

## **Instructions for fitting of modified rear wheel bearing RG5365P**

Please be aware that we offer a full half shaft & wheel bearing rebuilding service. Please contact us for details.

The conversion mentioned below is suitable for use with the following half shafts:  
All Bentley MkVI & R Type/ RR Silver Dawn models - RH shaft RG4346, LH shaft RG4345  
Silver Wraith SWB models - RH shaft RG 3192, LH shaft GB 4635.

It is worthwhile advising on the damage to the axles when the bearing wear is allowed to become excessive. The right side axle bearing outer track is held directly in the alloy main axle case whilst the inner bearing track is mounted on the inner axle case containing the differential pinions. This inner case is bolted together by eight studs and nuts. Initial failure of either wheel bearing or axle bearing causes outer axle bearing track movement and wear in the bearing bore of the main axle case. Once worn in this way the main axle case is all but scrap. Eventually the bearing wear allows the main crown gear and pinion to try to override each other, normally on the overrun, and tooth breakage occurs. On a Cloud series II or III the gear set is fairly strong and the inner axle bearing will rotate and bore into the inner axle differential gear case. In the instances of earlier cars the gear set will break first but more than often the two part inner differential gear case faces will also be fretted against each other, or the eight case studs will stretch. It is quite common to be able to remove these axle side bearings and shake the rollers out of their retaining cages; such is the amount of bearing wear.

It is surprising how long the axle will hold out, but the only problem is that when it does go bang there is so much damage that the cost is very high. If a rear wheel bearing has actually failed, that is the bearing has failed on the road in a collapsed state, there is no doubt at all that the relevant rear outer axle bearing, on the failed wheel bearing side, has been affected. It is in fact impossible for such a wheel bearing total collapse to not have caused some axle long term damage.

The initial failure of the wheel bearing is usually the breakage of the bearing cage, which separates the balls within the bearing. If the owner is lucky he/she hears a clicking, which sometimes disappears temporarily when the car is reversed. Unless the bearings are really badly worn it can be difficult to detect actual wear when the car is jacked up with the load relieved from the bearing and when the wheels are spun. In fact it is much easier to detect the wear when the wheel is removed as any imperfect movement of the bearing is hidden by the heavy flywheel effect of the road wheel. Once the wheel is removed it becomes necessary to have a good ear and light touch, rotating the hub back and forth feeling and listening for noise and roughness. Along with this back and forth movement the half shaft needs continually indexing around to cover the full 360 degrees of the bearing.

As the tooling and spares are not easily obtainable when out on the road, it is advisable to renew the rear wheel bearings unless the owner knows for sure that the bearings have been changed. Failing that, at least check the rear wheel bearings most thoroughly for any signs of wear.

Initial failure is often caused by sudden cage breakage. The narrow part of the cage separating each ball wears very thin, it breaks, initially there is no noise, two balls catch up with each other and the process continues at a pace. Very quickly the balls are nearly all on one side of the bearing allowing the bearing tracks to run off parallel with each other. At 50 / 60 mph the rest is history!

The other mode of rear wheel bearing failure is when the grease no longer lubricates and / or condensation has entered the bearing, resting at the bottom, it firstly erodes the track quickly followed by erosion of the balls. The rough balls either further carve up the tracks or the balls cut through the

cage. Incidentally the main axle bearings also suffer this condensation erosion, usually on the right side where the inside of the vertical axle case (this part of the case cannot be seen) channels the water directly to the bearing. It does not happen so frequently on the left side as the axle side plate which carries the bearing on this side (this plate can be seen externally) is tapered and usually directs water away from the bearing. In this mode the initial roughness of either the wheel bearing or axle bearing can be felt when driving; it is usually mistaken for flat spots on the tyres for the first five miles or so. It will sometimes persist for many more miles as the wear takes place. From the drivers view point the problem appears to disappear because, when the axle is warm, the spring that pre-loads the right-hand axle bearing allows the axle bearing to move in and out each time a worn section of the bearing comes on load. This spring also moves in sympathy to disguise or mask a worn rear wheel bearing. The driver naturally believes the flat spots on the tyres have been relieved as the car attains more mileage. There is however a degree of vibration still present from the rear end normally detected through the floor pan. Unfortunately by the time a driver actually hears or feels either a rear wheel bearing or axle bearing the damage is done.

### **History**

Two types of rear wheel bearing were used in production and the half shafts were also of different diameter at the bearing location, as was the bearing housing. The very early types were only used on A & B series Bentley MkVI models. The changeover to the later bearing arrangement started circa Feb 1948 and the later bearings, bearing housings and half shafts can be used on the earlier cars.

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All parts are identical on each half shaft assembly except for the half shafts themselves. It is also important to realise that the following only describes the bearing conversion and some parts are altered or discarded, although the basis of the bearing change does apply when replacing the original type bearings.

The original rear wheel bearings are still available but very expensive. This original bearing is capable of taking side thrust loads and any replacement type must be a thrust bearing, a normal roller bearing will quickly fail.

The usual disclaimers apply when a non-original bearing is utilised.

**NOTE.** The bore of both bearing and collar **MUST** be lubricated with engine oil before being pressed onto the half shaft.

### **Dismantling components and removing half shaft**

Remove road wheel, brake drum, disconnect the brake rod at the equaliser, remove the brake shoes and inter-shoe linkages. Undo the five nuts holding the axle tube to the bearing retaining plate / bearing housing, undo the four nuts holding the brake back plate. Note the bolt heads are prevented from rotating, so all these nuts will come off.

Take the lock nut off the brake adjuster wheel, to do this slacken the adjuster right off until it will not turn any more, after removing the lock nut unscrew the brake adjuster wheel, it is threaded just like the lock nut.

Move the brake actuator rubber inwards along the brake rod and then move the brake back plate off its four studs and onto the axle tube. Tap the flange of the half shaft to free the bearing housing and

half shaft, and withdraw the assembly from the axle, collecting the loose brake carrier which is still bolted to the bearing retaining plate. Collect the five holding bolts.

Note at this point that of the five retaining bolt holes, the ODD hole is facing towards the Brake ADJUSTER. If you don't remember this when assembling, you will have to strip the assemblies apart again!!!!

First undo the four nuts, bolts and spacers holding the bearing retaining plate to the brake carrier. Do not fail to collect the spacers. Now you will see the bearing spigot plate which has a protrusion on its inner face, this needs machining off and the plate just face-grinding on BOTH sides to clean it up and is discussed later. Note that this spigot plate has a taper lead on the opposite face to that face with the protrusion this taper face goes towards the axle.

Clean the brake carrier and assemble the machined plate to the carrier with the four nuts, bolts, SPACERS and spring washers.

**Remember taper face towards axle, and odd bolt hole adjacent to the brake adjuster.**



**Fig 1. Comparison of original and modified bearing, face view, the old bearing is on the left hand side.**

**Fig 2. Comparison of original and modified bearing, end view, the old bearing is on the left hand side.**



**Fig 3. wheel bearing housing after machining and the flange has been ground.**

The replacement bearing must not be allowed to end float within the bearing housing and will need a protrusion from the housing when the bearing is fitted of at least 0.001 inch. This amount allows a zero end load when the bearing housing flange has been covered in sealer and the assembly fitted to the axle. The various workshop manuals describe the removal of the half shaft assemblies, which

are removed complete with bearings and bearing housings, and also a spigot plate and bearing spacer ring. In the case of a straight forward replacement of the original type bearing it was always intended that the bearing spacer ring was to be face ground in order to just pre-load the new bearing, as previously mentioned. This is a point often disregarded when the original bearings are replaced and in particular when they are replaced as a result of a failure on the road .

**In the case of this suggested bearing conversion this spacer ring is discarded.**

### **Removal of the old bearing**

After removal of the half shaft it is necessary to mount the shaft in a lathe and turn down the bearing retaining collar until about 0.010 inch remains when it is easy to split and remove the remaining collar with a chisel, without damage to the shaft surface. It is important that the integrity of the shaft surface at this point is protected because eventually a new retaining collar will have to be pressed on to the shaft and it is only the interference fit between the collar and shaft plus the bearing fit, which retains the road wheel and bearing assembly. An alternative would be to use an angle grinder or cutter and remove the collar without damaging the shaft. Using a lathe does enable the straightness of the shaft to be checked as any out of truth will wear both axle and wheel bearings and take its toll on the half shaft splines. Once the retaining collar is removed the bearing spring (belleville washer) can be discarded as can the bearing spacer ring, which is loose in the bearing housing.



**Fig 4. Original bearing spigot plate, showing spigot lip.**



**Fig 5. Spigot plate after the lip has been face ground off.**



**Fig 5. blocks to hold the bearing housing during pressing operations.**

At this point it is necessary to mount the shaft in a hollow hydraulic press bed and provide a suitable support for the bearing housing whilst the shaft is pressed through, and therefore off the bearing. My own supports are made of a steel circular section some 9 inches in diameter and 1.250 inch thick.

This circular section was then machined to fit around the bearing housing with an integral step, this step was lathe-turned to fit the step in the bearing housing and then finally the circular section was sawn across the centre. This tool then forms two "U" shaped sections, which completely surround and support the bearing housing whilst the pressing operation is in progress.



**Fig 9. Supporting block showing how the block lip embraces the bearing housing.**

It is very important that the flange of the bearing housing, which is about 0.125 inch thick, is not used to support the housing during pressing operations. The bearing housing STEP must take the load and if any load is applied to the flange, distortion and subsequent water entry will result. There is also a very serious possibility of the flange breaking away at some time in the future.

By this time the wise owner will no doubt realise the wisdom of replacing these bearing whilst the car is in his / her own garage or with a specialist of their choice and not risking a distress purchase out on the open road.

### **Fitting of the New Bearing RG5365P**

Once the shaft has been pressed off the bearing it is necessary to recover the bell shaped spacer from the flange end of the shaft. This spacer positions the bearing the correct distance from the end of the shaft, and in doing so, sets the final running clearance between the brake back plate and the edge of the brake drum, clean off the spacer faces and the opposing half shaft face and replace the spacer immediately.

***As the modified bearing has a different centre section width from the original it is necessary to ADD another spacer RG5365SPACER (supplied with the bearing) to the original bell shaped spacer. This extra spacer should be placed on the half shaft now, so that its placement is not forgotten.***

Press out the old bearing from the housing. Examination of the housing flange will no doubt show that some water ingress has taken place and rust is present on the flange face.

Initially check the flange of the bearing housing to ensure it is flat and not distorted, if any out of truth is present it MUST be faced off, keeping any metal removal to within approximately 0.005 inch.

### **Bearing Protrusion**

Measure the thickness of the bearing and the actual depth of the bearing housing to the internal step where the bearing locates. These measurements will be approximately 1.5615 inch ( 39.66mm) if the bearing housing flange has not been faced off. The measurements finally will require adjusting by machining either the flange face or housing internal step to ensure that the bearing is thicker than

the housing depth by 0.001 inch. In other words when the bearing is fitted to the housing it should protrude by 0.001 inch. This protrusion allows for a thin film of sealer to be applied to the bearing housing flange, and also ensures that when the bearing housing is rebolted to the spigot plate the plate will actually contact the bearing and stop any bearing end float or looseness. In simple terms the bearing will be trapped hard between the spigot plate and bearing housing. Normally, even making allowances for truing up the housing flange, no more than 0.0010 inch needs removing from either the flange or the housing step.

### **Spigot Plate**

Next, examination of the bearing spigot plate will show a location protrusion or spigot, which needs machining off the plate and the plate face grinding to finish. This protrusion originally contacted the original bearing spacer ring, which has now been discarded, it should also be said that the protrusion did provide a spigot to assist in centralising the assembly. However the bearing housing attachment bolts and their holes are very accurate in size and circular pitch dimension, and therefore centralisation and the retention under load appears well catered for, even when the assistance of the spigot is lost. Note that it is necessary to dismantle the rear brake assembly to extract the bearing spigot plate!!

This spigot plate is shown in most parts lists on page K1 and is the item shown nearest the half shaft splines, it is not individually numbered, and the illustration does not show the spigot section on this plate. The bearing spacer ring, to be discarded, is also shown on page K1 and is the second item inwards from the half shaft splines. The plate spring (belleville washer) also to be discarded is shown as the fourth item from the splined end of the shaft.

### **Fitting the bearing**

Having prepared the bearing housing it is possible now to press the bearing into the housing, taking care to only exert pressure on the OUTER bearing track. Then after making sure that the original bell shaped spacer and **new spacer are both positioned on the half shaft beforehand**, the shaft can be pressed through the centre of the bearing and its housing. Make sure the original bell shaped spacer is orientated correctly with its large diameter against the flange of the half shaft.

When pressing the bearings onto the shaft journal, the bearing **MUST** be supported by its INNER track, certainly not the housing flange, and the applied pressure, on the end flange of the half shaft, must be in the region of 6 to 10 tons. Following this operation a new bearing retaining collar part number GB 4956P must be pressed onto the shaft with a minimum pressure of 15 tons and preferably 20 tons. Note that the retaining collar will be about 0.125 inch short of fully engaging the half shaft bearing journal when it has been pressed into place.



**Fig 10. Showing a finished assembly  
note how the new bearing fully  
fills the bearing housing.**

In order to visualise both the bearing and the collar pressing operations, the half shaft flange end, that is the end where the wheel lug studs are positioned, is upwards and takes the force of the hydraulic pressing ram, whilst both bearing and /or collar are in contact with a piece of tubular steel, which is supported by the cross beams of the press bed. The aforementioned piece of tubular steel needs to be made wide enough to be supported by the cross beams of the press bed and thick enough to stand 20 tons, that is about 0.750 inch! In addition it needs a raised section or upstand of approx 0.250 inch, some 2.150 inch (54.61 mm) outside diameter and the whole block needs boring through the centre 1.80 inch (45.72 mm), which makes it a tube. Visually this looks like a large steel ring with a smaller ring placed on the top. The upstand or smaller ring is sized so that it contacts the INNER bearing track or collar depending on which operation is being performed, and the bored hole allows it to pass over the 1.772 inch (45 mm) half shaft diameter where the bearing is fitted.

After the bearing and retaining collar are fitted, the half shaft assembly can be replaced once the bearing spigot plate has been refitted.

### **Building up**

Clean the face of the axle tube. If you have removed the brake back plate do NOT forget to replace it on the axle tube before proceeding further. Do not on any account attempt to paint the outside edge of the bearing housing flange before the assembly has been replaced. The outer flange of this housing is an exact fit inside of the bearing spigot plate and paint will only be shed off and prevent the mating flange face surfaces from contacting.

Coat the bearing housing flange with a very light coat of sealer. Enter the half shaft very carefully into the axle tube and engage the axle bevel wheel splines. Be careful when conducting this exercise not to damage the axle leather oil seal through which the half shaft splines must pass. Position the five bolts through the bearing plate and onto the axle tube fit the special spring washers and nuts and tighten. Do NOT use any other bolts except the originals.

You will need to centralise the brake adjuster and brake shoes as per the manual. It is vital that the adjuster is centralised **BEFORE** the shoe inter linkage is fitted. Then replace the brake back plate onto the four studs, then the adjuster wheel, then its lock nut, followed by the actuator rubber. Note there is a steel washer then a rubber between the rear of the adjuster and the back plate.

If the brake adjuster is disassembled, mark one adjuster tappet and one end before stripping, the tappets are handed!!! The brake actuator can be stripped by first removing the tin end cap.

Removing the actuator tappets complete with ROLLERS after displacing the split pins and then pushing the rod and wedge outwards. Do not lose, or forget the return spring fitted behind the wedge. Refit any adjuster or actuator.

Finally build up the foundation brakes completely, fit the brake drum and adjust the brakes. Reconnect the brake rod to the equaliser and ensure the rubber boot is positioned correctly on the actuator. Refit the road wheel.