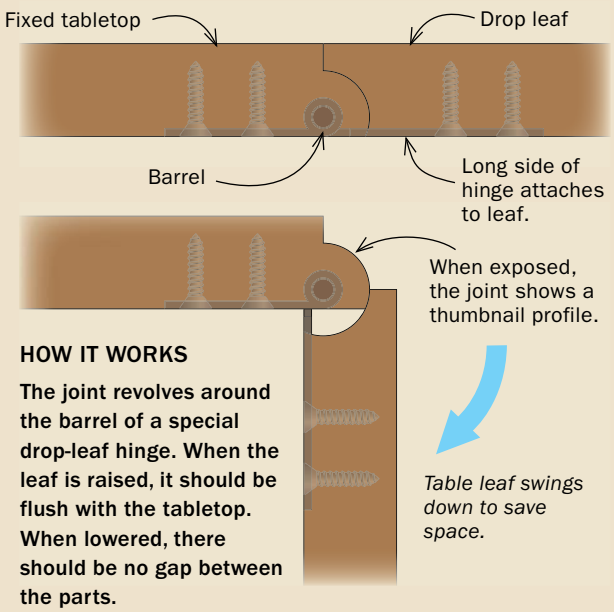
# The Rule Joint Done Right

## Anatomy of the joint

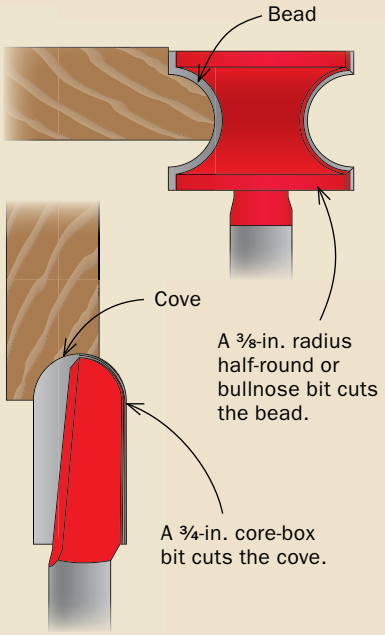



**HOW IT WORKS**

**The joint revolves around the barrel of a special drop-leaf hinge. When the leaf is raised, it should be flush with the tabletop. When lowered, there should be no gap between the parts.**

**A PAIR OF ROUTER BITS MAKES THE JOB EASY**

**For the two halves of the rule joint to meet without a gap, it is critical that the radii of these two router bits match exactly.**



# Attractive drop-leaf joint revolves around precise layout and matching router bits

BY MICHAEL ZUBA

Most commonly found on drop-leaf tables, the rule joint allows the outside leaves to be lifted to create a large, useful surface, or folded down to save space. The beauty of this molded joint is that it looks attractive whether open or closed, and it keeps the hinges hidden.

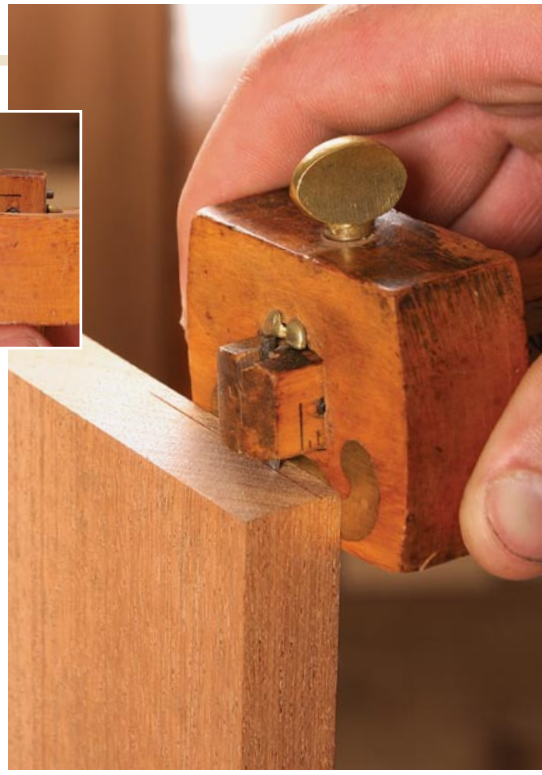
You need to understand the mechanics of this joint in order to lay it out and cut it accurately, and project articles rarely go into enough detail. A rule joint consists of a board with a bead (typically the fixed top of a table) and a board with a cove, or cope (typically the movable leaf). When the joint is closed, the two boards meet tightly and on an even plane. As the leaf is lowered, the cove rolls evenly around the bead. Two or more hinges support the leaf. The secret is to place the center of the hinge barrel in line with the center of the bead.

Although you can create this joint with matching molding planes or shaper knives, the method I'll explain uses two widely available router bits. And construction is easy when divided into three main steps: Cut the bead, cut the matching cove, and finally, install the hinges.

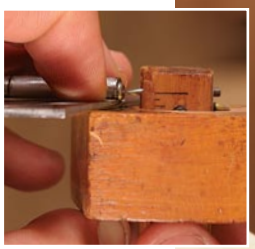
### Dial in the setup on a sample board

It is vital to the smooth operation of the rule joint that the boards remain flat and true, so rough-mill the boards a little oversize and allow them to rest in your shop for a week or so to make sure they are stable and don't cup or

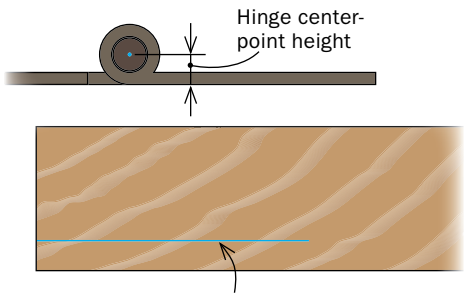
## Lay out the bead



### 1 LOCATE THE CENTER OF THE HINGE



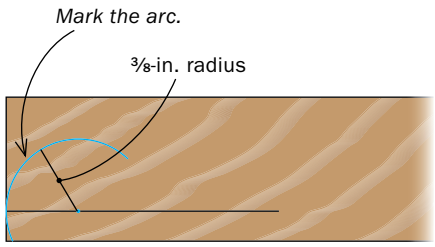
Because the joint revolves around the center of the hinge's barrel, you need to mark this location. Set a marking gauge to the distance from the flat side of the hinge to the center of the barrel, and scratch a line on the end of the sample board that will enter the router bit first.




*Mark line at hinge center-point height.*

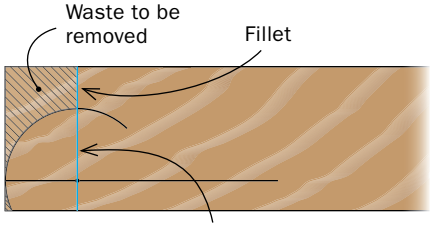
### 2 MARK THE ARC OF THE HALF-ROUND ROUTER BIT

Set a compass to equal the radius of the half-round bit you'll be using, in this case ⅜ in. Place one point on the edge of the board and the other on the center-point line created in step one. Draw an arc of about 180°.




### 3 COMPLETE THE LAYOUT

Drop a line at right-angles to the center point. This gives the location of the fillet, or straight section above the bead. The shaded area is removed on the router table to leave the beaded half.

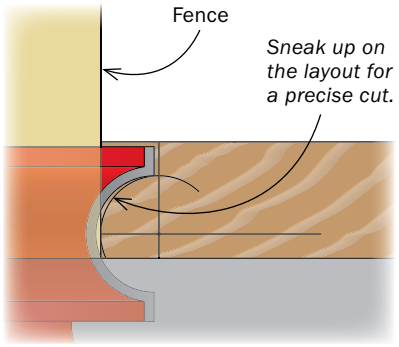



*Mark a vertical line at the center point.*

Photos: Mark Schofield; drawings: Kelly J. Dunton

# Rout the bead

***Fine-tune the setup.*** *Using the layout on the end of the sample board, set the half-round bit to the correct height. Make the first pass with the fence slightly forward, and then ease it back until the bead is cut perfectly.*




***Bead the tabletop.*** *Now that the router has been set up using the sample board, clamp a hold-down board to the fence of the router table and cut the bead on both sides of the fixed tabletop (above). Because only a small amount of wood is being removed, you can cut each bead in one pass. If a thin strip of wood is left attached to the top of the fillet (right), cut it off on the tablesaw and carefully sand it flush.*

twist. Then mill them to final thickness, in this case ¾ in. I always mill a sample board to the same thickness as the tabletop and use it for layout and test cuts all the way through the process to ensure the rule joint fits properly. This makes me confident that everything will work when I start cutting my valuable tabletop.

The rule joint revolves around the barrel of the hinge, so start laying out the joint by setting a marking gauge to the distance from the flat side of a drop-leaf hinge to the center of its barrel (see "The right hinge for a rule joint," p. 72). The grain of the tabletop and the drop leaf runs parallel to the rule joint, so the layout is done on the end grain. Scribe a line along the end grain of the sample board, registering off the bottom edge of the board. Make sure you lay out the end of the board that will contact the router bit first on the router table.

I used a ⅜-in. radius half-round or bullnose bit to cut the bead, so I set a compass to this distance. Put one point of the compass on the scribe line and the other where this line reaches the edge of the board. Now draw an arc of about 180° whose apex just touches the edge of the board. Use a knife and a square to mark a line perpendicular to the scribed line at the location of the compass point away from the edge of the board (see bottom drawing, p. 69). You now have established the location of the hinge and the profile of the bead.

I use a full half-round bit rather than a quarter-round beading bit because the half-round bit will cut a return past the centerline. If this is not cut, the bottom edge will bind as the leaf drops and the cope of the drop leaf will not roll evenly. You'll also need a ¾-in. radius core-box or round-nose bit, which should nest perfectly with the half-round bit. I used Freud bits 18-122 and 82-116, available at www.woodworker.com.

With the half-round bit mounted in a router table, use the sample board to set the correct height of the bit and then gradually move the fence back to sneak up on the exact line of the bead. Once set, clamp

# Cut the matching cove

***Transfer the layout.*** *Butt the tabletop to a fresh edge of the sample board with the fillet in line with that uncut edge. Transfer the outline of the bead.*

***Saw away the waste.*** *Use dado blades to cut away the bulk of the waste in what will become the cove.*

***Set up to cut the bead.*** *Align the sample board with the round-nose bit, but make the first cut with the bit slightly too low.*

a hold-down board to the fence, and make the cut to both sides of the fixed part of the tabletop. With a sharp bit, you can do this easily in one pass. Depending on the thickness of the board, you may be left with a thin strip of wood attached to the fillet (the vertical surface above the bead). Cut this away on the tablesaw and clean up the edge with sandpaper wrapped around a block, using a light touch. With the bead side complete, the next step is to cut the matching coves on the leaves.

***Check the fit.*** *After the first cut, the bead and cove should nest perfectly, but the coved sample board should still sit a little higher than the beaded board. Sneak up on the cut until the two boards are level.*

## Sample board strikes again

To get the approximate location of the cove, I butt the beaded board against the uncut side of the sample board and trace the bead onto the end of the board.

Remove the bulk of the waste with a ¼-in.-wide dado blade on the tablesaw, staying away from the traced line. This will prevent the core-box bit from having to make too large of a cut in a single pass. Set up the router table with the ¾-in.-dia. core-box bit. Use your sample board to make a trial cut just below the outline you drew. Now check the fit of cove to bead, and raise the height of the bit accordingly. The cut should produce a cove that perfectly matches the bead when the boards are mated on a flat surface.

When set up, I take a secondary fence and align it parallel to the primary fence with the sample board as a spacer. This fence acts like a featherboard to keep the


***Cove the drop leaves.*** *Once the sample board is right, clamp a second fence to the router table so that the wide leaves won't wobble as they pass the router bit.*

# Install the hinges

## The right hinge for a rule joint

**A regular hinge with its barrel in the middle won't work for this type of joint. Instead you need a drop-leaf hinge with sides of different lengths. The short side is attached to the beaded board, while the longer side is attached to the drop leaf so that the underside swings under the beaded board.**

### SOURCES OF SUPPLY

**DROP-LEAF HINGES**

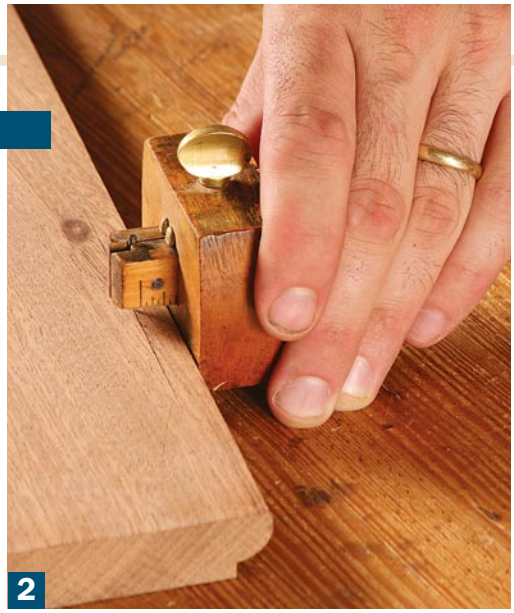
www.horton-brasses.com
www.londonderry-brasses.com

### FLATTEN THE HINGE IF NECESSARY

***How to check it.*** *The drop-leaf hinge should sit flat with the barrel facing up (top). If the leaves rise up as they approach the barrel, the hinge may not work properly.*

***Gentle persuasion.*** *Hold one leaf tightly in a vise and use a block of wood and a hammer to gently straighten the leaf.*

### LAY OUT THE POSITION


***Inset the hinge.*** *Set a marking gauge to the distance from the edge of the bead to the vertical line below the fillet (1). This marks the center of the hinge barrel. Scratch a line where the hinges will be centered (2). Then clamp the drop leaf to the tabletop, and locate the hinge upside down straddling the joint, with the barrel centered on the scribed line (3). Mark the outline deeply with a knife.*


### CUT THE MORTISE

***Set the router depth.*** *Set the depth of a straight bit to match the thickness of a hinge's leaf. Clean up the recess after routing away the bulk of the waste. Use a chisel to square up the sides of the hinge recess (right).*

## ATTACH THE HINGE




***One last cut, and it drops in.*** *Use a carving gouge or a chisel to cut a trench for the barrel of the hinge (1). Use full-threaded screws to attach the hinge to the tabletop and the drop leaf (2). Check that the two surfaces of the rule joint remain parallel throughout the movement with no binding or unsightly gaps (3). A bit of sanding smooths out the action.*

leaf tight to the fence, ensuring a smooth, consistent cut. With the beads and coves cut, you can move on to the hinges.

### A rule joint hinges on the hardware

Locating and installing the hinges is the most critical part of the process. The first step is to determine the number of hinges. For smaller pieces such as a Pembroke table, I use two hinges. For large tables such as a William and Mary gate-leg or a dining-room table, I would use up to four.

Set a marking gauge to the width from the edge of the bead to the vertical line you drew during layout. Now take the actual tabletop, and scribe a line along the underside of the bead to mark the centerline of the hinges.

Clamp the top and a leaf together, face down. Now place the hinge upside down with the barrel in line with the scribe mark. Using a knife, outline the location of the hinge across both boards. Set up a router with a ¼-in. straight bit and adjust the depth of cut to the thickness of the hinge leaf. Separate the boards and rout away the waste, staying away from the knifed line. Then clean up the walls with a chisel.

To make room for the hinge barrel, I use a #8 carving gouge to create a round-bottomed trench. You also could use chisels to create a straight-sided recess.

Set the hinge in the mortise to check that no part of the hinge projects above the bottom surface of either board. Fasten the hinge with appropriate screws and swing the leaf to check the fit. You may have to sand the surfaces very lightly, but that should be the limit to your fine-tuning.

Although this joint takes patience, you'll see the reward on your next table, whether the leaves are open or closed. □

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