

perfect-fitting **Box Joints**

All it takes to make this super-strong joint is a simple shop-made jig, a dado blade, and a table saw.

I often turn to box joints when I need an effective and attractive way to join the corners of a case or box. This joint has interlocking pins that create extra glue surface to assure a strong,

long-lasting joint. And the contrasting grain patterns really make a project stand out.

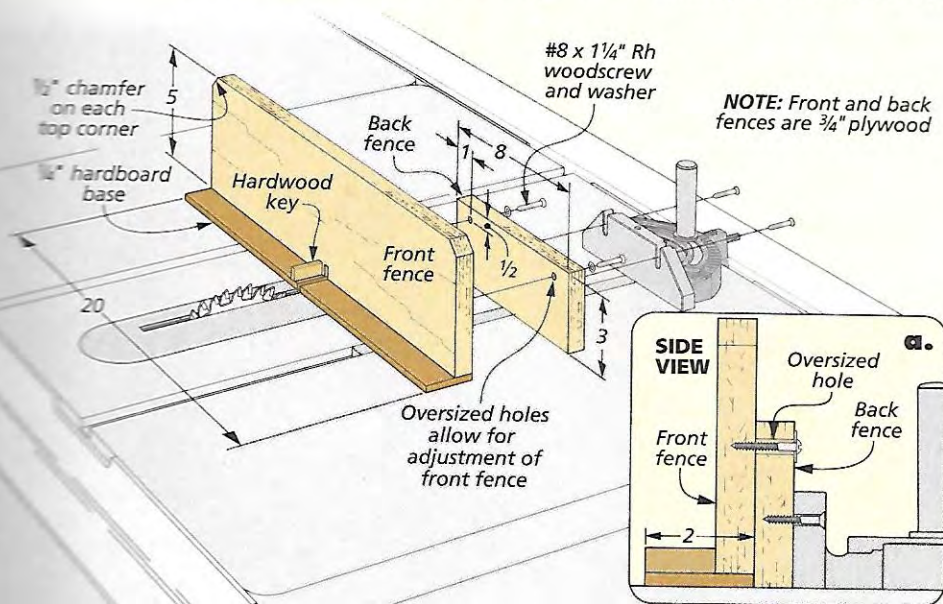
If there's one thing I like best about this joint, it's that I can cut it entirely on the table saw.

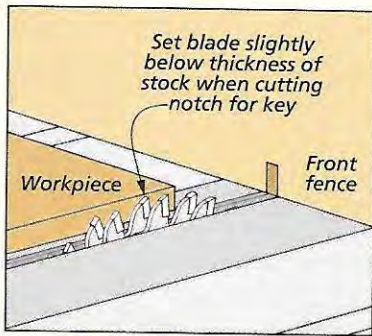
The series of slots are cut with a dado blade or special box joint blade, to create equally spaced pins that fit snugly in slots on the adjacent workpiece. The cuts go pretty fast when you use a simple, shop-made jig.

A SIMPLE JIG

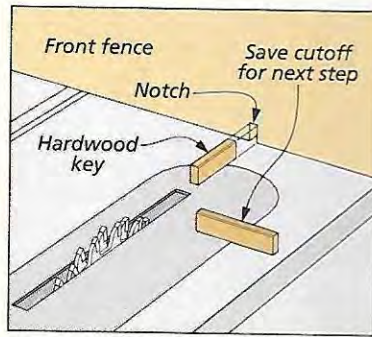
In order for the box joints to look good and, more importantly, fit properly, you'll need to space the pins on each workpiece precisely. And the best way to do that is with a box joint jig.

If you take a look at the drawing on the left, you'll see that the jig consists of two fences attached to your saw's miter gauge. The rear fence is simply screwed firmly to the miter gauge. And the front fence is attached with screws through two over-sized holes, so you can easily make adjustments to dial in a good fit.

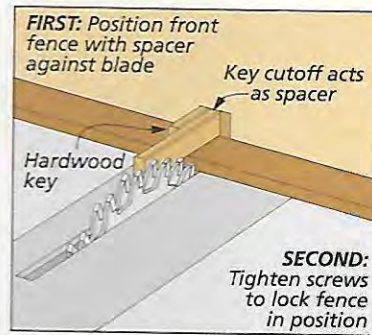




Key Notch. Set the blade just below the thickness of your workpiece when you cut the notch.



Cutting a Key. Size the hardwood key to fit in the notch made by the dado blade in the front fence.



Space the Key. The key cutoff should fit snugly against the saw teeth during setup.

The front fence is your guide for cutting the workpieces. It has a key sized to match the width of the dado blade. The key is positioned the same distance from the blade as the width of the blade to create a pin between each cut. This setup guarantees that the pins align with the slots in the mating piece. The fence backs up the cut. And a sled attached to the bottom of the front fence ensures that the workpiece is level.

BUILD THE JIG. I chose Baltic birch plywood for both fences because it's flat and stable, and it takes screws well. Once you've cut the workpieces to fit your saw, drill the oversized holes in the back fence (detail 'a', opposite page).

SET UP THE JIG. Completing the jig is really a combination of construction and setup. So your next step is to choose the dado blade you'll use to cut the slots. For the wine rack on page 18, you'll need a $\frac{1}{4}$ " dado blade. For slots with perfectly flat and square bottoms, you can purchase a box joint blade set, like the one shown in the box on the right. But any dado blade will get the job done.

To make a notch for the key, raise the blade to just under the thickness of the workpiece ($\frac{1}{2}$ " for the wine rack). You'll readjust the height later when you cut the box joints. With the front fence not yet attached to the back fence, cut a notch roughly centered on the front fence (upper left drawing). You can simply hold the front fence against the back fence to make this notch.

With the notch cut, you can turn your attention to making the hardwood key. The key registers the workpiece as you make a series of cuts along the end to create the pins and slots. I cut an extra-long blank so I could use a piece of it to set the spacing between the key and the saw blade later. Size the key to fit the notch in the fence. It should fit snugly, but not too tight. When you're sure of the fit, cut it to length and glue it in the slot in the front fence. Save the remaining piece of the key for the final setup steps.

BASE. With the key seated in the notch, you can glue the base to the bottom of the front fence. This base provides a flat surface for the workpiece to rest on while you make the box joints on the saw.

SET THE SPACING. To finish the setup, you'll need to space the key the correct distance from the blade. This is where the remaining length of the key comes into play. Place the cutoff portion of the key against the teeth of the saw blade and slide the fence over until the fixed key butts against it (right drawing, above). Again, this should fit snugly, but not tight against the saw blade. When the key is the proper distance from the dado blade, you can drive the screws into the front fence.

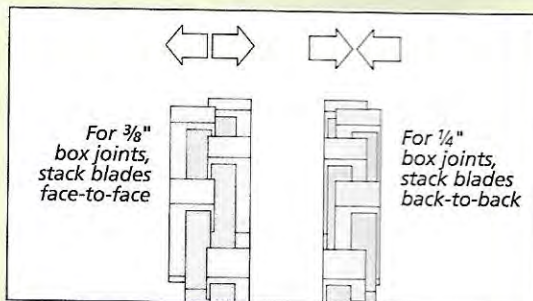
With the jig built and the setup completed, you can move on to make a test cut first, and then cut the final box joints in your project. I think you'll find the work goes pretty fast once you have the jig set up and ready to use.

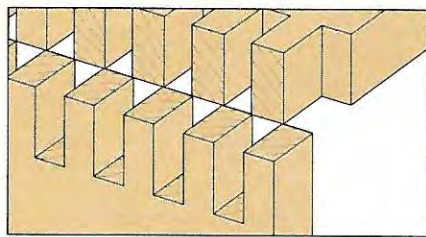
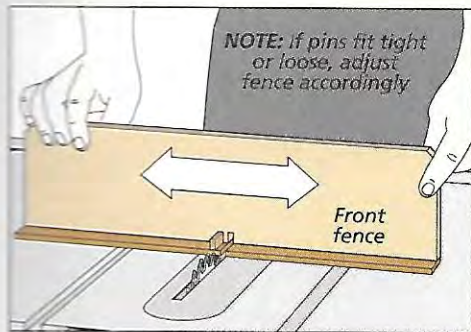
Worth a Look: Box Joint Blade

If you're looking for precise setups for common box joint sizes, then the *Freud Box Joint Cutter Set* is what you want.

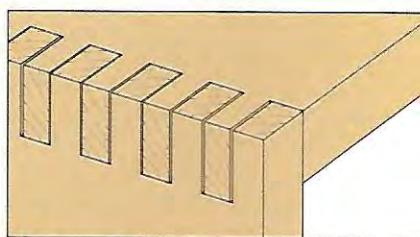
The teeth are brazed to the blade off center so this set can

cut precise slots at $\frac{1}{4}$ " or $\frac{3}{8}$ ", as shown in the drawing below. Plus the blade tips are ground to give you flat-bottom slots every time.

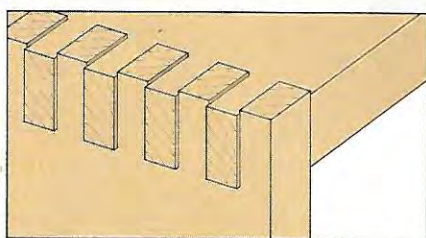
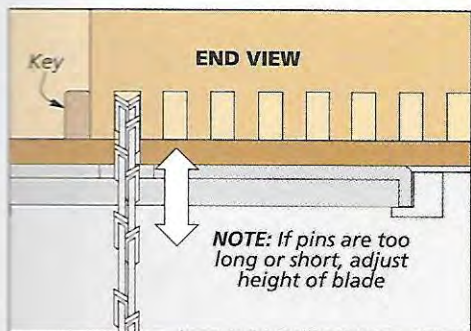




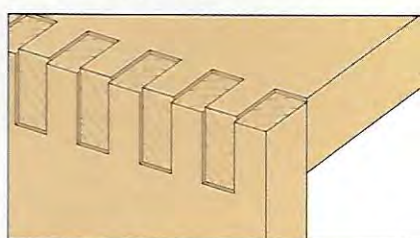
Too Tight. If you find the joint requires too much force, or won't go together at all, move the key toward the blade.



Too Loose. If there are noticeable gaps between the pins, adjust the fence to move the key away from the blade.



Long Pins. If the pins protrude too far (more than $\frac{1}{32}$ "), you'll need to lower the blade to correct this.



Short Pins. Short pins are the result of the blade being too low. Simply raise the blade to correct the problem.

Now you're ready to put your jig to the test by making the box joints. After some test cuts, you'll be on the way to the glueup.

LABEL THE WORKPIECES. Before you start cutting, you'll want to label each end and the top and bottom of the workpieces. This will help you keep the workpieces in the proper order while you're making the box joints.

TEST CUT. With joinery this exact, it's always a good idea to make a couple test cuts. I started the process with test pieces milled to the same thickness and width as my project pieces. When you're ready to make your first cut, raise the saw blade to $\frac{1}{32}$ " over the thickness of the workpiece. I did this so that the pins were just a little long. Then I can sand the

ends of the pins after the glue up and remove any glue squeezeout. (Remember to take the thickness of the sled into account when you're setting the blade height.)

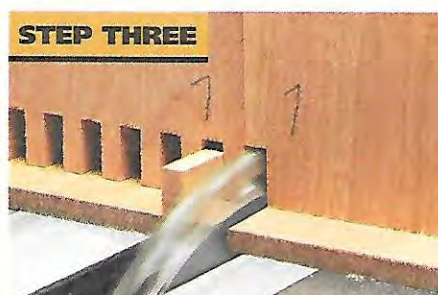
There are a couple things to note as you make your first cut. Make sure you hold the workpiece tight against the fence at all times. And make sure the end of the workpiece is seated flat



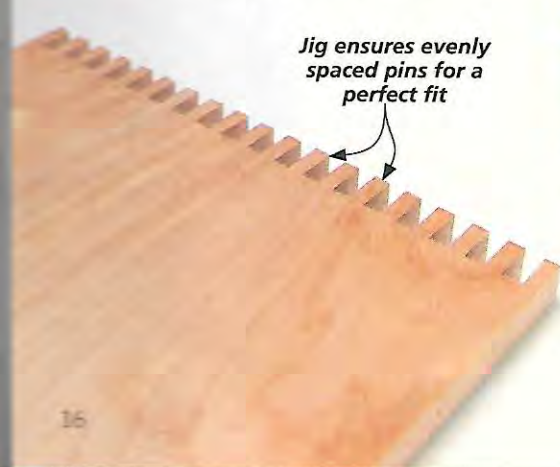
STEP ONE
First Cut. Maintain a firm grip to keep the workpiece in position against the fence and tight against the key.



STEP TWO
Cut & Repeat. As you move the workpiece after each cut, make sure the bottom edge stays flat on the sled.



STEP THREE
Cut the Mating Piece. Flip the workpiece around to act as a spacer to cut the initial notch in the mating piece.



STEP FOUR
Complete Second Workpiece. Continue across the second workpiece until all the slots are cut.



STEP FIVE
Trim to Fit. If needed, trim the workpieces so that each one ends with a full pin or notch for a more finished look.

against the sled. This consistency ensures that all the pins and slots will be identical in size.

CUT. To make the box joints, you'll cut a series of pins and slots along the end of the workpiece. The first slot is cut with the edge of the workpiece against the key, as shown in Step 1 at the bottom of the opposite page. When that slot is cut, fit it over the key and make the next cut. Then continue across the workpiece until all the slots are cut (Step 2).

ADJOINING SIDE. When the slots are cut in one workpiece, flip the workpiece around and use the first pin as a spacer to start the mating workpiece (Step 3). Continue cutting slots until you've reached the end of the second workpiece.

TEST FIT. When all the pins are cut, you can check the fit of the test joint. You should be able to insert the pins in the slots with gentle hand pressure. If you have trouble with the fit, take a look at the drawings at the top of the opposite page for some tips. A joint that's too loose won't hold well and could come apart. Likewise, a joint that fits too tight could cause the wood to split at the slots once the glue is added.

TRIM THE EDGES. Even though the pins and slots are the same size, each one may be just a hair smaller or larger than you intended. When this happens, you'll find you have an odd-sized pin or slot at one edge of the piece. In order to keep the case even, you can trim the edges of the workpieces so that a full pin or slot remains, as shown in Step 5 on the opposite page.

For tips on gluing and assembling box joint jigs, take a look at the box on the right. When assembly is done, you can sand the ends of the pins flush with the case and remove any glue squeezeout.

Box joints are an attractive option to join case or box corners. And I think you'll find they'll stand up to heavy loads and a lifetime of use, too. **W**

How-To: Gluing it Up

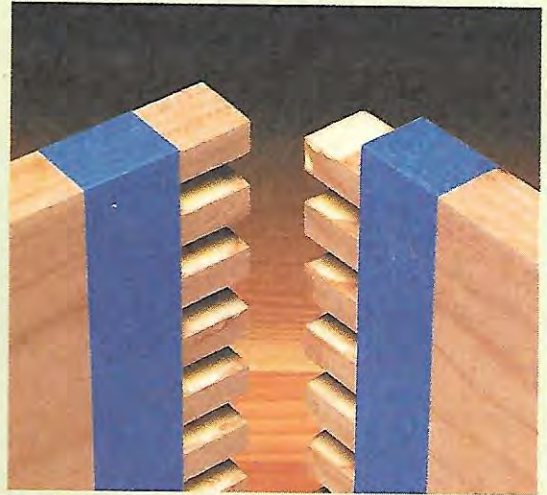
All the painstaking setup and test cuts you've gone through will finally pay off when it's time for assembly. Box joints that are cut properly square up easily. But you'll still need to work quickly once you apply the glue. You can use a slow-setting glue like liquid hide glue or *Titebond III* to give you a little more open time during the glueup.

GLUE. The advantage of box joints is the large amount of gluing surface the interlocking pins and slots create. So it only takes a small amount of glue to create a solid joint. In fact, you don't need to put glue on every surface. I like to use a brush to apply a small amount of glue to the top of each pin, as shown in the top right photo.

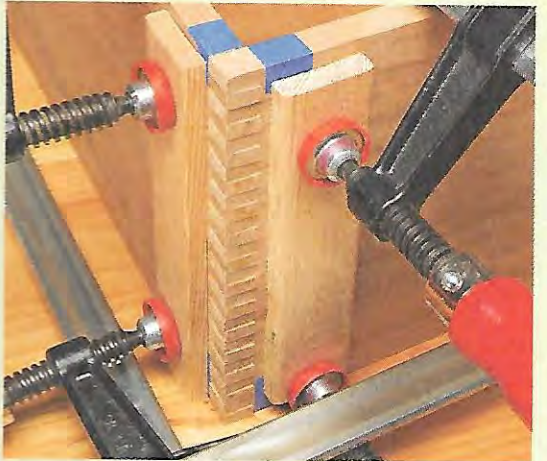
As you assemble the joint, the glue will spread to other surfaces. And you will get some glue squeezeout. I place masking tape next to the pins (top photo). This will trap any squeezeout on the inside corners where it's tough to remove. When the glue has skinned over, pull the tape off and the glue will come with it (bottom photo).

CLAMPING. Clamping box joints is a little different than clamping other types of joinery. Since the pins are slightly long, you won't be able to apply clamps directly to the corners of the case. So when you're ready to apply the clamps, you'll find clamping blocks come in handy. Take a look at the center photo to see how I used blocks to clamp the case. You can see that the blocks give you the ability to apply pressure to close the joint in both directions without touching the pins.

With its longer open time, *Titebond III* is excellent for gluing box joints.



▲ By applying glue only to the top of each pin, a strong long-grain to long-grain joint is created at each pin and slot.



▲ Clamping blocks distribute the force of the clamps evenly, without interfering with the proud-standing pins.



▲ After the glue has set, removing the tape reveals a clean joint, with no cleanup required.

