Add Bushings

These inexpensive accessories increase control and make the router even more versatile

BY JEFF MILLER

Routers are among the most versatile tools in the shop once you learn to control them, and one of the most versatile ways to gain this control is with guide bushings. These surround a router bit and provide a bearing surface that works with all kinds of shopmade templates and commercial jigs, making it easy to cut mortises, tenons, pockets for inlay, dovetails, dadoes, and sliding dovetails. More complex templates can include multiple joints, so you can rout all of the mortises in a chair or bed leg at one time.

The bushing itself is a metal tube attached to a plate. The predominant style of bushing is the one originated by Porter-Cable,

to Your Router Kit

which can be used in a number of different brands of router. A few companies have base designs that require their own bushings. Some routers allow for adjusting the guide bushings to be sure they are perfectly concentric to the router bits. Mine don't, so I make sure to keep the orientation of the router consistent as I work.

The key to working with guide bushings is understanding the offset between the bushing and the bit. A straight router bit must be smaller than the inside of the bushing. Calculating the difference between the outside diameters of the bit and the bushing and then dividing that number in half gives you the offset. For example, with a ½-in. bushing and a ⅜-in. bit, the offset is 1/16 in. Pay attention, though, because in many cases, you need to subtract this offset from both sides of a cut.

The art of template-making

There are many kinds of templates and many good ways to make them, depending on your tools, the materials you have lying around, and the task at hand.

I'll cover two of my favorite methods in this article. The first method is building up the template from separate pieces of solid wood, glued together and guided by the bushing size. I also sometimes cut slots in plywood or MDF. Because MDF is softer, you may want to toughen up the reference edges by painting them with thin cyanoacrylate glue.

The first step in designing your template is to calculate the offset. Then you'll want to determine the overall size of the template. It needs to be large enough to fully support the router base. Figure in a little

BUSHING BASICS

Most bushings need a trim. *For the bushing to work with thin templates, you should saw off some of the excess length. Leave ¼ in. to ⅜ in. to engage the template.*

Attachment varies by router. *The most common style is the Porter-Cable, which is held in the base of the router or an adapter by a threaded ring (left). Bosch's bushings are even easier to use, dropping into a spring-loaded holder (right).*

Two options for straight bits

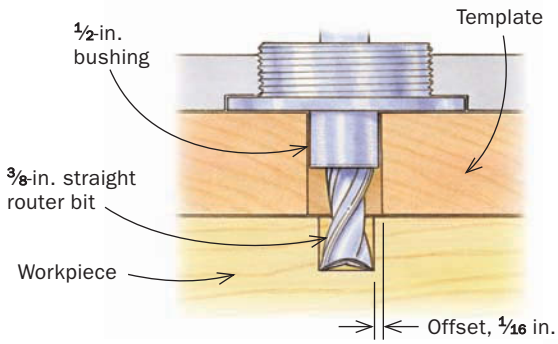
Normal straight bits (far left) are less expensive and work fine for most tasks, but I prefer spiral bits. They cut more cleanly, draw chips out of deep mortises, and have bottom cutters that extend to the center point, so they can plunge more easily.

—J.M.

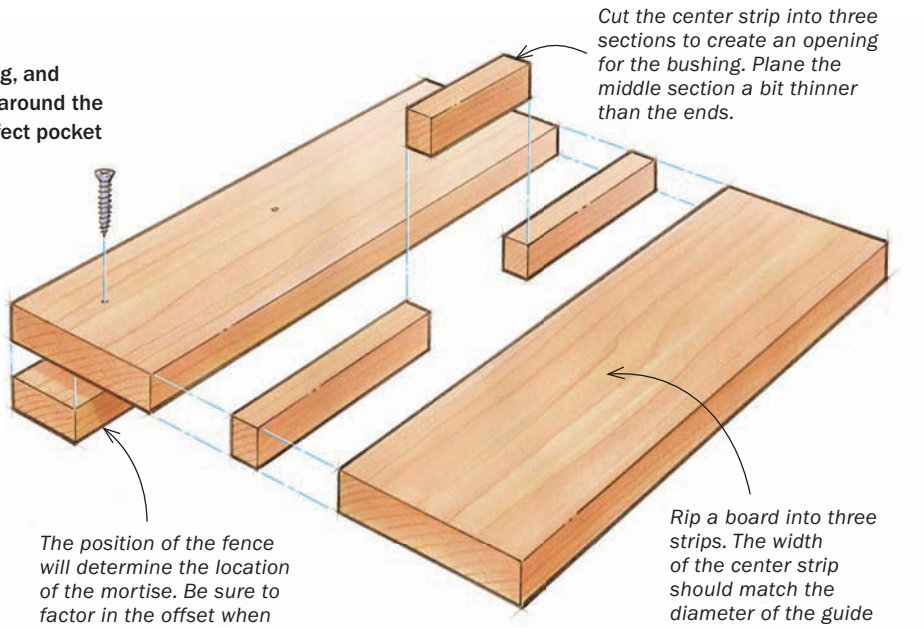
Fast, accurate mortising

EASY-TO-MAKE TEMPLATE

Mortising is one of the best tasks for bushing-guided routing, and there are many ways to make a template. This one is built around the bushing from individual pieces of solid wood, leaving a perfect pocket in the middle to guide the bushing.



FACTOR IN THE OFFSET
The bushing diameter is larger than the bit, so the cut will be offset from the edge of the jig. The difference in diameters divided in half is the offset.



Build the base. *Rip a strip from the center of a flat board, chop that strip into shorter pieces, and re-assemble the parts to leave a pocket in the middle. The goal is a slot that fits the bushing perfectly, so clamp the parts together to check. Use a spacer when gluing up the base to be sure the pocket is the right length, but don't glue it in.*

Add the fence. *Make the fence wide enough to extend from the edge of the template to the edge of the workpiece (don't forget the offset). Clamp it in place, feeling with your fingers to keep the outside edges flush (left). Then flip it over and drive screws (right).*

extra width and/or length so that you can clamp the template to the workpiece without interfering with the router.

Mortising is job one

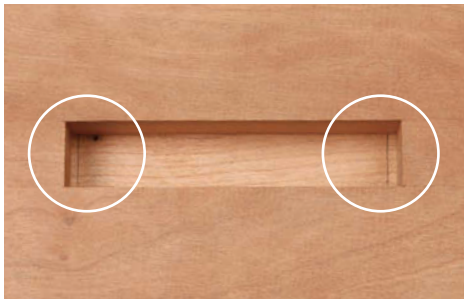
Mortising with a guide bushing is almost foolproof. It's useful if you need to cut mortises in the same location on various workpieces, and it is an excellent option for parts that are oddly shaped, such as chair components. Mortising is also a good way to learn the basics of bushing-guided routing.

I'll start with the mortises in a table leg. In this case I'll build the template from

Photos: Asa Christiana; drawings: Dan Thornton

MORTISES 101

With the template built, the mortising is almost foolproof. Just take shallow passes and pause to remove the chips.



Set up for mortising. *Bring the edge of the template to the edge of the workpiece, then extend the bit down to a line that represents the desired mortise depth and lock it there (top). You only have to mark the ends of the mortise to locate the jig accurately on the workpiece (above).*

Mortising tips. *Plunge the router ⅛ in. or so between passes. Deeper plunges will cause the bit to wobble slightly and cut an oversize mortise. Also, be sure to keep the router oriented the same way throughout the process. If the bushing is slightly out of line with the bit, the offset will vary when you twist the router, changing the path of the cut.*

separate solid-wood pieces to show how easy that is. Let's use a ⅜-in. straight bit with a ½-in. bushing, a typical combination for mortising, yielding a ⅜-in.-wide mortise at any length you need.

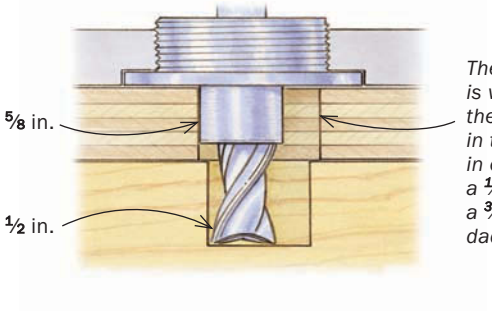
A template built in pieces—Start by ripping all the pieces from a single flat board. Rip a ½-in. (or slightly wider) strip from the middle, and then plane it to the same size as the bushing. Cut this strip into three pieces, with the center portion ⅛ in. longer than the desired mortise to account for the offsets on either end. Plane this middle piece a little thinner; it will be a spacer strip to control the length of the mortise opening in the jig.

Now glue the two big side pieces to the two outer middle strips. Put the thinner middle strip in place, but don't glue it (you might even wax it a little). When the glue

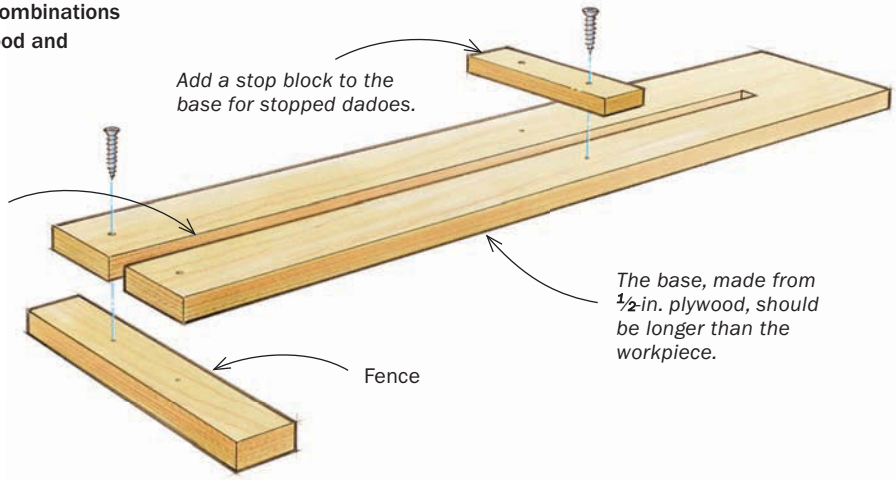
Keep it clean. *Mortises will become packed with chips, so pause occasionally to vacuum or blow them out. For the final pass, vacuum out the last chips, and clean up the mortise, pushing the bushing along each wall in case there is a little slop in the slot.*

Jig for dadoes and dovetails

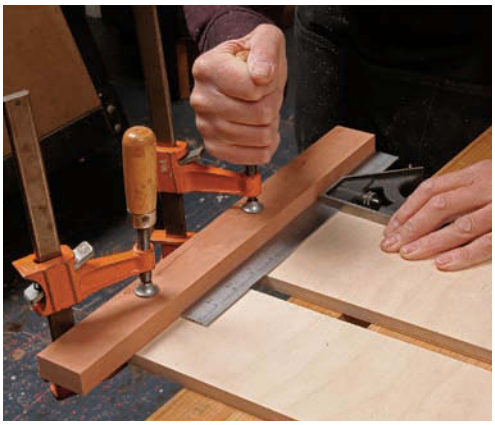
This template makes flawless dadoes, sliding dovetails, and combinations of the two. Make it by sawing a partial slot in a piece of plywood and attaching a fence at the open end.



The ⅞-in. slot is wider than the bushing in this case, in order to let a ½-in. bit cut a ¾-in.-wide dado.



MAKING THE JIG

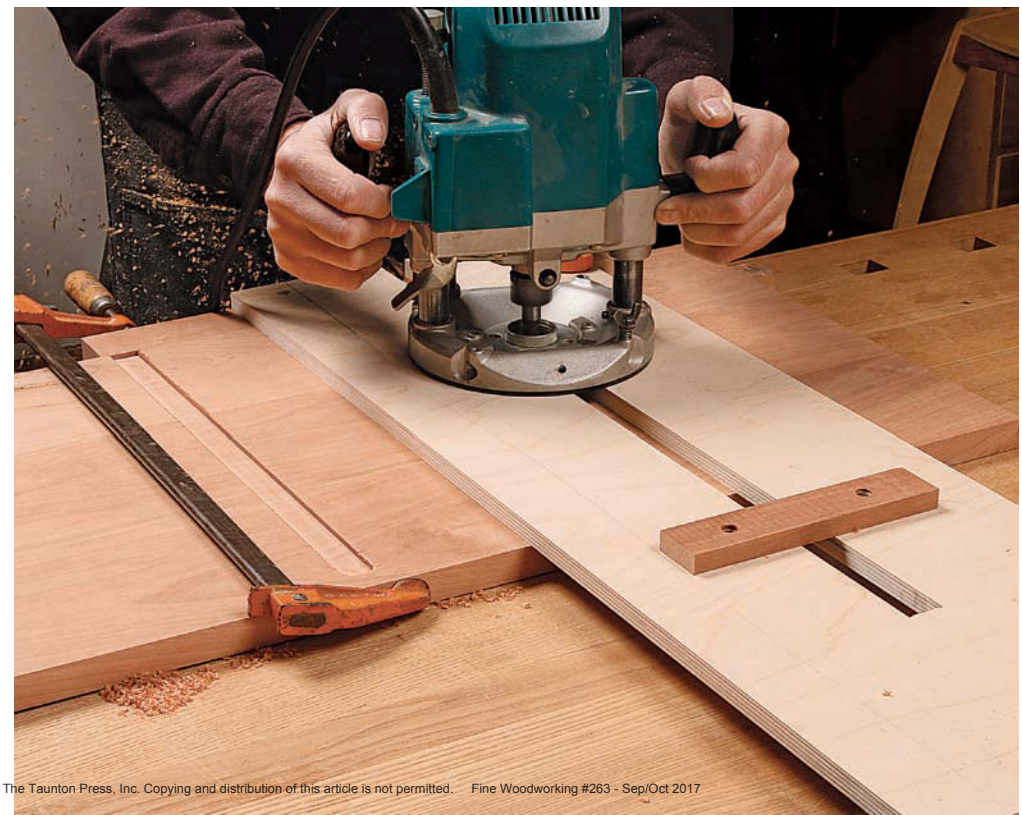


Cut the slot and add a fence. *Make long cuts, turning off the saw at the end of each cut, and then remove the waste with a jigsaw. Clamp the fence square to the slot and screw it in place.*

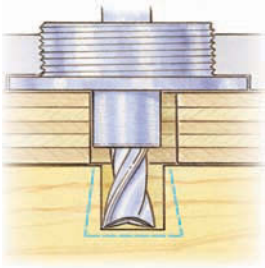
Stops are easy to add. *For stopped dadoes, screw down a block to stop the router in the right spot.*

ROUT A STOPPED DADO

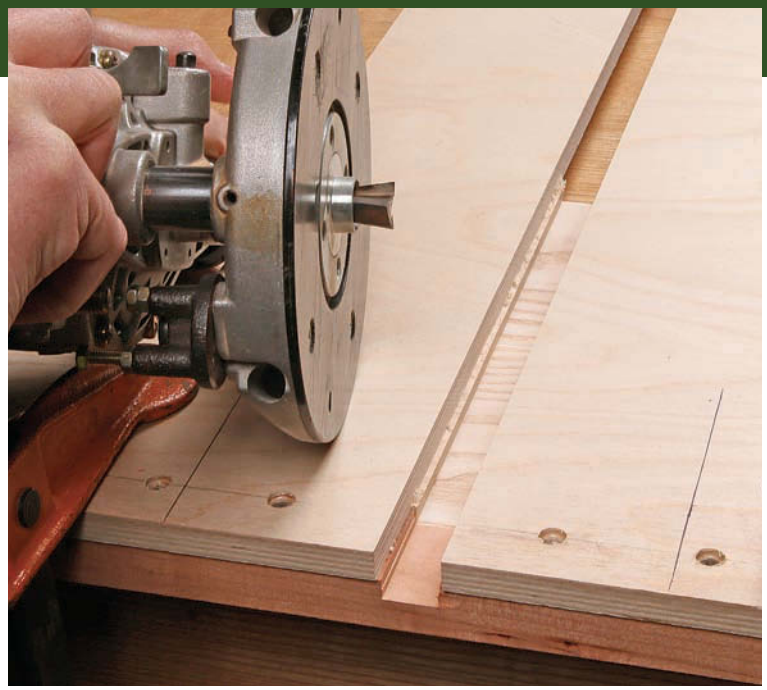
Up and back. *Use the notch in the fence to line up the jig with your layout marks (above). Push the router up the left side of the jig and then pull it back along the right side to keep the bushing tight to the walls of the slot on both sides (right). Square the ends of a stopped dado with a chisel.*



ROUT A DOVETAIL SLOT



Use a straight bit to remove most of the waste before dovetailing.



Start with a straight bit and follow with a dovetail. *Plow out a dado just narrower than the narrow part of the dovetail you'll be cutting (above). Follow with the dovetail bit. It helps to have a second router set up with the dovetail bit, so you don't have to change bits and lose your depth settings for each (right).*

is set, push the spacer strip out of the jig. Then joint and/or plane the template to make it flat.

Next, attach a fence on the bottom of the template. Account for the bit offset when locating it, and clamp it in place before screwing it down, to keep it from shifting. I don't use glue, so I can re-locate the fence as needed for other mortising jobs.

Tips for bushing-guided mortising

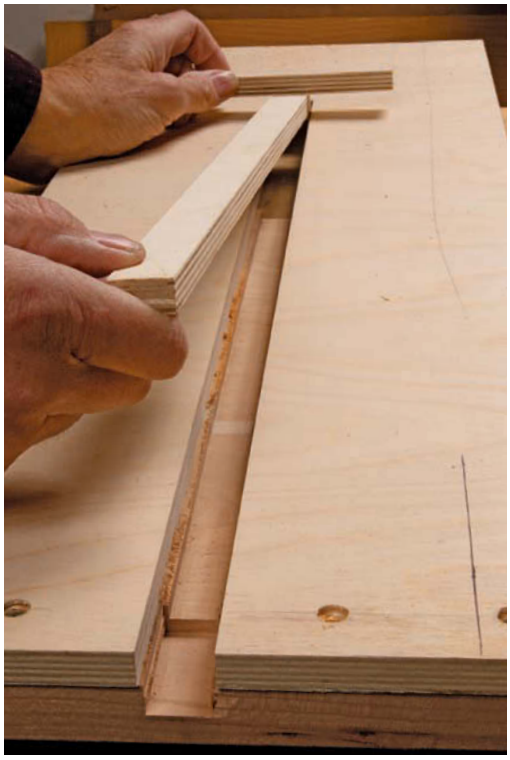
Clamp the template in place where needed and set the depth limit on the router. You can do this by measuring, or by placing the router on the template so that it hangs over the edge and allows you to set the depth directly from the workpiece.

Take multiple shallow passes and the work will go quickly.

Unless your mortise is quite shallow, you'll soon find that the bit is trapping wood shavings, limiting the router's movement. Stop to clear away the chips with a shop vacuum or a blast of air as needed.

When you get to the bottom of the mortise, clear the chips one more time and make a last clean pass at full depth, pushing gently against all sides of the template opening. Don't lift the router off the template until you've raised the bit up out of the cut and it has come to a complete stop.

Now you can move the template onto any part of your table leg to make identical mortises wherever you need them.



COMBINE DADOES AND DOVETAILS

Another handy stop. *After plowing the dado, drop in a strip to set the length of the sliding dovetail (left). This stop goes in and out easily between dadoing and dovetailing. The jig ensures that the sliding dovetail is perfectly centered on the dado, and accurate in length (above).*

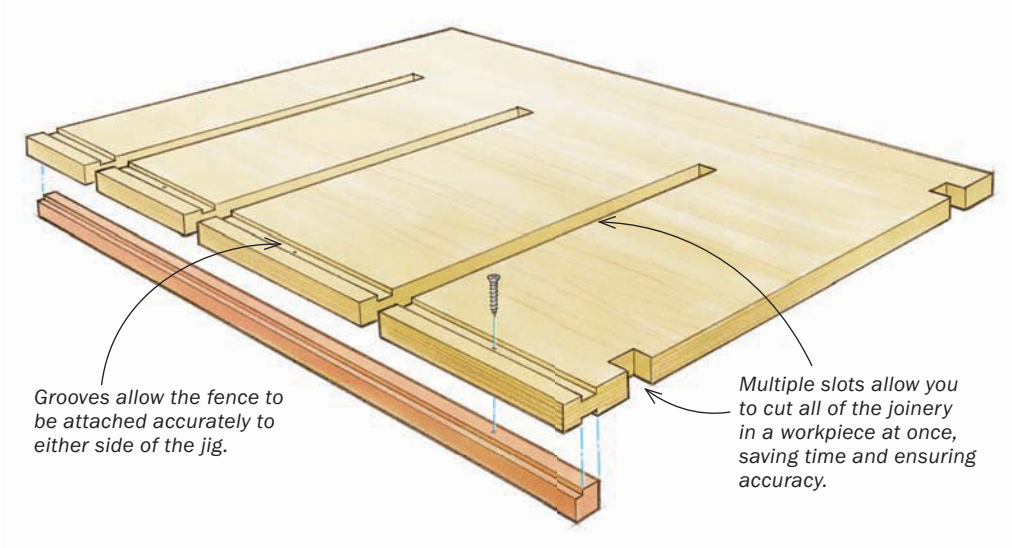
Dadoes without do-overs

To cut consistent dadoes without worrying about variations in size or any chance of the bit wandering, I use a two-sided fence that captures the bushing on both sides. This leaves the bit nowhere to go but straight. For this type of template, I usually use a single piece of plywood, making long stopped cuts on the tablesaw until I have the exact width I want (the width of the desired dado plus the two offsets). Then I cut out the waste piece with a jigsaw. At the stopped end of the slot, I leave enough plywood to keep the whole template stable. At the open end, I screw on a fence, being careful to keep the fence perfectly square to the slot.

The first time you rout a dado with this jig, the router bit will cut into the fence, and that notch will give you an exact

One jig to do it all

You can combine multiple joints into a single template for anything from a chair leg to an entire case piece. The one shown here is for the sides of a small chest of drawers with three drawer dividers and two rails dovetailed into the top edges.



Dadoes and dovetails. *This jig lets Miller cut a combination of long, shallow dadoes and short dovetail slots in three different spots on a solid-wood case side.*

indication of where to align the jig. Just line up the cut in the fence with your layout marks.

You can add stops anywhere along the opening by screwing down blocks to stop the router base.

The dado jig is perfect for sliding dovetails, too, with the same advantages over a single fence. The dovetail bit will cut more easily and accurately if you first plow out most of the waste with a straight bit. Then switch to the dovetail bit and finish up the cut.

Multi-joint template tames complex projects

Once you get the hang of working with guide bushings, you'll be able to work out your own ways to take advantage of the accuracy and control they give.

One of my favorite techniques for complex workpieces is to make a large template with multiple joints included in it. This locks in the joint locations. I use these multi-joint templates for the sides of case pieces (for dadoes, sliding dovetails, and half-blind dovetails) and the back legs of chairs (multiple mortises), among other tasks.

Master the basics of guide bushings, and you'll find many other applications for this indispensable router technique. □

Jeff Miller builds furniture in his storefront shop in Chicago, and teaches woodworking classes there and around the country.

Make it reversible. *The fence on this big jig has a shallow tongue that fits into matching grooves on either side, so it can be flipped for two opposite sides of a case.*