Cove Cutting Jigs for the BT3000
By Jim Frye

This article covers the construction and use of a set of jigs to create cove moldings on the BT3000. Making cove moldings on a table saw is an old technique and is easily done on the BT3K. This technique can be used to cut a cove of almost any dimension up to 3 9/16" deep and up to 9 1/2" wide, although those dimensions are probably way beyond the realm of practicality. The cove cut on a table saw is not a true circular form, but rather an ellipse of nearly circular shape. The deeper and narrower the cove, the more elliptical it's shape will be. Typical coves are usually 4 to 5 times wider than they are deep and this curve looks circular to the eye. In reality, this setup will cut almost any size cove that you would need for any furniture project. This method has been written up in many books on table saws, books on table saw jigs, and in many magazines over the years, so this is nothing new. The information may not be readily available to BT3K users and so is presented here with an orientation toward doing it on the BT3K.

Cutting coves on a table saw is accomplished by using a parallelogram to set the angle that the cove stock moves past the blade, and then setting a pair of table top guides to keep the stock at that angle during the cutting process. The cutting process involves multiple passes past the saw blade and the paired table top guides ensure that the cove is cut accurately and safely. The BT3K doesn't have overhanging tables to clamp the guide boards to and the front and rear rails are set below the table tops, which makes clamping the guides more difficult. That issue will be addressed later in this article.

The traditional cove cutting parallelogram is created with two 18" long and two 9" long bars bolted together at the ends. Make these from 3/4" plywood cut 1" wide. The first picture shows the parts of the parallelogram. The parallelogram also requires four 1/4x20x2" long flat head machine screws, four flat washers, and four wing nuts. The most important factor for this jig is that the holes in each of the opposing pieces must be exactly the same distance apart. To do this accurately, tape the 18" pieces together, one on top of the other, and drill a 1/4" hole 1/2" from each end through both pieces. Repeat this with the 9" pieces. Countersink the holes on the back side of the 18" long pieces to accept the machine screw heads. I soaked the four pieces of the parallelogram in Watco danish oil for several days to fill the pores of the wood. After curing, this plasticizes the wood, strengthens it, and stabilizes it. I wiped on a couple of coats of wiping varnish to protect the pieces. When the finish has cured, assemble the pieces to form the parallelogram. The washers are used as bearing surfaces for the wing nuts. Picture two shows the completed parallelogram.

To use the parallelogram to set the cutting angle, adjust the guide so that the distance between the inside of the long arms is the same as the desired width of the cove molding recess and tighten the wing nuts. Next raise the saw blade to the maximum depth of the cove molding. Then lay the parallelogram guide diagonally across the throat plate and rotate the guide until the teeth of the blade just touch the inside of both arms. See

picture three. The normal orientation to use here is from the left front of the saw the right rear, as shown in the picture. The rotation of the saw blade will tend to force the work piece against the right guide. Using a pencil or wax crayon, trace the inside edges of the guide's long sides on the saw table and throat plate. Remove the guide and lower the saw blade below the table. Next, extend the two lines you just marked to the front and rear edges of the tables with a straight edge. Mark the shape of the cove on the end of the work piece stock. Place the work piece on the saw table and align the sides of the cove cut with the lines at each end on the table. Mark each side of the work piece on the table and use these marks to lay out the lines for the guide boards. See picture four. Note that you can cut a cove off center in the work piece, and if you do, you must always pass the work piece past the saw blade with the same side to the right. The masking tape on the table top is to make the lines show up more clearly in the picture and wouldn't be used normally as it would cause the work piece to hang up.

This is the point where things differ for the BT3K. To clamp the guides to the table top requires a couple of blocks to allow the guides to be clamped to the front and rear saw rails. Picture five shows the parts of the riser blocks. These riser blocks are 2" wide, 1 3/16" thick, and at least 18" long. Double check the 1 3/16" thickness to make sure that the tops of the blocks are flush with the top of the saw tables. Following my cardinal rule of making my jigs from scrap stock, I cut the ones in the pictures from some 8/4 white oak, but laminated plywood would be a better choice. I mounted these blocks on the saw rails with 1/4x20 T-nuts and 1 1/4" long 1/4x20 flat head machine screws. The machine screws are long enough so they can be loosened just enough to slide the blocks on and off of the rails without disconnecting the T-nuts from the screws. If the screws are any longer than 1 1/4", they will touch and damage the bottom of the T-slot in the saw rails. I had to cut mine off with a Dremel mototool and a cutoff disk, because I could not find 1 1/4" long flat head stainless steel machine screws in my area. I like to use SS hardware on my jigs when I can as I like the finish and they don't rust. The T-nuts are standard hardware store items with the prongs bent back down and compressed flat in the jaws of a vise. The flanges are 3/4" wide which just fit in the top T-slot of the front rail. The rear rail does not have a T-slot as it is the slot for the rip fence and apparently the Ryobi engineers decided not to make it a full T-slot. Bad Ryobi engineers. The slot is also narrower than the front rail slot by about 1/8" and so the flanges of the T-nuts must have flats filed on each side to allow them to slide into the narrower slot on the rear rail. Since the blocks really don't have be really tight, but just held in place until the clamps are tightened down, the thin web of the T-nuts is sufficiently strong enough to hold the blocks in place until the clamps are set. The mounting holes are drilled 2" from each end. The front and rear rails have different shapes and the T-slots are oriented slightly differently. Align the blocks on the rails and mark the locations of the slots on the blocks. Notice that the T-slots are not centered in the 2" width. Label the blocks as front and rear blocks to avoid confusion later. Mark the center of the slots on the blocks. Drill the holes from the bottom of the blocks. Start with a 5/16" bit and drill each hole about 3/4" deep. Now switch to a 1/4" bit and drill the holes on through the block. The resulting 5/16" counter bore will allow the sleeve of the T-nut to slide up and down in the block. Countersink the tops of the holes to allow the flat head machine screws to sit below the

tops of the boards. I finished the blocks with a soak in Watco and wiping varnish. Picture six shows the blocks mounted on the rails.

At this point there needs to be some discussion on using these riser blocks with the sliding miter table (SMT). I have extra accessory tables for my BT3K and when I cut a cove on my saw, I remove the SMT and mount an accessory table in it's place. For those users who don't have this luxury, the front riser block can be modified to be used with the SMT in place. All that is required is to cut a 5/8" high by 9" wide dado across the bottom of and in the center of the riser block to clear the SMT track and mount on the front rail. The right hand T-nut would be disconnected from it's mounting screw to allow the block to installed over the SMT mount. Slide the left hand T-nut onto the front rail and swing the block into place over the SMT. Then engage the right hand T-nut. The table of the SMT is locked in position with the locking tab for cove cutting.

Slide the blocks onto the rails and position them at the ends of the areas where the guide boards will lie. See picture five to see how the blocks mount on the rails. Snug the screws down to lock the blocks in place. I use a commercial aluminum saw guide as the primary guide and an aluminum angle as the secondary guide, but a pair of straight edged boards will suffice also. Next position the guides in place and clamp them to the rails/blocks. Picture seven shows the guides clamped in place. Test slide the work piece through the space formed by the guides to ensure that it will not bind nor be loose during the cut.

Raise the saw blade to 1/8" above the table to begin the cove cutting. Always use a test piece of wood and cut the entire depth of the cove in the test piece to make sure you have the set up done correctly. Since most cove cutting will place the user's hands within the 3" danger zone around the exposed portion of the saw blade, always use push blocks and a push stick to move the work piece past the saw blade. The push blocks are used to keep the work piece flat on the table. The push stick is used at the end of the cut to keep the operator's hand away from the blade. Due to the small amount of stock being removed with each pass, there is very little resistance during the cutting process. However, the cut is being done at an angle to the blade and the arbor, so you should feed very slowly to avoid putting undo stress on the blade and the arbor bearings. You should always have at least 3/4" of stock behind the deepest part of the cove to provide enough material to prevent the work piece from splitting. If your cove piece has to be thinner, resaw or plane it to it's final thickness after cutting the cove. This will probably be a rare situation as most coves are either full triangles in cross section or require enough thickness on the sides for secure mounting to the case work. Don't be tempted to remove more than 1/8" with each pass as it will cause more upward pressure from the saw blade and possible chattering. This situation could lead to kickback and damage to the work piece or yourself. If you are going to be doing a lot of cove cutting, it would be a good idea to build a dedicated right side guide with some kind of finger board/block that would prevent the work piece from rising out from between the guides or from kicking back. If the right hand guide board had an "L" shaped area next to the throat plate area, that would provide a mounting point for such a fixture.

There are some tips related to cove cutting that never seem to get talked about in any of the other write ups on this subject. First and foremost, your stock must be straight, flat, and square. If the face of the stock is not flat, your cove will get wider and narrower along it's length. The best way to ensure this, is to cut your cove from 8/4 or 12/4 planed stock. If you make your cove stock by gluing up the piece from layers of wood, take extra care that the lamination process does not cause the face of the stock be wavy and cause you extra work jointing the face flat. Also, if you are laminating your stock, make the face piece thick enough that the cove won't cut through into the second layer. This will prevent a glue line from showing in the cove. If the primary edge is not straight, the cove will not be straight. Also, it is essential that all of the saw tables are exactly the same height. If they are not, you will get a deeper or shallower cove cut at the ends of the work piece. It's sort of similar to the snipe cut you get on a planer. When cutting the cove, raise the blade no more than 1/8" at a time until the cut is near the final depth. I normally raise the blade with one turn of the BT3000's elevation crank for each pass. Make the final pass a light cut and make it slowly to make the cut as smooth as possible.

The best blade for cutting coves on a table saw would be one that had teeth that had a slight arc to the tops of them. That type of blade is not available off the shelf, so the next best type of available blade to use for this kind of cutting is one where some or all of the teeth have a flat top (FT) grind. The 36T blade that came with my BT3K is an (FT) blade and will leave very fine tooth marks on the surface of the cove from the corners of the teeth. An alternate top bevel (ATB) blade will leave deeper marks than an FT blade. This will require some more scraping and/or sanding to remove the marks, but it is usable. You will get tooth marks no matter what type of blade you use, so scraping and sanding are a given. I use a sanding block of the same diameter as the cove to remove these marks. If you don't have a lathe available to turn a sanding block, you can make your own. I have a circular block that I made from a 20 ounce plastic soda or pop bottle. I filled it with fine play sand by repeatedly tapping the sides lightly to settle the sand and get as much in the bottle as possible. I kept tapping and filling until I could get no more sand in the bottle. With the bottle filled to the very top, I screwed the cap on tightly. This form is solid and has some mass to it to make sanding easier. It's also just the right size to use a 1/4 sheet of sandpaper with. I start with 60 or 80 grit paper to remove the tooth marks and then work down to my final girt for what ever finish I using. That's all there is to it. Always work carefully, with eye, hearing, and hand protection.