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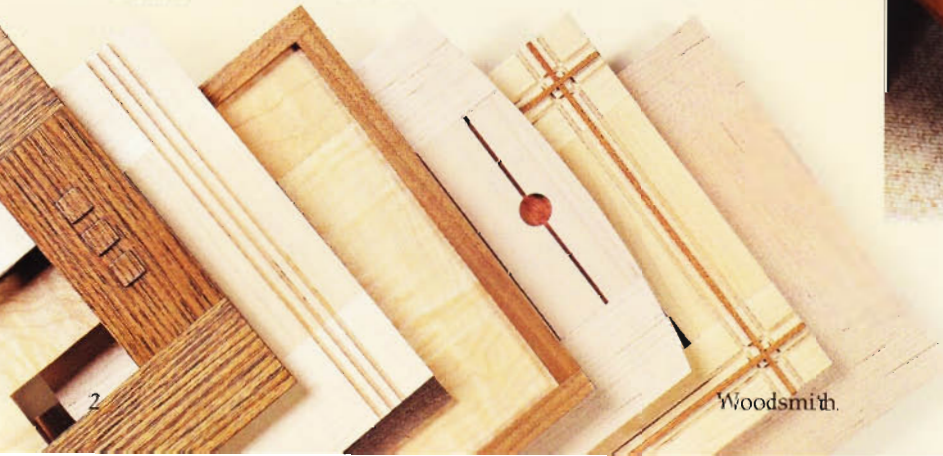

projects

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editor's note
Sawdust

One of the most common requests any woodworker gets, myself included, is for a picture frame. From a construction standpoint, the parts of the frame don't get much simpler — two pairs of identically sized parts with precise miters on each end.

And therein lies the rub. Cutting miters is often just a big hassle. Something always seems to be a little off, resulting in a frame with gaps at the miter joints. So we end up spending the better part of our time fiddling with the fit until we're finally satisfied with the joinery. Well, the next time you get a request for a picture frame (or two), check out the no-miter frames starting on page 16. The design centers around two separate frames built using butt joints. By overlapping the frames, you essentially create a rock-solid lap joint ready to accept the glass and photograph. And with simple material changes and a little detailing, you can create a wide range of frame styles suitable for any need.

Projects are only part of what each issue of *Woodsmith* contains. Quite honestly, I think it's the department and technique articles that are the most valuable. They contain information that will make you a better woodworker from this point forward. And that's going to come in handy no matter which project you build.

In this issue, I have two favorite articles. The first starts on page 14 and covers three ways to create tapers. My go-to tool for this is the table saw with a shop-built jig. But it's often faster to use a band saw or jointer to cut the tapers. In the article, you'll learn how to add those two great options to your bag of tricks.

The other technique article is the one on buffing on page 46. Making a small project "shine" can be a challenge, but you'll find that buffing your way to the right look is quick and easy. So sit back and take a look at the rest of this issue, then head to the shop and get started on your next project.

Bryan

Tips & Techniques

Disc Sander Sharpening System

I'm always looking for an easy way to sharpen hand tools. This disc sander sharpening jig fills the bill nicely. The jig adjusts to position tools at the correct angle and lets you produce a razor-sharp edge in no time.

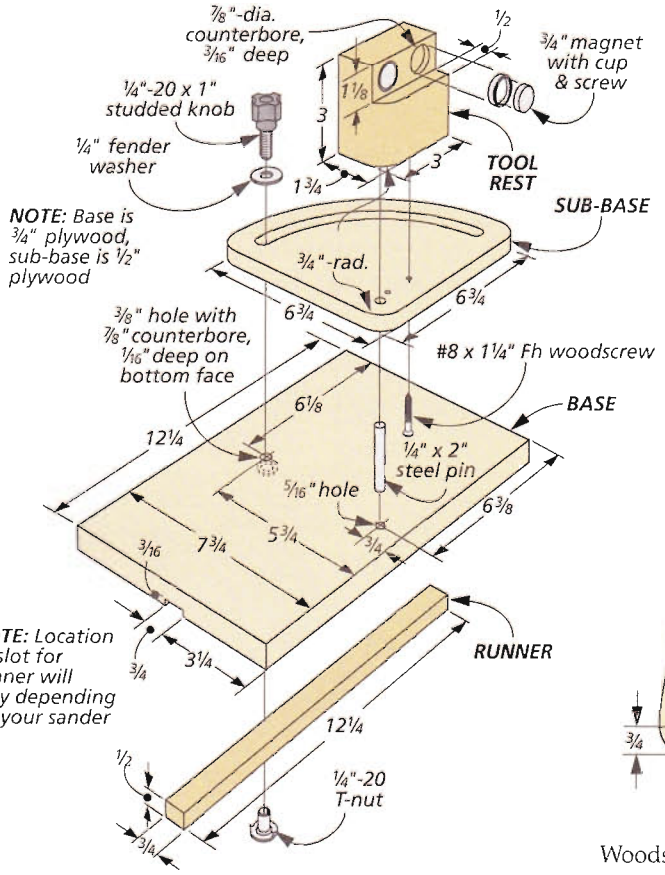
JIG COMPONENTS. The jig consists of a base, a sub-base that pivots to adjust the angle, and a tool rest that holds the chisel. It also has a runner for the sander's miter slot, hardware to make the jig adjustable, and two magnets to hold the tool.

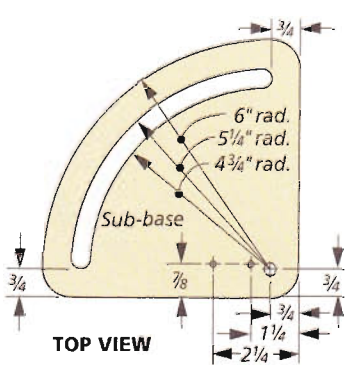
BUILDING THE JIG. After sizing the parts, cut the sub-base to shape with a band saw. A jig saw or scroll saw makes quick work of the curved slot (see the Top View below).

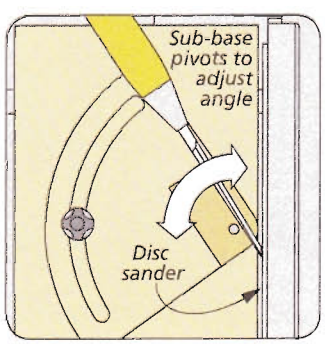
The tool rest has a roundover on one corner where it meets the sander, a notch to hold the tool, and two holes for magnets. As for the base, it has a shallow groove to accept the runner, as well as holes for a T-nut and steel pin.

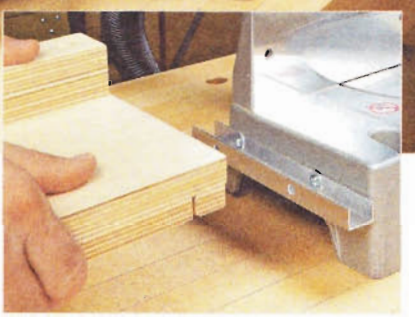
USING THE JIG. After assembly, clamp the jig in the miter slot of your sander, slide the tool to be sharpened onto the tool rest, and adjust the sub-base so it meets the sanding disc at the proper angle. Now turn on the sander to start sharpening. Once you achieve a sharp edge, it's best to finish up by honing the edge of the tool by hand.

Bill Wells
Olympia, Washington









Miter Saw Supports

I don't have room for a dedicated miter saw station in my shop, so I built these simple knock-down supports. This way, I can set my miter saw and these supports on a benchtop when I need to cut a long board (photo above).

As you can see, the supports are just two layers of plywood glued face to face. I also added a back fence made from two more layers of plywood that aligns with the miter saw fence. The supports have riser blocks glued to the underside that position them at the same height as the saw table.

SUPPORT CHANNELS. Near the end of each support where it meets the saw, I cut a narrow groove. As you can see in the inset photo, the groove fits over a piece of aluminum C-channel that's simply bolted to the side of the saw. (My miter saw had existing holes for bolting on the channel, but it would also be easy to drill holes through the thin wall of the saw's base in order to add the channel.)

The supports can be set up and broken down in minutes, making miter saw cuts easy even without a dedicated station.

Ron Shearer
Fairview, Oregon

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Handy Fold-Down Worktable

Every shop can use an extra worksurface. And when that bonus work area can fold up and out of the way while not in use, it's even better.

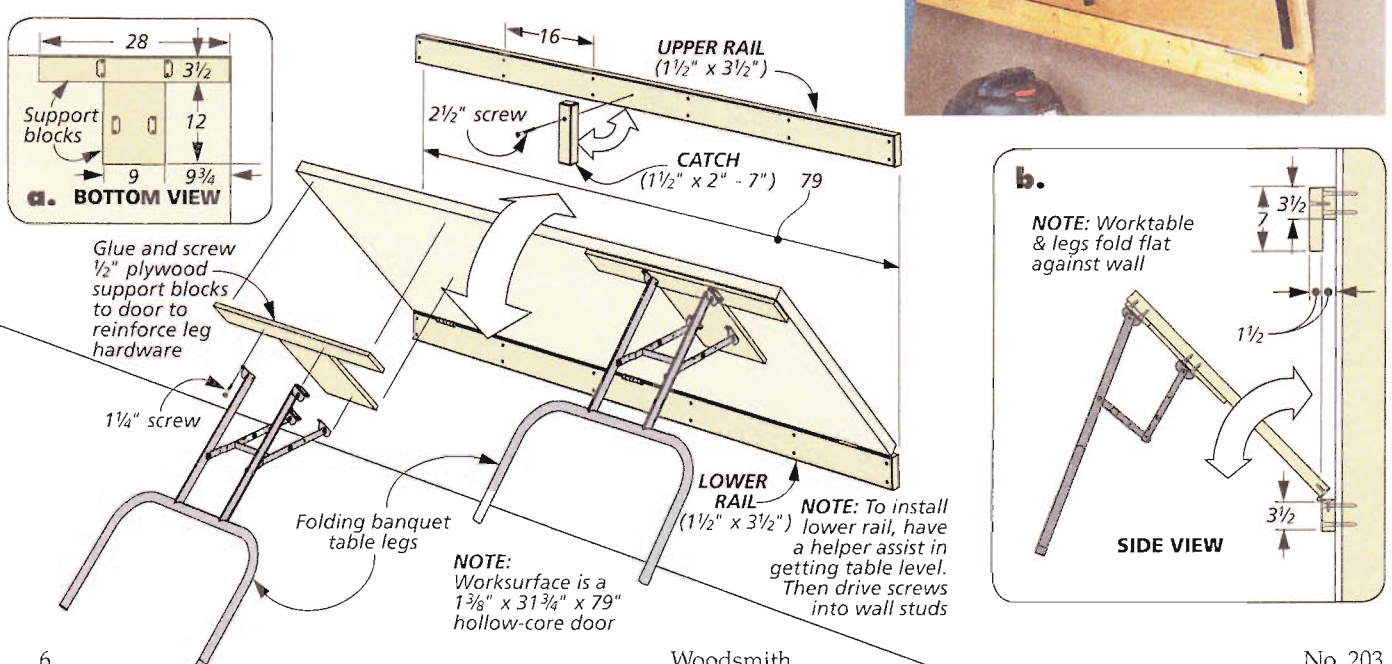
This was the inspiration behind the drop-down worktable shown below. As you can see, there isn't much to it. The worksurface itself is a hollow-core door. It has two folding table legs (see Sources, page 51) that are attached to its underside. Before adding the legs, I glued and screwed plywood support blocks to the door to help reinforce the leg hardware.

The door is attached with 3" butt hinges to a 2x4 lower rail that in turn is fastened to wall studs. Then, a second 2x4 upper rail is mounted in the same fashion above the door. This rail has a wood catch that swings down to lock the worktable in place in its stored position (inset photo).

To create the worktable, I attached the lower rail, hinges, blocks, and legs to the door first. After marking my stud locations, I had a helper assist me in moving the assembly into position on the wall and getting it level. Next, I drove screws through the rail and into wall studs to mount the worktable.

To install the upper rail and catch, simply fold the table up against the wall, and mark the position for mounting the upper rail. Secure it with screws driven into wall studs, and add the catch with a single pivot screw.

Robert Shillis
Easton, Pennsylvania



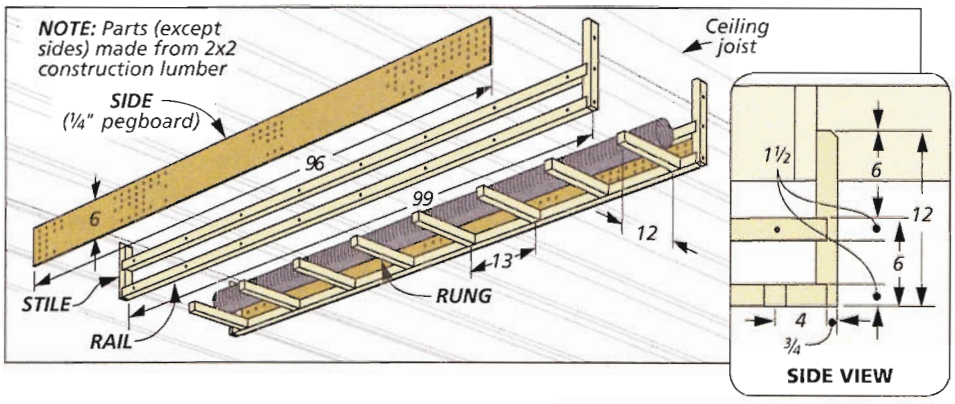
Overhead Hose Storage

I often need to break down my shop's dust collection to make room for cars in my garage shop. So I built a rack for storing my flexible dust hoses overhead.

The rack consists of a pair of 2x2 frames that are connected by rungs and secured to ceiling joists. (If your shop has an open ceiling, screw the frames directly to the joists. If not, screw 2x2 cleats to the joists first, and then screw the frames to the cleats.)

To get even more function from the rack, I screwed on pegboard sides. This way, I can use the rack to hold small hand tools and other shop supplies.

Jay Jorgensen
Albany, New York



Sawdust Stripper

A tried and true trick for making paint stripping less messy is to use sawdust and wood shavings. The wood shavings act as a mild abrasive that "sands" off paint, and the sawdust soaks up the gloopy paint remnants to make removal easier.

First apply the stripper as usual. When it sets up, sprinkle on a liberal amount of sawdust and wood shavings. Now use a scrub brush to work them into the surface (upper photo), and then scrape up and discard what's left (lower photo).

Willie Hancock
Blairsville Georgia

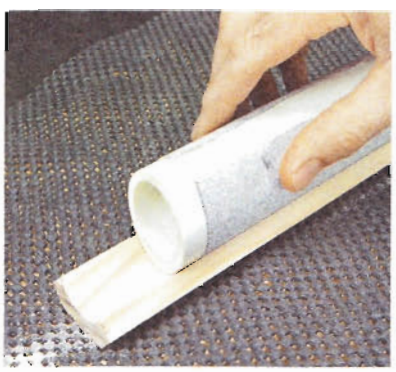
Quick Tips

TOWEL BAR CLAMP RACK

For storing small clamps in his shop, *Serge Duclos* of Delson, Quebec, uses old towel bars. They're easy to install and can be positioned horizontally or vertically on the walls.

PVC SANDER

Jason Stanley of Vancleave, Mississippi, employs an easy technique for sanding cove profiles. He finds a PVC pipe that matches the profile and wraps it in self-adhesive sandpaper.



WIN THIS PORTER CABLE COMPACT ROUTER

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a *Porter Cable* compact router kit just like the one shown here. To submit your tip or technique, just go online to *Woodsmith.com* and click on the link, "SUBMIT A TIP." You can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Robert Shillis, the winner of this Porter Cable router. To find out how you can win this router kit, check out the information on the left.

versatile Hardboard

Being inexpensive and readily available, it's easy to take hardboard for granted. So here's a deeper look at this must-have material.

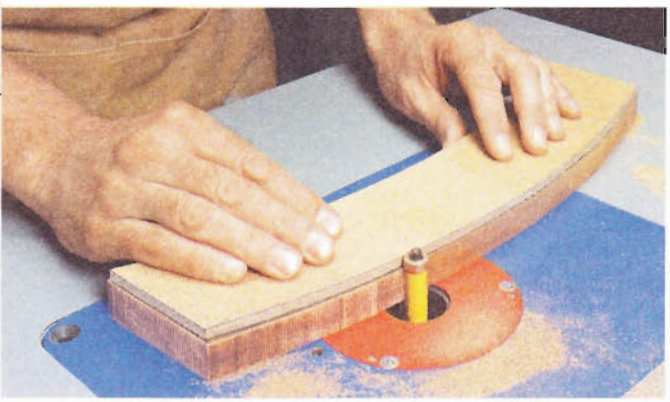
Hardboard is the utility player of the woodworking shop. It's great for jigs, drawer bottoms, cabinet backs — any place where you need a thin, strong panel at a low cost. Seeing as how it's such a useful product, I thought it might be worth taking a closer look at what hardboard is and how it's made.

Hardboard was invented in 1924 by William H. Mason. Mason called his product "Masonite" and today, that name is often used to describe hardboard, even if it's made by a different company. In simple terms, hardboard is made by combining heat and pressure to turn ground-up wood fibers into a smooth, dense panel.

The wood used to make hardboard is first chipped, then steamed to soften the fibers. The steamed chips are then ground to tear the fibers apart.

The wood fibers contain natural cellulose and lignin. The cellulose gives hardboard its strength while the lignin serves as the binder that holds the fibers together. Unlike particleboard or MDF, hardboard does not rely on adhesive in the manufacturing process.

PRODUCTION PROCESS. Hardboard is manufactured in one of three ways. The oldest method is know as the *wet* process. In this method, the ground wood fibers are mixed with water to create a slurry. This slurry is pumped onto a screen and then pressed between rollers to remove much of the water, leaving a wet mat of material. This mat is then placed in a heated press. Under several thousand tons of pressure and temperatures of up to 350°, the remaining water is forced out of the material and passes through the screen (Figure 1). The screen



Hardboard is indispensible when it comes to making templates (left) or shop jigs (right).

leaves behind the characteristic "waffle" pattern on one side of the board (right margin photo).

WET/DRY PROCESS. The second method of production is known as the *wet/dry* process. It's similar to the wet process, but the key difference is that the wet mat of material is passed through a dryer before it's placed in the hot press. Since most of the water is removed by the dryer, the mat can be pressed between two solid plates, resulting in a sheet that is smooth on both faces (Figure 2).

DRY PROCESS. The third process is the *dry* process. In this production method, the wood fibers are conveyed by warm air instead of water. The fibers are blown onto a form and then pressed between two hot plates (Figure 3).

FIBER ORIENTATION. In the dry process, the fibers are randomly oriented in all directions, as shown in Figure 4. This gives a finished sheet of hardboard added stiffness. In the wet and wet/dry processes, the fibers are randomly oriented in two directions only, resulting in a more flexible product with greater paintability.

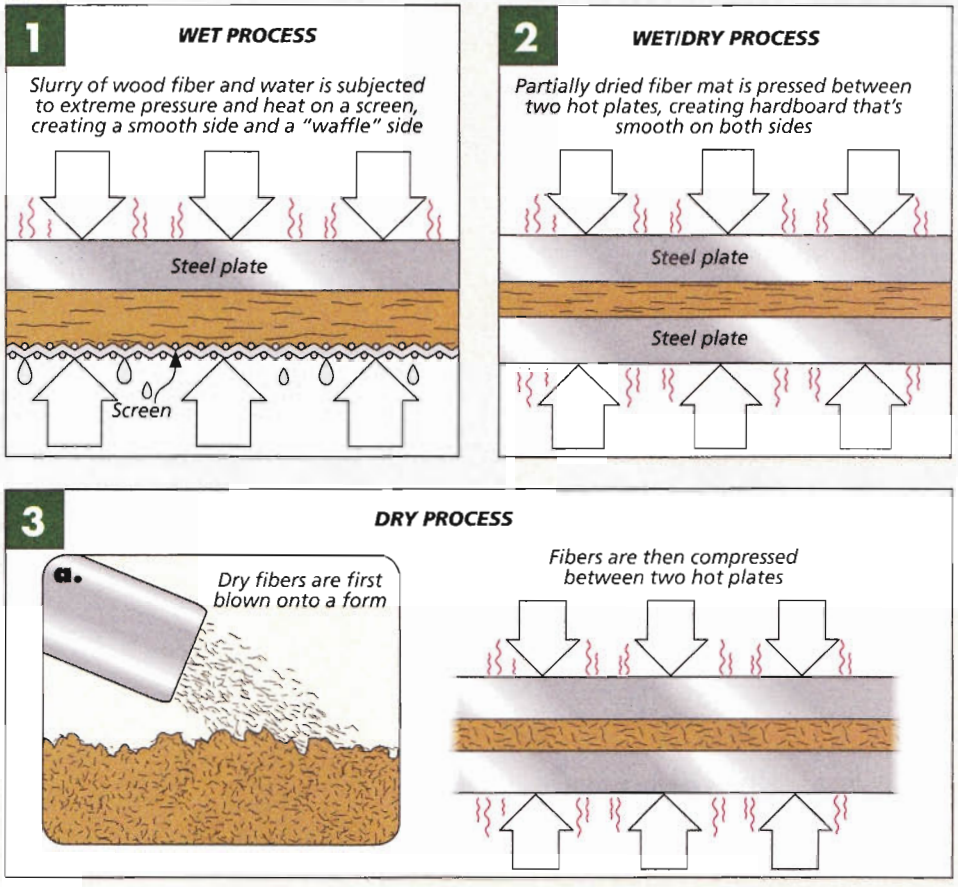
TEMPERING. An added step in the manufacture of some hardboard is tempering. Hardboard is tempered by applying a drying oil (usually linseed oil) to the surface of the hardboard and then curing it in an oven for several hours. The tempering process just barely penetrates the surface, but it makes the finished panel harder and more resistant to water. It also increases the hardboard's paintability.

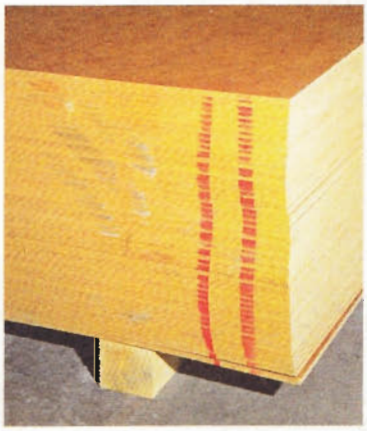
CLASSIFICATIONS. Hardboard is manufactured under five different classifications, based upon its strength and physical properties. To identify the class of hardboard, a system of color-coded stripes is used to mark each stack of hardboard panels (photo below). In decreasing order of strength, the classifications and markings are: tempered (one red stripe), standard (one green stripe), service-tempered (two red stripes), service (two green stripes), and industrialite (one blue stripe).

Most of the hardboard you'll come across in home centers is service grade. But I prefer to use service-tempered hardboard, even though it can be a little harder to find. It wears and holds up better, and takes finish well.

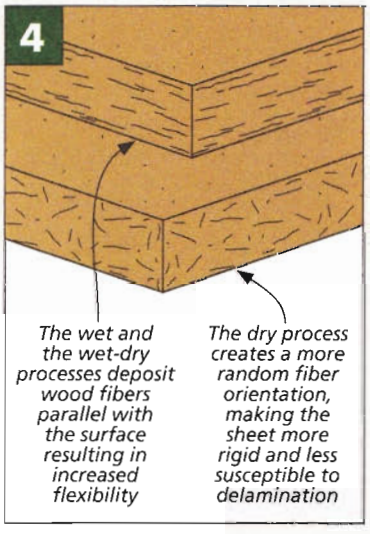
COLOR. You may have heard claims that the quality of hardboard can be determined by surface color (for example, darker hardboard is stronger than lighter). Actually, there's no basis in fact for this. The truth is that the color of hardboard is dependent on the type of wood product that's used to make it.

This information may not change the way you use hardboard, but at least the next time you pick up a sheet for a project, you'll have a better understanding of how it's made. W

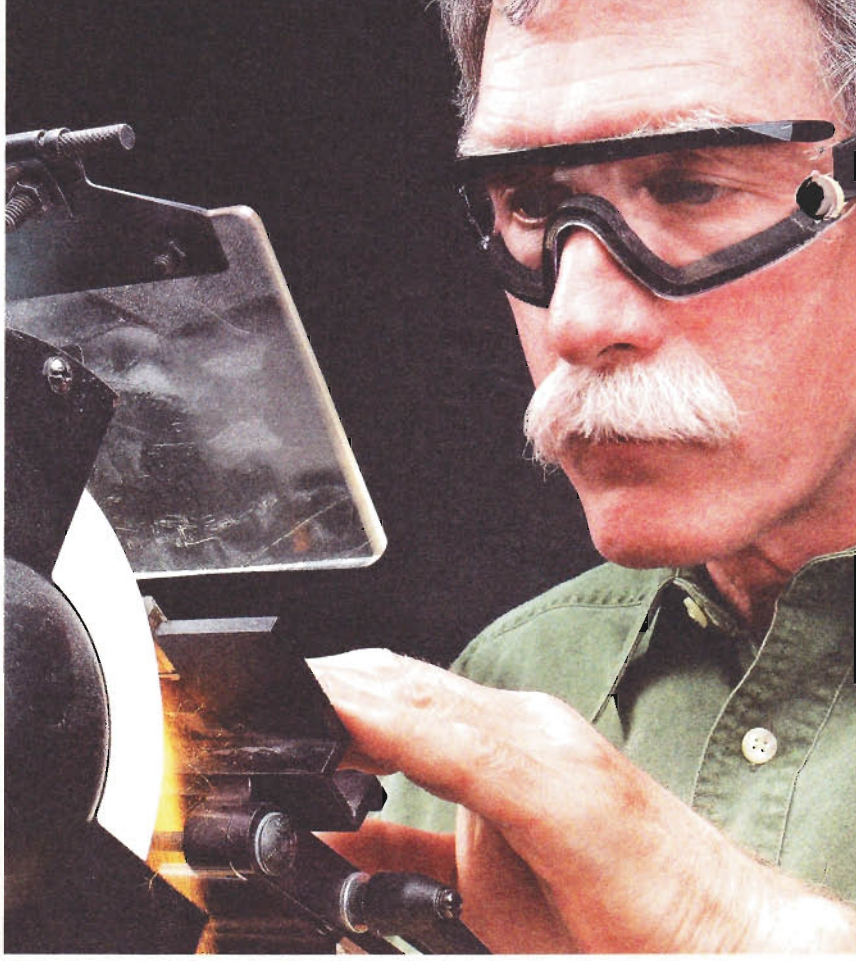




▲ Classifications of hardboard are indicated by color-coded stripes on each stack.



▲ The "waffle" pattern you find on some hardboard is a result of the manufacturing method.



focus on Eye Safety

With your eyesight at stake, safety glasses are a must. Fortunately, finding a comfortable pair that can do the job is easier than ever.

We've all read the safety warnings and heard the admonitions on television: The most important piece of safety equipment in the shop is a pair of safety glasses. And yet, every day woodworkers step in front of their table saws, router tables, and other power tools without eye protection.

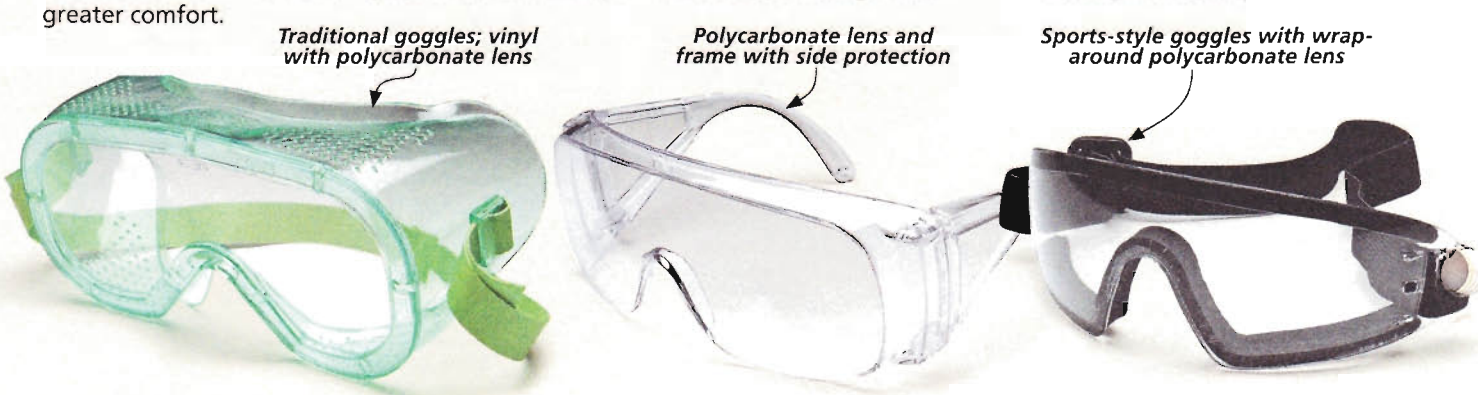
I'm not pointing a finger here. I'm guilty, as well. For years I told myself that it's just a quick cut and it'll be okay. But here's the scary statistic: According to *Prevent Blindness America*, there are over 600,000 eye injuries per year in the US. Over 90% could be prevented with safety glasses.

As I said earlier, this probably isn't news. So why do so many of us ignore it? In my case, it was simply a matter of never finding the right pair of glasses. Some were uncomfortable, and others had poor visibility, or fogged up while I was wearing them.

Hoping to improve my safety habits, I set out to find comfortable safety glasses that could provide adequate protection.

GOGGLES. The first product most of us ever experienced is the old-style plastic goggles (left photo below). They're not bad straight out of the package, but they scratch easily, fog up often, and are generally uncomfortable to wear. They're probably a big reason I ignored safety eyewear.

Safety eyewear has evolved to provide better protection and greater comfort.



MODERN DESIGNS. The center photo at the bottom of the opposite page shows a good example of how designs have evolved to include side protection. Fortunately, manufacturers now offer more comfortable designs.

Many companies are moving toward more sport-style safety glasses. These models, like the pair shown in the right photo on the opposite page offer plenty of protection and are very comfortable to wear. The wraparound lens even covers the sides, and the strap makes sure they stay in place.

POLYCARBONATE LENSES. The versatility of modern plastics allows manufacturers to produce a comfortable array of impact-resistant lenses for just about any task. Polycarbonate is more impact resistant than glass or most other types of plastic. That's why it's become the standard for protective eyewear. While safer than glass, it is not as scratch resistant.

▲ The ANSI Z87+ mark shows the glasses can protect against high-impact accidents.

ANSI & OSHA. To find some objective measure of protection, I turned to OSHA (Occupational Safety & Health Administration) for a little guidance. OSHA has adopted the ANSI (American National Standards Institute) standards for testing and evaluation of safety lenses and frames.

ANSI rates two levels of performance — basic impact and high impact. For carpentry and most woodworking tasks, safety lenses must be rated for high impact. Basic-impact lenses will carry the ANSI Z87 mark. (Z87 is the paragraph number of the governing regulation). High-impact products must withstand a ¼" steel ball dropped at 150 ft./sec. without cracking or chipping the lens. These glasses will carry the "+" sign on the frame or lens to show impact resistance (photo at left).

BIFOCAL LENSES. In addition to all these designs, those of us with less than perfect vision also have a few more options. Of course, you can have a pair of safety glasses made by your optometrist. Most eyeglass retailers offer safety glass options. But by the time you've added side protection, you've run up a sizeable bill.

Even if you can't see well enough to work without glasses, there are off-the-shelf corrective bifocal lenses that work well and won't break the bank. The left photo above is a good example.

OVER-GLASS PROTECTION. A less expensive option is a pair of polycarbonate safety glasses that fit over your normal glasses. I find that these, shown in the right photo above, offer excellent visibility while keeping my eyes safe. I even keep a spare pair on hand for shop visitors.

Face shield visors like the one in the box at left are another option. They protect not only your eyes, but your whole face from flying chips when you're turning. You can find out where I got these and all the other glasses in Sources on page 51. The biggest surprise might be the low cost of high-quality protection. Most of the glasses shown here cost less than $10 — a very small price to pay to save your eyes.

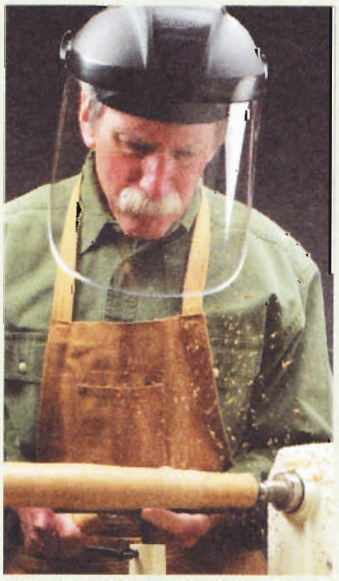
The bottom line is simple. Don't risk becoming a statistic. With so many great options available, there's no excuse for not protecting your vision. You'll find that donning your eyewear before stepping up to a machine will quickly become a habit. W

▲ Over-glasses protection offers safety and convenience.

Full-Face Protection

There are times when you need more than just eye protection. Some activities, like wood turning, expose your face to the risk of fast-moving chips. A full-face shield offers the perfect type of protection for your eyes and face. It's also adjustable to fit anyone.

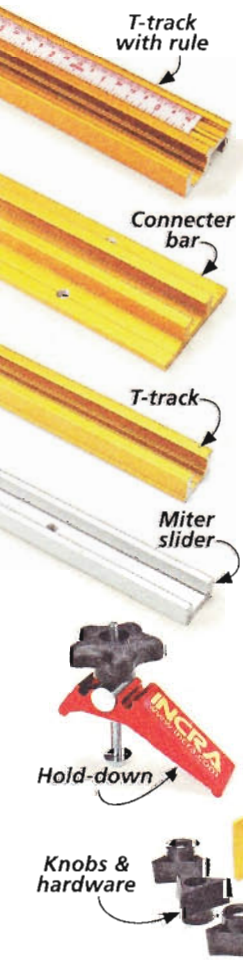
The 180° field of vision allows you to see everything that's happening while you're working. And although the polycarbonate face shield isn't as thick as the lenses in most glasses, the curved shape helps deflect just about anything you'll encounter under normal circumstances.

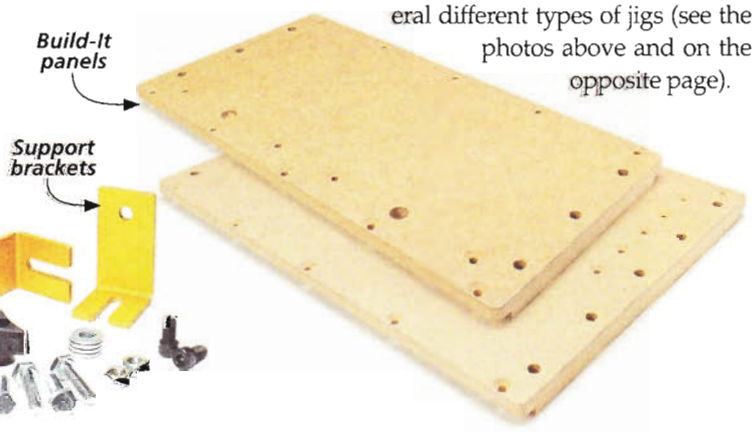


better jigs with the

Incra Build-It System

Need a new jig? The chances are good that you can make it easily with *Incra*'s unique system of interchangeable jig components.





As a woodworker, I take pride in my ability to assemble the right jig whenever a new challenge arises. But every once in a while, a manufactured jig will look interesting or useful enough that I'll consider buying the solution rather than building it. That certainly ended up being the case with the *Incra Build-It System*.

ONE SYSTEM, MANY USES. What's unique about the *Incra* system is that it's more than just a single-use jig. Rather, it's a system of interchangeable components that you can mix and match to build several different types of jigs (see the photos above and on the opposite page).

For the most part, these are jigs that you're sure to get a lot of use from, whether it's for accurate, repeatable crosscuts and miters, or dead-on tapers and tenons. Plus, you can use the *Incra Build-It* system to make jigs for a variety of tools. *Incra* has plans for table saw, router table, and disc sander jigs, just to name a few examples.

HOW THE SYSTEM WORKS. If you're interested in trying the *Incra Build-It System*, the best place to begin is with the *Starter Kit* that the company offers (see Sources on page 51.) This kit has all the components and hardware you'll need to get going with the system, as well as plans for building five different jigs.

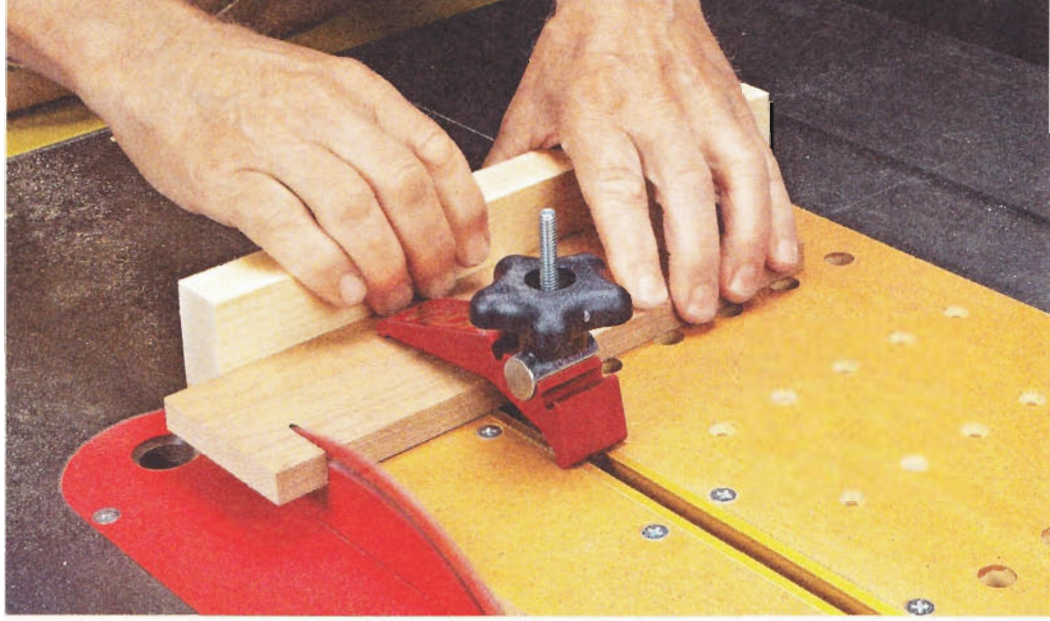
SYSTEM COMPONENTS

Speaking of the components of the system, it really starts with the *Incra Build-It Panel*. These 5/8"-thick, 15½"-long MDF panels serve as the base for almost every *Build-It* jig. They're available in large (11¾" wide) and small (7¾" wide) sizes and come pre-drilled with a number of holes to accommodate the other components of the system.

PANEL CONNECTORS. The panels have a rabbet cut on each edge that accepts another critical component, the panel connector. This anodized aluminum track lets you quickly join two or more *Build-It* panels side by side to make a variety of different jigs.

MITER SLIDERS. Since most of the *Build-It* system jigs need to slide in a table saw or router table miter slot, a miter bar called a "miter slider" is another important part of the system. These simply connect to the underside of the panels with screws, and they're adjustable for a good fit in your miter slot.

Incra also offers a variety of other items sold separately, including T-tracks, hold-downs, support brackets, and knobs, depending on what you need for the jig you have in mind. For an overview of all the components, take a look at the photos on page 12.



This simple crosscut sled ensures dead-on 90° table saw cuts.

JIGS YOU CAN MAKE

I found assembling the components of a *Build-It System* jig to be a fun woodworking diversion. It was almost like building with an *Erector Set*. But the jigs also require some hardwood parts, so there's a little more woodworking involved than simply screwing parts together.

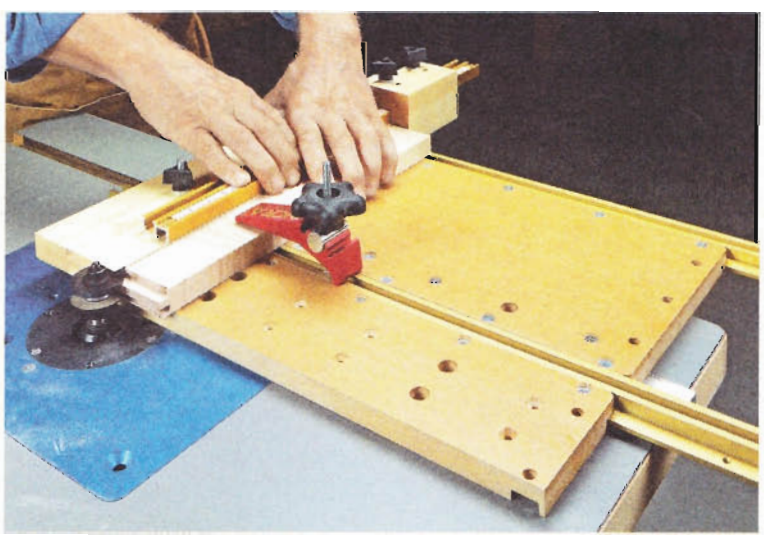
CROSSCUT SLED. To assemble the simple crosscut sled shown above, for example, I ripped a large *Build-It* panel in half to create the two sides of the jig. Then I added the miter slider and panel connector and trimmed the sled to size to fit my table saw. It also has a solid-wood fence glued and screwed to the back end of the base. The sled makes accurately crosscutting small parts a snap.

ADJUSTABLE ANGLE SLED. If you want to make a table saw sled with even greater functionality, then an adjustable angle sled fills the bill (main photo, page 12). It requires a few more components to make. These include three panels, two connectors, two miter sliders, two T-tracks, and some knobs, clamps, and brackets. But the trade-off is a versatile table saw sled that you can use for all your crosscutting and mitering needs.

COPING SLED. A coping sled is a great way to add the *Build-It* system's utility to a router table. As you can see at left, you only need a few parts to create a jig for making accurate cope cuts on the ends of door rails.

CREATE YOUR OWN. These three jigs are just a small sampling of what you can do with the *Incra Build-It System*. For even more jig ideas and plans, check out their website at *Incra.com*. There, you can browse all the different jig plans and download the ones of interest. *Incra* has also created an online community around the system by encouraging users to come up with and submit their own ideas to share with other woodworkers.

Overall, I found the system to be enjoyable to work with, and the *Build-It* jigs that I made are already getting a lot of use for projects in my shop. W



The Incra Build-It System coping sled rides in a router table miter slot. It allows you to accurately position door rails for cope cuts, and it backs up the cut with a solid-wood fence.

3 tools for Cutting Tapers

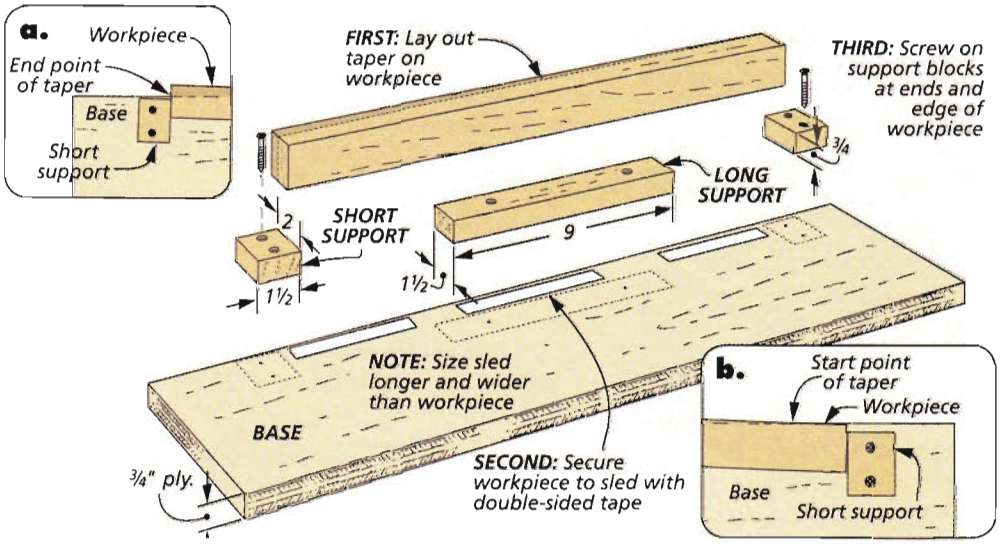
Table saw, band saw, or jointer — for making tapered cuts, all three tools have their place. Here are the pros and cons of each.

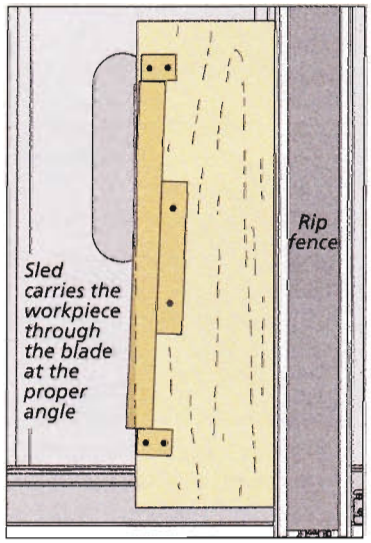
A taper is one of the most subtle woodworking details you can add to a project. But on parts like table legs, it can have a big impact by giving furniture a lighter feel, while at the same time adding a touch of elegance to the piece.

TABLE SAW. When it comes to accurate tapers, it's tough to beat the table saw. The only drawback is that it requires a jig, or sled, to carry the workpiece through the blade at the proper angle.

One of the simplest approaches is shown above. As you can see, it's just a base that rides between the blade and rip fence and three support blocks that secure the workpiece at the proper angle. To make a taper this way, mark it out on the workpiece, align the mark with the edge of the base, and press it firmly in place over strips of double-sided tape. (Add hold-down clamps if needed.)

Then add the support blocks to the front, back, and side of the workpiece with screws. Now all that's left is to position the rip fence and make the cut.





Band Saw

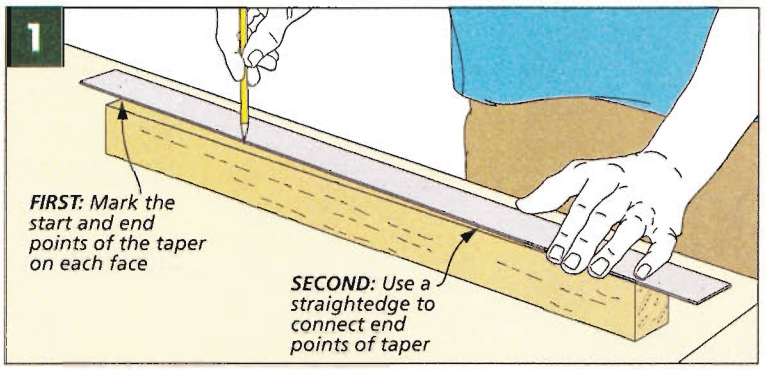
When cutting tapers at the band saw, no fancy jigs or sleds are needed. You just lay out the taper and cut it freehand.

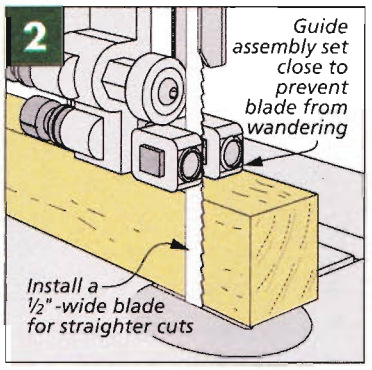
If there's any drawback to this approach, it's that the freehand cut introduces the possibility of inaccuracy. Plus, the rougher-cutting saw means you'll need a bit more work afterward to get smooth results. But with the right techniques, you can minimize these issues.

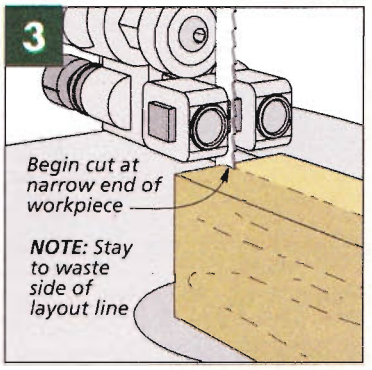
LAY OUT THE TAPER. The first step in a successful taper is laying it out properly. Figure 1 is a good guide. Mark the start and end points with a pencil, and connect them with a straightedge. It's also a good idea to mark the taper on both faces, so the layout lines are always visible. Finally, mark the shape of the finished workpiece on the end, so you'll have a good guide for starting the cut.

BAND SAW SETUP. Since a taper is a straight cut, I'd recommend installing a ½"-wide blade. This blade cuts quickly and tracks straight throughout the cut. Also, set the upper blade guide assembly fairly close to the workpiece to prevent the blade from wandering (Figure 2).

CUT THE TAPER. Your best bet is to start cutting at the narrower end of the workpiece, and exit the cut near the wider end (Figure 3). Make the cut in a smooth, single motion, and stay just outside of the layout line as you cut. Then you can make a final pass with a jointer, sander, or hand plane to clean up the cut and shave it down to its final size.







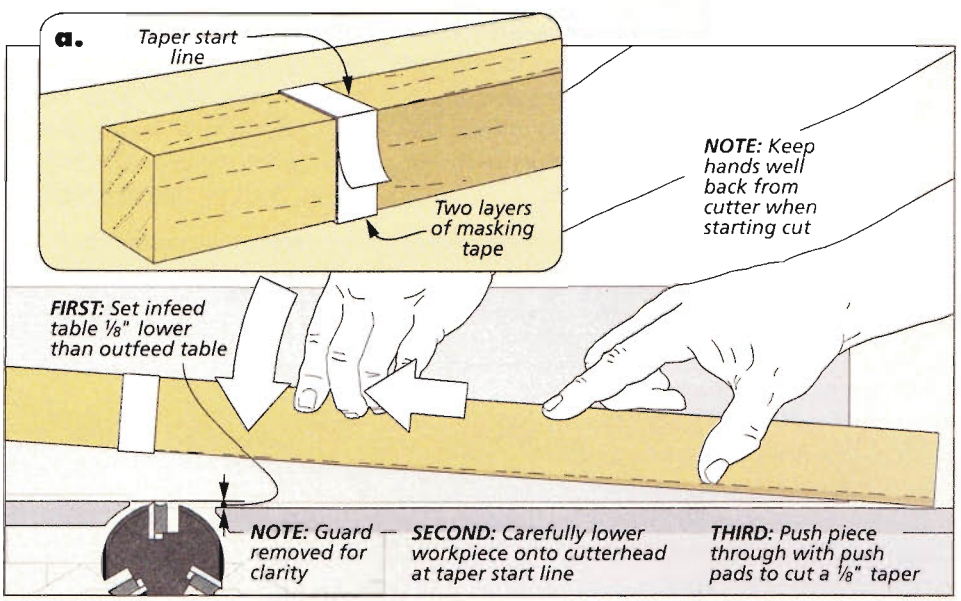
Jointer

Using a jointer to cut tapers may seem unusual, but it has its place. If you want to cut a very subtle taper (⅛" or ¼") on multiple sides of a table leg, then the jointer can handle the task quickly and easily.

To cut a taper at the jointer, you set the infeed table lower than the outfeed table (no more than ⅛") and lower the workpiece onto the spinning cutter at the starting point of the taper. As the workpiece rides over the outfeed table, the jointer creates a gradual taper (main drawing). The key is to keep a firm grip on the piece as you lower it, and keep your hands well back from the cutterhead as you begin the cut.

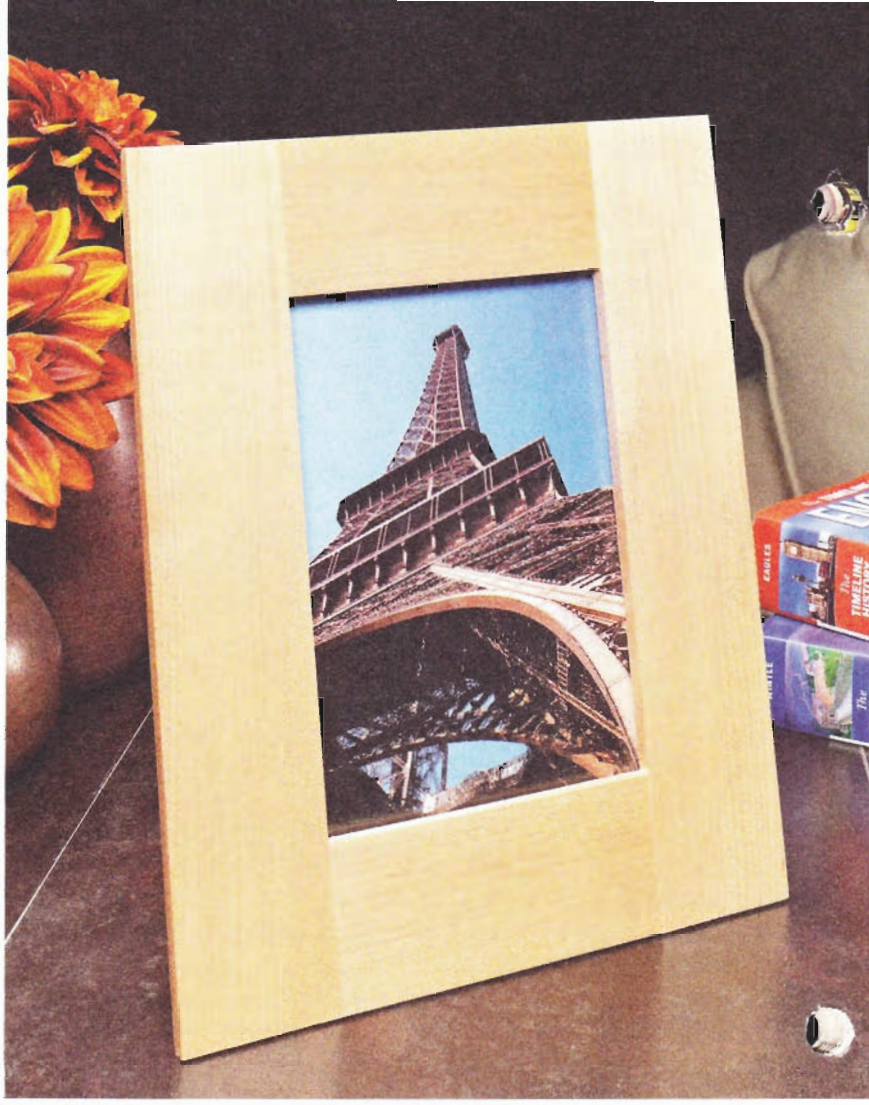
USE TAPE. The jointer cutterhead can make a circular indentation, commonly known as snipe, at the start of the cut. You can minimize this effect by wrapping two layers of masking tape around the workpiece right at the cutline (see detail 'a' above).

After the start, the cut is actually not much different than other jointer applications. Use push pads to apply firm, even pressure to the piece as you cut.



no-miter Picture Frames

Get great-looking picture frames without miters. We'll show you how with six design options.



Picture frames are almost the perfect weekend woodworking project. But one design element that prevents some woodworkers from giving them a try is the mitered corners. It's often difficult to get a clean, gap-free fit.

You won't have that problem with these frames. That's because they're built without miters. Instead, they use a layered construction technique that simplifies the joinery without sacrificing strength.

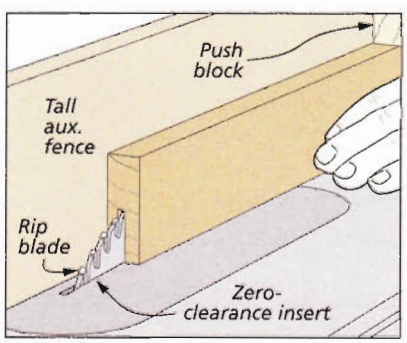
BUILT IN LAYERS. As you can see in the drawing on the opposite page, each frame is actually made up of two overlapping frames put together with butt joints. However, the joints of the top frame overlap the joints on the bottom frame. The two frames are glued face to face, and the offsetting joints create "half laps" at the corners for a rock-solid assembly.

The back frame pieces are narrower than those of the front frame. This creates a rabbet for your photo assembly, as well as a ¼" offset on the outside edges.

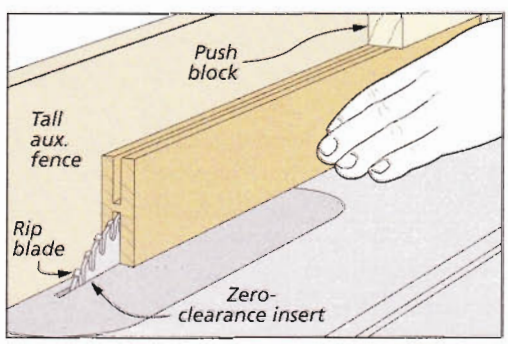
Shop Tip: Table Saw Resawing

When working with narrow pieces like these frame parts, it's easy to create thin stock from thicker boards by resawing them at the table saw.

To ensure a safe cut, however, it's best to cut the stock in a series of progressively deeper passes rather than in one pass. Also, use a push block to guide the board and a zero-clearance insert around the blade when cutting to further promote safety. The drawings at right will show you how it's done.



First Pass. *Set the blade height at less than half the stock's thickness and feed it through with the push block.*



Complete the Cut. *Flip the piece end for end and make progressively deeper cuts until you cut completely through the stock.*

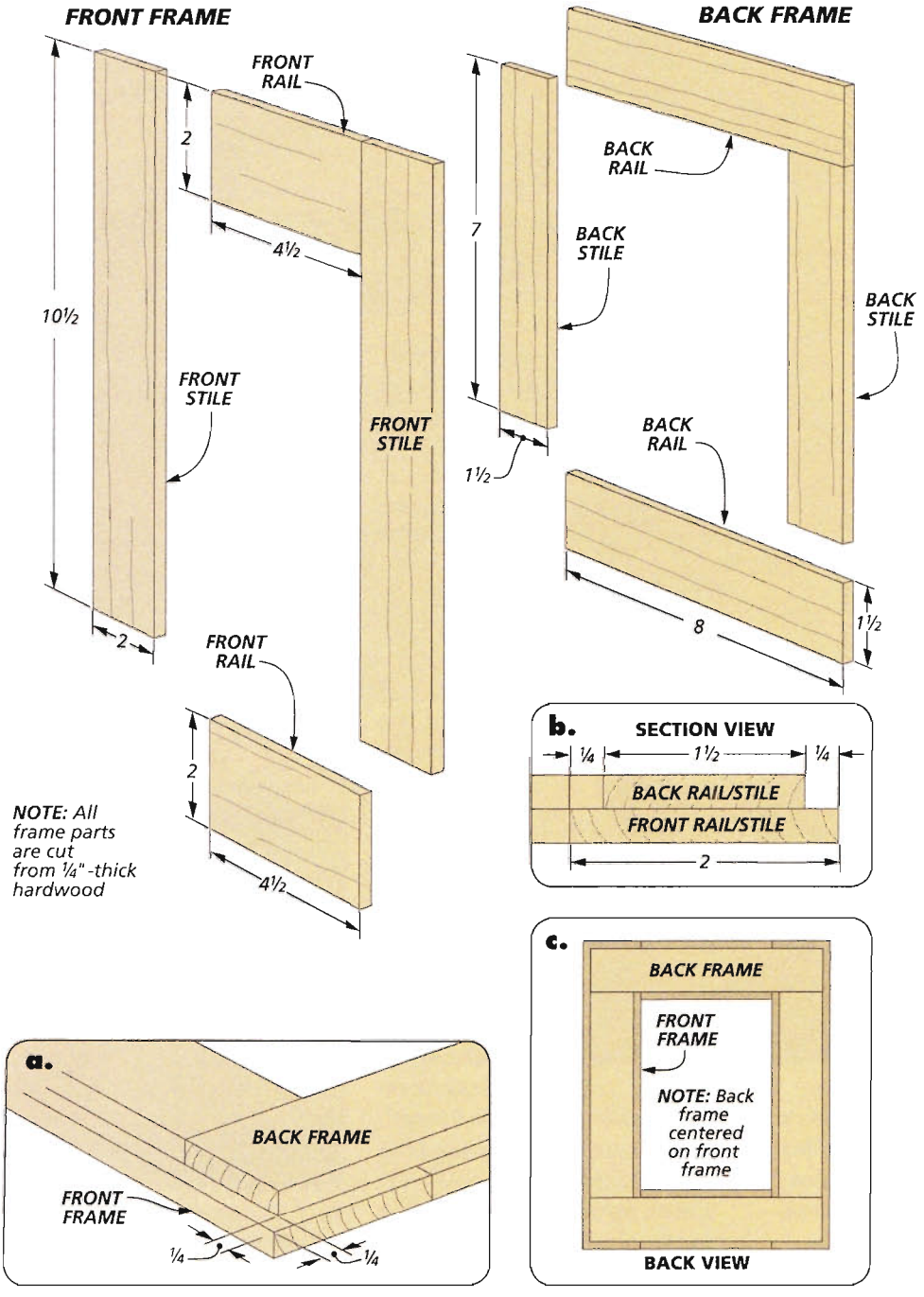
MULTIPLE OPTIONS. The frames are designed to hold 5x7 photographs, but it's easy to modify them for different sizes of photos. To give you some variety, I came up with five variations on the original design. These options use different woods, embellishments, or techniques to change the basic frame that you see at left. You'll find these options on the following pages.

Another nice thing about these frames is that you can build them out of boards from your scrap bin. To create the thin stock required, you can resaw lumber (page 16) or buy thinner stock like that shown in the box on page 18.

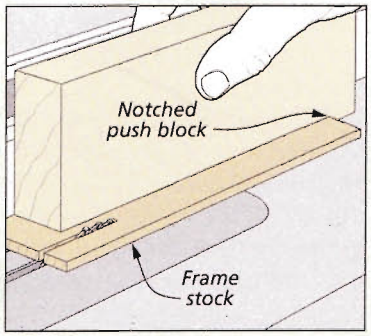
BUILD THE FRAME. Once you've selected your stock, making the frame is simple. Just cut the parts to size as shown at right. There's a tip for ripping narrow strips in the lower left drawing below.

Now you glue up the top and bottom frames individually. Just apply glue to the ends and clamp each frame together. I built a simple glueup jig that ensures square frames (middle drawing below). You can see how to build the jig on page 30.

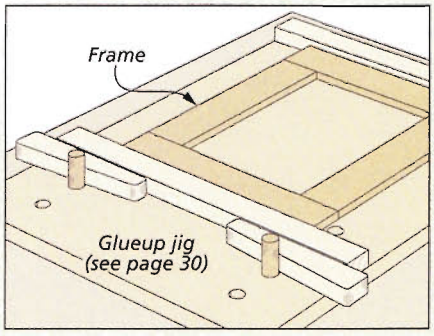
PUT THEM TOGETHER. All that's left to complete the basic frame is gluing the two frames face to face, as shown in the detail drawings at right. The lower right drawing shows how to keep the frames aligned during this glueup.



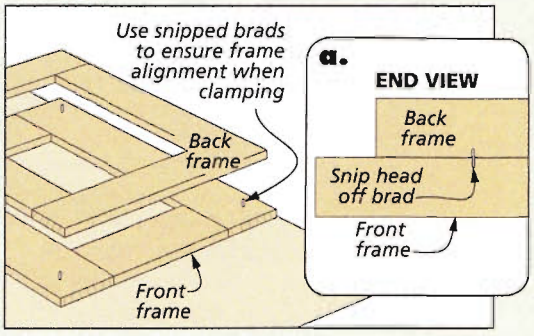
How-To: Build the Basic Frame



Rip Thin Stock. *To support the thin workpieces as you cut, use a notched 2x4 as a push block.*

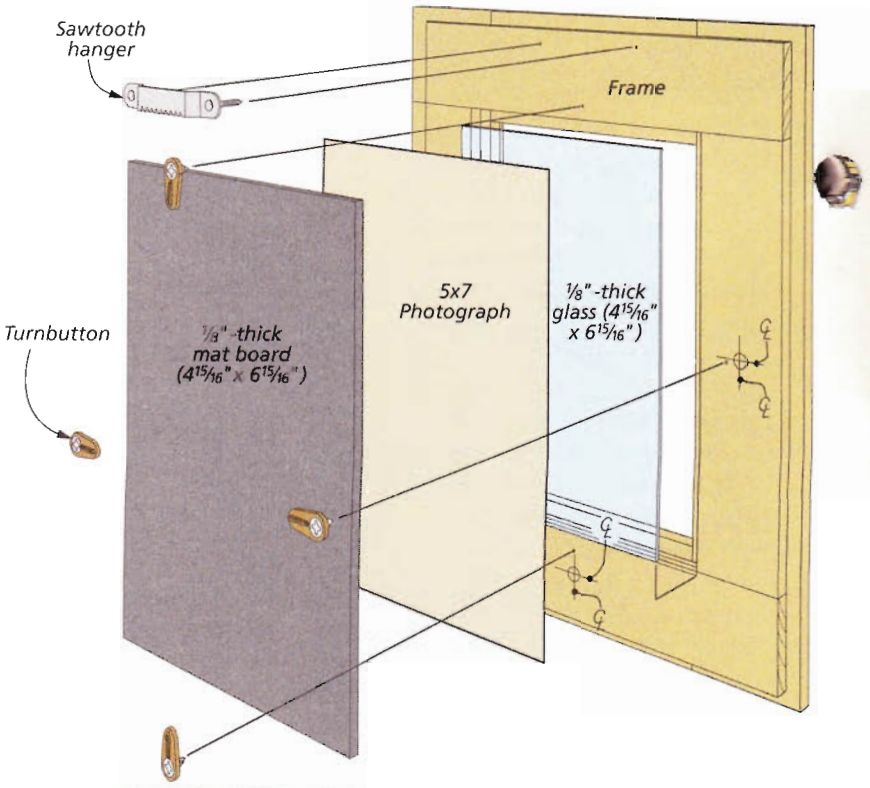


Glue Up. *This simple glueup jig ensures that the frame assemblies will be square. To build it, turn to page 30.*



Brads. *To keep the frames from shifting when gluing them together, tap in brads and snip off the heads before glueup.*

completing the FRAME



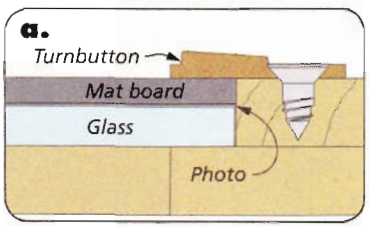
Once you have the basic frame built and finished, it only requires a few simple steps to get the frame ready to display your favorite photograph.

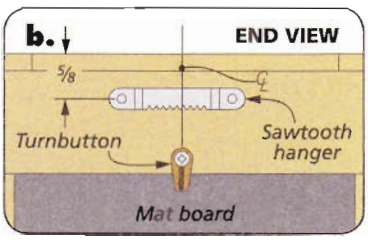
WALL OR TABLE? The first decision to make is whether you want the frame to hang on the wall or rest on a tabletop or another horizontal surface. If you plan to mount it to the wall, simply install a sawtooth hanger on the back of the frame. You can place it on a rail to display a portrait, or on a stile for a landscape (see detail 'b').

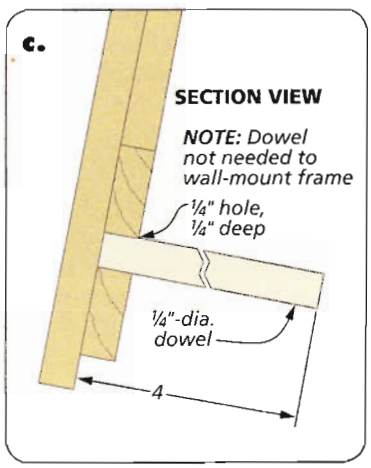
A length of dowel rests in a hole drilled in the frame to stand it up on a table.

If you want to place the frame on a surface like a tabletop, just drill a small hole in the backside and insert a short length of dowel (see detail 'c' and the photo on the left).

Here again, you can make the addition to the rail or stile of the frame, depending on whether you want the orientation of the photograph to be horizontal or vertical. In fact, you may want to drill the holes in both a rail and a stile in case you decide to change your mind about the photograph that you'd like to display later on.





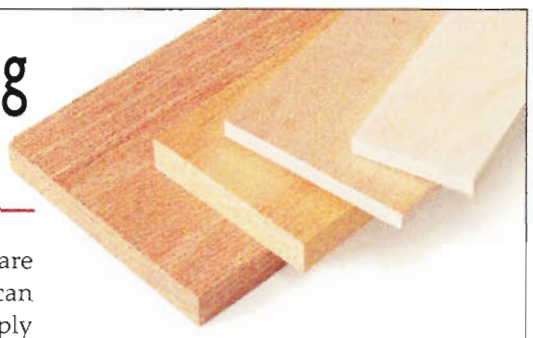


ADDING THE PHOTOGRAPH. Now it's time to add the photograph. As mentioned before, this frame holds a 5x7, which is a fairly standard photo size.

You can get a piece of glass cut to fit the frame at a hardware store or glass shop. It's best to get the glass cut just a hair smaller than the opening.

Now simply cut a piece of ⅛" mat board (available at most craft stores) to serve as the backer for your photograph. Put it all together, insert it in the frame, and secure the assembly with turnbuttons that are screwed to the back of the frame (see the main drawing and detail 'a' above).

Shop Tip: Buying Craft Wood



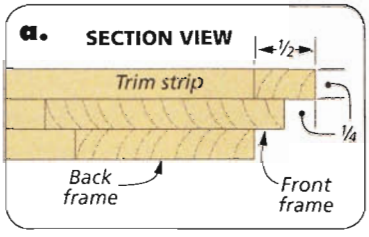
Most of the picture frame parts are made from ¼"-thick stock. You can resaw your own in the shop, or simply buy this thickness in the "craft wood" section of a local home center.

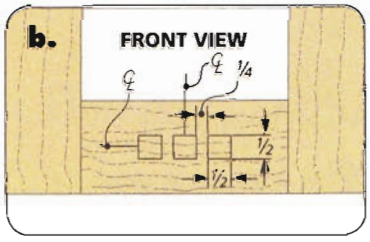
In the lumber aisle, there should be a section that offers a variety of smaller boards at ¼" and ½" thickness. You'll find species such as maple, oak, pine, and poplar.

add stylish ACCENTS

The great thing about this picture frame project is how easy it is to modify the frame to get a lot of interesting looks. Over the following three pages, I'll offer five different ways to change the original frame design.

One simple way to modify the picture frame is to embellish it with wood accent pieces. You can see two easy ways to do this in the photo at right. The maple frame on the left has walnut trim strips glued around the perimeter of the frame. The frame on the right is made of red oak, and it has six small wood squares glued to the rails to give it a Craftsman-style look.



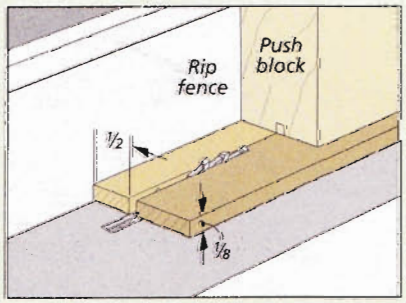


ADD THE ACCENTS. Neither embellishment is very difficult to make. For the trim strips, I started with ¼" stock, and then ripped ½"-wide strips at the table saw. Cut the strips to length, and glue them to the frame so they overhang the outer edges, as you can see in detail 'a.'

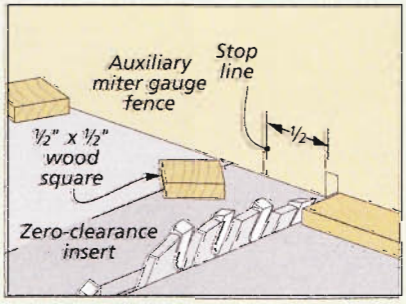
CLASSIC CRAFTSMAN. The Craftsman-style frame requires a couple more steps, but it's still straightforward. The squares are made from ⅛"-thick stock, so you'll need to resaw this from oak using the steps shown in the box on page 16. Then rip ½"-wide strips just as before (see the lower left drawing).

Next, you need to crosscut the individual squares. This is easy using a miter gauge with an added auxiliary fence to back up the cut, as shown in the middle drawing below. Finally, you can spot glue the squares by holding each one in place for around 30 seconds or so. The only challenge here is keeping them aligned. To help with this, I just clamped a straightedge to the frame before gluing on the squares. The lower right drawing shows you how this is done.

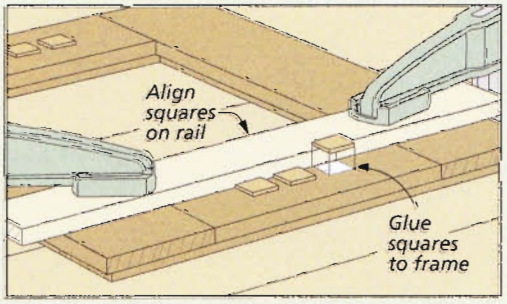
How-To: Add the Accent Pieces



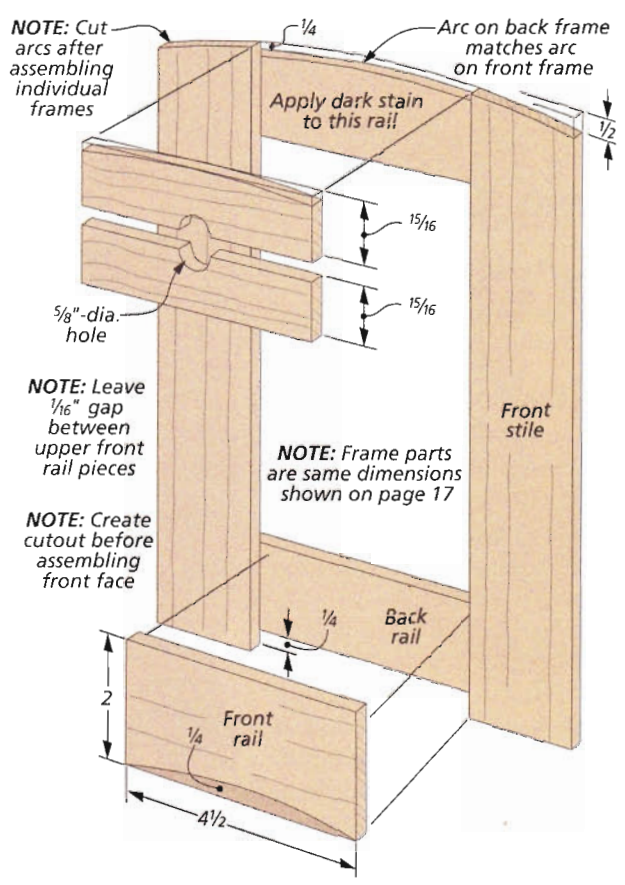
Rip Strips. *To cut the thin stock safely, use a notched push block to guide the workpiece past the blade.*



Cut Squares. *Add a wood fence to your saw's miter gauge to support the stock as you cut the squares.*



Glue on Squares. *A straightedge clamped to the frame keeps the squares aligned as you spot glue each one in place.*



create curves & a CUTOUT

The picture frame option shown above requires a little more woodworking, but the unique look you get is well worth the extra effort. As you can see in the drawing above, it's built similarly to the original frame but has a few subtle differences. Most noticeably, the top rail features the unique cutout that allows the darker back rail to peek through. There is also a subtle arc cut on both the top and bottom of the frame.

CREATE THE CUTOUT. Adding these details to the frame just takes a few steps. After cutting all the parts to size, you simply rip the top front rail in half at the table saw (lower left drawing). Then clamp in a 1/16" spacer strip to establish the proper gap between the two pieces.

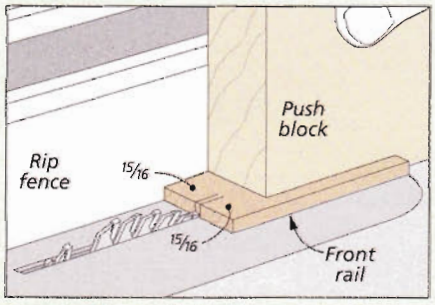
Now head to the drill press. Here, you can use a Forstner bit to bore the centered hole, as shown in the middle drawing below.

CUT THE CURVES. At this point, you can remove the spacer strip, and glue up the front and back frames individually just as before. Make sure to leave the gap between the two pieces of the upper front rail.

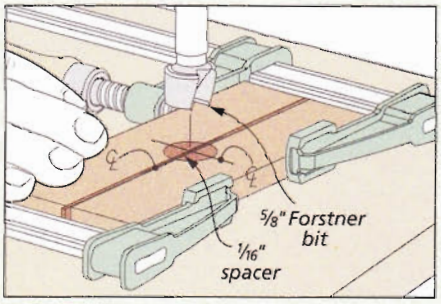
Next, lay out matching arcs on the front and back frames, and cut them both at the band saw as shown in the lower right drawing. Now stain the part of the upper back rail that's directly beneath the cutout with a dark stain.

At this point, you can finish up by gluing the two frames to one another with an even offset.

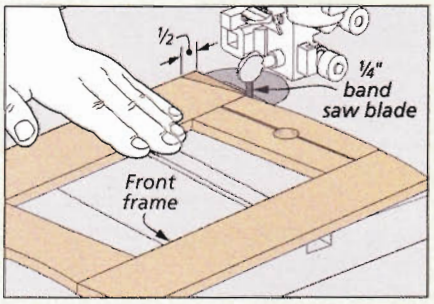
How-To: Add Cutouts & Curves



Divide Upper Rail. *After cutting all the parts to size, rip the front upper rail in half using a push block for support.*



Drill Hole. *Clamp a spacer between the parts and drill a centered hole on the drill press with a Forstner bit.*



Cut Curves. *Lay out the arcs on the frames, cut them to shape at the band saw, and then sand them smooth.*

decorative GROOVES

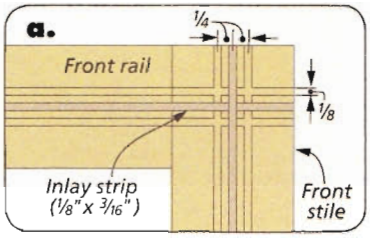
Another unique way to accent the basic picture frame design is to use your table saw to add decorative grooves to the frame. In the photo at right, you see two options that employ this technique. The frame on the right side has three grooves on each end of the frame. And the frame on the left side has grooves on all four faces that intersect in the corners. On this frame, mahogany inlay strips are glued into the center grooves.

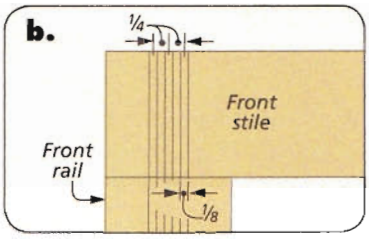
CUT THE GROOVES. The grooves are spaced so that the middle groove is centered on the frame rail, and the other two grooves are spaced ¼" on center to either side, as you can see in details 'a' and 'b' at right. The best way to ensure consistent grooves on opposite ends of the frame is to set up the saw carefully, and then flip the frame end for end for each pair of cuts. See the left drawing below for guidance.

ADD THE STRIPS. If you plan to add the inlay strips, the technique for making them is really not that much different than the other thin stock operations you've been using for this project. Just make the cut on the table saw using a wood push block for safety and support (middle drawing). Check the fit in the groove, and then sand the edges smooth.

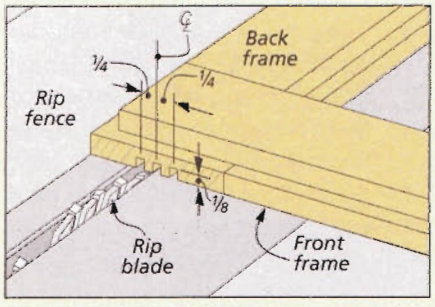
All that's left to do is glue in the inlay strips. As you can see in the lower right drawing, the vertical strips run the full length of the frame, while the horizontal strips are actually three individual pieces that butt against the edges of the longer strips. You can leave these thin strips a bit long and then trim them flush with the frame edges.

MAKE SOME MORE. Even with the embellishments, any one of these frames makes an ideal weekend project that's sure to be a one-of-a-kind gift for a friend or loved one. In fact, you may find that the weekend gives you enough shop time to make one of each.

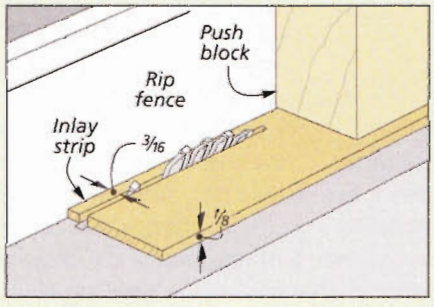




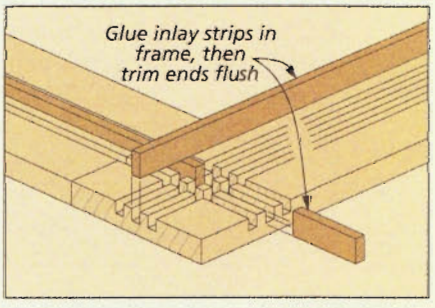
How-To: Cut Grooves & Add Inlay Strips



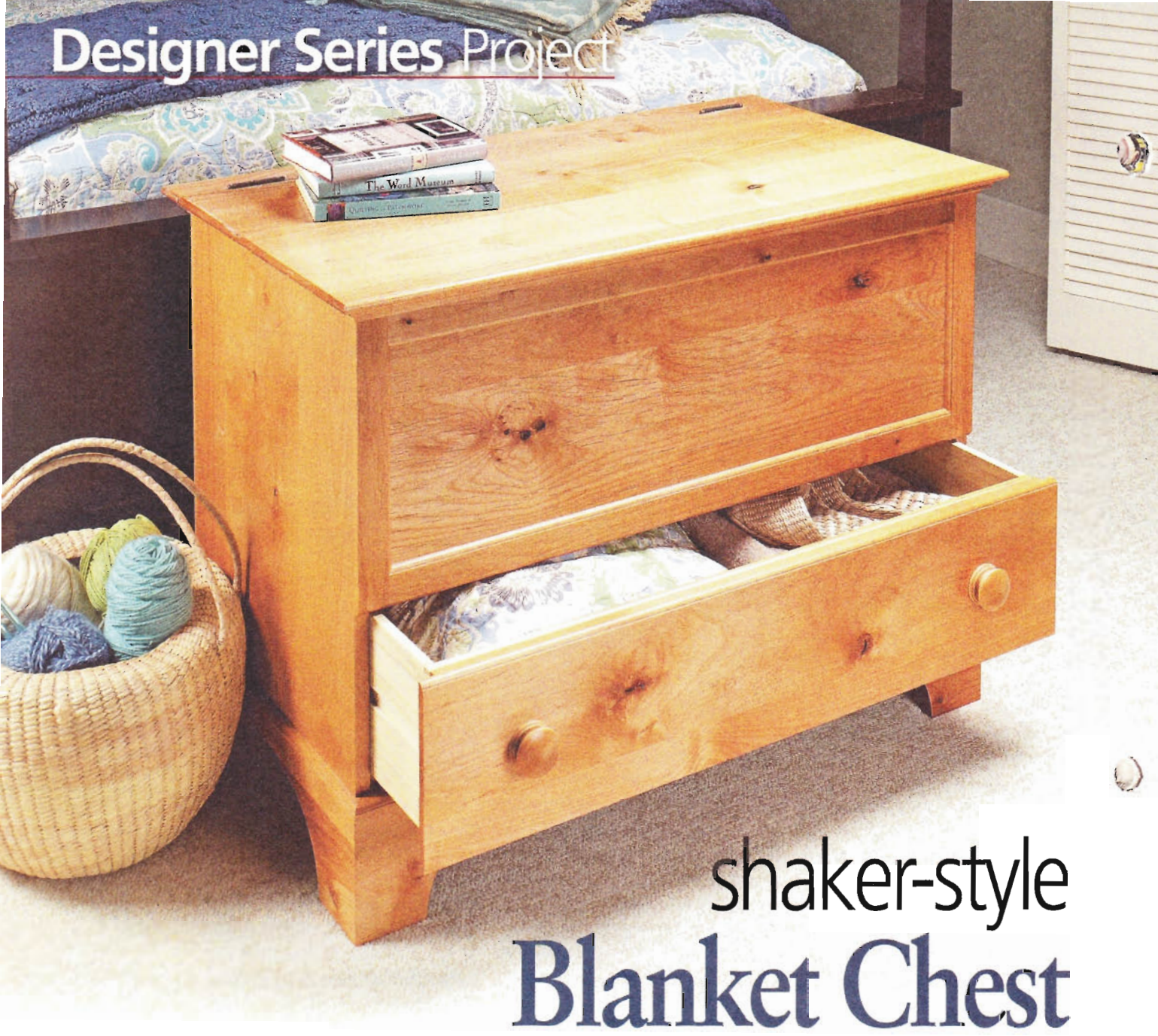
Cut Grooves. *Raise the blade just a hair over the saw table and make a series of passes over the blade.*



Make Inlay Strips. *You can cut the narrow inlay strips safely by once again using a notched push block.*



Glue in Strips. *Two inlay strips run the full length of the frame. The intersecting strips are cut to fit around them.*



shaker-style Blanket Chest

Once you look past the clean lines, attractive details, and beautiful wood, you'll discover the great storage options this chest provides.

The stylish, single-drawer blanket chest pictured above offers a very desirable combination — two practical storage options in an attractive package. The Shakers and other early-American craftsmen built many chests of this general design. Most often, they were constructed from plain panels joined with dovetails.

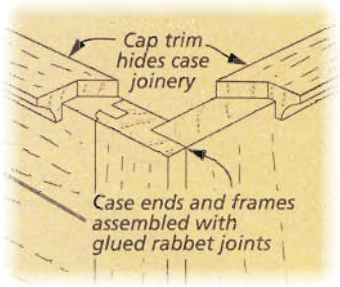
However, some of these provincial cabinetmakers weren't afraid to stray from standard practice. The original piece that inspired this chest illustrates this creative thinking. As you can see, the solid-wood panels typically used for the front and back of the chest have been replaced with attractive frame and panel assemblies. It's a simple change that transforms both the look of the chest as well as the way it's put together.

This frame and panel design allows the basic case to be assembled with nothing more than rabbeted and glued corner joints. The result is a rock-solid foundation that's also clean and seamless in appearance. When you add to this a few understated details and the rustic look of the knotty alder, the traditional design takes on a contemporary sophistication — pardon the contradiction.

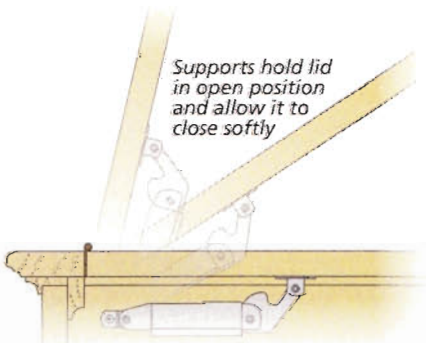
But don't take my word for it. Get busy and then find out what the critics have to say. I'm sure the reviews will be favorable.

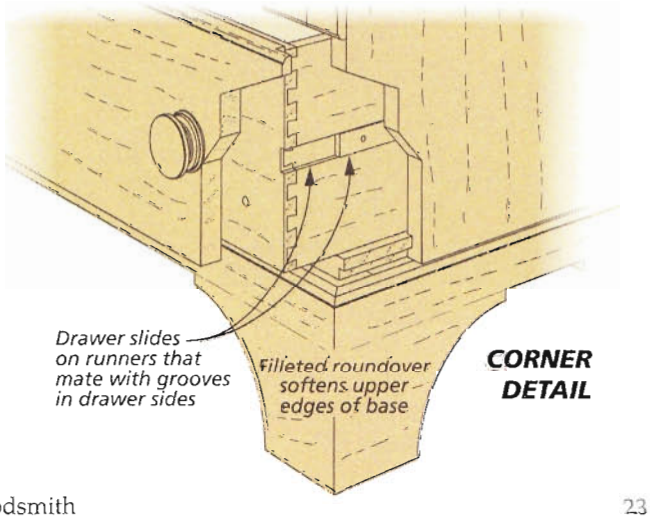
CONSTRUCTION DETAILS

OVERALL DIMENSIONS:
38¼"W x 20¼"D x 28"H

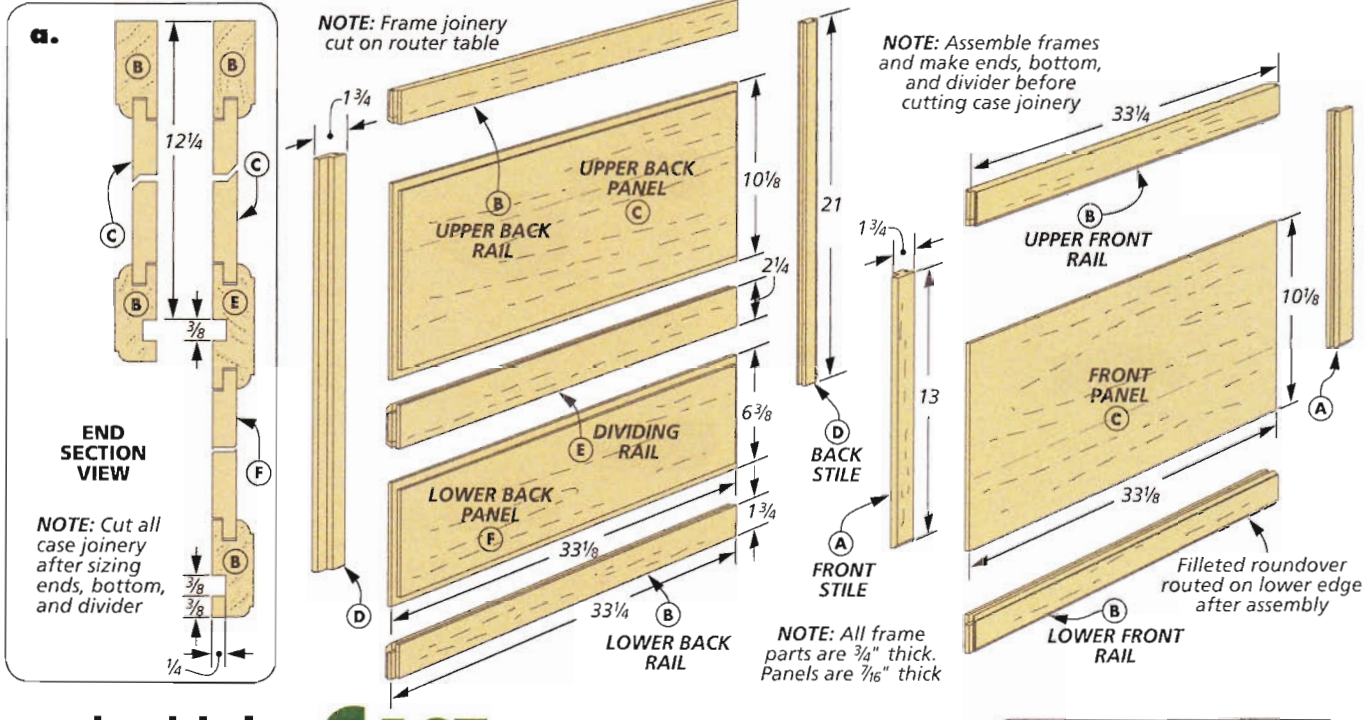


LID SUPPORT DETAIL





CORNER DETAIL



build the CASE

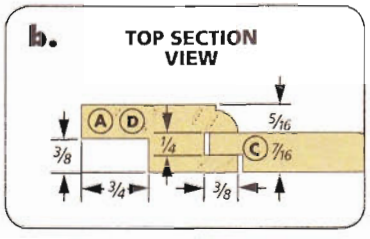
▲ A router bit set like the one shown above makes cope and stick joinery a breeze.

Assembling a sturdy case for the chest is your first task. It consists of the frame and panel front and back, two end panels, a bottom, and a divider. As I mentioned, the front and back frames are joined to the ends with rabbet joints while tongue and dado joints connect the bottom and divider panels to the ends and frames.

THE FRAMES. Building the front and back frames is a good place to start. As you can see above, the back frame has two panels separated by a horizontal dividing rail. The dividing rail is positioned to accept the case divider that forms the bottom of the upper compartment. The narrower, single-panel front frame creates the drawer opening.

I built the frames using cope and stick joinery cut entirely on the router table. This twist on the stub tenon and groove is quick, foolproof, and the results can't be beat. The frames feature a filleted roundover on the inside edges and hold panels that are rabbeted to fit the grooves (detail 'b').

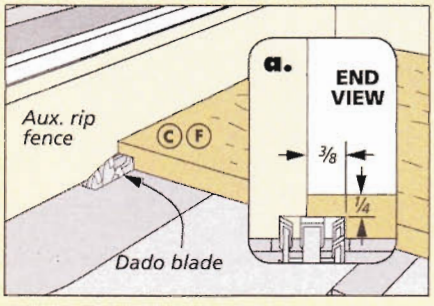
So once the rails and stiles are cut to size, you can make your way to the router table. The technique used to cut the frame joinery is explained in detail in the article on page 42.



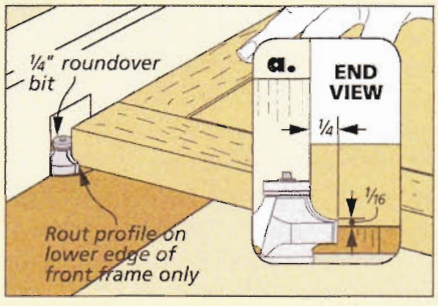
FRAME PANELS. With the frame joinery complete, I turned my attention to making the two identical upper panels and the narrower lower back panel. First, I glued up blanks and planed them to 7/16" thick. Then after cutting the panels to final size, you can rabbet the inside edges as shown below. The goal is a tongue that fits snugly in the frame groove.

ASSEMBLY. Now it's time for glue and clamps. Just make sure the

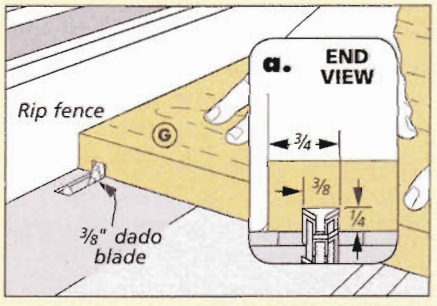
How-To: Case Joinery



Panel Tongues. *Sneak up on the thickness of the panel tongue by raising the dado blade between passes.*



Roundover. *After assembling both frames, I routed a filleted roundover on the lower edge of the front frame.*



Bottom Dadoes. *Start the case joinery by cutting dadoes near the lower edges of the ends and the back frame.*

parts are aligned accurately and the frames are square. Once the glue is dry, you can complete this stage by routing a roundover on the lower edge of the front frame, as shown in the How-To box on the opposite page.

CASE PANELS. Before cutting any of the case joinery, you'll want to have the ends, bottom, and case divider in hand. This way, you can cut all the dadoes at the same time to ensure alignment.

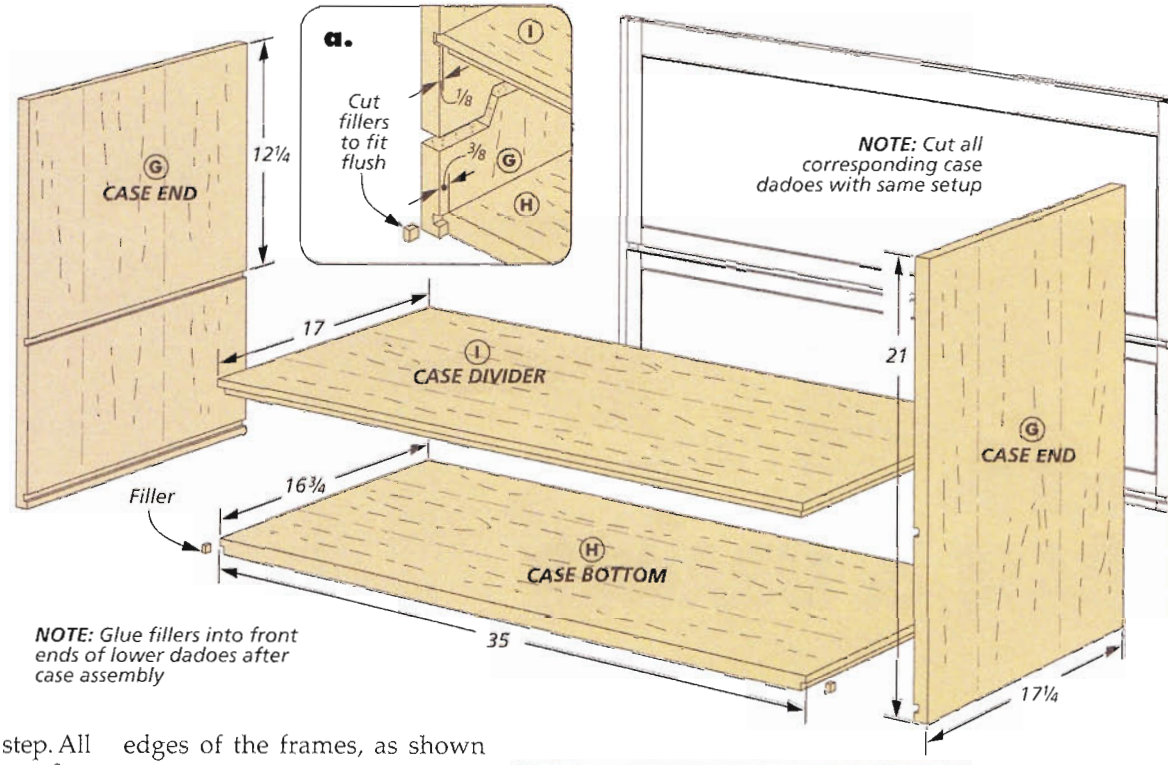
So another round of panel glueups is the next step. All of these parts are made from ¾"-thick stock. And then when cutting the panels to size, note that the case bottom is slightly narrower than the divider.

DADOES & RABBETS. The case joinery starts by installing a ⅜"-wide dado blade in the table saw. First I set up to cut the bottom dadoes in the ends and back frame. The dadoes that capture the divider are cut into the ends and both frames. To ensure accurate alignment, I referenced these cuts from the top edge of each part (How-To and detail 'a,' opposite).

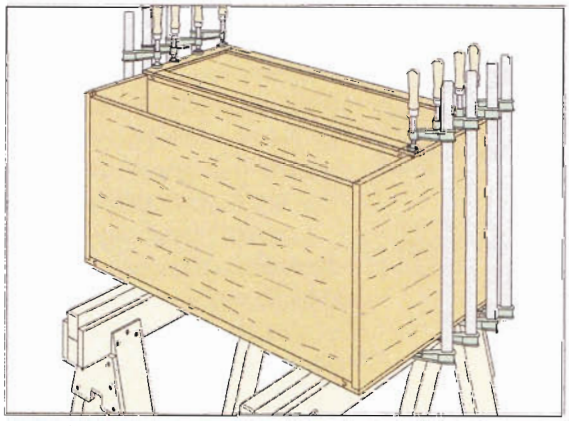
Next, I increased the width of the dado blade and buried the edge in an auxiliary rip fence to cut the rabbets along the outside edges of the frames, as shown below. It's best to cut these rabbets to full depth in several passes.

TONGUES. Finally, you can adjust the setup to form tongues on the upper edges of the bottom and divider. As shown above, the front edge of the bottom panel doesn't need a rabbet.

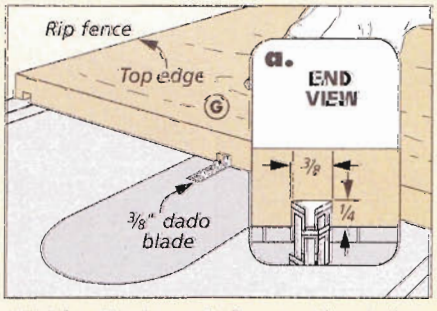
ASSEMBLY. Once you've checked the fit of all the parts, you can set up for assembly (Shop Tip at right). I started by gluing the bottom and divider between the two ends. The key here is to make sure they're positioned accurately front to back (detail 'a'). Then you can glue the front and back frames in place one at a time. Finally, add fillers to the front ends of the lower dadoes.



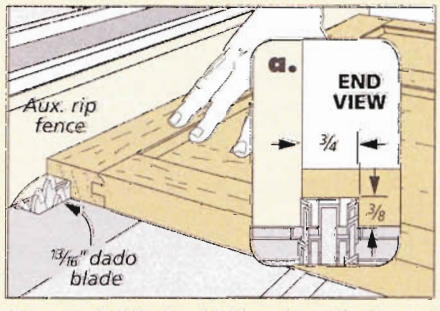
Shop Tip: Glueup



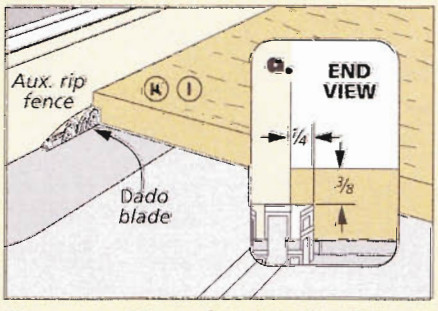
Step-by-Step. *I approached the glueup in small steps. Supporting the case on sawhorses during the assembly will give you the best clamping access.*



Divider Dadoes. *Reference the dadoes for the divider in the ends and front and back frame from the top edges.*

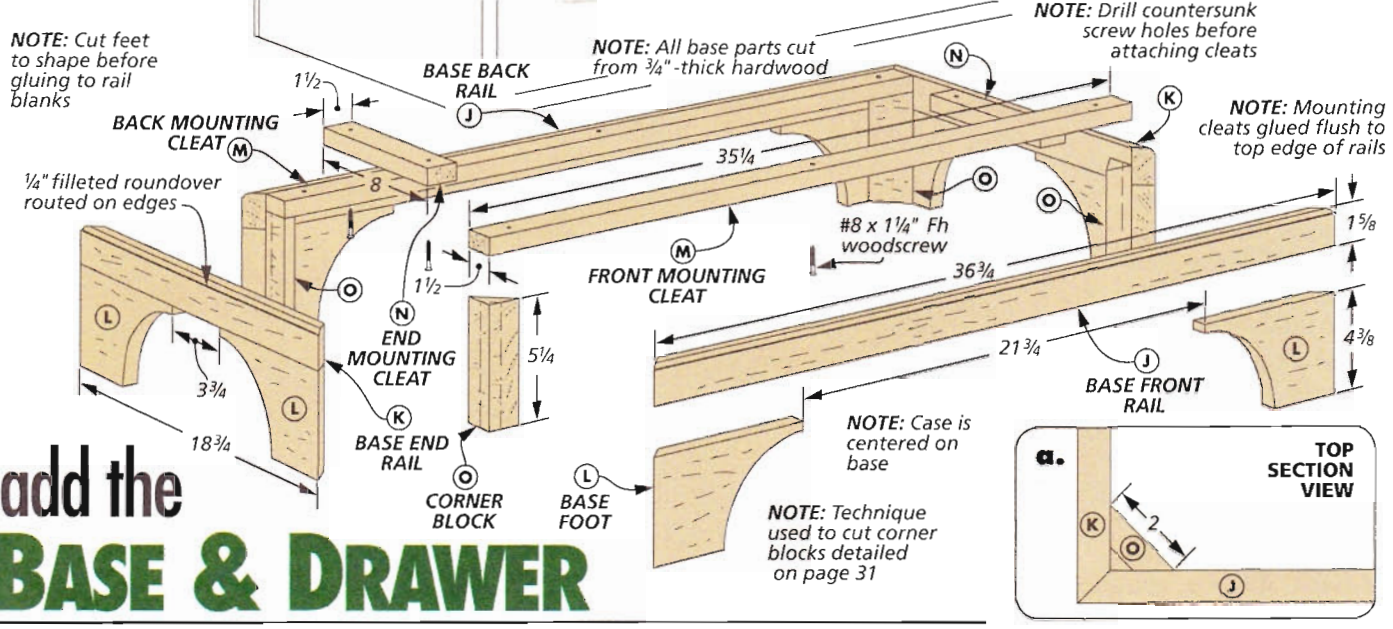


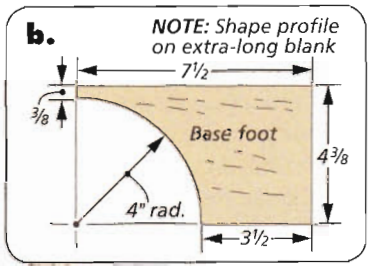
Frame Rabbets. *Widen the blade and bury it in an auxiliary rip fence to rabbet the outside edges of the frames.*



Tongues. *When forming the tongues on the bottom and divider, shoot for a snug fit to the dadoes.*

add the BASE & DRAWER





Next up is a base for the chest. It begins with four profiled rails mitered into a frame. A set of mounting cleats and corner blocks round out the assembly.

SHAPING THE RAILS. To simplify shaping the rail profiles, I approached the job a little differently. Each rail is built up from a narrow upper section and two pre-shaped feet. If you take care to get a good figure and color match, this glued-up construction will look seamless.

I started by cutting four extra-long rail blanks (two ends and a front and back) and the eight extra-long foot blanks to width. Then I matched them up and labeled them. The box below shows the steps that follow.

First, I laid out the profile on each foot blank, cut it to shape at the band saw, and sanded the curves smooth (detail 'b'). When you glue the feet onto the rail sections, the key is to get the spacing correct, as shown above. And as you tighten the clamps, make sure the surfaces stay flush.

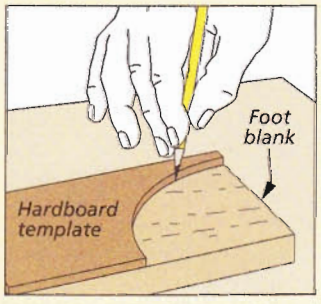
MOLD & MITER. Before mitering the pieces to length, I routed the filleted roundover on the upper edges of the rails. This is a quick job at the router table.

Now you can miter the parts to final length. Centering the "cutout" is simply a matter of laying out and making the cuts carefully. I mitered one end of each piece based on a layout mark. Then I used a stop block attached to a long, auxiliary miter gauge fence to position the second miter and ensure that the two opposing rails were exactly the same length.

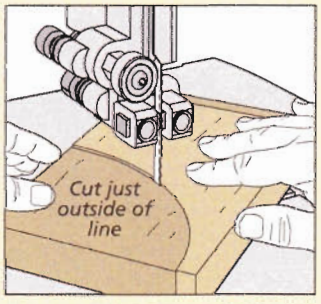
Once the miters are completed, the four base rails can be glued into a frame. Band clamps are your best bet for pulling the joints tightly together and will help guarantee a square frame.

CLEATS & CORNER BLOCKS. Completing the base goes quickly. First, I cut a set of mounting cleats, drilled countersunk screw holes, and glued them flush with the top of the base rails (drawing above). Finally, to reinforce the miter joints, I cut and installed

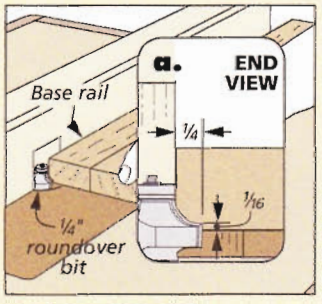
How-To: Make the Base Rails



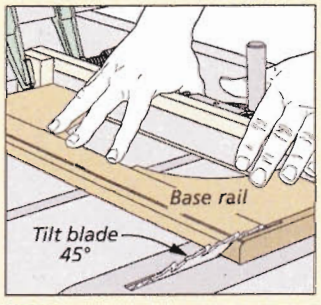
Layout. *I made a hardboard template to lay out the simple profile on the foot blanks.*



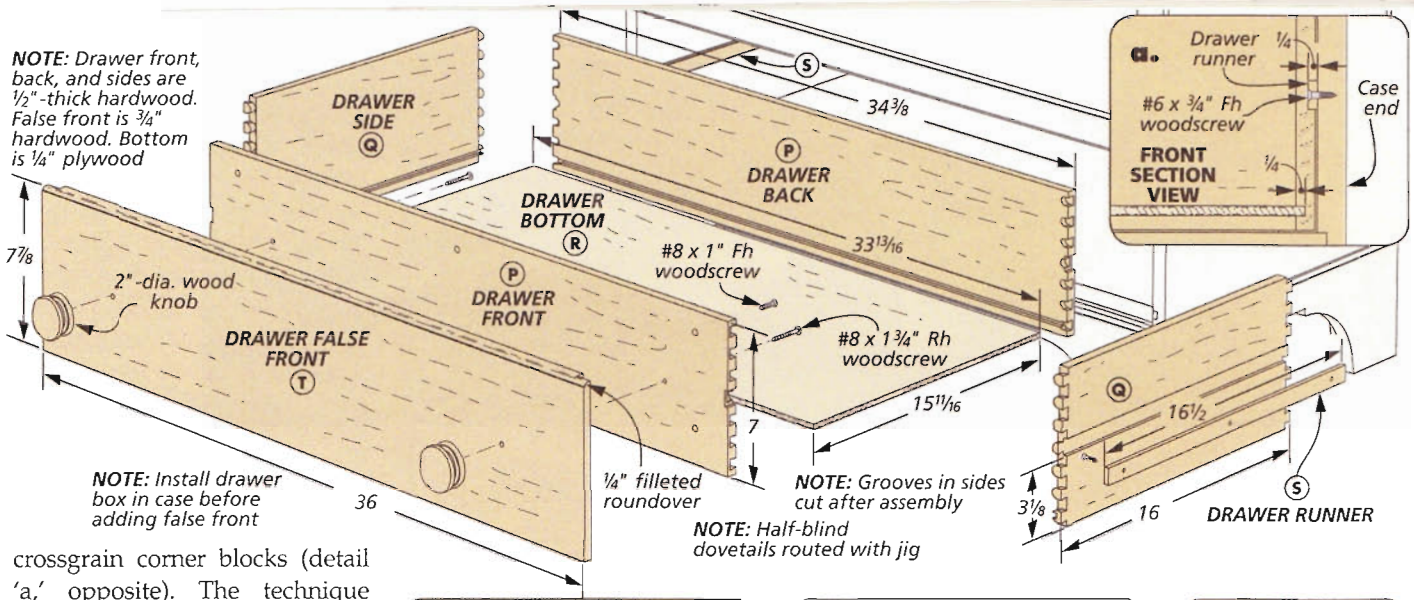
Shape Blanks. *If you cut smooth curves, you'll avoid a lot of extra cleanup work.*



Profile. *After gluing up the rails, rout a filleted roundover on the upper edge.*



Miters. *Use a long auxiliary miter gauge fence and a stop block to cut consistent miters.*



crossgrain corner blocks (detail 'a,' opposite). The technique for making these blocks can be found on page 31. They should fit snug to the mounting cleats and flush with the bottom of the feet.

THE DRAWER

After attaching the case to the base, I started work on the drawer. The construction is pretty standard. The drawer box is built from ½"-thick stock using half-blind dovetail joinery. The bottom is cut from ¼" plywood. The drawer slides on runners installed in the chest that fit grooves cut into the drawer sides. A rabbeted false front completes the drawer.

DOVETAILS. The drawer box comes first. The dovetail spacing is shown at right. Once the dovetail jig is put away, cut grooves for the bottom, cut the bottom to size, and glue up the box.

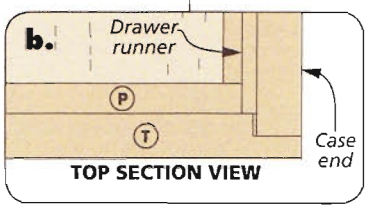
GROOVES & RUNNERS. It's easier to install the drawer box in the chest before making and adding the false front. The first step toward this goal is to cut a ¾"-wide centered groove in each drawer side, as shown in the box below.

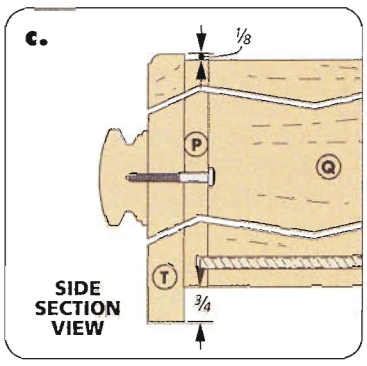
With the grooves completed, I cut runners to fit. They're sized in width to allow a small amount of clearance in the grooves — about 1/64". Each runner is installed in the case with three screws, so I predrilled pilot holes (detail 'a').

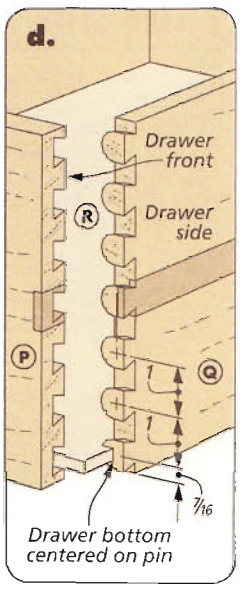
The key to installing the runners in the case accurately is to use a spacer. You can find out how this works on page 31.

FALSE FRONT. The false front can now be added. I started by cutting it to size from ¾"-thick stock. Then I switched to a dado blade to cut the end rabbets that allow the front to fit flush with case front, as shown below.

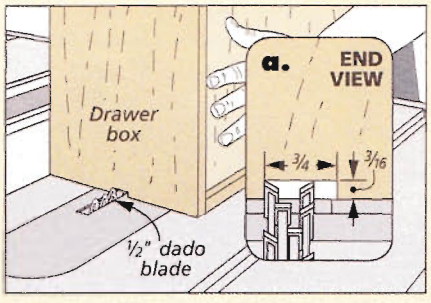
After routing a filleted roundover on the upper edge, all that's left to do is attach the front to the drawer box. As you can see in the drawing below, I used double-sided tape to help position the front before drilling pilot holes and finally, installing the screws.



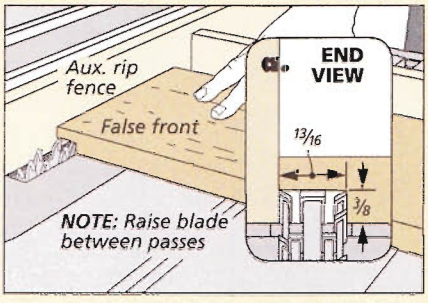




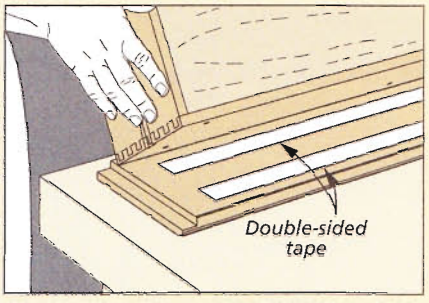
Drawer Construction



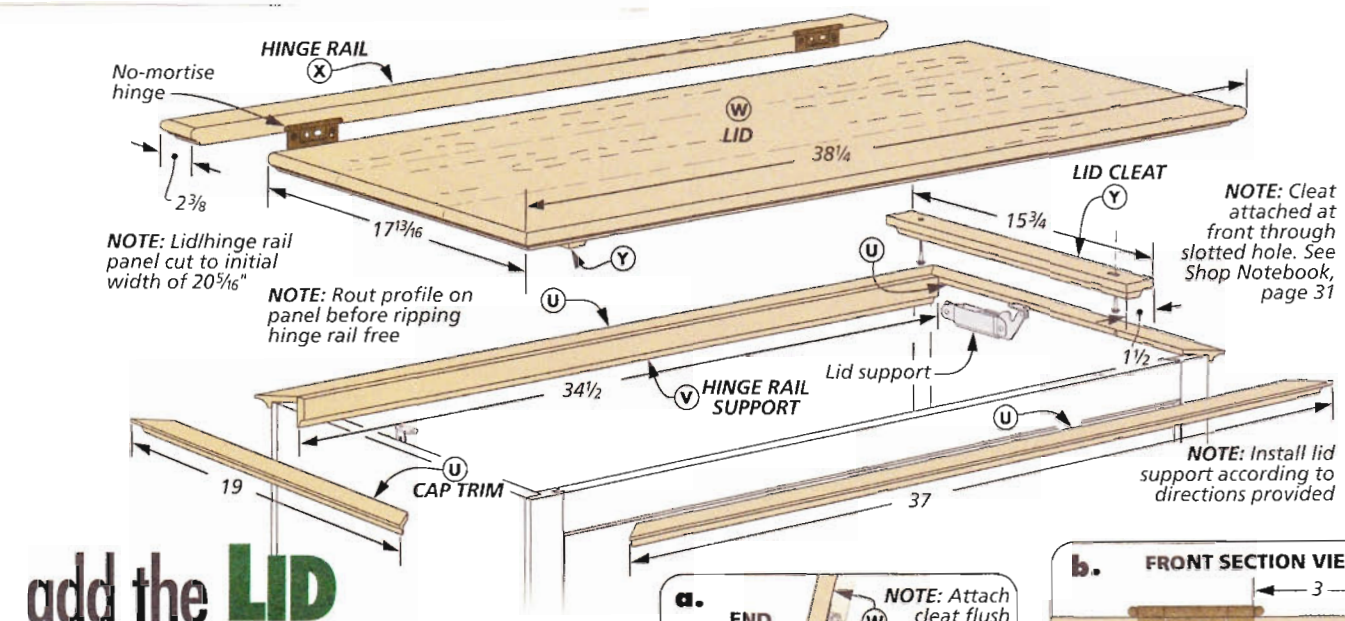
Centered Grooves. *Keep the grooves for the runners centered by flipping the drawer end-for-end between passes.*



Front Rabbets. *Bury a wide dado blade in an auxiliary fence to rabbet the ends of the false front. Make several passes.*



Check the Fit. *I attached the front temporarily and then checked the fit in the case before installing the screws.*



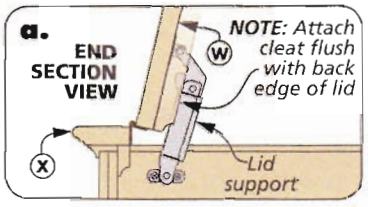
add the LID

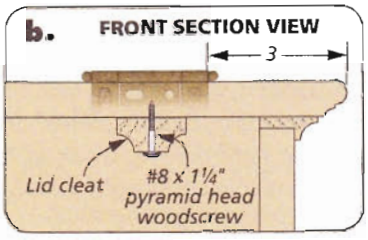
All that's left to do is install a cap trim around the top of the chest and then make and add the lid.

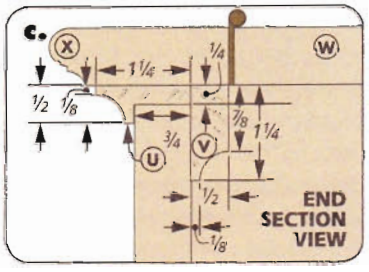
CAP TRIM. The molded trim hides the joinery on the top edge of the chest and creates a pleasing transition between the chest and lid. It's rabbeted to wrap over the edges (detail 'c') and mitered at the corners. The How-To box below shows how to make the small trim pieces safely by starting with wider blanks. You'll rotate between the table saw and router table to complete the job.

Once the cap is ready, miter the pieces to fit and glue them in place. And if necessary, sand the inside edges flush with the chest.

HINGE RAIL SUPPORT. Before starting on the lid, I fit one more "auxiliary" piece. A support glued across the back edge of the chest will help carry the weight of the lid. The ½"-thick support features a cove on the lower edge and is cut it to fit snugly between the ends of the chest (detail 'c').







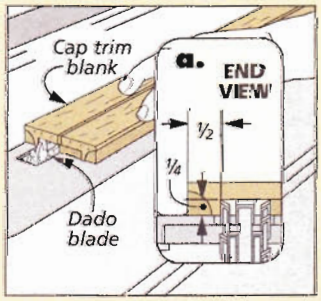
THE LID. The chest is ready for a lid. The lid actually consists of the lid panel, a hinge rail, and a pair of cleats. The hinge rail is glued to the top edge of the chest and the lid is hinged to it. The cleats are attached to the underside of the lid panel to help keep it flat (details 'b').

The lid panel and hinge rail start out as a single panel. After routing a cove and bead profile on all four edges, you'll rip the hinge rail from the back edge.

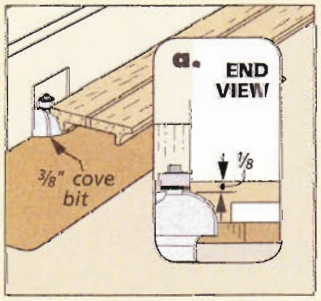
Start by gluing up the lid panel from ¾"-thick stock. When the clamps come off and the panel is cleaned up, you can cut it to "working" size. (The hinge gap is equal to a saw kerf's width. I added a hair more for cleanup).

LID PROFILE. The box on the opposite page leads you through the process used to shape the profile

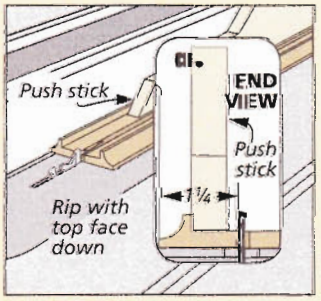
How-To: Make the Cap Trim & Cleats



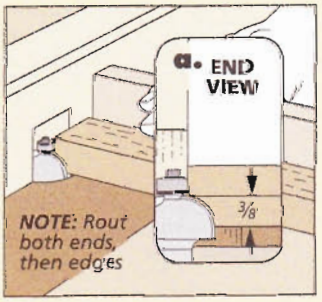
Groove. *First, cut a wide, centered groove down the middle of the blank.*



A Cove. *Next, rout a cove along each edge of the blank at the router table.*



Rip Free. *Finally, take the blank back to the saw and rip two trim pieces to width.*



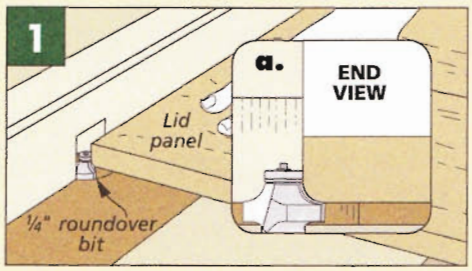
Cleat Coves. *Use the miter gauge to rout the coves on the ends of the cleats.*

at the router table. And with the profile complete, you can rip the hinge rail from the back edge of the panel and clean up the edges.

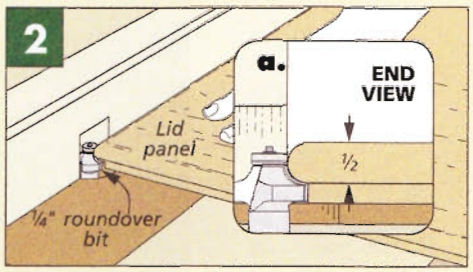
Before gluing the hinge rail to the chest, I fit the no-mortise hinges between the two sections and installed the cleats (detail 'b' and How-to on opposite page). Since the cleats are installed cross-grain, I attached the rear end with a fixed screw and the front end with a screw through a slotted hole (see page 31). The lid installation is completed by gluing the hinge rail to the cap and hinge support with an even overhang on the sides and back.

LID SUPPORTS. Lastly, I added a pair of lid supports. They'll hold the lid in the open position and also provide a "gentle close" (detail 'a,' opposite). And then I got busy on the finish. I already had the perfect spot for my chest ready and waiting.

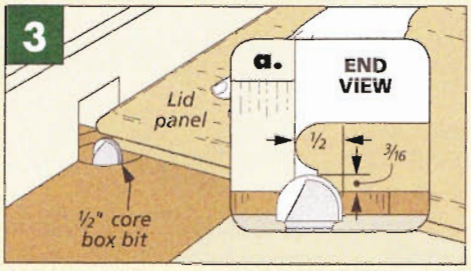
How-To: Shape the Lid Profile



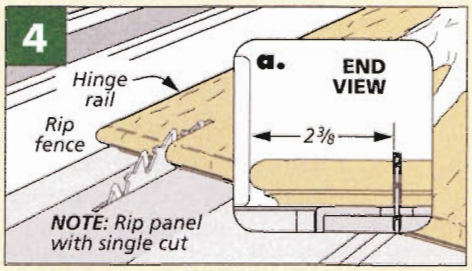
Upper Roundover. *Begin forming the bead element of the profile by routing a ¼" roundover on the upper edges of the panel.*



Lower Roundover. *To complete the bead, flip the panel and rout a filleted roundover by raising the bit between passes.*



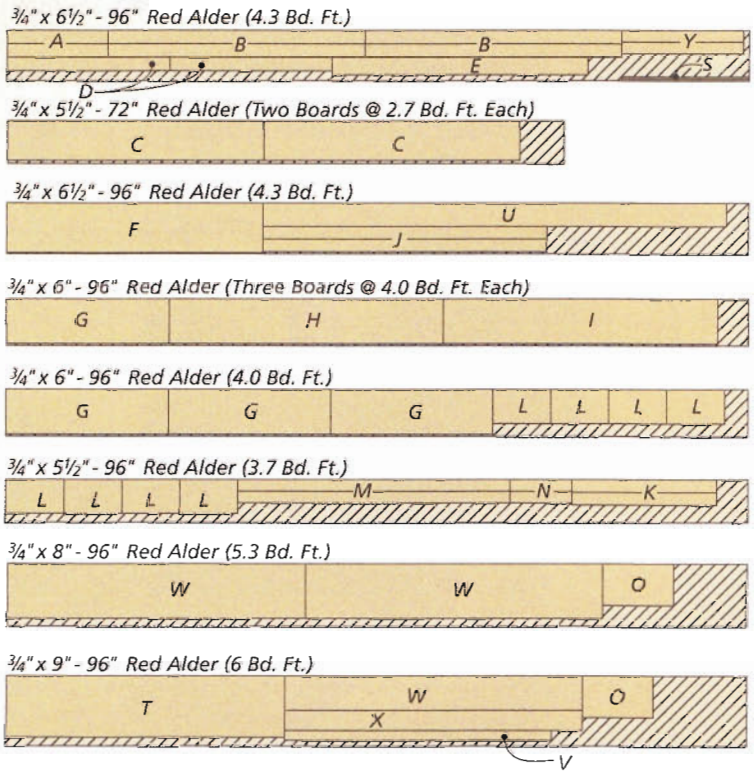
Cove. *I used a core box bit to form the small cove on the underside of the panel. You'll leave a fillet between the two elements.*

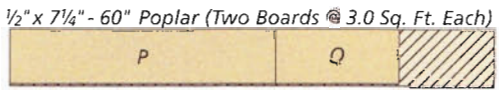


Hinge Rail. *Take care to get a clean, straight cut on both edges when you rip the hinge rail free from the lid panel.*

Materials, Supplies & Cutting Diagram

A	Front Stiles (2)	¾ x 1¾ - 13
B	Upper/Lower Rails (4)	¾ x 1¾ - 33¼
C	Upper Panels (2)	7/16 x 10⅛ - 33⅛
D	Back Stiles (2)	¾ x 1¾ - 21
E	Dividing Rail (1)	¾ x 2¼ - 33¼
F	Lower Panel (1)	7/16 x 6⅜ - 33⅛
G	Case Ends (2)	¾ x 17¼ - 21
H	Case Bottom (1)	¾ x 16¾ - 35
I	Case Divider (1)	¾ x 17 - 35
J	Base Front/Back Rails (2)	¾ x 1⅝ - 36¾
K	Base End Rails (2)	¾ x 1⅝ - 18¾
L	Base Feet (8)	¾ x 4⅜ - 7½
M	Front/Back Mounting Cleats (2)	¾ x 1½ - 35¼
N	End Mounting Cleats (2)	¾ x 1½ - 8
O	Corner Blocks (4)	1 x 5¼ - 2
P	Drawer Front/Back (2)	½ x 7 - 34⅜
Q	Drawer Sides (2)	½ x 7 - 16
R	Drawer Bottom (1)	¼ ply. - 15 11/16 x 33 13/16
S	Drawer Runners (2)	¼ x ¾ - 16½
T	Drawer False Front (1)	¾ x 7⅞ - 36
U	Cap Trim (1)	½ x 1¼ - 120 rgh.
V	Hinge Rail Support (1)	½ x 1¼ - 34½
W	Lid (1)	¾ x 17 13/16 - 38¼
X	Hinge Rail (1)	¾ x 2⅜ - 38¼
Y	Lid Cleats (2)	¾ x 1½ - 15¾



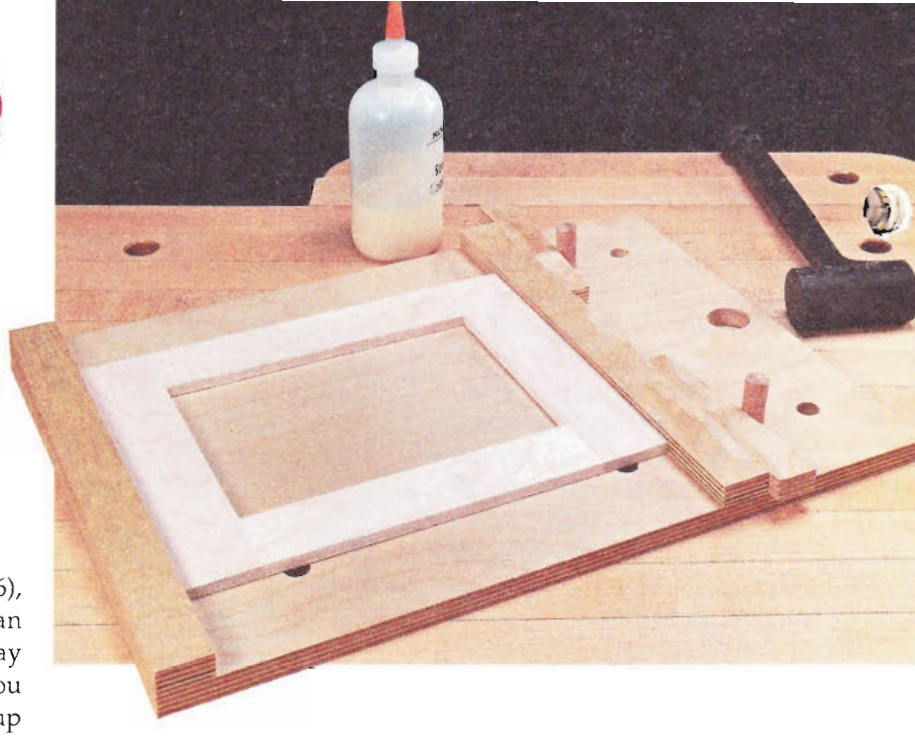


- (10) #8 x 1¼" Fh Woodscrews
- (6) #8 x 1" Fh Woodscrews
- (6) #6 x ¾" Fh Woodscrews
- (2) 2"-dia. Wood Knobs
- (4) 1¼" x #8 Pyramid Head Woodscrews
- (1 pr.) 3⅛" No-Mortise Hinges w/Screws
- (1 pr.) Lid Supports
- (2) 1¾" Rh Woodscrews

ALSO NEEDED: *One 24"x 48" Sheet of ¼" Birch Plywood*

NOTE: *Parts planed to thickness as necessary*

SHOP NOTEBOOK



Frame Glueup Jig

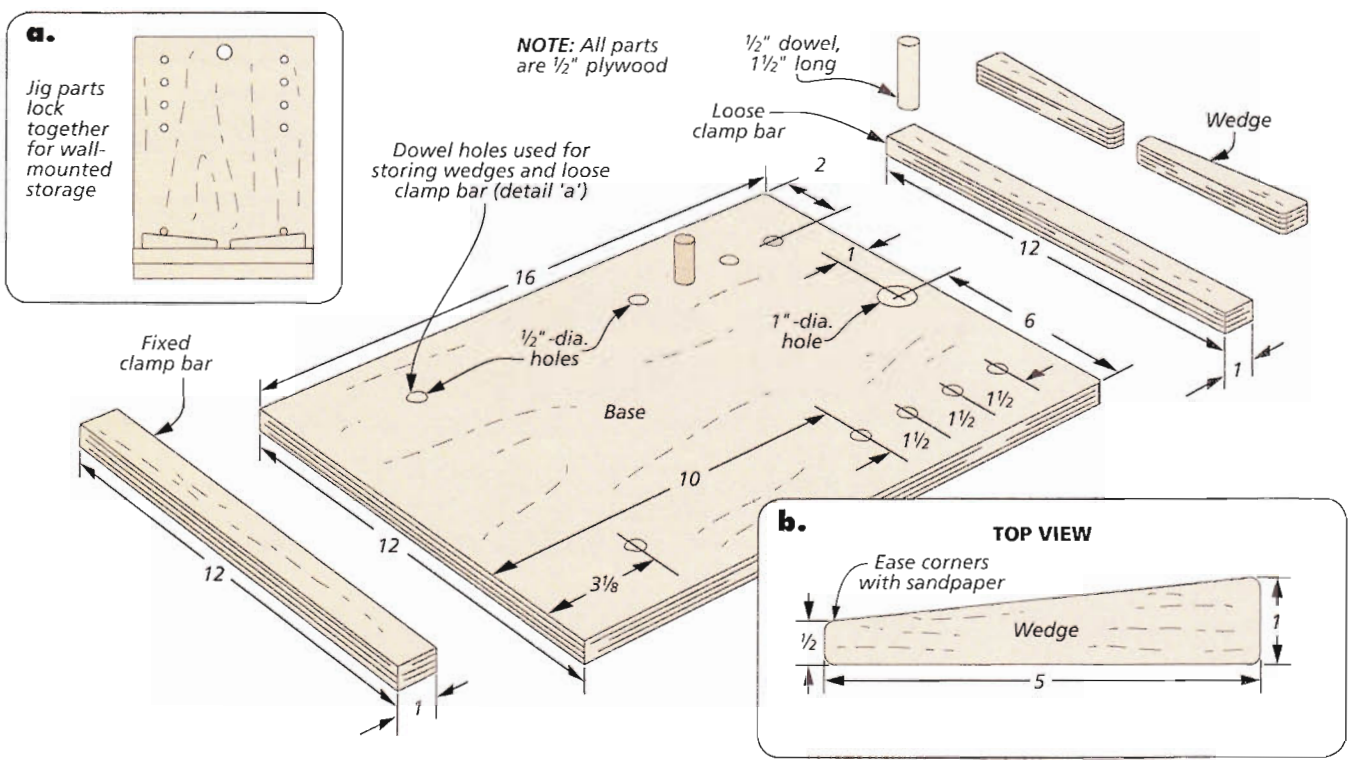
On the picture frames (page 16), I used butt joints rather than miters. But you still need a way to keep the frames square as you glue them together. The glueup jig shown at right is a simple solution to the problem.

As you can see in the photo, the jig secures the frame between two clamp bars to keep it square while the glue dries. By driving wedges between a pair of dowels and the loose clamp bar, you apply clamping pressure to the frame. The jig can also be used to glue up frames of different sizes, thanks to the two rows of holes drilled along the base that accept dowels at different positions.

BUILD THE JIG. The glueup jig is easy to build. The base, clamp bars, and wedges you see in the drawing below can all be cut to size from plywood. (Use a band saw to cut the wedges to shape as in detail 'b.') Then trim the dowels to their final length.

At this point, you can drill the holes along the base of the jig to make it adjustable. Also drill a larger hole near one end of the base so you can hang it on the wall for storage (see detail 'a'). Then glue one of the clamp bars to the other end of the base. I also applied a coat of wax to prevent glue from sticking to the base.

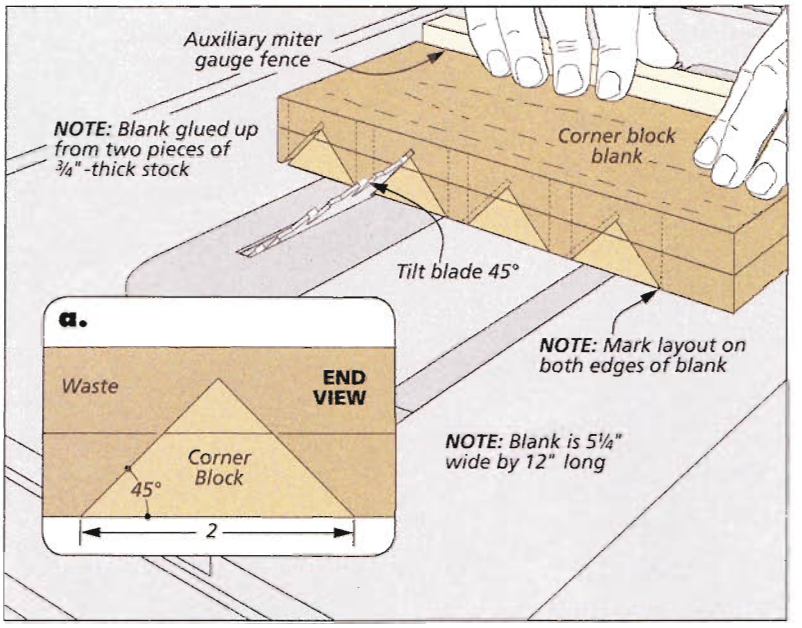
USING THE JIG. To use the jig, set the frame parts in place, and apply glue to the joints. Place the loose clamp bar at the end of the frame, and insert the dowels in the closest row of holes. Now lightly tap in wedges to apply clamping pressure. When the glue sets up, you can tap out the wedges and remove the frame.

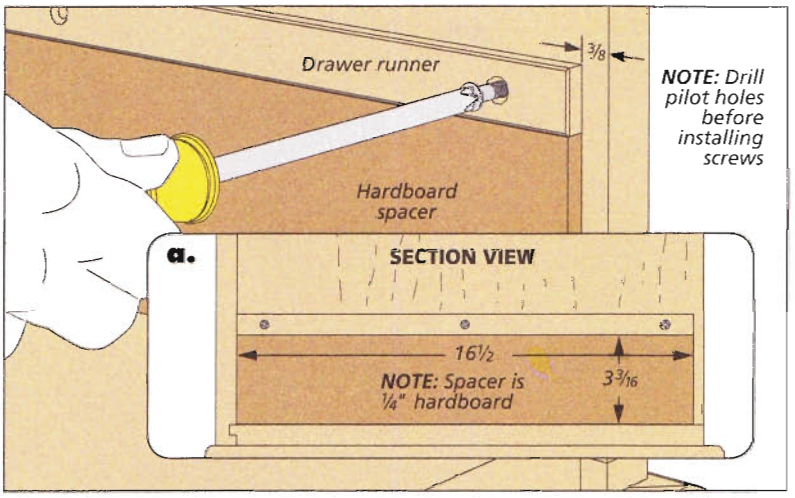


Corner Blocks

The triangular corner blocks that reinforce the mitered base of the blanket chest on page 22 should be cut "crossgrain" from a wide blank. This matches up the grain directions to avoid problems with wood movement.

To do this, I started by gluing up a blank from two pieces of ¾"-thick stock. After laying out the shape of the blocks on both edges (detail 'a'), I took the blank to the table saw. First, I made a 45° bevel cut along one side of each block, as shown at right. Then flip the blank around and cut the blocks loose with a second series of cuts.





Runner Spacer

The drawer runners on the chest on page 22 need to be installed at the same height and parallel to the bottom of the case. Rather than rely on measurements, I used a spacer to guarantee that the runners were located accurately and the drawer worked smoothly.

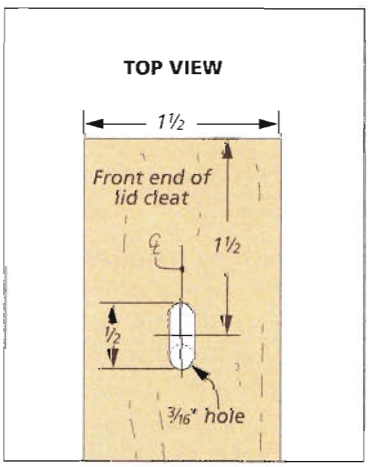
Just cut the ¼" hardboard spacer to the dimensions shown in the detail at left. Then simply place it along the side of the case, position the runner on top, and install the screws as shown.

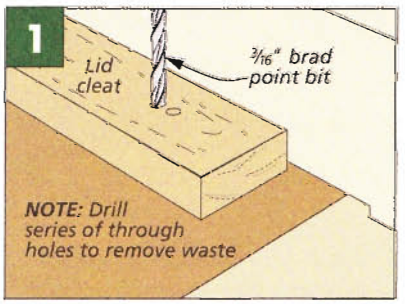
Cleat Slot

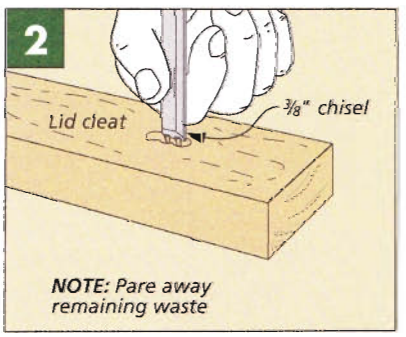
After all of my hard work, I wanted to be certain that the hinged lid of the blanket chest would stay flat. So I installed a pair of cleats on the underside.

To do the job, these cleats have to be attached "crossgrain" to the lid panel. But if the connection is too rigid, the lid panel can't expand or contract and it may cup or even crack. To avoid this possibility, I allowed for a little "freedom of movement" by attaching the front end of the cleat with a screw through a slotted hole.

The process for making the slots is shown in Figures 1 and 2. After laying out their location, I took the cleats to the drill press. First, I drilled out most of the waste between the layout lines with a brad point bit. Then, back at the bench, I used a chisel to clean up the sides of the slot.







space-saving Revolving Bookcase

Keep a few volumes from your library close at hand with this stylish bookcase.

When you think of a bookcase, you probably imagine a tall, wall-hugging case with several adjustable shelves. That conventional design is certainly a practical way to store and display your books and a few other decorative items.

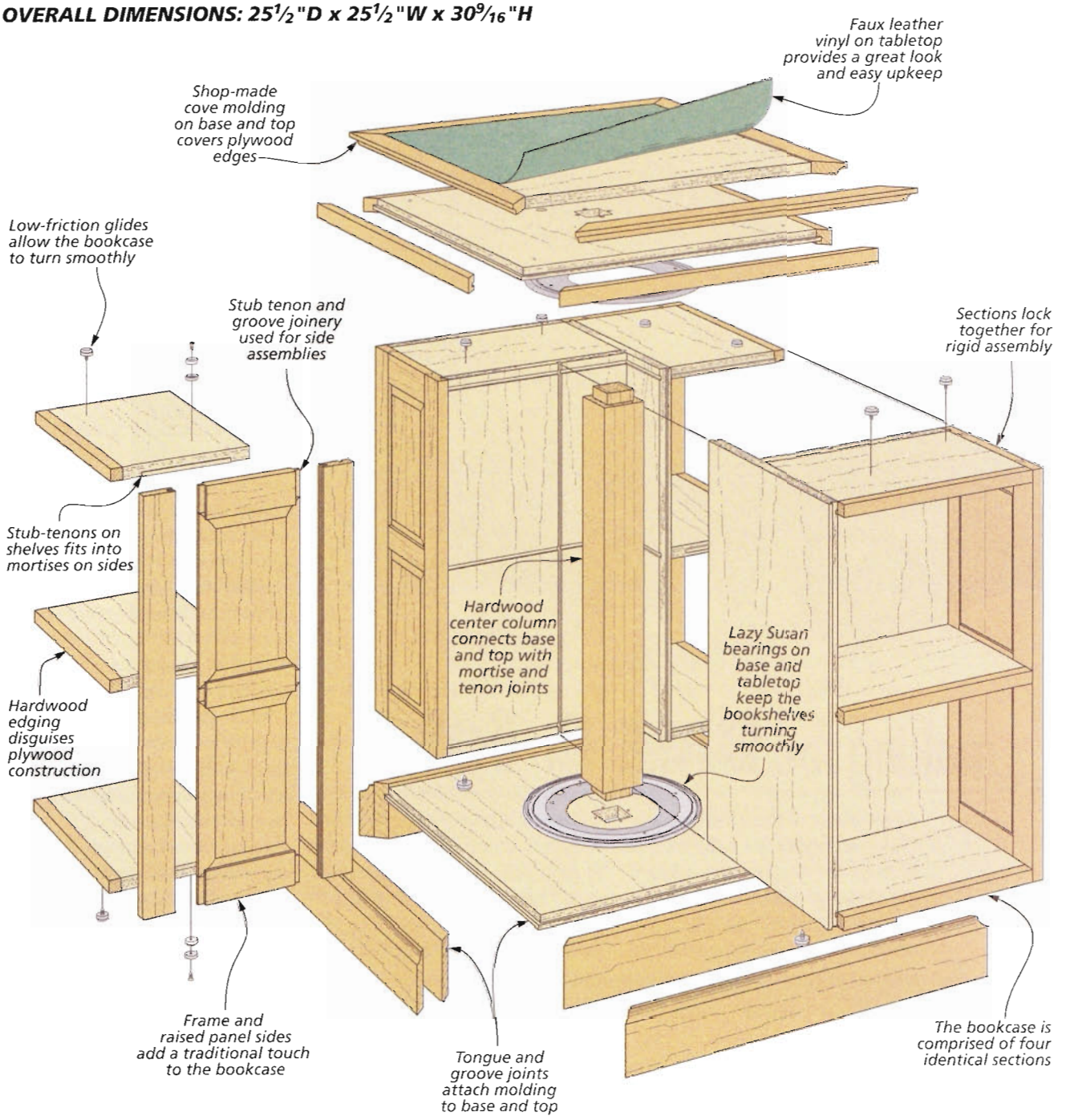
But I wanted something a little different that I could place away from the wall, next to my favorite chair. On top of that, I also needed a table for a small reading lamp and a cup of coffee.

The revolving bookcase shown above is perfect on both counts. It's a stylish table that also offers plenty of easily accessible storage. The tabletop and base remain stationary, connected by a sturdy center column. The main body of the bookcase is mounted to a pair of lazy Susan bearings that allow easy access to the compartments. And since the case is all plywood with hardwood molding, the cost is pretty reasonable, as well.

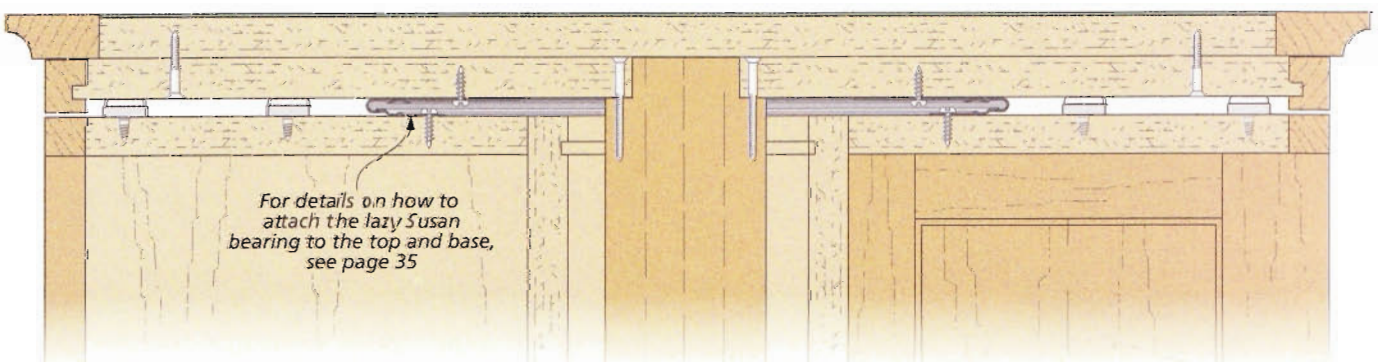
If you're thinking that the construction is going to be difficult, don't worry. The bookcase consists of four identical sub-assemblies, all built using simple tongue and groove joinery. Each one features a shelf and a pair of raised panels in a side frame. After building the four individual sections, I'll show you a hassle-free method to put them all together while keeping the assembly square.

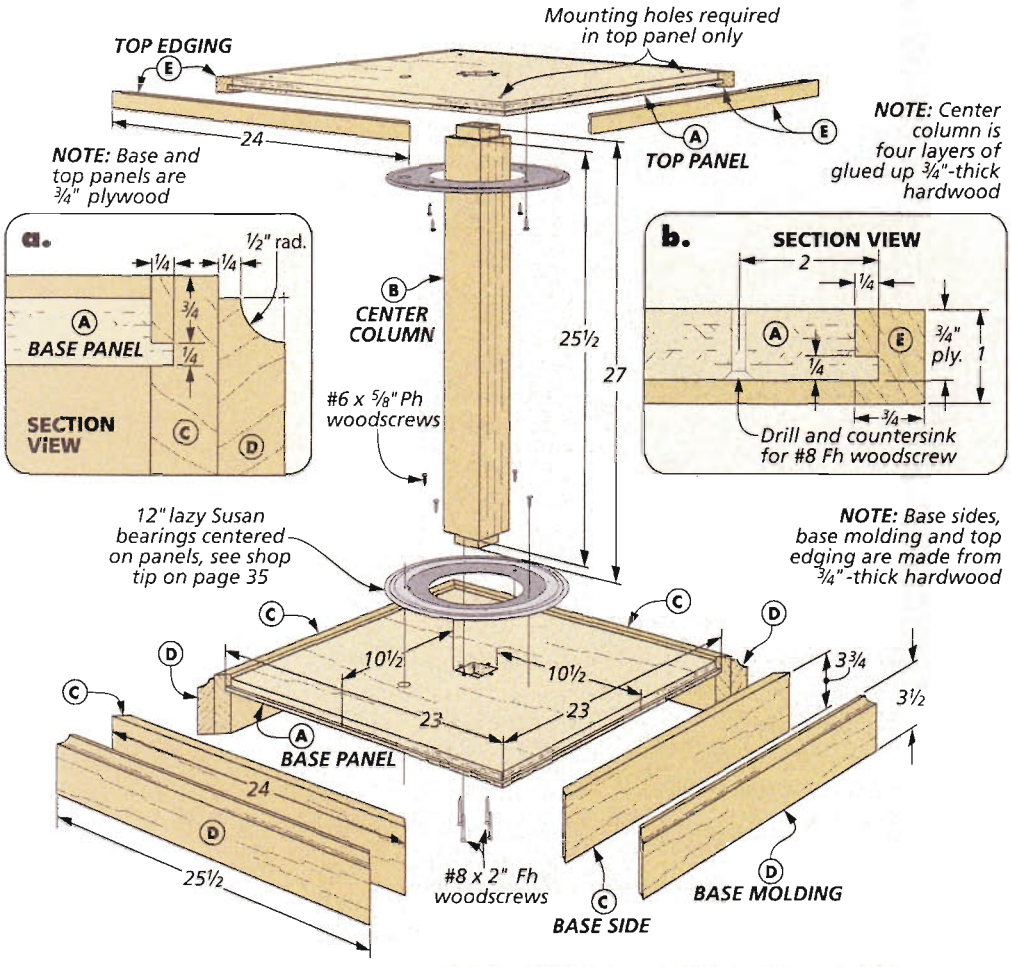
CONSTRUCTION DETAILS

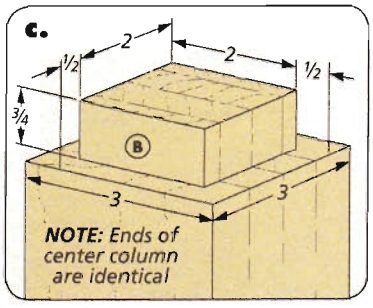
OVERALL DIMENSIONS: 25½"D x 25½"W x 30⁹⁄₁₆"H

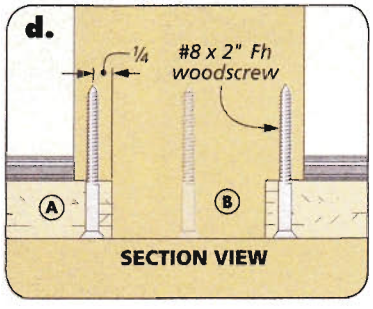


CENTER SECTION VIEW









making the BASE & TOP

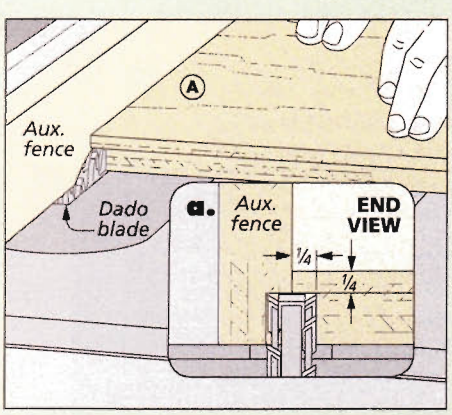
At the heart of the bookcase is a stationary table. The base is solid enough to support the revolving case and hold the hardwood center column, as well. The top is attached to the column.

PANELS. I started by cutting the plywood base and top panels to final size. Both need a rabbet on all four edges, so I installed a dado blade and an auxiliary rip fence on the table saw. By burying part of the blade in the fence, cutting consistent rabbets is a breeze, as shown in the box below.

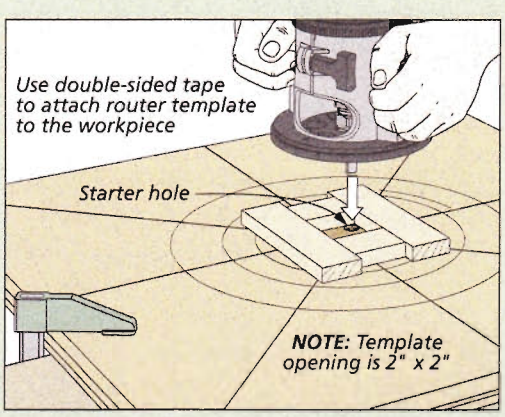
LAYOUT MARKS. After cutting the rabbets, the next step is to lay out the location for the lazy Susan. I started by marking the exact center of the panel to have a starting point for a compass (see the Shop Tip). You can do this by using a long straightedge and striking a line between the opposite corners to find the center.

From this center mark, you can mark the position of the inside and outside edges of the ring-shaped bearing. I also like to mark another ring for the position of

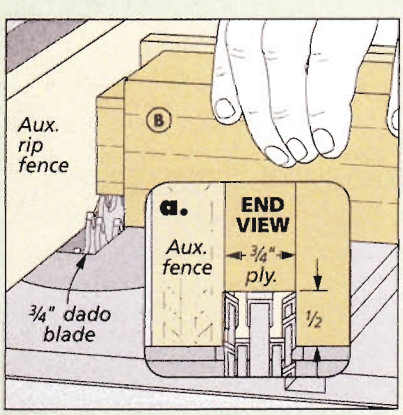
How-To: Tongue, Mortise & Tenon



Rabbet on Panels. *With a dado blade and an auxiliary rip fence installed on the table saw, creating the tongues is a snap.*



Rout the Mortise. *A shop-made template allows you to rout identical mortises on the top and in the base using a pattern bit.*



Tenons. *To cut the tenons on the center post, use an auxiliary fence on the miter gauge to guide workpiece.*

the screws and the access hole. These marks will help you keep the bearing centered on the panel.

MORTISES. Both panels also need a through mortise to mate with the tenon on the center column. In addition, four countersunk screw holes surround the mortise. Lay out the position of the mortise according to the measurements shown in the main drawing. You can also mark the positions of the holes for mounting the tabletop near the four corners, as shown in detail 'b,' on the opposite page.

A simple way to cut the square mortises is to make a template and rout out the recess with a pattern bit (center drawing, page 34). Leave the template attached so you can use it as a guide when squaring up the corners with a chisel.

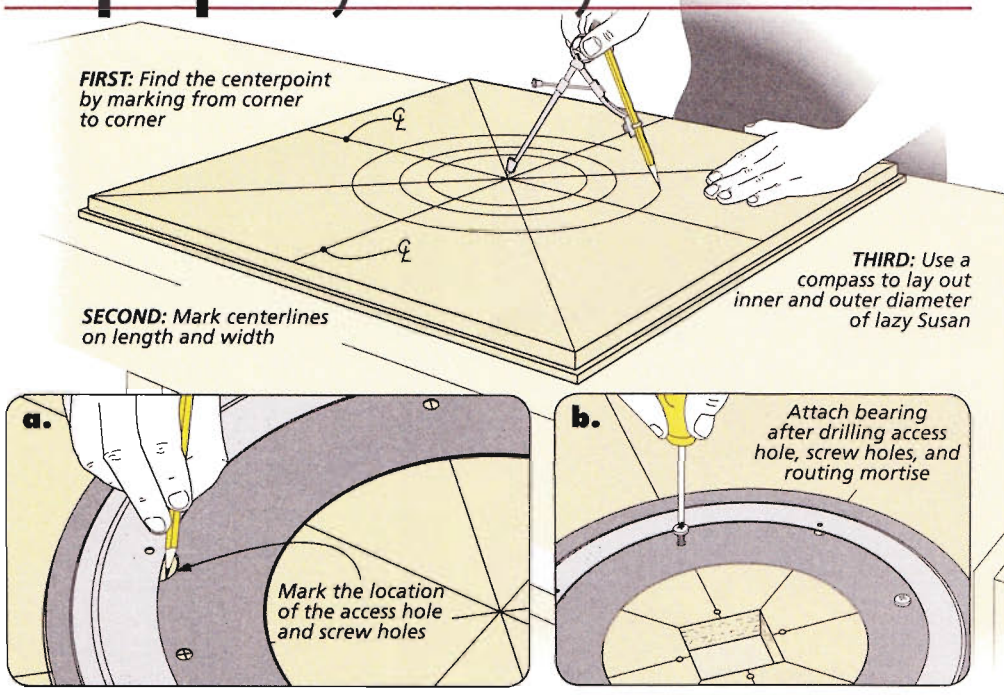
Now drill and countersink the screw holes around the mortises. While you're at it, put the bearing in place on the panel and drill pilot holes for the screws and the access hole you'll need later, when you make the final installation. On the top panel, drill and countersink screw holes to attach the tabletop.

CENTER COLUMN. A solid wood center column connects the top and bottom. I glued up a few pieces of stock to form the 3"-square column. After cutting it to final size, cut a tenon on each end using a dado blade and miter gauge (detail 'c' and How-To box, opposite page). Test the fit of the tenon in the base and top, fine-tuning the fit as needed. Then set the column aside while you finish up the base and top.

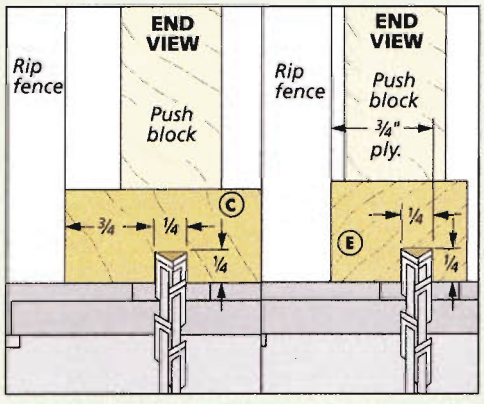
SIDES & MOLDING. Now you're ready to add the hardwood sides and molding to the base. You can see how I did this in the drawings below. Both layers are mitered to fit the base panel. It's best to glue the two layers together before mitering. Then, rout the cove after assembly.

EDGING. For the top panel, a simple strip of edging is applied. For this, just rip the hardwood strips at the table saw. Then cut a groove to match the tongue on the top. Now, all that remains is to miter and install the edging. You can set the top aside for now. You'll install it during the final assembly. You can, however, attach the column to the base with glue and screws.

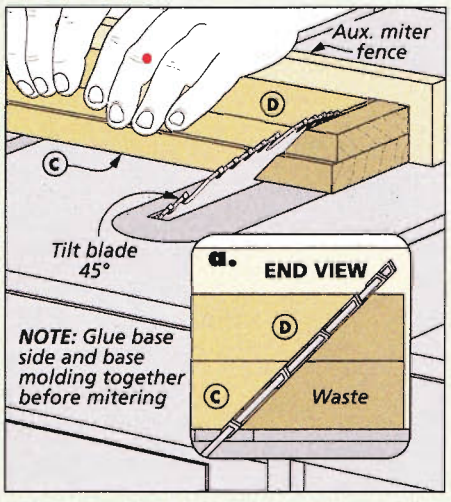
Shop Tip: Lazy Susan Layout



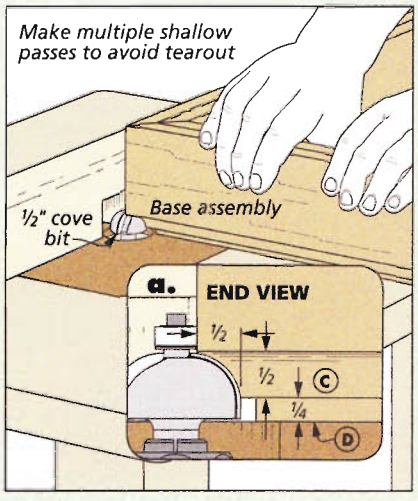
Molding & Trim



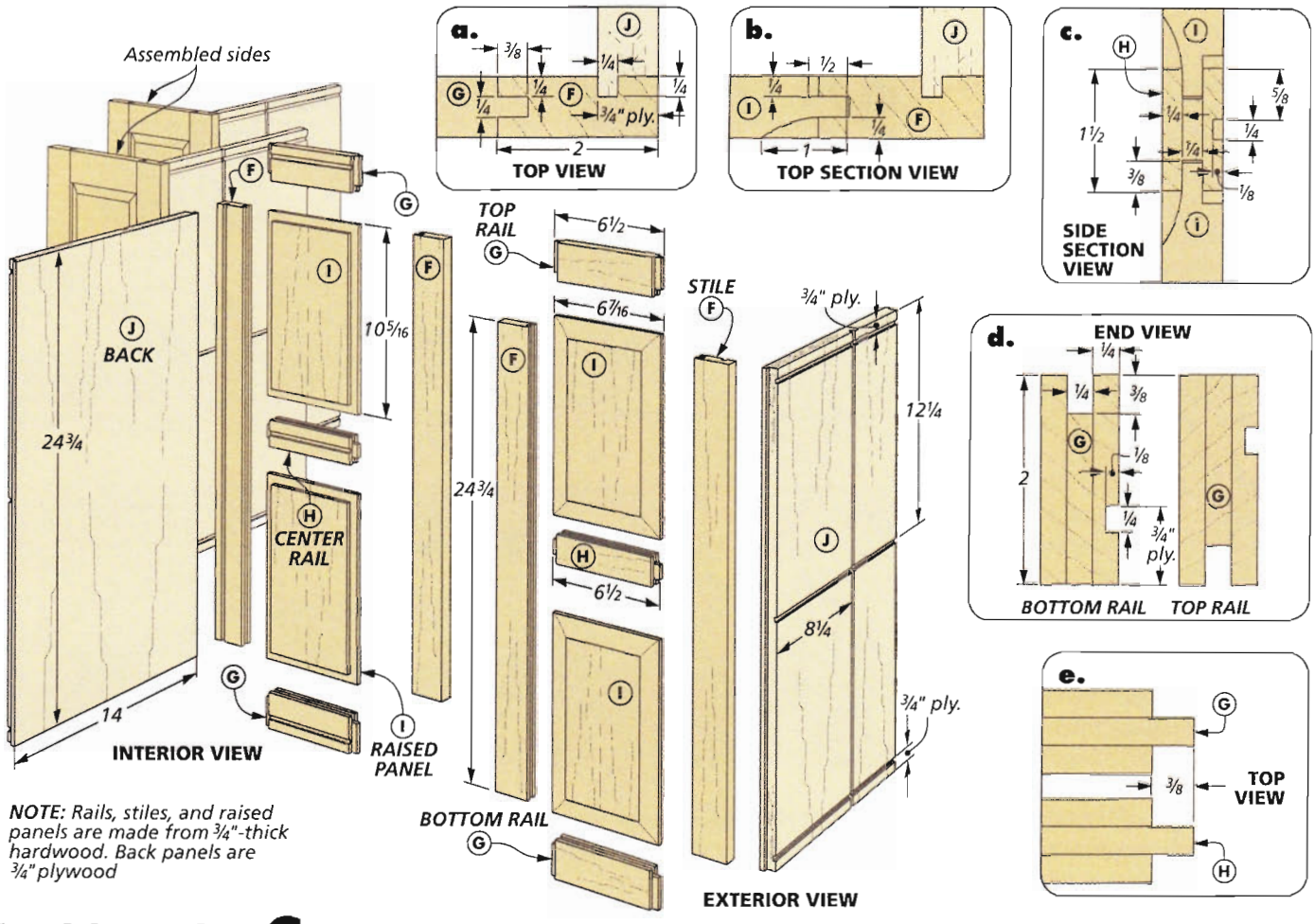
Groove. *The base sides and the top edging both need a groove to fit the tongues. It's a simple cut with a dado blade.*



Mitering. *With the sides and molding glued together, use an auxiliary fence on the miter gauge to miter the corners.*



Routing the Cove. *After the glue dries on the assembled base, rout the cove profile on the molding blank.*

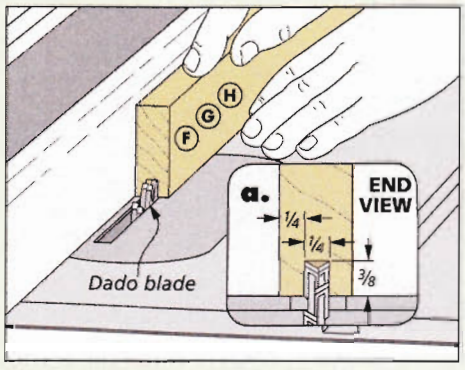


building the SECTIONS

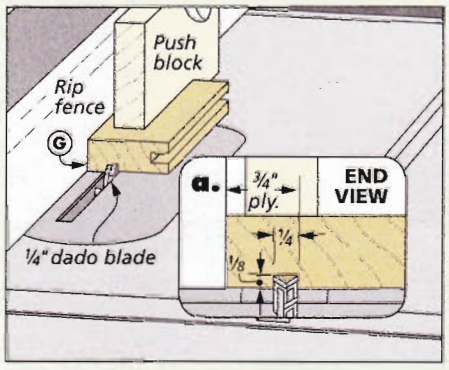
The base assembly provides the foundation for the bookcase. But it's the four storage sections that will turn it into a useful piece of furniture. Each section is identical, consisting of a frame and raised panel side, a back panel, and three shelves. The entire case is assembled using tongue and dado joinery. It's best to make the individual components for each unit at the same time, using the same saw setups. This way, the position of the dadoes and grooves will be consistent and the pieces will fit together properly.

START WITH THE SIDES. The frame and panel sides are at the heart of each section, so that's where I started. The joinery for the frames is simple stub tenon and groove. After cutting the rails and stiles to size, all you need to do is cut a centered groove on the inside edge of each piece to hold the panels (left drawing below).

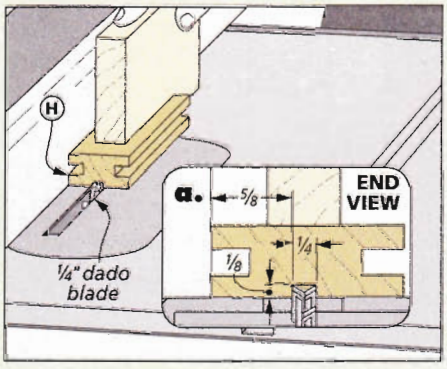
How-To: Rails & Stiles



Groove. *With a dado blade installed in the table saw, cut the centered groove on the inside edge of the rails and stiles.*



Top & Bottom Rail. *The top and bottom rails need a groove to hold the top and bottom in the final assembly.*



Center Rails. *The groove that holds the shelf is cut into the center rail. This groove is centered on the width of the rail.*

The center and right drawings at the bottom of the opposite page and the figures at right show how to make the remaining cuts. While you're at it, you can cut the grooves on the inside faces of the rails (details 'c' and 'd'). These grooves will hold the top, bottom, and shelves. Figure 1 shows an easy way to make the stub tenons. I like to use a test piece to sneak up on a snug fit for these parts.

RAISED PANELS. The next step is to make the raised panels. You can start by installing a raised panel bit in the router table. Since these bits have a large diameter, you'll need to set the speed of the router to its lowest setting. It's also a good idea to take shallow passes to ensure clean cuts. Raise the bit after each pass until you reach the final profile (Figure 2).

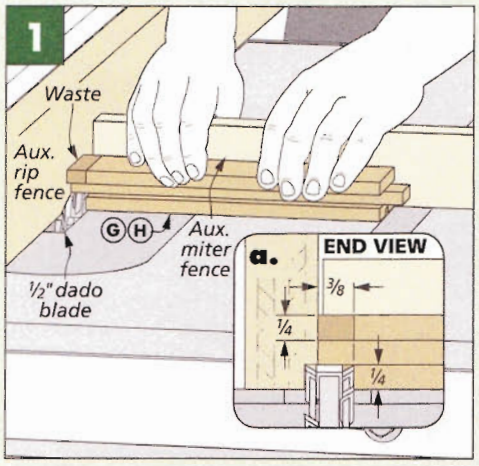
When you've completed the profile, cut a rabbet around all four edges of each panel, as shown in Figure 3. This forms a tongue that fits into the grooves on the rails and stiles you made earlier. This should be an easy, slip fit.

Before continuing the assembly, it pays to stain and finish the panels. By doing this now, you avoid the possibility of exposing unfinished wood when the panels expand and contract with seasonal changes in humidity. This way the entire panel is covered. Now you can assemble the frame and panel sides with glue and clamps.

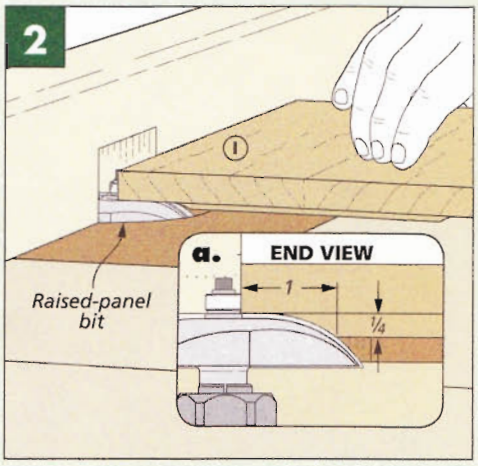
THE BACK. The back adds a great deal of stability to the construction. To start with, I cut tongues on both long edges that will fit into the grooves on the stiles (Figure 4). In addition, a long groove on the back face holds the tongue of an adjacent back, as shown in Figure 5. Finally, you can cut three dadoes on the back to hold the top, bottom, and shelves for the adjacent unit (main drawing).

ASSEMBLY. At this point, you're ready to assemble the backs and sides. The photo at right shows how. The important thing here is to keep each assembly square to avoid problems later.

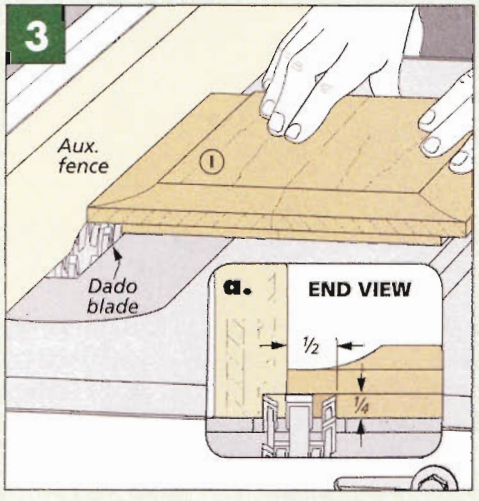
How-To: Build Raised Panel Sides



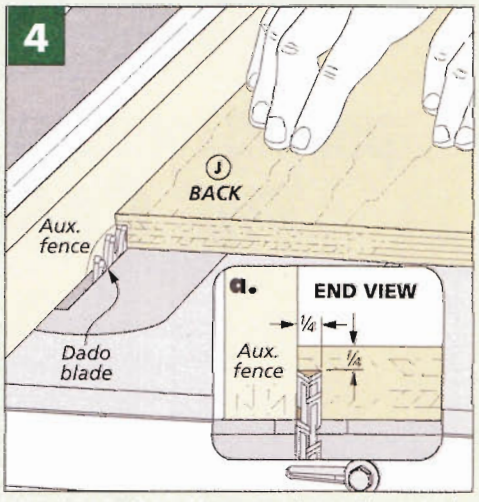
Stub Tenons. *You'll need to add an auxiliary fence to the rip fence and the miter gauge to cut the stub tenons on the rails.*



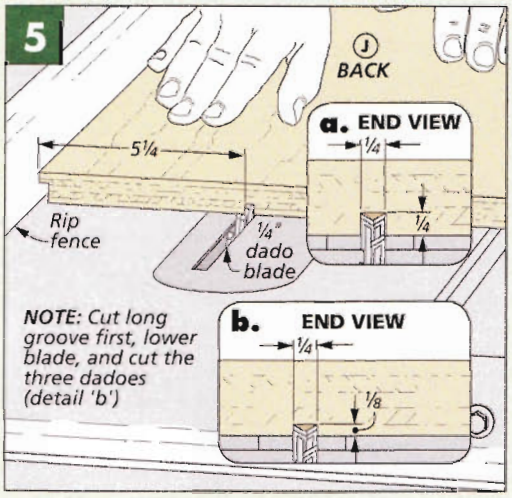
Raised Panel. *With a raised-panel bit installed in the router table, turn the speed down on the router and take light passes.*



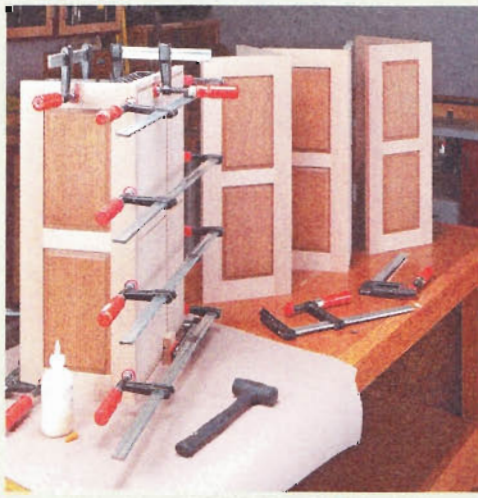
Rabbet. *To complete the tongue on the raised panels, head back to the table saw and cut a rabbet on the inside back edges.*



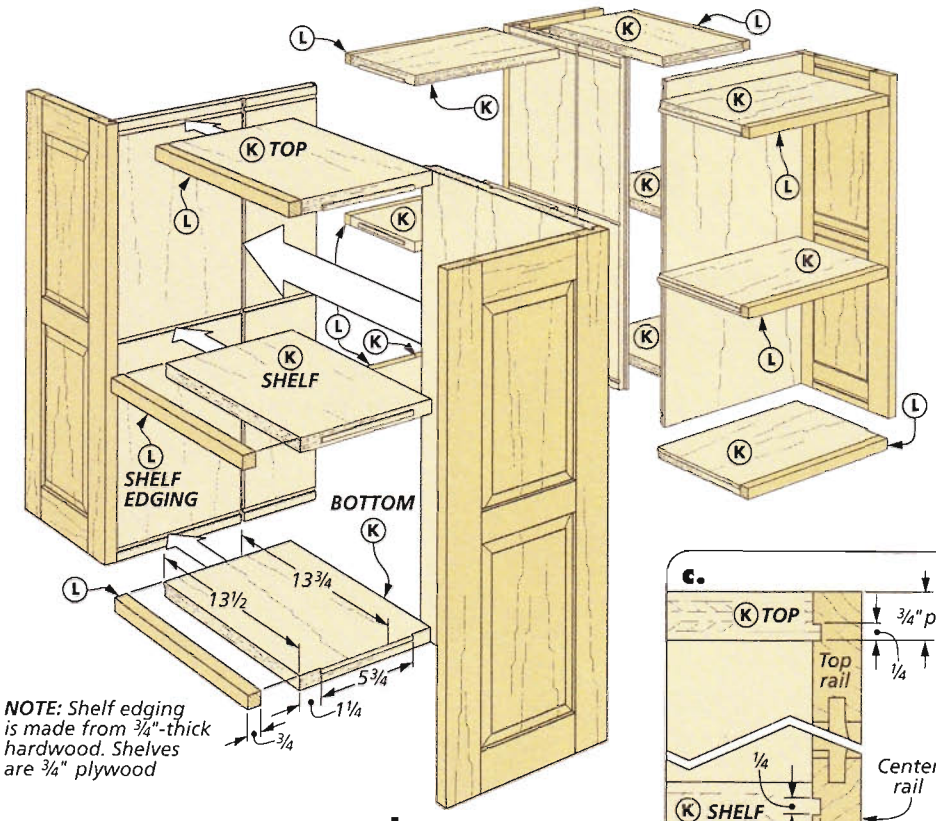
Tongue. *After setting up the table saw for cutting rabbets, raise the blade slowly to sneak up on a snug-fitting tongue for each back.*

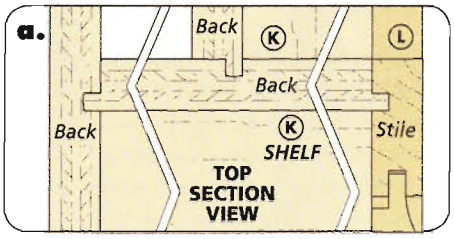


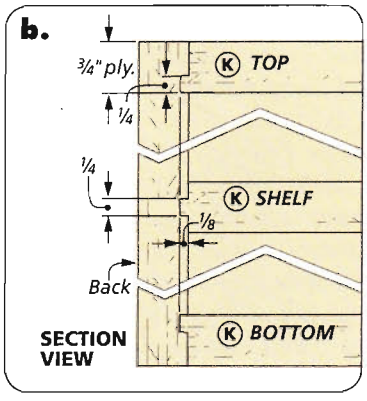
Dadoes & Grooves. *The backs need a long groove to connect to the other subassemblies, and three dadoes for the top, bottom, and shelf.*

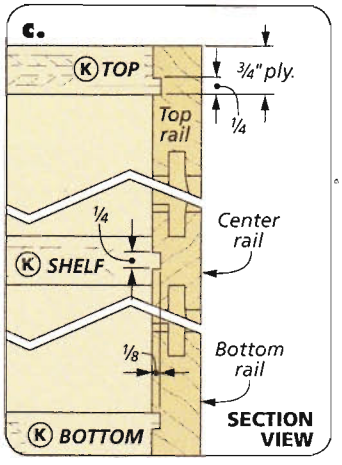


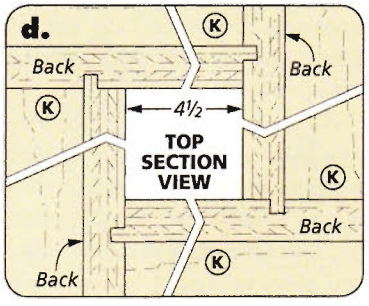
When assembling the sides and backs, make sure to keep each section square as you add clamps.











putting together THE CASE

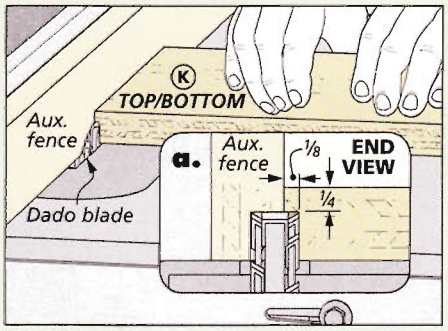
After the glue dries on the four side and back subassemblies, you can start to see how they'll come together to form the bookcase. All you need to do is make the tops, bottoms, and shelves for each unit and you'll be ready to assemble the whole thing.

THE TOP, BOTTOM & SHELVES. Each section holds a top, bottom, and center shelf in shallow grooves. The first step is to cut these parts to size. Then set up the table saw to cut the tongues on the ends of each piece. The box below shows how to carry out each operation. Note that the top and bottom have offset tongues while the tongue for the shelf is centered on the thickness.

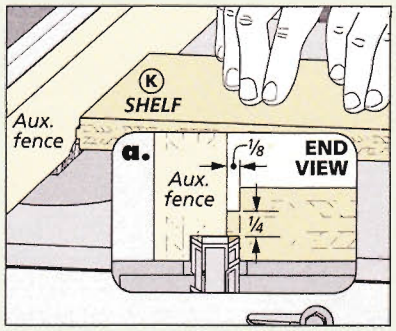
The right drawing below shows how I used a tall auxiliary fence on the miter gauge to nibble away the ends of the tongue so it will fit into the grooves in the rails.

EDGING. After completing the tongues, I made strips of hardwood edging. You can get started by planing some stock to match the thickness of the plywood.

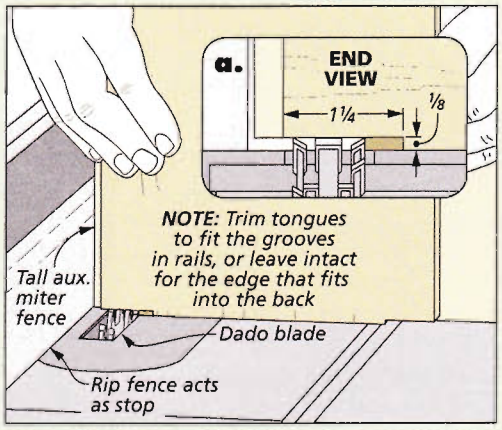
How-To: Cut the Tongues



Top/Bottom Shelves. *With an auxiliary fence installed on the rip fence, cut a rabbet to form the tongue.*



Center Shelf. *Lower the blade and make the first cut, then flip the workpiece over to center the tongue.*



Trim the Ends. *Install a tall auxiliary fence on the miter gauge and nibble away the waste to cut the tongue to final length.*

Then rip the blanks into ¾"-wide strips. After cutting them to length, attach them to the plywood with glue and clamps.

ASSEMBLY. Assembling all the components can be a bit tricky. If you have a friend who can help out, this is the time to give him or her a call. You'll need to do things is a specific order. The photos and drawings at right walk you through the process.

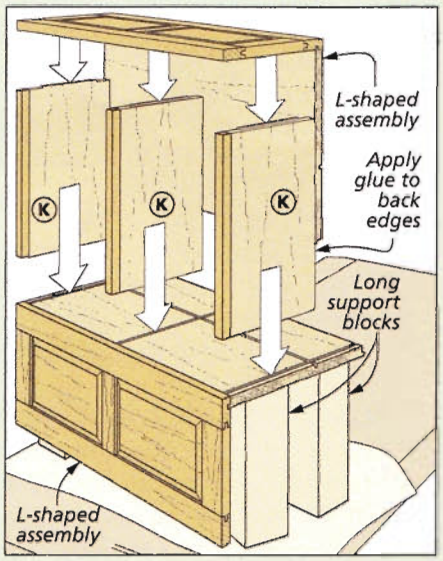
DRY FIT. The first step is to lay out the tops, bottoms, and shelves and dry fit them to a particular section. As you can see in the top left drawing, I rested one L-shaped corner assembly on some 4" x 4" blocks I keep near my bench for just such a task. This keeps the pieces off the bench and allows you to clamp everything together once you have it in place.

GLUEUP. Next, you'll join two of the L-shaped sections together, adding the top, bottom, and shelf as you go (top right photo). This is where the small tenons on the shelves are a life saver. They do provide a bit of strength to the joint, but more importantly, they keep the pieces from shifting out of alignment while you add glue and clamps. After completing the two subassemblies, you can take a break while the glue dries.

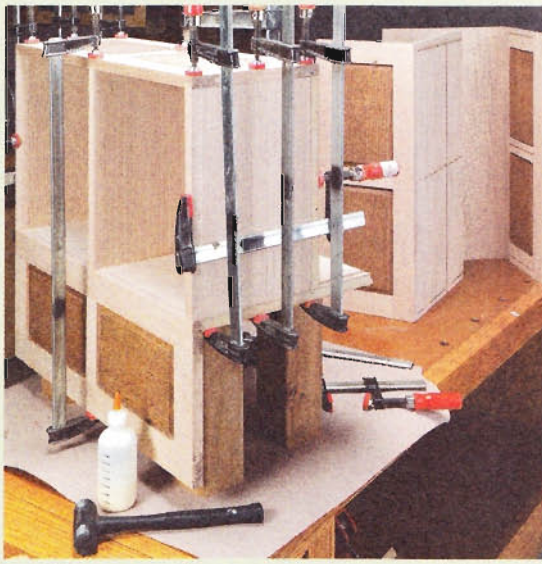
Bringing the two large subassemblies together can be kind of a balancing act. The tricky part is installing all the shelves in both pieces while adding glue and clamps. The center drawing shows how I continued to use the blocks to keep things off the bench. The key is to glue the pieces to one half and then bring in the other half to complete the joints. The blocks allow you to reach underneath the cases to position the pieces and apply clamps.

With everything in place, clamp across the sections as shown in the bottom photos. You can check the cabinet at several places to ensure it remains square. For the most part, the assembly is self squaring, but it still pays to keep an eye on it as things go together.

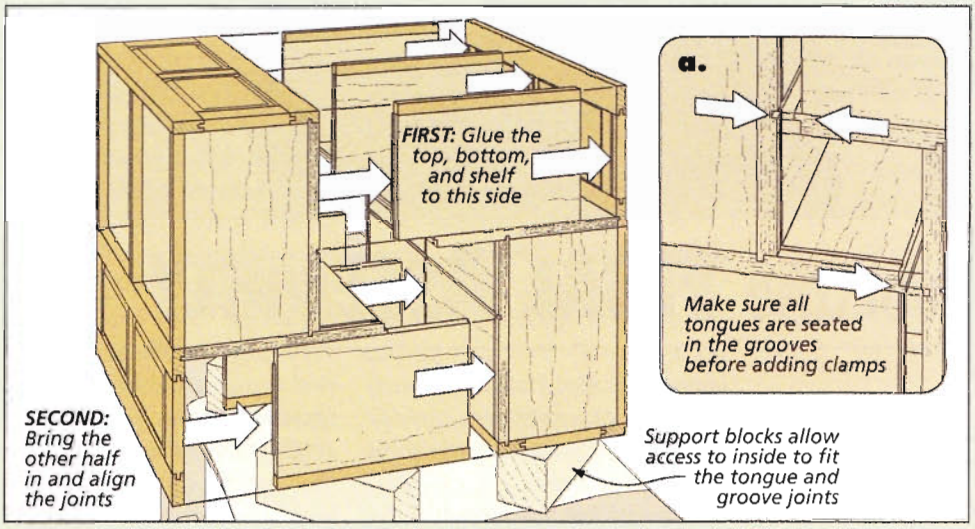
How-To: Final Case Assembly



Add the Shelves. *Place one L-shaped assembly on long support blocks while you install the top, bottom, and shelf.*

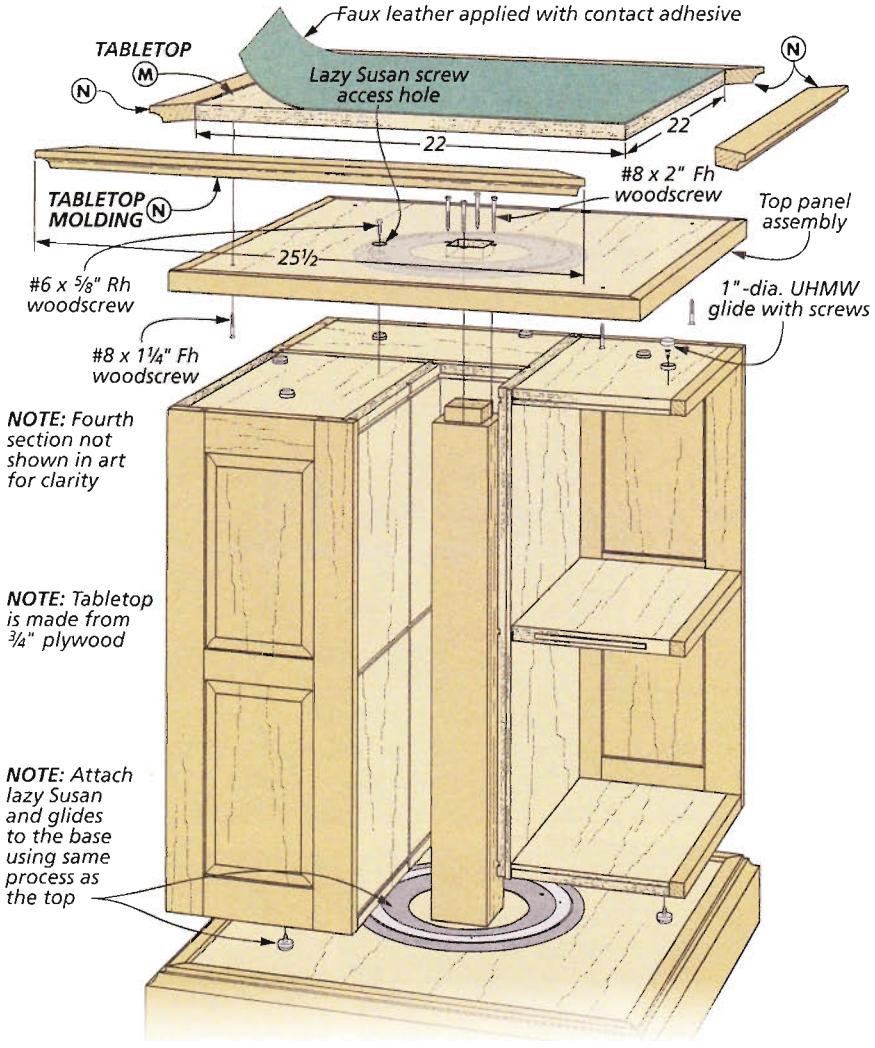


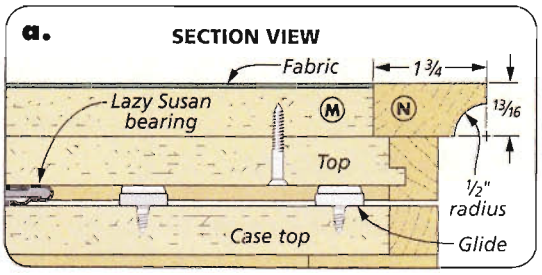
▲ With glue on the tongue and groove joints, install the second assembly on the shelf tongues and add clamps.

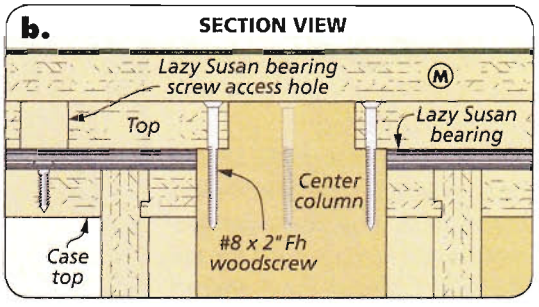


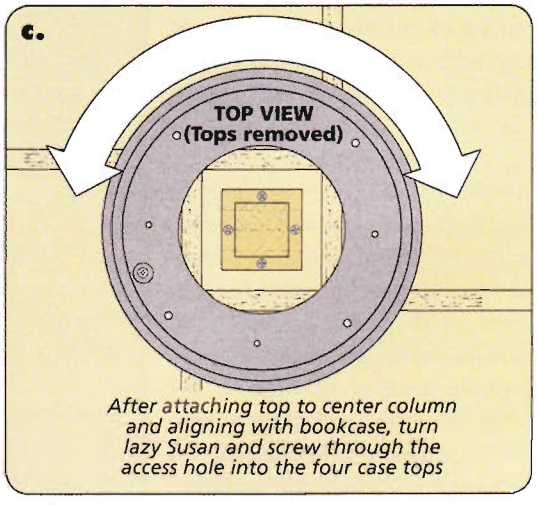
Final Assembly. *The final assembly can be a bit tricky. But if you glue the top, bottom, and shelves to one half then bring the second half in to meet them, it goes smoothly.*

▶ Clamp across the two half sections, checking to make sure top and bottom edges are flush.









bookcase FINAL ASSEMBLY

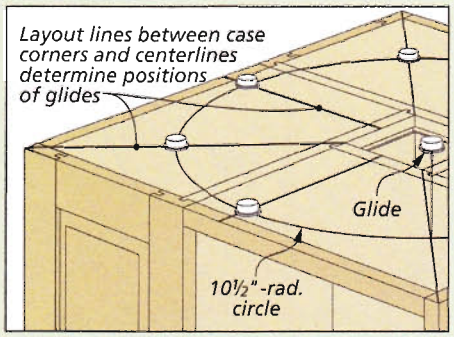
With the difficult task of assembling the case complete, you're in the home stretch of the project. All that remains is to install the case on the base and add the top. The connection between the two components is made solely through the lazy Susan bearings on the top and bottom. Sixteen low-friction plastic glides help keep the spacing even and the bookcase turning smoothly.

After that, you'll build and install the tabletop. Neither of these tasks presents any major challenges, but you'll need to pay attention to accuracy as you install the bearings to keep everything positioned properly.

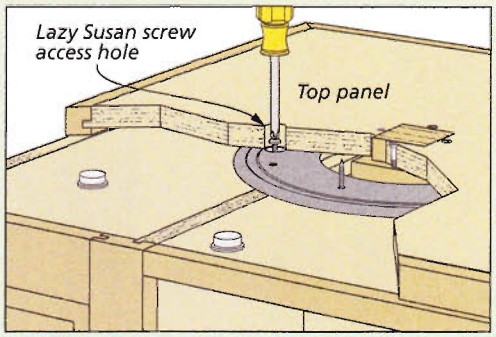
LAYOUT MARKS. The first step in the installation is to draw a few layout marks to help position the glides. The far left drawing shows what you need. Just use a straightedge to draw lines between the corners and centerlines of the sides. I also cut a block from scrap plywood to fit into the opening in the case so I could mark a centerpoint and scribe a circle.

GLIDES. The key to the bookcase turning smoothly is the set of glides. They have to be tall enough (5/16") to prevent the edging from rubbing on the case. You can add a washer for additional clearance.

How-To: Install the Top & Base



Glides. *With layout lines between corners and across centerlines, rough in a circle to establish the locations for the glides.*



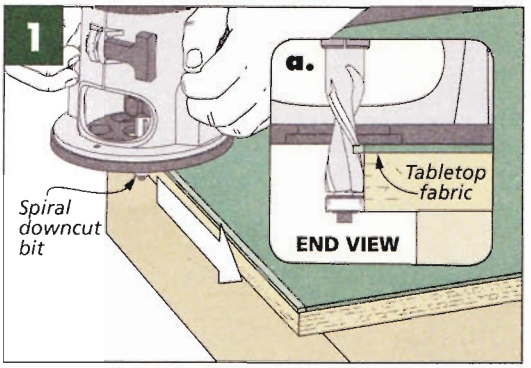
Installing Lazy Susan. *Using the access hole you made earlier in the base and top, align the lazy Susan and drive in the screws.*

ATTACH THE TOP & BOTTOM. With the glides installed, you're ready to connect the top and base to the case. I started by attaching the base. For this, I began by turning the case upside down and setting it on spacer blocks to allow the column to protrude. You can align the sides with the base to center the case. Then use the access hole to install the first screw into the lazy Susan bearing.

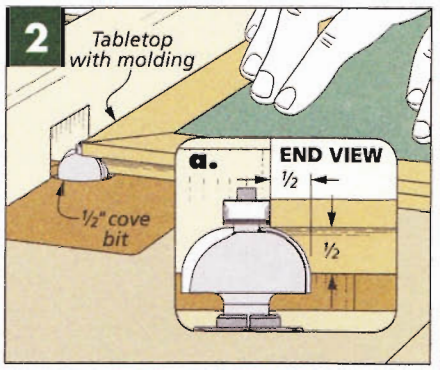
Now simply rotate the base and drive the rest of the screws to complete the assembly. After that, flip the bookcase over onto its bottom and fit the top panel over the center post. After screwing the top to the post, repeat the process to attach the bearing. At this point, it's a good idea to make sure the unit turns smoothly and without any wobble or rubbing.

TABLETOP. The last piece of the bookcase is the tabletop. Once again, I used a plywood panel edged with hardwood molding. I also covered the tabletop in a durable, faux leather vinyl. This makes for a softer top, as well as being easy to clean. It all begins by cutting the tabletop to final size.

Adding the fabric is pretty simple. I started with an oversized piece to make sure I didn't end up short. Then I sprayed contact adhesive on the surface of the tabletop panel and a light coat on the underside of the fabric, as well. After it feels dry to the touch, you can put the fabric in place. Then use a roller to force out any air bubbles. I trimmed it close to the edge with scissors first, then routed the remainder. Figure 1, above, shows an easy way to use your router to trim the fabric flush with the edges.

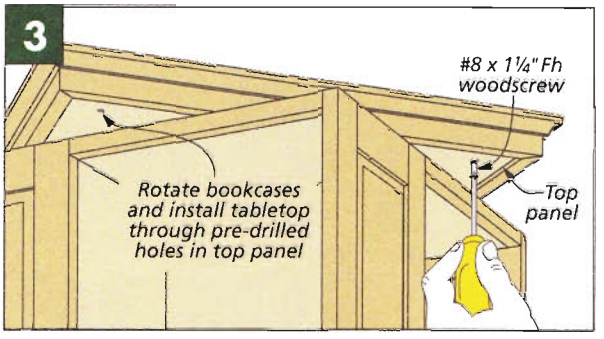


Trimming the Fabric. *The nice thing about this vinyl fabric is that you can trim it with a router. I used a spiral flush-trim bit.*



Routing the Cove. *When the glue has dried on the molding, head to the router table and rout the cove profile.*

MOLDING. The next step is to add the molding. As you can see in the main drawing on the opposite page, the molding fits flush with the fabric on the tabletop. Rather than rout the molding profile first, I opted to install it on the tabletop, then rout it afterward. The reason for this is that it's more difficult to clamp the molding in place with the cove profile already routed. By doing it this way, you can clamp the joints securely and make sure of a good fit.



Installing the Table Top. *You can access the screw holes you drilled earlier by rotating the case. Then add the screws to secure the tabletop.*

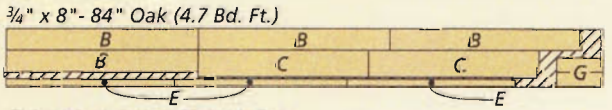
FINAL INSTALLATION. After routing the molding (Figure 2), I completed the project by attaching the tabletop. Figure 3 shows how it's done. Now you're ready to move the bookcase next to your favorite reading chair and relax. W

Materials, Supplies, & Cutting Diagram

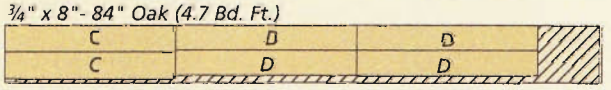
A	Base/Top Panels (2)	¾ ply. - 23 x 23	**H**	Center Rails (4)	¾ x 1½ - 6½
B	Center Column (1)	3 x 3 - 27	**I**	Raised Panels (8)	¾ x 6 7/16 - 10 5/16
C	Base Sides (4)	¾ - 3¾ x 24	**J**	Backs (4)	¾ ply. x 14 - 24¾
D	Base Molding (4)	¾ x 3½ - 25½	**K**	Top, Bottom & Shelves (12)	¾ ply. x 8¼ - 13¾
E	Top Edging (4)	¾ x 1 - 24	**L**	Shelf Edging (12)	¾ x ¾ - 13½
F	Stiles (8)	¾ x 2 - 24¾	**M**	Tabletop (1)	¾ ply. x 22 - 22
G	Top/Bottom Rails (8)	¾ x 2 - 6½	**N**	Tabletop Molding (4)	13/16 x 1¾ - 25½

- (2) 12"-dia. Lazy Susan Bearings
- (16) 1"-dia. Plastic Glides w/Screws
- (16) ⅜" Flat Washers
- (8) #8 x 1¼" Fh Woodscrews
- (8) #8 x 2" Fh Woodscrews
- (16) #6 x ⅝" Rh Woodscrews
- (1 yd.) Faux Leather Vinyl

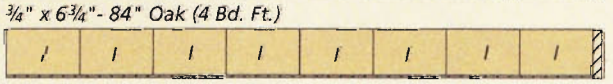
¾" x 8"- 84" Oak (4.7 Bd. Ft.)



¾" x 8"- 84" Oak (4.7 Bd. Ft.)

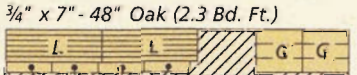


¾" x 6¾"- 84" Oak (4 Bd. Ft.)

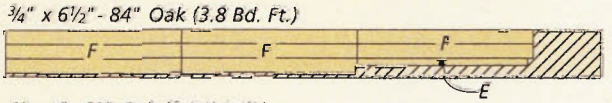


Also Needed: One 48"x 96" sheet of ¾" Oak Plywood
One 24"x 48" sheet of ¾" Oak Plywood

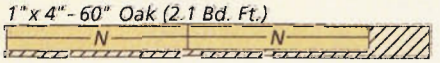
¾" x 7"- 48" Oak (2.3 Bd. Ft.)



¾" x 6½"- 84" Oak (3.8 Bd. Ft.)



1"x 4"- 60" Oak (2.1 Bd. Ft.)



NOTE: *Part N is planed down to 13/16" thick*

router table

Cope & Stick Joinery

Two separate router bits create the opposite profiles that mate to form a strong, attractive frame joint.

A pair of router bits and a foolproof technique is all it takes to make attractive, seamless frame and panel assemblies.

When it comes to creating molded frames like those made for the Shaker-style blanket chest on page 22, it's hard to beat the speed and accuracy of a cope and stick router bit set. In just a matter of minutes, you can cut both the profile and joinery that will come together like a hand in a glove.

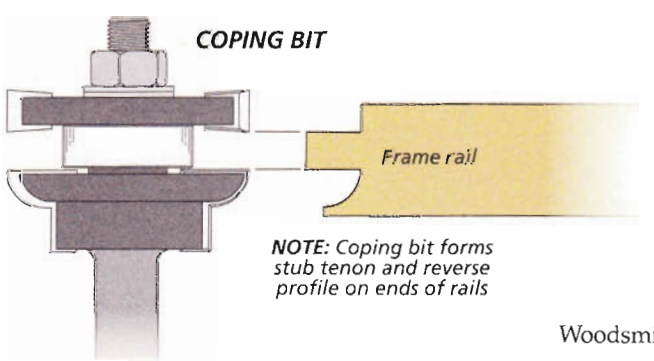
Cope and stick (also called rail and stile) refers to a two-step process for joining a frame with a profile on the inside edges. Stick (or sticking) is a traditional term for forming a molded edge on the rails and stiles and, in this case, the groove to hold the panel. Cope (or coping) refers to the technique of cutting a reverse molding along with a stub tenon on the end of the rails. The cope cuts are actually made first, hence the process is referred to as cope and stick.

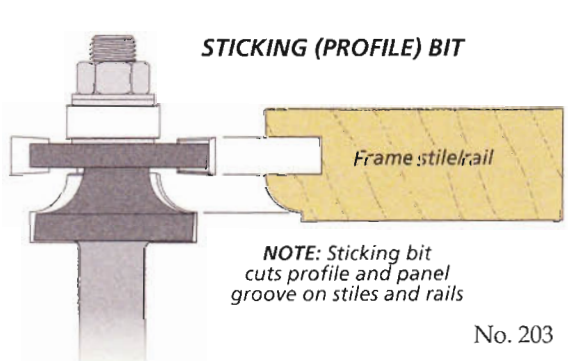
HOW THE BITS WORK. Although some cope and stick sets consist of one bit that performs both operations, a two-bit set is more common and will give better results. The simple ¼" filleted roundover set I used for the blanket chest is shown below. The coping bit forms the coped profile and stub tenon on the ends of the rails while the sticking bit cuts a decorative profile and a panel groove in the stiles and rails. Both bits are bearing-guided, so the depth of cut is always consistent.

These large bits are designed for and should always be used in the router table — never handheld. And also, due to their size, a speed range of 16,000 to 18,000 RPM is recommended. So you'll need a variable-speed router.

Considering the high-quality result offered, the technique is surprisingly easy to master. The real key to success with this type of joinery is careful setup. I'll offer a few step-by-step pointers to help you along your way.

COPE FIRST. As I mentioned, the cope cuts on the ends of the rails





are made first. This may seem backward, but there's a good reason. Since you're cutting across end grain when making the cuts, chipout is a hazard. However, if the edges of the rails are still square, the cuts can be backed up and chipout prevented.

GUIDE. When making the cuts across the narrow ends of the rails, you need a way to control the workpiece and guarantee a smooth, full-depth cut. For this purpose, I use the guide shown in the upper left drawing below. It runs along the router table fence and holds the workpiece square while also backing it up.

BIT HEIGHT. The cope cuts establish the depth of the profile as referenced from the outside face of the workpieces. Depending on the thickness of the stock and the bits you use, the groove (and tenon) will often be offset toward the inside of the workpieces. My bits are designed to cut a 5/16"-deep profile. So in 3/4"-thick stock, the groove will be 1/16" off center. Keep all this in mind when adjusting the bit height. A test cut or two is generally a good idea.

With the bit height adjusted and router table fence set in line with the bearing, you're ready to make the cuts. Hold the rail tightly against the guide and the fence with the outside face flat on the table (Figure 1). It's important to keep the rail pressed tightly against the table as you slide it across the bit. This will ensure an accurate and consistent depth of cut between all the coped ends.

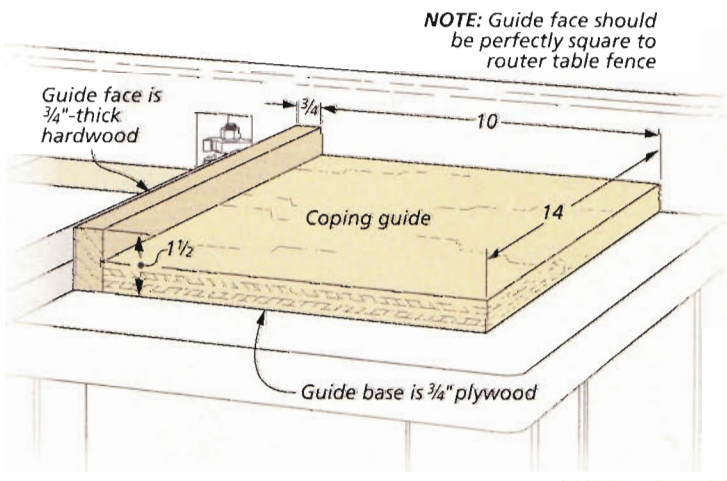
I try to make each cut with a single, slow pass. Since you're cutting a complex, multi-part profile, a second pass will possibly widen the groove and coped profile, resulting in a poor fit. You can afford to take your time.

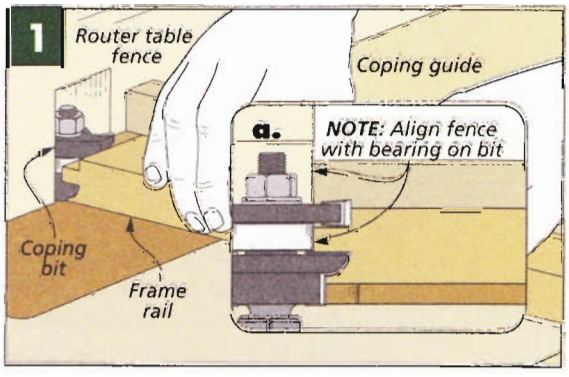
NOW STICK. Once all of the cope cuts are made, you can swap out the coping bit for the profile, or sticking, bit. As before, the router table fence is set in line with the bearing on the bit. The trick here is to adjust the height of the bit so that the profile and groove are cut to the proper depth through the thickness of the piece. If the bit is set too low, the rails will sit proud of the stiles — too high and you'll see the opposite effect. You want the stiles and rails to end up perfectly flush.

I use the coped ends of the rails as a quick guide to get the height setting of the bit in the ballpark (Figure 2). Just align the tenon on the end of the rail with the groove cutter on the profile bit. Then, I make test cuts in scrap pieces to fine-tune the height of the bit.

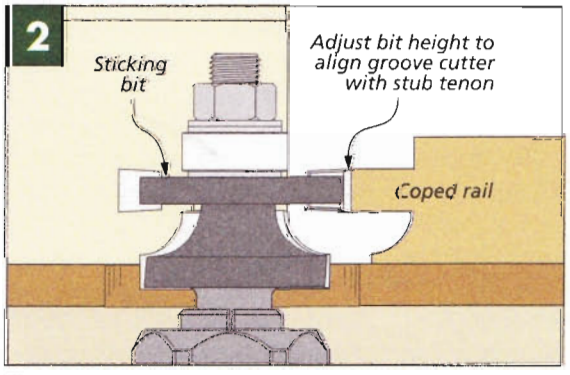
Of course, you'll need to stick both the stiles and the rails. And like the coped ends of the rails, make the cuts in a single pass with the outside face of the pieces held flat on the table (Figure 3).

That's all there is to it. A small dose of patience and a little concentration yields a snug-fitting, great-looking joint. W

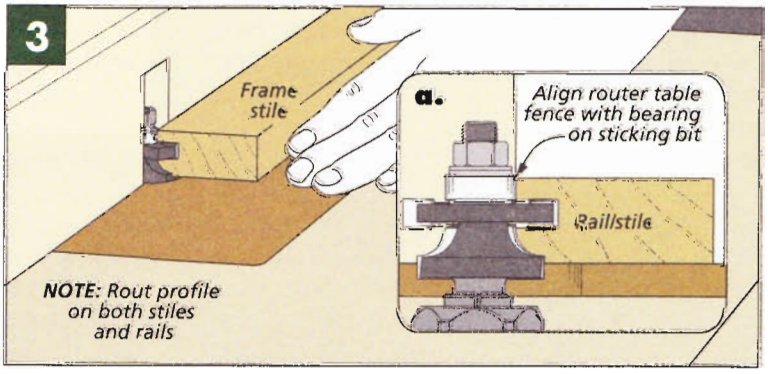




Cope Cuts First. *Hold the rail firmly against the router table, the fence, and the guide while making a slow, steady pass across the coping bit.*



Sticking Bit. *Proper height adjustment of the sticking bit is the key to achieving flush surfaces. The coped ends of the rails will help get you close.*



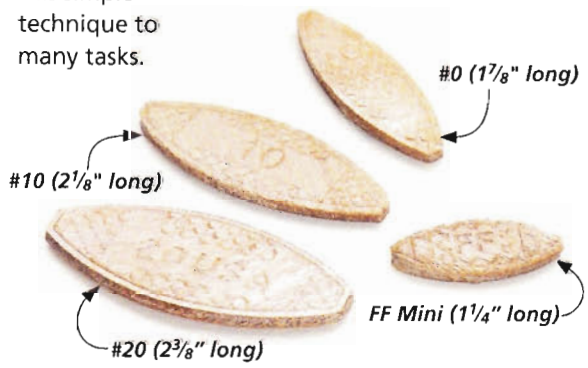
Sticking Cuts. *After fine-tuning the bit height with a few test cuts, you can stick the rails and stiles with one full-depth pass. Just like the cope cuts, maintain a steady feed rate and good pressure on the workpiece.*

dust off your

Biscuit Joiner

This versatile tool is as handy today as when it first hit the market. And for many joinery tasks, there's no better way.

About 25 years ago, the plate, or biscuit joiner, was introduced and took the woodworking world by storm. It was a very innovative tool that offered a variety of practical uses. Just about every woodworker either eventually bought one or wanted to. But after the initial excitement wore off, many of these biscuit joiners were put on the shelf to gather dust and don't see the use they once did. If this description fits, you may be overlooking a tool that can save you a lot of time and effort and improve the quality of your work.



A wide range of biscuit sizes allows you to adapt this simple technique to many tasks.

WHY? In essence, a biscuit joiner offers a quick and easy way to make a spline joint. You use the joiner to cut mating concave slots and then simply install the specially shaped biscuits across the joint. Depending on the application, the joint can be completed in only a few minutes. For me, the big selling point is that with just a little care, perfect alignment of the joint is just about automatic.

Now I'm not advocating that biscuit joinery take the place of all other types. It's a matter of choosing the most efficient and appropriate joinery method for the task at hand. And in many instances using biscuit joinery is a "no-brainer" — if you'll pardon the expression. It can earn its keep by making otherwise tricky or time-consuming tasks easy, fast, and virtually foolproof.

KEEP IT SIMPLE. As I explained, one of the advantages of biscuit joinery is that in its basic form, it's easy to master. That's why I like to keep it simple and use the tool for jobs that don't require fussing with complicated setups.

However, there are a couple things to keep in mind. First, you always want to match the biscuit size to the task (lower left photo). A large biscuit (#20) will give you more gluing surface and produce a stronger connection.

However sometimes a small biscuit (#0 or a "mini") is a better fit to the scale of the workpieces.

My second point is to always use enough biscuits to get the job done. In other words, if adding another biscuit or two will strengthen the joint or aid in the assembly, don't hesitate. It's a snap and biscuits are cheap.

Now let me offer just a few building situations in which using biscuit joinery makes good sense.

EDGE JOINTS. Keeping edge-to-edge glue joints in alignment can be a challenge. Of course, one such instance is during a panel glueup. Once glue is applied and the clamps are tightened, the boards tend to shift, and you can end up with an uneven surface. A biscuit installed every 8" to 10" along the joints can cure the problem, as in the main photo on the opposite page and Figure 1 at right. In this instance, I don't even bother to glue the biscuits into the slots. This simplifies the glueup while still guaranteeing a flat surface.

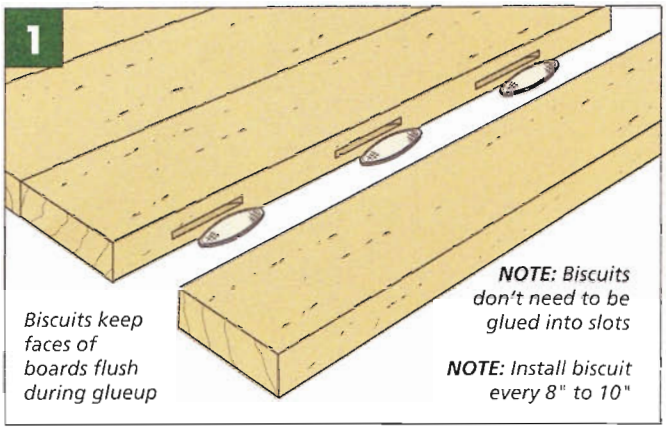
A similar application is shown in Figure 2 — wrapping a plywood panel with a solid-wood border. Again, the goal is perfectly flush surfaces. And in this case, cleaning up an uneven joint can be pretty touchy. Biscuits can be the answer. A bonus is a good measure of strength added to the joint.

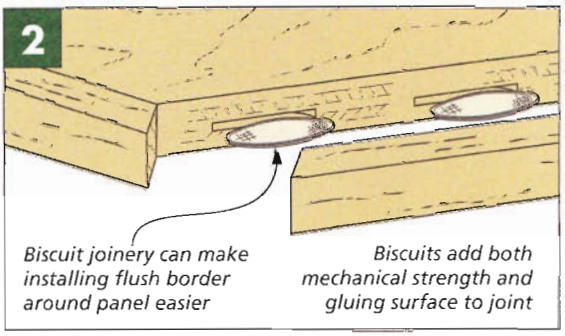
MITERED ASSEMBLIES. When building an assembly with miter joints, cutting and fitting the miters accurately is only half the battle. Miter joints can often be troublesome to glue and clamp. And even if you get past this hurdle, the long-term strength of the joints can come into question. Here, biscuit joinery can help you on both scores — keeping the mitered surfaces aligned during glueup while adding significant reinforcement to the joints.

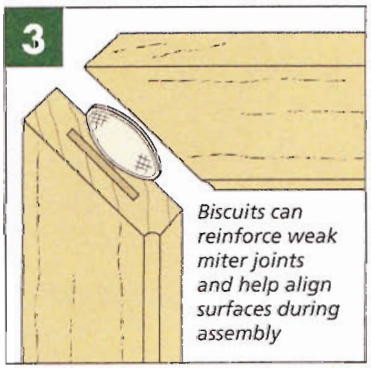
This effort-saving application can be applied to a flat mitered frame such as a mirror frame (Figure 3), or a "boxed" frame like that assembled for the base of a cabinet, as in Figure 4. Just remember that when installing biscuits across miter joints, choosing the right size and placing them correctly is the key.

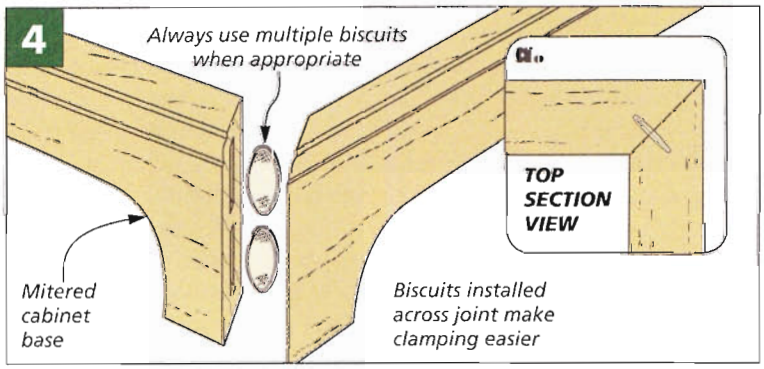
FRAMES & CASES. There are probably a hundred different ways to join two square workpieces — but maybe none faster and easier than using biscuit joinery. Assembling face frames, web frames, casework, or anything requiring moderate-strength joinery is fair game, as shown in Figures 5 and 6. Biscuit joinery can often take the place of more complicated and finicky joinery methods like mortise and tenon, dowel joints, or tongue and dado.

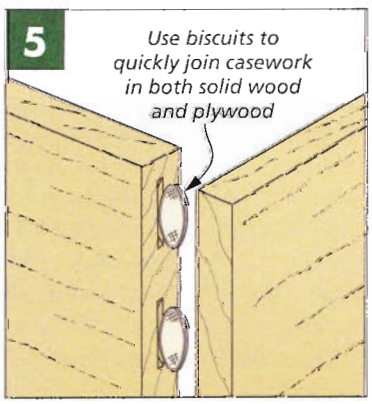
I'll admit that biscuit joinery isn't considered by some to be a "traditional" woodworking technique. But today's innovation has a way of becoming tomorrow's accepted practice. W

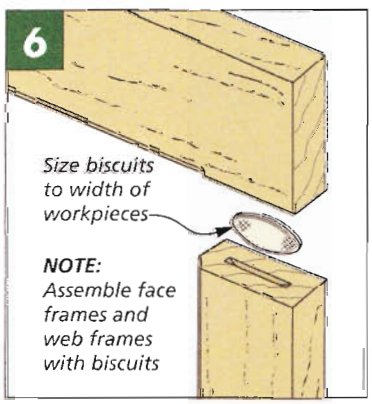












power

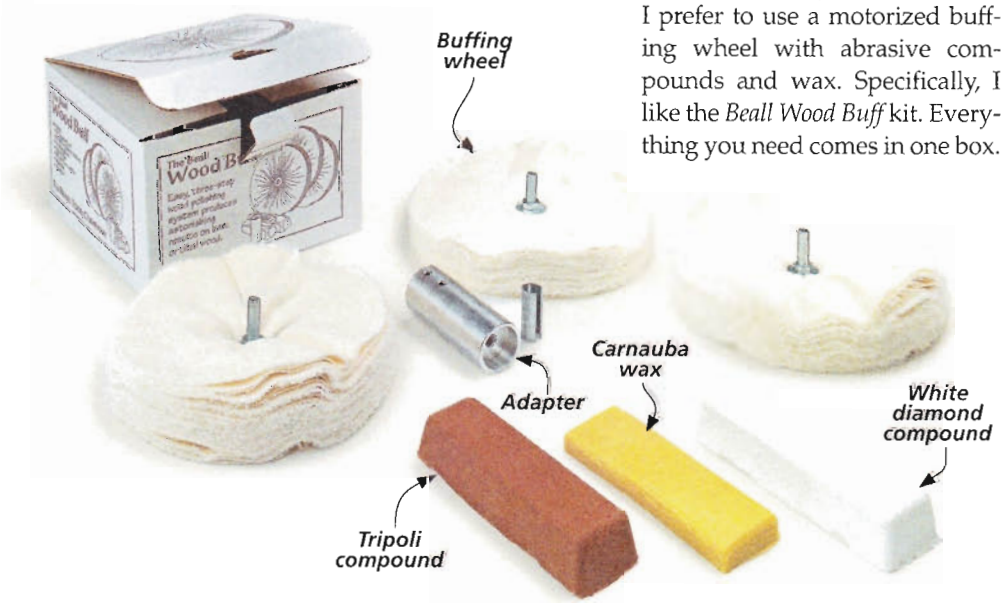
Buffing a Finish

A motorized buffing system takes the hard work and worry out of putting a high-gloss finish on your projects.

The *Beall Wood Buff* system has everything you need to get started buffing.

From a simple layer of wax buffed on over an oil-based finish all the way to a labor-intensive French polish, rubbing and buffing have long been a part of the wood finisher's repertoire. And there are several different tools and techniques you can use to buff a high-gloss finish.

BEALL WOOD BUFF. Although each different technique has its merits, I prefer to use a motorized buffing wheel with abrasive compounds and wax. Specifically, I like the *Beall Wood Buff* kit. Everything you need comes in one box.



This kit is easy to use and produces professional-looking results. Best of all, this method is flexible enough to allow you to use it on bare wood or over lacquer or other clear finishes.

WHAT'S IN THE BOX. As you can see in the photo at left, the kit includes three wheels and an adapter to fit them on the spindle of a motor (you supply the motor). Also included are three different compounds: Tripoli, white diamond, and finally carnauba wax. By using a different wheel for each abrasive and wax, you can buff a finish on your small projects in no time.

MOTOR. The heart of the system is, of course, the motor. You don't need a large motor, however. A ½-hp unit running at 1725 RPM is sufficient. If you want to avoid the expense of a new motor, a

great place to look for a used one is at a local heating and air conditioning company. The blower motors they use are inexpensive and perfect for the job.

The adapter in the *Beall* kit fits directly on the shaft of whatever motor you use, and locks in place with a set screw. The wheels screw into the adapter. Unlike other systems that require belts and pulleys and a much larger footprint, this system doesn't take up a lot of space and is easy to use.

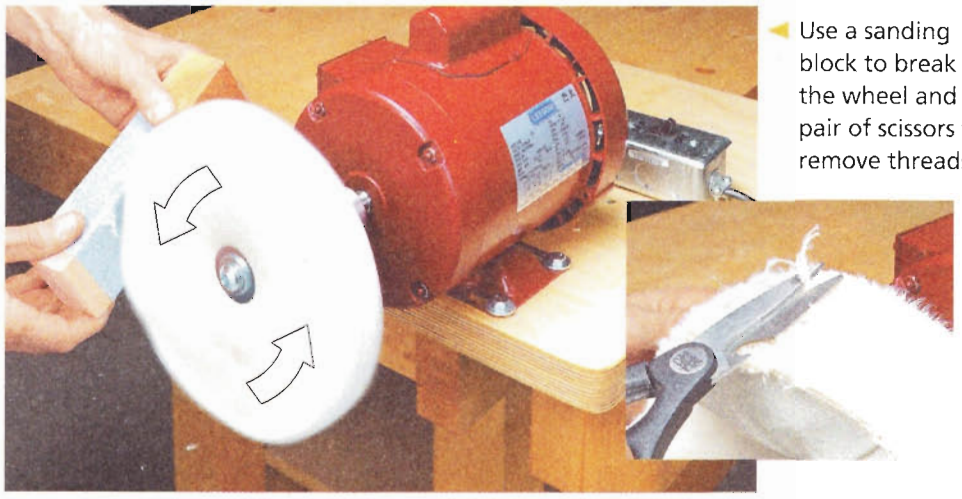
WHEELS. The wheels are made up of several layers of fabric, and each is designed to work best for a particular abrasive or wax. The first wheel, for the Tripoli compound, is all linen. The second, for the white diamond abrasive, alternates layers of flannel between the linen sheets. Finally, the last wheel is all flannel and is used with the carnauba wax.

Each wheel is labeled to avoid confusion. It's important to not mix abrasives on the wheels. Doing so will result in unwanted scratches on the finish.

CHARGING THE PADS. With the motor and the first wheel in place, you'll start by roughing up the cloth with an 80-grit sanding block (photos above right). This helps loosen the fibers. Then trim the edge to remove any strays. After that, you can begin charging the wheel with the Tripoli compound. Use a light touch so you don't overload the wheel.

TECHNIQUES. There isn't a big learning curve for buffing. And since the *Beall* system can be used directly on unfinished wood, there's not a lot of preparation necessary. But a coat of sanding sealer can help you get a smoother finish.

Whether you use a sealer or not, it's a good idea to sand the project up to 220-grit or so. Then it's just a matter of getting a feel for the different abrasives and waxes. You'll find that a light touch produces the best results. A practice piece or two is all it takes to get the hang of it.



Use a sanding block to break in the wheel and a pair of scissors to remove threads.

WAX. After working through the Tripoli and white diamond abrasives, you'll finish with the carnauba wax. This is a tough, hard wax that shines beautifully when buffed and adds a bit of protection to the piece. For many small projects, it's the perfect finish.

I think you'll find plenty of uses for the *Beall* system. But for larger projects, you might want to take a look at the box below for a drill-mounted buffing option. You can find out where to get either system in Sources on page 51. W

All it takes is a light touch of the bar to charge the wheel with abrasive compound.

Worth a Look: Foam Buffs

The *Beall Wood Buff* is great for small projects where you can take the wood to the wheel. But for larger work, the foam buffing pads shown in the photo below are just the ticket. They come ready to use installed on ¼" shafts. All you need is a drill and polishing compound, and you're ready to buff.

To add a polish to a large surface, I use auto polishing compound. It's easy to work with and it provides a tough, protective coat in addition to a high-gloss shine. One thing to keep in mind is that a corded drill is a better choice than a battery-powered model. The corded drill provides higher RPM and more torque for buffing the finish.

Foam pads provide the perfect solution for power buffing larger projects.

the Plane Facts

When it comes to understanding bench planes, it's not always easy to separate myth from reality.

There are some topics in woodworking that always generate more than their fair share of discussion and argument. One such debate revolves around the workings of bench planes — their design, setup, and use. And being a dedicated hand plane user for many years, I've always followed this line of talk with interest. The way I look at it, you can never know too much about the tools you use. And of course, my own personal experience and observation come into play, as well.

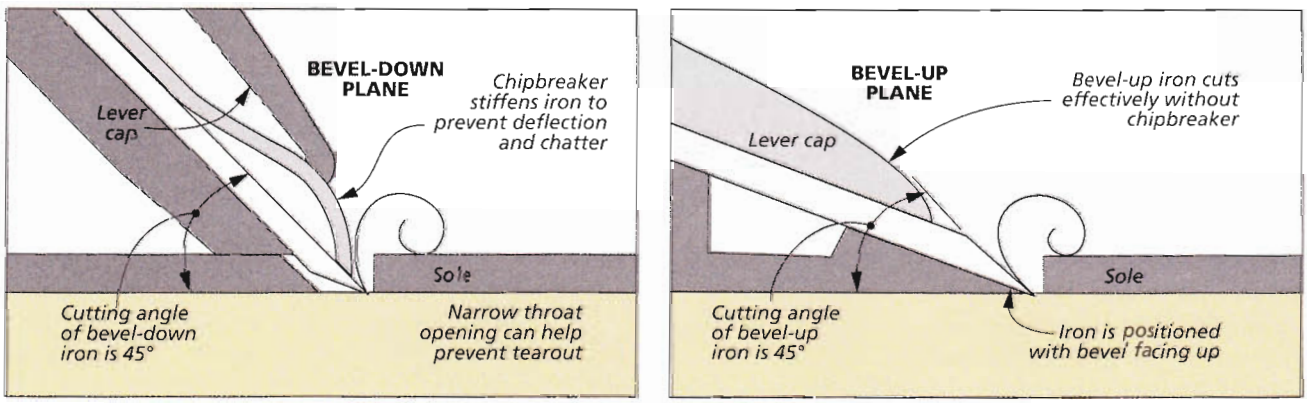
Now I won't pretend or expect to offer the final word on this complicated subject, but I would like to offer a few of my insights on some of the points of contention. I'll just give you something to chew on, and then you can draw your own conclusions.

BEST CUTTING ANGLE. Most bench planes are set up with a cutting angle of 45°. This is a good middle-of-the-road angle for face grain on the majority of woods. However, end grain cuts easier at the lower "slicing" angle of 35° to 40° found on a low-angle block plane or smoothing plane. When you raise the cutting angle to 50° to 60°, you produce a scraping cut that works well on very hard or highly figured woods.

BEVEL UP OR DOWN? A bevel-up or bevel-down design isn't necessarily important. It's the cutting angle that makes the difference. A bevel-up plane may have exactly the same cutting angle as a bevel-down plane (drawings below).

FUNCTION OF THE CHIPBREAKER. The name "chipbreaker" (also called cap iron) doesn't really present an accurate picture of the function of this important plane part. Blade stiffener would be better.

The shavings created by the plane iron are going to curl away from the iron regardless of whether they contact a chipbreaker or not. (Bevel-up planes



don't need a chipbreaker.) The most important job of the chipbreaker is to stiffen the iron and keep it from deflecting or chattering at the point of the cut. This became more common when planes incorporated adjustment mechanisms and thinner irons.

THROAT OPENING. The theory that a narrow throat opening reduces tearout makes sense and seems to work. With a tight throat opening, the wood fibers are supported by the sole right up until they engage the cutting edge. This prevents the fibers from lifting and tearing out ahead of the cut. Of course, the width of the throat opening can depend on the depth of cut and the size of shavings you're taking. A very narrow throat opening can clog when taking a heavy cut.

STRAIGHT OR CROWNED? The shape of the cutting edge depends on the type and use of a plane. I like to hone a very slight side-to-side crown into the edge of my smoothing plane iron so that the plane cuts an almost imperceptible trough (drawing at right). This allows better control and makes it easy to fine-tune the cut.

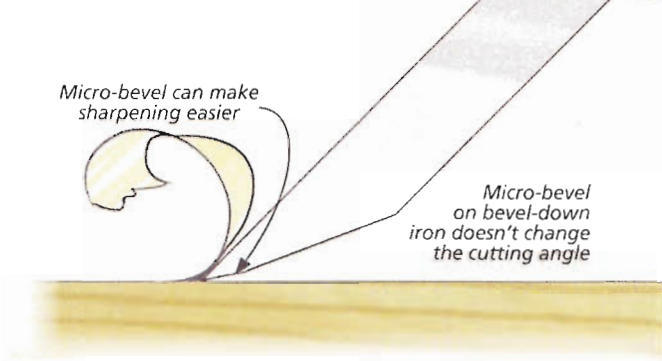
I've never agreed with the idea of simply rounding the corners of a smoother's iron. However, this can be a useful tactic for a jack plane that's used for rough work. The iron on a jointer plane should be sharpened straight across to produce a perfectly flat cut.

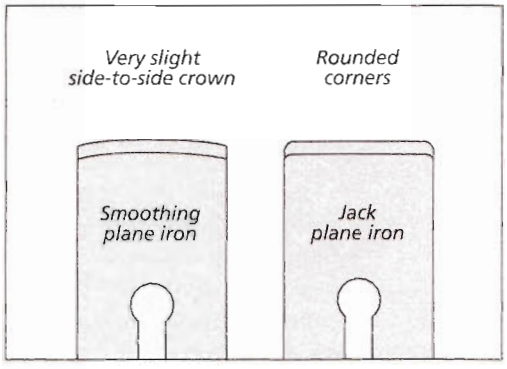
MICRO-BEVEL? The benefit of honing a micro-bevel on the edge of an iron can be misunderstood. To me, it comes down to convenience. On a bevel-down plane, a micro-bevel doesn't change the cutting angle, only the sharpening angle. The advantage is that the short micro-bevel is easier to touch up or resharpen than a wide bevel (right drawing).

On a bevel-up plane, a micro-bevel will increase the cutting angle, which may be helpful or may not. And again, it can make sharpening the blade go a little faster. The bottom line is that you have to decide whether the extra time spent adding a micro-bevel is worth the effort saved later.

IS A PERFECTLY FLAT SOLE A NECESSITY? Common wisdom says that the sole of a plane should be perfectly flat in order for it to cut properly. The answer to this one is "yes and no" and may depend on your definition of perfectly flat. The sole on most good quality planes is ground flat enough that the plane will function very well. You want to avoid a plane with a sole that's twisted or badly out of flat, but I don't obsess on a perfectly flat sole.

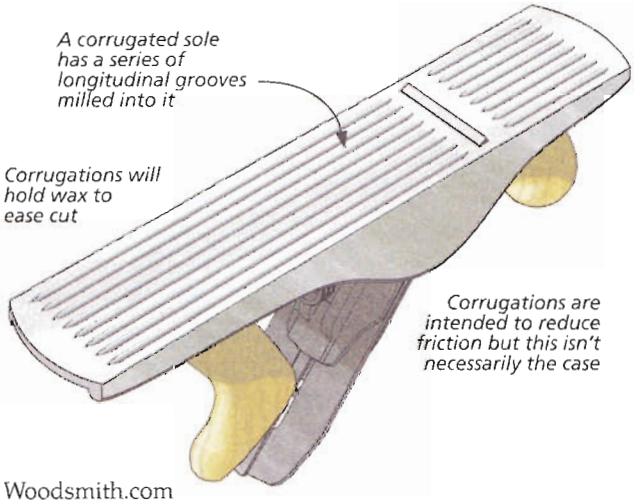
CORRUGATED SOLE? I've always been fond of planes with corrugated or grooved soles. But honestly, I don't know that this feature improves a plane's performance (left drawing below). The theory is that the corrugations reduce friction between the sole and the wood and make the plane easier to push. I use both types of planes and can't tell a difference. But, I have found that corrugations will hold and then release the beeswax I sometimes use to lubricate a plane's sole.

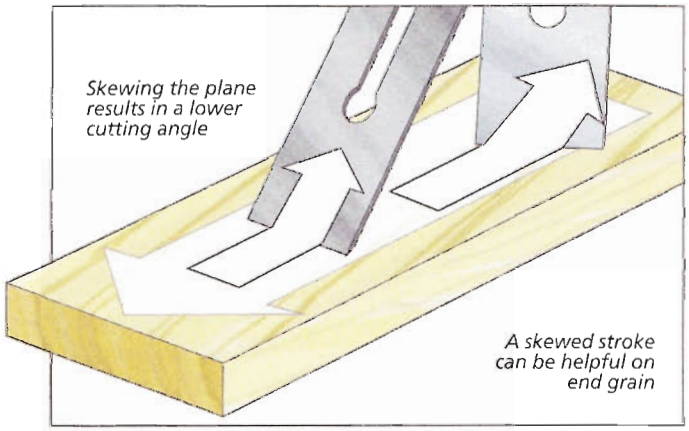




SKEWING THE PLANE. Holding a plane at a slightly skewed angle during a stroke, as in the main drawing on the opposite page, feels natural. But this begs a question: "How is the cut affected?" In a nutshell, skewing the plane lowers the effective cutting angle. With a mild skew (10° to 20°), this only amounts to a degree or two. However at a 30° to 40° skew, you approach the cutting angle of a low angle plane (right drawing below). On end grain, this can be helpful. But on face grain, you'll probably just increase the likelihood of tearout.

So that's my two cents worth. Now the debate can resume with a little more fodder. W





Questions & Answers

Cyclone Dust Collectors

Q ***Do cyclone-style dust collectors offer any noticeable advantages?***

John Cooley
Aspen, Colorado

A The term "cyclone" has come to define just about any dust collection system that incorporates a separator before the return air hits the filter. These two-stage dust collectors have become more popular for home shops in the last few years as the prices have dropped. Industrial dust collectors have used two-stage designs for years.

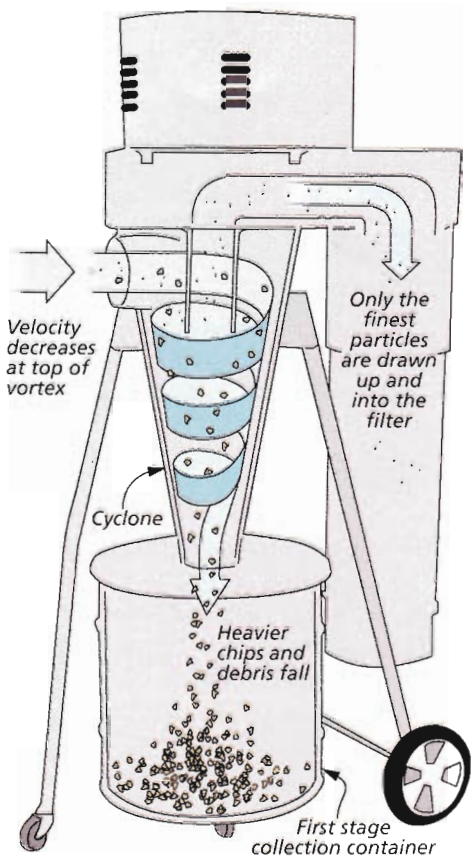
An inexpensive cyclone can be added to any system simply by purchasing a special lid for a trash barrel.

THE DIFFERENCES. In a typical single-stage dust collector, the impeller draws in dust and debris through a tube or hose and blows it into the collection bag and filter. This direct stream has two shortcomings: First, it allows large pieces of debris to hit the impeller, potentially damaging the blades. (This can even be dangerous if you happen to pick up some metal and it sparks on the impeller.)

Second, this system clogs the filter very quickly, especially in canister-type filter systems. When all the dust is shot into the pleated filter, it builds up quickly and forms a packed layer. Of course, a clogged filter diminishes the airflow throughout the system and translates to poor collection at the tool.

TWO-STAGE COLLECTION. A two-stage system places a "cyclone" between the collection hose and the impeller to collect most of the dust and virtually all of the chips and larger pieces. The result is more consistent airflow through the collector due to a filter that stays much cleaner.

Typical Cyclone Dust Collector



Another nice benefit is that the first-stage collection container is usually just a metal or plastic garbage can. It's much easier to empty than the bag on your dust collector.

OPTIONS. There are several types of cyclones on the market. Virtually all of the larger (5-hp and above) dust collection systems incorporate a cyclone. But you don't need to spend a lot to add a cyclone to your existing system.

You've probably seen the cyclone lids for plastic trash cans sold by many woodworking retailers. These lids have a pair of holes to accommodate standard dust collection hoses. One goes directly to the dust collector input. The other goes to the tool (left photo).

The configuration of the lid points the two hoses in opposite directions to slow down the airflow. As the speed of the stream decreases, gravity takes over. When the dust is sucked into the can, most of it falls to the bottom. The air then flows out of the cyclone, with very little dust left to clog the filter.

Other cyclone designs rely on a baffle inserted between the two hoses to slow down the airflow and allow the debris to drop. The principle remains the same in all the various designs.

You'll find that adding a cyclone to your system will immediately pay off in more powerful and reliable dust collection. And that translates to cleaner air in the shop. W

hardware & supplies

Sources

Most of the materials and supplies you'll need to build the projects are available at hardware stores or home centers. For specific products or hard-to-find items, take a look at the sources listed here. You'll find each part number listed by the company name. See the right margin for contact information.

The *Woodsmith Store*, in Des Moines, Iowa, is an authorized *Rockler* dealer. They carry many of the hardware items used in our projects. And they ship nationwide. Their customer service representatives are available for your calls from 8am – 5pm Central Time, Monday through Friday.

TIPS & TECHNIQUES *(p.4)*

- **Lee Valley**
  ¾" Magnets 99K32.11
  ¾" Magnet Cup 99K32.54
- **The Home Depot**
  Aluminum C-Channel 56870
  Banquet Table Legs FTL100

EYEWEAR *(p.10)*

- **Safety Glasses USA**
  Over-Glasses . . . . . HSOTGP

The other glasses in the article are available from *Rockler* and *Woodcraft* and can be found at most hardware stores and home centers.

JIGS & FIXTURES *(p.12)*

The *Incra Build-It System Starter Kit* mentioned on page 12, as well as various other individual components of the system, are available from a number of online retailers listed at right, including *Rockler*, *Amazon*, *Lee Valley*, and *Woodcraft*. They are also available for purchase at the *Woodsmith Store*.

PICTURE FRAMES *(p.16)*

The glass, posterboard, turnbuttons, and sawtooth hangers for the frames were purchased at a local hardware store. The frame cutout (page 20) is stained with *General Finishes Mahogany* oil stain. All the frame parts are finished with three coats of *Minwax Fast-Drying Spray Polyurethane* in satin.

BLANKET CHEST *(p.22)*

- **Horton Brasses**
  2"-dia. Maple Knobs . . . WK-3LB
  3⅛" No-Mortise Hinges . . NM-3
  1¼" Pyramid Hd. Screws . . .PH-8
- **Lee Valley**
  Lid Supports 03K20.06

The cope and stick router bit set used to cut the frame joinery for the chest is made by *Timberline* (440-14) and can be purchased at the *Woodsmith Store*. The set can also be purchased through *Amazon* or other online suppliers.

The finish applied to the chest simply consists of one coat of wiping varnish followed by two coats of spray lacquer.

REVOLVING BOOKCASE *(p.32)*

- **Woodcraft**
  Raised Panel Bit 99-521
  Lazy Susan Bearing 02Z51
- **Jo-Ann Fabric**
  Green Arctic Vinyl 2828424

The bookcase was finished with *Minwax Aged Oak Gel Stain* and a couple coats of spray lacquer.

BUFFING *(p.46)*

- **Amazon**
  Beall Wood Buff . . . B0037MDCPI
- **Stewart-MacDonald**
  Foam Polishing Pads 3415

MAIL ORDER SOURCES

Woodsmith Store
800-444-7527

Rockler
800-279-4441
rockler.com

Amazon.com

Home Depot
800-466-3337
homedepot.com

Horton Brasses
800-754-9127
horton-brasses.com

Incra
872-242-9975
incra.com

Jo-Ann Fabric
888-739-4120
joann.com

Lee Valley
800-871-8158
leevalley.com

Safety Glasses USA
800-870-6199
safetyglassesusa.com

Stewart-MacDonald
800-848-2273
stewmac.com

Woodcraft
800-225-1153
woodcraft.com

looking inside
Final Details

▲ *Blanket Chest.* A large, lidded compartment and oversize drawer offer plenty of practical storage space. But it's the subtle, Shaker-style details of this blanket chest that will catch your eye. Complete plans begin on page 22.

◀ *Revolving Bookcase.* The interesting feature of this bookcase is one you may not notice right off the bat. The core rotates to allow easy access to all four sides. Step-by-step plans start on page 32.

◀ *Picture Frames.* Using one basic design, you can create a variety of attractive picture frames. Best of all, you won't have to cut a single miter to make them. Turn to page 16 to discover how it's done.