Open Based Router Table

To be built on the Cheap

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1.1 Description & cost

This is an open base router table. I used 4x4's for the legs, with 2x4's as runners between the legs. It is very stable.

If you want to enclose the base, you could attach something to the sides of the legs. Or look elsewhere for some plans :)

I built this table with about $100.00 of material (tax included). The most expensive pieces were the laminate and the Lexan® for the insert plates.

1.2 Inspiration

I figured that I needed a router table, but I couldn't quite justify the expense. There were several things that I'd used my router on that, shall we say, weren't the safest things in the world. Having a router table would have made these operations much safer. I figured that a router table is similar to a workbench, of which I also want to build. So I dismissed the idea for a router table, and concentrated on how I was going to build a work bench. Then it hit me: A scaled down version of the bench would make a smashing router table! And I could practice the joinery needed for making a bench. I could kill two stones with one bird! It's amazing what one thinks of in the drive-thru.

1.3 Features

Simple mortise & tenon, laminated particle board top, Lexan® insert plate, oak trim to protect particle board, shelf for holding stuff (but mainly collects dust).

1.4 Jigs

I built three jigs while making my router table: one for the mortises, a tenoning jig, and one to help installing the router plate into the table top. The jigs are detailed in section 5.

1.5 Materials

1.5.1 Wood & other supplies

The expensive items are marked with **[$$]**.

1. 2 Kiln dried 4x4's
2. 3 Kiln dried 2x4's
3. 1 sheet of 0.75" particle board
4. 12' of 1.5" wide oak
5. 1 roll of self adhesive laminate **[$$]**
6. 1 sheet of 24"x24"x0.25" Lexan ® **[$$]**
7. 4 "L" brackets
8. 1" and 1.5" drywall screws (a 20th century wonder!)

1.5.2 Tools

1. plunge router
2. table saw
3. jigsaw
4. drill (I used a 12v DeWalt)
5. backsaw or dovetail saw
6. file

1.5.3 Router bits & equipment needed

1. 0.75" outer diameter template guide
2. 0.75" top bearing pattern bit
3. 0.50" flush trim bit
4. 0.50" straight bit for mortises. This bit should be able to extend 2.25" past the base of the router.
5. 9/16" straight bit (for plunging holes through things)
6. A round over or chamfer bit (for trim on router table)

7. The widest edge bit you plan on using in your router table
8. Adjustable router fence

1.5.4 Miscellaneous Stuff

1. Double sided tape (almost as useful as duct tape!)
2. bar clamps - at least 36"
3. glue (I used Gorilla Glue™ - good stuff!)
4. low angle block plane (preferably over 70 years old)
5. hair dryer
6. 50 pound bag of dog food and 20 or so bricks (yes, you can substitute a 60 pound bag of concrete)

2.0 Leg assembly construction

Height is a big consideration in a bench or router table. I decided to make my table the same height as my table saw so I could use it as an outfeed table, or to the side to support long stock. Whatever height you choose, make sure it's comfortable for working and affords a good view of the business end of the router.

2.1 Cutting 4x4 for legs

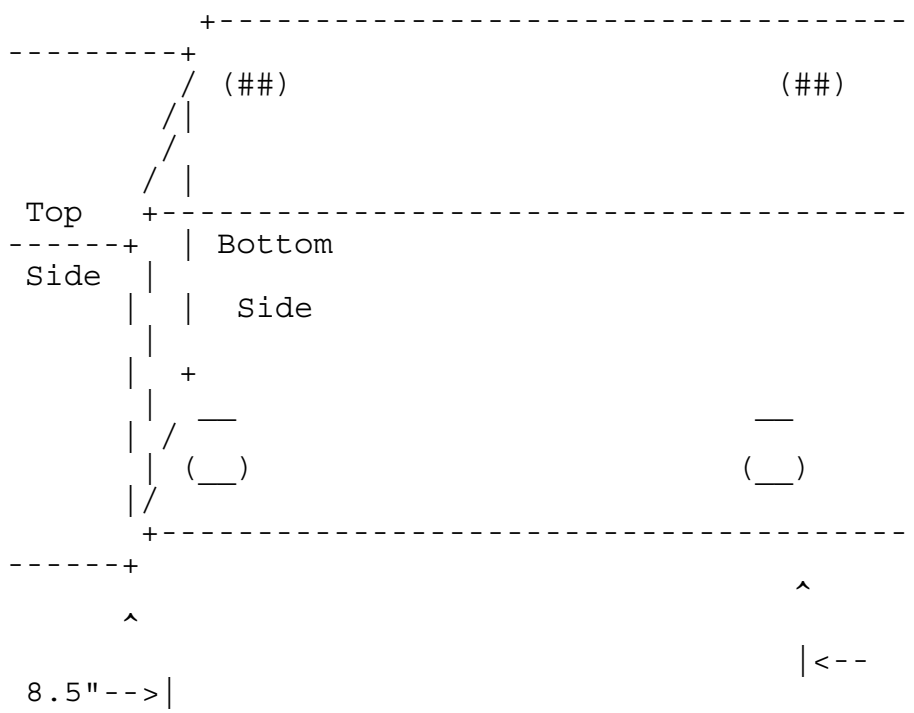
I cut the legs for my router table to a length of 32.5". This combined with a 1.5" top is the same height as my Jet contractor's saw. Be careful cutting the 4x4's to length. It can be quite a rush to cross-cut something like that on a table saw. If you're squeamish about it, use a cross-cut hand saw.

2.1.1 Mortise layout (Figure 1)

NOTE There are four mortises on each leg. These mortises mirror each other on adjacent sides of the 4x4.

IMPORTANT The mortises need to be no closer than 0.5" to any side of the 4x4.

Figure 1 - Mortise Layout in bad ASCII art



Mortise dimensions:
0.5" wide
1.5" deep
2.5" long

The mortises towards the bottom side of the 4x4 need to be cut 8.5" up from the bottom.

2.1.2 Cutting Mortises

Cutting the mortises is actually pretty easy with the little mortising jig I made. I used the double sided tape to hold the jig to the 4x4.

NOTE Be sure to put your 0.75" outer diameter template guide in your router before setting up the really long 0.5" straight bit.

I cut all the mortises together so I wouldn't have to change the setup on my router. I set the depth of cut so that the really long 0.5" straight bit extended 1.5" beyond the bottom of the jig.

I cut the mortises in several passes, stopping after each pass to clear the chips. I was not using an up-cut spiral bit, which would have made this a bit easier. I used a screwdriver and a shop vac to clear the chips.

2.2 Cutting 2x4 for runners

The runners for the table are cut from the 2x4's. You will need to cut 4 of each length, as there are two runners on each side--one at the top, and another 8" above the ground.

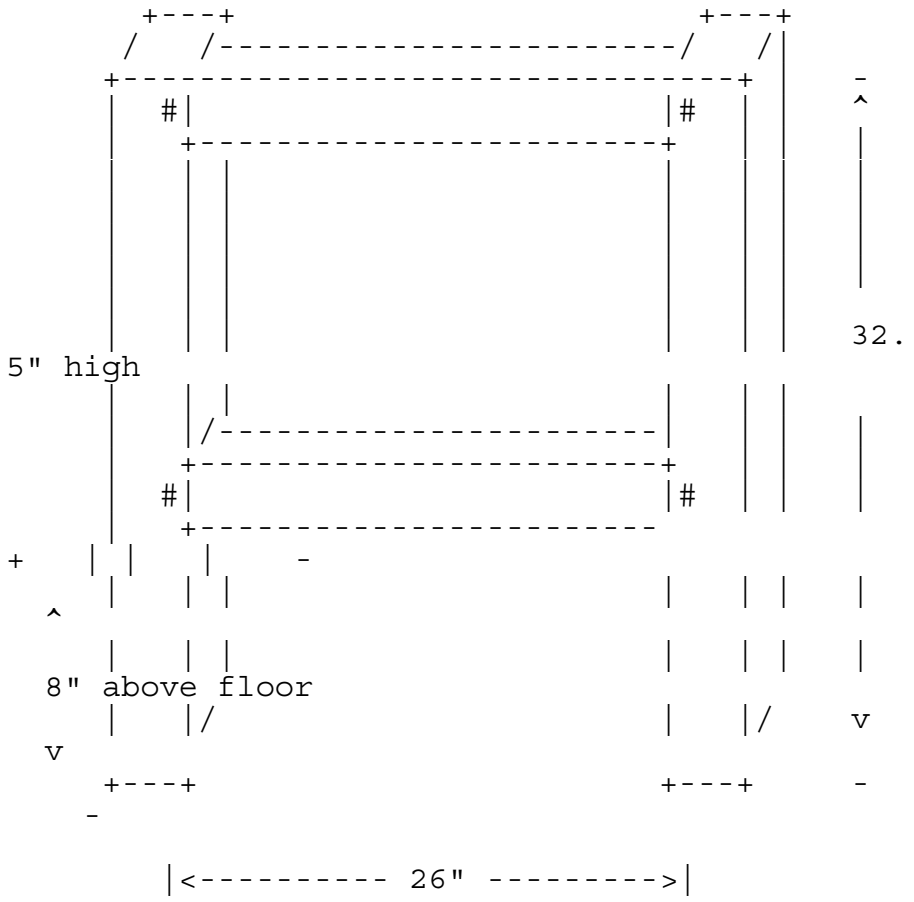
For the long side of the table, cut 4 sections of 2x4 26" long.

For the short side of the table, cut 4 sections of 2x4 15.5" long.

2.2.1 Support layout (Figure 2)

Again, here is a very bad attempt at some ASCII art. I don't know how some of those other people do it...

This is supposed to represent the long side of the router table. The tenons on the 2x4's and mortises in the 4x4's are represented by "#" symbols.



2.2.2 Cutting Tenons

Cut tenons on the end of each 2x4 so that they will stick into a mortise that is 1.5" deep, 2.5" long and 0.5" wide. You can use a commercial tenoning jig, build your own, or, for those who are low in the brow (what are you doing building a router table, anyway?), use your tenon saw. You do have one, don't you?

After cutting the tenons, round over the edges with your favorite file. It helps to do this while a 4x4 with a waiting mortise is about, just to check the fit.

2.3 Dryfit

Very important. Make sure that the 2x4's are even with the 4x4's. The table I build stood on its own while dry-fitting. I had to use a mallet to pound the thing apart so I could clamp it. And make sure it looks like a table before gluing.

2.4 Glue up and clamping

When satisfied that this structure looks "table-like," use your favorite glue to glue the whole thing together. I used Gorilla Glue™, cuz that was what I had close by (that and it's way strong).

Due to my clamping limitations (I really need more--you can _never_ have too many clamps), I had to glue it up one "section" at a time. I glued up the long sides first. Then glued these together with the short stretchers. Was it square? Almost. Does it bother me? Not really, this is only

going to live in the garag, er, shop. How much was it off? Less that .25".

3.0 Table top construction

Here is where it got kinda tricky for me.

3.1 Cutting particle board

Cutting the particle board to size was pretty easy. Cut out two sections, each 36" long by 24" wide. I used a circular saw (actually, the DeathSaw) and a piece of 2x4 as a straight guide. Be sure to wear a dust mask while doing this--do you really want to inhale dust, glue and formaldehyde? (remember that stuff from your high school biology class?)

3.2 Gluing

Once you have the two pieces of particle board cut to pretty close in size, glue them together. Now, if you've finished the table base, you have a handy dandy clamping area. I clamped the two pieces together with about every clamp that I could find in my shop.

Since I didn't have any clamps that could reach into the middle of the top, this is where the 50 pound bag of dog food comes in. These things work just fine when you need to apply pressure or add weight to something. I suppose you could also add bricks (which I also did), or something else to help with the gluing.

I did wait until the glue was fully cured before releasing the clamps.

3.3 Laminating

Laminating was pretty tricky for me, mainly because I had never done it. I hemmed and hawed over how to do it. Contact cement, 5' long roll, rollers. I chose to use a self-adhesive laminate. Why? I didn't have to fuss with any contact cement. If you're good with the contact cement and "normal" laminate, go that route if you so desire. You'd be an even bigger stud.

Make sure that there's not a lot of dust and junk on top side of the particle board. I built my router table in January. Now it may not get as cold in SoCal as the rest of the US of A in January, but it was cool enough to make handling the laminate difficult. In comes the hair dryer (your wife will just love it: "Honey, where's your hair dryer? I need it for my router table." "What!?!") Heat the laminate enough to make it a bit more pliable.

And follow the manufacturer's directions for applying the laminate.

After I stuck the laminate on the particle board, it was back out to the garage for it. The clamps, bricks and that 50 pound bag of dog food came into play again. I left it clamped for several days, just to make sure that everything stuck down real good.

After I was sure the laminate was firmly attached, I used a flush trim bit to trim the laminate. I also used the flush trim bit to even out any differences between the top and bottom piece of particle board. You may need to flip the top over to finish evening out the table top.

3.4 Cutting Lexan® for plate

Lexan® cuts weird. You can cut it with a table saw with a combination blade. Cutting it will make your shop smell of plastic. Badly. It also throws little shards of plastic about.

These things can get into the works of various machines and really cause you some trouble. Be sure to clean the plastic-dust (well, it's not *really* sawdust) out of your table saw and router.

I cut my plates 11.75" long by 9" wide. Using this size, I easily got 4 plates out of a 24" by 24" sheet of Lexan®.

3.4.1 Fitting the plate on the router

Here it helps if you know the center point of your router. I'll leave it to you to figure out how to center up the router on the plate. There's lots of ways to do it.

Once you have established where the center of the router is, you will need to drill some holes through the Lexan®. Be sure to have some sort of backing material, as the Lexan® tends to chip as your drill bit exits out the back side of the material. Don't Ask Me How I Know This.

If you have tapered head screws for attaching the base plates, be sure to use a counter sink on the holes. The screws should not stick up above the plate. Having the screws protrude from the base of the router plate would be bad. You'll be inviting all sorts of problems.

3.5 Cutting the hole in the plate

This part is actually kinda fun. Once you have the base plate attached to the router, put the 9/16" bit in your router. Make sure you have some clearance beneath the base plate. I supported mine on some scrap wood that was about 2.5" high. Turn your router on, and plunge the bit all the way through the Lexan®. This establishes hole that has (hopefully) a diameter greater than any bearings on your wider bits.

Next, I took my bit with the largest diameter and put it in the router. In my case, it is a 0.75" round over bit with a bearing. The bearing fit nicely through the hole.

Put the router (and base) back up on your scrap wood, turn the thing on and plunge the bit through the Lexan®. This will give you a nice hole in the material.

If you're really clever, you can use a variation of this to modify your base plate to take template guides.

Safety note: Make sure that the router is unplugged when you are changing bits. The last thing you want is to have is for the router come on when your fingers are near the business end of bits. Or to have an angry router buzzing around the floor of your shop.

3.6 Cutting the hole in the table top

This part was more tricky than the laminate. For this step, I made a simple router plate hole frame (see Section 5.3). I centered up this frame on the router table and attached it with double sided tape.

If you have a top-bearing plunge pattern bit (that's hopefully at least 0.5" wide), use this to cut the ledge on which the router plate sits.

If you don't have a top-bearing plunge pattern bit, but a normal top bearing pattern bit (like me), try something like this:

Then I put the 9/16" bit in the router and set the router on top of the router plate hole frame. I plunged the bit down to where it touched the laminate and locked the router in place. Using the depth stop on the router, I set it up for a 0.25" cut. I then un-plunged the router and turned it on. Very carefully, I made a plunge cut into the laminate covered particle board. I chose a spot along the plate hole frame that was in about the middle on one side. I also made sure

that the bit did not bite into the frame. This establishes the start hole for the pattern bit.

Take out the 9/16" bit and replace with your top bearing bit. Using the procedure above, set it for a 0.25" deep cut. Start at the hole you made with the 9/16" bit and follow the inside of the frame.

If you have a dial caliper, you can use that to verify the depth of the ledge.

After cutting this 0.25" deep groove, take the plate hole frame off the table, and cut out the center using a jig saw. Make sure you leave enough of a ledge to support the Lexan® insert.

I used a 0.75" top bearing bit for cutting the ledge. Yes, this is a bit wide, and the router needs to be turned 45 degrees to put it in and take it out of the table, but it does give plenty of support. I'm yet to have the router bounce out of the opening.

4.0 Finishing

4.1 Attaching top to legs

This part is pretty easy. I used 4 "L" brackets and 16 1" drywall screws The goal here is to make sure the top isn't going to slide around. Those big 4x4's will hold up quite a bit of weight.

4.2 Attaching trim

I trimmed the particle board with oak. I wanted to use a hardwood because of the abuse table edges receive. The oak is mitered at the corners, and is held to the table top using drywall screws and a bit of Gorilla Glue™.

If the trim is higher than the table top, here's where you can use your old block plane to trim it down. Set it for a very shallow cut. Try to stop before the blade takes the top layer of finish off the laminate. Again, Don't Ask Me How I Know This.

5.0 Jigs

5.1 Mortise Jig

This jig makes making the mortises for this router table quite easy. The jig I used is made out of a piece of

scrap pine, and is shown just to the right. You will need to cut a 0.75" wide hole all the way though the wood. This hole must be 2.75" long.

I cut this one using a straight 9/16" plunge bit, a 0.75" straight big, and a bottom bearing flush trim bit.

Step 1	I used the 9/16" straight bit to plunge a hole through the block of scrap pine. This gave my .075" pattern bit a place to start, and also a start hole for the flush trim bit.
Step 2	Use the router fence to help guide the 0.75" bit, and cut a 2.75" groove in the jig. Try to cut this groove about 0.25" deep. It's important that the groove is deep enough for the bearing on the flush trim bit to follow.
Step 3	Turn the jig over, and put the flush trim bit in the router. Make sure there is enough clearance beneath the jig, as you won't want to run your flush trim bit into the top of your bench or into anything that might be rolling around on your bench.

Set the depth stop for the flush trim but, and turn on the router. Carefully plunge the bit through the 9/16" hole. Did I mention that the flush trim bit needs to follow the groove left by the 0.75" bit? Follow this groove. When complete, you should have a piece of wood capable of being used to make the mortises described in this plan-o-sorts. And it most likely won't have the writing or the wavy top like mine does.

5.2 Tenon Jig

Using this tenon jig is a little on the wild side, so be careful.

What I did was butt joint two pieces of pine together. These

pieces are held together with drywall screws.

I didn't measure the pieces of pine before I made this jig. I cut Piece 1 so that it was a little big wider and a little bit higher than the miter gage that came with my table saw.

I cut Piece 2 so that it was about as long as Piece 1, but a couple of inches higher.

I put the drywall screws through Piece 1 into the edge of Piece 2. The approximate position of the screws are indicated by the "X" character in Figure 3.

Figure 3 - More Bad ASCII Art

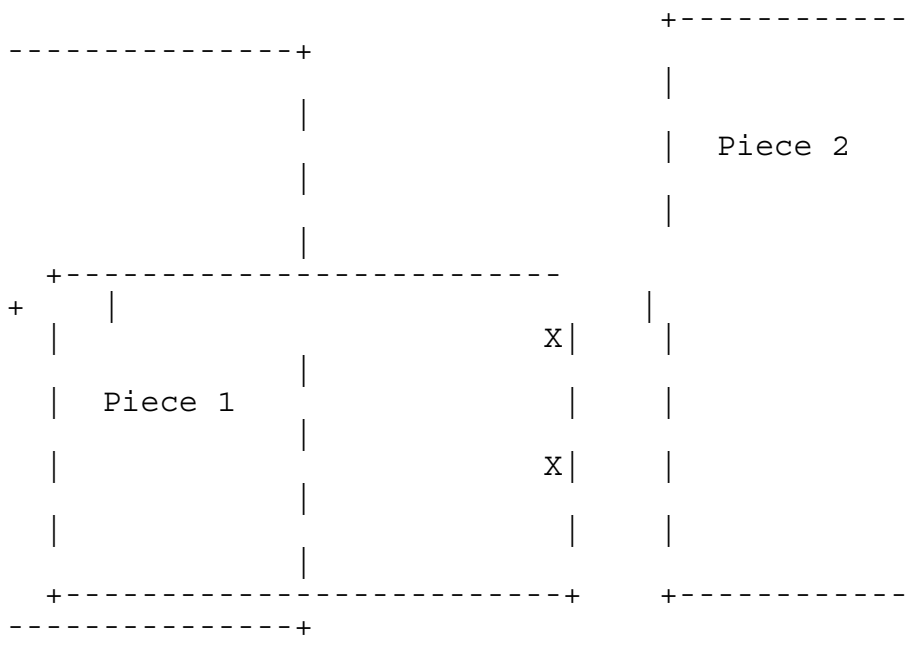
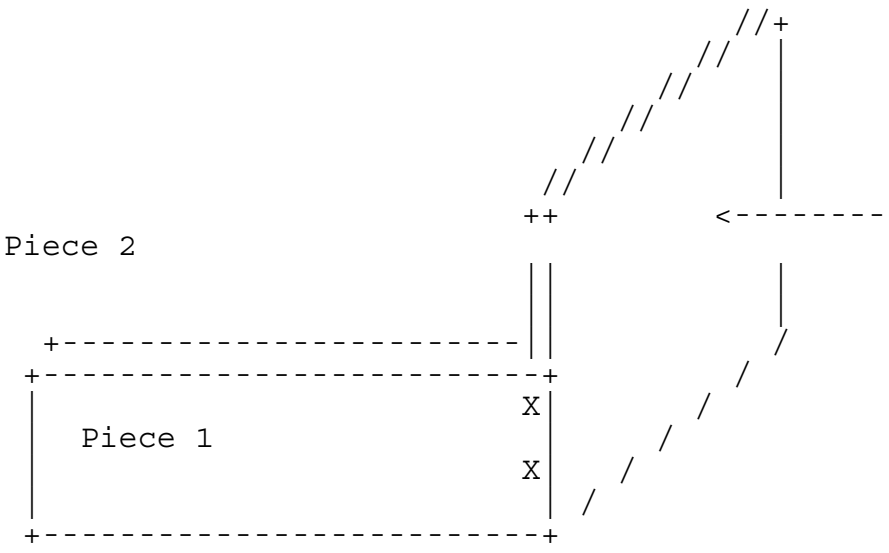


Figure 4 - The Attached Jig



While using this jig, I have it firmly clamped to my miter gage in such a way that I can cut the shoulder for the tenons. And I have the miter gage in the groove that's to the left of the blade. You can see the marking I have on the tenon jig to help line the thing up on my mitre gage.

It's fairly important to make sure that these pieces are pretty square, otherwise you could have some problems.

If you have a real "boughten" (*ahem* "Store-Boughten", Larry) tenon jig, you might want to use that instead of this.

Or if you want to hand cut them, hey, you're a better woodworker than I :)

5.3 Router Plate hole jig

This was fairly simple to make. It's basically a square frame into which the router's base plate snugly fits. You need to make sure that whatever pattern bit you use is long enough to cut a deep enough groove for your base plate.

6.0 After thoughts

Well, there you have it. More or less, this make a very functional router table. To give it a power switch, I purchased an "industrial" power strip with a 15 foot cord, and attached it to the side of the table. This works fine. It even gives me a nice place to plug in the shop vac to clean up the mess from the router.

And, no, I don't have a fence yet. I've been thinking on how to make one out of part of a left over 2x4. With a vacuum port, too.