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WOODWORKING TO IMPROVE YOUR HOME®

August 2003

TOOL TEST: 8 BENCHTOP MORTISERS

WEEKEND PROJECT CD & DVD STORAGE with style!

TIPS & JIGS TO MAXIMIZE YOUR MITER SAW

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Nº 278

AUGUST HOME PUBLISHING COMPANY

EDITOR'S NOTES

I'm always amazed at how much excitement an ordinary box can produce when it's delivered to our shop — especially if there's a chance it contains a tool. Everyone gathers around like kids at an ice cream truck — examining the label to see who it's for (and where it's from), lifting it up to check its weight, and then, based on these *very* scientific observations, venturing a guess as to what's inside.

I know it's silly. But the *Workbench* crew is admittedly, obsessed with tools. And I've got a hunch we're not the only ones. To find out if you qualify as a "tool nut," take the quiz below. If you answer "yes" to five or more questions, you're probably addicted — just like the rest of us. Fortunately however, there is an easy fix.

Tool Issue — You see, right now we're in the process of putting together a special issue of *Workbench* that's devoted exclusively to tools. This issue will include updated tool reviews, tips on setting up and using tools, a behind-the-scenes look at tool prototypes, a tool hall of fame, and much more. In short, it's a veritable buffet of all the useful (alright, and some not so useful) information we've discovered as we work with tools in the *Workbench* shop.

Readers Write — We'd also like to include stories and information about *your* experiences with tools: the best tool you've ever owned, a close call with a tool, a tool you used for *other* than its intended purpose, or just your "tool cents' worth" about a tool.

That's where I could use your help. To round up this information, we've posted a short survey at www.workbenchmagazine.com. You can complete the online survey, or mail your tool stories to my attention: Tim Robertson, Workbench Magazine, 2200 Grand Ave., Des Moines, IA 50312.

FREE TABLE SAW! Either way, you'll have a chance to win a FREE Delta table saw — just for submitting your story. And that's no toolin'.

Tim

TOOL NUT OR NOT?

1. Do you plaster bumper stickers about tools and woodworking on your truck?
2. Do you own more than one router? More than two? If so, do you change routers instead of router bits?
3. Can you name the model numbers of at least three tools in your shop?
4. Would you rather talk cutting capacity and chuck size than batting averages and rushing yardage?
5. Have you *ever* built a project, in part, in order to justify buying a new tool?
6. Is the tool review the first thing you read when you get your issue of *Workbench*?
7. Would you consider naming your son Stanley or your daughter Bailey?
8. Are all those blinking lights at your battery charging station starting to look a bit like a landing strip?
9. Do you call it an "adjustable end wrench" instead of a Crescent wrench? Or "locking pliers" instead of a Vise-Grip?
10. Have you started kicking the tires at the home center *more* than once a week?

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▲ When cutting rabbets on a jointer, a notch in the outfeed table *(see above)* provides clearance for the shoulder of the rabbet.

cutting rabbets ON YOUR JOINTER

Q *I've heard people talk about using their jointers to cut rabbets, but I've never attempted to do it myself. Can you tell me how to cut a rabbet on the jointer?*

Steven McCue
Mount Pleasant, IA

A You can use a jointer to cut either a narrow rabbet in the edge of a board *(see Photo at left)* or a wide rabbet in the face of a board *(explained in the Sidebar below)*. To do this, your jointer will need to be equipped with two things: a notch along the edge of the outfeed table and a rabbeting arm on the infeed table. The notch provides support for the shoulder of the rabbet, while the arm supports the unrabbeted portion of the workpiece when cutting wide rabbets.

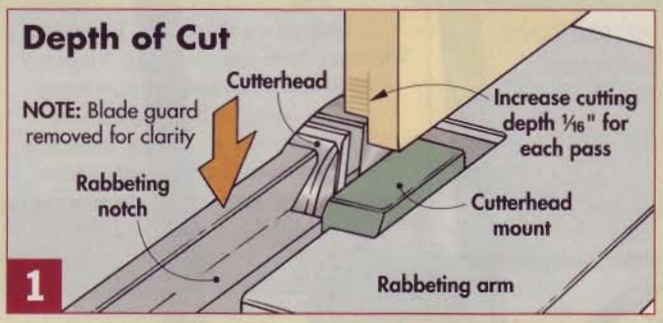
To produce a clean cut, you'll want to make sure the ends of the knives on the jointer are aligned, as shown in *Figure 2*. Just be sure the power to the jointer is off before adjusting the knives.

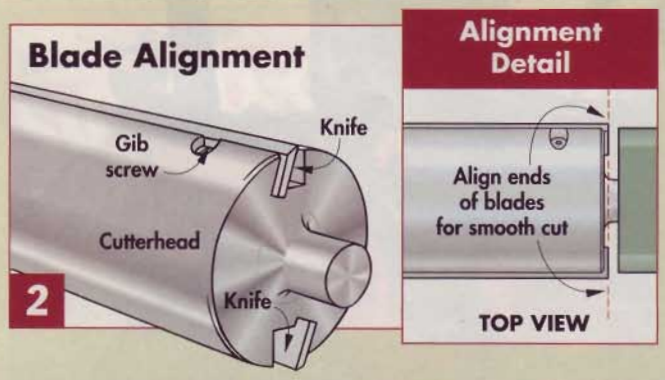
Establish the Width of Rabbet — The first thing you'll want to do is establish the width of the rabbet. This is done by measuring from the fence to the end of one of the jointer knives.

Then as you butt the workpiece against the fence, only the portion of the board that passes over the exposed knives of the jointer will end up getting rabbeted.

Make Multiple Passes — A jointer isn't designed to "hog away" a lot of material at once. So cutting a rabbet on a jointer requires making multiple passes, removing a little bit of material each time. As for depth, I like to set my jointer for a shallow cut — no more than $^1/_{16}$" *(Fig. 1)*.

Now you can make as many passes as necessary, lowering the infeed table another $^1/_{16}$" after each pass until you reach the desired depth of the rabbet.





Wide Rabbets

Using a jointer to cut a wide rabbet on the face of a board isn't as common a practice as rabbeting the edge of a board. It can still be done, however, using a similar technique as explained above.

Notice in the *Photo* at left that the blade guard is removed. The other key difference is that the rabbeting arm really comes into play to support the unrabbeted portion when cutting on the face of a board.

Got Questions? We Have Answers!

HOW TO SEND YOUR QUESTIONS:
Email: editor@workbenchmag.com
Forums: forum.woodnet.net
Mail: Workbench Q&A, 2200 Grand Ave., Des Moines, IA 50312

Include full name, address, and daytime phone number. You'll receive one of our handsome *Workbench* caps if we publish your letter.

▲ A slotted jig with parallel fences and stop blocks lets you make "plunge" cuts with a fixed-base router.

use a fixed-base router to TAKE THE PLUNGE

Q *I only own a fixed-base router. Can I still use it to make plunge cuts?*

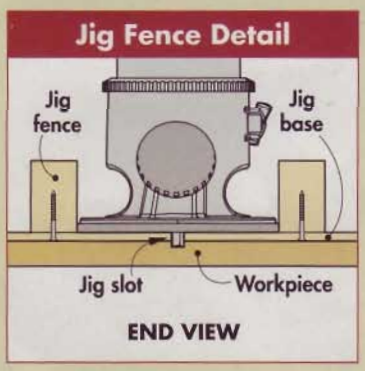
Tom Handlos
Via the Internet

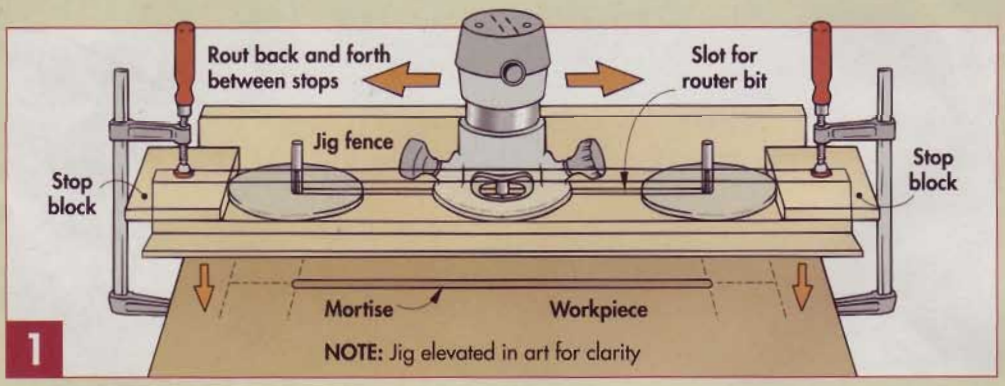
A Yes, you can. To keep the router from skidding out of control across the workpiece, you'll need a jig that keeps the router base aligned so the bit cuts exactly where you want *(Photo at left)*.

There are only three parts to this jig. The base is a piece of 1/4" plywood with a slot down the center to provide clearance for a straight bit. A pair of parallel fences (2x4's) screwed to the base guide the router in a straight line. Finally, a pair of stop blocks define the length of the cut *(see Fig. 1)*.

After setting the bit for no more than a 1/4"-deep cut, tilt the router at an angle, holding one side of the router base firmly against the base of the jig. Then slowly lower the bit into the slot in the jig until the router is flat on the base of the jig.

Now move the router back and forth between the stops. Don't worry about the routing direction since the fences keep the router aligned. You may need to make several shallow passes, depending on the depth of cut.





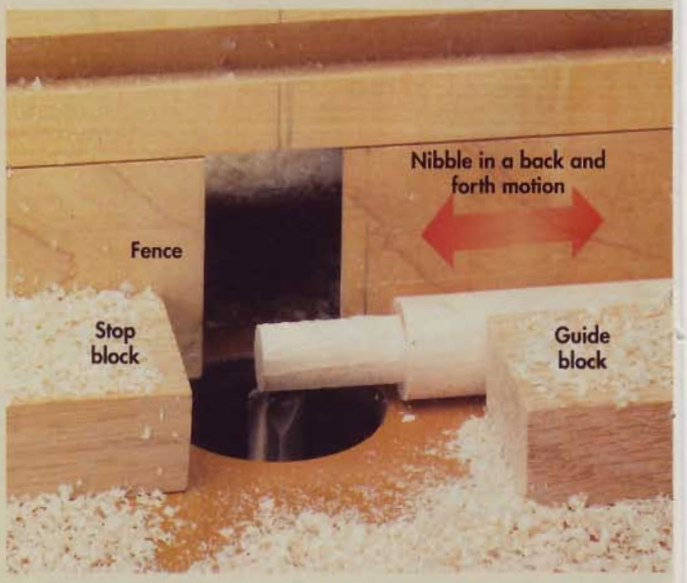
tenoning a dowel ROUT IT ROUND

Q *How do you cut a tenon on a dowel without a lathe?*

Denise McFurrin
Fort Worth, TX

A Start by mounting a straight bit in the router table. Then set the fence so the dowel is centered on the bit. To create a channel for the dowel, clamp a guide block to the table. A second block serves as a stop to establish the length of the tenon *(see Photo at right)*.

Now raise the bit 1/16" and push the dowel forward until it contacts the stop block. Next rotate the dowel to make a shoulder cut all around, then "nibble" away the waste.



Questions & ANSWERS

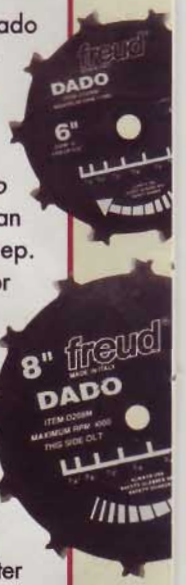
Warrington hammer HITS THE NAIL ON THE HEAD

Q *Why does a Warrington hammer have a wedge-shaped end?*
Tony Muzino
Lawrence, KS

A In a word, it's a finger-saver. The wedge-shaped cross peen lets you start small brads without hitting your fingers *(see Photo)*. Then reverse the hammer to drive them home. Notice also the two flat striking faces on the *sides* of the head. These come in handy in tight quarters. Order Warrington hammers ($3\frac{1}{2}$, 6, or 10 oz.) from Lee Valley, leevalley.com or 800-871-8158.

dado blades

What Size?

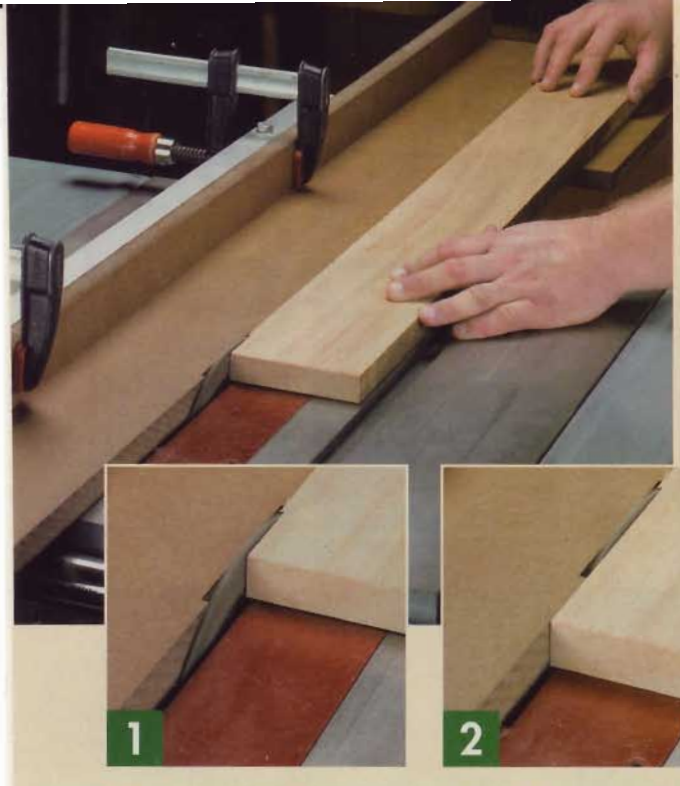


"Should I buy a 6" or 8" dado blade?" We hear that question often at *Workbench*. The answer really depends on the depth of cut you want to make.

Notice in the top *Photo* below that a 6" dado blade can create a cut up to 1" deep. Since I seldom cut rabbets or grooves deeper than $\frac{3}{4}$", my 6" blade gets the lion's share of use in my shop.

Say you're going to be cutting dadoes or rabbets in larger stock such as 4x's for example, then an 8" dado blade that can cut up to 2" deep would be a better choice. Just make sure your saw can handle the larger blade.

jointing on a TABLE SAW



▲ The recessed infeed edge of the fence guides the workpiece into the blade.

▲ The full-width, outfeed portion of the fence supports the jointed edge.

You don't need a jointer to get a straight, square edge on a board. An L-shaped auxiliary fence makes it easy to "joint" a board on a table saw *(see Photo at left)*. The fence works on the same principle as a jointer. On a jointer, the workpiece is fed along an infeed table set slightly lower than the knives. As material is removed, the outfeed table, which is set flush with the knives, provides support for the workpiece.

Infeed & Outfeed Sides — To adapt this idea to the table saw, this fence also has an *infeed* and an *outfeed* side. The infeed side has a long, shallow recess cut in one edge. In use, this recessed edge is used to guide the workpiece into the saw blade *(Photo 1)*. The outfeed edge of the fence (the full-width part) provides support for the workpiece after the cut is made *(Photo 2)*.

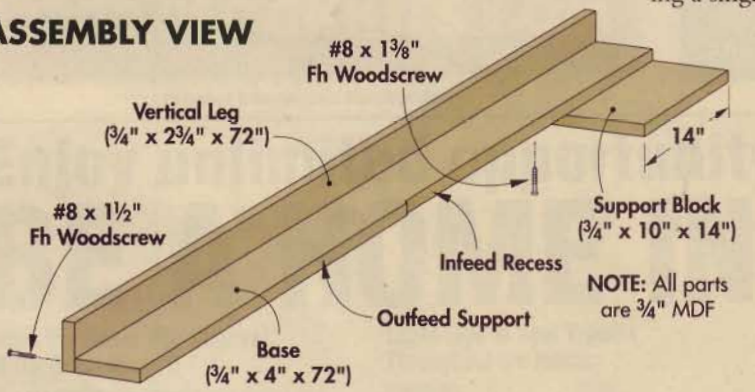
A Quick Build — The auxiliary fence consists of two pieces of $^3/_4$" MDF that are screwed together *(Construction View)*. The vertical "leg" of the fence is used to clamp the assembly to the saw's rip fence. For jointing long pieces, I also made a support block for the infeed end of the table. Note: Attach it *after* you cut the infeed recess.

Cutting the Recess — To cut the infeed recess, you'll need to move the rip fence to the left side of the blade. Set the fence to make a cut that matches the *exact thickness* of a saw kerf. Then, making a single pass, cut the recess as shown in the *Recess Detail* below. After the recess is cut, simply flip the assembly end-for-end to use it to joint the edge of a board.

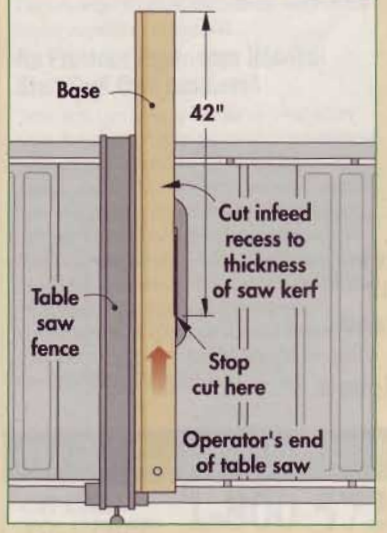
Setup — To set up the fence, align the *outfeed* support of the fence with the outermost teeth on the saw blade *(see Setup Detail)*. A framing square makes it easy.

Matt Danning
Piedmont, CA

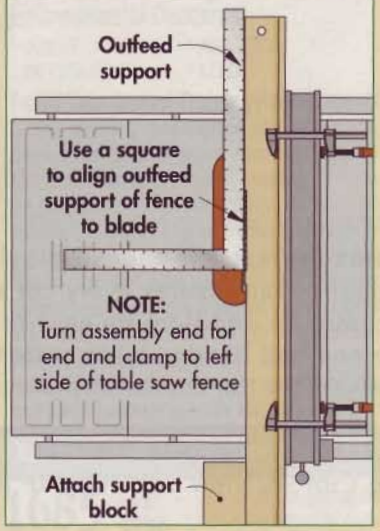
ASSEMBLY VIEW



Recess Detail



Setup Detail



TOOLS FOR TIPS!

Matt Danning, our Featured Tip winner, receives a Delta TwinLaser Miter Saw!

Send your shop or home improvement tips and techniques to:

Workbench Tips & Techniques
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Des Moines, IA 50312
Or, email us at:
Editor@Workbenchmag.com

no more mars

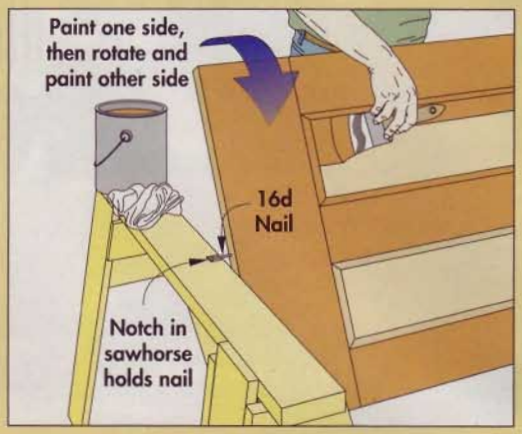
BRUSH-ON CLAMP PADS

When clamping a project, the pressure applied by a pipe clamp can mar the wood. An easy way to prevent that is to paint the jaws of the clamps with a plastic coating. You can get Rubberize-It or Plasti-Dip coatings at most home centers. To avoid making a mess, form a dam around the jaw with duct tape *(see Photo)*. Then, using a small brush, apply several coats to the surfaces of the jaws. Make sure you follow the manufacturer's recommended dry time between coats. The plastic-coated jaws protect the project and also improve the grip of the jaw on the wood.

David R. Miller
Nappanee, IN

easy painting

Revolving Doors



Painting doors can be a time-consuming process. Paint one side, let it dry. Flip the door. Paint the other side, let it dry. You know the routine.

I save time by tacking a nail in each end of the door, then setting the nails in notches cut in the top of my sawhorses. Now I just paint one side, rotate the door, then paint the other side. And it's easier to paint the ends and edges this way, too.

Vernon Unrath
Mandan, ND

take 'em with you

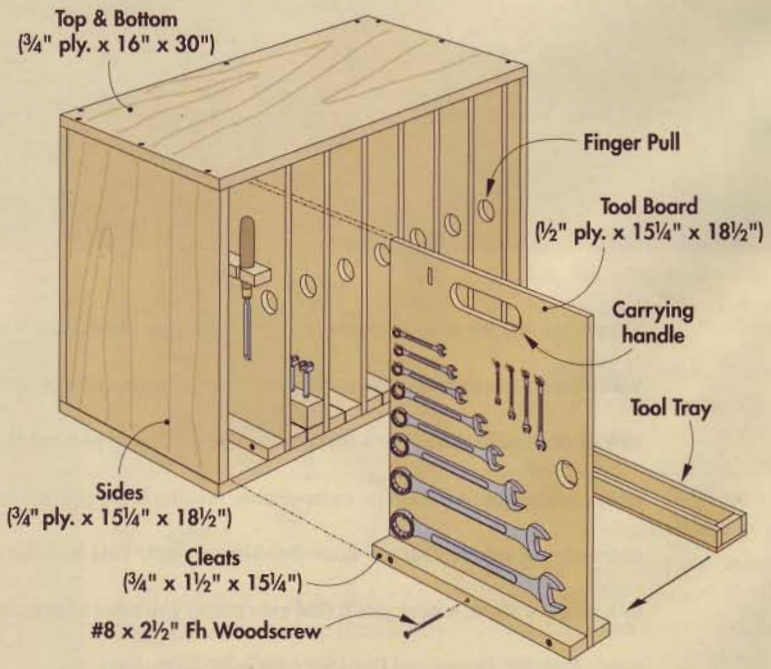
TOOL BOARDS

I've come up with a space-saving design for tool storage. The tools hang on both sides of plywood tool boards that slide in and out of a box, just like files in a cabinet *(see Illustration at right)*. The tool boards can be pulled out and carried to wherever you're working.

As you can see, each tool board is supported by a pair of cleats that prevent the board from tipping over at the job site. The cleats also act as spacers for the boards when they're in the storage box. This automatically provides clearance so the tools on adjacent boards don't interfere with each other.

As an option, you can add small trays to the tool boards to provide storage for small parts like bits, sockets, or nuts and bolts.

Steve Graham
Greenville, SC



small-piece ROUTER SLED

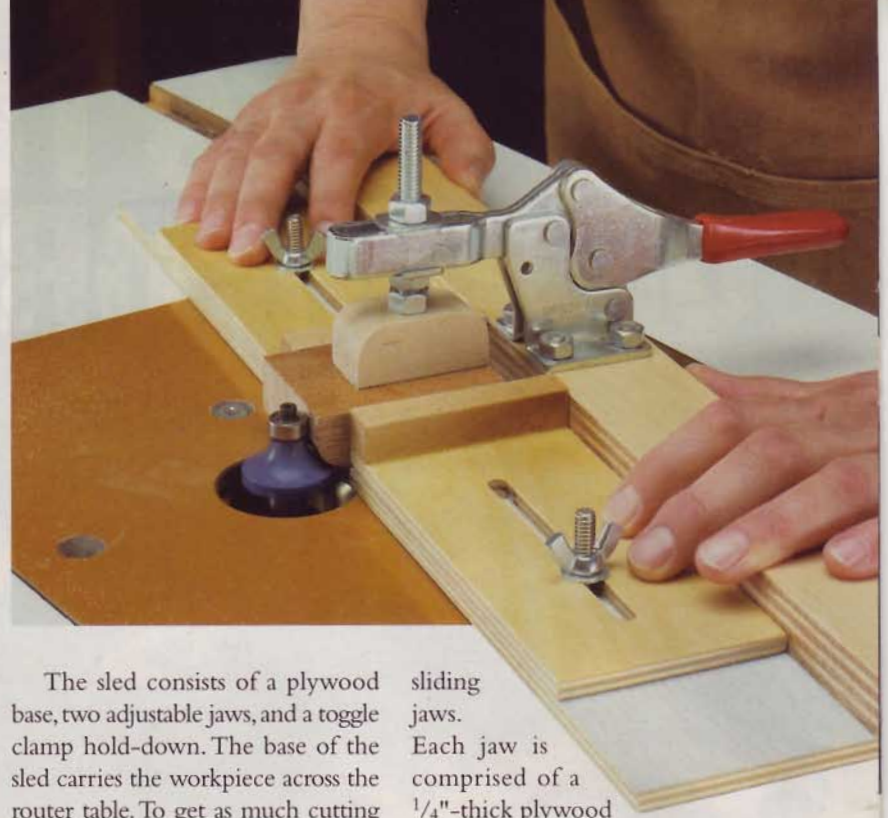
▲ The sliding jaws and clamp block adapt to a variety of workpiece shapes and sizes.

The true meaning of 22,000 rpm comes home to you the instant a small wood block you're routing becomes a projectile that's hurled across the shop. You check — yep, all your fingers are still intact.

It was an episode like this that prompted Jim Shipman of Detroit to design this small-piece router sled. He wanted an accessory that would hold the workpiece securely *and* keep his hands clear of the router bit.

How It Works — To understand how the sled works, take a look at the *Photo* above. The workpiece is extended over the edge of the sled and pinched between a pair of adjustable jaws.

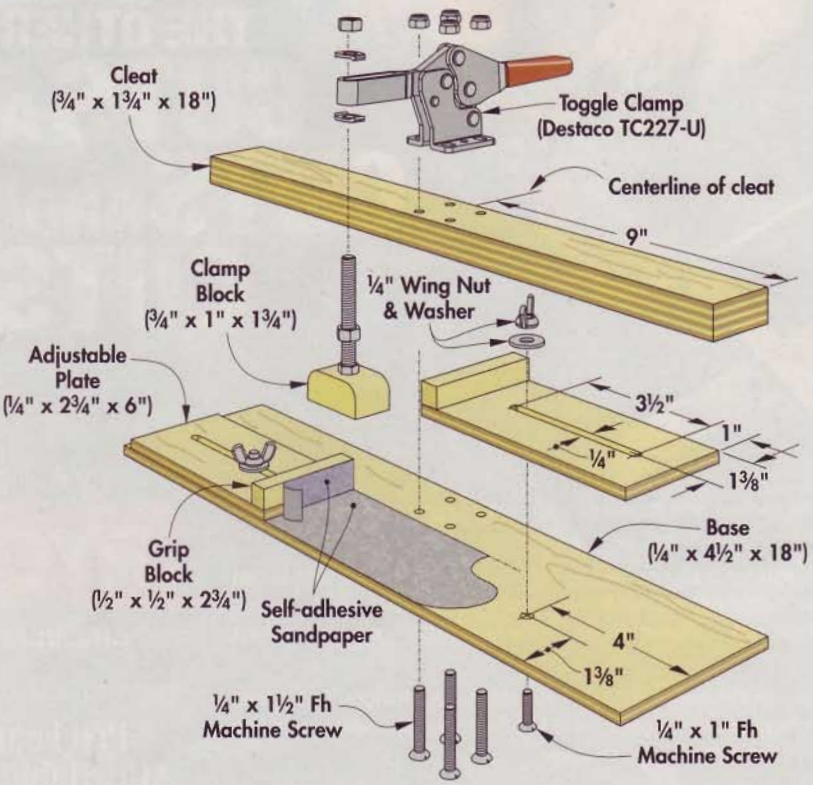
Downward pressure is applied with a toggle clamp. With the workpiece secure, you simply slide the sled across the router table to make a safe, accurate cut.



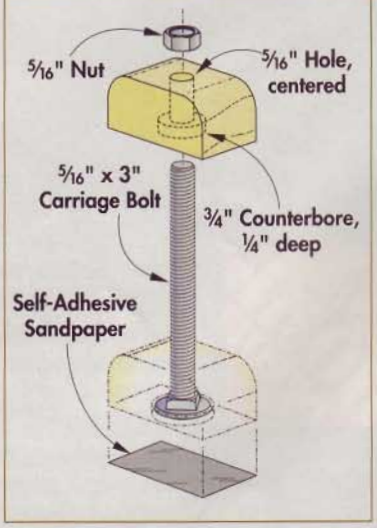
The sled consists of a plywood base, two adjustable jaws, and a toggle clamp hold-down. The base of the sled carries the workpiece across the router table. To get as much cutting capacity as possible, it's made of 1/4"-thick plywood, which minimizes the distance you'll have to raise the router bit. To add rigidity, a 3/4"-thick cleat is glued flush with the back edge of the base. And adhesive-backed sandpaper is added to the front area of the base to provide extra grip.

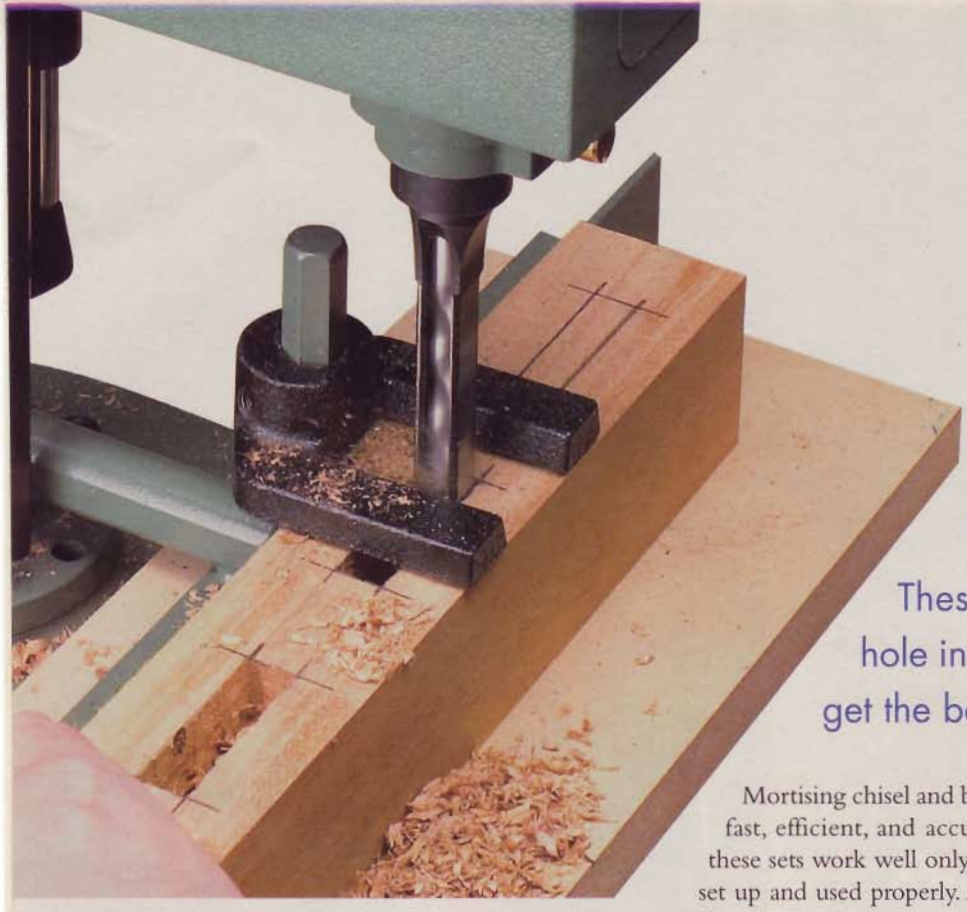
Sliding Jaws — The components that hold the workpiece are a pair of sliding jaws. Each jaw is comprised of a 1/4"-thick plywood plate and a 1/2"-square solid-wood grip block. The plates are slotted so the jaws can be moved to accommodate workpieces ranging from 1" to 7" in length. Again, add a strip of sandpaper to the face of each jaw to increase the grip.

Hold-Down — Downward pressure is applied to the workpiece using a toggle clamp mounted to the cleat. For a larger clamping surface, it's a good idea to replace the original bolt and rubber tip with a longer carriage bolt and a wood block faced with sandpaper *(see Hold-down Detail below)*.



Hold-down Detail





mortising magic CHISELS & BITS

These mortising sets drill a square hole in seconds — if you know how to get the best performance out of them.

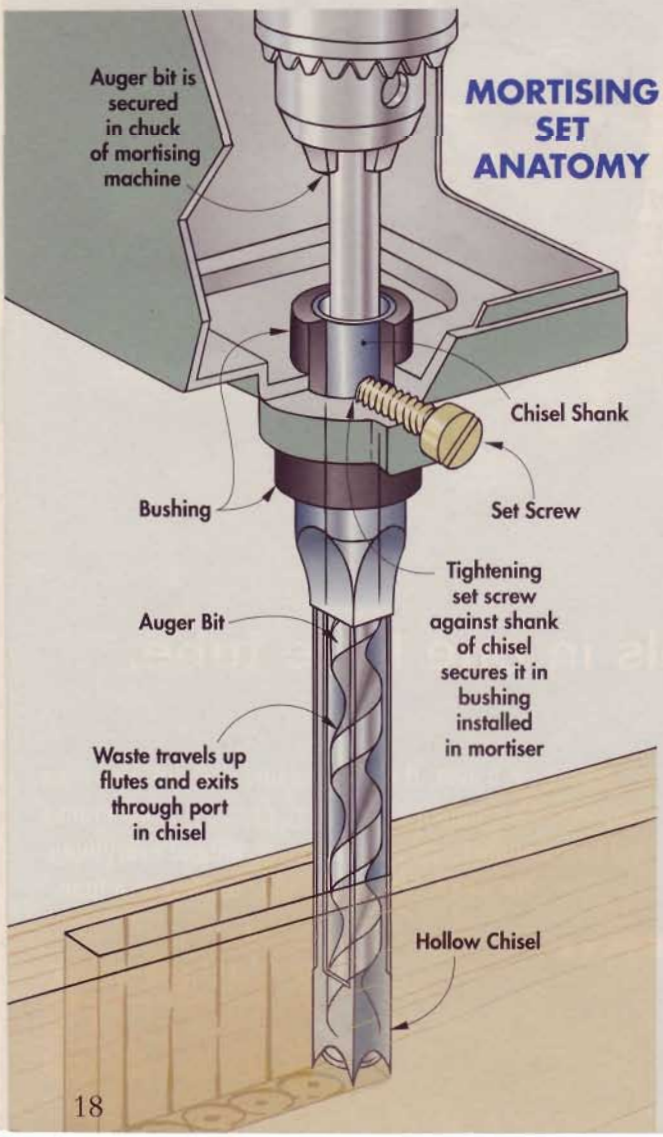
Mortising chisel and bit sets are fast, efficient, and accurate. But these sets work well only if they're set up and used properly. And even then they require some muscle, which is not surprising when you consider how they work.

Each set is comprised of an inner auger bit and an outer hollow chisel. The auger bit bores out the bulk of the wood, lifts the waste up out of the hole, and ejects it from the chisel waste port *(see Mortising Set Anatomy)*. The chisel finishes the mortise by squaring up the sides.

And the chisel part is what requires the muscle. Think about it — your machine's motor powers the auger bit, but the square corners of the mortise are cut *manually*, as you use the hand lever to drive the chisel down through the workpiece.

With this emphasis on force, it's easy to overlook another key factor — the feed rate. It's important you match the chisel's advance with the cutting rate of its companion auger bit. Feed too quickly and the wood shavings won't be able to exit the chisel port fast enough, causing the tool to jam. Feed too slowly and you're likely to burn your stock. It's always best to practice your technique first on some scrap stock of the same kind of wood.

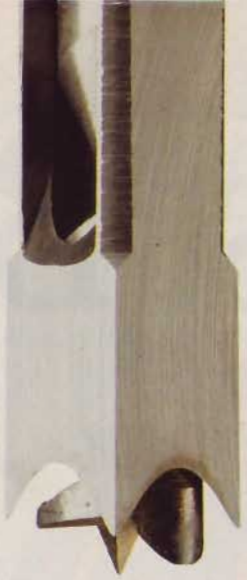
Another thing you can do to avoid jamming the chisel port is make sure the port is facing in a direction that allows the waste to be expelled into the "open" area of the mortise *(see the Photo above)*. This prevents the port from clogging.



► Chisel and bit sets ranging from 1/4" to 1/2" are priced from about $15 to $50 per set.

The Cutting EDGE

10 cent tip for ACCURATE SETUP

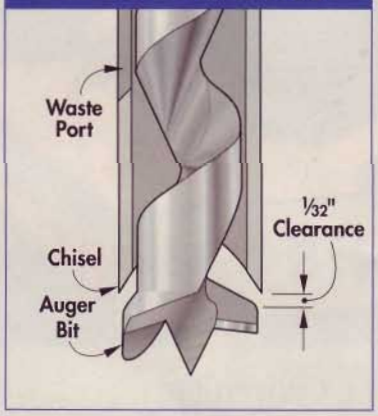


Proper setup is critical not only for accurate mortising, but also to ensure the best possible performance from your machine. Right off the bat, you need to decide on the size of mortise. (For more on this, see the *Sidebar* below.) Once you select the correct size chisel and bit set, the next step is to mount them in the mortising machine.

These chisels and bits are pretty finicky when it comes to adjustment. There needs to be a 1/32" clearance between the auger bit and the mortising chisel *(see Bit Clearance Detail below)*. Otherwise, the two could come in contact during a cut. When that happens, the two components will "weld" together in an instant, and your mortising set will be history.

As it turns out, the gap needed between the auger and the chisel is about the same as the thickness of a dime. So not surprisingly, a dime works great in establishing the clearance needed between the auger bit and chisel. (For details on this procedure, see the *Photo Sequence* at right).

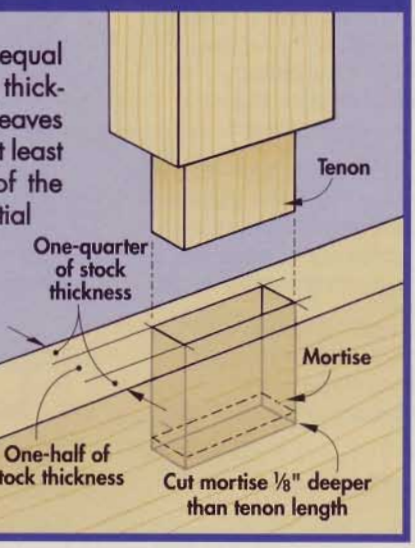
Bit Clearance Detail

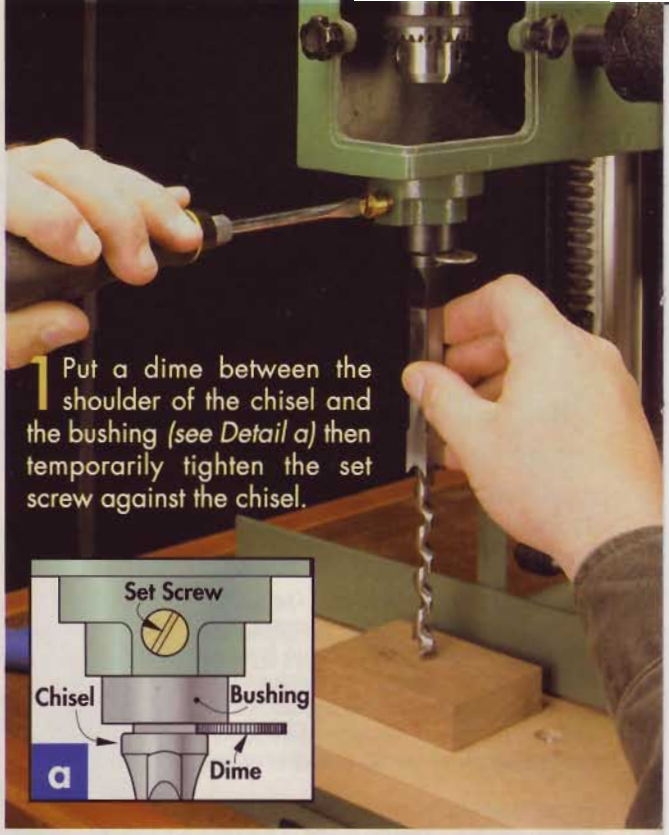


Mortise Size

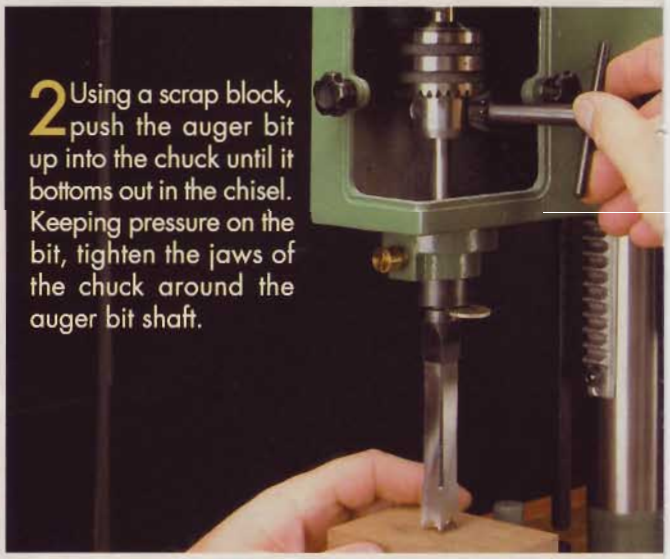
As a rule, a mortise should equal no more than one-half the thickness of the workpiece. This leaves each "wall" of the mortise at least one-quarter the thickness of the workpiece, which is substantial enough to avoid splitting.

To allow room for glue buildup, cut the mortise 1/8" deeper than the tenon.





1 Put a dime between the shoulder of the chisel and the bushing *(see Detail a)* then temporarily tighten the set screw against the chisel.



2 Using a scrap block, push the auger bit up into the chuck until it bottoms out in the chisel. Keeping pressure on the bit, tighten the jaws of the chuck around the auger bit shaft.

3 Remove the dime, raise the chisel up, square the chisel against the fence, and re-tighten the set screw on the shank of the chisel.

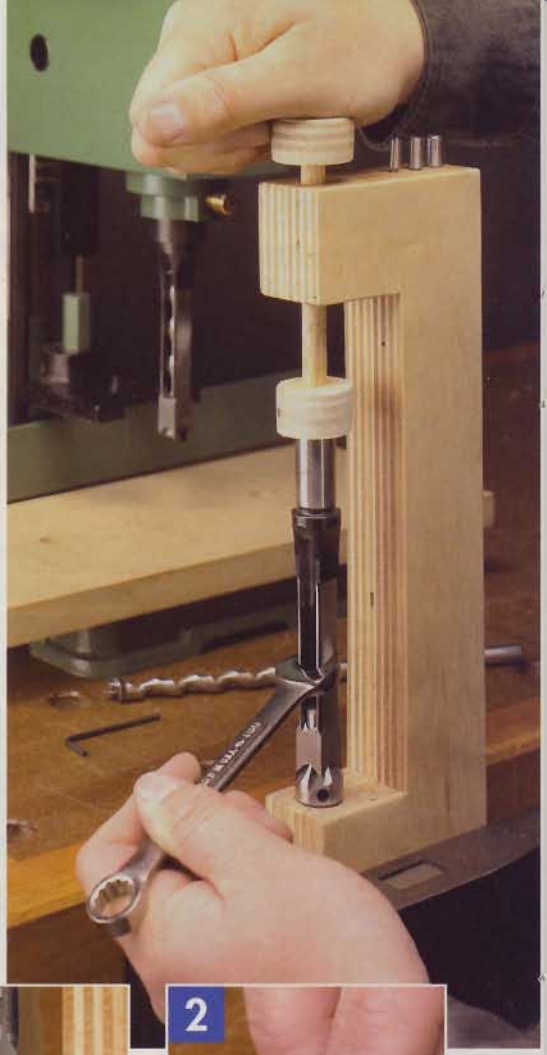
successful SHARPENING

▲ Sharpening Kit: Woodcraft/Delta Sharpening Kit (item 144385) available for $44.99 online at: woodcraft.com

As with all cutting tools, the chisel and auger bit have to be sharp. These, however, present an unusual challenge in that a chisel has four concave surfaces that need to be sharpened simultaneously. Fortunately, there are kits available *(see Photo at left)* to accomplish this while maintaining the chisel's inside angle.

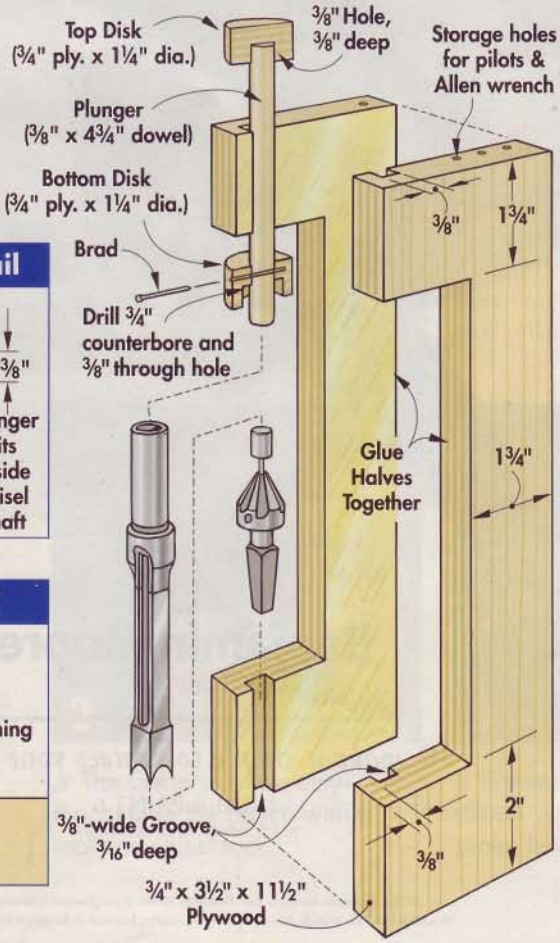
Sharpening kits are made up of several parts *(see Pilot Detail below)*. There's the sharpening bit, which does the actual work. Then there's the pilot, which is inserted in the tip of the bit and fits up inside the chisel. The pilot acts as a guide to keep the bit centered. Notice there are several sizes of pilots to fit the various sizes of chisels.

These kits are designed to be used with a hand brace. But it's difficult to keep the bit from wobbling as you turn the brace. So I made a C-shaped jig that keeps the elements in alignment during the sharpening process *(see Illustration below)*. The sharpening bit is kept stationary, and a plunger holds the chisel squarely on top *(see Plunger Detail)*. While applying light pressure on the top of the plunger, just a few rotations of the chisel with a wrench should do the trick.



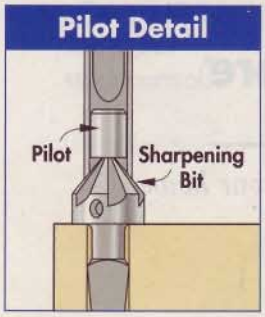
CHISEL SHARPENING JIG

NOTE: Disks are shown as cross sections for clarity



Plunger Detail

Pilot Detail

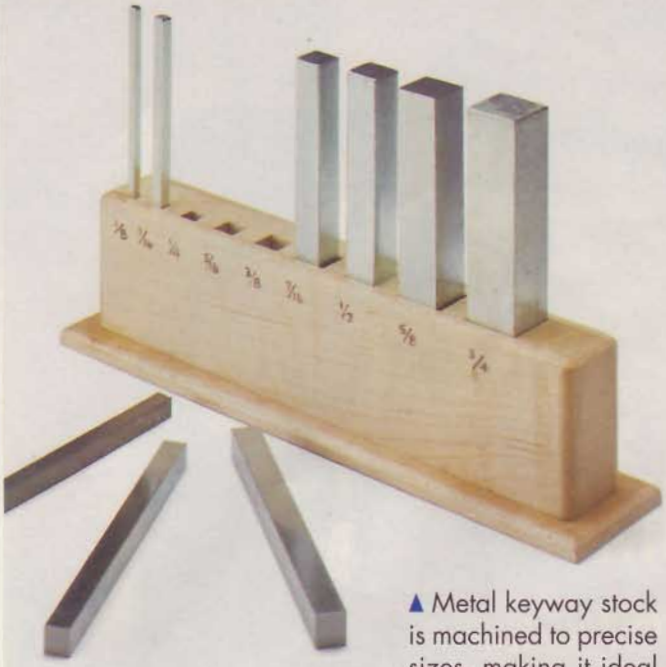


▲ To sharpen the interior, use a wrench to make a few clockwise rotations of the chisel on the bit.

▲ Now rub the chisel across a waterstone to flatten the outside faces and remove the burrs.

Auger Tips

▼ With a small diamond file, carefully remove any burrs from the inside surface of the scoring spur. Then hone the angled edge of the cutting lip (be sure to maintain the original angle).



▲ Metal keyway stock is machined to precise sizes, making it ideal for setup gauges.

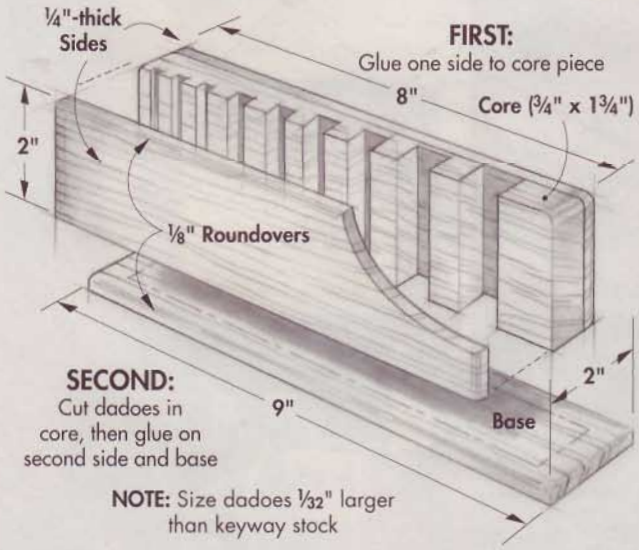
use keyway stock FOR PRECISE SETUPS

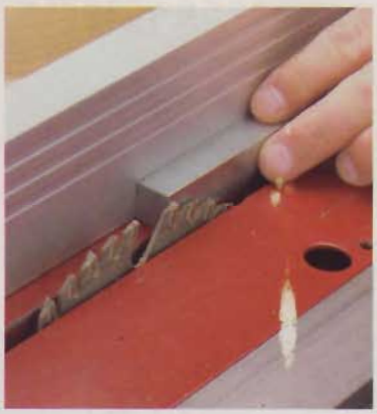
Getting an accurate reading off a metal rule when you're trying to set up tools can be a challenge. One way to quickly solve this problem is to make your own set of gauge blocks out of metal keyway stock. (Keyway stock is available at most hardware stores.)

What makes these gauge blocks ideal for tool setups is the fact they're precisely machined to exact sizes. Say you want to position the rip fence on the table saw or set the depth stop on a router for example. Simply reach for the block that corresponds with the setting you need *(see Photos below)*.

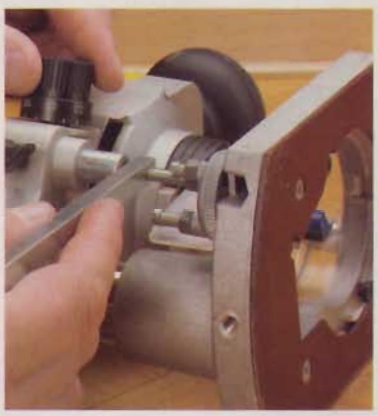
To make sure the gauge blocks are within arm's reach when needed, I also made a simple holder out of some scrap stock with the sizes marked on the side. The *Gauge Block Holder Illustration* at left provides all the information you'll need to make the gauge block holder.

GAUGE BLOCK HOLDER





▲ Use a gauge block to quickly and accurately set the rip fence on a table saw a precise distance away from the blade.



▲ To set depth of cut, start with the bit flush with the base of the router, then slip a gauge block between the depth stop and turret.

Glue Clean Up Tips

Here are two quick tips for dealing with glue squeeze-out on an inside corner assembly.

Mask It — One way to reduce clean-up time is to mask off the joint line with painter's tape before gluing *(Photo a)*. After gluing and clamping, wipe off the excess glue and remove the tape.

Scoop It — You can also use your fingers to crease the end of a plastic straw into a V-shaped scoop. The straw fills up with glue as you push it along the joint line *(Photo b)*.

3 steps to clamping MITERED FRAMES

1 Rubber pads slipped over the jaws of the pipe clamps help hold the frame pieces without damaging the tips of the mitered ends as light clamping pressure gets applied.

2 After applying glue to the ends of the remaining two frame pieces, carefully slip them in place between the two pieces already clamped. Make sure the face surfaces are flush.

3 With the frame glued up, position the remaining two clamps and tighten slightly. Then increase the pressure on all four clamps to align the mitered ends and draw the corners tight.

Gluing up all four mitered corners of a frame sounds easy enough. But if you're working alone (which is most of the time), keeping four pieces aligned while trying to tighten the clamps is next to impossible.

To keep mitered corners under control when working alone, I use two sets of pipe clamps and a three-step clamping process, shown at left.

Start With Opposite Sides — Begin by carefully positioning the mitered tips of two opposite sides of the frame between the jaws of a pair of clamps *(see Step 1)*.

Try to position the clamps the same distance apart as the length of the frame sides. Use one of the unclamped pieces to roughly check the spacing. Don't worry about being exact. You can reposition the assembly if needed.

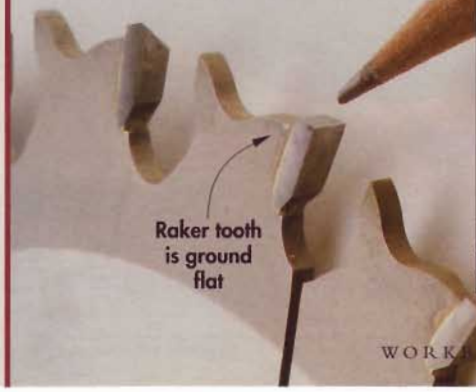
Next, apply light pressure to the clamps (just enough to hold the pieces between the jaws). **Note:** To avoid crushing the mitered tips on the frame pieces when applying pressure, I attached slip-on rubber pads to the jaws of the clamps.

Complete the Frame — The second step of the process is to apply glue to the mitered ends of the remaining two pieces and slip them into place to complete the frame. They should fit right into position between the two pieces that are already clamped *(Step 2)*.

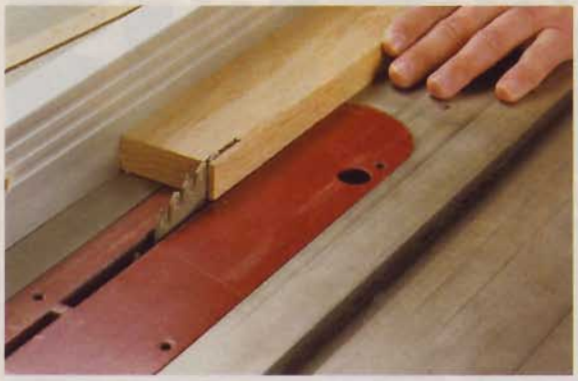
Add Remaining Clamps — To finish up, position the other two pipe clamps across the two pieces that were just added *(Step 3)*. Then gradually tighten all four clamps to align the miters and draw them tight.

Cut a Cleaner Kerf

Cutting a flat-bottomed groove for exposed splines is important. Otherwise the noticeable spline won't seat fully. To create a kerf with a flat bottom, I put away my standard saw blade and instead use one of the outer cutters from my dado set. Why? Because the teeth on many combination blades have alternate bevels, creating a V-bottomed kerf *(Combination Blade)*. The raker teeth on the dado cutters are ground flat across the top, producing a flat-bottomed kerf *(Outer Dado Blade Cutter)*.



1 An indexing jig makes it easy to rip thin strips to a uniform thickness from an extra-wide blank. With the jig's runner set in the miter gauge slot, butt the blank against the jig to position the fence.



2 After locking the fence in place, remove the jig and feed the blank through the blade using a push block. Now repeat *Step 1* and *Step 2* to rip as many edging strips as needed.

TIPS FROM THE WORKBENCH SHOP

indexing jig for RIPPING THIN STRIPS

Ripping several thin edging strips like those used on the CD/DVD storage cases *(page 48)* to the exact same thickness can be tricky. The answer is to use a simple indexing jig to set up each cut.

Make a Jig — The jig is just a 1/4" plywood block mounted to a wood runner. To make the jig, start by sizing the runner to fit in the miter gauge slot. Then place the block on top of the runner and move it close to the blade.

Once the distance between the block and the outermost tooth on the blade equals the thickness of edging you want to cut, fasten the block to the cleat permanently.

Set Up for First Cut — To use the jig to set up the first cut, simply slide it back away from the blade and butt an extra-wide workpiece against the block. Then slide the fence against the workpiece *(Top Photo)*.

Once that's done, remove the jig and rip the first strip, as shown in the *Bottom Photo*. Notice that the fence is positioned so the blade cuts the strip off on the outside (left side) of the blade. That way the edging strip falls off on the "waste" side, reducing the chance of kickback.

Rip Consistent Strips — To rip additional strips to the same thickness, place the jig back in the miter gauge slot and butt the same workpiece against the block again. After repositioning the fence, make a second cut similar to the first one.

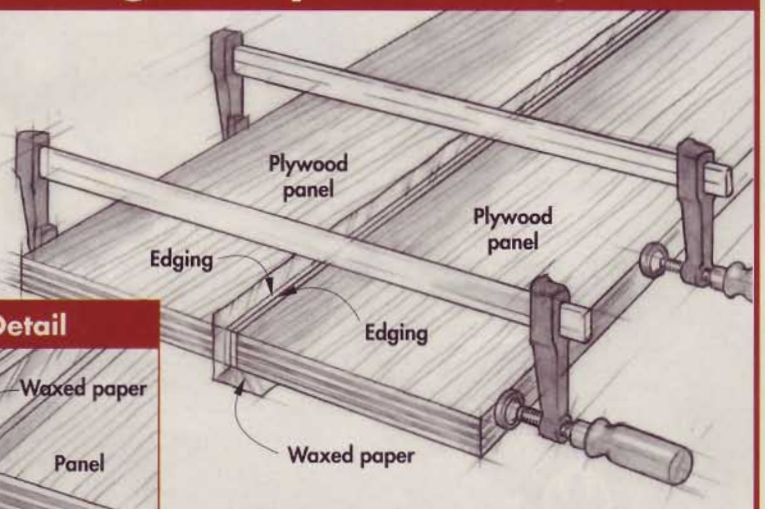
Now repeat the setup and ripping operation until you've cut as many strips as needed. You'll find that each strip you ripped is exactly the same thickness.

Safety Note: Once the workpiece has been ripped down to about 3/4" wide, stop using it and get another one.

Banding together makes glue-up easier

Applying thin strips of solid-wood edging usually requires a clamp every few inches to distribute the pressure evenly. Fortunately, there's a simple way to attach these strips of edging without having to use all the clamps in your shop. The idea is to use the actual edged pieces as "clamping blocks."

To do this, glue the edging onto two similar size pieces, as shown in the *Edging Detail*. Then clamp the two pieces edge to edge to distribute the clamping pressure, as shown at right. A piece of waxed paper between the two pieces will keep them from sticking together.



NOTE: Use waxed paper to protect the edging from sticking together during glue-up

build your own GARDEN GETAWAY

Summertime and the livin' is easy . . . and for that matter, so is building this elegant garden arbor. The secret is its simple modular design.

It's easy to see what makes this garden arbor such a peaceful place to relax. With its L-shaped design, you can tuck the arbor into a secluded corner of the yard. Also, the lattice wall panels provide privacy, as well as support for climbing plants. To top it off, there's an elegant roof system that offers shady shelter from the sun.

Appearance aside though, the most impressive thing about this arbor is how quickly it goes together. For the record, the entire structure was assembled — start to finish — in three hours.

Modular Construction — The secret to this fast assembly is that the lattice wall panels and roof sections are built in the shop as individual units, or modules. Then they're carried to the job site and set in place *(see Photo at right)*.

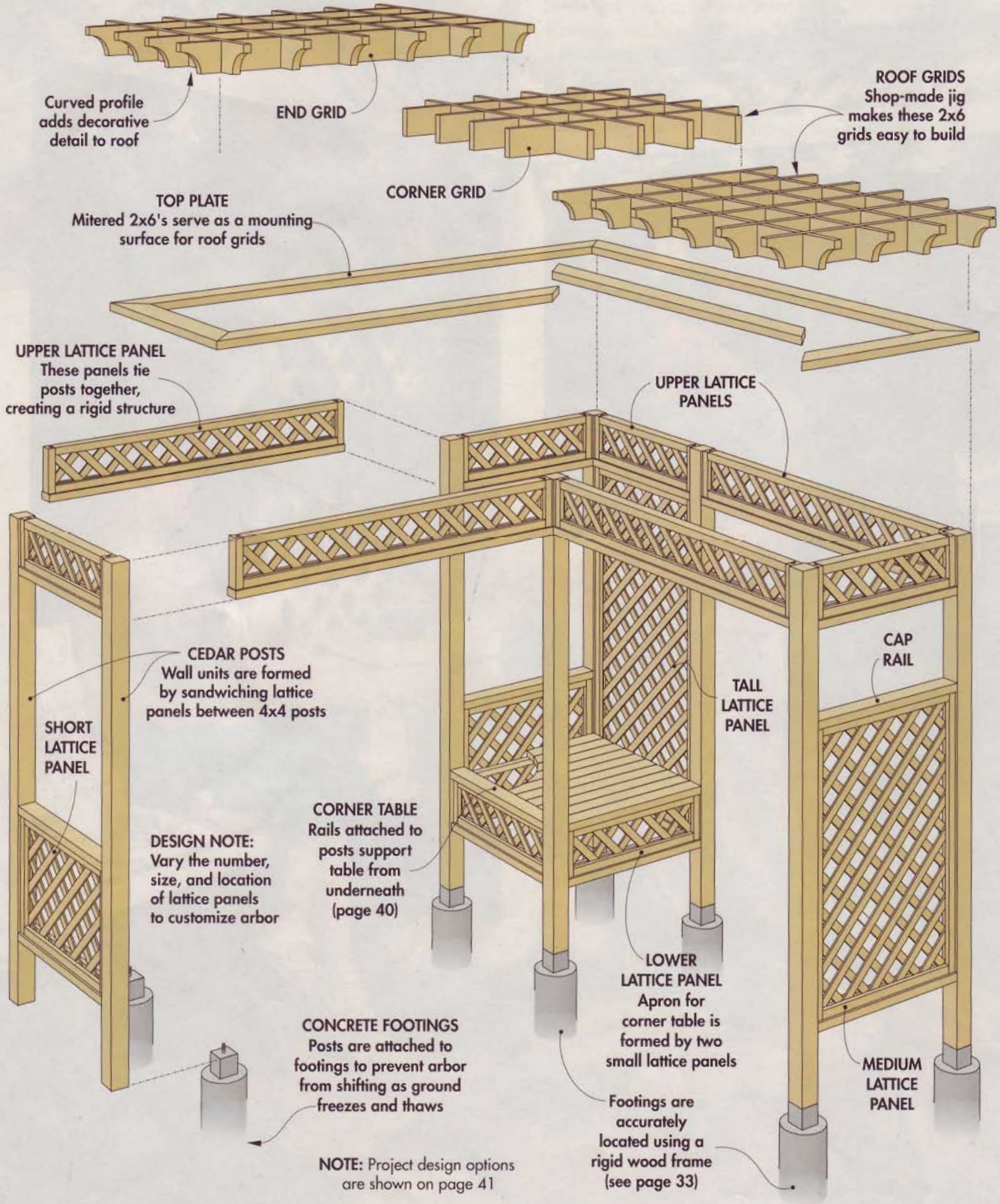
Because of its modular design, the plans for this arbor can be easily adapted to other projects. By reconfiguring the lattice panel and post assemblies, you can build privacy screens, a shelter over an entry door, or even a place to take a summer snooze. *(For more on this, see page 41.)*

Building Tips & Tricks — Whichever project you decide to build, the building tips and tricks we've included in this article are bound to make it a success. Be sure to check out our foolproof method for accurately laying out footings *(page 33)*. As for the roof of the arbor, it may look a bit intimidating to build, but don't worry. A shop-made assembly jig *(shown on page 39)* makes that a breeze.

WORKBENCH HOME

Construction Details

Overall Dimensions: 10'5" W x 10'5" D x 8'1½"



NOTE: Project design options are shown on page 41

lay the groundwork for FIRM FOOTINGS

This garden arbor is anchored by eight concrete footings. Now I know, digging holes and pouring footings might not be the most appealing part of a project. But everything that follows these steps rests — literally — on the work you do now.

Lay Out Footings — The first step is to lay out the locations of the footings. This arbor is designed so the centerpoints of the footings are either 36" or 72" apart. This spacing is important because the modular wall panels will be sized accordingly.

Typically, a tape measure is used to do this, but that requires a lot of measuring and remeasuring. And even then, the locations of the footings may still not be perfectly accurate.

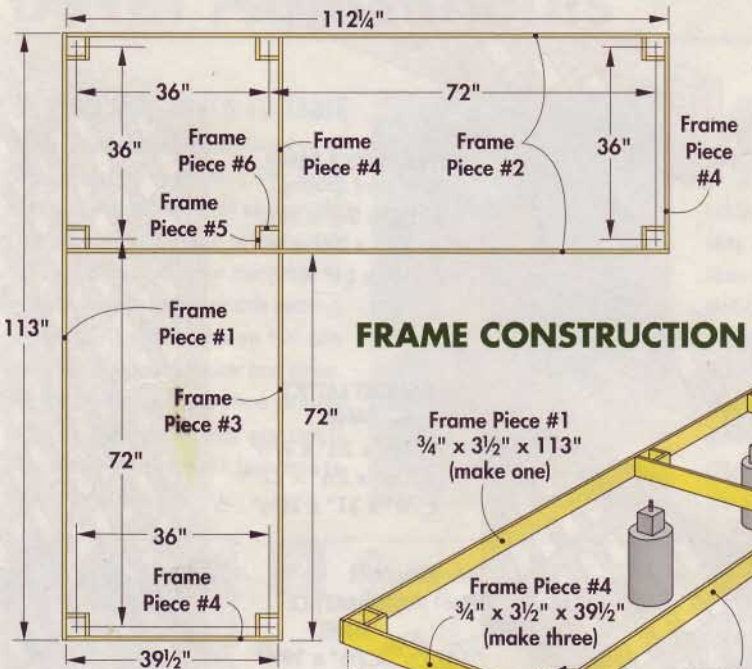
Footing Frame — So to make it easy to pinpoint the center of each footing, I built a rigid wood frame with eight "pockets" — one for each footing *(see Frame Construction below)*. These pockets serve as forms for the upper part of the footing.

The frame is built in the shop from 1x4 stock. As you can see, the distance between the centerpoints of the pockets matches the spacing of the footings (36" and 72"). This way, all you have to do is position the frame at the building site and then mark the centers of the pockets on the ground (a nail works fine).

Once that's done, remove the frame, dig the holes, and slip cardboard tubes into them to use as forms for the lower part of the footings. (I used 8" Sonotubes, which are available at most home centers.)

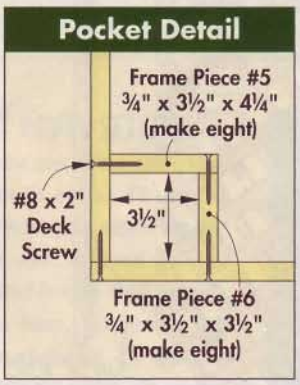
Pour the Footings — Now simply reposition the frame *(see Photo above)*, mix the concrete, and pour the footings. While the concrete is still wet, insert an anchor bolt in each footing, which will be used to secure the posts *(Anchor Bolt Detail)*.

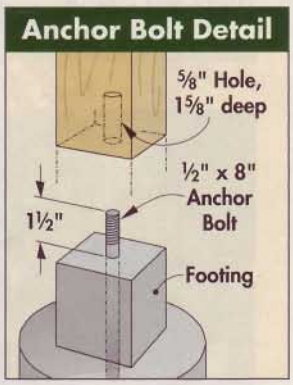
▲ First, level and stake the layout frame. Then pour the footings and install the anchor bolts *(Inset Photo)*.

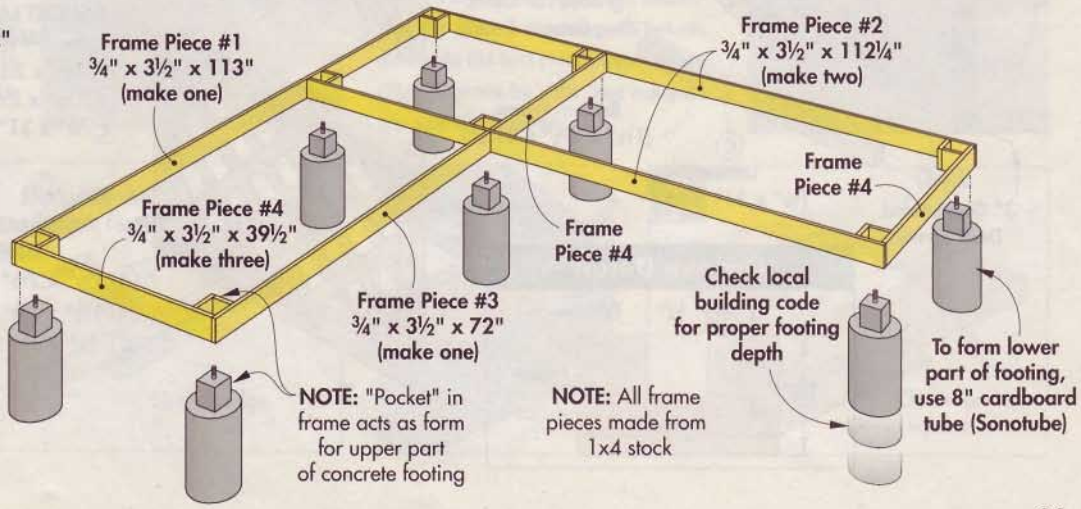


FRAME CONSTRUCTION

FRAME (TOP VIEW)







▲ For strength and rigidity, fit the frame around the lattice and screw the corners together. Then toenail the lattice into the frame with a brad nailer.

basic building blocks

LATTICE PANELS

The lattice panels on this arbor are a big part of its charm. But they're not just for looks. They also "tie" the arbor together, creating a strong, rigid structure. Note: To resist rot, I used cedar for the lattice panels, as well as all the other parts of this project.

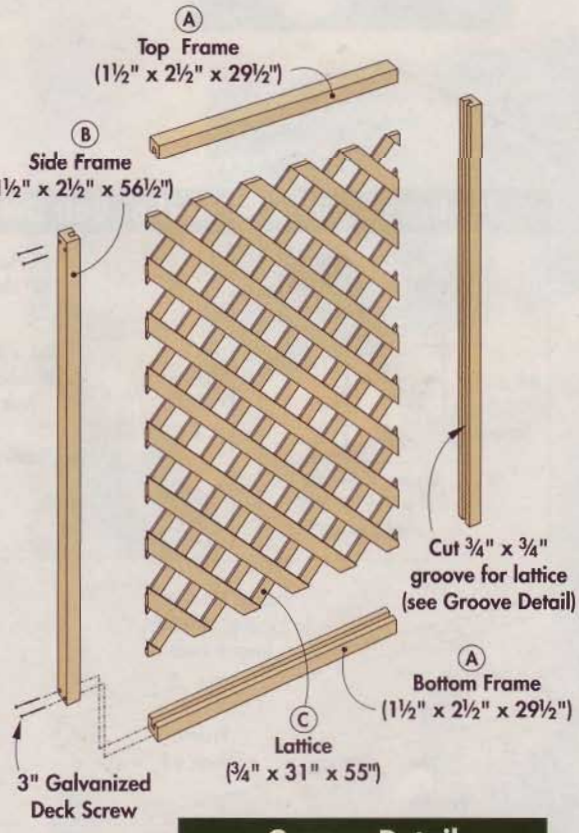
To get an overview of a *typical* lattice panel, take a look at the *Photo* at left and the *Construction View* below. Each panel consists of 3/4"-thick lattice surrounded by four 2x frame pieces. Later, cap rails and posts will be added to form the modular wall units. But for now, just concentrate on the lattice panels.

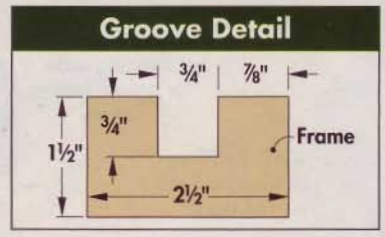
Planning — It pays to do some planning before you get started. The whole idea is to vary the size, number, and location of the lattice panels to suit your situation.

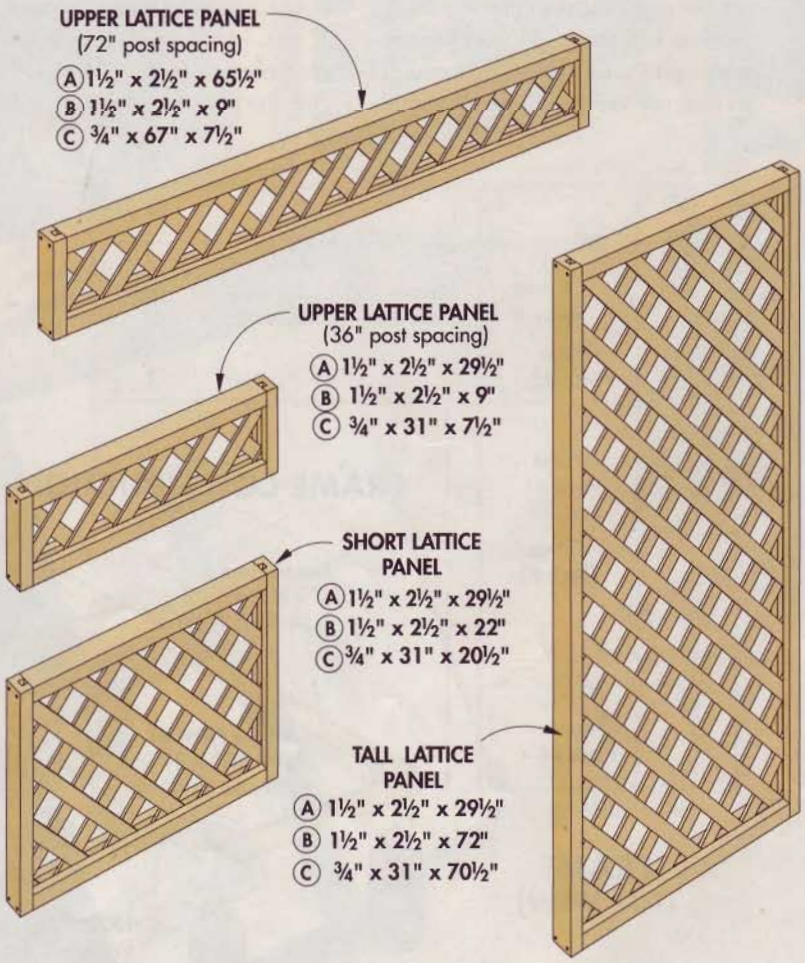
For example, the *Illustration* on page 35 shows the different heights of lattice panels I used for my project. A tall lattice panel in the back corner provides privacy, while the short panel next to it offers a view of the garden. There's also a medium panel, which provides a sense of enclosure, but with a more open feel.

In addition to the panels I just mentioned, the top of the arbor is

LATTICE PANEL CONSTRUCTION
(MEDIUM PANEL SHOWN)







banded by short upper panels. Two lower panels of the same height act as aprons for a table that's added later.

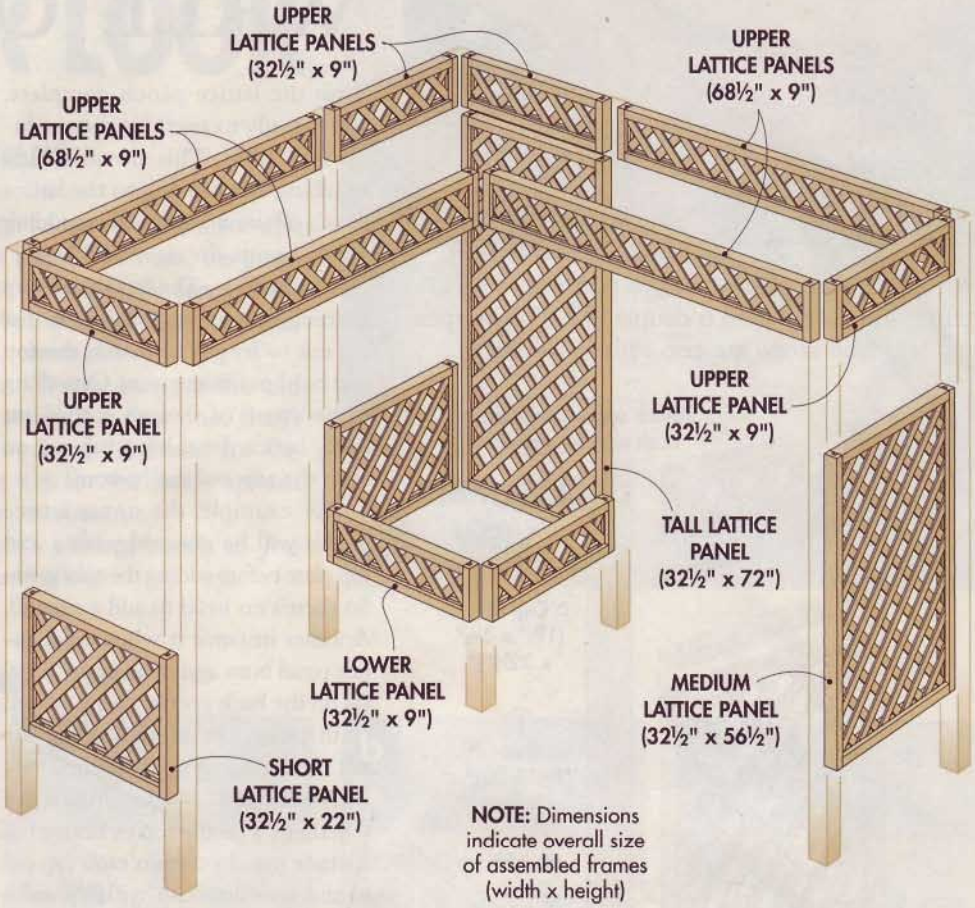
As for the *width* of the panels, they're sized to fit between the 4x4 posts of the arbor. If the posts are spaced 36" apart on center, build 32½"-wide panel. For 72" post spacing, make the panels 68½" wide.

Of course, there may be one or more areas where you don't want to install a lattice panel at all. I left one side open for a walkway, and another to provide clearance for a swing.

Construction — Once you decide on how to configure the lattice panels, the actual construction goes quickly. The frames are assembled with butt joints and screws. So all you need to do is rip the frame pieces (A, B) to width (2½") and then cut them to length *(see Construction View)*. Then, to hold the lattice, cut a groove in each piece *(see Groove Detail on page 34)*.

Now all that's left is to cut the lattice (C) to fit into the frames. I used "heavy" lattice. It's ¾" thick, which not only looks nice, but it makes for a strong panel. Check out the tips in the sidebar below for cutting lattice. Then assemble the panels as shown in the *Photo* on page 34.

LATTICE FRAME HEIGHTS



lessons on lattice

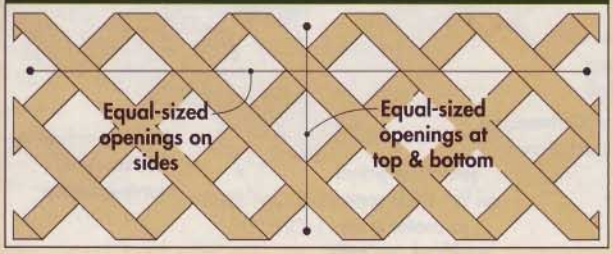
A circular saw equipped with a carbide-tipped blade makes quick work of cutting lattice. Even so, there are several things to keep in mind to get the best results.

Symmetrical Panels — First, the goal is to end up with a symmetrical panel. This means laying out the panels so the openings in the lattice are the same size on both sides and also at the top and bottom *(see Layout Detail below)*. For appearance, I also wanted one of the diagonal lattice strips to bisect each corner of the frame.

Cutting Guide — To produce a smooth, accurate cut, I'd recommend using a cutting guide like the one shown above right. It consists of two parts: a plywood base for the saw to ride on and a wood fence that guides the saw.

To make the guide, start with an extra-wide base. Then glue on the fence and trim the base to final width to create a "reference edge." After aligning this edge with the layout line, clamp the guide in place and make the cut.

Layout Detail



▲ It's easy to center the lattice panel on the 2x4 cap rails. Just set it on a couple of 1/2"-thick spacers and then screw the cap rails to the frame.

make it modular
WALL UNITS

With the lattice panels complete, you're ready to assemble the modular wall units. This involves first attaching 2x4 cap rails to the lattice panels *(Photo at left)* and then adding the 4x4 posts *(see Assembly View)*.

Cap Rails — The cap rails (D) are nothing more than cedar 2x4s that are cut to length to match the top and bottom frame pieces. One thing to be aware of though is that not every lattice panel has a cap rail on both the top *and* the bottom.

For example, the upper lattice panels will be covered with a 2x6 top plate before adding the roof grids. So there's no need to add a cap rail. Another instance is when a tall lattice panel butts against an upper panel (as on the back corner of my arbor). In that case, just attach a single cap rail to the top of the tall frame.

Assembly — Regardless of whether it's on the top or bottom of a lattice panel, position each cap rail so the ends are flush with the sides of the frame. You'll also want to center the cap rail on the width of the frame pieces, creating an equal overhang (1/2") on both sides.

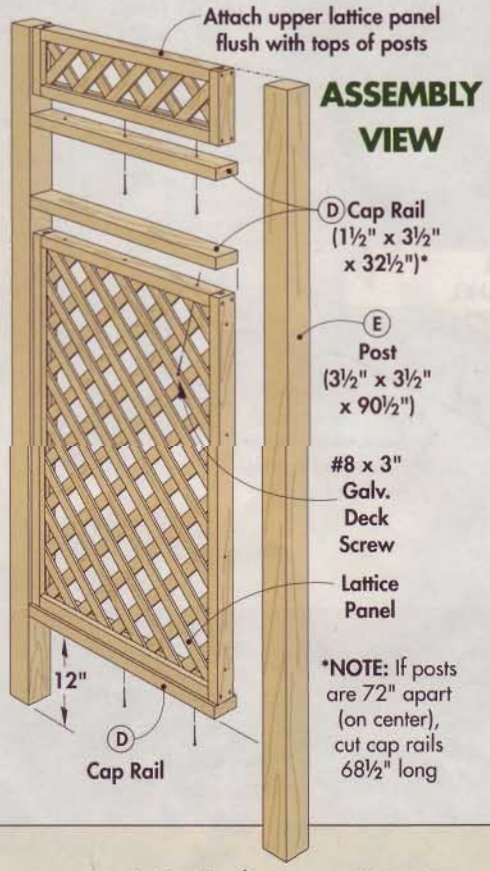
An easy way to accomplish that is to set the lattice panel on 1/2"-thick spacers as you screw the assembly together *(see Fig. 1)*. To hide the fasteners, I installed screws in the bottom of the lower cap rail. And for the upper cap rail, I drove the screws in from underneath.

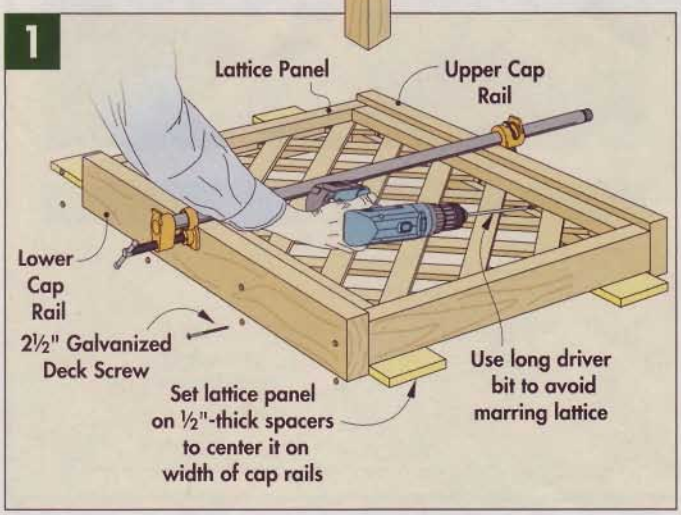
Planning for Posts — Now you can turn your attention to the 4x4 cedar posts (E). It's worth being picky when selecting these posts. Buy the straightest ones you can find. After bringing the posts into the shop, let them acclimate for a few days, then discard any posts that warp or twist.

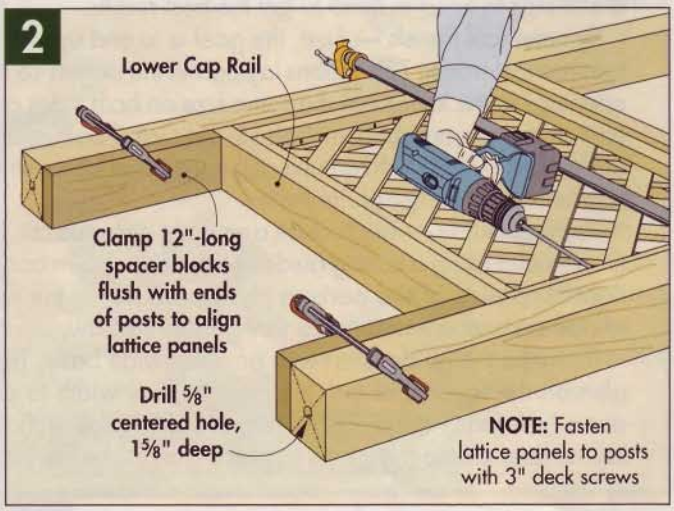
Altogether, you'll need eight posts for this project: two for each end wall unit, three for the back corner unit, and a single post on the inside corner *(see Construction View on page 32)*.

There's very little work to do on the posts. Just cut them to length (90 1/2"), then drill a hole in the bottom end of each post to fit over the anchor bolts on the footings *(Fig. 2)*.

Assemble Wall Units — Now you can attach the lattice panels to the posts to form the wall units. The upper lattice panels are flush with the tops of the posts *(Assembly View)*. For a uniform look at the bottom, the lower panels also need to align. To accomplish that, I clamped scrap pieces to the posts and used them as spacer blocks *(Fig. 2)*. With the spacer blocks in place, set the lower cap rail against them, and screw the panel in place.



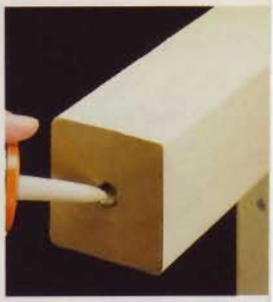




arbor assembly in 5 EASY STEPS

With most projects, there's one point where it all seems to come together. For this garden arbor, that point is quite literally when you erect the modular wall units. To do that, prepare the ends of the posts, as shown in the margin. Then follow the five installation steps shown here.

▲ To erect the garden arbor, start by lifting the back corner unit into place, fitting the holes in the posts down over the anchor bolts in the footings.



▲ Before you install the wall units, apply construction adhesive in the hole at the end of each post.

◄ The two end wall units are installed next. Here again, just set the posts over the anchor bolts. Then plumb each wall unit and temporarily brace it with a 1x4 staked in the ground.

▲ An upper lattice panel spans the opening between the corner and end units. Simply align it flush with the top of the posts and screw it in place.

▲ Attach a second upper panel to the inside post *(Fig. 4a)*. Then install this assembly, fastening the panel to the end wall unit with screws.

▲ With all of the upper panels in place, all that's left is to install two lower lattice panels. They create an apron for the corner table that's added later.

simple roof grid makes SHADY RETREAT

▲ One of three grids that form the roof of this arbor, this lightweight assembly is easily installed by two people.

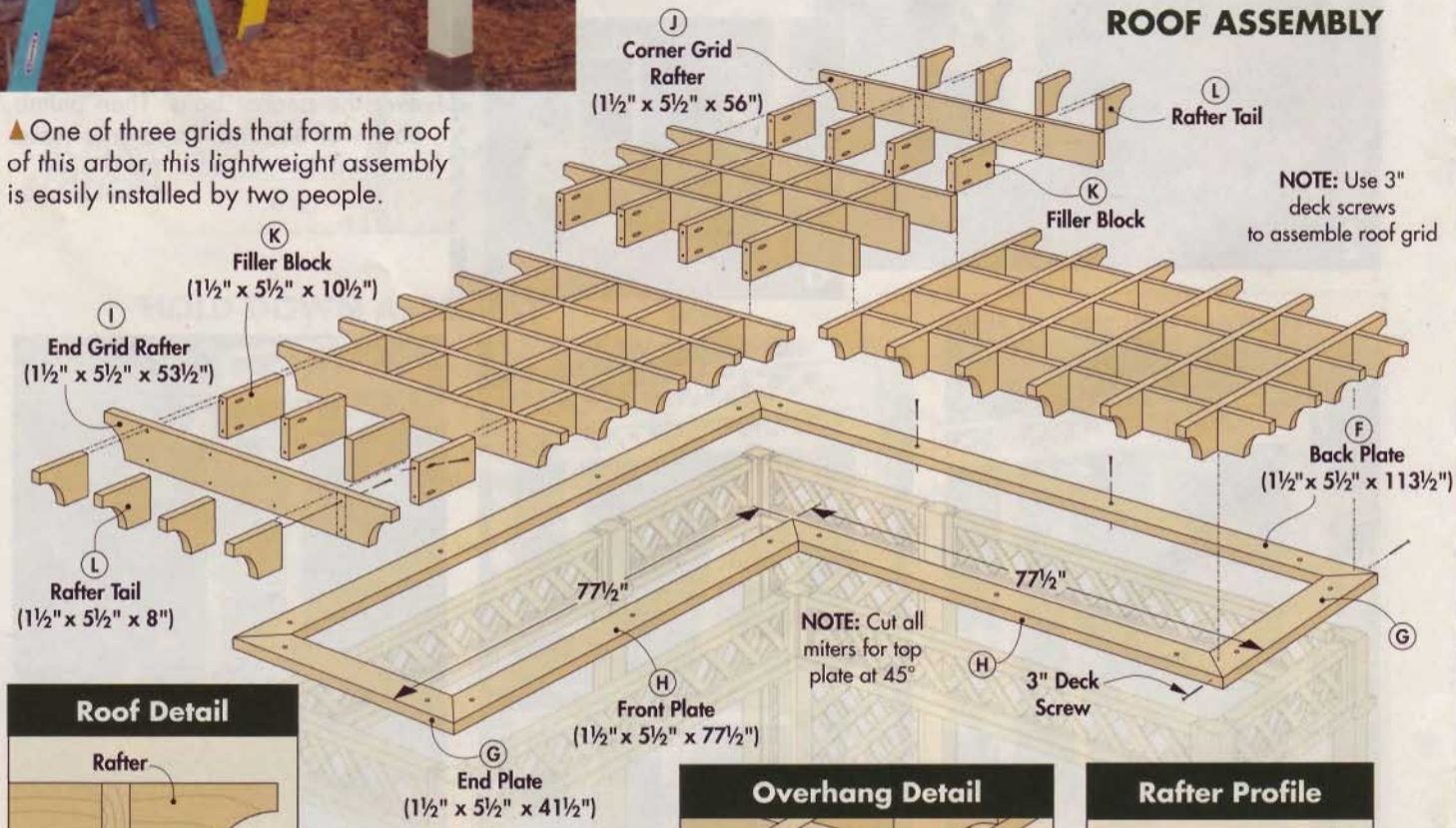
The crowning feature of this arbor is an elegant roof that provides a shady retreat from the sun. Like the wall panels, it's made up of separate modules that can be built in the shop, carried to the job site, and installed as a unit. Only in this case, the roof is made up of three large grids *(see Photo at left)*.

Top Plate — The grids rest on a 2x6 plate that runs around the top of the arbor *(see Roof Assembly Illustration)*. Besides providing a mounting surface for the grids, this wide top plate adds interesting detail to the roof.

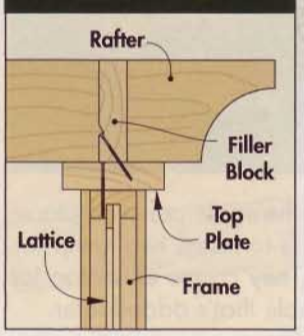
The top plate consists of two back plates (F), two end plates (G), and two front plates (H) that are mitered to length. One thing to keep in mind here is that you'll have to miter the two front plates to form both an *inside* and an *outside* corner.

When it comes to installing the top plate, the best way I found to do that is to first assemble it on the ground like a giant frame. Drive a couple of screws into each corner to hold the frame together. Then round up a helper and carefully lift it up onto the arbor. From there, you can move it around so there's an equal overhang all the way around — inside and out. Then simply screw it to the upper lattice panels.

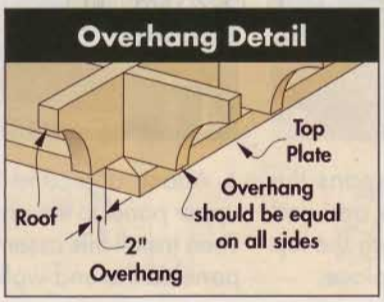
ROOF ASSEMBLY



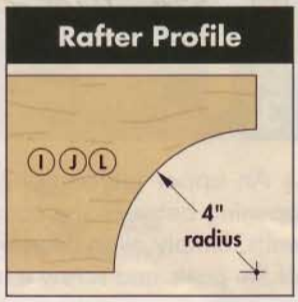
Roof Detail



Overhang Detail



Rafter Profile



Building the Roof Grids

Once the top plate is installed, it's back to the shop to build the roof grids. As I mentioned, there are three grids *(Roof Assembly)*. The two large grids on the ends of the arbor are identical — they're just oriented differently. A smaller grid covers the back corner of the arbor.

Although the grids contain quite a few parts, there's nothing all that complicated about building them. That's because many of the parts are identical. In fact, the entire grid system consists of two different lengths of roof rafters (I, J), some filler blocks (K) and a set of rafter tails (L) — all made from cedar 2x6s.

Rafters — The rafters are the main structural elements of the grids. Notice that the rafters (I) in the end grids overhang the front and back of the arbor. A graceful curved profile in these overhanging ends gives the roof its distinctive look, see *Rafter Profile* on page 38. The sidebar below shows a quick way to lay out the profiles.

As for the rafters (J) in the corner grid, they're a bit longer than the ones in the end grid ($2\frac{1}{2}$" longer to be exact). Also, only one end of these rafters overhangs the arbor. So you'll only need to lay out and cut the curved profile in those overhanging ends.

Filler Blocks & Rafter Tails — To form the grid, there are a number of short filler blocks (K) and rafter tails (L) that run perpendicular to the rafters. An arc cut on each rafter tail makes it appear that the rafter actually "runs through" the exposed side of the grid.

Assembly — After cutting all the pieces for the grids, they're assembled with butt joints and screws. The trick is keeping the pieces spaced evenly and making sure all the ends align. To do that, I used the assembly jig shown at right.

Install Roof Grids — Now you're ready to install the roof grids. Here again, you'll need a helper to lift the grids onto the roof *(see Photo on page 38)*. Then move them around until the two end grids butt against the corner grid. Check that there's an equal overhang on both sides, and be sure that the ends of the rafters and rafter tails align *(Overhang Detail)*. Then screw the grids to each other and to the top plate *(see Roof Detail on Page 38)*.

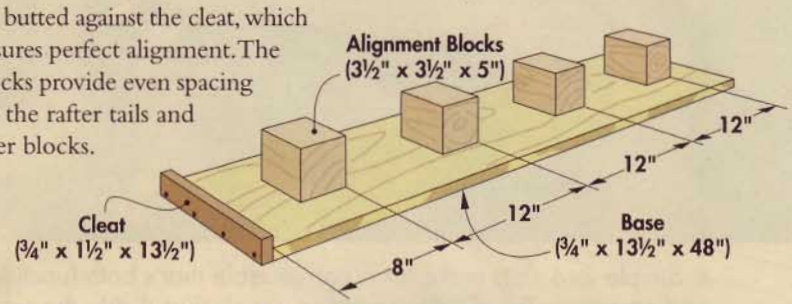
TIME-SAVING TEMPLATE

To save time, lay out the curved profile on each rafter (and tail) using a template made from scrap material. A jig saw makes quick work of cutting the rafter to shape.

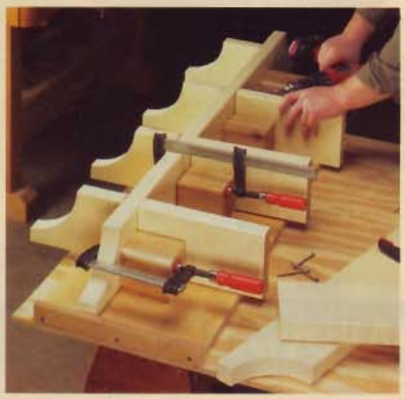
getting it all together
GRID ASSEMBLY JIG

Assembling the grid is easier and more accurate if you use a shop-made jig to align the parts *(see Illustration below)*.

The jig consists of a plywood base that provides a mounting surface for a wood cleat and a set of 4x4 blocks. In use, the ends of the rafters are butted against the cleat, which ensures perfect alignment. The blocks provide even spacing for the rafter tails and filler blocks.

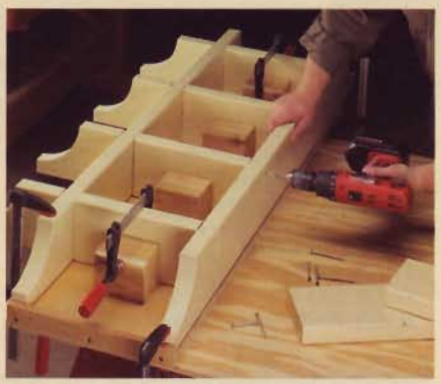


1 To assemble the grids, butt the end of the first rafter against the cleat. Then clamp the rafter tails to the alignment blocks, as shown and screw them to the rafter. Note: The roof grids are assembled upside down so the ends of the rafters can be registered against the cleat.



2 The next order of business is to install the first row of filler blocks. You'll need to reposition the rafter on the opposite end of the alignment blocks to do this. After securing the rafter with clamps as shown, set each filler block against the corresponding alignment block and then toe-screw it in place.

3 Now you're ready to add the next rafter. Here again, butt the end of the rafter against the cleat, clamp it in place, and screw it to the filler blocks. To complete the grid, repeat Steps 2 and 3 — repositioning each rafter and adding filler blocks as you work your way to the end.



▲ Simple 2x4 slats make for a corner table that's both functional *and* attractive. The two lower lattice panels that divide the corner of the arbor form the apron of the table.

corner table MADE EASY

The corner of this garden arbor is a perfect place for a small table. It's built into the opening formed by the lower lattice panels that were installed earlier.

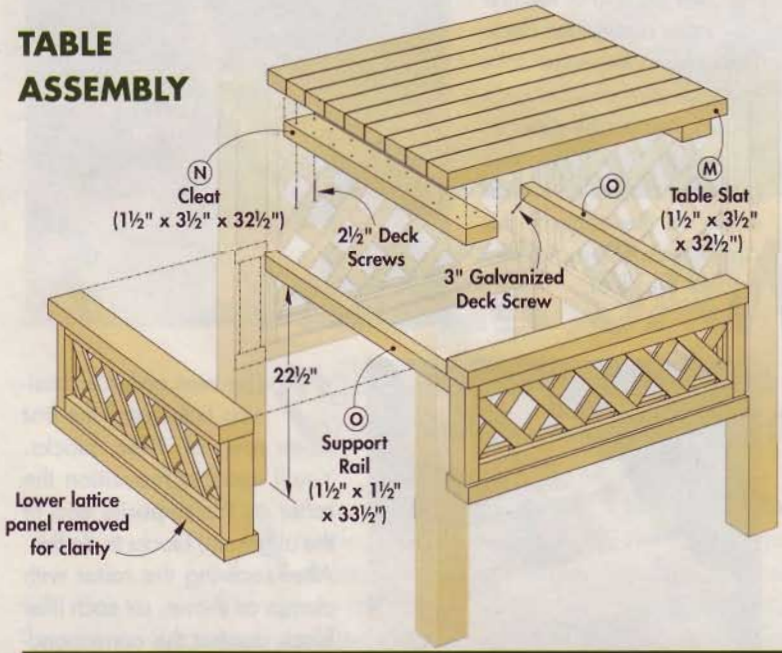
The table is extremely straightforward. A set of 2x4 cedar slats (M) attached to a pair of cleats (N) make up the table top *(see Table Assembly below)*. And the table top rests on two support rails (O) fastened to the posts.

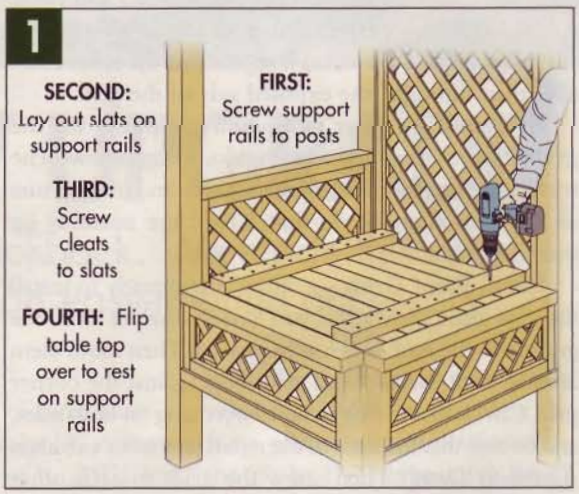
Table Assembly — All it takes to put the table top together is a handful of screws and a cordless drill. To simplify the construction (and to conceal the screw heads), I assembled it upside down, as shown in Figure 1.

Start by screwing the support rails to the posts. The goal here is to locate these rails so the slats will be flush with the cap rails on the lattice panels.

Next, cut the slats to length and set them in place with their *good* face down. After checking that they're evenly spaced, screw the cleats to the slats. Then flip the assembly over and set it in place.

TABLE ASSEMBLY





MATERIALS & HARDWARE

LATTICE FRAMES

A (20)	Top/Btm. Frames (36" post spacing)	1½" x 2½" x 29½"*
B (28)	Side Frames (2x cedar)	1½" x 2½" x various lengths
C (14)	Lattice Panels (cut from 3 sheets of lattice)	¾" x 48" x 96"

*If posts are spaced 72" apart (on center), cut top & bottom frames 65½" long.

WALL PANELS

D (11)	Cap Rails (36" post spacing)	1½" x 3½" x 32½"*
E (8)	Posts (cedar)	3½" x 3½" x 90½"

*If posts are spaced 72" apart (on center), cut cap rails 68½" long.

ROOF GRIDS

F (2)	Back Plates (cedar 2x6's)	1½" x 5½" x 113½"
G (2)	End Plates (cedar 2x6's)	1½" x 5½" x 41½"
H (2)	Front Plates (cedar 2x6's)	1½" x 5½" x 77½"
I (12)	End Grid Rafters (cedar 2x6's)	1½" x 5½" x 53½"
J (4)	Corner Grid Rafters (cedar 2x6's)	1½" x 5½" x 56"
K (56)	Filler Blocks (cedar 2x6's)	1½" x 5½" x 10½"
L (12)	Rafter Tails (cedar 2x6's)	1½" x 5½" x 8"

CORNER TABLE

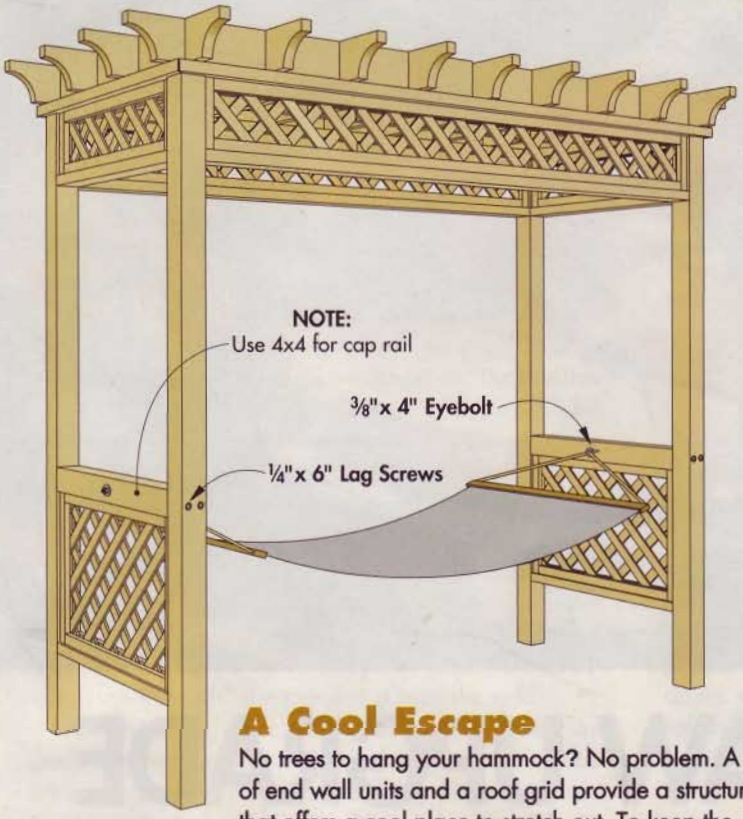
M (9)	Table Slats (cedar 2x4's)	1½" x 3½" x 32½"
N (2)	Cleats (cedar 2x4's)	1½" x 3½" x 32½"
O (2)	Support Rails (cedar)	1½" x 1½" x 32½"

HARDWARE

- 2½" Deck Screws (5 lbs.)
- 3" Deck Screws (5 lbs.)
- (8) ½" x 8" Anchor Bolts
- 3d Galvanized Finish Nails (2 lbs.)

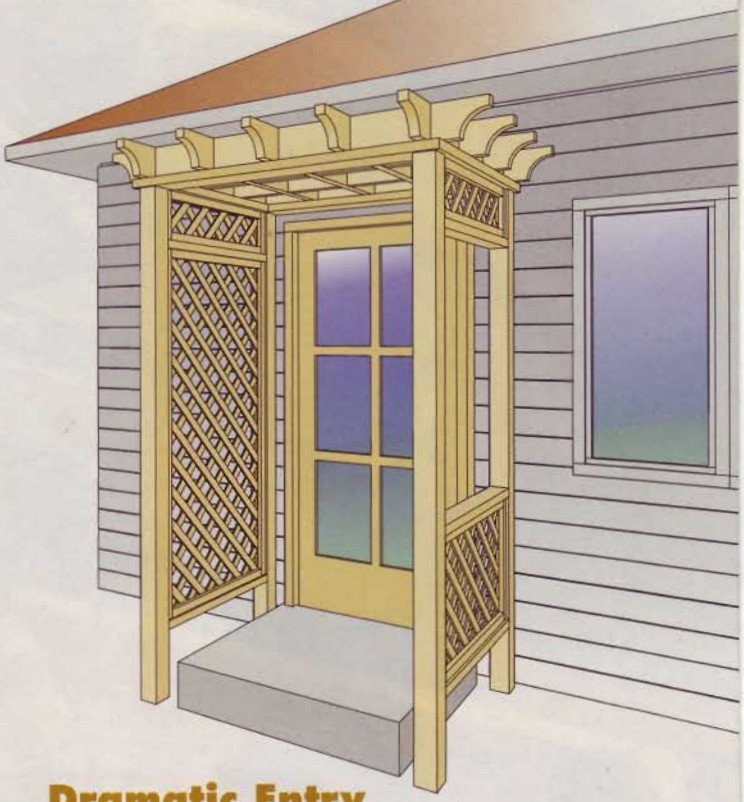
WORKBENCH HOME

DESIGN OPTIONS



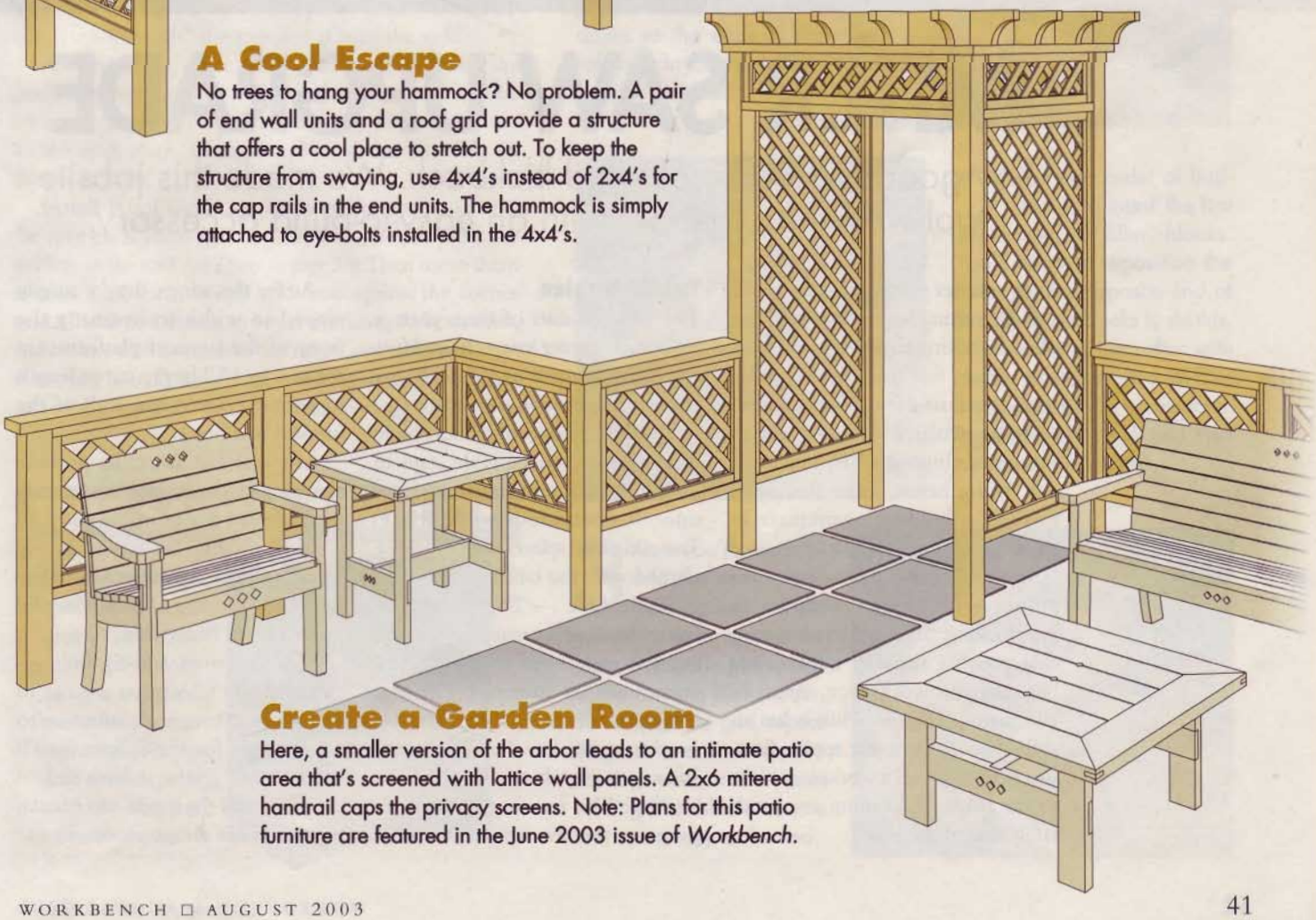
A Cool Escape

No trees to hang your hammock? No problem. A pair of end wall units and a roof grid provide a structure that offers a cool place to stretch out. To keep the structure from swaying, use 4x4's instead of 2x4's for the cap rails in the end units. The hammock is simply attached to eye-bolts installed in the 4x4's.



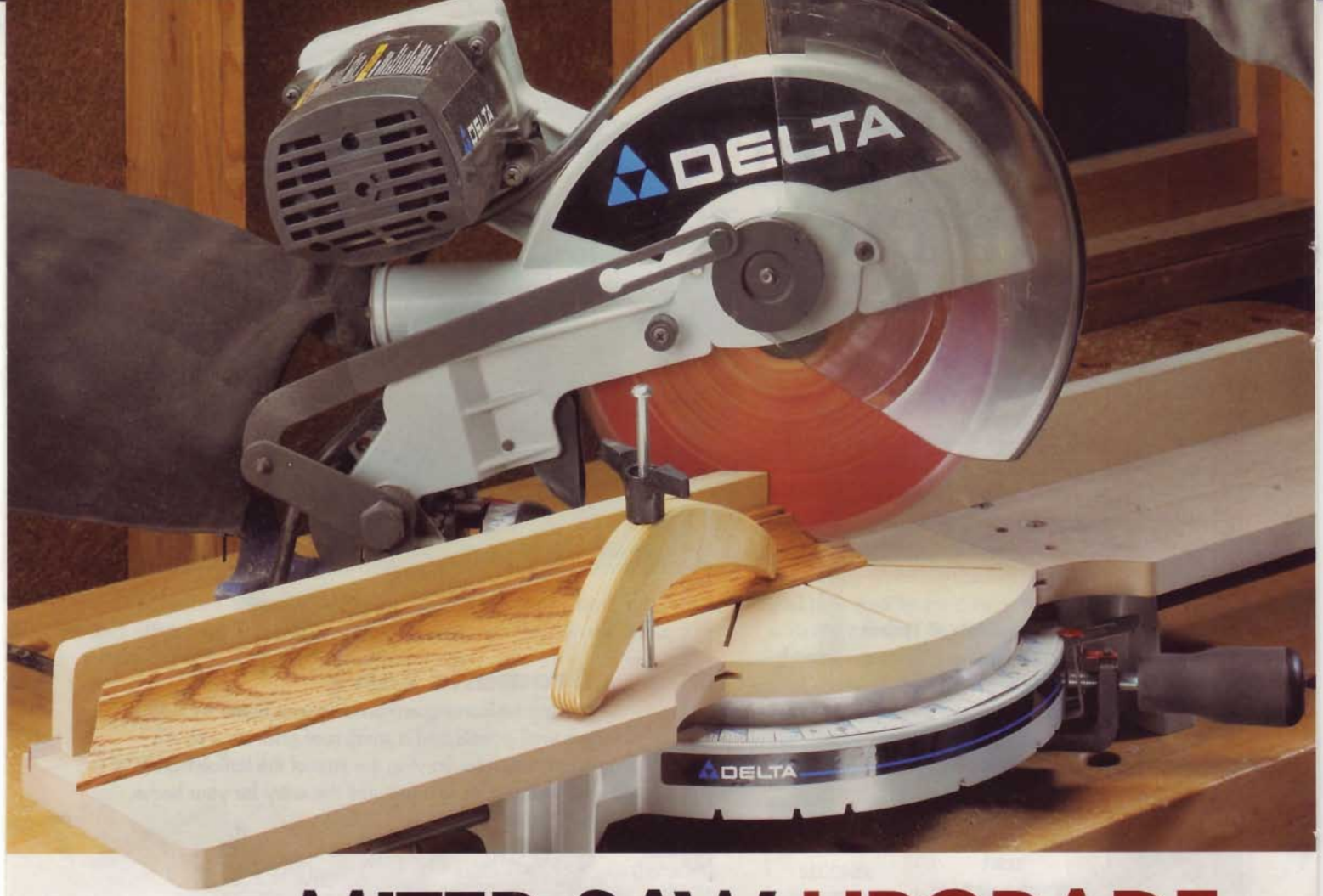
Dramatic Entry

Make a welcoming entrance to your home by adding two wall panels and a small roof grid. As with the arbor, consider varying the size of the lattice frames in the wall panels to customize the entry for your home.



Create a Garden Room

Here, a smaller version of the arbor leads to an intimate patio area that's screened with lattice wall panels. A 2x6 mitered handrail caps the privacy screens. Note: Plans for this patio furniture are featured in the June 2003 issue of *Workbench*.



MITER SAW UPGRADE

Say goodbye to chipout and kickback. We made this jobsite tool workshop friendly with an easy-to-build accessory.

A miter saw is a great tool for cutting boards to length and making angled cuts. Even so, I've always felt that these capable tools could use a few improvements.

In particular, I wanted a way to minimize chipout when making a cut. And a better, make that safer, method of holding a workpiece in place was also on the list.

This miter saw upgrade accomplishes both things. It includes an interlocking table and fence system that provide support behind *and* beneath the workpiece, virtually eliminating chipout. Plus, it has an arched hold-down that applies firm, steady pressure on a workpiece close to the blade — keeping my hands safely out of the way.

Table Basics

The table consists of three parts: a replaceable center insert (A) and two wings (B), all made of $^3/_4$" MDF *(see Construction View on page 43)*.

A pair of hardboard splines ensure that the three-piece table stays in perfect alignment, producing a smooth, continuous worksurface. Two additional splines keep the fence aligned with the table.

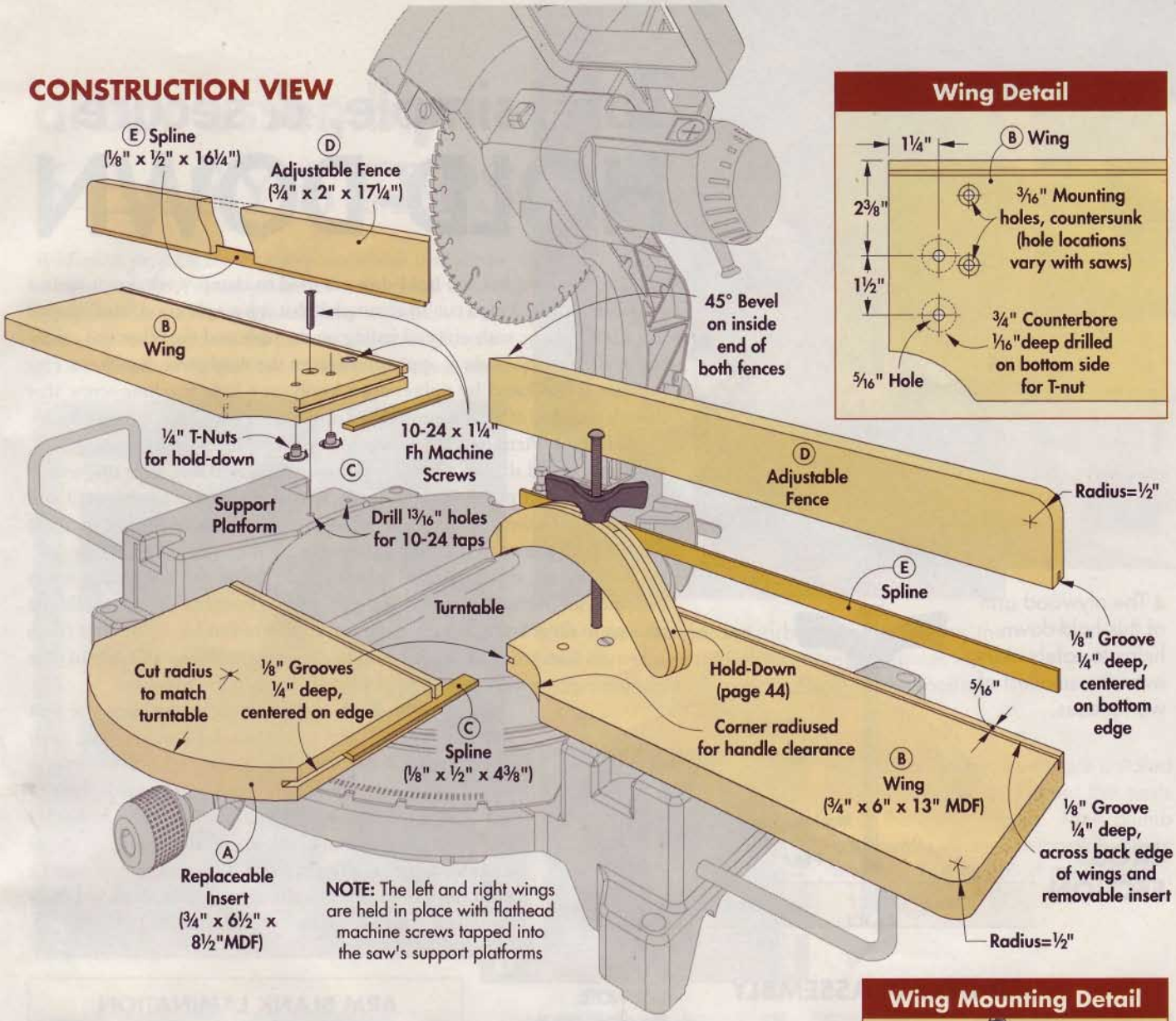
Table Size — There's nothing complicated about making the table, but you may need to modify the dimensions for your saw. The idea is to size the insert to fit the turntable on your miter saw. Notice that it's curved to match the front of the turntable. This ensures that the angle gauge on the saw remains visible.

As for the wings, they're simply ripped to width to overhang the front of the support platforms on the saw by 1". They're cut to length to extend 6" past the ends of the support platforms.

Just one last note. To provide clearance for the control handle that's used to rotate the turntable, you may need to modify the wings. In my case, cutting a curved notch in the front inside corner of each wing did the trick *(see Photo above)*.

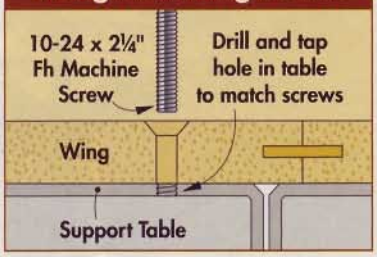
Cut Grooves for Splines — Once all the table parts are cut to size, you can turn your attention to the grooves for the splines. You'll need to cut a groove in both ends of the insert and the inside end of each wing. There's also a groove in the

CONSTRUCTION VIEW



Wing Detail

Wing Mounting Detail



top face of each table section for the fence splines.

I used 1/8" hardboard for the splines, so a single saw kerf made on the table saw is all that's needed here. To hold the pieces steady when cutting grooves in the ends, clamp a support block to the workpiece. *(A similar operation is shown in Figure 1 on page 54).* Also, to ensure that all the grooves align, set the same face against the rip fence for each cut.

T-nuts for Hold-Down — Before installing the table, I added a set of four T-nuts to the wings (two in each wing). These T-nuts provide several mounting locations for the hold-down. *(See Wing Detail above and Hold-Down Assembly on page 44 for installation details).*

Installing the Table — Now you're ready to install the table. The wings are held in place with machine screws that thread into holes tapped into the support platforms of the saw *(Wing Mounting Detail).* As for the insert, just fit the hardboard splines (C) into the grooves (no glue needed) and slip it in place.

Adjustable Fence

The second part of this miter saw upgrade is a two-part adjustable fence. The two fence sections can be moved right up to the saw blade to create a "zero-clearance" opening. That way, the back of the workpiece is always fully supported, so chipout is kept to a minimum. Like the table, the fence (D) is made from 3/4" MDF.

To make the fence, start by ripping the two fence pieces to width. As for length, each piece is sized to match the length of one wing *plus* half the width of the insert.

Bevel the Ends — Notice that the inside ends of the fence are beveled. This lets you cut miters up to 45° without cutting into the fence. If the angle exceeds 45°, or for bevel cuts, simply adjust the fence to increase the size of the opening.

Fence Splines — Finally, cut the grooves for the fence splines (E). This time, I glued the splines into the fence to make it easier to reposition.

▲The plywood arm of this hold-down helps to safely clamp even the smallest of workpieces.

safe, simple, & secure HOLD-DOWN

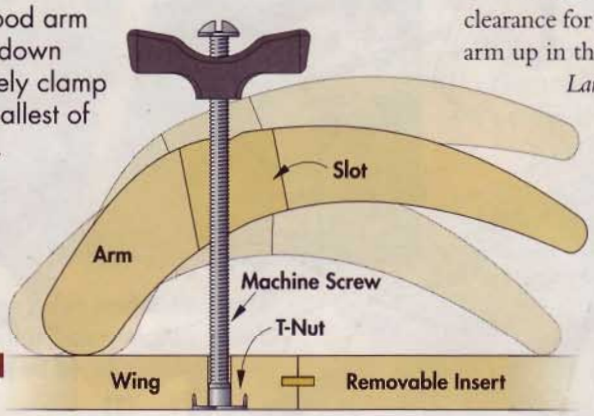
Like its name implies, the hold-down is used to clamp work down against the table when making a cut. To accomplish that, it has a plywood "arm" shaped like a boomerang, with one end resting on the table, and the other end reaching in close to the blade to apply pressure on the workpiece *(see Photo)*. This pressure is produced by tightening a knob on a long machine screw that threads into one of the T-nuts installed earlier *(see Hold-Down Assembly below)*.

Adjustable Arm — To accommodate workpieces of different widths, thicknesses, and shapes, a hold-down must be adjustable. This one excels in that regard. It pivots up and down, plus you can move it forward and back *(Cross Section)*. You can also change mounting locations to increase the reach of the arm. *(For more information on this, refer to page 45.)*

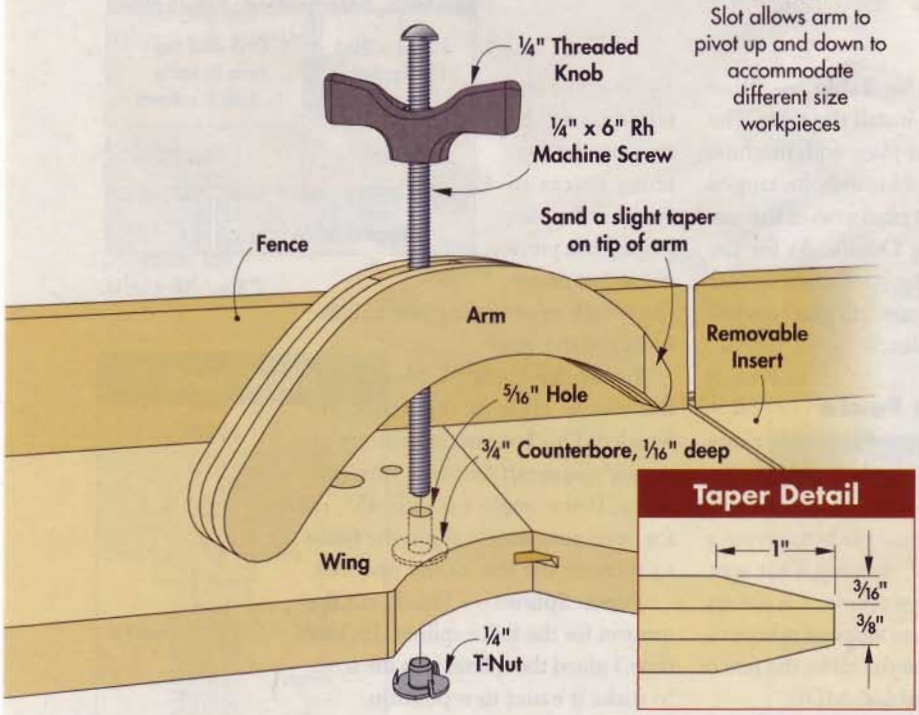
To make the arm adjustable, there's a wide slot in the arm that provides clearance for the machine screw. An easy way to create this slot is to build the arm up in three layers using 1/4" plywood. As you can see in the *Arm Blank Lamination Drawing*, the middle layer is formed by a couple of core pieces that are sandwiched between the two sides.

Shaping the Arm — After gluing up the blank, the next step is to cut the arm to shape. Make an enlarged copy of the *Pattern* below and use spray adhesive to attach it to the blank. A band saw (or jig saw) makes quick work of cutting the arm to shape. Then sand the edges smooth. I also sanded a slight taper on the tip of the arm to create a slimmer profile *(Taper Detail)*. This will let the arm be positioned even closer to the saw blade. In short, to boldly go where your own arm or hand shouldn't.

CROSS SECTION



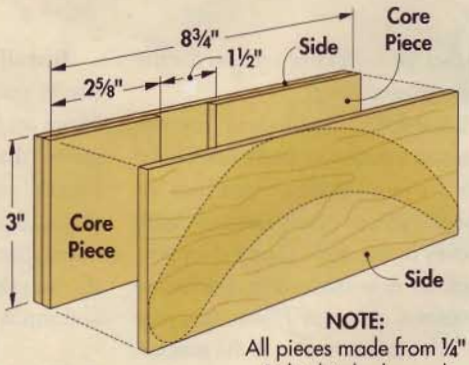
HOLD-DOWN ASSEMBLY



NOTE: Slot allows arm to pivot up and down to accommodate different size workpieces

Taper Detail

ARM BLANK LAMINATION



NOTE: All pieces made from 1/4" Baltic birch plywood

ARM PATTERN
(SCALE TO 400% FOR FULL-SIZED PATTERN)

3 handy accessories
A CLOSER LOOK

Replaceable Insert

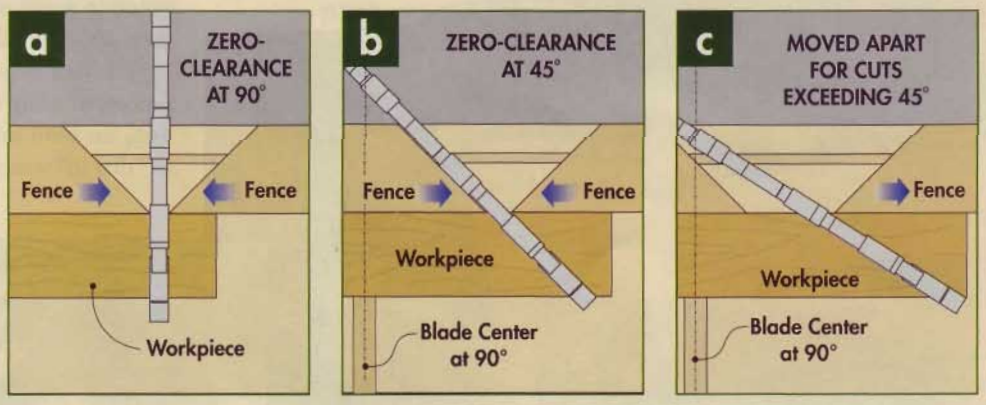
1 One look at this *Photo* is enough to see why this miter saw table has a *replaceable* center insert. With use, the insert gets chewed up. At that point, it won't fully support the bottom of the workpiece, so the saw blade will tear the wood fibers instead of producing a crisp, clean cut.

Fortunately, there's an easy fix. Simply remove the old insert and use it as a template for making a new one. Don't forget to cut the grooves in the ends of the insert for the splines, as well as the groove on top for the fence spline. Then slip the new insert into place, as shown.

Shop Tip: While you're at it, make several inserts so you can always have a replacement on hand.

Adjustable Fence

2 To reduce chipout when making a square cut, move the fence sections close to the blade to form a "zero-clearance" opening that supports the back of the workpiece *(Detail a)*. Since the ends of the fence are beveled, you can do the same thing for miters up to 45° *(Detail b)*. For cuts that exceed 45°, move the fence sections apart to avoid cutting the back corners *(Detail c)*.

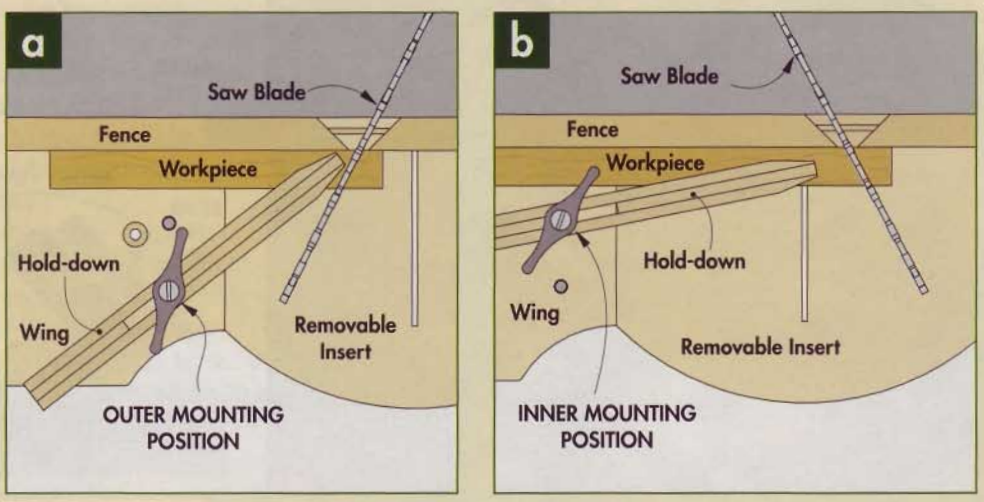


Hold-Down

3 Depending on the type of cut, the hold-down can be mounted in four different locations (two on each side).

Let's say you rotate the saw to the left and the part of the workpiece you want to keep is also on the left *(Detail a)*. In that case, mount the hold-down in the outer position, applying pressure as close to the blade as possible.

If you rotate the saw to the right though *(Detail b)*, the arm must have more "reach," so use the inner mounting position.



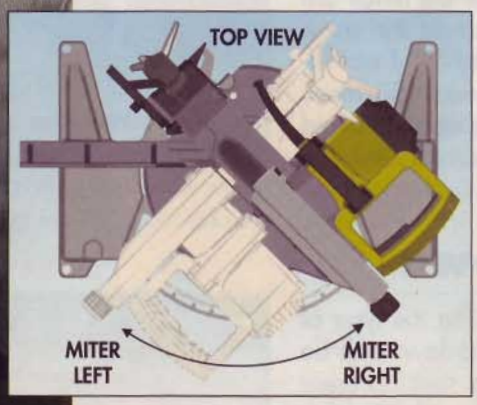
4-step MITER SAW TUNE-UP

Whether you're trimming boards to length, cutting miter joints, or making tricky compound angle cuts, a miter saw is ideally suited to the task. But even though these saws have all kinds of pre-set stops and angle scales which are designed to produce precise cuts, accuracy is *not* automatic.

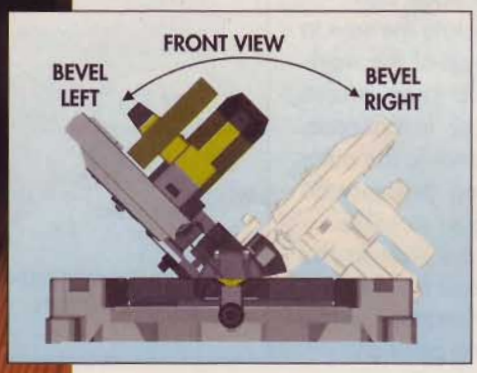
Even the best miter saws require regular tuning to ensure dead-on accuracy. And most saws do an excellent job of explaining those tune-up procedures in the owner's manual. They show which settings to check and how to make the necessary adjustments. By following those procedures, you can get *close* to an accurate setup.

Test Cuts — As with all tools, however, the proof is in the performance. And the only way to get your saw tuned to perfection is to make a series of test cuts, and then do some *fine* tuning based on those results.

The four steps on page 47 will walk you through the process of using test cuts to check the 45° and 90° settings for both miters *and* bevels. That will make it easy to "dial in" your miter saw for perfect cuts.



◄MITERS
To check the miter settings, you'll need to rotate the turntable on your saw to 0° and also 45° to the left and right.



◄ BEVELS
The bevel adjustments are checked by tilting the head of the saw to the left and right.

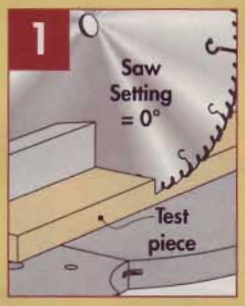
Miter Adjustments

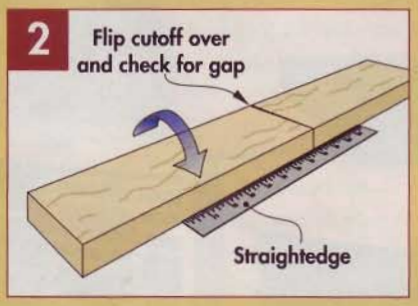
1 SQUARE BLADE TO FENCE

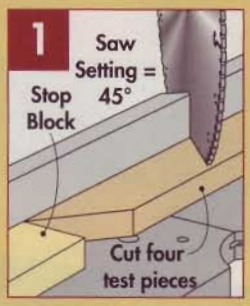
With the turntable set at 0°, check to see if blade is square to the fence. If it's not, adjust the saw according to the owner's manual. To check the setup, make a 90° crosscut in a wide test piece *(Fig. 1)*.Then flip one of the cutoffs over, butt the ends together, and align the edges with a straightedge *(Fig. 2)*. If there's a gap, readjust the saw, make another test cut, and check the setting again. Continue like this until the pieces fit tightly together.

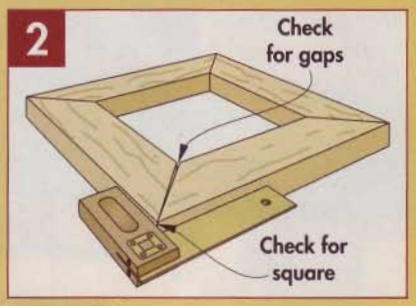
2 45° MITER SETTING

Next, rotate the turntable to 45° and check whether the blade is actually 45° to the fence *(see Photo)*. After making any necessary adjustments, miter four test pieces to identical lengths *(Fig. 1)*. Then fit the pieces together to form a frame *(Fig. 2)*. If there are gaps, readjust the setting, and make additional test cuts until you're satisfied with the fit. Finally, repeat the process for the opposite 45° setting.









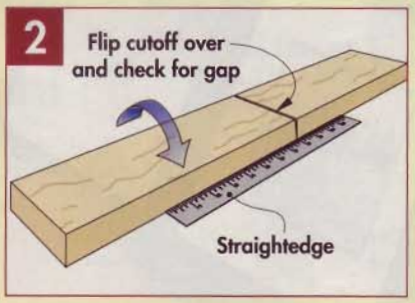
Bevel Adjustments

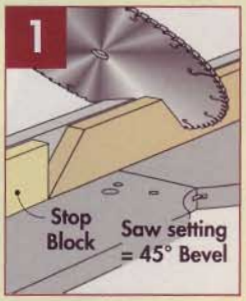
3 SQUARE BLADE TO TABLE

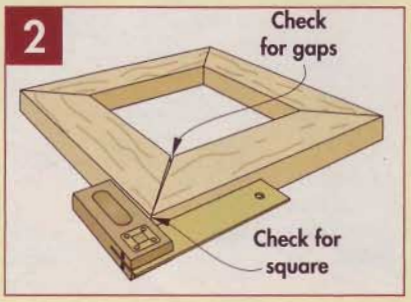
To ensure accurate bevel cuts, start by unlocking the knob that lets you tilt the arm of the saw. Then square the blade to the table *(see Photo)* and tighten the knob. To make it easy to return to this setting, adjust the built-in stop on the saw and then crosscut another test piece. For this test cut, set the piece on edge *(Fig. 1)*. Here again, flip one cutoff over and butt the ends together to check for a gap *(Fig. 2)*.

4 45° BEVEL SETTING

Tilt the arm of the saw so the blade is set at 45° to the table *(see Photo)* and adjust the 45° stop on the saw. Then cut a set of four identical-length test pieces. Notice that here, the pieces are standing on edge *(Fig. 1)*. This produces a longer cut, which will emphasize any error in the setup. As before, assemble the test pieces into a frame *(Fig. 2)*, check for gaps, and readjust the saw if necessary.







CD & DVD MEDIA STORAGE

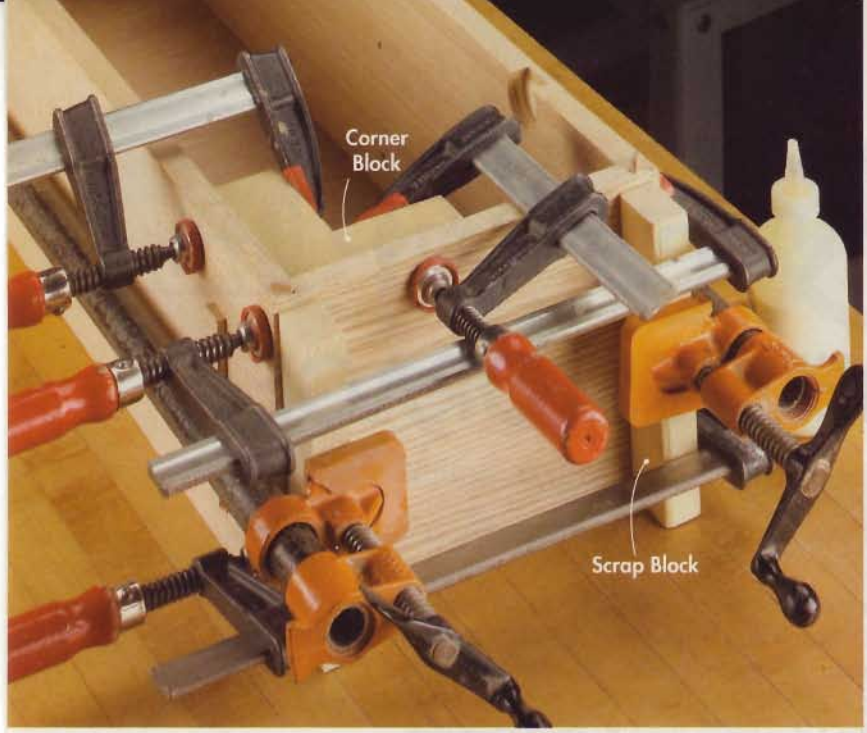
Wall-mounted oak cases with a "touch of glass" add practical and versatile storage to any room.

There's a lot to like about these CD and DVD storage cases. Not the least of which is they're downright good looking. To create a clean, contemporary appearance, the cases themselves are made from riftsawn (straight-grained) red oak plywood. As for the doors, solid oak frames with ribbed glass panels complete the modern look.

All that aside though, what really sets these cases apart from all the other CD and DVD storage systems I've seen is their versatility. As you can see in these *Photos*, by building multiple units and arranging them in different configurations on the wall, these simple cases become a dramatic focal point for the room. You can also build a single case and stand it upright on end *(see page 55)*.

Either way, each case holds up to 65 CDs or a combination of CDs and DVDs. A fold-down door provides a handy shelf for sorting through CDs. And the top of the case doubles as a nifty display shelf.

Black & white photos courtesy of David McClure ... naturaledgephoto.com



▲ L-shaped corner blocks keep the case square during glue-up. Also, scrap blocks clamped on the outside help distribute clamping pressure.

case construction

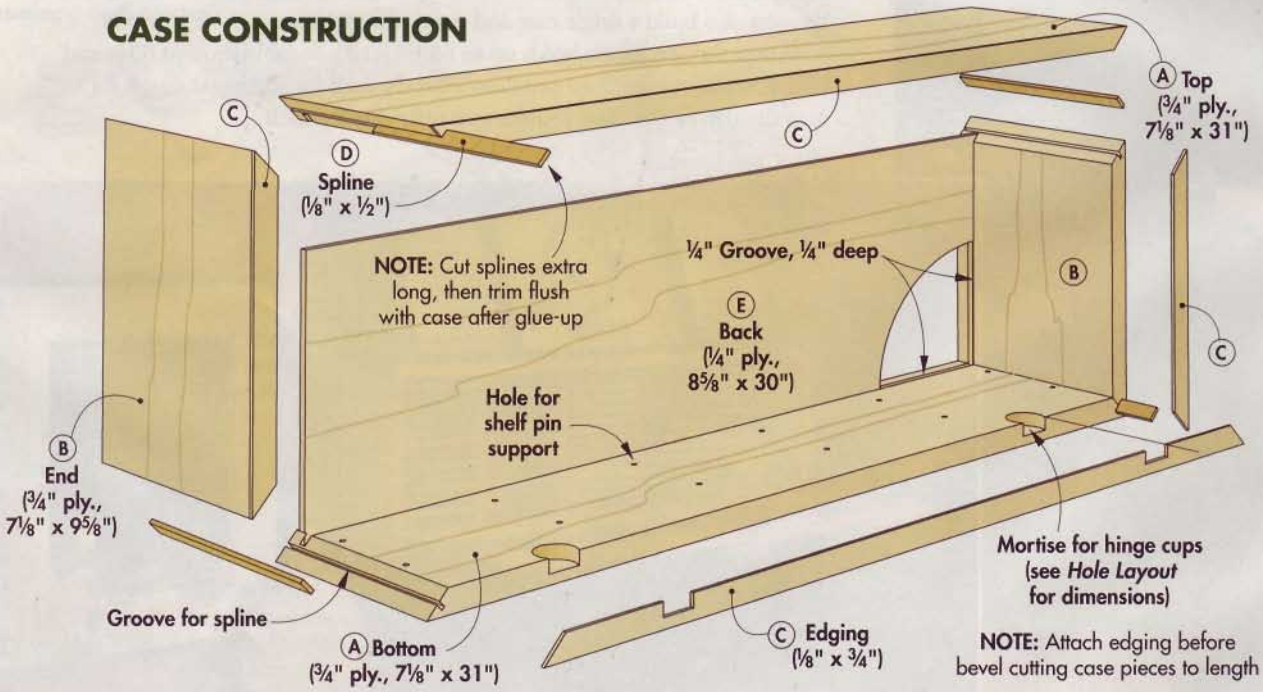
BUILD A BOX

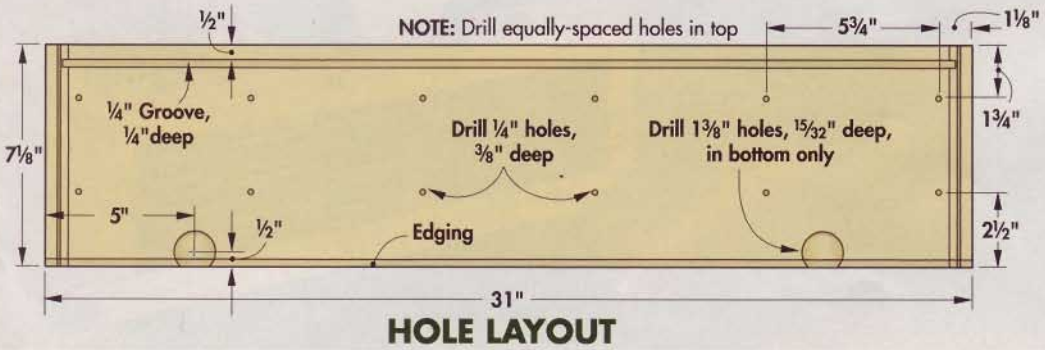
Each storage case starts out as an open plywood box with hardwood edging on the front *(see Case Construction View)*. As simple as that sounds, building the box provides an opportunity to try an interesting woodworking technique — cutting splined miter joints.

Sizing the Case Pieces — But before cutting any joinery, the first step is to rip the top and bottom (A) and both ends (B) of the case to width. These pieces will be bevel cut to length later, so to make that task easier, cut them a few inches longer than needed now.

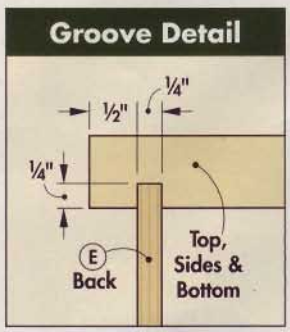
Edging the Pieces — The next step is to add hardwood edging (C) to the front of each case piece. So why not apply this edging *after* the case is assembled? It has to do with the hinges used to attach the fold-down door. To provide clearance for the hinges to operate, the mortises that hold them extend to the front of the case. It's easier to cut these open-mortises *with* the edging already attached.

CASE CONSTRUCTION





HOLE LAYOUT



With that in mind, rip the strips of edging and glue them in place. (For tips on cutting and applying hardwood edging, see page 32.)

Splined Miter Joints

Now you can get started on the splined miter joints. The miters conceal the end grain of the case pieces. The only problem is the end grain surfaces don't produce a strong glue joint. So splines are added to create a large glue surface that strengthens the joint. The splines also prevent the pieces from shifting out of alignment during glue-up.

Bevel the Ends — The miter joints are formed by cutting a bevel on both ends of each case piece. A table saw provides a quick, accurate way to do this. Start by tilting the saw blade to 45°, attaching a long auxiliary fence to the miter gauge, and bevel cutting one end of each piece. Then clamp a stop block to the fence and bevel the end pieces to final length *(Fig. 1)*. After repositioning the stop block, repeat the process for the top and bottom of the case.

Cut Grooves for Splines — The next step is to cut grooves in the beveled edges to hold the splines. You can leave the blade tilted to 45° to do this. It just has to be lowered a bit. You'll also want to attach an auxiliary fence to the rip fence, as shown in Figure 2. This way, you won't accidentally cut into the metal fence.

Now just set the fence to cut a groove that's centered on the beveled edge *(Fig. 2a)*. After making a test cut to check the setup, go ahead and cut the grooves. A single saw kerf is all that's needed for each groove.

Make the Splines — The final part of making a splined miter joint is to cut the hardwood splines (D). The thing to be aware of here is the grain direction of the spline. To produce a strong joint, the splines should be cut so the grain runs perpendicular to the joint line *(see Sidebar at right)*. You can leave the splines extra long for now. They'll be trimmed flush once the case is assembled.

Groove for Back — Before you do that though, you'll need to cut a groove in each case piece to hold a $^1/_4$" plywood back *(Groove Detail)*. Then cut the back (E) to size and dry-assemble the case to test the fit.

The "Hole" Story — At this point, you'll need to drill holes to form the mortises for the hinge cups *(Photo above and Hole Layout Detail on page 50)*. Then drill holes in the top and bottom for some shelf pin supports that are added later.

Assemble Case — Now you're ready to glue and clamp the case together. To avoid racking the case out of square, I'd recommend using a couple of corner blocks, as shown in the *Photo* on page 50. It's also a good idea to clamp scrap blocks to the outside of the case to help distribute the pressure.

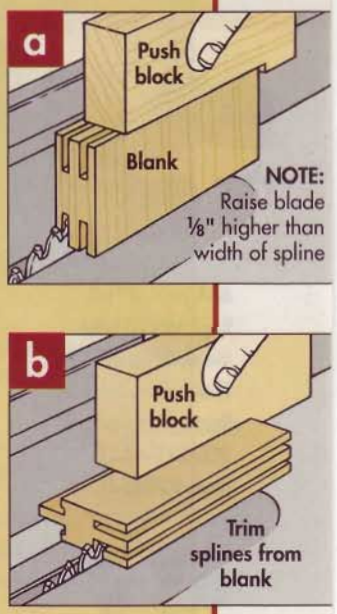
▲ When drilling the mortises for the hinge cups, it's a good idea to clamp a scrap block to the front edge of the case bottom to prevent chipout.

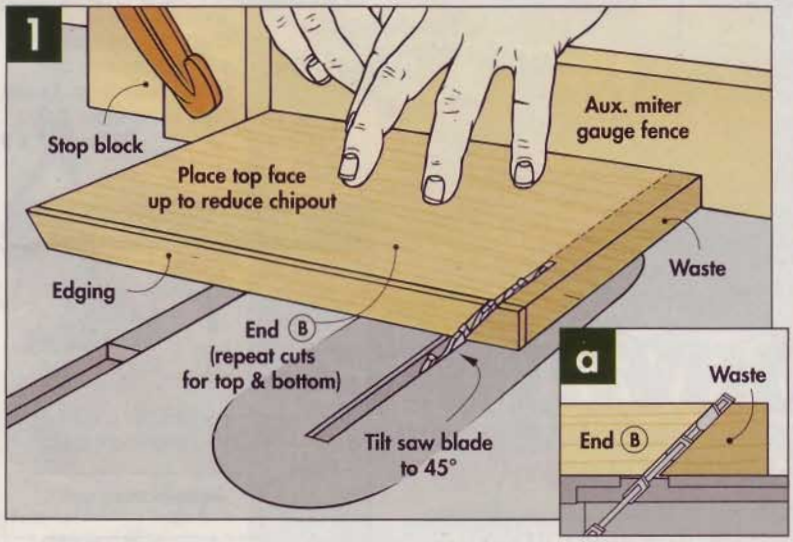
Two-Step Splines

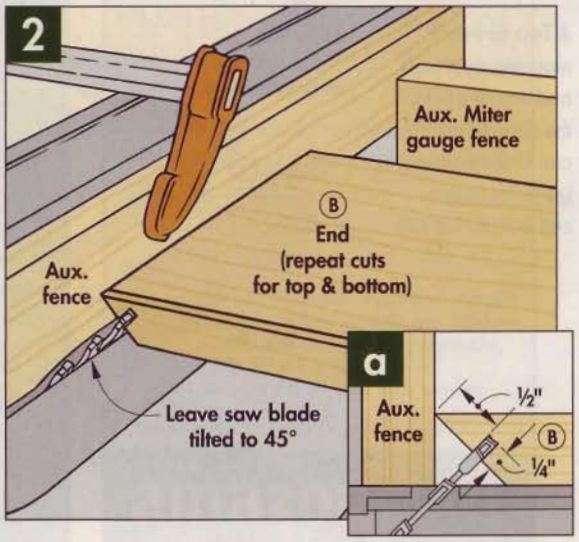
An easy way to make hardwood splines with the proper grain orientation is to cut them from a blank on the table saw.

First, set the rip fence so the blade cuts a spline of the desired thickness. Then raise the blade $^1/_8$" higher than the width of the spline and cut *several kerfs (Fig. a)*.

Next, reposition the fence, lower the blade, and trim each spline from the blank *(Fig. b)*. Make the splines slightly narrower than the combined depth of the grooves. This way they won't "bottom out," and the pieces should fit tightly together.







fold-down CASE DOOR

One of the distinctive features of this storage case is a fold-down door that doubles as a shelf for sorting CDs. The door has a ribbed glass panel that's semi-transparent *(see Photo at left)*. When the door is closed, the CDs and DVDs behind the glass create a rich mosaic of color.

The ribbed glass panel doesn't make the door any harder to build, but it is fairly heavy. This calls for a sturdy door frame to hold the glass. To accomplish that, I used splined miter joints to assemble the frame *(see Photo on page 53)*. These joints are similar to the splined miters for the case. Only here, the frame pieces are mitered (not beveled as on the case). Then a spline is glued into grooves cut in the mitered ends.

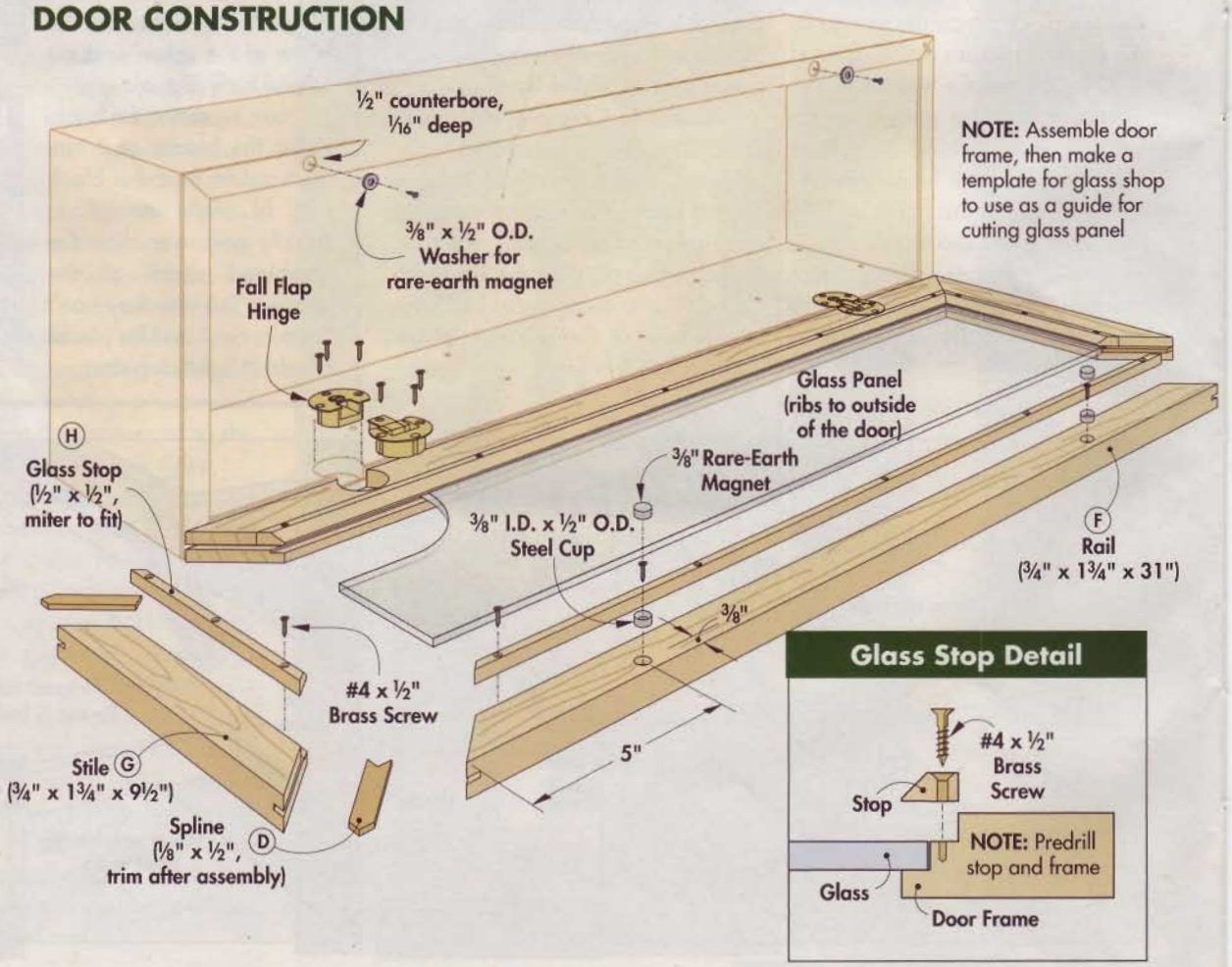
Stock Prep — Before cutting any joinery though, you'll need to prepare the stock for the frame pieces. Start by ripping the rails (F) and stiles (G) to width from 3/4" hardwood. Then cut them a few inches longer than needed. They'll be mitered to length later, after they're machined to hold the glass and some wood stops.

▲ The wood stops that hold the glass panel are mitered to fit and pre-drilled to avoid splitting. Beveled edges form a smooth transition from the door frame to the glass.

▲ A pair of "fall flap" hinges hold the door open. They're available at Rockler.com or call 800-279-4441 (Item #29454).

▲ Two rare-earth magnets, steel cups, and washers hold the door closed. You can order online at LeeValley.com or call 800-871-8158.

DOOR CONSTRUCTION



▲ I used spline miter joints to assemble the door frame. Two rabbets hold the glass and the wood stops.

Two Rabbets — A look at the *Photo* at right shows just what's involved in this machining. Notice that there are two rabbets cut in the inside edge of each frame piece. One rabbet holds the glass, and the other forms a recess for a wood stop used to secure the glass.

A quick way to cut these rabbets is to mount a dado blade in a table saw and then "bury" part of the blade in an auxiliary fence *(Fig. 1)*. Start by cutting a wide, shallow rabbet for the stop *(Fig. 1a)*. Then raise the blade to cut a deep, narrow rabbet to hold the glass *(Fig. 1b)*. The important thing here is that the depth of this second rabbet matches the thickness of the glass. This way, the glass will sit flush with the rabbet for the stop, allowing the stop to fit tightly against the glass.

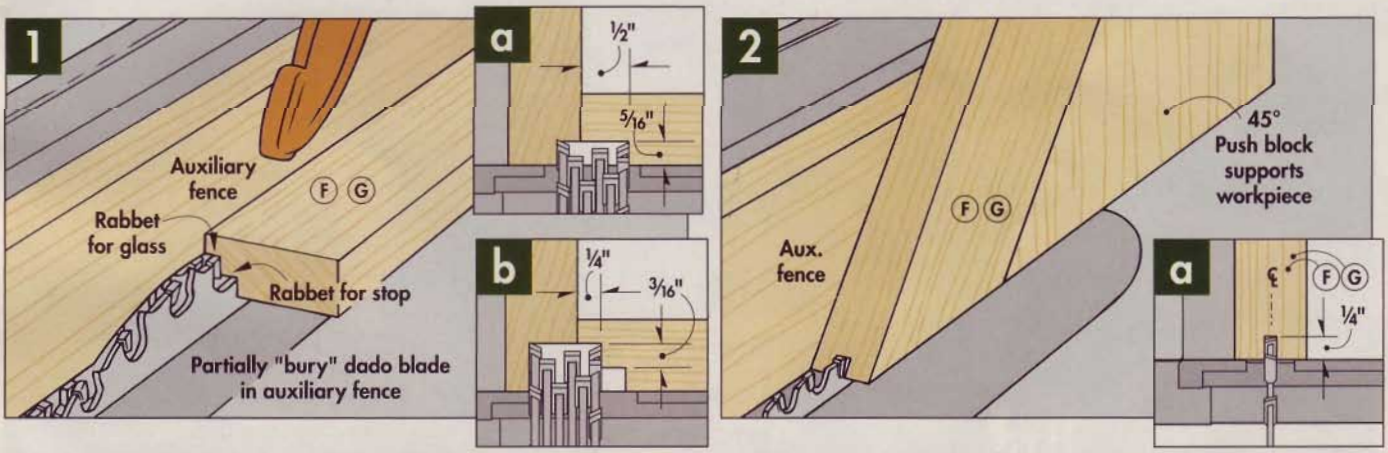
Grooves & Splines — There are two more things to do before assembling the door frame. That's to miter the pieces to length, then cut grooves in the mitered ends for the splines. It's this second part that's a bit tricky. That's because you have to stand each piece on end as you make a pass over the saw blade. Since the end is quite narrow, the piece will have a tendency to rock. So to hold it steady, I used a push block that's trimmed at a 45° angle *(Fig. 2)*.

Now cut the splines as before and glue and clamp the frame together. When the glue dries, trim and sand the splines flush with the frame.

Fall-Flap Hinges — At this point, you can turn your attention to the hinges. To hold the door at 90° to the front of the case, I used special hinges called "fall flap" hinges *(see Margin Photo on page 52)*. These hinges fit into holes drilled in the lower frame piece of the door. Just be sure the holes align with the ones drilled earlier in the bottom of the case.

Magnetic Catches — To hold the door closed, I added a pair of magnetic catches *(Margin Photo on page 52)*. Each catch consists of a rare-earth magnet that fits into a cup installed in the door and a washer attached to the case itself. When you shut the door, the magnet contacts the washer with a reassuring "click," securing the door.

Glass & Stops — All that's left is to add the glass and the wood stops (H) to hold it. To ensure that the glass fit, I made a hardboard template of the opening in the door. Then I had a glass shop cut the glass to match the template. As for the stops, they're easy to make on the table saw *(see Sidebar below)*. The stops are simply screwed in place.

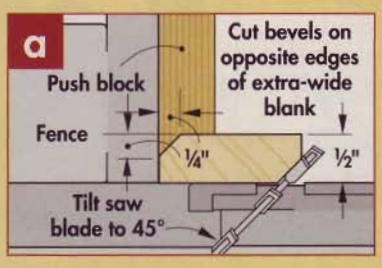


cutting small strips for stops safely

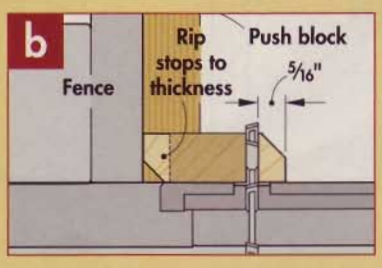
Whenever you have to cut thin, narrow strips of wood on the table saw, one of the cardinal safety rules is to start with an oversize piece.

The beveled stops that hold the glass in the door are a good example. If you look at the *Illustrations* at right, you can see how they're cut from a 1/2"-thick hardwood blank that's wide enough to make two stops, with some waste in the middle.

It's also a good idea to make the blank *longer* than needed. This provides "extra" material when mitering the stops to fit around the door opening.



▲ To make the glass stops, first bevel two opposite corners of a 1/2"-thick, extra-wide blank.



▲ Then use a push block to rip the stops to the desired thickness from each edge of the blank.

divide & organize
THE INSIDE STORY

In the design stage of this storage case, we looked at several manufactured CD organizers. But to be honest, I wasn't all that satisfied with them. They were either too flimsy, too plastic looking, or they just didn't seem to make the most efficient use of space. So I decided to make my own.

Dividers & Supports — The main components of these organizers are 3/4" plywood dividers (I) with rows of thin wood supports (J) that hold the CDs *(Organizer Assembly)*.

If you plan to use the entire case to hold CDs, make six dividers. Four of them should have supports on both sides, but for the two end dividers, you'll only need supports on one side. (The other side sits against the case.)

As for DVDs, make as many dividers as you want to form compartments inside the case. The DVDs are stored upright, so these dividers won't need any supports.

To prevent the dividers from tipping over, there's a groove in each end that fits over shelf pin supports *(Divider Detail)*. A single pass on the table saw is all that's needed to cut these grooves *(Figs. 1 and 1a)*. Just be sure to clamp a block to the divider to hold it steady.

Grooves for Supports — In addition to the grooves in the ends of the dividers, you'll also need to cut a series of grooves in one or both faces to hold the hardwood supports. To make it easy to slip CDs in and out, it's important that these grooves align from one divider to the next. One way to accomplish that is to first lay out the location of all the grooves in one divider and then use it as a setup gauge *(Fig. 2)*.

To do that, start by attaching an auxiliary fence to your miter gauge. Then position the divider so the first groove aligns with the saw blade and clamp a stop block against the divider.

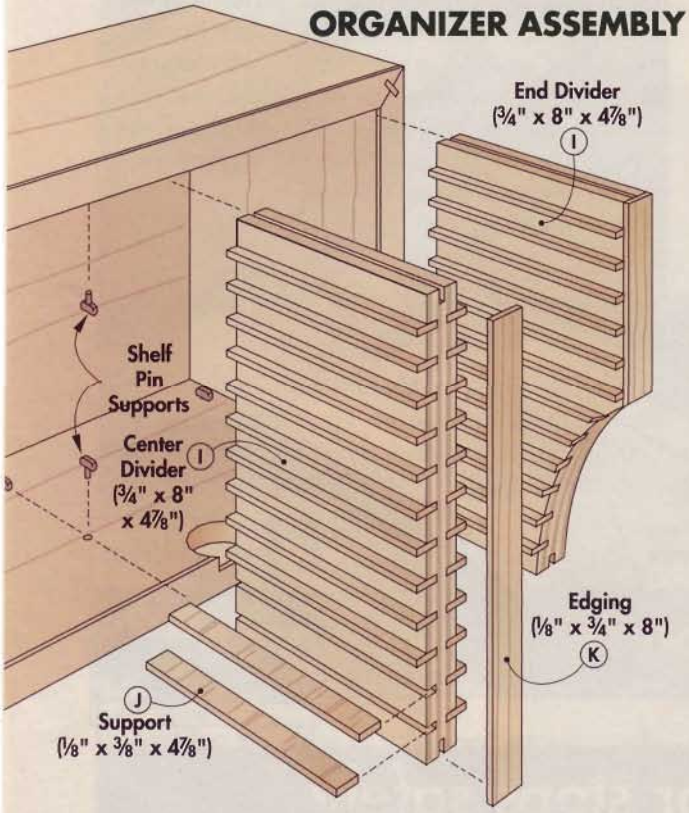
Next, cut a groove in one side of the divider, flip the piece over and cut a second groove in the opposite side. Once that's done, turn the divider end for end and make two more cuts using the same setup. Before moving the stop block, cut the first four grooves in the remaining dividers.

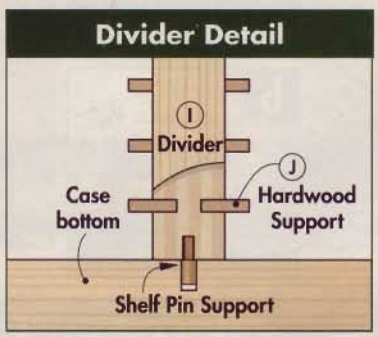
Now reposition the stop block for the second set of grooves and repeat the process *(Fig. 2a)* until all of the grooves are cut in all of the dividers.

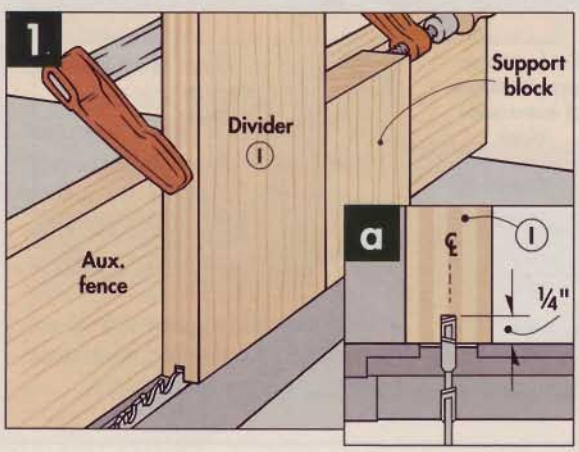
Edging — After completing the grooves, glue a strip of hardwood edging (K) to the front of each divider to cover the exposed plies. The edging also provides a way to register the supports, which come next.

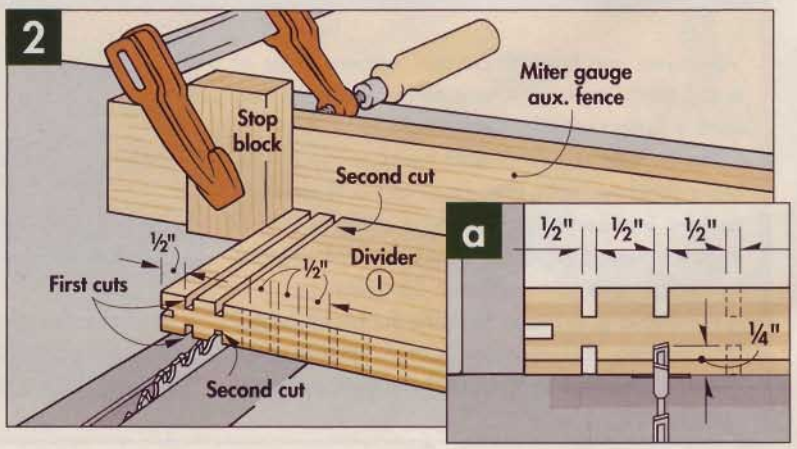
Supports — All that's needed to install the thin wood supports (J) is to apply a dab of glue to the grooves and press them into place.

ORGANIZER ASSEMBLY









wall mounting MADE EASY

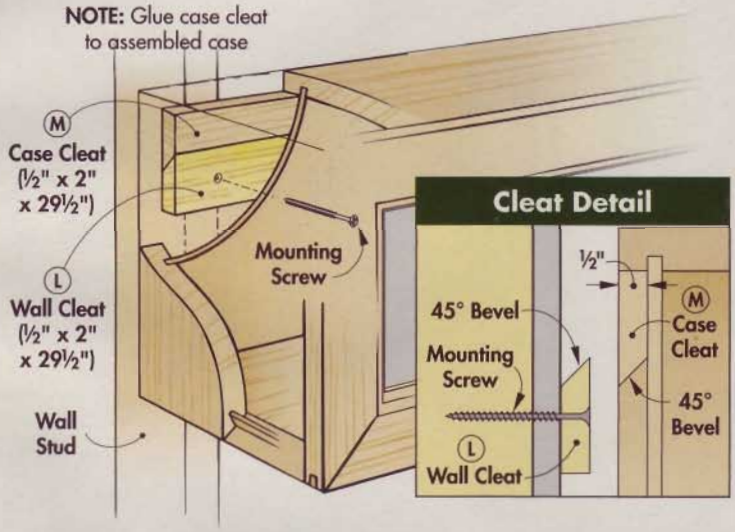
Hanging the finished case on the wall is pretty straightforward. It's installed using a two-part interlocking cleat system. Take a look at the *Illustrations* below to see how these two cleats work together.

A long wall cleat (L) that's beveled its entire length along the top edge is screwed directly to the wall. Keep in mind the case will sit higher than the top edge of the wall cleat once it's hung on the wall.

The second cleat (M) has a matching bevel, and it's glued directly to the case. When installed, the beveled cleats "nest" together, forming a solid connection and securing the case to the wall.

To make the cleats, start with a piece of 1/2"-thick hardwood that's 4 1/8" wide. Then rip a bevel down the center of the stock on the table saw. After attaching each half, go ahead and hang the case on the wall. The two cleats should fit together pefectly.

The only thing left now is to organize your CDs and DVDs. Then sit back, crank up the tunes, and enjoy your handiwork.



MATERIALS LIST (for one case)

A (2)	Case Top & Bottom (oak ply.)	3/4" x 7 1/8" x 31"
B (2)	Case Ends (oak ply.)	3/4" x 7 1/8" x 9 5/8"
C (4)	Case Edging (hardwood)	1/8" x 3/4" x 84"
D (8)	Splines (hardwood)	1/8" x 1/2" x 40"
E (1)	Case Back (plywood)	1/4" x 8 5/8" x 30"
F (2)	Door Rails (hardwood)	3/4" x 1 3/4" x 31"
G (2)	Door Stiles (hardwood)	3/4" x 1 3/4" x 9 1/2"
H (4)	Glass Stops (hardwood)	1/2" x 1/2" x 73"
I (6)	Dividers (plywood)	3/4" x 8" x 4 7/8"
J(120)	Supports (hardwood)	1/8" x 3/8" x 4 7/8"
K (6)	Divider Edging (hardwood)	1/8" x 3/4" x 8"
L (1)	Wall Cleat (hardwood)	1/2" x 2" x 29 1/2"
M (1)	Case Cleat (hardwood)	1/2" x 2" x 29 1/2"

HARDWARE

- (1) Ribbed Glass Panel (cut to fit inside door frame)
- (2) Concealed Fall Flap Hinges w/Screws
- (2) 3/8" Rare-Earth Magnets w/Cups and Washers
- (16) #4 x 1/2" Brass Screws
- (24) Shelf Pin Supports

ONLINE Extras

CD Case Cutting Diagram

Plans for a wood base can be found at:

WorkbenchMagazine.com

media storage DESIGN OPTIONS

▲ It's easy to convert this multimedia case into an upright cabinet. Just turn it on end and attach it to a wood base. Plans for the base are available as *Online Extras* at workbenchmagazine.com.

▲ A single wall-mounted storage case is also a good way to organize computer CDs and office supplies. Here again, the top of the case serves as an attractive display shelf.

WORKBENCH®

CD/DVD Media Storage Case

Issue #278 Volume 59 Number 4 JULY / AUGUST 2003

MATERIAL AND HARDWARE LIST (for one case)

A	(2)	Case Top & Bottom (oak ply.)	3/4" x 7 1/8" x 31"
B	(2)	Case Ends (oak ply.)	3/4" x 7 1/8" x 9 5/8"
C	(4)	Case Edging (hardwood)	1/8" x 3/4" x 84"
D	(8)	Splines (hardwood)	1/8" x 1/2" x 40"
E	(1)	Case Back (plywood)	1/4" x 8 5/8" x 30"
F	(2)	Door Rails (hardwood)	3/4" x 1 3/4" x 31"
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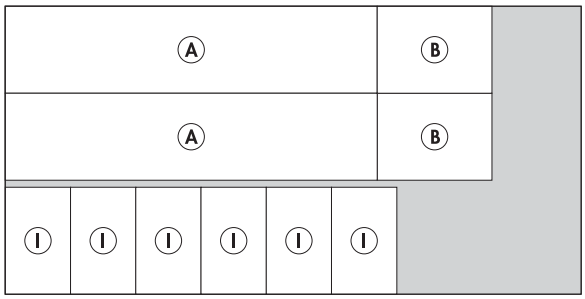
K	(6)	Divider Edging (hardwood)	1/8" x 3/4" x 8"
L	(1)	Wall Cleat (hardwood)	1/2" x 2" x 29 1/2"
M	(1)	Case Cleat (hardwood)	1/2" x 2" x 29 1/2"

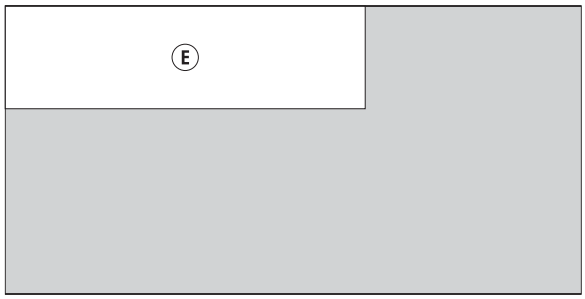
HARDWARE

- (1) Ribbed Glass Panel (cut to fit inside door frame)
- (2) Concealed Fall Flap Hinges w/Screws
- (2) 3/8" Rare-Earth Magnets w/Cups and Washers
- (16) #4 x 1/2" Brass Screws
- (24) Shelf Pin Supports

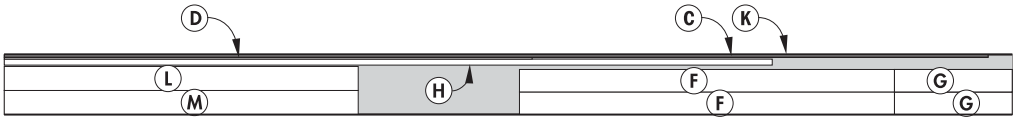
CUTTING DIAGRAM (NOTE: hardwood supports (J) not shown)



3/4" OAK PLYWOOD - 24" x 48" (QTY: 1)



1/4" OAK PLYWOOD - 24" x 48" (QTY: 1)



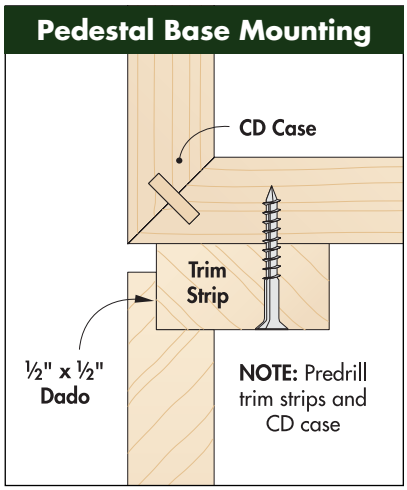
3/4" WHITE OAK - 5" x 84" (QTY: 1)

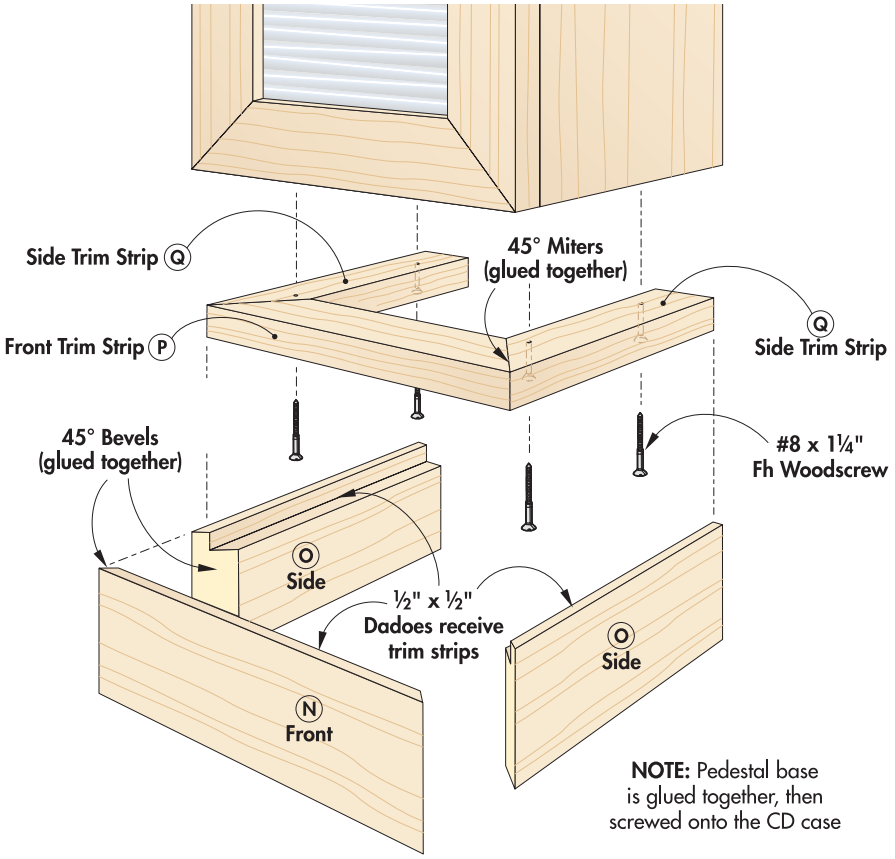
WORKBENCH®

CD/DVD Media Storage Case

Issue #278 Volume 59 Number 4 JULY / AUGUST 2003

PEDESTAL BASE for CD/DVD Media Storage Case



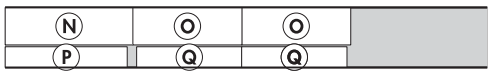


MATERIAL AND HARDWARE LIST (for one Pedestal Base)

N (1)	Front (hardwood)	$^3/_4$" x $2^3/_4$" x $9^5/_8$"
O (2)	Sides (hardwood)	$^3/_4$" x $2^3/_4$" x 8"
P (1)	Front Trim Strip (hardwood)	$^3/_4$" x $1^1/_2$" x $9^1/_8$"
Q (2)	Side Trim Strip (hardwood)	$^3/_4$" x $1^1/_2$" x $7^3/_4$"

HARDWARE
- (4) #8 x $1^1/_4$" Fh Woodscrews

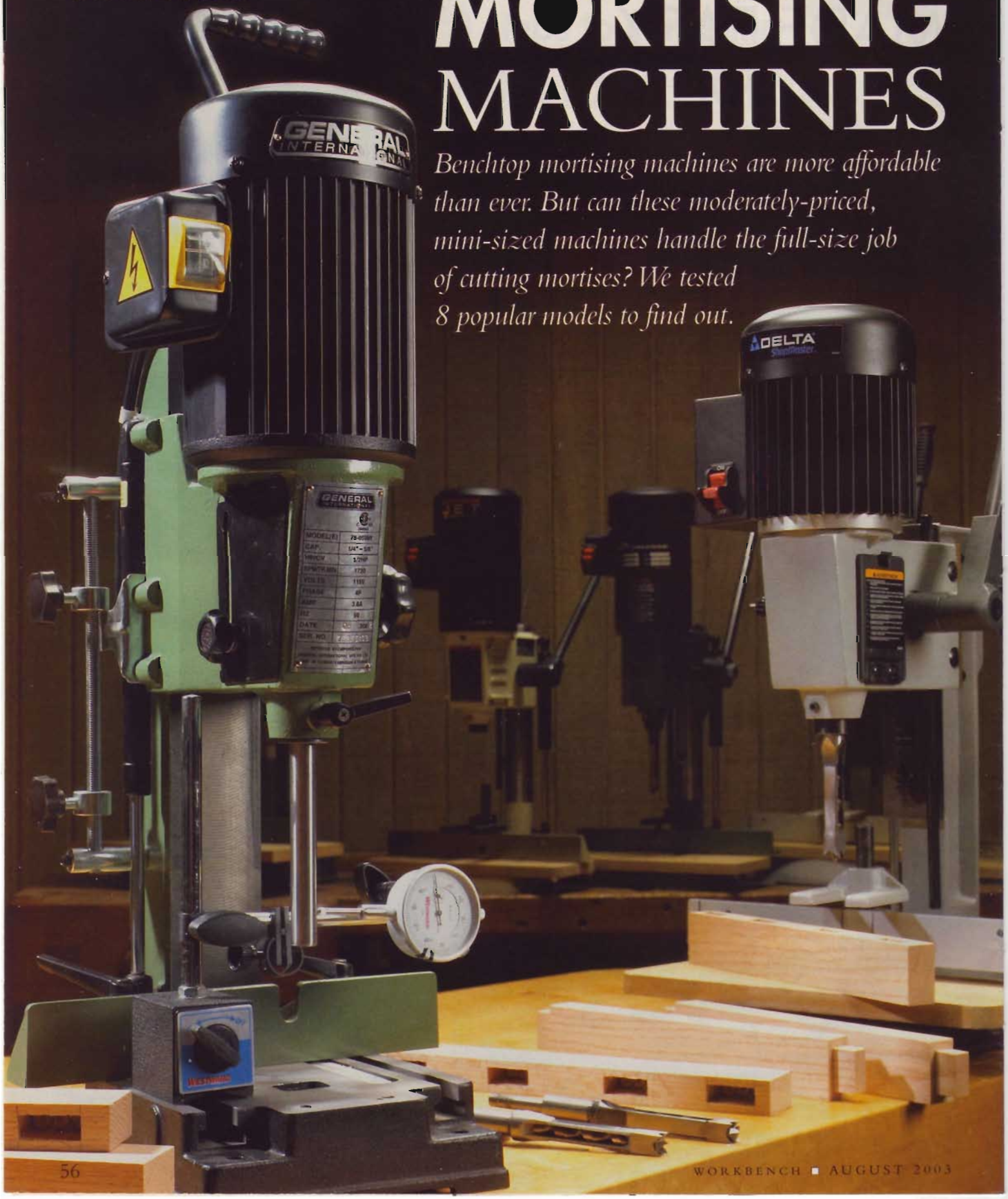
CUTTING DIAGRAM



¾" WHITE OAK - 5" x 36" (QTY: 1)

MORTISING MACHINES

Benchtop mortising machines are more affordable than ever. But can these moderately-priced, mini-sized machines handle the full-size job of cutting mortises? We tested 8 popular models to find out.

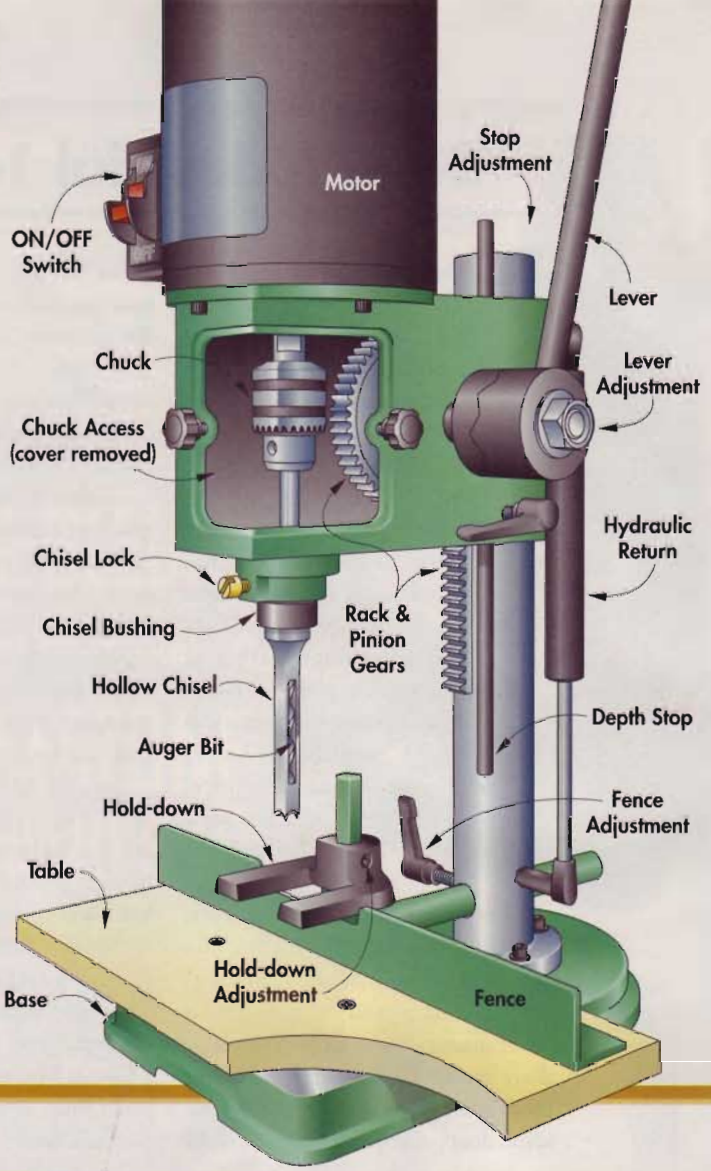


A mortise and tenon joint is one of the more challenging joints a woodworker can aspire to. That's largely due to the formidable task of cutting an accurate mortise. Benchtop mortising machines *(illustrated at right)* have the singular purpose of performing that task.

The difficulty of that job becomes apparent when you consider the mechanics of machine mortising. A special auger bit nests inside of a four-sided, hollow chisel. The auger bit bores a hole like any other drill bit. But following just behind the point of the auger bit are the four cutting edges of the hollow chisel. Their job is to remove the stock around the hole and render a round hole square. If you imagine making four simultaneous, full-depth cuts with $1/2$" chisels, you get a better sense of what these tools are expected to do.

Our testing of these tools revealed some surprising truths. Among them are that horsepower and bit speed are secondary to precise tolerances and smooth operation when it comes to how these tools perform. *(See the Sidebar on page 59 for more on this).* We also found that many of these tools required a "break-in" period before they realized their full potential.

Our testing procedures are explained in more detail below, and the results of those tests can be seen in the table on page 63 along with our final recommendations. Our impressions of the individual tools and their respective strengths and weaknesses are on the pages in between.

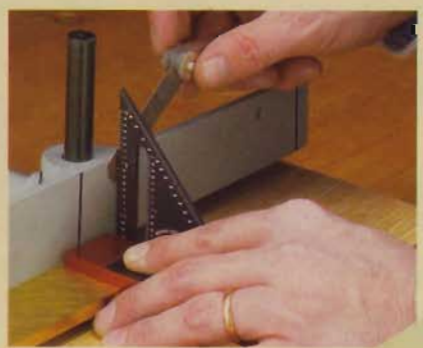


HOW WE TESTED

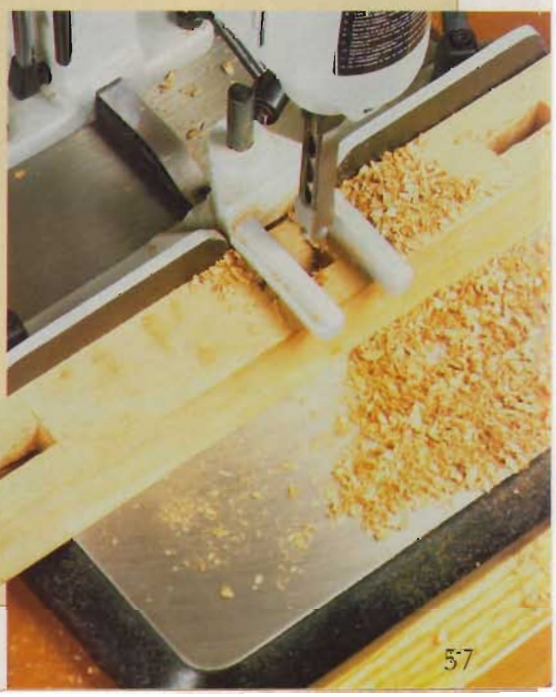
For a mortising machine to cut accurately and without the chisel binding in the workpiece, the fence and table must be flat and square to one another. Our first step, then, was to measure each of those factors *(see Photos below)*. Furthermore, the head must travel in a perfectly straight line, which we tested with a dial caliper and a machined steel rod *(see Photo on page 56)*. The acid test, though, was to cut dozens of mortises with each machine to determine how those factors influenced performance and to see how well the machines maintained an exact setup.

▼ When cutting mortises, accuracy, user effort, ease of setup, and hold-down effectiveness were all considered in each tool's final report card.

▲ Tables and fences were all inspected for flatness using a straightedge and feeler gauge.



▲ The angle between each table and fence was checked with squares and a feeler gauge.



Delta Industrial 14-651

Delta's model 14-651 mortising machine set the standard for this category by delivering both top-notch performance and user-friendly features. So many other tools in this test seemed to require us to compromise on one or the other. (As an aside, it's our considered opinion that performance far outweighs bells and whistles.) It's another huge feather in Delta's cap that this all-inclusive mortiser is also available at a very reasonable price.

On the subject of performance, there was only one other tool in this test that cut as effortlessly as this one (the Woodtek 1-hp machine). Frankly, we were surprised by how much effort many of these tools required — there seemed little benefit to using them at all. And while that did cause some disappointment, it also resulted in us having a real appreciation for a tool such as this one that indeed made mortising seem like a viable operation.

The excellent performance of this machine can no doubt be attributed entirely to its outstanding construction. The fence and table are both machined dead flat (the cast table is automatically superior to the MDF tables common on other machines). And our head travel test revealed only the most negligible variance.

Besides its superior performance and construction, this tool also boasts the best set-up and convenience features (a few of which are shown in the *Photos* below).

Most notable among those features is a rack-and-pinion, micro-adjustable fence. This is one of only two machines in the test with such a feature (the other being the Fisch) and Delta's design is far more accurate and easier to use.

At a Glance:

Price:	$237
Motor:	1/2-hp
Spindle Speed:	1,725
Chuck Capacity:	3/8"
Chisel Capacity:	1/2"
Max. Stroke:	5"
Head Space:	9 3/8"
Throat Space:	3 3/4"
Warranty:	2 years

Virtues: Superior performance and outstanding features.
Vices: None.
Verdict: The undisputed best choice on all accounts.

www.DeltaWoodworking.com
800-438-2486

Interestingly enough, this is the last tool we tested from this group. That seemed quite appropriate when we recognized that, had we been able to harvest the best characteristics of all the other machines and blend them into one, this is the tool that would've resulted. The real news, though, is that all this can be had for a considerably lower price than you might expect.

▲ Delta's 14-651 has all the best features, including a pinion-type lever that adjusts quickly and without tools.

► Securing the chisel and tightening the chuck are done with the same tool on this mortising machine.

▲ The micro-adjustable fence and tool-free settings make setup fast, accurate, and secure. Installing the riser block gives this machine the largest throat capacity in the bunch.

Woodtek 900-881

At a Glance:

Price:	$350
Motor:	1-hp
Spindle Speed:	1,725
Chuck Capacity:	1/2"
Chisel Capacity:	1"
Max. Stroke:	5 1/4"
Head Space:	9"
Throat Space:	3 3/4"
Warranty:	1 year

Virtues: Top-flight performance and large capacity.
Vices: Lacks features.
Verdict: A bit pricey, but the performance is there.

www.Woodworker.com
800-645-9292

▲ The two-position, screw-secured lever of the Woodtek lacks the convenience of the pinion-type levers.

Woodtek doesn't build a fancy mortising machine, but it certainly came through with a capable one in this 1-hp model. And we'll take capable over fancy any day when it comes to what makes a valuable mortiser.

What impressed us most about the Woodtek is how it made cutting a mortise seem almost effortless. In fact, we found ourselves double-checking subsequent machines to see if the difficulty we were having relative to the Woodtek was due to an improper setup on our part.

Turns out the Woodtek is just that much better than most other machines. Sharp chisels, dull chisels, cheap chisels, expensive chisels — it just didn't seem to matter. This 1-hp behemoth powered through mortises with equal, and remarkable, ease. But the additional horsepower doesn't fully explain the superior performance, especially considering that the only other machine that matched this one in ease of cutting was the 1/2-hp Delta Industrial.

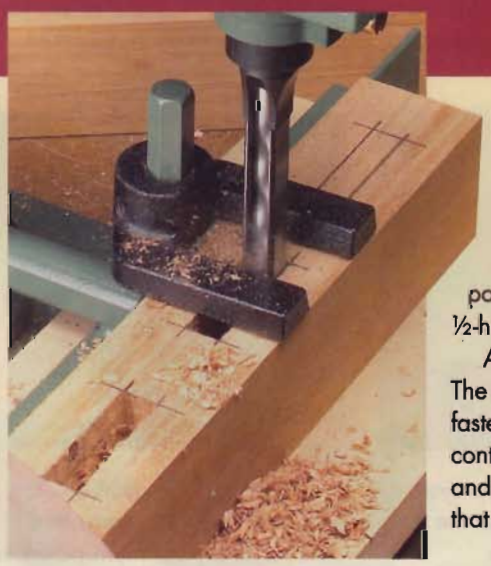
What this tool lacks are the user-friendly features that can be found on many other machines. For instance, every adjustment requires a tool of some sort. In fact, all told, three different tools are needed to setup this machine from scratch. We also found that we preferred the pinion-adjusting lever over Woodtek's two-position lever *(Fig. 1)*.

Additionally, the fence and table are somewhat crude compared to the Delta and General machines. This in itself is not that bad. Most of the machines lacked the high-quality components of the Delta and General. Given the relatively high price of this machine, however, we did see that as a disadvantage.

But again, we have to defer to this benchtop mortiser's flawless performance and consider it a good choice for any home shop.

The burning question is whether you can justify the higher price of this somewhat plain machine versus the moderate price of the Delta Industrial mortiser. Our answer to that is that the Woodtek's performance is certainly worth the price, but we still can't help but wonder why no bells and whistles.

RPM & Horsepower



Power and speed, while generally favorable in cutting tools, did not affect mortising machines in the manner we expected.

Horsepower, for instance, had little bearing on how effectively these tools cut. Inadequate horsepower would result in the bit stalling, which we saw only rarely. Also, if horsepower were a deciding factor, we wouldn't expect to see the ½-hp Delta match the performance of the 1-hp Woodtek.

As to bit speed, conventional wisdom says that faster is better. The theory is that a faster spinning bit will cut cleaner and clear faster, leaving less work for the hollow chisel. Our experience ran contrary to that. We found that the slower turning machines cut and cleared just fine and were less susceptible to the burning that can scar a workpiece and shorten the bit life.

MORE MORTISERS!

For a review of the Delta ShopMaster MM300 and the Woodtek 876-775, which were also evaluated as part of this test, go to

ONLINE Extras
WorkbenchMagazine.com

General International

General's model 75-050 mortiser is a paragon of user-friendly design, solid construction, and top-rate performance — following a brief "break-in" period, that is.

In fact, this was the first of several machines we saw that became increasingly easier to use with each subsequent mortise. At first, the herculean effort it took to cut a mortise with this machine caused us some concern. But as testing progressed, the machine became much more fluid and required us to lean into it with much less effort. After about a dozen mortises, we felt like the performance and the required operator effort had caught up to the outstanding construction and worthwhile features of the tool.

An example of the stellar construction is this machine's cast iron, precision-machined bed, which we consider a significant advantage over a bed made from MDF. Testing showed that the bed is dead flat and perfectly square to the beefy cast iron fence. Another noteworthy feature on the bed is a scale that aids with centering the stock under the chisel and bit.

The fence, besides being sturdy and flat, has a couple of other exceptional features. First is the fact that it runs on dual guide rails, which go a long way toward ensuring it's always square and also offers two points for securing the fence once it's positioned. The face of the fence is further enhanced by two deep notches that allow the stock hold-down to be lowered much further than many of the other tools in this test *(Fig. 1)*. That makes it possible to mortise much smaller stock without the need to shim the stock off the table.

Another big plus for this machine is its user-friendliness. This is the only machine in the group that doesn't require any tools beyond the chuck key to change the setup *(Fig. 2)*. A unique depth stop system limits both the upward and downward travel of the head *(Fig. 3)*. Being able to set the upward travel helps eliminate unnecessarily long pull strokes when mortising thin stock.

Our only complaint, and it's a small one, is the lever adjustment *(Fig. 4)*. We found the pinion style to be more versatile and easier to adjust than this type.

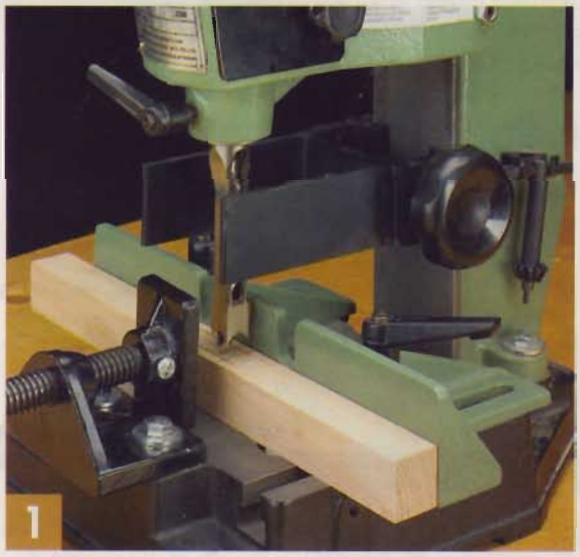
Nonetheless, this became one of our favorite machines in the group. And even with its relatively high price tag and requisite "break-in," we wouldn't hesitate to recommend using this mortiser in any shop.

At a Glance:

Price:	$299
Motor:	1/2-hp
Spindle Speed:	1,720
Chuck Capacity:	1/2"
Chisel Capacity:	5/8"
Max. Stroke:	6"
Head Space:	8 1/2"
Throat Space:	3"
Warranty:	2 years

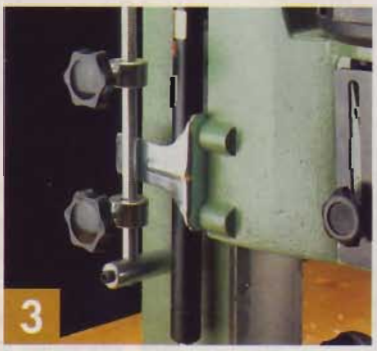
Virtues: Loaded with features. Above average performance.
Vices: Two-position lever.
Verdict: Break this one in and you'll have a great machine.

www.General.ca
524-326-1161



▲ A flat table, sturdy fence, a face clamp, and a beefy hold-down offer excellent setup and stock control.

▲ The General is the only machine in the bunch with a tool-free chisel lock.



▲ General's unique stop system allows you to customize the stroke length to the job.

▲ With only two positions to choose from, this lever often isn't set at an optimum position.

Jet JBM-5

At a Glance:

Price:	$199
Motor:	1/2-hp
Spindle Speed:	1,725
Chuck Capacity:	3/8"
Chisel Capacity:	1/2"
Max. Stroke:	4 3/4"
Head Space:	7"
Throat Space:	3 1/2"
Warranty:	2 years

Virtues: Solid performance, top-flight features.
Vices: Requires some muscle.
Verdict: The best mortiser you can buy for under $200.

www.JetTools.com
800-274-6848

Although not the most inexpensive tool in this test, we are convinced that Jet's JBM-5 is the best mortising machine to be had for under $200. Thus, we honor it with our *Top Value* award.

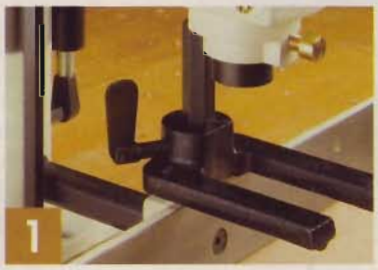
What really differentiates this tool from the similarly-priced and -sized mortising machines in this group are its features.

Securing the chisel requires a screwdriver and the chuck takes the usual key, but every other adjustment on this machine is tool-free *(Fig. 1)*. We found that the fewer tools we had to keep track of in order to change fence, depth stop, and hold-down settings, the more we enjoyed using a tool. And given the very narrow margins of performance differences between so many of these mortising machines, it became a significant measure of our satisfaction with a tool.

Convenience notwithstanding, a mortiser is only as good as its mortises. And on that count, this is a very good machine. From the first cut, this impressed us as a solidly-built, smooth-running machine.

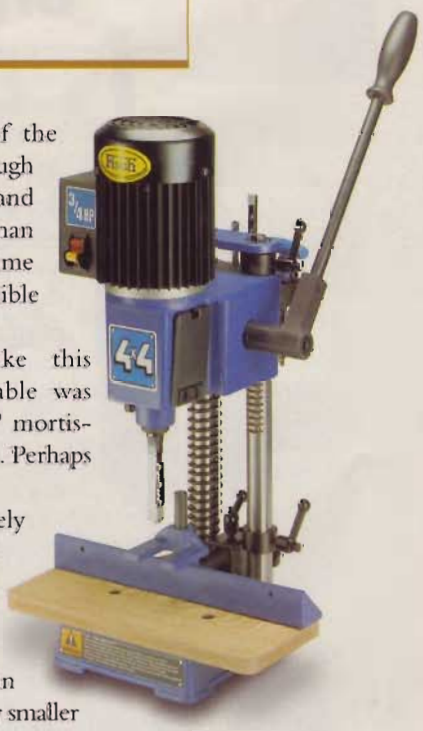
Nonetheless, it did require a decent amount of muscle to cut a 1/2" mortise. But like so many other machines, this one benefitted from a short "break-in" and eventually became quite easy to operate.

All in all, Jet's JBM-5 is a complete-package mortising machine with great set-up features and a very competitive price.



► While most stock hold-downs require a wrench to tighten, Jet built a thumb lever into their hold-down.

Fisch BTM-99



At a Glance:

Price:	$185
Motor:	3/4-hp
Spindle Speed:	1,725
Chuck Capacity:	1/2"
Chisel Capacity:	1/2"
Max. Stroke:	5"
Head Space:	6 5/8"
Throat Space:	2 3/4"
Warranty:	2 years

Virtues: A few nice features.
Vices: Requires enormous effort to cut 1/2" mortises.
Verdict: Low price, possibly an option for light use.

www.Fisch-Tools.com
724-663-9072

At first blush, this machine has a lot of unique and promising features. Among them are a micro-adjustable fence and a twin-column design, which is supposed to give the machine improved stability and accuracy *(Fig. 1)*.

Unfortunately, we found that cutting a 1/2" mortise with this machine demanded gargantuan effort. A thorough inspection of the setup, a different (though same-sized) chisel and bit set, and more than adequate break-in time yielded only negligible improvement.

What did make this machine more usable was trading out the 1/2" mortising set for a 3/8" set. Perhaps that is enough.

Given the relatively low price of this machine and the number of agreeable features on this tool, it could make an acceptable choice for smaller mortising applications.

► One nice feature of the Fisch is a micro-adjustable fence. Note also the dual-column design.

Craftsman 21906

Although Craftsman rates this tool with a capacity of up to 3/4" mortises, this machine, in our experience, is best suited to chisels no larger than 3/8".

In testing the Craftsman with the standard 1/2" chisel and bit set, we found the tool to have a propensity for stalling under the load. Also, the amount of operator effort necessary to make these cuts was well beyond what we considered acceptable when compared to other machines in this test.

This tool also required a a fair amount of fine-tuning to remove slop between the head and the column before we were able to start mortising.

We did notice some improvement following about 10 break-in cuts and were ultimately able to mortise quite effectively with the 3/8" chisel and bit that were included with the machine.

Clearly, we aren't able to give this tool our wholehearted recommendation, but the price is competitive and the machine does have a few worthwhile features. Among them are onboard tool storage and a scale printed on the bed *(Fig 1.)*.

◄ Craftsman's MDF table features a printed scale that "zeroes-out" under the bit center. This aids in accurate spacing of the mortises in the workpiece.

At a Glance:

Price:	$199
Motor:	1/2-hp
Spindle Speed:	1,725
Chuck Capacity:	3/8"
Chisel Capacity:	3/4"
Max. Stroke:	4 1/8"
Head Space:	7 1/4"
Throat Space:	3 1/2"
Warranty:	1 year

Virtues: Moderate price. A few nice features.
Vices: Sub-par performance.
Verdict: Limited ability, but not out of the question for light work.

www.Craftsman.com
800-549-4505

Bridgewood HM-11

Showing up as the last tool in the article probably doesn't look too good for the Bridgewood, which is unfortunate. It's actually not a *bad* machine. In fact, we'd characterize it as a no-frills, no-fuss mortiser that performs as well as many others. Unfortunately, we expected more in light of the price tag attached to this machine.

On the up side, this machine performs satisfactorily once you get accustomed to the higher bit speed, and it does have a couple of the features that we quickly came to appreciate throughout our testing. First is the pinion style lever. Another is the large, removable panel that allows access to the chuck. This is one of several similarities this machine bears to both Woodtek benchtop mortisers (the 1-hp model on page 59 and the 1/2-hp machine that can be seen on the *Workbench* website). In fact, this is virtually a twin to the smaller Woodtek machine, right down to the instruction manual.

Nonetheless, at just a few dollars less than the Delta Industrial mortiser, this one lacks the ease of operation and the substantive features that make the Delta such a bargain. For that matter, this one doesn't even come with any chisels as part of the purchase price. So factor in another $45 to $75 for that expense.

At a Glance:

Price:	$229
Motor:	1/2-hp
Spindle Speed:	3,400
Chuck Capacity:	3/8"
Chisel Capacity:	5/8"
Max. Stroke:	4 3/4"
Head Space:	8 3/4"
Throat Space:	3 1/2"
Warranty:	1 year

Virtues: Adequate performance and some nice features.
Vices: Overpriced.
Verdict: Capable but costly. Look for this one on sale.

www.WilkeMachinery.com
717-764-5000

Ultimately, this is a capable machine that's overpriced and underequipped. But if you should happen to find it at a deeply-discounted sale price, you'd never regret buying it.

Final Recommendations

Editor's Choice

DELTA 14-651

Delta's Industrial mortising machine includes the best features, top-rate performance, and a low price that belies its premium construction. There's just no better, more complete benchtop mortiser to be had.

Top Value

JET JBM-5

Getting this much machine for under $200 almost feels like stealing. But we assure you that the price *and* the performance of this machine are entirely aboveboard.

MORTISING MACHINE RATINGS

Tool	Table Flatness	Fence Flatness	Table/Fence	Side Deflection	Front Deflection
Delta Industrial 14-651	NV	.002	NV	.002	.002
Woodtek 900-881	NV	.007	.010	.006	.004
General International 75-050 M1	NV	.002	NV	.004	.004
Jet JBM-5	NV	.003	.017	.003	.005
Fisch BTM-99	NV	.004	.014	.002	.004
Craftsman 21906	NV	.005	.019	.012	.003
Bridgewood HM-11	NV	.004	NV	.004	.006
Multico PM16	NV	NV	NV	.004	.002

Numbers indicate greatest variation in inches. NV = no measurable variation. Head travel variation indicated as front/side deflection.

Multico's Multi-Purpose Mortiser

At a Glance:

Price:	$649
Motor:	3/4-hp
Spindle Speed:	3,450
Chuck Capacity:	3/8"
Chisel Capacity:	3/4"
Max. Stroke:	4 5/8"
Head Space:	6 3/8"
Throat Space:	4 1/2"
Warranty:	1 year

Virtues: Excellent fit and finish. Top-rate performance.
Vices: *Very* expensive.
Verdict: If money is no object, this is a solid investment.

www.GarretWade.com
800-221-2942

In light of the premium price of Multico's PM16, we decided to consider it separately from the more moderately-priced machines in our test. This clearly isn't a tool for the masses, but we did want to offer some insight into just what $650 could get you in a benchtop mortiser.

For starters, it will get you one of the most compact, lightweight, solidly-built mortisers available. The fit and finish of this machine are immaculate. The components, from the aluminum hold-down to the steel lever, are meticulously machined. Not surprisingly, the performance of this machine is also stellar. Plunging into mortises is fluid and effortless, so much so that the high spindle speed of this machine did not create the burning that plagues most high-speed machines.

Beyond being a superior mortiser, this machine doubles as a passable drill press when you install the drill chuck and arbor assembly that comes with it.

Nonetheless, we are a frugal bunch, so it's difficult for us to recommend a machine this costly. But for the woodworker who has it all, this would be a good choice.

Bench Dog has a "Loc" ON TRIM WORK

Here's a bold prediction: The new Trim-Loc *(pictured above)* from Bench Dog Tools will do for installing trim what the handheld calculator did for long division. That is, make it possible for anyone to accomplish it quickly and accurately.

What makes the Trim-Loc so valuable is that virtually every measurement, tolerance, and reference point critical to installing trim is built right into the tool. From finding the proper reveal to locating the first nail, the Trim-Loc has it covered.

The *Photo* sequence below shows how the Trim-Loc simplifies window trim installation. Other uses include laying out 45° and 90° cut lines, truing up your miter saw, and aligning butt joints, such as where base molding meets a door jamb.

The Trim-Loc sells for abour $25. For more information on Trim-Loc or any of Bench Dog's other products, visit www.BenchDog.com or call 800-786-8902.

▲ First tack the Trim-Loc to the window and hook your tape to it for an accurate measurement.

▲ Then mount the Trim-Loc to a bench to transfer the measurement to the workpiece.

▲ Finally, use the Trim-Loc to position the trim with the perfect reveal and to locate the first nail.

the near-defunct dowel "STEPS" UP WITH NEW LIFE

► The stepped drill bit allows you to drill one time and insert the dowel almost its entire length. Notice how contrasting dowels add interest.

Dowels — at least in my shop — had largely gone the way of the dinosaur. Given the plethora of other simple but sturdy fasteners to choose from, the relative complexity of aligning, drilling, and inserting dowels didn't make much sense.

A new twist on these old fasteners has me rethinking their usefulness, however. This new idea comes from Miller Dowel Company. What they've done is to re-engineer the standard dowel into the stepped dowel *(pictured at left)*. Where these newcomers outperform their forefathers is in simplicity. No jigs necessary, just a stepped drill bit that comes as part of the dowel kit. Drill through both pieces, spread a bit of glue on the ribbed sections of the dowel, and tap it into place. The difference here is that the stepped design allows the dowel to be inserted more than three-fourths of its length before you need to encourage it with a mallet. That's a lot less effort than a traditional dowel that has to be pounded into the hole almost its full length.

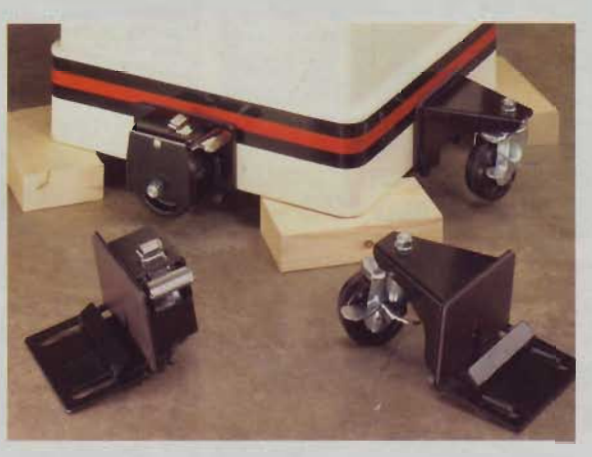
Kits include 50 dowels (available in two sizes) and the matching drill bit for around $30. Extra dowels are available for about $7 for 25. Woodcraft carries the full line.

Jet Tools' NEW CASTERS

Rolling tools out of the way when not in use is critical to making the most out of the available space in a small shop. And there's certainly no shortage of available mobility options, from the bases you buy to the bases you build. There is, however, one new variety of mobile add-on that offers a worthwhile alternative to the often expensive and clunky steel- or wood-framed bases.

Jet's new Clamp-On Caster Sets attach directly to woodworking machines with cabinet style bases. By simply shimming the tool up off the floor *(see Photo below)* the casters can be easily mounted to the base. Magnetic pads hold the casters in place while you tighten the clamping bars for a more secure connection.

Sold in sets of four, you can choose from a standard set, which includes two locking casters and two swivel casters, or a set of four swivel casters. Prices for the kits are about $60 and $70, respectively. To find a Jet dealer in your area, visit www.JetTools.com or call 800-274-6848.



► Shimming the tool off the floor with some 2x scrap is the only preparation necessary for installing a standard set of Jet Clamp-On Casters.

cordless impact drivers COME ON STRONG

► DeWalt's DW052K is one example of the new breed of impact drivers that take the strain out of heavy drilling and driving jobs.

Although not exactly new, cordless impact drivers are attracting the attention of a whole new audience of DIY'ers. The benefits of impact drivers have long been known to auto mechanics and other demanding tool users, but these recent compact variations are making them logical for the more casual handyperson, as well.

There are several advantages of an impact driver over a conventional drill. First off, they deliver up to three times the torque. Additionally, they are considerably smaller and lighter than their conventional counterparts. The biggest benefit, though, has to be that these drivers can apply their enormous torque without the typical kickback felt on your wrist, which can be a real comfort when driving lag screws or other large fasteners *(see Photo above)*.

► The impact action of these compact cordless drill/drivers eliminates the torque that usually gets transferred directly to the user's wrist.

The tool pictured here is DeWalt's DW502K. This 12-volt driver features a quick release hex chuck and pounds out 1,000 in-lbs. of torque. After using this driver in a variety of drilling and driving applications, I'm convinced that this breed of tool offers a very real alternative to the conventional cordless drill.

Impact drivers are also available from Milwaukee, Makita, Hitachi, and Panasonic. Prices range from about $200 to $300.

Stanley offers an EASY OPEN SHOP

Although my full-fledged shop is in my basement, this ZAG fold-up workstation from Stanley has become an invaluable addition to my garage. By folding into a compact cabinet that protrudes just a few inches from the wall, this bench is out of the way most of the time. But when I need a convenient worksurface or a few of the tools I commonly use around the house, it folds out into a durable, self-supporting shelf and pegboard tool rack.

▲ When not in use, the Stanley ZAG workshop folds up against the wall.

The ZAG workstation includes the worksurface, pegboard back, an assortment of storage compartments, and a fiberglass vise that holds up to 110 lbs. At just $40, this is a good use of money and space. Look for the Stanley ZAG Fold-Up Workshop at home centers and hardware stores.

▲ Painters bring whimsical designs to life with bold colors as on this fancy game table.

PAINTED WITH PASSION

STICKS

Housed in a 28,000-square-foot "idea factory," artists create unique furniture art from fallen trees.

Towering glass-paneled doors with painted storybook scenes greet visitors to the Sticks gallery and studio — a tiny glimpse of what lies inside. Nestled peacefully among the trees in Des Moines, Iowa, this bustling modern-day art and furniture business is home to 130 craft artisans who create one-of-a-kind furnishings for fine-art galleries and individual customers nationwide.

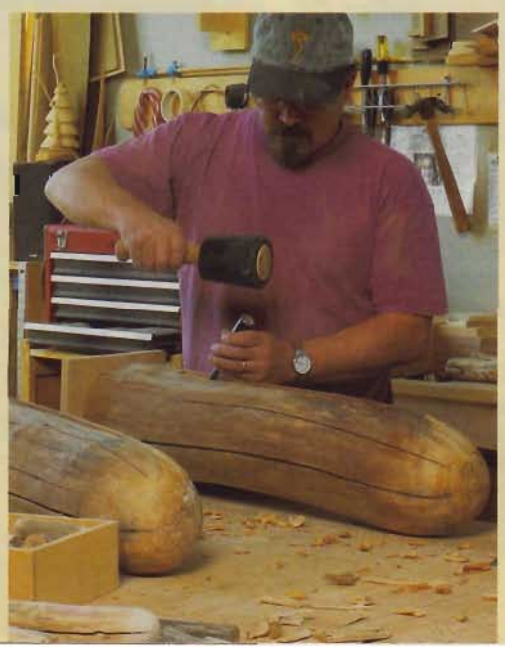
Every piece begins the same, with employees searching for branches, logs, and driftwood in the Iowa countryside and along the rivers. Back at the shop, a team of seasoned woodworkers transform these raw materials, along with a supply of milled lumber, into rustic creations like the ones shown here.

Once crafted, the pieces await the "magic fingers" of co-owner/artist Sarah Grant-Hutchison and her team of artists. Inspired mostly by life experiences and a vivid imagination, every detailed design is drawn by hand directly on the pieces.

After the designs are engraved and an undercoating is applied, the pieces move on to the painting area. Using custom palettes, another team of artists meticulously hand-paint each design. Layered brush strokes, rags, scrapers, even an artist's hands combine to create distinctive looks that can't be easily duplicated. This is part of what makes each Sticks piece one-of-a-kind.

To complete each unique piece of furniture art, workers in the finishing department add hinges, knobs, and decorative hardware. Start to finish, each piece takes about eight days.

You can see Sticks furnishings, or order a custom-made piece, in fine-art galleries around the country. For one near you, check out www.sticks.com or call 877-678-4257. Prices range from around $50 for a small statue to thousands of dollars for complete furniture sets.



► Under the hands of skilled woodworkers, logs are debarked and mortised to become the cornerposts for the bed shown at right.