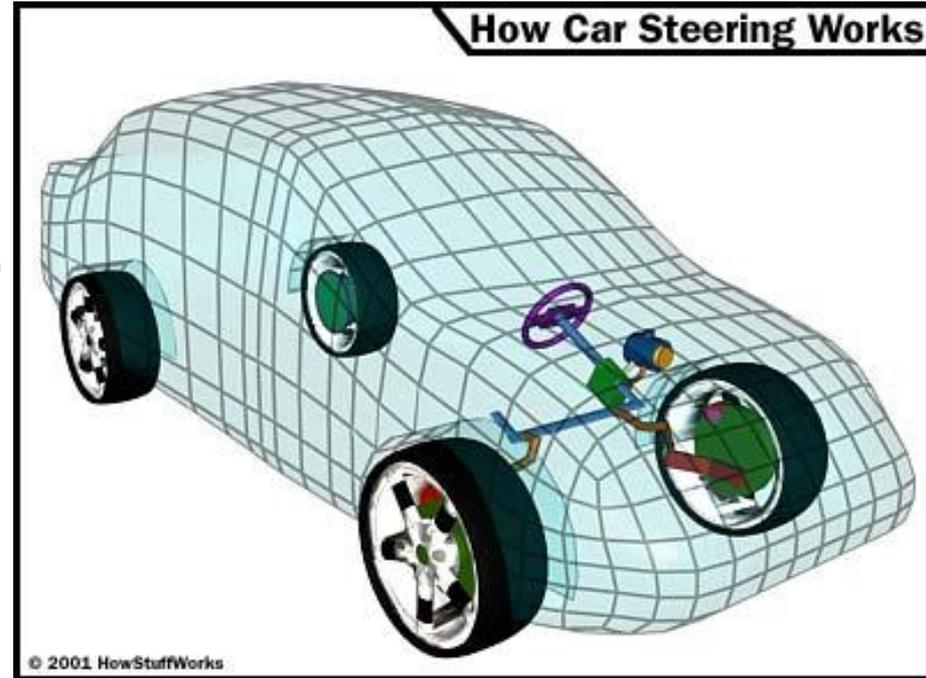


Steering System

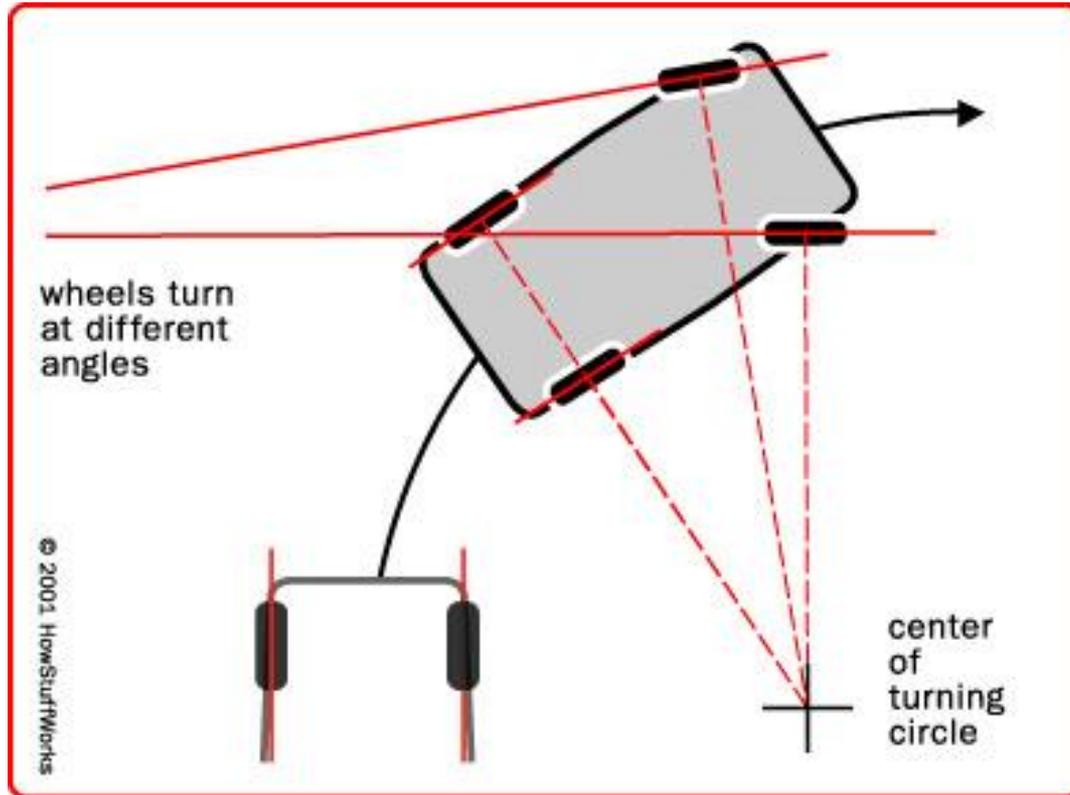
Function of Steering System

- Control of front wheel (sometimes rear wheel) direction.
- Transmit **road feel** (slight steering wheel pull caused by the road surface) to the drivers hand.
- Maintain correct amount of effort needed to turn the wheels.
- Absorb most of the shock going to the steering wheel as the tire hits holes and bumps in the road.
- Allow for suspension action.



Steering System

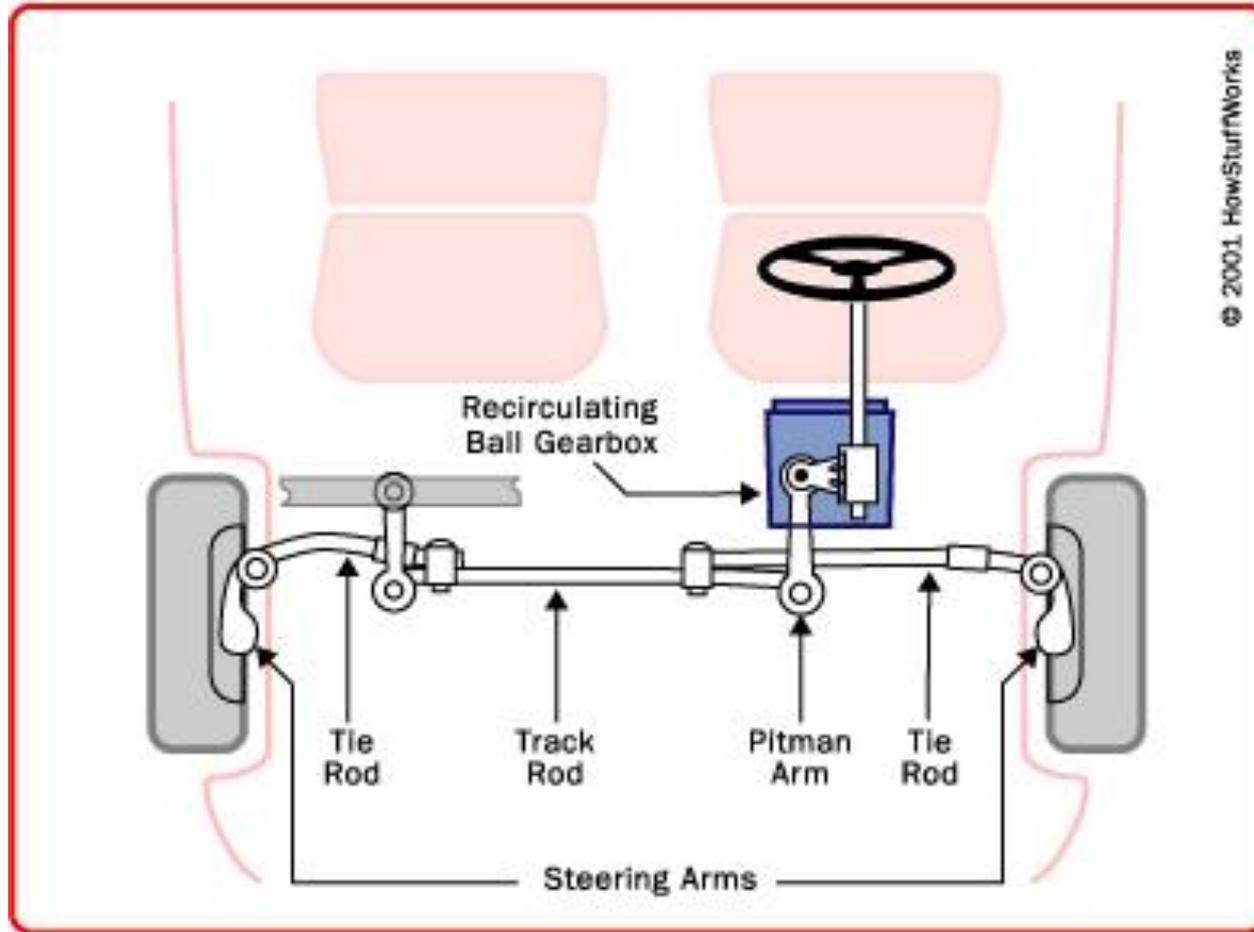
Turning the Car (when turning, front wheels don't point the same direction)



- Inside wheel turns at a smaller radius, hence the inside wheel turns at a steeper angle than the outside wheel.

Steering System

Linkage Steering System (Worm Gear)



Steering System

Linkage Steering System (Worm Gear) Parts

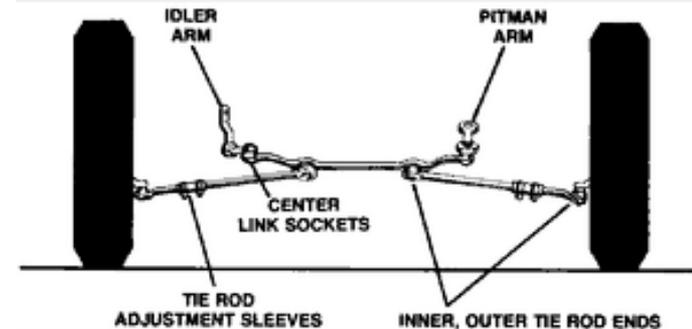
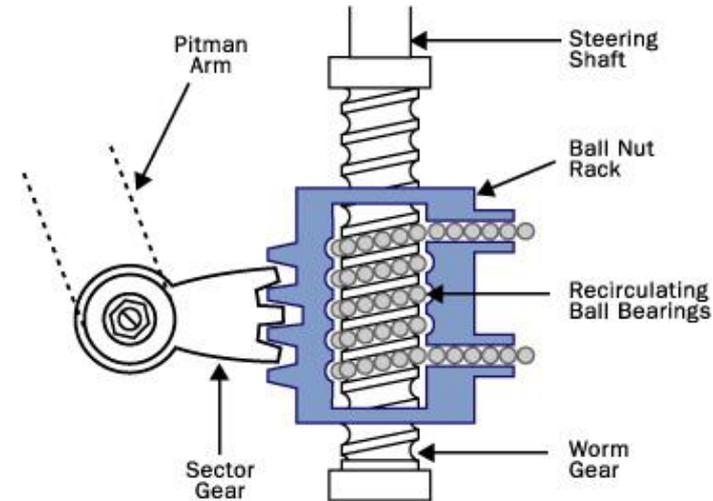
- **Steering Wheel** – used by the driver to rotate a steering shaft that passes through the steering column.
- **Steering Shaft** – transfers turning motion from the steering wheel to the steering gearbox.
- **Steering Column** – supports the steering column and steering shaft.



Steering System

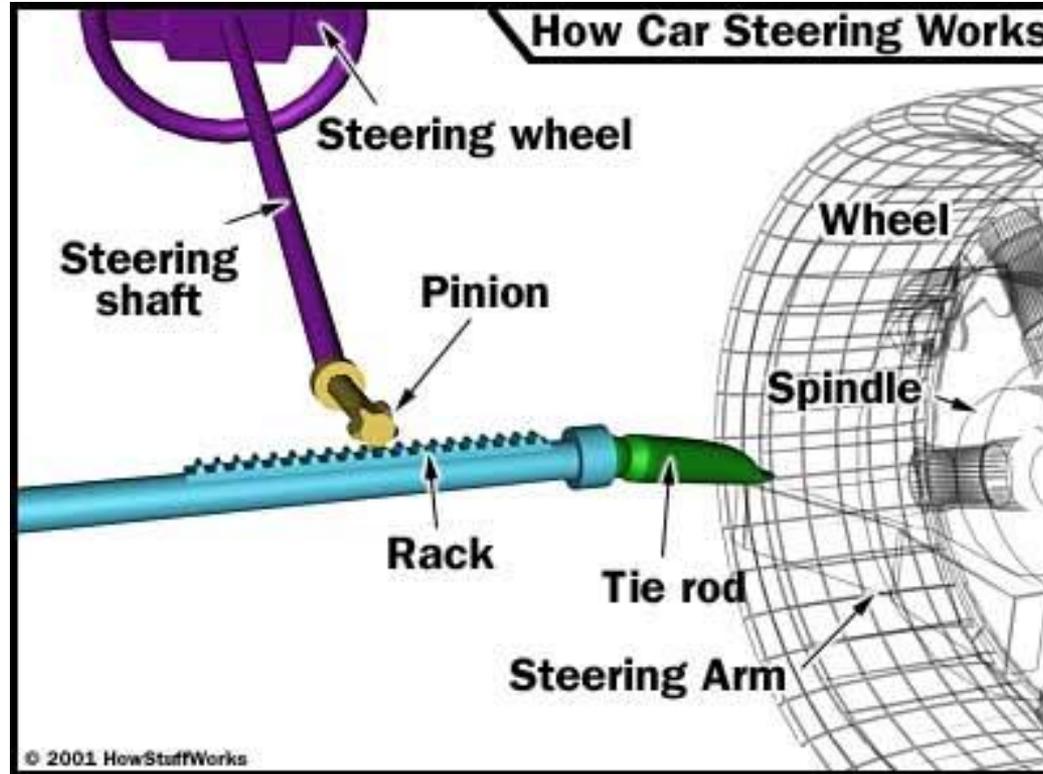
Linkage Steering System (Worm Gear) Parts

- **Steering Gearbox** – changes turning motion into a straight-line motion to the left or right.
- Steering gear box ratios range from 15:1 to 24:1 (with 15:1, the worm gear turns 15 times to turn the selector shaft once).
- **Steering linkage** – connects the steering gearbox to the steering knuckles and wheels.



Steering System

Basic Rack-and-Pinion Steering



- **Pinion Gear**- rotated by the steering wheel and steering shaft; its teeth mesh with the teeth on the rack.
- **Rack**- long steel bar with teeth along one section; slides sideways as the pinion gear turns.

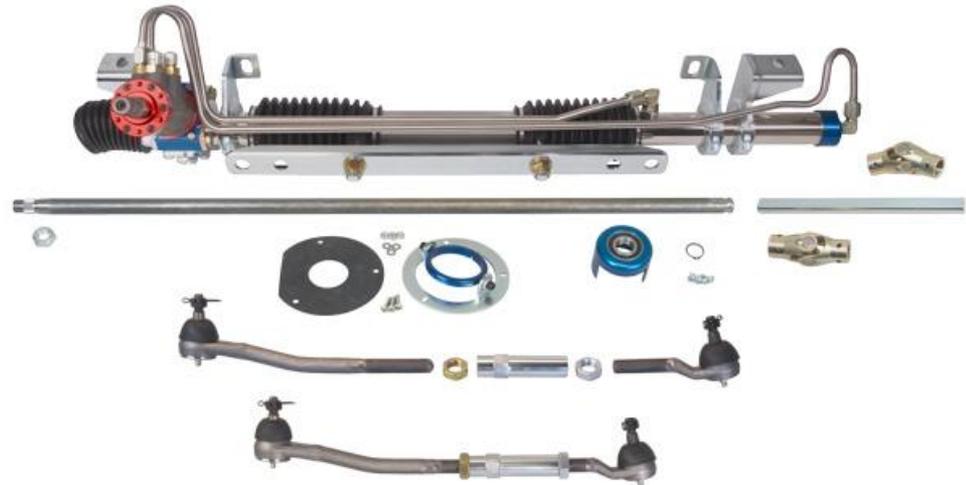
Steering System

Basic Rack-and-Pinion Steering

• **Gear Housing**- holds the pinion gear and rack.

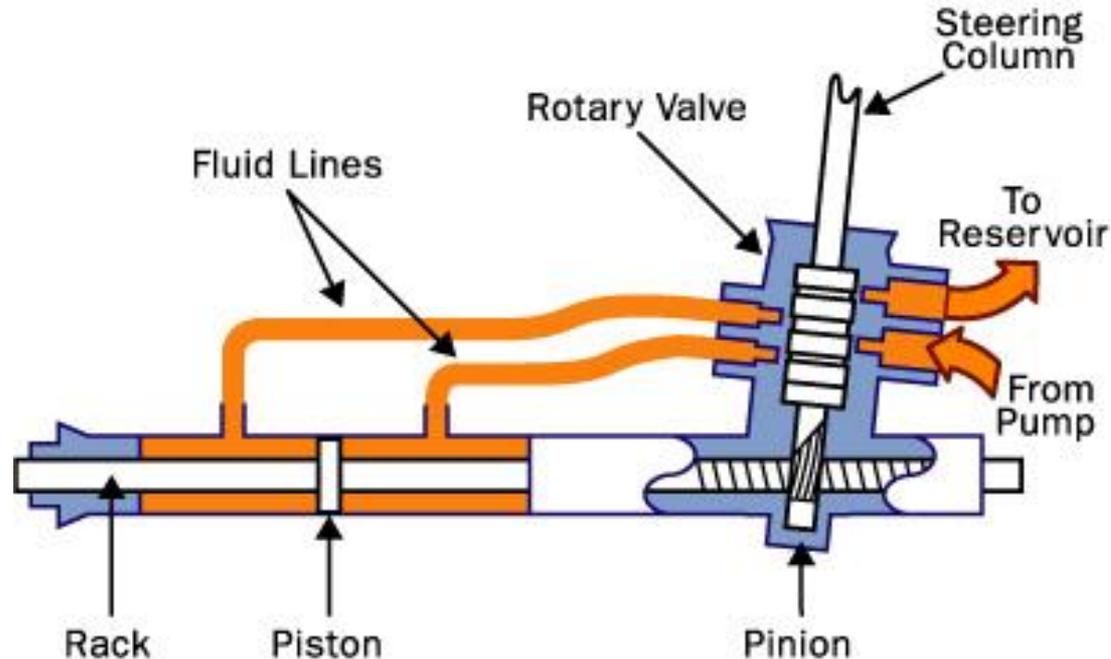


• **Tie-rods**- connects the rack with steering knuckles.



Steering System

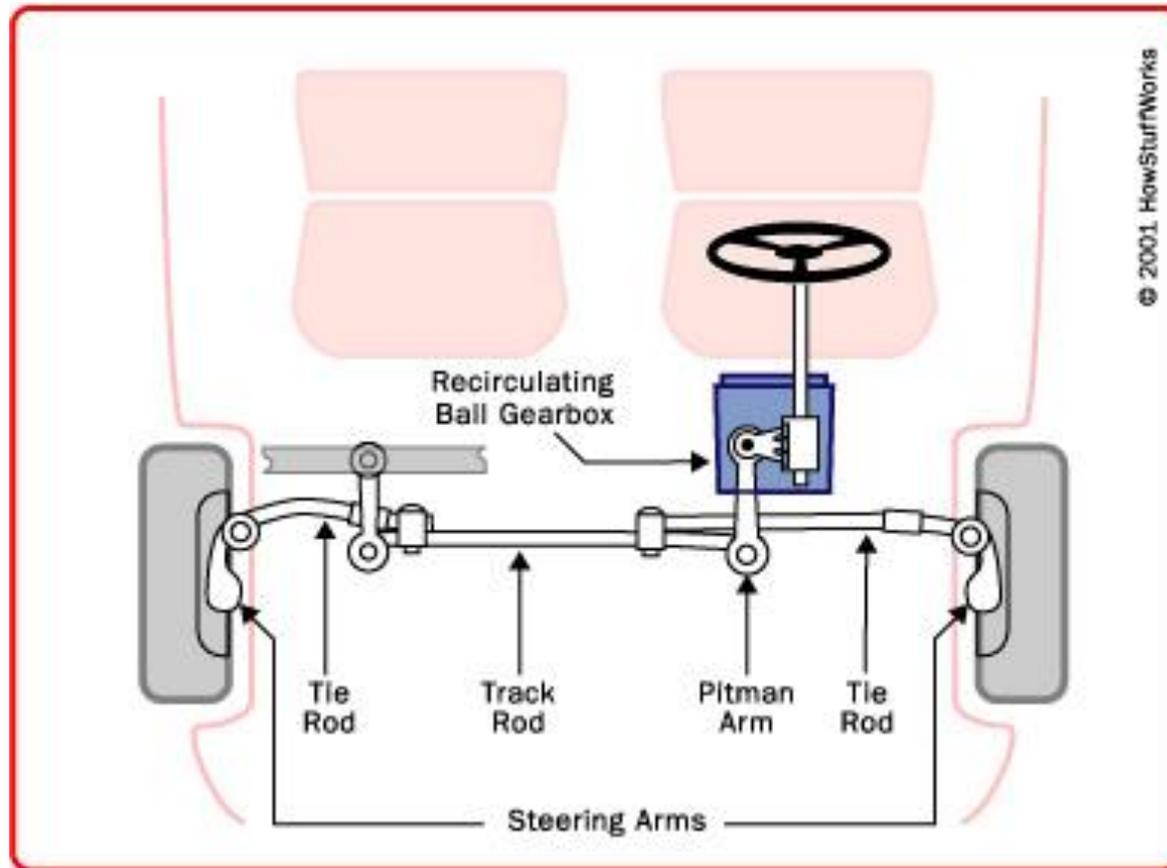
Basic Rack-and-Pinion Steering



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- Part of rack contains a piston
- Two fluid ports, one on each side.
- The side with high pressure pushes the piston to the opposite side (turning the wheel).

Steering Linkage

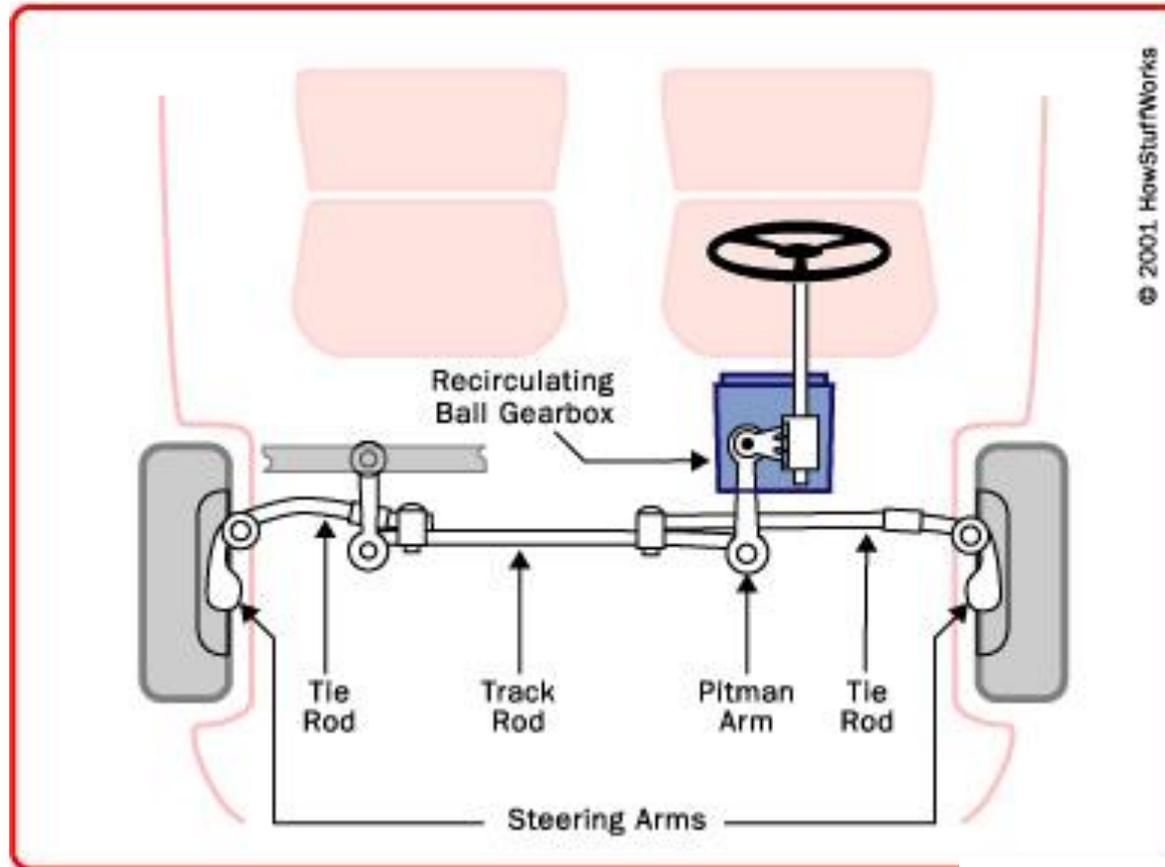


Pitman Arm transfers gearbox motion to the steering linkage.

- Pitman arm is splined to the gearbox.



Steering Linkage

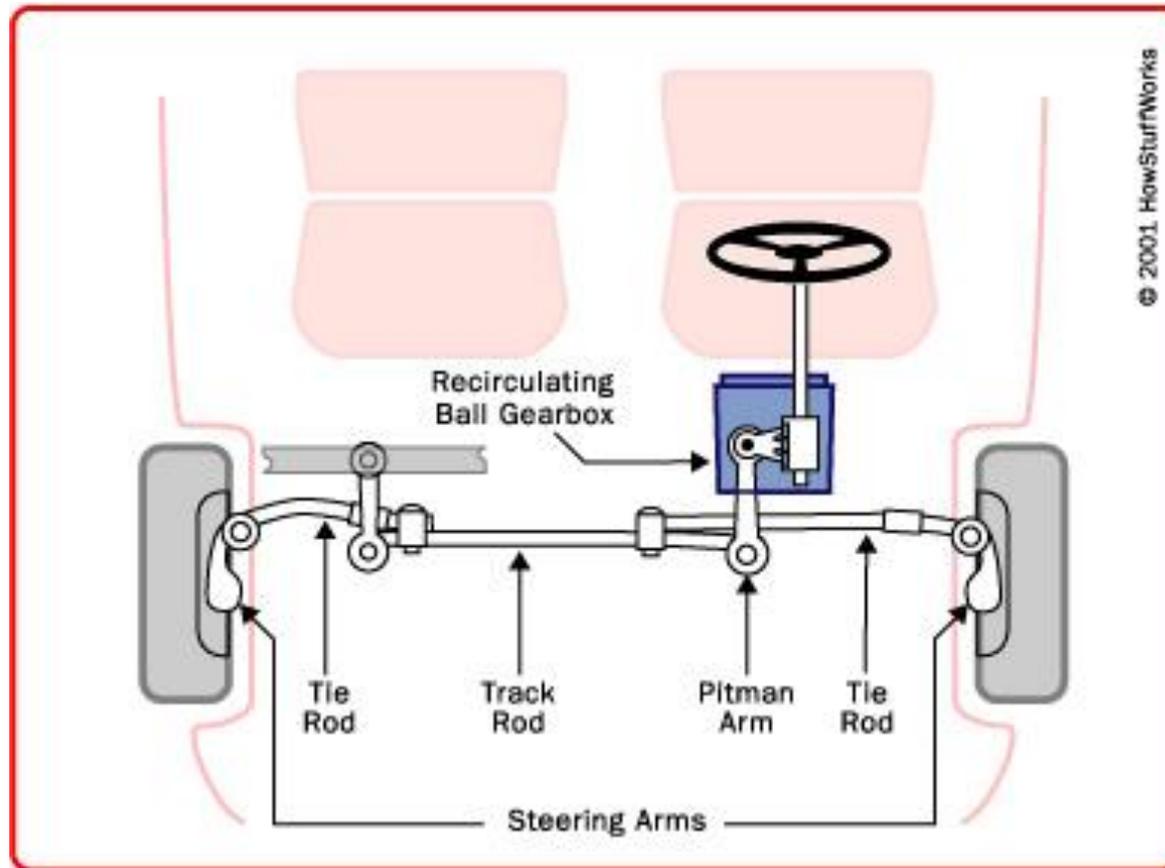


Center Link (Relay Rod) steel bar connects the right and left side of the steering linkage.

- Connects to Pitman arm, Tie rod ends, and Idler arm.



Steering Linkage

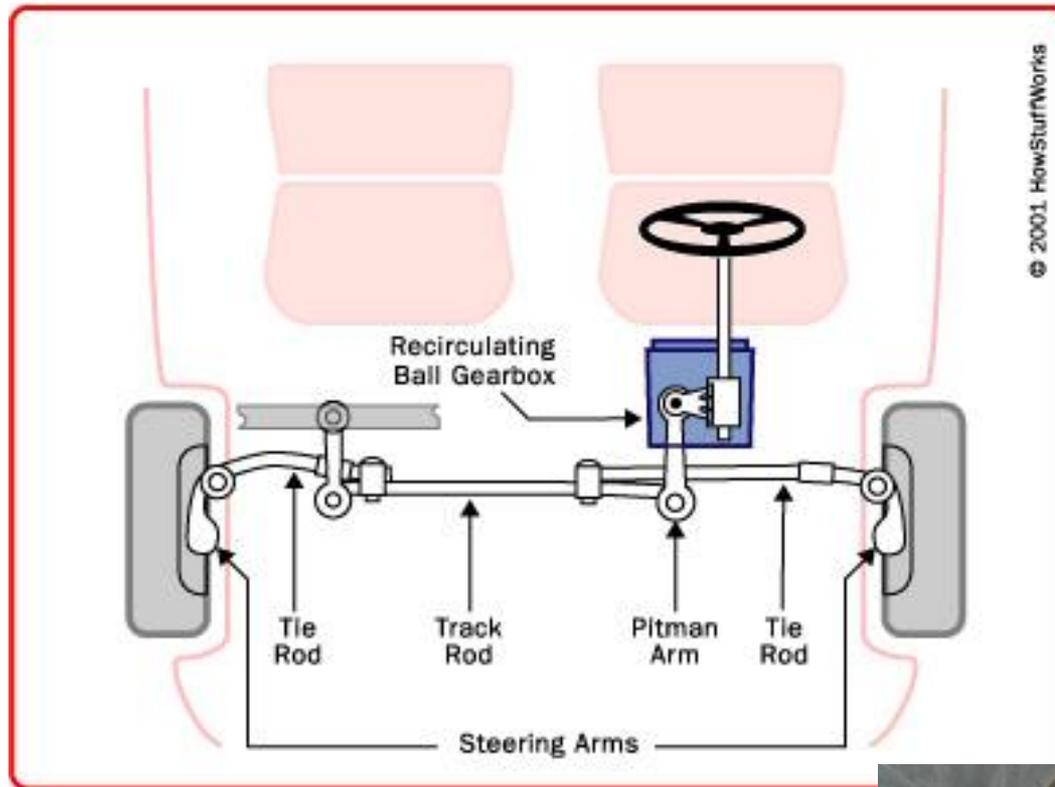


Idler Arm supports the end of the center link on the passenger side of the vehicle.

- Bolts to the vehicle's frame.
- If worn, will cause excessive steering play.



Steering Linkage

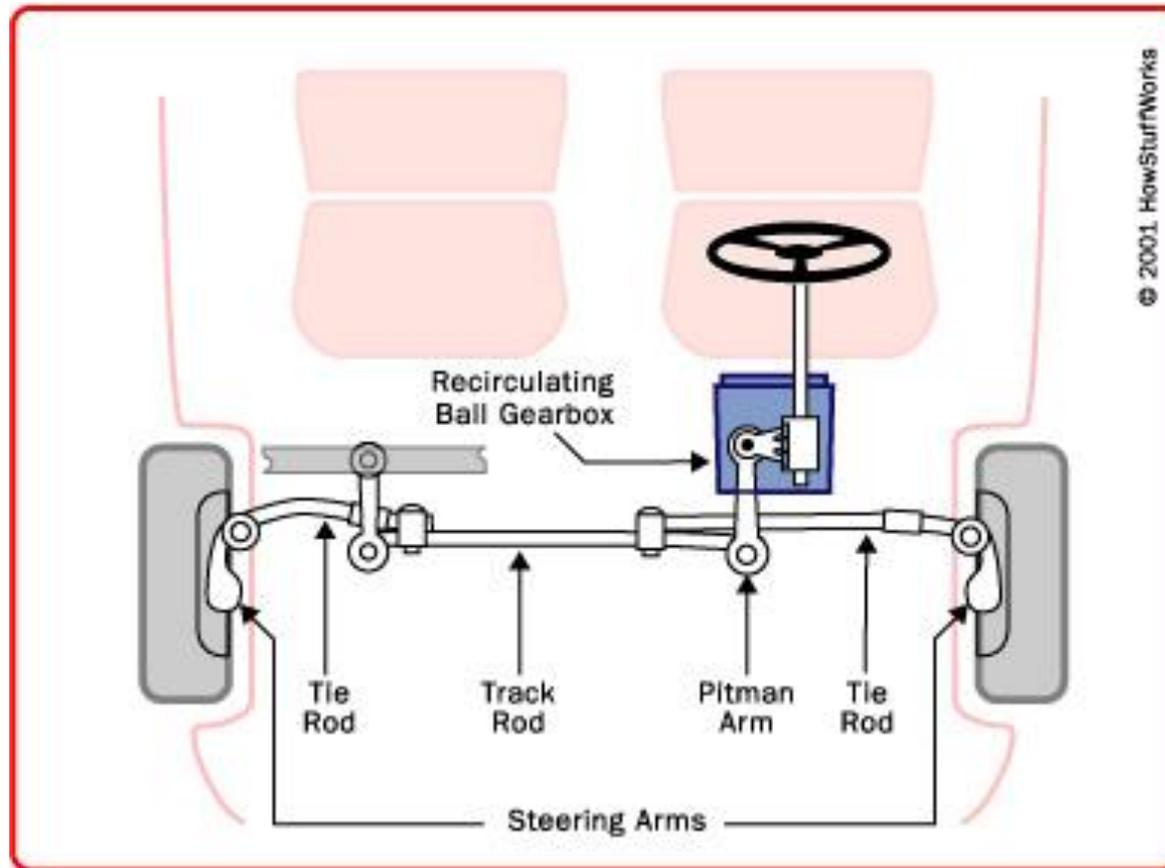


Tie-Rod Assemblies: Two tie-rod assemblies are used to fasten the center link to steering knuckles.

- Assembly is consist of inner tie-rod end, outer tie-rod end, and a toe adjustment sleeve.
- Be sure to check the toe setting after replacing the tie-rod ends.



Steering Linkage



Rack-and-pinion outer tie-rod end is similar to the regular tie-rod end, but the inner tie-rod end sits inside the rack assembly.



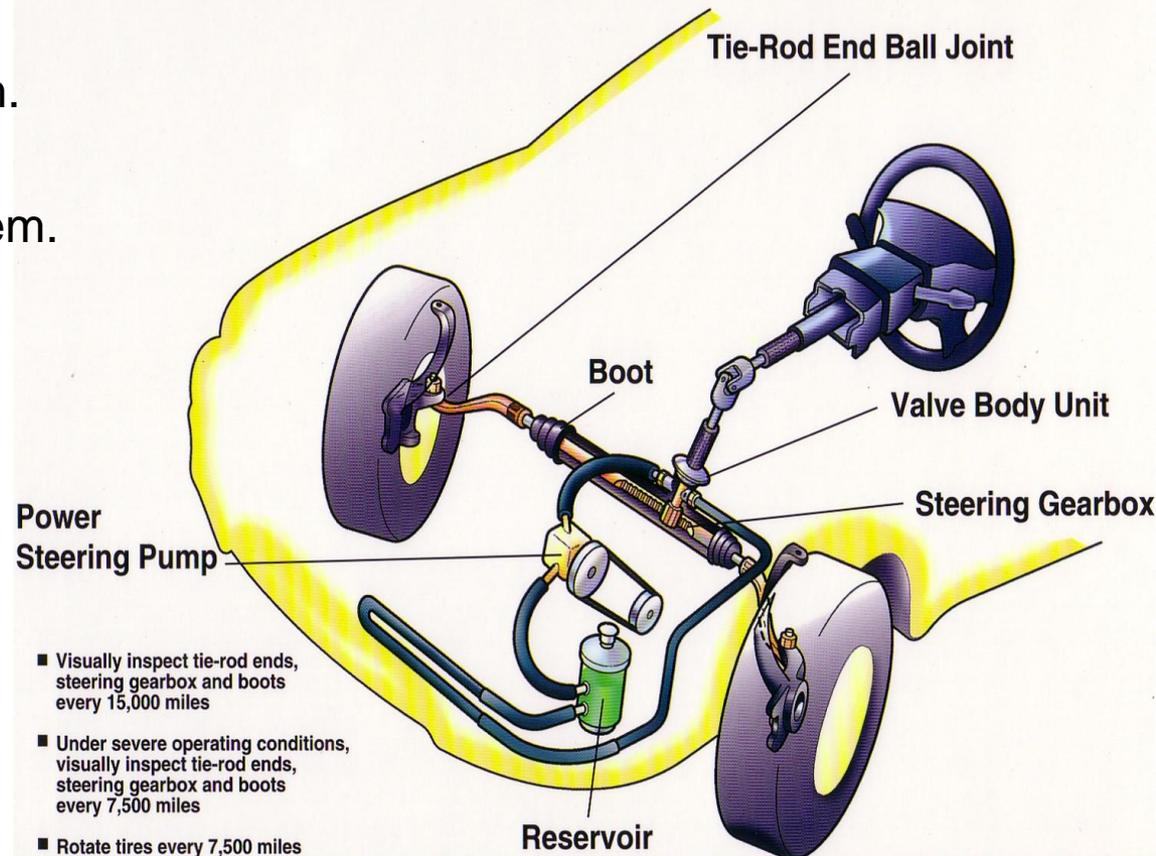
Steering System

Power Steering normally use an engine driven pump and a hydraulic system to assist steering action.

Three major types of power steering systems:

- Integral-piston linkage system.
- External power steering system.
- Rack-and-pinion system
 - Integral power piston.
 - External power piston.

Integral Rack-and-pinion system is the most common.

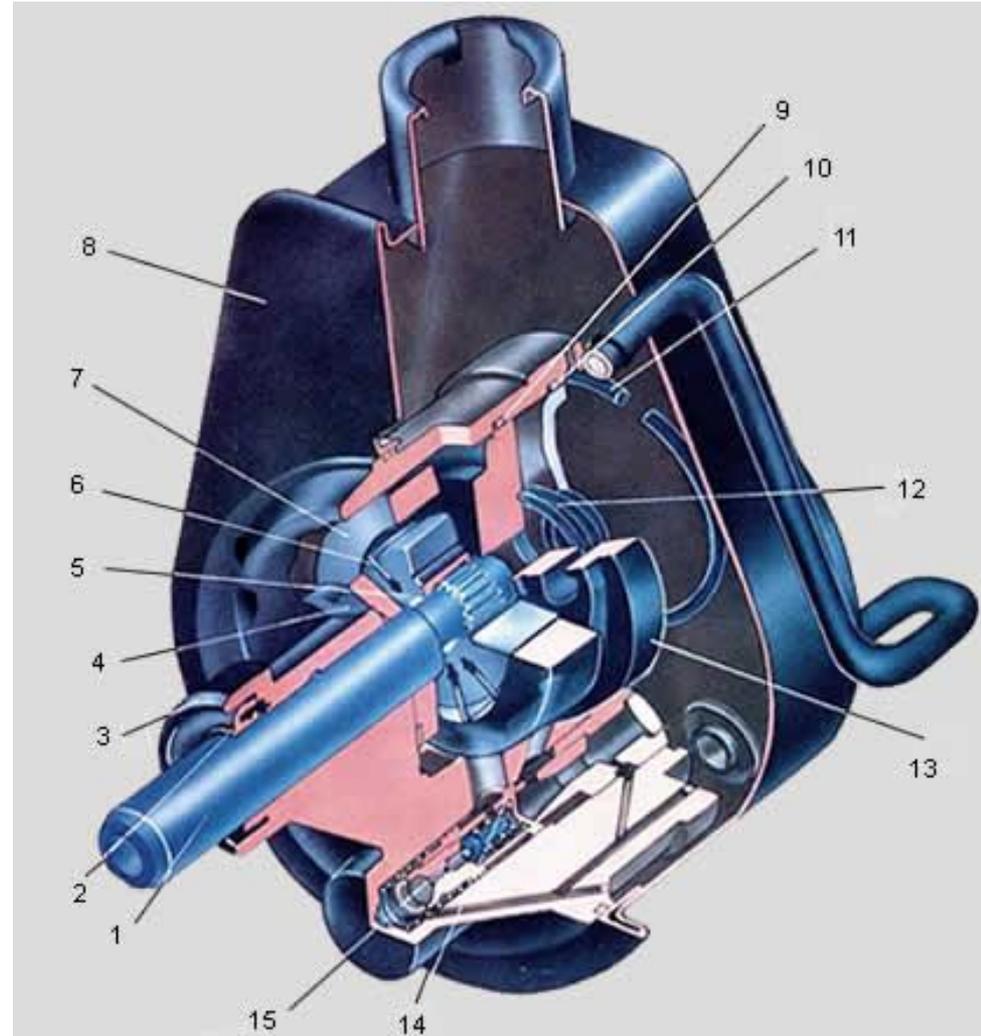


Steering System

Power steering pump is driven by the engine produces the hydraulic pressure for steering system operation.

Four basic pumps:

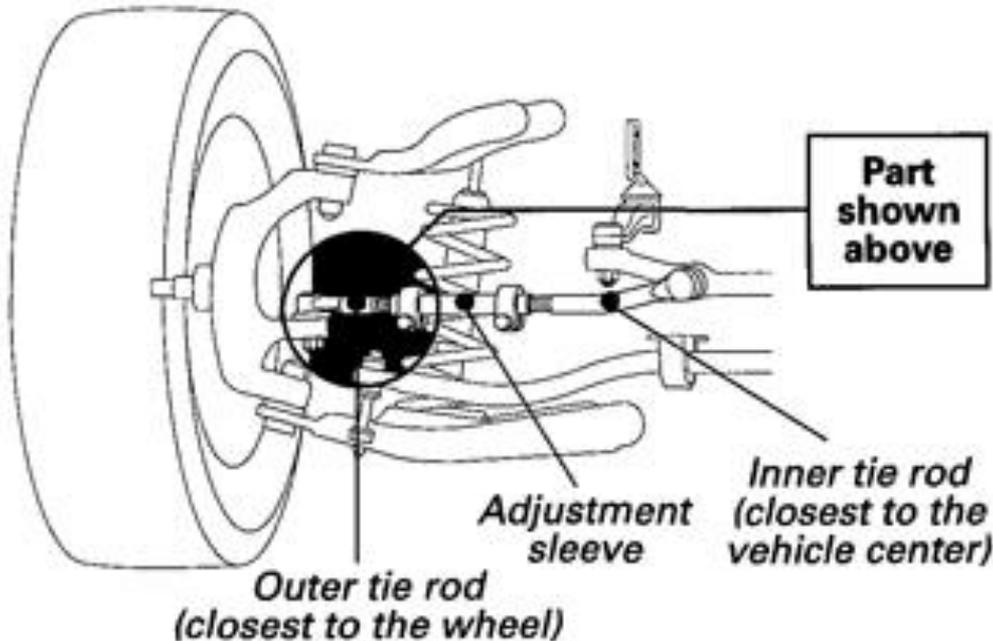
- Roller pump.
- Vane pump.
- Slipper pump.
- Gear pump.



Steering System Diagnosis

Steering Wheel Play is the most common problem.

Should not be able to turn the steering wheel more than 1 ½" (33mm) without causing movement of the front wheels.



Move the wheel side-to-side, should have no play.

Steering System Diagnosis

Hard Steering (steering wheel requires excessive turning effort)

- Low power steering fluid.
- Pump belt broken or slipping.



Steering System Noise

- Belt squeal is a loud screeching sound produced by a worn belt.
- Power steering pump noise is usually a loud whine that only occurs when the steering wheel is turned.
 - Low fluid level and air in the system.

Check fluid with engine turned off.

Steering System

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