
STEERING, SUSPENSION, WHEELS AND TIRES

SECTION 3A FRONT END ALIGNMENT

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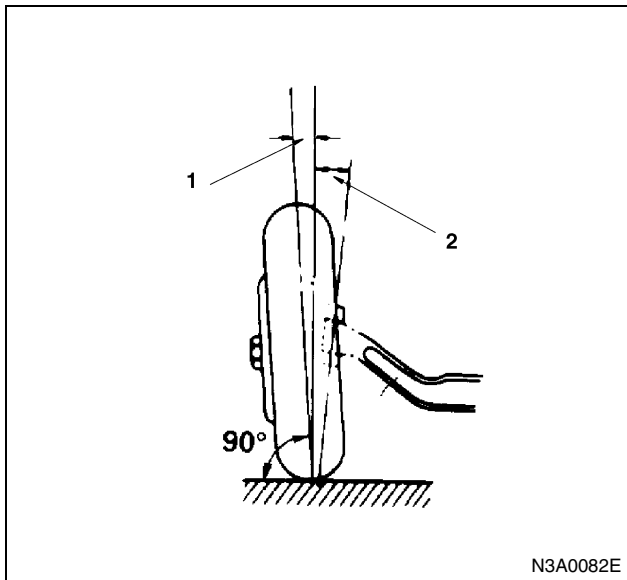
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GENERAL DESCRIPTION

Camber Angle

The reason why the camber is so important in wheel alignment is that it affects greatly the tire wear and characteristics. The front wheels of most cars lean slightly either inward or outward when seen from the front. This tilt of the wheel is called the camber. When the center line of the tire is completely vertical to the road, the tire has "zero camber". In the positive camber, the wheels incline outward at the tops while in the negative camber they incline inward at the tops. Excessive positive camber causes the outer edge of tire to excessively wear. On the other hand, excessive negative camber causes the inner edge of tire to wear.

Improper wheel camber setting will not only cause the tires' excessive wear, but also the tire will tend to move in the direction of the wheel which has a larger camber angle affecting the car's straight traveling ability. When measuring the camber, it is indicated by the angle.



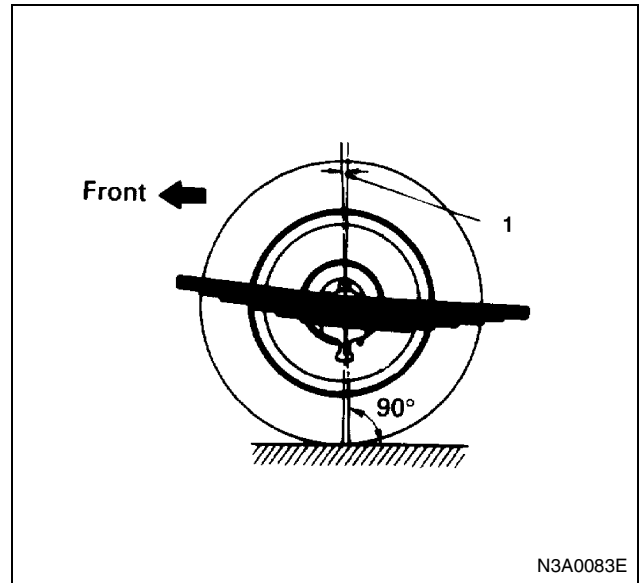
N3A0082E

Legend

1. Camber angle
2. Kingpin inclination

Caster Angle

Caster is the angle between the rearward inclination of king pin axis and a vertical center line of the wheel when the car is seen from its side. Like camber, it is also indicated by the angle. Caster angle affects greatly the straight traveling ability of the car, steering wheel maneuverability, self alignment effort and the returning ability of the car to the straight ahead position.



N3A0083E

Legend

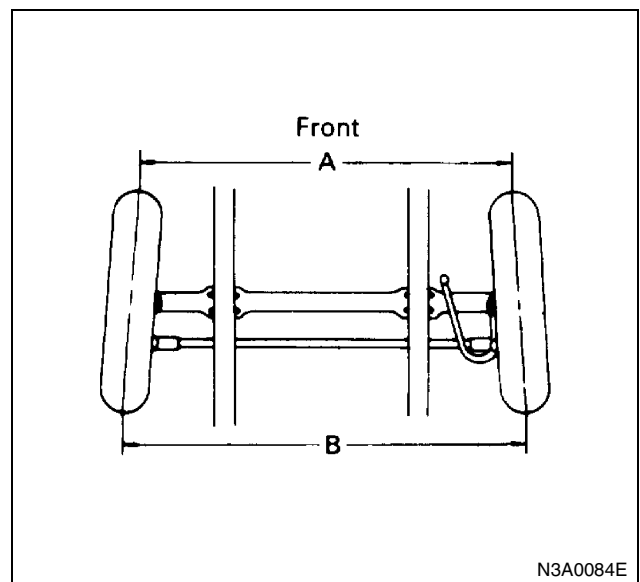
1. Caster angle

Toe-In

When seen from the top of the car, the front edges of the front wheels are slightly closer each other. The amount of this slight inward turning is called toe-in and usually expressed by millimeter.

The toe-in can be calculated with next formula.

$$\text{Toe-in} = B - A$$



N3A0084E

ON-VEHICLE SERVICE

Inspection

The points listed below must be checked prior to inspection front wheel alignment.

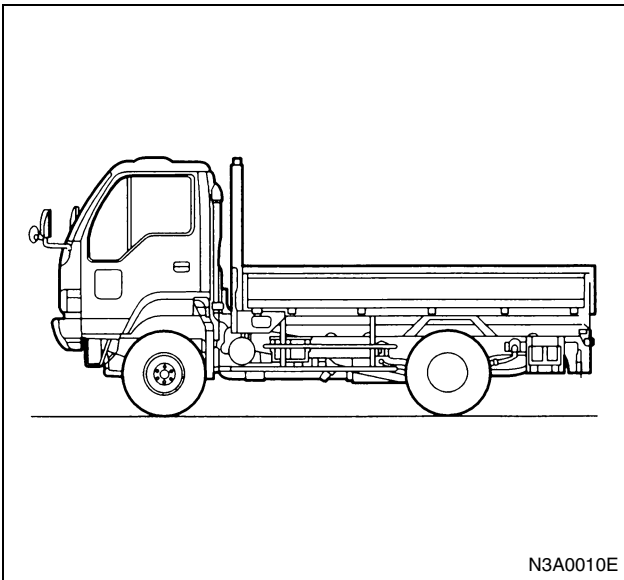
- Tire pressure and abnormal wear
- Front hub bearing for axial play
- Ball joint on steering linkage for play
- Operation of shock absorbers
- Tightness of suspension parts
- King pin bearings for play

Toe-in

Inspection

Measurement should be taken with the vehicle on a surface plate.

If a surface plate is not available, toe-in should be checked with the vehicle parked on a level floor.



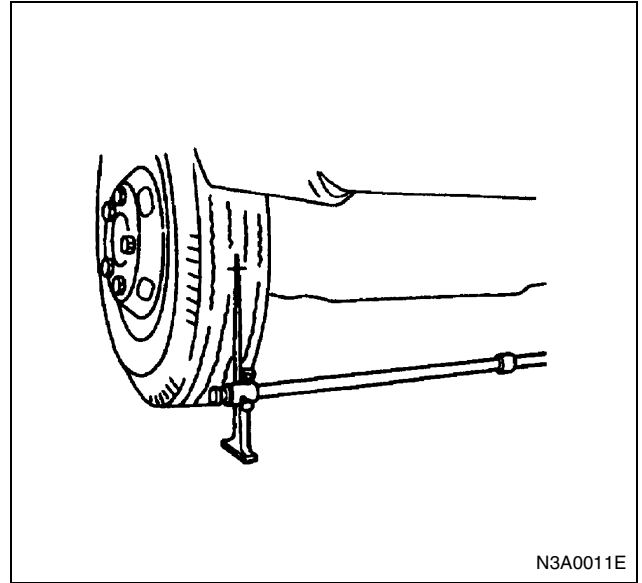
1. Set front wheels to its straight ahead position.
2. Align the toe-in gauge with center height of each wheels at front end.
3. Apply center marks to each wheel, then take measurement of distance A between the center marks on each wheel.
4. Move the vehicle slowly rearward until center marks get its rear end position.
5. Take measurement of distance B between the center marks at rear end.

The toe-in can be calculated with next formula.

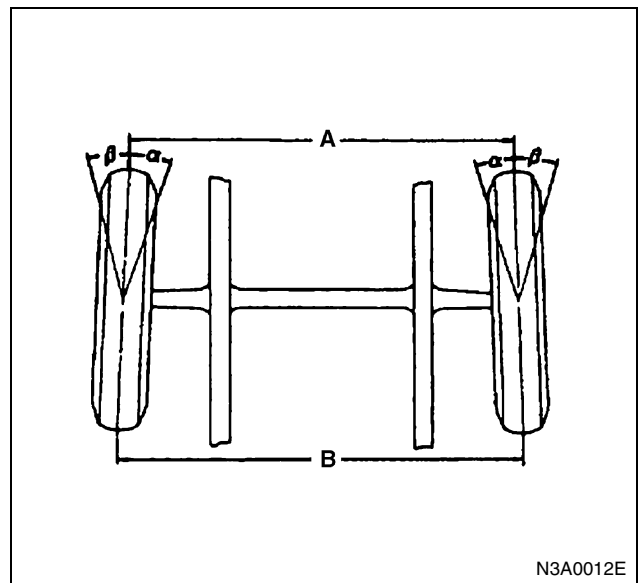
$$\text{Toe-in} = B - A$$

Toe-in

$$-2 \text{ — } 2 \text{ mm } (-0.08 \text{ — } 0.08 \text{ in})$$

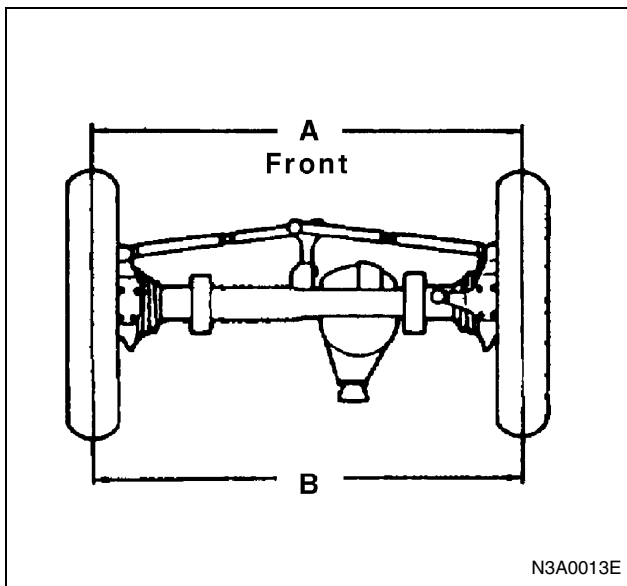


- Rigid Suspension

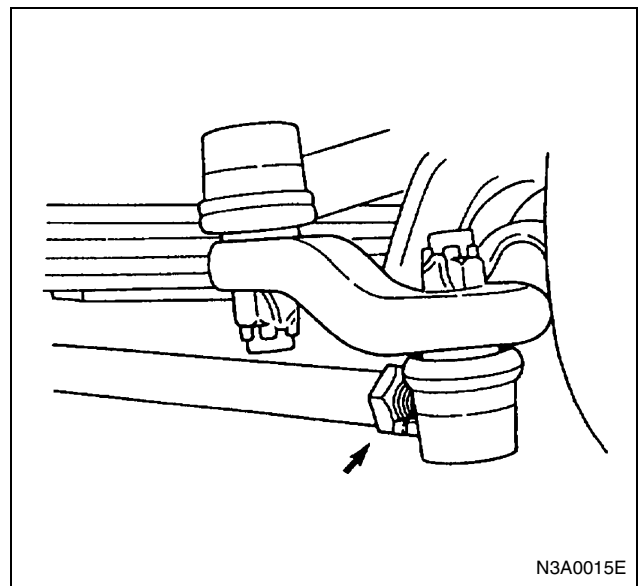


3A-4 FRONT END ALIGNMENT

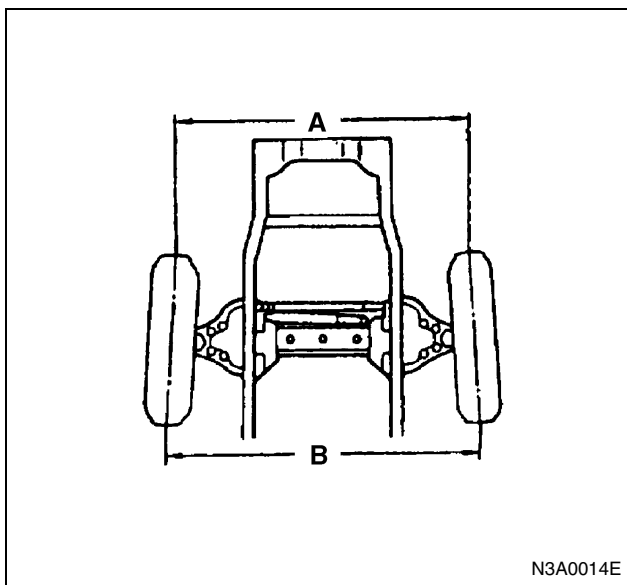
- NPS



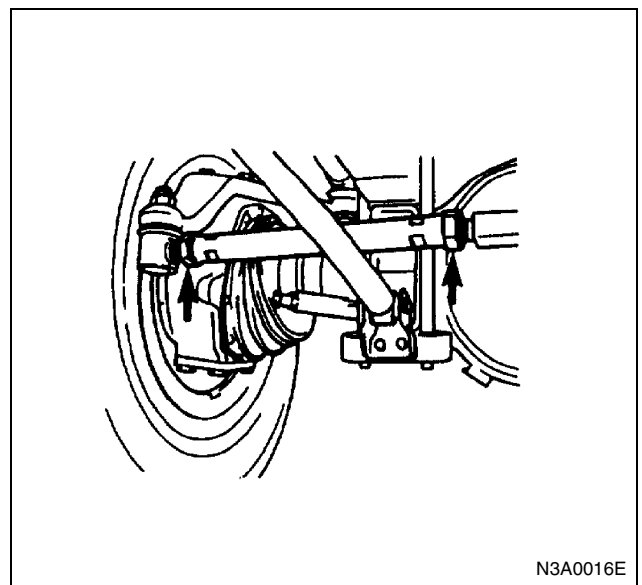
- Rigid Suspension



- Wishbone Suspension



- NPS



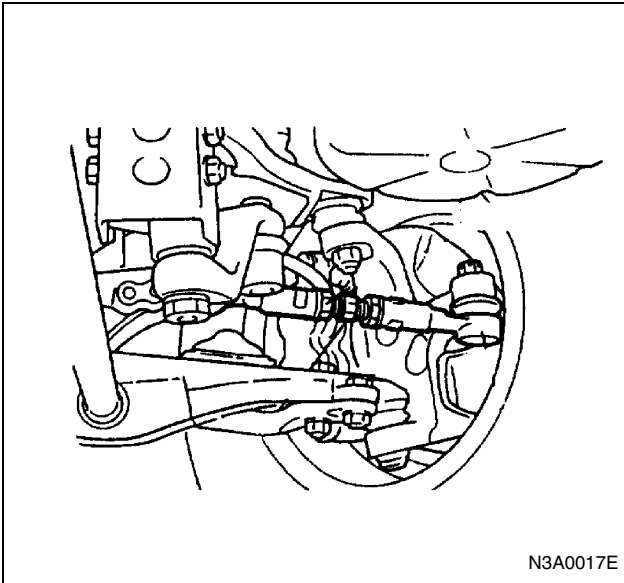
Adjustment

1. Loosen the lock nuts on the tie rod or outer truck rod ends.
2. Adjust length of the tie rod by turning the connecting rod on outer truck rod.
3. Tighten the lock nuts to specified torque.

Tighten:

- Lock nut to
Rigid suspension, NPS: 113 N·m (11.5 kg·m / 183 lb·ft)
Wishbone suspension: 167 N·m (17.0 kg·m / 123 lb·ft)

• Wishbone Suspension



Steering Angle

Wishbone Suspension Model		(deg.)
Vehicle Model	Outer	Inner
NKR (7.00-15 Tire)	35.0	38.0

Rigid Suspension Model		(deg.)
Vehicle Model	Outer	Inner
NHR	33.0	37.5
NKR (7.00-15 Tire)	29.5	38.5
NKR (7.00-16 Tire)	27.9	35.5
NPR (7.00-16 Tire)	35.0	47.5
NPR, NQR (7.50-16 Tire)	32.7	42.5
NQR (8.25-16 Tire)	30.0	36.5
NPS	29.8	37.5

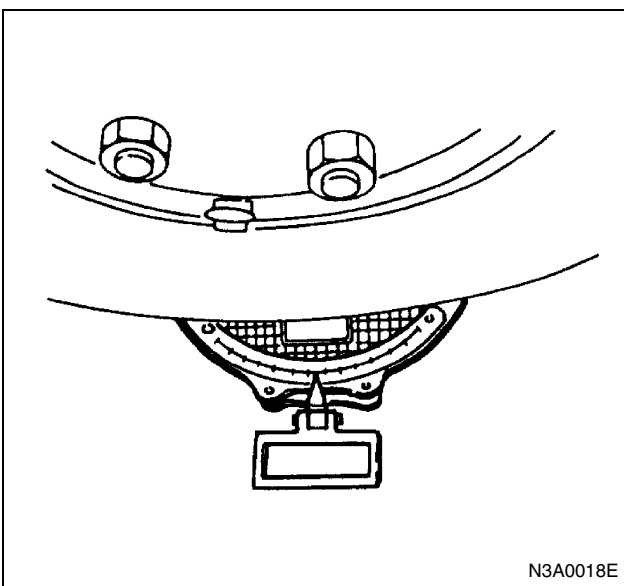
Turning Radius

Inspection

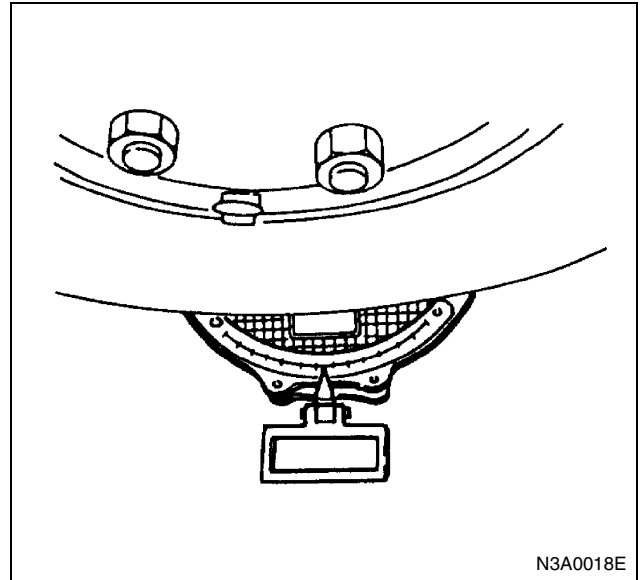
1. Position a suitable piece of wood equivalent in thickness to the turning radius gauge under each rear wheel.
2. Position each front wheel on a turning radius gauge by aligning the tire center line with the center of the turning radius gauge.
3. Turn the steering wheel clockwise or counterclockwise until the front wheels are locked.

Notice:

Turning the steering wheel with the brake pedal depressed using brake pedal pusher.



Reading of the turning radius gauge directly indicates the steering angle.



Adjustment

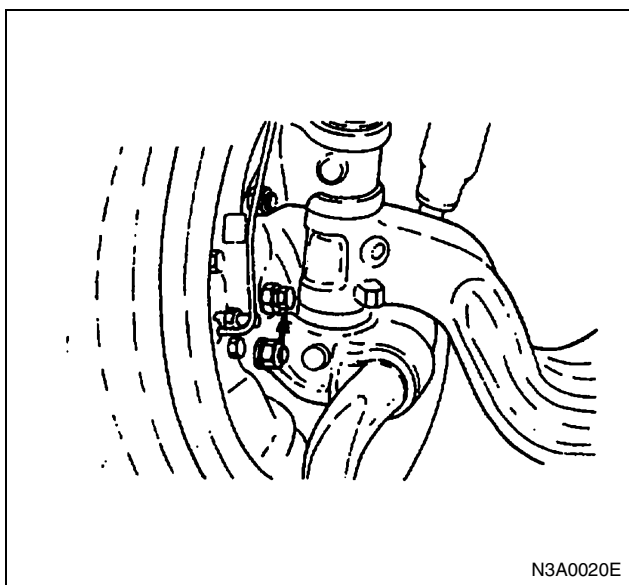
1. Loosen the lock nuts on the steering knuckle or the axle case.
2. Adjust projecting height of the stopper bolts.
3. Tighten the lock nuts to specified torque.

Tighten:

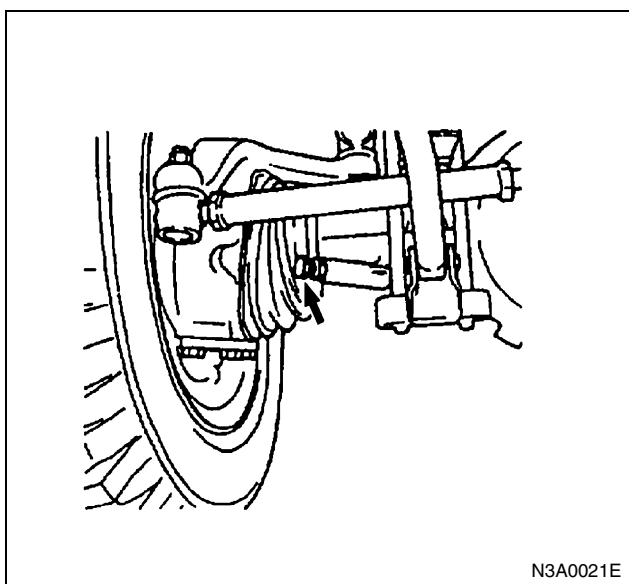
- Stopper bolt to
Rigid suspension: 186 N·m (19.0 kg·m / 137 lb·ft)
NPS: 49 N·m (5.1 kg·m / 36 lb·ft)
Wishbone suspension: 82 N·m (8.4 kg·m / 61 lb·ft)

3A-6 FRONT END ALIGNMENT

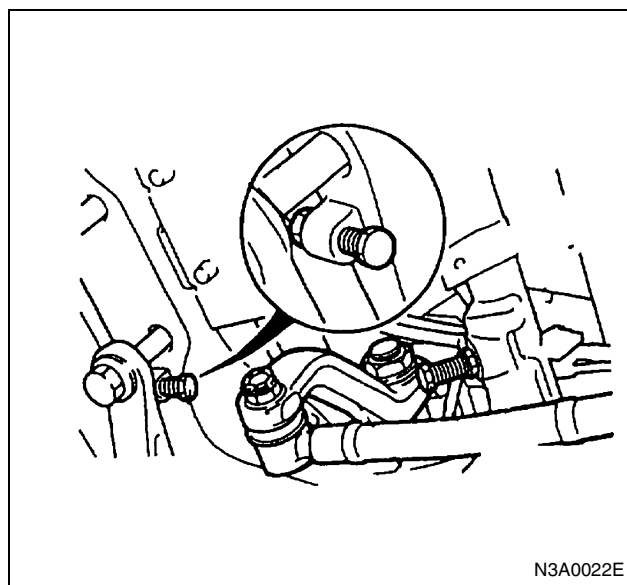
- Rigid Suspension



- NPS



- Wishbone Suspension



Camber Angle

Inspection

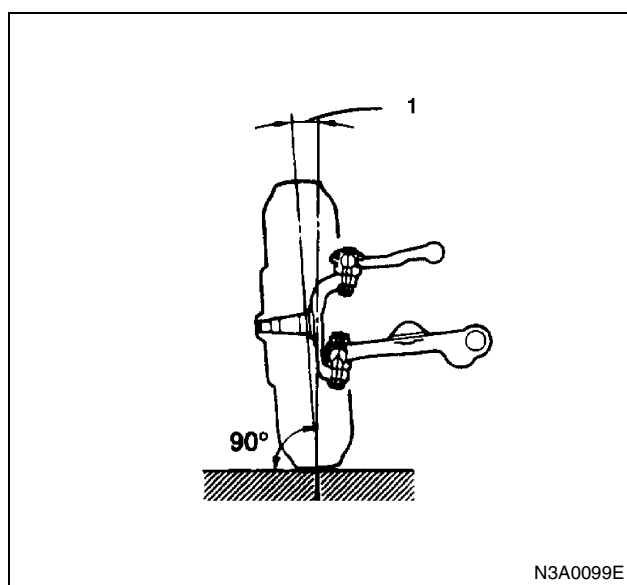
All Model except NPS

The toe-in can be checked on the gauge simultaneously.

1. When inspection of turning radius is completed, calibrate the scale of the turning radius gauge to zero.
2. Remove the front hub cap. Install camber, caster and king pin inclination gauge on end of the knuckle spindle horizontally.

Notice:

When removing hub cap, take care so as not to cause damage to gauge fitting face at end of the spindle. If end of the spindle has been scratched or damaged, correct before setting the gauge.



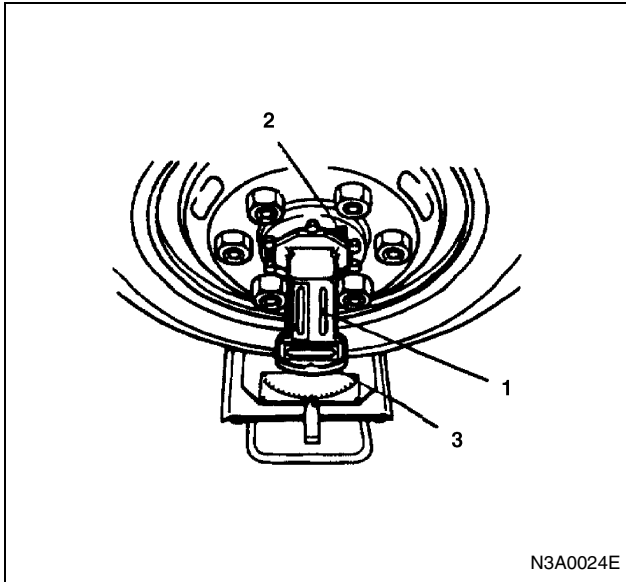
Legend

- 1. Camber angle

NPS

Remove the free wheel hub lock cover assembly, then install gauge adapter on end of the knuckle spindle. Install camber, caster and king pin inclination gauge on end of gauge adapter.

Gauge Adapter: 5-8840-2188-0



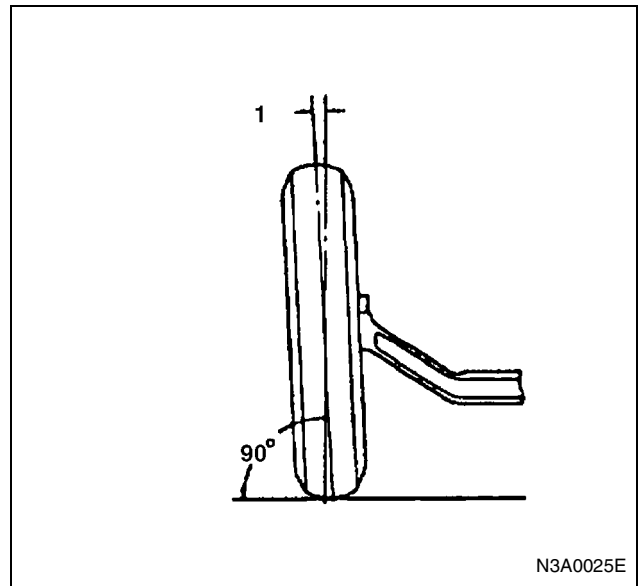
Legend

- 1. Camber angle
- 2. Gauge adapter
- 3. Wheel alignment tester

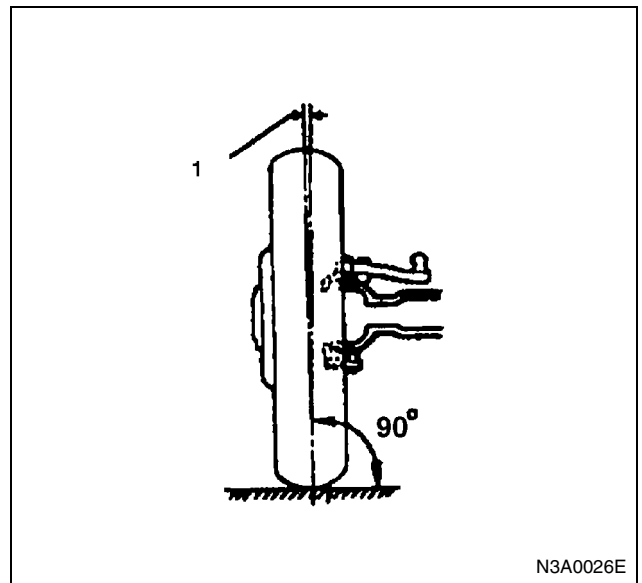
- 3. Reading of the camber scale directly indicates the camber angle (1).

Camber Angle (deg.)	
NHR Rigid Suspension	$1^{\circ}15' \pm 45'$
Rigid Suspension (except NHR)	$0^{\circ}15' \pm 45'$
Wishbone Suspension, NPS	$0^{\circ}15' \pm 45'$

- Rigid Suspension



- NPS



Caster Angle and King Pin Inclination

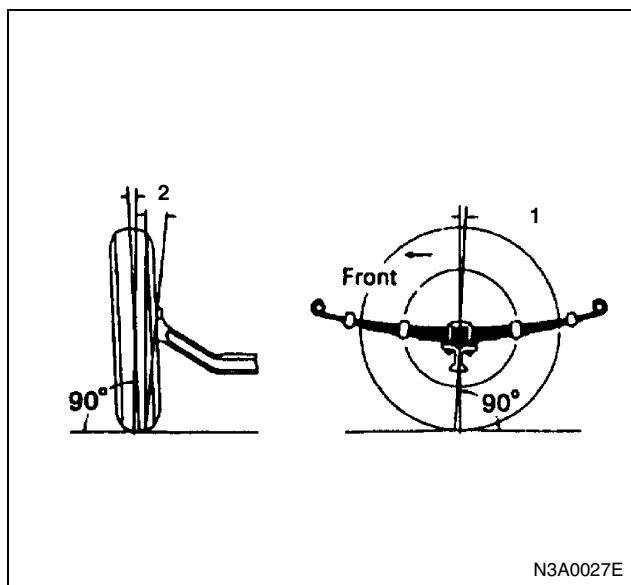
Inspection

The caster angle and king pin inclination can be checked on the gauge simultaneously.

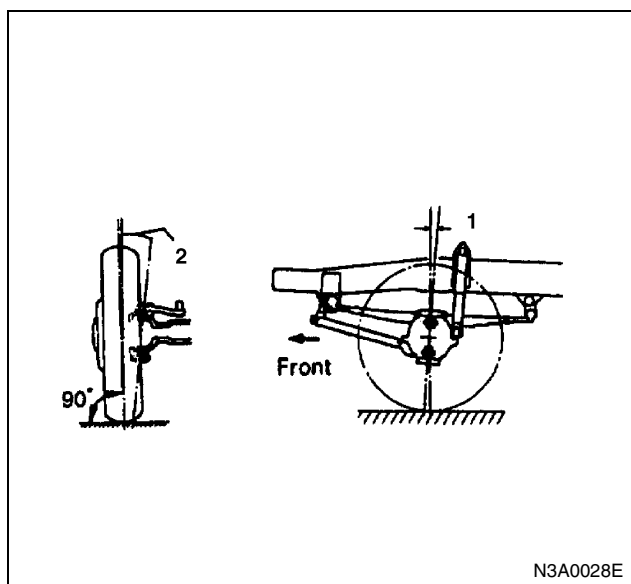
1. When inspection of camber angle is completed, calibrate the scale of the turning radius gauge to zero and turn the steering wheel clockwise (counterclockwise for checking caster angle (1) and king pin inclination (2) on the left side front wheel) until the front wheels are steered 20 degrees from the straight-ahead position.

3A-8 FRONT END ALIGNMENT

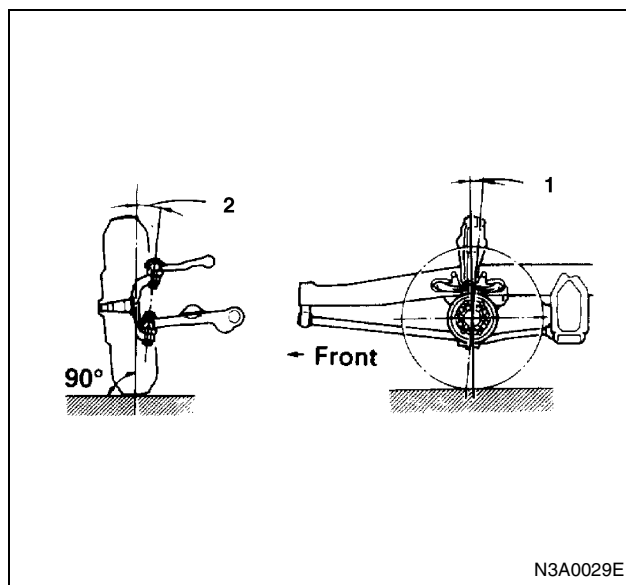
- Rigid Suspension



- NPS



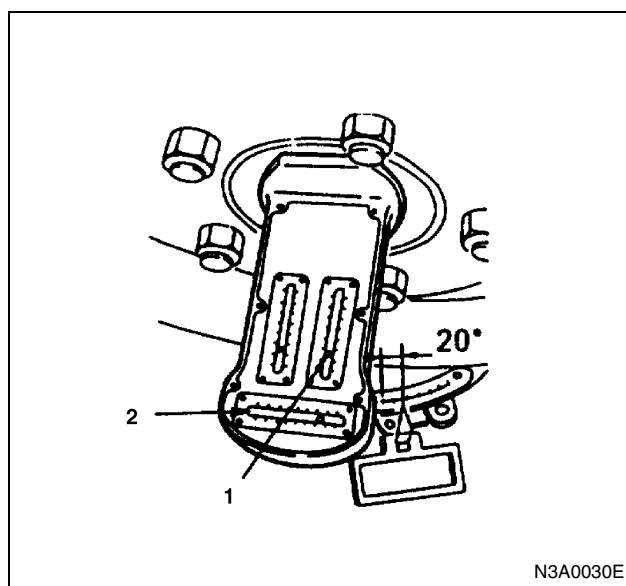
- Wishbone Suspension



Notice:

Turn the steering wheel with the brake pedal depressed using brake pedal pusher.

2. When the front wheels are turned 20 degrees, calibrate the caster and king pin scales to zero turning the camber, caster and king pin gauge adjuster.

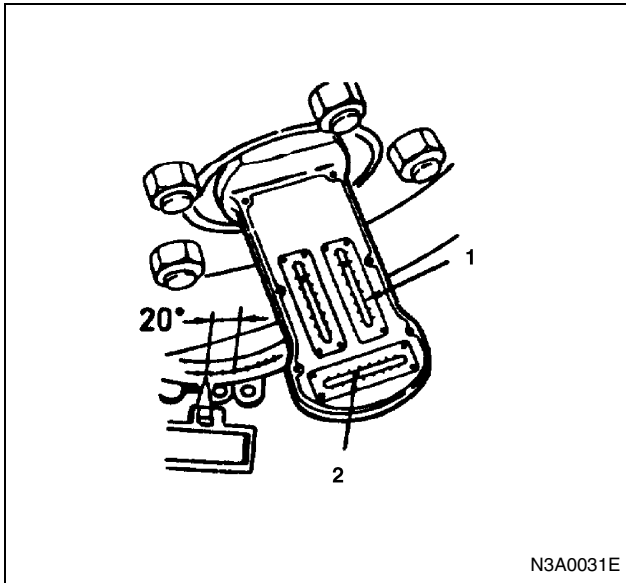


Legend

1. Caster angle
2. King pin inclination

3. Turn the steering wheel in the opposite direction until the front wheels are steered 20 degrees in the opposite direction. Reading of the caster and king pin scales directly indicates the caster and king pin inclination angles being checked.

Caster Angle and King Pin Inclination (deg.)		
	Caster Angle	King Pin Inclination
NHR	$1^{\circ}30' \pm 1^{\circ}$	$7^{\circ}15'$
NKR Rigid Suspension	$3^{\circ}00' \pm 1^{\circ}$	$12^{\circ}00'$
NPR, NQR	$2^{\circ}45' \pm 1^{\circ}$	$12^{\circ}00'$
Wishbone Suspension	$1^{\circ}00' \pm 1^{\circ}$	$9^{\circ}45' \pm 30'$
NPS	$2^{\circ}00' \pm 1^{\circ}$	$7^{\circ}15'$



Legend

1. Caster angle
2. King pin inclination

Adjustment

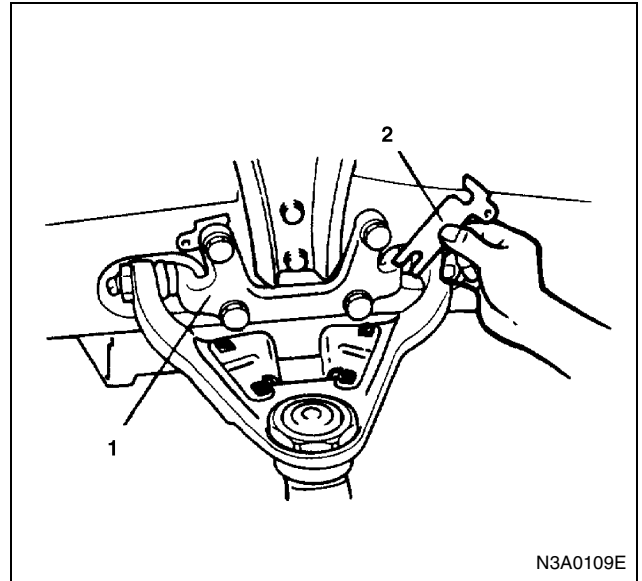
Rigid Suspension

The camber, caster and king pin inclination are built into front end and are not adjustable. If the camber, caster or king pin inclination is found to be out of alignment, check to locate the cause of trouble against the listing below and replace the parts necessary.

- Front springs for weakening
- Front I-beam (axle case) for distortion
- Bushing in king pin, King pin bearings for wear or deterioration

Wishbone Suspension

1. Set the jack under the cross member of the suspension and then raise the lower link with the jack and retain the jack with applied in the place.
2. Remove the shock absorber.
3. Attach the fulcrum pin (1) and loosen the bolts to the degree that it will not fall a part to adjust the camber angle using the shims (2).

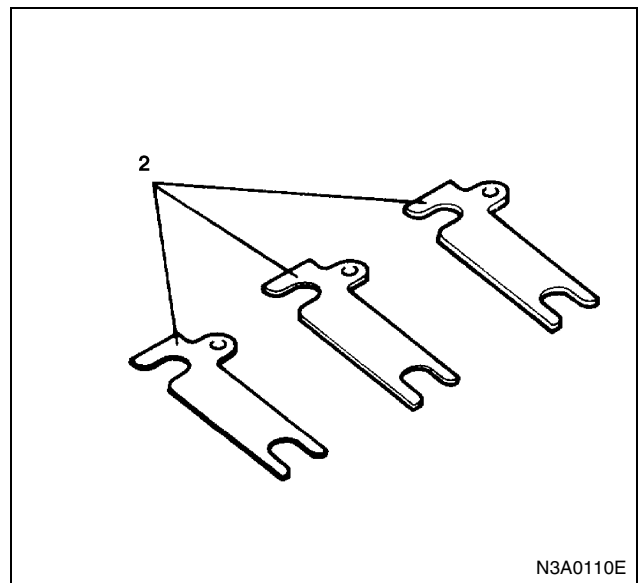


Camber Angle

If the number of shims (2) are evenly increased both at fore and aft, the camber angle becomes acute, while if decreased, the angle becomes obtuse.

Caster Angle

When the caster angle is obtuse, increase the number of shims (2) at the side, while the angle is acute, increase the number of shims (2) at the aft side.



Thickness of Shims Available

0.8 mm (0.031 in), 1.6 mm (0.063 in), 3.2 mm (0.126 in)

Conditions Where The Shims are Used

Number of Shims: 4 or less

Thickness: 9.6 mm (0.378 in) or less

Difference of Thickness (between Front and Rear): 4.8 mm (0.189 in) or less

In case the shim has already reached at the limitation in its number or its thickness, decrease the number of shims at the aft side to adjust the obtuse caster angle, while decrease the number at the fore side to adjust the acute caster angle.

3A-10 FRONT END ALIGNMENT

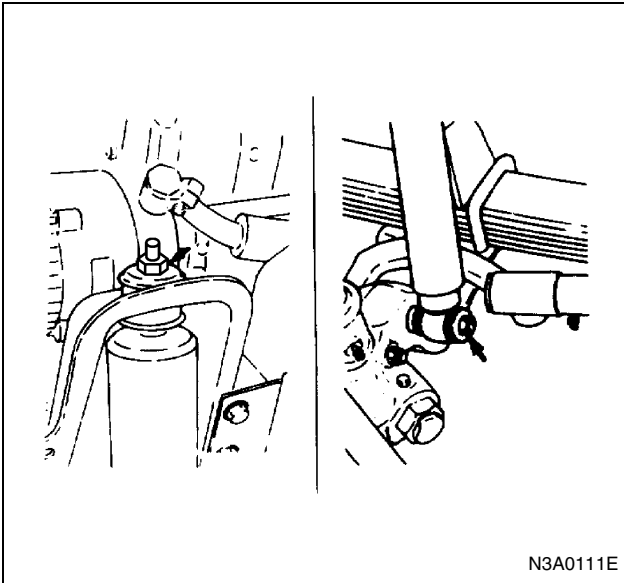
Notice:

Since the number of shims needed for caster angle adjustment varies depending on the conditions of the car, perform the adjustment procedures which are the most suitable for the car conditions.

4. Tighten the mounting bolts of the front shock absorber.

Tighten:

- Shock absorber bolt and nut to
Upper: 21 N·m (2.1 kg·m / 16 lb·ft)
Lower: 103 N·m (10.5 kg·m / 76 lb·ft)



Trim Height (Wishbone Suspension Only)

Adjustment

Adjust the trim height by means of adjusting bolt on the height control arms.

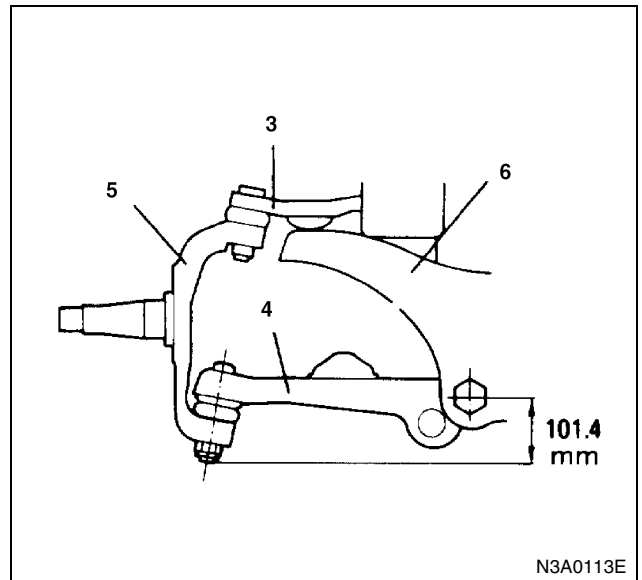
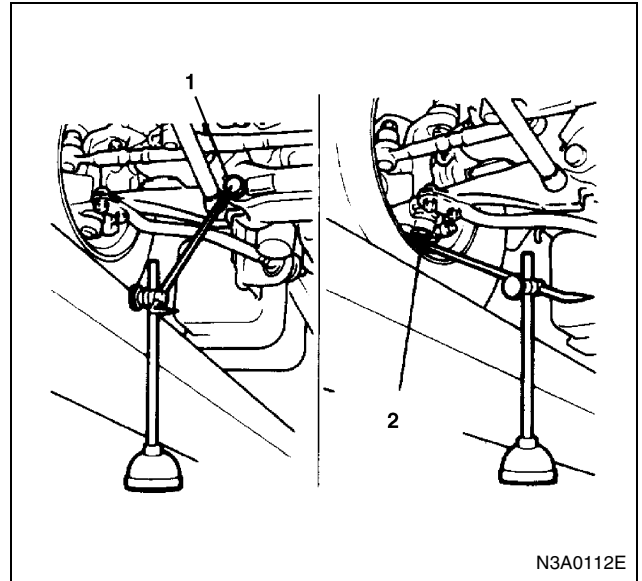
Caution:

When adjusting front end alignment, be sure to begin with trim height as trim height adjustment may change other adjusted alignments.

1. Check and adjust the tire inflation pressures.
2. Park the vehicle on a level ground and move the front of the vehicle up and down several times to settle the suspension.
3. Make necessary adjustment with the adjusting bolt on the height control arms.

Trim Height

101.4±5 mm (3.992±0.197 in)



Legend

1. Lower link bolt
2. Lower joint ball
3. Upper link
4. Lower link
5. Knuckle arm
6. Crossmember

Measurement of Side Slippage

When inspection and adjustments of toe-in, camber, caster and king pin inclination are completed, check for side slippage using a side slip tester.

Roll the wheels over the side slip tester as slowly as possible and take reading on the tester. If the amount of side slippage is in excess of 5 mm per 1 m, recheck the wheel alignment.

Side Slippage

Limit: 5.0 mm (0.197 in) Per 1m

