SHOP LAYOUT
SECRETS REVEALED! Page 74

ROUTER MORTISING JIG: MAKE PERFECT MORTISES EVERY TIME—IN SECONDS!

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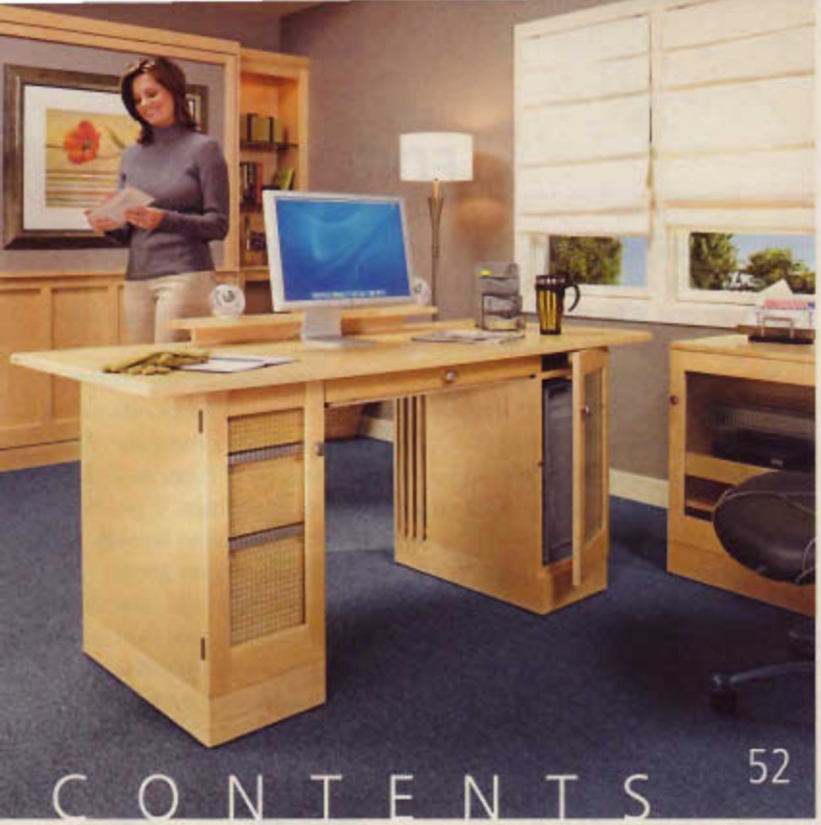
WORKBENCH VOL.61 NO.2 ISSUE #288

APRIL 2005



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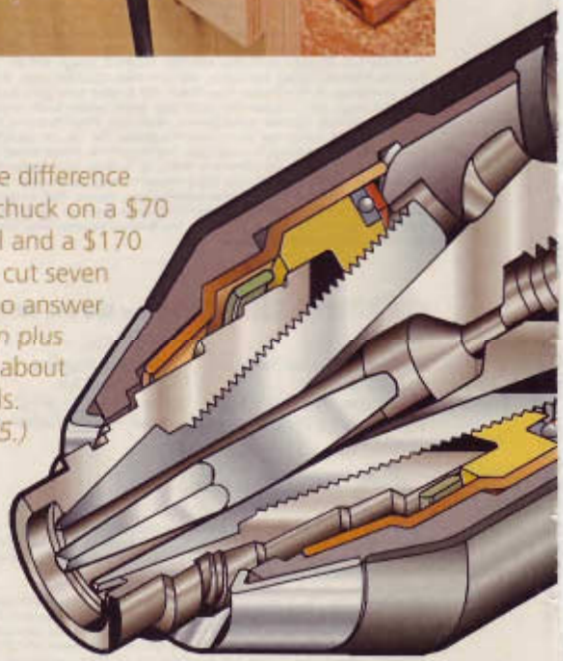

►What's the difference between a chuck on a $70 cordless drill and a $170 model? We cut seven drills apart to answer this question plus many more about cordless drills. *(See page 45.)*

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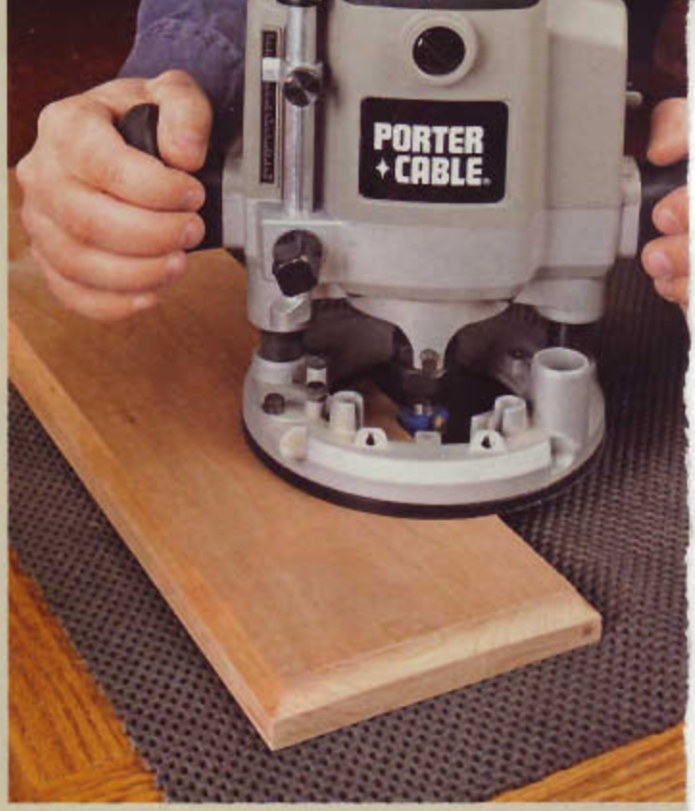

more ways to stop ROUTER BURN

Q *Your advice in the October 2004 issue about eliminating router burn marks was very helpful, but I still get some burning. Is there anything more I can do to eliminate the problem?*

Don Osborn
Westminster, CO

A Many factors contribute to router burn. Your first defense is to keep your bits clean and sharp. But even then, burn can occur. To prevent it, you need to know why it happens.

Wood Contains Resins — All wood contains resins. The resins are obvious in some wood, such as pine, but aren't visible in most woods — until they get burned by a spinning router bit. Maple, oak, and cherry, for example, are all very resinous.

Use Proper Bit Speed — Router bit manufacturers publish basic guidelines for recommended bit speed, as shown in the *Chart*, right. These recommendations are meant more for safety, but also offer a good guideline for preventing burn.

When working with resinous woods, it's a good idea to slow the router down, no matter what the bit size. With cherry and maple, I run the router at 18,000 RPM or less.

Keep Feed Rate Right — Moving the router at the proper speed is also important in preventing router burn. You need to move the router quickly enough to prevent the bit from spinning too long in one location and burning, but not so fast that the quality of the cut suffers. Unfortunately, there are no simple guidelines for this. You just have to develop a feel for what feed rate works best with different bits and wood species.

▲ Both of these pieces were cut from the same board and routed with the same bit running at the same speed. The top board shows what happens when you move the router too slowly.

Router Bit Size (dia.)	Maximum Speed (RPM)
0-1"	24,000
Up to 2"	18,000
Up to 2½"	16,000
Up to 3½"	12,000

Note: Find speed-control units for single-speed routers at MLCSWoodworking.com

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seal green wood to STOP SPLITTING

Q *I want to seal the ends of some green wood to prevent it from swelling, shrinking, and splitting. I've heard of a product called PEG that can do this. What is it, and where can I buy it?*

Marvin Petersen
Alta, IA

A Wood cracks because the fibers shrink as they dry out. The cells vary in size and orientation, so they can deform the wood as they pull against one another as they shrink.

To minimize the effects of this shrinking, you need to either seal or stabilize the wood fibers while the wood is still green. Woodturners often use a substance called Polyethylene Glycol (PEG). Rather than sealing wood, PEG works by displacing water so that the cells dry without shrinking.

PEG does have some drawbacks, though. To use it, you melt the waxy PEG in water, and then submerse the wood for several weeks. This makes the process suitable only for smaller pieces, such as turning blanks. Plus, PEG leaves a residue that limits glue and finish options.

Instead, I'd recommend a wood stabilizer called Pentracryl (PreservationSolutions.com). It brushes on and penetrates quickly, making it suitable for both large and small pieces. And it doesn't leave a residue, so you can use any glue and finish after the wood dries.

▲ Cup hinges use sophisticated mounting and adjustment mechanisms to make door installation simple.

why "European" hinges ALIGN DOORS BETTER

Q *You guys use a lot of "European-style" hinges in your projects. What are the advantages of this type of hinge?*

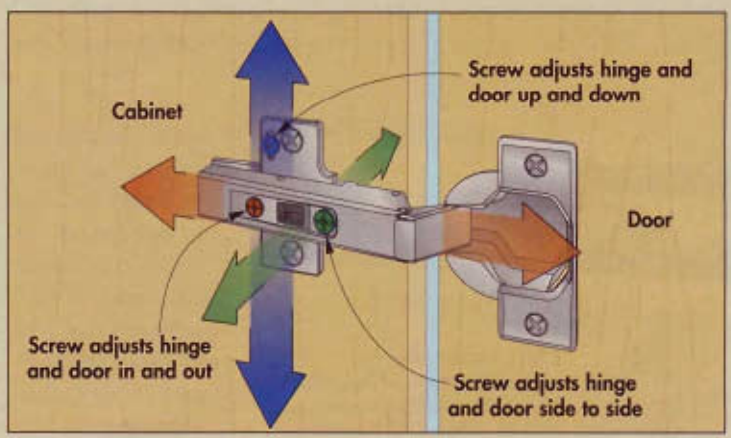
Todd Armbruster
Seattle, WA

A Many woodworkers refer to these hinges as "European" hinges because that's where they were first used in cabinetmaking. The standard name for them is cup hinges. That's because the door side of the hinge fits into a round pocket, or cup, bored into the door. We like cup hinges for a number of reasons.

First, cup hinges are hidden from view when the door is closed. This gives projects a clean, uncluttered look.

Second, these hinges are available in many configurations for face-frame and frameless cabinets, as well as inset, overlay, and offset doors.

Finally, and perhaps most importantly, cup hinges have an easy-to-use adjustment mechanism, shown at *left*. It allows you to align the door in three different directions *after* you install it in order to fit the door precisely in its opening.



Questions & ANSWERS

use epoxy to FILL VOIDS

▲ An epoxy patch isn't invisible, but it can keep a good board from becoming scrap.

Q *I purchased a load of mesquite and love the wood. Unfortunately, there are quite a few voids, knots, and splits in the wood. I was told I can fill them. Can you tell me how?*

Ray Camden
Tucson, AZ

A The best way I've found to fill voids or to stabilize loose knots in mesquite or any other wood is to use two-part epoxy.

Start by cleaning loose material and dirt out of the voids. This gives the epoxy a solid surface to bond with.

Next, mix up enough epoxy (the type sold in hardware stores works fine) to fill the void. To help the patch blend into the wood, color it by mixing in a small amount of sawdust from the same species. Pour the mixture into the void until it's slightly over-filled *(Photo, above)*. After the epoxy sets, sand it flush with the wood surface *(Inset Photo, above)*.

You can also create interesting effects or even inlays by tinting epoxy with universal paint colorants. Black works great to match the dark voids in mesquite.

stop fluorescent FLICKERING

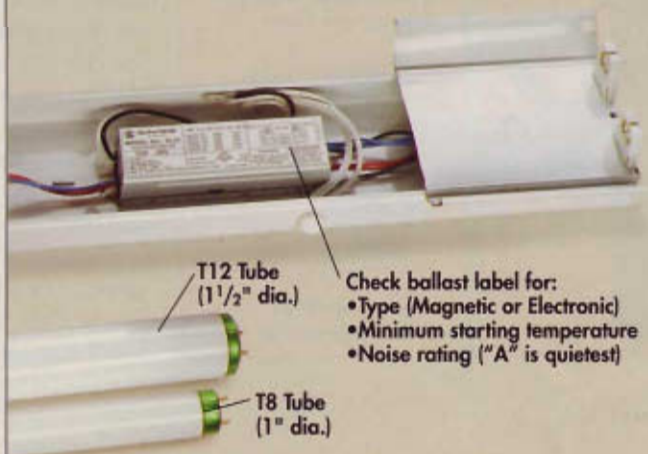
Q *I've been told that fluorescent lights are dangerous in the shop because they flicker and can cause a saw blade to seem to be standing still. Is this true?*

Marvin Little
Pell City, AL

A All lights "flicker" because of the way alternating current (AC) electricity works. In simple terms, the light turns on and off 120 times per second as the current alternates.

Flicker isn't visible in incandescent bulbs. But fluorescent fixtures with magnetic ballasts (common in older models) can flicker noticeably if the tubes or ballast are very old, or if the fixtures don't receive adequate voltage. This could cause a "strobe" effect that makes a saw blade appear to stand still, but it's very unlikely.

Fixtures with electronic ballasts don't flicker noticeably. They operate at a higher frequency, so the flicker rate is too fast to be noticeable. Plus, electronic ballasts are quiet and work well at low temperatures.



◄ Use fluorescent fixtures that have electronic ballasts and accept newer "T8" tubes rather than older "T12" versions. The T8s are more efficient and show colors more accurately than most T12s.

a copyright PROTECTS PLANS

Q *Woodworking has always been just a hobby, but now I've decided to build and sell some of my projects. How do I go about getting a copyright to protect the projects?*

Jeff LeMere
Little Suamico, WI

A You can't actually copyright a project or its design. To protect the project you build, you'd need a patent. But getting one can be an expensive and time-consuming process, as you have to prove the merits and uniqueness of your project.

A copyright does, however, protect written works like instructions or project plans you draw. And under the law, those original works are copyrighted automatically. For further protection, you can "officially" copyright plans for about $25. Learn how at Copyright.gov.

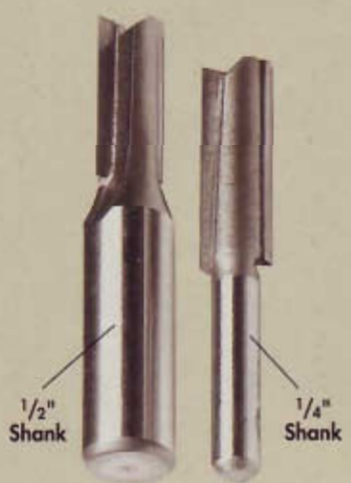
on router bit SHANK SIZE

Q *I have a router that accepts both 1/4"- and 1/2"-shank bits. Which size should I choose for freehand and table routing?*

Ronald Kosanovich
Via email

A Manufacturers offer most of their router bits in both 1/4" and 1/2" shank sizes. And there's generally little or no cost difference between the two.

As a rule, use 1/2" shanks whenever possible. They're much stronger than 1/4" versions. And because the bigger shanks have more mass and a larger gripping area in the collet, they produce less vibration as you rout. Even with smaller bits, like a 1/4" straight bit, you'll notice that the 1/2" shanks make for a smoother cut.



safe crosscuts with a SETUP BLOCK

Q *A project I'm working on calls for crosscutting a bunch of small pieces to the same length. The easiest way to get them all the same length seems to be using my fence as a stop block. Is there a better way?*

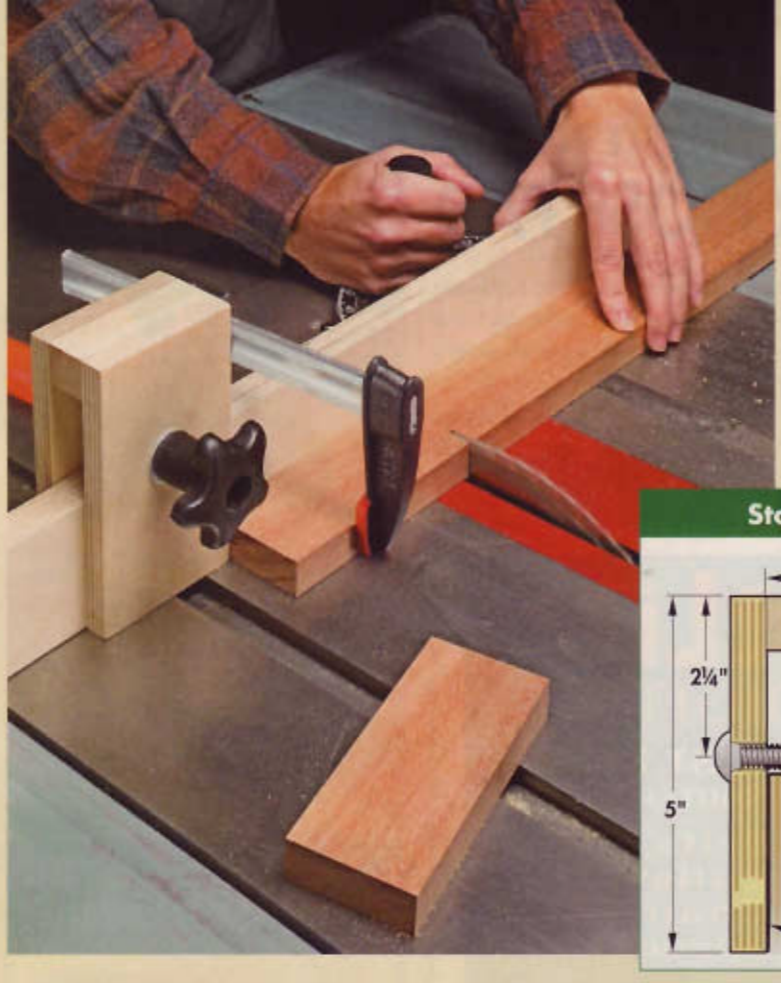
Matt Hoglund
Chicago, IL

A You shouldn't *ever* use the fence as a stop block when crosscutting. The risk of kickback is just too great. That's because the cutoff piece can get wedged between the fence and the blade, where it will get caught and thrown directly back at you. This could cause serious injury.

When crosscutting several pieces to the same length, use your rip fence equipped with a setup block, like the one in the *Photo* above.

To make a setup block, cut a piece of $^3/_4$"-thick scrap and clamp it to the rip fence several inches toward the *infeed* side of the blade. Then position the fence so the distance from the setup block to the blade matches the desired length of the workpiece.

Now you can crosscut safely by butting the end of your workpiece against the setup block. Push the miter gauge forward to make the cut. Shut off the saw, remove the cutoff, and proceed with the next cut in the same way.



quick & easy STOP BLOCK

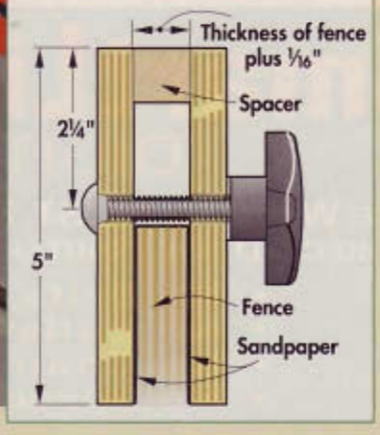
Stop blocks are an indispensable accessory when cutting pieces to length on the table saw or miter saw. And they don't get much simpler or quicker to make than this one.

Designed to clamp onto a fence, this stop block is made from two 3" × 5" pieces of $^1/_2$" plywood. A solid-wood spacer that's $^1/_{16}$" wider than the thickness of the fence holds the plywood pieces apart. (My fence is $^3/_4$" thick, so I made a $^{13}/_{16}$"-wide spacer.)

Tightening a knob on a carriage bolt that passes through both pieces of plywood clamps the stop block to the fence. A strip of sandpaper (for a wood fence) or rubber (for a metal fence) attached to the inside faces of the stop block provides a firm grip on the fence.

Robert E. DeGraw
Kirkland, WA

Stop Detail



finish nailer
NO-MAR NOSE PAD

The non-mar nose pad on my finish nailer disappeared almost immediately after I bought it. And as luck would have it, the part was no longer available. So I improvised a nose pad by dipping the metal tip into a rubberized plastic coating. (The coatings are available at most home centers and hardware stores.) The new nose pad cushions the blow from the nailer, so I don't have to worry about marring a project.

Kenny Turano
Valley Stream, NY

finishing tip

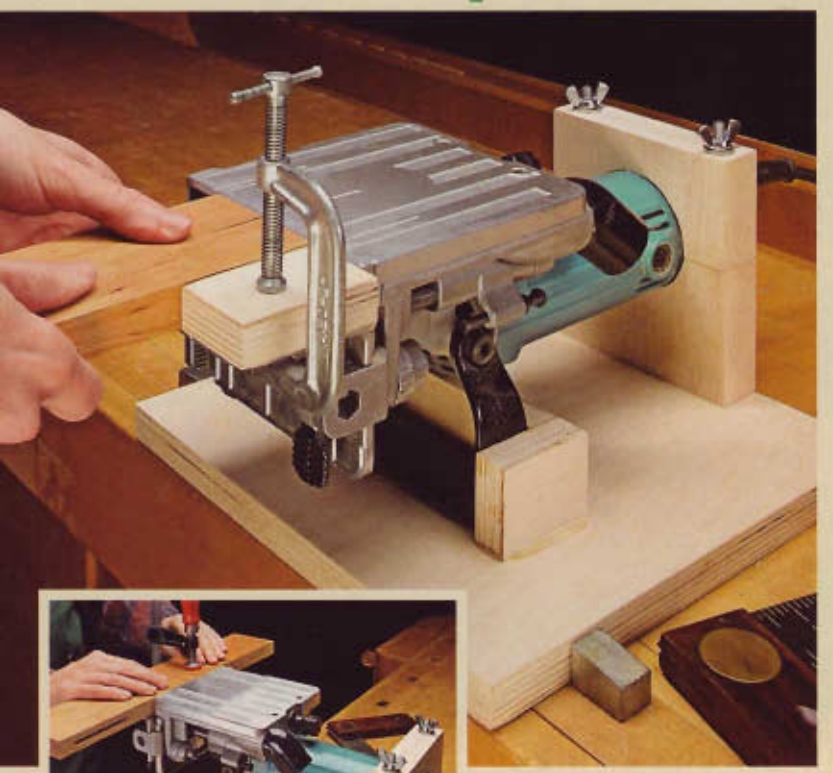
I build most of my shop jigs from plywood and then finish them with several coats of spray-on lacquer to protect the project. The only problem is the plywood edges are porous, and they absorb so much finish that it's difficult to get even coverage.

My solution is to first spray a small amount of lacquer in a separate container, and then brush it on the edges. When it dries, spray the entire jig with lacquer to create a smooth, even finish.

Jim Downing
West Des Moines, IA

Tips & techniques

inverted plate joiner CUTS SLOTS FAST



▲ This fixture holds a biscuit joiner upside down to make cutting slots fast and easy. Note how the layout lines for the slots align with the centerline on the base of the joiner.

I often use biscuit joints to assemble cabinet face frames. To cut the slots quickly and accurately, I mount my biscuit joiner upside down in a simple shop-made fixture *(Photo, left)*. With a scrap block clamped to the fence of the plate joiner (to keep the workpiece from "kicking" to the side), it's easy to make a controlled, accurate plunge cut in the end of a rail. To cut slots in the edge of the stiles, just remove the scrap block *(Inset Photo)*.

This fixture is made up of three main parts: a base that clamps to the bench, a U-shaped support that corrals the handle of the biscuit joiner to keep it from slipping backward, and a two-part mounting block that captures the barrel of the joiner *(Illustration, below)*.

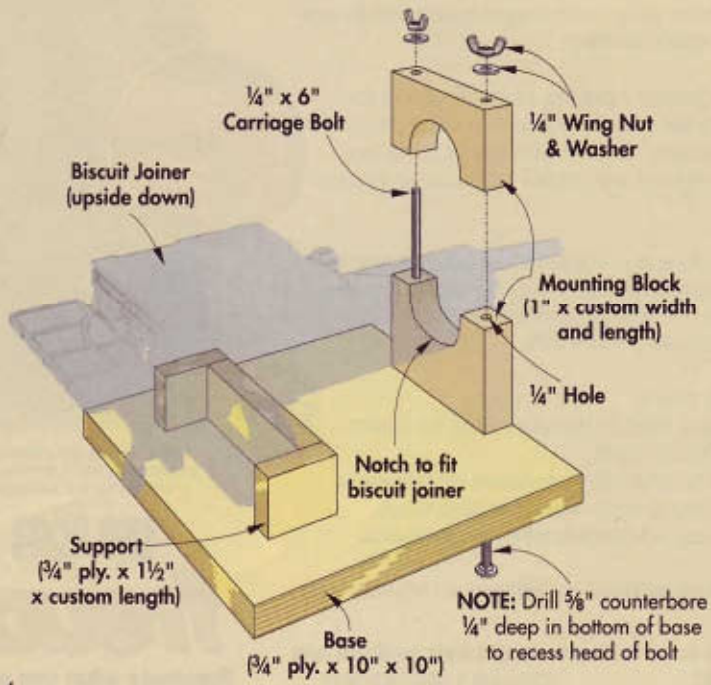
The base is simply cut to size as shown, but the support and mounting block will need to be customized to fit your biscuit joiner. That's easy enough to do for the support. Just set the joiner upside down on the base, cut the pieces to length so they surround the handle as shown, and then glue and screw them in place on the base.

As for the mounting block, it starts out as a single piece of 1"-thick hardwood. Rip it 2" wider than the barrel of your biscuit joiner, and cut it to length so that it extends 1" beyond the top of the barrel when the joiner is sitting upside down and level.

The next step is to cut the mounting block into two pieces. To determine the location of the cutline, measure the height to the center of the barrel (again, with the joiner sitting upside down). Then transfer this measurement to the mounting block and cut it apart. Once that's done, notch both pieces to fit around the barrel. **Note:** See page 15 to make these notches.

The mounting block is attached to the base with carriage bolts and wing nuts. This requires drilling oversize holes for the carriage bolts through both parts of the mounting block. You'll also need to drill counterbores in the underside of the base to create a recess for the bolt heads.

Robert Deatherage
Richfield, MN



BEST TIP!

For sending us this feature tip, Robert Deatherage wins a new Ridgid MS1250LZ 12" compound miter saw!

Mail Tips to:
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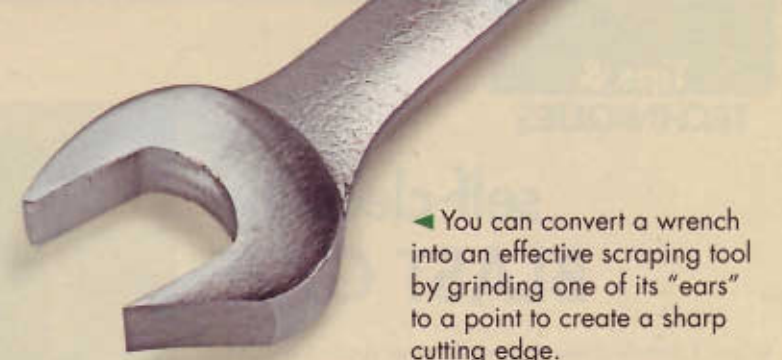
turning tenons WITH A WRENCH



◄ You can convert a wrench into an effective scraping tool by grinding one of its "ears" to a point to create a sharp cutting edge.

Here's an old tip for making a round tenon on the lathe. I use an open-end wrench to "turn" the tenon to size. The wrench should match the size of the tenon being turned. You'll also need to file or grind the wrench as shown above to make it a scraping tool for the lathe.

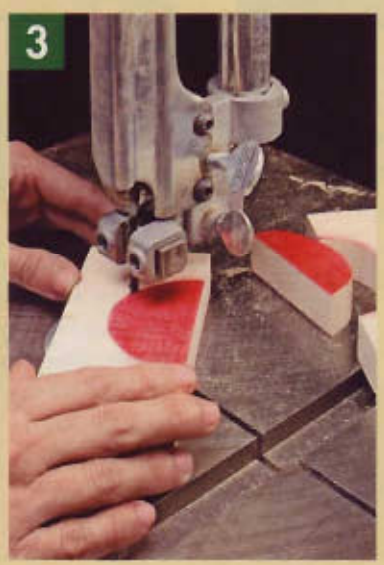
To turn the tenon, set the wrench on the tool rest with the cutting edge on top *(Fig. 1)*. Now ease the wrench into the spinning workpiece until it starts to peel off shavings. Stop the lathe frequently to check your progress, using the wrench as a gauge *(Fig. 2)*. Once the wrench slips over the stock, the tenon should be sized just right.

Adam Luff
Bartlett, IL

template produces perfect fit

When making a jig or fixture for a tool, I often have to create a custom opening that matches the tool's size and shape exactly. An easy way to do this is to make a paper template and use it to lay out the shape of the opening. **Note:** This technique is handy for making the opening in the mounting block for the barrel of the biscuit joiner *(page 14)*.

Start by cutting an opening that's larger than necessary in a piece of posterboard. Then apply strips of masking tape around the opening so they touch the body of the tool *(Fig. 1)*. Now attach the template to the workpiece with spray adhesive, and use spray paint to coat the opening *(Fig. 2)*. Cutting around the painted area produces a perfect fit *(Fig. 3)*.

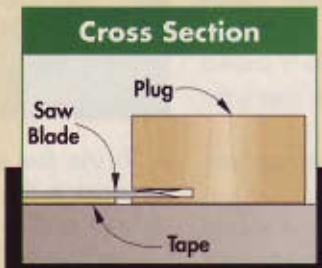


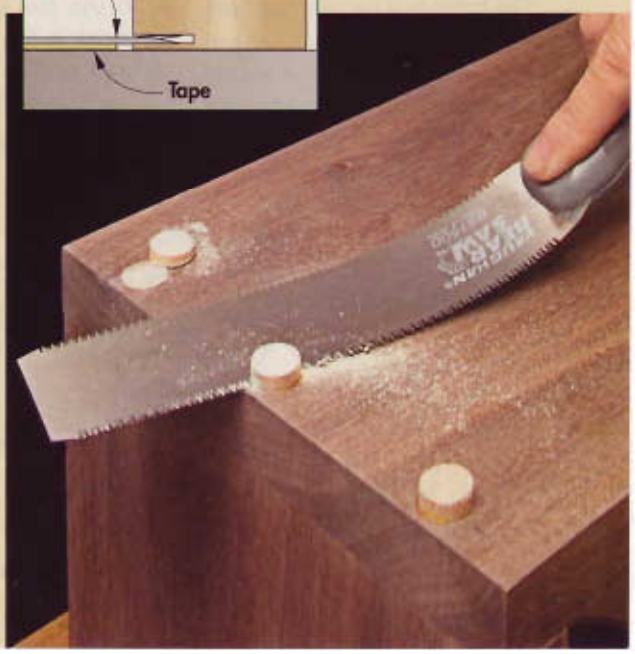
scratch-free FLUSH-TRIM CUTS

Trimming a wood plug flush with the surface of a project is one of those jobs that's harder than it looks. Even with the flexible blade on a flush-cut saw, the teeth have a frustrating tendency to scratch the wood.

To avoid that, I attach masking tape to the bottom of the saw blade *(Cross Section)*. The tape elevates the blade just enough to cut the plugs without marring the wood. Sanding the plugs flush completes the job.

Yaniv Matza
Tamarac, FL





self-cleaning BLAST GATE

When I installed my dust collection system, the blast gates that controlled the flow of air to each tool worked great. But after awhile, dust got packed into the lower corners of the gates, preventing them from closing completely and forming a good seal. This reduced the effectiveness of the system, so I had to disassemble the gates every so often to clean them out, which was a real hassle.

My solution was to trim the lower corners of each gate *(Photo, right)*. The dog-eared gates create a small opening (about 1/4") in the corner. Now when I slide the gate shut, it pushes the dust out of the openings. And with such small openings, there's no significant loss of suction.

Ralph Verbockel
Hilbert, WI

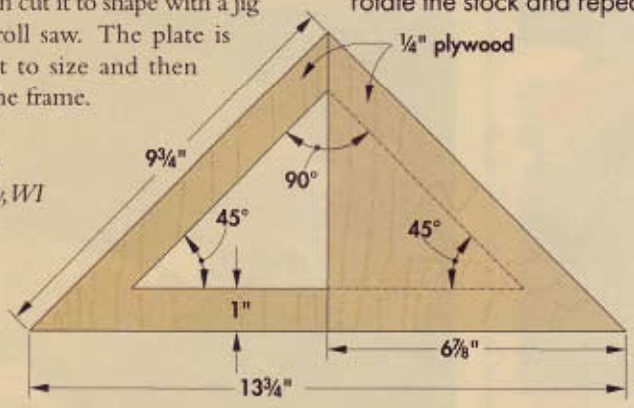
shop-made centerfinder FOR ROUND STOCK

I made this jig to easily find the center on round stock, such as dowels. It's just a triangular frame with a thin plate attached over one half that's used as a marking guide *(Photo, right)*. To find the centerpoint, you simply butt the round workpiece into the 90° corner of the frame and mark a line. Then rotate the stock and draw a second line. The intersection of the lines is the center of the stock.

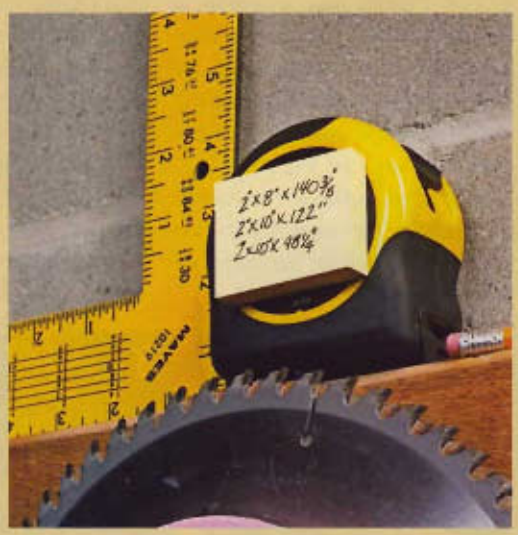
The frame and the plate are both made from 1/4" plywood. Lay out the angles on the frame as shown below. Then cut it to shape with a jig saw or scroll saw. The plate is simply cut to size and then glued to the frame.

AndyPasko
Genoa City, WI

▲ To use the centerfinder, hold the stock in the 90° corner of the frame and mark a line. Then rotate the stock and repeat.



handy notepad



I always used to jot down measurements on whatever scrap piece happened to be lying around my shop. But I've found it's more convenient to write them on a Post-It notepad attached to my tape measure with double-sided tape. These notes are easier to see — and harder to lose.

Ellis Biderson
Huntington Beach, CA

time-saving DADO BLADE SETUP

Sometimes it takes a lot of fussing around to get just the right combination of shims when setting up a dado blade. Especially if you're cutting dadoes in plywood, where the nominal and actual thicknesses of the material aren't the same. To save time, I numbered my shims and made a chart of which ones to use for each thickness of sheet material.

George Person
Costa Mesa, CA

Quick Tips!

Slip-Free Sanding

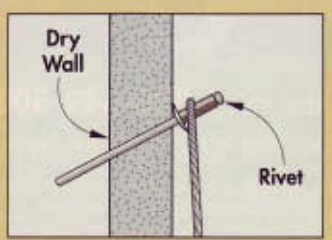
The sandpaper on my profile sander always seems to slip around as I'm working. So I wrap it tightly around the rubber pad, then slip on a $1^1/_2$" rubber O-ring to hold it tightly to the contours of the pad.

Michael Thrall
Janesville, WI

Riveting Solution

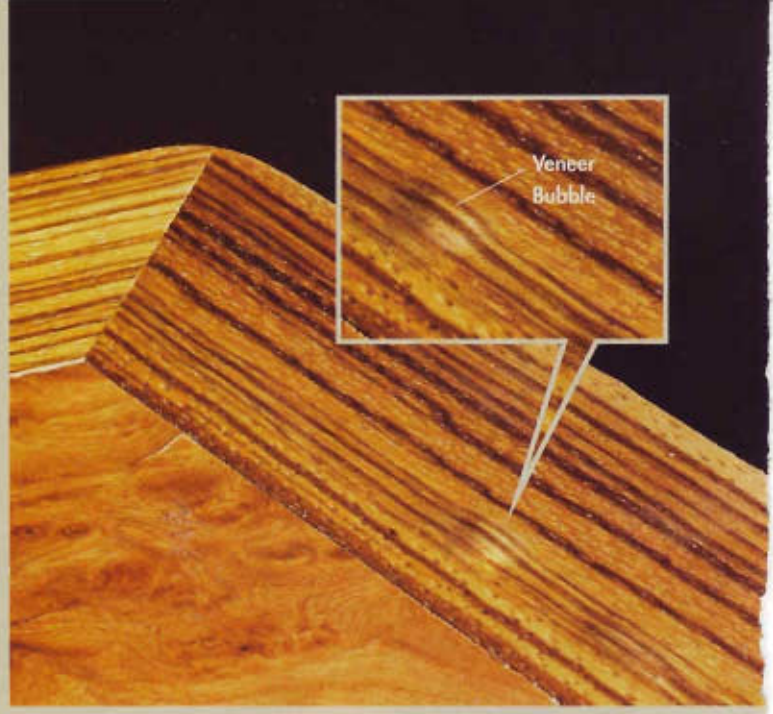
Recently, I discovered that pop rivets make great picture hangers. Unlike a nail, the flange on the rivet prevents it from penetrating too far into the drywall.

Harry Radtke
Sterling Heights, MI



Finishing Fundamentals

repairing & REFINISHING VENEER



Q I have a veneered project that I'd love to restore to its original look if possible. The problem is that the finish has faded in some areas, and the veneer has raised up in places to form small "bubbles." How can I go about successfully repairing and then refinishing the veneer?

Peter Flood
Via email

A Veneer repairs require caution and patience. Bear in mind that while it may look like solid wood, veneer is actually a paper-thin slice of wood held in place with an even thinner layer of glue. This makes repairs tricky, but definitely doable. And you can always replace the veneer if the repair doesn't work.

Repairing Veneer — At times, the veneer may buckle or bubble, indicating that the glue beneath it has lost its grip. Before stripping or refinishing a project like this, you'll want to repair the veneer first.

To start, use a sharp Xacto (or utility) knife to cut a small slit along the bubble's surface *(Fig. 1)*. Carefully depress one side of the veneer, and insert woodworker's glue under it using the tip of your knife *(Fig. 2)*. Repeat the process for the other half of the veneer, and then use your fingertip to press the veneer down into place.

Wipe off any excess glue that appears along the cut with a damp cloth. Then cover the repair with a sheet of wax paper topped with a piece of scrap wood. The wax paper will prevent the scrap wood from becoming glued to the veneer. Apply pressure by stacking a few heavy objects on top of the scrap wood, or use clamps if the repair is close to the edge *(Fig. 3)*. Then let the glue dry overnight.

Stripping Veneer — There are a couple of important precautions to take when refinishing any veneer. First, never use a belt sander. In fact, never use a palm sander with any grit coarser than #220, as you can easily sand through the veneer and expose the backing board.

Second, be sure to use a chemical remover that does not contain water and does not call for a water rinse, such as Formby's Paint & Poly Remover. (Water can seep beneath the veneer and dissolve the glue holding it in place.) After carefully stripping the surface of finish, remove the residue using Formby's Paint and Poly Remover Wash. It won't harm the glue and will leave your veneer intact.

▲ Always cut veneer bubbles along the grain to minimize damage to the surface. A sharp Xacto knife is a good tool to use.

▲ The knife also makes a fine tool for applying glue under the bubble. Place just a small amount on the tip of the blade.

▲ Clamps and a scrap block will hold the veneer down as the glue sets, while wax paper prevents the block from sticking.

This *Workbench* finishing question was answered by **Bruce Johnson**, Minwax finishing expert. If we use your finishing question in a future issue, you'll receive a prize!

Send your finishing questions to:

Mail: Workbench Q&A
2200 Grand Avenue
Des Moines, IA 50312

Email: Q&A@workbenchmag.com

Peter ► Flood received a Minwax Finishing Kit!

Finishing Fundamentals

choosing the RIGHT LACQUER

Q I heard that catalyzed lacquer is a much stronger, more durable finish than regular, off-the-shelf lacquer. Is this true? If so, do you recommend it for use on my home improvement projects?

Richard Dickerson
Champaign, IL

A Catalyzed lacquer is indeed longer lasting than standard off-the-shelf nitrocellulose lacquer, and it creates a glass-smooth finish on wood. This is because catalyzed lacquer is mixed with an acid catalyst either by the manufacturer (pre-catalyzed) or by you (post-catalyzed) prior to use *(Photo, left)*. As a result, the finish goes through a chemical reaction as it dries to form a tough, durable finish.

That doesn't mean that catalyzed lacquer is necessarily the best choice for the average woodworker, however. Catalyzed lacquer is a professional-grade product, so it comes in large quantities. (One gallon is the smallest amount you can buy.) Also, it has a limited shelf life. (Pre-catalyzed lacquer lasts up to six months, and once post-catalyzed lacquer is mixed, it's only good for a few hours.) Moreover, catalyzed lacquer is a spray-only product, so you'll need spray equipment in order to use it.

That said, it's hard to beat the tough finish of a catalyzed lacquer. So if you have spray equipment, have a lot of finishing to do, and need a durable finish, then give catalyzed lacquer a try. Just pay close attention to the safety guidelines at *left*.

Safety Considerations for Using Catalyzed Lacquer

1) Spray in a well-ventilated area.
2) Catalyzed lacquer is highly flammable. Work in an area with absolutely no open flames, stoves, heaters, or any other source of ignition.
3) A dust mask is not sufficient when spraying catalyzed lacquer. A NIOSH-approved vapor/particulate respirator is a must.
4) Avoid contact with eyes and skin.
5) Clean all tools and equipment in lacquer thinner immediately after use.

More Painting Advice: Why Three Coats?

Q I learned a lot from your painting tips in the December 2004 issue of Workbench, but it left my most pressing question about paint unanswered: Do I really need to go through the hassle of applying three layers of paint? For most paint jobs, it seems like more work than is necessary.

Todd Price
Reading, PA

A It's important to think of these three coats (primer, first coat, top coat) as a complete *system*, where each layer plays an important role.

Primer serves two basic functions. First, it makes the paint layers adhere better, preventing peeling. Second, it seals the wood, keeping stains or tannins from leaching into the paint layers. Primer works this way because it has more resin to help paint grip. With this in mind, primer isn't necessary on a smooth, previously painted surface.

The second layer, which is the first coat of paint, also serves two purposes in this system. Visually, it provides a greater "build" to the paint job, which makes for a nicer look when complete. And this first coat also gives you one last chance to sand out minor imperfections, so you can achieve a perfectly smooth surface with the top coat.

Once the first two coats are applied successfully, the top coat really becomes the "show coat" of the paint job. It gives the surface a decorative, durable appearance.

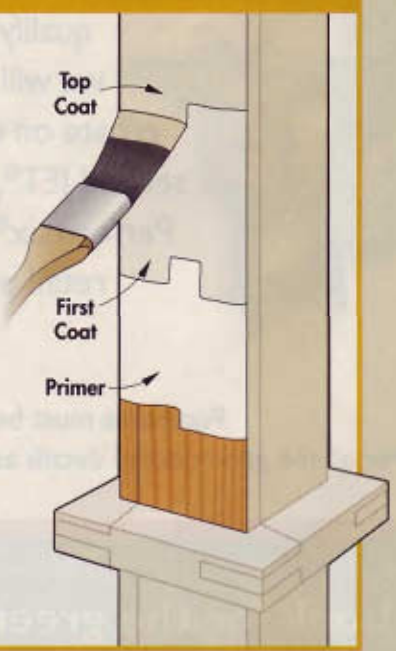


table saw moldings MADE EASY

▲ The Magic Molder makes cutting molding on the table saw easy. You can even change cutters while it's still mounted on the saw.

A molding head that mounts in a table saw isn't exactly a *new* tool, but it's an underutilized tool, as far as I'm concerned. This Magic Molder from LRH Enterprises, for example, will work in most table saws to cut intricate profiles that might otherwise require a shaper.

To be exact, you can make 80 different profiles with the Magic Molder (that's because 80 different cutters are available as inserts). Or by combining different cutters and resetting the rip fence between cuts, you can cut an *infinite* number of profiles.

While most molding heads have high-speed steel cutters, the Magic Molder's are solid carbide. The cutters are permanently affixed to plugs that lock in place on the molder head for a secure, safe connection. The body of the molding head is a thick disk of anodized aluminum that's perfectly balanced for smooth, chatter-free cuts. Aligning the cutters in the molder head is automatic thanks to a pin-lock system that secures the plugs *(Illustration, right)*.

Using the Molder — To make molding, you simply tighten the molder on the arbor, put the cutters in place, position the rip fence, and set the depth of cut. For safety, cuts should be made using push blocks and featherboards.

The first time I used the tool, I was amazed by its quiet, smooth operation. As for the quality of cut, it required almost no sanding when complete. Most profiles can be accomplished with a single pass over the blade, but large moldings require a series of successively deeper passes.

The Magic Molder starter set, which includes the molder head and one set of cutters, is available for around $200. Additional cutter sets are available for $99 each. For additional information, call 800-423-2544 or visit LRHEnt.com

▲ This new 96-tooth 12" finishing blade from H.O. Schumacher & Sohn has a -6° hook angle to produce ultra-smooth cuts.

Schumacher & Sohn PREMIUM BLADES

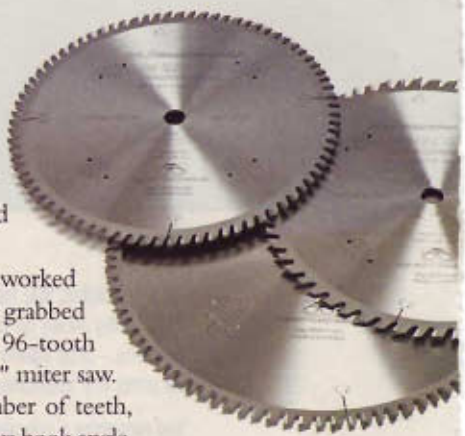
Finding a new manufacturer in the premium saw blade market is always exciting. That's why I was interested in getting my hands on these H.O. Schumacher & Sohn blades.

In total, 16 new blades are available for the table saw and miter saw in 10" and 12" diameters. The blades handle tasks that vary from ripping to cross-cutting, and even cutting composites.

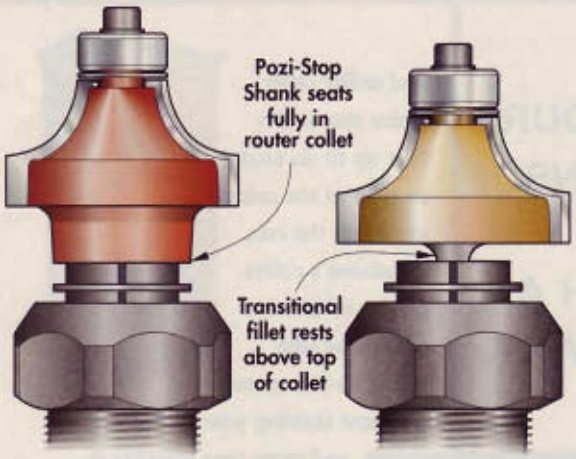
Among the many nice features of these blades are laser-cut, hand-hammered bodies for perfect balance, anti-vibration slots for reduced noise, and thick carbide teeth for long life and multiple resharpenings. The blades also feature a variable-tooth design for smooth cuts in different types of wood and other materials.

While all the blades worked well, the one that really grabbed my attention was the 96-tooth finishing blade for a 12" miter saw. This blade's large number of teeth, combined with a negative hook angle, mean you have to make a slower, more deliberate cut. But the design results in glass-smooth cuts in a variety of hardwoods *(Photo, left)*.

The Schumacher & Sohn blades range in price from $60 to $125. To locate a dealer, call 866-537-0700 or visit ITPTooling.com



▲ Sixteen new 10" and 12" blades are available, with tooth sets for different types of cuts and materials.



router bits with a POZI-STOP SHANK

Porter-Cable's new router bits have everything you'd expect from premium-quality bits — carbide cutters, non-stick coatings on the cutterheads, and anti-kickback features. But they lack one thing that's found on almost every other router bit: the transitional fillet.

The fillet is is the curved part of the shank right below the cutterhead *(see Illustration of Standard Bit above left)*. When you tighten a bit, this fillet must be raised above the top of the collet. If it's not, the collet won't get a secure grip on the straight portion of the shank. Needless to say, this spells trouble.

Pozi-Stop — Porter-Cable's new router bits eliminate this problem by getting rid of the fillet entirely on what the company calls its Pozi-Stop shank. In this design, the fillet meets the cutterhead at 90°. The area around where the shank meets the the cutterhead is also recessed.

With this type of shank, you just slip the bit down into the collet until the cutterhead bottoms out. Then, rather than fiddling around trying to raise the bit just a hair, you simply tighten the collet nut to secure the bit.

Pozi-Stop router bits are available with more than 70 different profiles. For more information, you can visit Porter-Cable.com or call 800-487-8665.

▲ The Pozi-Stop shank on Porter-Cable's new router bits allows the shank to seat fully in the router's collet for safer cuts.

square bearing LAMINATE BIT

Laminate trimming router bits typically have a round bearing that rolls along the surface of a workpiece as it trims. But anyone who has used this type of bit knows the bearing can pick up glue and dust, causing it to bind and mar the laminate surface.

This new bit from Euro Limited solves that problem. It has a square Teflon collar around the bearing. This collar *slides* along the surface, rather than rolls, to ensure consistent contact and smooth cutting. The bit also cuts a slight bevel on the laminate to ease the edge.

Two sizes of bits ($1/2$" and $3/4$") are available for use in a laminate trimmer or larger router for around $25. Visit EuroLimited.com or call 800-877-3876.

◄ After 100 crosscuts in pressure-treated wood, Timberline's new blade still looked new, while the standard blade had started to rust.

circ saw blades for TREATED LUMBER

Pressure-treated wood is tough on blades. Cutting it causes pitch and resin build up, and can make blades rust. But Timberline, a division of Amana Tool, now has a specially coated circular saw blade for cutting pressure-treated wood.

I was curious to see how the Timberline stacked up against a standard blade, so I made 100 crosscuts in wet, pressure-treated 2x8s with each blade. Right off the bat, the Timberline cut smoother and faster. And after a few days off, it hardly looked like it had been used at all. The standard blade, on the other hand, had begun to develop a coat of rust *(see Photo, above)*.

Timberline's circular saw blades for pressure-treated wood are available for $20. Visit AmanaTool.com or call 800-445-0077 to learn more.

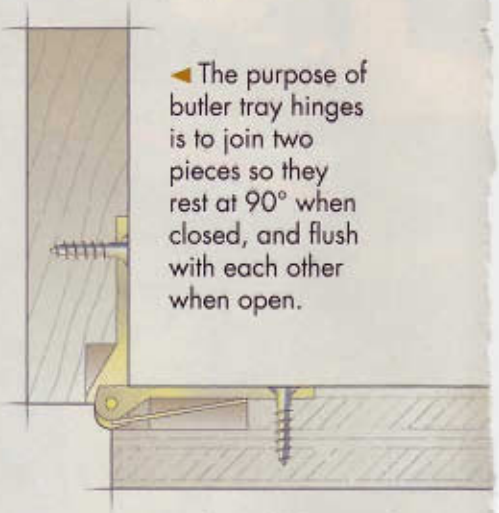
▲ A plunge router equipped with a flush-trim plunge bit and a hardboard template make it easy to cut a precision mortise for a butler tray hinge.

routing mortises for BUTLER TRAY HINGES

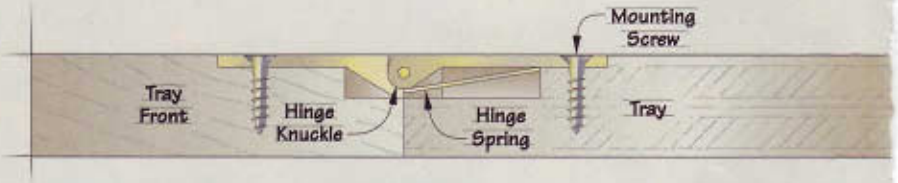
The front of the keyboard tray on the computer desk *(page 54)* is attached with a specialized hinge called a butler tray hinge *(see Photo below)*. It's a spring-loaded hinge that holds the tray front upright to conceal the keyboard when the computer isn't in use *(Illustrations, below)*. When you fold the tray front down, the hinges hold it open at a 180° angle, flush with the tray.

As you can see in the *Photo* at left, a butler tray hinge fits into what appears to be a fairly intricate mortise. But cutting this mortise — and getting the hinge to fit just right — is actually easier than it looks. All it takes is a plunge router equipped with a flush-trim plunge bit, a hardboard template, and a chisel. Note: Flush-trim plunge bits are available from Amana Tools at AmanaTool.com

Before cutting the mortise, you'll need to make a template with an opening that matches the size and shape of the hinge *(see Sidebar below)*. Then use the template and follow the step-by-step instructions on page 32 to rout the mortise.



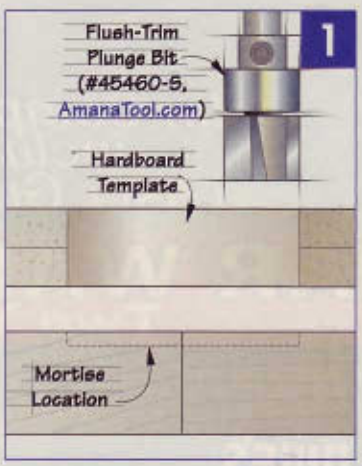
◀ The purpose of butler tray hinges is to join two pieces so they rest at 90° when closed, and flush with each other when open.

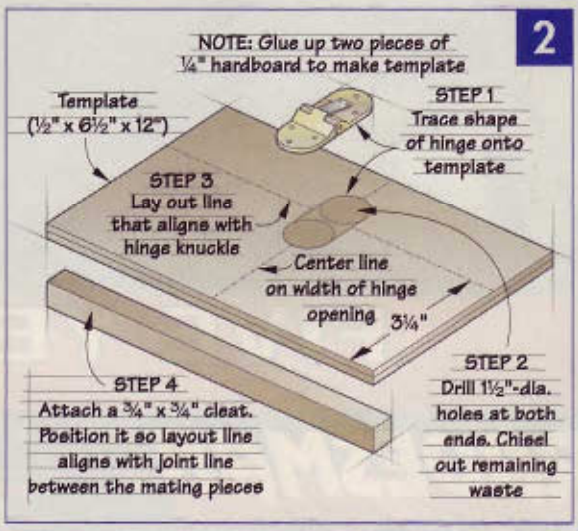


USE A TEMPLATE TO MASTER MORTISES

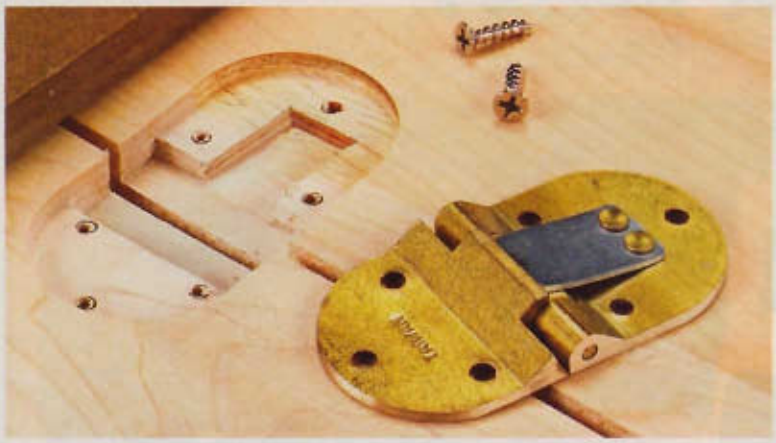
The key to cutting a mortise for a butler tray hinge is to make a template with an opening that matches the size and shape of the hinge. The bearing on the router bit rides around this opening, so the hinge should fit the mortise perfectly *(Fig. 1)*.

The template is detailed in *Fig. 2*. Notice that you'll need to lay out two lines: one that aligns with the "knuckle" of the hinge and a second line centered on the width of the hinge. A cleat registers the template against the edge of the workpiece.





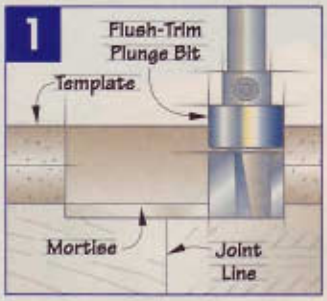
butler tray hinges: MAKING THE MORTISE



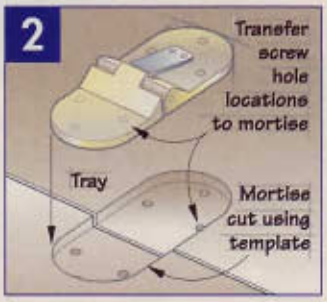
With the template complete, making a mortise is easy. Start by clamping the mating pieces together edge to edge. Then position the template (using the cleat and the alignment marks you made earlier) and clamp it in place.

Next, set the depth of cut to match the thickness of the hinge plate, and rout the mortise, as shown *(Fig. 1)*. That completes the router work. But you'll also need to cut notches for the hinge knuckle and the spring.

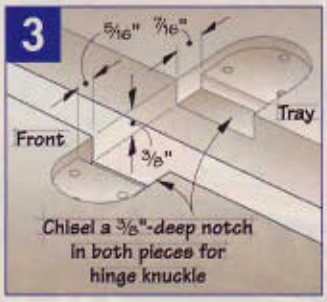
The problem is these notches will be very close to the hinge mounting holes. So to avoid removing material required for the mounting screws to get a good "bite," set the hinge in place upside down, and mark the hole locations *(Fig. 2)*. Now remove the hinge, lay out the notches, and chisel out the waste *(see Figs. 3 and 4)*.



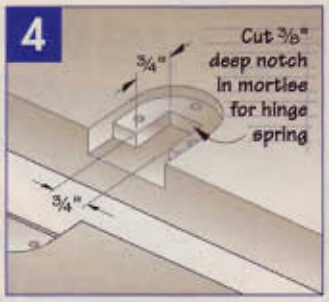
▲ With the template clamped in place, rout the mortise with the flush-trim plunge bit.



▲ Place the hinge upside down in the mortise, and then mark the mounting holes.



▲ Separate the pieces, and use a sharp chisel to cut the notches for the hinge knuckle.

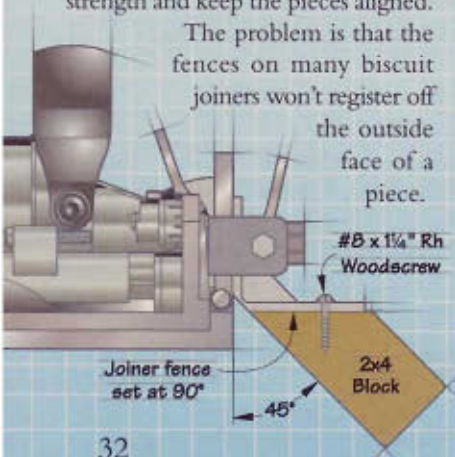


▲ A chisel also makes quick work of cutting a notch in the mortise for the hinge spring.

biscuit joints for BEVELED CORNERS

When joining pieces with beveled ends (like the bases on the home office projects, *page 54*), biscuits add strength and keep the pieces aligned.

The problem is that the fences on many biscuit joiners won't register off the outside face of a piece. As a result, the mating pieces may not be flush on the outside faces.



45° Block — To register the joiner off the outside face, just make a block from a scrap 2x4 that's beveled at a 45° angle, and attach it to the joiner's fence. You'll also need to chisel a notch in the fence to see the joiner's centerline. Then screw the block to the fence.

To cut the slot, trap the beveled end of the piece between the base of the joiner and the block. Then plunge the blade into the beveled end of the workpiece *(Photo, right)*.

TIPS FROM THE WORKBENCH SHOP

router guide SIMPLIFIES SLOTS

Many jigs and shop projects (like the mortising jig on *page 40*) call for a slot that's "stopped" at each end. A stopped slot is easy enough to cut with a plunge router, but you still need a way to guide the router in a straight line when making the cut, and to stop it at the end of the slot.

To accomplish both things, Senior Design Editor Jim Downing uses a simple router guide that clamps to a workbench *(Photo, above)*. This guide is designed to overhang the edge of the bench so you can clamp a workpiece underneath it. The base of the router is corralled in a framed opening to ensure a straight cut. Two stops establish the ends of the slot.

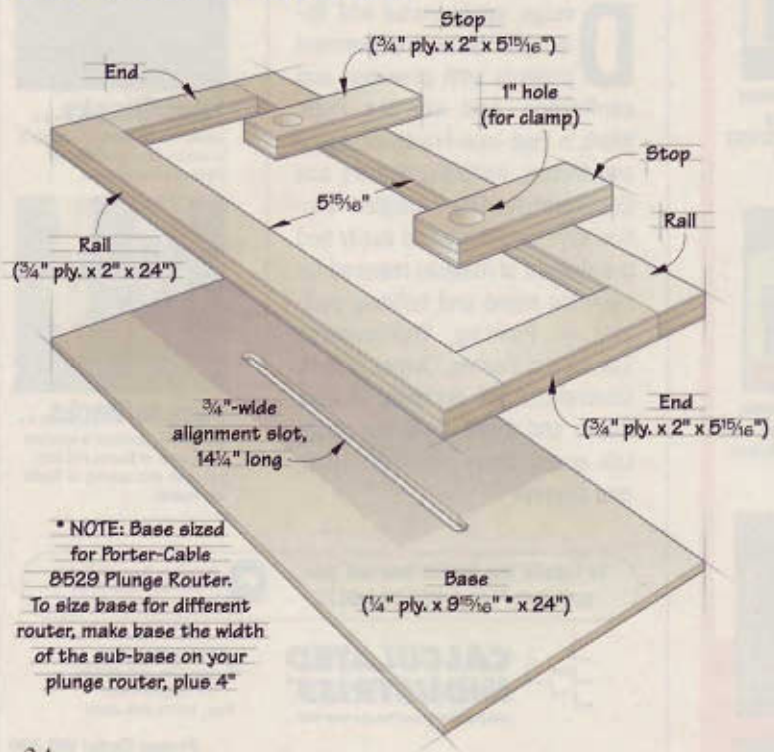
To make the router guide, first cut the base to size from $^1/_4$" plywood *(Illustration, below)*. Note that the width of the base will vary depending on the size of the sub-base on your router. Now you can add the plywood rails and end pieces that form the frame which traps the router. Cut these pieces to size so the router fits snugly inside this opening. Then glue the frame pieces to the base.

As for the stops, cut them to fit between the rails, too. Then drill a hole in each one to accept a clamp.

Before cutting any slots using this jig, you'll first need to cut a slot in the base. It forms a clearance slot for the router bit, and an opening to look through as you align the workpiece under the guide.

All that's needed to make this opening is the router you plan to use with the guide and a $^3/_4$" spiral bit. To avoid cutting into the worksurface, Use scrap blocks to elevate the guide above your bench. Then, after clamping the guide securely in place, set the router against one end, make a plunge cut, and rout to the opposite end.

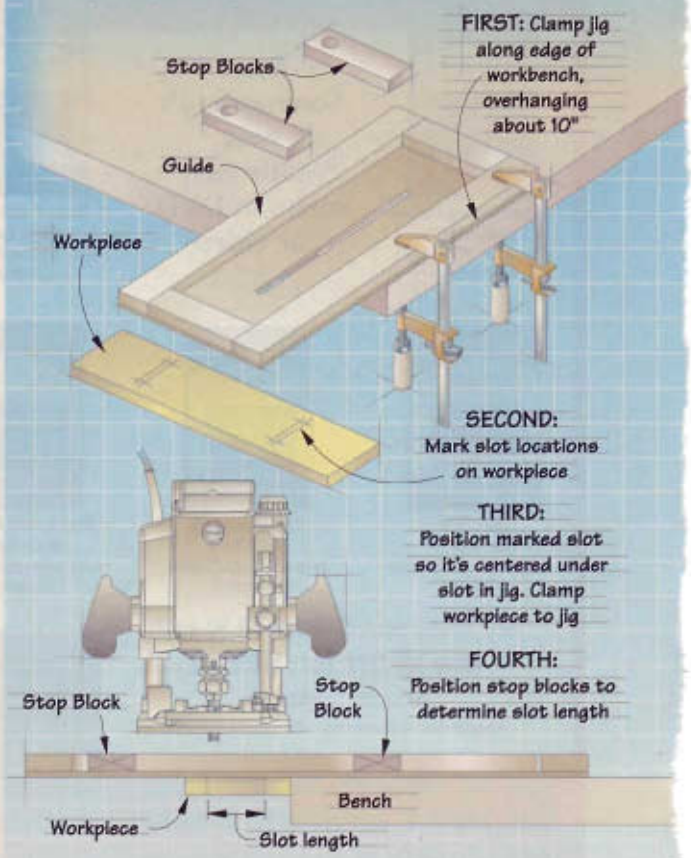
ROUTER GUIDE ASSEMBLY



▲ With a workpiece clamped underneath this router guide, it's easy to cut stopped slots *(left)*. A pair of stops define the ends of the slot.

ROUTING A STOPPED SLOT

It only takes a minute to set up this guide to rout a stopped slot. Just be sure the jig overhangs the bench and the workpiece is square to the jig. Lay out the slot in the workpiece, and use those marks to align the piece under the opening in the guide. Then follow the steps below.

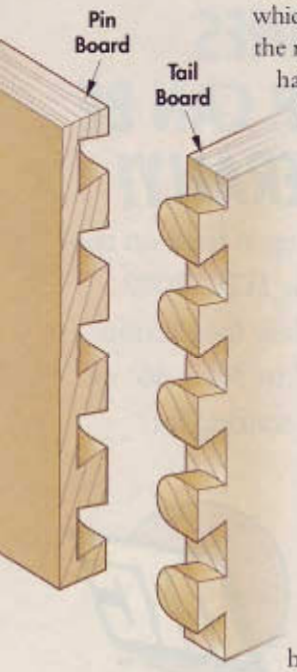


TOOL Close-Up

Porter-Cable DOVETAIL JIG

If you've ever wanted to add dovetails to your joinery repertoire, but balked at the cost and complexity of manufactured dovetail jigs, the Porter-Cable 4210 may be just what you're looking for.

For about $100, this 12" dovetail jig comes preassembled and includes a 1/2" dovetail bit, guide bushing, and dovetail template — which is everything you need (minus the router, of course) to start cutting half-blind or sliding dovetails *(Photo, above)*. And by purchasing an accessory kit, this jig can be upgraded to cut through dovetails and box joints, as well.



With a 1/8" steel base, CNC-machined aluminum template, and sturdy cam-lock clamping bars, this jig is solidly built. And besides being affordable and durable, the 4210 is remarkably easy to use. All you need to do is unpack it and clamp it to a sturdy worksurface to get started.

The four *Photos* at right provide a quick overview of setting up and using the jig to cut half-blind dovetails. For sliding and through dovetails, see page 38.

Half-Blind Dovetails

▲ Position the dovetail template by placing a workpiece (the pin board) in the horizontal position.

▲ Now place the mating workpiece tail board) in the vertical position and adjust the offset guide.

▲ Use the troubleshooting tips on the end of the jig to help fine-tune the setup for perfect joints.

▲ Then adjust the depth stop so you can quickly set up the router to cut perfect dovetails.

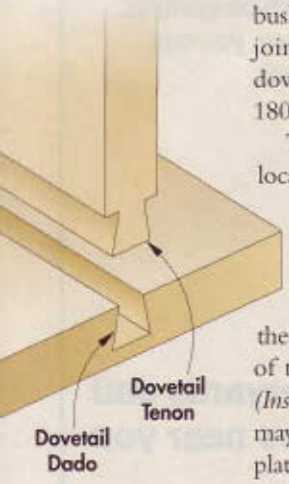
Sliding Dovetails

Another function of the 4210 jig is cutting sliding dovetails, sometimes called dovetail dadoes. This is a quick, strong joint that works great for building drawers, shelves, or even simple drawer slides.

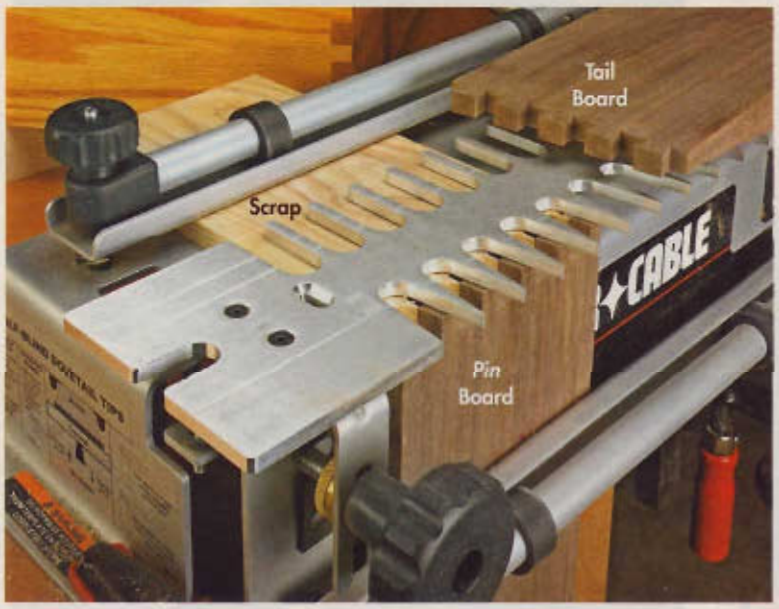
You use the same template, guide bushing, and dovetail bit to cut this joint as you would for half-blind dovetails. Just rotate the template 180° for this operation *(Main Photo)*.

To cut the dado, simply lay out the location of the cut on the workpiece and then align those marks inside the slot in the template.

To rout the matching tenon, clamp the mating workpiece in the vertical position, and use the edge of the template as a cutting guide *(Inset Photo)*. To perfect the fit, you may have to slightly adjust the template toward you (for a tighter joint) or away from you (for a looser joint). As always, make some test cuts to fine-tune the setup before routing the finished workpieces.



▲ The first step in cutting sliding dovetails is to establish the depth and width of the dado. Then fine-tune the tenon to fit snugly (as a shelf support) or loosely (for drawer slides).

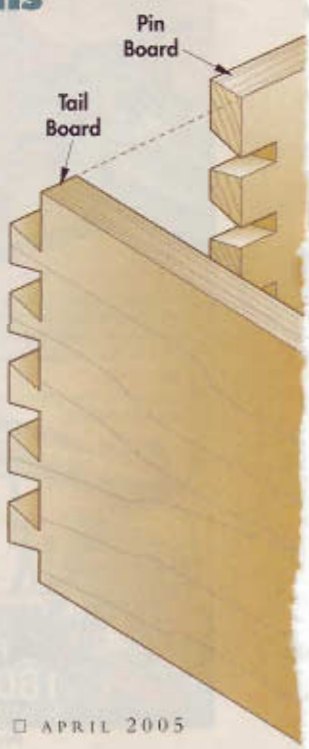


▲ Setting up the jig to cut through dovetails is similar to the half-blind setup. In this case, you'll cut one workpiece at a time, using a straight bit to cut the pins and a dovetail bit to cut the tails.

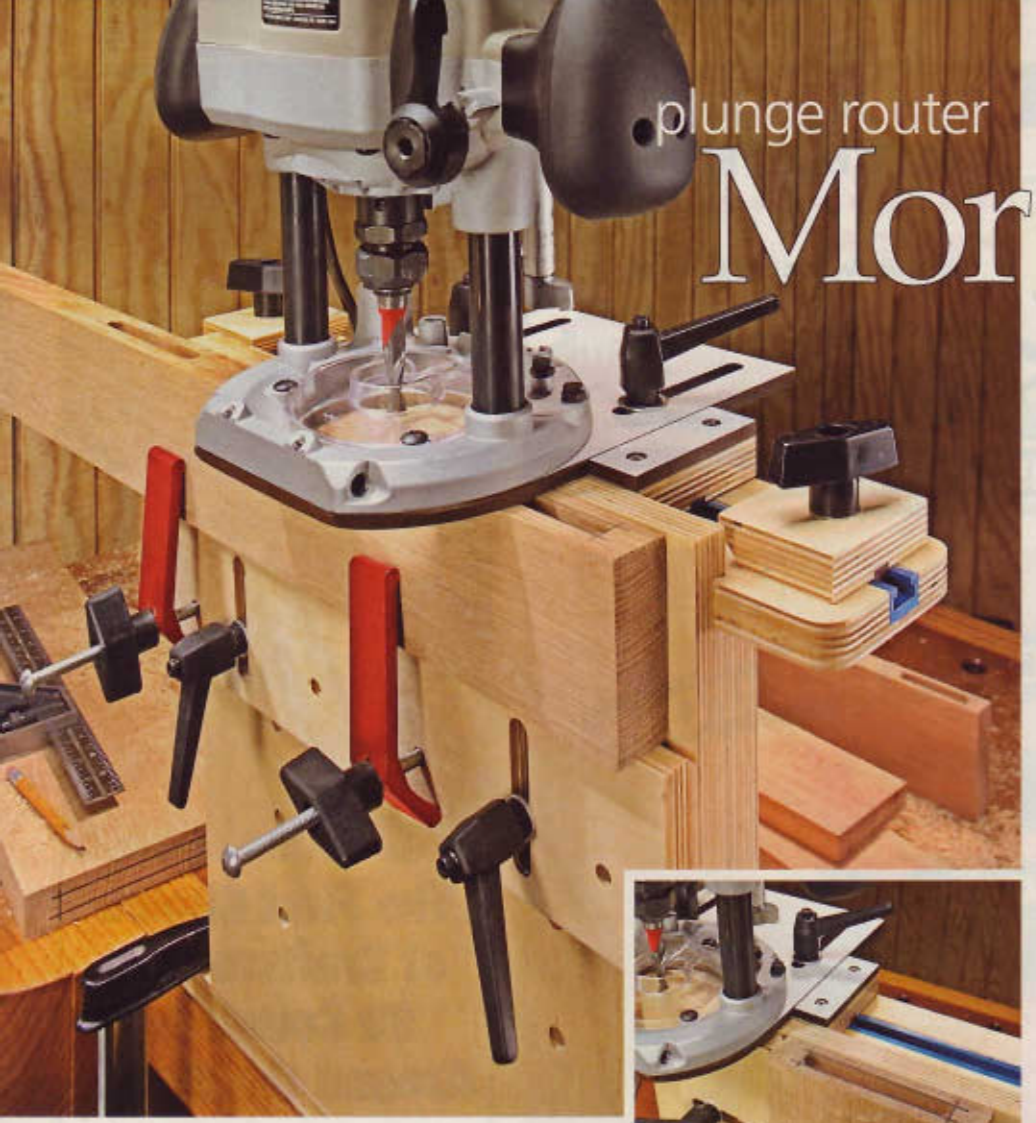
Through-Dovetails

Once you've mastered half-blind and sliding dovetails, you may want to try your hand at through dovetails. And for that, Porter-Cable offers an accessory kit that includes a different template, an $^{11}/_{32}$" straight bit, and an additional bushing. The accessory kit sells for about $70. The same kit enables the jig to cut $^{1}/_{2}$" box joints, though you will need to purchase a $^{1}/_{2}$" straight bit for that operation.

On the other hand, if you want all this capability right away, you can purchase the 4212 kit, which includes the 4210 jig as well as everything in the accessory kit for about $150. For more information on the 4200-series dovetail jigs and accessories, visit Porter-Cable.com, or call 800-487-8665.



plunge router Mortising JIG



Featuring infinite adjustability, dead-on accuracy, and smooth operation, this shop-made jig may be the LAST mortising machine you'll ever need to build. And the best part is it can be built mainly from scrap plywood.

For rock-solid joinery on your woodworking projects, a mortise and tenon joint is hard to beat. Unfortunately, the joint can be even harder to make.

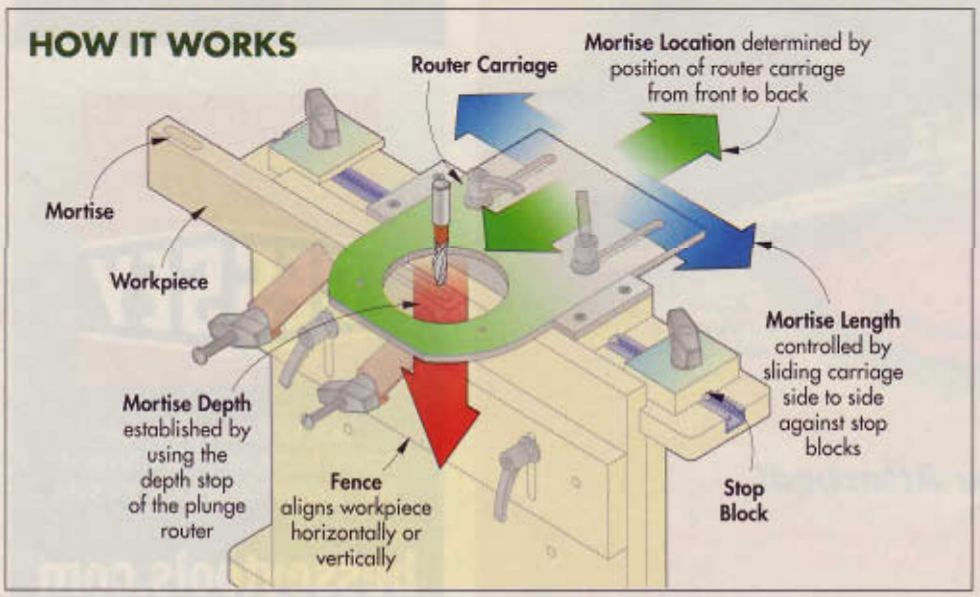
This is largely because cutting a mortise is such a demanding operation. The conventional means of making a mortise is to drill a series of holes in a row, and then use a chisel to pare away the waste. It's an arduous task that eats up a lot of shop time.

Shop-Made Solution — To cut mortises quickly and accurately, I built a jig that's designed to be used with a plunge router *(Photo, left)*. This jig adjusts in two directions. A carriage that holds the router moves front to back to establish the location of the mortise on the thickness of the workpiece *(see How It Works, below)*. This carriage slides side to side, as well, as you rout the mortise to length. The depth of the mortise is controlled by the router.

As with any routing operation, safety and accuracy depend on properly securing the workpiece. This jig makes that a snap. A fence aligns the workpiece either horizontally or vertically *(Photos, above)*. And a couple of metal hold-downs clamp it firmly against the jig.

Though the plywood needed to build this jig might be lying around in your shop, the hold-downs, and much of the other hardware, probably isn't. But don't worry, this hardware is readily available. For a complete list of hardware and sources for this jig, see page 44.

HOW IT WORKS



BUILD THE JIG BODY

The body of this jig consists of four main parts, all made from ¾" plywood. A base piece (A) clamps to the bench and is attached to the face of the jig with woodscrews. The thick two-part face (B, C) supports the carriage assembly and provides a surface to clamp the workpiece against. The face also provides a mounting surface for the last two parts: an adjustable fence (D) that clamps the workpiece down, and a guide rail (E) that houses a metal T-track for the sliding carriage.

To build the body, start by cutting the parts to size on the table saw. Next, round the corners of the guide and base smooth with a sander. The next order of business is to cut a groove in the guide to accept the T-track, and a dado in the back of the jig face to hold the guide. While you're at it, rout a chamfer on the top inside edge of the fence to provide dust relief.

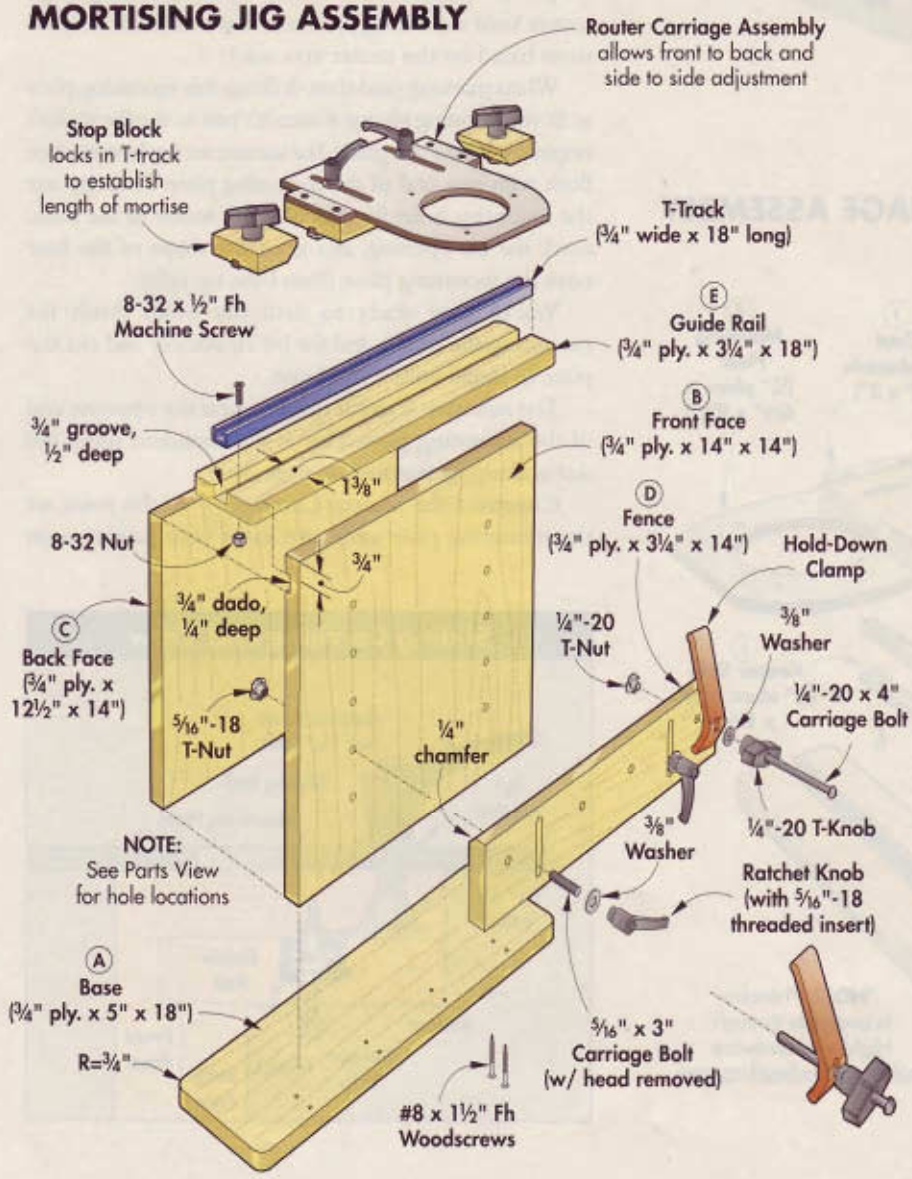
Drill Counterbores — A series of holes need to be drilled in both the front face and the fence to accept T-nuts. These holes will allow you to reposition the fence for different-size workpieces. They also provide a way to mount the hold-downs.

To recess the heads of the T-nuts, drill counterbored shank holes, as shown in the *Parts View* and *Front Face Detail* below.

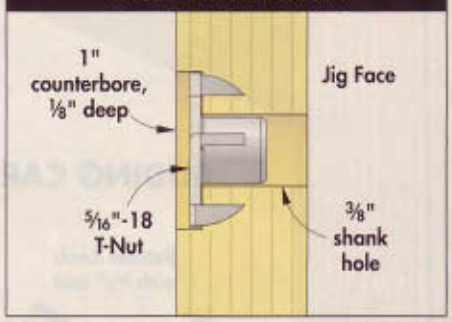
Adjustment Slots — The next step is to cut two slots in the fence to make it adjustable. You can make these slots by drilling end holes and cutting between them with a jig saw. Or, use the simple jig for routing slots that's shown on page 34.

Assembly — Once the slots are completed, install all the T-nuts. Then glue the front and back faces together, and glue the guide in place above the back face. When the glue dries, screw the base in place. Attach the fence with ratchet knobs and bolts, and install the hold-downs.

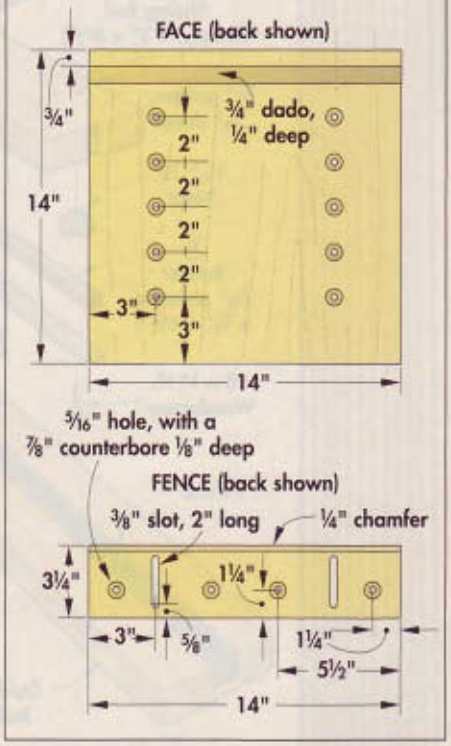
MORTISING JIG ASSEMBLY

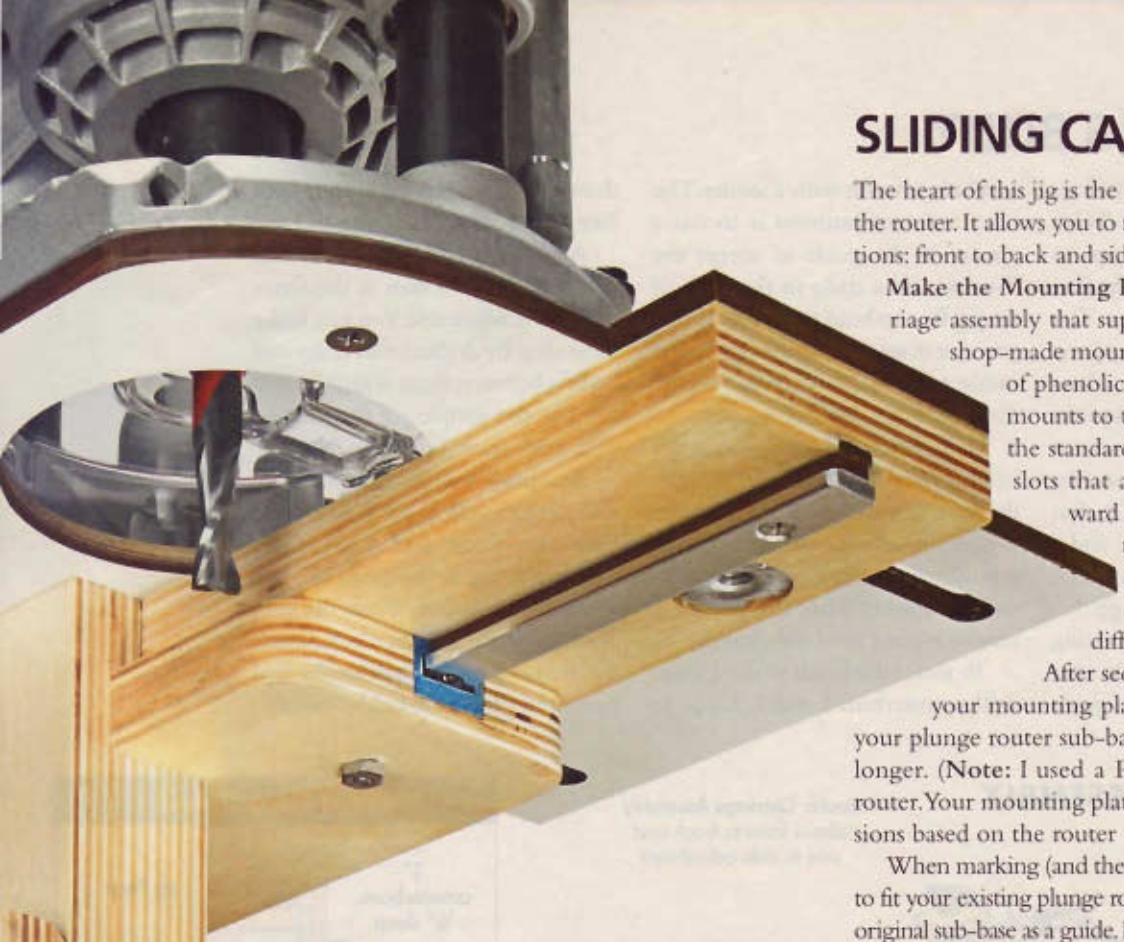


Front Face Detail



PARTS VIEW





SLIDING CARRIAGE

The heart of this jig is the carriage that's used to mount the router. It allows you to move the router in two directions: front to back and side to side.

Make the Mounting Plate — The part of the carriage assembly that supports the plunge router is a shop-made mounting plate (F). It's just a piece of phenolic (a hard, durable plastic) that mounts to the plunge router in place of the standard router sub-base. It has two slots that allow the plate to slide forward and backward in relation to the jig. These slots allow you to position the router and mortise on workpieces of different thickness.

After securing a piece of phenolic for your mounting plate, rip it to width to match your plunge router sub-base, and then crosscut it 3½" longer. (**Note:** I used a Porter-Cable #8529 plunge router. Your mounting plate may have different dimensions based on the router you use.)

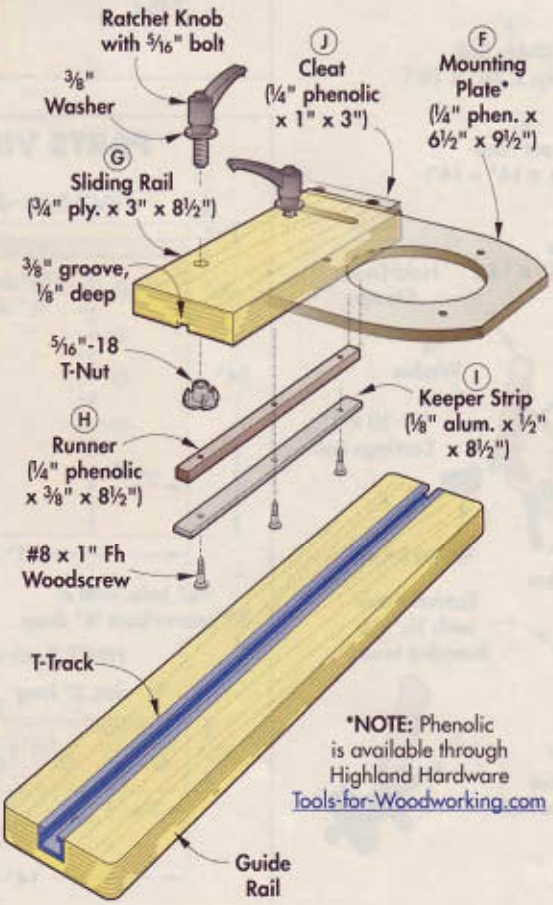
When marking (and then drilling) this mounting plate to fit your existing plunge router, it's best to use the router's original sub-base as a guide. For starters, set the base in place flush with one end of the mounting plate. Then lay out the mounting holes for attaching the router to the plate, mark the bit opening, and trace the shape of the base onto the mounting plate *(Parts View, top right)*.

You're now ready to drill the holes (both for mounting the router and for bit clearance) and cut the plate to shape with a band saw.

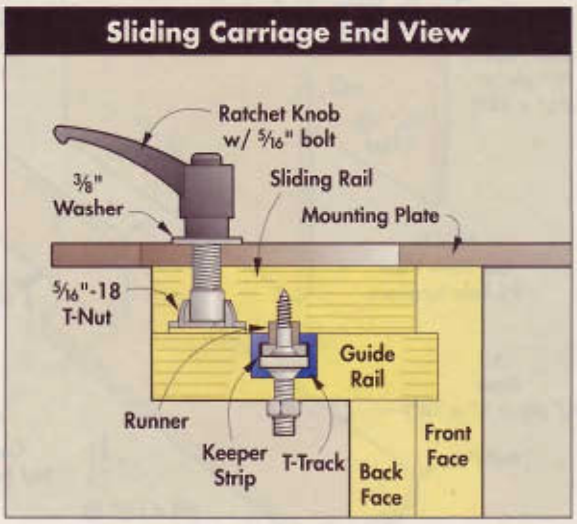
The next step is to cut the slots near the opposite end of the mounting plate. This is accomplished using the slot-making jig featured on page 34.

Construct the Sliding Carriage — At this point, set the mounting plate aside and focus your attention on

SLIDING CARRIAGE ASSEMBLY



Sliding Carriage End View



the rest of the carriage assembly. It consists of a plywood sliding rail (G) that accepts the mounting plate. A phenolic runner (H) mounted on the underside of this rail fits in the opening in the T-track to allow the carriage to slide from side to side. A keeper strip (I) locks the runner in the track to prevent racking. And two phenolic cleats (J) butt against the mounting plate to keep it aligned at 90° to the runner *(Router Carriage Assembly, left and Parts View, right)*. Cut all these parts, except the phenolic runner, to size.

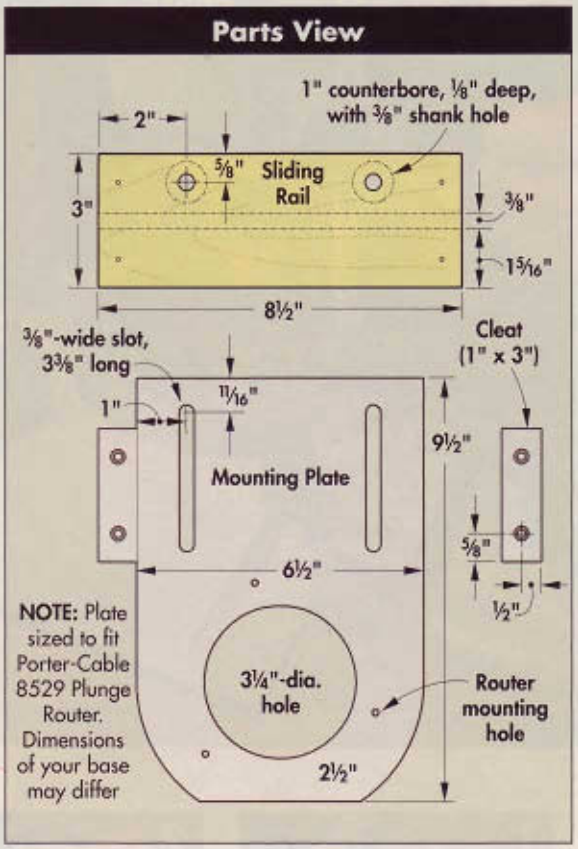
Test Fit — The runner needs to fit snugly in the T-track, but still slide smoothly. A good way to accomplish this is to cut it just a hair oversize, and then sand it down until it has the desired fit.

Just a quick note here: Start with a phenolic strip about 14" long. After sanding it to fit, you can cut off the the leftover to make runners for the stop blocks that will be added later.

Once the runner fits the T-track, cut a groove to match its width in the underside of the sliding rail, and glue the runner in place. Then, center the aluminum keeper strip under the runner, and screw it in place.

Add Cleats — There are just a few more steps, and then you're ready to mount the router carriage to the jig. First, center the mounting plate on the length of the sliding rail, butt the two phenolic cleats against it, and screw them in place. Next, use the slots in the mounting plate to mark for holes on the sliding rail. Drill these holes to accept T-nuts that, together with ratchet knobs, will lock the mounting plate in place on top of the sliding rail.

Put It All Together — With the router carriage fully assembled, you can now add all the hardware. Then, attach the router to the mounting plate, and slide it in place in the T-track, as shown in the *Photo* at left.



ADJUSTABLE STOP BLOCKS

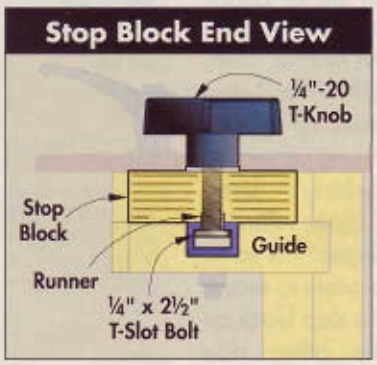
The last two parts of the mortising jig are a pair of stop blocks (K). These blocks slide in the T-track on either side of the router carriage assembly. When you lock the blocks in place in the track, they establish the proper length of the mortise by stopping the router carriage as you slide it in either direction.

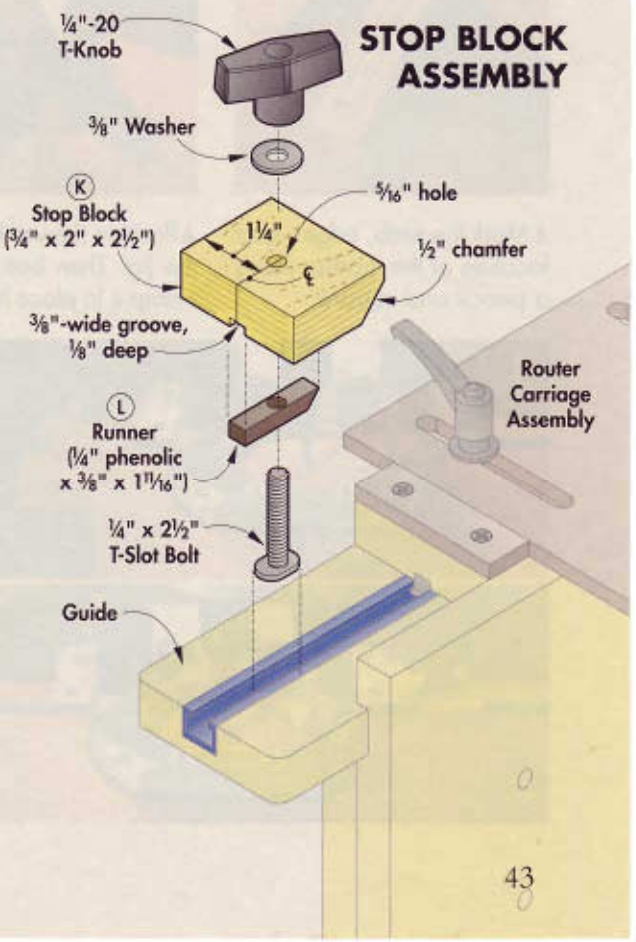
Each stop block is just a small plywood block with a chamfer cut in one end. It aligns in the T-track by means of a phenolic runner (L) that's the same width as the runner in the router carriage. A T-slot bolt that's inserted through a hole drilled in the center of the block allows the stop to slide smoothly in the track. And a T-knob threaded onto the end of the bolt locks the stop in place *(Stop Block Assembly, right)*.

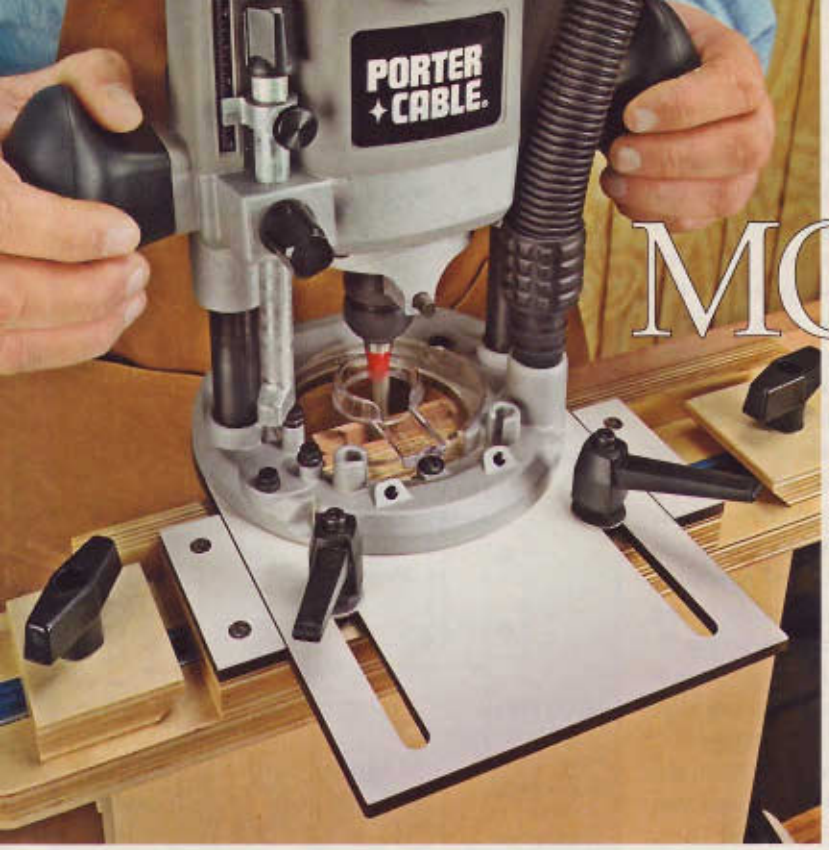
The blocks are kind of small to machine individually, so it's best to rip a longer blank to width, and then cut the groove for the phenolic runner on this blank. Then, chamfer one edge, glue the long strip of phenolic you cut earlier in place, and cut the blocks to final size.

Next, drill a centered hole through both the plywood block and the runner to accept the T-slot bolt.

After that, it's just a matter of inserting the bolt through the bottom of the block, threading a washer and knob on the top of the bolt, and sliding the stop blocks in place on the jig's T-track.





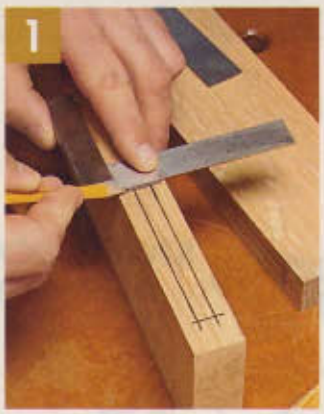


4 Easy Steps To Making MORTISES

This mortising jig makes setting up and cutting perfect mortises virtually automatic. This is due to the router carriage that can be adjusted from front to back and side to side to establish the location and length of a mortise.

The first step in making a mortise with the jig is to lay out the mortise with a combination square and pencil *(Fig. 1)*. Once that's taken care of, clamp the workpiece in the jig *(Fig. 2)*. Then adjust the carriage *(Fig. 3)* and stop blocks *(Fig. 4)*.

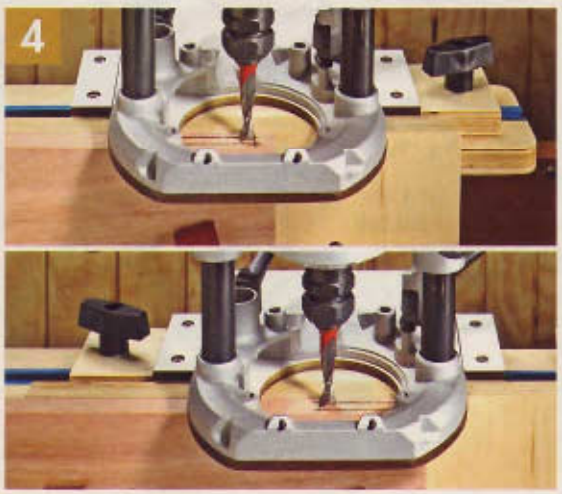
Once you're ready to rout, make a series of successively deeper passes, using the plunge router's depth stops to establish the final depth of the mortise *(Photo, above)*. A spiral upcut bit does a great job of removing dust and chips as you rout.



▲Mark the ends, edges, and location of the mortise using a pencil and square.

▲Position the workpiece flush with the top of the jig. Then butt the fence against it, and clamp it in place by locking the hold-downs.

▲Slide the router carriage into position so that the router bit aligns with the layout lines for the mortise, and then lock the knobs.



◄Slide the carriage to one side, so the bit aligns with the end of the mortise. Then, butt the stop block up against it, and tighten the locking knob *(Upper Photo)*. Repeat this same process to secure the stop block on the other side *(Lower Photo)*.

Mortising Jig Hardware Guide

Rockler
Rockler.com
800-279-4441
(1) 24" T-Track (#21739)
(2) Hold-Downs (#21912)
(2) Ratchet Knobs w/ 5/16"-18 bolts (#90902)
(2) Ratchet Knobs w/ 5/16" inserts (#90910)
(4) 1/4"-20 T-Knobs (#71506)
(12) 5/16"-18 T-Nuts (#26062)
(4) 1/4"-20 T-Nuts (#26054)

(2) 1/4" x 2 1/2" T-slot Bolts (#33939)

McFeely's
McFeelys.com
800-443-7937
(2) 5/16" x 3" Carriage Bolts (SCB-0530)
(2) 1/4" x 4" Carriage Bolts (SCB-0440)
(6) 3/8" Washers (WSS-0600)
(8) #8 x 1 1/2" Fh Woodscrews (0814-FSL)
(7) #8 x 1" Fh Woodscrews (0810-FSL)
(7) 8-32 x 1/2" Fh Mach. Screws (FMZ-0804)

(4) 8-32 Nuts (HSN-0832)

Highland Hardware
Tools-for-Woodworking.com
888-500-4466
(1) 1/4" x 11" x 15" Phenolic Board (BK-2)

ONLINE Extras
Online Cutting Diagram
WorkbenchMagazine.com

Cordless Drills DISSECTED

Knowing the $100 difference between consumer-grade and premium-grade drills will help you choose the perfect tool for the way you work.

On a fundamental level, I suppose we all know that a $170 cordless drill is "better" than a $70 cordless drill, all other things being equal. But the elementary understanding of the old adage that "you get what you pay for" has never been enough to satisfy my curiosity about what "better" really is. Sure, you can break it down to how powerful a drill is, or how many holes it can drill on a single battery charge, but that still doesn't get at the question of why one drill outperforms another. What, in fact, is the $100 difference?

To understand that, you need to get *inside* the drill, under the hood, so to speak. And that's what we did for this article. We gathered up seven drills — three consumer-priced models and four premium-priced models — and we dissected them *(Photo, above)*.

As we broke the drills down into their collective parts, we compared those parts to better understand the differences in drills that look an awful lot alike, but are priced quite differently. And not surprisingly, we found some important differences between the premium and consumer models in their batteries, chargers, switches, motors, gears, and chucks.

The next few pages offer a guided tour of each one of those components with some great cutaway photos and illustrations so you can see the differences as clearly as we did. And along the way, we'll offer some insight about how each difference ultimately impacts a drill's performance.

BATTERIES

On the surface (and even just below the surface) all rechargeable batteries look about the same. Each battery is actually a cluster of 1.2-volt cells networked together into a single power source *(Battery Pack Illustration, right)*. The number of cells determines the voltage of a battery. To determine how many cells a battery contains, simply divide the voltage of a battery by 1.2. An 18-volt battery, as an example, has 15 cells.

Despite this likeness, there are two key differences between premium batteries and consumer batteries.

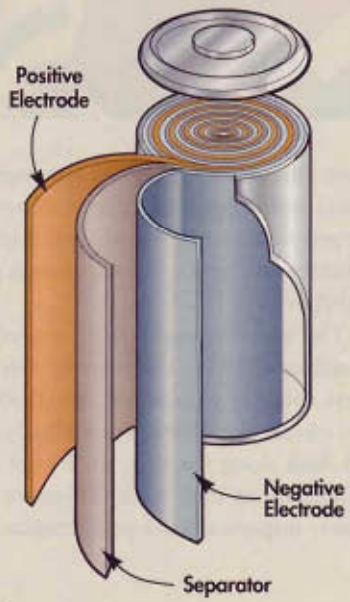
Cell Size — The first, and most obvious difference, is the physical size of the individual 1.2-volt cells *(Photo, lower right)*. Not surprisingly, bigger cells hold more "juice." This means longer run time, or more work accomplished, on a single charge.

This capacity is typically measured in Amp Hours. For instance, a premium battery might be rated for 2.4 Amp Hours, while a consumer battery is rated for 1.2 Amp Hours. This is an interesting, but not terribly practical, basis for comparison. In more real-world terms, I was able to drive 200 deck screws with a premium drill before the battery died versus 108 screws with a consumer drill.

Cell Anatomy — The second difference, and one that's a little more difficult to see, is the construction of a cell's internal components. This is what determines how many charge/discharge cycles a battery can withstand before its useful life is spent.

To understand the internal differences, you'll first need to know your way around the inside of a cell. Each cell contains a "jelly roll" of three key parts: the positive electrode, the negative electrode, and the separator *(Cell Anatomy Illustration, left)*.

CELL ANATOMY



The electrodes are of particular interest. It's not so much *what* the electrodes are made of as much as *how* they are manufactured that determines their longevity.

Sintered/Sintered — The most expensive, and most durable, means of constructing electrodes is called "sintering." This process uses intense heat (approximately 1,300° C) to laminate the active ingredient (nickel on the positive electrode and cadmium or rare earth metals on the negative electrode) to a metal substrate.

It's an expensive process, but sintered electrodes are flexible enough to withstand nearly 1,000 charge/recharge cycles before the battery can no longer hold a useful charge. In most premium batteries, both electrodes are sintered.

▲ BATTERY PACK
Several 1.2-volt cells make up a battery pack. The size and internal construction of the cells determine the performance of a battery.

▼ CELL SIZES
Larger individual cells within premium batteries create a longer run time on a single charge.

Sintered/Bonded — Most consumer batteries use a less expensive process to make the negative electrode (positive electrodes are still sintered). Rather than sintering the active ingredient to the negative electrode, it's pressed on in slurry or paste form. Then the electrode is baked at the relatively cool temperature of 700° F. This is called a "bonded" electrode. These batteries have a life expectancy of between 300 to 500 charge/discharge cycles.

Foam/Bonded — In the least expensive batteries, *both* electrodes are bonded, so the sintering advantage is completely lost. But another key difference is that the substrate of the positive electrode is a porous foam core (instead of thin metal in more expensive batteries).

In terms of manufacturing cost, foam has the advantage of requiring fewer preparation steps before the active ingredient can be applied. But in terms of performance, this creates a much less robust battery that is not likely to exceed 300 charge/discharge cycles. This type of battery is found on only the most inexpensive cordless tools.

BATTERY CHARGERS

Battery chargers are as different in appearance as batteries are similar, as evidenced by the chargers pictured here. But the differences extend well beyond their covers.

What truly separates one charger from another is how fast it can push power into a battery without overheating the battery and damaging it. In that sense, most modern chargers are considered "smart chargers" that sense dangerous temperature levels and stop charging the battery if it gets too hot.

Consumer chargers simply shut down if the temperature climbs too high. Premium chargers, by contrast, have sophisticated electronics that reduce the electrical flow to a trickle to keep charging without significantly raising the core temperature. The result is a faster overall charge rate because there is less downtime while batteries cool to a chargeable level. Some premium chargers even have an internal fan that draws air through the battery as it's charging to help moderate the temperature.

PREMIUM CHARGER

CONSUMER CHARGER

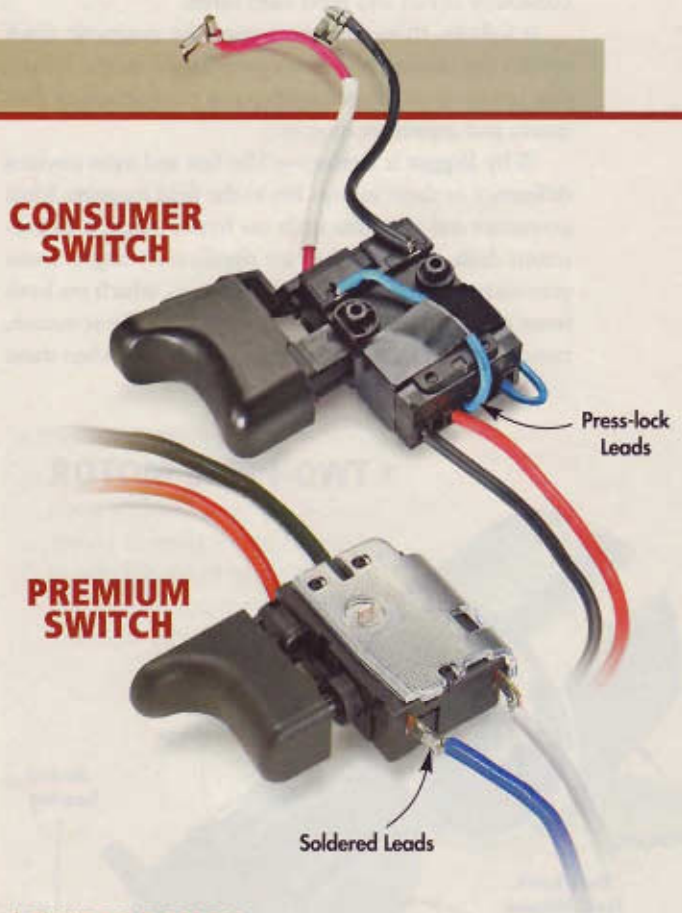
▲ Advanced electronics and internal fans make it possible for some premium chargers to charge two batteries simultaneously in as little as 30 minutes.

SWITCHES

The most heavily used, but least thought of, part of any drill has to be the switch. It's not the sort of thing you base your purchase decision on, but it's interesting to note that this is one of the most expensive parts in any drill. And it's also one place where consumer drills and premium drills can differ greatly. There are really only three visual cues that distinguish the two classes. First, the wires leading to the switch are typically a heavier gauge in the premium drills. And the wire connection in a premium switch is usually a soldered joint rather than a crimped joint. Finally, the premium switch is bulkier.

That bulk attests to the more sophisticated electronics contained within. The sole purpose of those electronics is to meter the amount of power flowing to the motor for variable-speed operation. Some smaller drills (12-volts and less) may still use simple contact switches that do not have variable speed, but none of these drills had one.

However, just because all these switches are variable speed does not necessarily make them equal. More expensive switches offer a wider range of variable speed, from 0 to 2400 RPM for instance, compared to perhaps 0 to 1800 on less costly models. This, of course, assumes all other things (gear ratio, specifically) are equal.



▲SWITCH DESIGN
Premium switches are larger, have soldered connections, and offer a wider range of speed and greater speed control than consumer switches.

MOTORS

As we began comparing motors from our dissected drills, it quickly became clear that these would be the truly distinguishing features among these tools.

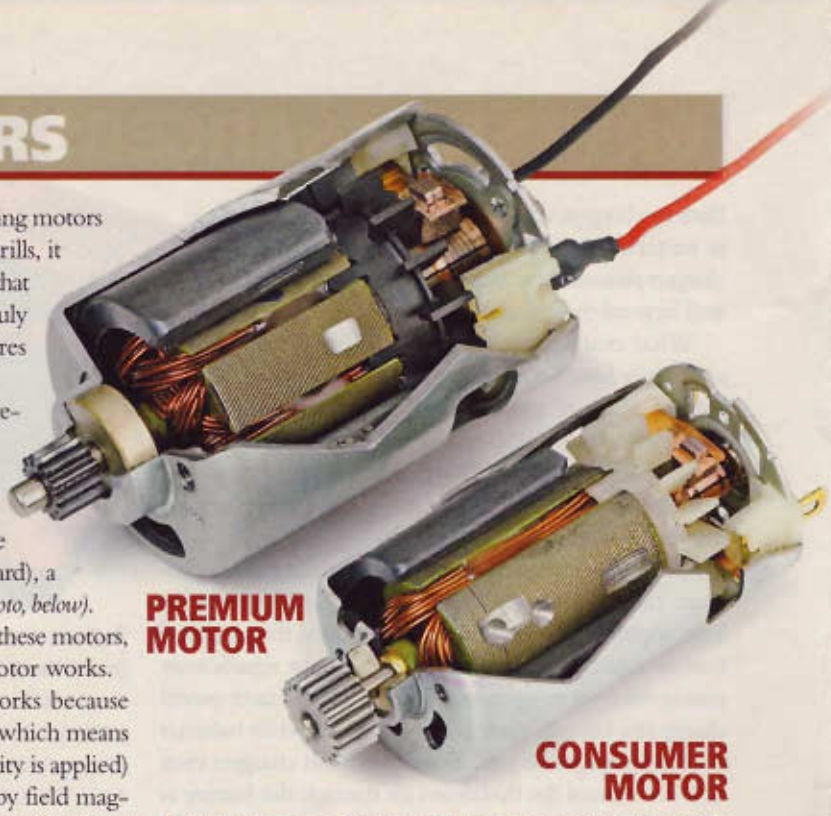
First of all, the premium motors are much larger *(Photos, right)*. And while some premium motors are one-piece (which has long been the standard), a couple of them were two-piece designs *(Photo, below)*.

But before we delve into the specifics of these motors, let's take a quick look at how an electric motor works.

In layman's terms, an electric motor works because the armature (or rotor) is an electromagnet (which means it only creates a magnetic field when electricity is applied) that continually gets attracted and repelled by field magnets in the motor housing *(Photos, above right)*. This causes the armature to spin as the two opposing magnetic fields constantly attract and repel each other.

It follows, then, that the bigger the magnetic fields within the motor, the more powerful the motor is. And that brings us to the point-by-point comparison of premium and consumer motors.

Why Bigger is Better — The first and most obvious difference in these motors lies in the field magnets. Most consumer and premium drills use ferrite magnets. In premium drills, however, they are significantly larger. Some premium motors use rare earth magnets, which are both more powerful and more expensive. As for the armature, remember that this only has a magnetic field when there is electricity present, so the efficient flow of electricity is key here.



▲ Bigger parts within a motor create larger magnetic fields, which is the driving force behind any electric motor. Also notice that the premium motor uses bearings around the shaft instead of bushings.

That flow begins at the brushes and commutator. And you can see that they're much larger in a premium motor. This is a more efficient design in the same way that a wider doorway allows more people to pass through it in less time. (Plus, the brushes, which do wear out, can be replaced in many premium drills.)

Once past the commutator, electricity flows through the windings on the armature. And as you might guess, larger wires are more efficient. Think of them in terms of an electrical interstate — a thicker wire equals a wider roadway and a more efficient flow of traffic, or electricity, as it were. Additionally, how tightly the coils are wound, how well they are tied together, and how they connect to the commutator are also important factors. These are a little more difficult to see, even with the motor disassembled, but rest assured that premium motors are held to much higher standards on all those counts.

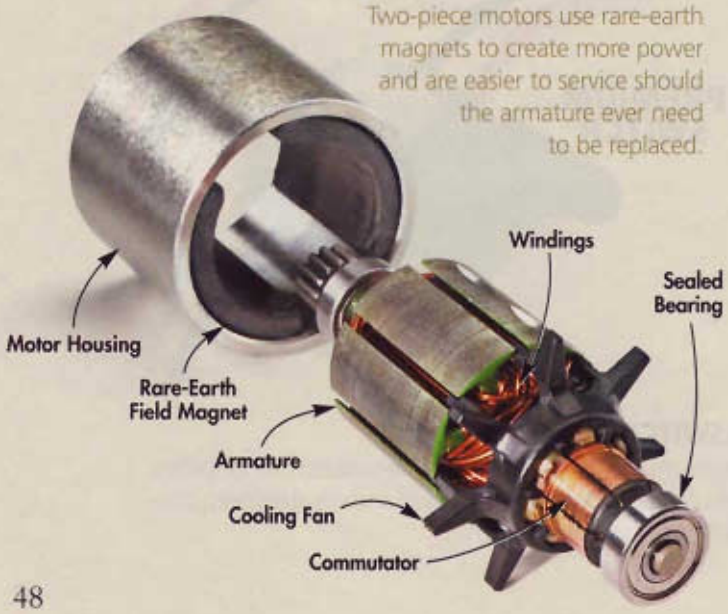
Other Details — A couple of other details that can impact the longevity of the motor are the commutator bearing and the cooling fan.

A high-performance bearing allows the motor to spin freely, so more power is used to perform the work rather than overcome resistance within the drill. Consumer drills often use bushings rather than bearings.

And the cooling fan helps dissipate heat, which can quickly degrade just about every component within a motor. Clearly, larger fans are more efficient at providing airflow to keep the motors as cool as possible.

▼ TWO-PIECE MOTOR

Two-piece motors use rare-earth magnets to create more power and are easier to service should the armature ever need to be replaced.



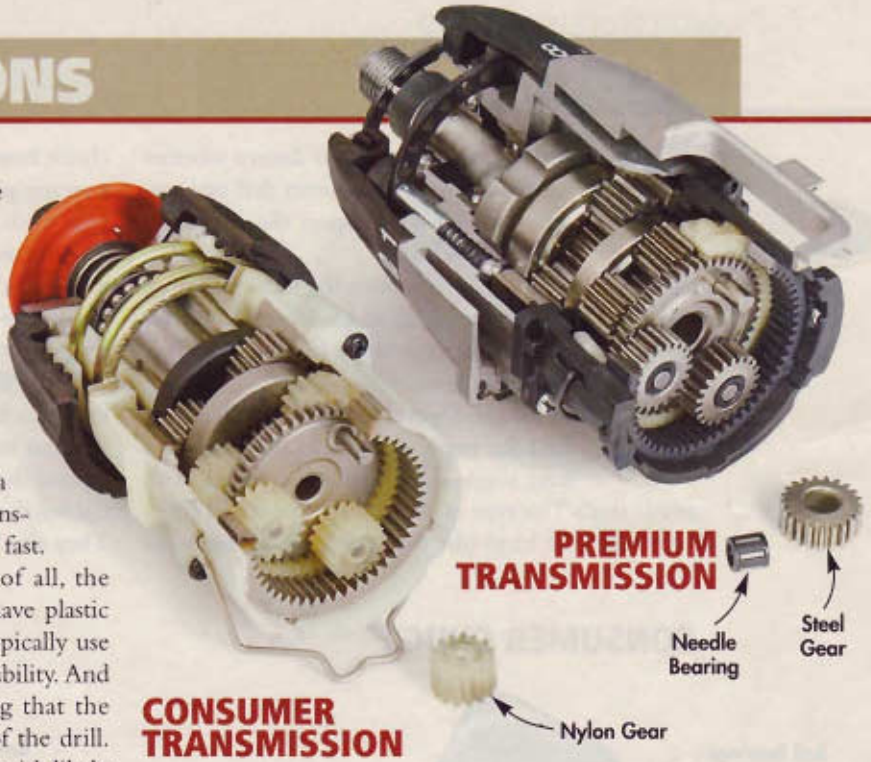
TRANSMISSIONS

Comparing the transmission of one drill to any other will likely turn up more differences than similarities *(Photo, right)*.

There are, however, a couple of general rules that differentiate a premium transmission from a consumer transmission, but they are anything but hard and fast.

Plastic vs. Metal Housing — First of all, the transmissions on consumer drills tend to have plastic or nylon housings, where premium drills typically use metal housings. The difference here is durability. And that's an important difference considering that the gearbox is one of the more delicate parts of the drill. Should the drill ever take a fall, this is where it's likely to break apart.

The metal gearboxes of high-end drills are also designed to take some of the unexpected abuse drills are subjected to. Typically, premium gearboxes are designed to withstand a drop of 12 feet or more. A typical consumer drill may only be able to withstand a drop of eight feet or less.



▲ Consumer transmissions are often designed with economy in mind where as durability is the goal of a premium transmission.

Gears — What's inside these gear housings also sets the premium drill apart from the consumer drill. However, this is also where any sense of uniformity is lost.

Nearly every premium drill we looked at had its own unique enhancements within the system of gears, while every consumer drill seemed to have its own set of cost-saving measures.

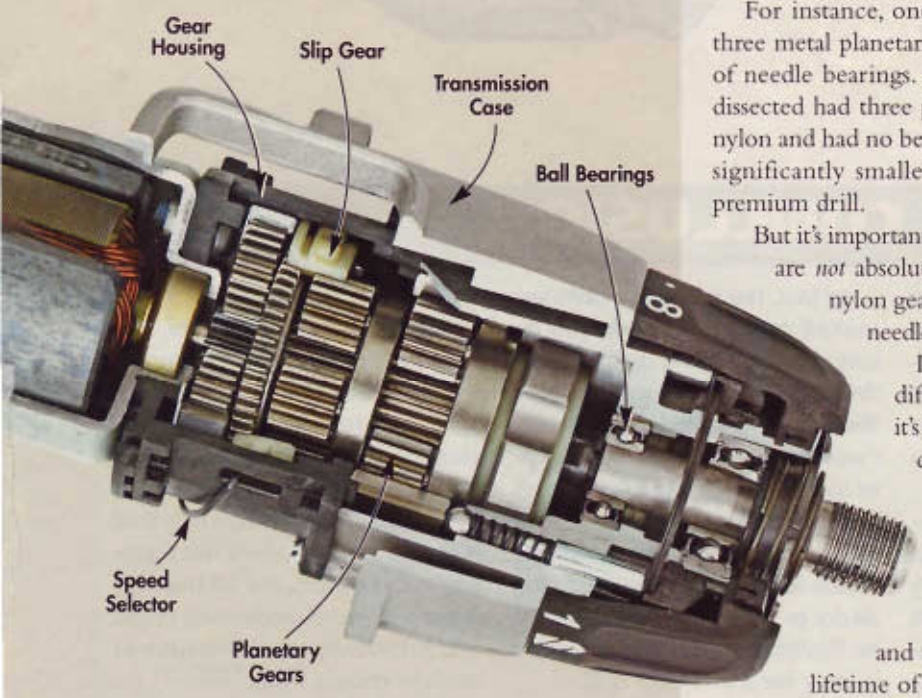
For instance, one premium transmission featured three metal planetary gears, all of which rode on a set of needle bearings. By contrast, a consumer drill we dissected had three planetary gears that were made of nylon and had no bearings. These nylon gears were also significantly smaller than the metal gears from the premium drill.

But it's important to remember that these differences are *not* absolute. Not every consumer drill uses nylon gears, and not every premium drill has needle bearings under the planetary gears.

If there is a general rule about the differences within the transmissions, it's simply that premium drills are more durable. These transmissions either have more gears or bigger gears, as well as more or better bearings within the assembly.

All of this adds up to a transmission that can create more torque and withstand that torque over a long lifetime of starting, stopping, and demanding drilling and driving operations.

TRANSMISSION ANATOMY



CHUCKS

Perhaps the easiest way to discern whether you're looking at a consumer drill or a premium model is to inspect the chuck *(see Illustrations below)*.

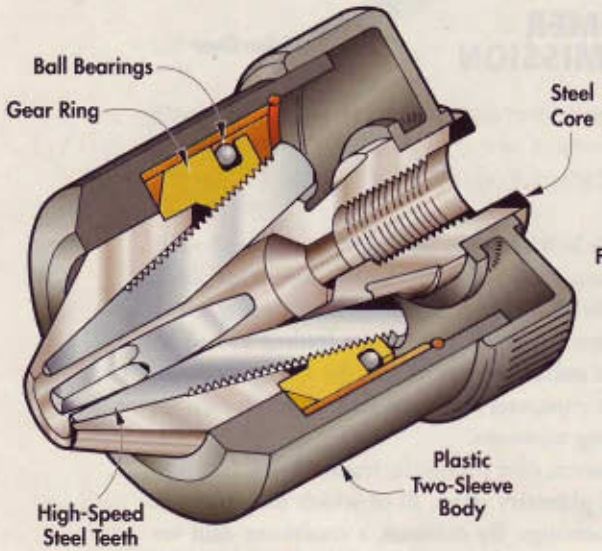
The chuck is often the most expensive part of any drill, and a logical place for manufacturers to save a few bucks in their consumer lines.

Single-Sleeve Chucks — The standard for premium chucks has become a steel, single-sleeve ratcheting chuck with carbide teeth. This type of chuck can be operated effectively with one hand (the ratcheting action keeps the chuck from spinning while you tighten it) and provides a secure grip on the bit with minimal effort (the carbide teeth get a solid bite on the shaft of the bit).

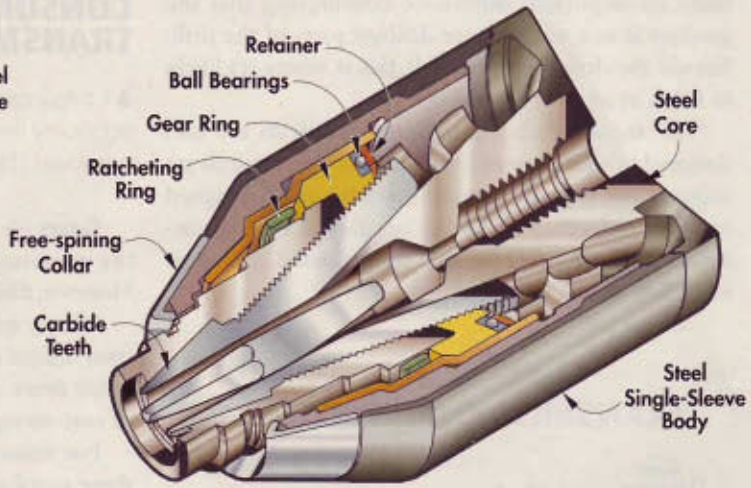
Also, the steel core of a premium chuck tends to be much thicker than the one in a consumer chuck. This makes the chuck much stronger so it can withstand drops or rough usage better than a consumer drill.

Two-Sleeve Chucks — Consumer grade drills, on the other hand, typically use a plastic, two-sleeve chuck without ratcheting action and no carbide teeth. This type of chuck requires two hands and a bit of muscle to tighten the high-speed steel teeth securely around a bit. They also lack the durability of premium chucks.

CONSUMER CHUCK



PREMIUM CHUCK



CONCLUSION

Clearly, two cordless drills that look almost identical on the outside can have some significant differences on the inside. But what all this means when you're trying to choose the best drill for you may not be entirely obvious.

And it's not at all fair to conclude from this comparison that consumer drills are necessarily "bad" tools because thay are built to different standards than premium drills.

In fact, the consumer drills we looked at for this article can do just about anything the premium drills can. It just depends on how the drill will be used. For instance, I wouldn't hesitate to build a deck or install a houseful of windows or doors using one of these consumer drills. On the other hand, if I were to make my living building decks or installing windows, I'd be foolish not to spend the extra money for a premium drill.

In a nutshell, the smaller batteries, less powerful motors, and less robust gears in consumer drills just don't have the capacity, power, or durability to work nonstop, day-in and day-out the way premium drills do.

So what it boils down to is this: if you're a pro, or work like a pro, pay for premium. For all the rest, there are several moderately priced and sufficiently capable consumer tools to choose from.

the complete HOME OFFICE SUITE

Torn between turning your spare room into a home office or a guest room? Now you can have both — with projects that make a spare room do double duty.

5 GREAT PROJECTS

There's really no such thing as a "spare" room. If you're lucky enough to have a bedroom in your home that doesn't have a full-time occupant, then you've probably faced the same question as countless homeowners before you: Will that empty room become a home office, or should we simply outfit it as a guest room?

The ideal solution is to do both. And that's precisely what these five projects do, by letting you switch easily from office to bedroom and back again.

In this issue:

COMPUTER DESK (A)

When the room is in office mode, the desk is the center of activity. This computer desk features a large worksurface with a unique wire management system built right in. The worksurface is supported by two pedestals that house a bank of drawers and a computer tower. A pull-out tray conceals the keyboard when not in use. Turn to page 54 for more.

PRINTER CABINET (B)

With construction similar to the desk pedestals, this glass-fronted cabinet has a slide-out shelf that provides easy access to the computer printer and its accessories. See page 64 for details.

LATERAL FILE CABINET (C)

Expand the desk's hanging file folder storage by adding this lateral file unit. A simple set of dividers lets you configure the drawers for standard- or legal-size folders. Find out how to build it on page 66.

Next issue (June 2005):

MURPHY BED (D)

To save space, we built a Murphy bed that tips down from a wall cabinet at night and hides behind a decorative front panel during the day.

DISPLAY CABINETS (E)

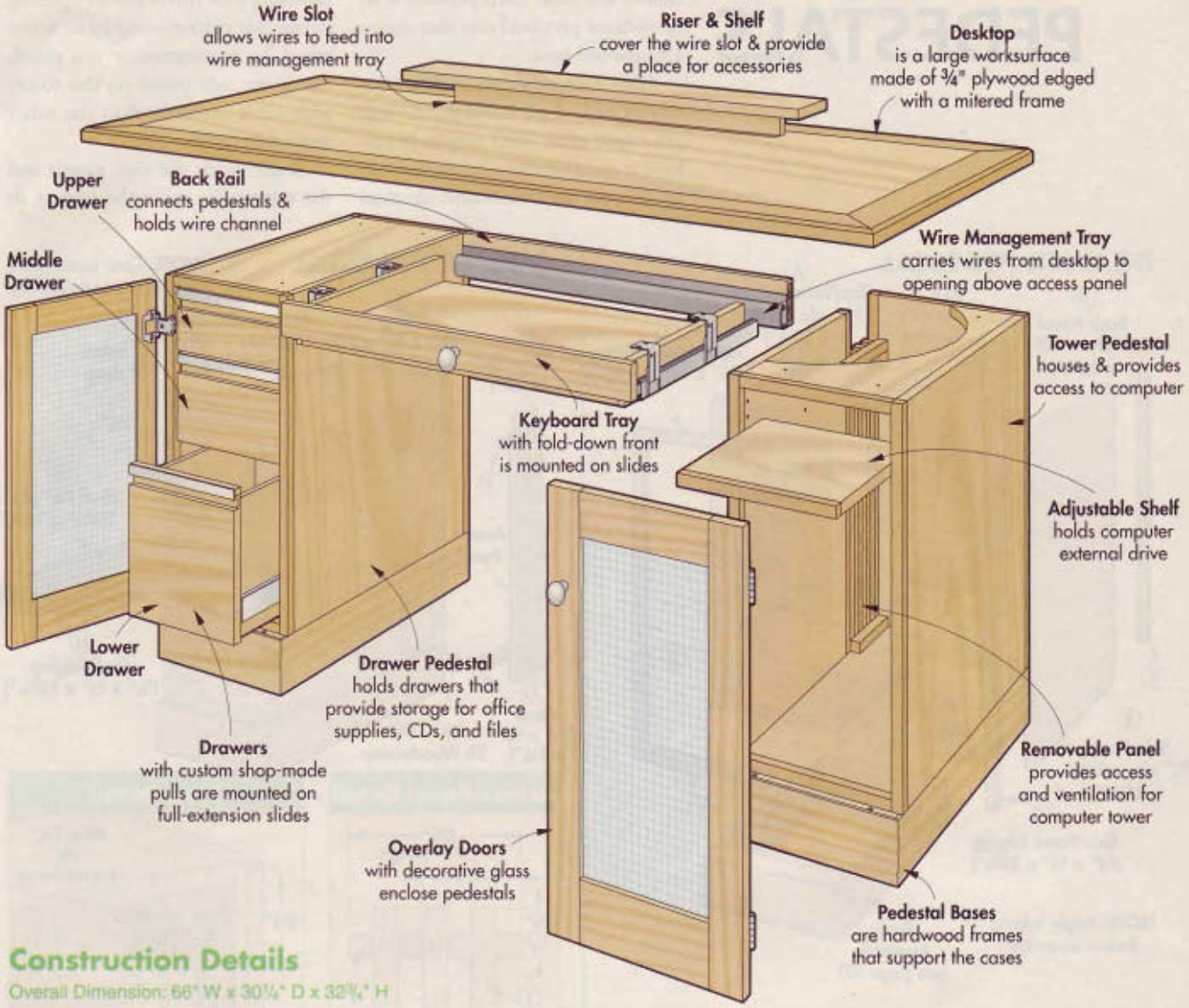
Display cases flank the Murphy bed and provide useful storage. Glass shelves and doors give the cabinets a contemporary look to complement the office furniture.

COMPUTER home office SUITE DESK

This desk features a huge worksurface and lots of storage. One of the handiest features is a removable panel for computer ventilation and wire access.

The heart of any home office is the computer desk. But what sets this desk apart from all others is that it's designed to look great anywhere in the room — whether up against the wall or out in the middle of the floor. That's the product of a unique wire management system built into the desk.

Wire Management — Taming all the wires that are part and parcel of a computer begins at the desktop. On our desk, a riser and shelf conceal these wires, which feed into a long slot in the desktop and into a wire management tray *(Wire Routing Detail)*. From there, the wires are directed



Construction Details

Overall Dimension: 66" W x 30¼" D x 32¾" H

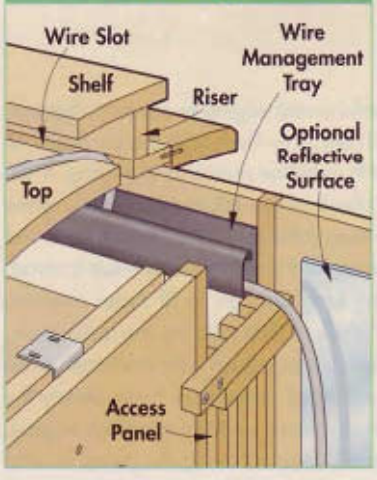
through an opening in the tower pedestal. A removable panel in this pedestal allows easy access to wires, and also provides ventilation for the computer tower. As an option, you may want to attach a mirror-like surface to the inside face of the pedestal back to see the back of the computer as you're making connections.

Top & Pedestals — The top of this computer desk, which is sized to provide an ample worksurface, is a maple plywood panel that's wrapped with a solid-wood frame *(Construction Details)*. It's supported by two pedestals enclosed by doors with textured glass. One pedestal holds a computer tower. The other contains three drawers that provide handy storage for office supplies, CDs, and files.

Keyboard Tray — Mounted on slides between the pedestals, the keyboard tray is wide enough to hold both the computer's keyboard and mouse. When not in use, the tray is concealed behind a fold-down front disguised as a drawer.

The Finish — To give the maple desk a warm, rich look, we used one of our favorite shop finishes. This finish "recipe" is easy to make and apply, but durable enough for hard use. For more about this custom blend used in the *Workbench* shop, see page 78.

Wire Routing Detail

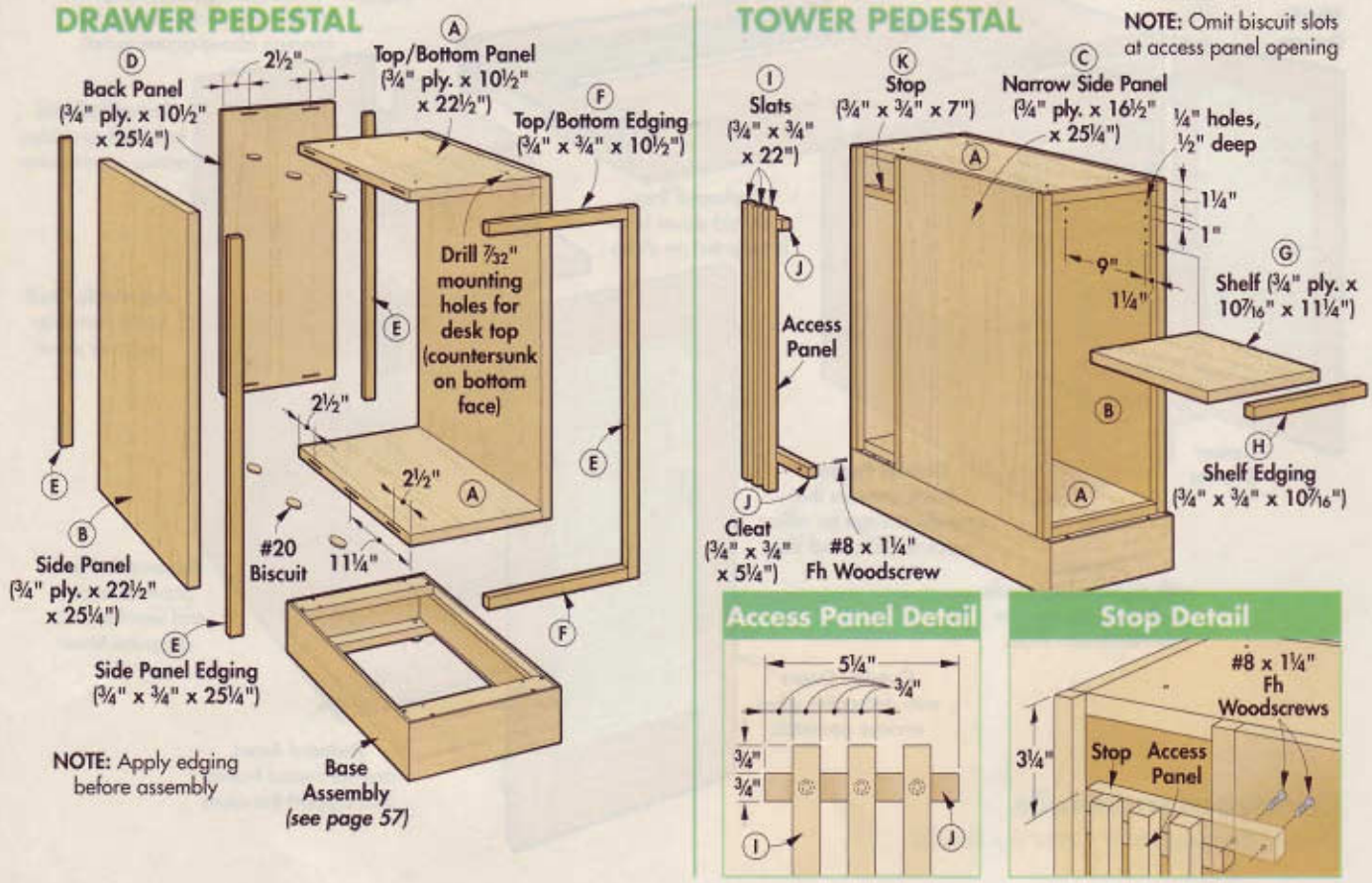


build a pair of PEDESTALS

The two pedestals are the foundation of this desk. Each pedestal is an open-front plywood case that sits on a hardwood base.

Case Construction — The cases consist of 3/4" plywood panels that are edged with solid maple. If you look at the *Illustrations* below, you can see that the cases are almost identical — but not quite. The case that houses the computer tower has an opening in one side that's covered by an access panel. To accommodate this panel, the inner side panel on the tower pedestal is narrower than the other three side panels.

Begin with the case panels and the edging. To make the edging fit



2 TIPS FOR PERFECT EDGING

When applying solid-wood edging to a plywood panel, the goal is to get it perfectly flush with the plywood. To do that, I start with oversize panels and edging. If the solid wood gets glued to the *edges* of a panel, make the panel extra-*long* (about 1/2"). If the solid wood goes on the *ends*, make the panel extra-*wide* instead.

Cut the edging long enough to fit these oversize panels, and 1/8" thicker. After gluing the edging on, use a flush-trim bit to rout it flush with the faces of the panel *(Fig. 1)*. A rabbeted scrap block helps steady the router and allows clearance for the extra-thick edging.

Once that's done, crosscut or rip the panel — and the attached edging — to final size *(Fig. 2)*.

perfectly flush with the panels, all of the panels start out as oversize pieces — either in width or length *(the Sidebar on page 56 explains why)*. Then the panels, along with the attached edging, are trimmed to final size.

With that in mind, cut the top and bottom panels (A) about $^1/_2$" extra *wide*. And make the side (B,C) and back (D) panels $^1/_2$" extra *long*. Then glue on the edging and trim it flush.

Adjustable Shelf — There's one more panel to take into account — an adjustable shelf (G) that holds an external computer drive. Here again, this is a plywood panel with edging (H) on the front. To hold the shelf, drill holes for shelf pins, as shown in the *Tower Pedestal Illustration*.

Biscuit Joints — Now it's time for the joinery. I chose biscuits as a quick and easy way to assemble the cases. The *Sidebar* below will walk you through the process of cutting the biscuit slots. Once that's done, glue the top, bottom, and sides together, and then add the back panel to square up the case.

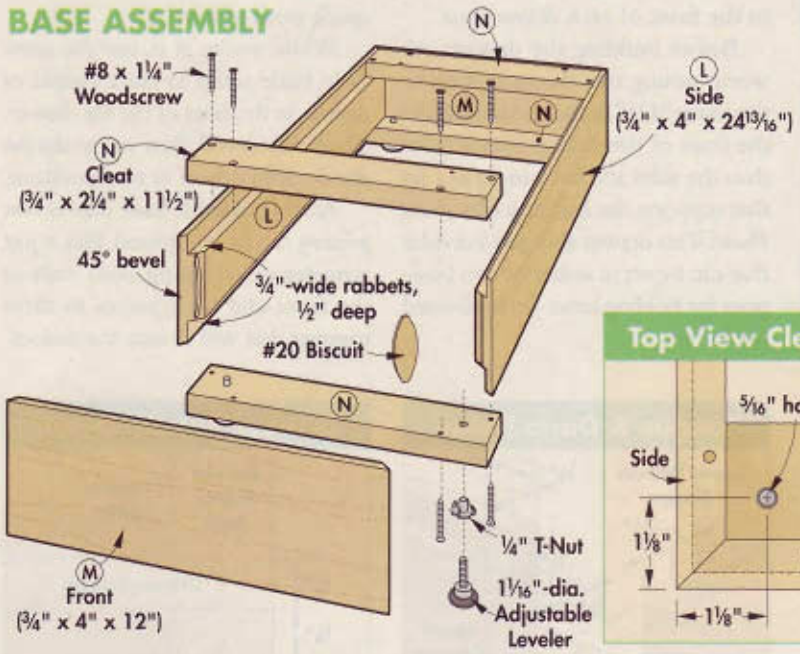
Access Panel — The next step is to make the access panel for the tower pedestal. It's made up of three vertical slats (I) that are glued and screwed to a pair of cleats (J) *(Access Panel Detail)*. The access panel is designed to slip into the opening in the case with a friction fit. A stop (K) at the top holds it flush with the narrow side panel.

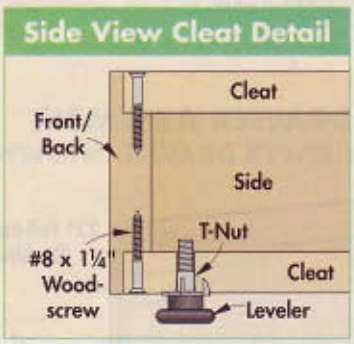
Build the Bases — With the case complete, you can focus on the bases. Each base is a hardwood frame with cleats on top and bottom *(Base Assembly)*. The frame consists of two sides (L) and a front and back (M) that are rabbeted to hold the cleats. These frame pieces are beveled on the ends and slotted for biscuits *(see page 32)*.

Add the Cleats — After gluing the frames together, it's just a matter of adding the cleats (N). You'll need to drill countersunk shank holes in the upper cleats for screws that will be used to secure the base to the case. Then bore holes in the lower cleats for T-nuts. The T-nuts receive adjustable levelers that allow you to level the desk.

To simplify assembly, it's best to glue and screw the upper cleats in place first. Then fasten the pedestal to the upper cleats with screws. Finally, attach the lower cleats the same way and install the levelers.

BASE ASSEMBLY





BISCUIT TIPS & TRICKS

▲ To lay out the locations of the biscuit slots, butt the mating panels together and mark centerlines across the joint.

▲ Next, align the plate joiner's centerline with the layout line, and cut slots centered on the thickness of the panel.

▲ Using the same fence setting, cut the slots in the face of the panel. A scrap board keeps the joiner from tipping.

▲ Mounted on full-extension slides, these desk drawers hold a variety of office supplies, including hanging file folders *(right)*.

build a bank of DESK DRAWERS

A bank of three different-sized drawers provides storage in the left-hand pedestal of this computer desk *(Photo, left)*. The upper drawer holds office supplies; the middle one is sized for CDs; and the large lower drawer accommodates hanging file folders.

Aside from their size, the drawers are similar. The drawer boxes are assembled with tongue and dado joints and mounted on full-extension drawer slides. And a false front with a shop-made pull is attached to the front of each drawer box.

Before building the drawers, it's worth noting two things that make the lower "file" drawer unique. First, the front of this drawer box is taller than the sides and back to form a lip that supports the hanging files *(Inset Photo)*. This drawer also gets a divider that can be set in either of two positions for holding letter- or legal-sized file folders.

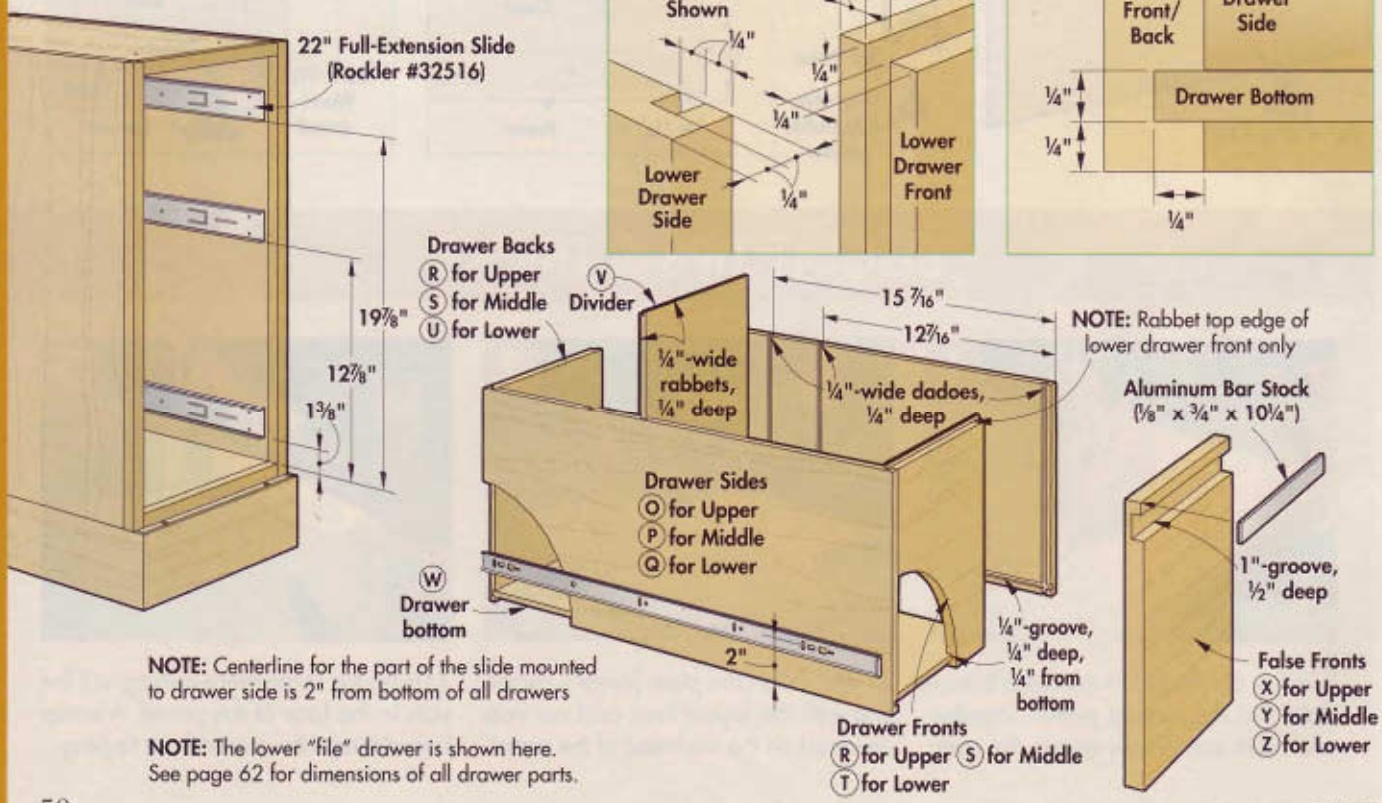
Build the Drawer Boxes — The first step in building the drawer boxes is to cut the sides (O, P, Q), fronts and backs (R, S, T, U), and the divider (V) to size from $^1/_2$"-thick maple *(see Drawer Assembly below and Materials List on page 62 for dimensions)*.

Now it's time to tackle the tongue-and-dado joints. Start by cutting dadoes in the drawer sides, which will accept tongues on the front and back pieces *(Tongue & Dado Detail)*. A table saw with a $^1/_4$" dado blade makes quick work of this.

While you're at it, use the same dado blade setup to cut a couple of dadoes in the sides of the file drawer. These dadoes will allow you to slip the divider into one of its two positions.

At this point, the basic drawer box joinery can be completed. This is just a matter of rabbeting both ends of the front and back pieces to form tongues that will fit into the dadoes.

DRAWER ASSEMBLY (LOWER DRAWER SHOWN)



Tongue & Dado Detail

Drawer Bottom Detail

NOTE: Centerline for the part of the slide mounted to drawer side is 2" from bottom of all drawers

NOTE: The lower "file" drawer is shown here. See page 62 for dimensions of all drawer parts.

You'll also need to rabbet the ends of the divider, once again forming tongues that fit into the dadoes in the sides of the file drawer.

That done, there's one more rabbet to cut. To create a lip that holds the hanging file folders, rabbet the top edges on the front of the file drawer and the divider.

Next, cut a groove in each piece except the divider to hold a 1/4" plywood drawer bottom (W) *(Drawer Bottom Detail)*. Then glue and clamp the drawer boxes together.

Install the Drawers — The next step is to install the drawers. To provide easy access to the contents, they're mounted on full-extension drawer slides. It's important that the slides are properly aligned from one side of the pedestal to the other. Otherwise, the drawers will bind.

A spacer made from a scrap of sheet material makes it easy to accurately align the slides *(Photo, above right)*. For starters, make the spacer tall enough to position the upper slide. After installing both upper slides, trim the spacer to the appropriate height for the middle drawer slides, and then once again for the lower ones.

That takes care of the part of the drawer slide that attaches to the cabinet. For the drawer part of each slide, mount them as shown in the *Drawer Assembly Illustration*.

Putting On a Front — Once the drawer boxes are installed, it's time to add the false fronts (X,Y,Z). These are 3/4"-thick pieces of maple with the shop-made pulls I mentioned earlier *(Sidebar, below)*.

After making the false fronts, you can attach them to the drawers. The goal here is to center the false fronts from side to side, with a 1/4" vertical gap between them. I used shims to ensure a consistent gap *(Photo, right)*. And the side-to-side position can be "eyeballed" pretty accurately. Double-sided tape holds the false fronts in place while you attach them to the drawer boxes with screws.

▲ Using a spacer to support the drawer slides makes installation easy and accurate.

▲ A couple of 1/4" hardboard shims ensure even spacing between false fronts.

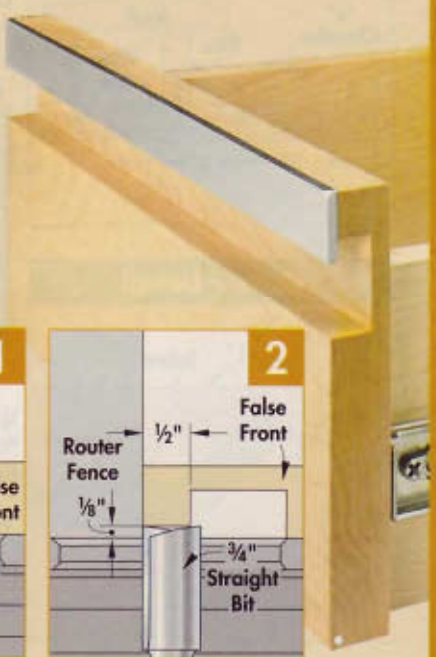
CUSTOM DRAWER PULLS

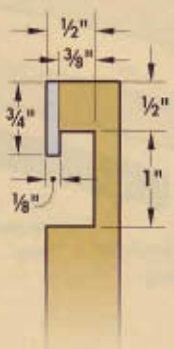
Nothing distinguishes custom furniture from factory products like shop-made pulls. And the unique pulls for these desk drawers are as easy to make as they are attractive and functional. They are formed by a recess in the false front of the drawer and a strip of 1/8"-thick aluminum.

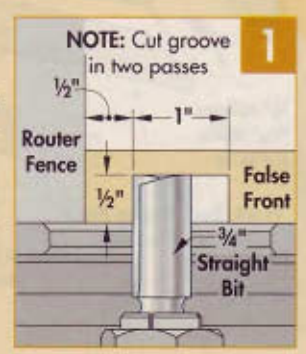
The recess is made by cutting a wide groove near the top edge of each false front *(Fig. 1)*. To produce a clean, flat-bottomed recess, I'd recommend using a router table and a straight bit to cut the groove. Slide each piece over the bit, using a slow, steady feed rate. Then move the fence and make another pass to widen the groove.

Once the recess is complete, it's just a matter of attaching the aluminum strip. This strip should sit flush with the face of the false front. That requires reducing the thickness of the lip on the false front to which the strip is attached. To do that, lower the router bit, adjust the fence, and make a shallow pass on each piece *(Fig. 2)*.

The aluminum strip is glued to the false front with epoxy. To ensure a strong, permanent bond, it's important to sand the back of each strip before applying the epoxy and then attach it immediately.







add the worksurfaces

TOP & KEYBOARD TRAY

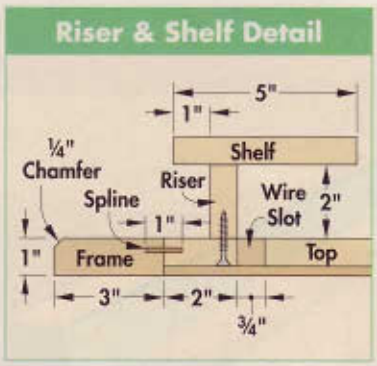
With the pedestals complete, I set about making the desktop and keyboard tray that mounts underneath.

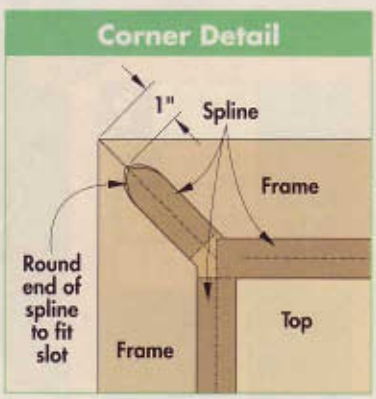
BUILD THE DESKTOP

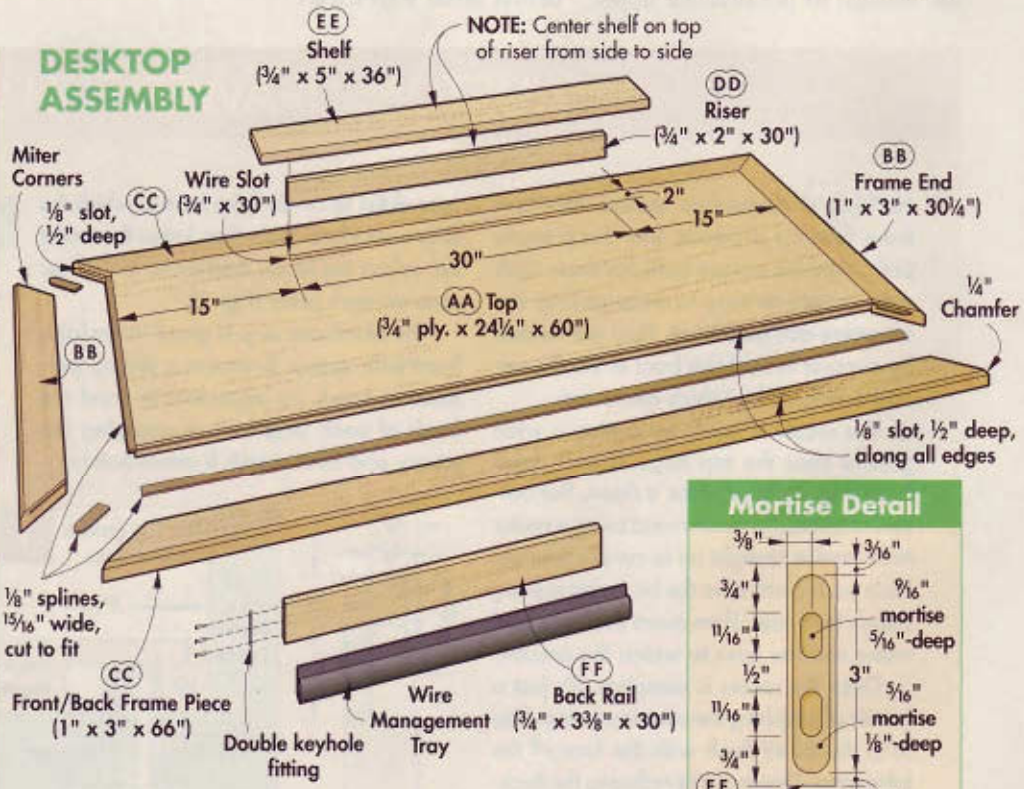
The desktop is a large plywood panel wrapped with a thick, mitered frame. A long slot lets you feed wires down through the desktop. This slot is concealed by an elevated shelf that holds small items like speakers.

Begin by cutting the top (AA) to size from ¾" plywood *(Top Assembly Illustration)*. Then rip the frame ends (BB) and the front and back (CC) pieces to width from 1"-thick maple. You'll want to crosscut these pieces a couple of inches longer than necessary, as this will make it easier to "sneak up" on a tight-fitting miter joint.

Miter & Fit the Frame — To ensure tight-fitting joints, I cut the miters for one corner at a time, then dry-clamp the pieces to the top to check the fit. After making any nec-







essary adjustments, I work my way from corner to corner until all four miter joints fit nice and tight.

Alignment Splines — The frame pieces must also fit flush with the top. That's the job of some long alignment splines that fit into grooves in the edges of the top and frame pieces. Short splines in the mitered ends of the frame pieces strengthen what is otherwise a weak glue joint because it's mostly end grain.

To cut the grooves for the splines, start by fitting an 1/8" slot-cutting bit in a handheld router. Adjust the depth of cut to center the slot on the plywood top. Then set the router on top of the plywood panel and rout the groove from left to right. Use the same setup (and register the base of the router on the corresponding surface) to cut the slots in the frame pieces. This will guarantee a flush fit on top. Also, when cutting the slot in the mitered ends, stop 1" from the outer edge.

Once the grooves are done, cut splines from 1/8" hardboard. You'll need to shape one end of the corner splines to allow the miter joints to come together *(Corner Detail)*. Now dry-clamp the frame one last time, make any adjustments needed, and glue it to the top *(Photo, upper right)*.

Rout a Chamfer — The next step is to rout a chamfer around the top edge of the frame. One thing to be aware of is that the wood fibers at the tips of the miters are fragile, so they could chip out at the end of the cut. To prevent that, rout a short chamfer first *(Photo, lower right)*. Then follow up by routing the chamfer along the entire length of the adjoining piece. Since the wood fibers are already removed, they can't chip out.

Wire Slot — Routing the wire slot is next. A handheld router fitted with a 3/4" straight bit makes quick work of this. Clamp a straightedge to the desktop to guide the router, and attach stops to establish the ends of the slot. Then rout the slot, making three progressively deeper cuts.

Add the Riser & Shelf — Now it's time to add the riser (DD) and shelf (EE). These are pieces of 3/4"-thick maple that are glued together into a T-shaped assembly *(Riser & Shelf Detail)*. Position this assembly flush with the back of the wire slot, and glue and screw it to the top.

Back Rail — With the top completed, you can turn your attention to the back rail (FF) that connects the two pedestals. The ends of this rail are mortised to receive double keyhole fittings that mount flush with the ends *(Fitting Detail)*. Later, this hanging hardware will hook over screws installed in the pedestals to "lock" them together *(see page 63)*.

KEYBOARD TRAY

At this point, you can turn your attention to the keyboard tray.

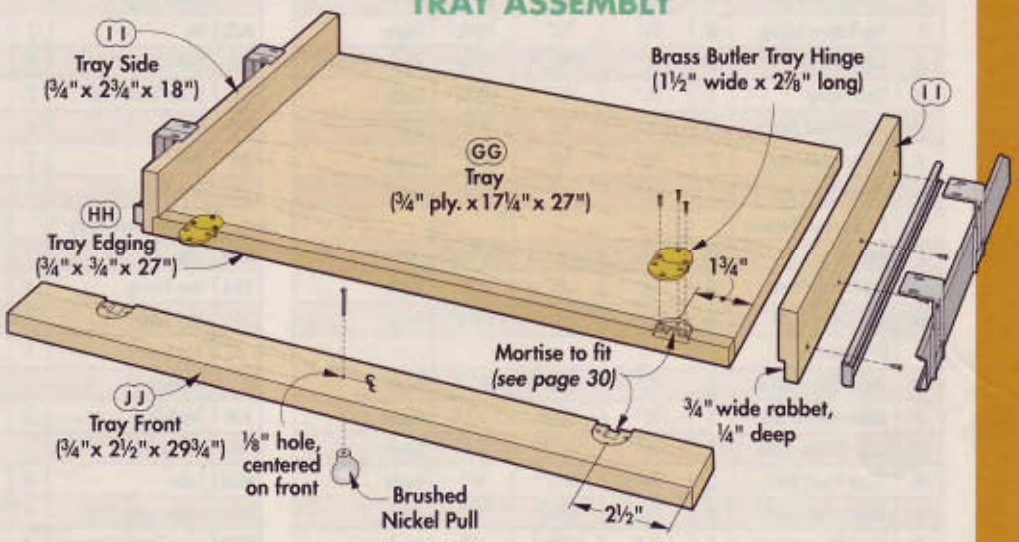
As you can see in the *Illustration* below, the tray (GG) is a piece of 3/4" plywood with maple edging (HH) glued to the front. Two sides (II) are rabbeted to accept the tray. And a front (JJ) piece is attached with spring-loaded butler tray hinges. *(For tips on installing this type of hinge, see page 30.)*

The tray is mounted underneath the desktop with full-extension slides. Separate these slides into two parts, and mount one half to the tray. The other half (the one with the mounting bracket) will mount to the top when you set up the desk *(see page 63)*.

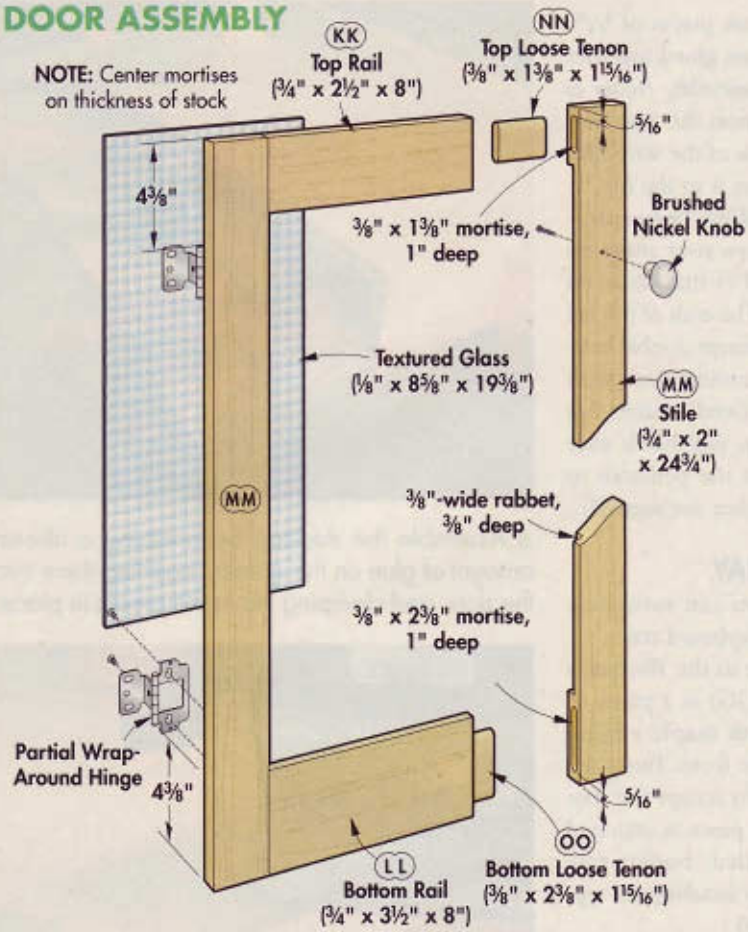
▲ Assemble the desktop by brushing a liberal amount of glue on the splines, inserting them into the slots, and clamping the frame pieces in place.

▲ To prevent chipout, first rout a short chamfer on one frame piece. Then rout the chamfer on the adjoining piece, routing up to the initial cut.

TRAY ASSEMBLY



DOOR ASSEMBLY



decorative GLASS DOORS

In keeping with the contemporary look of this computer desk, the doors that enclose the pedestals feature decorative glass panels surrounded by a a solid-wood frame.

Frame Construction — The frames are sized to match the width of the pedestals. As for height, they're ½" shorter than the case, which provides for a ⅛" gap at the bottom of the door and under the overhanging desktop.

I used mortise-and-loose-tenon joints to assemble the frames. This type of joint doesn't require taking the tenons into account when sizing the frame pieces. Just rip the rails (KK, LL) and stiles (MM) to width, then crosscut them to length.

Next, cut the mortises in each of the mating pieces. You can do this with a drill press and chisel. Or, if you build the router mortising jig on page 40, this is a great way to break it in. Then cut the loose tenons to fit. **Note:** For more information on how to make mortise-and-loose tenon joints, visit WorkbenchMagazine.com

Install Glass & Doors — After gluing up the frames, it's time to add the glass. To hold the glass, rout a rabbet in the back inside edge of the frame, and chisel the corners square. A bead of silicone sealant secures the glass. Install the hinges, then mount the doors to the pedestals.

MATERIALS

	Part	Qty	T	W	L	Material
	Pedestal Cases					
A	Top/Bottom Panels	4	¾"	10½"	22½"	Maple Plywood
B	Side Panels	3	¾"	22½"	25¼"	Maple Plywood
C	Narrow Side Panel	1	¾"	16½"	25¼"	Maple Plywood
D	Back Panels	2	¾"	10½"	25¼"	Maple Plywood
E	Side Panel Edging	9	¾"	¾"	25¼"	Maple
F	Top/Bottom Edging	8	¾"	¾"	10½"	Maple
G	Adjustable Shelf	1	¾"	10⁷⁄₁₆"	11¼"	Maple Plywood
H	Shelf Edging	1	¾"	¾"	10⁷⁄₁₆"	Maple
I	Access Panel Slats	3	¾"	¾"	22"	Maple
J	Access Panel Cleats	2	¾"	¾"	5¼"	Maple
K	Access Panel Stop	1	¾"	¾"	7"	Maple
	Pedestal Bases					
L	Base Sides	4	¾"	4"	24¹³⁄₁₆"	Maple
M	Base Fronts/Backs	4	¾"	4"	12"	Maple
N	Base Cleats	8	¾"	2¼"	11½"	Maple
	Drawers					
O	Upper Drawer Sides	2	½"	3¾"	22"	Maple
P	Middle Drawer Sides	2	½"	5¾"	22"	Maple
Q	Lower Drawer Sides	2	½"	10¼"	22"	Maple
R	Upper Front/Back	2	½"	3¾"	9"	Maple
S	Middle Front/Back	2	½"	5¾"	9"	Maple
T	Lower Drawer Front	1	½"	10⁷⁄₁₆"	9"	Maple
U	Lower Drawer Back	1	½"	10¼"	9"	Maple
V	Lower Drawer Divider	1	½"	9¹⁵⁄₁₆"	9"	Maple
W	Drawer Bottoms	3	¼"	9"	21½"	Maple Plywood
X	Top Drawer False Front	1	¾"	4¾"	10¼"	Maple
Y	Middle False Front	1	¾"	6¾"	10¼"	Maple
Z	Lower False Front	1	¾"	11¼"	10¼"	Maple
	Desk Top					
AA	Top	1	¾"	24¼"	60"	Maple Plywood
BB	Frame Ends	2	1"	3"	30¼"	Maple
CC	Frame Front/Back	2	1"	3"	66"	Maple
DD	Riser	1	¾"	2"	30"	Maple
EE	Shelf	1	¾"	5"	36"	Maple
FF	Back Rail	1	¾"	3⅜"	30"	Maple
	Keyboard Tray					
GG	Tray	1	¾"	17¼"	27"	Maple Plywood
HH	Tray Edging	1	¾"	¾"	27"	Maple
II	Tray Sides	2	¾"	2¾"	18"	Maple
JJ	Tray Front	1	¾"	2½"	29¾"	Maple
	Doors					
KK	Top Rails	2	¾"	2½"	8"	Maple
LL	Bottom Rails	2	¾"	3½"	8"	Maple
MM	Stiles	4	¾"	2"	24¾"	Maple
NN	Loose Tenons, Top	4	⅜"	1⅜"	1⁵⁄₁₆"	Maple
OO	Loose Tenons, Bottom	4	⅜"	2⅜"	1⁵⁄₁₆"	Maple

7 Easy Steps to

SETTING UP THE DESK

Setting up this computer desk isn't complicated, but the desk is a bit heavy and awkward to handle. So it's a good idea to round up some help before you get started. For the same reason, choose the place in the room you plan to use the desk, and set it up there.

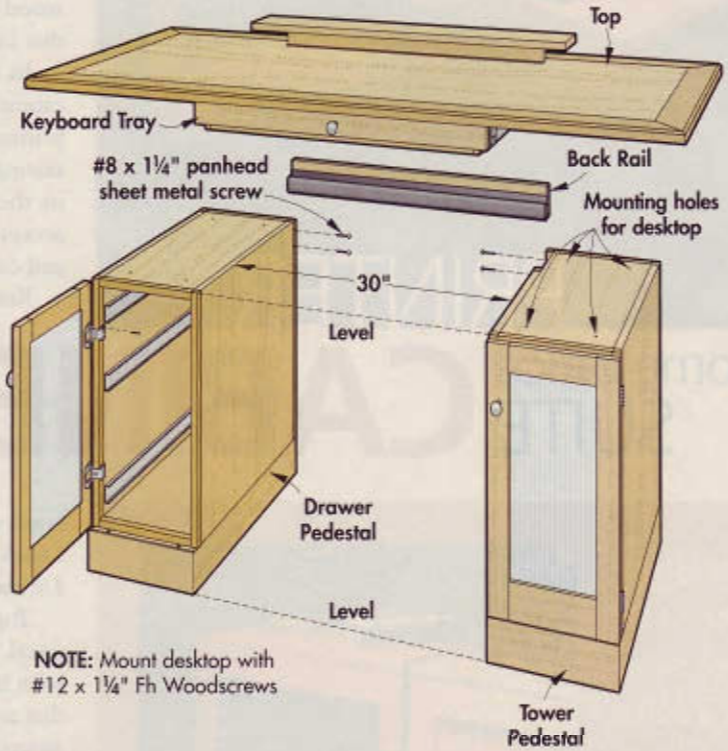
One thing to keep in mind is that the pedestals must be level before attaching the desktop. In addition, both pedestals should be at the same height. The levelers installed in the bases of the pedestals make that an easy task. Once that's done, you can proceed with the rest of the installation as detailed below.

1) Level Pedestals — Prepare for desk assembly by setting the pedestals 30" apart and leveling them as described above.

2) Mount Back Rail — Install two panhead screws in each pedestal as "mounting posts" *(Photo A)*. Then fit the keyhole hangers over the screws, and tap the rail into place. Check that both pedestals are square to the rail.

3) Mark Pedestal Locations — Center the desktop on the pedestals from side to side and front to back. Then mark lines underneath the top showing the locations of the pedestal sides and doors *(Photo B)*.

4) Drill Mounting Holes — Using the pre-drilled holes in the pedestals as guides, drill mounting holes into the underside of the desktop.



5) Lay Out Tray Location — Flip the top upside down, then center the tray (with slides attached) between the layout lines for the pedestal sides *(Photo C)*. Also, align the tray front with the layout lines for the doors. Now mark the locations of the mounting brackets on the tray slides as shown.

6) Attach Tray Slides — Separate each tray slide into its two components. Realign the mounting brackets on the slides with the layout lines *(from Step 5)* and fasten them with screws *(Photo D)*. Then reinstall tray.

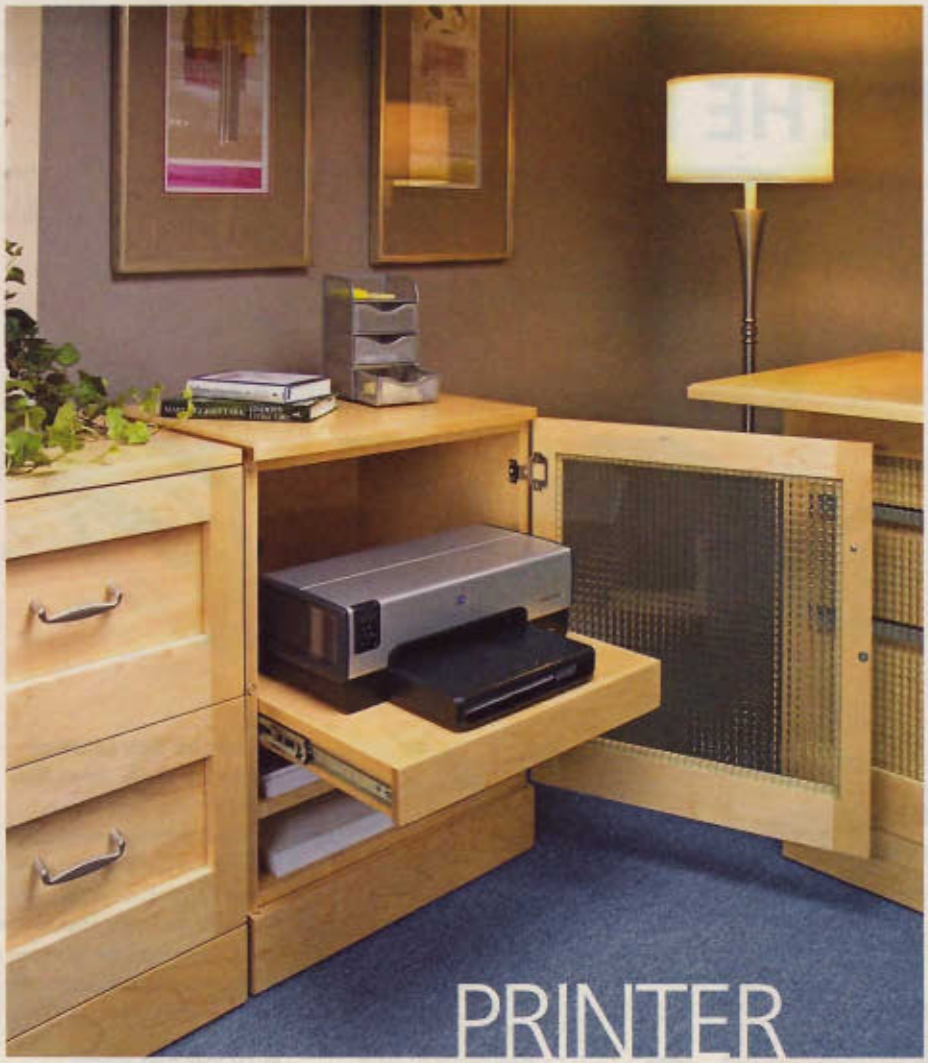
7) Secure the Desktop — Flip the desktop right-side up, reposition it on the pedestals, and install mounting screws.

HARDWARE & SUPPLIES

(1) Brushed Nickel Pull (#34659)*
(2) Brushed Nickel Knobs (#33678)*
(3) Pairs of 22" Full-Extension Drawer Slides (#32516)*
(1) Pair of 18" Full-Extension Keyboard Slides (#36304)*
(1) Wire Management Tray (#13665)*
(2) Textured Glass (#38821)*
(2) Pairs of Partial Wrap-Around Hinges (#49393)*
(8) 1⅛"- dia. Adjustable Levelers (#18631)*
(3) Lengths of ⅛" x ¾" Aluminum Bar Stock
(1) Pair 1½" x 2⅜" Brass Butler Hinges (#60624)*
(1) Pair ⅝" x 3" Double Keyhole Fittings (#28829)*
(4) #8 x 1¼" Panhead Sheet Metal Screws
(60) #8 x 1¼" Flathead Woodscrews
(8) #8 x 1" Flathead Woodscrews
(8) #12 x 1¼" Flathead Woodscrews
(1) CD Holder (#30536)*
⅛" hardboard splines x 15/16" wide (16 lin. ft.)
Clear Silicone Caulk
#20 Biscuits
(8) ¼" T-nuts

* Available from www.Rockler.com

ONLINE Extras **Desk Cutting Diagram**
WorkbenchMagazine.com



PRINTER CABINET

home office SUITE

This printer cabinet complements the computer desk nicely. In fact, it's just a simple variation of the desk pedestal. Its slide-out tray will hold an inkjet printer, while still leaving ample room for paper storage below.

To complement the style and function of the computer desk shown on page 54, we built this printer cabinet. It offers storage and convenient access to the one computer component the desk can't handle — an inkjet printer.

To make construction simple, as well as tie all your office furniture together, it's built almost exactly like the desk pedestals shown on page 56. Just like the pedestals, it has a solid-wood base, a plywood case edged with maple, and a frame-and-glass-panel door.

Cabinet Details — There are, however, some important differences between this cabinet and the pedestals.

First of all, the cabinet is wider, so it will accommodate most inkjet printers. Second, the cabinet is capped with an edge-banded plywood top (rather than the desktop that caps the pedestals).

In addition, the interior of the cabinet has a slide-out tray for the printer and an adjustable shelf for storing paper. And finally, a hole cut in the back panel of the cabinet accepts a flexible grommet for cords and cables to pass through.

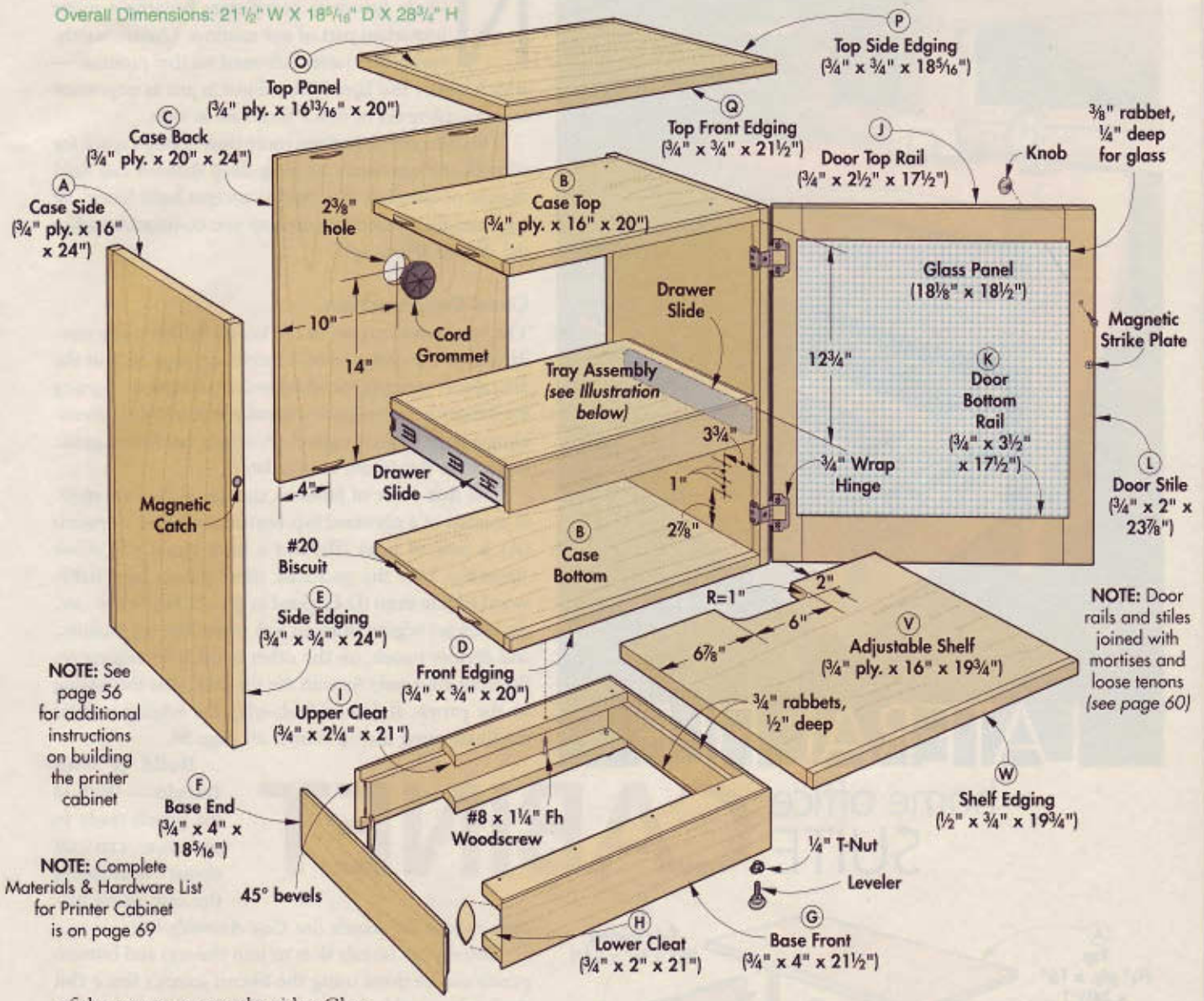
Keeping these differences in mind, go ahead and build the basic case, base, and frame-and-panel door using the instructions that begin on page 56 and the *Construction Details* at right. (A complete *Materials List* for the cabinet is on page 69.)

Top — Now you can add the top panel. It's a $^{3}/_{4}$" plywood panel (O) with hardwood edging strips (P, Q) that are mitered to length and glued around it. After you build the top, just position it flush with the back and sides, overhanging the front $^{13}/_{16}$", and screw it in place.

Printer Tray — The slide-out printer tray is a six-piece assembly of a plywood tray (R), two hardwood sides (S), a hardwood front (T), and two edging strips (U). To build it, first cut the pieces to size on the table saw. Then, cut dadoes in the bottom

Construction Details

Overall Dimensions: 21½" W X 18⁵⁄₁₆" D X 28¾" H

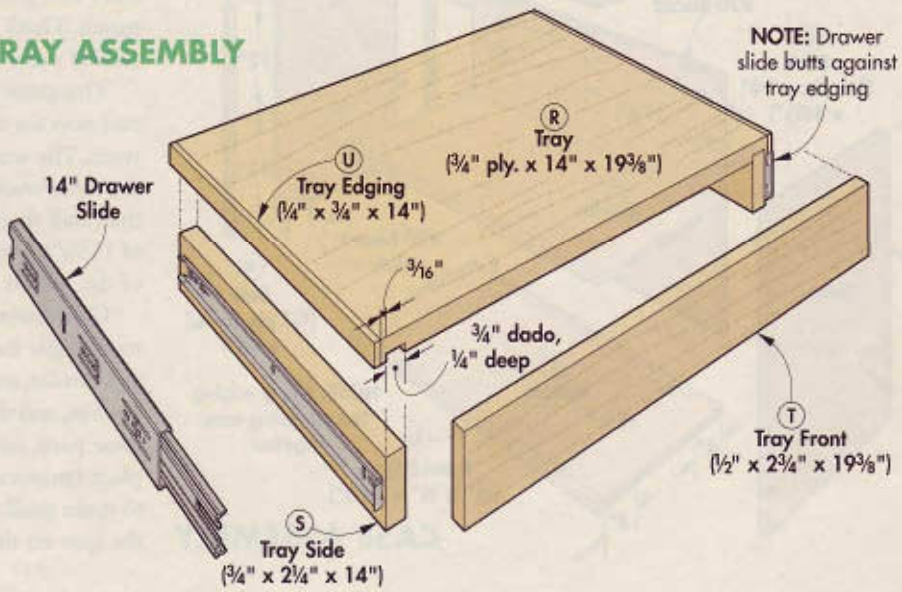


of the tray to accept the sides. Glue the tray together, making sure the tray front aligns flush with the top of the tray *(Tray Assembly, right)*. Once the glue sets, you can install the tray in the case using drawer slides.

Shelf — The adjustable shelf (V) is an even quicker addition since it's just a plywood panel with a strip of hardwood edging (W) glued to the front edge. The shelf has a notch in the back edge to allow clearance for cords in case you want to put other electronic components in the cabinet. This notch is easy to cut with a band saw or jig saw.

The adjustable shelf rests on shelf pins. These fit into holes drilled in the cabinet sides.

TRAY ASSEMBLY



LATERAL FILE
home office SUITE CABINET

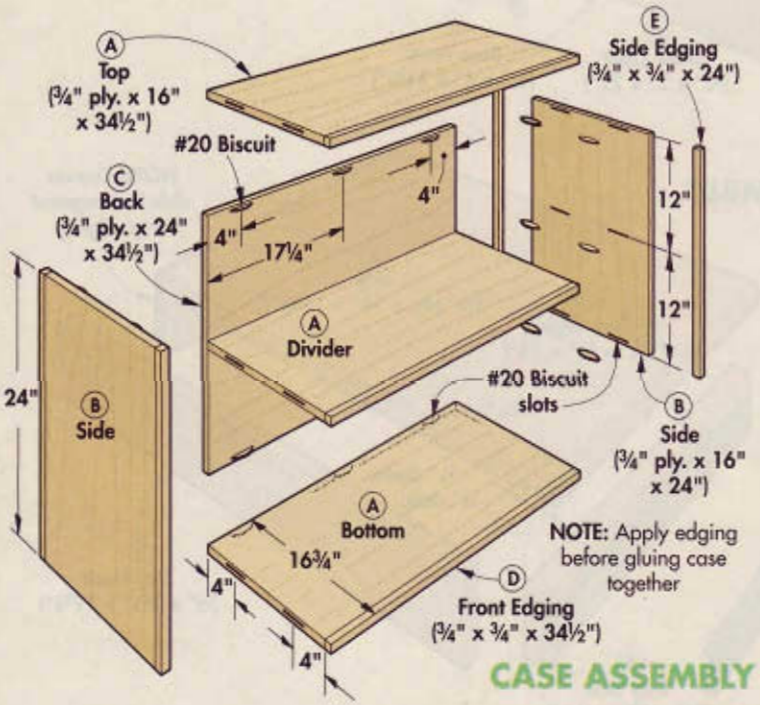
Not long ago, the "paperless office" seemed a likely future as computers became a more important part of our routines. Unfortunately, computers never delivered on that promise — which is why this lateral file cabinet is just as important to a complete set of office furniture as ever.

This file cabinet features more than enough space for all your storage needs. Its long, deep drawers can hold dozens of hanging files. And it accepts both letter- or legal-size files, depending on how you compartmentalize the drawer *(Photo, left)*.

Case Construction

The basic construction of the lateral file has many similarities to the desk pedestals shown on page 56. But the file cabinet presents the additional challenges of aligning the joinery between larger cabinet pieces and then assembling a large cabinet squarely. A simple hardboard guide helps with this (more on that later).

The first order of business, though, is the case itself. It consists of a plywood top, bottom, and divider panels (A), a pair of sides (B), and a back panel (C) *(Case Assembly)*. Like the pedestals, these panels have hardwood edging strips (D, E) glued to them. Only in this case, the sides get edging strips on *both* edges. The top, bottom, and divider panels, on the other hand, have edging on the front edge only. As with the the desk, glue the edging to the panels, and then flush-trim the edging to final thickness using the tip shown on page 56.



CASE ASSEMBLY

Build It with Biscuits — With all the panels ready to go, you can set about assembling the case, using biscuits to join the panels *(see Case Assembly, left)*.

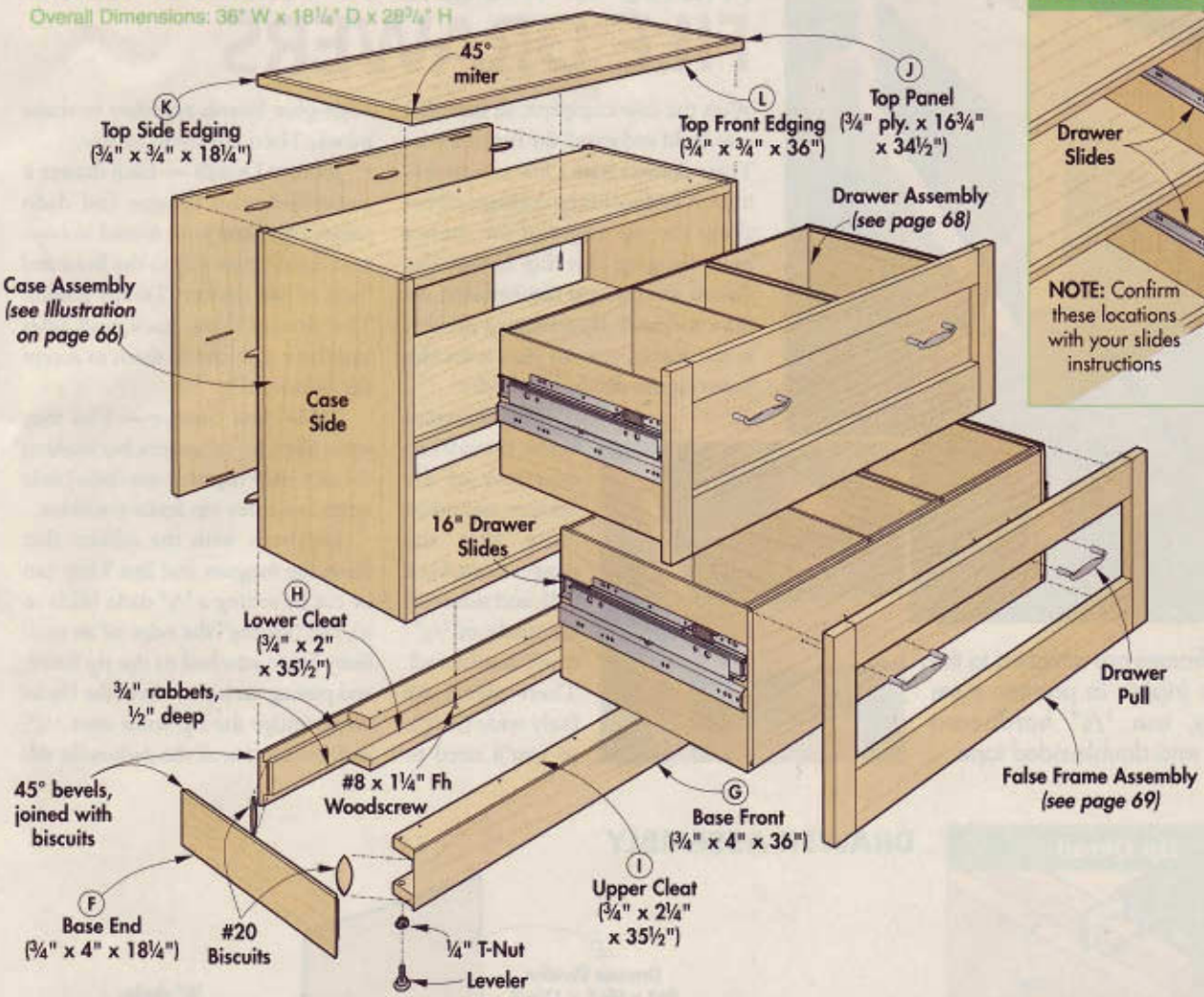
Cutting the biscuit slots to join the top and bottom panels can be done using the biscuit joiner's fence But that's not possible in the middle of the side and back panels. That's where the hardboard guide (mentioned earlier) really came in handy.

This guide makes it easy to cut perfectly aligned biscuit slots for the cabinet divider without a lot of layout work. The way it works is simple. By making the guide the same width as the side panels, and then slightly less than half their length ($^3/_8$" less, to be exact, for a total of $11^5/_8$"), I was able to use the guide to register the base of the biscuit joiner as I cut the slots *(see Photo, right)*.

Case Assembly — Once the slots are cut, you're ready to assemble the case. A good way to do this is to stand the top, divider, and bottom panels on edge, apply glue, insert biscuits, and then attach the side panels to them. Clamp these parts, and turn the case upright. Clamp the back in place temporarily to square up the case, and use a mallet to make small adjustments as you square up the case. Once the glue on this assembly dries, glue the back in place.

Construction Details

Overall Dimensions: 36" W x 18¼" D x 28¾" H



Drawer Slide Detail

Adding the Base — If you saw the pedestals for the computer desk on page 56, then the base of this file cabinet should look familiar *(Construction Details, above)*. Just like on the pedestals, the base ends (F), front, and back (G) have rabbets cut along the top and bottom edges to accept hardwood cleats (H, I), which are used to mount and level the cabinet. To build it, first bevel the ends of the base pieces. Then cut slots for biscuits in the beveled ends *(see the tip on page 32)*, and then glue the base pieces together.

Here again, glue the upper cleats to the base first to simplify assembly. Then drive screws up through the cleats into the bottom panel of the case. Now glue on the lower cleats, and install the levelers.

Top It Off — The last step in making the basic cabinet is to add the top. Like the printer cabinet top on page 64, it's a plywood panel (J) that's wrapped with strips of hardwood edging (K, L) that are mitered to length and glued in place. As with the printer cabinet, position the top on the cabinet so it's flush on the back and on the sides, and overhangs the front by ¾". Then screw it in place from inside the case.

QUICK TIP: BISCUIT SLOTS

▲ Cutting biscuit slots that align with one another across the center of a panel is challenging because there's no place to register the fence of your biscuit joiner. A simple solution is to use a hardboard guide to register the base of the joiner as you cut.

make & install
FILE DRAWERS

▲ False frames are attached to the drawers *(right)*. To position them properly, use 1/8" hardboard spacers and double-sided tape.

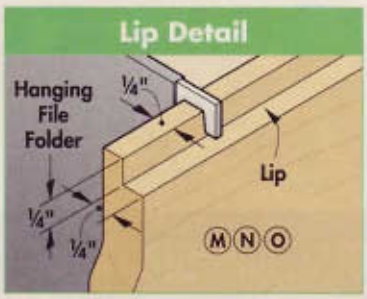
With the case complete, all that's left is to build and install the two drawers. These drawers have a few unique features. A lip formed by cutting a rabbet along the top edges of the drawer holds hanging files *(Lip Detail)*. The drawer accepts legal files between the front and back. By arranging dividers in the drawer, you can place letter files between the dividers and sides.

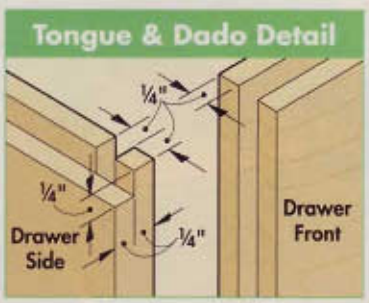
The *Illustration* below provides an overview of the drawer assembly. Note that the drawer front, back (M), and sides (N) are made of 1/2"-thick hardwood. These pieces are fairly wide (9 3/4"), so you'll need to edge-glue boards together to make panels. Then cut them to size.

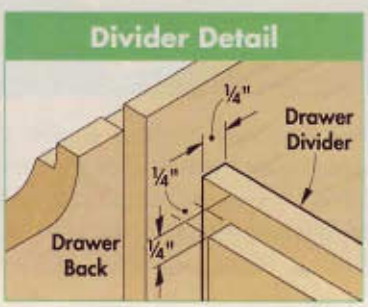
Joinery Details — Each drawer is assembled with tongue and dado joints. This same joint is used to connect the dividers (O) to the front and back of the drawer *(Divider Detail)*. The drawer front, back, and sides each have a groove in them to accept the bottom (P).

Table Saw Setups — This may seem like a lot of joinery, but making the cuts only requires one dado blade setup and three rip fence positions.

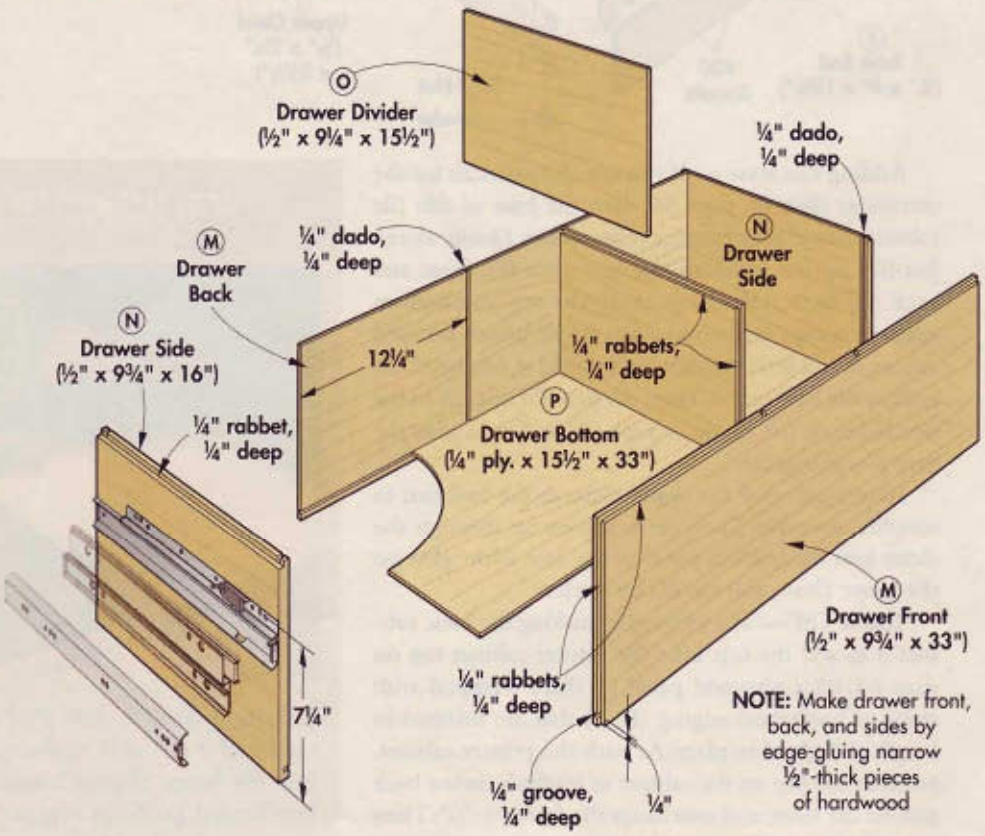
Let's start with the rabbets that form the tongues and lips. They can be cut by setting a 1/4" dado blade so it's just "kissing" the edge of an auxiliary fence attached to the rip fence, and passing each piece over the blade. Next, nudge the rip fence over 1/4", and you can cut all the dadoes for the







DRAWER ASSEMBLY



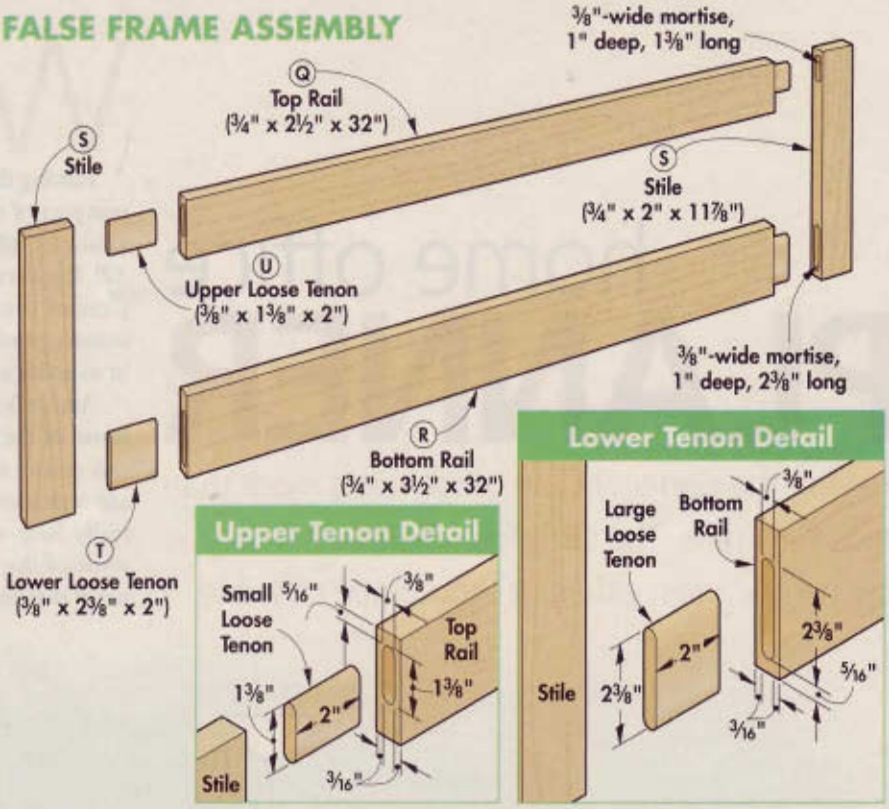
tongue and dadoes joints, as well as the grooves to accept the bottom.

Last, set the rip fence 12¼" from the blade to cut dadoes for the dividers. Flip the piece end for end between cuts for symmetrical dadoes. Then you can assemble the drawers.

Install Drawers — I installed these drawers with a set of heavy-duty "over-travel" drawer slides that hold 150 pounds. (With this in mind, never pull both drawers out at once, or the cabinet can tip.) Install the slides as shown on page 67, using the same methods as on the desk drawers.

False Frames — Hardwood false frames finish off the drawers. I built the frames using mortise and loose tenon joinery, just like the desk doors. After constructing the frames, mount them to the drawer fronts with screws from inside the drawer. Some double-sided tape and a hardboard spacer make it easy to align the frames *(Photos, left)*.

FALSE FRAME ASSEMBLY



MATERIALS & HARDWARE

	Part	Qty	T	W	L	Material
	Printer Cabinet					
A	Case Sides	2	¾"	16"	24"	Maple Plywood
B	Case Top/Bottom	2	¾"	16"	20"	Maple Plywood
C	Case Back	1	¾"	20"	24"	Maple Plywood
D	Case Front Edging	2	¾"	¾"	20"	Maple
E	Case Side Edging	4	¾"	¾"	24"	Maple
F	Base Ends	2	¾"	4"	18⅝"	Maple
G	Base Front/Back	2	¾"	4"	21½"	Maple
H	Base Lower Cleats	2	¾"	2"	21"	Maple
I	Base Upper Cleats	2	¾"	2¼"	21"	Maple
J	Door Top Rail	1	¾"	2½"	17½"	Maple
K	Door Bottom Rail	1	¾"	3½"	17½"	Maple
L	Door Stiles	2	¾"	2"	23⅞"	Maple
M	Small Loose Tenons	2	⅜"	1⅜"	2"	Maple
N	Large Loose Tenons	2	⅜"	2⅜"	2"	Maple
O	Top Panel	1	¾"	16 13⁄16"	20"	Maple Plywood
P	Top Side Edging	2	¾"	¾"	18⅝"	Maple
Q	Top Front/Back Edging	2	¾"	¾"	21½"	Maple
R	Tray	1	¾"	14"	19⅜"	Maple Plywood
S	Tray Sides	2	¾"	2¼"	14"	Maple
T	Tray Front	1	½"	2¾"	19⅜"	Maple
U	Tray Edging	2	¼"	¾"	14"	Maple
V	Adjustable Shelf	1	¾"	16"	19¾"	Maple Plywood
W	Shelf Edging	1	½"	¾"	19¾"	Maple
	Lateral File					
A	Case Top/Divider/Bottom	3	¾"	16"	34½"	Maple Plywood
B	Case Sides	2	¾"	16"	24"	Maple Plywood
C	Case Back	1	¾"	24"	34½"	Maple Plywood
D	Front Edging	3	¾"	¾"	34½"	Maple

	Part	Qty	T	W	L	Material
E	Side Edging	4	¾"	¾"	24"	Maple
F	Base Ends	2	¾"	4"	18¼"	Maple
G	Base Front/Back	2	¾"	4"	36"	Maple
H	Base Lower Cleats	2	¾"	2"	35½"	Maple
I	Base Upper Cleats	2	¾"	2¼"	35½"	Maple
J	Top Panel	1	¾"	16¾"	34½"	Maple Plywood
K	Top Side Edging	2	¾"	¾"	18¼"	Maple
L	Top Front/Back Edging	2	¾"	¾"	36"	Maple
M	Drawer Fronts/Backs	4	½"	9¾"	33"	Maple
N	Drawer Sides	4	½"	9¾"	16"	Maple
O	Drawer Dividers	4	½"	9¼"	15½"	Maple
P	Drawer Bottoms	2	¼"	15½"	33"	Maple Plywood
Q	False Frame Top Rails	2	¾"	2½"	32"	Maple
R	False Frame Bottom Rails	2	¾"	3½"	32"	Maple
S	False Frame Stiles	4	¾"	2"	11⅞"	Maple
T	Lower Loose Tenons	2	⅜"	2⅜"	2"	Maple
U	Upper Loose Tenons	2	⅜"	1⅜"	2"	Maple

Printer Cabinet Hardware
- (12) #8 x 1¼" Fh Woodscrews
- (12) #20 Biscuits
- (2) 14" Drawer Slides (#35685)*
- (2) Door Hinges (#49393)*
- (4) Levelers (#12295)*
- (4) ¼"-20 T-Nuts (#26054)*
- (4) Shelf Pins (#33860)*
- (1) 18⅛" x 18½" Glass Panel, Reed Texture (#39266)*
- (1) Cord Flexi-Grommet (#35546)*
- (1) Door Knob (#33678)*
- (1) Magnet Set (#32907, 38348)*

Lateral File Hardware
- (16) #8 x 1¼" Fh Woodscrews
- (21) #20 Biscuits
- (4) 16" Drawer Slides (#89749)*
- (4) Levelers (#12295)*
- (4) ¼"-20 T-Nuts (#26054)*
- (4) Drawer Pulls (#34659)*

* All items available at 800-279-4441 or Rockler.com

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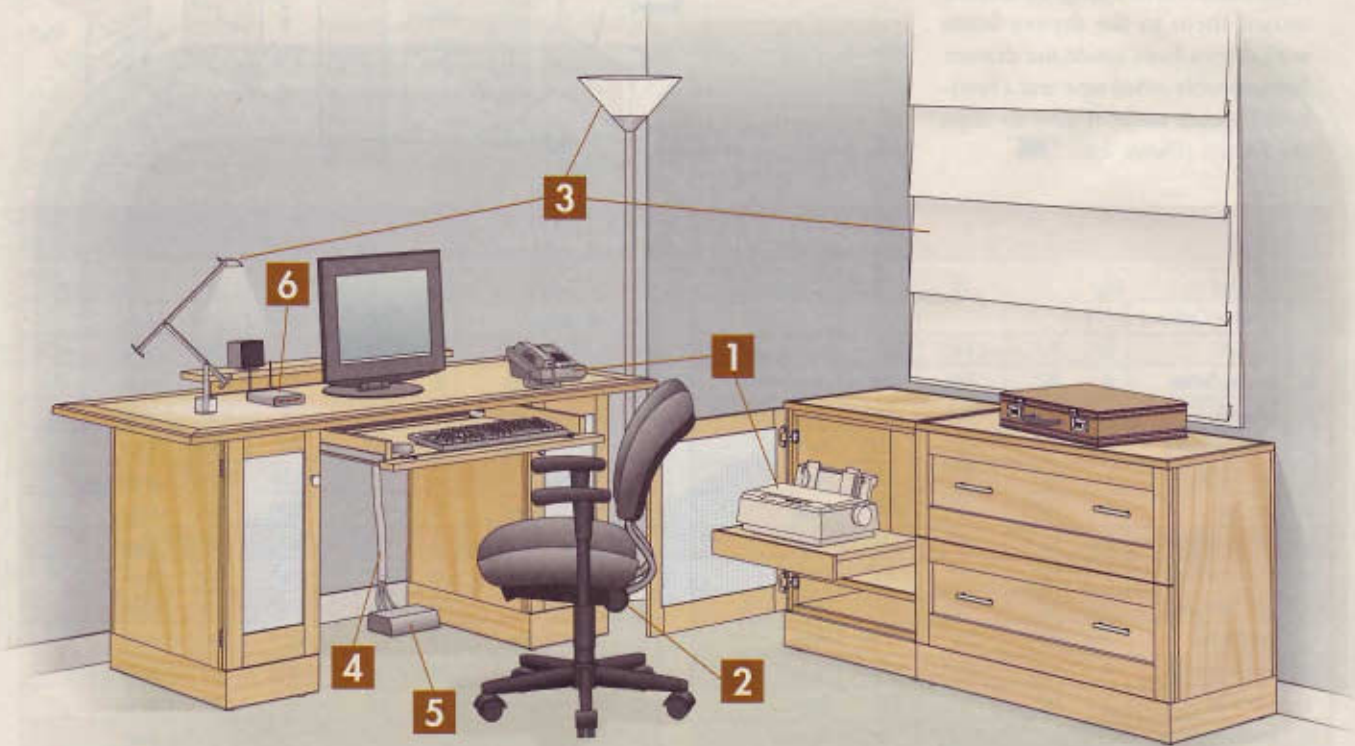
home office PLANNER

Having the perfect home office takes more than nice furniture. The strategies here will help you create the most efficient workplace possible.

Whether you use it to run a small business, or simply pay bills and surf the Web, your home office should have two qualities: comfort and efficiency.

Having the right furniture in the office is an important part of that equation. We've put together plans for a suite of office furniture that fills the bill nicely *(page 52)*. But furniture alone doesn't make a home office a pleasant place to work. It must be optimized for the utmost comfort, arranged to work the way you do, and lit to reduce eye strain *(details below and on page 71)*.

And let's not forget about the computer, the workhorse of the home office. With a few simple steps, you can ensure that your computer and all its accessories are organized and well-protected. One thing that can really help with organization is to take advantage of some of the vast variety of wireless computer components that are now available. See page 73 to learn more.



6 KEYS TO AN EFFICIENT HOME OFFICE

1 Reach Radius — A well-organized office has all the items you use most frequently within arm's reach as you swivel your chair from side to side. This is known as a "reach radius."

2 Ergonomics — Organize your office to avoid straining your neck, back, shoulders, and hands. Setting up furniture ergonomically is the key here.

3 Lighting — To minimize eye strain, arrange task lighting so it's focused directly on the work at hand. Ambient lighting should be positioned to reduce glare on the computer monitor.

4 Cord Management — The tangle of wires beneath your desk is often overlooked. If these cords need organized, there are a number of products to manage the clutter.

5 Power Protection — With all the money you have invested in your computer, it's worth protecting. Use surge protectors or battery back-ups to prevent lightning and power outages from damaging components.

6 Wireless — Today's technology lets you explore another cord management solution: cutting the cords entirely. The products are many, and less expensive than you'd think.

1) ESTABLISH A REACH RADIUS

To create the most efficient workspace possible, the items you use most frequently (keyboard, mouse, phone, printer, etc.) should be within your "reach radius" *(see Illustration, top right)*. The reach radius actually consists of two intersecting semicircles of space around your chair. Their radii are determined by both the rotation of your chair and the length of your extended arms.

The best way to establish an efficient reach radius is to arrange the furniture in an L-shape, with the desk forming half the L, and the printer cabinet and file cabinet forming the other half. This way, accessing the printer or an important file only requires turning your chair — not getting out of it. If you have more furniture and components in your office, then a U-shaped arrangement is even better than an L.

2) KEEP ERGONOMICS IN MIND

Ergonomics is the science of precisely fitting equipment and furniture to the human body. Our computer desk was designed specifically with ergonomics in mind. These simple tips will help you set it up for ultimate comfort when working.

The first key is your chair. It should have adjustable lumbar support for your back, adjustable height, and a comfortable seat that allows 1" to 4" of space between the edge of the chair and your knees. Five spokes with casters at the base of the chair are preferred to four for increased stability.

Some other important ergonomic considerations:

- **Position yourself** so your knees, waist, and arms are all bent at 90 degrees. Placing the keyboard at an even level with your chair's armrests helps accomplish this.
- **Hold your wrists** so they rest in a neutral (not bent up or down) position in front of the keyboard.
- **Place the monitor** so it's about 16" to 28" in front of you, and the top of the screen is at or slightly below eye level. This way, you look slightly down at it, rather than strain your neck to look up *(Illustration, right)*.

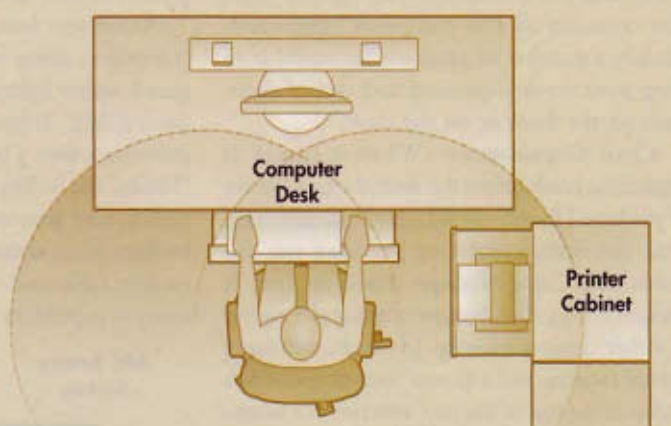
3) LIGHT IT RIGHT

Proper lighting for a home office consists of two types: ambient and task lighting.

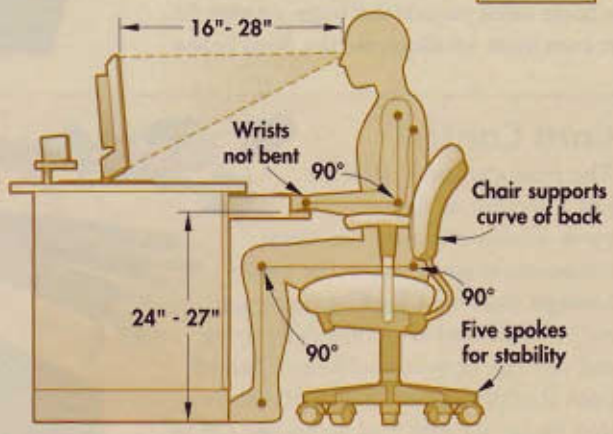
Ambient lighting is a combination of ceiling and natural light, while task lighting is directly focused on the worksurface. The source of ambient light should be slightly behind or beside you — but not too far back, or it can produce glare on the monitor. If possible, opt for a ceiling fixture that directs light upward, so that light is diffused by the ceiling before it reaches the rest of the room. And block out glare from natural light with blinds if necessary.

Ideally, task lighting should come from a lamp on the desktop. Choose a lamp that can swivel and rotate to focus light in different places, and use "warm" bulbs, rather than cool white bulbs, to prevent eye strain.

OFFICE SETUP STRATEGIES

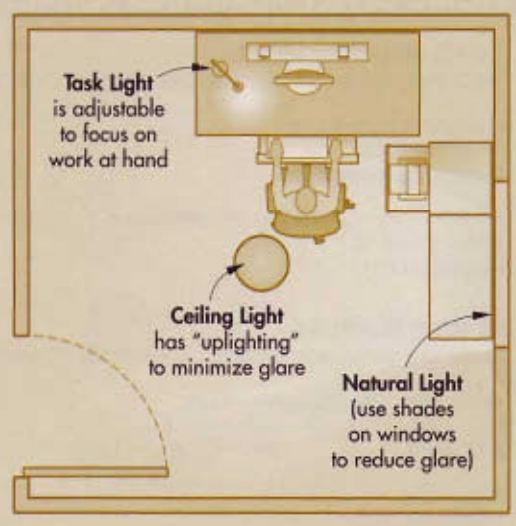


▲ REACH RADIUS
The two semicircles shown above represent your "reach radius." For maximum efficiency, try to arrange all the items you use frequently within this radius.



▲ PROPER POSITION
Setting up your workstation ergonomically helps eliminate potential health concerns such as eye strain, back problems, and carpal tunnel syndrome.

► LIGHTING
A well-lit office should have a combination of ambient light from behind and task light on the worksurface. Warm white bulbs are preferred, as they are easier on the eyes.



4) UNRAVEL THE BIRD'S NEST

The one area of every office that cries out for organization, yet is all too often overlooked, is the tangle of cords, cables, and phone wires that connects all that computer equipment. Luckily, a number of products are available to keep your cords organized and out of sight, both on the floor or on the desk.

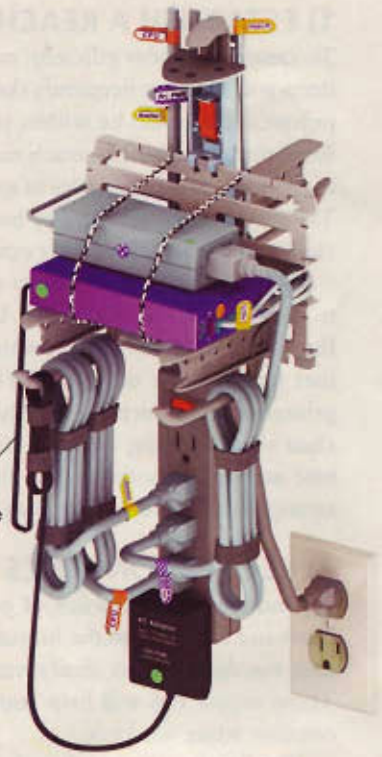
Cord Organizers — When it comes to organizing cords below the desk, the best variety of products I found was at CableOrganizer.com. One that really caught my attention was this Cable-Safe Cable Manager *(Photo, far right)*. It features hooks, clips, bungee cords, and a variety of other devices to keep 14 cords, two large power sources, and a power strip organized. A clamp at the top of the unit attaches to a work-surface to keep the unit off the floor.

Desk Discipline — For desk cord management solutions, Rockler may be the best resource out there. Two solutions (a wire master channel and flexi-grommet) are integrated into the home office projects that begin on page 52. For even more solutions, see the *Boxes* below.

5) PROTECT YOUR INVESTMENT

A fully outfitted office represents a sizable investment of your time and money. So make sure you protect all that valuable equipment.

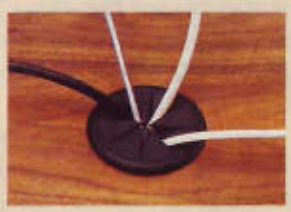
At the very least, you'll want to ensure your computer's safety with a surge protector that guards against lightning strikes. Some companies (such as APC, Tripp-Lite, and Belkin) offer surge protectors with a battery backup. If the power "blinks," the backup battery kicks in, giving you time to save your work and shut down. Several backups (such as this APC unit) feature multiple outlets, cable, and phone jacks for protecting many components at once *(Photo, below)*.



Cord Control

The products shown here are just a handful of ways to keep cords managed as they run from component to power source. The Cable Manager *(top)* from CableOrganizer.com is a 1/4"-thick rubber coil that easily wraps and unwraps from cords. Master Channels from Rockler *(bottom)* feature handy snap-shut latches for easy cord access and can be placed anywhere with the attached tape.

Desk Cleanup



Grommets are the traditional means of routing cords from desktop to floor, and Rockler offers two twists on standard grommets. Their flexi-grommet *(top)* has slits that meet at a centerpoint for pushing cords through. The brush grommet *(bottom)* hides cords neatly in its bristles.

HOME OFFICE PLANNING SOURCES: SUPPLIES & INFORMATION

CORD MANAGEMENT
Hardware and information on desktop & floor wire control

CableOrganizer.com
877-547-4580
CableOrganizer.com

Rockler Woodworking & Hardware
800-279-4441
Rockler.com

POWER SUPPLIES
Surge protectors and battery back-ups for PC components

American Power Conversion
877-272-2722
APC.com

Tripp-Lite
TrippLite.com

Belkin
800-223-5546
Belkin.com

WIRELESS COMPUTING
Information and product guides for wireless components

Wi-Fi Alliance
512-305-0790
WirelessEthernet.com

Intel Corporation
800-538-3373
Support.Intel.com/Support/Wireless/

Online Wireless Dictionary
WirelessDictionary.com

Bluetooth Special Interest Group
Bluetooth.com

6) CUT THE CORDS ALTOGETHER

The ultimate cord management solution for your computer is to simply eliminate the cords entirely. And with the technology that's available today, it's truly possible to do away with almost every wire (except the power cords) for a lot less money than you might expect.

A quick search of the Internet shows just how many components can now "talk" with your computer without wires. They include everything from simple components like a keyboard or mouse to more complex items like printers, laptops, and even the Internet.

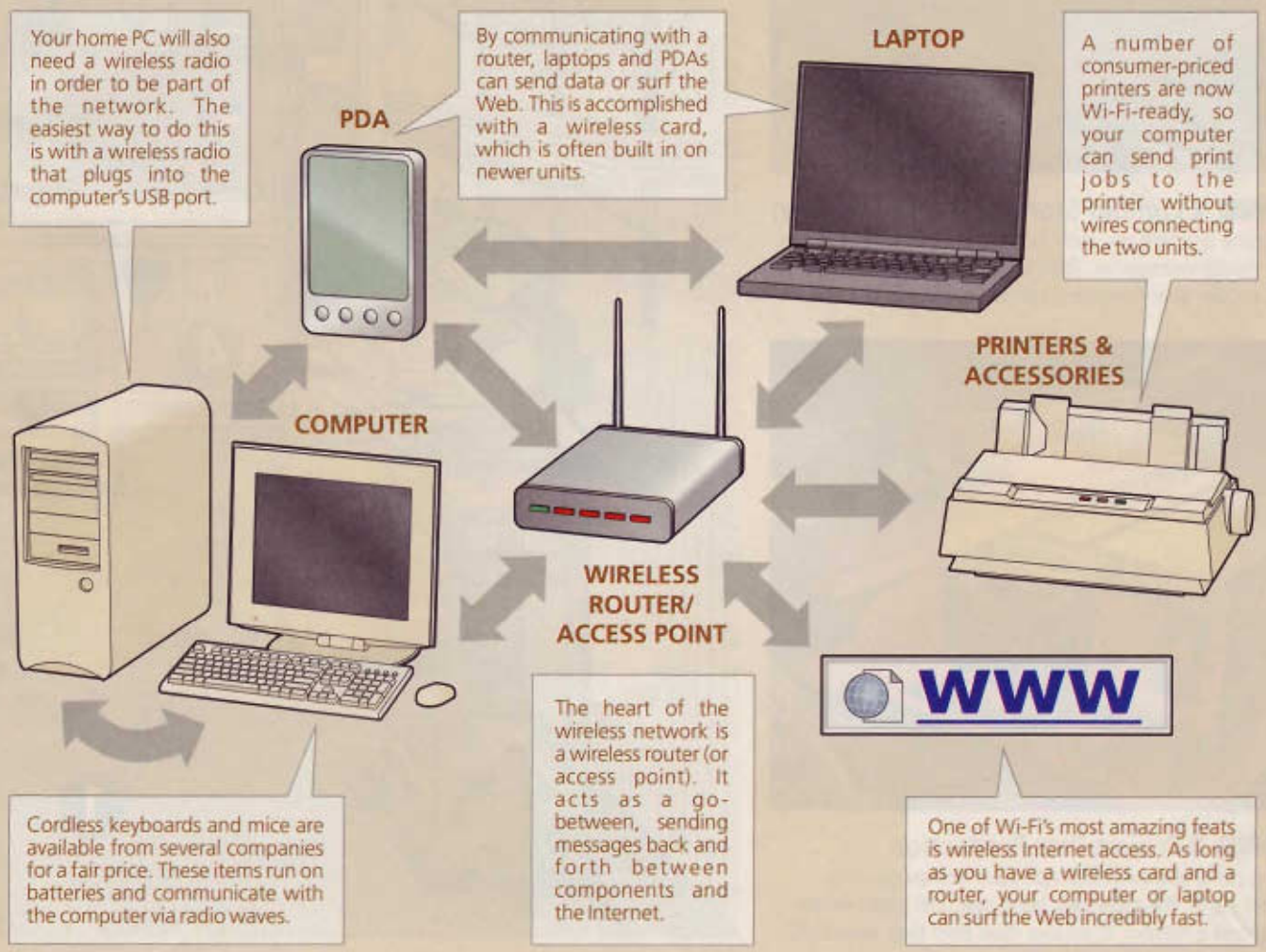
Simple Wireless — If you're not ready to go completely wireless, the cool things you can add at a relatively low price include a keyboard, mouse, and speakers. For these components, the wireless connection is created through a receiver that plugs into the back of your computer. The devices themselves are battery-powered, and they communicate with the receiver via radio waves. (Bluetooth is a common type of this technology.) A wireless keyboard and mouse set typically sells in the $50 price range.

Advanced Wireless — The next step up in wireless computer components is Wireless Fidelity, or "Wi-Fi." This type of wireless connection uses faster transmission rates and more powerful radio frequencies to connect one (or more) computers to laptops, PDAs, printers, the Internet, and each other — all without wires.

The first requirement of a Wi-Fi network is that each component within the network (computer, laptop, printer, etc.) have wireless capabilities through a Wi-Fi radio. These radios are often built into newer components, or can be added to laptops and PDAs in the form of a card, or to PCs through a USB connection.

A Wi-Fi network can work as long as each component has a radio, but it becomes even more efficient with the addition of a wireless router (or access point). This router is a fairly inexpensive piece of hardware with radio antennas. It acts as a middleman, sending messages between all the components, as well as the Internet *(see Illustration, below)*. For more information about setting up a wireless network, see the *Sources* on page 72.

WIRELESS POSSIBILITIES



BENCH BASICS
FUNDAMENTAL SKILLS FOR BETTER WOODWORKING

AN INSIDER'S GUIDE TO

SHOP LAYOUT

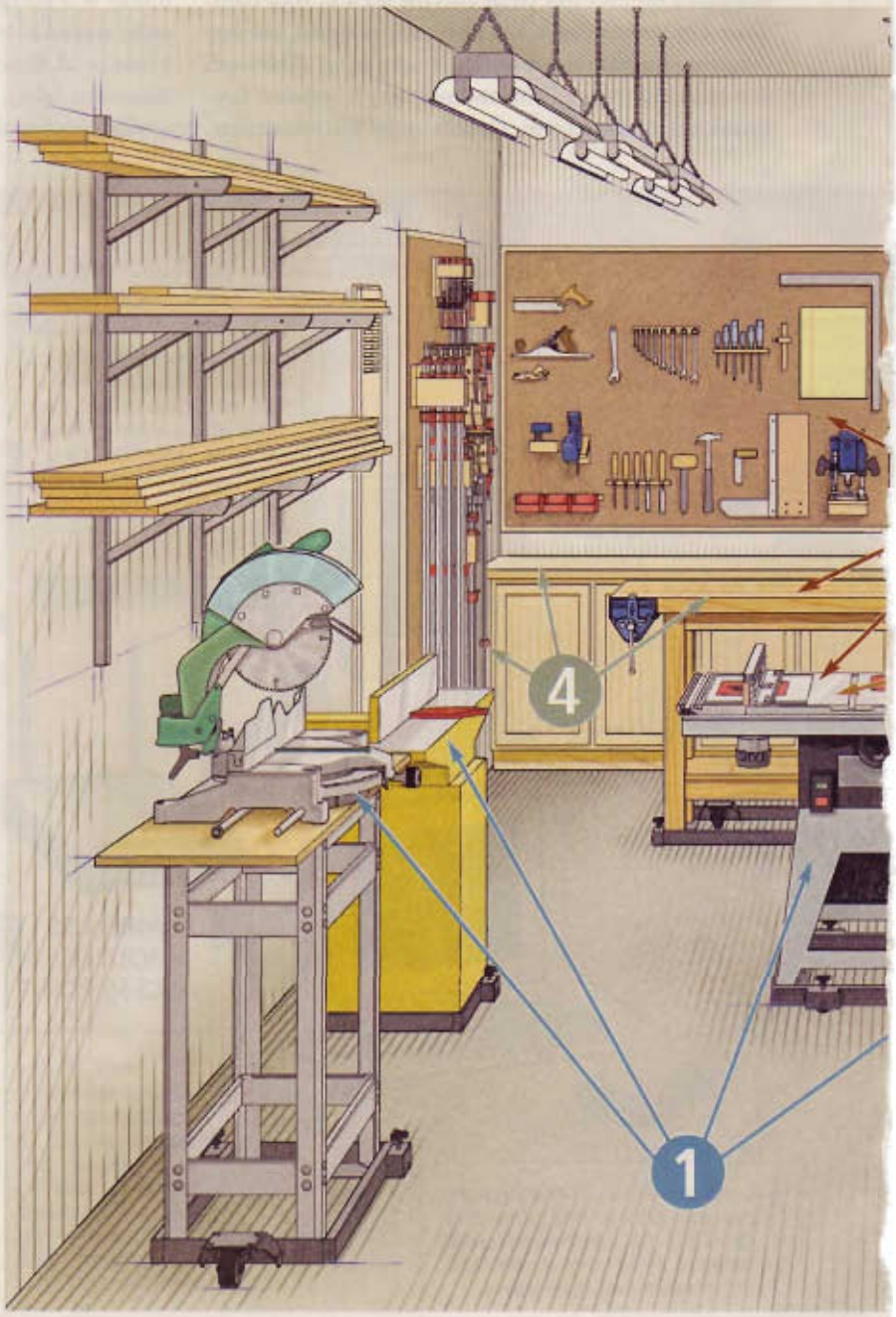
Follow these guidelines for selecting tools and arranging them effectively, and you'll have a hardworking shop that puts you "in the zone."

ZONE 1 Lumber Storage and Breakdown

This zone is where you store boards and break them down into smaller workpieces. Tools used here include a table saw, circular saw, miter saw, planer, and jointer.

ZONE 2 Project Part Production

In this zone, you cut and shape your workpieces into project parts. The table saw, band saw, drill press, router table, and a number of smaller tools earn their keep here.



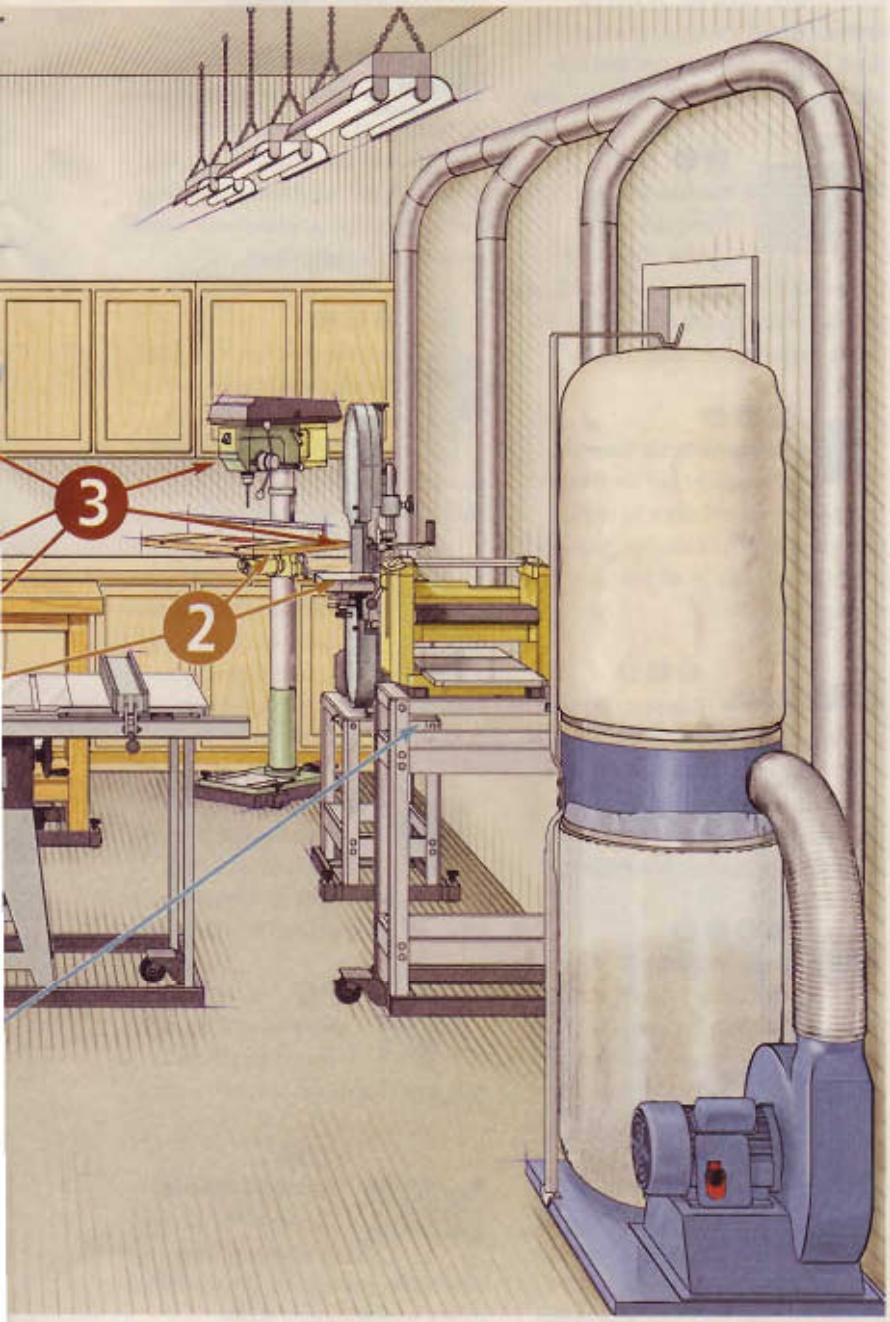
Setting up a woodworking shop seems easy enough on the surface. Just buy a bunch of tools, find some space, and move everything in. But putting together a hardworking shop requires a little more planning.

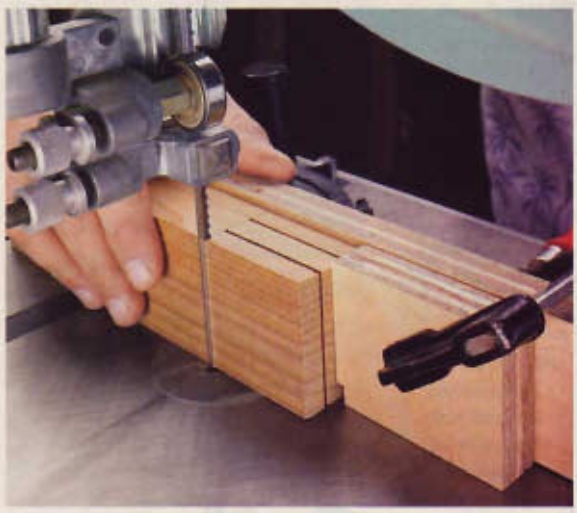
First, you have to figure out what tools you really need. Then you need to lay out your shop so those tools don't just fit, but work together effectively. It's really not difficult to do if you focus on function.

By understanding what each tool does, as shown on page 76, you can decide which ones to buy for your shop. And you need to understand that building projects involves a series of tasks that can best be accomplished in functional "zones."

Get Into the Zones — In a factory, raw materials go in, get processed, and come out as a finished product. To accomplish this efficiently, a factory is divided into task-based zones. A shop should be laid out the same way, in the four zones shown in the *Photos* and *Illustration* below. The floor plan on page 77 gives more details.

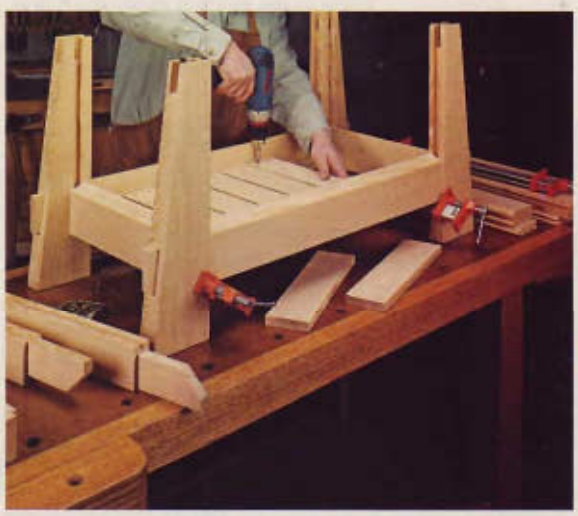
Of course, few shops are large enough for separate zones. But it's okay if they overlap, because many tools function in several zones *(see page 76)*. By keeping these zones in mind as you lay out your shop, you'll be sure each zone contains the right tools for its tasks. And you'll end up with one hardworking shop.





ZONE 3 Joinery & Handwork

Once project parts are cut to size, you need to add the joinery and fine details. Useful tools include layout tools, a table saw, band saw, workbench, router, sander, and chisels.



ZONE 4 Assembly & Finishing

This is where you turn all those parts into a completed project. Some of the tools for these tasks include a bench, clamps, and drill, plus gluing and finishing supplies.

BUY TOOLS BY FUNCTION

Most woodworkers have a pretty simple policy when it comes to tools: If we see it, we want it. And there are a lot of tools out there to want. That makes it hard to figure out which tools you really *need*, especially if you're just getting started in woodworking. The list below should make the job much simpler. It outlines the tools that should be in every shop, in relative order of importance. Along with each tool, you'll find a guide to the shop zones where it can be used *(see the Key, left)*. Where possible, we've listed potential substitutes for those tools, too.

KEY

1. Lumber Breakdown
2. Parts Production
3. Joinery & Handwork
4. Assembly & Finishing

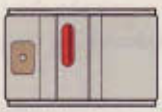
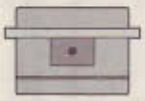


Table Saw. This is the core tool in the shop because no other tool performs so many tasks so well. Buy a good one, and it will last a lifetime. A circular saw can do some table saw tasks, but there is really no substitute for this tool.

Workbench. Before table saws existed, the bench was the core shop tool. And it's still crucial today as the primary worksurface for many tasks. You might get by with a solid-core door on sawhorses, but a good bench is a great asset.

Router. It may have started as a simple tool for creating decorative edges, but the router has become a joinery workhorse in the modern shop. You'll find countless accessories, but no substitutes, for this hardworking tool.

Drill/Driver. Modern drill/drivers, especially cordless models, are great labor-savers. No shop should be without one. Of course, you'll still need regular screwdrivers, but reasonable substitutes for a drill are few.

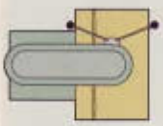


Router Table. Turning a router upside down and mounting it in a table brings hardcore shaping ability to the home shop. Its only substitute is a costly shaper.

Random-Orbit Sander. This sander will do everything from hog off stock to bring out a final sheen in a finish, making it the most versatile of all the types of sanders available.

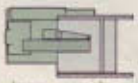
Clamps. There's an old woodworking adage that you can never have enough clamps. It's true. A shop needs bar clamps of several lengths, plus specialty clamps. The substitute for clamps: More clamps.

Shop Vacuum. Woodworking creates a mess, and a shop vacuum is the easiest way to clean it up. Plus, it can serve as a dust collector.



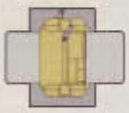
Drill Press. A drill press does what a hand drill does but with more precision and control. Plus, it drills mortises and handles big bits.

Hand Tools. Power tools are great, but you'll still need a few hand tools, such as layout tools, chisels and a block plane, for many tasks.



Band Saw. Band saws do more than just cut curves. For that, you can use a jig saw. But rely on a band saw for joinery, resawing, and more when you take your woodworking to a higher level.

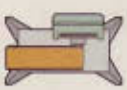
Jointer. You can straighten the edges of boards with a table saw or router table, but neither does it as well or as easily as a jointer. And it's a must-have if you buy rough lumber.



Thickness Planer. A planer lets you create custom-thickness boards, and surface rough-sawn lumber. Few other tools can do this.

Dust Collector. You can get by without a dust collector, but there's no better way to have a clean shop and healthy lungs.

Miter Saw. A must for home improvement, and great for rough cuts in the shop.



Belt/Disk Sander. This tool has gotten smaller and more affordable, making it a great addition to any well-equipped shop.

BENCH BASICS ONLINE
www.WorkbenchMagazine.com

GO ONLINE FOR:
- Tool icons you can print and arrange to lay out your shop
- A presentation on clear areas for most major shop tools

ESTABLISH CLEAR AREAS

The lumber and sheet goods we use to produce projects start off as large, rather awkward pieces that require a fair amount of handling space. You need to keep this in mind as you arrange your tools. Establish some "clear areas" around them, or you may end up with inadequate space to cut a 4x8 sheet of plywood or rip a long board on your table saw.

Every tool has unique clear-area requirements. And luckily, the areas may be able to overlap in order to save space. Learn more about how to set up clear areas in your shop through an online presentation at WorkbenchMagazine.com.

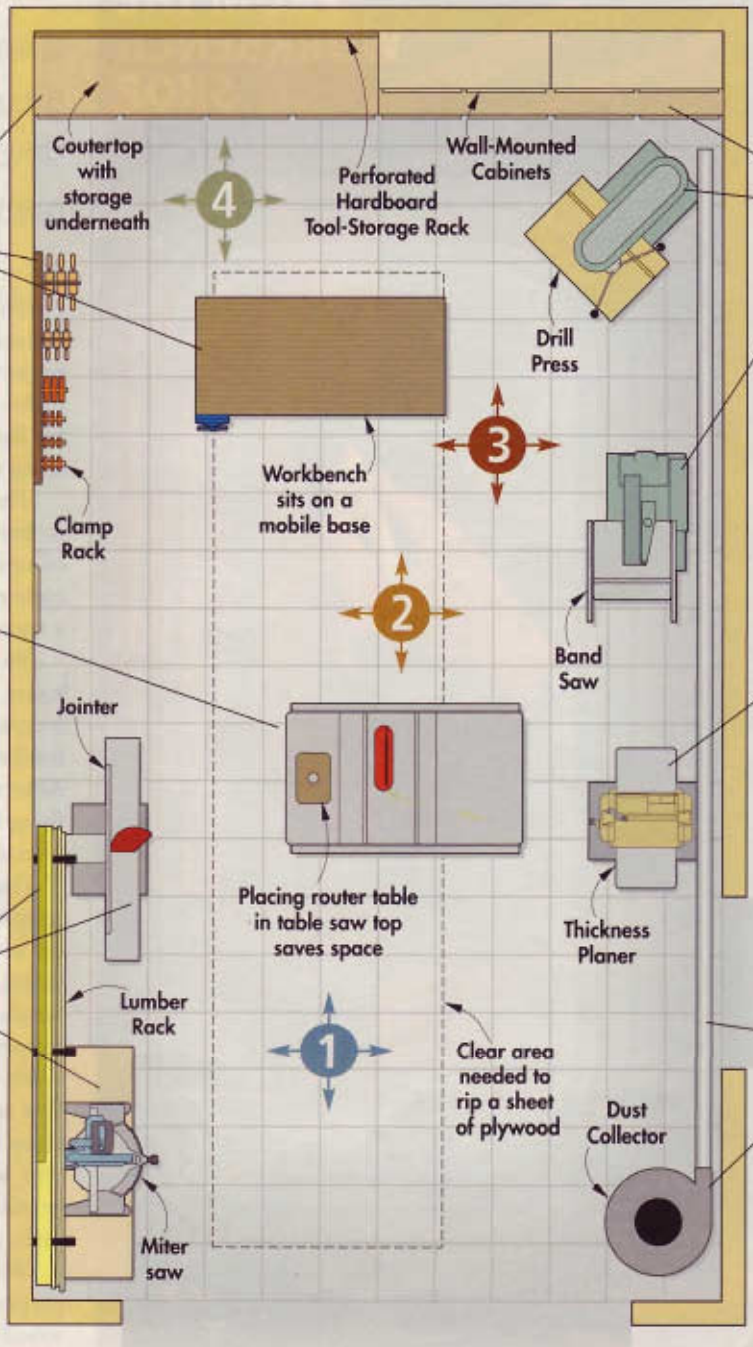
GETTING YOUR SHOP IN THE **ZONE**

Once you've decided what tools to buy, you can work out your shop zones. The *Floor Plan* below shows an overhead view of the shop on pages 74-75. It's the same size as a typical one-car garage. You'll notice that the zones overlap due to space constraints, but that attention has been paid to having all the necessary tools in the correct zone. Also notice the rectangle drawn around the table saw. This represents the "clear area" needed around this tool. You'll find more about this idea in the *Sidebar* on page 76. To lay out a floor plan for your shop, go to WorkbenchMagazine.com and print out the tool icons you see below.

All supplies for assembling and finishing projects reside within easy reach of the workbench.

The table saw sits near the center of the shop. Large clear areas surround the saw to allow space for handling lumber and sheet goods.

Tools used for breaking down lumber, along with the lumber rack, are located close to the door so you don't have to move long boards around the shop.



A drill press placed in a corner takes up little space but can still accommodate long boards. Bits are stored nearby, and other joinery tools sit nearby for easy access.

Some tools, such as the thickness planer and jointer sit "parked" against a wall most of the time. This keeps them out of the way until needed.

The dust collector tucks out of the way in the front corner. A single main duct runs along one wall, and has branches that serve all the main chip-producing tools.

3 NO-FAIL FINISHES

FROM THE WORKBENCH SHOP

Great-looking results are guaranteed with these simple finish recipes for maple, cherry, and oak.

Finishing can be one of the most intimidating parts of building a project. That's because the finish can make an otherwise perfect project fall flat, or turn a so-so effort into a thing of beauty.

The choice, then, when it comes to finishing, is often spending a lot of time experimenting to find the right effect, or just giving any finish a try and hoping for the best.

To make finding the right finish easier, I rely on my woodworking friends. We swap our "recipes" for finishes just as we might for meals. After all, why learn to cook something from scratch if a friend serves a version that suits your tastes?

Here, you'll find three of our best recipes for creating flawless finishes on some of our favorite woods: maple, cherry, and oak. And you'll be glad to hear that none of these recipes requires a pinch of this and a dab of that, or exotic ingredients that are difficult to obtain. Plus, all three finishes are easy to apply, so you won't have to worry about getting inconsistent results from piece to piece or project to project.

With all three, by the way, wood preparation is the same: Sand the wood through 220-grit, and then wipe away any excess dust before you apply the first coat.

Magnificent on Maple

When we built the home office suite of furniture *(page 52)*, we wanted a wood with a fresh, clean appearance and a light tone. Maple proved the perfect choice. This wood's pale blond color and distinctive but subtle grain look great in any setting.

And, because there were five projects to build, we wanted a finish that would go on easily and dry quickly. Water-based finish fills the bill here. But there's one problem: Maple turns a cold, uninviting gray color under water-based finish.

That's where our shop craftsman, Steve Johnson, stepped in to suggest his favorite recipe for an easy maple finish. He starts with an oil-based finish to add color, and then follows up with water-based finish to add protection and quickly build sheen *(see the Recipe Card, below right)*.

Applying the Finish — After sanding the project, apply a coat of satin Arm-R-Seal from General Finishes *(Fig. 1)*. This finish adds a hint of amber tone, thanks to the tung oil it contains. Add a second coat if you want more color.

Now apply a coat of Environment Friendly (EF) water-based finish, also from General Finishes *(Fig. 2)*. It dries in just a few hours, after which you can sand lightly to smooth out any ridges or dust in the finish *(Fig. 3)*. Then add two more coats, sanding in between to smooth the surface.

Oil finish gives maple a warm amber tone and makes the grain pop. Water-based topcoats applied afterward shorten finishing time.

Apply Arm-R-Seal with a foam brush. Wet the surface, and let the finish dry for eight hours.

Brush on the first water-based finish coat. The milky appearance disappears as the finish dries.

After the first coat of water-based finish dries (in two to three hours), sand the surface to get rid of any dust or raised wood fibers. Wrap 320-grit wet-or-dry paper around a wood block, and use light strokes.

RECIPE FOR MAPLE

Ingredients

- First coats: General Finishes Arm-R-Seal, satin
- Top coats: General Finishes EF Polyacrylic Blend, satin

Application

Apply one or two coats of oil-based finish to add amber color. Follow up with three coats of water-based finish, sanding between coats with 320-grit sandpaper.

Sources

GeneralFinishes.com; 800-783-6050

▲ This warm, lustrous look usually appears only after cherry ages for several months. But this finish helps to jump-start the process.

RECIPE FOR CHERRY

Ingredients
- First coats: Tried and True Varnish Oil
- Top coats: General Finishes Arm-R-Seal, satin

Application
Apply two coats of the Varnish Oil, allowing 24 hours drying time. Follow up with two coats of Arm-R-Seal

Sources
TriedAndTrueWoodFinish.com; 607-387-9280
GeneralFinishes.com; 800-783-6050

Our Choice for Cherry

Everyone loves the warm, reddish-brown color that is the hallmark of cherry. Unfortunately, freshly sanded cherry lacks this deep, lustrous tone. Instead, the wood is pinkish and tan.

The deeper tones don't appear until the wood has been exposed for months (or years) to the effects of ultraviolet rays from sunlight and oxidation from the air. That means you'll have to wait to get the cherry color you had in mind.

Or, you can stain cherry to give it that deep tone. But cherry absorbs stain unevenly, causing blotches. And the stain can obscure the grain.

To avoid these problems, Senior Project Designer Kent Welsh came up with a two-step finish that speeds up the aging process. The secret is to use a finish that contains linseed oil. This oil has a deeper amber color than many others, so it creates that signature "cherry" tone quickly.

Applying the Finish — Kent starts with Tried and True Varnish Oil *(see the Recipe Card, bottom left)*. Wipe on two thin coats as shown in *Figure 1*. (**Note**: You can get similar results using ordinary boiled linseed oil instead of the Varnish Oil.)

After these coats dry, scuff the surface to remove dust *(Fig. 2)*. Then switch to General Finishes Arm-R-Seal oil and urethane top coat. It dries in 8 hours, so you can apply the two final coats in one day *(Fig. 3)*.

▲ Rub in the Varnish Oil, and wipe off excess after an hour. Add another coat 24 hours later.

▲ After the second coat dries, use a "very fine" synthetic steel wool pad to remove imbedded dust.

► Use a foam brush to apply the Arm-R-Seal. Fully saturate the wood surface, and then let the finish dry. Follow up with two more coats, scuffing the surface in between with 320-grit sandpaper, or use a "fine" synthetic steel wool pad.

▲The open pores in oak often leave a pitted surface. Using wood filler, you can create a smooth surface that looks totally natural.

Outstanding on Oak

Oak remains one of the top choices for woodworking projects because it's readily available and reasonably priced. If there's a downside to oak, it lies in the wood's open pores that are especially visible in flatsawn stock. They can leave a pitted surface even after finishing.

One solution is to fill the pores with paste grain filler. But it can be a bit tricky to use.

That's why Senior Editor Dave Stone devised a downright simple recipe for grain filler that works great on oak. It requires only inexpensive water-based wood filler (meant for covering nicks and nail holes) that's available in hardware stores.

Make a Paste — Mix two parts "Golden Oak" Famowood Wood Filler *(see the Recipe Card, bottom right)* with three parts "Red Oak." This creates a color that blends almost invisibly with the natural color of oak. Add water (just a few drops at a time), and stir to make a paste the consistency of sour cream.

Next, use a plastic putty knife to apply the paste to the wood *(Fig. 1)*. Then scrape off any excess.

After the filler dries, sand the surface *(Fig. 2)*. This removes all the filler except for what lodges in the pores.

Now finish the wood with Zar fast-drying polyurethane *(Fig. 3)*. The oak will look natural, but will feel smooth as glass.

▲Spread the filler paste over the surface, and work it well into the wood surface to fill the pores.

▲After the filler dries, sand with 220-grit paper. Brush dust away, and wipe with a damp cloth.

◄Apply two or three coats of oil-based finish to bring the wood back to life. (I used Zar Fast-Drying Polyurethane.) A foam brush or rag works best to prevent you from accidentally pulling any filler out of the pores. Sand between coats.

RECIPE FOR OAK

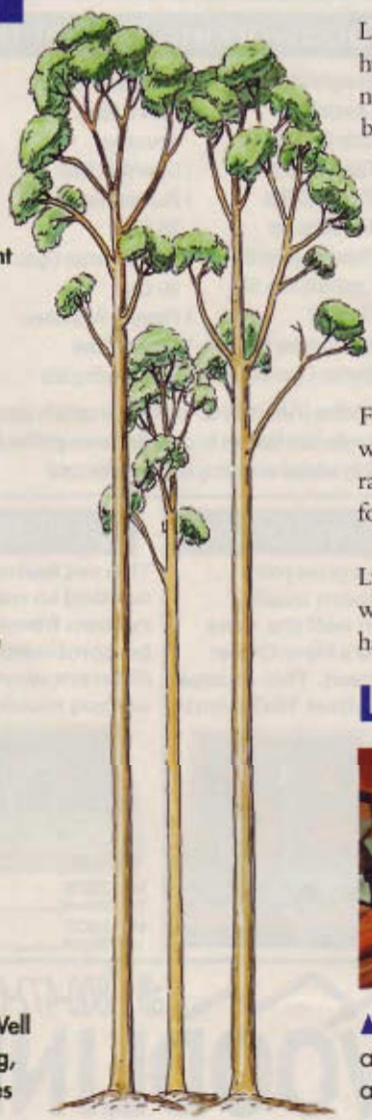
Ingredients
- Filler: Famowood Golden Oak and Famowood Red Oak
- Finish: Zar Fast-Drying Polyurethane, satin

Application
Mix the filler and work into the wood pores with a putty knife. Sand excess filler when dry, and apply finish.

Sources
EclecticProducts.com; 800-767-4667 (Famowood)
UGL.com; 800-272-3235 (Zar)

Lyptus

This hybrid eucalyptus tree offers an affordable and ecologically sensitive alternative to popular domestic and exotic hardwoods.



Properties:

- **Grain**
  Typically straight or shallowly interlocked
- **Dimensional Movement**
  Medium
- **Abrasion Resistance**
  High to moderate
- **Hardness**
  High to moderate
- **Decay Resistance**
  Moderate to very durable
- **Drying Rate**
  Fairly to very slow
- **Checking Tendency**
  Absent or controllable
- **Distortion Tendency**
  Absent or slight
- **Machining**
  Satisfactory
- **Dulling Effect**
  Moderate
- **Sanding**
  Very good
- **Painting & Staining**
  Very good
- **Glues Easily**
- **Holds Nails/Screws Well**
- **No Corrosive, Staining, or Leaching Tendencies**

Lyptus is a naturally occurring hybrid of two eucalyptus trees. Until now, however, the wood has not been grown in commercial volumes. But thanks to Weyerhauser and Aracruz Wood Products, Lyptus may soon become a staple on hardwood dealers' racks.

Woodworkers are sure to appreciate Lyptus because it has many qualities of an exotic hardwood at the price of a domestic. For instance, in appearance and workability, it's most often comparable to mahogany. But Lyptus sells for about half the cost of mahogany.

Other familiar familiar traits of Lyptus include a cherry-like tone, with density and hardness similar to hard maple.

If there's a downside to Lyptus, it's that it will dull tools faster than many common hardwoods. Jim Cox of Cox Custom Cases has built several pieces with Lyptus and doesn't see this as a big problem. As far as he's concerned, the beauty of the wood and its excellent finishing qualities make some additional sharpening or knife-changing worth the effort.

From a forestry perspective, Lyptus makes sense because it can be harvested after only 14 to 16 years of growth, which is faster than many other hardwoods. This, along with other growth properties of the tree, allows Lyptus to produce up to 30 times more volume than other forests.

For more information about Lyptus, visit Weyerhauser.com

Lyptus Flooring

▲ Solid Lyptus flooring is available in two grades, two widths, and either finished or unfinished.

▲ A full line of pre-finished Lyptus laminate flooring is also available in a variety of colors.

Tools & PRODUCTS

WORKBENCH APPROVED

Hitachi 2 1/4 HP ROUTER KIT

Hitachi's new 2 1/4 HP router combination kit is currently one of the best values available in router kits. The KM12VC sells for around $200 and includes the motor, fixed base, plunge base, a carrying case, and a host of accessories not commonly included with other kits *(Photo, right)*.

Fixed Base — Just as the new kit arrived, I was getting ready to build a stack of dovetailed drawers for a project I was working on. This seemed like a great opportunity to test the router. It didn't take long to see how perfectly suited this router is to the work.

First, the centering guide that comes with the kit made it easy to accurately position the base of the router so the guide bushing will be centered around the bit *(Photo, lower right)*. And once I started cutting dovetails, I immediately came to appreciate the low profile of the motor. It makes the router less likely to tip and ruin a joint.

Fine-tuning the router for depth of cut was equally agreeable. An easy-to-read microadjusment ring made for quick, precise adjustments.

Plunge Base — The first thing I noticed when I switched from the fixed base to the plunge base is how easy it is to move the motor from one to the other.

▲ By mounting the straightedge sub-base to the plunge base, I was able to rout flutes using a piece of scrap hardwood as a fence.

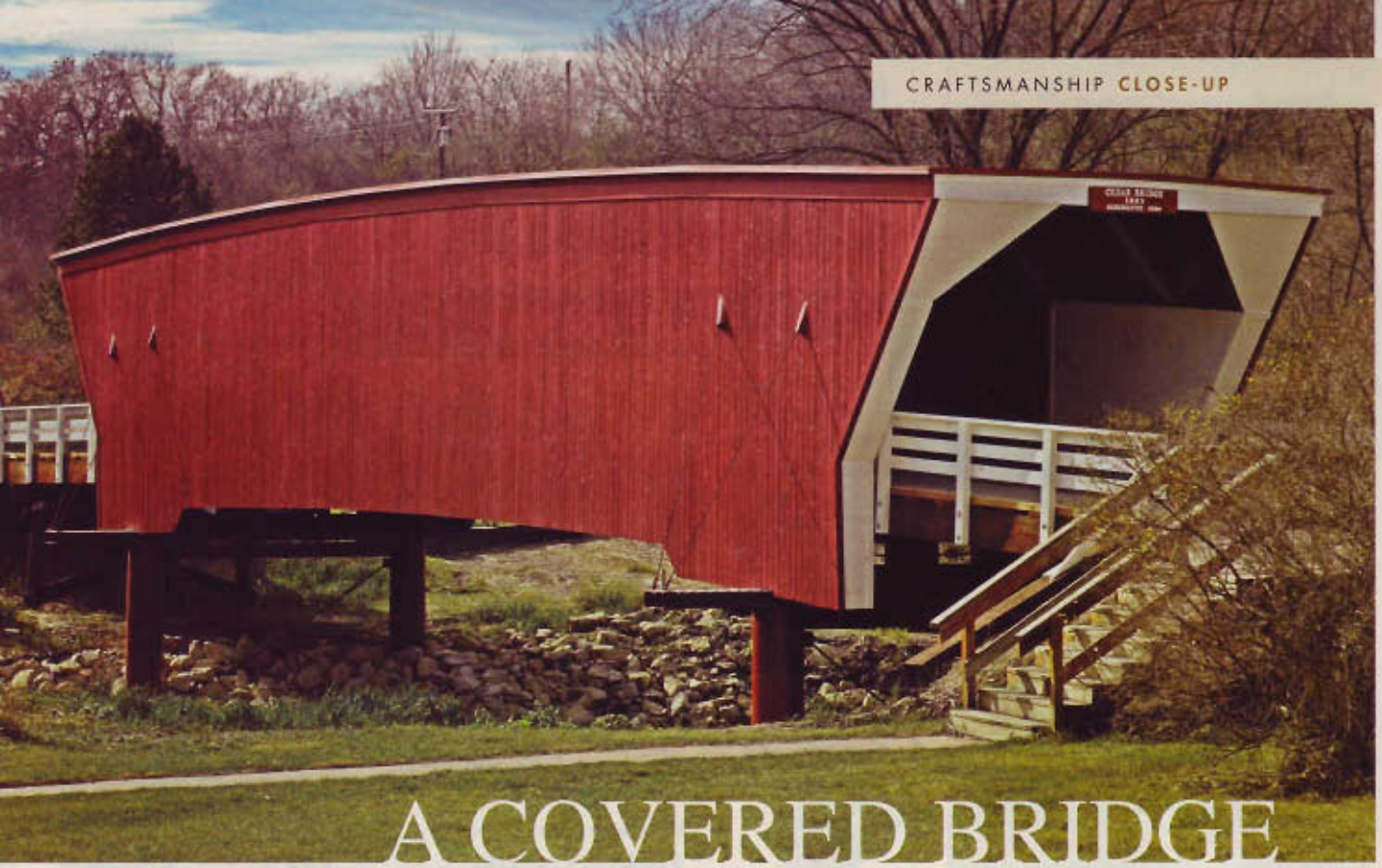
▲ In addition to the usual wrenches and collets, the Hitachi KM12VC includes seven guide bushings, a centering guide, and a straightedge sub-base.

As a plunge router, the Hitachi performs admirably. The plunge release is positioned in easy reach; the plunge action is smooth and accurate; and fine depth adjustment is simple and precise.

▲ A centering guide comes with the kit. It works in both the 1/4" and 1/2" collets.

Impressions — While I don't want to take too much away from the Hitachi router kit, I do have to admit that I missed a few of the refinements that are becoming more common on competitive packages. A second power switch that's easier to reach when you're gripping the handles and a through-table depth adjustment would be welcome additions to this kit. Nonetheless, this is an excellent kit at a remarkable price.

Visit HitachiPowerTools.com or call 800-829-4752 for more information.



A COVERED BRIDGE RISES AGAIN

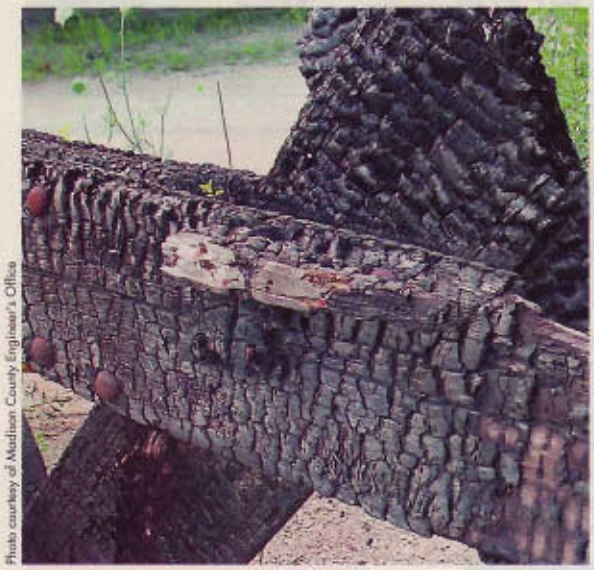


Photo courtesy of Madison County Engineer's Office

▲ After a tragic fire set by an arsonist, little remained of the Cedar Bridge near Winterset, Iowa. But by reading the clues in the charred framing of the bridge, *above*, a determined group of preservationists helped bring this historic structure back to life, *top*.

Dotting the hilly landscape of Madison County, Iowa, five covered bridges stand as testament to the ingenuity and creativity of the builders who constructed them over a century ago. Built between 1870 and 1890, the bridges span the creeks and gullies that define this hilly, rural landscape. They bear the names of their builder or the creek they cross, such as Roseman, Hogback, Holliwell, and — the most famous of all — Cedar Bridge, *above*.

Local residents always admired the bridges (which are the last of 19 that stood originally) and hold a festival every fall in their honor. In recent years, the bridges gained national exposure when they served as the backdrop for Robert James Waller's book, *The Bridges of Madison County*, and the movie of the same name.

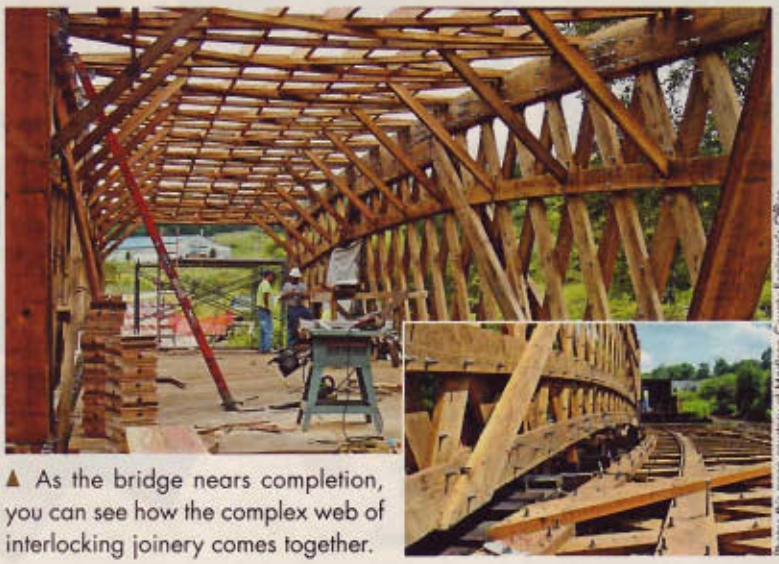
Form Follows Function — Though the bridges now conjure romantic notions, beauty wasn't the sole motivation of their builders. The bridges were enclosed to preserve the massive and costly timbers that make up the roadbed and supporting structure. That they stand today is proof of this practical wisdom.

While each bridge is unique, they all share similar brick-red cedar walls and graceful lines. The structures behind these walls showcase the craftsmanship of the builders on a grand scale, with mortise-and-tenon and half-lap joinery. Curved timbers give the bridges additional strength.

A Fallen Bridge Rises Again — While the bridges withstood time and use, the Cedar Bridge succumbed to fire in 2002 when an arsonist burned the 76-ft. long structure to the ground. And this bridge was more than a historic relic. It was the last bridge still in use. Few thought it could be replaced.

But members of the local Covered Bridge Preservation Association decided they could build a replica of the bridge on the original site. Turn to page 96 to learn more about this amazing structure, and visit MadisonCounty.com for to learn more about all of the bridges.

rebuilding HISTORY



Photos this page courtesy of Madison County Engineer's Office

▲ As the bridge nears completion, you can see how the complex web of interlocking joinery comes together.

When the Cedar bridge burned in 2002, the only solid record of its construction — the structure itself — was lost. Original plans from 1883 were long gone, and no other blueprints had ever been drawn.

Luckily, a few charred sections of the sidewall trusses remained *(Photo, page 94)*. Plus, another bridge still standing featured similar construction techniques. Using those guides, a group of craftsmen from a local construction company set about building a new bridge.

These builders soon discovered the incredible challenges this complex bit of woodworking presented. That's because a covered bridge isn't just an ordinary bridge with an enclosure built on top. This type of bridge is built as a system. The sidewalls are load-bearing trusses. The roof structure sits on top of the trusses, and the roadbed hangs from the lowest members.

Two Bridges in One — Cedar Bridge is unique among the others in Madison County, and among others found around the nation, because it combines two truss styles. One style, the queenpost truss, consists of diagonal timbers tied to curved horizontal beams, known as chords, at top and bottom.

The second style, which is called a lattice truss, is formed by crisscrossed members. Either truss style alone produces a strong bridge. Combining them made the original Cedar Bridge so strong that it was still in service on a well-traveled country road after 120 years.

Joinery Tour de Force — After the design was hammered out, Douglas fir lumber was custom-milled to create the massive timbers that make up the bridge. Most are 2" thick or more, and as wide as 16". Some measure over 20-ft. long.

And though you can see many bolts in the structure, they're not all that hold the members together. The lattice pieces are secured with lap joints that were all routed by hand. To further complicate matters, the lap joints had to be cut into the arched chords. That made laying out the joints no simple matter. Craftsmen even built a wide steel base plate and a set of guides for the router to make this task easier *(Photos, left)*.

In addition to the laps, the trusses feature mortise-and-tenon joints in some areas. And the beams that support the roadbed are notched on the ends to interlock with the chords.

Even after the cedar siding and roof were added, all of this fantastic workmanship is still visible from inside the bridge. This means that everyone who visits or uses this reborn Cedar Bridge can admire the craftsmanship for another hundred years — or longer.

▲ A craftsman routs one of the mortises that join the lattice pieces to the chords. Before assembly, the joints get a coat of wood preservative.

WORKBENCH®

PRINTER CABINET & LATERAL FILE

Issue 288 Volume 61 Number 2 April 2005

MATERIALS LIST

MATERIALS & HARDWARE

	Part	Qty	T	W	L	Material
	Printer Cabinet					
A	Case Sides	2	¾"	16"	24"	Maple Plywood
B	Case Top/Bottom	2	¾"	16"	20"	Maple Plywood
C	Case Back	1	¾"	20"	24"	Maple Plywood
D	Case Front Edging	2	¾"	¾"	20"	Maple
E	Case Side Edging	4	¾"	¾"	24"	Maple
F	Base Ends	2	¾"	4"	18 5/16"	Maple
G	Base Front/Back	2	¾"	4"	21½"	Maple
H	Base Lower Cleats	2	¾"	2"	21"	Maple
I	Base Upper Cleats	2	¾"	2¼"	21"	Maple
J	Door Top Rail	1	¾"	2½"	17½"	Maple
K	Door Bottom Rail	1	¾"	3½"	17½"	Maple
L	Door Stiles	2	¾"	2"	23⅞"	Maple
M	Small Loose Tenons	2	⅜"	1⅜"	2"	Maple
N	Large Loose Tenons	2	⅜"	2⅜"	2"	Maple
O	Top Panel	1	¾"	16 13/16"	20"	Maple Plywood
P	Top Side Edging	2	¾"	¾"	18 5/16"	Maple
Q	Top Front/Back Edging	2	¾"	¾"	21½"	Maple
R	Tray	1	¾"	14"	19⅜"	Maple Plywood
S	Tray Sides	2	¾"	2¼"	14"	Maple
T	Tray Front	1	½"	2¾"	19⅜"	Maple
U	Tray Edging	2	¼"	¾"	14"	Maple
V	Adjustable Shelf	1	¾"	16"	19¾"	Maple Plywood
W	Shelf Edging	1	½"	¾"	19¾"	Maple
	Lateral File					
A	Case Top/Divider/Bottom	3	¾"	16"	34½"	Maple Plywood
B	Case Sides	2	¾"	16"	24"	Maple Plywood
C	Case Back	1	¾"	24"	34½"	Maple Plywood
D	Front Edging	3	¾"	¾"	34½"	Maple

	Part	Qty	T	W	L	Material
E	Side Edging	4	¾"	¾"	24"	Maple
F	Base Ends	2	¾"	4"	18¼"	Maple
G	Base Front/Back	2	¾"	4"	36"	Maple
H	Base Lower Cleats	2	¾"	2"	35½"	Maple
I	Base Upper Cleats	2	¾"	2¼"	35½"	Maple
J	Top Panel	1	¾"	16¾"	34½"	Maple Plywood
K	Top Side Edging	2	¾"	¾"	18¼"	Maple
L	Top Front/Back Edging	2	¾"	¾"	36"	Maple
M	Drawer Fronts/Backs	4	½"	9¾"	33"	Maple
N	Drawer Sides	4	½"	9¾"	16"	Maple
O	Drawer Dividers	4	½"	9¼"	15½"	Maple
P	Drawer Bottoms	2	¼"	15½"	33"	Maple Plywood
Q	False Frame Top Rails	2	¾"	2½"	32"	Maple
R	False Frame Bottom Rails	2	¾"	3½"	32"	Maple
S	False Frame Stiles	4	¾"	2"	11⅞"	Maple
T	Lower Loose Tenons	2	⅜"	2⅜"	2"	Maple
U	Upper Loose Tenons	2	⅜"	1⅜"	2"	Maple

Printer Cabinet Hardware
(12) #8 x 1¼" Fh Woodscrews
(12) #20 Biscuits
(2) 14" Drawer Slides (#35685)*
(2) Door Hinges (#49393)*
(4) Levelers (#12295)*
(4) ¼"-20 T-Nuts (#26054)*
(4) Shelf Pins (#33860)*
(1) 18⅛" x 18½" Glass Panel, Reed Texture (#39266)*
(1) Cord Flexi-Grommet (#35546)*
(1) Door Knob (#33678)*
(1) Magnet Set (#32907, 38348)*

Lateral File Hardware
(16) #8 x 1¼" Fh Woodscrews
(21) #20 Biscuits
(4) 16" Drawer Slides (#89749)*
(4) Levelers (#12295)*
(4) ¼"-20 T-Nuts (#26054)*
(4) Drawer Pulls (#34659)*

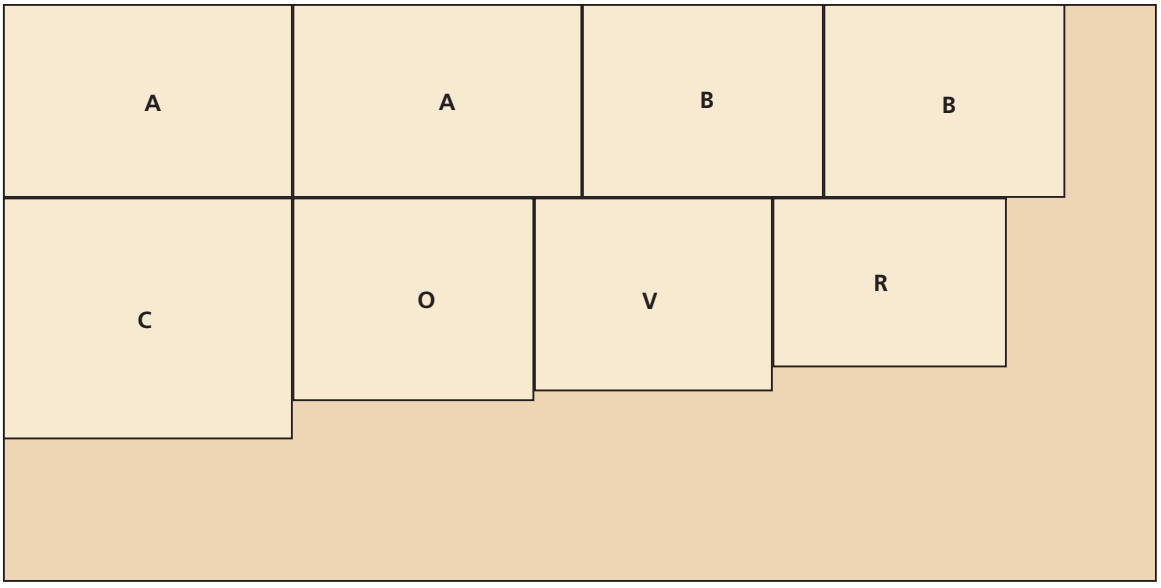
* All items available at 800-279-4441 or Rockler.com

ONLINE Extras
WorkbenchMagazine.com

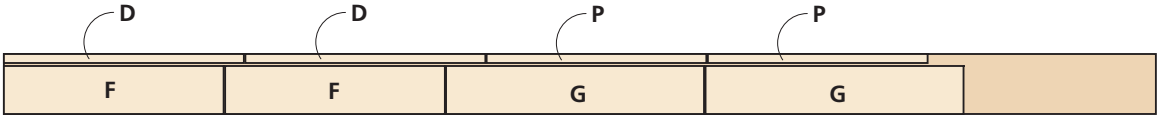
Cutting Diagrams: Printer Cabinet & Lateral File
Articles & Videos: Tongue & Dado Joinery & Loose Tenon Joinery

Issue 288 Volume 61 Number 2 April 2005

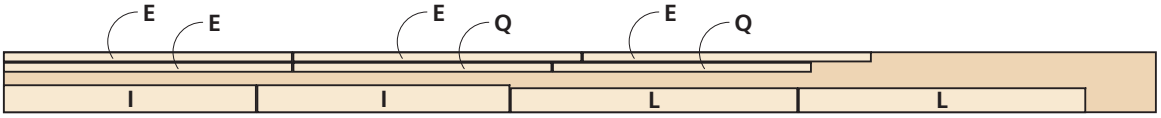
PRINTER CABINET - CUTTING DIAGRAM



¾" x 48" x 96" MAPLE PLYWOOD



¾" x 5" x 96" MAPLE



¾" x 5" x 96" MAPLE

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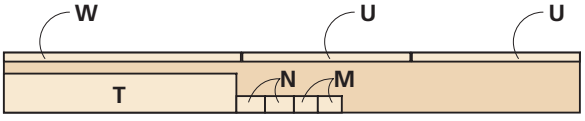


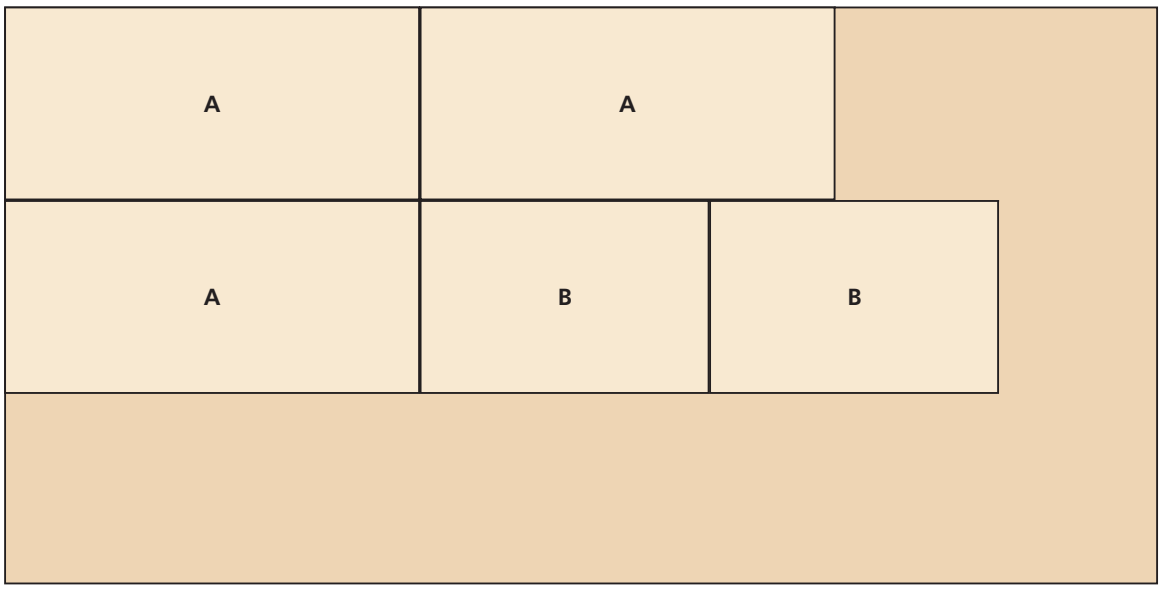
½" x 5" x 48" MAPLE

NOTE: Plane "U" to ¼" thick.

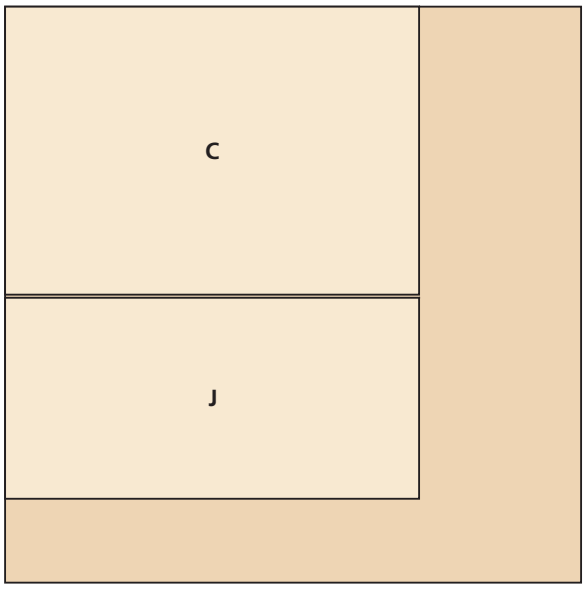
NOTE: Plane "N" and "M" to ⅜" thick.

Issue 288 Volume 61 Number 2 April 2005

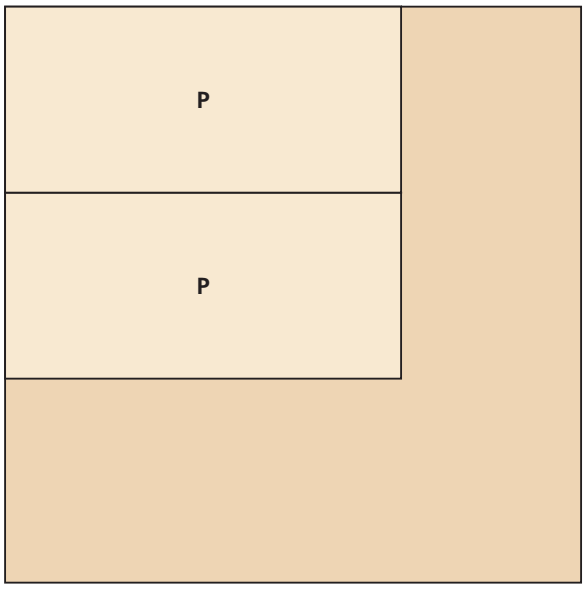
LATERAL FILE - CUTTING DIAGRAM



¾" x 48" x 96" MAPLE PLYWOOD



¾" x 48" x 48" MAPLE PLYWOOD



¼" x 48" x 48" MAPLE PLYWOOD

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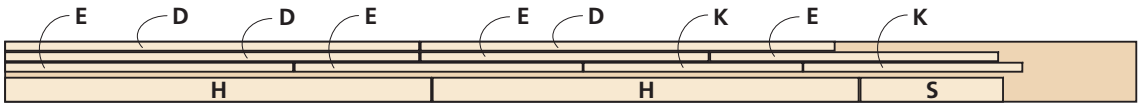
LATERAL FILE - CUTTING DIAGRAM



¾" x 5" x 96" MAPLE

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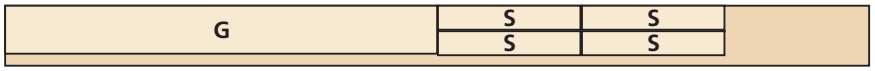
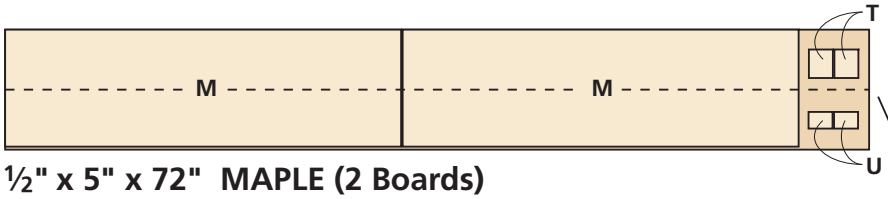


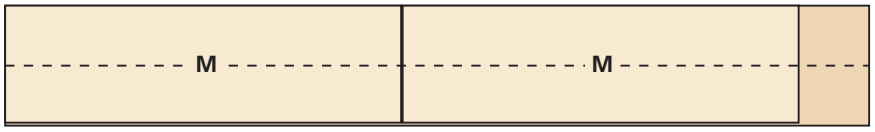
¾" x 5" x 72" MAPLE

¾" x 5" x 72" MAPLE

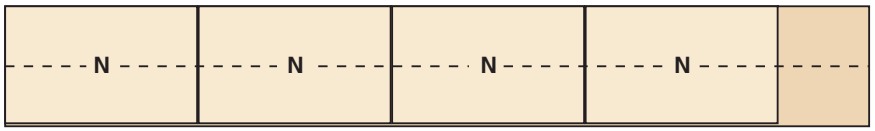
¾" x 5" x 72" MAPLE



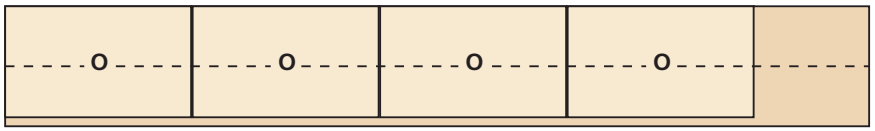
½" x 5" x 72" MAPLE (2 Boards)



½" x 5" x 72" MAPLE (2 Boards)



½" x 5" x 72" MAPLE (2 Boards)



½" x 5" x 72" MAPLE (2 Boards)

NOTE: Glue up two 5" wide pieces to create drawer fronts, backs, sides, & dividers. Then rip to final width.

WORKBENCH®

MORTISING JIG

Issue 288 Volume 61 Number 2 April 2005

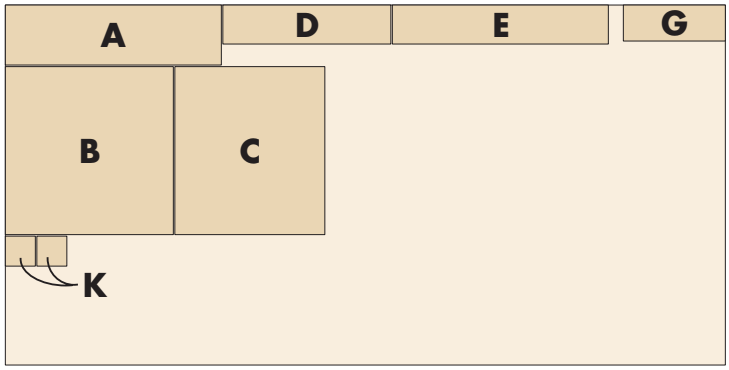
HARDWARE LIST

Rockler
Rockler.com
800-279-4441
(1) 24" T-Track (#21739)
(2) Hold-Downs (#21912)
(2) Ratchet Knobs w/ 5/16"-18 bolts (#90902)
(2) Ratchet Knobs w/ 5/16" inserts (#90910)
(4) 1/4"-20 T-Knobs (#71506)
(12) 5/16"-18 T-Nuts (#26062)
(4) 1/4"-20 T-Nuts (#26054)
(2) 1/4" x 21/2" T-slot Bolts (#33939)

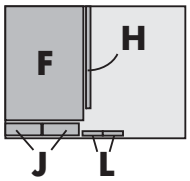
McFeely's
McFeelys.com
800-443-7937
(2) 5/16" x 3" Carriage Bolts (SCB-0530)
(2) 1/4"x 4" Carriage Bolts (SCB-0440)
(6) 3/8" Washers (WSS-0600)
(8) #8 x 11/2" Fh Woodscrews (0814-FSL)
(7) #8 x 1" Fh Woodscrews (0810-FSL)
(7) 8-32 x 1/2" Fh Mach. Screws (FMZ-0804)
(4) 8-32 Nuts (HSN-0832)

Highland Hardware
Tools-for-Woodworking.com
888-500-4466
(1) 1/4" x 11" x 15" Phenolic Board (BK-2)

CUTTING DIAGRAM



¾" x 30" x 60" Baltic Birch Plywood



¼" x 11" x 15" Phenolic Board

WORKBENCH®

COMPUTER DESK

Issue 288 Volume 61 Number 2 April 2005

MATERIALS LIST

MATERIALS

	Part	Qty	T	W	L	Material
	Pedestal Cases					
A	Top/Bottom Panels	4	¾"	10½"	22½"	Maple Plywood
B	Side Panels	3	¾"	22½"	25¼"	Maple Plywood
C	Narrow Side Panel	1	¾"	16½"	25¼"	Maple Plywood
D	Back Panels	2	¾"	10½"	25¼"	Maple Plywood
E	Side Panel Edging	9	¾"	¾"	25¼"	Maple
F	Top/Bottom Edging	4	¾"	¾"	10½"	Maple
G	Adjustable Shelf	1	¾"	10 7/16"	11¼"	Maple Plywood
H	Shelf Edging	1	¾"	¾"	10 7/16"	Maple
I	Access Panel Slats	3	¾"	¾"	22"	Maple
J	Access Panel Cleats	2	¾"	¾"	5¼"	Maple
K	Access Panel Stop	1	¾"	¾"	7"	Maple
	Pedestal Bases					
L	Base Sides	4	¾"	4"	24 13/16"	Maple
M	Base Fronts/Backs	4	¾"	4"	12"	Maple
N	Base Cleats	8	¾"	2¼"	11½"	Maple
	Drawers					
O	Upper Drawer Sides	2	½"	3¾"	22"	Maple
P	Middle Drawer Sides	2	½"	5¾"	22"	Maple
Q	Lower Drawer Sides	2	½"	10¼"	22"	Maple
R	Upper Front/Back	2	½"	3¾"	9"	Maple
S	Middle Front/Back	2	½"	5¾"	9"	Maple
T	Lower Drawer Front	1	½"	10 7/16"	9"	Maple
U	Lower Drawer Back	1	½"	10¼"	9"	Maple
V	Lower Drawer Divider	1	½"	9 15/16"	9"	Maple
W	Drawer Bottoms	3	¼"	9"	21½"	Maple Plywood
X	Top Drawer False Front	1	¾"	4¾"	10¼"	Maple
Y	Middle False Front	1	¾"	6¾"	10¼"	Maple
Z	Lower False Front	1	¾"	11¼"	10¼"	Maple
	Desk Top					
AA	Top	1	¾"	24¼"	60"	Maple Plywood
BB	Frame Ends	2	1"	3"	30¼"	Maple
CC	Frame Front/Back	2	1"	3"	66"	Maple
DD	Riser	1	¾"	2"	30"	Maple
EE	Shelf	1	¾"	5"	36"	Maple
FF	Back Rail	1	¾"	3⅜"	30"	Maple
	Keyboard Tray					
GG	Tray	1	¾"	17¼"	27"	Maple Plywood
HH	Tray Edging	1	¾"	¾"	27"	Maple
II	Tray Sides	2	¾"	2¾"	18"	Maple
JJ	Tray Front	1	¾"	2½"	29¾"	Maple
	Doors					
KK	Top Rails	2	¾"	2½"	8"	Maple
LL	Bottom Rails	2	¾"	3½"	8"	Maple
MM	Stiles	4	¾"	2"	24¾"	Maple
NN	Loose Tenons, Top	4	⅜"	1⅜"	1 15/16"	Maple
OO	Loose Tenons, Bottom	4	⅜"	2⅜"	1 15/16"	Maple

HARDWARE & SUPPLIES

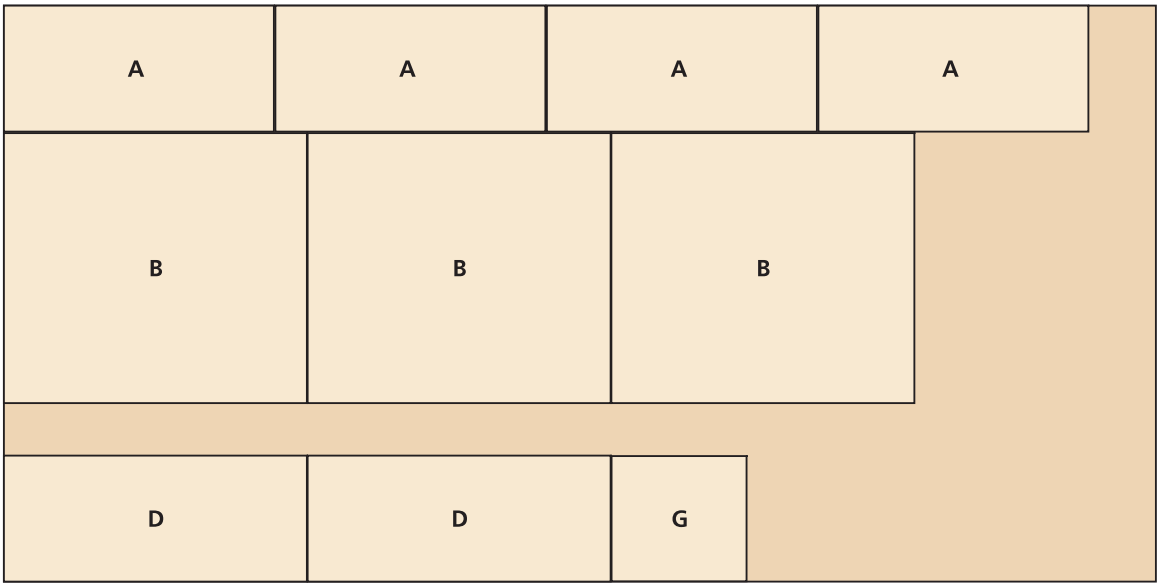
- (3) Brushed Nickel Knobs (#33678)*
- (3) Pairs of 22" Full-Extension Drawer Slides (#32516)*
- (1) Pair of 18" Full-Extension Keyboard Slides (#36304)*
- (1) Wire Management Tray (#13665)*
- (2) Textured Glass (#38821)*
- (2) Pairs of Partial Wrap-Around Hinges (#49393)*
- (8) 1 1/16"- dia. Adjustable Levelers (#18631)*
- (8) ¼"-20 T-nuts (#26054)*
- (3) Lengths of ⅛" x ¾" Aluminum Bar Stock
- (1) Pair 1½" x 2⅞" Brass Butler Hinges (#60624)*
- (1) Pair 9/16" x 3" Double Keyhole Fittings (#28829)*
- (4) #8 x 1¼" Panhead Sheet Metal Screws
- (60) #8 x 1¼" Flathead Woodscrews
- (8) #8 x 1" Flathead Woodscrews
- (8) #12 x 1¼" Flathead Woodscrews
- (1) CD Holder (#30536)*
- ⅛" hardboard splines x 15/16" wide (16 lin. ft.)
- Clear Silicone Caulk
- #20 Biscuits

* Available from www.Rockler.com

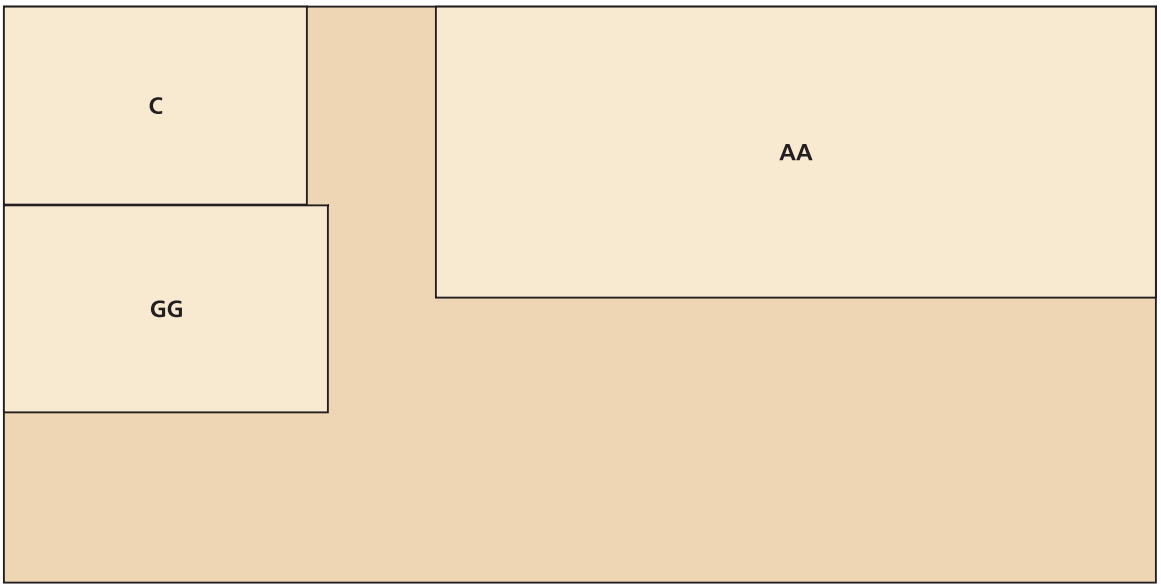
ONLINE Extras **Desk Cutting Diagram** WorkbenchMagazine.com

Issue 288 Volume 61 Number 2 April 2005

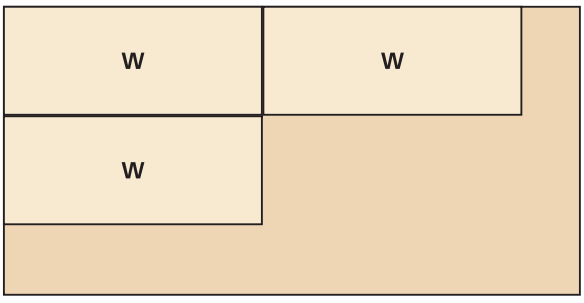
CUTTING DIAGRAM



¾" x 48" x 96" MAPLE PLYWOOD



¾" x 48" x 96" MAPLE PLYWOOD



¼" x 24" x 48" MAPLE PLYWOOD

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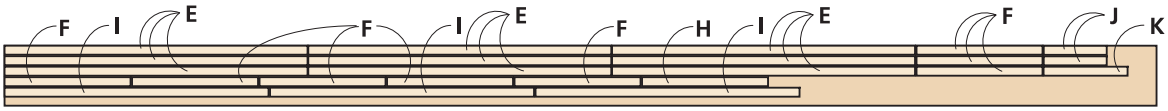
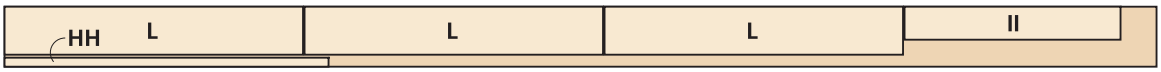
CUTTING DIAGRAM



¾" x 5" x 96" MAPLE



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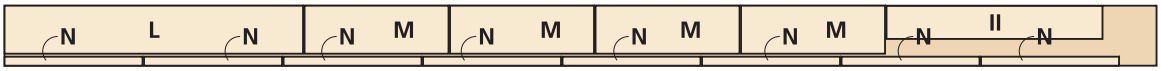
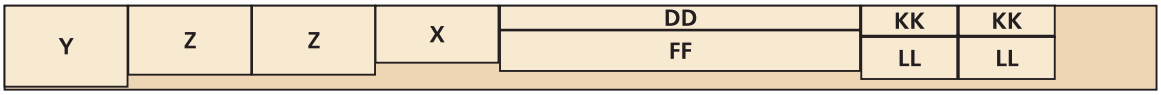
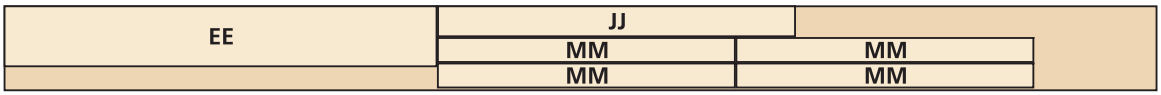


¾" x 5" x 96" MAPLE



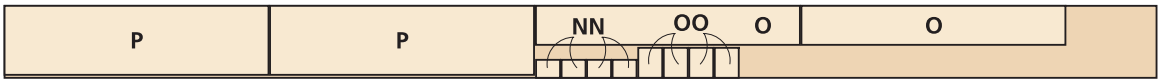
¾" x 7" x 96" MAPLE

NOTE: Glue up both Z pieces to make lower drawer false front (Z).

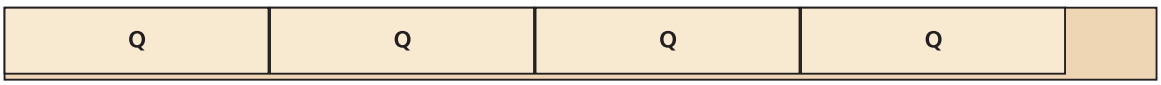


¾" x 7" x 96" MAPLE

½" x 6" x 96" MAPLE

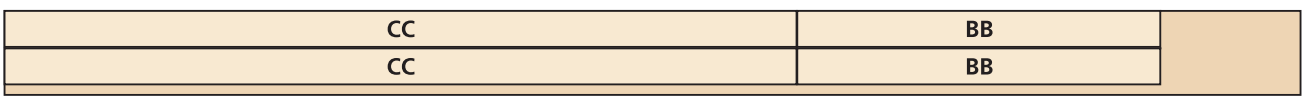


½" x 6" x 96" MAPLE



NOTE: Glue up two Q pieces to make each lower drawer side (Q).

½" x 6" x 96" MAPLE



1" x 7" x 108" MAPLE