

Cluster #10 - Leigh Dovetail Jig

Primary Use

The D4R dovetail jig can be set up to make through dovetails, half-blind dovetails, rabbetted half-blind dovetails, sliding dovetails, and much more. While the D4R is very versatile and potentially a precision tool, it is complicated and not intuitive to use. Therefore this cluster provides safety training for using the DR4 to make through dovetails only. If you desire other types of dovetails, refer to the Leigh User Guide, which can be accessed through the Woodchips website. Five optional templates expand the D4R's capabilities to include Finger Joints with the F2 template, Isoloc Joints with three Isoloc templates (six patterns) and Multiple Mortise & Tenon Joints with the M2 attachment. The D4R works with any router but two sizes of template guides, 7/16" and 5/8", are required. A router with a 1/2" or 8mm collet is required to use with 8mm shank cutters.

Important Parts

- Two cam-action speed-clamps, one in the front and one in the rear, which secure your stock during routing. They require "thumb tightening" only.
- Cam-clamp step washers that are used to make small adjustments in the clamping pressure of the cam-action speed-clamps.
- Adjustable guidefinger assembly – a total of 26 guide fingers that slide along two bars. The guide fingers can be positioned by the operator to create dovetails of nearly any desired spacing. The guidefinger assembly, which guides the movement of the router, has two surfaces, one for cutting tail boards and one for cutting pin boards. On the D4R jig, all tail boards are cut with an 8-degree dovetail bit that matches the 8-degree fingerguide, and all pin boards are cut with a straight bit.
- Machined-in-place side stops that position your clamped stock laterally.
- A range of 13 different carbide tipped cutter heads designed to be used with different thicknesses of stock and to cut different types of dovetails.
- Two adjustment scales – one for cutting pin boards and the other for cutting tail boards, control the in and out positioning of the guidefinger assembly.
- A guide bushing must be attached to the base of your router. Use only the 7/16" OD guide bushing to make half-blind dovetails and smaller through dovetails. Use the 5/8" guidebushing to make larger through dovetails; never use this guidebushing to make half-blind dovetails.
- Many of the router bits you will use have 8mm shafts. Since we do not have an 8mm collet, use an 8mm-to-1/2" collet spacer that adapts a 1/2" collet for use with 8mm shafted router bits.
- The Vacuum and Router Support (VRS) System magnetically attaches to the guidefinger assembly rails and when connected to the shop vacuum system, can be used to vacuum up most of the router chips. The VRS also

helps support the router while cutting dovetails. Use the VHS system at all times.

The following table is a quick reference guide for selecting the appropriate cutter bit/guide bushing combination.

Tail Board (sides) Thickness	Pin Board (fronts and backs) Thickness	Dovetail Bit	Straight Bit	Guidebushing Outside Diameter	8mm-to-1/2" collet spacer
Up to 1"	1 to 1 1/4"	No. 100	No. 150	5/8" OD	N/A
Up to 1"	5/8 to 1"	No. 90	No. 160	5/8" OD	N/A
Up to 1"	1/2 to 13/16"	No. 80-8	No. 140-8	7/16" OD	Use
Up to 1"	3/8 to 5/8"	No. 75-8	No. 140-8	7/16" OD	Use
Up to 1"	1/4 to 1/2"	No. 70-8	No. 140-8	7/16" OD	Use
Up to 1"	Up to 3/8"	No. 60-8	No. 140-8	7/16" OD	Use
Up to 1"	Up to 1/4"	No. 50-8			Use
			No. 140-8	7/16" OD	

Overview of the Through Dovetailing Process

This section presents an overview of the process for making through dovetails. For this lesson the pin board (fronts and backs) thickness is between 1/2" and 13/16" and the tail board (sides) thickness is no greater than 1". The above table indicates that for pin boards of this thickness you should use an 80-8 dovetail bit, a 140-8 straight bit, and a 7/16" OD guidebushing. If your pin boards are thicker or thinner than this be sure to select the appropriate cutter bits and guidebushing. All cuts will be made on vertical boards with the symbols (and) facing the operator.

To make through dovetails with the Leigh D4R jig you will need:

Four pieces of wood of the appropriate length, width, and thickness for the box or drawer you want to make, and a fifth piece that you will use as a test piece, a very sharp pencil, a one horsepower router and a pair of router collet wrenches, a 7/16" OD guide bushing, a No. 80-8 dovetail bit, a No. 140-8 straight bit and a collet spacer that allows you to use an 8 mm diameter router bit with a 1/2" collet.

For the purpose of explaining how to route through dovetails using the D4R jig, a box or a drawer is comprised of two pin boards and two tail boards. As the picture indicates, the tails are cut with a dovetail cutter bit and the pins are cut with a straight bit. Pin boards are usually the fronts and backs of drawers and boxes and tail boards are usually the sides. The next picture shows how to layout and mark the two tail boards and two pin boards that will comprise your box or drawer. The symbol □ is used to indicate the outside of pin boards and the symbol ▣ is used to indicate the inside of tail boards. A symbol shown in dotted lines indicates the

symbol is marked on the opposite side of the board from the camera. For example, you would write the ☐ symbol on the outside of the back pin board. It is shown in the picture below in dotted lines as though you were looking through the board to see it on the opposite side of the back pin board. Always write the ☐ symbol on the **outside** of the front and back pin boards (or use a piece of masking tape on each board and mark the appropriate symbols on the masking tape). Similarly, mark this symbol ☑ on the **inside** of the side tail boards as shown below. When you insert these boards into the front speed clamp in preparation for routing, be sure to always have these symbols facing you. When you assemble the finished box with the faces properly oriented, any one of the pin board ends will fit any one of the tail board ends.

Now that you have laid out and marked the four sides of your box or drawer, it is time to prepare your router.

Preparing Your Router

1. Attach a 7/16" guidebushing to the base of your router. Insert the guidebushing into the base of the router so the slot in the guidebushing base meshes with the small steel pin fitted into the router base. Then tighten the retaining ring with your fingers only. Do not use pliers on the guidebushing.
2. Insert an 8mm-to- 1/2" collet spacer into a 1/2" collet and thread the collet onto the router spindle. The collet and the collet spacer each have one (and only one) split that runs their entire length. Ensure these two splits are in perfect alignment. If they are not perfectly aligned the router bit will loosen and move while you are routing, spoiling your workpiece.
3. Install the router base onto the router body.
4. Insert the dovetail bit into the collet and tighten it. Be sure to tighten the collet securely or it will move while you are routing, spoiling your piece.
5. Spin the bit and collet with your fingers to make sure it is properly installed and does not contact the guidebushing.

Setting the Spacing of Your Dovetails


After the router is set up and you have laid out and marked the four sides of your box, adjust the finger assembly to determine the spacing of your dovetails.

1. Before adjusting the guidefinger, insert the spacer board and secure it with the back clamp.
2. Next, install the guidefinger assembly on its rails with the Through Dovetails Pins side facing up so you can read the scale.
3. Clamp a pin board vertically in the front clamp and position it snug against the left stop. Ensure the pin board is flush against the bottom of the finger guide assembly.
4. Raise the guidefinger assembly about 1/16" so the finger guides will slide freely laterally when they have been loosened. When raising and lowering the guidefinger assembly keep the left and right sides of the finger assembly level, and always raise and lower the two sides simultaneously.

To reposition the finger guides:

1. Use the square-headed Leigh screwdriver to loosen the guidefinger lock screws on the finger guides that you want to reposition. Do not remove the screws completely or they could become lost.
2. Slide the guide finger to the desired position by placing your finger in the center of the guide finger and sliding it along the guide bars. Either estimate the location of the guide fingers or use a scale to determine their location.
3. Tighten the lock screws of any guide finger you move. Do not over tighten. Ensure all guidefinger lock screws have been tightened before you begin routing or router vibration could cause lock screws to fall out and be lost.
4. Always lower the guide finger assembly down onto the workpiece before routing.

Routing the Tail Boards:

- Remove the pin board and rotate the guidefinger assembly 180 degrees so the Through Dovetails Tails scale is facing up. Position the depth of cut to $\leq 1"$. At this setting, the dovetail cutter bit will cut all the way through the tail boards.
- Clamp a tail board vertically in the front clamp so the  faces the operator.
- Set the depth-of-cut of the dovetail cutter bit, which should be the exact thickness of your pin boards. To do this place a pin board flush under the guidefinger assembly and mark the thickness of this board using a very sharp pencil. This pencil line indicates the depth of cut of the dovetail bit.
- Place the router, with the guidebushing and dovetail bit installed, on the guidefinger assembly and adjust the depth of cut of the router bit so it is level with the center of the pencil line.
- Install the Vacuum and Router Support (VRS) System on its rails and plug in the router. Route out the half-pin and pin sockets. Route only between the rounded guidefinger tips. To minimize tear-out, place a sacrificial board behind the piece you are routing. The sacrificial board will replace the original board spacer and will be held in place by the rear clamp. Ensure the sacrificial board and the board to be cut are flush. When you have completed your cuts turn off the router while it is resting on the guidefinger assembly and VRS. Ensure it has stopped rotating before lifting it off the guidefinger assembly to prevent assembly and/or VRS damage from the rotating bit.
- Rotate the routed tail board 180 degrees and route out the opposite end of the board.

Routing the Pin Boards:

1. Rotate the fingerguide assembly so the Through Dovetail Pins scale is facing up. Do not change the fingerguide spacing.
2. Set both the left and the right width-of-cut scale so the first increment above the "?" mark is directly over the red line.
3. Position your test pin board vertically in the front clamp so the board is snug against the left stop and so the top of the board is butted up against the bottom of the fingerguide assembly.
4. Mark the depth of cut of the router bit. Do this by placing a finished tail board horizontally flush under the fingerguide assembly and mark a thin pencil line with a very sharp pencil across the vertically clamped pin board.

5. Unplug the router, remove the dovetail bit from the router and replace it with the 140-8 straight bit.
6. Place the router on the fingerguide assembly and adjust the depth of cut of the straight bit so that the tip of the straight bit is even with the bottom of the pencil line. Plug in the router.
7. Route out the waste between the pins. When routing out waste between pins start by making a climb cut. Do so by moving the router from right to left making sure you are holding the router tightly because the router bit will want to dig in and make a very aggressive cut. After you make the climb cut, remove the waste from the right side of the cavity and then route out the waste from the left side of the cavity. Then, clean out the balance (center) of the cavity. To minimize tear out, put a sacrificial board behind the piece you are routing. Your sacrificial board will take the place of the red oak spacer board and will be held in place by the rear clamp.
8. Check the fit of the test pins with the tail board you cut previously. Ensure when you test the fit of your joint, the ☒ faces in and the ☐ symbol faces outward.
9. If the fit is a little too tight move the fingerguide assembly AWAY from you by one half of a division of the Through Dovetails Pins scale. If it is very tight move the fingerguide assembly a full division away from you. Re-clamp and re-cut your test board. Repeat as required until you achieve a good fit.
10. Route your two pin boards. When clamping your pin boards in the jig ensure the ☐ is facing you.
11. Fit all four sides together making sure the ☐ symbols face outward and the ☒ symbols face inward.
12. Finally, after completing the fit, ensure all tools and bits are returned to the appropriate boxes and the area is thoroughly cleaned. The router bits used in the dovetail operation should not be used on any other tool.

Safety

- **Always wear eye protection or a face shield.**
- Roll sleeves above the elbow and don't wear loose clothing, loose jewelry or gloves.
- Ensure the jig assembly is securely clamped to a table or bench.
- Always unplug the router when adjusting or replacing the cutter bit.
- Before plugging in the router ensure the cutter head and collet turn freely and are not contacting the guide bushing.
- Ensure the guidebushing is tight.
- Ensure the cutter bit is secured very tightly in the collet.
- Ensure the cutter bits you plan on using are appropriate for the thickness of wood you are using.
- Never allow the rotating cutter bit to contact any part of the jig. Be especially careful not to inadvertently allow the cutter bit to contact the guide fingers.
- Do not tilt the router on the jig.

- Turn the router off and allow it to stop spinning before removing the router from the jig. When removing the router from the jig always move it horizontally.
- Do not route at face level.
- When you turn on the router, make sure to hold it tightly and away from the workpiece and jig as the router has a strong tendency to move laterally when it is turned on.
- Consider wearing hearing protection.

Member Demonstration

Have each member perform the following:

Install a dovetail cutter bit into the router collet.

- Set the depth of the cut as directed by the instructor.
- Route a tail board.
- Remove the dovetail bit and collet spacer from the router.
- Place the router, with the guidebushing and straight bit installed, on the guidefinger assembly and adjust the depth of cut of the router bit.
- Route a test pin board.
- Check fit of joint and recut your test pin board as required to get a good fit.

If a member is uncomfortable with these operations, repeat the hands-on portion of the cluster.