
A MIND OF HER OWN
THE EXPERIENCE ECONOMY
DIANA
THE SECOND CREATION
SOUL MATES
FROZEN INNOCENT
GLORY
ANNE TYLER
TREASURES OF BRITAIN
THE COMPLETE garden flower book
DORY BOOK
A SMILE IN THE MIND
WOODEN SHIP
GARDEN DESIGN
VANITY FAIR'S HOLLYWOOD

Classic Bookcase

"A room without books is a body without a soul," wrote Cicero more than 2,000 years ago. A great scholar, he also understood the pleasures of building bookshelves, although a noble statesman of ancient Rome couldn't be expected to do handwork. He wrote to a friend, "Your men have made my library gay with their carpentry work. . . . Now that [we have] arranged my books, a new spirit has been infused into my house. . . . Nothing could look neater than those shelves."

Things haven't changed much—even in the Information Age you still can't have too many bookcases, and this classic design will instill new spirit into any room. Its simple good looks work just about anywhere—the kitchen, the kids' rooms, the office, the living room, or filled with towels and soaps in the bath. With a neat finished back, it can serve as a simple room divider, or it can go against the sofa or wall. Paint it white, use bright primary colors for the kids, distress it or use crackle paint to make it look old, or dress it up with fancy moldings.

This bookcase is designed to get you up to speed with one of woodworking's most valuable tools—the router. While building this project, you'll learn two fundamental ways to guide a router, how to make a nearly foolproof jig that keeps the router in check, and how to use four different router bits. You'll learn how to make grooves across the middle of a board (called dadoes), make a shoulder in the edge of a board (a rabbet), rout edge profiles, and use straightedges and templates to put a smooth edge on a piece of wood—even one with curved edges.

As Cicero knew, building a bookcase is an ideal complement to the life of the mind. ■

What You'll Learn

- Setting up and using a router
- Routing rabbets
- Template routing
- Making dadoes with a router
- Squaring the ends of a routed dado or groove
- Routing edge treatments
- The elements of mitering a molding
- Filling and smoothing using putty
- Prepping for and applying a high-quality paint job

Everyone's heard Murphy's Law–if anything can go wrong, it will. It's not a bad motto for woodworkers—if you interpret it the right way. Though often cited as a curmudgeonly joke, the real meaning of Murphy's Law is that with experience and forethought you can get the outcome you want.

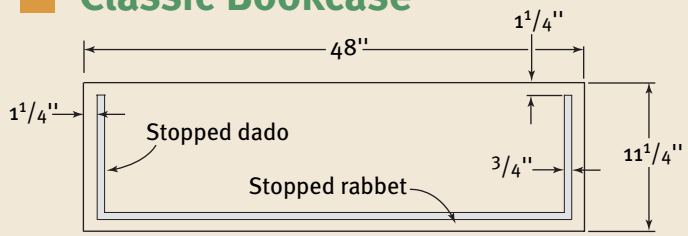
Murphy's Law was developed in 1949 by scientists and engineers of the U.S. Air Force researching the effects of rapid deceleration on the human body. The tests were technically complex and brutal on the subjects. Every time a technician plugged an electrode into the wrong receptacle or made an ambiguous note, the whole operation had to be repeated at great expense and a fair bit of human suffering. The team (led by Capt. Edward A. Murphy) soon developed a methodology that required analyzing every aspect of the test to find everything that could possibly go wrong. Then, they redesigned the whole system so nothing could go wrong and the tests could be conducted quickly and safely.

Successful woodworking is all about adopting the true spirit of Murphy's Law—that you can plan ahead and prevent problems before they occur. With a little experience gained from time in the shop and from reading and talking with other woodworkers, you'll soon learn the kinds of things that can go wrong and how to prevent them. You'll get lots of practice with this when you're using a router.

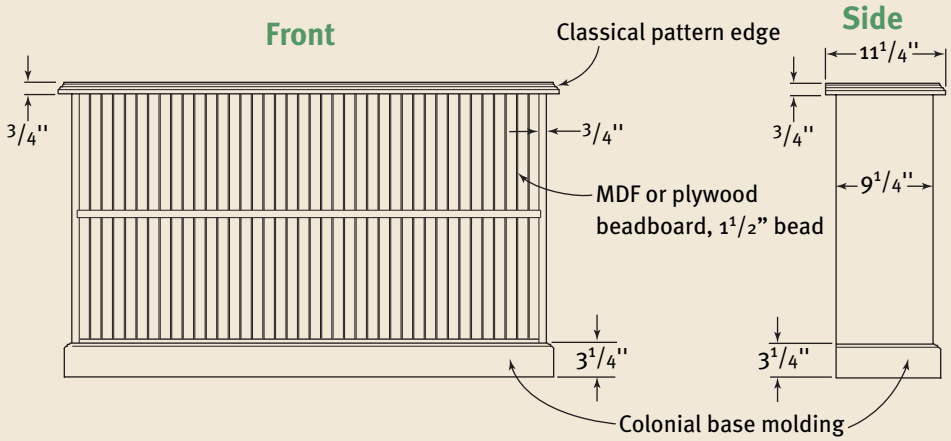
Routers are one of the most versatile tools in the shop, but I suspect more woodworking projects have been messed up by routers than any other means. It's not that routers are particularly dangerous or malignant; they are so fast and efficient that a moment's inattention can mess up hours of previous work.

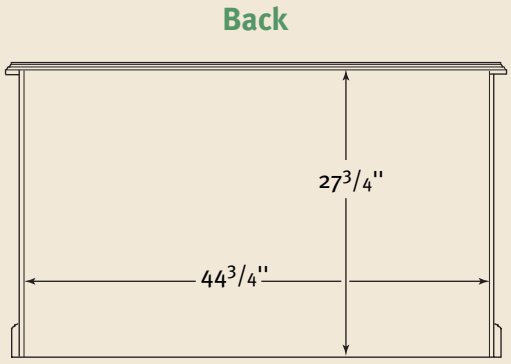
This bookcase gives you a good grounding on using a router with complete control. You'll learn to guide the router with fences, bearing-mounted bits, and jigs so that the machine cuts along the path you want.

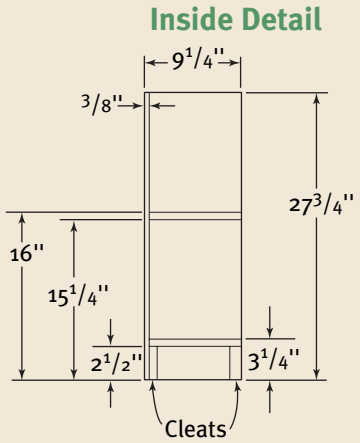
Classic Bookcase



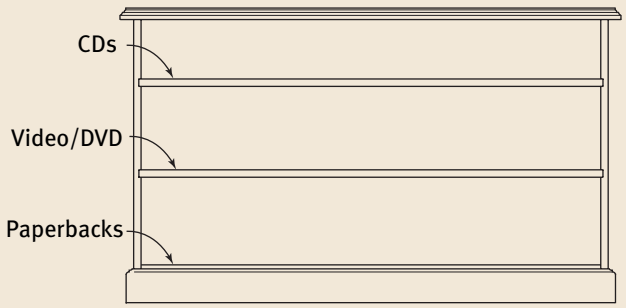
Top as seen from underside

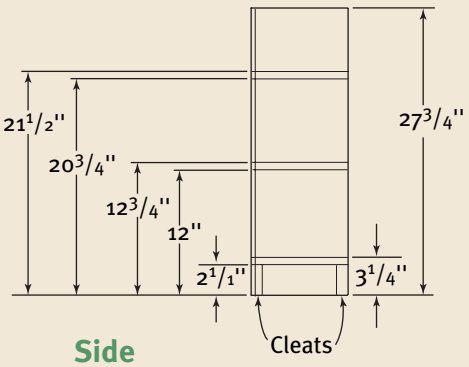






Variation: Information Age Classic Bookcase





MATERIALS

Quantity	Actual Dimension*	Length	Description	Notes
1	¾" x 11¼"	4'	Top	1" x 12" poplar. Finishes at 48".
1	¾" x 9¼"	6'	Sides	1x10 poplar. Yields two sides, finished at 28".
2	¾" x 9¼"	8'	Shelves	1x10 poplar. Yields two shelves, finished at about 44".
1	½" x 3¼"	8'	Colonial base molding	Any material; primed is nice.
1	¾" x 2½"	10'	Aprons and cleats	1x3 poplar. Two pieces finish to 44".
1	¼" x 4' x 4' (half sheet)		Back	MDF (primed is easiest to paint) or plywood beadboard, 1½" beads. Or plain MDF or plywood.
1	¾ x ¾"	18"	Molding stock	Used for converting jig for stopped moldings.
			Yellow glue	
		1¼"	#7 or #8 flat-head wood screws	Self-drilling, square drive preferred.
		2"	#7 or #8 flat-head wood screws	Self-drilling, square drive preferred.
		1"	Brads	
			Double-sided tape	
			Quick-dry, easy-to-sand filler	
			Paintable caulk	
			Random-orbit sanding disks	150 and 220 grit
			Sandpaper	120, 180, 220 grit
1			Tack cloth	For use with oil-based paint only.
1 quart			Primer	Optional, gives the best finish.
1 quart			Paint	Oil or water based.
			Solvents	As per paint label.
			Denatured alcohol	For general cleanup.
			Paintbrushes	Five disposables or one moderate-quality bristle brush if using water-based paint.

*See p. 44–45 for information on actual vs. nominal dimensions.

Tools

- Saw capable of cross-cutting an 11¼"-wide board
- Router
- ½"-diameter x 1" cutting depth template bit
- ½"-diameter x ¾" cutting depth template bit
- ⅜" rabbet width x ½" cutting depth rabbeting bit
- Router depth gauge or small sliding square
- Tape measure
- Several small bar clamps, two 24" panel clamps and two 48" panel clamps
- Plywood straightedge
- Steel ruler
- 6" sliding square
- 12" sliding square
- Classical pattern edge-trimming bit
- Corner chisel
- Mallet
- #8 countersink drill bit
- Square-drive bit
- Cordless drill/driver
- Warrington hammer
- Circular saw and 50" guide
- Nail set
- Random-orbit sander
- Hand-sanding block

▲ Knowing how to cut and fit mitered moldings is useful for all kinds of woodworking, from furniture making to picture framing, or for putting up moldings and trimming windows in your living room.

You'll use the router to make dadoes and rabbets to build a bookcase that uses standard dimensional lumber, goes together square, is nearly impossible to rack, and with its complex profile routed on the top edge is classically good looking.

You'll also learn the basic elements of a high-quality paint job, mitering corners, and applying molding—all skills you can use around the house, from refinishing furniture to building picture frames or trimming a window.

Building the Bookcase

Take the time when selecting your materials for this project to get wood that has very little cup. A cupped ¾"-thick board simply will not slide into a ¾" dado.

▲ You'll need four router bits to build the bookcase. From left: a ¼"-shank template-cutting bit with a 1" cutting depth and a ½" diameter; a classical pattern bit with a ½" shank; a ¼"-shank template-cutting bit with a ¾" cutting depth and a ½" diameter; and a ½"-shank rabbet-cutting bit with a ⅜"-wide cut.

Cut the Parts to Length

1 Check your material for knots, gouges, and other flaws. Orient flaws on the inside or back edge whenever possible.

2 Crosscut two ¾" x 9¼" sides to 27¾". Cut the ¾" x 11¼" piece for the top to 48".

3 For ease of handling, rough-cut the ¾" x 9¼" shelves to 48".

WORK SMART

If your miter saw or chopsaw can't handle boards of this width, use a circular saw and crosscut guide.

Lay Out the Dadoes and Rabbets

To avoid confusion later and to understand the bookcase-building process, start by drawing directly on the wood all the various cuts you'll make with the router. This way you'll see clearly on the wood just what you're supposed to do, and it's apparent immediately if the router is set up wrong or if you're about to rout in the wrong place.

Laying out the sides

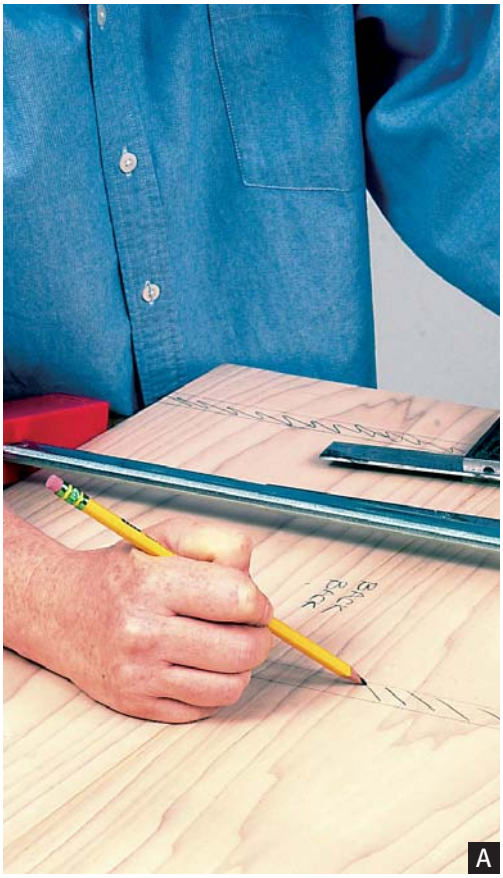
The shelves slip into **dadoes** cut into the sides. For the shelves to be parallel to the floor and to one another, the dadoes in each side piece must be exactly the same distance from the floor. To make sure this happens, you'll mark and cut them together, with the bottom edges of the side pieces aligned. You'll also mark the locations of the cleats that will be fastened beneath the lower dado to give extra support to the bottom shelf and provide a firmer footing for the bookcase.

Each side piece also has a **rabbet** on the inside back edge, running the full height to conceal the edges of the MDF back. Building it this way gives the bookcase a more polished appearance, as well as providing solid bearing surfaces for the back to prevent racking.

1 Lay the side pieces on the bench side by side with the ends flush. Clamp them together and down to the bench so they can't shift.

2 Hook the tape measure from the bottom, and lay out the locations and widths of the cleats and the dadoes according to the measurements in the illustration on p. 139. Put hatch marks where the dado will be cut to make it clear where material will be removed, as shown in photo A.

3 Unclamp the side pieces and draw a line ⅜" in from the back edge of each piece. The side pieces are mirror images of one another, so the back edges are the edges that are touching in the middle. Put hatch marks in this area to represent the rabbet.



A

Laying out the top

The top of the bookcase is wider than the side pieces, and it overhangs all around—1¼" on the sides and front and ¾" at the back. The side pieces slip into stopped dadoes in the top so that the groove won't show at the front of the case. The back edge of the top is also rabbeted to accept the MDF back, but unlike the sides, it has a stopped rabbet. A rabbet that went the full length of the back would mar the bookcase's appearance from the side.

1 Use a sliding square to set out the stopped dadoes according to the measurements in the illustration on p. 139. Draw hatch marks in what will be the dado.

2 Draw the stopped rabbet along the back edge, with hatch marks to show the material that will be removed.

Rout the Rabbets

Now that you know exactly where the rabbet is cut, you can use your router and rabbeting bit to remove some wood.

Cutting rabbets for the sides

Set up your router as described in "Skill Builder: Router 101—Rabbeting" on p. 144, and cut ⅜"-wide x ⅜"-deep rabbets in the back edges of the side pieces.

Cutting rabbets for the top

The stopped rabbet in the top is ¾" wide x ⅜" deep—wider than the rabbets in the sides. This is to allow for the fact that the top overhangs in the back. You'll need two setups to cut it.

1 Clamp the top to the workbench with the hatch marks up. The edge to be rabbeted should overhang the bench. Make sure the clamps are out of the router's way.

2 Don't try to start the rabbet perfectly at the left corner of the stopped dado on the left side of the top. Simply start the rabbet within the hatch marks of the stopped dado—the left edge will be cut cleanly in the course of a later step when you route the stopped dado. Continue routing until you reach the other stopped dado. Stop when the rabbeting cutter is within the hatched area that will be removed when routing the other stopped dado.

3 Widen the rabbet to ¾" by making a second cut with a ¾"-long template routing bit according to the method described in "Skill Builder: Template Routing with a Straightedge" on p. 148, as shown in photo B. Set the depth to ⅜". Once more, the stopped dadoes will clean up the ends of the rabbet.


B

Rout the Dadoes

Dadoes are a great way to support bookshelves. They're good looking and strong, and when the fit is good, the square corners lock the shelves in place to prevent racking. There are many ways to cut dadoes, but using a router jig that takes Murphy's Law into account makes the operation safe and quick. Since the jig uses a template routing bit and has guides on both sides of the cut, the bit is under control at all times (see the sidebar on p. 150 for how to make this jig).

Cutting dadoes for the sides

1 Clamp the two side pieces together with the penciled dadoes aligned and the rabbets in the middle. Clamp them to the bench with the penciled dado about 8" from the end and one of the rabbets slightly overhanging the front edge.

WORK SMART

Both ends of these rabbets will be hidden from view, so don't worry if they aren't perfect.

WORK SAFE

Keep the router base on the workpiece until the bit stops turning.

SKILL BUILDER Router 101—Rabbeting

What You'll Need

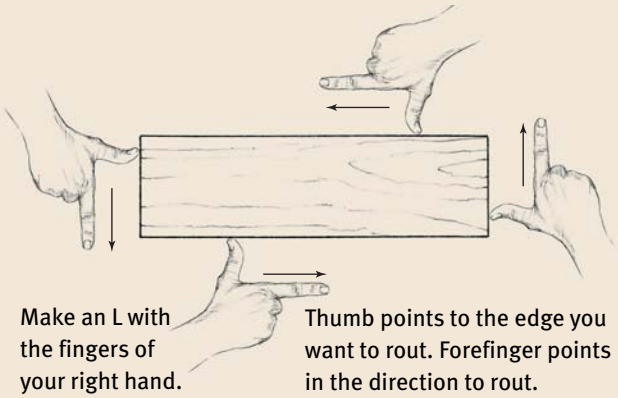
- Router
- Rabbeting bit, ⅜" rabbet depth and a ½" cutting length
- Scrap wood for practice, 1" x 5" x 3'
- Two clamps
- Combination square or router-bit depth gauge
- Dust mask
- Hearing protection
- Safety glasses

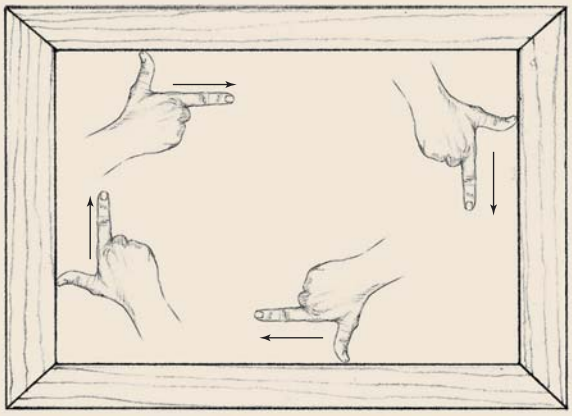
Rabbeting is a great application to start learning to use the router because it's a simple cut that's easy to set up and guide. With the bearing on the tip of the rabbeting bit, the router is docile and easy to control as long as you remember the rule: Rout against the turning of the bit. The easiest way to figure out just which way to rout is by making an L with your right thumb and forefinger. Point to the surface you want to rout with your thumb. Your right forefinger points in the direction the machine should travel.

If you rout in the other direction (called climb cutting), the router tends to pull itself along buy the turning of the bit, making it difficult to control. Climb cutting is used in some circumstances, but most of your routing should be done using the above rule.


A

Routing Rule of Thumb and Forefinger





The key to router success is keeping the base flat on the surface. If the router tips just a little off vertical, it can rout a perfectly molded divot in the edge before you know what has happened. Concentrate on keeping the router flat on the work, with the bearing pressed against its guiding surface. Keep your work area clean, your clamps out of the way, and make sure the router cord runs free before you start. That moment of inattention when you look down to step over an obstruction could be enough to mess up a perfect edge. Whenever you run a router, you should wear hearing protection, eye protection, and a dust mask.


B

Setting Up the Router

Before working with the collet or bit, be certain the router is unplugged.

1 Move the base plate away from the body of the router to give you room to work. Loosen the collet lock nut by holding the shaft steady with one of the two wrenches that came with your router, as shown in photo B, or by using the shaft-lock button if your router has one.

2 Insert the shank into the collet as far as it can go, then back it out about 1/16" and hand-tighten the collet.

3 Using the wrench or wrenches, crank the lock nut as tightly as you can.

4 Put the router upside down on the bench. Hold the 3/8" step on a router-bit depth gauge over the side of the bit and raise or lower the cutter until the end of the cutter just touches the gauge, as shown in photo C. You can also use a sliding square. Set the blade at 3/8" and put the end of the blade on the router base, with the base of the square as a height gauge for the bit. Make sure the end of the blade is within the square's base so that it can rest flat on the router base plate so the base of the square is perpendicular.


C

5 Check that your workspace is clear, make sure the on/off switch is set to off, and plug in the router.

continued on next page

SKILL BUILDER Router 101—Rabbeting — *continued*

Routing the Rabbet

1 Clamp the workpiece with the edge to be rabbeted overhanging the edge of the bench (this prevents the bearing from scoring your benchtop). Position the clamps so the router base won't run into them when making the rabbet.

2 Start your first test cut anywhere in the middle of the piece. Put the router base on the workpiece, but make sure the bit is about 1" away from the edge. The seemingly great distance from the work is because many routers give a little twitch when switched on, and you don't want the bit to accidentally touch the wood before you're ready to cut.

3 When you're routing, you need to be in a strong and stable position that lets you see what's going on at the bit. Stand well back from the work, and bend at the knees to see the cutter, as shown in photo D.

4 Once the router comes up to speed, push it directly inward. It'll make a lot of noise and dust at first, but as soon as the bearing touches the edge, it'll quiet down. Push the router from left to right, at the same time exerting a steady inward pressure to keep the bearing against the edge. Don't push too hard, or the bearing will dent the wood.

D

5 Make a cut several inches long, move the bit about 1" away from the edge (as in your starting position), and turn off the router. When the bit has stopped spinning, remove the router and check the depth of cut with a sliding square. Adjust by trial and error until the depth is correct.

Rabbeting the Ends

It takes some practice to get the rabbet perfect at the ends of the board. The most common mistake is taking a little chunk out of the end by running around the corner. This happens when you are trying too hard to keep the bearing in contact with the edge of the workpiece. With a little practice, you can get perfect corners. The secret is an inch of climb cutting at each end.

1 Clamp a board as described above, and start the router about 2" to the right of the left end of the edge to be rabbeted.

2 Turn on the router, push it against the edge, and slowly bring it to your left. You're making a climb cut in the opposite direction of the rule of thumb and forefinger. You'll find the router doesn't want to stay against the edge as it does when you rout in the other direction. Be prepared for the router to pull toward you a little, but don't worry if it does. Go slowly and you'll be in control. Watch the bit, and you'll see that before the bearing reaches the left end of the board, the wider diameter cuts a rabbet right to the end.

3 When you reach this point, stop your motion to the left, and push the router inward so the bearing contacts the edge. Then you can start cutting from left to right in the normal fashion.

4 When you get to the far end, slow down and watch what's happening. In a similar fashion, you'll stop when the cut goes to the end, but before the bearing runs off the edge. The biggest mistake people make when routing is to assume they have to rush just because the router is so fast and noisy.

2 Place the jig on the workpiece so the left edge of the slot aligns with the left side of the dado. The hatch marks should be visible in the slot. The right side of the slot should be parallel to the right side of the penciled dado but slightly wider. If the slot isn't parallel, either the jig's vertical fence isn't square to the slot or the dado was drawn wrong. Figure out which is the case and fix it.

3 Make sure the vertical fence is snug against the edge of the workpiece by using long clamps tightened across the two pieces, parallel to the slot, as shown in photo C. Clamp the tee at the top end of the jig down to the bench.

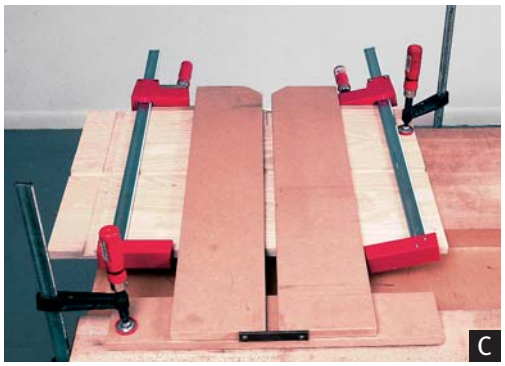
4 Set the depth of cut to about 3/16", guide the router into the slot, and rout across both side pieces, running the bearing against the left side of the slot. Once you've routed both pieces and the bit has traveled beyond the far edge of the workpiece, slide the router to the other side of the slot so the bearing runs on the right side of the slot and pull it toward you.

5 Stop the router, set the depth of the final cut to 3/8", and make another run around the slot.

6 Repeat this procedure on the other dadoes.

Cutting dadoes for the top

Dadoes don't have to go the full width of the piece. You can use this jig to stop the dado at any point by slipping a 3/4" x 3/4" x 18" piece of scrap into the slot. Here's how it works: As you're routing along the left edge of the slot, the bearing encounters the stop and prevents any further forward motion.


C

D

Slide the bearing against the right side of the slot and bring the router home. This leaves a stopped dado with rounded corners. Later you'll chisel them square.

Rather than measuring to find the proper length for the slot, follow this procedure.

1 Clamp the jig in place square against the edge of the workpiece and over the penciled dado. Because the jig is near the edge of the workpiece, you can't get clamps on both sides of the jig, so clamp across only one side and clamp the end to the bench, as shown in photo D.

WORK SMART

Run a test to make sure your dado jig cuts a slot that accommodates the thickness of the wood you're using for the shelves and sides.

WORK SMART

Since this bookcase is going to be painted, you could forego the clamping and simply screw the jig to the workpiece. The screw holes won't show once they're filled with putty and sanded smooth. Be sure to use flat-head screws and get the heads below flush so they won't trip up the router.

SKILL BUILDER Template Routing with a Straightedge

What You'll Need

- Router
- Template router bit with a ¼" shank, a ½" diameter and a ¾" cutting length
- Plywood or MDF fence, ¾" (or ½") x about 6" wide x 50" long
- ¾ x ¾ x 18" molding stock for stop
- Sliding square
- Four clamps
- Safety gear

Straight-sided router bits with a bearing mounted on the shank are called template bits. They're most often used with a template (straight or curved) clamped atop the workpiece. The bearing runs against the template, and the bit cuts the material below it exactly flush with the template. As always when using a router, be sure to wear a dust mask, hearing protectors, and safety glasses.

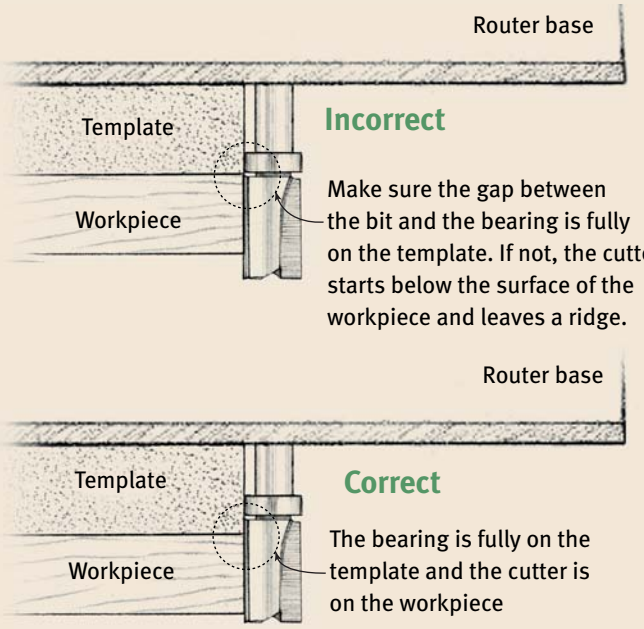
Setting Up

Use a piece of plywood or MDF with a perfectly straight and smooth edge that's a little wider than your router's base and at least a couple of inches longer than the edge to be routed. Make sure there are no dings or voids in the edge—the cut edge will exactly match the template's edge, including flaws.

1 Clamp the workpiece to the bench and use a sliding square to mark ¼" in from the edge on both ends of the workpiece.

2 Clamp your straightedge along this line, with the clamps well back from the edge so the router won't interfere with them.

Setting Template Router Bit Depth



3 With the bit secured in the collet, place the router on the left end of the fence where it overhangs the workpiece, and raise or lower the bit until the bearing and the space between it and the workpiece are wholly on the fence, as shown in the illustration above, or it leaves a ridge.

The lower end of the bit should extend below the workpiece—but it doesn't matter by how much.

Template Routing

1 Start the router well away from the edge, get your stance, and push the bearing against the template. Rout from left to right, as shown in the photo at right.

2 Using a sliding square, make a vertical mark on the inside of the slot and a horizontal one on the face of the jig at the end of the dado, as shown in photo E.

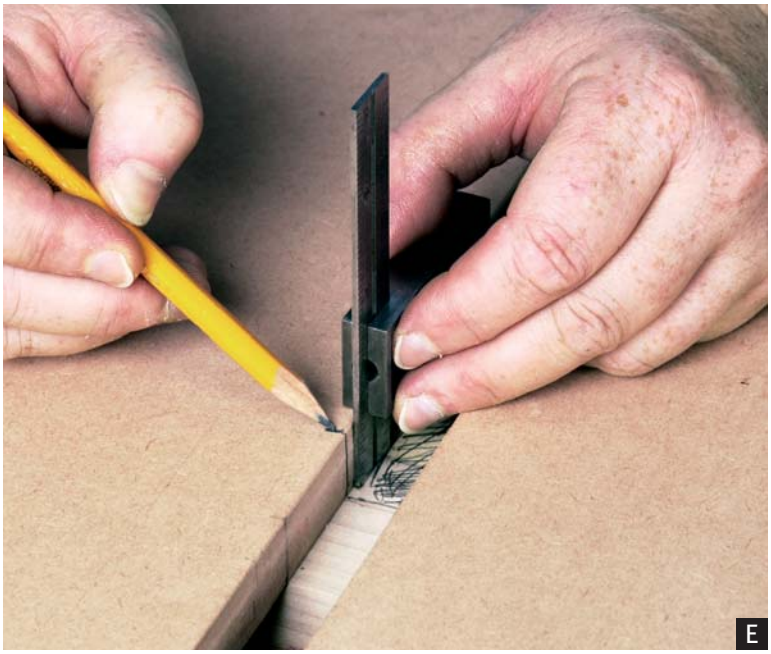
3 Put a piece of ¾" x ¾" molding stock that's clearly too long into the slot, and push it up against the top end (it'll be a little loose in the slot but that's okay). Draw a line on the molding that aligns with the mark you made in step 2.

2 Listen to the router to judge the feed rate; it will tell you what to do. If you're going too fast, you'll hear the motor slow down a little. If you feed too slowly, the surface of the wood will burn.

3 If your router seems to complain too loudly, don't try to cut the full depth in one pass. Slide the router back an inch or two so it's not cutting, and turn it off. Raise the bit a little and make a cut the full length of the workpiece. Then lower the bit to the final depth and make another full-length pass. Make sure that after you raise the bit, the bearing still rides on the fence.

Crosscut the molding to length, and check that its end aligns with the mark on the jig.

4 Cut the stopped dado in two passes, just as you did the dadoes in the side pieces. Start the router as you did for the sides, and run the bearing down the left edge of the slot. When it reaches the molding stop, push into the stop and over to the right side of the slot. Then pull the router toward you, keeping the bearing against the right side of the slot.


E

Rout the Edge Treatment on the Top

To give the top edge of the bookcase more visual interest, rout a profile in the front and sides using an edge-trimming bit with a tip-mounting bearing. The process is the same as that used to make the rabbets, including starting and stopping without turning the corners.

1 Set the depth of cut by testing it on offcuts that are the same thickness as the top of the bookcase. Clamp the offcut to the bench, and put a classical pattern bit into the router. Flip the router over, and set the depth by eye so the corner of the bit is about 1/16" above the base, as shown in photo F.

SKILL BUILDER Making a Dado Cutting Jig

What You'll Need

- ¾" MDF or plywood 4" to 26" wide (two pieces 30" long, two pieces 20" long)
- Plywood or MDF, ¾" x 1" x 4" (scrap okay, size is approximate)
- Stop, ¾" x ¾" molding stock , about 18" long
- Two bar clamps
- Two panel clamps (must open at least 30")
- Pocket-hole jig
- 1¼" pocket-hole screws
- 1¼" flat-head screws
- Combination square
- Sticky notes
- Block plane and/or hand-sanding block
- Two offcuts from shelf material, each about 6" long
- Backsaw

There are several ways to cut dadoes, but the safest, easiest, and most precise way is to use a jig like this. Clamp the jig down tightly with the fence against the edge of the board, and it makes identical dadoes that are always square to the edge and exactly the right width. You'll make two passes with the router to make each dado—the first with the bit set to cut into the wood to a depth of about 3/16", the second to cut to the full ⅜".

It's critical that the fence on this jig be square to the slot. The sequence of assembly is important to achieving this result.

1 Draw a line perpendicular to the edge of one of the 30" pieces. Using a 12" combination square with the base against a long edge, make the line about 2½" back from one end.

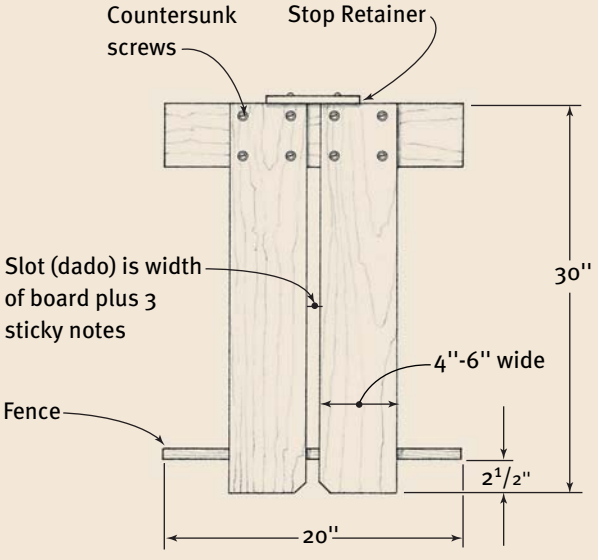
2 One of the 20" pieces is the fence that fastens on its edge with pocket-hole screws along the line you just drew. Using the pocket-hole jig, drill pocket holes in the piece as shown in the illustration at right. Place the fence on the line and drive a pocket-hole screw at just one end. Make sure the other end is also on the line, perfectly square to the edge. Fasten the other end in place. Double-check using your sliding square to make sure the fence is perpendicular to the slot, and drive the remaining pocket-hole screws.

3 Fasten the base (the other 20" piece) face down to a line squared across the other end about 4" back from the edge.

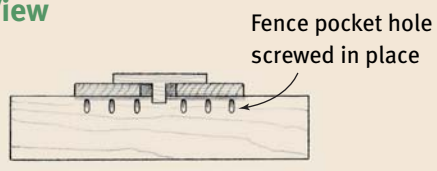
4 Flip the piece over, with the fence against the edge of the bench. Peel two sets of two sticky notes from a pad and stick one set to each end of each shelf offcut. The sticky notes act as shims to make the slot a little wider than the shelf. Position the shelf offcuts along the inside long edge of the 30" piece, with one offcut at each end.

5 Place the other 30" piece along side the offcuts. Align the ends with the other 30" piece, and clamp the two long pieces together near both ends, as shown in the photo at right. This puts the second long piece perfectly parallel to the first, separated

Murphy's Law Dado Jig



End View



by the shelf offcuts. Fasten the fence and the base to the second long piece with the appropriate screws. Don't use glue because you might want to make an adjustment later. Remove the clamps and the offcuts.

6 The jig needs a retainer across the slot at the top end so you can slip a stop in place to limit the length of the dado (see "Cutting Dadoes for the Top" on p. 147 for details on fitting and using the stop). Use a small piece of scrap (a piece of leftover hardboard is perfect), and fasten it with a couple of pocket-hole screws. Their washer heads are perfect for this, since you won't have to countersink them into the thin hardboard.

7 Using a backsaw, cut away the inside corners of the long pieces, widening the mouth of the slot, which makes a good place to start the router.

8 Break all of the edges using a block plane or hand-sanding block so the jig is easy on the hands and has a neater, more finished appearance.

F

2 Run this bit set-up on the test piece for a few inches to see if you like the way the profile looks. Experiment with raising and lowering the bit slightly for different effects.

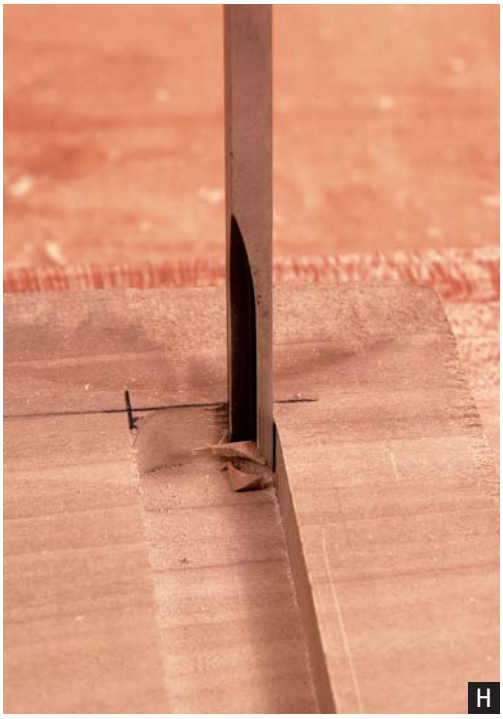
3 When you like the depth setting, clamp the top to the bench (dadoes down and rabbet toward the back of the bench) with the left end overhanging about 18". Start routing at what will be the left back corner of the top. Rout down the left end, around the corner (go slowly and keep the bearing in contact), and down the front until you get close to the bench, as shown in photo G on p. 152.

4 Reposition and reclamp the top (twice if necessary) to rout all the way around it—right up to the back right corner. When resuming your routing after repositioning, back up a few inches and start the router away from the edge. Push inward, and make the bearing contact the edge at a place you've already cut. Move the router to the

WORK SMART

Position a clamp so the router base bumps into it before the bearing plows a groove in the side of your bench.


G


H

WORK SMART

Practice with the corner chisel before working on your bookcase.

WORK SMART

If the fit of the dado is tight, it's easier to alter the board that fits into the dado rather than the dado.

right and continue cutting the profile. You'll never see where you started and stopped.

Square the Stopped Dadoes

The rabbet has a rounded front edge, but your side pieces have square corners. Make the stopped dado fit the sides by squaring its ends using a chisel. You can make a square corner with a bench chisel, but it's far easier with a proper corner chisel.

1 Put the arms of the chisel against the end of the dado made by the router, with the corner against your penciled layout marks.

2 Hold the chisel perfectly vertical, as shown in photo H, and whack it with a mallet. Clean out the excess down to the bottom of the dado, using a bench chisel if necessary, as shown in photo I.

3 Check the fit of the side pieces in the dadoes. If the fit is tight, it's probably because there's some cup in your side pieces. First try planing a chamfer around the upper end of the side piece. If that doesn't work, use a block plane to take a few strokes off one or both faces of the upper end where they slip into the dado.


I

Fasten cleats to the sides

1 Now work on the lower ends of the sides. Use a sliding square to make a mark ¾" from the front edge of the bookcase and another mark ¾" in from the rabbet on the back edge. Measure the distance between these lines.

2 Crosscut two pieces about 10"-long from the ¾" x 2½" poplar, and clamp or


J


K

WORK SMART

You can use your countersink drill bit for drilling pilot holes without having to remove the countersink head. The tip of the drill will be through the wood well before the countersink starts cutting.

tape together and cut two identical pieces to fit between the marks. These are the cleats.

3 Clamp a cleat to one side piece so its top edge is flush with the bottom of the dado, as shown in photo J.

4 Turn the piece over and drive three screws to hold the cleat in place. Drill pilot holes from the inside out. Don't countersink too deeply. The heads need to be only about ⅛" below the surface.

5 Remove the screws and clamps, apply glue to both surfaces, reclamp, and fasten in place. Wipe up any glue drips with a wet paper towel.

Drill Pilot Holes All Around

To increase the strength and stiffness of the bookcase, the dadoes are reinforced with long screws into the end grain. Rather than guessing where the screws go or measuring to find their location, just drill the pilot holes before assembly—from the outside in.

1 Drill three fairly evenly placed pilot holes in the dadoes in the sides and top as shown in photo K.

2 Flip the pieces and countersink a 2" screw in each pilot hole from the outside.

Cut the Aprons

The aprons fit between the the side pieces at the bottom. Their length is exactly the same as the distance between the inside edges of the stopped dadoes in the top.

1 Rather than using your tape measure that will require reading and remembering fractions, take a direct measurement using the apron itself. Start by slipping a piece of ¾" scrap into one of the stopped dadoes.

2 Use the scrap as a stop: Place the squared end of a length of ¾" x 2½"

apron stock against the stop, and let it extend across the top and over the other stopped dado. Mark the location of the inside edge of the other dado on the wood, being sure to put an X on the waste side. Clamp or tape it to a companion piece for the other apron, and cut both pieces to length.

3 Double-check that the length is correct by laying the aprons between the stopped dadoes on the top.

4 Put two pocket holes in each end of both aprons.

Assemble the Case

As always, put the case together with clamps to check both your clamping strategies and to make sure the pieces are correctly made before gluing.

Dryfitting

1 Screw the aprons to the front and back of one of the side pieces, as shown in photo L. Use your thumb to keep the top edge of the aprons flush with the bottom edge of the dadoes.

2 Lay the assembly on its back edge and fasten the front apron to the other side piece. Use a piece of ¾" scrap in the dado for alignment, as shown in photo M.

3 Gently flip the assembly to rest on the front edges, and fasten the back apron in place.

4 Place the top on the bench with the dadoes up, and insert the assembly into the stopped dadoes. Use long panel clamps and clamp from the top to the bottom of the side pieces if necessary to hold them in place.

5 Check that the case is square. Use your largest square to make sure the inside angle between the top and the side is 90 degrees. Also make sure the rabbets are flush at the upper back corners. If they're not, make sure the side pieces are all the way into the stopped dadoes.


L


M

6 Stand back and take a look at the bookcase from a distance. Look for racking and out of squareness. When

everything checks out, remove the clamps and aprons, and sand all the pieces to 220 grit using a random-orbit sander.

Gluing up

1 Apply glue to the ends of the aprons, the end grain of the cleats, the tops of the side pieces, and in the stopped dadoes, as shown in photo N. Replace the clamps.

2 Put the case face down on the bench and measure the diagonals to check squareness before driving the screws.

3 Hook the tape measure over an upper corner of the case and measure the diagonal to the lower corner, as shown in photo O. Exactly where you hook it isn't as important as being able to hook it in the same relative location when you measure the other diagonal.

4 Measure the other diagonal and compare. If the sides are all the way in the dadoes and the aprons are the correct length, the diagonals will not be very different. If they are, try shoving the bookcase into square and see if that works. If not, loosen the clamps and make larger adjustments.

5 When the diagonals match (or are within about 1/16"), drive 2" screws into the pilot holes in the top, as shown in photo P.


N


O


P

WORK SMART

Before using a template-routing bit, check that the tiny screw locking the shank-mounted bearing in place is tight. If the screw loosens, the bearing can slide above the level of the fence. With no guide in place, the router will plow through the fence and into the workpiece.

Install the Shelves

Position the bookcase on the bench with the rabbet side up and the top overhanging the edge so the front is flat on the bench.

Cutting to length

Since the rabbets are the same depth as the dadoes, you can get the length of the shelves by measuring the distance between the rabbets on the back.

Q

1 Push the hook of your tape measure against the rabbet at the upper dado, and open the tape until its case is against the rabbet on the other side, as shown in photo Q. Lock the tape open.

2 Move to the other rabbet and check that the distance is the same. Keep the tape measure locked.

3 Next, transfer the measurement to the workpiece. Hook the tape measure on the squared end of a ¾" x 9¼" shelf piece and put a mark on one edge at the far end of the tape case. Put an X on the waste side.

4 Clamp the two shelf pieces together or use double-sided tape, then crosscut to length.

Checking the fit

The shelves should slide easily into the dadoes. If they don't, deal with them in the same way you dealt with the sides—by chamfering the ends or by planing the faces. Once they're in place, you'll note that even with their fronts resting on the bench, the back edges stick up above the rabbet, making it impossible to fit the back. The shelves must be made narrower by an amount equal to the depth of the rabbet. You could remove this material with a circular saw and guide, but the point of this project is learning to use the router. So, you'll remove the excess using a router and a template-cutting bit.

1 Make a pencil mark at the bottom of the rabbet on both ends of each shelf, as shown in photo R. Remove the shelves from the case.

2 Clamp a shelf to the bench, then clamp a straightedge to the shelves. Align each end of the straightedge with


R

your marks and rout away the excess with the template bit against the straightedge.

Testing your clamping strategy

Gluing the shelves in place requires long panel clamps on each shelf front and back.

1 Keeping the case on the bench with the front side down, insert the bottom shelf and put a clamp across the back. Place the bar right down on the edge, as shown in photo S. Repeat with the other shelf.

2 Set the case upright, then apply two more clamps across the front, as shown in photo T.

3 Stand back and take a look to see that the sides fit properly. If the sides bow outward at a shelf, it's too long. If they bow inward, the shelf is too short. Adjust as necessary.

4 When the shelves fit, sand both sides smooth using a random orbit sander and 220-grit disks. Break the edges using sandpaper and a hand-sanding block.


S


T

Gluing and screwing the shelves in place

1 Apply glue to the dadoes and to the ends of the shelves and clamp as before.

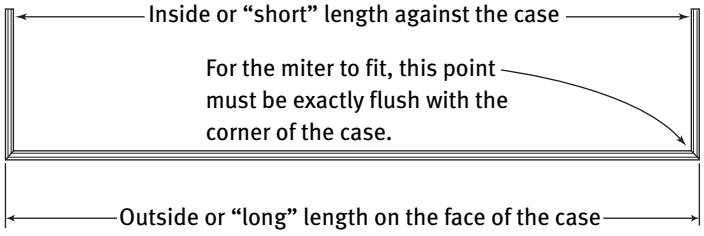
2 Drive 2" screws through the pilot holes, and let the glue dry.

Install the Base Molding

Decorative moldings meet at the corner in nonstructural miter joints, as shown in the illustration below. Measuring and cutting perfect miters around all four sides can be tricky—it requires perfect measuring, perfect cutting, and perfectly adjusted tools. In this project, you'll ace all that by simply applying molding to only three sides. That way, you can concentrate on getting the front corners right.

Before installing any molding, make sure the aprons are flush with the front and back edges of the side pieces. If they stand proud, plane them flush. If they're a little below flush, just leave them alone.

The Elements of a Mitered Corner



Fitting the molding

1 Cut the longest piece first so if you make a mistake, you can use it to make shorter pieces.

2 Cut the miter in one end. Set your miter box or chopsaw to cut a 45-degree angle, and clamp the molding in place with the decorative edge up and the longer end on the face of the molding.

3 Clamp the molding to the front apron at each end. Keep it flush to the bottom of the apron—it looks fine if the shelf is a little higher than the molding. Make sure the inside of the miter (on the back side of the molding) is right at the corner of the case.

4 Draw a line on the back side of the molding along the outside edge of the case. Remove the molding and square the line around both edges.

5 Once more, set up the molding in the miter saw to cut right the other miter on the line, with the long side of the molding facing outward, away from the fence.

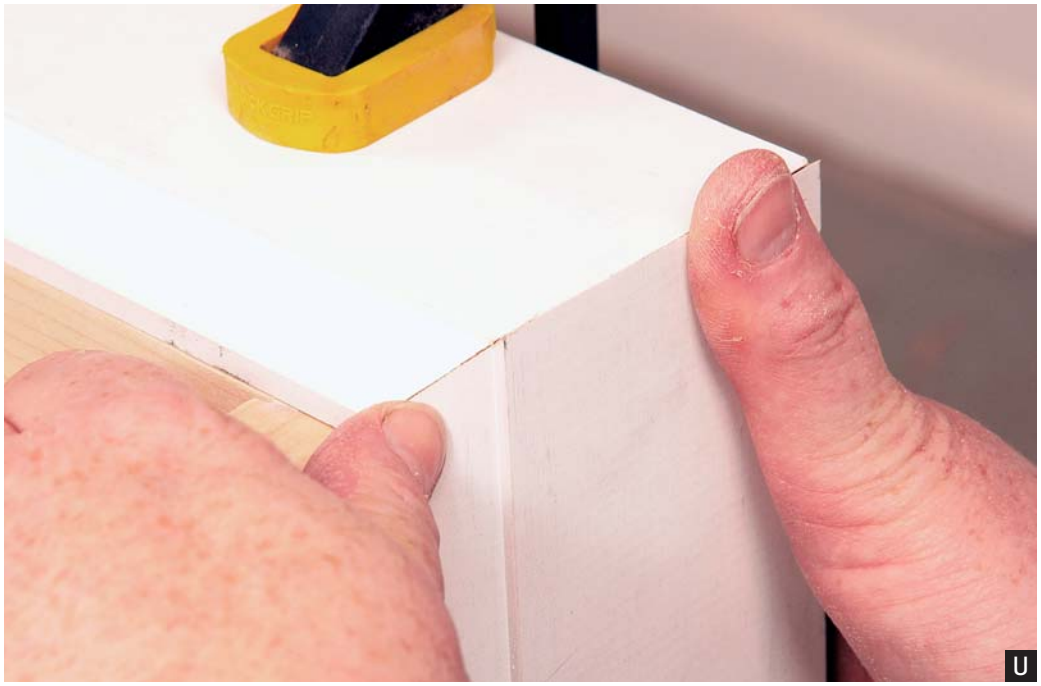
6 Clamp the molding in place again, and check the fit. Leave the clamps in place.

7 Rough-cut a piece of molding about 12" long, and miter one end with the long side on the face.

8 Hold this piece of molding against the front molding piece that's clamped in place, pushing firmly to get a tight fit at the miters, as shown in photo U. Clamp it in place.

9 Using your square, mark on the molding where to cut it flush with the back edge of the case, as shown in photo V. Set the saw to 90 degrees and make the cut.

10 Repeat with the other corner.


U

WORK SMART

If the joint at the miter doesn't fit, check that the apron is flush or perhaps you can angle the molding slightly to improve the fit. It could also be that the miter is rough or not sawn properly, or the front molding piece shifted.


V

Gluing and nailing the molding

Traditionally, furniture makers fasten molding and trim with tiny brads, although very small finishing nails will also work. The small heads of brads don't make much more than a dimple in the wood, even when they're countersunk with a nail set. For painted work such as this, you can also use small-headed trim screws and fill the holes with putty.

1 Using 1" brads and a Warrington hammer, start the brad with the straight end of the hammer so you don't mash your fingers (see photo W on p. 160).

2 When the brad is set in the wood and no longer needs to be held, switch to the face of the hammer. Stop driving just before the head is flush so you don't dent the surface of the bookcase.

3 Set the brad head below the surface with a nail set by putting the tip of the nail set into the dimple on the brad


W


X

and driving it slightly below the surface, as shown in photo X. Drive a brad every 6" or so.

Leveling the bottom

When the molding is fastened, flip the case upside down (protect the top from scratches by using a piece of clean plywood, cardboard, or carpet), and plane the bottoms of the side pieces, cleats, and moldings flat so the case will sit level, as shown in photo Y.


Y

Install the Back

If your case is square, cutting the back to fit is a simple job. If something went wrong and the case isn't square, you'll have to cut the back to match.

Cutting the back to fit

1 Once more, set your tape measure for the inside distance between the rabbets at the top of the case. Transfer the measurement to the beadboard by hooking the end of the tape over one

edge (perpendicular to the beads) and mark at the back side of the tape case. Repeat for the bottom of the case, resetting the length of the tape if required.

2 Using a circular saw and a 50"-long guide, cut the piece to width with the guide on your marks.

3 Measure the distance from the rabbet on the top of the case to the bottom edge of the apron and transfer this measurement to the edge of the beadboard, going parallel to the beads. Repeat on the other side of the case and transfer this measurement to the other edge of the beadboard. Cut with your circular saw and guide.

4 Slip the back into place to check the fit. If the fit is very tight, you may have to flex the back a little to get it in. If the back is still too big, use your block plane to shave down one edge. If the back is a little small and some gaps show on the sides, don't worry because you'll have a chance to fill them before painting.

5 Once the back fits, use a straightedge to draw light lines on the back to show you where the shelves lie underneath the beadboard. That way you'll know where to put the nails.

Fastening the back

To fasten the back to the narrow rabbet, use 1" brads or finishing nails rather than screws. Screws are relatively large and would make a mess if you ran through the edge of a shelf. The hole made by a misplaced brad is a much smaller problem, easily filled with a little putty and sanded smooth.

Finishing

Eighty percent of getting a great paint job is preparation. When you start with a flat, smooth, clean surface, it's hard to get bad results. But prep work requires a lot of patience. You just have to be disciplined, and settle down to doing your best on each rather dull step, even though what you really want is to get the paint on so you can see your finished project.

Filling and sanding

1 Fill all the countersinks, any small gaps in the dadoes that show in the front of the bookcase, knots, dings, and other imperfections with a readily sandable filler. Apply it with a putty knife or a plastic spreader. Push down hard to get the filler to go into the hole, then scrape off the excess, as shown in photo Z.

2 For any gaps in the back or in the mitered corners of the molding, use some soft, paintable caulk that comes


Z

WORK SMART

Check that the front of your shirt and your cuffs are dust-free. It's not much good vacuuming everything else if your every movement sends out a cloud of sanding dust.

WORK SMART

Follow the paint maker's directions on solvents, prep, and cleanup. Modern paint chemistry is complex; you can't always mix and match brands or types. Sometimes a paint's chemistry is very specific, and you'll get the best results by using compatible products.

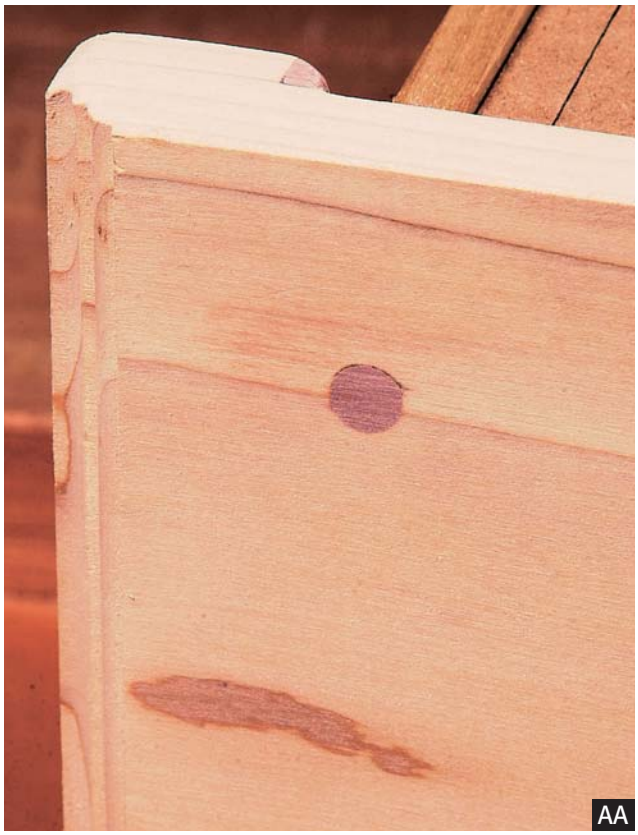
in a tube. It's much easier than standard fillers to mold it into a nice radius with your finger. That way you'll get a smooth surface that won't require sanding.

3 Once the filler is dry, hand-sand using a block and 150-grit paper. When you start, the area around the hole is smeared with a thin layer of filler. Sand the surface until the smear is gone from around the filled hole and the edges of the fill appear crisp, as shown in photo AA.

4 As you're sanding, look for holes you missed or areas that need a little more filler. Apply another round of filler, and sand it again.

5 Switch to 220-grit paper and sand a slightly wider area around the filler.

6 Since the rest of the piece was sanded before assembly, simply check it over for smoothness and break all the edges.



AA

Cleaning

Cleaning is the most overlooked step in getting a fine finish. If you neglect it, the painted surface will end up as rough as sandpaper, no matter how much you time you spend sanding.

1 Vacuum or brush the bookshelf inside and out. Clean up the surrounding area as well.

2 Wipe the surface with a paper towel wet with denatured alcohol to remove any hand oils or chemical contaminants. This step also picks up any remaining dust.

3 Wipe down the surface with a tack cloth to pick up any remaining dust. If you're using a water-based finish, make sure you have a compatible tack cloth.

Painting

You can use any type of paint you like for this project. Everything looks good on it, from faux-distressed milk paint to super-glossy enamel.

1 For the best finish, start with a primer coat. A primer paint is full bodied and designed to fill the grain, smooth the surface, and sand easily. Check with your paint dealer to find a product compatible with the paint you intend to use. Apply a thin coat or coats as specified by the manufacturer, as shown in photo BB.

2 Sand lightly with 220 grit using a random-orbit sander until smooth to the touch. Don't sand away the paint—remove as little as necessary to get a smooth surface. You won't be able to get right into the corners with the machine, so do that part by hand with the sandpaper on a hand-sanding block. Vacuum and wipe with a tack cloth.

WORK SMART

Most paint problems result from applying too much paint, often without allowing enough drying time between coats. Thin coats of paint self-level better, and they dry more quickly and completely.

3 Apply a thin coat of top-coat paint. When it's dry, sand lightly with 220-grit paper. You don't want to sand away all the paint, just smooth off the nibs. Vacuum up the dust.

4 To get the surface looking really good, apply at least two coats of paint. If you sand and clean carefully between each coat, the surface will be smooth and even.