

Woodsmith®

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Vol. 37 / No. 218

DINING ROOM BUFFET

- Classic Cherry Construction
- Ample Storage Space
- Large Display & Serving Area

Inside:

MUST-HAVE
Measuring Tools

ROUTER BITS FOR
Tabletop Profiles

JOINERY WORKSHOP:
Perfect Tenons Every Time

**BIGGER &
BETTER**

5 Great Projects
More Tips & Techniques



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EDITORIAL

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from the editor Sawdust

In our first Guild Edition of Woodsmith, I asked you to let me know what you thought of the new look and larger size. Well, let's just say the response exceeded my expectations — with many great comments and suggestions. The response was so overwhelming that I resorted to a form letter of sorts to make sure I got back to everyone as quickly as I could and go into a little more detail about why we made some of the changes.

Overall, the Guild Edition was well-received. But there was one thing about it that bothered me — and apparently it bothered a lot of you, too. That's the absence of the three-hole punch. Unfortunately, the additional pages made it impractical for our printer to continue to punch holes in *Woodsmith*. So I did what I usually do when faced with a problem. I came up with a jig, as you can see in the photo at right.

You can find all the details you need to build your own version at Woodsmith.com/magazines/extras. And it works great for drilling and organizing any other magazines and catalogs you may have in your shop into three-ring binders.

There are a few things I'd like to highlight in this issue. The first of which is the beautiful cherry buffet featured on the cover. It's the last project in our recent dining room series. A couple of previous issues featured a matching hutch, a dining room table, and a set of chairs. Based on the comments we've received, it's been a popular set of projects. If you've decided to build the entire set, please send in some photos of your completed projects.

The room divider that begins on page 28 is the answer to creating some cozy spaces right where you need them. Plus, the construction is simple, and the two-tone look gives it a style that will fit in just about anywhere.

Finally, the issue wouldn't be complete without a couple of great shop projects. The bit index (page 22) is a classic way to keep your drill bits organized and close at hand. And if you deal with small parts, the sled on page 36 is a safe and accurate way to cut them at the table saw.



Bryan

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readers

Tips & Techniques

Overhead Fan Mount

My small basement workshop lacks adequate air circulation, but finding the floor space to set a pedestal or box fan in my confined shop just wasn't in the cards. Instead of looking to the floor, I found the solution to my problem overhead.

I devised a circular platform that allows me to mount a small but powerful fan. The platform is then mounted to a plywood base that has a section of T-track recessed in a groove. The base is long enough that I can position the fan to aim it at almost any location in my shop.

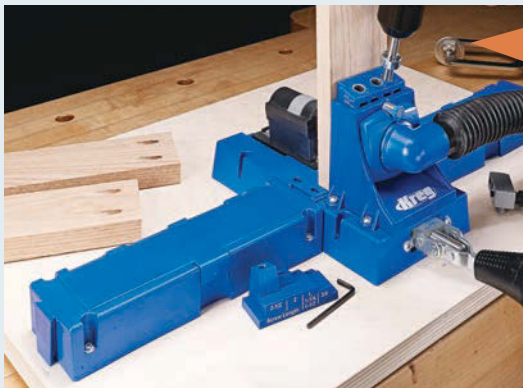
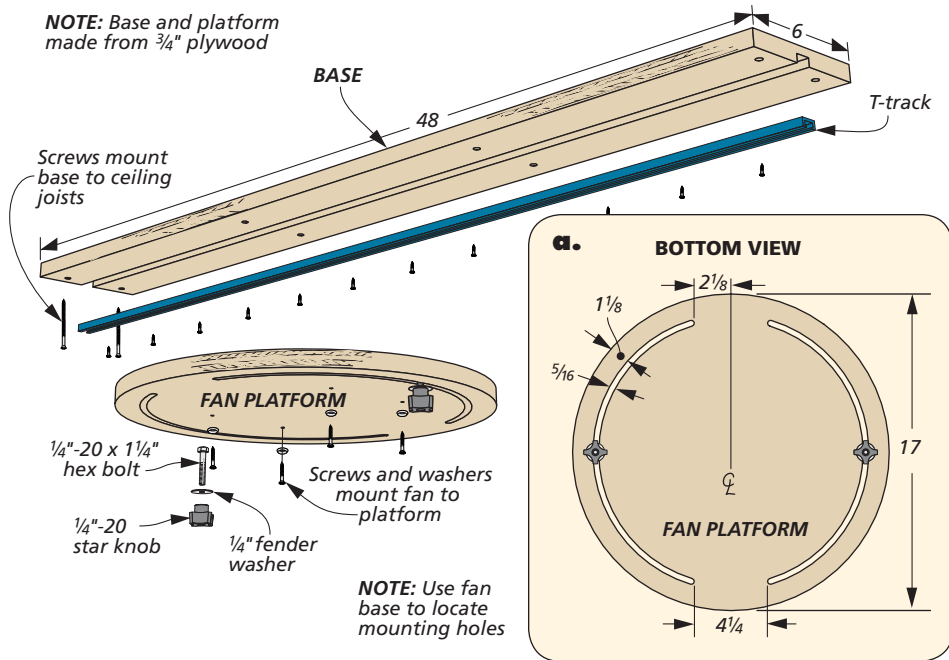
The circular platform has a couple of adjustment slots that let me rotate the fan almost a full 180°. The platform is held to the T-track with a pair of threaded knobs, hex head bolts, and washers.

BUILD TECHNIQUE. To make the base, cut a groove down the center and install the T-track. The base can be any length to suit the space you have available. I used a simple router trammel to cut out the circular fan mount platform. The trammel also worked well for routing the two adjustment slots in the platform.

Greg Wilson
Santa Rosa, California



NOTE: Base and platform made from 3/4" plywood

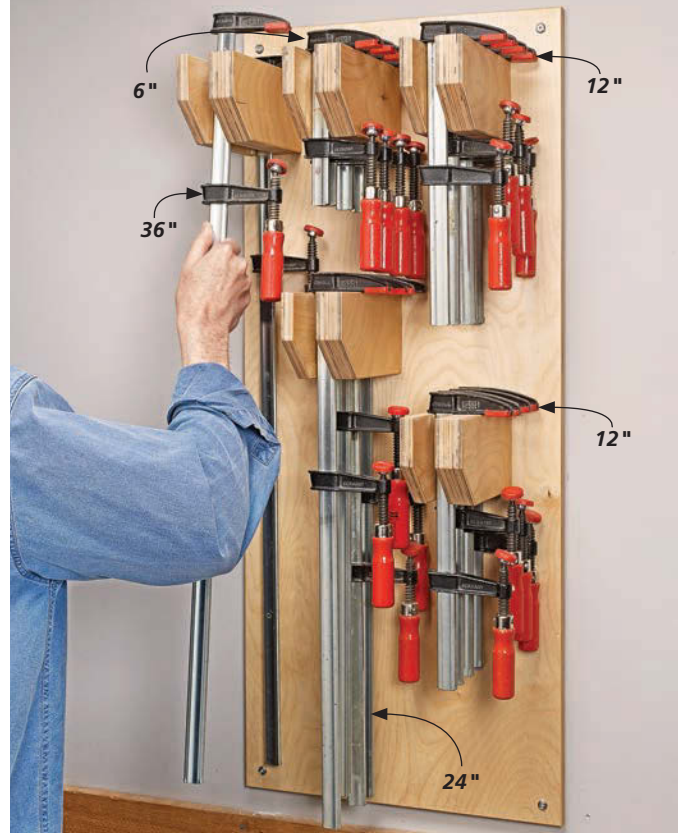
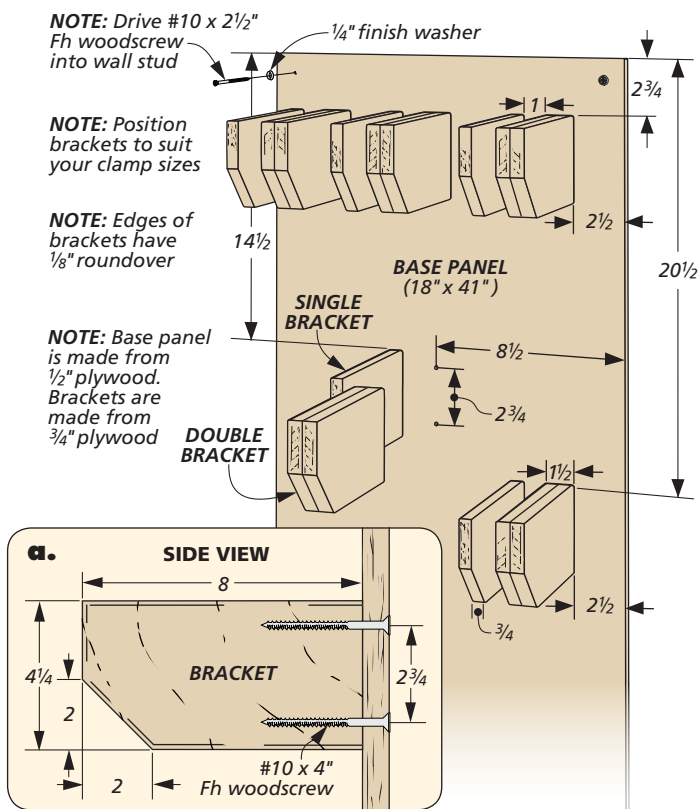


Win This Kreg K5 Jig

Simply send us your favorite shop tips. If your tip or technique is selected as the featured reader's tip, you'll win a Kreg K5 Jig 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." There, you can submit your tip and upload your photos for consideration.

The Winner!

Congratulations to Gary Brown, the winner of this Kreg K5 Jig. To find out how you can win this jig, check out the information at left.



Space-Saving Bar Clamp Rack

Having accumulated a number of Bessey F-style bar clamps over the years, I eventually came to realize that stacking them on the shelf underneath my workbench wasn't the ideal storage option. They were difficult to get to, and I always managed to knock a couple off the shelf when picking them up. Since I had some free wall space available, I decided to make

this simple storage rack to get my clamps out from underneath my workbench and make them more accessible.

SIMPLE DESIGN. My storage rack allows clamps to be "stacked" in each pair of brackets to save space. The design of the single- and double-layer brackets cradle the Bessey F-style bar clamps perfectly. The brackets are made from plywood

and are fastened to the base panel with screws from the back side.

As you can see in the photo, I positioned the brackets based on the length of the clamp bars. That kept the longer bar clamps from interfering with the clamp brackets below.

*Patrick O'Rourke
Moncks Corner, South Carolina*

QUICK TIPS



Pocket Screws in Tight Places. Recently, while building a fireplace surround for his home, *Keith Hoffman* of Afton, Minnesota, realized he couldn't install pocket screws in a tight space with his drill driver. Instead, he switched to a small ratchet, ¼" socket, and drive bit to get the job done.



Router Bit Cushions. *Serge Duclos* of Delson, Quebec, likes to drop a small piece of pipe insulation into the collet of his router before inserting the bit. This keeps his bits from bottoming out and potentially loosening up during use or causing excessive vibration.

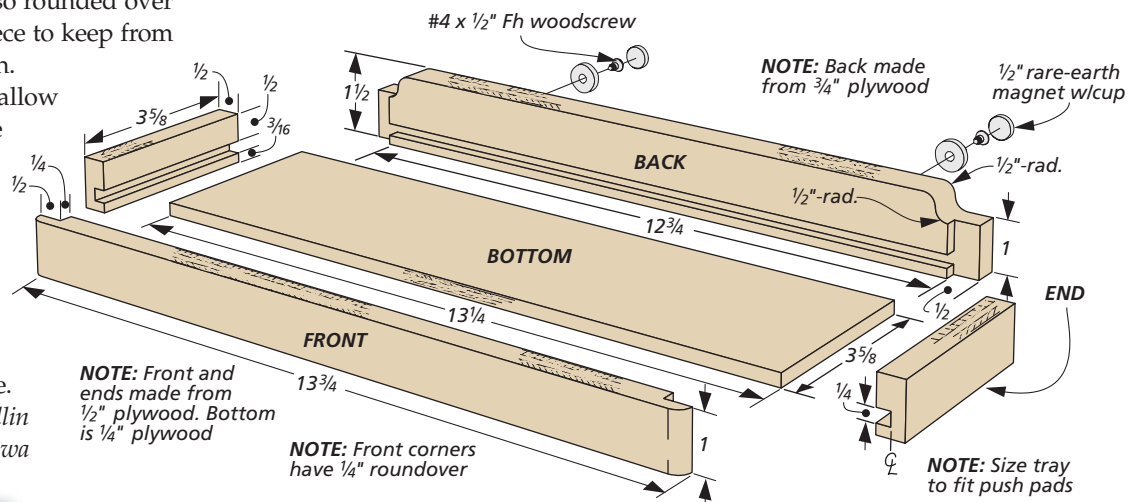
Push Pad Tray

A good set of push pads is a must-have safety item when using a jointer. And the jointer bed seems like the logical place to store them. That is, until you walk over to your jointer, with board in hand, and realize the push pads are right in the way of where you need to set the workpiece. Well, this handy, easy-to-mount tray solves that problem while keeping the push pads at the ready.

SIMPLE CONSTRUCTION. As shown in the photo at right and the illustration below, the push pad tray is constructed from plywood. The front, back, and end pieces all have a groove along their inside edge. This groove holds the plywood bottom panel. The back and front pieces also receive a rabbet along their ends. These rabbets interlock with the end pieces to make a sturdy tray. I also rounded over the ends of the front piece to keep from snagging my shop apron.

I drilled a couple shallow holes in the back of the tray to recess two rare-earth magnets and cups. These are more than enough to hold the tray to the jointer. The tray then goes together with a little glue at the corners and in the groove.

*Bill Mullin
Creston, Iowa*



QUICK TIPS



Benchtop Upgrade. Faced with replacing his battered workbench top, *Lee Kraftchick* of Miami, Florida, instead opted to cover his workbench with some inexpensive solid bamboo flooring. The flooring is easy to install with glue or finish nails, and it resists scratches and stains.



Dowel Gauge. *John Cusimano* of Lansdale, Pennsylvania, found that the dowels at his local home center were often under or oversized. To get the exact size dowel for his projects, he made this dowel gauge block that he can take with him when he shops for dowels.

Low-Cost Dust Separator

I have long needed to upgrade the dust collection system in my workshop. My prior system consisted of pulling my shop vacuum over to the tool I was using and plugging it in. This works just fine for many of the operations I do, but the filter in the shop vacuum kept clogging up quickly, resulting in reduced suction power.

Not wanting to spend a lot of money, I came up with the solution you see here. It allowed me to make a two-stage dust extraction system using mostly items I already had in my shop, plus a few inexpensive pieces of PVC.

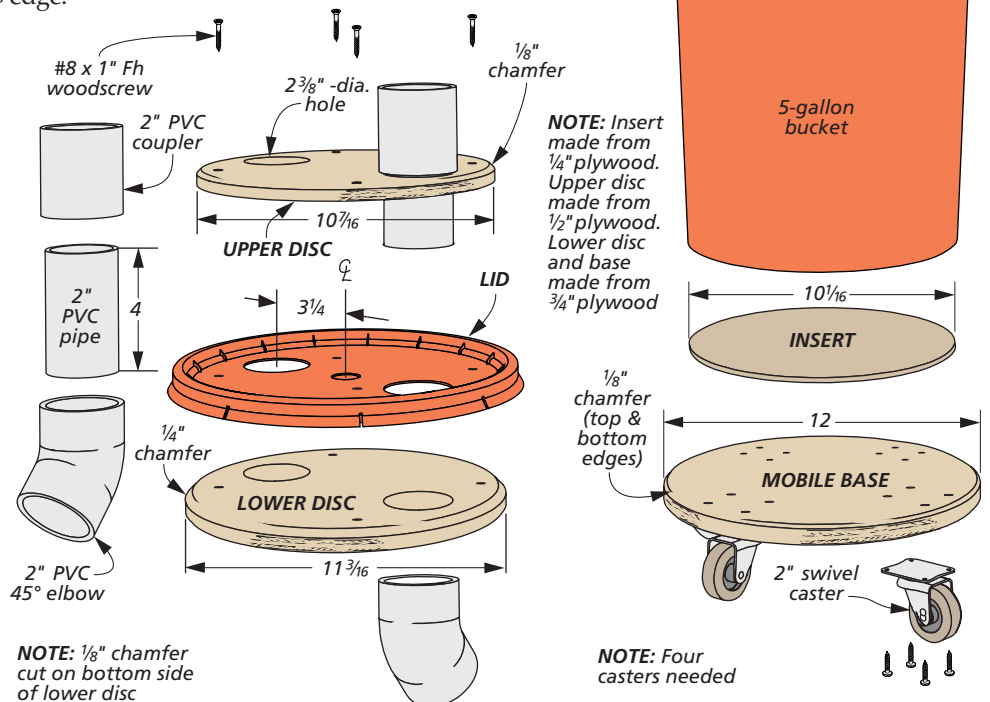
HOW IT WORKS. Since the two elbows inside the bucket face in opposite directions (inset photo), a vortex is created when the shop vacuum is attached and turned on. This vortex deposits most of the wood chips and dust into the bucket. This, in turn, keeps the filter in my shop vacuum clean for much longer, which prevents a loss of suction power.

BIG BUCKET. At the heart of my new dust collector is a five-gallon bucket that acts as the first stage of the system. I sandwiched the lid between two plywood discs and secured the assembly with screws. The discs act as an anchor point for two short sections of PVC pipe and elbows. I chamfered both edges of the lower disc for a better fit inside the bottom of the lid. I also chamfered the top of the upper disc to remove the sharp edge.

ADD PVC. Each PVC assembly consists of a coupler, a pipe, and a 45° elbow. The coupler size I used is a slip fit with the hose on my shop vacuum. I drilled the holes in the discs and lid using a hole saw and held the PVC in place using some epoxy. The coupler and elbow should slide over the pipe and rest flush against the discs on either side.

MOBILE BASE. To give my dust collector some mobility, I cut another disc, chamfered both edges, and added four casters. A thin plywood insert glued to the mobile base surface keeps the bucket from sliding off the base.

Gary Brown
Maroa, Illinois



NOTE: $\frac{1}{8}$ " chamfer cut on bottom side of lower disc

all
about



building your Shop First Aid Kit

Without a doubt, when you're working in the shop, an injury is always a possibility. Some injuries, such as a splinter or a small cut, can be merely a nuisance. Others can be much more serious and require a trip to the urgent care center.

In all cases, a well-stocked first aid kit should be easily within easy reach. It's your first line of care for both minor and

some serious injuries. Here, you'll find my recommendations for creating your own kit. Most of the supplies are available at your pharmacy, and harder to find items are listed in Sources on page 67.

COMPACT, ACCESSIBLE STORAGE. The first requirement for a first aid kit is storage. I use an inexpensive plastic container with a handle, shown above. It keeps

supplies dry and dust-free in the shop. But more important, it's big enough to hold everything I need to deal with most shop emergencies.

It's important to clearly label the container. You can download labels from the internet or design your own.

SPLINTER TREATMENT. As you know, the most common injuries you'll encounter in the shop are splinters. They range from a tiny sliver to what seems like a 2x4 stuck in your skin. The sterile *Splinter Out* picks you see at left make splinter removal easier. The ultra-sharp point and wide, flat body make them effective and easy at removing splinters.

If you can get to the end of the splinter, a tweezer with fine points works better than common household tweezers. The ones shown at left also incorporate a magnifying glass to help you target the splinter more effectively.

A trick I learned from a nurse for removing small splinters that are hard to see is to wipe the area with isopropyl (rubbing) alcohol first. It makes the skin more translucent, so the splinter shows up better. The alcohol also disinfects the area to help prevent infection later on.

◀ Sterile eyewash can help flush debris and errant liquid splashes from the eye.

▶ This sterile tool was designed to grab a splinter for easier removal.



▶ Sharp points and a magnifying glass make these tweezers ideal for removing splinters.





▲ Keep a supply of bandages and sterile saline in your first aid kit to treat and protect minor wounds.

FIGHTING INFECTION. Infection is a concern not only for splinters, but for any open wound. A bottle of sterile saline solution can be used to wash out the wound (left photo above). Betadine or hydrogen peroxide applied to the area also helps reduce infection. For deep wounds, though, it's best to stick with the saline solution and then seek professional medical treatment.

FOREIGN OBJECTS IN THE EYE. Next to splinters, dust in the eye is another common ailment. For that I keep a bottle of sterile eye wash solution on hand (lower left photo, opposite page). It's better than tap water for flushing debris away. It also

helps reduce irritation from accidental splashes of liquid such as finishes or solvents. As with serious injuries, have your eyes looked at by a professional after you've thoroughly rinsed them.

FINGER WOUNDS. A woodworker's hands and fingers typically display scratches or bandages of some sort. It's inevitable when you're working with wood and sharp tools. A wide range of bandage sizes and types is a requirement for a shop first aid kit (photo above).

Fingertip and knuckle bandages are always within reach in my shop. They're specially shaped to conform to and move with the fingers. I buy the heavier-duty

ones with a stronger adhesive. They stand up to a lot of abuse in the shop. If you need additional protection for your fingertips, you can use a finger cot that rolls onto your finger.

A liquid bandage product is great for small scratches. You apply it with a brush. It's flexible and waterproof, too. I find it's also a great product to use on cracked skin during the winter.

WOUND CARE. Since woodworkers use a lot of tools with sharp cutting edges, a deeper skin wound is a real risk. I keep a supply of the items you see above and in the main photo for first aid treatment.

With an injury, your two primary concerns are to clean the wound and stop the bleeding. I've already talked about using a sterile saline solution for irrigating the wound. But stopping the bleeding is even more important.

For minor wounds, there's a powder product you can apply to the wound that causes the blood to clot. For more serious injuries, use sterile gauze pads or surgical compresses. The key is to apply plenty of pressure to the wound to stop the bleeding. If the bandages become soaked, apply fresh ones on top of the others.

GET HELP. The most important lesson I've learned is to get help. For this I keep a cell phone handy. Another great option is shown in the box at left. It's always best to err on the side of caution and seek medical attention if a shop injury might be serious. **W**

GETTING HELP: BUTTON PAGER

You've seen the commercials where an elderly person has fallen and uses a pager button to get help. Those same products can be a big help in case of a shop emergency. They include one or more pager buttons that you keep

with you at all times. When you press the button on the pager, a receiving unit in the house sounds a loud alarm. This way, a family member can come to the rescue and provide any assistance you may need.

► An inexpensive paging system sounds an alarm when you press the remote button.

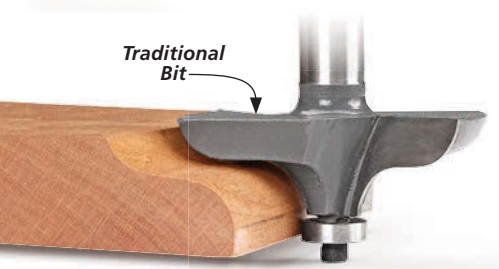




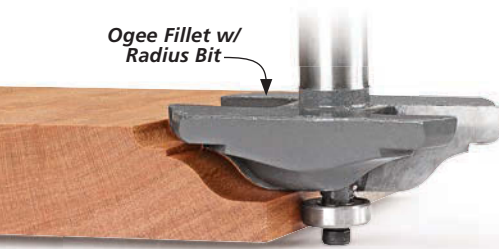
a high-end look with Table Edge Router Bits



Thumbnail Bit



Traditional Bit



Ogee Fillet w/ Radius Bit

▲ Table edge router bits cut wide profiles to better suit the large-scale surfaces of tables and cabinet tops.

A well-chosen profile added to a tabletop makes the edge more friendly both to the eye and hand. The problem is a small round-over or narrow chamfer doesn't really cut it on a large, thick tabletop.

That's because a small profile gets lost in the wide expanse of the top. The challenge then becomes creating a more impressive profile that creates a smoother visual transition to the edges and is better scaled to size of the table. That's where a table edge bit comes into play.

NOT JUST BIGGER. The obvious difference between table edge bits and ordinary profile bits is the overall size. The cutting diameter of the bits is around 2⁵/₈" and they're only available in 1/2" shanks. That size has some implications for use, but I'll get to that later.

Another difference has to do with the orientation of the profile. A typical profile bit creates a shape that's about as wide as it is deep. A table edge profile, on the other hand, is much wider than it is deep.

This wider profile looks more in proportion with a large tabletop.

PROFILE OPTIONS. Several bit manufacturers make table edge bits. In the left margin, you can see three bits from one maker that give you an idea of just some of the profiles that are available. (For sources of the bits, turn to page 67.)

Having several choices gives you the ability to use a profile that suits the style of the project. In addition, you can coordinate the profile of the tabletop to similar (though smaller) profiles used elsewhere in the project or with other furniture items in the same room.

As you might imagine, table edge bits cost more than a regular profile bit. Depending on the brand, they can run from around \$30 up to \$90.

PUTTING THE BITS TO WORK

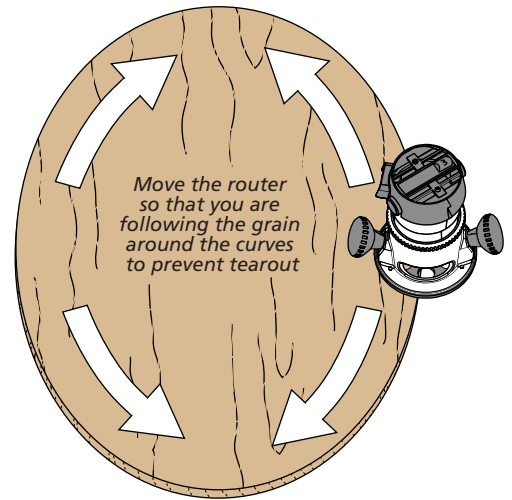
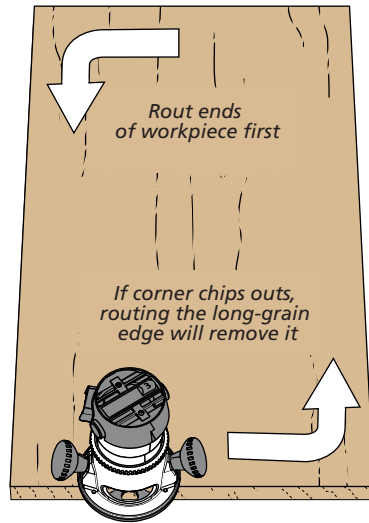
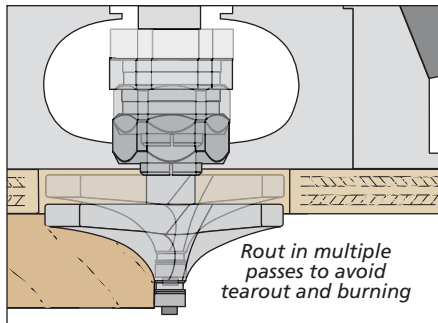
Selecting a bit is one thing, but putting it to work is another. Due to the larger size, there are a few issues to consider.

SLOW DOWN. The first way these large-diameter bits alter how you work is the speed requirements. The bits I used had a recommendation of 18,000 RPM. This translates to the “3” setting on my router’s dial, according to the manual. (If your router doesn’t have variable speed, you can purchase an aftermarket controller.)

SOLID SUPPORT. In addition to the operating speed, you have to accommodate the bit. A table edge bit isn’t likely to fit through the opening in your baseplate. And even if it did, there wouldn’t be much surface area left over to provide good support while routing.

I made a large auxiliary baseplate to solve both those issues. In the box below, you can find the details to make a similar baseplate for your router.

SMALL BITES. When you’re ready to turn on the router, the process will seem pretty familiar to using a typical profile bit. Routing the full profile involves removing a lot of waste material. To ease



the strain on the router and bit, create the profile in multiple passes, lowering the bit between each pass.

That being said, for the first pass or two, you can set the bit for a $\frac{3}{16}$ " depth of cut or so. Any chipout you get will be eliminated in subsequent passes. The closer you get to the final depth of cut, the shallower the cut you should take.

FIND YOUR DIRECTION. The order and direction of the cuts makes a difference, as well. On a rectangular top, I start by routing across one end, as shown in the upper left drawing. As the bit exits the cut, it could chip out the trailing edge. But the blemish will be cut away once you shape the long edge.

Things get a little trickier on oval or round tops. The transition from long grain to end grain is more subtle, and routing against the grain may lead to tearout. To prevent this, I take light cuts and move the router so that it’s working “downhill” to the grain (upper right drawing).

This means that for some cuts, you’ll be cutting opposite the normal routing direction (backrouting). But by taking light cuts and keeping firm control of the router, it isn’t a big deal.

The final result is a smooth, crisp profile that enhances the look of your tabletop. Table edge bits give you another option for adding detail and making your project stand apart from the rest. **W**

How-To: ROUTING OVERSIZED PARTS

For me, the size of the workpiece determines whether to use the router table or a hand-held router to create a profile with a table edge bit. For smaller and mid-size parts, a router table offers the best combination of support and control for me. Sometimes it’s handy to set

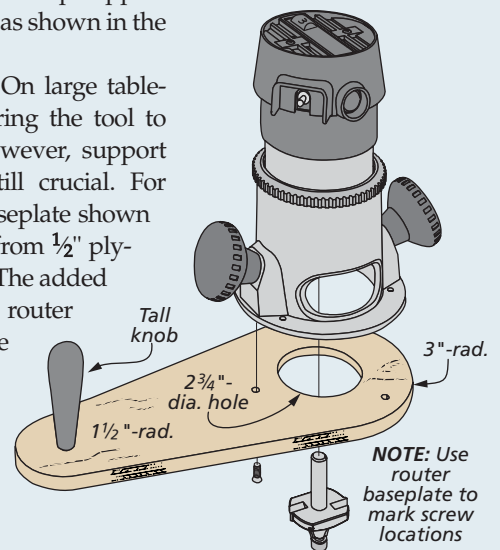


▲ A roller stand can be used to support a long workpiece as you complete a cut. For wide panels, you may want to set up additional supports to the side of the table, as well.

up support stands to help support long or wide parts, as shown in the lower left photo.

AUXILIARY BASEPLATE. On large tabletops, I prefer to bring the tool to the workpiece. However, support and control are still crucial. For that, I made the baseplate shown at right. It’s made from $\frac{1}{2}$ " plywood for stiffness. The added size prevents the router from tipping in use — especially near the corners. A tall knob on the end gives you more control to steer the router in use.

NOTE: Auxiliary baseplate made from $\frac{1}{2}$ " plywood (6" x 13 $\frac{1}{2}$ ")



great gear

Leigh's new router table Dovetail Jig

The first time I saw the new *Leigh RTJ400* dovetail jig, my initial thought was that it's a lot different than other dovetail jigs I'm accustomed to using. For years, I've owned a jig that's used with a hand-held router. The router moves in and out of a comb-like template to cut the joints.

This jig, on the other hand, takes that basic concept and flips it on its head. The workpieces are still secured to a template. But the

template, rather than the router, is the part that moves. Instead of a hand-held router, the guide bushing and bit are installed in a router table. Then you pass the template over them to cut the joints, as you can see in the photo above.

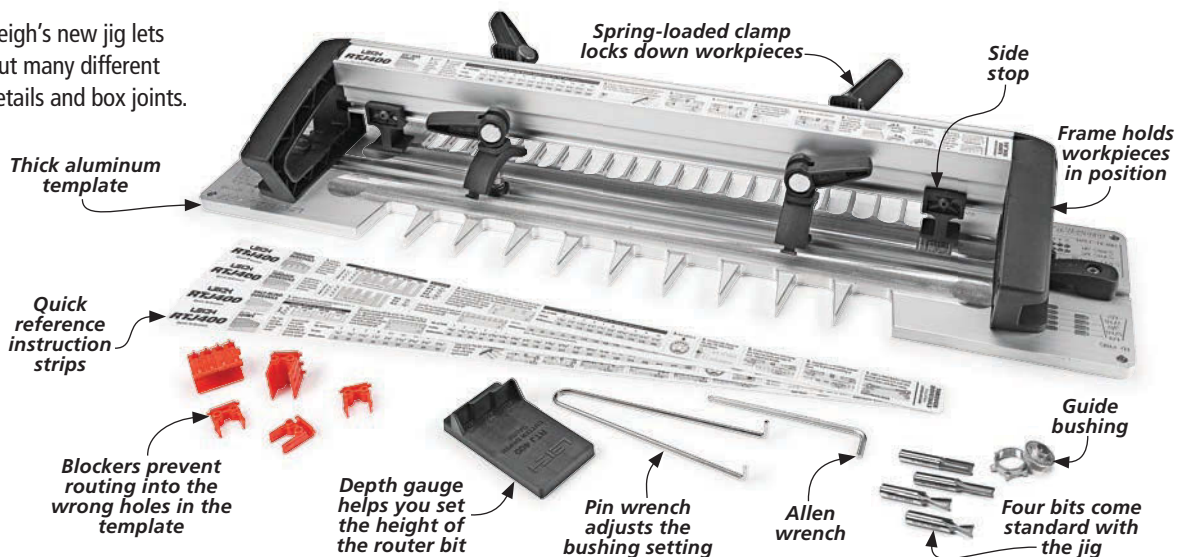
Not only does the *Leigh* jig work differently than most other dovetail jigs, but it also claims to be a lot more versatile. According to the manual, you can make nine types of through dovetails, three different sizes of half-blind dovetails, and four sizes of box joints. It can also

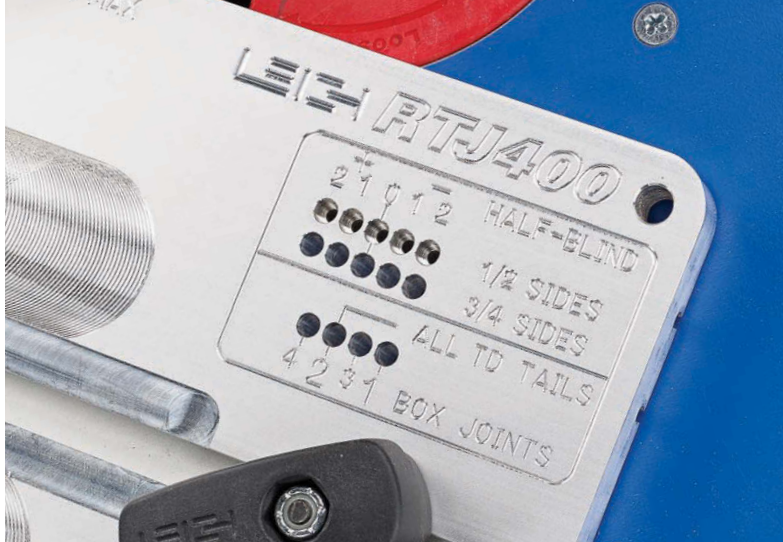
tackle unique joints such as half-blind box joints and angled dovetails.

As you can understand, I was intrigued by the possibility of increasing my joinery capabilities with this jig. So I decided to put it through the paces in my shop to see how well it worked.

JIG OVERVIEW. At \$329, the *RTJ400* is certainly not the cheapest dovetail jig on the market. But my hope was that its versatility, paired with the quality I've come to expect from *Leigh*, would make it a good investment.

◀ Leigh's new jig lets you rout many different dovetails and box joints.





▲ One of the secrets to the jig's versatility and ease of use is the series of "presets" at each end of the jig. To rout a particular joint, you just position the frame using the indicated preset holes, and the jig is ready to go.

As you can see in the photo at the bottom of the opposite page, the RTJ400 includes a variety of accessories. Leigh also provides a very thorough manual, quick reference instruction strips, and a DVD that walks you through every cut you might want to make.

As I started working with the jig, I was impressed by its ease of use. Even though the jig can cut many different kinds of joinery, each setup is simple to achieve. Plus, it's straightforward to switch from one setup to another when needed.

TWO-SIDED TEMPLATE. The jig has several features that contribute to both its simplicity and versatility. For one, it has a double-edged template that allows you to cut both the tails and pins for a through dovetail. You can see both edges of the template in the photo on the opposite page. The template also acts as a base for a frame that provides a clamping surface for holding the workpieces.



▲ Rotate the elliptical bushing to fine-tune the fit of a joint. Just turn it to the right or left to tighten or loosen the fit.

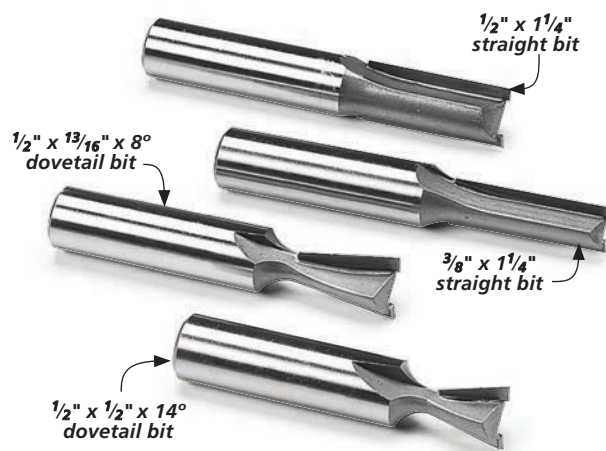
PRESET HOLES. At the ends of the template, you'll find the secret to what makes the jig so easy to set up and use. And that's a series of preset holes and slots for routing different types of dovetail and box joints. You can see the holes at one corner of the jig in the upper left photo.

These holes are used to position the frame on the template for each type of joint. If you want to cut through dovetails, for example, you position the frame using the corresponding presets on the template. Then, when it's time to rout a different joint, you simply switch to a different set of holes.

ELLIPTICAL BUSHING. The guide bushing also contributes to the jig's versatility (lower left photo). It has an opening with an elliptical shape, rather than a perfect circle. (The same type of bushing is used with other Leigh jigs, as well.) This is an important consideration, as it allows you to fine-tune



▲ The spring-loaded clamps slide in a track and hold the workpieces securely to the frame as you rout the joints.



▲ These bits come standard with the jig and can handle basic through dovetails, half-blind dovetails, and box joints. Other bits are available as options.

the fit of the joint easily. If a joint is too loose or too tight, you can fix it by rotating the bushing as shown below.

Since they're elliptical, rather than circular, the bushings might seem like they'd add a measure of confusion to using the jig. But I found that really wasn't the case. The trick, as the manual explains, is to strike a centerline on the reducer ring that holds the bushing. That way, you have an easy reference for adjusting the bushing based on the cut at hand.

OTHER FEATURES. If a jig is going to handle as many joints as the Leigh claims it can, it's going to need a lot of router bits, as well. And Leigh's jig certainly delivers in that area. It comes standard with four different bits, which can be used to cut the through dovetails, half-blind dovetails, and box joints shown in this article (upper right photo). An accessory kit is also available with more bits and bushings to expand the capabilities of the jig.

Other features enhance the accuracy of the jig. There are blockers that fill holes in the template when you want to change the spacing of the joint. Side stops allow for accurate positioning of the workpiece. And the heavy-duty, spring-loaded clamps keep the pieces from shifting while you rout (near left photo).

IMPRESSIONS. Lots of gadgets are all well and good, but I was particularly impressed with the jig in use. At 11 pounds, it has good heft that keeps it firmly in place on the table as you rout the joints. I also find that I enjoy the measure of control provided by routing at a router table. For a closer look at some of the joints the jig can make, turn the page.

THROUGH DOVETAELS

The Leigh RTJ400 isn't the only jig on the market capable of routing through dovetails. But with five different sizes of dovetails, it's one of the most versatile. What's more, the jig makes this complex joint surprisingly easy to cut.

SET THE FRAME. For standard through dovetails ($\frac{1}{2}$ " pins and 1" tails), you'll use both edges of the jig's template. The edge of the template with straight fingers is for the tails, and the edge with the angled fingers is for the pins. The first step is setting the frame in the preset holes, in this case to cut the tails (refer to Figure 1).

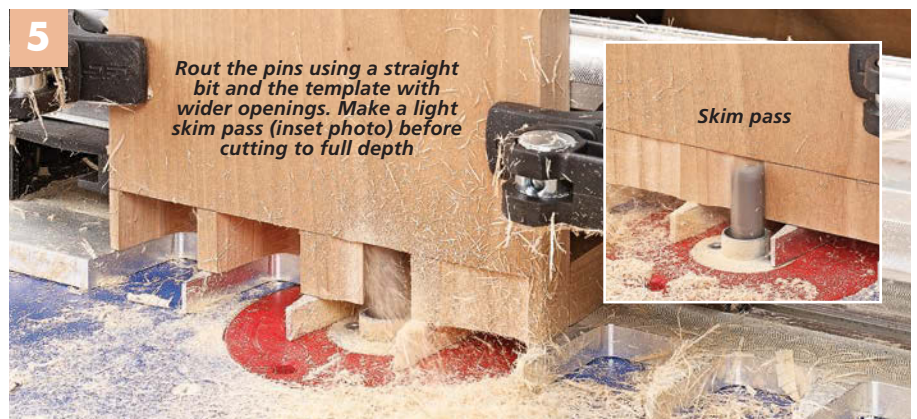
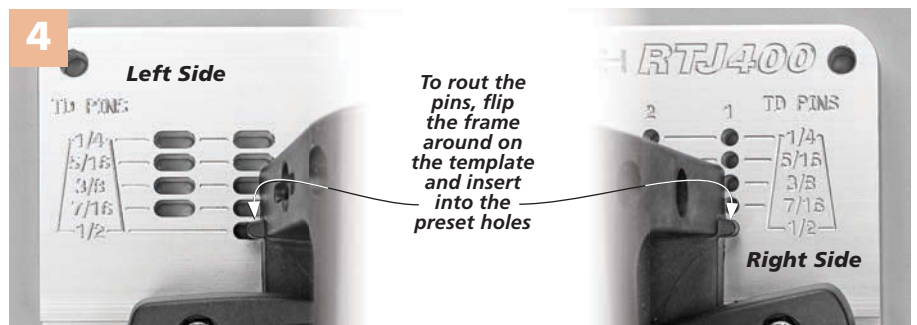
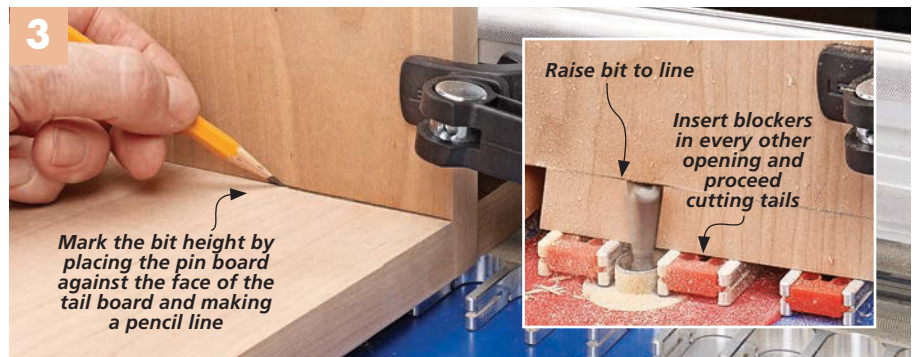
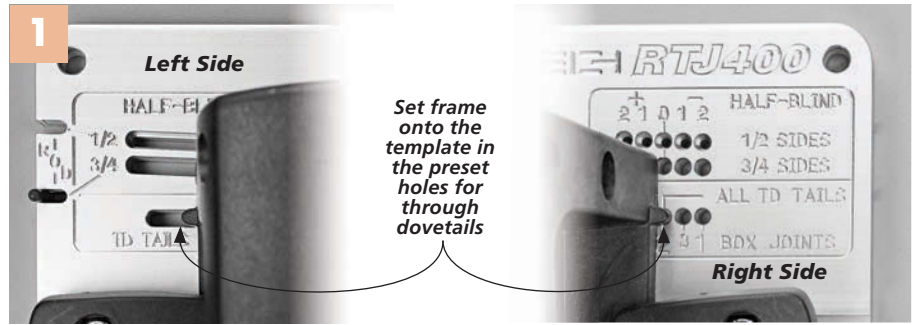
POSITION THE WORKPIECE. You'll have to position the first workpiece on the template manually, but this isn't difficult to do. Just use a rule to center the workpiece over the fingers of the template, and clamp it down (Figure 2). Then set the left side stop against the workpiece to lock in the setting for routing subsequent workpieces (inset photo). Note that there's also a backer board that's clamped horizontally behind the workpiece. This helps to prevent tearout while routing.

SET THE BIT HEIGHT. With the frame and workpiece positioned, the next step is to set the height of the bit. And since these are through dovetails, that means you can use the mating workpiece to establish the depth of the cut, as shown in Figure 3. For standard through dovetails, you'll only rout in every other opening in the template, so you can insert the blockers in the other openings (inset photo). Then just rout in and out of the template openings to complete the tails.

FLIP THE FRAME. Now you can turn your attention to the mating pin board of the through dovetail joint. To cut this side of the joint, you'll rotate the frame and align it with the "pin" side of the two-sided template. This template has wider openings and angled fingers on either side of the opening.

To set the frame on the template, you'll use the preset holes that match the diameter of the bit you'll be using to cut the dovetail pins, which is $\frac{1}{2}$ " in this case (refer to Figure 4).

ROUT THE PINS. While you use a dovetail bit to cut the tails, you'll actually rely on a straight bit to cut the pins. The reason this works is due to the angled sides of

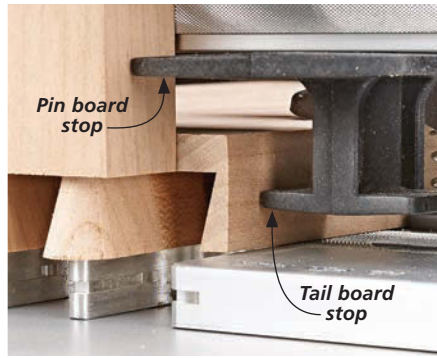


the template openings, which you can see in Figure 5 on the opposite page.

The good news is that the setup for routing the pins is easy. The side stop you set in Figure 2 will automatically position the pin board to match. And you set the bit height the same as is shown in Figure 3.

When it comes time to rout the pins, you'll just want to be aware that this is a hefty cut that removes a lot of material. So it's best to make a light skim pass first to establish the shoulder, as shown in the inset photo of Figure 5. Then you can finish routing the pins.

FINE-TUNING THE JOINT. Almost every dovetail joint requires some fine-tuning to get the fit just right. And as promised, the *Leigh* jig has a number of features that make this process easy. If the joint is too loose or too tight, you simply turn the elliptical bushing in the router table, and make another test cut. For joints



▲ With the Leigh jig, you can rout both the pins and tails of a half-blind dovetail joint in one operation.

that are proud or recessed, you reposition the frame in the template using the "+" or "-" holes. (You can see these clearly in Figure 1 on the opposite page.) I found I was able to dial in a perfect fit with just a few test cuts.

HALF-BLIND DOVETAELS

Really, the bread-and-butter joint for any dovetail jig isn't through dovetails,

but half-blind dovetails. I use this type of joint all the time, particularly for drawer construction (refer to the cherry buffet on page 42). And, as I expected, the *Leigh* jig is well-equipped to handle half-blind dovetails, too.

The typical manner of routing half-blind dovetails is to offset the position of the pin board from the tail board, and rout both parts of the joint at once. And the *Leigh* jig allows you to cut them this way, as well. In fact, the side stop has two settings, so it positions both the tail board and pin board for the cut simply by placing them against the corresponding parts of the stop (upper left photo).

SETUP GAUGE. Setting the height of the bit is a little trickier for a half-blind dovetail, since you won't be cutting all the way through the workpiece. Fortunately, *Leigh* offers a simple depth gauge that simplifies the process (near left photo). You just raise the bit to match the setting of the bit you're using until it just barely grazes the underside of the gauge.

STOP ROD. As it is, the jig's template works great for routing half-blind dovetails in $\frac{3}{4}$ "-thick stock. Of course, sometimes you want dovetails in $\frac{5}{8}$ " or thinner stock. This requires limiting the distance that the router bit cuts into the opening in the template, and *Leigh* solved this problem with a long nylon stop rod. When needed, it passes through holes in the template openings to limit the depth of cut (inset photo, above left). Then it simply stores below the template frame when not needed.

FINAL IMPRESSIONS. The *Leigh RTJ400* is pricey compared to other dovetail jigs. But after extensive use in my shop, I have to say that this versatile, easy-to-use jig is worth the cost. In fact, it has changed the way I look at dovetail joinery. I now consider the router table my go-to tool for these cuts. **W**



▲ For routing half-blind dovetails in thinner stock, you pass a stop rod through the template to limit the depth of the bit's cut.



▲ A bit depth gauge makes it easy to set the height of the dovetail bit for cutting accurate half-blind dovetail joints.

How-To: CREATE PERFECT BOX JOINTS

The *Leigh* jig handles four sizes of box joints with ease, as well ($\frac{3}{32}$ ", $\frac{3}{16}$ ", $\frac{3}{8}$ ", and $\frac{3}{4}$ "). And setting up for box joints is even easier than for dovetail joints. Instead of centering the workpiece on the template, you use the long

stop rod to set the position of the side stop for routing the box joints (photo below). Then it's just a matter of shifting the frame between two positions to create the interlocking pins and slots on the mating workpieces.



◀ Preset holes in the jig template allow you to accurately position the side stop for routing perfect-fitting box joints.

of exposed end grain that can absorb moisture and lead to decay. A stepped, angled groove on the underside of the frame parts accepts the slats and establishes the tapered look of the window box, as illustrated in detail 'a.'

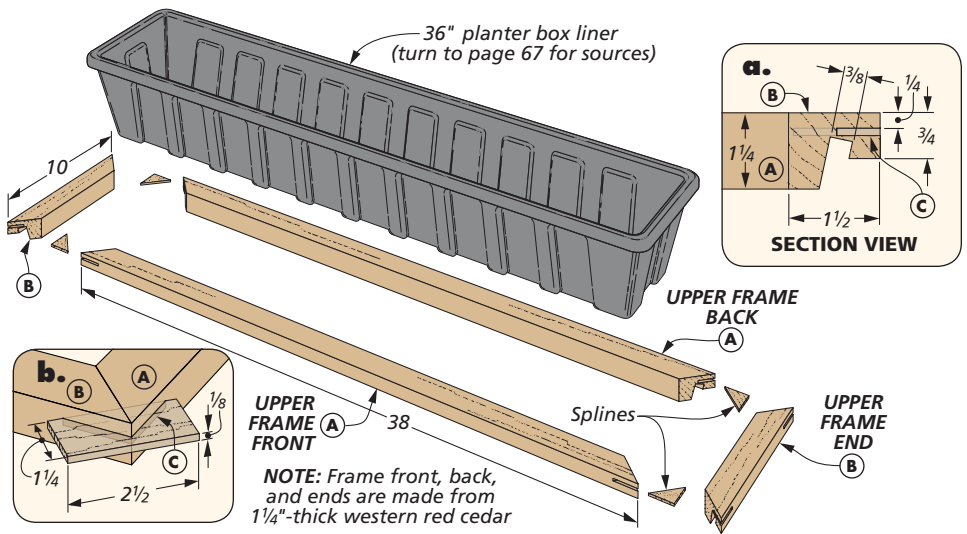
The process for doing this is more manageable than it appears on the surface. The trick is knowing the right order of operations. The box below walks you through the main steps.

I prepared extra-long blanks for the front, back, and two end pieces. These match the final thickness and width of the frame parts (detail 'a' at right).

The angled groove is the first detail to tackle, as shown in Figure 1. Cutting it before creating the step means the rectangular blank has the most stability.

In order to create a lip on the frame blanks, turn the blanks on edge and trim away the outer edge of the blank. Replace the dado blade with a regular blade and set it square to the table (Figure 2).

The upper frame is joined with miters cut on the ends. I did this by placing the top face down on the saw table.



Take your time setting up the saw and miter gauge for accurate cuts.

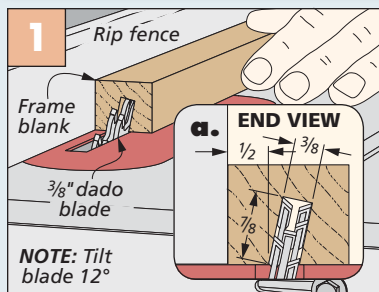
Gluing up a mitered frame is tricky at best. What makes it even harder is that the previous steps don't leave much surface area for applying clamps. My solution was to make an MDF clamping form to fit inside the completed frame, as illustrated in Figure 3.

SPLINES. The mitered joints look great, but the joints aren't durable enough to make the grade outdoors. In order to

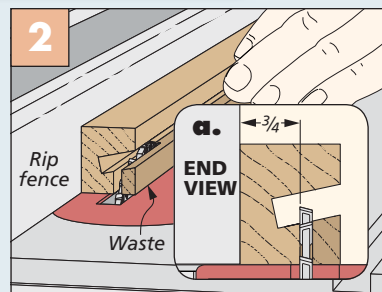
strengthen the joint, I used a table saw jig to cut a slot through the joint and added splines. The jig holds the frame at a 45° angle. As a result, the bottom of the slot is perpendicular to the mitered face, as in Figure 4. The grain of the spline will run across the joint line to increase the amount of long grain glue surface.

Then you can size a spline blank to match the width of the slots. After cutting the splines to rough length, glue them in place and trim them flush (Figure 5).

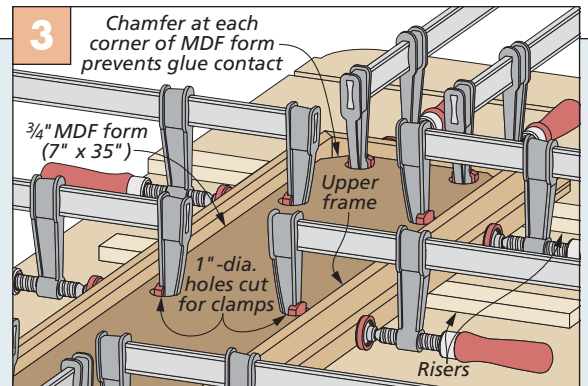
How-To: MAKE A MITERED FRAME



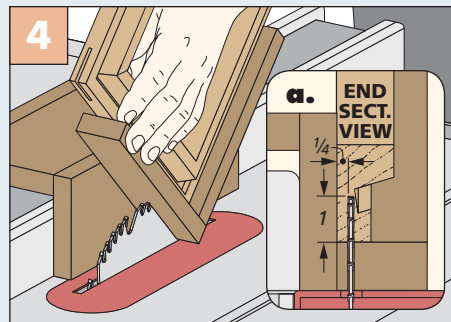
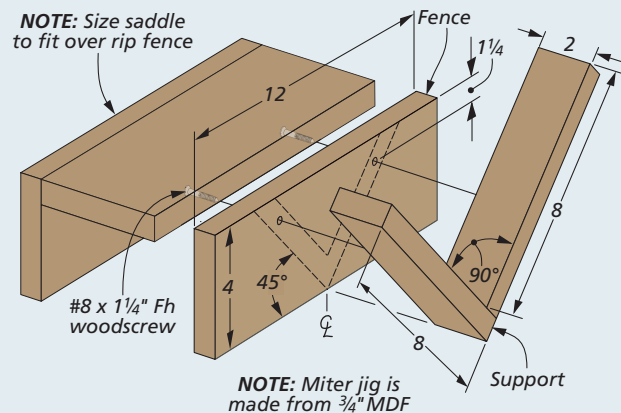
Angled Groove. Tilt the dado blade to create the groove that holds the slats in the upper frame.



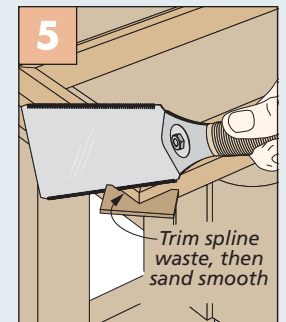
Trim One Edge. Rotate the frame blank on edge to cut away one side of the groove.



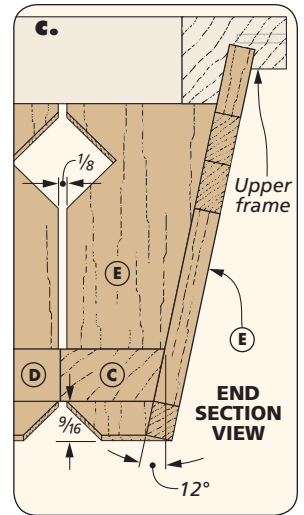
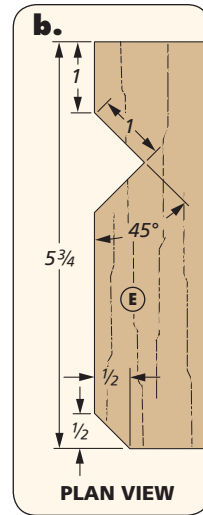
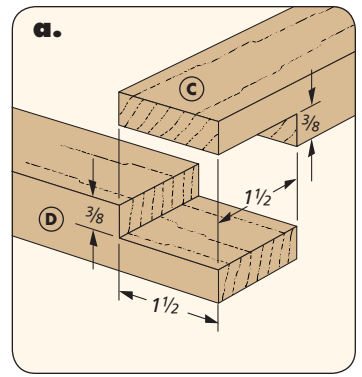
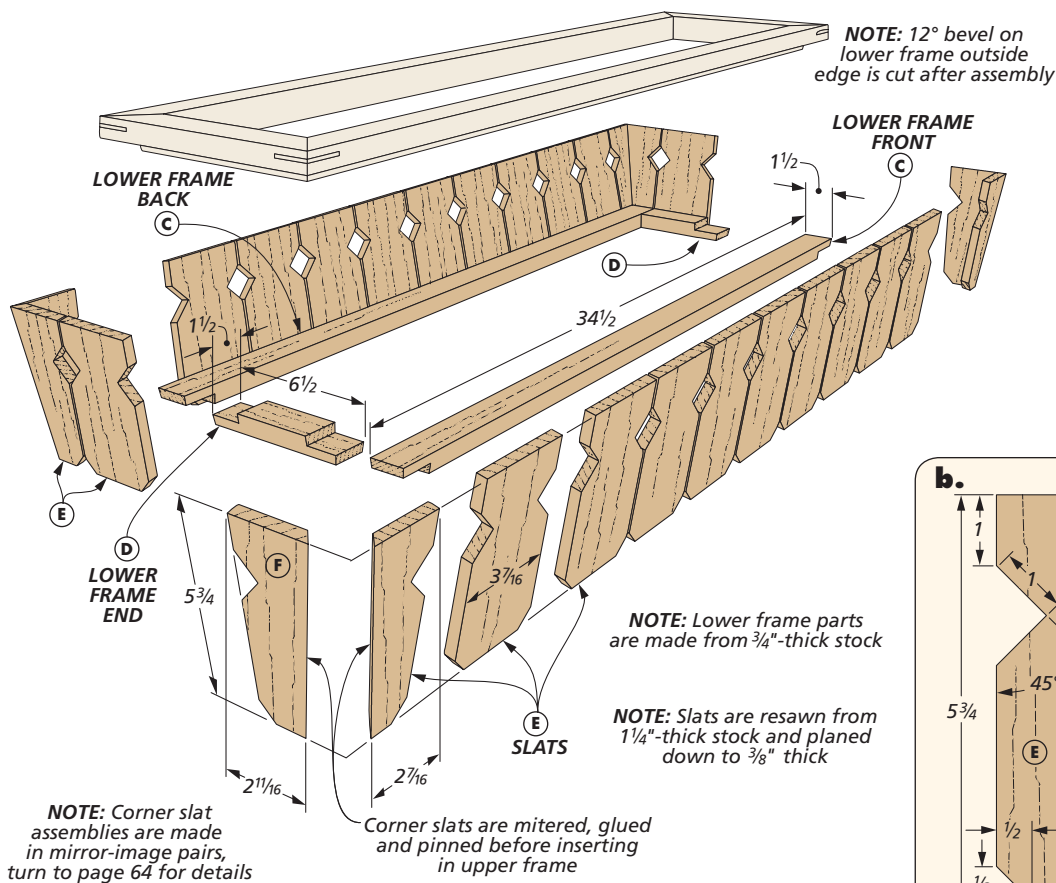
Gluing Form. An MDF form keeps the frame square while the glue dries. Drill holes in the form to provide access for the clamp heads.



Cut the Spline Slot. The saddle jig holds the frame in the correct position to cut the spline slots that reinforce the miters.



Trimming Splines. Cut away most of the excess with a hand saw.



Lower frame & SLATS

The lower frame of the planter box is simpler than the upper frame. Instead of miters and a clean look, I chose the brute strength of half laps.

TABLE SAW JOINERY. In addition to the sturdy construction, half laps are easy to cut on the table saw. All it takes is one setup, as shown in the box below.

There's one catch: The lower frame rests inside the slats, which are angled outward. So the frame needs to be beveled to match the slope of the slats. This is best done after assembly of the frame. For the ends, the miter gauge offers the best control and results. For the long edges, you can use the rip fence (lower right drawings).

SLATS. The slats give the window box its distinctive look. The lower ends are dog-eared with a chamfer, and they have a diamond cutout along the middle.

The box on the facing page gives you a good summary of the process. But there are a few additional things to highlight.

EXTRA PARTS. I resawed the slat blanks from thicker stock. The key when planing them to size is to aim for a snug fit in the groove in the upper frame.

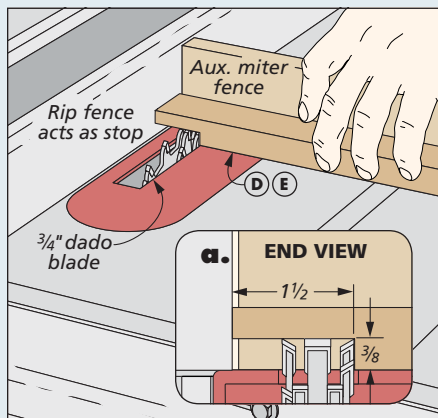
It's a good idea to make a few extra slats to use as test pieces and have a few extras on hand in case of a miscut.

Most of the slats are straightforward to make. But the corner slats are mitered and tapered to create a seamless edge and match the bevel of the frames. This adds a few extra steps but isn't complicated.

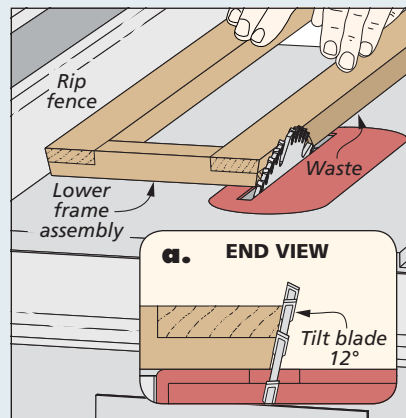
TWO-STEP DIAMONDS. The diamond-shaped cutout is the first detail to add to the slats. This is done by making two cuts on each edge of the slats. The key here is making sure the cutout on each slat is located consistently. A stop block attached to the rip fence is a good way to register the parts to make the cuts.

Mark the location of the top edge of the cutout on one of the slats. You can

How-To: CUT HALF LAPS & BEVEL



Cutting Half Laps. The key to the half laps is taking the time to set the blade height to half the thickness of the parts.



Bevel The Frame. The saw blade is tilted to match the slope of the groove in the upper frame.

How-To: SHAPE & INSTALL SLATS

use that as a gauge to position the stop block (Figure 1). Now it's just a matter of making the same cut in all the slats.

Completing the notch involves changing the setup. You need to flip the slats around to make the second cut. So I moved the auxiliary fence on the miter gauge to offer better support for the slats.

Like before, grab a test piece to fine-tune the position of the rip fence. I also found it necessary to lower the blade slightly to prevent scoring the opposite side of the cutout, as in Figure 2.

A CHAMFER ON THE END. The final detail step is cutting a chamfer on the lower corners of all the slats, as you can see in Figure 3. By now, you have a pretty good idea of how this cut is made.

BEVEL & TAPER. The basic slats are complete. The task now is to cut the corner slats to final size. This involves cutting a taper along the length and mitering the edge of the corner slats — a compound-angle cut.

The way to do this is to use a sled that holds the slat at the correct angle, as shown in Figure 4. You can find the details in Shop Notes on page 64.

FINAL ASSEMBLY. Bringing all these parts together is the payoff for the careful work you've been doing. I flipped the upper frame upside down on my bench and marked centerlines on the length.

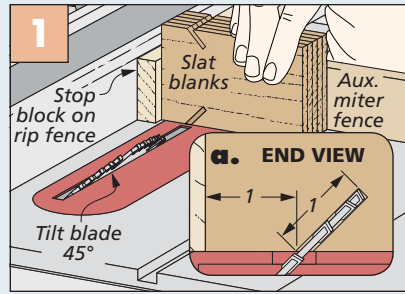
From there, I glued the mating corner slats together, as in Figure 5. (Be sure to use a waterproof glue.) Once the miter joint is dry, you can glue the corner pieces in place (Figure 6). You can avoid waiting for glue to dry by pinning the slats in the grooves.

The lower frame is added next. What's important here is that the frame rests level across the bottom, as in Figure 7.

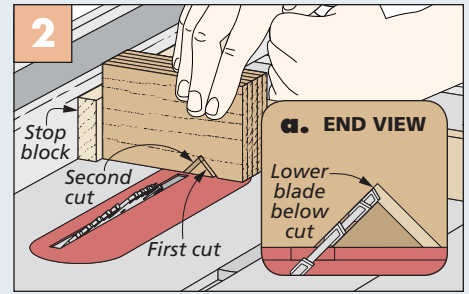
The goal with the remaining slats is to space them evenly between the corners. I marked a centerline on two slats and aligned them with the marks on the frame (Figure 8). Set the slats into the groove (without glue) and tweak the side-to-side location to get even gaps (about $\frac{1}{8}$ "). Then glue the slats in place one at a time.

There are several ways to attach the planter box to a house. On page 65, you can see one solution that uses a unique hanging bracket and beveled cleat.

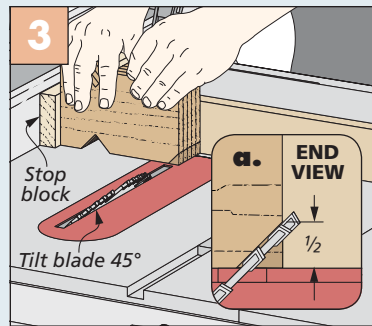
Even though cedar is weather-resistant, I primed and painted the planter (refer to Sources on page 67 for the color). Then it's a matter of dropping in the liner and picking the flowers to put inside. **W**



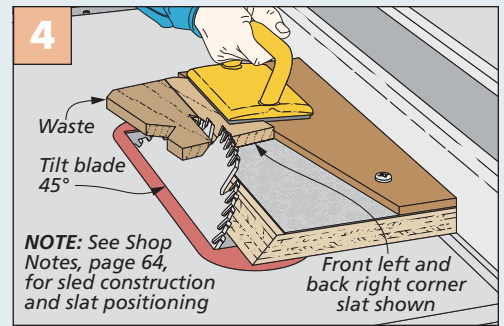
1 A Decorative Notch. You can speed up the shaping process by cutting several slats at one time.



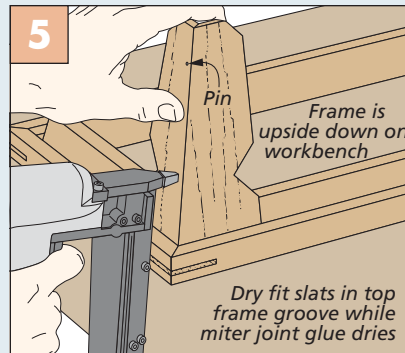
2 Second Cut. Reposition the stop block and lower the blade to cut a crisp point on the inside of the notch.



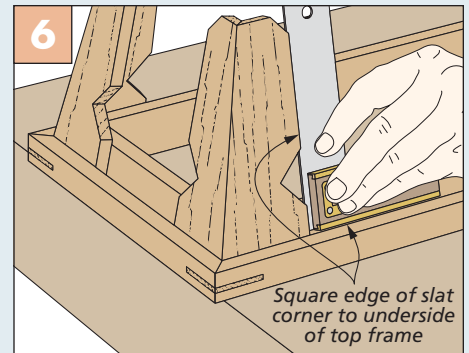
3 Chamfer. The setup for cutting the chamfer on the lower end is similar to creating the notch.



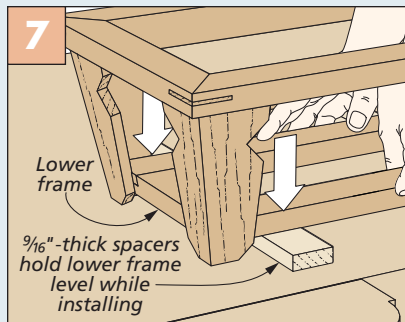
4 Slat Sled. To accurately cut the beveled taper on the corner slats, I used a simple jig to register the parts.



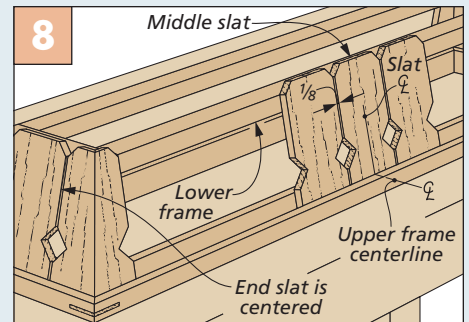
5 Nail Glued Corners. Drive 23-gauge pins to act as clamps for holding the miter joint tight as the glue dries.



6 Start at the Corner. Use a try square to make sure the corner slat assemblies are aligned during the glueup.



7 Add the Lower Frame. Insert the lower frame through the upper frame and glue it to the corner slats.



8 From the Center. Center the middle slat between the corners. Then space the remaining slats equally in between.



tri-fold **Drill Bit Index**



▲ Folding the drill index turns it into a compact package that's easy to store on your benchtop or a shelf.

Store your most-used drill bits in style with this modern take on a classic storage device.

A few of us around the *Woodsmith* shop have a fondness for antique tools. There's a certain charm about the styling and utility of these old-time classics. When our managing editor, Vince, brought in an antique drill bit index, it inspired the design for the one shown above.

The triangular index provides a stable platform for your most commonly used bits during use. For storage, the index folds up into a compact unit, as shown in the photo at left.

The three sides pivot on pins made from brass rods. Each side of the index is unique in shape so that all three sides nest together when collapsed. The two free ends butt together when expanded.

NOTES ABOUT CONSTRUCTION. Building this project isn't difficult, but its construction techniques may not be what you're used to. This project relies heavily on patterns to shape each of the parts and locate key features like the holes for the pins that hold everything together.

Each side consists of two identical cap pieces and a core. I used walnut for the caps and padauk for the core. Using the patterns below, you'll get a head start on laying out the blanks.

MAKING THE PATTERNS. But before you get too far, there's a tip I want to point out. I used thin sheets of flexible, high-impact polystyrene (HIPS) to make the patterns (refer to Sources on page 67).

HIPS is easy to draw on with a pencil or fine-point permanent marker. It also cuts easily with a knife or scissors. Since you'll be applying and removing the patterns often as you shape and assemble the parts, HIPS is durable enough to withstand the repeated use.

To start, make enlarged copies of the patterns below or download full-size patterns from Woodsmith.com. After roughly cutting out the paper patterns, attach them to the plastic with spray



▲ High-impact polystyrene (HIPS) makes an ideal material for patterns. It's durable and cuts easily with a knife or scissors.



▲ Use double-sided tape to attach the plastic patterns to the blanks. The patterns can be easily removed and reattached as needed.

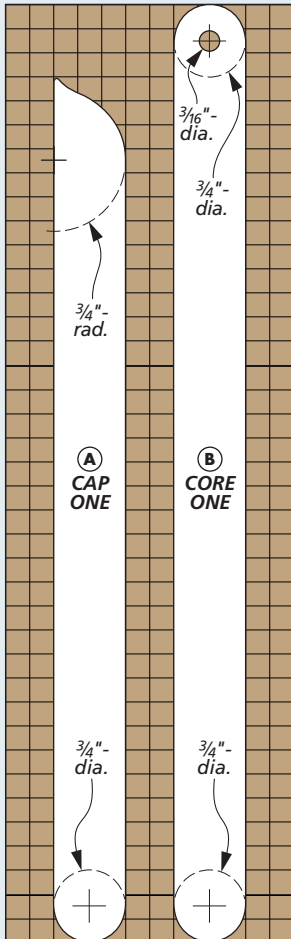
contact adhesive. Carefully cut out the plastic patterns, using a straightedge where needed for the long edges.

To lay out the shaded radiused areas on the patterns and mark their centerpoints, I used a Forstner bit sized for each

diameter shown on the pattern. Simply press the centerpoint of the bit into the plastic and rotate the bit by hand to dimple the centerpoint. This provides a handy reference later when it comes time to drill out the waste and hinge holes.

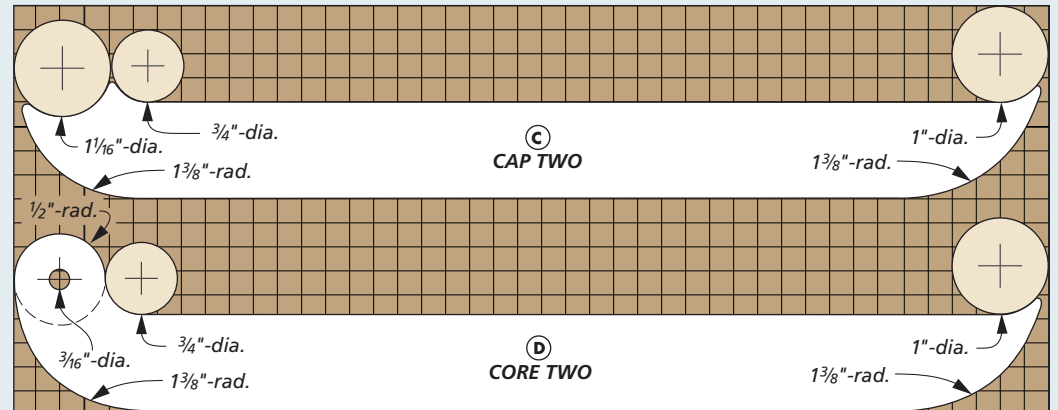
How-To: LAY OUT THE PATTERNS

PATTERN ONE
(One square = 1/4")

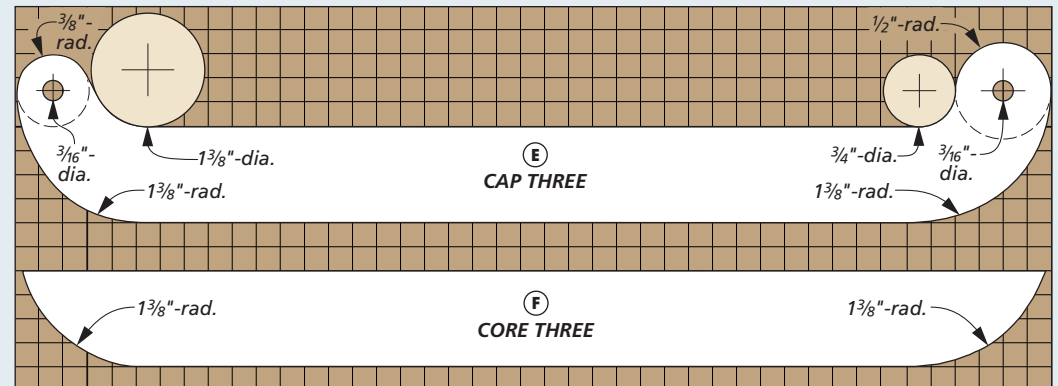


NOTE: Enlarge patterns 200%. The highlighted areas (tan circles) are removed when drilling out waste for final shaping of part.

PATTERN TWO (One square = 1/4")



PATTERN THREE (One square = 1/4")



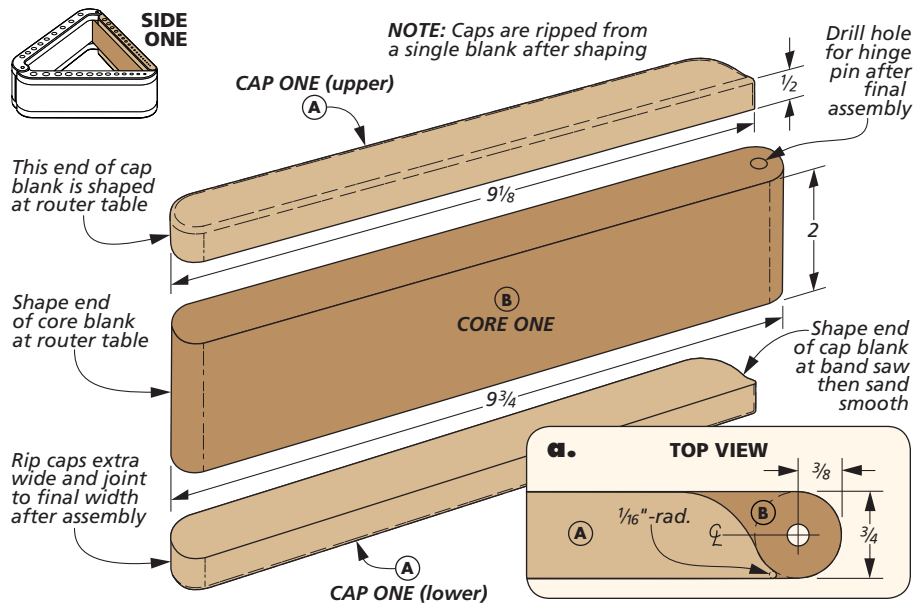
For full-size patterns, go to Woodsmith.com

Getting **STARTED**

Once you have the patterns in hand, you can start to work on making the parts. You'll construct one side at a time, each with two caps and a core.

PREPARING THE BLANKS. For each of the three sides of the drill index, you'll prepare two blanks: One for the core and another for the caps. After you've completed the shaping of the cap blank, you'll rip it in two to create the top and bottom caps.

When preparing your blanks, it's a good idea to square up the edges and faces. Having square reference edges and smooth faces makes the shaping and assembly process a lot easier. I used double-sided tape to fasten the patterns to the blanks. When you do this, make sure to mark the centerpoints of all the radii using an awl. You'll reference these points when reinstalling the patterns during the shaping process. These centerpoints also mark where you need to drill during and after assembly to complete



the curved shapes and prepare for installing the brass hinge pins.

SIDE ONE

The illustrations above and below guide you through the process of making the first of the three sides of the drill index.

I started by cutting the core blank to size. Use the pattern to locate the centerpoint for the hinge pin and mark it, but don't drill it yet. Then round over both ends at the router table, as shown in Figure 1.

CAP BLANK. The blank that forms the two caps starts out in a similar fashion. Except you'll leave it a little wide to account for the saw kerf when ripping the blank to create the two caps. Joint the edges and faces square, as before. Using the pattern as a guide, trace the shape on the edge of the blank. One end is rounded over at the router table. The opposite end is shaped at the band saw, as in Figure 2. I used an oscillating spindle sander to smooth the curves. You could also use a small-diameter sanding drum chucked in the drill press.

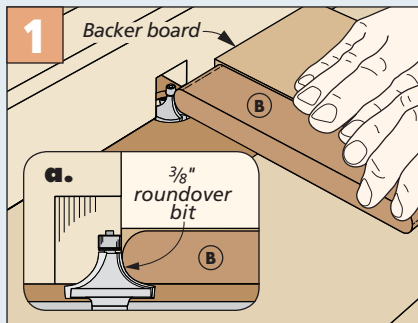
Once the shaping is done, rip the cap blank in two to form each of the caps (Figure 3). After sanding to remove the saw marks, you're ready for glueup.

CLAMPING SETUP. The clamping setup I used is shown in Figure 4. I took advantage of the face vise and bench dogs on my bench. A pair of cauls between the dogs traps the workpieces and spreads the clamping pressure.

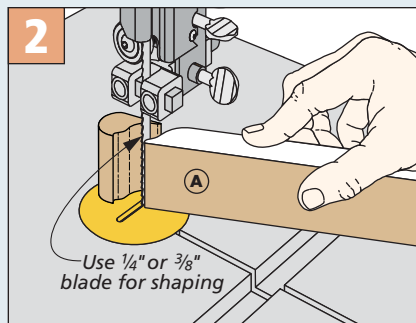
The key to the glueup is to make sure the rounded end of each of the three pieces is flush. That's where the cleat comes in. The cleat is clamped square to the cauls. Butt the pieces against the cleat and tighten the vise to clamp the pieces.

Joint the faces and edges smooth and set the assembly aside for now. You'll do the final shaping of the assembly after all of the sides are complete.

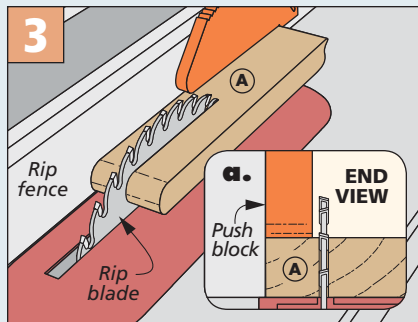
How-To: SHAPE & ASSEMBLE SIDE ONE



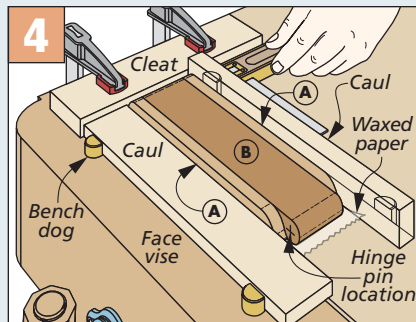
Shaping the Blanks. Round over both ends of the core and one end of the cap blank at the router table.



Band Saw Caps. Attach the pattern to the caps blank to mark and cut the profile on the end at the band saw.



Creating the Caps. Rip the blank in two, leaving the caps extra wide. Sand or plane the caps to final thickness.



Glue & Clamp. To keep all three parts aligned and square during glueup, use the vise with a pair of cauls and a cleat.

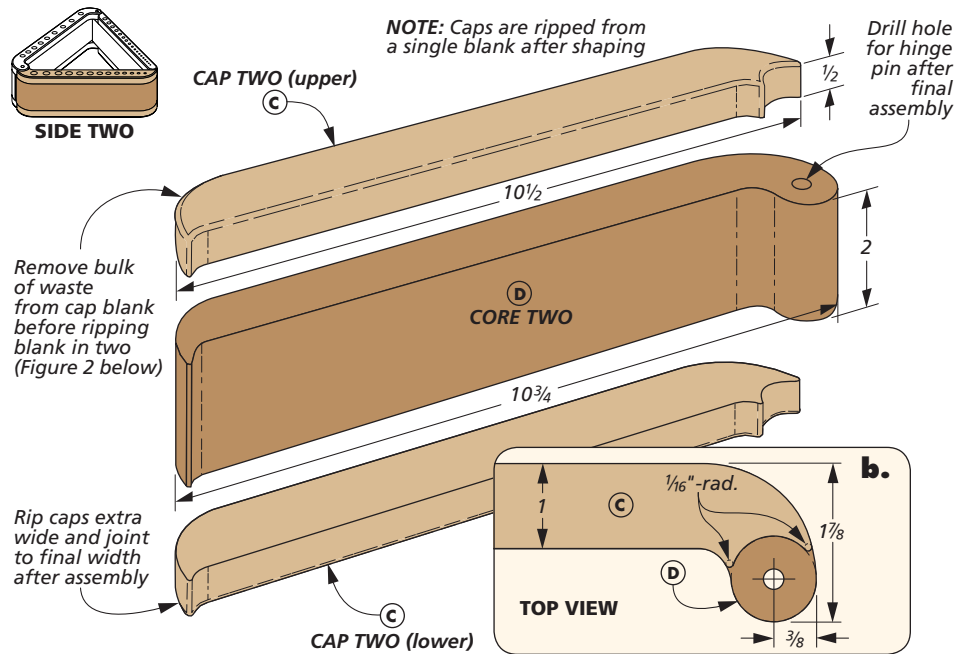
SIDE TWO

The second side of the drill index requires a little more shaping, but otherwise the construction process is pretty similar. The drawings on this page will guide you, and I'll highlight the important steps.

CAP BLANK. As illustrated at right, the caps for side two are a little more involved than for side one. In Figure 1 below, you can see how I used the centerpoints on the patterns as a guide to drill out the inside radii at each end using Forstner bits. These become reference points for marking the core blank. I cut away the bulk of the waste at the band saw, as illustrated in Figure 1.

CORE BLANK. As also shown at right, the core blank for side two is thicker. This is to account for the hinge knuckle at one end. At the opposite end, a cove mimics the cove on the end of the caps.

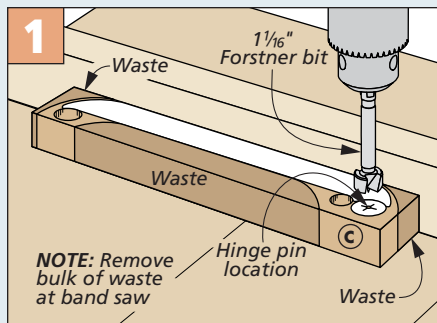
Use the cap blank as a guide to mark and drill the radii on the core blank, as in Figure 2. (You'll drill the hinge hole after all the sides are assembled.) I used double-sided tape to attach the cap blank



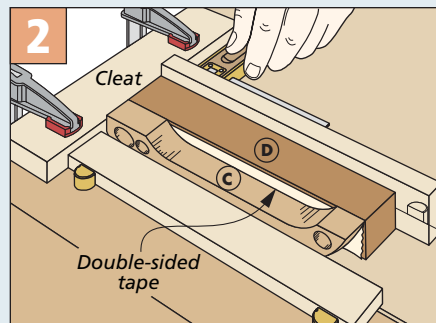
to the core blank. Then drill through the core blank using the cap blank as a guide (Figure 3). After removing the cap blank, rough out the shape of the core and sand it smooth, as shown in Figure 4.

Rip the caps in two and use a dowel to help align the parts during assembly, as you can see in Figure 5. Then remove the waste on the upper and lower caps at the band saw (Figure 6).

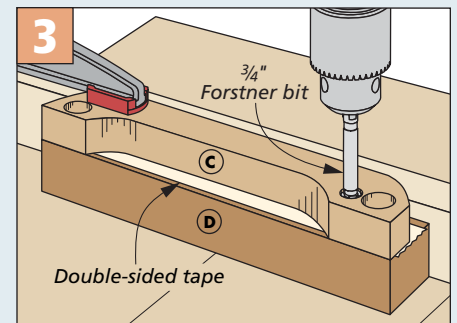
How-To: SHAPE & ASSEMBLE SIDE TWO



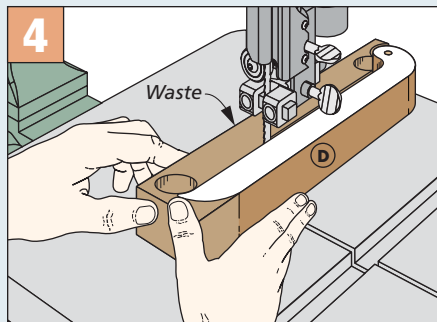
Mark & Drill. Use the pattern to mark and drill the inside radii, then remove most of the waste at the band saw.



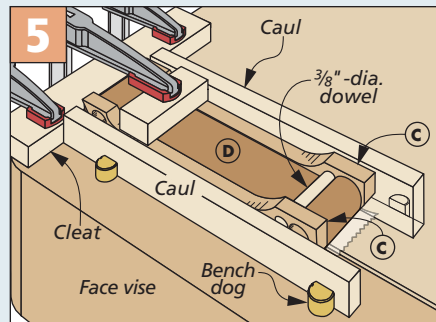
Alignment. Apply double-sided tape to the core blank and use a cleat to align the two blanks while clamping.



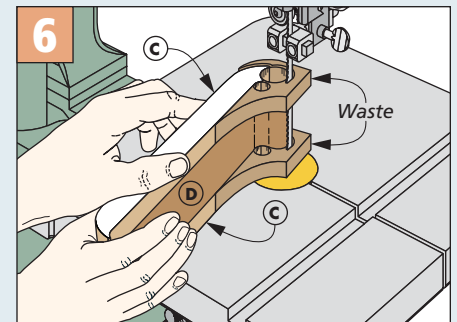
Drill Guide. Use the cap blank as a guide to drill the inside radii of the core blank at the drill press.



Cut to Shape. Attach the pattern to the core blank to serve as a guide to remove the waste at the band saw.



Gluing & Alignment. A dowel helps align the parts while clamping them using the clamping jig on the benchtop.



Final Shaping. After the assembly is dry, remove the remainder of the waste at the band saw and sand smooth.

Final DETAILS

With two sides roughed out and glued up, you're ready to move onto the third side. Then you'll concentrate on the fit and finish during final assembly.

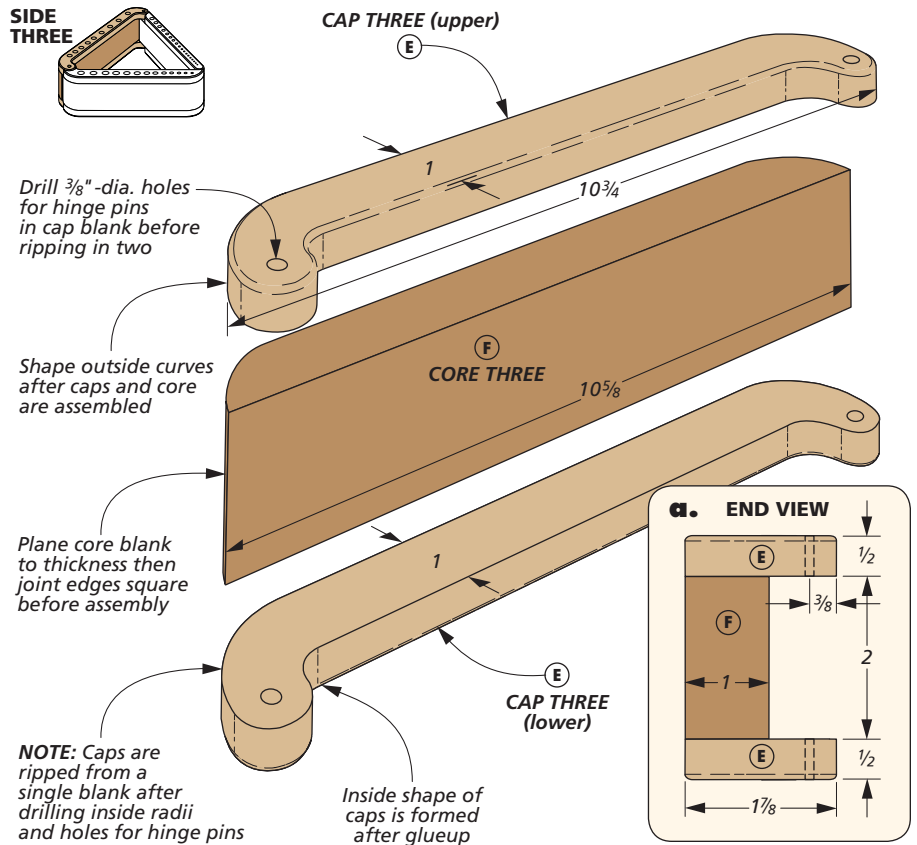
SIDE THREE

The final side of the drill bit index goes down a familiar road. The most critical part of the process is aligning the holes for the hinge pins during glueup. But I'll talk more about that later.

SHAPING THE CAPS. The outside shape of the caps for the third side dictate the shape of the core, so I made the caps first. Figure 1 below shows the process of marking the centerpoints of the inside radius cuts and the hinge pin locations. I made the blank wide enough to incorporate the centerpoints to help locate the Forstner bit when drilling (Figure 2). I waited until the caps were glued to the core before removing the waste.

Before ripping the cap blank in two, I drilled the holes for the hinge pins, making sure they were square to the face. The fence on your drill press helps to register the blank for drilling.

A SIMPLE CORE BLANK. Once you've drilled the holes and ripped the blank to form the two caps, you're almost ready for glueup. But first, you'll need to make the core. It's a rectangular blank cut to size with the edges jointed square. You can even leave the blank a little long since the ends will be removed during the final shaping at the band saw.



GLUEUP. Using the bench vise setup as before, you'll need to ensure that the holes for the hinge pins are aligned. I inserted a piece of brass rod through the holes for the hinge pins, making sure they were square to the face. The fence on your drill press helps to register the blank for drilling.

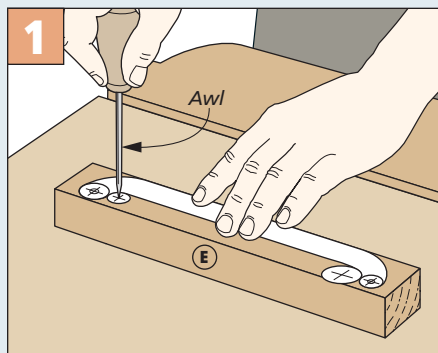
FINAL ASSEMBLY DETAILS

The process of assembling the drill index starts by doing some final shaping and

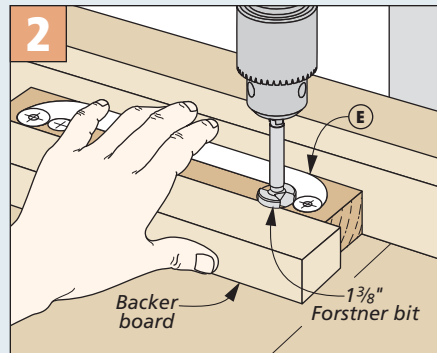
smoothing with a sanding belt. I rounded over all of the outside edges of the caps with a 1/8" roundover bit at the router table. The rest of the assembly involves installing the hinge pins and doing the final shaping. The drawings on the next page help guide you along.

DRILLING FOR HINGE PINS. The position of the hinge pins results in a slight gap (about 1/32") between the sides when the index is collapsed for storage. The goal is to align the centerpoints of the hinge pin

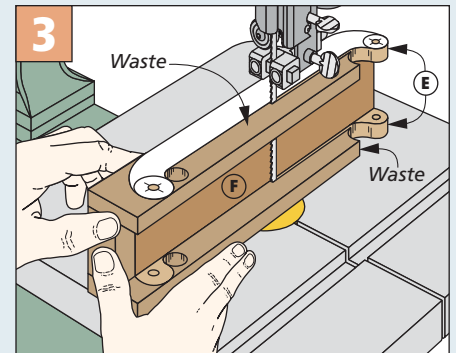
How-To: SHAPE & ASSEMBLE SIDE THREE



Marking Centers. Attach the pattern to the cap blank flush on a jointed edge. Mark the hole centers with an awl.

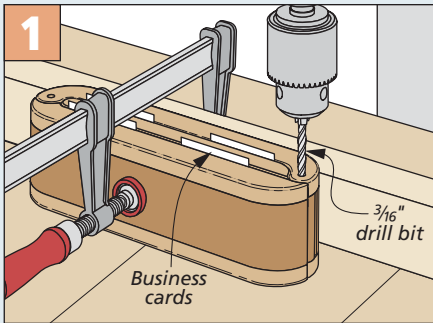


Drilling. Drill the inside radii and holes for the hinge pins at the drill press. You'll remove the waste after glueup.

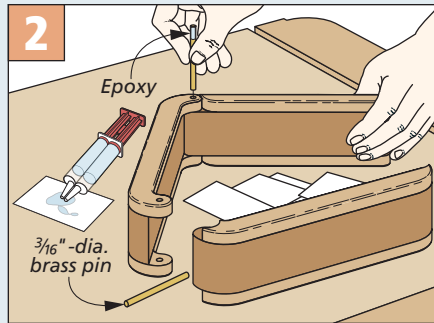


Cut to Shape. After the glue dries, cut the waste from the caps and core at the band saw and then sand smooth.

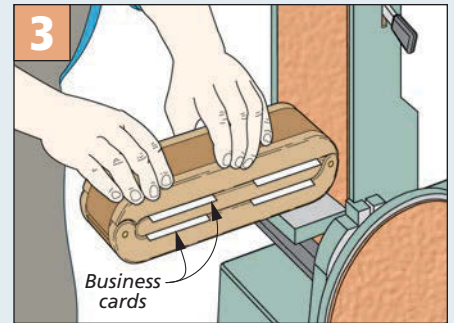
How-To: COMPLETE THE ASSEMBLY & FIT THE BITS



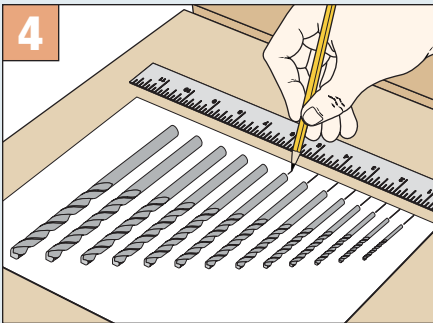
Card Spacers. For even gaps when the index is closed, insert business cards as spacers before drilling for hinge pins.



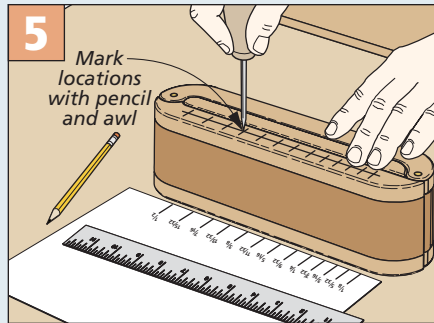
Hinge Pins. Assemble the three sides by inserting $\frac{3}{16}$ "-dia. brass pins in the pivot holes. Use epoxy to secure the pins.



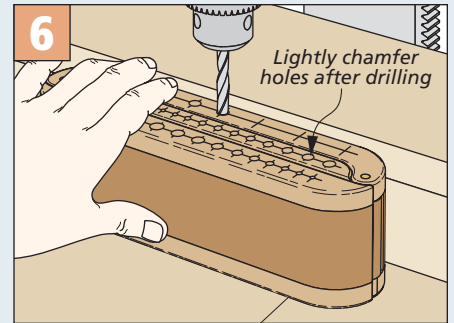
Final Sanding. Refine the outside curve of the assembled index at the belt sander then finish with some hand sanding.



Drill Bit Layout. Arrange your drill bits with equal space between each bit and then mark the shank centerpoints.



Hole Locations. Transfer the marks from your layout to the centerline along the edge of one of the sides of the index.



Drilling. Use the fence on your drill press to locate and drill oversized holes to accommodate the bits.

locations on sides one and two with the holes in the caps on side three. To maintain consistency in this gap width, I used a few business cards stacked together as spacers (Figure 1 above).

Once everything is aligned and clamped together, use the holes in the caps on side three as a guide to drill through the other two sides. Cut the brass rod to length before assembling the drill index. Then use epoxy on one end of the hinge pin to secure it (Figure 2).

FINAL SHAPING. With the index assembled, I inserted the business card spacers once again. Some careful sanding at the belt sander will smooth the ends of the assembled unit and make a nice transition between the parts (Figure 3). You may need to touch up some of the round-overs on the cap after this step.

A little hand sanding is all you need to prepare the index for a finish. I sanded through 150-grit before wiping on a couple coats of oil finish. I applied the finish

before drilling the holes for the drill bits. This way, you avoid having the finish run down into the holes.

STORING YOUR DRILL BITS. The idea of making the drill bit index was to have a place to keep your commonly used bits at hand. Figures 4 through 6 above show you how to lay them out to locate the holes you'll need to drill.

Lay the drill bits on a piece of paper or light cardboard and space them as desired. I did this for my sets of brad-point, twist, and spade bits. Mark the centerpoints of the drill bit shafts on the paper to transfer to the edge of the drill index. Scribe a centerline down each edge of the index to keep the holes aligned.

When drilling the holes, I used a bit slightly larger than the shank size ($\frac{1}{64}$ " or $\frac{1}{32}$ ") so the bits would be easier to insert and remove. I drilled the holes $\frac{1}{2}$ " deep with brad-point bits. That was followed up with a countersink bit to create a slight chamfer and ease the edges.

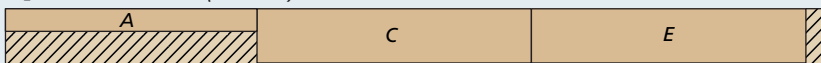
With this handy drill bit index, using, storing, and keeping your drill bits accessible has never looked so good. **W**

Materials, Supplies & Cutting Diagram

A Cap One (2)	$\frac{1}{2} \times \frac{3}{4} - 9\frac{3}{4}$	E Cap Three (2)	$\frac{1}{2} \times 1\frac{7}{8} - 10\frac{3}{4}$
B Core One (1)	$\frac{3}{4} \times 2 - 9\frac{3}{4}$	F Core Three (1)	$1 \times 2 - 10\frac{3}{4}$
C Cap Two (2)	$\frac{1}{2} \times 1\frac{7}{8} - 10\frac{3}{4}$		
D Core Two (1)	$1\frac{7}{8} \times 2 - 10\frac{3}{4}$		

• (2) $\frac{3}{16}$ "-Dia. x 3" Brass Rod

1½" x 2" - 36" Walnut (1 Bd. Ft.)



2" x 2" - 36" Padauk (1.3 Bd. Ft.)





Freestanding Room Divider

It's simple to create a boundary between living spaces with this stylish storage unit. The contemporary design will complement any décor.

Homes with open floor plans have increasingly gained favor with home buyers over the last couple of decades. These floor plans encourage family togetherness, and they increase your options when entertaining guests. They can also make a home with a modest square footage feel much larger. But sometimes it's necessary to subtly break up the room to make a space more user-friendly. That's where this freestanding room divider is the perfect addition.

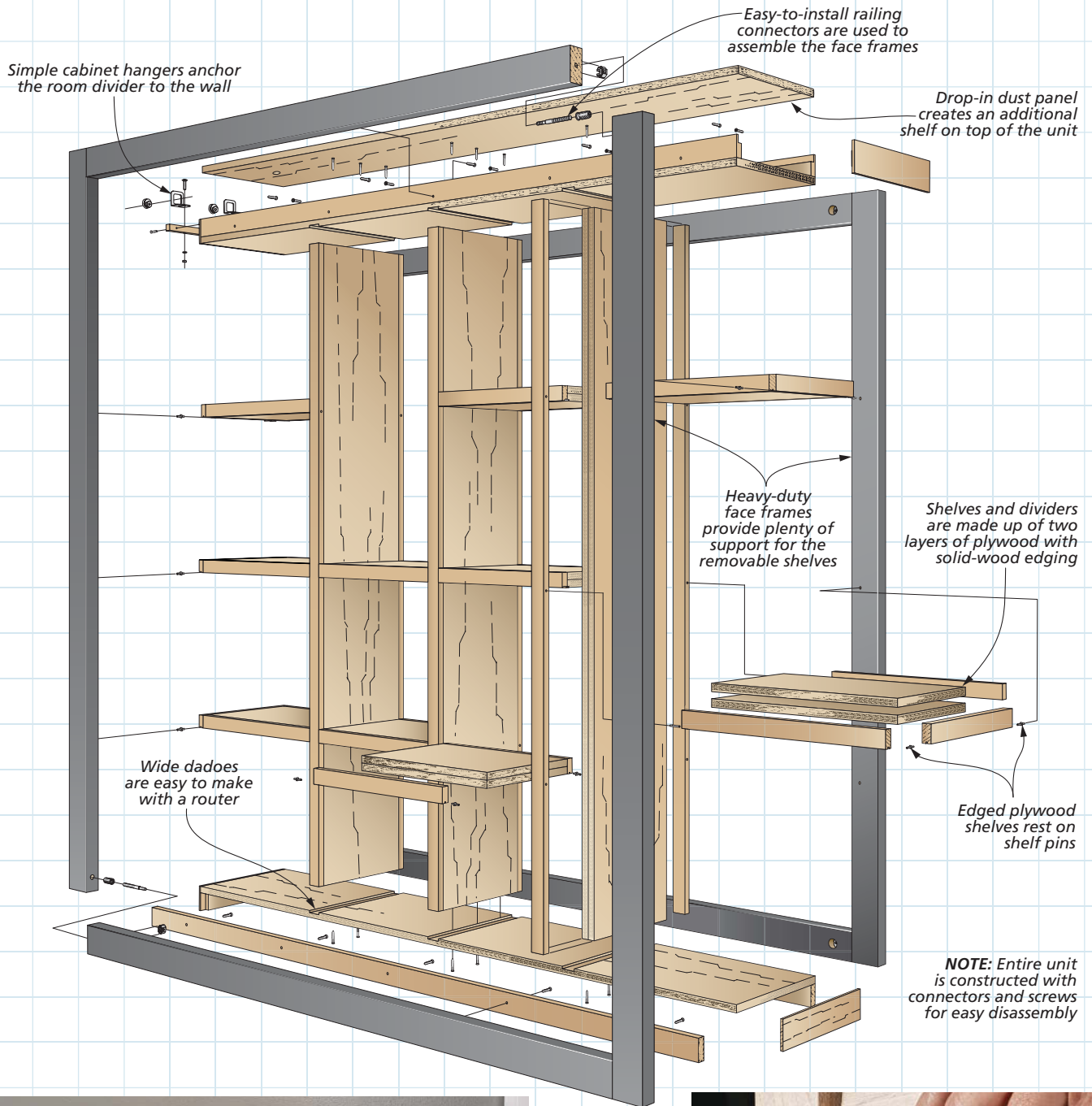
This room divider can be used anywhere there's a need to separate a space without adding a permanent wall. I used ours to screen an entryway from the main living area, as shown above. The open construction of this divider still lets plenty of light through, and the removable shelving allows the unit to be customized to suit any space or decorating desire.

Don't let the size of this room divider scare you off. We designed this project to go together very easily. And we even

made it so the whole thing can be broken down and moved from one space to another if the need should ever arise.

The bulk of this two-tone unit is made from maple plywood panels with solid-wood edging. This ensures a quick build while still giving the room divider a rock-solid foundation. But the thick, solid-wood face frames really set this project apart. They give the room divider its unique look while providing stiffness for the overall assembly.

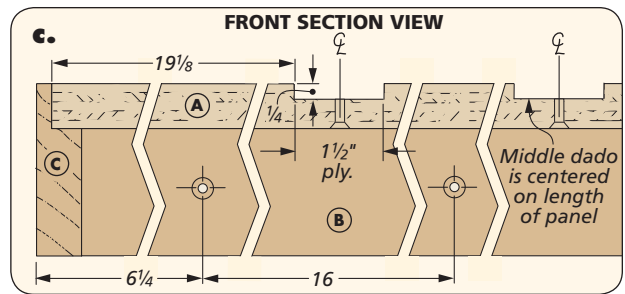
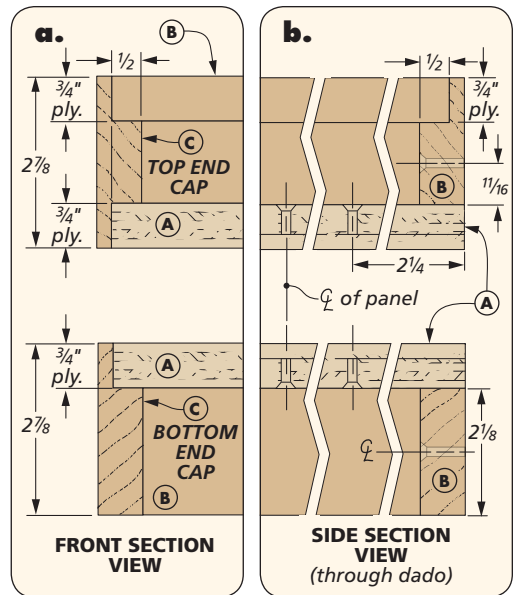
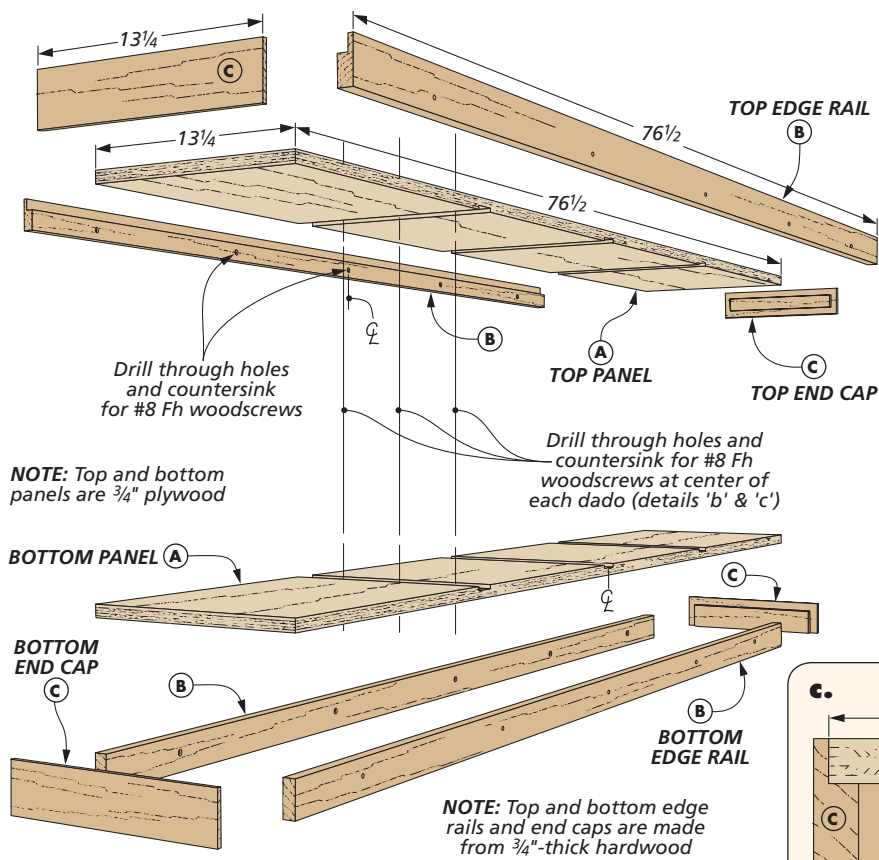
Construction Overview / OVERALL DIMENSIONS: 78"W x 78"H x 16¹/₄"D



▲ These easy-to-install hangers provide three-axis adjustability and ensure the room divider stays put. Find out where to get them in Sources on page 67.



▲ Adjustable shelf pins make arranging the shelves a snap. The groove in the edging completely hides them from view.



Make the TOP & BOTTOM

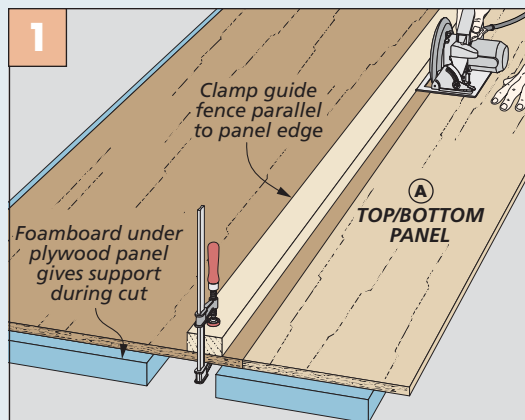
A natural starting point for this project is with the top and bottom panel assemblies. Nearly identical in construction, they consist of plywood panels edged with solid stock. These assemblies will trap the three dividers between them later on.

START WITH THE PANELS. There are many ways to break down large sheet goods

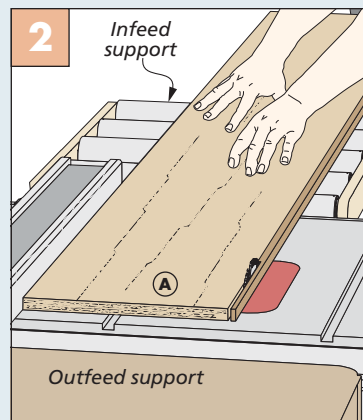
into manageable-sized pieces. I opted to use a large piece of foam insulation board to support the plywood while cutting it to rough size with a circular saw. I used a straightedge clamped to the plywood to guide the saw (Figure 1, below). It's then easy to rip the panels to their final width using the table saw (Figure 2).

Since the panels are each over a foot wide and a little over six feet long, extra care needs to be taken to safely cut the panels to their final length. I found that a crosscut sled on my table saw made the cuts in the safest and most accurate manner. This process is shown in Figure 3. Be sure to save a piece or two of the offcuts

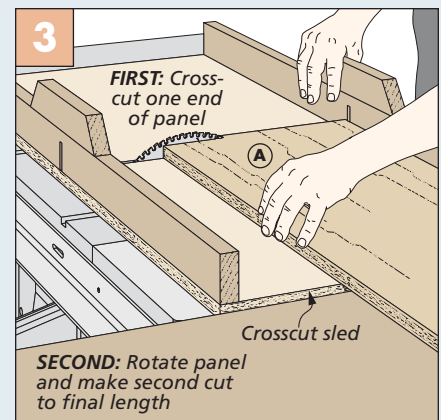
How-To: CUT PLYWOOD PANELS TO SIZE



Rough Cut Plywood Panels. Foam insulation boards provides plenty of support while cutting the top and bottom panels to rough size.



Finish Rip. The table saw makes a clean rip cut in the two, more manageable-sized pieces.



Cut Panels to Final Length. A table saw sled is the safest way to crosscut large panels to size.

How-To: CUT THE DADOES & RABBETS

from this step. They will come in handy setting up the dados next.

EVENLY SPACED DADOES. Each panel has three wide dados cut on its inside face. These dados hold the upright dividers in place. To ensure that the dados cut in the top panel line up perfectly with the ones in the bottom panel, I decided to rout the matching dados at the same time. But before jumping into making the cuts, a little preparatory work is necessary.

ROUTER GUIDES. The key to this method of routing dados is a pair of router guides. The guides consist of a $\frac{1}{4}$ " hardboard base with a $\frac{3}{4}$ "-thick hardwood fence for the router to ride against. The box at right shows how to make a guide and trim it to fit your router and bit.

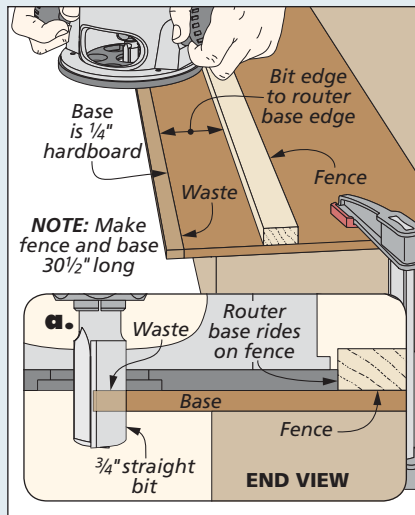
SETTING UP THE GUIDE. The dividers are made from two layers of $\frac{3}{4}$ " plywood. Since plywood thickness can vary from its stated size (usually a hair thinner), I made a couple spacer blocks from the offcuts I saved earlier. Just be sure you are using the same plywood for the panels as you are for the dividers.

The box at the upper right shows how to orient the router guides on the panels. With the spacer blocks positioned, clamp a couple of cleats to the underside of the router guides and tack them in place with a few brads. The clamps are then repositioned to hold the guides in place.

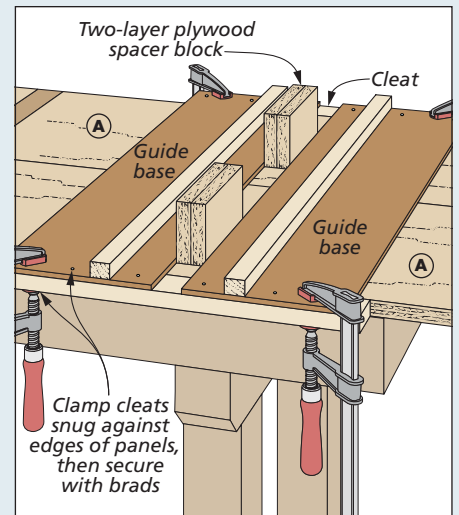
ROUT THE DADOES. With all of the prep work out of the way, all that's left is to rout the dados. The middle box at right shows exactly how to rout the first dado in two passes. Then it's just a matter of sliding the router guide along the panel to the next dado location and repeating the process.

ADD THE RAILS & CAPS. With the panels complete, it's time to add the rails and caps. Cut these parts to size and then take a look at the main drawing on the opposite page. You'll see that the top edge rail needs a rabbet along the top edge. This holds a dust panel later on. Also note that the top end cap has rabbets on all four edges while the bottom end cap only has rabbets on three edges.

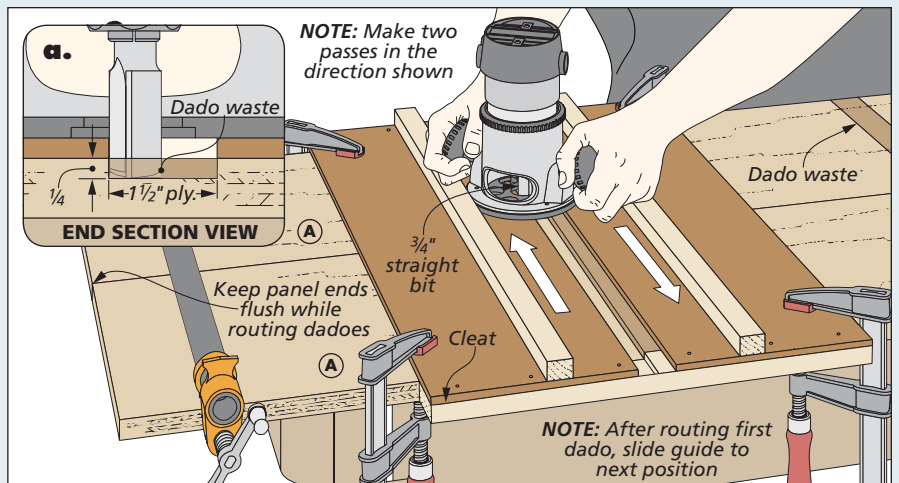
With all of the pieces marked, I used a table saw set up with a dado blade and auxiliary rip fence to cut the rabbets (drawings, at right). You're then ready to assemble the panel assemblies. A little glue and some clamps is all it takes.



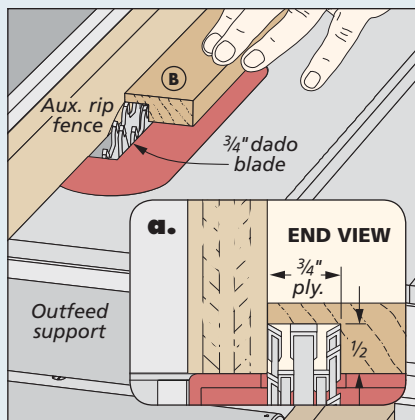
Make Two Router Guides. With the fence attached to the base, trim the edge of the base with a straight bit.



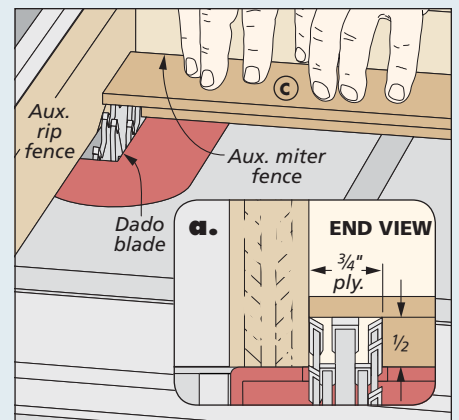
Connect the Guides. Using the two spacer blocks, position the guide bases and clamp the cleats in place.



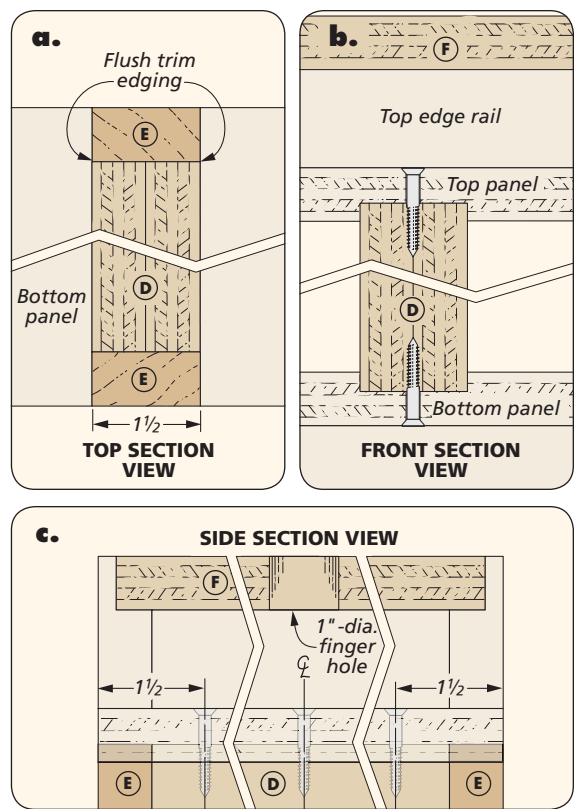
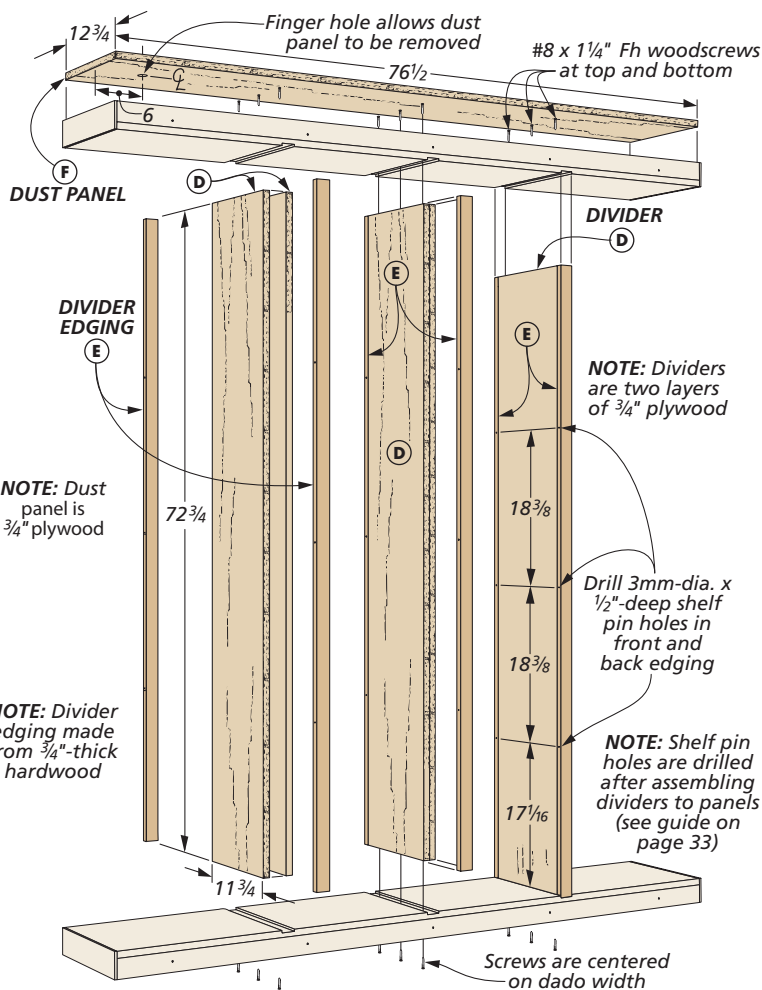
Rout the Dados. With the top and bottom panels oriented correctly, clamp the router guides over the first dado position. It will take two passes to complete the wide dado. The guides can then simply be repositioned for the next dado.



Rabbet the Rails. A dado blade in the table saw makes quick work of cutting the rabbets in the top rails.



Rabbet the End Caps. Be sure to use a backer board when cutting the rabbets in the end caps to avoid tearout.



Build the **DIVIDERS & SHELVES**

With the top and bottom panel assemblies completed, it's time to add some dividers to the mix. That'll be followed up with the removable shelf construction. Despite their obvious size differences, all of these parts go together in a

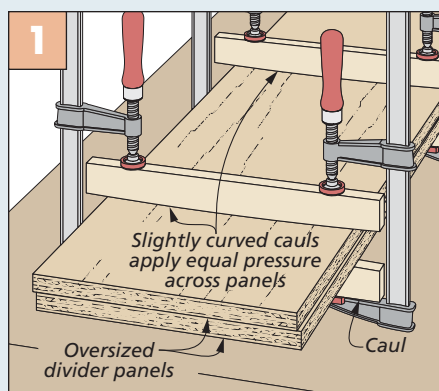
similar fashion. Finally, the top will be capped off with a dust panel.

DIVIDERS FIRST. Each divider assembly consists of two plywood panels laminated together. Some hardwood strips are then attached to the long edges of

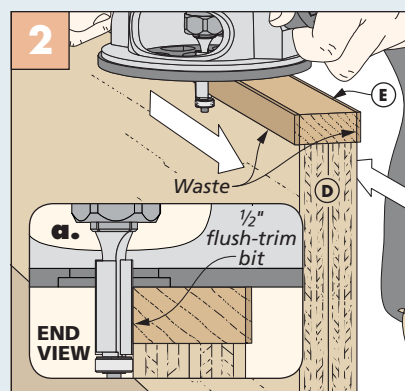
the dividers. There's nothing too taxing about making these assemblies, but it can be a bit challenging to get the long edges of the large panels lined up perfectly while gluing them together.

To avoid this frustration, I cut the plywood panels needed for the dividers a little wide. I was then able to intentionally offset the panels edges when applying the glue and clamps (Figure 1, below). This ensures that you have a straight edge to run against the table saw rip fence while cutting the dividers

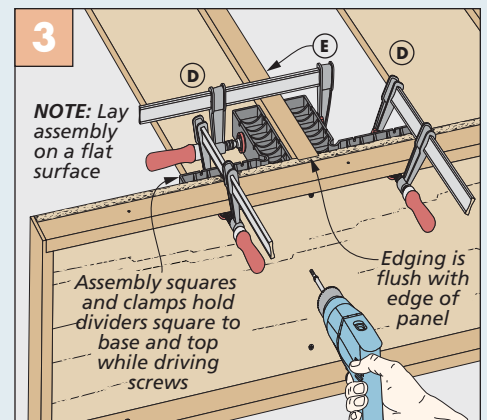
How-To: INSTALL VERTICAL PANELS



Glueup Panels. Offsetting the panels ensures a straight edge for ripping them to finished width at the table saw.



Clean Up Edging. Trimming the edging flush with the divider leaves a seamless transition.



Assemble the Divider Panels. A flat surface and assembly squares are helpful when assembling the divider panels.

to final size. Shop Notes on page 65 has more information about this technique.

ADD THE EDGING. With the dividers ripped to their final size, adding the edging is a simple task. Cut the edging strips a little wide, so they can be trimmed flush after they're glued to the dividers. This process is detailed in Figure 2 at the bottom of the opposite page.

DIVIDER ASSEMBLY. Joining the dividers to the top and bottom panel assemblies will start to give this project some life. This isn't a complicated process, but it will require a large, flat surface and a little patience. Figure 3 (bottom of opposite page) shows how I used a couple of assembly squares and some clamps to hold everything in place while I drove the screws home.

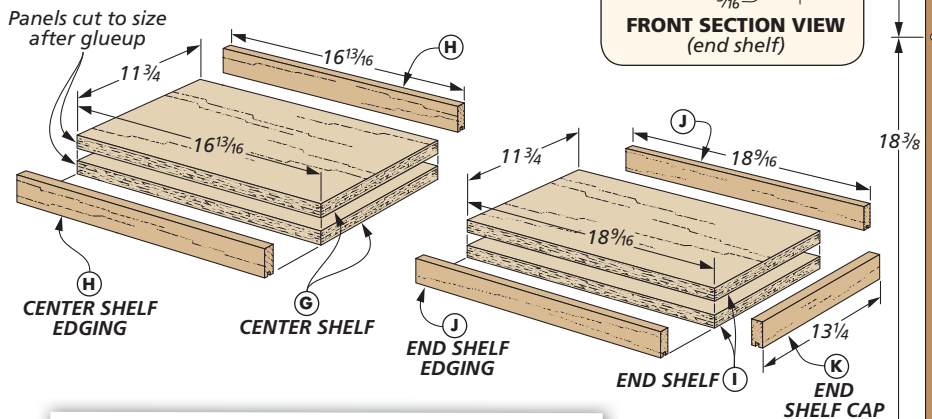
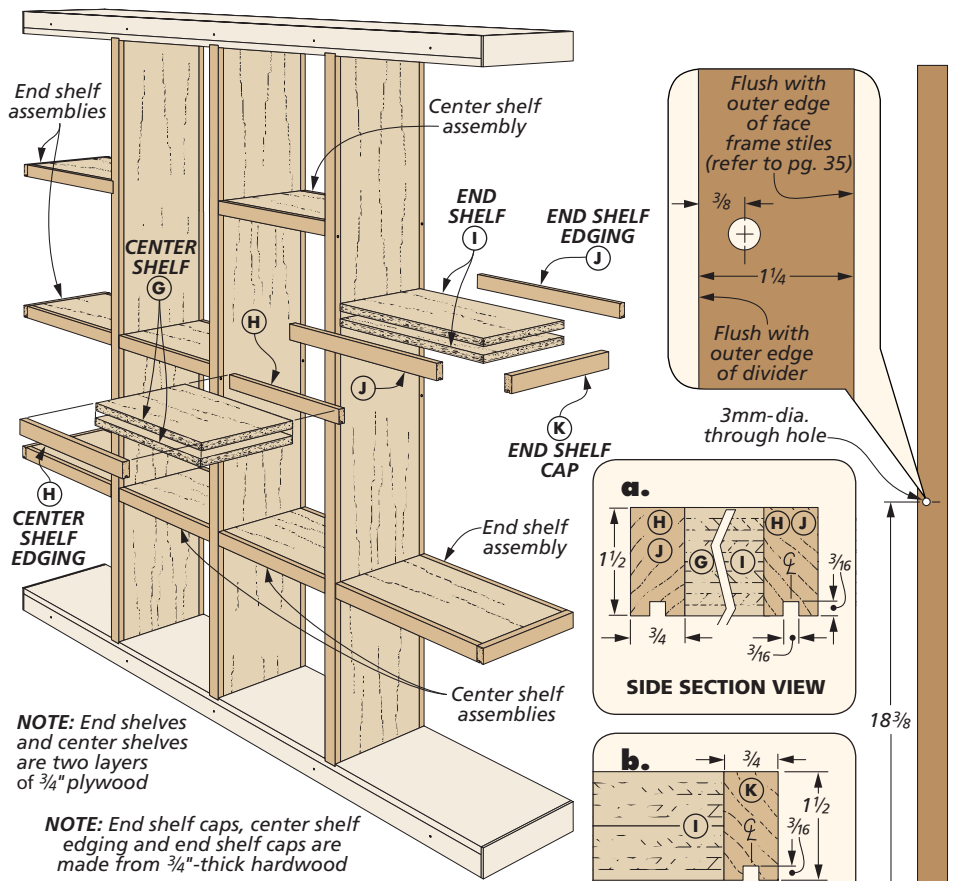
MAKING THE SHELVES. Since the offset glueup process I used to assemble the dividers worked so well, I decided to use the same method for the shelves. This means you'll need to cut the panels extra wide and long, glue them together, and then cut them to final width and length.

Attaching the solid-wood edging to the shelves is also done the same as the dividers. Rip the pieces wide, attach them with glue, and trim the excess material (Figure 2, opposite page). You'll want to leave the end caps off the end shelves at this point. They'll be applied after the shelf pin grooves are routed in the edging.

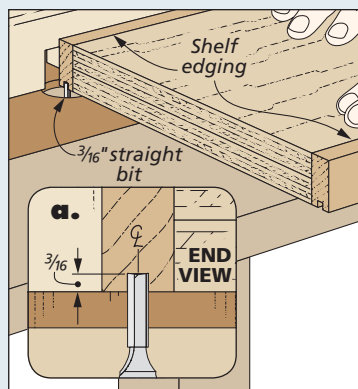
ROUT SHELF PIN GROOVES. The box at right shows all the details for routing the shelf pin grooves on the underside of the shelf edging. Make this groove on both edges of all the shelves. With the grooves completed, add the end caps to the end shelves in the same manner that the edging was applied. You can then rout the shelf pin grooves in the shelf end caps.

DRILL SHELF PIN HOLES. To keep the holes for the shelf pins equally spaced in the divider edging, I made the drilling guide shown in the margin at right. It's simply a piece of $\frac{1}{4}$ " hardboard with holes located to assist in drilling the shelf pin holes in the edging, and later, the face frame stiles. Drill the dividers now.

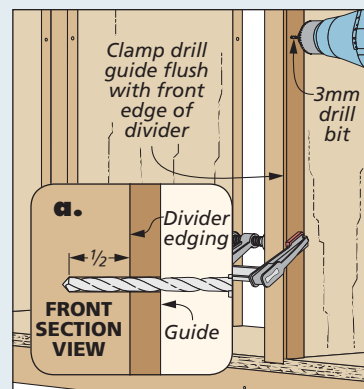
FINAL DETAILS & FINISH. As shown in the main drawing on the opposite page, a dust panel can be cut to size and dropped in place for now. Since the face frame parts will be painted, I applied a finish to all the completed parts at this point. (Refer to Sources on page 67.)



How-To: PREP FOR SHELF PINS

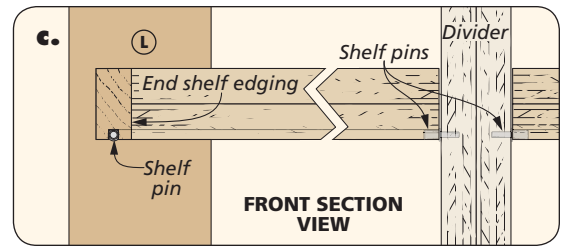
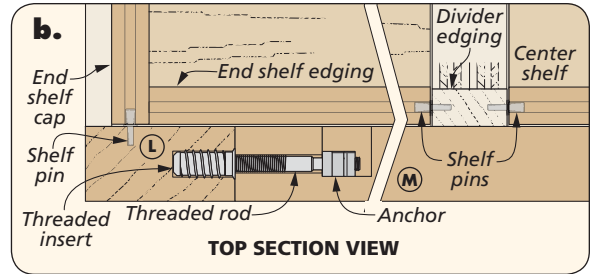
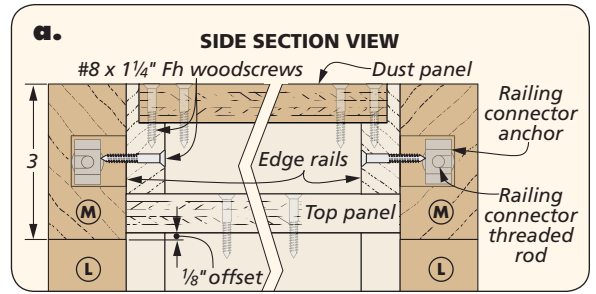
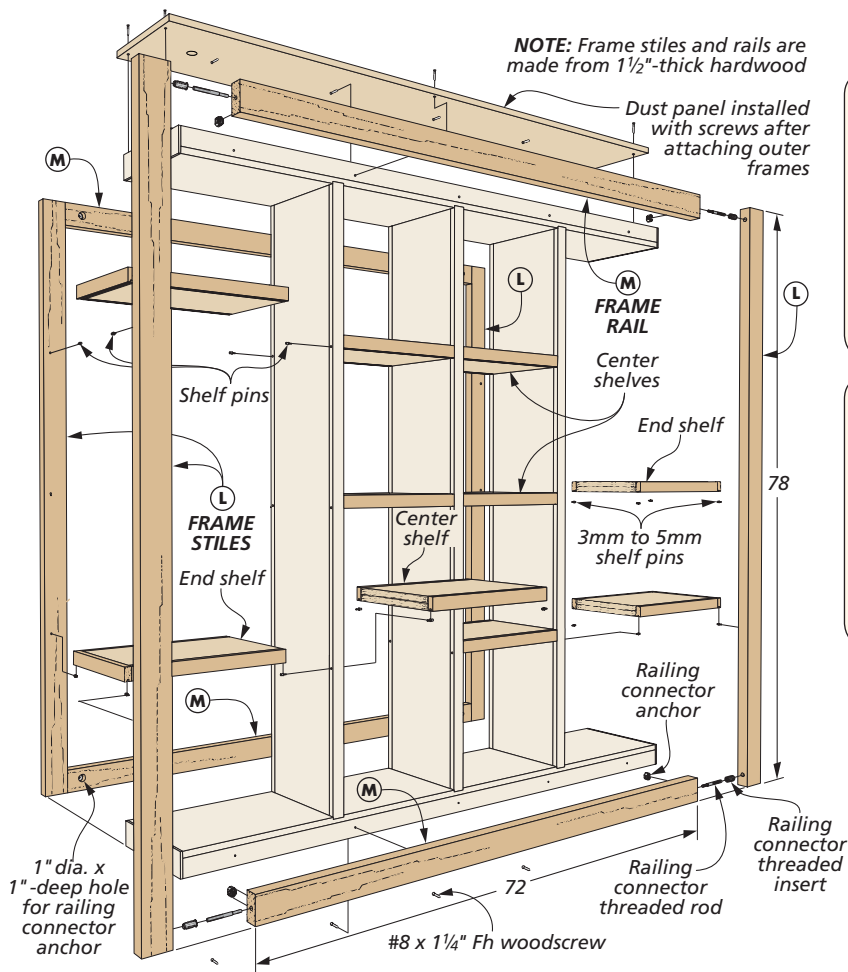


Grooves. A small straight bit makes quick work of routing the shelf pin groove.



Shelf Pin Holes. Clamp the drilling guide flush with edge of divider and drill shelf pin holes.

SHELF PIN DRILLING GUIDE



Complete the ROOM DIVIDER

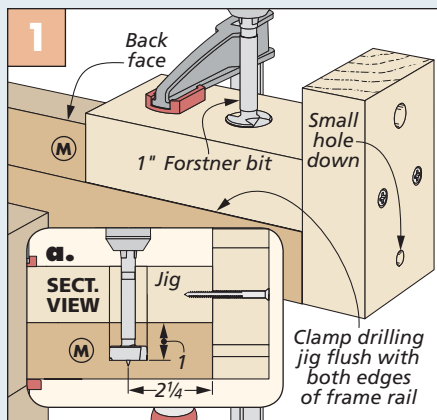
To tie the room divider together, I added a pair of substantial face frames on both sides of the unit. The face frames act to hold the entire unit square, as well as support the end shelves. The best part is there's no fussy joinery to cut on the ends

of the long stiles and rails. I used railing connectors to draw the joints together. You'll want to start with sturdy, straight stock for these pieces and cut them to size.

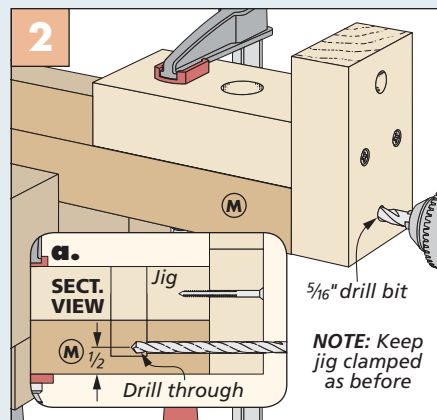
RAILING CONNECTORS DRILLING GUIDE. Installing the railing connector hardware isn't

difficult. But it does require drilling some mounting holes accurately near the ends of the stiles and rails. Since the face frame pieces are long and would have required outriggers to drill at the drill press, I decided to make a simple drilling guide (shown below) to allow the use of a hand-held drill. Turn to Shop Notes on page 65 to see how to make this drilling guide.

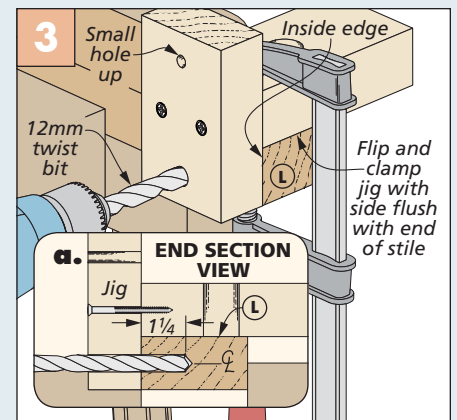
How-To: DRILL RAILING CONNECTOR HOLES



Anchor Holes. Position the drilling guide as shown to drill the hole in the back face of the rails.



Threaded Rod Holes. Leave the drilling guide in the same position on the rail to drill the end hole.



Threaded Insert Holes. Now place the drilling guide as shown to drill the hole in the edge of each stile.

How-To: ADD CONNECTORS, PINS & HANGERS

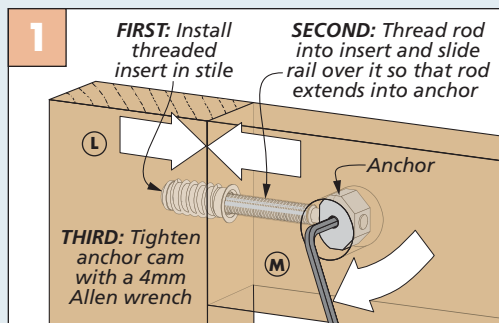
CONNECTOR MOUNTING HOLES. The three-step process shown at the bottom of the opposite page walks you through how to position the drilling guide to drill the three holes needed for the railing connectors. Be sure to carefully label all of the frame pieces to make this process easier.

ADD THE RAILING CONNECTOR HARDWARE. With all of the mounting holes drilled, Figure 1 at right shows how to install the railing connector hardware. You'll start by inserting the threaded insert portion of the connector into the hole drilled in the edge of the stile.

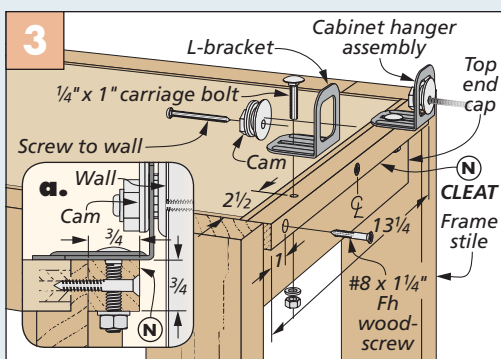
The threaded rod is then partially threaded into the insert in the stile. Now, simply line up the rail and stile so that the threaded rod slips into the hole in the end of the rail. The trick here is to leave just enough of the threaded rod extending into the hole in the back of the rail for the anchor to slide into place. Once the anchor starts threading onto the rod, a 4mm Allen wrench can be used to snug it up the rest of the way.

You don't have to go overboard on tightening these connectors. You just want to snug up the fasteners enough to hold the frames together while you attach them to the rest of the room divider.

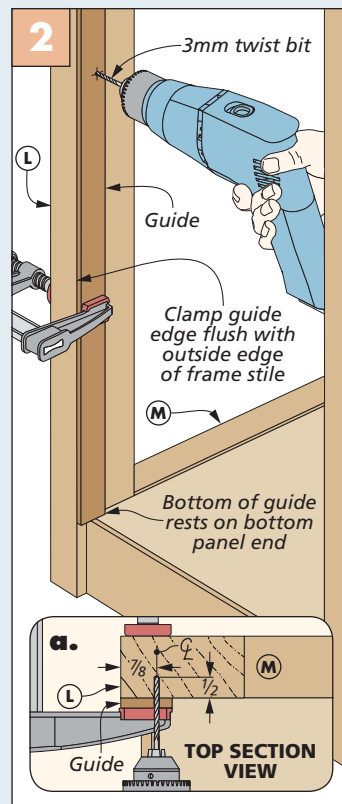
MORE SHELF PIN HOLES. Now is a good time to test the fit of the face frames by clamping them in position against the inner assembly. I took this opportunity to drill the remaining shelf pin holes in the face frame stiles using the drill guide (Figure 2). Be sure to orient the correct edge of the guide to the outside edge of the stile.



Install the Hardware. Follow the three steps above to install the hardware and assemble the two face frames.



Add Cabinet Hangers. A cleat attached to the top panel provides a surface for two cabinet hangers to be added to the unit.



Shelf Pin Holes. Position the drill guide and drill the shelf pin holes in the stiles.

FINISHING DETAILS. Before permanently attaching the face frames to the main assembly, I painted them black to contrast with the rest of the room divider. The paint and finishing information is listed in Sources on page 67.

Finally, the face frames are attached using screws through the top and bottom rails. Then secure the dust panel with screws, as well. To keep the room divider from tipping, I anchored my unit to the wall using cabinet hangers (Figure 3). **W**

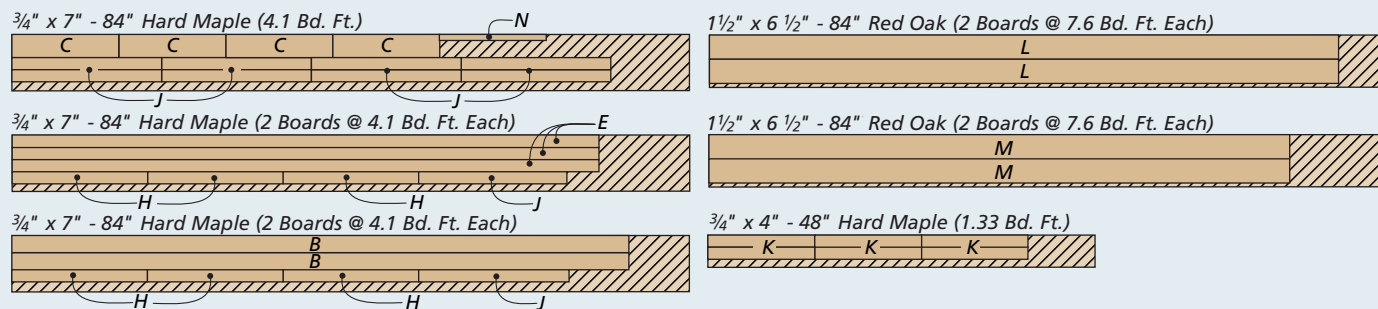
Materials, Supplies & Cutting Diagram

- A** Top/Btm. Panels (2) 3/4 ply. - 13 1/4 x 76 1/2
- B** Top/Btm. Edge Rails (4) 3/4 x 2 1/8 - 76 1/2
- C** Top/Btm. End Caps (4) 3/4 x 2 7/8 - 13 1/4
- D** Dividers (3) 1 1/2 ply. - 11 3/4 x 72 3/4
- E** Divider Edging (6) 3/4 x 1 1/2 - 72 3/4
- F** Dust Panel (1) 3/4 ply. - 12 3/4 x 76 1/2
- G** Center Shelves (6) 1 1/2 ply. - 11 3/4 x 16 13/16

- H** Center Shelf Edging (12) 3/4 x 1 1/2 - 16 13/16
- I** End Shelves (6) 1 1/2 ply. - 11 3/4 x 18 9/16
- J** End Shelf Edging (12) 3/4 x 1 1/2 - 18 9/16
- K** End Shelf Caps (6) 3/4 x 1 1/2 - 13 1/4
- L** Frame Stiles (4) 1 1/2 x 3 - 78
- M** Frame Rails (4) 1 1/2 x 3 - 72
- N** Cleat (1) 3/4 x 3/4 - 13 1/4

- (8) Railing Connectors
- (48) 3mm to 5mm Shelf Pins
- (47) #8 x 1 1/4" Fh Woodscrews
- (2) Cabinet Hangers w/Hardware

ALSO NEEDED: Four 48" x 96" sheets of 3/4" maple plywood





Multipurpose Small Parts Sled

Cutting a wide range of small parts accurately and safely on the table saw has never been easier. This handy sled takes care of the details.

The table saw is the shop workhorse for cutting workpieces to size. But for small workpieces, this can be a tricky operation. It becomes difficult to hold the piece securely and at times, the cutoff goes flying across the shop. This sled is scaled down to make cutting small parts easier.

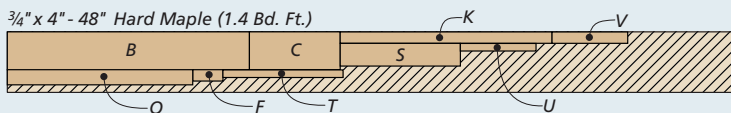
As a foundation, there's the basic sled you see on the opposite page. Like most sleds, adjustable runners on the bottom ensure a smooth, sliding fit in the miter slots on your table saw. The sled features a simple fence with a stop block for making square, repeatable crosscuts.

The real beauty of this simple design is the ability to add attachments for cutting miters, ripping thin stock, and cutting tiny parts to length. If your woodworking is on a smaller scale, this sled is an easy weekend project that's sure to see a lot of use in your shop.

Materials, Supplies & Cutting Diagram

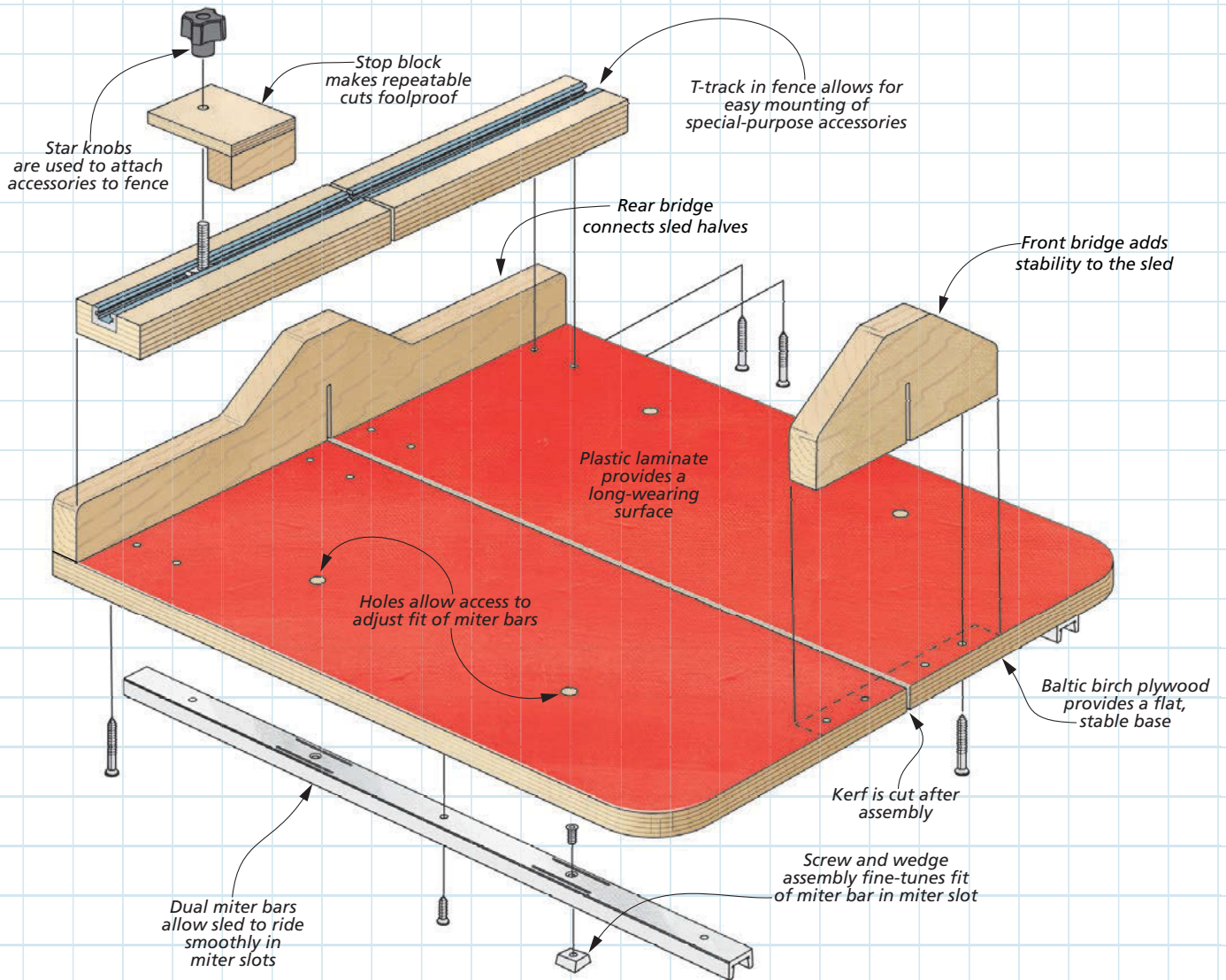
A Sled Base (1)	$\frac{1}{2}$ ply. - 16 x 18	L Holddown (1)	$\frac{1}{4}$ Hdbd. x $1\frac{3}{4}$ x 14	W Tray Top (1)	$\frac{1}{4}$ ply. - $7\frac{15}{16}$ x $2\frac{7}{8}$
B Rear Bridge (1)	$\frac{3}{4}$ x $2\frac{1}{2}$ - 16	M Fence Base (1)	$\frac{3}{4}$ ply. - 7 x $7\frac{15}{16}$	• (2) 24" x 24" Plastic Laminate	
C Front Bridge (1)	$\frac{3}{4}$ x $2\frac{1}{2}$ - 6	N Fence Top (1)	$\frac{1}{4}$ ply. - $7\frac{15}{16}$ x $8\frac{7}{8}$	• (2) 18" Inkra Miter Bars	
D Fence (1)	$\frac{3}{4}$ ply. - 2 x 16	O Small Parts Fence (1)	$\frac{3}{4}$ x 1 - $12\frac{1}{4}$	• (1) 24" T-Track	
E Stop Block Top (1)	$\frac{1}{4}$ ply. - 2 x $2\frac{5}{8}$	P Stop Top (1)	$\frac{1}{4}$ ply. - $\frac{3}{4}$ x 3	• (4) $\frac{1}{4}$ " - 20 x 1" Flange Bolts	
F Stop Block (1)	$\frac{3}{4}$ x $\frac{3}{4}$ - 2	Q Stop (1)	$\frac{1}{8}$ ply. - $1\frac{1}{4}$ x 3	• (4) $\frac{1}{4}$ " - 20 Star Knobs	
G Miter Fence Block (1)	$\frac{3}{4}$ ply. - 16 x $8\frac{3}{16}$	R Tray Base (1)	$\frac{1}{4}$ ply. - $7\frac{15}{16}$ x 7	• (3) $\frac{1}{4}$ " - 20 Threaded Inserts	
H Miter Fence Top (1)	$\frac{1}{4}$ ply. - 16 x $10\frac{1}{16}$	S Tray Back (1)	$\frac{3}{4}$ x $1\frac{1}{2}$ - $7\frac{15}{16}$	• (3) $\frac{1}{4}$ " - 20 x $\frac{3}{4}$ " Knurled Thumbscrews	
I Rip Fence Block (1)	$\frac{3}{4}$ ply. - 6 x 14	T Tray Front (1)	$\frac{3}{4}$ x $\frac{1}{2}$ - $7\frac{15}{16}$	• (8) #8 x 1" Fh Woodscrews	
J Rip Fence Top (1)	$\frac{1}{4}$ ply. - 6 x $15\frac{7}{8}$	U Tray Side (1)	$\frac{3}{4}$ x $\frac{1}{2}$ - 5	• (6) #6 x $\frac{1}{2}$ " Rh Woodscrews	
K Hold-down Bar (1)	$\frac{3}{4}$ x $\frac{3}{4}$ - 14	V Tray Ramp (1)	$\frac{3}{4}$ x $\frac{3}{4}$ - 5	• (8) #8 x $\frac{1}{4}$ " Fh Woodscrews	

$\frac{3}{4}$ " x 4" - 48" Hard Maple (1.4 Bd. Ft.)



ALSO NEEDED: One 24" x 24" sheet of $\frac{3}{4}$ " Baltic birch plywood, One 24" x 24" sheet of $\frac{1}{2}$ " Baltic birch plywood, One 24" x 48" sheet of $\frac{1}{4}$ " Baltic birch plywood, One 12" x 12" sheet of $\frac{1}{8}$ " Baltic birch plywood, One 12" x 24" sheet of $\frac{1}{4}$ " hardboard

Construction Overview / OVERALL DIMENSIONS: 16"W x 3³/₈"H x 18"D



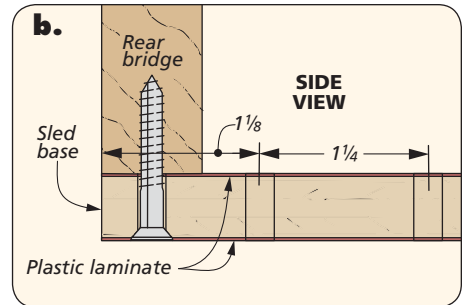
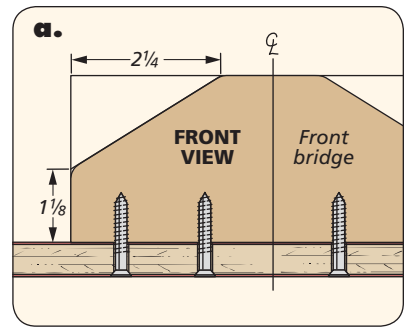
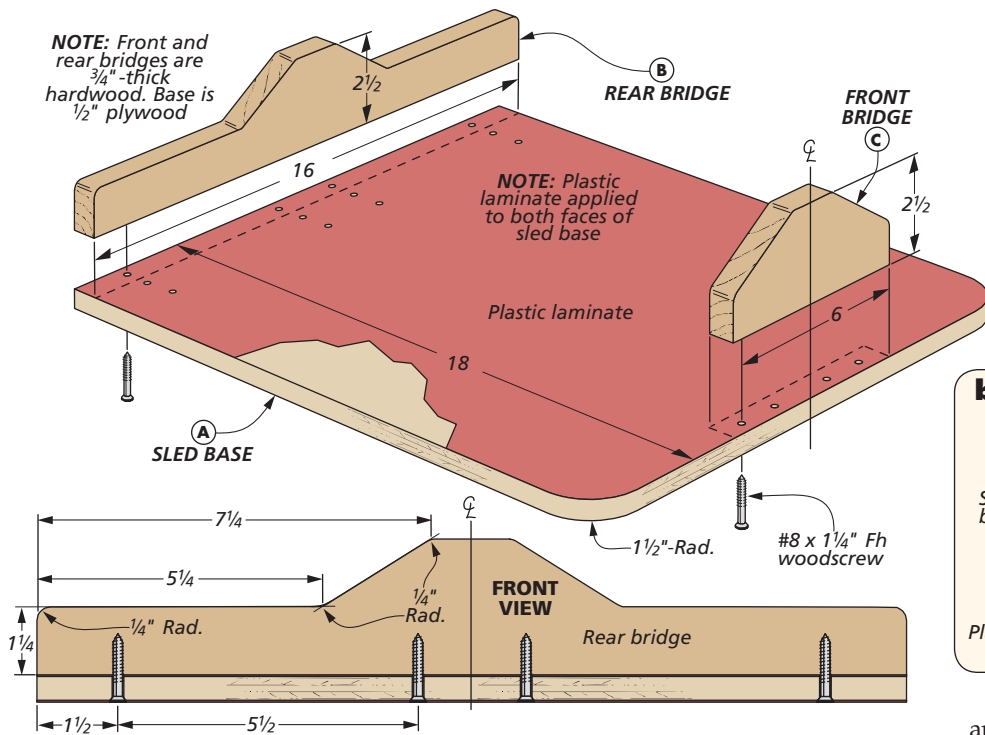
▲ Cutting miters on small frame parts is a snap with a pair of auxiliary miter fences.



▲ Rip narrow, thin stock safely using the rip fence attachment with a built-in hold-down.



▲ A simple fence with a stop block makes square crosscuts on small parts a sure thing.



start with a BASIC SLED

This sled isn't too much different than most table saw sled designs, but it's scaled down to make cutting small parts simple. Two miter bars under the laminated plywood base register the sled on the saw for smooth operation through the cut. A fence with T-track and a stop ensure consistency in the precision of each cut on duplicate parts.

LAMINATED BASE. I started by building the base out of $\frac{1}{2}$ " Baltic birch plywood.

But there's one thing I need to mention before you turn on the saw. Take some extra time to ensure your saw is tuned up for making square cuts. It's important that the side edges of the base are square to the back edge. When you're ready, cut the base to size. After this, round off the two front corners and sand them smooth, as shown above.

Plastic laminate adds a tough, long-wearing surface to the top and bottom of the base. I used spray contact adhesive to attach oversized pieces of laminate to both faces of the base. To trim the laminate flush, you might find it easier to

apply one piece of laminate and then trim it flush before applying the other piece.

FRONT & REAR BRIDGES. You'll be cutting through the base of the sled the first time you use it. To keep the sled together, the bridge pieces connect the two halves of the sled, as illustrated above.

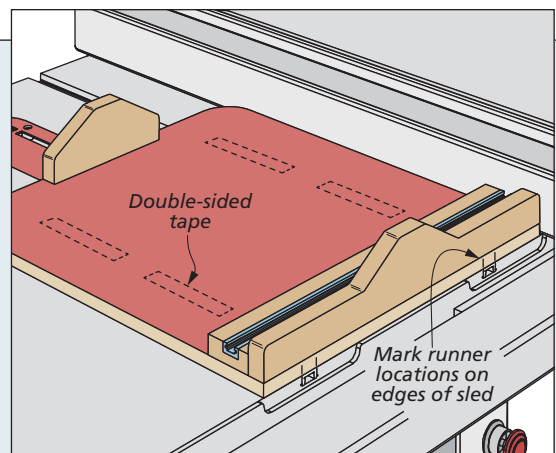
Both bridges are cut to size from $\frac{3}{4}$ "-thick stock. After shaping them, use screws through countersunk holes to fasten them to the base from the bottom, as shown in details 'a' and 'b.'

While you're at it, drill the holes used to attach the fence you'll make later. Then you can install the bridges, taking the time to ensure they're flush with the front and back edges of the base. It's important that the rear bridge is square to the edge

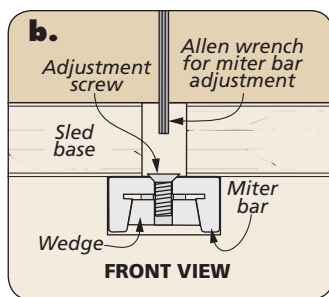
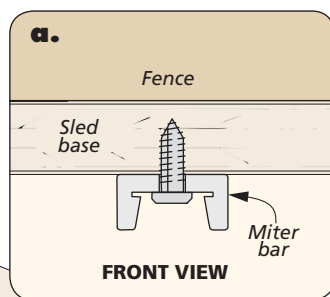
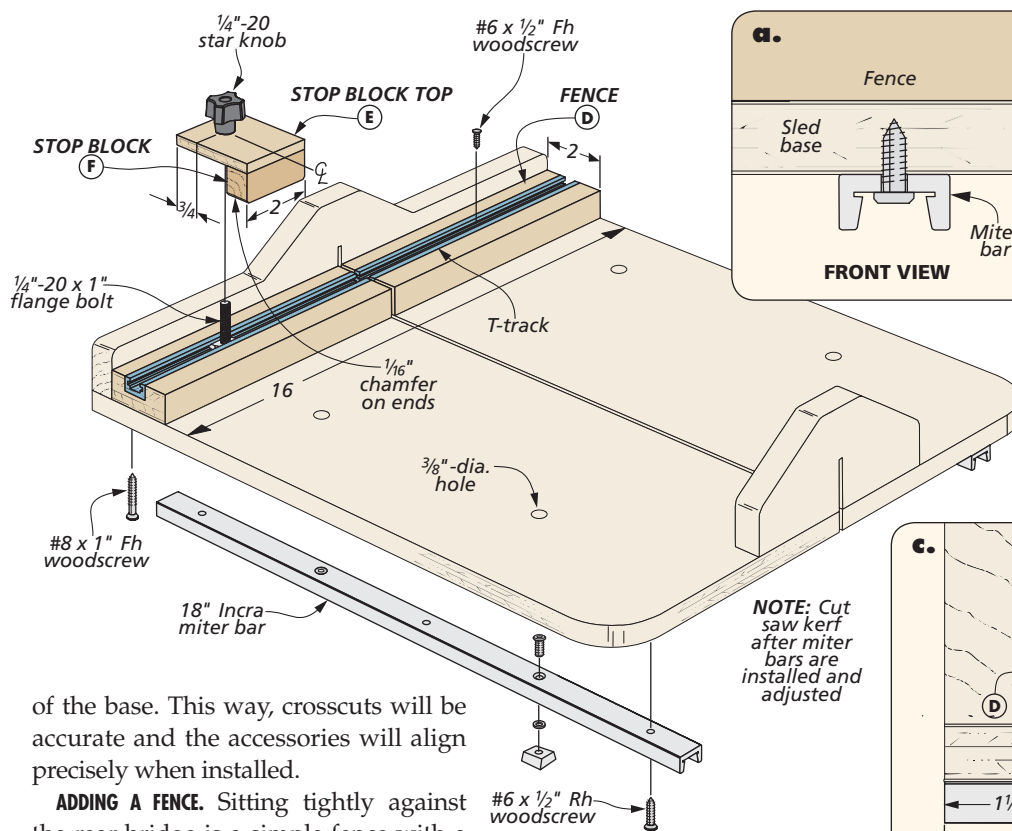
How-To: MITER BAR INSTALLATION

The *Inkra* miter bar shown on the left features a simple mechanism for adjusting the bar to obtain a perfect fit in the miter slot. A screw pulls a wedge against the tapered sides of the miter bar to expand them slightly. The illustrations on the right step you through the process of locating and installing the miter bars so that the sled is centered on the blade.

It starts by placing the sled against the rip fence and adjusting the rip fence to center the sled. Use double-sided tape on top of the miter bars to temporarily position them for locating the screw and access holes. Then you can mark and drill the holes.



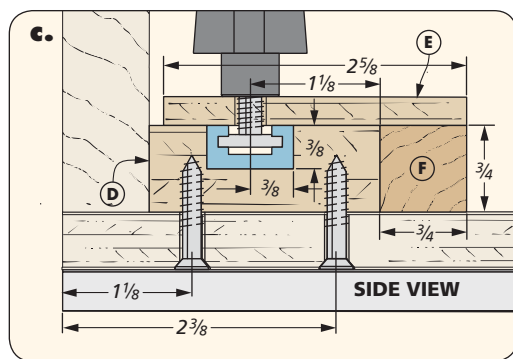
Locating the Bars. Align the ends of the miter bars and sled with the back edge of the saw before lowering the sled onto the miter bars.



NOTE: Locate access holes for miter bar adjustment screws after miter bars are positioned on sled (see box below)

NOTE: Stop block made from 3/4" -thick hardwood. Stop block top made from 1/4" plywood. Fence made from 3/4" plywood

NOTE: Cut saw kerf after miter bars are installed and adjusted



of the base. This way, crosscuts will be accurate and the accessories will align precisely when installed.

ADDING A FENCE. Sitting tightly against the rear bridge is a simple fence with a T-track, as shown above. A stop and a variety of accessories can be attached to the fence depending on the type of cuts you need to make.

The fence body is made from 3/4" Baltic birch plywood. Before you cut the groove for the T-track, take a look at detail 'c.' You'll notice that the track is offset from the centerline of the fence. After installing the T-track, clamp the fence tight to the bridge and base before installing screws from the underside of the sled.

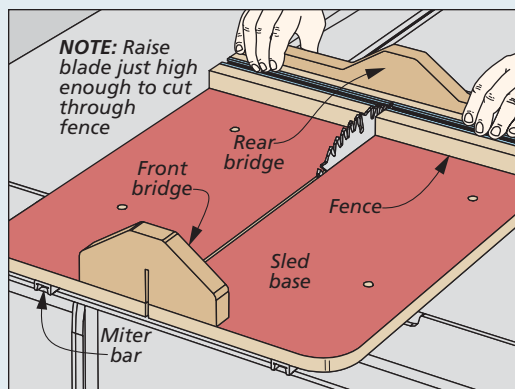
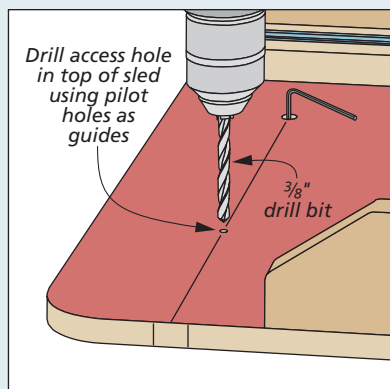
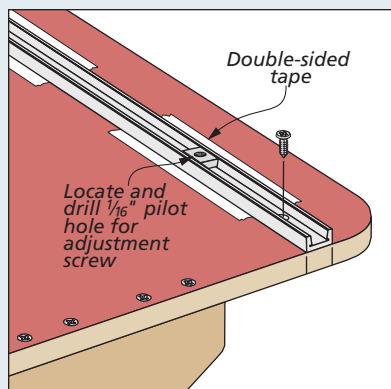
ADJUSTABLE STOP. A sliding stop makes repeatable crosscuts accurate and easy. The two-part construction is simple to

make, as you can see in the main drawing above and in detail 'c.' Install the stop in the T-track with a flange bolt and knob.

INSTALLING THE MITER BARS. When using the sled, its centerline should be aligned with the table saw blade. This means the location of the miter bars depend on where your saw's miter slots are positioned in relation to the blade. The box below steps you through the process of centering the sled on the blade, plus locating and installing the miter bars.

I used a pair of miter bars to make sure the sled runs straight in the miter slots.

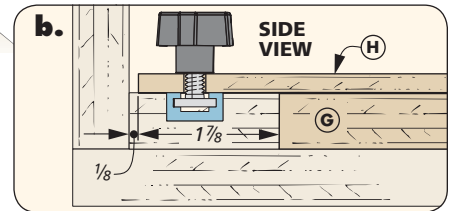
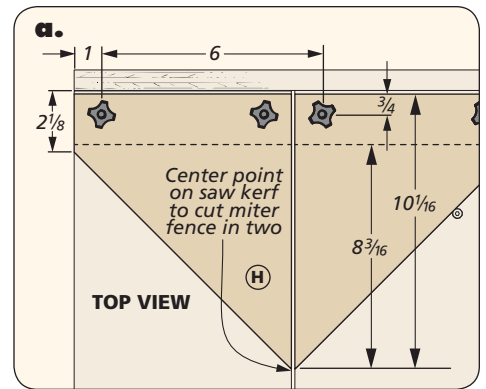
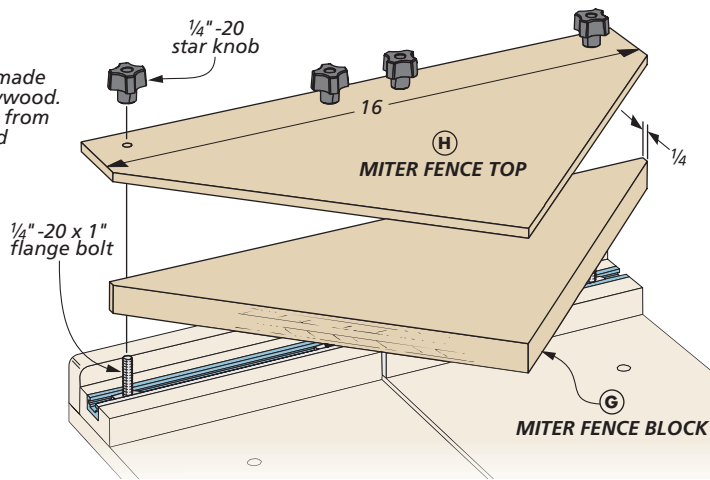
The *Incra* miter bars include wedge-shaped adjusters that allow you to fine-tune the fit of the bar in the miter slot. For smooth-sliding operation, you'll also need to locate and drill holes through the sled to be able to access the adjustment screws, as seen above. I did this by marking the screw location on the bottom of the sled, removing the miter bars, and then drilling a small pilot hole through the sled. This way, you can enlarge the hole from the top to avoid chipping the laminate when drilling.



Drilling Holes. With the miter bars temporarily attached, mark and drill the holes used to fasten the bars to the sled. Before permanently attaching the miter bars, locate and drill access holes for the adjusters.

Square Cut. After the miter bars are attached and adjusted, make a shallow pass to cut through the sled base, fence, and T-track.

NOTE: Top made from 1/4" plywood. Block made from 3/4" plywood



specialized ADD-ONS

With the basic sled you're all set to cross-cut small parts to length on your table saw. But I've added a few special accessories that make the sled even more functional. The first is a pair of miter fences to aid in cutting miter joints. Next is a hold-down that allows you to use the sled to rip narrow workpieces from thin stock. Finally, for extra-small pieces that are hard to crosscut and corral on the table saw, there's a small platform and tray to catch the cutoffs.

MITER FENCES

Cutting miter joints on small parts can be tricky. The miter fences shown above make this task easier. You start by making the triangular fence block and then adding the top to create a single unit you'll cut in two later. The top overhangs the fence on the sled so it can be attached with star knobs, as in detail 'b.'

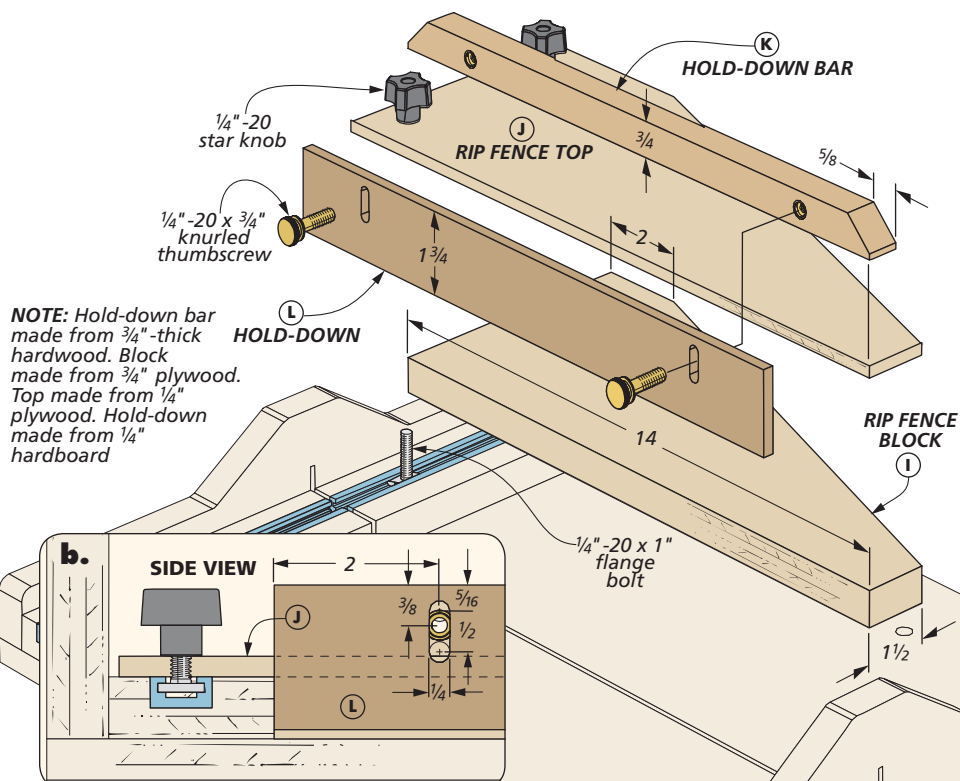
The only trick in making these two parts is to make sure the sides are 45° to the back edge. After gluing the top to the block, sand all of the edges smooth and then drill the four holes used to attach them to the sled's fence.

Center the miter fence assembly on the sled, aligning the tip with the center of the kerf in the sled. Secure all of the knobs

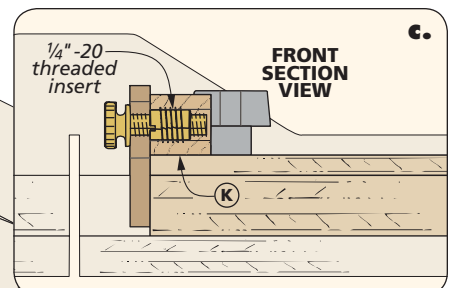
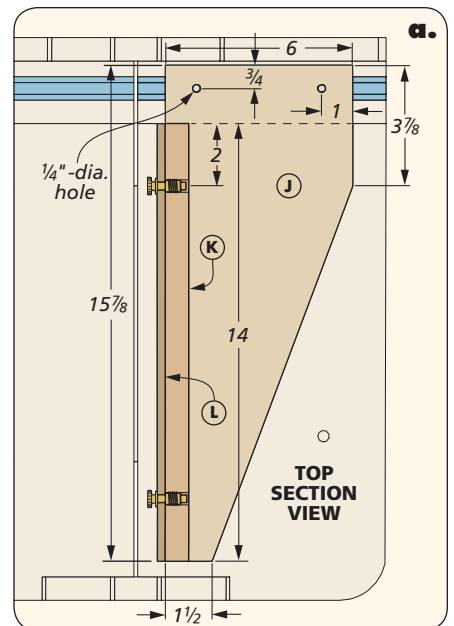
and slide the sled through the saw to cut the miter fences into a matching pair, as illustrated in detail 'a.'

HOLD-DOWN & RIP FENCE

The next accessory to build is a hold-down assembly you can use for ripping thin stock to width. The hardboard



NOTE: Hold-down bar made from 3/4"-thick hardwood. Block made from 3/4" plywood. Top made from 1/4" plywood. Hold-down made from 1/4" hardboard



hold-down keeps the workpiece steady during the cut (refer to the photo on page 37). Construction starts out similar to the miter fences, as illustrated in the drawing at the bottom of the opposite page. The rip fence top caps off the rip fence block.

I started with rectangular blanks for the block and top, cutting them to overall size. After gluing the top to the block and allowing for the overhang, I cut the tapered edge and sanded it smooth. Details 'a' and 'b' provide all of the dimensions. Drilling the holes used to fasten the assembly to the sled is next.

The hardboard hold-down is fastened to a hold-down bar. This bar is in turn glued to the top of the rip fence assembly. After cutting the bar to size and beveling the ends, I installed a pair of threaded inserts. Thumbscrews secure the hold-down in these inserts.

Next, glue the bar to the top of the rip fence assembly. The hold-down is cut and then slotted for the thumbscrews. Create the slots by drilling overlapping holes and filing them smooth.

making two assemblies: The fence with a stop and the tray assembly.

FENCE & STOP ASSEMBLY. The fence and stop assembly is simple to make, but there are a couple of key things to keep in mind as you go along.

I started with the fence base and added the plywood top. As before, the top overhangs the base to allow attachment to the sled's fence. Just drill the two holes.

The small parts fence is cut to size before you install a threaded insert. The insert is for a small, sliding stop. Glue the fence to the platform, making sure it's square to the blade with the platform installed on the sled. The stop comes next. Its top is slotted to allow for small adjustments. The stop itself is beveled on one end to avoid trapping the workpiece, as you can see in detail 'b' below.

SIMPLE BOX. The tray is made up of $\frac{3}{4}$ "-thick hardwood sides glued to a $\frac{1}{4}$ " plywood base. One end of the tray is beveled to act as a ramp to guide cutoffs into the tray. I rabbeted the tray back to accept the top that connects the tray to



▲ The auxiliary fence platform and tray allow you to cut extra-small parts safely while collecting them in the tray.

the fence on the main sled. I glued the sides to an oversized piece of plywood that forms the base, making sure the sides were square. Once the glue dries, you can trim the plywood flush.

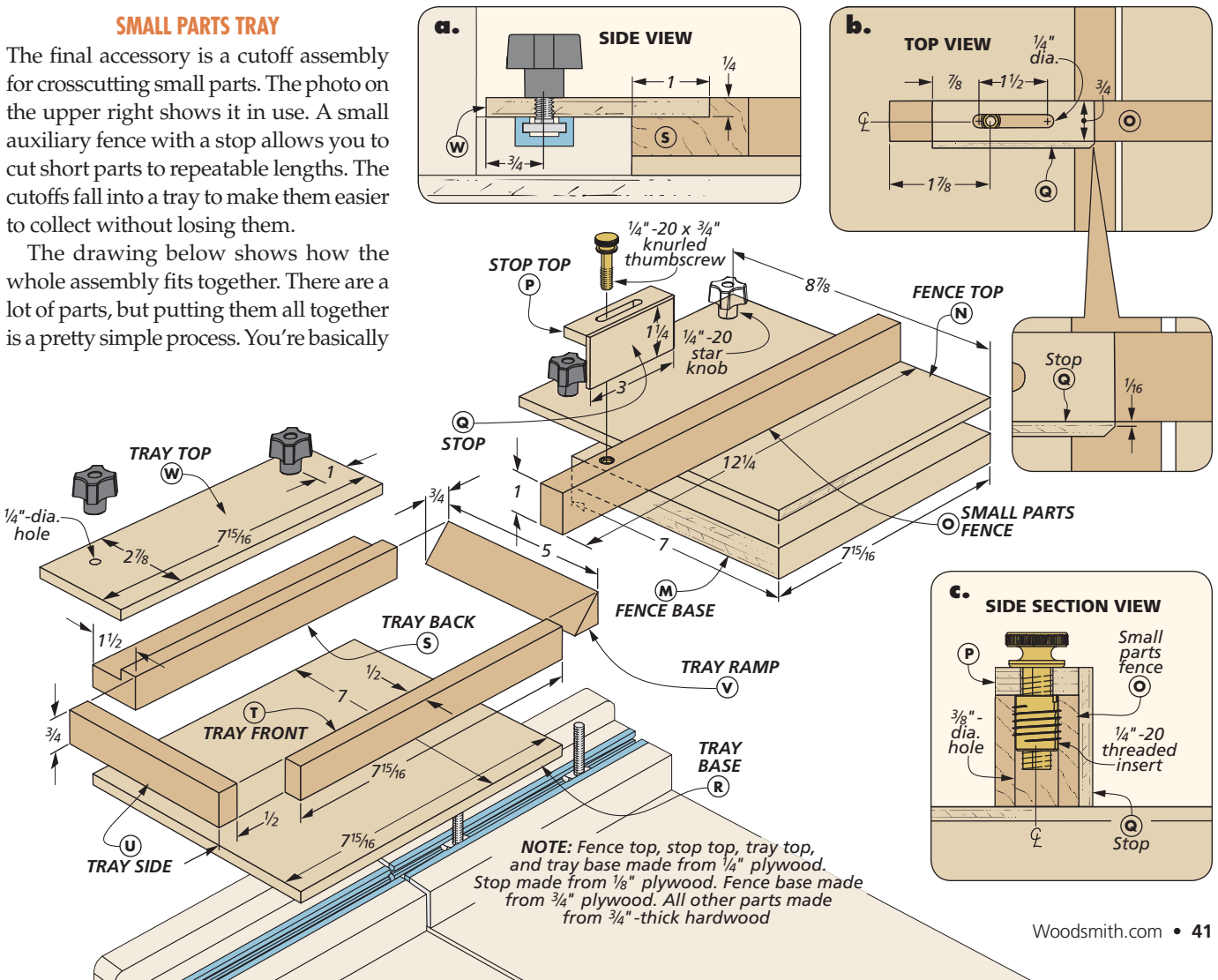
To finish off the tray, the tray top comes next. Cut it to size, drill a pair of holes, then glue it to the tray back.

With your sled complete, cutting small parts is easy and hassle-free. **W**

SMALL PARTS TRAY

The final accessory is a cutoff assembly for crosscutting small parts. The photo on the upper right shows it in use. A small auxiliary fence with a stop allows you to cut short parts to repeatable lengths. The cutoffs fall into a tray to make them easier to collect without losing them.

The drawing below shows how the whole assembly fits together. There are a lot of parts, but putting them all together is a pretty simple process. You're basically





Dining Room Buffet

Complete your heirloom cherry dining room set with this stylish buffet. It lends ample storage and a large serving area for all your gatherings.

In the last two issues of *Woodsmith*, we've provided plans for a dining room table, a set of chairs, and a china hutch (refer to the photo on the opposite page). In this issue, this latest dining room suite of furniture comes to a close with the cherry buffet you see here.

VERSATILE FURNITURE. All four of the furniture pieces are designed to go great with one another in any dining room setup. And the buffet is no exception. But if

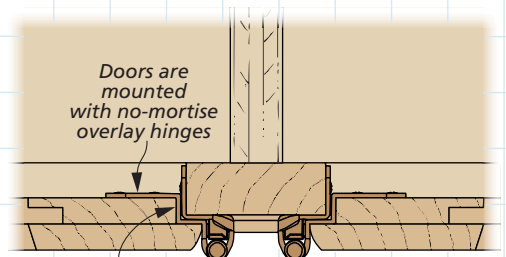
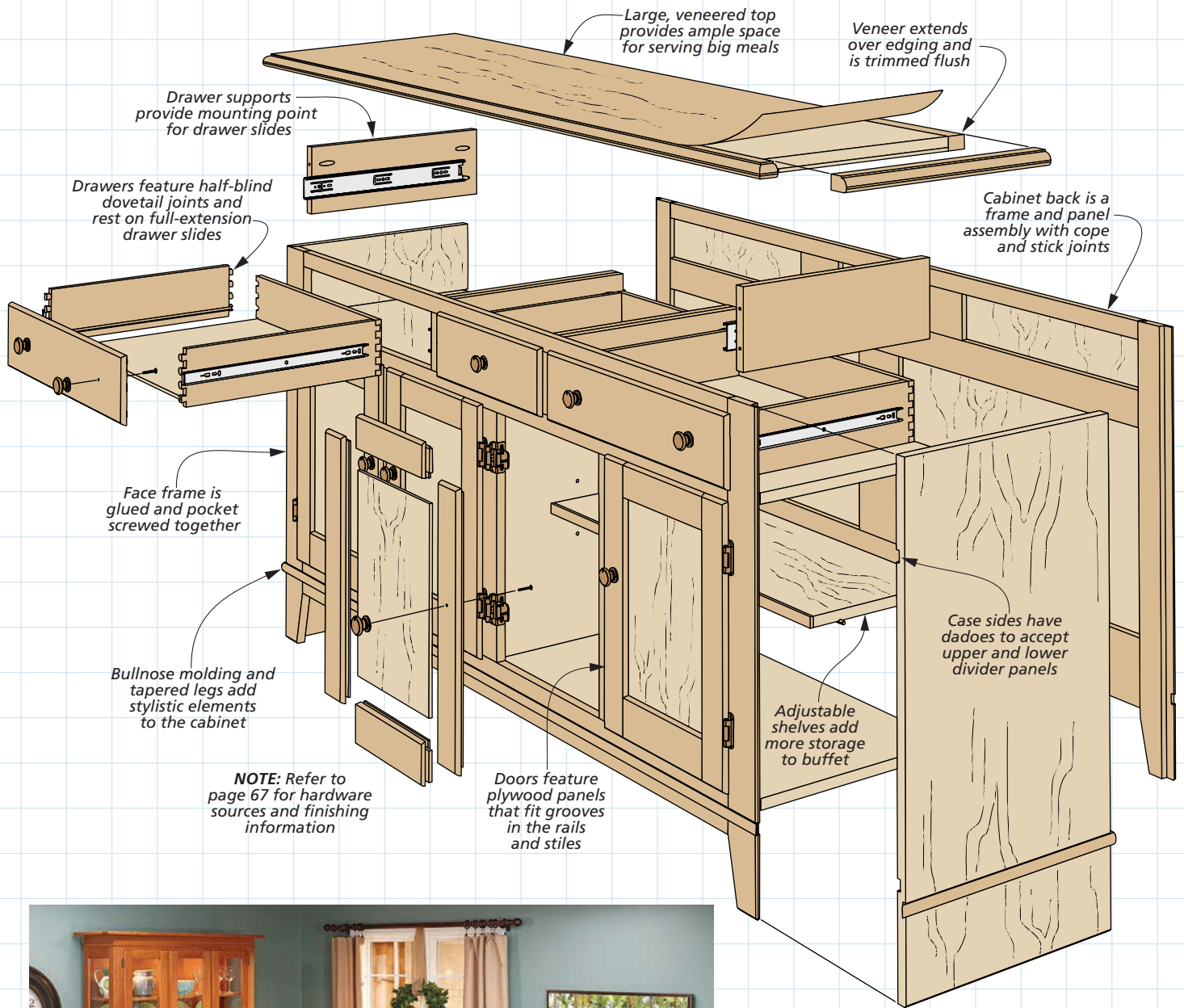
you lack the space or budget to build the entire set, then this buffet is worth a closer look as a stand-alone piece. With its sleek appearance, ample storage space, and large serving area on the top, it would be a useful addition in almost any home's dining room.

EASY TO BUILD. If you saw the china hutch in the last issue, then this buffet should look pretty familiar. It shares a number of design details with the lower cabinet

of the hutch. Those include doors and a back assembly that are joined with cope and stick joints, drawers assembled with half-blind dovetails, and a veneered top panel.

The buffet is wider than the hutch, however, and it features three drawers for storage. And, of course, the wide, deep top is open, which makes it a great serving area for big meals and a nice-looking display area the rest of the time.

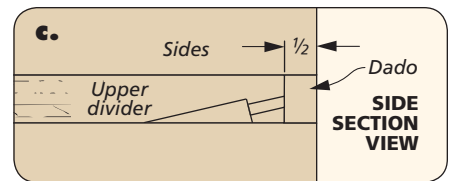
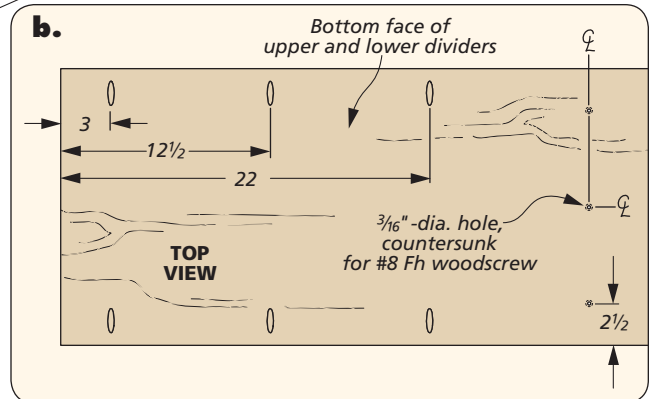
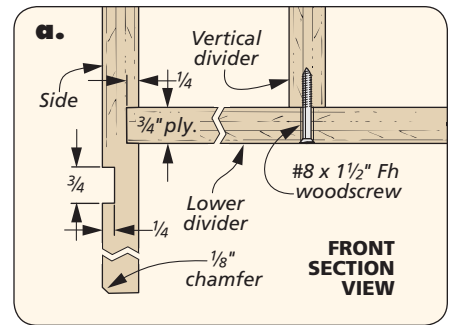
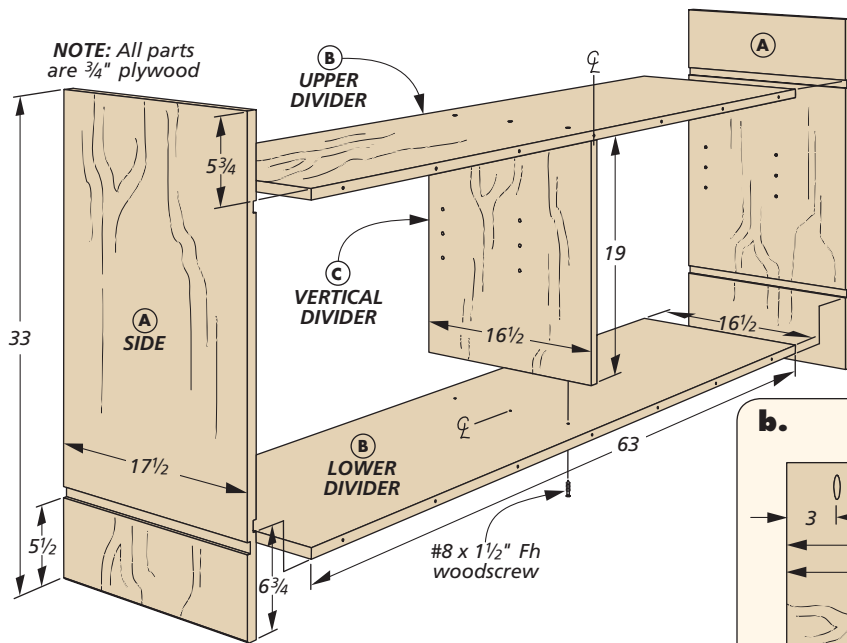
Construction Overview / OVERALL DIMENSIONS: 68"W x 34"H x 19¼"D



TOP SECTION VIEW



▲ The buffet is just one of the projects in our most recent suite of dining room furniture. To find in-depth plans for the table, chairs, and china hutch shown here, go to WoodsmithPlans.com.



Build a sturdy CASE

The case structure is a good place to start work on the dining room buffet. It's made up of two sides and upper, lower, and vertical dividers cut from cherry plywood.

You can cut the sides and upper and lower dividers to final size at this point, but hold off on cutting the vertical divider to final length until after assembly. Note that the sides are an inch wider than the dividers (drawing above).

DADOES. You'll notice that the side panels each have three dadoes. Two of the dadoes are on the inside face to accept the upper and lower dividers. And one dado on the outside face holds a strip of decorative bullnose molding. Cutting these dadoes is simple at the table saw.

Just set up a dado blade to match the thickness of $\frac{3}{4}$ " plywood, and pass the pieces over the blade.

POCKET HOLES. You're just about ready to join the sides with the upper and lower dividers. But first, drill a series of pocket holes in the lower faces of both divider panels (detail 'b'). Later on, these will be used to lock the face frame and back assembly in place. I also drilled three countersunk holes centered on the length of the panels. These holes are used to secure the vertical divider with screws.

ASSEMBLY. Now you can join the sides to the upper and lower divider with glue and clamps. Note that the edges

of the upper and lower dividers are centered on the width of the sides (refer to detail 'c' above). You can use temporary spacers to set this distance as you assemble the case.

With the case assembled, it's time to measure and cut the vertical divider to final length to fit between the upper and lower dividers. Center the panel in the case, and transfer the pilot holes from the top and bottom into the divider. Then use woodscrews to secure it.

SHELF PIN HOLES. The basic case is nearing completion. All that's left before getting started on building the face frame is a series of holes in the sides and vertical divider for shelf pins.

These holes need to align perfectly from panel to panel in order for the shelves to sit level. I accomplished this goal by creating a drilling template, as shown in the box at left. To make it, simply cut a piece of hardboard to size, and drill the holes as shown. Then use the template as a guide as you drill the holes in the case sides and vertical divider.

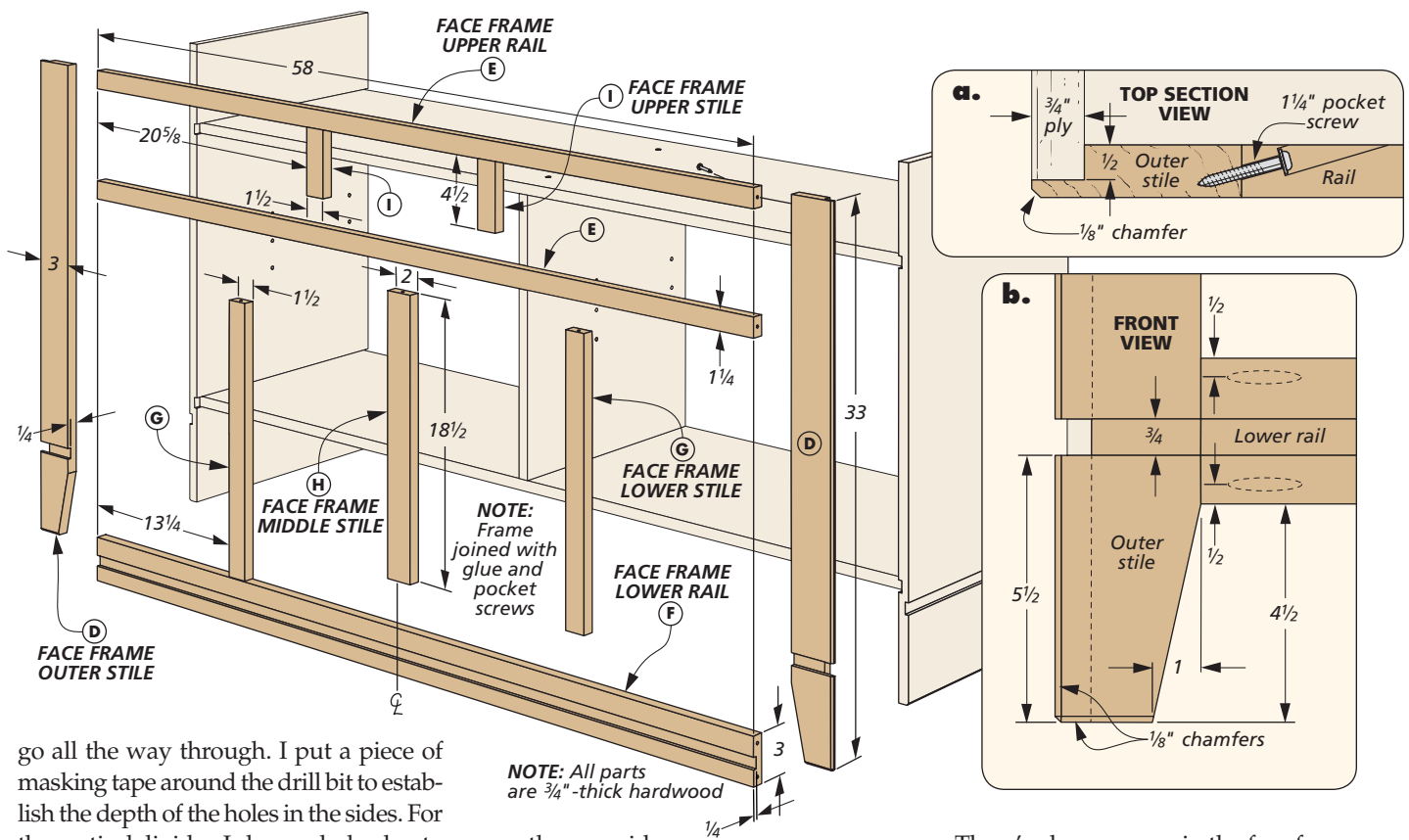
Note that the holes in the sides are $\frac{3}{8}$ " deep, while those in the vertical divider

How-To: DRILL SHELF PIN HOLES

Drilling Template. This hardboard template ensures consistent holes in the sides and divider. Just align it as detailed above and drill $\frac{3}{8}$ " deep into the case sides. On the vertical divider, use a backer and drill all the way through.

NOTE: Align template flush with back edge of lower divider (case side will overhang by $\frac{1}{2}$ ")

a. Masking tape, $\frac{1}{4}$ " bit, $\frac{3}{8}$ "



go all the way through. I put a piece of masking tape around the drill bit to establish the depth of the holes in the sides. For the vertical divider, I clamped a backer to the opposite face of the divider to prevent blowout on the back side of the holes.

FACE FRAME. You're now ready to turn your attention to the face frame of the case, which is shown in the drawing above. It's a series of rails and stiles that are joined with glue and pocket screws.

I started by cutting the outer stiles to final size before cutting the other parts to length. This way, I could position the outer stiles over the case sides and measure for the parts that fit in between.

First, you'll want to cut the rabbet on the outside edges of the stiles that fits

over the case sides, as shown in the lower left drawing. This is easy to do by burying a dado blade in an auxiliary rip fence at the table saw.

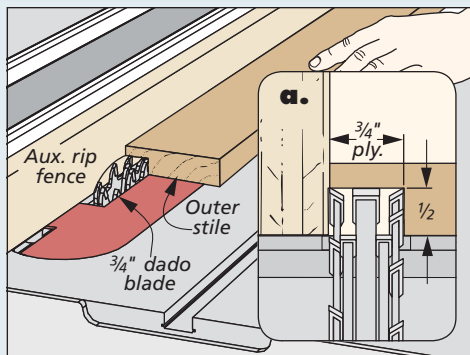
Next, cut a dado near the bottom end of each stile to accept the bullnose molding. Lay out and cut a taper on the bottom end of each outer stile at the band saw, and chamfer the outside edge and bottom end of each (refer to detail 'b' above).

With the outer stiles complete, clamp them in position on the case and measure between them to determine the final length of the rails. Cut these to size, as well as the upper and lower stiles.

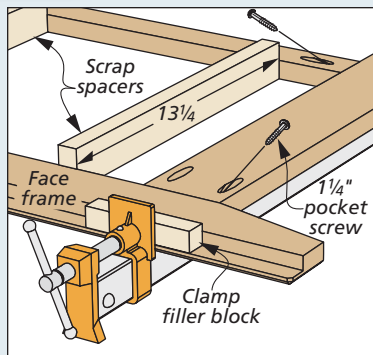
There's also a groove in the face frame lower rail. This matches the dadoes in the outer stiles to accept the bullnose molding. Cut this using a dado blade.

FACE FRAME ASSEMBLY. It's time to drill pocket holes in all the rails and the upper and lower stiles. Then assemble the face frame with glue, pocket screws, and clamps (middle drawing below). Use spacers to establish the openings correctly in the frame, and keys to align the dadoes and groove. Finally, glue and clamp the face frame to the front of the case and drive in pocket screws to secure it (lower right drawing).

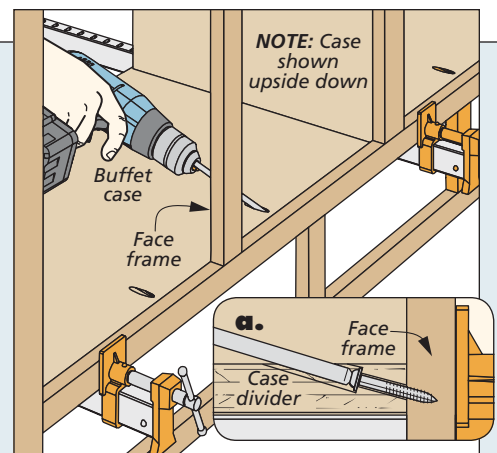
How-To: ADD THE FACE FRAME



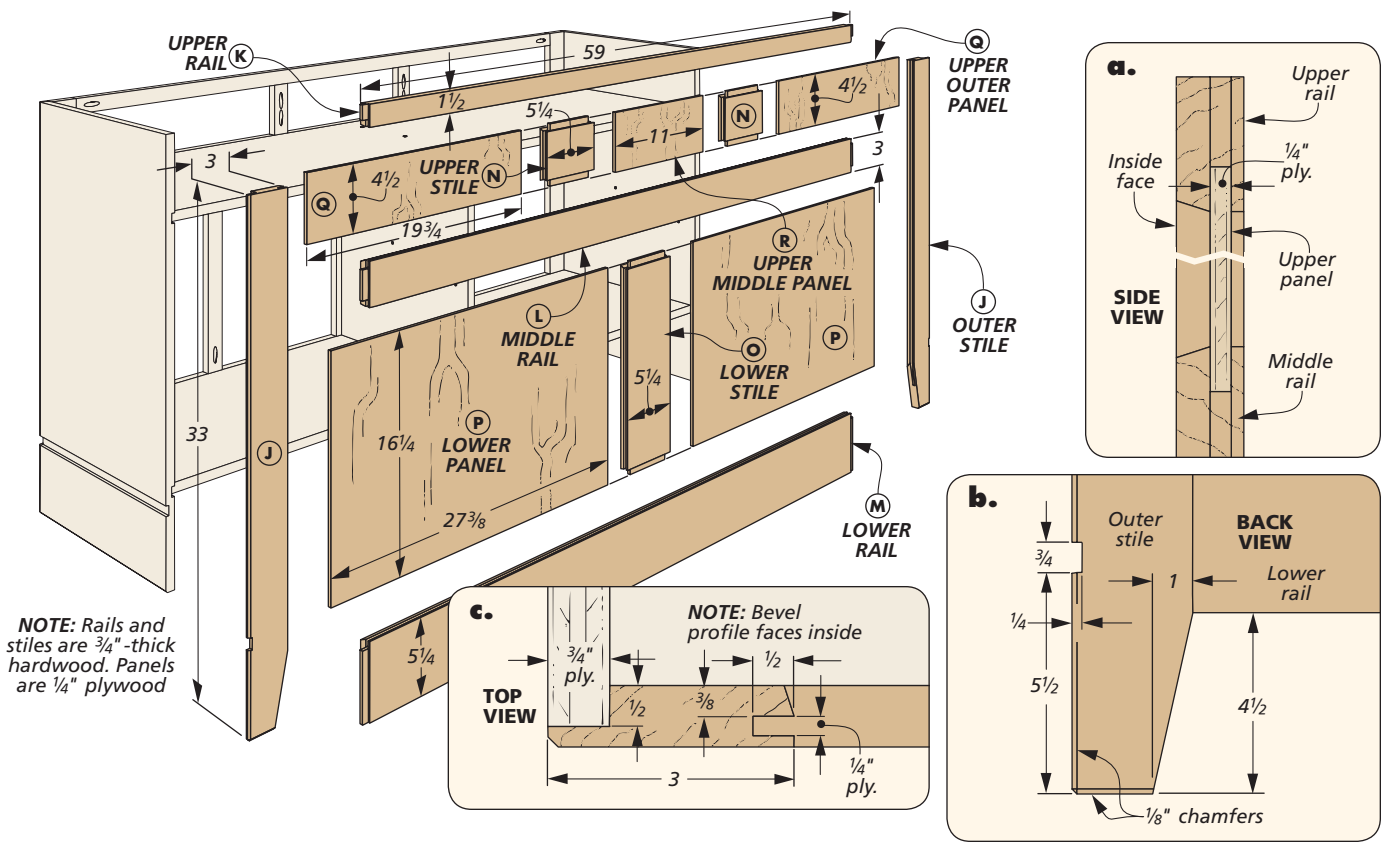
Rabbet Stiles. Bury a dado blade in a wood auxiliary fence and then cut a rabbet on the edge of the outer stiles.



Assembly. Join the face frame with glue, clamps, and pocket screws. Use spacers for the openings.



Face Frame to Cabinet. Glue and clamp the face frame to the case, and then drive in pocket screws to secure it to the cabinet.



Add the **BACK & SHELVES**

The back of the buffet is a little more elaborate than just an ordinary piece of plywood. Rather, it's a frame and panel assembly that's designed to look great when the doors of the cabinet are open. It's made of solid cherry rails and stiles that surround $\frac{1}{4}$ " plywood panels.

As with the face frame shown on the previous page, you'll begin by cutting the outer stiles to their final dimensions. Then cut the rabbets on the edges and chamfer the outside edges and bottom ends.

Finally, trim the tapers on the bottom of the stiles at the band saw.

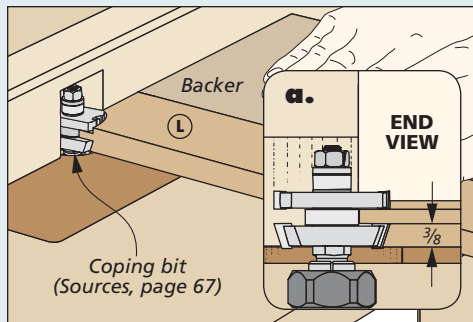
With the outer stiles complete, you can clamp them in place on the case, just as you did with the face frame, and measure for the other frame components of the back. Then cut the three rails and three additional stiles to size. You're now ready to get set up for the joinery that will bring these rails and stiles together.

COPE & STICK JOINERY. To join the rails and stiles and create grooves for the panels,

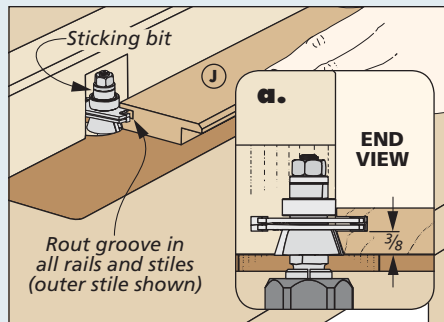
I used a cope and stick joint. The box at the bottom of the page walks you through the process. The joinery technique requires a pair of router bits for cutting mating joints on the parts. First, you use the coping bit to cut the stub tenons on the ends of the rails and inner stiles. And then you switch to a sticking bit to cut the grooves and mating profile on the edges of all of the parts.

The key to a successful cope and stick joint is to make plenty of test cuts, and take your time to get the bit settings just right, particularly the thickness of the

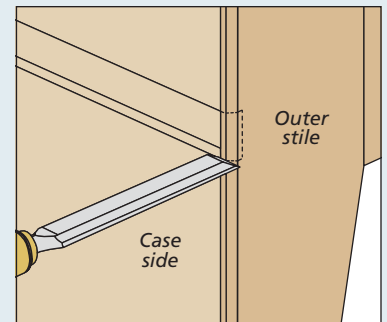
How-To: ASSEMBLE THE BACK



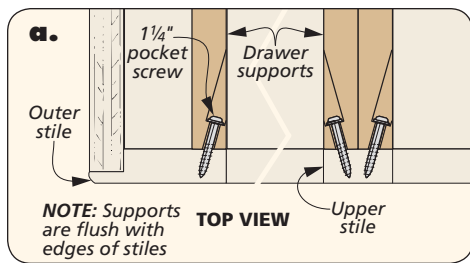
Coping Bit. Use the coping bit to cut the ends of the rails and upper and lower stiles. A backer holds the pieces square as you cut.



Sticking Bit. After setting the height of the sticking bit to cut a mating groove, rout the edges of all the parts with the bit.



Chisel Notch. After the back is installed, notch the outer stile to match the dado for the molding.



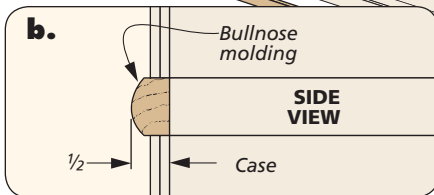
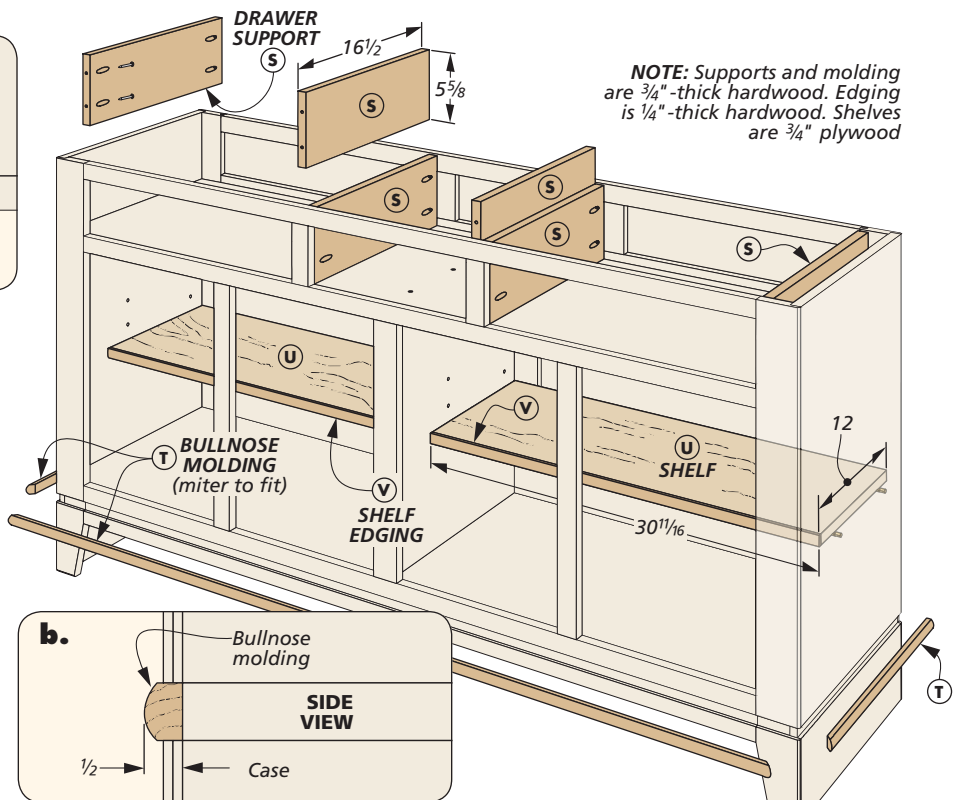
stub tenon so it matches the plywood. Once you get the cut right with the coping bit, though, you can use the piece to set the height of the sticking bit.

COMPLETE THE BACK. After achieving a nice fit, you can dry fit the assembly, and measure for the plywood panels. As you cut all five of them to size, note that the grain runs vertically on all the panels. Now glue up the assembly.

Once the glue on the back has dried, you can attach it to the case, again using glue and clamps. As with the face frame on the previous page, you'll drive pocket screws through the holes in the upper and lower dividers and into the rails of the back assembly. Finish by trimming a notch in the outer stiles for the bullnose molding (lower right drawing, opposite page).

DRAWER GUIDE SUPPORTS. When it's complete, the cavity at the top of the buffet cabinet holds three dovetailed drawers mounted on full-extension drawer slides. Drawer guide supports provide a surface for attaching the slides.

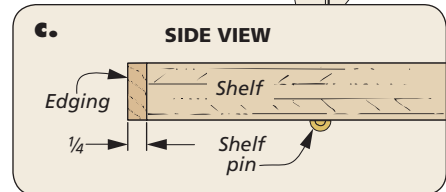
These supports are just hardwood pieces installed in the top of the cabinet with pocket screws. The four center supports align perfectly behind the upper stiles of the face frame. The outer



supports align with the inside edge of the outer stiles (refer to detail 'a').

BULLNOSE MOLDING. Before moving on to the drawers, I took a little time to finish out the exterior of the cabinet. One detail is the decorative strips of bullnose molding that fit the dadoes and grooves near the bottom of the cabinet (detail 'b').

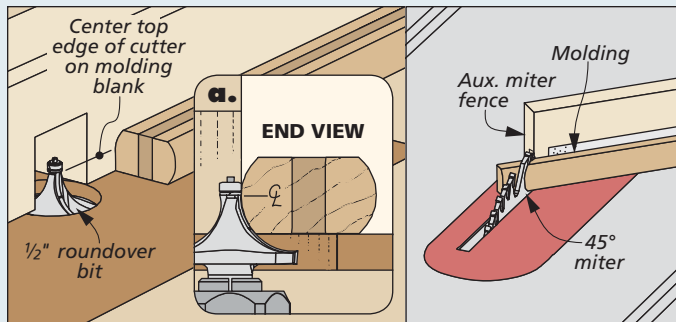
To make the molding, plane some extra-long, extra-wide blanks down to fit the dadoes and grooves in the cabinet. Now head to the router table, and center the top edge of the cutter on a 1/2" roundover bit on the thickness of the blank. Make two passes on each edge



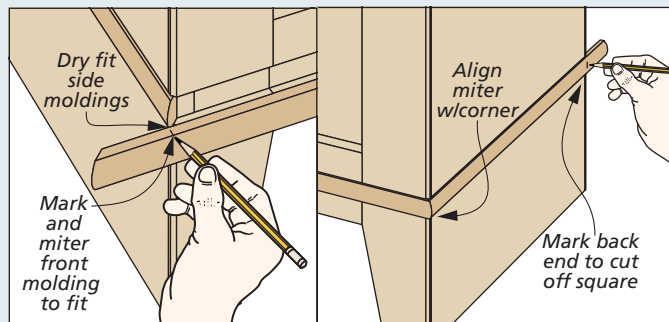
of the blank. Then rip the strips free to form two pieces of bullnose molding. The molding is mitered to fit in the dadoes and grooves on the bottom of the buffet (see the drawings below).

SHELVES. The shelves that fit behind the doors are simply cut to size from cherry plywood. Then glue a cherry edging strip to the front (detail 'c' above).

How-To: ADD THE BULLNOSE MOLDING

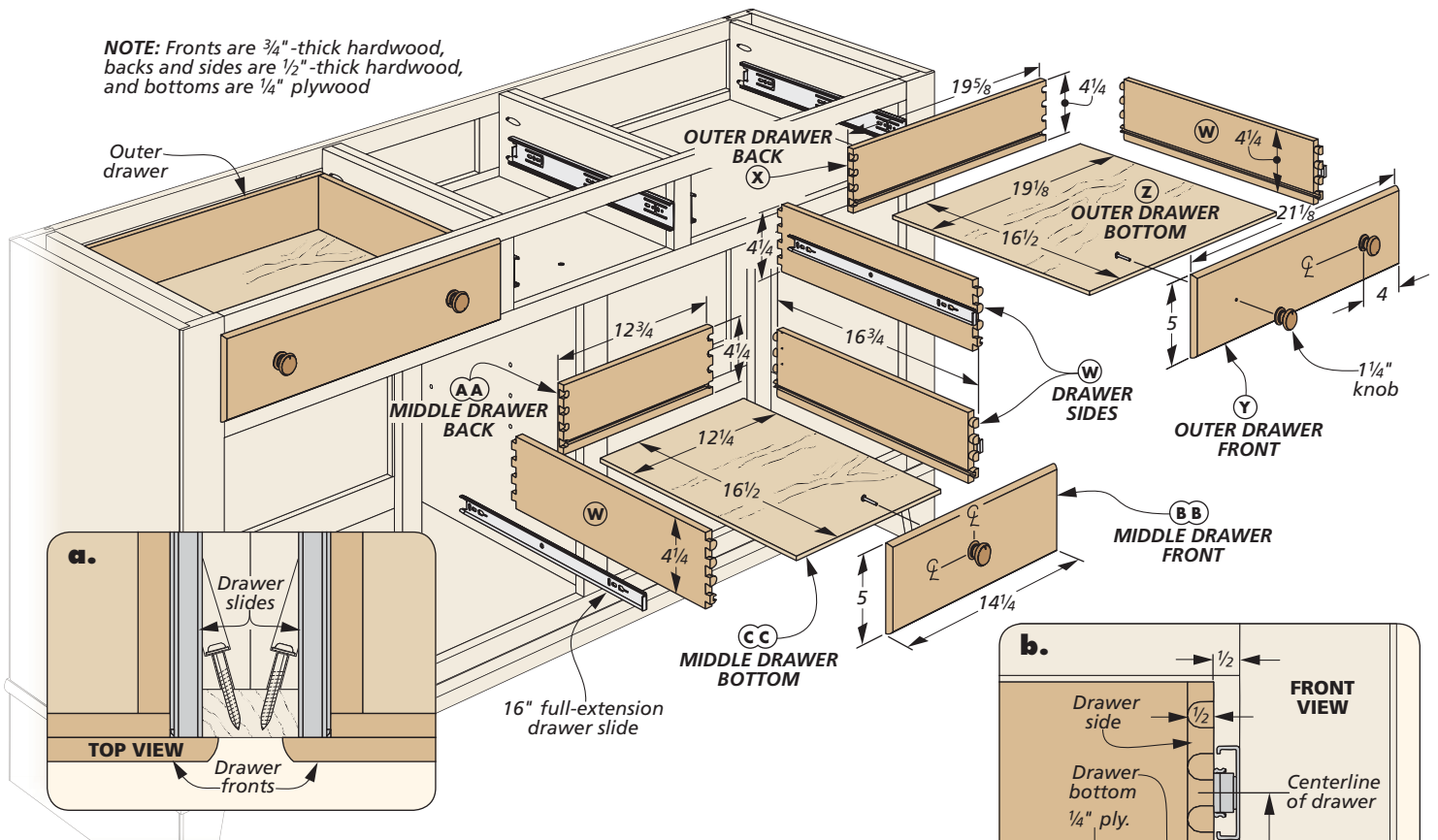


Rout & Miter. Rout all four edges of a wider, longer blank to create the molding profile. After ripping strips of molding free, miter the ends of two of them to fit the side dadoes.



Cut to Fit. Dry fit the side moldings, and mark and miter the front molding to fit at the front of the case. Then mark the back of the side moldings, and cut them off square to fit.

NOTE: Fronts are $\frac{3}{4}$ "-thick hardwood, backs and sides are $\frac{1}{2}$ "-thick hardwood, and bottoms are $\frac{1}{4}$ " plywood



Make the DRAWERS & TOP

At this point, the buffet is starting to take shape. Three more assemblies will get you the rest of the way there, and those are the dovetailed drawer boxes, veneered top, and doors. I started with the drawers.

DRAWER DETAILS. The three drawers feature $\frac{1}{2}$ " maple sides and backs, $\frac{3}{4}$ " cherry fronts, and $\frac{1}{4}$ " plywood bottoms. Note that the middle drawer is narrower than the two outer drawers. And on all the drawers, the fronts are both longer and

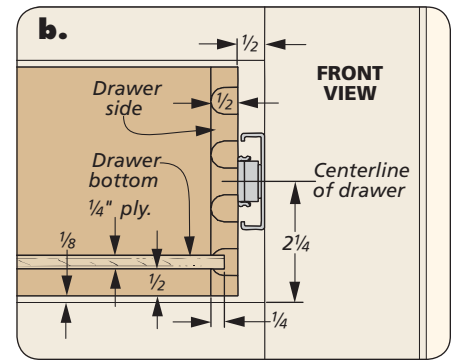
wider than the sides and backs to form a lip that overlays the face frame. The parts are joined with half-blind dovetails.

After cutting the drawer fronts, backs, and sides to size, you need to make a few cuts on the drawer fronts. You'll cut a rabbet on all four edges before you rout the dovetail joints (lower left drawings). This forms a lip around the perimeter.

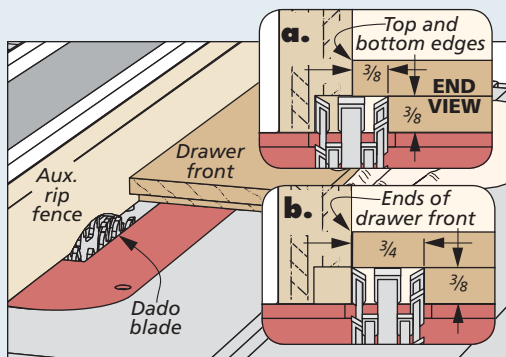
HALF-BLIND DOVETAILS. Now you're ready for the joinery. For the drawer sides and

backs, you can rout them as you typically would half-blind dovetails, by offsetting the pieces in a dovetail jig and routing both the pins and tails of the joint at once.

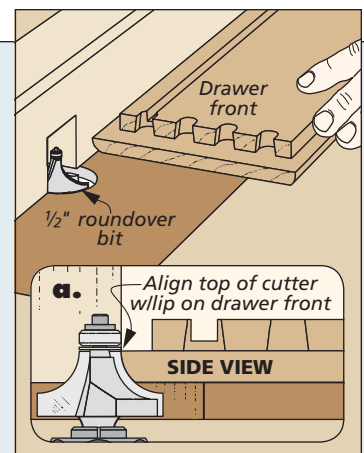
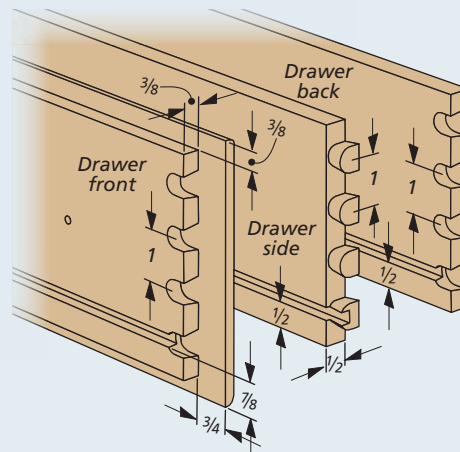
Because of the lip on the drawer front, you'll have to make these joints a little differently and rout the pin boards (sides) and tail board (front) separately. But the cut is well within the capability of any



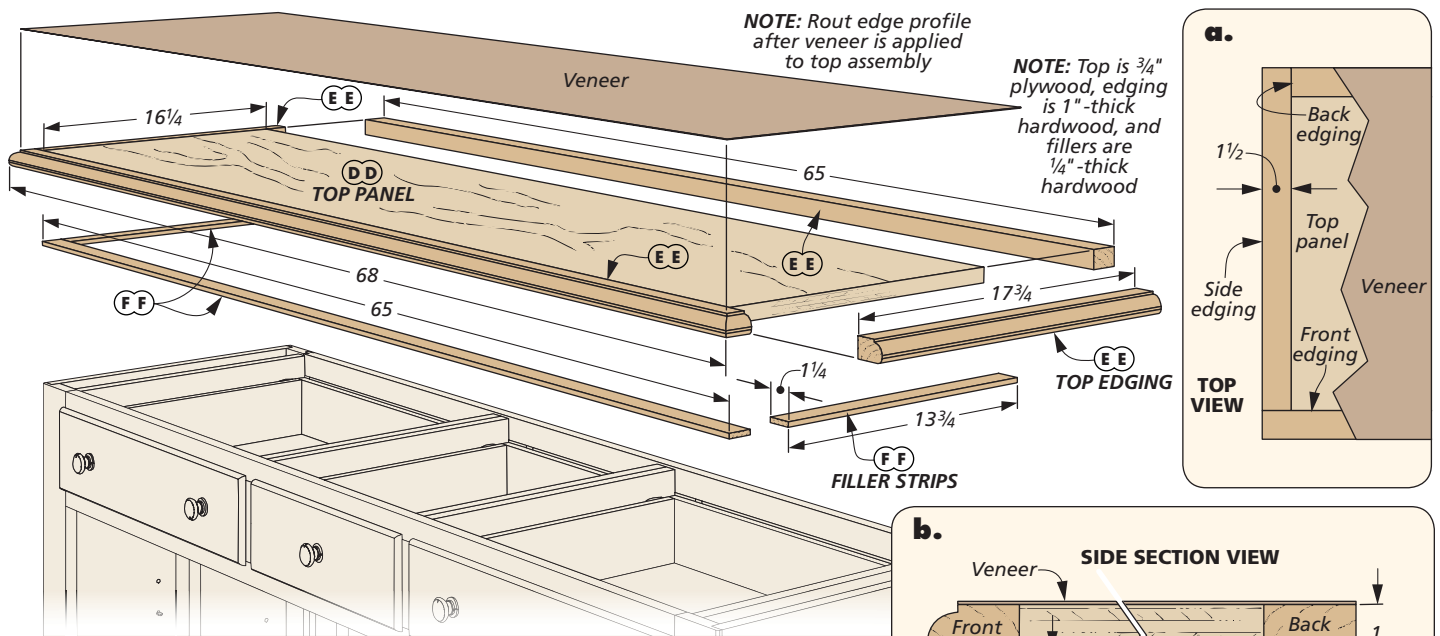
How-To: DRAWER CONSTRUCTION



Rabbet Front. Use a dado blade buried in an auxiliary fence to rabbet the front. Note that the end cuts are wider than the edges.



Profile. Complete the drawer fronts by routing a rounded profile around the perimeter.



commercial dovetail jig. You'll want to refer to your jig's manual for the details. (Or see page 14 for a review of a new dovetail jig that can handle the task.)

COMPLETE THE DRAWERS. After the joints are cut and the fit is good, cut grooves near the bottom edge of all the parts to accept the drawer bottoms. Next, head to the router table to create a rounded profile on the drawer fronts, as shown in the lower right drawing on the opposite page. Then cut the bottoms to size, and assemble the drawers with glue.

All that's left now is to add hardware to the drawers. First, mount knobs to the drawer fronts, as shown. The drawers are mounted on full-extension drawer slides. Attach the slides to the drawer sides and the drawer guide supports before installing the drawers.

TOP ASSEMBLY. The buffet top is a plywood panel that's edged with solid cherry and topped with a paper-backed veneer. It makes a perfect serving area for large meals once the buffet is complete.

To make the top, you'll want to start by cutting the plywood panel to size. The next parts to go on are the edging strips around the perimeter of the top panel. As you can see in detail 'a' above, these edging strips meet at the corners with butt joints. I cut and glued on the back piece first, followed by the sides, and then the front edging strip.

There are also some thin filler strips on the underside of the top panel. These align flush with the bottom of the edging strips and give you a good surface to glue to the top of the buffet cabinet.

After planing these strips to fit, cut and glue them in place on the underside of the top panel, as shown in detail 'b.'

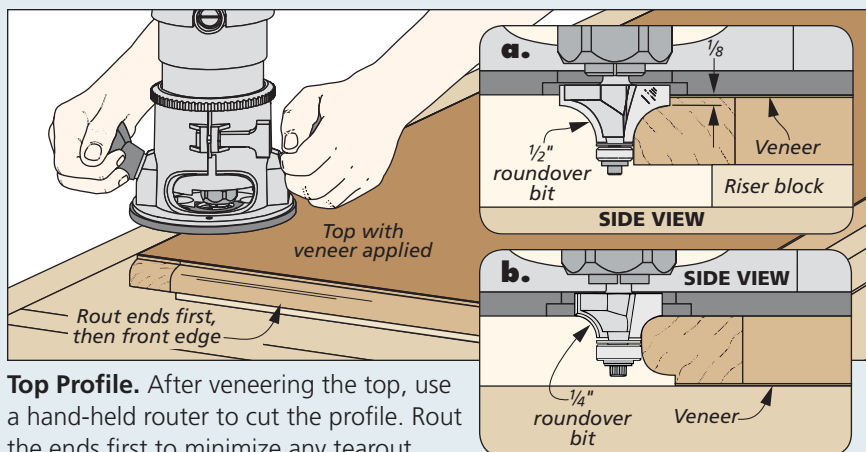
VENEER. You might have noticed that I haven't applied the veneer to the top yet. That's because the veneer is actually applied after the edging strips. It extends over the edging, and then is routed with a roundover bit to form a seamless transition between the edging and the veneer.

To add the veneer, cut it slightly oversize, and use contact adhesive and a J-roller to apply it. I like to use firm pressure and work from the center of the panel toward the edges to roll the veneer smooth and remove any air pockets. Once you're pleased with the results, you can use a flush-trim bit in a hand-held router to cut the veneer flush with the outside edge of the edging strips.

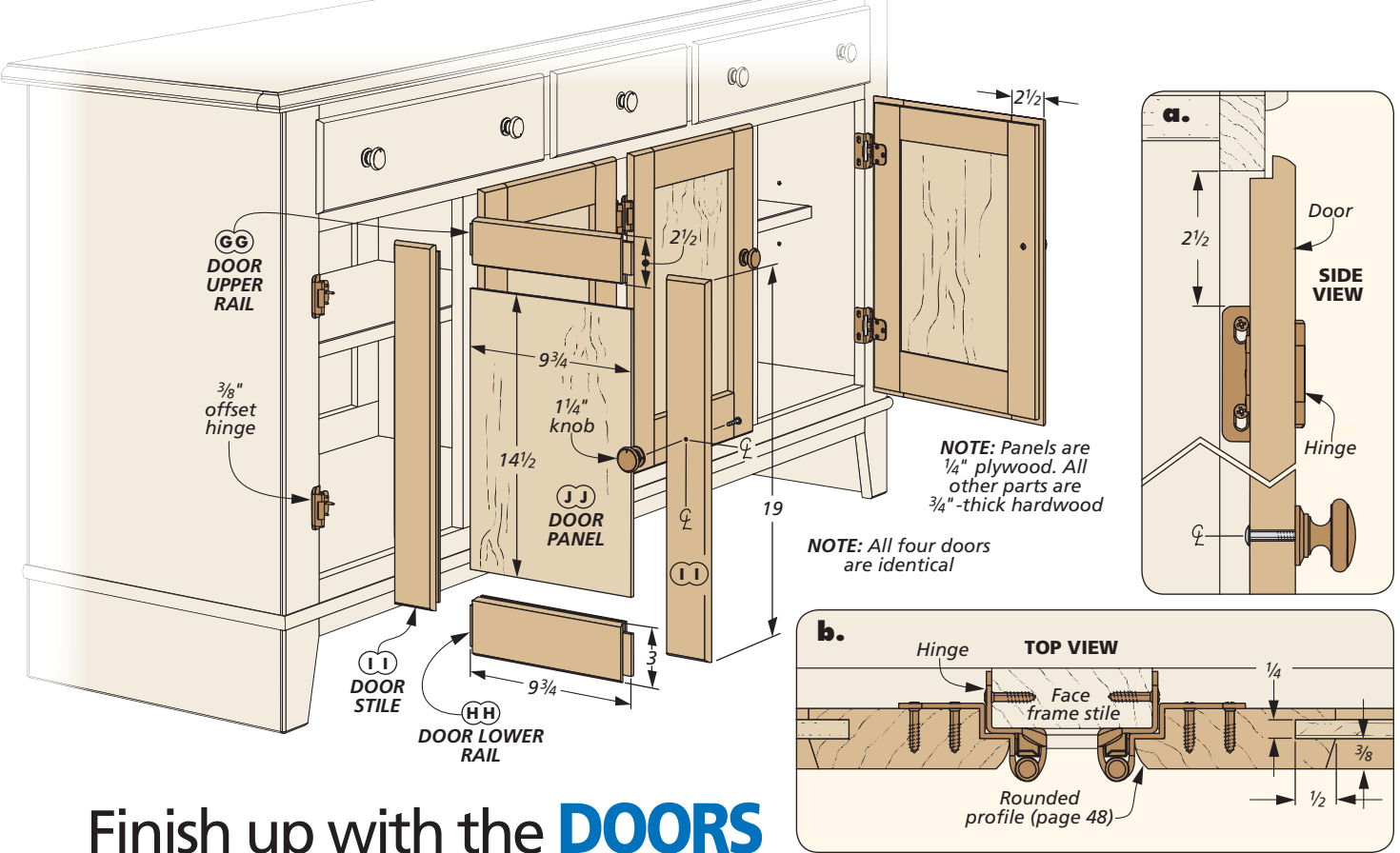
COMPLETE THE TOP. Now it's time to rout the profile on the top. Start with the panel right-side up, and use a $\frac{1}{2}$ " roundover bit to rout the roundover around the ends and front of the top, cutting both the edging and veneer in the process (refer to the main drawing and detail 'a' at left).

Now flip the panel upside-down, and use a $\frac{1}{4}$ " roundover bit to rout the profile around the ends and front of the bottom of the panel (detail 'b'). Finally, position the top on the case, and glue and clamp it in place.

How-To: TOP EDGE PROFILE



Top Profile. After veneering the top, use a hand-held router to cut the profile. Rout the ends first to minimize any tearout.



Finish up with the **DOORS**

The final details that bring the buffet to completion are the four doors that enclose the front of the cabinet. Each one features a plywood panel surrounded by rails and stiles that are assembled with cope and stick joinery. In fact, it's the same joinery that's used on the back assembly shown on page 46.

The four doors are identical to one another. So you can get started by cutting two rails and two stiles for each door to final size, as shown above.

COPE & STICK JOINERY. Just as before, set up the coping bit in the router table first to

cut the stub tenons on the ends of the stiles. Then switch to the sticking bit, and use the stub tenon to set the height of the bit. Cut the grooves in all four parts for each door, and check the fit.

DOOR ASSEMBLY. Once you have achieved a flush surface between the parts, you can assemble the doors to measure for the plywood panels. Then assemble the rails and stiles around the panels and glue and clamp the doors together.

RABBET & BULLNOSE. There are just a few more details remaining to complete the doors. First, you'll notice that the

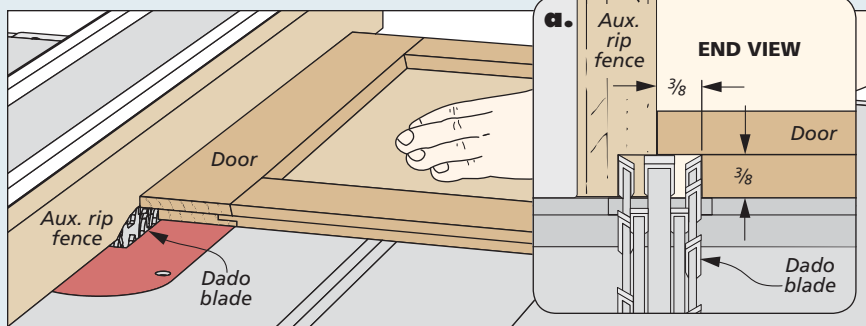
perimeter of each door features a rabbet around the backside to fit the opening in the cabinet face frame. This is easy to accomplish using a dado blade buried in an auxiliary rip fence, as shown in the drawings below. Note that this rabbet is a good opportunity to fine-tune the fit of the doors in the frame. If you find that the door fits tight, simply adjust the width of the rabbet to make the door fit the face frame. (Make sure to take the thickness of the hinges into account.)

Finally, you'll cut a subtle rounded profile around the front of the door frame. This is the same profile that's shown in the drawing at the bottom of page 48.

DOOR HARDWARE. To simplify installation, the doors are mounted with no-mortise hinges designed for 3/8" overlay doors. So it's just a matter of installing the hinges on the doors, spacing them correctly, and attaching the hinges to the face frame. The knobs are also easy to install. Just be sure to note the orientation of the hardware shown in the drawing above, with the hinges placed on the outside of each pair of doors and the knobs in the center.

COMPLETE THE BUFFET. Now you can take your time staining and finishing the components of the buffet. You'll find the information you need in sources on page 67. Then it's ready for service. **W**

How-To: DOOR RABBET



Lip Around the Door Frame. The doors partially overlay the face frame of the buffet. This requires a lip formed around the perimeter of each door. Cut rabbets by burying a dado blade in an auxiliary rip fence and passing the frame over it.

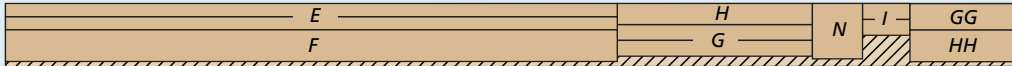
Materials, Supplies & Cutting Diagram

- | | | | | |
|--------------------------------------|---|-----------------------------------|---|---|
| A Case Sides (2) | $\frac{3}{4}$ ply. - $17\frac{1}{2} \times 33$ | S Drawer Supports (6) | $\frac{3}{4} \times 5\frac{5}{8} - 16\frac{1}{2}$ | • (6) #8 x $1\frac{1}{2}$ " Fh Woodscrews |
| B Upr./Lwr. Dividers (2) | $\frac{3}{4}$ ply. - $16\frac{1}{2} \times 63$ | T Bullnose Molding | $\frac{3}{4} \times \frac{1}{2} - 105$ rgh. | • (46) $1\frac{1}{4}$ " Pocket Screws |
| C Vertical Divider (1) | $\frac{3}{4}$ ply. - $16\frac{1}{2} \times 19$ | U Shelves (2) | $\frac{3}{4}$ ply. - $11\frac{3}{4} \times 30\frac{11}{16}$ | • (3 prs.) 16" Full-Extension Drawer Slides |
| D Face Frame Outer Stiles (2) | $\frac{3}{4} \times 3 - 33$ | V Shelf Edging | $\frac{1}{4} \times \frac{3}{4} - 65$ rgh. | • (9) $1\frac{1}{4}$ " Antique Brass Knobs |
| E Face Frame Upper Rails (2) | $\frac{3}{4} \times 1\frac{1}{4} - 58$ | W Drawer Sides (6) | $\frac{1}{2} \times 4\frac{1}{4} - 16\frac{3}{4}$ | • (4 prs.) $\frac{3}{8}$ " Overlay Hinges |
| F Face Frame Lower Rail (1) | $\frac{3}{4} \times 3 - 58$ | X Outer Drawer Backs (2) | $\frac{1}{2} \times 4\frac{1}{4} - 19\frac{5}{8}$ | • (8) $\frac{1}{4}$ " Shelf Supports |
| G Face Frame Lower Stiles (2) | $\frac{3}{4} \times 1\frac{1}{2} - 18\frac{1}{2}$ | Y Outer Drawer Fronts (2) | $\frac{3}{4} \times 5 - 21\frac{1}{8}$ | • (1 sheet) 24" x 96" Paper-Backed Veneer |
| H Face Frame Middle Stile (1) | $\frac{3}{4} \times 2 - 18\frac{1}{2}$ | Z Outer Drwr. Btms. (2) | $\frac{1}{4}$ ply. - $16\frac{1}{2} \times 19\frac{1}{8}$ | |
| I Face Frame Upper Stiles (2) | $\frac{3}{4} \times 1\frac{1}{2} - 4\frac{1}{2}$ | AA Middle Drawer Back (1) | $\frac{1}{2} \times 4\frac{1}{4} - 12\frac{3}{4}$ | |
| J Back Outer Stiles (2) | $\frac{3}{4} \times 3 - 33$ | BB Middle Drawer Front (1) | $\frac{3}{4} \times 5 - 14\frac{1}{4}$ | |
| K Back Upper Rail (1) | $\frac{3}{4} \times 1\frac{1}{2} - 59$ | CC Middle Drwr. Btm. (1) | $\frac{1}{4}$ ply. - $16\frac{1}{2} \times 12\frac{1}{4}$ | |
| L Back Middle Rail (1) | $\frac{3}{4} \times 3 - 59$ | DD Cabinet Top (1) | $\frac{3}{4}$ ply. - $16\frac{1}{4} \times 65$ | |
| M Back Lower Rail (1) | $\frac{3}{4} \times 5\frac{1}{4} - 59$ | EE Top Edging | $1 \times 1\frac{1}{2} - 180$ rgh. | |
| N Back Upper Stiles (2) | $\frac{3}{4} \times 5\frac{1}{4} - 4\frac{1}{2}$ | FF Top Filler Strips | $\frac{1}{4} \times 1\frac{1}{4} - 170$ rgh. | |
| O Back Lower Stile (1) | $\frac{3}{4} \times 5\frac{1}{4} - 16\frac{1}{4}$ | GG Door Upper Rails (4) | $\frac{3}{4} \times 2\frac{1}{2} - 9\frac{3}{4}$ | |
| P Lower Panels (2) | $\frac{1}{4}$ ply. - $27\frac{3}{8} \times 16\frac{1}{4}$ | HH Door Lower Rails (4) | $\frac{3}{4} \times 3 - 9\frac{3}{4}$ | |
| Q Upper Outer Panels (2) | $\frac{1}{4}$ ply. - $19\frac{3}{4} \times 4\frac{1}{2}$ | II Door Stiles (8) | $\frac{3}{4} \times 2\frac{1}{2} - 19$ | |
| R Upper Middle Panel (1) | $\frac{1}{4}$ ply. - $11 \times 4\frac{1}{2}$ | JJ Door Panels (4) | $\frac{1}{4}$ ply. - $9\frac{3}{4} \times 14\frac{1}{2}$ | |

$\frac{1}{4}$ " x 3" - 96" Cherry (2 Sq. Ft.)



$\frac{3}{4}$ " x 6" - 96" Cherry (4 Bd. Ft.)



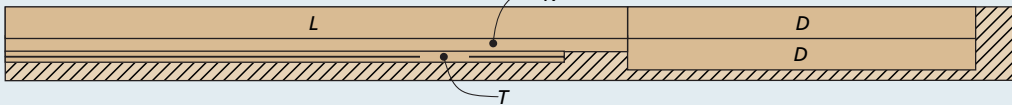
$\frac{3}{4}$ " x 6" - 96" Cherry (4 Bd. Ft.)



$\frac{3}{4}$ " x 6" - 96" Cherry (4 Bd. Ft.)



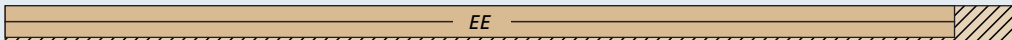
$\frac{3}{4}$ " x 7" - 96" Cherry (4.7 Bd. Ft.)



$\frac{3}{4}$ " x 7" - 96" Cherry (4.7 Bd. Ft.)



$\frac{5}{8}$ " x 3 1/2" - 96" Cherry (2.9 Bd. Ft.)



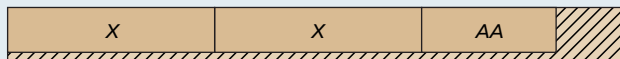
$\frac{1}{2}$ " x 5" - 60" Hard Maple (Two boards @ 2.1 Sq. Ft. each)



$\frac{3}{4}$ " x 6" - 60" Hard Maple (Two boards @ 2.5 Bd. Ft. each)



$\frac{1}{2}$ " x 5" - 60" Hard Maple (2.1 Sq. Ft.)



ALSO NEEDED: Two 48" x 96" sheets of $\frac{3}{4}$ " cherry plywood,
One 48" x 96" sheet of $\frac{1}{4}$ " cherry plywood

tips & techniques for Better Tenons

Mortise and tenon joinery is a hallmark of solid, long-lasting construction. To improve your skills, it's helpful to take some time to zero in on one part of the process. Here, let's take a look at how to raise your tenon-making game.

YOUR TARGET. Before you get to the nitty-gritty of making and fine-tuning the fit of a tenon, I find it helpful to have an idea

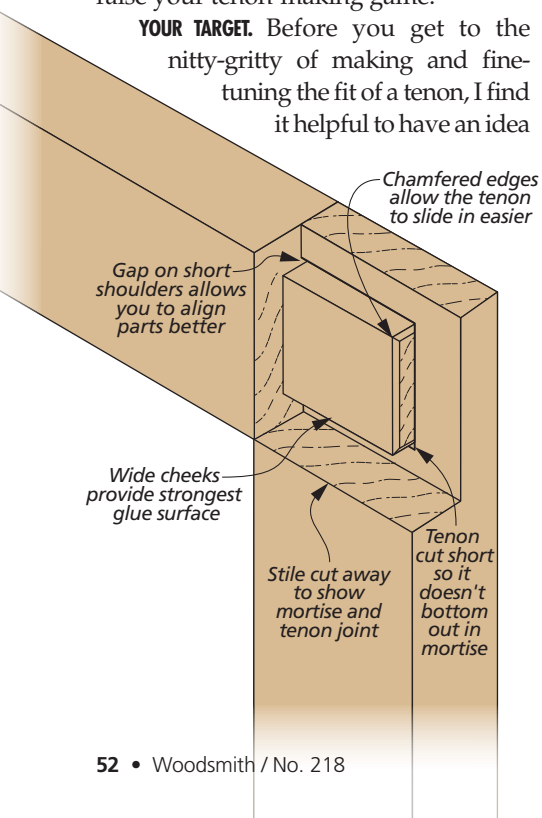
of the key details. The drawing and photos below highlight what you're after.

For me, there are two main points of attention: First, the connection between the wide cheeks of the tenon and the long-grain walls of the mortise. This gives the joint its strength. The other surfaces have at least one end-grain component and contribute very little to the overall strength of the joint.

The other detail that I key in on is a tight, even seam around the shoulders. This looks good, but it also resists the forces that try to lever the pieces apart.

As for the fit of the tenon at the ends of the mortise, I'm not concerned about that. In fact, a little gap here gives you some wiggle room to align parts at assembly.

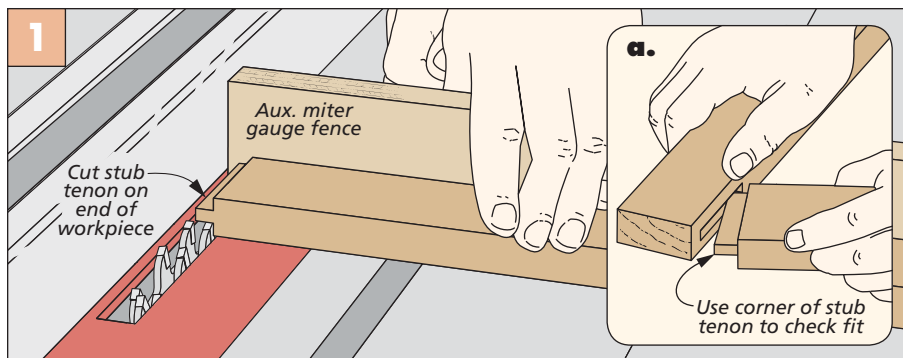
Another aspect you don't need to worry about is making the length of the



▲ A properly sized tenon should fit into the mating mortise with moderate hand pressure or light mallet taps.



▲ Another test for a tenon is to dry fit the joint and raise the mortised piece. The workpiece should stay in place.



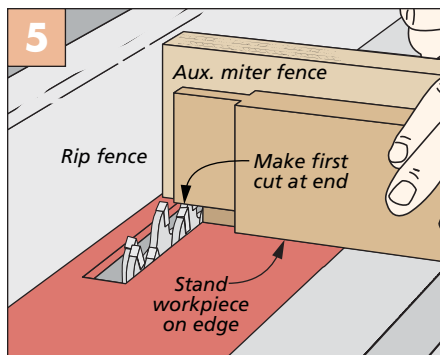
Adjust the Blade Height. Dial in on the correct blade height with test cuts across the tip of one test piece. The result is a stub tenon that will allow you to check the fit to the mortise. You're aiming for a fairly snug fit.

tenon match the depth of the mortise perfectly. I prefer the tenon to be a little short, so I don't have to worry about cleaning up the bottom of the mortise.

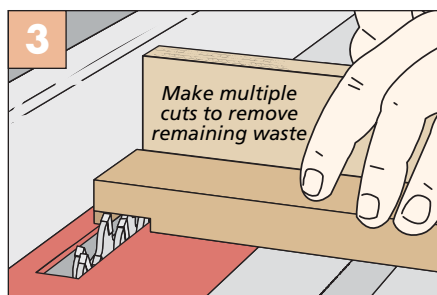
There are several good ways to make tenons. No matter which method you choose, your aim should be to get a good-fitting joint right from the tool. The less time and effort you spend in fine-tuning tenons means more time you have for other details. To get an idea of what I mean, I'll provide an overview of one popular and simple tenon technique.

DADO BLADE METHOD. There's a reason that many woodworkers turn to a dado blade to cut tenons. The setup is simple, the process is straightforward, and with a little practice, the results are hard to beat. Long story short, you use a miter gauge to guide the workpiece across a wide dado blade to create each face of the tenon. Of course, there's more going on here than meets the eye.

Prior to cutting the actual workpiece, I like to make a couple extra parts so they can be used as test pieces for setting up cuts. This takes away the pressure of trying to get things right on the first try.



Edge Shoulders. You may need to adjust the blade height to cut the edge cheeks and shoulders of the tenon.

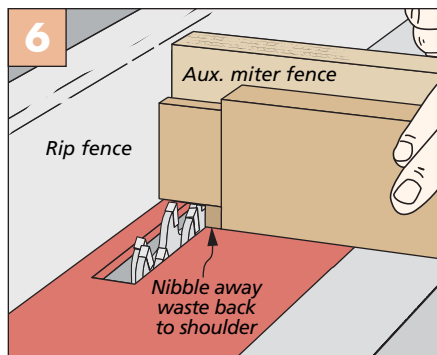


Nibble Waste. Once the shoulder cut is made, start to nibble away the waste toward the end of the tenon.

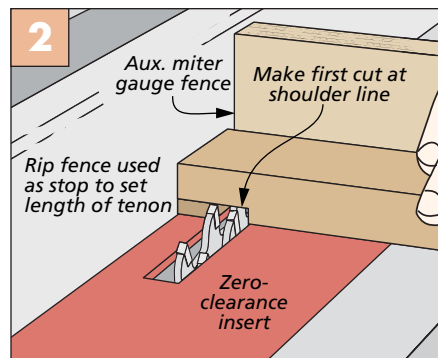
The drawings on this page run down the overall process. In Figure 1, you can see how to use a test piece to sneak up on the correct blade height. I start with the dado blade set low and make a pass along each wide face. At this point, the stub should be too thick to fit the mortise.

SNUG FIT. Raise the dado blade a tad and make another pair of passes. Remember, you're removing material from each face, so don't raise the blade too. You've reached your goal when you can just barely fit the tenon in.

From here, you can set the rip fence to cut the full length of the tenon. Grab your



Edge Shoulders Last. Complete the tenon edge by making a careful cut along the short shoulders.



First Cut. Start with a cheek cut along the shoulder line, keeping the workpiece flat on the table and tight to the fence.



Back & Forth. Remove ridges left by the dado blade to create a smoother tenon cheek and a better glue surface.

project parts and cut the wide tenon cheeks (Figures 2 and 3). Most tenons are longer than the width of your average dado blade. So you'll need to make multiple passes across the blade.

These overlapping cuts can leave ridges that affect the fit of the tenon. To smooth them out, I slide the workpiece back and forth across the blade, as in Figure 4.

SHORT CHEEKS. The remaining step is cutting the end cheeks of the tenon. Here the workpiece is held on edge. Remember, this isn't a critical glue surface, so you don't need to worry about getting an air tight fit.

The margin photo shows what the results will look like. The cheeks of the tenon may still show light scoring marks. But overall, the cheeks are smooth, not ragged. If everything went well, then each tenon should slide home easily.

The reality is a joint or two may show small gaps or may not close at all. On the next pages, I talk about the process for tracking down and fixing any problems.



▲ Here's the result of cutting a tenon with a dado blade.

Troubleshooting Tenons

Taking the time and care to set up your table saw and cut accurate tenons pays off when it's time to fit the joints together. However, it isn't uncommon to end up with a couple of joints where you still need to do some additional work.

You may wonder why you have a problem at all if you've followed the steps I've already discussed. The answers cover a wide range: Individual workpieces may vary slightly in thickness or width. A part may have a subtle bow or curve. Depending on your technique, the mortise size may not be perfectly consistent. Whatever the reason, when the fit isn't right, you need to do a little detective work to diagnose the problem and fix it.

ONE STEP AT A TIME. On these pages are several common issues you're likely to run across. In some situations, you may have more than one problem going on. I find it's easier to take things one at a time. Focusing your attention on a single issue makes it easier to get a better-fitting joint in the end.

TOO THICK. I start with looking at the fit of the tenon cheeks to the sides of the mortise. After following the process on the previous pages, the most common problem occurs when the tenon is just a hair too big. It may fit only with a lot of clamping pressure, or firm mallet strokes.

The danger here is that you run the risk of splitting the workpiece as you drive the tenon into the mortise. In addition, once the glue goes on, the joint may swell slightly. So you may be unable to even assemble the joint at that point.



▲ Trim tenon cheeks with a shoulder or rabbet plane, or a hardwood sanding block (inset). Take care to keep the tenon straight and parallel to the face of the workpiece.

The temptation is to take it back to the table saw and trim it. The problem is it's all too easy to take too much off. Instead, skip the table saw and reach for some hand tools to get the final fit. The photos above show two tools that accurately make the tenon thinner.

Considering its name, it's no surprise that many woodworkers think a shoulder plane is just for trimming shoulders of tenons and rabbets. But actually, I find that this specialized tool is ideally suited for paring tenon cheeks.

A shoulder plane is narrow, so you need to trim a tenon in several passes. It's possible to create a tapered tenon, if you aren't careful. So check your progress often as you work.



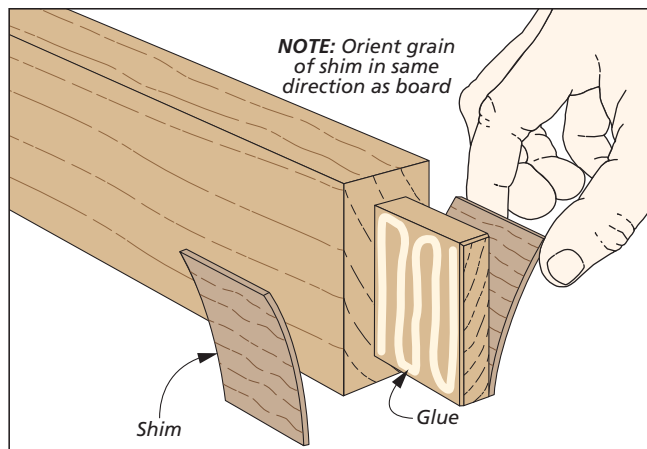
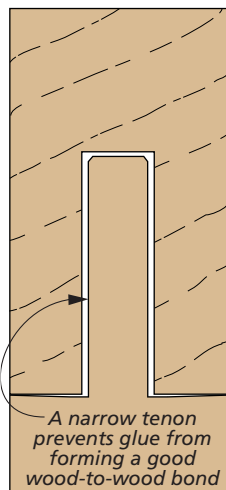
The other tool is simpler by far — a sanding block. To keep the tenon flat, I use a hardwood block rather than a cork block. I apply adhesive-backed sandpaper to the block, leaving at least one edge without sandpaper. This “safe edge” prevents me from altering the shoulder of the joint unintentionally. I size the block so that I can sand the entire tenon cheek.

No matter which tool you use, the key is taking the same amount of material off each face. This keeps the tenon centered for a consistent fit of the overall assembly.

TOO THIN. The opposite problem is a tenon that drops into the mortise without any resistance. Don't worry, your workpiece isn't doomed to the scrap bin. To rescue it, you first need to make the tenon bigger. You do that by gluing a thin shim to each cheek. Clamp it firmly so that you have a gap-free connection between the shim and cheek.

When the glue is dry, refit the joint. I like to use relatively thick shims so I can recut the tenon at the table saw. If you use thin shims, you need to fit the joint with a shoulder plane or a sanding block.

THE SHOULDERS. Taking care of the wide cheeks allows you to concentrate on



Shim a Small Tenon. If a tenon is too small, glue shims on each cheek. After the glue dries, you can recut the tenon at the table saw or trim it to size, as shown in the upper photos.

other aspects of a strong and good-looking mortise and tenon joint. The next area of attention is the fit between the tenon shoulders and the mating piece that has the mortise.

Slide the joint together and examine the joint line along the two faces and both edges. If there's a gap all around the joint, the culprit could be that the tenon is bottoming out in the mortise. Check to make sure the mortise is clear of any chips. Then trim back the tenon slightly (if necessary), and reassemble the joint.

On a side note, I like to cut a small chamfer on the end of the tenon, as shown in the upper left photo on this page. This makes inserting the tenon easier and provides some glue relief.

EVEN SHOULDERS. Another problem is a step between the face and end shoulders. My tool of choice here is a chisel to remove the step (upper right photo).

When you're sure the shoulders are even and the joint still doesn't close tightly, there may be a small ridge of waste where the tenon cheeks meet the rim of the mortise. The remedy is to pare the waste away with a chisel. Take care not to cut into the tenon (near right photo).

Some woodworkers undercut the shoulders of a tenon to ensure a tight joint line. The idea here is that you hold the chisel at an angle to create a beveled shoulder where it meets the tenon (far right photo). If you do this, be sure to leave at least a $\frac{1}{16}$ " flat around the outer edges.

If the flat is too narrow, the undercut shoulder may show up as a gap if you have to do a lot of sanding after assembly.



▲ A slight chamfer around the end of the tenon allows it to slide into the mortise easier, and it provides some glue relief.



▲ Cure stepped shoulders by taking small bites with a chisel. Register the chisel on the low side of the shoulder.



▲ A small ridge of waste where the tenon meets the shoulder can prevent a joint from seating. Trim it with a chisel.



▲ Undercutting the shoulder all around the tenon is another method for eliminating gaps. Leave a narrow flat on the rim.

Now I said earlier that I don't tweak the mortise, but I sometimes make an exception. With the chisels out, it's easy to cut a slight chamfer around the edge of the mortise. This creates a small recess to accept minor inconsistencies in the shoulder.

And it also provides glue relief during assembly to reduce squeezeout.

ASSEMBLY. The final stage of the process is assembly. But beware, there are still hazards to avoid. The first is applying too much glue — and in the wrong places.

Instead, put the glue only where it matters most, the cheeks and sides of the mortise. This is shown in the photos at left. Brush a thin coat of glue on the wide cheeks of the tenon. Then use a paddle to put a coat on the mortise walls. Putting glue on both surfaces prevents starving the joint and creating a weak bond.

Now don't dawdle. Get the joints together quickly. Moisture in the glue can cause a tenon to swell and make it difficult to insert. It's easy to go from a just-right fit to too tight.

As you make the last turns on your clamps, the joint will close tightly. After applying these tips and techniques, it will be the last time you need to think about this joint. And peace of mind is a good destination if you ask me. **W**



▲ Apply a thin, even coat of glue to the wide cheeks of the tenon. Too much glue here can lead to messy squeezeout.

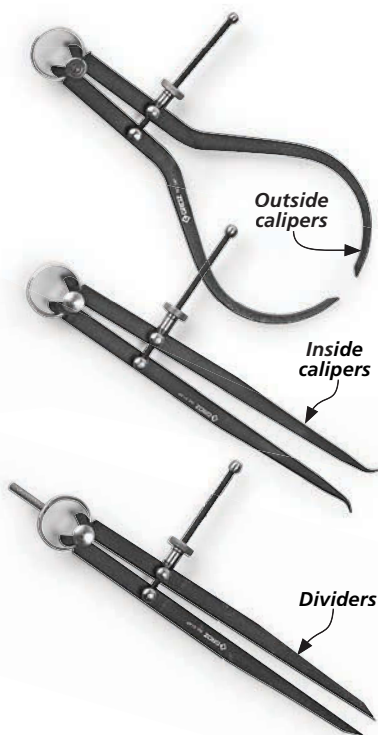


▲ For the strongest joint, brush glue onto the side walls of the mortise. No other glue is necessary for solid assembly.



working with

Calipers & Dividers



▲ Calipers and dividers can be purchased from most woodworking catalogs or online sources, either individually or as a set.

It seems like every time I pick up a tool catalog, I see some new digital or electronic woodworking gadget. While tools like these definitely have their advantages, there are times when simple is better. Calipers and dividers are a good example.

Calipers have been around for centuries and are used by machinists and other trades, as well as woodworkers. In essence, they're nothing more than a pair of metal "legs" that are joined at one end so they can pivot. This allows you to open or close the legs to gauge the size of a part.

TYPES. There are three main types of calipers — outside, inside, and dividers (photo at left). As the names imply, outside and inside calipers are used when working with outer or inner diameters or openings. Dividers have sharpened points for laying out work.

The calipers shown here are referred to as spring calipers. As you can see in the



▲ The legs of a spring caliper are held under tension by a bow spring at one end. A threaded rod and knurled nut allow you to make fine adjustments.

photo above, the legs on a spring caliper are connected by a round bow spring at the top (end) of the tool. A threaded rod and knurled nut are used to hold the legs in a fixed position, so you can make repeat measurements.

SIZES. Calipers are available in a range of sizes, from 3" to 12" (upper right photo on opposite page). The size refers to the maximum opening of the legs.

For woodworking applications, I find the 6" and 8" sizes to be the most useful.

New calipers and dividers are available from several woodworking supply companies (refer to Sources on page 67). But you can often find quality, used examples at flea markets, garage sales, and online auction sites like *eBay*.

USING CALIPERS & DIVIDERS

Calipers work on the principle of measurement by comparison rather than actual dimensions. They don't have a rule or scale. Instead you use them as a gauge for sizing workpieces. Using both outside and inside calipers requires developing a certain feel. In order to get an accurate reading, you want to set the caliper so there's just a slight drag on the part you're measuring, without crushing it. A little practice is all it takes.



▲ To set a caliper to a specific size, place one leg against the end of a rule. Then open (or close) the other leg as needed. The knurled nut holds the legs in position.

Outside calipers are especially useful for gauging the size of round parts, particularly when turning. You can use a rule to set the opening of the calipers to an exact dimension (photo above). Then as you turn down your workpiece, just use the caliper to check your progress. I keep several calipers near my wood lathe when turning spindles. This allows me to set each caliper to a different size that corresponds with the various diameters of the spindle I'm making.

You can also use calipers to transfer dimensions directly from an existing workpiece. This is helpful if you're making multiple identical parts.

INSIDE CALIPERS. I don't use inside calipers as often as outside calipers, but I keep a pair handy for tasks like gauging the width of a groove or opening or the inside diameter of a hole (lower right photo). After gauging the inside of the opening, you can transfer the size of the



▲ Calipers are sized according to their maximum opening. They typically range from 3" to 12", as shown here.

opening to an outside caliper to use in sizing the mating part.

DIVIDERS. Unlike calipers, dividers are more of a layout tool. I use mine to step off equal segments on a workpiece or scribe a circle. They're handy for laying out repeating patterns, such as carved moldings. And they work great for laying out shelf pin hole locations, as shown in the photo at left.

Calipers and dividers are one of those basic tools that every woodworker should have in his toolbox. Fortunately, they're affordable enough that you really don't have an excuse not to. **W**

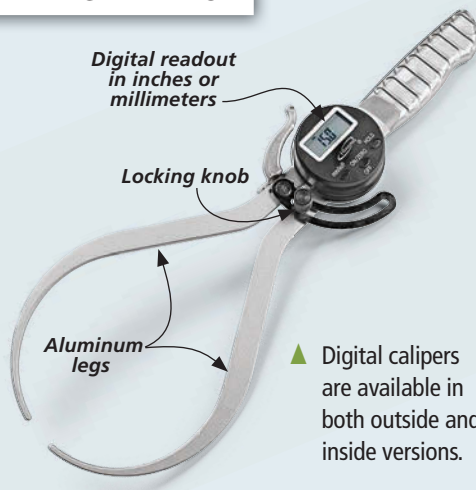


▲ A pair of dividers comes in handy for laying out equally spaced parts, joinery, or the locations for shelf pin holes.

Worth a Look: DIGITAL CALIPERS

The basic design of calipers has remained the same for centuries. Recently, however, the advent of inexpensive digital readouts have brought calipers into the modern age.

The example shown at right features a digital display that reads in decimal or fractional inches, as well as millimeters. A locking knob allows you to set the spring-loaded legs to a precise opening for accurate, repeatable work. For sources, refer to page 67.



▲ Digital calipers are available in both outside and inside versions.



▲ A pair of inside calipers can be useful for gauging the diameter of a hole, recess, or other interior space.

in the
shop



9 must-have Shop Solutions

A well-equipped shop contains more than just tools, wood, and hardware. In fact, in order to do your best work, you need to regularly spend time tuning and maintaining your tools and machines. For that, you'll need a few other supplies.

A good set of wrenches and sockets are a must. However, I also keep a few lubricants and cleaners on hand. The products you see on these pages are the ones I reach for most often. They're critical to keeping

your tools running smoothly and making clean cuts. (For sources of these supplies, turn to page 67.) I've broken down the materials into a few broad categories.

PEAK PERFORMANCE

A good place to start is with the machines in your workshop. If you treat them well, they'll stay accurate and be ready for use whenever you step into your shop. But just like the family car, power tools need

some periodic maintenance. In addition to the supplies shown here, it's a good idea to check the owner's manual for your tools to see what's recommended.

LIGHT MACHINE OIL. You need to keep the moving parts like adjustment screws on power tools and even the mechanisms on hand planes lubricated for easy operation. And while just about everyone has a can of WD-40, it really isn't meant to be used as a lubricant. The better



▲ Buffing a coat of paste wax onto metal tool tables (and even jigs and fixtures) forms a barrier to prevent rust and allows a workpiece to slide across with much less effort.



▲ Spray-on dry lubricants coat bits and blades to reduce friction for easier use, extend tool life, and prevent pitch and resin buildup.

choice is light machine oil. 3-In-One is a common brand, and there are other versions that are just as effective. Go easy as you apply it. A light coat offers the best lubrication without getting gummy.

GREASE. The heavy-duty gears and moving parts inside big power tools like your planer need more than a light coat of oil to fight wear and tear and reduce friction. My go-to solution is a can of spray lithium grease, as in the main photo on the facing page. The key is spraying it on then wiping down the excess, so it doesn't create a buildup.

TWO KINDS OF WAX. One downside to grease is that it can attract and hold dust. The result is a sticky grime that may cause more problems than it solves. So for gears and screws that are constantly exposed to dust, like the cutterhead lift mechanism inside a thickness planer, I rub a bar of paraffin wax across the gears (upper inset photo on the facing page). The wax leaves a dry surface that's less likely to attract dust.

Speaking of wax, a can of soft paste wax comes in handy for tool tables and even jigs. A buffed-out coat of wax makes workpieces slide smoothly and combats rust formation, as shown in the lower left photo on the previous page.

CLEAN CUTS

A smooth-running tool equipped with a sharp bit or blade is a recipe for top-notch results. But there are some other ingredients you can add to the mix to keep your cutting tools in top shape.

DRY LUBRICANT. Sharp bits and blades work better because they decrease the



▲ Cutting sticks create a waxy barrier that helps keep drill bits cool and prevent chips from clogging up the flutes.



▲ Cutting and tapping fluid works to loosen and carry chips away for better results.

amount of effort needed to make a cut. You can help that along by periodically spraying the cutting edges of bits and blades with dry lubricant, as shown in the lower right photo on the facing page. The slippery, microscopic coating left behind reduces friction.

CUTTING STICKS & FLUID. Drilling into metal can gum up and prematurely dull bits.

Waxy cutting sticks coat bits to keep metal chips from clogging the bit. Cutting and tapping fluids work to reduce friction, keep bits cooler, and carry away chips better (upper photos).

BIT & BLADE CLEANER. Over time, resins accumulate on saw blades and router bits. The result is cutting edges that break down faster. You can remove the gunk with a quick spray of bit and blade cleaner and a brass brush, as in the right photo.



▲ All it takes is a few spritzes of blade cleaner to soften caked-on resin and pitch. The residue scrubs right off.



I want to mention one final thing. Don't think you need to have everything shown here, since several items can fill more than one role. What's more important is developing a maintenance routine for the tools in your shop and sticking to it over the long haul. The payoff will be tools that work reliably and cut smoothly whenever you use them. **W**

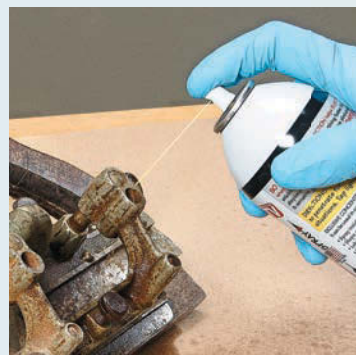
How-To: RUSTY TOOL RESCUE



I'm a sucker for an old tool that can be brought back to life with a little TLC. While I'm not afraid to spend some time reconditioning a tool, I don't want to make it my day job. Instead, I rely on a few helpers that can take some of the hard work out of the task.

Let's just say many old tools suffer from "deferred maintenance." The result can be threaded parts frozen tight with rust. Penetrating oil shown in the photo at right works like magic to get things unstuck.

Then, rather than remove surface rust with a wire brush in a drill or tedious hand sanding, soak rusty parts in a rust dissolving solution (left photo). After a few hours, the rust residue scrubs right off.



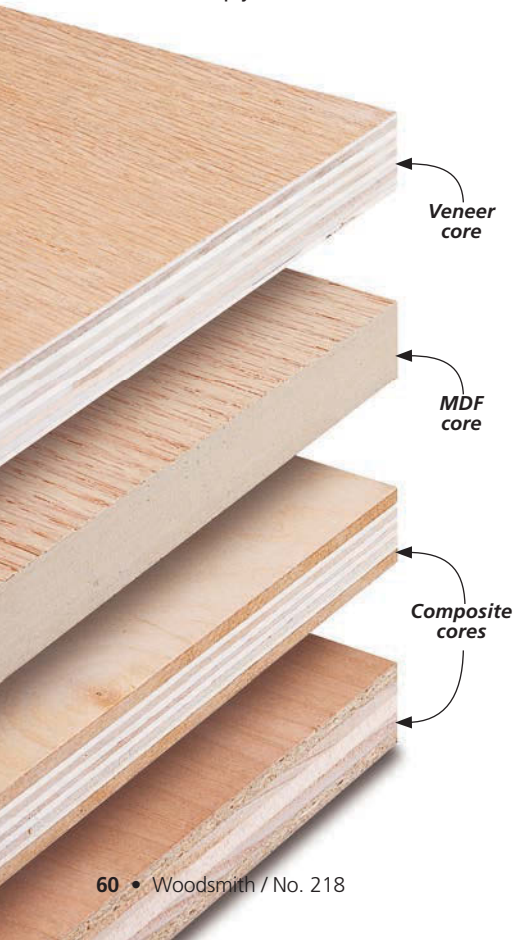
▲ A spray-on penetrating oil soaks in to break the bonds of parts that are heavily corroded.





▼ Different types of cores can impact the weight, thickness, and flatness of plywood.

choosing the right **Plywood**



I use plywood in a lot of my projects, and I know I'm not alone. There are several good reasons to use it. It's flatter and more stable than hardwood, and it cuts and assembles nicely. But perhaps most important, when you're building something large, it lets you make panels a lot more easily than having to glue a number of boards together.

When it comes to buying plywood, though, things can get a little confusing. There are so many different types, cores, and quality grades for plywood that it's tough to keep track of it all. Let's take a closer look at plywood, so you can find what you're really looking for.

UNDERSTANDING PLYWOOD GRADES. The first question when it comes to plywood for a project is, "How good do you want it to look?" If it's for a shop storage project, then appearance probably

isn't a huge concern. For a project like the cherry buffet on page 42, however, you'll want plywood that looks its best.

Plywood has a grading system that helps you choose the best options available. The grading contains a letter and a number (A-2, B-3, etc.). The letter refers to the quality of the front face, with "A" being the best and "D" being the worst. The number refers to the back face (1 is best; 4 is worst).

Grading will vary by manufacturer and wood species, but in general, a higher grade means more uniform color and grain, with fewer voids and defects. In the lower grades, you'll be more likely to find knots, voids in edges, and color blotches.

When shopping for plywood, my advice is to not get hung up on the grade. Instead, choose the plywood based on appearance. Remember that

higher grades mean higher prices, so you want to be smart here.

For example, home centers in my area only have B- and C-grade plywood, but it still looks pretty good. (A-grade plywood is often found at a lumberyard or specialty retailer.) Also, keep in mind that a project part like a tabletop only needs a good grade on one face since you'll never see the bottom face.

FACE VENEERS. Another issue that's important when you're choosing plywood is the look of the grain on the face veneer.



▲ Check the thickness of plywood in multiple spots before beginning a project. Plywood is often thinner than its stated dimension.

This is dictated by how the veneer is cut (refer to the box below). Rotary cut is the most common type of face veneer for plywood. If you want a riftsawn or quartersawn look, it may require a special order.

GETTING AT THE CORE. There are also three different options for the core of a sheet of plywood: Veneer, MDF, and a composite that's a mixture of materials. You can see examples of these cores in the photo at the bottom of the previous page.

Veneer core has thin layers of wood with alternating grain (photo above). This makes the plywood less likely to bow or cup, but it may have voids in the edges. The number and thickness of plies varies based on the type of plywood.

MDF core is a sheet of MDF with face veneers on it. It has smoother, void-free edges. But it's also heavier, and the material doesn't hold fasteners as well.

Composite core plywood features a combination of traditional veneers and MDF or particleboard layers. The MDF or particleboard is just below the face veneer to make the sheet flatter. This gives the plywood sheet the smoothness of MDF core and the stiffness and screw-holding capability of veneer core.

▲ For greater stability, the plies inside a sheet of veneer core plywood alternate grain direction from one layer to the next.

PLYWOOD THICKNESS. Any time you're working with plywood, you'll need to deal with the issue of inconsistent thickness. Typically, veneer core and composite core plywoods are a hair thinner than their stated dimensions, while MDF core isn't. This can impact projects in a variety of ways — everything from the width of edging to the size of dados and grooves. Luckily, it's easy to compensate for these differences with careful measurements (photo at left) and fine-tuning your tool settings, such as a dado blade's thickness.

MAKING THE RIGHT CHOICE. There are a lot of options when it comes to plywood, but it's not difficult to understand the differences. With a little legwork, you can find great plywood sheets for your next project that won't break the bank. **W**

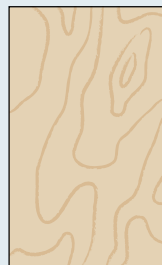
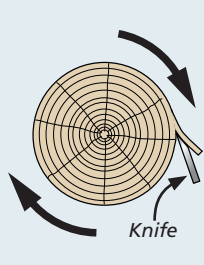
A Closer Look: PLYWOOD FACE VENEERS

One key consideration when choosing plywood is the appearance of the face veneer. By far the most common type of face veneer is rotary cut (top left). For this type of cut, the log is laid against a knife, and the veneer is peeled off the outer circumference of the log.

Another way is to cut the veneer from a log like boards. This type of cut produces a cathedral grain (top right).

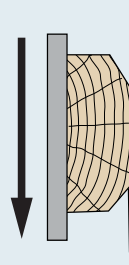
Veneer can also be cut at an angle to produce riftsawn or quartersawn veneer for plywood (bottom drawings). These techniques produce great-looking plywood, but you can expect to pay a premium for these products.

ROTARY CUT



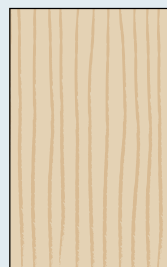
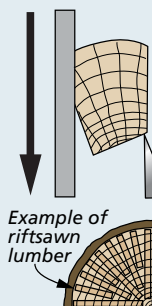
Rotary cut veneer is produced by rotating the entire log against a long knife

PLAIN SLICING (FLAT CUT)



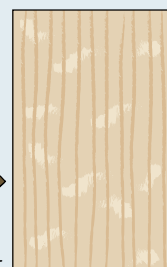
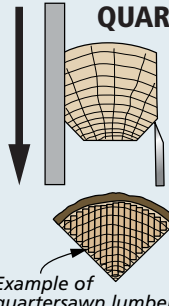
Slicing the log parallel to the center creates veneer with cathedral grain

RIFTSAWN



Cutting the veneer at 30° to 60° to the rings produces straight grain without the flecking of quartersawn

QUARTERSAWN



Quartering the log before slicing it (at 60° to 90° to the rings) results in straight grain and flecking



choosing & using **Push Sticks**

While you can master the basics of ripping at the table saw in a short time, a key element of the process is safely controlling the workpiece. To maintain better control, you have a few options to choose from.

To be honest, most of the time I use my hands to guide a workpiece. My left hand is fixed on the saw table holding the piece against the fence. At the same

time, my right hand provides the push (photo below). I like this method since the feedback through my fingers lets me know how the cut is progressing.

However, there comes a point when the rip fence and my fingers are just too close to the blade for comfort. It's a bit subjective, but anytime I'm ripping pieces under 5" in width, I reach for a helper.

That help comes in the form of either a push block or a push stick. These accessories do the same thing, drive a workpiece through the table saw blade. The only difference is their shape.

PUSH BLOCK. The name push block implies its shape. I use a push block that's cut from a piece of two-by stock. A notch along the bottom edge creates a heel at the back end. (There are commercial versions that work similarly.)

The advantage of a push block is that while you're moving a workpiece forward, the long base of the push block applies downward pressure on the workpiece.

I view this accessory as a disposable item. For ripping narrow parts, I can run the push block right across the blade. After a while, the bottom and heel are too chewed up to work. But it only takes a minute to make another one.

PUSH STICKS. The other type of guide that many woodworkers routinely use is a push stick. Here again, these can be shop-made or purchased. These long-handled accessories feature a small notch on the business end to catch the back end of



▲ When making wide cuts, your hand guides the workpiece. I like to hook my outer fingers over the fence rail to serve as a physical reference to make the cut safely.

a workpiece and push it through the blade. The main benefit to using a push stick is that the longer length keeps your hand away from the blade. Push sticks are pretty thin so they're useful when cutting narrow parts. That also means they work well with blade covers, as shown in the upper right photo.

PUTTING THEM TO WORK. Unless a workpiece is fairly short, it's not practical to use a push block when beginning a cut. The pressure on the unsupported back end would raise the front edge of the workpiece like a teeter totter.

That means you need to start the cut by guiding the workpiece with your hand and then grab the push block along the way. The key is knowing the right moves to get the job done safely. The photos below show the three-step process.

To minimize reaching, I park my push block either on top or right next to the rip fence. Feed the workpiece steadily through the blade. As the end of the workpiece approaches the edge of the saw table, use your left hand to keep the workpiece firmly on the table as you reach for the push block with your right. Make sure the hook engages the workpiece and push the piece past the blade.

Either a push block or a push stick will satisfy most of your needs. However, I've found that there are a couple of cases where it's nice to have other, more specialized accessories.

SADDLE FOR THIN STRIPS. Earlier, I mentioned that my push block works well for narrow stock. But if I need to cut a lot of thin strips for edging plywood, for example, my usual push block can get chewed up pretty quickly. Instead, I turn



▲ A notched 2x4 push block makes for a simple, disposable guide. You can cut into the block while still maintaining control.



▲ A narrow push stick can fit between the blade cover and rip fence for all but the narrowest cuts.



▲ This saddle is ideal for cutting narrow strips. Riding along the rip fence ensures that the piece you're cutting is moving in a straight line.



▲ Rubber-bottomed push pads give you a firm grip to hold the workpiece against the saw table.

to a different pushing device. This one is a saddle that rides along the rip fence (near left photo above). With this setup, the side that pushes the workpiece can't drift away from the fence and get cut by the blade. The side is notched to accept several common thicknesses.

PADS FOR JOINERY. One of the keys to cutting accurate rabbets and dadoes is holding the workpiece against the saw table. Otherwise the workpiece can rise

up and cause an inconsistent depth of cut. To avoid this problem, I use a pair of rubber-bottomed push pads (near right photo above). These spread the pressure you apply over a broader area so you can make the cut with ease.

Making smooth, accurate cuts goes hand in hand with safe practices at the table saw. Using the guides and learning the techniques shown here will put you on the right path. **W**



▲ Start cutting a long board by feeding the workpiece with your hands. The push block should be located within easy reach.



▲ Use your left hand to keep the workpiece moving slowly as you reach for the push block with your right hand.



▲ Complete the cut with the push block. Lift your left hand from the saw table to keep it clear of the blade.

Shop Notes

Cutting Compound Miters

The corner slats on the window box (page 18) are joined with compound miters. To keep a consistent spacing between slats, the width of the front and back corner slats is different from the end slats. What makes it a challenge is that to cut the eight corner slats, you need four different setups. The lower left drawing below shows how each pair of corner slats relate to the others.

VERSATILE SLED. The solution comes in the form of a simple table saw sled. The details of the sled are shown in the drawing below.

One edge of the sled runs along the rip fence. (I needed to move the rip fence to the left side of the blade for this step.)



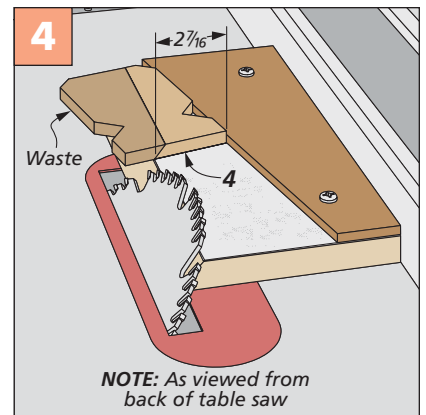
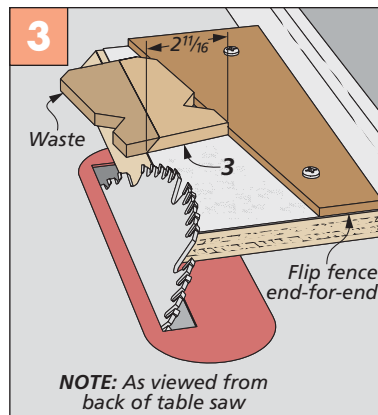
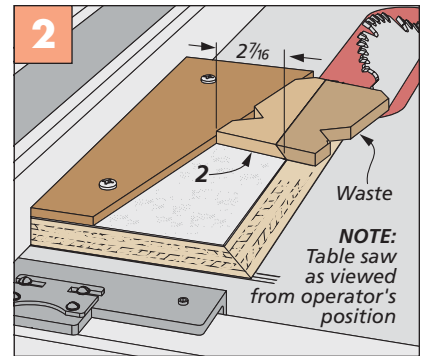
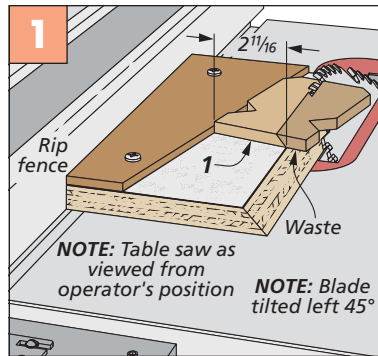
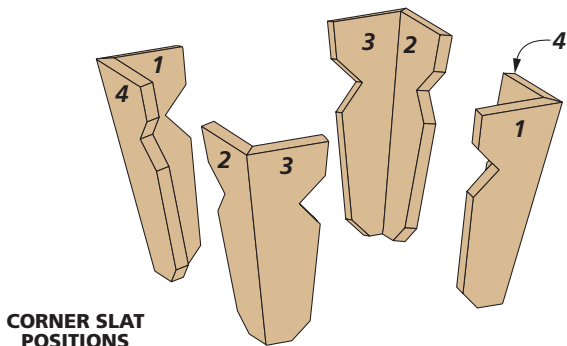
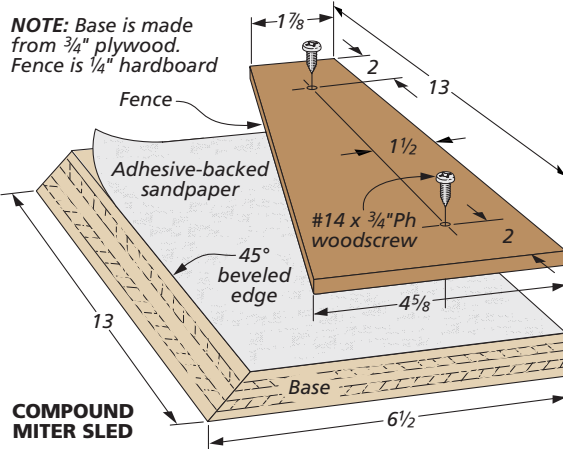
The opposite beveled edge serves as a guide for positioning the slat along an angled fence. Sandpaper on the base helps keep the slat from creeping as you hold it in place with a push pad, as shown in the photo above.

MAKING A CUT. In order to cut the slats accurately with the sled, you just need to mark the width of the slat on its top edge. To keep things organized, I arranged the corner slats in four groups

of two to match the four different cuts you need to make.

Figures 1 - 4 below highlight the setup for each cut. You set a slat on the base and slide it along the fence until the layout line aligns with the beveled edge of the base. Then use a push pad to hold the slat in place as you make the cut.

Notice that in Figures 3 and 4 the fence and slat are flipped end for end to cut the opposite miters from the first two cuts.



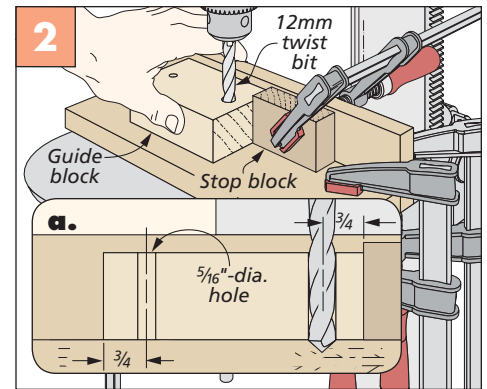
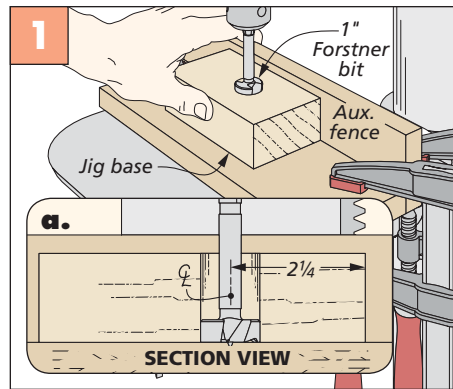
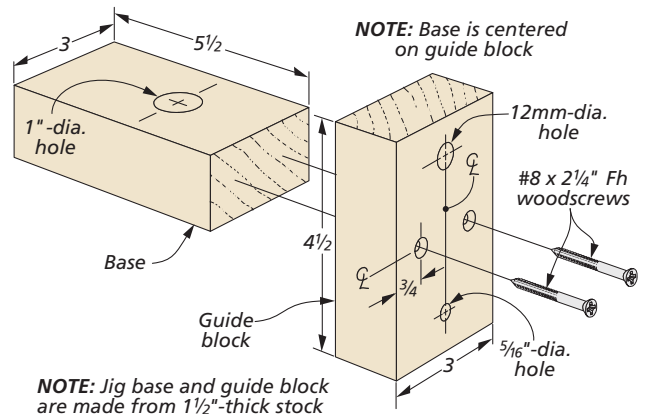
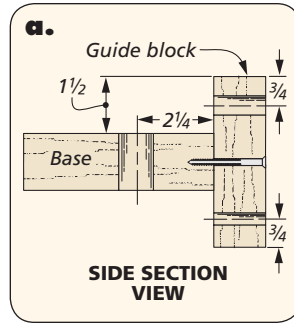
Hardware Drilling Guide

The face frames for the room divider on page 28 are held together with railing connectors. These connectors require the accurate drilling of a few holes near the ends of the rails and stiles. In order to keep the hole spacing consistent between parts, I made this simple drilling guide to assist in lining them up.

THICK BLOCKS. The drilling guide is made from a couple of thick hardwood blocks screwed together to form a 'T.' Before fastening the two blocks together, you'll want to lay out and drill the holes.

The base piece of the guide has one hole drilled in its face. This locates the hole that houses the anchor portion of the railing connector.

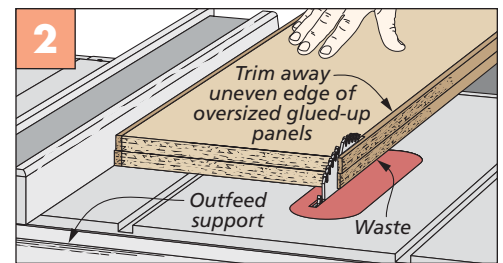
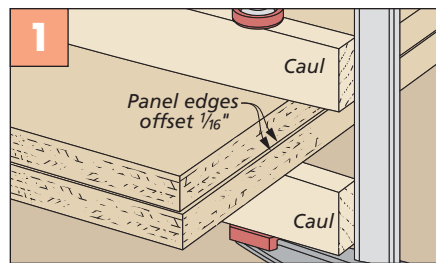
The two holes in the guide block position the hole for the threaded insert in the stile edge and the hole for the threaded rod that extends into the end of the rail. The boxes at the bottom of page 34 show how to use the drilling guide.



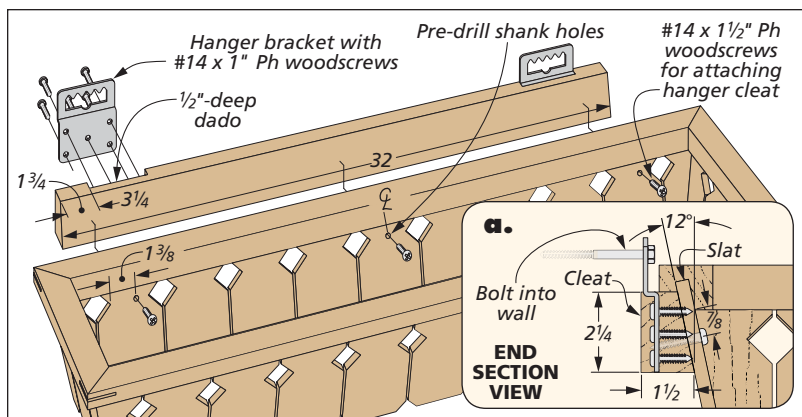
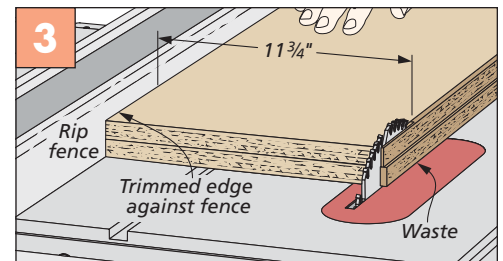
Trimming Two-Layer Panels

The room divider on page 28 has three large upright dividers, each constructed from two layers of 3/4" plywood. When face gluing these large panels, it's difficult to keep the edges flush and get the clamps in place without the panels sliding out of alignment.

To avoid this frustration, I cut the plywood panels needed for the dividers a little wide. I was then able to intentionally offset the panels' edges when applying the glue and clamps, as shown in Figure 1. This ensures that you have a straight edge to run against the table saw rip fence while cutting the dividers as shown in Figure 2. The result is that you can still get four single-layer panels from their finished size (Figures 2 and 3).



In order to maximize the yield of a sheet of plywood, be sure you only cut the oversize panels about 1/8" wider than necessary. This allows you to overlap the panels about 1/16" on each side, as illustrated in Figure 1. The result is that you can still get four single-layer panels from one sheet of plywood.

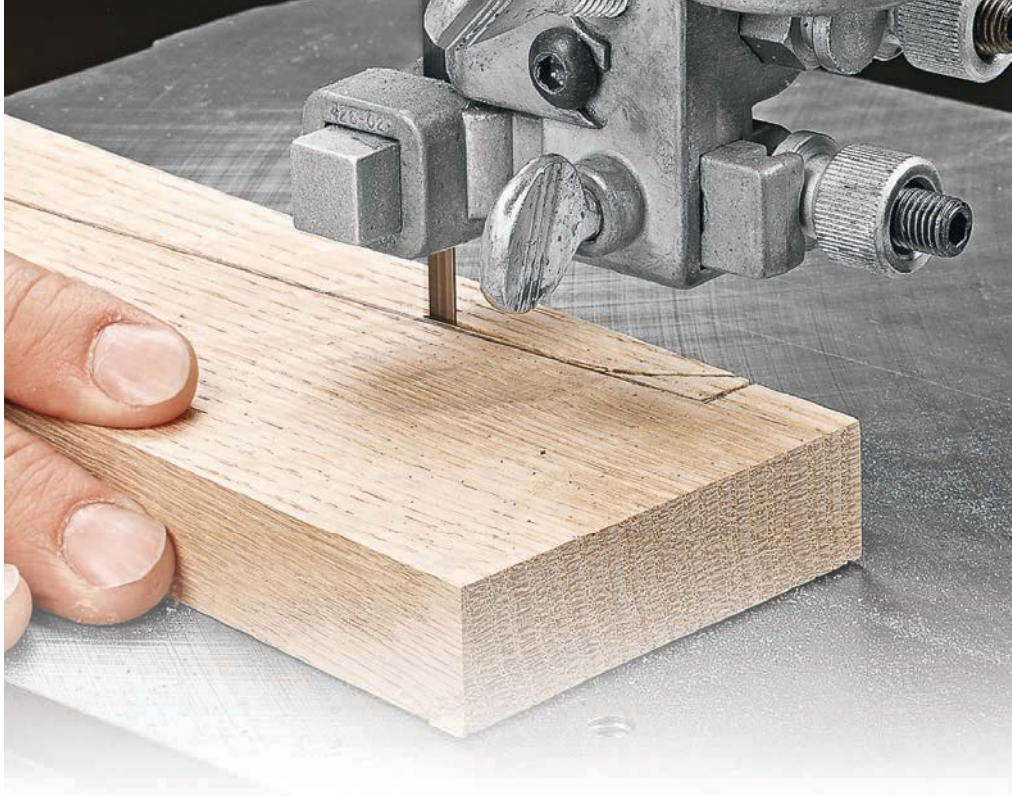


Planter Box Hanger Cleat

Once it's filled with flowers and potting soil, the planter box from page 18 can be pretty heavy. So I wanted an easy way to attach it to the house. You can see what I came up with in the left drawing. The secret is a heavy-duty hanger bracket that looks like a giant-sized sawtooth picture frame hanger.

The brackets are set into shallow dadoes cut in a cleat that I screwed to the back side of the planter box. The cleat is made from the cedar, just like the planter box. I beveled one long edge to match the angle of the slats, as shown in detail 'a.' The brackets hook over lag screws that are driven into the side of the house. **W**

cut on The Waste Side



I often read directions that say to “cut on the waste side of the line.” How much waste should I leave?

*Eric Oslund
Independence, Missouri*

Working to a layout line is an essential woodworking skill. A layout line on a workpiece separates the material you want to keep from the material that needs to be removed — the waste. So the line helps determine the ultimate size and fit of a project part or even a joint.

The key is understanding what part of the workpiece the layout line is on. For me, the lines serve as a “do not exceed” reminder. But ultimately, it’s the final fit and look that’s most important. Here are two examples that illustrate how to use layout lines as a guide.

CURVED & IRREGULAR SHAPES. When creating a curved edge on a workpiece, the first step is to remove most of the waste quickly. A band saw is an ideal choice for this, as shown in the photo above.

The blade leaves noticeable marks, so you don’t want to cut right on the line. Otherwise you would lose your reference for shaping the curve. Instead, keep the blade slightly away from the line. The closer you cut, the easier (and quicker) it is to clean up the profile right to the line. With a well-tuned saw and a little practice, you can reliably cut pretty close to the line (up to $\frac{1}{32}$ ”).

The second step is smoothing the edge, working just to the layout line without removing it. You can do that with a sanding drum (lower left photo) or with a router, a template, and flush-trim bit.

INSTALLING HARDWARE. Shaping a part isn’t the only place where knowing how close to cut to a layout line is important. The other example, creating a hinge mortise, is shown in the lower right photos. I traced the hinge to locate it on the edge of the door. A router and a straight bit removes most of the waste area inside the pencil lines.

In order to do the final fitting, turn to your chisels. Here’s where the layout line comes into play. For a snug fit, you need to trim up to, but not remove, the line. Trimming away the layout line results in a mortise that’s too large — by the width of the pencil line on each side.

Layout lines are your roadmap to staying on course while you work. Learning to read what they’re telling you will make your projects better. **W**



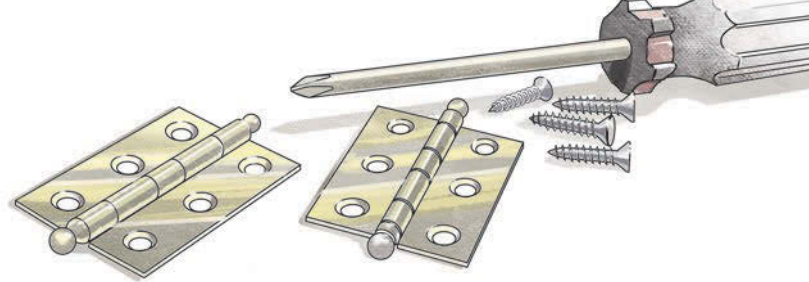
▲ In order to create a workpiece with a smooth curve, be sure to keep your layout lines. Sanding away the line eliminates your guide and it’s much harder to make a smooth, even curve.



▲ Use your chisels to trim away the waste right to the pencil lines so a butt hinge fits in the mortise like a hand in a glove.

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.

SHOP FIRST AID (p.10)

- **Rockler**
Splinter Out 36562
Magnifying Tweezers 81943
- **Amazon**
Pager System B0032FMSWS
Saline Eyewash B00INAXF1K

TABLE EDGE ROUTER BITS (p.12)

- **MLCS**
Thumbnail Bit 8559
Traditional Bit 8567
Ogee Fillet w/Radius Bit 8564

LEIGH DOVETAIL JIG (p.14)

- **Highland Woodworking**
RTJ400 Dovetail Jig 105881
Accessory Kit 105882

WINDOW PLANTER BOX (p.18)

- **Lee Valley**
Hanger 00F16.10
- **windowbox.com**
36" Box Liner BXI-NM-02368

The planter box was primed and then painted with Benjamin Moore's exterior paint in Mountain Peak White.

ROOM DIVIDER (p.28)

- **Lee Valley**
Cabinet Hangers 01L06.01
Railing Connectors 00S12.40
- **Lowe's**
Shelf Pins 163200



The room divider face frames were primed and painted with a black satin spray paint. The remainder of the project was finished with three coats of spray lacquer.

SMALL PARTS SLED (p.36)

- **McMaster-Carr**
1/4"-20 Thumbscrews 92421A540
1/4"-20 Insert Knobs 5993K22
- **Rockler**
Miter Bars 21982
1/4"-20 Flange Bolts 31969
T-Track 22104
- **Nevamar**
Laminate (Liberty Red) S-1027

CHERRY BUFFET (p.42)

- **Amazon**
Cope & Stick Bits B001GI7TCM
- **Lee Valley**
1 1/4" Knobs 02W26.22
Shelf Supports 05H20.41
16" Drawer Slides 02K42.16
- **Hardware Source**
3/8" Inset Hinges 400171
- **Veneer Supplies**
Cherry Veneer PBCHRFC28

The buffet was stained with a mixture of three parts Zar cherry stain and one part Wood Kote Jel'd stain (cherry). Then it was sprayed with two coats of lacquer.

CALIPERS & DIVIDERS (p.56)

- **Craft Supplies USA**
Caliper/Divider Set 1050860001
Digital Calipers 1042510002



OILS & LUBRICANTS (p.58)

- **Amazon**
Lithium Grease B001DKQ0X2
- **Rockler**
BladeCote 52670
- **Enco**
Tap Ease Stick 825-8140
Tap Magic Fluid 505-2007
- **Home Depot**
PB Blaster 16PB-THD
Metal Rescue WH290497
Paste Wax 00203



TABLE SAW ACCESSORIES (p.62)

- **Woodworker's Supply**
Push Stick 886-669
- **Woodcraft**
Push Blocks (Pads) 111170

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MAIL ORDER SOURCES

Project supplies may be ordered from the following companies:

Woodsmith Store
800-444-7527

Rockler
rockler.com

amazon.com

Benjamin Moore
benjaminmoore.com

Craft Supplies USA
800-551-8876
woodturnerscatalog.com

Enco
use-enco.com

Hardware Source
877-944-6437
hardwaresource.com

Highland Woodworking
800-241-6748
highlandwoodworking.com

Home Depot
homedepot.com

Lee Valley
leevalley.com

Lowe's
lowes.com

McMaster-Carr
mcmaster.com

MLCS
800-533-9298
mlcswoodworking.com

Nevamar
877.726.6526
nevamar.com

Veneer Supplies
veneersupplies.com

windowbox.com
888-427-3362

Woodcraft
woodcraft.com

Wood Kote
woodkote.com

Woodworker's Supply
woodworker.com

Zar
zar.com

looking inside Final Details



▲ *Room Divider*. Whether it's placed against a wall or in the middle of a room, this shelving unit is both practical and attractive. Removable shelves enhance its utility. We'll walk you through each step of the construction, beginning on page 28.



▲ *Small Parts Sled*. This scaled-down version of the classic table saw sled includes all the features you'd expect to find — plus a few more that are designed specifically for working with small parts. Plans begin on page 36.



▲ *Window Planter Box*. This planter box is ideal for mounting beneath a window or on a deck railing. And the “picket fence” design of the slats gives this weekend project a unique look. Turn to page 18 to get started.



◀ *Dining Room Buffet*. The final chapter to our dining room suite, this buffet incorporates several of the same great design features found in the other pieces — frame and panel joinery, elegant bullnose profiles, and solid cherry construction. To learn more about how to build it, turn to page 42.