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#121 May 2006
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A READER'S DIGEST PUBLICATION

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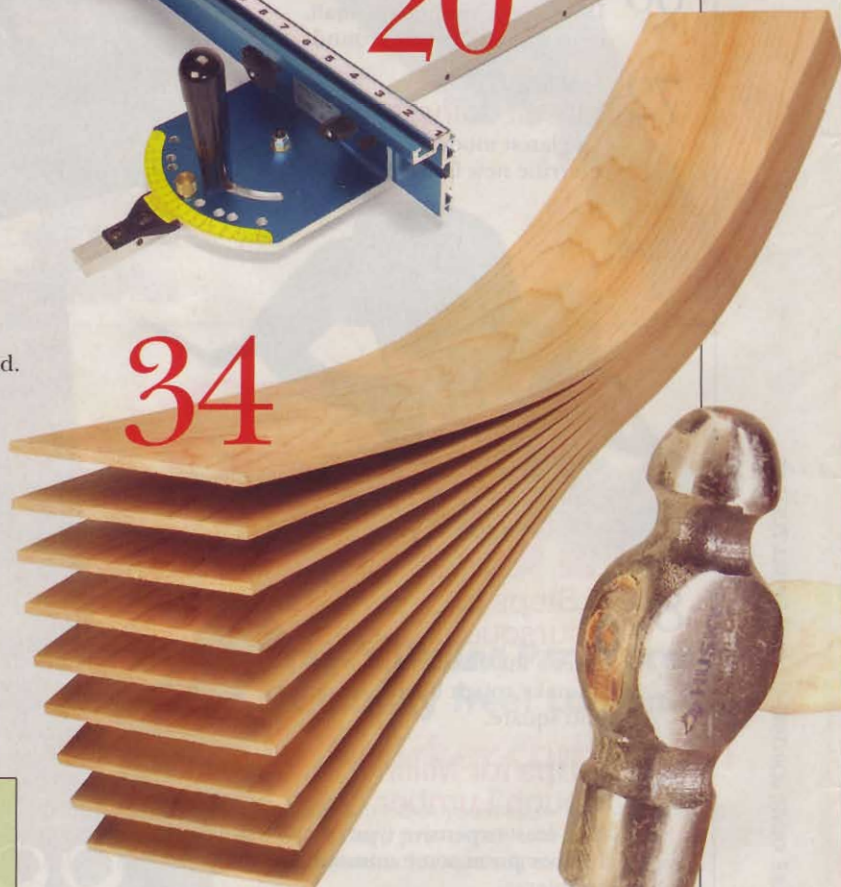
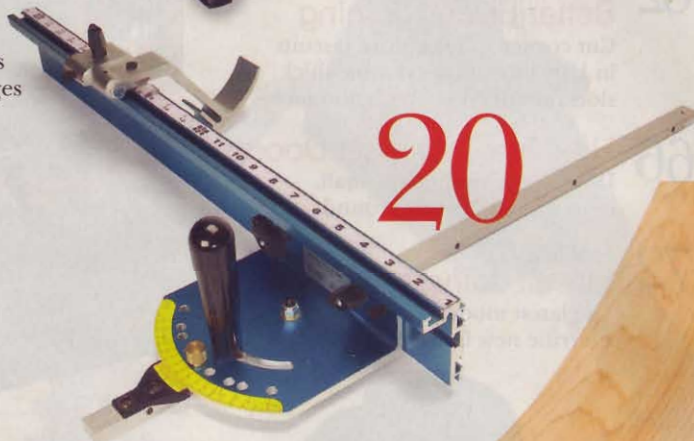
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Editor's Pick American Woodworker
January 2006

"I just wanted to express how pleased I am with your cyclone. I used to own an imported cyclone and upgraded to the 3hp Dust Gorilla. All I can say is WOW! What an amazing difference. The amount of suction I'm getting at each machine is unreal, easily double what I got with my old machine. Yours is built like a tank, it's quiet, and it's a pleasure to use. Hopefully, I'll never need another cyclone, but if I do, you guys have my business for life. So many manufacturers claim that their product will do this and that, then it turns out to be nothing but a dud. Your machine is every bit as good as advertised and then some. Thank you."

- Lou Miller, North Wales, PA

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260 Madison Ave., New York, NY 10016; (212) 850-7226
CHICAGO **James Ford** (312) 540-4804
Sherry Mallit (sales assistant) (312) 540-4824
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Classified Manager, **Don Serfass**, (215) 321-9662, ext. 30

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QUESTION & ANSWER edited by Dave Munkittrick



PULLEY PROBLEMS

Q I am trying to swap cutterheads on my jointer (I'm going carbide), but I can't get the pulley off the old cutterhead. Do I need to get a new pulley? Will I be able to get it on the shaft of the new cutterhead?

A You don't need a new pulley. You do need a pulley puller. You can buy or rent one at most hardware stores (see Source, below). Expect to pay around \$5 to rent and as much as \$30 to buy one. A puller is designed to hook onto the back of the pulley. A threaded rod screws down onto the shaft center. As the rod tightens against the shaft, the jaws pull on the pulley. There are two- and three-jaw pullers. Three-jaw pullers cost more but are easier to use because the pulling power is distributed at three points around the pulley instead of two. A two-jaw puller can fit into tight spaces better. We found a combo two- and three-jaw puller (see Source).

You may face the same problem in reverse when you try to put the pulley on the new cutterhead shaft. Here's an old machinist's trick for getting tight-fitting pulleys or bearings on a shaft: Bake the pulley. Iron expands with heat, which should open up the hole in the pulley enough to get it on the shaft. There's no need to get the pulley red hot. Just pop it into an oven at 300 degrees F for 10 minutes or so. (Don't forget to use oven mitts!)



Bake a tight-fitting pulley. The heat will expand the pulley so it fits easily on a shaft.

Source Enco, (800) 873-3626, www.use-enco.com
Combo 2/3 jaw puller, #891-4057, \$34.

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.

DRILL-PRESS SPEED

Q Do I really need to change my drill-press speed for small-diameter bits? They seem to drill OK at a slow speed and it's kind of a hassle changing the belt all the time.

A On the road or in the shop, it's best to obey the speed limit. In the case of twist bits, the small-diameter bits rely on high rpm rates to clear the flutes of wood chips. At high speeds, the flutes are better able to carry the chips up and out of the hole. At slow speeds, the flutes tend to jam up with material, which leads to slow cutting and high temperatures that will dull bits prematurely. There's also a tendency to push harder to overcome the jammed bit, which can result in a broken bit.



STEAMED VS. UNSTEAMED WALNUT

Q Is it true that air-dried walnut looks a lot better than kiln-dried?

A Kiln drying actually has little effect on walnut's color, but steaming does. Steaming blends the natural colors and distributes them evenly throughout the wood fibers. The result is a rather drab, grayish-brown board. Kiln-dried walnut is usually steamed because furniture manufacturers like the uniformity it gives to their furniture. That's why many people have been led to believe it's the kiln that kills walnut's natural beauty.

Unsteamed walnut, whether it's dried by kiln or air, preserves the purples, reds, greens and browns that naturally occur in walnut.

As an individual craftsperson, you may sometimes want to avoid sifting through boards for good color matches. That's the time to pick steamed walnut. For special projects in which you really want the rich, true colors of walnut displayed, go for unsteamed.

UNSTEAMED WALNUT

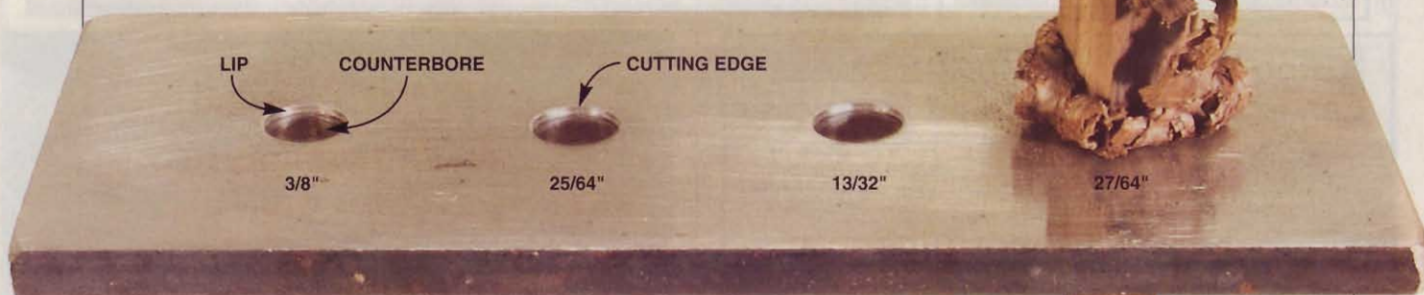
STEAMED WALNUT

edited by Tim Johnson

Make Your Own Dowels

I never seem to have the right dowel. If it's the correct diameter, it's the wrong kind of wood. Rather than stocking dowels of every size and species, I make my own, using a tool that's probably been around since the Iron Age.

My dowel maker is a 1/4-in. steel plate with holes that decrease in diameter by 1/64-in. increments. Driving a square blank through the series of holes produces a round dowel that matches the smallest diameter. The blank should be no larger than the largest hole; shaving one end to a point makes starting easier. The dowel is roughly shaped at first; successive passes refine it. Dowels made this way are perfectly sized, but they often show some tear-out. They also have to be made in short sections; hammering slender blanks that are longer than 12 in. causes too much deflection.



Each hole is drilled through from the top and then counterbored 1/64-in. oversize from the bottom. Stop the counterbore 1/16 in. short, so all that remains of the original hole is a 1/16-in.-wide lip at the top. This lip provides the cutting edge. The counterbore provides clearance for the dowel.

To drill accurately sized holes, you must firmly clamp the plate to your drill-press table and your drill bits have to be sharp. Use a center-punch to locate each hole and keep the drill bit from wandering. Operate the press at 1,000 rpm (slower for 7/16-in. or larger bits) and use cutting oil while you drill.

Flattening and polishing the top surface creates cutting edges around the holes. For this step, you can use your sharpening stones or sandpaper adhered to a flat surface.

Shannon Hooge



POLYETHYLENE CUTTING BOARD

ECONOMICAL INSERTS

Commercially made zero-clearance inserts cost about \$20. I make my own for less than \$3 from 3/8-in.-thick polyethylene cutting boards, which are flat and rigid. A 14-in. x 17-in. cutting board (\$10 at a discount department store) yields four inserts.

After rough-sawing the blank on my bandsaw, I attach the saw's insert with double-faced tape. Then I rout the blank to final size using a flush-trim bit. I drill 11/64-in. pilot holes and install the adjustment screws, which are 3/8-in.-long #10-24 Allen-head set screws

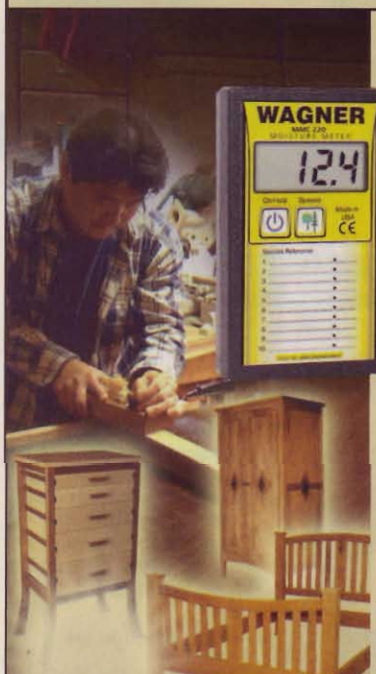
(about 40 cents each at a hardware store).

Raising the blade through the polyethylene to cut the zero-clearance slot leaves plastic curls around the edge. They're easily removed by filing or sanding.

Paul Boutin

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BOARD-STRETCHING JOINT

I bought a planer/molder so I could make my own moldings. My living room required one 28-ft.-long molding, but all I had to make it were 12-ft. boards. I didn't want to settle for separate 12-ft. molding sections



mitered during installation. I wanted this molding to be one continuous piece. Joining the boards with diagonal scarf joints before molding them was the solution.

To make a scarf joint, lay out the angles using at least a 4-to-1 ratio—4 in. of run for every 1-in. rise. Increasing the ratio strengthens the glue joint. The joint will be inconspicuous if you match the boards' grain direction and patterns. Use your band-saw or a sabersaw to cut the angles. Then joint the edges by attaching a fence and routing with a flush-trim bit.

Glue the boards together on a flat surface. Install the clamps perpendicular to the joint to keep the pieces from sliding. You may have to notch the edges of the boards to hold the clamps at the proper angle.

Dave Olson

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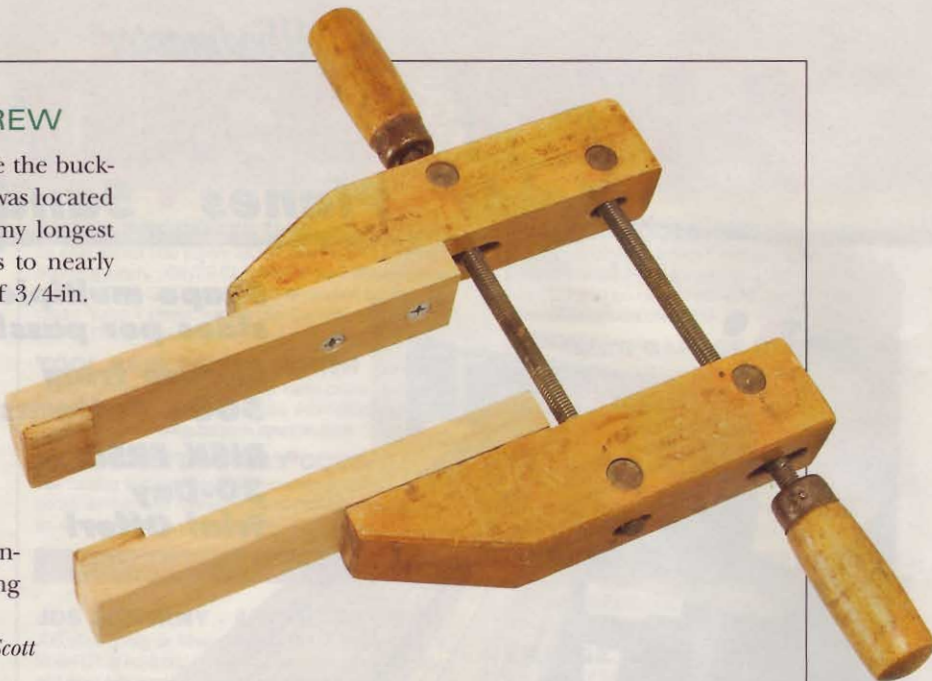
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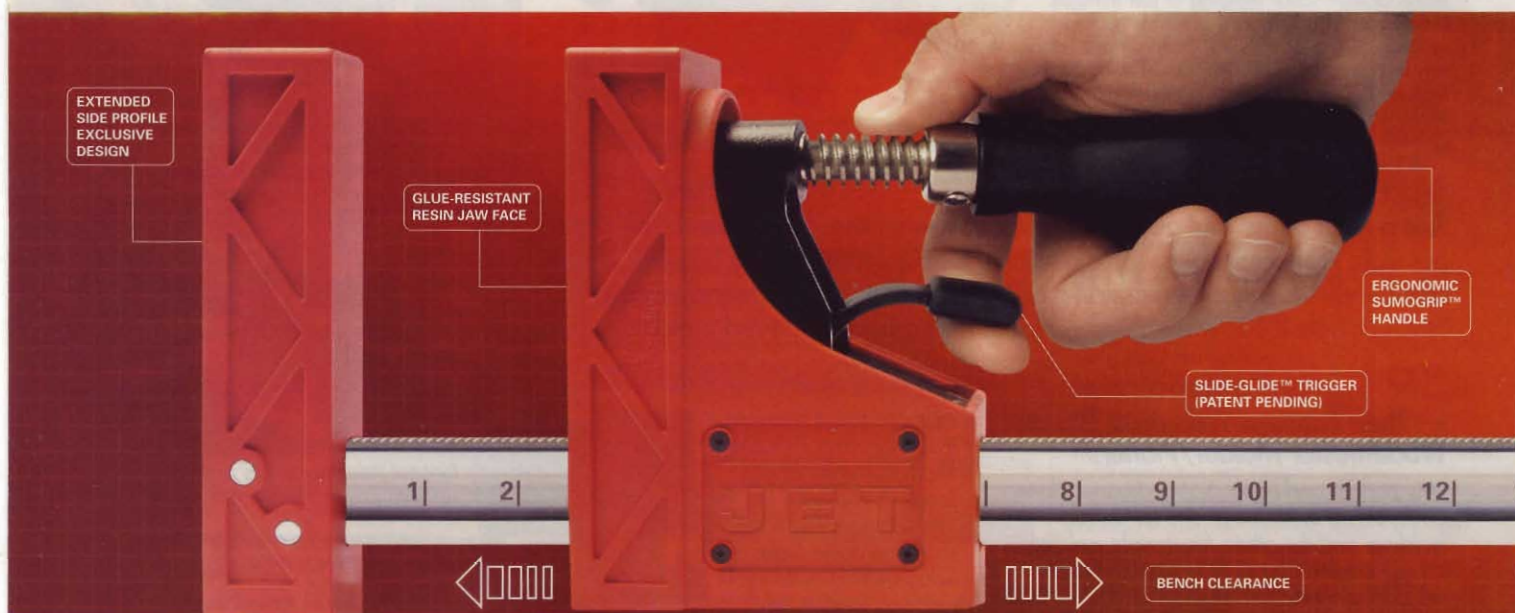
DEEP-REACH HANDSCREW

Recently, a friend asked me to reglue the buckled veneer in a tabletop. The problem was located too far from the edge to clamp with my longest handscrew, so I added wooden fingers to nearly double its reach. I made the fingers of 3/4-in. hickory, though you could use any hard, stiff wood. I fastened them with 1-1/2-in.-long No. 14 screws. The fingers reduce the jaw capacity by 1-1/2-in., down to 3 in. on my 8-in. handscrew. Longer fingers on a larger handscrew should be thicker to minimize deflection. To screw on the fingers, I open the jaws wide, like a yawning cartoon alligator.

Leif Scott



We'll give you \$150, this great-looking shirt and a durable shop apron for your Workshop Tip! Send your original tip to us with a sketch or photo. If we print it, you'll be woodworking in style. E-mail your tip to workshoptips@readersdigest.com or send it to Workshop Tips, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121. Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions and use them in all print and electronic media.



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THE WELL-EQUIPPED SHOP

by George Vondriska

JET'S NEWEST CYCLONE COLLECTOR

The JC-3 is Jet's first foray into the hot cyclone dust collector market. More than just a me-too entry, the Jet offers features not found on other collectors.

One unique feature is the pressure tube that allows you to use a plastic bag in the barrel. The tube runs from the cyclone down to the collection barrel. It uses the negative pressure from the cyclone to pull the bag tight against the inside of the barrel, which keeps the bag from being sucked into the cyclone.

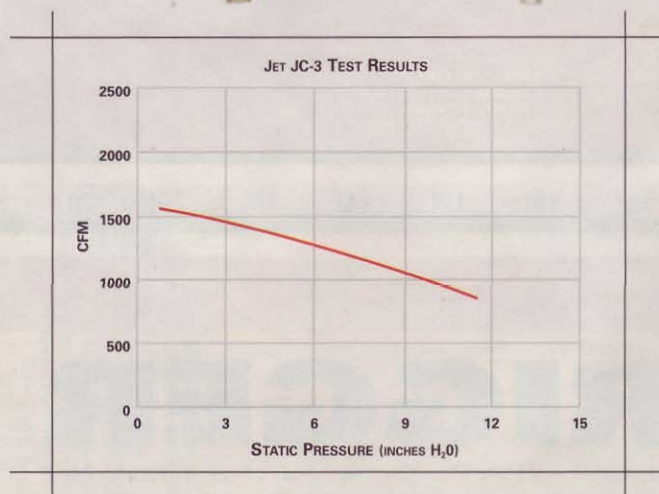
Jet's unusual inlet design is an 8-in. round port that flares to a rectangular shape. The rectangle's height almost equals the separator cylinder's height to enhance airflow and separation performance.

The JC-3 combines a 14-in. backwardly inclined steel impeller with a 3-hp motor to produce excellent airflow performance. Airflow is measured in cubic feet per minute (CFM); see our test results in the chart, below.

The separation performance on the Jet is excellent. A neutral vane inside the separator cylinder promotes smooth airflow and aids in separating the debris from the air stream. After this cyclone "ate" an entire barrel of dust from our workshop, only a trace of dust made its way to the collector bag under the filter. While working, it produced a noise level of 87 decibels.

Jet uses a snap ring for quick, easy changes of the plastic collector bag. The cartridge filter features a built-in paddle wheel that allows you to clean clogged pleats with the turn of a handle. The Jet JC-3 comes in two models: the JC-3CF (shown above) with a 2-micron-rated cartridge filter and the JC-3BF with a standard filter bag.

The collector includes a sturdy tripod stand and a dolly cart for the dust barrel. The collector will fit under an 8-ft. ceiling.



Source Jet Tools, (800) 274-6848, www.jettools.com Jet cyclone dust collector with cartridge filter, JC-3CF, \$1,700.
Jet cyclone dust collector with bag filter, JC-3BF, \$1,400.

EDITOR: RANDY JOHNSON • ART DIRECTION AND PHOTOGRAPHY: JOE GOHMAN, UNLESS NOTED

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WELL-EQUIPPED SHOP



HAND-PUMP VACUUM BAG

A vacuum bag is a great way to press veneer onto a substrate. It exerts uniform pressure across the surface—something that can be especially tricky to do on large or curved parts. A vacuum-bag system usually involves a specialized vacuum pump and can cost several hundred dollars. For a less-expensive option, try a Thin Air Press kit, \$55 to \$60. It uses a hand-operated pump and saves you a bunch of cash. It's also an economical way to try out vacuum veneering.

In addition to the hand-operated pump, the kit includes a 20-mil bag with a one-way valve, breather netting and tape to seal the bag's mouth. Kits are available with either a 14-in. x 47-in. bag or a 26-in. x 28-in. bag.

When your project has been prepped and slipped into the bag, pressing it closed against the tape seals the opening of the bag. The breather netting, draped across your project, allows air to evacuate evenly so you get uniform pressure on the project. Start pumping and you'll see the vacuum bag slowly compress against your work. It takes about one minute of pumping to empty the air from the bag. The bag provides plenty of pressure to flatten veneer and holds the vacuum long enough for the glue to dry.

Two 14-in. lengths of sealer tape are included with the kit. You'll want to keep some spare tape on hand, since the tape is the Achilles seal, er, I mean, heel in the system. One piece will work for a few applications, but any particles, like sawdust, that get on the tape will interfere with its ability to seal. Replacement tapes are available at \$4 for two 14-in. pieces.

Source Roarocket Skateboard Co., (416) 938-4588, www.roarocket.com
Thin Air Press kit with 14-in. x 47-in. bag, #01300, \$55. Thin Air Press kit with 26-in. x 28-in. bag, #01301, \$60.

NEW MITER GAUGES

A good-quality, accurate miter gauge can greatly improve your tablesaw's capabilities. With a gauge, you may even find you don't need to eat up more shop space by adding a miter saw. Two new models from JessEm Tool and Kreg Tool are great

examples of well-made miter gauges.

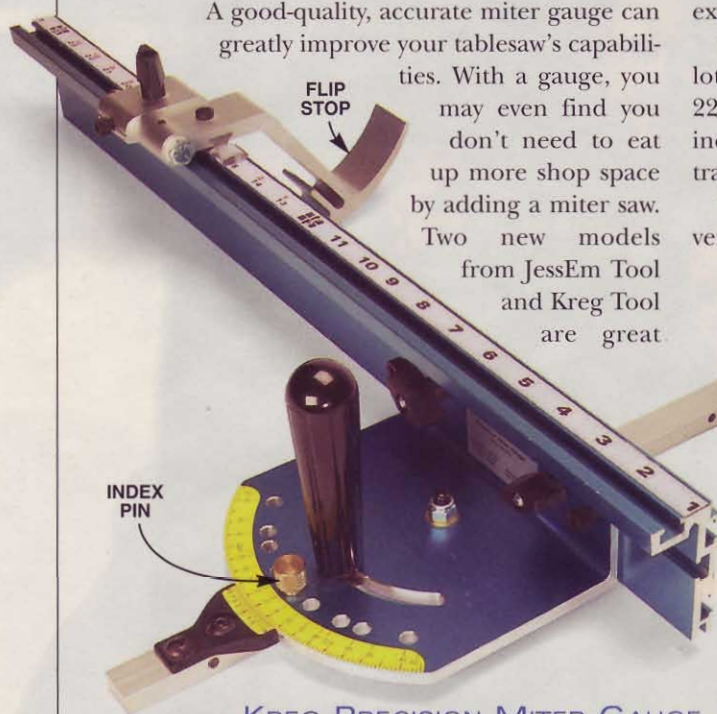
The Kreg Precision Miter Gauge System, \$160, offers lots of value for the buck. Commonly used angles, 10, 22.5, 30 and 45 degrees left and right, are located by an index pin. Additional angles can be set using the protractor and vernier scale built into the head.

The flip stop is very convenient. Its curved

shape allows it to pivot up, out of the way, when you slide in your material for your first squaring cut.

For your final cut, simply butt the square end of your board against the side of the stop. It's a slick system that rarely needs to be flipped completely out of the way. The head pivots 60 degrees in both directions. Its crosscut capacity is 24 in.

Setting the fit of the bar to the miter gauge slot is a little fussy. You need to remove the bar from the table slot and turn each of five bar adjusters to customize the fit. After that's done, this proved to be a simple-to-use, accurate miter gauge.



KREG PRECISION MITER GAUGE

A Natural Progression to...



The JessEm Mite-R-Excel, \$220, is a beautiful piece. It uses an unusual two-pin system to effectively and precisely adjust the miter gauge head to the proper angle. One pin positions the head to within 5 degrees of the angle you want. The second pin locates the head to the last half-degree that you want. If you'd like to go beyond that, a vernier scale allows you to dial the head into 1/10-degree accuracy. It's extremely easy to hit a precise angle with this miter gauge. The head pivots 45 degrees in both directions. The fence has a flip stop for repetitive cuts and a 36-in. crosscut capacity.

Miter gauge bars rarely fit miter gauge slots with much precision. The Mite-R-Excel bar is conveniently adjusted from above, while the bar is in the miter gauge slot. It's very simple to do.

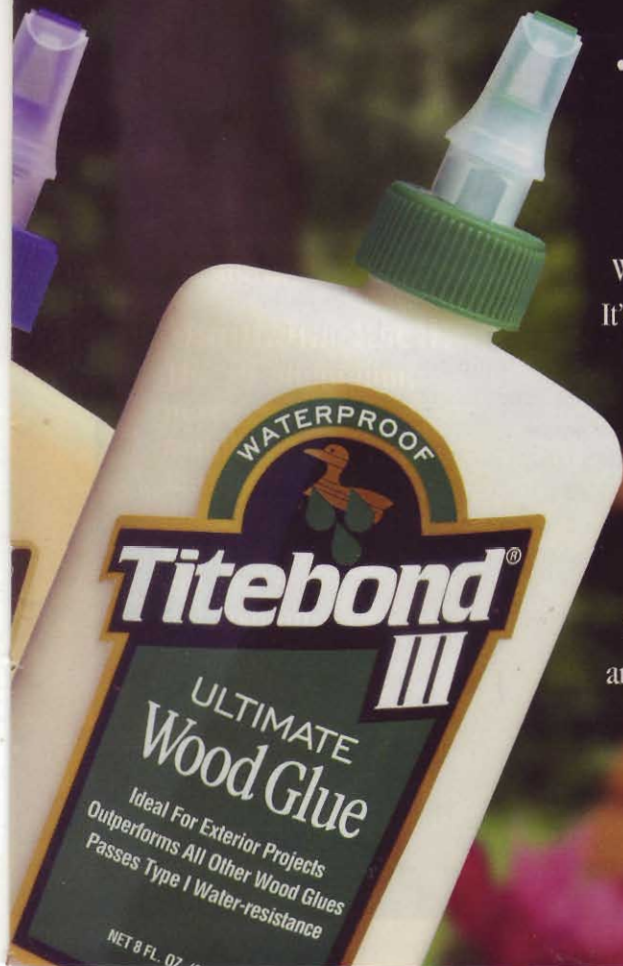
Sources Kreg Tools, (800) 447-8638, www.kregtools.com
Precision Miter Gauge System, #KMS7102, \$160. • JessEm Tools, (866) 272-7492, www.jessem.com JessEm Mite-R-Excel, \$220.



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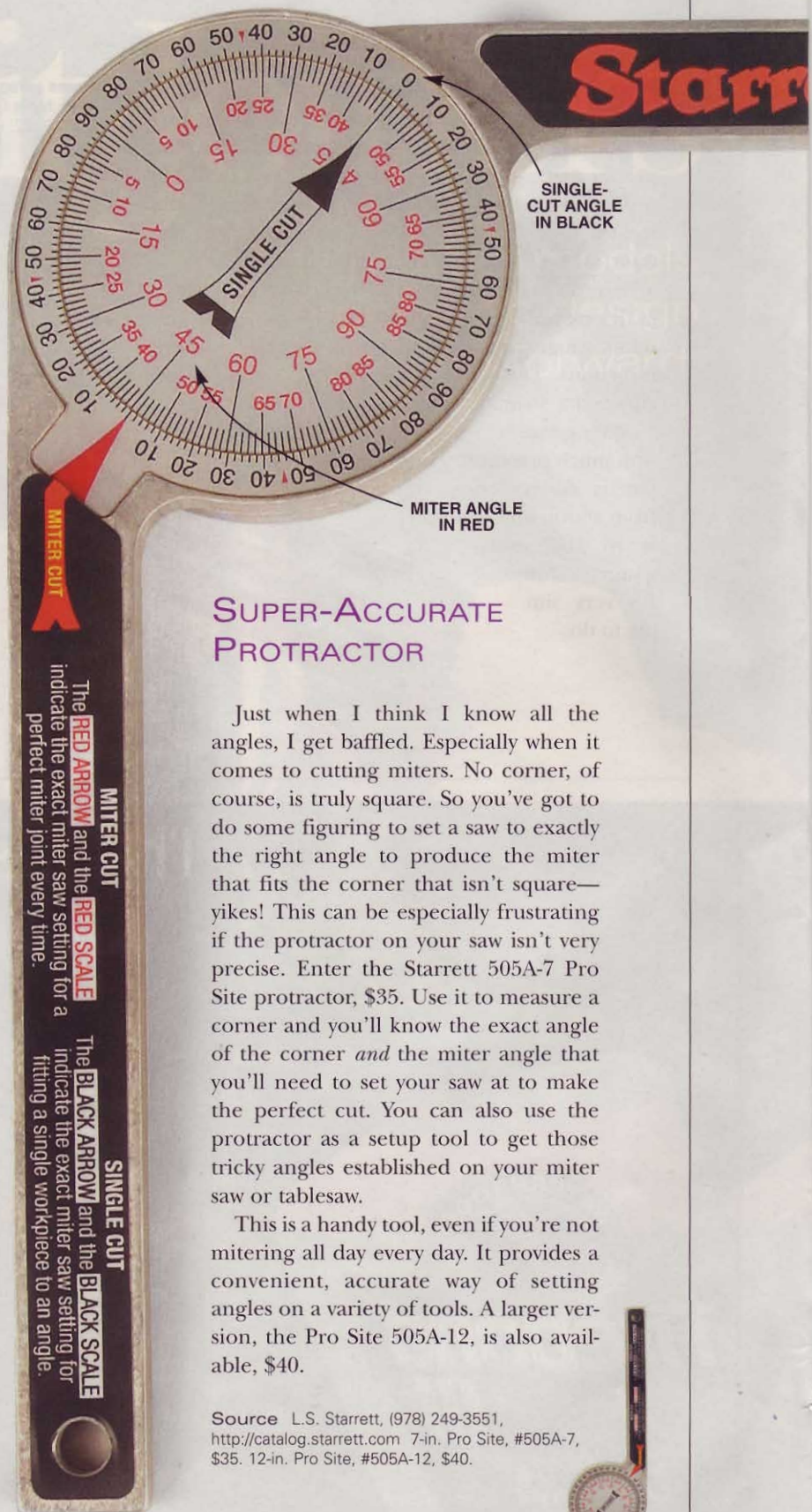
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SUPER-ACCURATE PROTRACTOR

Just when I think I know all the angles, I get baffled. Especially when it comes to cutting miters. No corner, of course, is truly square. So you've got to do some figuring to set a saw to exactly the right angle to produce the miter that fits the corner that isn't square—yikes! This can be especially frustrating if the protractor on your saw isn't very precise. Enter the Starrett 505A-7 Pro Site protractor, \$35. Use it to measure a corner and you'll know the exact angle of the corner *and* the miter angle that you'll need to set your saw at to make the perfect cut. You can also use the protractor as a setup tool to get those tricky angles established on your miter saw or tablesaw.

This is a handy tool, even if you're not mitering all day every day. It provides a convenient, accurate way of setting angles on a variety of tools. A larger version, the Pro Site 505A-12, is also available, \$40.

Source L.S. Starrett, (978) 249-3551,
<http://catalog.starrett.com> 7-in. Pro Site, #505A-7,
\$35. 12-in. Pro Site, #505A-12, \$40.

10 Easy Ways to Add *Roll-Outs*

Roll-out shelving is one of the most popular features of new kitchen cabinets. Mounted on standard drawer slides, these shelves give you easier access to boxes, jars and kitchenware. You can easily add roll-outs to existing cabinets as well. If you do, take three things into account: First, determine whether you must build out the inside of the cabinet so the roll-out and slide clear the door or face frame, including the hinges. Second, choose which kind of drawer slide to use: partial- or full-extension. And third, decide what shape and size to make the roll-out drawer box. These 10 tips cover most of the options—whether you're retrofitting or building new cabinets.



1 USE ZERO-PROTRUSION HINGES

Zero-protrusion hinges (see Source, page 32) swing the door completely clear of the opening, allowing a roll-out to be pulled out without hitting the door's edge. These hinges let you mount the drawer slides directly to the cabinet sides. Zero-protrusion hinges may be awkward to install in an old cabinet, because they might require new holes.



2 ATTACH SLIDES TO A PANEL

Mount drawer slides to a new panel so the roll-outs clear the existing hinges or face frame. Then screw the panel to the inside of your cabinet. Make the panel full height to create a finished look on the inside of the cabinet.



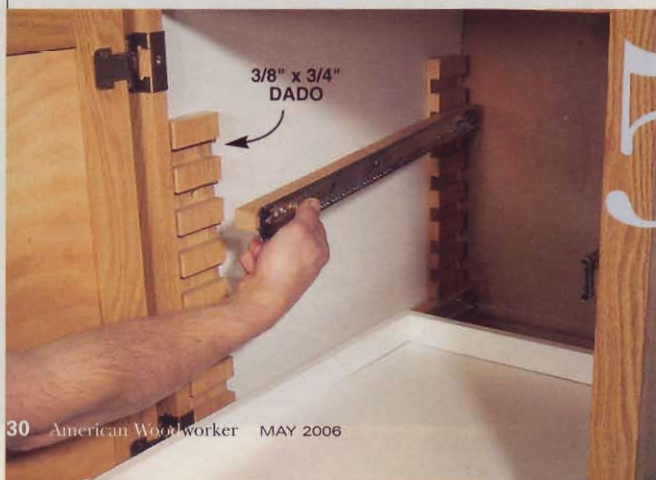
3 MOUNT SLIDES ON PLASTIC SPACERS

These spacers provide an easy way to move out your slides so they clear face frames, hinges or doors. They're available in 1/8-in., 3/8-in., 1/2-in. and 3/4-in. heights (see Source, page 32). After screwing the spacers to the cabinet sides, attach the slides to the spacers with No. 7 wood screws or Pozi-system screws (see Source).



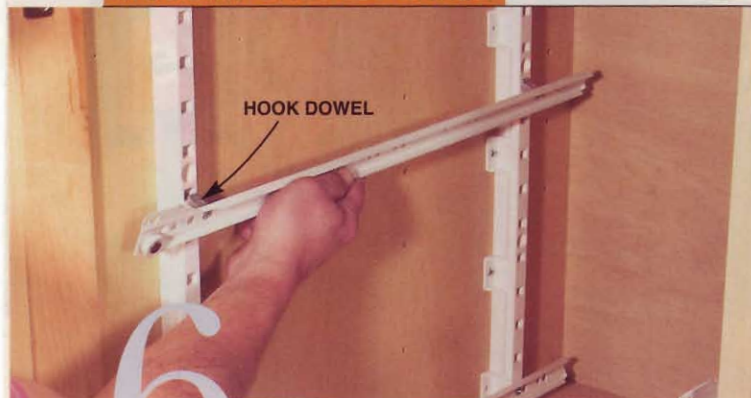
4 USE MOUNTING BRACKETS ON FACE-FRAME CABINETS

Mount one bracket on the face frame and the other on the cabinet back. The slides simply snap into place. This cabinet has a 1/8-in. plywood back, which is not thick enough to hold screws. An easy solution is to install 3/4-in. mounting strips on the back using construction adhesive.



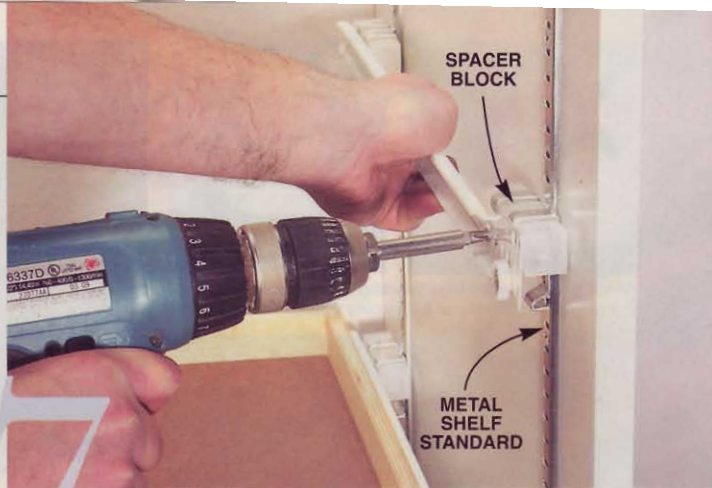
5 MAKE ADJUSTABLE SUPPORTS

Make supports from 3-in.-wide boards that are thick enough so the roll-outs clear the face frame and door. Space dadoes at 1-in. intervals. Mount the cabinet part of the slide to a 3/4-in. square strip of wood that is the same length as the cabinet's inside depth. Slip the strips into a set of dadoes and add the roll-out.



6 USE A READY-TO-INSTALL SYSTEM

This system is a simple, quick way to add adjustable roll-outs. It uses small blocks called hook dowels that attach to the slide. They fit into square holes spaced at 1-in. intervals in the standards. The mounting strips stand off either 1 or 1-1/4 in. from the cabinet side to clear hinges, face frames or doors (see Source, below).



7 BUILD OUT FOR METAL STANDARDS

Here's a simple way to install roll-outs in cabinets that have metal shelf standards: Mount your slides to plastic spacer blocks that have shelf clips on their backs. The system is quick and adjustable but is only rated for 35 pounds per roll-out (see Source, below).



8 PREVENT DOOR DAMAGE WITH BUMPERS

Install drawer bumpers to prevent slides from scratching a door. These bumpers extend beyond most bottom-mounted epoxy-style slides, but you may need to add a spacer, such as a washer or cardboard shim, behind the bumper to keep a full-extension ball-bearing slide from scratching the door.

9 CORRAL STUFF WITH TALL BACKS AND SIDES

Build your roll-outs with tall backs and sides if they will carry tall or stacked items. Make the front low to keep items easily accessible. Full-extension slides provide easy access to the contents at the roll-out's back (see Source, below). They cost about twice the price of three-quarter-extension, bottom-mounted, epoxy-style slides, though.

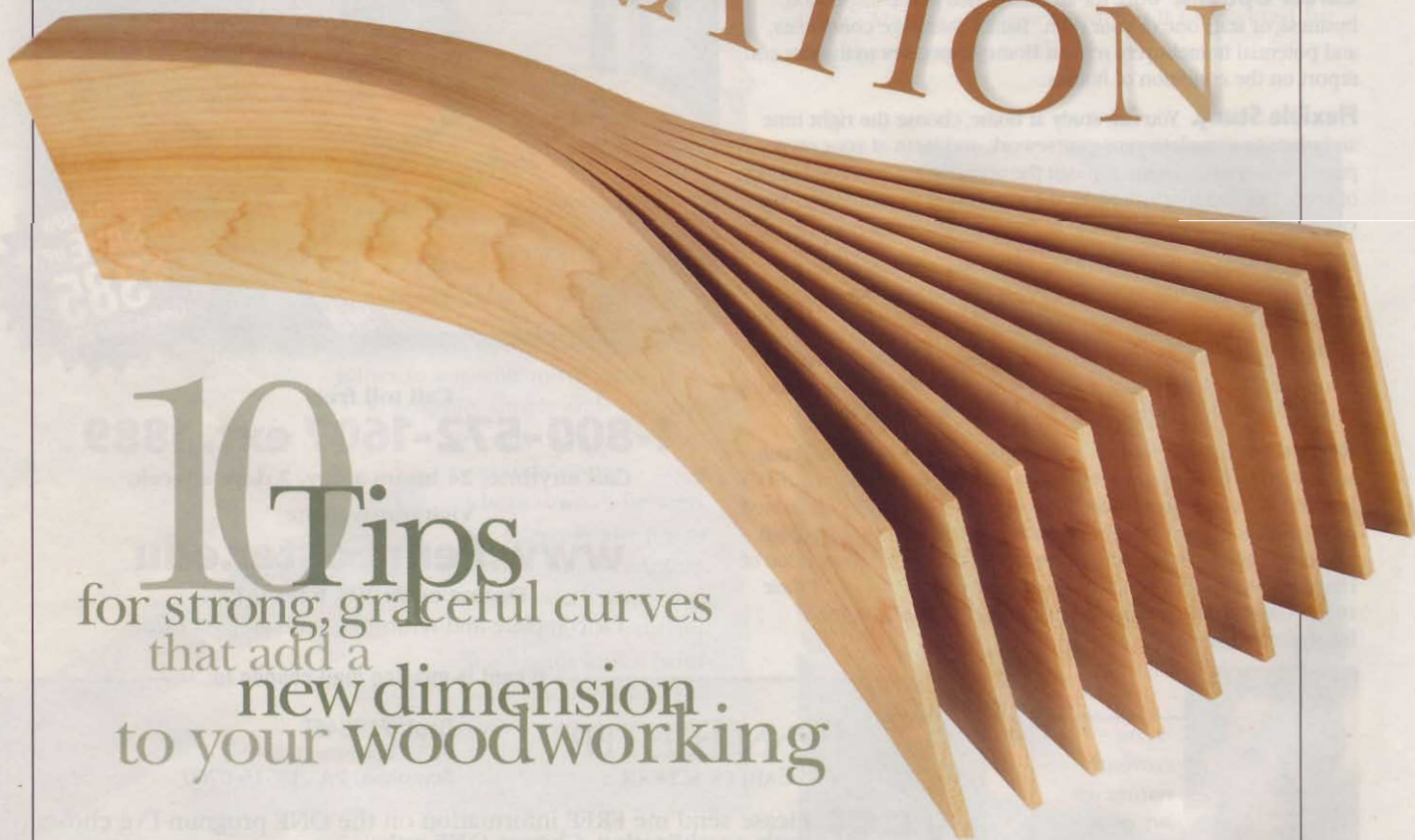


10 HIDE THE SLIDES

For a refined look, extend roll-out fronts to cover the ends of the slides. Use dados to attach an extended front on shallow roll-outs. For taller roll-outs, use biscuits.

Source Woodworkers Hardware, (800) 383-0130, www.woodworkershardware.com Zero-protrusion hinge, #B071T7500, \$8 ea. 3/4-in. (19-mm) plastic spacers, #B060.275, \$0.58 ea. Face-frame slide-mounting brackets, #KV8404, \$0.80 ea. Rear slide-mounting bracket, #KV8401, \$1 ea. Adjustable support sets, #TNB520, \$17 a set. Shelf-standard mounting system, #KV1303, \$3 ea. Full-extension slides, #KV8400 B22, \$13 a set. Drawer bumpers, #BX1926 WH, \$0.30 ea. Pozi-system screws for 5-mm holes, various sizes, \$3 to \$4 per 100.

Bent Wood LAMINATION



10 Tips for strong, graceful curves that add a new dimension to your woodworking

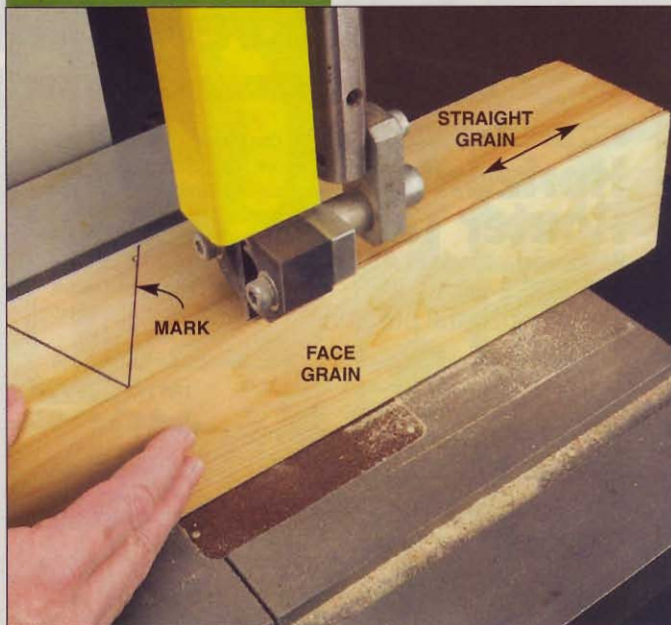
Is your woodworking ready to break free of the box? Check out bent laminations. You'll find a whole new world of possibilities to explore. Woodworkers use bent wood laminations for everything from chair rockers to drawer handles. Bent laminations do more than give your project a graceful look; when used as a structural element, such as a table leg, they are actually stronger than if the piece were cut from a single block of wood. That's because the grain runs parallel with the shape; there is no weak short grain.

A bent lamination is simply a board sliced into thin, flexible plies and glued back together in a

form to create the desired shape (see photo above).

Bent laminations don't take a lot of specialized equipment. You probably already have all the tools you need: a bandsaw or tablesaw to cut the thin plies and a planer to take off saw marks and adjust each ply's thickness. You will also need a bunch of small bar clamps, two-part urea-formaldehyde glue, a glue spreader and some sheet stock to make forms.

Here are 10 tips to get you started making your own bent laminations. Start small—try something like drawer pulls—and have fun. With a little practice, you'll be ready to handle any curve.



1 CUT ON THE STRAIGHT-GRAINED EDGE

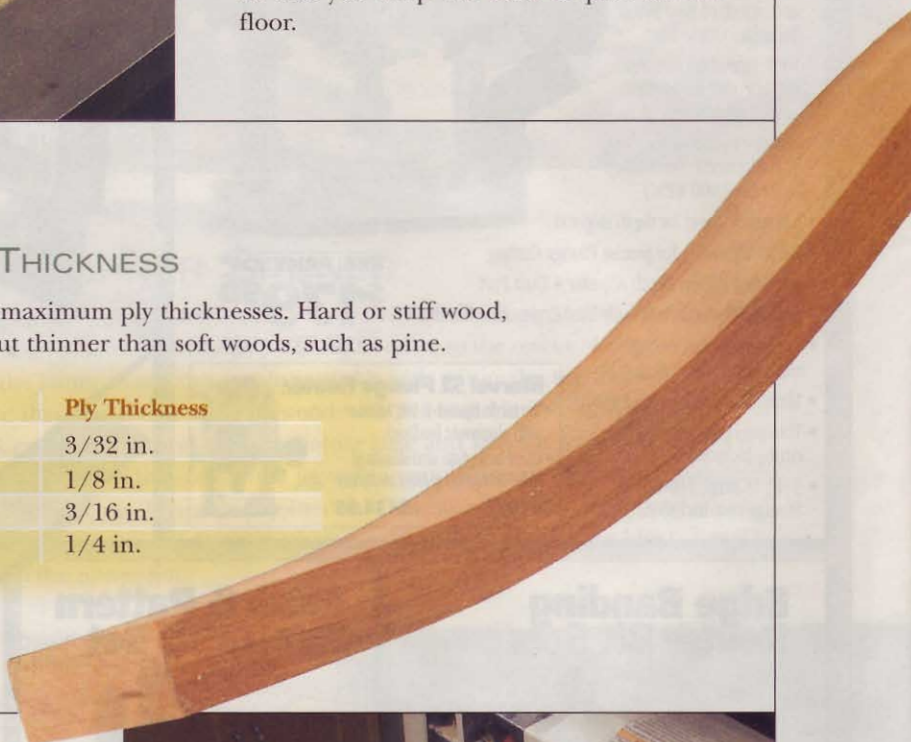
Cut the plies through a straight-grained edge rather than the face-grain side. Because the cuts are made parallel to the grain, a straight-grained board can be sliced and put back together with little interruption to the grain lines. This helps keep the plies almost invisible.

Mark your stock with a triangle so the board can be reassembled in the right order, in case you drop the stack of plies on the floor.

2 USE THE RIGHT PLY THICKNESS

The chart shows approximate maximum ply thicknesses. Hard or stiff wood, such as maple, may need to be cut thinner than soft woods, such as pine.

Lamination Radius	Ply Thickness
2 to 4 in.	3/32 in.
4 to 8 in.	1/8 in.
8 to 12 in.	3/16 in.
12 in. or more	1/4 in.



3 CLEAN UP SAW MARKS

Make a simple sled to plane the thin plies smooth. A 3/4-in. board with a thin backer glued to one end is all it takes to support the ply through the planer. Make light passes of about 1/64 in. to avoid chip-out. Planed surfaces keep the glue lines thin and almost invisible.



4 USE THE RIGHT GLUE

Use a two-part urea-formaldehyde glue for bent laminations. It sets hard but slowly. The hard set helps the lamination hold its shape. The long open time takes the frenzy out of glue-up. I recommend Unibond 800; it's a urea-formaldehyde glue with three shades of powdered catalyst to better match the wood you're using. It also cleans up easily with water.

Epoxy is also a good choice for bent laminations, but it costs almost twice as much as urea-formaldehyde.

Standard wood glue is not the best choice for bent laminations. Yellow glue sets soft and fast. It is also prone to glue creep, a phenomenon in which the cured glue creeps out of the laminations over time, resulting in unsightly, raised glue lines.



5 COMPENSATE FOR SPRING-BACK

You can never predict exactly how much spring-back will occur. But you can compensate for spring-back in your form design with the formula at right.

R_{final} is the radius you want for your bent lamination; (n) is the number of plies; R_{form} is the radius of your jig.

Formula:

$$R_{\text{final}}(n - 1)/n = R_{\text{form}}$$

Example: A 5-in. radius, 10-ply lamination.

$$5 \text{ in.} (10-1)/10 = 45/10 = 4.5 \text{ in.}$$

PROJECT RADIUS

NUMBER OF PLYS

FORM RADIUS



6 FOAM ROLLERS SPEED GLUE-UP

Apply glue with a disposable roller. It's the quickest, easiest way to get an even glue film on each ply. Lay the plies in the form and clamp. After the glue has set, you can remove the lamination from the form and machine or shape it as you would any piece of wood. Waxed paper protects the form from excess glue.

7 CUT OUT THE MIDDLE OF A TWO-PART FORM

Mark a line parallel to the original layout line on the form blank. Set a compass to the total lamination thickness plus form liners (see Tip #8, page 40). Cut out the marked slice on the bandsaw. The result will be a perfectly matched two-part form when the lamination and liners are added. Simply cutting the form in two causes a mismatch between the two halves.

8 LINE THE FORM WITH CORK

Apply a layer of self-stick cork liner (available at home centers, 12-in. x 4-ft. sheet, \$6) to the form. This liner helps even out irregularities in the sawn form. Cork also creates a nonslip surface that aids in holding the lamination to the form as you apply clamping pressure.



9 ONE-PART FORMS HANDLE SHARP CURVES

Use a one-part form for curves in excess of 180 degrees or for complex shapes. A one-part form is easier to make than a two-part form, but it does require numerous clamps and that can make glue-up more challenging. Because pressure is applied only where the clamps are located, using a one-part form can result in some crushed wood fibers, an uneven surface and gaps in the glue lines. Most of these problems can be avoided by simply not overtightening the clamps. Use clamp blocks and plenty of clamps to help spread the clamp pressure evenly.



10 TWO-PART FORMS APPLY EVEN PRESSURE

Use a two-part form whenever possible to clamp the plies together. Two-part forms are the best choice for gentle curves under 180 degrees. The two parts apply even clamping pressure along the lamination's entire length.

Using glued-up sheet stock is a quick, easy way to make a form blank. Waxed paper protects the form from glue squeeze-out.

by George Vondriska

THE FESTOOL TS 55 EQ

THIS PRECISION SAW
AND GUIDE-RAIL
SYSTEM MAKES
EXTREMELY
CLEAN CUTS
IN PLYWOOD.



EDITOR: TOM CASPAR • ART DIRECTION: JOE GOHMAN • PHOTOGRAPHY: BILL ZUEHLKE

What's your trick for cutting up a full sheet of plywood? Do you flop it onto your tablesaw and wrestle it past the blade? Do you use a circular saw and gnash your teeth over chipped veneer and a wandering, burnt edge? If so, help is on the way.

The Festool TS 55 EQ plunge-cutting circular saw and guide rail (\$430) make cutting plywood as easy as one, two, three. The results are amazing (Photo 1). You won't get ragged edges, even with such chip-prone materials as melamine or oak plywood. And every cut will be right on the money (Photo 2). You can also use this system for cutting solid wood as thick as 1-15/16 in.

Best of all, you can do all your cutting on a pair of sawhorses. This system is a good alternative to a panel saw or a sliding table for your tablesaw. It's more portable, takes up a lot less space and costs less.

HIGH-QUALITY CUTS

The Festool TS 55 EQ saw and guide rail work together to reduce chipping to a minimum. Both have replaceable zero-clearance splinter guards (Photos 3 and 4).

The saw is engineered to minimize run-out in the arbor and blade. The result is a smoother cut than other saws can make. The blade that comes with the TS 55 EQ is similar to a high-quality tablesaw blade designed to cut plywood. A riving knife helps prevent binding in solid wood and scoring plywood as the blade exits the cut (Photo 5).

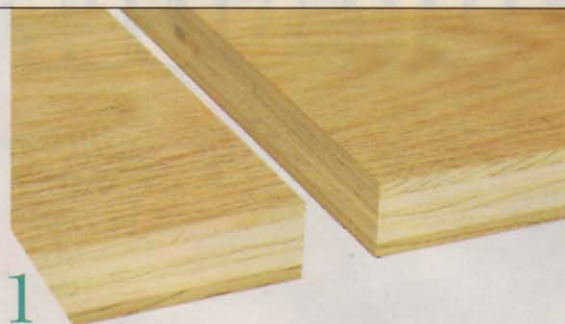
The Festool TS 55 EQ has a 10-amp motor with electronic variable speed (EVS). EVS keeps the motor running at a constant rate under load. This produces a smoother cut than cuts made by saws without EVS, which can bog down under load. Variable speed is particularly beneficial for cutting aluminum or plastic.

The TS 55 EQ's guide rail is an aluminum extrusion that's engineered to track the saw in a perfectly straight line. The guide rail has a raised bar that fits into a groove on the saw's base. The fit between the guide rail and saw can be fine-tuned by a couple adjustment knobs on the saw. Once adjusted, the saw travels very straight. There's virtually no play. A low-friction tape on top of the guide rail helps the saw glide easily.

EASY SETUP

Accurate cuts are a cinch to make with this system. You just line up the guide rail with your pencil marks, or a line, and start sawing. Your cuts will be exactly on the line.

The guide rail has rubber strips on the bottom to help the plywood stay put. Although the strips do a pretty good job, it's best to clamp the guide rail, too. You can use spring clamps, but the Festool guide-rail clamps (\$30 for two) are more convenient. They engage in a T-track on



1

Absolutely straight, virtually chip-free cuts are easy to make with the Festool TS 55 EQ (\$430). It's hard to believe that a circular saw can produce these results, but it's true.



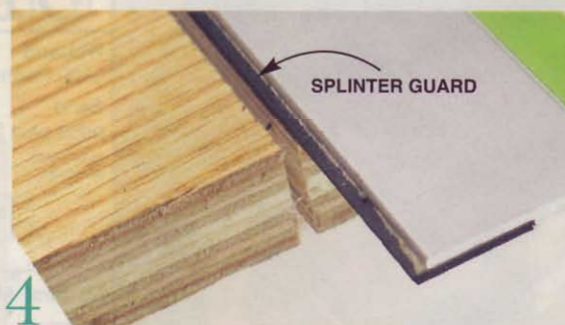
2

Making a precise cut is simple because the saw's blade cuts exactly even with the edge of the guide rail. All you have to do is position the guide rail on a pencil line. The saw travels in an absolutely straight line along a raised bar on the guide rail.



3

The saw's zero-clearance splinter guard prevents chipping on the outside edge of the blade.



4

A splinter guard on the guide rail prevents chipping on the inside edge of the blade.

the bottom of the guide rail, so there's no chance of them interfering with the cut.

This saw gives you a lot of flexibility in how you plan your cuts. The spring-loaded plunge mechanism allows you to start and stop a cut anywhere on a sheet of plywood. Start the saw with the blade retracted and depress the machine to make the cut. Allow the machine to retract by spring pressure at the end of the cut. This plunging ability is helpful for getting the maximum yield from a sheet, especially when the cuts don't line up with each other and you have to start or stop in a corner. It's very easy to preset the saw's depth of cut (Photo 6).

The one drawback to this system occurs when making identically sized pieces. With the Festool TS 55 EQ, you must lay out each cut and accurately position the guide rail each time. If you're not careful, you could accumulate a lot of error. Identical pieces are much easier to make with a tablesaw.

WHAT ELSE DOES IT DO?

Mitering a pair of very long 24-in.-wide pieces for a countertop would be tough to handle on a tablesaw, but it's a snap with the TS 55 EQ. Just position the guide rail right on the cutline.

The TS 55 EQ also works well sawing long bevels for mitered corners. Again, all you have to do is position the guide rail on a pencil line. Even when tilted, the saw cuts right on the line.

With the addition of a longer guide rail and new blade (see Source, below) the Festool system is a great way to straight-line rip solid wood. The TS 55 EQ has a maximum cutting depth of 1-15/16 in. For thicker work, Festool will introduce the TS 75 later in 2006 (\$450 to \$500, including a guide rail). It will have a 2-3/4-in. depth of cut.

The guide rail is also compatible with the Festool OF 1010 EQ plunge router (\$325, Photo 7).

ACCESSORIES

The TS 55 EQ's standard guide rail is 55 in. long. An additional 106-in. guide rail (\$190) is available.

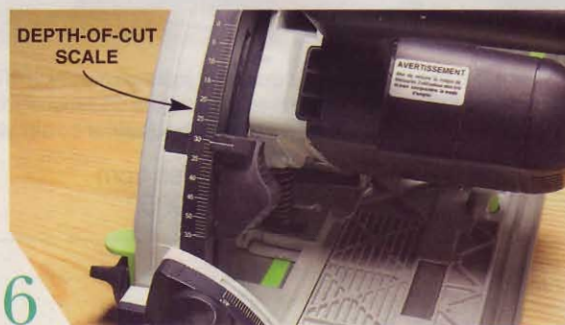
To prevent the power cord and vacuum hose from catching on the guide rail's end, Festool makes an accessory called the Deflector (\$11). I heartily recommend it. Festool also offers a large protractor-like Angle Unit (\$62) for setting up diagonal cuts.

THE FINAL ANALYSIS

The TS 55 EQ produces impressively clean cuts in plywood. It easily reduces large pieces of plywood into finished pieces. When it's connected to a shop vacuum, there's almost no dust. For an installer working away from the shop, this system provides an accurate way to field-cut



The TS 55 EQ saw is engineered very differently from other circular saws. Most importantly, its arbor has very little run-out. The saw has a riving knife to prevent binding, comes equipped with a 48-tooth plywood blade and has excellent dust extraction.



The TS 55 EQ is a plunge-cutting saw, which means you can start or stop a cut anywhere on a sheet of plywood. It's easy to lower the blade to a preset depth of cut.



The Festool OF 1010 EQ plunge router (\$325) fits on the guide rail, too. You can cut dados and rabbets to join the pieces you cut with the saw.

sheets of plywood for interior trim and casework.

So, for the home shop, do you get rid of your tablesaw? Not quite. You still can't beat a tablesaw when it comes to quick repeatability and making a wide variety of joints. The TS 55 EQ is a great companion to a tablesaw, but not a complete substitute.

Source Festool, (888) 337-8600, www.festoolusa.com
 TS 55 EQ, #561174, \$430. Ripping blade, #439685, \$30. 106-in. guide rail, #491937, \$192. Replacement splinter guards for saws, #491473, \$13 for five. Replacement splinter guard for 55-in. guide rail, #483164, \$9. Angle Unit, #491588, \$62. Deflector, #489022, \$11. Clamps, #489570, \$30 for two.

Bookcase *Entertainment* Center

By Randy Johnson

This eye-catcher uses simple biscuit joinery.
Its modular design keeps the
cabinets easy to handle and install.

If you're like most people, you'd probably like more storage space for your books and collectibles. If you've also been looking for a place to put one of the new wide-screen televisions, then this cabinet has everything you desire. The cherry wood and Craftsman-styled details give it a warm traditional look.

This cabinet makes extensive use of biscuit joinery, which keeps assembly of the cabinets and the miters on the baseboard and on the crown straightforward. It's built in eight main sections (Fig. A, page 50), each built separately and then jointed together when all are complete. This approach makes it possible to build the large cabinet even in a fairly small shop, as long as you have a large enough area to do final assembly. In the shop where I worked, I found room along the garage door.

The TV opening in this cabinet is 60 in. wide by 40 in. tall by 21 in. deep. This space is big enough for most of the newer LCD and DLP 50-in. wide-screen projection TVs and even some that are bigger. A word of caution, though: TV dimensions vary widely from model to model. If you plan to build this cabinet, I recommend you buy your TV first or at least get the exact dimensions. Then you can adjust the dimensions of the TV opening, if necessary. Pay particular attention to your TV's rear ventilation requirements and adjust the dimension on your cabinet as needed.





PROJECT REQUIREMENTS AT A GLANCE

Materials:

Four sheets of 3/4-in. veneer-core cherry plywood
One sheet of 1/4-in. fibercore cherry plywood
Four sheets of 3/4-in. veneer-core birch plywood
45 bd. ft. of 4/4 cherry lumber

Seven pairs of no-mortise door hinges
Two pairs of full-extension drawer slides
Glass for door and shelves
Stain and topcoat

Tools:

Biscuit joiner
Brad nailer
Compound miter saw
Cordless drill
Jointer
Planer
Router and router table
Tablesaw
Clamps
Dado blade

Doweling jig

Edge-band iron and trimmer
2-in. hole saw
Rabbeting router bit
45-degree chamfer router bit
Rail-and-stile router bit set

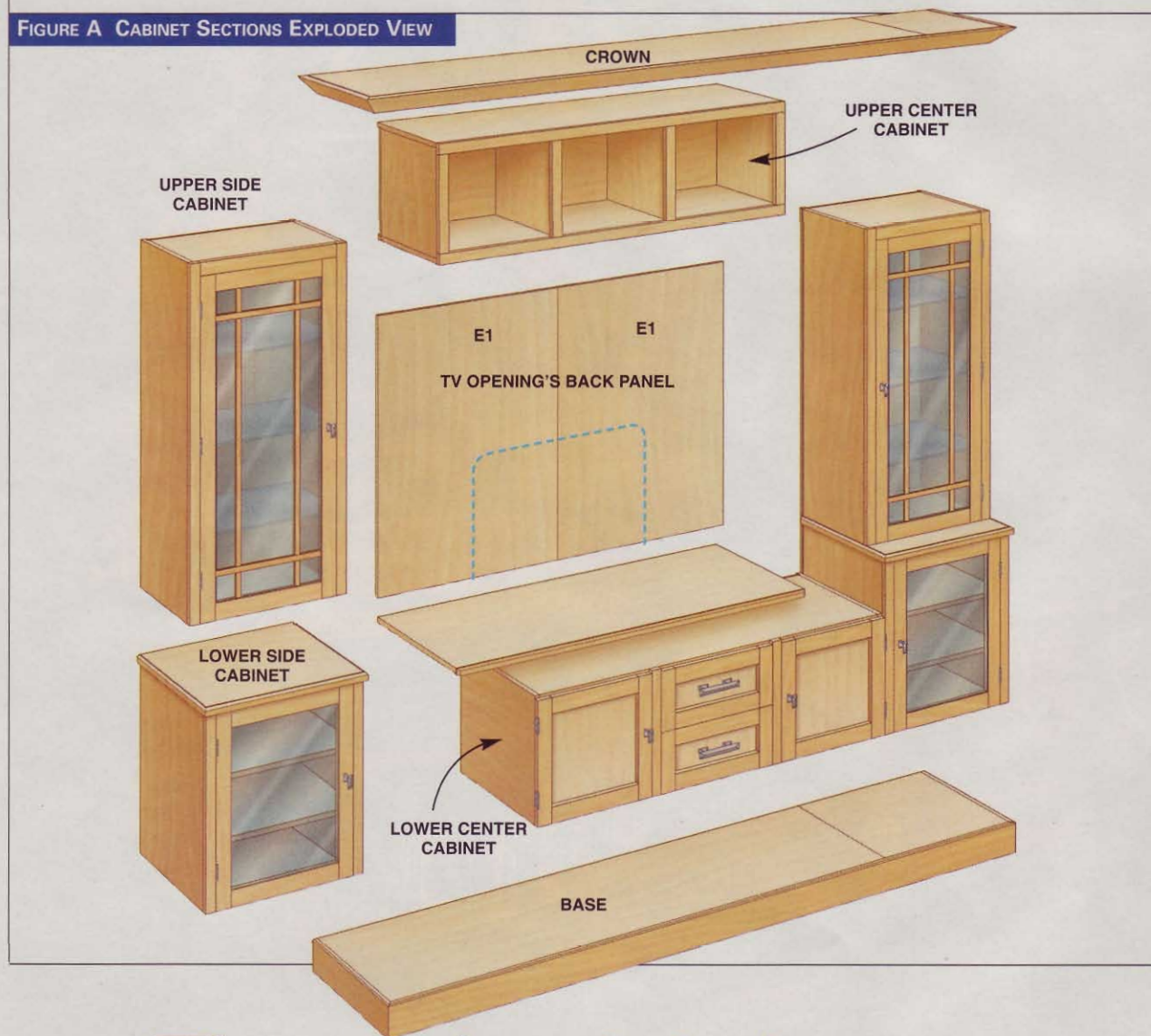
Hardware:

Shelf pins
Connector bolts
Assorted screws
Magnetic catches
Glass retainer clips
Threaded inserts
No. 20 biscuits

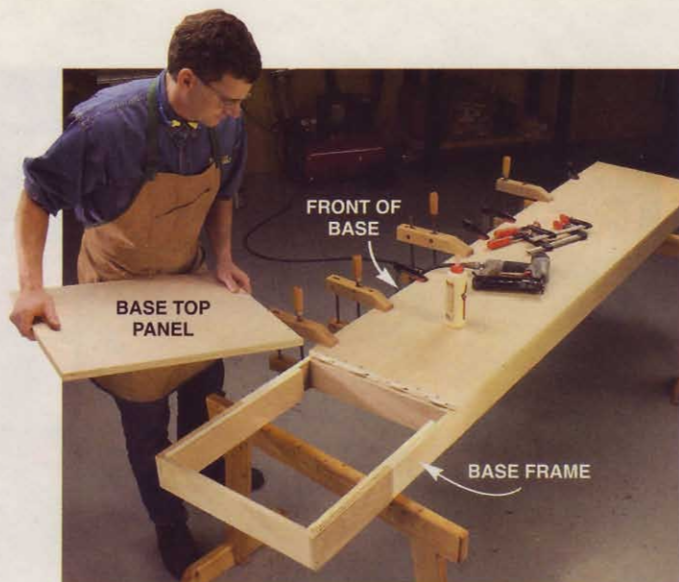
Cost:

Approximately \$1,100

FIGURE A CABINET SECTIONS EXPLODED VIEW



The sectional design of this cabinet makes for easy handling during assembly and installation.

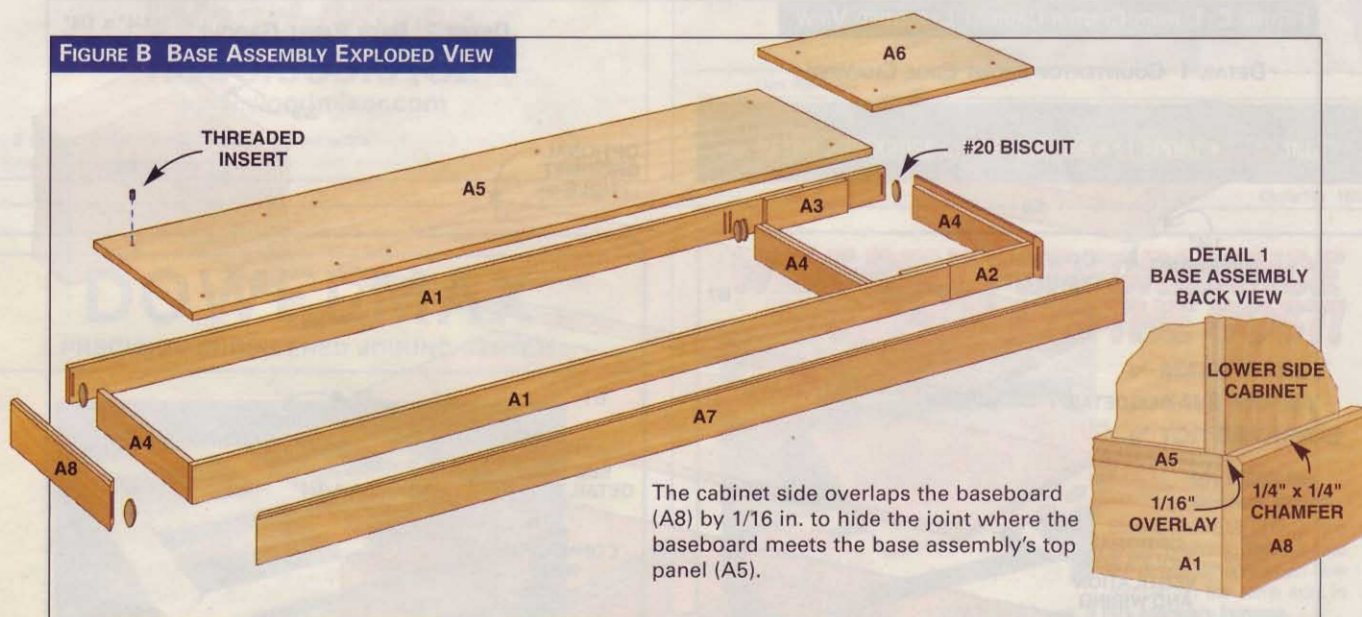


1 Start by assembling the base. Brad-nailing makes quick work of fastening panels to the frame. Along the front edge, however, I use clamps to avoid nail holes, which would otherwise show when the lower cabinet doors are open.



2 Add the solid-wood baseboard to the base frame using glue and clamps. No need for nails here. The mitered corner contains a single biscuit that helps with alignment and strengthens the joint.

FIGURE B BASE ASSEMBLY EXPLODED VIEW



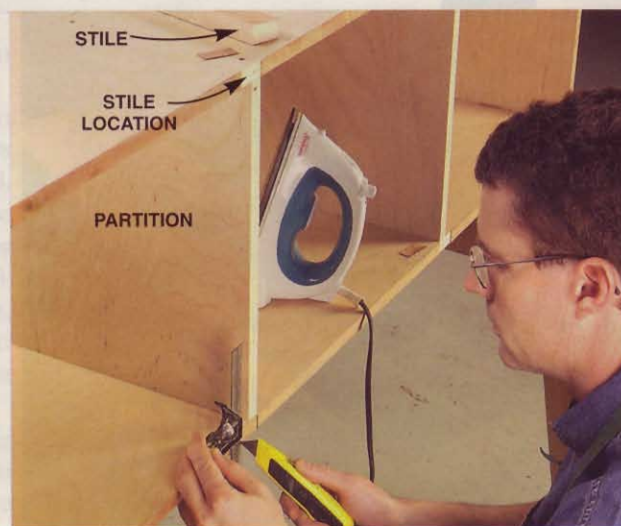
The cabinet side overlaps the baseboard (A8) by 1/16 in. to hide the joint where the baseboard meets the base assembly's top panel (A5).

LAY OUT YOUR PLYWOOD FIRST

Pick the best looking sheets for the sides of the lower side cabinets and sides of the upper side cabinets (C2, D2). These pieces are arranged on the plywood layout (see Fig. M, page 59), so the grain matches when the cabinets are assembled. I used birch plywood for the inner parts of the lower cabinet rather than cherry plywood and saved about \$250 on materials. When stained, the color of the birch plywood becomes very similar to the stained cherry plywood.

BUILD THE BASE ASSEMBLY

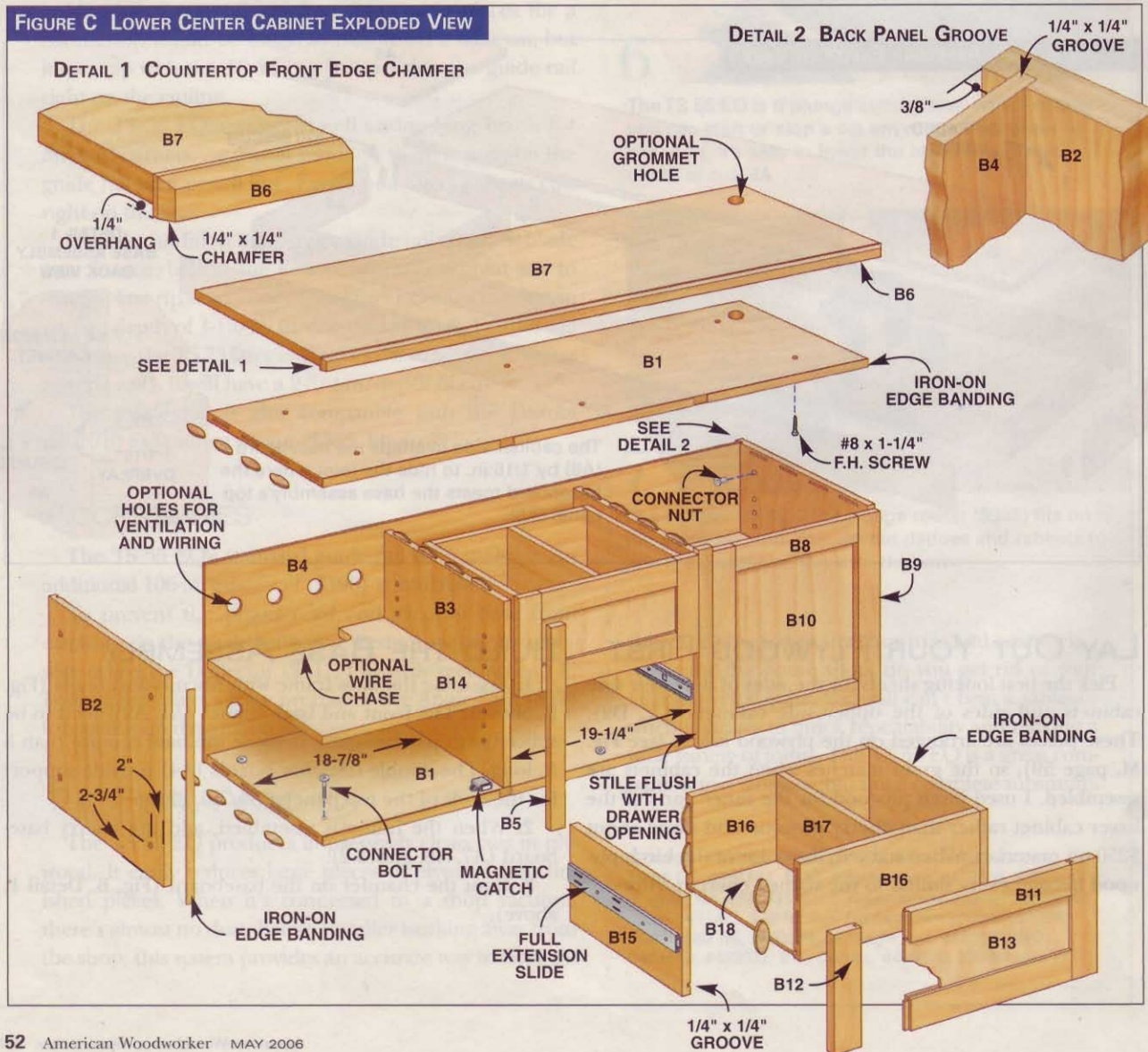
1. Assemble the base frame with biscuits and brads (Fig. B, above). The front and back frames (A1, A2) need to be spliced with patches (A3), because the base is more than 8 ft. long. The double stretcher boards (A4) provide support for the ends of the top panels (A5, A6, Photo 1).
2. When the frame is assembled, add the cherry baseboard (A7, A8, Photo 2).
3. Rout the chamfer on the baseboard (Fig. B, Detail 1, above).



3 Check that your cabinet boxes are square. Both corner-to-corner diagonal measurements should be the same. If they're not, raise the clamps on the corner with the long dimension and apply pressure until both diagonal measurements match.

4 Trim away the edge banding where the stiles attach to the top and bottom panels. This allows the stiles to be tightly glued to the partitions.

FIGURE C LOWER CENTER CABINET EXPLODED VIEW



BUILD THE LOWER CENTER CABINET

4. Cut out the cabinet bottom, top, sides and partitions (B1, B2, B3, Fig. C, page 52).

5. In the side panels, cut a groove for the back (B4, Fig. C, Detail 2).

6. Cut slots for the biscuit joinery.

7. Edge-band the front edge of the top, bottom and side panels, but not the partitions (see Sources, page 59).

8. Sand the inside surfaces of the plywood parts—it will save you time and hassle later on.

9. Assemble the parts with biscuits and screws. Use masking tape next to the joints to catch any glue that squeezes out.

10. Check that the cabinet is square. Use offset clamps to pull it square, if needed. (Photo 3). Slide the back in and secure it with screws.

11. Trim the edge banding (Photo 4) so the stiles (B5) can be glued tightly against the partitions (B3). First trace the location by holding the stile in place. Then cut on the line with a knife, heat up the cut section of edge banding and peel it off.

12. Glue and clamp the stiles to the partitions.

13. Glue the edge strip (B6) to the countertop (B7) and rout a chamfer on the top edge and ends (Fig. C, Detail 1).

14. Attach the countertop to the lower center cabinet with screws.

BUILD THE LOWER SIDE CABINETS

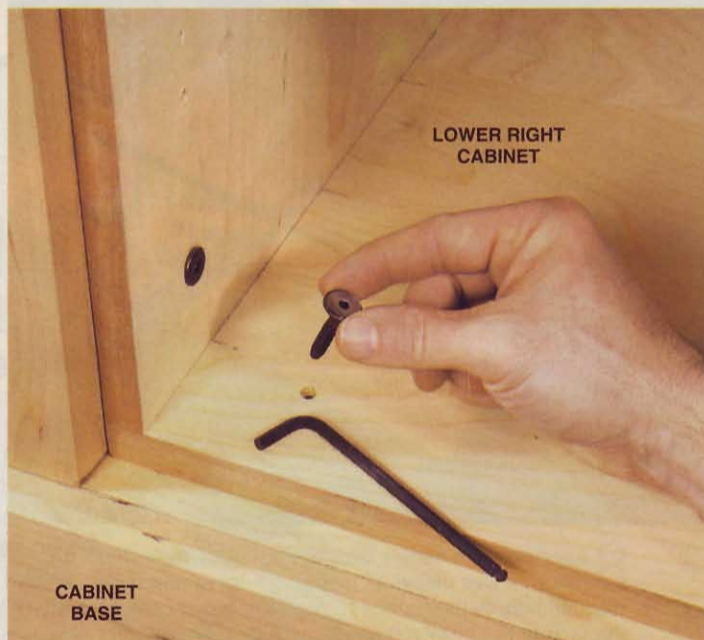
15. Cut out and assemble the parts (C1 through C4) for the lower side cabinets (Fig. D, page 54). Note that the cabinet sides (C2, D2) facing the TV opening have a groove on both sides (Fig. F, page 54). One groove is for the backs of the cabinets and the other is for the TV opening's back panel (E1).

16. Add edge strips (C5, C6, C7) to the countertop (C8) and chamfer the top corners. Also notch the inner corner of the countertop for the tongue of the TV panel (Fig. F).

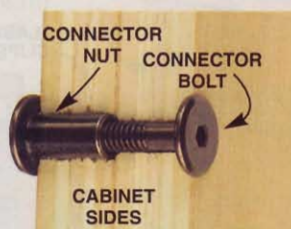
17. Use connector bolts to join the lower side cabinets to the lower center cabinet (Photos 5 and 6); see Sources, page 59).

18. Next, join this trio of cabinets to the base with connector bolts and threaded inserts (Photo 7). The side cabinets should overlap the baseboard by 1/16 in. (Fig. B, Detail 1, page 51). This overlap hides the seam between the baseboard and the top panel (A5) of the base assembly.

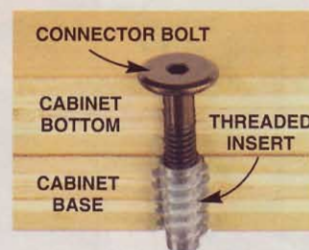
19. To accurately locate the threaded inserts in the base, I found it best to drill through both the bottoms of the lower cabinets and the base at the same time using a 1/4-in. drill bit, which is the right size for the coupler bolt. Then slide the cabinets aside and enlarge the holes in the base to 3/8 in. for the threaded inserts.



5 Attach the lower cabinets to each other and then to the base. Connector bolts make it easy to disassemble and reassemble the cabinet for finishing and moving.



6 Use connector bolts with nuts for the cabinet-to-cabinet connection.



7 Use connector bolts and threaded inserts for the cabinet-to-base connections.

BUILD THE TV OPENING'S BACK PANEL

20. Because the TV opening's back panel (E1) is 60-1/4 in. wide, you'll need to edge-glue two pieces of plywood together (Photo 8). When carefully biscuitted, these two pieces will glue up flush and only require a little sanding to knock down any ridge between the pieces.

21. When the back panel is the correct size, rout a rabbet along the top edge and two sides (Fig. E, page 54). The resulting tongue fits into the grooves on the sides of the side cabinets and the bottom of the upper center cabinet. This tongue-and-groove joint holds the TV opening's back panel in place and prevents any gaps around its perimeter that might be caused by it or the side cabinets being slightly out of square.

22. Slide the TV opening's back panel into place between the lower side cabinets.



9 Use connector bolts to attach the upper side cabinets to the lower side cabinets. The countertop is sandwiched between them.

FIGURE E RABBIT DETAIL ON TV BACK PANEL

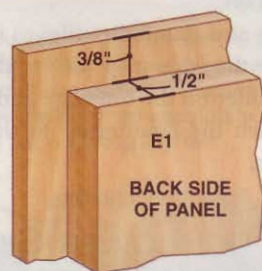
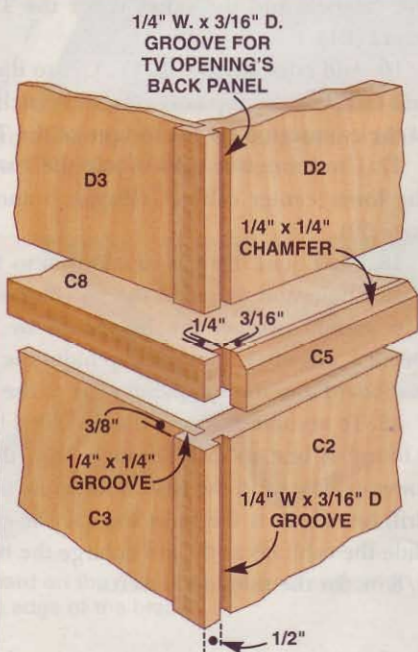
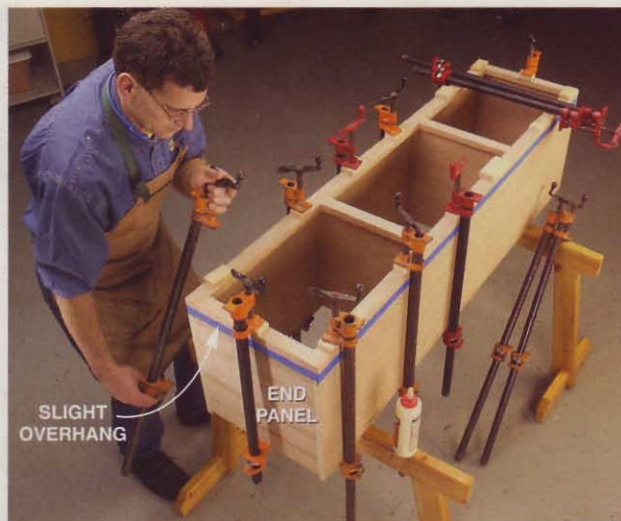


FIGURE F DETAIL OF GROOVES FOR CABINET BACKS AND TV BACK PANEL



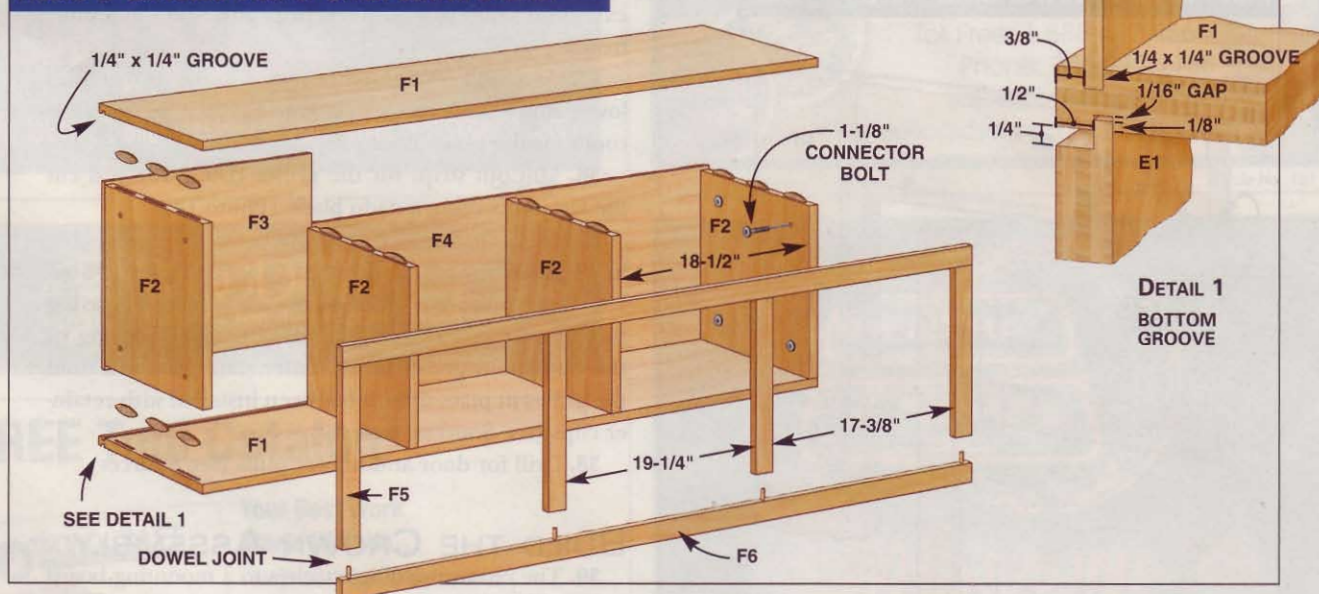


10 Glue the face frame to the upper center cabinet. The stiles overhang the cabinet by a small amount. This ensures a tight joint between these stiles and the stiles of the upper side cabinets.



11 Install the upper center cabinet. Use support boards to hold the center cabinet in position. Join it to the upper side cabinets using connector bolts and nuts.

FIGURE G EXPLODED VIEW OF UPPER CENTER CABINET



BUILD THE UPPER SIDE CABINETS

23. Cut and assemble the parts for the upper side cabinets (D1 through D5, Fig. D). Only the front edge of the bottom (D1) needs edge banding. The edges of the cabinet sides (D2) and top (D1) are covered by the three-sided face frame.

24. Use coupler bolts and nuts to attach the upper side cabinets to the lower side cabinets. Sandwich the counter-top between them (Photo 9).

BUILD THE UPPER CENTER CABINET

25. Cut out and assemble the parts (F1, F2, Fig. G, above).

26. Slide in the back panels (F3, F4), and attach with

screws. The back is in two parts so the grain can run vertically.

27. Assemble the face frame (F5, F6) using dowels.

28. Attach the face frame to the cabinet. The face frame should overhang by $1/32$ in. on each end (Photo 10). This ensures that these stiles pull up tight to the upper side cabinets' stiles when they are joined together.

29. Position the upper center cabinet between the upper side cabinets. (Photo 11). The groove on the bottom of the upper center cabinet (Fig. G, above) fits onto the tongue on the top of the TV opening's back panel.

30. Clamp the upper center cabinet to the upper side cabinets and drill for the coupler bolts.

31. Install the coupler bolts and remove the clamps.

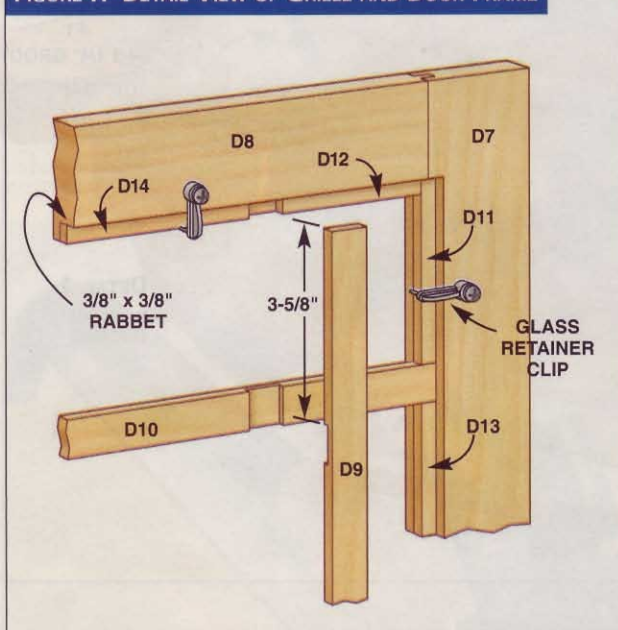


12 Rout the rails and stiles for the doors. Featherboards keep the parts snug against the fence and table for accurate routing. I used a rail-and-stile router bit set with a chamfer profile to match the chamfers on the baseboard and countertops.



13 Rout a rabbet in the back inside edge of the doors that receive glass. Chisel the rounded corners square.

FIGURE H DETAIL VIEW OF GRILLE AND DOOR FRAME



BUILD THE DOORS AND DRAWERS

The doors and drawer fronts are all inset flush with the face frames. Inset doors are more work to fit and install, but they provide a nice clean look to the final cabinet. For a complete description of how to fit and install inset doors, see "How to Hang Inset Doors," page 66.

32. Rout the rails and stiles (B8, B9, B11, B12, C10, C11, D7, D8, Photo 12 and Fig. H). I used a router bit with a chamfered profile to go along with the chamfered details on the baseboard and countertops (see Sources, page 59).

33. Cut out the panels (B10, B13) for the lower center cabinet doors and drawer fronts and assemble them.

34. Build the drawer boxes and install them on full-extension slides (see Sources, page 59). Add the drawer fronts.

35. Assemble the door frames for the upper and lower side cabinet and rout out the back lip to make room for the glass (Photo 13).

36. Mill out strips for the grilles (D9, D10) and cut the lap joints using a dado blade (Photo 14).

37. Fit the grilles into the upper side doors and glue in the filler strips (D11 through D14, Fig. H, left; Photo 15). Don't glue the grille to the door frame. Leaving them removable makes final sanding and finishing of the doors and grilles much easier. The glass will hold the grilles in place after it has been installed with retainers (see Sources, page 59).

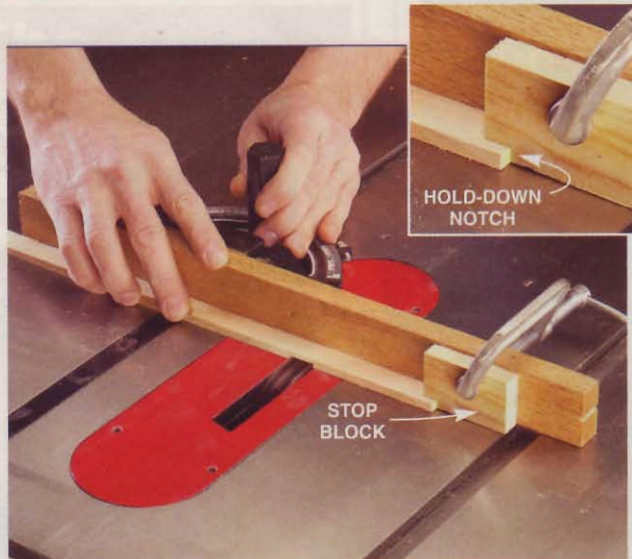
38. Drill for door and drawer pulls (see Sources).

BUILD THE CROWN ASSEMBLY

39. The crown molding attaches to a mounting board and glue blocks, creating a single assembly (Fig. L, page 58), that is then attached to the top of the other cabinets.

40. A lip on its bottom side fits over the top of the cabinets the way a lid rests on a shoe box (Fig. J, page 58). For this reason, it's important that the mounting board (made of G1 and G2) be correctly sized. I've provided "in a perfect world" dimensions in the Cutting List on page 60, but you should take a measurement off the top of your cabinet and adjust the size of your mounting board accordingly. The length is the most critical measurement. If it's too short, the crown assembly will simply not go on, and you will have to do some creative chiseling or scraping to make it to fit. In fact, I recommend making your mounting board 1/32 in. to 1/16 in. longer than the overall measurement at your upper cabinets.

41. When you have the mounting board cut, add the



14 Cut the lap joints in the grille parts using a dado blade. A notched stop block guarantees the location of the lap joint will be the same on all the grilles. The notch also holds the grille part against the saw table.

front and back frames (G4, G5, G6). Pay special attention that the distance between the frames and the mounting board's ends and front is 1-1/2 in. (Fig. J, page 58). Any variation here will affect the position of the angled glue blocks, which can be added next (Photo 16). Attach them by rubbing them into a generous squirt of glue and letting the glue dry completely before you attach the crown molding.

42. While the glue is setting, cut out the crown molding (G9, G10).

43. The compound miters on the crown molding are most easily done on a compound miter saw. A tablesaw would work, but you will need to build a hold-down jig for your miter gauge to hold the long front molding firmly while sawing. And you will also need to support the long end that hangs off your tablesaw.

44. On your miter saw, set the miter angle to 35.26 degrees and the bevel angle to 30 degrees. Make some test cuts and see how the pieces fit. You may need to adjust your angles slightly to get a perfect fit.

45. After you've fit the miters, it's time to slot the ends for biscuits (Photo 17).

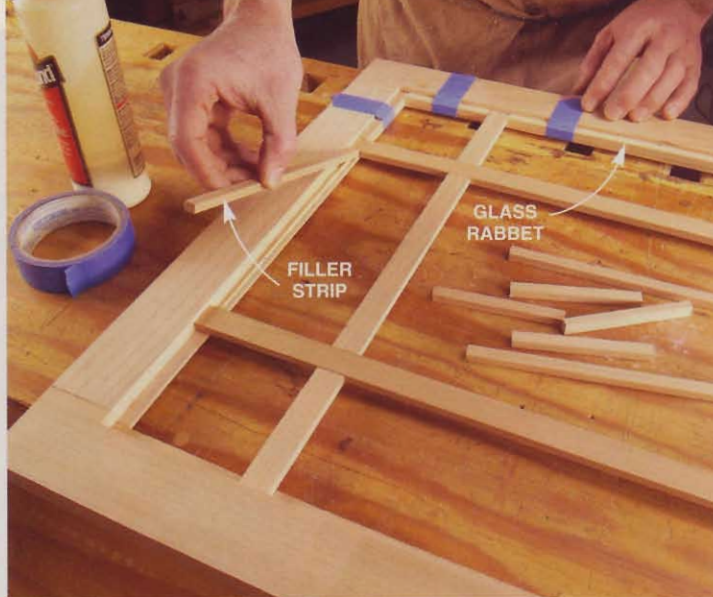
46. Glue and clamp the crown molding to the mounting board and angled glue blocks (Photo 18). Hooked clamping blocks (Fig. K, page 58) greatly simplify this task by giving you a flat place to clamp against and by applying even pressure to the molding.

47. When the glue has dried, the crown assembly can be lifted into place and screwed down (Photo 19).

COMPLETE THE FINISHING TOUCHES

48. Drill grommet holes in the cabinets and cut wire and ventilation openings in the TV back panel and cabinet backs as needed for your specific TV and other equipment.

Now that you've built your cabinet, it's time to take it apart for final sanding, staining and finishing.

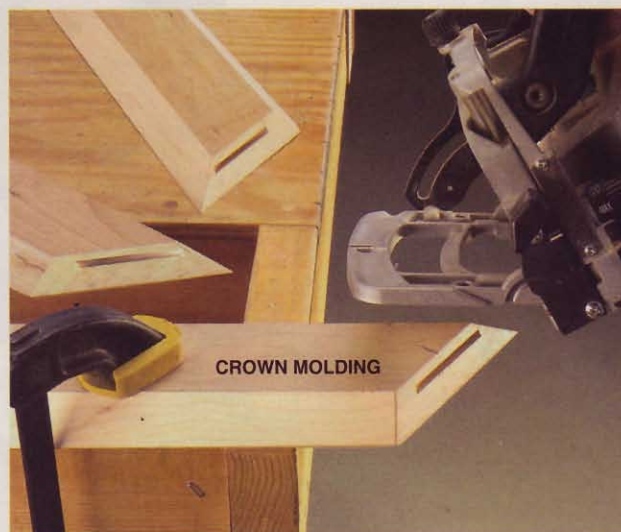


15 Glue filler strips into the rabbet in the back of the upper door frames. The filler strips are the same thickness as the grille and will leave a shallow rabbet for the glass.





16 Attach the angled glue blocks to the inner frame and mounting board. The angled blocks will support the crown molding.



17 Slot the ends of the crown molding for biscuits. Biscuits' versatility really becomes apparent when you have a challenging joint, such as this compound miter, to assemble.

FIGURE J CROSS-SECTIONAL VIEW CROWN ASSEMBLY

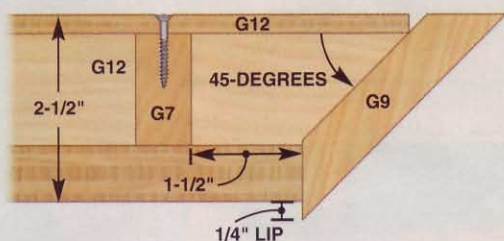


FIGURE K HOOKED CLAMPING BLOCK

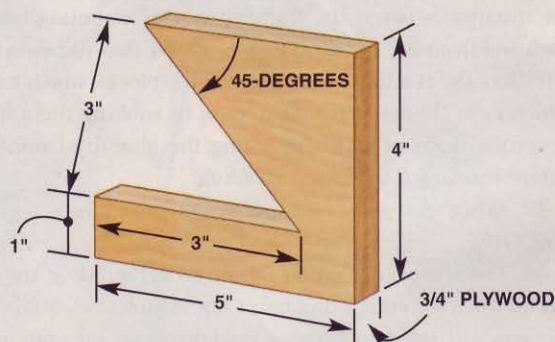
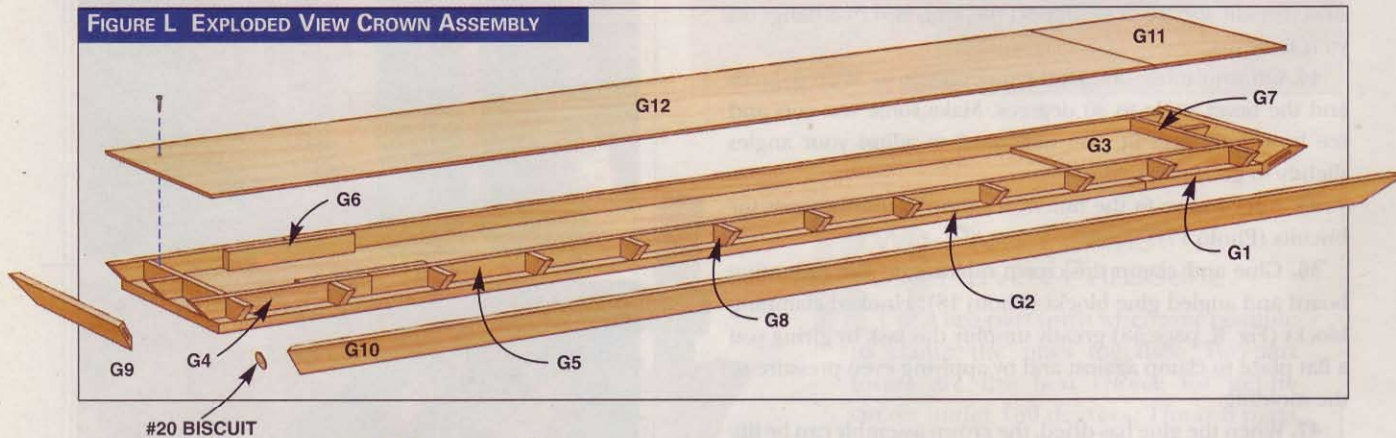
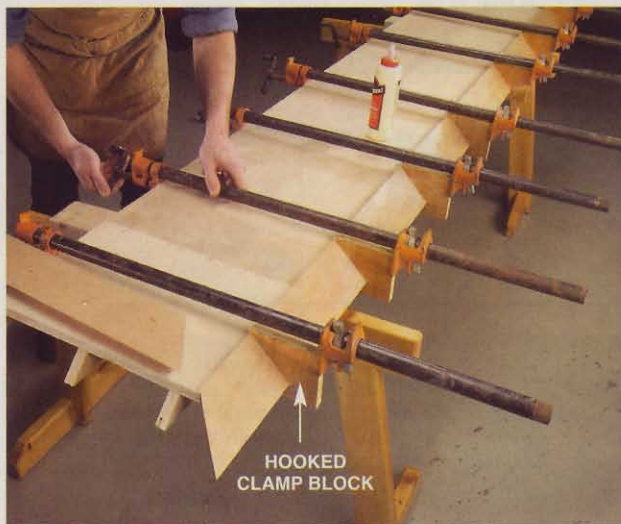


FIGURE L EXPLODED VIEW CROWN ASSEMBLY



Tips for cutting compound miter joints:

- If the miter is open on the face or the back side, along the entire length of the joint, you need to adjust your saw's bevel angle.
- If the joint is open at just one end of the joint, you need to adjust the miter angle.
- Getting a perfect fit usually requires fine-tuning both angles.

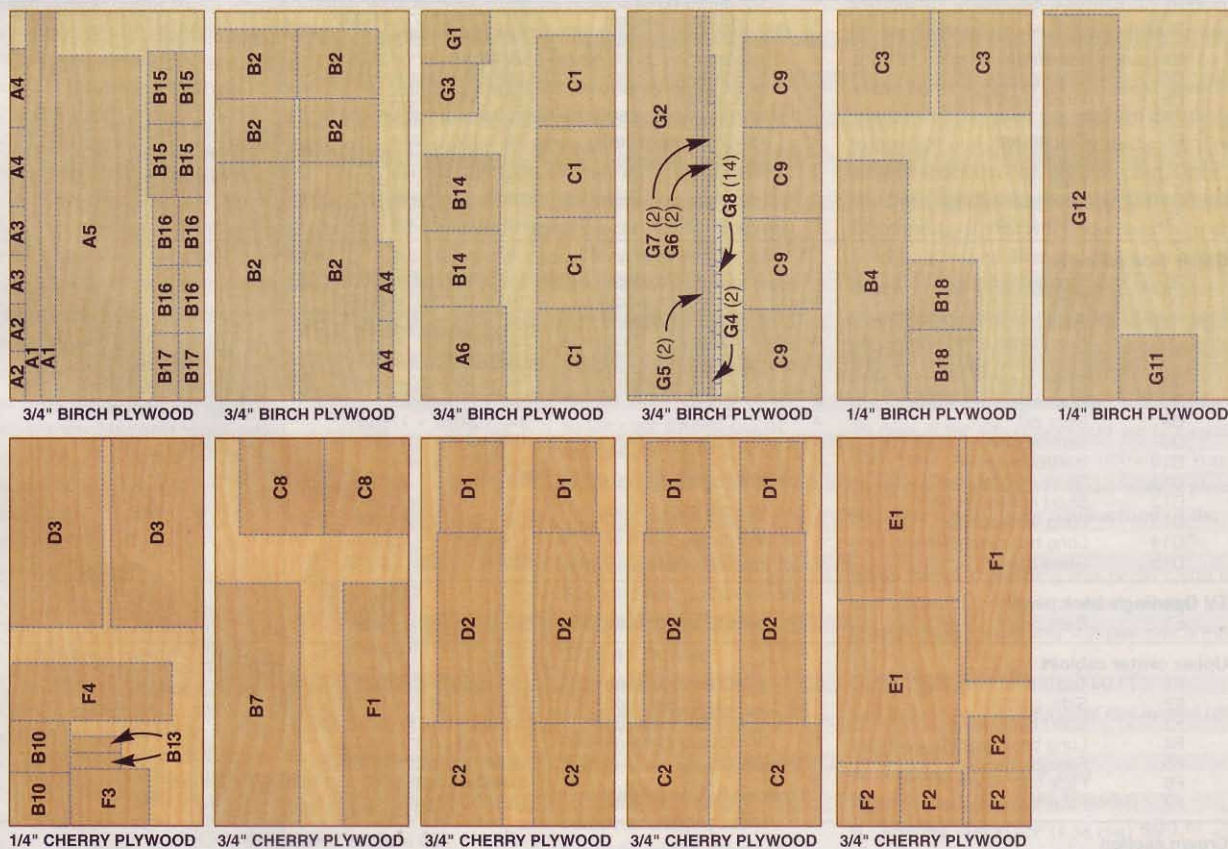


18 Glue the crown molding to the mounting board. The hooked clamp blocks make it easy to hold the crown in place. Use the end crown molding to check the alignment of the front molding.



19 Screw the crown assembly to the tops of the upper cabinets. After all the doors, drawers and hardware have been fitted, take the cabinet sections apart for a final sanding, staining and finishing.

FIGURE M PLYWOOD LAYOUT DIAGRAM



Sources Amana, (800) 445-0077, www.amanatool.com Reversible bevel stile-and-rail router bit assembly, #55370, \$100. • Glass Source, (800) 588-7435, www.theglasssource.net Glass for door and shelves, approx. \$200. • Rockler Hardware, (800) 279-4441, www.rockler.com 1-1/8-in. connector bolts for joining two 3/4-in. pieces, #31831, \$3.29 per pack of eight. 2-3/4-in. connector bolts for joining three 3/4-in. pieces, #31856, \$4.39 per pack of eight. Cap nuts for connector bolts, #31815, \$3.49 per pack of eight. 1/4-in.-20 hex drive threaded inserts, #31872, \$3.39 per pack of eight. No-mortise hinges, statuary bronze, 3-in. overall length, #90437, \$3.29 per pair. 5-mm self-centering bit, #22575, \$20. • Woodworkers Hardware, (800) 383-0130, www.woodworkershardware.com Glass panel clips for upper doors, 3/16-in. offset, brown, #LAH262, \$4 per 20. Glass panel clips for lower doors, 5/16-in. offset, brown, #LAH264, \$4 per 20. Belwith door pulls, #BWP2151 WOA, \$4.38 ea. Belwith drawer handles, #BWP2153 WOA, \$5.13 ea. Full-extension drawer slides, 18-in., #KV8400B18, \$11.50 a set. 5-mm spoon shelf supports, antique brass, #HB214, \$2.20 per pack of 20. Cherry pregglued iron-on edge tape/banding, 7/8 in. x 25 ft., #ET078PCH25, \$7 per roll. 5/64-in. self-centering bit for hinges, #VB3, \$7.

CUTTING LIST

OVERALL DIMENSIONS: 21-3/4" DEEP X 113-11/16" WIDE X 79-1/2" TALL

Part	Name	Qty.	Material	Dimensions (T x W x L)	
Base					Note: If your plywood for the front and back frames (A1, A2) is less than 3/4 in. thick, adjust the length of the stretchers (A4) so the final width of the plywood frame assembly, without the baseboard, equals 20-15/16 in.
A1	Long front, back frame	2	Birch plywood	3/4" x 3-3/4" x 96"	
A2	Short front, back frame	2	Birch plywood	3/4" x 3-3/4" x 11-7/8"	
A3	Patch	2	Birch plywood	3/4" x 3-3/4" x 12"	
A4	Stretchers	4	Birch plywood	3/4" x 3-3/4" x 19-7/16"	
A5	Long top panel	1	Birch plywood	3/4" x 20-15/16" x 84-7/8"	
A6	Short top panel	1	Birch plywood	3/4" x 20-15/16" x 23"	
A7	Front baseboard	1	Cherry	13/16" x 4-1/2" x 109-1/2"	
A8	End baseboard	2	Cherry	13/16" x 4-1/2" x 21-3/4"	
Lower center cabinet					Note: If your plywood for the sides (B2) is less than 3/4 in. thick, adjust the length of the top and bottom (B1) so the final width of the lower center cabinet equals 60 in. Also, if your plywood for the top and bottom (B1) is less than 3/4 in. thick, adjust the length of the partitions (B3) so the final height of the lower center cabinet, excluding countertop, equals 17-1/4 in. when measured at the partitions.
B1	Top, bottom	2	Birch plywood	3/4" x 19-9/16" x 58-1/2"	
B2	Side	2	Birch plywood	3/4" x 20-3/16" x 17-1/4"	
B3	Partition	2	Birch plywood	3/4" x 19-9/16" x 15-3/4"	
B4	Back	1	Birch plywood	1/4" x 17-1/4" x 59"	
B5	Face-frame stile	2	Cherry	13/16" x 1-1/2" x 17-1/4"	
B6	Edge strip	1	Cherry	3/8" x 1" x 60"	
B7	Countertop	1	Cherry plywood	3/4" x 21" x 60"	
B8	Boor rail	4	Cherry	3/4" x 2-1/4" x 14-1/8"	
B9	Door stile	4	Cherry	3/4" x 2-1/4" x 17"	
B10	Door panel	2	Cherry plywood	1/4" x 13-3/16" x 14-1/16"	
B11	Drawer front rail	4	Cherry	3/4" x 2-1/4" x 15-1/2"	
B12	Drawer front stile	4	Cherry	3/4" x 2-1/4" x 8-1/2"	
B13	Drawer front panel	2	Cherry plywood	1/4" x 15-7/16" x 4-11/16"	
B14	Shelf	2	Birch plywood	3/4" x 19-7/16" x 18-3/4"	
B15	Drawer side	4	Birch plywood	3/4" x 7" x 18"	
B16	Drawer end	4	Birch plywood	3/4" x 7" x 16-3/4"	
B17	Drawer divider	2	Birch plywood	3/4" x 6-3/8" x 16-1/2"	
B18	Drawer bottom	2	Birch plywood	1/4" x 17" x 17-1/4"	
Lower side cabinets					Note: If your plywood for the sides (C2) is less than 3/4 in. thick, adjust the length of the tops and bottoms (C1) so the final width of each lower side cabinet equals 24 in.
C1	Top, bottom	4	Birch plywood	3/4" x 19-9/16" x 22-1/2"	
C2	Side	4	Cherry plywood	3/4" x 20-3/16" x 25-3/4"	
C3	Back	2	Birch plywood	1/4" x 23" x 25-3/4"	
C4	Face-frame stile	4	Cherry	13/16" x 1-1/2" x 25-3/4"	
C5	Inner edge strip	2	Cherry	3/8" x 1" x 20-5/8"	
C6	Front edge strip	2	Cherry	3/8" x 1" x 24-3/4"	
C7	Outer edge strip	2	Cherry	3/8" x 1" x 21-3/8"	
C8	Countertop	2	Cherry plywood	3/4" x 21" x 24"	
C9	Shelf	4	Birch plywood	3/4" x 19-7/16" x 22-3/8"	
C10	Door rail	4	Cherry	3/4" x 2-1/4" x 17-1/4"	
C11	Door stile	4	Cherry	3/4" x 2-1/4" x 25-1/2"	
C12	Glass panel	2	Tempered	1/8" x 17-1/8" x 21-5/8"	
Upper side cabinets					Note: If your plywood for the sides (D2) is less than 3/4 in. thick, adjust the length of tops and bottoms (D1) so the final width of the upper side cabinets equals 24 in.
D1	Top, bottom	4	Cherry plywood	3/4" x 15-9/16" x 22-1/2"	
D2	Side	4	Cherry plywood	3/4" x 16-3/16" x 46-3/4"	
D3	Back	2	Cherry plywood	1/4" x 23" x 46-3/4"	
D4	Face-frame stile	4	Cherry	13/16" x 1-1/2" x 46-3/4"	
D5	Face-frame rail	2	Cherry	13/16" x 1-3/4" x 21"	
D6	Glass shelf	6	Polished edge	1/4" x 15-7/16" x 22-3/8"	
D7	Door stile	4	Cherry	3/4" x 2-1/4" x 45"	
D8	Door rail	4	Cherry	3/4" x 2-1/4" x 17-1/4"	
D9	Vertical grille	4	Cherry	1/4" x 3/4" x 41-1/4"	
D10	Horizontal grille	4	Cherry	1/4" x 3/4" x 17-1/4"	
D11	Short vertical filler	8	Cherry	1/4" x 3/8" x 3-5/8"	
D12	Short horizontal filler	8	Cherry	1/4" x 3/8" x 3-1/4"	
D13	Long vertical filler	4	Cherry	1/4" x 3/8" x 32-1/2"	
D14	Long horizontal filler	4	Cherry	1/4" x 3/8" x 8-1/2"	
D15	Glass panel	2	Tempered	1/8" x 17-1/2" x 41-1/8"	
TV Opening's back panel					
E1	Back panel	2	Cherry plywood	3/4" x 30-1/8" x 40-1/8"	
Upper center cabinet					Note: If your plywood for the top and bottom (F1) is less than 3/4 in. thick, adjust the length of the sides and partitions (F2) so the final height of the upper center cabinet equals 15-1/4 in.
F1	Top, bottom	2	Cherry plywood	3/4" x 16-3/16" x 59-15/16"	
F2	Side, partition	4	Cherry plywood	3/4" x 15-9/16" x 13-3/4"	
F3	Short back panel	1	Cherry plywood	1/4" x 19-5/8" x 14-1/4"	
F4	Long back panel	1	Cherry plywood	1/4" x 40-5/16" x 14-1/4"	
F5	Face-frame stile	4	Cherry	13/16" x 1-1/2" x 12"	
F6	Face-frame bottom rail	1	Cherry	13/16" x 1-1/2" x 60"	
F7	Face-frame top rail	1	Cherry	13/16" x 1-3/4" x 60"	
Crown section					Note: If your plywood for the front and back frames (G4, G5) is less than 3/4 in. thick, adjust the length of the end frames (G7) so the outside measurement of the front and back frames equals 17-1/2 in.
G1	Short mounting panel	1	Birch plywood	3/4" x 17" x 13"	
G2	Long mounting panel	1	Birch plywood	3/4" x 17" x 95"	
G3	Joint patch	1	Birch plywood	3/4" x 14" x 14"	
G4	Short front, back frame	2	Birch plywood	3/4" x 1-1/2" x 16"	
G5	Long front, back frame	2	Birch plywood	3/4" x 1-1/2" x 95"	
G6	Joint patch	2	Birch plywood	3/4" x 1-1/2" x 12"	
G7	End frame	2	Birch plywood	3/4" x 1-1/2" x 14"	
G8	Angled glue block	14	Birch plywood	3/4" x 1-1/2" x 3"	
G9	End crown	2	Cherry	3/4" x 4" x 19-7/8"	
G10	Front crown	1	Cherry	3/4" x 4" x 113-11/16"	
G11	Short top panel	1	Birch plywood	1/4" x 18-1/2" x 15-7/8"	
G12	Long top panel	1	Birch plywood	1/4" x 18-7/16" x 95"	

12 tips for better biscuit joining

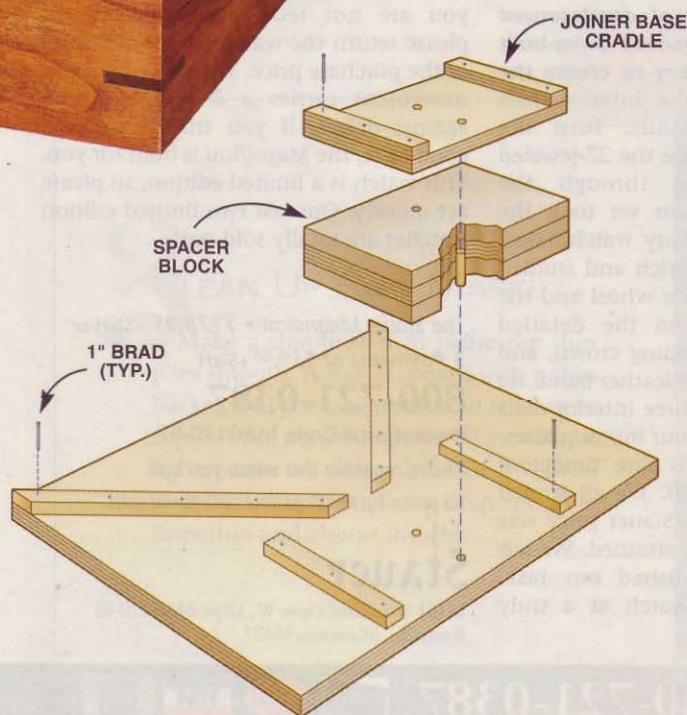
Improve Performance and Expand Function

by Richard Tendick



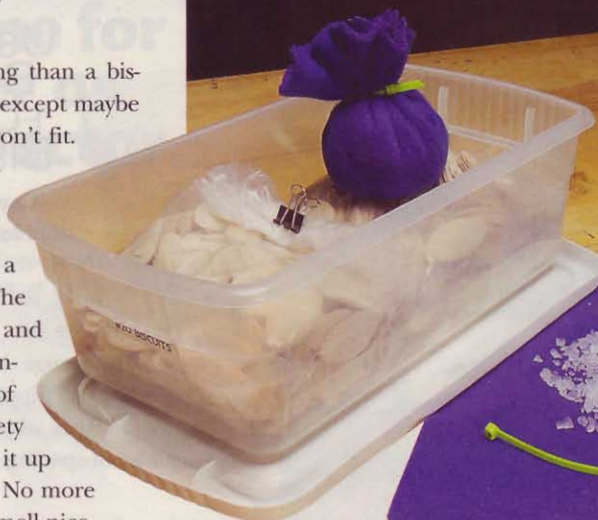
MAKE CORNER SPLINES

Decorative corner splines sure make an ordinary box look great. But they can be a bit dicey to cut on a tablesaw. Let your plate joiner come to the rescue. A simple jig holds the box and the joiner so you can cut slots quickly with minimal setup hassles. The jig is nothing more than a piece of scrap plywood with two wood strips set at 90 degrees to each other. A cradle fits around the plate joiner base and keeps it from rocking on the box corner. The cradle is indexed to the jig with a couple dowels. Use spacer blocks to adjust the spline spacing. Plunge the joiner into the wood slowly to prevent tear-out where the blade exits the wood. With this box, you only need one spacer block; just flip the box over to cut the upper slot.



PRESERVE YOUR BISCUITS WITH KITTY LITTER

Nothing is more aggravating than a biscuit that won't fit into a slot—except maybe a whole bag of biscuits that won't fit. Biscuits swell as they absorb moisture, whether from glue or the air. To prevent swollen biscuits, store them with a desiccant, such as kitty litter. The kitty litter absorbs moisture and keeps the air inside the container dry. Pour a small amount of kitty litter (the crystalline variety is less messy) onto a cloth, tie it up and toss it into the container. No more fat biscuits and they'll always smell nice.



HIGHLIGHT CAST-IN MARKS ON YOUR JOINER

The cast-in alignment marks on a joiner can be difficult to read. If you're tired of squinting, use a permanent marker to highlight the marks. The difference it makes will amaze you.

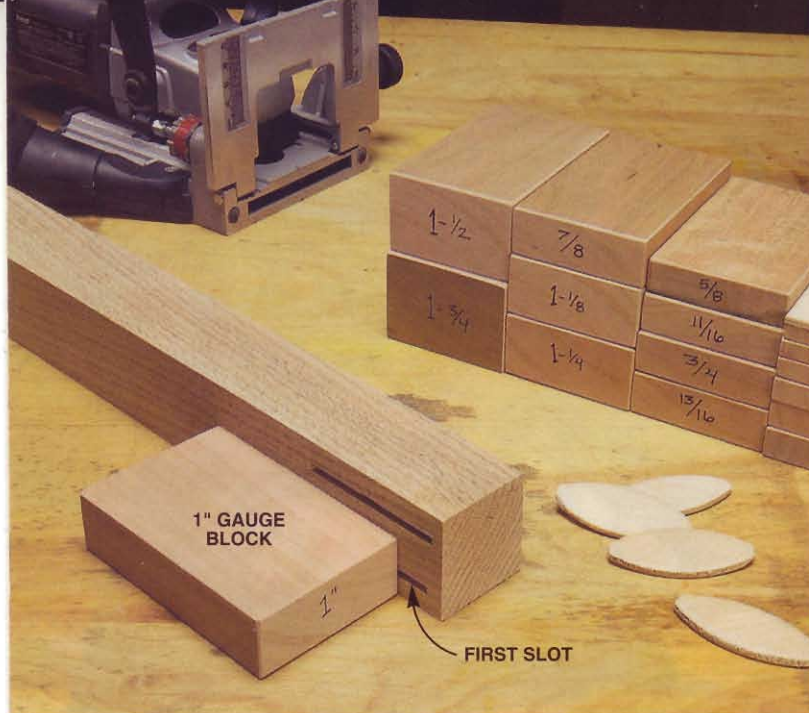


APPLY GLUE WITH AN ACID BRUSH

Glue must be evenly applied throughout the biscuit slot to get the strongest joint possible. The easiest way? Squirt some glue into the slot and then run a glue brush, sometimes called an acid brush, through the slot until the glue is evenly coated on both sides and the bottom.

Source Highland Hardware, (800) 241-6748, www.highlandhardware.com Glue brushes, #166025, \$3 for 10; #107792, \$10 for 50.





USE GAUGE BLOCKS FOR DOUBLE BISCUIT JOINTS

Gauge blocks are handy for cutting double biscuit joints. Cut the first slot with the joiner base referenced off the work surface. Then, use a spacer block under the joiner base for the second cut.

The gauge block eliminates the hassle and confusion of flipping your stock or resetting the fence. Make a whole set and you'll be covered for any biscuit-spacing need.



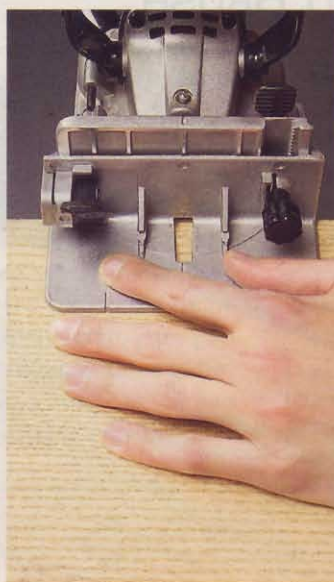
RUN BISCUITS LONG IN NARROW FRAMES

You don't have to own a mini-biscuit joiner to assemble narrow frames. If possible, simply shift the slots so the larger biscuit extends into areas where it won't be seen, for example, the top or bottom of a face frame. After the glue has dried, cut the protruding biscuit with a hand-saw. Then flush-trim with a router or sander.



HOLD THE FENCE FOR ACCURACY

It's easy to misalign a slot with both your hands on the joiner's handles. Working that way, you can't feel whether the fence is fully in contact with the stock. The slightest shift up or down on the handle can cause the biscuit slot to be cut wrong. Use one hand to hold the fence down onto the board and you'll eliminate errors.



QUICK, ACCURATE FENCE SETTINGS

Gauge blocks work great for quick, accurate fence settings. All you do is pinch the block between the fence blades. This technique will also ensure the fence is set parallel to the blade. Joiners with rack-and-pinion fence adjustments automatically set the fence parallel with the blade. For this type of joiner, use spacer blocks between the fence and a flat surface—like your benchtop—for rapid fence settings.

TAKE A QUICK TEST FOR THE RIGHT FIT

Don't use a biscuit that fits loosely in the slot. All you'll get is a weak joint. Dry-fit biscuits in their slots before glue-up. The biscuit should slide into the slot with hand pressure. Then, hold the board so the biscuits are hang-

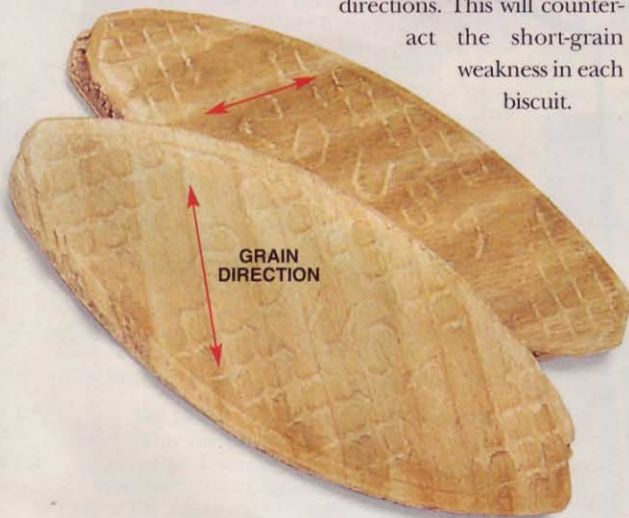
ing. A biscuit that is too loose will fall out. Don't forget to test the other side of the joint in the same way.

If you have a slot that's too big for any biscuit, glue a shim into the slot and then recut the slot.

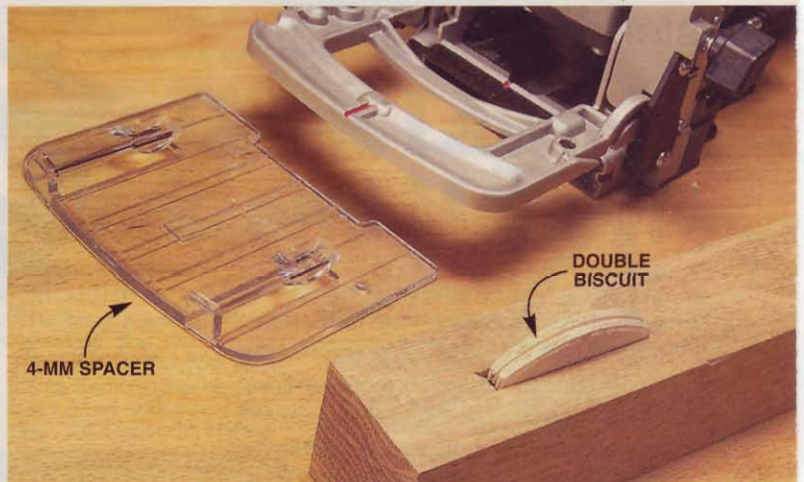
LOOSE BISCUIT

ALTERNATE GRAIN DIRECTION WHEN USING DOUBLE BISCUITS

Biscuits are made from compressed beech wood. The grain runs diagonally across the biscuit. The biscuit is weakest along this grain line. When you install two biscuits in a joint, put them in with the grains running in opposite directions. This will counteract the short-grain weakness in each biscuit.



GRAIN DIRECTION



4-MM SPACER

DOUBLE BISCUIT

CUT A DOUBLE-WIDE SLOT FOR ADDED STRENGTH

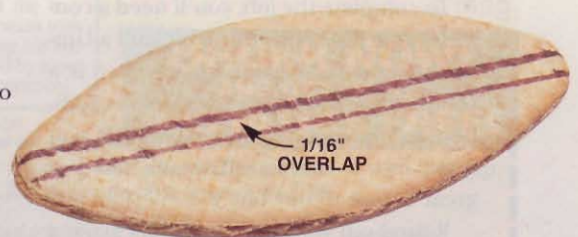
Using two biscuits in a double-wide slot is a great way to increase joint strength when the stock is too thin for two separate slots. This is especially useful when joining a 3/4-in.-thick table apron to a leg. Some manufacturers include or offer a 4-mm spacer that fits under the fence for this task, but you can easily make one yourself from scrap wood. Create the double-wide slot by inserting the spacer after the first cut. This will raise the blade just the right amount to create room for a second biscuit.

TEST THE SLOT DEPTH

Biscuit slots that are too shallow won't allow the boards to go together. Cut the slots too deep and most of the biscuit is buried in one side, weakening the joint. Here's a quick test to see whether your joiner is set right. Cut a test slot,

slip in a biscuit and draw a pencil line. Take the biscuit out, turn it around and reinsert it. A second pencil line should be 1/16 in. beyond the first line. This will provide a 1/32-in. clearance around the biscuit for excess glue.

Refer to your owner's manual to adjust the depth of cut at a given setting.



HOW TO Hang Inset Doors

by Tim Johnson

Install butt hinges perfectly and establish consistent, slender margins.

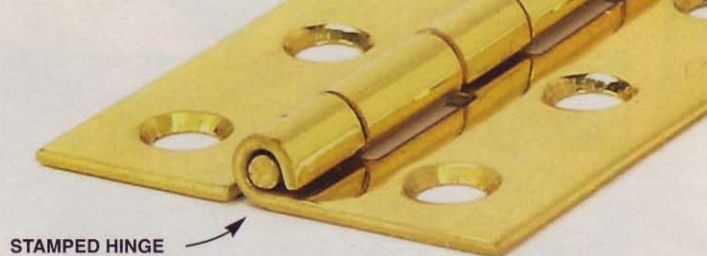
Nothing signals skillful craftsmanship like an inset door with elegant hinges and eye-pleasing margins. This challenging job leaves no room for error: Uneven surfaces and unsightly gaps will tell the tale if the hinges, door and frame don't fit precisely. Like mastering hand-cut dovetails, successfully hanging inset doors on mortised butt hinges is a woodworking milestone.

I'll show you a three-step method for installing inset doors that produces great results every time. First, you match the door to the opening. Then you rout mortises for the hinges. And finally, you create uniform, attractive margins between the door and frame. Of course, you can skip the mortising step altogether by choosing different hinges (see "No-Mortise Hinge Options," page 70).

To complete the job, you'll need a couple simple jigs, a mortising bit, and a laminate trimmer. A laminate trimmer is a compact router that's a really handy addition to any woodworking shop. (If you don't own a laminate trimmer, this is a great excuse to buy one.)

Round out your door-installing arsenal with a pair of secret weapons—a plastic laminate sample swiped from the home center and a double-bearing flush-trim router bit. This great new bit should be a fixture in every woodworking shop.





CHOOSE HINGES

Your first task is to choose between extruded (also referred to as drawn or cast) or stamped hinges (see photos, above). Extruded hinges are machined and drilled, so there's virtually no play between the knuckles or around the hinge pin. Stamped hinges are made from thinner stock. Their leaves are bent to form the knuckles that surround the pin. Extruded hinges will last longer, because their knuckles have more bearing surface.

I often use stamped hinges because they cost about one-third as much as extruded hinges and they're available at most hardware stores. They work fine in most situations. Examine stamped hinges carefully before buying. If you notice large gaps between the knuckles and vertical play between the two hinge leaves, keep looking. Be aware that

some stamped hinges are brass plated rather than solid brass. Hinges with loose pins make it easy to remove and reinstall the door, but they aren't widely available.

Before you install the hinges, make sure the screws' heads recess fully in the chamfered holes in the hinge leaves. Amazingly, the brass screws supplied with brass hinges often don't fit. If that's the case, you'll have to deepen the screw-hole chamfers or use smaller screws.

Brass screws are delicate. The heads strip easily or break off, leaving the shaft buried in the wood. Avoid trouble with broken brass screws by threading the pilot holes with steel screws, which are much more durable. Install the brass screws only once, after the piece is completely finished. Or forget brass screws altogether and leave the steel screws in.

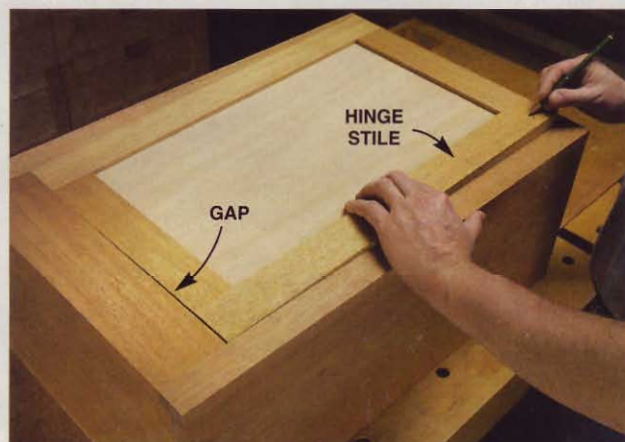
FRICTION-FIT THE DOOR

I make each door about 1/32 in. larger than its opening. Then I trim it to fit squarely and snugly. First I joint the latch stile until the door slips between the face frame's stiles without binding. Then I check the door's fit: While holding the hinge stile flush against the face frame, I butt the door's top edge against the frame's upper rail. If no gap appears, the door and opening are square. Then I joint the door's top and bottom until the door wedges into the opening—I want a friction fit, so the door stays put.

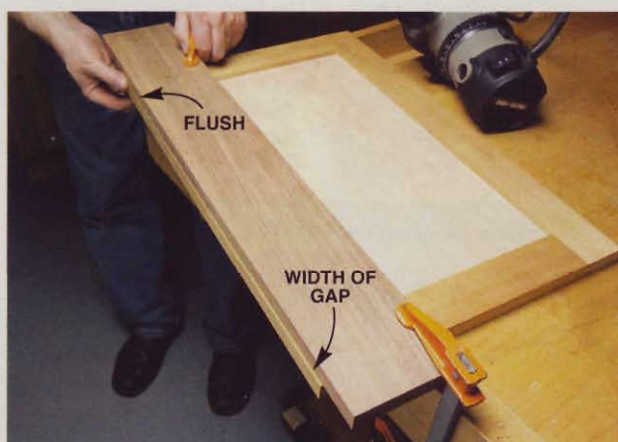
If the door or the face frame are out of square, I true them by tapering the door's hinge stile. I mark the end that needs to be tapered while I hold the door in position (Photo 1). If the gap along the top appears above the

hinge stile, as in the photo, the side's taper increases from top to bottom. If the top's gap appears above the latch stile, the side's taper runs in the opposite direction. The taper increases from zero at one end to the width of the top's gap at the other end. If the top's gap is wider than 1/16 in., I taper both the side and the end, removing one half of the gap from each edge.

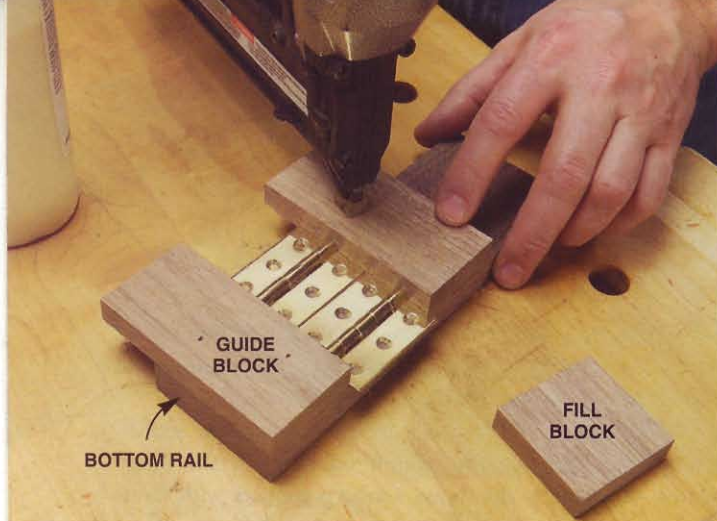
Routing is one way to taper the stile (Photo 2). You could also use a hand plane or your jointer. Just make sure the taper runs the full length and the tapered edge is perpendicular to the door's face. When both the hinge stile and top edge fit properly without any gaps, trim the bottom edge so the door fits snugly in the opening.



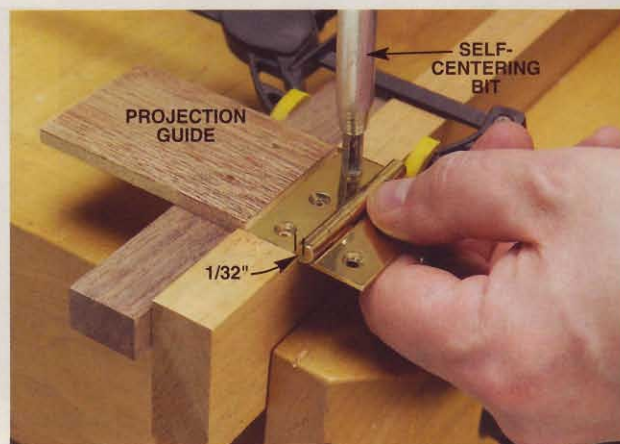
1 True an out-of-square door by tapering the side, rather than the end. The side is longer, so the taper will be more gradual and less noticeable. In this case, making the hinge stile narrower at the marked end will eliminate the gap at the top.



2 Taper the side with a straight board and a flush-trim bit. Position the board so it's offset by the width of the gap at the marked end and flush at the other end. Routing this taper eliminates the guesswork associated with creating tapers with a jointer.



3 Use the hinges to make your mortising jig. This guarantees that the hinges will perfectly fit the mortises. After installing the guide blocks, add the fill block to provide continuous support for the router.



4 Locate the hinges on a test piece, using a projection guide to position the center of the barrel $1/32$ in. out from the board's face. Drill pilot holes using a self-centering bit.

FIGURE A HINGE-MORTISING JIG



This jig requires a mortising bit with a top-mounted bearing (Photo 6; Sources, page 70). Both guide blocks are perpendicular to the bottom rail. The distance between the guide blocks is the length of the hinge. The fill block sets the mortises' width; its setback ensures through mortises.

FIGURE B HINGE PROJECTION GUIDE

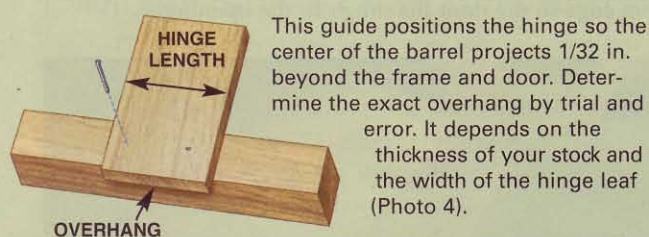
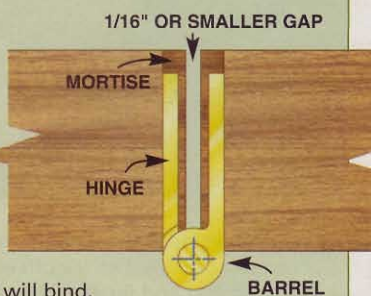


FIGURE C MORTISE DEPTH

Your mortises should create a gap of $1/16$ in. or slightly less between the door and the frame. Usually, this means the hinge leaves must be recessed slightly below the surface. If they're flush, the gap will be too wide. If they're too deep, the gap will disappear and the door will bind.

Calculate the hinge mortise depth by subtracting $1/16$ in. from the hinge barrel diameter and dividing the remainder in half.



ROUT THE MORTISES

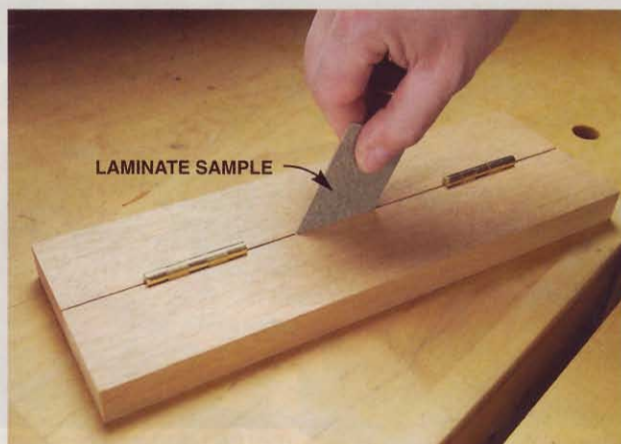
Make two jigs, one for routing the hinge mortises (Fig. A, left; Photo 3) and the other to position the hinge in the mortise (Fig. B, left; Photo 4). Then rout test mortises to dial in the depth of cut (Fig. C, left; Photo 5). Laminate samples make perfect gap testers for frame-and-panel doors with stiles and rails up to 2 in. wide; these samples are usually slightly less than $1/16$ in. thick. Doors with wider frame parts should have slightly wider gaps, because they'll exhibit greater seasonal movement.

Rout mortises in the door first (Photo 6). Make sure they go in the correct stile! It's easiest to rout hinge mortises all the way through. If you want to rout half-blind mortises, to shoulder the hinge leaves along their length, simply modify your mortising jig by moving the fill block forward to meet the hinge leaf. This modification eliminates the need for the hinge projection guide, but it requires squaring the mortise corners by hand after routing.

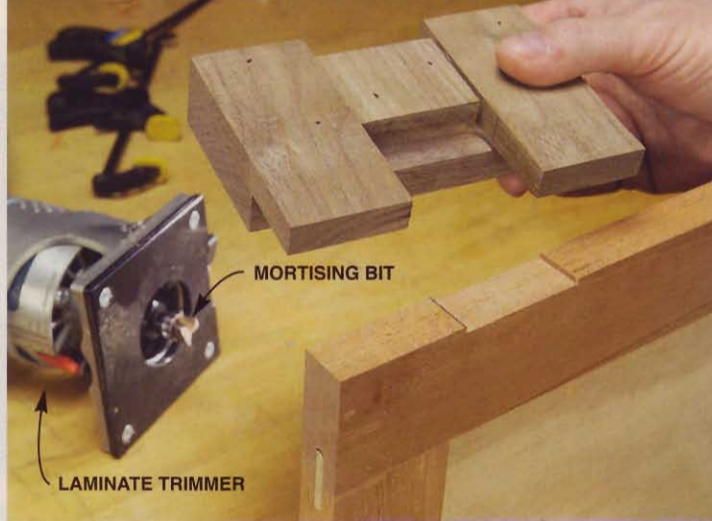
No hard and fast rule exists for locating the hinges on the door. One method is to align the hinge with the door's rails. However, this doesn't work if the top and bottom rails are distinctly different widths. Another method is to divide the door's length by six or seven and center the hinges one unit from the ends. Use your eye and trust your gut.

Carefully transfer the mortise locations to the face frame (Photo 7). Your marks have to be perfectly located, because the hinges fit the mortises so precisely. Use the door's top-to-bottom friction fit to hold it in position, and make sure the door's hinge stile is flush with the face frame's stile.

Rout mortises in the face frame (Photo 8). If you don't have a laminate trimmer, your options are to chop these mortises by hand or to change your entire procedure and rout these mortises first, before you assemble the face frame.



5 Test the mortise depth by mounting hinges on scrap stock. The gap should equal the thickness of laminate. If the gap is too wide, the mortises aren't deep enough. Widen a gap that's narrow by jointing the door stile.



6 Rout mortises in the door stile. Locate the mortise at least one hinge length from the top. Because of its small size, a laminate trimmer works great for this delicate job.



7 Transfer the mortise locations from the door to the face frame using a straightedge. The door's snug top-to-bottom fit holds it in position.



8 Rout mortises in the face-frame stiles using the mortising jig. You'll need a laminate trimmer for this job, because the mortises are so close to the corner.

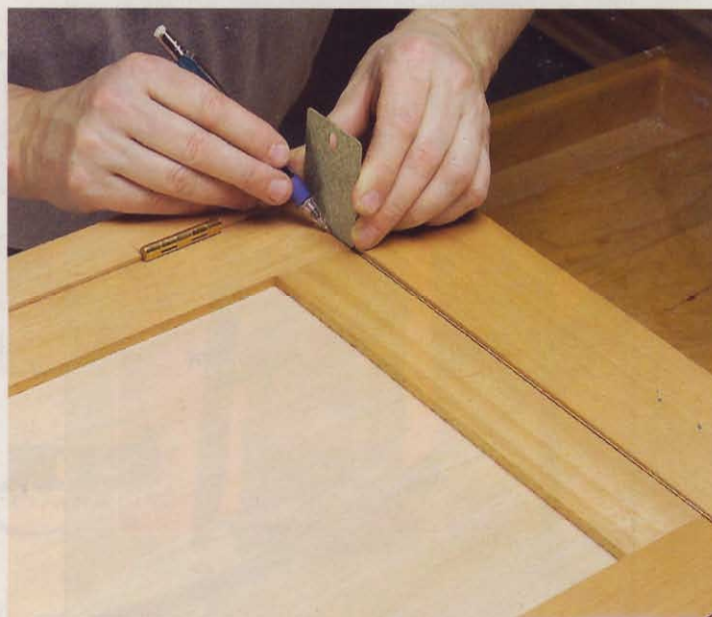
MOUNT THE HINGES AND CREATE EVEN MARGINS

After mounting the hinges on the face frame, temporarily install the door by pressing the mortises onto the mounted hinges' loose leaves. Then mark the door's ends and latch stile for trimming (Photo 9).

Remove the door, clamp on a straight board and rout the ends to final length using a flush-trim bit with two bearings (Photos 10 and 11). Clamp the board so its straight edge barely covers the line; the line indicates the laminate sample's thickness and the goal is to remove exactly that thickness.

If you build during the summer's high humidity when your lumber is at its widest seasonal dimension, a one-laminate-sample gap between the door's latch stile and the face frame is sufficient. But if you build during the winter, it's wise to provide extra room for the door's seasonal movement (Photo 12).

9 Mark the door's final size, using a laminate sample to establish uniform gaps. Slightly recess the door in the opening, using the hinges and the top-to-bottom friction fit to hold it in position. Mark with a mechanical pencil, so there's no gap between the laminate and the line.



No-Mortise Hinge Options



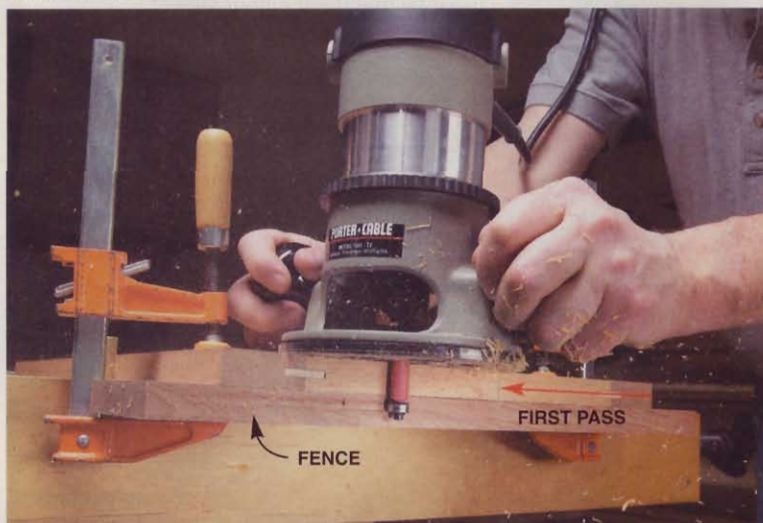
If mortising hinges isn't your idea of woodworking fun, consider one of these two options for mounting inset doors.

Euro-style hinges only require drilling holes for hinge cups and mounting screws. They also have the advantage of adjustability: Once the door is installed, you can easily move it up or down, side to side and in or out—whatever it takes to even up the margins. These hinges take up a lot of space inside the cabinet, though, and some versions only swing open to 95 degrees.

No-mortise hinges are quite simple to install and they leave an acceptably narrow gap. Some no-mortise hinges have elongated slots for adjustability. Still, the door must be carefully fitted to the opening and the hinge locations have to be carefully laid out. It's a good idea to use a projection guide, like the one shown in Photo 4, to ensure that the door and frame faces will be flush. No-mortise hinges are available in a variety of finishes, including polished and satin brass, but they're often made of plated steel instead of solid brass.



10 Rout the door to final length. Use a fence and a flush-trim bit with top- and bottom-mounted bearings to avoid blowing out the back edge. First, rout halfway using the top bearing.



11 Flip the door over, adjust the bit to use the bottom bearing and finish routing.



12 Allow for seasonal movement between the door's latch stile and the frame. Make the gap wider if you build during the winter, when the humidity in your heated shop is probably significantly lower than during the summer months.

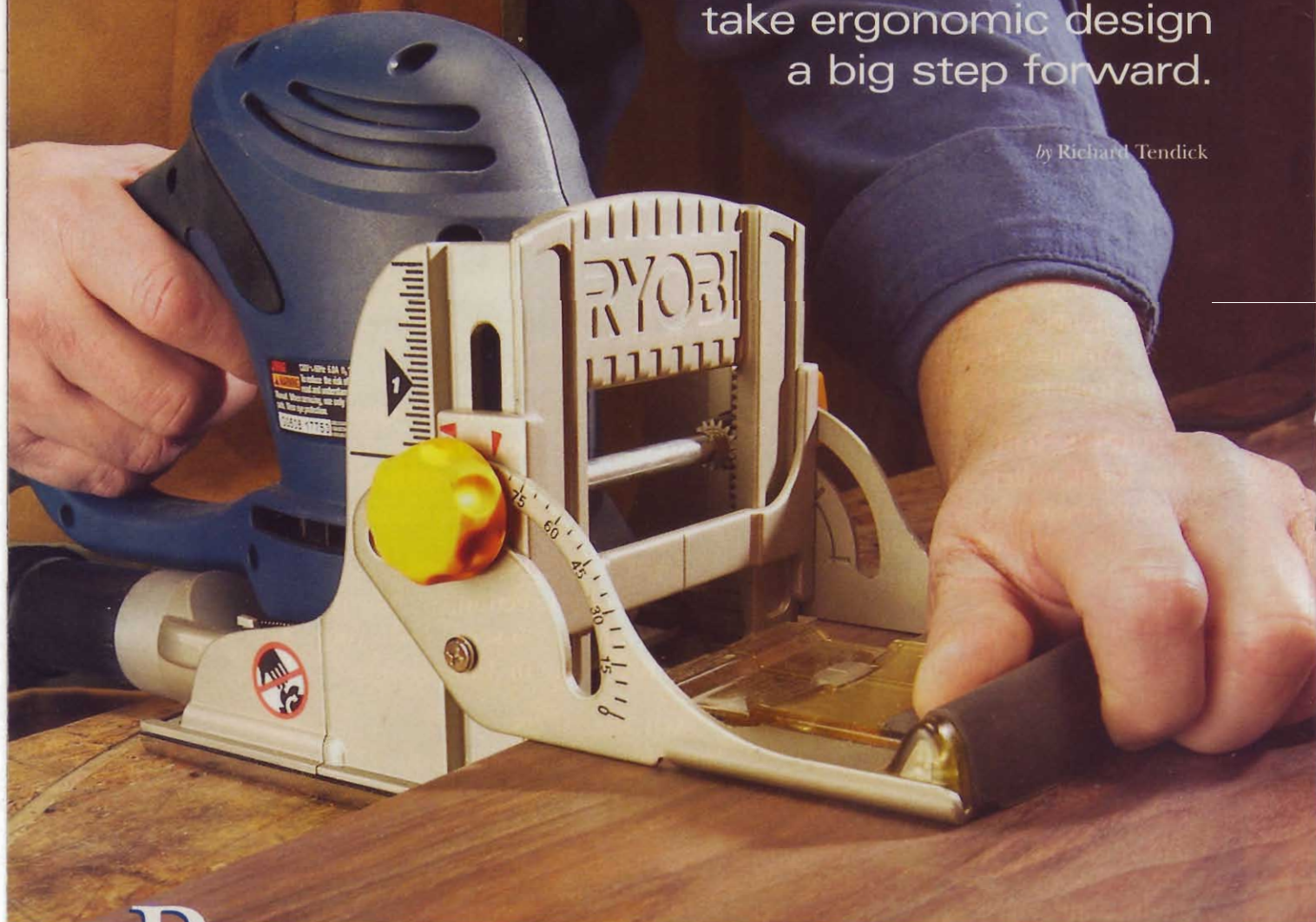
Sources Woodcraft, (800)-225-1153, www.woodcraft.com Drawn brass cabinet hinge, 2 in. x 1-1/2 in., #16R59, \$18 a pair. Solid-brass butt hinge, 2 in. x 1-3/8 in., #85112, \$4 a pair. Self-centering hinge-drilling bit, 5/64 in. for No. 3 and No. 4 screws, #16143, \$11. • Amana Tool, (800) 445-0077, www.amanatool.com Mortising bit, #45460-S, \$23. • Freud Tools, (800) 334-4107, www.freudtools.com Top- and bottom-bearing flush-trim bit, 1/4-in. shank, #50-501, \$30.

Tool Test

Biscuit Joiners

The newest models take ergonomic design a big step forward.

by Richard Tendick



Biscuit joiners, also known as plate joiners, have proven so useful that many woodworkers consider them core tools. Why? Here are just a few ways you can benefit from using a biscuit joiner:

- Make mortise-and-tenon joints for furniture. Biscuits, after all, are simply loose tenons.
- Save time leveling boards glued side by side by aligning them with multiple biscuits.
- Make Tjoints for shelving without having to tweak dados to fit undersized plywood.

- Join an entire kitchen cabinet without unsightly screws.

The machine is simple to operate. It requires only three adjustments: the fence height, which locates the slot, the fence angle, which varies to fit miters, and the depth of cut, which can be set to fit different biscuit sizes. Each biscuit joiner has slightly different features to make these adjustments. Some models are more user-friendly than others, but they all get the job done. Let's take a closer look.

FEATURES

PARALLEL FENCE

You might think all biscuit joiner fences automatically lock down parallel to the blade, but they don't. If you inadvertently tighten a fence in a crooked position, the slots on mating boards won't line up. In addition, the pieces won't slip together as easily as they should. This can spell real trouble ahead.

We prefer biscuit joiners whose fences travel on a rack-and-pinion or screw-and-rod system, which keeps the fence parallel to the blade (see photo, top right). With such a system, you don't have to check the fence each time you adjust it up or down. Other biscuit joiners require an extra step to avoid locking the fence in a crooked position. These fences should be set by placing a block of wood between the fence and the blade or between the fence and a flat surface. This works OK; it just takes longer to set up.

The rack-and-pinion and screw-and-rod fences have an additional bonus: You can micro-adjust them up and down by turning a knob. It couldn't be easier. For joinery work, where a rail might be set back from a leg, for example, this fine calibration is very useful. The set-it-with-a-block fences are more difficult to micro-adjust. You must add a shim or make a thinner block.

FENCE LENGTH

Many woodworkers push down on a biscuit joiner's fence to hold it tight to the workpiece. This ensures that slots on opposing boards align with each other and that they're square to the edge. Longer fences are easier to hold down than shorter ones (see photo, center right).

135-DEGREE FENCE

Biscuit joiners excel at aligning miter joints. There's very little room for error in positioning the slots, however. If the slots on one piece are a different distance from the edge than the slots on the other piece, you won't get a sharp corner. Instead, one piece will stick out past the other.

The adjustment range of some fences is 0 to 90 degrees. To cut miter slots on these machines, you must set your fence at 45 degrees and register the slots from the miter's inside corner. The biscuit joiner may easily slip in this position. We prefer fences that angle another 45 degrees downward, to a 135-degree position (see photo, bottom right). On some biscuit joiners, a clamp-on auxiliary fence also allows you to get to 135 degrees. With either fence, you can register from the miter's outside corner. This method is more accurate, and slipping is virtually impossible.

HEIGHT-ADJUSTMENT KNOB

The most convenient type of fence to adjust automatically remains parallel to the blade as it travels up and down. To move the fence, you turn a knob.

FENCE

The longer the fence, the more easily you can hold it firmly against the workpiece. Fence length varies widely from model to model.

FENCE LENGTH

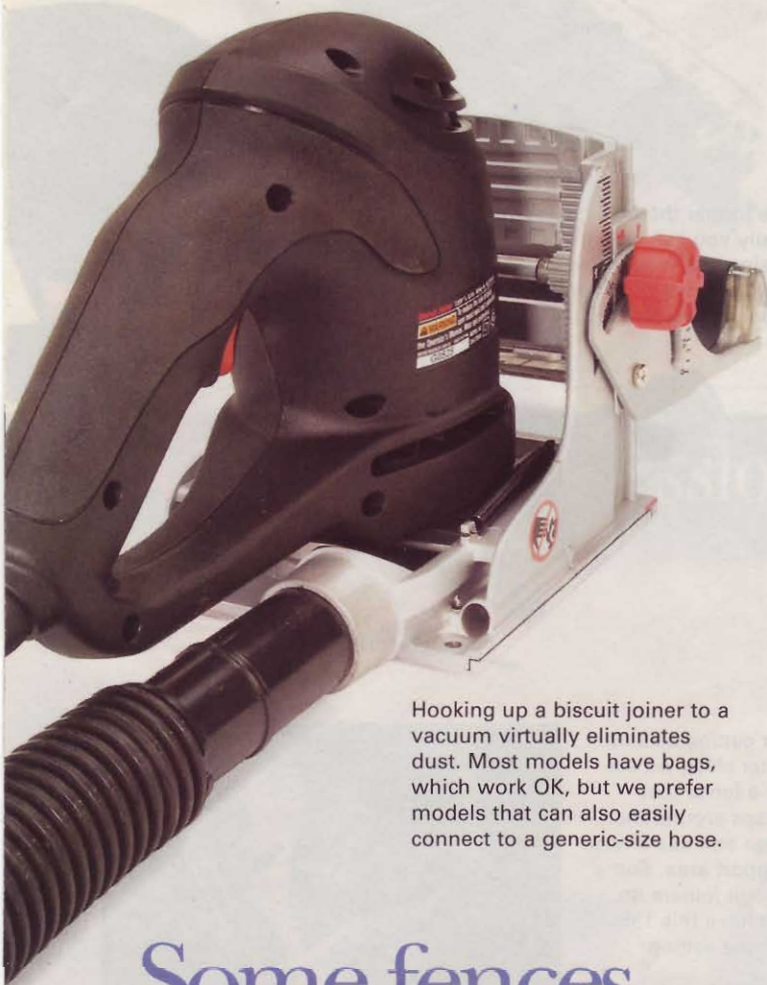
For cutting accurate miter slots, we prefer a fence that wraps around the edge and has a wide support area. Some biscuit joiners do not have this 135-degree setting.



FEATURES



The slide mechanism that the motor travels on should have a minimum of play. This will result in accurate slots of consistent size.



Hooking up a biscuit joiner to a vacuum virtually eliminates dust. Most models have bags, which work OK, but we prefer models that can also easily connect to a generic-size hose.

Some fences automatically lock down parallel to the blade. Others don't.

PRECISE SLIDE MECHANISM

Every biscuit joiner has a slide mechanism that controls the in-and-out movement of the motor and blade (see photo, top left). The less play in this mechanism, the closer slots will be to the optimum 4-mm thickness. That's crucial for precision alignment, such as edge-to-edge gluing. The more play in the slide mechanism, the greater the chance that some slots will be thicker than others. Extra-thick slots allow biscuits to wiggle up and down, so your boards would be less likely to align with each other.

It's possible to make consistently sized slots on a machine that has a fair amount of play; however, it takes practice. You must lock your wrist and arm just so, both pushing and pulling the motor. This cocks the machine up or down and, in effect, removes the play. Machines that have little play are much easier to operate. You can hold your arm and wrist any way that's comfortable, so making consistent slots doesn't require as much concentration.

DUST COLLECTION

Biscuit joiners make lots of dust. Most machines come with a dust-collecting bag. All machines have a port for vacuum hoses (see photo, left). We prefer machines whose round ports fit common hose diameters, although you may need a step adapter. Other ports have unusual-shaped openings that only fit the manufacturers' own hoses.

DEPTH-OF-CUT SETTINGS

Every biscuit joiner has depth-of-cut settings for the three most commonly used biscuits, the No. 0, No. 10 and No. 20. Some machines have additional depth-of-cut settings for specialized biscuits (see "The Weird World of Biscuits," page 78).

The most useful of these unusual biscuits is the giant No. S-6. Its extra-deep penetration and increased glue-surface area make a very strong joint. The No. S-6 biscuit setting is labeled M, or Max. An odd thing about the No. S-6 biscuit, however, is that it requires two cuts made side by side. On all machines, the M setting produces a slot of the correct depth, but not enough width. You must make two plunges 1/4 to 3/8 in. apart to make a complete No. S-6 slot.

PROFILES

RYOBI JM82K, \$100 CRAFTSMAN 17539, \$100

Automatically parallel fence	Yes
Length of fence	Long
135° fence setting	Yes
Dust bag included	Yes
M depth-of-cut setting	No



The newest entries in the field are by far the most comfortable to use. These Ryobi and Craftsman models have three features no other machine has: a D-handle, a vertical motor and a very long fence with a large front grip. The D-handle puts your hand and wrist in a natural position, unlike the barrel-grip on many other biscuit joiners. The vertical motor has the blade directly attached to the motor shaft, which eliminates noise created by the bevel gears in right-angle motors. The large handle on the end of the fence provides the ideal position for your other hand to keep the fence tight against the board. The fence is mounted on a rack-and-pinion system and is micro-adjustable with a knob.

One shortcoming in these machines is the slide mechanism. It has more play than any other we tested, which can result in making some slots much too thick. With practice, you can control the play and produce slots of a consistent thickness, but they'll still be slightly thicker than the optimum 4-mm size. If not for this inconvenience, the great features and the low price (\$100) would make these machines hands-down winners.



FENCE GRIP

We love the ergonomics of these two similar machines. They're the only biscuit joiners with a large fence grip, which helps you maintain control of the cut. The D-handle is very easy on the wrist.

Sources Craftsman, (800) 377-7414, www.sears.com/craftsman • Ryobi, (800) 525-2579, www.ryobitools.com

PORTER-CABLE 557, \$200

Automatically parallel fence	Yes
Length of fence	Long
135° fence setting	Yes
Dust bag included	Yes
M depth-of-cut setting	Yes



The Porter-Cable biscuit joiner has every feature you could ask for. The fence is quite long and easy to adjust, riding on two rods and a center screw. This fence's height-adjustment knob is more sensitive than knobs on rack-and-pinion machines. That makes micro-adjustments easier but coarse

adjustments more time-consuming. The fence-tilting mechanism has two ranges, 0 to 90 and 90 to 135 degrees. The slide mechanism has very little play. The handle located behind the motor is easy for even small hands to hold.

The 557 has seven blade-depth settings, including one for small FF (face frame) biscuits unique to Porter-Cable. The large opening in the fence makes it easy to view your mark on the board, but it also makes it difficult to balance the fence on narrow stock. Sliding a plastic plate under the fence solves this problem. It's included with the biscuit joiner.

Source Porter-Cable, (800) 487-8665, www.portercable.com

The Porter-Cable 557 has all the best features. In addition, it's the only model that comes with two blades: a standard 4-in. blade and a 2-in. blade. The 2-in. blade is used for joining face frames as narrow as 1-1/2 in. using Porter-Cable's exclusive FF-sized biscuits.

FF-BISCUIT BLADE

STANDARD BLADE



PROFILES

DEWALT DW682, \$160 CRAFTSMAN 27730, \$190

Automatically parallel fence	Yes
Length of fence	Medium
135° fence setting	No
Dust bag included	Yes
M depth-of-cut setting	Yes



These two models have a rack-and-pinion fence that's very easy to adjust. The fence remains parallel to the blade as you move it up or down.

Sources DeWalt, (800) 433-9258, www.dewalt.com • Craftsman, (800) 377-7414, www.sears.com/craftsman



This is a very user-friendly design. The front ends of both models are identical. They both have the same convenient rack-and-pinion system for adjusting fence height. The slide mechanism has very little play. The two models have different motors, motor housings and top grips. The DeWalt has a comfortably sized handle behind the motor and a trigger switch. The Craftsman's larger-diameter motor barrel and paddle switch is less comfortable, especially for woodworkers with small hands. For a right-hander, we'd prefer more finger room between the motor and the dust bag on the Craftsman. Both machines have four depth-of-cut settings: three for standard biscuits and one for the M setting. We've got one small complaint: The knobs on the fence are quite small. Larger knobs would make it easier to micro-adjust the fence height and lock the fence in place.

FREUD JS100A, \$100 FREUD JS102, \$120

Automatically parallel fence	No
Length of fence	Short
135° fence setting	JS100A-No JS102-Yes
Dust bag included	Yes
M depth-of-cut setting	Yes

Both of these Freud models are basic, low-cost, no-frills machines. The only difference between the two is the fence: The JS102's fence tilts, while the JS100A's does not. The slide mechanism on both models has very little play. Both machines have six depth-of-cut settings.

The fence on both models is less user-friendly than average. It's shorter than fences on all other models. Short fences are harder to steady than long fences. It's awkward to place your hand on this fence because of the four strengthening ribs cast into it. You must place a block under the fence when setting its height to ensure that it



remains parallel to the blade. Even when locked down hard, the fence slips out of position too easily.

The large diameter of the motor housing makes it awkward for woodworkers with small hands to hold the machine.

Source Freud Tools, (800) 334-4107, www.freudtools.com

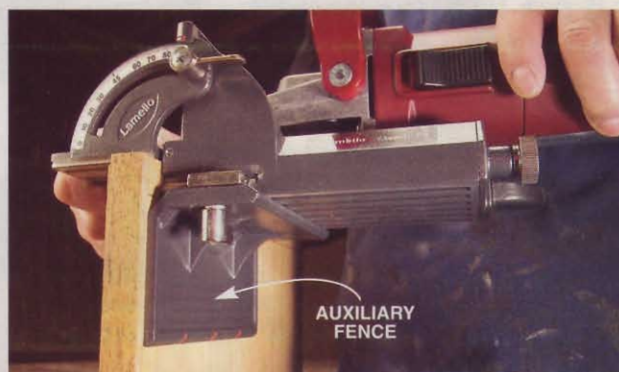
PROFILES

LAMELLO CLASSIC C3, \$439 LAMELLO TOP 20S3, \$799

Automatically parallel fence	No
Length of fence	Medium
135° fence setting	Yes
Dust bag included	C3-No 20S3-Yes
M depth-of-cut setting	Yes

Precise, smooth operation is the hallmark of both Lamello biscuit joiners. They're ruggedly built machines designed for daily production work. Their silky-smooth sliding mechanisms have virtually no play.

The Top 20S3 has an unusual feature that's not on the C3: You can dial the Top 20S3's blade up or down to micro-adjust its height (see photo, below right). This allows you to raise or lower the blade 2 mm (about 1/16 in.) from a center



The auxiliary fence on both Lamello biscuit joiners can be attached to the base for additional support.



CLASSIC C3

TOP 20S3

position without moving the fence.

Turning the dial one notch raises or lowers the blade 0.1 mm (about .004 in.).

The Top 20S3 has a fully electronic soft-start motor; the C3 does not.

Precision aside, both models have a fence that takes extra time to adjust. It doesn't automatically lock parallel to the blade. To be precise, you should use a block to set it.

Both models have six depth-of-cut settings. Their bases are easy to open to gain access to the blade or to clear the dust port. A dust bag is a \$33 accessory. The dust port is rectangular, designed to fit a Lamello hose (\$49).



The Top 20 is the only biscuit joiner whose blade height can be micro-adjusted with an indexed dial.

Source Colonial Saw Co., (800) 252-6355, www.csaw.com

VIRUTEX AB11C, \$295

Automatically parallel fence	No
Length of fence	Long
135° fence setting	No
Dust bag included	No
M depth-of-cut setting	No

The Virutex biscuit joiner has a good slide mechanism with very little play and large locking levers, but it's short on other features. The fence is long but flexes under pressure. You must level the fence with a block when adjusting its height. The English markings for the fence height are in half-inch increments, which isn't very helpful. The only depth-of-cut settings are for No. 0, No. 10 and No. 20



biscuits. A dust bag is not provided or sold by Virutex. You can special-order a vacuum hose that screws onto the dust port (\$25).

Source Virutex, (800) 868-9663, www.virutex.com

PROFILES

MAKITA 3901, \$172

Automatically parallel fence	No
Length of fence	Medium
135° fence setting	Yes
Dust bag included	Yes
M depth-of-cut setting	Yes

The bottom plate of the Makita 3901 is much easier to open than those on most models. You can quickly remove material clogging the dust port or switch to a smaller-diameter blade.



The Makita's slide mechanism has very little play. The fence has large locking levers that are easy to tighten. The 3901 has six depth-of cut settings. The fence has a rack-and-pinion adjustment mechanism, but unlike those on other models, on this one you can inadvertently lock the fence in a position that's not parallel to the blade. Its motor housing is rather large in diameter, which is awkward for woodworkers with small hands.

Source Makita, (800) 462-5482, www.makitatools.com

The Weird World of Biscuits

Most woodworkers are familiar with No. 0, No. 10 and No. 20 biscuits, but did you know there are 14 different kinds of biscuits and hardware? The weird part is that the name of a biscuit doesn't tell you much about its size or use. Most of these unusual biscuits are only available through some Lamello distributors. You

don't need a Lamello biscuit joiner to make slots for them, but you do need extra depth-of-cut settings. If you don't have the right setting, though, you may be able to recalibrate an existing setting.

■ **No. S-6.** This biscuit is a monster: It's 3-3/8 in. long, measures 1-3/16 in. wide and requires a slot that's 11/16 to 13/16 in. deep and 3-1/2 in. wide. The extra depth makes it inappropriate for slots in the face of

3/4-in. stock, but the No. S-6 is perfect for super-strong joints in thicker wood. Cutting the slot requires an M (Max) setting on a biscuit joiner.

■ **Duplex.** This steel hinge is smaller than a No. 6 but larger than a No. 20. Cutting a slot to house this hinge requires a D setting on a biscuit joiner.

■ **Simplex.** This two-part, interlocking aluminum biscuit is used for knock-down fittings.



No. S-6



DUPLEX



SIMPLEX



K-20



C-20

RECOMMENDATIONS

A biscuit joiner is a simple machine to set up and operate. Almost every machine we tested has the three basic adjustments: fence height, fence angle and depth-of-cut for different biscuits. We prefer machines with long, easy-to-adjust fences that angle downward to 135 degrees. We also like machines that have more than the three basic depth-of-cut settings.

For a good value that's very user-friendly, we really like the Ryobi JM82K/Craftsman 17539 (each \$100). They share a significant drawback, however. The slide mechanism on the samples we tested had a much larger than average amount of play, which resulted in many slots that were far over the optimum 4-mm thickness. This makes precision work difficult. You can remove much of the play by operating the machine with a stiff wrist, but it's awkward.

Four more-expensive machines are fine for precision work. The Makita 3901 (\$172) and DeWalt DW682 (\$160)/Craftsman 2773 (\$190) have loads of good features and tight slide mechanisms. The Lamello Classic C3 (\$439) is built like a tank and works as precisely as a Swiss watch. The DeWalt/Craftsman fence is easier to set parallel to the blade than the fences on the Makita and Lamello.

For a biscuit joiner that has all of the features we like, we recommend the Porter-Cable 557 (\$200). It costs \$40 more than the DeWalt DW682, though. For the extra money, you get a fence that tilts to 135 degrees (which is better for mitering) and a special blade for small face-frame biscuits.

Another Biscuit Joiner To Consider

CRAFTSMAN MINI BISCUIT JOINER 17550, \$70

The Craftsman Mini Biscuit Joiner is the only biscuit joiner that can cut slots for teeny, tiny R-1, R-2 and R-3 biscuits. That's all it does. These biscuits are perfect for small, narrow work, such as picture frames. The Mini Biscuit Joiner's fence is very basic. A plastic ridge on the fence fits into a series of slots on the machine to ensure the fence and blade remain parallel. Flipping the fence changes its angle from 90 to 45 degrees.



It's shorter than a No. 20, but it requires a deeper slot made with a biscuit joiner's S setting.

■ **K-20.** This plastic biscuit is designed for situations in which clamping the joint is impractical. Once the biscuit is inserted into a slot, the biscuit's teeth prevent it from coming out. The K-20 is the same size as a No. 20.

■ **C-20.** Also a plastic biscuit, the C-20 is used with epoxy to join solid-surface countertops. It's the same size as a No. 20.

■ **Fibro.** Fibro biscuits are made from com-

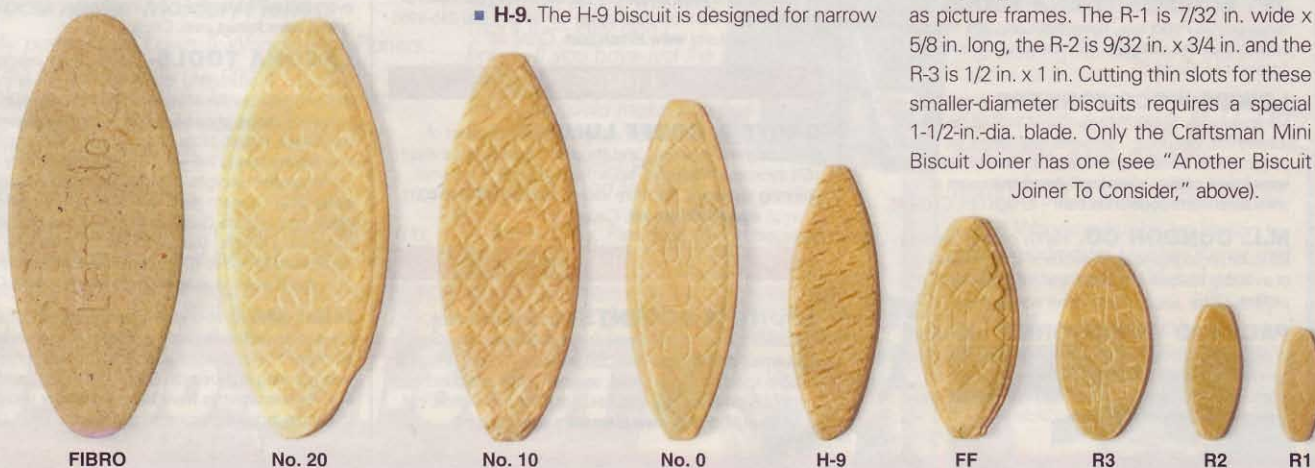
pressed fibers rather than solid wood. They currently come in the No. 20 size. Fibro biscuits are more consistent in thickness than wood biscuits, because they don't swell in storage. That's a big advantage for aligning boards, when every biscuit should fit tightly in the slots. Fibro biscuits are preferred for slots cut near the surface because glue causes Fibro biscuits to swell less than wood biscuits. Fibro biscuits are not as strong as wood biscuits, though, so they're not the best choice for a structural joint.

■ **H-9.** The H-9 biscuit is designed for narrow

stock, particularly face frames. It fits in rails as narrow as 1-3/4 in. Cutting the slot requires a special 3-1/16-in.-dia. blade, available through Lamello distributors.

■ **FF.** This biscuit is also designed for narrow face frames. It can join rails as small in width as 1-1/2 in. Cutting the slot requires a special 2-in. blade, which only fits the Porter-Cable 557. FF biscuits and blades are available through Porter-Cable distributors.

■ **R-1, R-2 and R-3.** These biscuits are used for aligning very thin or narrow pieces, such as picture frames. The R-1 is 7/32 in. wide x 5/8 in. long, the R-2 is 9/32 in. x 3/4 in. and the R-3 is 1/2 in. x 1 in. Cutting thin slots for these smaller-diameter biscuits requires a special 1-1/2-in.-dia. blade. Only the Craftsman Mini Biscuit Joiner has one (see "Another Biscuit Joiner To Consider," above).



FIBRO

No. 20

No. 10

No. 0

H-9

FF

R3

R2

R1

5 Steps to Foursquare Boards



RAMON MORENO



BILL ZUEHLKE

It sounds obvious, but the key to accurate woodworking is to start with accurately machined boards. They must be straight, flat and square. Roughsawn lumber is anything but. Here's a time-honored order of procedure to turn rough boards into foursquare boards.

by Tom Caspar

1 JOINT ONE FACE

Make one face flat and smooth using your jointer. It's OK to leave some low spots here and there. If you get tear-out, try feeding from the opposite end. Mark the feed direction that gives the best results on the end of the board. This mark indicates grain direction and reminds you to "start here."



2 PLANE THE OPPOSITE SIDE

Use your thickness planer to make the other rough face parallel to the jointed face. Grain direction is easy to figure out: The grain on the second face runs in the opposite direction as the grain on the first face. That means the mark you made in Step 1 should appear on the end nearest you, face down, as you feed each board into the planer.



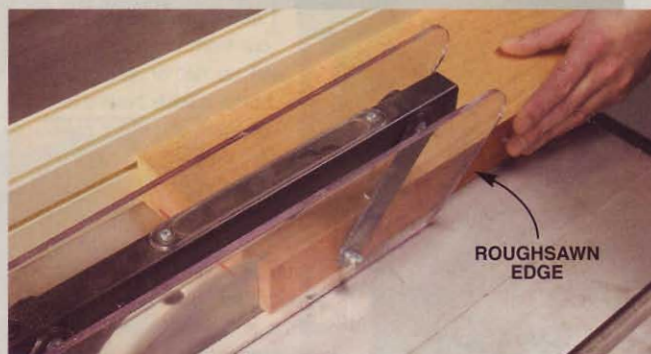
3 JOINT ONE EDGE

Make one edge flat, straight and square. Grain direction matters here, too. If you get tear-out going one direction, turn the board around, place the opposite face against the jointer's fence and try again. This is the reason you thickness-plane before you edge-joint: If you only have one smooth face, you could only edge-joint in one direction.



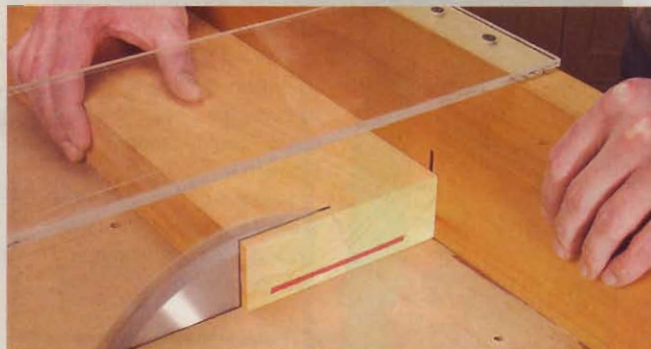
4 RIP THE OPPOSITE EDGE

Use your tablesaw to cut a second edge parallel to the first. Make the cut about 1/32 in. wider than the final dimension. Then return to the jointer and make a 1/32-in.-deep cut on the ripped edge. Now both edges are smooth and square to the board's faces.



5 CROSSCUT THE ENDS

Use your tablesaw or miter saw to square one end of the board. Then use a stop block to cut it to length.



8 Tips for Milling

Get the best yield from the least-expensive wood.

Transforming a long, gnarly plank of rough lumber into a set of perfectly milled boards is immensely satisfying. Not only do you save money, but you become intimate with the character of every precious piece of wood. The biggest benefit, however, is being absolutely certain

that your boards are truly flat, straight and square. That's the solid foundation you need to make accurate cuts, lay out precise joints and glue boards together without gaps. Here are some helpful pointers to build that foundation.

by Tom Caspar

CUT BIG BOARDS INTO SMALL PIECES

You might think the best strategy for milling rough lumber is to flatten as large a piece as possible, then cut it into smaller parts. Not true. It's better to cut a big rough-sawn board into individual pieces, one for each part on your cutting list, more or less, and then start milling.

The problem with the big-board strategy is that the smaller pieces you cut from it may not end up flat or straight.

Some boards have a lot of internal stress built up inside. When the board is whole, all this stress is in balance. When you rip the board, you release some of that stress. Each half seeks a new balance and a new shape. A flat, straight board ripped down the middle might well make two boards that aren't flat or straight. It's hard to predict which boards will react this way, so I assume every board could present this problem.

I always cut my individual pieces slightly oversize, adding 1/2 in. of length and 1/4 in. of width.

CHALK LINE



USE THE BEST CROSSCUTTING TOOLS

Rough lumber can be tricky to crosscut safely. Its faces and edges are rarely flat and straight, so using a chop saw, miter saw or tablesaw is not the best practice, because the blade could bind, stall or kick back.

My favorite tools for crosscutting are a jigsaw, a circular saw and a Japanese tree-trimming saw (see Source, below). This very coarse handsaw cuts incredibly fast, even through thick hardwoods.

I generally crosscut before doing any jointing or planing. Crosscutting reduces a big board to more manageable sizes, so I can mill more accurately. I put my board on four sawhorses for plenty of support and mark it with chalk, a felt-tip pen or a carpenter's soft-leaded pencil.

Source Lee Valley, (800) 267-8735, www.leevalley.com
Long-blade Japanese pruning saw, #EC710, \$33.

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

Rough Lumber



To make pieces dead flat, I usually let boards rest before taking them down to final thickness. I plane boards 1/8 in. thicker than needed and stack them with stickers or stand them on edge so air can circulate around every side.

After the boards rest for a day or so, I check each board for flatness by laying it on my tablesaw or jointer. It's not unusual to find that some previously flat boards have cupped or twisted a bit. I rejoin one side of these boards, then plane every board to final thickness.

AVOID BADLY TWISTED BOARDS

Some twisted boards are hopeless causes. You might just as well turn them into firewood. Sure, you can joint them flat, but a few rogue boards have a nasty habit of slowly continuing to twist, no matter how many times they're jointed or how short or narrow you cut them.

If your rough lumber is only slightly twisted, however, don't get too alarmed. It doesn't mean you've got junk wood. It may remain perfectly stable after it's milled. Just cut it as short and narrow as you can in the rough state—but not less than 12 in. long—to get the maximum yield in thickness.



CUT OFF THE ENDS FIRST

Cracks in a board's ends are a common flaw. Cut them off before you do any other crosscutting, so you know the true, usable length of your board. These cracks are also called end checks. Large checks are easy to see and remove, but you may also find hairline cracks that aren't easily visible on the board's surface or end.

I cut off the end of a board a little bit at a time, like slicing a loaf of bread. The slices are about 1/4 in. thick. As each slice falls off, I inspect it for checks. If the slice breaks very easily across the grain, it probably contains a hairline check.



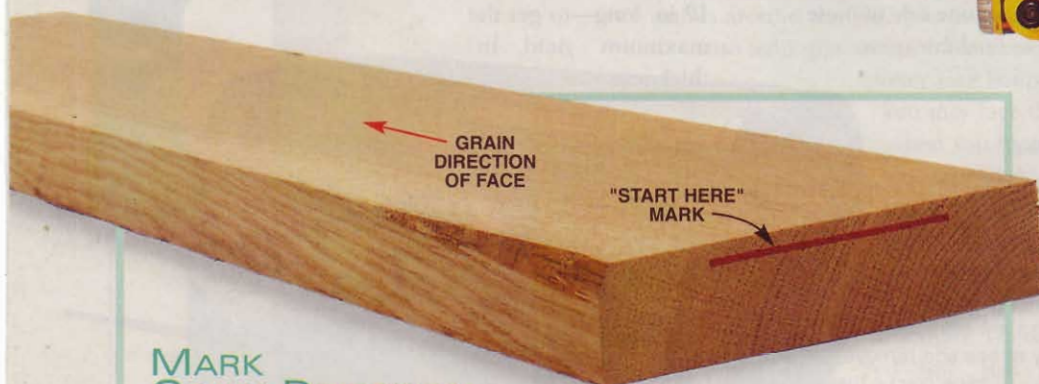


VERN JOHNSON

FOLLOW THE GRAIN

I'm sure you've seen boards like the one above whose grain runs off the edge in a bad way. If that board becomes part of a project, its slanting grain stands out like a sore thumb. I prefer to eliminate this problem at the outset, while the board is still rough. When I've got this type of board, and enough width to spare, I cut a new edge that more truly follows the grain.

I prefer to use the bandsaw for ripping rough lumber, but a circular saw works well, too. If you're ripping long boards on the bandsaw, use a tall support on the outfeed side to steady the workpiece.



MARK GRAIN DIRECTION

As I'm jointing the faces of rough boards, I always mark grain direction on the board's end. This mark tells me to "start the cut here" on the nearest face. This line won't be removed by jointing or planing.

When I stack boards for planing, I look at the marks and orient them all the same way: face down and pointing away from the planer (see "5 Steps to Foursquare Boards," page 86). Even if the boards fall onto the floor as they come out of the machine, I can easily reassemble them with the grain all going the same way, and get right back to work.

SKIP PLANE TO REVEAL GRAIN

What exactly is under that rough surface? Sometimes it's quite difficult to read the grain, spot defects or figure out where the sapwood lies in a roughsawn board—all the things you'd want to know before cutting it up.

If I'm stumped, I run the whole board through the planer. I plane just enough to remove the high spots and skip over the low spots. I don't need to see an entirely planed surface to mark up the board for cutting into smaller pieces.

When the board comes out of the planer, I don't assume it's flat. I'll cut it up into smaller pieces and joint one face of every piece before running it through the planer again. You lose a bit of the board's maximum thickness when you skip plane, but that's usually no big deal.

PARTIALLY PLANED SURFACE



edited by Tim Johnson



Suspended Compressor

I love my compressor, but on my garage shop floor, it's a real toe-stubber. It has such a low profile that it's easy to overlook until...boink! Following one particularly nasty run-in, I raised my head to yowl and discovered the solution to my problem: ceiling space.

I installed 1/4-in. eye bolts with nuts and washers in a 3/4-in. plywood base. After nailing cleats to the

base to contain the compressor, I attached vinyl-covered chains with quick-link fasteners to the eye bolts and suspended the base out of the way, above my miter saw's extension table. I got all the supplies I needed at the home center for about \$30. Now my compressor overlooks me!

Luke Hartle

BANDSAW-BLADE CLIP

I never thought twice about the spring tension in coiled-up bandsaw blades until I dropped one. When it hit the floor, the coil exploded and the wild blade bounced right back at me. I was wearing shorts, so the teeth left nasty scratches as they raked across my shins.

While shopping for office supplies, I discovered the perfect solution: binder clips. They're much more convenient to use than twist-ties and they make coiled blades easy to carry and hang. Binder clips cost less than a buck each and they come in a rainbow of colors, so my blades are even color-coded by size.

Sean Koehler



We'll give you \$150, this great-looking shirt and a durable shop apron for your original Small Shop Tip!

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The editors of American Woodworker



edited by Tim Johnson



SHOEHORN VANITY

I built a 7-ft.-long vanity in my garage shop for installation in an upstairs bathroom. Preliminary measurements of the doors, hallways and stairways indicated we could fit it into place, no problem. We willed the upended cabinet up the first flight of stairs, found the second flight was narrower than the first and had to remove the handrail. At the top of the second flight, we had to remove a thermostat and ceiling light fixture. Then, while trying to fit the vanity through the bathroom door, we discovered the opening was wider at the bottom, where we'd measured, than at the top, necessitating the removal of the door, door casing and jamb. To finally tilt the vanity into place, we had to remove a fold-down attic stairway, springs and all. Reassembling the house afterward took more time than installing the vanity had.

Jon Frost

GLOSSY SATIN FINISH

My wife wanted a satin finish on the kitchen cabinets I'd just built. I hadn't done much finishing, but I wanted to complete this project single-handedly, so I bought a spray gun and satin polyurethane. Using a fresh can for each coat, I poured the polyurethane into the gun, being careful to stop before I reached the light-colored sludge at the bottom of the can.

It turns out I have a knack for spray finishing. I didn't have a single drip or sag. But instead of a satin sheen, each coat looked glossier. After the third coat, I could've used the cabinet doors as a shaving mirror!

A painter friend knew immediately what I'd done wrong. He explained that satin polyurethane is gloss polyurethane with flattening agents added. Over time, these flatteners settle to the bottom of the can—the funny-colored sludge I'd so carefully avoided using was actually the settled-out flatteners. To create the satin sheen I wanted, I should have stirred the polyurethane.

Dan Whitelock



Make your woodworking mistakes pay! Send us your most memorable "What was I thinking?" blunders. You'll receive \$100 for each one we print. E-mail to oops@readersdigest.com or send to AW Oops!, American Woodworker, 2915 Commers Drive, Suite 700, Eagan, MN 55121. Submissions can't be returned and become our property upon acceptance and payment. We may edit submissions and use them in all print and electronic media.