

# Renewing SU Carburetor Throttle Shafts

Replacing worn SU throttle shafts and bushings is one of the dreaded tasks that LBC owners come to face early on. In fact it is a relatively simple procedure that a modestly skilled owner can accomplish using fairly common garage tools and at minimal expense. Here is a simple procedure for doing the job.

## **Step 1 – The new parts**

- New replacement throttle shaft(s) from Burlin or one of their distributors – roughly \$25 each. The shafts we used were provided by Joe Curto and are slightly undersize (.310) for proper running clearance
- Two 3/8 OD x 5/16" ID x 1" OAL sleeve bearings for each shaft – your choice of Oilite, plain bronze, PTFE, or similar. They can be purchased from any industrial supply house for about \$2.00 - \$5.00 each depending on your choice of material. The ones we used were Oilite and provided by Moss.
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## **Step 2 – The tooling**

You will need access to a good sturdy drill press with a table vise and 3/8" drill chuck. I will be showing pictures of the process using the Cincinnati milling machine in my shop which is overkill for this job. One of the ubiquitous Taiwanese mill/drills or a good sturdy drill press will work just fine. You just need a machine with enough quill travel to maintain your setup across tool changes. You will also need the following cutting tools. You are not going to be doing any heavy cutting so inexpensive imported HSS tools are fine for this job. If you plan on doing this to put bread on the table you might wish to spend a few dollars more for a higher quality brand name. The prices below are for imported cutting tools that will easily do a dozen or more carburetors if properly cared for – e.g. run at low speeds and feeds.

- A straight shank 3/8" six flute HSS chucking reamer - \$9.00 at Shars
- A 3/8" HSS square end mill, preferably with four or more flutes - \$4.00 at Shars
- A sharp 5/16" HSS jobber twist drill, preferably new - \$0.88 at Shars
- A 12" length of 1/2" x 3" cold rolled flat steel bar - \$14 from an online metal supplier
- A 5" long piece of 5/16" drill rod for setup - \$4.00 from McMaster.

The following pages describe the machining process. The carburetors were provided by a local TR4A owner and already had bushes installed. We considered removing the old bushes but after a few unsuccessful attempts with a tap I decided to bore them out as if they were not there. That process worked perfectly, and I would recommend it.

### Step 3 – The Fixture

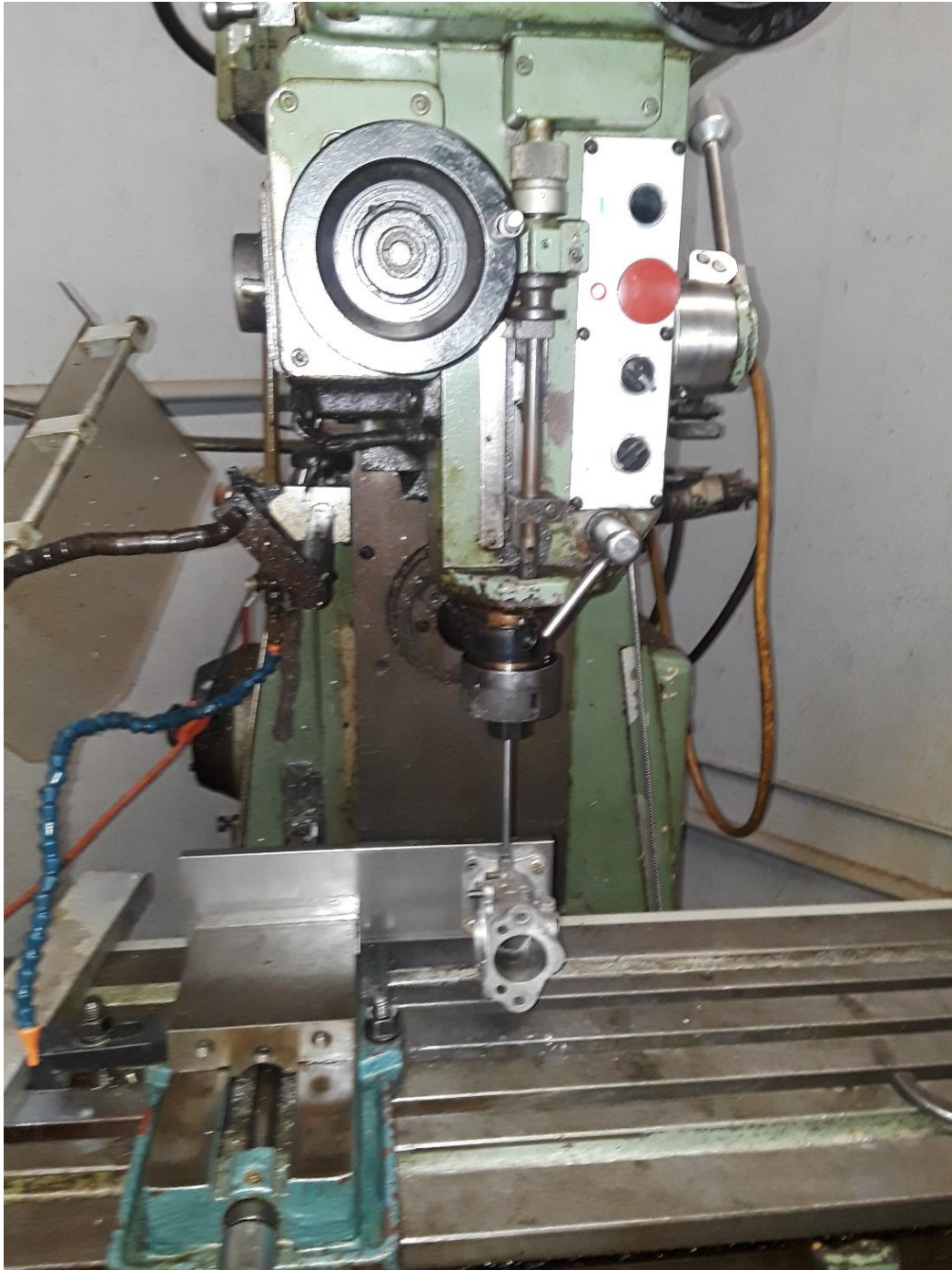
You will need to construct a fixture for holding the carburetors during the machining process. I drilled four holes in the end of the cold rolled flat to match the bolt pattern in the base of the carburetor and clamped it in my machine vise as shown in this picture. The carburetor bodies were bolted to the steel bar for machining.





## Step 4 – Setup the carburetor

Next you need to setup the carburetor body for machining. The 5/16" drill rod is chucked in the machine spindle and used to do that. After loosely bolting the carburetor body to the fixturing plate the fixture and work is moved under the drill rod which is lowered into the shaft openings in the body of the carburetor and out the backside. With the drill rod in place to center the work tighten the vise jaws on the fixture plate and then the table clamps for the vise. Once the fixture is clamped to the table the carburetor attaching bolts can be fully tightened. Now the drill rod is withdrawn and re-inserted to double check the setup. It should pass through the body without interference or binding. If necessary slacken the fixturing bolts and adjust the position of the body as needed. The mounting holes in the base of the carburetor are slightly oversize and provided enough clearance for fine adjustment. Once the fixturing is completed to your satisfaction proceed to Step 5



## Step 5 – The plunge cut

Remove the drill rod from the chuck and insert the 3/8" end mill. Set the spindle speed to roughly 200-300 RPM. Lower the quill to bring the end mill into contact with the body of the carburetor and set the depth gauge on the quill to zero. Raise the quill slightly, turn the spindle on, and slowly plunge cut a counterbore into the body of the carburetor stopping just short of going all the way through. Use light pressure, keep a close eye on the depth gauge, and feed slowly to avoid over shooting!





## Step 6 – Deburring and finishing to size

Remove the end mill and chuck up the reamer. Repeat the plunge operation using the reamer taking care to go no deeper than the initial plunge cut. This will remove any burrs left by the end mill and produce a final size. I checked my end mill on a bit of scrap before applying it to the carburetors and found it cut a bit undersize. You should check yours as well to make sure it does not cut oversize. A 23/64 end mill may be a better choice for the rough cut.





## Step 7 – Install the new sleeve bearing

Remove the reamer and using a brass faced hammer gently tap the new sleeve bearing into the counterbore. Stop when the bearing bottoms in the counterbore. I used a deburring wheel on a bench grinder to slightly bevel the leading edge of the bearings to aid in starting them.





### Step 8 – Trim bearing flush to body

Now once again using the end mill trim the top of the bushing flush with the top of the body. A flat file can be used to remove any edges left by the end mill.





## Step 9 – Clean up ID of bearing

Now run the twist drill through the newly installed bearing to remove any burrs left by the previous operations and open up any loss of internal dimension caused by the press fit. The new throttle shaft should now be a close free fit to the ID of the new bearing.





That completes the installation of the first sleeve bearing. Without disturbing the rest of the setup unbolt the carburetor body from the fixture plate, rotate it 180 degrees, and loosely reattach it to the fixture. Use the drill rod inserted through both bearings top to bottom to re-center it on the fixture, tighten the attaching bolts, and repeat steps 5-9 to install the second sleeve bearing. When the second bearing is complete run the new throttle shaft through both bearings top to bottom to check the fit. If there is any tightness or binding on the shaft run the twist drill through the bearings top to bottom one last time to eliminate it. That's it – the carburetor is done. If you are doing more than one carburetor continue with them without breaking the setup and only minor positioning adjustments if any will be needed. This procedure produced a perfect throttle shaft fit on the two carburetors we did – right on the .0025 undersize provided by the new Joe Curto shafts. I can't imagine getting a better fit using a different procedure.