



# Triangle Diamond Rip Sled

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## Introduction

This article describes making a table saw sled designed primarily for ripping equilateral triangle segments for turning. It has a built in angled fence that the piece cannot undershoot. The fence can be set with the aid of the table saw fence, making it easier to set the fence parallel. There is also a hold down that can be quickly adjusted for different thicknesses of wood so that your hands don't need to be anywhere near the blade.

The rip sled can be modified to cut diamonds (as long as the same angle is used), as the fence is reversible to an right-angled edge. Although designed with equilateral triangles in mind, it could be used to rip any single style of isosceles triangle.

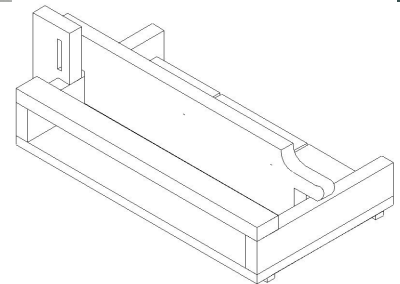
First a plywood base is attached to runners using the table saw fence as a guide. Then front and back supports are added. The fence prepared and aligned, then beveled. The hold down and support are constructed then

added to the sled, as is a brace on the left side.

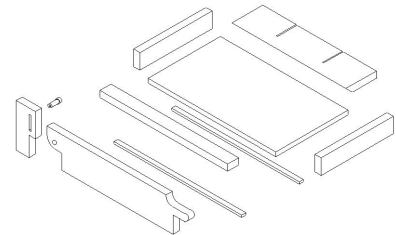
Using the sled to rip triangles is described, as is converting the sled to ripping diamonds.

## Basic Sled

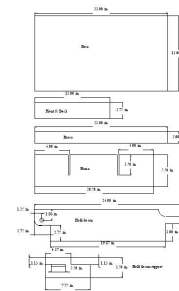
The sled is constructed to rip triangle up to about 20 inches long. It could easily be made longer by changing the dimensions of the parts. Before beginning have a look at Drawing1, an isometric view of the completed sled, Drawing2, an exploded isometric view of the sled, and Drawing3, a visual cutting plan of the parts. 3/4" plywood is used for the base of the sled. The runners are 3/8" x 3/4" UHMW. Most of the rest of the parts are 5/4 Radiata Pine from Home Depot. Substitute any reasonable strong wood you like, although if the thickness varies you may have to change some of the dimensions a bit.



Drawing1 An isometric view of the rip sled.



Drawing2 An exploded isometric view of the rip sled.



Drawing3 A visual cutting list, showing dimensions of the parts. Download Drawing3 as a pdf separately.

Begin by cutting two runners of UHMW, 3/8" x 3/4" x 23". Yes, you could make the runners out of hardwood and wax them, but the UHMW is dimensionally stable regardless of the humidity, and slides very nicely. It's even used for pillow block bearings in food service applications. Then cut a rectangle of 3/4" plywood 23" long and 13" wide (alert readers may notice the appearance of the plywood changes in the later figures. This is because I started with 1/2" plywood and found it wasn't strong enough for this application. Cutting on a bevel with a hold down pressing in the middle tends to bow thinner plywood, leading to inaccurate cuts). If your table saw miter slots are more than about 12" apart you may have to increase the width.

You should probably cut the rest of the parts, except perhaps the hold down, at this time to prevent constantly rearranging the saw set up. Follow the dimensions in Drawing3 to cut the front, back, race and fence of 5/4" (mine was just under 1-1/8") wood. Don't obsess over the exact width of the pieces--for the front and back I used 5/4 x 6 pine and ripped it in half, yielding pieces about 2-5/8" x 13". The brace is 2" x 23". The rip fence is the full width of the 5/4 x 6 after jointing and facing on the table saw by 20-1/2".

Place the plywood base on the table saw. Adjust your rip

fence so that the base is centered on the miter gauge slots and parallel to the blade as in Fig01. Mark the center of each miter gauge slot at the front and back of the base and draw a line connecting the marks. Then mark locations for runner mounting screws 2" and 2" from front and back. Remove the base from the table saw and drill body holes and countersink for the screws at all marked locations. Drop the UHMW runners into the miter slots even with the front of the saw. Place the base back on the table saw against the fence and aligned with the front of the saw and the UHMW runners. Hold everything in place with a couple of clamps as in Fig02. Drive screw to hold the runners in place. Unless you over countersunk the holes tremendously, 1" flathead screw should work fine.



Fig01 Laying out mounting holes for the miter gauge runners.



Fig02 Mounting the miter gauge running strips.

Measure the actual width of your front and back parts. Measure and mark that distance from the front and back of the sled. Slide the fence out of the way and use a square to draw a line across the base at the marks to guide placing the front and back as in Fig03. Spread some glue on the bottom of the front piece and place it on the base aligned with the guide line. Bring the sled to the front of the saw and use clamp the front to the base and table saw as in Fig04. If your saw doesn't allow this you can clamp it off the saw, but be careful that the clamps don't bow the base. Use a square to check the alignment of the front with a square as in Fig05 before the glue sets. Repeat this procedure for the back. After the glue sets you can reinforce the glue with some screw driven up from the bottom of the base, but stay well away from the saw line.



Fig03 Using a square to lay out the position of the front.



Fig04 Clamping the front to the base.

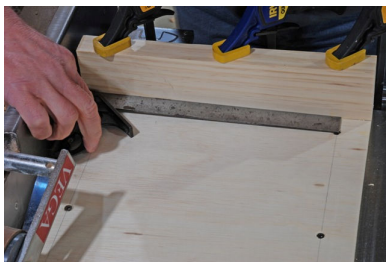


Fig05 Checking the alignment of the front on the base before the glue sets.

Despite the fact that it's missing from some of the pictures, glue and screw the brace across the front and back at the far left side at this time. This will help keep the sled flat.

Set your table saw blade to 30 degrees as accurately as you can. I suggest you use an accurate 30/60 triangle, or one of the new electronic devices rather than trusting the indicator on your saw. Adjust the blade

height so that it's a little higher than the thickest wood you intend to rip and run the sled through the blade as in Fig06.



Fig06 Cutting the blade slot with the blade set at 60 degrees.

If you haven't already done so, return your blade to 90 degrees to cut the fence to length. Joint one edge of the fence, and skim rip the other edge so that it is parallel to the jointed edge. Make sure the fence is flat, as if it is not it will tend to bow the base. If it is not, find a flatter piece, or joint on face and then plane the other parallel. Mark lines 6" from each end of the fence 4" long. Use your table saw, as in Fig07, or your band saw to cut slots slightly wider than the screws you'll use to mount the fence to the base.



Fig07 Using the table saw to cut slots in the fence.

Prepare a fence extension so you can use your table saw fence to align the sled fence. It should be 2" wide and 20-1/2" long. Joint one edge and skim rip the other edge so that the edges are parallel. Return the blade angle to 60 degrees.

Using your table saw fence and the fence extension as a guide, set the fence so one edge is aligned with the right edge of the blade slot of the base. Lock the fence in place with two screws and washers positioned about 1/2" from the right edge of the fence in the slots as in Fig08. Remove the fence extension and move the table saw fence out of the way. Then pass the sled through the blade to cut a bevel on the fence, as in Fig09. Now flip the fence so that the bevel faces down as in Fig10.



Fig08 Aligning the fence with the right edge of the blade kerf to bevel the fence. The fence extension and your table saw fence make it easier to get the fence parallel to the blade.



Fig09 The fence after beveling.

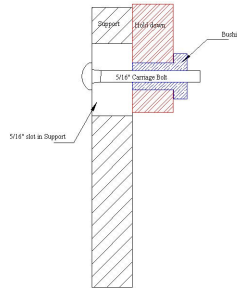


Fig10 The fence after flipping it over so that the bevel faces down.

## Hold Down

To make the hold down you'll need a 5/16x3" carriage bolt, and a 5/16" knob. You'll have to cut the hold down and the support as shown in Drawing3, and turn a bushing. Drawing4 is a cross section of the Hold Down Depth Adjustment mechanism. The carriage bolt slides up and down in a slot in the support. The square shoulders of the bolt keep it from turning when you tighten

or loosen the knob. The bushing, which is just a little longer under the shoulder than the hold down thickness, allows the hold down to swing up and down with only moderate lateral play.



Drawing4 A cross section view of the support, bushing, bolt and hold down.

Cut out the support using the dimensions indicated in Drawing3. The slot is drawn with square ends--that was a convenience for the isometric drawing--it's easier to drill two 3/8" holes and saw out between them. If you have a scroll saw use that to saw out the slot between the holes. If not, use your band saw to rip the support even with the outer edges of the holes, saw the other line, then glue the pieces back together.

Cut out the hold down to the dimensions in Drawing3. Attach craft foam (available at Wal\*Mart) to the bottom of the hold down. Place it on the sled so the left edge of the hold down is aligned with the right edge of the kerf. Place the support against the left side of the hold down and mark the location of the support on the back. Drill and counter sink the back for mounting screws. Screw the support to the back

with a couple of long screws as in Fig11.



Fig11 After attaching the support to the back.

Turn the bushing on your lathe. Mount a 1-1/2" x 1-1/2" x 1-3/4" piece of hardwood, such as maple on between centers. Turn the piece round. Leaving a shoulder full diameter, reduce the rest of the bushing to 3/4". Remove it from the lathe and check the fit in the drilled hole in your hold down. The fit should not be sloppy, but should let the bushing rotate easily. Adjust if necessary. Trim the reduced end of the bushing so that it is just longer than the width of the hold down. Mount the bushing in a chuck and drill a through 3/16" hole for the carriage bolt. The completed bushing, along with bolt and knob, are shown in Fig12. Mount the hold down by putting the bolt through the support from left to right. Place the bushing in the hold down with the shoulder towards the

right, then place the bushing over the bolt and screw on the knob as in Fig13.

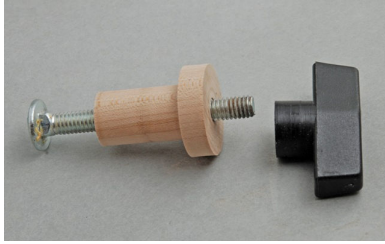


Fig12 the completed bushing along with the carriage bolt and knob.

that the base of the fence is the desired triangle width from the left side of the blade kerf. as in Fig 15.



Fig14 Adjusting the hold down height.

board over and again slide the board against the fence and front of the sled, turn on the saw and rip again. Repeat until you run out of board or have enough pieces.



Fig16 Set-up to rip triangles.



Fig13 After mounting the hold down on the support.



Fig15 Using the fence extension, and table saw fence to set the fence.



Fig 17 Set-up to rip triangles from the back.

## Using

To use the rip sled, first adjust the hold down. Place a sample of the stock you will rip on the base centered between the front and back. Loosen the hold down knob. Lower the hold down on the sample so that it lies flat on it, then tighten the knob as in Fig14. Adjust the fence, using the fence extension and your table saw fence, so

To rip a piece, place the board against the fence and front of the sled and lower the hold down as in Fig16 and Fig17. Gently use the hold down to keep the stock in place and push through the blade as in Fig18. It is probably safest to turn off the saw before returning the sled to its original position and removing the cut piece. Flip the

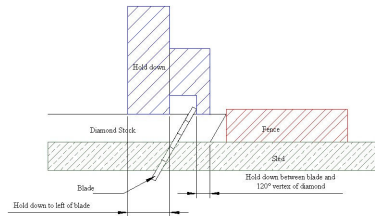


Fig18 Ripping triangles with the rip sled.

## Diamond Conversion

To convert the sled to rip diamonds you will need to make an auxiliary hold down. The length of the auxiliary hold down is the same as the active part of the hold down, or 20", and the width will depend on the size stock you are ripping. Look at Drawing5 to help figure out the width of board to use and the depth of dado to cut. You want to hold the off cut down, not force it to twist into or away from the blade. Once you've figured out the dimensions of the hold down, use your table saw to cut the dado. Use spray adhesive to attach craft foam to the bottom of the auxiliary hold down. Drill a couple of mounting holes an inch or so from the top of the auxiliary hold down. The

completed auxiliary hold down is shown in Fig19.



Drawing5 A cross sectional view showing where the auxiliary hold down should bear on the diamond stock.



Fig19 The completed auxiliary hold down.

Reverse the fence so the 90 degree face is towards the blade as in Fig20. Loosen the knob so that the hold down is flat on the base. Place the auxiliary hold down flat on the base next to the hold down and attach it with a couple of screws as in Fig21.



Fig20 After reversing the fence so the 90 degree edge faces the blade.



Fig21 After attaching the auxiliary fence.

Adjust the height of the hold down by loosening the knob and laying it flat on a piece of the stock you intend to cut, then tightening the knob as in Fig22. Measure the thickness of your stock. Multiply this thickness by 1.73 and use your table saw fence and fence extension if necessary to set the fence that distance from the right edge of the blade kerf. Rip the diamonds as you did the triangles, only you don't flip the board between cuts. The first diamond will have to be rotated

180 degrees to rip the other edge.

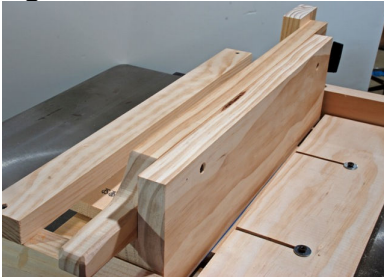


Fig22 Adjusting the height of the hold down.

greatly increase the hold down power. It gives the hold down a little wiggle room on thickness, and seems to increase friction. You can get it in the crafts section at Wal\*mart, Michael's, or any such store. The plain foam and spray adhesive is usable in more situations than the self-stick. Buy the big pack of assorted colors--I've found all sorts of uses for it.

## Materials and Sources

I used 3/4" BC exterior plywood for the base of the sled. Birch plywood would be a better choice, and Baltic Birch even better, but more expensive. Perhaps you wouldn't need the brace if you're prodigal on plywood.

You can buy UMHW from woodworking suppliers precut to fit in miter gauge slots. You can also buy this very versatile material in bigger chunks from Industrial Suppliers and rip your own on the table saw. Try McMaster-Carr, or Google it.

I used 5/4 Radiata pine from Home Depot for the other parts of the sled. It's reasonably strong and straight for the money. Anything you have in the neighborhood of 1" thickness will do.

The craft foam, attached with 3M spray adhesive, seems to