

# Front End Alignment

By Dick Harrington

Does your Falcon/Comet have a mind of its own as far as what direction it wants to head in? Maybe its time for a front end alignment! Understanding what's involved in an alignment will better prepare you for seeking a qualified professional that can get your baby tracking straight and true.

## Can it Be Aligned?

Before you head out to get an alignment done, it is imperative that you have all of the front suspension and steering parts in good working order. The Falcon/Comet front suspension consists of an upper control arm, lower control arm, coil spring, spring saddle, front strut rod and a shock absorber. The steering consists of upper and lower ball joints, tie rod ends, adjusting sleeves, centerlink, drag link and a steering gear box. Each of these parts can wear out do to many miles of roads well traveled and lack of maintenance (called an annual grease job). Lets review each part and what can wear out.

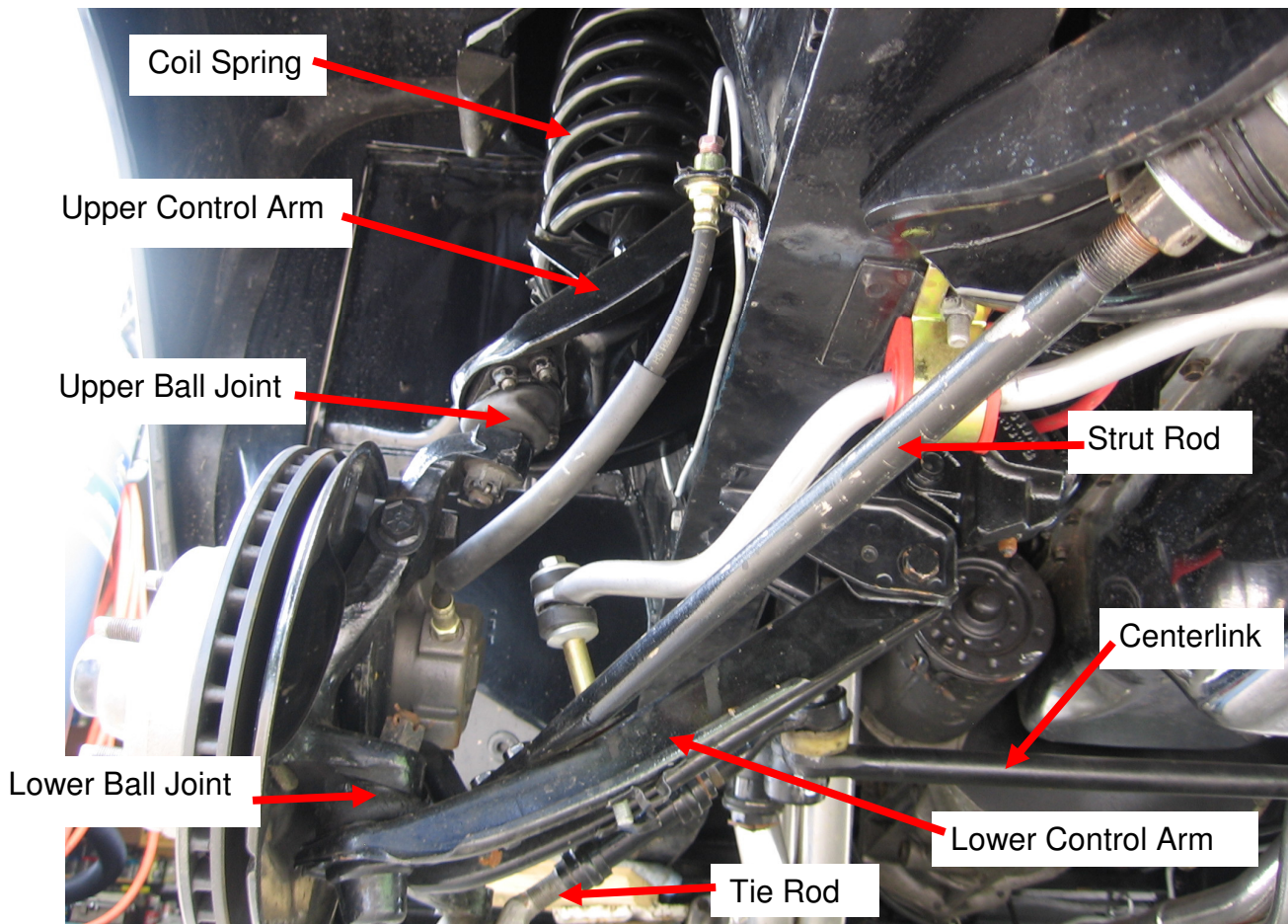
**Upper Control Arm** (also called an A arm) – the upper control arm pivots up and down on a shaft. That shaft threads into two large nuts, the nuts then thread on to the upper control arm. The treads on the shaft wear out, the first sign of wear is the squeak or grown during suspension travel. The shaft can be grease to increase its service life.

**Lower Control Arm** – the lower control arm pivots up and down on a bushing, just below the motor mount. Typically the bushing is an inner and outer steel sleeve that encapsulates rubber. Over time the rubber deteriorates and the bushing should be replaced,

**Coil Spring** – Transfers the weight of the car to the upper control arm. It sits in the shock tower and is attached to the upper A arm by a spring saddle. Coil springs get weak with age and if the car has noticeable sag they may need to be replaced.

**Spring Saddle** – Attaches the bottom of the coil spring to the upper control arm. It contains a pivot assembly that allows the coil spring to stay seated on top of the upper A arm during suspension travel. Early Falcons/Comets (1960-63) had greaseable bronze bushings in the spring saddle. Latter models switched to steel bushing with encapsulated rubber. The bronze bushing type will wear out and the encapsulated rubber ones will deteriorate. The bronze bushing type should be greased to increase its service life.

**Front Strut Rod** – Attaches to the lower control arm and the front frame cross member. On early Falcon/Comets the strut rods are adjustable; sometime in 1964 the strut rods became un-adjustable. There are large rubber bushing at the front of the of the strut rods that deteriorate over time.



Passenger side front suspension looking from the front. 1963 Falcon with Granada Disc brakes.

**Shock Absorber** – Runs through the center of the coil spring and attaches to the top of the shock tower and on the lower end to the spring saddle. They wear out with age and miles.

**Upper and Lower Ball Joints** – The ball joints tie the upper and lower control arms to the spindle. Age, dirt and rough roads wear out ball joints. Ball joints should be greased at each oil change.

**Tie Rods** – A self explanatory name, tie rods tie the spindles to the steering box, so the wheels can steer. A tie rod is really another ball joint. There are four tie rods, an inner and an outer on each side of the car. Age, dirt and rough roads wear out tie rod ends. Tie rod ends should be greased at each oil change.

**Adjusting Sleeve** – A treaded hollow sleeve that ties an inner and outer tie rod end together. It is threaded to allow adjustment. There is one on each side of the car.

**Centerlink** – A long steel rod that ties the inner tie rods to each other. It also fastens to the pitman arm on the steering gear box and to the drag link.

**Drag Link** – This supports the centerlink on the passenger side of the car. It contains a bushing that allows a shaft within the drag link to pivot as the vehicle is turned. The bushing can wear out with age.

**Steering Gear Box** – This is what converts your rotary steering wheel motion into linear motion to shift the wheels left or right. It contains bearings, gears, and steel balls. Each of these parts can wear out with age. There is grease in the steering box that should be checked every 20 years or so!

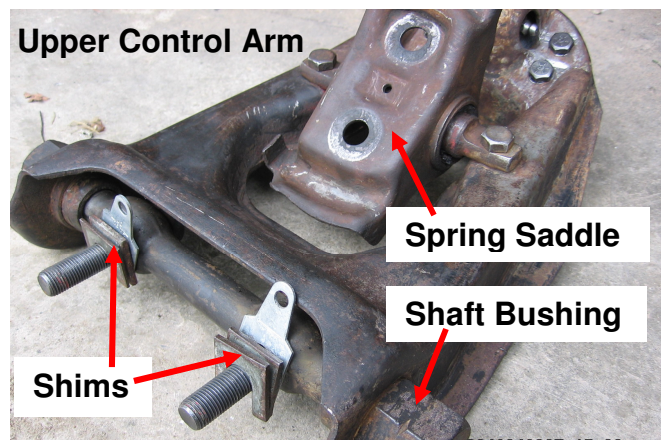
Before paying for an alignment you should have a qualified automotive technician check all of the suspension and steering components for wear. Absolutely no way can an alignment be done if any one of the above mentioned parts is worn out.

## Understanding the Alignment Process

When a Falcon/Comet is aligned, four areas are checked and adjusted if necessary. The four areas are:

**Camber** – Camber is the angle of the tire to the road. Negative camber leans the tire in at the top (towards the motor) and Positive camber leans the tire out (away from the motor). The object of camber is to keep the tire tread flat on the road. A sign that camber is not adjusted properly is the inner or outer edge of a tire wearing faster than the rest of the tire. Camber is adjusted by placing shims behind the bolts that attach the upper control arm to the shock tower.

**Caster** – Caster is the angle of the upper and lower ball joints to each other. Positive caster leans the top of the upper control arm towards the driver (in relationship to the lower control arm). Negative caster leans the top of the upper control arm away from the driver. A little positive caster will help the steering wheel return to center after a turn is completed. Too much positive caster will increase steering effort. Caster is adjusted by placing shims behind the bolts that attach the upper control arm to the shock tower.

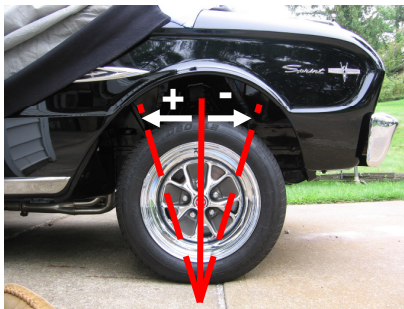


An upper control arm removed from a car. Note the location of where the shims go to adjust camber and caster. If your suspension creaks and groans, it is probably due to lack of lubrication at the upper control arm shaft bushings.

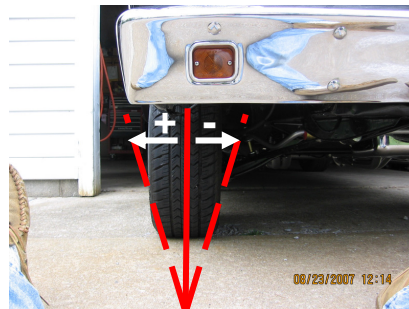
When adjusting caster and camber it is desirable to have each side of the car similarly adjusted. A vehicle that pulls in one direction is likely due to differences between each side.

**Toe** – Toe is the angle of the front wheels to each other. Zero toe would mean that the front wheels are parallel to each other and aligned with the rear wheels. Toe-in means that the fronts of the tires are turned slightly towards each other. Toe-out means the fronts of the tires are turned slightly away from each other. Toe is adjusted by rotating the adjusting sleeve between the inner and outer tie rod ends on each side of the vehicle.

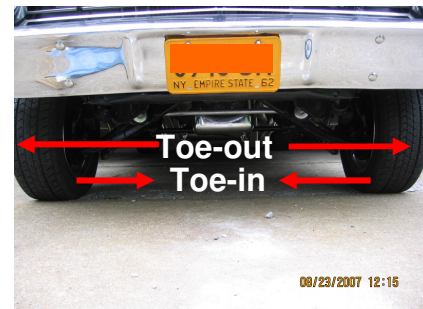
**Centered Steering Wheel** – When going down the road it is nice to have the wheel facing straight when the car is going straight. This is done by rotating the adjusting sleeves between the inner and outer tie rod ends on each side of the vehicle. This is considered by most technicians to be part of adjusting toe.



Caster



Camber



Toe

## The Alignment

A modern alignment is done on a pretty sophisticated piece of equipment. The alignment machine will make use of a computer, lasers and photo optics to precisely measure your wheel locations in reference to each other. A typical alignment machine will cost upwards of \$20,000 and required a highly trained and skilled technician to operate it. It will probably take a minimum of 2 hours to do the alignment.

Your car will be placed on a large rack (lift), each wheel will be raised and have an alignment head attached. Each wheel will be rotated with the alignment head to check each wheel for run out (run out is a measure of how straight your rims are, hit any curbs lately), this is called compensated. Once each wheel is compensated, a caster sweep will be done (this involves steering the wheels in each direction). The technician will now have a read out of your car and can compare it to the vehicle alignment specifications (this information is stored in the computer and yes, Falcon and Comet data is there).

Camber and Caster are adjusted first. Since both caster and camber are controlled by shims behind the upper control arm, it is a balancing act to get correct. A 1/32" shim will

change either caster or camber about a ½ degree. The process involves loosening the upper control arm bolts, prying out on the upper control arm and inserting a shim. The control arm is then tightened and a caster sweep is redone. This process is repeated until the vehicle is brought into camber and caster specification.

After camber and caster are in spec, the steering wheel is centered and the toe is adjusted to specification.

## Potential Issues

Before heading to the alignment rack with my Sprint hardtop, I replaced all of the potential wear components. The car was placed on the rack and the alignment was begun, the technician (me) could not get a consistent reading. It was determined that there was a binding in the suspension someplace. I went back home and disassembled the suspension and found that I had over tightened the upper control arm shaft nuts. Returning back to the rack, again a consistent reading could not be obtained. In examining the situation, it was determined that the super heavy duty front coil springs that were in the car had the tie rod ends at such an extreme angle that on suspension extension they were binding up. Returning home again, the front suspension was disassembled again and the coil springs were replaced. Back on the rack again and this time a good consistent camber caster was achieved. A quick trial run and the car drove nice and straight, but was a little twitchy on turn in. Back on the rack again a little more toe-in was added. The car now steers very nicely and goes down the road nice and straight.

Some of my Falcon/Comet buddies have been turned away from an alignment shop because the alignment heads could not be mounted on the rear wheels. The issue is the quarter panel sheet metal covers up the upper portion of the rear tire. I had this issue occur on my 63 convertible and resolved it by lifting the frame of the car to gain clearance and then mounting the alignment head horizontally instead of vertically after the wheel was compensated. The vehicle was then lowered for the alignment process.

**Footnote:** I work for a technical college and have access to an alignment rack. I spent at least 30 hours on the rack. Obviously I am not a highly trained automotive technician! The Falcon/Comet is a bear to align. You have to get under the hood to loosen the upper control arm, then get under the wheel well to add or remove shims and return to under the hood to tighten the upper control arm (of course some of the shims will fall off at this point). This process is repeated time and again until the specs are met. With experience, I got my time down to about three hours.

My advice is to look for an alignment facility that has a fixed price alignment and an old guy. New vehicles are mostly aligned by turning bolts and shims are not required. This is much simpler and much more accurate.