Modern Automotive Technology
Chapter 74
Wheel Alignment
Learning Objectives

- Explain the principles of wheel alignment.
- List the purpose of each wheel alignment setting.
- Perform a pre-alignment inspection of tires, steering, and suspension systems.
- Describe caster, camber, and toe adjustment.
- Explain toe-out on turns, steering axis inclination, and tracking.
- Describe the use of different types of wheel alignment equipment.
Pre-Alignment Inspection

- Check for the following:
  - incorrect tire inflation
  - loose wheel bearings
  - wheel or tire runout
  - worn tires
  - tires of different sizes and types
  - worn steering or suspension components
  - incorrect curb height and weight
  - incorrect cradle adjustment
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1. Toe-In is caused when the wheels are closer at the front than at the rear.

2. When the wheels are turned, Positive Caster lifts the vehicle and helps keep the wheels traveling in a straight line.
Toe-In

Front of wheels closer together
Caster Measurement

Measured in degrees, from true vertical
Positive Caster

Most common on vehicles with power steering
3. Steering Axis Inclination (SAI) is the angle, away from the vertical, formed by the inward tilt of the ball joints, king pin, or MacPherson strut tube.

4. Incorrect toe will cause Feathered Edging to form on the tire tread.
Steering Axis Inclination (SAI)

If the angle is incorrect, part replacement is needed.
Reading Tire Wear

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>Rapid wear at shoulders</th>
<th>Rapid wear at center</th>
<th>Cracked treads</th>
<th>Wear on one side</th>
<th>Feathered edge</th>
<th>Bald spots</th>
<th>Scalloped wear</th>
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<tbody>
<tr>
<td>1.</td>
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<td>CAUSE</td>
<td>Underinflation or lack of rotation</td>
<td>Overinflation or lack of rotation</td>
<td>Under inflation or excessive speed</td>
<td>Excessive camber</td>
<td>Incorrect toe</td>
<td>Unbalanced wheel</td>
<td>Lack of rotation of tires or worn or out of alignment suspension</td>
</tr>
<tr>
<td>CORRECTION</td>
<td>Adjust pressure to specifications when tires are cool, rotate tires</td>
<td></td>
<td></td>
<td>Adjust camber to specifications</td>
<td>Adjust toe in to specifications</td>
<td>Dynamic or static balance wheels</td>
<td>Rotate tires and check alignment</td>
</tr>
</tbody>
</table>
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5. Negative Camber causes the tops of the wheels to tilt inward when viewed from the front.

6. Negative Caster tilts the top of the steering knuckle toward the front of the vehicle.
Negative Camber

- Wheels tilted in at top
- Inner tread touches road
- Negative camber
Negative Caster

Reduces steering effort
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7. Toe-Out results when the fronts of the wheels are farther apart than the rear.

8. Incorrect camber produces wear on one side of the tire tread.
Toe-Out

Front of wheels farther apart

Toe-out
9. **Tracking** refers to the position or direction of the two front wheels in relation to the two rear wheels.

10. **Positive Camber** results when the tops of the wheels tilt outward when viewed from the front.
Tracking

4-wheel alignment

Improper tracking
Positive Camber
Wheel Alignment Tools
Wheel Alignment Tools

A. Steering wheel lock
B. Brake pedal depressor
Toe Adjustment

Changing tie-rod length on a rack-and-pinion unit
Toe Adjustment

Changing tie-rod length on linkage type steering

- Turn downward to increase rod length
- Turn upward to decrease rod length

Left-hand sleeve

- Turn downward to decrease rod length
- Turn upward to increase rod length

Right-hand sleeve
Alignment Rack
Alignment Console
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