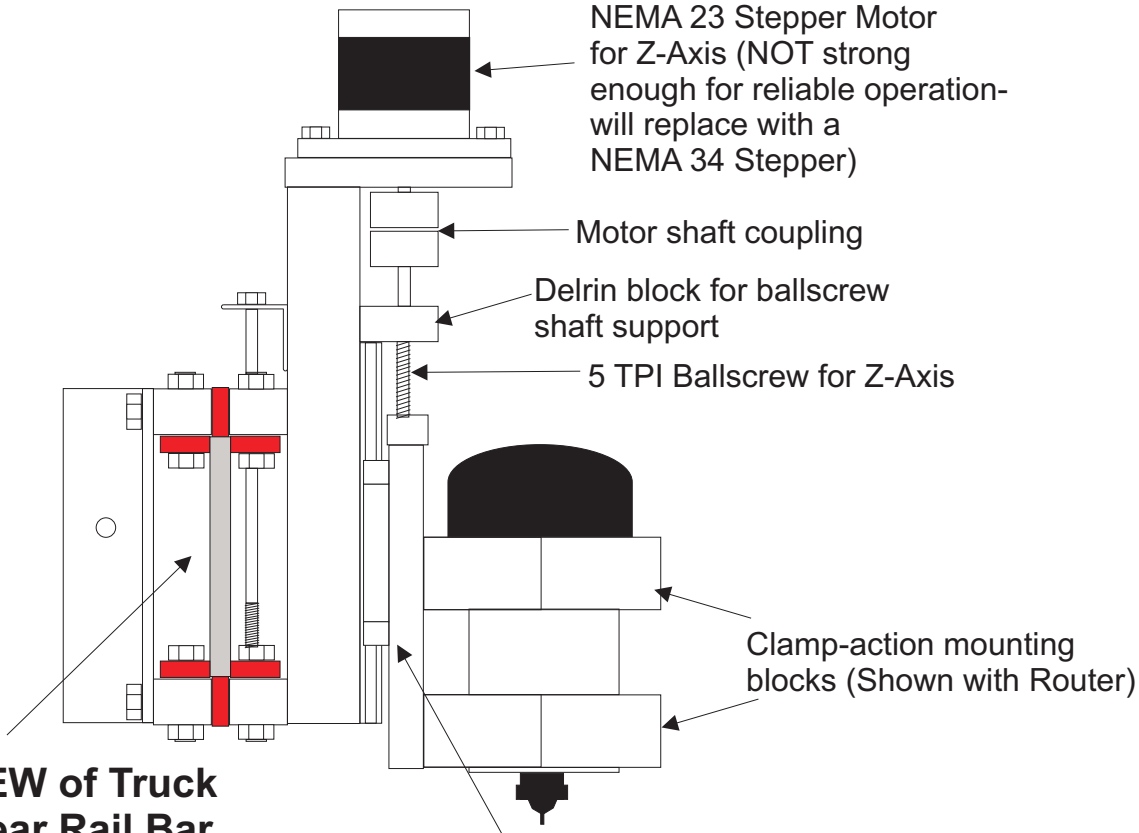
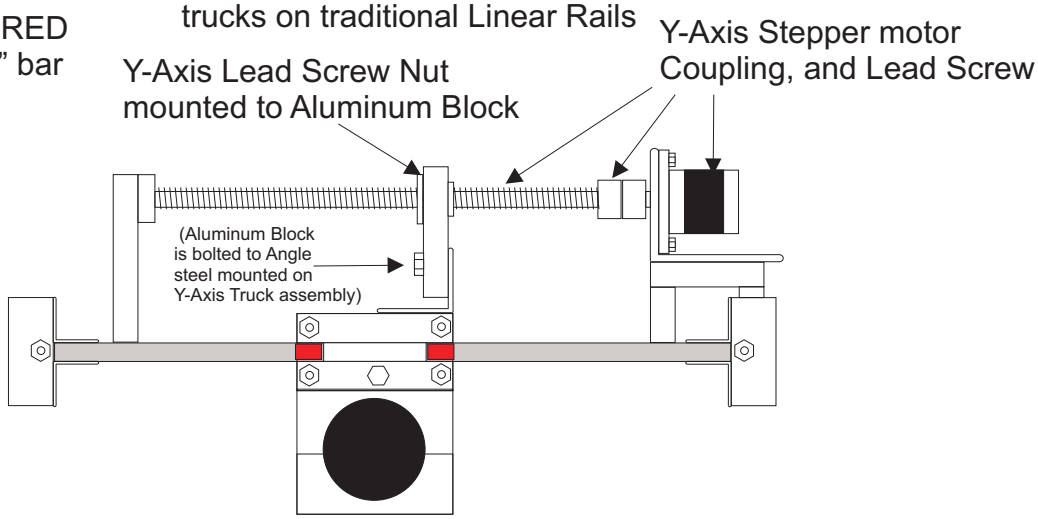


SIDE VIEW of Truck and Linear Rail Bar of Y-Axis

(Shown mounted to the Z-Axis assembly)

NOTE the bearings are shown in RED which travel along the 3/8”x4”x36” bar for the Y-Axis Linear Rail*

*(Shown in GREY)



Top View of Y-Axis assembly (Shown with Z-Axis motor mount removed, so you can see top view of Y-Axis bearing Truck)

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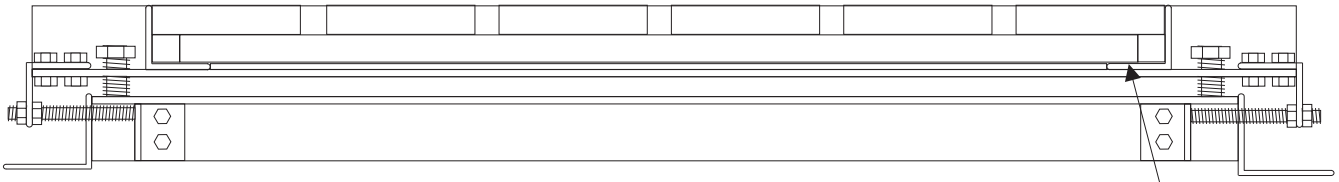
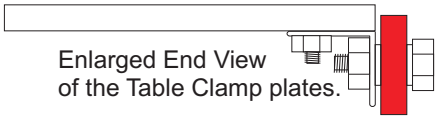
The Table surface is constructed of 3/4”x3 1/8”x48” slats of T6061 Aluminum, (spaced 5/8” apart) which is mounted onto a frame constructed of 1”x1” tubular steel. This frame was then mounted inside a second frame which is constructed of 2”x2”x3/16” Angle steel. After assembling
the Table frame, I realized that this design created a “shelf” approximately 1” wide along the inner edge underneath the table. I decided to make use of this “shelf”, my making set of six 2”x24”x1/4” adjustable hold-down clamp mounts Made of hot roll steel, each of these have been drilled, and tapped with ½”holes 13 TPI for mounting hold-down clamps. Since this “shelf” is 1” below the bottom surface of the Aluminum slats, I installed small pieces of angle steel onto the ends of each of these flats, and mounted small bearings on each. This raised the flats to within 0.040” of the bottom surface of the aluminum slats. (As well as making them easier to quickly slide from one position to another when mounting hold-down clamp bolts on the table surface).

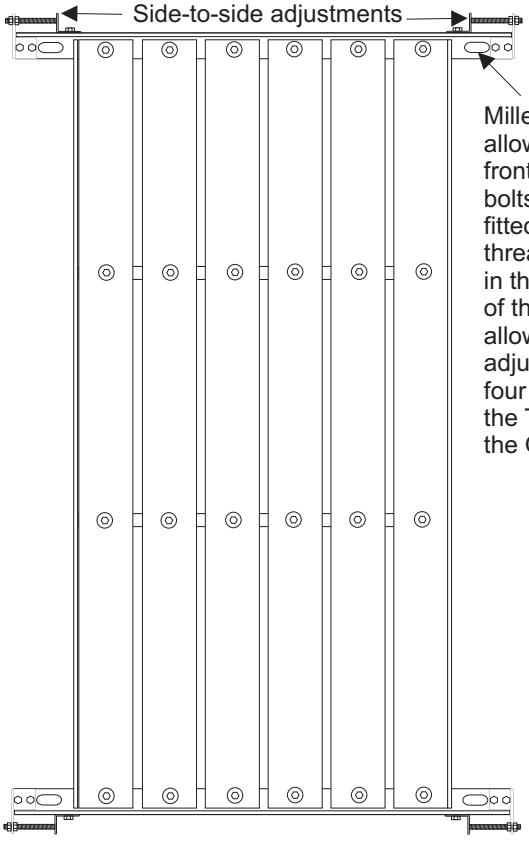
Front View of Table Surface





Enlarged End View
of the Table Clamp plates.

Top View of Table Surface



Milled slots over-size to allow slight adjustments front to back. ½”diameter bolts with flat washers fitted top and bottom are threaded into tapped holes in the front and rear Angles of the Base Frame. This allows the Table height to be adjusted on each of the four corners for leveling the Table in relation to the Gantry.

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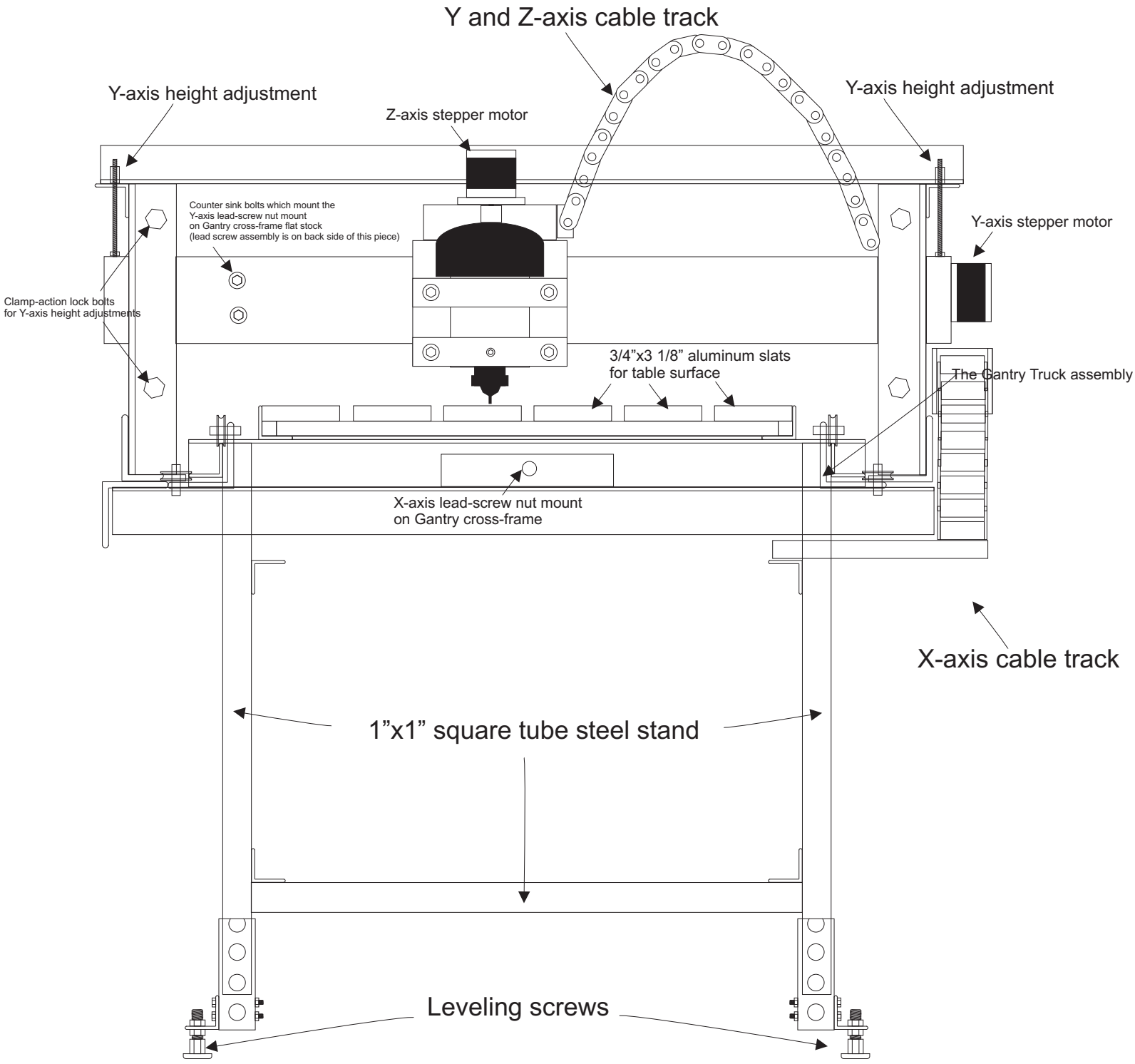

FRONT VIEW

Design Details of My CNC Router Table

LEFT SIDE VIEW