

THE ROUTER

The Durham Woodworking Club



January 31, 2016

THE ROUTER

- A **router** is a tool used to rout out (hollow out) an area in the face of a relatively hard workpiece, typically of wood or plastic.
- The main application of routers is in woodworking, especially cabinetry.
- **Routing is a high speed process** of cutting, trimming, and shaping wood, metal, plastic, and a variety of other materials.
- There are two standard types of router—plunge and fixed.
- When using a **plunge-base router**, the sole of the base is placed on the face of the work with the cutting bit raised above the work, then the motor is turned on and the cutter is lowered into the work.



FIXED BASE ROUTER

- With a **fixed-base router**, the cut depth is set before the tool is turned on.
- The base plate is then either rested flat on the workpiece overhanging the edge so that the cutting bit is not contacting the work (and then entering the work from the side once the motor is turned on), or the base plate is placed at an angle with the bit above the work and the bit is "rocked" over into the work once the motor is turned on.
- In each case, the bit cuts its way in, but the plunge router does it in a more refined way, although the bit used must be shaped so it bores into the wood when lowered.



BASE PLATE ROUTER

- The **baseplate** is generally circular (though this, too, varies by individual models) and may be used in conjunction with a fence attached to the base, which then braces the router against the edge of the work, or via a straight-edge clamped across the work to obtain a straight cut.
- Other means of guiding the machine include the template guide bushing secured in the base around the router cutter, or router cutters with built-in guide bearings.
- Both of these run against a straight edge or shaped template. Without this, the varying reaction of the wood against the torque of the tool makes it impossible to control with the precision normally required.



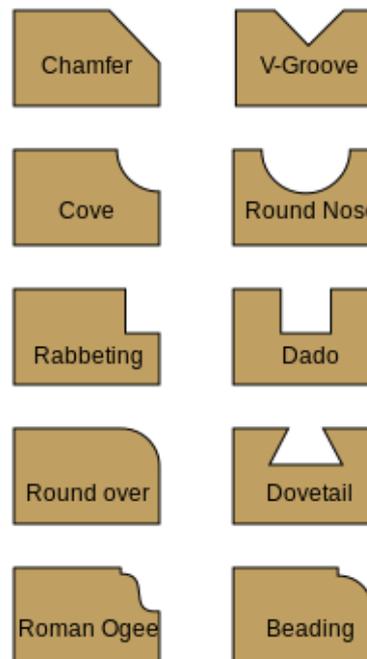
ROUTER BITS

- Router bits come in hundreds of varieties to create either decorative effects or **joinery** aids. Generally, they are classified as either **high-speed steel** (HSS) or **carbide-tipped**.
- Edge bits have a small wheel bearing to act as a fence against the work in making edge moldings. These bearings can be changed by using commercially available bearing kits.
- Non-edge bits require the use of a fence, either on a router table or attached to the work or router.
- Anti-kickback bits employ added non-cutting bit material around the circumference of the bit's shoulders which serves to limit feed-rate.
- Bits also differ by the diameter of their shank, with $\frac{1}{2}$ inch, 12mm, 10mm, $\frac{3}{8}$ inch, 8mm and $\frac{1}{4}$ inch and 6mm shanks (ordered from thickest to thinnest) being the most common.



ROUTER BITS

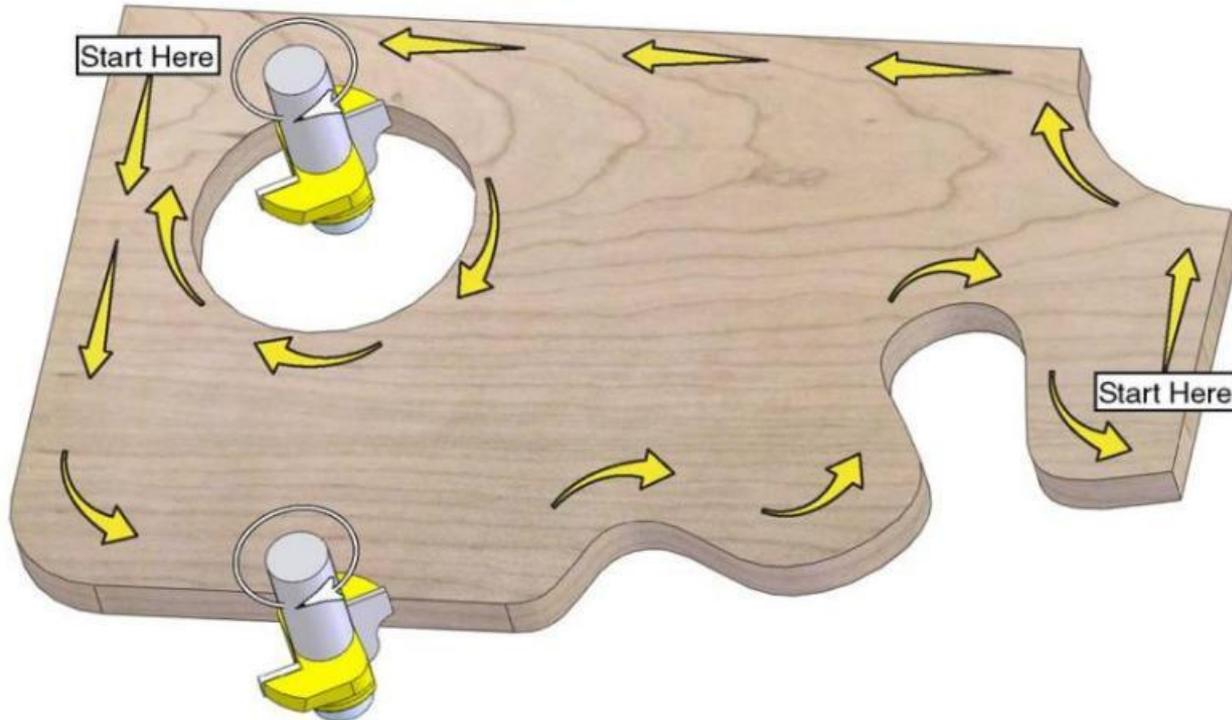
- Sometimes complimentary bits come in sets designed to facilitate the joinery used in frame and panel construction.
- Router bits can be made to match almost any imaginable profile. Custom router bits can be ordered.
- They are especially beneficial for home restoration projects, where production of the original trim and molding has been discontinued.



FEED DIRECTION RULES

Feed Direction Rules

- ▶ Always feed the router against the rotation of the bit. This prevents the router from grabbing the wood and self-feeding, resulting in a loss of control.
- ▶ When routing around the exterior of a shape, feed the router counterclockwise.
- ▶ When routing around the interior of a shape (such as the circle shown below), feed the router clockwise.
- ▶ Begin routing across the end grain first (as indicated with "Start Here" in the figure below). This reduces tearout at the corners.



FEED DIRECTION

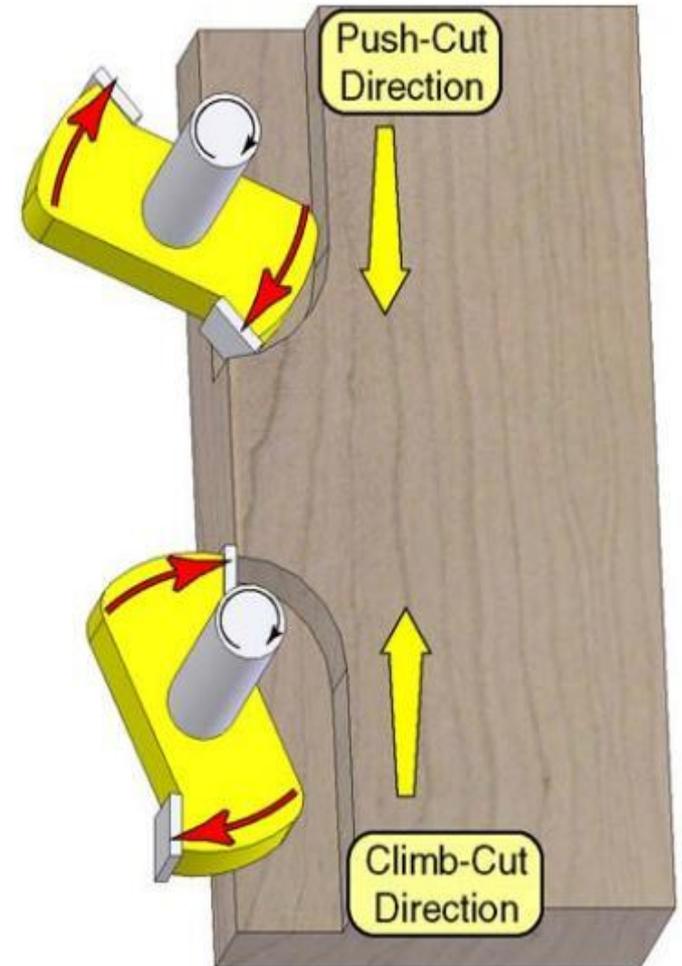
Router Feed Direction

For safety and control, the router should always be fed in the direction against the rotation of the bit. This is called push-cutting (among other names). Feeding the router in the same direction as the bit rotation is called climb-cutting, and is extremely dangerous.

When fed in the push-cut direction, the router bit resists forward movement and provides greater control to the operator.

If a router is fed in the climb-cut direction, the router bit tends to self-feed, climb, or walk its way down the edge of the workpiece. Feeding in this direction can, and will, cause the router to grab suddenly and jerk down the workpiece, resulting in loss of control.

Special care needs to be taken when making dado cuts and plunge cuts with a router because one side of the bit is push-cutting, and the other side is climb-cutting. This can have unpredictable results as each side of the bit engages the workpiece.



COLLET SIZES & BIT CHANGES

Collet Sizes

- Just about any larger, variable speed router will offer both $\frac{1}{4}$ " and $\frac{1}{2}$ " collets.
- This is important, as larger bits aren't made with a $\frac{1}{4}$ " shank size. The shank is just too weak and would break in use.

Bit Changes

- Routers have traditionally required two wrenches to loosen and tighten the collet, much like a table saw.
- But many manufacturers offer one-wrench systems. There is usually a lever or button that locks the spindle in place while using a single wrench to change bits.



VARIABLE SPEED

- Just like your drill press, larger diameter bits require a slower speed. When cutting speed is too fast, the wood will burn.
- Many modern routers allow the speed of the bit's rotation to be varied. A slower rotation allows bits of larger cutting diameter to be used safely. Typical speeds range from 8,000 to 30,000 rpm.
- The ideal speed is the fastest speed (just short of burning) that gives the smoothest possible cut.
- Most routers with $\frac{1}{2}$ " collets have variable speed because they're designed to run larger bits. A single speed router is restricted to very limited work with small diameter bits.



Speed control



POWER & CIRCUITRY

- Compare the amperage of motors when purchasing a new router, not just the stated horsepower.
- Most 2 to 2 ¼ hp routers will draw between 10 and 13 amps.
- Buy a brand name router with a higher amperage draw and it will likely have a little more power.
- Most of the better routers now have a soft start feature. This brings the router to full speed over a second or so, resulting in a very soft feel in your hands.
- “Electronic variable speed” or “electronic feedback circuitry” regulates router speed, keeping it more constant even when faced with higher loads. It also gives you more control and smoother cuts.



STOP SYSTEMS & FINE ADJUSTMENT CONTROLS

Stop System

- A plunge router is plunged downwards until you hit a stop for the desired bit depth. A good stop system is key.
- A turret stop, sometimes has as many as eight steps, each a specific distance apart. This is very handy when making deep cuts, perhaps cutting $\frac{1}{8}$ " deeper per pass. The lower turret steps to the final depth setting and then back-track as many steps up as needed.

Fine Adjustment Control

- In addition to being able to stop where you want to, you need a method of getting there, and accurately dialing in a final depth.
- Fixed-base routers excel, because turning the motor in the base will dial in a specific depth.



ROUTER SAFETY

Ten Tips For Safer Routing

1. Feed stock in the right direction – against the rotation of the blade (into the cutting action).
2. Ensure that the bit is properly seated in the collet.
3. Match the bit size to the router speed.
4. Clean your bits before they get caked with pitch and tar.
5. Don't use dull bits – re-sharpen or replace them.
6. Take light cuts and make multiple passes, particularly when using thin bits.
7. Always ensure your stock is securely held in place before routing.
8. Always hold the router with two hands.
9. Don't start cutting until the bit reaches full speed.
10. Use a router table when possible, particularly for larger diameter bits.



Thank you

