Routing Safe & Sound

By: Patrick Spielman, "New Router Handbook "

Following, are seven tips to keep your hand-held router under control, your workpiece intact and your first-aid kit closed. When you lose control of a router, whether totally or just a little, it's the workpiece that most often gets messed up. Now and again, you'll chip or break a bit. And if you're really unlucky, you will get hurt. Keep this in mind: Most router bits rotate at a speed in excess of 20,000 rpm. When something goes wrong -- a grab, a dig, a jolt to the machine, bad things happen fast. I have had my fingernails trimmed mighty close by a dovetail bit before I knew what happened.

Router safety is essentially a matter of controlling the router and securing the workpiece (and vice versa on the router table). Safety considerations are therefore intimately related to the quality of the cut. The safest routing technique will by and large yield the best finished surface.

Here are some tips to help you produce the quickest, smoothest and safest cuts with a router.

Some Bits Bite Back

Not all router bits are created equal. Some are far less capable of handling the stresses of cutting wood and will break easily. Some are prone to other problems, such as burning or catching in the cut. Recognizing bits that need particular care will help you keep them from biting you and your work.

Long, thin bits are fragile: Thin bits with cutting-edge lengths that are more than three times longer than their diameters are easily stressed and broken. Some of the thinnest bits are milled into their shank, making them even more fragile. This 3/8-in.-dia. bit has less than 1/16 in. of steel between the flutes. Cut in 1/8-in. increments or less with these bits.

Trapped bits need precise guidance: Some bit designs, such as dovetail bits and T-slot cutters, trap the bit in the work. The slightest wavering in the cut will mess up the workpiece. These bits should be used only with jigs and fences to guide them.

Dovetail and T-slot bits also break easily. They are designed to cut while fully engaged in the workpiece, which is the most stressful kind of cut for any router bit. Most of the cutting is done at the ends of the flutes where their diameter is at a maximum. However, most of the stress is concentrated where the shank and the flutes meet, which is the thinnest part of the bit. To make matters worse, some of these cutters are ground into the shank. Just take things easy, and don't force the cut. For long T-slots and sliding dovetails, I pre-plow with a straight bit.

Many other kinds of bits cut in such a way that you can't lift the router straight up and off the workpiece freely. These bits include cope-and-stick cutters, glue- and finger-joint bits, bull-nose bits and some profile bits. To be used successfully, they should be treated as trapped bits.

Spiral bits can be unpredictable: Spiral up-shear and down-shear bits can produce impeccable surfaces. The cutting edges travel in a spiral motion and are always engaged in the work, unlike ordinary straight bits. Up-shear bits send the chips into your face, and down shears send the chips into your socks. Large spiral-ground down-shear bits have one nasty feature: If the bit catches in the work, it will pick the router up and out of the cut. I almost lost my grip on a router with a down-shear bit that suddenly climbed up the work. Down shears are too unpredictable for this woodworker, especially on end grain. If you use them, cut very lightly, or use them in a router table with a power feed.

Listen To Your Router Whine

Routers always seem to whine, but you should listen to them. The sound a router makes while idling should not

change appreciably in the cut. If it does, you may be stressing the bit and the motor.

It's all too easy to overwork a bit because it's difficult to estimate how much stress a particular cut will put on a bit. The volume of material you remove increases exponentially when you double the dimensions. This means that you remove 25 times more wood from a given length of a 5/8-in.-sq. rabbet than from a 1/8-in.-sq. rabbet. However, the stresses on the bit are not 25 times as great. Your best estimate will come from how it sounds in the cut. If your bit chatters, screeches or just sounds unhappy, then slow down the cut.

Jigs Are Safety Devices In Disguise

Jigs secure the work and control the path of the cut, reducing the chances of error. Consequently, they are essential to the most accurate--and the safest--router cuts.

The best jigs have a few things in common. They secure the workpiece without interfering with the path of the router. They offer a large surface for the router to run on, giving it stability. And jigs guide the router positively and completely through the cut. Avoid designing jigs that trap the workpiece between a fence and the cutter. When using an edge-guide on a router, position the bit in the fence.

It's often the simplest jigs that help the most. On a standard outside edge cut, less than half the base casting rides on the workpiece. If you rout around a corner, as little as 25% of the base rides on the workpiece, and the chances of tipping are great. I make an offset sub-base that increases stability by giving the router a larger platform to ride on.

Getting Away With The Climb Cut

The direction of cut has great bearing on the quality of the cut. If you look at a router upside down, you'll see that the bit spins counterclockwise, and when the router is on top of the workpiece, it's spinning clockwise. When the router is pushed through the cut with the bit spinning into the edge of the workpiece, it's called a climb cut. The bit can self-feed or climb along the cut, wrenching the router forward. Running a router in the opposite direction, with the bit spinning out of the edge of the workpiece, is anti-climb cutting. Though riskier, climb cutting produces a superior edge, without the kind of tearout anti-climb cuts produce.

Use the anti-climb cut for most work, but when you need a perfect edge, use a climb cut, taking light passes. Learn to feel the speed and depth of cut when the router starts to grab and self-feed, so you don't lose control.

Keep Gravity On Your Side

Bad accidents with routers do happen. I heard of a carpenter who tried to rout some molding under a countertop. He didn't secure the motor in the casting. Halfway through the cut, the motor spun out of its casting and onto his leg. The lesson should be obvious: Keep gravity on your side. Hand-held routers should always be used horizontally with the bit facing down. It can be tempting to run a router sideways down a board, especially if the bit is oriented to cut that way, but don't do it. Find a different bit, or make a jig that supports the piece in such a way that you rout horizontally.

Start The Router Without Wobble

I start a router with its base casting flat on the edge of the workpiece. I find it troublesome and risky to set down an already running router on the workpiece. However, starting the router on an edge isn't completely risk-free. Some machines will jerk from the torque of the motor and possibly push the bit into the workpiece. Worse, starting a cut before the bit reaches full speed can break the bit. I prefer soft-start machines because they don't twist on start up.

Rout Comfortably

Routing at a standard bench height is difficult and tiring for me. I can't see what's going on easily, so I end up hunched over trying to see where the bit is. Being able to see the bit is crucial to keeping the router under control. To solve the problem, I made a special routing bench 40 in. high. It allows me to stand tall and see what

I'm doing. I also make router jigs for my bench vise that stand at about the same height. I'm 6 ft. 1 in. tall, so 40 in. off the ground may not be the best height for you. Experiment to find your most comfortable routing height.

Safety Tips For Your Router

1. Read your owner's manual.
2. Make sure that you have selected the proper bit. Check the type, shank strength, cutting length and diameter, and sharpness of the bit.
3. Make sure that the router horsepower and speed is appropriately matched to the material, the intended depth of cut, and the size of the bit selected.
4. Always disconnect the power when changing bits, servicing the router, or mounting attachments.
5. Make sure that all bits, attachments, clamps, and locking devices are secured before starting the router.
6. Make sure that the on-off switch is off before connecting the power.
7. Dress properly. Wear eye-, hearing-, and dust protection devices, and either short-sleeve shirts or long-sleeve shirts with rolled-up cuffs. Wear a shop apron or tight clothing. Make sure that your hair, jewelry, etc., will not become entangled with any moving parts of the router.
8. Keep children and observers at a safe distance.
9. Make certain that all workpieces are securely clamped and will not shift during routing.
10. Always grip the tool tightly, especially when starting up the router; when you have to resist the initial motor torque. Keep both hands on the knobs or handle, or use a foot switch when the job requires a "third hand".
11. Be especially cautious when routing small pieces. Make test cuts in solid unchecked stock of a safe size.
12. Be absolutely certain that the bit is not in contact with the workpiece and that no part of it will strike the wood when you are turning on the power.
13. Develop the habit of turning off the router immediately after you have switched it on. As the motor starts to coast down, use your eyes, ears, and sense of touch to detect any unfamiliar conditions or irregularities.
14. Always shut the power off immediately at the first sign of any unfamiliar noise or vibration. Always be aware of the feeling in the handles and the "hum" (that can even be heard through hearing protectors) that indicates the router is operating properly.
15. Do not operate electric routers in moist, wet areas or damp environments.
16. Do not use mounted abrasives, carving burrs, drills, or other non-routing tools and cutters in routers just because they have shanks that are the same size as your router's collet.
17. If the router or work tends to ride upwards and requires extra pressure to feed, turn off the power immediately. This indicates the bit is dull, it is slipping out of the collet, or just that you have selected the wrong bit design.
18. Don't force-feed the router or work in any situation.
19. Do not try to increase the bit's depth of cut by inserting less of the shank in the collet. Most bits should have at least 3/4 of their shank length inserted into the collet.
20. Always feed the hand-held router into the work in the correct direction, against the bit rotation. In router table use, feed the workpiece in the direction that is also against the bit rotation.
21. Maintain your router equipment diligently. Replace worn parts, discard worn-out and poor bits, and check the router periodically.

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