

It might be the Shaft

Worn distributor bushings shouldn't be neglected

By Bruce Smith

After fifty-plus years of use, the distributor in your old car has probably had some rebuilding done to it. Along with the periodic replacement of breaker points, it might have received new shims, insulators, friction plate, and maybe even new springs along the way. A fresh coat of paint to the outside may give you the warm feeling that it's like new again and ready for another 50 years. But these 'kit' parts and paint don't address what could most worn out about it: the main shaft in the distributor bore. While end play in the main shaft can be corrected using shim washers, radial play (also called axial play) will require new shaft bushings. This makes the rebuilding a bit more involved, especially if your distributor was built without bushings to begin with.

Most distributors use one or more steel or bronze bushings in the base of the body. Honed to a tight tolerance, this ensures that the shaft rotates with precise control over the opening of breaker points and the distribution of spark. The photo below shows the teardown of two Bosch distributors with their pairs of bushings separated by felt oiling wicks. The cast iron body distributor on the left is a model 0 231 129 022 and the aluminum body distributor on the right is an 0 231 129 031. But prior to about 1964, Bosch built cast iron distributors without bushings, allowing the shaft to ride directly inside the bore of the distributor. Three such distributors used in Porsche four cylinder motors are the VE4 BRS 383, the VJ4 BR9, and the VR4 BR18 shown below. This arrangement was probably considered suitable for the projected lifetime of these parts, and this has indeed been proven to be the case as many are still running fine as built. But bores and bushings will eventually wear. And the problems associated with this can sometimes be hard to isolate.

Right: Bosch cast iron 022 and aluminum body 031 distributors with factory shaft bushings. Bushings are removed with a shop press and a small socket and extender.

Below: Bosch cast iron BRS 383, BR9, and BR18 distributors with no factory shaft bushings.



Symptoms of a worn shaft bore

A poor running engine can suffer from a multitude of problems. The standard diagnostic approach is to check compression (or leak-down), adjust valves, confirm fuel delivery, adjust ignition, and then address the carburetors. But if poor or erratic performance remains, especially at high RPMs, the issue may lie deeper inside the distributor. As the distributor shaft rotates, any axial free play or wobble will effect spark delivery and dwell. When the shaft is driven from its bottom end for hundreds of millions of rotations, it will eventually begin to wear starting at the top of the bore. Problems becomes detectible as the radial play approaches about 0.1mm.

Pictured below is an example with a very worn out distributor. These side-by-side photos show the opening gap in breaker points when this distributor's shaft is at rest (left) compared to the gap when thumb pressure is applied to the top cam (right). The gap difference should normally be well below 0.1mm but here it is more than three times that.



A simple test for shaft play is to push on the cam and observe any change to the points gap. Here it's much larger than it should be.

As you would expect, this distributor's dwell will wander significantly, especially at crank speeds above 3000 RPM. Spark delivery becomes erratic as well, leading to the firing between cylinders off by several degrees. The test results below show the extent of the problem. This is a 'lights-off' photograph from a Sun tester running this distributor at about 1500 RPM (3000 at the crank). The indicator needle on the left should point to a sin-

gle gradation marking. Instead, it jumps over a range of about 3°, which is a full 6° at the crank. It's not tough to imagine how this would impact a running motor. This was a distributor that had been 'rebuilt' with all of the standard kit parts and a new lick of paint. But the simple testing of the shaft play was evidently never done.



Excessive radial play will lead to erratic timing between rotations.

Replacing (or placing) the bushings

Changing bushings in a distributor that already has them is fairly straight forward with some basic tools and a source for the parts. Removal of old bushings can be done with a shop press and the right socket. A Craftsman 7/16" socket with a 1/4" extension works well. A special Bosch piloted driver was made for this but it isn't really necessary. Unfortunately, the correct replacement bushings are starting to become NLA. But these can be machined from the standard offerings of oil impregnated plain sleeve bronze bushings made by Oilite with a little modification. Original Bosch bushings are 5/8" in length with a 5/8" OD and an ID necessary to be reamed to fit the 1/2" diameter of the distributor shaft bore. Standard Oilite bushings of these dimensions are available with a smaller 7/16" ID. This can be further machine bored to 31/64" and then reamed individually to the distributor shaft once inserted into the distributor. These modified bushings are shown below, together with an adjustable carbon steel angle blade reamer and pilot extension to hone the ID for the individual distributor shaft. These US made reamers can be found at tool suppliers like McMaster Carr and are fairly reasonably priced.



New modified plain sleeve bushings have been fit to this distributor and then hand reamed to size.

But what to do if you're starting with a distributor that had no bushings to begin with, like the BRS383, BR9, or BR18 (or other older Bosch distributors)? In this case, the distributor body needs to be bored open to the correct dimension to accept the new bushings. Not too difficult a task, or to have your local machinist carry out. As shown below, after drilling the

inside dimension to size, the bore is machine reamed to allow the press fitting of new sleeve bearings. The result is seen in the photos of two BR18 distributors below. On the right is a newly bored distributor body and on the left is with a pair of new bushings inserted. Then these are reamed to be tight to the shaft to remove any trace of wander or wobble.



Drilling then reaming the bore of an older Bosch distributor to accommodate new bushings.



Two Bosch BR18 distributors bored to fit new bushings (right) and with bushings inserted (left).

So is this a DIY project? Well sort of. The machining that is needed for an older cast iron distributor is a pretty basic task for your local machinist. You might be able to find a vendor with the correct sized Bosch bushings. If not, standard sized plain sleeve bushings can be machined to fit. Reaming them to the correct ID is the critical step as this is the issue that you're setting off to solve. Investment in a reamer and pilot extension may be a one-time tool but there aren't any short cuts here. Simple drilling isn't going to be good enough and the final fitment needs to be done after the bushings have been inserted. But done right, your distributor should truly be able to last decades longer.

Dr. Bruce Smith is an engineering professor at the Rochester Institute of Technology. His website is www.cfi-auto.com. 