

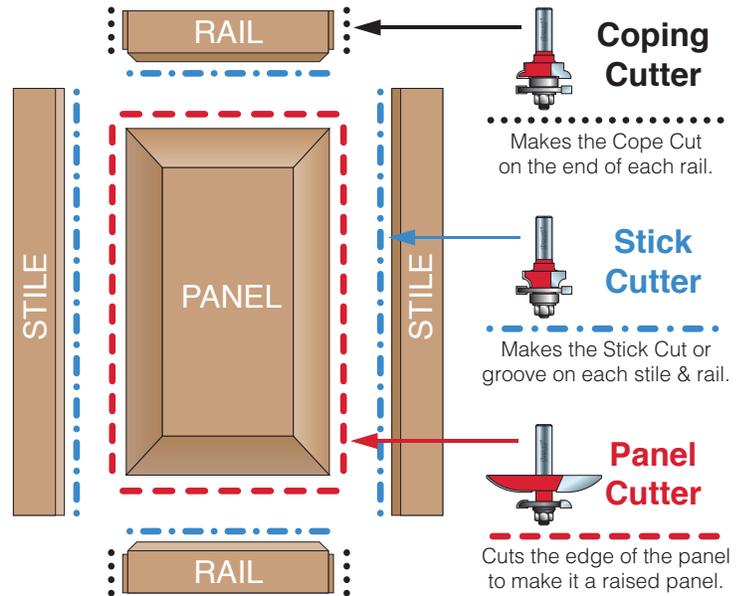
# Raised Panel Doors Made Simple With Freud's 2+2 Raised Panel Bit Set

Congratulations on your purchase of Freud's world class 2 + 2 Raised Panel Bit Set. This revolutionary design combines two small wings that cut downward and two large wings that shear upward for an extremely smooth cut in hardwoods, softwoods, and even plywoods. Freud's mission is to design and manufacture the highest quality, most technically advanced cutting tools available. This set contains everything you need to create the rail & stile and raised panel for beautiful doors for cabinets or any other project you have in mind. Freud develops and manufactures different carbide blends for each cutting application, so you can be sure that the high quality bit you're using was designed specifically for creating flawless raised panel doors in plywood, hardwood and soft wood.

## Introduction To Making Raised Panel Doors

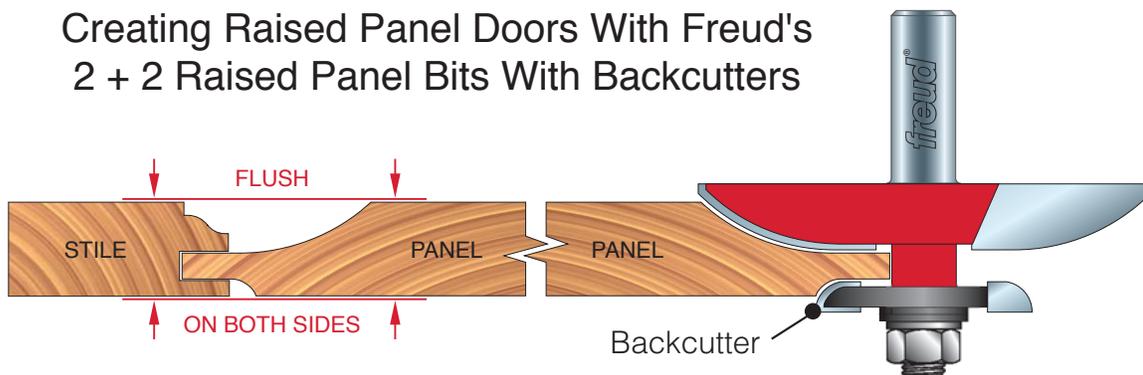
A raised panel door consists of a frame that surrounds a panel. The frame consists of rails and stiles. Each door has two rails and two stiles that form the frame around the panel.

- Door stiles are typically the vertical parts of the door frame. Rails are typically the horizontal parts of the door frame.
- One edge of each rail and stile is machined with a groove to hold the panel. The ends of the door rails are machined with a tongue to fit into the side of the door stile and form a strong glue joint for the frame.
- The machined groove and profile on the edge of the rails and stiles is called a stick cut. The machined tongue and counter profile on the end of the rails is called a cope cut.
- The length of the door stile is the same as the height of the door. The length of the door rail is determined by subtracting the width of both of the stiles from the door width, and then adding the length of both of the tongues on the ends of the rails. Freud's Matched Rail and Stile Bits produce a tongue that is 7/16" long. Freud's One-Piece Rail and Stile Bits produce a tongue that is 3/8" long. Be sure to use the correct dimension when calculating the length of your rails.
- Rails and stiles are typically 3/4" thick and 2" to 2-1/2" wide.

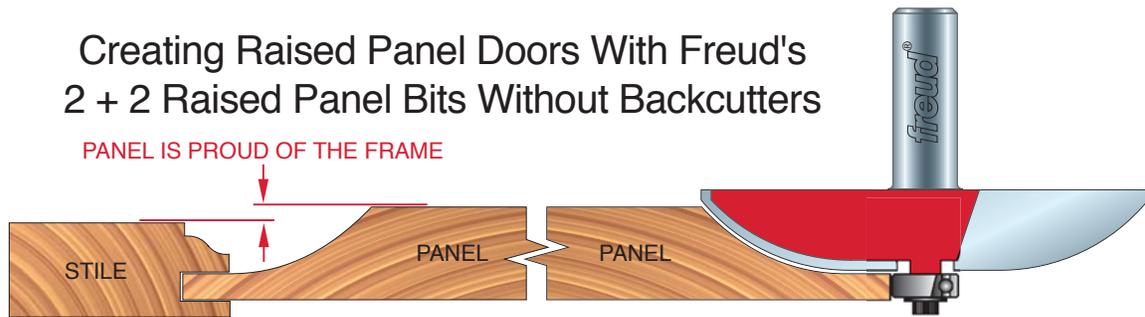


Freud produces 2 + 2 Raised Panel Bits (panel cutters) with and without backcutters. 2 + 2 Raised Panel Bits with backcutters are typically used to create doors with panels that are flush with the frame on both sides when using 3/4" stock. 2 + 2 Raised Panel Bits without backcutters are typically used to create doors with panels that sit proud of the frame when using 3/4" stock. Freud also produces 2 + 2 Raised Panel Bits for 5/8" stock for producing panels that are flush with the front of the frame.

## Creating Raised Panel Doors With Freud's 2 + 2 Raised Panel Bits With Backcutters



## Creating Raised Panel Doors With Freud's 2 + 2 Raised Panel Bits Without Backcutters



### Safety Instructions

Creating raised panel doors is a fun, and rewarding woodworking project. As with any woodworking project, however, your first concern must always be safety.

**⚠ WARNING:** Failure to obey these warnings could lead to serious bodily injury or death:

- Use router bits with a router only
- Carbide is a very hard and brittle material. Slight shocks can damage the carbide. Before each use, check that the bit is sharp and free from damage. DO NOT use the bit if it is dull, broken, cracked or if any damage is noticed or suspected
- Before each use, make sure that at least 80% of the router bit shank is inserted into the collet. The end of the bit shank should be at least 1/8" from the bottom of the collet.
- Before each use, ensure that the collet has been tightened and that the work piece is secure.
- Read and obey all warnings and instructions contained in the router's owner's manual, and for any accessory that is used. If you do not have the correct owner's manual, obtain one from the manufacturer before using the router bit.
- Always wear eye protection or a full face shield complying with current ANSI Standard Z87.1
- Always wear hearing protection.
- Keep body, clothing and hair clear of spinning bit. Do not wear loose hanging clothing or jewelry.
- Use a router table and fence wherever possible. Be sure all guards are in place.
- Bits over 1-1/2" in diameter must only be used with the router mounted in the table.
- Use multiple passes when removing large quantities of material.
- Never use bit on router that will exceed maximum recommended RPM of bit.
- If you have any questions regarding your router bits, please call Freud Customer Service at 800-472-7307. In Canada call 800-263-7016.
- Make sure that you are well rested before working with power equipment.
- Do not use power equipment if you have consumed any drugs or alcohol. If you are taking prescription medication, check with your physician to ensure it is safe for you to operate power equipment.
- Always turn off and unplug the router before removing and installing router bits or making adjustments to the router or router accessory.
- Keep these instructions in a safe place for future reference.

### Making A Raised Panel Door

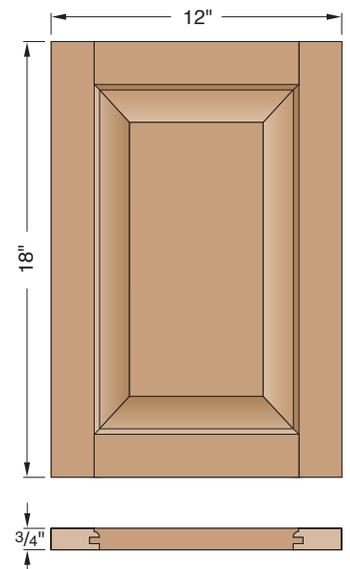
There are five major steps to creating a raised panel door. First, you cut the parts for the rails, stiles, and panels, to size. Then, you make the cope cuts on the end of the rails. Next, you align the stick cutter with your completed cope cuts and make matching stick cuts on the rails and stiles. Then, you make the raised panel cuts on the panel. And finally, you assemble and finish your door.

In the following example we're going to make a raised panel door that is 12" wide by 18" tall. In this example, we'll be using a three piece cabinet bit set that includes a raised panel bit with backcutter. You must use 3/4" thick stock for all parts.

If you've never made a raised panel door before, you may want to make your first one from scrap material to become familiar with the process. To make an attractive, flat, and perfectly square raised panel door, make sure all stock is flat and consistent in thickness. You may also want to label the good side of all of your work pieces lightly in pencil that can be easily sanded off later.

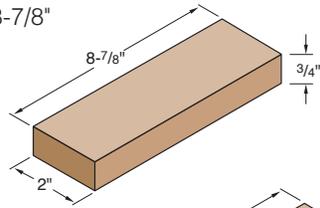
#### You will need the following tools and materials:

A router table, fence, router (3-1/4 HP recommended), straight edge, ruler, wood glue, clamps for gluing up your finished project, 3/4" thick material for your rails, stiles and panel, several pieces of test wood (milled to the same size and thickness as the material you use for your finished door), a coping sled or miter gauge. Instructions for making a coping sled can be found at the end of these procedures.

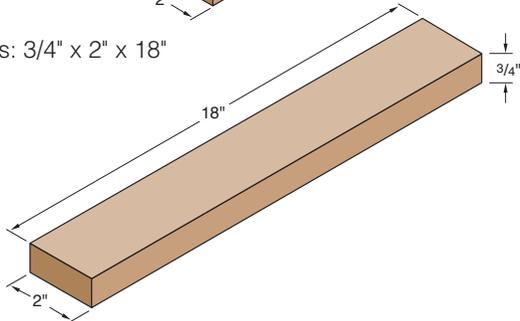


# STEP 1 - Preparing Parts For A 3/4" x 12" x 18" Raised Panel Door

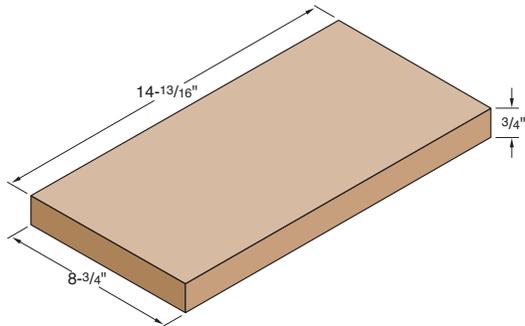
**A - RAILS:** Cut rails: 3/4" x 2" x 8-7/8"



**B - STILES:** Cut Stiles: 3/4" x 2" x 18"



**C - PANEL:** Cut Panel: 3/4" x 8-3/4" x 14-13/16"



How to calculate the length of your Rails:

The length of your rails is equal to the width of your door minus the width of your stiles + 7/8"(tongue length x2)

This example:  $12" - 4" + 7/8" = 8-7/8"$

How to calculate the length of your Stiles:

The length of your stiles is always equal to the height of your door.

This example: = 18"

How to calculate the size of your Panel:

**Length:** The length of your panel is the height of your door minus the width of your rails + 7/8" minus 1/16"\*.

This example:  $18" - 4" + 7/8" - 1/16"* = 14-13/16"$

**Width:** The width of your panel is the width of your door minus the width of both stiles + 7/8" minus 1/8"\*.

This example:  $12" - 4" + 7/8" - 1/8"* = 8-3/4"$

\*Material is removed to allow for expansion and contraction, which occurs mainly across the grain of the wood.

\*Note: Different species of wood expand and contract differently. To be completely accurate and sure you remove exactly the right amount, you may want to understand more about the specific wood you are using. There are many wood shrinkage calculators on the internet.

Tip 1: Cut extra parts for test pieces or error replacements.

Tip 2: Use a Freud LU85 Ultimate Cutoff blade to ensure a perfect end cut on rail and stile parts.

Tip 3: Label the good side of your parts lightly in pencil: Label your rails with an 'R', your stiles with an 'S' and your Panel with a 'P'.

## STEP 2 - Creating The Cope Cuts On The Ends Of The Rails

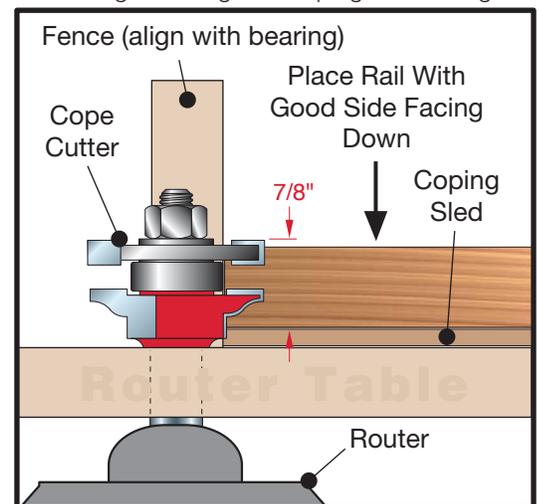
**A. Inserting the cope cutter into the router collet.**

- Unplug the router.
- Set the router speed to the recommended setting for the cutter
- Be sure the collet of the router is clean and in good working order.
- The cope cutter profile is turned downward towards the shank and has a bearing between two cutters.
- Make sure that 80% or more of the router bit shank is inserted in the router collet.
- Tighten the bit securely in the collet.

**B. Setting the cutter height and making a test cut.**

- With the router unplugged, set the cutter height so that the top edge of the carbide tooth is approximately 7/8" above the top surface of the coping sled (if you are not using a coping sled, measure from the top surface of the router table).
- Use a straight edge to set the router table infeed and outfeed fences to be aligned with the bearing on the cutter.
- If you are using a miter gauge, you must also align the fence parallel to the miter gauge track.
- Before plugging in the router be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence.
- Plug in the router and make a test cut across the end of a test piece of stock by using a sled or miter gauge to feed the stock perpendicularly across the cutter.

Installing & Setting The Coping Cutter Height



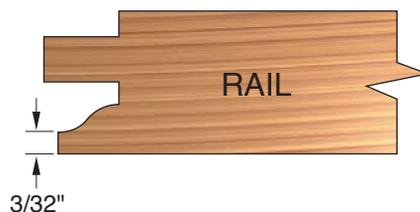
Tip 1: Make the opening between the infeed and outfeed fence as narrow as possible (without touching the cutter) to provide maximum support.

Tip 2: Use a backer board on the sled or miter gauge to reduce the blow-out at the back end of the cope cut.

Tip 3: Using a sled or miter gauge to make end cuts provides more stability because there is more bearing surface against the fence.

**C. Fine tune the cutter height so that the edge of the profile step is approximately 3/32" – As shown in the illustration.**

- Unplug the router.
- If the edge is less than 3/32", raise the cutter slightly.
- If the edge is greater than 3/32", lower the cutter slightly.
- Hold the test cut stock against the cutter to ensure that the end of the tongue was touching the cutter bearing when the cut was made.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence.



**D. Making the cope cuts.**

- Plug in the router and with the good side of the rails facing down; make the cope cut on each end of the rail parts.

## STEP 3 - Creating The Stick Cuts (or grooves) On The Rails & Stiles

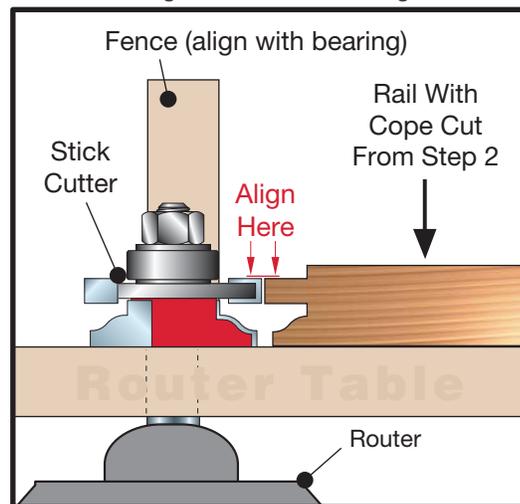
**A. Installing the stick cutter.**

- Unplug the router.
- Be sure the collet of the router is clean and in good working order.
- Set the router speed to the recommended setting for the cutter.
- The stick cutter profile is pointed away from the shank and has a bearing above the two cutters.
- Make sure that 80% or more of the router bit shank is inserted in the router collet.
- Tighten the bit securely in the collet.

**B. Setting the cutter height and making a test cut.**

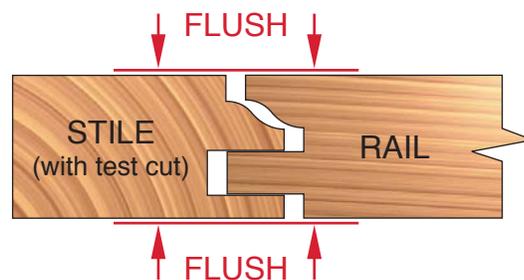
- With the router unplugged, use one of the completed cope cuts on the end of your rails as a guide to set the cutter height.
- The top of the groove cutter and the top of the tongue on the cope cut should be perfectly aligned as shown in the adjacent diagram.
- Use a straight edge to set the router table infeed and outfeed fences to be aligned with the bearing on the cutter.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut along one edge of a test piece of stock.

Setting The Stick Cutter Height



**C. Fine tuning the cutter height.**

- Unplug the router.
- Test fit each cope cut into the stile cut on the test piece. Both sides should be flush.
- If the height is not right adjust the cutter up or down.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence.
- Plug the router in and make another test cut and repeat the procedure until you achieve the correct alignment.



**D. Making the stick cuts (grooves).**

- With the good side of the rails and stiles facing down, cut a groove (stick cut) on one edge of each rail and stile part.

Tip 1: Use consistent pressure and feed rate when making the stick cuts. This ensures a consistent and straight groove along the edge of each rail and stile.

Tip 2: When making the stick cuts, use feather boards to hold the material safely on the table and use push sticks for safety.

## STEP 4 - Creating The Raised Panel

### A. Installing the raised panel cutter.

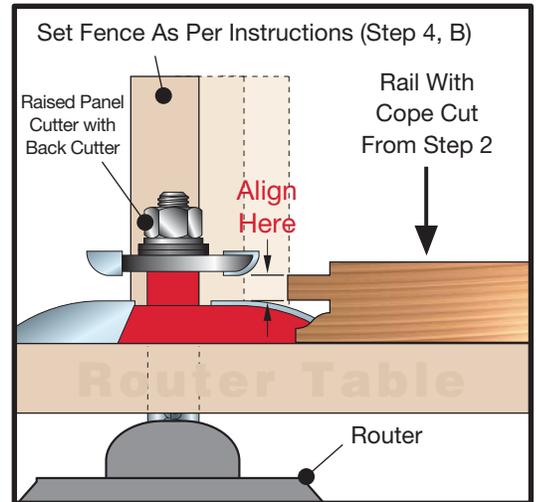
- Unplug the router.
- Be sure the collet of the router is clean and in good working order.
- Make sure that 80% or more of the router bit shank is inserted in the router collet.
- Set the router speed to the recommended setting for the cutter.
- Tighten the bit securely in the collet.

### B. Setting the cutter height and making a test cut.

- For a raised panel cutter with a back cutter, with the router unplugged, set the cutter height so the tongue of the cope cut on your rails is aligned with the gap between the back cutter and the panel cutter.
  - For a raised panel cutter without a back cutter, with the router unplugged, set the cutter height so the remaining tongue thickness on the panel is 15/64".
  - Set the fence depth forward so that the cutter will remove 1/3 of the material.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut on one edge of the test panel.

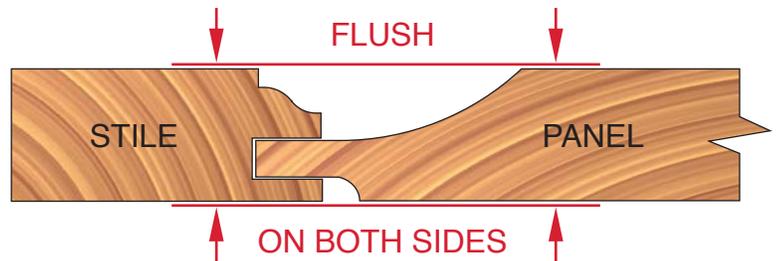
- Unplug the router.
- Set the fence depth back so that the cutter will remove the next 1/3 of the material. Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut pass on the cutter.
- Unplug the router.
- Set the fence so that it is aligned with the bearing on the cutter. Before plugging the router in, be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut pass to remove the final portion of the material.

Setting The Raised Panel Cutter w/ Backcutter



### C. Fine tuning the cutter height.

- Unplug the router.
- Fit the test panel into the rail and stile parts to ensure that the panel will fit snugly into the groove.
- Adjust the cutter height and repeat B if necessary.



### D. Making the raised panel cuts.

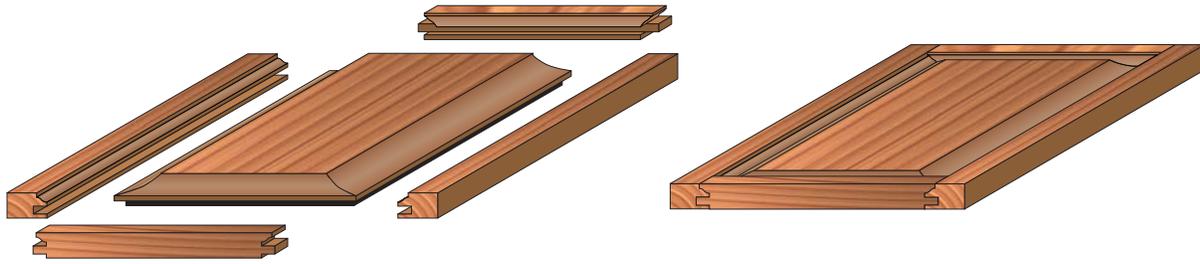
- Unplug the router.
- Reset the fence to remove 1/3 of the material from the panel.
- Before plugging in the router be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut along the end grain of the panel.
- Rotate the panel 1/4 turn counter-clockwise and make a cut with the grain.
- Rotate the panel 1/4 turn counter-clockwise and make a cut along the end grain of the panel.
- Rotate the panel 1/4 turn counter-clockwise and make the final cut on the panel.
- Unplug the router.
- Reset the fence to remove the next 1/3 of the material from the panel. Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make four additional passes in counter-clockwise sequence as above.
- Unplug the router.
- Set the fence so that it is aligned with the bearing on the cutter. Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make the final four passes in a counter-clockwise sequence.

## STEP 5 - Assembling And Finishing The Door

### A. Dry fitting the door parts.

- Assemble all of the parts of the door and verify that the final door size is correct.
- If you cut your rails and stiles wider than your finished width, rip them down to the correct size on your table saw.

Tip 1: Tip: Use a Freud LM74 Glue Line Rip blade on your table saw to create a perfect finished edge on the rails and stiles.



**B. Pre-finishing the door parts.**

- Apply finish to the raised panel before assembling the door to ensure consistent coverage where the edge of the raised panel tucks into the grooves of the rails and stiles.
- Do not apply finish to the cope cuts on the rails or the stick cuts at the end of the stiles, as this will weaken the glue joints on the finished door.

**C. Glueing and assembling the door parts.**

- Glue and clamp the cope cuts at the end of the rails into the stick cuts on the stiles.
- Do not glue the raised panel to the rails and stiles. The panel is intended to 'float' inside the rail and stile frame to allow expansion and contraction of the wood, due to heat and humidity.

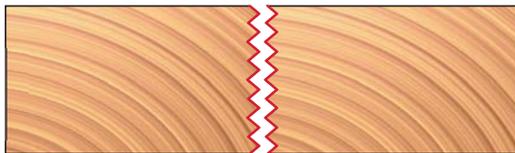
**Optional Glue Joining Instructions For Making Large Panels**

When making wider panels, you'll want to make a glue joint for a superior fit and secure door. Using Freud's 99-038 Raised Panel "V" Joint Bit or the 99-031 Reversible Glue Joint Bit, you can make stronger joints by creating a larger surface area for glue. These bits are ideal for joining narrow boards to form wide panels such as what is required for larger raised panel doors. The joint produced aligns the pieces and provides more glue surface for a strong, invisible joint.

'V' Joint Bit



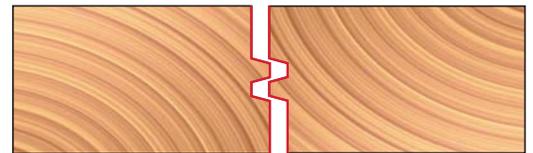
Item # 99-038



Glue Joint Bit



Item # 99-031



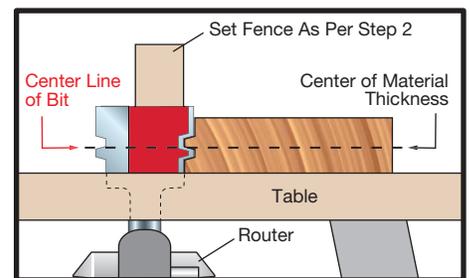
**STEP 1: Insert The Glue Joint Bit Into The Router Collet.**

- The Glue Joint Bit should only be used in a table mounted router.
- Unplug the router.
- Be sure the collet of the router is clean and in good working order.
- Set the router speed to the recommended setting for the cutter.
- Make sure that 80% or more of the router bit shank is inserted in the router collet.
- Tighten the bit securely in the collet.

Glue Joint Bit



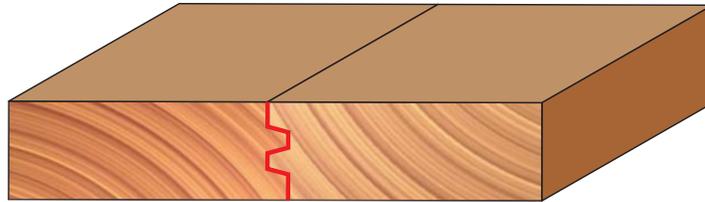
Item # 99-031



Tip 1: For best results, plane all material to consistent thickness and joint the edges before using the Glue Joint Bit.  
 Tip 2: When making the cuts use feather boards, hold down and use push sticks for safety and best results.  
 Tip 3: A router table fence with separately adjustable infeed and outfeed fence faces such as the Freud SH-5 provides the capability to use the Glue Joint Bit to straighten and flatten imperfect board edges and eliminates the need to use a jointer.

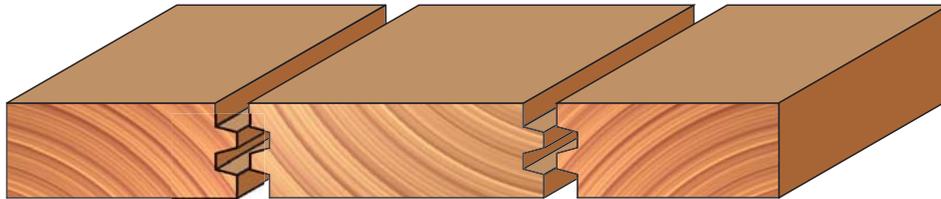
## STEP 2: Set The Cutter Height And Make A Test Cut.

- Unplug the router.
- The height of the cutter above the router table must be equal to half the material thickness plus 5/8".
- Use a straight edge to set the router table infeed and outfeed fences to be aligned with the smallest cutting diameter of the bit, as shown in the illustration in step 1.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make a cut along the edge of a piece of sample stock.
- Cut the sample piece in half and flip one of the cut pieces. Check the fit of the joint.
- Unplug the router.
- Adjust the cutter height if necessary to make the surfaces flush. If the piece that was flipped is higher than the piece that is face up you need to lower the bit. If the flipped piece is lower you need to raise the bit.
- Before plugging the router in be sure that the bit rotates freely and does not contact any part of the router, the router table or the router fence. Plug in the router and make another test cut.



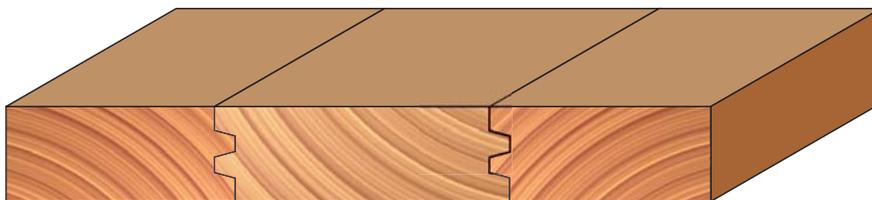
## STEP 3: Create Glue Joint Edges

- Label the best surface of each board as "Face"
- Run one edge of a board with the side labeled "Face" up
- Flip the board and run the opposite edge with the "Face" down.
- Repeat these steps on all but two of the pieces.
- One of the remaining two pieces should be run "Face" side up on one edge only.
- The last should piece be run with the "Face" side down on one edge only.



## STEP 4: Glue And Clamp The Panel

- Turn all of the pieces face side up.
- Arrange the pieces so that the mating edges are adjacent and the board on each end has a flat edge.
- Apply glue to all edges and use plenty of clamps to secure the panel until the glue dries.
- Remove the clamps, sand or plane the panel flat and smooth and trim to final size.

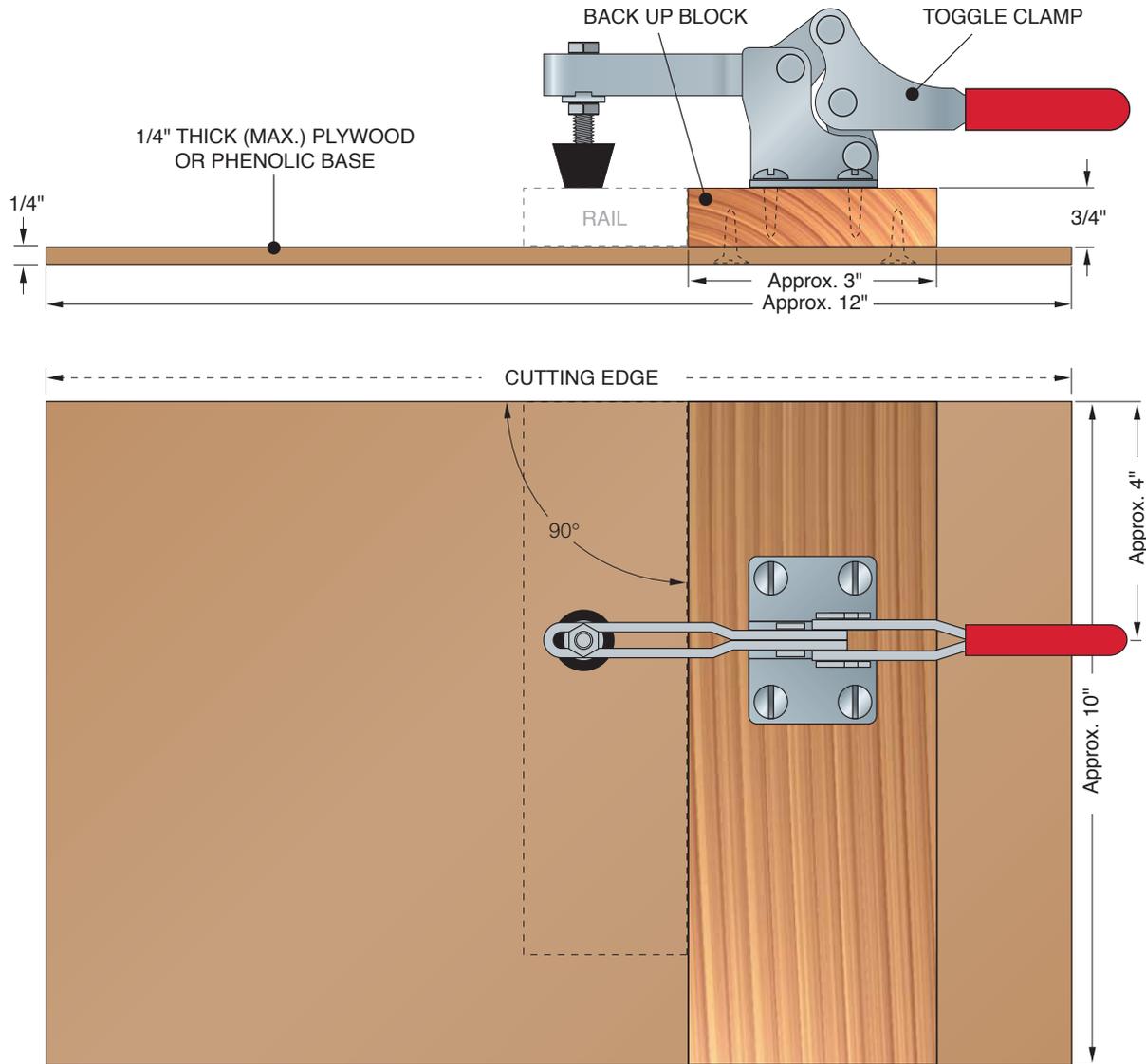


## Instructions For Making A Coping Sled

Using a coping sled can ensure safe, stable cuts when routing; particularly when routing the narrow cross-grain cuts on the ends of your rails. The large phenolic or plywood base provides more surface area for safer feeding, and the toggle clamp secures the work piece in place and keeps it perpendicular to the fence when cutting a short edge. The back up block helps prevent tear-out and can also be used as a template for future cuts.

Making a Coping Sled:

- Cut a piece of 1/4" thick phenolic or plywood 12" x 10" for a base. Be sure that the piece is flat and stable.
- Cut a piece of 3/4" thick wood 3" x 10" for a back up block.
- Attach the back up block to the base, as shown below, so that it is 90 degrees to the cutting edge. Be sure that the cutting edge is straight and true; Trim the edge on a table saw if necessary.
- Attach the toggle clamp to the top of the back up block. Ensure that it's in a suitable position for clamping down your work piece.



To find out more about Freud products or to order a catalog visit

[www.FreudTools.com](http://www.FreudTools.com)

Freud America, Inc. 1-800-472-7307 (U.S.) 1-905-670-1025 (Canada)

© 2004 Freud America, Inc. No portion of this piece may be reprinted without written consent of Freud America, Inc. The color Red on Router Bits is a US Registered Trademark of Freud America, Inc.