



Under Table Routing and Shaping with the Double-Tilt System

SAFETY

WARNING

READ, UNDERSTAND AND FOLLOW ALL THE INFORMATION IN THIS OWNER'S MANUAL.

The meanings of WARNINGS, CAUTIONS, AND NOTES are:

WARNING

A **WARNING** is given when failure to follow the directions could result in injury, loss of limb, or life.

CAUTION

A **CAUTION** is given when failure to follow the directions could result in temporary or permanent damage to the equipment.

NOTE

A **NOTE** is used to highlight an important procedure, practice or condition.

NOTE

It is important to provide adequate lighting in your shop area.

Eye Protection

- Always wear eye protection when you use power equipment. Use goggles, safety glasses or a face shield to protect your eyes.

- Goggles completely surround and protect your eyes. Many goggles will also fit over regular glasses. Be sure your goggles fit closely, but comfortably.
- Safety glasses don't fog as easily as goggles and can be worn all the time. Regular eyeglasses normally have only impact resistant lenses. They are not safety glasses.
- A face shield protects your entire face. And you can flip it up out of the way when you don't need it. A face shield can be used with regular glasses.

Ear Protection

- Prolonged exposure to high noise levels from high speed power equipment can damage your hearing.
- Hearing protectors screen out noise that can damage your ears. Wear hearing protection when you are exposed to high intensity power equipment noise.

WARNING

- ◆ Read, understand and follow the Mark V/7 Owner's Manual and the manual for every power tool you use.
 - ◆ Additional warnings, cautions and instructions and operating techniques are provided in the Shopsmith book, Power Tool Woodworking for Everyone. (A copy is included with your new Mark V/7, and is also available from Shopsmith.)
 - ◆ Wear proper eye and ear protection. Also, wear a dust mask.
-

Setting Up the Under-Table Shaper Mode

1. Turn off and unplug the Machine.
2. Using your 5/32" Allen wrench, remove the Saw Table Insert (138) and replace it with the Shaper/Router Table Insert (see figure C-89).

NOTE

If dust collection chute is attached to the bottom of the Shaper/Router Insert, remove prior to attaching the insert to the worktable.

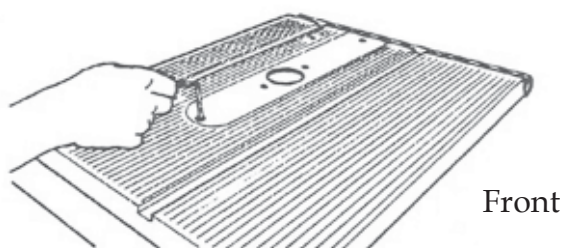


Figure C-89

3. Screw the Shaper Guide Pins into the Shaper/Router Table insert. Tighten slightly with a flat-head screw driver.
4. Slide the Headstock all the way to the left on the way tubes so that the Headstock is up against the Power Base Mount. Tighten the headstock lock.
5. Mount the Shaper Arbor (555117) on the main spindle. Tighten the setscrew against the flat of the spindle.
6. Position the worktable surface just above the top of the Headstock. Tighten the table height lock. Then loosen the tilt lock and tilt the table to the left 90°. Tighten the tilt lock.
7. Using your 5/32" Allen wrench, remove the Tie Bar Guard (155) that is attached to the Tie Bar underneath the worktable.
8. Dismount the worktable by loosening the table height lock and pulling the worktable straight up, as shown in figure C-90.

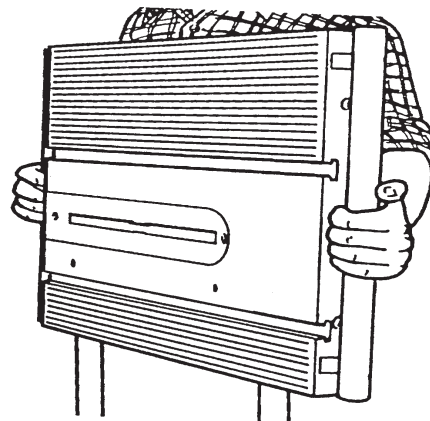


Figure C-90

9. Turn the worktable 180° so that the surface of the worktable faces the opposite direction and remount into the carriage. To remount the worktable, loosen the table height lock and place the support tubes in the carriage. Gently rock the worktable front-to-back until the racks engage the pinions and the tubes drop smoothly into the holes. Sometimes it helps to slowly turn the table height crank clockwise while you rock the table. This will position the support tubes at exactly the same height and get the racks started properly in the pinions. Lower the table all the way in and tighten the table height lock.
10. Slide the carriage toward the headstock until it butts up against the rubber spacer next to the headstock. Secure the carriage lock.
11. Check and secure if necessary, the headstock lock, the carriage lock, the table height lock and the worktable tilt lock.
12. Loosen the locking knob on the base mount on the right hand side of the way tubes (xxx). Grasp the way tubes with both hands close to the base mount, then raise the machine into the vertical position. Tighten the base lock on the back side of the Mark 7, then rock the way tubes side-to-side. Retighten if possible. This helps take the play out of the base pivot and keeps the Mark 7 from wobbling.
13. Loosen the quill feed lock and the table height lock. With one hand, turn the quill feed to raise the shaper arbor up through the hole in the shaper/router table insert. At the same time, with the other hand, move the

- worktable in and out by turning the table height crank. Adjust the worktable so that the shaper arbor is centered in the shaper/router table insert. When centered, secure the table height lock and secure the quill lock (with the quill extended so that the shaper arbor is above the worktable).
14. Using a 11/16" wrench, remove the hex nut and rub collars on the end of the shaper arbor. First place a rub collar back on the arbor. Then put the cutter on the arbor. Make sure to position the cutter with the cutting edge facing the direction appropriate for the direction the work piece will be fed into the cutter. See the instructions on page A-12 for rotation information.
 15. Install another rub collar onto the arbor. Then place the tongue washer on the arbor with its "tongue" in the arbor's slot. Finally, thread the hex back on the arbor as shown in figure C-91.
 16. Adjust the height of the cutter to the desired profile by loosening the quill feed lock and rotating the quill feed handle. Be sure to secure the quill feed lock when completed.
 17. Attach the Shaper Guard Assembly to the worktable by sliding the T-Nut attached to the post into the T-Slot (Miter Gauge slot) on the worktable closest to the carriage. The T-Nut should be slid in from the outfeed side of the cutter/worktable and positioned so that the guard shield fits over both pins on the Shaper Table Insert. Lower the guard shield so that the bottom is 1/8th inch above the workpiece. Lower the Brush Assembly so that is 1/8th inch above either the workpiece or the worktable, whichever is appropriate.
 18. To add dust collection, attach a 2 1/2 inch hose to the top of the shaper guard assembly.

WARNING

Always use a rub collar under all shaper cutters. Also, be sure the tongue washer is correctly installed and directly under the top hex nut, and that the nut is tight.

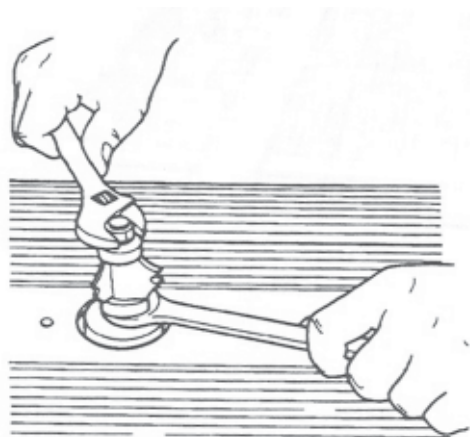


Figure C-91

WARNING

When returning from the Shaper mode to other operations using the worktable, be sure to replace the Tie Bar Guard to the Tie Bar located under the Worktable.

Under-Table Shaping Operations

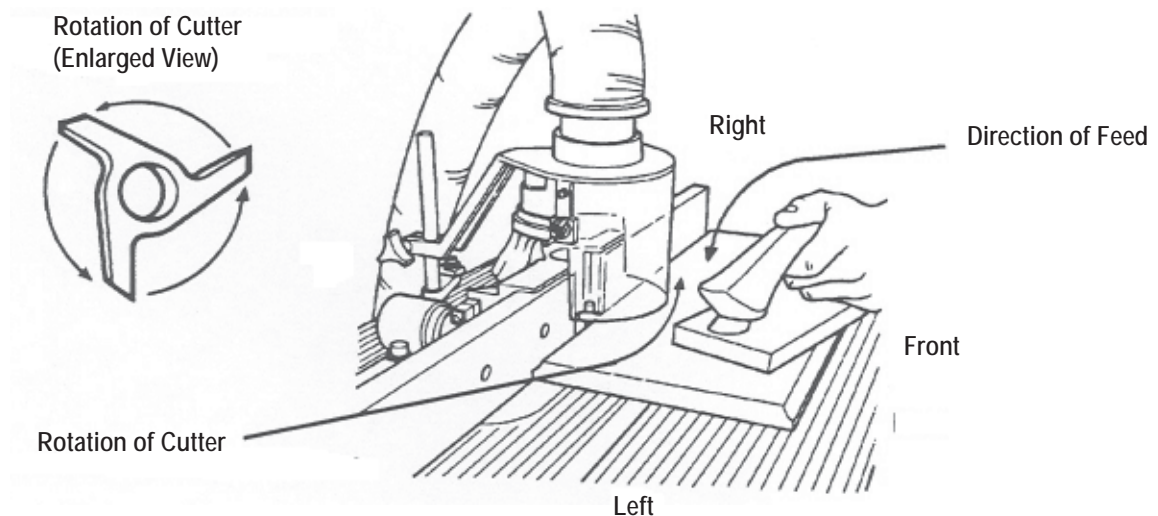
WARNING

- ◆ Internal routing or shaping of the edge of a hole (or small opening less than 6" in diameter) in any shape should not be attempted.
- ◆ Never "freehand" shape or route. Always use pins with piloted router bits or rub collars with shaper cutters.
- ◆ Never attempt pin routing or pin shaping when removing the entire edge of the workpiece.
- ◆ Try to free the workpiece so that the cutter is cutting in the same direction as the wood grain, though this is not always possible.
- ◆ Always feed the workpiece against the rotation of the cutter. Otherwise, a kickback will occur.
- ◆ Feeding the workpiece too fast and/or exceeding the maximum recommended 1/8" depth-of-cut could result in "stalling" the motor or belt slippage.
- ◆ Make sure the cutting edge of the shaper cutter faces toward the direction of the workpiece feed. For forward direction, this

WARNING

is right to left, in reverse mode.

- ◆ Feed the workpiece at a slow, steady rate. Use extra care in shaping or routing workpieces with figured grain or knots, as these may cause kickbacks.
- ◆ Use a push stick to feed workpieces up to 3" wide. When it is necessary to push a narrow workpiece underneath the circular shield, use a long piece of scrap wood to feed the workpiece into the cutter and use a feather board to hold the workpiece in against the shaper fence.
- ◆ Always use a fence (like the Shopsmith Shaper Fence) or table insert pins and rub collars to guide and support the workpiece. Failure to do so could result in bodily injury.
- ◆ Always use a shaper fence when removing the entire edge of the workpiece.
- ◆ Always use a fence (such as the Shopsmith Shaper Fence) when using router bits or shaper cutters without pilots or rub collars.



NOTE

The Speed Chart for the Mark 7 is programmed into the control panel of the PowerPro headstock. Refer to page D-2 of this manual for operating instructions. If your operation is not listed in the speed chart, refer to the Manufacturer's recommendations.

Safety**WARNING**

Before performing Under-Table Shaping operations:

- Read the SAFETY section, especially for the Under-Table Shaping mode.
- Complete ALL the Assembly and Alignment procedures.
- Secure locks.

Operations

Several things affect the quality of cut made by the Mark 7 including cutter sharpness, cutter speed, cutter diameter, cutter length and profile, feed rate and wood hardness. To get the most from you Mark 7, you must consider all these elements every time you use it. Also, you should carefully choose wood stock with straight grain and free of knots.

There are several ways you can best use the Mark 7 for Under Table Shaping. Go to the section which best describes the activity you wish to perform:

- ♦ *Shaping and Routing*, using the Optional Shopsmith Shaper Fence.
- ♦ *Pin Shaping and Pin Routing*
- ♦ *Routing with Specialty Bits*, which remove the entire edge for decorative edges or jointing use the Optional Shopsmith Shaper Fence.

Shaping and Routing

You can use pins which thread into the shaper table insert, or a shaper fence when you use the Mark 7 for shaping or routing. However, we strongly recommend using the Optional Shopsmith Shaper Fence whenever possible, since it offers the most support for the workpiece and it provides more efficient dust collection. And you must always use a shaper fence when you remove the entire edge of the workpiece.

Some customers may already own a Shaper fence. If you do not own one, you should buy the Shopsmith Shaper Fence (part number 555144) before operating the Mark 7 as a shaper. The following instructions and illustrations show use of the Shaper Fence. Unless you will be pin shaping or pin routing irregular stock with piloted bits, we recommend the Fence.

Shaper Cutters

If you are not using Shopsmith Shaper Cutters, make sure that the cutters you use are rated for 12,000 rpm. Shaper cutters can cut many different profiles. A glue joint shaper cutter, for example, is designed to cut the full profile of the workpiece. A combination cutter such as the bead and quarter round, is designed to cut a profile on part of the workpiece edge. This partial cut may constitute the entire operation, or it may be just part of a profile which is produced by several passes with the same cutter or in combination with other cutters

WARNING

Never use shaper bits larger than 2-1/8" diameter, and which have an exposed cutting edge of 2-1/2".

A variety of shapes are possible by changing cutter height, depth of cut, worktable height and sequence of passes. Shaper rub collars control the lateral depth of cut when pin shaping. Since the collars turn with the cutter, they tend to score the wood. This can be minimized by bearing against the collars with light contact and by keeping

collars clean and free of nicks and burrs.

You should sharpen the shaper cutters before you use them. Sharp cutter can determine the quality and efficiency of a cut. Figure D-54 shows a shaper cutter being sharpened on an oil stone. For more information on how to sharpen shaper cutters, see the "Sharpening" Chapter in the Shopsmith book, Power Tool Woodworking for Everyone, 4th edition.

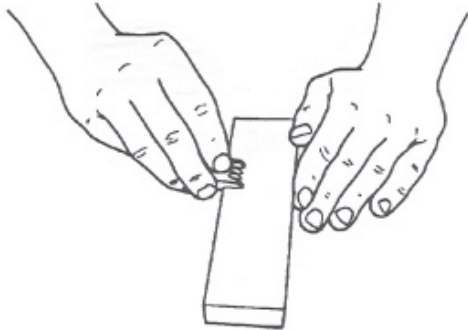


Figure D-54

A 1/2" shaper spindle (555117) with rub collars is included with the Mark 7. You may also purchase the optional Ball Bearing Shaper Spindle (order part number 555472). This spindle has ball bearings in the collars which permit the collars to roll with the workpiece and assure a smooth, burn-free result. This means there is much less tendency for the workpiece surface to be marred as the workpiece presses against the collars during the shaping operations.

To assemble the collars and cutters on the Shaper Spindle.

NOTE

Follow the instructions for setting up in the Under-table Shaper Mode in Section C of this manual.

Router Bits and Specialty Bits

You can use most 1/2" Shank router bits with the Mark 7 using the Shaper Fence, but you can use only piloted router bits for pin routing. You can also use any 1/4" shank router bit by inserting the router bit's shank into the optional 1/4" Router Chuck (order Part Number 514632).

WARNING

Never use router bits or specialty bits larger than 2-1/8" diameter, or which have an exposed cutting edge of 2-1/2" or longer.

Also, before you proceed, make sure that:

- ◆ Mark V is unplugged.
- ◆ Shaper Insert (dust chute removed) is installed.
- ◆ All Assembly and Alignment steps have been performed.

FOR SHAPING OR ROUTING USING A SHAPER FENCE, go to section directly below.

FOR PIN SHAPING OR PIN ROUTING, go to Page D-30.

FOR USING RAISED PANEL BITS USING A SHAPER FENCE, go to Page D-32.

Under-Table Shaping or Routing Using a Shaper Fence

Install a Shaper Fence

1. Install a shaper fence on the worktable according to the instructions which came with it. The Mark 7 shaper fence is being installed in Figure D-55, and it is being secured under the worktable by a square nut in Figure D-56.

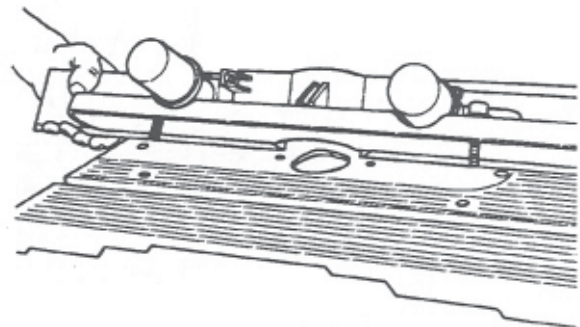


Figure D-55

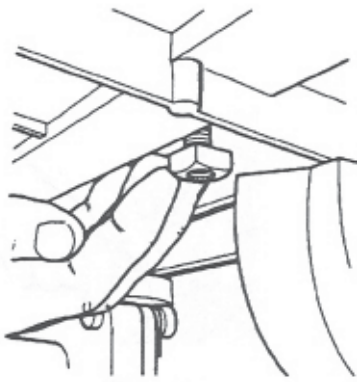


Figure D-56

- Use a straightedge to set the fence boards parallel with each other, as shown in Figure D-57.

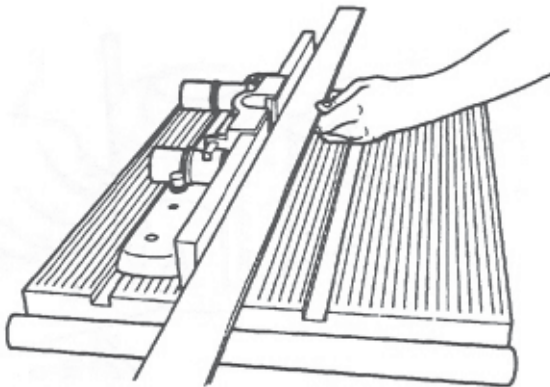


Figure D-57

NOTE

If the fence boards will not set parallel with each other, a slight onetime shimming will be necessary. Before you shim, the back of the shaper fence must be securely attached to the worktable.



To shim, loosen the slotted screws holding the boards to the fence brackets. Insert pieces of masking tape between the back, bottom side of the boards and the face of the brackets. Stick the tape to the brackets. Then tighten the screws and check that the boards are parallel. Repeat, if necessary.

- After the fence boards are parallel with each other, tighten the shaper fence's socket head cap screws, as shown in Figure D-58.

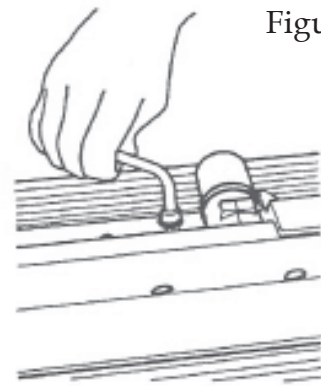


Figure D-58

- Adjust the fence boards side to side by loosening the slotted screws which hold the boards to the fence brackets. The cutter should not touch the boards ends. A 1/8" clearance is sufficient. Tighten the screws.
- If you are edge shaping or routing and part of the edge remains uncut, you must adjust both the infeed and outfeed boards in line with each other, and to the depth of cut you want. Do this by using 5/32" Allen wrench to loosen the cap screws which hold the rear fence guard to the fence assembly. Then turn the knobs in the back of the shaper fence. Each click of a knob is 1/64".
- When the shaper fence is adjusted for the proper depth of cut, securely tighten the cap screws on the back of the shaper fence.



If you are removing the entire edge of the workpiece, the infeed and outfeed fences must be offset in order to support the workpiece before and after cut.

INSTALL THE GUARD ASSEMBLY

- Place the guard assembly's base clamp to the right rear edge of the worktable and tighten the knob on the bottom of the clamp with a 9/16" wrench, as shown in Figure D-59.

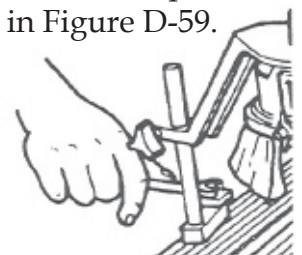


Figure D-59

8. Lower guard shield in place of 1/8" from the top of the workpiece and centered over the cutter. See Figure D-60



Figure D-60

9. Tighten the three-lobed knob on the guard support.
10. Attach the Dust Collector hose to the top opening of the guard.
11. Attach one or more feather boards, if possible.
12. Attach the telescoping legs to the worktable.

MAKE THE CUT

NOTE

Determine whether the Mark 7 needs to be operating in Forward or Reverse Mode based up the direction of the cutter.

13. Adjust the speed in accordance with the speed chart and turn on the Mark 7.
14. Position the workpiece on the proper side of the worktable, as shown in Figure D-61.

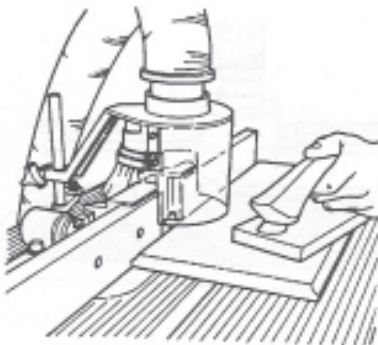


Figure D-61

NOTE

If you are removing the entire edge of the workpiece, run a 12" long piece of scrap wood approximately 4" through the cutter. Turn off the Mark 7, then adjust the outfeed fence outward to meet the finished edge of the workpiece.

WARNING

Avoid taking deep cuts with straight or non-piloted router bits. With the exception of single-pass dovetail cuts, limit the depth of cut to 1/4" for each pass when using straight or not-piloted router bits up to 1/2" diameter. When using shaper or router bits over 1/2" diameter, limit the depth of cut to 1/8" per pass.

Make cuts in more than one pass by adjusting the fence until the final depth is reached. Cuts made with the grain of the wood are always smoother and easier than cuts made against or across the grain. For this reason cross-grain and against-the-grain cuts should always be made slowly. When shaping is required on all four edges of a workpiece, make the end-grain cuts first so any splintering is removed by the edge-grain pass. When it is necessary to push a narrow workpiece under the guard, use a long piece of scrap wood and a feather board to hold the workpiece against a fence.

Whenever possible, make the pass with the cutter under the workpiece. This allows the workpiece itself to act as an added guard. Keep fingers away from the cutting area and hook your fingers over the edges of the workpiece to guard against slipping. Figure D-62 demonstrates a door panel bit cutting under the workpiece.

NOTE

The illustrations show the spindle turning counterclockwise with the direction on the control panel on forward. If the cutters are situated so that the spindle needs to operate in the reverse direction, the feed directions need to be opposite of that shown in the illustration.

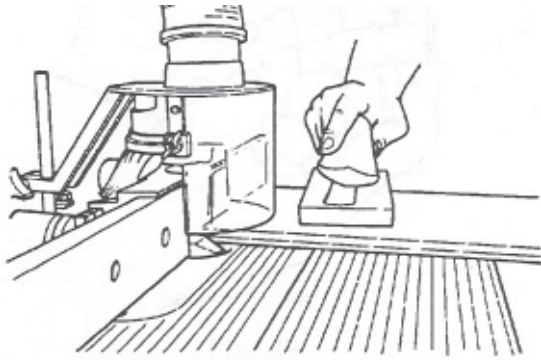


Figure D-62

Using Feather Boards with a Shaper Fence

Feather boards help hold a workpiece in the proper position to the cutter and prevent the workpiece from kicking back. Shopsmith recommends using as many feather boards as feasible to support the workpiece horizontally and vertically. Here are instructions for making a feather board holder to be attached to the top of each side of the shaper fence. Figure D-63 illustrates two feather board holders already installed on the shaper fence.

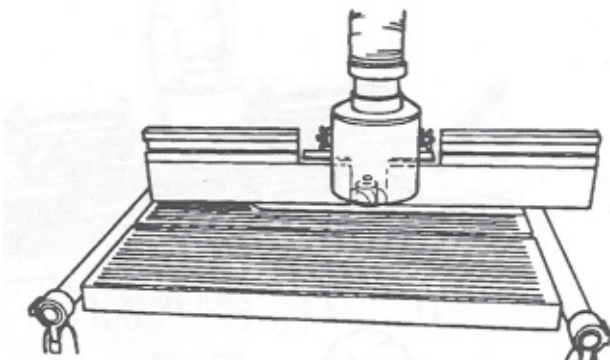


Figure D-63

Make a Feather Board Holder

Tools Needed:

- Electric Drill (or Mark 7 in drill press mode)
- 5/32" drill bit with countersink
- Light mallet or hammer
- Six slotted (or Phillips head wood screw) #6, 2-1/2" long
- Medium slotted screwdriver (or Phillips screwdriver)

1. Each feather boards holder should be hardwood, and should measure about 2" wide x 3/4" thick x 9" long. *You may want to work with 18" long stock, then cut in half.)
2. Cut a groove 3/4" wide x 1/4" deep down the middle for the entire length, as in Figure D-64. Place the cut toward the "top" side of the workpiece.

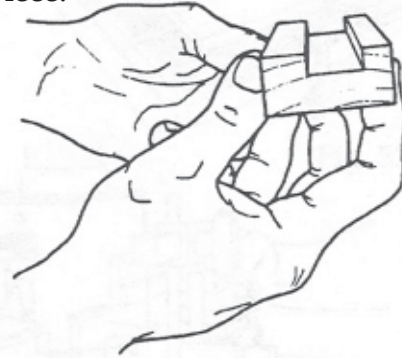


Figure D-64

3. Use the electric drill and a 5/32" bit to drill three holes through the width of each workpiece, as in Figure D-65. Countersink each hole deep enough for the head of the wood screws you will be using. Make sure you don't drill into the groove.

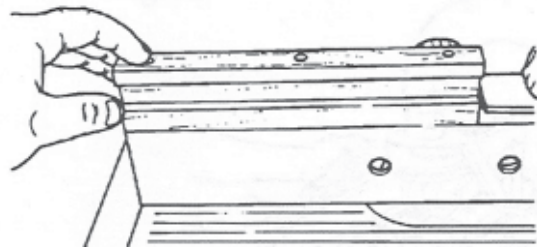


Figure D-65

4. Put a screw in each hole so the screw point is flush with the bottom of the workpiece.
5. Place the feather board holder on top of each fence and line it up with the end of the fence board. See Figure D-65.
6. Lightly tap each screw head so that it punches a mark on the top of the shaper fence. Remove the feather board holder.
7. Use the 5/32" drill bit to drill 1/2" deep holes at each punch mark in the top of the shaper fence.

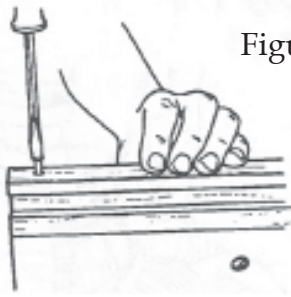


Figure D-66

- Attach each feather board holder to the shaper fence, see Figure D-66.

Each feather board holder can accommodate one feather board. If you use a feather board on the infeed side, it is usually best to use one on the outfeed side, also. Figure D-67 shows four feather boards used for shaping a thin, narrow workpiece. Also notice the use of a push stick.

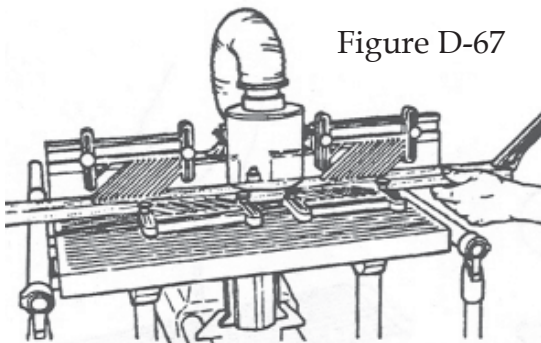


Figure D-67

Figure D-68

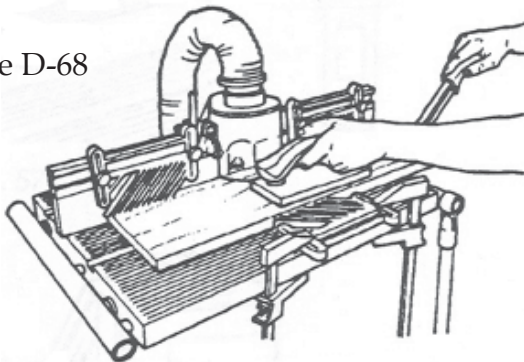


Figure D-68 illustrates two feather boards mounted on a feather board holder. Since the workpiece is too wide to install a feather board in the miter gauge channel of the worktable, notice how the horizontal feather boards are clamped to the worktable. When you want to use feather boards for horizontal pressure on the workpiece, remove the channel guide from the feather boards and clamp the feather board to the front of the worktable.

Using the Miter Gauge with the Shaper Fence

The miter gauge gives stability and support to end cuts when shaping or routing. Not in Figure D-69 that the dust shield is adjusted to clear both the top of the miter gauge and the handle. It is worth the effort to readjust the dust shield because the miter gauge gives the board extra support and stability during the cut.

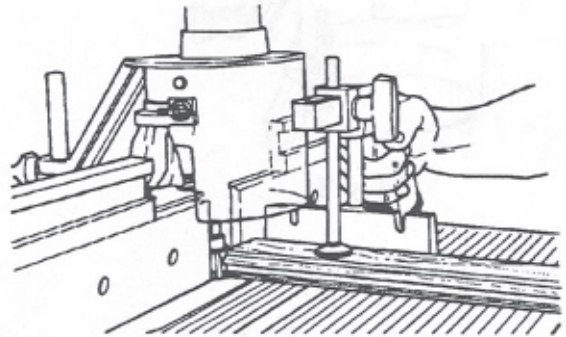


Figure D-69

Using a Extra Dust Collection Hose

Even though the dust shield is efficient, some operations could benefit from using an extra dust collection hose. The Shopsmith DC3300 Dust Collector experiences very little decrease in efficiency when one or two more hoses are added, so you should consider the setups shown in Figure D-69 and D-70. Figure D-70 illustrates an elbow brush clamped to the worktable behind the shaper fence. This second hose is able to collect dust thrown from the rotation of the cutter.

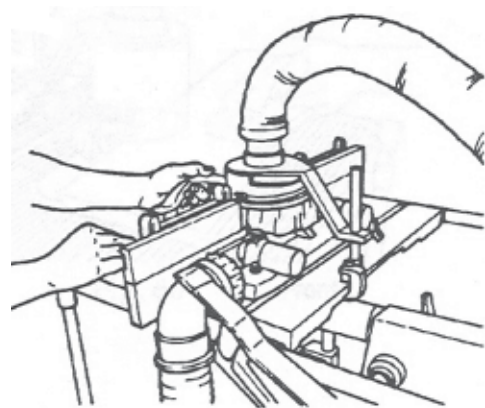


Figure D-70

Figure D-71 shows the utility pickup clamped to the guard support of the standard shield during pin shaping or pin routing operations. The second hose also collects the dust thrown from the rotation of the cutter.

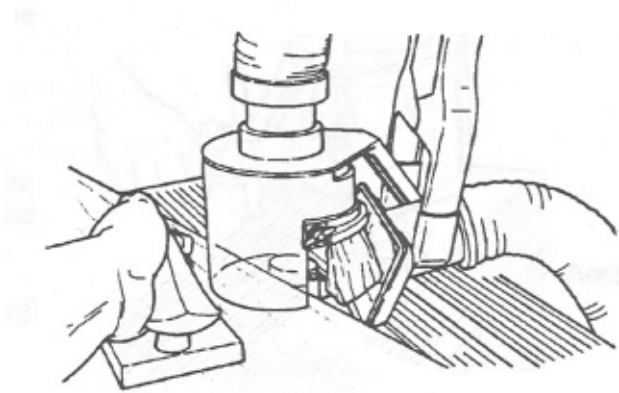


Figure D-71

Pin Shaping and Pin Routing

(Using piloted router bits only)

Install the Pins in the Shaper Table Insert

1. Screw in both pins which came with the shaper table insert, and securely tighten them with a medium blade screwdriver, see Figure D-72.

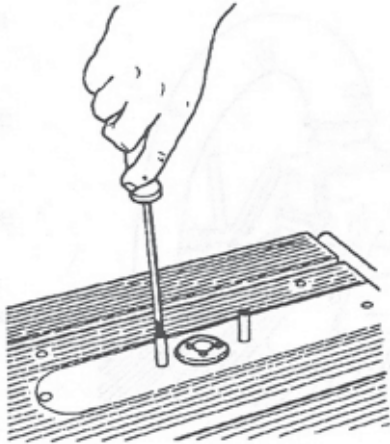


Figure D-72

Install the Cutter

2. Install the cutter:
 - a. **IF YOU** will be using a shaper cutter, assemble the shaper spindle according to the section on "Shaper Cutters" on page __, then proceed with Step 4 below.
 - b. **IF YOU** will be using a 1/2" shank piloted router bit, insert the bit's shank in the 1/2" router chuck and securely tighten one set-screw, then tighten the other one. Then proceed to Step 3 below.
 - c. **IF YOU** want to use a 1/4" shank piloted router bit, insert the bit's shank into the optional 1/4" router chuck (514632) and securely tighten one setscrew, then tighten the other one. Then proceed with Step 3 below.

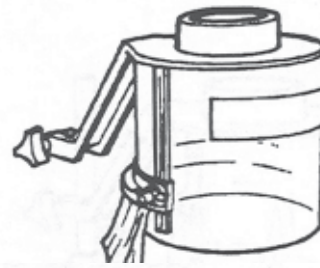


Figure D-73

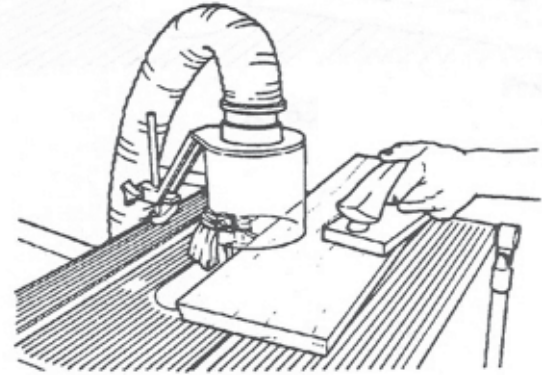


Figure D-74

- d. **IF YOU** want to use the optional full length dust shield for pin shaping or pin routing, shown in figures D-73 and D-74, follow the assembly instructions which came with it and use it in place of the standard dust shield illustrated in this manual. Then proceed to Step 3 below.
3. Turn the table height crank in or out to adjust the worktable and center the cutter under the hole in the shaper table insert. Lock the worktable height crank.
 4. Lower the worktable and adjust it according to the height where you wish the cutter to contact the workpiece.

Install the Guard Assembly

5. Place the guard assembly's t-nut into the rear miter slot on the outfeed side of the worktable and tighten the t-nut by turning the post.
6. Lower the guard shield to 1/8" above the top of the workpiece and centered over the cutter.
7. Tighten the three-lobed knob on the support shield.

8. Lower the brush as far as possible, and tighten the two wing nuts.
9. Attach a dust collector hose to the opening in the top of the guard, as shown in Figure D-75.

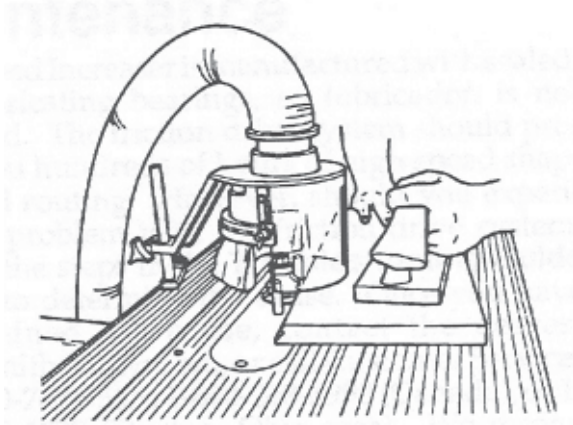


Figure D-75

Make the Cut

10. Make sure that the headstock, quill, worktable, and carriage are all locked and or tightened.
11. Plug in and turn on the Mark 7. Program the speed in accordance with the speed chart built into the PowerPro Headstock.
12. Position the workpiece on the right side of the worktable, as in Figure D-76.

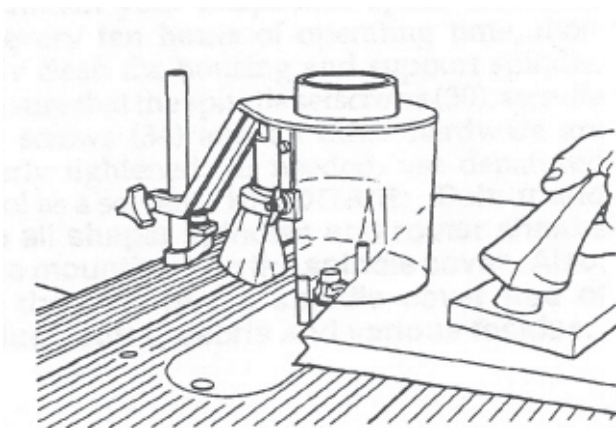


Figure D-76

WARNING

- ◆ Feed the workpiece against the rotation of the cutter, right to left in front of the cutter, when the PowerPro Headstock is operating in the forward direction. Otherwise, a kickback can occur.
- ◆ Make deep cuts in more than one pass. Avoid taking deep cuts with straight or non-piloted router bits. With the exception of single-pass dovetail cuts, limit the depth of cut to 1/4" for each pass when using straight or non-piloted router bits up to 1/2" diameter. When using shaper or router bits over 1/2" diameter, limit the depth of cut to 1/8" per pass.
- ◆ Never pin shape or pin rout without the use of the right starter pin. Always mount the left pin whenever possible.
- ◆ Using a push block, hold the workpiece firmly against the right pin and feed the workpiece slowly into the cutter.
- ◆ Internal pin shaping, i.e. the shaping of the edge of a hole or small opening (less than 6" in diameter) in any shape, should not be attempted.

Cuts made with the grain of the wood are always smoother and easier than cuts made against or across the grain. For this reason, cross-grain and against-the-grain cuts should always be made slowly. When shaping or routing is required on all four edges of a workpiece, make the end-grain cuts first so any splintering is removed by the edge-grain pass. When it is necessary to push a narrow workpiece under the guard, use at least one push block.

Whenever possible, make the pass with the cutter under the workpiece. This allows the workpiece itself to act as an added guard. Keep your fingers away from cutting area and have them hooked over the outer edges of the workpiece to guard against slipping.

Using Raised Panel Bits

Using raised panel bits and other large, specialty router bits with the Mark 7 ensures the best rpm setting for the bit. Many router bit manufacturers state that large diameter bits are safest and perform best at lower router speeds like the 10,000 rpm operating speed of the Mark 7.

Raised panel bits, illustrated in Figure D-77, and other large, specialty router bits require the use of the drum sander insert in the worktable instead of the shaper table insert. Following the instructions in the section, "Shaping and Routing Using the Shaper Fence," except you must install the drum sanding insert in the worktable instead of the shaper table insert.

Some specialty bits may be wide enough to touch the wooden fence closest to the cutter. Use a bench chisel or sander to remove part of the wooden fence which will touch the cutter.

WARNING

Never use router bits or specialty bits larger than 2-1/8" diameter, or which have an exposed cutting edge of 2-1/2" or longer.

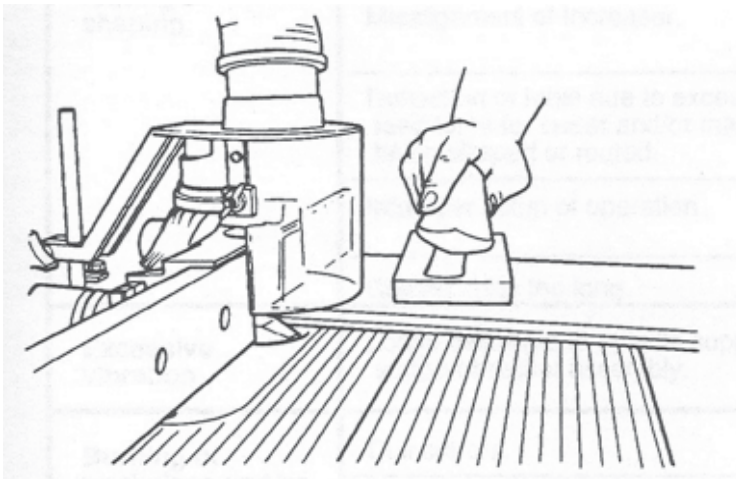


Figure D-77

NOTES

Over-Table Routing Operations

WARNING

SAFETY RULES FOR ROUTING/SLOT MORTISING:

- ◆ READ, UNDERSTAND AND FOLLOW all the information in this manual and the Owners Manual for the Mark 7 on which the Routing/Slot Mortising accessories will be mounted.
- ◆ Wear safety goggles, safety glasses with side shields, or a full face shield.
- ◆ Wear hearing protectors and a dust mask.
- ◆ Tuck long hair under a hat or tie it up. Do not wear ties, gloves, jewelry or loose clothing. Roll sleeves up above your elbows. Wear non-slip footwear.
- ◆ Always mount the circular shield and brush assembly in the Mark 7 quill before performing Routing/Slot Mortising operations.
- ◆ Always run the router at 'FAST' speed.
- ◆ Avoid taking deep cuts. With the exception of single-pass dovetail cuts, limit depth of cut to $\frac{1}{4}$ " for each pass when using bits up to $\frac{1}{2}$ " diameter. When using bits over $\frac{1}{2}$ " diameter, limit depth of cut to $\frac{1}{8}$ ".
- ◆ Never freehand rout. Always use the rip fence or miter gauge when using bits without pilots, and a starter pin when using bits with pilots.
- ◆ Always feed workpiece against the rotation of the bit. Otherwise a kickback will occur.
- ◆ Use a push stick to feed a narrow workpiece. When it is necessary to push a workpiece underneath the shield, use a long piece of scrap wood.
- ◆ Cut with the grain when straight-line Routing/Slot Mortising.
- ◆ Do not stand directly in-line with the workpiece. In the event of a kickback you could be hit.
- ◆ Feed the workpiece slowly. Use extra care in Routing/Slot Mortising workpieces that contain figured grain or knots, as these may cause kickbacks.
- ◆ When Routing/Slot Mortising across the grain of workpieces up to 10" wide, always use your miter gauge with safety grip to control the workpiece.
- ◆ When stop Routing/Slot Mortising, always use stop block(s) to control the length of cut. Failure to use stop block(s) will cause a kickback.
- ◆ When Routing/Slot Mortising an oversize workpiece, always use at least one push block to help control the workpiece. Hold the workpiece firmly against the rip fence.
- ◆ When edge Routing/Slot Mortising with a piloted bit, always use either a starter pin or a fence to start the cut and/or guide the workpiece.
- ◆ Turn off and unplug the Mark 7 before mounting router bits.
- ◆ Use only Shopsmith parts and accessories on your Shopsmith equipment. Mounting non-Shopsmith parts and accessories on your Shopsmith equipment will create a hazardous condition and will void your warranty.
- ◆ Make sure the setscrew in the chuck is tightened against the flat of the main spindle.
- ◆ Make certain that the two lock-screws secure the bit in the chuck.
- ◆ Listen for chatter or signs of looseness at start-up. If you hear, see or suspect problems, turn off the power and unplug the machine. Correct any problem before proceeding.
- ◆ Keep the bits clean, maintained and sharp.

WARNING

ASSEMBLY and SETUP

Before any routing/slot mortising operations can be performed, you must put together the circular shield and brush assembly and set up the Mark 7 properly.

TOOLS REQUIRED:

- Medium blade screwdriver
- 5/32" Allen wrench

WARNING

Turn off and unplug the Mark 7 during the Assembly and Setup procedure.

1. Assemble the circular shield and brush.
 - a. Place the cap screw through the washer and mounting bracket. Secure the cap screw with the nut.
 - b. Place the mounting bracket into the vertical slot on the circular shield. Make sure the threaded bolt and the guide pin (located just below the threaded bolt) go through the vertical slot. Secure the shield with the washer and wing nut.
 - c. Find the mounting "grooves" on the brush, and slide them (from top down) onto their matching "notches" located on the circular shield, then insert a carriage bolt through each side of the shield, with the bolt head inside the shield and the threads pointing outward. Secure the bolts with washers and wing nuts.
2. Set up the Mark 7 into the vertical position. (Refer to section C of this manual).
3. Attach the circular shield and brush assembly to the Mark 7 quill.
 - a. Using a 5/32" Allen wrench, loosen the screw (3) on the mounting bracket. Slide the mounting bracket assembly as far up the quill as possible. It should fit up against

the quill's collar. When in place, tighten the screw (See Figure D-78)

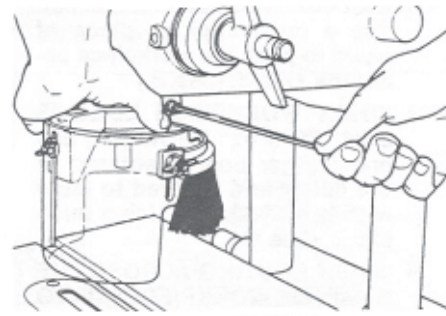


Figure D-78

4. Insert a router bit into the router bit chuck and tighten both bits setscrews. (Make sure you use the appropriate chuck with your choice of router bit.)
 - a. Rotate the MARK 7 quill until the flat side of the shaft faces the brush assembly.
 - b. Mount the router bit chuck onto the quill shaft with the chuck's setscrew over the flat side of the shaft.
 - c. Securely tighten the chuck's setscrew over the flat side of the shaft. (You may need to raise the circular shield in order to get your Allen wrench to the setscrew.)
5. If the rip fence is necessary for the function you are doing, mount the rip fence on the worktable. Position the fence so that it supports the workpiece behind the bit.
6. Position the circular shield and brush assembly. Set the depth of cut you will be making. Loosen the front wing nut (8) and lower the shield until it is 1/8" from the top of the workpiece. Tighten the wing nut. You will note that the brush acts as a rear guard and is lowered to the top of the workpiece and/or the rip fence.

7. Position the workpiece according to the following illustrations in figure D-79:

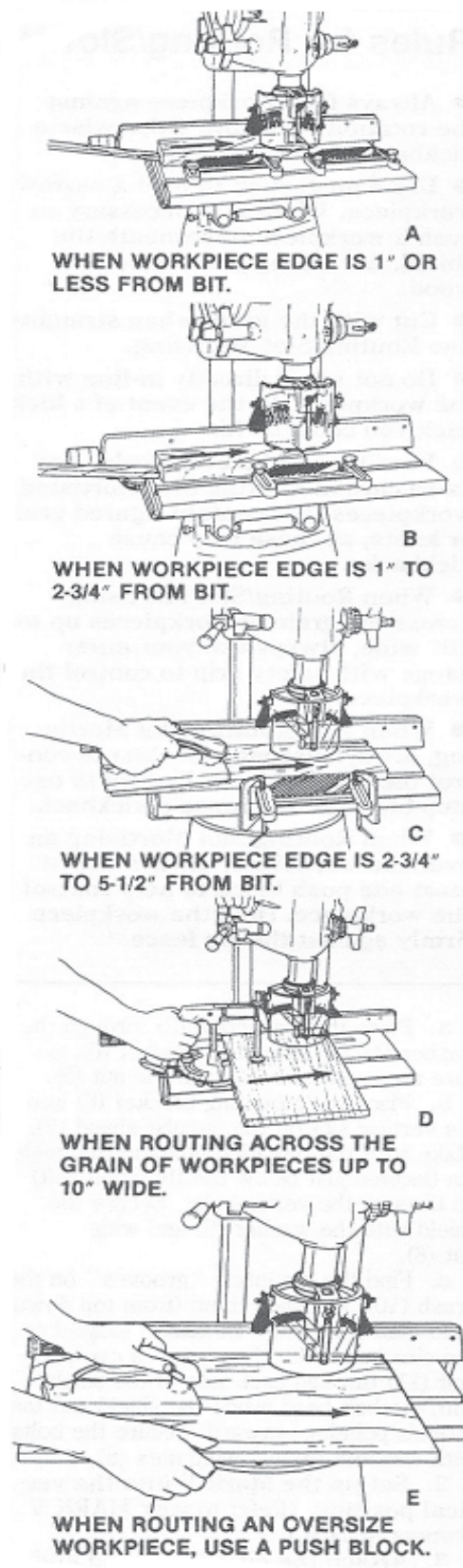


Figure D-79

WARNING

- ◆ WHEN WORKPIECE EDGE IS 1" OR LESS FROM BIT, use on feather board on the infeed side and an additional feather board on the outfeed side, both secured in the table slot. Use a push stick or when it's necessary to push workpiece underneath the shield use a piece of wood. (See A.)
- ◆ WHEN WORKPIECE EDGE IS 1" TO 2 3/4" FROM BIT, use two feather boards as above or use one feather board centered to the cutter, secured in table slot. Use a push stick or piece of wood to push the workpiece under the shield (See B.)
- ◆ WHEN WORKPIECE EDGE IS 2-3/4" TO 5-1/2" FROM BIT, use one feather board centered to the cutter and secured to table with two C-clamps. Use a push block (See C.)
- ◆ WHEN ROUTING ACROSS THE GRAIN OF WORKPIECES UP TO 10" WIDE, use a miter gauge and safety grip. Workpiece must extend 5-1/2" away from bit. (See D.)
- ◆ WHEN ROUTING AN OVERSIZE WORKPIECE, use a push block (See E.)

GENERAL ROUTING

Feed the work against the router bit's direction of rotation. Because the operations described in this section use the rip fence or an auxiliary facing behind the bit, the feed is always from left to right. The cutting action of the bit tends to keep the work against the fence. If you feed from the opposite side, the bit will try to move the work away from the fence.

The width of each cut depends on the size of the route bit being used. The depth of each cut is set by lowering the quill and locking it in position. Turn off the machine to make dept-of-cut adjustments. Routing/Slot Mortising cuts should be made with the speed dial set at 'FAST' and with reasonable feed pressure so the bit can do its job without choking or burning. Do not form deep cuts in a single pass (dovetail cuts are an exception). Deep cusp are easier to make and will be smoother if you get to full depth of cut by making several passes.

The depth of single pass cuts should be limited as follows:

- 1/4" maximum depth of cut for bits up to 1/2" diameter.
- 1/8" maximum depth of cut for bits over 1/2" diameter.
- Less than the above limits when routing extremely hard wood.

Router cuts made with the grain are smoother than against the grain cuts. If you can't work with the grain, feed the stock slower than normal and use less depth of cut for best results.

When making cross grain cuts, some chipping will occur where the bit cuts through, so allow for it by making the cut on an extra-wide piece. Then remove the chipped edge using the table saw or jointer.

SLOT MORTISING

Mortise and Tenon joints are used in furniture construction, casework, and other projects. Mortises, in particular, can be made several ways. Good, clean slot mortises (mortises with rounded ends and enclosed on all four sides) can be created with the router bits on your Mark 7.

Tenons are usually cut on the table saw using the Tenon Master Jig (555479). Any tenon made on the table saw, however, will have square ends. So in order to match up a slot mortise with a square tenon, you need to slightly round off the tenon ends with a rasp or bench chisel. If you prefer to have a square mortise to match a square tenon, you need to square up the slot mortise ends, again using a bench chisel. See figure D-80 showing both ways.

One way to make a mortise is to use two stop blocks (see the section on Stop Cuts), one to stop the workpiece at each end of the mortise. To control the length of the mortise, clamp stop blocks to the rip fence. If your workpiece is too long for this, then you will need to clamp stop blocks on the rip fence extension. If you are cutting an open mortise (where the cut extends

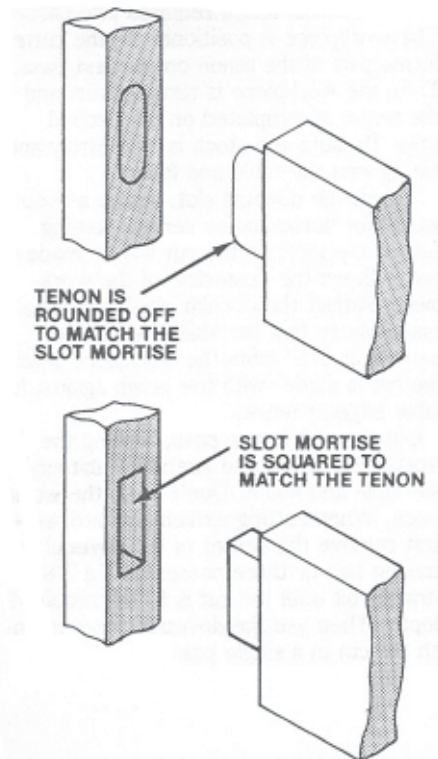


Figure D-80

through the end of the workpiece), you will only use one stop block. After you have clamped on the appropriate stop blocks, set the depth of cut on the Mark 7 quill, plunge the router bit to a proper depth for a pass, then lock the quill. Route the mortise in multiple passes until you reach the desired depth of the mortise.

Another way to cut a slot mortise is to preset the depth you want for the mortise, then plunge the route bit into the workpiece, much as you would a drill bit. Make a series of intersecting plunge holes to the end of the mortise. After making the last plunge cut lock down the Mark 7 quill, then clean out the mortise with the router bit. Make sure you do not accidentally press the bit against the ends of the mortise, because it may lengthen it. If you do wish to lengthen the mortise, do it by plunging the route bit as described above.

How deep can you make a mortise? For a 1/4" router bit, go no deeper than 3/4" into the wood, a 3/8" bit should go no deeper than 1-3/8", and a 1/2" bit should go no deeper than 1-1/8". The width of a mortise depends on the size of the router bit you are using.

For open ended or “through” mortises, you can progressively route to the full depth of your bit on one die of the workpiece, then turn the workpiece over and repeat the process on the other side. This way you can use a 1/4” router bit on stock up to 1/2”, a 3/8” bit on stock up to 2-3/4”, and a 1/2” bit on workpieces up to 2-1/4”.

If you need deeper mortises, you must use a brad-point drill bit to drill out the mortise. You may need to clean up the mortise by using a bench chisel.

RABBETS

Rabbets are two-sided cuts made in front of the fence, utilizing only part of the full diameter of the bit.

When cutting rabbets, make and use auxiliary facing. (See Figures D-81 AND D-82).

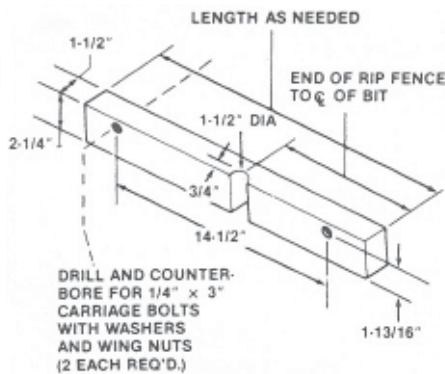


Figure D-81

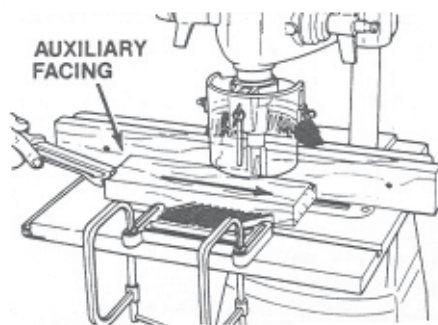


Figure D-82

The relief area allows adjustments so the bit can project beyond the bearing surface of the facing. The depth of cut is controlled by quill extension; width of cut is controlled by how much the bit projects. If you need a wider cut, move the table or reposition the fence and make another pass.

When working with a workpiece that extends beyond the rip fence, use an auxiliary facing that’s longer than the fence permitting the use of stop blocks to make stop rabbets.

When cutting an end rabbet, if the size of your stock permits, always use the miter gauge and safety grip to feed the workpiece.

DECORATIVE EDGING

Cutting decorative edges is similar to making rabbets. Some bits have a pilot on the bottom to control lateral depth of cut. If the bit does not have a pilot, straight-line edging must be done using the rip fence and the auxiliary facing. Use feather boards when the work dimensions permit. When cross grain routing, always use the miter gauge with safety grip to feed the workpiece when dimensions permit.

STOP CUTS

Mark the workpiece where the stop cut begins and ends. Clamp stop blocks to the rip fence to control the beginning and end of the cut. A long auxiliary facing may be necessary.

Extend the quill to penetrate the workpiece and lock it. Then move the workpiece until it contacts the stop block. Some stop cuts are quite deep, so repeat passes will be necessary. The width of the slot depends on the size of the router bit.

If the cut starts at the edge of the stock and stops in the center, only one stop block is needed. Cut only when feeding left to right. (See Figure D-83)

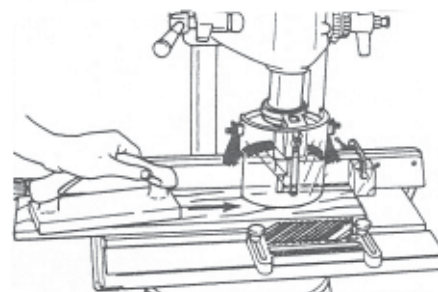


Figure D-83

HORIZONTAL ROUTING

The main advantage of horizontal routing is that more usable table area is provided together with better load support for larger and heavier workpieces.

Put the Mark 7 in the horizontal position. Adjust the circular shield as required by the work to be performed, with the brush moved up to the table from the underside. Feed the workpiece against the rotation of the cutter. Keep your hands at least 3" from the bit.

When making cuts with the grain, lower the table below the bit. Bolt a high wooden auxiliary fence to the rip fence (bolts recessed) and clamp the feather board to it to bear against and guide the workpiece. (See Figure D-84)

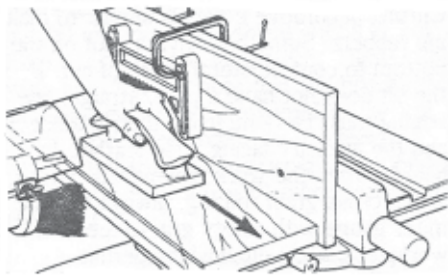


Figure D-84

Use a push block to feed the workpiece from back to front, because the bottom of the bit is doing the cutting.

When making cuts across the grain, use the miter gauge and safety grip and feed from back to front. (See Figure D-85)

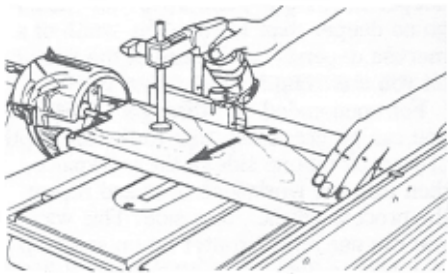


Figure D-85



When using the miter gauge in the left slot, position the table so that the miter gauge clears the bit.

SINGLE DOVETAILS

A dovetail is one of the strongest joints because it will resist a pulling strain in every direction but the one from which the tenons are inserted. The same cutter is used to form the dovetail slot and the tenon.

The dovetail tenon requires two passes. The workpiece is positioned so the cutter forms part of the tenon on the first pass. Then the workpiece is turned over, and the tenon is completed on the second pass. Be sure the stock is held firmly and flat against the table and fence.

To cut the dovetail slot, set up as you would for horizontal or vertical routing. Adjust the table so the cut will be made directly down the center line of the workpiece. Adjust the circular shield will be no more than 1/8" from the workpiece when the cut is made, with the brush against the table edge or fence.

Cut the slot in one pass, feeding the workpiece slowly and keeping it flat against the table and fence. Don't force the workpiece. When cutting extremely hard wood, first remove the center of the dovetail by making two to three passes with a 3/8" straight bit until the cut is to the required depth. Then use the dovetail cutter to finish the cut in a single pass.

NOTES
