

Steering and Suspension

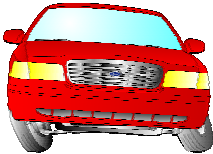
## Steering and Suspension Fundamentals

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Steering and Suspension

## Suspension System

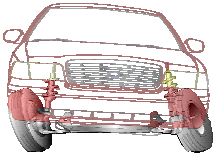
- Support the weight of the vehicle
- Distribute the load to each tire
- Keep the vehicle's wheels in firm contact with the road
- Provide a smooth comfortable ride



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## Suspension System

- The vehicle's sprung weight is supported by:
  - Coil springs
  - Leaf springs
  - Torsion bars
  - Struts
- Ride control is improved with:
  - Shock absorbers
  - Sway bars



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## Non-Independent Suspension

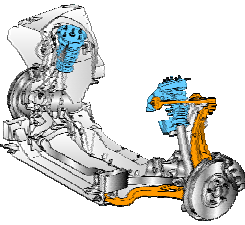
- Solid axle suspended by leaf or coil spring at each end
  - Reliable
  - High load capacity
  - Common on trucks and SUVs
  - Used for front and rear suspension



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## Independent Suspension


- Allow each wheel on an axle to move independently of the other wheel
  - Light weight
  - Improved ride quality
  - Improved handling
  - Used for front and rear suspension



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## Steering System

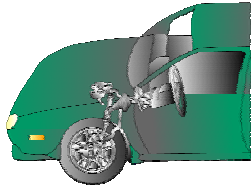
- The steering system allows the driver to control the direction of the vehicle
- A series of linkages connect the steering wheel to the wheels and tires
- Power steering uses hydraulics or fluid pressure to reduce steering effort



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## Steering System Types

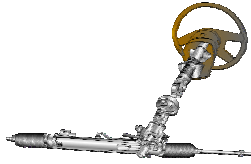
- Rack and pinion
  - Light weight
  - Compact design
- Recirculating ball
  - Minimal internal friction
  - Road shock isolation
  - Commonly used on full size trucks, SUVs and cars



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## Rack and Pinion Steering

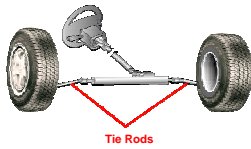
- The rack is a rod with gear teeth cut along one side
- The rack meshes with the teeth of a small pinion mounted at the end of the steering shaft
- The steering shaft runs through the steering column to the steering wheel



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## Rack and Pinion Linkage

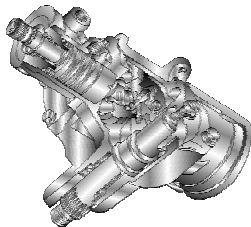
- Two inner tie rod ends are secured to the outer ends of the rack
- The inner tie rod ends drive the tie rod
- The tie rods drive the outer tie rod ends
- The outer tie rod ends drive the steering knuckle



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## Recirculating Ball Steering

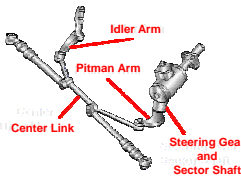
- Five major components
  - Housing
  - Worm shaft
  - Ball nut
  - Recirculating balls
  - Sector or cross-shaft
- Uses parallelogram steering linkage



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## Parallelogram Steering Linkage

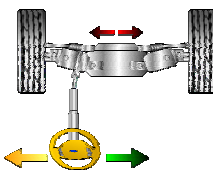
- Sector shaft drives the pitman arm
- Pitman arm drives the center link
- Center link drives the inner tie rod end
- Inner tie rod end drives the tie rod
- Tie rod drives the outer tie rod end
- Outer tie rod end drives the steering knuckle



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## Steering Gear Ratios

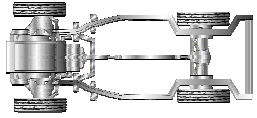
- Steering ratio refers to the number of degrees of driver input in relationship to the number of degrees of tire movement
  - Fast ratio
  - Variable ratio



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### Alignment Angles

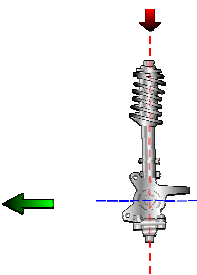
- Proper alignment provides for vehicle control and minimal tire wear
- Three angles are commonly adjustable
  - Caster
  - Camber
  - Toe



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### Caster

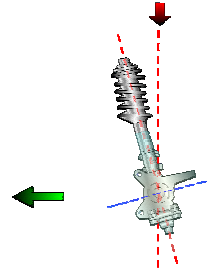
- The forward or rearward tilt of the steering axis as viewed from the side of the vehicle
  - Neutral



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### Caster

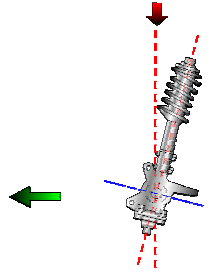
- The forward or rearward tilt of the steering axis as viewed from the side of the vehicle
  - Neutral
  - Negative



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### Caster


- The forward or rearward tilt of the steering axis as viewed from the side of the vehicle
  - Neutral
  - Negative
  - Positive



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### Camber Angle


- Inward or outward tilt of the tire when viewed from the front of the vehicle
  - True vertical is referred to as zero camber or camber neutral



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### Camber Angle

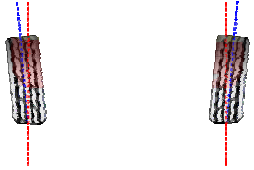
- Inward or outward tilt of the tire when viewed from the front of the vehicle
  - True vertical is referred to as zero camber or camber neutral
  - An inward tilt is referred to as negative camber



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### Camber Angle

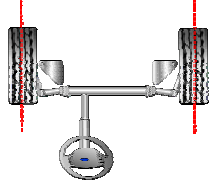
- Inward or outward tilt of the tire when viewed from the front of the vehicle
  - True vertical is referred to as zero camber or camber neutral
  - An inward tilt is referred to as negative camber
  - An outward tilt is referred to as positive camber



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### Toe

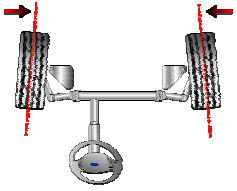
- Measurement of the difference in distance between the front of the tires and the rear of the tires
  - Zero toe



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### Toe

- Measurement of the difference in distance between the front of the tires and the rear of the tires
  - Zero toe
  - Toe in or positive toe



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### Toe

- Measurement of the difference in distance between the front of the tires and the rear of the tires
  - Zero toe
  - Toe in or positive toe
  - Toe out or negative toe

