

## Tip #53 Shopsmith Overarm Pin Router

The Shopsmith Routing System is a home or small shop version of a commercial machine that was originally developed for high-speed mass duplication of furniture parts and components.

In the overarm mode of operation, a rigid arm holds a router motor securely in a fixed position over the table surface. The arm itself has a built-in quill-feed lever that controls the depth-of-cut.

During the duplication process, the routing system suspends a router motor and bit above a precisely aligned pin which protrudes up from the table surface and rides in a precut groove in the underside of a guiding fixture. By guiding fixture. By guiding the fixture over the pin, the operator can cut the identical design or shape in a workpiece attached to the top (or opposite) side of the fixture.

In the undertable mode, the base of your router is attached to the underside of the table. When the router is installed in this manner, the router bit will protrude up through the table surface.

Besides the obvious timesaving benefits of high-speed duplication, the routing system also offers certain safety advantages by providing improved visibility and control of the work, as well as the ability to perform operations on smaller workpieces that would be almost impossible to grip firmly while using a hand-held router.

The routing system will cut-out, shape, mold, mortise, duplicate and form intricate, professional-looking joinery for a wide variety of projects.

### ROUTING SYSTEM-SETUP AND FEATURES

To set up your routing system, follow the instructions in the Owners Manual that came with your Routing System.

The Shopsmith Routing System (Figure 22-1) offers a number of unique features:

- In the overarm mode, the throat capacity of the routing system ranges from 13-5/8" to 15-1/8" (depending upon the diameter of the router motor being used).
- By moving the arm to the top of the steel column, projects up to 12" thick can be worked in either the overarm or undertable mode with ease.
- In the overarm mode, the arm holds any router motor from 2-1/2" to 4" in diameter firmly in position.
- For under-table routing, a universal table plate will accept virtually any router base for quick, simple mounting.
- The routing system's precision rack-and-pinion vertical feed mechanism offers up to 3-1/2" of vertical travel to provide easy depth-of-cut control during over-arm operations.
- A large see-through guard keeps your hands and fingers out of the danger zone, protects your eyes, and directs debris to a dust collection system.
- The worktable is 30" wide by 18" deep and offers over 7" of front-to-back adjustment. It can be locked into position at any location. Its smooth, laminated surface offers a large number of threaded holes to enable the convenient attachment of optional feather boards, fences and other devices to improve

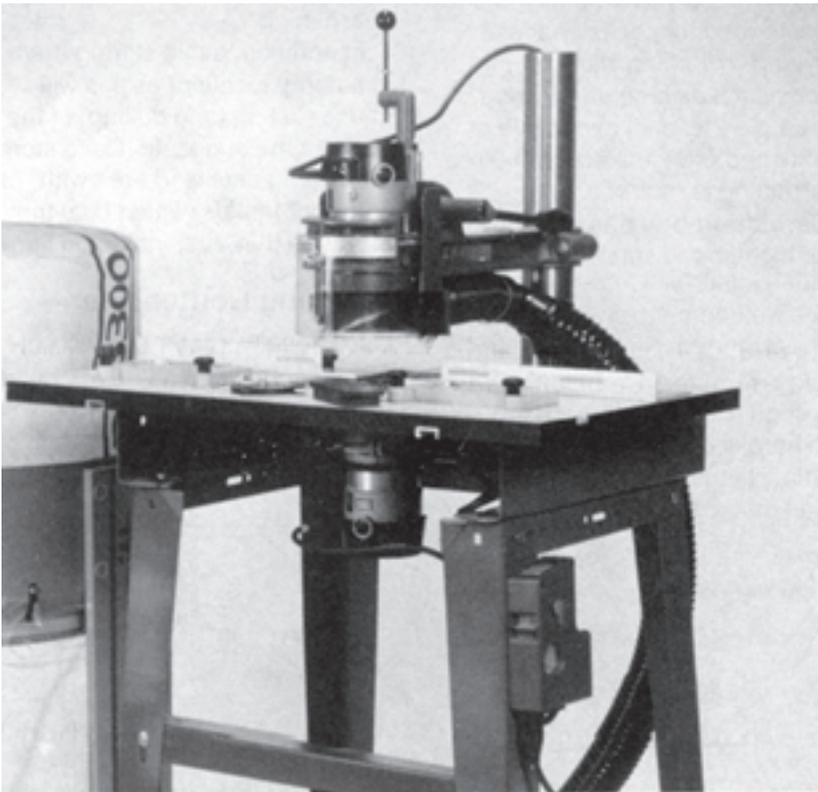


Figure 22-1. The Shopsmith Routing System.

workpiece control and safety during operations.

- The built-in miter rail allows the use of the Shopsmith Miter Gauge as a guide or safety device during operations.
- Interchangeable table inserts provide adequate workpiece support when using a variety of different sized router bits.
- Screw-in guide pins allow precision pin routing with a variety of bit sizes.
- The optional two-piece adjustable fence is used to guide workpieces during straight-line routing and for mounting fence extensions and stop blocks.

## ROUTER BITS

Router bits come in a large variety of shapes and sizes, each designed to preform a specific operation. Generally speaking, most router bits have three main components. These are the shank, the flute and the pilot (Figure 22-2).

The **shank** is the part of the bit that is gripped firmly by the collet (or chuck) of the router motor. The **pilot** is the portion that rides against the edge of the workpiece and controls the depth-of-cut of the bit during operations. The **flutes** are the cutting edges of the bit.

### Piloted Versus Un-Piloted Bits

When buying router bits, you have the option of selecting either piloted or un-piloted bits (Figure 22-3).

**Piloted bits** are used when cutting a decorative profile on a straight or curved workpiece where the entire edge of the workpiece is **not** to be removed. When choosing piloted bits, you can select from bits with solid pilots or bearing pilots. Solid pilot bits are less expensive, but create friction that

could burn your workpiece edge during cutting. Although bearing pilot bits are slightly more expensive, they will eliminate this friction and burning of the workpiece edge.

**Un-piloted bits** offer no edge guide and will cut all the way to the tip. They are therefore designed for use on projects where the entire edge of the workpiece is to be removed or a decorative cut is desired somewhere within the perimeter of the stock. As a result, they should always be used with a fixture, guide pin or fence.

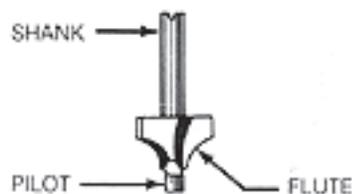
### Router Bit Materials

Router bits are available in a variety of different materials, based upon the amount of use they are expected to receive and the types of materials they are intended to cut.

**High-speed steel bits** are the most commonly available type and are intended for occasional use only, or for working with soft woods such as pine or redwood. These are the least expensive of all bits and offer limited use before sharpening is required.

**Carbide-tipped bits** generally offer high-speed steel shanks and bearing pilots with carbide cutting flutes welded-on to provide for more extended use before sharpening is required.

Carbide-tipped bits should be used for working with hardwoods such as oak or maple, plastic laminates or composite materials



**Figure 22-2.** Components of a typical router bit.

like particleboard. These bits are slightly more expensive than high-speed steel bits.

**Solid carbide bits** are usually only available in simple, straight profiles and offer the same benefits of durability as carbide-tipped bits.

### Router Bit Types

Router bits are available in many different shapes for a variety of specialized jobs. Figure 22-4 shows examples of the types that are available.

### Mounting Router Bits

Always insert the bit all the way into the router's collet and then back it out about 1/8" before tightening to prevent the transfer of heat and vibration from the bit to the router motor armature.

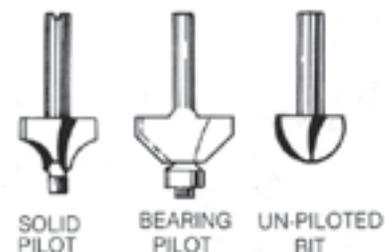
### Router Bit Storage

When storing router bits, never throw them carelessly into a drawer with other tools. This could result in nicking of the edges and necessitate costly, professional sharpening.

In addition, avoid storing them in a damp location, as this will cause rusting (and dulling) of the edges. One suggestion is to store them in an enclosed area with camphor tablets (which coat the bit with a thin, rust-inhibiting film).

### Cleaning Router Bits

Occasionally, router bits will collect pitch that should be re-



**Figure 22-3.** Router bits are available in piloted or unpiloted styles.

Grooving Bits	Edge Cutting Bits
<p>These bits are used primarily for work on flat surfaces. They consist of a shank and cutting edge with no pilot.</p>	<p>These bits usually have a pilot to guide the bit along the edge of your material as the cut is being made.</p>
 <p><b>Veining Bits</b> . . . round bottomed bits for decorative grooves, carving, inlay work and lettering.</p>	 <p><b>Rabbeting Bits</b> . . . for joints along workpiece edges or step cutting.</p>
 <p><b>Straight Bits</b> . . . flat bottomed bits that cut on the sides and bottom. For routing grooves, cutting dados and rabbets, mortising, carving and leveling recesses.</p>	 <p><b>Chamfering Bits</b> . . . for decorative chamfers on thick edges.</p>
 <p><b>Vee Groove Bits</b> . . . V-shaped bits for decorative carving, sign work, chamfering edges, fluting and lettering.</p>	 <p><b>Cove Bits</b> . . . for decorative edging and the concave side of drop-leaf table joints.</p>
 <p><b>Core Box Bits</b> . . . rounded bits for carving and fluting flat surfaces such as drain-boards, servers and tables.</p>	 <p><b>Beading Bits</b> . . . for all-purpose edging and the convex side of drop-leaf table joints.</p>
 <p><b>3-in-1 Bits</b> . . . bits that cut a straight side up to 1-1/4" deep, make a smooth rounded corner and shape a perfectly flat bottom in a single pass.</p>	 <p><b>Corner Round Bits</b> . . . for decorative edging on all types of projects.</p>
 <p><b>Hinge Mortising Bits</b> . . . bits specifically designed to mortise areas for hinges. Also used for dados, rabbets and stock removal.</p>	 <p><b>Roman Ogee Bits</b> . . . for large decorative rounded edging.</p>
 <p><b>Dovetail Bits</b> . . . bits used to form sliding dovetail joints and dados in furniture.</p>	 <p><b>Slot Cutters</b> . . . are used for forming slots in the edges of workpieces like those used in tongue-and-groove joinery.</p>
 <p><b>Tee Slot Bits</b> . . . T-shaped bits for cutting hanging slots in plaques and picture frames or routing sliding tracks.</p>	<p><b>Laminate and Veneer Trimming Bits</b></p>  <p><b>Combination Bits</b> . . . these bits are designed to trim plastic laminates and veneers. Both flush and bevel trim bits are available but only carbide-tipped or solid carbide bits should be used for this type of work.</p>
 <p><b>Round Nose Bits</b> . . . similar in design and purpose to core box bits, yet offer longer cutting edges for forming deeper grooves or flutes.</p>	 <p><b>Piloted Straight Bits</b> . . . are also designed for laminate trimming, but offer straight sides and no beveled cutting edges.</p>
 <p><b>Panel Bits</b></p> <p>These bits have a tip like a drill bit with a pilot just above it. The tip drills through your workpiece, then the workpiece can be moved to cut grooves and lattice work, cutouts for sinks in countertops, and slots in paneling for electrical boxes.</p>	

Figure 22-4. Just a few of the wide variety of router bits that are available.

moved to prevent burning of the work-piece edges. This cleaning can be easily performed with household oven cleaner. However, always remove bearing pilots from bits to avoid getting solvents or oven cleaner in the bearings. These materials will destroy the bearing lubricant and cause premature bearing failure.

### Sharpening Router Bits

As with all cutting tools, router bits require occasional sharpening for optimum performance. High-speed steel and carbide-tipped bits can be easily honed in the shop (see Chapter 24 for sharpening techniques). However, if carbide-tipped or high-speed steel bits become extremely dull or nicked, they

should either be replaced or taken to a professional sharpening service.

### ROUTING SYSTEM SAFETY

**Warning: Before using the routing system, read and understand these important safety instructions:**

**Danger Zone-**The danger zone on the routing system includes any location within 3" of the rotating bit. Always keep hands clear of this area when working with the machine.

**Protective Guard-**Keep the seethrough guard in place and set at no more than 1/4" above the surface of the workpiece during overarm or undertable routing.

- Always wear proper eye and ear protection.
- Never attempt to clamp the overarm assembly onto any column less than 2-3/4" in diameter by using bushings or adapters.
- Follow your router manufacturer's recommendations as to replacement parts for your router.
- Before beginning any operation or turning on your router motor, always check to be sure the router, overarm assembly, depth stop rod, depth control handle, worktable, table plate, accessories, safety devices, fences and fixtures are secured.
- Whenever possible, use a push stick, push block, feather board, miter gauge with safety grip, fixture or other safety device to maneuver a workpiece into the rotating bit. This is especially true of small or narrow stock.
- Always keep a firm grip on your workpiece and never hold it with your hand in line with the bit.

- When cross-grain routing stock up to 10" wide, use your miter gauge with safety grip to control the workpiece (which must extend 5-1/2" away from the router bit).
- To prevent the router from grabbing and throwing the workpiece, always feed the stock against the rotation of the bit and never with it. During overarm routing, stock being worked in front of the bit should be moved from left to right. During under-table routing, stock being worked in front of the bit should be moved from right to left.
- Always cut with the grain of the wood and not against it for a smoother, safer cut.
- To avoid being hit by a thrown workpiece, never stand in-line with the workpiece being fed.
- Never rout second-hand lumber. It may contain nails or screws that could damage your bit and cause serious injury.
- Use extra care when working stock that contains highly figured grains or knots to avoid kickbacks.
- Do not rout boards that are warped, bowed or cupped.
- When working long boards or sheet materials, always support them adequately with roller stand(s) placed from 1' to 4' from the table.
- Never freehand rout stock less than 12" x 12" in size or equivalent.
- With the exception of single-pass dovetail cuts, limit your depths-of-cut to 1/4" for each pass when using bits up to 1/2" in diameter to cut hardwoods.
- Never exceed depths-of-cut of 3/8" when using bits up to 1/2" in diameter to cut soft woods.
- When using bits over 1/2" in diameter, limit your depths-of-cut to half the recommended depths for bits up to 1/2" diameter.
- NEVER feed your workpiece between the rotating router bit and a fence, as this could cause a kickback.
- When stop routing, always use stop block(s) to control the length of cut. Failure to use stop block(s) could cause a kickback.
- NEVER install a router bit without first unplugging the router motor.
- Make sure the router bit is secured firmly in the collet. Loose bits could work free and cause serious injury.
- Insert bits all the way into the collet and retract them about 1/8" to avoid transferring vibrations and heat to the motor armature.
- Listen carefully for sounds of chattering or looseness at start-up. If you hear, see, or suspect problems, turn off the tool immediately, unplug it and check it out thoroughly. Correct the problem before proceeding.
- NEVER try to make your own collet adaptor to hold different sized bits. Balance is very important at high speeds, so always use purchased adapters.
- Keep router bits clean and sharp at all times.
- Attach the routing system to a dust collection system . . . or wear a close-fitting dust mask.

### **SPECIAL CAUTIONS AND CONSIDERATIONS ON MATERIALS AND TECHNIQUES**

Because routers are powerful, high-speed tools with unique

performance characteristics, you must pay particular attention to the materials and techniques you are using to avoid mistakes and safety hazards.

- All hardwoods should be worked in light, multiple passes without pausing or dwelling to avoid burning the workpiece. Open grained hardwoods such as oak and similar species will splinter very easily when you reach the end of a crossgrain cut. For this reason, it's always a good idea to either make very light passes, leave extra stock on the width of the workpiece so the splintered area can be cut away or backup your workpiece with a scrap block at the exit point of the bit. Another good technique to avoid splintering is to make all cross-grain cuts first, then make your cuts with the grain.
- Softer woods such as lauan, basswood, pine and willow can be worked in slightly heavier passes but "tear" or "fuzz" easily and will require more finish sanding.
- Highly figured woods such as birdseyes, crotchwoods and burls have an inconsistency of grain that requires cautious, light passes to produce a clean cut.
- Particleboard and similar composite materials contain high concentrations of glue that can quickly dull high-speed steel bits. Therefore, it is recommended that you always use carbide-tipped or solid carbide bits when working these materials.
- Plastic laminates are very hard materials that can also dull high-speed steel bits quickly. Again, always use carbide-