

## Turning a Toolbox Pencil

### Supplies Needed

- 11mm Drill Bit
- 3/4" x 3/4" x 5" Pen Blank
- Pen Mandrel
- Toolbox Pencil Bushings
- Narrow Parting Tool
- Glue (Thick CA or Epoxy)
- Sandpaper
- Drill or Drill Press
- Barrel Trimmer 13/32"
- Pen Press or Clamp
- Eye and Ear Protection

### Cutting and Drilling the Pencil Blank

1. Draw a 1" line lengthwise across the center of the blank to help maintain proper grain alignment when turning.
2. Cut each blank 1/4" longer than the brass tube.
3. Using a drill press with the blank secured in a vise or clamp, drill a hole through the center of the blank stopping an 1/8" short of the bit exiting the blank. Drill at 2,000–3,000 rpm backing the drill bit partially out of the hole every 1/2" to clear chips. When using larger bits or drilling plastics drill at 250–500 rpm.
4. Trim away a small amount of wood from the end of the blank to expose the hole. The blank should be slightly longer than the brass tube. This technique prevents cracking caused when the bit exits the blank.

### Gluing the Brass Tubes Into the Blanks

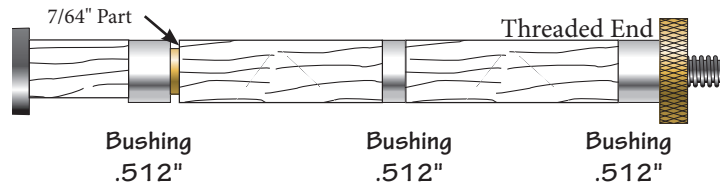
1. Lightly scuff the exterior of the brass tube with 220 grit sand paper to prepare it for gluing.
2. For a fast bond, use thick cyanoacrylate adhesive (super glue) or 5 minute epoxy. For additional working time and more thorough bond, use expanding polyurethane (Gorilla or Sumo Glue). Apply a thin layer of glue to the tube and insert it into the blank rotating the tube as you go to spread the glue evenly. Make sure the wood extends beyond the tube on both ends to allow for trimming.

### Trimming/Truing the Blanks

1. Remove excess wood using either a barrel trimmer or disc sander to square the ends of the wood blank with the tube. This step is critical for the pencil components to fit together properly. **Do Not** trim the brass tube as this may result in an improper fit when the pencil is assembled.

### Mandrel Setup and Turning

1. Assemble the bushings and blanks on the pen mandrel as shown below. Be sure that the ends of the blanks with the reference mark meet together at the center of the mandrel.



2. Advance a 60° revolving cone center into the dimpled end of the mandrel and tighten using light pressure. **Do Not** over tighten the tailstock or mandrel nut as this may cause the mandrel to flex resulting in off-center barrels.
3. Turn both blanks to the desired shape leaving the blanks slightly larger than the bushings.
4. Using a sharp 1/16" parting tool, make a part 7/64" wide in the end of the upper blank until the brass tube is exposed. This is for the hex ring on the top of the pencil.
5. Sand the blanks using progressively finer grits of sand paper, then apply your favorite finish.

### Assemble the Parts

Layout the parts as shown paying careful attention to keep the pencil tubes in the same orientation as when on the mandrel. Use a vise or clamp with wood or plastic jaws to prevent damaging parts during assembly.

*Hint: While removing the tubes from the mandrel, mark the inside of each brass tube where they join to maintain grain alignment during assembly.*

1. Press the hex coupler into the lower tube opposite the internally threaded end.
2. Press the hex ring onto the exposed end of the upper tube. If the ring is loose, glue it in place with thick super glue.
3. Press the upper tube onto the other end of the hex coupler.
4. Pull the sharpener off the pencil transmission and screw the pencil transmission into the threaded end of the lower tube.
5. Apply a small amount of thick CA glue to the inside the indented end of the sharpener coupler and press over the pencil transmission inside the upper tube. Wait for CA glue to dry and thread the sharpener onto the sharpener coupler.

