Wheel Alignment - Corvette

SPECIFICATIONS

WHEEL ALIGNMENT SPECIFICATIONS

Wheel Alignment Specifications

Suspension	Camber	Camber Cross Tolerance	Caster	Caster Cross Tolerance	Total Toe	Steering Wheel Angle	Thrust Angle
FE1 & FE3							
Front	-0.20° +/- 0.5°	+/- 0.5°	7.4° +/- 0.5°	+/- 0.5°	0.08° +/- 0.20°	0° +/- 1.0°	-
Rear	-0.18° +/- 0.5°	+/- 0.5°	-	-	-0.02° +/- 0.20°	-	0.0° +/- 0.10°
FE4 (Z06)							
Front	-0.70° +/- 0.5°	+/- 0.5°	6.9° +/- 0.5°	+/- 0.5°	0.08° +/- 0.20°	0° +/- 1.0°	-
Rear	-0.68° +/- 0.5°	+/- 0.5°	-	-	-0.02° +/- 0.20°	-	0.0° +/- 0.10°

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Lower Control Arm Cam Bolt Nut	170 N.m	125 lb ft
Front Tie Rod Jam Nut	68 N.m	50 lb ft
Rear Lower Control Arm Cam Bolt Nut, Front	145 N.m	107 lb ft
Rear Lower Control Arm Cam Bolt Nut, Rear	95 N.m	70 lb ft
Rear Tie Rod Jam Nut	60 N.m	44 lb ft

REPAIR INSTRUCTIONS

MEASURING WHEEL ALIGNMENT

Steering and vibration complaints are not always the result of improper alignment. One possible cause is wheel and tire imbalance. Another possibility is tire lead due to worn or improperly manufactured tires. Lead/pull is defined as follows: At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path. Lead is the vehicle deviation from a straight path on a level road without pressure on the steering wheel. Refer to **Radial Tire Lead/Pull Correction** in Tires and Wheels in order to determine if the vehicle has a tire lead problem.

Before performing any adjustment affecting wheel alignment, perform the following inspections and adjustments in order to ensure correct alignment readings:

- Inspect the tires for the proper inflation and irregular tire wear. Refer to **Tire Inflation Pressure Specifications (1)** in Maintenance and Lubrication and **Tire Diagnosis - Irregular or Premature Wear** in Tires and Wheels.
- Inspect the runout of the wheels and the tires. Refer to **Tire and Wheel Runout Specifications** in Vibration Diagnosis and Correction.
- Inspect the wheel bearings for backlash and excessive play. Refer to **Wheel Bearings Diagnosis** in Suspension General Diagnosis.
- Inspect the ball joints and tie rod ends for looseness or wear.
- Inspect the control arms and stabilizer shaft for looseness or wear.
- Inspect the steering gear for looseness at the frame. Refer to **Fastener Tightening Specifications** in Power Steering System.
- Inspect the struts/shock absorbers for wear, leaks, and any noticeable noises. Refer to **Struts or Shock Absorbers On-Vehicle Testing** in Suspension General Diagnosis.
- Inspect the vehicle trim height. Refer to **Trim Height Inspection Procedure** in Suspension General Diagnosis.
- Inspect the steering wheel for excessive drag or poor return due to stiff or rusted linkage or suspension components.
- Inspect the fuel level. The fuel tank should be full or the vehicle should have a compensating load added.

Give consideration to excess loads, such as tool boxes, sample cases, etc. If normally carried in the vehicle, these items should remain in the vehicle during alignment adjustments. Give consideration also to the condition of the equipment being used for the alignment. Follow the equipment manufacturer's instructions.

Satisfactory vehicle operation may occur over a wide range of alignment settings. However, if the setting exceeds the service allowable specifications, correct the alignment to the service preferred specifications. Refer to **Wheel Alignment Specifications** .

Perform the following steps in order to measure the front and rear alignment angles:

1. Install the alignment equipment according to the manufacturer's instructions.
2. Jounce the front and the rear bumpers 3 times prior to checking the wheel alignment.
3. Measure the alignment angles and record the readings.

IMPORTANT: When performing adjustments to vehicles requiring a 4-wheel alignment, set the rear wheel alignment angles first in order to obtain proper front alignment angles.

4. Adjust alignment angles to vehicle specification, if necessary. Refer to **Wheel Alignment Specifications** .

FRONT CASTER AND CAMBER ADJUSTMENT

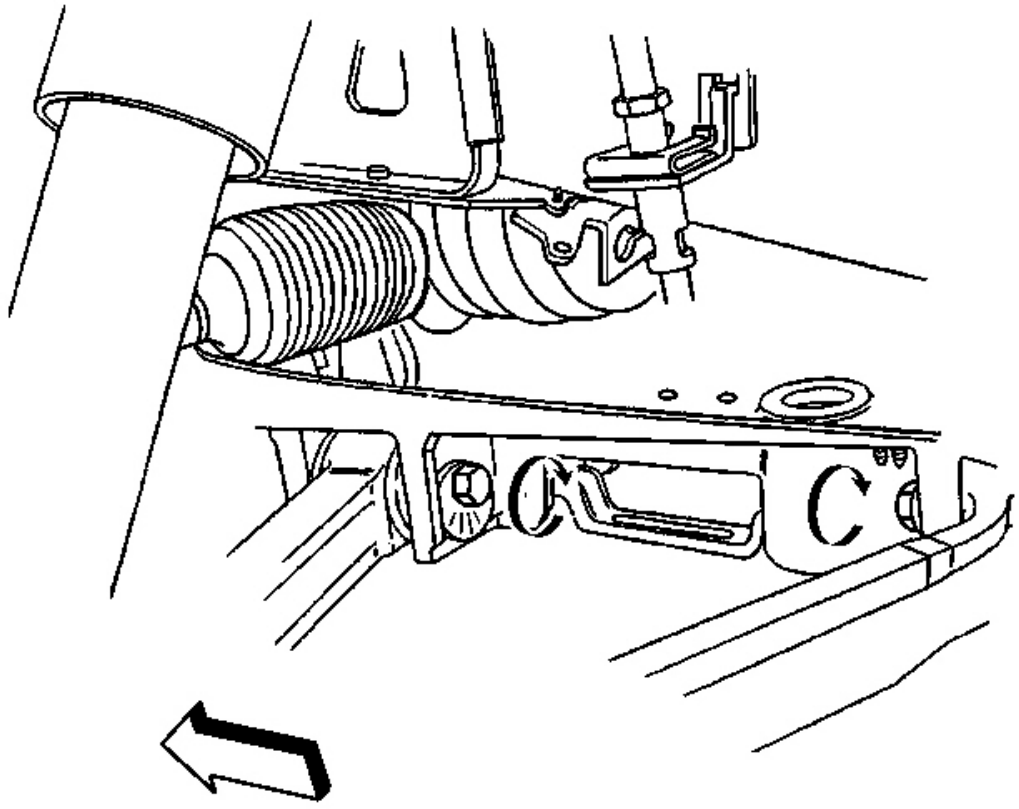

Fig. 1: Front Caster And Camber
Courtesy of GENERAL MOTORS CORP.

1. Loosen the lower control arm cam bolt nuts.
2. Rotate the cam bolts to the required caster or camber specification setting. Refer to **Wheel Alignment Specifications** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Maintain the caster or camber setting while tightening the cam bolt nuts.

Tighten: Tighten the front lower control arm cam bolt nuts to 170 N.m (125 lb ft).

IMPORTANT: Check the toe setting AFTER changing camber or caster.

4. Check the caster and camber settings after tightening.

5. Adjust the caster and camber setting if necessary.

FRONT TOE ADJUSTMENT

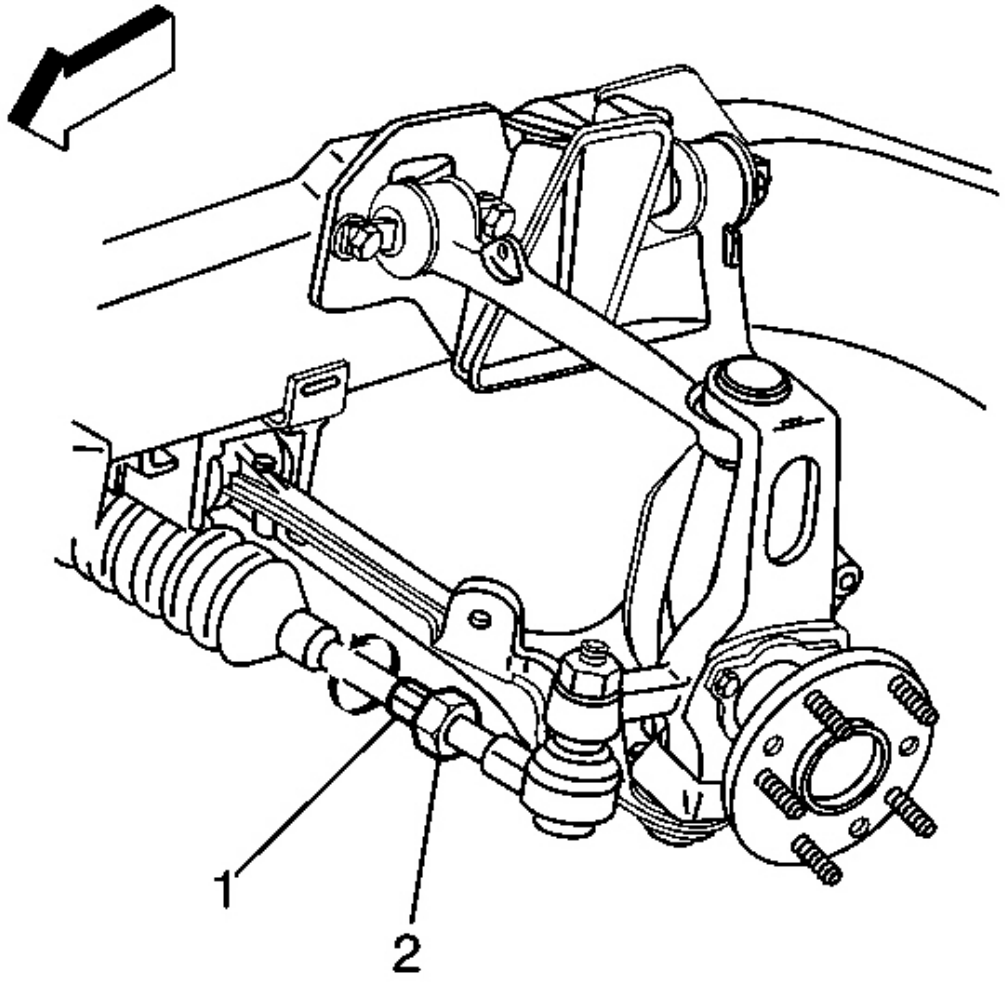

Fig. 2: Jam Nut & Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

1. Loosen the jam nut on the tie rod (2).
2. Rotate the inner tie rod (1) to the required toe specification setting. Refer to **Wheel Alignment Specifications** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Tighten the jam nut on the tie rod.

   Tighten: Tighten the front tie rod jam nut to 68 N.m (50 lb ft).

4. Check the toe setting after tightening.
5. Adjust the toe setting if necessary.

REAR CAMBER ADJUSTMENT

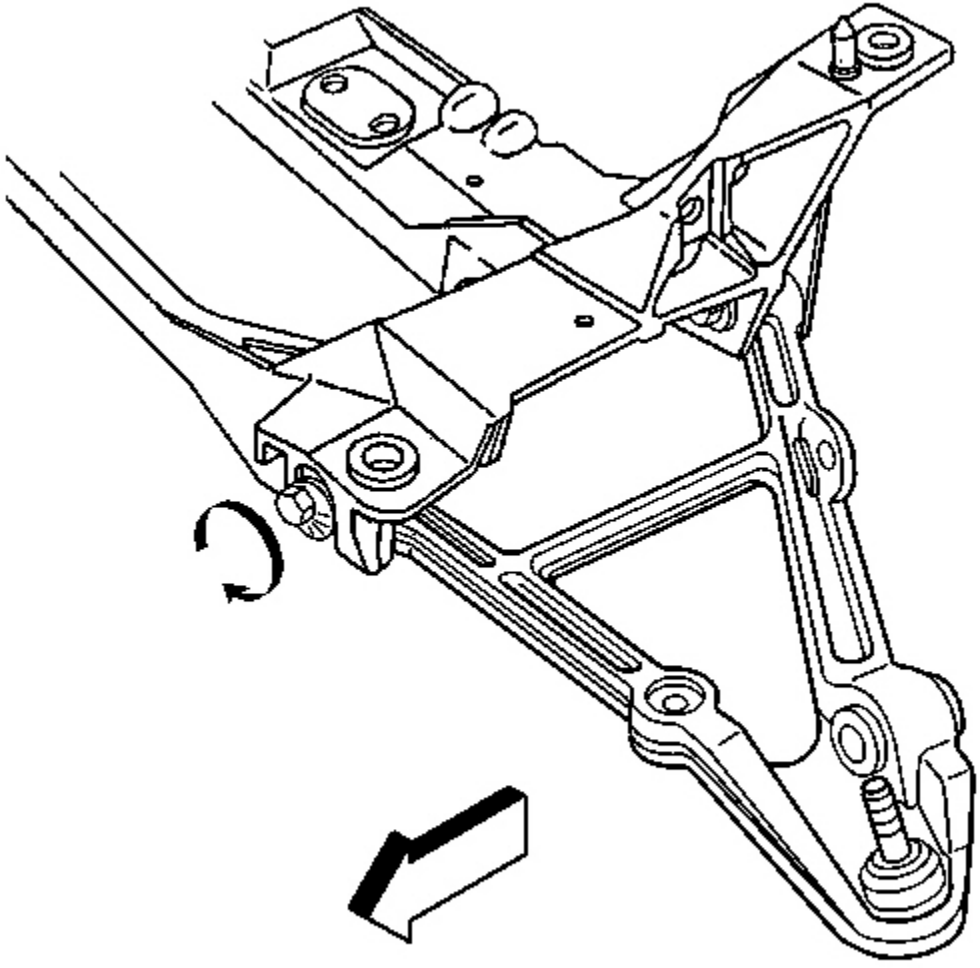

Fig. 3: Lower Control Arm Cam
Courtesy of GENERAL MOTORS CORP.

1. Loosen the lower control arm cam bolt nuts.
2. Rotate the cam bolts to the required camber specification setting. Refer to **Wheel Alignment Specifications** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Maintain the camber setting while tightening the cam bolt nuts.

Tighten:

- Tighten the rear lower control arm (front) bolt nut to 145 N.m (107 lb ft).
- Tighten the rear lower control arm (rear) bolt nut to 95 N.m (70 lb ft).

IMPORTANT: Check the toe setting AFTER changing camber or caster.

4. Check the camber setting after tightening.

   Adjust the camber setting if necessary.

REAR TOE ADJUSTMENT

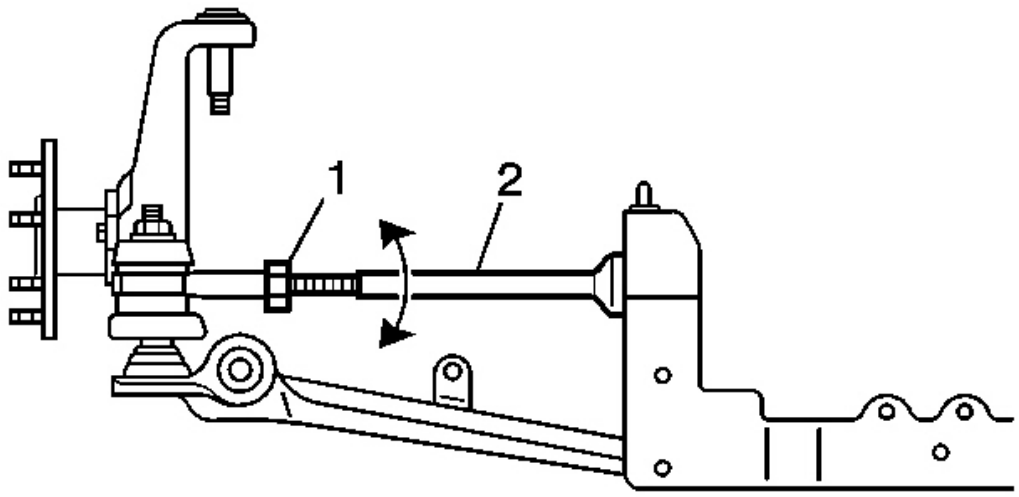

Fig. 4: Rear Suspension Adjustment Link Lock Nut & Inner Tie Rod
Courtesy of GENERAL MOTORS CORP.

1. Loosen the rear suspension adjustment link lock nut (1).
2. Rotate the inner tie rod (2) to the required toe specification setting. Refer to **Wheel Alignment Specifications** .

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Tighten the rear suspension adjustment link lock nut.

   Tighten: Tighten the rear suspension adjustment link lock nut to 60 N.m (44 lb ft).

4. Check the toe setting after tightening.
5. Adjust the toe setting if necessary.

DESCRIPTION AND OPERATION

CASTER DESCRIPTION

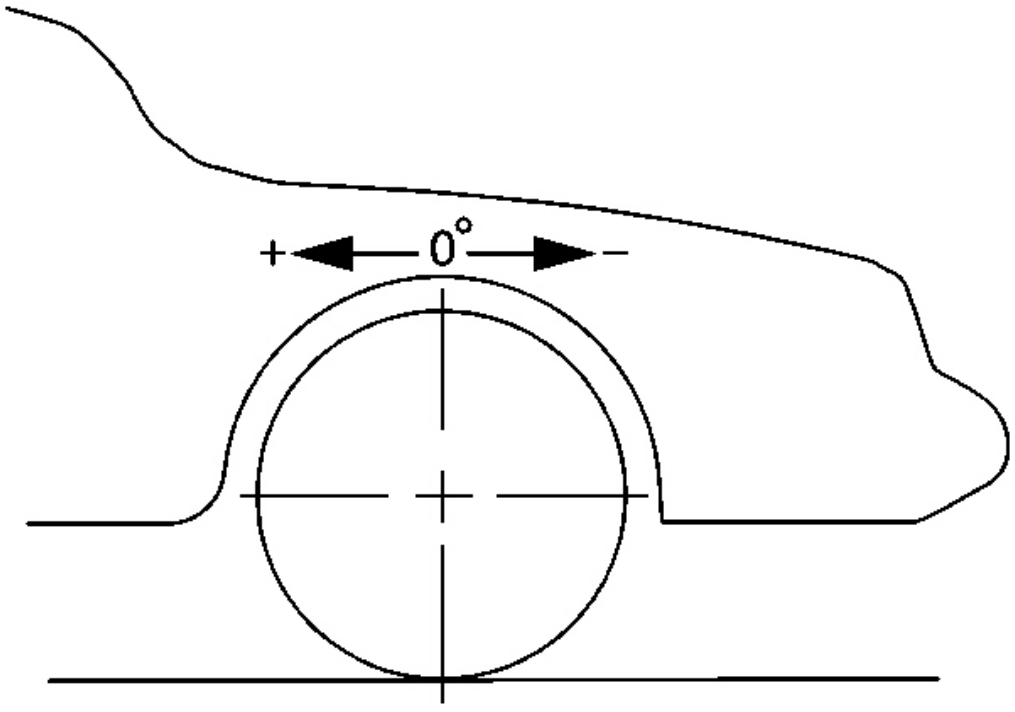

Fig. 5: Illustrating Caster Angle
Courtesy of GENERAL MOTORS CORP.

Caster is the tilting of the uppermost point of the steering axis either forward or backward, when viewed from the side of the vehicle. A backward tilt is positive (+) and a forward tilt is negative (-). Caster influences directional control of the steering but does not affect the tire wear. Caster is affected by the vehicle height, therefore it is important to keep the body at its designed height. Overloading the vehicle or a weak or sagging rear spring will affect caster. When the rear of the vehicle is lower than its designated trim height, the front suspension moves to a more positive caster. If the rear of the vehicle is higher than its designated trim height, the front suspension moves to a less positive caster.

With too little positive caster, steering may be touchy at high speed and wheel returnability may be diminished when coming out of a turn. If one wheel has more positive caster than the other, that wheel will pull toward the center of the vehicle. This condition will cause the vehicle to pull or lead to the side with the least amount of positive caster.

CAMBER DESCRIPTION

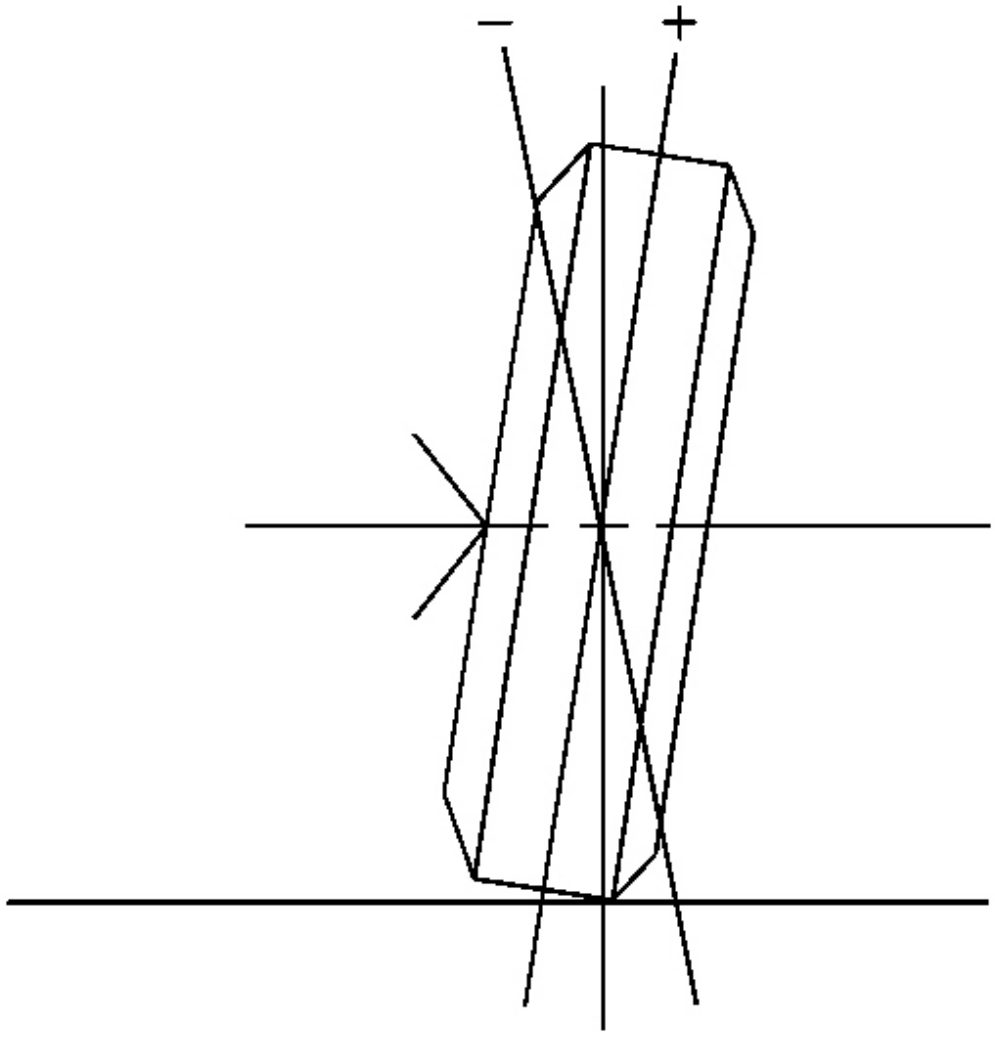

Fig. 6: Illustrating Camber Angle
Courtesy of GENERAL MOTORS CORP.

Camber is the tilting of the wheels from the vertical when viewed from the front of the vehicle. When the wheels tilt outward at the top, the camber is positive (+). When the wheel tilts inward at the top, the camber is negative (-). The amount of tilt is measured in degrees from the vertical. Camber settings influence the directional control and the tire wear.

Too much positive camber will result in premature wear on the outside of the tire and cause excessive wear on the suspension parts.

Too much negative camber will result in premature wear on the inside of the tire and cause excessive wear on the suspension parts.

Unequal side-to-side camber of 1 degree or more will cause the vehicle to pull or lead to the side with the most positive camber.

TOE DESCRIPTION

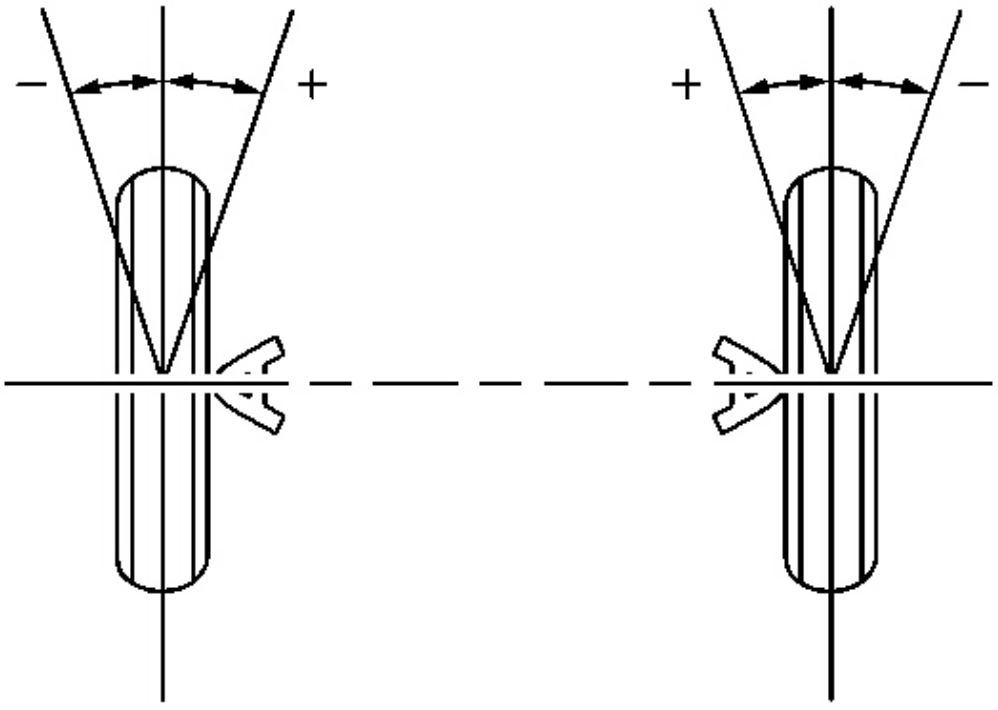

Fig. 7: Illustrating Toe
Courtesy of GENERAL MOTORS CORP.

Toe is a measurement of how much the front and/or rear wheels are turned in or out from a straight-ahead position. When the wheels are turned in, toe is positive (+). When the wheels are turned out, toe is negative (-). The actual amount of toe is normally only a fraction of a degree. The purpose of toe is to ensure that the wheels roll parallel.

Toe also offsets the small deflections of the wheel support system that occur when the vehicle is rolling forward. In other words, with the vehicle standing still and the wheels set with toe-in, the wheels tend to roll parallel on the road when the vehicle is moving.

Improper toe adjustment will cause premature tire wear and cause steering instability.

THRUST ANGLES DESCRIPTION

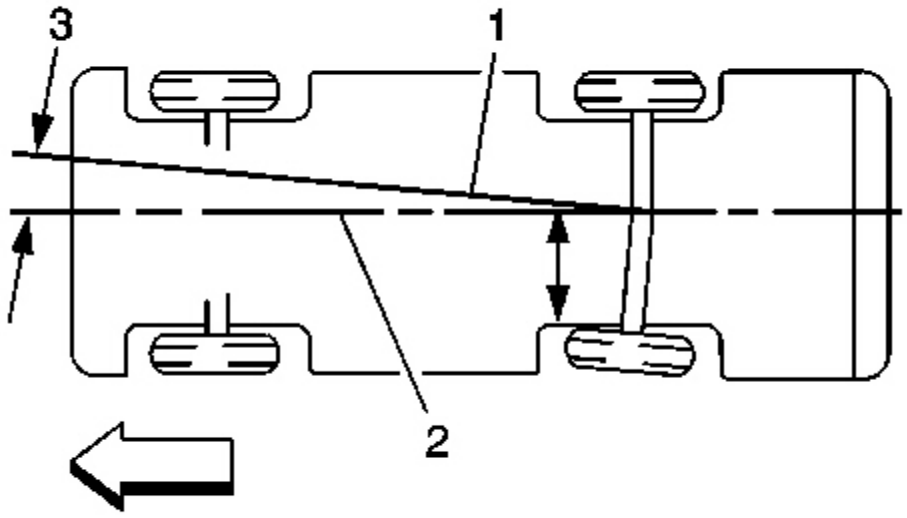

Fig. 8: Illustrating Thrust Angles
Courtesy of GENERAL MOTORS CORP.

The front wheels aim or steer the vehicle. The rear wheels control tracking. This tracking action relates to the thrust angle (3). The thrust angle is the path that the rear wheels take. Ideally, the thrust angle is geometrically aligned with the body centerline (2).

In the illustration, toe-in is shown on the left rear wheel, moving the thrust line (1) off center. The resulting deviation from the centerline is the thrust angle.

If the thrust angle is not set properly the vehicle may "dog track", the steering wheel may not be centered or it could be perceived as a bent axle. Thrust angle can be checked during a wheel alignment.

Positive thrust angle means the thrust line is pointing to the right hand side (RHS) of the vehicle.

Negative thrust angle means the thrust line is pointing to the left hand side (LHS) of the vehicle.

If the thrust angle is out of specification, moving the axle to body relationship will change the thrust angle reading.

If the vehicle is out in the Positive (+) direction-moving the RHS forward and/or LHS rearward will move the thrust angle towards zero degrees.

If the vehicle is out in the Negative (-) direction-moving the RHS rearward and/or LHS forward will move the thrust angle towards zero degrees.

LEAD/PULL DESCRIPTION

At a constant highway speed on a typical straight road, lead/pull is the amount of effort required at the steering wheel to maintain the vehicle's straight path.

Lead/pull is usually caused by the following factors:

- Tire construction
- Wheel alignment
- Unbalanced steering gear

The way in which a tire is built may produce lead/pull. The rear tires will not cause lead.

MEMORY STEER DESCRIPTION

Memory steer is when the vehicle wants to lead or pull in the direction the driver previously turned the vehicle. Additionally, after turning in the opposite direction, the vehicle will want to lead or pull in that direction.

WANDER DESCRIPTION

Wander is the undesired drifting or deviation of a vehicle to either side from a straight path with hand pressure on the steering wheel. Wander is a symptom of the vehicle's sensitivity to external disturbances, such as road crown and crosswind, and accentuated by poor on-center steering feel.

SCRUB RADIUS DESCRIPTION

Ideally, the scrub radius is as small as possible. Normally, the SAI angle and the centerline of the tire and the wheel intersect below the road surface, causing a positive scrub radius. With struts, the SAI angle is much larger than the long arm/short arm type of suspension. This allows the SAI angle to intersect the camber angle above the road surface, forming a negative scrub radius. The smaller the scrub radius, the better the directional stability. Installing aftermarket wheels that have additional offset will dramatically increase the scrub radius. The newly installed wheels may cause the centerline of the tires to move further away from the spindle. This will increase the scrub radius.

A large amount of scrub radius can cause severe shimmy after hitting a bump. Four-wheel drive vehicles with large tires use a steering damper to compensate for an increased scrub radius. Scrub radius is not directly measurable by the conventional methods. Scrub radius is projected geometrically by engineers during the design phase of the suspension.

SPECIFICATIONS

Use illustration for wheel alignment specifications. See **Fig. 1** .

Suspension	Camber	Camber Cross Tolerance	Caster	Caster Cross Tolerance	Total Toe	Steering Wheel Angle	Thrust Angle
FE1 & FE3							
Front	-0.20° ± 0.5°	± 0.5°	7.4° ± 0.5°	± 0.5°	0.08° ± 0.20°	0° ± 1.0°	--
Rear	-0.18° ± 0.5°	± 0.5°	--	--	-0.02° ± 0.20°	--	0.0° ± 0.10°
FE4 (Z06)							
Front	-0.70° ± 0.5°	± 0.5°	6.9° ± 0.5°	± 0.5°	0.08° ± 0.20°	0° ± 1.0°	--
Rear	-0.68° ± 0.5°	± 0.5°	--	--	-0.02° ± 0.20°	--	0.0° ± 0.10°

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Fig. 1: Wheel Alignment Specifications
Courtesy of GENERAL MOTORS CORP.