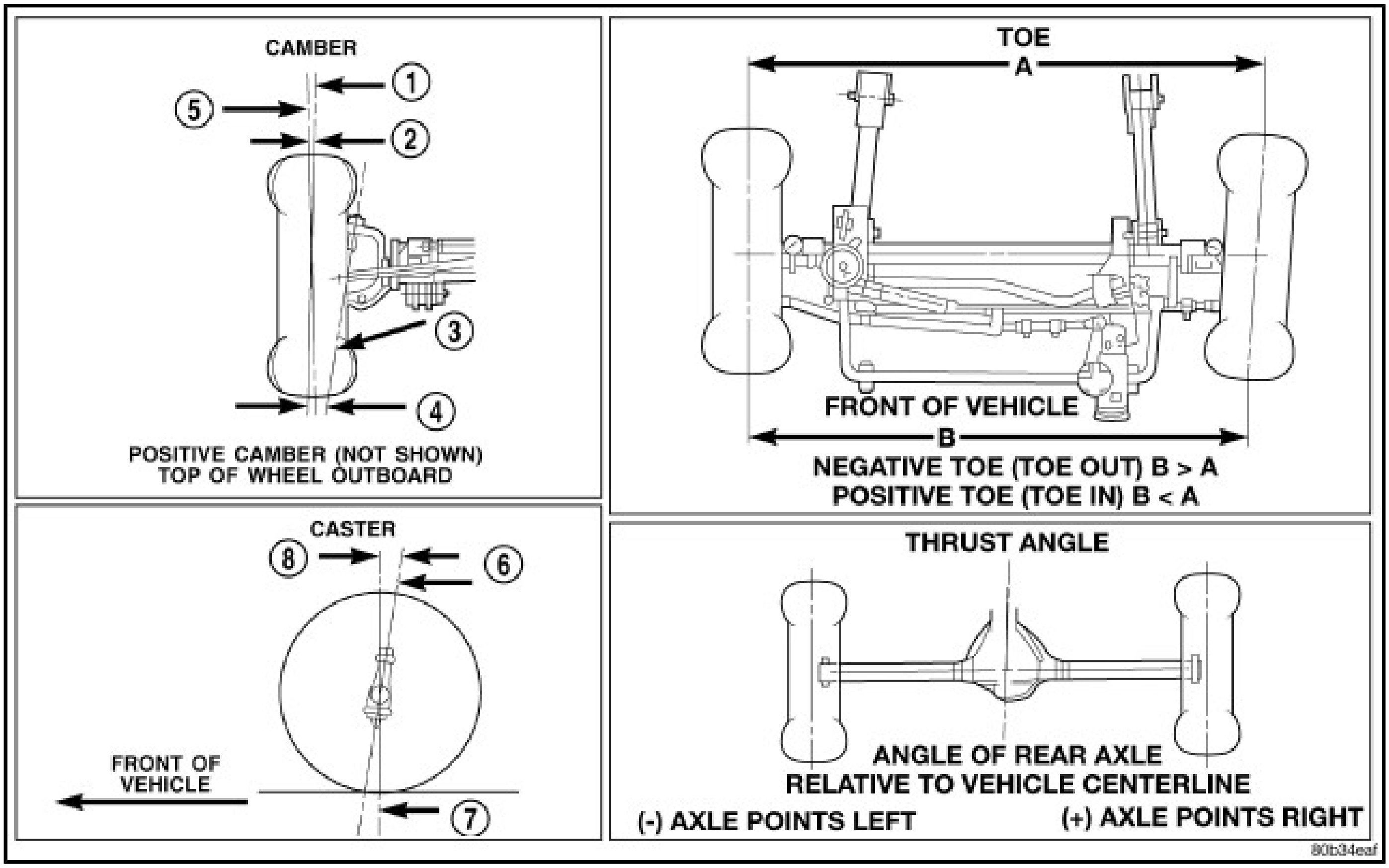
DESCRIPTION AND OPERATION

DESCRIPTION



Wheel alignment involves the correct positioning of the wheels in relation to the vehicle. The positioning is accomplished through suspension and steering linkage adjustments. An alignment is considered essential for efficient steering, good directional stability and to minimize tire wear. The most important measurements of an alignment are caster, camber and toe position.

CAUTION: Never attempt to modify suspension or steering components by heating or bending.

OPERATION

- **CASTER** is the forward or rearward tilt of the steering knuckle from vertical. Tilting the top of the knuckle rearward provides positive caster. Tilting the top of the knuckle forward provides negative caster. Caster is a directional stability angle. This angle enables the front wheels to return to a straight ahead position after turns.
- **CAMBER** is the inward or outward tilt of the wheel relative to the center of the vehicle. Tilting the top of the wheel inward provides negative camber. Tilting the top of the wheel outward provides positive camber. Incorrect camber will cause wear on the inside or outside edge of the tire. The angle is not adjustable, damaged component(s) must be replaced to correct the camber angle.

- **WHEEL TOE POSITION** is the difference between the leading inside edges and trailing inside edges of the front tires. Incorrect wheel toe position is the most common cause of unstable steering and uneven tire wear. The wheel toe position is the **final** front wheel alignment adjustment.
- **STEERING AXIS INCLINATION ANGLE** is measured in degrees and is the angle that the steering knuckles are tilted. The inclination angle has a fixed relationship with the camber angle. It will not change except when a spindle or ball stud is damaged or bent. The angle is not adjustable, damaged component(s) must be replaced to correct the steering axis inclination angle.
- **THRUST ANGLE** is the angle of the rear axle relative to the centerline of the vehicle. Incorrect thrust angle can cause off-center steering and excessive tire wear. This angle is not adjustable, damaged component(s) must be replaced to correct the thrust angle.

DIAGNOSIS AND TESTING

PRE-WHEEL ALIGNMENT INSPECTION

Before starting wheel alignment, the following inspection and necessary corrections must be completed. Refer to the suspension and steering system diagnosis chart below for additional information.

1. Inspect tires for size, air pressure, and tread wear. If tire wear is found, proceed to following steps. If not, proceed to step 2.
    1. Inspect the front wheel bearings for wear using the procedure outlined in the hub and bearing section.
    2. Inspect the front wheels for excessive radial or lateral runout and balance using procedure outlined in tire and wheel section.
2. Inspect the ball joints, linkage pivot points, and the steering gear for looseness, roughness, binding, wear or noise using the appropriate component diagnosis procedure.
3. Road test the vehicle. The purpose of road testing the vehicle is to fully understand the voice of the customer. During the road test, the customer complaint should be duplicated under the same conditions that the customer cites (i.e. road, lane, and speeds) as an issue.
    1. Vehicle pulling and steering wheel off center complaints can often be misdiagnosed. The road test should be used to determine if the vehicle is actually pulling, or if the steering wheel is off center.
    2. While driving in a stable manner, a test driver can differentiate a pull and wheel off center condition by momentarily releasing the steering wheel and observing whether the vehicle tracks straight, follows the road crown or if the steering wheel is simply off center to one side.
    3. Depending on the results, the appropriate corrective action should be applied.

SUSPENSION AND STEERING SYSTEM DIAGNOSIS

CONDITION	POSSIBLE CAUSES	CORRECTION
FRONT END NOISE	1. Loose or worn hub and bearing. 2. Loose or worn steering or suspension components.	1. Replace the hub and bearing. 2. Tighten or replace components as necessary.
EXCESSIVE PLAY IN STEERING	1. Loose or worn hub and bearing. 2. Loose or worn steering or suspension components. 3. Loose or worn steering gear.	1. Replace the hub and bearing. 2. Tighten or replace components as necessary. 3. Replace steering gear.
FRONT WHEELS SHIMMY	1. Loose or worn wheel bearing. 2. Loose or worn steering or suspension components. 3. Tires worn or out of balance. 4. Wheel Alignment.	1. Replace the wheel bearing. 2. Tighten or replace components as necessary. 3. Replace or balance the tires. 4. Align the vehicle to specifications.
VEHICLE INSTABILITY	1. Loose or worn wheel bearing.	1. Replace the wheel bearing.

CONDITION	POSSIBLE CAUSES	CORRECTION
	2. Loose or worn steering or suspension components.	2. Tighten or replace components as necessary.
	3. Tire pressure.	3. Adjust the tire pressure.
	4. Alignment.	4. Align the vehicle to specifications.
EXCESSIVE STEERING EFFORT	1. Loose or worn steering gear.	1. Replace the steering gear.
	2. Column coupler binding.	2. Replace the coupler.
	3. Tire pressure.	3. Adjust the tire pressure.
	4. Wheel Alignment.	4. Align the vehicle to specifications.
VEHICLE PULLS TO ONE SIDE	1. Tire pressure.	1. Adjust the tire pressure.
	2. Tire.	2. Cross rotate the front tires.
	3. Alignment.	3. Align the vehicle to specifications.
	4. Loose or worn steering or suspension components.	4. Tighten or replace components as necessary.
	5. Radial tire lead.	5. Rotate or replace tires as necessary.
	6. Brake pull.	6. Repair the brake system as necessary.
	7. Weak or broken spring.	7. Replace the spring.

WHEEL ALIGNMENT

CAMBER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

The wheel camber angle is preset. This angle is not adjustable and cannot be altered.

CASTER

Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

Check the caster of the front axle for correct angle. Be sure the axle is not bent or twisted. Road test the vehicle and observe the steering wheel return-to-center position. Low caster will cause poor steering wheel return ability.

During the road test, turn the vehicle to both the left and right. If the steering wheel returns to the center position unassisted, the caster angle is correct. However, if steering wheel does not return toward the center position unassisted, a low caster angle is probable.

Caster can not be adjusted.

TOE POSITION

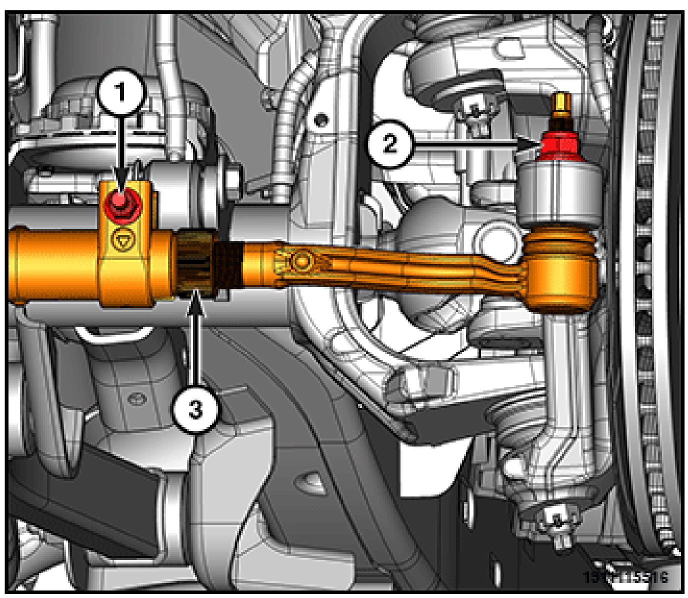
Before each alignment reading the vehicle should be jounced (rear first, then front). Grasp each bumper at the center and jounce the vehicle up and down three times. Always release the bumper in the down position.

NOTE: The wheel toe position adjustment is the final adjustment. This adjustment must be performed with the engine running, if the vehicle is equipped with power steering.

1. Start the engine and turn the steering wheel both ways before straightening the steering wheel. Center and secure the steering wheel.

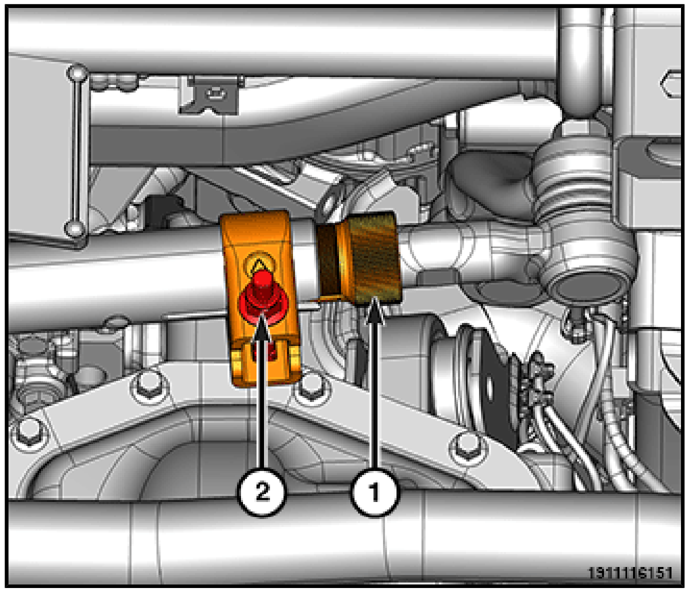
   NOTE: Design specifications for the steering wheel angle is 0.5° right of center.

2. Loosen the adjustment sleeve clamp bolts (1).
3. Adjust the total toe with the tie rod. Turn the knurled adjuster (3) until the correct total toe is reached. **Center** both sockets at the knuckles and the clamp bolts and tighten to the proper (Torque Specifications). **Make sure the toe setting does not change during clamp tightening.**



4. Adjust the drag link adjuster sleeve (1) so that the left and right toe values are equal. Verify the steering wheel is still straight. Position the drag link adjuster clamp (2) as shown and tighten to the proper (Torque Specifications).

5. Verify the toe specifications and turn off the engine.



CURB HEIGHT MEASUREMENT

The vehicle suspension height should be measured before performing wheel alignment procedure. Also when front suspension components have been replaced. This measure must be performed with the vehicle supporting it's own weight and taken on both sides of the vehicle.

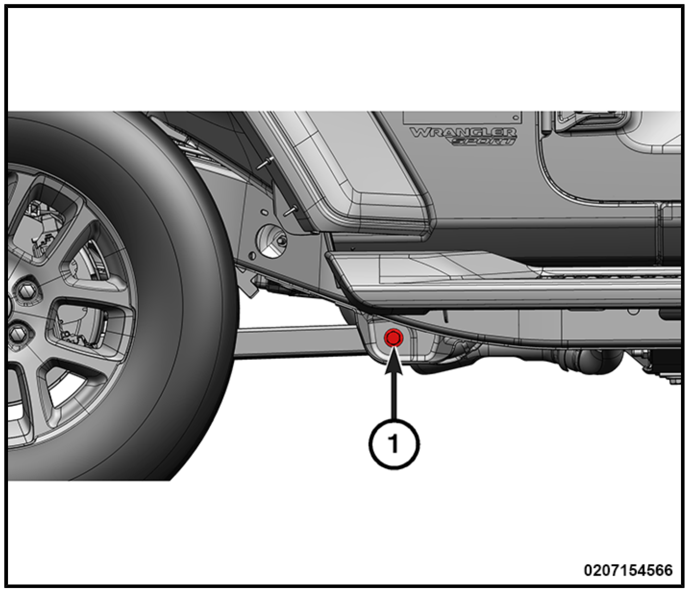
Front and rear curb heights are not adjustable. The spring selections at assembly determine curb height for acceptable appearance of the vehicle. Curb height dimensions assume full fluids (including fuel) and zero passengers. Refer to the table below for front curb height dimensions.

Vehicle curb height audits should be performed utilizing the following procedure:

NOTE: Make sure the vehicle is in 2WD when checking curb height.

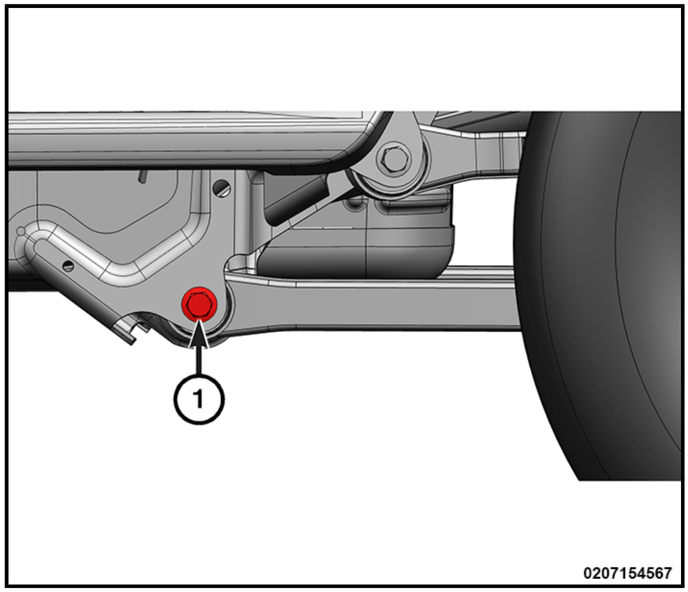
FRONT CURB HEIGHT

1. Bounce the front of the vehicle five times.
2. Measure and record the dimensions
3. Measure the height from the center of the lower control arm rear bolt (1).
4. Measure the height from the center of the front wheel to the ground.
5. Subtract the lower control arm bolt height from the wheel center height to get the front curb height.



REAR CURB HEIGHT

1. On each side of the vehicle, measure the height from the center of the lower control arm front bolt (1) to the ground.
2. Measure the height from the center of the rear wheel to the ground.
3. Subtract the lower control arm bolt height from the wheel center height to get the rear curb height.



CURB HEIGHT SPECIFICATIONS

MODEL	FRONT	REAR
SPORT	40 mm / ±12 mm 1.57 in. / ± 0.47 in	71 mm / ±12 mm 2.80 in. / ± 0.47 in
RUBICON	32 mm / ±12 mm 1.26 in. / ± 0.47 in	69 mm / ±12 mm 2.72 in. / ± 0.47 in
MOJAVE	20 mm / ±12 mm 0.79 in. / ± 0.47 in	66 mm / ±12 mm 2.60 in. / ± 0.47 in

TOLERANCES

TOLERANCE	CROSS HEIGHT TOLERANCE
± 12 mm ±0.47 in	± 12 mm ±0.47 in

02 - Front Suspension/Wheel Alignment/Technical Specifications

MEASUREMENT SPECIFICATIONS

NOTE:
All specifications are given in degrees.

NOTE:
All wheel alignments are to be set at curb height (Refer to 02 - Front Suspension/Wheel Alignment - Standard Procedure) .

Front Wheel Alignment Service Measurement Check Specifications						
	Total Toe**	Caster	Cross Caster*	Camber – Left	Camber – Right	Cross Camber*
Sport	0.20° +/- 0.20°	4.65° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.50°	-0.25° +/- 0.50°	0.00° +/- 0.50°
Rubicon	0.20° +/- 0.20°	4.45° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.50°	-0.25° +/- 0.50°	0.00° +/- 0.50°
Mojave	0.20° +/- 0.20°	4.48° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.50°	-0.25° +/- 0.50°	0.00° +/- 0.50°
NOTE: **Caster values required to be greater than or equal to 4.0° for all variants**						
* Cross Alignment values are determined by taking the left side value minus the right side value.						
** TOTAL TOE is the sum of both left and right wheel toe setting. TOTAL TOE must be equally split between each wheel on the same axle to ensure the steering wheel is centered after setting toe. Positive toe is toe-in and negative toe is toe-out.						

Rear Wheel Alignment Service Measurement Check Specifications					
	Individual Toe*	Sum Toe*	Thrust Angle	Individual Camber*	Cross Camber*

Rear Wheel Alignment Service Measurement Check Specifications					
	Individual Toe*	Sum Toe*	Thrust Angle	Individual Camber*	Cross Camber*
All	0.15° +/- 0.33°	0.30° +/- 0.33°	0.00° +/- 0.30°	-0.10° +/- 0.65°	0.00° +/- 0.65°
* For reference only. These are non adjustable angles.					

02 - Front Suspension/Wheel Alignment/Technical Specifications

SET-TO SPECIFICATIONS

NOTE:
All specifications are given in degrees.

NOTE:
All wheel alignments are to be set at curb height (Refer to 02 - Front Suspension/Wheel Alignment - Standard Procedure) .

Front Wheel Alignment Set-To Specifications						
	Total Toe**	Caster	Cross Caster*	Camber – Left	Camber – Right	Cross Camber*
Sport	0.20° +/- 0.15°	4.65° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.37°	-0.25° +/- 0.37°	0.00° +/- 0.50°
Rubicon	0.20° +/- 0.15°	4.45° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.37°	-0.25° +/- 0.37°	0.00° +/- 0.50°
Mojave	0.20° +/- 0.15°	4.48° +/- 1.00°	0.00° +/- 0.50°	-0.25° +/- 0.37°	-0.25° +/- 0.37°	0.00° +/- 0.50°
NOTE: **Caster values required to be greater than or equal to 4.0° for all variants**						
* Cross Alignment values are determined by taking the left side value minus the right side value.						
** TOTAL TOE is the sum of both left and right wheel toe setting. TOTAL TOE must be equally split between each wheel on the same axle to ensure the steering wheel is centered after setting toe. Positive toe is toe-in and negative toe is toe-out.						

Rear Wheel Alignment Set-to Specifications					
	Individual Toe*	Sum Toe*	Thrust Angle	Individual Camber*	Cross Camber*

Rear Wheel Alignment Set-to Specifications					
	Individual Toe*	Sum Toe*	Thrust Angle	Individual Camber*	Cross Camber*
All	0.15° +/- 0.30°	0.30° +/- 0.30°	0.00° +/- 0.30°	-0.10° +/- 0.50°	0.00° +/- 0.50°
* For reference only. These are non adjustable angles.					