

VOLVO RACK & PINION

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DESCRIPTION

Rack and pinion steering gear is mounted in rubber insulators to front crossmember. Movement of steering wheel is transmitted by steering shaft assembly to helical pinion.

Rotation of pinion causes rack to move laterally where tie rods, attached to rack, transmit this movement to spindle arms, causing front wheels to change direction.

Two types of steering gears are used by Volvo. The first is a Cam Gear unit which may be recognized by the two bolt rack damper cover. The second type is a ZF unit which has a plug type rack damper cover.

REMOVAL & INSTALLATION

STEERING GEAR

Removal

1) Push protective cover up out of way of lower joint. Remove lock bolt and nut from pinion flange. Bend flange apart slightly.

2) Raise and support front of vehicle and remove wheels. Remove tie rod nuts and disconnect ball studs from spindle using ball joint removal tool (9995043).

3) Remove splash guard and bolts securing steering gear to crossmember. Disconnect gear from flange and remove gear.

Installation

To install, reverse removal procedure making sure that recess on pinion shaft is aligned towards lock bolt opening in flange.

TIE RODS

Removal

1) Raise vehicle and remove wheels. Remove tie rod nuts and disconnect ball studs from spindle using ball joint removal tool (9995043). Remove splash guard.

2) Loosen inner clamps for both rubber bellows and drain oil, then re-attach clamp on side not being removed (if applicable). Bend up tie rod lock and disconnect rod from steering gear.

3) Clamp ball stud in vise, loosen lock nut and unscrew rod, counting number of thread turns. Remove outer clamp for rubber bellows and remove bellows.

Installation

1) Install rubber bellows and outer clamp. Screw on lock nut same number of turns as when removed. Install ball stud and tighten lock nut.

2) Attach tie rod to steering gear and punch ball stud edge into rack groove. Fill a suction gun with 6.75 oz. (200 cc) of 20W-50 engine oil and inject oil into steering gear through rubber bellows inner end.

3) Install inner bellows clamp and tighten clamp and tighten clamp after turning tie rod so that ball stud is up. Connect tie rod to spindle making sure that both rods are the same length within .08" (2 mm).

ADJUSTMENT

NOTE: Adjustments are performed during gear assembly process. See Overhaul as outlined.

OVERHAUL

CAM GEAR

Disassembly

1) Clean steering gear. Check inner ball joints for wear. Loosen pinion side rubber bellows. Drain oil.

2) Remove pinion side ball stud, lock nut and rubber bellows. Bend up locked portion of ball joint and unscrew pinion side tie rod. Repeat procedure on opposite side of gear.

3) Remove rack damper cover, spring "O" ring and piston. Remove pinion cover and lift out pinion assembly. Pull out rack from pinion side of gear housing and remove rack bushing using a puller (4078).

4) Use a puller (5047) to remove pinion lower bearing. Clean all parts and check for wear. Replace all seals, rack bushing and worn parts.

Reassembly & Adjustment

1) Lubricate all parts with 20W-50 engine oil. Install new rack bushing so that locks align with gear housing slots. Install pinion lower bearing using a driver.

2) Install pinion with upper bearing (no shims) in housing. Install pinion spacer sleeve. Cover with gasket (no seal). Use a dial indicator to measure pinion end play. Record for later use. Remove pinion assembly.

3) Insert rack in gear housing from pinion side using care that rack teeth do not damage rack bushing. Apply a non-hardening gasket compound to pinion cover seal and install seal in cover using driver (2734).

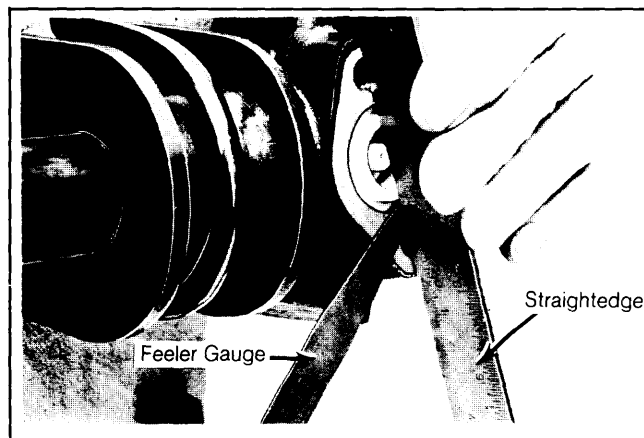
4) Calculate required pinion shim thickness by adding .004-.010" (.10-.25 mm) to pinion end play in step 2). This will give correct pinion preload.

5) Install pinion, shims and spacer sleeve with shims between upper bearing and spacer sleeve. Install pinion cover with gasket and seal.

6) Place rack damper piston in housing without "O" ring or spring. Using straightedge and feeler gauge, measure end play between end of piston and housing.

7) Measure gasket thickness. For correct preload, calculate shim thickness required to obtain a total thickness (gasket and shim) .001-.006" (.02-.15 mm) greater than piston end play. Install spring and "O" ring in piston. Install shims, gasket and cover.

Fig. 1: Measuring Rack Damper Piston End Play on Cam Gear Type



8) Using torque gauge (5053), crank rack back and forth from one end to the other. Torque reading should be 8-14 INCH Lbs. (.9-1.5 N.m). Install pinion side tie rod and punch ball joint edge into rack groove.

Steering Gears & Linkage

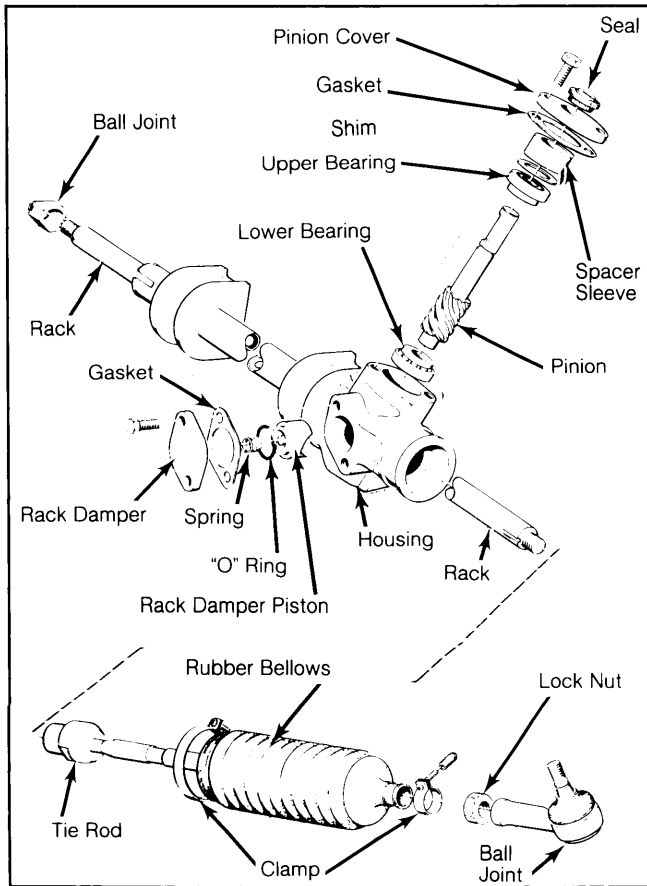
VOLVO RACK & PINION (Cont.)

NOTE: When installing old tie rod, place a thin shim between ball joint and rack shoulder so unused portion of ball can be used for punch locking.

9) Install pinion side rubber bellows with inner clamp only. Install lock nut and ball stud. Repeat procedure for other side of gear and adjust both rods to the same length within .08" (2 mm).

10) Use a suction gun to inject 6.75 ozs. (200 cc) of 20W-50 engine oil through outer end of pinion side rubber bellows. Install outer clamps on bellows.

Fig. 2: Exploded View of Cam Gear Steering Gear Assembly



ZF STEERING GEAR

Disassembly

1) Clean exterior of steering gear. Check inner ball joints for wear. Remove pinion side rubber bellows. Bend up locked portion of ball joint. Unscrew tie rod from rack. Remove opposite tie rod in like manner.

2) Remove dust seal and rack damper cotter pin. Remove cover and spring using tool (5119). Bump rack with palm of hand to aid removal of rack damper piston.

3) Remove pinion shaft dust seal. Unscrew the pinion shaft nut using tool (5119). Clamp pinion shaft in a soft-jawed vise and tap lightly on housing with soft mallet to remove pinion.

4) Remove rack from pinion side of housing and remove rack bushing by pressing in locking tabs and prying bearing out. Press pinion thrust washer and

bearing from shaft. Clean all parts and check for wear. Replace all "O" rings and worn parts.

Reassembly & Adjustment

1) Press bearing onto pinion and install snap ring and thrust washer. Install new "O" rings on rack bushing and press bushing into housing making sure that tabs on bushing fit correctly into slots of housing.

2) Lubricate rack. Insert rack into pinion side of housing, using care not to damage rack bushing with rack teeth. Lubricate and install pinion with bearing.

3) Install new "O" ring in pinion nut and install nut using tool (5119). Torque to 16-19 ft. lbs. (22-27 N.m). Install snap ring and press down against nut.

4) Fill cavity on top of nut with grease and install dust seal. Install new "O" ring on rack damper piston, grease piston and install piston and spring.

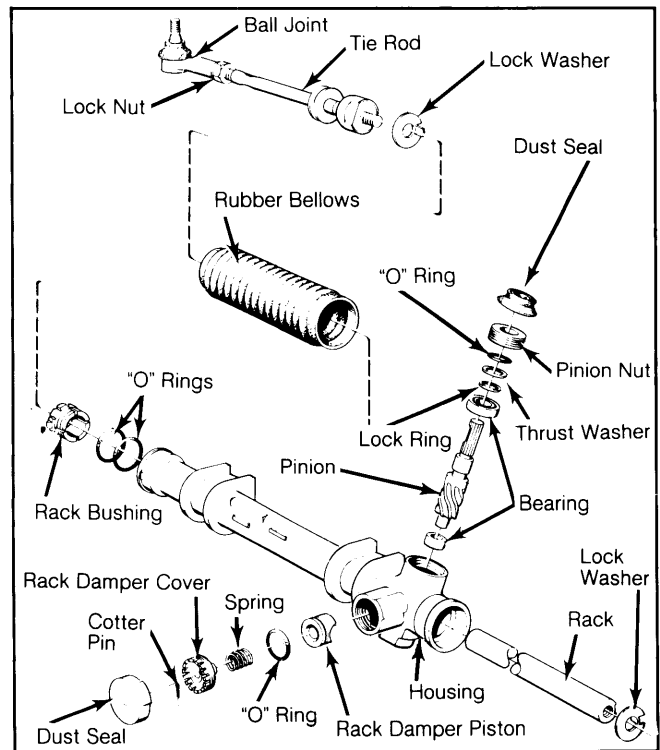
5) Install, but do not tighten rack damper cover (use tool 5119). Using torque gauge, crank rack back and forth between end positions. Torque should be 8-14 INCH Lbs. (.9-1.5 N.m).

6) To increase torque, screw in rack damper cover. Lock cover in correct position with cotter pin and install dust cover.

7) Crank out rack fully. Fill rack tooth spaces with grease. Crank rack in and out. Repeat grease application, using approximately 1 oz. of grease.

8) Install tie rods using new lock washers and bend washer to lock rod in place. Install rubber bellows.

Fig. 3: Exploded View of ZF Steering Gear Assembly



TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Pinion Bearing Preload ¹	8-14 INCH lbs. (.9-1.5 N.m)
Pinion Nut	16-19 ft. lbs. (22-27 N.m)

¹ — With rack installed and moved back and forth between end positions.