

## Bushing Replacement (for PN 18252050)

The shifter and brake pedals on a Cal-3 I recently bought were loose and sloppy, so I decided to replace the plastic bushings with some homemade bronze ones. I done this earlier for a friend's Cal-2, but this time I thought I'd take some pictures and write up the procedure.

Here are the parts you need to get. (you'll need some tools, too, as described below)



The piece on the left is a 3/4 inch od, 5/8 inch id bronze bushing. You can get these at most big hardware stores; they cost a couple of bucks. The other piece is a well nut. It should be sized to fit the bushing as in the next pic. The screw goes in the well nut, and the nut holds the screw in place.



The next thing you need to do is turn the outer diameter of the bushing to size. You can do this with hand tools, but you'll need a micrometer or caliper to measure the od accurately. The target for the outer diameter turns out to be 18.95 mm, which means that you only need to take off about 0.05 mm of material ( $3/4 \text{ in} \times 25.4 \text{ mm/in} = 19.05 \text{ mm}$ .  $19.05 \text{ mm (original od)} - 18.95 \text{ mm (target od)} = 0.10 \text{ mm}$ , but you divide this by 2 to get the amount of material to remove. This is a little less than 2 thousands of an inch, which is less than the thickness of a piece of paper!) To do this, I chucked the screw from the well nut in a hand drill, turned the drill on and took most of the material off with a Dremel tool equipped with a coarse sanding drum. Then I finished the od of the bushing with a piece of emery paper.



Turning the outer diameter to size. Both the drill and the Dremel tool are turned on to do this.

Next you cut off the bushing to the desired height. I cut most of the way thru bushing using the Dremel with a carbide saw bit to get it reasonably true (again, you turn both the drill and the Dremel tool on to do this). Then I removed the bushing from the well nut and cut all the way thru the bushing, finishing the cut surface with a grinder then emery paper. You might want chamfer the outer edge of the bushing.



You then use a fine sanding drum on the Dremel (a dowel & emery paper would work) to take a little off the inside of the bushing so that it will fit properly on the bike. You don't need to take much off, probably only a few thousandths of an inch. I don't think you need a picture of this.

You use a bolt, washer, and socket arrangement to draw the new bushing into the shifter or brake lever. You'll probably need two wrenches to do this.



Use a little grease before installing the shifter or brake pedal and you're done!