

**STEERING AND
FRONT SUSPENSION,
SHOCKS AND
SPRINGS**

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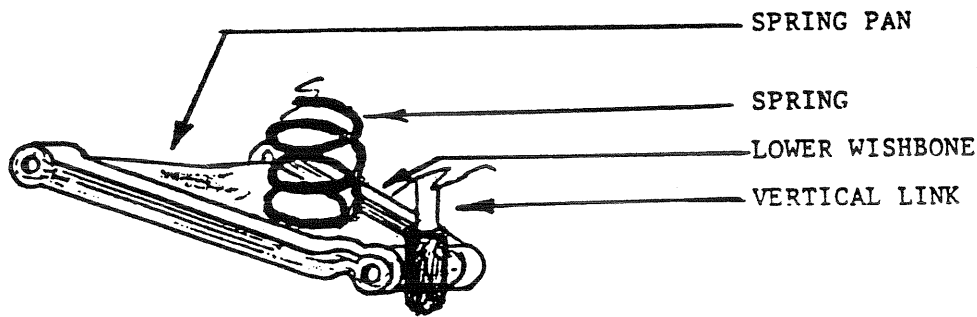
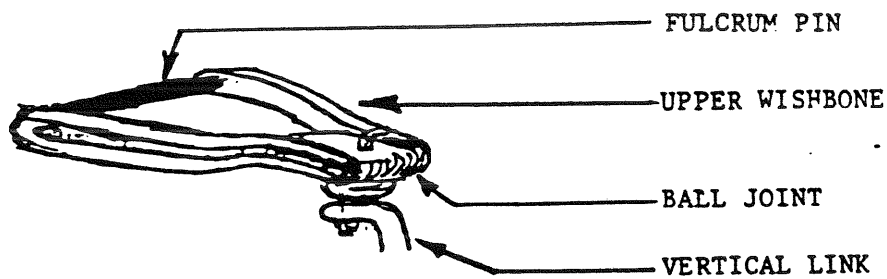
FRONT SUSPENSION REBUILD FOR THE BEGINNER

Skill Level C/D

This article is intended to guide the owner with no experience and a minimum of tools (a good jack and jackstand are musts) through a job which most TR 6s will need. Moreover, you do not need to do the whole job. You can do only those parts you feel capable of. Another thing that helps is to look at the front suspension as a series of jobs to be done step by step. When looked at in this context the job does not seem so overwhelming. There are quicker ways to do it and maybe better ways. However, those having the skills and or tools don't need any guidance from me. I realize lots of photos and drawings would help, but life's too short for me to attempt to do that. Frequent reference to shop manuals will help considerably.

There are 5 levels of frequency and difficulty to proper front end maintenance.

(1) Upper inner rubber bushings. These are easily replaced and are good for about a year or 15-20,000 miles. With the wheel removed and the full weight of the car resting on a jack or jackstand placed directly under the spring, remove both bolts holding the ball joint to the upper wishbones. Put the bolts back through one of the wishbones to keep the hub and brake assembly supported. Remove the cotter key, nut, and washer from the inner end of the loose wishbone. Use an up and down pumping motion as well as outward pressure to remove it and the old bushings. Use sandpaper if necessary to clean the fulcrum pin where the bushings were removed. Likewise clean the hole in the upper wishbone thoroughly. Lightly coat one of the new rubber bushings with Vaseline or Armorall and slip it on to the fulcrum pin. Coat another bushing and slip it into the outward facing side of the wishbone. Now place the wishbone and bushing over the fulcrum pin and adjust until both bushings are equally into the wishbone. Clean the washer and replace it, the bolt, and a new cotter pin. It is that easy! Now repeat for the other wishbone. Reconnect the ball joint.



LEFT FRONT SUSPENSION

(2) The next job in order of frequency and difficulty is replacement of the lower nylon bushings and steel bearings. Because the lower inner rubber and steel bushings (job #3) are most easily (not too easy - more on difficulty later) replaced at the same time when using this method, we'll cover both jobs at once. You will now need a safe support such as a jackstand under the frame and a jack directly under the spring. Raise on the jack until the car just lifts off the jackstand, then let down until the weight is barely on the frame. Remove the tie rod end from the steering lever (see the Easy Tie-Rod and Ball Joint Removal article for method). Look at the outer lower wishbone pivot bolt and nut. Start with the wishbone at the nut end. This way you will not have to take the bolt out and have the vertical link, brake, etc. hanging freely. Let me digress briefly to tell you the following is a lot easier with the brake disc and caliper removed. If you're going to do that job too, jump ahead and read up on it now.

Having the wishbone removed makes it much easier to do the bushing replacement work. If you have a vise you can probably replace the rubber and steel inner bushings by using deep sockets as show in Illustration 2.

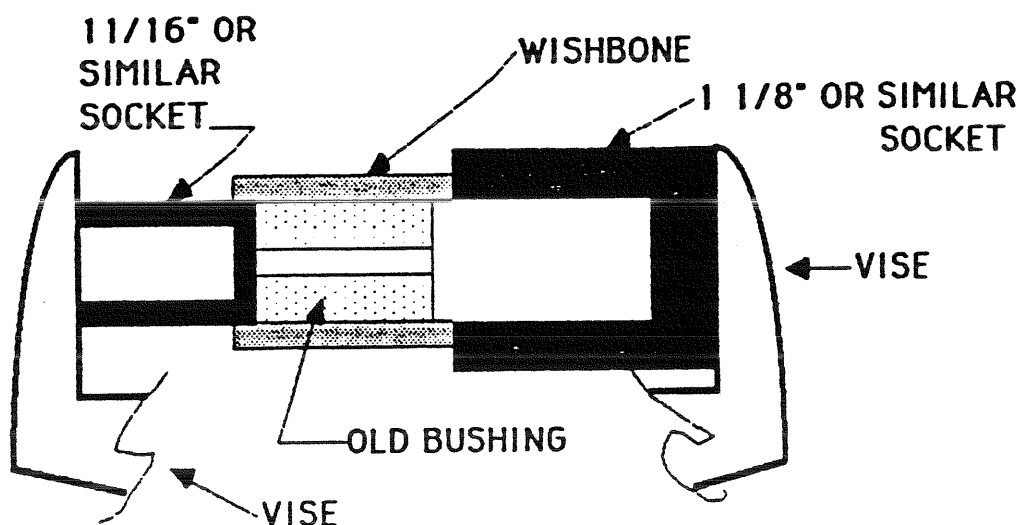


ILLUSTRATION 2

When you tighten the vise, the smaller socket pushes the old bushing through the wishbone and into the large socket. If you don't have a vise or can't use this method, any machine shop can press out the old bushings and press in the new.

The bushing must protrude equally on both ends. The new ones go in much better if coated with Armorall, soap, or Vaseline. Believe me you can't hammer them in and out. The outer bushings and steel bearing are a little easier. Lightly grease the inside of the hole in the wishbone. Liberally grease the inside of two of the tin water shields and the nylon bushings. Place the nylon bushings in the water shields without the rubber sealing rings. Assemble the nylon bushings, water shields, steel bearing, and thrust washers on both sides of the wishbone as they will be when fitted and place on a 1/2" x 3" bolt (preferably threaded the entire length) and nut. Carefully tighten the nut until you have pressed the assembly fully into place. Remove the thrust washers. Place the wishbone back on the spring plate and, beginning with the inner stud, tighten just snug perhaps even leaving the outer bolt several turns loose.

Remember that they must be fully tightened later. Repeat the above for the other wishbone.

(4) At this point it is a good idea to examine the bottom trunnion for excessive play. Put a fair amount of sideways pressure on it and look for movement. Actually, considering the way most TRs are maintained, if the car has more than 50,000 miles they are probably in need of replacement anyhow. It is less overall work to do this now but, again, it expands the scope of this job some. At this point we're getting a lot of things torn apart at one time. I'll include it here and you take your choice. To remove the trunnion you must remove the hub and brake disc assembly and to remove the hub/brake disc you must remove the brake caliper. It may be difficult to break the caliper mounting bolts loose with the vertical link unsupported so do it before you have the lower wishbones loose. Also, there are thin shims between the caliper and the vertical link. Loosen both bolts several turns, then take one fully out. The shims for that bolt should fall away. Then remove the other bolt and shims. Make sure you note the numbers and locations of the shims because they may not be equal. Wire up or hang the caliper so that the brake hose is not supporting it. To remove the trunnion, you must remove the steering lock stop. The bolt for the stop is easily broken. Heat it as hot as possible as quick as possible to loosen. When you replace the trunnion, fill it about 1/8 full of grease and liberally grease threads of both trunnion and link. Screw the trunnion on as far as it will go, then back off as little as possible to put it in proper operating position. Install the stop loosely. If the trunnion turns freely in each direction far enough to hit the stop it is ok.

We're finally ready to put something together. Place the rubber sealing rings in the water shields for the lower outer bushings. Place a greased thrust washer on the bolt and slide the bolt into the front wishbone until it just pokes through the other side. Place another thrust washer, sealing ring, and water shield over it and try to get one to stay in the water shield on the inner side of the rear wishbone. Some stiff grease will help hold them in place. Right about now an extra set of hands sure helps if you can enlist someone. Slide the trunnion into place

between the wishbones, being careful not to dislodge the thrust washers. If it seems like the trunnion won't go, have your helper pry one of the wishbones away with a screwdriver. Push the bolt on through and put on the rear thrust washer, water shield, sealing ring and nut. Tighten the nut to about 55 foot pounds (or about as tight as you can manage with a 1/2" ratchet). Go to the next slot in the nut if possible and put in a cotter key which has no appreciable slop in the hole (5/32" as I recall and it is a hard size to get, most parts stores carrying only 1/8" and 3/16"). If you can't go tighter, slack the nut off some. However, this bolt must have considerable tension on it. Replace the hub assembly and brake caliper and the tie rod end (as well as anything I've forgotten).

(5) Not to again expand the job, but it is a good idea to repack (replace the grease) the wheel bearings and replace the seals while you have the caliper and hub/disc off. Be sure you put the seal in the right way -- felt face exposed, metal face against the bearing. Adjusting the bearing with a new seal is tricky because you must get it tight enough to compress the felt but not put pressure on the bearing. See the Wheel Bearing Adjustment When Installing a New Seal article for an easy way to do this.

WHEEL BEARING ADJUSTMENT WHEN INSTALLING A NEW SEAL

Skill Level D

First let me refer you to related articles on an alternate modern type seals, frequent adjustment indicated by low brakes when turning, and adding grease fittings for the bearings. These appear elsewhere in this section. However, it is not necessary that you read them first.

To install a new seal, you will need to remove the brake caliper and disc as per the previous article. The felt seal used on the TR 2 through TR 6 is a crude prehistoric type, long ago done away with even by MG. The problems are several - Insufficient sealing ability, water absorbtion, dirt collection,

short life, etc.. Additionally, a new seal must have the felt compressed to about half the original thickness. It is hard enough for the novice to learn the feel of adjustment let alone to be hindered by trying to guess if he is compressing the seal or beginning to tighten the bearing. The following encompasses both initial adjustment with a new seal and adjustment with an old seal.

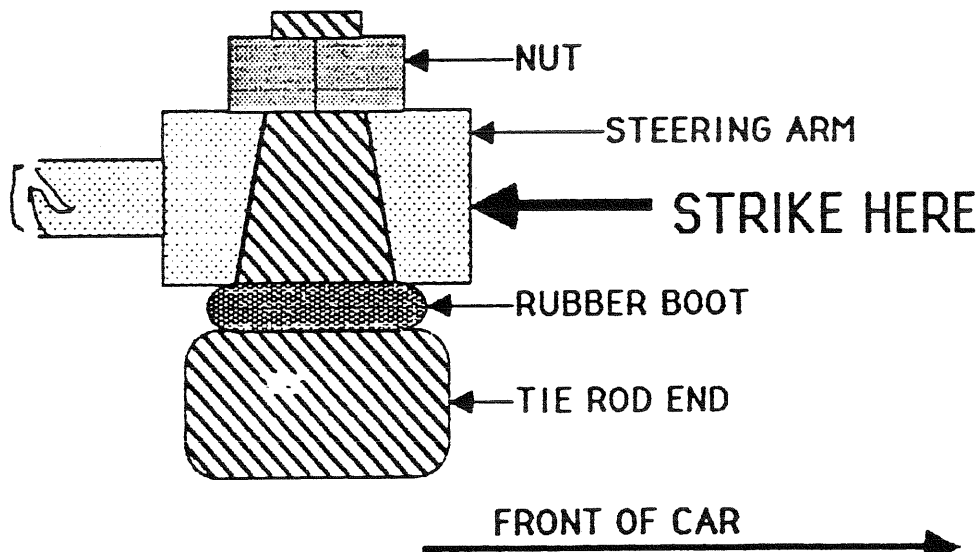
With the hubcap off, put the wheel on with two lug nuts snugged down. Use channel lock pliers or a wrench to tighten the spindle nut to a firm but light tension. Use of a torque wrench is ideal if you have one. Torque should be about 15 foot-pounds. Spin the wheel a few times. Loosen the nut until all tension is removed. Grasp the wheel firmly at the top and bottom and try to wiggle. You should be able to feel the play in the bearing. If not sure, tighten or loosen a little until you think you've got the hang of it. Tighten the nut again and spin the wheel. Loosen about one flat of the nut ($1/6$ turn), spin the wheel and test for play. Repeat until you feel play. Then tighten the nut one flat. Set the nut to the next slot of the nut in the tighter direction that will allow cotter pin installation. Note there are two holes in the spindle so you should not have to turn far. Use a new cotter pin of the correct size ($5/32"$ as I recall). Do not use a pin appreciably smaller than the hole. Bend over tightly. Remount the dust cap, wheel, and hub cap.

EASY TIE ROD END AND BALL JOINT REMOVAL

Skill Level D

To the novice it seems intuitive that to remove the tapered bolt portion of a tie rod end or ball joint it must be forced upward out of the taper. This is entirely true - except you can't do it by pounding on the end. All that accomplishes is mushrooming the threaded end. There are tools made for this which look like a two pronged fork with the prongs tapered to a

point. By driving the prongs under the ball part of the joint you force it upward. However, if you don't want to spend the bucks for one of these tools, there is another way. Simply loosen the nut except for the last few threads and then strike the end of the steering arm on the vertical link squarely with a large hammer. You may have to do this several times before the tapered part of the joint pops right out. Make sure you strike the vertical link or steering arm from the end which can't move as shown in the illustration. Be careful you do not hit the rubber boot. If you do, clean it thoroughly with lacquer thinner and patch liberally with silicone seal.



EASY FRONT WHEEL BEARING CAP REMOVAL

Skill Level D

According to the owners manual and some other incredibly nieve publications that little round black tin cap is easily removed by inserting a screw into the hole in the middle and simply turning the screw in against the end of the spindle and continuing to turn until the cap is forced out of the hub. If everyone who has done this successfully were to send me \$5, I couldn't make change for a nickel !

A better way is to weld (or have welded) a large washer to it. Be careful you don't weld the hole shut, it is a vent for the hub. Then you just grasp the washer with a pair of channel-lock pliers and wiggle the cap out. If you weld it on the car, be careful you don't set the wheel bearing grease on fire. However, the alternative is to half destroy the cap by hammering a screwdriver on the edge in several places trying to knock it outward.

SPEEDI-SLEEVES - A BETTER IDEA FOR FRONT END REBUILDS

There are several places in the front suspension where surfaces that are supposed to stay clean and smooth just can't beat the odds. For example, the upper inner fulcrum. This thing sets there in all the water, salt, and dirt you can find to drive through with no seal whatever save the rubber bushings. Naturally it is going to rust. And when it rusts, it eats up those rubber bushings like Dom Delouise (or however it is spelled) goes through pizzas. Stainless steel Speedi-sleeves are the cure. Simply file all the rust away and put a Speedi-sleeve over the ends where the bushings go. For a complete explanation of Speedi-sleeves see the Speedi-sleeve article in the Engine section. Other uses are to resurface spindles where seal wear or careless mechanics have chewed it up, the lower inner control arm hole , and the outer lower control arm hole if not too badly worn off center and it can be reamed out about .010".

FRONT WHEEL BEARING WEAR AND REPACKING WHEEL BEARINGS

Skill Level B/C

Due in part to the crude felt seal used with TR inner bearings this is not a maintenance item to be skipped over very many times before you have a dry bearing. I've seen them rusted with broken rollers and even frozen (semi welded from heat) to the spindle due to seal failure. Some cars seem to require far more frequent adjustment than others. All 3 of my cars have the same bearings, yet 2 require adjustment at least twice as often as the other.

Assuming you have a hub puller and a shop manual the job is rather easy so I won't go into the actual operation. Essentially just take the spindle nut off, remove the brake caliper (watch the shims don't get lost) and pull. Even if you don't have a hub puller the odds are you won't have a problem. Here are a few cautions and tips to keep in mind:

1. Always use a new seal.
2. Be sure you install the seal with the metal cup into the hub. The felt goes toward the spindle.
3. Moisten, but don't saturate, the seal with SAE 30 oil then coat the face of the felt with grease.
4. When installing the hub you will be deforming the metal of the seal and compressing the felt. Tighten the spindle nut to about 15 foot-pounds of torque and spin the wheel. Check that some torque remains, and if not, snug down the nut again. Loosen the nut. Retorque to about 3-5 ft.-lbs. or just a little pressure on the wrench. If you can't get the cotter pin in go looser or tighter, whichever requires less turn of the nut. Remember there are two holes and they don't both line up with the nut in the same position. Always use a new cotter pin. A cotter pin that is too small is worthless. It should be a snug fit in the hole.
5. Always remove all grease from the bearings and from inside the hub.
6. When cleaning the bearings, do not use gasoline because it etches the bearing. Use naphtha or kerosene, blow dry, then spray with brake or carb cleaner.

7. Clean the bearing inner race and the spindle thoroughly and apply a few drops of Locknut. Do not use Loctite Bearing Lock or you'll never get the bearing off again.
8. After a few days or 100 miles jack up the front end, grasp the tire at the top and bottom and try to wobble the wheel. If you have any perceptible play in the bearing you'll feel it. Retighten the bearings. This must be done with the assembly cold (not driven for several hours).
9. Check play and adjust if needed every 2000 to 5000 miles.
10. Use only the highest quality wheel bearing grease made for disc brakes.
11. Grease must be forced into the bearing between the rollers, not just smeared on the surface.

A GOOD CHEAP TOOL FOR PACKING BEARINGS

I found a neat tool at Penn-Jersey for packing bearings. It is two slightly dished disks about 4" in diameter with a threaded hole in the center. A hollow threaded tube with a grease fitting in the top and a hole through the side about 3/4" from the bottom end is screwed into the bottom disk. The bearing is then placed over the tube and the second disk is screwed onto the tube, sandwiching the bearing between. You then apply grease with a gun to the fitting until the grease starts coming out of the sides of the bearing. Disassemble the tool and clean the excess grease from the inner race of the bearing and you're ready to go.

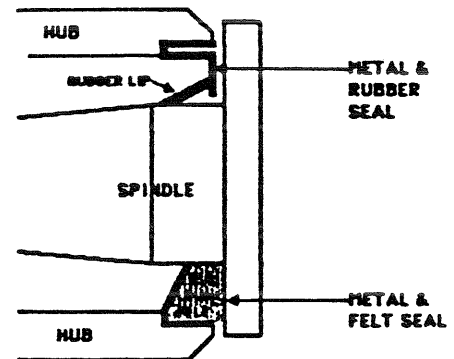
A BETTER FRONT WHEEL BEARING SEAL

Skill Level B/C

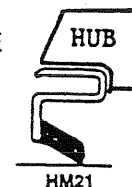
The stone age felt seal on TRs has always irritated the hell out of me. First because a new one must be compressed making accurate feel of wheel bearing adjustment difficult. Second because it takes on water, contributing to the inner bearing

going dry and failing. Third, and most important, many novices put them in backwards. It seems like TR 6 wheel bearings always need adjustment (indicated by a falling brake pedal after turning sharply when parking) and I feel seal induced bearing wear is at fault.

There is a modern seal which can be used and in my experience to date seems to work. Since the original seal worked against a vertical face on the spindle (lower half of illustration), the shoulder which conventional seals use in most cars and which we will use is quite narrow (upper half of illustration). Therefore, it is vital that you get the right seal. The correct seal is CR Industries 13612. A problem arises in that CR apparently makes two types of 13612. One is shaped like a conventional seal, but the one you need is a type HM 21 as shown here. This should be available from any bearing supplier listed in the yellow pages.



NOTE: THIS IS OPPOSITE HAND FROM ABOVE



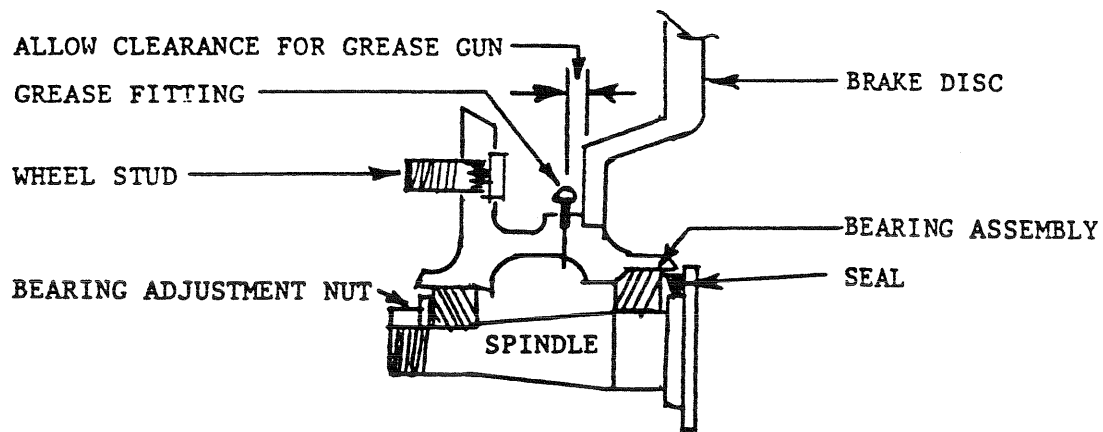
PROLONG THE LIFE OF WHEEL BEARINGS AND MAKE MAINTENANCE EASIER

Skill Level C

Repacking (renewing the lubricant) in front wheel bearings "by the book" requires removal of the front hub to gain access to the inner bearing, which in turns requires removal of the brake caliper. Caliper removal is a job which involves being careful that you don't lose the shims on the bolts and the near impossible task of getting the shims back on the bolts. This little exercise is a bitch and is enough to discourage many novice mechanics. The following can be done without hub and caliper removal. On the other hand, many of the pros just leave out the shims because they don't want to bother with them. The

shims are there to center the caliper on the disc and definitely should not be left out. It is also difficult for the inexperienced to adjust the bearings because they must learn the feel of compressing the antiquated felt seal; that is, are they compressing the felt or overtightening the bearing? These seals also absorb water and lead to premature bearing failure. See the previous article for a better seal if you feel you have the confidence to tackle caliper removal (it isn't that hard, you just have to think and be careful with the shims).

Here is a quick and easy way to help a car which has bearings in apparently good condition. Virtually anyone who can operate an electric drill and a tap can do it in less than half an hour per front wheel. Obviously it is still preferable to remove the hub, clean it, and do the drilling and tapping.



With the wheel removed and the car safely blocked up, locate the four bolts that hold the brake disc to the hub. In the "low spot" of the hub flange between the bolts, clean away as much rust as possible by chipping and brushing (rust dulls drills). Using a 1/8" drill, start drilling a hole as close to the edge of the flange as possible for a grease passage (see illustration).

The following sounds a little Mickey Mouse but if you take your time it will work fine. If you screw up, just plug the hole and move around the flange 90°. Once your hole is started (about 1/8" deep) rotate the hub so you will be drilling from the side or bottom. This way the drill cuttings fall away and can't go into the interior of the hub when you break through. Drill slowly, stop often, and put grease in the hole and on the drill bit. The grease will capture the cuttings. This is especially important when you break through. Again drilling in an upward direction, drill the hole out to 7/32" to a depth of from 1/4" to no more than 3/8". Tap threads in the hole using a 1/4" x 28 fine thread tap until the tap bottoms in the hole (don't force it). It is a good idea, but not absolutely necessary, to follow this with a bottoming tap (a tap which cuts full threads all the way to the bottom of a hole). A few gentle squirts with spray carb cleaner will wash out any fine cuttings. Now install a straight 1/4" x 28 threaded grease fitting. The ideal fitting is the one that came in the tool kit of early cars for use on the rear axle universals. It is about 1" long and is part #2, plate AU of the Roadster Factory catalog. However, I don't think they are available now. Most small fittings available at parts stores will do. I've used NAPA # 715-1081. You should visualize the location of the fitting before you drill to insure that your grease gun will have clearance to get to it.

Remove the tin cover over the adjusting nut and, if necessary, adjust the bearing. See item 4 of "Front Wheel Bearing Wear and Repacking Wheel Bearings" in this section for the proper method. Using a grease gun filled with quality wheel bearing grease, start filling the hub until grease starts to come out around the outer bearing. This should never be more than about 40 strokes of the gun even if the hub is totally dry. Replace the tin cap.

You will probably never have to grease the bearings again but you should give them a pump or two of the grease gun and check adjustment every 5,000 mile (10,000 at most).

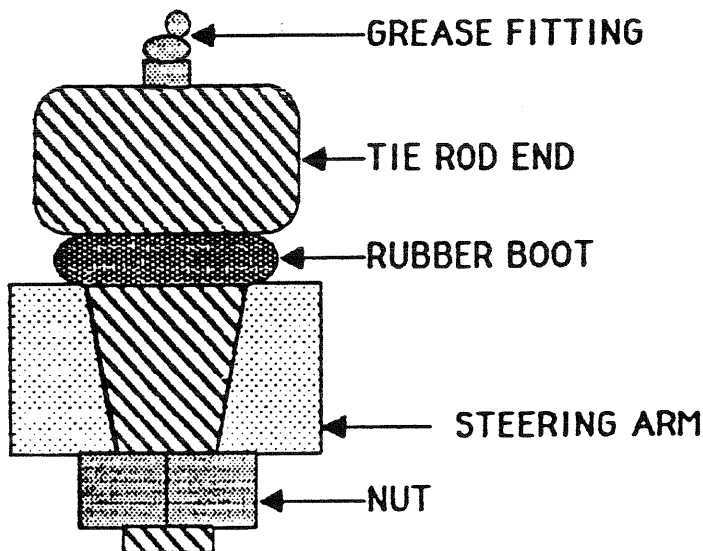
EXTENDED TIE ROD END LIFE

Skill Level D

Here is a simple trick which can extend the life of your tie rod ends considerably. This is especially true if the boots crack or come loose from the lip on the tie rod. The TR 6 tie rod end is mounted with the ball and socket up. This tends to make the small amount of grease put in a new ball joint run downward when hot, leaving the ball dry and prone to rapid wear. Simply install a grease fitting in the tie rod end and grease regularly.

Drill a $7/32"$ or $15/64"$ hole in the sheet metal plug in the top and tap this out to $1/4 \times 28$ fine thread. Do not run the tap in all the way to the full threads. Stop a little short. This will allow the grease fitting to get a firm fit in the rather thin metal. The drill, tap, and the grease in the joint should carry all the drill cuttings upward and away from the hole.

When you grease the tie rod end do not overfill the boot or it will come off the retaining groove. Only pump until you see the SLIGHTEST amount of movement of the boot, usually about 5 pumps.



OILING Your Steering Gear

Skill Level C/D

The owners handbook and all the other sources tell you to remove the plug from the top of the steering rack, put in a grease fitting, give it 5 pumps of 90 gear oil and refit the plug. In the first place, why in hell would you go to all the trouble to install and remove a grease fitting each time? Leave the thing in there. Secondly, you stand a good chance of breaking the important ground wire (the little black one) under the plug. Next, you wouldn't think you could find a grease fitting with the same threads in the U.S. Last, and most important, you can't find a grease gun that will pump gear oil!

First, remove the plug from the cap. Next remove the cap. Now that one's not as easy as it sounds because it's a big mama. However, it isn't too tight so judicious use of a large Crescent wrench, pipewrench, or Vise-Grips will usually do the job. Be careful you do not lose any of the thin washers under the cap. There are two ways to go here- the craftsman approach or the Fred Flintstone special. First, the F. F. method. Take the cap to an auto parts store and get a 1/8 x 27 pipe thread grease fitting and try it in the hole. Pipe threads are tapered so after a few turns the fitting may jam tight. If it does, you'll have to build up enough washers to make the ground wire tight. The Bugatti Especialle method is to get a 1/8 x 27 tap and tap the hole out. Reinstall the cap, the ground wire, and install a 1/8 x 27 threaded grease fitting.

Now the fun begins - trying to get gear oil into the rack. You will need a small, inexpensive grease gun - one of those ones about an inch in diameter and four inches long. Also get a flex hose for it about 12" long. Open the gun and place about 1/4" of the stiffest grease you can find on the plunger. Pull the plunger all the way back and fill the gun with 85-140 gear oil (80 W-90 will do but 85-140 will not leak out of the gun as easy). Assemble the gun, snap it on the grease fitting, and pump away until the gun is empty. That's it. Repeat about every 5,000 to 10,000 miles depending on whether your steering rack boots leak.