EDITOR'S NOTES

Three centuries, three routers, and three remarkable innovations. That pretty much sums up this photo. In fact, it's a perfect "snapshot" of how the router has evolved.

ROUTER PLANE. For example, the router in the foreground, also called a router plane, was introduced in 1896. The metal body of this tool holds a vertical cutter that's "bent" at an angle. This made it ideal for removing waste at the bottom of a groove.

Although the router plane was definitely a cut above using a chisel, it was still a single-purpose tool.

ELECTRIC ROUTER. So it's not surprising that when electric routers (like the one shown at left) first appeared in the 1930s, they quickly earned a place in many home shops. After all, it was hard to beat a tool that let you rout all kinds of different profiles and woodworking joints.

This versatility made the router an indispensable tool. And later improvements — more powerful motors, plunge capability, and built-in dust collection — cinched its reputation.

But the evolution of the router didn't stop there.

CORDLESS ROUTER. To see what I mean, check out the tool on the right. It may look like just another router. But a close inspection reveals an important difference — it's *cordless*. With a 19.2-volt battery, this router spins a bit at 23,000 RPM and makes crisp, clean cuts with power to spare. Now *that's* what I call a breakthrough.

Of course, routers aren't the only woodworking tools that are undergoing significant changes these days.

TOP 10 NEW TOOLS. In this issue, we take a close look at 10 of the most innovative new tools for 2002 — tools that are bound to change *and* improve the way we work wood. I think you'll be fascinated by what's in store.

Judging by these 10 tools (and some well-deserving tools that didn't make the list), it's already been a remarkable year. And I'm sure there are quite a few more new and innovative ideas around the corner. Look for more on these new tools and products in upcoming issues of *Workbench*.

Tim

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Questions & Answers

Get More Life from a Rechargeable Battery

Q *The batteries in my cordless tools don't seem to last very long between charges. Is there a way to extend the run time of a battery between charges?*

Nate Miller
San Jose, CA

A There are several things you can do to extend the life of a rechargeable battery (see *Charging Tips* below). One of the simplest is to NOT drain a battery of every last bit of energy (voltage) before recharging it. Instead of discharging a battery completely, use it until you start to notice a significant drop in power, then charge it. Even if you aren't using the battery, it's a good idea to charge it periodically.

Another mistake many people make is popping a warm battery into the charger right after taking it out of the tool. Heat is one of the worst enemies of a battery. And batteries produce heat both as they're discharged and as they're charged. So let the battery cool down to room temperature (about 30 minutes) before you put it into the charger.

Keep in mind a battery that's sitting idle loses about 1 percent of its charge a day — roughly half its charge in two months. Storing the battery in a cool, dry place will help it hold each charge longer. Excessive heat on the other hand will dry out the battery cells.

Finally, if your batteries have reached the end of their life and do need replacing (see the sidebar below left), you might consider switching tools to the newer nickel metal-hydride (Ni-Mh) batteries. Compared to the more common nickel-cadmium (Ni-Cd) batteries, Ni-MH batteries offer up to 30 percent more storage capacity. This translates to a longer run time.

BATTERY RECYCLING

The Rechargeable Battery Recycling Corporation (RBRC) is on a mission to keep the harmful materials in Ni-Cd and Ni-Mh rechargeable batteries out of the solid waste stream. So to promote rechargeable battery recycling, the nonprofit organization has launched a nationwide campaign: "Charge Up to Recycle!" If you'd like to help, look for the RBRC's Battery Recycling Seals (one is shown here) on the packaging when purchasing rechargeable batteries and battery-powered products. And when your batteries no longer hold a charge, don't toss them. Instead, drop them off at the nearest RBRC collection center. Some of the retailers participating include Home Depot, Sears, Target and Wal-Mart stores. To locate the center nearest you, call 1-800-8-BATTERY, or visit the RBRC web site: www.rbrc.com.

Charging Tips

- **Before recharging a recently used battery, let it cool down to room temperature first.**
- **Don't recharge or use batteries in extreme temperatures.**
- **Don't return a fully charged battery to the charger for an "extra boost."**
- **Charge a new battery overnight. It may take 3-4 recharging cycles (conditioning) to reach full capacity.**
- **Don't use the charger as a storage case for batteries when they aren't being used (check manufacturer's instructions). This can shorten a battery's life.**
- **Fully charge batteries before storing them for next use.**
- **Store batteries — and chargers — in a cool, dry place away from any extreme heat sources such as direct sun. Keep them away from sources of magnetism, too.**

Food-Safe Wood Finishes: What Should I Use?

▲ **Behlen's Salad Bowl Finish is available from Woodcraft by calling 1-800-225-1153.**

Q *What type of finish do you recommend for a cutting board and cooking utensils?*

Mary Steffes
via the Internet

A You can always leave these items unfinished, and wipe on a coat of mineral oil when they start to look dried out.

But if you want to avoid the "dry" look, then I'd recommend an oil finish. The oil will penetrate the wood, so you don't end up with a film that eventually flakes off as with a varnish, lacquer, or water-based finish. You can find oil finishes available through mail-order catalogs that are sold specifically as non-toxic, food-safe finishes. One type of finish I'd recommend is Behlen's Salad Bowl Finish, shown above.

I've also had good results using a homemade oil-wax finish. You'll find the recipe below.

FOOD-SAFE FINISH RECIPE

You can make your own food-safe finish by mixing up a combination of mineral oil and paraffin wax (both readily available). I like to use mineral oil because it's safe for consumption.

The recipe isn't complicated or difficult to make. All you need to do is mix *roughly* 10 parts mineral oil to one part paraffin wax (the kind used for canning). Don't worry about measuring exactly. The final ratio doesn't have to be exact.

Start by filling a small can about half full with mineral oil. Next, scrape a few wax shavings into the can of oil. To dissolve the shavings, place the can in a warm spot or set it in a pan of hot water. Just make sure it isn't near an open flame because paraffin is flammable. After about 15 minutes, the wax should be melted, and the finish will be ready to apply. You can get by wiping on a coat or two, but plan on reapplying additional finish periodically.

◄ **Everything needed to make a food-safe finish is available in the grocery store.**

Flattening a Worn Waterstone

Q I recently noticed that my waterstone is starting to dish out in the center. What's the best way to flatten it again?

Terry Mulligan
St. Cloud, MN

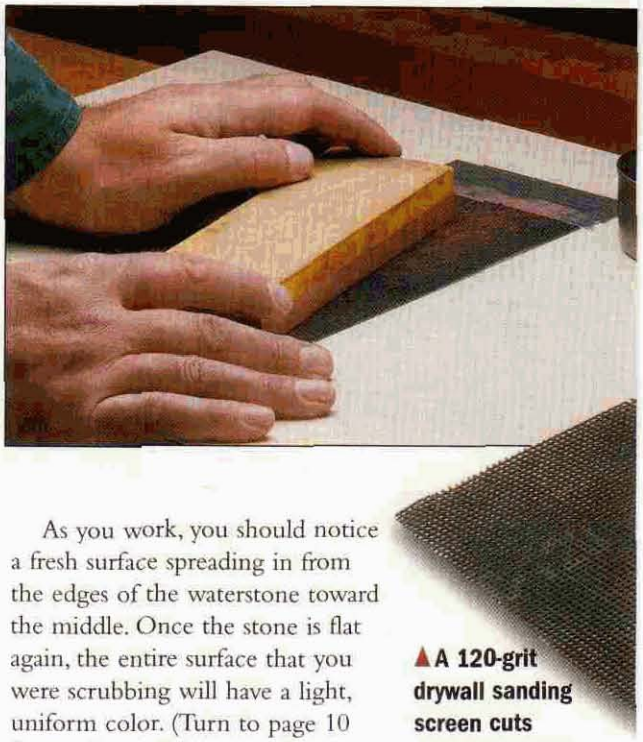
A The center of a waterstone gets the most use no matter how careful you are to use the entire surface of the stone when sharpening. This means it's going to naturally become worn or "dished out" after several uses. Periodic maintenance to "true up" the working surfaces is the price you pay for the fast-cutting action of a waterstone.

One of the quickest and most effective methods I've found for flattening a waterstone is to "scrub" the stone in a circular motion on top of a sanding screen.

When it comes to the sanding screen, I prefer to use a 120-grit screen made for smoothing drywall joint compound (available in the paint aisle of most home centers).

To keep the screen from shifting as you flatten, tape it to the top of an old countertop as shown in the photo at right. (Actually any flat wood surface or a piece of plate glass will work.) Keep a small can of water nearby to sprinkle on the screen, too. This keeps the screen from clogging up.

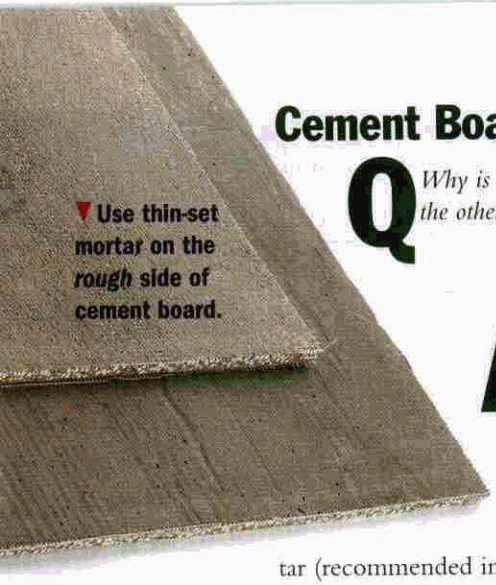
Be sure to check your progress frequently. If you've never used one of these drywall sanding screens, you'll be surprised how quickly it cuts. And if you aren't careful, it's easy to remove more of the stone's surface than necessary in a hurry. This will cause the stone to wear out prematurely.



▲ **A 120-grit drywall sanding screen cuts quickly to flatten a waterstone.**

As you work, you should notice a fresh surface spreading in from the edges of the waterstone toward the middle. Once the stone is flat again, the entire surface that you were scrubbing will have a light, uniform color. (Turn to page 10 for another quick way to flatten a worn waterstone.)

Cement Board Etiquette



▼ Use thin-set mortar on the *rough* side of cement board.

Q *Why is one side of cement board smooth and the other side rough?*

Mark Constantine
via the Internet

A Cement board is manufactured with a smooth side and a rough side so you can match the board to whatever type of mastic you're going to use.

For example, if you're planning on using thin-set mortar (recommended in most applications), the cement board should be hung with the *rough* side facing outward. The rough texture of the board provides more "tooth" for the mortar to hold onto.

▲ Use adhesive on the *smooth* side of cement board.

On the other hand, when you're using an adhesive instead of mortar, the *smooth* side of the cement board should face outward. This way you can use less adhesive. (It takes too much adhesive to fill the voids between the ridges on the rough side.)

Always check the manufacturer's instructions before using the cement board.

QUICK TIP

Flattening Waterstones in a Pinch

I've known woodworkers who use the rough face of a cement block or step to quickly flatten their waterstones. Although most cement blocks aren't perfectly flat, they're usually close enough to get a passable cutting edge. So assuming you have a relatively flat block, sprinkle water on the top of the block and scrub the stone back and forth a few times.

Sizing Nails Dates to Ancient Rome

Q *Can you tell me where the "d" in a 6d or 8d nail originated?*
Barry Johnson
Columbus, OH

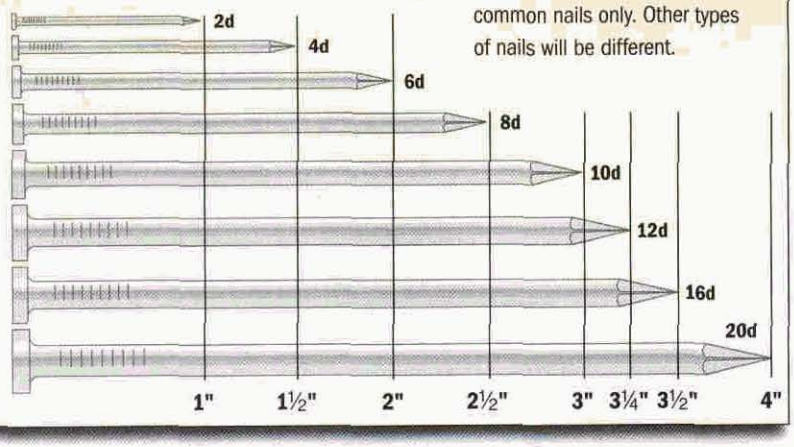
A The typical nails today, made from drawn wire, were first introduced in the late 1800s. They're usually sold according to their typical use and by the "penny" size. This system for sizing nails by the "penny" designation indicated by a "d" following the number size is actually a hold-over from the nail's distant past.

In 15th century England, nails were priced so many "pence" (pennies) per 100 nails. The modern British abbreviation for pence is "d," which originally was an abbreviation for the "denier" — a descendant of the ancient Roman penny the "Denarius." With inflation, the basis for the penny designation soon lost relevance to the actual costs of nails. However, the naming system stuck.

Common Nail Sizing Chart

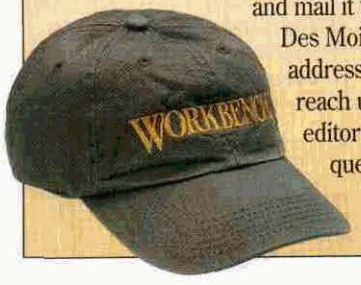
Here are the lengths of *common nails. You can roughly calculate the nail length up through 10d nails by dividing the penny size by four and adding one-half inch. Here's an example for a 6d nail: (6/4 = 1½ + ½" = 2"). If you know you need a nail 2½" long, subtract one-half inch, then multiply by four. You get an 8d nail (2½" - ½" = 2 x 4 = 8).**

***NOTE:** These sizes are for common nails only. Other types of nails will be different.



SHARE YOUR QUESTIONS!

If you have a question about woodworking, home improvement, or just something you're curious about like the question above, write it down and mail it to WORKBENCH Q&A, 2200 Grand Ave., Des Moines, IA 50312. Please include your name, address and daytime phone number. You can also reach us via Fax at (515) 283-2003 or by email at editor@workbenchmag.com. If we publish your question, we'll send you one of our handsome and fashionable *Workbench* caps.



Tips & Techniques

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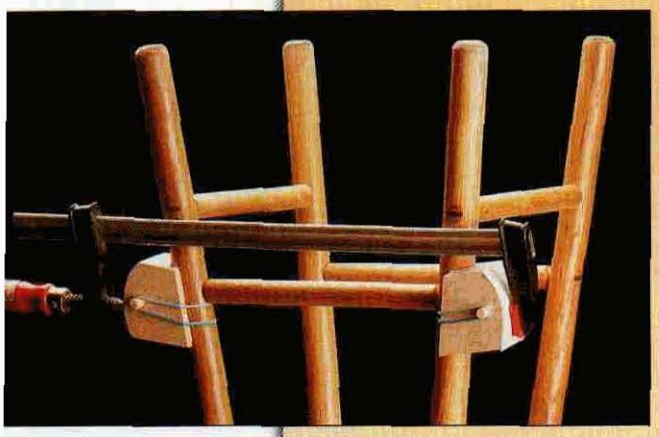
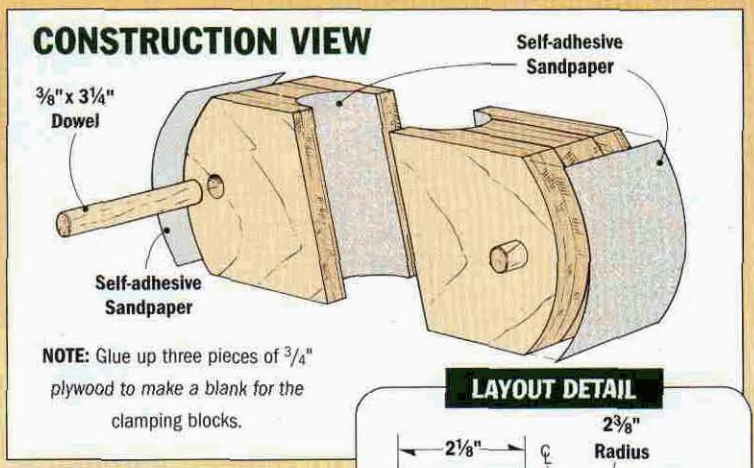
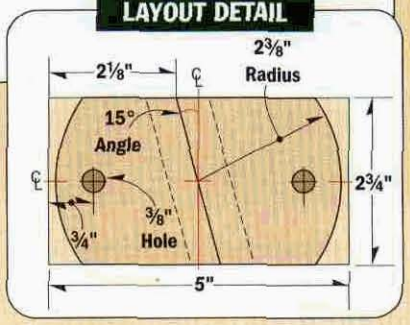






Angled Clamp Blocks

When repairing a shop stool recently, the clamp kept slipping off the round, angled legs. To get it to stay put, I made two clamp blocks like those shown above.

To make them fit around the legs, there's a curved recess in the *inside* edge of each clamp block (see drawing above). The curved *outside* edges create parallel clamping surfaces that prevent the clamp from slipping. To temporarily hold each block in place while tightening the clamp, you simply stretch a rubber band around the leg and a dowel that sticks out the sides.

It's easiest to make both clamp blocks from a single, thick blank. I glued up three pieces of 3/4" plywood.

Once the glue dries, the next step is to drill an angled hole through the blank that's close to the angle of the legs (15° in my case). Later, when the blank is cut apart, the sides of this hole will form the curved recesses of the clamp blocks.

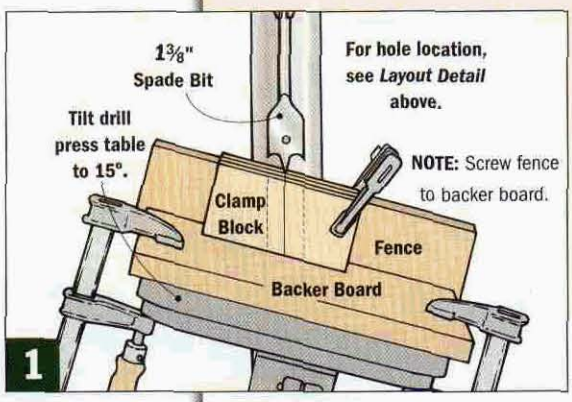
To determine the location of the hole, start by laying out the angled line that will be used when cutting the blocks apart (*Layout Detail*, above). Then transfer the line across the top of the blank.

To drill the hole, tilt the table on the drill press 15°, as shown in *Figure 1*. Then clamp a fence and backer board to the table. To keep the blank from shifting, clamp it securely to the fence before drilling the hole.

Note: There's no need to worry if the angle isn't exact. In use, you can compensate for that by positioning the clamp at a different spot on the curved, outer edges of the blocks.

There are a few more things to do to complete the clamp blocks. First, lay out and drill two holes for the dowels. Then lay out the arc near each end and cut the curved ends to shape. Finally, cut the blank apart to form the two clamp blocks, tap a dowel into each one, and add self-adhesive sandpaper for extra "grip."

John T. Yates, Jr.
Allison Park, PA



This Featured Tip was submitted by John T. Yates, Jr. of Allison Park, PA. He earns $250 worth of tools from THE STANLEY WORKS

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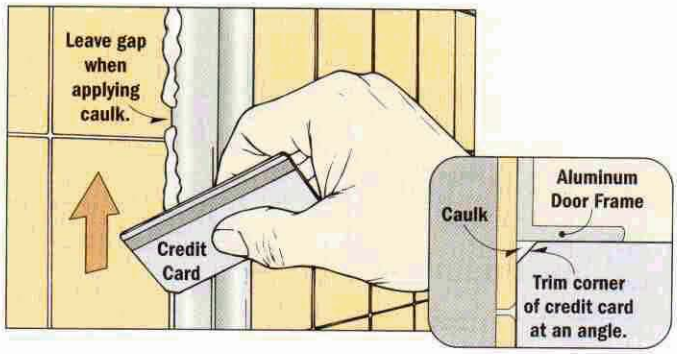
Credit Card Caulk Spreader

There's a knack to applying a smooth, even bead of caulk. And just about the time you figure it out, the job is usually done.

So to get good results right from the start, I use a credit card as a spreader (see drawings at right). To produce a uniform bead, cut the corner of the card at an angle. Then lay down the initial bead of caulk, leaving a short gap every 6" or so. As you work, the gap is filled in with the caulk that builds up on the credit card.

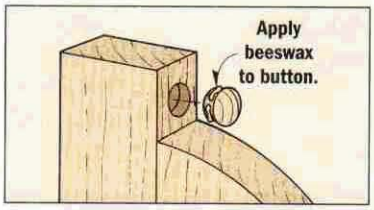
Andy Gilanyi from *Medford, NJ*



Beeswax Buttons

I often use wood buttons to cover the exposed screw holes on a project. To make them easily removable (and still keep them from falling out), I apply beeswax to the button and "stick" it in the hole.

Robert Timz
Mill Valley, CA



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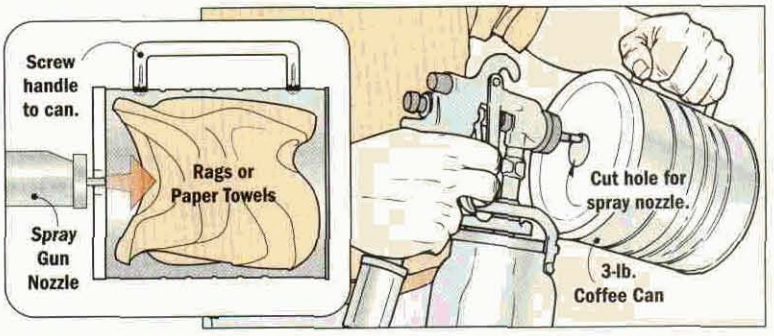


Spray Gun Clean-up Can

It's hard to beat the quality of a finish that's applied with a spray gun. It produces a smooth, even finish in a fraction of the time it takes to do it with a brush.

But there's a downside to using a spray gun — the clean up. It's messy and time consuming, particularly if you're using a solvent-based finish. Not only that, the fumes from the thinners can be dangerous, as well.

One way to deal with this is to make a clean-up can for your spray gun (see drawing above). All that's required is a 3-lb. coffee can and a cabinet handle.

Cut a hole in the plastic lid of the can for the end of your spray nozzle. Then fill the can with rags or paper towels to absorb the finish and thinner that's sprayed out when cleaning the gun (see detail).

A word of caution: If you store the used rags in an enclosed area or in a pile, they could start a fire. So take them out of the can, and let them air dry in a well-ventilated area before disposing of them.

Roger Ferris
Omaha, NE

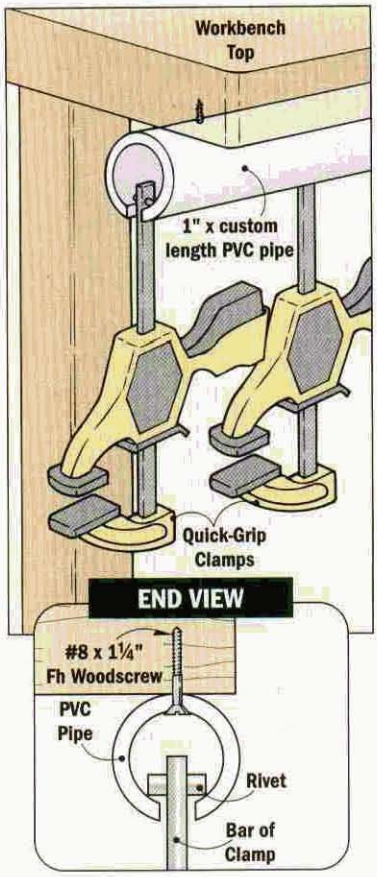
Magnetic Dispenser For Brads & Nails

It's a real pain having to dig around in your tool belt to get a tiny brad or small nail. So I use a paper clip holder with a magnetic ring at the top as a dispenser (see photo above).

Now when I need a brad, I just give the holder a shake. The brads stick to the top so it's easy to take one out. Note: Paper clip holders are readily available at most stationery stores.

Anna Victoria Reich
Albuquerque, NM

PVC Pipe Clamp Hanger



Over the years, I've acquired quite a few Quick-Grip clamps. To keep my clamps within easy reach, I made a simple hanger that mounts underneath my bench (*see drawing at left*).

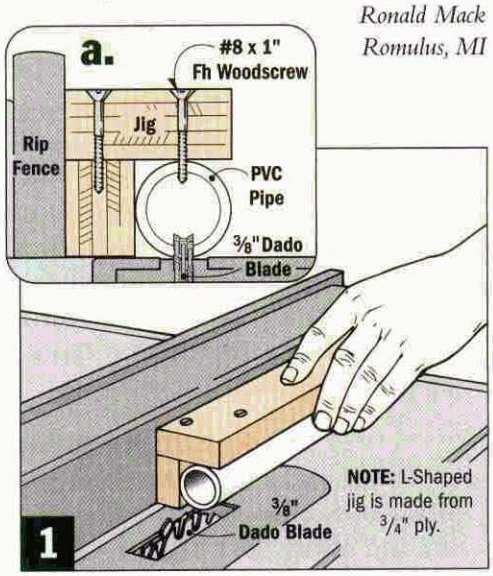
The hanger is a length of 1" PVC pipe with a slot in the bottom that lets you slide the clamps in and out. To hold each clamp in place, there's a rivet near the end of the bar that's cradled by the pipe *(End View)*.

The tricky part in making the hanger is cutting the slot down the length of the pipe. If you use the table saw like I did, it's important to keep the pipe from twisting when making the cut. Otherwise, the blade might bind and cause the pipe to kick back.

What I found worked well is to mount a $^3/_8$" dado blade in the table saw and then use an L-shaped jig to carry it through the blade *(Figs. 1 and 1a)*. The jig is made from a couple of $^3/_4$" plywood scraps that are glued and screwed together. Notice that the vertical "leg" matches the height (diameter) of the pipe. This prevents the jig, and the pipe, from rocking back and forth when cutting the slot.

After completing the slot and removing the screws that hold the pipe, use the same screw holes when mounting it to your bench. The slot provides easy access when installing the screws.

Ronald Mack
Romulus, MI



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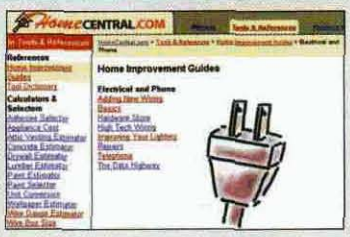
Powerful Solutions Available Online

Even the most confident DIY'ers can become uncertain when working with the electrical circuitry in their homes. In this case, a little bit of uncertainty is a good thing. Maybe you're planning an entire room addition and wondering if you can wire it yourself. Or you might just be thinking of replacing a standard outlet with a GFCI. Either way, you can't be too careful with electricity.

That said, with thorough research, some professional guidance, and a healthy dose of respect for electricity, most handy people can safely and effectively perform all manner of electrical work around their houses.

If you provide the respect, the Internet is an excellent resource for the research and professional guidance. *(Always consult local codes for restrictions on DIY electrical work.)*

FOR SMALL PROJECTS:



www.HomeCentral.com — There are a couple things to look for on this site.

First, look under the list of *Home Improvement Guides* for the *Electrical and Phone* section. In there, you'll find a long list of electrical projects, repair guides, and product information.

Secondly, be sure to check out the *Wire Gauge Estimator* and the *Wiring Box Size Estimator.* Both are very handy to make sure you're matching the proper components. You can find these listed in the *Estimators and Calculators* section.

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www.DansWiringPage.com — Dan is a former electrical contractor/journeyman electrician. Now he works in facilities maintenance, with electrical being a major focus of his duties.

On his site he offers a number of color-coded diagrams for common household wiring projects such as GFCI installation, three-way switches, and light fixtures.

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After speaking with Tom, I'm convinced of his qualifications and intend to use his services in my own electrical upgrade.

Feel free to contact Tom via his Web site, or by calling 1-888-248-1052. He'll even answer a question or two before the meter starts running.

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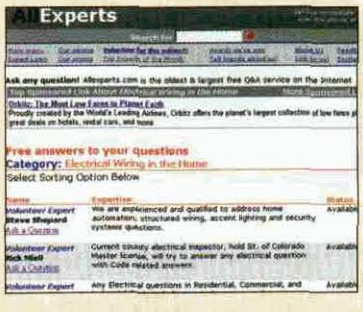
www.AllExperts.com — This site puts you in touch with experts on a variety of subjects. I got excellent results from the electrical experts when I posted a lengthy question regarding my home electrical service. You can see the entire question and three detailed answers I received on www.WorkbenchInteractive.com.



To find the electrical pros on AllExperts.com, select the *Home/Garden* category from the home page. Then look under the *Repair/Renovate* heading for the *Home Repair* category. Follow that link, and you'll go to a list of home improvement topics. Select *Electrical Wiring in the Home.* Pose your question to any of the experts listed there and you'll have answers in about 24 hours.

More electrical sites on page 22

Powerful Solutions Available Online ... *continued from page 20*

SITES FOR TECHNICAL AND CODE INFORMATION:

www.eBuildingCodes.com — Here's an excellent source to buy code books (including the National Electrical Code).

You can also use the *Find Codes* search feature to look up contact information for building code authorities in your state. Be sure to contact them before starting work.

www.CPSC.gov — The Web site of the U.S. Consumer Product Safety Commission, this site has loads of information that will be of value to anyone considering electrical work in their house.

To find the list of applicable publications, follow the *Consumer* link from the home page. Then click on *CPSC Publications*. On the next page, select to have the publications listed *By General Category*. Finally, click on *Electrical Safety* to get to the list of publications.

Be sure to check out the *Home Electrical Safety Audit Room by Room Checklist*, *Home Wiring Hazards* booklet, and the *Arc Fault Circuit Interrupters (AFCIs) Fact Sheet*. I've included a small excerpt from the AFCI fact sheet in the box at left.

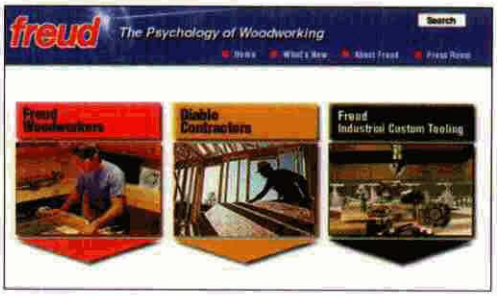
AFCI & GFCI: WHAT'S THE DIFFERENCE?

The AFCI (Arc Fault Circuit Interrupter) should not be confused with the GFCI (Ground Fault Circuit Interrupter).

The GFCI is designed to protect people from severe or fatal electric shocks while the AFCI protects against fires caused by arcing faults. The GFCI also can protect against some electrical fires by detecting arcing and other faults to ground but cannot detect hazardous, across-the-line arcing faults that can cause fires.

From the CPSC Publication: Arc Fault Circuit Interrupter (AFCI) Fact Sheet

Freud Slips Onto the Web



At long last, Freud, Inc. — manufacturer of woodworking power tools and accessories — has joined other major tool manufacturers with a Web site of their own: www.FreudInc.com.

The site is an excellent first effort by the company, offering a blend of product information and educational materials.

Once you get past the animated splash page, you can choose your area of interest: *Freud Woodworkers*, *Diablo Contractors*, or *Freud Industrial Custom Tooling*.

I spent most of my time in the *Freud Woodworkers* section. In here, you can browse through the online catalogs, download printable catalogs, or learn the basics of cutting tools in *Bits and Blades 101*.

Also be sure to check out the *Project Ideas* area. This is a convenient list of links to projects offered by woodworking magazines.

Another interesting feature, which is found in the *Saw Blades* section of the site, is called *Which Saw Blade Do I Need?* Just answer three questions about your project and equipment, and the site will recommend a few blades for you to consider. Other features include a *Dealer Locator* and a *Customer Service* link.

Women In Woodworking

www.WomenInWoodworking.com

Women have been working in their woodshops for years. But until recently, finding information specifically geared for women woodworkers has been nearly impossible.

Now, thanks largely to Ann Rockler Jackson, CEO of Rockler Woodworking and Hardware, there's a Web site devoted entirely to women woodworkers.

The site is called *Women In Woodworking*, and first went online in June 2000.

The site includes a very active forum of woodworkers exchanging tips, opinions and ideas on all things shop related.

Other features of the site include a daily woodworking tip and a list of workshops.

To DIY or Not to DIY? Find Out at The House Of Remodeling.

Every home improvement project begins with a long list of questions:

- Can I really do this myself?
- Should I do this myself?
- What's involved in the process?
- What tools and materials will I need for the job?
- How much money can I save by doing this job myself?

That's a lot of questions. Fortunately, there's a site called www.HouseOfRemodeling.com that can help answer all of them.

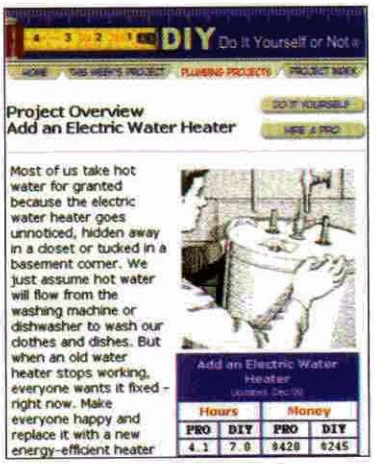
The site is run by a Chicago-area newspaper company, so local features will only be helpful to Chicagoland residents. For the rest of the country, there are more than 200 project articles with information to help you decide the best solution to your home improvement challenges.

HERE'S HOW IT WORKS:

Select a category from the list on the left side of the page – *Plumbing* for example.

Now select a specific project, such as *Add an Electric Water Heater.*

The next page is an overview of the project. It includes a national cost average for hiring a professional for the job. You'll also find a rundown of the skills needed if you decide to do it yourself. Plus, on this page is a chart that lets you compare the time and cost of a professional installation to the time and money you'll invest by doing the job yourself (see the image).



Included in the chart is a link to a page that lets you enter your zip code so project costs will be adjusted to your region. This is one of the most valuable features this site offers.

Many of the projects (the ones marked with a red asterisk) have expanded information available by clicking on the *Do It Yourself* or *Hire A Pro* buttons.

Select the *Do It Yourself* button and you'll get detailed, step-by-step instructions and a tool and materials list.

The *Hire A Pro* option gives you some helpful advice for finding the right contractor for the job.

Medicine Cabinet

Mirror, mirror in the wall ... good-looking, shop-built, and storage for all.

MEDICINE CABINET ANATOMY

Despite a similar appearance, the medicine cabinet is built quite differently from the towel rack.

For instance, the case of the cabinet is $^1/_2$"-thick melamine, and it has glass shelves instead of hardwood *(Case Assembly)*.

Another difference is a slightly different face frame assembly. And, of course, the medicine cabinet has a mirrored door instead of the open front of the towel rack.

BUILD THE CASE

To begin building the case, cut the sides (A), top and bottom (B), and back (C) to size.

Next, rabbet each end of the side pieces to hold the top and bottom *(Rabbet Detail)*. Then, cut a rabbet in the back edge of all the case pieces for the back *(Side Detail)*. Now drill shelf-pin holes in the case sides.

Assemble the case by gluing and screwing the top, bottom, and sides together. Then nail the back into the rabbet.

BUILD THE FACE FRAME

With the case built, the next step is to apply a solid wood face frame to the cabinet. The frame is rabbeted to wrap from the front of the cabinet to the sides *(Frame Detail)*. That way it provides a solid surface to mount hinges on. It also acts as a backband that sits against the drywall when the cabinet is installed.

To make the frame, I planed some 2x stock to $1^5/_{16}$" thick. Then, working with four extra-long blanks, I rabbeted each piece.

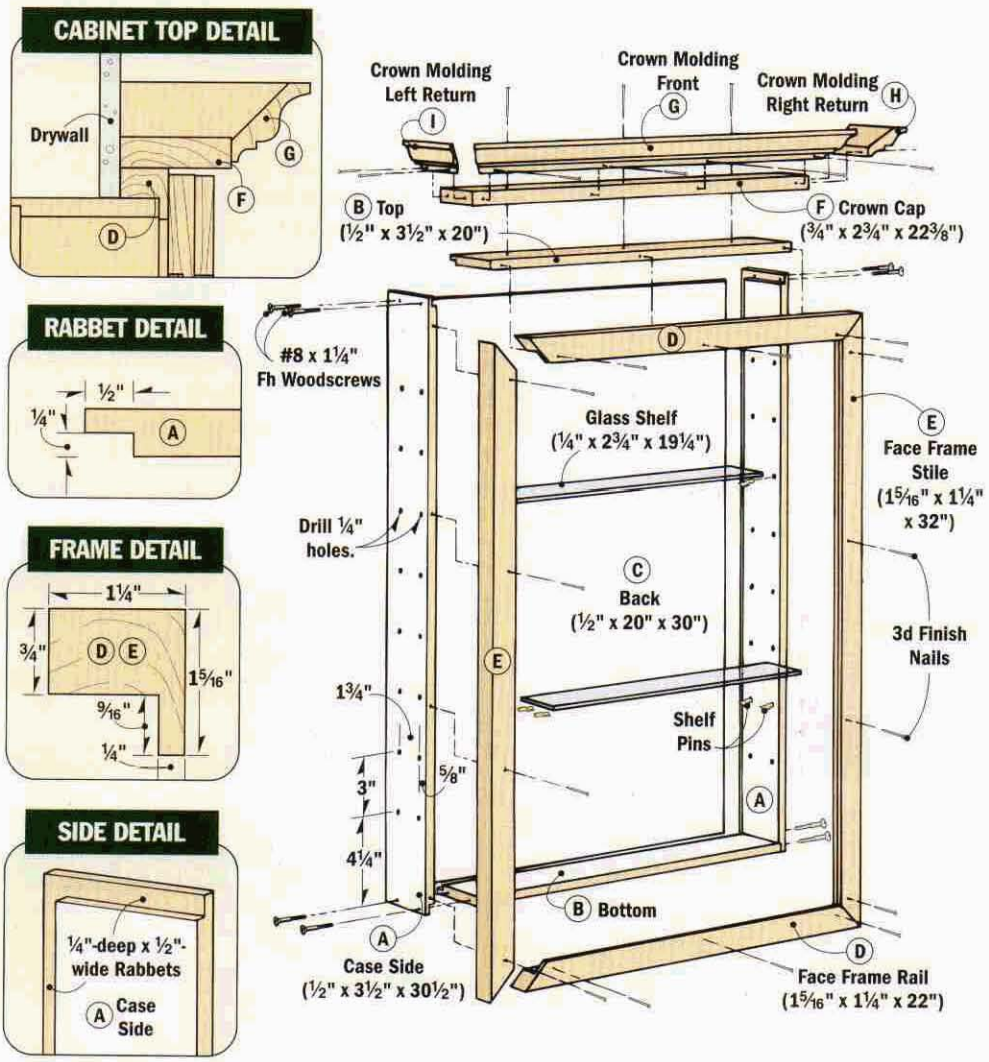
Next, miter the rails (D) and stiles (E) to length and face nail them to the cabinet. Work your way around the case as you do this to get tight miters at each corner.

APPLY THE CROWN MOLDING

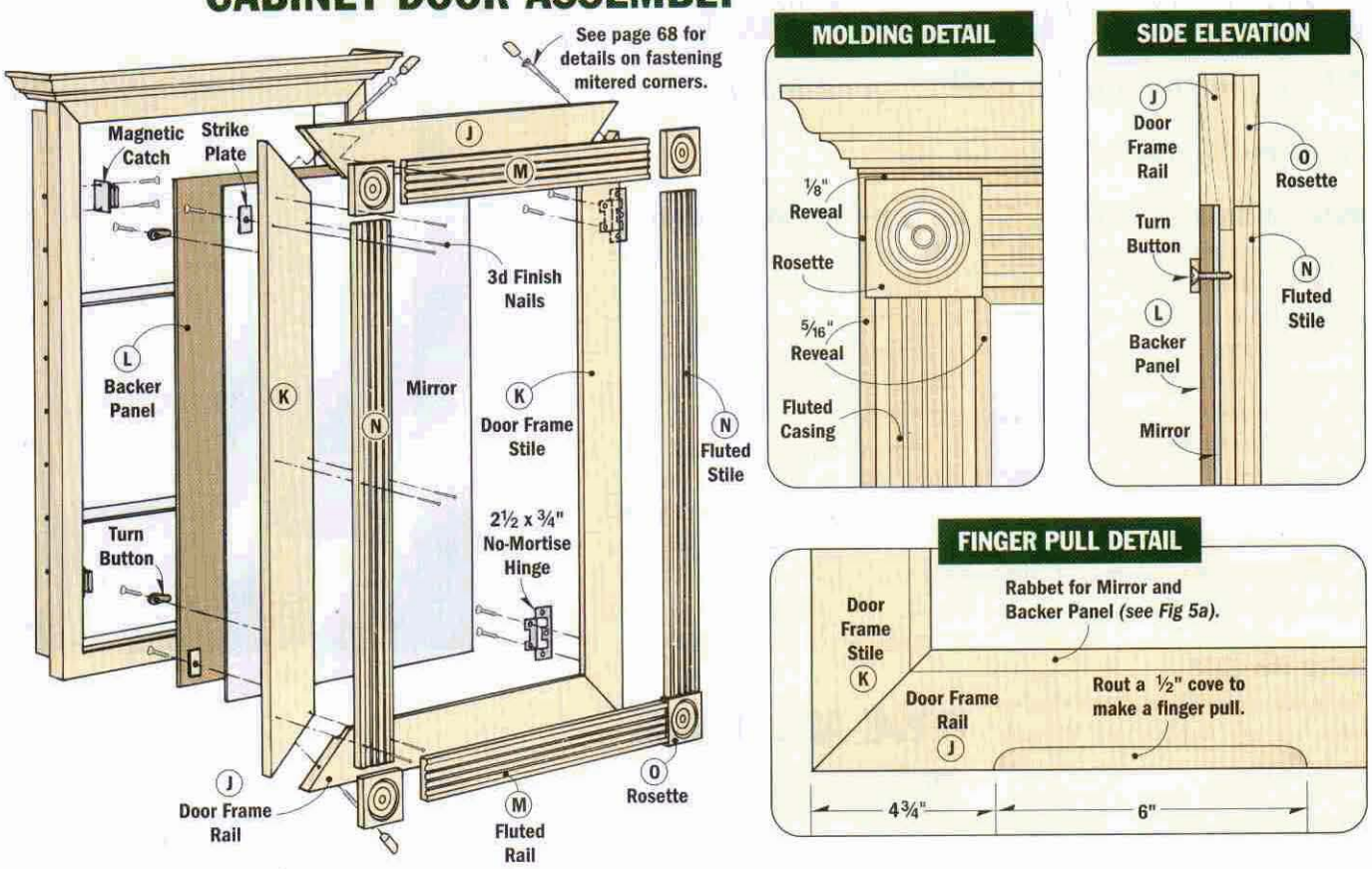
The first step in applying the crown molding to the top of the cabinet is to attach a crown cap (F) that serves as a mounting surface *(Cabinet Top Detail)*. Cut the cap to size and glue and nail it to the frame.

Now you can make the compound cuts in the crown molding before nailing it to the cap. Cuts like these can be done using a sled on a table saw. Or, if you've got a compound miter saw, there's a great technique explained on page 69.

CASE ASSEMBLY



CABINET DOOR ASSEMBLY



MIRRORED DOOR DETAILS

The structure of the mirrored door is a hardwood sub-frame. The front of the frame gets trimmed in the same fluted molding and corner rosettes as the towel rack. In the back of the frame is a rabbet that houses the mirror and a hardboard backer panel *(Side Elevation, above)*. Turnbuttons screwed into the frame hold the mirror and backer panel in place. The door is connected to the cabinet with two no-mortise hinges.

BUILDING THE FRAME

To build the door frame, start by mitering the rails (J) and stiles (K) to length. There's a table saw sled for accurately cutting miters like these on page 66. Then, when you're ready to assemble the frame, use the assembly technique that's explained on page 68.

ROUTING THE FRAME

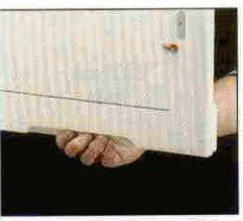
With the frame constructed, the next step is to rout the rabbet for the mirror and backer panel *(Fig. 5 and Rabbet Detail)*. The rabbeting bit will leave rounded inside corners, which you can square up with a chisel *(Corner Detail)*.

Next, use a ½" cove bit to rout the finger pull on the bottom rail of the frame *(Finger Pull Detail)*. The length and placement of the finger pull isn't critical, so you can freehand rout this detail.

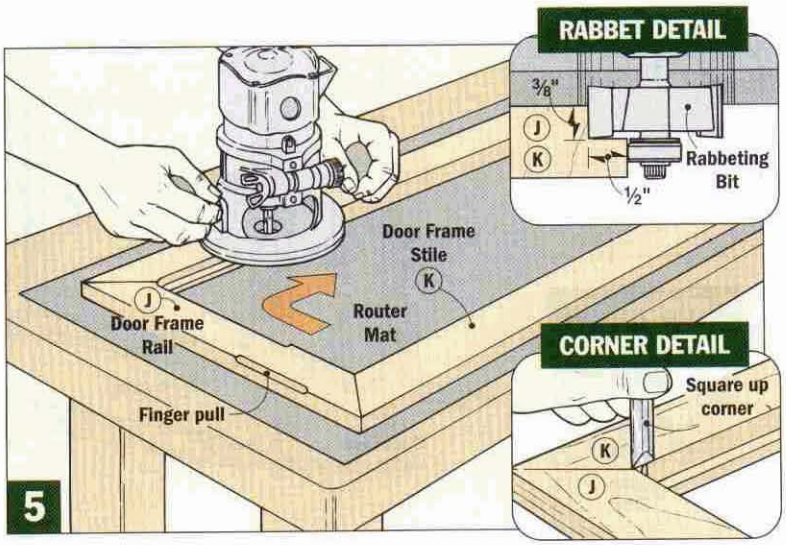
TRIM AND FINISH

Now that the structural part of the medicine cabinet door — the sub-frame — is built, it's time to add the decorative pieces: the fluted rails (M) and stiles (N) and the corner rosettes (O).

The *Molding Detail* shows how to position the rosettes and fluted casing with the proper reveals.



▲ **A finger pull routed in the bottom rail of the door frame makes the cabinet easy to open.**



Install the rosettes with glue and finish nails. Then, after cutting the fluted rails and stiles to fit between the rosettes, glue and nail them on.

When the molding is nailed to the frame, you can fill the nail holes and prime and paint the door.

CLOSING DETAILS

There are just a few hardware pieces to put on before the cabinet is ready to go in the wall.

Start by installing the no-mortise hinges. Attach the hinges to the door frame first. Pre-drill the screw holes with a self-centering bit. Then drive the hinge screws by hand to avoid damaging the delicate brass screws.

Now line the door up to the cabinet and pre-drill the cabinet for the hinge screws. Again, screw the hinges to the cabinet frame by hand.

Next, install magnetic catches inside the cabinet and mount the strike plates on the back of the door *(Cabinet Door Assembly)*.

Finally, fit the mirror and backer panel in the rabbeted frame and secure them with turnbuttons.

INSTALLING THE CABINET

Unlike the towel rack, this cabinet will *not* fit in a standard stud space. Which means you'll have to notch at least one stud to fit the cabinet into the wall.

It also means that you'll have to bolster both edges of the cutout to help support the cabinet.

The steps to install the cabinet are described in *Opening a Wall For the Medicine Cabinet*, below. Read through the process completely before getting started so you can work with confidence.

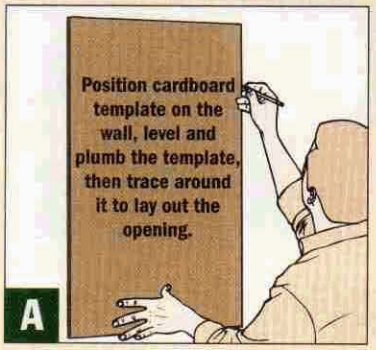
When the installation is finished, there'll be no sign that the cabinet is inset to the wall. In fact, unless your guests look very closely, they may never even realize there's an entire medicine cabinet behind that beautiful mirror.

MATERIALS LIST

MEDICINE CABINET

A (2)	Case Sides (melamine)	$\frac{1}{2}$" x $3\frac{1}{2}$" x $30\frac{1}{2}$"
B (2)	Case Top/Bttm. (melamine)	$\frac{1}{2}$" x $3\frac{1}{2}$" x 20"
C (1)	Case Back (melamine)	$\frac{1}{2}$" x 20" x 30"
D (2)	Face Frame Rails (pine)	$1\frac{5}{16}$" x $1\frac{1}{4}$" x 22"
E (2)	Face Frame Stiles (pine)	$1\frac{5}{16}$" x $1\frac{1}{4}$" x 32"
F (1)	Crown Cap (poplar)	$\frac{3}{4}$" x $2\frac{3}{4}$" x $22\frac{3}{8}$"
G (1)	Crown Molding Front	$\frac{9}{16}$" x $3\frac{1}{4}$" x $25\frac{5}{16}$"
H (1)	Crown Molding Right Return	$\frac{9}{16}$" x $3\frac{1}{4}$" x $4\frac{1}{4}$"
I (1)	Crown Molding Left Return	$\frac{9}{16}$" x $3\frac{1}{4}$" x $4\frac{1}{4}$"
J (2)	Door Frame Rails (poplar)	$\frac{3}{4}$" x $2\frac{3}{4}$" x 22"
K (2)	Door Frame Stiles (poplar)	$\frac{3}{4}$" x $2\frac{3}{4}$" x $31\frac{7}{8}$"
L (1)	Backer Panel (hardboard)	$\frac{1}{4}$" x $17\frac{1}{2}$" x $27\frac{3}{8}$"
M (2)	Fluted Rails	$\frac{1}{2}$" x $2\frac{1}{8}$" x $16\frac{3}{4}$"
N (2)	Fluted Stiles	$\frac{1}{2}$" x $2\frac{1}{8}$" x $26\frac{5}{8}$"
O (4)	Rosettes	$\frac{5}{8}$" x $2\frac{1}{2}$" x $2\frac{1}{2}$"

OPENING A WALL FOR THE MEDICINE CABINET

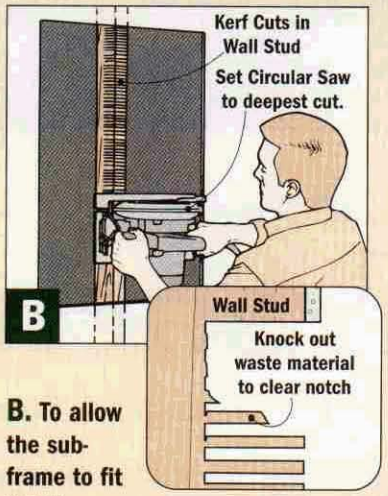


A. **Rather than try to support the weight of the cabinet when laying out the opening in the wall, make a cardboard template the same size as the *overall* cabinet back ($20\frac{1}{2}$"-wide, $30\frac{1}{2}$"-tall). Then position the template on the wall.**

Make sure the template is level and plumb, then trace around it. Now cut the drywall with a keyhole saw and remove it.

With the wall opened up, you can determine how much work you'll have to do to make the cabinet fit.

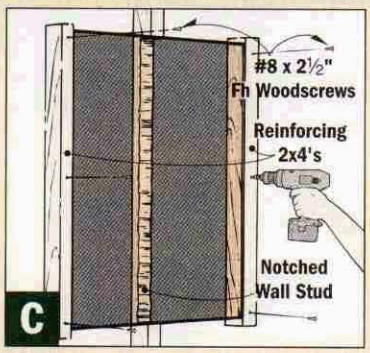
You'll have to notch at least one stud, and maybe two of them, for the cabinet to fit.



B. **To allow the sub-frame to fit tightly against the wall, any studs inside the opening will have to be notched at least 2" deep.**

So, with a circular saw set for it's deepest cut, make several kerfs in the stud.

A couple of safety tips here: First, keep both hands on the saw *at all times*. Second, use a step stool or short ladder so you're not working over your head with the saw. When the kerfing is complete, remove the waste *(Detail, above)*.



C. **The last thing to do before installing the cabinet is to reinforce the edges of the cutout with 2x4's.**

Cut the 2x4's slightly longer than the opening so they extend beyond the top and bottom of the hole. Then spread construction adhesive on both edges of the 2x4's before fitting them into the wall and screwing through the drywall.

Once the adhesive has had a chance to harden, the opening is ready to accept the cabinet. Make sure the cabinet is level and plumb before driving screws through the shelf-pin holes and into the reinforcing 2x4's.

3 Weekend Projects: 3 Wall Shelves

No complex joints, just solid boards and a handful of screws, and you're on your way to building an array of adjustable shelving.

One of the first woodworking projects I ever built was a basic wall shelf. Like most shelves, it wasn't anything fancy — just two vertical supports connected by a few boards. If I remember correctly, it wasn't much to look at either. (The painted pine boards were held together with butt joints and screws.) Even so, I like to think that what it lacked in appearance, it made up for in strength.

Fortunately, it ended up being sold at a garage sale long ago. And to be honest, I haven't missed it a bit. But I have built a number of other wall-mounted shelves since then. Each one presented an interesting woodworking challenge — designing a shelf that was both attractive *and* sturdy.

3 WALL-MOUNTED SHELVES

To show you some different possibilities, we're featuring three different wall-mounted shelves in this article. You can use them to organize all kinds of items.

A traditional oak *display shelf* (shown above) is ideal for a living room, den, or kitchen. A handy *utility shelf* (page 38) will help you clean up the clutter in the garage or laundry room. Plus, there's also an easy-to-build *knock-down shelf* for a kid's room (page 41).

ADJUSTABLE. Although the appearance and construction of each shelf project is different, they all share one thing in common. Each unit is designed with *adjustable* shelves so you can move them up or down to match the height of the items being displayed or stored.

TRADITIONAL DISPLAY SHELF

This stylish oak shelf gets its traditional look from the curved profile on the top and bottom of the end supports. And to create a light, airy feeling for these end supports, there are five equally spaced dowels that fit between the stiles and act as rungs for an adjustable shelf.

Coves on the ends of the adjustable shelf "nestle" onto the dowels and prevent the shelf from moving side to side (see inset photo on page 34). Similar coves on the fixed shelves fit onto a bead on the top and bottom rails to create a decorative end profile.

END SUPPORTS

The end supports get a great deal of strength from the grain orientation of the stiles (A) and the top and bottom rails (B). If you take a look at the *Construction View* at right, you'll notice that the grain runs vertically in all four pieces of the end supports. The rails are edge-glued to the stiles to create a strong joint — without having to make any complicated cuts.

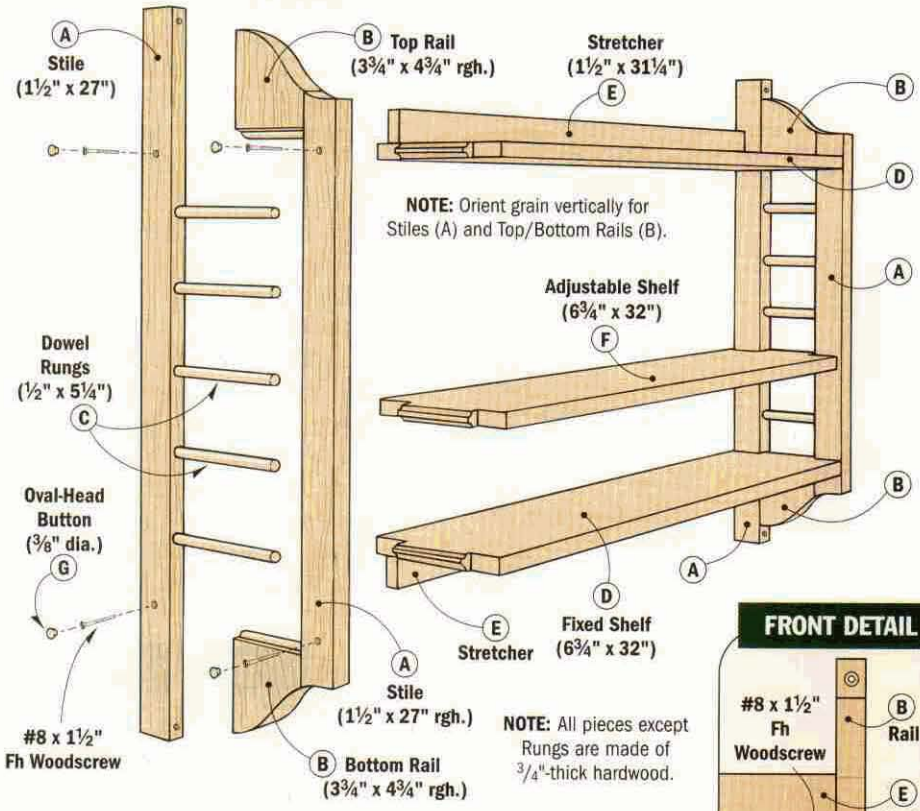
Another important element of the end supports is to make sure the holes in the edge of each stile that hold the dowel rungs (C) line up. This way the adjustable shelf sits level no matter where you place it. Aligning these holes is easiest to do with all four stiles cut to length, then clamped together so they can be marked at the same time.

MORTISING. Start by laying out the centerpoint of each hole. To make it easy to accurately align the bit to the centerpoints, I clamped a fence to the drill press table and used it to position the workpiece. Then, after chucking in a Forstner bit, I drilled the holes $^3/_4$" deep *(Figs. 1* and *1a)*.

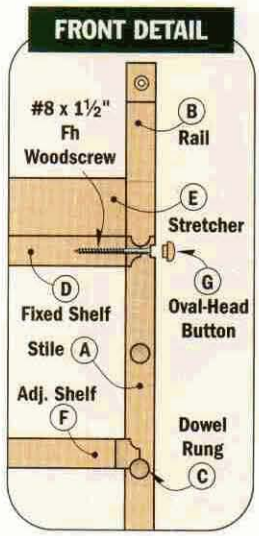
BEAD WORK. Once the dowel holes are drilled, you can begin work routing the bead on the top and bottom rails. You don't need a specialized router bit to cut this bead. By adjusting the height of an ordinary $^1/_4$" round-over bit to leave an $^1/_8$" shoulder, and routing both sides of the rail, you can create a $^1/_2$" bead *(Figs. 2* and *2a.)*

CONSTRUCTION VIEW

Overall Dimensions: 32¾"W x 6¾"D x 27"T



NOTE: All pieces except Rungs are made of $^3/_4$"-thick hardwood.

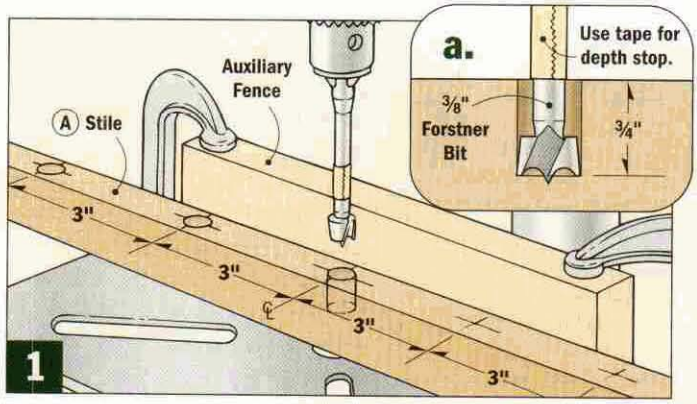


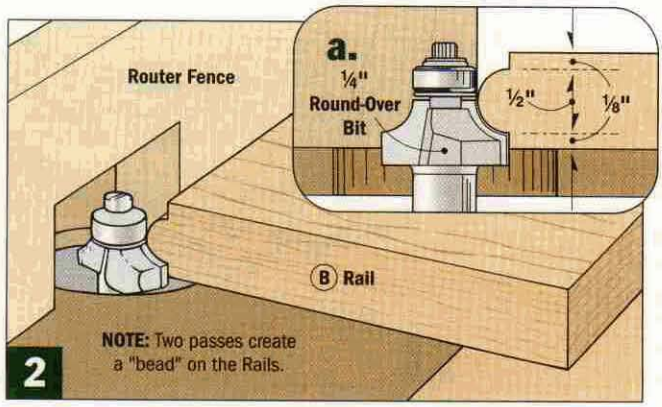
MATERIALS

A (4) Stiles	$^3/_4$" x 1$^1/_2$" x 27"
B (4) Top/Bottom Rails	$^3/_4$" x 3$^3/_4$" x 4$^3/_4$"
C (10) Dowel Rungs	$^1/_2$" x 5$^1/_4$"
D (2) Fixed Shelves	$^3/_4$" x 6$^3/_4$" x 32"
E (2) Stretchers	$^3/_4$" x 1$^1/_2$" x 31$^1/_4$"
F (1) Adjustable Shelf	$^3/_4$" x 6$^3/_4$" x 32"
G (8) Oval-Head Buttons	$^3/_8$" dia.

HARDWARE

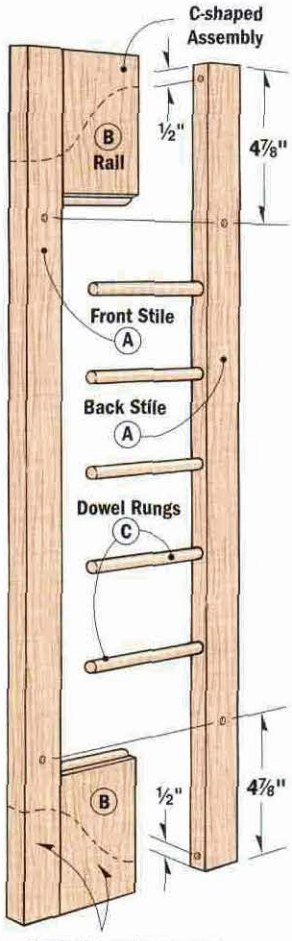
(8) #8 x 1$^1/_2$" Fh Woodscrews
(4) #8 x 3$^1/_2$" Fh Woodscrews





CONSTRUCTION VIEW

▲ **Evenly-spaced dowels act as rungs that support the adjustable shelf.**

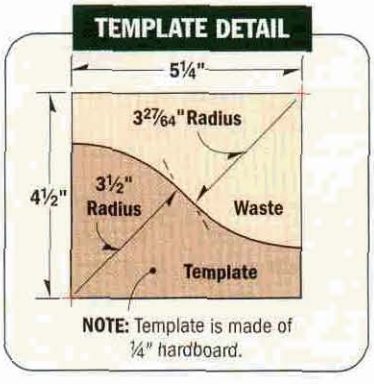


END SUPPORTS

With the dowels cut, you can begin the assembly process for the end supports. There are really four steps involved to complete each support.

STEP 1. Start by gluing the front stile (A) to the top and bottom rail (B) to create a C-shaped assembly *(Construction View)*. As I mentioned earlier, it's this edge-to-edge glue joint that makes the end supports so strong.

STEP 2. Next, you'll want to lay out and cut the curved profile on the top and bottom of the C-shaped assembly. This is much easier to do without the second stile attached just yet. Laying out the profile is easy using a ¼" hardboard template *(Template Detail)*.



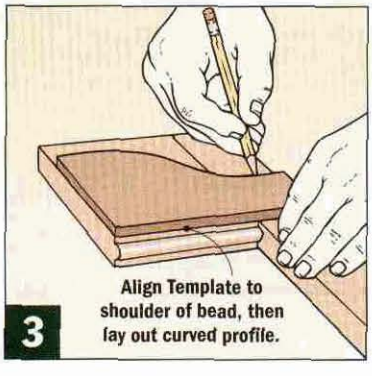
Once the curve is marked (see *Fig. 3*), remove the template and rough cut the profile on the band saw, as shown in *Figure 4*. When making the cut, stay on the waste side. Then file or sand up to the layout line. This will create a smooth profile without any ridges.

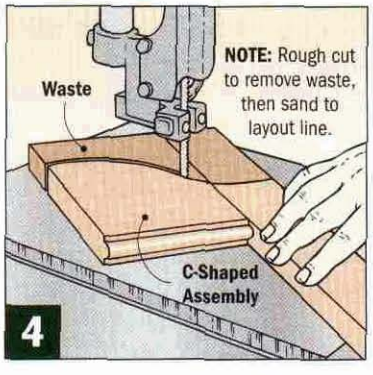
STEP 3. After shaping the end, you can add the dowel rungs (C) to the C-shaped assembly. Don't bother gluing the dowels into the holes. They fit tightly enough without it. However, it's a good idea to test the fit by clamping the back stile in place. That way, if any of the dowels are too long, you can trim them shorter without having to disassemble any glued joints.

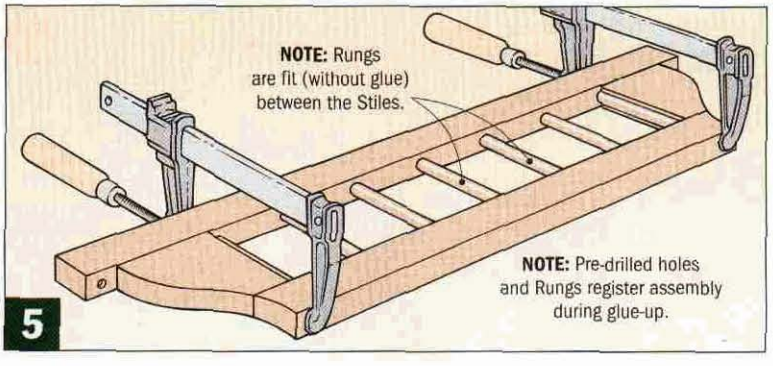
STEP 4. Once everything fits, remove the back stile temporarily. Then drill two holes in each stile (*Counterbore Detail*, page 37). These will be used when attaching the fixed shelves.

While you're at it, go ahead and drill the same-sized counterbored shank hole near the top and bottom of the back stiles, too. These will be used to mount the shelf to the wall.

Next, glue the back stile in place. Clamp across each rail to hold the assembly while the glue dries (*Fig. 5*).







SHELVES & STRETCHERS

Now it's time to work on the fixed shelves (D) and stretchers (E) that connect the supports, along with the adjustable shelf (F).

COVES. All three shelves have a couple of things in common. To start, both ends of each shelf have a cove on the top and bottom (see *Shelf Cove Detail*, page 37). This allows the shelves to nestle snugly onto the rungs, as well as the bead on the rails (see *Construction View*, page 37).

You can rout these coves with a ¼" cove bit by routing one edge, then turning the board over and routing the other edge. You don't have to worry about chipout because you're going to notch the ends of each shelf next anyway.

NOTCHES. Another similiarity the shelves share are notched ends. These notches allow all three shelves to fit around the stiles. Plus, they keep the *adjustable* shelf from moving front to back.

Take a look at the *Fixed Shelf Notch* and *Adj. Shelf Notch* at right. Notice how the adjustable shelf notches are deeper than the notches on the fixed shelves. This is so the adjustable shelf can be lifted in and out of place easily.

Before cutting the notches, mark their locations on all three shelves. Then you can cut the notches using three quick setups on the table saw.

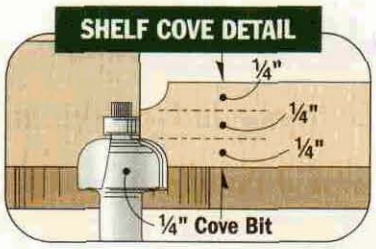
Start by raising the table saw blade $1\frac{1}{2}$" (notch width) and make two cuts on each end of all three shelves *(Fig. 6)*.

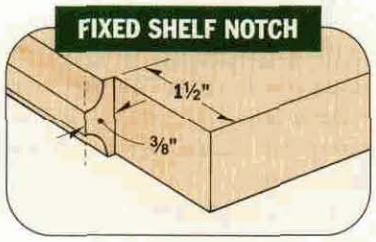
For the second set of cuts, lower the saw blade to $\frac{5}{8}$" and remove the waste on all four corners of one of the boards *(Fig. 7)*. This will become the adjustable shelf.

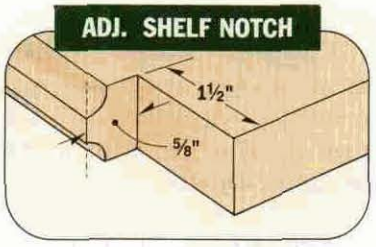
The waste on the remaining fixed shelves can be removed the same way. Only this time, lower the blade to $\frac{3}{8}$" to account for the different depth notch.

STRETCHERS. The adjustable shelf is done once the notches are cut. But the two fixed shelves still need another piece — stretchers (E). These add rigidity to the overall shelving unit.

After cutting the stretchers to size so that they'll fit tightly between the end supports, they can be glued flush with the back edge of the fixed shelves (on top of the top shelf, and underneath the bottom shelf).

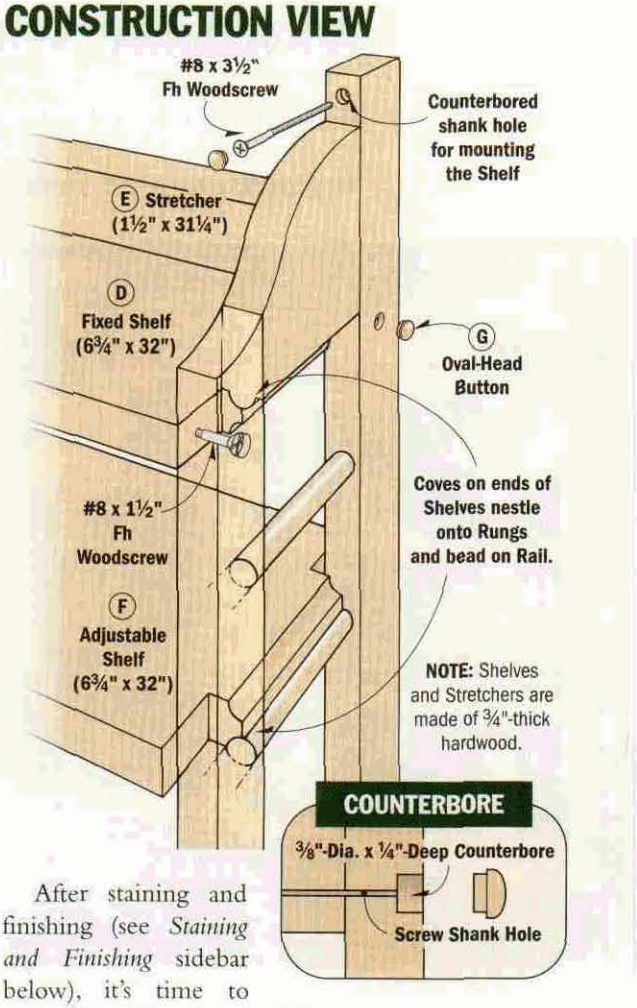






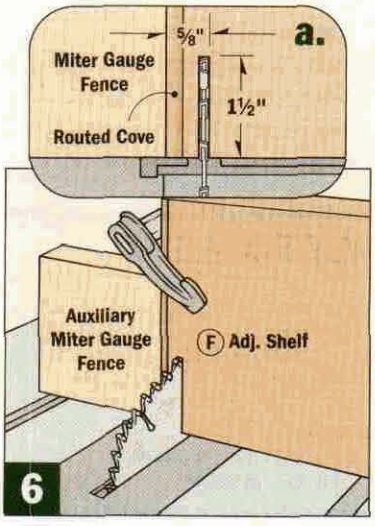
FINISHING UP & MOUNTING

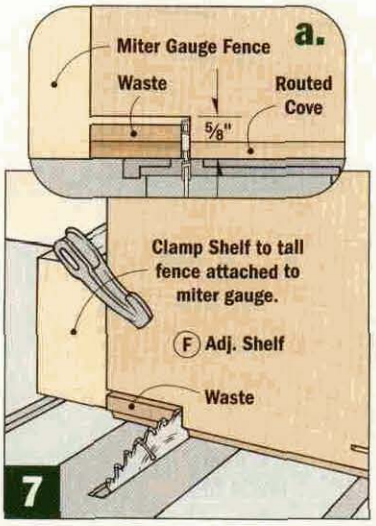
The next step is to screw the fixed shelves to the end supports. And to keep the look of the shelf unit real clean, the holes are plugged with $\frac{3}{8}$"-dia. wood buttons.



After staining and finishing (see *Staining and Finishing* sidebar below), it's time to mount the shelves. Leveling it is easy since the end supports are already locked in place by the fixed shelves.

Simply position the unit where you want it located and screw it to the wall studs. Once both end supports are permanently attached, you can add the adjustable shelf.





STAINING AND FINISHING

To highlight the oak grain in this shelf, I combined two different colors of Minwax Wood Finish stain: one part Early American and two parts Colonial Maple. After the stain dried, I used three coats of a tung oil finish to help protect the shelf against moisture and to add lustre to the project.

Modular Utility Shelf

All you need to build this strong ladder-like utility shelf are some inexpensive pine boards and a couple of hours in the shop.

This utility shelf has a lot going for it — it's made of inexpensive pine lumber, it's quick and simple to make, plus it's strong and functional. Another thing I like is how easily you can add on more shelf sections if your storage needs change.

For example, the shelf in the photo at left has two separate sections. Each section consists of long shelves fit between two ladder-like end supports. I bought the wide shelves at a local home center. And unlike the oak display shelf (see page 35), *all* of the shelves in this project are adjustable.

LADDER-LIKE END SUPPORTS

A utility shelf usually gets loaded down with a lot of items, some pretty heavy. So to support the weight, I designed sturdy end supports that resemble a ladder. The solid rungs of the ladder are mortised into corner posts to provide solid support for the shelves.

Okay, I know what you're thinking. How can you build this shelf in a couple of hours with all those mortises? Well, if you take a look below, you'll see how I was able to save time using a simple construction method.

Each corner post is made up of *two* long stiles (A). Rabbets and dadoes in the inside face of each stile form the mortises once the two pieces are glued up.

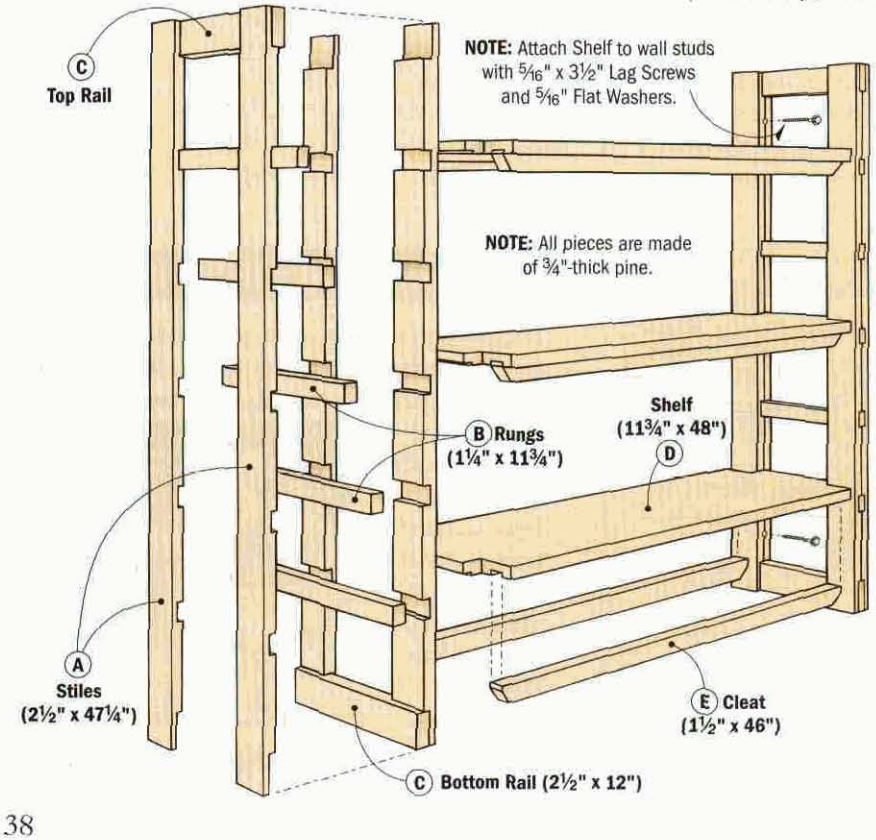
CORNER POSTS. The key when making the two-piece corner posts is to ensure that all of the mortises match up perfectly — not only in both halves but also from post to post. Of course, you could always mark eight different pieces and cut each individual mortise separately. But then you run the risk of the mortises not lining up in both halves of the corner posts.

Instead, I came up with a much easier — and more accurate — way that involves making both pieces of each corner post out of a single 1x6. This allows you to cut all of the rabbets and dadoes for both halves of a corner post at the same time.

But remember, the mortises also need to line up from corner post to corner post. This is accomplished by using an auxiliary rip fence to position the 1x6's for each pair of cuts.

CONSTRUCTION VIEW

Overall Dimensions: 49 1/2"W x 11 3/4"D x 47 1/4"T

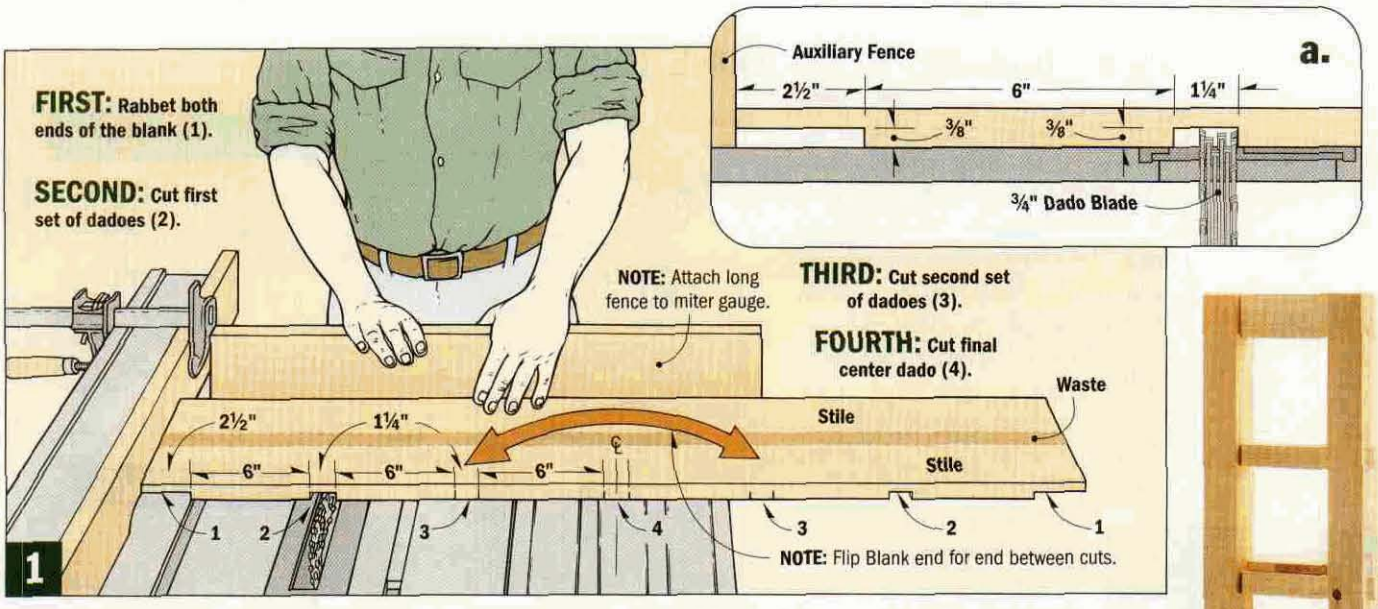


MATERIALS

A	(8)	Stiles	3/4" x 2 1/2" x 47 1/4"
B	(10)	Rungs	3/4" x 1 1/4" x 11 3/4"
C	(4)	Top/Bottom Rails	3/4" x 2 1/2" x 11 3/4"
D	(4)	Shelves	3/4" x 11 3/4" x 48"
E	(6)	Cleats	3/4" x 1 1/2" x 46"

HARDWARE

(4) 5/16" x 3 1/2" Lag Screws
(4) 5/16" Flat Washers



▲ **Ladder-like end supports create a sturdy utility shelf that can be expanded when you need more storage.**

HOW IT WORKS. Making the corner posts is actually a lot easier than it sounds. It does involve quite a bit of flipping boards end-for-end, and adjusting the fence. But the results (perfectly matching mortises) are worth the effort.

Start by laying out all of the rabbets and dadoes on an extra-wide blank. (I used a 1x6.) Now take a look at *Figure 1* to see the sequence of cuts. The idea is to work from each end of the blank toward the middle, flipping the board end-for-end between cuts.

With a ¾" dado blade in the table saw, position the rip fence to cut the shoulder of the rabbet on both ends of all four 1x6 blanks. Then clear away the waste.

Once all of the rabbets are cut, reposition the fence to cut the shoulder of the closest dadoes *(Cut 2* in *Fig. 1)*. Now cut the shoulder of these dadoes in all of the blanks. Next, reset the fence and make a second pass to complete each dado for cut 2. At this point, you should have four 1x6's with rabbeted ends and a dado $8\frac{1}{2}$" from the ends.

You'll have to reposition the fence again to cut the next pair of dadoes (*Cut 3* above) the same way. Keep repeating the process until you've cut five matching dadoes in all four blanks.

Now that the time-consuming part is done, simply rip two $2\frac{1}{2}$"-wide pieces from each 1x6 blank to make the individual stiles.

RAILS & RUNGS. There's one more thing to take care of before moving on to the assembly stage. That's making the rungs (B) and the top and bottom rails (C) that complete the end supports.

First rip enough stock that will fit the rabbets and dadoes you just completed. Then crosscut each piece to 12" long.

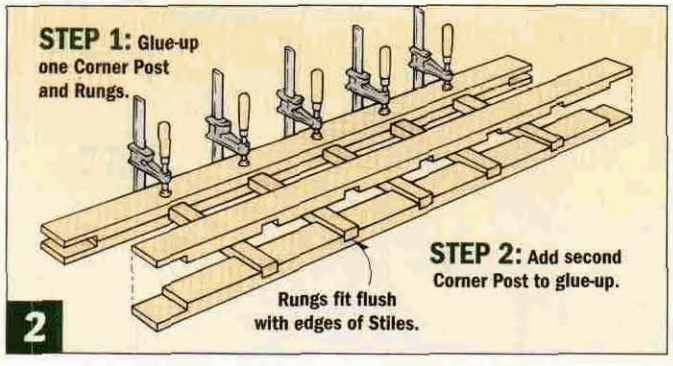
GLUE-UP & ASSEMBLY

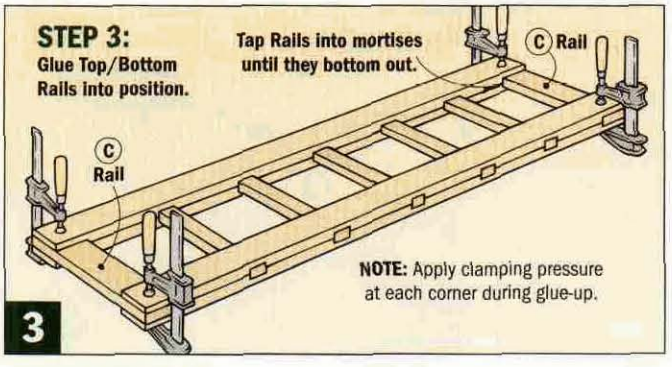
Now it's time to assemble the end supports. With so many pieces to wrestle with, this can get a bit hectic. So to make it easier, I used a three-step process.

First, I glued-up a single corner post with the ends of the rungs flush with the outside edge of the stiles, as shown in *Figure 2*. To keep the pieces from shifting around during glue-up, clamp each joint. Now repeat the process for the second corner post, again clamping directly over the joints *(Fig. 2)*.

The top/bottom rails are the final pieces to be added to the end supports. Start by lightly tapping them into position until they bottom out in the mortises. They should also be flush with the ends and edges of the corner posts.

Again, clamping pressure at the corners helps ensure a strong glue joint *(Fig. 3)*.

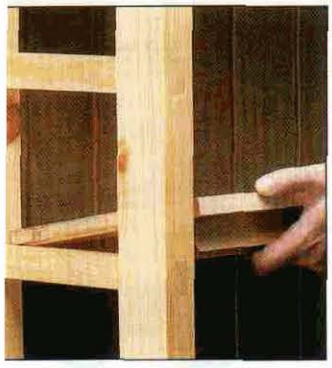




ADJUSTABLE SHELVES

Once the end supports are done, work can begin on the adjustable shelves. One thing you'll notice about the shelves is that the ends "split the difference" on the thickness of the rungs. This way, you can add another shelf section later on by making only *one* more end support. The ends of the second set of shelves simply share rung space with the first set (see photo).

Solid wood is a good choice for the shelves because of the long span. But finding flat boards that are wide enough is a problem. To keep the construction simple, I didn't want to go to the trouble of gluing-up narrow strips. Luckily, I found some 12"-wide pine panels at a home center that were already glued up.



▲ Notches on the ends of the shelves fit around the corner posts to keep the shelves from moving front to back.

GROOVES. To keep the shelves from sagging, I made two $^3/_4$"-thick pine cleats (E) that fit into grooves underneath each shelf. To cut the grooves, mount a $^3/_4$" dado blade in the table saw and set the rip fence. Then, with the workpiece riding against the fence, cut the groove in each piece *(Figure 4)*.

RABBETS. To keep the shelves from shifting side-to-side on the rungs, the ends need to be rabbeted. To cut these, I partially buried the dado blade in an auxiliary fence *(Figs. 5* and *5a)*.

NOTCHES. And to keep the shelves from moving front to back, the corners are notched to fit around the end supports *(Shelf Notch Detail)*. You'll have to switch to a regular blade to cut these notches. I followed the same procedure I used to cut the notches on the oak display shelf (see page 37).

BEVEL THE CLEATS. Notice above *(Cleat Detail)* that the ends of the cleats are beveled. This provides the clearance that's needed to lift the shelves in and out. After beveling the corners, glue the cleats into the grooves in the bottom of the shelves.

INSTALLING THE SHELF UNIT

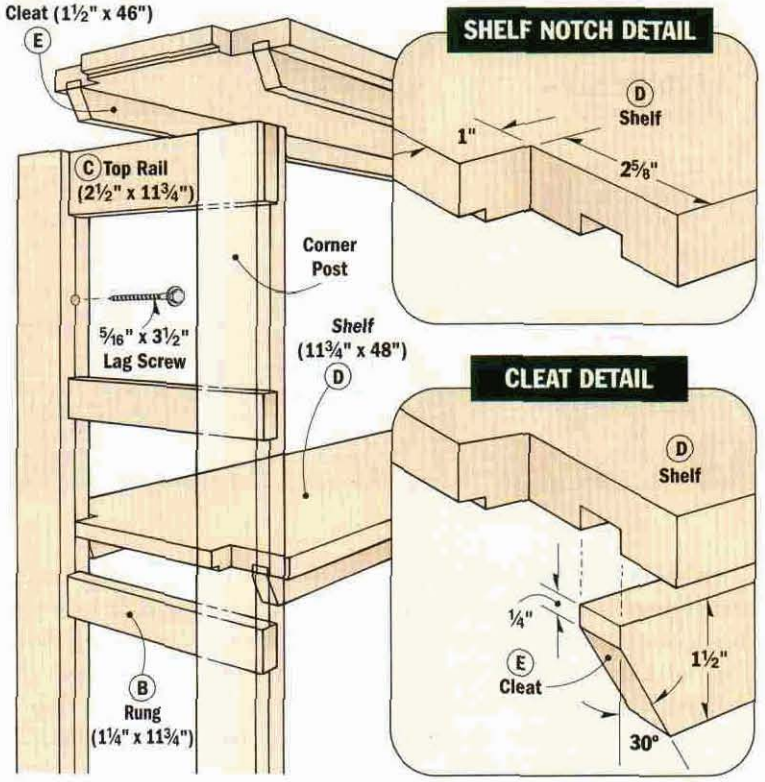
Utility shelves are notorious for getting scratched up. So before mounting the unit, I applied three coats of a protective polyurethane finish.

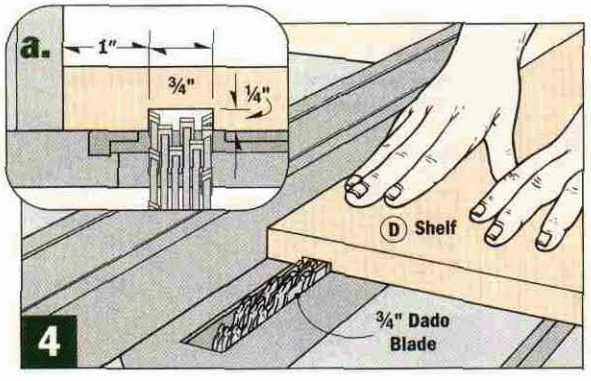
When you get ready to mount the shelf, there are a couple of important things to note. First, you'll want to use a large lag screw to support the weight of the shelf and whatever's stored on it. (I used $^5/_{16}$" x $3^1/_2$"). And second, be sure to screw into the wall studs.

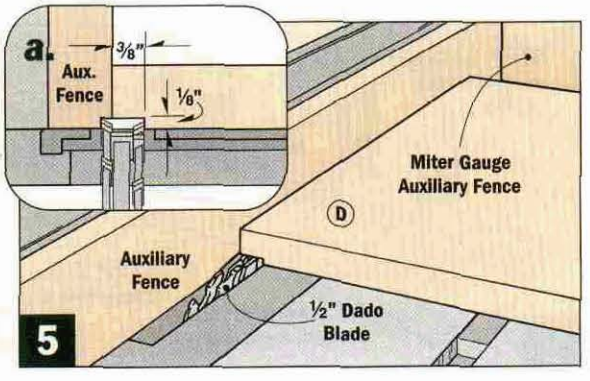
Start by attaching one end support so that it's plumb. Next, with a shelf in place, position and attach the remaining end support. (An extra pair of hands comes in handy here.)

Here's a tip: If the wall has a bad bow, rip a small amount ($^1/_8$") off the back edge of the shelves to get them to fit against the wall.

CONSTRUCTION VIEW







Knock-Down Wall Shelf

If you're looking for a sturdy wall shelf for a kid's room that's easy to build and just as easy to take apart, this is the one.

This knock-down wall shelf shares many of the same characteristics as the traditional display shelf (see page 35) and the utility shelf (see page 38). It's simple to make, doesn't use any complicated joinery, and it can be expanded for more storage if your needs change.

The design of this shelf is extremely straightforward — just four different parts to assemble. It doesn't even use glue, yet it's still amazingly sturdy.

The secret to its strength is a series of notches that allow the shelves and comb-like end supports to form a solid, interlocking connection. To reinforce that connection, the shelves have a cleat on the back that is "wedged" tightly between the two end supports.

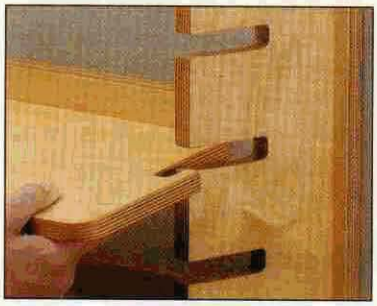
This interlocking design also means you can quickly "knock down" the removeable shelves and reconfigure them in different slots when your storage needs change.

Or as you can see below *(Optional Configuration)*, you can increase the amount of storage space by building a third end support and adding more shelves.

But doesn't cutting all those slots take a long time? Not at all. I used a simple hardboard template, along with a jig saw and handheld router to cut them. (For more on this technique, refer to page 42). But you could also use a band saw or a hand saw instead.

MATERIAL CHOICE. The choice of materials is another place where you have some options. Any type of $^3/_4$" plywood would work fine. But I chose Baltic birch plywood for a couple of reasons. First, it's relatively flat and stable. So it's always a good choice for projects like this shelf.

If you take a look at the photo at right, you'll see the second reason I chose birch ply. Notice there are very few voids in the plies on the edges. So even with the edges exposed, there's no need to apply edgebanding to cover the plies. Not to mention that the thin plies make the shelf look quite attractive once you apply a finish (see *Finishing Touch* below).

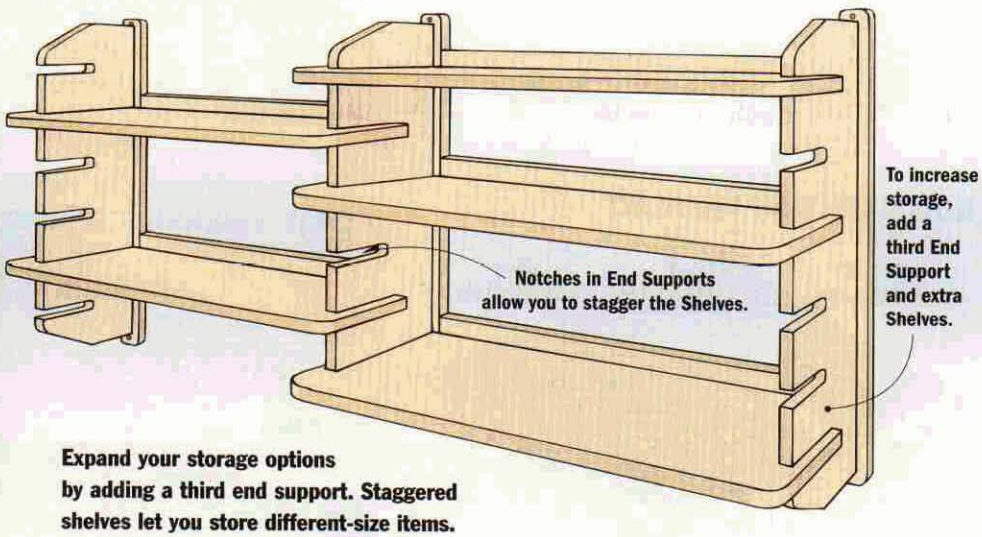


◄ Interlocking notches in the shelves and end supports create a strong shelf unit.

FINISHING TOUCH

The design of this shelf, and the fact it's in a kid's room, means you'll probably be repositioning the shelves around a lot. So I'd suggest giving the shelf a tough, durable finish such as polyurethane. Plus, polyurethane is a good choice to use on Baltic birch because it turns the light-colored plywood a warm amber color. I wiped on three coats of Varathane Classic Clear Diamond Wood Finish, sanding between coats.

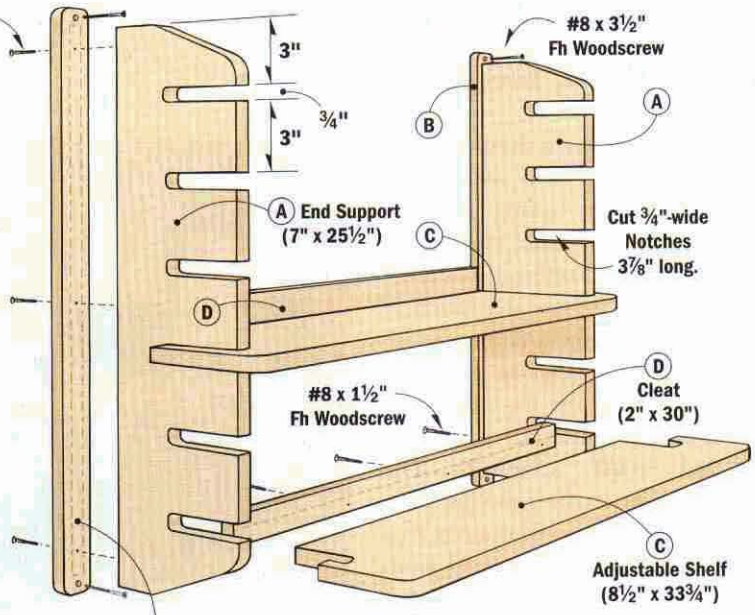
OPTIONAL CONFIGURATION



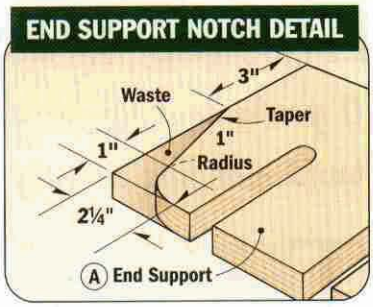
Expand your storage options by adding a third end support. Staggered shelves let you store different-size items.

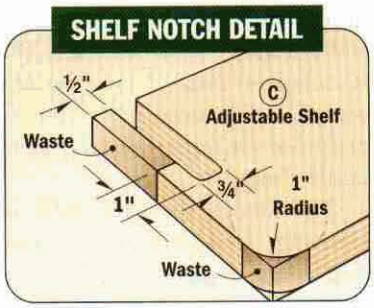
CONSTRUCTION VIEW

Overall Dimensions: 34"W x 9¼"D x 27"T



NOTE: All of the pieces for this knock-down shelf are made from ¾" Baltic birch plywood.





MATERIALS LIST

A	(2) End Supports	¾" x 7" x 25½"
B	(2) Mounting Strips	¾" x 2" x 27"
C	(2) Adj. Shelves	¾" x 8½" x 33¾"
D	(2) Cleats	¾" x 2" x 30"

HARDWARE

(18) #8 x 1½" Fh Woodscrews
(4) #8 x 3½" Fh Woodscrews

▲ Comb-like end supports let you easily reconfigure shelves to fit your needs.

SIMPLE CONSTRUCTION

The design of this shelf makes it easy to build. Notice in the *Construction View* how the end supports are like giant combs connected by two (or more) shelves. A handheld router and template make it a snap to cut the notches (more on that later).

END SUPPORTS

The first step is to cut the end supports (A) to final size. Once that's accomplished, you can concentrate on cutting the notches.

The quickest way I found to do that was to use a simple hardboard template and a handheld router with a pattern bit.

TEMPLATE. There are two important elements of the template. First, the notch dimensions are critical (see *Notch Cutting Template*). Whatever size you make the notch in the template, that's the size you'll get in the end supports.

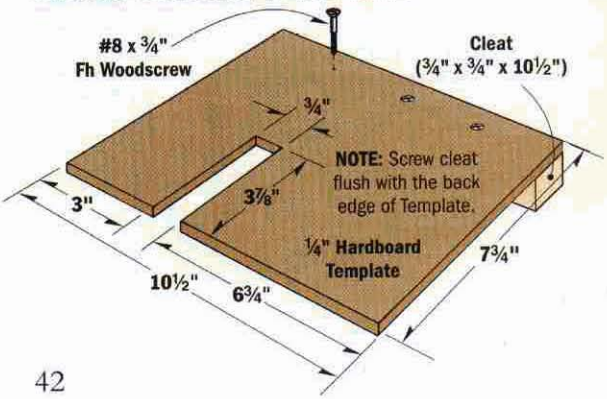
As for the length of the template, you'll want to leave enough room to clamp it to the end supports without having the clamp interfere with the router base.

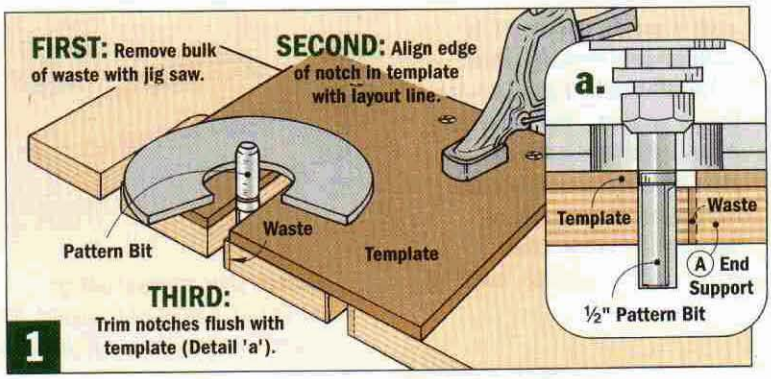
To cut the notches, lay out each one and remove as much material as possible with a jig saw. Next, line up the template notch with the layout line and clamp it in place. Now adjust the router so the bearing on the pattern bit rides against the edge of the template. Then clean up the remaining waste *(Fig. 1)*.

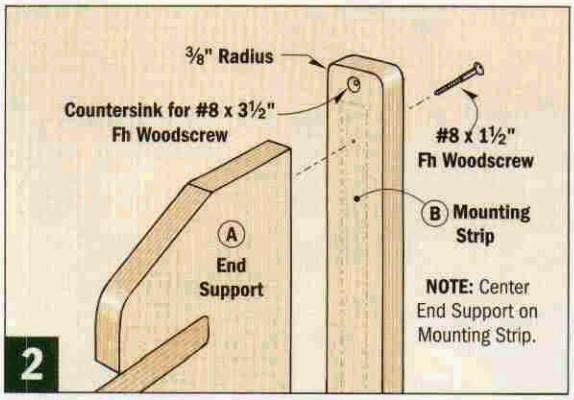
Although the template notch has a square end, the pattern bit creates a rounded one. Instead of squaring it off, I just left it round. To create a slim profile, I also cut a gradual taper on both the top and bottom *(End Support Notch Detail)*.

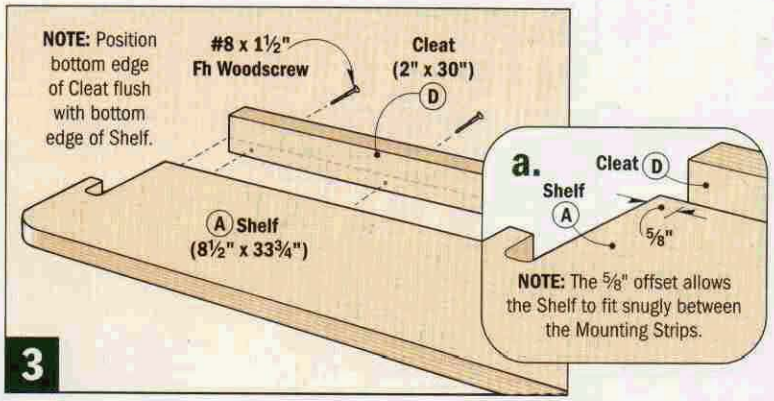
MOUNTING STRIPS. To complete the end supports, each one is attached to a mounting strip (B).

NOTCH-CUTTING TEMPLATE









Later, these strips will be screwed directly to the wall. After cutting the mounting strips to length, round over the corners for appearance. But before you screw the mounting strips and end supports together, drill a countersink near the top and bottom of both strips to fasten them to the wall (see *Fig. 2*).

The reason I drilled these holes now is because there isn't much clearance once the end supports are actually attached. Now screw the end supports and mounting strips together.

INTERLOCKING SHELVES

Once that's done, turn your attention to the interlocking shelves (C). These are pieces of $^3/_4$" plywood with a notch in each end.

You can use the same rough cutting and flush-trim routing procedure to form the shelf notches. But you'll have to remove the cleat from the template first.

These notches form a small tab on the ends of the shelves. I didn't want this tab to extend all the way to the back of the end support. So I trimmed part of it off (*Shelf Notch Detail*, page 42). This left a 1"-long tab. While I was at it, I also rounded the front corners of the shelves.

CLEATS. The knock-down shelf is nearly done except for a couple of small details. To prevent the shelf from racking, there's a plywood cleat (D) attached to the back of each shelf *(Figs. 3* and *3a)*.

Cut the cleats to fit between the mounting strips, then screw them in place. Finally, ease the edges where the notches interlock (see *Tip*, right margin).

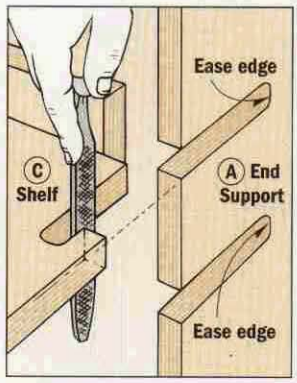
MOUNTING THE UNIT

Now you're ready to mount the shelf to the wall. The goal here is to make sure both end supports are plumb and parallel with each other. This becomes easier with the adjustable shelves in place. Let me explain.

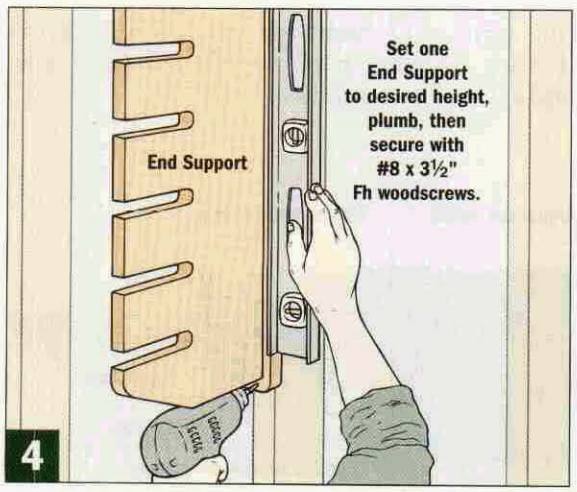
Start by mounting one of the end supports to the wall, as shown in *Figure 4*. Next, position the other end support at the same height and slide the shelves into the top and bottom notches. This will "lock" the ends of the shelf together but still allow you to reposition the unattached end support if necessary.

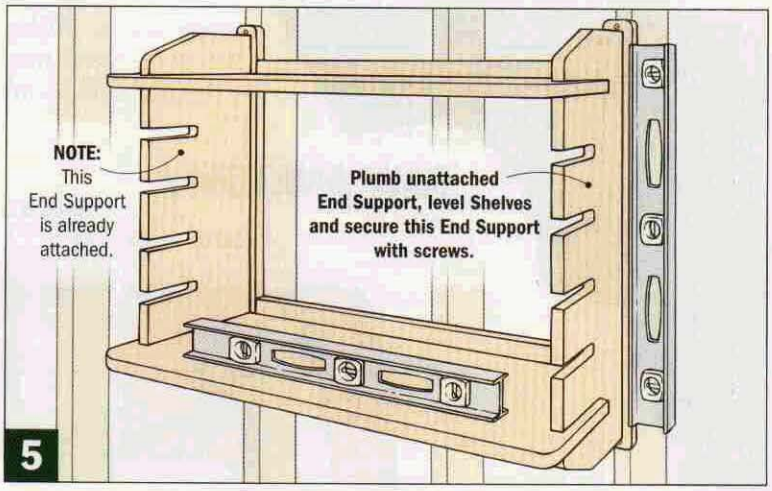
Then use a couple of levels to make sure the second end support is plumb and the shelves level, as shown in *Figure 5*. Once you're satisfied that everything is positioned exactly how you want it, screw the second mounting strip in place.

You now have an attractive, sturdy knock-down shelf for a kid's room or anywhere else you need storage space.



TIP: A small mill file works well to ease the edges of the notches. This allows the shelves to slide into position easier.





Reciprocating Saw Savvy

A reciprocating saw tops the list of tools for many home remodeling jobs. With a little know-how, the right blade, and a little practice, you can learn to use it like a pro.

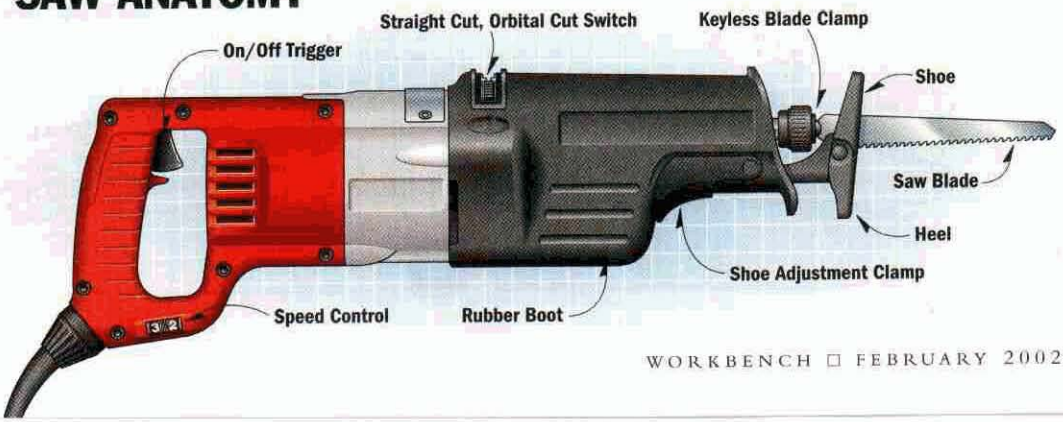
Tear it down, then build it up again. That's the name of the game with many remodeling projects.

And if a job *does* require demolition, there's one tool that stands out above the rest— a reciprocating saw. With its agressive cutting capabilities, a reciprocating saw is definitely the meat-eater at the top of the food chain.

This makes it easy to enlarge a window opening, remove a wall, or cut through plumbing pipes in a hurry. (A friend of mine even uses his 'recip' saw to cut tree roots.)

Although it's an extremely versatile tool, a reciprocating saw can be intimidating to use. If the blade binds or the saw bucks in the middle of a cut, it will give you a bone-jarring jolt. And if the saw blade wanders off course, it can chew into material you never even intended to cut.

SAW ANATOMY



But there's no reason that a recip saw has to be a 'wild child.' With a basic understanding of the tool, the right saw blade (see sidebar below), and the proper cutting techniques, it's quite possible to make controlled, accurate cuts.

SAW ANATOMY. To get a close look at the business end of a recip saw, look at the drawing on page 44. The *saw blade* is held securely by a *clamp*. Since replacing bent or broken blades is a frequent occurrence, I'd recommend buying (or renting) a recip saw with a "tool-less" blade change like the one shown here.

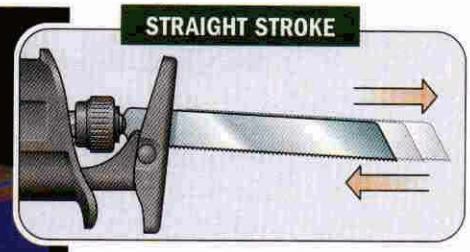
The *shoe* of the saw is used to brace it against the workpiece during a cut. To control the depth of cut, the shoe on most saws can be adjusted in and out. An adjustable shoe also makes it possible to distribute wear on the blade evenly.

To protect the saw from dirt and moisture (and to provide a comfortable grip), there's a rubber *boot* molded around the front of the saw. Holding the boot firmly with one hand and the large, D-shaped handle with the other provides excellent control, even when making a heavy cut.

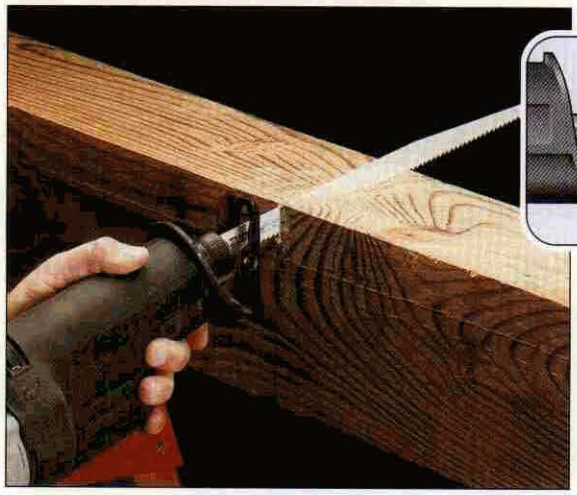
BLADE SPEED. Another thing that affects the control of cut is the *blade speed* — the number of blade strokes per minute. This can range from 0-3200 strokes per minute, depending on the model you have.

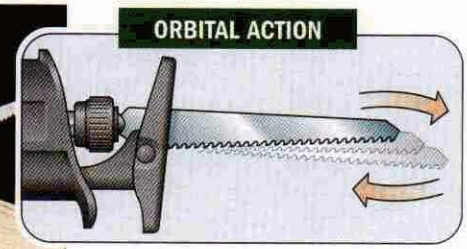
The blade speed can be adjusted either by means of a variable speed trigger, or a separate control. A light touch on the trigger produces a slow reciprocating motion. Pressing harder increases the blade speed *and* the aggressiveness of cut.

STRAIGHT OR ORBITAL? In addition to blade speed, another consideration is the cutting motion of the saw blade. The back and forth, *straight stroke* is what gives the recip saw its name. On some models, you can also switch to an *orbital* cutting action. Select the one that's best suited to the job at hand and the material you're cutting. See photos above.



The straight, back and forth stroke is the basic cutting action for reciprocating saws. It's the only safe option when cutting metal. You can also use it for general purpose demolition if you switch to a blade with 3-6 teeth per inch.





An orbital cutting action produces a slightly circular motion as the blade moves back and forth. This pulls the blade through the material, producing a more aggressive cut as with the beam shown here.

SELECTING THE RIGHT SAW BLADE

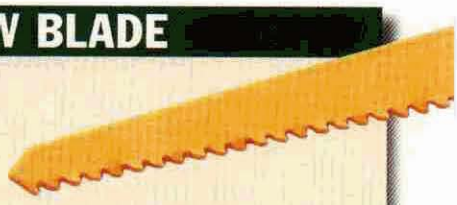
To get top-notch performance from a 'recip' saw, it's important to select the correct saw blade. Here are a few guidelines that will make that a snap.

MATERIAL. First, choose a blade that's suited to the material you're cutting. Wood- and metal-cutting blades (upper two photos) are the most common. A blade embedded with carbide grit (lower photo) is ideal for ceramic tile, cement board, and fiberglass.

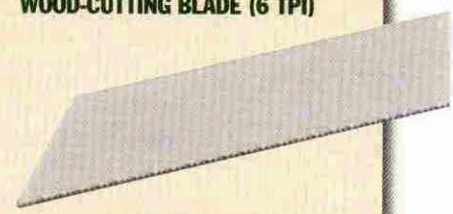
BI-METAL. Most blades are made of two types of metal. These *bi-metal* blades have extremely hard steel teeth for durability. To allow the blade to bend when cutting in hard-to-reach places, the teeth are welded onto a more flexible steel body.

SIZE. Another consideration is the *size* of blade. They range in length from 3" to 12" long. Use a short blade for plunge cuts and longer blades to increase the depth of cut. As for width, the wider the blade, the easier it is to make a straight cut.

TPI. One final thing to keep in mind is the number of *teeth per inch* (TPI). Blades range from 3-18 TPI. The fewer TPI, the more aggressive (and ragged) the cut. A higher TPI delivers smoother cuts.



GENERAL PURPOSE WOOD-CUTTING BLADE (6 TPI)



FINE-TOOTH, METAL-CUTTING BLADE (18 TPI)

CARBIDE-GRIT BLADE FOR TILE, CEMENT BOARD, & FIBERGLASS

Basic Cutting Techniques

MAKING FLUSH CUTS

When trimming one part of a project flush with another, no other power tool can handle the job like a reciprocating saw. Figure 1 shows a good example — cutting the end of a deck beam flush with the post.

USE THE SHOE. To get the best results when making a flush cut (or any cut for that matter), the first and foremost rule is to *use the shoe*. This is the small metal plate at the nose of the saw. (It's small so you can cut in close quarters.)

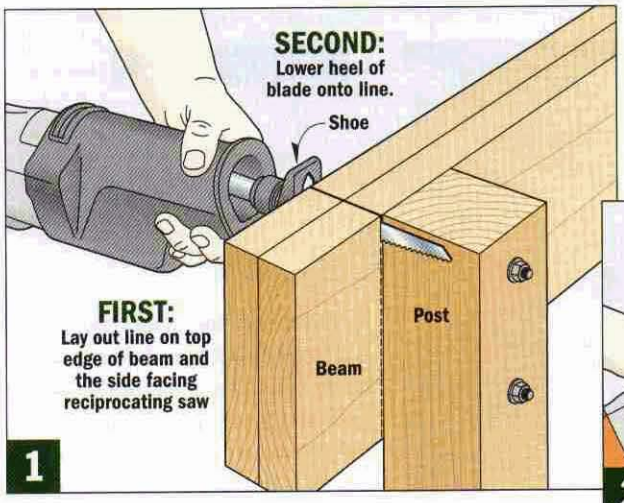
In spite of its size, the shoe has an important job. By bracing it against the workpiece *(Fig. 1)*, the shoe provides the primary means of making a controlled, accurate cut.

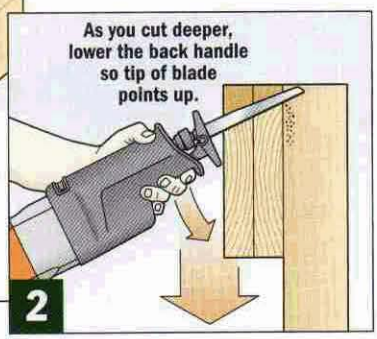
To start the cut, you'll want to use a *slow* cutting speed, so press the trigger gently. Then slowly lower the *heel* of the blade down onto the layout line.

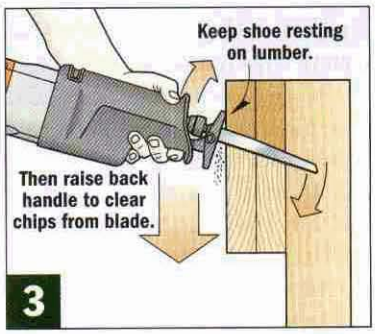
As you cut deeper and bury the blade in the wood, dust and chips can clog the gullets between the teeth on the blade. This will cause the blade to heat up. When that happens, the blade won't cut as efficiently as it should.

An easy way to clear the chips is to rock the saw up and down as you cut. To do this, lower the back handle so the tip of the blade points up *(Fig. 2)*. Then raise the back handle so the tip points downward *(Fig. 3)*.

As you do this, remember to keep the shoe against the workpiece. If you pull it away so only the tip of the blade is cutting, the blade may drift off course.







STRAIGHT, ACCURATE CUTS

A reciprocating saw isn't a precision tool, but it *is* possible to get a relatively straight, accurate cut.

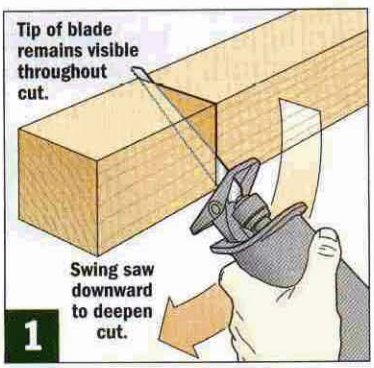
The key is to cut with the *widest* part of the blade. Unlike the narrow tip, it won't deflect and cause the blade to veer off track.

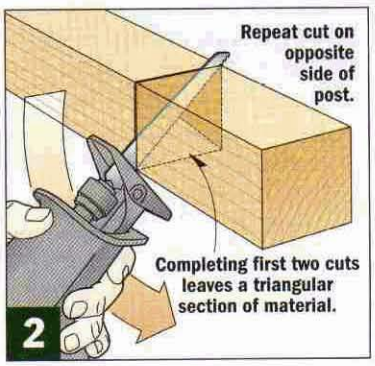
A look at Figure 1 shows how to make a straight crosscut in a 4x4 post. Start by lowering the handle of the saw so the blade is at an angle and the tip points up.

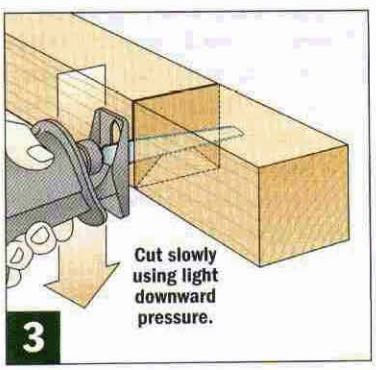
Now turn on the saw and ease the heel of the blade into the upper corner of the post nearest to the saw. As you cut deeper, imagine an invisible pivot point at the tip of the blade that "locks" it in place at the opposite upper corner. With that in mind, continue cutting, swinging the saw around the pivot point.

Once the heel of the blade has cut down to the lower front corner, stop the saw. Then repeat the process on the opposite side *(Fig. 2)*.

After completing both cuts, a triangular section of material is all that's left holding the post together *(Fig. 2)*. To remove this material, hold the saw so the blade is horizontal, and use light downward pressure cutting slowly and steadily *(Fig. 3)*.





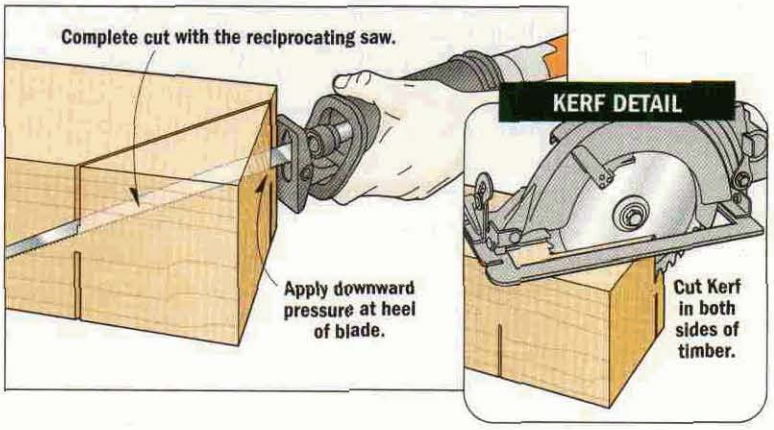


Quick 'Recip' Tips

COMPLETING LONG, DEEP CUTS

A standard ($7^1/_4$") circular saw can't cut all the way through the thickness of a large beam or timber. It's possible to do that by mounting a long blade in a reciprocating saw. But a long blade vibrates quite a bit, so it has a frustrating tendency to veer off course.

To establish a straight line, I use a circular saw to cut a kerf in each side of the timber *(Kerf Detail)*. The kerfs serve as guides for the reciprocating saw blade. Just slip the blade into the kerf, and start the cut with the heel of the blade. Then make a slow, deliberate cut as you slice through the remaining thin section of material.

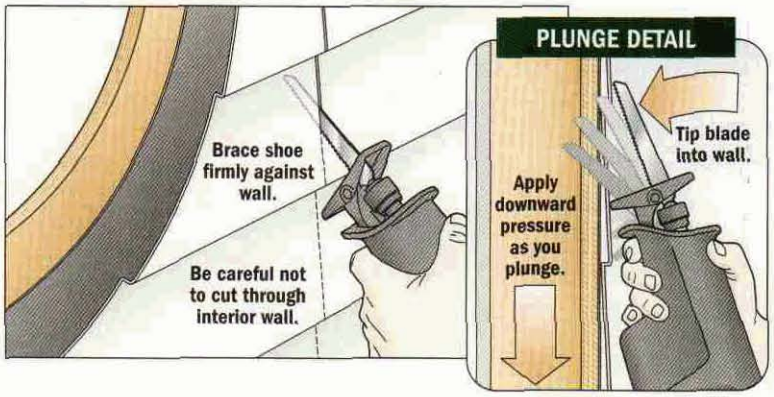


TAKING THE PLUNGE

With its saber-style blade, a reciprocating saw is well-suited to making a plunge cut into a surface like a wall that's made up of several layers of material.

SHORT BLADE. For best results, mount a *short* blade in the saw. A long blade is likely to bend or break as the tip strikes against the wall.

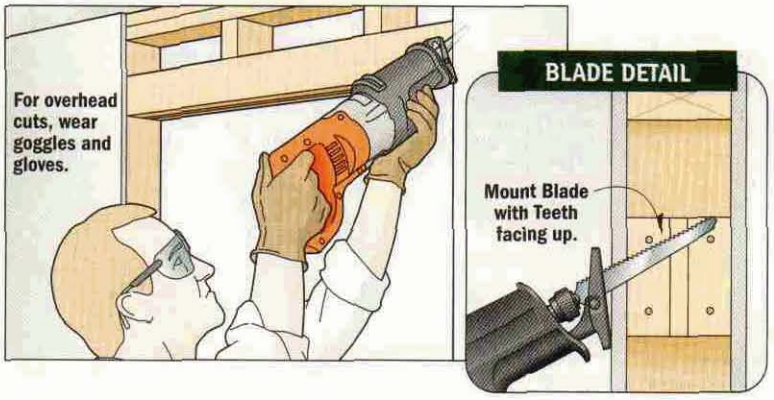
SLOW & EASY. To avoid kickback, start with a *slow* speed and *gradually* raise the saw handle. As the tip of the blade begins to cut into the wall, press down on the saw until it cuts through *(Plunge Detail)*.



REVERSE BLADE FOR OVERHEAD CUTS

A reciprocating saw will allow you to get in over your head, and I mean that in a good way. Simply by reversing the blade, you'll be surprised at how much easier it is to handle the saw when making cuts overhead.

As shown at right, mounting the blade upside down (so the teeth face up) lets you hold the saw in the same comfortable fashion as when making any other cut. Although the blade is oriented differently, all of the same rules apply. Note: It's especially important to wear goggles and gloves when making overhead cuts.

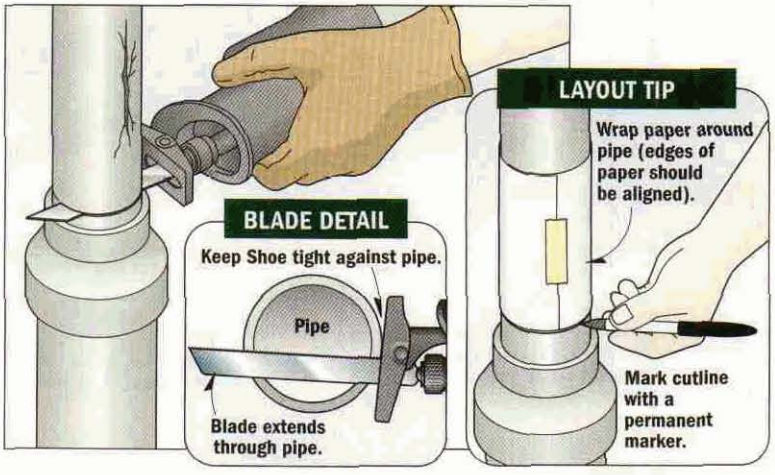


"MUSTS" FOR CUTTING METAL PIPE

Cutting metal pipe with a reciprocating saw is so fast and easy, you just might retire your hack saw for good.

The tip shown at right will help to mark an accurate layout line around the pipe. Then mount a metal-cutting blade that's long enough to extend all the way through the pipe — even on its back stroke *(Blade Detail)*. Otherwise, the tip of the blade can hit the pipe on the return stroke and bend the blade.

Keep in mind that metal can grab the blade and make the saw lurch. To prevent this, it's doubly important to hold the shoe firmly against he pipe. As the blade enters the pipe, bring the saw up to speed gradually, moving the blade *slowly* through the pipe as you cut.



Demolition Do's and Don'ts

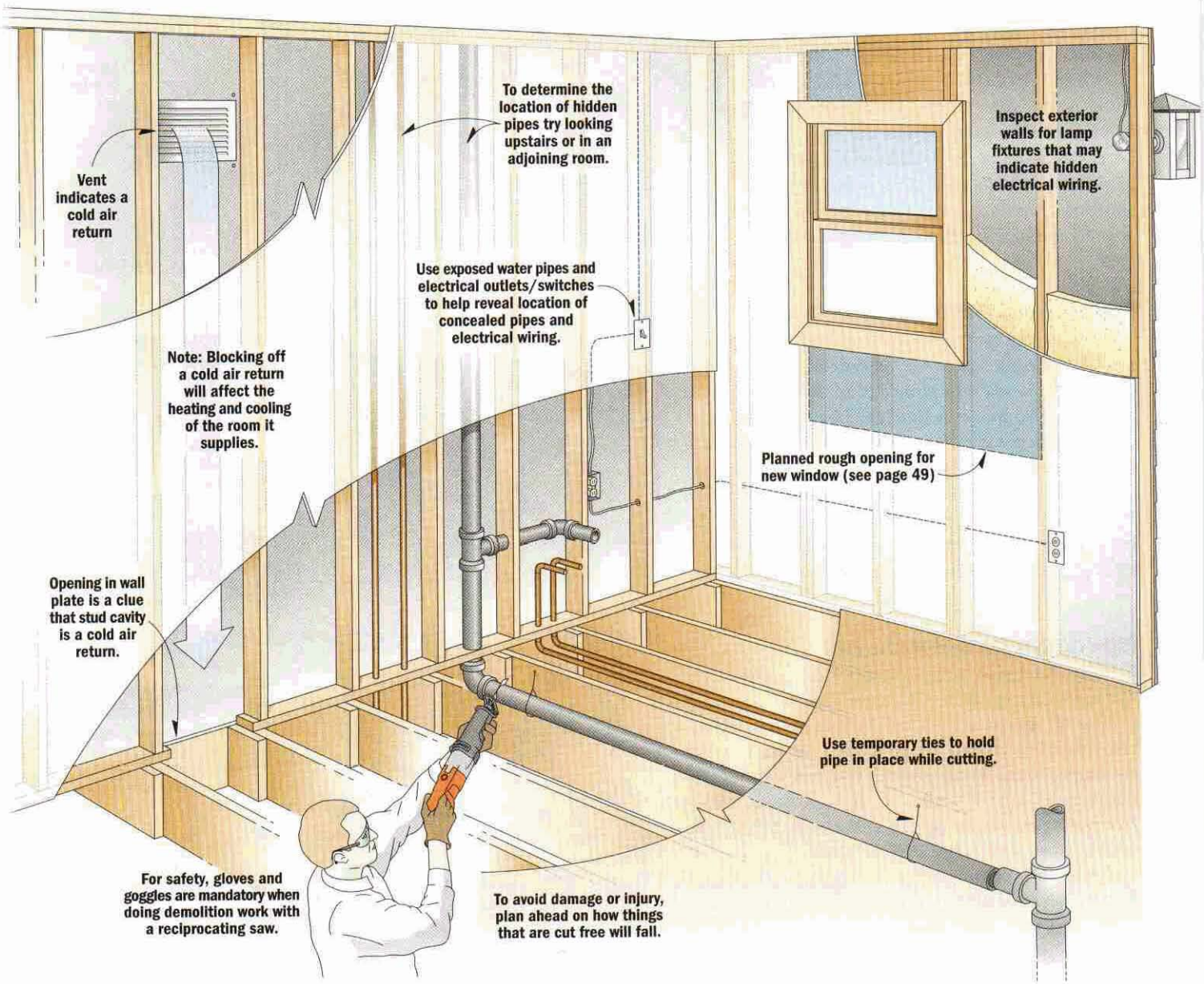
A reciprocating saw is an indispensable tool when it comes to a remodeling project that requires cutting into a wall. But before making the first cut, it's important to be aware of any potential dangers hidden inside.

SAFETY CHECK. A quick check to see whether there are any electrical outlets, switches, or pipes will provide some obvious clues as to what's inside the wall. And don't forget to inspect the *opposite* side as well. You definitely don't want to cut into any electrical wires or plumbing pipes.

COLD AIR RETURN. Another potential problem area that's easy to overlook is a cold air return. It's defined by a vent and an opening in the bottom plate of the wall (see drawing below). Aside from that, it's nothing more than a cavity formed by the drywall and studs. If you block the return, the room won't heat or cool properly.

THE FALLING FACTOR. One more thing to keep in mind is how something will fall when you cut it free. The pipe in the drawing below is a good example. Notice that it's temporarily held in place with wire ties so it won't fall and cause damage or injury when it's cut loose.

TURN OFF POWER. Once you've determined all the obstacles, be sure to turn off the power to that part of the house before cutting into the wall. The step-by-step instructions on the next page will explain a typical job of enlarging a window opening.

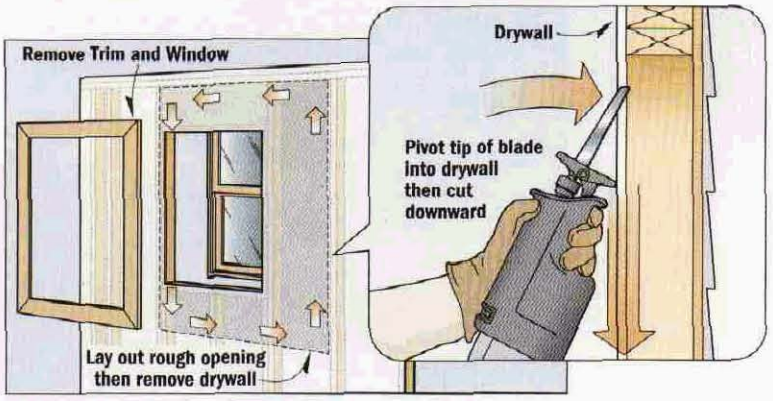


Enlarging a Window Opening

1 CUT & REMOVE DRYWALL

Using a reciprocating saw makes it easy to enlarge a window opening. The first step is to make a plunge cut in the drywall and then around the layout lines for the rough opening (drawings at right).

To avoid cutting too deeply, mount a 5"-long blade and hold the saw at a steep angle with the shoe resting on the wall. Then, using a slow blade speed, rock the saw forward until the tip of the blade slices into the drywall. Increase the speed as you cut downward. (There's almost no resistance.) When cutting across the wall, you'll feel a 'tick' as the blade scores the studs.

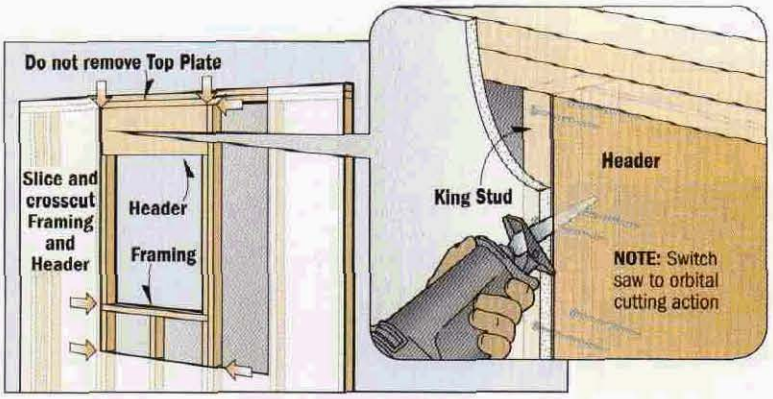


2 SLICE THROUGH WALL FRAMING

With the drywall removed, the reciprocating saw will make quick work of slicing through the wall framing that needs to be removed.

With the saw turned *off*, insert the tip of the blade into the widest gap you can find. (The gap between the header and king stud is a good bet.) To prevent the blade from getting jammed up, use a *fast* cutting speed and then cut down through the crevice *very slowly*, clipping through the nails as you work (see detail).

As for the studs at the bottom of the opening, mark a line, then pivot the saw sideways as you cut them free.

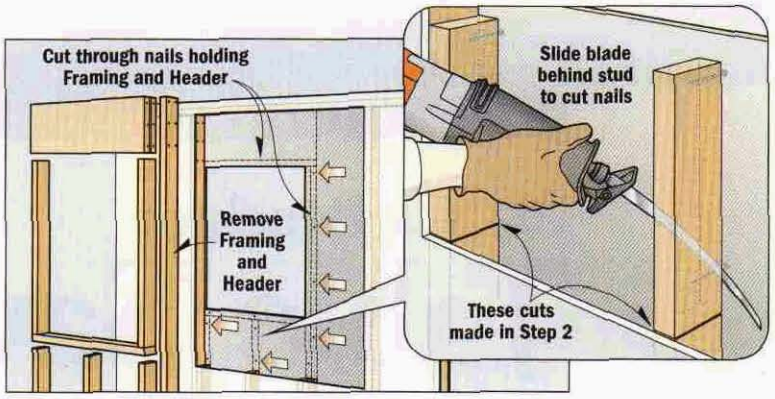


3 "SKIN" FRAMING LOOSE FROM SHEATHING

At this point, the framing is still attached to the exterior wall sheathing and siding. But it only takes a few minutes to cut it loose.

To do this, mount a 12"-long blade in the saw and then slide it between the wall stud and the sheathing, as shown in the detail. Notice that you'll have to bend the blade a bit to get it behind the stud.

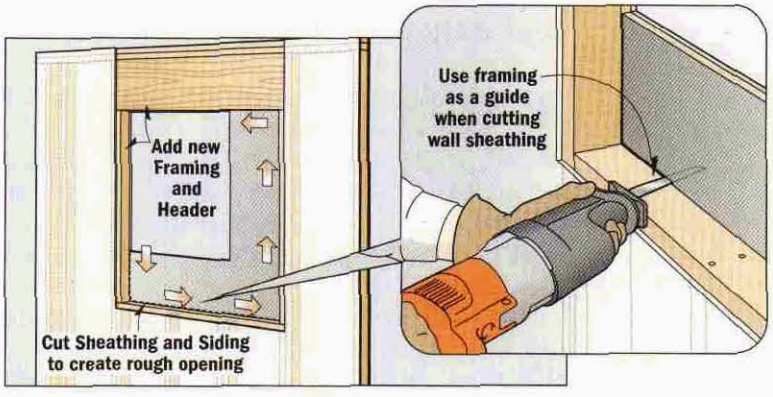
Be careful here as you start the cut. If the blade gets pinched, the saw can kick back. So get a firm grip, and then just as before, use a fast-cutting speed as you cut through the nails and "skin" the framing loose.

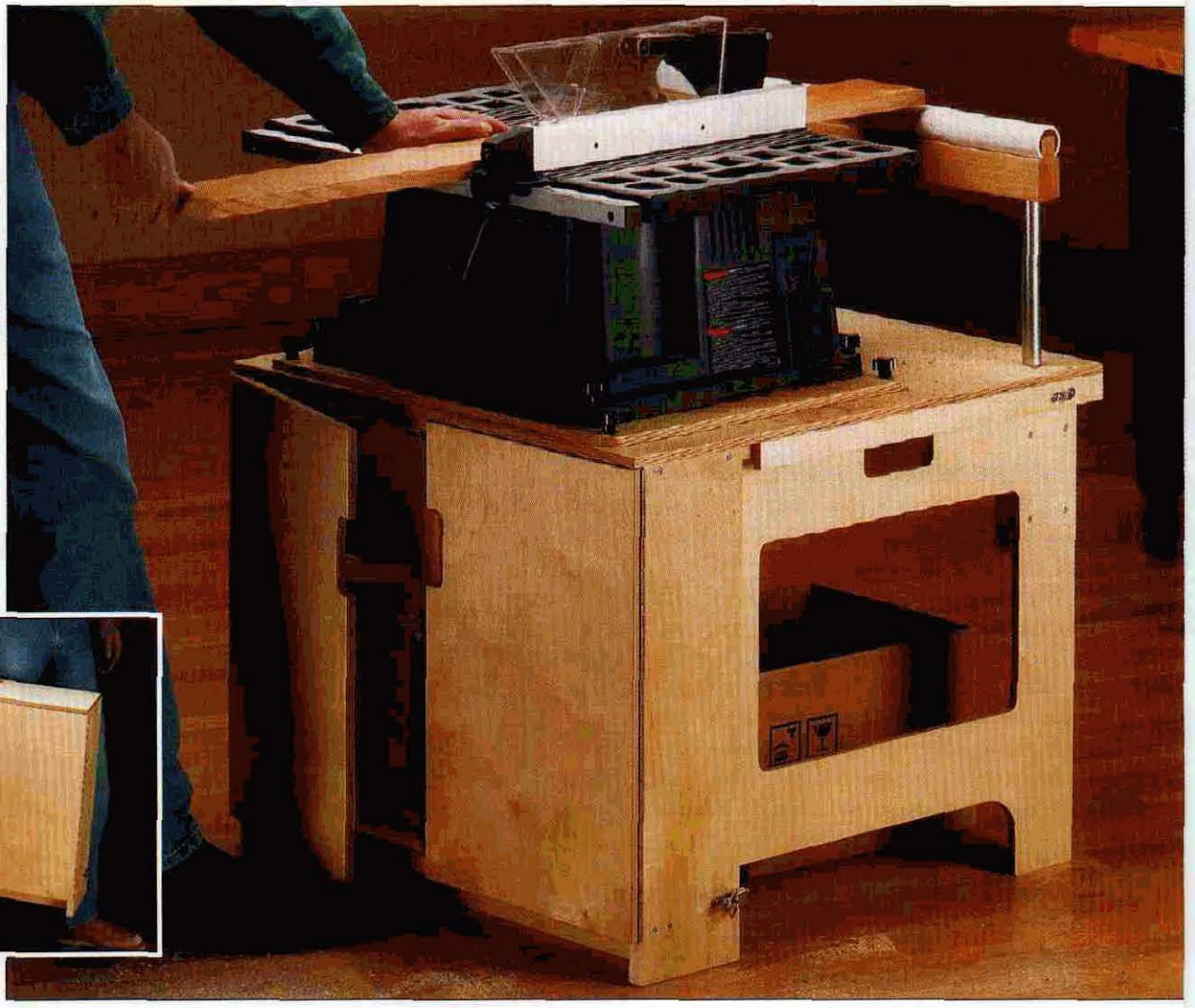


4 CUT SHEATHING & SIDING

To complete the rough opening, there are two layers of material that still need to be removed — the wall sheathing and the exterior siding. But first, you'll need to frame the new opening (see drawing at right). The framing can be used as a guide which makes it easy to accurately cut the sheathing and siding.

To do this, set the flat part of the blade on the framing (see detail). Then, using the shoe for support, pivot the blade into the sheathing and cut all the way around the rough opening. Just keep a watchful eye that the blade doesn't chew up the new framing.





▼ **This table saw station folds into an easy-to-carry, compact case.**

Build a Benchtop Table Saw Station

This benchtop table saw station sets up quickly, folds for compact storage and easy carrying, and even includes a compartment for accessories.

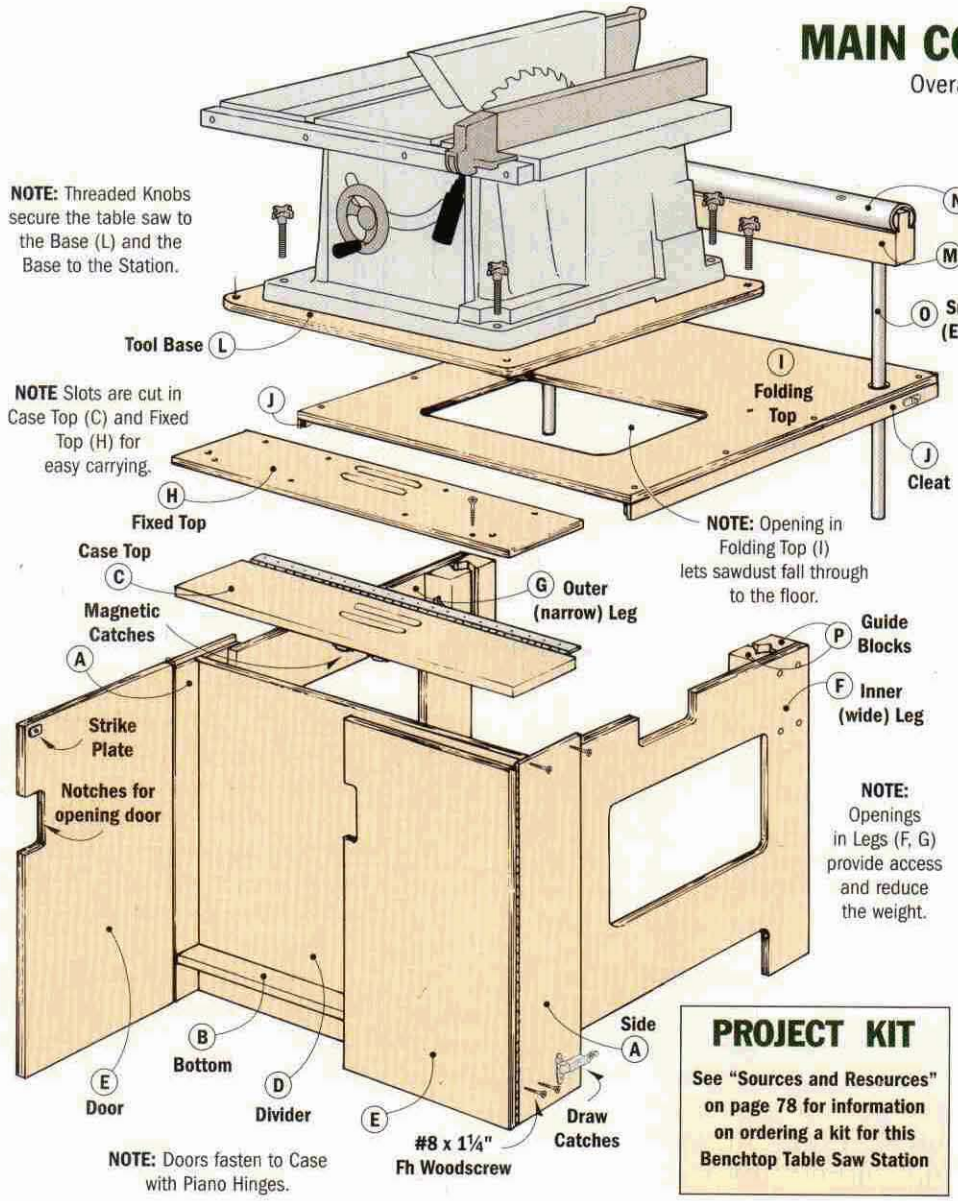
Dragging around a pair of saw horses and a platform to set up a benchtop table saw can be a pain. Of course, you can always buy a manufactured stand. But chances are, a good one is going to be a bit pricey.

So I built my own benchtop table saw station (shown above). Now I have a portable, sturdy support to use in the shop, the driveway, even the back yard. Plus, I was able to add some features I didn't find in the store-bought stands. First, there's a cabinet in the case for accessories. Another thing you'll like is the outfeed support. With the relatively small size of the table on many benchtop table saws, it's a big plus when cutting long boards.

But the neatest thing about this table saw station is how quickly it knocks down for easy moving and storage. The whole station can be folded up into its case and carried like a large suitcase (see the small inset photo above). And no matter where you're working, setup only takes a minute (see *Simple Setup Sequence* on page 51).

MAIN CONSTRUCTION VIEW

Overall Dimensions: 28"W x 31¼"D x 24"T
(without Tool Base and Table Saw)



WORKBENCH ONLINE

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Free cutting diagram for Benchtop Table Saw Station

PROJECT KIT

See "Sources and Resources" on page 78 for information on ordering a kit for this Benchtop Table Saw Station

MATERIALS

TABLE SAW STATION

A	(2)	Sides (Maple)	¾" x 6¼" x 23½"
B	(1)	Bottom (Maple)	¾" x 21½" x 27"
C	(1)	Case Top (Maple)	¾" x 7⅜" x 27"
D	(1)	Divider (Ply)	½" x 23" x 27"
E	(2)	Doors (Ply)	½" x 13 15/16" x 21⅜"
F	(1)	Inner (wide) Leg (Ply)	½" x 25½" x 22⅝"
G	(1)	Outer (narrow) Leg (Ply)	½" x 24" x 22⅝"
H	(1)	Fixed Top (Ply)	½" x 8" x 28"
I	(1)	Folding Top (Ply)	½" x 23¼" x 28"
J	(2)	Cleats (Maple)	¾" x 1¼" x 23¼"
K	(2)	Keeper Blocks (Maple)	1¼" x 1½" x 6"
L	(1)	Tool Base (Ply)	½" x 20" x 24"

OUTFEED SUPPORT

M	(1)	Crossbar (Maple)	1½" x 3" x 26¼"
N	(1)	Cover (PVC)	1¼" x 26¼"
O	(2)	Support Tubes (Conduit)	¾" I.D. x 17½"
P	(4)	Guide Blocks (Maple)	1½" x 1½" x 7"

HARDWARE* (Order a kit on page 78)

(42) #8 x 1¼" Fh Woodscrews
(10) 5/16" x 1½" Threaded Knobs
(8) 5/16" T-Nuts
(2) Magnetic Catches/Strike Plates w/Screws
(2) 5/16"-18 x ⅝" Threaded Inserts
(2) 2⅝" x 1⅝" Draw Catches w/Screws
(3) 1 1/16 x 48" Piano Hinges**

* See page 57 for accessories hardware
** Cut to fit (2 at 21¼", 2 at 18½", 1 at 27")

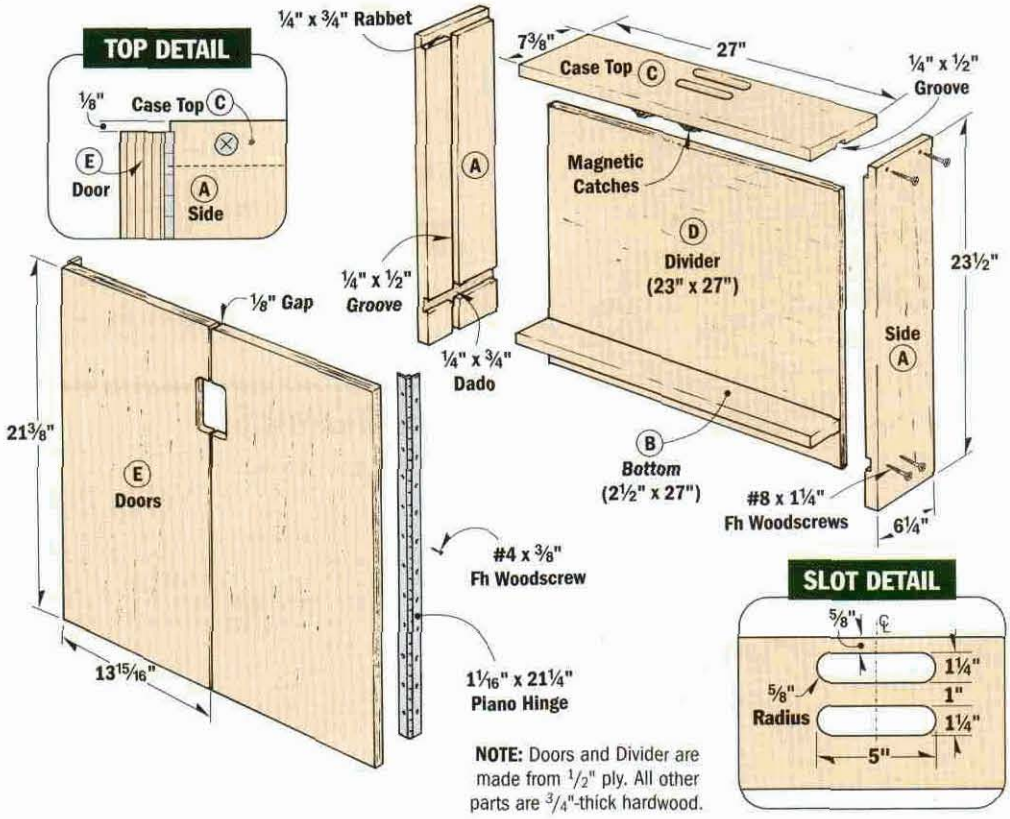
SIMPLE SETUP SEQUENCE

▲ **To set up the table saw station, start by unlatching the folding top and then lifting it into the open position.**

▲ **Next, swing out the folding legs from inside the case until they "lock" firmly into place underneath the top.**

▲ **Now position the tool base so that the holes align and tighten the threaded knobs to secure the table saw to the station.**

CASE ASSEMBLY



I began building the table saw station by making the case. As you can see above, it's divided into two compartments. The side enclosed by the doors forms shallow storage for table saw accessories. The other side, which is deeper, houses the legs when they're folded inside.

The case consists of two tall sides (A), a narrow bottom piece (B), and a top (C) with two handholds. All of these pieces are made from ¾"-thick maple. There's also a ½" plywood divider (D) that forms the two compartments.

BASIC JOINERY

I wanted the case to be sturdy, yet simple to construct. So it's assembled with a combination of rabbet and dado joints.

RABBETS. To hold the top of the case, the sides are rabbeted along the top edges. An easy way to cut these rabbets is with a ¾" dado blade and an auxiliary fence. Then use the miter gauge on the table saw to guide the workpiece through the cut *(Figs. 1 and 1a)*.

DADOES. Besides the rabbets in the upper ends, there's also a dado near the lower end of each side to hold the bottom. The location of this dado determines the height of the cabinet for the accessories. I wanted the outfeed support to fit in the space between the bottom and the top of the case, so I laid out the location of the dadoes as shown in *Figures 2* and *2a*.

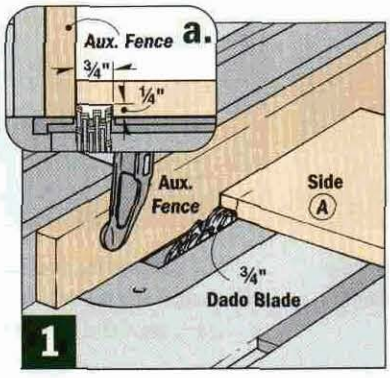
To cut the dadoes, adjust the width of the blade to match the thickness of the bottom piece (¾"). Then dado each side (see *Figs. 2* and *2a*).

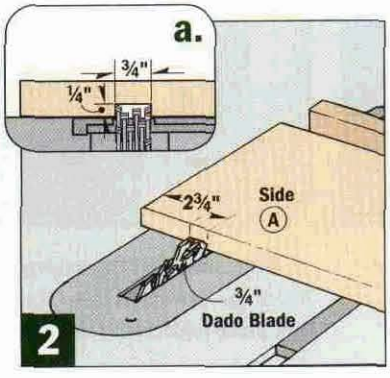
GROOVES. To complete the sides, you'll need to cut a groove in each piece to hold the plywood divider. As I mentioned, the divider forms two different-size compartments — a shallow one in front, and a deeper one in back. This means the groove that holds the divider has to be located closer to the *front* edge of the sides.

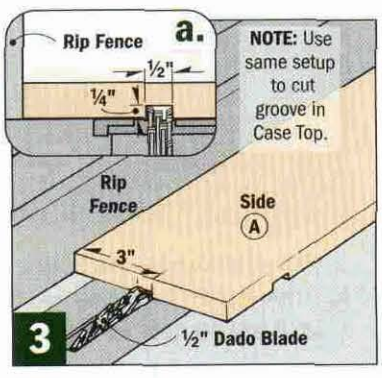
So with the front edge of the side riding against the rip fence, cut the grooves, as shown in *Figures 3* and *3a*. Now you can move on to the case top.

CASE TOP. The top of the case fits flush with the front edge of the sides (see *Top Detail* above). But it extends beyond the back of the case so that you can hinge the folding top to it later on.

The only joinery needed in the top is a groove to hold the divider. Cutting the groove is a snap since your saw is still set up for the same pass that was made on the case sides. Again, to properly position the groove, make the cut with the front edge of the case top riding against the rip fence.



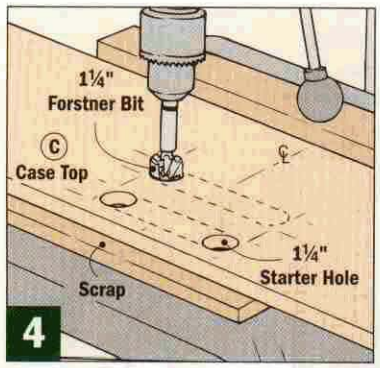


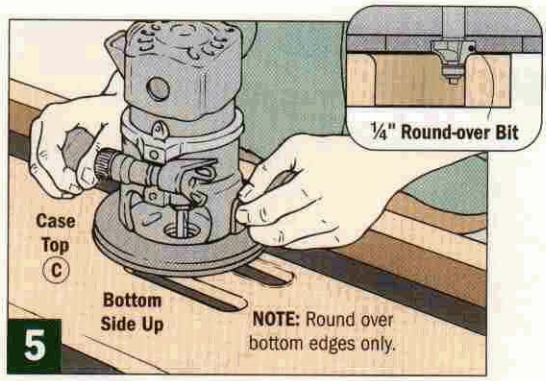


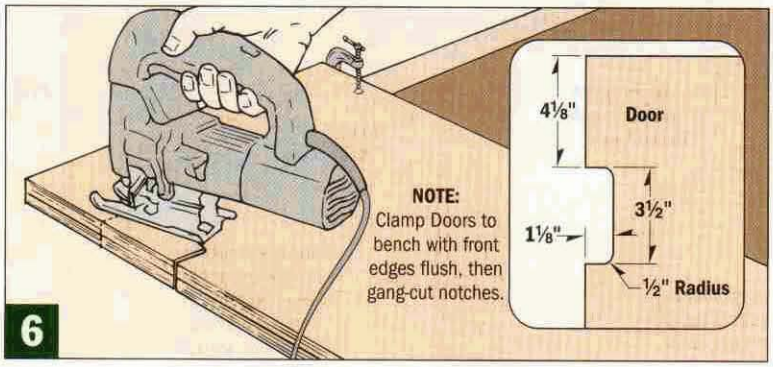
The top of the case has two slots that form a handle (see *Slot Detail*, page 52). An easy way to make these slots is with a Forstner bit and a jig saw. The Forstner bit provides a cleaner edge than a straight bit.

First lay out the slots and drill starter holes in the ends with the Forstner bit, as shown in *Figure 4*. Next, remove the waste with the jig saw. To make it easier on my hands, I also rounded over the bottom edges of the slots, as shown in *Figure 5*. Don't worry about the top edges. The fixed top (added later) will cover them up.

ASSEMBLY. Putting the case together is pretty straightforward. The divider is glued into the grooves in the top, and screwed to the bottom. The sides are glued and screwed to the top and bottom.







ADDING THE DOORS

Two plywood doors (E) will complete the case. The critical element with the doors is to size them to fit flush with the sides and bottom of the case, leaving an $\frac{1}{8}$" gap between the doors. To prevent the doors from binding, they sit $\frac{1}{8}$" below the case top (see *Top Detail*, page 52).

To make it easy to open the doors, I made a notched opening in each door panel. A quick way to do this is to gang-cut the notches with a jig saw, as shown in *Figure 6*. Now ease the edges of the doors with a sanding block to keep them from splintering.

HINGING THE DOORS. The next step is to fasten the two doors to the case and add some hardware. I used a piano hinge to attach each door to the case side. (See the sidebar below for a couple of tips for marking and drilling perfectly aligned pilot holes when using piano hinges.)

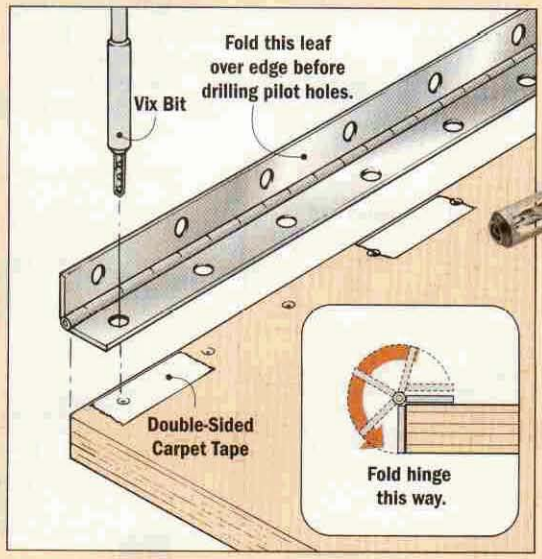
Finally, to hold the doors closed, I added a pair of magnetic catches and strike plates.

TIPS FOR INSTALLING PIANO HINGES

One of the biggest concerns of using a piano hinge is aligning it so that the door doesn't bind. Another problem you run into is centering all of the mounting holes. Here are a couple of tips to make installing piano hinges easier.

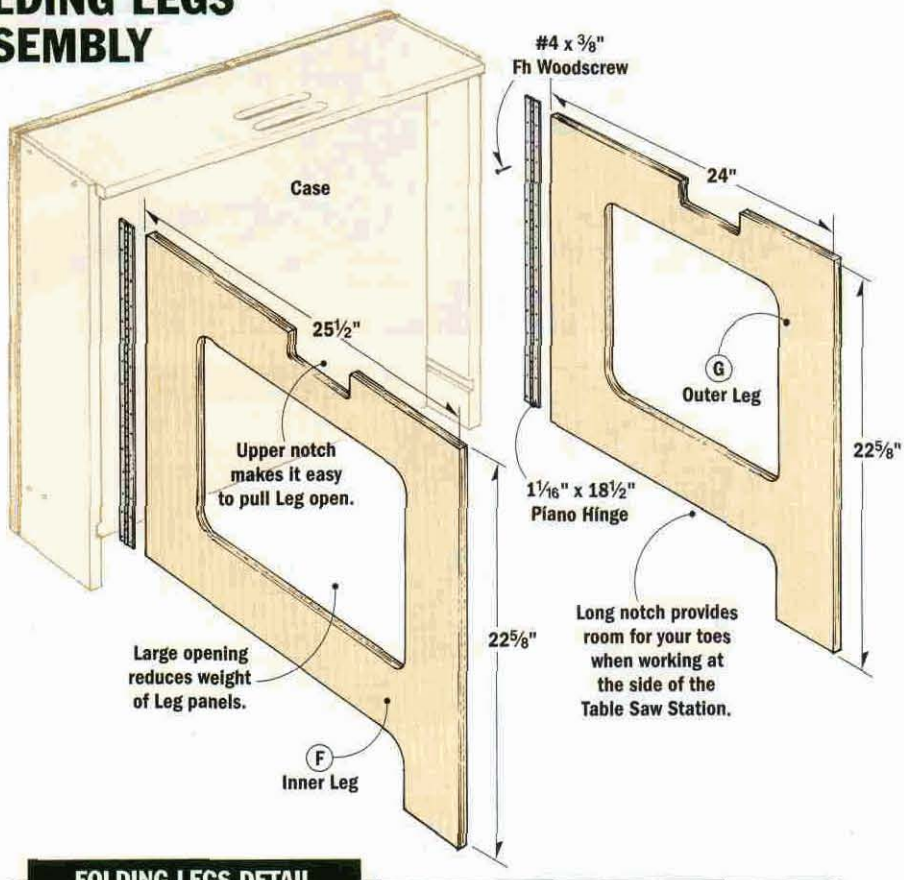
HINGE ALIGNMENT. A simple folding trick works well to position both leaves of the hinge. To start, run a few pieces of double-sided tape along the edge where you're going to position one leaf of the hinge. Then fold the other leaf over the edge (see Detail). This automatically positions the barrel of the hinge in the correct location.

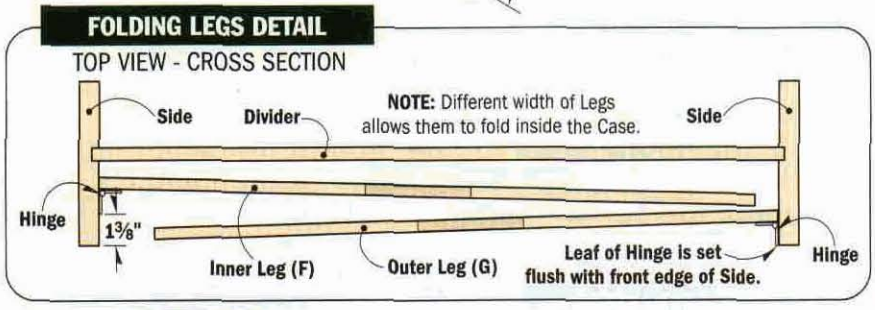
DRILLING PILOT HOLES. The best way I found to drill centered pilot holes is with a self-centering (Vix) bit. So with the hinge folded over the edge, drill the first set of pilot holes. Then remove the hinge and repeat the procedure with the other workpiece. This creates perfectly centered and aligned holes in both pieces.



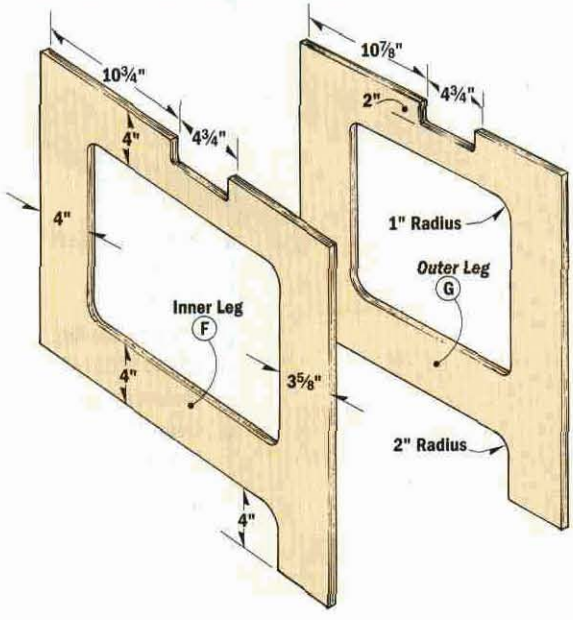
▲ **As you insert this bit, the beveled end centers the tip of the bit in the mounting hole. Sources: Rockler, 1-800-279-4441; and Garrett Wade, 1-800-221-2942.**

FOLDING LEGS ASSEMBLY

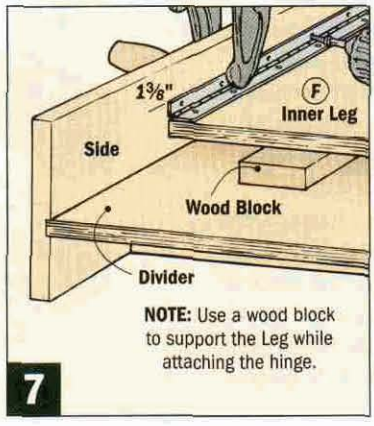




LEG CONSTRUCTION



NOTE: The dimension of the notch in the top of each Leg provides clearance for your hand when carrying the case. After cutting all the notches, sand any rough edges smooth.



FOLDING LEGS

The top of the station is supported by two large, swing-out legs. At a glance, these legs look alike. But there's an important difference.

As you can see in the drawing at left, the inner leg (F) is 1½" *wider* than the outer leg (G). This lets you fold both legs, one over the top of the other, and tuck them inside the case. Each leg has a large opening that reduces the weight of the station (*Folding Legs Assembly*). It also provides access for the outfeed support (more on this later).

In addition to the opening, I cut two notches in each leg. A notch in the top edge makes it easy to reach inside the case and grab the leg *(Leg Construction)*. It also provides clearance for your hand when carrying the case. Plus, a long notch in the bottom edge provides toe-room so you can work around the station without accidentally kicking the leg.

INSTALL HINGES. After completing the notches, the next step is to hinge the legs to the case.

I started with the inner leg. If you look at the *Folding Legs Detail*, you can see that the hinge for this leg is set back 1⅜" from the front edge of the case side. This setback provides the room inside the case that's needed for the legs to fold flat.

An easy way to install this hinge is to first clamp it to the case *(Fig. 7)*. Then use a block to support the leg while screwing the hinge in place.

Now you can attach the outer leg. The hinge for this leg is flush with the front edge of the side.

FIXED & FOLDING TOPS

The top of this station is made up of two ½" plywood pieces that provide a mounting surface for the table saw. A large *folding top* swings up and down for compact storage. And there's a smaller *fixed top* that provides additional support.

FIXED TOP. I started by cutting the fixed top (H) to size *(Two-Part Top)*. Like the top of the case itself, the fixed top has two slots that serve as a handhold. To lay out these slots, I used the existing slots in the case

top as a template. To do this, position the fixed top flush with the overhanging edge of the case top. Then, from underneath, mark the location of the slots on the fixed top.

After roughing out the slots, screw the fixed top to the case. Now it's just a matter of trimming the slots flush with the ones underneath. To do this, I used a handheld router and a flush trim bit *(Figs. 8 and 8a)*. Then I routed a roundover on the top edges *(Fig. 8b)*.

FOLDING TOP. Now it's time to turn your attention to the folding top (I). It's a large plywood panel with an opening cut in it for sawdust to fall through *(Two-Part Top)*. While you're at it, it's easiest to drill two holes near the outer edge of the top now for the outfeed support that's added later.

The next step is to hinge the folding top to the case. I found it's easier to do this with the case turned upside down *(Fig. 9)*. This ensures that the two parts of the top will be flush with each other to create a flat mounting surface.

CLEATS. To complete the folding top, I added two cleats (J). These $^3/_4$"-thick maple strips provide a mounting surface for the catches used to secure the folding top to the case (see upper photo at right).

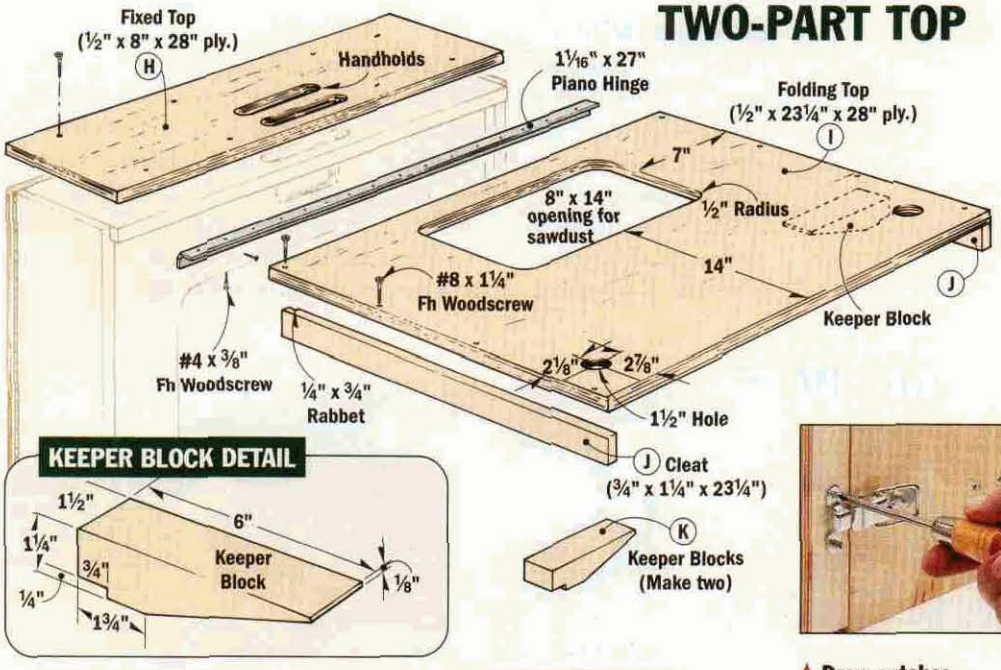
One thing to note is that each cleat is rabbeted on the end *closest* to the hinge (see *Rabbet Detail*). This rabbet prevents the cleat from hitting the case when you lower the top.

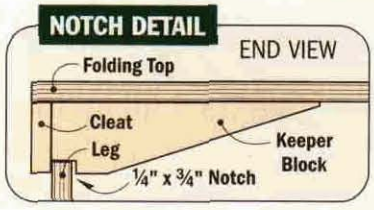
KEEPER BLOCKS. After screwing the cleats in place, I added two wedge-shaped keeper blocks (K) underneath the folding top *(Keeper Block Detail)*. These blocks "lock" the legs in the open position.

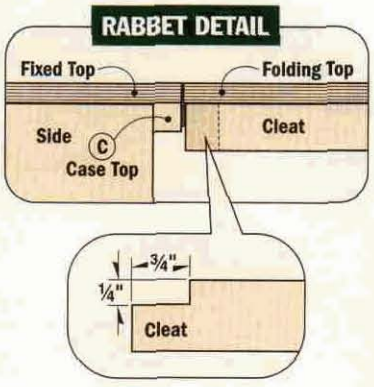
To make this work, there's a notch in the thick end of these blocks *(Notch Detail)*. The purpose of this notch is simple. When you swing a leg open, the top edge slides along the ramp formed by the tapered block and then "clicks" into the notch (lower photo at right). This "locks" the leg in the open position.

To make each keeper block, rabbet one end of a $1^1/_2$"-thick piece to form the notch. Then use a band saw (or jig saw) to cut it into the shape of a wedge. After sanding it smooth, position the thick end of the block against the cleat and glue it in place *(Fig. 9)*.

TWO-PART TOP

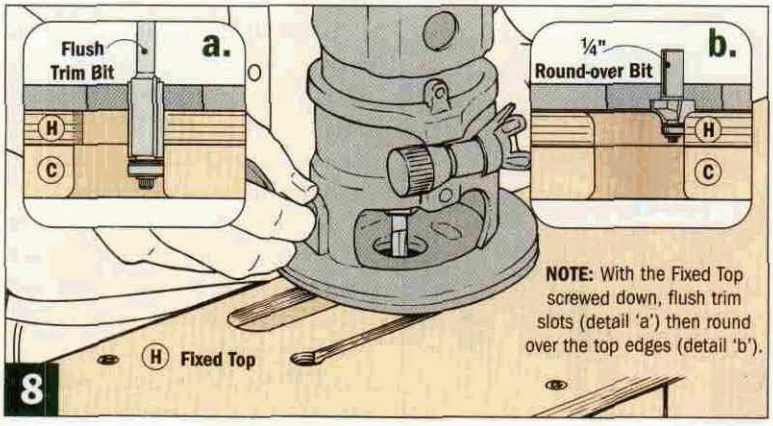


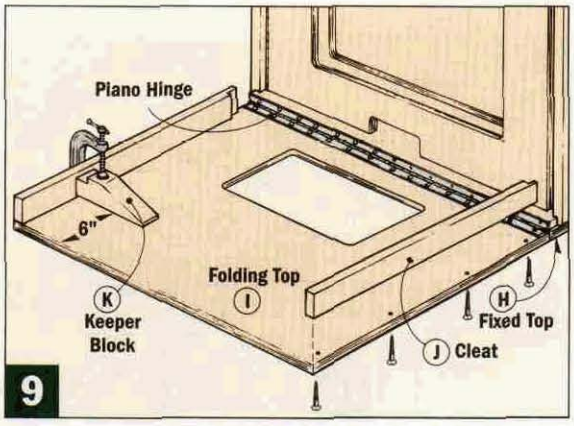




▲ **Draw catches keep the folding top locked shut and the legs contained when the station is folded up.**

▲ **Each leg swings open along the tapered keeper block and "locks" into the notch.**





MOUNTING THE SAW

One of the challenges in building this project was how to mount the table saw. Since the station folds for storage, I wanted a quick, easy way to secure *and* to remove the saw.

The solution was to use a separate tool base, as shown below. The table saw is mounted to the tool base, which in turn is secured to the station. So to "break down" the station, just remove the tool base and fold up the legs into the case.

TOOL BASE. The tool base (L) is a large piece of 1/2" plywood. I cut an opening in it to allow sawdust to fall through and then rounded the sharp corners *(Fig. 10a)*.

MOUNTING HOLES. The next step is to drill four mounting holes in the tool base that are used when securing it to the station. The base is held in place by knobs that thread into T-nuts in the top *(Tool Base)*.

All four holes are located the same distance from the corner of the base *(Fig. 10a)*. To make it easy to position the base, it's best to drill oversize holes (1/2" in my case).

Now it's time to locate the holes in the top for the T-nuts. Set the tool base in place and stick a 1/2" bit into each hole to "dimple" the top. Then drill the holes and install the T-nuts.

There's one last set of mounting holes that needs to be drilled. These will be used when securing the table saw to the tool base. Note: The location of these holes will vary depending on your saw.

Here again, threaded knobs and T-nuts are used to secure the saw. Only this time, I drilled shallow counterbores in the bottom of the base for the T-nuts. This way, the tool base sits flat on the station.

ADJUSTABLE OUTFEED SUPPORT

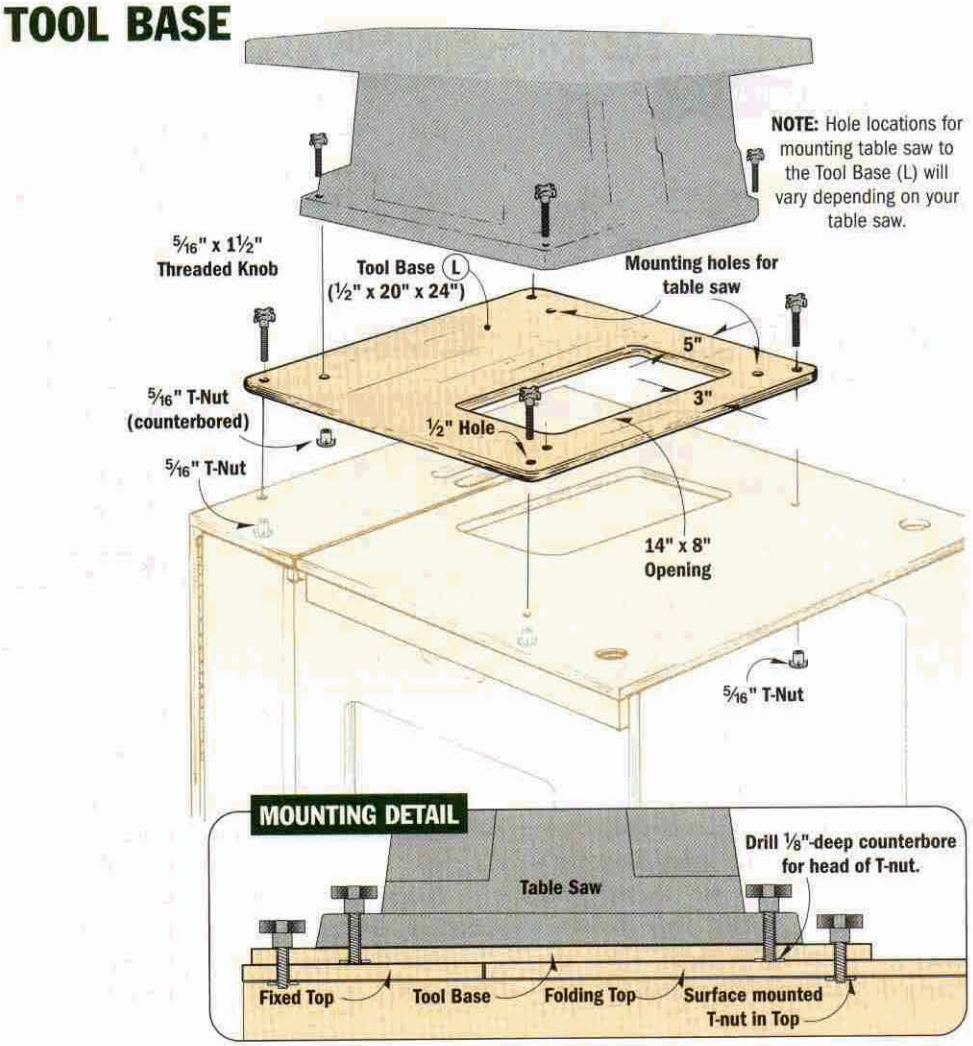
With any table saw, you need a way to keep long boards from tipping off the back edge of the saw. This station is designed with an adjustable outfeed support that does just that.

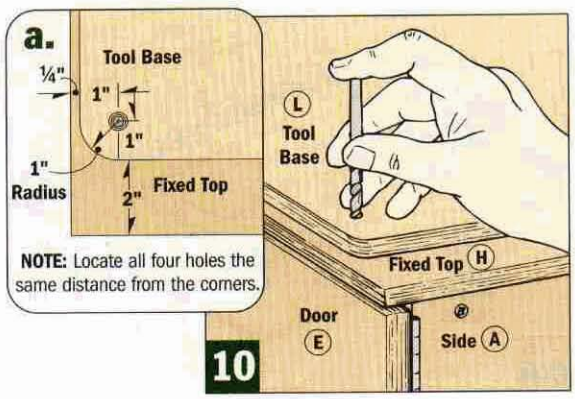
To "catch" long boards, it has a wood crossbar with a plastic pipe on top *(Outfeed Support)*. The plastic is slick, so when a board contacts the pipe it slides smoothly over the top. This whole assembly is attached to a pair of metal support tubes that slide up and down between two sets of guide blocks.

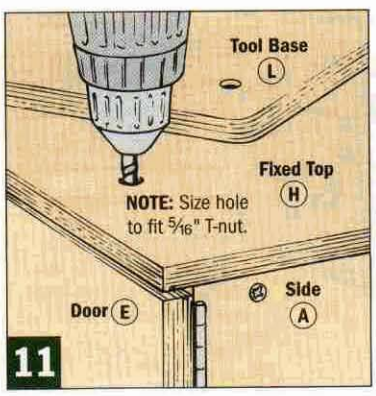
CROSSBAR. To provide sturdy support, the crossbar (M) is made of 1 1/2"-thick hardwood (maple). You'll need to drill two holes in the bottom edge of the crossbar to hold the metal support tubes.

To allow the plastic pipe to fit onto the crossbar, there's a thick tongue on the top edge (see *Side View*). This tongue is formed by rabbeting both sides.

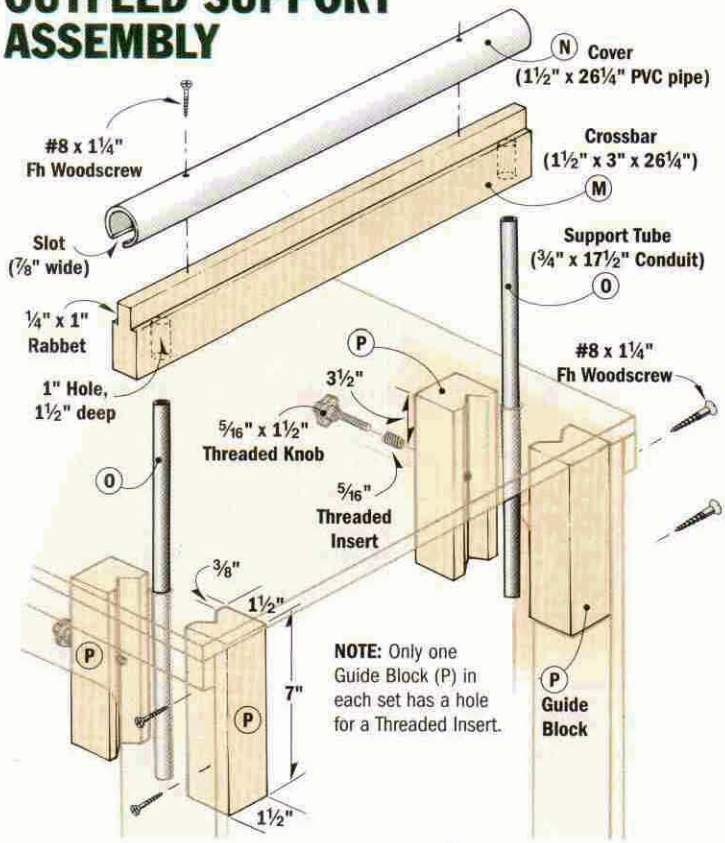
COVER. The plastic cover (N) on top is cut to length to match

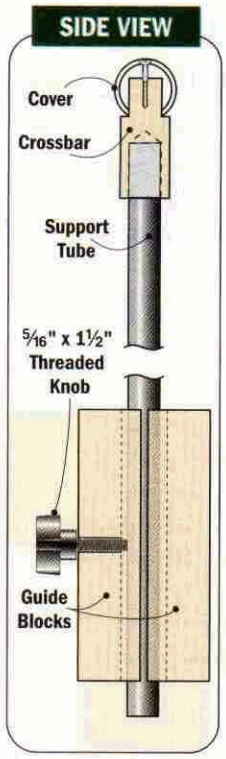


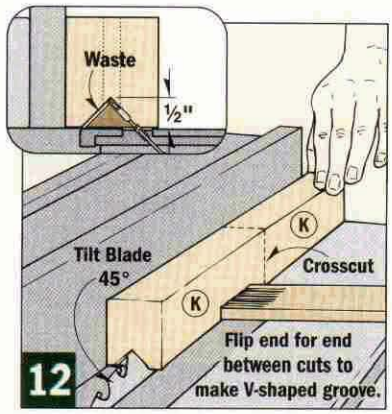


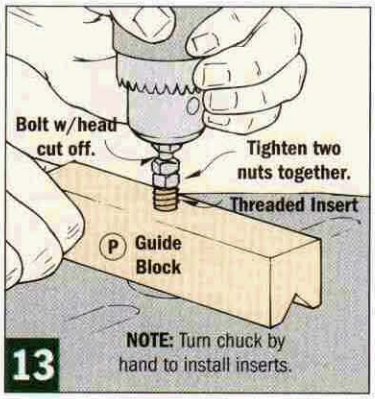


OUTFEED SUPPORT ASSEMBLY









the crossbar. (I used $1^1/_2$"-dia. PVC pipe.) To fit over the tongue on the crossbar, you'll need to cut a slot down the length of the pipe. Note: Turn to page 16 for a tip on cutting this slot safely on a table saw.

Now slide the pipe onto the end of the crossbar and tap it down until it's flush at both ends. Two screws will make it stay put.

The next step is to add the metal support tubes (O). I used ¾" electrical conduit. After cutting the conduit to length, glue the pieces into the crossbar with epoxy.

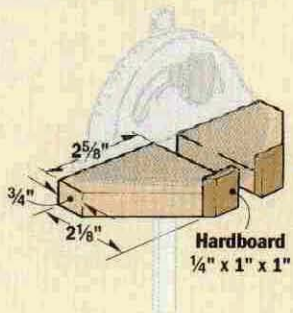
GUIDE BLOCKS. Each support tube is "sandwiched" by two hardwood guide blocks (P). These blocks have a V-shaped groove that allows the outfeed support to slide up and down. After it's adjusted, tightening a threaded knob "locks" it in place.

An easy way to make the guide blocks is to cut the V-groove in a piece that's long enough for two blocks (one set). Then crosscut the blocks to length and install a threaded insert in one of the blocks for each set. Mounting a cut-off bolt with a couple of "jam" nuts in the drill press makes it easy to drive the insert straight in *(Fig. 13)*.

To finish up, I made some holders for table saw accessories (see below). Now the table saw station is ready to go anywhere.

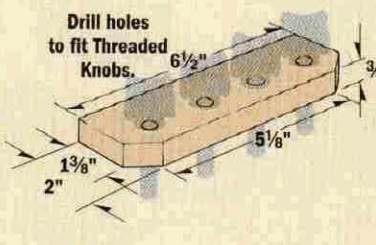
▲ Shop-made holders let you store accessories inside the case (see the sidebar below for details).

MITER GAUGE HOLDER



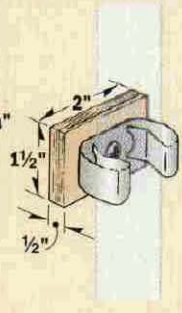
▲ Hardboard strips on the front of these maple "wings" keep the miter gauge in place.

THREADED KNOBS HOLDER



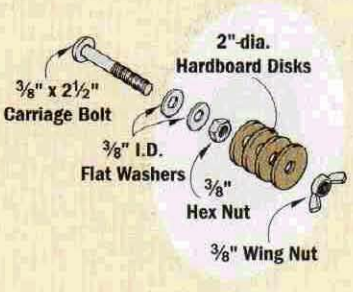
▲ The holes in this maple block are home to the knobs used to secure the tool base.

OUTFEED HOLDER



▲ A broom clip mounted to a plywood block holds the outfeed support.

SAW BLADE HOLDER



▲ Saw blades fit over the shank of a bolt, with ¼" hardboard disks serving as spacers for the blades.

Workbench Editors Choose 10 New Tools for 2002

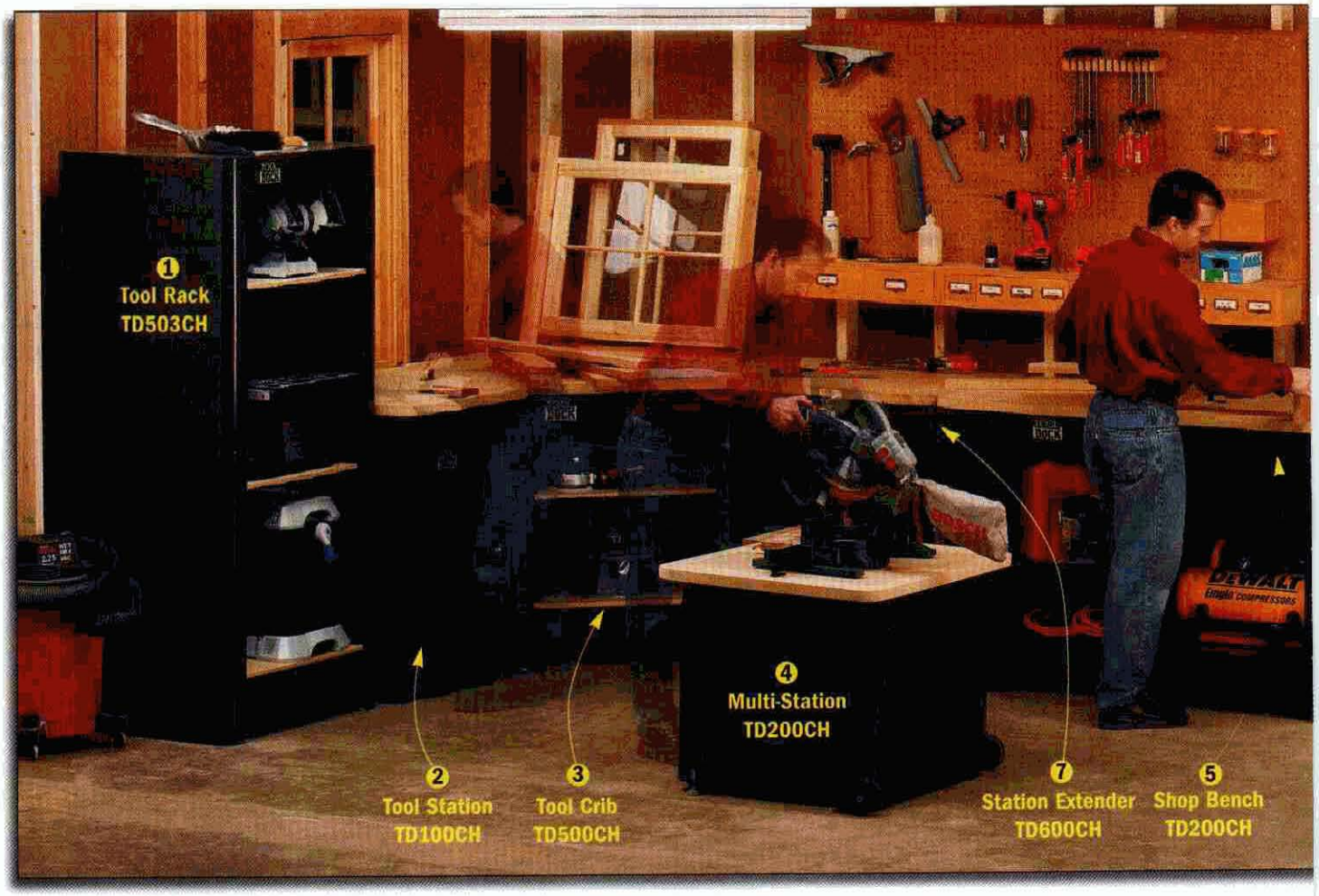
From out of the sound and fury that is tool marketing, 10 products broke through the clamor to capture Editors' Choice honors for innovation.

Hardly a day goes by here at *Workbench* that we don't receive a flurry of press releases from tool manufacturers touting their latest products. Fortunately, we're quite a group of certifiable tool junkies, so weeding out the good from the bad never gets tedious for us.

What really keeps it exciting is that, mixed in amidst announcements about bigger batteries and prettier packaging, there are always tools that demonstrate real innovation in their design.

Ten such tools are presented here. But make no mistake, these certainly aren't the *only* tools that gained our approval in the past few months. It actually took quite some time to pare the list down to just 10. And the reasons we selected these particular tools for our list are as individual as the tools themselves.

We ultimately selected these tools because we believe they will set the standard within their respective categories in the very near future. They will do so because they offer new solutions to old problems, and because they include enhancements that will empower you to achieve the best possible results.



TOOL DOCK OFFERS SWIFT SHOP SET UP

One of the cruelest ironies of "setting up shop" is that, in order to build the workbenches, tool bases, and storage cabinets that comprise a good shop, you just about need a shop filled with workbenches, tool bases, and storage cabinets. It's the DIY'ers "Catch 22."

Fortunately, Waterloo Industries has come up with a line of shop cabinets, called Tool Dock Modular Workshop, that will take you from working *on* your shop to working *in* your shop much faster.

As you can see in the photo below, the Tool Dock system is a collection of sturdy steel cabinets with all the features a DIY'er needs.

While each cabinet is a little different, some of the things you'll find built right into the units are plastic drawers, latching doors, removable dust bin, ports for connecting to a dust collection system, and casters or non-skid leveling feet.

QUICK-CHANGE INSERTS

What really distinguishes Tool Dock, though, are the quick-change inserts that let you trade one portable tool for another in just seconds *(Photo a, below)*.

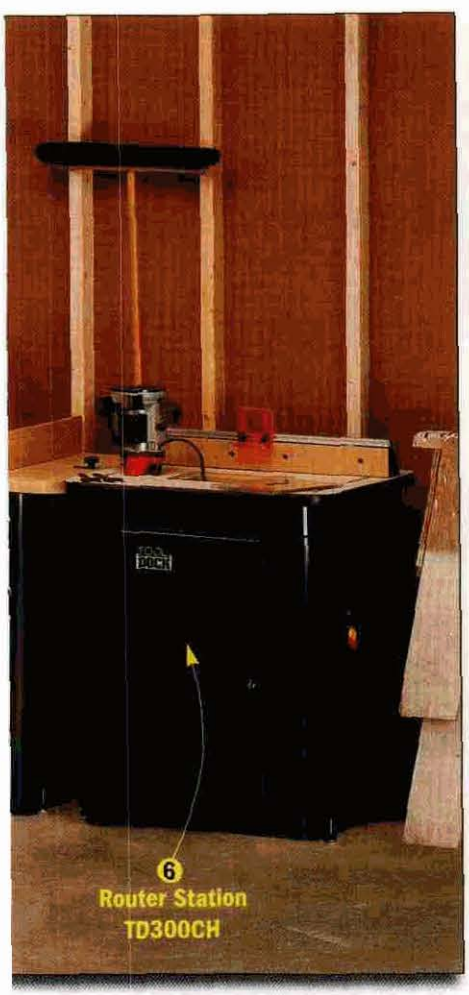
The quick-change inserts are $1/2$"-thick fiberboard bases that bolt directly to benchtop tools. The inserts are then locked into a rabbeted cutout in the $1\frac{1}{4}$"-thick cabinet tops. There's also a sanding table insert available with a series of holes that allow dust to be drawn through the table by a vacuum or dust collection system.

When tools aren't in use, they can be stored in the tool rack *(Photo b)*. Up to four tools can be stored in the rack at one time.

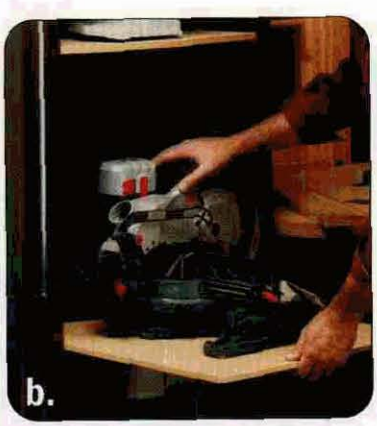
Another great part of this system is the router station. With or without the rest of the components, this is an excellent router table for the money. It includes the steel cabinet, melamine top, clear polycarbonate router plate, adjustable fence, on/off safety switch, and storage for 18 router bits.

Because Tool Dock is a modular system, you can buy as many or as few cabinets, tops, and extensions as you need to fit your shop.

For more information on the Waterloo Industries Tool Dock shop system, or to locate a dealer near you, visit www.ToolDock.com or call 866-573-0335.



▲ **Quick-change inserts bolt directly to portable tools and then lock into the cabinet tops for easy changeovers.**



▲ **The Tool Rack includes four adjustable insert supports for holding tools not in use.**

At a Glance:

Price:

❶ Tool Rack	$179
❷ Tool Station	$199
❸ Tool Crib	$149
❹ Multi-Station	$199
❺ Shop Bench	$309
❻ Router Station	$299
❼ Station Extender	$89

Virtues: Fast, convenient alternative to building your own cabinets. Easy to customize by buying as many or as few units as you need and mixing and matching accessories.

Vices: Limited height adjustment for different stature DIY'ers.

Waterloo Industries . 866-573-0335
www.WaterlooIndustries.com
www.ToolDock.com

MILWAUKEE HAS A NEW HANDLE ON ROUTING

The term "ergonomic" tends to gets overused in the tool industry. Changing a square part to a round one is often touted as a new "ergonomic redesign" of a tool. But for the first time in a long time, there is a new tool that truly meets the definition of "ergonomically designed." (Which means something is designed so people can use it with the greatest level of efficiency and safety.) That tool is the Milwaukee Body Grip Router.

The most obvious innovation (and the router's namesake) is a contoured palm grip surrounding the motor housing. It's clear that the engineers at Milwaukee recognized that the closer your hand is to the router's center of gravity, the better control you're going to have.

I've long had the habit of holding my fixed-base router by the motor housing for things like laminate trimming, rounding over, or chamfering. When I tried this router in those applications, I felt like the tool was designed specifically for me. It came as close to being an extension of my hand as any power tool I've ever used.

For more aggressive routing, the two soft-grip handles provide a conventional grip on the router. One of the handles can be mounted in three different positions.

The Body Grip also boasts one of the best depth adjustment systems going, including a micro-adjustment knob accurate to $1/64$".

The router also shines when table mounted, thanks to a through-the-base depth adjustment system.

At a Glance:

Price:	**$312** w/case **$285** w/out case
Motor:	$1\frac{3}{4}$ HP/11 Amp
Speed:	24,000 RPM
Collets:	$\frac{1}{4}$" & $\frac{1}{2}$"
Warranty:	One-year

Virtues: Contoured body grip for better control. Precise depth adjustment. Multi-position handle.

Vices: Does not include Torx driver for removing sub-base.

Milwaukee 262-781-3600
www.Mil-Electric-Tool.com

DEWALT'S COMPRESSOR BLOWS AWAY THE COMPETITION

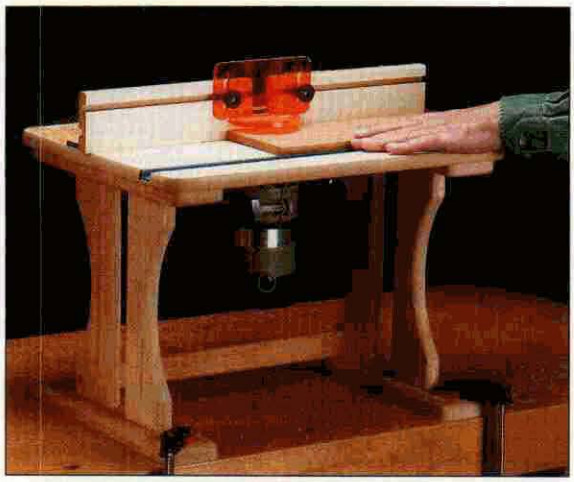
When DeWalt purchased the Emglo air compressor company a little over a year ago, I heard a lot of tool enthusiasts wonder aloud whether it would mean cool new products, or just yellow Emglos.

The answer, if the new D55155 is any indication, is: Expect some impressive new products.

This new 2 HP, 4-gallon electric compressor goes a long way toward addressing some universal shortcomings in compressor design.

First, it's compact — $21\frac{3}{4}$" long, 23" wide, and $12\frac{1}{2}$" tall. Second, there's a large, comfortable handle attached to the air tank. Combine those two features and you've got a compressor that's a whole lot easier to carry from one place to another than wrestling with the clunky compressors that are so common.

Another place the DeWalt compressor scores big is in ease of use. The pressure gauges, pressure valve, and quick couplings are all facing forward on the motor



COMPACT ROUTER TABLE, BIG FEATURES

At a Glance:

Price:	$119
Table Size:	16" x 21"
Under Table Clearance:	13½"
Top:	Laminate on MDF
Weight:	16 lbs.

Virtues: Small enough to set up or store anywhere. Large work surface relative to overall size. Excellent fence. Very affordable.

Vices: Dust port must be purchased separately.

Rockler 800-279-4441
www.Rockler.com

Bigger is not always better when comparing router tables. Take Rockler's Benchtop Router Table as an example. Although it's quite compact, this router table comes up big when you look at the features.

First, consider the top. Even though the entire table is small enough to set up on any workbench and then stow it away underneath it, the size of the worksurface isn't compromised at all. The top — which is made of ¾"-thick MDF and laminated melamine — measures 16" wide and 21" long. That's as big as many full-size tables that cost three times as much. And it's certainly large enough for most of the work I do.

The thick MDF top is also beefy enough to support even high-horsepower routers, and the slick melamine is durable and makes for easy material feeding.

Another impressive feature is the two-piece fence. Just like the top, the fence is ¾"-thick MDF veneered with melamine. This design is borrowed straight off Rockler's full-size router tables and sports the same aluminum angle backer and T-slots for fence adjustment and hold-down attachments. Another length of aluminum track serves as a miter gauge slot toward the front of the table.

The table comes standard with an insert pre-drilled for the Porter Cable 690 router. Rockler also offers several other plates to accommodate most popular routers. All of the plates have leveling screws that make it easy to "true" the insert flush with the table.

Supporting the top is a set of sturdy hardwood legs. The legs provide nearly 13½" of clearance underneath the table and have hardwood feet that are designed to be clamped to any flat worksurface.

The table is available exclusively from Rockler Woodworking and Hardware as item number 38121 in their catalog or on their Web site.

shroud. Very convenient compared to typical compressor designs that require you to stand on your head while sticking your hand perilously close to the hot motor to readjust the pressure.

SHOP TEST

To test the compressor's performance, I first tried it in the *Workbench* shop. I started by making sure the tank was completely drained and then clocking it to see how fast it "recovered" a full charge. It filled in 60 seconds on the money. Very fast.

Then I loaded up a framing nailer with 16d nails and fired them into a pressure-treated 6x6 post as fast as I could.

I was never able to deplete the pressure in the tank enough to affect the performance of the nailer. When I quit firing, the compressor recovered a full charge in about 5 seconds. The compressor passed the shop test easily.

FIELD TEST

Satisfied that the 55155 could keep up with me in the shop, I hauled the compressor out to a friend's house to help him shingle his roof. This is when I really noticed how quiet the compressor is. Rarely did I hear the machine cycling on and off throughout the day.

At the end of the day, packing the compressor up is also painless. Just roll it up onto the tube steel cage to access the drain valve on the bottom of the tank. Open the valve and the air tank will be drained faster than you can roll the cord onto the built-in cord holder.

POWER REQUIREMENTS

It's also worth noting that, even with all this performance, the compressor requires just a 15 amp power connection. And given that 20 amp outlets (required by some compressors) are in short supply in most houses and sometimes scarce on construction sites, that's a feature DIY'ers and professionals alike can appreciate.

At a Glance:

Price:	$359
Motor:	2 HP/15 Amp
Capacity:	4 gallons
Weight:	61 pounds
Warranty:	One-year

Virtues: Relatively lightweight. Compact design. Two quick couplers. Conveniently positioned gauges and controls.

Vices: Somewhat pricier than similarly sized competitors' tools.

DeWalt 800-433-9258
www.DeWalt.com

FIRESTORM TURNS UP THE HEAT ON CORDLESS DRILLS

At a Glance:

Price:	12V	$79
	14.4V	$99
	18V	$119
Chuck:		3/8" Keyless
Battery:		Ni-Cad
Charger:		3-hour
Warranty:		Two-year home use

Virtues: Quick-change chuck. Infinite clutch. Good power.

Vices: One battery, no rapid charger.

Black & Decker... 262-544-6986

www.BlackAndDecker.com

If there's been one thing missing from the cordless tool market, it has been real innovation. (No ... bigger batteries and brighter colors do NOT qualify as innovation.)

Recently, though, Black and Decker came through with some real useful upgrades when they redesigned their Firestorm line of cordless drills. (The upgrades affected the 12V, 14.4 and 18V models only.)

The first innovation is the *Quick Connect Bit Change* System (see the photo). With the press of a button, the entire chuck comes off to reveal a socket that accepts hex-shank bits. There is no quicker way to go from drilling to driving that I've seen.

Another impressive change is the infinite clutch. I was able to dial the clutch in to set screws perfectly in a variety of situations. The clutch is marked with screw lengths to help you find the setting you need quickly.

The battery design on the drills is also new. The old post-style batteries have been replaced by a slide-in version that's much easier to remove from the tool by pressing a single button.

When it came time to actually use the tool, *I* was not disappointed. On a single charge on the 14.4V model, I was able to pre-drill and then drive 197 3" deck screws into a pressure-treated 4x4. In all honesty, that's when I gave up. The battery still had some life left in it, but I was satisfied that the tool could outwork me in most situations. (And driving all those screws had given me quite a cramp in my forearm.)

A two-position gear box (14.4V and 18V models only), electronic level, and a rubber comfort grip are additional hallmarks of this top-flight DIY tool.

Considering that the 12V and 14.4V drills sell for under $100, there's nothing on the market to rival their value.

PORTER-CABLE'S CORDLESS ROUTER

Year after year, the Porter Cable 690 has been the most popular selling fixed-based router on the market. And year after year, the folks at Porter Cable have been satisfied to leave this venerable little router well enough alone. The tool has changed very little since its introduction some 30 years ago. But now, all of sudden, Porter Cable has decided to use the 690 platform to become the first tool maker to introduce a cordless router that's officially named the 9290.

GREAT, ANOTHER CORDLESS TOOL

Simply making a cordless version of this timeless router was not enough *to include Porter Cable in our Top 10 Tools* list. Cordless tools, after all, are nothing new. And I'm sure we can all think of a tool or two that doesn't fit the cordless mold.

The 9290, however, offers much more than just cord-free operation. For instance, the new spindle lock is a long-awaited improvement on the 690 and is most welcome on the cordless version. The old toggle switch has also been updated to a dust-proof rocker switch.

WHAT'S NOT NEW

So, with all the changes, does the 9290 have the traits that made its ancestor a legend? Yes, it does. All the versatility that we've come to

MAKITA SANDER OFFERS COMFORT & DUST CONTROL

Nobody enjoys sanding. Nobody.

Fortunately, tool makers understand our universal distaste for sanding and are constantly trying to find ways to make better tools for the job.

Enter the Makita BO6030, 6" random orbit sander — the latest, greatest weapon in the never-ending war on "sander's fatigue."

COMFORT FACTOR

Makita claims 30 percent less vibration in this sander versus their competition. They credit that largely to a rubberized rear handle (see the photo). And while I can't vouch for the exact numbers, I can say that this is one of the most comfortable random orbit sanders I've used.

The 6030 also features a front handle for greater control during two-handed operations. For working in tight spaces, the front handle is removable and the motor housing serves as a palm grip. I've used the sander in all three configurations with excellent results.

DUST FACTOR

Comfort notwithstanding, where the Makita really shines is in dust control. Although most sanders include a token dust bag, they tend to collect more dust on the outside of the bag than the inside.

With the 6030, however, Makita seems to have hit on a really effective through-the-pad dust collection system. While sanding will *always* be a dusty job, this sander does a commendable job of keeping dust out of the air.

At a Glance:

Price:	$179
Motor:	2.7 Amp
Speed:	4,000 - 10,000 OPM
Pad Diameter	6"
Orbit Diameter	1/8"
Weight:	5 lbs.
Warranty:	One-year

Virtues: Very effective dust collection. Low vibration, comfortable operation.

Vices: None

Makita 800-462-5482
www.Makita.com

expect from Porter Cable's fixed-based routers is still here. The 9290 is compatible with all 690 accessories. And the battery on this router is interchangeable with all of Porter Cable's 19.2V cordless tools.

At a Glance:

Price:	$249
Motor:	19.2V, 600 watt
Speed:	23,000 RPM
Collets:	1/4" & 1/2"
Warranty:	One-year

Virtues: Good cordless power. Easy bit changing. Adaptable to all 690 accessories.

Vices: No variable speed.

Porter Cable . 800-487-8665
www.Porter-Cable.com

CHARGE IT UP

Okay, so the 9290 looks good on paper, but what about in the shop? Well, I was pleased.

Bit and collet changing is a breeze thanks to the spindle lock, and a flat top lets you set the tool upside down for changeouts. And when you're ready to rout, the 9290 is, too.

The battery charges in an hour and then delivers a surprising level of power and longevity.

One quick note here about batteries: To get the best performance from rechargeable batteries, they should always be "conditioned" before being put into service. Conditioning a battery is simply a matter of charging it all the way up, then draining it completely *four to six times before the battery is used.*

After five rounds of battery conditioning, I put the router to work by subjecting it to a 1/2"-deep, continuous cut in red oak with a 5/8" straight bit. I ran it until it died, which was only after it had removed about 9 sq. ft. of material.

Under the more realistic loads of rounding over and chamfering, the router should deliver very close to Porter Cable's claim of 100 linear feet. in hardwood or 200 feet in softwood with a 1/2" bit. I personally chamfered 60 feet of oak without the router slowing down.

That's enough to convince me that the 9290 could meet my expectations in most routing situations. And not having to manage a cord while routing is priceless.

My one complaint is the lack of variable speed. Maybe next year.

FREUD'S NEW JIGSAW CRUISES

Cruise control is a "must-have" on my car. It is, after all, the ultimate example of letting the machine do the work for you. So when Freud told me about their new FJ85 variable speed jigsaw with electronic cruise control, I was intrigued.

The theory, as the folks at Freud explained it, was that the saw would self-regulate its power so it maintained a constant cutting speed even when encountering flaws or knots in wood.

Consider that theory proven. I virtually tortured this saw, equipped with the coarse-cutting blade that Freud included in the box, by forcing it through knots, tight turns, and faster feed rates than I'd normally use (or recommend). It would not quit. Not once was I able to bog the saw down. I actually found that the blade would chatter under the stress before the motor would slow under the extreme loads.

Which isn't to say you should buy one of these saws and beat it silly. But for clean, straight cuts through inconsistent stock, this is the jigsaw you want.

ADDITIONAL HIGHLIGHTS

The new FJ85 also features a 6.0 amp motor, which is up from the 4.8 amps of earlier models. A quick blade changing system that works with the pull of a lever, orbital and variable speed settings, and a dust collection port are also standards on this well-equipped jigsaw.

At a Glance:

Price:	$109
Motor:	6.0 Amps
Speed:	0-3,000 SPM
Blades:	T-shank
Blade Change:	Tool-less
Shoe Adjustment:	Hex wrench

Virtues: Powerful, self-regulating motor. Priced much less than competitor's of similar performance.

Vices: Dust port interferes with shoe adjustment.

Freud 800-334-4107
www.FreudInc.com

BOSCH CORDLESS MITER SAW: HAVE SAW, WILL TRAVEL

Forget that the Bosch model 3924 10" compound miter saw is cordless. I say forget it because this saw performs so well that the missing power cord will never be, well ... missed.

In my test, one fully-charged 24V battery provided enough juice to make more than 30 consecutive cuts through a wet, pressure-treated 4x4. Which satisfied me that it could keep up on even my most demanding home improvement jobs.

Just to be sure, though, we sent the saw along with a deck building crew to see how it performed in the "real world."

Throughout the entire project, the Bosch was the only miter saw on the job site. By the time the deck was complete, we almost had to fight the builders to get it back. The Bosch performed flawlessly,

SLOW GRIND ... TAKE IT EASY

Occasionally, a new tool comes along that makes me ask "Why did this idea take so long?" That's what happened with Delta's new variable-speed 6" bench grinder (model 23-655).

It's the variable-speed feature that really sets this grinder apart. For the most part, grinders have been available in two varieties: very slow (less than 2,000 RPM) or very fast (3,450 RPM). This grinder fills that gap, operating between 2,000 and 3,450 RPM.

What that means for the DIY'er is that they can now have one very affordable grinder that's good for general purpose grinding at high RPM's and good for sharpening at low RPM's.

SPEED KILLS

Running a grinder at a lower speed during sharpening keeps heat build-up near the cutting edge to a minimum, which means less chance of drawing the temper and ruining a perfectly good chisel or plane iron. To make the grinder even better-suited to sharpening, Delta included a white, friable wheel as standard equipment.

Friable means that the wheel crumbles easily, so there's constantly a new grinding surface being exposed — another big part of preventing heat build-up.

A second, 60-grit grey wheel comes with the grinder, as well. This wheel is perfect for coarse grinding operations such as sharpening lawn mower blades and axes.

The grinder comes packaged with an adjustable lamp, see-through eye-guards, wrench, and diamond wheel dressing tool, in addition to the two wheels.

If there's one thing missing from this package, given its obvious intention as a sharpening grinder, it's a sliding tool holder for ensuring the perfect angle. A good after-market guide can remedy that easily enough, though.

At a Glance:

Price: $79
Motor: 2.5 Amp
Speed: 2,000 to 3450 RPM
Wheels: 6"-dia., white friable, grey 60-grit
Warranty: Two-year

Virtues: Variable speed. White wheel included. Reasonably priced.

Vices: Doesn't include tool guide for sharpening.

Delta 262-438-2486
www.DeltaWoodworking.com

cutting through a wide variety of materials that included composite decking, 2x cedar material, and a variety of pressure-treated stock.

The crew told us they were able to get at least a half day's work out of each battery even on the days when they were cutting almost continuously. And that even included making compound cuts.

MORE THAN JUST A BIG BATTERY

The quality of the Bosch 3924 doesn't stop with its power. It has plenty of other features that would be welcome on any miter saw.

First, the base has all the usual detent stops for miter cutting (0°, 15°, and 45°). But it also has stops that, when used in conjunction with indexed positions on the bevel gauge, make cutting crown molding nearly mistake-proof (see *In The Shop* on page 69 for more).

Other features, such as soft-grip handles (including one on top specifically for carrying the tool), electric motor brake, and a spindle lock make the saw user friendly.

As standard equipment, the saw includes a 24-tooth, carbide-tipped blade, $3\frac{1}{2}$"-tall sliding fence, quick-clamp material hold down, two batteries, one-hour charger, and a dust bag. (Note: Model 3924B does *not* include a charger.)

PORTABLE

One of the biggest attractions of any cordless tool is that you're supposed to be able to take it anywhere. And with that in mind, the 3924 has an aluminum base to keep weight to a minimum. Weighing in at a lean 30 pounds, this saw is ready to travel. With this blend of performance, portability and usability, this is a good choice for anyone willing to spend the money.

At a Glance:

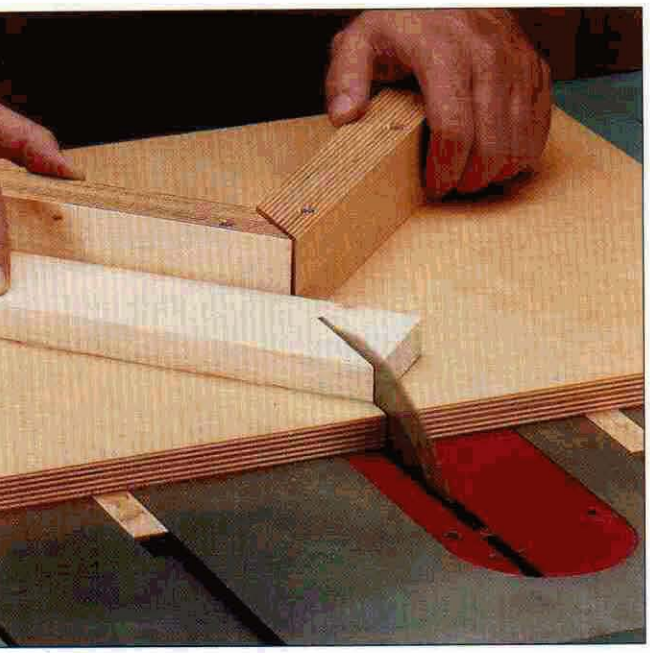
Price: $460
Capacities: 48° L & R miter cuts
2° to 47° Bevel cutting
Speed: 3,600 RPM
Blade: 24-tooth, thin-kerf, carbide
Warranty: One-year

Virtues: Excellent power. Lightweight. Lots of extras.

Vices: Much pricier than corded models.

Bosch 262-781-3600
www.BoschTools.com

In the Shop



▲ **A shop-made miter sled makes it quick and easy to cut tight-fitting miter joints on the table saw.**

Table Saw Miter Sled

Cutting a miter joint on the table saw is a routine process, at least in theory. Just rotate the miter gauge 45° to cut the first piece. Then adjust it to the opposite 45° setting, move it to the other side of the blade, and cut the mating piece.

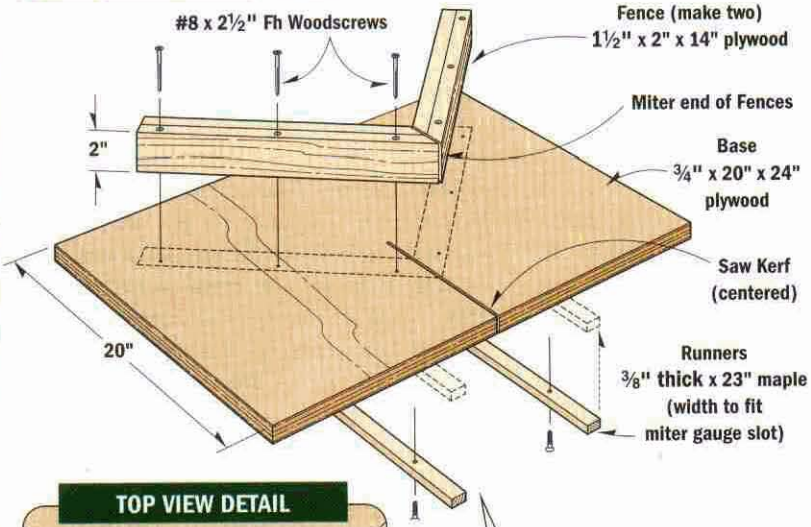
But in practice, it's not always that simple. Sometimes, no matter how careful you are, one of the angle settings on the miter gauge is "off" by just a hair, and you end up with a gap in the joint.

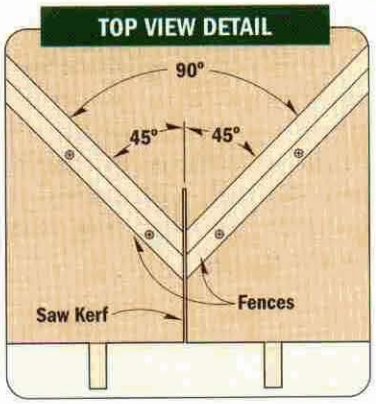
So when building the mitered frames for the bathroom towel rack shown on page 30 or the mirrored medicine cabinet on page 33, you may want to consider using a *miter sled* like the one shown in the photo above. This sled provides a fast, accurate way to cut perfect-fitting miter joints.

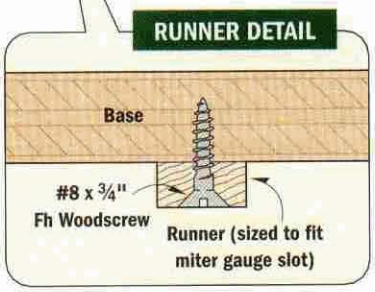
The key to making it work is a two-part fence that forms a 90° angle *(Construction View* and *Top View Detail,* above). When cutting a miter joint, the first workpiece is held against one face of the fence, and then the mating piece against the other. This ensures that the *overall* angle will be 90°, so you end up with a tight-fitting joint.

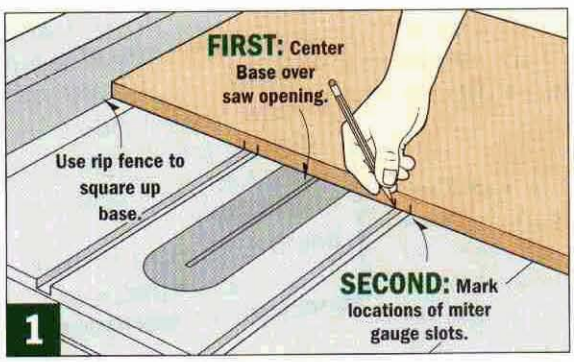
The miter sled consists of three main parts: a base that carries the workpiece through the blade, the two-part fence, and a pair of runners that guide the sled in the miter gauge slots of the table saw.

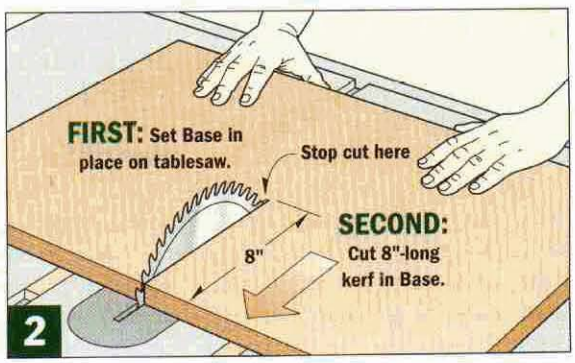
CONSTRUCTION VIEW











BASE. The base of the sled is made of $^3/_4$" plywood. It should be large enough to provide plenty of support for a workpiece, but not so big that it's awkward to handle. (I made mine 20" by 24".)

RUNNERS. The sled is guided by two runners that are attached to the bottom of the base. These runners are $^3/_8$"-thick hardwood (maple) strips that are ripped to width to fit in the miter gauge slots. To establish the location of the runners, center the base on the blade and then carefully mark their location *(Fig. 1)*. Then drill countersunk shank holes in the runners and screw them to the base (*Runner Detail*).

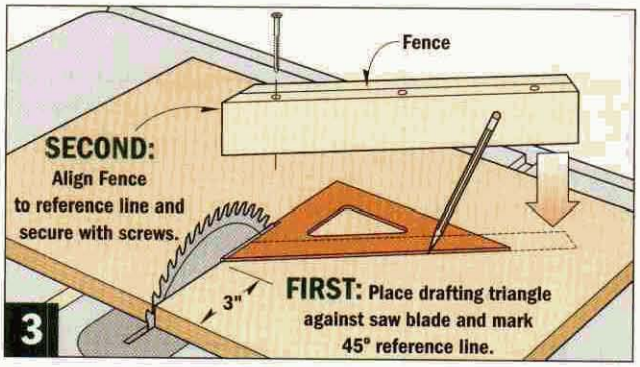
Once the runners are installed, the next step is to cut a kerf in the base for the saw blade. Notice in *Figure 2* that this kerf is only cut partway through the base.

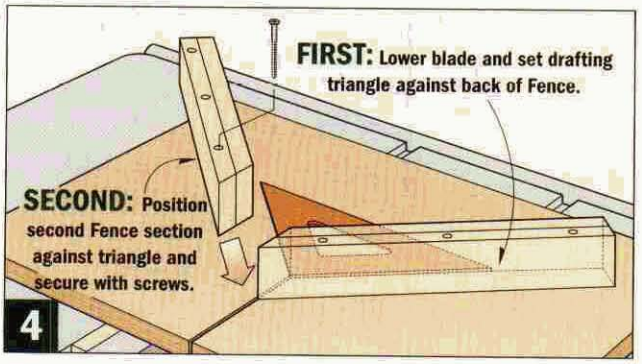
ADD THE FENCE. The fence consists of two $1^1/_2$"-thick sections. Each section is made by gluing up two pieces of $^3/_4$" plywood. Before installing the fence, it's best to miter one end of each part. There's nothing critical about these miters. They just simplify the assembly so the two parts will fit together at the "point" of the fence.

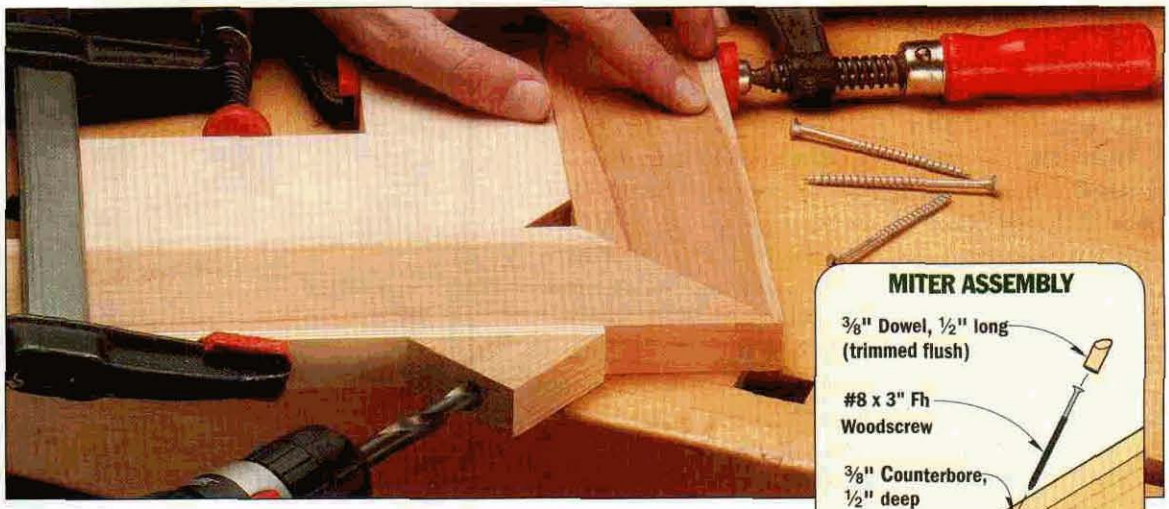
The accuracy of the sled depends on the proper positioning of these sections. So it's worth taking a few minutes to make sure they're dead-on accurate. The best way I found to do this is to use a plastic drafting triangle.

Start by setting the sled on the table saw and then butting the triangle against the blade *(Fig. 3)*. Just be sure it's against the body of the blade, not the teeth. Then after laying out the location of the fence, screw it to the base.

Now all that's left is to attach the second fence section. You can use the same basic process. Only this time, set the triangle against the back of the fence, as shown in *Fig. 4*. Then screw the second fence section in place.







Clamping & Fastening Mitered Corners

Cutting a tight-fitting miter joint is half the battle. The other half is *assembling* it. That's because when you apply clamping pressure, the mitered ends of the frame have a frustrating tendency to slip out of alignment. In addition, when you glue end grain to end grain as in a miter joint, it produces a fairly weak joint. So it's a good idea to reinforce it.

TWO ASSEMBLY JIGS

An easy way to solve both of these problems is to use two simple assembly jigs. (You can see both of these jigs in the photo shown above.)

First of all, there's an L-shaped corner block that prevents the mitered pieces from shifting out of alignment. In addition, a drilling guide makes it easy to drill an angled hole for a screw that strengthens the miter joint *(Corner Block and Drilling Guide,* below*)*.

CORNER BLOCK. The corner block is a scrap piece of 3/4" plywood. To avoid racking the frame, be sure to square up the block. After cutting the block into its L-shape (which allows clamps to reach across it), "knock off" the outside corner to provide room for any glue that squeezes out.

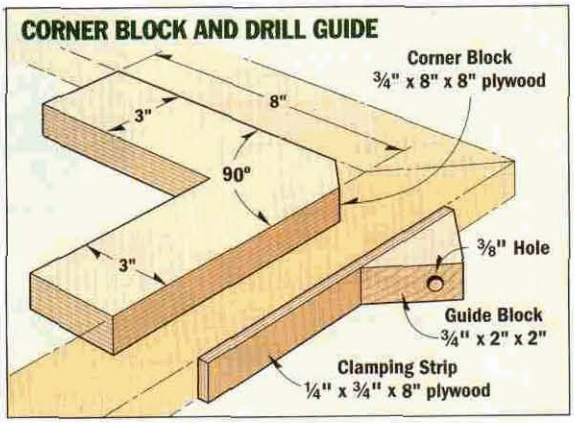
DRILLING GUIDE. As for the drilling guide, it consists of two parts: a wedge-shaped block that guides the drill bit and a 1/4" plywood clamping strip that serves as a clamping surface.

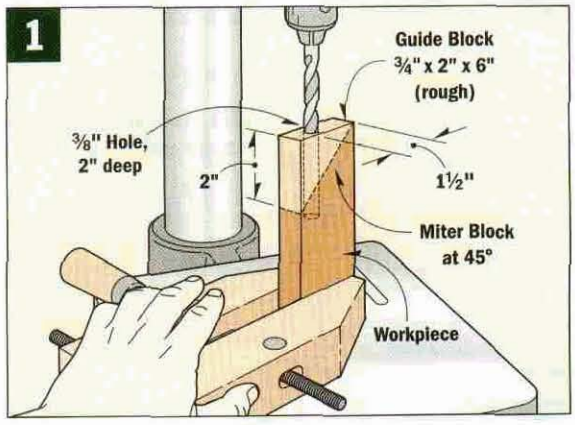
To make the guide, drill a hole in the end of an extra-long block of 3/4"-thick hardwood *(Fig. 1)*. Then trim the block at a 45° angle and glue it to the clamping strip.

ASSEMBLY. To use the jigs, start by dry assembling the miter joint (no glue) and then clamping the corner block and drilling guide in place. Then drill a counterbore in the workpiece, as shown in the *Miter Assembly* above. Note: Drill the hole in an inconsipicuous area like the top or bottom edge of the frame.

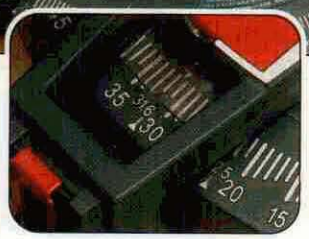
The next step is to drill the shank hole. You may need to disassemble the miter joint to do this. Otherwise, the drill bit may not be long enough.

Now apply glue to the mitered ends and clamp the corner block against the frame again. After installing the screw, glue in a dowel to cover the screw hole. Then trim the dowel flush and sand the surface smooth.



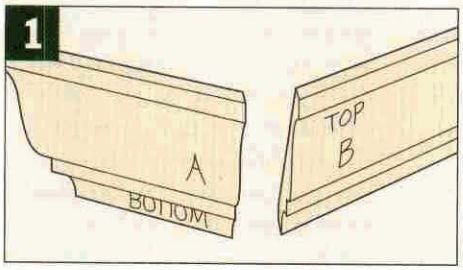


▲ **The bevel gauge, while not having a stop, is clearly marked at 33.9°.**

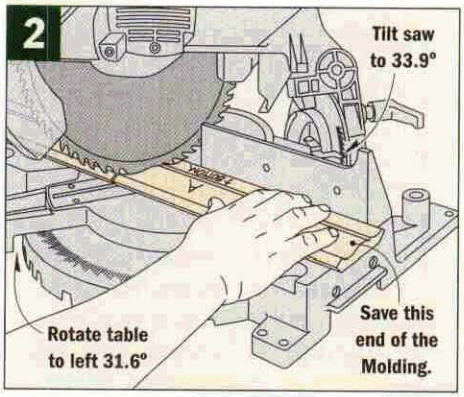


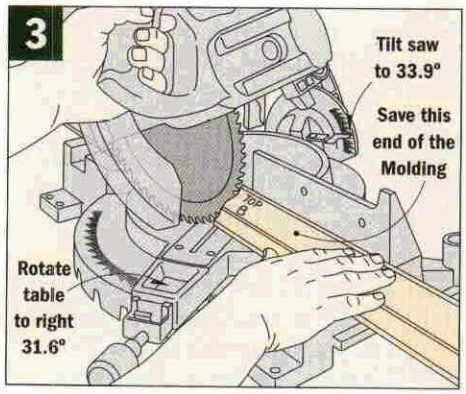
◀ **Most new miter saw tables have detent stops at 31.6° that make setting up for compound cuts in crown molding much easier.**

How to Cut Crown Molding with a Miter Saw



Making compound cuts in crown molding is a trial-and-error process for even seasoned trim carpenters. Fortunately, most of today's miter saws have detent stops in the tables and index marks on the bevel gauges that take the guesswork out of setting up the saw for such cuts (see photos, above).





HOW IT WORKS

Figure 1 shows two pieces of crown molding cut for an outside corner. One of the pieces is labeled 'A' and the *bottom* edge of the molding is marked. The other piece, labeled 'B' has the *top* edge of the molding marked. With the pieces labeled and marked this way, it's easy to set up your compound miter saw for perfect cuts.

Start with piece 'A.' Rotate the table to the left, stopping at the 31.6° detent *(Fig. 2)*. Now tilt the head of the saw so the bevel gauge reads 33.9°. When making the cut, the molding should be positioned with the *bottom* edge against the fence and the piece you want to use to the right.

To set up for the adjoining cut in piece B, rotate the table to the 31.6° detent on the right side of the table *(Fig. 3)*. Leave the bevel setting the same. Position the molding with the *top* edge against the fence. Once again, save the right end of the molding.

Around The House

Installing a Pedestal Sink

Installing a pedestal sink adds style and space in a small bathroom. But before you head out to the home center or plumbing supply store to buy a pedestal sink, there are a few things to consider.

First of all, this type of sink comes in two parts: a tall pedestal that sits on the floor, and a basin that's supported by the pedestal (see *Anatomy of a Pedestal Sink* below).

THE PEDESTAL. Although they may look similar, not all pedestals are alike. Especially when it comes to how they're fastened to the floor.

Some pedestals are "glued" to the floor by running a bead of silicone around the base. But this probably isn't the best solution, especially if there are kids climbing around the sink looking for the toothpaste.

A better option is to buy a pedestal with a mounting hole for a lag screw in the base. I'd also recommend a pedestal with a recessed area in the base *(Securing Pedestal)*. This recess provides clearance for the water pipes if they run up through the floor.

INSTALLING THE SINK

Before installing the sink, there are a few preliminary things to do. Most likely, you'll need to add a support block in the wall. Also, there may be some plumbing work involved. This means you'll have to remove the drywall (or wall covering) to provide access to the wall.

SUPPORT BLOCK. Although the basin sits on the pedestal, it has to be securely tied into the wall framing. A 2x6 support block toe-nailed between the studs provides a solid surface for mounting the basin (see *Support Block* below).

PLUMBING. After the rough-in work is done, you may need to move the drain and water supply lines. The drain should be centered behind the pedestal. But the supply lines require more planning.

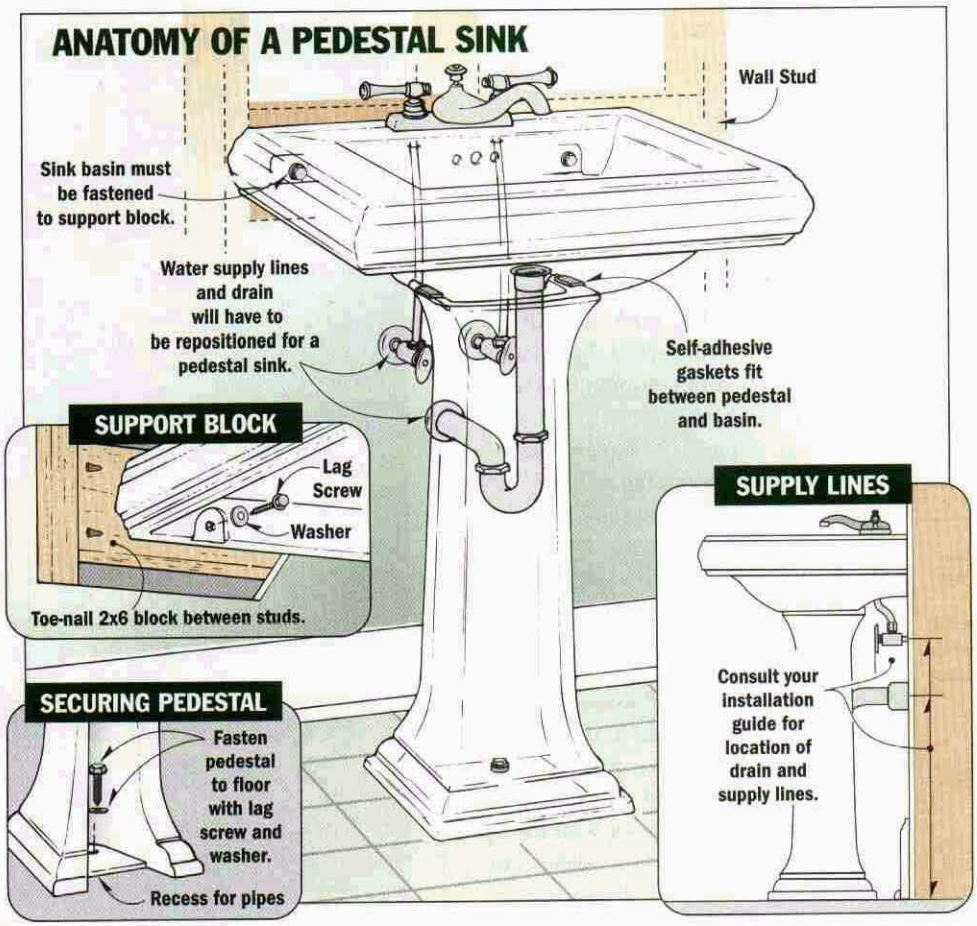
SUPPLY LINES. If your sink is on an outside wall, the water lines will come up through the floor to prevent them from freezing. (The recess in the base accommodates the pipes.) When the pipes are on an interior wall, the important thing is their location. The goal is to make sure they're high enough to be concealed by the sink, but still have enough hand clearance to open and close the shut-off valves *(Supply Lines)*.

Note: The installation guide that comes with the sink should provide exact locations for all plumbing.

After completing the plumbing and closing up the wall, you're ready to install the sink. If you have a pedestal that's held in place with a lag screw and washer, here's a tip: Once the lag screw is snug, resist the urge to give it one more turn. The base of the pedestal will crack if you apply too much pressure.

The next step is to add the basin. Before setting it in place, install the faucet. It's also a good time to attach the self-adhesive gaskets (provided with the sink) that act as a cushion between the basin and the pedestal.

Now secure the basin to the support block with lag screws and washers. Here again, be careful not to overtighten the screws. Then connect the water and drain lines.



Arts & Craftsman

Driven by perfection, English woodworker Christopher Vickers makes detailed replicas in the finest tradition of Arts and Crafts-style furniture.

Christopher Vickers began his career at age 16 as an apprentice in a cabinet joinery shop, where he learned to make Victorian boxes. Today, he specializes in building Arts and Crafts furniture with handcut dovetail joints, metalwork like the brass squirrel on the mirror shown here, and intricate inlays made from holly, fruitwood, and even 5,000-year-old bog oak.

But it's the accuracy in style and detail that sets his pieces apart. Vickers admits being a perfectionist doesn't make his work any easier. "The original construction, if it can be found out, needs to be found out," he says. Why? "Because I want to do it right."

Take the Morris chairs shown below for example. Replicas of a very early Morris & Co. original design, they feature turned spindles and rungs on both sides and the front of the chair, along with split-turnings set into grooves in the front legs.

Apart from the obvious beauty of the quartersawn figuring and handmade brass handles, the oak and cedar St. George Cabinet (behind the chairs) features mortise and tenon joints pegged with oak dowels for strength and visual interest.

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