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December 2005

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WORKBENCH

VOLUME 61 NO. 6 ISSUE #292

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EDITOR'S NOTES

One of the more fascinating aspects of woodworking is turning a project to shape on a lathe. Just ask 12-year-old Carson Downing, who is shown here making the chips fly. He's trying his hand at turning one of the gift boxes featured in this issue, and as you'd imagine, he is understandably proud of his work *(Inset Photo)*. As it turns out, so is his father, Kim Downing, who happens to be our Art Director here at *Workbench*.

Several years ago, Kim bought a lathe for Carson that was powered by an electric drill. It was a rough-running tool at best, but Carson quickly learned the basics. And with only that small amount of experience, he soon progressed to a mini-lathe and began turning pens, bowls, and other gift items.

The point is, you don't need years of practice to turn a great-looking project. If you haven't done much turning before, try experimenting with the simple techniques for using a scraper shown on page 48. That will get you started on the right track for making the turned gift boxes *(page 50)*.

As for the unique decorative inlay on the lid of each box, it's actually easier to accomplish than it looks. All it takes is a scroll saw and some epoxy mixed with a readily available colorant.

By the way, if you like the gift boxes but don't own a lathe, be sure to check out our tool review of mid-sized lathes beginning on page 62. You'll be surprised at how affordable it is to get a good-quality tool. And the best part is, there's still plenty of time to buy a lathe, get a starter set of lathe tools, and turn some gift boxes for the holidays.

Tim

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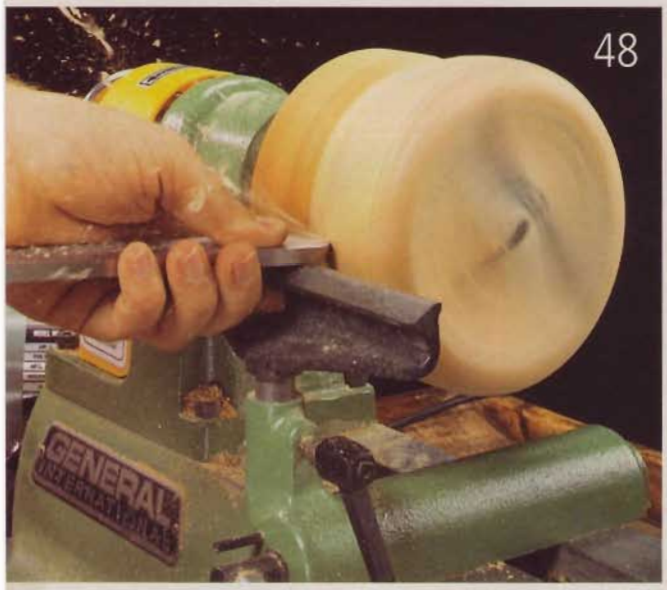
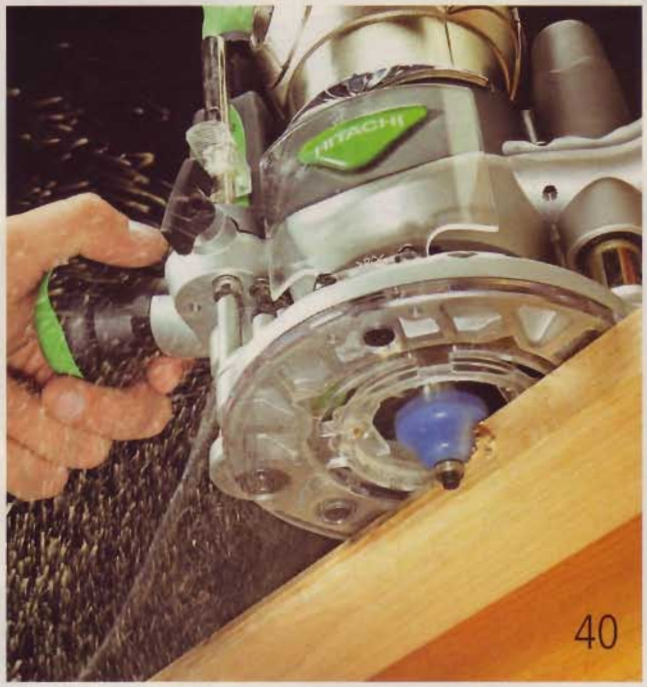
WORKBENCH® December 2005



FEATURES



IN EVERY ISSUE

READER'S WORKSHOP

WORKBENCH SHOP TIPS

BENCH BASICS

THE CUTTING EDGE

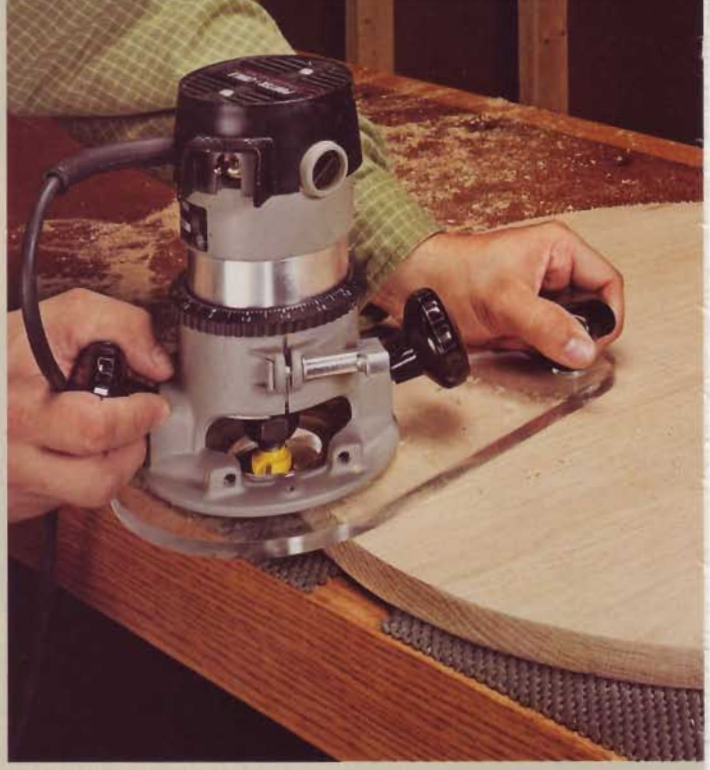
DEPARTMENTS

Questions & ANSWERS

improve a router with AN OFFSET BASE

Q *I'm new to using a router, and I sometimes have trouble with the router tipping as I use it on the edge of a workpiece. What can I do to prevent this?*

Nancy Martinson
Atlanta, GA



▲ An offset base stabilizes the router to prevent it from tipping when routing edge profiles. Mount the router with one handle in line with the end of the base.

A Routers do tend to be top-heavy because the motor is located high up in the housing. Combine this with the fact that you have less than half the base on your workpiece when edge-routing, and it's no surprise that the router can tip easily. The results can be a torn-up workpiece and a racing heartbeat. Thankfully, there are ways to prevent tipping.

Proper Position is Key — When routing by hand, it seems natural to hold the handles parallel to the edge of the workpiece. But this position makes it difficult to apply enough downward pressure without tipping the router.

To avoid this problem, always keep one of the router handles over the workpiece. Push down on that handle to keep the router firmly planted, and guide it forward using the other hand.

Add an Offset Base — If you do a lot of edge routing, it's a good idea to get an offset base. This is a flat, teardrop-shaped piece of plastic that mounts to your router in place of the standard sub-base *(Photo, top right)*. The long base and handle give you great leverage, making it easy to hold the router stable. And you can use the offset base as an edge guide, too *(Photo, right)*.

You can purchase an offset base for $25 or less. Some come pre-drilled to fit popular routers, or you can use your router sub-base as a template for drilling mounting holes.

▲ By clamping a scrap-wood block onto the offset base, you can use it as an edge guide for routing dadoes and grooves.

GOT QUESTIONS? WE HAVE ANSWERS!

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

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Forums: forums.woodnet.net
Mail: Workbench Q&A, 2200 Grand Ave., Des Moines, IA 50312

build bookcases over BASEBOARD HEAT

Q *I've wanted to make a set of the built-in bookcases you featured in your December 2004 issue (Photo, right), but the wall where I want to locate them has a radiant baseboard heater. Is there any way to install the bookcases over the heater?*

Bob Reed
via email

A As long as you provide adequate airflow around the radiant baseboard heater, you can build the bookcases over it.

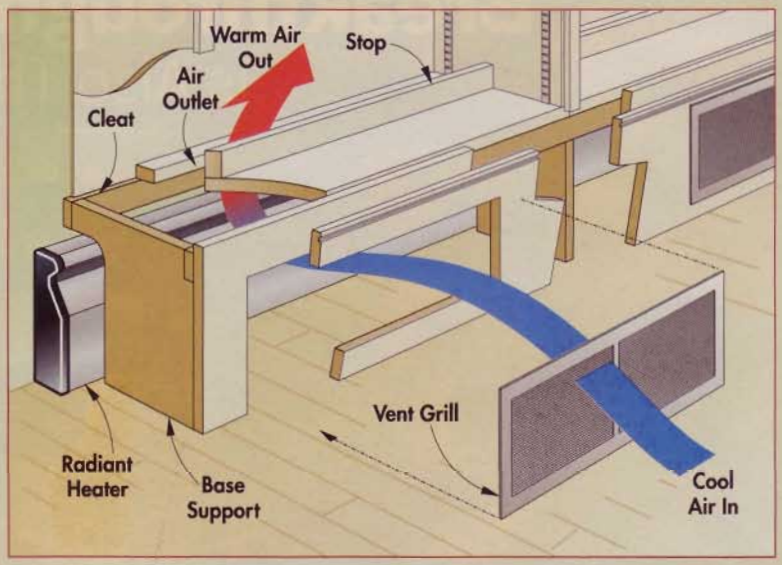
A Modified Base Adds Airflow — To provide that airflow, you need to modify the bookcases and the base they sit on, as shown in the *Illustration* at right.

First, put vents in front to allow cool air in. The simplest way is to cut openings in the base front panel and through the trim boards that fit over it. Then add grills to cover the openings. You can always remove them later if you need access to the heater.

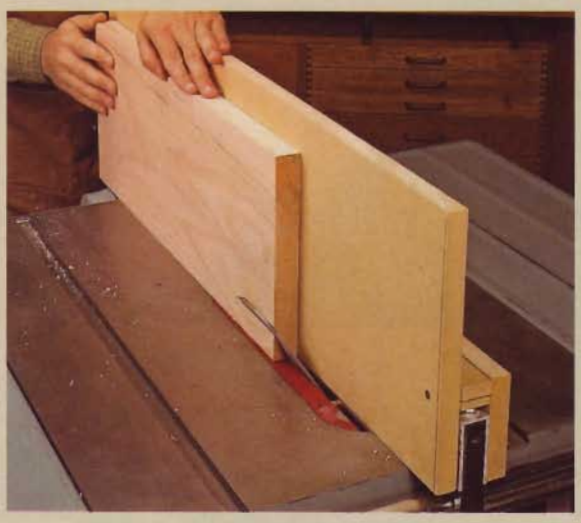
Next, cut an air outlet in the bottom panel of each bookcase, just above and in front of the heater, to let the warm air out. Add a stop to prevent items on the lowest shelf from blocking the opening or falling on the heater.

To make the bookcase base fit over the heater, replace the base back panel with a wall-mounted cleat. Notch the base supports, and attach them to this cleat.

Inspect Before Building — Before you build over the heater, inspect it and perform any service it may need, such as straightening the fins, tightening the housing, and cleaning, while you still have easy access to it.



▲ Vent holes in the front of the base unit and an air outlet in the bookcase allow warm air to flow into the room. Remove the vent grills occasionally and vacuum lint and dust that accumulate on the heater.



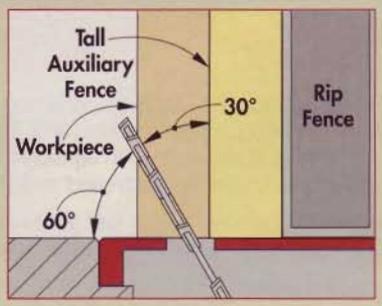
▲ To cut a bevel greater than 45°, tilt the blade to the complementary angle, and stand the workpiece on edge. Use a tall fence for added support.

go vertical to CUT A STEEP BEVEL

Q *I need to cut a 60° bevel on a wide board, but my table saw only tilts to 45°. Can you please explain how to do this?*

Kevin Courtney
Happy Valley, OR

A The secret to this cut lies in knowing the angles your saw *can* cut, and then applying the principle of complementary angles (two angles whose sum equals 90°). You *can* tilt the blade to 30°, which is the complement of 60°. So you can cut this steep bevel if you stand the board on edge *(Photo and Illustration)*.



Bionic Wrench

16 WRENCHES IN 1

The Bionic Wrench ($29) from Loggerhead Tools just made searching through your toolbox for the "right" wrench a whole lot easier.

This wrench/plier hybrid automatically adjusts between $^{7}/_{16}$" and $^{3}/_{4}$" (11 mm and 20 mm) when you squeeze the handle, effectively replacing 16 sizes of SAE and metric wrenches. The wrench applies gripping force to all six sides of a nut or bolt for a solid, slip-free hold. It also comes with a lifetime warranty. For more information or to buy a Bionic Wrench, visit LoggerheadTools.com or call 888-564-4374.

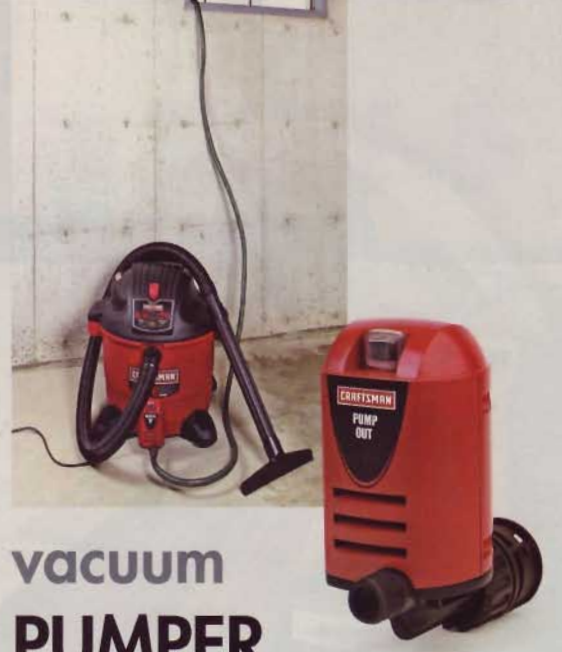
AO Safety Select

SAFETY GEAR FOR HER

More than ever before, women are tackling home improvement projects on their own. For that reason, some manufacturers are tailoring products to the female market.

One excellent example of that is a line of safety gear from AO Safety. Until now, women had to use products that were designed for men, which often didn't fit them well. And ill-fitting safety equipment rarely provides the highest level of protection. The Safety Select line includes eye, hearing, and respiratory protection in smaller sizes to better fit female users.

For more information, visit AOSafety.com or call 800-327-3431.



vacuum

PUMPER

Imagine how much easier it would be to clean up a wet basement without having to haul the vacuum drum upstairs every time it needs emptying. That's possible with the new Craftsman Pump Out. This little pump connects to the drain of most wet/dry vacs and pumps water and other liquids at up to 10 gallons per minute — even up an incline as high as 40 feet.

The Pump Out is available in Sears stores or at Craftsman.com for about $40.

▲ No more hauling the drum to empty liquids out of your wet/dry vac. When it's full, simply flip the switch on the Pump Out and let it do the heavy lifting.

YEAH, IT'S A HEMI

That's right — Hemi Tools. This new line of 18-volt tools is offered by B3 Brands in conjunction with Dodge. The line will initially include reciprocating, circular, and jig saws, as well as a hammer drill, flashlight, batteries, and a charger. They're expected to be on store shelves by early January 2006 and be priced similarly to premium cordless brands.

Look for hands-on testing of the tools in a future issue of *Workbench*. In the meantime, visit DodgeHemiPowerTools.com or call 866-316-3232 for more information.

Young Woodworkers Show Bright Future

Furniture projects designed and built by high-school students prove that young people have a passion for craftsmanship and are ready to stake their claim as the next generation of American woodworkers.

Take one look at these projects, and you can tell they were created by woodworkers with first-rate design and building skills. So it might surprise you to find out all three were built by high-school students.

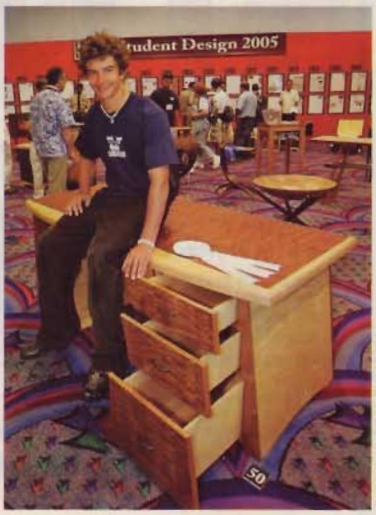
These talented students were all winners in the 2005 Student Design Contest, a competition for high-school and post-secondary woodworking students held every two years by the Association of Woodworking and Furnishings Suppliers (AWFS). This year, 22 high-school students exhibited their craftsmanship at the AWFS Fair, one of the biggest woodworking trade shows in the nation. The show gives these young people a chance to learn more about woodworking as a hobby, or even a career. So they all win big whether or not they take home a prize.

Of course, we can't show you all of the finalists and winners here. But you can see them in a book called *Fresh Wood, Volume 2*, available at FreshWood2005.com.

The next Student Design Contest will be held in 2007. To learn how you can get your student or school involved in this wonderful program, visit AWFS.org.

John Hamer from Princeton Day School in Princeton, New Jersey, won first prize in the "Creative Chair" category with this unique entry, also shown at *top*. The seat and back are made from edge-glued maple slabs. Walnut strips are bent and laminated to form the curved legs. The seat detaches from the legs for easy transport.

Meredith Smith from Cedar Ridge High School in Hillsborough, North Carolina, took first prize in "Traditional Table." She created the colorful tree image in the top using marquetry. Five different species of wood veneer make up the image, which she then applied to an MDF substrate. The frame and gracefully arched legs are made from maple.



Josiah Whitney from Cedar Ridge High School in Hillsborough, North Carolina, walked away with an honorable mention in the "Creative Casework" category with this desk. It's made with bendable wood panels, plywood, solid maple, and several types of highly figured veneer. Those include sapelli, birch, Spanish cedar, and bubinga.

► A few strokes with a hand plane are all it takes to turn a rough-cut cylinder into a round post.

turn a square timber INTO A ROUND POST

Q *The new porch rail I'm building calls for round posts instead of conventional square posts. The only problem is that I don't have a lathe to turn them. Is there a way to make square 4x4s round without a lathe?*

Mike Zucovich
via email

A There is a quick, easy way to make a round cylinder from a square 4x4. And all you need is a table saw, a hand plane, and some sandpaper.

Start at the Table Saw — First, lay out a circle on the end of a 4x4. Then tilt your table saw blade to 45° *away* from the fence. Position the fence so the blade just skims the arc of the circle. Then make four passes to cut the corners from the post *(Figs. 1 and 1a)*.

Now adjust the blade to 22½° and reposition the fence to cut away most of the remaining waste *(Figs. 2 and 2a)*. You'll make eight passes with this setup.

Note: After the first few cuts, you'll have only about ½" of flat surface riding against the saw table and fence. But as long as you keep firm pressure on the stock and your hands away from the blade, you can make these cuts safely.

Plane, Then Sand — Now clamp the post down and use a hand plane to knock down the remaining high spots between the flats *(Photo, above)*. After that, sand the post smooth, starting with 100-grit paper.

Tips & techniques

clamp cradle holds WORK SECURELY

One way to hold a workpiece flat against a benchtop is to use bench dogs and a vise. If your bench doesn't have bench dogs, you can use clamps. The only drawback is that clamp heads often get in the way of your tools.

My solution is to use a pipe clamp and a shop-made cradle that clamps in the vise *(Photo, right)*. This arrangement holds the work securely against the benchtop. Plus, it leaves the top clear of obstructions.

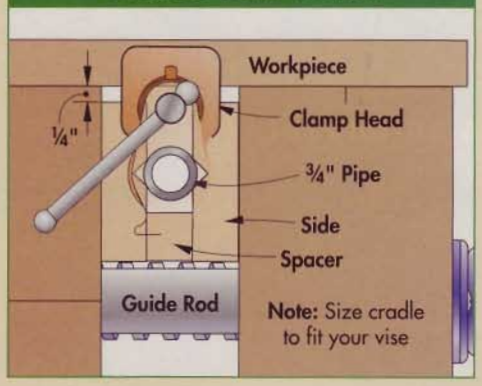
The cradle is a U-shaped assembly made up of two sides and a spacer that is sandwiched between them *(Illustrations, below)*. And there's a V-groove in each side to hold the pipe clamp securely in the cradle.

Just a note on sizing the cradle. The goal is to end up with the clamp heads *below* the surface of the workpiece so they're not in the way when sanding or planing. The position of the clamp heads is determined by the location of the V-grooves in the sides of the cradle. Another thing to take into account is the width of the sides. They must be narrow enough so they don't extend above the benchtop when resting on the guide rods of the vise. Rip the sides to width to allow 1/4" clearance below the benchtop.

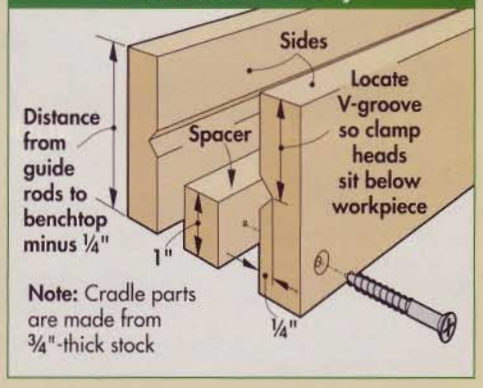
Serge Duclos
Delson, QC, Canada

▲ To secure a workpiece flat against a benchtop without clamps getting in the way, use a pipe clamp housed in a shop-made cradle. Simply tighten the cradle in a vise, and then clamp the workpiece.

Section View Detail



Cradle Assembly



TIGHTER BUSHINGS

I can never get the guide bushing on my router quite as tight as I want. And recently, the lock ring vibrated loose in the middle of a cut, damaging the bit and bushing.

To make the lock ring stay put, I wrapped the threads of the bushing with Teflon tape. A couple of wraps is all it takes to make the lock ring fit tight.

BEST TIP!

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

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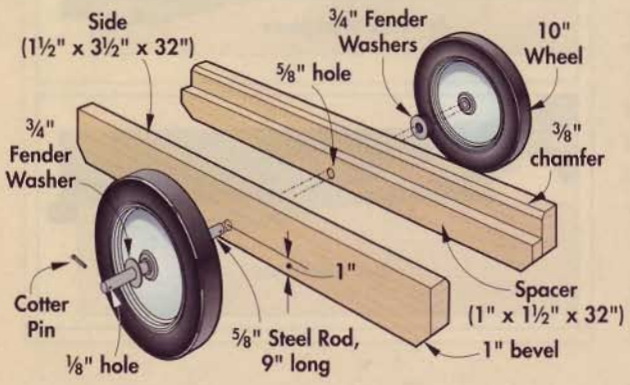


mobile mover for SHEET STOCK

It seems the older I get, the harder it is to move full sheets of material around by myself. Of course, it doesn't help that some types of material like ¾" medium-density fiberboard weigh in at almost 100 lbs. per sheet. So to make it easier to transport sheet stock, I made a simple two-wheeled cart *(Photo, left)*.

The cart consists of a pair of 2x4 sides with a spacer sandwiched between to form an opening that holds the sheet *(Illustration, left)*. You'll want to make the spacer about 1" thick, so you can lower a ¾" sheet down into the opening without any trouble. It also helps to rout a chamfer on the upper inside edge of each side.

To make the cart mobile, I purchased a pair of 10" wheels at the hardware store. There are smaller ones available, but these large wheels are easier to roll over uneven floors. The wheels are connected by an axle made from a ⅝" steel rod. Large fender washers prevent the wheels from binding against the sides. And cotter pins hold the wheels on the axle.

Michael Hauck
Ashville, OH

quick setup for POCKET-HOLE BITS

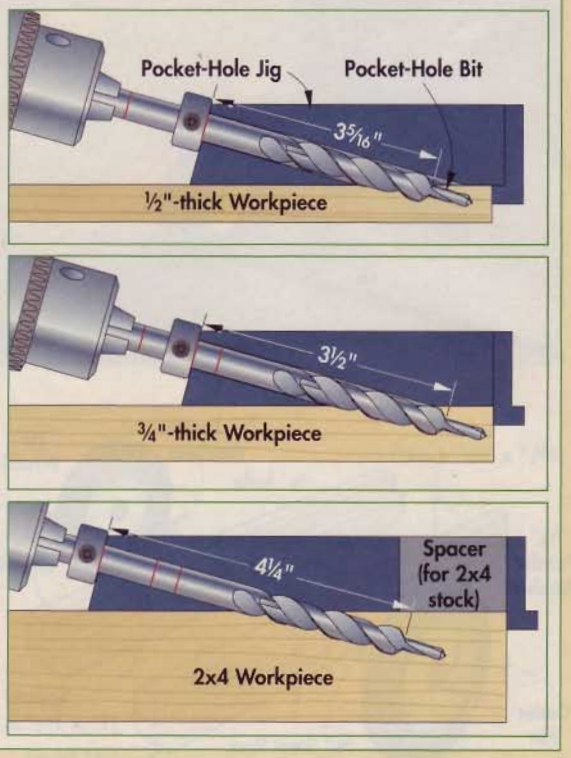
One of the few adjustments that must be made when using a pocket-hole jig is to position the stop collar on the drill bit *(Photo, below)*.

The collar determines the depth of the pocket hole. Ideally, the depth is set so the screw will be centered on the thickness of the stock when it exits the workpiece.

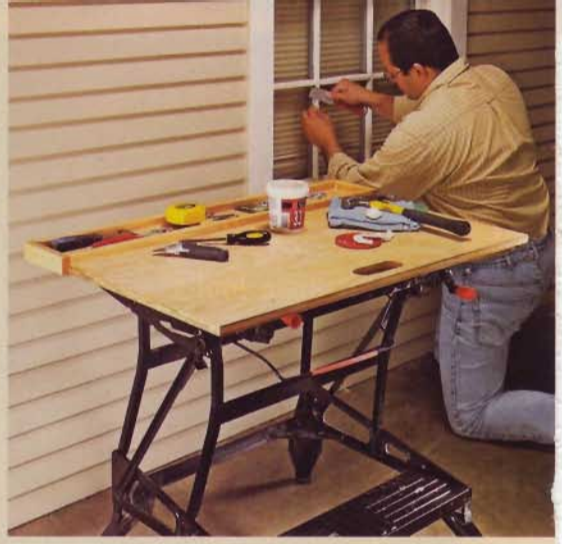
Since many of the projects I assemble with pocket screws use woods of varying thickness, I frequently have to reposition the stop collar. To do this quickly and accurately, I made several index marks on the drill bit *(see Photo at left)*. An index mark for ½"-, ¾"-, and 1½"-thick stock takes care of most jobs *(Illustrations, right)*. You can file the marks on the bit, or use a permanent marker.

Yaniv Matza
Tamarac, FL

Index Mark Locations



light-duty WORKTABLE



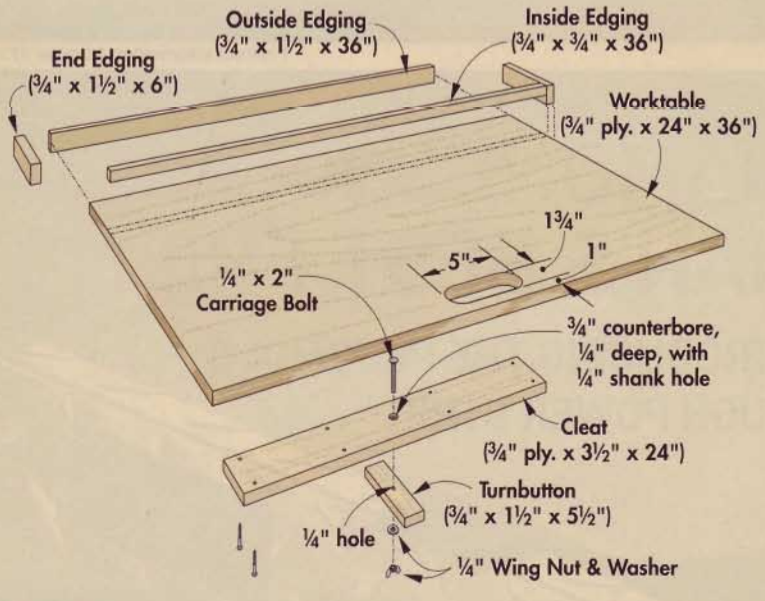
I use my portable Workmate for all kinds of jobs around the house. To make it even more versatile, I "topped it off" with a simple worktable *(Photo, right)*. In addition to providing a light-duty worksurface, the table has a convenient tray to hold hardware and small tools.

The worktable is a piece of 3/4" plywood with a handhold to make it easy to carry the Workmate when it's folded up. The tray is formed by gluing three strips of hardwood around the edges and a narrower strip to the top of the worktable *(Illustration, below)*.

It only takes a minute to attach the table to the Workmate. You simply fit a cleat that's attached to the bottom between the adjustable jaws of the Workmate. Then rotate a wood turnbutton so it's perpendicular to the cleat to "lock" the table.

To make this work, the cleat and turnbutton are bolted together and secured with a wing nut. You'll need to drill a counterbored shank hole for the bolt in the cleat before screwing it to the table.

Robert Helseth
Minneapolis, MN



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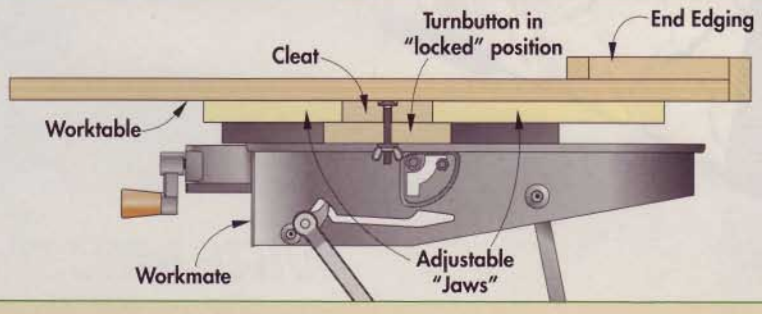
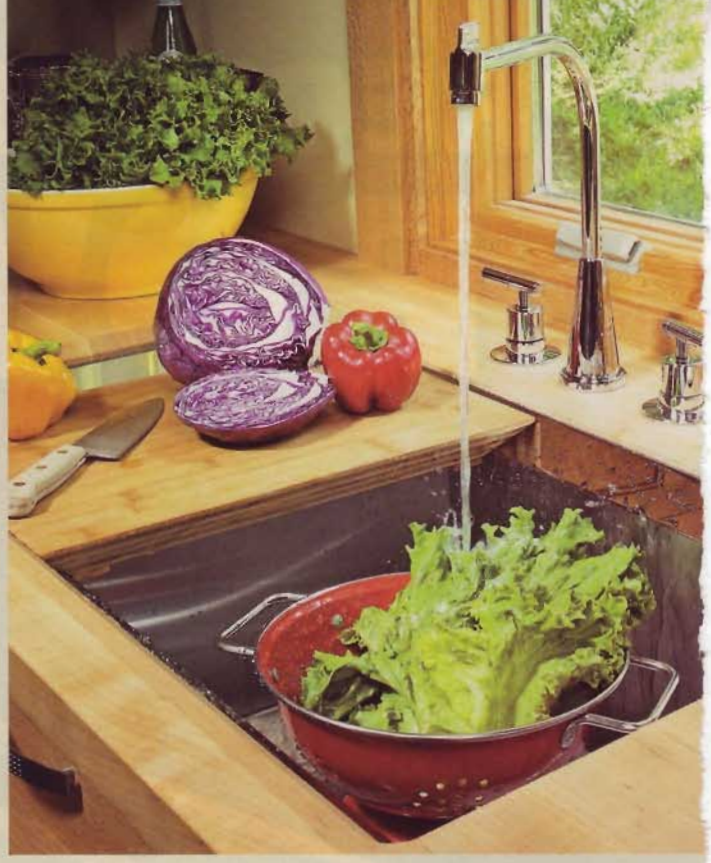


Finishing Fundamentals

two finishes for
BUTCHER-BLOCK TOPS



Q *I recently installed a butcher-block countertop. Which finish should I use to make it safe for food preparation?*

Bryan Stephens
Lake Ozark, MO

A Several finishes say "food-safe" on the label, but that's more of a marketing device than a description of the finish itself. In reality, *any* finish is safe for food contact after it's cured (the rule of thumb is to wait 30 days).

With this in mind, I'd recommend using either a polyurethane finish or mineral oil for a butcher-block countertop.

Polyurethane — Of these two finishes, polyurethane is the most durable, and it provides the best protection against moisture. One of the downsides, however, is it dries slowly, allowing dust to settle in the finish. Also, you have to apply it with a brush, so it can be challenging to get a smooth finish.

Gel Polyurethane — To get the advantages of polyurethane without as much hassle, you can use a gel polyurethane. Butcher-block manufacturer John Boos (JohnBoos.com) makes one called EZ-DO *(Photo, middle right)*. The finish is easy to apply. Just load a rag with gel, and wipe it in a circular motion. Then, in a couple of minutes, use a clean rag to wipe off the excess gel.

You'll need to apply several coats of the gel to get a good build. Be sure to allow each coat to dry thoroughly before applying the next. Then, use 400-grit sandpaper and mineral oil to "wet-sand" the topcoat of finish for a smooth surface.

Mineral Oil — If, on the other hand, you plan on cutting food right on the counter, you may want to use mineral oil as the finish *(Photo, right)*. Mineral oil penetrates the surface of the wood to protect against moisture. And if you need to remove knife marks later, it's easy to sand through both the oil and marks, and then apply more oil.

Sometimes, you'll see a bottle of finish named "Butcher Block Oil." This is nothing more than mineral oil with a different name.

Food-Safe Finish
As long as a finish has cured fully (such as the polyurethane on this cutting board and butcher-block top), it's safe to prepare food on it.

Gel Poly
For a butcher-block counter, this wipe-on, wipe-off gel poly protects against moisture and looks like varnish.

Mineral Oil
If you plan on cutting on the butcher block, a simple coat of mineral oil applied every few weeks is sufficient.

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

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Finishing Fundamentals

the best use for
WAX ON WOOD

Q *I'm thinking about using wax to finish one of my projects. Are there any tips for applying it to achieve a smooth surface and a nice sheen?*

John Loch
Lake Shore, MN

A Wax provides very little moisture and scuff protection, so it's best not to use it as an actual "finish." Instead, use wax *after* you apply the finish to create a glass-smooth surface and consistent sheen on the wood.

To do this, coat a 0000 steel wool pad with wax. Use the pad to lightly abrade the surface of the finish, working the wax into the finish in a circular motion *(Fig. 1)*. After a few minutes (it varies a bit by manufacturer), the wax will start to film over. At this point, take a clean, dry cloth, such as a cotton rag, and buff the wax to an even sheen *(Fig. 2)*.

I typically use a neutral-colored wax at this step, but a variety of tinted waxes are available if you'd like to slightly change the color of the finish.

1

▲ After the finish dries, load 0000 steel wool with a layer of wax, and rub it lightly into the surface.

2

▲ When the wax films over, use a clean cotton rag to buff the surface and create an even sheen.

▲ Using a sharp chisel, you can carefully pare a run of dried finish off the wood's surface without ruining the surrounding finish.

quick fix for a
FLAWED FINISH

Q *I noticed some runs in a polyurethane finish after it dried. Can I remove them?*

Vince Campise
Columbus, OH

A I use a sharp chisel to pare off a dried run. To avoid damaging the surface of the wood, hold the chisel as flat as possible, and carefully trim off the run, as shown at left.

Of course, you'll still be able to see where the run has marred the finish. To fix this, you're going to need to apply one more quick coat of finish. First, sand the piece one more time. Use 220-grit paper, just like you would between coats of finish, and sand a bit more aggressively at the source of the run to buff out the mark.

After sanding, wipe the surface free of dust, and apply another coat of finish. Any evidence of the drip should be long gone.

To prevent drips in the future, don't overload the bristles with finish, and always stroke the surface holding the brush at 45° to smooth runs and brush marks. It also helps to check the finish under a low-angle light for imperfections before it dries.

easy-to-build panel saw
ONE DAY, UNDER $50

It's never been easier to crosscut a full sheet of plywood by yourself than with this shop-built panel saw. Just slip the sheet in from the side. Then slide the carriage that holds your circular saw down between two guide rails. A removable pin releases the carriage *(Inset Photo)*.

Crosscutting a full sheet of plywood isn't easy. You either have to wrestle it onto the table saw, or do the best you can with sawhorses and a circular saw. And the results aren't always pretty.

That explains why home centers have those fancy panel saws you've probably seen. They feature a vertical bed that supports the sheet while a circular saw slides down a pair of rails to make the cut.

Unfortunately, commercial panel saws cost big bucks. So rather than buy one, Christopher Dromey of Provo, UT, figured out how to build one that works great for less than $50.

This panel saw has a large plywood bed that mounts to the wall *(Bed Assembly)*. A number of 1x4s add rigidity to the bed. And a thick ledge near the bottom supports the sheet as you cut *(Photo, left)*. Two vertical rails guide a sliding carriage that holds the circular saw *(Inset Photo)*.

Begin with the Bed — The first step is to cut the bed (A) to size from ¾" plywood. To make sure the bed stays flat, you'll need to add a grid of reinforcing pieces. The first piece is a backer (B), which is centered on the width of the bed and screwed in place. In use, the circular saw will cut into this backer, so you'll want to locate the screws near the edges of this piece.

Once the backer is attached, it's time to add the top and bottom ledges (C). Each ledge consists of two pieces, one on each side of the backer. Rip these pieces to width from 2x stock, and screw them to the bed. To provide a stable rest for large sheets, be sure the two pieces of the bottom ledge are level with each other.

After installing the ledges, cut the horizontal stiffeners (D) to length from 1x4 stock. Then screw them to the bed, as shown.

Guide Rails — The next components to add are two guide rails (E) made from 2x stock. The lumber for these guide rails must be straight. Otherwise, the saw carriage will bind during the cut. You'll want to get the straightest 2x6 you can find, and then rip both guide rails from it.

Once that's done, cut a rabbet in the back inside edge of each rail *(Bed Assembly)*. These rabbets form a track for the carriage to ride in *(Top View)*.

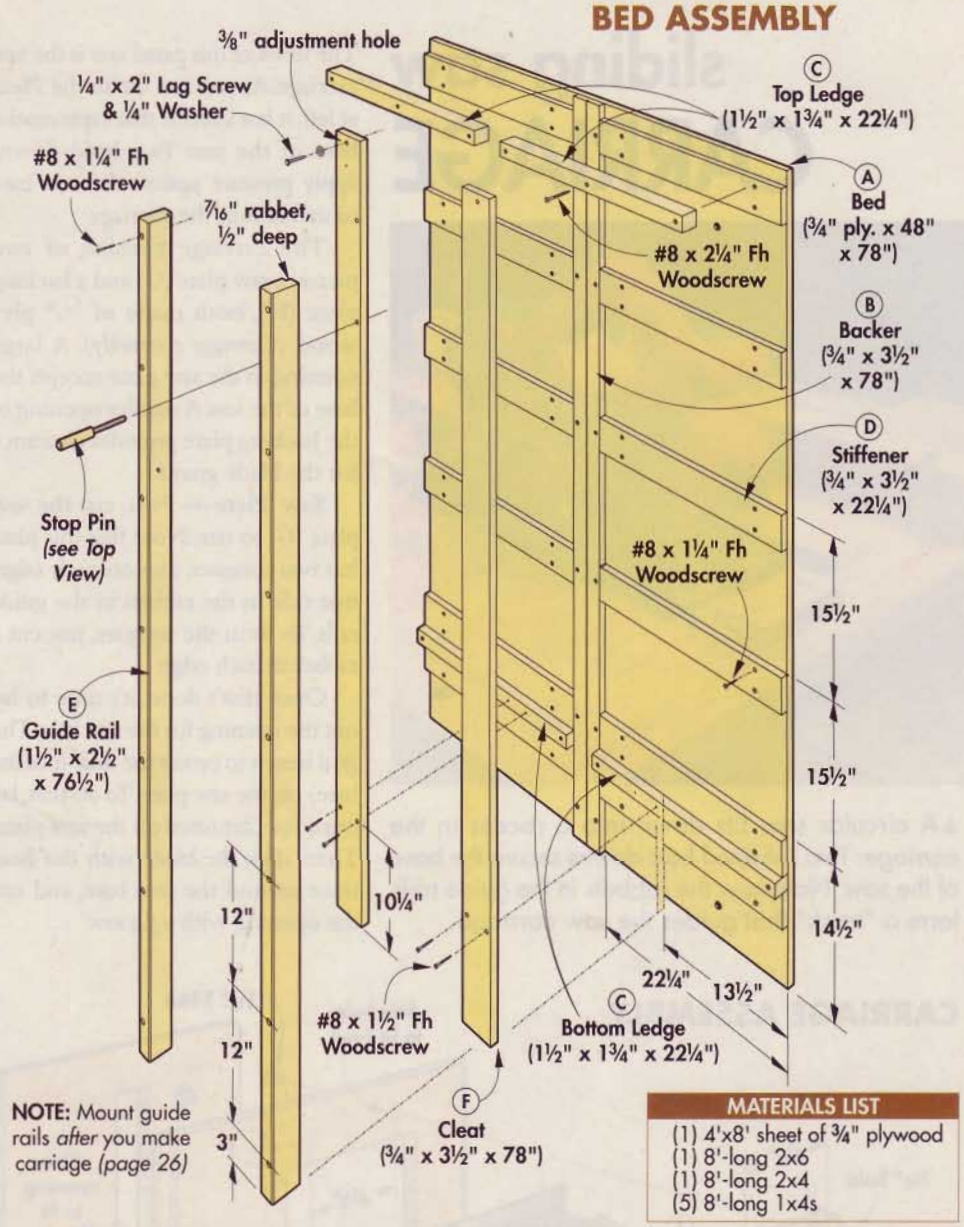
All that's left to complete the guide rails is to drill the holes that will be used to mount them to the panel saw. Eventually each rail gets screwed to a cleat, which is in turn attached to the top and bottom ledges. This requires drilling deep counterbored shank holes for the mounting screws *(Top View)*.

Although the guide rails are complete at this point, it's best to wait until after you make the carriage to attach them. That way, you can use the carriage to establish the spacing between the rails.

Add the Cleats — There's no need to wait to add the two cleats (F) though. Cut them from 1x4 stock to match the height of the bed, and attach them to the top and bottom ledges. Two screws secure the cleats to the bottom ledge. On the top, however, a single lag screw passes through an oversize hole drilled in the cleat. This lets you adjust the location of the guide rails if necessary.

Carriage Support Pin — After mounting the cleats, the last thing to do is to make a pin to support the carriage above the workpiece. The pin is a short steel rod secured in the end of a dowel with epoxy. It fits into one of two holes drilled in either cleat *(Guide Rail Detail)*. Use the lower hole for 48"-wide sheets and the upper hole for Baltic birch, which is 60" wide.

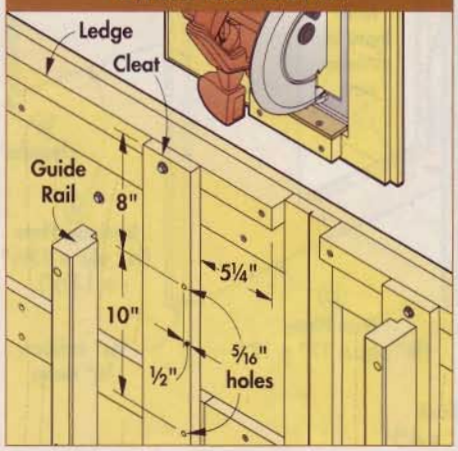
BED ASSEMBLY



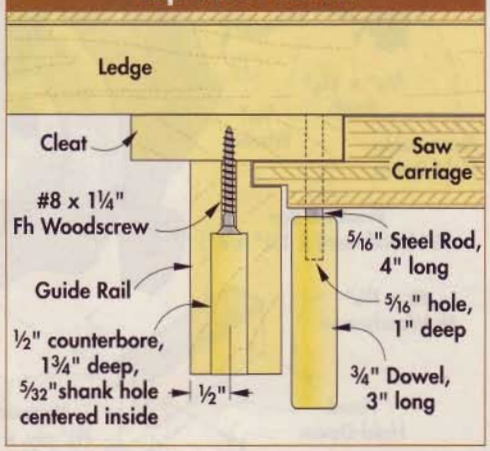
MATERIALS LIST

(1) 4'x8' sheet of 3/4" plywood
(1) 8'-long 2x6
(1) 8'-long 2x4
(5) 8'-long 1x4s

Guide Rail Detail



Top View Detail



sliding saw CARRIAGE

▲A circular saw fits down into a recess in the carriage. Two L-shaped hold-downs secure the base of the saw. Note how the rabbets in the guide rails form a "track" that guides the saw carriage.

The heart of this panel saw is the saw carriage. As you can see in the *Photo* at left, it has a recess that captures the base of the saw. Two hold-downs apply pressure against the saw base to secure it in the carriage.

The carriage consists of two pieces: a saw plate (G) and a backing plate (H), both made of 3/4" plywood *(Carriage Assembly)*. A large opening in the saw plate accepts the base of the saw. A smaller opening in the backing plate provides clearance for the blade guard.

Saw Plate — First, cut the saw plate (G) to size. Note that this plate has two tongues, one on each edge, that ride in the rabbets in the guide rails. To form the tongues, just cut a rabbet in each edge.

Once that's done, it's time to lay out the opening for the saw base. The goal here is to center the *blade* (not the base) on the saw plate. To do that, lay out a line, centered on the saw plate. Then align the blade with this line, trace around the saw base, and cut the opening with a jig saw.

Now test your saw to see if it fits into the opening. It's possible that one or more of the controls (like the depth control locking lever, for instance) might be in the way. If so, notch the opening so the saw fits.

Next, to accept T-nuts that help secure a removable hold-down (added later), drill two shallow counterbores on the back of the plate.

Backing Plate — After installing the T-nuts, you can cut the backing plate (H) to size. Center this plate on the saw plate, and then lay out and cut the opening for the blade guard.

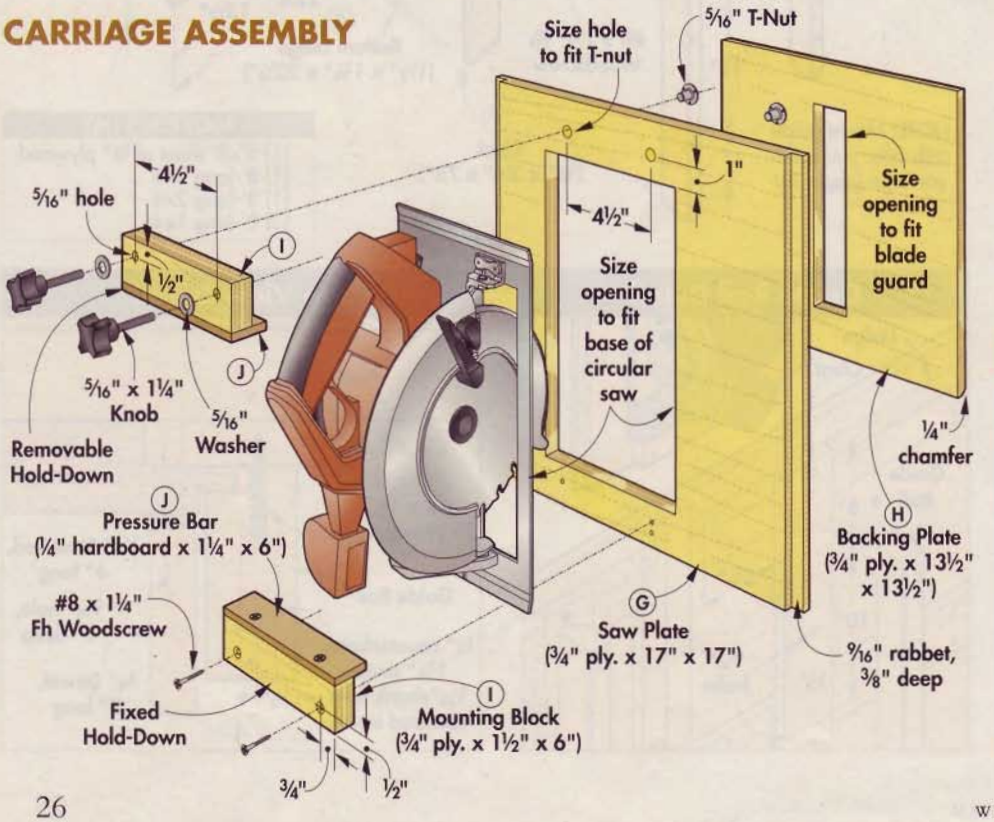
Then rout a small chamfer on the leading edge of the plate. (It will allow the carriage to slide smoothly across the bottom ledge of the panel saw.) That takes care of the backing plate. Now just center it on the saw plate, and glue it in place.

Hold-Downs — All that remains is to add the two hold-downs. The one near the leading edge of the carriage is fixed. But the rear hold-down is removable, so you can quickly take the saw out of the carriage.

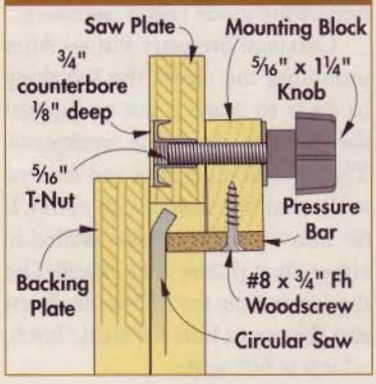
Each hold-down has two parts: a mounting block (I) that attaches to the carriage and a pressure bar (J) that fits against the saw. Here again, you may have to modify the size or shape of these parts to fit your saw.

Finally, screw the fixed hold-down to the carriage. Then thread knobs into the T-nuts you installed to secure the removable hold-down.

CARRIAGE ASSEMBLY



Hold-Down Detail



install guide rails & SET UP PANEL SAW

The accuracy of this panel saw, and how smoothly it operates, depend on the rails that guide the carriage. They must be straight, square to the bottom ledge, and parallel to each other.

To make sure the first guide rail goes on straight, snap a chalk line on one cleat *(Fig. 1)*. Locate this line 3/4" in from the edge, which will center the guide rail on the width of the cleat. Now align the rail with the chalk line, square it to the ledge, and fasten it with screws *(Fig. 2)*.

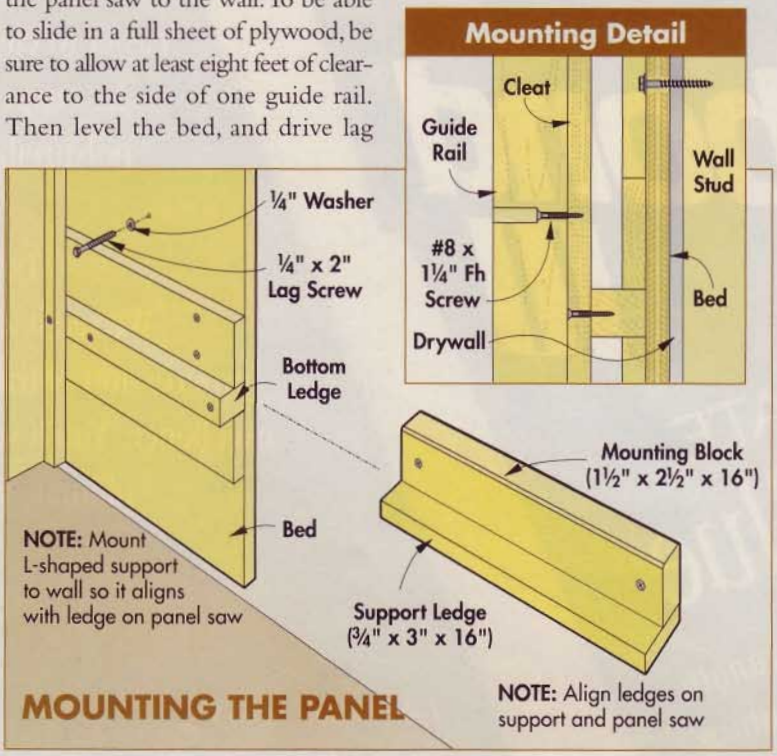
The next step is to install the second rail parallel to the first. An easy way to do this is to use the carriage as a spacer *(Fig. 3)*. Start by clamping the second rail in place. Then slide the carriage between the two rails to check that it moves freely without too much play. Adjust this rail as needed, and then screw it in place.

Install the Panel Saw — Once the rails are attached, it's time to mount the panel saw to the wall. To be able to slide in a full sheet of plywood, be sure to allow at least eight feet of clearance to the side of one guide rail. Then level the bed, and drive lag screws through it into the wall studs. To help support long sheets of material, mount an L-shaped support to each side of the saw, level with the bottom ledge *(Illustration, below)*.

Before you make the first cut, check the carriage one more time. It should still slide smoothly between the guide rails. If not, loosen the lag screws that attach the cleats at the top, and adjust each rail as needed.

Reference Kerf — The last thing to do is to make a shallow saw kerf in the backer attached to the bed. This kerf provides a handy way to position a sheet of plywood before making a cut. You simply align the layout line on the sheet with the kerf.

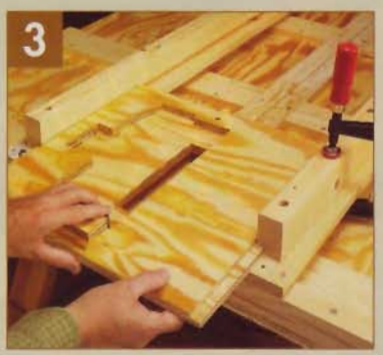
To make the kerf, mount the circular saw to the carriage, and adjust the blade so it will cut 1/8" deep into the backer. Now fit the carriage between the guide rails from the top, turn on the saw, and make the cut.



INSTALL GUIDE RAILS

▲ For a straight guide rail, snap a chalk line on one cleat, and align the edge of the guide rail with it.

▲ Now square the rail to the ledge, clamp it along the chalk line, and screw it to the cleat.



▲ Before attaching the second guide rail, make sure the carriage slides freely from top to bottom.

dead-on dadoes — GUARANTEED!

The plywood cases for the kitchen cabinets *(page 68)* are assembled with simple dado joints. Simple to cut maybe, but trickier to get the piece that goes *into* the dado to fit snug. It's the old "nominal-thickness-versus-actual-thickness" dilemma ($^3/_4$" plywood is actually $^{23}/_{32}$" thick). Because of this, you can't use a $^3/_4$" straight bit to cut a dado for $^3/_4$" plywood, as it makes for a sloppy fit.

A better solution is to make two passes using a smaller, $^1/_2$" straight bit and a pair of edge guides *(Photo)*. By routing along the fence of one guide and back down the other, you get a perfect-fitting dado.

Reference Edges — The key to making this work is to create a *reference edge* on each guide that indicates where the bit will cut. On one guide, this reference edge aligns with the layout line for the dado *(Using the Guides)*. The second guide is positioned by butting its reference edge against a spacer. Just be sure the spacer matches the thickness of the project part that's going to fit into the dado.

Making the Guides — So how do you establish these reference edges? It's accomplished automatically in the process of making the guides.

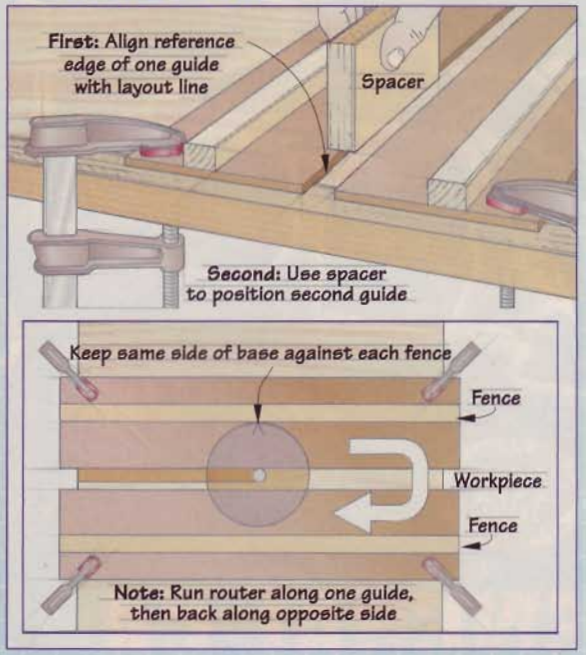
Start with an extra-wide piece of $^1/_4$" hardboard for the base of each guide. (A 6"-wide piece should be fine.)

▲ These edge guides make it easy to rout tight-fitting dadoes for plywood using a standard straight bit.

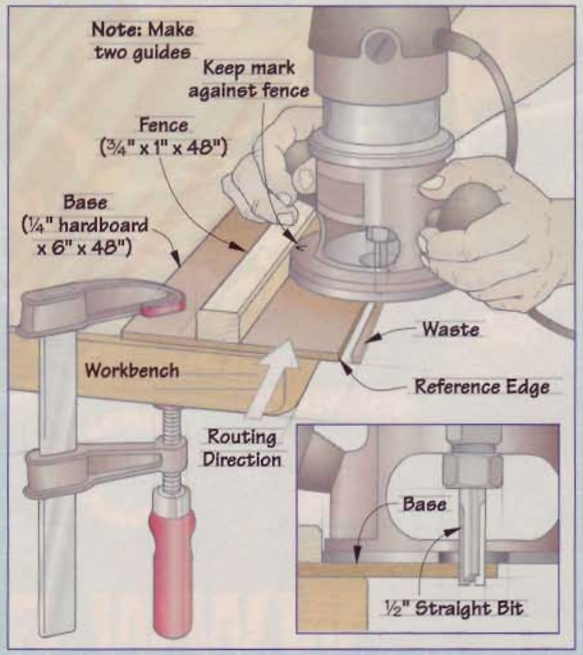
Then glue and clamp the fence to the base. **Note:** Position it so there's about $^1/_4$" of material that needs to be trimmed. Now mount the same straight bit you'll be using to cut the dadoes in the router, and trim off the waste *(Making the Guides)*. The edge that's cut is the reference edge.

Note that on some routers the bit isn't perfectly centered in the base of the router. So make a mark on the router base, and keep that mark against the fence when trimming the waste off the edge guides *and* when cutting the dadoes *(Making & Using the Guides)*.

USING THE GUIDES



MAKING THE GUIDES



TIPS FROM THE WORKBENCH SHOP

plunge-cut a perfect SINK TEMPLATE

An undermount sink provided a practical and attractive solution for our kitchen remodel *(page 76)*. But installation of this type of sink isn't as forgiving as a traditional drop-in sink. Since the sink opening will be visible, the edges and corners of the opening must be perfectly straight and square.

To accomplish that, I made a ¼" hardboard template of the opening and then used a router equipped with a guide bushing and a straight bit to cut it. Of course, this means the opening in the template also has to be straight and square. That's easy to do on a table saw. You simply make a series of plunge cuts by raising the blade through the template *(Photos, above)*.

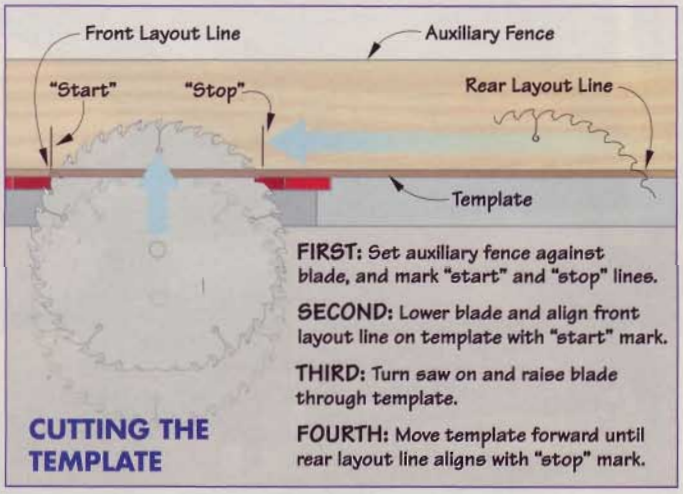
Layout — Start by using the paper pattern (included with sink) to lay out the opening on the template. I made mine ¼" longer and wider than the pattern to account for the guide bushing. Extend the lines all the way to the edges of the template.

Before cutting the opening, you'll need to determine where to begin and end the cut. An easy way to do this is to mark a "start" and "stop" line on an auxiliary fence attached to the rip fence *(Illustration, below)*.

Just a note about the auxiliary fence. It's also used to hold the template down against the table saw as you raise the blade. So attach it ¼" above the table to provide clearance for the template to slide underneath.

Take the Plunge — To cut the first side of the opening, lower the saw blade and slide the template under the auxiliary fence. Position it so the front layout line aligns with the "start" mark *(Fig. 1, above)*. Now turn the saw on, and raise the blade all the way up through the template. At this point, slide the template forward until the back layout line aligns with the "stop" mark *(Fig. 2)*. Then turn the saw off, and lower the blade. Reposition the template, and repeat the process to cut the last three sides.

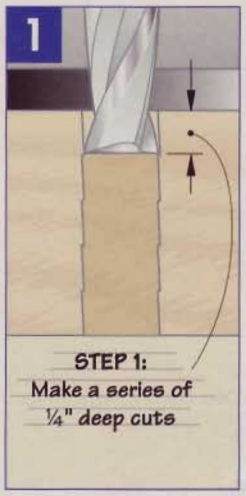
To prevent the cutout from shifting — and possibly binding — against the blade on the last cut, I used double-sided tape to attach hardboard "keepers" around the three sides of the opening that are already cut.



MAKING SMOOTH, ACCURATE CUTS IN THICK PIECES

The butcher-block counter in our kitchen project is a 1½"-thick slab made of hard maple — too hard and thick to cut with a circular saw. So to get a clean, crisp cut, I used an edge guide and a router equipped with a spiral bit. (I used a bit with a 2"-long cutting edge available at WhitesideRouterBits.com)

Set the counter on a piece of plywood to support the cutoff when it falls free. Then clamp on an edge guide *(page 30)* and make a series of progressively deeper passes *(Fig. 1)*. Now reset the edge guide to make a final, full-depth clean-up pass *(Fig. 2)*.



TIPS FROM THE WORKBENCH SHOP

alignment jigs for HAND-DRILLED HOLES

The special fasteners we used to join the butcher-block countertop sections *(page 76)* require accurately aligned holes. These holes have to be bored with a handheld drill, so we made two simple jigs to ensure precision.

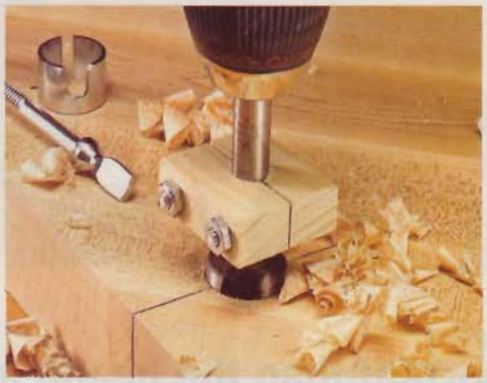
COUNTERTOP FASTENER

SHOP-MADE FORSTNER BIT STOP COLLAR

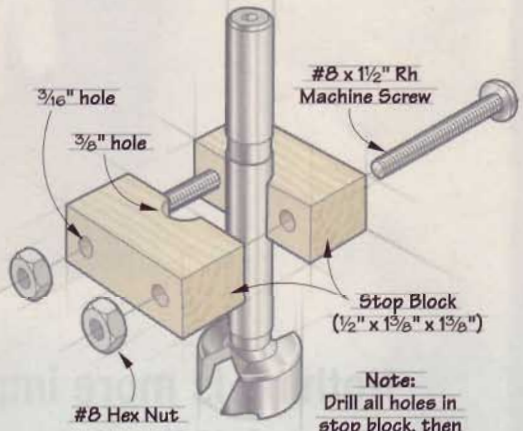
The two sleeves of each fastener fit into counterbores drilled in the bottom of the counter. It's easy to drill the holes with a Forstner bit, but the hole depth must also match.

Standard stop collars won't work, because they're smaller than the diameter of the bit. So I made a large wood stop collar that "clamps" around the shank of the bit *(Photo)*.

To make the collar, drill holes for the shank of the bit and for two machine screws. Cut the block in half, and then tighten nuts on the screws to pinch the collar around the bit.



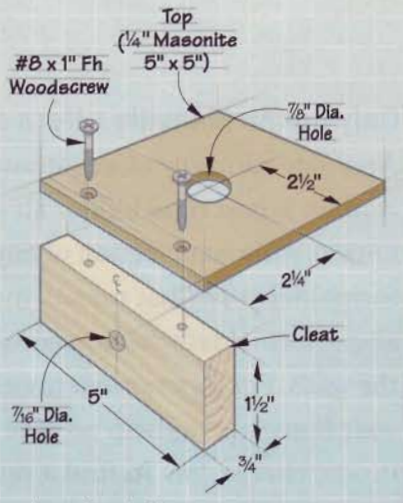
▲ To ensure holes of uniform depth, this wood collar "bottoms out" on the counter, stopping the bit at the desired depth.



EDGE DRILLING & ALIGNMENT GUIDE

The threaded draw bolt that connects the sleeves of the fastener passes through holes drilled into the edge of each countertop section. These holes must intersect the counterbores for the sleeves at the same point from one fastener to the next. Plus, the holes have to be parallel to the top of the counter.

This simple L-shaped guide handles both jobs *(Illustration, right)*. A large hole in the hardboard top of the guide accepts a dowel that registers the guide on the counterbore *(Inset Photo)*. And a smaller hole in a wood cleat guides the bit as you drill the hole *(Photo, right)*.



▲ Use a dowel to accurately align the drilling guide with the counterbore that holds the sleeve of the fastener. Tape the dowel if necessary for a snug fit. Then drill the hole for the threaded draw bolt.

BENCH BASICS
FUNDAMENTAL SKILLS FOR BETTER WOODWORKING

A GUIDE TO BUYING THE RIGHT ROUTER

Learn the basic differences between the two types of routers, and you'll be well on the way to choosing the tool that's right for you.

No matter what kind of woodworking you do, you can't make it far down the list of must-have tools without including a router. It's perhaps the most versatile of any woodworking tool because it does everything from shape simple edge profiles to cut complex joinery.

But if you're trying to buy your first router — or your second or third — you've discovered that there are numerous models available with a variety of different features. That makes selecting the right one difficult until you understand the real benefits of those features. We'll sort it all out over the next few pages, starting with a little basic anatomy.

Router Basics — At its core, a router is just an electric motor with a device on one end of the shaft called a collet that holds the bit. We'll discuss collets further on page 44.

Alone, though, there'd be no way to make a controlled cut with just a motor holding a bit. The motor needs to be secured in a base that holds it at a 90° angle to the workpiece and has a flat bottom to ride on the wood as you cut. This base is what defines the type of router.

The Fixed-Base Router — The simplest way to secure the router is with a base that clamps onto the motor. A router equipped this way is known as a *fixed-base* model. You can see one in detail on page 41.

That name implies that the base can only be locked in one position, but that's not true. By sliding the motor up and down or rotating it in the base, you can raise or lower the bit.

You can only do this when the router is not cutting, though. So to change cutting depth, you have to shut the router off, and then adjust the base. Plus the bit always projects from the bottom of the base, making it tough to start a cut that's located away from an edge, such as a mortise.

The Plunge Router — An inventive woodworker eventually figured out that if you mount the motor on a pair of columns with springs inside, then you could slide it up and down easily.

Add a locking mechanism and a depth-stop system, and you could make adjustments as you cut. Plus, you could raise the bit above the base, turn on the router, and then plunge the spinning bit into the middle of a board. This became known as a *plunge* router, also shown on page 41.

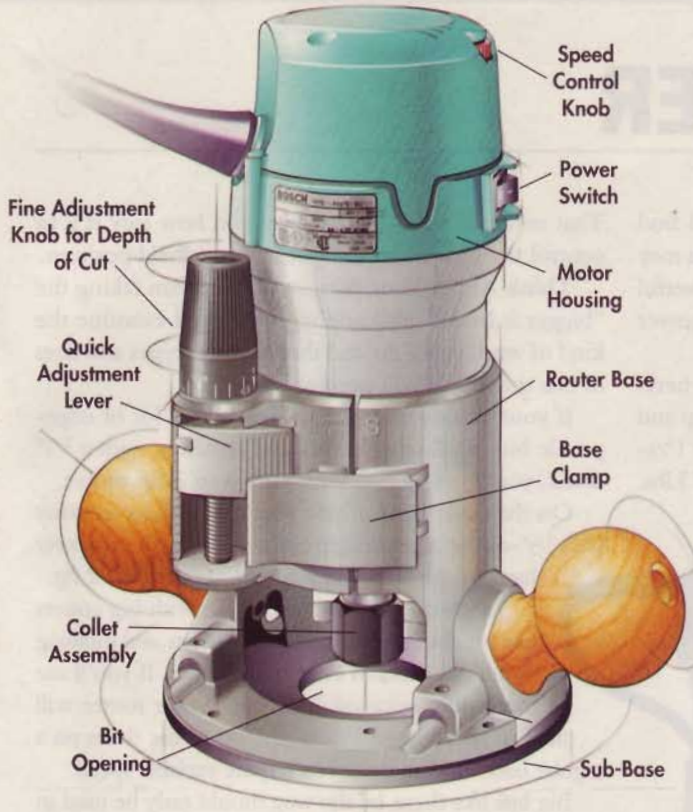
Factor In Other Features — After studying the basic anatomy, you can can learn, starting on page 42, about other important router considerations. Most apply to either a fixed-base or plunge router, or even to the latest router craze: the combo kit, shown in the *Sidebar* at left.

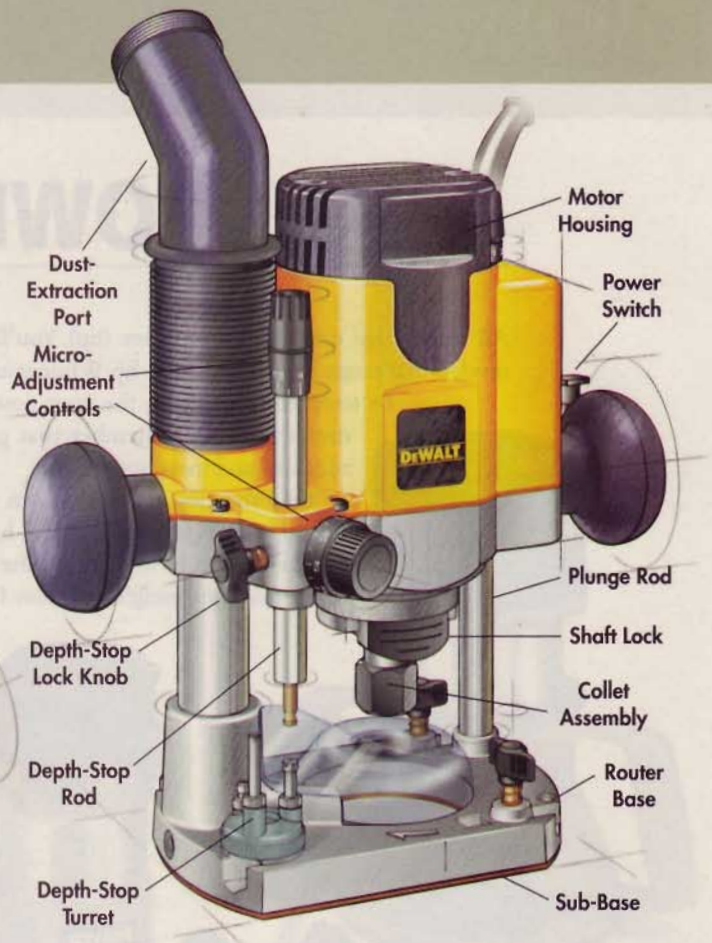
Most of these considerations are important whether you are using the router handheld or mounted in a router table. But in this article we'll concentrate more on handheld use.

In the end, we'll boil it all down to help you decide which of the two types is the right router for you.

COMBO KITS

Combination router kits aim to offer the best of both worlds by pairing a single router motor with both a fixed and a plunge base. You get twice the capability at a price lower than buying two individual routers. Most combo kits come with a 1½- to 2½-hp motor.





ANATOMY OF A **FIXED-BASE**

- **MOTOR HOUSING:** Contains the router motor and the shaft that the bit mounts into.
- **ROUTER BASE:** Holds motor housing in position and guides router. Locks to establish cutting depth of bit.
- **MICRO-ADJUST KNOB:** Allows fine-tuning of bit cutting depth after a rough setting is achieved.
- **COLLET ASSEMBLY:** Holds the bit in the router, and mounts into the tapered end of motor shaft.
- **SPEED CONTROL:** Adjusts motor rpm to match the speed requirements of different bits.

ANATOMY OF A **PLUNGE ROUTER**

- **PLUNGE RODS:** Allow the motor housing to slide up and down in order to establish cutting depth of bit.
- **PLUNGE LOCK:** Fixes the motor in position on the plunge rods at the desired cutting depth.
- **DEPTH-STOP ROD:** Stops downward plunge movement to limit cutting depth of bit.
- **DEPTH-STOP TURRET:** Provides adjustable stops for the depth-stop rod to allow multiple-depth cuts.
- **POWER SWITCH:** Located on or near one handle so it can be engaged while both hands are on the router.

On the Edge. A fixed-base router makes easy work of routing edge profiles. Its light weight and low-mounted handles increase stability and control when you need to rout with a large portion of the base unsupported.

Up the Middle. A plunge router excels when cutting in the middle of the face or edge of a board. The router can be positioned over the cut with the bit raised, then turned on before plunging the bit to begin the cut.

THE QUEST FOR **POWER**

All routers are rated by horsepower (hp). You'll find models that range from $1\frac{1}{2}$ to $3\frac{1}{2}$ hp. While you may be tempted to purchase the most powerful router possible, remember that power adds size and increases weight.

Take the two models shown here. The big one *(left)* is rated at $3\frac{1}{2}$ hp and weighs close to 18 lbs. The smaller $1\frac{3}{4}$-hp model *(right)* weighs less than 13 lbs.

Size Matters. If you use large bits regularly, choose a high-horsepower router *(above)*. For everyday use, a mid-size model *(right)* works well with less bulk.

That means there's a big difference in how easy it is to control the tool when using it in a handheld position.

Think About Your Bits — Rather than taking the "bigger is better" philosophy, you should examine the kind of work you'll do, and therefore the types and sizes of bits the router will need to spin.

If your woodworking involves using a lot of edge-profile bits, small straight bits, and anything with a $\frac{1}{4}$" shank, you'll get by fine with a $1\frac{1}{2}$- to 2-hp router.

On the other hand, if you plan to cut deep mortises with $\frac{1}{2}$"-dia. or larger straight bits, or work with extremely hard woods, then get a router with at least 2 hp.

Large-diameter bits and those with big cutters like panel-raising bits, rail-and-stile sets, and molding cutters all demand even more power. If you'll use them only occasionally, a mid-power router will do. But you'll need $2\frac{1}{4}$ to $3\frac{1}{2}$ hp to use them on a regular basis. And all these bits require variable speed.

Big bits like these, by the way, should only be used in a table-mounted router. They're too hard to control when guiding a router by hand. And because a table-mounted router is essentially a stationary tool, weight and size aren't big issues. So for a dedicated table router, you should opt for a high-horsepower model.

You're probably wondering, then, what's the best size for all-around use. In our experience, a 2- to 3-hp model will accomplish most tasks with ease.

Recommended Bit Speeds

BIT SIZE (DIA.)	MAX. SPEED (RPM)
<1"	24K
1"	22K
1½"	20K
2"	18K
2½"	16K
3"	14K
3½"	12K

SPEED REQUIRES **CONTROL**

A router spins the bit at up to 24,000 rpm. If you consider that most bits have two cutting edges, that means 48,000 cuts per minute. That might be okay on a $\frac{1}{2}$" straight bit, but it's way too fast for a 3" raised-panel bit. Thankfully, most routers offer speed control, so you can slow the router to match the bit *(Chart, left)*.

While intended primarily for safety, the ability to control bit speed can be handy at other times, too. Some woods, such as cherry and maple, have a tendency to burn. But if you slow the bit speed to a little below the recommended maximum, it will generate less heat. Another good time to slow the bit speed is if you need to move the router slowly for better control.

Along with variable speed comes a feature called "soft start" that brings the router motor up to your set speed slowly when you turn it on. Think of it like slowly pressing your car's accelerator, rather than flooring it every time.

HOW TO ADJUST **DEPTH OF CUT**

FIXED-BASE, **FIXED-DEPTH**

In order to rout accurately, you need to be able to control the depth of cut. And to make a deep cut, you usually have to make several shallow passes. In both cases, the ability to adjust the bit's depth of cut accurately is critical. On a fixed-base router, the adjustments are easy to make, but precision can be hard to achieve.

Get It in the Ballpark — Making large adjustments to the bit's cutting depth is a simple, if somewhat crude, operation. You first open the clamp on the base that locks the motor housing in place. Then move the motor housing up and down, or rotate it in the base, depending on the router design. Once you get the bit close to the desired position, you're ready for fine tuning.

Fine-Tune the Cut — Most fixed-base routers now have a fine-tuning mechanism that you can use to dial in the depth exactly *(Photos, right)*. These micro-adjustment systems move the motor just a fraction of an inch with each turn. Scales on the adjustments are meant to help you dial in the exact depth change desired, but measuring the bit before *and* after you close the base clamp works best.

Rotating Ring. Turning this large ring allows fine adjustment. A scale on the base shows the resulting depth change.

Micro-Adjust Knob. A threaded rod connected to this small knob rotates to make small depth adjustments.

PLUNGE BASE, **VARIED DEPTH**

Plunge routers use complex-looking systems to make child's play out of depth-of-cut adjustments. Best of all, they allow you to preset multiple depths before you begin routing and then move between them without ever shutting off the router as you work.

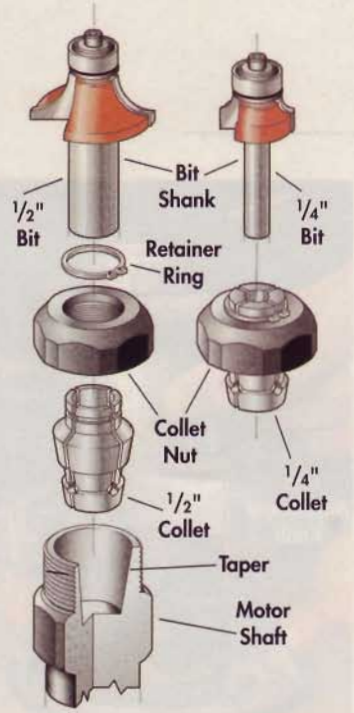
Sophistication & Intimidation — The adjustment mechanisms on a plunge router might look confusing, especially in comparison to those on a fixed-base router *(Photo, right)*. But the system is easy to understand.

Rather than rotating in a base, the motor housing slides up and down on a pair of rods. A lever adjacent to one of the handles allows you to lock the housing at any point on the rods *(Inset Photo)*.

Attached to the motor housing is a long depth-stop rod. As you plunge the housing down, that rod eventually bottoms out against one of several stops attached to the base. These stops sit on a rotating device called a turret. Adjusting the position of the depth-stop rod and height of the turret stops allows you precise control of cutting depth.

Repeatability Is Automatic — This ability to lock in exact settings comes in handy any time you need to make multiple passes for a deep cut. Just set the maximum depth, lock the stops, and make progressively deeper passes until the depth-stop rod bottoms out.

Multiple Stops. The depth stops on a plunge router make it easy to set cutting depth exactly. And they offer repeatability from cut to cut and workpiece to workpiece.



GET A GRIP ON THE COLLET

With all the other features you need to pay attention to, it's easy to overlook the importance of the collet. It seems like a minor component, but it has a big job: holding the bit.

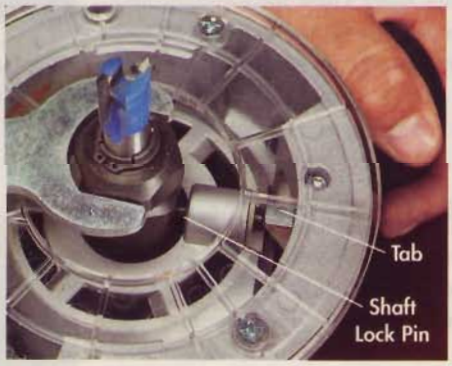
The Squeeze Play — The collet squeezes the shank of the bit, much like a drill chuck. We all know, though, that drill chucks tend to slip easily. That's inconvenient with a drill bit, but it's downright dangerous with a router bit.

To grip the bit effectively, a router uses three parts that work together. The *collet* is a cylinder with a series of vertical slits and an inside diameter of 1/4" or 1/2" *(Illustration, left)*. The outside of the collet is tapered to fit a matching taper in the *shaft* of the motor. Tightening a *nut* forces the collet deeper into the shaft, which closes the slits to squeeze the bit. To work well, these parts have to be well-machined. And, as a general rule, more slits equal a better collet.

Change Should Be Easy — While a firm grip is critical, the collet also has to release the bit easily. Look for a router with a "self-releasing" collet. As you loosen the collet nut, this type opens the collet to break its grip on the bit.

Routers used to require two wrenches to tighten or loosen the collet. But now, most have a shaft lock, so you only need one wrench *(Photo, below left)*. A few routers even have "automatic" locks that simplify bit changing in a table-mounted router *(Photo, below right)*.

Pin It In. To lock the shaft on most routers, you simply push a spring-loaded pin into a recess in the motor shaft. Then, you can loosen the collet nut with a single wrench. On many routers, it's easiest to change bits with the motor out of the base.



Lift to Lock. The shaft-lock pin can be tough to reach when a router is mounted in a table. On a few models, though, a small tab will press the pin into the shaft automatically when you raise the motor all the way up to change bits.

Hands-On Control. The plunge-lock lever should be easy to reach and to operate with your hands on the handles.

An Alternate Base. A D-handle base, available for most fixed-base routers, increases control thanks to a larger handle and built-in switch.

KEEP IT UNDER CONTROL

One area where plunge and fixed-base routers vary greatly is in the types of controls they have, and their placement. With either type, though, good controls are essential for safe use.

Plunge Keeps Controls In Hand — Because you can adjust cutting depth as you cut with a plunge router, the plunge lock has to be accessible with your hands on the handles *(Photo, far left)*. Usually, the power switch is located on or near one of the handles, as well.

Fixed-Base Controls Require a Reach — The motor housing and base are separate units on fixed-base routers, so the power switch can't be located on a handle. This makes the switch difficult to reach when you have both hands on the handles. One great solution is to add an optional D-handle with a trigger switch *(Photo, near left)*.

DUST COLLECTION KEEPS IT CLEAN

One trait all routers share is the ability to make a large mess in a big hurry. This is no surprise when you consider that most router bits take two good-sized bites with every rotation. Yet most manufacturers have done little to integrate any sort of system into routers that will effectively collect these chips.

There are a few exceptions, however, such as the router in the *Photo* at right that can be connected to a dust-collection hose.

As more woodworkers are becoming aware of the hassles and health risks associated with wood dust, though, they are outfitting their shops with dust-collection systems. So it's likely that we'll see integrated chip collection built into a greater number of routers as demand for this feature grows.

In the meantime, there are a number of ways to add dust collection to routers, ranging from shop-built solutions to add-on accessories that can be hooked to a shop vacuum *(Photos, right)*. These can be anything from simple hoods that hang below the router base to replacement sub-bases that have intakes surrounding the bit opening.

Of course, with either an integrated or add-on system, you do have to contend with a hose as you work.

Built-In Solution. This router uses the hollow space inside one of the plunge rods as a port for dust-collection. A clear shroud around the bit corrals chips without obscuring the bit from view.

Add-On Accessories. This sub-base mounts on a router with a round base and accepts either a hood *(below left)* or a slim vacuum port *(below right)* to collect chips and dust.

NOW CHOOSE THE ONE RIGHT ROUTER

Now you should have a pretty good understanding of what fixed-base and plunge routers are, the differences between them, and their features. But this still doesn't tell you which of the two types you should buy first.

The Old School — The answer used to be simple: A fixed-base router comes first. They're less expensive and easier to understand. Then, when you're ready to tackle more complex projects or try your hand at cutting joinery with a router, you make a major investment in a plunge router.

The New School — These days, the rules have changed. Plunge router prices have plummeted while capability and quality have grown. Prices on some basic plunge models rival what you'd expect to pay for a fixed-base version. So if you'll own only one router, we say make it a plunge.

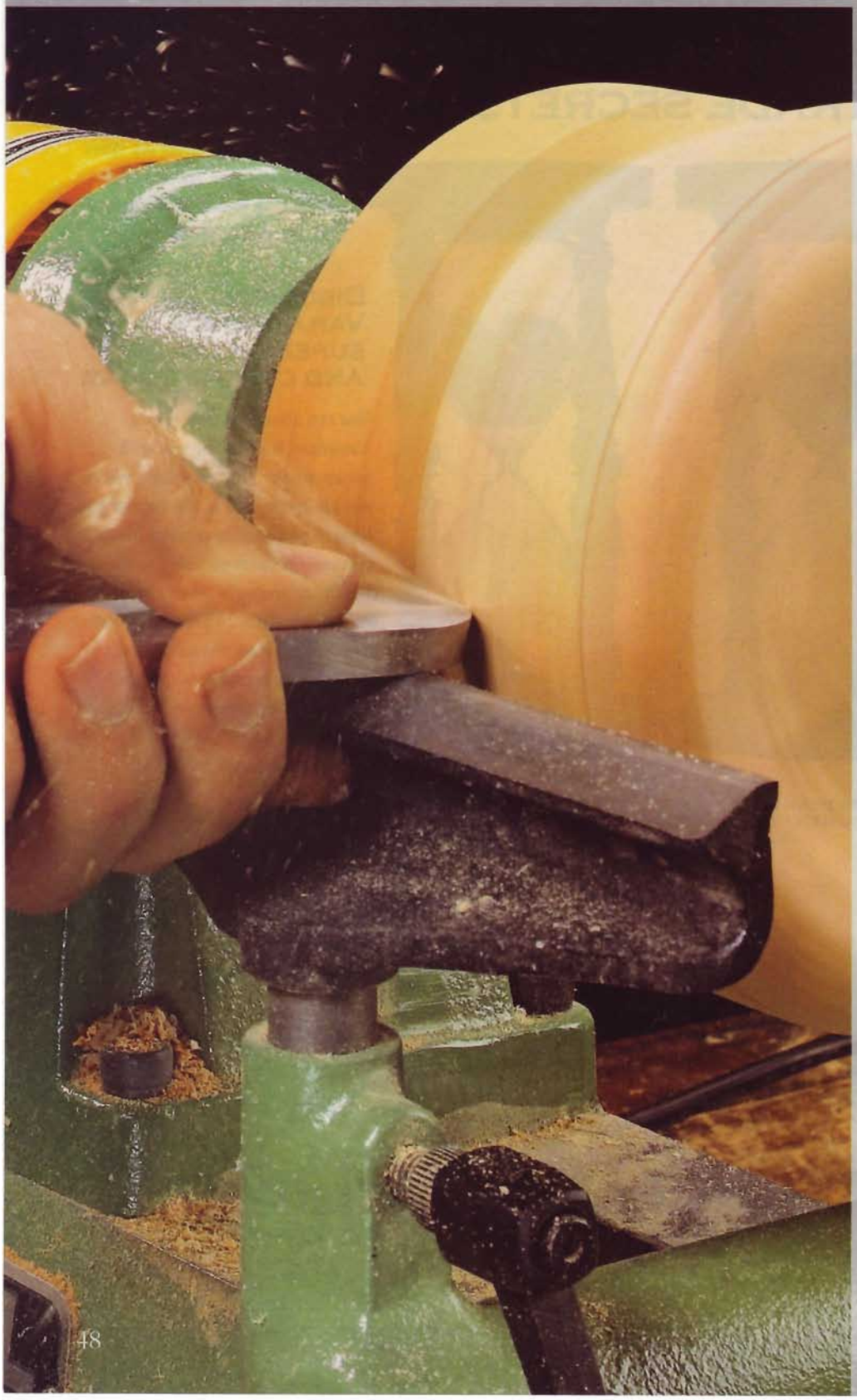
The Buy-Two School — The ultimate solution, of course, is to own a fixed-base *and* a plunge router. But it can be difficult to justify owning two routers.

This explains why combo kits *(page 40)* are the hottest routers around right now. With one, you can simply slide on whichever base is most appropriate for the job.

But even the best combo kits often involve a few compromises. And they don't give you all the advantages that having two totally independent routers can bring.

You'll quickly understand this the first time you want to rout any type of joinery that requires two different bits, such as through dovetails, tongue-and-groove joints, or cope-and-stick joints. Instead of having to switch bits and dial in setups repeatedly, you just put one in each router, dial them in, and you're ready to go.

LATHE SCRAPERS



When it was time to turn the holiday gift boxes for this issue *(see page 50)*, scrapers were the natural tool for the job. The reasons for this are simple. First, scrapers are among the easiest lathe tools to use. And second, they're versatile enough to handle almost every aspect of a small turning project — from roughing out a blank to turning it to shape to getting a glass-smooth finish.

Scraper Anatomy — A scraper is an incredibly simple tool — just a thick steel blade with a short bevel on the end. Scrapers are available in a variety of profiles, but we used just two for our turned boxes: round-nose and square-end scrapers *(page 49)*.

Regardless of the profile, what makes a scraper cut is a burr (or hook) that's formed when you grind the beveled end. The burr is quite short, so it limits the depth of cut you can make. This makes a scraper safe and predictable to use. (The box on page 49 shows how to grind a scraper to get a sharp burr.)

Tool Rest Height — But just having a sharp burr doesn't necessarily mean that the scraper is going to cut well. The scraper has to be positioned correctly to get the burr to cut. That depends in part on the height of the tool rest.

When turning the *outside* of a bowl (or spindle), the idea is to position the tool rest so the cutting burr is slightly *below* the centerline of the workpiece *(Outside Cut, page 49)*. In this position, the scraper won't "catch" because there's no material directly below the burr.

If you're scraping the *inside* of a bowl, adjust the height of the tool rest so the burr cuts slightly *above* the centerline *(Inside Cut)*. Here

Simple Tools, Super Results

again, notice how the clearance beneath the burr prevents the scraper from digging in.

Using the Scraper — Once the tool rest height is established, turn on the lathe, and set the scraper on the tool rest. Position your hands with your thumb above the scraper and your index finger in the recess below the tool rest, as shown in the *Photo* at left. This position lets you better control the movement of the scraper.

Start with the handle of the scraper low, and ease the beveled end into the spinning workpiece (the burr isn't cutting at this point). Then slowly raise the handle until the burr starts to cut.

Two Scrapers — Now that you know how to get the burr to cut, let's revisit the two basic types of scrapers: round-nose and square-end.

Essentially, a round-nose scraper is used to rough out or shape a workpiece. When roughing out stock, simply slide the round-nose scraper straight across the tool rest at 90° to the workpiece. The rounded burr of the scraper does a fine job of rough material removal.

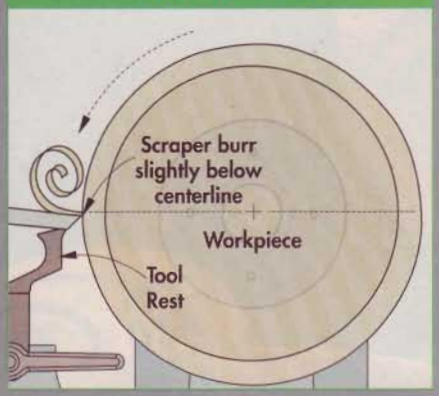
To form a curved profile, swing the handle of the scraper in an arc *(Round-Nose Scraper, far right)*.

The square-end scraper is used primarily for smoothing and flattening a workpiece. To flatten rough stock, just cut in at 90° to the workpiece, pull the scraper back, and then cut in again.

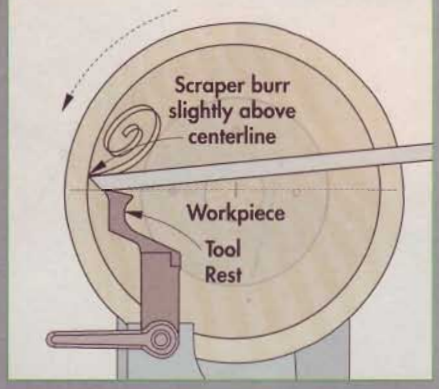
For smoothing a turned project, skew the scraper at a slight angle, and slide it along the workpiece. Of course, if you're smoothing a part of the piece that's round, there's no need to skew the scraper. Just follow the contour of the stock to smooth it *(Square-End Scraper, far right)*.

TOOL REST HEIGHT

Outside Cut

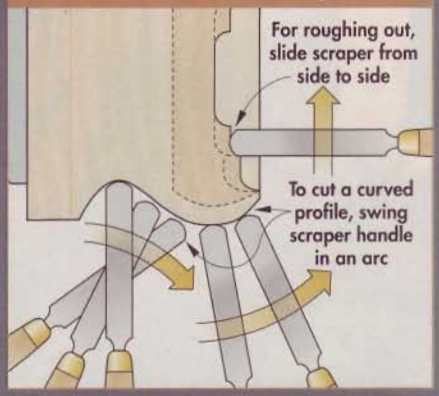


Inside Cut

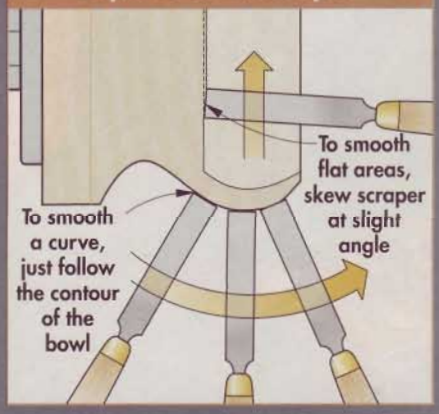


2 TYPES OF SCRAPERS

Round-Nose Scraper



Square-End Scraper

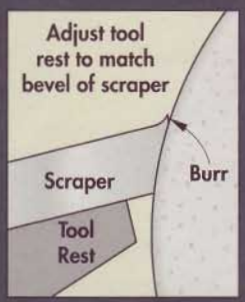


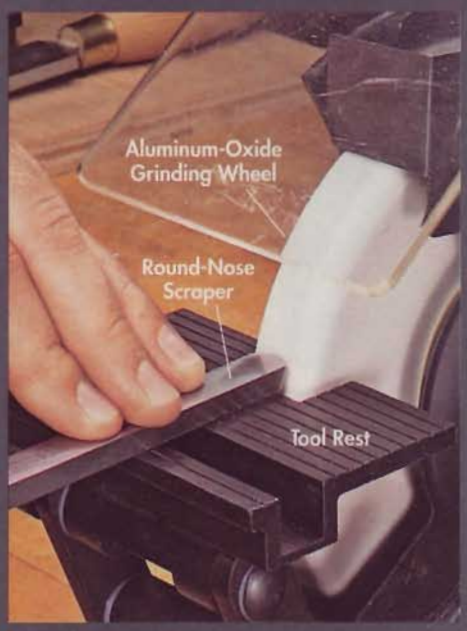
SHARPEN OFTEN FOR GREAT RESULTS

A scraper is the easiest of all lathe tools to sharpen. All you need is a grinder and a large tool rest. Start by tilting the tool rest to match the bevel angle of the scraper.

Now set the scraper flat on the rest and smoothly swing the handle to the side as you grind the bevel. (For square-end scrapers, move the tool straight across the rest.)

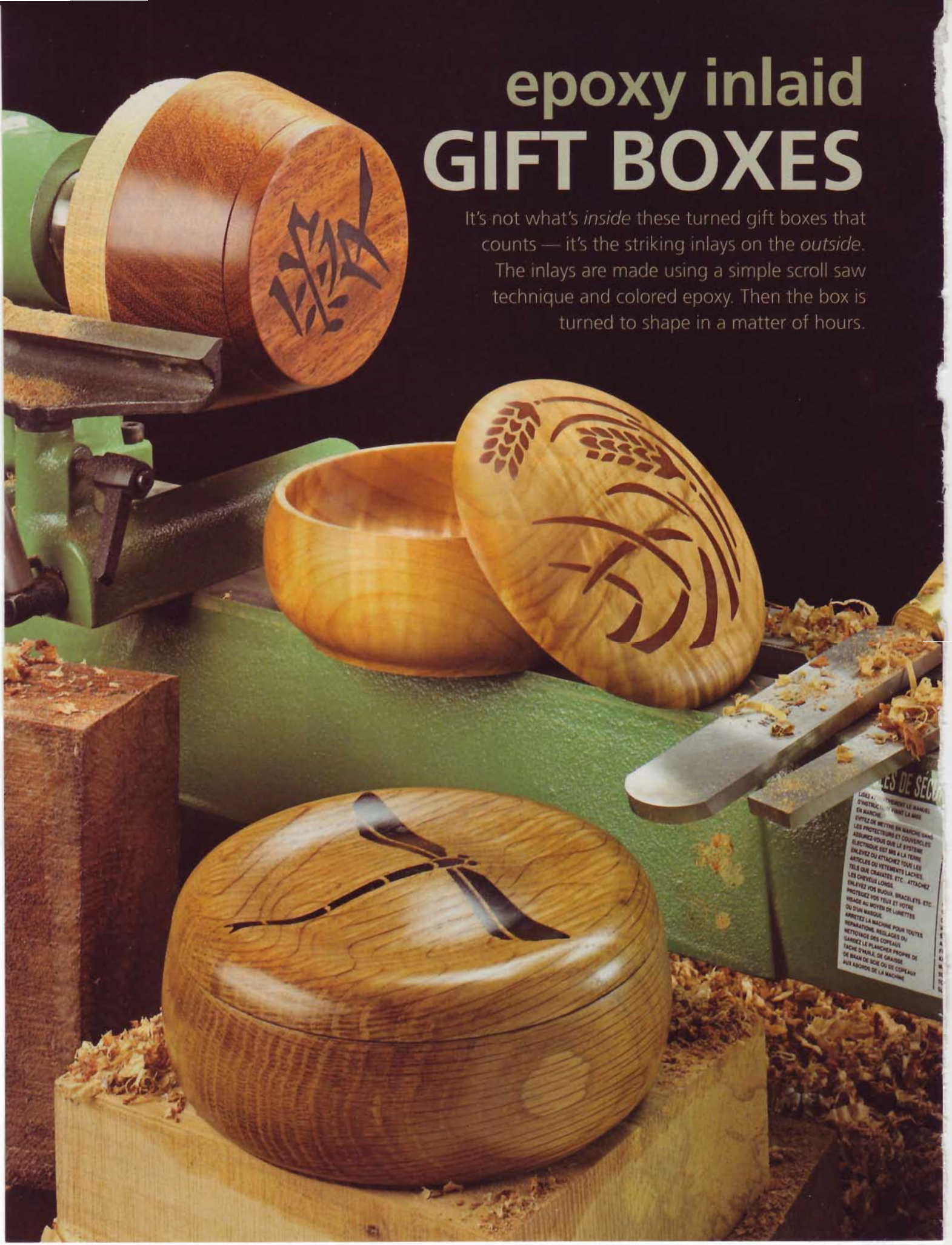
When you feel an even burr all the way across the top edge, you're ready to turn.





epoxy inlaid GIFT BOXES

It's not what's *inside* these turned gift boxes that counts — it's the striking inlays on the *outside*. The inlays are made using a simple scroll saw technique and colored epoxy. Then the box is turned to shape in a matter of hours.



THINK OUTSIDE THE BOX

Usually, it's hard to resist opening the lid on a small box to see what's inside. That's not the case with these turned gift boxes, however. The intricate inlays on the *outside* are what grab all the attention.

Epoxy Inlays — Now I know, you're probably thinking that making these inlays is a tedious, time-consuming matter. But it's really a simple two-step process. First, the openings are cut on the lid with a scroll saw *(Inset Photo, right)*. Then these openings are filled with a colored epoxy. Once the epoxy cures, turning the lid to shape reveals the decorative inlay *(Photo, right)*. (For information on the coloring agents and the epoxy we used, see the *Box* below.)

As the Box Turns — Making the inlays is half the fun of these unique gift projects. The other half is turning the boxes to shape. The good news is you don't need to be an expert to do this. All three boxes can be turned using a few simple lathe tools (a round-nose scraper, a square-end scraper, and a parting tool) and some straightforward scraping techniques *(see page 48)*.

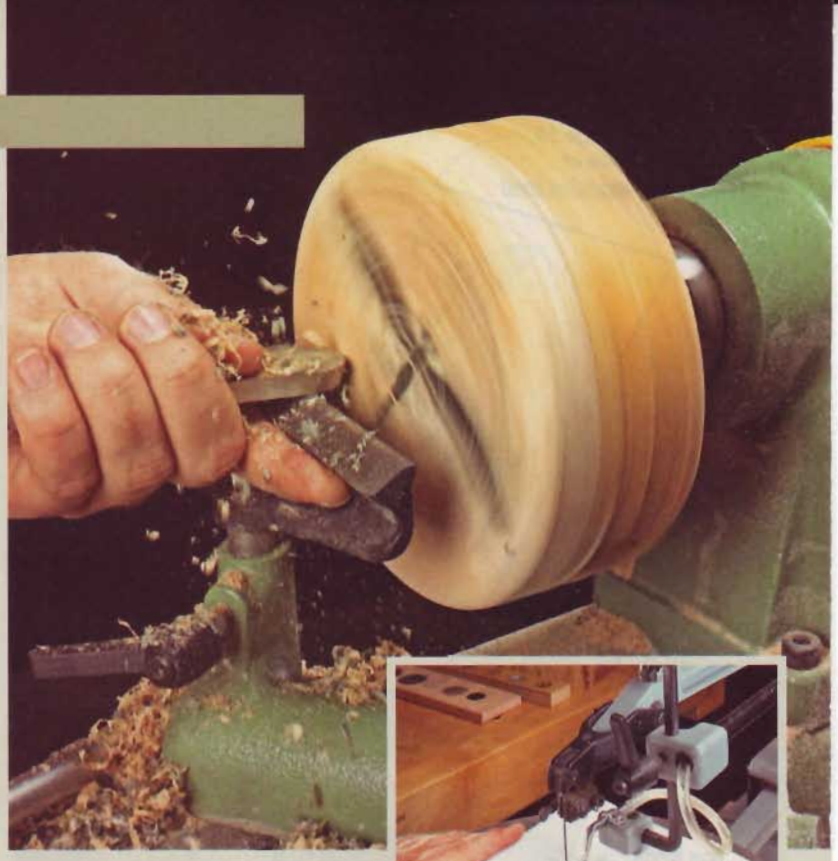
Endless Possibilities — As you can see in the *Photo* at left, I made three boxes. The instructions for turning the box with the dragonfly on the lid begin on the next page, and dimensions for all three are on page 55. (Full-size box profiles are at WorkbenchMagazine.com.)

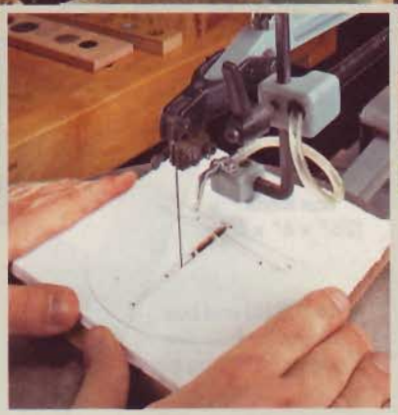
Keep in mind, however, that you don't have to make *any* of the three boxes shown at left. The beauty of turning a project on a lathe is that the possibilities for creativity are virtually limitless. Using our instructions in this article, you may want to experiment with the shape and size of your own turned box. Small changes in the shapes and dimensions can make a big difference in the appearance of the box itself.

Picking a Pattern — As for patterns, the dragonfly, stalks of wheat, and symbol for love on the lids of the boxes at left are shown at 50% on page 55 and full-size at WorkbenchMagazine.com. But here again, you may want to use another pattern altogether.

Buying Blanks — That takes care of everything except for the wood. To match the color and figure between the lid and the box, I cut both pieces from a single blank. This requires a thick piece that you're not likely to find in a scrap bin, so I would recommend purchasing some turning blanks.

I bought 3"×6"×6" turning blanks from Craft Supplies, USA (WoodturnersCatalog.com; 800-551-8876). Not only were these thick enough to cut the lid and box from a single blank, but they had amazing figure and were very stable. I made the box with the "love" symbol from bubinga, and the box with the stalks of wheat from figured Western maple. As for the dragonfly box, it's made from a thick chunk of 12/4 quartersawn white oak.





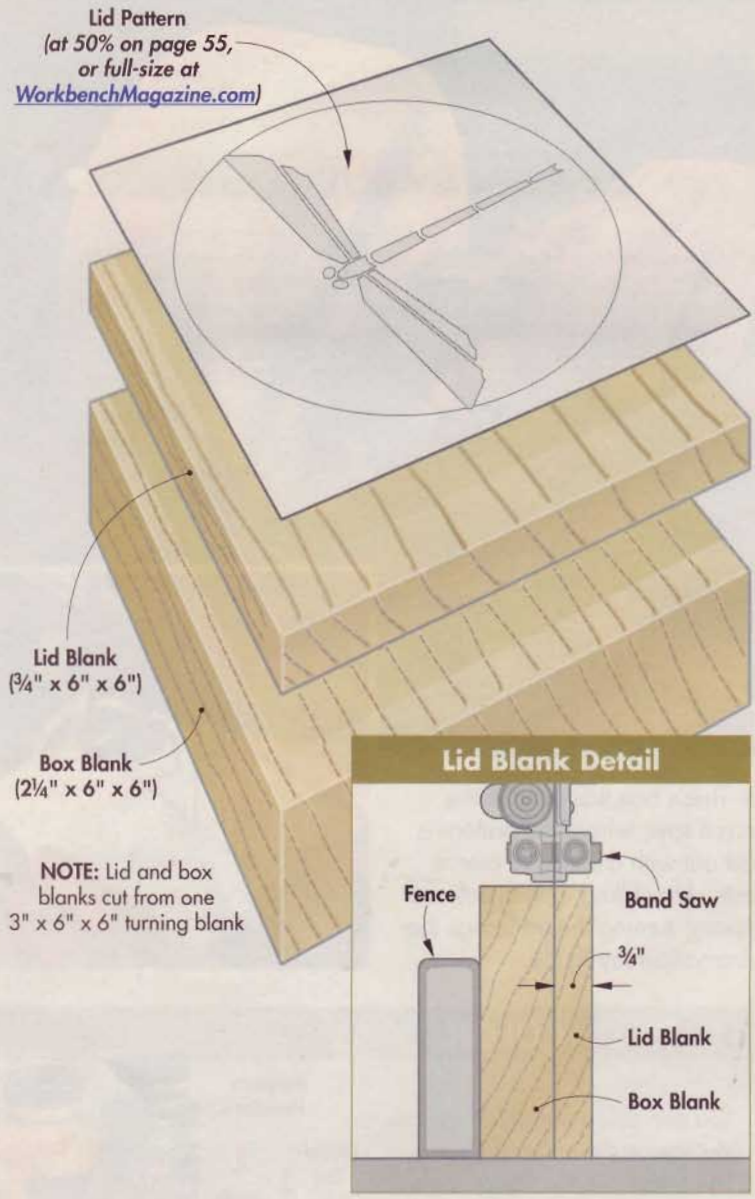
► These box lids start on the scroll saw, where the pattern is cut out with a series of pierce cuts. After filling in with colored epoxy, turning the lid brings the dramatic inlay to life.

EPOXY + COLOR

You can use a variety of agents to change the color of epoxy. The scrap pieces shown, below right, represent just a handful of the many colors you can produce.

I got good results by using tempera powders (available at craft stores). And liquid and powder tints designed for use with epoxy are available from Bonstone (800-425-2214; Bonstone.com).

The epoxy I used is a 30-minute epoxy from a hobby shop. It cures slowly, so you can mix in the color and pour the epoxy into the lid cutouts before it sets.



create the EPOXY INLAY

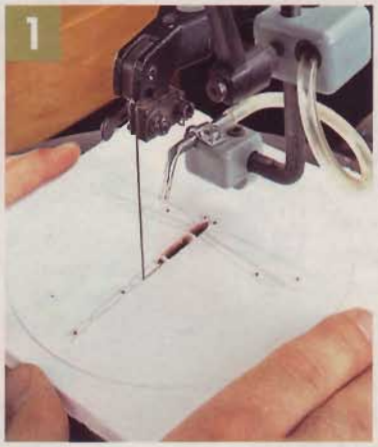
As mentioned on page 51, both the lid and box portions of this gift box are made from a single wood blank *(Illustration, left)*. This ensures consistent color and grain pattern between the lid and the box on the finished piece.

Separate Lid from Box — Once you select a block of wood, the first step is to separate the lid blank from the box blank. To do that, use a band saw to slice a ¾"-thick piece from the blank *(Lid Blank Detail)*. Set the thicker box blank aside for now.

Apply & Cut Pattern — That done, select a pattern that you like, make a copy of it, and apply it to the top of the lid blank with spray-on adhesive. The next step is to cut out the pattern with a scroll saw. To cut each opening, you'll have to make a "pierce" cut. This requires drilling small holes (1/16" or 3/32") in each section, so you can insert the scroll saw blade before attaching it to the arm of the scroll saw. (I used a #9 skip-tooth blade to make these cuts cleanly.) Then cut out the openings as shown in *Fig. 1*.

Mix Epoxy — Once the cutouts are complete, you can focus your attention on the colored epoxy mixture that will fill them. First, mix about 2 fl. oz. each of epoxy and hardener together. Then add the colorant. It doesn't take much — just about a half-teaspoon of powder or liquid *(Fig. 2)*.

Fill Cutouts — Before pouring the mixture into the cutouts, place masking tape over the back of the lid blank, so it won't leak through. Then fill the cutouts with the epoxy mixture *(Fig. 3)*. As you're pouring, be sure to smooth and even out any voids in the epoxy with a small scrap piece. Don't worry about being too neat and tidy here, though. You'll clean up the surface when you turn the lid to shape.



▲ To cut the pattern on the lid blank, make "pierce cuts" on the scroll saw. Carefully cut each opening before moving to the next.

▲ Add a half-teaspoon of colorant to 4 fl. oz. of epoxy, and mix well. Stir slowly to prevent bubbling, and pop any bubbles that form.

▲ Pour the colored epoxy mixture into the openings in the lid blank, and then use a small scrap as a scraper to smooth the surface.

turn the LID TO SHAPE

Once the epoxy has fully cured (give it about 12 hours), you're ready to turn the lid to shape.

The lid blank can't be attached directly to the faceplate on your lathe. This is because the holes for the mounting screws would be visible inside the finished lid. So you'll need to attach it to a wood block (a glue block), which will mount to the faceplate instead. The glue block I used is a scrap 2x6 that's cut to match the size of the lid blank. To establish the center of the block, mark diagonal lines from corner to corner on one face. Then glue the lid blank to the opposite face.

When the glue dries, cut the lid blank and glue block round on the band saw (leave them slightly oversize). Then mount the faceplate as shown in *Fig. 1*, and thread the faceplate onto the spindle of the lathe.

Turning the Lid — The first turning operation you'll want to take care of is truing up the edge of the lid *(Fig. 2)*. This step is done at slow speed (about 500 RPM). **Note:** Refer to page 49 to see how to establish the height of the tool rest.

Next, move the tool rest, and clean up and flatten the top of the lid *(Fig. 3)*, so you'll have a clean slate for turning the lid profile. Set your speed at around 2,000 RPM for this and the remaining steps.

Once the lid is flat, use a round-nose scraper to begin creating the curved profile of the lid *(Fig. 4)*. A cardboard template of the completed shape comes in handy here. You can make one using the profile on page 55.

Once you're satisfied with the lid profile, cut a rabbet in the base of the lid with a parting tool *(Fig. 5)*. This rabbet forms a lip that will fit inside the box later on.

With the rabbet cut, sand the lid smooth on the lathe. Then separate the lid blank and glue block, as shown in *Fig. 6*, and sand the underside of the lid.

▲ Using the diagonal lines on the glue block as a guide, center the faceplate on the glue block, and attach it with screws.

▲ Turn the lid blank and glue block to a rough cylinder with a round-nose scraper. Work your way across until it spins smoothly.

▲ To remove the paper and epoxy residue, as well as flatten the lid, move the tool rest to the front, and work your way from the outside to the center, making cuts along the piece with a square-end scraper.

▲ A round-nose scraper makes quick work of the lid profile. Work from the outside in, and check your work with a cardboard template.

▲ Use a parting tool to cut a $^1/_4$" x $^1/_4$" rabbet along the bottom edge of the lid. This rabbet forms a lip that fits in the top of the box.

▲ To separate the lid blank from the glue block, use a parting tool to cut down the "glue block" side of the joint line. Cut into the block until the lid is almost separated, then use a handsaw to complete the job.

turn the box to MATCH THE LID

Now you can turn your attention to the box the lid will fit onto. Like the lid, the box blank needs to be glued to a 2x6 glue block, and then cut to a rough (and slightly oversize) cylinder on the band saw. (Here, use a compass to establish a $5^3/_4$" circle on the blank.) Then center the lathe faceplate on the glue block, screw it in place, and thread it onto the lathe spindle.

As with the lid, start by roughing out the box (at low speed) and flattening the top (at medium speed). The next step is to hollow out the center of the box. To do this, make a "dished" hole by working from the outer rim of the hole and cutting in and down toward the center. The objective here is to establish the depth of the box *(Fig. 1)*.

Create an Opening — In order to create a seamless look between the lid and box, you'll need to turn them together. To do this, first cut a shallow recess for the lid across the top of the box with a parting tool. You want to create a recess that matches the depth of the rabbet on the lid ($^1/_4$"), so the lid can fit tightly into it. When you near the outer rim, "sneak up" on the outside lip of the bowl *(Fig. 2)*. Then stop the lathe, check the fit of the lid, and expand the recess until the lid fits tightly *(Fig. 3)*.

Turn Lid & Box — With the lid taped in place, move the tool rest to the outside of the box, and turn the box and lid together to create a seamless profile between the two. Start near the bottom of the box, and work your way toward the top, gradually rounding the side with a round-nose scraper *(Fig. 4)*. Once you're satisfied, switch to a square-end scraper to begin smoothing. Pay close attention to the seam between the lid and the box, as you'll want this to be as smooth as possible *(Fig. 5)*.

Complete the Inside — Now you can remove the lid and continue hollowing out the inside of the box. Again, work from the outer rim toward the center, gradually enlarging the opening *(Fig. 6)*. When you reach the lip for the lid, turn the inside so it follows the contour of the outside of the box. Also, enlarge the opening just a hair, so the lid can be removed more easily and won't jam. Then flatten the inside bottom of the box with a square-end scraper.

All that's left now is to sand the box, and then part it from the glue block just as you did with the lid *(page 53)*. Then apply a finish (wiping varnish or spray-on lacquer work well), and this box is ready to give.

▲ Once the box is trued up, flat, and spinning smoothly, start by hollowing the center with a round-nose scraper. Stop frequently, and check your progress with a combination square.

▲ Next create a wide, shallow recess to fit the lid. Gradually "sneak up" on the lip until the lid fits nice and tight.

▲ Once the lid fits tightly in this recess, apply some double-sided tape to it, and stick it firmly in place on the box.

▲ Now use a round-nose scraper to turn the side of the box and lid together. Make sweeping motions to shape the box.

▲ When you're satisfied with the profile, switch to a square-end scraper and begin smoothing out the side of the box.

▲ Finally, move the tool rest back to the inside, and continue hollowing out the inside of the box. Note how the tool rest angles in to support the round-nose scraper as closely to the work as possible.

INLAY PATTERNS

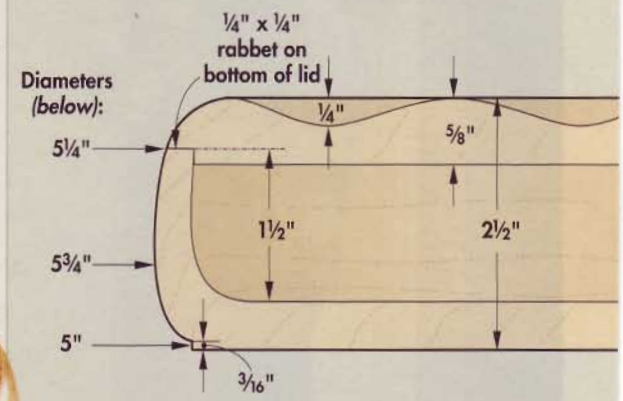
DRAGONFLY

WHEAT

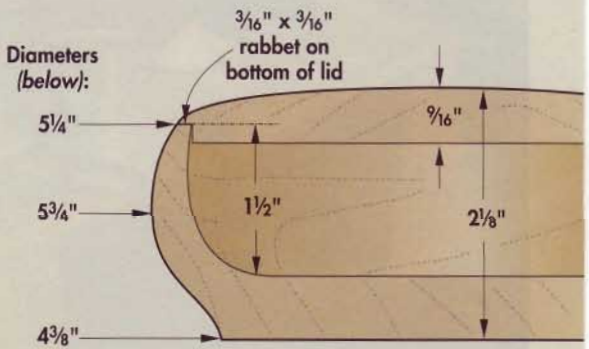
LOVE SYMBOL

GIFT BOX PART VIEWS

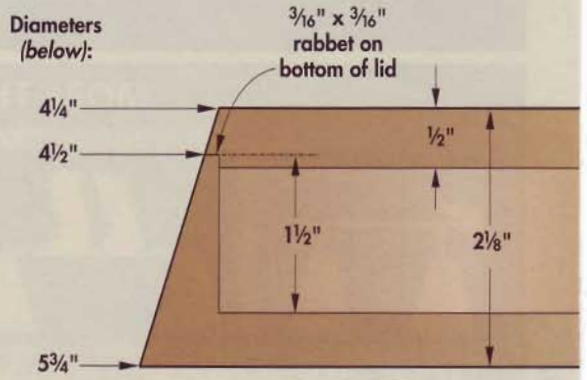
▼This "dragonfly" box was turned from a 6" x 6" piece of 12/4 oak. Epoxy with black colorant forms the inlay.



▼The figured grain in this maple gift box is highlighted by a "wheat" inlay of epoxy and red tempera powder.



▼The ancient symbol for love decorates this bubinga box. The epoxy for the inlay is tinted with black colorant.

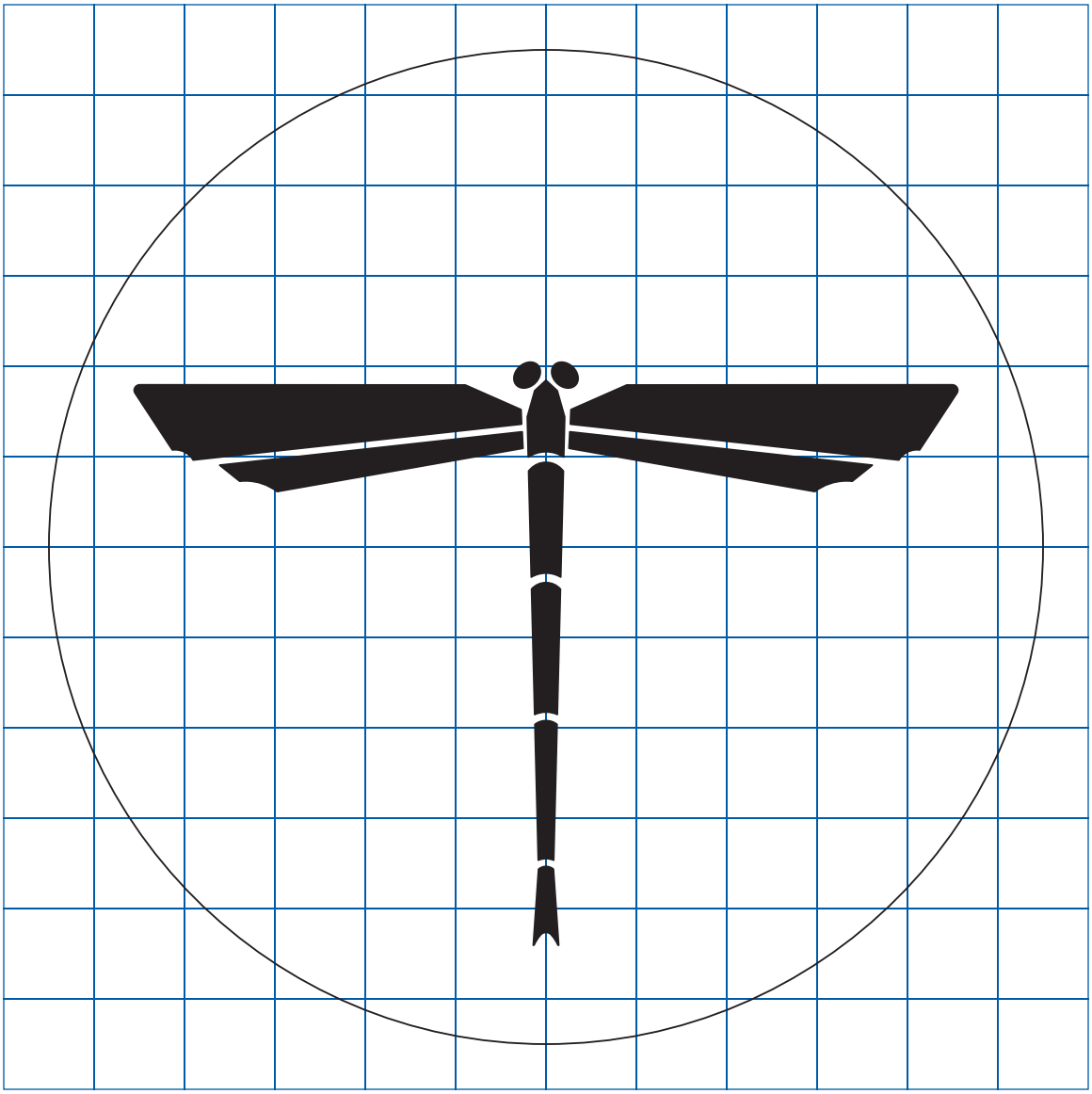


WORKBENCH®

INLAID GIFT BOX PATTERNS

Issue 292 Volume 61 Number 6 December 2005

Dragonfly Pattern 100%



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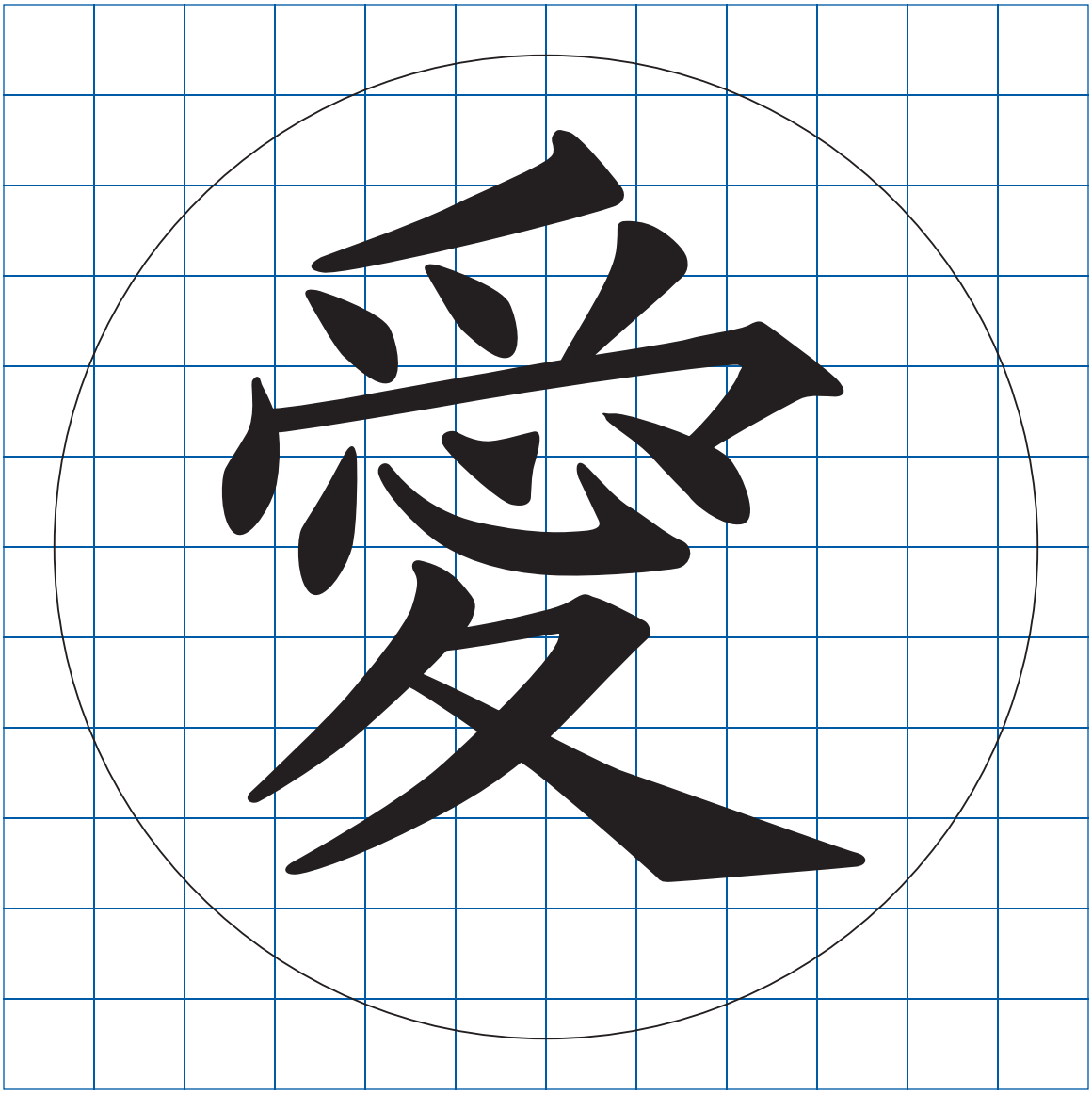
Wheat Pattern 100%

Issue 292 Volume 61 Number 6 December 2005

Love Symbol Pattern 100%



SUPER SAWHORSES

These sawhorses take versatility to new heights with a scaffold that locks onto the bases. And this is just one of many chores these horses can handle.

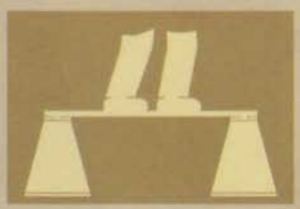
For projects inside the shop and around the house, I'd find it tough to get by without a good set of sawhorses. I've had several sets, but they all turned out to be disposable. Some were flimsy, others too heavy, and even the good ones eventually got too beat-up to save.

So I decided to devise a set that would be sturdy, last a long time, and, above all else, be versatile. But they had to be easy to build, too. After all, they're sawhorses, not furniture.

A Different Sort of Horse — What I came up with are the rather different-looking horses you see here. Of course, they perform all the tasks you'd expect from sawhorses *(Box, below)*. But they have a few unique features that make them far more versatile than ordinary horses.

MORE THAN JUST A ONE-TRICK PONY

SAWHORSES
Raise boards to just the right height when cutting them by hand.



ELEVATED PLATFORM
Add a light but strong platform *(page 60)* to make a scaffold.

OUTFEED SUPPORT
Add a support *(page 60)* to your table saw when cutting long workpieces.

TOOL STATION
Raise the adjustable-height platform to create a handy tool station.

STEP STOOL
For more reach, use one horse as a step stool.

A Sure-Footed Base — This versatility starts with a pair of base units shown in the *Construction Details*, below. These base units stand just 17" tall, so they're quite compact. But they house sliding panels that adjust up to 29" high to match the needs of the job at hand.

Saddles — If that job involves cutting boards, you can bolt a pair of "saddles" to the adjustable panels *(page 59)*. These saddles work as sacrificial tops that you can cut into without tearing up the horses.

Outfeed Support — When you need to cut long boards on the table saw, just bolt on an adjustable outfeed support. It's shown on page 60.

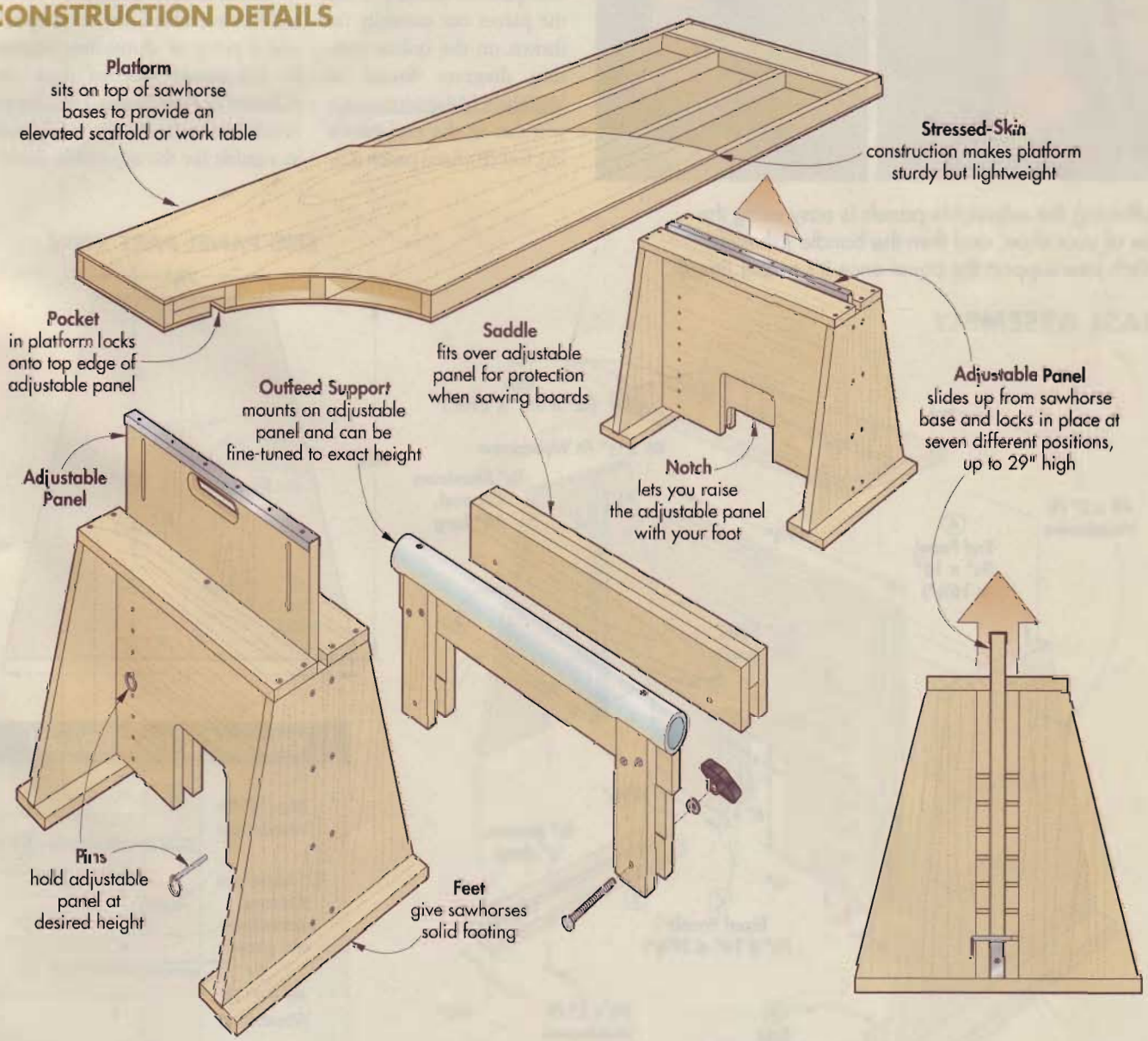
Work Platform — The most unique feature of these sawhorses, though, is the long work platform *(Photo, page 56)*. It sits on the bases and elevates you to the right height for working on ceilings. The platform locks in place thanks to "pockets" cut into the underside that mate with the adjustable panels *(Inset, page 56)*.

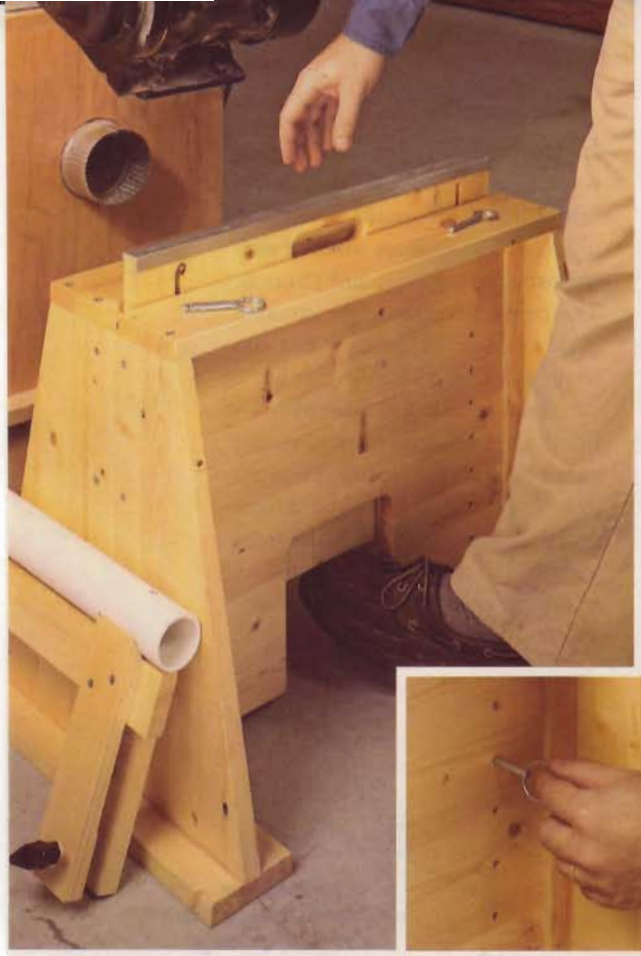
To make the platform strong yet lightweight, I used "stressed-skin" construction. The *Illustrations* below and on page 61 will help you understand how it works.

The platform consists of a solid-wood frame between two outer "skins" that are made from $^1/_4$" plywood. The skins are attached with construction adhesive and 1" brads. This creates a featherweight structure that won't twist or flex but has heavyweight load-holding ability.

Glued Panels Aid Assembly — I built the sawhorses from pine. But rather than glue up panels, I bought pre-glued versions at the home center. You can make one base from a single $^3/_4$" x 20" x 96" panel. The rest of the parts come from ordinary 1x6 and 1x8 pine boards.

CONSTRUCTION DETAILS





▲Raising the adjustable panels is easy using the toe of your shoe, and then the handle *(above)*. Hitch pins support the panel once it's raised *(inset)*.

start with a
STURDY BASE

The heart of this sawhorse system is the base, shown in the *Photo* at left. Each one is made up of two tapered ends that are joined by a pair of fixed panels, two feet, and a top *(Base Assembly, below)*. An adjustable panel slides up and down between the fixed panels, allowing you to change the height of the sawhorses. When raised, the adjustable panel rests on pins that fit through holes in the fixed panels *(Inset Photo, left)*.

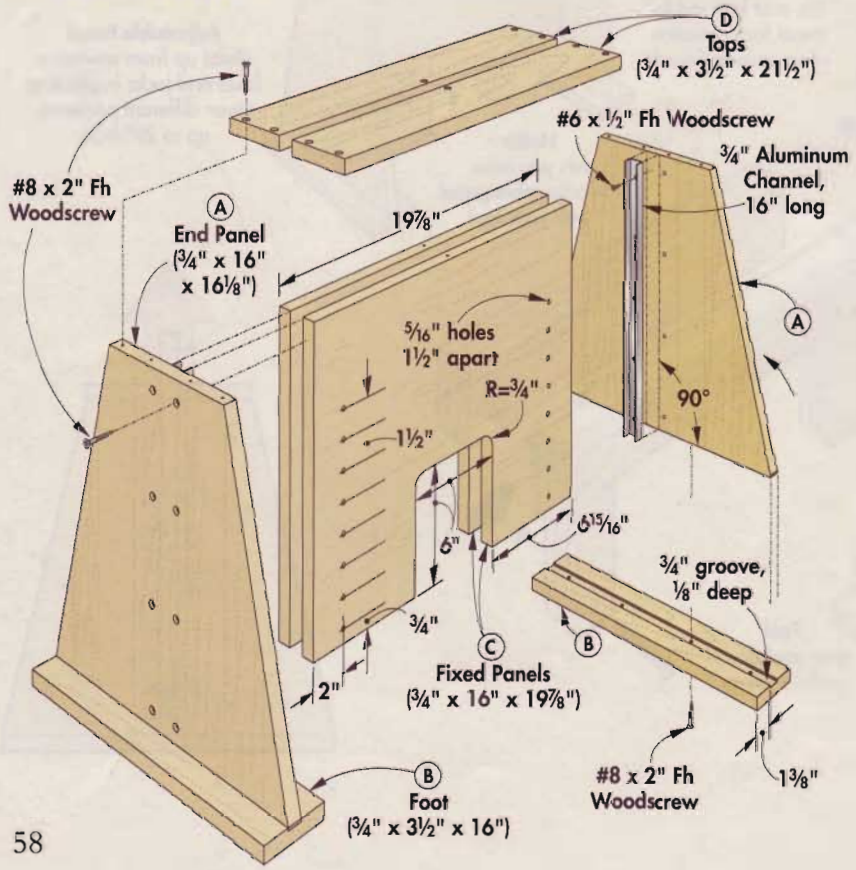
Rough-Cut Parts — Start by cutting all of the base parts to size. If you lay the pieces out carefully (as shown on the online cutting diagram found at WorkbenchMagazine.com), you can fit the end panels (A), feet (B), fixed panels (C), top pieces (D), and adjustable panel (E) on a single pre-glued pine panel.

With the parts cut, set up a dado blade in your table saw, and then cut a shallow groove in each foot. This groove captures the end panel to prevent it from warping. Then drill holes and screw these parts together.

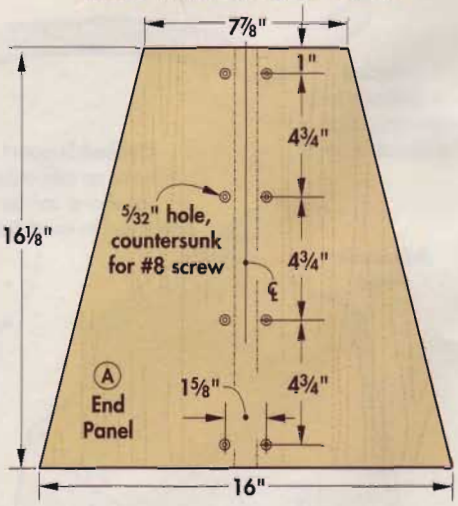
You'll notice that I used 2"-long screws to assemble the base. Those may seem long, but because the screws are driven into end grain, the extra threads on these long screws add a lot of holding power.

Install Channel — With the ends and feet assembled, the next step is to add a piece of aluminum channel to the inside face of each end *(Channel & Panel Detail)*. This channel (available in hardware stores) acts as a guide for the adjustable panel.

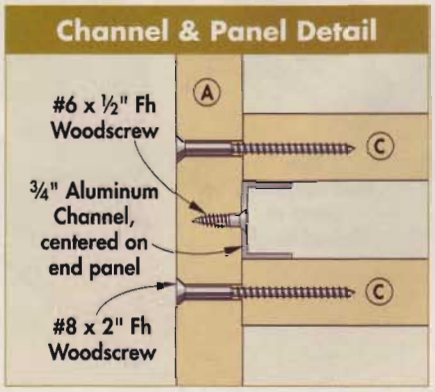
BASE ASSEMBLY



END PANEL PART VIEW



Channel & Panel Detail



You'll need to cut the channel to length. (I used my miter saw to do that.) Then drill countersunk shank holes for #6 x 1/2" flathead woodscrews. Next, center each channel on the width of the end panel, and then screw it in place.

That done, drill countersunk shank holes in the end panels for screws that mount the fixed panels *(End Panel Part View)*. But don't install these panels just yet.

Notch & Drill Panels — Next, each fixed panel needs two rows of holes for the pins the adjustable panel rests on. Plus, there are notches in the bottom edges that let you slip the toe of your shoe in and raise the adjustable panel *(Photo, top left)*. Then just grab a handhold and pull it up.

To make sure the holes and notches align, lay everything out on one panel, and then clamp the other panel to it. Then drill the holes, and use a jig saw to cut the notch in both panels at the same time.

This is also a good time to complete the adjustable panel *(Adjustable Panel & Saddle Assembly)*. It gets a notch at the bottom and a pair of vertical slots, which are used for securing the outfeed support. To form each slot, bore two end holes, and then cut between them with a jig saw. I created the handhold the same way, but I eased the opening with a 1/4" roundover bit *(Handhold Detail)*.

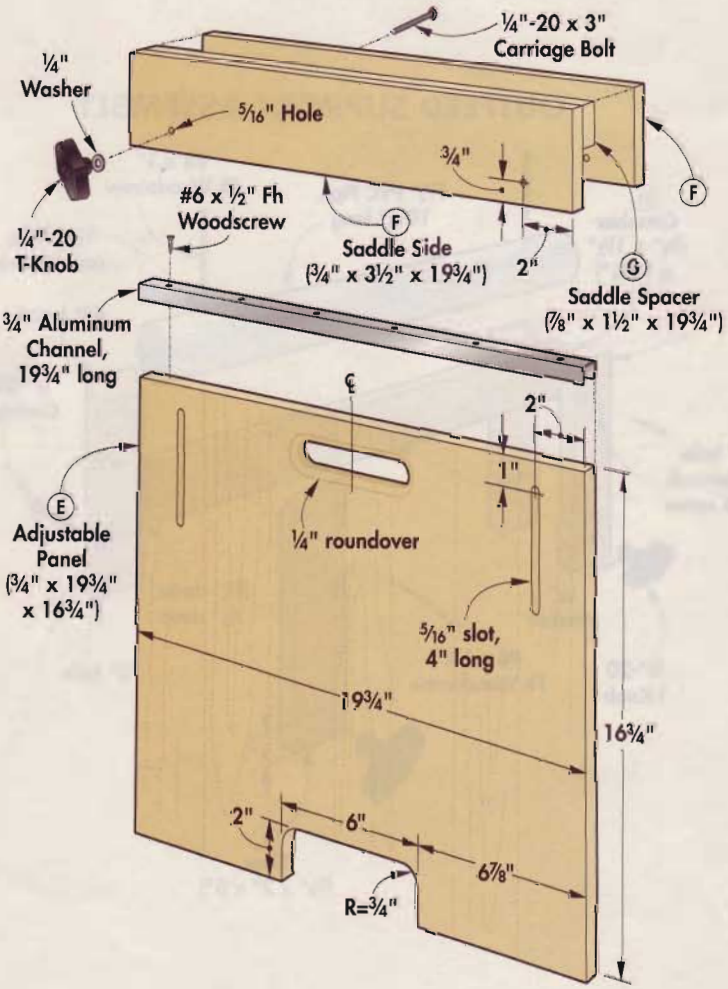
Finally, attach a piece of aluminum channel to the top edge of the sliding panel. It protects the exposed end grain and prevents warping.

Assemble the Bases — Now you're ready to assemble the bases. Just butt the fixed panels against the aluminum channel, and drive in the screws. Next, slide the adjustable panel into place, and position the tops on the sawhorse base beside it. Leave enough clearance for the adjustable panel to slide, and secure the tops with screws.

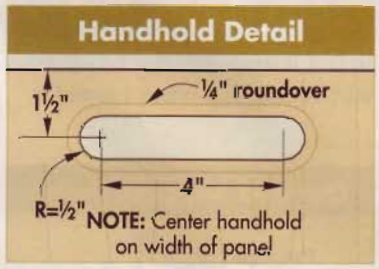
Saddle Up — Next, I made a pair of saddles that slip over the adjustable panels *(Photo, right)*. They consist of two sides (F) and a spacer (G). I joined them with glue only, so there's no danger of hitting a screw with a saw blade when cutting boards on the saddles.

▲ The tops of sawhorses always get chewed up when sawing boards. But replaceable "saddles" protect the adjustable panels on these horses.

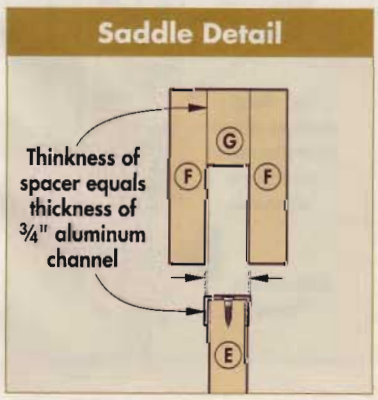
ADJUSTABLE PANEL & SADDLE ASSEMBLY



Handhold Detail



Saddle Detail



▲The outfeed support lends a helping hand when working with long stock. It mounts to the adjustable panel and can be set to the exact height you need.

add a support & WORK PLATFORM

The next accessory I added to the horses is an adjustable outfeed support *(Photo, left)*. It's just a length of PVC pipe mounted on an assembly that straddles the adjustable panel *(Outfeed Support Assembly)*.

Start by cutting the crossbar (H) and risers (I) to size. The risers each get a shallow dado that allows them to clear the top of the adjustable panel *(Outfeed Support Detail)*. Also, the upper end of each riser is beveled at 45° to cradle the PVC pipe.

Establish a Solid Platform — The last, and certainly most unique, accessory for these sawhorses is the work platform. It acts as a scaffold, allowing you to work a couple of feet off the ground. And you can walk back and forth on the platform as you work instead of continually moving a stepladder around.

Keyed In — The platform is simple to put on or remove — it just rests on top of the sawhorse bases. It is held securely in place by a simple "locking" system.

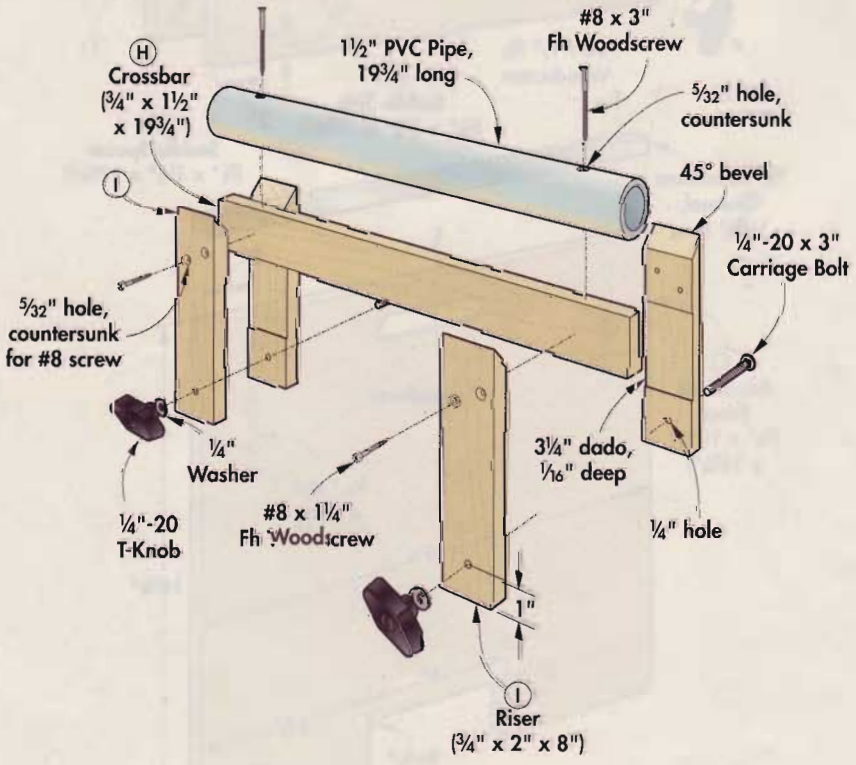
Look at the *Platform Assembly* and the *Pocket & Key Detail* on page 61, and you'll see there's a "pocket" in the underside of the platform. To lock the platform in place, first raise the adjustable panel to its lowest stop, and then insert the locking pins. Now slip the pocket in the platform over the exposed top of the adjustable panel.

Note: You should only stand on the platform when it's sitting directly *on the sawhorse bases*. You can raise the platform higher for use as a tool station, but not to make a taller scaffold.

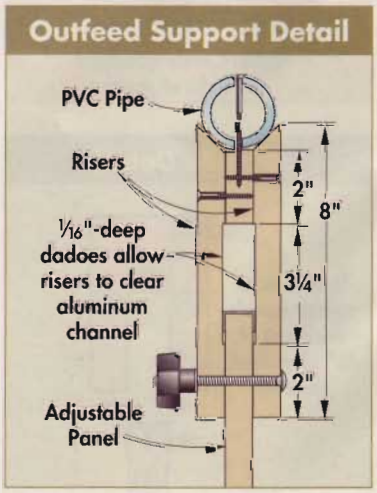
Stressed-Skin Panel — Earlier, I described the "stressed-skin" construction of the platform. If you take another look at the *Illustration* on page 57, you'll recall that it's just a solid-wood frame covered by two thin plywood skins.

The secret to its strength lies in the fact that the skins are seamless, and attached securely to the frame with construction adhesives and brads. You might think this essentially hollow panel can't be strong enough to hold a person, but it can. In fact, it supported *two* 170-lb. guys without sagging when I tested it.

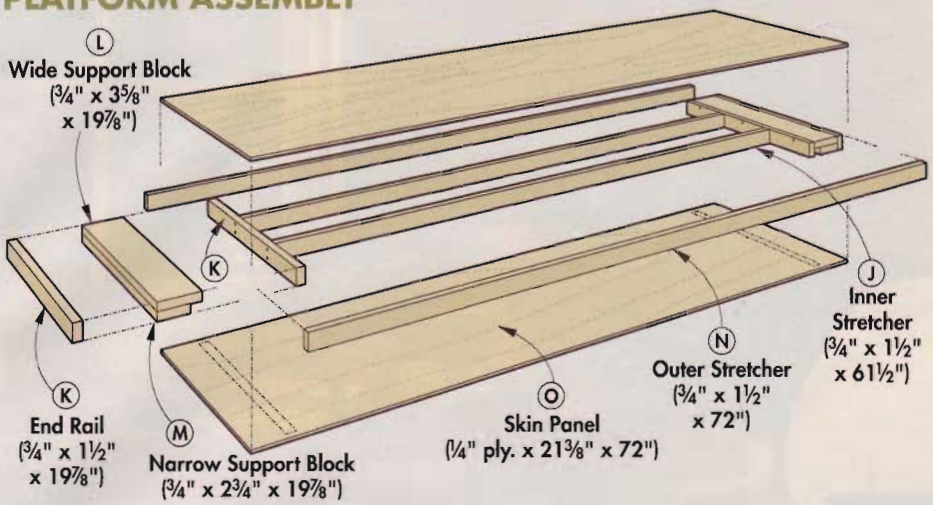
OUTFEED SUPPORT ASSEMBLY



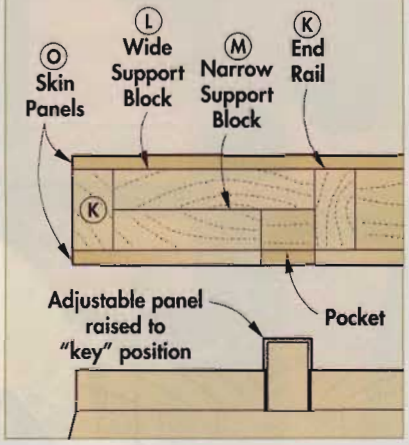
Outfeed Support Detail



PLATFORM ASSEMBLY



Pocket & Key Detail



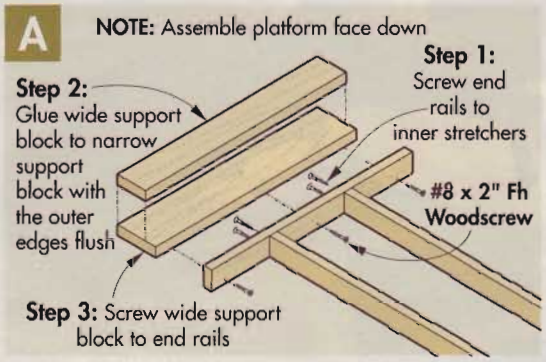
Get Framed — Start building the platform by cutting the two inner stretchers (J) and four end rails (K) to size. Next, make a two wide and two narrow support blocks (L, M). While you're at it, also cut two outer stretchers (N) to size.

Note: When you attach the narrow support block to the wide one, you need to align one edge of each piece. This means the opposite edges are offset, which forms the pocket discussed earlier *(Pocket & Key Detail, top right)*.

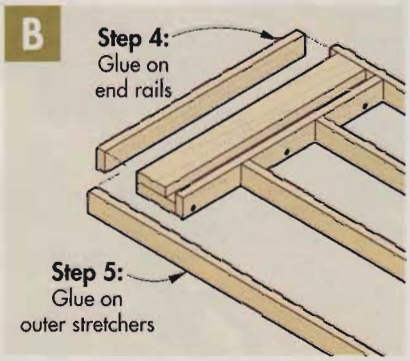
After cutting the frame parts, just cut the plywood skins (O), and you're ready to begin assembly *(Figs. A through D, right)*. When attaching the skins, use construction adhesive, and drive a brad into the frame every 6".

Finally, finish up the platform by routing through the plywood skin to complete the pockets.

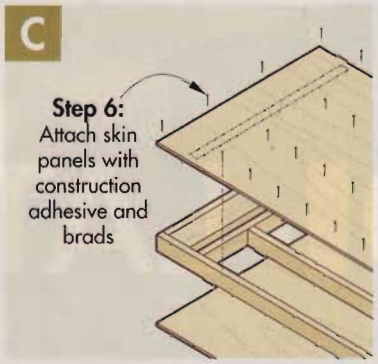
A



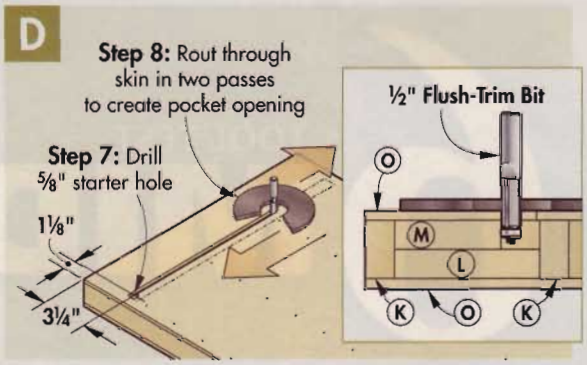
B



C



D



MATERIALS & HARDWARE

Part		Qty	T	W	L	Material
Sawhorses (Two)						
A	End Panels	4	¾"	16"	16⅛"	Pre-glued Pine Panel
B	Feet	4	¾"	3½"	16"	Pre-glued Pine Panel
C	Fixed Panels	4	¾"	16"	19⅞"	Pre-glued Pine Panel
D	Tops	4	¾"	3½"	21½"	Pre-glued Pine Panel
E	Adjustable Panels	2	¾"	19¾"	16¾"	Pre-glued Pine Panel
Saddles (Two)						
F	Sides	4	¾"	3½"	19¾"	Pine
G	Spacers	2	⅞"	1½"	19¾"	Pine
Outfeed Support (One)						
H	Crossbar	1	¾"	1½"	19¾"	Pine
I	Risers	4	¾"	2"	8"	Pine

Part		Qty	T	W	L	Material
Platform (One)						
J	Inner Stretchers	2	¾"	1½"	61½"	Pine
K	End Rails	4	¾"	1½"	19⅞"	Pine
L	Wide Support Blocks	2	¾"	3⅝"	19⅞"	Pine
M	Narrow Support Blocks	2	¾"	2¾"	19⅞"	Pine
N	Outer Stretchers	2	¾"	1½"	72"	Pine
O	Skin Panels	2	¼"	21⅜"	72"	Pine Plywood

- (82) #8 x 2" Fh Woodscrews
- (32) #6 x ½" Fh Woodscrews
- (8) #8 x 1¼" Fh Woodscrews
- (2) #8 x 3" Fh Woodscrews
- (1) ¾" x 1/16" x 72" Alum. Channel
- (1) 1½" PVC Pipe
- (120) 18-gauge Wire Brads
- (4) ¼" x 2" Cotterless Hitch Pins
- (4) ¼"-20 x 3" Carriage Bolts
- (4) ¼"-20 T-Knobs

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

WORKBENCH®

SAWHORSES

Issue 292 Volume 61 Number 6 December 2005

MATERIALS LIST

MATERIALS & HARDWARE

	Part	Qty	T	W	L	Material
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Saddles (Two)						
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G	Spacers	2	⅞"	1½"	19¾"	Pine
Outfeed Support (One)						
H	Crossbar	1	¾"	1½"	19¾"	Pine
I	Risers	4	¾"	2"	8"	Pine
Platform (One)						
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K	End Rails	4	¾"	1½"	19⅞"	Pine
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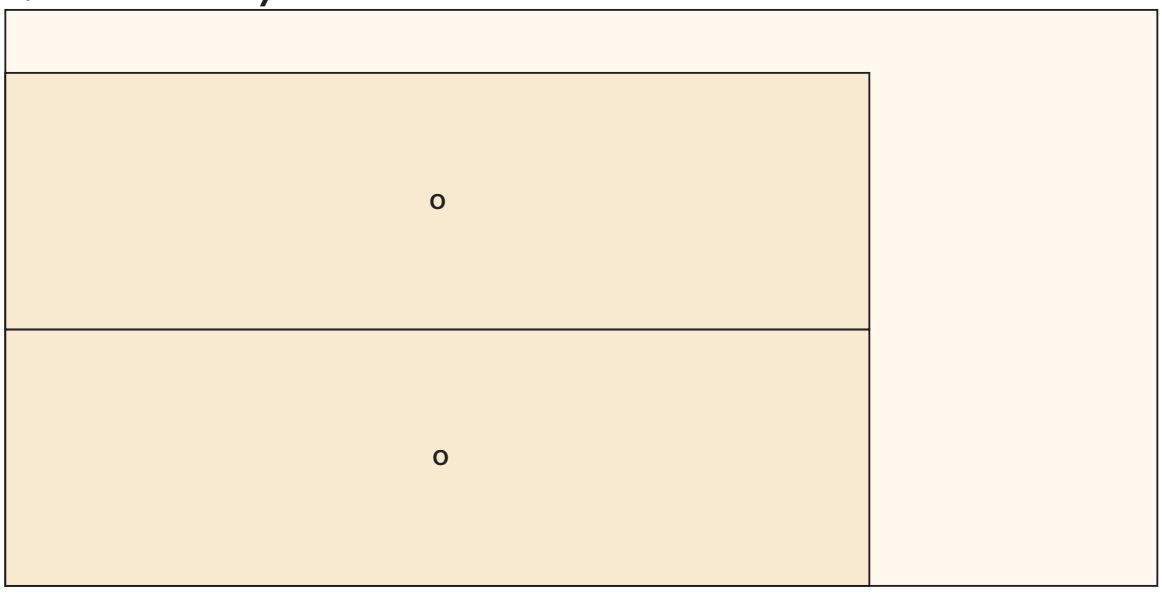
N	Outer Stretchers	2	¾"	1½"	72"	Pine
O	Skin Panels	2	¼"	21⅜"	72"	Pine Plywood

(82) #8 x 2" Fh Woodscrews
(32) #6 x ½" Fh Woodscrews
(8) #8 x 1¼" Fh Woodscrews
(2) #8 x 3" Fh Woodscrews
(1) ¾" x 1/16" x 72" Alum. Channel
(1) 1½" PVC Pipe
(120) 18-gauge Wire Brads
(4) ¼" x 2" Cotterless Hitch Pins
(4) ¼"-20 x 3" Carriage Bolts
(4) ¼"-20 T-Knobs

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

CUTTING DIAGRAM

¼" x 48" x 96" Plywood



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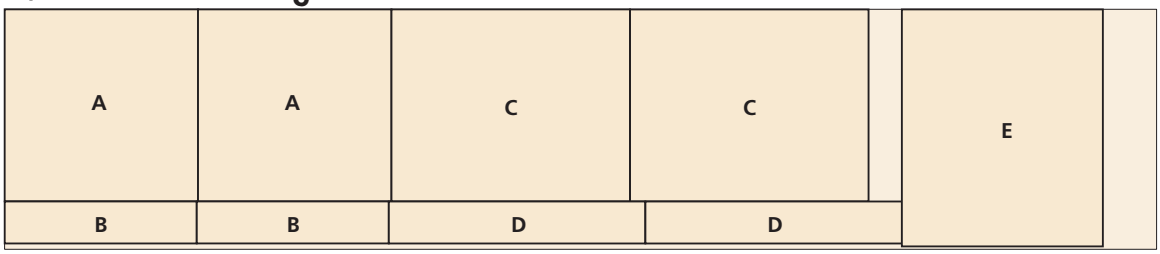
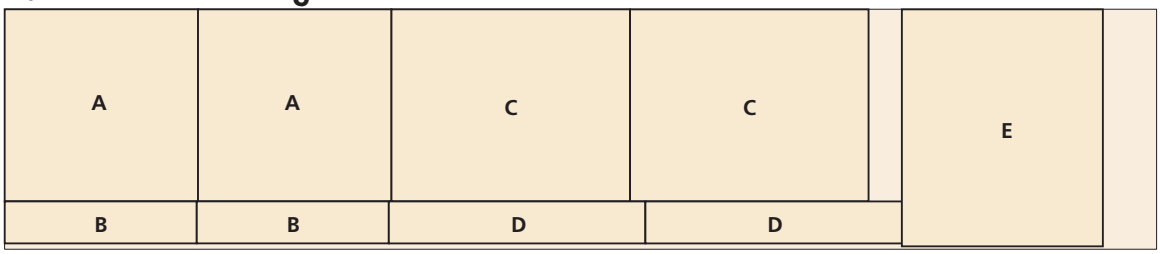
CUTTING DIAGRAM

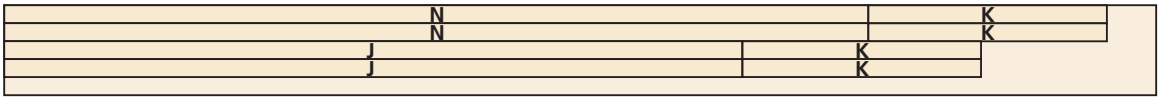
¾" x 20" x 96" Pre-glued Panel



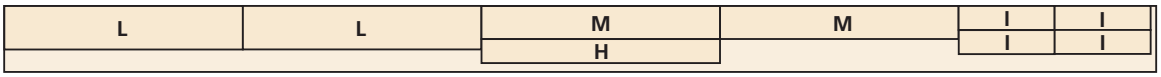
¾" x 20" x 96" Pre-glued Panel



¾" x 8" x 96" Pine

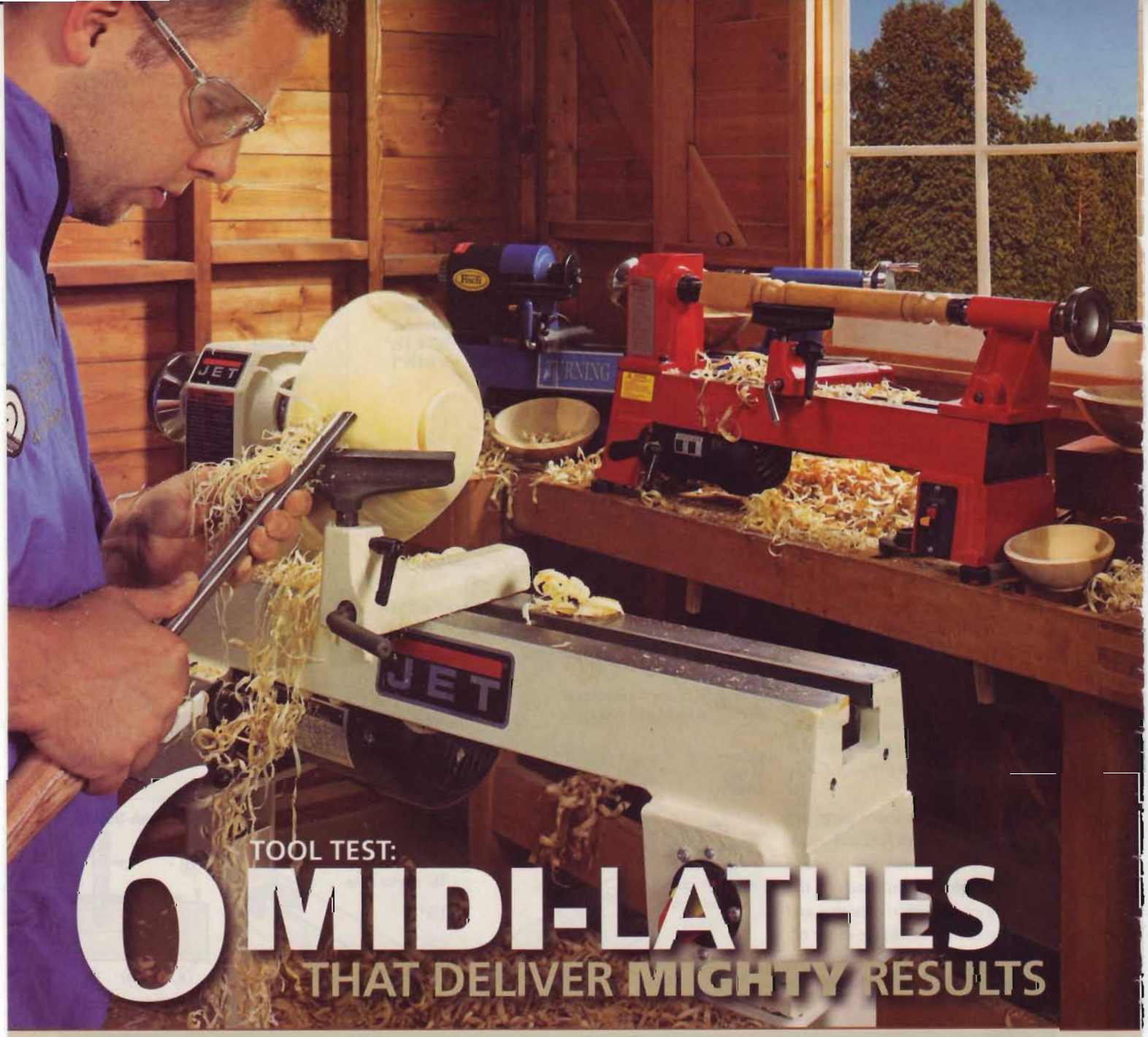


¾" x 6" x 96" Pine



¾" x 4" x 60" Pine

¾" x 4" x 60" Pine



6 TOOL TEST: MIDI-LATHES THAT DELIVER MIGHTY RESULTS

Every time I flip through a tool catalog, it seems there's yet another new midi-lathe on the market. They're called midi-lathes because their turning capacities are about midway between mini-lathes, which are used primarily for turning pens, bottle stoppers, and other small items, and full-size lathes, which can turn everything from enormous bowls to porch columns.

So why the sudden popularity of midi-lathes? There are a few reasons for that, actually.

First is their compact size. Unlike a freestanding lathe, which requires its own dedicated space in the shop, midi-lathes are relatively unobtrusive. They require little more than a corner of the workbench. And even though they're a bit heavier than many benchtop tools, it's not out of the question to store them away when they're not in use.

Another reason is the affordable price of these lathes. Consider that the top performer in this test sells for less than $300, compared to twice or three times that for many full-size lathes, and this is a very economical way to get started turning.

The third reason is capacity. Right out of the box, many of these lathes can turn a bowl as large as 10" in diameter and spindles as long 14", 15", and even 19". (Compare this to 12"- to 16"-dia. bowls, and spindles 40" or longer on a full-size lathe.)

Additionally, most of these lathes offer the option of bolting on a bed extension, which can as much as triple their spindle-turning capacity.

ANATOMY OF A LATHE

And it's worth noting that almost all of these lathes can accept the same accessories (chucks, centers, and faceplates, for example) as their full-size counterparts.

So, in short, for relatively little money, you can own a lathe that requires less space to begin with but can expand right along with your skills.

All of this, of course, still doesn't answer the question of which midi-lathe is the best choice for your shop. So to help make that decision a little easier, we tested six popular models.

HOW WE TESTED

To find out which of these midi-lathes performed the best, we started by turning the largest bowl each lathe could handle. This test quickly revealed which lathes were adequately powered, the amount of vibration in each tool, and how easily each tool rest adjusts.

However, bowl turning told us nothing about tailstocks and all the related components. So we also spent some time turning spindles to evaluate the "far" end of the lathes.

Anatomy of a Lathe — In the course of our testing, we discovered a number of important factors that differentiate one lathe from another. I've already touched on a few (power, vibration, and tool-rest adjustment). But differences in the individual parts, such as the centers, spindles, and quills, also proved paramount in our final opinions. In order to better understand how these factors affect the performance of a lathe, it's a good idea to bone up on the anatomy of a typical lathe *(Photo, above)*.

▲The most common means of changing speeds on these lathes is to adjust the position of the belt on the pulleys. The Fisch (shown here) makes that especially easy with a large access door over the pulleys.

POWER & PERFORMANCE

However much these lathes may resemble one another, we started noticing important differences as soon as we started turning bowls.

Power, or lack of it, was the first distinction we found. The Jet and Delta performed admirably by powering through 1/2"-deep cuts without slowing. The Fisch and General lathes couldn't quite match that power, but still performed respectably with cuts up to 3/8" deep. Both the Grizzly and the Turncrafter proved slightly underpowered by stalling on anything beyond a 1/8"-deep cut.

At the same time, we found vibration to vary quite a bit in these tools. Not surprisingly, the lightweight Grizzly was the worst shaker in the bunch. We felt a moderate amount of vibration in the Turncrafter, while the Fisch shimmied only lightly. As for the Jet, Delta, and General lathes, all three were rock-solid without so much as a shudder under maximum load.

Heavier tools, of course, tend to dampen their own vibrations, but weight alone isn't enough to make a tool run smoothly. In the same way that a misshapen arbor on a table saw can cause blade wobble, the spindle surfaces on a lathe must be flawlessly machined, or the tool will vibrate.

To see how much these factors influenced our experience with the tools, we measured runout on the inside of the spindle and on the shoulder *(Top Photo, page 65)*. As expected, we measured more runout on the tools with the most vibration *(see table on page 67)*.

COMPONENT QUALITY

Power and vibration, of course, aren't the only factors that differentiate these tools from each other. Differences in the design and quality of the components of the lathes also weighed heavily on our opinions. Those differences can be easily divided into three key areas on the lathe: the headstock, tailstock, and tool rest.

Headstock — Most of these headstocks follow the same basic template — a handwheel on one side, a spindle on the other side, and a belt and pulleys on the inside. Grizzly is the one variation on this theme. First

MIDI-LATHES

JET JML-1014

Virtues: Heavy; Powerful; No vibration; Large capacities; Good fit and finish; Wide range of speeds; Affordably priced.

Vices: The belt was so tight that speed adjustments were difficult to make; Chips collected on top of the motor.

Verdict: This is an impressive lathe from head(stock) to tail(stock). If it had a looser-fitting belt and a chip deflector over the motor, we'd dare call it perfect.

www.JetTools.com
800-274-6848

PENN STATE INDUSTRIES TurncrafterPro

Virtues: Heavy; Above-average fit and finish; Excellent price.

Vices: Slightly underpowered; Axial movement in the tailstock; Limited speed selection; Light vibration under load.

Verdict: In light of the affordable price, we were willing to give it a pass on a few of its shortcomings. It's not a top performer, but it's an affordable way to get started turning and still have money left to buy turning tools.

www.PennStateInd.com
800-377-7297

of all, there's no handwheel. Second, this lathe has electronic variable-speed control, so the belt-and-pulley system inside the headstock is quite different. On each of the other lathes, you change the speed by moving the belt on the pulleys *(Top Photo, page 64)*.

These seemingly small differences actually make quite an impact on how this lathe works. The electronic variable-speed feature is a plus, provided you don't mind giving up a bit of top-end speed. The missing handwheel, however, turned out to be a liability.

First of all, having a handwheel makes it much easier to turn the workpiece slowly when you're measuring, marking, or inspecting it. But the bigger issue is how *not* having one complicates setup changes on this lathe.

On each of the other lathes, you simply push a knock-out bar through the center of the handwheel to dislodge the drive center *(Photo, below)*. But no handwheel means no place for a knock-out bar. Grizzly's solution is to use a nut that threads onto the spindle *(Photo, below right)*. When you want to remove the spur center, you have to loosen the nut

(continued on page 66)

▲Runout in the spindle and/or misaligned centers can cause vibration in a spinning workpiece. We used a dial indicator to check runout on each lathe.

▲The typical method of removing spur centers to change setups is to insert a knock-out bar through the handwheel to push the center out.

▲Grizzly's less convenient method uses a nut to push the center out.

DELTA LA-200

Virtues: Heavy; Powerful; Smooth-running; Quiet; Good capacities; Above-average fit and finish; Easy speed changes.

Vices: Rough quill movement; Chips collected on top of the motor; Side-to-side movement in the tailstock.

Verdict: This is an excellent lathe with just a few bugs. If you can work around them, you'll have no problem turning out great work.

www.DeltaWoodworking.com
800-223-7278

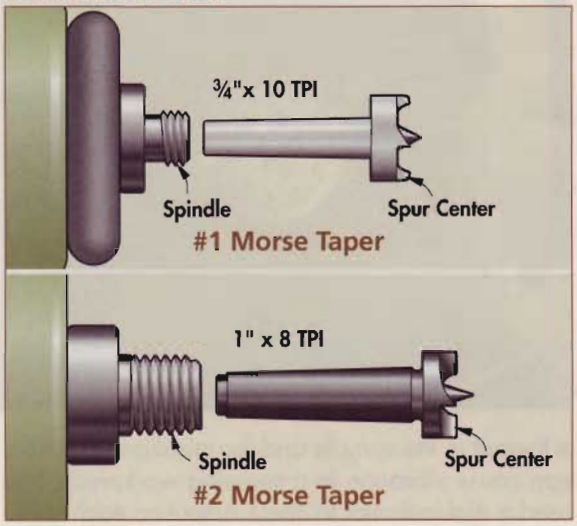
FISCH TC90-100

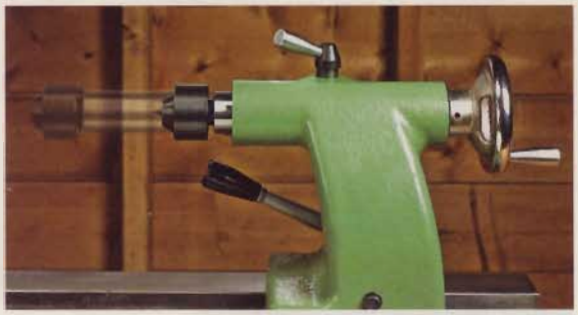
Virtues: Heavy; Powerful; Chip deflector over motor; Easy tailstock and tool rest adjustments; Good speed selection; Easy belt access.

Vices: Rough thread on spindle; Moderately rough finish inside the spindle; Quill lock fits poorly.

Verdict: Despite a few issues with the fit and finish, this is a quality lathe with adequate power and excellent setup characteristics.

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





▲The quill travel on the General International lathe is quite long, making it ideal for horizontal drilling in workpieces like pens and pencils.

to push it off. I guess you're on your own if you forget to replace the nut before installing the center.

And while we're on the subject of centers, we might as well take issue with Grizzly for those, as well.

Presumably as a cost-saving measure, Grizzly opted to use #1 Morse Taper centers and a spindle with ¾" x 10 threads per inch (TPI) *(Illustrations, left)*. Every other lathe in this test uses a #2 Morse Taper and a 1" x 8 TPI spindle.

What this means to you is that the Grizzly won't accept most after-market centers, faceplates, or chucks because they're all designed for the larger taper and thread.

Think of this like router collets. A #1 Morse Taper is like a ¼" collet. In many cases, this is good enough. But there are times when bigger really is better. In the same way that you'll never find a panel-raising router bit with a ¼" shank, many valuable lathe accessories are available only in a #2 Morse Taper.

Tailstock — Moving to the far end of the lathe, we come to the tailstock. Despite similarities in name and appearance, this is actually quite different from the headstock.

First of all, the tailstock is adjustable along the length of the lathe bed, so it can support workpieces of various lengths. And although the handwheel on the tailstock looks just like the one on the headstock, its purpose is quite different. In this case, the handwheel extends and retracts the quill. The quill accepts a live center, which is what ultimately makes contact with and supports the workpiece.

A good tailstock will move smoothly and accurately along the bed, lock down securely once it's in position, and have a smoothly adjusting quill with plenty of travel.

The Jet and General both received high marks on all scores. The General in particular impressed us with nearly 4" of adjustment in the quill *(Photo, left)*. That can come in handy anytime a turning project requires horizontal drilling.

The Fisch, Delta, and Turncrafter lathes all suffered from axial play in their tailstocks (the tendency for the tailstock to move side-to-side as you adjust it along the bed). This makes it

MIDI-LATHES

GENERAL INTL. 25-100

Virtues: Heaviest in the category; Excellent capacities; Quiet; Easily accessible belt; Long quill travel.

Vices: Limited speed selection; Rough mill marks on bed and spindle shoulder; Difficult to change belt position on lower pulley.

Verdict: This is a sturdy tool with some excellent features. Unfortunately, it demonstrated slightly less power and a few more glitches than much lower-priced models.

www.General.ca
819-472-1161

GRIZZLY G8690

Virtues: Easy speed control; No axial movement when sliding the tailstock; Very affordable.

Vices: Underpowered; Noisy; Lightweight castings; Difficult adjustments throughout; Significant vibration; Small swing capacity.

Verdict: Although it doesn't compare well to the other lathes, this could still serve as a very affordable pen lathe as long as your turning ambitions don't go beyond that.

www.Grizzly.com
570-546-9663

almost impossible to align the centers, which is one more factor that can cause vibration when you're turning.

One additional black mark for the Delta was the incredibly rough adjustment of its quill. Turning the wheel required a bit too much muscle, and the actual movement of the quill was halting at best.

The Grizzly had no axial play, but the fit of the tailstock to the bed was so tight that we had to strong-arm even the smallest adjustments. This lathe also has the shortest quill travel at just 1" (average for the other machines is just over 2").

Tool Rest — The tool rest is, to borrow a modern term, the interface of a lathe. This is where you connect with the tool for every single function of turning. And what's more, it's a constantly changing interface. As the size and shape of your workpiece changes, the tool rest must be repositioned for the safest, most effective approach to your work.

Clearly then, we were looking for tool rests that slide smoothly along the bed, lock solidly in position, and have an adequate range of adjustment for a wide range of workpiece sizes.

The Jet, Delta, Fisch, and Turncrafter lathes all received superior marks for their tool rests. Without exception, the rests slide smoothly, lock solidly, and feature well-designed levers that are large enough to operate easily, but not so large that they interfere with adjustment.

▲ Tailstocks and tool rests need to slide smoothly, have an adequate range of adjustment, and lock down securely if you're going to get the best results in your turning.

The General fared slightly worse because the tool rest didn't slide smoothly. And some of the handles on this tool are a bit undersized.

The Grizzly tool rest was just all-around poor. The fit was so tight that we nearly had to disconnect the clamp to move the rest. And the large lever and knob were often in the way as we tried to reposition the rest. It also lost points because the tool rest couldn't be lowered enough to position the tool below the centerline of the workpiece.

FINAL RECOMMENDATIONS

Throughout the testing, the Jet JML-1014 set the standard. From its rock-solid construction, quality components, and smooth, powerful performance, we found nothing at all to complain about. And all of this comes at a very affordable price. This lathe ran away with our Editor's Choice award.

The Penn State Industries TurncrafterPro, at just $160, is an impressive bargain. You do sacrifice a little in the way of power, but you can compensate for that with sharp tools and a less aggressive turning style. Otherwise, the Turncrafter has castings, components, and fit-and-finish that rival lathes costing twice as much. All of that adds up to a Top Value award in our book.

	JET JML-1014	PENN STATE INDUSTRIES TurncrafterPro	DELTA LA-200	FISCH TC90-100	GENERAL INTL. 25-100	GRIZZLY G8690
Price	$250	$160	$250	$340	$350	$160
Motor	½ HP, 5 amp	½ HP, 8 amp	½ HP, 6.6 amp	½ HP, 6.8 amp	½ HP, 3.5 amp	⅓ HP, 3.1 amp
Speed Range (RPM)	500-3,975	500-3,200	500-3,700	500-3,700	480-4,023	0-3,025
Weight (lbs)	72 lbs	68 lbs	71 lbs	70 lbs	96 lbs	35 lbs
Morse Taper	#2	#2	#2	#2	#2	#1
Spindle Thread Size	1" x 8 TPI	1" x 8 TPI	1" x 8 TPI	1" x 8 TPI	1" x 8 TPI	¾" x 10 TPI
Bowl Capacity	10"	10"	10"	10"	10"	6"
Spindle Capacity	14"	18"	14½"	15"	15"	19"
Runout*	.001"/.001"	.0005"/.001"	.0005"/.00125"	.00425"/.001"	.00"/.0005"	.0015"/.001"
Power	High	Low	High	Moderate	Moderate	Low
Vibration	None	Light	Light	Severe	None	Severe
Setup & Adjustment	Excellent	Good	Good	Excellent	Excellent	Poor
Fit & Finish	Excellent	Excellent	Excellent	Good	Good	Poor

*Spindle runout dimensions are shown as: inside taper/shoulder

custom kitchen Cabinets

After building the "Dream Island" in the October 2005 issue of *Workbench*, only an equally stylish set of custom cabinets would do for this kitchen. But even without the matching island, there are some compelling reasons for building custom cabinets in your own kitchen.

First of all, building custom cabinets allows you to tailor them to your personal tastes, the style of your home, and the way you work in the kitchen. As you may recall, those were all important criteria for this kitchen, which had to satisfy *her* contemporary tastes and *his* affection for more traditional styling.

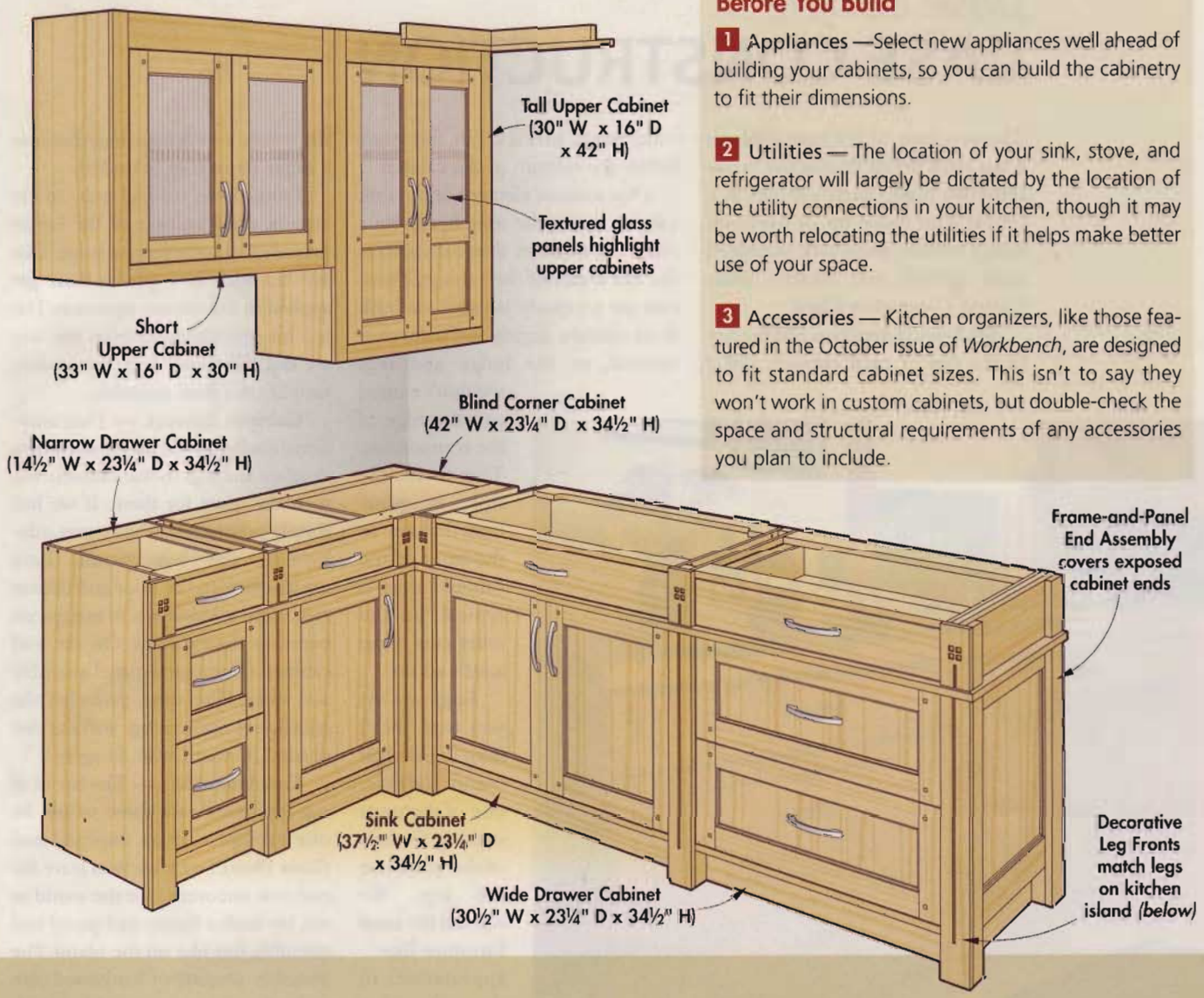
By the way, if you don't have a copy of the October issue, the "Dream Island" article will be available for a limited time at no cost on our website, WorkbenchMagazine.com.

And since many of the details of these cabinets are identical to those in the island, you'll want that article handy if you plan to build a set of these cabinets for your own kitchen. All of the techniques and tips you'll need can be found in there.

As for the specific dimensions of these cabinets, those are also available online as a free downloadable plan.

In this article, we'll show you how, with a few simple modifications to

Construction Details



Before You Build

1 Appliances —Select new appliances well ahead of building your cabinets, so you can build the cabinetry to fit their dimensions.

2 Utilities — The location of your sink, stove, and refrigerator will largely be dictated by the location of the utility connections in your kitchen, though it may be worth relocating the utilities if it helps make better use of your space.

3 Accessories — Kitchen organizers, like those featured in the October issue of *Workbench*, are designed to fit standard cabinet sizes. This isn't to say they won't work in custom cabinets, but double-check the space and structural requirements of any accessories you plan to include.

the island plans, we were able to bring the defining style elements of the island to the cabinets. Those include the Craftsman-inspired legs, the hardwood ledge, and frame-and-panel doors, drawer fronts, and end assemblies.

We'll also touch on the unique aspects of the six cabinets we built for our kitchen. In the end, you'll be able to mix and match the cabinets, and even resize them, to maximize your kitchen space.

Six Cabinet Designs — While it's true that we built six distinct cabinet types to fill our kitchen, they are just variations on two basic themes: lower cabinets and upper cabinets.

For instance, the lower cabinets include a sink cabinet, a wide-drawer cabinet, a narrow-drawer cabinet, and a blind-corner cabinet *(Construction Details)*. The uppers are even simpler. Here, we built one tall upper cabinet and two short upper cabinets.

Each cabinet fills a specific purpose and differs from the others in the details. But fundamentally, they are the same. They share the same case-work, the same drawer construction, and the same door assemblies. The only meaningful difference is size.

Ultimately, of course, the dimensions of our cabinets can serve only as a guideline for yours. For a truly custom fit, you'll need to measure your kitchen and adjust the size of your cabinets to best fill the space. And as you make those calculations, you'll have to factor in the variables outlined in *Before You Build*, above.

▲ The kitchen island, featured in the October 2005 issue of *Workbench*, defines the style of this kitchen.

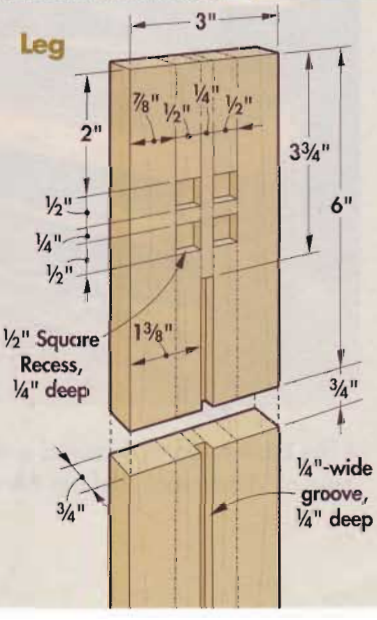
base cabinets
CASE CONSTRUCTION

The structure of the base cabinets is the same for all four of the variations we built. Each cabinet is a simple case made up of plywood sides, a bottom, and a back assembled with rabbets and dadoes *(Base Cabinet Construction View)*.

Solid-wood stretchers add rigidity to the top of each cabinet, and a solid-wood toekick fills the space below the bottom of the cabinet.

One unusual element of the sink cabinet is that the stretchers have a relief cut in them that runs almost the full width of the cabinet. These cuts are necessary because we built these cabinets slightly shallower than normal, so the ledge and legs wouldn't extend past the edge of the countertops. That means the sink is positioned closer to the front of the cabinets than is typical. So the relief cuts make a little room.

▲ The "legs" on these cabinets, which are actually just decorative leg fronts, are made by ripping an extra-wide blank into thin strips and then cutting and routing the details.



Legs — As you may recall from the kitchen island article, one of the most striking features of that project is the legs. We wanted the same furniture-like appearance in these cabinets, so we applied that element here, as well.

In this case, though, we only had to make decorative leg fronts, since they're purely an aesthetic element rather than a structural one, as on the island. However, when it came time to add the frame-and-panel end assemblies, we did apply two plain leg sides to complete the illusion of legs on the cabinets.

We made the leg fronts for the cabinets precisely the same as we did for the island. We first ripped an extra-wide blank into thin strips. Then we cut and routed the decorative details in the individual strips before gluing the whole works back together into a single piece *(Leg, below left)*.

From there, we had only to cut away a small section of the leg to provide clearance for the ledge. That left us with two pieces that get applied to the cabinet separately. This is a bit of a variation from the way we did the island legs, but it does simplify the final assembly.

Cabinet Spacers — One additional challenge we had to overcome to adapt the legs to the cabinets was to make space for them. If we had simply positioned the cabinets side-by-side, the legs would have encroached on the door and drawer space. Our solution was to use spacers between the cabinets. On the end cabinet, a frame-and-panel assembly and some filler strips provided the additional mounting surface we needed *(Corner Detail, far right)*.

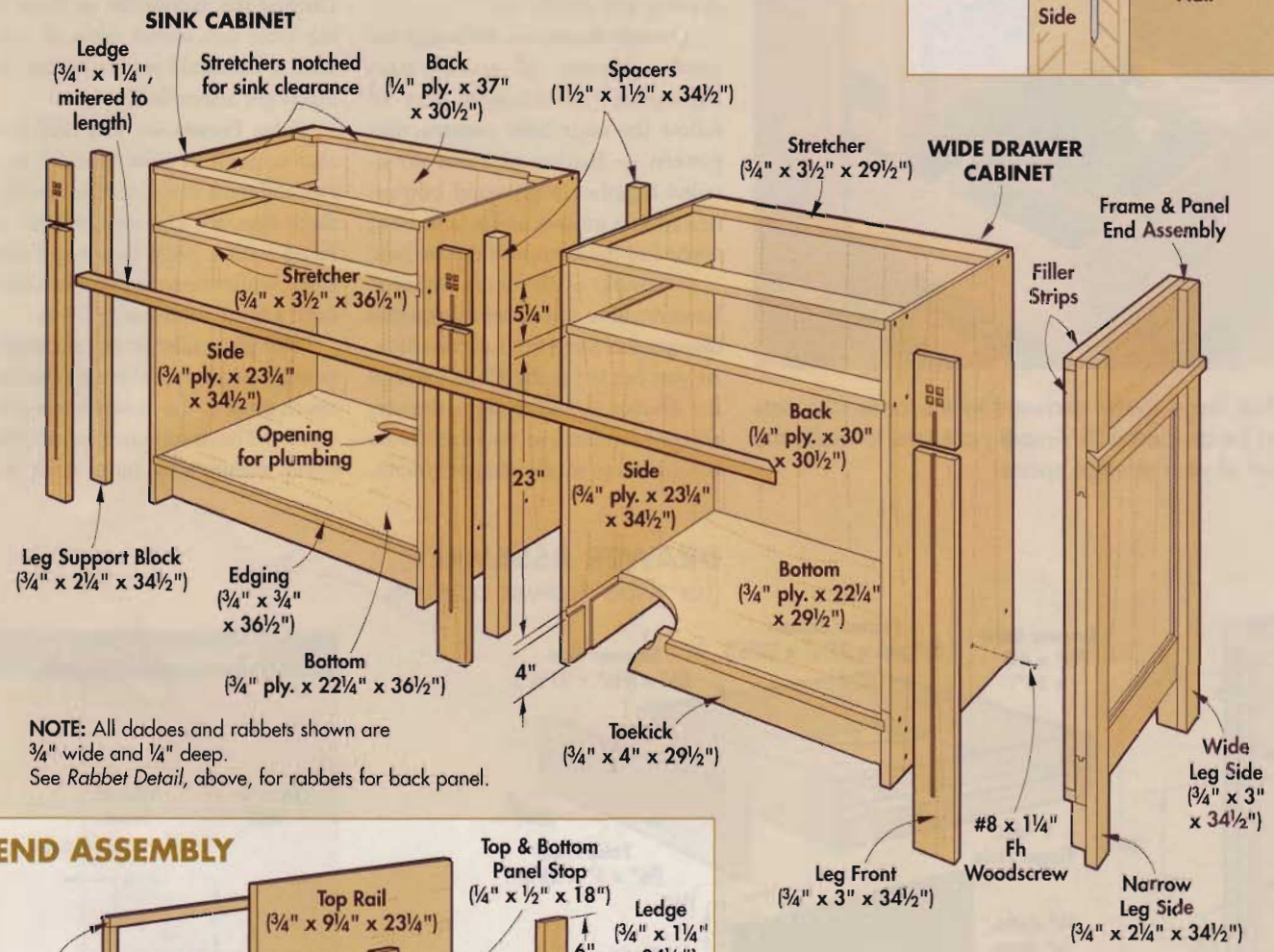
End Assemblies — The layout of our kitchen meant there would be one cabinet with an exposed end *(Main Photo)*. So rather than leave the case side uncovered for the world to see, we built a frame-and-panel end assembly, just like on the island. The assembly consists of hardwood rails and stiles that are assembled with stub tenon and groove joints *(End Assembly)*. Each frame piece has a groove cut in the inside edge, which accepts a hardwood panel stop. A plywood panel is glued to the stops.

Filler Strips — To build up the thickness of the end assembly, we applied hardwood filler strips. This ensures that the leg side aligns with the decorative leg front.

Leg Sides — The purpose of the leg sides, along with two small filler blocks, is to continue the illusion of legs from the front of the cabinets.

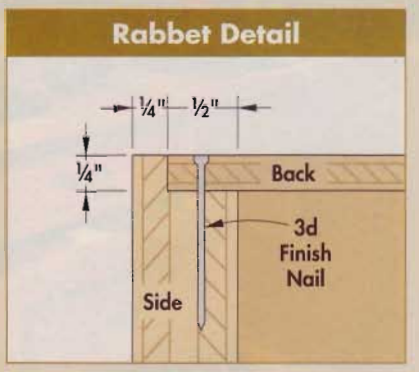
Ledge — Next comes the ledge that wraps around the front and exposed ends of the cabinet. This has been simplified from the island and here requires only machining it to size and mitering it to length.

BASE CABINET CONSTRUCTION VIEW

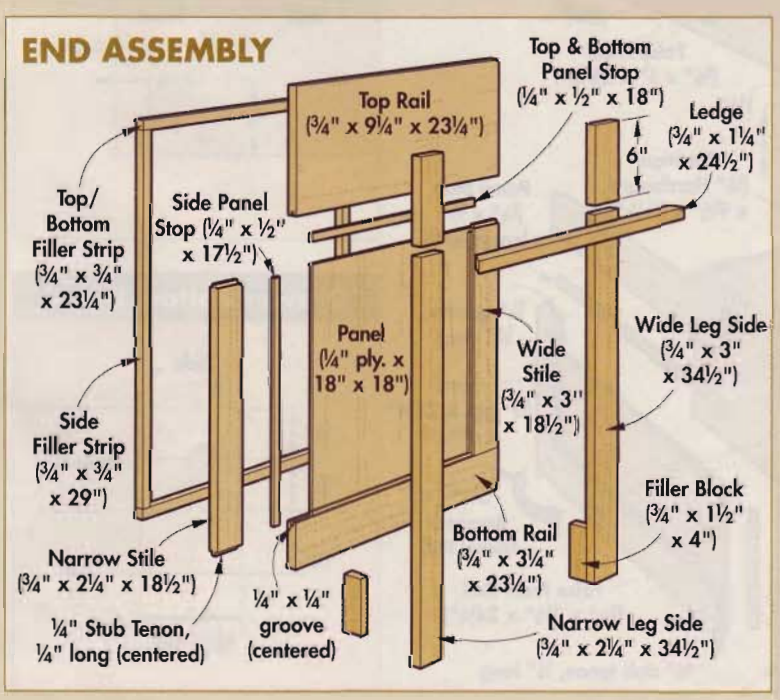


NOTE: All dadoes and rabbets shown are ¾" wide and ¼" deep.
See *Rabbet Detail*, above, for rabbets for back panel.

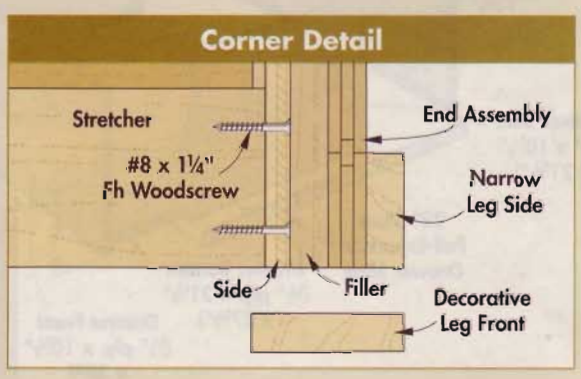
Rabbet Detail



END ASSEMBLY



Corner Detail



▲ The large lower drawers in the base cabinets can be divided with simple partitions to make the most of your storage space.

frame & panel
DRAWERS & DOORS

With all the casework and applied molding complete on the base cabinets, the next step is to build the drawers and doors.

Drawer Boxes — Although we used a variety of drawer sizes throughout our kitchen, they all follow the same basic construction pattern — hardwood boxes dovetailed together, a plywood bottom nested in a groove, and a false front applied to the assembled drawer box.

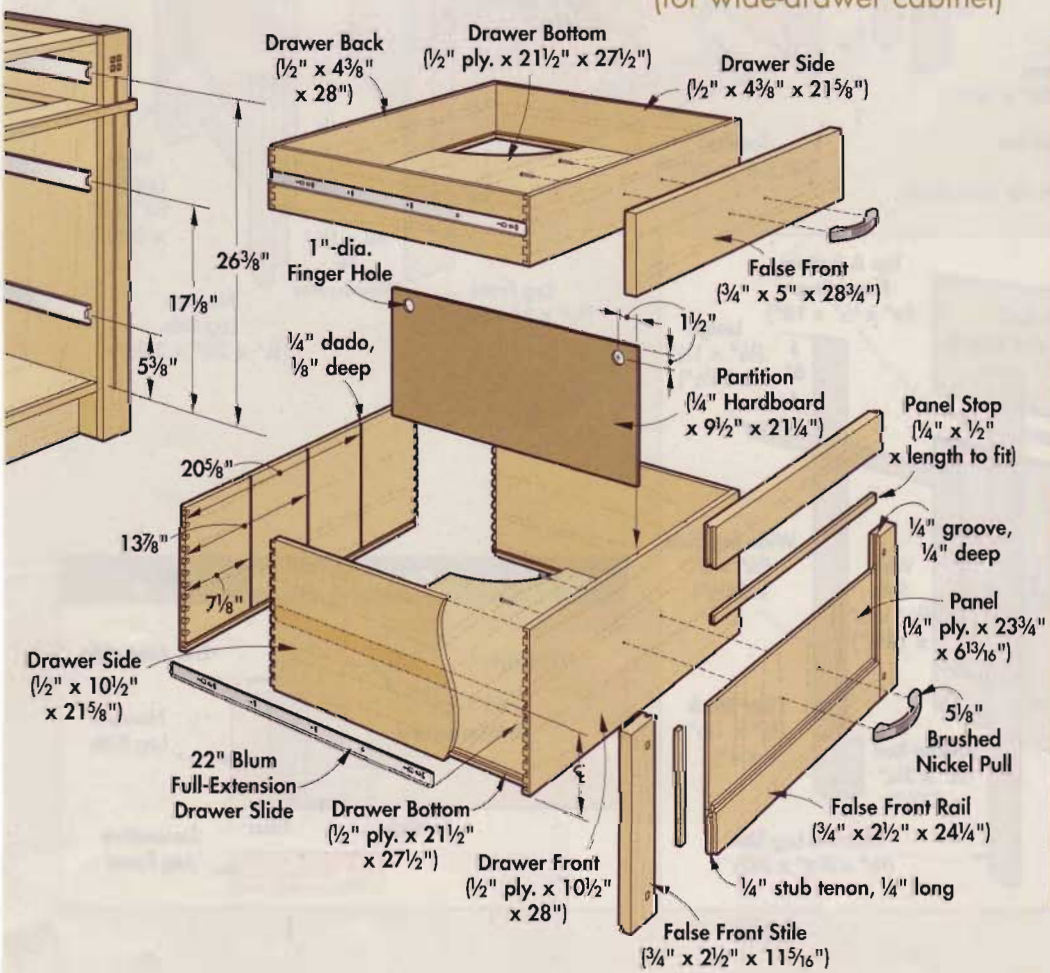
A couple of the wide drawers, however, have one more feature that distinguishes them from all the others. As you can see in the *Photo,* left, and the *Illustration,* below, these drawers accept partitions, so you can divide the space into smaller compartments.

The partitions themselves are simply 1/4" hardboard panels that are cut to fit into dadoes in the drawers. Cutting the dadoes can be done on the table saw, router table, or even with a handheld router before the boxes get assembled.

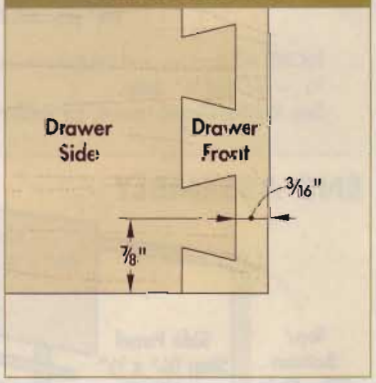
False Fronts — You may have also noticed by now that we used two different styles of false front on these drawers. The top drawers are faced with a plain hardwood false front, while the lower drawers each have a frame-and-panel facade.

The plain false fronts are simple enough — just cut them to size, and attach them to the drawer boxes with screws. The frame-and-panel false fronts require a bit more work, but

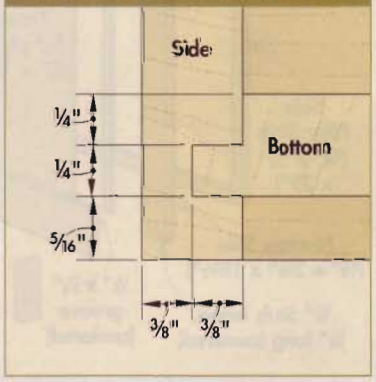
DRAWER ASSEMBLY
(for wide-drawer cabinet)



Dovetail Detail



Drawer Bottom Detail



you should recognize this construction from the end assembly. Although smaller in scale, this is the same stub-tenon-and-groove frame with panel stops and a plywood panel.

Drawer Installation — After mounting the drawer boxes inside the cabinets (the drawer slide locations are shown in the *Illustrations* on page 72), you can attach the false fronts to their respective drawers. Use spacers to create consistent gaps between the drawer fronts — pocket change always serves nicely for this. Then temporarily affix the fronts to the drawer boxes with double-sided tape as you drive screws from inside the drawers.

Base Cabinet Doors — The doors on the base cabinets are identical to those on the kitchen island. The hardwood frame is built with mortise-and-tenon joints *(Door Assembly)*. Panel stops get glued into grooves in the frame parts. Then a plywood panel is glued in behind the stops. Finally, at each corner of the frame, a wood peg adds a touch of Craftsman styling *(Photos, right)*.

These are easy to create by simply drilling a shallow hole with a Forstner bit. Then chisel out the waste to make the square mortise. Finally, glue in a short piece of 3/8" x 3/8" stock, and sand it flush.

Upper Cabinet Doors — While it may seem a bit like putting the cart before the horse to discuss the doors for the upper cabinets (which begin on the next page), they're enough like the base cabinet doors that we thought it best to cover them at the same time. There are really only a few small differences.

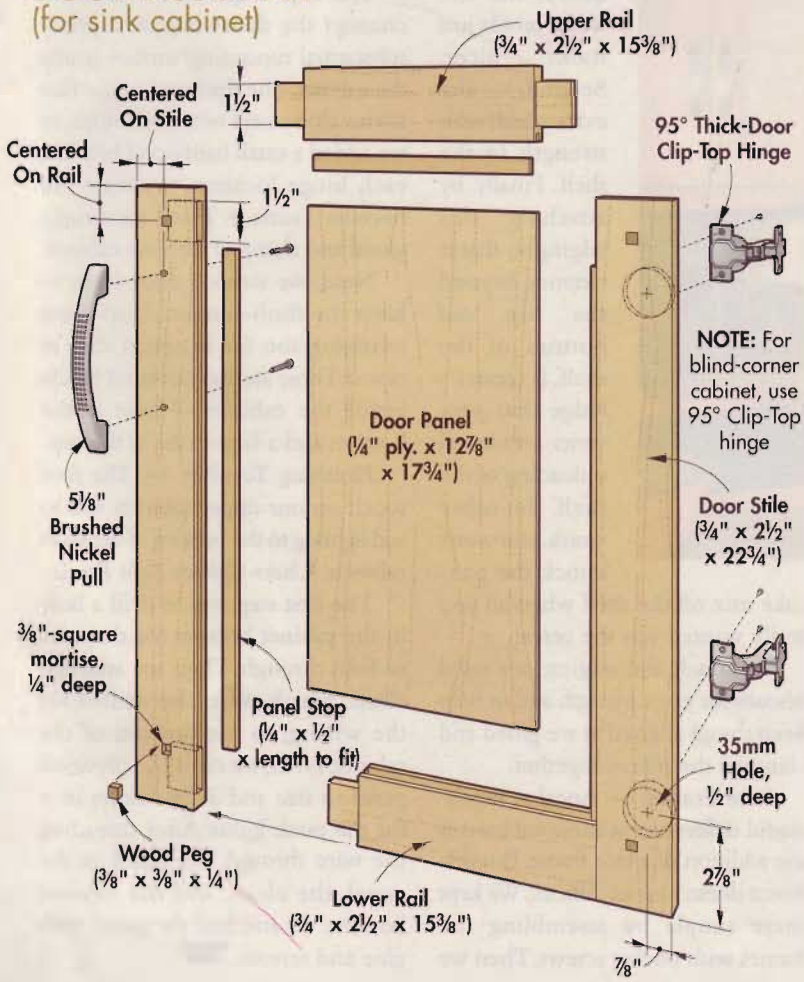
In the short upper cabinets, we traded the plywood panel for a glass panel. The only change this creates is that the panel is attached with silicone adhesive instead of wood glue.

The tall doors are a bit more involved because we used both a plywood *and* a textured-glass panel in these. The doors are just too tall for a single panel of any kind. And since we had to divide them anyway, we took the opportunity to add this attractive design element.

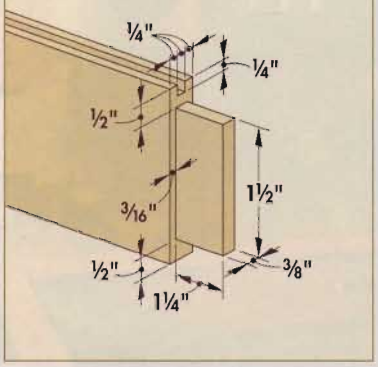
This does, however, affect the way these doors are built. The division means the addition of a center rail *(Upper Cabinets, page 75)*. This rail is assembled with mortise-and-tenon joints, just like the upper and lower rails. You'll also need to groove *both* edges of this center rail since there will be a panel installed above *and* below it.

▲ Faux pegs at the corners of the frame-and-panel doors are simple to create by drilling and chiseling a square pocket and then gluing in a short peg.

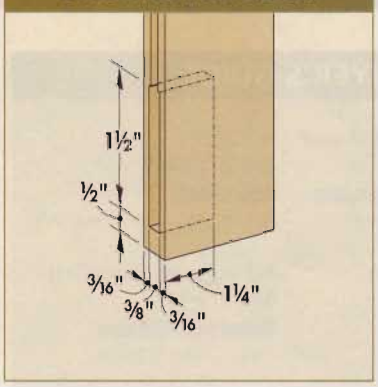
DOOR ASSEMBLY
(for sink cabinet)



Rail Tenon Detail



Stile Mortise Detail



upper cabinet CONSTRUCTION

The upper cabinets, while sharing many of the same construction details of the base cabinets and island, bring in a few elements that we haven't dealt with up to this point.

The case construction remains pretty much the same — plywood boxes held together with dadoes. A couple of small differences here are the mounting cleats attached to the back of the cabinet and the shelf pin holes in the sides of the tall cabinets. These holes accommodate an adjustable shelf that comes a bit later. Drill the shelf pin holes before assembling the cases, then add the cleats as the last step in the case construction.

Adjustable Shelf — The adjustable shelf in each of these upper cabinets is simply a plywood panel with a wide piece of hardwood edging applied to the front edge *(Shelf Edging Detail)*.

We used the wide edging here for a few reasons. First, these shelves will be in plain view through the glass panels in the doors, and the wider profile just looks nicer. Second, the extra width adds strength to the shelf. Finally, by attaching this edging so that it extends beyond the top *and* bottom of the shelf, it creates a ledge that prevents accidental unloading of the shelf. In other words, you won't knock the pancake mix off the shelf when all you really wanted was the cereal.

To attach the edging, we used biscuits for extra strength and to help keep things aligned as we glued and clamped the pieces together.

Face Frames — Another meaningful difference in these cabinets is the addition of a face frame. But different doesn't mean difficult. We kept these simple by assembling the frames with pocket screws. Then we used biscuits to attach the frames to the cases. The biscuits add a bit of strength, and they're a huge help in keeping the assemblies aligned while you glue and clamp them.

There is, however, one important sidenote about the face frames. Wherever the side of a cabinet butts up against an adjoining wall, the stile on that side of the frame should be cut extra-wide to allow for scribing. An extra 1/4" is typically enough, but you'll want to check for any larger irregularities in your wall, just to be safe.

Door Support — We already covered building the frame-and-panel doors on page 73. But before you can mount the doors in the cabinets, there are a few support pieces that need to go on first.

The cup hinges that we used to connect the doors require a pretty substantial mounting surface inside the cabinet. The thickness of the face frame alone isn't nearly enough, so we added a small hardwood block at each hinge location to create the necessary surface. These are simply glued and clamped into the cabinet.

Next, we needed door stops to keep the flush-mount doors from swinging too far in when they're closed. Those are also just small blocks inside the cabinet — one at the bottom and a larger one at the top.

Finishing Touches — The final touch on our upper cabinets was to add lighting to the bottom of the short cabinets *(Under-Cabinet Light Panel)*.

The first step was to drill a hole in the cabinet bottom for the wire to feed through. Then we attached cleats, which were also drilled for the wiring, to the bottom of the cabinet. Next, we cut a 1/4" plywood panel to size and drilled holes in it for the puck lights. After threading the wire through the holes in the panel, the cleats, and the cabinet bottom, we attached the panel with glue and screws.

BUYER'S GUIDE

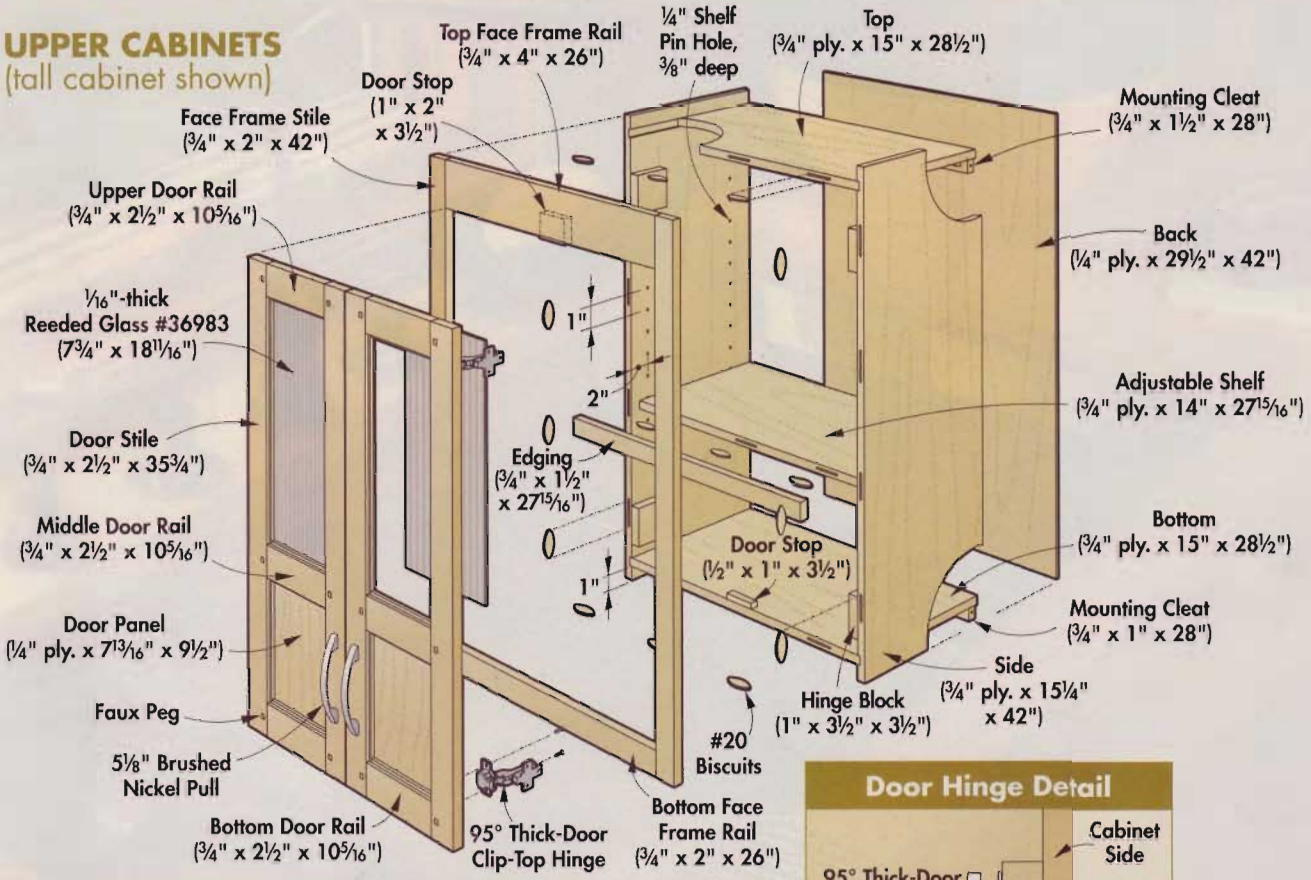
Woodworker's Hardware
800-383-0130
WoodworkersHardware.com
Drawer/door pulls, slides, hinges

Rockler
800-279-4441
Rockler.com
Textured glass, hinges, drawer slides

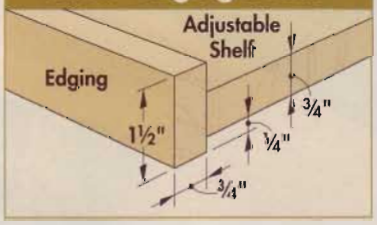
CabinetParts.com
800-857-8721
CabinetParts.com
Hinges, Drawer slides

BLI Lighting Specialists
800-279-4441
BudgetLighting.com
20W, 120-Volt puck lights

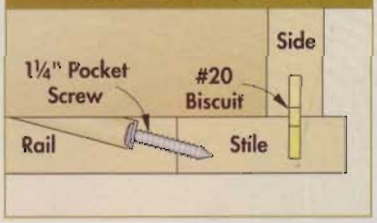
UPPER CABINETS
(tall cabinet shown)



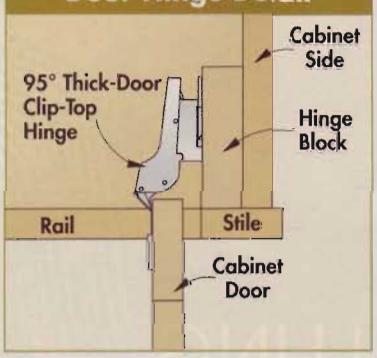
Shelf Edging Detail



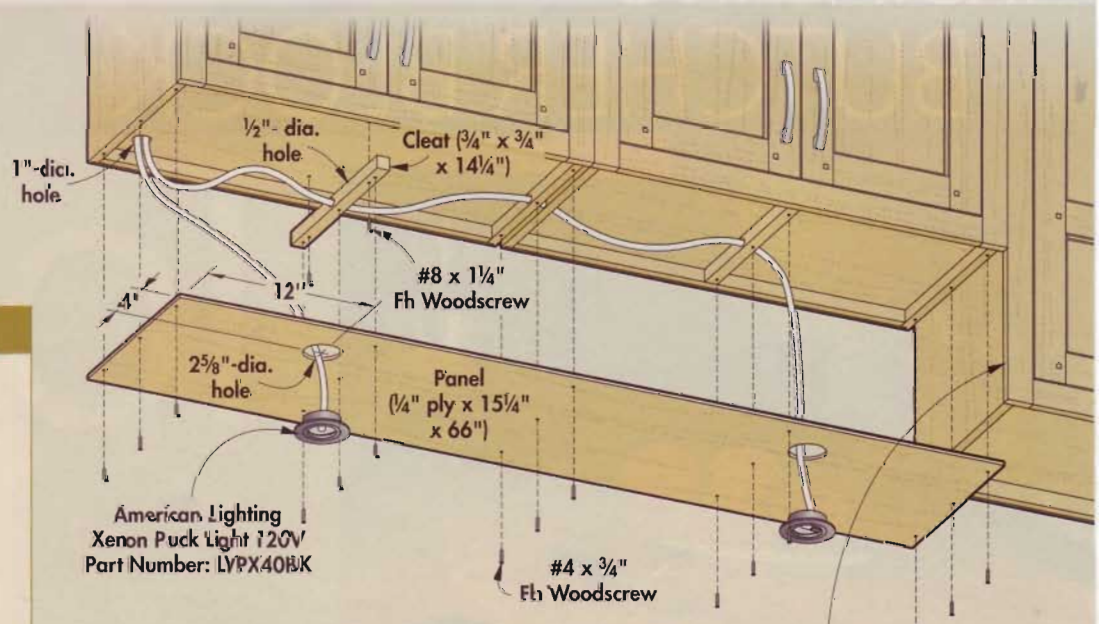
Face Frame Detail



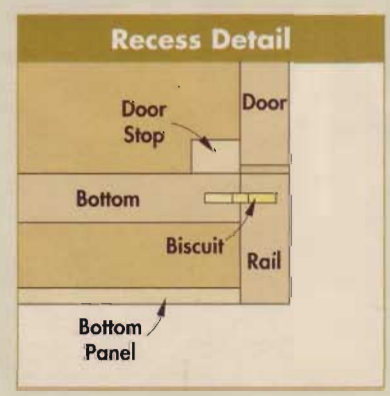
Door Hinge Detail



UNDER-CABINET LIGHT PANEL



Recess Detail



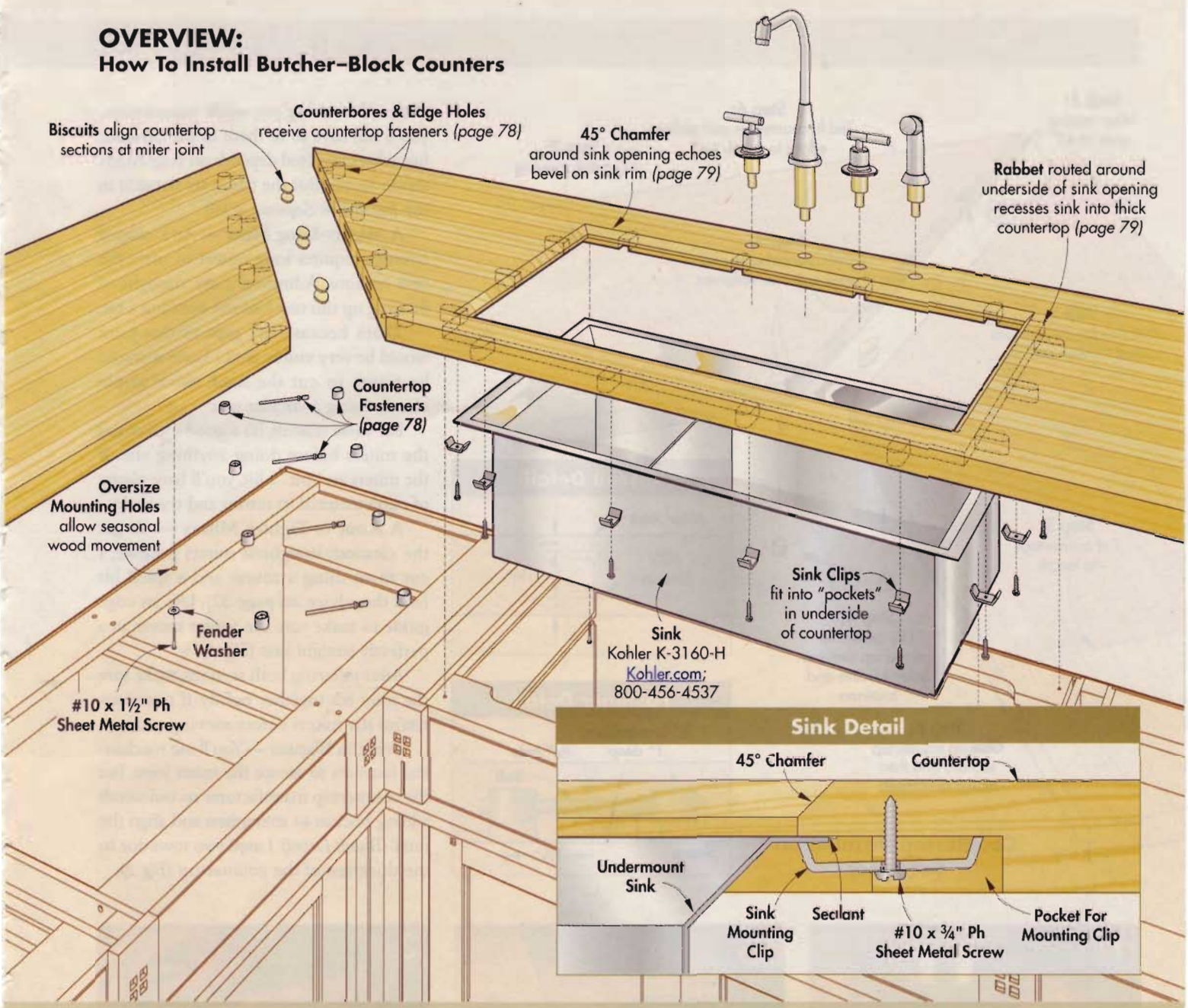
NOTE: Tall cabinet does not have ¼" plywood panel.

NOTE: Flush trim edge of face frame when cabinet side is exposed.

INSTALLING BUTCHER BLOCK

Tops

OVERVIEW:
How To Install Butcher-Block Counters



To top off the kitchen cabinets on page 68, I wanted countertops that were elegant and durable, with a classic look that complemented the cabinets. But I didn't want to break the budget with stone or solid surfacing. I decided that maple butcher-block counters would be the best choice.

At first, I figured I'd just build the countertops. But the idea of cutting, jointing, gluing up, and sanding all those strips of hard maple into perfectly flat slabs was a bit daunting. Plus, a quick count proved I'd have to make a major investment in bar clamps to have enough for the job.

Using Pre-Made Tops — That's when I arrived at a perfect compromise: I'd buy the countertops, and then install them myself.

For the tops, I turned to John Boos and Company (JohnBoos.com). The maple tops I used are 1½" thick and come in 2- to 12-foot lengths. Plus, they're economical at less than $4 per square foot.

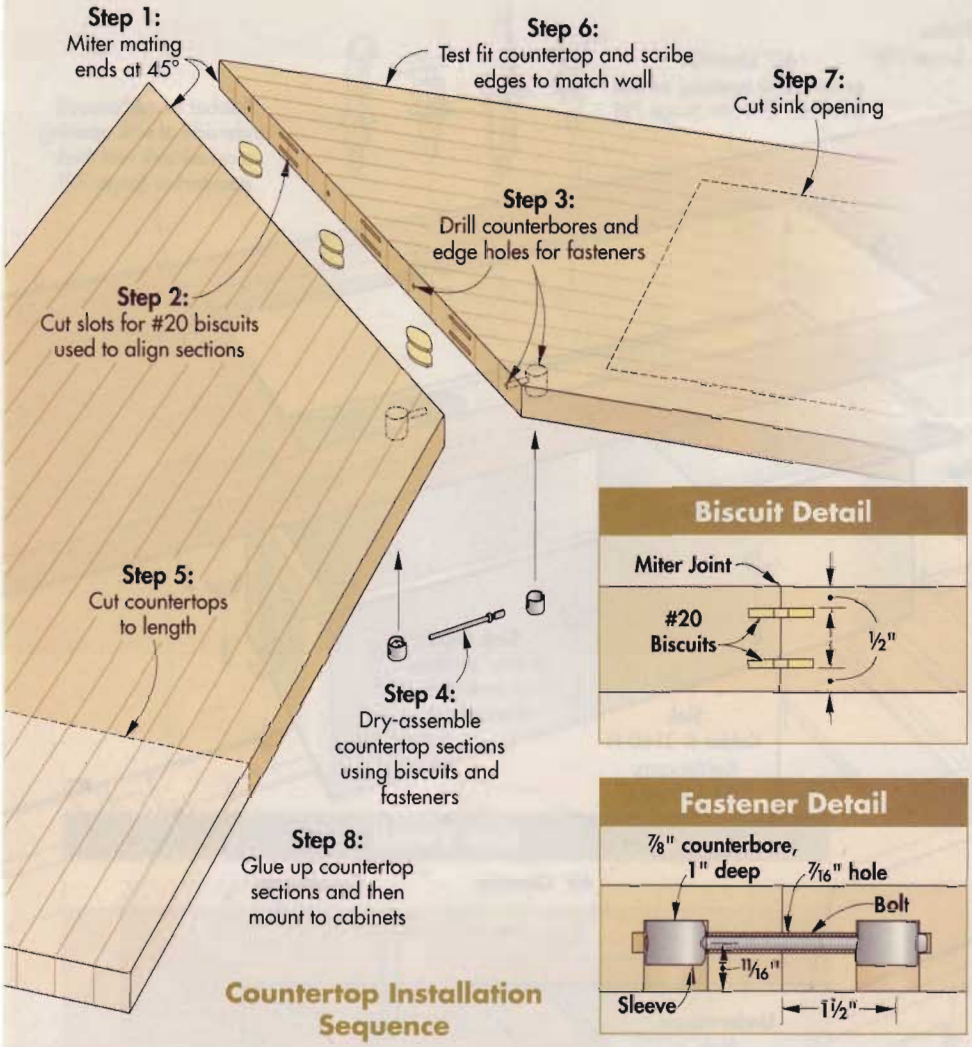
In some situations, you may be able to order countertops in the exact length that you need. More often, though, you'll order them extra long and then cut them to fit.

A Quick Overview — Installing the tops was really a straightforward process. The *Illustration* above shows what's involved.

The big challenge here is cutting the long miters where the two sections meet. But a router and shop-built guide make it easy *(page 78)*. Two more jigs simplify installing the unique fasteners that join the sections.

I also added an undermount sink, which required clean, accurate cuts and a decorative edge *(Sink Detail)*. Again, a router and template keep the process simple *(page 79)*.

After that, it's just a matter of mounting the countertops to the cabinets. This is like installing any other countertop, except the mounting holes are oversize, as shown above, to allow the countertop to expand and contract with changes in humidity.



Countertop Installation Sequence

Even when using pre-made countertops, you'll still have to fit them to the cabinets. Just what's involved depends on your countertop layout. But the basics are detailed in the *Installation Sequence* at left.

A Mighty-Long Miter — An L-shaped counter requires long miters to mate the two sections. Admittedly, the thought of messing up this step had me sweating a bit.

That's because any gaps in that joint would be very visible. And I knew it would be tough to cut the hard, thick maple cleanly using a circular saw.

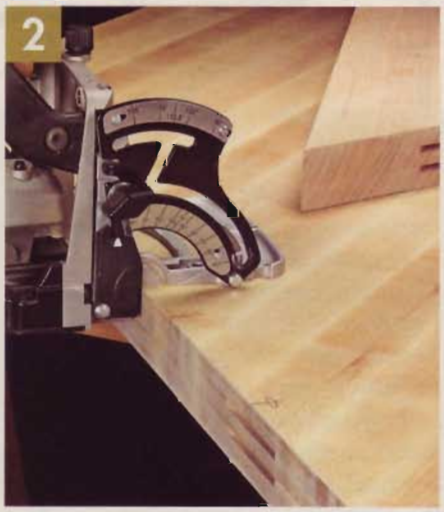
For these reasons, it's a good idea to cut the miters before doing anything else. If the miters are "off" a bit, you'll have plenty of extra material to retrim and try again.

A Rout to Tighter Miters — To get the cleanest, straightest miters possible, I cut them using a router and a spiral bit (and the advice on page 32). Use an edge guide to make sure the router moves in a perfectly straight line *(Fig. 1)*.

After mitering both sections, make sure the joint fits together tightly. If necessary, retrim the miters before moving on.

Bring in Biscuits — You'll use mechanical fasteners to secure the miter joint, but the countertop manufacturer recommends adding biscuits to strengthen and align the joint *(Biscuit Detail)*. I used two rows due to the thickness of the countertop *(Fig. 2)*.

▲After laying out the miter angle, clamp an edge guide in place to guide the router. Make 1/4" deep passes, holding the router tightly against the guide fence.



▲Two rows of #20 biscuits help align the mating edges of the tops. Cut slots for the biscuits 1/2" from each face and between the fastener locations.

▲After boring holes for the fasteners, dry-fit the slabs to make sure they draw together tightly. A large nail or nail set is used to tighten the fasteners *(Inset)*.

Finish Up with Fasteners — To join the countertop sections, I used Tite Joint fasteners (available from Rockler.com). They have sleeves that fit into counterbores in the underside of each countertop section. Draw bolts span between the sleeves through holes drilled in the edge of each piece *(Fastener Detail)*. To simplify aligning these holes, I made a pair of jigs, shown on page 34.

After installing the hardware, dry-fit the joint to test the fit *(Fig. 3)*. Snug down the fasteners, but don't glue up the joint yet.

Cut To Length, Then Scribe — With the countertop temporarily assembled, you can measure and cut each section to length. Like the miters, this is best done with a router and spiral bit.

That done, temporarily position the countertop on the cabinets. Chances are good that you'll notice gaps between the back edges of the counter and the walls. If so, you'll need to scribe the back edges to match the contours of the wall, and then trim them to fit. (See the October 2005 issue of *Workbench*.) Now disassemble the sections to make sink installation easier.

Sink Into the Opening — I outfitted my countertop with an undermount sink, so the opening had to be straight and square, with clean edges. A router and spiral bit are the tools of choice, once again. But instead of using an edge guide, I cut a hardboard template and equipped the router with a guide bushing. See page 32 to learn more.

Once you complete the template, attach it to the countertop with double-sided tape. Then rout the opening *(Figs. 4 and 4a)*.

The sink I chose has a polished, beveled edge around the rim *(Photo, right)*. I decided to echo this design by routing a chamfer around the opening *(Figs. 5 and 5a)*.

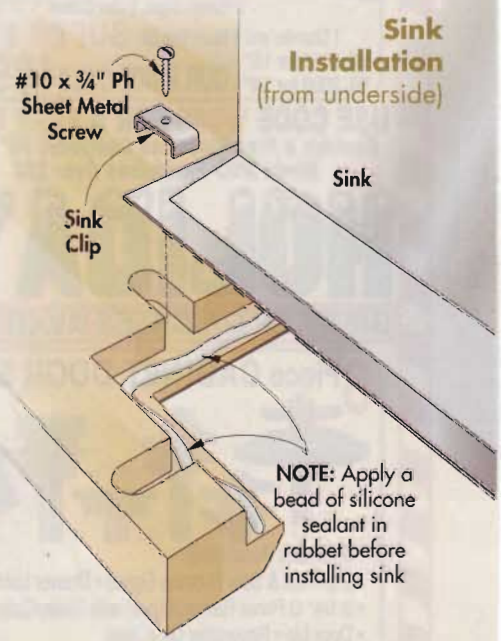
Next, I laid the counter face down and routed a rabbet to recess the sink in the opening *(Figs. 6 and 6a)*. Many rabbeting bits won't cut a 3/4"-wide rabbet. But I found a Superabbet bit from Amana (#49360, AmanaTools.com) with enough capacity.

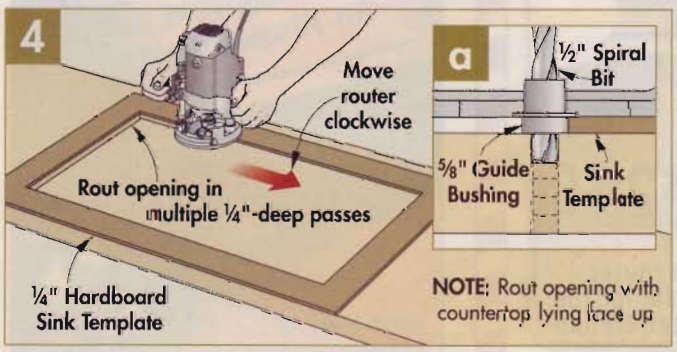
The sink mounts with U-shaped clips that span between the sink rim and the countertop *(Illustration, right)*. Like the sink itself, the clips are recessed into pockets around the sink opening *(Fig. 7)*.

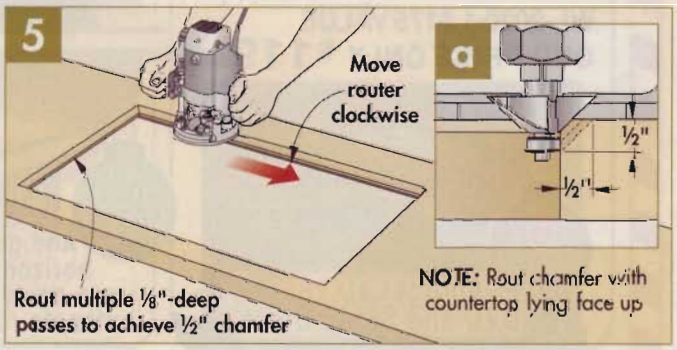
That done, you can bore holes for the faucet. Locations for these vary, so use the template included with the faucet as a guide.

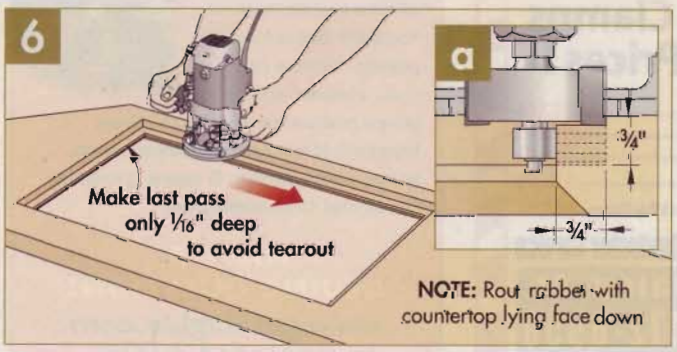
Finish & Install — Now reassemble and glue up the sections before sanding and applying finish. When it dries, mount the sink and install the faucet. Finally, screw the countertop to the cabinets.

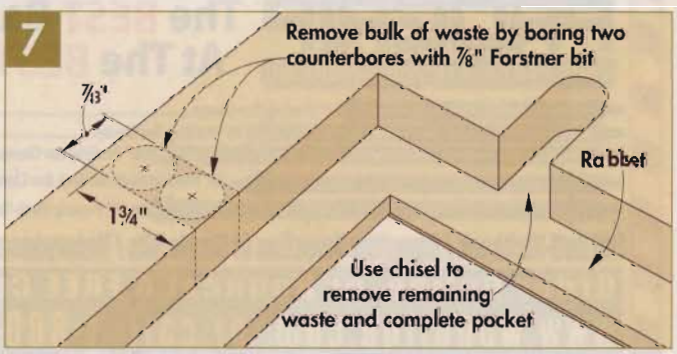
▲ A chamfer on the edge of the sink opening echoes the beveled sink rim.

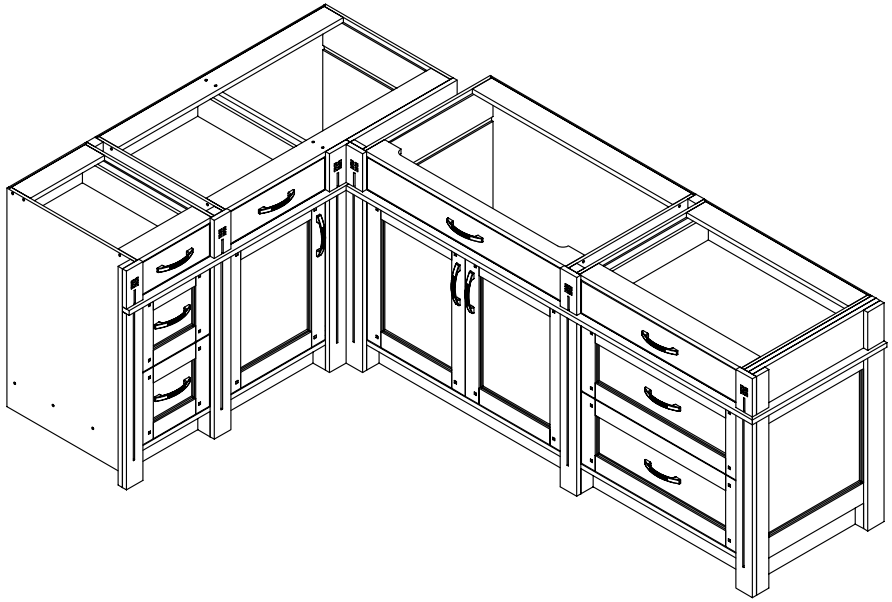


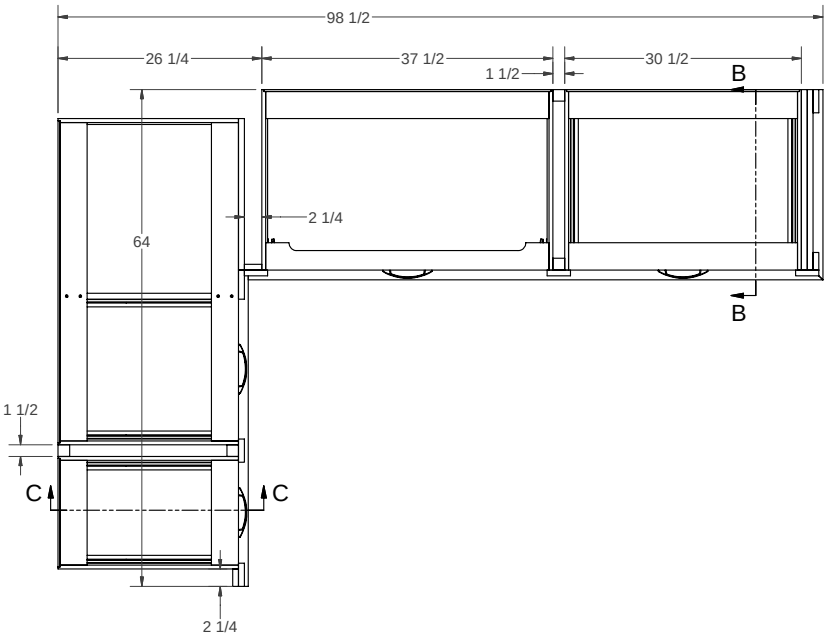


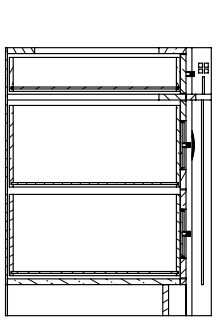




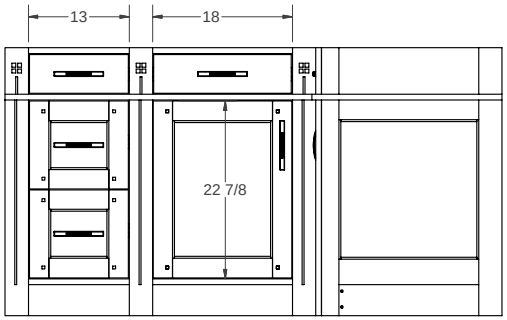


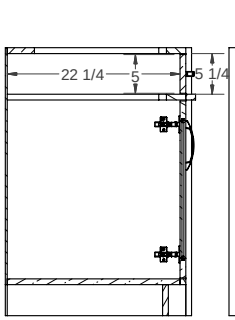




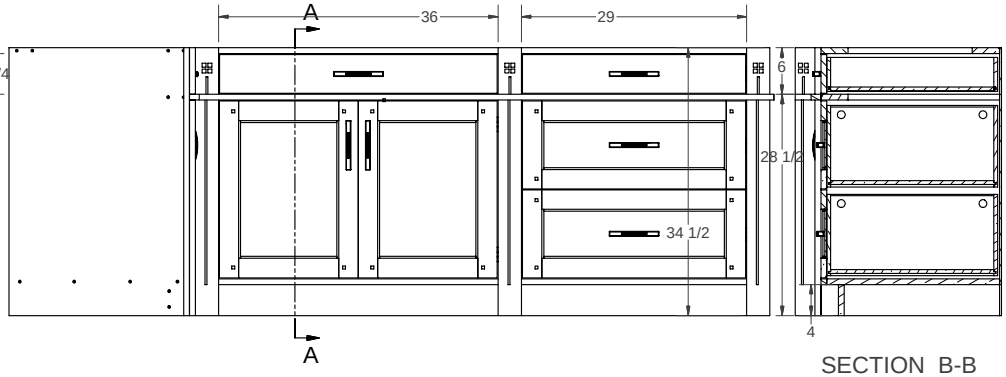


SECTION C-C





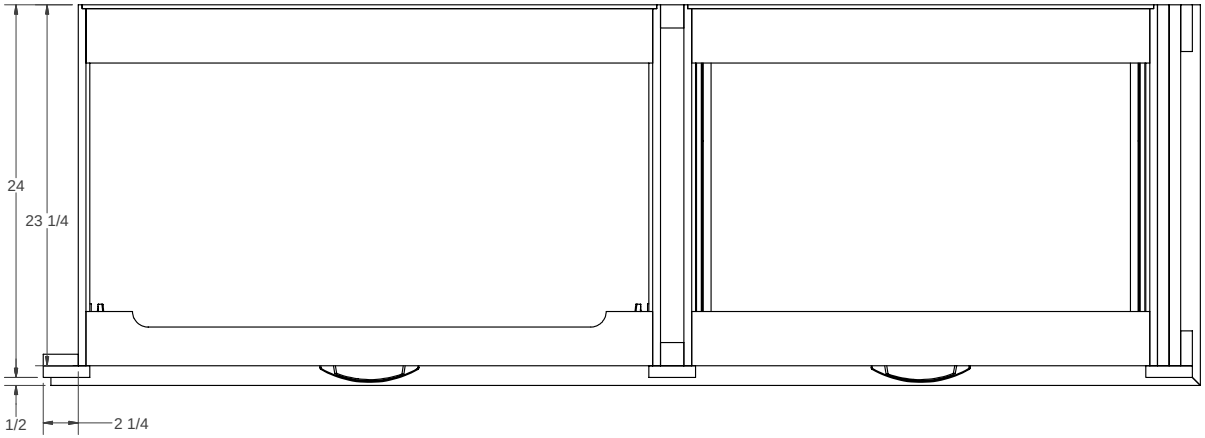
SECTION A-A



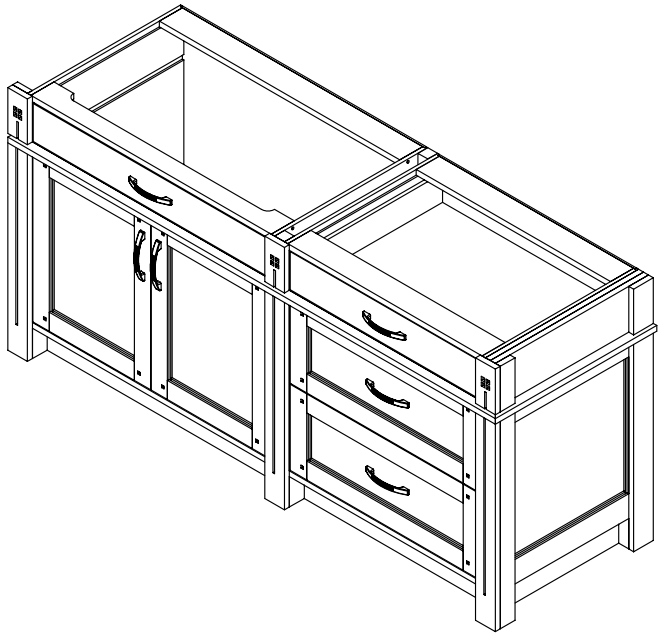
SECTION B-B

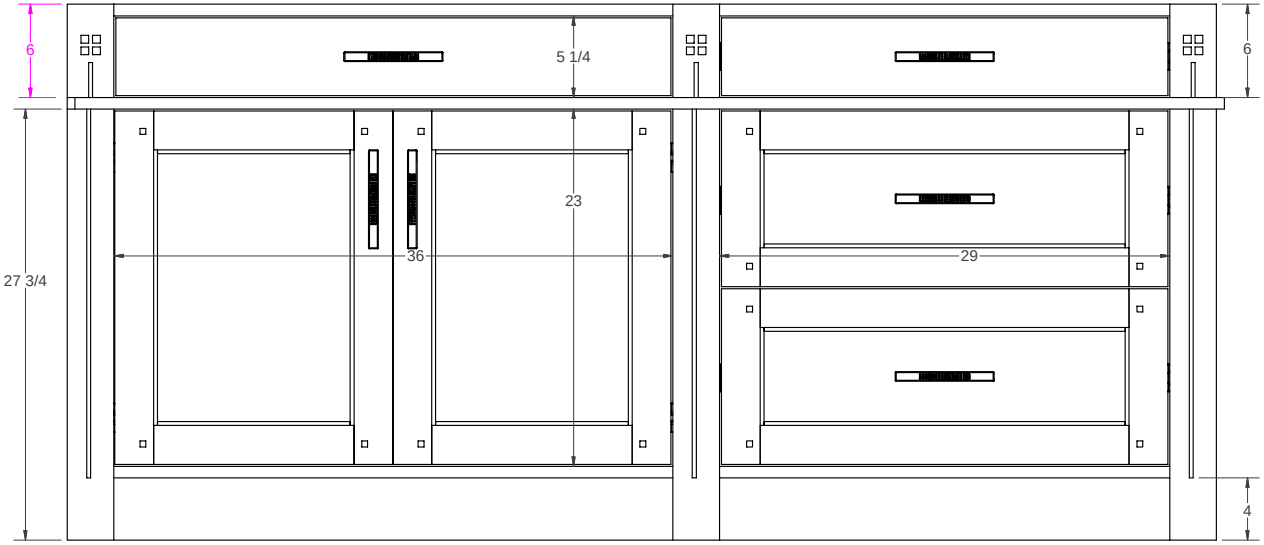
REVISED JULY 27,05

WORKBENCH	291 Kitchen Upgrade	Downing	1

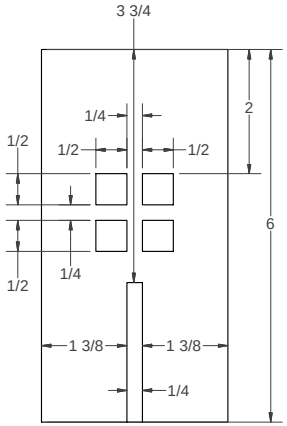


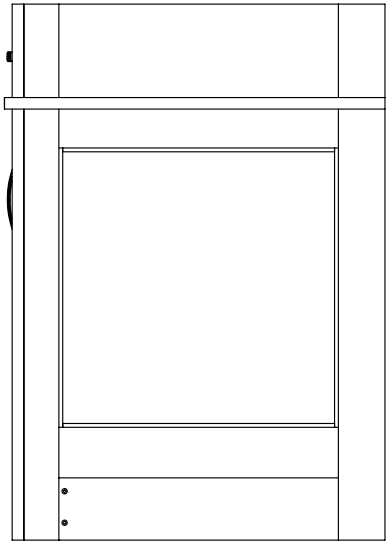
TOP VIEW





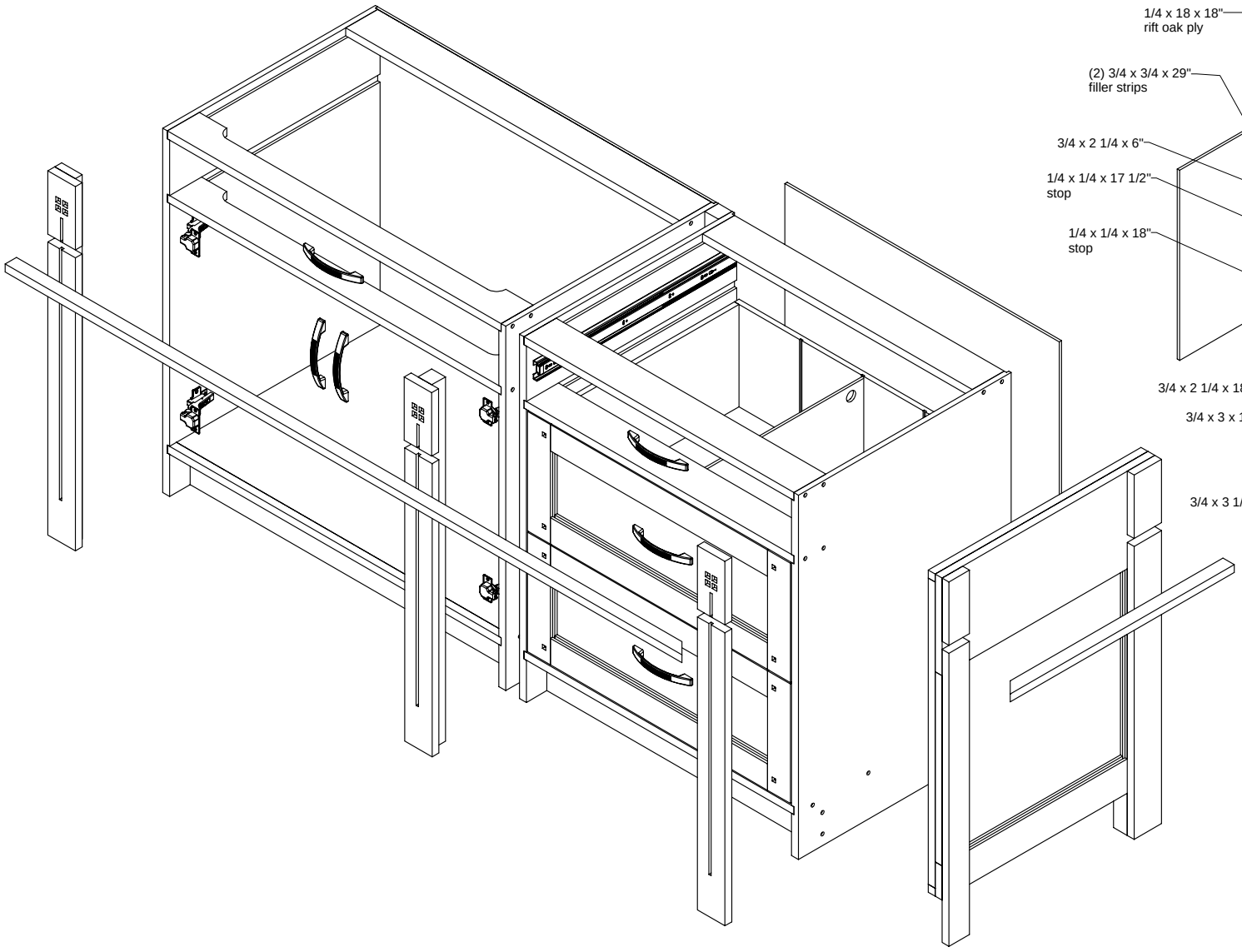
FRONT VIEW

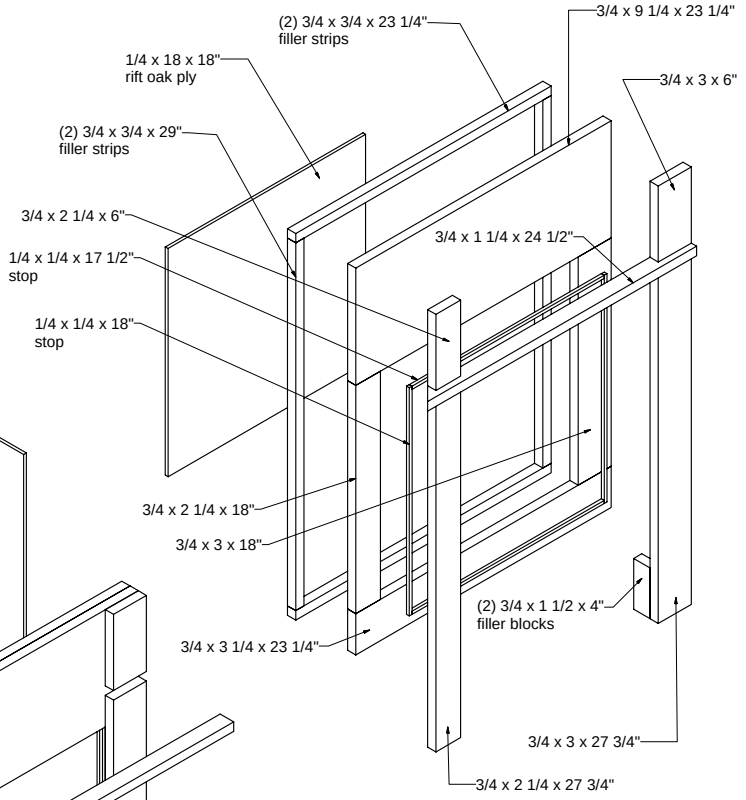




END VIEW

WORKBENCH	291 Kitchen Upgrade	Downing	2





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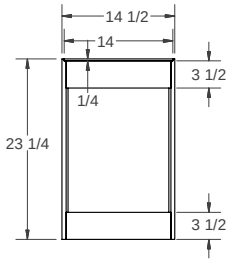
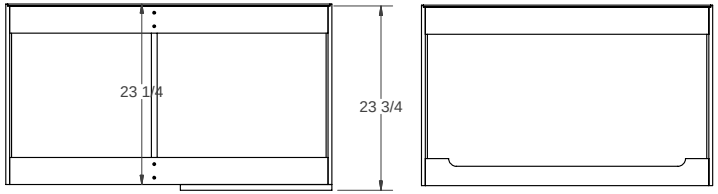
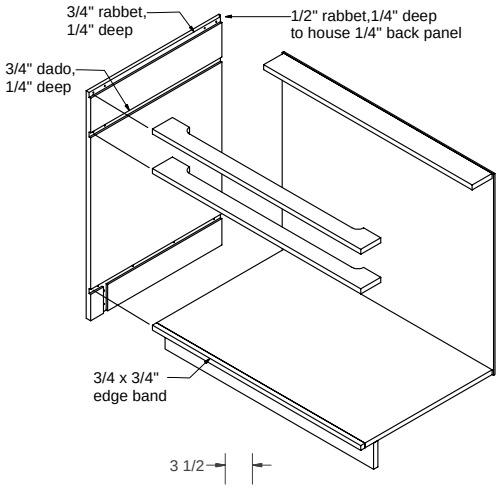
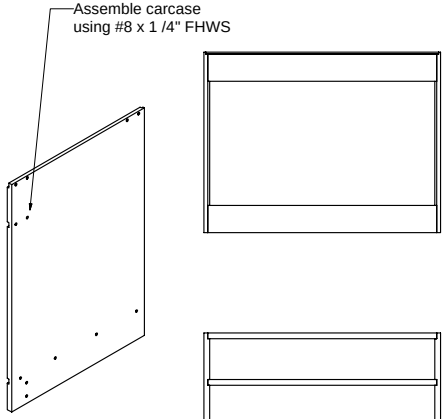
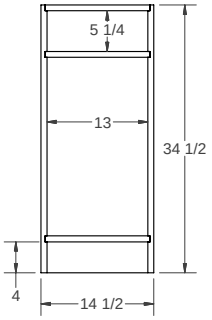
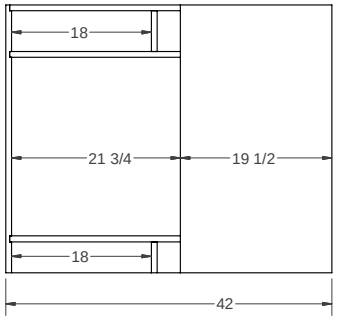


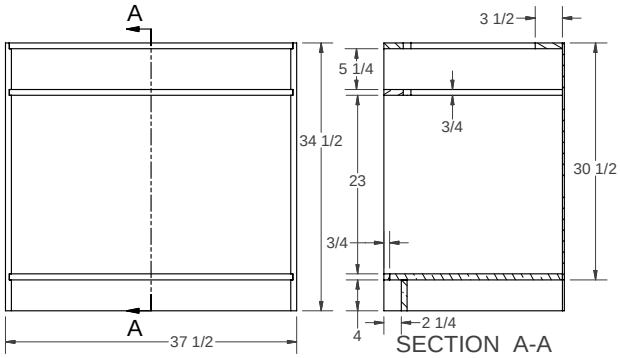




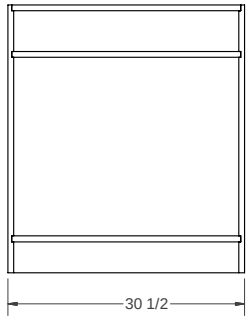


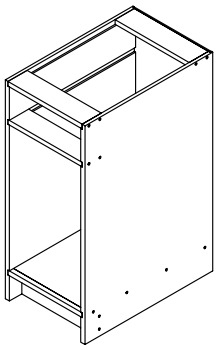


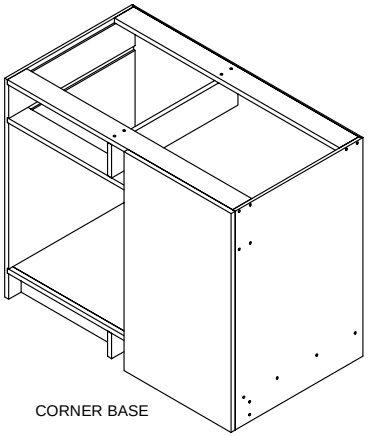


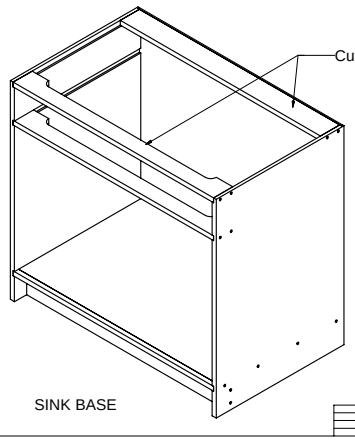


SECTION A-A

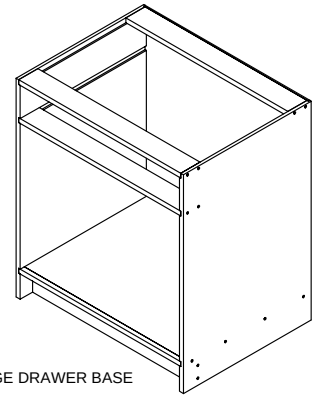



SMALL DRAWER BASE

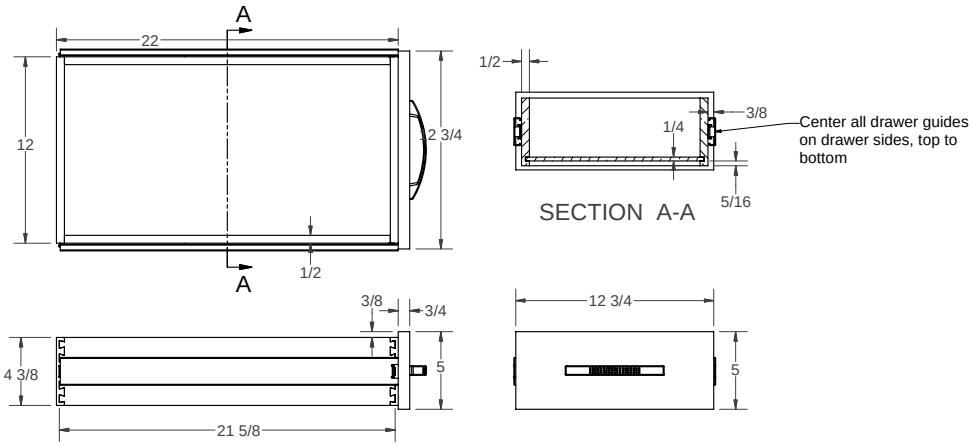

CORNER BASE



SINK BASE

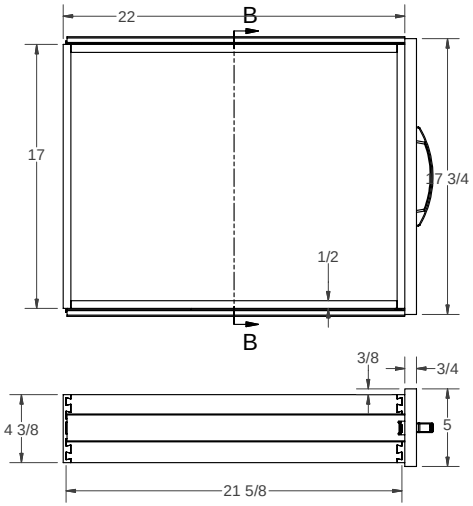

LARGE DRAWER BASE

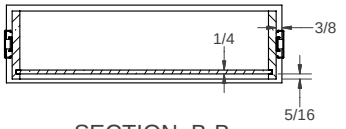
WORKBENCH	291 Kitchen Upgrade	Downing	4



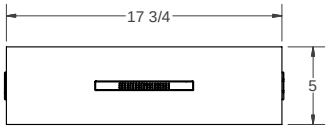
Center all drawer guides on drawer sides, top to bottom

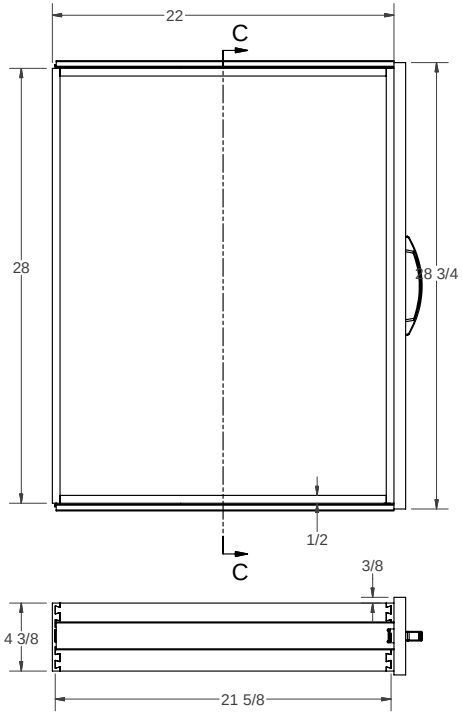
SECTION A-A



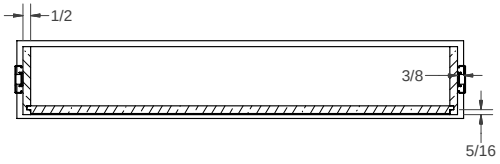


SECTION B-B

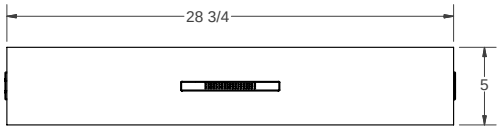


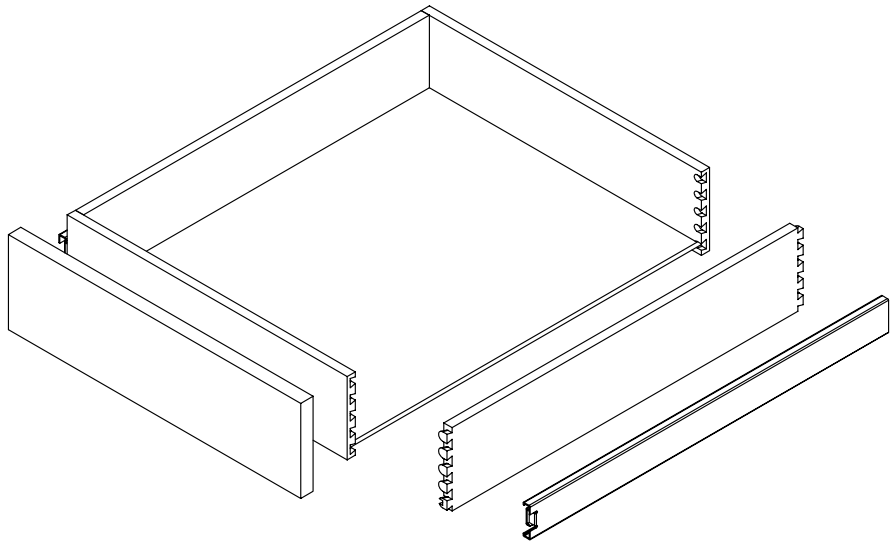


Drawer Slides
Blum #34876
22" whit epoxy-coated



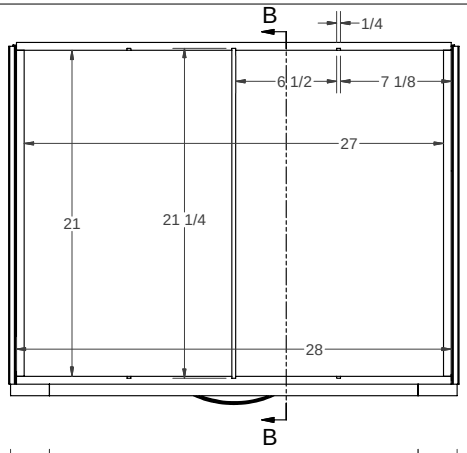
SECTION C-C

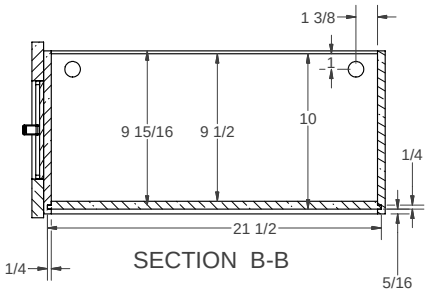




REVISED JULY 27,05

WORKBENCH	291 Kitchen Upgrade	Downing	5





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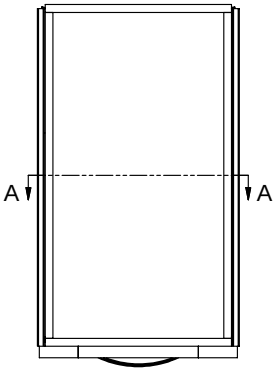
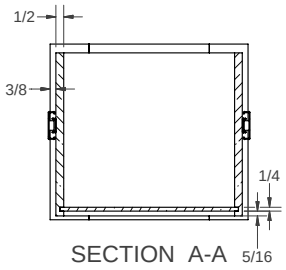
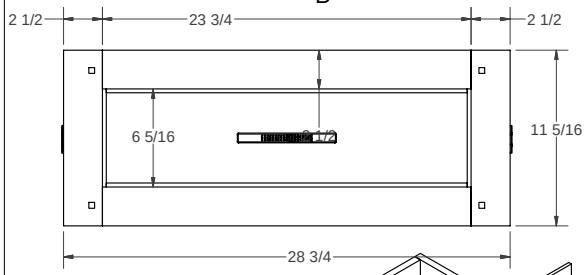
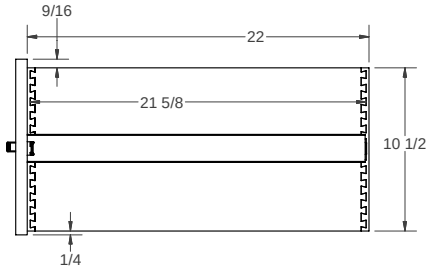
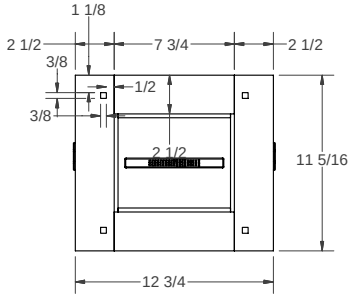


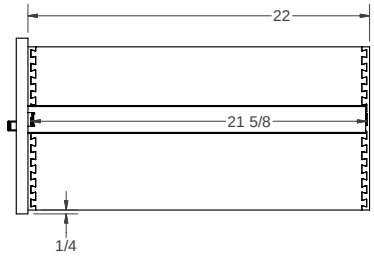


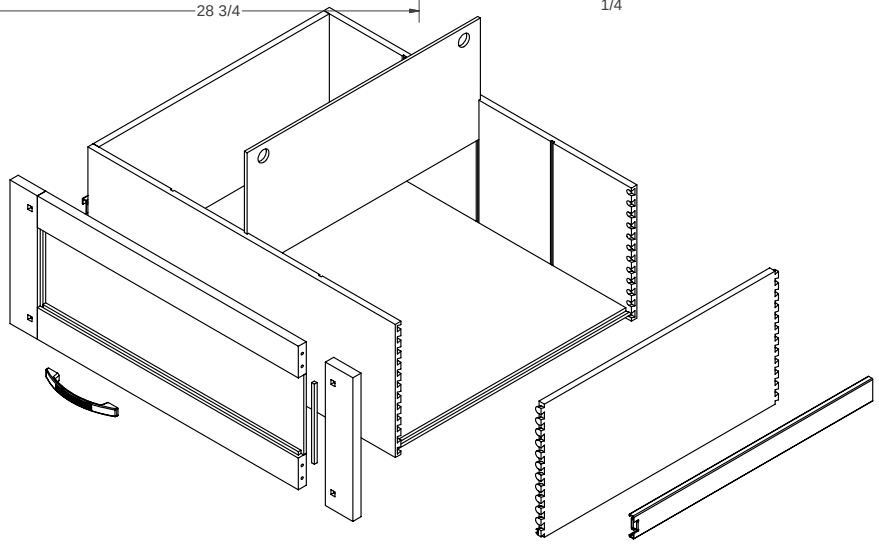
SECTION A-A

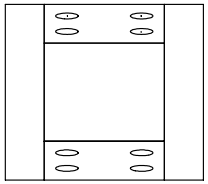








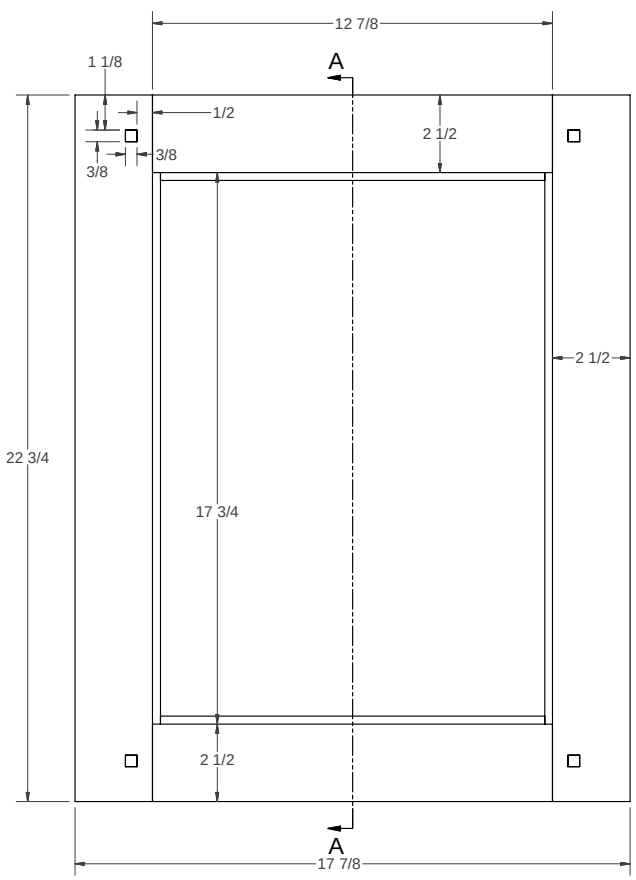


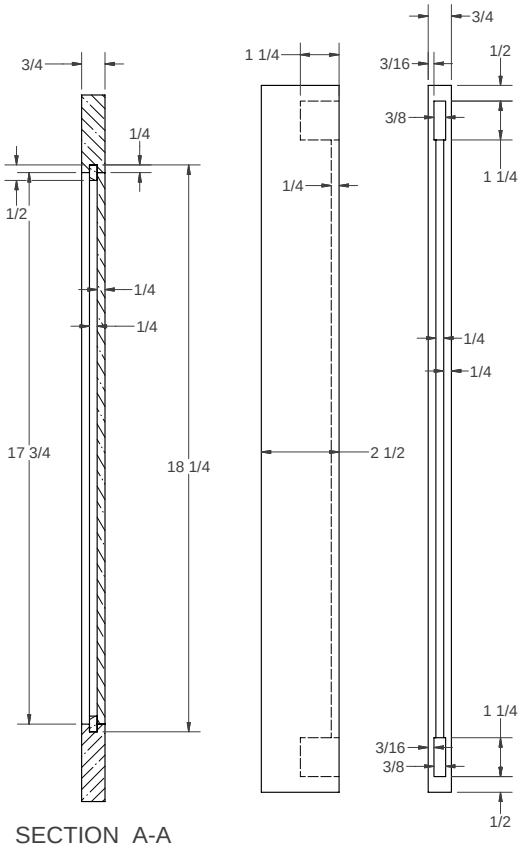


REVISED JULY 27,05

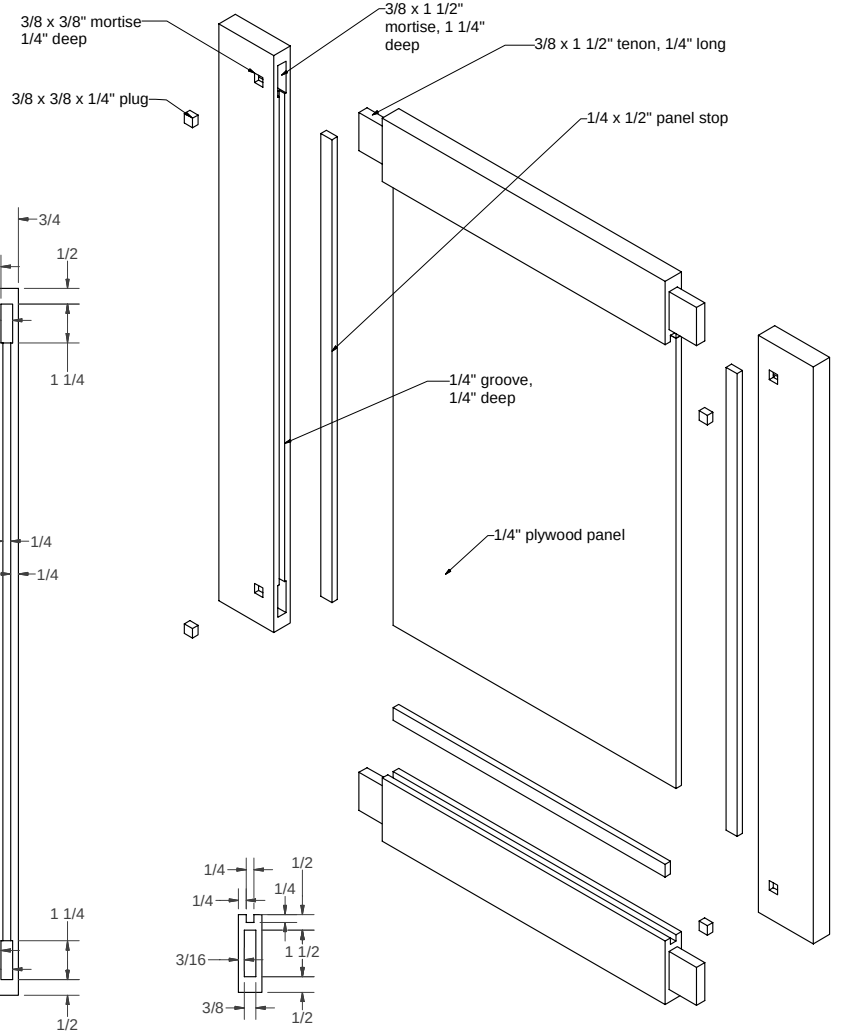
WORKBENCH	291 Kitchen Upgrade	Downing	6

HINGES
Blum #55879
thick door, inset

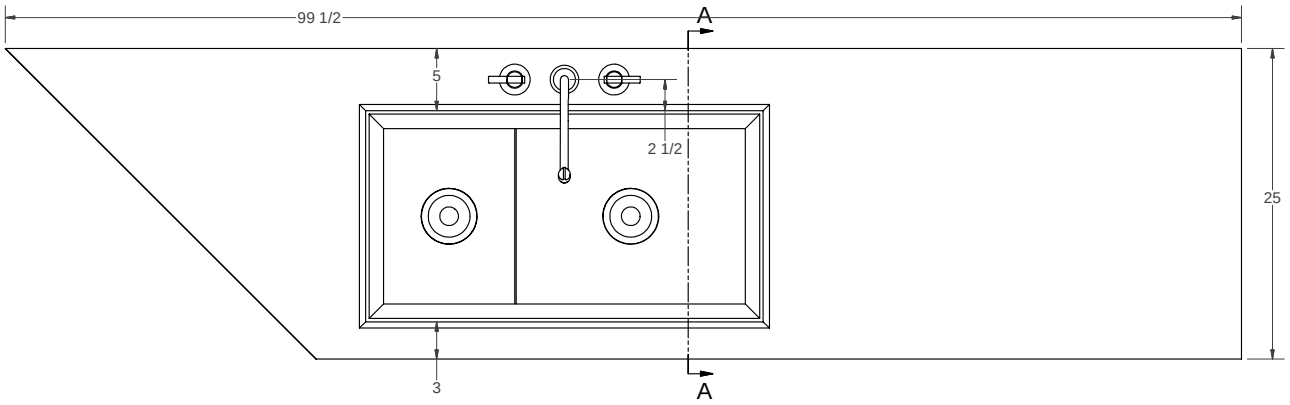


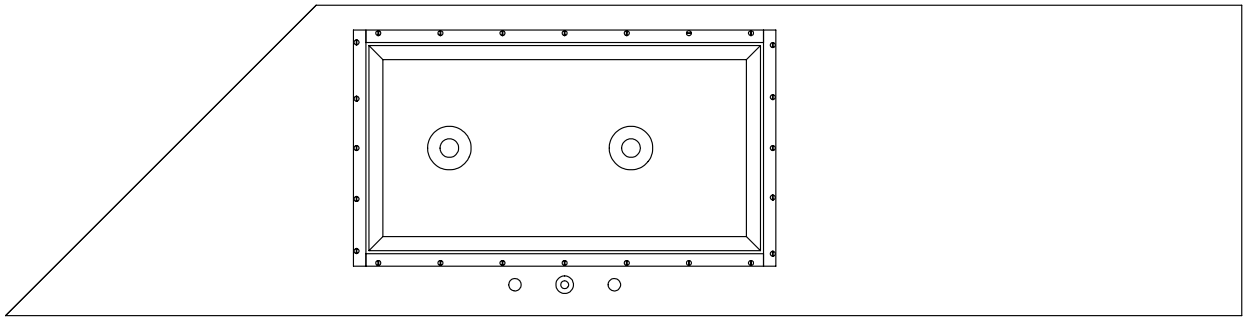


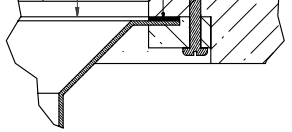
SECTION A-A



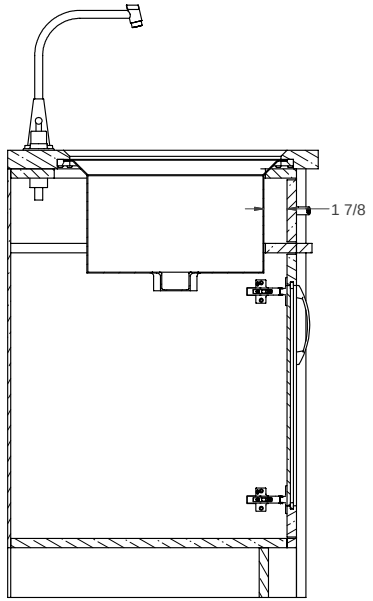
WORKBENCH	291 Kitchen Upgrade	Downing	7



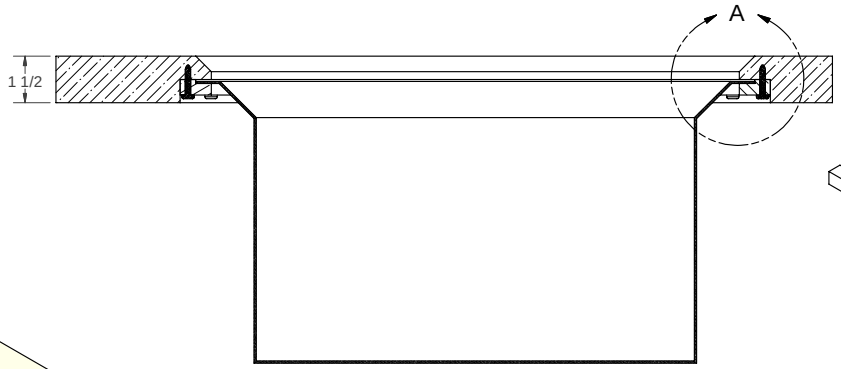




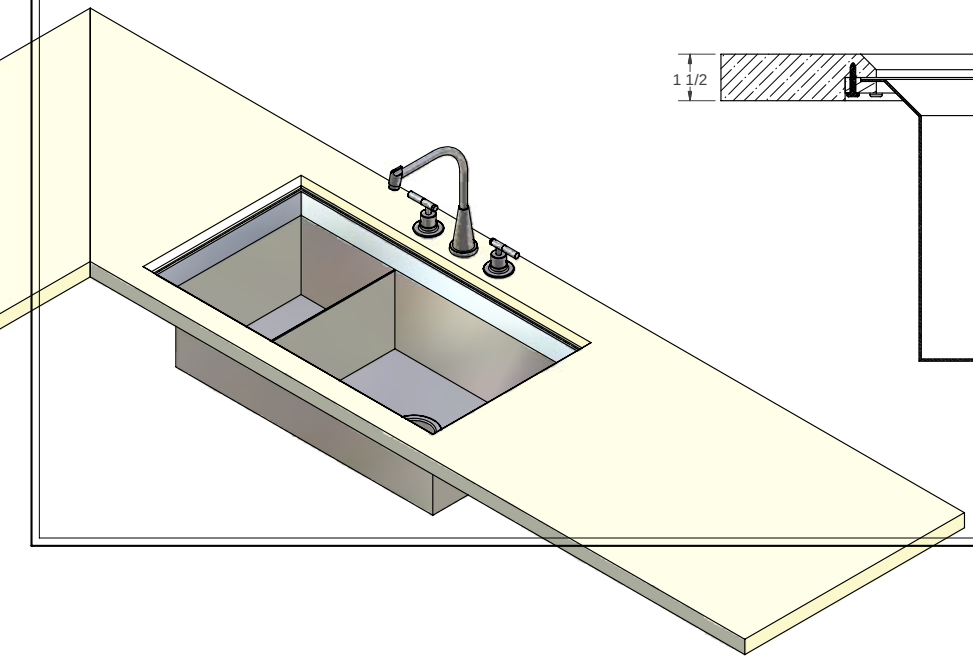
DETAIL A
SCALE 1 : 1

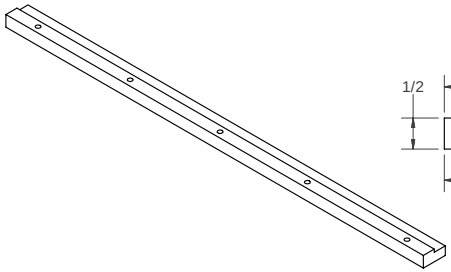


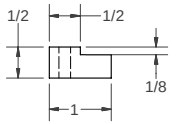
SECTION B-B



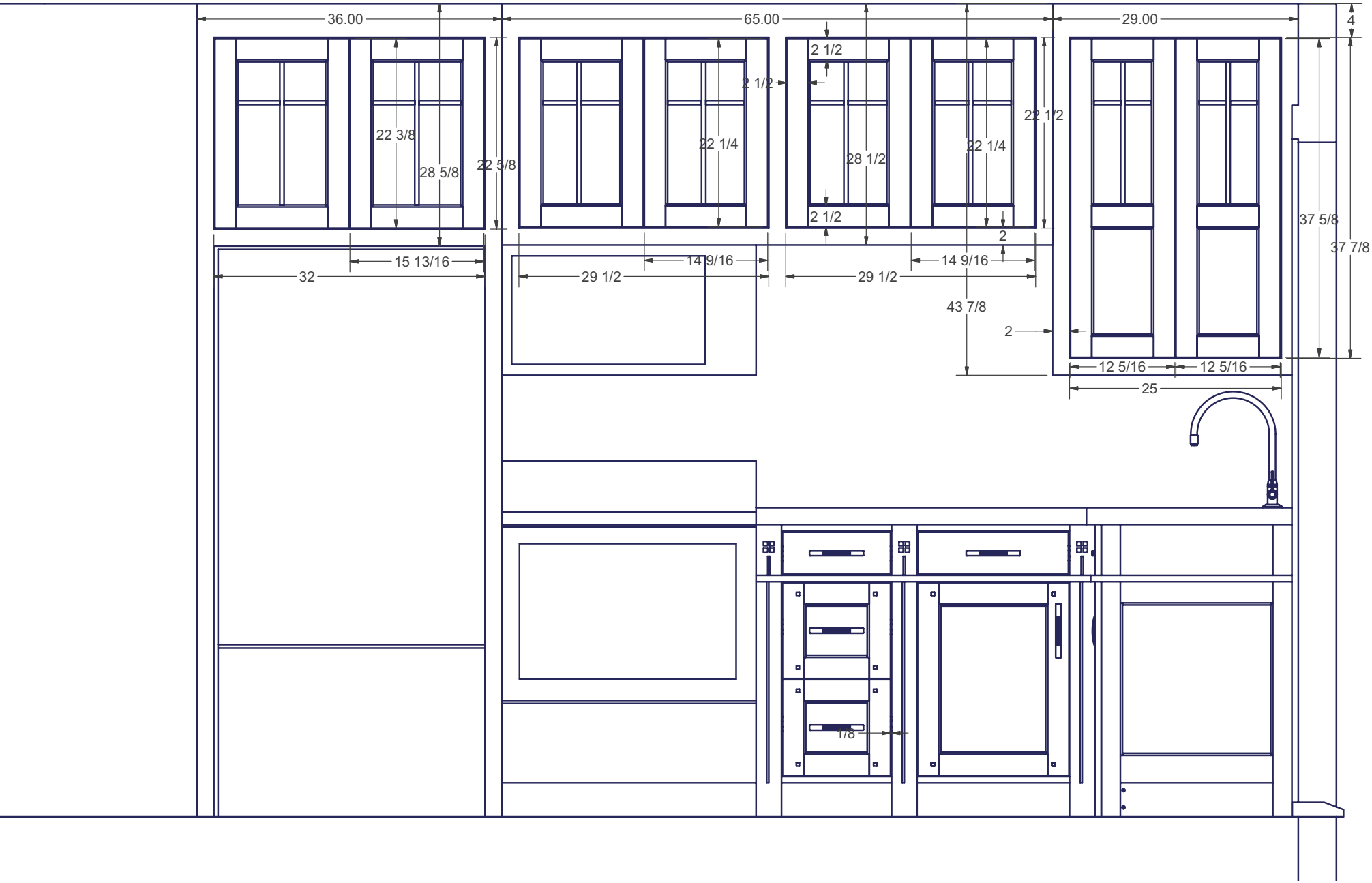
SECTION A-A







WORKBENCH	UNDER-MOUNT SINK	Downing	1


36.00
65.00
29.00
4
2 1/2
2 1/2
22 1/2
22 3/8
28 5/8
22 5/8
22 1/4
28 1/2
22 1/4
2 1/2
2
37 5/8
37 7/8
15 13/16
14 9/16
14 9/16
32
29 1/2
29 1/2
43 7/8
2
12 5/16
12 5/16
25
1/8

the straight story on SPIRAL CUTTERS

Jointers haven't changed much over the last few decades. But recently, several manufacturers have borrowed an old woodworking concept to make a jointer a better, cleaner-cutting tool.

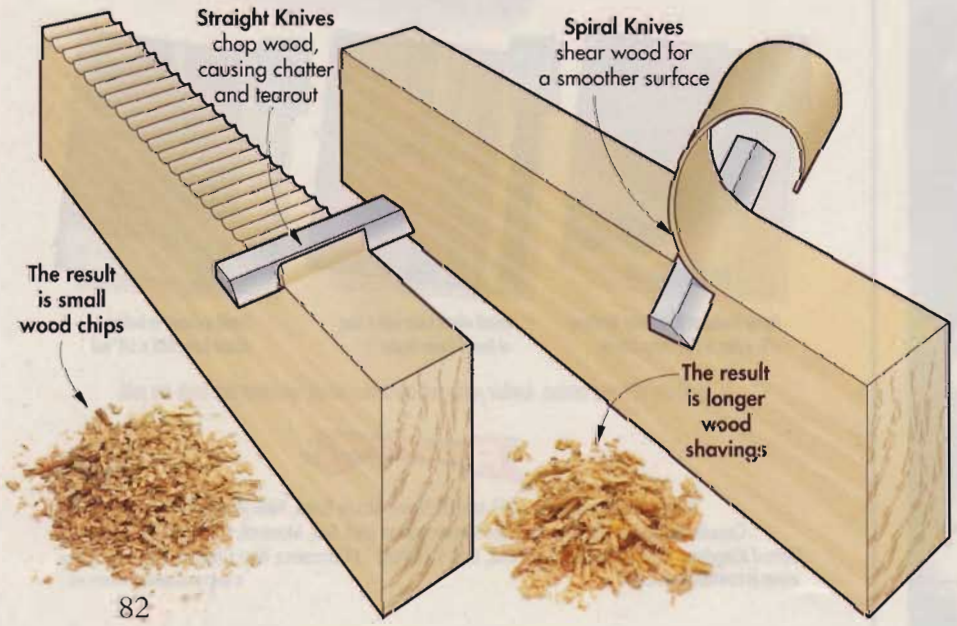
To understand this concept, think about using a hand plane. Conventional wisdom says to skew the blade at an angle to the workpiece. The result is a shearing cut that leaves a smoother surface and prevents tearout.

Dire Straights — Unfortunately, most jointers don't allow you to cut this way. This is due to the design of the jointer cutterhead — it has straight knives that chop in a motion that's perpendicular to the edge of the board *(Illustration, below left)*. This can cause tearout, especially when you're working with highly figured wood. Evidence of this chopping motion can also be seen in the tiny wood chips straight knives produce.

The Spiral Solution — Recently, the concept of skewing a hand plane at an angle has been incorporated into the design of jointer cutterheads. With knives that wrap around the cutterhead in a spiral, these tools shear the wood fibers, rather than chopping them *(Illustration, below right)*. The result is a smoother cut that produces longer shavings — and requires a lot less sanding.

To the Test — This distinction became especially clear when I compared a straight-knife jointer cutterhead with a spiral cutterhead. To truly push their capabilities, I set the depth on the two jointers for aggressive, 1/8"-deep cuts. Then I jointed the edge of a 10/4 maple board on the two machines. The results shown in the *Photo* below speak for themselves.

Turn to page 84 for an overview of the spiral cutterheads you can use on your jointer.



▲ Edge grain was gouged severely after a pass over a jointer with straight knives. Spiral knives left the same edge smooth.

SPIRAL CUTTERHEADS: THREE NEW OPTIONS

When it comes to replacing a straight-knife jointer cutterhead, there are three different options: spiral high-speed steel (HSS) knives, staggered carbide inserts, and helical carbide inserts *(Photos, above)*. Each style is available on both 6" and 8" cutterheads (as well as longer heads for professional models) to fit the jointers of most major manufacturers.

Spiral HSS — The spiral HSS cutterhead we tested came from Sunhill Machinery *(top left)*. It features flexible knives that twist around the cutterhead. The height of these knives is pre-set in the cutterhead by the manufacturer. If you need to replace them after installing the cutterhead *(see Box below)*, the knives are self-registering.

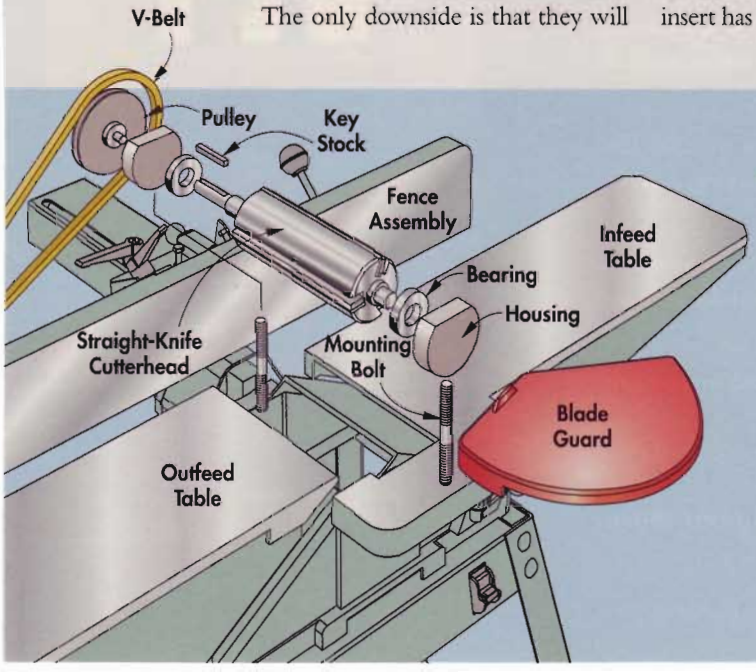
These knives produced glass-smooth cuts throughout our testing. The only downside is that they will dull just as quickly as standard high-speed steel knives (especially in manufactured materials like plywood and MDF). And if you hit a nail, you'll need to replace (or resharpen) the entire knife. The upside is the reasonable price: $140 for a 6" head and $220 for an 8" head (800-929-4321; SunhillMachinery.com).

Staggered Carbide — One of the carbide cutterheads we looked at was from Woodtek *(top middle)*. It has dozens of individual carbide inserts staggered along the length of the head in a V-shaped pattern.

These carbide inserts stay sharper longer than high-speed steel, which is a big plus if you're working with a manufactured material such as melamine or MDF. Plus, if the inserts get dull, you simply rotate them a quarter-turn. Considering that each insert has four separate cutting edges, this extends the cutting life of each insert significantly.

Each carbide insert has a countersunk hole in the middle, which makes it self-registering. A mark on the face of each cutter keeps you from getting mixed up when changing inserts. The only drawback is the price: $320 for a 6" head and $400 for an 8" head (800-645-9292; Woodworker.com).

Helical Carbide — The third spiral cutterhead is manufactured by Byrd Tool *(top right)*. It also has carbide inserts, but the edges of these inserts align with one another as they wrap around the head. This slight design difference makes the Byrd head excel. Even when cutting highly figured woods like birdseye maple, the "eyes" don't tear out. The 6" head is $350, and the 8" is $450 (800-441-2973; ByrdTool.com).



INSTALLING A CUTTERHEAD

Installing a new spiral cutterhead can be done fairly easily using the directions supplied with the cutterheads. But be prepared to devote at least a couple hours to the installation.

Changing Cutterheads — The *Illustration* at left provides a brief overview of what's involved in changing cutterheads. The first steps are removing the blade guard, fence assembly, and pulley guard. Then you'll need to lower both tables to access the cutterhead, remove the pulley, and remove the bolts that hold the cutterhead in place.

With the old cutterhead removed, reverse the steps to install a new one. Then reset the table heights, and you're ready to joint.

TOOL Close-Up

get a grip ON YOUR WORK

Featherboards are invaluable for many table saw operations. But most featherboards I've seen have one limitation — they only exert pressure in one direction (either inward against the fence or downward against the saw or router table).

The new Grip-Tite 2000 system eliminates this problem. It features two featherboards that apply pressure inward *and* downward at the same time *(Photo, right)*. Here's how the system works.

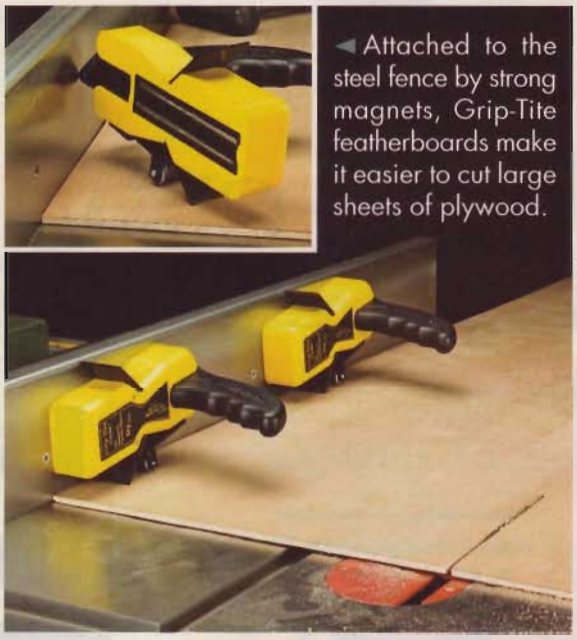
An extremely strong magnet is built into the base of each featherboard *(Inset Photo)*. This magnet lets you secure the featherboards quickly and easily to a steel auxiliary fence (included with the package) that attaches to the rip fence *(Photo, above)*.

The actual pressure is applied by a roller guide, which is attached to a flexible plastic arm. An abrasive sleeve covering the roller helps to grip the workpiece.

Downward Pressure — To exert pressure downward, the arm that holds the roller guide works like a spring. The idea is to position the featherboard so the arm is slightly compressed as you feed a workpiece under it. That way, the roller guide pushes the piece downward against the table saw.

Inward Pressure — The second job of the roller guide is to apply pressure inward against the fence. To see how this works, look at the *Top View* below. Note that the roller is angled slightly toward the fence. Because it's angled like this, the roller guide gently pulls the workpiece toward the fence as you make a cut. That's especially handy when working with large sheets of material that have a tendency to drift away from the fence.

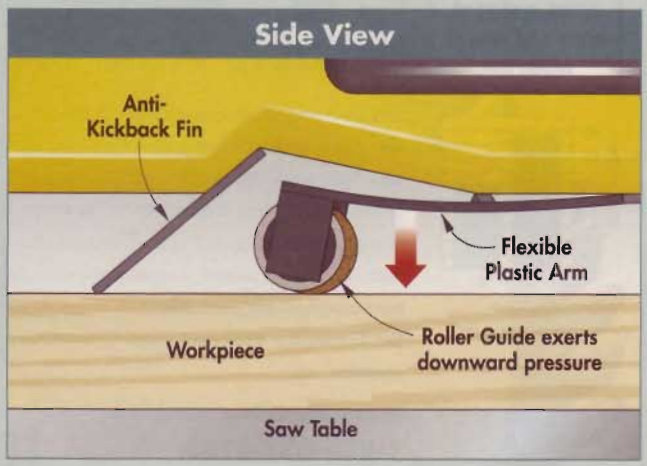
The Grip-Tite 2000 System is available from Mesa Vista Designs for $150. For more information, go to Grip-Tite.com or call 800-475-0293.



◄ Attached to the steel fence by strong magnets, Grip-Tite featherboards make it easier to cut large sheets of plywood.

HOW THE ROLLER GUIDE WORKS

►To apply pressure downward, adjust the featherboard so the arm holding the roller guide is compressed *(Side View)*. The roller guide is also angled inward, which makes it steer the work gently toward the fence *(Top View)*.



Tools & PRODUCTS

WORKBENCH APPROVED

Colt Palm Router
LAMINATE TRIMMER

Bosch recently updated their line of laminate trimmers with several enhancements over the previous model. The new line of trimmers bears the name Colt Palm Router.

The enhancements include a modest power increase (5.7 amps up from 5.6) and a higher top speed (35,000 RPM compared to 30,000 RPM). Additionally, a variable-speed model of the trimmer is now available, which is a first for Bosch trimmers.

A number of comfort features and ergonomic improvements are part of the redesigned trimmer, as well. For better comfort and control, Bosch added finger-support "pockets" to the trimmer base, and a soft-grip body to the variable-speed motor *(Photo, above)*.

Several accessories are available to complement the trimmer, including an offset base to extend the router's reach *(Photo, middle right)* and a tilt base for trimming laminates at an angle *(Photo, bottom right)*.

Prices for Colt Palm Routers range from around $100 for the single-speed model up to about $250 for a complete laminate installer's kit that includes the offset base, tilt base, edge guide, and carrying case. Visit BoschTools.com or call 877-267-2499 for more information.

◄ An optional offset base allows you to work right up against the wall and trim a backsplash.

◄ An optional tilt base extends the reach of the bit to trim right up to a corner.

ZIRCON i700: NOT YOUR AVERAGE STUD FINDER

Zircon's latest stud finder, the StudSensor i700, packs all the best features from previous models into a single easy-to-use tool. The scanner features three modes for locating wood or metal studs, metal pipes or wire, and live electrical wires. It automatically scans at varying depths to locate targets, and a signal strength indicator helps distinguish between deep and shallow targets. A laser pointer and built-in pencil allows one-handed marking when a feature has been located. The i700 retails for around $70. Visit Zircon.com or call 408-963-4550 for more information.