



Built-In Basics

Level bases, modular construction,
and scribing to walls are keys to success

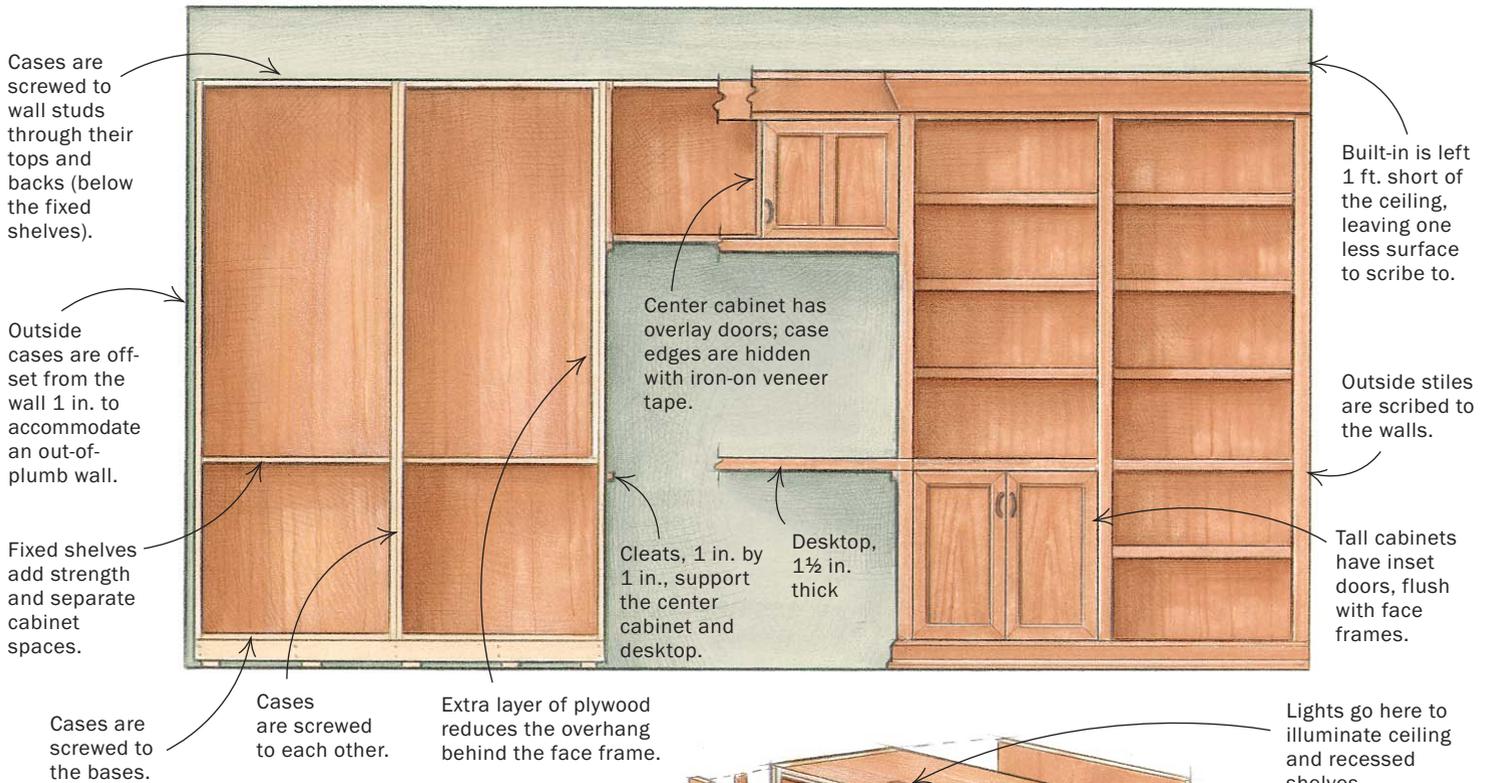
BY TONY O'MALLEY

When designing and building the more utilitarian pieces for your home—entertainment centers, bookcases, corner hutches—you'll inevitably consider the question: Should I make it freestanding or built-in? The answer involves both aesthetics (which will look better?) and economics (do you want to spend all of that time and effort on a project you'll have to leave behind if you move?). Sooner or later, you're likely to tackle a built-in.

Over the last few years I've earned an increasing portion of my income from wood-

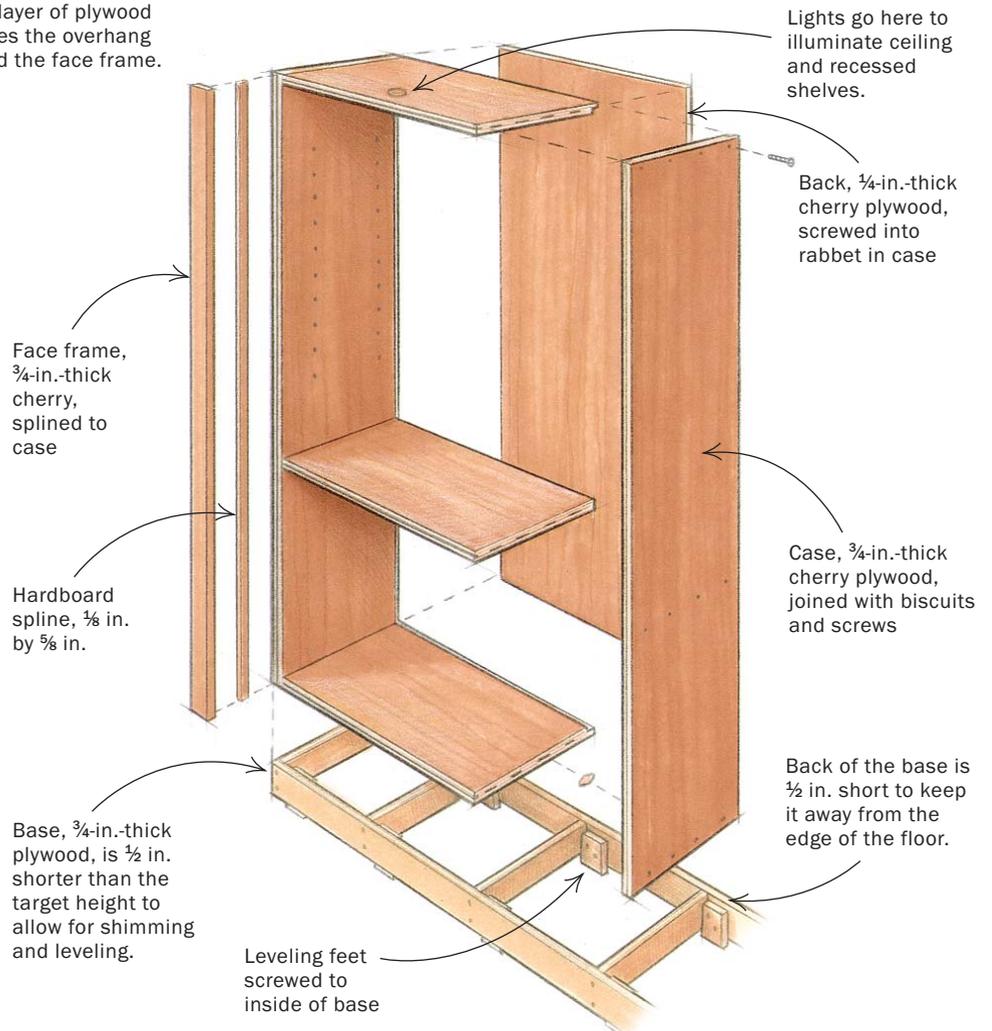
ANATOMY OF A TYPICAL BUILT-IN

For this home office, separate cabinets, made of hardwood plywood, were screwed together on a level base. Then solid face-frame pieces were nailed to the cases with the two outside stiles scribed to fit the walls. Crest and base moldings went on next. Shelves (on adjustable pins) and doors (on cup hinges) were installed, and last, the thick desktop slab was slid into place.



working, and the majority of it has been from built-in projects. Built-ins are popular with homeowners for two important reasons: First, they add value, becoming a permanent, hand-crafted part of a home. Second, you can buy a piece of furniture at a store, but you can't buy a built-in.

Built-ins are a unique form of woodworking, sharing elements of furniture, cabinetry, and finish carpentry. Because the built-in is permanently attached to one or more of the walls, the floor, or the ceiling of a room, the design goal must be to make the built-in appear as an integral part of the room. That means matching and integrating the room's features, especially moldings, into the design. But a built-in also can stand out as a bold counterpoint to the design features of a room. Either way, a successful built-in requires careful planning for its installation. Ideally, all of the finishing is done prior to installation. That, in turn, leads to a number of construction techniques specific to built-ins, including modular cases, scribed edges, and reveals or V-grooves to conceal seams and joints where the cases or face frames come together.



BASES AND CASES

START WITH LEVEL BASES



Shim one base level. Check it along its length and width. While leveling it, raise it to the target base height.



Use small squares of plywood as leveling feet. Screw these to the base, which will remain level even when shifted slightly during later stages.



Raise and level the second base. Use a level and a tight mason's cord to bring the second base up to the same level as the first one.

This article follows the making of a built-in wall unit for a home office and includes many of the typical challenges that built-ins present, especially those that involve bookcases and cabinets.

Start with the room

No two rooms are exactly alike, so no two built-ins are alike either. It's rare to find room surfaces that are dead straight, let alone level and plumb. Yet a built-in must stand level and plumb if it's to look right



1

Place two cases on each level base. These cases should be sanded and finished before installation.

and if the doors and drawers on the unit are to work properly.

Every built-in starts with a careful assessment of the room conditions, in addition to the obvious measuring of the space it will be built into. The key to success is to scribe parts accurately where they meet the walls, floor, or ceiling, which requires cutting those parts oversize.

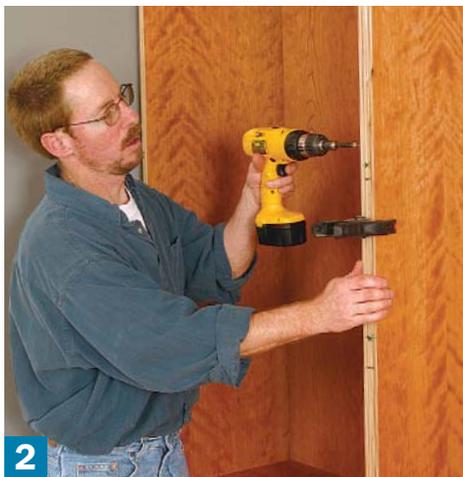
Then work out the design

Built-ins run the stylistic gamut from traditional to modern. A painted built-in generally is less expensive than a natural or stained-wood version. In my painted built-ins, I use birch plywood for most case construction and solid poplar for the trim.

Painted built-ins are more forgiving because the joints can be caulked and painted over.

The built-in here was planned for in the home's original design and construction. It fills the entire length of a 14-ft. wall but stops a foot short of the 8-ft. ceiling. It also calls for lights on top of the cabinets behind the crown molding and inside the top of each bookcase.

The design is contemporary and straightforward but with some subtle refinements worth mentioning. The wood is cherry, straight-grained in the face and door frames. For contrast, the door panels are plainsawn with custom walnut pulls. The four tall cabinets are in the same plane at 16 in. deep, with the upper shelves set back



2

Screw the cases together. Drive the screws just below where an adjustable shelf might go.



3

Screw the cases to the base. Make sure the cases are flush with the front and inside edges of the base so that the face frame and base molding go on straight. Note that the base ends up $\frac{1}{2}$ in. short of the wall, avoiding inconsistencies at the edge of the floor.

a few inches to allow the interior lighting to reach them. The open shelves are deep enough for oversize books and magazines, while the closed cabinets are deep enough for storage. The desktop extends to 25 in., and its flared shoulders lie neatly over the vertical face frame, visually connecting the desktop to the fixed shelves in the bookcases. The center cabinet above the desktop is recessed from the main cabinets, creating a visual counterpoint and making the crown molding more eye-catching.

Build the cases

The cases were built from $\frac{3}{4}$ -in.-thick cherry plywood, and the backs from $\frac{1}{4}$ -in.-thick cherry plywood. Hardwood plywood usu-



4

Connect the sides. Set the center cabinet on its cleats to set the distance between the tall cases. Clamp in the desktop slab to plumb the cabinets, and screw through the cabinet backs to attach them to the wall studs. Shim where there are gaps.



ally has an "A" side and a mediocre side, so orient it for best appearance.

I use biscuit joinery for almost all case construction (see my article in *FWW* #165, pp. 66-71) because it's versatile, simple, and reliable. On this project, most of the joints could have been screwed together as well because the rows of screws are concealed by moldings, the desktop, or adjacent case sides. Screwing together the cases strengthens the joinery and makes assembly easier because it eliminates clamping.

Before assembling the cases, I ran a $\frac{1}{8}$ -in.-wide groove in the front edge of all

the case parts. These grooves will receive splines to position the face-frame parts. I also cut rabbets into the case parts for the back panels.

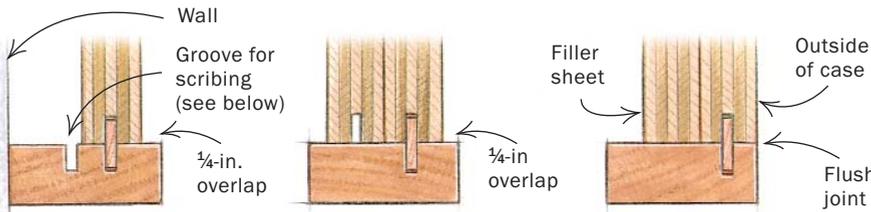
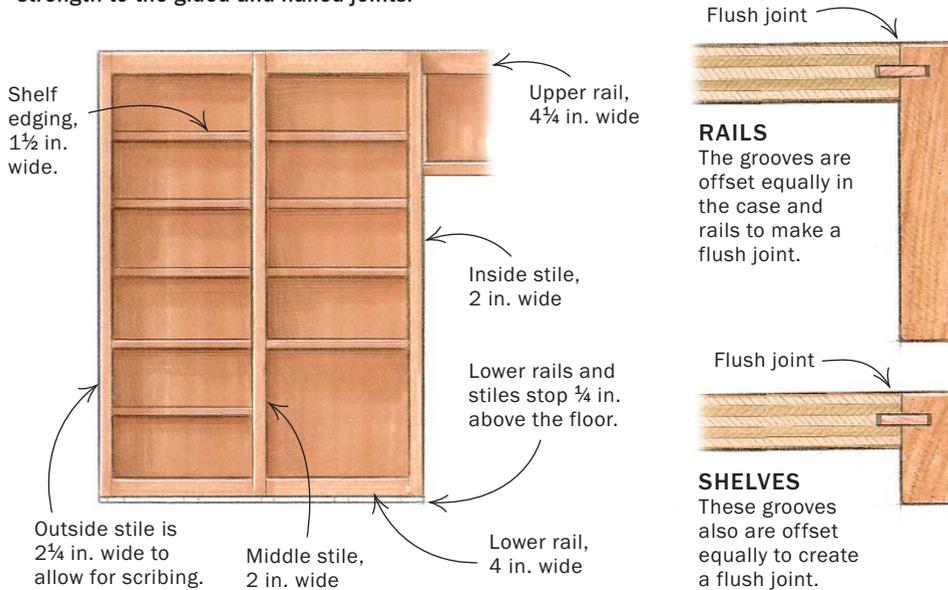
Before installation, I finished all of the parts with Waterlox, which is a tung-oil-based finish that can be wiped, brushed, or sprayed on, and builds like a varnish. I applied three coats, sanding in between with 320-grit paper.

Install level bases

The bases for built-ins always should be separate from the cases. That way, you can

SPLINES ADD STRENGTH AND EASE ASSEMBLY

All of the frame pieces receive $\frac{1}{8}$ -in. splines, which serve a number of functions: They locate the pieces precisely on the cases, hold them in place during dry-fitting, and add some strength to the glued-and-nailed joints.



OUTSIDE STILES

The groove in the stile is offset an extra $\frac{1}{4}$ in. to create a $\frac{1}{4}$ -in. overlap inside the case.

MIDDLE STILES

The groove in the stile is offset $\frac{1}{4}$ in. to create a $\frac{1}{4}$ -in. overlap in the case. Only one spline is necessary.

INSIDE STILES

The grooves are offset equally to make a flush joint outside the case. Plywood filler reduces the overhang inside the case.



After scribing the outside stile to the wall, put the remaining stiles in place. Their long splines should secure them during the dry-fit.

level the bases independently of the larger, more cumbersome cases. There are lots of simple ways to make structural bases for built-ins. Stud lumber can work in many situations; just mill it straight beforehand. But I generally screw together simple boxes from the scrap $\frac{3}{4}$ -in.-thick plywood that's left over from the cases.

Start with a target height—in this project it was the floor of the cases—and work from there. Whatever the target height, the rough base should be built $\frac{1}{2}$ in. shorter to allow for dips in the floor and for shimming up to the target height.

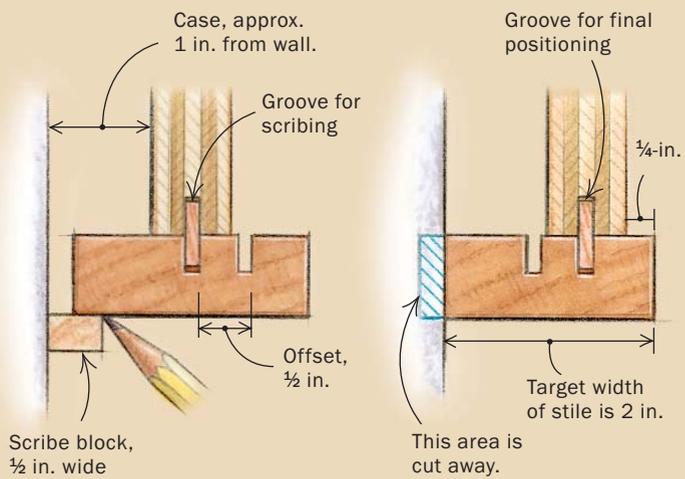
If the base molding is going to touch the floor, it should be milled $\frac{1}{2}$ in. wider than the finished dimension to scribe it to an uneven floor. In this project, I tacked a small shoe molding onto the base molding, which eliminated having to scribe the base molding to the floor.

For this unit, I started by shimming one of the two bases level (see the photos on p. 64). If possible, determine which side of the room is highest overall, and start on



A two-groove sequence makes scribing a cinch. First, make the outside stiles $\frac{1}{4}$ in. wider to accommodate walls that are slightly bowed. Cut the first groove for final positioning, and cut a second one for scribing.

Extra groove makes scribing easy



1. Position the stile on the scribing groove and use the scribe block to mark the area to be removed.
2. Cut to the scribe line with a jigsaw or bandsaw. Use the other groove to install the stile.



Fit the rails. Starting at the outside cabinets, mark and fit the upper and lower rails and the edging for the fixed shelf. Then move to the inside cabinets.

that side. To level the second base to the first, I stretched a length of mason's cord from the outside corner of the first base to the outside corner of the second (a laser level also will work), then raised the second one up to the stringline. Once leveled, a base can be screwed to the floor or the wall studs. But in this project, because the bases needed to be shifted slightly when the entire row of cabinets was brought together, I let them float. Once the bases are in place, it's a good time to locate and mark the wall studs.

Install the cases—Set the cases on their leveled bases, and screw them together. Attach the cleats that will support the center cabinet and the desktop. Position the center cabinet and clamp it to the side cabinets. Screw through the walls of the center cabinet to attach it to the side cabinets. Next, set the main desktop slab on its cleats and snug a clamp across the two cases to true up the entire assembly.

Now the entire unit can be attached to the wall. Because I had access to the top of the cabinets, I drilled through the tops at an angle into the studs. I also screwed through the case backs underneath the fixed shelves.

Install the lighting next—Before the face-frame parts, moldings, doors, and desktop are in the way, install any lighting or power strips that you desire.

For the set of cabinets in this project, I used small, surface-mounted halogen lights, which are shaped like hockey pucks and available in home centers. I mounted



Prepare the face-frame pieces for installation. Chamfered edges hide inconsistencies at the joints, allowing you to prefinish the parts in the shop and nail them on one at a time.

one underneath the top of each open case, hidden behind the top face-frame rail. These throw some light onto the recessed shelves below. I also mounted one atop each cabinet to throw soft light into the 1-ft. space above the cabinets. The lights are

hidden by the crown molding, as is the four-way outlet that was installed above the cabinets by an electrician.

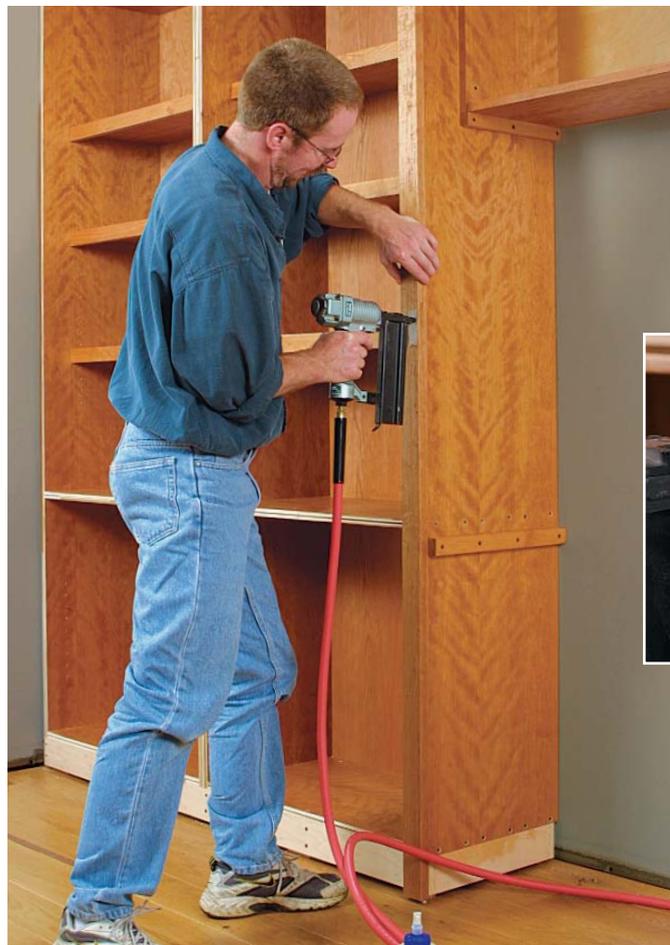
Mill and dry-fit the face-frame pieces

With the cabinets installed, I proceeded to dry-fit the face-frame pieces to the cases. Traditional kitchen-cabinet face frames are built as independent frames, held together either with mortise-and-tenon joints or pocket-hole screws, then applied to the cases. With some built-ins, this is a sensible approach. But building large face frames is awkward and unnecessary.

Instead of having flush, glued joints at the intersections of the face-frame panels, I chamfered the edges of all the parts and the ends of the horizontal pieces, leaving a small V-groove wherever parts come together, to hide any minor inconsistencies. As a result, I was able to cut and dry-fit all of the face-frame pieces to the installed cabinets but finish them in the shop on my bench.

With all of the face-frame pieces in place—dry-fitted at this point—you can

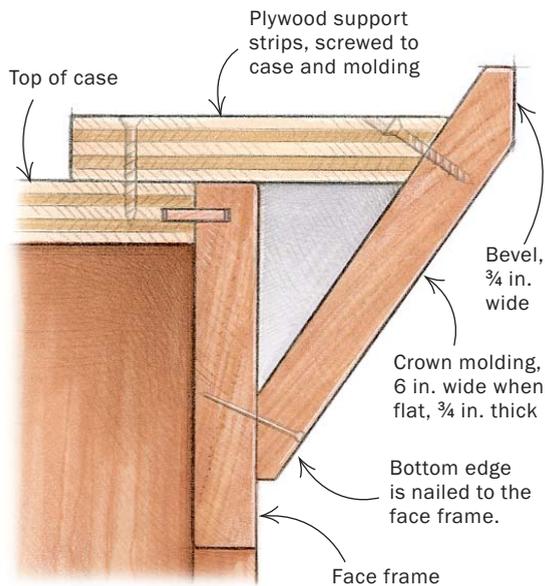
2. INSTALL THE FACE FRAMES



Start with the innermost stile. This joint must be flush. Adjust the alignment as you nail on the piece. Shoot through a thin piece of cardboard if your gun has a tendency to dent the surface (inset). Later, fill the nail holes with colored wax.



CROWN AND BASE MOLDINGS



CROWN MOLDING

record the exact openings for the mitered frame doors. The idea is to avoid trimming the doors to fit, as mitered doors must be trimmed equally on all four sides to maintain their symmetry. If you make the doors before at least dry-fitting the face frame, you may end up with uneven miters or uneven gaps around the doors.

Finish and install the face frame

Sand and finish all of the face-frame stock, along with the base- and crown-molding stock. The face-frame parts on most large built-ins are nailed to the cases because it is difficult to clamp and glue face frames to installed cases. I filled the nail holes with wax colored to match the wood tone. I removed the excess wax by rubbing hard with a clean rag.

Working from the stile nearest the center—with its flush joint—I reinstalled the precut, prefinished face-frame parts using a pneumatic nail gun for speed. If you don't have a nailer, you can predrill and nail on the parts with #6 finish nails. I also ran a quick bead of glue into the spline grooves.

Fit and install the moldings

Base molding seems like it should slap on easily and quickly, but that's rarely the case with built-ins. Miter any outside corners first; here I started with the return pieces under the desk. Then cut the end that meets the wall, scribing it to fit if necessary.

Last, cut or scribe the bottom edge of the piece to bring the top edge of the base molding to the target height.

Installing crown molding is trickier—

The crown molding is a flat piece of 6-in.-wide stock with chamfers cut at the bottom and top edges (see the drawing above). The chamfer at the bottom determines the angle at which the crown projects from the case; I chose 35°. Pieces of plywood attached to the top of the cases support the upper half of the molding. Basically, I nailed the bottom of the molding in place, then screwed the support pieces to the back of the molding and to the tops of the cases.

I added some glue to the outside miters when everything was ready for final nailing. The squeeze-out cleaned up easily from the finished wood. I nailed the miters together, then went back and added nails along the rest of the molding to secure it to the cases. I finished by screwing on the support blocks behind the top edge.

Make and install the doors

The doors on this project are mitered frames around a 1/4-in.-thick plywood panel. The mitered look suits this project's contemporary, angular demeanor, and the walnut splines added after assembly will ensure the joints stay tightly closed.

You can use off-the-shelf plywood for the panel, but the back side of the wood is

A trick for mitering crown molding



Use a sample block to break down the angle. The 6-in.-wide molding won't fit in the miter saw when tilted into its 35° position. But you can fit a smaller version of the molding in the miter saw, tilted against the fence. Set the fence to 45°, and make a cut (left). Then lay the molding flat on the saw (right) to find the proper fence and blade angles for cutting the real thing, which must lie flat.

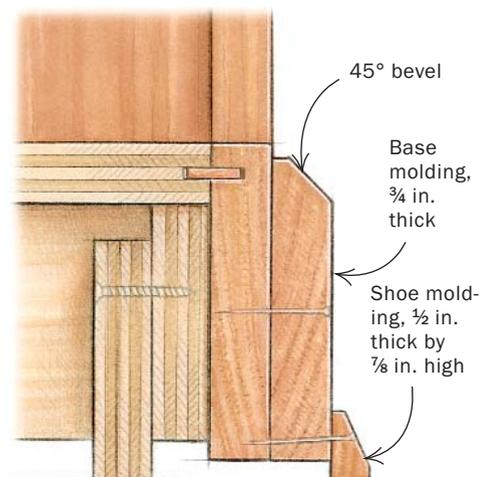
likely to be pretty shabby. To get clean faces in and out, I veneered both sides of a plywood panel, making a nice bookmatch from sequential leaves of veneer.

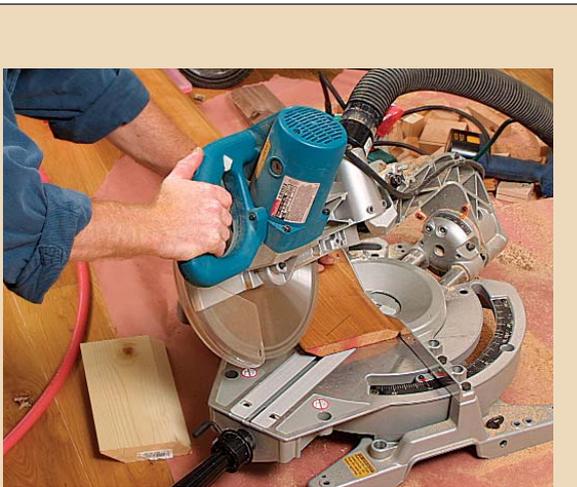
I used biscuits to align the faces of the miters during assembly. The biscuits add some strength to the joint but would not be sufficient without the splines.

Make a simple jig for the tablesaw (see *FWW* #151, p. 49), and cut slots through the mitered corners. Clamp a tall auxiliary fence to the tablesaw fence to keep the jig from tipping. Then plane stock for the splines.

Hang the doors—I chose cup hinges for their versatility and ease of installation,

BASE MOLDING





Make test cuts to fine-tune the fit. You will have to reverse the saw fence to cut the opposite angle.



Work from the center out. Clamp blocks to the face frame to ensure an even reveal. On the return pieces, fit the miters first, then dry-fit the pieces and mark their lengths. The front pieces will be trickier. You must nibble away at each end to creep up on a good fit.

though traditional butt hinges would work just as nicely. Cup hinges are classified according to the relationship between the door and the case part they are hung from—inset, full overlay, or half-overlay. The doors on the center cabinet are full overlay, while the bottom doors are inset—with a twist. Because the cabinet side is set back from the edge of the face frame, I had to block out behind the face frames to create a flush surface for an inset hinge.

Make and fit the desktop

The desktop is a solid slab of 8/4 cherry planed to 1½ in. thick. It rests on cleats screwed to the case sides. I wanted the ex-

tended portion of the desktop to overlap the face frame, angling outward to meet the inside edge of each stile and connecting the desktop visually to the fixed shelf. But cutting clean, precise notches in a single slab would have been impractical.

Instead, I glued up one slab for the entire desktop, then ripped off the front, overlapping section. I crosscut the back section to the same length as the top cabinet and dry-

fitted it on its cleat to mark the location of the front of the cabinets. After ripping the back flush with the front of the cabinets, I glued on the longer front extension piece and did another dry-fit to lay out the angled ends. Last, I slid the desktop into place and screwed through the cleats to attach it. □

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Install the base molding. Starting with the return piece, shim the molding up to its proper height and mark the miter (above). Cut the return, and mark and cut the front piece, then nail the moldings in place. A small shoe molding will hide the gap below (see the drawing at left).

