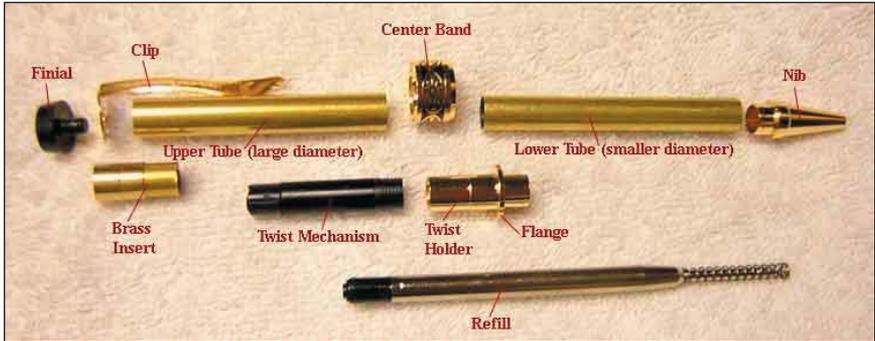


Half-Twist Ballpoint Pen/Pencil Hardware Kit

Requires large-diameter "B" mandrel, convertible pen/pencil bushings (88K78.79), $1\frac{1}{32}$ " and letter "O" drill bits, and minimum $\frac{5}{8}$ " square blank.



Parts diagram for convertible pen/pencil.

1. Cut the blanks the length of each brass tube giving a little extra length for the facing of the blanks after the tubes have been glued in.
2. Drill the upper blank, the shorter one, with the $1\frac{1}{32}$ " drill bit.
3. Drill the lower blank, the longer one, with the letter "O" drill bit.
4. 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.
5. 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.
6. Clean the tube, after plugging, with acetone or alcohol on a rag.
7. 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 or cyanoacrylates (CAs) can also be used. (If not using epoxy, go to step 10.)

8. Place some of the epoxy into the blank using a small piece of dowel or other small stick.
9. Roll the appropriate tube in the epoxy.
10. 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.
11. Push the 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.
12. Set it aside for 60 minutes until the epoxy has had time to reach its maximum strength.
13. If you are using CA glue, the wait is only about 60 seconds. When using polyurethane the wait will be about 24 hours.
14. 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 piece of rolled up sandpaper to remove any glue that may have gotten into the tubes.
15. Using a barrel trimmer of the proper size, face off each end of the blanks 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.
16. 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.
17. 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 Blanks



1. Assemble the blanks on the mandrel with the right bushings in the right place, as shown above. 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 blank diameters are the same as the bushings.
4. After turning the blank, sand the surface in progressive steps until you get to 440 grit.
5. After sanding to 440 grit, stop the lathe and measure $1\frac{7}{8}$ " from the cap clip end (shorter blank) and mark. With a sharp parting tool, cut a groove all the way to the brass tube on the cap center band end. This will receive the center band of your pen.
6. Remove the blanks from the mandrel.

Assembling the Pen

Please refer to the pen parts diagram.

1. Press the nib into the smaller end of the longest blank.
2. Press the twist holder into the other end. **Do not** press on the end of the holder. Use a press block made from a piece of wood with a $\frac{5}{16}$ " hole. Slip the longer end of the holder into the block for pressing. This will allow the pressing force to be on the flange and not the thin threaded end.
3. Place desired refill into the barrel. If inserting the pen refill, make sure the spring is in place on the refill. (The pencil mechanism does not need the spring.)
4. Place the twist mechanism over the insert and screw into place.
5. Check the operation of the mechanism.
6. Set this piece aside for a moment.

7. Press the three-piece center band onto the exposed brass tube.
8. Press the brass insert into the other end of the brass tube until it is flush.
9. Place the finial threads through the clip and screw into the brass insert.
10. Slide the cap on the mechanism.
11. Check for correct operation again.

Changing Inserts

1. Unscrew the pen cap (the shorter end of the pen).
2. Remove the present refill and replace with the other one. When removing a pen refill, make sure that the spring comes out also. When replacing the pen refill, make sure the spring is in place.
3. Screw the cap back on the pen.

The pen uses a standard Parker-style refill. The pencil accepts 0.7mm leads.