Dampers Ride Height Steering Column

Dampers

July 2009: All you ever wanted to know about dampers, including the quote on page 15 "The parallel-piston lever-arm damper was functionally very good, and the fact it has been superseded by the hydraulic telescopic, and the strut in particular at the front, is mainly due to the final assembly advantages of these, rather than any functional gain in the areas of ride and handling". In other words, simply replacing the dampers is largely a waste of time and money, you would have to go for a wholesale replacement of the suspension system front and rear to get anything approaching modern levels of handling. OK for serious competition maybe, but it destroys the essence of the MGB in the process - that of predictable handling and ease of control, and how far do you go with engine gearbox, rear axle, suspension, steering and brake modifications before it is an MGB no longer, but just a hollowed-out shell?

However as far as overall suspension design goes the very detailed 'The Rover Group, Company and Cars, 1986-2000' by Mike Gould (a gift from my local postie with 'MGB, The Complete Story' another very detailed book) describes how the Rover 800 based on the Honda Legend suffered from Honda's insistence on wishbone suspension which resulted in a hard ride, saying that strut suspension would have allowed more travel and hence more comfort. The reason for that is that with wishbone suspension the wheel and hub move in an arc, whereas with strut it's in a straight line, retaining steering and suspension alignment over greater travel. If you had anywhere near that travel with wishbones the alignment would change massively over the full travel unless the wishbones were pivoted in the centre of the car as some 'modern' rear systems are.

Hydraulic Damper Fluid *Added November 2009*

Needless to say there are strongly-held views on what fluid should be used. The Workshop Manual states "Armstrong Super (Thin) Shock Absorber Fluid No. 624. (If this fluid is not available any good-quality mineral oil to specification SAE 20W can be used, but this alternative is not suitable for low-temperature operation)." It doesn't specify what it means by 'low temperature' but looking at the lubrication chart for the engine anything consistently below 10C/50F is considered 'cold' and anything consistently below -10C/15F is **very** cold! However the 'standard' temperature range goes down to -10C/15F, so maybe if don't go below that at any time you would be OK. But I can remember it getting as low as -27C some years ago in the UK, although that was before 'climate change'. I've always used hydraulic jack oil (Halfords £4 for 500ml) and never had a problem, although others claim that foams which destroys damping. Still others claim that claim is rubbish, foaming in jacks would be a bigger problem than in dampers! Motor-cycle fork oil is frequently mentioned as it is said to have a seal swelling agent which reduces the chances of leaks over time. Available in various viscosities from 5W to 30W, you would probably want to keep to 10W or 15W. Halfords also sell 'Halfords Central Hydraulic Fluid' at £15 per litre said to be suitable for 'certain' power hood, suspension, traction control and central locking systems, but it seems to be for modern cars and their highly sophisticated systems. Moss sell 'shock absorber oil' (for a start they are dampers, the springs are the shock absorbers, and it isn't really oil but hydraulic fluid) at £8 for 473ml. A certain authenticity in the quantity, I suppose, being 16 oz i.e. Imperial like the rest of the car.

Topping-up

Front dampers on the MGB are side-fill with a combined filler and level plug, but need a syringe with a short length of tubing to get the fluid in. Push the tube in at least an inch and push fluid in until it trickles out. Rear dampers are top-fill under plastic plugs on the rear shelf by the battery cover and the same syringe is useful for these as well, remember to block the end of the tubing with a finger-tip to prevent drips on paint-work as with brake and clutch.

As well as what fluid to use in both there is further scope for argument over fluid level in the rears, believe it or not. The Workshop Manual simply says "fill to the bottom of the filler plug hole". But some say it should be half an inch below it on the rears to allow an air space to absorb up fluid expansion on heating up, otherwise it could be forced past the seals. But if that is correct, why doesn't the manual say so? I then started thinking about the positions of the filler plugs, and realised that with the front damper filler plug on a vertical face of the damper body, filling to the bottom of the hole will still leave a significant air-space above it. But the rear dampers have the filler plug on top, which may not unless there is an air-space under the lid i.e. above the bottom of the filler plug hole. When I converted Vee from telescopics back to lever-arms I bought a 'kit' containing dampers, drop-links and bottom plates second-hand from some

unknown MG at Stoneleigh, and it was only when I decided to recheck the fluid level some time after fitting them that I discovered the filler plug hole was also on a vertical face, and not on top as they should be! "Ah ha", I thought, that would leave an air-space in the rears as well, and maybe that part of the manual had been copied from that for another vehicle where both front and rear filler plugs **are** on a vertical face. But looking again in the manual not only does it show a top-fill rear damper, with instructions to remove the plastic plug in the chassis rail to access it, but it also shows the front damper with a top-mounted filler-plug! So from there being an obvious air-space above the fluid on both types, there could be none on either. When Vee's rear dampers started leaking (after having lasted a few years, I was quite prepared to change them at the outset as they were an unknown quantity) I got the correct top-fill ones of course, and checking the level before fitting found that it was indeed about half an inch below the bottom of the filler plug hole. So that's good enough for me, and having found with leaking dampers that the fluid level can drop a long long way before it affects damping, leaving a half inch gap below the bottom of the filler plug hole on the rears is neither here nor there, and at least you are sure that there **is** then a clear air space, if that makes a difference.

But then replacing Vee's damper valves with adjustable ones the process involves removing the 'lid', and the underside of that has quite a large space above the bottom of the filler hole, i.e. an air space.

As far as getting fluid into them is concerned whilst dribbling fluid in to the top of the rear dampers is possible with great care the side filler on the fronts is another matter. But an 'oral medicine fluid syringe' and short length of screen washer tubing makes both a doddle. Don't get it mixed up with little Johnny's though, and don't let it drip on paintwork, it's as bad as brake fluid!

Leaking seals:

Being hydraulic and containing shock-absorber fluid the usual failure mode of these is for the seals on the shaft that the arm(s) connect to start leaking, and a leaking damper can be an MOT (UK annual inspection) failure point if the tester suspects or finds it is affecting damping, before that you may get advisories of 'damper misting'. If they are not leaking (but still damping!) you shouldn't have any need to check and top-up the dampers, even though it is a routine maintenance item. When they do start leaking the usual course of action is to replace them and for a long time only rebuilt were available, which can be variable, althoughwith two cars over 30 years each I've only had one that started leaking again in about 12 months. New are available from some suppliers at several times the price of rebuilt, albeit minus the cost of returning the old unit.

Another option is replacing the seals yourself, which can be done although a press may be needed to remove the arm from the body, and it is subject to the condition of the arm where the seal runs. Edouard P in France has produced a step-by-step guide published on MG Experience.

Replacement

Before paying for replacement dampers (i.e. ideally get them on a personal visit to the supplier) check they move smoothly and are heavily damped through their full travel and back to the centre, then wiggle the arms up and down near the centre and make sure there is no slop as they change direction. Exchange dampers where you return the old one is much cheaper than buying new, and the rebuilt replacements are usually of reasonable quality. But as the rebuild is only as good as the original it is possible to get a duff one that fails after quite a short period, however it is still much cheaper to have to change it again fairly soon than to buy new. Out of three replacement lever-arm dampers I had to change a rear one for a second time after only a year or so, its replacement and the other two have been fine. At the time of writing I have just replaced another one so the jury is still out on that. *Update October 2009* Annoyingly that started weeping after a year or so, but lasted a further couple of years and MOTs before it got bad enough to start dripping on the floor, which was when I changed it again. Hopefully better luck this time. *2018:* Another front replacement on Vee due to my own error (don't ask) but all the others (both cars) fine so far, apart from an advisory of 'light misting' on Bee's near-side rear in 2019, not replaced until 2023.

Stevson Motors in Birmingham were often mentioned as a good rebuilder of customer's own units, but could take a while. However I understand they no longer do that, only fuel, brake and oil hoses, pipes and unions, which I have used them for including one-offs to my design.

November 2023 Another mentioned just this month in MG Chat on the MGOC forum (passed on to me by Michael Beswick) is Vintage and Classic Engineering near Bala. The original poster said after a long discussion he is satisfied that they do a proper refurb and not just a 'paint and despatch', and another poster said he had used them himself earlier in the year. Again customers own units (although they do have some in stock), so a time delay involved as well as double postage (unless you are nearby).

T H Brearley writes on the MG Enthusiasts forum regarding replacement rear units:

> "So, having bought some recon units from Moss, I thought it might be useful to find some numbers which would indicate effectiveness, for future reference.
>
> "In the spirit of improving the sum of human knowledge, this is what I found. With each damper clamped upright in a vice a 10lb weight (e.g. sledge hammer head) took the following times to pull each lever from the top of its range to the bottom:
>
> "Old N/S damper 6.5 secs
> "Old O/S damper 5 secs
> "New N/S damper Infinite (it never reached the bottom)
> "New O/S damper 28 secs"
>
> And subsequently posted "I should have said that the O/S damper moved slowly through the first 2/3 of its stroke before stopping. It could be pushed all the way down with a firm hand." I think he means the N/S.

Then Dave O'Neill posted:

> "OK, I've checked a couple of NOS dampers. One took 11 seconds and the other took 9 seconds. I used a Lucas M35J starter motor, which weighs 9lb 12oz."

So a big difference between NOS and rebuilt, which may or may not have been down to the rebuilt being 'uprated'. It was also pointed out that with a straight weight on the arm this would only be testing the rebound, some other arrangement would be needed to lift the arm to test compression.

When I fitted adjustable valves in the V8 rears I removed them complete with drop-links and bottom plates as being easier. Held in a vice the weight of the link and plates was enough to pull the arms down slowly, but I didn't bother timing it. For the other direction I have a spring balance and pulled up with that showing as close to 15lb as I could keep it. The original valves gave 9 secs and 10 secs, the adjustable on minimum gave 6 secs and 8 secs i.e. a 25-30% reduction. Turned harder half-way gave 16 secs (I didn't bother going any harder!), so they are very much biased towards making the suspension harder. But on the road at minimum they very definitely make the ride more to my liking.

Personally I've never - unlike telescopics - had lever-arms go soft, only leak. I've never bothered to do any more than check them (rebuilt) on the suppliers bench as above - one of the benefits of having a good supplier reasonably close to home.

Front replacement: *Updated October 2009*

When changing a front damper for the first time you will almost certainly need a new upper link special bolt, nut and bushes, as each one I have done has had the pin corroded solid with the inserts in the bushes. In both replacements I have done the link bolt was supplied with a Nyloc nut instead of the original low-profile castellated nut and split-pin. In neither case was the bolt long enough - or the nut low-profile enough - to be fully tightened - with a Nyloc nut there should be about three threads clear of the bolt, but the bolt barely reached the Nyloc let alone go through it. Fortunately the bolts were drilled for a split-pin and I had a suitable low-profile castellated nut in each case. **Do not use a Nyloc nut without there being at least three threads visible with the nut fully tightened, the bolt could come out in use.**

Raise the front of the car by jacking under the rear edge of the cross-member (if you jack further forwards than that it will slide further forward in a series of sudden and noisy movements which is a bit disconcerting. Place axle stands under the outer edges of the spring pans, and lower the jack just enough to lift the damper arms off the rebound rubbers. **It is important to do this otherwise when you remove the top link bolt the axle assembly and hub will shoot downwards as they are under significant spring pressure.**

Next comes removal of the top link bolt connecting the damper arms to the swivel axle. Easy to say, much harder in practice. The bolt runs through the arms of the damper and steel sleeves in the rubber bushes. It is a snug fit in both and unless it has already been replaced fairly recently or was assembled using Waxoyl and copper grease it will almost certainly be well rusted to both. The rubber bushes will probably also have deteriorated and be bonded to the eye in the swivel axle. In two replacements on may cars this has been the case and I have had to hacksaw through the bolt both sides of the swivel axle eye. On a second replacement of one of them everything came apart very easily.

Remove the nut on the end of the link pin, it is usually castellated with a split-pin. Slacken right off the clamp-bolt holding the two arms of the damper together, and drive a wedge between them to lever the arms apart and give you more room to cut through the link bolt.

Use a length of cable or whatever to tie the swivel axle to the bracket of the bump and rebound rubbers to prevent the axle falling outwards and stressing the brake hose when the link pin has been cut through or removed.

You can try driving the link bolt out of the bushes and arms, but it shouldn't take much hammering to realise it isn't going to shift. If not, cut the flange off the end of each bush by chiselling and cutting at an angle into the eye of the swivel axle. This reveals a section of link bolt on each side to cut through without damaging the inner faces of the old damper (which might then be rejected as a core replacement) or the swivel axle eye. Use a hacksaw where you can turn the blade at 90 degrees to the frame and this should allow you cut inwards and upwards each side. With a decent blade it shouldn't take many minutes to cut through both sides, and the damper arms can be lifted up from the swivel axle eye. Remove (it really should be that easy) the four bolts securing the damper body to the cross-member. I use a universal joint between the ratchet and socket, it gives that extra depth for all four bolts and a bit of angle for the back ones where the inner wing curves over them. Lift the damper away - it is heavy!

Now you have to drill, cut, twist and hammer the old bushes and remains if the link bolt out of the swivel axle eye, they will probably come out as a single piece, which can only be done if you have previously removed the flange from the bushes as previously described. Remove any lumps of rubber that are stuck in the eye as this will make insertion of the new ones more difficult.

Check the fluid level in the damper now, it's easier. If you find you have to add a lot, or in any case after transportation where they may have been at a different orientation to when fitted to the car, work the arm up and down it's full travel several times to expel any air from the valves. Remove any dirt or grit from the cross-member where the damper will sit. At this point I put a bit of copper grease into each hole in the cross-member, then put the damper in position. Coat each bolt with copper grease and insert just a few threads, don't tighten them any more than that until all four bolts are started. Again slacken the clamp-bolt holding the two arms together and wedge the arms apart to fit over the bushes. This is necessary when leaving sound bushes in the swivel axle, not just for new ones.

Coat the outside of new bushes and the inside of the swivel axle with Waxoyl and insert the bushes. They will probably be much wider than the gap between the damper arms even if they are wedged apart. You can either put one or more large nuts over the threaded end of the link bolt then tighten its nut to squeeze the bushes fully into the eye or use a small sash-cramp or something similar. Eventually you should be able to get the bushes far enough in and the damper arms far enough apart to fit the two together, but before you do so put some copper grease inside the steel sleeve of each bush, wiping off any excess from the rubber.

Place the damper arms over the bushes, put more copper grease in the holes in the arms and on the link bolt. Tap the bolt through the appropriate damper arm the bushes, and the other damper arm. Note that the bolt has a special round head with one flat which engages with a recess on one damper arm. This is the front arm on the right-hand side, the rear arm on the left, therefore the bolt can only go in one way each side. Things might need a bit of wiggling about while you are tapping to get everything lined up.

Note where the split-pin hole is in the bolt and fit and tighten the nut (40ftlb). This has to clamp the damper arms onto the ends of the bush sleeves, and the inner ends of the bush sleeves together, so it does up tight. The final position of the nut should allow insertion of the split-pin, of course. Refit and tighten the damper arms clamp bolt (28 ft lb). As the four mounting bolts allow a little wriggle-room for the damper now is the time to use it to try and correct any tendency to pull to one side or the other on a flat and level surface (note a normal drainage camber will cause the car to pull to the kerb side slightly). Pulling to one side or the other is caused by unbalanced camber, not by tracking as many think. Which ever side the car pulls there is more camber that side than the other, so pushing the damper arms **forwards** as you tighten the four bolts (43-45ftlb) will tends to reduce it, and pulling the damper arms **backwards** on the other side will do the same. It may not do much but is worth a go while you are at it. Refit the wheel and away you go. Inspect the new damper from time to time in the early days just in case you have got a duff one, and always before an MOT.

Rear dampers: *August 2009*

Replacement

The damper, drop-link, rebound rubber and bump-rubber pedestal (and for that matter spring) must be treated as a set for correct and safe operation of the rear suspension and these vary from model to model. Whilst the damper obviously controls the rate of spring compression and expansion through the normal working range, the compressed limit is controlled by a pedestal on the axle hitting a bump-rubber under the floor, and the expanded limit is controlled by the rebound strap which is fixed between a body and axle. The final component is the drop-link between damper arm and spring/axle assembly. In an ideal world the spring, in it's normal working position, will position the axle about mid-way between the fully compressed and fully expanded positions, and the drop-link length should be such that the damper is also about mid-way in its travel. The loading on the car could be a little as a single occupant, or it could be two people plus tools and luggage with the consequent compression of the spring, so maybe a median between these two is chosen by the designer as the 'central' position. Whatever, it is vital that the drop-link, rebound strap and pedestal are installed as a set so that it is the rebound strap and bump rubber that provide the limits to axle movement and not the damper

itself. Get these wrong and the damper will suffer damage. In theory it doesn't matter as much if the spring varies in set or hardness, as the other components will limit axle travel regardless and so protect the damper. But if the spring is too soft or flat you will be hitting the bump rubbers over relatively small bumps (been there, done that, extended the shackles) or at the other extreme the car will have a very tail high ("submissive monkey") stance and be hitting the straps relatively easily. Whilst hitting the bump-rubbers is merely uncomfortable, continually 'hitting' the rebound straps will eventually break them, and then you will start hitting the damper limit and damaging that.

Chrome bumper 4-cylinder cars had one set of drop-link, rebound strap and pedestal, chrome bumper V8 had a different set, and all rubber bumper cars had a third set in this case the same for 4-cylinder and V8. It's well known that chrome bumper V8s had a higher ride height to 4-cylinder chrome bumper cars to improve the exhaust to ground clearance utilising a different front cross-member that was later commonised to all rubber bumper cars. The rear spring hangers were lowered at the front and the rear on all rubber bumper cars i.e. 4-cylinder and V8, hence all rubber bumper cars have the same damper and axle movement limiting parts, even though the V8 springs are harder. What is less well known is that they differed between chrome bumper 4-cylinder and V8 cars as described here. The combination of parts for each model from the Parts Catalogue is as follows:

Model	Armstrong catalogue	BL catalogue	Drop-link	Length	Rebound strap
4-cyl chrome bumper	8178LH/RH	GSA168 LH 169 RH	97H 2031	8.5"	AHH 6355
V8 chrome bumper	10801LH/RH	GSA328 LH 329 RH	37H 8075	9.75"	BHH 989
4-cyl rubber bumper to 76	12012LH/RH	GSA368 LH 367 RH	37H 8778	10.5"	BHH 989
V8 rubber bumper	12012LH/RH	GSA368 LH 367 RH	37H 8778	10.5"	BHH 989
4-cyl rubber bumper 77 on	12075LH/RH	GSA368 LH 367 RH	37H 8778	10.5"	BHH 989

Pedestal and bump rubber part numbers.

Peter Caldwell of Wisconsin posted the following information on the MGCars BBS as part of a thread on this subject in December 2006:

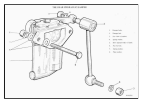
> "Armstrong conveniently stamped their part number on every shock (except for Spridget fronts which were cast). On all rears the number is stamped on the underside of one of the mounting ears. B rear shocks will have 8178LH or RH, or 12012 or 12075 (LH, RH).
> "Per Armstrong's 1978 USA catalog... 8178 fit all B and GT (4 cyl) through 1974 (The 73 and 74 BGT V8 used 10801 which I've never seen). All models 75 through 5/76 used 12012. Then all models 6/76 to end used 12075. Again, I've seen absolutely no difference in the 8178, 12012, 12075. I suppose if matching, check that the numbers are the same."

His dates more or less tie up with what is in the BL Parts catalogue and so allows us to associate the Armstrong numbers stamped on the items with the catalogue numbers and hence models. This might seem rather pointless if the damping is all the same, but remember there were many other applications for these dampers and hence many other Armstrong numbers, many of which are bound to have different damping characteristics, and this makes the Armstrong numbers very useful when buying second-hand units where you cannot be sure of the original source.

Replacement: Ostensibly two bolts and three nuts, but it can still be a bit of a bear to remove. If you haven't changed them before the drop-link nut (11/16") will likely be corroded to the drop-link pin in the damper arm, and nut and pin will turn as one, either that or the nut will come undone but the tapered pin will be seized to the damper arm. Heat not advisable due to the rubber bush in the drop-link. Fortunately it is easy to remove the damper complete with drop-link and bottom plate and deal with them on the bench. Note that the Leyland Parts Catalogue indicates that the damper bracket fits directly against the lower spring pad by stating that only two spring-locating plates are fitted per car but four are fitted - two against the upper spring pad and two against the lower.

Important - chock the front wheels. Slacken the road wheel nuts a smidgen before raising the rear wheels off the ground if the handbrake isn't up to much. Jack under the diff and put axle stands under the springs immediately forwards of the U-bolts. This is necessary to keep the springs compressed otherwise you will not be able to pull the damper plate down off the U-bolts, if the springs are extended the damper lever arm will be almost fully down. Remove the road wheel. Remove the nuts (11/16") and spring washers from the bolts (5/8") holding the damper to the chassis rail, turn the bolts to free them up, but leave them in-situ for the moment.

November 2023:



Bee has the bolts going through the damper and the nuts and spring-washers inside the arch, but Vee has the bolts fitted from the arch side, both always like that in my ownership. However the Leyland Workshop Manual drawing shows the bolts going through from the arch side and nuts and washers against the damper. That way means you either use a spanner (limited leverage) on the nuts on the back, and they are very tight at 55-60 ft lb, and fitting washers and nuts in limited space, or a socket and breaker bar (maximum leverage) on the heads in the arch which means breaking the torque of the nut plus any seizing of the bolt in the chassis rails. Reversed means the socket and breaker bar is only overcoming the torque of the nuts, but the damper must be removed and offered up with the bolts already in the damper. You also need to be sure the bolts aren't long enough to foul the tyres. If the bolts have seized in the chassis rails (copper grease!) then you are probably snookered in either case as there is insufficient room to get the damper off the bolts when they are fitted from the arch, and if from the damper side then the damper will be stuck fast anyway.

Undo the U-bolt nuts (9/16" deep socket makes life easy), and pull the damper plate down off the U-bolts. Pull the damper complete with bolts back from the chassis rail (or support the damper and pull the chassis rail bolts back to release it) and lower the whole assembly down and away from the car.

With a rusted drop-link nut I had to hacksaw at an angle part-way through the nut then chisel the cut open to free the nut. Because the pin had been turning in the damper arm this came out relatively easily. Where the nut came undone leaving the pin stuck in the arm I fitted one of the chassis rail nuts to the pin so it was flush with the end of the pin to spread the load (drop-link nuts are Nyloc), then with a lump-hammer behind the arm whacked the end of the nut and pin with another biggish hammer a couple of times and it popped out.

Check the fluid level in the new dampers before fitting. If you find you have to add a lot, or in any case after transportation where they have probably been lying down, work the arm up and down it's full travel several times to expel any air from the valves. With the top-fill arrangement of the rear dampers leave 1/2" air-gap between the bottom of the threads and the fluid.

If you removed the damper, drop-link and bottom plate as an assembly then assemble them again before fitting, use copper-grease on the drop-link pin and threads, but don't tighten the upper drop-link nut at this stage.

If you can get the damper up against the chassis rail with the bolts fitted from that side then do so, you can get more torque on the nuts if they are in the arch. However with the Ron Hopkinson rear ARB if there is not enough room the bolts have to be fitted from the arch side, and the limited room makes getting a torque wrench and socket on the nuts difficult if not impossible when the nuts are on the back of the damper.

As for removal the spring needs to be partially compressed i.e. with axle stands immediately in front of the U-bolts in order to get the damper plate underneath the spring. Fit the damper plate onto the U-bolts, making sure the spring pad and locating plate are already in place, and the U-bolt nuts. Tighten all nuts - 55-60 ft lb for the damper to chassis rail nuts, if these are not fully tight they can 'knock' over bumps. For damper-plate nuts use your judgement as they are compressing rubber pads and will only tighten gradually. Recheck after a few miles. With the weight of the car on its suspension (i.e. axle stands still under the springs) the upper drop-link nut can be tightended i.e. with the drop-link in about the middle of its travel. If the axle is hanging down the upper rubber bush could tear when the suspension goes into full compression.

Internal Valving *January 2015*

Fixed
Adjustable

Fixed:

Sven Hinrichsen wrote to me from Germany asking if I could offer any advice on internal valving, as he had several sets of dampers purporting to be for the same car but with quite different internal components. I couldn't help, as I've never had any spares or old ones as when I have needed to replace any it has been part-exchange, as it were, with the old ones going to the supplier of the new. However I said I would be interested to hear of anything he did find out, to include here. He subsequently received some advice from Peter Caldwell which he passed on to me, and I reproduce his 'conversation' with Peter below. Incidentally Sven is in the process of building an MGB GT with an electric power source for urban commuting, read all about that here.

> Hi Peter, I'm Sven from Germany and I'm restoring an MGB GT and converting it to electric drive. I write to you because I cannot find information on the setup of the Armstrong shock valves, and in this forum you are referred to as being the specialist on these. There is nobody here in Germany and Europe who can tell

me which are the exact parts for original front and rear shock valves. Disassembling several valves revealed different setup for left and right shocks even for reconditioned pairs fresh from the counter... Let me give you a short overview:

- Plug screws differ in having an o-ring or not (I don't think this affects damping characteristics) and they come with two or four drilled holes.

- On outer springs I could find some information, they mainly differ in wire thickness and no. of windings (and colour), original MGB specification is the blue version with approximately 2.1mm wire thickness and approximately 5 1/3 windings. Some were built in together with washer(s), some not.

- The inner valve part differs in no. of notches or cut-outs (1 or 2) at the top of the tapered part and the inner pin taper has two diameters, additionally there are also different springs.

- You can see the outer cone of the valve with the green arrow indicating a ring of marking of the valve seat in the plug screw. The inner cone (red arrow) is in its seat in the outer cone. The "inner pin taper" is marked with the blue line, and the yellow arrow points to the notches or cut-outs in the outer cone. Some of my valves have two of these, some only one. I think, it affects the damping of the inner valve by letting more oil pass through when the valve is slightly open and even more when there are two of them...

Sven

Sven, There ARE different valve designs that vary by the generation of casting by Armstrong. Remember, the same design was made by Armstrong from 1962-1990. There were many small differences in the valve as determined by the small changes in the castings. We hope that Armstrong made the valve changes based on damping characteristics they could test on a dyno. I can't tell you what should be in the castings you have, but I CAN tell you not to over think this. It doesn't make a huge difference from a street driven perspective. We do make an externally adjustable shock that may interest you as you try to find the best spring rate for your application. Peter

Hi Peter,
And thanks for your quick reply. Your statement 'It doesn't make a huge difference from a street driven perspective' helps a lot, because with my EV conversion I will drive 95% in the city and the top speed will not exceed 110 km/h. So I'll just keep an eye on assembling the right hand valve identical to the left hand valve.
Thank you again and best regards,
Sven

You want to be sure that the main valve body, the part with the hex nut, is correct for the casting. 1 takes an o-ring with washer, and 1 without. There is a depth difference, too. Good luck. Peter.

Okay, so I will also have a close look at the cast bodies of the shocks...

Telescopic Dampers - or "Nix to Spax" *April 2006*

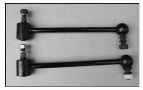
The V8 came with telescopic Spax dampers at the rear fitted by the PO. After only a few thousand miles one started leaking, and as I couldn't get a direct replacement I had to buy the pair. And at about £60 as opposed to about a tenner for a single reconditioned lever-arm unit I was not best pleased. It also took Moss three attempts to get the right ones to me, there are two different bottom pin sizes and they kept sending me the wrong one, but that is a bit by-the-by. Having driven roadsters and V8s both with and without telescopics and the rear anti-roll bar and uprated front bar, I can say that whilst the anti-roll bars **do** have an effect on handling and axle location I could detect no real difference between the two types of damper. Click on the thumbnails below for full-sized images.

The replacements lasted for many tens of thousands of miles (no more than one should expect) but I had been aware for a while that the ride was getting quite bouncy, especially over humps and dips. The USP of the Spax is their adjustability, but unless you have them on the softest setting they give a bone-jarring ride, and many testify to this. Thinking that they may have 'softened up' over the 70k or so miles they have been on the car (which itself is a poor 'feature') I tried turning the adjusters, but needless to say they had seized, and I decided that I would not replace them

when the need next arose but go back to lever-arms. However I was concerned that if one should fail, unless I splashed out again for a replacement (or possibly a pair), I might have to take the V8 off the road for a time while I sourced a pair of lever-arms together with the drop-links and bottom plates. So at the 2006 Stoneleigh MG Spares Show I was on the lookout and managed to pick up the whole lot minus one bottom plate for a tenner, and got a used bottom plate from elsewhere for another fiver. They were already assembled but I wanted to part them for cleaning and painting, but as usual (IME) the nuts had seized. **TIP:** Careful hacksawing as far as I could through the nut without cutting into the studs (OK, I just nicked the threads, but that won't affect its strength) then using a cold-chisel to open up the cut cracked the rust and it came undone. Using heat is inadvisable is it is bound to damage the rubber bush the stud is mounted in, which is not a replaceable item. That left me needing a couple of nuts, which being Imperial are not that easy to come by. Popped down to my local Halfords where the chap who usually MOTs all my cars had a root through his toolbox and came up with exactly what I needed (That's **another** pint I owe you ...).

I then discovered that despite measuring two lengths of drop-link at the show, and thinking I had got the longer V8/rubber bumper items (10 5/16" pivot pin centre to pivot pin centre, thanks Graham), I actually ended up with the shorter CB items (8 3/4"). Only discovered this as part of an email thread with someone else, who had the longer ones and needed the shorter! Sadly he was in America so a swap was out of the question. Rather than buy another pair I decided to try 'cutting and shutting' them to extend them (as I had with the rear shackles on the roadster) by the required 1 1/2" or so. Looking round the garage I found a couple of front suspension bottom trunnion bolts that were the correct (0.5") diameter and did the necessary cutting and welding. Two coats of Hammerite smooth on them and the bottom plates and they were ready to go on.

I was quite surprised to find the U-bolts and the nuts and bolts holding the top brackets to the chassis all came undone quite easily as they had not been touched in my ownership, likewise the replacements went on straight-forwardly, the whole job only taking a couple of hours. **TIP:** The only thing to be aware of is that the two bolts holding each damper to the chassis rail are different in length by about 1/4", which could cause you some head-scratching if you get them mixed up and the two shorter ones on the same side. At some point the forward bolt was recessed into the chassis rail to give more clearance for tyres, possibly for the wider tyres on GT and V8, the shorter bolt goes in this position.



Took the car for a test drive and immediately noticed that on 'normal' surfaces the ride seemed exactly the same but over humps and dips there was no bounce, just a more appropriate firmness without harshness. The standard lever-arms have a two-stage valve that gives relatively mild damping with short movements and harder damping with larger movements, something I have never seen attributed to telescopics of any type. I was deliberately taking the car over as many speed humps as I could find, and going at them progressively harder, when I actually broke one of the welds. It was my fault, when doing the first one I became aware that I was feeding the wire too quickly, which tends to form bobbles of weld on the surfaces of the two pieces being joined rather than fusing them together. No matter, 1/2 hour to take the broken drop-link off, clean up the joint and re-weld, but this time I slipped the spacer tube from the aforementioned bottom bolt (exactly the right internal diameter) over the shaft first, then welded the shaft, then positioned the spacer tube so it covered both welds, and applied more weld between spacer and shaft. Repainted, refitted a couple of days later, and so far so good.

Ride Height

Ride Heights Spring Specs Front Springs Rear Springs

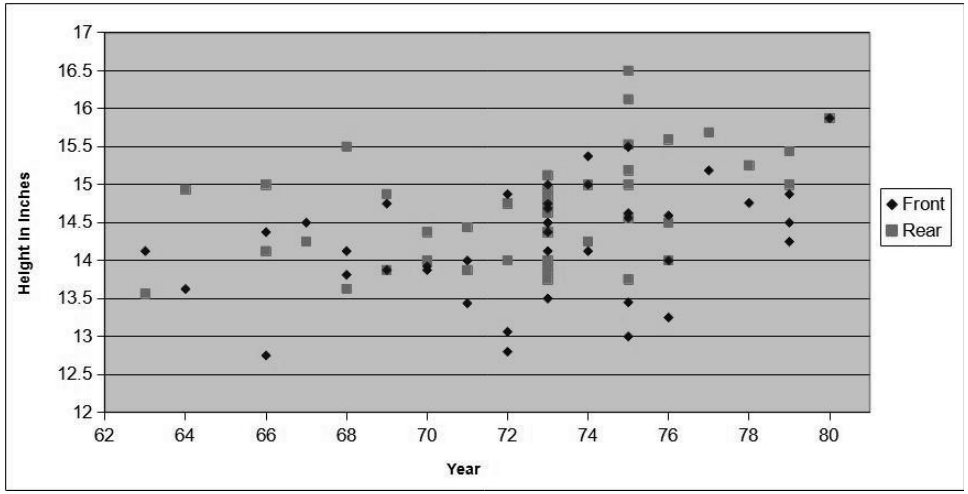
The accepted method of measuring and comparing ride heights is from the centre of the axle to the bottom of the bright trim strip running the length of the car, and this removes any effects of wheels and tyres. The car should be sitting on its wheels on flat and level ground, and be fully fitted out i.e. ready to drive off. Missing major components particularly engine/gearbox will of course allow a car to sit higher and will not be valid, even more so if the car is on a rotator (it has been known ...)!

Ride Heights

Spring and rebound strap appearance with normal loads
Converting RB to CB

Following a question on the MG BBS the information on ride heights below was posted, all measurements are taken from the centre of the hub to the bottom of the chrome strip. If you would like to add to this resource please mail me with your year (state CB or RB if 1974), Roadster/GT, measurements, and any notes regarding age/mileage of springs, departure from standard etc.

Note: It may seem obvious but the static ride height of a car depends on how much weight is on the suspension. Take the engine, gearbox and seats out for example and you remove a good quarter of the weight. The body will rise on the springs, probably to the limit of the rebound rubbers at the front and the rebound rubbers at the rear. On both my RB V8 and CB roadster this results in there being very close to 17.5" from the centre of the hubs to the bottom of the trim strips, front and rear.



Car	RHF	LHF	RHR	LHR	Owner	Notes
63 roadster	14.25	14	13 3/4	13.375	Rob van der Linden, Cambridgeshire	Original springs, 60k
64 Roadster	13.75	13.5	15.375	14.5	Mike Jones, Malaga, Spain	All new springs and bushings. First two sets of rears from MGOC were 2" too high, 3rd set MGOC got from British Springs.
66 Roadster	14.5	14.25	14.25	14	Bud	
66 Roadster(?)	12.75	12.75	15	15	Max Heim	Original Fronts, new rears, 175R-14 tyres.
67 GT	14.5	14.5	14.25	14.25	Barrie Parkinson	Rebuilt front end with V8 bushings, stock springs. Rear all new plastic bushings and fibreglass springs. No bumpers, alloy head, no spare, 1 battery.
68 GT	13.625	14	15.5	15.5	BobMunch, Boise	
68 GT	14.25	14	13.625	13.625	John Hubbard, Huntsville, Alabama	The fronts are up from 13.625 following a front-end rebuild. The wishbones and pivots were badly worn, see John's pics

69 Roadster	14	13.75	14.75	15	Tony Elphick, Wagga Wagga, Aus	Standard. Rears reset 15 months ago, fronts new
69 Roadster	14.5	15	13.5	14.25	Miguel Clemente	50k miles, all original except for front bushes.
70 Roadster	13.875	13.975	14.25	14.5	Joe Lucas, Winipeg, Canada	Stock all around except for new bushings front & back. Spare tire on board, single 12 volt battery in place.
70 Roadster	13.875	13.875	14	14	Peter Baker, UK	Heritage shell 20k, spare tire on board, single 12 volt battery in place.
71 GT	14	14	13.75	14	Bill, Montana	Front springs new, rears original with new bushes and pads. 200k+miles
71 GT	13.5	13.375	14.375	14.5	Bob Wilson	Fronts (red) 3k, rears (original?) 113k?
72 Roadster	12.8	12.8	10.24	10.24	Richard Thompson	These seem very low but are off Richards own site and converted from cm at 2.54cm to the inch.
72 Roadster	14.875	14.875	14.75	14.75	Iain MacKintosh	
72 Roadster	13.125	13	14	14	Stan, Bucks, UK	68k, fronts look original, rears have been replaced but look flat
73 Roadster	14.5	14.5	14.25	14.5	Paul Hunt, Solihull, UK	Original fronts (120k+miles?), new rears (20kmiles), new rear bushes
73 Roadster	14.25	14	15.125	15.125	Paul Hunt, Solihull, UK	RB Roadster front and rear, red poly bushes at rear, 10k miles
73 Roadster	15	14	15.375	14.313	Ken Earnhardt, USA	All worn suspension parts replaced. New rears fitted.
73 Roadster	14.875	14.5	14.875	15	Ken Earnhardt, USA	New fronts fitted to the above, at which time the RH rear was found to be too high, the spring having a greater arch. LH and RH rears swapped over. Updated figures after a little settling, 165SR-15 tyres in use.
73 GT	13.5	13.5	14	14	Paul Tegler	
73 Roadster	14.25	14.5	13.875	14	Richard Smith, USA	New Victoria British rears c1994, original fronts. Rears originally too high and at the limit of rebound straps, settled since. 185/70 x 14 tyres rub slightly on left-hand rear wing.
73 GT	14.75	14.75	14	13.5	Kerry Schofield	78k recently rebuilt by MG specialist
73 GT	15	15	15	14.25	Kerry Schofield	MGOC parabolics at the rear with GAZ dampers. At the front I have had Frontline castor wedges fitted and no other change. (4th Feb 2017)
73 GT	14.375	14.375	14	13.75	Tony Davison, Bristol	Original rears but dismantled and remade in the early 1990's in South Africa, nearside now with a broken leaf, see Tony's info here
73 GT	14.375	14.375	14.75	14.7	Tony Davison, Bristol	New rears following broken nearside leaf, see Tony's info here
74 GT	14.25	14	14.25	14.25	Steve Cioffi, Everett, Ma	Original springs, all new bushings and mountings
74 CB Roadster	15	15	15	15	Rutger Gooszen	Rear Spring leafs within spec en new bushings, new koni dampers. Front original. 74 15 15
74 CB V8	15.5	15.25	15.25	14.75	Gordon, UK	LHR bush collapsed, replacement pending, possible mods
75 Roadster(?)	15.5	15.5	16.125	16.125	Bob Hacker, Vancouver, Washington	Stock springs, V8 bushes
75 GT V8	14.5	14.625	15.125	14	Paul Hunt, Solihull, UK	Original, LHD sag on a RHD!
75 GT V8	14.5	14.625	15.375	15.6875	Paul Hunt, Solihull, UK	New fronts and rears, 5k
75 GT V8	14.5	14.75	15.125	15.25	Colin, UK	Pretty standard apart from Koni dampers, springs probably original, 77k
75 Roadster	15.5	15.5	16.5	16.5	Dave Tetlow, Bucks UK	CB & V8 conversion, CB springs, still trying to reduce ride height
75 Roadster	13	13	13.75	13.75	Dave Tetlow, Bucks UK	As above, but now with 1" shortened V8 front springs, reverse-eye rear springs. Standard dampers with uprated valves, 15" MGC wheels with 185-65 tyres.
75 Roadster	13.3	13.6	15	15	John Tampkins	CB conversion, MGOC lowered front springs, chrome bumper (100lb/in) parabolics at the rear with all the shims above the springs.
76 Roadster	14.625	14.5625	15.625	15.5625	Barry Kindig, Escondido, CA	New springs all round, 1.25" lowering blocks at rear, 185R70 14 tyres
76 Roadster	13.25	13.25	14	14	John Leader, Austin, TX	Lowered fronts from BritTex, 2 1/2" lowered rears from Moss. Pirelli P6000 205/55 15 on Minilite. 28psi front, 31psi rear.
76	14	14	14.5	14.5	Mark Garret, UK	Lowered fronts, lowered parabolics on rear (all plates on top of springs), Spax all round.
77 Roadster	15.25	15.125	15.625	15.75	John, Brisbane Australia	

78 Roadster	14.56	14.96	14.96	15.55	Peter Bird	
79 Roadster	14.5	14.5	15	15	Martyn Harvey, Ontario Canada	V8 conversion, early GT fronts, de-arched GT rears.
79 Roadster	14.25	14.25	15	15	Mike Cook	V8 conversion, late GT fronts, lowering blocks on original rears, 79k miles.
79 Roadster	14.75	15	15.75	15.125	Lars-Erik Kallstrom	Front: Moss Road uprated springs AHT21, V8 bushes, 500 miles. Rears standard, 70k miles.
80 GT	15.875	15.875	15.875	15.875	Ray Swadling	Standard springs with poly bushes all round, 800 miles.

By-the-way. The V8 always had a higher ride height to compensate for its reduced ground clearance. At the front this was achieved by using a special cross-member, which eventually became the cross-member on all rubber-bumper cars, and at the rear by using lowered spring mounting points. Clausager states that the V8 ride height was not altered with the introduction of rubber bumpers. My rubber bumper V8 has lowered front **and** rear hangers for the rear springs, but I have it on good authority from Kelvin Dodd that a chrome bumper V8 he has seen definitely only had the lowered front hangers, the rear hangers were standard. Subsequently confirmed on two CB V8s I was able to inspect. If the rear hangers were altered for rubber bumper V8s, i.e. to make them the same as rubber bumper four-cylinder cars, then there would have been a change in V8 ride height. The rebound straps didn't change on the V8 with rubber bumpers which implies axle travel was the same, and the 4-cylinder cars adopted the V8 straps for rubber bumpers which implies they got the same suspension travel. However 4-cylinder cars seem to have used the same bump rubber pedestal all through, whereas the V8 originally had it's own pedestal for chrome bumper which changed to the 4-cylinder item for rubber bumpers, which implies a change in suspension travel between V8 chrome and rubber bumpers. Likewise the 4-cylinder seems to have kept the same damper drop link all through, whereas the V8 changed between chrome and rubber bumpers, both being different to the 4-cylinder item. V8 springs were always different and changed between chrome and rubber bumpers.

Spring and rebound strap appearance with normal loads




There have always been intermittent complaints from North America that new springs sourced locally raise the rear way too much and sometimes are too stiff or arched to get the rebound straps or even the shackles installed without some serious extra weight in the boot/trunk. If you have to do that then at the very least the rear will be higher than it should and may even be fully extended instead of mid-way between the extremes of its travel which is obviously very wrong. With the vehicle on its wheels, even with nothing in the boot/trunk, the rebound strap should be curved round in an arc, the lever-arm damper arms approximately horizontal, the springs nearly flat, and the shackles around vertical or pointing slightly rearwards, as shown in the pictures on the left of this paragraph (click to enlarge). The rebound straps must **not** be straight and under tension.

Currently there seems to be a real spate of problems (but see this), and people in the UK are beginning to complain of the same thing. You **should** be able to fit the rebound straps by jacking each spring up under the body - without any extra weight in the boot - **before** the body starts lifting off its supports. On UK-sourced springs I have done this without difficulty, even putting the harder rubber-bumper springs on a chrome-bumper car. Similarly people have asked how to get the shackles pointing to the rear instead of the front. Again it is a matter of spring hardness - the correct springs should be almost flat with just the weight of the unladen body, and as they take the weight of the body and start to flatten they will move backwards. If the weight of the car is on its wheels, even unladen, and they aren't pointing slightly backwards, the springs you have are simply too hard or over-arched for your car. However it occurs to me that all the work I have done has been on a chrome-bumper car. With the lower shackle mounting position relative to the chassis rails of rubber-bumper cars it is possible that these can lock in the fully forward position unless levered downwards while jacking slightly higher. However once the rebound straps are fitted this shouldn't occur again. *Updated August 2007:* Since writing this I've had to replace the rear springs on the V8. Having now bought three sets of springs from three different suppliers and fitted them to two different cars I have never had any problems using simply the weight of the body to compress the springs enough to attach shackles, damper drop-links and rebound rubbers, and this includes fitting harder RB roadster springs to a CB roadster. Nor have I had any problems with the shackle 'locking up' in a forward position on either CB or RB car. See Rear Spring Replacement.

My problem has been the opposite - ride-height too low and grounding over 'sleeping policemen' and rough ground particularly when laden (we use the car frequently for holidays with a comprehensive tool kit and trolley-jack as well as luggage). I had tried and removed rubber-bumper roadster springs as part of another exercise which raised the ride height just fine, but being harder they gave a very unpleasant choppy rise over some surfaces. In July 2003 I modified some shackles by 'cutting and shutting' to give about an inch extra height at the rear, as described below in 'Extended Shackles'.

Converting RB to CB *Added January 2008* A number of factors to consider here:

- Standard CB springs on a standard RB shell will do very little as the mounting points for the rear springs are lower on RB cars than CB cars, and at the front the car sits higher on the cross-member. Special flattened or lowered springs must be used, or at the very least the rear modified by turning over one leaf, or replacing the main leaf with a reverse-eye one. You can fit lowering blocks between axle and spring and use longer U-bolts, but that increases the leverage on the bushes in cornering. Altering the rear spring mounts themselves in order to use standard CB springs is a major job, particularly the rear eyes.
- With flattened or lower springs if you do nothing else you will almost certainly 'bottom' the suspension over relatively minor bumps and humps. RB cars have a higher pedestal that sits on the axle under the bump-rubber, so the shorter CB item can be fitted instead to increase the compression travel. This now means the axle has greater travel under compression than before, which means you could hit the limit of movement of lever-arm dampers and damage them, so you must also fit CB drop-arms which are shorter. But then that means you run the risk of hitting the damper limit when the axle is extended, so you must fit CB rebound straps as well.
- But if you fit lowering blocks between axle and springs you must use the original damper drop-links as you haven't changed the relationship between the body and the springs and hence the bottom plate the drop-link attaches to, just the body and the axle. This will still need the lower CB bump-stop pedestals and the shorter rebound straps as before as they are both on the axle.
- And after all that, as Kevin Jackson has pointed out, you now run the risk of grounding the exhaust, as it is angled to sit lower to clear the lower axle position of the RB car!
- Kevin also pointed out one benefit of achieving a lower ride height through flatter springs and that is less leverage on the bushes and so probably better axle location, i.e. the opposite of lowering blocks.

Spring Specs *Updated October 2008*

Front:

Car	Free Height	Spring Dia	Free Coils	Loaded Height	Load Weight	Rate lb/in	OE Part No.
Pre-72 Roadster	9.9	3.238	7.5	7	1030	348	AHH 6451
Pre-72 GT	9.1	3.28	7.2	6.6	1193	480	AHH 5789
72 Roadster	10.2	n/a	7.5	7.24	1030	348	n/a
72-on CB GT	9.32	n/a	7.2	6.84	1193	480	BHH 1077
73-on Roadster	10.2	n/a	9	7.44	1030	373	BHH 1225
RB GT	10.2	n/a	9	7.44	1030	373	BHH 1225
V8 (all)	9.32	n/a	7.2	6.84	1193	480	BHH 1077
Competition lowered	8.63	n/a	6	6.14	1193	480	C-AHT 21

Notes:

1. Information from Clausager, Factory WorkShop Manual, Factory Parts Catalogue, Special Tuning Manual, and Haynes.
2. The 73-on Roadster, CB and RB, and RB GT all had the same front springs as indicated above.
3. 'Loaded Height' is at the specified 'Load Weight' i.e. partially compressed. The difference between the free height and loaded height is the deflection, or the working load divided by the rate.
4. Clausager refers to the 1972 change as a 1/2" increase to all models to prevent excessive settling on export models when lashed down on ships decks for long periods, however the workshop manual shows a change of about 1/4" at that time.
5. Clausager makes reference to what he calls a 'Part number change only' in November 1972. However the Workshop Manual has three sets of specs for the CB roadster - I have assumed (maybe wrongly) that the third set is in fact the November 72 set that Clausager mentions. I have called these '1973 Roadster'. Dave Wood states he received a recall notice for his 72B later that year for a spring change to raise the height by 1/4" to meet minimum headlight heights which would seem to concur with the workshop manual. The Parts manual only has two part numbers covering the change early in 72, not the change in November 72.

Spring quality in terms of what height you end up with has been problematic for years - sometimes higher than expected sometimes lower. If they are higher then about all you can do is opt for a softer spring from the list and hope, I wouldn't fancy cutting some off as some have apparently done. Finding them too low has happened when people have selected a 'lowered' or competition spring, and in that case you can put shims in the spring pan. Moss sell nylon spacers, these are 3/16" (5mm) thick, and say you can use two maximum, the outside of the spring pan

is pretty deep but the inner raised section is less. The effect is about double at the hub so two will raise the front by about 3/4".

Rear:

Car	Leaves	Interleaving	Width	Gauge	Load (flat)	Rate lb/in	Deflection in	OE Part No.
CB Roadster to May 63	5 + bottom plate	None	1 3/4"	0.2187in	400lb	99	4.04	AHH 6453 (GSV 1006)
CB Roadster May 63 on	5 + bottom plate	1/2 2/3 3/4	1 3/4"	3@0.2187in, 3@0.1875in	450lb	93	4.97	AHH 7080 (GSV 1006)
CB GT	6 + bottom plate	1/2 2/3	1 3/4"	3@0.2187in, 3@0.1875in	510lb-540lb	99	3.2	AHC 31
RB Roadster to Sep 75	6 + bottom plate	1/2 2/3	1 3/4"	3@0.2187in, 3@0.1875in	510lb-540lb	99	3.2	AHC 31
RB GT	6 + bottom plate	1/2 2/3	1 3/4"	3@0.2187in, 3@0.1875in	510lb	n/a	n/a	BHH 1767
RB Roadster Sep 75 on	5 + bottom plate	n/a	n/a	n/a	n/a	n/a	n/a	BHH 1779
RB GT LHD Sep 76 on See note 4	6 + bottom plate	1/2, 2/3	n/a	3@0.2187", 3@0.1875"	450	n/a	n/a	n/a
CB V8	6 + bottom plate	1/2, 2/3, 3/4, 4/5	1 3/4"	3@0.2187", 3@0.1875"	550lb	n/a	n/a	BHH 1133
RB V8	6 + bottom plate	1/2, 2/3, 3/4, 4/5	1 3/4"	3@0.2187", 3@0.1875"	550lb	n/a	n/a	BHH 1771
Competition	n/a	n/a	n/a	n/a	375	100	3.75	C-AHH 8343
Competition	n/a	n/a	n/a	n/a	542	124	4.37	AHH 7346
Competition (lowered AHH 7346)	n/a	n/a	n/a	n/a	542	124	3.37	C-AHT 20

Notes:
1. Information from Clausager, Factory Workshop Manuals, Factory Parts Catalogue, Special Tuning Manual, and Haynes.
2. Although the roadster originally is described as having five leaves and a bottom plate ('six leaves' elsewhere) and the GT is described as having six leaves and a bottom plate ('seven leaves' elsewhere) both the 63-on CB roadster and various GT springs are described as having 3 leaves of each thickness. This seems contradictory, and the roadster did get shorter U-bolts when it reverted to the previous number of leaves in September 1975.
3. These springs are listed - without prices - by GB Springs as 'Heritage Car Springs', with some variations from the original part numbers. Some of these seem to be where the spec was changed for a particular model, only the later spec is now supplied, for example only one CB roadster spring is listed whereas until May 1963 a different spring was used. Also they don't list a CB GT spring but it was the same one used for early RB roadsters i.e. AHC 31.
4. With 11/16" rear ARB.

Unloaded Rear Spring Dimensions

A question about this was asked on the BBS and as I still have the relatively new rubber-bumper items I posted the following as a guide:

A	eye centre to eye centre	41 1/4"	

B	inverted height from floor to top of top spring	8 5/8"	
C	front eye centre to pin top centre	19 1/8"	

See also the picture on the right of the table.

Remember these are relatively new rubber-bumper roadster springs, but all others should be close. If your dimension A is significantly less and B is significantly more then over-arching is the problem. If the dimensions are close but you still cannot compress them enough during installation, or the resultant ride-height is much too high, then the leaves are much too hard. In either case get your money back and source them from a reputable supplier in the UK.

April 2021:

See also Tony Davisons measurements of old and new CB springs, and his account of replacing them.

Update January 2013: By now it's probably best to leave off the 'in the UK' as people here are getting duff springs as well. But Mark Bates in the US had the 'submissive monkey' stance, the rebound rubbers were pulled taut and snapped while parked. He removed them and found that dimension B - the arch - was fully an inch and a half more than mine. He purchased another set from The B Hive in America and they do have very similar unloaded dimensions to mine.

See also Front and Rear Suspension Considerations from Doug Jackson's British Automotive site.

Front Spring Replacement

Specifications

The first thing to say is that spring compressors are not required. Support the front of the car safely e.g. with axle stands under the chassis rails and/or front crossmember. Place a jack under the spring-pan and raise the axle until the upper damper arms are just clear of both the rebound rubbers.

Most seem to agree thus far, but opinions differ as to whether the four bolts that secure the spring-pan to the lower A-arms should be removed next and just the spring-pan lowered to free the spring, or whether the lower trunnion bolt should be removed disconnecting the A-arms from the swivel axle, and the A-arms and spring pan complete lowered to free the spring.

Having tried both ways I would only ever recommend the latter method, for the following reasons:

Firstly, because the spring-pan is not parallel with the ground anyway, and even less so when the front of the car is raised, it is extremely difficult to support it so that the tension is taken off all four bolts at the same time. Instead the pan has to be raised and lowered slightly for each bolt to be removed. This damages the threads on the bolts. Even worse is reassembly - one has to fiddle around raising and lowering the jack little bits at a time to get the four bolts through the A-arms and spring pan one at a time, all the while with one's face just inches from an unsecured spring, don't forget the spring pan is also unsecured and could twist releasing the spring.

Secondly, it is my experience that the tapered ARB drop-link pin (all bar 74 to 76 RB roadsters) seizes in the spring-pan, and the two have to be removed together for them to be parted on the bench. If this happens you have no option but to use my preferred method.

Removing the lower fulcrum pivot bolt (through the swivel axle trunnion and outer end of the A-arms) is a single operation and allows you to lower the spring pan on the jack while it is still held securely, until all spring tension is released. With the jack out of the way you push the pan down a bit more with one hand and simply lift the spring out with the other. That done, you can tackle the spring-pan to A-arm bolts in complete safety.

This method also allows you to inspect the thrust-washers on the pivot bolt, and reverse or replace them if grooved which can silence clonks when applying the brakes.

Another more recent option has been to remove just two of the spring-pan bolts, and slacken the other two, then allow the spring pan top pivot down on the A-arms. But the A-arms are not parallel so the pan is going to bind between the arms unless the slackened bolts are very slack. This will almost certainly have to be the inner bolts given that the ARB drop-link pin seizes in the spring-pan. Also if removing the spring is anything to do with working on the A-arms, replacing the inner bushes, or any of the pivot pin components, the pivot pin will have to be removed anyway so you might as well do it up front. With the rear two bolts through the spring-pan and A-arm

removed, and where fitted the drop-link detached from the ARB, both A-arms can be removed, the front one complete with spring-pan and drop-link.

I did use this method to reassemble with new CB roadster springs which have a long free height and I couldn't push the A-arms down far enough to insert the spring. But then I had to move the jack from the middle of the spring-pan to the very outer edge before I could compress the new spring enough to get the fulcrum bolt fitted. Leaving the A-arm to spring-pan bolts slack also helps with refitting the pivot bolt through the arms and the trunnion, if the holes are offset you can't get the bolt through the second A-arm hole. If none of the spring-pan bolts have been loosened the ends of the A-arms should still be in line.

Some have said that just letting the suspension hang down on the rebound rubbers takes enough tension out of the spring to be able to remove the pivot bolt or the spring-pan bolts safely, which could be the case with the shorter and harder front springs, but until you have done it once you won't know, and you don't want to find out the painful way that it isn't the case!

In the time-honoured phrase - "reassembly is the reverse of removal" - that is, push down the A-arms complete with spring-pan, insert spring, jack spring-pan and pivot swivel-axle until the lower bolt can be inserted. The only thing to watch is that the grease seal, thrust washer and seal support are all present and correct on reassembly.

Another tip when buying new springs of any type is to insist on a pair with the same free height! The pair my supplier put on the counter for Vee differed by nearly 1/4". He got a matched pair without quibble, but said "it won't make any difference". At first I thought he meant that the free height made no difference to the loaded height which is obviously wrong, but once fitted although the loaded height had been the same with the old springs with the new, even after a shakedown run, there was a 1/2" difference. So maybe he meant "it doesn't matter what the free height is, the loaded heights will probably be different anyway!". Also the free heights were quite a bit higher than spec, so if you are able go for the shortest.

Update September 2007 Another tip is that when sliding the A-arms down off the trunnion, as soon as the hole in the trunnion is cleared refit the bolt and nut and this will stop the grease seals etc. falling off and the bolt/nut getting dirty/lost. But I digress. Many moons ago for various reasons I fitted CB GT front springs to the roadster as they are stiffer, but with a lower free height, which gives much the same ride height. At the time they gave much the same ride height with less roll and dive under braking, but since then they have settled and for some time I haven't been able to get the hydraulic jack under the rear edge of the cross-member, and the A-arms and track-rods were both angled upwards (outer ends relative to inner) which didn't seem to me to be correct. So I decided to replace them with new originals, and in doing so found that I needed to employ a combination of the two methods above. The CB GT springs have a free height of 9.32" (and the used ones were a little less than this anyway) and pushing down on the A-arms/spring pan with the lower fulcrum pin removed was all I needed to do to get the old spring out. However the correct springs have a free height of 10.2" (and in fact the new ones were a little taller than that) and I could not push the arms down far enough to get the new spring located in the groove in the spring pan. So I removed the inner spring pan bolts altogether, and with the outer bolts slackened (actually only the bolt as I couldn't get at the anti-roll bar drop-link nut easily) the pan pivoted downwards with a bit of pressure and in went the spring. I then jacked up under the inner edge of the pan, and with a bit more levering got the holes aligned and the bolts back in. This is still a much safer method than complete removal of the four spring pan bolts as the pan and hence the spring is still securely retained by the outer two bolts (or bolt and anti-roll bar drop-link pin). So far so good, but when I jacked up under the spring pan I found I couldn't compress the new springs enough to get the holes in the fulcrum and A-arms aligned, I had to jack under the far outer edge of the pan to be able to do it. Not only that, but when on the ground a quick measurement showed that the front ride height had leapt up from 14" to 16" and looked ridiculous!

Not being a believer in springs 'settling' soon after installation, nevertheless a tour round some of the speed-hump ridden streets of Solihull and some bumpy country lanes for an hour settled them to 15.375" at the front both sides, with 14.125" at the rear also both sides. Better, but still a little high at the front, but it will probably settle more over time. I think the initial settling is due to the front springs only sitting in the spring-pan and cross-member, and so not fully seated until they have been worked up and down a bit. In contrast the rear springs are positively located by bolts and I'd expect very little initial settling. The A-arms and track rods are now angled slightly downwards (click thumbnail), and I now have 6.625" clearance under the front cross-member as opposed to about 5.5" previously.

Update October 2007

Replaced Vee's front springs today. Being shorter it was much easier than Bee's, I only had to remove the anti-roll bar and lower fulcrum bolts, and slacken the bolts between the spring pan and the rear A-arm. Pushing the pan and A-arms down the old spring came out easy enough, although the axle assembly kept pivoting inwards getting in the way, and I didn't have enough hands to hold that out, push down the spring pan and lift out/replace the spring, so I propped the axle assembly up out of the way with a piece of wood between the hub and the ground. Didn't take much more than an hour each side. Before

starting the ride height between hub centre and bottom of the trim strip was 14.5" on the right and 14.625 on the left. Immediately after replacement the right was 16.25" and the left 16.5", and after a couple of miles over the speed bumps came down to 15" and 15.5" More disparity there than originally, and the springs were the same free height, so we'll see how it goes. Clearance under the Y-pipe on the exhaust is now 4.45", up from 3.5" before, which was way below the spec ground clearance of 4.25". This thumbnail shows (from left to right) the original roadster springs (with a nice curve in them!) taken out some years ago, the newly removed CB GT springs, and new V8 springs waiting to go into Vee.

Update October 2009
Measured Bee's ride height as 14.75" right front, 14.625" left front, and 14.25" for both rears. Vee's are 14.5" right front, 14.625" left front, 15.375" right rear, and 15.6875" left rear.

Update May 2022
Bee 14.5" right front, 14.4" left front, 13.875" right rear, 14.25" left rear. Vee 14" right front, 14.5" left front, 15.5" both rears.

All measurements eye-balling the centres of the hubs so not accurate to the thou. Significant change in the first two years then very little in the dozen years since, most of which has been spent surrounded by 'traffic calming' measures but without a deterioration in ride height.

Rear Springs

It is purely the leaf springs that locate the rear axle in the car, nothing else. Just in case you wondered how much it moves around under acceleration and cornering forces, have a look at this Healey video which has much the same leaf spring and lever arm damper arrangement: https://www.youtube.com/watch?v=tN-4LLAKlpw. Note that the movement is nothing to do with the lever-arm dampers, telescopics would make little if any difference. You would need a multi-link system to positively locate it against rotation about the half-shafts and sideways movement.

Leaf Spring Lubrication

Once I started using the V8 in mainly dry weather the rear springs started squeaking quite badly, which had the Navigator complaining. I didn't want to spray oil on them as I was concerned for the rubber bushes at each end, particularly the front bush which is a lot more difficult to change than the rear bushes, so decided to use Waxoyl which doesn't harm rubber. Waxoyl is also much less likely to get washed out from between the springs when Vee does get wet, like on organised runs!

I actually painted it on semi-congealed rather than as a liquid suitable for spraying, then used a hot air gun to melt it whereupon most of it was absorbed into the gaps between leaves and interleaving and little dripped off. At first it didn't seem to have made much difference, but then over a bit of driving it seems to have 'worked in' and they have definitely become much quieter and now I can't say that I notice them at all and neither has the Navigator commented recently. It would have been much easier to apply with the springs removed from the car and laying on their sides, but a much bigger job overall of course.

In response to a question on a Bulletin Board I mentioned this but another contributor said he didn't like Waxoyl because it dried out. In my experience whilst it does 'dry' in that the white spirit that makes it liquid evaporates it leaves behind the waxy stuff which if you rub it between your finger tips is still slippery i.e. does still lubricate, and as I say is much less likely to get washed out than oil or even grease. And being drier it will pick up less dirt and grit.

Update August 2007: Having broken a rear spring on this year's Snowdon Run before I replaced them I laid the new springs on their sides, painted on some dollops of Waxoyl, then used a heat gun to melt it into the crevices between springs and interleaving. When they were 'dry' I could pick them up by the eyes and it was a cleaner job than I was expecting to fit them while coated. Incidentally, this is the third set of springs I have bought from three separate suppliers and fitted to two different cars - one chrome one rubber, including stiffer rubber bumper roadster springs to the chrome bumper roadster, and I have never had any trouble getting the shackles, damper drop-links or rebound rubbers attached, or in getting the shackles to point downwards. The weight of the body was more than enough to compress the springs before the body lifted off the axle stands in all cases.

Rear spring mounting *June 2016*


It's well known that rubber bumper cars higher ride height is obtained by a modified crossmember at the front and lowered spring mounting points at the rear, and this applies to both 4-cylinder cars and V8s. Also that the V8 chrome bumper was the first to use the modified crossmember as it needed more ground clearance for the exhaust than the 4-cylinder. But what about the rear springs on chrome bumper V8s? Over the years I've seen arguments as to whether the rear mounting points on these cars were lowered or not, and I've been intrigued as to the answer. At a recent MG run I had the opportunity to find out as there were not one but two chrome bumper V8s. When parked up at the finish I happened to see the cars, no owners in attendance to ask, so I took some surreptitious pictures.

The results were quite interesting: Both 4-cylinder and V8 rubber bumper cars have lowered front and rear mounting points consisting of a deeper front bracket and the holes for the rear shackle pins being below the centre-line of the chassis rail, but the chrome bumper V8 only has deeper front brackets, the rear points are through the chassis rail just like the 4-cylinder car. Even so the front brackets **are** different between chrome and rubber bumper V8 - the rubber bumper part looks deeper than the chrome bumper, and has a reinforcing piece, and this partial lowering at the rear seems to be confirmed by the CB V8 drop-link being 9.75" long whereas the CB 4-cylinder is 8.5" and all RB cars are 10.5" . Whilst British Motor Heritage lists rear spring front hangers, it only differentiates between chrome bumper and rubber bumper, V8 is not mentioned, ditto Brown & Gammons and Moss Europe which quote the BMH part numbers.

Rear spring replacement *November 2010:*

October 2024: September's issue of the MGOC Blog has an article on rear springs including replacement items. For rear springs they say "MGOC Spares offers a full range of leaf springs from Q Parts manufactured to exacting standards, offering unbeatable quality with features not found elsewhere with the peace of mind that our springs have undergone rigorous testing and have been developed for real world use. They are not marketed as original but supplied under a 'Q' suffix, meaning uprated owing that Q Parts Springs springs are rated a little higher than standard to provide a much longer service life than so-called original springs, which we find do not last." These have RSK part numbers.

June 2016: I've just become aware of a news item posted in 2015 on the West Cheshire MG Club website (scroll to the bottom) saying that BMH guarantees correctly specced springs made by GB Springs. However I can find no reference to them on the BMH website. But GB Springs on their website do list what looks like the full range for the MGB at least, plus for other models and marques.

February 2023: At last as a result of conversations with Noel Wade I've found this page which includes the following:

> In the face of badly made, incorrect alternatives, British Motor Heritage (BMH) is optimising its five year partnership with GB Springs to guarantee the supply of quality, original specification leaf springs for British classics of the MGB/Midget era.
> ...
> Concluded John Yea: "From hereon we will use the British Motor Heritage label on all our springs. This is the customer assurance that the product is as close to the original manufacturer's specification as possible, and that the quality of the spring has been validated and therefore justifiably carries the original part number. Without this sign of authenticity, it is really a case of buyer beware."

Also this BMH page with links to the full BMH brochure, listing products from GB Springs on page 150 (of the printed brochure, page 53 of the PDF) which include those on the GB Springs page plus AHT20Z uprated 2" lowered.

March 2023: Noel has contacted me again to say that several suppliers now have the GB Springs with the Heritage sticker, including Moss where he has purchased his. I'm hoping to get an update following installation. However at the time of writing looking at the specifications of the six springs Moss list three say 'after-market' and three don't, so you would need to check with Moss.

April 2023: Noel has now got his car back, it sits level and at the correct height and he is very pleased.

August 2007:



Spot the difference. Following the breakage of a rear spring on the V8 on the 2007 Snowdon Run I ordered replacements from the MGOC and approached fitting them with some trepidation. Would I have the same over-arched/too hard springs that so many seem to have? Would I find the bolt seized in the front eye bush that Americans frequently complain of? In the event I had neither. The front nuts came undone easily with nothing more than a spanner, and when the shackles and U-bolts had been undone and the rear of the spring lowered to the floor the bolts just tapped/twisted out. With the new springs fitted and the weight on the car

there is a decent amount of slack in the rebound strap, about 3 1/2" between the top of the bump-stop pedestal and the bottom of the bump rubber, and about 15 7/8" measured between the centre of the wheel hub and the bottom of the trim strip.

On fitting the new springs one point that did differ on the rubber bumper V8 compared to the CB roadster (both CB roadster and RB roadster springs on this car) is that on the V8 I only had to lift the springs up by hand and I could insert the shackles. On the roadster I had to jack under the spring to slide the rear eye back along the chassis rail until I could get the shackle inserted, probably because the harder RB V8 springs had less free arch than the CB roadster. One problem I had with the V8 that I hadn't had with the roadster with either new red poly bushes at one time and new rubber another, is that the latest bushes have a significantly thicker flange than before, which meant that even without the lock-washers I couldn't get the nuts started. I had to squeeze the sides of the shackle together with a small sash cramp to compress the bushes before I could get the washers on and the nuts started. Other than that everything was straightforward, the only complication on the V8 being the Hopkinson anti-roll bar. To get the bracket of this located on the U-bolts I had to jack under the spring until the bracket was just below the end of the U-bolts, then slowly lower it whilst locating the bracket holes over the threaded ends, until enough thread was sticking through to get the nuts started. Both the front eye bolts and the shackle nuts are done up until they suddenly come tight as the front hanger butts up against the bush sleeve, and the shackle pins have shoulders which the closing plate clamps down onto. How tight to do the U-bolt nuts is always an awkward question - I've never seen a torque figure given, so how tight do you go? Having done this job several times now it seems to me that as you start to compress the flat rubber bushes either side of the spring the nuts get stiffer quite gradually, then they seem to get quite a bit stiffer quite quickly. This is about the point I stop, but they need checking again after a short shakedown drive, and again several hundred miles later (checking the front eye bolt and the shackle nuts as well this time). During my shakedown drive I noticed some creaking coming from the right-hand side, on my return I could tighten this side quite a bit more (possibly as I did that side a couple of days prior to the left-hand side) and on a second run the creaking had disappeared. One thing that did **not** change was the rear ride-height.

One thing I did which I usually do when re-fitting MGB components, to ensure easy removal in the future, is to coat the front bolt and bush and the rear shackle pins and bushes and the rear chassis holes with Waxoyl. Before fitting I had also laid the springs down on one side, painted a decent layer of Waxoyl on, then ran my heat-gun up and down to completely melt it into the joints between springs and interleaving. When that had solidified I turned them over and treated the other side. Not even that messy when picking them up to fit to the car, and that is what latex gloves are for.

So I have now bought three different types of spring, from three different suppliers, over a period of years, and fitted them to two different cars, and never had the 'too-hard/arched' problem that so many complain about. Am I just lucky? Or is everyone that gets this problem buying from dodgy suppliers? Or are they simply not installing them correctly? I wish I knew.

July 2010: A pal's MGB fails its MOT with a broken rear spring.


Unlike the V8 it wasn't obvious as the wheel was still central in the wheel arch, as this car has the factory rear anti-roll bar which controls the fore and aft position of the axle. I suppose the ride height might have been a little lower that side but it wasn't obvious. Keith brought it round, but when the door bell went I hadn't heard the car, apparently it had conked out round the corner! This time (on the last visit it conked out two streets away, so an improvement) a fuel leak had developed and emptied the tank. A short push to a convenient slope allowed the car to roll round the corner and onto the drive, so that was going to be the first job. In the event the rubber hose between the pump and the metal pipe leading to the carbs had split, so an easy fix, and I was able to manoeuvre the car into the best place for the spring change.

For security I drove the front of the car up onto ramps, with the front of the car pointing down the slight slope on my drive. The rear was supported on axle stands just in front of the front eye, with pieces of wood inserted into the flanges of the bracket between the floor reinforcement section an the axle stand. If one end is on its wheels and you are pulling an pushing at things it's very easy to tip stands over, particularly if its the front on the ground and the rear in the air, even with chocks.


This time not so lucky as both front eye bolts are seized in the spacer tubes. I can turn the bolt with a spanner, but as I release the pressure I can feel them springing back a bit, so the spacer is turning inside the rubber bush. Pondered cutting through with a jig-saw, but they can only cope with a few mm of metal, so opt for a cutting disc for the (4 1/4") angle-grinder. Only had grinding discs before, which are thicker and have an off-set flange. Discovered that with the thinner, flat cutting disc the locking ring has to be turned over so the flat side contacts the disc, as otherwise it isn't gripped.

Decide to cut the spring off the eye as close to the eye as I can, to give me as much space as possible to cut up the sides of the eye and through the bolt and spacer tube. I was gobsmacked at how quickly it made the first cut, probably less than a minute, and with that out the way the other two cuts probably less than 2 minutes each. Angle the grinder for the first cut so the sparks fly away from the car and not under it, and downwards for the other two cuts. This meant that with one of the cuts each side it didn't go through all the way in one go, so just turn the eye 180 degrees and cut through the rest. The eye just dropped out of the bracket, and a bit of wiggling got the thin ring that was the end of the spacer tube off the remains of the bolt. Less than five minutes, and no collateral damage to the bracket or anything else, it took me longer to get the spring and bottom plate off the U-bolts!

One bump-stop pedestal had completely rotted away, and the other was hanging on by a thread, so replacements needed for those as well as the front eye bolts. Reassembled everything with Waxoyl, turning to a clear liquid on what was a very warm day. As on the V8 with the front eyes mounted the rear shackles lined up with the chassis rail holes without compressing the spring, neither did the shackles lock under the chassis rail when I jacked up under the spring to fit the U-bolts and bottom plate. Again the U-bolts and plates were the biggest fiddle, getting them lined up, and getting the 'bump' in the top plate lined up with the hole in the bottom of the axle spring-pad. The factory anti-roll bar makes this slightly more difficult as you can't move the axle fore and aft directly, you have to rotate the whole axle to move the spring mounting pad into position over the spring. The second side is even worse as with the first side fitted you can't even do that, and a firm push from a foot on the brake drum was needed. One thing I noticed is that the new front bolts are only **just** long enough, and that is with the old nuts and lock-washers. Nylocs were supplied with the bolts but to be honest I don't think they were long enough to get the requisite minimum three threads clear, as it was the end of the bolt was just shy of the end of the nut. Other than that (well, there are only the shackles left!) it all went back together inside the hour, and that includes wheels on and tools etc., put back in the garage.

Herb Adler tackles the same problem.

Extended Shackles

The roadster always looked low at the rear to my eyes, and the springs were almost flat even when unladen, so I thought they were worn out. Fitted a pair of new OE items and was surprised to find that they made very little difference. As we use the car frequently for trips away from home laden with a comprehensive toolkit and trolley jack as well as luggage, speed-bumps and uneven ground were a real problem, with frequent grounding of the exhaust. I had also never been able to change a wheel by jacking under the axle as the tyre was too far up inside the arch and always had to jack under the front mounting, which means lifting the car quite a long way before the tyre cleared the ground. However this was minor compared to the Navigator's wincing when grounding.

In July 2003 I decided I had to do something about it. I did have rubber bumper roadster springs on for a while (part of another exercise) and whilst these gave me the extra height they were also harder and gave a choppy and unpleasant ride over some surfaces and eventually the proper springs went back on. I considered re-arching these springs but felt that would be a bit hit and miss. The alternative was longer shackles. I was surprised to find that rubber bumper and chrome bumper cars used the same shackles. Seeing as how the front eye is only about an inch or so lower, but the car is 1 1/2" higher, the extra must come from extra spring hardness and/or arching and this does seem to be the case on my RB V8. I did find some adjustable shackles but they are very expensive, more than I was prepared to spend. A few enquiries elicited no other sources of longer shackles, other than paying an engineering shop to produce some, or modifying standard ones myself.

The very expensive adjustable shackles mentioned above have three pairs of holes for the bottom pin, which is just a long bolt going through both plates. The originals have the pins pressed into splined holes in the shackle plate and the pins have a double shoulder at the threaded end, the smaller of which fits into the hole in the closing plate. This keeps the threads away from the side of the hole so protecting them, but more importantly makes the tightened shackle a rigid parallelogram, aiding spring and hence axle location. Plain bolts will allow the rectangle of the closed shackle to be distorted into a rhomboid during cornering, which will give more lateral movement of the spring and hence the axle. Over time this will tend to make the holes in the plates oval and wear grooves in the bolts so weakening them. There is also the issue of tightening the shackles. Even when the original shackle is tightened to 30 lb.ft. the bushes are only lightly nipped and there is clearance for the spring eye to pivot on them. But without some form of spacer tube a plain bolt is going to tighten the shackles onto the bushes and spring eye, restricting movement, and probably damaging the bushes in a short time.

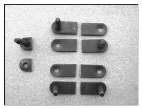
I decided to modify some myself. But rather than cut up and weld a piece into my existing ones I bought two pairs of the standard items and used those. This was for two reasons - I wanted a 'proper' set to go back to if I needed to, and I wanted only one weld in each rather than two. In the event it was an easy enough job and if I were doing it again I would extend the existing pair with two welds and a piece of flat bar and save myself £40.

The first job was to decide how long - the distance between the centres of the shackle pins - I wanted them to be. The standard items are 2.5", I wanted about an extra inch as measured between the hub centre and the bottom of the chrome strip, and given the various angles and lengths of parts I reckoned on about 1.25" longer at the shackle, i.e. 3.75" in total. I didn't want to guess and get it wrong but be a bit more scientific, so I made up two wooden blocks to go between the spring eyes and the chassis rails, shackles removed, then added and removed further wooden 'shims' until I got my 1" extra between hub and trim. This was a bit of a fiddle, jacking and lowering the spring and axle, but fortunately I got it right on the second go. I then measured the distance between the centres of the holes in the chassis rail and spring eye, and it turned out to be 3.75". Oh well, at least I knew it was going to be right.

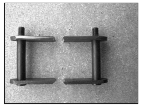
At this point a word about removing the springs. I say 'removing' but I didn't actually remove them altogether, the front bolt was all that was left so the following process is good for complete removal too:

- Jack under the axle to raise the back of the car off the ground and securely support the body under the rear spring front mounting point reinforcing plates, high enough so that the wheels are off the ground when the jack is removed.
- Lower the axle so it is suspended on the rebound straps, or, if your straps are broken or suspect don't go any lower than good rebound straps would allow to avoid stressing the dampers or rear brake flex hose, and support the axle near the bottom of its travel on axle stands. Now would be a good time to replace bad rebound straps!
- Now jack under the spring itself, close to the U-bolts. Raise it a couple of inches or so but not so much as to start lifting the body off its supports.
- Remove the four U-bolt nuts, pull the damper mounting plate and spring locating plate down off the U-bolts and push them towards the front of the car so that they are under the front half of the spring. If you raised the spring and axle high enough above this is easily accomplished in the normal downward travel of the damper.
- Jack the spring down, it will clear the U-bolts, and keep going until all tension is released, pushing the damper mounting plate further forward if required.
- Remove the rear shackle. With no tension in the spring you should be able to wiggle it about to get it free once the closing plate is off. If the rubber bushes are damaged or perished change them.
- Removing the front mounting bolt now will allow complete removal of the spring, if required. Take care, they are surprisingly heavy! If the drivers side has sagged more than the passengers swapping over the springs will restore an element of balance when the car is occupied.

By putting wooden blocks between the spring rear eyes and chassis rails and varying the thickness of the blocks with shims, supporting the springs under the axle on jacks and lowering the car till the tyres just touch the ground, you can get a reasonably accurate measurement of the distance between the centre of the hub and the bottom of the trim strip as it will be in normal use. The distance between the centres of the holes on the spring and chassis rail then determines the required shackle length. With a pair of dial calipers I used the outside jaws to measure the distance between the closest part of the two holes, then used the inside jaws to measure the furthest part, halved the difference and added that to the lowest figure to get the centres.



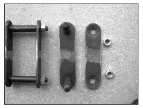
By cutting and shutting two pairs of shackles, as I was, you then have to determine where to make the cut. I felt it best to make each half the same length, which meant half of 3.75" i.e. 1.875" from the centre of one of the pins. Careful measuring, scribing and cutting produced the pieces as shown in the picture on the left (click to enlarge). As well as the pieces from four shackles which are going to be welded together to produce two, you can also see an example of the discarded parts of each shackle. 3/75" is just inside the flat part of the shackle plates, much more and you would be cutting across the dished part (which is no big deal but it would look a bit odd when welded together), and you only have about 0.25" available anyway before you reach the pin. Don't weld half of a closing plate to half of a pin plate as I have the top ones laid out! I didn't, but only noticed I had them laid out incorrectly when viewing the picture when I came to write this account.



I wanted to grind the welds flat after fabrication, so to get maximum strength from the weld I ground both sides of each cut edge at an approximate 45% angle to make a 'V' groove each side when the pieces were put together, as shown in this picture. Not terribly clear, but you should be able to make them out.

Next came the job of welding them together. I decided to do the shackle plates before the closing plates as I considered the former easier to get aligned with reference to each other, then the closing plates can be aligned with reference to the welded shackle plate. The shackle plates need to be aligned such that the pins are parallel in two dimensions - one so that the centres of the pins are the same distance apart for the whole of their length, and the other so that the two pins are at the same angle when viewed one behind the other. Finally the two halves of the shackle plate should be as level and flat as the previous two alignment criteria allow. I opted for holding them

lightly in a vice across their width, tapping first one then the other until all three criteria were met, then tightening the vice and making sure they were still correctly aligned. Because I was welding two halves of different shackles together they were of slightly different widths which meant that when one was tight in the vice the other was still loose, so I used some thick card as 'soft jaws' which deformed and gripped each half with relatively equal force. I MIG welded one side filling the 'V', checked the alignment again, then turned them over and welded the other side filling the other 'V'.



The closing plates are less critical, only having to get them flat and level, and using the completed shackle plates to ensure that the holes are at the correct centres. The welded and ground parts can be seen here.

All that remains is to fit them. With the U-bolts undone and the spring tension released you should be able to insert the shackles and bushes into the spring eye and chassis rail quite easily. Because they are longer than the originals and because the spring may be resting on the previously removed damper locating plate in its forward position, you may have to pull the rear end of the spring down a little against its tension in order to get the shackle in. You may also need a little Waxoyl or washing-up liquid on the bushes to act as a lubricant to aid insertion. Don't use oil or grease as it will rot rubber. Fit the closing plate, spring-washers and nuts. When tightening the nuts they may tighten up before the shoulder on the pin has located itself into the hole in the shackle plate, then come looser as they locate properly, before finally tightening up to 30 lb.ft.

Jack the spring up under the axle, fit the spring locating plate and damper mounting plate onto the U-bolts, and fit and tighten the U-bolt nuts. The Workshop Manual shows double-nuts which can be locked together, but Nyloc nuts seem to be fairly common these days. Some say Nyloc nuts should only be used once, but I have seen a reference in a manual that says as long as you can't turn them with your fingers they are fine to reuse. If in doubt replace them. All that remains is to jack under the axle so you can remove the body supports, lower the wheels to the ground, and measure your new ride height after a short drive to settle things. After a longer drive recheck the tightness of the shackle and U-bolt nuts. The fitted shackles can be seen here, pointing slightly to the rear, and not far off right-angles to the spring which is nearly flat.

A comparison of 'today' (February 2017) with when first modified, after some 14 years and 25k miles:


Note that extending the shackles will apply more leverage to the chassis rail bushes so you can expect a little more lateral axle movement when cornering. Bee's 175 tyres do rub both sides occasionally, but that is a factor of wheel offset with her after-market wire wheels more than anything else.

Steering Column

Originally the column was solid i.e. non-collapsible and did not have a steering lock or ignition switch. RHD and LHD for all markets used the same components which consisted of a separate inner and outer. Various non-North American countries got steering locks at different times between 1962 and late 69, and hence had different inners and outers, which also differed between RHD and LHD. In 1967 North America got a collapsible column for the Mk2, with what Clausager describes as 'an easily defeatable' steering lock. In 1970 non-North American inners and outers changed. There were still locking and non-locking variants, and hence RHD and LHD locking variants. North America got a different column with improved, side-entry lock. From 1st January 1971 the UK required a steering lock, so a column with a front-entry lock was fitted to cars for all markets except North America. For the 1972 model year in non-North American markets the column changed to a collapsible assembly rather than separate tubes and shafts. V8s had a full energy-absorbing column from the outset, changing model number for RB cars, and only then did all models get the same full energy-absorbing column.

Wheel Splines:

According to Clausager four different types of column and wheel hub splines were used over the years, and are not interchangeable. However he gives the four types as 62 to 67, 67 to 69, 70 to 76, and 77 on - model years where appropriate. The Parts Catalogue doesn't entirely bear that out, but it has its own gap in the information. There are two sections for 4-cylinder columns and wheels - one described as 'Not North America or V8' and the other as 'North America collapsible type'. But with Clausager stating that the North American collapsible type wasn't used until the Mk2 of 1967, which if correct and because there are no parts listed for North America before that, indicates that all models used the same types for the Mk1, and that is what I have assumed. The Parts Catalogue is also quite clear that the same spoked wheel AHH9284 and columns were used in non-North American markets until the start of the 1970 model year. So whilst North America used one type for the Mk1, and another type until the start of the 1970 model year, other markets used the same type from the start of production to the start of the 1970 model year. Still with the wire-spoked wheel, although this wheel has a different part number AHH 9825, implying it was different to the non-North American parts. To my way of thinking this makes all markets for the Mk1, and non-North American to the start of the 1970 model year using the first variant, and North America Mk2 to the start of the 1970 model year using the second variant.

From 1970 to 72 the wheel for all markets had flat alloy spokes with five holes in each, changing to slots for the 73 model year because the holes trapped fingers. But only a few months later the slots were changed to depressions as the slots trapped dangly jewellery! V8s had the side-entry lock on the full energy-absorbing column, and the wheel with depressions for the whole of production. From the start of rubber bumper production all cars regardless of market got the full energy-absorbing column (crushable outer as well as collapsing shaft) with side entry lock. The components then remained unchanged until the end of the 76 model year. As the wheels and columns have different change points, and the Parts Catalogue indicates the wheels were common to all markets, V8 and 4-cylinder, they must have been compatible, so this is the third variant of splines - 1970 to 1976. I've been able to compare a 73 roadster and a 75 V8, and whilst the wheels fit on each others splines the taper seems to be slightly different, even though the change-points indicate they should be the same. With the 'right' wheel pushing the wheel down onto the taper locks it, whereas with the 'wrong' wheel even pushed down it wobbles from side to side very slightly, which is probably because the V8/RB column is almost 6mm wider. 1975 Jubilee GTs may have had an all-black wheel with a gold MG horn-push logo. Other cars built during the 1975 Jubilee year had the metal-finish spokes with the gold logo.

For the 77 model year the column and wheel (now with four rubber-covered spokes) changed, again common to all markets, giving the fourth variant - 1977 on. However this is more to do with completely different arrangements for cancelling the indicators and sounding the horn, the splines and threads appear to be the same. The MG logo was originally dark grey, then silver as standard. UK 1980 LE models had the standard wheel but with a red MG logo. North American Limited Edition models of 79 and 80 had a wheel similar to the 70 to 72 but with three holes instead of five, finger-trapping perhaps no longer being considered a hazard.

October 2013:
I have found the following list concerning North American cars which agrees with the change-points above:

Years	Type	Splines	Thread	Socket
62-67	Mk1 wire spoke	3/4" by 48	11/16" X 27 TPI	1 5/16" or 34mm
68-69	Mk2 wire spoke	5/8" by 36	9/16" X 27 TPI	1 1/16" or 27mm (to be confirmed)
70-76	Flat alloy spoke	11/16" by 36	9/16" X 18 TPI	1 1/16" or 27mm
77-80	Plastic spoke and NA LE	11/16" by 36	9/16" X 18 TPI	1 1/16" or 27mm

However markets other than North America probably continued with Type-1 until 1970 and so only have three types. Note that although the splines and thread are the same the column diameter of the Type 3 increased for V8 and rubber bumper cars, and the cancelling cam is different. Note also that Type-3 and Type-4 splines and thread are identical, but the steering wheels for all markets changed in 1977 to one with the indicator cancelling arrangement integral to the wheel, instead of using the cam on the column. So whilst the steering wheels are interchangeable on the column, the Type 3 wheel will not cancel the indicators on a Type-4 column and switch-gear.

Interestingly the 'collapsible' columns before the full energy-absorbing allow the shaft to move freely up and down within the inner. So in any frontal impact an unbelted occupant could push the wheel forwards, collapsing the inner and crushing the switchgear, allowing more travel before hitting something solid but little energy absorption i.e. deceleration. If the collision is so severe as to move the rack rearwards the steering wheel and inner shaft would actually move towards the occupant, possibly allowing even a belted driver to hit it, although that would collapse the inner shaft. The later full energy-absorbing columns are different in that the inner cannot move in and out of the outer. An unbelted driver will probably suffer greater injury from this type of column as the wheel cannot be pushed forwards until there is sufficient force (from the driver!) to deform the structure the column is bolted to. If the rack moves backwards then the inner will shear with very little force, and no energy absorption as before. It's only if the toe-board comes back far enough to hit the bottom of the column outer that the mesh construction of the outer will do its energy-absorbing stuff, and prevent the wheel moving towards the driver. But it's difficult to see how that could happen, except possibly in a V8 where the engine moves backwards. If the impact is severe enough to deform the toe-board, even with a V8, it's difficult to see how the energy absorbing column is going to make much difference to the injuries of the driver, given that this 130kph/75G impact of an MGB with a solid concrete wall resulted in no intrusion into the cabin.

Bulkhead Seal: *October 2024*

A short plastic bellows AHA5435 with the 'solid' columns up to chassis number 258001 in August 71 for the model year.

Then a longer plastic bellows BHH531 for the intermediate collapsible column.

The full energy-absorbing column used on RB 4-cylinder cars and all V8s used a flat gasket and clamping plate.

Cowl: *August 2019*

Two plastic halves covering the indicator switch on CB 4-cylinder cars (one stalk), indicator and wiper stalks and ignition switch on RB models and all V8s. Where there is only the one stalk the cowl is much smaller and the two halves - top and bottom - are separated with four easily accessible screws going up from the bottom half into threaded sockets in the top half. With the later version where there are two stalks and the ignition switch the cowl is much longer as well as broader and extends under the dash and binnacle, and the screws are trickier. The two halves are one each side, with two easily accessible screws going through the left-hand half into the right-hand nearer the driver, and two more further away one in each half going into brackets on the column outer. This second pair are shrouded by the binnacle and dash as it curves round the cowl, and there is no direct access with a screwdriver. A PO had obviously removed and not refitted them on my V8 - thankfully - but even so it's not possible to get the halves off without forcing them past the binnacle which risks breakage - and they are NLA.

So the only option is to drop the steering column by undoing the three column to dash bolts - DO NOT undo the three toe-board bolts for this job. The left-hand half of the cowl can be removed just by slackening all three bolts - they undo quite a way before coming free, but to remove the half with the ignition switch needs the two on the right to be removed completely to allow the column to tilt over. Be very sure to note where any packing is present between

column and dash, as that is part of column UJ alignment. Leaving the left-hand bolt fitted but with plenty of slack prevents the column dropping and putting undue stress on the UJ and rack components, so if removing the column altogether make at least one of the three dashboard bracket bolts the last one to be removed.

September 2023: Refitting a pal's 78 cowl after column stalk switch work I just could not get the two halves to line up neatly, whereas they did as two halves off the column, and it wasn't stalk switch wiring getting trapped. I removed the switches again so I could peer down inside the cowl to see what was happening - and realised that both the brackets for the inner screws were bent, one considerably, which was holding the two halves apart at that end. Repositioned - firm hand pressure was enough but there is room to get a pair of pliers in, and everything went back together neatly which was very pleasing.

The toe-board bolts just clamp a plate and rubber seal to the toe board, with a sliding fit to the column, they are not clamping that end of the column in position. Normally one would expect the seal to be pressing on the column with equal force all the way round, which will help keep that end of the column in the correct position when the upper part is disconnected or slackened. But just in case it is pressing on one side more than another, e.g. if those bolts were tightened before the column was fully aligned, it might be an idea to slacken and retighten those **first** to even out any forces, and only then undo the column to dash bolts.

On Vee the position of the column is such that the right-hand screw is shrouded more than the left-hand, so it's possible that just by slackening the column to dash bolts, you may be able to slide the column first one way then the other for the best access to each in turn. Note the positioning first, and put it back to that when you finish. If in doubt you may need to check the alignment of the steering column UJ.

Even with the screws out of the two-stalk type the difficulties continue, as both halves need manipulation to get them off over the ignition switch and the ends of the stalks, they don't just drop free as with the single-stalk type. Probably why the books say to remove the column complete with cowl and switches, which would be right pain if all you wanted to do was adjust the pre-77 horn brush! In fact the book says to remove the column complete with the steering wheel as well as the cowls and switches, which is stupid if you subsequently need to remove the wheel.

Steering Lock: *December 2014*

See also Ignition Switch
When does your steering lock?
Replacement
What lies inside

Types used:

Dates	Chassis No.	Markets	Lock	Switch	Comments	Switch Style
May 62 - Aug 68	101-152454	Germany, Finland (Oct 67), Austria (Jan 68)	13H4180	27H6237	Use BMK2259	Spades on switch
Aug 68 - Dec 70	152455-231338	Above plus France (Sep 69)	13H4862	27H6237	Use BMK2259	Spades on switch
Dec 70 - Feb 72	230617-275645	Not North America or Sweden	BHA5709		Use BMK2259	Combined lock and switch
Feb 72 - Sep 74	275646-361000	As above	BHA5215	37H7708	Use BMK2259	Spades on switch
May 62 - Sep 74	101-361000	As above	BMK2259	37H5934		Spades on switch
Sep 74 - end	360301-on	As above	BHM7056	BHA5398	Note 1	Lock with switch, multi-plug
		V8	18G8905		Note 2	Lock with switch, bullets
May 62 - Aug 68	101-152454	Sweden	13H4180	27H6237	BMK2259	Spades on switch
Aug 68 - Dec 70	152455-231338	As above	13H4862	27H6237	BMK2259	Spades on switch
Nov 67 - Sep 69	138401-187840	North America	BHA4715	37H4114		Lock and switch NLA
Sep 69 - Aug 71	187211-258000	North America, Sweden (Dec 70)	BHA5050	BHA5056	Alternatives	Lock and switch NLA

Aug 71 - Aug 72	258001-296000	As above	18G8906			Combined lock and switch
Sep 69 - Aug 71	187211-258000	As above	18G8901	BHA5070		Lock and switch NLA
Aug 71 - Aug 72	258001-296000	As above	18G8905	BHA5070		Lock with switch, bullets
Aug 72 - Aug 73	294251-324942	As above	18G8984	BHA5128		Bullets on wires
Aug 73 - Aug 73	324943-325855	As above	18G9064	BHA5288		Lock and switch NLA
Aug 73 - Aug 73	325856-328800	As above	18G9118	BHA5288		Lock with switch, multi-plug
Aug 73 - Jun 76	328110-410000	As above	18G9119	BHA5292		Multi-plug
Jun 76 - end	410001-on	As above	18G9119	BHA5069		Multi-plug

Note 1a: Lock is now BHM7144 complete with switch. This is the North American lock and switch with extra grey and purple/pink wires, the original may have the grey but not the purple/pink. The remaining four wires should connect directly to the same colour wires in the main harness, but double-check before plugging in. The grey and purple/pink should not have corresponding wires in the other half of the UK multi-plug.
Note 1b: Switch no longer available, use BHA5292. Again this is the North American version as above.
Note 2: Prices for replacement lock with switch for the V8 varies from £31 to £120! If only the switch has failed it may be worth trying BHA5292 as they can be had for little more than a tenner, and if it fits it saves having to cut off the lock which cannot be done by drilling up from below like it can with the earlier side-entry locks. You would need to cut off the multi-plug, discard the grey and purple/pink wires, and solder bullets to the remaining brown, white/green, white and white/red wires.

When does your steering lock? *July 2022* In a discussion about unexpected loss of oil pressure (from something like cooler or cooler hose failure, or gauge hose failure) and low pressure warning lights on the MG Enthusiasts forum one chap from North America said the warning lights are unlikely to prevent damage to the engine based on the experience of his daughter in a 1977: "She told me she had caught a glimpse of the oil pressure gauge dropping, had put the transmission in neutral, and pulled over to the side of the road where she turned the engine off. (North American specification vehicle have an ignition lock that, when moved to the off position, lock up the steering wheel...)". The upshot was the engine suffered damage from running with no oil.

The situation with the lock amazed me, and I was also surprised the engine suffered damage if it was only idling briefly. On my 73 roadster after turning back from the ignition position to the accessories position, then turning to the off position from there, a convoluted push-twist-pull procedure is needed before the key can be withdrawn. I can hear the lock tongue is released in preparation for locking as I withdraw they key, but of course it only physically locks when the wheel is turned to a position where the tongue can engage with a slot in the column. It unlocks when the key is inserted and turned towards the accessories position. My 75 V8 is different in that turning back from the ignition position to the accessories position one cannot turn the key any further until a push-button on the lock is depressed. That allows the key to be turned further to switch the accessories off and allows the key to be withdrawn - but unfortunately I cannot tell when the lock actually engages as it has never locked in my ownership! Clausager says that V8s locks 'were similar' to those used in North America at the time and had a push-button which needed to be operated to turn the key back to the locking position (marked 'O') and withdrawn, and that system was used on non-North American 4-cylinder cars in 1974: "That persisted until October 1977 when the final type of steering lock without push-button was introduced, still with a slightly different lock for North American specification cars". Posing the question on the MGOC forum two people responded one with a 78 and another with a 1980 saying it only engages as the key is withdrawn, but not whether the accessories can be turned off before that. Less easy to check on RB 4-cylinder cars as nothing is wired to the accessories circuit from the factory, unlike 71 and on CB 4-cylinder cars and all V8s where the heater fan can be used to tell when the accessories circuit is powered and when it isn't. FWIW the Golf only turns off the radio etc. as the key is withdrawn, and it is only then that the column can lock. Inserting the key does nothing, turning it disengages the lock and goes straight to ignition.

Given the number of safety features America forced the MGB to adopt over the years I'm gobsmacked that they would require a system that locked the steering wheel as soon as the ignition was turned off and before the key was withdrawn, and felt sure the original poster must have made a mistake. An American pal has a 76 and that is the same as my V8. He asked a couple of pals of his and the upshot is that they are the same as the UK i.e. the lock can only engage when the key is withdrawn, and unlocks when the key is inserted and turned towards the accessories position,

which seems to be the same as the previous lock but without the push-button. Which does leave Clausager's comment that North American locks are 'slightly different' outstanding.

Incidentally while looking into this some people seem to have trouble disengaging the lock. If you have fully engaged the lock by manually turning the wheel at a standstill, then when you released the wheel it will have sprung back due to the friction of the tyres on the ground. With the lock now engaged there is considerable pressure on the side of the tongue in the slot, meaning it cannot be disengaged just by turning the key - without risk of breaking the key. You have to manually turn the wheel in the same direction as before to take the pressure off the lock before the key will turn to disengage it and turn the ignition on, but it seems not everyone understands that. (My Mercedes A-Class automatically wiggles the steering wheel when it unlocks the steering ... which is also done automatically at some point when getting in the car and starting the engine, I can't remember!

Lock replacement: Note this process is only suitable for chrome-bumper 4-cylinder cars as the thread end of the bolt can be accessed from below. On V8 and rubber bumper cars the lock covers this and the bolts have to be removed from the head end, which almost certainly needs the column to be dropped.

January 2021: But before jumping into lock replacement if the key won't come out, Crispin Allen who was faced with having to remove the column as his car is a late-model RB, tried removing the switch from the lock first ... and it was the switch that was causing the problem! Far easier to deal with, and stripping, cleaning and lubricating the switch mechanism with Vaseline was all that was needed. But if you have to proceed and are only replacing the lock, or the switch, and not both as a unit check right at the start that the new and old components do fit together and that the lock operates the switch correctly - before fitting and finding it doesn't!

When Bee came to me there was only one ignition key so I had a spare cut from that. It worked, but over the years as the lock has worn on the rare times I use it I have found that it is very difficult to turn the lock all the way back and remove the key as normal. This earlier 'front-entry' lock needs a twist-push-twist-pull to turn the accessories off and remove the key, but this key wouldn't do that, it would come out too soon. As well as leaving the ignition switch then capable of being operated with a screwdriver, I cannot get the 'good' key in, so have to persevere with the 'spare' key - which fortunately does go back in, wiggling and turning gently until finally the lock does fully return, the key comes out as it should, and the 'good' key then works again. OK, so don't use the spare key, and get another one cut and hope that would work. Well the 'good' key is itself a copy and not original to the car or even of the same type, so what with that and 40 years of use on the original lock I decided to replace the lock now rather than wait until it properly jams, which is almost bound to be at an inconvenient time. Vee has a side-entry lock with a push-button release.

The original lock is quoted as being BHA5215 (chrome bumper Feb 72 on), with BMK2259 being a universal replacement for that and others. Googling BHA5215 showed loads of suppliers, ranging in price from £59 to (gulp) £107. The good news was that I wanted to get mine from Motaclan/Leacy as part of a shopping list it was worth going to collect and they were the cheapest. The bad news was they were out of stock! As the Irish shopkeeper said, "Well when we don't have them in stock ours are cheap too". So I looked up BMK2259 at Motaclan/Leacy, the good news being they were in stock, the bad news being they were (even bigger gulp) £154! So I rang them, and apparently those part numbers include the ignition switch, and it was the switches that were unavailable for the BHA5215 version. They have the bare locks listed separately as BHA5215X, but only on their stock system, not on the website. So he looked up those, the good news was they had them in stock, and the even better news was that minus the switch they are only £43!

February 2021:

John Hall of Queensland Australia happened to post a picture of the switch terminals on his RHD 73 and I noticed the switch had 'ears' with two screws that looked like they were attaching it to the front of the lock body, instead of being a circular switch slotting into the lock and secured with a single grub-screw from the side as on Bee. Going back to the Parts Catalogue I can see that out of five drawings (have to take drawings with a pinch of salt though) of switches and locks one is shown with mounting ears and the rest are circular, and from there it gets rather complicated trying to work out which type was used when, but all that can only be of academic interest. Even when the Catalogue was published 50 years ago there was a single lock and switch used as a replacement for all CB types (lock BMK2259 with switch 37H5934), and what is on your car now may already be a replacement. Suppliers don't help as they are neither consistent in the part numbers they use between each other and in some cases not even on different pages from one supplier. The crucial thing is that if only intending to replace **either** lock **or** switch, you will need one that is compatible with what you have now, so Caveat Emptor. For RHD 4-cylinder RB cars it does seem that only one lock and switch was used throughout - BHM7056 and BHA5398 and this is the completely different side-entry lock in the cowl. All V8s use 37H8905 for both lock and switch, again side-entry.

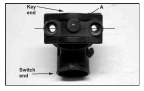
These locks have special shear-bolts clamping them to the column. They may still have the heads attached which will seem odd. Many years ago I queried the fact that on my Mum's new Mini they still had the heads, and shouldn't they have sheared off when being tightened? Apparently not, they are supposed to shear if anyone attempts to undo them. However the heads were missing from Bee's.

I was thinking that I would have to remove the steering column as I didn't want to use an angle-grinder in the cabin. But having a look I could see that the bolts are angled downwards and to the drivers side of the car, so conveniently placed for drilling along the length of the threaded part. Furthermore the shanks of the bolts stopped about 1/4" short of the hole they were in, which makes a useful drill guide, so drill in-situ it was. However! The first thing I had done was to test both keys operated the new lock and the bolt smoothly, don't want to wreck the old lock then find the new one doesn't work.

I needed to move the indicator stalk sub-harness out of the way, and unplugging it from the main harness seemed easier than removing the cowl and the switch from the column. However the black rubber moulded plugs and sockets stick together quite well and it was difficult to get a good grip on both halves. Then I had the idea of using external circlip pliers to lever the two halves apart, which took about one second!

With that out of the way I decided to remove the switch from the back of the old lock, so that vibration etc. from drilling didn't damage it. There is a small screw going downwards at an angle from the drivers side, through the body of the lock and into the switch. A little fiddly to get at, I used a hex drive screwdriver point in a very small ratchet. It's small, don't lose it. With that out I eased the rubber boot off the lock and the switch came away. I then offered up the switch to the new lock - there is a key and key-way that has to be aligned - and checked that with the battery cut-off switch back on the accessories, ignition and cranking all worked. Again you wouldn't want to complete the installation to find it didn't.

I decided to use a 4 or 5mm drill to start with, even though the threaded hole is about 6 or 7mm, as a smaller drill goes through easier, then its hole acts as a guide for the larger drill. Drilled first one screw then the other with the small then the large drills until going by the depth I reckoned I was just past the join of the two halves that were clamped around the column. By now the lock was moving back and fore slightly round the column, tried levering against the column tube with a pry-bar, but not too hard. Drilled some more until I was sure the large drill was fully past the join, levered again and it fell off. It really didn't take me much more than an hour. I had managed to drill right up the middle of one bolt, and only slightly off to one side of the other. Note that this can only be done with the earlier front-entry locks mounted lower down the column, not the later side entry accessed through the cowl as the bolts are in line with the lock instead of being at right-angles to it.

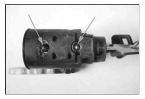


Nothing more to do except position the new lock - which is a Lowe and Fletcher just like the original - onto the column, and do up the bolts no more than finger-tight as again I didn't want to complete the installation i.e. fully tighten them until I was sure everything worked. The clamp part has an offset hole, which seems to go to one end of the lock.

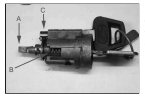
Fitted the switch into the back of the lock and inserted the screw ... and the switch came back out again. Had a couple of goes, but it still wouldn't go into the matching hole in the switch body, and I was beginning to think that the alignment was wrong. But with the screw going in partly from above with all the wiring there it wasn't that easy to hold the switch into the lock with one hand while positioning and turning the screw with the other. So I slackened the lock clamp bolts sufficiently for the lock to hang down which put the screw at a much more convenient horizontal angle, and it went straight in. Again tested the operation of the switch with both keys and all was well, so repositioned the lock and did the bolts up finger tight again. This time I turned the column, keys out, so that the bolt engaged and locked the steering, then waggling the wheel to take the load off the bolt check the keys retracted it, again all good. So final tightening of the bolts, and find the bolt heads are 13mm. They are also at an angle, so whilst one is easily accessible from below, the other is virtually on top of the column. Fortunately I have a set of swivel-head combination metric ratchet-ring spanners, and the 13mm one does the job. Not enough leverage to shear the top one, which I wouldn't attempt with the ratchet ring anyway, and although I could get a standard socket on the lower one I just do them up 'tight' but not too tight. I'll leave them like that for the time being to check all is well, with a view to increasing the tightness later on.

What lies inside: Someone on the MGOC forum mentioned recently that when their key barrel fell out of the lock they drove it for some time using a screwdriver to turn the innards. It struck me that with a steering lock that might have compromised the locking mechanism, and you wouldn't want it to engage when driving along! I'd (of course) still got the faulty lock I replaced as above, and as it wasn't going to be any use for anything else decided to investigate how it worked.

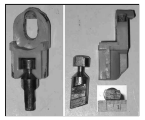
The bottom line is that the barrel assembly turns a plastic cam, which as well as turning the ignition switch proper also lifts the lock out of engagement. So even with no barrel the cam has disengaged the lock once the ignition is on, and although there is no longer a spring detent to prevent the switch coming back by itself, if it does so hopefully it will cut the ignition before the lock engages! Still not a good idea to drive without a barrel though, as it is part of the barrel that positively prevents the lock coming back into engagement until you have withdrawn they key, as described here.



Getting in is tricky. There seems to be a 'lid' over the innards, with a couple of dimples that looked like they might have been filled with something to hold it in place. The metal is very soft so easily drilled, and eventually the lid levered off, leaving a side piece inside the lock. It was only afterwards that I discovered a tiny-tapered pin in the side of the lock that was actually what was holding the lid in place. That needed to be drilled out as well, but as the pin is hard and the metal around it soft eventually I had drilled round it and could pull it out with pliers, and the remaining part of the lid came out.

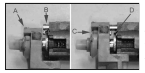


At that point the barrel assembly was moving slightly in the lock body, I couldn't see what was holding it in (the key was inserted), and eventually 'persuaded' it out by tapping with a cold chisel and hammer on a suitable projection. That came out, leaving two plastic components inside - a blue one carrying the metal locking peg that engages with a slot in the column shaft, and a white cam that operates the switch as well as lifting the blue part with the locking peg out of engagement with the steering column as the key is inserted and turned.



It looked like the blue part should just push out, but the edge of the peg that engages with the column shaft had peened over very slightly which made that part wider than the close-fitting slot, and needed a bit more persuasion. After that the white cam came out as well.

That allows one so see how it is the white cam that operates both the switch and initially disengages the lock, but there is another more important aspect to keeping the lock disengaged.



There is a sliding rod on the barrel assembly that is pushed into a recess in the blue part once the key has been inserted and turned and the lock is disengaged, and keeps it disengaged irrespective of what the white cam does after that. When switching off and removing the key it's only when one has gone through the turn-push-turn-pull process on this version of the lock and the key starts coming out of the barrel that this rod is withdrawn from the blue part, and the locking peg drops onto the column shaft or into its recess with a definite click. So the barrel assembly is fundamental to keeping the lock disengaged once the ignition key has been inserted and turned. The main function of the white cam as far as the lock is concerned is just the initial disengagement, the fact it can also keeps the lock disengaged once the switch has been turned if the barrel is removed is only secondary. In fact the sliding rod holds the blue part higher than some parts of the white cam, and whilst the cam will prevent the locking peg fully engaging with the column, without the barrel it does allow it to drop slightly. So depending on how much clearance there is the peg could catch slightly on the shaft slot as the steering is turned.

Indicator/turn Switch and Cowl Positioning *August 2015:*

If fitting or replacing a column on chrome bumper cars i.e. without the full energy-absorbing column (i.e. not V8s, and North America may have got them earlier than the UK) the column outer has to be positioned correctly for the indicator/turn switch and cowl. Note that the position of the inner and hence the steering wheel on all cars, and the cancelling striker on Mk1 cars, is determined by the rack being bolted to the front cross-member. The column outer and hence the switch and horn brush and cowl, can slide up and down over the inner, i.e. relative to the steering wheel, and is supported by two U-clamps in brackets, one under the edge of the dash and the other under the heater shelf. To adjust the position of the column outer slacken both these and slide the outer up and down to suit. Correct positioning depends on whether you have a Mk1 or a Mk2:

- On Mk1 models the cancelling striker position is fixed, but there is a small amount of variability in the position of the switch on the outer. Position that centrally within it's range of movement, then clamp the outer such that the switch fingers are correctly aligned with the cancelling striker.
- On Mk2 models the switch goes in a fixed position on the outer, set by a 'lump' on the switch body that sits in a cut-out in the tube, and there is a large range of adjustment in the position of the cancelling striker on the column inner. In this case the column outer position is determined by the relationship between the column cowl and the back of the wheel. The cowl has a flange that should fit neatly inside the back of the wheel, but not so far that the back of the wheel rubs on the base of the flange. With that set correctly, adjust the position of the cancelling striker to suit the position of the switch fingers.

At the base of the column outer there should be a concertina tube to seal the hole in the bulkhead, over a range of column outer positions.

Note that even slackening these clamps may well disturb the column and rack UJ alignment, which should be checked afterwards.

With the later full energy-absorbing column the relationship between inner and outer and hence the switches, striker, horn brush, cowl and steering wheel are all fixed within the column.

Repairs:

January 2025: Out of stock at Moss but shown as in stock at the other usual suspects.

November 2023:

> Brendan Hussey has written to me about the lower bush for the intermediate collapsible column MPB1002:
>
> "Apparently the lower bush MPB1002 is not only out of stock everywhere but according to Moss they will not be getting any more in as their supplier is out of business. Moss also had numerous complaints and I guess it was due to the poorly fitting part...
> "TBH I guess this is to be expected when one considers the ID/OD measurements and I suspect that the aforementioned part was not designed for this job - it was probably a part from some other application from another vehicle."
>
> Brendan also sent dimensional information of the shaft showing how difficult it is to get this bush fitted. He was contemplating breaking the shear pins so he could fit a new bush, then repairing the pins, but as the bushes are no longer available anywhere (it seems) there is no point. I think I would have tried cutting the bush length-wise with a very fine blade, or a hot wire (as Robin Goujah's was), in preference to that. As the OD seems to be bigger than the column outer ID as well, and is difficult to push in, maybe a saw cut would solve both problems and be a snug fit to both. But, as I say, no bushes available.

The original solid and early collapsible columns (CB cars except V8) have upper and lower bushes which wear and can be an MOT failure. The later full energy-absorbing columns (RB cars and all V8s) use a ball-bearing at the top and apparently at the bottom which don't seem to suffer from the same wear problems. As far as the UK goes columns prior to the 1972 model year use upper bush GSV1095. For the lower felt bush columns without steering lock use 17H6565, and those with the lock use 13H569. The intermediate collapsible column from 1972 until the end of chrome bumper production use upper bush MGP1050P and lower bush MPB1002 which is challenging to replace. This has been discussed several times on the MGOC forum and pictures and descriptions, and dealing with failed shear pins, have been pulled together here. Some European markets had column locks on Mk1 cars and so had different columns. North America had different columns - with locks - from the start of Mk2 production. Only from the start of rubber bumper production did all markets get the same energy-absorbing column (Clausager). The remainder of this section relates to this full energy-absorbing column.

Vee's steering wheel has always had a bit of rotational play in the column. At about 6-7mm it is a good bit less than the UK MOT limit of 13mm (and a whole lot less than the 30mm specified in my Toyota Celica manual!) but I still didn't like it, for one thing it rattles over some surfaces. As well as the rotational play the steering lock has never worked in my ownership, so I was wondering if I would be able to do anything about that. The car also had a fuel pump short before my time (as had Bee and two other cars I have worked on, all with fuses now!) so the brown and white were damaged. The white only very slightly there (much worse elsewhere) but the brown has had the bullet connector for the switch harness cut out altogether and the wires spliced together. It's had various electrical bits added before my time also connected to this splice, and when I added a horn relay I added one more to it (at least mine was brown). I'd also had an alarm installed, and the fitter soldered his wires to the 12v and indicator wires on the switch side of the multi-plugs (easier to get at) so with the repairs and additions it was all a bit of a mess round the column - another opportunity.

First job was to remove the upper UJ clamping bolt, so the column shaft can be pulled out leaving the UJ behind. It's worth mentioning here that although my roadster has just a notch on the column shaft, and a groove running all the way round the rack shaft meaning the two shafts can be reassembled in any orientation which seems to be the norm, both the V8 shafts only have notches, so the UJ can only be installed in one position on **both** shafts - strange, but true. Loosen the other bolt right off while there is still some support from the other shaft, but leave the bolt in position so the UJ stays on the rack shaft, and the nut on the bolt a few threads so the bolt doesn't fall out!

Steering wheel comes off with the usual method. This makes it much easier to get the two halves of the cowl off, especially as the additional screws at the bottom, handily (not!) covered by the dashboard, were removed and not refitted by a PO. This is why the book says to remove the column complete with cowl and switches, which would be right pain if all you wanted to do was adjust the horn brush! In fact the book says to remove the column complete with the steering wheel as well as the cowls and switches, which is stupid if you subsequently need to remove the wheel. Unscrewed the column switches and left them dangling. At that time I couldn't see how to remove the ignition switch from the steering lock so had to cut the splice in the brown, and the alarm wire. The other ignition switch wires are on bullets, rather than a multi-plug like the column switches.

When it came to undoing the three toe-board bolts they were only finger-tight, and when I got them all out (the top one is tricky, needing two 3/8" wobble extensions) the plate wasn't attached to the column anyway, not just loose but flopping all over the place and falling right off when I finally removed the column! The hole in the plate is quite a bit

bigger than the end of the outer tube it fits over, so there is no way it can align the bottom of the column to the UJ, which some say it does, but more of that later, the upshot is that simply slackening the three toe-board bolts should be all that is required to pull the column out, and leave the plate and rubber seal in-situ - much easier than completely removing all three bolts.

When I undid the upper bolts and started trying to pull the column out I could tell the lower half of the inner was staying where it was, even though I had removed the UJ bolt. I realised I would have to lever it out from inside the engine compartment so would need to support the wheel end of the column on some cord while I did so - of course no cord within reach! So I tried to put one of the upper bolts back in but even though the column bracket is slotted it was too far back to get any bolts in. Took quite a bit of pressure pushing the column down towards the toe-board against what seemed like spring pressure to get one in. When I finally got the column out of the car I found I could pull the bottom half completely out as the shear pins (actually injection moulded plastic) had done just that - hence the rotational play.

There is a spring at the bottom of the lower half, pressing back against the lower bush in the outer, and forwards against a circlip on the inner shaft, which is effectively trying to push the shaft out of the bottom of the outer all the time. Ordinarily the shear pins mean it is pulling on the upper half of the shaft, and the upper bearing on that is pulled down into the upper end of the column, as well as being retained by another circlip. That's why I had trouble temporarily getting an upper bolt back in - I was having to compress that spring by pushing the column towards the toe-board far enough to get an upper bolt in, and it's quite a hefty spring! As to when and how the pins had sheared, I don't know.

With the column finally out there is a plastic sleeve wrapped round the lower half of the column, covering the collapsible mesh section. Glued or heat-bonded with five blobs down the edge I cut through the bonds with a sharp knife, and can now see the shaft through the mesh. With the lower half of the shaft pulled out I can see the remains of the injection moulding process in two places on the upper/inner half of the shaft, and four 'nubs' of plastic sticking out of four holes (two each side) in the lower/outer part. I also find that with the lower half of the shaft out, the free end of the upper half is free to flap about inside, and in some positions the steering lock (key out) is catching, but when held centrally it is free. So I wonder if it has been attacked by thieves before my time (apparently if you don't turn the wheel to engage the lock when you have removed the key, they can wrench the wheel round and as the locking pin drops into the hole the momentum snaps it off). But later on when I have been working on the column I find the lock engaging with both parts fitted, and has to be released with the key, so maybe the locking pin is whole but just sticky. I do find the ignition switch slathered in oil, maybe squirted in to try and get the lock working. **Never** use oil or grease in a lock, only graphite powder.

With the column on the bench I espy a tiny grub-screw under the switch, which when unscrewed to flush with the lock housing allows the switch to be withdrawn. If you are going to be leave the switch out for any length of time screw this back in to prevent it falling out and getting lost. One oddity with the ignition switch is that with the various work that has been done on the wiring there is black insulation tape wrapped round it, which I have to remove to expose the alarm wire soldered to the brown, and I find a purple/pink wire. Now this is only used on North American spec cars, for the anti-runon valve. So whether the car has had an American column and/or switch at some time, or whether the manufacturers use a standard tail and just cut the unused wires off (there is no spare contact on the switch for this wire) I don't know. *Update: The purple/pink is standard on all switches for this type of column i.e. all RB cars but there is no corresponding wire in the harness-side of the UK multi-plug.*

I don't want to cut the lock assembly off the column (the shear bolts have sheared off), so wonder if I can remove the upper half of the shaft from the outer. This may allow me to see what is happening with the column lock, and possibly free it up if it isn't broken. I espy a circlip quite deep inside top of the outer, and manage to get that out of its slot. My angled internal circlip pliers won't go in that far, but by using one leg of a straight external set to lift up one end, I can then get one leg of my angled internal pair in that, and shift the other end of the circlip with one leg of my external pair. The shaft with it's bearing can then move up and down a couple of inches, but something is stopping it coming out altogether. There is an alloy casting at the top of the tube, held on with three large pop-rivets. I'm guessing I could have drilled those out, and the casting would have come out allowing the upper bush and shaft out, but don't have any replacements that size so stop short of drilling them out. Oh well, it's not had a steering lock for my 16 years, I doubt it matters now. *December 2014:* It was only after replacing the steering lock on Bee that I suddenly thought that it was probably the steering lock that was holding the shaft in the outer, if I had inserted and turned the key it might have come free. However when responding to a BBS request about stripping these columns I mentioned that, but he had the same problem and didn't even have his lock fitted. *end of update* Incidentally, the fact that the upper part of the shaft is retained in the outer this way, means that hammering on the end of the column to free the steering wheel, especially if your knees are braced behind the wheel, means that you are highly unlikely to break the shear pins, much less collapse the column. It's more likely to be a problem at the other end if you have to hammer or lever the UJ back on if the splines are stiff, but even then there is a strong spring pressing the lower shaft downwards, the same principle as bracing your knees behind the wheel.

December 2017: John Bilham had to go through a similar process when installing PAS but was more persistent than I was. He writes:

> Unfortunately the kit was supplied with an earlier modified steering column (presumably pre 410000, BHH1596, mine's an ex-US '77 Roadster, BHH1856). The only problem this presented me with was the difference in the aluminium bearing carrier at the steering wheel end - mine has a smaller diameter section where the switchgear sits. Rather than send the whole thing back for a replacement (I live in France) I decided, after a conversation with the vendor, to swap the bearing carriers.
>
> I decided to remove 'my' bearing carrier first, so drilled the heads off the three rivets hoping to just slide it off the column. That didn't work, but on closer inspection I noticed that in addition to the large inside circlip which retains the bearing (I wasn't going to remove the bearing itself), there was another small outside one sitting on the shaft in front of the inner ring of the bearing. When I removed this the carrier and bearing slid off. Looking at the exposed shaft, there is the slot for the circlip, then a rubber oil seal, similar to that on a valve stem, that the bearing sits on, and then what looks like another slot, although it's difficult to see.

When I drilled the heads off the rivets on the other, supplied, column, the carrier moved a few mm but wouldn't slide off. This column has the large inside bearing-retaining circlip but not the outside one on the shaft. I then realised the heads had come off but the rest of the rivets had remained in place and these were obviously catching on something hidden on the column. They couldn't have been very tight because they just rotated with the drill bit, and were still long enough to almost touch the shaft. Took enough off them to allow them to fall out and the bearing casing just slid off. This revealed an outside circlip similar to mine, but this was sitting behind the bearing (which was what the remains of the rivets were snagging on) but with a similar oil seal in front of it.

Mystery 1 is why one column had the outer/shaft circlip behind the bearing and the other in front. Mystery 2 is why there is not an outer/shaft circlip on **both** sides of the bearing. My upper shaft (when the inner was not fitted) would not move either up or down inside the column outer while the bearing was retained by the inner/housing circlip. Both of John's bearings and housings slid off his shafts, so were not a press-fit. Assuming mine (being the same as one of John's) was not a press-fit either, what stopped that moving downwards in the column outer unless it was a second outer/shaft circlip on the steering-wheel side of the bearing?

Further investigation by John (more than he needed to do for installing his PAS for which I'm grateful) dismantled the bearing housing into housing, bearing, shim and circlip and revealed all, click the thumbnail.

Subsequently John writes:

> I then discovered that the new steering column was also 10-15mm longer than mine, taking it beyond the range of adjustment provided by the brackets that it bolts to under the dash, and I am currently working on this. It also jeopardises the position of the column vis-�-vis the column down to the rack (they are too close). The end of the new steering column, where it passes through the firewall, is now supported by a swivelling bearing housing, seemingly to compensate for the absence of the third column support under the dash, to provide adjustment when aligning the column and the rack's column, at the u/j. The three holes in the housing, however, do not align with those in the firewall and the captive nuts beyond, and would need to be bigger anyway to provide some adjustment. So far I have drilled them out sufficiently to align with the holes in the firewall, and may well need to make them even bigger to provide adjustment when I come to fit the u/j.

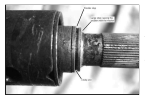
But back to the repair ...

... and to somehow join the two halves of the inner shaft back together. They are sort of rectangular section where they slot together (to guarantee still being able to steer even if the pins shear!), which has to have some clearance of course. There are holes in the outer, and a 'waisted' section under each hole in the inner. Plastic/nylon is injected through the hole on one side, filling the waisted sections and the gap between the two halves of the shaft, and exits from the hole on the other side. The broken ends of the shear pins came out of the lower half of the shaft easily enough, and the moulded inserts can be eased off the upper half. Whether the moulding around the waisted section always compresses over time to give some play, or whether mine only had the play because the pins had sheared I don't know. I decide to leave the remains of the injection moulding in place as removing them could introduce even more play, but need to pin the two halves of the shaft together. I can see where the pins have sheared off, so mark this position on the outer casing, then slide the lower half of the shaft over the upper until the holes in the outer line up with my marks, i.e. they are over the middle of the waisted sections. I use the holes in the outer as a guide and drill through the inner, so I can insert a pin all the way through.

I decide to slather some Araldite under and round the two halves of the nylon insert, and inside the holes in both upper and lower sections, so that when the lower half is pushed back over the upper that, and a pin through the hole, should

hold the two halves together and take out the rotation play between them. Some people have said they used a hot-glue gun to replace the nylon shear-pins, but as described above there is a strong spring trying to pull the lower half of the inner out of the bottom of the outer, but the upper half of the inner is retained by a bearing at the top of the outer, so the force of the spring is being exerted on the repair. I use a metal pin in each position, not being bothered about changing the collapsible characteristics after all these years, **you do this drilling and pinning at your own risk!** Note that the two halves of the shaft will fit together in two positions 180 degrees out. Oddly both my rack and column shafts have notches for the UJ bolts rather than one shaft having a notch and the other a groove all the way round, so my column and rack shafts will only connect in one position, which means if I reassemble the column shaft 180 degrees out the indicator cancelling cam will end up in the wrong position (as it would if you had a shaft with a groove, match-marked it, and reassembled to that). No big deal as it is only a friction fit on the shaft and can be slid round, but nicer to get things correct in the first place.

Leave that to set a bit and start tidying up the wiring, which basically consists of putting bullets back on the ends of the original brown wires in the harness and ignition switch tail. However as I have no less than four additional circuits that need to connect back to this brown, rather than have a veritable daisy-chain of bullet connectors I splice three of them together with one bullet (two have in-line fuses close by and the third connects to a relay with a spade also close by, so easy enough to isolate each of them for diagnostics) and use the fourth hole for the alarm wire as that goes across the car to the alarm unit in a mini-harness. Turn the power back on and check everything electrical still works, even though the switches are still dangling, and the horn button is removed with the wheel. It's while doing this I discover a thick washer on the carpet, same size as the three that are still on the upper bolts - wonder where that came from...



I then start thinking about the pesky bottom spring and circlip. As I said it is pretty hefty, and just with hand pressure I can't get it compressed far enough to get the circlip on - nowhere near. I'm thinking I'm going to have to lever it down with something, but it will have to be pretty thin as there is going to be very little room to fit the circlip in its slot. I find some flanged plates about 8" by 2" from my BT days some 30 years ago (!) which may be strong enough. I cut a hole in this plate, which just fits over the end of the part of the shaft the circlip fits into, which is narrower than the part that the spring and a washer fits over. As I've only got two hands I stand the steering wheel end of the column on a suitable block of wood, put one end of my plate under the edge of my bench, and press down on the other end of the plate with a hand. It's compressing OK, but the problem is the washer is catching on the shoulder of the shaft, and as I'm levering rather than a straight press it is proving impossible to keep this washer aligned with the larger diameter it is supposed to go over while I'm levering. Go and gaze at my various bits again, and see an old box plug spanner which looks interesting. I'm amazed to discover this just fits over the narrower part of the shaft, and also just fits inside the washer and spring, so perfect for aligning the washer with the thicker part of the shaft! So now I put the box plug spanner through my plate, put the washer and spring on the end of the box plug spanner, and slide that lot over the end of the shaft. Now levering on the plate pushes everything over the larger diameter, and I remove the box plug spanner to reveal the circlip slot - so far so good. However it's still a bit of a fiddle picking up and manoeuvring the circlip one-handed while pressing down on my lever with the other, so I devise a system of string and a tommy bar (from the same plug spanner!) to pull the plate back and compress the spring while the column is clamped in the vice, and I have two hands to fit the circlip. Easy-peasy? - er no. Of course I have forgotten that the circlip is now trapping the plate! But filing the hole in the plate out to a 'keyhole' shape slightly larger than the circlip, but still smaller most of the way round than the washer, I can now fit the circlip into its slot, and lift the plate off over it. Feel thoroughly pleased with my ingenuity, and life-long policy of never throwing anything away - "If you haven't found a use for something yet, you haven't kept it long enough". In fact I have had a major clear out of the garage recently as we are planning to move house this year, but obviously kept enough of the right bits! Finally reattach the plastic cover over the mesh section of the outer, taping it up with masking tape while the adhesive dries.

And now for the refitting and alignment! There is a small ring welded to the outer tube, which the loose plate butts up against, so I wondered if it should be attached to that, although there was no sign it had been. However that puts the plate about 1/2" away from the toe-board which obviously isn't right. And with this column unlike earlier types the inner is fixed in the outer and cannot move up and down, only rotate, so the whole column has to be able to move up and down to get the right distance from the rack shaft so the UJ bolts will fit through the cut-outs in the shafts. Although some have said this bottom plate is part of the alignment, pushing the bottom of the column into the correct position, I've come to the conclusion it is nothing more than a body seal against water, noise and fumes. Two people have confirmed that theirs is also loose and detachable (making it odd that Moss Europe at least show it as part of the column), and another has said the same and that he has a rubber bush, that slides onto the lower part of the column outer, and makes a snug fit to the hole in the plate.

August 2016: That makes more sense, and Moss Europe have a closeup of this plate and the rubber seal, where part of the seal pushes through the hole in the plate. However they show the seal having been slid onto the column first, then the plate. As there are bolts that go through the plate, seal and toe-board one would expect the seal to be sandwiched between the plate and the toe-board, i.e. the plate pushed on first, and the seal after it. When the column and rack-shaft have been correctly aligned over-size holes

in the plate and/or toe-board should allow bolts to be pushed through and tightened to provide clamping, but not alignment. In practical terms it was easier to loosely bolt the plate and seal to the toe-board first, then push the end of the column through the hole, rather than slide the plate and seal onto the column, put it in position with at least one upper bolt, then try and get the plate bolts in - the top one in particular is a real fiddle but all are more difficult that way. Now the seal and plate are positioned laterally and vertically **by the column**, and when the plate bolts are tightened it compresses the rubber such that it expands sideways and seals to the column shaft, as well as being bolted down to the toe-board, to prevent the ingress of water.

Another thing concerns the alignment gauges. The book says to remove the **rack**, even when it is the column that is being refitted. You **do** have to remove the rack later on, but there is no point doing it now only to have to refit it, then remove and refit it a second time later on. If using the Moss gauges these have two tapped holes depending on which rack and column they are used for. Compare the gauge to the UJ, position the tip in line with the centre of the UJ, and see which hole in the gauge lines up with the clamp bolt hole in the UJ, and put the clamp screws in those holes. Note that each part of the Moss gauge seems to be a couple of milli-metres shorter than the rubber bumper UJ (not so the chrome bumper), so bear this in mind when doing the alignment i.e. leave a couple of mil between the points or you may not be able to get both UJ clamp bolts in right at the end (alternatively, fit the UJ first, nip up the column bolts to get the correct in and out adjustment, then pull the rack forwards to replace the UJ with the gauges and note the gap between the tips, if any. When you have corrected the column and rack shimming for horizontal and vertical alignment make sure you end up with that same in and out gap). Apart from that when refitting a column it's easier to fit the alignment gauges first, minus the screw in the column piece. Then fit the column loosely, the alignment gauge easily goes through the toe-board plate and seal, and then fit the screw to the column half of the gauge. This is a bit fiddly being recessed into the toe-board 'cup' as it is but can be done. It would be easier with a knurled bolt, or even a hex bolt, or if the screw could be pushed in to the hole a little way before the threads started. Note that the screws must screw into the bottom of the cut-out in the shafts, not onto the splined portion. My Haynes is completely wrong here, by saying the rack and column should be fitted **before** installing the alignment gauges. This simply cannot be done, the two have to be moved apart a couple of inches to get the gauges onto the shaft, and off again to refit the UJ. With the gauges on adjust the column position and the shims as above to get the correct alignment. However my Leyland Workshop Manual also has a major error, in that it tells you "Slacken the screw on the column point gauge and slide the gauge down until the points of both gauges are on the same plane but not overlapping". The whole point of the gauge screws with this column is that they **must** screw into the cut-outs in the shafts, and the whole column must be slid up and down to get the correct in and out position. Unless you do this it is highly likely that you will **not** be able to get the second UJ clamping bolt inserted, the cut-out in the shaft not lining up with the hole in the UJ. This isn't the case with earlier columns, where the whole inner shaft is free to slide up and down inside the outer, with those the shaft will automatically take up the correct position. I repeat, with this later energy-absorbing column you can only adjust the in and out position of the inner, and hence get the cut-out in the correct place for the UJ, by moving the whole column on its upper bolts (which is also why the toe-plate must be able to slide up and down on the column outer).

Additionally at the end of the process i.e. with the gauges replaced by the UJ, it tells you tighten the two upper bolts, then measure the gap at the third bolt, and fit shims accordingly. This makes no sense to me, as the gauge of the correct size would have to be gripped by almost the same tension as the final shims which is 12-17 ft lb as you were sliding it in and out. Better to align, fitting shims as required to the third bolt and tightening all three to get the correct alignment while the gauges are still on the shafts. More long-winded certainly, but it seems more accurate to me. The two upper column bolts do not allow the column to 'rock' on them when tightened, so unless the shimming required on the third bolt is negligible to nothing then there must be some sideways pressure on the UJ and hence the rack pinion bearing. If you shim the column to that final position, then the two shafts will **not** be accurately aligned. When the column and rack shafts are correctly aligned with the gauges, only then pull the rack forwards to remove the gauges, fit the UJ, and refit the rack. Unlike the column, the rack (with any shims) should **always** go back in the same position. Whereas if you are only fitting shims to the third column bolt and fully tightening that after the UJ is installed, you could be affecting the vertical alignment, and indeed would have to lever the bottom of the column downwards in order to get the shims inserted. This is why it makes more sense to fit the gauges before installing the column, leaving the rack where it is until the very end of the process, only then pulling the rack forwards to remove the gauges and refit the UJ. Note that if you raise the front wheels off the ground you only have to remove the four rack bolts, leaving the track-rod ends attached to the steering arms. As you pull the rack forwards a few inches to allow you to remove the gauges and fit the UJ, the wheels will simply go 'pigeon-toed' i.e. turn in towards each other.

Refit rack bolts, tighten UJ clamp bolts, refit switches. Check all the electrics again, which involves putting the key in the ignition, and immediately sense that it is now closer to the bottom of the dashboard than it was before. I now realise what that odd thick washer was - it must have been between the column and body brackets on the right-hand bolt which would space that side down a bit - buggah! To fit it now would involve realigning the column. Consult the workshop manual to find something I missed before, that there should be such a spacer on **all three** upper column bolts! Indeed six shown in the Leyland Parts Catalogue, but only three in online parts lists. However the manual talks in terms of "if the packing washers are mislaid" so it is probably no big deal, and I can live with it until I next have to remove rack or column. Refit the column cowls **before** the steering wheel as it is easier, and if the lower cowl screws (covered by the

edge of the dashboard) were fitted before don't bother refitting them, they just aren't needed. If you haven't upset the positioning of the indicator cancelling cam, and it was correct to begin with (cam pointing at the switch when straight-ahead), then loosely refit the steering wheel to turn the shaft to the straight-ahead position, then refit the wheel fully. Otherwise fit it with the nut not fully tightened, take it to a quiet straight road close by (not 10 miles away!), and adjust as required. Take your socket etc. with you so as to fully tighten it before driving back, so you can take the scenic route and enjoy getting your car back on the road again. The rattle-free steering really is an improvement.

Steering Column Universal Joint

CB UJs are longer than RB - about 3.5" from clamp-bolt to clamp bolt whereas RB are about 2.5", RB are also recessed further into the bulkhead than CB, possibly because of a repositioning of the rack on the crossmember and the shaft passing through the chassis bracket for the engine mount. The CB V8 has the same crossmember as all RB cars but a unique rack and steering column with the CB UJ, with the same rack and steering wheel positions for CB and RB I don't know why it didn't have the same column, rack and UJ right through. Again I don't know if it applies to all rubber bumper cars, or just to V8s, but there is an oddity in the splined shafts that go in the UJ. On the CB roadster the column shaft has a notch for the clamp bolt meaning it can only go in the UJ in one rotational position, whereas the rack shaft has a groove all the way round meaning it can go in the UJ in any rotational position. This means the two shafts can be assembled in as many different relative positions as there are splines on the shafts. But on the V8 both column and rack shafts have the notch which means the two shafts can only ever be assembled in one relative orientation.

As far as I was aware CB cars (including V8) always used UJs that could be dismantled and just the spider, cups and needle bearings replaced with a kit originally 17H3873 now GUJ200. But most suppliers currently show a one-piece assembly with non-replaceable bearings - AHH6000. That was always the part number for the complete assembly in the Leyland Parts Catalogue, so I tend to think suppliers have adopted that number for a one-piece alternative. However Moss for example quotes AHH6000 as 'OE' and AHH6000Z as 'after-market', showing the one-piece in both cases with the OE as 'NCA', but unless the factory did start using a one-piece in the final few months of CB production that's probably a stock photo. RB cars (including V8) always had a one-piece originally 575732 now listed as GLR3084 or NRC7704.

Both my UJs, and images of others for sale look the same, have the same distance from the centre of the spider to each clamp-bolt, which means the UJ can be fitted either way round. But this picture dating to 2017 which seems to be of a 65 MGB in Poland, so probably LHD, has the centre of the spider offset towards one clamp bolt by a significant difference. So much so that it looks like either it has been assembled from one CB yoke and one RB, or is for a completely different vehicle altogether. There is no indication in the Parts Catalogue that an LHD UJ differed from an RHD. The centre-line of the two shafts crosses at a certain point in space, and that is where the centre of the UJ must be for correct alignment. Not only is this UJ going to position the column in a different place to how it would otherwise be with a symmetrical UJ, but the centre of the spider will be in a significantly different point in space depending on which way round it is fitted to the shafts. The former situation is possible on the early and mid era columns as the outer tube can slide in the mounting brackets, and the position of the outer in those brackets positions the cowl to the steering wheel.

Lubrication:

Bee's didn't originally, and probably the first one or two replacements, but since then and currently they have a grease nipple (not that annual greasing has prevented wear!). One piece UJs are sealed for life. The supplied nipple is an angled one, and is in two parts i.e. a straight nipple screwing into an angled base. With the steering turned to the appropriate position the nipple is pointing straight up, so easy to get a 6mm socket on to unscrew it from its base, which I had previously screwed in to the tapered threads so as to position the nipple between the two yokes. I have the idea of making an adapter by finding a bolt that screws into the nipple base, drilling a hole through that, cutting the head off, then drilling and tapping a for straight standard nipple to screw in to the bolt. The first brass bolt I find in my box of bits screws into the nipple base. It's a bit loose as the threads aren't the same but should be OK as I only intend to use it for greasing, replacing it with the under-sized nipple between services. The bolt has a 3BA thread, so I drill and tap the standard-sized nipple right the way through (it doesn't need a ball and spring to keep dirt out as it isn't staying on the car) making it easier to clear out swarf afterwards, and I pump a little grease through the assembled nipple and adapter stud just to make sure they are clean. Unscrew the under-sized nipple, screw in my adapter, pump grease gently until some issues from the cups, and none comes from where the adapter screws into the nipple base, which I reckon is a pretty good result! Finally unscrew the adapter and refit the under-sized nipple (which still has its ball and spring to keep dirt out of course). All I have to do now it put the adapter in a small poly bag and keep it somewhere I can find it at the next service ...

Replacement:

UJ change for both CB and RB types is a fairly straightforward operation - jack the wheels off the ground, remove the four rack bolts, pull it forwards about an inch or so (the wheels will toe in) and with the CB column shaft pulled back (early collapsible column inners move in and out a couple of inches) there should be enough room to get either UJ assembly off the shafts.

RB is just a straight swap from here, for CB removing the circlips and tapping the yokes knocked the cups out, but the new ones need the big vice to press them in, so no problems of them being loose next year! I then go to grease it using the supplied nipple and find it is smaller than standard, so my grease gun doesn't fit. The tapping in the UJ body is also smaller than normal so a standard nipple won't fit that either. Eventually I sort out a solution but in the meantime get on with checking the alignment of the column and rack shafts. When refitting the rack the rear bolts with spring-washers screw down into welded nuts in the brackets but the front ones go up through the cross-member brackets with spring-washers and nuts on top of the rack as there is a section of weld inside the bracket to hold the heads still with a finger-tip while tightening the nut.

December 2024: Because of the repeated issues with play developing in the spider with the original assembly I replaced the whole thing with the one-piece. I asked the MGOC if I could have an allowance against the original purchase price of the spider kit and they wrote back saying they would give me a full refund on return so I removed the spider from the yokes ... and what a pain that was! Not only did I have to use double sockets to press the first cup in each yoke out enough to grip with a vice and wrench it with both hands until the cup came free, but then I had to press the second cup back far enough to get the spider out. I tried double sockets again but this time without the cup to align it the 'cupless' spider kept tilting to one side. Eventually I had to drift the spider down with a small socket on the 'cupless' end to push the second cup into a larger socket - try holding all that lot in place with one hand while hitting it with a hammer - far enough to get the spider out. Then grasp that yoke and twist the second cup out. Managed that with one yoke but the other just would not twist, I had to put a 3/8" socket extension bar inside the cup, again a large socket underneath, and hammer it out into that. So much for tapping the edge of the yoke with a hammer while holding it in your other hand as depicted in the manual! These days close tolerance parts like this (I've heard the same with front wheel bearings) don't seem to be made to the correct tolerances any more - this was super tight but a previous kit just one year old failed the MOT because the cups were sloppy in the yokes. Took that back to John Hill's and he said it must be the yokes worn. But I keep old parts and had taken him the previous kit (failed with slop in the spider bearings), he test fitted a cup and then had to go to the workshop to get it out again! Gave me 50% off a replacement. At least I shouldn't have to go through that palaver again - replacing the one-piece is a doddle by comparison, I just hope the one I have bought for Bee is as good as the one that came to me on Vee.

August 2024: At the MOT I again get an advisory for worn inner rack joints, and there is again slop in the column UJ after barely 1000 miles. This time I opt for the one-piece replacement (similar to the RB UJ) instead of the spider kit, but replacement with that is by no means straight-forward as it is not a direct replacement!

November 2023: As part of a long saga involving steering racks I changed the column UJ yet again - for the fifth time each time with them showing play - not that it had any effect on the steering column problem, that seems to have been down to pinion shimming!

This time was more of a struggle than I remember on the previous occasions. It needed the cups pressed through with double sockets (small one on the back of one cup, large one round the other one being pressed out) in a large vice as far as they would go i.e. until the spider is pressed up against the inside face of the spider, then the few mm of the cup that protruded gripped tightly in the vice while I twisted the yoke back and fore lifting all the time - not easy. Then the spider and the other cup has to be pressed the other way through the yoke, again with double sockets, the small one this time pressing on the end of the spider, again to expose a few mm of cup, remove the spider, grip the cup in a vice and twist out as before.

Reassembly also needs a large vice - if there is a grease nipple fit this first. Get the first cup started in one side of the yoke - no sockets needed but make sure it is 'square' to the hole before applying loads of force. Then once part-way in feed one end of the spider into the 'empty' side of the yoke and swivel the other end of the spider over the partially fitted cup and insert it being careful not to dislodge any needles, but they should be held in position with pre-applied grease. Then fit the other cup, again no sockets and being careful it is 'square', and especially careful that both ends of the spider are fitted into the cup without dislodging any needles. Once the spider is in both cups clamp up to put both cup bases flush with the yoke. Then another small socket on the back of each cup in turn to press it in just enough to fit the circlips.

Circlips were another issue - the existing ones seemed too big for the hole, circlip pliers wouldn't lift them straight out so I had to use a combination of pliers and a very small screwdriver to lift one end free of the hole then pull on that to get the rest out. By contrast if anything the new circlips are a bit smaller than I would like, floating in the groove much more, with only a small overlap when pushed to each extremity. Next time will be a one-piece!

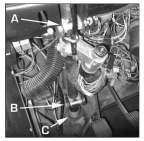
October 2018: Returning from The Beacons Run in Bee 'at speed' I'm aware of a slight vibration from the steering wheel - but nowhere near as bad as when the V8 wheels were unbalanced - and investigating shows there is slop in the UJ - again, after six years and just 10k, and despite this one having a grease-nipple I've lubricated each year, so yet another replacement needed. By contrast the different design on Vee - despite 100k with me quite a few of which with significant wheel imbalance and wobble - is the one that came with the car. Replacements can be very variable in price - anything from £8 to £16 from the usual suspects plus eBay. Delivery can be anything from £0 to £11 with some sources having a low item price but high delivery cost, so you need to look at the total price when making a decision. Before replacing that (the fourth replacement!) I got the front wheel balance checked.

August 2012: Bee had advisories on both track-rod ends this year. Having a quick look the boots had split on both, and the pin on one was loose in the body so I'm surprised it wasn't a fail. But while checking those I became aware of slop in the column UJ (again!) and that is usually a fail. This will be the third replacement, the first (July 1997) failing at the next MOT as the cups were loose in the yokes, but I got a 50% refund on that one against a replacement. The second replacement (July 1998) lasted about eight years and 20k, this one (bought June 2006) six years and 12k. Thinking it could be column and rack alignment, my previous attempts being done with wire pointers as above, and having recently found Moss UK have the alignment gauges, I get the UJ, track-rod ends and gauges from Moss.

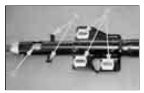
Alignment: *July 2008*

It is vital to get this correct or you will get rapid wear of the UJ and rack pinion bearing and possible breakage of the pinion shaft. Play in either is a UK MOT failure, but note that a certain amount of rotational play in the collapsible steering columns themselves is acceptable (my Toyota Celica manual quotes 1/4" at the rim, for example, which is about what my V8 has, but I have had to replace the UJ on the roadster a couple of times even though it only had barely detectable play).

The objective is to get the centre-line of the rack shaft crossing the centre-line of the column shaft at the exact centre of the UJ. It is achieved by shims between the four rack to cross-member mounting points, together with positioning of the steering column within the movement of its mounting bolts. It is necessary because the rack and column shafts sit at different angles in both the vertical and horizontal planes, as well as manufacturing tolerances in the bodyshell and crossmember. The factory used this tool (click thumbnail), note that the different bores were probably because it was a standard tool across a range of BL vehicles, although there are different lengths of column and rack shafts of which more later. Highly unlikely to be available now (until replicas available from Moss), so how do we replicate it? Personally I wrapped some stiff wire around the end of each shaft, with the tip of each wire at a point in space equal to where the centre of the UJ would be when fitted to that shaft. You can get the tip exactly on the centre line by rotating each shaft in turn, if you get any wobble of the tip it isn't aligned, so tweak it until it is stable. Then it is a matter of fitting shims and adjusting the column as required to get the two tips just touching, which could be quite a long process of trial and error. Others have said they used blobs of Blu-Tak or similar. The problem with both of these is that it is very easy to knock the tip of the wire or Blu-Tak off-centre as well as length. Some have said they loosely fit the rack, connect up the UJ, then measure the gaps between the rack casing and the crossmember and fit shims accordingly. Personally I don't think that is good enough on its own as the weight of the rack will be hanging on the UJ to some extent, although it is probably good enough to get a starting point for shims, and trial and error with pointers after that for fine adjustment. *Update January 2010:* Even worse is a method I've seen where someone turns the steering wheel back and fore while someone else tightens up each rack bolt bit by bit, till the steering wheel binds, then that bolt is slackened a bit, a section snipped out of a washer so it can be slid on the bolt, and that bolt tightened. That is so crude, the UJ will surely start binding way before you can feel any resistance at the steering wheel, hence still be binding when it is backed off a bit and the washer tightened. Besides which the washers that were shown were way thicker than any shim I have seen. Definitely from the "If it isn't bodged it won't work" school of engineering.



The early and intermediate columns (all Mk1 cars, and non-North American chrome bumper cars except V8s) had a different mounting arrangement to the final full energy-absorbing column. The early and intermediate columns have two sets of brackets under the dash, the one at the steering wheel end offers up and down movement whilst the one at the toe-board end offers up and down movement between column and bracket and side to side movement between bracket and heater shelf.



The later energy absorbing column has one bracket under the dash with three bolts, and the bottom of the outer tube has a loose plate with three bolts screwing it into the firewall. It's been said that this bottom plate and its bolts are to align the column but that is **not** the case, they simply clamp the loose plate and a gasket to the toe-board and are solely to seal the body aperture against water, noise and fumes ingress. The three upper bolts go into caged nuts so offer some side to side adjustment, and spacers between one or more of the column and body brackets offer up and down adjustment of the UJ end by tilting the column. With those three bolts tightened the column is held rigidly so there is no scope for adjustment at the toe-board plate, those three bolts are only tightened when UJ alignment has been achieved. The slots in the column brackets only take account of

dimensional differences between rack and body column brackets from car to car, the fore and aft position of the column is determined by the rack position and the UJ.

With the early and mid-era columns if you remove the column or slacken its clamp bolts even if you haven't altered the rack you will need to recheck the alignment before tightening the column clamp bolts. For these columns the inner shafts are free to slide up and down and will automatically take up the correct position when the UJ is fitted. This is not the case for the later energy-absorbing column where the inner is fixed in relation to the outer. As long as you note where any spacers were fitted to the column mounting point and replace them as found to set the vertical positioning you can remove and replace the column and the UJ will position it correctly both fore and aft and horizontally, and you will have to insert both UJ clamp bolts and tighten the rack bolts before tightening the column bolts. That does leave some scope for side to side misalignment because of the caged nuts in the body bracket so it is preferable to pull the rack forward to remove the gauges and fit the UJ.

As far as using gauges goes my Haynes says that the rack and column should be fitted before installing the alignment gauges. That can be done with the early and mid-era columns (my CB roadster) as the column inner can be slid up the outer to get enough space to fit and remove the (Moss at least) gauges. With the early column the inner can be slid back far enough to enable the UJ to be fitted and removed as well, but with the mid-era column with steering lock the inner does not slide back far enough for the UJ, only the gauges. With the later full energy-absorbing column (my V8) you can't fit or remove either gauges or UJ without moving either the column back or the rack forwards as the inner cannot be moved relative to the outer.

The rack gauge must be positioned correctly on the shaft by use of its clamping screw in the notch or groove. The Moss gauges have two holes for the screw - the one nearest the open end is correct for the UJ with the replaceable spider (early and mid column), the one nearest the tip for the later one-piece UJ (later column). For early and mid-era columns the column gauge need not be clamped onto the shaft as it only has to meet the tip of the rack gauge and the inners slide freely for the fine positioning needed to get the column clamp bolt inserted. Adjust the column position and the rack shims as above to get the correct alignment. With the later column the inner column cannot slide in the outer and so that gauge must have its screw tightened into the notch as well, and the column must be loose on it's three mounting bolts to get the correct fore and aft and lateral position, adding and removing spacers and shims to both column bolts and rack bolts to get the correct vertical alignment.

Once correctly aligned, with the early column you can pull the inner back far enough to refit the UJ. With the mid-era column the gauges can be removed but the inner will not push back far enough for the UJ. **Do not** slacken the column clamps at this point or you will lose the vertical alignment. You will have to remove the rack bolts (carefully noting the position of any shims) to pull the rack forwards. With the later column you can safely remove the column screws - carefully noting the position of any spacers - as the UJ will position the column horizontally and in and out, the same spacers in the same position ensuring the same vertical alignment is achieved. however you may lose side to side adjustment at that end so it's safer to remove the rack bolts for this column as well.

For the later energy-absorbing column my Leyland Workshop Manual says to fit the rack after the column, and after the gauges have been fitted. But because the rack shaft passes through a hole in the right-hand engine mount the gauge cannot be fitted onto the rack shaft until it has been passed through the engine mount. If you have had the column off then it **is** easier to fit that gauge before the column is reinstalled because the gauge is in a recess in the bulkhead and more difficult to get at than with the earlier columns. That way is also easier than fitting the column, then pulling the rack forwards to fit both gauges. Additionally towards the end of the process it tells you to replace the gauges with the UJ, then fully tighten the two upper bolts, then measure the gap at the third bolt, and fit shims accordingly. This makes no sense to me. Better to align, fitting shims as required to the third bolt and fully tightening all three to get the correct alignment while the gauges are still on the shafts.

For removing the gauges and fitting the UJ either the column could be pulled back or the rack pulled forwards but as above that will lose the side-to side alignment to some extent. Also the column bolts will have to be completely removed to get it pulled back far enough to get the UJ on, and you will be working deep inside the recess on the bulkhead to get the splines engaged. And because of only having a notch in the column shaft the two only go back in one relative position that will allow that clamp bolt to be inserted, with someone else in the cabin supporting and manoeuvring the column from verbal instructions! Despite the positions of the four rack bolts it's easier to remove those and support the UJ with the left hand while manoeuvring the rack shaft into position with the right-hand reaching down into the engine compartment, and especially if it's the rack that has been removed in the first place. And with my V8 rack at least that will also only go back in the UJ in one rotational position to allow the clamp bolt to be inserted.

Note that even with the front wheels on the ground with the four rack bolts removed, leaving the track-rod ends attached to the steering arms, as you pull the rack forwards to allow you to remove the gauges and fit the UJ the wheels will simply toe-in towards each other and gives enough of a gap to fit the UJ.

Some time later I came across a web page by Simon Jansen in New Zealand who had fabricated his own alignment tool and gave the dimensions he used, see here and scroll down to January 2006. This topic comes up on mail lists and BBs

from time to time and I had posted links to Simon's site. Recently someone came back querying the 29mm dimension from the centre of the notch in the shafts and the tip of the tool, saying his was more like 33mm. I passed this on to Simon, and he said it was possible as his car was a mish-mash of components as it was a conversion from rubber bumper to chrome **and** from LHD to RHD. I measured a new RB V8 UJ as carefully as I could and also came up with 33mm, with 45mm for my chrome bumper roadster (measured on car) and posted this as a warning with the link I already had on this site to Simon's page.

Some time after that Kelvin Dodd of Moss US posted this link to a replica tool available from Moss. It's curious that it seems to come with two sets of screws, as it would need two sets of **holes** to be suitable for both chrome and rubber bumper cars, which would need only one set of screws. I asked Kelvin if could confirm whether there were one or two sets of holes, and what the distances to the tips were. He came back with the information expressed slightly differently as being an overall length of 2.11", one hole 0.336" from the **open** end, and another hole 0.936" from the open end. The bore is 0.744+-0.005/0.002" or 18.9mm (slightly smaller than Simon's 19.3mm), and the hole depth is 1.70". Converting this to distance from the tip and millimetres I get 1.174" or 29.82mm for one hole and 1.764" or 44.8mm for the other, and this is where it gets curious. The Moss 29.82mm is pretty close to Simon's 29mm, and the Moss 44.8mm is very close to the 45mm I measured on my CB roadster. However my RB V8 UJ measures 33mm, which is the same measurement that the person who queried Simon's dimension in the first place, and looking in the Parts Catalogue there are only two part numbers for UJs for all models, years and markets i.e. one for CB and one for RB.

So I've re-measured my new RB V8 UJ more carefully, and still get around 1.2415" which equates to 31.5mm, so the Moss 1.174" or 29.82mm remains a mystery (Simon's original 29mm less so as his car is much modified). If making a tool for yourself you will need to check your UJ dimensions very carefully.

Update March 2010: Just been made aware of the identical alignment tool at Moss Europe. The good news is that it is only £7.65 (£16.50 in Sep 2017) as opposed to $24.95 when the exchange rate is 1.5 i.e. $12 or £16! The bad news is that they insist on you ordering at least £10 of parts, before they tell you the shipping costs (subsequently that restriction was removed).

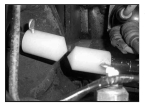
Update August 2010: I get the Moss gauges with a replacement UJ and track-rod ends, so measure them myself, at 44.58 for the CB and 30mm for the RB and all V8s. The latter UJ is 31.5mm, and as that column has a fixed shaft this means that a small gap has to be left between the tips otherwise you cannot get both clamp bolts through the UJ. Doesn't matter for the earlier columns as the inner slides in and out to suit. As I've got to change the steering column UJ, and the rack has to be pulled forward for that, it's a good opportunity to check the alignment at the same time (which is why I bought the gauges with the UJ ...).

The gauges are a nice snug fit on the shafts which is good, and one thumbscrew in each gauge going into the shaft groove holds them firm. The tips are about 1/8" out, part horizontal and part vertical, which could have contributed to UJ wear, but there is some up and down and side to side play in each shaft so the end result would have been not much by way of sideways forces on the UJ. I'll need to adjust the sideways misalignment at the column mountings, so I opt for seeing if I can get the vertical alignment corrected there as well, rather than fiddling with shims at the rack. This style of collapsible (not the later full energy-absorbing) column used on UK 72 and 73 models is supported by two body brackets, one up by the dash and another one further down under the shelf.

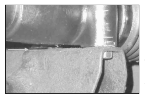
Both are slotted so each mounting can move up or down independently giving quite a large change in vertical position of the UJ end of the column shaft. I find the top can go up just a little bit and the bottom down, which puts the gauge pointers in perfect vertical alignment.

For horizontal alignment the lower bracket has two bolts up through the heater shelf (with support clips for brake and clutch pipes and harness) and with the nuts slackened the bracket and hence the UJ end of the column can be moved from side to side. With this column the inner can slide up and down freely so you need to pull the wheel up a bit while moving the column, as if the gauge points overlap they will jam and possibly get damaged. Then it's unbolt the rack again and pull it forwards as before to remove the gauges and fit the UJ, lining up the splines by eyeballing the front and rear tyres each side to get to get the steering straight, then fitting the UJ with the wheel in the straight-ahead position, and finally bolt the rack back down. The UJ only attaches to the column shaft in one position as the cut-out for the clamp bolt is cut straight across, but the rack shaft is cut all the way round (oddly the V8 only has notches in **both** shafts). Really I should have put a paint-mark on the rack-shaft in line with the slot in the clamp before removal, but as I've got to change the track-rod ends as well and then get the alignment checked, it'll come straight in the end.

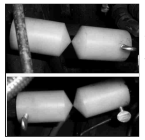
April 2023:
For Bee's new rack none of the column adjustments would get the tips in line - rack shaft too low - so the upper



mountings to the cross-member had to be shimmed.



The other potential issue is that both mounting points on the rack may not sit square to the brackets on the cross-member, and that proved to be the case, the upper one on the near-side had a 12 thou gap when the other three bolts were nipped up, so that side is going to need a spacer 12 thou thicker than the upper off-side. In the end I put a 63 thou spacer on the off-side upper and an 85 thou on the upper near-side. Getting them in was a fiddle as neither of them can be fitted with fingers. In the end I did them by lifting the rack up with one hand while I slid them into position from underneath using an open-ended spanner to guide them. I had bolts in position and protruding from the mounting, pushed the spacer up to touch the threaded end of the bolt, then lifted the bolt and pulled the rack forwards a bit to put the bolt over the hole in the spacer (without knocking it out of position ...), lower the bolt into the spacer, then wiggled the rack, bolt and spacer about until the bolt was aligned with the threaded hole in the cross-member bracket. Bolts with a ground point would have been easier ... and had spacers been needed at the lower bolts then easier still!



They raised the rack shaft pointer above the column pointer, but I had put that in its lowest position to try and meet the rack pointer before shimming, and it was a simple job to raise the column pointer using the two column brackets.

One-piece UJ for CB cars: *September 2024:*

The original CB assembly of yokes plus replaceable spider part number AHH6000 hasn't been available for a long time (other than used) but suppliers are showing that part number with a suffix letter which usually indicates it is a copy part, however all the ones I have seen are a one-piece UJ **similar** to the RB item. AHH6000Z (for example) is not an exact replacement for the original CB assembly but a 'near equivalent' being 4" overall instead of 4 3/8" and having different pinch-bolt centres at 3 1/4" instead of about 3 1/2". In theory that shouldn't cause a huge problem with the early and intermediate steering columns where the inner is free to move up and down inside the outer tube to a certain extent - as my 73 roadster does. The later full energy absorbing columns used on all RB cars is different in that the inner is in a fixed position in the outer and used a one-piece UJ (GLR3084 still available). The CB V8 whilst having a different column seems to have used the same UJ as 4-cylinder cars. North American Mk2 CB had different columns at various times and may have had different UJs.

Whilst the one-piece does avoid the fiddle of getting the spider and cups out of the yokes, and refitting them, they are about seven-times the price (I have seem them even higher at £120) of the repair kit for the repairable version. OTOH I have replaced Bee's five times now in 34 years, lasting less and less each time despite being very careful with alignment! Although not a source of MOT problems recently (the 'original' (to me) and first replacement were) there have been advisories of wear in Bee's rack for about three years, including a replacement only a few months old. So I'm wondering if it is the UJ they are picking up and in November 2023 replaced it yet again and on a retest it made no difference. **Not only that but less than a year and 1500 miles later that one is also showing play, and the rack inner joints again get an advisory!** Ironically, despite doing over 100k and several years of that with intractable steering wheel vibration Vee is still on the same one-piece UJ she came to me with - and quite possibly the original at 230k! Because of the vibration I expected problems with that UJ, so bought a new one ready for if and when I got the vibration fixed, which I did eventually but the UJ still shows no play at all so it sits 'on the shelf'.

Used with the CB column where the inner moves longitudinally in the outer the steering wheel will take up a position about 1/4" further away from the driver which has two knock-on effects: The first is that the back of the wheel will move closer to the cowl which has a fixed position determined by the indicator switch which sits in a location notch in the outer tube, and the other is that the steering lock may no longer engage. For the first the outer and hence the cowl should slide through the under-dash brackets to suit (which will correct the steering lock), but slackening those may alter the original alignment. Alignment will be altered by the shorter UJ anyway by the column shaft having to be angled down to meet the rack shaft, so you will need to go through the alignment process in any event. But the gauges are designed for a specific distance between the centre of the spider and the pinch-bolt so that is another issue and each half of the tool will be 1/8" too long. Only the rack half will have the issue as that shaft is in a fixed position, the column half moves with the shaft, but I found both halves needed to be modified. The only person I am aware of to have used this UJ chose to 'create a new pinch-bolt recess in the column using the new UJ as a jig'. Either both shafts would need new pinch-bolt locations to put the centre of the new UJ in the same position as before to maintain alignment, but CB (at least) 4-cylinder rack shafts have a groove all the way round so that can't be modified as it would widen the groove by 1/8" meaning with the clamp bolt inserted the UJ would be able to move on the shaft. The column

shaft just has a notch so in theory by inserting the shaft to the UJ such that the notch no longer lines up with the pinch bolt hole I can imagine drilling through the pinch-bolt holes of the new UJ to create a new notch. But there are two things to watch out for because the centre of the UJ is 1/8" closer to the rack. Firstly the new notch in the column shaft would have to be 1/4" closer to the end of the shaft and with the intermediate shaft being able to move in and out of the outer it would have to be clamped in the correct position in some way while you are drilling to maintain the relationship of the steering wheel to the cowl to avoid rubbing or a gap. Secondly because the rack shaft is angled downwards the centre of the new UJ will be lower than the old one so the alignment would have to be checked with gauges to see if the column needs to be moved in its clamps. But I didn't fancy drilling the column shaft anyway.

Installation: *December 2024*

 With the modified gauges fitted to the shafts and the tips touching as expected the wheel had moved 1/4" closer to the cowl and would have rubbed on it (I'd removed the cowl and the steering wheel to allow the column shaft to move down to meet the rack shaft). In theory slacking the upper and lower column clamps should have allowed me to slide the outer through them 1/4" closer to the bulkhead, but it would not move even when fully slackened. I wondered if the U-clamps on the outer were keyed to it in some way, so it would have to come off. Grub screw for the ignition switch was the easiest way to disconnect that, and the indicator switch removed. Removed the column gauge and the clamp bolts and the column was out in not much more time that it took to write it. On the bench the U-clamps were a tight fit on the outer but it was easy to tap then up the outer the required 1/4" as the original position was clearly visible, and it could go back in. The U-clamps are a tight fit in the body and dashboard brackets, took a bit of fiddling to get the bolts through, which was why the outer wouldn't slide in-situ. Barely nip them up to the column shaft can be aligned to the rack shaft. Refit the gauges, refit the rack to the cross-member fully tightening all four bolts to ensure the rack shaft is in its final position. Tweak the column clamps in the brackets to get the tips of the gauges touching on both vertical and horizontal orientations. Only up and down movement was needed, I had corrected the horizontal alignment when this rack was fitted. Fully tighten the column clamp bolts and recheck as the column may have moved.

 Unbolt the rack and pull it forwards to remove the gauges, and fit the new UJ. Refit the rack bolts and tighten the UJ clamp bolts. Then it should just be a matter of refitting the ignition switch to the lock with its fiddly grub screw, the indicator switch, steering wheel, horn pencil and horn push. Check all electrical functions - ignition, cranking, indicators for lights and cancelling, headlights dip, main and flash, and horn, and finally refit the cowl.

The biggest part of the job is repeatedly getting underneath to unbolt and bolt up the rack to remove the old UJ and fit the gauges then again to remove the gauges and refit the new UJ, which has to be done in any event. By contrast removal and replacement of the column was quicker and easier than getting the old spider out and fitting the new one had been on previous occasions. Time will tell if this one-piece lasts any longer than the five spiders. Detectable place in-situ could be seen and felt, off the car there was none with it in my fingers although the two halves are floppy, but with one half clamped in a vice and the other half held with grips there was the same play. But then again, how would a DIY-er get it assembled into the yokes in a domestic garage if there were no play? By contrast the one-piece assembled in a factory is a different matter. That was stiff off-car and has no play on-car ... but waggling the steering wheel reveals play further down i.e. the rack or beyond! I know the TREs are good as the pins were very stiff to move while they were unbolted from the steering arms, and the steering arms were supporting themselves when the TREs were unbolted which means the inner joints are being gripped, so the rack pinion will be the next investigation, and after that king-pins. I may be going overboard but Vee has never had that advisory with all original (to me) components, Bee didn't before 2021 and since then it has been every year despite two different racks and at least two column UJs.

1st January 2025: Did I say no play on car? When I removed the shims from the rack and bolted the cover back down there was just detectable play in the UJ! Less than with the rack set correctly, so that will just have to stay. Next test will be to redo the MOT test that shows play in the inner rack joints with the shims removed and cover bolted down, and if that shows none then it can't be the inner joints, so remaining play can only be the pinion. And having fitted two rebuilt racks both the same that will have to stay as well, advisories or not!

21/01/2025, 13:14 Steering & Suspension Subsections