

Notes from the Shopsmith Woodworking Academy

Clean Cuts — PART 3: All About Router Bits

Power woodworking routers will only work as well as the cutting tools that fit into them. If you're not using the right bit for the job...or your Bit is dull, you're not going to achieve the quality of results you seek. It's just that simple.

Maybe you just purchased the Shopsmith Router Package or one of our great new *Pro Fence System* Router Tables for use with your hand-held router motor and you're ready to go to work. Well, hold it for just a minute. Don't forget that even the best, most powerful router will fail to produce great results with a lousy bit.

Not to worry, though. *Most* of the bits you can purchase are good when you first get them. This is certainly true of all the bits offered in Shopsmith's Catalog. The problems start *after* you've used them for a while...a fact that's especially true for high-speed steel bits.

Look at it this way...a good circular saw blade is a cutter, too...except that it has 24, 36, or 50 cutting edges...even more on a plywood blade. With proper care, it will stay sharp for a long, long time. On the other hand, most router bits have just two cutting edges. That means that each edge of a router bit does far more work than any individual saw tooth...**FAR** more!

Any way you cut it, router bits are bound to lose their keen edges more quickly than a tool that carries more teeth. If you're routing plywood or particleboard, you can count on the rock-hard glues used in them to dull high-speed steel bits very quickly. And if you hit a concealed nail or screw with a router bit, you can kiss it goodbye! Used with care, however (and barring any deep nicks), dull bits can be brought back to life time-after-time.



The two basic types of router bits

Router bits come in two basic types...those made of high-speed steel – and those made of solid carbide or with fused-on carbide cutting tips.

Carbide Bits – the *Rolls-Royce* of router bits

Solid carbide and carbide-tipped bits were first used by industry when this extremely hard (80 on the Rockwell “C-Scale” of hardness) alloy was first developed in the late 50's. Solid carbide bits are most widely available in “straight” configurations, including small veining bits, some laminate trimmers and small diameter core box profiles. Most other bit profiles are generally only available in carbide-tipped styles, although there are some exceptions.

Widely available and extremely popular today with even the “average consumer”, carbide tipped bits are made by brazing extremely hard carbide cutting tips onto a face of high-speed steel. They may cost a bit more, but they'll last a **LOT** longer!

Their ability to take harder-than-average use makes them an



excellent investment. However, you should know that carbide-tipped bits...even when brand new...are marginally less sharp than their high-speed steel counterparts, a fact that doesn't affect their overall performance. Carbide bits still outperform high speed steel bits in the long run.

When you buy a carbide-tipped bit, take a good, close look at the cutting edges. Use a magnifying glass, if necessary. Look for good, clean brazed joint where the tip meets the shank. Tiny, hairline fault bubbles or cracks *could* indicate a poor quality bit. Be advised, however, that there's no way to forecast disappointment for certain since small gaps might cause no long range problems at all. Still, to be safe, we recommend that you buy a bit that at least *looks* well-brazed.

Not all carbide-tipped bits are created equal, either. You may find some tagged "Carbide" while others may be tagged "Carbide Production". In most cases, the "Production" bits have a heavier deposit of Carbide brazed onto the cutting edge, and that allows for more sharpening.

If you're planning to use your router for plywood or particleboard joinery or edging, by all means, invest in top-quality, carbide-tipped bits. If you're trimming high-pressure plastic laminates or rock-like composite countertop materials, **ALWAYS** use solid carbide or carbide-tipped bits, as high-speed steel bits will dull very rapidly on these materials.

When Carbide bits finally need to have their edges touched-up a bit, you'll have to use a diamond sharpening stone to do the job. When performing this job, be very careful to rub **only** the flat edge of the Carbide tip against the stone's surface and not, at any time, run the stone across the outer edges of the tips in a fashion that will change the bit's overall diameter.

Sharpening these bits can be a tricky process...especially since carbide bits can easily cost \$30, \$50, even up to \$100 or more for large, specialized shapes. Ruining one of these babies can "hurt". If you're not confident in your router bit sharpening abilities, the good news is that virtually every town seems to have at least one, good, professional sharpening service. Even if your local professional lacks the specialized tools for sharpening carbide edges, he probably can recommend someone who has the right tools and the experience to do the job. Qualified sharpeners can even replace broken or chipped carbide cutter edges.

So, how can you tell if your local sharpener has done a good job? Held to the light, a well-sharpened edge should be free of shiny spots and small chips. The final test is simply to use the tool. You'll know right away if it's been sharpened properly by how smoothly and vibration-free it runs and by the finish it leaves on a cut edge. If it doesn't cut at least as well as when it was new, complain.



High-Speed Steel Bits – *The workhorses*

High-Speed (hardened) Steel bits are the least expensive bits and are the ones found most often in the shops of novice to intermediate level woodworkers. Originally formed from mild steel, these bits are then hardened in a special heat treatment process, usually to within 60 to 65 on the Rockwell "C-Scale" of hardness.

There's no real secret to sharpening most of these bits. As with their Carbide counterparts, remember to take care in rubbing **only** the flat edge of the cutter against the stone's surface and not, at any time, run the stone across the outer edges of the tips in a fashion that will change the bit's overall diameter. Use an Aluminum Oxide stone such as "India" or "Aloxite" and be sure the stone is well-dressed with sharp, well-defined edges.

A set of triangular or knife-edged Aluminum Oxide stones such as those shown in Figure 1 will make the whole sharpening process a lot easier. Their thinner edges make it easier to sharpen



Fig. 1. Special purpose Aluminum-oxide honing stones.

these comparatively tiny tools. Even the smallest of router bits – those used for straight cuts and veining – can be sharpened with a set of these stones. **CAUTION:** Drop one of these fragile stones on the shop floor and it'll shatter into a thousand pieces!

If you use a larger benchstone, mount it to your work surface with bench dogs or clamps to hold it steady while you rub the bit on it. Use a lubricant to keep the stone clean.

Honing almost all router bits is based on the principle that the whole face of the cutting flute is on *one* plane. If that flat plane is large enough, you can find and hone it. Touch-up sharpening is *always* done on the *face* of the flute and *never* on its contoured profile (See Fig. 2).

Unlike honing large chisels on a benchstone, the action of the stone on these small tools is limited to very, very small movements: 1/4" of total back-and-forth movement, or even less.

You might choose to mount the bit securely in a vise and move the stone instead of the bit during sharpening. You can put together a very handy device for doing this job by mounting your MARK V's Drill Chuck in the Tailstock Chuck Arbor, slipping it into your MARK V's Tailstock and using it as shown in Figure 3.

Squirt a drop or two of oil on the bit itself and position the stone on the major portion of the flat of the bit. Avoid rubbing the pilot of the bit (on solid pilot bits), as this will ruin it. When the oil on the bit darkens with swarf (little flakes of metal), you'll know that you're on your way to a sharp edge.

If you're having trouble getting the *feel* of the flat, you can check just how well you're doing by using a dark color, felt-tipped marker to coat the bit's face. By checking to see how much of the color is removed, you can tell whether you're honing the entire surface. It helps to use a good, concentrated light and a magnifying glass.

If a burr forms on the profile of the bit, remove it very carefully with a Hard Arkansas Stone.

To check for sharpness, run the cutting edge over your thumbnail: it should "grab" the nail and leave a slight "track" rather than slip over it easily.

The shaft: don't overwork it.

A small shank coupled with a large cutting edge can weaken a bit. The larger the shank, the stronger the bit. This is one reason why Shoptsmith offers a selection of bits made with 1/2" shanks for those tough straight or dovetail-cutting jobs.

Don't overwork the shank or the cutting edge by "hogging" into stock at high speeds and fast feed rates. This will stress the bit and the router motor...overheating both. Whenever practical, take a series of light cuts in smooth passes.

When mounting a bit in the Router's chuck or collet, push it in until the shaft bottoms-out, then retract it about 1/16" to 1/8". This will prevent the transfer of heat and vibrations directly to the motor armature of your hand-held router.

General routing tips

Always try to feed your stock into the router *against* the rotation of the router bit. This keeps

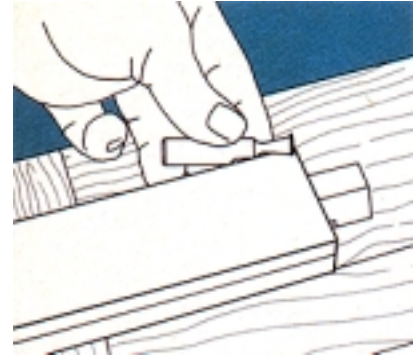


Fig. 2. Honing face of router bit on bench stone.

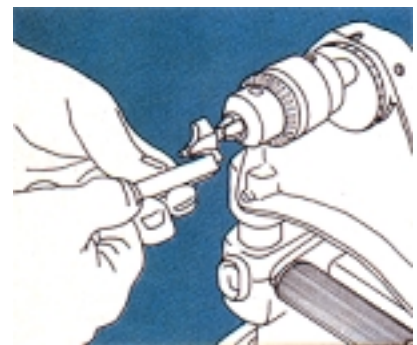


Fig. 3. Drill chuck mounted on tailstock chuck arbor to hold router bits while sharpening.

the speeding bit from “grabbing” the workpiece and forcing it past the bit’s cutting edges too quickly.

Clean router bits always work better. Pitch and resin build-up can seriously affect the performance of even a sharp router bit, causing burning and unsightly marks. If you notice a build-up of pitch or resin, remove it immediately with a commercial sawblade cleaner.

CAUTION: Remove the ball bearing pilots before performing this cleaning operation...as these cleaners can remove all lubrication from these bearings, rendering them useless.

When used to trim laminate material, a router bit with a ball bearing pilot can really get gummed-up. Clean the outer collar of the bearing with the tip of a rag soaked in a solvent that will dissolve the type of glue used. Once cleaned, use a bearing lubricant to re-lubricate the bearing pilots before going back to work.

If you’re using your MARK V for routing with either the 1/2" shank bits or with 1/4" shank bits and our special 1/4" Router Chuck, you should rev the machine up to its maximum speed of 5200 rpm’s.

For even smoother cuts, add the Shopsmith Speed Increaser to boost your routing speeds to 10,000 rpm’s. But just remember...although higher speeds can produce better results...so can slowing down your feed rates and taking a series of lighter cuts.

Coming up in the January/February issue — PART FOUR – Oriental Waterstones