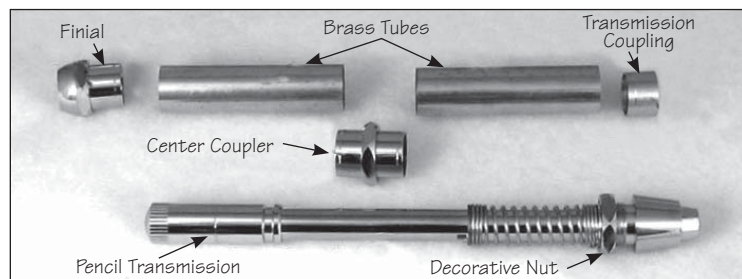


## Woodworker's Sketch Pencil Hardware Kit

Requires standard "A" mandrel, woodworker's sketch pencil bushings (88K80.73),  $\frac{29}{64}$ " drill bit, and minimum  $\frac{3}{4}$ " square blank.



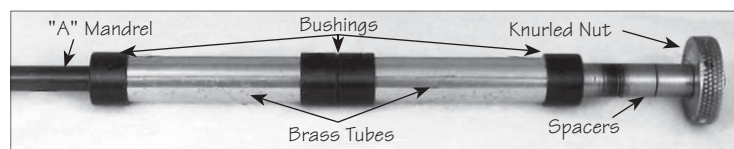
Parts photograph for sketch pencil.

### Preparing the Material Blanks

1. Cut the material blanks a little longer, approximately  $\frac{1}{4}$ ", than the tubes.
2. Drill both blanks through the center, lengthwise, with the  $\frac{29}{64}$ " bit. This is a large-diameter hole, so it is advisable to drill a pilot hole of a smaller diameter to prevent splitting the blank.
3. Polish the brass tubes with sandpaper. This can be done by hand or on a power machine such as a belt sander. The purpose of the sanding is to clean off the oxidation and roughen the tube so that the glue will have a better adhesion surface.
4. Plug the ends of the tube with the material of your choice. Some use base wax (a dental product), or play dough, or even a slice of potato. Just push the ends of the tubes into a thin section of the material. This will form a plug to keep the glue from getting into the tube.
5. Clean the tube, after plugging, with acetone or alcohol on a rag.
6. Prepare your glue. You can use a fast-drying, two-part epoxy, one hour or less. Be sure to mix it thoroughly. (A Post-it® Note pad makes an excellent mixing place. When you are finished just tear it off and throw it away.) Polyurethanes and thick flexible cyanoacrylates (CAs) can also be used. (If not using epoxy, go to step 9.)
7. Place some epoxy into the blank using a small piece of dowel or other small stick.
8. Roll the appropriate tube in the epoxy.
9. Insert the tube with a twisting motion until it is almost all the way into the material blank. Then use the dowel to push it in until the end is flush with the blank. Use the dowel to rake off the excess glue even with the blank and the tube.

10. Push the brass tube through the blank until the other end is flush with the blank. Then rake the glue flush with that end. Now push the tube back into the blank until the tube ends are equidistant from the ends of the blank.
11. Set it aside for 60 minutes until the epoxy has had time to reach its maximum strength.
12. If you are using CA glue, the wait is only about 60 seconds. When using polyurethane the wait will be about 24 hours.
13. When the glue has cured, use a hobby knife to remove the plugs from the ends. It is also a good idea to clean the tubes with a brass gun-cleaning brush or a rolled up piece of sandpaper to remove any glue that may have gotten into the tubes.
14. Not cleaning out all glue from the tubes is the most common cause of pencil failure. **Be certain** that all dried glue is removed from inside the tubes before proceeding.
15. Using a barrel trimmer of the proper size, face off each end of the blank until it just touches the brass end of the tube. **Stop** facing at this point. Your pencil's proper operation is dependent on having the proper length tube. This facing operation can also be done with the proper jig and a disc or belt sander.
16. Not having the proper tube length is the #2 cause of pencil failure. Sanding, on a disc sander, using a jig to hold the tube square with the disc, is a more sure way of getting the proper length. It should be tried if you have any doubt as to your abilities to square the material with the barrel trimmer.
17. Another good method of squaring the ends of the blanks is to turn the blanks until they are just round. Using a miter gauge to maintain the blanks perpendicular to the sanding disc, just touch the ends to the disc. Once the blanks are square and you can see the ends of the tubes brighten, then return the blanks to the mandrel and finish the turning until the desired contour is accomplished.

### Turning the Material Blanks



1. Assemble the blanks on the mandrel using the bushings. With these bushings it is not necessary to be particular with the order they go on the mandrel. They are identical.
2. Tighten the tailstock before tightening the blanks on the mandrel. This will center the mandrel first. Then tighten the nut that holds the blanks.

3. Turn the blanks to the desired contour, making sure that the blank diameters are the same as the bushings.
4. After turning the blanks, sand the surface in progressive steps until you get to 400 or 500 grit.
5. Apply the finish of your choice and polish.
6. Remove the blanks from the mandrel.

### Assembling the Pencil

Please refer to the pencil parts photograph.

The third most common error resulting in a non-functional or damaged pencil is the misalignment of the parts when pressing them in place. The use of a good pen press or small arbor press is recommended, but it can be accomplished with a good C-clamp and much care. When pressing in the various parts, by any means, **be sure** that the parts are straight and in line with the blanks. If the part is cocked or otherwise misaligned, at the very least, a poor fitting pencil will result. At the worst, you may have a pencil that is not usable. Exercise caution here!

Occasionally, you will encounter parts that are a little loose fitting. This can be corrected by using a **small** spot of glue, usually CA, on these parts before pressing them home.

1. Press the finial into one end of one of the finished blanks.
2. Press the center coupler into the other end of the blank.
3. Press one end of the other blank onto the center coupler, observing good pattern and grain matching techniques.
4. Now press the transmission coupling, small end first, into the remaining end of the blank.
5. Slide the decorative nut onto the small end of the pencil transmission. Slide it over the spring and then thread it onto the threads on the transmission. It will pass by the threads and may appear loose. This is normal.
6. Slide the pencil transmission into the end where the transmission coupling was pressed and screw it tight in place.

To advance the lead, press the button on the finial.