

## Fabricating Two Piece Pen

In this unit you will fabricate a two piece pen from aluminum round bar using a metal lathe. Use the following steps to help you fabricate the pen to the dimensions indicated on the attached drawing. You will also be required to obtain a “Bic” style pen insert for pen.

### Machining process common to both pieces.

1. Cut two pieces of 5/8” aluminum bar stock to a length of 3” each using a hacksaw or horizontal bandsaw.
2. End face and centre drill all of the ends.
3. Attach one end of your work piece to the lathe chuck and support the other end with the tailstock. Parallel turn both pieces to a diameter of ½ inch (500 thou.) – **Note:** since a portion of your piece is going to be held by the lathe chuck, you will have to turn one end to ½” diameter, flip the piece in the machine and turn the other end. Make sure you center it carefully in order to have a uniform finish.

### Machining process of the bottom piece.

1. In order to avoid wobbling, mount your piece in the chuck as far in as you can with less than half of its length sticking out. Using a 5/32” drill bit, drill one end to the full depth of the bit – approximately 2” deep. **Remember to clean the bit every ¼” – ½” drilling depth to avoid clogging it up with chips and causing it to break.**
2. Flip the piece and drill the other end until the hole is all the way through.
3. Change the drill bit size to 5/16 and drill one end to a depth of ¾”.
4. Remount your piece with the end that has a bigger diameter hole attached to the lathe chuck and the other end supported with a tailstock.
5. Set up for a 2 ½ degree taper and turn your piece until the end tip is down to ¼” diameter or the total length of the tapered section is about 2”.

6. Remove your work piece and thread the 5/16" internal diameter hole using a 3/8" NF tap.

### **Machining process to the top piece.**

1. Parallel turn a section of 5/8" length on one end of the workpiece to a diameter of 3/8".
2. Chamfer the tip of your workpiece to 45 degrees in order to make it easier for threading.
3. Using a 5/32" drill bit, drill to a depth of about 2".
4. Remount the piece so that it is flipped around in the lathe. Set up for a 2 ½ degree taper and turn your piece until the total length of the tapered section is slightly longer than 1 ¼".
5. End face the tapered end to remove the centre drilled section. (you want a flat end on the top of your pen.)
6. Remove your work piece and thread the reduced diameter section (3/8" section) using a 3/8" NF die. Check to make sure that the two pen pieces will screw together snugly.

### **Additional and optional work.**

Your pen can be dressed up by making a brass ring that fits between the two pen sections.

Take a ½" diameter brass rod and drill a 3/8" hole down the center of its long axis. Part / cut off a length that is 1/8" to ¼" to create a ring that will slide over the threaded portion of the upper half of the pen and sit in between the two halves after they have been screwed together.

### **Final finishing of the pen.**

The surface of your pen might be covered in "tooling marks" that you do not like. The finish can be changed to either a "matte or mirror" finish.

1. Use a hand file to smooth the surface of your pen while it turns on the lathe. Clean the file frequently as it will clog up with aluminum.

2. Hold sandpaper (280 grit) on the pen as it turns on the lathe and then switch to 400 grit emery cloth. After a few minutes working with the emery cloth, a matte finish will form on the surface of the pen that will give it a stylish look and feel.
3. A finer matte finish can be created by switching to a 600 grit and then 800 grit emery cloth.
4. A mirror finish can be created by putting a paste polishing compound on the pen and buffing it to a glass finish using a buffing wheel or buffing pad.