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Bill Krier
Editor
WOOD® magazine

Adobe Acrobat Troubleshooting Guide

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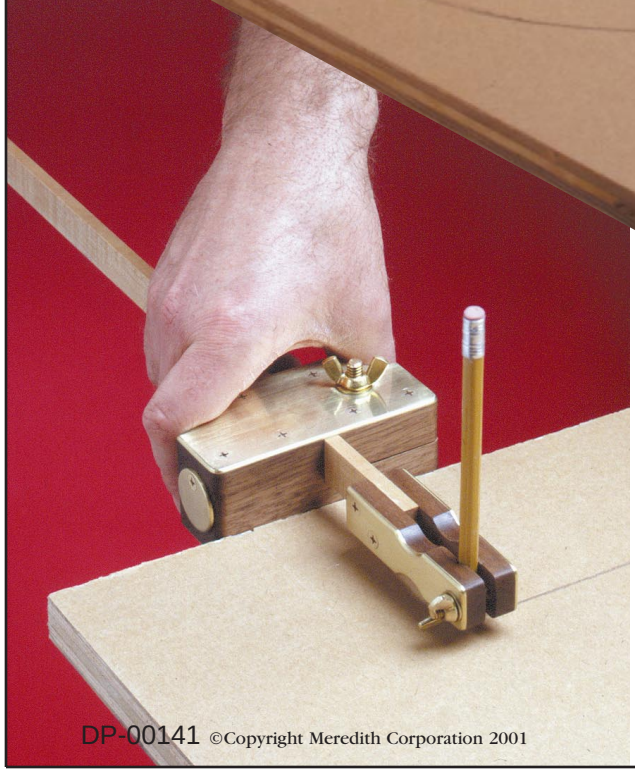
*Collector's Edition

Marking Gauge/Trammel



Mark perfect arcs, circles, parallel lines, and perpendicular lines with our walnut and brass homemade tool. Not only does it work with the precision you require, but the metal/hardwood combination makes for a great-looking tool as well.

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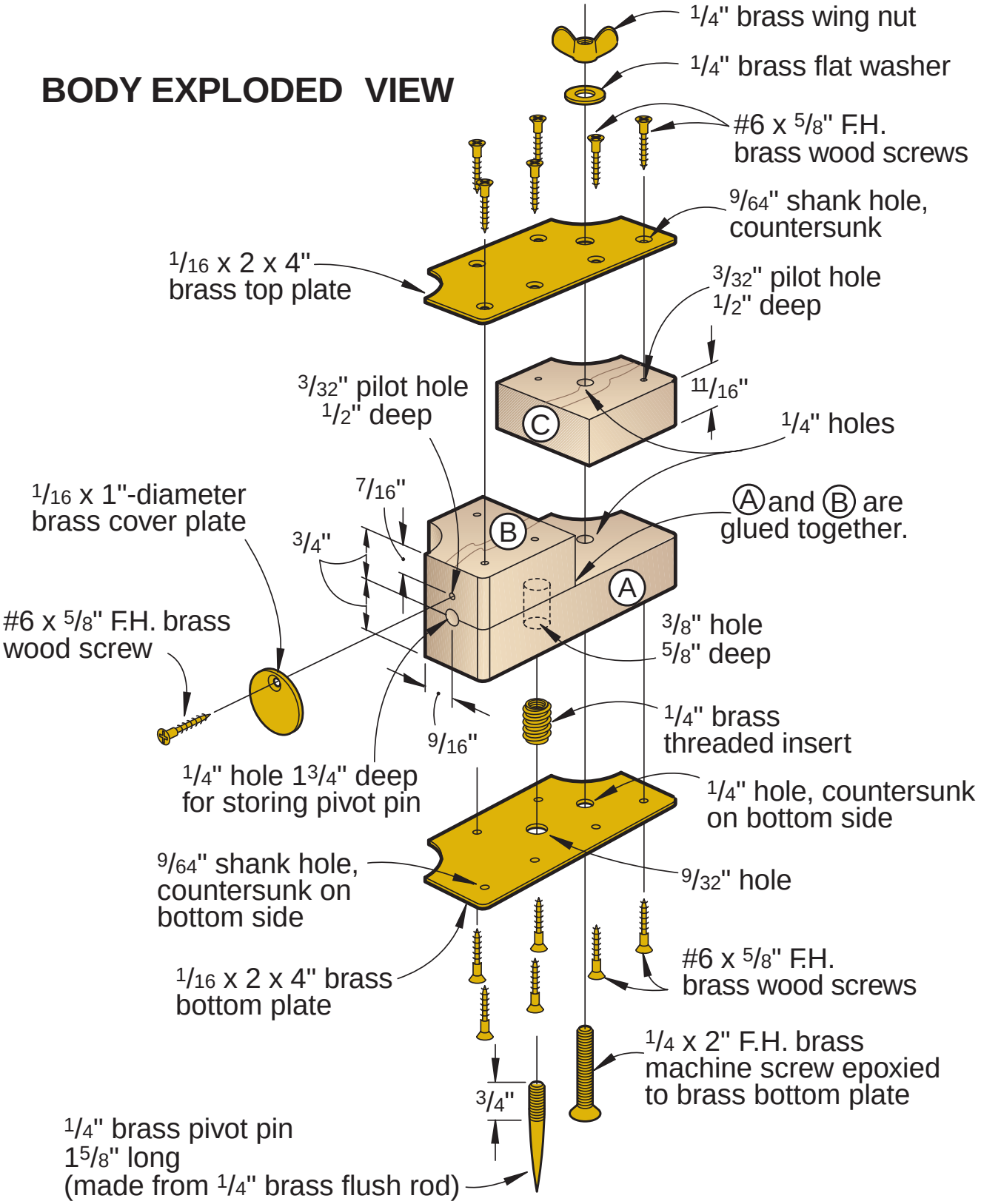
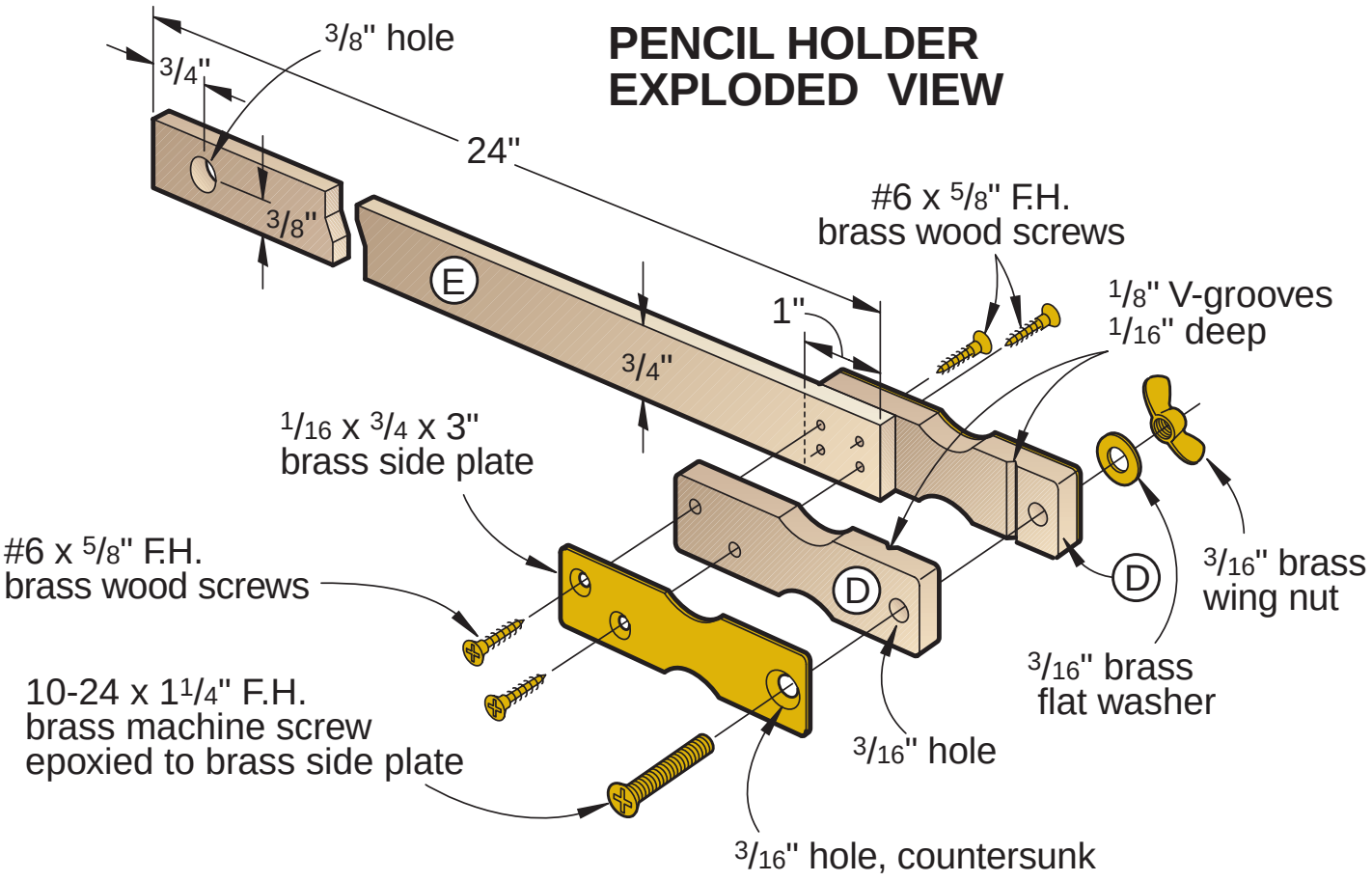
BODY EXPLODED VIEW



PENCIL HOLDER
EXPLODED VIEW



Bill of Materials

Part	Finished Size			Matl.	Qty.
	T	W	L		
A body	¾"	2"	4"	W	1
B body	¾"	2"	1⅞"	W	1
C body	11⁄16"	2"	1⅞"	W	1
D pencil holder	5⁄16"	¾"	3"	W	2
E bar	¼"	¾"	24"	M	1

Materials Key: W–walnut, M–maple

Supplies: 1⁄16×2×12" brass bar, 1⁄16×¾×12" brass bar, (1) 10-24×1¼" flathead brass machine screw with flat washer and wing nut, (1) ¼" brass flush rod, (1) ¼×2" flathead brass machine screw with washer and wing nut, (17) #6×⅝" flathead brass wood screws, (1) ¼" threaded brass insert.

Note: *Although the brass we used measures .064", it is often referred to as 1/16"-thick brass. See our source for a kit containing all the necessary hardware in the Buying Guide at the end of the article.*

Let's start by building the trammel body

1 Cut the trammel body parts (A, B) to the sizes listed in the Bill of Materials from ¾" walnut. With one end and both edges flush, glue and clamp the pieces together face-to-face.

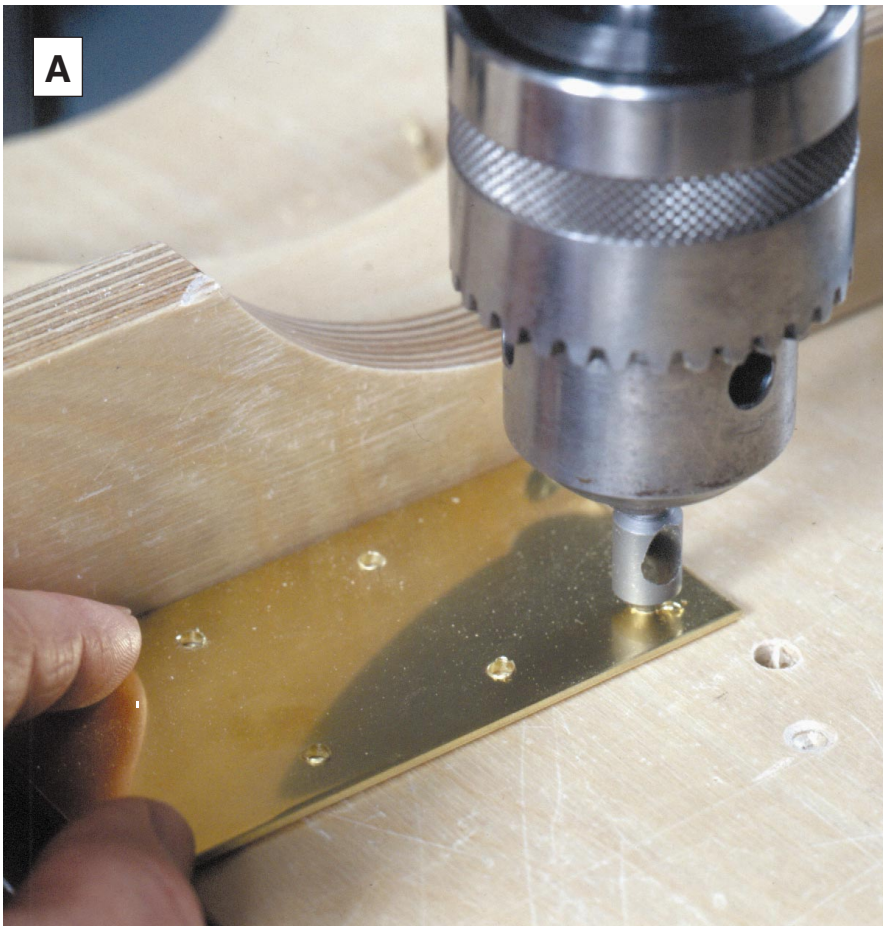
2 Remove the clamp, and mark the centerpoint for the pivot-pin hole, where dimensioned on the Body Exploded View drawing. Drill a ¼" hole 1¾" deep in the end, where dimensioned on the drawing. (We did this on our drill press, using a brad-point bit.)

3 Cut the remaining body piece (C) to size. Note that part C is 1/16" thinner than the thickness of body part B.

4 From 1/16×2×12" brass bar stock, crosscut two pieces 4" long each for the top and bottom body plates. You can cut the brass with a fine-tooth blade on your bandsaw, tablesaw, or scrollsaw. (We used the tablesaw with a 60-tooth carbide-tipped blade, a zero-clearance blade insert, and a miter gauge fitted with a wooden extension. The zero-clearance insert supports the brass for making a safer and cleaner cut.) File or sand any burrs off the ends of the brass pieces.

5 Use a crafts knife to cut the Top and Bottom Plate full-size patterns. Using spray adhesive (we used 3M spray mount #6065), secure the paper patterns to the brass. Carefully align the edges of the paper patterns with the brass.

6 Fit your drill-press table with a fence. Chuck a 9/64" bit into your drill press. Using the fence for accurate alignment, drill the 9/64" holes through both pieces of brass where marked.



Make a slight depression on the inside face of the brass plates with a countersink bit to remove the ridge.

To help eliminate bit wander, slide the drill bit as far as it will go into the chuck. This supports the bit more, allowing it to flex less. When drilling through the brass, the bit may create a small ridge on what will be the surface that mates with the walnut. If the ridge is not removed, it will prevent the brass plates from mating flush with the walnut body, creating a gap. To remove the ridge, mount a countersink bit into your drill press, and very lightly machine the inside surface of both pieces of brass plates to remove the ridge. (As shown in *Photo A, above*, we used a Weldon countersink bit. It cuts clean with no vibration or burrs. See the listing in the Buying Guide for our source.)

7 Turn the brass pieces over (pattern side up), and countersink each 9/64" hole. (We test-countersank holes in the remaining brass stock first, allowing us to accurately set the depth stop on our drill press. The screwheads need to seat flush in the countersunk holes later.)

8 Using double-faced tape, adhere the bottom plate to the walnut body. Drill a 1/16" guide hole through the brass at the threaded-insert location, giving you an accurate centerpoint for drilling the 3/8" hole into the wood later.

9 Separate the brass and wood, and drill a 3/8" hole 5/8" deep into the wood and a 9/32" hole through the brass for the threaded insert.

10 Install the ¼" brass threaded insert in the 3/8" hole in the walnut (A). (To do this, we double-nutted a ¼" roundhead machine screw and threaded the insert onto the machine screw and against the

Use the fence on your drill-press table to align the bit over the previously countersunk holes in the brass.

nuts. Then, we used a wrench and a screwdriver to drive the insert squarely into the hole. We used the screwdriver to press the insert downward and the wrench to thread the insert into the hole. Doing this is more accurate than trying to drive the insert in place with just a screwdriver.)

11 Chuck a self-centering 7⁄64" Vix bit into your drill press, and position the fence to align the bit over the countersunk holes. (See the Buying Guide for our source of this bit.) Drill the pilot holes for the brass screws into the walnut as shown in *Photo B, above*. To help hold part C in place, use a ¼" spacer, as shown in the photo.

12 Drive #6×⅝" brass flathead wood screws through the brass and into the trammel body. Continue using the ¼" spacer between parts B and C for support. Bandsaw the radii to shape. (We used a ¼" skip-tooth blade.)

13 Drill a ¼" hole through the trammel body (A, C). Countersink one end of the hole, where shown on the Exploded View drawing, to house the head end of a ¼×2" flathead brass machine screw.

14 Drum-sand the two radii. Then,

lightly sand the edges and ends of the trammel body.

Now, clean up the brass and make it shine

1 Using a round and a flat file (we used an 8" mill file and an 8" round file), file a 1/16" round-over along the edges of the brass top and bottom plates.
2 Sand the exposed surfaces of brass smooth. (To do this, we used 180-, 220-, and 320-grit sandpaper.) For an even shinier appearance, sand with progressively finer grits of sandpaper. If the screwheads protrude just slightly, they can be sanded flush; if they protrude too much, remove them and drill the countersinks deeper.
3 Mix quick-set epoxy (5-minute epoxy), and epoxy the 1/4×2" brass machine screw in place. After the epoxy has cured, sand the bottom plate again to remove any excess epoxy and to smooth the head of the screw flush with the brass bottom plate. The 1/4×2" brass screw and mating wing nut allow you to secure the trammel bar in the body later by simply tightening the wing nut slightly.
4 Finish-sand the trammel body, and apply an oil finish to the wood. Immediately wipe any finish off the brass.

The pencil holder and trammel bar come next

1 Cut the pencil-holder pieces (D) to size. Tilt your tablesaw blade 45° from center, and raise it 1/16" above the surface of the saw table. Using a wooden extension on your miter gauge for support, cut a V-groove in each pencil holder (D), where shown on the Full-Size Patterns and the Pencil Holder Exploded View drawing.
2 Cut the trammel bar (E) to size. Check the fit of the bar into the body (A, B, C). The bar should slide smoothly, yet clamp securely in the trammel body.
3 For hanging the completed trammel, drill a 3/8" hole through the bar where shown.
4 Glue and clamp the pencil holders to the bar, aligning the V-grooves. See the Pencil Holder Exploded View for particulars.
5 Cut two pieces of 1/16×3/4" brass bar to 3" long to cover the outside face of the pencil holders. Transfer the paper patterns, and drill and countersink the holes like you did earlier with the brass on the body. Note that the two screws on one brass plate are offset from those on the opposite plate. Secure the two pieces of brass to the pencil holders with #6 screws.
6 Using your drillpress and a 3/16" bit, drill a hole through the brass-covered pencil holders to house a 10-24×1 1/4" machine screw. To reduce the chance of chip-out, place a 1/4"-thick spacer between pencil holders when drilling the hole. Countersink the hole.
7 With the spacer still in place, bandsaw the radii on the pencil holders, and drum-sand each radius smooth. File and sand the brass as before.
8 Epoxy the 10-24×1 1/4" brass machine screw in place, being careful not to get any epoxy on the exposed threaded end. Finish-sand the pencil holder and bar.

Add the cover plate and pivot pin

1 Transfer the 1"-diameter cover plate pattern to 1/16" brass. Drill and countersink the hole where marked. Cut the cover plate to shape, cutting just outside the marked line. The cover is used to cap the end of the 1/4" storage hole for the brass trammel pivot pin.
2 Using double-faced tape, secure the cover plate to the end of a 1"-diameter dowel. Using the previously drilled hole in the cover plate as a guide, drill a pilot hole into the dowel, and further secure the brass cover plate to the end of the dowel with a screw. Clamp the dowel in your workbench vise with the brass end up. File the edges of the cover plate flush with the edges of the dowel. Then file and sand the round-overs on the cover plate.
3 Drill a 3/32" pilot hole in the trammel body (B) for mounting the cover with a #6 screw.
4 To form the pivot pin, cut a 1 5/8"-long piece off the threaded end of a brass flush (toilet) rod. If the threaded end is longer than 3/4", cut the threaded end to length, then crosscut to 1 3/4" long. Chuck the threaded end into your drill press. Start the drill press and use a file to sharpen the end of the pivot pin. Sand the point until it shines. Assemble the project in the configuration shown.

Buying Guide

Hardware kit. All the pieces listed in the Supplies listing (brass not cut to length). Catalog no. MGT2000, $20 ppd. For a Weldon countersink bit, add $9.10. For a self-centering #5, 7/64" Vix bit, add $8.80. Puckett Electric Tools, 841 Eleventh St., Des Moines, IA 50309, or call 800/544-4189 or 515/244-4189 for current prices and to order.

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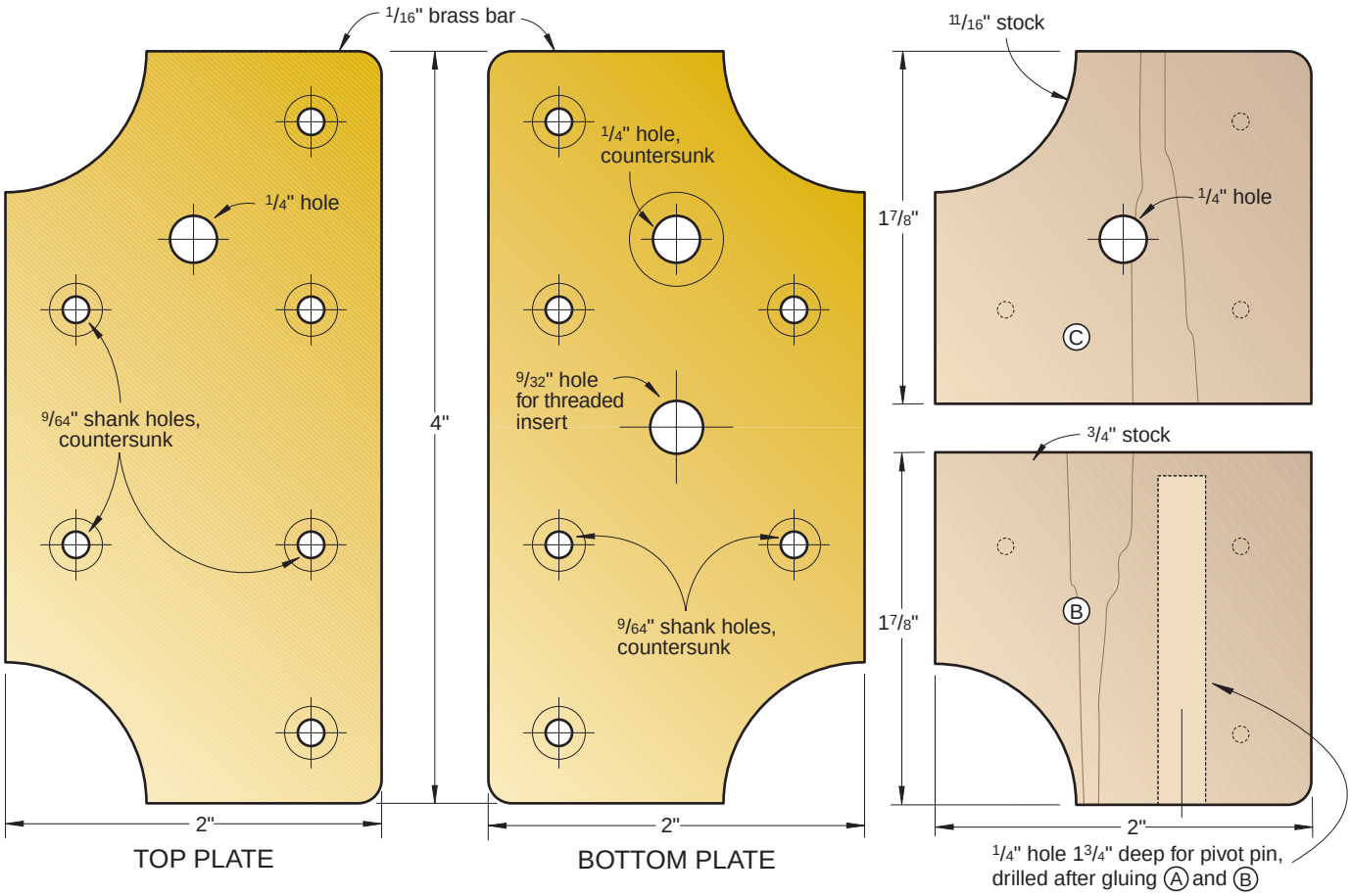

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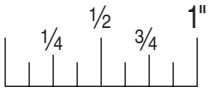
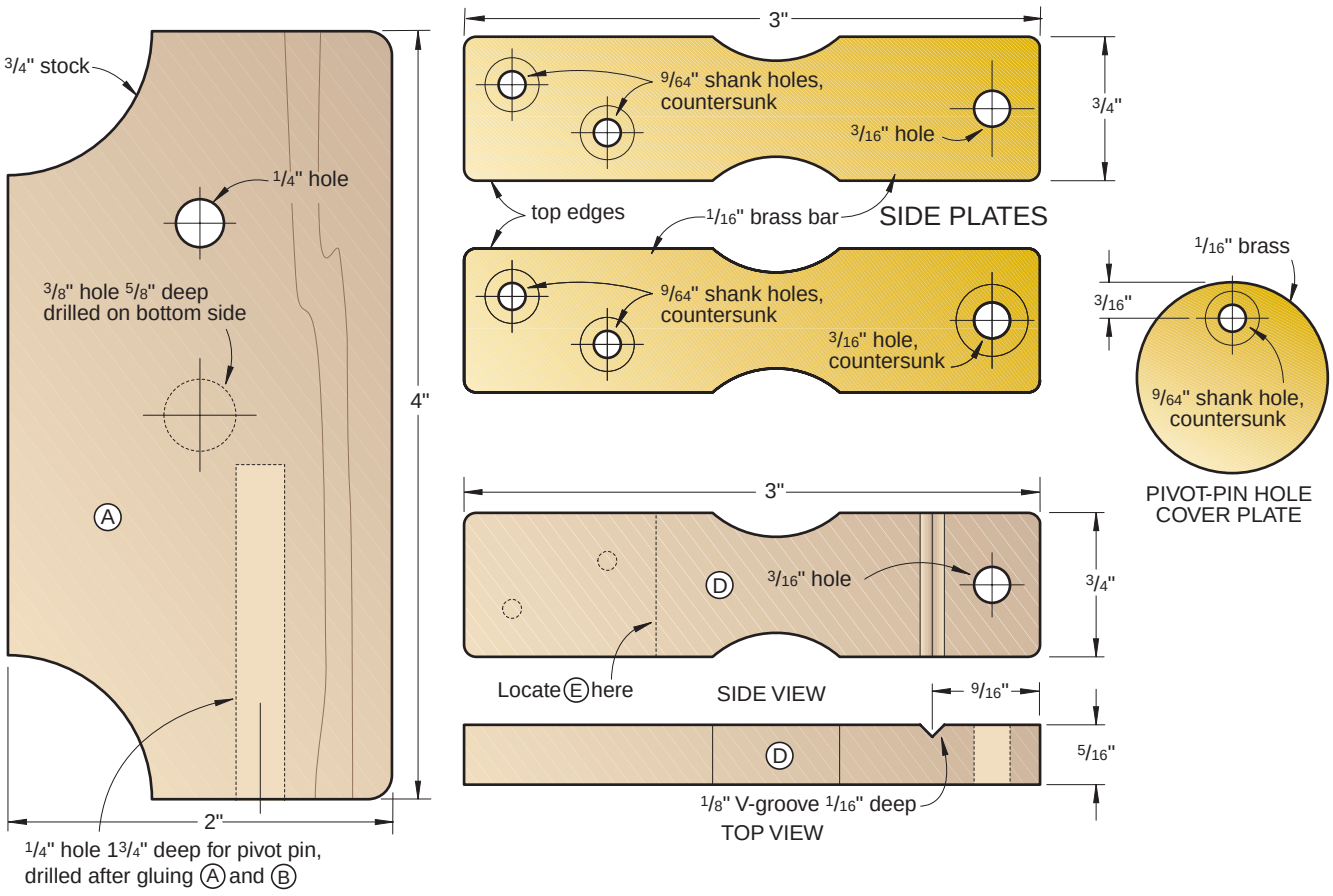


SCALE

FULL-SIZE PATTERNS



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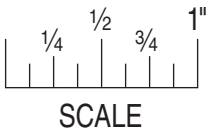

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