SPECIFICATIONS

WHEEL ALIGNMENT SPECIFICATIONS

Wheel Alignment Specifications

Truck Line	Model	Caster L-R		Cross Caster, L-R	Camber	Cross Camber, L-R	Toe	Steering Wheel Angle
IMPORTANT: **Caster is relative to frame. The caster values must be compensated for the measured frame angle. Frame angle is positive when higher in the rear and negative when lower in the rear. Refer to Front Caster and Camber Adjustment.**								
C1500	Silverado, Sierra w/16" Tires Reg, Ext Cab or Crew Cab	3.75° +/- 1.00°	4.00° +/- 1.00°	- 0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
C1500HD	Silverado, Sierra w/16" Tires Crew Cab	4.50° +/- 1.00°	4.75° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
K1500	Silverado, Sierra w/16" Tires Reg, Ext Cab or Crew Cab	3.80° +/- 1.00°	4.10° +/- 1.00°	- 0.30° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
K1500	Silverado, Sierra w/17" Tires Reg, Ext Cab or Crew Cab	3.60° +/- 1.00°	4.30° +/- 1.00°	-0.70° +/- 0.75°	+0.25° +/- 0.60°	0.00°+/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
K1500	Sierra Denali w/20" Tires	3.50° +/- 1.00°	4.50° +/- 1.00°	-1.00° +/- 0.75°	- 0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
C1500/K 1500	Silverado/Silverado SS/Sierra, w/20" Tires	4.10° +/- 1.00°	5.10° +/- 1.00°	-1.00° +/- 0.75°	-0.10° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
K1500HD	Silverado, Sierra Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
C2500LD	Silverado, Sierra Reg or Ext Cab	4.50° +/- 1.00°	4.75° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	- 1.0° +/- 3.5°
K2500LD	Silverado, Sierra Reg, Ext Cab or Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°

C2500HD	Silverado, Sierra Reg, Ext Cab or Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
K2500HD	Silverado, Sierra Reg, Ext Cab or Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
C3500/3600	Silverado, Sierra Reg, Ext Cab or Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
K3500/3600	Silverado, Sierra w/Dually Reg, Ext Cab or Crew Cab	4.25° +/- 1.00°	4.50° +/- 1.00°	-0.25° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
K3500/3600	Silverado, Sierra Non-Dually Reg, Ext Cab	4.50° +/- 1.00°	5.00° +/- 1.00°	-0.50° +/- 0.75°	+0.25° +/- 0.60°	0.00° +/- 0.60°	+0.10° +/- 0.20°	-1.0° +/- 3.5°
C/K 1500	Silverado, Sierra with Rear Wheel Steering - Values are for the rear of the vehicle.	-	-	-	-0.50° +/- 0.50°	-	0.00° +/- 0.20°	-1.0° +/- 3.5° Thrust Angle 0.00° +/- 0.15°

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Tie Rod Jam Nut	68 N.m	50 lb ft
Rear Tie Rod Jam Nut	65 N.m	48 lb ft
Upper Control Arm Cam Bolt Nuts	190 N.m	140 lb ft

REPAIR INSTRUCTIONS

MEASURING WHEEL ALIGNMENT (W/REAR WHEEL STEERING)

Learn Wheel Alignment

After replacement of the handwheel position sensor, rear wheel position sensor, or rear wheel steering control module it is necessary to perform the learn wheel alignment procedure.

Alignment Procedure

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 vehicles 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** 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** then perform the learn alignment procedure.

Learn Wheel Alignment Procedure

1. Turn ignition to ON position, with the engine ON.
2. Install the scan tool.
3. Center the steering wheel.
4. Lift the rear of the vehicle off the ground ensuring the rear wheels are centered.
5. Go to the Learn Alignment menu choice in the scan tool. Follow the prompts on the scan tool.

IMPORTANT: When prompted by the scan tool you must turn the steering wheel a full 90 degrees to the left and a full 90 degrees to the right and then to center and hold. If this step is not done properly then it is possible to cause a false DTC for the steering wheel position sensor.

6. Press the continue button.
7. Use the scan tool to clear all rear wheel steering DTCs.

MEASURING WHEEL ALIGNMENT (W/O REAR WHEEL STEERING)

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 vehicles 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** 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

IMPORTANT: Caster measurements or valves must be compensated for the measured frame angle.

1. Caster is relative to frame, the caster values must be compensated for the measured frame angle by using a digital protractor or equivalent on a flat portion of the frame in front of the rear tire.

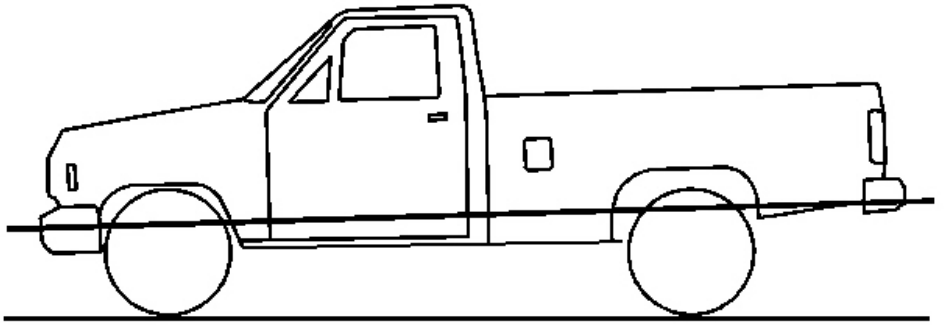

Fig. 1: Identifying Positive Frame Angle
Courtesy of GENERAL MOTORS CORP.

2. Frame angle is positive when higher in the rear. Measure both sides of the frame and take an average from those measurements. Then add the average frame angle to the caster reading when making adjustments.

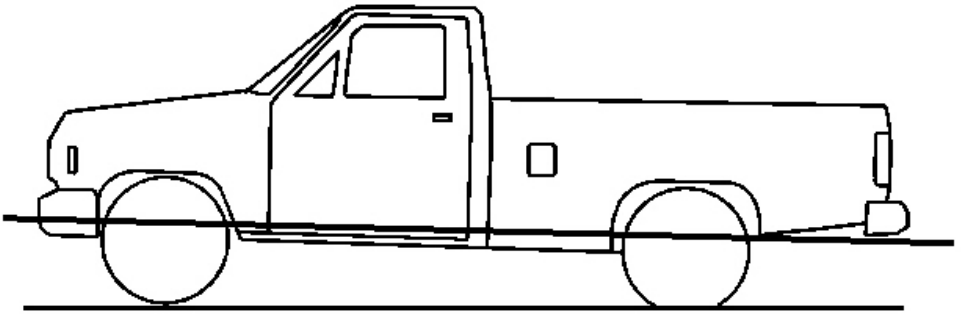

Fig. 2: Identifying Negative Frame Angle
Courtesy of GENERAL MOTORS CORP.

3. Frame angle is negative when lower in the rear. Measure both sides of the frame and take an average from the measurements. Then subtract the average frame angle from the caster reading when making adjustments.

4. The caster and camber adjustments are made by rotating the offset cam bolt and the cam in the slotted frame bracket in order to reposition the control arm.

IMPORTANT: Before adjusting the caster and camber angles, jounce the front bumper three times to allow the vehicle to return to normal height. Measure and adjust the caster and the camber with the vehicle at curb height. The front suspension Z dimension is indicated in Trim Heights. Refer to Trim Height Inspection Procedure in Suspension General Diagnosis.

For an accurate reading, do not push or pull on the tires during the alignment process.

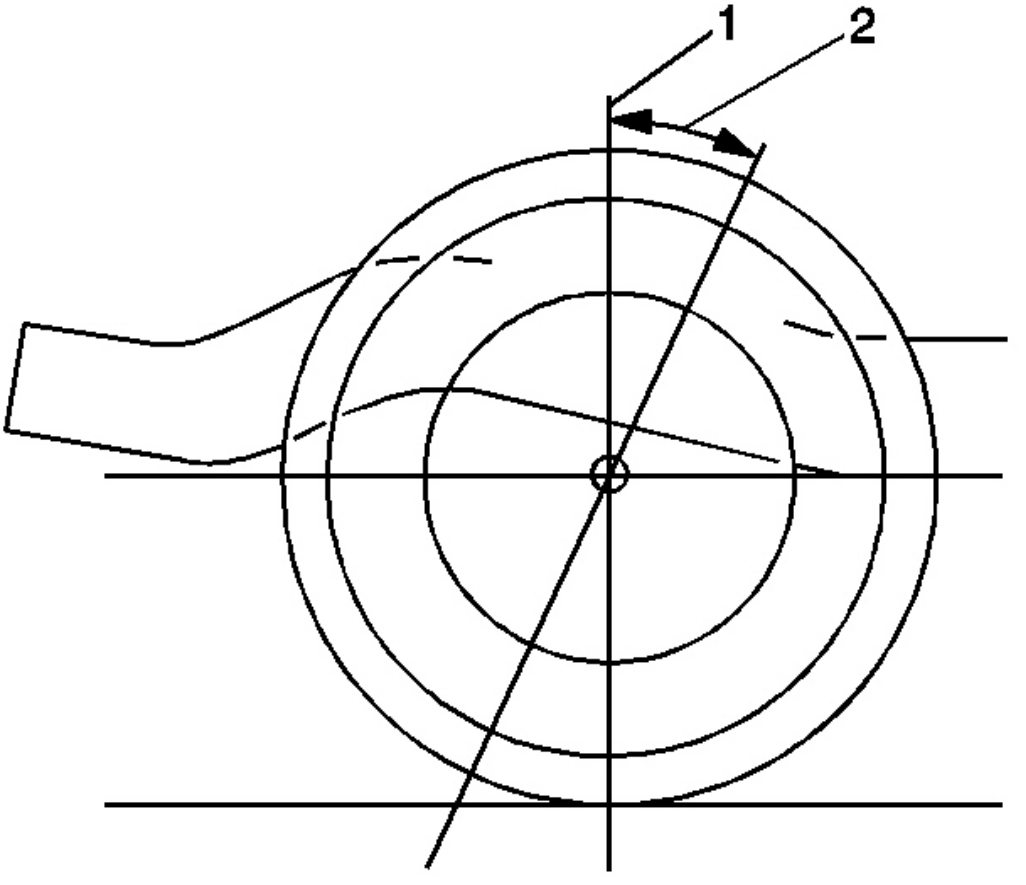

Fig. 3: Determining The Caster Angle
Courtesy of GENERAL MOTORS CORP.

5. Determine the caster angle (2). Be sure to compensate for frame angle where required.

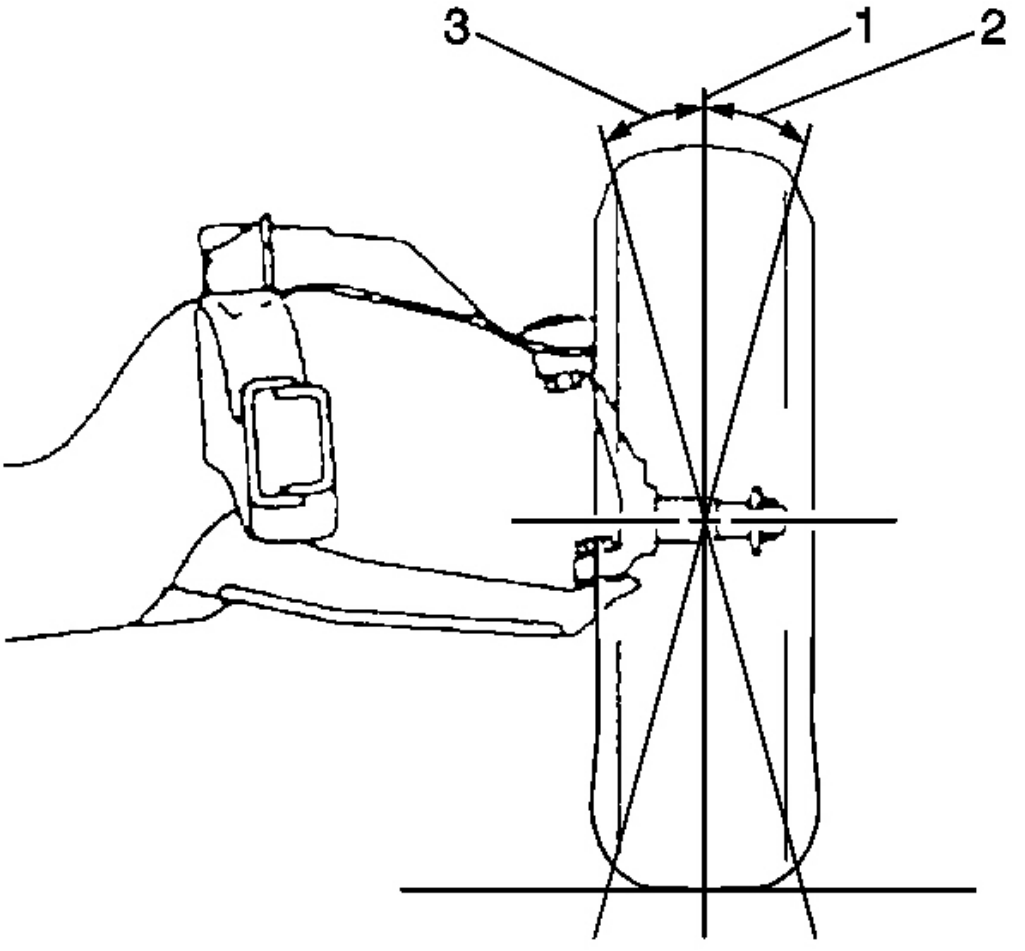

Fig. 4: Determining The Positive Camber Or Negative Camber
Courtesy of GENERAL MOTORS CORP.

6. Determine the positive camber (2) or negative camber (3) angle.

7. Remove the pinned adjusting cam insert. Do not reinstall the cam insert.
8. Loosen the upper control arm cam adjustment bolts.

NOTE: Refer to FASTENER NOTICE in Cautions and Notices.

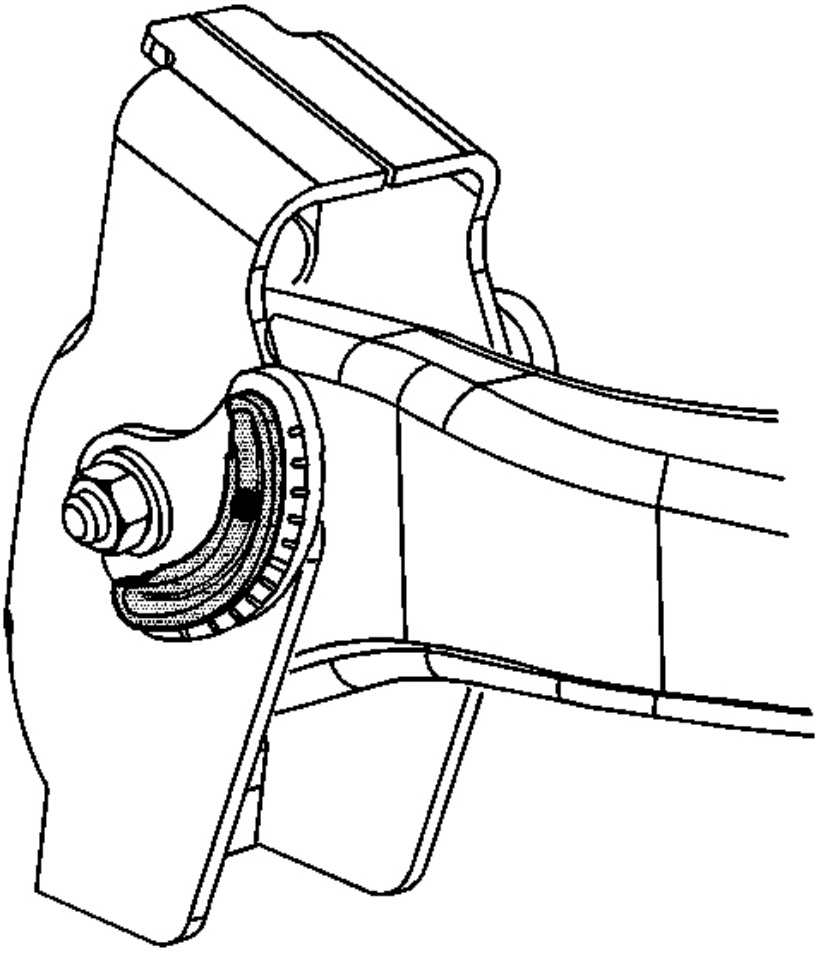

Fig. 5: Adjusting The Caster And Camber Angle
Courtesy of GENERAL MOTORS CORP.

9. Adjust the caster and the camber angle by turning the cam bolts until the specifications have been met.

When the adjustments are complete, hold the cam bolt head in order to ensure the cam bolt position does not change while tightening the nut.

Tighten: Tighten the cam nuts to 190 N.m (140 lb ft).

10. Verify that the caster and the camber are still within specifications. Refer to **Wheel Alignment Specifications.**

When the caster and camber are within specifications, adjust the toe. Refer to **Front Toe Adjustment**.

FRONT TOE ADJUSTMENT

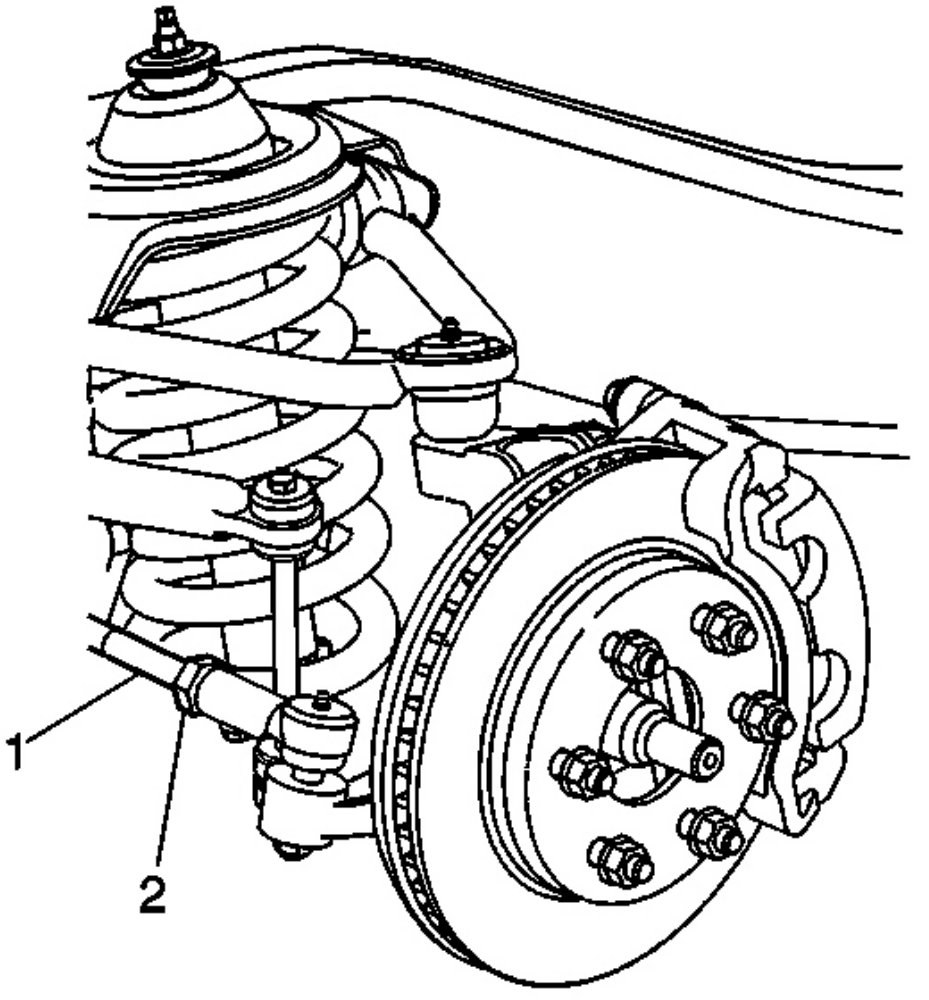

Fig. 6: Adjusting Front Toe
Courtesy of GENERAL MOTORS CORP.

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 tie rod jam to 68 N.m (50 lb ft).

4. Check the toe setting after tightening.
5. Re-adjust the toe setting if necessary.

REAR TOE ADJUSTMENT

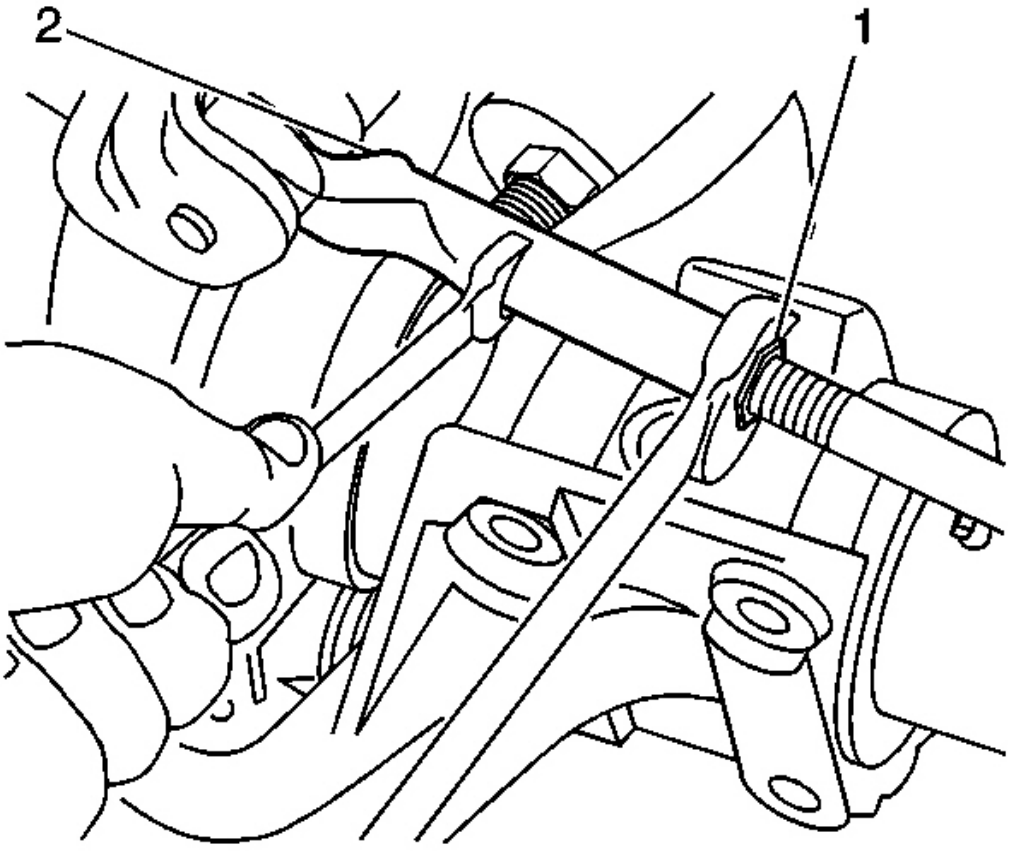

Fig. 7: Loosening The Tie Rod Jam Nut
Courtesy of GENERAL MOTORS CORP.

1. Loosen the jam nut on the tie rod (1).
2. Rotate the inner tie rod 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 tie rod jam to 65 N.m (48 lb ft).

4. Check the toe setting after tightening.
5. Re-adjust the toe setting if necessary.

DESCRIPTION AND OPERATION

CASTER DESCRIPTION

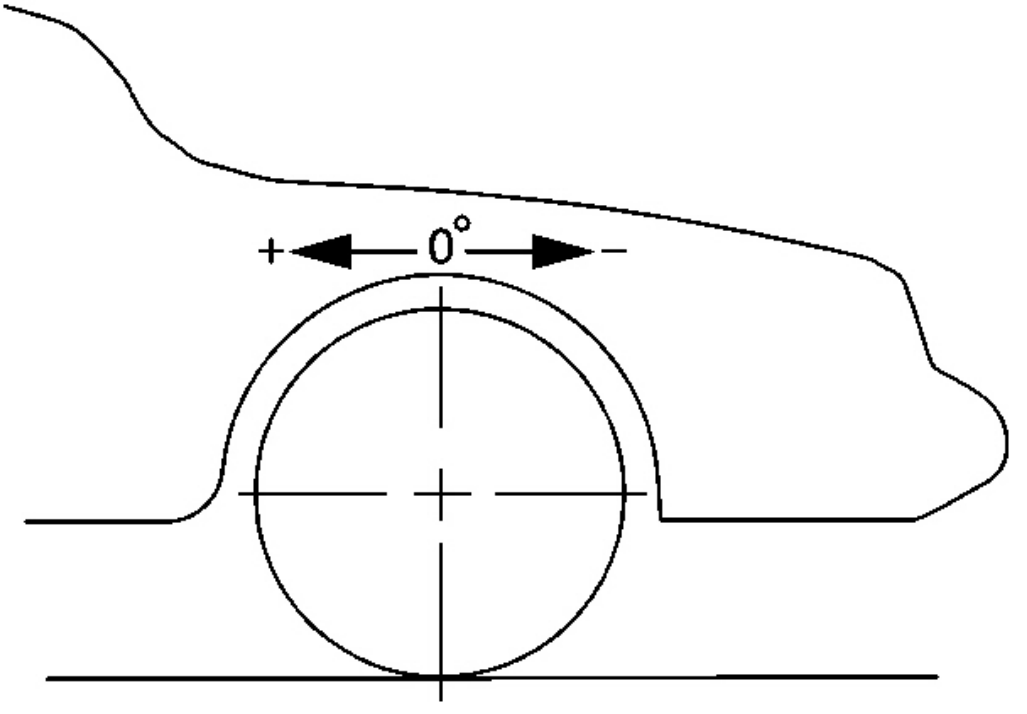

Fig. 8: Illustrating Caster Angle
Courtesy of GENERAL MOTORS CORP.

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.

REAR TOE ADJUSTMENT

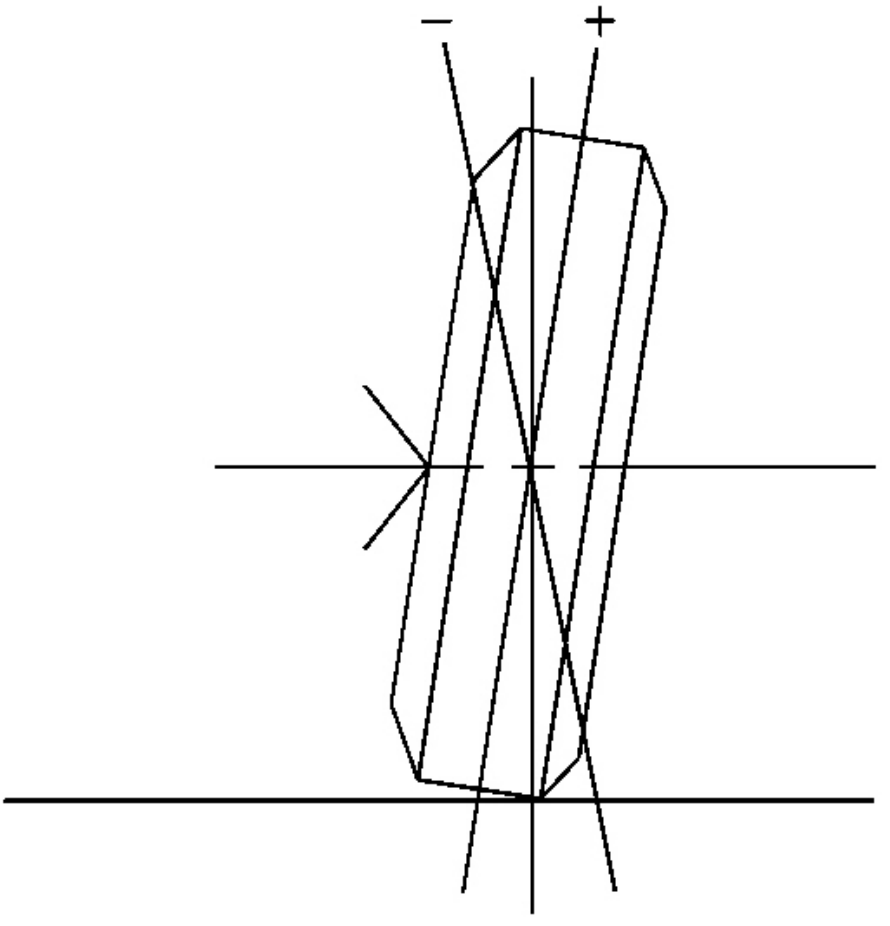

Fig. 9: Illustrating Camber Angle
Courtesy of GENERAL MOTORS CORP.

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

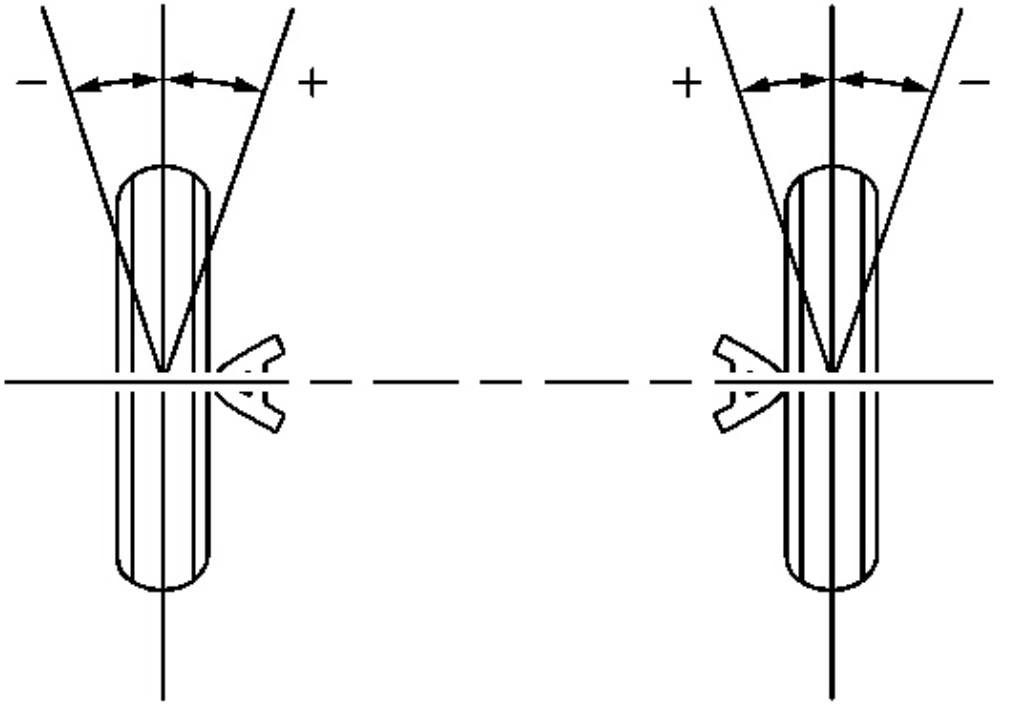

Fig. 10: Illustrating Toe Angle
Courtesy of GENERAL MOTORS CORP.

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.

SETBACK DESCRIPTION

Setback applies to both the front and the rear wheels. Setback is the amount that one wheel may be aligned behind the other wheel. Setback may be the result of a road hazard or a collision. The first clue is a caster difference from side-to-side of more than 1 degree.

THRUST ANGLES DESCRIPTION

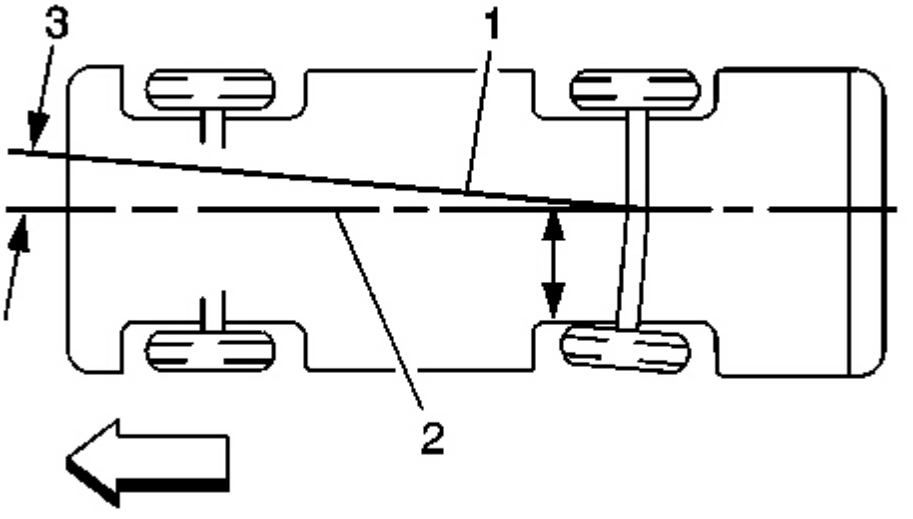

Fig. 11: Illustrating Thrust Angles
Courtesy of GENERAL MOTORS CORP.

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.