

A Guide to Guide



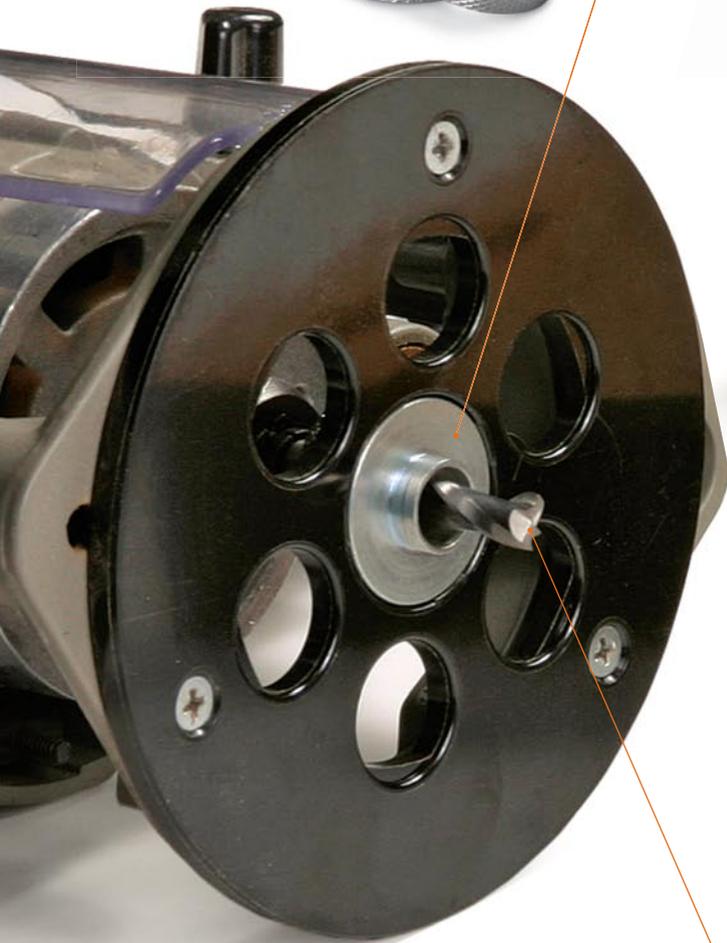
BETTER THAN BEARINGS

The advantage of a guide bushing is that it stays fixed and stable against its reference surface while allowing the bit to spin and plunge freely.



BY GREGORY PAOLINI

7 simple jigs make it easy to rout mortises, slots, holes, and more



THE BIT TO USE

You can use a bushing with nearly any router bit, but a spiral upcutting bit works best for most cuts.



Routers need guidance, something firm and fixed to make sure the bit goes only where you want it to. Think bearing-guided bits, edge guides, and fences.

But there's a type of guide that woodworkers often overlook: the guide bushing. It's often the simplest, fastest way to make accurate and repeatable cuts—some of them difficult or impossible with any other type of guide. Used with simple shopmade templates, bushings make it easy to cut mortises, bore dowel and shelf-pin holes, and rout evenly spaced stopped dadoes in a carcass.

Bushings have several unique strengths. They allow you to plunge-cut and use spiral bits, which aren't available with bearings. You can cut into the middle of a workpiece, not just along its edge. And you never have to worry about a bearing wearing out and seizing up during a cut or burnishing the edge of the work.

Don't forget the offset

The most important thing to learn about using bushings is the offset—the distance between the cutting edge of the router bit and the outside edge of the bushing. The offset is the key to

Bushings

creating jigs and templates to cut the sizes and shapes you want. To determine the offset, subtract the bit diameter from the bushing diameter and divide by two. For example, with a $\frac{3}{4}$ -in.-dia. bushing and a $\frac{1}{2}$ -in.-dia. bit, the difference is $\frac{1}{4}$ in. Half that, or $\frac{1}{8}$ in., is the offset, so the edge of the template must be $\frac{1}{8}$ in. from the edge of the cut.

Second, be sure the offset is large enough for chips to exit the cut. That's critical if you use a spiral upcutting bit to cut mortises. The bit helps clear out chips that inevitably build up and pack the slot, but you have to give the chips somewhere to go. I like to use a bushing with a $\frac{1}{2}$ -in. or $\frac{5}{8}$ -in. outside diameter and a $\frac{1}{4}$ -in.-dia. bit.

Third, be sure the bushing isn't longer than your template is thick. Otherwise, the bushing will hit the workpiece and you'll be dead in the water. Either make the template out of thicker material or trim the bushing as shown at right.

The other key is that the bit and guide bushing are very close to concentric; otherwise, the offset will be greater on one side of the router than the other. That can produce a too-narrow mortise or a slot with a wavy edge. Some router manufacturers sell centering cones to help adjust the offset, but I use a simpler method (see tips at right). To adjust the bushing location on most routers, you'll need to adjust the base. You may need to enlarge the mounting holes or replace the baseplate.

A final tip

With a plunge router, if you go too deep, the spinning router collet will hit the guide bushing—and burning metal is an unpleasant aroma. So set the depth stop accordingly.

On the next four pages I'll show you my favorite jigs and templates for guide bushings. You'll come up with many more.

Gregory Paolini is a professional furniture maker in Waynesville, N.C.

Setup TIPS



They often need a trim

Too much of a good thing. Most bushings are too long for $\frac{1}{4}$ -in.-thick template stock. As is, this one will hit the workpiece.



Easy to trim. Use a hacksaw to trim the bushing to just under the thickness of your template stock. Clean up the sawn edge with coarse sandpaper.

Alignment is essential



Center the bushing

Dovetail-bit test. To find out if the bushing and bit are concentric, raise a dovetail bit until it nearly touches the bushing, then spin it by hand. You'll quickly see if the bushing is off-center.



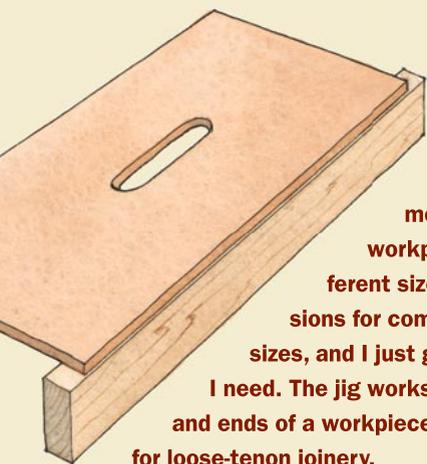
Keep the router in line

Tape marks the spot. Just in case the offset between the bit and the bushing is still a little inconsistent, Paolini keeps the router in the same relative position for each pass, ensuring a consistent cut. The piece of green tape is his reference.

7 super jigs for bushings

These simple templates and patterns let you cut mortises, holes, slots, and elaborate shapes with a plunge router fitted with a guide bushing and a spiral upcutting bit. All the jigs begin with a piece of 1/4-in.-thick plywood or MDF.

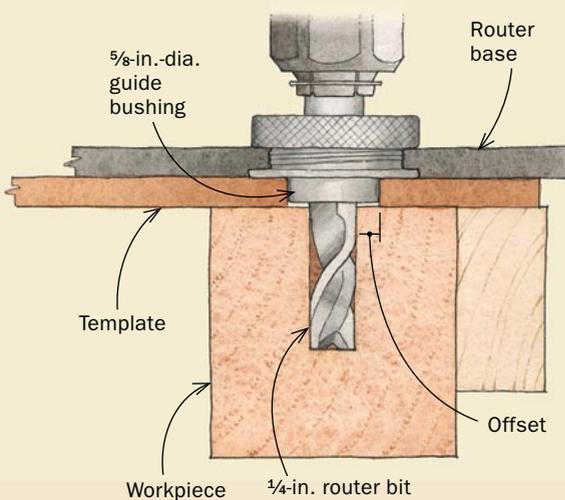
1 Mortising is job one



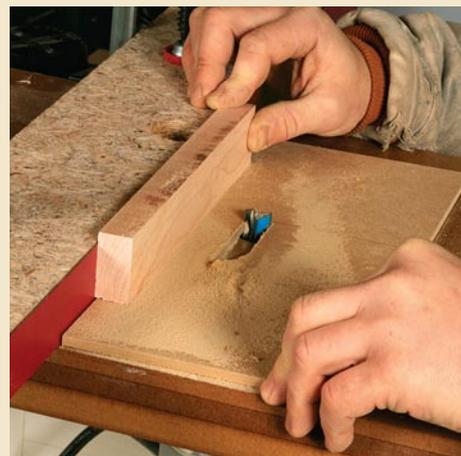
This simple jig lets you cut the same mortise on workpieces of different sizes. I have versions for common mortise sizes, and I just grab the one I need. The jig works on the sides and ends of a workpiece, so it's ideal for loose-tenon joinery.

Make the base as wide as your router's base and twice as long. Attach it to a hardwood fence milled flat and square. Lay out the mortise slot on the bottom of the template, adding the proper offset to the width and length. Cut the slot at the router table, and try to make it fit the bushing exactly. If you have a bit that's the same size as the outside of the guide bushing, use it. Otherwise, use a smaller bit and cut the slot in multiple passes. Some people drill a starter hole for this kind of cut, but I find it unnecessary. I rest the right side of the template on the router table, then carefully lower the left side onto the spinning bit and move the template right to left to make the cut.

For workpieces of different thicknesses, add shims next to the fence.



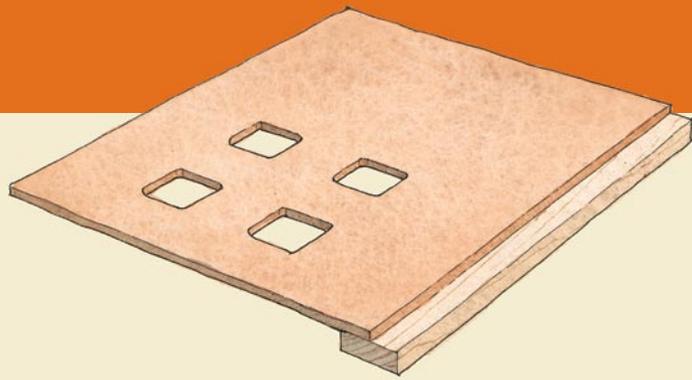
Attach the fence. Leave the fence slightly proud of the base so you can reference off it when cutting the slot for the bushing.



Slot the base. Hold the jig's fence against the router-table fence and carefully lower the template onto the bit to start the slot.



How to use the jig. Attach the jig using a vise (shown) or clamps. Make full-depth plunge cuts at the ends of the slot, with a series of shallower passes to clean out the middle. Blow out the chips before making a final pass. Don't forget to record the bushing size and bit size on the jig for future reference.



2 Piercing template cuts any shape, anywhere

This template lets you cut a decorative design or a recess for an inlay anywhere on any workpiece. Just like mortising templates, you use a piercing template with a specific spiral bit and bushing so that the cutout you make is always the same size. I find that a 5/8-in.-dia. bushing allows good chip ejection around a 1/4-in.-dia. bit.

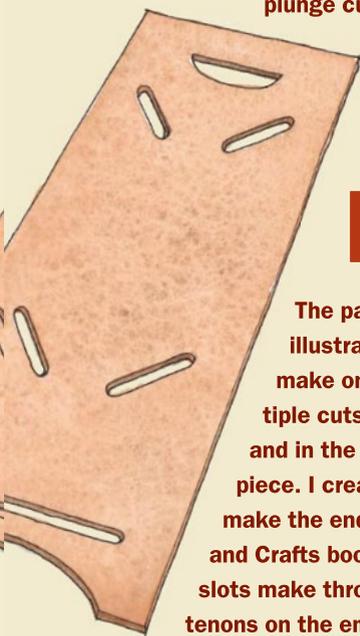
Again like the mortising template, this one has a fence that is proud of the base. However, be sure that the edges of the base are square to the fence. That's because you'll have to rotate the base against the router-table fence to cut the holes, and you want to be sure everything stays square. Again, be sure to consider the bushing/bearing offset when laying out the holes in the template. Make a plunge cut to pierce the base and begin cutting the template. Position the template on the workpiece with carpet tape, clamps, screws, or a fence.



Cut the pattern. Use a 1/4-in. straight bit to cut the pattern in the template. In this case, rotate the template against the router-table fence as needed.



Cut the workpiece. To pierce a workpiece completely, make a series of progressively deeper cuts until the waste pieces drop free.



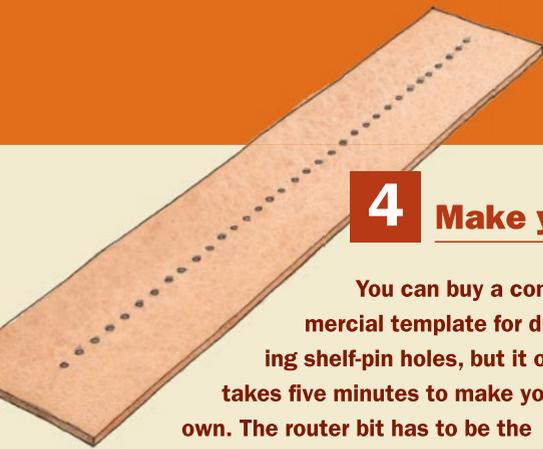
3 Make a full pattern for a furniture part

The pattern shown here illustrates how you can make one template for multiple cuts both on the edge and in the middle of a workpiece. I created this pattern to make the end pieces of an Arts and Crafts book rack. The angled slots make through-mortises for tenons on the ends of the shelves; the other shapes are for decorative cutouts. I made all the cuts with a 1/2-in.-dia. bushing and a 1/4-in. bit. It takes time and a bit of math to lay out and cut the slots. But you end up with a pattern that is well suited to limited production runs.

Just align the edge of the pattern with the edge of the workpiece and clamp the two together.



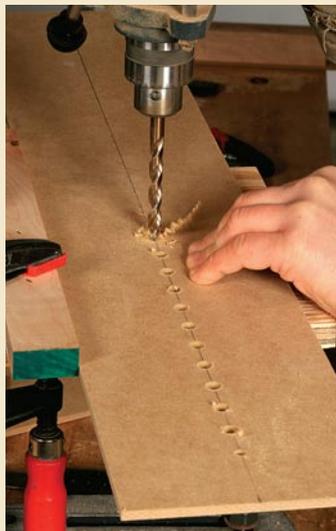
One template, multiple cuts. Paolini designed this template so he could make angled cuts for through-mortises as well as decorative curved cutouts on the ends of a book rack (FWW #197, p. 42).



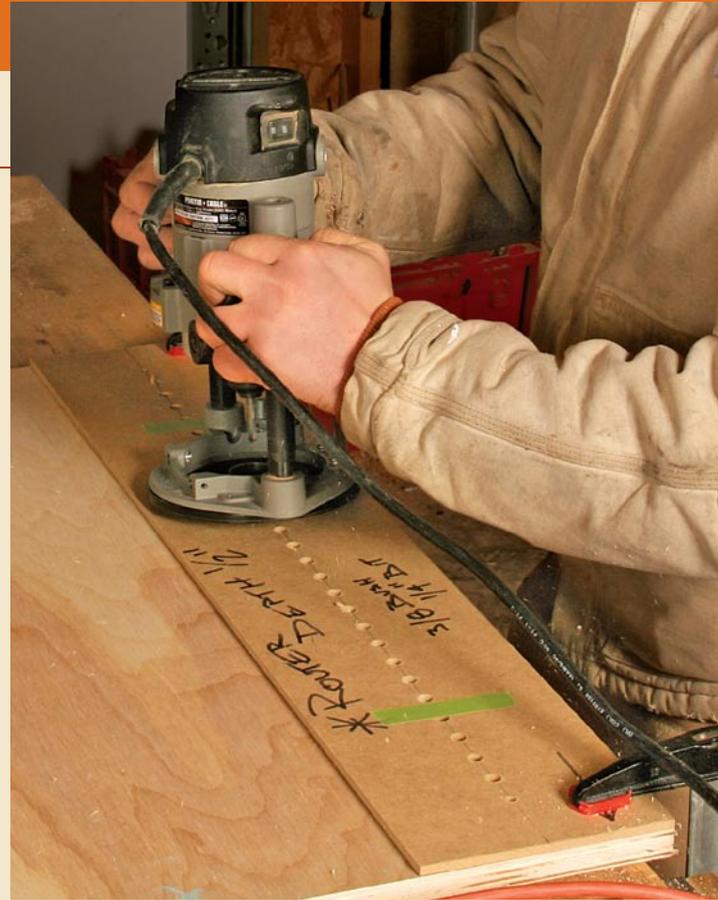
4 Make your own shelf-pin jig

You can buy a commercial template for drilling shelf-pin holes, but it only takes five minutes to make your own. The router bit has to be the same diameter as the shelf pins, typically $\frac{1}{4}$ in. I use that bit with a $\frac{3}{8}$ -in.-dia. bushing. When setting the router's depth stop, don't forget to factor in the thickness of the template.

I usually cut the template long enough to fit the side of the cabinet I'm drilling, but it will work for taller pieces, too. Just drill the end holes with a $\frac{1}{4}$ -in. bit, then drill the remaining holes for the bushing. To drill a second set of holes, use a $\frac{1}{4}$ -in. drill bit to align the template with the last shelf-pin hole you drilled.



Drill, then drill again. Drill a series of holes sized to match the guide bushing. Clamp the template to the workpiece and make a series of shallow plunge cuts for the shelf-pin holes.



5 Doweling jig solves joinery problems



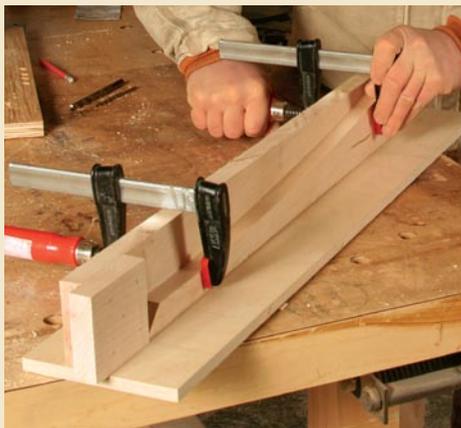
Dowel joints are a great problem-solver, stepping in when traditional joints won't work. You can use this jig to drill dowel holes in mating pieces.

Make the base wide enough to support the router and long enough to hold the longest workpiece. I use the one shown here to attach stretchers to the legs of a table.

Drill holes to match the outside diameter of the bushing, cen-

tered on the workpiece and spaced as needed. As with the shelf-pin jig, the bit diameter has to match the dowel diameter. In this case, I used a $\frac{1}{4}$ -in.-dia. bit and a $\frac{3}{8}$ -in.-dia. bushing.

It's easiest if both pieces are the same thickness. If they aren't (if you're doweling a thin apron to a thick leg, for example), make the jig for the thicker piece, then use shims to center the thinner workpiece on the template holes. If the ends of the joint don't align (as shown here), you can move the stop block or shim it.



Clamp the workpiece to the jig. The vertical fence and end blocks locate the legs. Paolini moves the stop block for the stretchers.



Flip the jig and make the holes. Use the router like a drill to plunge-cut the dowel holes.



Perfect fit. The jig ensures that the holes in the stretcher and leg line up perfectly. The joint is easy to glue up and very strong.



6 Circle-cutting trammel

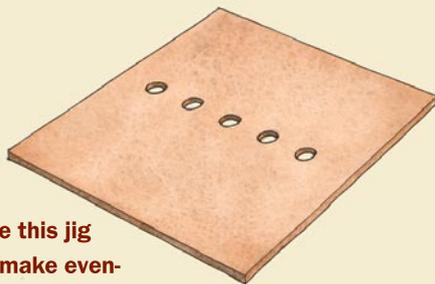
Cutting a perfect circle for a tabletop is a breeze if you use a guide bushing to position the router on a simple trammel—which is nothing more than a rectangle with holes in it.

Drill a pilot hole at one end for a screw that will be the circle's center point. From that center point, measure the desired radius plus half the router-bit diameter, and mark another center point. Drill a hole the same size as the outside diameter of the guide bushing you'll use. You can add more bushing holes to get several sizes of circle from one trammel. The size of the bit and bushing aren't critical. I usually use a $\frac{3}{8}$ -in.-dia. bit and a $\frac{5}{8}$ -in.-dia. bushing.

To make the circle, work on the underside of the workpiece. Anchor the center-point screw, slip the bushing into its hole, and make a series of shallow passes.



World's simplest trammel. A screw acts as the pivot point (in the underside of the stock), and the guide bushing drops into another hole. The bushing allows you to plunge the bit as you make progressively deeper cuts.



Use this jig to make evenly spaced long cuts, such as flutes in architectural elements or dados in the sides of a small cabinet (shown). The jig requires only one setup—you don't need to reset a fence for each new cut. And the jig allows you to make a series of stopped dados or grooves on the workpiece, which is tedious with a router and edge guide, and impossible with a tablesaw.

Unlike the other jigs shown here, this one is meant to slide along a fence rather than be clamped or pinned to the workpiece, so setup takes a couple of extra minutes. Make the jig wide enough that it will slide along the fence without tipping. Drill holes the same size as the outside diameter of the guide bushing, on the centers for the grooves you want to cut. For a $\frac{3}{8}$ -in.-dia. groove, I used a $\frac{5}{8}$ -in. bushing. Clamp a fence to the workpiece parallel to the desired grooves;

7 Parallel-groove jig



One setup, multiple grooves. Think of this template as a large router base that you slide along a fence. The series of holes for a guide bushing produces evenly spaced slots without having to move the fence.

if you're making stopped cuts, add blocks to set the beginning and end of the cuts. Butt the template against the fence, fit the router bushing into the first guide hole, and push the router along the fence to make the cut. Repeat until you have as many grooves as you need.