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This seal is your assurance that we build every project, verify every fact, and test every reviewed tool in our workshop to guarantee your success and complete satisfaction.
WATCH THE DOVETAIL SHOWDOWN

Hear the roar of the router and the whisper of the chisel as the man-versus-machine Dovetail Showdown on page 50 unfolds in a FREE video at woodmagazine.com/dtvideo

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THE INSIDE STORY:
EDITOR BLOGS

WOOD magazine projects editor Owen Duvall traveled to China recently and toured a musical-instrument factory where stringed instruments are still crafted by hand. See Owen's blog with photos at woodmagazine.com/odblog

RATE THIS ISSUE

Help us shape your magazine. Pop by our Web site and tell us which articles, projects, and techniques you liked best in this issue. The short survey at woodmagazine.com/march08survey will take less than five minutes.

DEER ME!

We've added 25 new intarsia plans from expert Judy Gale Roberts (including the handsome buck, above) to the more than 1,000 furniture and project plans already in the WOOD Store®. Get them at woodmagazine.com/intarsia
March 2008

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WOOD magazine
March 2008

Marlen shows off the Greene-and-Creene-style sofa table he recently made.

Dave made a crucifix that sold for $180 at a church auction.

Jim designed and built this vanity for his newly remodeled bath.

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Old Masters
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Marlen shows off the Greene-and-Creene-style sofa table he recently made.

Circle No. 95

Merry Christmas!
Putting some MUSCLE into it

The comparison on page 50 of hand-cutting versus machine-cutting dovetail joints took me back in time, back to 1875 to be exact; and to a woodworker who lives in that era every day.

I don't have to tell you about the advantages of power tools. You no doubt have a shop full of them, and dearly appreciate each one for the speed, ease-of-use, and great results it gives you.

With power tools all around us it's easy to forget that most of today's woodworking principles were developed over thousands of years by woodworkers using nothing but hand tools. And today you'll still find craftsmen who have unplugged their power tools to pursue woodworking as it was done pre-machine age—before we had dust collectors, air filters, respirators, ear muffs, and countless guards and pushsticks to protect ourselves from our hobby. You'll find these folks—affectionately known as "Neanderthals"—talking old tool ways on numerous woodworking Web sites.

One of them is Robby Pedersen, who worked on our staff several years ago before setting out on his own to build custom furniture full time. I doubt there's anyone more committed to using hand tools. He builds every piece of furniture almost entirely by hand, from tree to finished product. Yes, Robby even chops down the tree. He tells me a typical mature oak tree requires 800-1,000 axe swings over a 3-5 hour period (I'll take your word for it, Robby, and stick with my chainsaw, thank you). He crosscuts the trunk to log lengths by hand, but does make one concession to technology by using a motorized sawmill to turn the log into boards. From there it's back to using only hand tools to plane, saw, join, and scrape the stock. It's his passion to do everything as it was done more than 130 years ago, hence the name of his business: rvp1875. And if you're interested, he shares that knowledge through classes (find out more at rvp1875.com). He recently filled me in on these hand-tool truths:

- With practice comes speed. Robby estimates he can make a hand-dovetailed drawer in 30 minutes—about one-third the time it took us in the dovetail duel.
- Hand-tool use is great exercise. "I do well in triathlons—and don't train at all," he quips.
- Hand tools force you to understand the wood. "You spare yourself unnecessary work by not fighting the grain."
- Don't do the same task too long. "I'll cut mortises and tenons for a while, then switch to surface planing, then do something else. You get used to a different workflow in order to save your body."
- He quickly learned why yesterday's workbenches are shorter than today's. "Hand-planing surfaces absolutely wore out my arms until I cut my benches down 3" to shift the work from my upper body to my legs."
- But even a diehard Neanderthal appreciates machines, so long as they're not motorized. "I was tearing myself up hand-chopping hundreds of mortises until I got an 1870-era foot-powered mortiser—I love it," says Robby.
Our bulletin board for letters, comments, and timely updates

Before you buy your next tablesaw blade...

Just as this issue was shipping to the printer, we discovered that a number of the performance grades for the Freud P410 tablesaw blade, at right, were incorrectly recorded in the review of general-purpose tablesaw blades (issue 181, December 2007/January 2008). We’ll provide more details soon both online (woodmagazine.com), and in our next issue. After re-verifying our test results for that blade, though, we feel confident in adding the P410 to the list of Top Tools in that review. It’s an especially good blade for cutting melamine-coated particleboard.

—WOOD Editors

Wanted: a talented editor

We have a rare opening on the WOOD magazine staff for a Projects Editor. This person will produce articles on a variety of woodworking topics including projects, techniques, and tools. Duties also include: overseeing how-to photography and illustrations; online content creation and assisting in video production; as well as managing special assignments. Occasional travel is required.

Minimum qualifications:

■ Bachelor’s degree in journalism, English, or communication. Technical writing experience is helpful.
■ Specific hands-on knowledge of woodworking and woodworking tools and machinery.

Candidate also must be a strong writer and a self-starter, able to work in a team-oriented environment, use desktop publishing equipment, and communicate well over the phone and in person. Please note that this position is in Des Moines, Iowa.

Send your cover letter and resume to Dave Campbell at WOOD magazine, 1716 Locust St., LS-221, Des Moines, IA 50309; by e-mail to dave.campbell@meredith.com; or by fax to 515-284-2115. EOE.
Classic rocker
Enjoy the comfort of the contoured seat and perfect balance of this chair indoors or out. You’ll be rockin’ in no time thanks to the no-nonsense glue, screw, dowel, and round-tenon joinery. The included patterns make it a snap to shape the curved parts.

Shoulder planes
These handy tools help you trim tenons and rabbets to fit their sockets tightly. Our in-shop tests point you to the top-performing models.

A Buyer’s Guide to Tablesaws
In the market for a tablesaw but not sure which one to buy? You’ll find the type of saw with features that best meet your needs.

Shoulder planes
These handy tools help you trim tenons and rabbets to fit their sockets tightly. Our in-shop tests point you to the top-performing models.

Rout dowels and round tenons
Make dowels from any wood species, or add round tenons to the ends of square stock using your router table.
6 Simple Ways to Trick Out Your ROUTER

Every woodworker—regardless of skill level—should have at least one router in the shop. This versatile tool earns its keep profiling edges, cutting joints (everything from dadoes to dovetails), and plowing into surfaces for inset elements (such as inlay) to beautify projects. With a few well-chosen jigs and accessories, you'll increase its value even more. Here are the six top add-ons to enhance the performance of your router; you'll find more free router-related jigs, tips, plans, and videos at the Web site listed below.

Watch two free videos demonstrating how to set up and use a dovetail jig and how to get the most benefit from your router table at woodmagazine.com/trickout.

LET A BUSHING BE YOUR GUIDE

Install a guide bushing in your router's base opening, and use it to follow an edge guide or template for routing pattern-perfect parts. Because you use an ordinary straight bit with no bearing, you can even plunge for template cuts in the field of a workpiece.

THE UPSIDES OF A PLUNGE BASE

Fixed-base routers typically cost less than a plunge router and will handle most of the router-oriented tasks in your shop. But many fixed-base routers, such as the PORTER-CABLE 891 (above right), can be bought in a combination kit (model 894PK) that also includes a plunge base (below), adding the ability to start and stop a cut in the middle of a workpiece. These "field" cuts include stopped flutes and dadoes, as well as recesses in router-carved signs. The motor easily swaps between the bases, giving you the versatility of two routers for a little more than the price of one. As a bonus, you can mount the fixed base in a router table; then exchange the motor between it and the plunge base for handheld work.

ROUTER TABLE = GREATER CONTROL

Mounting a router upside-down in a table gives you greater command of the workpiece and cutting action, especially on pieces too small to safely rout with a handheld router. Whether you buy one or build your own (find free plans at woodmagazine.com/trickout), insist on a perfectly flat tabletop, a precise and adjustable fence, and an effective dust-collection port. With those basics covered, consider an up-front switch to start and stop the router, and feather boards for ultimate workpiece control.
EXACT-WIDTH DADO JIG

Here’s a jig for routing bookcase or cabinet-side dadoes that exactly match the thickness of your shelf stock. No special bits are needed. Just use an ordinary straight bit and a guide bushing. (We used a 1” guide bushing and a 1/2 straight bit.) To start, cut a 1/4” rabbet 3/4” deep along the inside edge of both guide rails (A). Then complete the jig, as shown in the drawing. To customize the rails for a different bushing and bit, use them to trim the rabbet in the guide rails. The remaining lip will now match your bushing/bit combo. To set the jig for your shelf stock, slip the jig over the shelf stock, as shown above right.

PAINLESS DOVETAILS MADE BY MACHINE

Dovetail joints have long been considered the hallmark of quality woodworking. A precise, easy-to-use through-dovetail jig earns you that reputation without years of practice. Some, like the PORTER-CABLE Omnijig Joinery System 77240 shown, expand your repertoire with variable pin spacing (for that hand-cut look) and the ability to cut half-blind dovetails, sliding dovetails, and even box joints with included and optional accessories.

ADD-EM-AS-YOU-GO BIT STORAGE

This modular router-bit storage system fits into any drawer and easily grows to meet your expanding bit collection. A 1-2-3 progression of block sizes maximizes the number of possible arrangements. As shown, there’s room for wrenches, guide bushings, and even one large block drilled to hold rotary-tool bits. To build your modular storage, rip and then crosscut 3/4” MDF (medium-density fiberboard) into 1 1/4”, 2 1/2”, and 3 3/4” squares. Drill centered, slightly oversized holes for easy bit removal; 3/8” and 13mm holes for 1/4”- and 1/2”-shank router bits, and 3/8” and 3/4” holes for 1/4”- and 1/2”-shank high-speed rotary-tool bits. Dip the blocks into an oil-varnish blend, such as Danish oil, and after wiping off the excess finish with a rag, dry the blocks on a window screen propped on sawhorses. With the finish dry, arrange the blocks in your drawer. Fill in the extra drawer space with snug-fitting pieces of 3/4” hardboard, and use these traylike spaces for storing accessories.

Snug the guide rails (A) against the stock, and tighten the wing nuts. Slip the jig off the stock, and clamp the jig onto the piece being dadoed, aligning the gap between the rails (A) over the marked dado on the side panel. Adjust the depth of cut with your router sitting on top of the rails. Rout one pass with the guide bushing riding against one of the rabbeted rails. Make a second pass riding the bushing against the opposite rabbeted rail.
Shop Tips
Helping you work faster, smarter, and safer

Miter to picture-frame-perfect length the first time

I've had great success cutting perfect miters for picture frames using a dedicated sled with a plastic 45° drafting triangle acting as a fence, as shown at right. After squaring the sled base to the guide bar, I cut a saw kerf two-thirds of the way through the sled. Next, I centered a fence a little shorter than the longest side of the triangle on the back edge of the sled. Finally, I screwed the triangle to the sled so that the point of its 90° angle splits the saw kerf.

To use the sled, I first crosscut all my frame sides to finished length—plus ¼" to account for the kerf of my tablesaw blade. Then, I cut a scrap of stock the same width as the frame workpiece and hold a scrapwood stop against it as shown. With the workpiece butted against the stop, the blade removes half of the ¼" excess length with each cut. It's as easy to cut on the right side of the blade as it is the left with no adjustments like you would have on a mitersaw.

—Niki Avrahami, Carwolin, Poland

Workbench expansion gives you a leg up

I was building a corner cabinet when I realized my workbench wasn't quite wide enough for the project. To solve the problem, I enlisted my bench vise to create a temporary workbench addition, as shown.

The extension top is a separate, compact table that's quickly but firmly held in place by the vise. To install it, I first use the bench vise to align the surface of the extension flush with the benchtop. Then I use the leveler on the bottom of the leg to firmly position the rest of the extension and take some of the pressure off the vise.

—Dove Wywil, Janesville, Wis.

continued on page 17
Lucy, you've got some splinin' to do

Miter joints are some of the weakest in woodworking because of poor end-grain to end-grain gluing. That's why I always reinforce my miter joints with a spline. I used to cut the spline slots with a jig on my tablesaw, but that gets awkward with a large frame.

Recently, I began using my biscuit joiner to simplify this process. By adding an aluminum plate to the jointer's fence, as shown, the slot is automatically centered on the joint. I cut the added plate to shape using a metal-cutting blade on my bandsaw.

A couple of caveats: When cutting the 90° bird's mouth, leave at least 3/16" of metal at the back of the plate for strength. And remember that you could accidentally cut into the added plate with the joiner's blade if you don't properly adjust the depth.

—Jack Williams, Elephant Butte, N.M.

Snap a sharp line in glass

Having four daughters and three grandchildren, I am forever making picture frames. Usually these frames are not a common size, so I started to cut my own glass with mixed results. Finally, I made the glass-breaking jig shown right to provide uniform pressure for a clean break. On one of the plywood layers, I glued a 3/8" x 1" scrap of plastic countertop laminate.

To use the jig, clamp it over the glass sheet, leaving just enough room for the glass cutter. After scoring, reclamp it next to the score line, and snap off the extra glass.

—Karl Mueller, Fairport, N.Y.
3-way mitered half-laps

Combine the flowing grain of a miter joint with the strength of a half-lap using only your tablesaw.

Accuracy is important to making this joint, so before machining your stock, double-check and adjust your tablesaw blade to make it square with the tabletop. Then adjust your jointer’s fence dead-on square with its bed.

For the tables on page 60, we made all the legs and two sets of rails the same width and thickness. To begin, machine the legs and rail pieces to the same width and thickness before cutting the pieces to length. Save the cut-offs to test your dado-blade height. Cut 45° miters on the ends of each rail without reducing its length.

Next, using a dado stack that’s a hair wider than half the width of the project parts, make test cuts in the cut-off scraps until the blade cuts half the part thickness, as shown at right. Lock the saw’s blade height to prevent slipping.

Now you’re ready to begin cutting the joints, starting with the legs.

ANATOMY OF A MITERED HALF-LAP JOINT

For a tight joint, start with stock that’s machined to the same width and thickness (A). Then cut dadoes that equal half the thickness of the stock (B).

RAISE THE DADO BLADE HEIGHT UNTIL THERE’S A NO-GAP OVERLAP

To test dado-blade height settings for this joint, use two pieces of scrap the same thickness and width as your parts. Then raise the blade until the dadoes just touch, as shown at right.
Mark the dado start on one leg. Clamp a stop-block to a miter-gauge extension, and make dadoes on two adjacent faces of each leg. Place one edge of a rail at the edge of a dado on one of the legs. Then use a crafts knife to mark the other edge of the dado. Align the score mark with the dado blade, and reposition the stopblock. Rotate the workpiece, dado down, and cut the other half of the dado on the two adjoining faces.

Use cut-off scrap to test the fit before making the remaining cuts on each leg. Now, rabbet the mitered ends of the rails. Gradually reposition a stopblock until you rabbet to the edge of the miter. Cut identical rabbets on both ends of each apron part. Rails should fit snugly within the dadoes, with the mitered end flush with the corner of the table leg. If they don't fit, you'll need to adjust the joint using a sanding block, as shown in the next step.

Test-fit the rail parts in the leg dadoes. If the faces aren't flush, gently sand the rail rabbet with a 100-grit sanding block with abrasive on just one surface. Working on a dead-flat surface, apply clamping pressure to where the rails overlap the legs. Check for square at each joint and that all four legs touch the surface. Allow the glue-up to dry for at least four hours. Using a random-orbit sander to avoid cross-grain scratches, sand the rails and legs flush up to 180 grit. Avoid accidentally rounding over the edges and corners. Hand-sand inside corners to 180 grit.
**Our Experts Test**

**Dust-Collector Remote Controls**

**SHOP FOX, D3038**

110-volt model (shown), $45  
220-volt model #D3346, $40

**Editor test-drive:**  
In my crowded basement shop I have to bob and weave across the room just to get to the dust collector. Then I have to bend and reach over the blower to flip the switch, which is mounted about 16" off the floor. It's terribly inconvenient. Now I use a Shop Fox remote to turn it on from anywhere in the shop. It even works from two rooms away despite dividing walls. I especially like that it comes with two remotes, but did not like the dangly clips because every time I reached for the remote I had to spin the unit to find the switch. Instead, I removed the clips and applied hook-and-loop patches to one unit as well as my tablesaw's rip fence, so it's always within reach. I attached a metal disc to the other so it grabs onto a magnetic belt clip.

---

**To learn more:**  
800-840-8420; shopfox.biz

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**FERNBROOK SMART SWITCH, DK2202XT**

110-volt model #DK1101XT, $43  
220-volt model (shown), $50

**Editor test-drive:**  
With the Fernbrook system a single remote controls both the dust collector and air-filtration unit. For $50 the basic unit controls the dust collector; to add air-filtration control (or even an exhaust fan) you need to buy an accessory 110-volt outlet for single-speed machines (like mine) or a toggle switch—that replaces your outlet—for variable-speed air cleaners ($30–$40 each). With the latter, you can then control the air cleaner's speed with the remote as well. I hooked up my 220-volt collector to the Smart Switch and had it running in just a few minutes. For the air cleaner I had to replace a wall outlet with the RM1102 Relay Module—essentially just changing outlets. Now I run both machines whenever necessary, for as long as required, with just a touch on the remote. And, it even works from up to 200' away.

---

**To learn more:**  
800-382-1924; dnet.net/frnbrock

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**PENN STATE LONG RANGER III, LR110-3**

110-volt model (shown), $60  
220-volt model #LR220-3, $70

**Editor test-drive:**  
My dust collector is really loud, so I don't like to leave it running. That soon became a lazy, messy habit as I found myself not using it often enough unless machining a lot of stock. Now with the Long Ranger remote I use my collector every time I fire up a machine. Turns out, the remote doesn't have to be pointed directly at the wall unit as with my TV remote. It worked consistently from inside the house, through walls, out in the pole barn, and—because I wanted to see just how “long range” it really is—from my driveway 330' away. You can buy a second remote ($20) that's reprogrammable for the same controller.

---

**To learn more:**  
800-377-7297; pennstateind.com

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**LONG RANGER MULTIGATE SYSTEM, LRMSET220**

110-volt model #LRMSET110, $50  
220-volt model (shown), $60

**Editor test-drive:**  
I've had a remote control on my 3-hp dust collector for years, but—just like with the TV in my living room—the remote often comes up missing. With Penn State's MultiGate System there's no need for a remote because the metal blast gates turn the collector on and off when I open and close them, something to be done anyway. It took about two hours to install the control unit and five gates and connect them with 22-gauge wire. It's really simple, even if you don't do much electrical work. I like that the gates have an open slot, so they push stray chips out the back upon closing rather than causing the gate to jam. The base system comes with the relay box, one gate, and 100' of wire. Extra gates cost only $10 each, and an extra 100' of wire costs $10.

---

**To learn more:**  
800-377-7297; pennstateind.com

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**Why buy?**

You've probably more than once made a quick cut at your tablesaw or jointed an edge without turning on your dust collector, just to avoid walking across the shop to turn on the collector. That's where a radio-frequency remote controller comes in handy, enabling you to switch a dust collector on and off from anywhere in the shop. That increases your working efficiency, and, hopefully, ensures good health. Here are four great remote options, all costing $60 or less.
Here's a rock-solid solution to stock support, sent in by WOOD magazine reader John Lanigan, of Concord, New Hampshire. Mount it to a workbench, as shown, or add legs for a stand-alone support. Easy height adjustability makes it a versatile addition to your shop.

We used 3/4" MDF for most of the construction and laminated two pieces of 3/4"-thick stock to form the movable post (F). The beveled support pad (H) allows stock to move over it with ease. When assembling the unit, note that only the bottom end of the sleeve front (B) is screwed in place, allowing the top of B to flex. This enables you to lock the post (F) in place in the sleeve assembly (A/B) using a four-arm knob, pressure block (C), and a steel mending brace.

Project design: John Lanigan

Materials List

<table>
<thead>
<tr>
<th>Part</th>
<th>FINISHED SIZE</th>
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<tbody>
<tr>
<td>A sleeve sides</td>
<td>3/4&quot; 3&quot; 24&quot; MDF</td>
</tr>
<tr>
<td>B sleeve front/back</td>
<td>3/4&quot; 1 1/2&quot; 24&quot; MDF</td>
</tr>
<tr>
<td>C pressure block</td>
<td>3/4&quot; 1 1/4&quot; 4 1/2&quot;</td>
</tr>
<tr>
<td>D bottom braces</td>
<td>3/4&quot; 1 1/2&quot; 11&quot; MDF</td>
</tr>
<tr>
<td>E bottom bracket</td>
<td>3/4&quot; 3&quot; 8&quot; MDF</td>
</tr>
<tr>
<td>F post</td>
<td>1 1/4&quot; 1 1/4&quot; 27&quot;</td>
</tr>
<tr>
<td>G upper brace</td>
<td>3/4&quot; 3&quot; 11 1/2&quot; MDF</td>
</tr>
<tr>
<td>H support pad</td>
<td>3/4&quot; 3&quot; 12&quot;</td>
</tr>
</tbody>
</table>

Materials key: MDF—medium-density fiberboard, P—pine.
Supplies: #8 x 1 1/2" flathead wood screws, #8 x 2" flathead wood screws, 1/4"-20 four-arm knob (1), 1/4" T-nut (1), 1/2"x2" mending brace National N114-314 (1).

Find dozens of FREE project plans at woodmagazine.com/freeplans
Tool Shop

Zero (Chip-Out) Tolerance

Don't accept workpiece chip-out on your tablesaw. Instead, eliminate it by using a zero-clearance insert for every cut you make.

Anyone who's ever crosscut oak plywood knows how face-grain chip-out can ruin an edge. Once the damage is done, you're forced to either fill those voids or accept the flaws on your project.

But you don't have to live with chip-out. A shop-made zero-clearance insert replaces your tablesaw's factory-supplied throat plate—and its wide gap that allows unsupported wood fibers to tear away during a cut. Because you cut the blade slot with the blade you're using, the zero-clearance insert fully supports the fibers.

It's a good idea to use an insert for every blade and every cut you make. Plowing a 7/4"-wide dado? Use a custom-fitting insert to stop chip-out. How about a 1/2" dado? Make another insert. Cutting a 30° bevel? Get an insert just for that. You can easily make insert plates, so cut out a dozen blanks and keep them handy for every time you change blades or bevel angles. After using an insert for a specific setup, mark it with that setting (and blade) and save it so you'll have it for the next time you make the same cut.

How to make inserts fast

You can buy pricey, premade phenolic inserts, but we like to make our own zero-clearance inserts from 1/4"- or 1/2"-thick Baltic birch plywood. This stable material proves strong, and doesn't have voids between plies. Medium-density fiberboard (MDF) also makes a good insert, but lacks the strength of plywood. Hardwoods, although strong, can shrink or swell with seasonal changes in humidity, and don't work as well as plywood.

With a pattern bit installed in your router table, use your saw's original insert to make duplicates. Some insert plates have antilift tongues [Photo A] or lateral-adjustment screws—with these you need to create a pattern to use for making copies. To do this, trace your insert plate onto a blank of plywood or MDF, smoothing the tongue or screw areas. Cut close to the line at your bandsaw, and then sand the pattern until it fits snugly into your saw's throat. If you want the antilift benefit of the tongue, you can add this to your inserts by cutting a groove on the bottom side and then gluing in a thin strip of hardwood that protrudes under the tabletop.

Cut out rectangular plywood blanks slightly larger than the pattern. Using cloth-backed, double-faced tape, secure the blank to the pattern, and then bandsaw to within 1/4" of the pattern. Next, rout the blanks to shape using a pattern bit or flush-trim bit in your router table [Photo B].

Customize the inserts to fit your tablesaw

Now that you have the blanks cut to shape, make a finger hole (for removing the insert) by drilling a 1/4" hole through each insert. Keep it at least 1" to the side of where the blade will project through the insert.

continued on page 30
On many saws with 10" blades, the blade retracts only ¼" or so below the table surface [Photo C], meaning your unkerfed insert blank won't sit flush with the tabletop. You've got three options here: First, use a smaller diameter blade—like one of the outer blades from your stacked dado set, or a blade from your portable circular saw—to cut a relief slot that your 10" blade will fit into. (Unless the blade you use has the same kerf width as your 10" blade, don't raise it high enough to break through the surface.)

Your second option is to adhere the blank onto the metal insert plate, clamp it in place, and then slowly raise your spinning 10" blade until it just pokes through the plywood blank [Photo D]. Now separate the two plates and install the zero-clearance insert over the blade.

With option #3, rout a ¼" channel along the bottom of the insert deep enough to give the blade initial clearance [Photo E] when you place it in the saw. However, do not rout deeper than half the thickness of the insert. More than half would weaken it and create a potential safety hazard.

You'll also have to cut relief holes or slots for blade guards, splitters, or riving knives. You can do this with your tablesaw and 10" blade—with the original insert installed—if the relief exits the back of the insert. If it does not, use a jigsaw [Photo F]. You might also have to relieve the bottom face for such things as the arbor assembly and flange, or for parts specific to the original insert [Photo G]. Machine these shallow relief areas at the drill press with a Forstner bit or on a router table.

**Now level the insert with the tablesaw top**

If your insert sits too high, drill or rout relief areas on the bottom where it sits on the throat tabs or rabbet. If your insert sits too low, add leveling screws so you can adjust the fit perfectly from the top. (Use either setscrews or machine screws.) To do this, either transfer the screw locations from the original insert, or use thumbtacks to mark them [Photo H]. Now drill shank holes, and countersink or counterbore on the top face. Add the screws [Photo I] and then raise or lower them to make the insert flush [Photo J].

**Check the blade depth**

With this steel rule resting on the insert ledges, you can see that the 10" blade requires a relief cut in a blank insert.

**Pre-cut the blade kerf**

Because the insert rests on top of the saw, secure it firmly with double-faced tape and a board and clamps.

**Route a relief channel**

Use any bit that can rout a channel. We used this dish-carving bit to create a ½"-wide relief necessary for a 45° bevel cut insert.

**Allow for protrusions**

A relief area for the arbor assembly proves necessary when raising the blade to cut 2" or thicker workpieces.

**Mark screw locations easily**

Place thumbtacks onto the ledges, and then gently lower the insert into place. Tap it lightly to make indentations.

**Add adjustment screws**

Add hex screws for leveling. Add wood screws to one edge and end for lateral adjustments if the insert is too loose.

**Level the insert to the top**

Adjust the leveling hex screws to ensure the insert sits flush with the tablesaw's top. If it sits too high your workpieces will catch on it.
A Perfect Puzzler

Puzzle master Perry McDaniel shares his secrets for impossible-looking wooden boxes with piston-perfect sliding dovetails.

The ancient Egyptians might have been the first to use the dovetail, but present-day Texan Perry McDaniel has definitely given this old woodworking joint a few new twists. Working in his garage shop, he has designed more than 35 original wooden puzzles. (Factoring in several production runs, Perry estimates that he's built more than 4,500 boxes.) In fact, his work is stashed away in the private collections of puzzlers from all over the world.

One key to most of Perry's designs is the simple sliding dovetail. The super-tight dovetails that have become his trademark look impossible to make, but they're not. In fact, once you know a few basic rules, you'll discover that the impossible is not only possible, but surprisingly simple.

Building two of Perry's own custom puzzles, you'll learn two different ways to rout perfectly fitting dovetails. In addition, you'll master two clever magnetic locking mechanisms that can be adapted to fit other boxes or drawers.

Perry's 4 rules for super-tight sliders

Although they differ in design and complexity, Perry's puzzles obey a few simple rules. Following these guidelines not only ensures smooth-sliding dovetails, it also helps you avoid wood-movement woes whenever you're working with gnat's-backside tolerances.

Rule 1: Start with stable wood. Perry likes using contrasting species of wood, but sticks with the most dimensionally stable species, such as walnut, mahogany, and padauk. "Steer clear of maple and oak," he says. "As soon as the humidity changes, even a little, your project is likely to stick—and stay stuck."

Rule 2: It's safer to go small-scale. "Even the best wood will expand and contract a little," he says. When aiming for a seamless fit that's sure to slide in any season, Perry keeps his projects on the small side. Most of his designs use dovetailed slides shorter than 6".

Rule 3: Prep work must be precise. Absolute flatness is essential for a smooth-sliding dovetail joint. To check for flat, press the boards together after jointing both faces. "If they're both really flat, you'll feel a little suction when you pull them apart."

Rule 4: Use a thin film finish. "Oil-based finishes sink into the wood, swell the fibers, and can freeze up a previously perfect joint," he says. Instead, Perry sprays his puzzles with two light coats of shellac. The super-thin film finish enhances the color of the wood and seals the surface from absorbing moisture. "Avoid wax," he warns. "Although it's slick in some instances, when used in a sliding dovetail, wax tends to stick."

Fortunately, Perry's found a slippery substitute: "A spritz of a dry tool lubricant, such as TopCote, does the trick." ($13, no. 97594 at Rockler, 800-279-4441, or rockler.com)

Perry McDaniel shows a few of his puzzling creations. It's hard to find another project that can offer so much delight (and frustration) and uses so little wood.
Building the Caged Dove

To help you make a puzzling project, Perry designed this box exclusively for WOOD magazine readers. You'll try your hand at cutting sliding dovetails with your router, but you'll be able to complete this fun puzzler even if your joinery isn't perfect. That's because Perry designed the dovetailed ends to look like they're supposed to slide. Instead, the drawer slides open from one end [above and Drawing 1]. A pair of rare-earth magnets (one of Perry's favorite locks) holds the drawer closed and snaps it shut with a satisfying "click." First-time puzzle solvers are typically surprised to see how easy it is to open the box once they know its "secret."

You don't need much stock to start. For safe jointing and planing, Perry suggests starting with two 6½x20" blanks, one you can joint and plane down to ¾" and another (of contrasting wood) you can machine to 1" thick. "If you cut carefully," he says, "you'll have enough material to make three boxes."

Incremental positioning made simple

According to Perry, cutting perfect-fitting dovetails can be explained by a "dovetail formula:" Depth of Cut equals the Cut Diameter minus half the Cut Spacing; then divide that by the tangent of the Dovetail Angle. Whew! "But you don't really need to do a lot of math to figure out what works," he quickly adds. "The formula simply demonstrates that for each dovetail height, there's only one workable spacing." But what does it all mean where the bit hits the board? "By keeping one factor constant," he explains, "adjusting the other will achieve a perfect-fitting dovetail joint, every time."

For perfectly consistent spacing, Perry usually uses an incremental fence (see Sources), but for the Caged-Dove puzzle, he devised a three-board trick that provides the same degree of consistency and works with any router-table fence.

In addition to a router table, you'll need a ¾" 14°-degree dovetail bit, a pair of ¾"-thick spacers, and a backstop as long as your router table is wide.

After establishing the first fence setting and locking the fence in place, insert spacers the same thickness as your dovetail spacing (¾", in this case) and clamp on a backstop that traps the spacers against the fence [Photo B]. After making the first cut, remove the spacers and slide the fence against the backstop [Photo C], then make the first cut in the mating workpiece.

Note: You'll need to test and tweak the fit of the dovetails before routing your box. Practice project Steps 4-7 using scrap stock. Adjust the bit height as necessary before using good wood.
Start with the ends

1. Joint one face and an edge of each blank. After making sure the faces are "suction" flat (see Rule #3), mark the freshly jointed edges [Photo A].

2. Using your tablesaw, rip both blanks to 6" wide. Then, with the jointed faces down, plane the blanks to the finished 1" and ¾" thicknesses.

3. Cut a clean, square end on both blanks. Perry prefers to use a tablesaw sled for precise crosscutting, but you also can do this using an extension on your miter gauge. Next, use a stopblock to crosscut a 2½"-long piece off each blank for forming the box ends (A/B) [Drawing 2]. Set aside the remaining blanks for now.

4. At the router table, set a ½" dovetail bit just a hair less than ¼" high. Adjust the fence to cut about ¼" into the edge of part B (at the widest part) [Drawing 2a], and then position the ¾" spacers and backstop against the back of the router fence, as shown in the Shop Tip on the previous page. Rout the first dovetail groove.

5. Remove the ¾" spacers and move the fence away from the bit until it butts against the backstop [Photo C]. Clamp the fence in place, and rout the first groove into part A.

6. Reposition the spacers between the backstop and your router fence and continue shifting the fence each time you rout each new groove. After one or two cycles through Shop Tip steps 1-3, routing two tail grooves in each board, check the fit of your sliders. At this point, the dovetails may be slightly loose [Photo E]. Measure the gap, and raise the bit by that amount.

7. Test-fit your freshly cut dovetails in parts A and B one last time before...
Matching the end grain for a seamless look, glue the ends (A/B) to the filler (D). The cauls prevent the clamps from denting your work.

Brushing on glue and sliding them together. Work quickly; the glue may swell the wood and prevent you from sliding the pieces together.

Using a miter gauge and push block with his belt sander, Perry quickly finish-sands the box while still keeping the edges square.

The gluing jig ensures that the top/bottom straps (E) offset the box ends equally. They overhang the front and back by at least 1/4.

To make the drawer (C) and filler (D) [Drawings 1, 2b], cut a 2 3/4 x 2" piece from each leftover blank.

With a 1" Forstner bit in your drill press, bore the drawer cavity 1/4" deep and centered 1" from the front edge of the drawer (C) [Photo G].

Flip the drawer (C) end-for-end and using a 3/8" Forstner bit, drill a hole centered 3/8" from the back edge and as deep as the rare-earth magnet is thick. (See Sources.) In the filler (D), bore another magnet hole the same size and depth centered 1/2" from the back edge. (Perry offsets the holes by 1/8" so the magnets hold the drawer in place.)

Apply a drop of cyanoacrylate (CA) glue into each magnet hole, and then press the magnets into place. (Tip: Be sure to test the polarity of the magnets before you glue them in to make sure they attract. If you reverse the poles, the magnets will push the drawer open, rather than hold it shut!)

Now capture the dove in the cage

1. Plane a piece of 1"-wide maple 22" long to 1/4" thick.

2. From this strip, cut four 3 3/4" pieces for the top/bottom straps (E). (Perry cuts these overlong and then trims them after assembly.) Glue them to the top and bottom of the box, where dimensioned, using a gluing jig made from 1/8"-thick MDF [Photo J, Drawing 3]. Apply glue only to the part of the straps that contact the filler (D) and ends (A/B).

3. Cut four 1/2"-long front/back straps (F) to fit between the top and bottom straps. Glue the back straps first. Use glue sparingly to avoid squeeze-out. Allow the glue to dry before gluing the front straps to the front end of the drawer. (Tip: By inserting a strip of cardboard behind the drawer, the front end will protrude enough to help you apply adequate clamping pressure.)

4. Using a belt sander, sand the ends of the top and bottom straps (E) flush with the front and back straps (F).

5. After finish-sanding the straps, Perry finishes the box with two light coats of spray shellac.

Note: Parts initially cut oversize. See instruction for details.

woodmagazine.com
Puzzle PLUS: The Sandfield Box

This baffling box started Perry down the puzzle pathway almost a decade ago. Based on a design patented in 1887, the finished joint looks impossible to make, until you see that the dovetails run diagonally through the box. To add to the mystery, Perry’s puzzle employs a locking pin. This simple lock prevents persistent wigglers from uncovering this box’s secret—until you tap the top to release the pin from the magnet.

This box isn’t difficult to make, but the precise dovetail-bit positioning requires an incremental-positioning router table fence. (For an affordable incremental fence, see Sources.) Rather than attempting to juggle spacers, Perry uses the fence’s positioning scale to “zero in” the bit after making the first cut, and then relies on the measurements on the fence to quickly and accurately position it for subsequent cuts.

As with the Caged-Dove puzzle, start with oversize blanks that you can joint and plane safely. Two 1″×3½×20″ blanks yield five or six boxes.

Build the box

1 Joint a face and one edge of each blank, and mark the jointed edge. Rip both blanks to 3″ wide; then plane the unjointed face of the top blank to 1″, and the bottom blank to ¾″. (Tip: Rip an extra piece of ¾″-thick scrap to 3″ to help center the bit in Step 3. Because the 20″ sliding dovetails are sure to stick, Perry then crosscuts both blanks to a more manageable 10″ long.)

2 Install a ¼″ dovetail bit in your router table and set the cutter height just under ¼″. Using two pieces of scrap, repeat the test-fitting steps described in Steps 4–7 (on page 35) of the Caged Dove puzzle to set your bit height. This time, however, the process will go quicker because you can use the fence’s scale to move the fence in ¼″ increments. Test your dovetails and raise the cutter as necessary for a tight fit.

3 Position the fence to center a dovetail groove in the blank. To do this, measure to the center of the extra piece that you cut in Step 1, adjust your fence, and rout a groove through the board. Now, turn the board end for end and rout the groove again. Unless you’re perfect, the finished groove will wind up being slightly wider than the bit [Photo K]. Adjust the fence to center the bit in the groove by eye, and slide the fence scale so it reads 1½″ under the cursor.

4 Set your incremental fence to ¾″, and rout the first dovetail groove in the blank for the bottom (B). Then reset to 2½″ and cut the second dovetail groove [Drawing 4].

5 Routing the blank for the top (A) is almost as easy as the bottom. In this case, you’ll remove much more material, leaving only the long dovetail pins that fit the grooves you cut in Step 4. Start by setting the fence so the dovetail bit lightly scores the edge of the blank; then move the fence and make two or three progressively deeper passes until the fence reads 3½″. Reposition the fence to 2½″, rout a dovetail groove, keep moving the fence, and progressively rout out the waste until the fence reads 4½″ [Photo L]. Finally, move the fence to 2¼″, and rout the far edge.

6 Slide the resulting dovetail pieces together and crosscut the assembly into 3″ long blanks. You’ll notice that the dovetail fit loosens slightly once the length is reduced (per Perry’s Rule #2).

If the resulting dovetail pieces are too tight, cut them to 2½″.

Make the drawer with the drop-pin lock

1 Using a ¾″ Forstner bit in your drill press, bore a hole ¾″ deep for the treasure compartment in the bottom (B), where shown [Drawing 4].

2 With a ½″ Forstner bit, drill mating holes in the top (A) and bottom (B) to accept the magnet and steel locking...
4 THE SANDFIELD BOX, STEP-BY-STEP

STEP 1. Machine the blanks.


STEP 3. Drill the holes.

1764" steel pin 1/4" long

1/8"-diam. magnet 1/4" long

1/2" hole 1/4" deep

1/16" steel pin 3/4" long

1/16" hole 1/4" deep

STEP 4. Mark the square.

STEP 5. Cut the corners.

1/16" chamfers

1/16" chamfers

Finish the box

1 Using a combination square, draw 45° lines connecting the center points of each side of your box. Then bandsaw just shy of your lines as shown in [Photo O].

2 Sand up to your pencil lines with a belt sander as shown in [Photo I], and finish-sand the box.

3 Using 220-grit paper, lightly chamfer any sharp corners; then spray on two light coats of shellac.

Finishing tips:

Small parts can be cut safely on the bandsaw. Install the locking pin before cutting so the top and bottom can't shift.

Sources

Caged Dove
8mm rare-earth magnet: #127198, 10 for $11; Call Woodcraft Supply at 800-225-1153 or visit woodcraft.com.
Bits: 1/2" 14° dovetail router bit, 1" and 3/8" Forstner bits.

Sandfield Box
Magnet and steel locking pin set: #PUZ-1, $1 per pair; (add $2.95 for shipping). Call 888-536-4478 or online at woodmagazine.com/puzzlepin.

Fence: Incra Universal Precision Positioning Jig, #25971, $60. Call Rockler at 800-279-4441 or visit rockler.com.
Bits: 1/2" 14° dovetail router bit, 1/4" and 3/8" Forstner bit.

written by Joe Hurst-Wajszczuk

Photos: Marcus Irvin
Illustrations: Roxanne LeMoine; Lorna Johnson

Small parts can be cut safely on the bandsaw. If the magnet shifts, the box might become permanently locked.

Give the quick-setting glue several minutes to dry. If the magnet shifts, the box might become permanently locked.

woodmagazine.com
Classic Country Oak Hutch

Timeless styling and mail-order legs make this a project you and generations to come will appreciate.

See a Slide Show of this project coming together at woodmagazine.com/slides.

This piece matches the drop-leaf table (at left) featured in the December/January 2007/2008 issue.
Make the end assemblies

1. Cut the end rails (A) to size [Materials List, page 44]. Rout a ¼" bead along the outside bottom edge of each center end rail [Drawing 1a]. Then cut a groove the thickness of ¾" plywood in the inside face of each lower end rail [Drawing 1]. Now cut slots for #10 biscuits in the end of each rail. Finish-sand the rails.

2. Cut the end panels (B) to size. Then cut a rabbet along the top and bottom edge of each panel [Drawing 1]. Finish-sand the panels.

3. Glue and clamp the top and center end rails (A) into the end panel (B) rabbets [Drawing 1]. Keep the rail ends and the panel edges flush.

4. Lay out the biscuit slot locations on the top post and stretcher post of each leg (C) [Drawing 1]. (See Sources for the legs.) Then cut slots for #10 biscuits. Inspect the legs, and finish-sand them where needed.

5. Apply masking tape to the lower end rails (A) and the leg (C) stretcher posts, and mark centerlines. Then glue, biscuit, and clamp the end assemblies [Photo A].

Build the case

1. Cut the divider panels (D) and divider banding (E) to width and 1" longer than listed. Then glue and clamp.
the banding to the front edge of the panels. With the glue dry, sand the banding flush with the panel faces. Now cut the dividers to length, trimming both ends.

**2** Lay out shelf-support hole centers on the dividers (D/E) [Drawing 2]. Drill the holes with a ¼" brad-point bit.

**3** Cut notches in the dividers (D/E) for the upper front rail (G) [Drawing 2]. Make the 2¼"-long cuts on your bandsaw using the fence and a stopblock [Photo B]. Then finish the notches by repositioning the fence and stopblock and making the ¾"-long cuts. Finish-sand the dividers.

**4** Cut the bottom panel (F) and front rails (G) to size. Then rout a ¾" bead along the bottom front edge of the lower front rail [Drawing 3]. Glue and clamp the lower front rail to the bottom panel, flush at the ends and top edge. Sand the rail flush with the top surface of the panel, and finish-sand the assembly.

**Note:** To ensure a tight joint between the lower front rail (G) and the divider banding (E), use a hard, flat sanding block to sand the rail flush with the bottom panel (F).

**5** Drill countersunk shank holes and form ¾" slots in the upper front rail (G) [Drawings 3 and 3a]. (For the #8 screws in this project, drill ¾" pilot holes and ½" shank holes.)

**6** Attach the dividers (D/E) to the bottom (F/G), using a spacer to position the interior dividers [Photo C]. Then attach the upper front rail (G) to the dividers [Photo D].

**Note:** Our ¾" plywood measured .703" (2640) thick. To compensate for the under-thickness plywood when evenly spacing the dividers (D/E) on the bottom (F/G), we cut a spacer 1 3/16" long.

**7** Cut the back (H) to size. Drill counterbores and pilot holes for three figure-eight fasteners into the top edge [Drawings 3 and 3b]. (For the #6 screws in this project, drill ¾" pilot holes.) Finish-sand the back. Glue and clamp the back to the dividers (D/E) and bottom (F/G). Drill screw holes through the back and into the dividers, and drive the screws.

**Add ends, top, and shelves**

**1** Dry-clamp the end assemblies (A/B/C) to the case, and measure the distance from the bottom of one lower end rail (A) groove to the bottom of the other end rail groove. Then cut the stretcher shelf panel (I) and stretcher shelf edging (J) to size, using your measurement as the length. Glue and clamp the edging
to the panel, flush at the top. Cut notches in the ends of the edging [Drawing 3]. Finish-sand the shelf.

Glue and clamp one end assembly (A/B/C) to the case, flush at the top and back. Then, with the glue dry, add the other end assembly and the stretcher shelf (I/J) [Photo E].

Cut the shelf panels (K) and shelf banding (L) to width and 1" longer than listed. Then glue and clamp the banding to the panels. With the glue dry, sand the banding flush with the panel faces. Now cut the shelves to length, trimming both ends.

Edge-glue an oversize blank for the top (M). Sand the blank smooth and trim it to finished size. Then chuck a \( \frac{3}{8} \)" round-over bit into a handheld router [Drawing 4a], and rout the ends, and then front edge [Drawing 4].

Now make the doors

1 Cut the stiles (N), rails (O), and panels (P) to size. Then make the doors [Drawings 5 and 5a], as shown starting on page 46. Now, with the doors complete, drill knob screw holes, mount the hinges on the doors, and hang the doors in the case openings. For guaranteed door-hanging success, see page 88.

Finish and assemble

1 Remove the hinges and spring catches. Inspect all the parts, and finish-sand where needed. Apply the finish. (We stained with Varathane Golden Oak no. 227, and let it dry for 24 hours. Then we sprayed on two coats of Minwax Satin Polycrylic, sanding between coats with 220-grit sandpaper.)

2 Install figure-eight fasteners on the back (H) [Drawings 3b and 4]. Clamp the top (M) to the case, flush at the back and centered side-to-side. Using the holes in the figure-eight fasteners and the centers of the slots in the upper front rail (G) as guides, drill pilot holes into the top. Fasten the top with screws and flat washers [Drawing 4].

3 Rehang the doors and install the catches and knobs. Install the shelf supports and shelves.
Upper cabinet

Build the case

1. Cut the sides (Q) to size. Then lay out and drill shelf-support holes with a 1/4" brad-point drill bit [Drawing 6], making mirror image parts. (To view a video showing how to quickly and accurately drill shelf-support holes, go to woodmagazine.com/shelfholes.)

2. Glue and biscuit one end of the top rail (T) into one stile (S). Then flex the sides (Q) apart and glue and biscuit the other end.

3. Cut the back rails (R), stiles (S), and front rail (T) to size. Rout a 1/4" bead into the back rails [Drawings 7 and 7a].

4. Measure the actual thickness of your 3/4" plywood, and cut grooves in the sides (Q) [Drawing 6]. Then cut grooves in the back rails (R) [Drawing 7a]. Now, with a dado blade in your tablesaw, form tenons on the rail ends. Finish-sand the rails and the inside faces of the sides.

5. Lay out biscuit slot centerlines on the stiles (S) and front rail (T) [Drawing 7], and cut #10 biscuit slots. Mark the ends and center of the front rail arch. Connect the points with a fairing stick, and draw the arch. (For a free fairing stick plan, go to woodmagazine.com/fairing.) Bandsaw and sand the arch. Finish-sand the stiles and rail.

6. Glue and clamp the stiles (S) to the sides (Q) with the ends and outside edges flush. Sand the stile edges flush with the sides, and then finish-sand the outside faces of the sides.

7. Cut the back (U) to size, and finish-sand it. Glue the back into the back rail (R) grooves, with the edges of the back and the rail tenon ends flush. Then glue and clamp the rail tenons and back into the side (Q) grooves. Now glue, biscuit, and clamp the front rail (T) in place [Photo F].

8. Cut the top (V) to size, and finish-sand the inside face. Then glue and clamp the top to the case, checking for square. Drill screw holes through the top and into the sides (Q), upper back rail (R), and front rail (T), and drive the screws [Drawing 7].

Install the crown

1. Before making the crown cleats (Y), check the spring angle of your crown molding [Photo G]. Then cut a 1/2x1 1/2x36" board. Make cuts equal to the spring angle on both ends of the board [Drawing 7b], and cut one cleat to length from each end. Repeat until you have eight cleats. Now, on your drill press, drill and countersink a screw hole in each cleat.

2. Glue and clamp the crown cleats (Y) to the top (V) [Drawings 7 and 7b], and screw them in place [Photo H].

3. Mark the center of an 8' length of crown molding. (We used standard 1/2x3 1/2 crown available at lumberyards and home centers.) Measure the width of the case, and working from the center of the length of crown molding to each end, mark this dimension (This is the miter-to-miter length.) Then cut the crown front (Z) to length by cutting a compound miter at each end. (To view a video showing how to cut crown molding, go to woodmagazine.com/crownmldg.) Glue and clamp the crown front to the case [Photo I].

4. Miter the two remaining crown pieces to mate with the crown front (Z), mark the length [Photo J], and cut the crown sides (AA) to length. Glue and clamp the crown sides in place. Finish-sand the crown.

Finish and assemble

1. Inspect all the parts and assemblies, and finish-sand where needed. Apply stain and a clear finish.

2. Drill pilot holes and screw mending plates to the buffet back (H) [Drawing 7]. Then position the upper cabinet.

6. UPPER CASE SIDE (Inside face of left side shown)

3/4" holes 1/4 deep
1/4" from back edge

1/4" groove
1/4 deep
1/4 from back edge

"To fit 1/4" plywood

Holding the cove edge of the crown molding against a flat surface, measure the angle between the surface and the molding back.
Aligning the square end of each crown cleat (Y) with a layout line, glue and clamp, and then screw them in place.

Apply glue to the back of the crown front (Z) along the bottom edge and to the crown cleats (Y), and clamp the crown in place.

Dry-fit the overlength mitered crown side (AA), and mark the finished length flush with the back of the rear cleat (Y).

36° bevel (match crown)

1/4" groove 3/8" deep, 1/4" from back edge

1/16" biscuit slot

1/8" bead

1/8" F.H. wood screw

6" x 4" mending plates

1/8" F.H. wood screw
on the buffet, flush at the back and centered side-to-side. Now using the holes in the mending plates as guides, drill pilot holes into the lower back rail (R) and drive the screws.

3 Insert shelf supports into the upper cabinet side (Q) holes, and install the shelves (W/X).

Written by Jan Svec with Chuck Hedlund
Project design: Jeff Mertz
Illustrations: Roxanne LeMolne; Lorna Johnson

Materials List

<table>
<thead>
<tr>
<th>Buffet</th>
<th>FINISHED SIZE</th>
<th>T</th>
<th>W</th>
<th>L</th>
<th>Mat. Qty</th>
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<tr>
<td>A</td>
<td>end rails</td>
<td>3/4&quot;</td>
<td>23/4&quot;</td>
<td>12&quot;</td>
<td>O</td>
</tr>
<tr>
<td>B</td>
<td>end panels</td>
<td>3/4&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>OP</td>
</tr>
<tr>
<td>C</td>
<td>legs</td>
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<td>3&quot;</td>
<td>34/4&quot;</td>
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</tr>
<tr>
<td>D</td>
<td>divider panels</td>
<td>3/4&quot;</td>
<td>16&quot;</td>
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</tr>
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<td>3/4&quot;</td>
<td>1/4&quot;</td>
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<td>16&quot;</td>
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<td>G</td>
<td>front rails</td>
<td>3/4&quot;</td>
<td>23/4&quot;</td>
<td>42&quot;</td>
<td>O</td>
</tr>
<tr>
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<td>back</td>
<td>3/4&quot;</td>
<td>15&quot;</td>
<td>42&quot;</td>
<td>OP</td>
</tr>
<tr>
<td>I</td>
<td>stretcher shelf panel</td>
<td>3/4&quot;</td>
<td>10/4&quot;</td>
<td>44/4&quot;</td>
<td>O</td>
</tr>
<tr>
<td>J</td>
<td>stretcher shelf edging</td>
<td>3/4&quot;</td>
<td>1&quot;</td>
<td>44/4&quot;</td>
<td>O</td>
</tr>
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<td>15&quot;</td>
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</tr>
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<td>1/4&quot;</td>
<td>12/4&quot;</td>
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<tr>
<td>M</td>
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<td>19&quot;</td>
<td>50&quot;</td>
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</tr>
<tr>
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<td>2&quot;</td>
<td>13/4&quot;</td>
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</tr>
<tr>
<td>O</td>
<td>rails</td>
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<td>2&quot;</td>
<td>9/4&quot;</td>
<td>O</td>
</tr>
<tr>
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<td>9/4&quot;</td>
<td>10/4&quot;</td>
<td>OP</td>
</tr>
<tr>
<td>Q</td>
<td>sides</td>
<td>3/4&quot;</td>
<td>12&quot;</td>
<td>41/4&quot;</td>
<td>O</td>
</tr>
<tr>
<td>R</td>
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<td>3/4&quot;</td>
<td>3&quot;</td>
<td>47/4&quot;</td>
<td>O</td>
</tr>
<tr>
<td>S</td>
<td>stiles</td>
<td>3/4&quot;</td>
<td>3&quot;</td>
<td>41/4&quot;</td>
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</tr>
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<td>4&quot;</td>
<td>42&quot;</td>
<td>O</td>
</tr>
<tr>
<td>U</td>
<td>back</td>
<td>3/4&quot;</td>
<td>47/4&quot;</td>
<td>36/4&quot;</td>
<td>O</td>
</tr>
<tr>
<td>V</td>
<td>top</td>
<td>3/4&quot;</td>
<td>12/4&quot;</td>
<td>48&quot;</td>
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<td>9/4&quot;</td>
<td>46/4&quot;</td>
<td>OP</td>
</tr>
<tr>
<td>X</td>
<td>shelf edging</td>
<td>3/4&quot;</td>
<td>11/4&quot;</td>
<td>46/4&quot;</td>
<td>O</td>
</tr>
<tr>
<td>Y</td>
<td>crown cleats</td>
<td>3/4&quot;</td>
<td>1/2&quot;</td>
<td>3&quot;</td>
<td>O</td>
</tr>
<tr>
<td>Z</td>
<td>crown front</td>
<td>3/4&quot;</td>
<td>31/4&quot;</td>
<td>51/4&quot;</td>
<td>OC</td>
</tr>
<tr>
<td>AA</td>
<td>crown sides</td>
<td>3/4&quot;</td>
<td>31/4&quot;</td>
<td>14/4&quot;</td>
<td>OC</td>
</tr>
</tbody>
</table>

*Parts initially cut oversized. See the instructions.

Materials key: O-red oak, OP-oak plywood, EO-edge-glued oak, OC-oak crown molding.

Supplies: #6x5/4", #6c1", #6x7/4", #6x8/4", #6x8/1/2", #6x2" flathead wood screws; #8x1/4" panhead screws (3); 1/8 flat washers (3); #10 biscuits; 7/8" mending plates (2).

Blade and bits: Stack dado set, 1/4" bead and 1/4" round-over router bits, 1/4" brad-point drill bit.

Sources


Hardware: Figure-eight fasteners no. 21650, $2.39 pkg. of 8 (1 pkg.), 27/8" partial-wrap non-mortise full-inset hinges no. 31495, $6.99 pkg. (3 pkg.); spring catches no. 29785, $3.59 pkg. of 4 (1 pkg.); 11/8" knobs no. 26588, $4.29 ea. (3); shelf supports no. 22781, $2.99 pkg. of 16 (2 pkgs.). Rockler, 800-279-4441, rockler.com.
In the time it takes to sit through a sitcom on TV, you can have some real fun creating these sturdy, no-fuss doors.

Frame-and-panel doors add class to any project, but they don't have to add a lot of assembly time. Using the straightforward process detailed here, you can crank out great-looking doors for many applications, including furniture, cabinets, and built-ins. Frames use ¾"-thick stock with ¼" panels in various materials and veneers. (See page 49.) A general-purpose saw blade will do the job, although a dado stack cuts smoother tenons.

Take a few minutes to tune your tablesaw before cutting any project parts. Check that the fence and miter slots run parallel to the blade. Attach an extension to the miter gauge, and use a drafting triangle to square the gauge to the blade. Then lock your blade at precisely 90° to the tabletop. Okay, let's start the stopwatch.
Step 1: Calculate your door dimensions using the plan below. From ¾" stock, rip all rail-and-stile stock to width @ (2" wide in the example above). Cut extra stock just in case you make a mistake.

**Success secrets:** For uniform color and grain match between the frame parts, cut them from the same board. The technique we'll use later to cut grooves and tenons requires stock exactly ¾" thick, so thickness plane all frame stock at one time. Then take advantage of these doors' easy assembly, and complete the remaining steps before the wood has time to move.

Step 2: Attach a spacer block near the front of the fence with double-faced tape, and lock the fence where the distance between the block and blade equals the stile length @. Cut the stiles, re-adjust the fence, and cut the rails @.

**Success secrets:** Because the workpiece slides free of the fence-mounted spacer block before you cut, there's little danger of kickback. Cut your longest frame parts (usually the stiles) first. Why? If you make a measurement mistake, you can reuse the miscut piece for the shorter rails.

Step 3: Adjust the blade height to ¾" and set the fence to center the blade on the edge of a frame scrap. Make a test cut and measure the depth. If your blade has alternating-bevel teeth that leave an uneven groove bottom, sand it flat as shown on page 49.

**Success secrets:** Grooves, as illustrated below, can be cut in fewer passes with a regular blade instead of a thinner blade. Once you perfect the depth, lock the blade height to ensure uniform cuts on each piece. Reduce tear-out by using a zero-clearance tablesaw insert.

---

**HOW TO DETERMINE FRAME-AND-PANEL DOOR DIMENSIONS**

To size an inset door for a specific opening, first subtract ¼" from the size of the opening to allow a ⅛" reveal around the door. Then figure the part sizes as follows:

- The length of the stiles @ equals the door height.
- The rail length @ equals the door width minus two times the stile width @ plus ¼" for the two ¾" tenons.
- The panel width @ equals the length of @ minus ¼".
- The panel length @ equals just less than the stile length @ minus two times the rail width @ plus ¼".
Step 4: Move the fence away from the blade about 3/16". Cut one groove in scrap, then turn it end-for-end for a second pass. Measure the width of the groove, and gradually move the fence away from the blade until the two cuts produce a 3/16"-wide groove. (Every fence movement doubles the width of the groove.)

Success secrets: Measure your panel thickness before cutting grooves into the frame. Actual panel stock thickness may vary slightly from 1/8", especially if you try some of the decorative panels shown on page 49. You can increase or decrease the groove width up to 1/6" to accommodate your panel thickness.

Step 5: Cut a kerf on one edge of a stile or rail. Rotate the part end-for-end and make the second pass to complete the groove, as in Step 4. Repeat both cuts for the remaining rails and stiles.

Success secrets: For consistency, use a feather board as shown above. Feed stock over the blade as quickly as possible to avoid burning the inside of the groove, which can reduce the strength of the glue joint. (Scorched surfaces do not absorb glue well.)

Step 6: For maximum visual impact, center prominent grain shapes, such as cathedral pattern. To visualize the final look, mask out the width of the panel using two strips of cardboard spaced apart the same width as the panel. If necessary, add two more pieces of cardboard to mark the top and bottom of the panel. Then mark the area to be cut.

Success secrets: If your plywood has a glue line on its face, avoid it on the panel or center it as a pattern element.

Step 7: Using the marks from the previous step as a guide, cut the panel to size.

Success secrets: To prevent tear-out, use a zero-clearance throat insert. If cross-cutting tear-out extends more than 3/8" in from the ends of the panel, replace or resharpen your saw blade.

Step 8: Install a dado blade slightly wider than 3/4", and raise it to just greater than 3/4" high. Attach the spacer block used in Step 2 to the front of the fence; then set the fence to leave a 3/8" gap between the spacer block and the left side of the blade. Butt the end of a frame scrap against the spacer block before dadoing each face.

Success secrets: To reduce tear-out, use a zero-clearance dado-blade insert.

Step 9: Check the tenon fit on a stile groove. If the tenon is too thick, raise the blade height, and recut until it fits. Now check the tenon length. To cure gaps at the groove bottom, nudge the fence away from the blade. To eliminate gaps at the tenon shoulders, move the fence closer to the blade. Then cut tenons on the ends of each rail.

Success secrets: A too-thick tenon can be fixed easier than one that's too thin. Anticipate minor differences in groove widths by leaving a little extra to be removed in the next step.
Step 10: To thin slightly oversize tenons, make a sanding block by attaching 100-grit, adhesive-backed sandpaper to one face of a hardboard scrap. Sand using the same number of passes on each side of the tenon to keep it centered.

Success secrets: This also eliminates minor scoring from the dado blade, producing a stronger glue joint. By applying sandpaper to just one face of the scrap, you avoid marring the tenon shoulders.

Step 11: Dry-fit the joints with the panel to confirm the correct panel size, as shown on page 46. Then glue one tenon on each rail, and seat them at the ends of a stile. Insert the panel, glue the other two rail tenons, and add the other stile. Clamp and check for square by measuring diagonally for equal distances between the corners.

Success secrets: To keep loose panels from rattling, apply a spot of glue to only the centers of both rail grooves.

Optional step: If the groove bottom is ridged from the blade’s teeth, lower the blade height about 3/4". Then attach a strip of adhesive-backed sandpaper to the edge of a 3/8"-thick hardboard scrap, and use it to sand away the ridges. Sand with the same number of strokes in each groove for consistent depth.

To eliminate this step, cut grooves with a flat-tooth ripping blade or high-quality dado set. Both leave fewer ridges or score marks on the groove bottom.

Use different materials for different looks

Frame: red oak. Panel: clear acrylic (1/8" thick). Frosted panels also are available.

Just because these doors are quick to make doesn’t mean they cramp your creativity. To go beyond the basics, rout a cove, round-over, or ogee profile around the front edges of the assembled door. (Do the rails first to limit tear-out.)

For contrast, mix wood species, such as a walnut panel in a maple frame. Then try one of the combinations shown above or one of the following panels:
- Punched tin alone or over hardboard.
- Mirrors or decorative glass.
- Wood-veneered hardboard. For veneering tips, see WOOD magazine issue 179 (October 2007), page 42.
- Hardboard coated with chalkboard paint. (Contact Rust-Oleum at 800-323-3584 or rustoleum.com.)
- Beaded wainscoting strips or sheets, available at many home centers.
- Painted sheet steel (for holding magnets) attached to MDF or hardboard using contact cement.
- Perforated hardboard on a shop cabinet door.
MAN VS. MACHINE

Which is faster: Hand- or machine-cut dovetails? Which method yields better results? Armed with their favorite tools, we let two accomplished woodworkers “duel” to find the answers.

The Challenge

It began with an off-the-cuff comment from Design Editor Jeff Mertz that he could build a drawer box with hand-cut, through-dovetail joints faster than someone using a dovetail jig and router. To test his claim, we pitted him against WOOD magazine tool tester Pat Lowry, who recently had

11:48 With the inside and outside of all of the boards marked, Jeff completes the scribing and layout of the pin boards.

27:30 Realizing that Pat’s already routed his tail boards, Jeff concedes defeat. But the match goes on...

44:17 After sawing along the marked lines of the pin boards for the first drawer, Jeff finishes chiseling out the waste.

6:12 After measuring the joint spacing on the sample box, Pat sets the finger positions on the dovetail jig.

12:32 With the router set, Pat completes the measurements, jig setup, and test cuts. He’s ready to cut the tails.

18:56 Pat machines the tail boards for all three drawers, removing the material slowly to prevent tear-out.
Each contestant was given twelve 4x4x12" poplar boards to make the drawers. They had to replicate the joint in a supplied sample. Both contestants were permitted to have all of their tools laid out and ready for use. Pat’s tools consisted of a Leigh model D4R dovetail jig that includes bits and guide bushings; a router; and a 4" square, costing $586 total. Jeff’s lineup of a fine-tooth Dozuki saw, six-piece chisel set, wheel-type marking gauge, 4" sliding bevel, and wood mallet ran a little less than half the cost of Pat’s, or $250. Although Pat selected the top-of-the-line D4R jig for ultimate ease of use and precision, jigs that cost from about $100 to $220 less than this model do a fine job of cutting variably spaced through-dovetails. When using a lower-cost jig, the investment in tools for either method is comparable.

**About the contenders**
Besides teaching classes in cabinet construction, Jeff also completed a one-week class in joinery that covered hand-cut dovetails at the Marc Adams School of Woodworking (marcadams.com) in Franklin, Indiana. In the two years since then, Jeff has become proficient at crafting these joints. Pat has experience with many dovetail jigs and is adept at their setup and adjustments.

The outcome

As shown in the time line, Pat was the winner, completing all three drawers in 40 minutes. Half of his time was used to machine all of the pin boards and assemble the drawers. Jeff was able to complete just one drawer in 97 minutes. His total time for pin layout for all three drawers, and tail layout for one drawer, was 15 minutes. The remaining time he spent sawing, chiseling, and fine-tuning the joints to assemble the drawer. “I knew that I was in trouble when I heard Pat start to machine all of the pin boards while I was just chiseling away at the first two boards for the first drawer,” Jeff notes.

Post-match analysis

Although the joints produced by both methods look great, it took Jeff about twice as long to hand-cut and fit the joints for one drawer than it did for Pat to machine-cut and assemble one drawer. Adding a projected time of 85 minutes for each of the remaining drawers, it would have taken Jeff 4½ hours to complete the task.

Pat and Jeff agree that when you have a lot of joints to make, such as for kitchen-cabinet drawers, opt for the timesaving machine-cut process. If you have only one or two drawers to build, go with the hand-cut method unless you’re able to quickly set up and adjust your jig and router. (The hand-cut method also creates less fine dust and noise.) For an heirloom project that deserves a handcrafted look, characterized by fine scribe marks for the lengths of the pins and tails, the choice is obvious—reach for your hand tools.

Written by Owen Duvall
Photographs: Eric Salmon
Dear Reader: As a service to you, we’ve included full-size patterns on this insert for irregular shaped and intricate project parts. You can machine all other project parts using the Materials List and the drawings accompanying the project you’re building.

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Toothpick Dispenser
Page 72

Ribbon Clock
Page 82
Join pattern (Section 1) here.

Oak Hutch Leg Full-Size Pattern (Section 2)

Join pattern (Section 2) here.

Oak Hutch Leg Full-Size Pattern (Section 3)
Toothpick Dispenser
Page 72

Ribbon Clock
Page 82

FULL-SIZE FORM PATTERN

Foldline

Place face veneer here.
Using Ready-Made Project Parts

To buy or not to buy? That is the question. Manufactured wood parts open new design possibilities, save you time, and maybe even save money.

Because turning and carving require special equipment and skills, most woodworkers avoid projects with turned and carved parts. It shouldn’t be that way. Manufacturers have the machinery and expertise to produce high-quality, perfectly matched wood components in a wide variety of styles, sizes, and species. Most parts are kept in stock and ready to ship. And a quick Internet search revealed that in many cases, a 3x3x36” turning square costs more than a manufactured leg!

While shopping for legs for the hutch on page 38 and the drop-leaf table in our previous issue, we talked to leading manufacturers of furniture parts. What we learned will help you immeasurably the next time you consider factory-made parts.

Are manufactured parts as good as those I’d make?

The more pieces glued up to make a blank for a part, the greater the chance that variations in color and grain will detract from the beauty of your finished project. Manufacturers generally make turnings up to 2¾” diameter from a single piece of solid stock. Thicker parts are made from glued-up blanks. There are some exceptions, so it’s best to ask whether the parts you order are solid stock or glue-ups.

Manufacturers tell us they make every effort to keep grain defects, sapwood in cherry and walnut, and dark heartwood and mineral stains in maple to a minimum. Of course, with lumber coming from smaller trees these days, the larger the diameter of the part, the greater the possibility it will contain a defect. None of the manufacturers guarantees 100 percent clear-grain parts, but undesirable features should be confined to a portion of the part that can be oriented inward, leaving a flawless face for show.

Parts are shipped finish-sanded, but you should carefully inspect them before applying a finish. You may want to do some spot-sanding. All three manufacturers in the chart on the next page will refund the purchase price if you’re not satisfied with their products.

### HOW LONG IS A LEG?

Browsing the manufacturers’ Web sites or looking in their catalogs, you’ll see legs offered in different lengths. Here’s a guide to the lengths you’ll need for different uses.

<table>
<thead>
<tr>
<th>TYPICAL LEG LENGTHS</th>
<th></th>
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<tbody>
<tr>
<td>Chair</td>
<td>16”</td>
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<tr>
<td>Coffee table</td>
<td>18”</td>
</tr>
<tr>
<td>End table</td>
<td>21”</td>
</tr>
<tr>
<td>Dining table</td>
<td>29”</td>
</tr>
<tr>
<td>Counter-height kitchen island</td>
<td>34½”</td>
</tr>
<tr>
<td>Bar-height kitchen island</td>
<td>42”</td>
</tr>
</tbody>
</table>
Need something different?
For an extra charge, manufacturers will slice turnings in half or quarters for use as onlays. Turnings also can be V-cut or notched to fit over a case corner. This adds three to five days to delivery time.

The mating of computer (CAD) drawings with computer-controlled machinery means that modifying an existing profile or creating an entirely new one doesn't require a large-quantity order, long lead time, or a vault of money. Although prices are quoted on a case-by-case basis, expect to pay twice the price of a standard profile for a custom one of similar complexity. Allow three to four weeks' lead time for custom work.

More than just legs
While turned parts constitute the majority of offerings, manufacturers supply a wide variety of other parts, including cabriole legs, square tapered legs, ogee feet, carved corbels, and turning squares. And for really fast project turnaround, some manufacturers sell ready-to-assemble solid-wood furniture kits, including chairs, tables, and vanity bases. The chart at right summarizes the products, quality standards, special services, and return policies offered by the three manufacturers we surveyed.

Written by Jan Svec
Photographs: Keith Chamberlin/FLEK Design, Doug Myers, Matthew Osborne

A lathe operator at Classic Designs by Matthew Burak turns out a cartload of identical Doric columns.

At top, a router head on a lathe at Adams Wood Products begins carving. The finished leg above sports perfectly formed spirals.

For fast order turnaround, manufacturers keep hundreds of parts in stock, like these at Osborne Wood Products.

A technician at Osborne Wood Products finish-sands a spiral column on a brushesanding wheel.

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For fast order turnaround, manufacturers keep hundreds of parts in stock, like these at Osborne Wood Products.

A technician at Osborne Wood Products finish-sands a spiral column on a brush-sanding wheel.

Products
- Appliques
- Ball-and-claw legs
- Bedposts
- Billiard table legs and subrails
- Bun feet
- Cabinet legs
- Chair legs
- Columns
- Corbels
- Finials
- Furniture kits

Hardware
- Legs and columns for kitchen islands and cabinets
- Ogee bracket feet
- Pilasters (split onlays)
- Profiles by linear foot
- Queen Anne and cabriole legs
- Round table aprons
- Shaker legs
- Sofa legs
- Square tapered legs
- Table pedestals and pedestal legs
- Turned coffee, dining, and end table legs
- Turning squares

Wood species
- Solid or glue-up
- Sapwood
- Sanding

Quality standards

Special services
(Extra charges apply.)

Return policy

Contact
Online ordering
## Profiles of Mail-Order Furniture Part Manufacturers

<table>
<thead>
<tr>
<th>Adams Wood Products</th>
<th>Classic Designs by Matthew Burak</th>
<th>Osborne Wood Products</th>
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<td>Yes, plus robe rails</td>
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</tr>
<tr>
<td>Alder, cherry, hickory, mahogany, maple, oak, pine, walnut, paint grade. (All products are not available in every species.)</td>
<td>Alder, cherry, mahogany, maple, oak, pine, walnut</td>
<td>Alder, birch, cherry, hickory, mahogany, maple (hard and soft), oak, pine, walnut, paint grade. (All products are not available in every species.)</td>
</tr>
<tr>
<td>All turnings are solid stock up to 2 1/2&quot; in diameter, with some maple turnings solid up to 3 1/2&quot; diameter. Glue-ups are color-matched.</td>
<td>All turnings are solid stock up to 2 1/2&quot; in diameter, with a significant number solid up to 3 1/2&quot; in diameter. Glue-ups are color- and grain-matched.</td>
<td>All turnings are solid stock up to 2 1/4&quot; in diameter.</td>
</tr>
<tr>
<td>Some sapwood in cherry is allowed, but kept to a minimum. Cherry parts with too much sapwood and off-color maple parts are sold as paint grade.</td>
<td>Some sapwood in cherry is allowed, but kept to a minimum. Sapwood should not encroach on the two-thirds of the leg that constitutes the show face.</td>
<td>Maximum of 25 percent sapwood in cherry and mineral streaking in maple is allowed.</td>
</tr>
<tr>
<td>Parts are finish-sanded and ready to use.</td>
<td>Parts are finish-sanded and ready to use.</td>
<td>Parts are finish-sanded and ready to use.</td>
</tr>
<tr>
<td>Counter-height legs can be split in half or quartered for use as onlays, and V-cut to fit over a corner. Allow three to five business days extra for these services. Modification of stock profiles and complete custom turnings are available.</td>
<td>Any symmetrical leg or column can be split in half or quartered for use as onlays, or V-cut or notched to fit over a corner. Square top posts and stretcher posts can be full-, three-quarter-, or quarter-rounded. Legs can be mortised, and aprons tenoned. Allow three to five business days extra for these services. Modification of stock profiles and complete custom turnings are available.</td>
<td>Counter-height legs can be split in half or split diagonally for use as onlays, and V-cut to fit over a corner. Modification of stock profiles and complete custom turnings are available. Allow three to four weeks for custom turnings. One-week rush orders available for an additional charge. Two- and three-dimensional CAD drawings of legs available for download from the Web site.</td>
</tr>
<tr>
<td>Return in original condition with original invoice within 30 days for exchange or refund. Must call for authorization. After 30 days, returns subject to a 15% restocking charge, plus cost of return freight. No returns after 90 days.</td>
<td>Return within 30 days for a refund of the purchase price.</td>
<td>Return in original condition and packaging within 30 days for refund of the purchase price. Should the problem occur due to system or clerical error, regular shipping costs refunded.</td>
</tr>
<tr>
<td>423-587-2942, adamswoodproducts.com</td>
<td>800-843-7405, tablelegs.com</td>
<td>800-849-8876, osbornewood.com</td>
</tr>
<tr>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

woodmagazine.com
Talk about rearranging the furniture! Square 'em up or string 'em along. These easy-to-build tables reconfigure as your needs change.

PROJECT HIGHLIGHTS
- Overall dimensions: 18" square x 18" tall.
- We made the tables from cherry and cherry plywood. But oak, walnut, or mahogany also makes a good choice.
- As an alternative to ¼" tempered glass in the top frame, you can install an MDF panel with a decorative overlay. See the sidebar, "3 great top options in 5 easy steps," page 62.

Skill Builder
- Learn how to make rails that install flush with the outside faces of table legs using a unique notched miter joint.

First up: the legs and rails
1. From laminated ¾" cherry or solid stock, cut the legs (A) and rails (B) to the thickness and width listed [Materials List, page 63] and 19¼" long. For precise-fitting joints, plane the legs and rails to exactly 1¼" square. (You'll crosscut the legs to the finished length of 18" after machining the dadoes to receive the rails.) Trim the rails to the finished length of 18" by miter-cutting both ends.
2. To avoid a machining error, mark the two outside faces of each leg (A) at both ends where you'll cut the 1¼" dadoes ¼" deep 2" from the ends [Drawings 1 and 2]. Also, draw lines 1¼" from the top ends of the legs for cutting off the waste. Using a ¾" dado blade in your tablesaw and an
With a leg (A) tight against a stopblock, cut a ¾" dado ½" deep 2" from the end into the two marked faces. Repeat at the other end.

Extension with a stopblock attached to the miter gauge, form the dadoes [Photos A and B] to precisely fit the rails (B).

Crosscut the legs (A) to the finished length of 18" at the marked lines at the top ends. Then, using a backer board attached to a miter gauge on your router table to keep the legs square to the fence and prevent tear-out, rout a ¼" round-over around the top and bottom ends of the legs [Drawing 1]. Sand the legs to 220 grit.

Using your dado blade, cut a ¼" notch ½" deep into the mitered ends of each rail (B) [Drawings 2 and 2a, Photo C]. For help with this to ensure a perfect fit into the dadoed legs (A), see page 18.

To assemble the table, glue and clamp a top and bottom rail (B) into the dadoes in a pair of legs (A) [Photo D], checking for square. Remove any glue squeeze-out from the joints and mitered ends of the rails. Repeat for the other pair of rails and legs. Then, glue and clamp the remaining top and bottom rails to the two leg/rail assemblies [Photo E].

Add the shelf and top

1. Cut the shelf supports (C) and glass supports (D) to the sizes listed. Sand smooth. Set the glass supports aside.

2. Cut the plywood shelf (E) to size to fit inside the bottom rails (B). Then, cut a ¼" rabbet ½" deep around the shelf on the top face [Drawing 2]. Sand the shelf, using care not to go through the thin veneer.

3. To position the shelf supports (C) on the inside faces of the bottom rails (B) so that the top of the shelf (E) is flush with the top edges of the rails, cut a 2x10" spacer from your ¾" plywood or other scrap of the same thickness. Place the table with the bottom up. Then, glue the supports to the rails in a butt-joint configuration [Drawing 2], using the spacer to position them [Photo F]. Now, glue and clamp the shelf to the supports.

4. Cut the top frame sides (F) to size. Using your dado blade and a stopblock clamped to your rip fence, cut a 2½" rabbet ¾" deep at each end of the sides on opposing faces to form the half-lap joints [Drawings 2 and 2b, Photo G].

5. Glue and clamp the top frame sides (F) together, verifying tight lap joints and square.

6. Using a fence and stopblock on your bandsaw, cut into each corner of the frame to form a 1½x1½" notch.

Leg

Crosscut legs to the finished length of 18" after cutting dadoes.

1/4" dadoes
1/4" deep

11/4" dadoes
1/8" deep

19 1/4"

1/4" round-over

1/2" round-over

11/4" dadoes
1/8" deep

1/2" round-over
Glue and clamp the shelf supports (C) to the bottom rails (B), using a spacer clamped flush with each rail top to position the support.

ings 2 and 2B, Photo H]. Flip the frame over, remove the stopblock, and cut each corner again to complete the notch [Photo I].

Using your dado blade, cut a ¼" rabbet ⅜" deep around the outside edges of the frame (F) on the bottom face [Drawing 2]. Sand smooth.

Position the frame on a flat worksurface with the top face up. Then, glue and clamp the glass supports (D) to the inside edges of the frame, flush with the bottom.

Finish up
1. Finish-sand any areas that need it to 220 grit. Remove the dust.
2. For ease of finishing, mask the mating glue-joint areas on the frame (F) and top rails (B) using ⅛"-wide easy-release painter's tape [Photo J]. (You'll glue the frame to the rails after finishing.) Also, if you plan to install an optional MDF top with decorative overlay instead of the glass, mask the top faces of the glass supports (D).

Apply a stain, if you wish, and a clear finish. We applied Varathane Premium Gel Stain, no. 445 Traditional Cherry, followed by two coats of a water-based clear satin polyurethane, sanding to 320 grit between coats.

Remove the masking tape from the top rails (B) and frame (F). Then, glue and clamp the frame to the rails with the outside edges flush. To prevent damaging the finish, use protective clamp pads and apply light pressure.

Finally, have a piece of ¼" tempered glass cut to 13" square. Move the table(s) to the desired location, and place the glass in the frame(s). Now round up some treats and do a little munching to celebrate your handiwork.

Written by Owen Duvall with Jeff Mertz
Project design: Kevin Boyle
Illustrations: Roxanne LeMoine; Lorna Johnson

3 great top options in 5 easy steps

You can customize the table to perfectly match your decor—or to create a striking accent—simply by replacing the glass with an MDF panel laminated with a decorative overlay.

- **Laminate** – Plastic laminates are available in a myriad of colors and patterns, making it easy to coordinate with your decorating scheme. You'll find laminates at your local home center. Shown at left: Wilsonart WIL4575 Mesa Pearl Textured Gloss.

- **Wall paneling** – Think that this sheet good comes only in wood tones? Not so. You can find the paneling in a variety of colors, patterns, and textures at home centers and other sources. To find a source near you, go to gp.com/build and click on "Decorative Finish Panels." Shown at left: Georgia-Pacific StyleLine Panel Coffee Bean Leather. (We found a 4x8' sheet of this approximately ½"-thick material for less than $20.)

- **Sheet metal** – Go thin and flashy with a copper or an aluminum overlay. We used .0216"-thick, 16-ounce soft copper sheeting, available in a 14x60' roll (enough for four tops) from the Storm Copper Components Co. for $56.47 ppd. Call or click 800-394-4804; stormcopperstore.com. You can find aluminum flashing at your home center.

Step 1 Cut a 14"-square piece of ½"-thick MDF to make a substrate for your selected overlay material.

Step 2 Adhere the overlay to the MDF. For laminate or wall paneling, use contact cement (no clamping needed). Use a polyurethane glue to bond sheet metal to the MDF. (We used Liquid Nails Rhino Ultra Glue.) To ensure strong adhesion, place a piece of waxed paper and another 14"-square piece of MDF on top of the metal and clamp the assembly together. The waxed paper prevents glue squeeze-out from adhering the top MDF to the metal.

Step 3 For a metal overlay, polish the metal by hand-sanding with 220-grit sandpaper or a medium 3M Scotch-Brite pad, creating a fine scratch pattern in a straight or an angled direction, as you wish. Or, use a random-orbit sander to produce a swirl pattern. For a rustic look, peen the metal with a hammer. To preserve the sheen, spray the metal with two coats of a clear, water-based polyurethane.

Step 4 To ensure a snug fit of the top in the frame (F), measure the opening. (Ours measured 13" square.) Then, using your tablesaw with a carbide-tipped blade, trim the top to size.

Step 5 Place the top in the frame (F), tight against the glass supports (D). Next, measure the offset between the tops of the frame and the top. Now, rout a ⅜" rabbet to a depth equal to your measurement into the bottom of the MDF along the edges. To ensure a flush top, make several passes with small depth increments as you approach the final depth, checking the fit after each pass.
With your bandsaw fence positioned 1½" from the outside of the blade, make a 1½"-long cut into each corner of the frame (F).

Remove the stopblock to prevent a trapped cutoff. Turn over the frame, and bandsaw each corner again to complete the notch.

Mask along the inside top edges of the top rails (B) and the rabbeted edges on the bottom face of the frame (F).

---

**Materials List**

(for one table)

<table>
<thead>
<tr>
<th>Part</th>
<th>FINISHED SIZE</th>
<th>Matt. Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A* legs</td>
<td>11/4 x 11/4 x 18</td>
<td>LC 4</td>
</tr>
<tr>
<td>B* rails</td>
<td>11/4 x 11/4 x 18</td>
<td>LC 8</td>
</tr>
<tr>
<td>C shelf supports</td>
<td>1/2 x 1/2 x 15</td>
<td>C 4</td>
</tr>
<tr>
<td>D glass supports</td>
<td>1/2 x 1/2 x 12 1/2</td>
<td>C 4</td>
</tr>
<tr>
<td>E shelf</td>
<td>1/4 x 15 1/2 x 15 1/2</td>
<td>CP 1</td>
</tr>
<tr>
<td>F top frame sides</td>
<td>1/4 x 2 1/2 x 18</td>
<td>C 4</td>
</tr>
</tbody>
</table>

*Parts initially cut oversize. See the instructions. Materials: LC—laminated cherry, C—cherry, CP—cherry plywood.

**Supplies:** 1/4"-wide easy-release painter’s tape, 1/4" x 13" x 13" tempered glass.

**Blade and bit:** Dado-blade set, 1/8" round-over router bit.

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**Cutting Diagram**

**A** x 1/4 x 1/4 x 1/4" Cherry (5.3 bd. ft.)

**B** x 1/4 x 1/4 x 1/4" Cherry plywood

**C** x 24 x 24" Cherry (4 bd. ft.)
This double stopblock with connecting safety fence ensures identical mortises. Plunge the workpiece down along the edge of the right-hand stopblock using a pushpad, as shown at left, to start the mortise. Then feed the workpiece to the left through the cut until it bumps the left-hand stopblock. Finally, raise the workpiece along the edge of the left-hand stopblock.

To center the mortise on the workpiece end, mount stopblocks on your router-table fence, as shown above. To figure the spacing between stops, add the workpiece width to the length of the mortise, and subtract the distance of the mortise from one edge.

To make fast and accurate repetitive cuts, put your ruler aside and start using stops.

Stops can be used on nearly every tool in your shop to precisely position and control cuts, holes, and miters for greater speed and accuracy with less frustration. To demonstrate their versatility, we’ve assembled a collection of ways that stops can speed repetitious project steps.

These stops all have one thing in common: When temporarily attached to saws, router tables, or drill presses, they limit the movement of workpieces or fences so you get consistent results time after time. Although you can buy stops or use clamps, most stops can be made using scrapwood.

When making your own stops from blocks of wood, like the one shown at right, be sure to cut a “relief” chamfer or rabbet where indicated to prevent sawdust buildup from changing the position of the stop. Even with that precaution, remember to periodically brush or blow debris away from the stop.

When assembling stops with more than one part, like the router-table double stop shown above, avoid using nails or screws that might accidentally come into contact with a saw blade or router bit. Check clamp positions to ensure they won’t touch your blade or bits.

Dust trapped between a workpiece and stop can throw offyour precision. Cutting a ⅛” chamfer on the bottom edge of a stop allows dust a place to go between cuts.
If you're boring a series of holes on a drill press, place the stopblock to make the first hole. Then use scrapwood spacers cut to lengths equal to the spacing between the holes to be drilled, in this case 4" and 6" from the stopblock.

When cutting miters, bevel your stopblocks to complement your workpieces. The angled stop gives you more solid contact, and you won't blunt the tips of your mitered ends.

Clamp an L-shape stopblock to your bandsaw fence to cut tenon cheeks to length. To cut the tenon shoulders, leave the stopblock in place and adjust the fence. Make the blocks long enough that the clamp doesn't interfere with the upper roller guide.

Sometimes, you need to move your tablesaw fence closer to the blade, and then return it to the same position—when switching between crosscut and dado blades, for example. A clamp attached to the fence rail serves as a stopblock for the fence's return trip.

This stop's width equals the distance from the edge of the blade nearest the stop to the far edge of the slot minus the width of strips to be cut. After each cut, slide the fence until the workpiece touches the edge of the stop; then cut the next strip.
Dust Collectors Under $400

Would you buy a dishwasher that didn’t actually clean your plates and pots? How about a lawn mower that cuts only half the blades of grass it passes over? Of course not. You expect machines to perform their tasks.

We’re with you. And that’s why we say you should not spend your hard-earned money—and risk your health—on a dust collector that fails to trap fine dust—even dust too fine to see. In our test of 15 portable dust collectors, we found that all could move debris from the machine to the collection bags with varying success. However, nine of those units featured dust-capturing filtration so inferior, they merely recirculated much of the fine dust back into the air. And it’s that breathable dust that medical studies have proved to be the most harmful to your health.

There’s more to dust collection than just sucking up debris. We’ll show you which machines do it best—and which ones return less fine dust to your shop’s air.

Dust collector basics

Before we get into filtration, it’s important to understand how a dust collector works. The type we tested suck chips and dust into an impeller, which then spews them into bags strapped above and below a steel rim. The bottom bag collects what settles, while the top bag (and unfilled areas of cloth bottom bags) filters and traps the dust as air escapes through it.
A dust collector needs to move dust and chips at least 3,500 feet per minute to keep them suspended in the air and prevent them from settling in the duct. Multiplying the air speed by the area of the duct gives you cubic feet per minute (CFM), the performance spec cited most often in dust-collection discussions. Typical home woodworking machines have 4" dust ports and require a minimum airflow of 400 CFM.

But CFM is only one of two key factors in gauging dust-collector performance. The other is resistance, measured in inches of static-pressure loss. The very ductwork you need to channel the debris to the collector actually chokes that airflow, especially as you add length or change directions. For example, every elbow, wye, or reducer in your line creates resistance versus a similar setup with a straight duct of one size. The length of duct and material it’s made of also adds resistance. (Ribbed flex-hose, for example, adds three times the resistance of smooth-walled metal duct, so it’s important that you use as little of it as possible.)

**We went high-tech to test these collectors**

With assistance from Dr. Greg Maxwell of Iowa State University’s engineering department, we created a testing apparatus using smooth-walled metal ductwork that we attached to each collector’s port (shown at left). On the open end, we used a funnel-shaped stopper, threaded to an anchored bolt, to simulate different lengths and shapes of ductwork.

We utilized a pitot tube and manometer inside the duct to measure airflow (CFM) and resistance in inches of static-pressure loss (SP). These figures help pinpoint which collector will work for you. To determine the amount of SP loss you should expect to encounter, go to woodmagazine.com/spcalc, or read issue 119 (December 1999), pages 16–18.

Of the 15 units we tested, 11 have 6" inlet ports and the rest have 5" ports. All models come with a wye that lifts the debris over the inlet and you can attach two 4" ducts. (All have a cap that you can close one of the 4" ports.) We tested each unit with 4" metal duct for a true apples-to-apples comparison (see chart at right), and also tested them with 5" or 6" duct to match their ports (next page). We found that each machine achieved greater suction with less resistance using the larger-size duct. (Using 5" and 6" duct or flex-hose, however, requires a greater minimum CFM level than 4" duct to keep debris in suspension.) If you intend to use 4" duct or flex-hose with a wye, plan to add blast gates near the wye so you can close off one duct while using the other. Leaving both open cuts your machine’s suction capability in half.

**Know your dust-collection needs**

**Typical shop setup for a portable dust collector**

One dust collector connected in this manner serves three machines by using blast gates. Or you could use one length of flex-hose and simply move it from one machine to another.

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**Filtration proves critical for you and the collector**

Wood debris ranges from heavy particles (like planer chips) that quickly fall to the floor, to microscopic dust particles that remain suspended in the air for 30 minutes or longer and can’t be seen without magnification. The smallest size dust collectors lose CFM as the amount of resistance (SP loss) increases. Select a model that operates at a high CFM rate for a given SP loss for your duct setup. Because you’ll need to maintain at least 400 CFM in 4" duct to keep dust and chips in suspension, look for performance results to the right of the shaded area. Peak performance of each dust collector is noted at right.

---

**Two Units Deliver Adequate Airflow Over 8' Static Pressure**

Dust collectors lose CFM as the amount of resistance (SP loss) increases. Select a model that operates at a high CFM rate for a given SP loss for your duct setup. Because you’ll need to maintain at least 400 CFM in 4" duct to keep dust and chips in suspension, look for performance results to the right of the shaded area. Peak performance of each dust collector is noted at right.

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woodmagazine.com
a human eye can see is about 10 microns. (Human hair, by comparison, measures about 40–60 microns in diameter.)

These dangerous, breathable, ultrafine particles easily escape through the porous woven-cloth bags rated at 30-micron filtering efficiency. You should insist on at least a 5-micron filter media (bag or pleated cartridge), but a 1-micron filter proves even better. These finer filtration bags are made from thicker material (usually felt) and have more pinholes per square foot—to allow air to pass through—when compared with 30-micron woven cloth bags. So not only do these bags trap fine dust, but they also increase the collector's airflow by reducing resistance.

Five of the units we tested come standard with a 1-micron top bag, and of those, Penn State also includes a 1-micron bottom bag on both of its models. The others three (Delta 50-760, JDS 14040, and Steel City 65200) have nonporous plastic bottom bags. Delta's 50-850 comes with a 5-micron top bag and plastic bottom bag.

Ironically, two units—General International's 10-105M1 (2 microns) and Grizzly's G10292 (2.5 microns)—included fine-filtering top bags but offset them with 30-micron bottom bags that allowed fine dust to escape. After we shared test results with these companies, both elected to replace the bottom bags with plastic, effective immediately. (Grizzly's Bill Crofutt said the company will also replace both 30-micron bags on the G1028Z with a 2.5-micron top bag and plastic bottom bag.)

All other models except Rikon (10 microns) feature two 30-micron bags. If you want to upgrade the filtering efficiency, you can opt for bags or cartridge filters from most of these manufacturers, or you can buy much larger high-efficiency aftermarket bags that provide more surface area to filter dust and allow air to escape. (For a comparison of their performance, read "A high-efficiency top filter combined with a plastic bag below proves best" on next page.)

**More factors to influence your buying decision**

- **Clampless bags mount easiest.**

  Securing the lower bag to the collector housing proves to be a two-handed job at best, and sometimes a third hand becomes necessary. We found the easiest to install were bags with a springy metal hoop [Photo A] sealed inside the bag's rim. These also produced a tight seal against dust leaks. Only the Delta 50-760 and Jet DC-1100A have such hoops.

  Next best is a continuous pocket around the bag, with the lever-action band clamp slipped into it [Photo B]. Some models use friction clips to hold the plastic bags in place [Photo C] while you tighten the band clamp around them—eliminating the need for a third hand. Bags with belt loops [Photo D] make bag changes difficult and tended to bunch and create dust leaks.

- **They're all mobile, but...**

  Because these dust collectors are portable, they all have four swiveling casters, so you don't have to parallel-park them. But only two units, the Central Machinery and Delta 50-760, include handles for you to guide them around. Some have sturdy legs that bend away from the bottom bag that also serve reasonably well as handles. The majority proved wobbly but strong enough for their purpose.

  (Continued on page 70)
A high-efficiency top filter combined with a plastic bag below proves best

To find out which combination of top filter media and bottom collection bag works best, we tried each option on the Jet DC-1100A. We paired up combinations of the standard 30-micron cloth bags, a plastic lower bag, a 5-micron filter bag (from Jet), a 2-micron cartridge filter (from Jet) [Photo E], and a 1-micron oversize bag (from American Fabric Filter, 800-367-3591 or americanfabricfilter.com).

As you see in the chart below, using a high-efficiency filter on the top and a nonporous plastic bag on the bottom added 40–80 CFM of airflow versus 30-micron bags. And although stepping up from a 5-micron to a 1-micron bag didn’t improve airflow in our test, it will boost your shop’s air quality. Some manufacturers told us they get greater airflow with cartridge filters versus standard-size bags. We were unable to test each collector with all filter and bag options.

But finer filtration and increased airflow come at a price. A cartridge typically costs $200–$250, three times as much as a high-efficiency bag. American Fabric Filter (AFF) custom-designs and manufactures oversize 1-micron bags ($60–$160) to fit each customer’s dust collector and shop limitations (low ceilings, for example).

Cartridge cleans quickly

As you see in the chart below, using a high-efficiency filter on the top and a nonporous plastic bag on the bottom added 40–80 CFM of airflow versus 30-micron bags. And although stepping up from a 5-micron to a 1-micron bag didn’t improve airflow in our test, it will boost your shop’s air quality. Some manufacturers told us they get greater airflow with cartridge filters versus standard-size bags. We were unable to test each collector with all filter and bag options.

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Fine Filters Increase Airflow and Quality

Any high-efficiency filter medium paired with a plastic bottom bag gains CFM and overcomes more SP loss than any system using a 30-micron bag. Peak performance of each combination is noted using 4” duct.

Dusty trail leads to doctor’s office

Tester Jeff Hall learned a tough lesson with wood dust while testing these collectors. Jeff has a sensitivity to walnut dust that gets his nose and sinuses running, but he purposely used walnut dust to season all of the bags before taking airflow and resistance readings, using it as a red flag that a particular machine might be leaking dust. And many of them did leak around fittings and seals. But what Jeff didn’t count on was that the units with 30-micron bags actually forced much of the fine dust—including dust too fine to see—back into the air he was breathing. When his nose alerted him, he began wearing a respirator. But it was too late. So much dust got into his lungs that it caused a respiratory infection that lasted three weeks and required three rounds of antibiotics. The lesson: Filtering and trapping dust is critical, so use filtering media on your collector of 5 microns or less.
The impeller on Delta's 50-760 blows dust and chips directly into the collection chamber without need for a jumper hose.

**Jumper** hose adds resistance. Fourteen of the 15 collectors we tested have the motor and impeller resting on the base just above floor level. (Only the Delta 50-760 [Photo F] has them located at midlevel.) Those 14 machines have 2-3' of flex-hose to transfer debris from the impeller to the bags, and that creates more drag to cut into overall performance. The Craftsman [Photo G], Delta 50-850, and Steel City models use 6" hose, which creates less resistance. (Our testing proved that larger-diameter duct created less resistance when compared with smaller duct.) All others use 5" hose. Still, because of variables such as fan size and shape and bags, some models with 5" hose outperformed the 6" units. We're confident those machines would perform even better with 6" hose. Five of the 5" models had extra-long hoses that resulted in near-right angles [Photo H] in use, restricting airflow.

**Foam strip helps seal leaks.** General International was the only manufacturer to include self-adhesive foam, used to line the rim where the bags mount. This proved effective at preventing dust leaks with the band clamps tightened.

**Gain airflow by adding an aerodynamic hood**

While testing the 15 units with straight metal duct, Jeff Hall discovered that when he cupped his hands around the open end of the duct, the air velocity increased while static pressure decreased. So we decided to compare different inlet ports in search of an advantage.

We bought a common tapered dust hood and made a custom bell-mouth hood, shown at right. For the latter, Jeff laminated two pieces of 3/4"-thick MDF, cut a 4" hole into the center, routed one edge of the hole with a 1" round-over bit, and then glued that piece to a standard 4" plastic port. (You can also buy these in metal or plastic.)

We tested these on several collectors, and found that on one of the lower-performing units, we gained nearly 100 CFM with the plastic dust hood and nearly 140 CFM with the MDF bell-mouth hood while dropping resistance nearly 1" SP. We achieved similar results with one of the top-performing collectors. The reason for the improvement? Air (and with it, dust) changes direction easier when it encounters smooth transitions versus perpendicular corners.

Plastic or metal dust hoods and bell-mouth hoods sell for about $7-20 depending on size. (Many jointers come with a dust hood, as do some tablesaws.) But it's easy to make your own bell-mouth hood, using whatever dimensions fit your machine. If your machine has a straight port, you can remove it and replace it with a more aerodynamic hood.

---

**Great Tip!**
You can do the same thing on any dust collector with inexpensive foam weatherstripping, available at home centers and hardware stores.
You won't go wrong with either of these dust collectors

Our tests revealed three clear leaders in their ability to overcome static pressure losses while achieving high CFM: Delta's 50-760, Grizzly's G1029Z, and Penn State's DC2000B. We're naming the Grizzly and Delta as co-winners of our Top Tool award. Here's why:

The Grizzly outperformed all units by overcoming the most static pressure in 4" and 6" ducts and was second only to the Delta in maximum airflow. Its 2.5-micron top bag filters out most of the ultrafine dust, and with Grizzly making the switch to a plastic bottom bag, its overall performance should only improve. We tip our hat to Penn State for its fine-filtering bags, but its airflow performance proved slightly lower than that of the Grizzly.

But if you don't have the 220-volt hookup necessary for the Grizzly, you'll get great performance from the 110-volt Delta. It achieved the highest maximum CFM, has the easiest bag-changing system, and a super-efficient 1-micron filter bag.

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COLLECTING THE DIRT ON DUST COLLECTORS UNDER $400

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4. (B) Band clamp in belt loops  6. (B) Blast gates  8. (C) China
   (C) Band clamp with friction clips  (B) Dust heads  (T) Taiwan
   (H) Hoop enclosed in bag rim  (F) Canister filter  (J) Taiwan
   (P) Band clamp in continuous pocket  (N) Flexible hose  (K) Taiwan
   (S) Band clamp with cinch straps  (M) Fine-micron filtering bag
   (E) Excellent  (L) Plastic collection bag
   (G) Good  (R) Remote control
   (F) Fair  (S) Separator lid for trash can
   (P) Poor  (ALL) All of the above except separator

Written by Bob Hunter with Jeff Hall
Illustrations: Tim Cahill

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Pop-up Toothpick Dispenser

Even the humble toothpick can have an exotic holder. While turning this clever container you'll learn an ingenious technique for making a box with an inset lid.

1 Gather the materials

You'll need a 3x3x6" hardwood blank for the body; a contrasting-color 1\(\frac{3}{4}\times1\frac{3}{4}\times4"\) blank for the finial and cup; a 4"-long piece of 1/4" hardwood dowel for the shaft; 1/4", 1\(\frac{1}{8}\), and 1/4" Forstner bits; and medium-viscosity cyanoacrylate (CA) glue. The blanks should be straight-grained, dry, and free of cracks. (We used olive for the body and walnut for the finial and cup. You can use any highly figured wood or laminate a body blank from two or more species.)

Trim the body blank to 5" long, squaring both ends. Find the centers of the ends by drawing diagonals, and mark the diagonal intersections with a center punch or awl. To make turning templates, photocopy the three Toothpick Dispenser patterns on the WOOD Patterns insert. Adhere the pattern copies to cardboard with spray adhesive, and cut them to shape with a crafts knife.
2 Turn the blank into a cylinder and form a tenon

Mount the body blank between centers. Use a spindle roughing gouge to turn it into a 3" cylinder. Then use a parting tool to form a 1/8" tenon 1/4" long on the end as shown at right. (This end becomes the bottom of the dispenser.) Next remove the blank from the lathe and the drive center from the headstock. Install a four-jaw chuck onto the headstock spindle. Now mount the blank into the chuck by gripping the tenon with the chuck jaws.

3 Form the lid

Form the top curve on the end of the blank with a spindle gouge, checking the profile with the top template. Then mark the 1/4" lid diameter on the curved surface. Now "raise" the lid with a 1/8" parting tool by cutting from the edge of the blank to the marked lid diameter, forming a 1/4" shoulder as shown below. Finish-sand the side of the lid to 320 grit. With the lathe turning, apply paste wax to the lid side and buff with a paper towel. (We used Briwax.) Install a drill chuck into the tailstock quill and a 1/4" Forstner bit into the chuck. With the lathe running, advance the tailstock quill and drill a 1/2"-deep hole into the lid.

Part the lid from the blank with a 1/8" parting tool, making the lid 1/8" thick at the edge, and leaving a short stub on the remaining blank. Adhere sandpaper to a flat surface, and finish-sand the bottom of the lid. Apply paste wax to the lid bottom and buff. Avoid getting wax into the center hole.
4 Fit the lid and finish the top

Tools: 1/4" Forstner bit, 3/8" square-nose scraper.
Tool rest: Slightly above center.
Speed: Drilling, 500 rpm; turning, 1,800 rpm.

Install a 1/4" Forstner bit into the drill chuck mounted in the tailstock. With the lathe running, advance the tailstock quill and drill a 1"-deep hole. Then use a square-nose scraper to form a rabbet at the edge of the hole slightly larger than the diameter of the lid and slightly deeper than the thickness of the lid edge. Use the edge of the protruding lid stub on the body blank as a guide to the proper diameter, as shown below. Make very small cuts with the scraper, testing the fit with the lid until it fits snugly into the recess.

5 Complete the top and shape the body

Tools: 3/8" spindle gouge, 3/8" parting tool, 1/4" spindle roughing gouge.
Tool rest: Spindle gouge, slightly above center; spindle roughing gouge and parting tool, center.
Speed: 1,800 rpm.

Install a cone live center into the tailstock. Press the lid into the body recess, advance the cone center into the lid hole, and apply light pressure. Now, making light cuts, use a spindle gouge to shape the edge of the blank, matching the curve of the lid.

Using the body template as a guide, mark the body length. Then make a gauging cut to the bottom diameter with a parting tool. Now use a spindle roughing gouge to shape the body, as shown below, checking your progress with the template. Finish-sand the body and lid, apply paste wax, and buff.

6 Hollow the body

Tools: 3/8" square-nose scraper, 1/4" Forstner bit, 3/8" parting tool.
Tool rest: Scraper, slightly above center; parting tool, center.
Speed: Turning, 1,800 rpm; drilling, 500 rpm.

Back the tailstock away from the body. Bend an L-shaped hook onto a piece of wire and use it to remove the lid. Use a square-nose scraper to enlarge the recess just enough to allow the lid to loosely fit the recess.

Install a drill chuck into the tailstock quill and a 1/4" Forstner bit into the drill chuck. With the lathe running, advance the quill to extend the hole in the body to 3 1/4" deep, as shown below. Separate the body from the waste with a parting tool. Sand the bottom of the body flat, apply paste wax, and buff.
7 Shape the finial

**Tools:** 1¼" spindle roughing gouge, ⅜" and ⅝" parting tools, ⅜" spindle gouge.

**Tool rest:** Roughing gouge and parting tool, center; spindle gouge, slightly above center.

**Speed:** 2,500 rpm.

Mount the 1⅝×1⅛×4" finial and cup blank in the four-jaw chuck. Use a spindle roughing gouge to turn the blank into a 1¾" cylinder up to the chuck jaws. Then use a ¾" parting tool to turn a ⅝" tenon 1¾" long on the end. Using the finial template as a guide, shape the finial with a spindle gouge, as shown at left. Now switch to a ⅞" parting tool and form a ⅝"-diameter tenon ½" long at the base of the finial. Finish-sand the finial, apply paste wax, and buff. Part the finial from the blank with a ¾" parting tool, leaving a ⅛"-long tenon on the finial.

8 Make the cup

**Tools:** 1¼" spindle roughing gouge, skew chisel, 1½" and 1¼" Forstner bits, ⅝" parting tool.

**Tool rest:** Roughing gouge and parting tool, center; skew, slightly above center.

**Speed:** Turning, 2,500 rpm; drilling, 500 rpm.

Use a spindle roughing gouge to reduce the remaining cylinder to 1⅛" in diameter. Smooth the cylinder with a skew chisel, and true the end. Install a 1½" Forstner bit into the tailstock-mounted drill chuck, and drill a ⅜"-deep hole in the end of the cylinder, as shown at left. Switch to a ¾" Forstner bit, and drill a ⅛"-deep hole centered in the 1½" hole. Finish-sand and wax the cup, keeping the wax out of the ⅛" hole. Mark the cup length, and part it from the blank.

9 Assemble the dispenser

Glue the finial into the ¼" lid hole with medium-viscosity cyanoacrylate (CA) glue, and let it cure. Then cut a piece of ¾" hardwood dowel 3⅝" long for the shaft. Dry-fit one end of the shaft into the lid and the other end into the cup. Test the fit of the cup assembly into the body, trimming the shaft length if necessary. Remove and disassemble the cup assembly. To keep glue from leaking, adhere a piece of masking tape to the cup bottom, covering the ¼" hole. Glue the shaft into the lid and cup holes with CA glue. Reinsert the cup assembly, align the lid grain with the body grain, and let the glue cure. Remove the cup assembly and remove the masking tape. Lower the cup assembly halfway into the body, and loosely fill the dispenser with toothpicks. To close the dispenser, nest the lid into the body rabbet, aligning the grain. Dispense toothpicks by raising the cup about halfway. The toothpicks splay outward, making them easy to grasp.

Written by Jan Svec with Brian Simmons
Project design: Brian Simmons
Illustrations: Roxanne LeMoine; Lorna Johnson
Simple ‘n’ Sturdy Tool Stand

From inexpensive 2x4s, ¾" MDF, and ¾" perforated hardboard, you can build this rock-solid workstation.

Basic-Built projects require only a limited number of inexpensive and readily available tools and materials. For more information, go to woodmagazine.com/basicbuilt

PROJECT HIGHLIGHTS
- Overall dimensions: 48" wide x 18" deep x 30½" high.
- The stand easily levels to uneven floors using threaded levelers that adjust with a screwdriver.
- You’ll find all of the materials and supplies needed at your local home center.

Add this easy-to-build stock support to the tool stand to ensure safety and accuracy when machining long workpieces. To build one, see page 24.
Square a stud in 2 easy steps

You don't need a jointer to remove the rounded corners of a 2x4. You can do it with any tablesaw. Just make sure that you start with the straightest boards you can find. For the best results, crosscut the studs to the needed lengths before ripping the edges.

Glue and clamp together each end panel, using small clamps at the corners to ensure tight half-lap joints.

Start with the panels

1. From pine 2x4s, cut the stiles (A), end rails (B), back rails (C), feet (D), front rails (E), and cleats (F) to the sizes listed [Materials List, page 79]. For the best appearance and fit of the parts, remove the rounded corners from the 2x4s. For help with this, see the Shop Tip, above right. You can get two 1½"-square cleats from a 33"-long 2x4. To do this, rip the piece down the center. Then, cut off the rounded edge on each piece for a finished width of 1½". Set the feet aside.

2. From ¼" perforated hardboard, cut the end panels (G) and back panel (H) to the sizes listed.

3. Using a dado blade in your tablesaw, cut a 3" rabbet ¾" deep into each end of the stiles (A), end rails (B), and back rails (C) [Drawings 1 and 1a] to form half-lap joints. Or, as an alternative to a dado blade, cut the rabbets using a circular saw and router, plus an easy-to-build, two-in-one jig featured in issue 179 (October 2007), page 86, or online at woodmagazine.com/halflapjig.

4. Measure the exact thickness of one of your ¼" perforated hardboard end panels (G). Then, using your tablesaw and a standard ¼"-kerf blade, make two passes and cut a ¾"-deep groove, as wide as your hardboard is thick, ¾" from the inside face of each stile (A), end rail (B), and back rail (C) [Drawings 1 and 1a]. Need help? See the Shop Tip on the next page.

Now assemble the panels

1. Glue, assemble, and clamp together two stiles (A), two end rails (B), and an end panel (G) [Photo A]. Repeat to assemble the other end panel. Then assemble the remaining two stiles, back rails (C), and back panel (H) in the same way. Sand the assemblies to 150 grit.

2. Mark centerpoints on the outside faces of the end-panel stiles (A) and bottom end rails (B) for the countersunk shank holes where dimensioned [Drawing 1]. Then, mark the centerpoints on the top front rail (E) and cleats (F), where shown [Drawing 2]. Drill the holes. For the #8 flathead wood screws, drill ¾" shank holes. Because the pine is soft, you don't need to drill pilot holes.
With the end and back panels clamped together, drive the screws into the predrilled holes in the end-panel back stiles (A).

Use a helper (or support stand) to ensure safety when ripping the 24x48" MDF panels for the shelves (J, J) and top (K) to size.

Assemble and clamp together the end panels (A/B/G) and back panel (H), with the outside face of the top cleat (F) flush with the back edges of the end-panel stiles (A). Drive the screws.

Glue and screw the adjustable-shelf cleats (L) to the shelf (J), flush with the front and back edges and centered end to end. Set the shelf aside.

From % MDF, cut the bottom shelf (I) and adjustable shelf (J) to the sizes listed. Then cut two 18x48" pieces to form the laminated top (K) [Photo C]. For consistent hole depths, wrap a piece of masking tape around the bit for a visual depth stop. Separate the pieces, and apply glue to the mating faces using a roller. Next, realign the pieces, clamp them together, and drive the screws. After the glue dries, scrape off the squeeze-out. Then rout 7/8" round-overs along the top and bottom edges and ends of the top.

Position the top (K) with the bottom face (screw side) up. Then, center the tool stand, with the top end down, front-to-back and side-to-side on the top. Using the shank holes in the top front rail (E) and cleat (F) as guides, drill pilot holes into the top. Drive the screws.

Wrap it up

Retrieve the feet (D). Drill the 1/2" holes 1/2" deep with a 3/8" hole centered inside into the bottom of the feet, where dimensioned [Drawing 2]. Next, drill the countersunk mounting holes into the bottoms for attaching the feet to the stand. Install the 3/8" T-nuts and 3/4x2 1/4" levelers into the counterbored holes. Now screw-mount the feet to the stand [Photo F].

Set the stand upright. Then, position the adjustable-shelf supports (M) where desired. Using the 1/4" holes in

SHOP TIP

Cut a snug-fitting panel groove in 2 steps

Think that your 1/4" perforated hardboard panels measure the specified thickness? Chances are they measure about 1/8", as ours did. To size the grooves in the stiles (A), end rails (B), and back rails (C) to snugly fit the panels, cut the grooves in two passes using a 1/4"-kerf blade in your tablesaw. Here's how.

Step 1 Position your rip fence to cut a groove 1/4" from the inside face of the stiles (A), end rails (B), and back rails (C). With the outside face of each part against the fence, rip a 1/4"-deep groove along an edge. Cut another groove in a 1 1/2x3" cutoff about 12" long.

Step 2 Shift the fence toward the blade as needed to widen the groove. With the same face of the cutoff against the fence, rip it again. Check for a snug fit of the hardboard. Adjust the fence if needed, and cut again. Then widen the groove in the parts.
the perforated end panels (G) as guides, drill the mounting holes into the supports. Drive the screws.

3 Finish-sand any areas that need it to 150 grit, and remove the dust. Apply two coats of a clear finish to the stand and adjustable shelf (J/L). We applied a water-based clear satin polyurethane. Install the shelf on the supports (M). Now place the stand where desired, equip it with your tools, and get started on your next project!

**2 EXPLODED VIEW**

Clamp the two MDF pieces for the top (K) together with the edges and ends aligned. Drill the countersunk holes.

**Cutting Diagram**

- **A**: 1½ x 3½ x 96" Pine (2x4)(2 needed)
- **B**: 1½ x 3½ x 96" Pine (2x4)
- **C**: 1½ x 3½ x 96" Pine (2x4)
- **D**: 1½ x 3½ x 96" Pine (2x4)

- **E**: 3/4 x 24 x 48" Medium-density fiberboard (2 needed)
- **F**: 3/4 x 48 x 48" Perforated hardboard
- **G**: 3/4 x 24 x 48" Medium-density fiberboard

**Materials List**

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<tr>
<td>A</td>
<td>stiles</td>
<td>1½&quot;</td>
<td>3&quot;</td>
<td>27&quot;</td>
<td>P</td>
<td>6</td>
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<tr>
<td>B</td>
<td>end rails</td>
<td>1½&quot;</td>
<td>3&quot;</td>
<td>14&quot;</td>
<td>P</td>
<td>4</td>
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<tr>
<td>C</td>
<td>back rails</td>
<td>1½&quot;</td>
<td>3&quot;</td>
<td>34&quot;</td>
<td>P</td>
<td>2</td>
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<td>D</td>
<td>feet</td>
<td>1½&quot;</td>
<td>3&quot;</td>
<td>17&quot;</td>
<td>P</td>
<td>2</td>
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<tr>
<td>E</td>
<td>front rails</td>
<td>1½&quot;</td>
<td>3&quot;</td>
<td>34&quot;</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>F</td>
<td>cleats</td>
<td>1½&quot;</td>
<td>1½&quot;</td>
<td>34&quot;</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>G</td>
<td>end panels</td>
<td>¾&quot;</td>
<td>9½&quot;</td>
<td>22½&quot;</td>
<td>PH</td>
<td>2</td>
</tr>
<tr>
<td>H</td>
<td>back panel</td>
<td>¾&quot;</td>
<td>28½&quot;</td>
<td>22½&quot;</td>
<td>PH</td>
<td>1</td>
</tr>
<tr>
<td>I</td>
<td>bottom shelf</td>
<td>¾&quot;</td>
<td>8&quot;</td>
<td>34¾&quot;</td>
<td>MDF</td>
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<tr>
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<td>7¾&quot;</td>
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<td>2</td>
</tr>
<tr>
<td>K</td>
<td>top</td>
<td>1¼&quot;</td>
<td>18&quot;</td>
<td>48&quot;</td>
<td>LMDF</td>
<td>1</td>
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<tr>
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<td>adjustable-shelf cleats</td>
<td>¾&quot;</td>
<td>1¼&quot;</td>
<td>32½&quot;</td>
<td>P</td>
<td>2</td>
</tr>
<tr>
<td>M</td>
<td>adjustable-shelf supports</td>
<td>¾&quot;</td>
<td>1½&quot;</td>
<td>8&quot;</td>
<td>P</td>
<td>2</td>
</tr>
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</table>

**Materials key:** P-pine, PH-perforated hardboard, MDF-medium-density fiberboard, LMDF-laminated medium-density fiberboard.

**Supplies:** #8x1¼", #8x2", #8x2½", #8x3" flathead wood screws; ½" T-nuts (4); 3/8 x 2½" levelers (4); #14x3/4" panhead screws (4).

**Blade and bit:** Dado-blade set, ¼" round-over router bit.

Written by Owen Duval with Chuck Hedlund
Project design: Jeff Mertz
Illustrations: Roxanne LeMoine; Lorna Johnson
Don't Get Nailed by Shrapnel

The incident

As I was ripping a 2"-thick oak leg salvaged from an old drafting table, I struck a hidden nail, causing the carbide-tooth blade to chatter as it cut through the metal. I paused for a moment, thinking everything was okay, and then proceeded to finish the cut. BIG MISTAKE! A carbide blade tooth suddenly broke loose and struck my right index finger. This caused a small but jagged cut that, to my relief, bled and hurt little. I cleaned and bandaged the cut. By the next morning, my finger was swollen and stiff. So I went to my doctor, who ordered an X-ray. To our astonishment, the image, shown above right, revealed that the carbide tooth had penetrated my finger and lodged against a bone. This required surgical removal of the piece and stitching of a nicked tendon. Thankfully, my finger healed without any permanent damage.

—George Shea, North Haven, Conn.

The woodworker

George works for an advertising/marketing agency. An intermediate-level woodworker, he builds furniture and other home projects.

The warning signs

Trying to be a thrifty woodworker, George cut the salvaged wood without first checking it for hidden metal objects. Although all of the hardware was removed, he did not consider the possibility that the leg might contain a broken nail or other piece of metal.

The lessons

Here are some things you can do to prevent such an incident.

- Visually inspect every board—old or new—for metal objects, including staples. Deeply embedded objects can be hard to detect, but stains or tiny openings may clue you in to entry points for nails or screws.
- Use a strong magnet, such as a rare-earth type, or a metal detector to check the board for ferrous metal.
- Should you strike a metal object during a cut, immediately shut off the saw. Remove the blade, and have it inspected by a professional sharpening service or the manufacturer for possible damage.
- Always use your saw's blade guard, and wear safety glasses.
- Never stand or position your hands directly in line with the blade.

(You can find metal detectors at woodworking supply stores for as little as $18. Some stud finders also detect metal.) Scan the board slowly and methodically, using a zigzag motion and overlapping the passes. Scan both faces and along the edges and ends.

Earn $100 for your story

Help other readers work safely by sharing a personal shop-related mishap or near miss. Send a detailed description of the incident (about 150 words) along with photos or illustrations and a daytime phone number to: Safety: Real Life Lessons, WOOD magazine, 1716 Locust St., LS-221, Des Moines, IA 50309-3023. Or e-mail us at safety@woodmagazine.com

An LED on this metal detector illuminates as it finds a nail embedded into this tiny opening along the edge of a piece of 5/4 oak.
Scrapwood Project

Rippling Ribbon Clock

Build this whimsical eye-pleaser from leftover veneer.

Fashion the form first

1 From 1/4"-thick hardwood (we used hard maple; softwoods might not prove strong enough to form the ripples in the veneer) cut a 3x7" blank.
2 Make a copy of the full-size form pattern from the WOOD Patterns® insert on page 53. Attach it to one edge and end of the blank with spray adhesive, wrapping it around the blank at the dotted line.
3 Using a 1/4" or smaller blade on your bandsaw, cut away the waste portion of the blank. Sand both faces smooth with your spindle sander or a drill-press sanding drum.
4 Cover both inside faces of the form with clear packing tape to prevent the glued-up veneer from sticking to the form.

Make the clock body

1 Cut six pieces of veneer 3 1/2x8 1/2" with the grain running the long dimension. (We used bird's-eye maple for the face, on top of five alternating plies of walnut and mahogany.)
2 Dampen the veneer with warm tap water (to make it pliable and prevent splintering) until all surfaces are covered. Do not soak them. Stack them in the order you want for the finished clock—with the face veneer oriented as indicated on the form pattern—and then place them between the form sections.
3 Gradually tighten clamps along the length of the form, stopping when the form sections have pulled together. It's okay if some portions have slight gaps. Leave clamped overnight.

continued on page 84
Because this "sandwich" proves difficult to hold squarely on a drill press, use a cordless or electric drill instead.

Remove the veneer pieces from the clamps and lay them out to air-dry—an hour or two should do it. Keep the veneers in the same order so they'll glue together tightly.

When they're dry, apply a thin, even coat of yellow wood glue to the mating veneer surfaces. Sandwich them together in the form and clamp tightly. Allow the glue to dry overnight. (Don't worry if the outer edges of the veneer gap slightly; you'll trim away the outer edges later.)

Before removing the clamps, drill a 1/4" hole 2 3/4" deep into the end of the form-and-veneer sandwich (Photo A), where shown on the pattern. Remove the veneer blank from the form.

Cut a 2"-diameter disc from 7/8" stock, and sand it smooth. We used poplar, and then painted it black.

Cut a 1/8" hole % deep at a 5° bevel into the base 1/2" from the edge.

Apply three coats of satin spray lacquer to the clock body, sanding lightly between coats with 400-grit sandpaper.

Install the stainless-steel rod into the base hole with epoxy. Slide the clock body onto the rod, adhering it to the rod with epoxy.

Now finish the job

1. Cut a 2"-diameter disc from 7/8" stock, and sand it smooth. We used poplar, and then painted it black.
2. Drill a 1/4" hole 1 3/4" deep at a 5° bevel into the base 1/2" from the edge.
3. Apply three coats of satin spray lacquer to the clock body, sanding lightly between coats with 400-grit sandpaper.
4. Install the stainless-steel rod into the base hole with epoxy. Slide the clock body onto the rod, adhering it to the rod with epoxy.
5. Press the clock movement into the 1 3/4" hole.

Project design: Schlabaugh & Sons

Source

Clock and stainless rod: One clock part #RC-1, $7.50; five clocks: part #RC-5, $32.50 (add $4.95 for shipping), Schlabaugh & Sons, 800-346-9663 or online at schsons.com.

Veneer: Assorted pack for one clock part #LP-RC-1, $3.50; assorted pack for five clocks: part #LP-RC-5, $15.50 (add $4.95 for shipping), Schlabaugh & Sons, above.

EXPLODED VIEW
Installing Inset Doors

The right hardware combined with foolproof marking guarantees perfection.

Inset cabinet doors, like those on the hutch on page 38, can be an acid test of your woodworking skills because with no overlay to hide a less-than-perfect hanging job, any misalignment shows. Fortunately the job isn’t as hard as it looks. Here’s how.

First choose the right hardware. For the hutch project we selected partial-wrap, non-mortise, full-inset hinges, shown above right. These widely available hinges make it easy to inset a ¼”-thick door. The non-mortise feature leaves a ¼” gap between the door hinge stile and the case, and the screw slots allow for fine-tuning of the door position after installation.

To begin, mark the location of each hinge on the door. (For the hutch, mark lines 2” from the top and bottom of each hinge stile. Align the top edge of the top case leaf with the upper mark and the bottom edge of the bottom case leaf with the lower mark.) Drill pilot holes centered in the slots, and screw the hinges in place. Then test-fit the doors in the openings. You should see an equal ⅛” gap on all four sides between the door and the case. If not, trim the door edges where necessary. To make sure you reinstall each door in the opening for which it was fitted, mark the location (left, center, right) on the bottom edge of the bottom rail.

Apply 2”-wide masking tape to the case at the hinge locations with ⅛” of the tape width on the front edge of the case and the remainder wrapped around the corner onto the inside face. Now, to accurately position the hinges on the case, follow the four steps shown in the photos.

With all the screw holes drilled, remove the hinges and tape, and apply finish to the project. After the finish dries, install the doors, centering the screws in the slots. Check the alignment of each door and, if necessary, make adjustments. The hinge case-leaf slots allow up-and-down adjustment, and the door-leaf slots allow right-to-left adjustment.

Step 1
Center the door in the opening with ⅛” shims. Mark the joints between the hinge knuckles on the tape.

Step 2
Reaching inside the cabinet from the top, trace the back edge of each hinge case leaf onto the tape.

Step 3
Remove the door and extend the knuckle-joint marks onto the tape on the inside face of the case member.

Step 4
Adhere a hinge to the case with double-faced tape, aligning it with the marks. Drill pilot holes centered in the slots.
Here's a recipe for black oak

Q: Years ago, I knew of a vinegar solution that blackens oak. I remember the vinegar part, but what else goes with it?

—Scott Swager, Joliet, Calif.

A: Add a little iron and now you’re cookin’, Scott. Iron mixed with white vinegar produces a centuries-old finish, called “iron buff,” that can be brushed onto oak, and most other woods, to darken their color.

To make iron buff, rinse a pad of steel wool with lacquer thinner to remove the protective oil. Allow the pad to dry. Then tear the pad into pieces and soak them in a pint of vinegar until the acid begins to dissolve the steel. Soak the pad overnight for a light color change or for a week to achieve darker colors. When a dab of iron buff turns a test board the desired color, strain the solution through a tightly-woven cloth, such as an old t-shirt, to remove the largest pieces of undissolved iron. Then strain it again through a coffee filter to remove the remaining particles.

The vinegar itself doesn’t change to a dark color that dyes the wood. Instead, the iron in the vinegar reacts with chemicals in the wood, causing them to change color. Because it’s a chemical process instead of a wiped-on stain or dye, you get blotch-free color. Each batch will vary, though, so mix enough to stain an entire project. Apply an optional oil-based stain to deepen the gray or black color for a darker tone. Then apply a film finish.

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Ask WOOD

Specific gravity: a weighty subject

Q: I've heard people refer to a wood's specific gravity. What are they talking about? Is it important when I'm choosing wood for a project?

A: Specific gravity tells you how much the wood's cell structure contributes to its density, Kerry. It's the ratio between the density of a piece of wood after it's oven-dried and the density of enough water to equal the wood's volume. That volume for the second measurement varies with wood's moisture content, so before you can compare different wood species, a specific-gravity chart like the one below needs to tell you whether the wood was tested when green, dried to 12 percent moisture content, or oven-dry.

Specific gravity matters because woods with high specific gravities tend to swell and shrink more across their grain than those with lower specific gravities. That can be hard on painted finishes for outdoor projects, for example. So for these applications, look for woods with low specific gravity, such as cedar or redwood.

Not all woods have a specific gravity less than 1. Lignumvitae's specific gravity of 1.05 (oven-dry weight to green volume) means it's heavier than water and sinks. Such density makes it good for mallets and other tools.

<table>
<thead>
<tr>
<th>Wood Species</th>
<th>SG Green</th>
<th>SG 12%</th>
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<tbody>
<tr>
<td>Ash (White)</td>
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<td>.60</td>
</tr>
<tr>
<td>Birch (Yellow)</td>
<td>.55</td>
<td>.62</td>
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<tr>
<td>Cedar (Western Red)</td>
<td>.31</td>
<td>.32</td>
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<tr>
<td>Cherry</td>
<td>.47</td>
<td>.50</td>
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<tr>
<td>Hickory (Shagbark)</td>
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<td>.72</td>
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<tr>
<td>Maple (Silver/Soft)</td>
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<td>.47</td>
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<tr>
<td>Maple (Sugar/Hard)</td>
<td>.56</td>
<td>.63</td>
</tr>
<tr>
<td>Oak (Northern Red)</td>
<td>.56</td>
<td>.63</td>
</tr>
<tr>
<td>Oak (White)</td>
<td>.60</td>
<td>.68</td>
</tr>
<tr>
<td>Pine (Western White)</td>
<td>.36</td>
<td>.38</td>
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<tr>
<td>Poplar</td>
<td>.40</td>
<td>.42</td>
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<tr>
<td>Redwood (Young)</td>
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<td>.35</td>
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<tr>
<td>Sweetgum</td>
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<td>.52</td>
</tr>
<tr>
<td>Walnut</td>
<td>.51</td>
<td>.55</td>
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</tbody>
</table>

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Ask WOOD

Cabinets should store wine on its side

Q: I’m designing a wine cabinet that when closed looks like a steamer trunk. But I don’t know the best angle for storing wine bottles. Also, what else does such a cabinet normally hold?

—Bill Prange, Canyon Country, Calif.

A: So long as the bottle angle keeps the cork moist, you’re storing it safely, Bill. Beyond that, just keep it away from heat and direct sunlight.

As for accessories, a drawer to hold a corkscrew and towels would be handy. If your design allows, include racks or storage space for wine glasses, as we did with the wine cabinet in issue 172 (October 2006), shown below. For plans and instructions to make this cabinet, go to woodmagazine.com/winecabinet

It’s So Easy, I Just Open The Door And Step In!

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These woodworking wares passed our shop trials.

Compact belt sander delivers big performance

Some purists consider a belt sander a crude woodworking tool, capable of hogging away material in a hurry, but not good enough for fine work. That's because belt sanders usually weigh 12 lbs. or more and prove cumbersome. Porter-Cable's 371K compact belt sander has broken those barriers and earned a place in my shop.

This tool is not like any belt sander I've used. First of all, it weighs only 5 lbs. Second, its compact body, full-length rubber-grip back, and removable front handle make it easy to maneuver—even with one hand—into tight places and overhead without my arms getting weary. And third, the dust collection proves surprisingly effective when hooked up to my shop vacuum.

I began using the 371K to sand planer snipe and scallop marks from 700 linear feet of 3"-wide trim I milled for my house. It would take a random-orbit sander a week to do that job, but I did it in just a few hours with this dandy and didn't feel like I'd just wrestled a hog. The 371K proved invaluable as I used it to scribe the back edges of laminate countertops—with excellent one-handed control—to match my kitchen walls. I'd struggle to get that kind of fit with a big belt sander.

After using the sander for extended uses it got a little hot—as I'd expect with any power tool—but the rubber grip insulated my hand from the heat. The 371K comes with one 80-grit, 2½"x14" belt. I recommend getting some finer grits as well because I was able to sand an edge-joined coffee table top smoother than I expected (180 grit), saving me a few steps with my finish sander. A five-pack of belts costs $10 at Woodcraft (800-225-1153 or woodcraft.com).

—Tested by Kevin Boyle

Compact Belt Sander, model 371K

Performance  *****
Price $120
Porter-Cable 888-848-5175; deltaportercable.com

The sky, er, ceiling's the limit with these stackable panel clamps

It's like when someone first figured out the solution to overcrowded parking in a city: Go vertical. That's what the makers of R&R Clamp have done with their unique stackable clamps. With space always at a premium in home and professional workshops, this clamping system allows you to glue up and clamp multiple assemblies by stacking them like floors of a parking garage.

Here's how the system works: First, you screw two alignment bars to a plywood base, making sure to keep them parallel to each other. Then, when you attach two clamps onto these bars (at any of the multiple mounting slots), they're dead-on square every time. Glue up your workpieces, place them between the jaw clamps, and then tighten using your drill and a 3/4" socket and adapter (included). To stack clamps simply place them on top of each other as you align the interlocking position pins.

Besides being able to clamp up more assemblies in a limited benchtop space, I found that by the time I got six panels glued and stacked the bottom one was ready to take out. I loosened the bottom clamps and removed that panel without disturbing any of the others. Then, I glued up another panel and put it into that one's place. Don't use excess glue or it will drip onto panels below. Or, place wax paper between layers.

—Tested by Steve Feeney

Stackable panel clamps

Performance  ****
Price $195, 6-clamp, 2' starter kit
R&R Clamp 920-863-2987; rrclamp.com

We test hundreds of tools and accessories, but only those that earn at least three stars for performance make the final cut and appear in this section.