

Replacing the Spindle Bearings

Detailed Instructions

These are detailed instructions on how to replace the spindle bearings on a 9x20 lathe sold by many suppliers and made in China.

The YAHOO 9x20Lathe group Files Section contains the 'Rebuild', and 'Tricking Out' documents. Well worth browsing!

Refer to the manual that came with your lathe, or look on the Grizzly or Harbor Freight web sites for PDF copies of the manual. They are not identical. Grizzly released an updated manual. It has good information and details not in the older manual.

My thanks to John Pitkin, Chas, and Racerx1500 for their suggestions and edits.

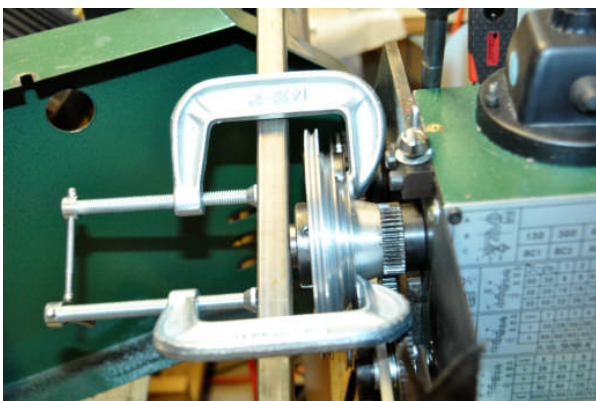
SO TO WORK!

The tapered bearings and outer races are separate pieces and have a definite direction. Make sure when reassembling, you orient the outer races and bearings correctly.

Cover the ways with wood or heavy cardboard to prevent any damage. UNPLUG THE LATHE!

Loosen the set screw on the Pre-load (spanner) nut, but don't remove it entirely. There is a brass anti-score disk under the set screw so it doesn't mangle the spindle threads. This disk isn't shown on some older diagrams!

Turn the Pre-load (spanner) nut so the set screw is at the bottom of the nut. Turn the *SPINDLE* (not the nut) to remove the Pre-load (spanner) nut in order to avoid losing the brass anti-score disk (don't ask)!



If you have never removed the belt pulley before, you may have to use a persuader to remove it. Notice that the C-clamp has a good bite on the meat of the pulley. Use care not to bend or deform the belt flanges on the aluminum pulley. Remove the Pulley, Gear, Ring, and Washer. You can leave the key in place if it isn't loose. While you have the pulley off, you may want to relieve the pulley bore so it slides on the spindle shaft.

Remove the screws and threading placard on the front of the head stock.

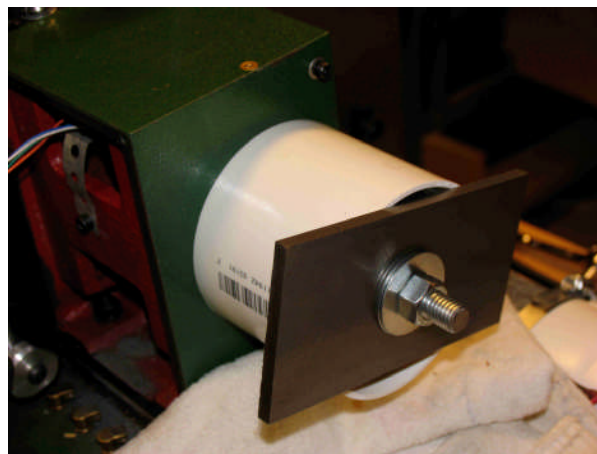
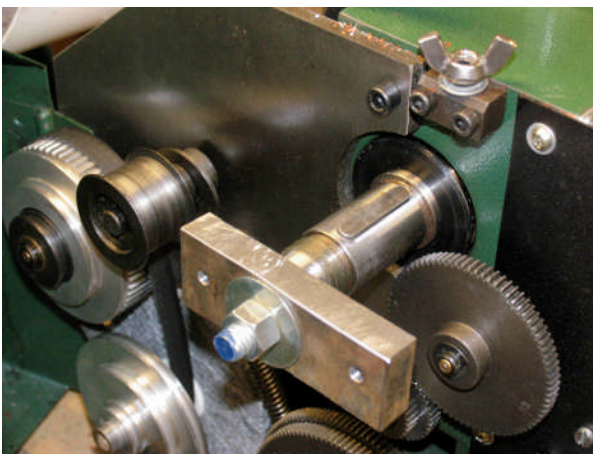


Before removing the 80T gear and its shaft, check for TWO set screws in the headstock under the threading placard. Some of these lathes have set screws that hold shafts in place. It isn't listed in instructions or manual, but check for it before you remove the 80T gear shaft. It wasn't on my lathe, but may be on yours. I removed just about everything because I was adding a Tachulator (tachometer for spindle RPM) and tumbler reverse as well. The pointer indicates upper set screw that locks the upper quadrant shaft. The lower shaft locking screw is visible

about an inch below the pointer. Failure to loosen these screws will result in stripped threads when removing the shafts.

Note: On the diagram, the bearing **AND** outer race are shown as one piece, but they are two separate pieces not shown separated.

You can use a spider gear puller like Harbor Freight Part# 37824-8VGA "46 Piece Bolt Puller Set". You can also improvise one. A 2' piece of all-thread 1/2" to 3/4" and some nuts. Don't go smaller than 1/2" for the all thread. Two pieces of plate steel are used as bearing surfaces. . Use a short piece of black pipe. I used a PVC 3" coupler from the local borg store. Try to center the threaded rod in the spindle hole, and crank the nuts in opposite directions.



The spindle will come free, and the washer and bearing on the left (gear) side of the spindle will be free. You will need some form of persuasion to get the right (spindle nose) side bearing (6) off the spindle. Here, the bearing separator HF Part #93980-0VGA "BEARING SEPARATOR

AND PULLER SET" works well. Put a piece of hardwood between the shaft and the pusher end of the spindle shaft.

The bearing Outer Races are still inside the headstock at this point. Push the two black sheet metal shields toward the center of the headstock. Insert a piece of wood dowel from the outside; gently tap around the edges and knock the shields into the center of the headstock and remove.

The next part concerned me the most. If you are going to replace the bearings, you will need to remove the bearing outer races. A three arm bearing puller can be used, but I was uncertain if I could get enough of a grip on the bearing outer race. I used a piece of steel rod and hammer to gently tap the outer races toward the outside of the headstock. Work your way around the edge and keep doing it until the outer races are free.

Now clean all the parts off, clean out the headstock bearing seats, and put a light coating of oil on them.

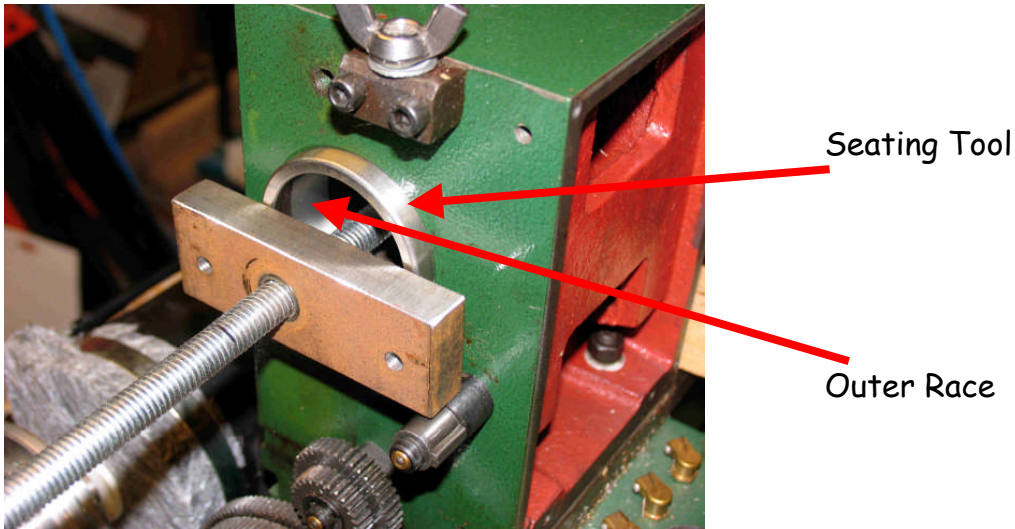
Note: Dependant upon the difficulty in removing the Inner Races and bearings it is essential to make sure the new bearings are a hand press fit on the spindle bearing journals. See "Bearing Journal Sizing" at the end of this document and consult the 'Rebuild Manual' for details.

Select a suitable piece of tubing or use one of the Old Outer Races ground down to make an insertion spacer for pressing the new Outer Races into the Bearing Seats. You want the "Pressor" to be a slip fit in the headstock bearing seat. Getting everything to line up will take some finagling.



This photo shows how to grind down the old outer race to use as a "Pressor".

Now use the improvised puller and the "Seating Tool" to press in the outer races one at a time. Remember to orient the outer race's taper facing outward ie. The thick part of the Outer Race goes toward the center of the head stock.



Reinstall the shields (7).

Please read the section on "Bearing Journal Sizing" below. This is very important and critical part of the bearing replacement.

Grease: Use either Red n' Tacky No 2 or a high temperature bearing grease on the bearings about 25 to 40% fill is correct. There is some disagreement on which is better.

Reinstall washer (5) and bearing (6) closest to the nose end on the shaft. Remember to orient the bearing correctly. Grease the bearing (6), and insert the spindle (3) into the headstock housing. Grease and seat the bearing on the gear side of the headstock and insert it onto the spindle. Make sure it seats all the way in. If you removed the 80T gear and shaft (15), replace it now. Remember the brass disk in the Pre-load (spanner) nut? Don't lose it. Put the washer (5), ring (8), gear (9), belt pulley (10), and Pre-load (spanner) nut (13) back on the spindle shaft.

Set the pre-load per the information below and tighten the set screw. You may have to make this adjustment several times over the first 1-4 running hours. My lathe is now blissfully silent!

My lathe has a variable speed DC drive, and when I was doing the bearing replacement I added a Tachulator (tachometer) to it, and started on the Tumble Reverse.

Bearing Journal Sizing:

Caution!

The bearing journal is the part of the spindle that the inner race of the bearings ride on. In the 'Rebuild Manual', on page 14 on the 'Spindle Dimensions' photo the journals have a size of 1.378". This is only the size of that particular journal. Your bearings should be fitted to the journal on your lathe.

The fit of the bearings on the spindle bearing journal is **CRITICAL!** A tight fit is acceptable, but a too loose fit or non-concentric spindle is a rejected lathe! Because these lathes are not made to high quality tolerances, the bearings are intentionally made too tight on the Spindle shaft journals. This prevents you from adjusting the Pre-Load. Before replacing the bearings, you should make sure that you can slide the left side inner bearing race (closest to the pulley) over it's journal with medium to firm hand pressure. It is almost certain that you will not be able to do this from the factory. You can do this to the right side journal as well, but this is less critical. I am fortunate that I have a second lathe available to me to use in sizing the bearing journal. I used the bearing inner race(s) and a diamond hone to accurately size the bearing journal(s).

Contributed by John Pitkin concerning the bearing journal fit:

The right bearing inner race may be a bit firm as once it is in place it doesn't move in relation to the spindle. Only the left side moves when adjusting the preload. But the left end needs to move when *cold* with a gentle tap of the mallet in order to make adjustments.

When sizing the spindle journals, how tight is too tight? Well, if you can't move the inner race on the spindle with a gentle tap from a nylon mallet, then how do you think you are going to adjust the preload? That inner race needs to move along the shaft. When setting the preload, you may find you are only turning the spindle nut 1 or 2 degrees to get the proper tension.

How loose is too loose? The races should not slip easily. They should be a firm interference fit so there is no play when things warm up. The fitting must be approached very cautiously. If you go too far you will have to take the spindle to another lathe and knurl the spindle journals or replace the spindle.

When everything is assembled, be sure to do a run-in at low speed for 30 minutes to an hour. Check the spindle and head stock every five minutes during this run-in period to make sure it is not too hot. If you detect heat, stop the lathe and back off the preload. If things are just warm after an hour, increase the speed for 5 minutes and check again.

After using the lathe for a few hours, the preload may need additional tightening as the bearings seat. The temperature should never get warmer than a warm cup of coffee.

Contributed by Chris (cba_melbourne):

If you want to adjust preload a little more accurately, you first have to reduce the grossly oversize spindle journal diameters to the correct tolerance diameter as specified by the taper roller bearing manufacturers. To do an accurate job you will also need new bearings, because by hammering a bearing onto an oversize shaft the inner ring gets expanded and distorted out of round. Then you need to understand that the bearings on a lathe spindle need be preloaded FAR (2-3times)more than for example car wheel bearings. It's not possible to do this by torque, there are too many variables to distort torque figures, and a little too much preload can kill the bearing, whilst a little low preload cause bad surface finish and reduced precision. It is done by observing headstock temperature. With the bearing ONLY FILLED TO 1/3 with a light high quality grease (AND NO MORE!!!), preload is increased such as the headstock becomes nicely handwarm after 10 minutes running, but UNDER NO CIRCUMSTANCES HOT TO TOUCH after 1/2 or 1 hour running. This setting usually needs be checked after the first 5-10 hours of running, just in case the bearing was inadvertently overfilled with grease and got initially too hot.

Do NOT try this before correcting the diameters of the spindle journals, it is near impossible to finely adjust preload with bearings that are grossly overtight and seized tight onto the spindle.

I can confirm Chris's observation that it is impossible to adjust the pre-load until you have correctly sized the bearing journals. I had to remove the old bearings from my lathe spindle with a bearing puller, and use a lot of force at that!