Drive Axles

VOLVO

DL, GL, GLT,
GLE, & DL & GL Diesel

DESCRIPTION

Rear axle assembly uses a hypoid type ring and pinion gear set. Semi-floating axle shafts are retained in housing by tapered roller bearings and a bearing retainer at housing outer ends.

Bearing clearance is not adjustable and is determined by bearing design. Differential adjustment is accomplished by the use of shims.

AXLE RATIO & IDENTIFICATION

A plate attached on left side of axle housing gives axle ratio, part number, and serial number.

REMOVAL & INSTALLATION

AXLE SHAFTS & BEARINGS

Removal

1) Raise and support vehicle. Remove wheels. Disconnect brake line from caliper. Remove caliper and disc. Remove bolts for thrust washer through holes in axle flange.

2) Remove axle shaft using puller. Remove inner seal using puller or pry it out with a screw driver. Press bearing and lock ring off axle shaft. Remove oil seal.

Installation

1) Fill space between new seal lips with grease. Install seal on axle shaft. Install bearing and new lock ring by pressing on axle shaft. Always use a new lock ring and insure that bearing is installed with taper away from axle shaft flange.

2) Install inner seal. Fill bearing, space between seals, and between seal lips with good quality grease. Install axle shaft and tighten thrust washer bolts.

3) Install brake disc and caliper, reconnect brake lines. Bleed and adjust brakes. Install wheels and lower vehicle.

PINION FLANGES & SEAL

Removal

1) Disconnect rear section of propeller shaft from pinion flange. Check for looseness of pinion in its bearing. If it is loose, this must be corrected before a new seal is installed.

2) Remove nut from flange using holding tool. Remove flange using puller. Remove old oil seal.

Installation

1) Coat lips of new oil seal with grease. Install oil seal using seal driver.

2) Press on flange. Install flange washer and nut and tighten. Reconnect propeller shaft.

AXLE ASSEMBLY

Removal

1) Raise and support rear of vehicle and remove wheels. Support rear axle with jack and holding adaptor. Remove upper attaching bolts for shock absorbers.

2) Remove parking brake cables from levers and brackets on brake backing plate. Remove brake line at union from rear axle housing and propeller shaft from pinion.

3) Disconnect track bar from bracket on rear axle housing and remove lower attaching bolts for spring. Lower jack until trailing arms release from spring. Loosen bolts holding rear axle housing to trailing arms. Lower jack and pull rear axle assembly forward.

Installation

1) Move axle under vehicle. Install bolts attaching support rod and track rod to rear axle. Attach springs to trailing arms. Raise the rear axle and guide springs into position in top supports.

2) Attach track to body bracket. Reconnect propeller shaft to pinion flange. Install attaching bolts for spring and tighten nuts for support rods and trailing arms. Install brake line at union.

3) Install upper bolt for shock absorbers and reconnect parking brake cable. Adjust parking brake and bleed brakes. Install wheels and lower vehicle.

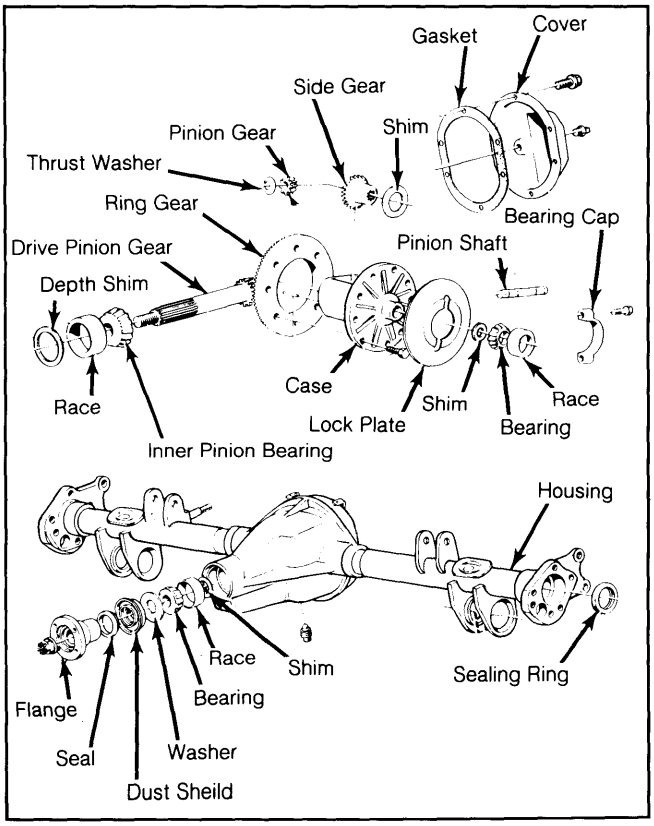
OVERHAUL

DISASSEMBLY

1) Place axle assembly in support stand with pinion flange pointing downward. Remove brake lines and axle shafts. Remove inspection cover.

2) If final drive is being reconditioned because of noise, run a tooth contact pattern check before disassembly as this may assist in locating fault.

Fig. 1: Exploded View of Volvo Drive Axle Assembly



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3) Check alignment markings on bearing caps and carrier. If there are no markings, or if they are difficult to see, mark 1 side with a punch. Remove cap. Using a case spreader, spread case and lift out carrier with ring gear.

4) Turn final drive over and drain oil. Remove pinion flange and press out pinion. Remove pinion front bearing, washer and oil seal with driver. If necessary, drive out rear pinion bearing from case using a drift.

5) Clean gasket surface and remove any burrs present. If necessary, pull off rear bearing from pinion. Pull off differential carrier bearing and retain shims.

6) Remove lock plate for ring gear bolts, remove bolts and ring gear. Drive out lock pin securing differential gear shafts and remove shaft, gears and thrust washers.

INSPECTION

1) Inspect all parts for wear or damage. Install differential gear into carrier together with shaft and thrust washers. Use no lubricant.

2) Check play of differential side gears. If play exceeds specifications when gears have been rotated to maximum play, replace thrust washers with thicker ones.

REASSEMBLY & ADJUSTMENT

Case Assembly

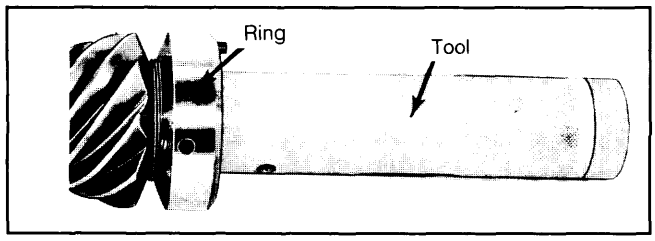
1) Place differential side gears together with thrust washers in differential carrier. "Roll" in both side pinions simultaneously with dished thrust washers.

2) Drive in shaft. Install ring gear, making sure that contact surfaces are clean and without any burrs. Install new ring gear bolts and tighten.

Drive Pinion Depth & Bearing Preload

1) Clean marking surface on drive pinion. Install adjusting ring tool on pinion and place this assembly into housing. *See Figs. 2 & 3.* Place pinion on carrier so bolt on adjusting ring faces large side of carrier.

Fig. 2: Pinion Adjusting Ring and Tool



Pinion gear installed in adjusting ring tool.

2) The pinion should have a certain nominal measurement to the center line of the ring gear. Due to manufacturing tolerances, there are deviations from this nominal measurement.

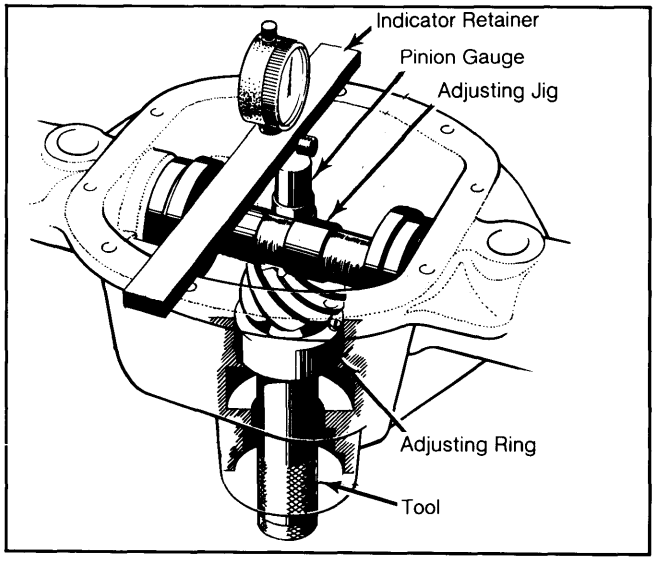
3) On rear axles made by Volvo, the deviation is always positive and is indicated in hundredths of a millimeter. The plus sign is excluded.

4) Place pinion gauge on ground surface of pinion and adjusting jig in differential bearing positions. Place dial indicator retainer with dial indicator on gasket face of axle housing with dial indicator foot touching adjusting ring.

5) Zero dial indicator. Move indicator over until it touches pinion gauge. If the pinion is, for example, marked 33, the pinion gauge should lie .013" (.33 mm) under adjusting fixture. *See Fig. 4.*

6) Adjust setting by turning cam on pinion until dial indicator shows correct value. Lock adjusting ring with set screw.

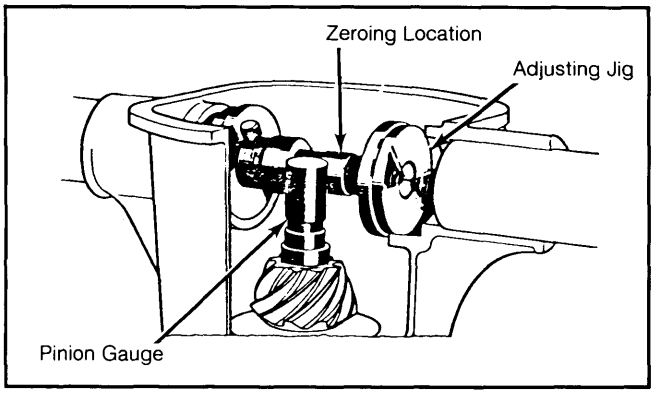
Fig. 3: Measuring Drive Pinion Gear Installed Height



Pinion gear and adjusting ring tool installed in housing.

7) Remove measuring tool and pinion. Place complete rear pinion bearing with outer ring in measuring fixture. Put on plate, spring and nut with flat side of nut facing up.

Fig. 4: Dial Indicator Zeroing Location



The dial indicator retainer is not installed.

8) Rotate plate and bearing several times so that rollers take up correct set. Place adjusting ring in retainer and dial indicator opposite adjusting ring, zero indicator. Set pointer of indicator to outer ring of bearing.

9) The indicator will now show directly thickness shims should have. *See Fig. 5.* Measure shims for correct thickness with micrometer. Since it is unlikely to find a shim with exact thickness required, shim may be .0012" (.03 mm) thicker or .002" (.05 mm) thinner than measured value.

10) Press rear bearing on pinion with sleeve. The washer under rear bearing inner ring must NOT be installed when overhauling. Place measured shims in axle housing and press in both outer rings of bearings.

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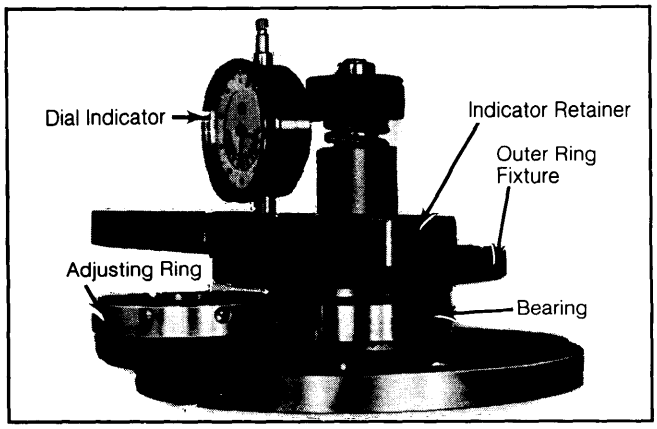
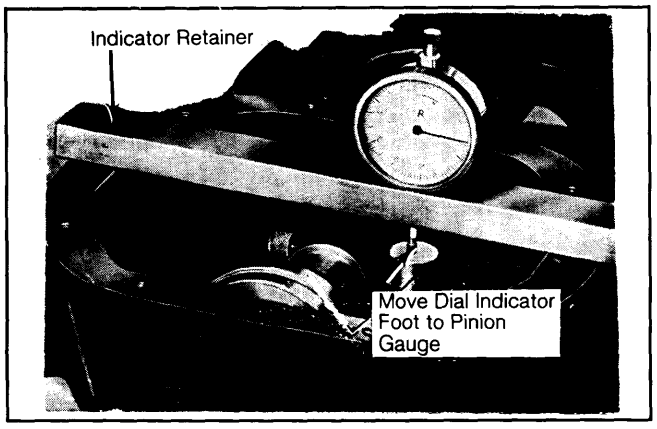
Fig. 5: Determining Pinion Depth Shim Thickness



The indicator will show directly the thickness shims should have.

11) Insert pinion in housing and install three .03" (.75 mm) thick shims and front pinion bearing. Pull pinion into housing. Install washer and nut on pinion shaft and tighten to specifications.

Fig. 6: Measuring Installed Depth of Pinion Gear



Adjust shim thickness as necessary to obtain specified torque.

12) Install pinion gauge and dial indicator retainer. *See Fig. 6.* Pull down pinion while rotating it backwards and forwards. Set dial indicator to zero. Press pinion upwards while rotating it forwards and backwards. Dial indicator will read clearance.

13) Remove pinion and remove shims corresponding to the measured clearance plus .003" (.07 mm). Reinstall pinion. Now use torque gauge to check pinion bearing torque. Adjust shim thickness if required to obtain specified torque. Recheck pinion depth using measuring tools as described in step **3)**.

Backlash & Side Bearing Preload

1) Lubricate inside of adjustment rings and install them on differential carrier. Ring with black oxidized adjustment ring should be placed on ring gear side. Also lubricate bearing bores in carrier. Install carrier and adjustment rings in axle housing.

2) Use dial indicator and adjust rings so that specified backlash is obtained. Backlash may vary within designated range but should be as close to specified backlash as possible.

NOTE: Due to altered manufacturing and test procedures, it is no longer possible to determine correct installation of gears by means of a contact pattern test. The pinion gear should always be installed in its marked position regardless of the contact pattern.

3) If the gear set is correctly installed, but still causes noise, try re-positioning pinion gear .002" (.05 mm) "plus" or "minus" (try "plus" first). This may help if pinion gear has been incorrectly marked.

4) After correct backlash is obtained, remove carrier and adjustment ring. Place adjusting ring and bearing into measurement fixture with flat side of nut facing downwards.

5) Rotate plate several times. Install dial indicator and retainer, and zero indicator on adjusting ring. Place measuring point of indicator facing bearing and read off indicator.

6) Use a micrometer to form a shim pack equal in thickness to clearance indicated by dial indicator plus .003" (.07 mm). Place shims together with measured bearing to one side. Repeat this procedure with the other bearing.

7) Install shims on differential carrier, making sure which side respective bearing and shims are installed on, and press on bearings. When installing second bearing, use support so as not to damage first bearing.

8) Install expansion tool on carrier and expand until pins are flush against hole edges in carrier. Tighten screws an additional 3 1/2 turns. Install differential carrier and outer rings. Install bearing caps and tighten bolts to specification.

9) Install pinion oil seal and flange, inspection cover and gasket. If inner oil seals for axle shafts were removed, drive them in. Reinstall axle shafts and adjust end play if necessary. Install brake discs, caliper, and brake lines. Bleed and adjust brakes.

AXLE ASSEMBLY SPECIFICATIONS

Application	Specification
Side Gear Play	[1] .0024" (.06 mm)
Pinion Bearing Preload Torque	
Used Bearing	5-10 INCH lbs. (.6-1.1 N.m)
New Bearings	13-30 INCH lbs. (1.5-3.4 N.m)
Pinion-to-Ring Gear	
Backlash Preferred	.006" (.15 mm)
Backlash Range	.005-.007" (.13-.18 mm)
Differential Bearing Preload	.005-.008" (.13-.20 mm)
Nominal Pinion Depth	2.55" (64.7 mm)

[1] — Maximum clearance.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Pinion Flange Nut	
Without Integral Washer	200-220 (272-299)
With Integral Washer	145-180 (197-245)
Bearing Cap Bolts	36-50 (49-68)
Ring Gear Bolts	45-60 (61-82)
Axle Shaft Thrust Washer Bolts	36 (49)