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Editorial Content Chief, *WOOD* magazine



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Cope-and-stick doors

Add easy elegance to your furniture projects.

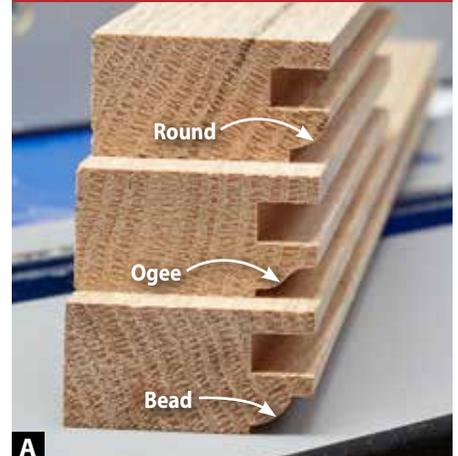
Nothing dresses up a cabinet like a raised-panel door. A decorative edge on the door's rails and stiles frames the panel to set it off, and tenon-and-groove joinery gives it long-lasting durability. You can easily create the "sticking" profile on the inside edge of the door frame and the mating "coping" cuts on the ends of the rails using a set of matching router bits.

Know your door anatomy

Before cutting material, let's define some basic door-construction terms. The *panel* fits into a grooved *frame* consisting of horizontal *rails* that fit between vertical *stiles*. The sticking router bit cuts a groove in the edge of the stiles and rails and shapes a profile on one edge of the frame pieces [Photo A].

The coping bit cuts a *stub tenon* that fits in the groove and creates a profile that mates with the sticking cut. The increase in face-grain gluing surface strengthens the resulting joint.

PICK A STICKING PROFILE



A

Sticking bits give you a choice of edge profiles from traditional round, suitable for Shaker-style projects, to the more elaborate ogee.

Start by sizing things up

Overlay doors typically overlap the cabinet opening by $\frac{3}{8}$ " all around, so if you choose this door style, make the finished door $\frac{3}{4}$ " taller and $\frac{3}{4}$ " wider than the opening. Inset doors fit within the cabinet opening and flush with the front of the cabinet, and require a uniform $\frac{1}{16}$ " gap around all sides; so for this style, make the door height and width $\frac{1}{8}$ " less than the opening.

Stile length always equals the door height. But rail length depends on the width of the stiles and the bit set used. (See **Determining Rail Length Drawing**, above right.) If the bit cuts a $\frac{3}{8}$ "-deep groove, you'll need to add twice that— $\frac{3}{4}$ "—to allow for the tenon on each end of the rail.

Prepare the frame stock

To make tight, flush-fitting joints, all rail and stile pieces must be of uniform thickness. After planing the stock, rip the stiles and rails to width and cut them to length. Save some cutoffs for making test cuts later. Then select and mark the outside faces [Photo B].

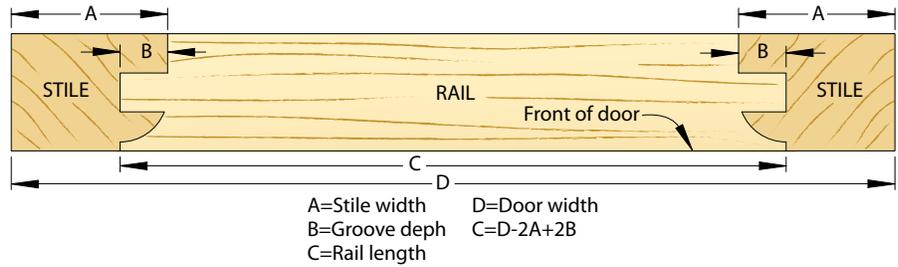
Quick Tip! For rails 6" or shorter, rout the sticking cut first in a long piece of rail stock, then cut individual rails to finished length.

Make the sticking cuts

Install the sticking bit in your table-mounted router and use a piece of frame stock as a gauge to adjust the bit height. Position the bit so the full sticking profile appears on the face side (against the table) while leaving sufficient stock behind the groove [Photo C].

With the bit height set, use a straight-edge to bring the router-table fence flush with the bit's top bearing [Photo D]. Install featherboards on the table and fence to hold the stock firmly in place

DETERMINING RAIL LENGTH



PUT YOUR BEST FACES FORWARD



B To help you keep the proper orientation when routing the stick and cope cuts, mark the outside faces of the rails and stiles.

ADJUST THE STICKING BIT HEIGHT



C Butt a piece of frame stock against the sticking bit and adjust the bit height so the full sticking profile shows with $\frac{3}{16}$ " to $\frac{1}{4}$ " of stock left above the groove cutter.

SET THE FENCE



D A metal rule sliding on both fence faces should just skim the bit bearing. Spin the bit by hand to ensure the fence clears the bit.

STEADY GO THE STICKING CUTS



E Keeping the marked faces down against the table, rout the inside edges of each rail and stile. Feed the stock steadily past the bit for smooth cuts.

and provide uniform cuts [Photo E]. Make the sticking cuts in all the rail and stile pieces and an extra piece of scrap

stock to use later as a test-cutting piece for setting up the coping bit.

Rout a raised panel

Flat panels of plywood or solid wood work well in cope-and-stick doors, but a solid-wood raised panel, such as the one shown in the photos in this article, adds visual interest. If you own a 3-hp variable-speed router, create a raised panel with a horizontal bit. Its mass helps it power through cuts with the carbide cutters leaving a clean, smooth surface. (See **More Resources** on page 35 for other methods of raising panels.)

Available in several profiles, these cutters perform best at low speed (10,000 rpm or less). Success also requires making the cuts in multiple passes, as shown in the photos, right. Rout the panel ends first, then the sides.

START SHALLOW



Adjust both bit height and fence depth to make a shallow first pass. Start with the two cross-grain cuts first to minimize tear-out, and rout all four edges before adjusting the fence back for the next passes.

SNEAK UP IN MULTIPLE PASSES



Once the bit's bearing sits flush with the fence, raise the bit in stages to make multiple passes until you reach the proper panel thickness.

SET THE COPING BIT HEIGHT



F Align the bottom edge of the upper cutter with the top edge of the groove to cut the stub tenon in perfect alignment with the sticking groove.

Learn how to cope

Set the stiles aside, remove the sticking bit, and install the coping bit. Using the test piece you made earlier as a gauge, adjust the bit's height [Photo F]. Then, align the fence and bit bearing as you did with the sticking bit.

Because the coping cut goes across the end grain of the rails, use a backer board to support the test piece and keep it square to the fence [Photo G]. Make a cut and fine-tune the bit's height accordingly [Photo H].

Once you have the face of the test piece fitting flush with the face of a stile, make the coping cuts in both ends of each rail, placing the marked face down against the router-table top.

Size the panel

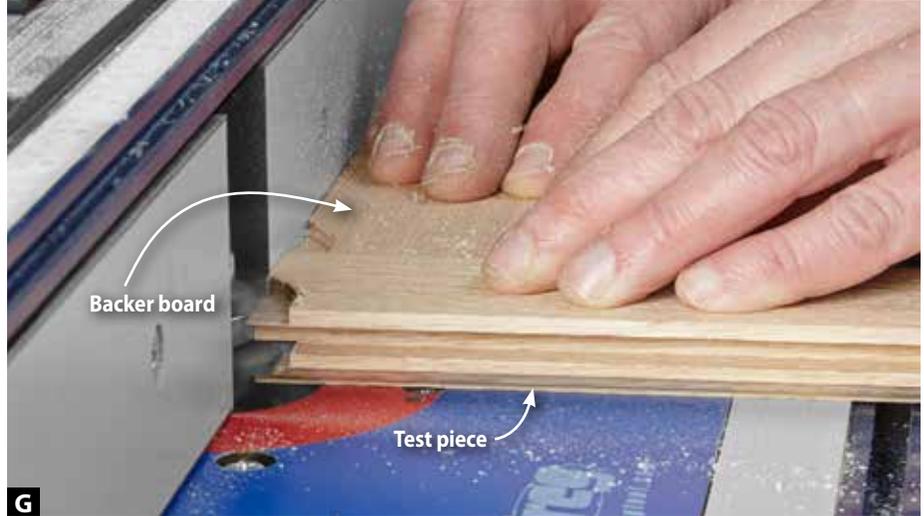
Whether you make the panel from plywood or a solid wood, size it $\frac{1}{16}$ " smaller than the space within the panel grooves of the door frame. This allows the frame joints to close tightly and provides room for a solid-wood panel to expand. Figure panel width by subtracting $\frac{1}{16}$ " from the rail length. To find the panel length, dry-assemble the panel frame and measure the distance between the rails, including the grooves, then subtract $\frac{1}{16}$ ".

Assemble the door

Dry-fit the door frame and panel to check for fit. Disassemble it, apply glue to one end of the rails, and position them on a stile. Slide the panel into place (no glue); then glue the other stile to the rails. Clamp the frame together [Photo I].

Produced by **Kerry Gibson**
Illustrations: **Roxanne LeMoine, Lorna Johnson**

BACKER SERVES MULTIPLE PURPOSES



G To make the coping cut in the end of a rail, butt the rail test piece against the fence and a square backer board. The backer also helps prevent tear-out.

CHECK THE BIT HEIGHT



H If the test cut leaves excess stock on the top edge of the tenon, as shown in the photo, lower the bit. If the excess is on the bottom edge, raise the bit.

EASY DOES IT

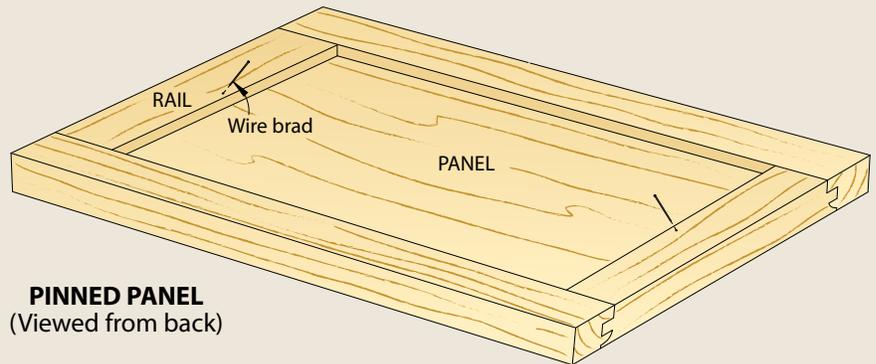
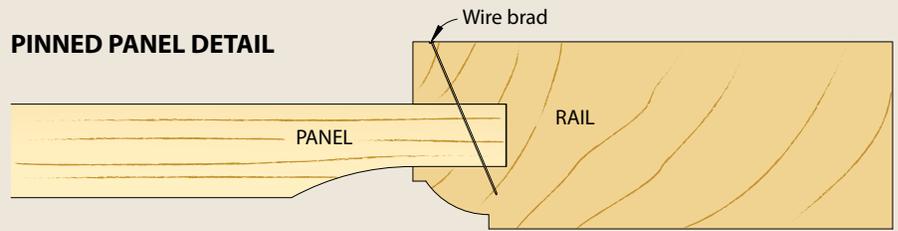


I Properly routed cope-and-stick joints fit tightly so light clamping pressure snugs them up while helping keep the door assembly flat and square.

Taming a rattler

Panels cut too small or thinner than the groove in the rails and stiles of a door will likely rattle. If you hear a rattle during a dry-fit assembly, insert a spacer to fill the gap. You can use commercially available spacers, such as Space Balls or the rubber panel barrels shown *below* [Sources]. Or, for a homemade solution, substitute a ¼" length of vinyl window-screen spline.

But what about a door that develops a rattle down the road, after the door has been glued together? In that case, drive a small wire brad at an angle through the rail and into the panel on the back side of the door. (See **Pinned Panel**, *below*.) A pin nailer makes quick, easy work of this task and provides a nearly invisible fix. 🌲



Sources

Space balls: (100), no. 12386, Rockler, 800-279-4441, rockler.com. ¼" panel barrels: (100), no. 00508.14, Lee Valley Tools, 800-267-8767, leevalley.com.

More Resources

► Learn more about raised-panel bits and tips for setting up your router: woodmagazine.com/raised-bits



► To find out about vertical panel-raising router bits, check out this free article: woodmagazine.com/vertbit



► Read about using your tablesaw to cut raised panels in issue 164 (Sept. 2005) or download the article for a small fee at: woodmagazine.com/2raised



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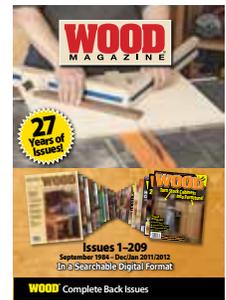
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