PROFESSIONAL ROUTER TABLE

If you've worked with a router before you know the incredible work it can help you produce. A router does have some limitations. It is unsafe to use large bits in a router freehanded and narrow pieces, such as molding, can be difficult to shape.

A router table can help solve some of these problem and open up a whole new world of design and project possibilities for you. We designed this router table to be of professional quality, but also fold so the "weekend woodworkers" among us will be able to store it in the corner of the garage.

We designed this router table so that it requires only basic carpentry techniques, a minimal number of tools, and wood that is available at most hardware stores. We used Southern Yellow Pine, Red Oak, ¾" plywood, and common fastening hardware.

Router Table Finished

Router Table Base

The base for this router table is designed so that the front legs fold in and the tabletop tilts down. This is a nice feature if storage space is a concern. The legs should be built from a relatively solid wood.

We selected Southern Yellow Pine for its low price and relative durability. The material we used came from 2" x 10" framing lumber available at most "home centers" such as Home Depot and Lowes.

If you don't need a folding table you can modify the plans so the base is permanently attached to the table top. Another option is to build an enclosed base. Building an enclosed base can help control dust and noise.

Router Table
in Folded Position

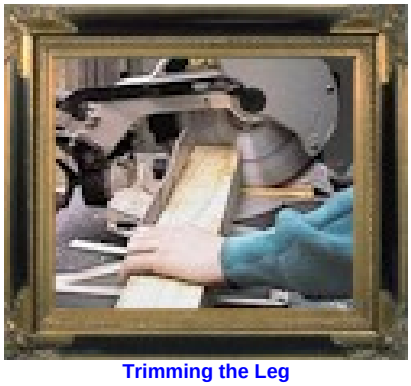
Step 1 - The Legs

The four legs are made by gluing two 1 ½" x 3" x 36" boards together to make a post that measures 3" x 3" x 36". To ensure a strong bond, make sure both pieces are clean and free of dust and oils before gluing. Clean with denatured alcohol if necessary to remove excess sawdust

Gluing the Leg

Step 2 – Trim Legs

After the legs have dried, trim them down to 34" long. Make sure the ends are cut square.



Trimming the Leg

Step 3 – Build the Cross-supports

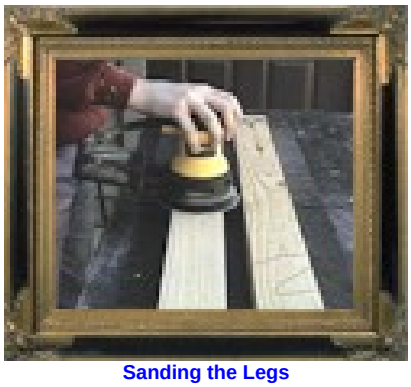
Cut two cross-supports for the back – 1 ½" x 3" x 30"

Cut four cross-supports for the sides – 1 ½" x 3" x 12 ¾"

Step 4 - Sand and Smooth all Surfaces

Sand and smooth all of the surfaces of both the legs and the cross supports. As you can see in the picture to the right, we first planed the legs and then sanded them. The planer is useful for removing material fast; a belt sander would work as well. Use a finishing sander to smooth out the legs.

Planing the Legs



Sanding the Legs

Step 5 – Cut and Insert the Dowels

The next step is to drill and insert dowel rods into the end of each cross support.

This is done because screws that are tightened into end-grain tend to pull out easier than screws fastened across the grain. By fastening the screw through the end-grain, and into the dowel, we form a tighter joint. The dowels should be made from ¾" diameter hardwood.

Cut the Dowels

1) Drill a hole 1 ½" from the edge to the hole's center.

Drill the Hole

2) Cut the dowels slightly longer than the width of the board, coat with glue, and pound into place.

Note: The **side supports** should have a dowel inserted into only one end; the **back supports** have one on each end.

Trimming the Dowels

3) After the dowels dry, use a flush cut saw to trim off the edges.

Trimmed Flush

Step 6 - Pre-drill the Legs

The size of the holes drilled for the legs will depend on the size of the lag screws and washers. We purchased sixteen ¼" x 6" lag screws and sixteen ¼" washers.

Using a Forstner bit, drill a hole large enough to sink the washer and the head of the lag screw below the surface.

Note: Each cross support should have two lag screws fastened on EACH END. Please refer to the diagram at the right for drill positioning.

Drill with Forstner

Step 7 – Drill the post

After drilling the holes with the Forstner bit drill a hole through the center using a bit that is slightly larger than the diameter of the lag screw (we used a 3/8" drill bit).

Forstner Bit

Drilling the Bolt Hole

Step 8 – Assemble the legs

Drill a pilot hole in the legs and assemble using a socket wrench. Make sure that the joints are tight so the legs won't wobble.

Assemble the Legs

Step 9 – Attach Hinges

Note: If you prefer to have a fixed base, skip this step and bolt the legs together.

After you have assembled the back and the two sides, it's time to attach the hinges. The hinges should be placed at the end of each cross brace and attached to the leg. Purchase the biggest and best quality hinges that you can find (that will fit).

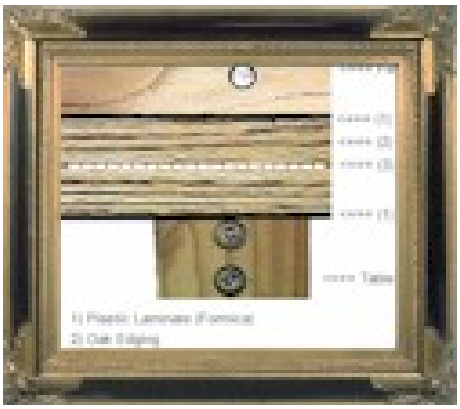
Mortise the cross brace and the leg so that they receive the hinge. Don't mount the hinges using the supplied screws. Instead use 2" – 3" decking screws. The longer length of these screws will improve their holding power. Make sure they aren't longer that the width of the posts.

Note: We had to modify a hinge by grinding and drilling to make it fit our cross brace.

Hinge Attached

Router Table Top

The top of our router table is made from two pieces of ¾" plywood, edged by a 1 ½" strip of oak, and covered on both sides by a layer of Formica plastic laminate. This may seem like a rather complex top for a router table but the design is based on some basic logic. **First**, the top needs to be heavy to dampen the vibrations generated by the router. The two layers of plywood accomplish this. **Second**, the layer of Formica on the top provides a smoother surface. **Third**, the layer on the bottom helps prevent warping by equalizing the moisture



Router Table Top
Table Composition

loss from each side. **Fourth**, the oak edge strip makes the table more attractive and helps to equalize moisture loss from the edges.

Step 1 – Cut the Plywood

The first step is to cut two pieces of ¾" plywood to a size of 22" x 38". (The finished top will measure 23 ½" x 39 ½") It is best to use plywood that is heavy, smooth, and as flat as possible. We used a type of plywood called "Para-Ply" at Home Depot that is as strong and stable as furniture grade plywood and heavier than particleboard!

Step 2 – Glue the Plywood

Glue the two pieces of plywood together and allow them to dry. If the pieces have a slight warp; glue them together so that the warps are opposite and counteract each other.

Gluing The Plywood

Step 3 – Cut and Glue the Edge Trim

Cut two pieces of red oak (or similar hardwood) - ¾" x 1 ½" x 22"

Cut another two pieces of red oak – ¾" x 1 ½" x 39 ½"

Glue the 39 ½" pieces to the front and back edges of the table top; the 22" pieces will be glued to the opposite sides.

Remove any
Excess Glue

Gluing the Trim

Step 4 – Level the Edges

After the edge molding has dried, make sure it is level with the plywood on both the top and bottom. The molding must be even with the top and bottom or the laminate will have a rolling surface at the edges. Fill any larger voids and cracks in the plywood with wood putty. Use denatured alcohol to clean the surface and prepare it for the contact cement we will apply in the next step.

Step 5 – Glue the Laminate in Place

Using contact cement, glue the laminate in place. (Follow the direction on the manufacturer's can.)

The gluing process is usually done as follows:

1) Clean the surface. (See Step 4 "Level the Edges" above)

2) Brush the contact cement onto both the plywood and the laminate.

3) Allow contact cement to dry on both pieces. It should change to an aqua shade and be dry to the touch.

4) Press the laminate and plywood together. – see tip below (Use a roller to ensure all air pockets have been flattened.)

Tip: When the laminate and the plywood are

Brushing on the Glue

Stickers in Place

pressed together they will bond instantly. For this reason, you must be sure that they are aligned correctly. The easiest way to ensure that they are properly aligned is to use standoff strips or "stickers". Place a number of dowels or thin strips of wood over the plywood. Then place the laminate on top of the sticks. This will allow you to position the laminate. Once you have it in position, remove the center strip and press the laminate down to the plywood. The laminate should bond instantly to the plywood. Next, work away from the middle removing the strips and pressing the laminate down, until you reach the ends.

Rolling the Laminate

Step 6 – Cover the Opposite Side

Repeat step five and cover the other side with laminate.

Contact Adhesive

Step 7 – Smooth the Table Edges

The edges of a plastic laminate can be very sharp. For safety reasons they should be smoothed or routed. Using a router with a pilot bit, rout the edges of the tabletop. We used a chamfer bit to form a slight bevel on the edges of our table.

Phenolic Insert

Phenolic material is a dark plastic-like resin. Its resembles a cross between Plexiglas and Formica Laminate. The material is very hard and strong. With exception to the foul smelling fumes emitted when cutting, Phenolic material machines exceptionally well. The insert we chose is ½" thick. We chose a color that contrasted the color of our tabletop. There is a practical reason for this. The contrasting color provides a visual reference to the "Danger Zone" of your router table.

Edge View of Insert

We chose this material purely for safety reasons. In our opinion, many of the router plans currently available call for inserts made of dangerously thin material such as plastic or wood. If the router should kick or bite into the workpiece, its torque will be transferred to the insert. If the insert is made from a fragile or weak material it could shatter or split and drop the spinning router. The Phenolic insert is not cheap though. The insert we purchased cost $25 and measured 11 ¼" x 15". This was enough material to make two 7 ½" x 11 ¼" pieces. We used one piece to make an insert for small router bits and the other for larger diameter router bits.

Safety Note

When you are machining Phenolic inserts they will tend to spill out clouds of noxious dark smoke and fumes. (It smells like burning plastic). For safety you should wear eye, ear, and lung protection. The best protection comes from a carbon-filtered pesticide type gas mask. A regular cotton dusk mask will do little to protect you. Make sure the area you are working in is well ventilated. If you work in your garage, open the doors. If you work in your basement, consider doing as much of the machining as possible outside.

Step 1 - Cut the Insert

The first step in machining the insert is to cut it to size. Using your table saw, split the insert in half. It is extremely important that they be EXACTLY the same size. It can be difficult, if not impossible, to rip the piece exactly in half. The easiest way to fix this is to rip the insert and then set the table saw to trim the edge on each on. This way you can be sure that they are exactly the same size. Use a file or sheet of sandpaper to smooth the edges of the newly cut surface.

Splitting the Insert

Note: Blade guard removed for picture - Use yours!

Trimming the Inserts

Step 2 - Layout the Insert

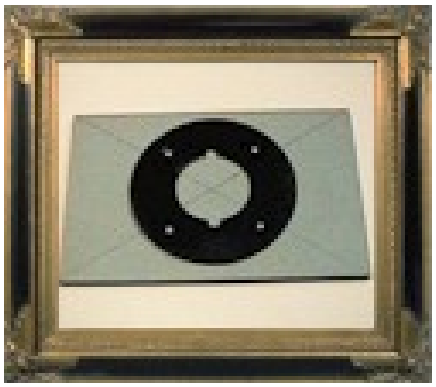
First
Draw two diagonal lines from opposite corners to find the center.

Diagonal Lines

Second
Place a bit in your router and lower it down so that it touches the point where the two lines cross. You router should now be centered on the insert.

Bit Touching Center

Third
Draw an outline around your router's base.



Router Base on Insert

Fourth
Remove your router's plastic base-plate, place it on the insert, and mark the position of the screw holes.


Layout Complete

Step 3 - Drill out the center.

Use a hole saw to drill out the center of the insert. The hole should be slightly larger than the largest bit you think you will eventually use. Since we had enough material to make two inserts, we drilled a 1 ½" hole in one for small to medium sized bits and a 3 ½" hole in the other for large panel raising bits. Use a file or sandpaper to round off the edges around the hole you just drilled.


Hole Saw Drilling

Step 4 - Drill out the screw holes

Drill the screw holes you marked in step two. The holes should be slightly larger than the diameter of the screws you plan to use with your router. (You might need to buy longer screws to fit through the thicker material.) After you drill the holes; use a countersink bit to drill a recess for the screw heads.


Screw Hole Drilled

Step 5 - Round the Corners

We will save the final step of machining the insert, rounding the corners, until after we cut the insert hole in the router table top.

Insert to be Rounded

Router Table - Finishing Touches

Now that you have the top and the base made it's time to connect them together. The following steps describe how to make and attach the mechanism that will allow the table to fold for storage. If you don't need a folding table you could skip these steps and attach the top to the base using "L Brackets". They are available at most hardware stores.

Step 1 - Making the Arm Mechanism

1) You will need to cut two pieces of hardwood (we used red oak) to 3" x 5" x 1" (actual lumber size)**.**

2) Mortise a **box** hinge into the end of the other side.

3) Mortise a **strap** hinge into the end that has the miter cut on it. Mortise it into top side, that is the side that has the LONG end of the miter cut on it.
Note: When mortising the strap hinge, the mortise should be deep enough to conceal the entire hinge. This way you won't have to mortise the table top through the laminate.

From here on out the hardwood board with the hinges attached will be referred to as the arm mechanism.

Mortising the
Arm Mechanism

Step 2 - Attaching the Arm Mechanism

1) You will now need to cut two box shaped slots in the back of the top runner. The hole should be deep and wide enough to accommodate the arm mechanism.

2) Attach the box hinge end of the arm mechanism into the slots you just cut into the top runner. Make sure the mechanism can move freely and does not catch on the slot.

The bottom picture to the right shows the arm mechanisms being tested with the front legs folded in.

Arm Mechanism attached to Base

Both Arms On Base

Step 3 - Attaching the Arms to the Table Top

1) Set the table top in position on the base. Make sure the overhang is even on all sides.

2) Mark the position of both the legs and the arm mechanism onto the bottom of the router table top with a pencil. Flip the entire unit over so that the legs are resting upside down on the table top.

3) Reposition the legs and attach the hinges to the bottom of the router table's top. You will notice in the picture to the right the penciled outline of the arm mechanism. The arm mechanism has been flipped open to expose the hinges so they could be attached to the table top.

Arms Attached to Base and Top

Step 4 - "Pin the Legs"

1) We will now make pins for the front legs. These pins will help keep the legs open and secured when you are using the table.

2) Cut two pins approximately 3" long from rod stock. We used a common galvanized gutter nail. (To save a little money!)

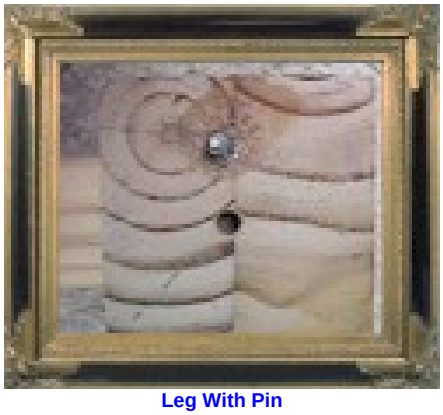
3) Round the ends on the pins so they will slide easier into the holes we are about to drill. Use a grinder or a belt sander. If you don't have either of these you can use concrete.

4) Drill a hole, slightly bigger than the pins, in the top of the front legs about 2" deep. Put in a few drops of glue and drive the pins in place.
Note: The hole should not be in the exact center or it will hit the bolts in the leg. We found this out the hard way; see picture to the right.

5) To determine the position of the hole for the top, flip the top down until it rests on the pins and mark the position.

6) Once you have the position marked, drill a hole that is slightly wider than the holes you drilled in the legs. Be careful not to drill through the top.

Pins for Base



Leg With Pin

Step 5 - Cutting the Table Top

1) The next step is to cut a hole in the top of the table for the insert. This is accomplished by first marking the positions, cutting a rough hole, smoothing this hole out with a router, and then using a Rabbet bit to create a ledge for the insert.

2) We begin by taking the phenolic insert and positioning it on the top of the router table. You should try to place it in the center, or as close to the center as possible. The exact position of the hole will depend on personal preferences. Also, remember that the arm mechanism and the hinges are below the table top. Please take this into account when positioning your insert. We positioned ours just slightly forward of the exact center of the table.

3) Once you have the insert positioned currently draw a pencil line around it.
Note: Use a Very sharp pencil for the most accurate markings.

4) Next, take a compass and adjust it to the exact width of your Rabbet bit. (See picture to right)

5) Holding a ruler against each of the inset lines, draw a line INSIDE the box with the compass.

You should now have two boxes drawn on your router table top, an inner and an outer box.

Inner Box: The inner box is the boundary line for the hole in the router table. It goes all of the way through the top.

Outer Box: The outer box is the outermost boundary of the Rabbet you will route for the insert. The Rabbet is set to the depth of your insert for a flush fit.

Laying Out the Cut

Measure with Compass

Step 6 - Cut Out the Center

1) Drill a hole just inside (¼ - ½") the INNER line.

2) Use a jig or reciprocating saw to rough cut the center.

Note: As you can see from the bottom picture to the right, the cut does not have to be pretty. We will clean it up with a router in the next step.

Hole Drilled in Top

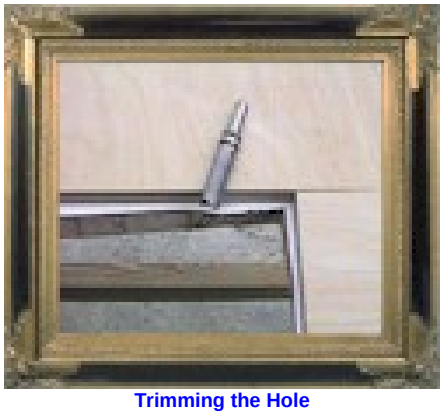
Hole Cut in Top
(Notice my shoes?)

Step 7 - Trimming the Cut

1) Once you have the inside cut out, clamp a couple of pieces of straight boards to the table top so they line up with the inner most box boundary lines.

2) Use a pattern bit to trim the cut to the edge of the boards. The bearing on the pattern bit will restrict the depth of cut to the edge of the boards. Unless you position guide boards all the way around the edge of the inner box (we didn't) you will want to stop your routing before the end of the guide boards and move them.

3) Move the boards to the opposite corner and rout the other side of the inside box.



Trimming the Hole

Step 8 - Rout the Rabbet

1) Using the same router bit you measured earlier, rout a Rabbet around the inside of the hole you just trimmed up.

2) It should be set to the same depth as the thickness of your phenolic insert. In our case, ½".

A Rabbet Bit

Step 9 - Fit the Insert

1) Now that you have the hole for the insert cut and routed you will need to adjust the phenolic insert to fit the hole.

2) Because the router bit cuts in a circular path, the corners of the insert hole are rounded. You could either square off the corners of the hole and leave the insert untouched, or you could round the corners of the insert. We chose to round the corners of the insert.

3) Use a belt sander and round the corners a little at a time. Test the fit and round again. It doesn't take too long before the insert will drop into the slot flush with the table top.

Testing the Fit

A Perfect Fit

Router Table Fence

One of the nicest features of this folding router table is its heavy duty fence. A fence on a router table is not needed for all operations but it makes many jobs a lot safer and easier.

We designed the fence with a large (4") opening to accommodate the largest panel bits available. The faces allow you to narrow

the gap around the router bit to reduce the gap.

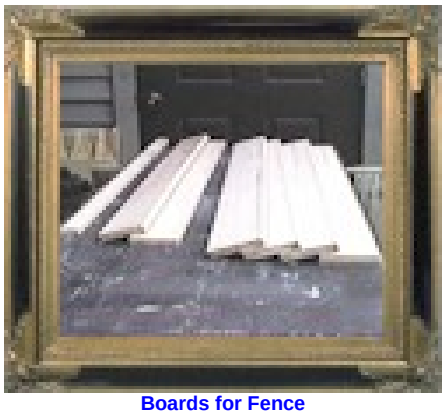
Router Table on Fence

Step 1 - Building the Body of the Fence
We built this fence by gluing up a number of smaller 1" boards. We used Red Oak because it is very strong, stable, and relatively inexpensive.

1) Start by cutting 2 pieces to 3 ½" x 46". These will form the top half of the fence.

2) Next, cut four pieces to 3 ½" x 21". These will form the bottom half of the fence.

3) Finally, cut two pieces for the front face to 3" x 22 ¼". Bevel the edges of the face pieces as seen in the picture to the right.



Boards for Fence

Bevel the Face

Step 2 - Glue the Body Together
1) It is now time to glue the body of the router fence together. Make sure the wood is clean and dry.

2) The two 46" pieces are to be glued together.

3) Glue two of the 21" pieces at each end of the 46" pieces so that a 4" gap is left in the center.

Note: The picture to the right shows the assembled fence. White lines are separate pieces.


Fence Glued Together

Step 3 - Trim the Fence to Size
Trim the ends of the fence so all of the boards are even. The final fence length should be approximately 45".


Trim the Fence

Step 4 - Drill the Face

1) While the fence body is drying we can prepare the face of the router fence.

2) The fence is held in place by four ¼" x 5" carriage bolts with wing nuts.

3) Use a forstner bit to drill a hole large enough to conceal the head of the carriage bolt.

> Drill two holes in each face;
> The first, centered at 6 3/8" in from the beveled end.
> The other, 14 ¼" inside from the beveled end.


Drilled Face

4) Use a 5/16" Drill bit and drill a hole in the center of the holes you drilled with the

forstner bits.

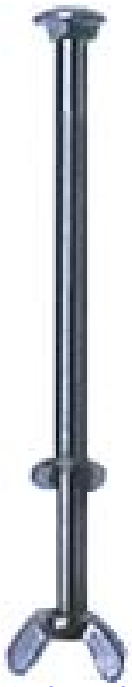
Fence as Seen
From Bottom

Step 5 - Drill the Body

1) After the body has dried, it is time to drill for the bolts that will attach the face to the body.

2) Because we want to be able to slide the face boards to adjust for different router bits, we will need to make slots that are 2 ½" long and 3/8" wide.

Bolts Through Fence



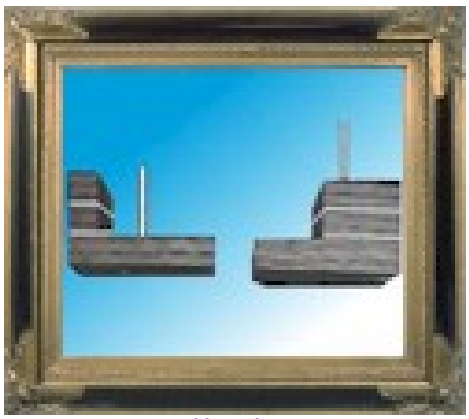
Carriage Bolt
Washer
& Wing Nut

Step 6 - Making the Locking Clamps
The fence is secured to the table by a locking clamp at each end.

Right Clamp
1) Cut a piece of hardwood to 3"x4 ½"
2) Cut two pieces - 3" wide x 1" long.

Left Clamp
1) Cut a piece of hardwood to 3"x4 ½"
2) Cut two pieces - 3" wide x 2 ½" long.

Glue and clamp the left and right clamp as pictured to the right.



Locking Clamps
(White Lines
Show Separate Pieces)

Step 7 - Attaching the Locking Clamps

Once the locking clamps have dried it is time to attach them to the fence. The clamps are held in place by a 6" long carriage bolt and a wing nut. The carriage bold is inserted through a hole that is drilled all of the way through the fence and into the locking clamp. A wing nut and a washer are used to secure the locking clamp to the fence body.

The final step to fitting the locking clamps is to insert the guide pins. The guide pins keep the locking clamps from rotating and causing the fence to slip. The guide pins are made from 3/8" steel and are cut to 1 ½" long. Drill a hole in each of the locking clamps that is slightly smaller than the diameter of your pins. Make sure the hole does not go all of the way through the clamps. After you have drilled the holes squeeze a little epoxy or polyester glue into the hole and tap the pins in place. Next, re-attach the clamps to the fence and mark the place where the guide pins touch the fence. Remove the clamps and drill a hole slightly larger than the diameter of the pins.

Locking Clamp Attached

Step 8 - Cutting the T-Rail

To aid in position and alignment of the router fence we added a "T-Rail" to the right side of the router fence. This rail will help you quickly position the fence parallel to the front of the table.

1) Cut a piece of hardwood 1 ½" x 9"

2) "Dog-ear" the edges as pictured to the right

3) Secure the T-Rail to the bottom right side of the fence with glue and drywall screws. The rail should be position in 1 ½" from the right edge and fastened so that it is exactly perpendicular to the fence.

Step 9 - Sanding and Staining.

The last thing you will need to do to the fence is to thoroughly sand it. You should work to round all of the edges. After all of the parts have been sanded and cleaned you can stain and seal the fence to protect it during use.

T-Rail Set at 90 Degrees