

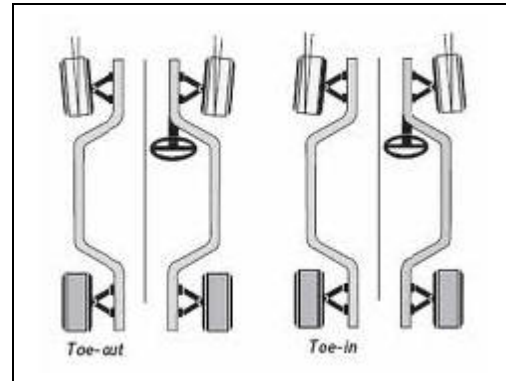


## Get Yourself in Alignment - Part 1

By Jim Lunson, tech committee

I get lots of questions asked about getting the MG cars front end aligned properly. Questions range from what is the proper setting, how to make the measurements, how to align the steering wheel, and who has a good shop to do a proper electronic alignment. All are valid questions and I will try to answer them here.

For any MG, there are only two things that we need to be concerned with on the front alignment: the proper toe-in setting for the two front wheels, and secondly, their proper positioning with the steering wheel. Contrary to



most modern cars that have adjustments for the camber (tilt inward of the front wheels when viewed from the front) and castor (tilt of the king pin from vertical when viewed from the side) as well as the standard toe-in/toe-out setting, MGs are completely rigidly fixed for all but the toe-in adjustment. There is nothing else to adjust. And most modern cars, especially those with front wheel and all-wheel drive, require alignment adjustment of the rear wheels as well, including a tie in to the front end alignment to provide the correct "thrust angle" so all four wheels are pointed in the exact same direction. Again, the MGs, with a fixed rigid rear end assembly, have no adjustment on the back wheels.

The last time I bought tires for my MG, the salesman tried hard to twist my arm to purchase the "all wheel alignment" package. He used the old adage that it would make the tires wear much better, improve gas mileage, make handling easier, and absolutely had to be done every year at a bare minimum. I politely refused the service, and held my ground. Then, while in the service bay getting the tires mounted, the alignment technician came over to give me another dose of sales pitch; at least until he looked closely at the MG's suspension and then exclaimed There is no way to adjust anything here. It's all fixed. So the answer to where is a good place to get a good modern electronic four-wheel alignment is "nowhere." You can do it yourself.

The proper toe-in is all that can be set on an MG. This needs to be set so the distance across the car for the front face of the tires is approximately 1/16" shorter

than the same spot on the rear side. This creates the "tow-in" effect required for the car. The theory is that when the car is moving forward, there is a friction drag from the tires on the road surface. This drag pulls the entire suspension system back slightly. While this pulling is happening, the wheels are then in perfect straight-ahead alignment allowing the car to role perfectly. This exact measurement is not critical and varies slightly from each MG model and also changes with wear and tear on the suspension over the miles. The ideal is to maintain about 1/16" difference when the car is still.

This adjustment is made on the tie rods ends protruding from the steering rack. Each tie rod end coming out from the steering rack is threaded on the outboard end and screws into a short piece which attaches to each wheel hub. Adjustment is made by threading this tie rod either more into or out of the short end, with the threads on the end either going into or out of the short end, changing the length between the tires. There is also a jamb nut on these threads which is tightened against the short end after the adjustment is made to lock the length and prevent any unwanted movement.

The problem is that in trying to set the 1/16" difference, it is easy to measure the front of the tires level with the center of the wheel, but difficult on the rear side because the body of the car gets in the way of taking a straight across measurement. To take this rear measurement, you need to overcome the problem by using either of two methods. One is to build a wide rigid U-shaped frame of wood or metal that will span between the tires below the car body and yet allow a comparison of the dimensions between the front and rear higher up on the tires. This frame can then be set at both on the front of the tires and on the rear and the measurements compared to obtain the 1/16". A second method is to get two blocks of wood, preferably 4x4 and make them exactly the same length, preferably the exact outside diameter of the tire. Then set them on the ground against the outside of the front tires, making sure they are exactly centered with the center of each wheel and the tires are at the same pressure. Then simply measure on the floor the distance between the boards at the front and back ends and set the toe-in accordingly. Either way, take the measurement and adjust the tie rods lengths to get the 1/16" difference. Each complete turn of a tie rod equates to about 1/32", so if the measurements are exactly equal at the front and rear of the wheel, each rod needs about a one-half



rotation inward to get the 1/16" difference. Get the dimension set and then tighten up the jam nuts to hold everything in place and you should be all set.

There is a third way to set the alignment which I use. This involves the feel of the steering wheel. I start by reducing the toe-in about 1 full turn of the tie rod on each side of the car to insure there is plenty of toe-in. Then drive the car a short distance at 20-30 mph. If the toe-in is too great, there is strong tendency for the car to want to move straight ahead, with any turn of the steering wheel to either side taking a lot of effort. You can feel it in the steering wheel. Second step is to increase the spread of the front tires by a full turn on both sides. Drive the car again and feel if the steering is easier. The method is to continue this process until the steering is easy and the car rolls well. You can tell when you go too far as the front of the tires will then be wider than the rear (toe-out). This will cause the steering wheel to float or skate as you drive, requiring more turning of the steering to affect any turn of the car. It is a pronounced unmistakable feel. When this occurs, readjust the tie rods inward again, probably about 1/2 a turn of each. This pulls the front of the tires back toward each other slightly, soon giving a perfect alignment. Then tighten the jam nuts and you are set with a perfectly aligned MG. This method takes a little longer, but by using the steering wheel feel, you can get a very good alignment setting for your particular MG.

This is how to set the alignment for any MG. Not a hard job, but does require getting slightly under the front of the car, using a wrench and vise grips to loosen the jam nuts, and make the necessary rotations of the tie rods, but with a little practice, it is not hard and will yield as good an alignment as any shop can accomplish. Just count your rotations of the tie rods and don't forget to retighten the jamb nuts when everything is set.

The final step is to align the steering wheel so that when it points exactly straight ahead, that is where the car is going. This is not critical, but makes for much more pleasant driving when going straight ahead on a road and feeling the steering wheel correspond precisely to the direction of the car and not having it cocked off to one side. I go into how to accomplish this task next month.



## Get Yourself in Alignment - Part 2

By Jim Lunson, tech committee

I went over last month how to do a good front end alignment on an MG. The next step after doing this task is to make sure the steering wheel is aligned with the road wheels. There is nothing more disheartening than to be out cruising down a long smooth straightaway only to notice that as the car tracks beautifully straight ahead in perfect alignment, the steering wheel is cocked to one side or another. Try to straighten up the steering wheel and the car veers off to one side. Not a pretty feeling and once you notice it will drive you nuts. The obvious solution to this problem is to match the steering wheel going straight ahead with the alignment of the front wheels. It will be explained here.

The first step in this process is to insure that the steering wheel is set properly on the steering column. Most MGs have a mark on the end of the steering column shaft which should point straight up when the car is going straight ahead. This can be checked by removing the steering hub and cover assembly and looking at the end of the shaft where the large center bolt holds the steering wheel in place. The steering wheel



should be pointed straight ahead when this mark is in the 12:00 position. Often, sometime in the past, a shortcut process to center the wheel may have been done by simply pulling the steering wheel off and rotating it on the splines to match the track of the tires. This fixes the problem but is not a good solution as the steering rack is then not evenly spaced, meaning the turning range is unequal, going left to right. You will have three turns to one side, but only one to the other, causing problems when you need to make a sharp turn somewhere. You will either turn the wheels too far causing damage or won't be able to turn sharp enough to make the turn you need to. So check this and see if this has been done in the past. If so, the first thing to do is pull the steering wheel and get it on the splines accurately: showing perfectly straight ahead when the mark is straight up.

If there is no mark on the shaft, then the task is more complicated as you have to get under the front end and see if the tie rods protrude approximately the same length from the rack when the tires point straight ahead. If the steering wheel is

incorrectly set, different lengths of the tie rods will be very evident. It does not take but changing the splines one notch to show a marked difference in tie rod lengths. So take a look and make sure they are equal. This can also be checked by turning the steering wheel and counting the revolutions from the straight ahead position to the end of the turn. The steering turns should be about the same in both directions.

One other rare problem occurs if the steering pinion (the shaft from the steering rack up to the universal joint joining the steering column) has been removed and reinstalled. Errors can occur if the pinion has been inserted incorrectly either into the rack or into the splines on the u-joint. Misalignment here when things were assembled together can occur. This is rather complicated to correct, but happens only rarely. It will throw off the steering wheel alignment severely however, when everything else looks perfect. If there is no way to align the steering wheel with the protruding tie rods being close to equal in length, then this may be the problem. So check to tie rod lengths first.

Assuming the steering wheel is only off roughly 45° or less, and the tie rods are about equal in length when moving straight ahead, the next step is to determine which way the alignment needs to be adjusted to get it straight with the steering wheel. If the steering wheel tilts to the right when the car is moving straight, then when the steering wheel is straight, the car would track to the left. The tie rods are connected to the wheel assembly in front of the pivot pin, so this situation would mean the left tie rod is too long and the right one is too short. The reverse applies of course if the steering wheel points to the left. So look at the steering wheel when moving straight ahead and determine what which side has to be shortened and which has to be lengthened. It's basic geometry to get the wheels pointing straight ahead.

The next step is to make the corrections, being careful to maintain the proper alignment which we did last time. The easiest way to do this is to adjust each tie rod lengths one complete turn at a time. Place a horizontal mark on each tie rod so you will know when it has been turned one complete revolution. Then loosen the jam nuts and make the correction to each side, shortening the one side (thread it into the outboard end closest to the wheel) and lengthening the other side by unthreading it. Do each side one revolution at a time. Then take the car for a short test drive to see if the problem has been fixed. If it has, you are finished and can retighten the jam nuts. If the car still tracks to one side, repeat the process with another complete revolution of each tie rod. If the tracking has been made worse, you adjusted the tie rods backwards and need to go back and turn them in the opposite direction two turns (one to correct the mistake and another to get the adjustment going in the

right direction). Perhaps it is wise to write down left screw into and right screw outward (or the reverse) so you remember between trial runs which way you are turning things and can continue as necessary.

To maintain the perfect alignment we obtained last time, a check that can be done is to place a piece of tape on the front side of the tire tread of each tire and measure the distance between them. After turning the tie rod ends inward and outward, the distance should remain the same. Any variation means you either turned both sides inward or both outward, not correcting the alignment with the steering wheel. The tape method has to be replaced after each test drive too as it will come off as soon as the tires turn on the pavement.

Another trick I use when doing these adjustments is when raising the front end up to gain access to the steering parts, use wheel ramps rather than jack stands. Ramps keep the weight of the car on the tires and that tends to hold the wheel alignment in place. Jack stands leave the tire assembly hanging loose and you can go overboard quite as easily making alignment changes.

Also keep in mind that most roads have a center crown for drainage. This makes the center of the road slightly higher than the shoulder edge and this slope can cause the steering to pull toward the lower side. This pull makes it look like the steering wheel is not centered as you need to adjust the track slightly to the left to overcome this slope. So make sure the test road you use is flat enough to not give a false reading during your test drives or find a dual lane road and test drive on both the right and left lanes to see how the steering wheel sits when going straight ahead.

One last note is doing a wheel alignment and steering wheel centering is that the adjustments I suggest here are based on a good suspension system. The methods apply to all MGs from TDs on (only TCs don't have rack and pinion steering or similar tie rod assemblies.) Often many parts in this front end assembly get severely worn and getting the toe-in within 1/16 and centered with the steering wheel aligned is nearly impossible. I will go into how to check the suspension and steering systems on your MG for excessive wear in the next issue.



## Get Yourself in Alignment - Part 3

By Jim Lunson, tech committee

I've been writing about getting the front end of an MG into alignment and getting aligned with the steering wheel. An item that is critical for all this to happen is to have a solid, secure front end suspension. To do this often requires the rebuilding of several components of the front end as the MGs are old, probably not properly greased, and the systems were not designed to withstand much of the road conditions encountered today. There are several things to look for in wear and tear in this area that must be addressed before a good alignment can be done.

The first step is to jack up one of the front tires while leaving the other one on the ground so the weight of the car holds it in place. With one wheel in the air, tug the tire in and outwards, grabbing it at the 6 and 12 o'clock positions. There should be no movement in this direction. Movement here indicates wear in the suspension or wheel bearings. If there is wobbling, the next step is to repeat this same motion while observing the workings from the front of the car. From here, you can see what is moving. If the suspension remains fixed doing this test but the wheel, and tire moves, then the bearings are worn and in need of adjustment. I covered how to do this repair in past articles.

If, however, the entire wheel system, including brake and hub assembly moves in and out, two places on the suspension need to be checked. This wheel assembly is anchored at the top by the shock absorber arm and at the bottom by the horizontal pivot fulcrum at the outboard end of the A-arms. See what is moving as the tire moves in and out in the vertical direction as both are critical to hold the assembly rigid.

**Shock Absorber** - The shock absorber on all MGs (except for TCs) has a horizontal shaft that holds two long lever arms which reach over and attach to the top of the wheel assembly. In addition to providing the shock dampening, the shock provides the bracing to hold the top of the wheel assembly rigid. First check to see that the bolts holding the shock down on the cross member are tight and the entire shock is not moving. Then check to see if the rubber bushing between the shock arm and wheel assembly are firm. Tightening the shock absorber

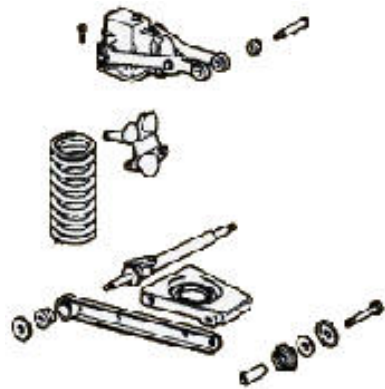


bolts is an easy fix, removing the horizontal bolt that connects the shock end to the wheel to replacing the two rubber bushings is not so easy but must be done if there is movement here.

These two bushings are rubber and wear away over time. Replacement requires removing the horizontal bolt at the end of the shock arm. This bolt has a flat side on the head that jams against the shock arm so it will not rotate and getting it extracted can be impossible. I've found that unless the bolt easily slides out, it will never come out and must be cut off with a hacksaw. And this cut requires two cuts, one on each side of the wheel anchor kingpin so the two shock arms can be lifted up. Then the bolt pieces can be driven out with a hammer and punch. Once out, a new bolt replacement and bushings are available. I recommend inserting the new polyurethane type bushings in place of the original rubber as these last much longer. And use anti-seize on the new bolt in case you want to remove it later.

Rarely, movement in this area comes from the shaft in the shock absorber. If this is the case, replacement of the shock absorber is needed, usually also requiring the bolt noted above to be cut to be able to remove the old shock where the arms attach to the wheel assembly.

**Bottom Fulcrum Pivot/A-Arm** - The bottom pivot pin system is one of the weakest links on MGs, is usually the first place movement shows up in the suspension system,



and an area that can become dangerous if not repaired. This fulcrum pin runs horizontally, from front to back of the car, at the outboard end of the a-arms which extend on either side of the spring pan. This connection links the car frame, spring pan, and wheel assembly together and ties them onto the lower end of the kingpin wheel assembly. Rotation of this fulcrum pivot is constant every time the car bounces on any sort of bump and all the weight of this corner of the car is carried on it. This pin consists of a large bolt running through a brass sleeve in the bottom of the wheel assembly.

Constant clean grease lubrication of this pin is critical to avoid wear and with the weight of the car on it, grease squeezes out rapidly. Without grease, the bolt seizes up in the brass sleeve. Rotation transfers from the sleeve to the bolt; however, only now with the entire bolt and nut assembly fixed, it turns on the opening in the a-arm. The a-arm opening is not designed to take the rotation and the hole enlarges rapidly, causing the wheel assembly to move in all directions. Have a friend bounce the car while observing the bolt. It should move up and down with the wheel



assembly, but should not rotate. If turning, the bolt is frozen and needs rebuilding. Often, enlargement of the hole causes movement of the wheel assembly, and will wear almost completely through the bottom of the a-arm, and when it does, the car drops onto the road, not something you want to happen while moving. There is grease fitting on the bottom of the wheel assembly for getting grease between this bolt and the sleeve. Plus if the bolt moves horizontally when the wheel is pulled or pushed at the six o'clock position, it is worn and needs reworking.

The second weak link on this lower anchorage is where the a-arms attach inboard to the main cross member. Here there are two large rubber bushings that go between each a-arm and the bracket on the main cross member. These bushings are made of rather soft rubber to improve the car's ride, but they erode quickly causing the entire spring and spring pan assembly to move around on the bolts. This movement then transmits to the wheel assembly causing movement.

If there is movement here, the only solution is to remove the a-arms, the spring and spring pan, and the fulcrum bolt and replace everything. First, remove the spring and pan assembly, being careful that the spring does not fly out. Then unbolt the a-arms. The fulcrum pin may have to be driven out with a hammer if it has seized up. The a-arms can be reused if the hole in the outboard end is not enlarged. The brass bushing inside the wheel assembly probably needs replacing along with the fulcrum bolt. This requires a press to install a new sleeve which may involve taking the entire wheel assembly to a shop. Not too difficult if it has been freed from the car at both the top and bottom.

And while the a-arms are disassembled, it is easy to replace the bushings on the inboard end with better material, either the MG V8 bushings or newer polyurethane material. This a-arm removal process is extensive and when reassembled use the best material possible so it will not need redoing for a long period. Once rebuilt at the top and bottom with new bushings and rubber, there should be no further movement.

**Kingpin** - One last check on the wheel suspension system is the kingpin itself. The king pin is the large vertical shaft that runs down through the wheel assembly and



allows the wheel to pivot when the steering wheel is turned. It has a ring at the top which anchors to the shock absorber arm and a hole at the bottom for the fulcrum pivot to secure this end. This is a pretty durable system on MGs, provided some sort of grease lubrication was done on the car over the years and usually does not wear excessively (no rubber components). There are grease

fittings on this shaft (later MGBs had a second one added in the midpoint also) and as long as grease was added at some time, it probably stayed in there keeping this from wearing. If not, you will see movement between the top of the shaft and the wheel assembly at the shock absorber arm connection. This indicates there is wear inside this shaft, either to the shaft or the brass sleeves inside the tube in which it rides. This system can be removed and overhauled with new bushings, new kingpins and special reamers tools to insure perfect alignment and fit, but I have found that if this area needs rebuilding, it is easier to just replace the entire system. This is more expensive, but guarantees that the pieces will mate together exactly and that all the bushings are pressed perfectly in place. Again, this system is pretty well built on MGs and lasts, even when little lubrication was done. So check the anchorage at the top and bottom first before proceeding with king pin work. You may not need it once the top and bottom have been refurbished properly.

So the key is to check the wheel assembly for movement in the vertical position to see what is worn and needs work. Checking in this vertical direction only eliminates any movement which could be caused by the steering system which is a whole another subject. And once this vertical rebuilding has been accomplished so that there is no movement here, you can then move on to the steering system if it is necessary, knowing that the suspension system is now not preventing proper steering and handling of the car.

One last note is the importance of doing the proper lube job on the front suspension. Changing the oil is always emphasized as being crucial maintenance and the lubrication portion of this step is merely thrown in as an afterthought. It is just as vital to maintaining a good operating car and vital to keeping the front suspension in tip top shape. So, if you change your own oil in your MG, get a grease gun too and hit those fittings every time. And if you have your mechanic change the oil, be sure to remind him the old car has lots of grease fittings in the front suspension and each and every one needs attention as well.