

## AUDI POWER-ASSISTED RACK & PINION

4000, Quattro

### DESCRIPTION

A power-assisted rack and pinion steering gear is used. The system consists of a vane pump, rotary piston pinion gear assembly and an oil reservoir.

The vane pump draws fluid from the reservoir and supplies it to the flow control valve. The control valve supplies fluid to the proper side of the rack-piston when the steering wheel is turned.

The pump is belt driven and is mounted on the front of the engine. The reservoir is located near the firewall.

### LUBRICATION

#### CAPACITY

1 qt. (.95L)

#### FLUID TYPE

ATF Dexron

#### FLUID LEVEL CHECK

Remove reservoir cover, start engine and check fluid level. Fluid level should be at mark on upper inside of reservoir.

#### HYDRAULIC SYSTEM BLEEDING

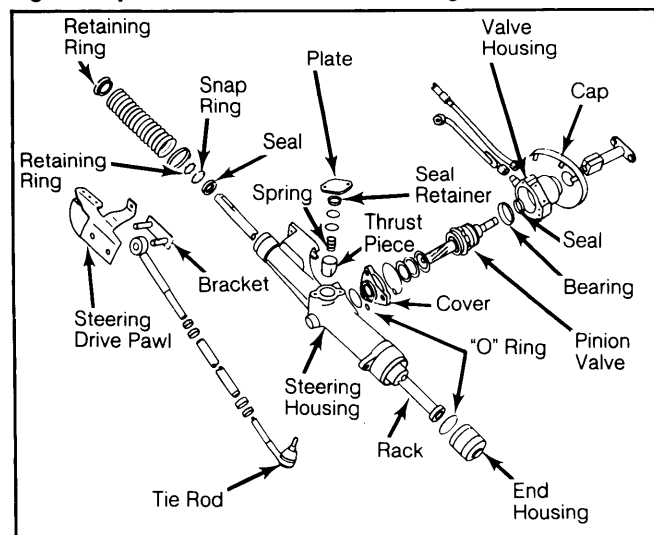
1) Start engine and allow to idle. Check that fluid is at proper level. Turn steering wheel lock to lock several times quickly.

2) Continue until fluid level remains at reservoir mark. Make sure that no bubbles appear in reservoir when steering wheel is turned. Shut off engine and check that oil level does not rise more than 3/8" (9.5 mm) above mark.

#### OIL FILTER REPLACEMENT

Remove outer cover, gasket and spring from reservoir. Remove inner filter cover and filter insert. Replace filter. Install new filter, replace old filter cover, spring, gasket, and top cover. Check fluid level.

Fig. 1: Exploded View of Power Steering Gear



**NOTE:** Oil filter insert must be replaced whenever repairs are made to power steering system.

### ADJUSTMENT

#### PUMP BELT

1) Remove belt from alternator and air conditioning compressor. Loosen 2 nuts on pump mounting bracket.

2) Turn adjusting nut on bracket until belt deflection is 3/8" (9.5 mm) at center of belt. Tighten nuts to specifications. Reinstall alternator and air conditioning belts.

#### STEERING GEAR

1) Loosen lock nut on steering gear. Hand tighten adjusting screw until it just touches the thrust plate. Hold adjusting screw and tighten lock nut.

2) Check adjustment with engine idling. No play should be felt. Readjust if necessary.

### TESTING

#### SYSTEM PRESSURE TEST

1) Install pressure gauge (US1074/2) between pressure hose and pressure pipe of valve housing, with pressure gauge valve open. Run engine at idle.

2) Turn steering wheel lock to lock several times. Check pressure. Pressure should be 986-1189 psi (69-84 kg/cm<sup>2</sup>). If pressure is not within limits, replace steering gear.

#### PUMP PRESSURE TEST

1) With pressure gauge installed, start engine and idle. Close valve (for no longer than 5 seconds) and check pressure. Pressure should be 986-1189 psi (69-84 kg/cm<sup>2</sup>).

2) If pressure differs, check limiting valve by inspecting bores in valve and piston for obstructions. Check that piston moves freely in housing. Install new valve if necessary.

#### LEAKAGE TEST

1) With engine idling, turn steering wheel to full lock and hold in position. Inspect all connections and tighten, if necessary. If leak shows at steering pinion, replace housing seal and both intermediate cover seals.

2) If pinion shaft seal is leaking, fluid will have entered gear housing. Check for fluid by loosening outer clamp on right steering boot and pushing boot in. If seal is leaking, disassemble steering gear. Replace all seals.

### REMOVAL & INSTALLATION

#### STEERING GEAR

##### Removal

1) Drain fluid from system. Disconnect pressure and return pipes from valve housing. Disconnect lower steering shaft from pinion shaft. Move cap out of the way.

2) Remove steering drive pawl and tie rod bracket nuts. Disconnect tie rods from bracket. Remove bolts attaching gear housing to body. Remove gear housing.

# Power Steering

## AUDI POWER-ASSISTED RACK & PINION (Cont.)

### Installation

To install, reverse removal procedures. To facilitate tie rod installation, install one tie rod to steering gear and tighten before installing other tie rod.

### VANE PUMP

#### Removal

Remove alternator and vane pump belts. Disconnect pressure and suction lines from pump and cover openings. Remove retaining bolts from bracket and lift pump from engine.

#### Installation

To install, reverse removal procedures. Adjust belt deflection to 3/8" (9.5 mm) at center. After installation of pressure and suction lines, start engine and turn steering wheel to full lock and check for leaks in connections.

## OVERHAUL

Before disassembling steering gear, check output and system pressure. Always use all parts in repair kit (811 498 020) and always use new self-locking nuts.

### PINION HOUSING SEAL

#### Disassembly

1) Remove attaching bolts from valve housing and remove housing. Remove pinion gear and intermediate cover.

2) Remove "O" rings from intermediate cover (1 on each side) and drive out intermediate cover oil seal. Anchor housing in padded vise and drive out oil seal from the back.

3) Install new seals from the inside cover and housing. Make sure that seal lip on housing seal faces intermediate cover. Seal lip of cover seal must face valve housing. Replace both intermediate cover "O" rings.

#### Reassembly

To install, reverse removal procedures. Protect pinion teeth on shaft when replacing intermediate cover. Do not damage "O" rings during installation.

### STEERING GEAR

#### Disassembly

1) With steering gear assembly removed from vehicle, remove pinion valve housing. Remove pinion valve assembly. Remove plate, seal retainer, spring, and thrust piece from steering housing.

2) Remove retaining ring, clamp and boot from steering housing. Remove retaining ring and snap ring from steering housing.

3) Remove end housing and "O" ring from steering housing. Pull rack out of steering housing. Using oil seal puller, remove oil seal from steering housing.

#### Reassembly

1) To install new oil seal to steering housing, place oil seal on flat surface and push sleeve (available in repair kit 811 498 020) into oil seal. Slide rack into steering housing.

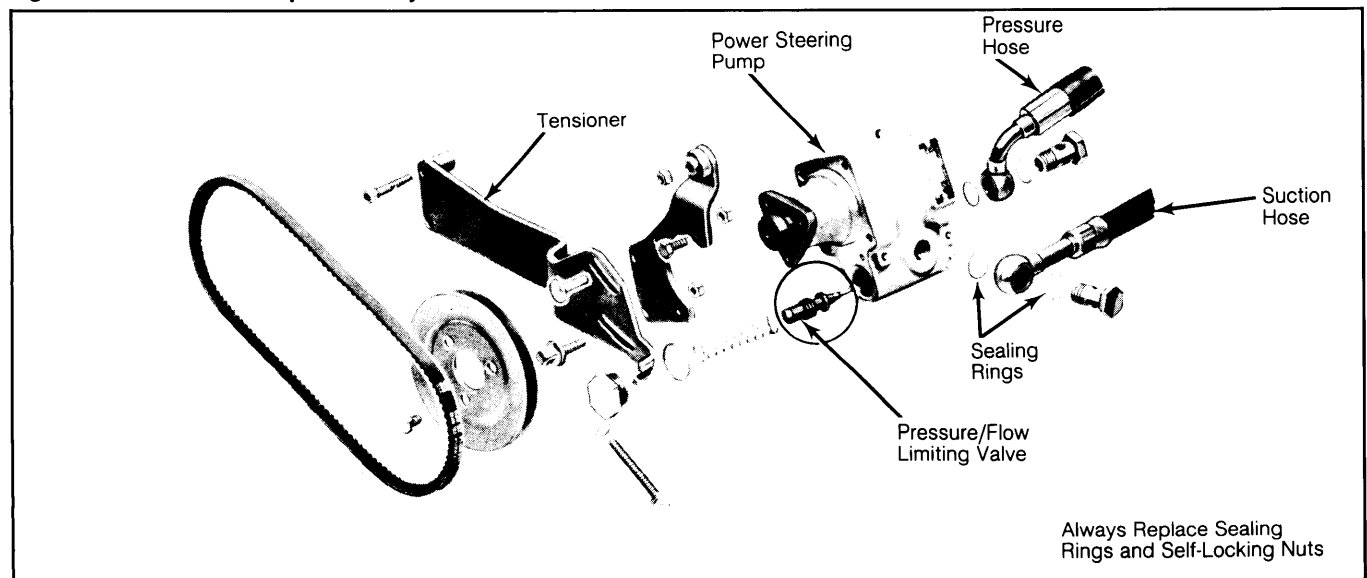
2) Slide oil seal with sleeve over rack and into steering housing using installer tools (VW 426 and VW 4166). Remove sleeve. Install snap ring and retaining ring.

3) Install end housing with new "O" ring. Install thrust piece, spring, "O" ring, seal retainer, and plate. Install clamp, boot, and retaining ring. Install pinion valve assembly as previously described.

### TIGHTENING SPECIFICATIONS

| Application                            | Ft. Lbs. (N.m) |
|--|----------------|
| End Housing .....                      | 37 (50)        |
| Pressure-Flow Limiting Valve Cap ..... | 42 (57)        |
| Pressure Pipe .....                    | 29 (39)        |
| Return Pipe                            |                |
| On Pump .....                          | 29 (39)        |
| On Valve Housing .....                 | 22 (30)        |
| Steering Drive Pawl .....              | 32 (44)        |
| Tie Rod-to-Steering Drive Pawl .....   | 32 (44)        |
| Valve Housing Bolts .....              | 14 (19)        |

Fig. 2: View of Vane Pump Assembly



Only pressure/flow limiting valve can be replaced.