Steering geometry

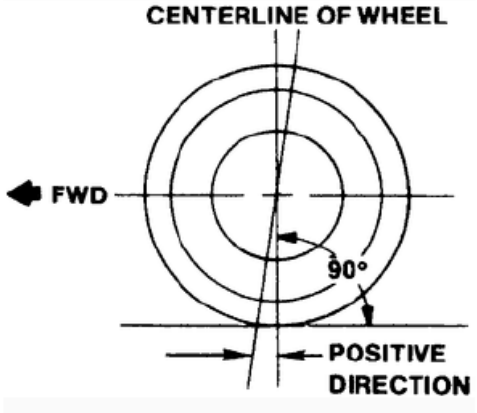
Front wheel alignment (also known as front-end geometry) is the position of the front wheels relative to each other and to the vehicle. Correct alignment must be maintained to provide safe, accurate steering, vehicle stability and minimum tire wear. The factors that determine wheel alignment are interdependent. Therefore, when one of the factors is adjusted, the others must be adjusted to compensate.

Front-end alignment is best checked with sophisticated equipment, such as an alignment rack.

Caster angle
See Figure 16

Caster angle is the number of degrees that a line, drawn through the center of the upper and lower ball joints (or strut and lower ball joint) and viewed from the side, can be tilted forward or backward. Positive caster means that the top of the upper ball joint (or strut) is tilted toward the rear of the vehicle, and negative caster means that it is tilted toward the front. A vehicle with a slightly positive caster setting will have its lower ball joint pivot slightly ahead of the tire's center. This will assist the directional stability of the vehicle by causing a drag at the bottom center of the wheel when it turns, thereby resisting the turn and tending to hold the wheel steady in whatever direction the vehicle is pointed. A vehicle with too much (positive) caster will be hard to steer and shimmy at low speeds. A vehicle with insufficient (negative) caster may tend to be unstable at high speeds and may respond erratically when the brakes are applied.

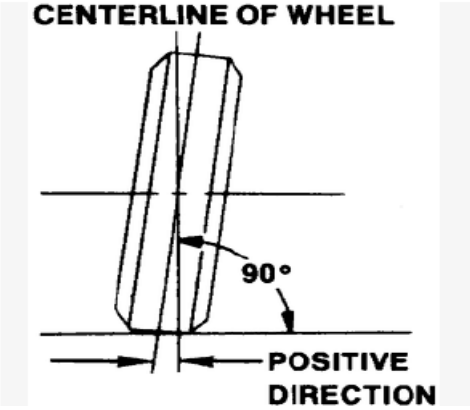
Figure 16 A positive caster angle will have the lower ball joint pivot slightly ahead of the center of the tire and the strut or upper ball joint tilted toward the rear of the vehicle.



Camber angle
See Figure 17

Camber angle is the number of degrees that the wheel itself is tilted from a vertical line, when viewed from the front. Positive camber means that the top of the wheel is slanted away from the vehicle, while negative camber means that it is tilted toward the vehicle. Ordinarily, a vehicle will have a slight positive camber when unloaded. Then, when the vehicle is loaded and rolling down the road, the wheels will just about be vertical. If you started with no camber at all, then loading the vehicle would produce a negative camber. Excessive camber (either positive or negative) will produce rapid tire wear, since one side of the tire will be more heavily loaded than the other side.

Figure 17 A positive caster angle means that the top of the wheel is slanted slightly away from the vehicle so that when loaded, the wheels will be approximately vertical, producing even tire wear.

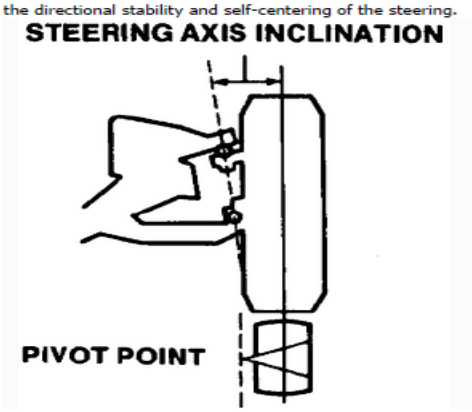


Steering axis inclination
See Figure 18

Steering axis inclination is the number of degrees that a line drawn through the upper and lower ball joints (or strut and lower ball joint) and viewed from the front is tilted to the left or the right. This, in combination with caster, is responsible for the directional stability and self-centering of the steering. As the steering knuckle swings from lock to lock, the spindle generates an arc, causing the vehicle to be raised when it is turned from the straight-ahead

position. The reason the body of the vehicle must rise is straightforward: since the wheel is in contact with the ground, it cannot move down. However, when it is swung away from the straight-ahead position, it must move either up or down (due to the arc generated by the steering knuckle). Not being able to move down, it must move up. Then, the weight of the vehicle acts against this lift, and attempts to return the spindle to the straight-ahead position when the steering wheel is released.

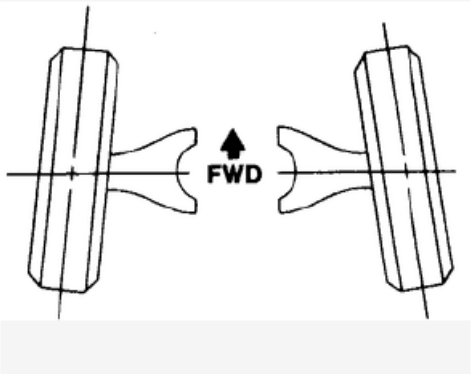
Figure 18 Steering axis inclination, in combination with caster, is responsible for the directional stability and self-centering of the steering.



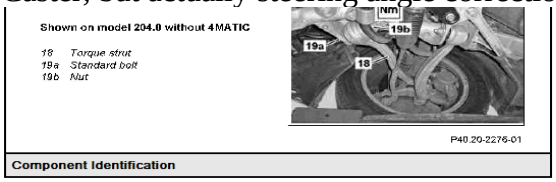
Toe-in
See Figure 19

Toe-in is the difference (in inches) between the front and the rear of the front tires. On a vehicle with toe-in, the distance between the front wheels is less at the front than at the rear. Toe-in is normally only a few fractions of an inch, and is necessary to ensure parallel rolling of the front wheels and to prevent excessive tire wear. As the vehicle is driven at increasingly faster speeds, the steering linkage has a tendency to expand slightly, thereby allowing the front wheels to turn out and away from each other. Therefore, initially setting the front wheels so that they are pointing slightly inward (toe-in) allows them to turn straight ahead when the vehicle is underway.

Figure 19 Toe-in.



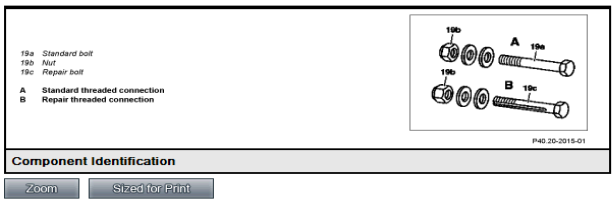
Caster, but actually steering angle correction.



Component Identification

Zoom | Sized for Print

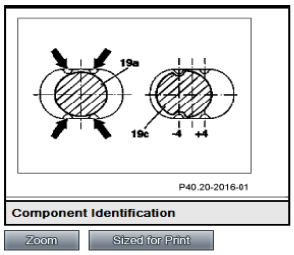
3 Remove series bolt (19a) with nut (19b) on torque strut (18).
For caster correction.



Component Identification

Zoom | Sized for Print

4 To adjust camber and caster, replace the respective standard bolt (19a) on the torque strut (18) or cross strut (17) with a repair bolt (19c).
A Standard threaded connection
B Repair threaded connection



Component Identification

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The standard bolt (19a) is centered by the bumps (arrows) in the bearing of the torque strut (18) or cross strut (17). Grooves in the repair bolt (19c) permit it to be installed into the rubber mount on either the right or left side, allowing the torque strut (18) or cross strut (17) to be adjusted by a distance of 4 mm to the inside or outside.
The repair bolt (19c) must not be rotated after being fixed into place in the rubber mount of the strut rod (18) or the cross strut (17). Do not tighten the nut (19b) yet so that the rubber mount of the strut rod (18) or cross strut (17) can twist when the vehicle is rocked to settle the suspension.