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#120 March 2006
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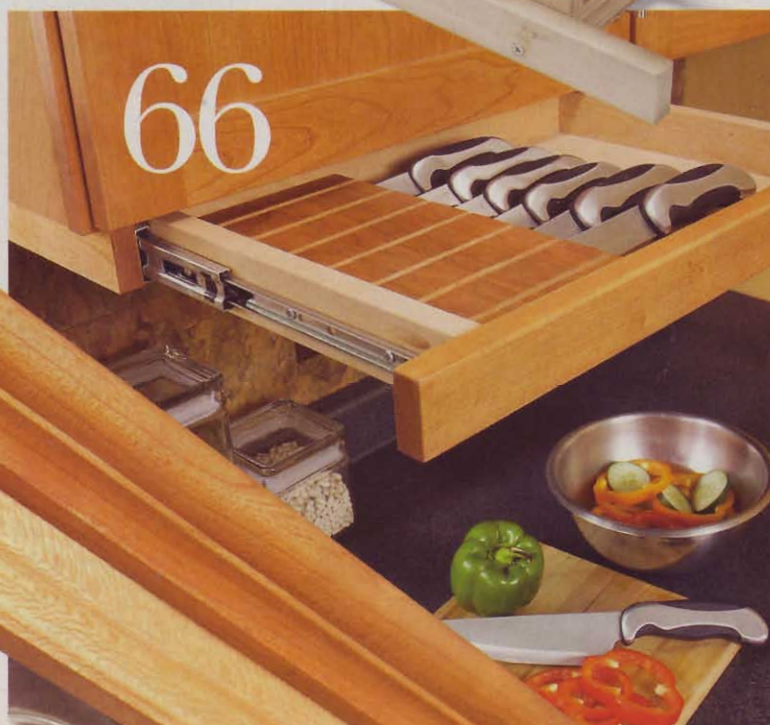
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QUESTION & ANSWER edited by Dave Munkittrick



SHARPENING BITS

Q Can I sharpen my own carbide router bits?

A The short answer is no. It takes the specialized equipment of a professional sharpening service to properly sharpen carbide bits, especially if they have any nicks in the edge. However, it is possible to hone the edge of a bit that's just starting to get dull.

You'll need a 1,200-grit diamond stone or fine diamond paddle to cut the hard carbide. Lay the bit so the cutter's face lies flat on the stone or paddle. Take a half dozen strokes or so on each cutter face. Count your strokes. Lubricate the stone or paddle with water or a lightweight oil, such as 3-In-One. It's important to take an equal amount off each cutter. Check for sharpness by visually inspecting the edge. You should see no spots where light reflects back off the cutting edge.

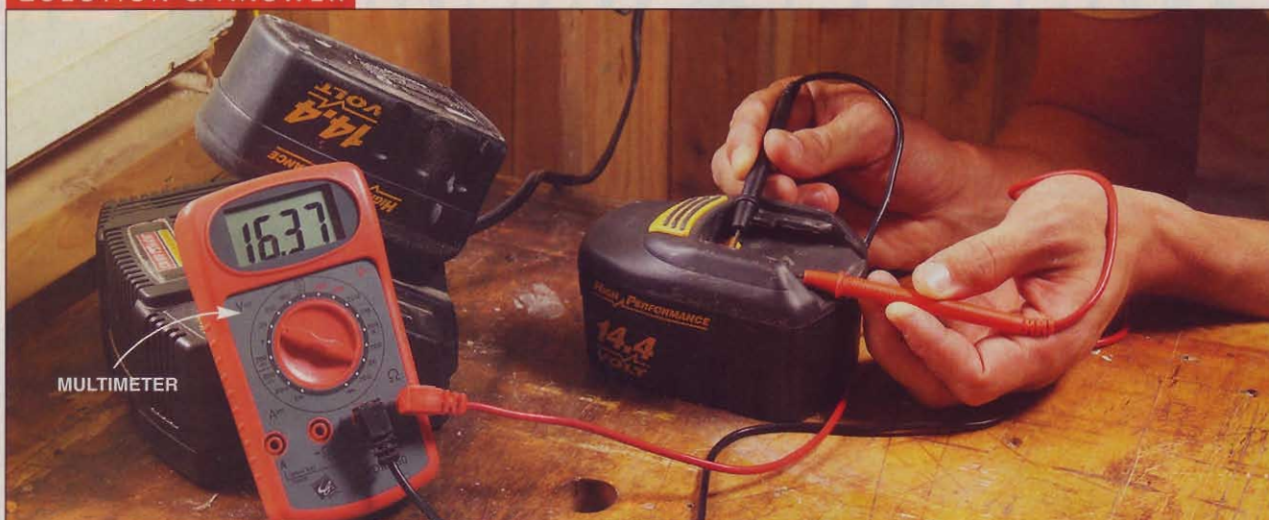
BEST WAY TO MOUNT A FACE VISE

Q The back jaw of my face vise sticks out an inch from the edge of my workbench. I've noticed traditional benches have the back jaw set flush with the edge of the bench. Is there any advantage to this?

A This vise question comes up all the time. The reason the back jaw was set flush on traditional benches is that it provides better support for a long board clamped on edge. Boards were held in this position so the edge could be jointed with a hand plane. The flush vise jaw allows the opposite end of the board to be clamped to the bench. The board is then continuously supported against the edge of the workbench. This allows you to work on the edge without wobble. Few of us still joint boards by hand anymore, but there are still times when we modern woodworkers need to tightly clamp a long board to the bench.



ART DIRECTION: JOE GOHMAN • PHOTOGRAPHY: STAFF, UNLESS NOTED



BILL ZUEHLKE

BATTERY HEALTH CHECKUP

Q The battery on my cordless drill runs down quickly, although I haven't had this tool for very long. How can I tell for sure whether my battery is shot?

A Run a simple test. First, make sure your battery is fully charged. Then set an electronic multimeter to a

24-volt range and touch the two battery terminals with the probes. A good battery should test 1 to 2 volts over the voltage listed on the battery. A 14.4-volt battery, for example, should read 14.4 to 16.4 volts. If it doesn't, you need a new battery.

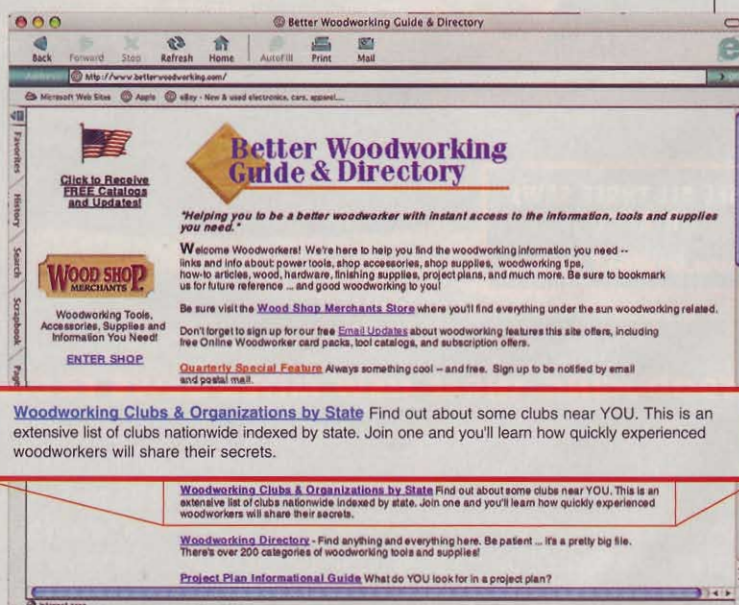
The biggest cause of premature battery failure is running it down too far before it's recharged. Unlike a cell-phone battery, a power-tool battery should be charged as soon as it begins to slow. When you detect a loss of power, let the battery cool to room temperature and then put it in a charger.

WHERE TO FIND A WOODWORKING CLUB

Q I recently moved to a new state and I'm looking for a local woodworking club. Is there a reference available for us itinerate woodworkers to find fellow enthusiasts?

A This Web site offers an extensive list of woodworking clubs and guilds: www.betterwoodworking.com. Click on "Clubs and Organizations." Then select your state and you'll find a comprehensive listing of woodworking, carving and wood-turning organizations in your area.

This site also has many other useful links for the woodworker, including schools. Click on "Woodworking Directory," then "Schools and Academies."

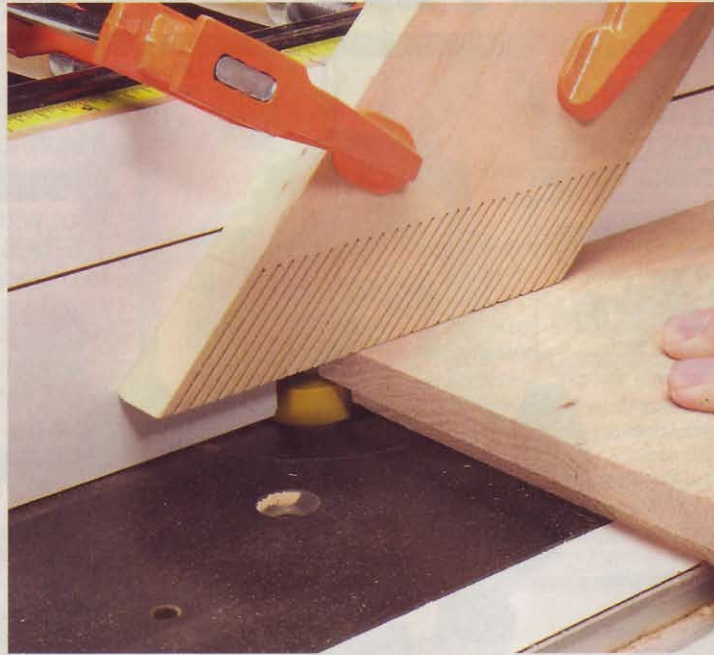


ROUTING EVEN-DEPTH RABBETS

Q My router table is jinxed. When I cut a rabbet all the way around a board, it's never even. What should I do?

A First check that your insert plate is even with the router tabletop. If that's OK, either your board or your router table isn't flat. Either way, here's a simple fix to your problem. Clamp a featherboard on your fence directly over the bit. The featherboard holds the workpiece tight to the table to ensure a consistent depth of cut. It's almost impossible to apply even downward pressure on a workpiece by hand. Slight variations in the pressure you apply invariably result in uneven routing along an edge.

If you find your router table has a sag in it, add a brace or two under the top for support.



If you have a question you'd like answered, send it to us at **Question & Answer, American Woodworker**, 2915 Commers Drive, Suite 700, Eagan, MN 55121 or e-mail to qanda@readersdigest.com. Sorry, but the volume of mail prevents us from answering each question individually.

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QUALITY WOODWORKING TOOLS • SUPPLIES • ADVICE™

edited by Tim Johnson

Eliminate Pipe Stains

I learned the hard way that pipe clamps leave ugly black stains during glue-ups wherever they contact wet wood. Those stains are hard to sand out! Fortunately, I've discovered an inexpensive solution that keeps all my glue-ups pristine.

For a couple dollars at the home center, I bought a shower-curtain rod cover, which is a 5-ft.-long flexible plastic tube that's slotted along its length.

Coincidentally, it's the perfect diameter to slip over my 1-in. pipe clamps. I cut the tube into 3-in.-long sections and outfitted all of my clamps. Now before I tighten the clamps, I simply slide the tube sections into position over squeezed-out glue or any other damp spot.

Serge Duclos



ART DIRECTION: VERN JOHNSON • PHOTOGRAPHY: VERN JOHNSON, UNLESS NOTED

BEAUTIFUL BUTTON KNOBS

As a kid, I used to play with my grandmother's button box every time we visited. I loved all those bright, shiny colors! Now that I've inherited her treasure hoard, I found a way to display these beautiful antiques on a sewing cabinet I made for my wife.

Old buttons make fascinating knobs. I turn or buy a set of wooden knobs (see Source, below) and then drill out the centers of the knobs with a Forstner bit. I finish the knob and epoxy the button into the recess. Of course, new buttons work fine, too, and are easier to buy in a complete set.

Vern Johnson

Source: Horton Brasses Inc.,
(800) 754-9127,
www.horton-brasses.com
Flat-grained maple knobs in
a variety of shapes and sizes,
about \$1 each.

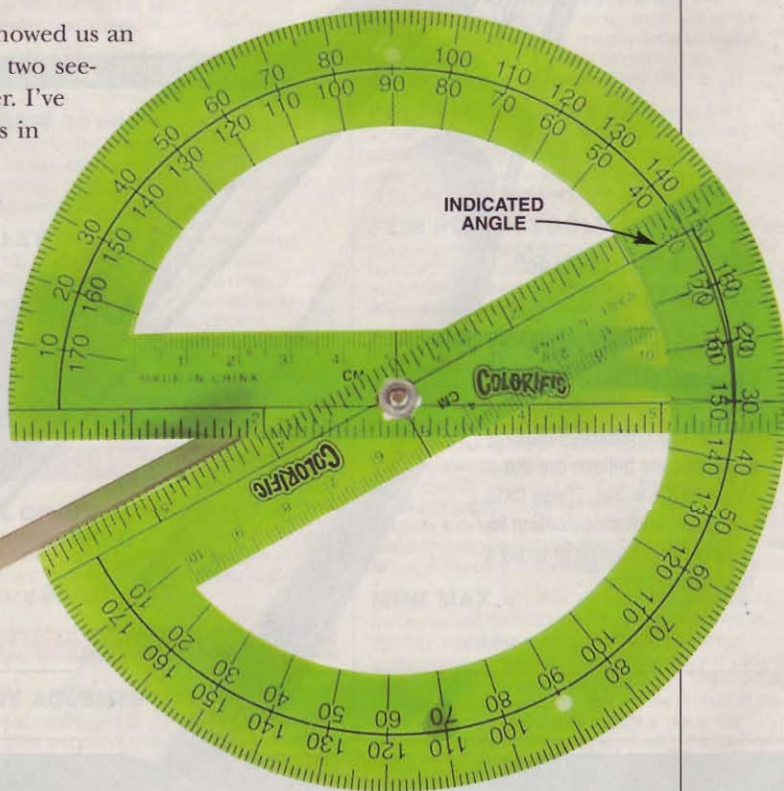


PROTRACTOR ANGLE GAUGE

When I was in high school, my math teacher showed us an easy way to indicate angles. She simply fastened two see-through plastic protractors on top of one another. I've used this simple device to draw and check angles in my workshop ever since.

Start with a pair of identical protractors from an office supply store (about \$1 each). Carefully drill out the center holes to exactly fit a 6-32 x 3/8-in. flat-head machine screw. Next, drill a countersink for the screw head in the bottom protractor, so the protractor sits flat for drawing angles. Install the screw and nut, making sure the protractors are precisely aligned. During use, the top protractor's zero line indicates the angle on the bottom protractor's scale. The angle matches the opening, because the bottom edges of the protractors are parallel to the zero lines.

Alice Garrett





ROUTER WRENCH RISERS

Trying to keep the wrenches that came with my router in position for tightening or loosening the collet used to drive me crazy. The nuts are so widely spaced that the slim wrenches would often slip out of place.

Fortunately, I discovered a solution at my local hardware store: basin mack gaskets, which are stepped rubber washers used while installing sinks.

Fasten a gasket on each side of one wrench with spray adhesive or contact cement. Then use a utility knife to sculpt the opening.

During use, the gasket-covered wrench goes on the shaft nut. One gasket holds this wrench away from the motor housing. The other gasket acts as a platform for the wrench that goes on the collet nut. If the gaskets are too thick to properly align the wrenches, just slice them thinner. One side of this wrench works for tightening; flip it over for loosening.

C. Jeffrey Goldberg

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Source Ace Hardware, (866) 290-5334, www.acehardware.com
Danco #36561B basin mack gasket, #4025029, \$8 for a pack of five.



INEXPENSIVE BLADE FOR SUSPECT LUMBER

I'm always on the lookout for orphaned boards. I've reclaimed lots of useful material from old pallets, downed trees, remodeling job sites and salvage yards; I've even rescued weathered siding from old barns. I try to remove all the nails, dirt and grit before sawing my salvaged treasures. But to make sure I don't damage one of my expensive blades, I cut these boards with an inexpensive 7-1/4-in. circular saw blade purchased at a home center. These blades can cut boards as thick as 1-1/2 in. and they're designed for tough use, with teeth made from a softer but less brittle grade of carbide.

David Olson

Source Home Depot, (800) 553-3199, www.homedepot.com
Oldham 7-1/4-in. 16-tooth industrial carbide combination saw blade, #B7254216, \$4.50.

American Woodworker MARCH 2006 21



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WORKSHOP TIPS



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DOUBLE SCROLLSAW BLADE LIFE

When my scroll saw blade gets dull, it's really only dull on the bottom half, because the wood I cut is usually less than 1/2 in. thick. To get more life out of my blade, I made an auxiliary table that raises the workpiece, so I can cut with the top half of the blade when the bottom half gets dull.

I made the table by screwing together pieces of 3/4-in. melamine and 1/2-in. plywood and edge-banding all four sides. I drilled a 7-16-in. hole in the center for the blade and cut a 1/16-in. slot in from the back so I can slip the table on and off without removing the blade. I filed slight chamfers on the top of the hole and slot, so they won't catch on the workpiece. I also widened the slot at the back, so it easily slips around the blade. Cleats glued on the bottom hold the table securely in place on the saw (see photo, below).

I've discovered that it takes less time to install the table than it takes to change a blade, so in addition to saving a few bucks in scroll saw blades, my table saves time, too.

Jay McClellan



RAMON MORENO

Circle No. 17

THE WELL-EQUIPPED SHOP

by George Vondrisk

ROUTER WITH ABOVE-TABLE ADJUSTMENT

Tired of reaching under your router table to make bit height adjustments? Like the idea of a router lift, but intimidated by the price? Have a look at Freud's FT1700VCEK router, \$179. It joins the ranks of 2-1/4-hp routers, with the added benefit of above-the-table bit height adjustment. Only a few other routers in this size range offer that feature.

The FT1700VCEK has a 13-amp variable-speed motor that operates from 8,000 to 23,000 rpm. Like other similarly sized routers, the Freud model includes soft start, so the motor slowly ramps up to speed. It comes with 1/4-in. and 1/2-in.

collets.

To adjust from above the table, you'll need to drill a 7/16-in. hole in your router-table insert for the height adjustment wrench. The wrench is included with the router, along with a layout template to locate the hole.

Freud tells us it is not planning to make a plunge base for this machine.

Source Freud Tools, (800) 334-4107, www.freudtools.com
Router, #FT1700VCEK, \$179.



DOUBLE-DUTY TRIM BIT

When I make a face frame for a cabinet, I make it slightly oversize and then trim it with a bottom-bearing flush-trim bit after it's attached. When I want to make lots of identical parts, I use a template and top-bearing pattern-cutting bit. Thanks to Freud, you can now do both operations and more with one bit. Its new top- and bottom-bearing straight bits have a bearing on each end. This also allows you to rout from either side of your workpiece when you're pattern routing, giving you the benefit of always routing with the grain and, thus, avoiding tear-out.

The 50-501 model, \$30, has a 1/4-in. shank and 1/2-in. cutting diameter. The 50-509, \$40, has a 1/2-in. shank and 3/4-in. cutting diameter.

Source Freud Tools, (800) 334-4107, www.freudtools.com
Top- and bottom-bearing straight bits, #50-501 \$30; #50-509, \$40.

SOFTWARE FOR EASY CALCULATIONS

Want to see smoke come out of a woodworker's ears? Have the person calculate the part sizes for frame-and-panel doors or figure out the total board feet required for a project.

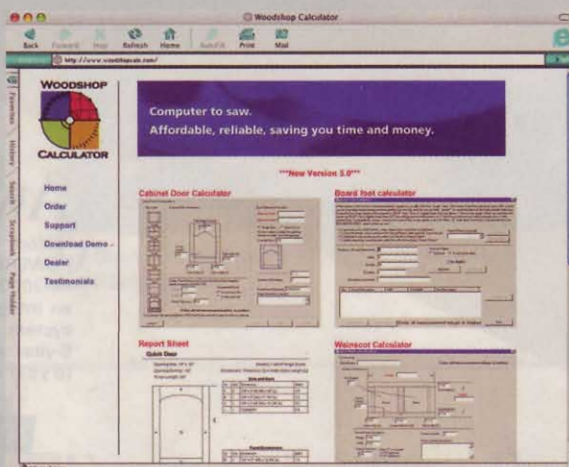
If you don't do these calculations every day, it's easy to get confused. The Woodshop Calculator, easy-to-use \$35 software makes it easy to calculate door and board-foot requirements. It also provides layout dimensions for making your own arched-panel door templates or can be used with a set of commercially made cathedral-door patterns. This is powerful software at a great price.

To calculate board feet, you enter your part sizes—just as you would in a cutting list—including each part's quantity, thickness, width, length and description. Thickness must be entered as the material's rough thickness; for instance, 3/4-in. material is entered as 1-in. The software produces a printed report that contains all the part sizes and the total board feet.

The frame-and-panel door function provides a parts list report that lists all the dimensions and total board feet needed for your doors. If you are making

lots of doors, you can even print labels to attach to each part as you make it, so you can keep track of what goes where. The arched-panel template set, which sells separately for \$60, includes an instructional DVD.

Source SPC, (651) 450-0644, www.woodshopcalc.com
Woodshop calculator, \$35. Cathedral-door template set, \$60.



NEW POWERMATIC SAW IS LOADED

The new 3-hp, 240-volt, Powermatic PM2000 10-in. cabinet saw has a retro look, but a load of innovative features.

Of all the blade guards I've seen, the PM2000's is one of the easiest to use. It is easy to take off and, more importantly, easy to put back on. It also has a riving knife, a feature not seen on most U.S. saws. The riving knife, positioned behind the blade, acts as a spacer in the saw kerf to prevent the blade from being pinched during sawing. It's a valuable safety device that reduces the risk of kickbacks. The riving knife has a quick release, so it's easy to take on and off. The blade is shrouded, so dust collection happens right at the blade, instead of down in the cabinet, the way it occurs in most cabinet saws. The shroud really improves dust collection.

The PM2000 has an arbor lock, so you don't need to bite a board into

the blade or use two wrenches to crack your blade loose.

And when it comes to rolling, the folks at Powermatic have really come up with a great idea. Retractable casters are built in to the cabinet. The hand wheel that typically controls the blade angle has two positions on the PM2000. In the second position, it operates the caster mechanism, pushing the casters down toward the floor and lifting the cast-iron base.

The PM2000 is available with a 30-in. fence for \$2,100 or a 50-in. fence for \$2,200. The price tag on this saw puts it toward the top of its category, but the list of new-to-the-category features helps set it apart.

Source Powermatic, (800) 274-6848, www.powermatic.com 10-in cabinet saw, #PM2000, with 30-in. fence, \$2,100, with 50-in. fence, \$2,200.

UNIVERSAL ROUTER BASE WITH A TWIST

Got a router that you can't get a set of guide bushings for? Or do you just want to simplify attaching your router to such accessories as an offset base, circle cutter, or fence?

The TurnLock base plate from Milescraft, \$20, is part of a system that will turn you on to a whole new

way of attaching fixtures to your router. Components simply lock and unlock with a twist of your wrist.

The TurnLock baseplate has a nearly infinite combination of holes that will align with many different routers. A list on the Milescraft Web site will tell you which routers the base does and doesn't fit. A centering pin

comes with the baseplate to center it on your router collet. One 3/4-in. guide bushing is included with the baseplate but a set of eight can be added for \$15.

They're made of glass-filled ABS plastic. I was skeptical of the material and the super-simple mounting system, but both work well.

When you've got the TurnLock baseplate on your router, you can easily twist your router in and out of other accessories, such as the 1205 offset base, \$20, and 1203 circle/edge guide, \$30. Milescraft products are available at Lowe's.



Source Milescraft, (815) 874-2400, www.milescraft.com TurnLock baseplate, #1200, \$20. TurnLock bushing set, #1202, \$15. Circle/edge guide, #1203, \$30. TurnLock offset base, #1205, \$20.

MULTIPLE-PROFILE DOOR SET

The Insert-Pro raised-panel bits from Infinity Tools, \$140, are a prime example of what can be done with insert cutters in router bits.

One raised-panel router-bit body accepts cutters with three different profiles. And because it's not brazed into the bit, carbide used for insert tooling is different than the carbide that's brazed into conventional bits.

According to Infinity, these cutters will last about twice as long as those made of brazed carbide.

The Insert-Pro bit, with one profile included, is at the high end of the raised-panel cutters' price range. But here's the deal: First, you get convenience. If you want to have access to more than one raised-panel profile, you only have to buy

the cutters, not the bit. The cutters sell for \$30 apiece and, of course, you need two.

Second, Infinity asserts that the finer-grain carbide used in these cutters results in a keener edge, which means a smoother profile, which means less sanding. Sweet! Third, the longer-lasting carbide saves you sharpening costs. When the cutters need to be honed, you can remove them from the body, lay them flat on a diamond stone and easily touch them up.

The Insert-Pro panel-raising bits are not available with a back cutter. Infinity bits can be purchased directly from the manufacturer.



Source Infinity Tools, (877) 872-2487, www.infinitytools.com Insert-Pro, \$140. Replacement cutters, \$30 each, two required.



Perfect Butt Joints in Laminate

AN UNDERSCRIBE ROUTER ATTACHMENT GUARANTEES SUCCESS

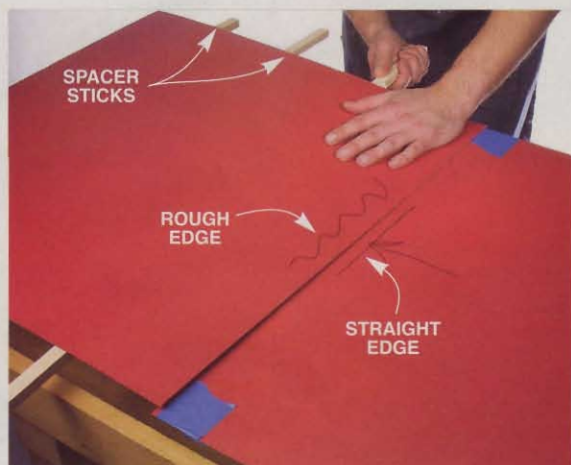
Long countertops or those that turn corners need butt joints. You can use several methods to make this joint, but the easiest way to get tight-fitting, professional-looking results is with an underscribe attachment on a trim router. The term *underscribe* refers to the attachment riding under the piece being scribed. The cut is guided by a small lip on the underside of the attachment that follows the straight edge on the bottom piece of laminate (see Fig. A, page 32).

NOW YOU
SEE IT

NOW YOU
DON'T



1 The first step to making a perfect plastic-laminate butt joint is to rout a straight edge on one piece of laminate. Use a straight board as a guide and a flush-trim bit to make the cut.



2 Apply both pieces of laminate to the substrate. The piece with the straight edge goes down first; the second piece overlaps it by a small amount. Spacer sticks prevent the laminate from sticking to the substrate, making it easy to align the parts.



3 Rout the joint. Keep the underscribe attachment's lip in constant contact with the bottom piece's straight edge while routing and keep the attachment firmly against the laminate surface.

1. Start by making a couple of small (approximately 12-in. x 12-in.) test countertops from scraps of the same laminate you will use in your finished project. Using the same kind of laminate is important, because even a small difference in laminate thickness will affect the accuracy and fit of the final joint. Use the test countertops and Steps 2 through 9, to set up the underscribe attachment. Rout an inch or two on one of the test tops, check the fit and adjust the underscribe base as necessary. The base has built-in micro-adjusters, so fine-tuning is simple. When you have the perfect fit, run one more test cut using the entire joint on one of the test countertops. You will only get one shot at your project, so now is the time to fine-tune the attachment to perfection.

2. Rout a straight edge on one piece of laminate (Photo 1). You'll end up with a small burr on the bottom edge of the laminate. Remove the burr with a file, so the laminate will glue down completely flat. Mark a straight pencil line along this straight edge. The lip on the underscribe attachment rides on this edge and guides the router through the cut. As a result, this first piece of laminate is called the guide piece. Mark the adjoining edge on the second piece of laminate with a wavy line to show that it has a rough edge (Photo 2).

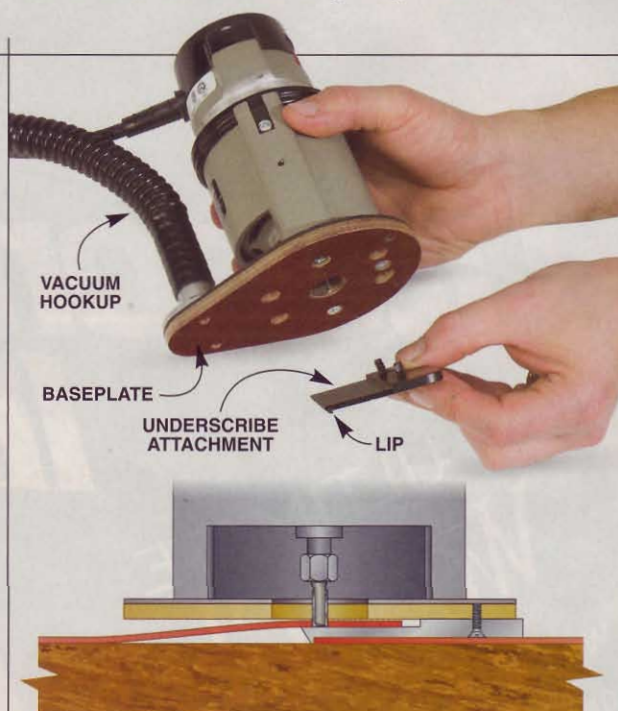
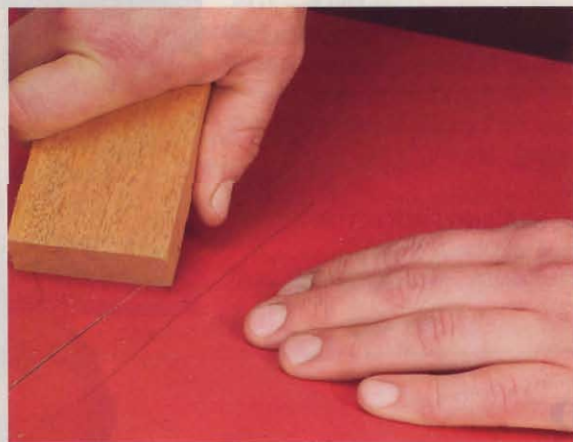


FIGURE A UNDERSCRIBE ATTACHMENT DETAIL

The underscribe attachment has a lip that rides on the straight edge of the bottom piece of laminate and lifts the edge of the top piece while a 1/8-in. router bit does the cutting.



4 Shave the burr off the bottom edge of the overlap piece with a utility knife.



5 Press the overlap piece into place using a block of wood. The piece should fit snugly and snap into place.



6 Hide any trace of the seam by applying permanent marker or an oil stain of similar color to the laminate. Wipe off the excess with solvent and a rag.

Source Betterley Industries Inc., (800) 871-7516, www.betterleytools.com Complete kit including trim router, baseplate, underscribe attachment and vacuum hookup, #DU310, \$279. Kit including trim router, baseplate and underscribe attachment, #U310, \$219. Underscribe attachment and vacuum hookup, #DUB310, \$159. Underscribe attachment only, #UB310, \$100. Vacuum hookup only, #D100, \$79.

3. Position the guide piece on the substrate without adhesive and make a pencil line on the substrate along the laminate's straight edge. Next, lay down the second piece, overlapping the guide piece by 1/4 in. to 3/4 in. Use pieces of masking tape to mark this overlap.

4. Remove the laminate pieces from the substrate and apply adhesive to all parts.

5. Reapply the guide piece of laminate, making sure it lines up with the pencil mark you traced onto the substrate in Step 3. Use spacer sticks to prevent it from sticking until you have the laminate aligned. Pull out one stick at a time, starting with the edge closest to the pencil line. Use a laminate roller to make sure the laminate is thoroughly pressed down.

6. Apply the overlap piece using the same method. Line it up with the tape on the guide piece, remove the spacer sticks, and roll it down. Roll as close to the seam as you can. This helps prevent chips from getting under the laminate when you rout the seam. Also, a vacuum attachment is available for the underscribe attachment. It removes almost all the debris as you rout the seam so is well worth the money (see Source, below).

7. Clean the laminate surface and your router base, because a small piece of debris between the router base and the laminate could cause a nasty scratch. A little paraffin wax on the router base helps it to slide easily.

You're now ready to rout the joint (Photo 3). With the router turned off, position the lip of the underscribe attachment firmly against the straight edge on the guide piece (Fig. A). Turn the router on only after you're sure it's positioned properly. Maintain contact between the lip and the guide piece throughout the cut.

8. Use a utility knife to remove the burr from the bottom edge of the newly trimmed piece (Photo 4). Flick the waste away from the bottom of the joint as you go. Also peek under this piece for any stray chips and remove them. It's paramount that you leave no chips under this piece of laminate or it will not push down level with the first piece.

9. Snap the trimmed piece into place using a wood block with a rounded edge (Photo 5). Use a laminate roller to press the seam down thoroughly.

10. Hide the seam with permanent marker or an oil stain in a color similar to the laminate (Photo 6). Wipe the seam with a solvent, such as denatured alcohol or lacquer thinner, to remove any excess marker or stain on the surface of the laminate.



Chronicle Books LLC, (OTR)

Slot & Spline Paneled Door

Hands down,
the easiest way to make
a frame-and-panel door

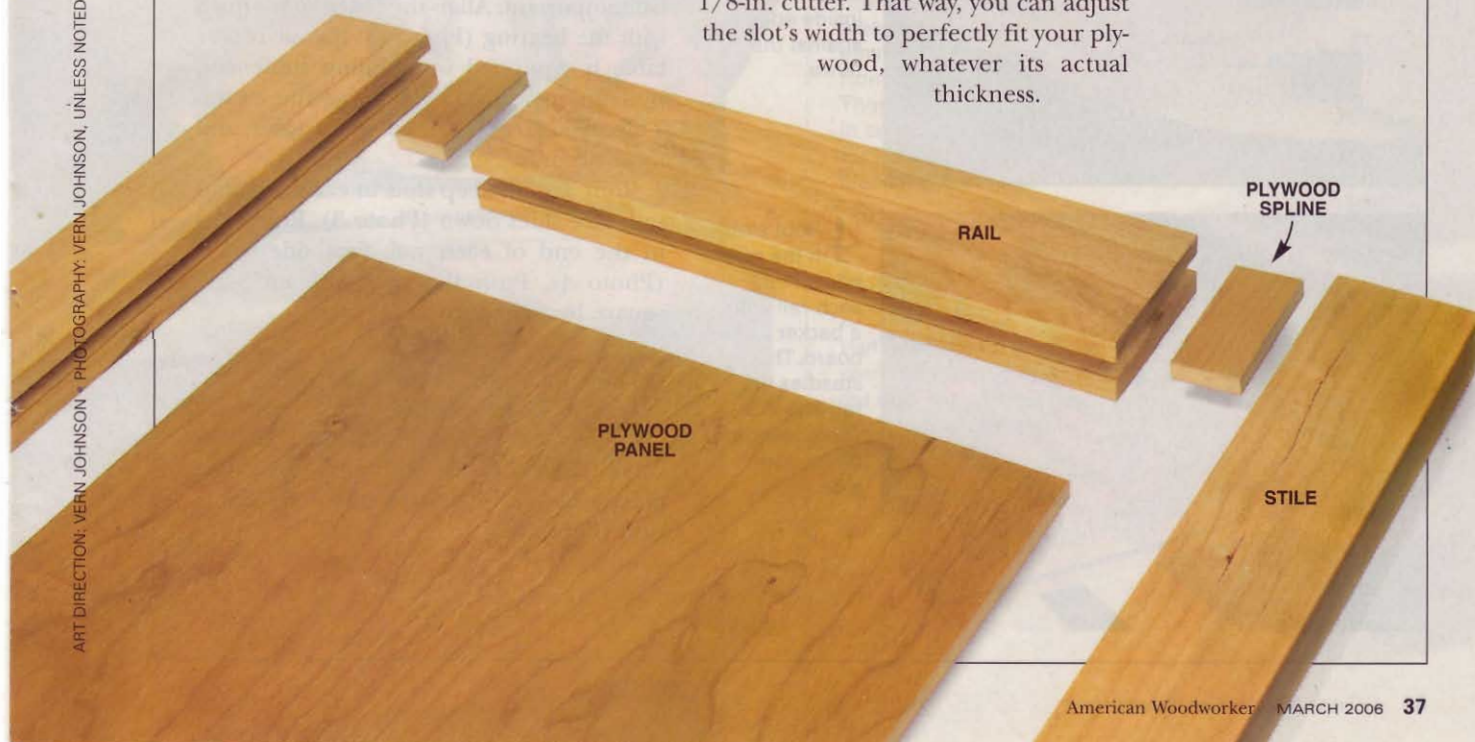
A good-looking frame-and-panel door is really quite easy to make, if you keep it simple. Just use a plywood panel and a slot-and-spline joint (see photo, below). This door is held together by splines made from 1/4-in. plywood. The panel is 1/4-in. plywood,

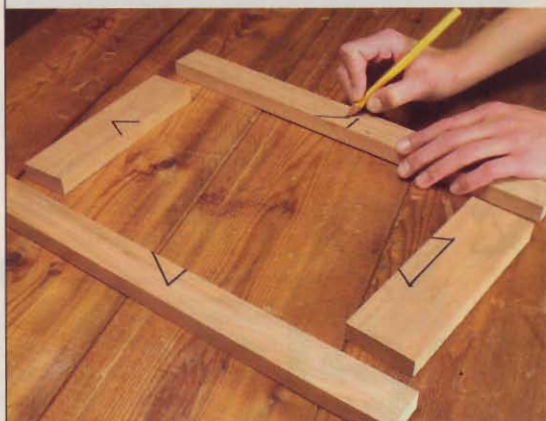
too. The splines and panel fit into the same size slots in the stiles and rails.

All you need to make the door is a router table and a 1/8-in. slotting cutter (see photo, right). Plywood is usually undersized, so a 1/4-in. cutter would be too big. Instead, you'll make two slightly overlapping passes using the 1/8-in. cutter. That way, you can adjust the slot's width to perfectly fit your plywood, whatever its actual thickness.



A 1/8-in. slotting cutter is the only bit you need to make this door.

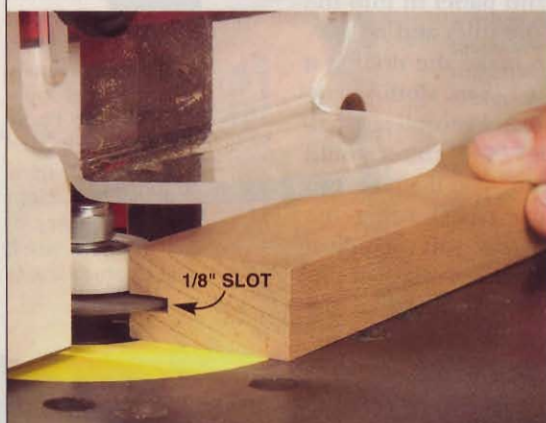




1 Mark the door's parts using the cabinetmaker's triangle. It identifies the top and bottom rails, and the left and right stiles.



2 All the joints for this door are cut on the router table. Set up a 1/8-in. slot cutter so its bearing is flush with the fence.



3 Rout 1/8-in.-thick slots the full length of each stile and rail. Refer to your marks to be sure each face side is down and the inside edge is against the fence.



4 Rout slots in the rails' ends. Push each rail with a backer board. This steadies the rail and prevents tear-out on its back side.

TOOLS AND MATERIALS

You'll need a tablesaw, small handsaw, router table and 1/8-in. slot cutter with a bearing that makes a 3/8-in.-deep slot, though a 1/2-in.-deep slot is OK, too. Slot cutters and bearings are widely available. I used a set from Amana tools, a 1/8-in. three-wing slotting cutter assembly (#53406-1, \$30) with bearings for 3/8-in. and 1/4-in. deep slots (#47729, \$20).

If you're making lots of doors, I recommend using an adjustable cutter. You'll only have to make one pass per slot, rather than the two passes shown in Photo 6. Most adjustable cutters use shims, but I found one that can be dialed to various widths, the Amana E-Z Dial slot cutter (#55500, \$104). It makes 1/8- to 1/4-in.-wide slots that are 1/2-in. deep. I made my door from 3/4-in.-thick solid wood and 1/4-in. MDF-core plywood, but you can use this technique with any type of plywood or material of any thickness.

MILL THE STILES AND RAILS

Rip and crosscut the stiles and rails so they have square sides and ends. Note that the rails butt up to the stiles. Make an extra stile or rail for testing the router setup. Mark the stiles and rails (Photo 1).

ROUT SLOTS, FIRST PASS

Install the slot cutter in the router table. To approximately center the slots on 3/4-in. material, raise the cutter 1/4-in. above the table. Exactly centering the slots isn't important. Align the fence so it's flush with the bearing (Photo 2). If your router table is equipped with sliding subfences, push them within 1/16 in. of the cutter. This makes routing end grain safer and more accurate.

Rout 3/8-in.-deep slots in each stile and rail, face sides down (Photo 3). Rout slots in the end of each rail, face side down (Photo 4). Push the rails with an 8-in.-square backer board.

ROUT SLOTS, SECOND PASS

Figure out exactly how much wider the slots must be to fit the plywood. Hold a small piece of plywood next to a test piece's slot and mark the plywood's thickness (Photo 5).

Place the test piece on the router table, face side down. Raise the cutter to just below the pencil line. Turn on the router and make a short second pass (Photo 6). Test the plywood's fit in the slot. If you have to use force to push in the plywood, the slot is too narrow. If you can fit two pieces of paper between the spline and the slot's wall, the slot is too wide. When you've got the right fit, make a second pass on all the rails and stiles.

CUT THE SPLINE

Rip a long, narrow strip from the plywood. Cut the strip $1/32$ in. narrower than the combined depth of two slots.

Measure the rails to determine the spline's length. The splines run from the outside edge of a rail to the bottom of the slot. Cut the splines to length. The safest way to cut these small pieces is with a band-saw or with a backsaw and miter box. Put the splines in the rails' ends, without glue, and assemble the door.

CUT THE PANEL

Measure the panel opening. Add $11/16$ in. to the opening's length and width and cut the panel to this size.

GLUE THE DOOR

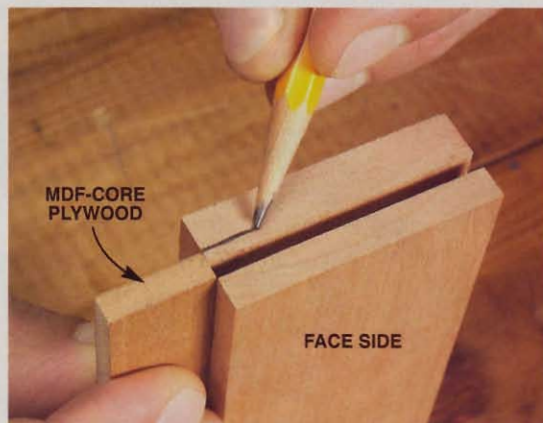
Sand the panel and the inside edges of the stiles and rails. Glue the splines into the rail's ends (Photo 7). Put glue on both sides of the splines' slots and on the rails' end grain. Position the splines so they extend $1/32$ in. beyond each rail's outside edge. Apply glue to both sides of the splines protruding from the rails.

To make the door as strong as possible, glue the panel, too. You can't do this with a solid-wood panel, because it must be free to expand and contract, but plywood won't move. Run a bead of glue on the back side of the long slots in the stiles and rails.

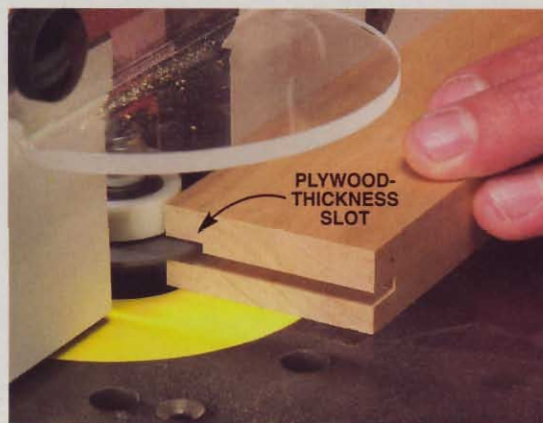
To assemble the door, insert one rail into a stile. Slide in the panel, then the second rail. Make sure the rails align with the stile's ends. Push the second stile into place and clamp (Photo 8). Sand flush the protruding spline after the glue has dried.

The cherry sideboard photo on page 37 comes from *Thos. Moser: Artistry in Wood* by Thomas F. Moser with Brad Lemley, 2002. Used with permission of Chronicle Books LLC, San Francisco, www.chroniclebooks.com.

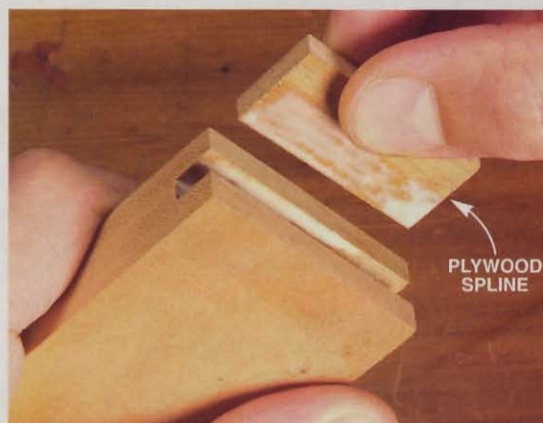
5 Mark the plywood's thickness on the end of a test piece. Raise the slot cutter to just below the pencil mark.



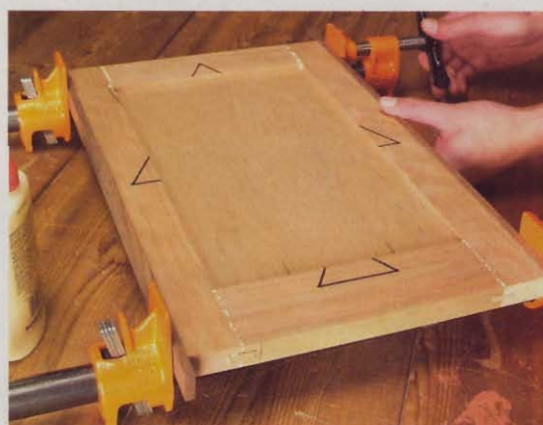
6 Make a second pass on the test piece to widen the slot. Adjust the slot's width by raising or lowering the cutter until the plywood fits perfectly. Then make a second pass on all the stiles and rails.



7 Glue splines into the rails' ends. Apply a bead of glue to the panel slots, too, but only on the slot's back edge, so glue won't leak out the front.



8 Clamp the door. There's no messy squeeze-out around the panel's front, just in the back. Gluing the panel isn't required, but it makes the door extremely strong.



3 Great Router Jigs

Make your router
a workshop workhorse

by Tim Johnson

DADOES



MORTISES



SHELF HOLES



If you only use your router to rout decorative edges, you're missing the boat. Your router can be the most versatile tool in your shop. The secret to unlocking your router's potential is to use it with specialized jigs. A dovetail jig is a perfect example:

With this jig, your router can do the same job as an expensive dovetailing machine.

Fortunately, you can make many useful router jigs in your shop without spending an arm and a leg. I'll show you three simple jigs that will expand

your woodworking capabilities by leaps and bounds: one for dadoing, one for mortising and one for making shelf pin holes. Although these jigs have been around since the dawn of routers, they're indispensable additions to any woodworking shop.

ADJUSTABLE Dadoing Jig



A pattern bit is a flush-trim bit with the bearing mounted on the shaft.

This jig (Fig. A, below) takes the guesswork out of routing dados, because setting the exact width is virtually foolproof. Being able to tailor the dados' width to precisely match the thickness of shelves is a real blessing when you're building cabinets with hardwood plywood, which is always undersize in thickness.

This jig accommodates wood up to 24 in. wide. Its double T-square design guarantees dados that are square to the edges on both left and right cabinet sides. Positioning the jig couldn't be easier—just line up the fixed fence with the top of each dado. This jig must be used with a pattern bit (see photo, left, and Sources, page 43). This combination is perfect for use with nominal 3/4-in.-thick plywood. It allows routing dados from 5/8 to 1-1/8 in. wide and up to 1/2 in. deep.

MAKE THE JIG

1. Glue and screw the fixed fence (A) to the rails (B). Make sure the joints are perfectly square.
2. Rout the slots in the adjustable fence (C) on a router table, using the router table's fence and a 5/16-in. straight bit.
3. Use the adjustable fence's slots to locate the rails' carriage bolt holes. Lay the fence on the jig, snug against the fixed fence and flush with the rails. Using a pencil, transfer the slot locations to the rails.

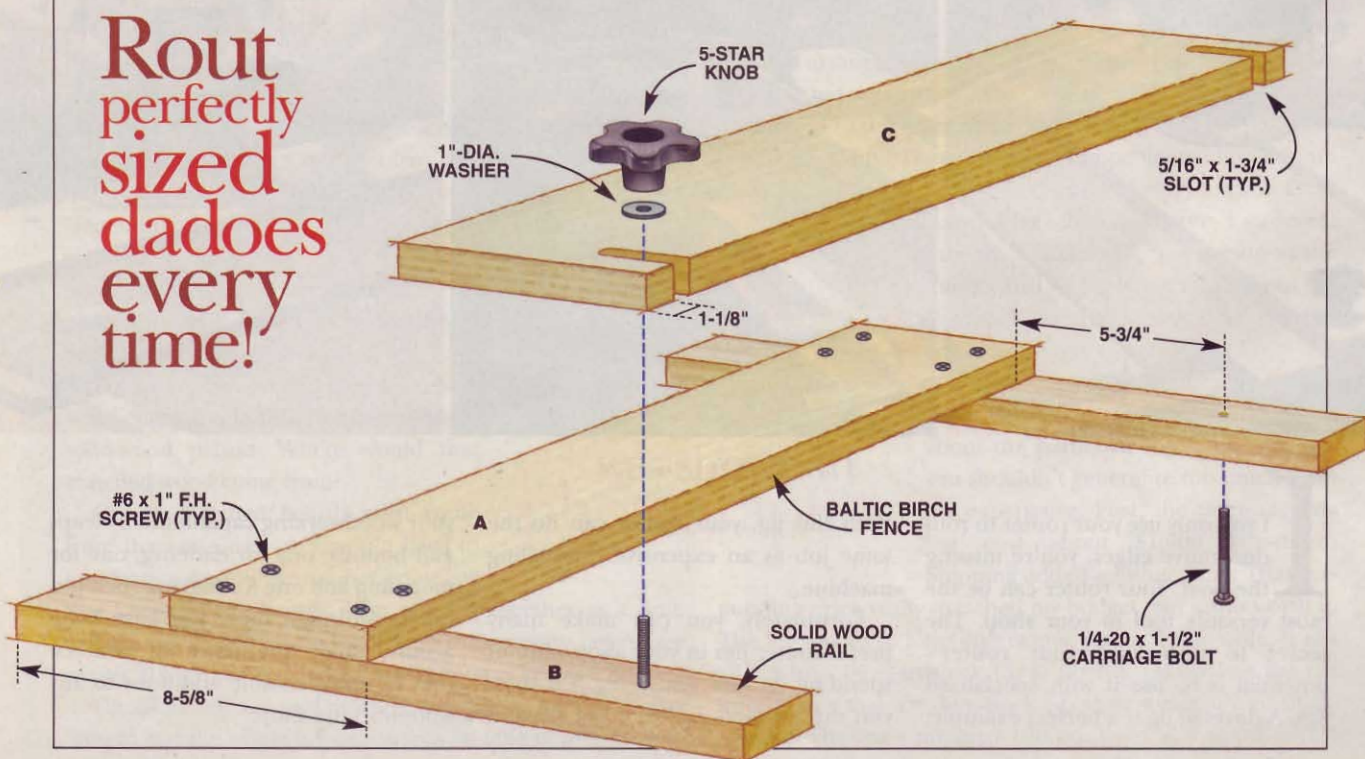
4. Drill and counterbore the holes.
5. Install the carriage bolts.

CUTTING LIST

Part	Name	Number	Dimensions
A	Fixed fence	1	3/4" x 5" x 29-7/8" *
B	Rail	2	11/16" x 2-1/2" x 18"
C	Adjustable fence	1	3/4" x 6" x 29-7/8" *

* Length allows cutting both fences from one 60-in. length of Baltic birch plywood

FIGURE A ADJUSTABLE DADOING JIG

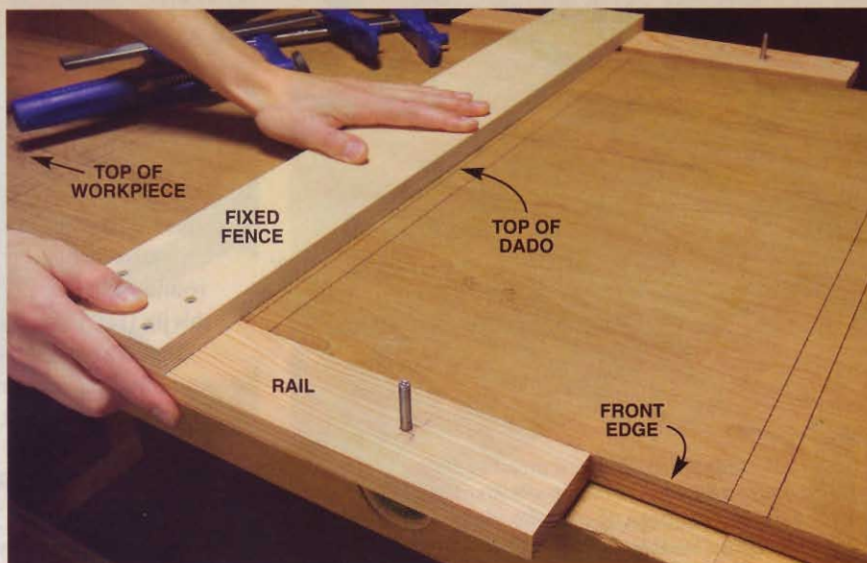


Rout perfectly sized dados every time!

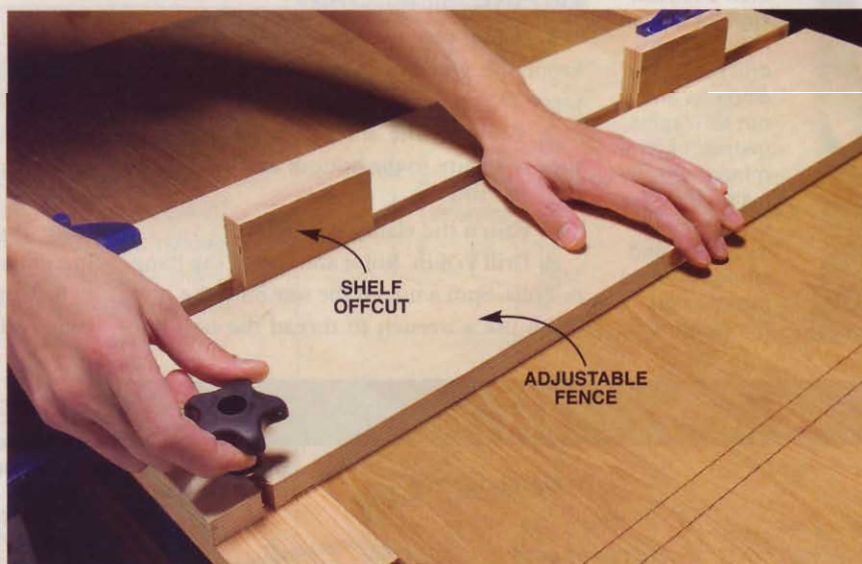
USE THE JIG

1 Position the fixed fence on a line indicating the top of each dado. Always orient the jig with the fixed fence at the top of the workpiece. Make sure the jig's rail is firmly seated against the edge. Then clamp both pieces to your bench.

Both rails are square to the fixed fence, so it doesn't matter which rail registers the jig. Out of habit, though, I always register the jig against the front edge of the workpiece.



2 Set the adjustable fence using offcuts from your shelves as spacers. This method guarantees that the dados will be exactly the right width.



3 Rout the dado in two passes. During the cut, the pattern bit's shaft-mounted bearing rides against the jig's fences, so the dado it cuts is exactly the same width as the opening. Bear against the fixed fence during one pass and against the adjustable fence during the other.



Sources Amana Tool, (800) 445-0077, www.amanatool.com 5/8-in.-dia. x 1/2-in. flush-trim plunge-routing (pattern) bit, #45469, \$21. • Rockler, (800) 279-4441 www.rockler.com 5-star knob, #23804, \$1 ea.

VERSATILE Mortising Jig



If you have a plunge router with an edge guide, you can machine professional-quality mortises without buying an expensive benchtop mortiser. All you need is a plunge-routing bit (see photo, left, and Sources, page 45) and this jig (Fig. B, below).

This jig accepts workpieces of any length. They can be positioned against one end of the jig or extend beyond both ends. Although it accepts stock up to 3 in. wide and 4-1/2 in. thick, this jig is invaluable for routing mortises in narrow pieces, such as door stiles or delicate legs, on which a large, top-heavy plunge router would be tough to balance. By fully supporting the router's base, this jig makes mortising a breeze.



An up-cut spiral bit routs a better mortise than a regular straight bit can. It cuts like a drill bit, lifting chips up and out as it spins, instead of jamming them inside the hole. Chatter-free operation and smooth-walled mortises are the result.

MAKE THE JIG

1. Glue two oversize blanks together. From the glued-up blank, cut the bottom piece (A) to final size.
2. Glue on the sides (B), making sure they're square to the bottom and level at the top.
3. Fasten the clamp rail (C).
4. Drill 1/4-in. holes and install the hanger bolts. Spin a nut all the way onto the bolt. Then use a wrench to thread the bolt into

the hole. A doweling jig makes it easy to accurately drill the holes.

5. Make the end stop (D). To make the adjustable stop (E), drill start holes at the ends. Then rout the slots in several passes, using a 5/16-in. straight bit, your router table and a fence. Raise the bit in 1/4-in. increments.

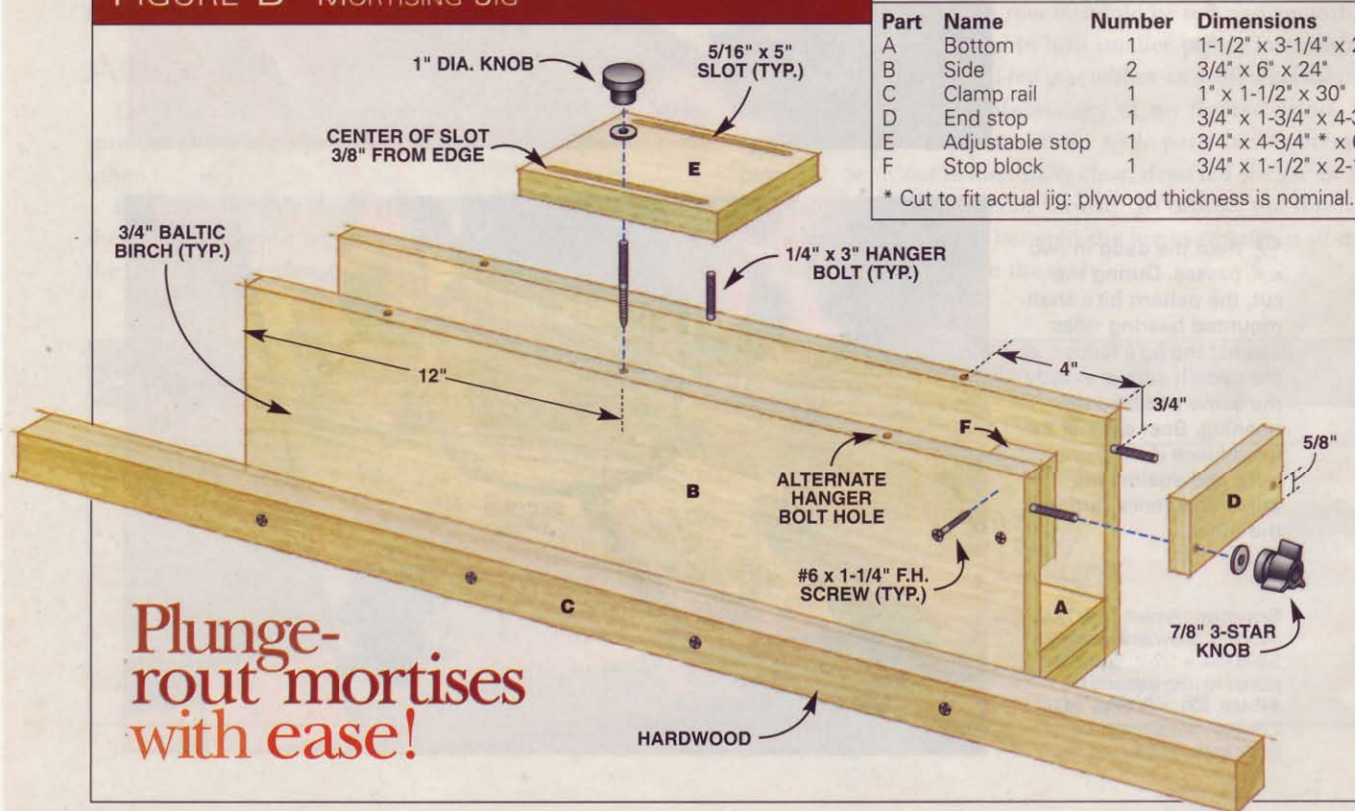
6. Cut stop blocks (F) as necessary for each routing job.

FIGURE B MORTISING JIG

CUTTING LIST

Part	Name	Number	Dimensions
A	Bottom	1	1-1/2" x 3-1/4" x 24"
B	Side	2	3/4" x 6" x 24"
C	Clamp rail	1	1" x 1-1/2" x 30"
D	End stop	1	3/4" x 1-3/4" x 4-3/4" *
E	Adjustable stop	1	3/4" x 4-3/4" * x 6"
F	Stop block	1	3/4" x 1-1/2" x 2-1/2"

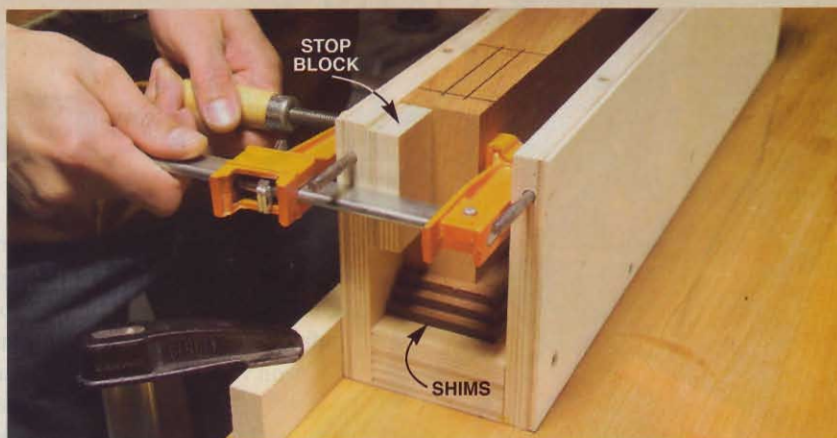
* Cut to fit actual jig; plywood thickness is nominal.



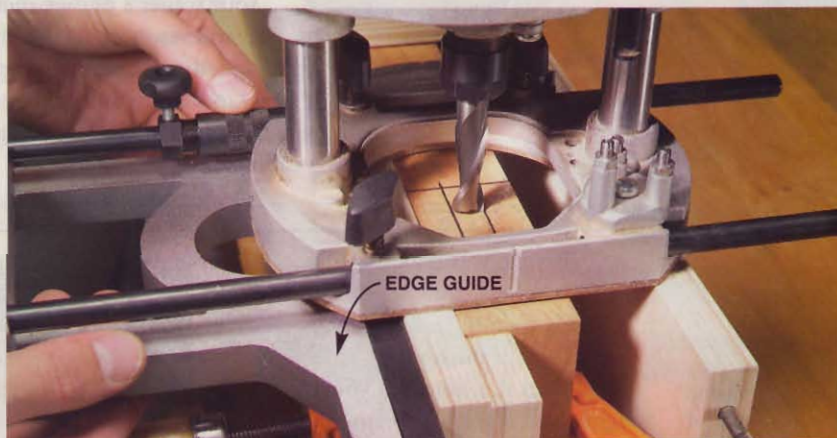
Plunge-
route mortises
with ease!

USE THE JIG

1 Clamp the workpiece in position. First, use shims to raise it flush with or slightly below the top of the rails. Install a stop block when you rout multiple pieces with mortises near the ends, such as this table leg. The width of the stop block determines the location of the top of the mortise. To accommodate wide stock, cut notches for the clamp heads in the back of the jig.



2 Center the bit on the layout lines by adjusting the router's edge guide. With the router unplugged, use the plunge mechanism to lock the bit in position just above the workpiece's surface. Before you adjust the edge guide, orient the bit's cutting flutes to span the mortise.

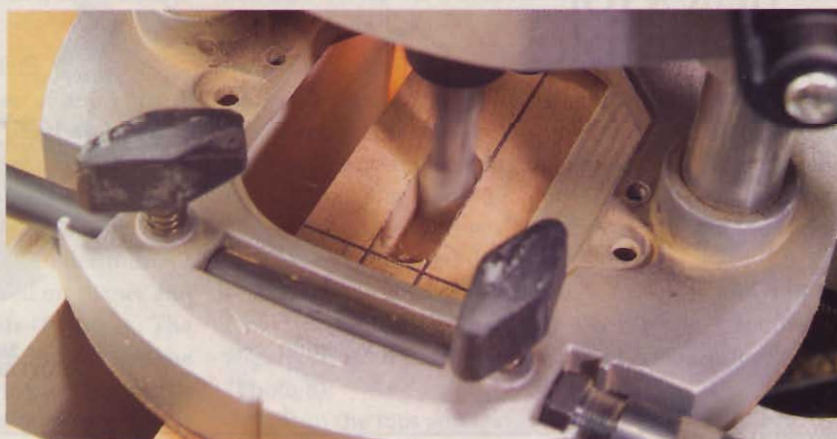


3 Install stop blocks. For the table leg shown here, the end stop determines the top of the mortise and the adjustable stop determines the bottom.

To rout mortises in the middle of a long workpiece, such as a bedpost, remove both stops. Install a second adjustable stop and relocate the first, using the alternate hanger-bolt holes (Fig. B). Center the mortise between the stops when you clamp the workpiece in the jig. If you only have a couple mortises to rout, don't bother with the stops. Just rout to the layout lines.



4 Plunge-rout the mortise in several shallow passes. After routing, square the mortises with a chisel if your tenons are square-shouldered.



Sources Freud Tools, (800) 334-4107, www.freudtools.com 1/4-in.-dia. up-cut spiral bit, #75-102, \$21. 5/16-in.-dia. up-cut spiral bit, #75-104, \$45. 3/8-in.-dia. up-cut spiral bit, #75-106, \$42. 1/2-in.-dia. up-cut spiral bit, #75-109, \$74. • Rockler, (800) 279-4441, www.rockler.com 1/4-in. x 3-in. hanger bolts, #24463, \$2 per package of eight. 1-in. round knobs, #34095, \$1 ea. 7/8-in. 3-star knobs, #68064, \$1 ea.

SUPER-SIMPLE

Shelf-Hole Jig

Forget about tedious drill press setups or using pegboard as a not-so-accurate template: This jig (Fig. C, below) eliminates the onerous task of drilling adjustable shelf holes. And because you plunge-rout the holes, you won't have any of the unsightly tear-out that drill bits frequently cause.

To use the jig, you need a plunge router equipped with a 1/4-in. bit and a template guide (see photo, left, and Sources, page 47). Your router's plunge mechanism must slide smoothly; side-to-side play will result in oversize holes. Operate at a slow (9,000- to 12,000-rpm) speed and use a steady plunge rate.

It's easy to modify this jig. For example, the holes can be spaced differently from the edges or clustered in groups. You may need a shorter version to fit inside a cabinet.



A spiral down-cut bit eliminates tear-out around the edge of the hole, thanks to the bit's downward shearing action. This bit works especially well with veneered plywood, which tears out easily.

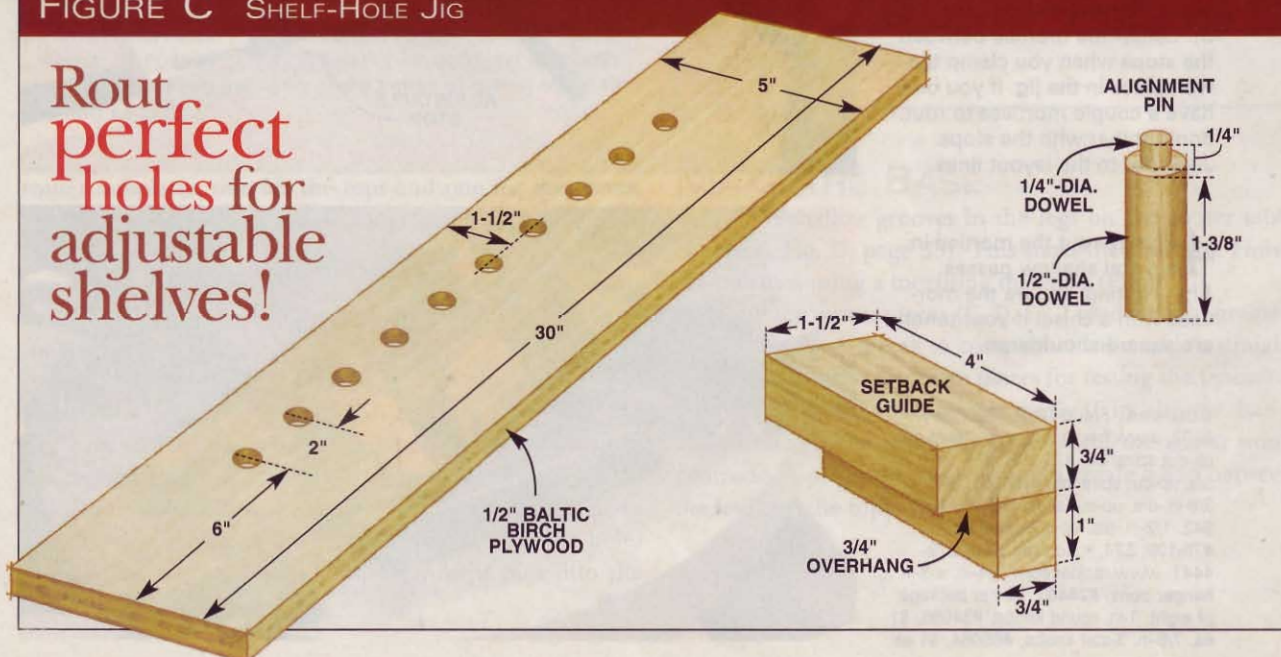
MAKE THE JIG

1. Before you make the jig, test-fit your template in a hole drilled with your Forstner bit. The guide should fit snugly without binding.
2. Lay out the holes.
3. Drill the holes on your drill press, using a fence and a 1/2-in. Forstner bit. Before you drill, set the depth stop so only the center point of the bit goes all the way through the jig.
4. Flip the jig over to finish drilling the holes. This two-step drilling method ensures clean holes on both faces of the jig.
5. Make the alignment pin:
 - Joint one side of a 2x4 and clamp it to your

drill press, jointed side down.

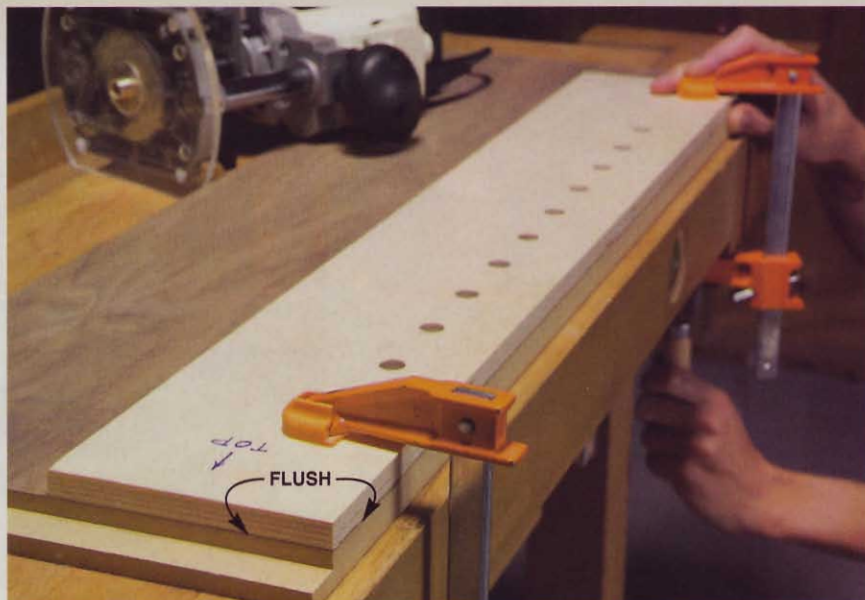
- Using a Forstner bit, drill a 1/2-in. hole all the way through the 2x4.
- Seat a 1-3/8-in. length of 1/2-in. dowel in the hole so it sits below the 2x4's surface.
- Without starting the drill press, lower the bit to mark the dowel's center, using the walls of the 1/2-in. hole to guide the bit.
- Install a 1/4-in. bit and drill a 1/2-in.-deep hole in the dowel, using the center mark you've just made to guide the bit.
- Glue a 1/4-in. dowel in the centered hole. Then trim it to final length.

FIGURE C SHELF-HOLE JIG

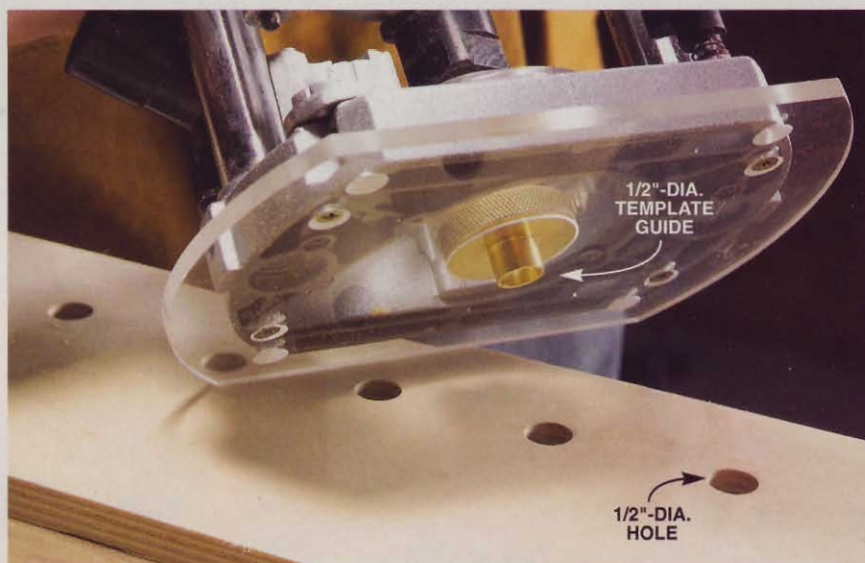


USE THE JIG

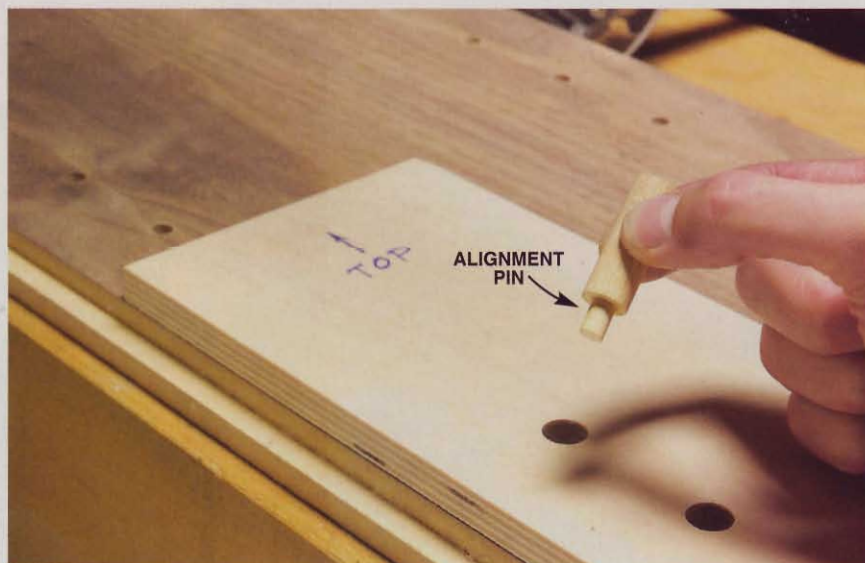
1 Position the jig flush with the top and the front edge of the cabinet side. Securely clamp the jig and you're good to go. To rout the back row of holes, flip the jig over and align it flush with the top and the back edge. You can also use this jig inside a completed cabinet. Just register it against the cabinet's top or bottom. If you need to allow room for an inset door or Euro-style hinges, use a pair of setback guides (Fig. C) to move the holes farther back from the front edge.



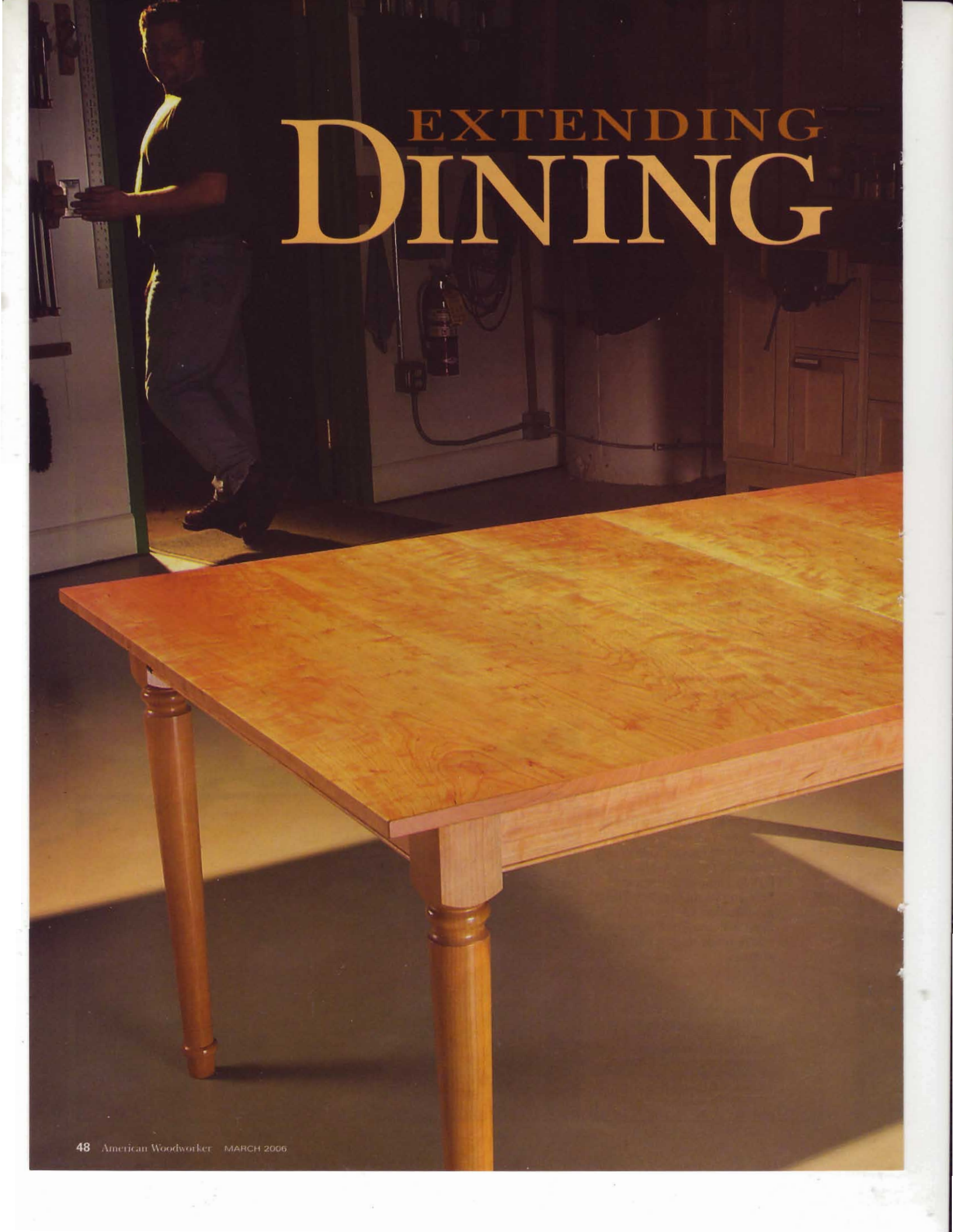
2 The template guide precisely fits each hole, locking the router in position, so every hole you rout is perfectly located. The guide's collar must extend less than 1/2 in. so it doesn't protrude beyond the 1/2-in.-thick jig. The guide must exactly fit the holes in the jig, but the size of its outside diameter isn't critical. To use a 1/2-in. template guide like the one shown here, drill 1/2-in.-dia. holes; to use a 5/8-in. guide, drill 5/8-in.-dia. holes.



3 The alignment pin makes it easy to reposition the jig on long cabinet sides. Installing the pin aligns the jig's top hole with the last hole you've routed. With the pin installed, clamp the jig flush with the front edge and you're ready to rout additional holes.



Sources Porter-Cable, (888) 848-5175, www.porter-cable.com 1/2-in.-o.d. template guide (most routers accommodate Porter-Cable template guides), #42033, \$7. • MLCS, (800) 533-9298, www.mlcswoodworking.com 1/4-in.-dia. solid-carbide spiral down-cut bit, #5177, \$14.

A man in a dark t-shirt and light-colored pants stands in a workshop, looking towards the camera. He is positioned near a doorway. In the foreground, a large, rectangular wooden dining table with a light-colored wood top and turned legs is prominently displayed. The background shows workshop equipment, including a fire extinguisher and a large metal tank.

EXTENDING DINING

TABLE

Storing the leaves is a snap—they tuck away under the top.

Have you ever seen wood glow? That's what happened when I finished this table. I turned off the shop lights, walked out the door and took a glance back at my labor of love. That huge cherry surface radiated warm light like embers from a campfire. Wow!

I had always wanted a turned-leg dining table, especially one that could be lengthened for family gatherings. I'm not much of a turner, though, so I put off building a table until I discovered that you can buy very nice legs, already turned (see "Mail-Order Table Legs," page 53). There went that excuse! The table's extension slides, of course, are also ordered from a catalog.

Adding two leaves, as I did, extends the table to seat eight people. Without leaves, it seats six. If you want a table longer than this to seat more people, you can buy longer extension slides and add more leaves. You can store up to four leaves inside this table, provided they don't have aprons. With longer slides and four leaves, add a center leg for support in the middle of the table. Attach the leg to a board that's attached to both pairs of slides. For this to work, use geared equalizer slides. The middle sections of these slides always stay in the center of the opened table.

by Joe Gohman

PROJECT REQUIREMENTS AT A GLANCE

Materials:

40 bd. ft. of 4/4 cherry
10 bd. ft. of 5/4 cherry
Four turned cherry table legs
One pair of table extension slides
One sheet of 1/2-in. MDF for templates
Two quarts of varnish

Tools:

Tablesaw, tenoning jig, jointer, 13-in. planer, mortising machine, biscuit joiner, router, router table, 1-in.-dia. flush-trim pattern bit, 3/8-in.-dia. straight bit, 1/4-in.-dia. edge-beading bit, finish sander, bar and pipe clamps

Hardware:

Rare earth magnets
Continuous hinges
Table alignment pins
Tabletop fasteners
Table locks
Cost: \$500 for average hardwood lumber

FIGURE A EXPLODED VIEW

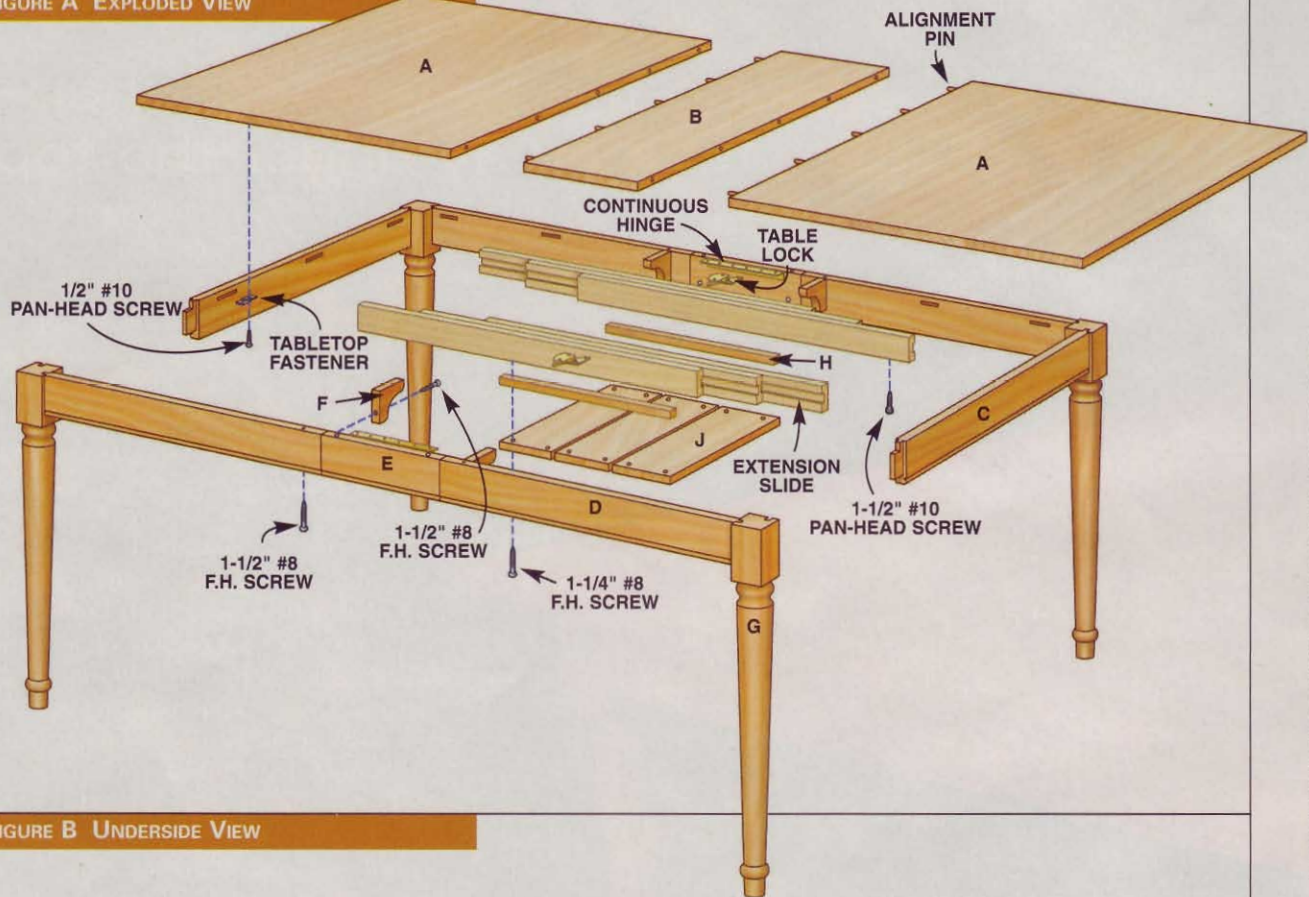
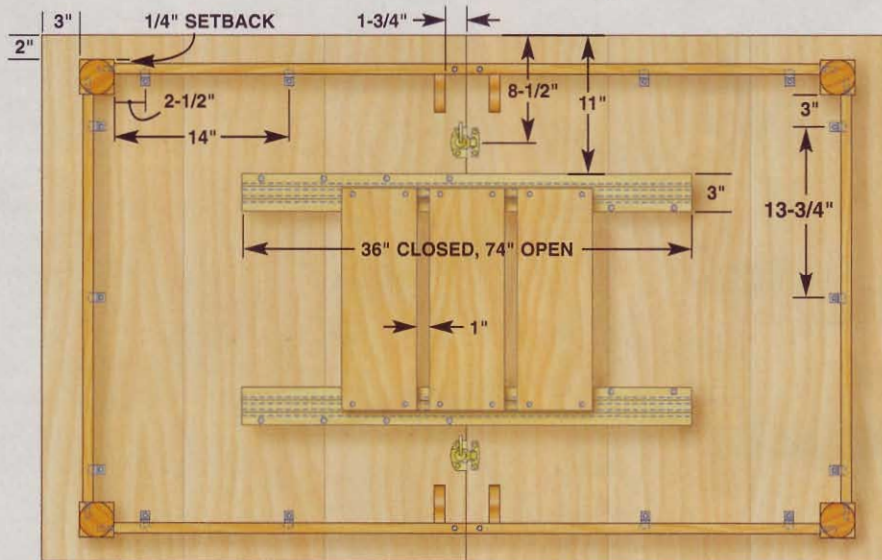


FIGURE B UNDERSIDE VIEW



EDITORS: TOM CASPAR AND BRUCE KIEFFER • ART DIRECTION: JOE GOHMAN • PHOTOGRAPHY: RAMON MORENO • ILLUSTRATION: FRANK ROHRBACH



Folding Leaf Aprons

Our family rarely uses a tablecloth when our table is fully opened, so I added aprons to the leaves. Leaf aprons make the table look uniform. If you routinely use a tablecloth, however, you don't need them.

I hinged the aprons so the leaves would fit under the table's top. Two pairs of rare earth magnets hold each apron in place. One set of magnets (see photo, right) holds the apron flat for storage. Another set, behind the hinge, holds the apron perpendicular when in use.

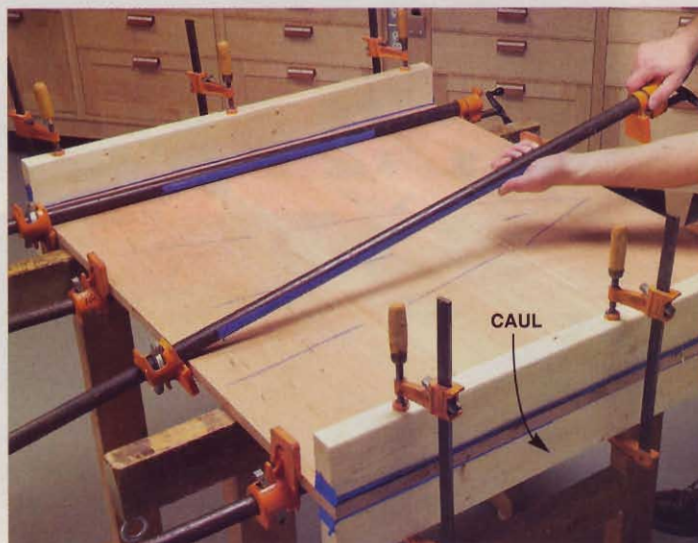
Both leaves store under the top. Their aprons fold flat, which enables them to sit on a shelf that has been attached to the extension slides.



1 I used wide, roughsawn boards for my tabletop and flattened them with my planer. Place each board on a MDF or melamine carrier and stick shims under the board's high spots. This prevents the board from rocking or bending as it's planed.

MAKE TOPS AND LEAVES

1. The tops may be made from pieces of any width. I selected wide matched boards (A, Fig. A, page 50) (see also "Honey, I Bought a Log!" page 56.) The top's thickness is only 3/4 in., but I played it safe and used 5/4 (1-1/4 in. thick) lumber to allow for cup or twist in 12-in.-wide pieces. If you use 4- to 6-in.-wide top boards, 4/4 lumber is fine. I don't have a monster 12-in. jointer, so I used my planer and a carrier board to flatten the top's boards (Photo 1). The carrier board has a stop screwed to one end to prevent the planed wood from slipping backward. Every gap under the planed board has to be shimmed. I used tape to hold the



2 The table's top is made in two pieces; the grain runs the short way. Each piece consists of three or more boards. Use biscuits and glue one joint at a time to make the joints as even as possible. Keep the top flat with cauls. Make the tops slightly oversize.

shims in place. When the top surface became flat, I flipped the board over, removed the carrier and continued planing.

I used narrower boards for the leaves (B) to lessen the chance that they may cup. The tops are restrained from cupping by the aprons screwed underneath, but the leaves' aprons aren't fastened the same way.

2. Glue the tops and leaves 1/4 in. wider and 1/4 in. longer than final size (Photo 2). Use biscuits or splines for alignment. Sand the tops and leaves to make the joints flush (Photo 3).

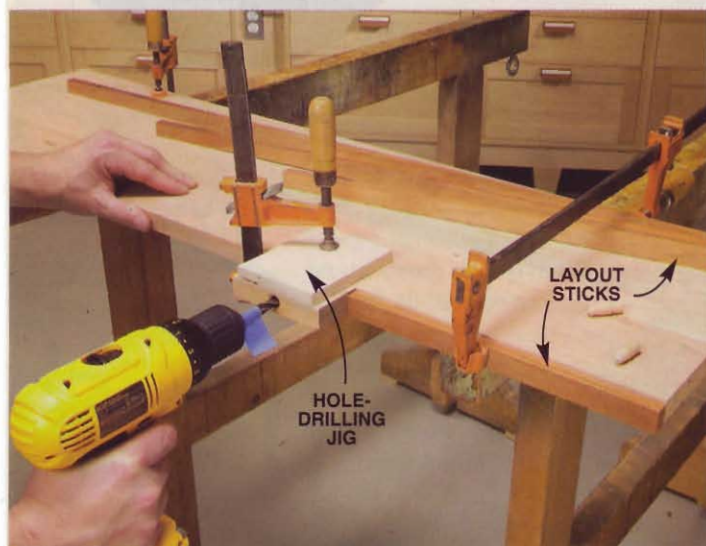
3. Trim the tops and leaves to size (Photo 4). I made two



3 Sand the top's glue joints until the pieces are flush. My favorite tool for this job is a 6-in. random-orbit sander. It removes material much faster and more evenly than a standard 5-in. machine can.



4 Trim both tops to final size with a large template and a pattern bit (see inset photo). This ensures that the tops are exactly the same width and length. I left my router table's insert plate attached to the router to help steady it.

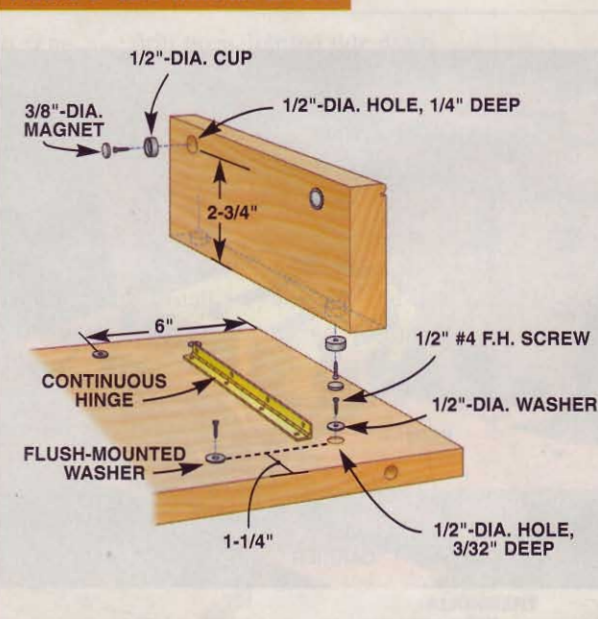


5 Drill holes in the leaves for alignment pins. These holes must be spaced exactly the same on each leaf and both tops. I used a shop-made jig and a series of layout sticks to position each hole.

router templates, one for the tops and one for the leaves. These templates ensure that the tops and leaves are exactly the same length, so their ends line up when the table is assembled. Make the templates the final size of a top and a leaf. To avoid router blowout, cut the end grain first, then the long grain.

4. Build the jig for drilling alignment-pin holes in the tops and leaves (Fig. G, page 53). Position the jig for the first hole by butting its block to the end of the workpiece. For registering subsequent holes, use a series of layout sticks (K) (Photo 5; Cutting List, page 54). Register the sticks from the same ends of the tops and leaves. Drill the holes using a brad-point drill, and tap alignment pins into the holes (see Sources, page 55).

FIGURE C LEAF MAGNET LAYOUT



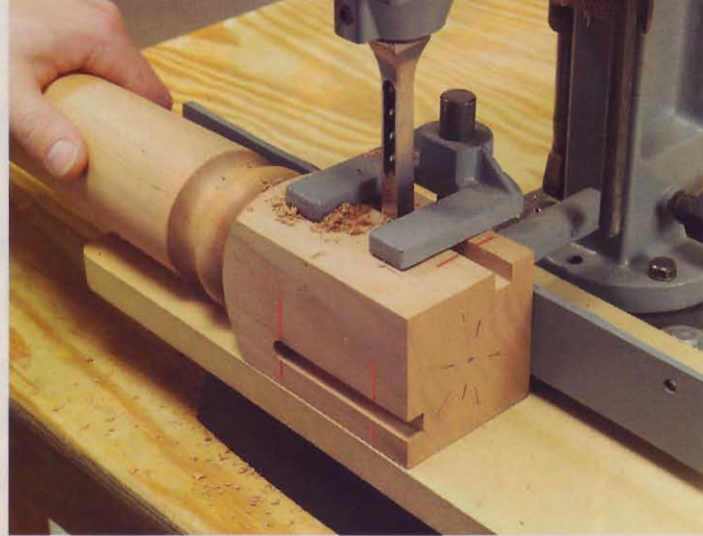
MAKE THE BASE

5. Rout shallow grooves in the legs on the router table (Photo 6, Fig. D, page 53). This starts the mortises. Finish the mortises using a mortising machine (Photo 7).

6. Mill the apron pieces (C, D, E). I used straight-grained boards for these pieces to complement the table's straight lines. Make one or two extra pieces for testing the tenoning setup. Note that the leaf aprons are 1/16 in. shorter than a leaf's width. If the leaf shrinks in width, the apron won't protrude. A protruding apron would create a gap between the leaf and the tops.



6 Rout a groove in the legs to start the mortises. This step is not strictly necessary, but it improves the joint's accuracy. The groove's purpose is to guide a mortising machine's chisel.



7 Cut the mortises using a hollow-chisel mortiser. The routed grooves automatically align the chisel, so you won't get holes that are slightly offset in an irregular line. This method produces deep mortises with very straight, even sides.

Mail-Order Table Legs

I bought the legs for my table, rather than turn them myself. It isn't as much fun, but it is much quicker. Here are three legs I considered. They're all made from solid 2-3/4-in. stock, with no glue lines, and are sanded ready to go. I chose the middle leg for my table. These suppliers make many more leg styles in various widths, lengths and wood species.

Classic Designs,
www.tablelegs.com,
#303-L, \$35 each.



Osborne
Wood Products,
www.osbornewood.com,
#1020, \$27 each.



Adams Wood Products,
www.adamswoodproducts.com,
#A0901-28-3, \$21 each.



FIGURE D MORTISE DETAIL

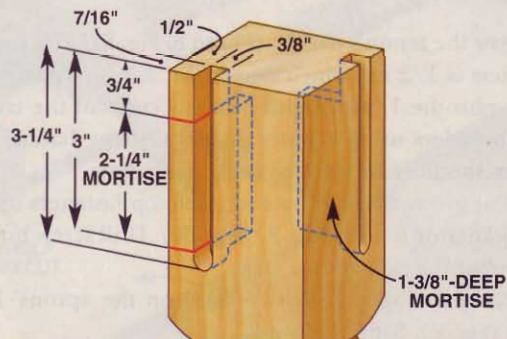


FIGURE E TENON AND APRON BEAD DETAIL

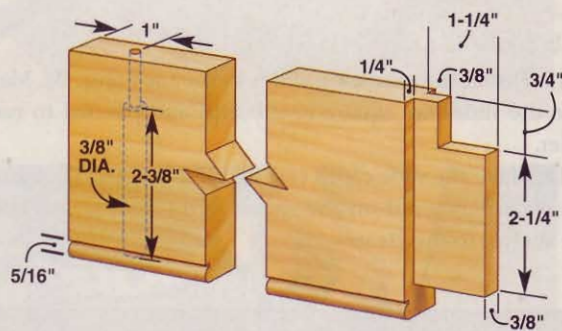


FIGURE F OGEE BLOCK

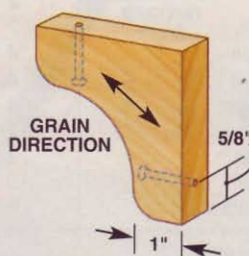
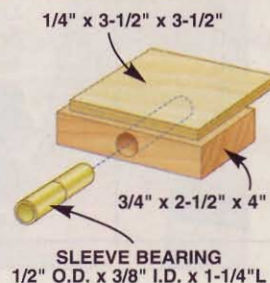
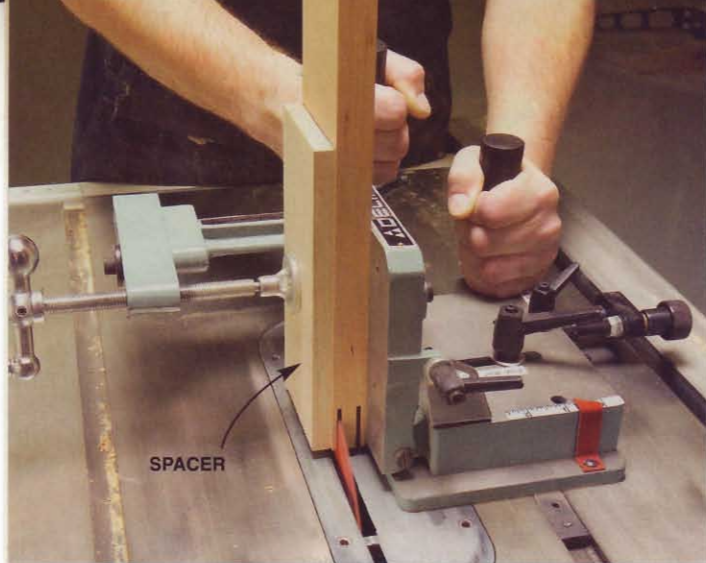


FIGURE G TABLE-PIN DRILLING JIG





8 Saw tenons on the aprons. There are many ways to do this, but I like to use a tenoning jig. It cuts the tenon's cheeks with only one setup. The spacer goes inside the apron for the first cut, outside for the second.

7. Saw the tenon's cheeks (Photo 8, Fig. E). The spacer's thickness is 1/2 in., which equals the 3/8-in. width of the tenon plus the 1/8-in. width of a saw cut. Cut the tenon's side shoulders using a miter gauge. Cut the haunch and bottom shoulder by hand or using a bandsaw.

8. Cut grooves in the rails for tabletop fasteners using a plate joiner or router (Fig. B, page 50). Drill screw holes in the end of the side aprons (D).

9. Sand the aprons. Rout a bead on the aprons' lower edges (Fig. E). Sand the beads.

10. Glue the legs and end aprons (C). Then add the side aprons (D).

ASSEMBLE THE TABLE

11. Fasten the extension slides to the tops (Fig. B). Make sure the slides are square to the tops and parallel to each other.

12. Make the slide cleats (H) and leaf shelves (K). Fasten the cleats, centered on the slides' middle sections. Fasten the shelves to the cleats.

13. Screw two table locks to the tops. Fasten them together to draw the tops tight.

14. Attach the leg and apron assemblies to the tops. Make sure the apron's ends line up with the joint between the tops and with each other. Install the screws at the aprons' ends. These screws lock the aprons in place, while tabletop fasteners allow the tops to expand and contract. Install the tabletop fasteners.

15. Make the ogee blocks (F, Fig. F, page 53) and screw them in place. These blocks keep the rails aligned and square to the tops.

ASSEMBLE THE LEAVES

16. Drill holes for the magnet cups and washers in the leaves and aprons (Fig. C, page 52). Mount the hinges to the aprons.

17. To install the aprons on the leaves, open the table upside down and place one leaf between the tops (Photo 9). Align the leaf's aprons to the tabletop aprons. Insert shims at both ends of each leaf apron to make up the difference between the apron's length and the leaf's width. Fasten the apron's hinges to the leaf. Add the table locks to the leaf. Repeat the process on the second leaf.

FINAL TOUCHES AND FINISHING

18. Remove the leaves and turn the table upright. Round the tops' corners with coarse and then fine sandpaper. Slightly round the edges of the tops and leaves with sandpaper, too, as well as the aprons' bottom edges. As you sit at the table, every edge you touch should be soft and smooth.

19. Break down the table into smaller pieces for finishing. Remove the rail-and-leg assemblies and the extension slides. To equalize the absorbency of my figured wood, I applied SealCoat shellac to all the table parts (see Sources, page 55). SealCoat is essentially clear, dewaxed shellac in a 2-lb. cut. Apply two coats of varnish. To protect the finish, put a large piece of felt between the leaves when you store them, face to face, inside the table.

CUTTING LIST		OVERALL DIMENSIONS: 42"W x 68"L x 29-3/4"H, EXTENDS TO 92"L WITH BOTH LEAVES		
Part	Name	Qty.	Dimensions (Th x W x L)	
A	Top	2	3/4" x 34" x 42"	
B	Leaf	2	3/4" x 12" x 42"	
C	End apron	2	7/8" x 3-1/2" x 35"	
D	Side apron	4	7/8" x 3-1/2" x 29-1/2"	
E	Leaf apron	4	7/8" x 3-1/2" x 11-15/16"	
F	Ogee block	4	7/8" x 3" x 3"	
G	Leg	4	2-3/4" x 2-3/4" x 29"	
H	Slide cleat	2	3/4" x 3/4" x 20"	
J	Leaf shelf	3	3/4" x 6" x 17-3/4"	
K	Layout sticks	4	3/4" x 3/4" x 9-1/2", 19", 28-1/2", 38"	



9 Install aprons on the leaves after the whole table is assembled. Clamp a support board to the table to ensure that the leaf apron is flush with the table aprons. Then fasten the apron to the leaf.

Sources Enco, (800) 873-3626, www.use-enco.com Sleeve bearing, 3/8 x 1/2 x 1-1/4 in., #325-7495, \$1 ea. • Freud Tools, (800) 334-4107, www.freudtools.com Edge-beading bit, 1/8-in. radius, #80-122, \$20. Top-bearing flush-trim (pattern) bit, 1-in. dia., #50-112, \$27. Straight bit, 3/8-in. dia., #12-110, \$16. • Lee Valley, (800) 871-8158, www.leevalley.com Continuous hinge, 3/4 in. x 8 in., #00E28.08, \$7 ea. Rare earth magnets, 3/8-in. dia., #99K32.03, \$0.36 ea. Magnet cups, 1/2-in. dia., #99K32.52, \$0.36 ea. Magnet washers, 1/2-in. dia., #99K32.62, \$0.32 ea. • Van Dyke's Restorers, (800) 787-3355, www.vandykes.com Table locks, #02012448, \$2 ea. Table alignment pins, 3/8 in. dia., #02363845, \$1 for 10. Tabletop fasteners, #02367325, \$3 for four. • Woodworker's Hardware, (800) 383-0130, www.vvhhardware.com 36-in.-long extension slides, #ZM3, \$39 for a set. • Zinsser, (732) 469-8100, www.zinsser.com SealCoat Universal Sanding Sealer, \$15 a quart.

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Honey, I Bought A Log!

For perfectly matched boards,
I ordered a whole flitch-cut cherry log.

by Joe Gohman

I love the look of natural, unstained cherry, but I've never had much luck matching its color and figure. Every cherry board I've bought at a lumberyard has looked different. Some were red; others were brown. Some were curly; others were plain. Variation isn't a big problem with many projects, but when I dived into building a huge dining table (see "Extending Dining Table," page 48), I resolved to be choosy. I wanted showy boards that all looked alike.

A dining table is a great opportunity to display beautiful boards. I could have used cherry plywood and glued on solid-wood edges, but I prefer the look of wide, solid-wood planks. Where would that matched wood come from?

Clearly, matched boards must come from the same tree, so I would have to buy from a sawmill or lumber company that keeps all the boards from one log together as a unit, called a flitch. A flitch-cut log is sawn in successive layers (see photo, above) and is dried, stickered and stacked as a unit.

Flitch-cut logs are sold as whole units or in parts. You may have to buy the whole log or you may be able to pick individ-

ual boards. Buying a whole log gives you more options in cutting and arranging pieces, but it's also more expensive. You'll probably get more wood than you'll need for a single project.

I turned to the Internet to order my log (see Source, page 57). This was fun! There are many companies to choose from. On many Web sites, I could see photos of every log and every board in each log. Before I ordered, though, I talked to a real person at the lumberyard who told me more about the log, such as the presence of defects, color, figure and expected yield.

There are as many different logs as there are trees in a forest. I'll tell you a bit about the particular log I ordered, but you shouldn't generalize too much from my experience. First, the price tag. My log cost about \$1,000 kiln-dried. Shipping added another \$250. That eye-

popping price really stretched my budget, but it was worth it. The log was 12 ft. long with center boards 16 in. wide. It was all cut into 1-1/4-in.-thick (5/4) boards. (Many logs are cut into boards that are 1-in.-thick (4/4) or a mixture of thicknesses.) The log contained 170 bd. ft. of 5/4 wood, which

I bought
my log
over the Internet—
every board
was shown in
photographs.

works out to be about \$6 per bd. ft.

That's about the same price I pay at the lumberyard for top-grade 5/4 lumber, but the yield of this log was substantially less. Flitch-cut wood generally includes an irregular bark edge, all the sapwood and the pith, which is the soft and unstable center of the tree. It may also contain crotches, where the fork of a branch makes the wood grain much wilder. My log had everything: bark, sapwood, pith and a crotch. The crotch was too highly figured to use in my table, but its grain is so cool that I've set it aside for another project.

My log was sliced into 10 boards. The two outside slices were mostly light-colored sapwood, so I set them aside for use as (expensive) utility wood in other projects. The center four slices were quartersawn and had cracks following the pith. The remaining four slices were plainsawn, wide and relatively defect-free. All in all, my yield was reduced at least 25 percent.

On the plus side, I made eight 12 x 48-in. boards with the same striking figure, two more than I needed. I also cut a lot of 4-in.-wide straight-grained boards (the quartersawn and riftsawn portions of the flitch), which were perfect for the table's aprons.

After all that work, this table really looks fabulous. My spouse knows—all too well—that our table is a real con-

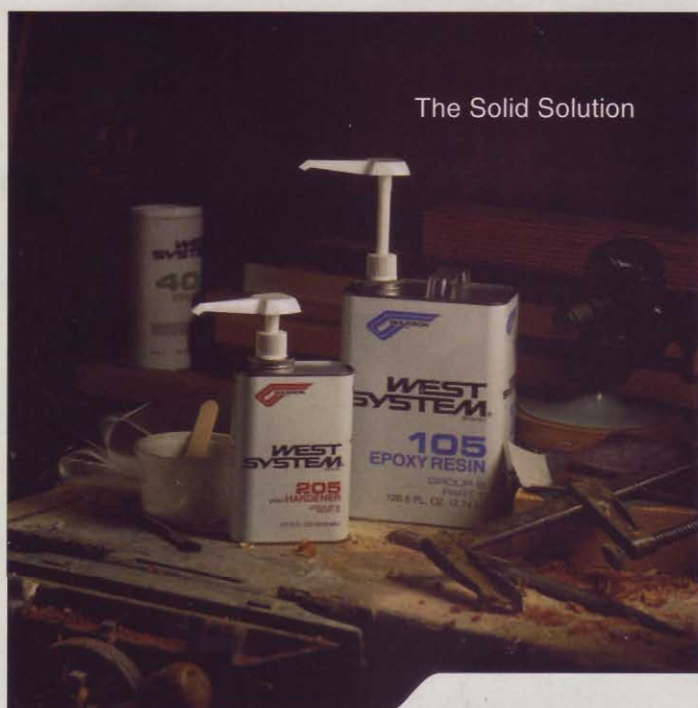
versation piece. Buying a whole log was an expensive but convenient way to get matched boards. It sure makes a great after-dinner story.

Source Hearne Hardwoods, (888) 814-0007 www.hearnehardwoods.com
Cherry lumber and logs, prices vary.



Flitch-cut boards can be expensive, but they make a spectacular top. All the wood matches. Each piece of this cherry dining table has the same golden color and shimmering curly figure.

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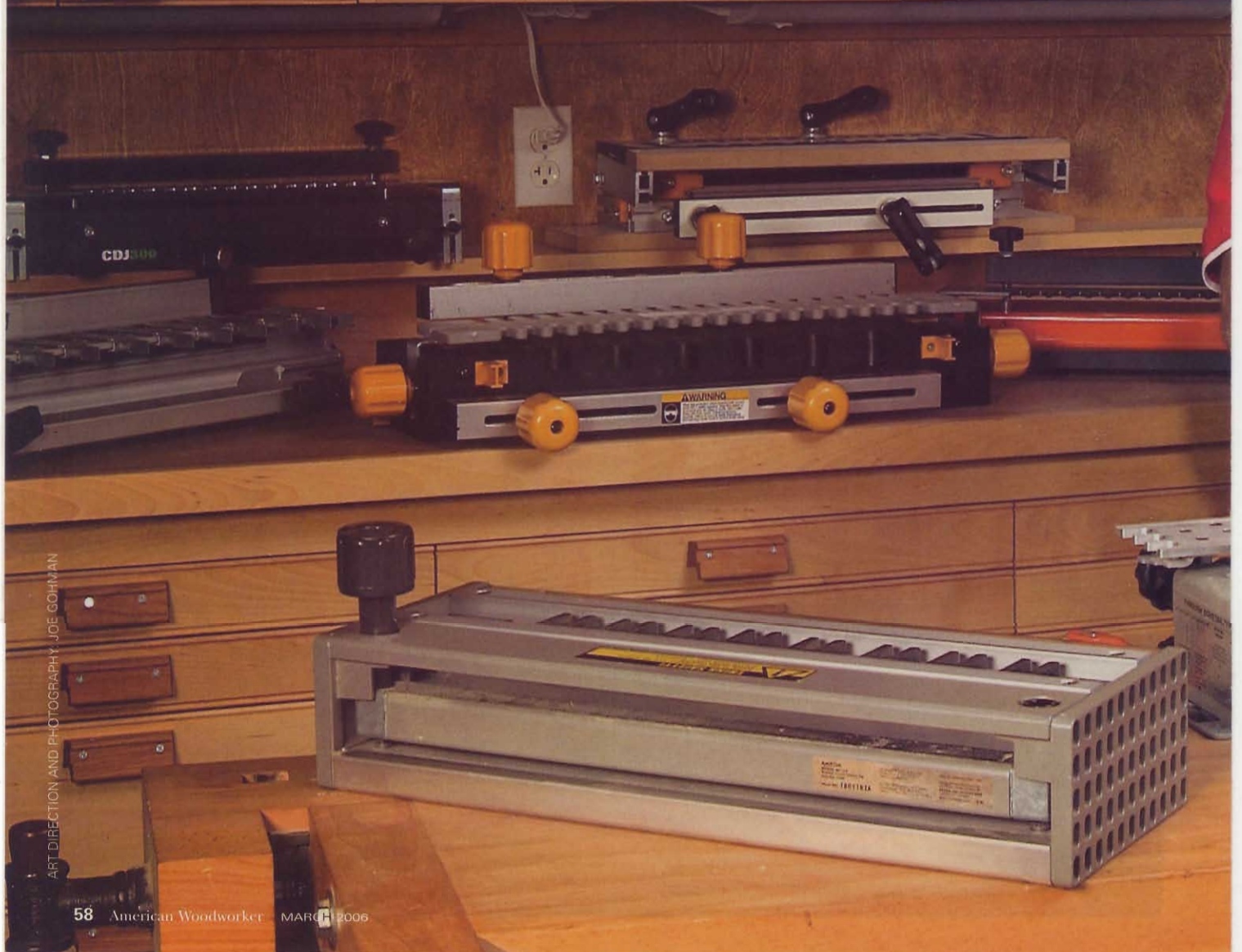
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JIGS



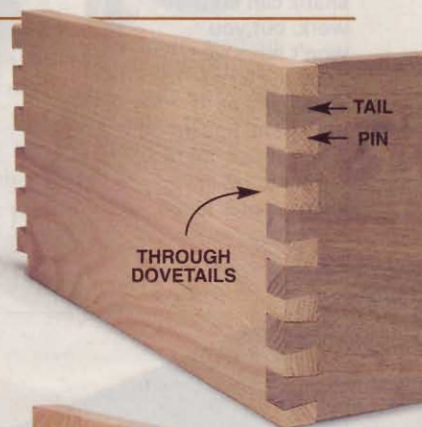
Router-based jigs are the fastest way to cut dovetails. Dovetail joints are a strong, attractive way to join many projects, including drawers, jewelry boxes and blanket chests. We examined 11 jigs that can cut both through and half-blind dovetails (see photos, below). Many jigs on the market cut only half-blind dovetails. You can see our review of half-blind dovetail jigs in AW #84, December 2000, page 66.

USER-FRIENDLY FEATURES

After using these jigs for a while, we found several features that made some more user-friendly than others. These features included cam levers for clamping, adjustable side stops, icons that tell what part of the joint is will be cut and setup indicators to accurately reset the jig to a previous successful setting. Other features that separated the jigs were bit-shank diameter, adjustable or fixed templates and the widths of the joints they make. All but one of the jigs use some type of guide bushing as part of its system (see "Guide Bushing," page 60). If your router doesn't accept the guide bushing required by the jig, you may be able to get an adapter from your router's manufacturer. Or you can make a custom router baseplate that will accept the correct guide bushing (see "See-Through Router Base, page 75).

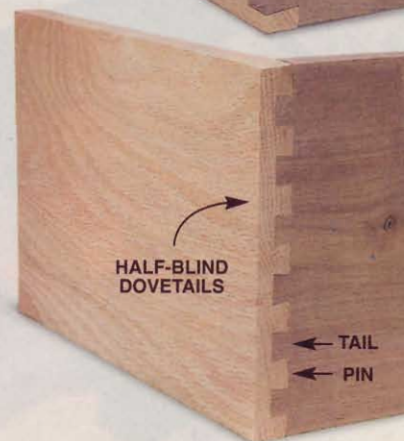
THROUGH DOVETAILS

Through dovetails project all the way through the mating piece, making the pins and tails visible from both sides. They're typically used in case construction, for instance, in a blanket chest.



HALF-BLIND DOVETAILS

Half-blind dovetails can be seen half the time: from the side, but not from the front. They're typically used for drawers.



FEATURES



JIGS COME IN DIFFERENT WIDTHS

The first step in deciding which jig is for you is deciding how much width capacity you need. Jigs are available with 12-in., 16-in. or 24-in.

width capacities. The 12-in. capacity jigs will handle drawers and jewelry boxes, but not blanket chests. Jigs with larger capacities have larger price tags, but may also offer additional features. All the jigs will handle wood that is 3/4 in. thick, but some will also accept wood as thin as 1/8 in. and as thick as 1-1/2 in. We think a jig that handles a range of 1/2 in. to 1-1/4 in. is sufficient for most shops.

GUIDE BUSHING

All but one of these jigs require a guide bushing on your router. Most use the Porter-Cable style, shown here.



LARGE-SHANKED BITS CHATTER LESS

Router bits with 1/2-in. shanks are less prone to chattering through the cut than those with small shanks. Cutting dovetails in 3/4-in.-thick hardwood can really tax the bit. With careful handling, any size shank can do the work, but you won't have to baby the large-shank bits as much. The jigs in this test use 1/4-in., 8-mm or 1/2-in.-shank router bits.



CAM LOCKING LEVERS ARE EASY TO USE

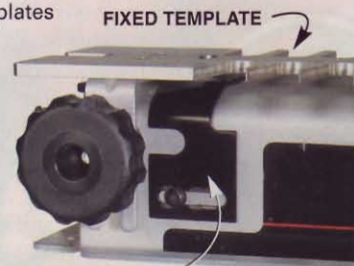
Cam locks are a much easier, faster way to clamp material in the jig. We prefer cam locks over threaded knobs, hands down. You'll especially notice their convenience and speed when dovetailing a big stack of parts or if your hands don't have the strength they used to.



CAM LOCK

ADJUSTABLE SIDE STOPS EASE CENTERING YOUR WORK

Adjustable side stops are better than fixed stops because an adjustable stop allows you to center the joint on the end of your board. With fixed stops, you must size your workpiece to match the template. If you want a perfectly centered joint. Jigs with adjustable templates don't require adjustable side stops, because you can move the template fingers to any location you want.



FIXED TEMPLATE

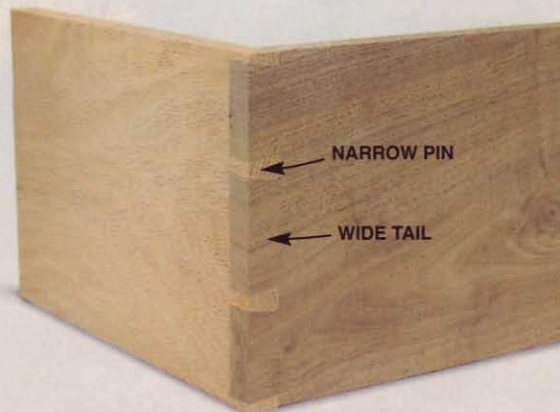
ADJUSTABLE SIDE STOP

ADJUSTABLE TEMPLATES PROVIDE DESIGN FLEXIBILITY

Here's one of the most important jig-buying decisions: How creative would you like to be? Some dovetail jigs use templates with adjustable fingers that allow you to vary the size and spacing of the dovetail joint. Adjustable-template jigs are not significantly more complicated to use than jigs with fixed templates, which create only closely spaced joints.



ADJUSTABLE-TEMPLATE FINGERS

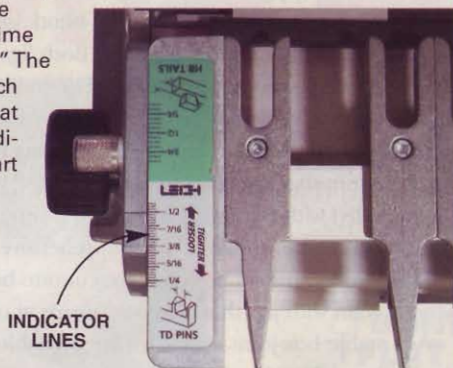


NARROW PIN

WIDE TAIL

INDICATOR LINES SIMPLIFY SETUP

Indicator lines simplify repeating setups on a dovetail jig. This is important because jigs that cut both through and half-blind dovetails require you to change the templates when you switch from through to half-blind or from pins to tails. Since tiny changes in the setup can affect the joint's quality, the question becomes, "How easy is it to repeat the setup the next time you use the jig?" The answer? It's much easier on jigs that have a setup indicator lines as part of the machine.

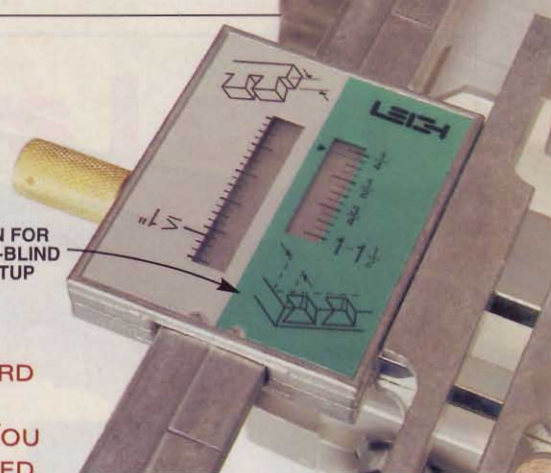


INDICATOR LINES

ICON FOR HALF-BLIND SETUP

ONBOARD ICONS KEEP YOU INFORMED

Onboard icons provide you a visual clue as to which part of the joint the machine is set up to cut, whether it's half-blind, pins or tails. When you face the jig, the icon that is right-side up shows you the joint that the jig is set to cut. Icons simplify setup and may save you a miscut board. This is especially important if you don't use the jig frequently.



ADJUSTABLE-TEMPLATE JIGS



TEMPLATE FINGERS

AKEDA DC16

\$300 INCLUDES TEMPLATE FINGERS FOR HALF-BLIND, 7-DEGREE THROUGH DOVETAILS AND BOX JOINTS (BITS EXTRA) • **\$500** COMPLETE KIT, INCLUDES DUST HOOKUP, COMPLETE SET OF BITS AND ADDITIONAL TEMPLATE FINGERS

The Akeda DC16 uses a unique template system made up of separate phenolic fingers that can snap in and out of the jig. The system works well and is easy to use. The finger system is engineered to provide a perfectly fitting through

dovetail with little or no test cutting. Adjusting the fit of a through dovetail is done using different-diameter straight bits. The jig's body provides a platform that completely supports the router, eliminating any chance of the router tipping and ruining your work. A dust collection kit is available, \$30, which allows a shop vacuum to grab most of the chips pouring off the jig. It works great. Included with the jig are fingers for cutting half-blind and 7-degree through dovetails and box joints. The owner's manual is comprehensive and well-done.

This jig doesn't have cam locks, but the entire clamp bar tightens from one handle position. You only have one handle to spin, and the leverage from it is good. Cutting half-blind dovetails on this jig is a slower process than on the other jigs, because the Akeda does only one board at a time. Most of the jigs in this test rout both boards at once for half-blind joints.

You can buy the complete kit, with all the bits, a dust collection kit and three sets of guide fingers. Or you can buy the jig only and add bits and accessories as you need them. The jig comes with template fingers for half-blind, 7-degree through dovetails and box joints. Four other sets of through dovetail fingers are available for cutting 9-, 11-, 14- and 20-degree through dovetails. The corresponding bits are also sold separately.

Source Akeda Jigs, (877) 387 6544, www.akedajigs.com

Capacity/Width	Capacity/Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicator
16 in.	1/4 to 1 in.	1/4 in.	Yes	No	N/A	No	No



LEIGH D1600

\$320 • INCLUDES HALF-BLIND AND THROUGH FINGERS, BITS, GUIDE BUSHING AND 1/2-IN. TO 8-MM REDUCER



LEIGH D4R

\$450 • INCLUDES HALF-BLIND AND THROUGH FINGERS, BITS AND GUIDE BUSHING

Leigh makes two jigs: the D1600 with 16-in. capacity and the D4R with 24-in. capacity. They are very similar, but the D4R has a couple of advantages. The individual fingers on the D4R can also be split, allowing you to change the size of your pins for both through and half-blind dovetails. In fact, the D4R is the only jig in this test that allows you to vary the size of the pins in both through and half-blind dovetails. Additionally, the D4R will handle thicker material. Both jigs have easy-to-read icons indicating which mode the jig is in. The indicator lines on their templates, used for repeating setups, are also easy to read. There's a spot in the owner's manual to record these settings for your next use. Using Leigh's 8-mm-shank router bits requires a 1/2-in. to 8-mm adaptor (\$6, not included with the D4R), but they'll chatter less than 1/4-in. shank cutters. The owner's manual is comprehensive and well done.

Half-blind joints on both jigs are cut one board at a time, a slower process than with jigs that cut both boards at once.

Adjustable box-joint templates are available for both jigs, \$229 for the D4R and \$197 for the D1600.

Source Leigh Jigs, (800) 663-8932, www.leighjigs.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
16 in.	1/8 to 1 in.	1/4 in. and 8 mm	Yes	Yes	N/A	Yes	Yes
24 in.	1/8 to 1-1/2 in.	1/4 in. and 8 mm	Yes	Yes	N/A	Yes	Yes

PORTER-CABLE 7216

\$400 • INCLUDES FIXED HALF-BLIND TEMPLATE, ADJUSTABLE THROUGH TEMPLATE, BIT FOR HALF-BLIND TEMPLATE AND GUIDE BUSHING



The 7216 is a heavy jig with a built-like-a-tank feel and a well-written owner's manual. Its through dovetail template provides variable spacing; its half-blind template does not. Half-blind dovetails are cut with both boards in the jig, a bonus in a production operation. Two additional router

bits are required for through dovetails. For through dovetails, the jig will accept a 1/2-in.-shank dovetail bit, which reduces chatter.

The 7216 allows you to change the size of the pins in through dovetails only.

Source Porter-Cable, (888) 848-5175, www.porter-cable.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
24 in.	1/2 to 1 in.	1/4 in., 1/2-in. *	Yes **	Yes	Yes	No	Yes

* 1/4 in. for half-blind, 1/2 in. available for through ** For through dovetails only, not for half-blind

FIXED-TEMPLATE JIGS



MOUNTING BRACKET

CMT 300

\$240 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES



MOUNTING BRACKET

TREND CDJ 300

\$237 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES

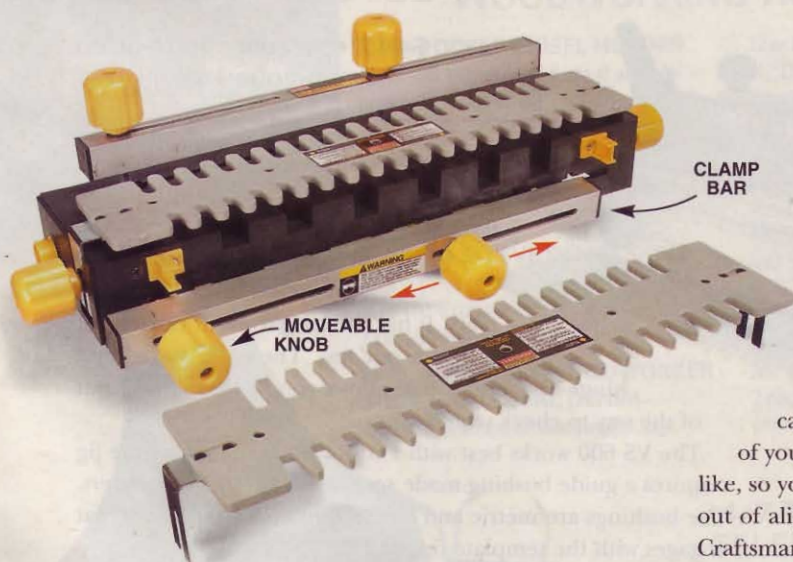
These two jigs are nearly identical. On the CMT, the mounting bracket used to hold the template on the jig must be swapped between templates. On the Trend, the mounting brackets are attached to each template, which means fewer parts to adjust and misplace. The guide bushings included with the jigs require the purchase of a universal router base, \$40. Otherwise you'll need to provide your own

15.8-mm guide bushing.

Box-joint templates are available for both jigs: \$90 for the CMT templates, \$70 for Trend templates. Bits for half-blind joints are included in both.

Sources CMT, (888) 268-2487, www.cmtusa.com
• Trend, (270) 872-4674, www.trend-usa.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
12 in.	1/2 to 1 in.	1/4 in.	No	No	No	Yes	Yes



CLAMP BAR

MOVEABLE KNOB

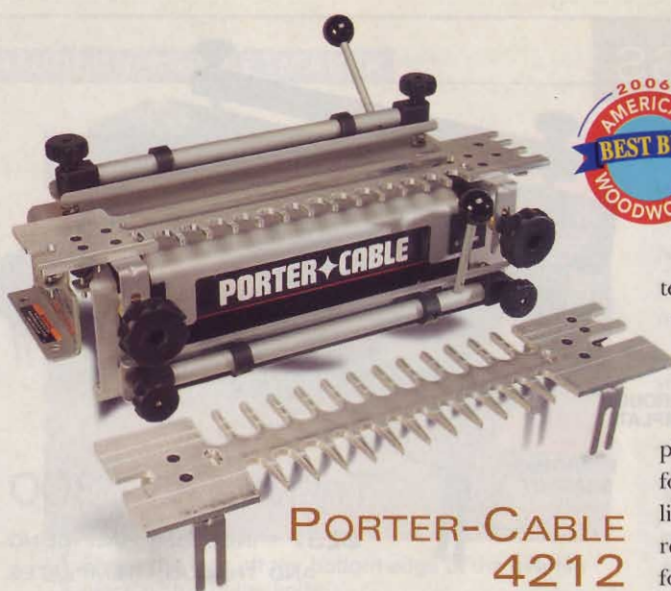
CRAFTSMAN 25455

\$200 • INCLUDES HALF-BLIND, THROUGH AND BOX-JOINT TEMPLATES AND BIT FOR HALF-BLIND JOINTS

This Craftsman jig has a greater capacity than other jigs in this price range. The handles that tighten the clamp bar can be moved, allowing you to position them close to the material for a better grip. This machine has a built-in depth-of-cut indicator which greatly simplifies setting the cutting depth of your router bit. The templates are more flexible than we like, so you need to be careful that you don't flex the template out of alignment when you position material. Add \$25 for the Craftsman router bit set for cutting through dovetails.

Source Sears, (800) 349-4358, www.sears.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
16 in.	3/8 to 1 in.	1/4 in.	No	No	No	No	Yes



PORTER-CABLE 4212

\$159 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES, GUIDE BUSHING AND BITS

This Porter-Cable model is one well-conceived jig and a great value. A great amount of how-to-use-it information is printed right on the body of the jig. Icons etched into the

templates remind you which one to use. The etching on these icons could be deeper, to make them easier to see, but it's still pretty easy to glance at the jig and know what to do, even if you haven't used it in a while. A number of depth-of-cut gauges are also built right into the jig to simplify getting bits set just right. With 1/2-in. shank cutters used for all the cuts, there's very little risk of chatter. Indicator lines are also etched into the templates to help you with repeating setups, although these lines could be a little finer for greater accuracy. Template changes are dirt simple—just a matter of loosening a knob and sliding the template on or off.

The templates included with the jig also allow cutting box joints and sliding dovetails. To cut box joints, you'll also need a 1/2-in. straight bit.

Source Porter-Cable, (888) 848-5175, www.porter-cable.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
12 in.	1/4 to 1-1/8 in.	1/2 in.	No	Yes	Yes	Yes	Yes



FESTOOL VS600

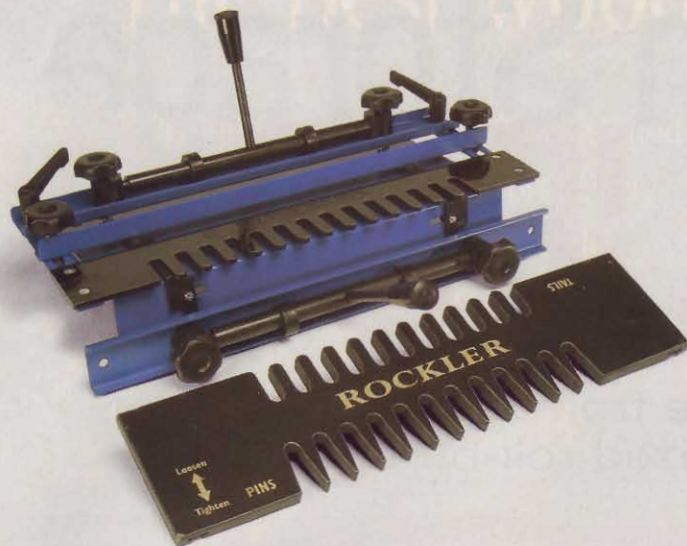
\$447 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES

The VS 600 is more than a dovetail jig; it's a joinery system. If you purchase additional templates, besides making dovetails, the jig can be used for adjustable shelf holes, box joints and dowel joinery. It has the largest width capacity of all the jigs in our test. The template is on a hinge-like mount that allows you to easily flip it out of the way to check your work.

The VS 600 works best with Festool routers because the jig requires a guide bushing made specifically for Festool routers. The bushings are metric and have a built-in retainer ring that engages with the template fingers.

Source Festool, (888) 337-8600, www.festoolusa.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
24-1/4 in.	1/4 to 1 in.	8 mm	No	No	Yes	No	Yes



ROCKLER DOVETAIL JIG COMBO 23882

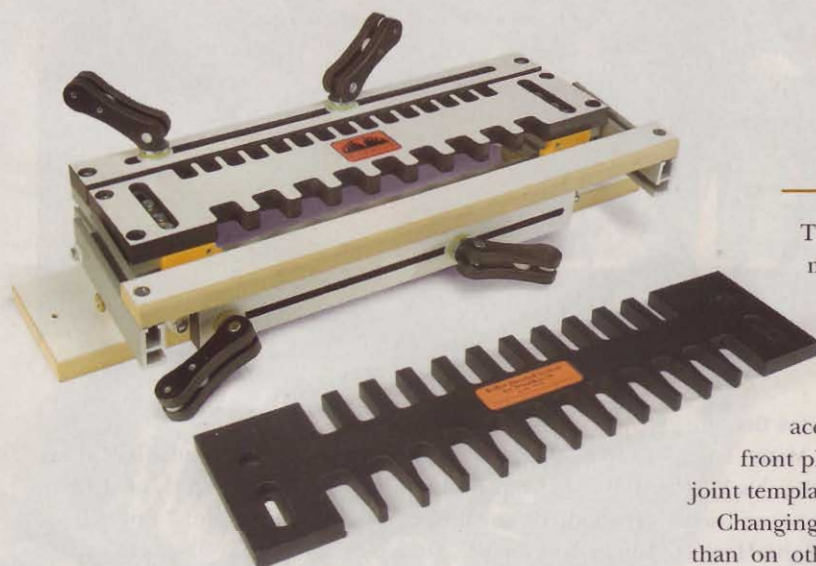
\$139 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES, BITS AND GUIDE BUSHING

This Rockler jig has indicator lines etched into the top of the jig, which is very helpful in repositioning the template. Icons on the through template help with setup, but there are none on the half-blind template.

Changing templates is more cumbersome than on other jigs. On this jig, it requires removing and reinstalling the bolts that hold the template on.

Source Rockler, (800) 279-4441, www.rockler.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
12 in.	1/2 to 1-1/4 in.	1/4 in.	No	Yes	Yes	Yes	Yes



WOODHAVEN 7500K

\$375 • INCLUDES HALF-BLIND AND THROUGH TEMPLATES AND BITS

The Woodhaven 7500K's cam style handles can move close to the work to provide better locking pressure on the material. This is the only jig that uses a pattern-cutting dovetail bit instead of a guide bushing, which is an advantage if you have a router that doesn't accept guide bushings. The 7500K also provides a front platform to fully support the router base. A box-joint template is available for \$63.

Changing the 7500K's templates is more cumbersome than on other jigs, since it requires removing and reinstalling the bolts that hold the template on.

Source Woodhaven, (800) 344-6657, www.woodhaven.com

Capacity/Width	Capacity/ Thickness	Bit Shank Diameter	Adjustable Templates	Cam Levers	Adjustable Side Stops	Onboard Icons	Setup Indicators
12 in.	3/8 to 1 in.	1/4 in.	No	Yes	Yes	No	No

3 Kitchen Storage PROJECTS

Squeeze more space from your cabinets with customized roll-outs.

by Eric Smith
and David Radtke



It may seem like a paradox, but even kitchens that are overflowing have underutilized space. Many base cabinets are only half used, because the back is inaccessible, stuffed with long-forgotten items you can't see unless you get down on your knees with a flashlight. Here's a set of pull-outs that bring everything within reach.

MATERIALS

To make the trays shown here, you'll need a half sheet of 3/4-in. hardwood plywood, 2-ft. x 2-ft. of 1/2-in. plywood, 17 lineal ft. of 1-in. x 4-in. maple, 2 lineal ft. of 1-in. x 6-in. maple, four pairs of 20-in. full-extension ball-bearing slides, a box of 1-5/8-in. screws, wood glue and construction adhesive.

1 Under-Sink Storage

To begin, measure the areas of open space around the plumbing. You may only be able to put a single pull-out on one side, or you may have to shorten them or build them around pipes coming up through the base.

BOTTOM PULL-OUTS

Measure the frame opening and cut the base (A) 1/4 in. narrower (Fig. A, page 67).



Make the drawers 1 in. narrower than the opening between the partitions. Cut and assemble the base assembly (A, B) and drawer parts (C, D, E). Sand and apply two coats of finish to the base and drawers.

Set the drawer slides on 3/4-in. spacers flush with the front edge of the partition (B). Screw them to the partitions; then pull out the drawer members. Set the drawer members on the same 3/4-in. spacers to create the proper bottom clearance for the tray, and screw them to the sides of the trays flush to the fronts. Screw the base assembly to the bottom of the cabinet (Photo 1). Slide in the drawers.

SIDE-MOUNTED PULL-OUTS

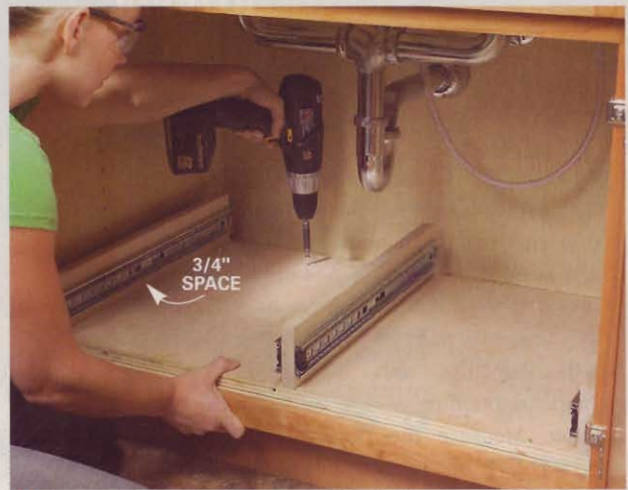
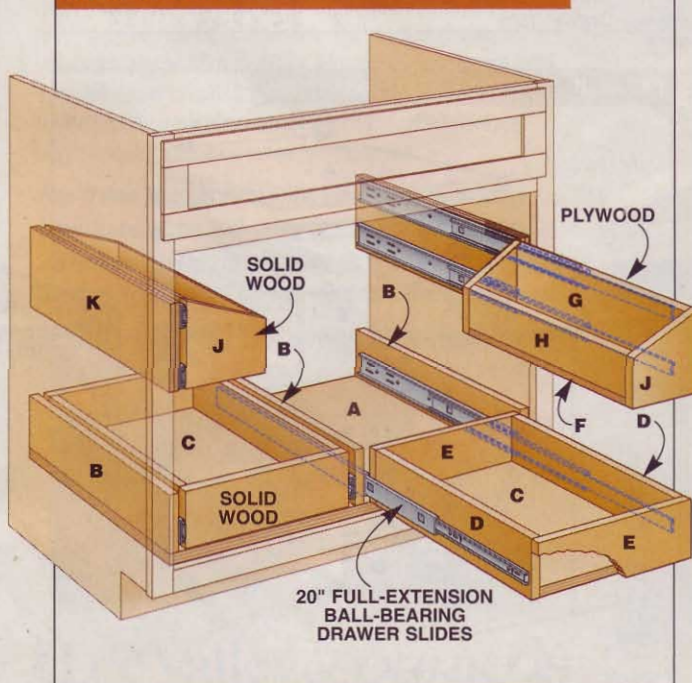
Make the side support cleats (K) so they sit flush or slightly proud of the face frame. Check for hinges that might get in the way of the pull-out tray. Assemble the trays with glue and screws. Apply finish.

Attach the slides and mount them in the cabinet (Photos 2 and 3). Scuff the cabinet side with sandpaper and use construction adhesive and screws to hold the cleats. Cabinet sides are often finished, so screws alone may not hold well.

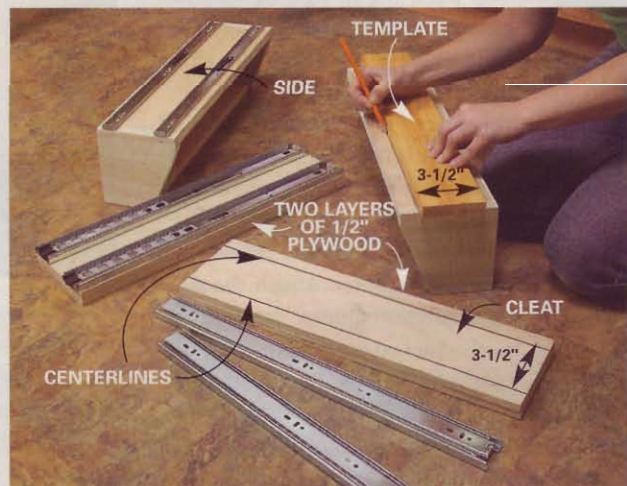
CUTTING LIST

Part	Name	Qty.	Dimensions (Th x W x L)
A	Plywood base	1	3/4" x 32-3/4" x 20"
B	Base partition	3	3/4" x 3-1/2" x 20"
C	Plywood tray bottom	2	3/4" x 12-3/4" x 18-1/2"
D	Tray side	4	3/4" x 3-1/2" x 18-1/2"
E	Tray front and back	4	3/4" x 3-1/2" x 14-1/4"
F	Upper tray bottom	2	1/2" x 5-1/2" x 18-1/2"
G	Plywood upper tray side	2	3/4" x 5" x 18-1/2"
H	Plywood upper tray side	2	3/4" x 3" x 18-1/2"
J	Upper tray front, back	4	3/4" x 5-1/2" x 5-1/2"
K	Side cleat, double layer	4	1/2" x 5-1/2" x 20"

FIGURE A UNDER-SINK STORAGE EXPLODED VIEW



1 Build and install a base assembly for the bottom pull-outs. Center the base assembly in the cabinet just behind the hinges. Align the front edge with the face frame and screw it to the bottom of the cabinet.



2 Install the slides on the side pull-out trays. Center a 3-1/2-in. template on the cleat and the tall side of each tray and trace the edges. Center the mounting holes of the slides on these lines.



3 Attach the support cleats to the side of the cabinet using screws and construction adhesive. Use a temporary plywood spacer to hold each cleat in position.

Mini-Pantry

These pull-outs bring boxes, jars and cans within easy reach. To build this mini-pantry, you'll need two sheets of 3/4-in. hardwood plywood (I used Baltic birch for its attractive edge) and two pairs of 20-in. full-extension ball-bearing slides.

Start by building a box to fit inside the cabinet. Measure the frame opening and subtract 1/4 in. to get the box's outside dimensions. I made this pantry for a 24-in. base cabinet, so change the cutting list to fit your base. Also keep in mind that most 3/4-in. plywood actually measures 23/32 in.

Cut the box parts (A, B, C) and assemble them with glue and screws (Fig. B, below right). Find the drawers' width by subtracting 1 in. from the openings in the box.

Cut all the pieces for the drawers (D, E, F, G). Soften the edges of the drawer sides (D) and drawer face (G) using a 1/4-in. round-over bit. Assemble the drawer parts (D, E, F) with screws and glue. Position the center shelf (F) at the height you prefer. Attach the sides (D) with finish nails and glue.

Set the drawer slides on the bottom of the box. Align the slides with the front edge and attach. Remove the drawer member and screw it to the drawer side 1/4 in. above the bottom.

Install the box (see photo, below). Install the drawers. Center the drawer faces (G) on the drawers and screw them from the inside. Drill 1-1/2-in.-dia. holes for finger pulls or attach shallow pulls. Apply two coats of finish.



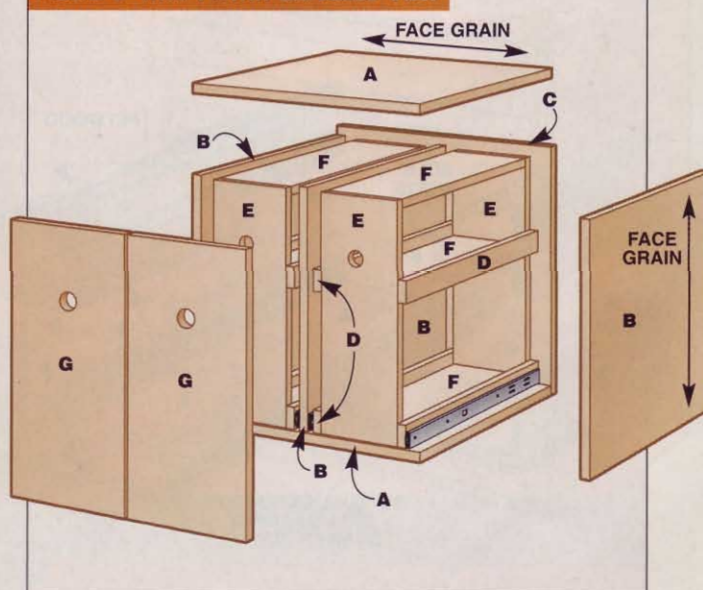
Build a box for the drawers to fit inside the base cabinet. Remove the cabinet doors and slide the box into the cabinet. Screw the box securely to the bottom of the cabinet.



CUTTING LIST Overall Dimensions: 20-1/4"H x 20-3/4"W x 22"D

Part	Name	Qty.	Dimensions (Th x W x L)
A	Base and top	2	3/4" x 20-1/2" x 20-3/4"
B	Sides and center	3	3/4" x 20-1/2" x 18-13/16"
C	Back	1	3/4" x 20-3/4" x 20-1/4"
D	Shelf side	8	3/4" x 1-3/4" x 20-1/4"
E	Drawer front and back	4	3/4" x 6-7/8" x 18-1/2"
F	Drawer top, bottom, shelf	6	3/4" x 6-7/8" x 18-3/4"
G	Drawer face	2	3/4" x 9-3/4" x 19-3/4"

FIGURE B MINI-PANTRY EXPLODED VIEW



Under-Cabinet Drawer

Unused space often sits in plain view under the upper cabinets. This pull-out is perfect for storing knives or coupons. You'll need 8 lineal ft. of 3/4-in. x 1-3/4-in. hardwood that matches your cabinet, 2 lineal ft. of 1-1/8-in. x 1-1/8-in. hardwood, 1 ft. x 2 ft. of 1/4-in. hardwood plywood and one pair of 12-in. full-extension drawer slides.

Measure the space under the cabinet. Cut the supports (G) to fit this space and protrude about 1/16 in. below the cabinet. Size the drawer by subtracting 2-1/2 in.—1 in. for the slides and 1-1/2 in. for the two fixed sides (D). The front-to-back dimension is the minimum required for a 12-in. drawer slide.

Cut the drawer parts (A, B, C, E). Assemble the drawer using pocket screws or glue and finish nails. Rout the bottom of the drawer frame with a 3/8-in. rabbeting bit set 1/4 in. deep. Square the corners with a chisel. Then nail in the plywood bottom with 3/4-in. brad nails. Draw a centerline 3/4 in. up from the bottom edge on the fixed sides (D) and the drawer sides (B). Screw on the drawer slides, flush to the front.

Glue and screw the undercabinet supports to the fixed sides. Install the drawer assembly (see photo, below). Glue the drawer pull (F) in the center behind the drawer front. Then finish the drawer to match the cabinet.



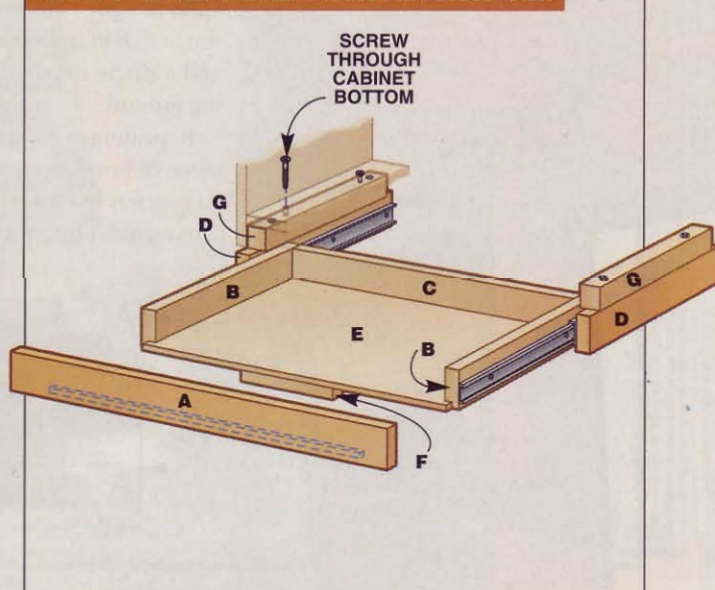
CUTTING LIST

Part	Name	Qty.	Dimensions (Th x W x L)
A	Drawer front	1	3/4" x 1-3/4" x 20-1/2"
B	Drawer side	2	3/4" x 1-3/4" x 11-7/8"
C	Drawer back	1	3/4" x 1-3/4" x 15-1/2"
D	Fixed side	2	3/4" x 1-3/4" x 11-7/8"
E	Drawer bottom	1	1/4" x 16-1/8" x 11-3/4"
F	Drawer pull	1	1/2" x 1/2" x 5"
G	Support	2	1-3/16" x 1-1/8" x 10-3/4"



Install the completed drawer assembly. Clamp it to the cabinet and fasten it with screws from above.

FIGURE C UNDER-CABINET DRAWER EXPLODED VIEW



3 Router-Made

Three custom profiles with infinite possibilities

Your router table is the perfect tool for making an almost limitless variety of picture frames. The problem is that with so many router bits and possible combinations of bits, where do you start? The three picture-frame profiles in this article are a good begin-

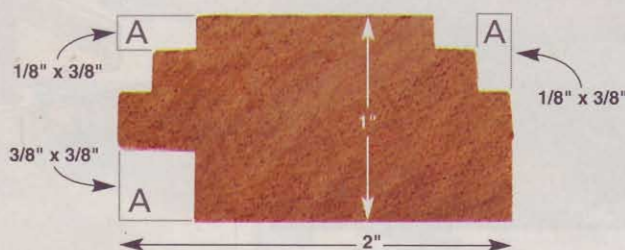
ning. With the exception of the final profile, all use common router bits. Each frame illustrates a basic technique; use them as springboards for your own unique creations.

by Eric Smith

One-Bit Frames Are Fast and Easy

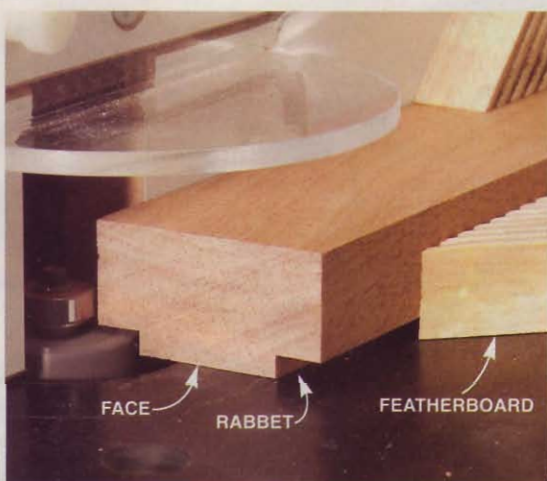
This mahogany picture frame is no two-bit design. The complete profile is made with a single 3/8-in. rabbeting bit, a single fence setting and a single depth-of-cut setting. There's no fussing around.

Repeating a router-bit cut on both sides of a piece of wood or changing the depth of the cut is an easy way to create unique profiles. Try using different router-bit profiles for other custom frames.

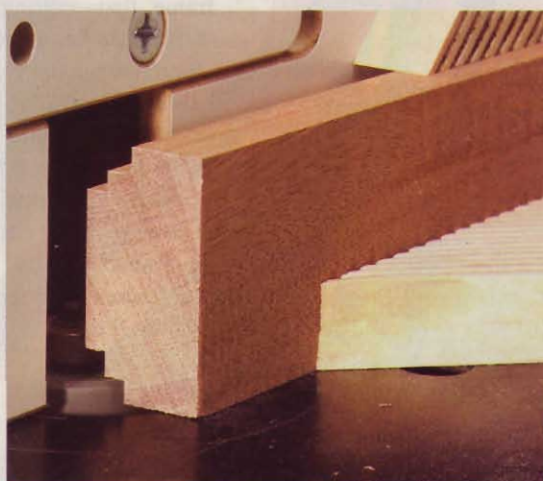


EDITOR: DAVE MUNKITTRICK • ART DIRECTION AND PHOTOGRAPHY: VERN JOHNSON

Picture Frames



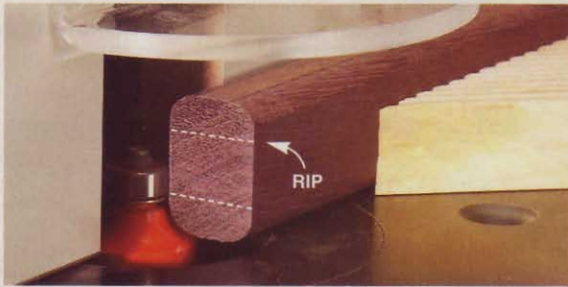
1 Make the first two cuts with the stock face down on the table. Set the fence flush with the bearing and raise the bit to cut a 1/8-in. x 3/8-in. rabbet. Featherboards guarantee smooth, straight cuts.



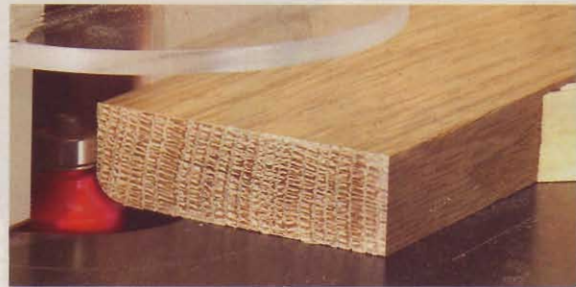
2 Make the second two cuts with the stock on edge. The fence and bit-height settings remain the same.

Inlays Add Interest and Depth

Make this frame profile using three standard router bits: a 1/4-in. round-over bit, a classic ogee bit and a 3/4-in. straight bit. Rout all the pieces, glue the inlay and then cut the miters. I like to use contrasting woods, in this case, riftsawn white oak with a purpleheart inlay.



1 Round all four edges on an extra-wide blank of inlay stock. Make the blank at least 1-1/2 in. wide so you can safely rip two 3/8-in.-deep inlays from each blank.



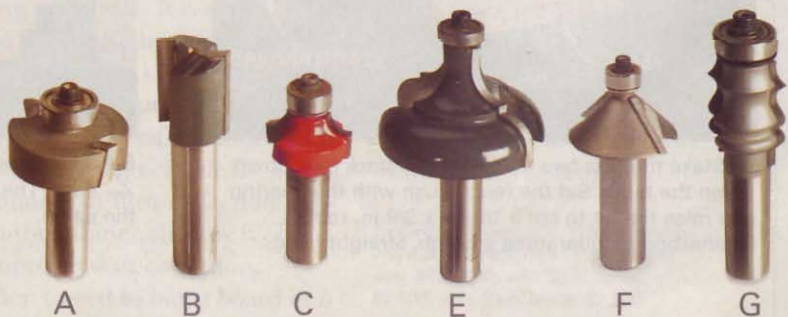
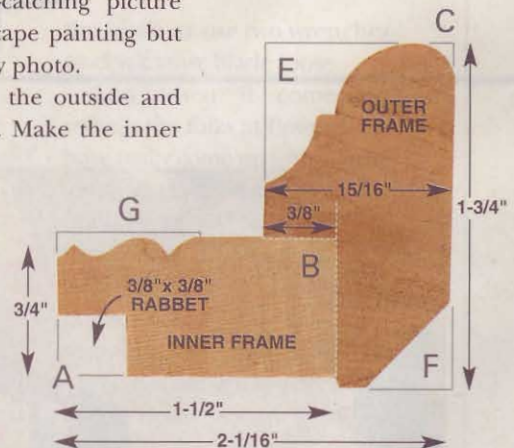
2 Rout the roundover on the outside edge of the frame stock.

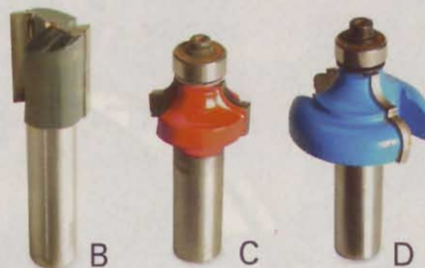
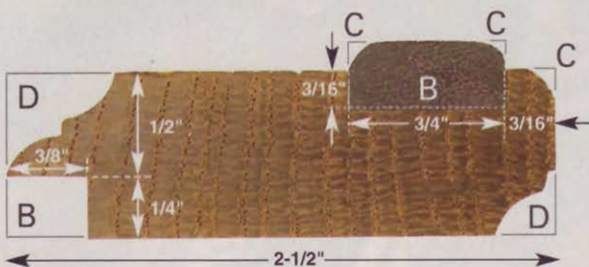
Make Large Frames in Two Parts

Two-part (or even three- or four-part) frames are a great way to create deep, eye-catching picture frames beefy enough for a big landscape painting but capable of holding even a small family photo.

I built this frame with cherry on the outside and quartersawn sycamore in the inside. Make the inner frame first, cutting the usual 3/8-in. rabbet (Photo 1) and then routing the profile on the face (Photo 2).

Then machine the outside frame (Photos 3 through 6). Miter and glue the inner frame; then cut the outer frame to fit. Tack the frames together with a few brad nails.

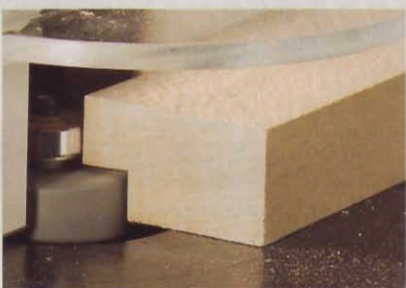




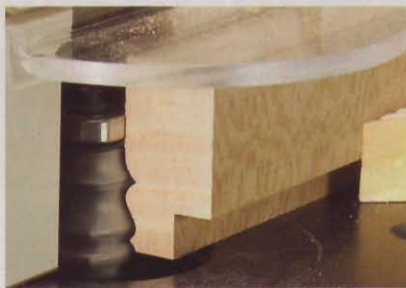
3 Plow the inlay groove next to the rounded edge.



4 Cut the inside edge profile using a classic ogee bit. Cut the back edge profile by dropping the bit to half height. Move the fence forward to cut half the bit's depth.



1 On the inner frame, cut the rabbet to house the matte board, glass and artwork.



2 Add a distinctive profile to the face of the inner frame using a specialized picture-frame molding bit.



3 The outer frame gets an ogee profile. I used a specialized bit that creates an extra-large roundover.



4 Complete the rounded edge by flipping the board and routing a roundover on the ogee's opposite side.



5 Use a straight bit to cut a rabbet to house the inner frame.



6 Chamfer the back edge to lift the frame off the wall and make the frame appear less massive.

Sources

(A) Amana Tools from ToolsToday.com, (888) 699-3939, www.toolstoday.com 3/8-in. rabbeting bit with 1/4-in. shank, #49300, \$26; with 1/2-in. shank, #49302, \$27. (B) MLCS, (800) 533-9298, www.mlcswoodworking.com 3/4-in. straight bit, #5455 1/4-in. shank, \$13; #7755 1/2-in. shank, \$14. (C) Freud Tools from Seven Corners Hardware, (651) 224-4859, www.7corners.com 1/4-in. round-over bit with 1/4-in. shank, #34-110, \$28; with 1/2-in. shank, #34-120, \$30. (D) Rockler, (800) 279-4441, www.rockler.com Classic ogee bit with 1/4-in. shank, #91666, \$32; with 1/2-in. shank, #91673, \$32. (E) MLCS, (800) 533-9298, mlcswoodworking.com Picture-frame ogee bit with 1/2-in. shank only, #8622, \$39. (F) Amana Tools from ToolsToday.com, (888) 699-3939, www.toolstoday.com Chamfer bit with 1/4-in. shank, #49400, \$25; with 1/2-in. shank, #49402, \$26. (G) MLCS, (800) 533-9298, mlcswoodworking.com Picture-frame molding bit with 1/4-in. shank, #6321, \$30; with 1/2-in. shank, #8621, \$30.

See-Through Router Base

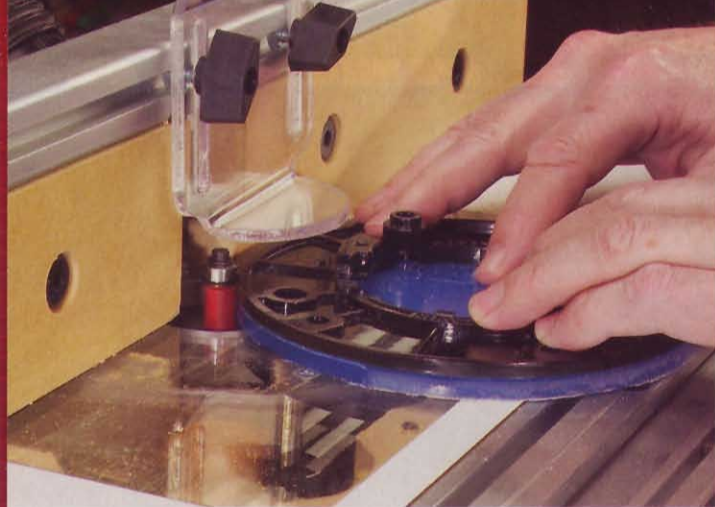
See where you're going on a dovetail jig.

Why are so many router bases solid black? I hate peering through those little holes to align my router on a workpiece. The problem is worse on a dovetail jig, where you must blindly feel your way around the template's fingers. I managed to nick my template a few times before I discovered router expert Bill Hylton's technique for making a see-through base. It eliminates all that hesitation and anxiety.

This new clear base is designed to accept Porter-Cable-style guide bushings. If your old base doesn't accept guide bushings or they're hard to find, making this new base and adding guide bushings will allow you to do more things with your router. The trick to making this base is getting the guide bushing centered on the router's axis. Just follow these steps and you'll be routing in the clear in no time.

by Dave Munkittrick

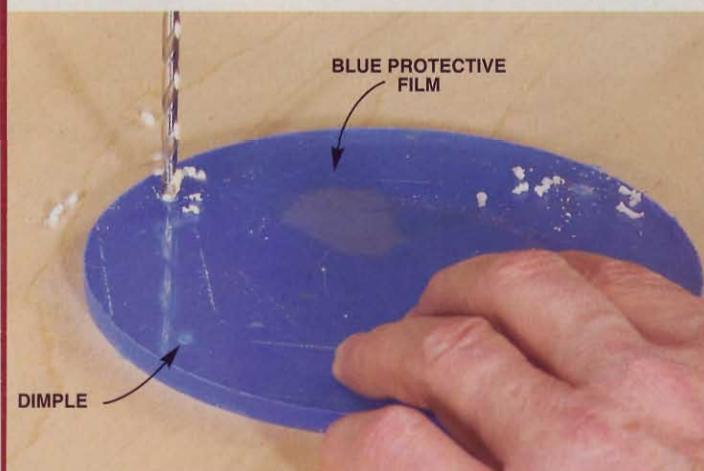




1 Shape a rough-cut clear plastic blank on the router table using a flush-trim bit. Secure the original base to the blank using double-stick tape.



2 Mark the mounting screw locations using a self-centering bit mounted in a drill press. All you need is a slight dimple on the surface. Don't drill all the way through the blank, because the centering bit is not the final diameter.



3 Drill the mounting screw holes using the dimple marks to center the bit. Center the dimpled hole under the bit with the power off. Secure the blank firmly with your hand, raise the bit, turn on the drill press and drill the hole.



4 Countersink the mounting screw holes. Center the bit by lowering it into the hole with the power off, as in Photo 4. Set the depth of cut so the screw heads will be sunk slightly below the base's surface.

MATERIALS AND TOOLS

Make your base from 1/4-in.-thick acrylic or polycarbonate plastic. Acrylic is available at most hardware stores and home centers. Polycarbonate is more shatter-resistant, although it's less stiff, harder to find and more expensive. Either plastic can be machined like any hardwood using standard woodworking equipment. Leave the protective film on to protect the plastic from scratches during machining.

To make your clear base, you'll need these items: a drill press, router table, bandsaw or jigsaw, flush-trim bit, 1-1/4-in. and 1-3/8-in. Forstner bits, a countersink bit, a centering bit for your router (see Source, page 78) and double-stick tape. You may need longer screws to fasten this new thicker base to your router.

DRILL MOUNTING HOLES

Use the manufacturer-supplied base as a template for your clear base. Secure the original base to the plastic blank with double-stick tape. Cut and shape the blank on your bandsaw and router table (Photo 1). Keep the blank moving at about the speed of a clock's second hand to prevent the plastic from melting. On the drill press, mark the centers for the mounting screws (Photo 2).

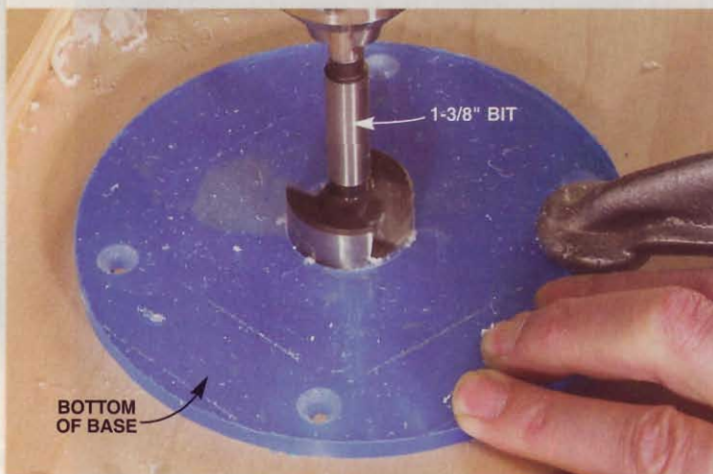
Gently pry the original base off the blank using a putty knife. Select a twist bit just large enough to let the mounting screw shank easily pass through the hole. Drill the mounting holes all the way through the base (Photo 3). Friction from a spinning drill bit can easily melt plastic. When drilling plastic, use a quick, repetitive in-and-out action. Pause for a second between strokes to allow the bit and plastic to cool.



5 Locate the base's center by putting a centering bit in your router, lowering the baseplate onto it and tapping the plastic with a hammer. The resulting mark will be dead center.



6 Drill out the center hole. Center the plate on the bit and clamp it down. Use an in-out feed action to keep the bit cool and the plastic from melting. You should get wispy curls of plastic, not molten mounds.



7 Flip the plate and drill the larger counterbore hole. Center the plate using the smaller bit and clamp. Change to the larger bit and drill.



8 A flame finish adds just the right touch. It turns the hazy, machined edges crystal clear. Just wave the flame from a blowtorch back and forth until you see the haze disappear. Be careful not to overheat the plastic or it will bubble.

Drill countersinks for flat-head screws (Photo 4). I use flat-head screws to mount a base, because the tapered heads automatically draw the base into the exact location each time it's fastened. A countersink bit has the same profile as a flat-head screw. Don't use a large twist bit to drill the countersinks; the profiles don't match.

DRILL CENTER HOLES

After the base has been shaped and the mounting screw holes completed, fasten the base to your router. Chuck a centering bit or a V-groove bit with a sharp point into your router. With the new base in place, gently lower it onto the router until it barely touches the plastic surface. Lock the router base assembly tightly to the router. Take a small hammer and lightly tap the plastic over the centering bit (Photo 5). Use the resulting mark to center the base under a 1-1/4-in. Forstner bit. Clamp the base to the drill press table. Check to make sure the bit is still in line with the mark. Drill the center hole

through the base (Photo 6).

Flip the base so the countersinks face up (Photo 7). Center the base on the table using the same Forstner bit that drilled the hole and clamp the base down to the drill press table. Change to a larger 1-3/8-in. Forstner bit. Now, before you get too excited about drilling from a smaller hole to a larger one, let me explain: Typically, you would drill a large counterbore first, followed by the smaller through hole. In this case, the mark from the centering bit is on the wrong side of the base for the large counterbore hole. I use Forstner bits because they are rim-guided. They can cut a larger hole over a smaller one without trouble.

After all the machining is done, remove the protective film and use sandpaper to lightly round-over the bottom edge. You can clean up machine marks and scratches by carefully using a blowtorch (Photo 8). The result is a crystal-clear finish that's not really necessary, but it sure looks good.

Source MLCS, (800) 533-9298, www.mlcswoodworking.com, Universal centering alignment pin, #9054, \$6.

9 Tips for Beating Router Tear-out

Stop router disasters before they start.

by Eric Smith

Snap, crackle, crunch!

No, it's not your breakfast cereal. That's the sound of router tear-out.

Aaargh!

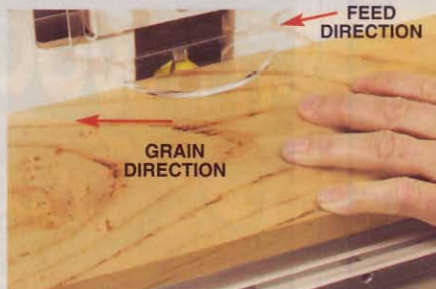
And that's the sound of a woodworker facing a do-over or repair.

Tear-out can happen cutting across or against the grain, cutting too deeply, using

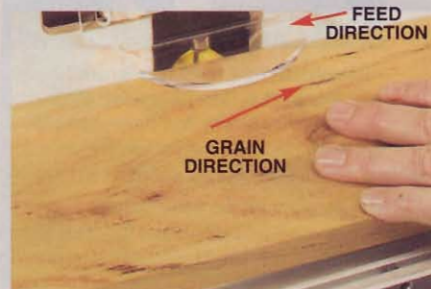
a dull bit or just running into a hidden flaw. One thing's for sure: It'll always happen at the worst possible time. Although it can't completely be avoided, you can definitely minimize the chances of tear-out by following some simple techniques and precautions—without adding a lot of time or expense to your projects.

1 Pay Attention to Grain Direction

Visualize a feather cut by a router. It would be a mess, of course, but the point is that when you rout against the grain (see photo, left), the wood reacts just like a feather. The grain is running right into the bit rotation. The wood's fibers are likely to catch and break apart ahead of the cut, producing tear-out. But when you run the router with the grain (see photo, right), you get a smooth cut.



Feeding your stock so the grain direction crashes head on into the bit rotation is like running your finger the wrong way on a feather. Nasty tear-out is almost a sure thing.



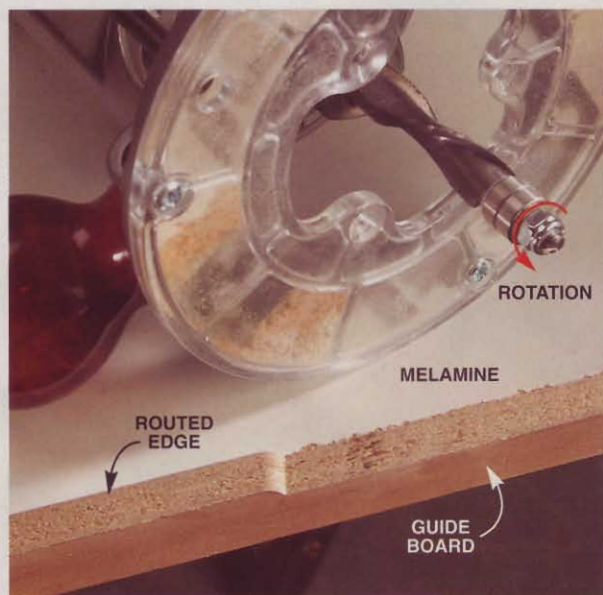
Flip a board end for end to change the direction from which the grain meets the cutter. Now the grain flows in the same direction as the bit rotation. The result will be a smooth cut with little or no tear-out worries.



2 Make a Very Light Final Pass

Trying to hog out a clean edge in one pass is asking for tear-out trouble. Instead of gambling with an expensive piece of wood, take the time to make at least two passes: one heavy pass and a very light final pass.

Because the final pass is just a shaving cut, the bit is a lot less likely to catch and tear the wood fibers. You'll get a smooth surface, even if the grain is going the wrong way.



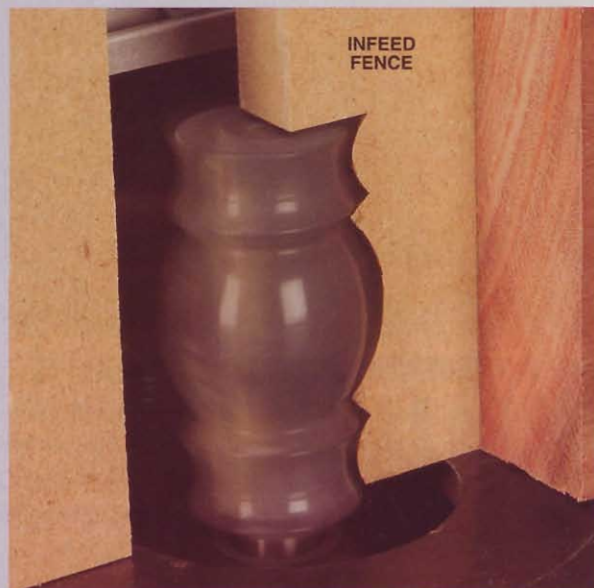
3 Use a Down-Cutting Spiral Bit for Flush Trimming

Down-cutting spiral bits push down on the wood's surface. The result is a clean, tear-out-free shearing cut. Down-cutting spiral bits work especially well for trimming or cutting through delicate veneers, melamine, laminates and highly figured woods.

4 Use a Zero-Clearance Fence

A zero-clearance fence backs up the wood as it's fed into the router bit, making it difficult for the wood to chip.

To make a zero-clearance fence, set the router bit at the height and depth you want. If you have removable subfences, turn the router on and slowly slide the infeed side of the fence into the bit. If your fence has a fixed face, clamp temporary subfences on both sides. With the router running, loosen the clamps on the infeed fence enough to slowly slide the subfences into the spinning bit.





5 Rip and Start Over

Sometimes you have no choice but to cut your loss and make a new piece. Other times, you can afford to trim the piece and start over. Just rip a bit off the damaged edge and then rout it again.

When I'm working with wood that looks likely to tear out, I try to give myself some wiggle room by cutting a wider piece than I need, then ripping it to size after I've successfully routed the edge.

7 Make Some Plunge Cuts

Routing against the grain may be unavoidable. On some edges, the grain reverses direction, so you can't win. If you're getting tear-out along an edge—or even if it looks like you might—make a series of plunge cuts every inch or two. This will cause the splinters to break off at the cutout before they can ruin your profile.

The best way to make plunge cuts is to hold one end of the board tightly against the outfeed fence and the other end away from the spinning bit. Push the board against the fence, then pull it out. Move the board forward an inch or two and repeat.



6 Stop End-Grain Blowouts with a Backer Board

Route the end grain first and use a backer board. That's the best way to reduce your chances of blowing out a corner. The backer board supports the cut so the corner has no chance to tear away. Make sure the backer piece is at least as thick as the piece you're routing. Clamp the pieces together for rock-solid support.





8 Make Shallow Climb Cuts

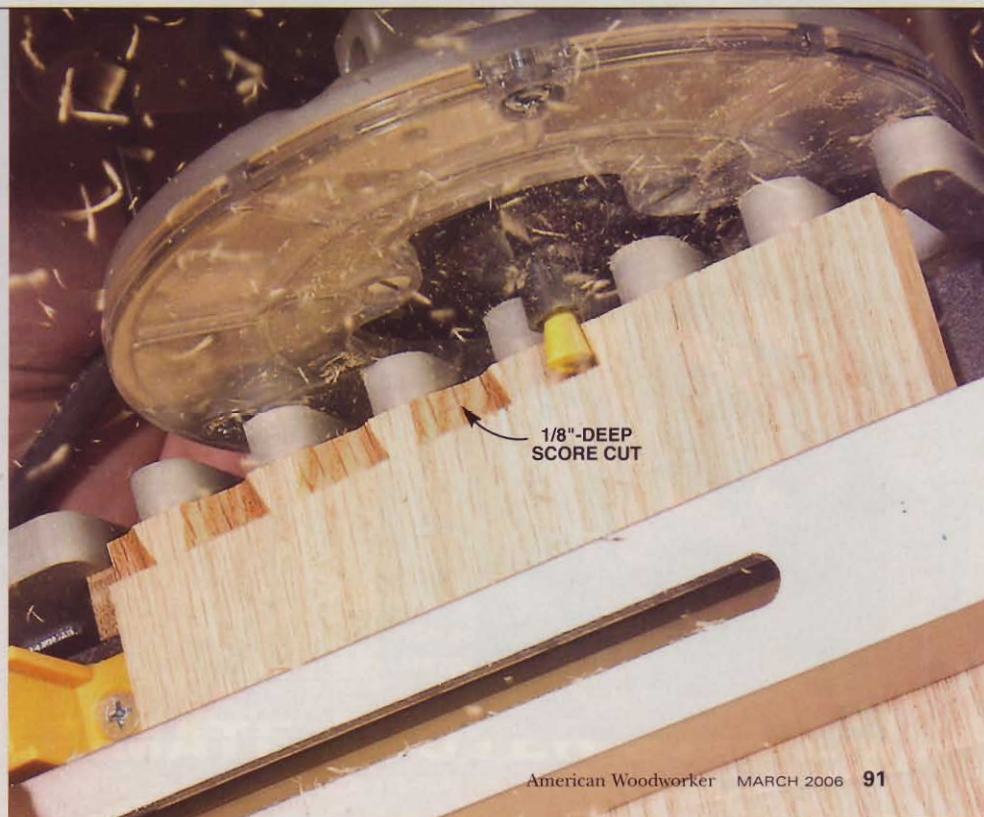
Reversing the normal direction of the router feed is called climb-cutting. Climb-cutting can involve either moving clockwise with a handheld router or pushing wood from left to right on a router table. Climb-cutting almost always eliminates tear-out, but it also makes the router more difficult to control. That's because the stock is fed in the same direction as the bit is spinning, so the bit wants to grab the wood and pull. This makes climb-cutting potentially dangerous. It's not recommended for most routing. If you follow a few rules, though, climb-cutting is a great way to get yourself over those pesky areas where tear-out is almost a sure thing.

Play it safe:

- Always make very shallow, light passes, especially when using a big bit.
- Secure the wood and/or router very firmly.
- Make sure the bit is sharp. A dull bit grabs and pulls, but a sharp bit cuts with less effort.
- On a router table, use featherboards whenever possible to hold the board and keep it from running away.
- When using a handheld router, firmly clamp down the stock. If the workpiece is narrow, add support so the router won't tip.
- Never climb-cut small or narrow pieces on the router table. It's better to cut the profile on a large piece and trim it to the size you want later.

9 Make a Scoring Cut on Dovetail Jigs

Face grain can splinter when you run a bit in and out of a board in a dovetail jig. Instead of having wood filler at the ready, start by making a light scoring pass along the entire edge of the board. Gently move the router in and out of the template fingers. Make the cuts about a 1/8 in. deep. Then go back and finish.



edited by Tim Johnson



HINGED FRAMES GIVE BROAD-BASED SUPPORT

Whether I need support for cutting plywood or bases for an assembly table, I reach for my hinged frames instead of sawhorses. The hinged frames open into stable, double-armed platforms that can be used individually or together.

Each assembly consists of two identical frames and two identical gates made from 3/4-in. fir plywood using half-lap joinery. Four continuous hinges hold the parts together and facilitate opening and closing. Hook-and-eye screw latches lock the assembly in the open position.

Randy Johnson

Overall Dimensions: 31-7/8" x 37" x 37"* for one hinged frame assembly

Part	Name	Number	Dimension
	Frame	2	3/4" x 31-7/8" x 37" **
A	Stile	4	3/4" x 3-1/2" x 31-7/8"
B	Rail	4	3/4" x 3-1/2" x 37"
C	Hinge	1	1-1/2" x 30"
	Gate	2	3/4" x 16" x 20"
D	Stile	4	3/4" x 3" x 20"
E	Rail	4	3/4" x 3" x 16"
F	Hinge	3	1-1/2" x 18"
G	Latch	1	2" hook-and-eye screw

* 2" x 31-7/8" x 37" when closed

** 2-in. toe kick below bottom rail



Hinged frames fold flat for storage.

FINISH ON TAP

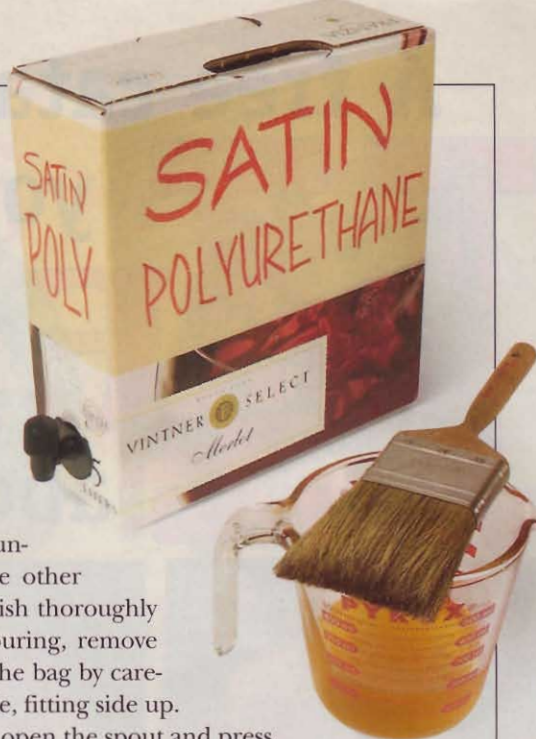
I buy varnish by the gallon because it's more economical, but after a few uses, the rim fills with gunk and the finish begins to skin over inside the can. As a result, I usually have to throw the can away before it's empty.

I solved this problem by recycling a 5-liter wine box into an air-tight varnish dispenser. Choose a box with a twist-open spout. After enjoying the wine (and a good night's sleep!), remove the empty bag and carefully pry the spout out of its fitting. Rinse the bag and let it dry.

Filling the bag with varnish is a two-person job: One person holds a funnel and the bag while the other person pours. Stir the varnish thoroughly before pouring it. After pouring, remove any air that remains inside the bag by carefully compressing it on a table, fitting side up. While the bag is compressed, open the spout and press it back into the fitting. Make sure the spout is oriented to operate correctly when the bag is back inside the box.

Because the bag is air-free, once it's reinstalled, you'll be able to stir the varnish by simply shaking the box. A classy label ensures that no one mistakes your polyurethane for pinot noir.

Jay McClellan



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Circle No. 181

LADDER LUMBER RACK

I organized all my short boards by turning an inexpensive 6-ft. stepladder (about \$30 at a home center) into a lumber rack. Now every board is easy to see and reach.

My ladder didn't have treads on the back legs, so I screwed on wooden cleats that align with the treads on the front.

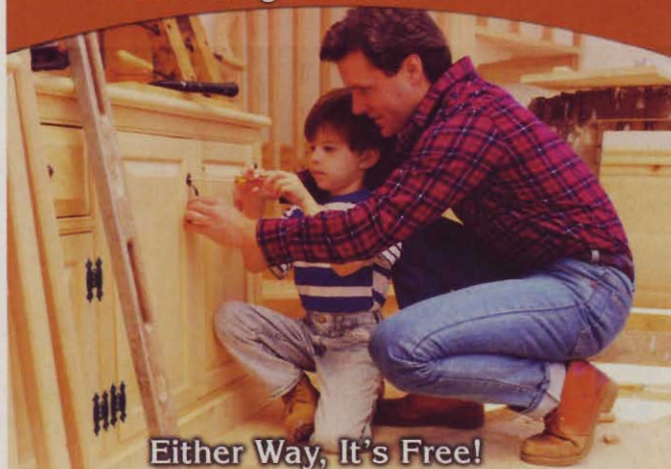
I connected the cleats and treads by screwing 1/4-in. plywood shelves on top. The shelves make boards slide easily. I can store boards as long as 7 ft. on the bottom shelf. Fully loaded, my ladder lumber rack holds about 20 bd. ft. of lumber.

Dan Kelts



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Circle No. 127

edited by Tim Johnson

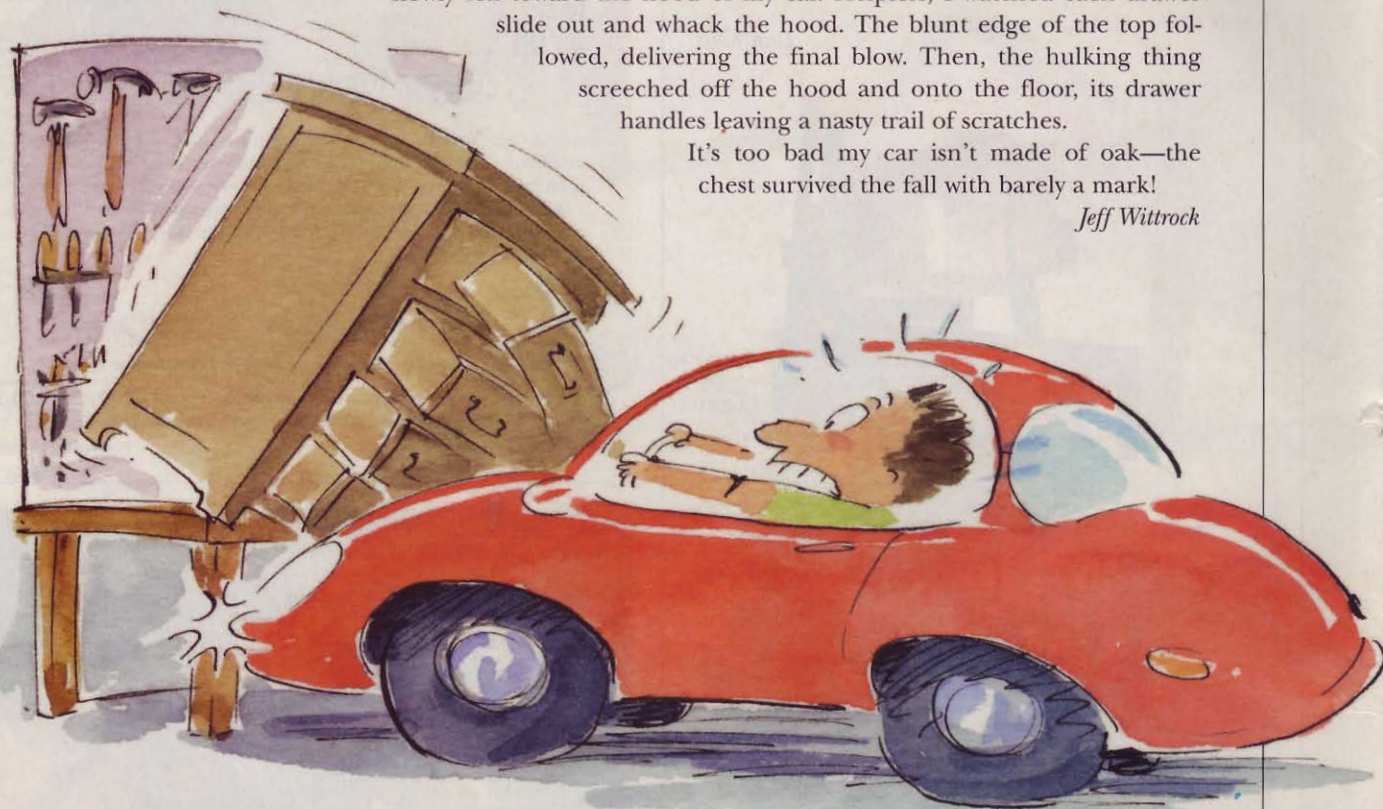
SWAN-DIVING DRESSER

In my garage, my workbench sits against the front wall, leaving just enough room to squeeze in my car. Recently, I was building a solid-oak chest of drawers for my mother-in-law. At the end of each day, I stored the chest on my workbench so my car would fit in the garage. The workbench is narrow, so the chest barely fit on it.

While parking the car one night, I bumped into the workbench, jarring the chest. It teetered and slowly fell toward the hood of my car. Helpless, I watched each drawer slide out and whack the hood. The blunt edge of the top followed, delivering the final blow. Then, the hulking thing screeched off the hood and onto the floor, its drawer handles leaving a nasty trail of scratches.

It's too bad my car isn't made of oak—the chest survived the fall with barely a mark!

Jeff Wittrock



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SAW STAINER

Last week, while building a pergola for my back yard, I set a treated 2x6 on my brand-new tablesaw, which had been a much-appreciated gift from my wife. I set the fence to rip the 2x6 to size, but then I was called away.

I had fully intended to come right back to make the cut. Unfortunately, life got in the way, and I did not return to my shop until the next morning. When I picked up the 2x6, I was horrified. Where the board had been, the cast-iron table had rusted. I guess damp treated wood and cast iron don't mix.

Fortunately, I was able to remove the stain with steel wool and elbow grease, but now the table has an uneven sheen. And, no, my wife doesn't know what happened to her gift—yet.

Bob Huddleston