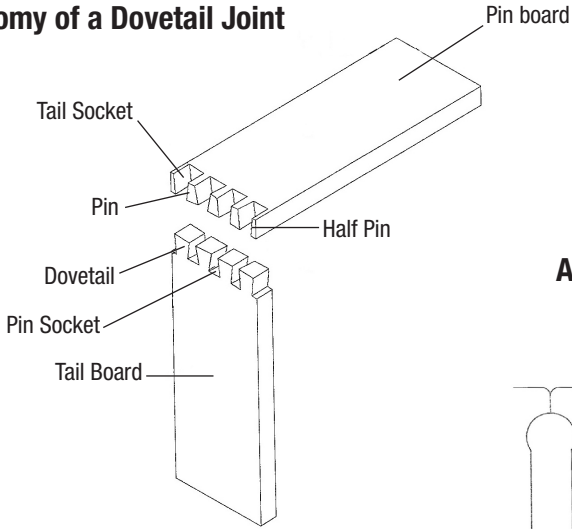




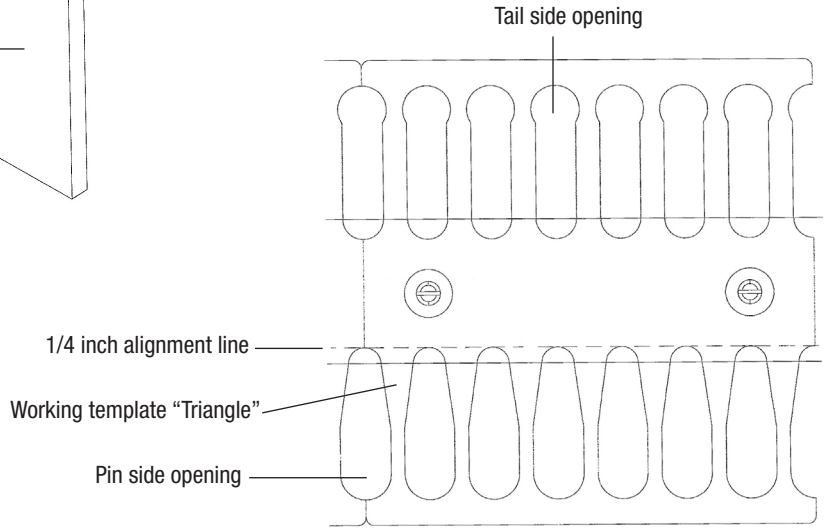
DovetailTemplateMaster[™]

Model 1218 Users Manual

Anatomy of a Dovetail Joint



Anatomy of a Working Template



Materials required to make your working dovetail and pin jigs:

(A) Working template blanks should be 7 ½ inches wide by 10 ½ inches long. Recommended materials are: 1) 3/34 inch to ½ inch solid wood 2) ¾ inch to ½ inch veneer plywood (also called Russian, European, Applewood or ship grade plywood or 3) ¾ inch to ½ inch MDF (medium density fiberboard).

NOTE: ¾ inch thick blank material is required if you want to dovetail boards less than 3/4 inches thick.

(B) The backer board should be 2 ¼ inch wide by 3 ½ inch tall, and 6 inches longer than the combined length of the working templates to be machined. Recommended materials are: 1) solid wood or 2) glue together (to make a board 2 ¼ inches thick) three pieces of the ¾ inch thick working template material used.

The tools required to make and use your dovetail working jigs are:

(A) Router with a ¼ inch collet

(B) 8° Dovetail bit ½ inch diameter, 13/16 inch cutter length and ¼ inch shaft with either a 5/8 inch ball bearing guide or a 5/8 inch router guide.

(C) ½ inch diameter by ¾ inch minimum length pattern bit with 1/3 inch shaft and ½ inch ball bearing guide.

(D) Screw driver

(E) Drill

(F) #10 1 ½ inch counter sink drill bit

(G) Drill bits: 1/4 inch, ¾ and 5/8 inch diameters (forstner recommended)

(H) Reciprocating saw or chisel

(I) .5mm drafting pencil or sharp scratch awl

Hardware required:

- (A) Two ¾ inch #10 pan head screws to secure the template master to the working template blank for routing
- (B) Two ½ inch diameter flat washers to secure the template master to the working template blank for routing
- (C) Two ½ inch diameter flat washers to position each working template on the backer boards before adjustments are completed
- (D) Two 1 ½ inch #10 flat head screws to lock each template to the backer board after adjustments are complete

Additional hardware for the box and hinge jigs:

- (A) A 1/2 inch diameter 13/16 inch minimum length straight cutter with a 5/8 inch diameter bearing to cut both joints
- (B) Two ¾ inch #10 pan head screws to secure the positioning stop
- (C) Two ½ inch diameter flat washers to secure the positioning stop before adjustments are completed
- (D) Two 1 ½ inch #10 or #12 flat head screws to lock the positioning stop

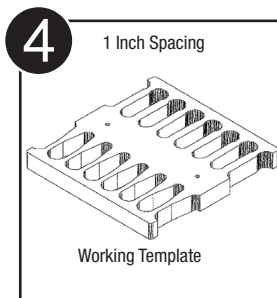
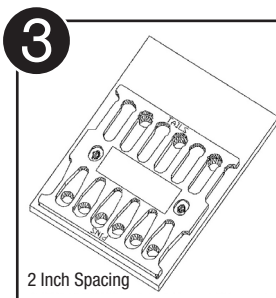
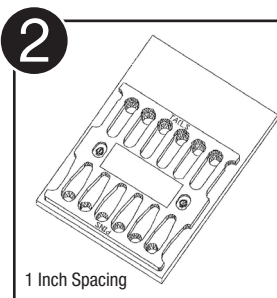
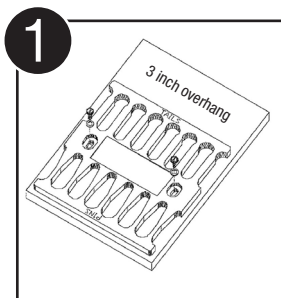
NOTE: The ball bearing guide is a must for the pattern bit. It's the only way to accurately machine the working templates.

A router guide can be used with the dovetail bit and the box joint cutter. However, a 5/8 inch diameter ball bearing guide is recommended for both the dovetail cutter and the box joint straight cutter because the concentricity and accuracy of the ball bearing guide is better than the router guide.

Safety Warning: Always wear safety glasses or eye shields before commencing power tool operation. Read, understand, and follow your power tool manufacturer's instructions for safety. Always keep hands at a safe distance from spindles and cutting tools. Always disconnect power source before adjusting power tools.

HOW TO MAKE WORKING JIGS – METHOD 1

- 1 Screw the Master to $\frac{1}{2}$ to $\frac{3}{4}$ inch thick by $7\frac{1}{2}$ inch wide and $10\frac{1}{2}$ inch long plywood or solid wood blank (grain direction aligned with openings) with washers and $\frac{3}{4}$ inch pan head screws, leaving a 3 inch overhang to clamp the blank to the work bench for routing.
- 2 Drill $\frac{5}{8}$ inch diameter starter holes in each opening
TIP: After routing working template, clean the dust build up from the Master with mild soap and water to prevent a change in the size of the opening for the next use.
- 3 Drill $\frac{5}{8}$ inch diameter starter holes in every other pin board template openings and in all other dovetail board template openings.
- 4 Clamp the blank with the starter holes over hanging the work bench, and rout openings with a $\frac{1}{2}$ inch diameter pattern bit. Insert router bit in starter holes to begin cuts. Cut excess blank material off around edges and rout outside edges following the DovetailTemplateMaster™. Repeat the process as many times as necessary to produce enough working templates to match the desired length of the working jig.



5 Remove every other one of the pin board guide “triangles” in the working templates with a reciprocating saw or chisel. Cut the working template at the base of the openings as shown above. Smoothness of cut will not affect the quality of the finished joint.

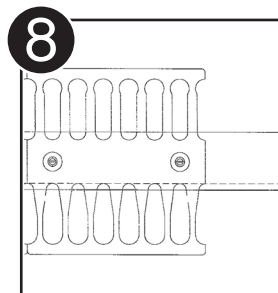
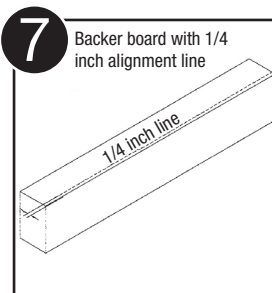
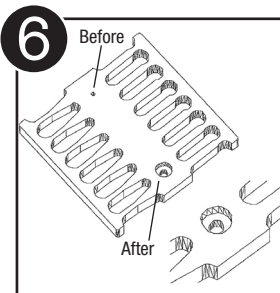
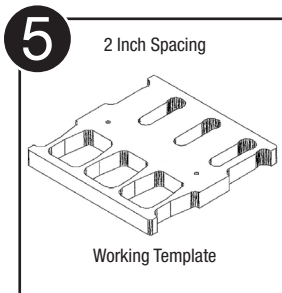
CAUTION: To avoid accidentally damaging the Master, allow the router to come to a complete stop before removing the bit from the template.

6 Drill $\frac{1}{4}$ inch to $\frac{3}{8}$ inch diameter through holes in the working template at both screw holes for securing the Master to the blank. Drill $\frac{3}{4}$ inch diameter holes $\frac{1}{4}$ inch deep at these holes to recess the mounting screw heads and washers.

7 Square up a 2 $\frac{1}{4}$ inch thick by 3 $\frac{1}{2}$ inch tall backer board that is 6 inches longer than the length of all the working templates produced, or glue three $\frac{3}{4}$ inch thick by 3 $\frac{1}{2}$ inch wide boards to equal the width plus 6 inches of all working templates produced, and join the top edge square. **Sides must be square to the top!** Draw a line on top of the backer board $\frac{1}{4}$ inch from the board's edge.

TIP: Glue the pieces, then drive screws on 3 inch centers to act as clamps. Remove screws before using to avoid damage to router bits.

8 Align the working template's pin opening “triangles” with the $\frac{1}{4}$ inch line on the backer board so all the pin openings just touch the line, and the left side is visually in the center of the backer board. Clamp the working template in place. Drill holes in the backer board using the template's through holes drilled in a previous step as locators. Screw the working template to the backer board with pan head screws and washers. (See Illustration)



9 Align and fasten the remaining working templates and screws and washers by repeating the previous steps. Make sure the right and left sides of the working templates touch and both front and rear edge are in line

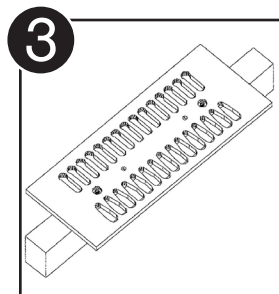
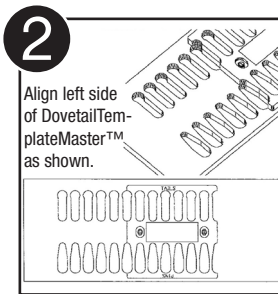
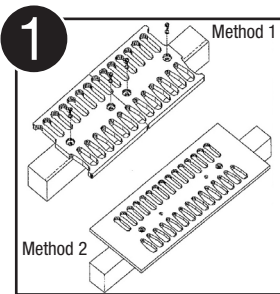
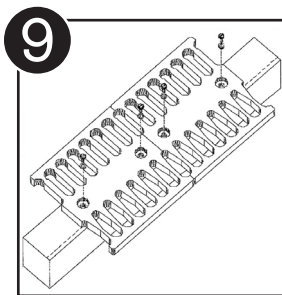
HOW TO MAKE WORKING JIGS – METHOD 2

1 Method 2 is recommended for box joint templates and dedicated special purpose jigs. However, if the working template is damaged during use, the entire template must be replaced. With Method 1, only the damaged section of the template needs to be replaced.

2 Rout the first set of openings, then index the Maser to the right by aligning the last routed opening and the left side of the Master. Rout the second set of openings. Continue indexing until the working template is the length desired.

TIP: "Feel" the proper alignment of the Master at the pin and tail openings with a finger

3 Make a backer board 2 ¼ inches thick by 3 ½ inches wide, and 6 inches longer than the length of the completed working template. Drill recessed and through holes into the working template as shown above. Align the working template to the 1/4 inch line on the backer board and fasten with screws and washers.



TEST CUT AND HOW TO USE WORKING JIGS

① To ensure a pin is located at the center of the joint, scribe a pencil line at the center of the end grain of the test tail board. Clamp the board vertically in a bench vise. Center align the working jig's center tail opening with the pencil line on the tail board. Clamp the jig in place.

TIP: Make the working jig from two templates. Align the "line" where the templates meet with the pencil line on the test tail board for centering.

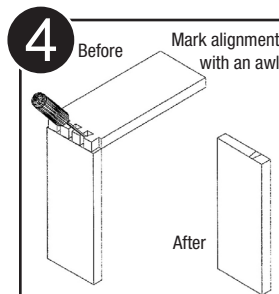
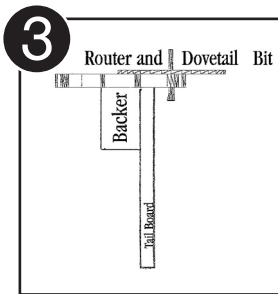
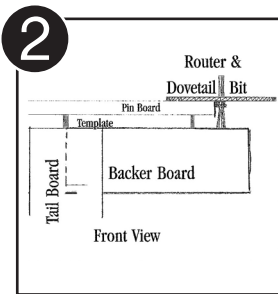
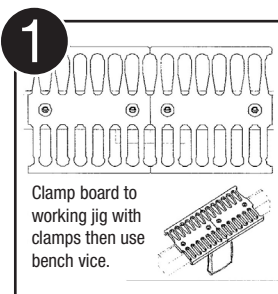
② Adjust the dovetail bit's depth of cut to the thickness of the pin board, plus a little (e.g. width of a business card), to create easy flush sanding of the assembled joint.

TIP: Place the pin board and a business card on top of the working template. Set the router on top of the card and adjust the bit so it just touches the backer board. This will leave the dovetails proud of the pin board by only the thickness of the card.

③ Insert the dovetail bit through one of the large tail openings. Set the router on top of the working template. Holding it securely, turn the router on and slowly rout the pin socket (space between the dovetails) in the tail board, keeping the router base flat against the top of the working template. Repeat until all pin sockets are cut in the tail board.

CAUTION: To avoid damaging the working template, allow the router to come to a complete stop before removing the bit from the template.

④ Align routed test tail board on top of the test pin board as if assembling the joint. Mark lines between the two tails on the end grains of the pin board using an awl or very sharp pencil. This will indicate the pin "triangle" location. Only one pair of lines is required.



TEST CUT AND HOW TO USE WORKING JIGS

5 Clamp pin board vertically in a bench vise and locate the working jig's pin side "triangles" using the scribed lines. The "triangle" edges should line up between the two scribed marks as shown.

6 Adjust ½ inch diameter pattern bit depth of cut to thickness of the tail board plus a little (e.g. width of a business card), to create easy flush sanding of the assembled joint.

TIP: Place the tail board and a business card on top of the working template. Set the router on top of the card and adjust the bit so it just touches the backer board. This will leave the pins proud of the tail board by only the thickness of the card.

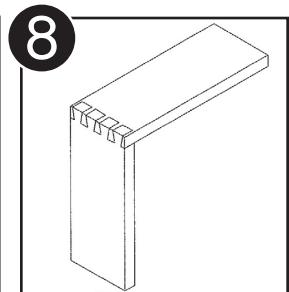
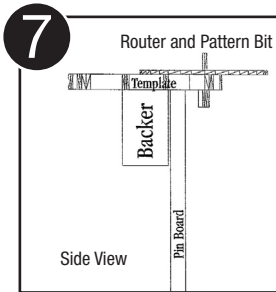
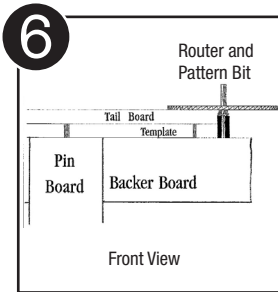
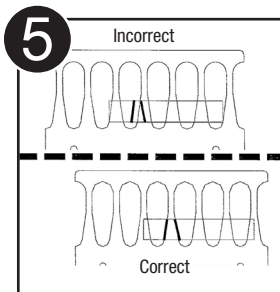
7 Insert the pattern bit through one of the large pin openings. Set the router on top of the working template. Holding it securely, turn the router on and slowly rout the test tail socket (space between the pins) in the pin board, keeping the router base flat against the top of the working template. Repeat until all tail sockets are cut in the pin board.

CAUTION: To avoid damaging the working template, allow the router to come to a complete stop before removing the bit from the template.

8 Assemble dovetail joint and check for fit. If fit is acceptable, glue joint and sand and plane tails and pins flush. If joint fit is not acceptable, apply techniques found in **How to adjust working jigs** section.

TIP: To create the look of a hand-cut dovetail joint, scratch a line around both the pin and tail boards at the base of the sockets.

TIP: Making dovetails that are wider than the working jig: Align the tail opening visually in the center of the tail board and make first cuts with the dovetail bit. Index the jig (as in Method 2) either right or left and cut the remaining pin sockets. Repeat as needed to cut all the pin sockets required. Align the dovetail board to the pin board and scribe one "triangle". Align the pin side of the working jig to the "triangle" and cut the dovetail sockets in the pin board. Index right and left to cut all the required tail sockets. Assemble the joint.



HOW TO ADJUST WORKING JIGS

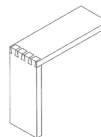
❶ If a dovetail joint does not fit as intended, adjustments are made only to the pin board cuts. The space between the tails (the pin sockets) is equal to the diameter of the dovetail bit and can not be changed on the tail board. Larger pins correct loose fitting joints, and smaller pins correct tight fitting joints.

NOTE: The thickness of the pin and/or tail board does not affect joint tightness. Once properly adjusted, the working jig never needs to be changed.

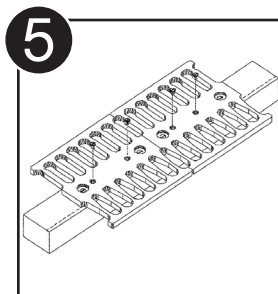
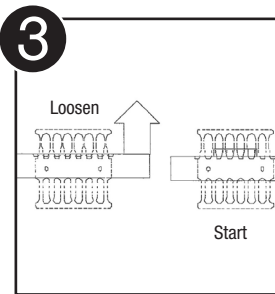
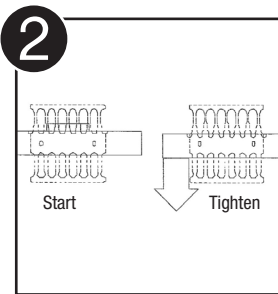
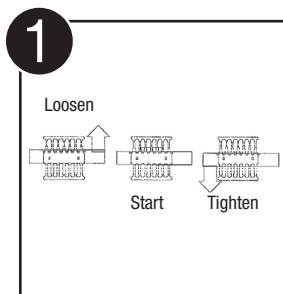
❷ If joint is loose: Back out screws and move the backer board toward the center of the template “just a hair”. (This results in pins that will be slightly wider when routed.) Retighten screws. In making the tail sockets, all of the material on the pin board, except for that covered by the working template’s “triangles”, is routed away. When more of the “triangles” cover more of the pin board, more material remains after routing, making the pins wider and the joint tighter.

❸ If joint is tight: Back out screws and move the backer board toward the center of the template “just a hair”. (This results in pins that will be slightly thinner when routed.) Retighten screws. In making the tail sockets, all of the material on the pin board, except for that covered by the working template’s “triangles”, is routed away. When more of the “triangles” cover less of the pin board, less material remains after routing, making the pins thinner and the joint looser.

❹ After making the required adjustments, cut another test pin board and check the fit.

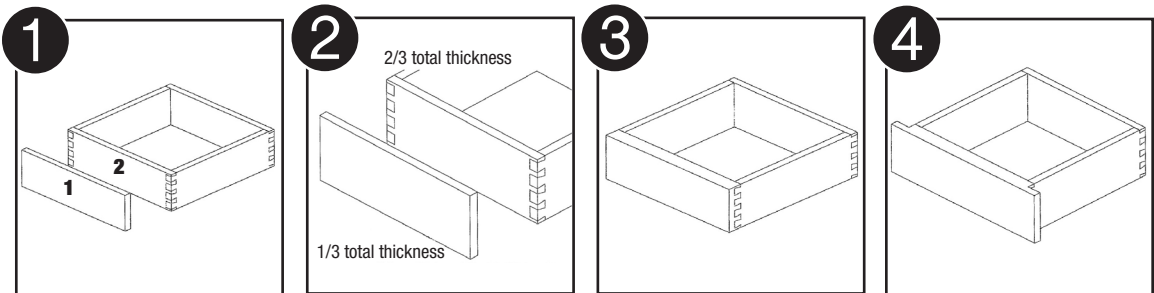


❺ When the fit of the joint is satisfactory, drill two counter sunk holes through each working jig template and drive the two 1 ½ inch flat head screws flush with the top of the working template. This locks the working template in place, preventing the jig from shifting in use.



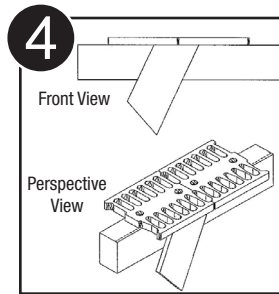
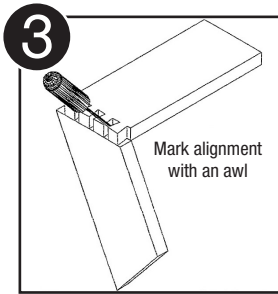
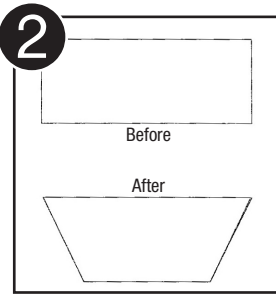
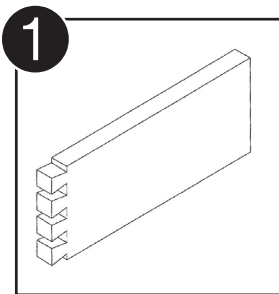
HOW TO MAKE HALF BLIND DOVETAIL JOINTS

- 1 Half blind drawers are made from two boards: (1) an appearance board and (2) a pin board.
- 2 It is best if the appearance board is about 1/3 of the total thickness of the completed drawer front; e.g., use a 1/4 inch thick Appearance Board for a drawer with a total thickness of 3/4 inches.
- 3 After all the dovetail joints have been routed, assembled, glued and sanded smooth, glue the appearance board to the front of the drawer's pin board, covering the end grain of the tail board (drawer side), creating a half-blind dovetail drawer
- 4 For rabbeted half-blind dovetails, make the appearance board larger than the pin board by twice the depth of the rabbet. For a full-rabbeted drawer front, make the appearance board both longer and wider by twice the size of the rabbet.
TIP: Cut scrap blocks the size of the rabbet to help align the Appearance Board front



HOW TO MAKE ANGLED DOVETAIL JOINTS

- 1 Cut tail boards, as described previously, in both ends of the tail board.
- 2 Cut the desired angle on the pin boards, making sure both of the boards are exactly the same size.
- 3 Align the tail board to the angled pin board, ensuring the edges are flush. Mark a “triangle” on the pin board to use in aligning the working jig with the pin board. This is the same step taken in making square dovetails, only the pin board in this operation is at an angle.
- 4 Align the angled pin board with the working jig as shown, making sure the “triangle” is completely covered, as described previously.

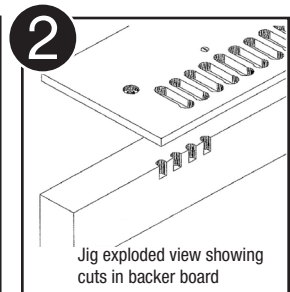
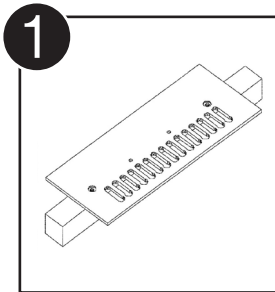
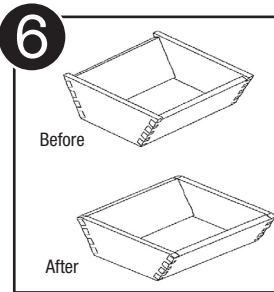
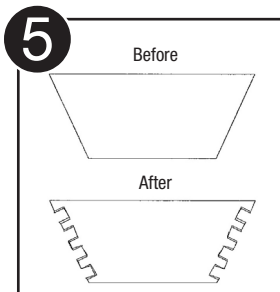


HOW TO MAKE ANGLED DOVETAIL JOINTS

- 5 Rout the tail sockets in the pin boards as previously described.
- 6 Assemble the angled dovetail joints. Plane or sand half pins flush with the tail boards to eliminate the fragile pointed edge.

HOW TO MAKE BOX JOINTS

- 1 Produce a working template, with only the tail openings, to the desired length, and attach it to a backer board, following directions for Method 2. (Pin openings are not used in box and/or hinge joints.)
- 2 Cut through the template into the backer board with a 1/2 inch pattern bit with a 5/8 inch diameter bearing. **Do not use a dovetail bit.** The left most cut in the backer board will be used to position a stop.

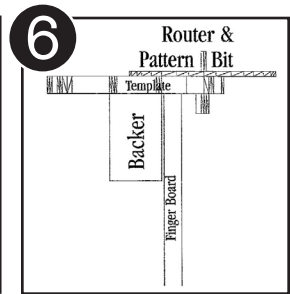
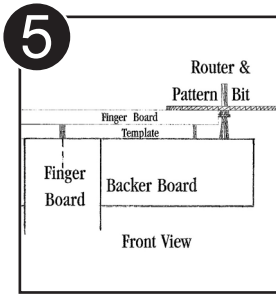
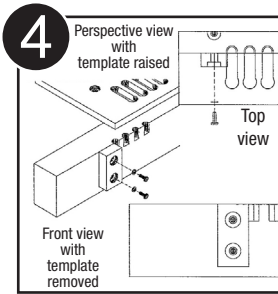
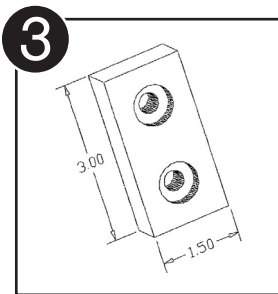


HOW TO MAKE BOX JOINTS

- 3 Make a positioning stop, in roughly the size shown in the illustration. While not necessary, the recessed holes give the jig a more professional look when completed. If holes are not recessed, use 1 ½ inch screws to secure the stop to the backer board.
- 4 Screw the stop to the backer board, aligning the right edge of the stop with the outside edge of the left most cut in the backer board. The stop is intended to position the jig exactly ½ inch from the edge of the finger board when cutting finger sockets. After the stop is attached, clamp the finger board to the jig using the stop to position the board.
- 5 Use a ½ inch diameter straight bit with a 5/8 inch bearing to cut the finger sockets. Place a finger board on top of the template, set the router on top of the board with the bit protruding over the edge, and adjust the depth of cut so the bit touches the backer board.

TIP: Place one board and a business card on top of the working template. Set the router on top of the card and adjust the bit so it just touches the backer board. This will leave the fingers proud of the tail board by only the thickness of the card.

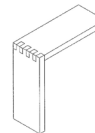
- 6 Insert the router bit through the left most large tail openings. Set the router on top of the working template. Holding it securely, turn the router on and slowly rout a test tail socket keeping the router base flat against the top of the working template
- CAUTION: To avoid damaging the working template, allow the router to come to a complete stop before removing the bit from the template.**



HOW TO MAKE BOX JOINTS

7 Exactly ½ inch from edge of board. If the test cut is not exactly ½ inch wide, adjust the stop slightly and make another test cut, continuing until the cut is exactly ½ inch wide. When the cut is correct, rout all the finger sockets (openings between the fingers). Cut two boards.

8 Assemble joint and check fit. If joint is too tight, sand or pare openings slightly wider using a chisel



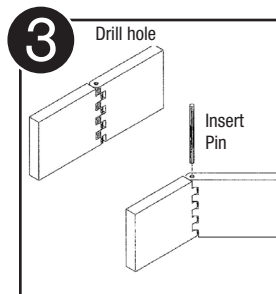
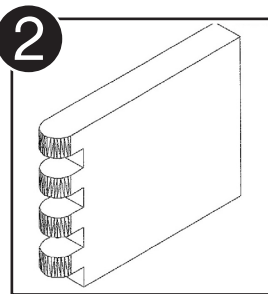
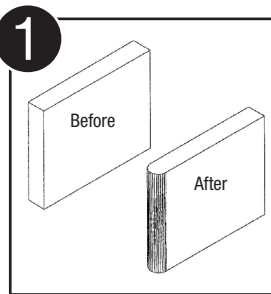
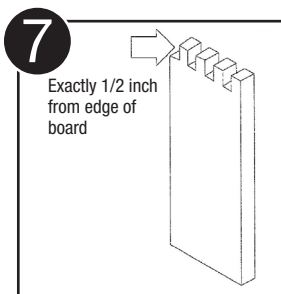
HOW TO MAKE HINGE JOINTS

1 Round the ends of two boards of equal thickness, using a round over bit with a radius equal to ½ the thickness of the board.

2 Using the working jig designed for box joints, cut finger sockets into the rounded end grain edges of both boards.

3 Push the fingers of the two boards together, and secure the boards in a straight line. Drill a vertical hole equal to the diameter of the hinge pin to be used. (Drilling is more successful when the boards are aligned in a straight line rather than at an angle) Insert hinge pin in drilled hole.

NOTE: It's important the hole be in the exact center of the fingers to avoid the joint binding when rotated.



TROUBLESHOOTING

Dovetail joint loose

- Adjust working template to tighten fit
- Check wobble of dovetail bearing and replace if loose
- Check concentricity of dovetail router bushing and replace if not concentric
- Check angle of dovetail bit and replace if it is not 8 degrees
- Correct loose router bushing

Dovetail joint tight

- Adjust working template to loosen fit
- Check angle of dovetail bit and replace if it is not 8 degrees

Tear out of wood at joint

- Most likely cause is the wood being used. Mahogany is one of the best and pine one of the worst to rout. Highly figured boards are difficult to machine
- Use straight grain boards
- Make sure appearance surface is “against” backer board
- Clamp 1/2 inch thick scrap in front of board to reduce tear out
- Finish board before routing. Tear out is minimized with no effect on the glue joint’s glue strength
- Replace or sharpen bits
- Make sure clamps are tight when securing board to backer board

Dovetail or pin end grain surface is recessed

- Increase depth of cut of router bit

Sloped end grain surface on pin or tail

- Backer board is not square to working template

Uneven bottom in sockets

- Tighten clamps to prevent working jig from rocking when cutting sockets