

Cambridge/El Grande Rollerball and Fountain Pen Hardware Kits

Requires large-diameter "B" mandrel, el grande pen bushings (88K78.75), $\frac{31}{64}$ " and $\frac{33}{64}$ " drill bits, and minimum $\frac{3}{4}$ " square blank.



Parts Diagram for the El Grande Rollerball and Fountain Pen

Preparing the Material Blanks

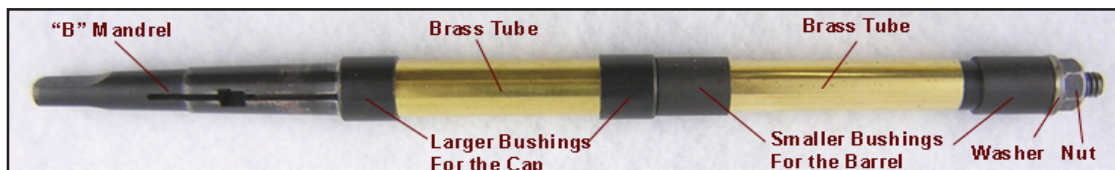
This is a large-diameter pen. Extreme care must be taken when drilling the blanks. Because the bits are large, there is a high probability that the blank will split if the bit is allowed to exit the material. For that reason, the blank length should be the length of the tube plus $\frac{3}{4}$ ". This will allow you to drill the hole in the blank without piercing through the bottom of the blank with the drill bit, thus preventing the blowout or splitting of the blank. Some pen makers will drill both blanks with the $\frac{31}{64}$ " bit and then enlarge the hole in the short blank with the $\frac{33}{64}$ " bit.

1. Mark each blank the length of each tube plus $\frac{3}{4}$ ". Mark the place on the outside of the blank where the tube end will be when completed.
2. Drill the short blank with the $\frac{33}{64}$ " bit. Place the blank in your centering vise or other holder. Move the vise to a position where it is possible to lower the bit in front of the blank.
3. Place the bit in the drill press and lower it until the end of the bevel on the bit is just below the mark made in step 1.
4. Mark this position so that you can return to it easily and exactly. A drill press stop is perfect for this operation.
5. Retract the drill bit.
6. Move the blank until it is perfectly centered under the bit. Marking an X from corner to corner on the end of the blank will establish its center.
7. Drill the hole slowly and deliberately to the depth stop.

8. Remove the blank and trim it off a little longer than the line marked in step 1.
9. Drill the long blank with the $\frac{31}{64}$ " bit. Place the blank in your centering vise or other holder. Move the vise to a position where it is possible to lower the bit in front of the blank.
10. Place the bit in the drill press and lower it until the bevel on the bit is just below the mark made in step 1.
11. Mark this position so that you can return to it easily and exactly. A drill press stop is perfect for this operation.
12. Retract the drill bit.
13. Move the blank until it is perfectly centered under the bit.
14. Drill the hole slowly and deliberately to the depth stop.
15. Remove the blank and trim off a little longer than the line marked in step 1.
16. 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.
17. Plug the ends of the tubes 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.
18. Clean the tube, after plugging, with acetone or alcohol on a rag.
19. 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 22.)
20. Place some of the epoxy into the blank using a small piece of dowel or other small stick.
21. Roll the appropriate tube in the epoxy.
22. 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 until the end is flush with the blank. Use the dowel to rake off the excess glue even with the blank and the tube.
23. 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.
24. Set it aside for 60 minutes until the epoxy has had time to reach its maximum strength.
25. If you are using CA glue, the wait is only about 60 seconds. When using polyurethane the wait will be about 24 hours.
26. 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.

27. Not cleaning out all glue from the tubes is the most common cause of pen failure. **Be certain** that all dried glue is removed from inside the tubes before proceeding.
28. 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 pen's proper operation is dependent on having the proper length tubes. This facing operation can also be done with the proper jig and a disc or belt sander.
29. Not having the proper tube length is the #2 cause of pen 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.
30. Another good method of squaring the ends of the blank is to turn the blank until it is just round. Using a miter gauge to maintain the blank 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 with the right bushings in the right place. The right bushing can be found by comparing the diameter of the bushing to the piece of hardware that will be placed in that place. For instance, the bushing that is the same size as the clip will fit on the end of the blank that will eventually become the top of the cap.
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 area next to the bushing is turned to the size of the adjacent bushing.
4. After turning the blank, 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 Pen

Please refer to the Pen Parts diagram.

The third most common error resulting in a non-functional or damaged pen 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 pen will result. At the worst, you may have a pen 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 nib holder into one end of the lower tube (this is the longest tube). Make sure you choose the appropriate end of the tube to preserve the pattern or grain match on your pen.
2. Press the receiver holder into the other end of the lower tube.
3. Screw in the black receiver.
4. Drop the spring, small end up, into the lower tube.
5. Remove cap from refill and drop it in with the point sticking out of the tube.
6. **Note:** *If making the fountain pen, replace steps 4 and 5 with this:*
Insert refill cartridge or converter pump on the writing nib.
7. Screw on the nib.
8. Lay this assembly aside for a minute.
9. Slide the center ring onto the center ring holder.
10. Press this assembly into the upper tube (short tube). Be sure to observe all techniques regarding grain or pattern match.
11. Press the brass insert into the other end of the same tube with the threaded end up. Press it in until the shoulder is flush with the blank. This will leave the threads sticking out.
12. Place the clip over the threaded part of the brass clip insert.
13. Place the clip ring over the clip with the notch over the clip.
14. Screw on the finial.
15. If the clip is not quite tight you can disassemble the clip and press the threaded insert into the tube just slightly more.
16. Place the cap on the pen.