Propshaft

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Be careful what you drive over Grease Nipples Length Removal UJ Alignment Yoke Alignment Links

The sectioned MGB at the British Motor Museum, Gaydon

Be careful what you drive over Added February 2009

Bob Muenchausen sent me these pictures of the aftermath of driving over a mattress in the road. The driver complained of a propshaft vibration, but still drove at speeds of up to 60mph until the debris managed to puncture the fuel tank and he lost his fuel.

Pals from Australia have also told me that if ever they drive over a snake they always check to see it is lying in the road afterwards. They can get flipped up onto the axle, and from there get into the cabin ...

Grease Nipples

Your propshaft may have a number of grease nipples from in the worst case none to an ideal three - both UJs and the sliding joint at the front. Manufacturers go through cost-cutting exercises from time to time and also look to reduce routine maintenance to make ownership cheaper for fleet users, removing the grease nipples from the prop-shaft was such a victim at one point. You would be correct in thinking grease nipples are always better and will extend the life of the joints, but as long as they last the typical three years of fleet ownership they couldn't care less after that. Fortunately the better suppliers of spares for our MGs are a little more enlightened and supply joints and complete prop-shafts with the requisite number of grease nipples. I am sure that there are other suppliers out there who don't, you pays your money and takes your choice.

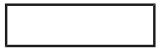
Look for them, and if you have them grease them at 3k intervals maximum. I have found the easiest way to grease them is to reverse the car up a pair of ramps, make sure it cannot roll off the ramp or tip them, then jack under the axle to lift one wheel off the ramp just enough to turn that wheel. It is the only time I work under a jacked vehicle, I reckon that with the amount of 'headroom' given by the ramps and I'm only jacking an extra inch or so I am safe enough. With that done you can rotate the wheel with a foot to get each nipple into a suitable position for greasing. Pump until you just hear grease oozing out of the joints, done regularly this should only need three or four pumps on each UJ, possibly a couple more on the sliding joint.

Length

There were several prop-shafts over the years. The basic construction was the same but the lengths varied according to rear axle, gearbox, and in some cases whether overdrive was fitted or not. The technical description of the shaft is "Double-ended, Circlip Type, with Fixed and Sliding Joints". The Leyland Parts Catalogue gives dimensions for each but there is some

doubt as what that dimension actually refers to. Initially it seemed logical that it would be the fitted length i.e. the distance between the gearbox and rear axle flanges, then I wondered if it referred to the overall length fully compressed (there is a sliding joint just behind the front UJ to cope with engine and axle movement). I subsequently obtained some Hardy Spicer dimensional information from the original designer of the MGB axles, gearboxes and prop-shafts which I have summarised in the table below, together with Parts Catalogue information. Subsequently I measured my roadster and found the **fitted** length to be 31.1875", close enough to the book figure of 31.125" for me to now be convinced that the Catalogue figures do indeed refer to the fitted length. This does make most sense, as the vehicle manufacture would give that dimension the propshaft designer/manufacturer, and they would use their knowledge and experience to decide how much 'slack' there should be in the sliding joint. Bob Howard of Connecticut reported that two he took off 4-synch cars, plus a newly purchased replacement (AHH 7487), all measured the same as each other at 30.25 which you can see is almost an inch shorter than the figure given in the Catalogue, which means there is about 1" of 'slack' in his sliding joints. I measured my roadster tube length at 21 3/8", less than 1/5" different to the Hardy Spicer figure below, and subject to interpretation of exactly where on the weld one takes the measurements (I measured from the centre).

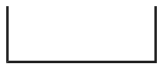
Gearbox/Axle	BL Part No.	Catalogue/ Fitted Length	Hardy Spicer No.	Tube Length
3-synch, no OD, Banjo	AHH 7488	30" (76.2cm)	114H02771	20 9/32" (51.51cm)
3-synch, OD, Banjo	AHH 7487	31.125" (78.9cm)	114H02776	21 17/32" (54.67cm)
3-synch, no OD, Salisbury	AHH 7487	31.125" (78.9cm)	114H02776	21 17/32" (54.67cm)
3-synch, OD, Salisbury	AHH 7486	32" (81.3cm)	114H02779	22 9/32" (56.6cm)
4-synch, OD/no OD, Salisbury, not V8	AHH 7487	31.125" (78.9cm)	114H02776	21 17/32" (54.67cm)



Using the first two options to give datum points for the banjo axle one can plot the relative positions of the 3-synch non-OD and OD gearbox flanges in the car. Then using those points as datums one can then plot the relative positions of the Salisbury axle flanges in the car. This shows that the prop-shaft for the Salisbury axle and 3-synch with OD option really needs to be 32.1" (81.5cm), but as will be seen below there is over an inch of movement either side of the central point where the splines in the sliding joint remain fully engaged, so this small discrepancy is not important. It has also allowed me to measure the length of the prop-shaft required when an early car with a banjo axle has a 4-synch gearbox fitted, a not uncommon modification. This turns out to be exactly the same as the first option i.e. 30" (76.2cm).

Subsequently ... Colin Parkinson reported that he had measured some gearboxes - bell-housing flange to output shaft flange - 4 synchro with O/D at 32.5in, 4 synchro without overdrive at 33ins, and 3 synchro without o/d at 33.25. All approx. FWIW.

All shafts had a Tube Diameter of 2", a Flange Diameter of 3 7/16", and used UJ/journal Part No. GUJ 101. Up to chassis number 138401 the same bolts were used at both ends (AAA 4039), after that different bolts were used at the gearbox end (22H 1107). These bolts are safety-critical items. My roadster rear flange is 2 1/2" from weld to flange face, and the front flange and sliding joint 7 5/16" from weld to flange face (fitted).



Click on the thumbnail to see a drawing showing the measurement datum points. You will notice the overall length is dimension FFC and this is the Flange to Flange Closed (i.e. fully compressed) length. Unfortunately the table of data that gives all the other dimensions for the shaft does not include this one for some reason. There is also a question mark over exactly where the FFC measurement is taken between. The drawing shows it being the raised portion in the middle of the flange i.e. the overall length between two straight-edges laid across the middle of the flanges. But a friend who was an apprentice at Hardy Spicer and used to make drawings like these happened to see these drawings and said that the measurement was taken between the machined faces of the flange i.e. the outer portion where the bolts go through (FFC2 in red on the accompanying picture) and not the overall length, as the raised centre of the flange is part of the rough casting and not precise. Note that the sliding joint is assembled so as to have the shaft yokes **in the same orientation**.

I don't have all the equivalent information for the V8 but I have taken measurements from a spare and my car which are as follows:

BL Part No.	Tube Length	FFC Length	Fitted Length	Tube Diameter	Flange Diameter	UJ/J
AHC 113	19.25" (48.9cm)	29.75" (75.57cm)	31.25" (79.38cm)	2" (5.1cm)	3.8" (9.65cm)	GUJ

The FFC measurement needs care because on my spare you can push the sliding joint all the way in, then when let go it eases out by about 1/4" because of a rubber 'boot' over the sliding joint, so you have to keep it under compression as well as keeping the flanges in line with the tube. I measured my old V8 shaft fully compressed, plus the fitted length of the one on the car and came up with a difference of about 1.5". This was more than I was expecting, and I did wonder how much spline I had left. But further measurements showed that there was 2" of movement available before the splines **started** coming out of the socket, and 2 1/4" of spline on the shaft, so I have plenty of movement left. The splined socket is 4 3/8" deep so potentially gives just over 2" of movement with the splines fully engaged, or 1" each way from a notional central point, making Bob's 1" difference between fully compressed and fitted just about spot-on.

Gearbox-end bolts are in the gearbox flange on all cars, and retained by it. You can't replace these bolts on 4-cylinder cars unless you remove the flange from the gearbox output shaft, but you can on the larger V8 flange, there is a flat on one side of the OD casing that enables this. If you do remove the flange be prepared for oil to run out as the sleeve on the flange comes out of the oil seal. 4-cylinder cars use 5/16" bolts and nuts, V8s use 3/8". 4-sync cars and V8s have special bolts at the gearbox end with a flat on one side of a rounded head and this stops the bolt turning when the nut is tightened - 22H 1107 and 22B483 respectively. 3-sync use the same bolts at the gearbox as at the axle end, which are the same for the 4-synch as well - AAA 4039. The V8 uses 53K 117 at the axle end. 4-cylinder nuts are LNZ 105 with spring washers WL 600051 or GHF332. According to the Parts Catalogue the V8 uses nut GHF223 with spring washer WL 600051, but that is the same 5/16" washer as for the 4-cylinder which won't fit a 3/8" bolt, the correct item is WL600061 or GHF333. Also note that 4-cylinder nuts are Nyloc at both ends on both 3-synch and 4-synch cars, i.e. eight off, but only four spring washers are specified. These are probably for the axle end due to limited space at the gearbox end. Similarly the V8 nuts are Aero or Stiff nuts at both ends, and again only four spring washers.

Removal *September 2016*

4-cylinder: The 5/16" UNF gearbox flange bolts have to be fitted to the flange before the flange is attached to the gearbox output shaft. Standard hex-head nuts on Mk1 cars, on Mk2s

they are specials with domed, round heads having a flat which engage against another flat on the flange, to hold them still while tightening and loosening the nuts. So only one half needs a spanner, but you still need to prevent the shaft from turning while tackling the nuts, whilst needing to be able to turn it to get at each nut one after the other. Bee's are quite low-profile, and even a ring spanner slipped off at one point, so care is needed. It's a fiddle getting the nuts back on the captive bolts, so while the flange is off make sure the threads are good and the nuts start easily. At the axle end standard bolts are used, but space is still restricted and whilst you can get a ring spanner on one side you can only get an open-ended spanner on the other. As you can't get a socket on either, I don't know where Haynes get their torque figure for these nuts and bolts from, the WSM doesn't specify one. In the end I didn't actually remove the prop-shaft, I had started the job with the intention of changing the OD oil-seal, but discovered early on that it wasn't necessary, so went no further than slackening the rears.

V8: As the UJs are bigger there is more room for the nuts and bolts, and when I had occasion to change Vee's prop-shaft (leaving the bolts in the flange) I can't recall any difficulties. The bolts are larger than for the 4-cylinder at 3/8" UNF but otherwise have the same domed, round head with a flat on one side to lock against the flange when tightening or loosening.

March 2017: I had someone remove the engine and gearbox as part of a comprehensive engine and body restoration, but they went bust. Fortunately I manage to retrieve everything, bar some of the fasteners which had got lost, and the nuts for the propshaft were a case in point. I obtained replacement Nyloc nuts, but they wouldn't go on, jamming on all four (3/8" UNF) bolts after about a quarter-turn. They fitted other 3/8" UNF bolts on the car, and other 3/8" UNF nuts from the car wouldn't fit these bolts either, so the bolts were the issue. Damaged? All four exactly the same? Unlikely. Replaced with a different size or thread? Again unlikely as they are a special design to lock to the flange when tightening and loosening. In the end I ran a die down them, which was easier than trying a nut, and after that the nuts went on easily, so just crap in the threads.

But just about to try the die on the first bolt while they were all still fitted to the gearbox, I noticed a flat on one side of the OD casing ... which allows you to remove the bolts! You can't do this with the 4-cylinder drive flange as it is smaller.

All: Feed the shaft forwards and down to remove. See here about marking flanges (unnecessary despite what manuals say) and UJ spiders (essential even though manuals don't mention it) before removal and dismantling.

UJ Alignment *Added July 2011*

Not normally something to think about until you start changing things in the drive-line i.e. engine, gearbox, prop-shaft, rear axle, rear suspension. Although the drive-line is angled downwards from front to back because the crank-shaft is higher than the rear axle, hence the engine/gearbox is tilted downwards and the diff pinion upwards, the drive line should not be in a straight line through the prop-shaft. If this were the case the UJs would not articulate as the prop-shaft rotates, which causes them to wear faster than they should. It is only when the needle rollers rotate as the propshaft rotates that they get adequate lubrication. Therefore the line through the engine and gearbox has to be higher or lower than the line through the axle pinion, and the propshaft is at a different angle to both of them, in practice the engine line is higher. However the angles will changes as the suspension moves up and down, and the higher the maximum prop-shaft speed the smaller the angles need to be, so there is not a magic figure for angle. This link should explain most things you need to know for a street car.

Yoke Alignment *Added April 2009*

Some confusion here caused by the Haynes manual, which has an exploded drawing showing the prop-shaft yokes 90 degrees apart and an assembled drawing showing them in line. They should be in line, the factory workshop manual has similar exploded and assembled drawings but they are shown in line in both. Additionally the assembled caption states "...it is essential to see that the forked yokes on both shaft have their axes parallel to each other. In other words the yoke (A) must be in alignment with the yoke (B), and the flange (C) must be in alignment with the flange (D)", see the attached picture.

However both manuals go on to say something about removal and refitting of the propshaft which seems unnecessary: They say to mark the four flanges (gearbox, prop-shaft x 2 and axle) to assist in refitting them in their original positions, the workshop manual going on to say in bold **"This is most important"**. Haynes additionally says this is because the prop-shaft is balanced to fine limits. Good practice maybe, but precisely because it **is** balanced to fine limits it won't matter how the prop-shaft is re-attached to the gearbox and axle flanges, the result will be as balanced as it was before. Any prop-shaft should be capable of being fitted to any gearbox and axle in any position without loss of balance. What **is** very important and seems to have been missed in both manuals is that if dismantling the propshaft you must mark all four yokes to ensure these go back together in the original alignment i.e. both halves of each UJ and the sliding joint, as reassembling either pair of yokes 180 degrees out, or getting the sliding joint 180 degrees (or any angle for that matter) out, almost certainly **will** upset the balance of the shaft.

December 2009:

Fletcher Millmore on the MG Enthusiast BBS has said that the sliding yoke and tube should have alignment arrows on them, to at least get that part assembled correctly, however they can be very indistinct, as can be seen (ho ho) here. He's gone to the trouble of taking some pictures of the best one he could find, as well as some sketches of the sort of partial markings you are likely to find in practice for which I'm very grateful. You still need to mark the relationship of the two halves of each yoke before removing UJs though, which as long as you make all four in line will also work for the sliding joint as well.

http://www.mgb-stuff.org.uk/