ASSEMBLY INSTRUCTIONS

BUMP-STEER KIT

READ INSTRUCTIONS COMPLETELY BEFORE STARTING THIS PROJECT

****SEE WARRANTY AND DISCLAIMER ON LAST PAGE****

OVERVIEW OF BUMP-STEER

Definition of bump-steer: Bump-steer is a change in toe angle caused by the suspension moving up or down. Bump-steer is built into the geometry of the suspension and steering system, and has nothing to do with turning the steering wheel. The effect of bump-steer is for the wheel to toe-in or toe-out when the suspension moves up or down. This toe change or "steering" occurs any time the suspension moves, whether it is from body roll, brake-dive, or hitting a bump in the road. Bump steer is undesirable because the suspension is steering the car instead of the driver.

Cause of bump-steer: The front wheels do not move directly straight up or down when the car hits a bump. Instead, the wheel follows an arc, or curving path, that pushes the wheel slightly inward (towards the centerline of the car) or outward (away from the car) in response to vertical wheel movement. The outer tie-rod (which connects the steering rack to the wheel) also moves in-and-out in an arc as it moves up and down. If the rate which the outer tie-rod arcs in or out does not match the rate the wheel moves in or out, the wheel will be turned by the tie-rod. This is bump-steer.

The center point of the arc traveled by the wheel (known as the instant-center) is controlled by the location and angle of the moving suspension links. This point moves as the ride height changes. In contrast, the arc of the outer tie-rod is controlled by the position of the steering rack, which is fixed. In order to eliminate bump-steer, both the length and the center point of the two arcs must be the same. However, since the instant center moves with ride height, bump-steer cannot be eliminated throughout the entire range of suspension travel. Therefore suspension designers concentrate on minimizing bump-steer within the range of movement closest to factory ride height. Changing the ride height or other suspension components may move the suspension outside this narrow "optimized" window.

To lessen or eliminate a bump-steer problem, you need to alter the height of outer tie-rod relative to the steering rack. Small changes in this relationship can be made with offset rack bushings. Making big changes requires adjustable tie-rod ends, also known as a bump-steer kit.

BASIC INSTALLATION

Caution! Installing this product requires disassembly of some components of the steering system. If you are not confident you can complete the job safely, have the work performed by a certified technician who is familiar with the front suspension of a Mustang. **Failure to install this part properly may lead to serious injury or death.**

Before starting the installation of your QA1 bump-steer kit, read the instructions carefully and thoroughly. A good chassis manual, available at your local parts store, may also aid in your installation. Check to make sure you have all of the parts and hand tools needed to complete the installation.

1. Raise the front of the car and place it on jack stands. Consult your owner's manual for proper jacking points. Jack the vehicle up so that the vehicle sets securely on the stand. **SEE YOUR CAR'S OWNER'S MANUAL FOR PROPER JACKING LOCATIONS. DEATH OR SERIOUS INJURY CAN RESULT IF INSTRUCTIONS ARE NOT CORRECTLY FOLLOWED.**
2. Loosen the jam nut that locks the outer tie-rod to the inner tie rod. Do not back the nut far away from the outer tie rod. Just back it off enough so it is not contacting the outer tie-rod.
3. Remove the nut that holds the outer tie-rod to the spindle. Disconnect the tie-rod from the spindle. Tapping the side of the spindle with a hammer will loosen the tie rod so that it falls out.
4. Hold the inner tie-rod with a wrench to prevent it from spinning and unscrew the outer tie-rod until it comes completely off.
5. Thread the aluminum collar of the bump-steer kit onto the inner tie rod until it contacts the jam nut. Thread the steel rod-end (with jam nut) into the aluminum collar until the whole assembly matches the length of the original outer tie-rod that you removed earlier. Make sure the rod-end is threaded at least 1 inch into the aluminum collar. Tighten the jam nuts.
6. Insert the tapered end of the new tie-rod stud into the spindle. Secure it with the supplied nut.
7. Arrange the spacers and rod end on the straight portion of the tie-rod stud. The final adjustments will be made on an alignment rack by the alignment shop. In the meantime, install the spacers at your "best guess" position, which you determine by trying to make the tie rod as close as possible to parallel with the lower control arm.
8. Install the nut on the bottom of the stud. Torque the bottom nut to 50 ft.-lb. and the top nut to 40 ft.-lb.
9. Repeat steps 1 thru 8 on the other side of the car.
10. Recheck that all nuts are tight, including the jam nuts.
11. Bring the car to an alignment shop and align it according to the instructions below.

ADJUSTMENT

1. Set the car on an alignment rack (with moveable tables for the front wheels) and set the toe.
2. Next, compress the suspension at least 1 inch. This can be done by securing a winch ("come-along") to the floor and winching down on the front cross member, or otherwise depressing the front bumper. Measure the ride height with the suspension compressed. You will need to compress the suspension to this same height again later. Read the toe at the new compressed height and again at normal ride height. Compare the two readings. **The goal is to have the smallest possible change in toe between the at-rest and compressed suspension height.**

3. Rearrange the spacers and repeat step 2 from above. It is basically a process of trial and error until you achieve the smallest possible toe-change. See **Tips** below.
   Important: Compress the suspension the same amount each time so that you can compare the toe readings accurately.
   Important: Make sure you compare the "at-rest "and "compressed" readings to find the toe change each time you try a different arrangement of spacers. Do not directly compare the compressed toe readings, because the static toe will change when the spacers are rearranged. It is the **toe-change due to suspension movement** you are trying to reduce, not the total toe reading. If this is confusing, start at step 1 and reset the toe to the desired "at-rest" setting for each arrangement of spacers you try. That way the "compressed" toe readings can be compared directly.
   It is often impossible to achieve absolutely zero toe-change. It is better to arrange the spacers so that the car toes-in slightly when the suspension is compressed instead of toeing-out.
4. Once the spacers are arranged in their optimum position, reset the toe to the desired setting.

Tips to help find the correct setting more quickly:

- If the stock K-member, spindle and ball joints are used, the best position is more likely to be with the rod end at the middle to top of the stud (more spacers at the bottom).
- Caster angle settings affect bump steer. Increasing caster with caster/camber plates raises the outer tie-rod. The more caster is added, the more the spacers will be needed above the rod-end to compensate.