

1992 Volvo 940

Submodel: | Engine Type: L4 | Liters: 2.3

Fuel Delivery: FI | Fuel: GAS

The following procedure only pertains to axle shafts on vehicles with multi-link rear suspensions.

NOTE: Because of the nature of the multi-link suspension, component position and bolt tightening values (torque) are critical to ride quality and rear wheel alignment. When installing components, exact location must be achieved — close doesn't count. Tightening specifications must be followed exactly or component function will be impaired.

1. Disconnect the negative battery cable.
2. Raise and support the vehicle safely. Do not allow the rear lifting device to interfere with the support arms.
3. Remove the wheels.
4. Remove the brake caliper mounting bolts and use a piece of wire to hang the caliper out of the way.
5. Mark the position of the brake disc relative to its small locating pin, then remove the disc.
6. Remove the brake shoes.
7. Disconnect and remove the parking brake cable from the wheel bearing housing.
8. Remove the retaining bolt for the support arm at the housing. Tap the support arm loose.
9. Remove the nut and bolt holding the lower link arm to the housing.
10. Remove the retaining bolt for the track rod (Panhard rod) at the bearing housing and use a small claw-type puller to remove the track rod.
11. Loosen and remove the large nut holding the end of the driveshaft within the bearing housing.
12. Remove the retaining nut for the upper link at the bearing housing. The wheel bearing housing can now be removed as a unit.

NOTE: There are shims between the bearing housing and the upper link arm. Collect them when the housing is removed.

13. Mount the housing assembly in a vise.
14. Place a counterhold tool (5340 or equivalent) between the hub and bearing housing.
15. Press out the hub with a proper sized drift.
16. Remove the circlip retaining the bearing in the wheel bearing housing.
17. Press the bearing out of the wheel bearing housing, using a counterhold tool (5341 or equivalent) and a suitable drift. Apply the drift to the inner ring.
18. Use a bearing puller (2722 or equivalent) and a counterhold (5310 or equivalent) to pull the inner ring off the hub.

To install:

19. Press in the new bearing using the drift and counterhold. Install the circlip.
20. Using a counterhold below the inner ring, press the hub into place.

WARNING

If the counterhold (support) is not applied to the inner ring, the wheel bearing will be destroyed during the hub installation.

21. Install the wheel bearing housing onto the driveshaft and install the driveshaft retaining nut. Secure the nut, but don't tighten it; that will be done later.
22. Install the shims between the upper link and the wheel bearing housing and then install the retaining nut at the upper link.
23. Pull the wheel bearing housing outwards at the top and tighten the upper link arm nut to 85 ft. lbs. (116 Nm) This pulling out is essential to insure correct wheel alignment when completed.
24. Tilt the bearing housing outwards at the bottom (as necessary) to refit the lower link arm and it's retaining bdt. When in place, pull the bottom of the bearing housing inwards (towards the center of the vehicle) and tighten the link arm to 36 ft. lbs. (49 Nm) PLUS an additional 90 degrees of rotation.
25. Install the support arm and its bolt. Tighten the nut to 44 ft. lbs. (60 Nm) PLUS an additional 90 degrees of rotation.
26. Install the track rod (Panhard rod) and tighten to 63 ft. lbs. (86 Nm).
27. Reinstall the parking brake cable at the bearing housing.
28. Reinstall the brake shoes, the brake disc as marked and the brake caliper. Tighten the caliper mounting bolts to 44 ft. lbs. (60 Nm).
29. Install the wheel, tightening the lugs to 60–62 ft. lbs. (82–85 Nm).
30. Lower the vehicle.
31. Tighten the axle nut to 103 ft. lbs. (140 Nm) PLUS 60 degrees of rotation.

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The following procedure only pertains to axle shafts on vehicles with multi-link rear suspensions.

NOTE: On vehicles with a multi-link suspension, the axles are actually halfshafts, bolted to the differential. Each halfshaft has a constant velocity (CV)-joint at each end, allowing a full range of motion as the vehicle passes over bumps and depressions.

1. Loosen the large halfshaft retaining nut in the center of the wheel bearing housing.
2. Loosen the halfshaft retaining nut.
3. Raise and safely support the vehicle.
4. Remove the wheel(s).
5. At the center of the vehicle, remove the eight bolts holding the upper and lower sections of the final drive housing.
6. Remove the bolts holding the halfshaft to the final drive unit (differential) and remove the shaft from the wheel bearing housing.
7. When the shaft is removed, inspect the rubber boots for any sign of splitting or cracking. The boots must be intact and waterproof or the joint within is at risk. A light coat of silicone or vinyl protectant applied to a CV-boot will extend its life.

To install:

8. When reinstalling, fit the threaded end (at the wheel) first, then position and secure the inboard end. Always use new, lightly oiled bolts and tighten them to 70 ft. lbs. (95 Nm).
9. Reinstall the lower section of the final drive housing. Before tightening the eight mounting bolts, install two 12mm long bolts (or 12mm drifts) into the centering holes and align the panel. This is essential to insure correct wheel alignment when finished.
10. Tighten the eight mounting bolts to 52 ft. lbs. (71 Nm) PLUS 30 degrees of rotation.
11. Use a new, lightly oiled halfshaft retaining nut and install it on the threaded end of the shaft. Tighten it until it is snug, but do not final-tighten at this time.
12. Install the wheel(s).
13. Lower the vehicle.
14. Apply the hand brake and tighten the halfshaft nut to 103 ft. lbs. (140 Nm) PLUS 60 degrees of rotation. Double check the wheel lugs for correct tightness.

Fig. 1: The axle halfshafts are connected to the differential by retaining bolts

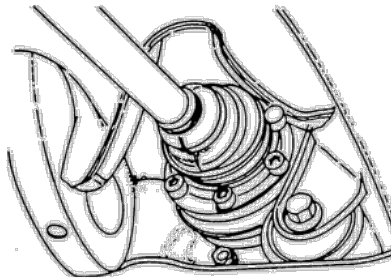
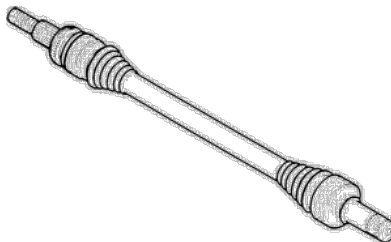


Fig. 2: Rear halfshaft assembly



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WARNING

This operation requires removal of a substantial amount of weight from the rear of the vehicle. Position the jackstands at the front end, under the control arm brackets, and at rear, under the jack mounts. If the vehicle is not supported as described, it may become front heavy.

Except Multi-Link Suspension

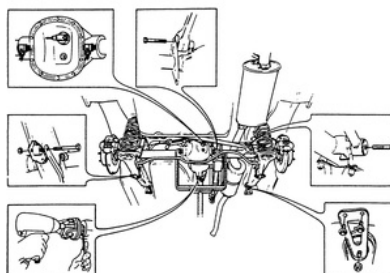
1. Raise the vehicle and support it safely.

WARNING

This operation requires removal of a substantial amount of weight from the rear of the vehicle. Position the jackstands at front end, under the control arm brackets and at rear, under the jack mounts. If the vehicle is not supported as described, it may become front heavy.

2. On the 240 Series, remove the rear axle vent hose and the brake line brackets. Do not loosen any brake lines; they will be left intact.
 3. Remove the brake calipers and secure them to the upper spring mount with a piece of stiff wire.
 4. Remove the axle shafts, as outlined in this section.
 5. Position the jacks or cradle below the rear axle so that the axle is supported.
 6. If the exhaust system runs under the axle housing, disconnect the first joint forward of the axle, disconnect any hangers or brackets behind the axle and remove the rear section of the exhaust system.
 7. Disconnect the reaction rods or torque rod from the axle housing.
 8. Disconnect the Panhard rod from the rear axle.
 9. Remove the parking brake cables and mounting brackets from the rear axle.
 10. Detach the connector for the speedometer transmitter and, if equipped, the connectors for the ETC system.
 11. Loosen and remove the bolts attaching the driveshaft to the pinion flange.
 12. Double check that the axle assembly is firmly supported by the jacks or cradle. Remove the bolts which hold the lower mount of the shock absorber.
 13. On the 240 Series:
 - A. Remove the adjacent bolt which holds the anti-roll bar (sway bar).
 - B. Loosen, but do not remove the trailing arm bolts at the front of the trailing arm.
 - C. Lower the jacks or cradle and allow the axle assembly to pivot downwards on the trailing arms. When clear of the vehicle and well supported on the jacks or cradle, remove the trailing arm mounts at the axle housing.
 - D. Remove the rear axle assembly.
 14. On the 700 and 900 Series:
 - A. Remove the front brackets for the support arms. Pry the support arms loose from the front mounts.
 - B. Remove the rear axle assembly.
 - C. Once the axle assembly is clear of the vehicle, remove the anti-roll bar (sway bar). Mark the support arms for the left and right sides and remove the arms from the axle housing.
- To install:**
15. On the 240 Series:
 - A. Position the axle unit under the vehicle and attach the trailing arm mounts. Tighten the bolts only enough to hold and still allow motion.
 - B. Raise the axle and align the springs to their upper mounts. Install the anti-roll bar bolts and the bolts for the lower shock absorber mounts
 - C. Attach the torque rods to their mounts and attach the Panhard rod to its mount. Tighten these bolts only enough to hold and still allow motion.
 16. On the 700 and 900 Series:
 - A. Make sure the left and right markings are observed. Fit the bushings within the clamps and fit the clamps.
 - B. Tighten the clamps in a crisscross pattern to 33 ft. lbs. (45 Nm) and reinstall the anti-roll bar if so equipped.
 - C. Position the axle on its jacks or cradle and elevate it so the support arms align with both their front mounts and the spring seats.
 - D. Install the front brackets for the support arms and tighten the two bolts to 35 ft. lbs. (48 Nm). Tighten the nut to 62 ft. lbs. (84 Nm).
 - E. Install the lower shock absorber bolts and tighten to 62 ft. lbs. (84 Nm).
 17. Reinstall the driveshaft to the pinion flange.
 18. Connect the wiring for the ETC sensor and/or the speedometer sensor, as required.
 19. Install the parking brake cables and brackets. Adjust the parking brake.
 20. Reinstall the exhaust system, as necessary.
 21. Complete installation by reversing the removal procedure.
 22. Check oil level in differential.
 23. Lower the vehicle.

Fig. 1: Points of reference for solid rear axle removal



Multi-Link Suspension

Because of the nature of the multi-link suspension, component position and bolt tightening values (torque) are critical to ride quality and rear wheel alignment. When installing components, exact location must be achieved; close doesn't count. Tightening specifications must be followed exactly or component function will be impaired.

1. Raise the vehicle and support it firmly with stands. Locate front lifting arms as far forward as possible. Make sure the rear lifting arms do not interfere with the support arms.
2. Remove the rear wheels.
3. On one side only, remove the bolt holding the support arm to the wheel bearing housing.
4. Drive out the support arm.
5. Remove the nut and bolt holding the lower link arm to the wheel bearing housing.
6. Remove the bolts holding the track rod (Panhard rod) to the wheel bearing housing. Use a small claw puller and an M12 bolt 50mm long to move the rod away from the housing.
7. Remove the bolts joining the upper and lower sections of the rear axle housing.
8. Swing the lower part of the wheel bearing housing outwards and swing down the lower part of the axle housing. It will still have the arms attached to it and will be attached to the vehicle by the arms on the opposite side.
9. Matchmark the flanges at the rear of the driveshaft.
10. Remove the four bolts and lower the driveshaft.
11. Place a jack or cradle under the center of the final drive (differential) unit.
12. Raise the jack and support the unit.
13. Remove the bolts holding the final drive to the upper housing.
14. Lower the final drive slightly. Remove the wiring to the impulse sender.
15. Remove the bolts holding the axles to the final drive.
16. Carefully lower the final drive unit and remove it from under the vehicle.

To install:

17. Raise the final drive unit almost to its final position under the vehicle and connect the impulse sender cable. Tighten the bolt to 7 ft. lbs. (10 Nm).
18. Raise the unit to its final position and install the three bolts to the upper housing. Tighten the bolts. When the bolts are secure, the jack or cradle may be removed.
19. Attach the halfshafts to the final drive. Tighten the bolts to specifications.
20. Install the driveshaft to the pinion flange. Remember to observe the matchmarks made earlier and position the driveshaft properly.
21. Raise the lower section of the axle housing. Loosely install the bolts which retain it to the upper housing. Before tightening the mounting bolts, install two 12mm long bolts (or 12mm drifts) in the centering holes and align the panel. This is essential to insure correct wheel alignment when finished. Tighten the mounting bolts to specifications.
22. Position and install the lower link arm on the wheel bearing housing. Before tightening the nut and bolt, pull the housing in towards the center of the vehicle. When all the play is out of the mount, tighten the link bolt to specifications.
23. Install the support arm and track rod.
24. Install the wheels.
25. Check the oil level in the final drive and top up as necessary.
26. Lower the vehicle.

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CAUTION

This procedure requires removal of the rear brake pads or shoes. Brake pads and shoes may contain asbestos, which has been determined to a cancer causing agent. Never clean the brake surfaces with compressed air! Avoid inhaling and dust from brake surfaces! When cleaning brakes, use commercially available brake cleaning fluids.

Except Multi-Link Suspension

1. Raise the vehicle and safely support it on jackstands.
2. Remove the applicable wheel.
3. Remove the brake caliper mounting bolts and remove the caliper. Secure the caliper, with a piece of stiff wire, to the rear springs.

NOTE: Do not allow the caliper to hang by the brake line.

4. Remove the brake disc and parking brake shoes.
5. Remove the thrust washer bolts through the holes in the axle shaft flange.
6. Using a puller (slide hammer), remove the axle shaft, bearing and oil seal assembly. If a slide hammer is not available, the brake disc may be bolted onto the axle backwards (remember to mount the nuts tapered side out) and used to pull the axle free.
7. Remove the inner oil seal using a suitable puller or small prybar.
8. Clean the inside of the rear axle tube.
9. Press off the toothed wheel. Use 2 V-blocks.
10. Raise up the seal and pressure plate on the axle shaft so that the divided press plate can be placed on the bearing.
11. Place the press yoke over the press plate.
12. Removing the bearing together with the snapping. Use press tool 5212 or equivalent.

To install:

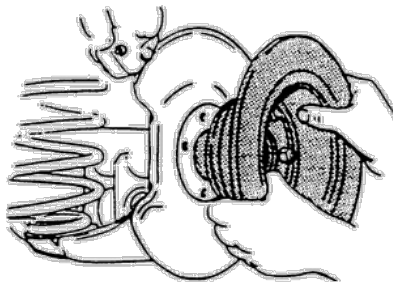
13. Pack the new bearing with grease before installation. The preferred method is with a bearing packer (a low cost tool available at most automotive supply shops) but it may be done by hand if necessary. The bearing must be packed from one side until the grease comes out the other side.
14. Fill the space between the lips of the new oil seal with wheel bearing grease.
15. Position the new seal on the axle shaft.
16. Using a press, install the bearing with a new locking ring, onto the axle shaft.

WARNING

When reinstalling the additional toothed gear on axles, the gear must be installed precisely 116mm onto the shaft. The acceptable margin is plus or minus 0.1mm. If at all possible, use Volvo tool 2412 which will allow precise location of this gear. If this gear is not properly located, the vehicle may not run properly.

17. Install the inner oil seal in the axle shaft housing using a seal installation tool (such as Volvo 5009 or similar) and drift.
18. Install the axle shaft into the housing, rotating it so that it aligns with the differential.
19. Install the bolts for the thrust washer and tighten to 29 ft. lbs. (40 Nm).
20. Install the parking brake shoes, brake disc, caliper and pads. Use new bolts and tighten to 43 ft. lbs. (58 Nm). Make sure the brake disc rotates free of the brake pads.
21. Install the wheel and adjust the parking brake.
22. Lower the vehicle.

Fig. 1: Removing the axle shaft using the brake disc



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The drive axle is said to have a certain axle ratio. This number (usually a whole number and a decimal fraction) is actually a comparison of the number of gear teeth on the ring gear and the pinion gear. For example, a 4.11 rear means that theoretically, there are 4.11 teeth on the ring gear for each tooth on the pinion gear. By dividing the number of teeth on the pinion gear into the number of teeth on the ring gear, the numerical axle ratio (4.11) is obtained. This also provides a good method of ascertaining exactly what axle ratio one is dealing with.

Another method of determining gear ratio is to jack up and support the vehicle so that both rear wheels are off the ground. Make a chalk mark on the rear wheel and the driveshaft. Put the transmission in neutral. Turn the rear wheel one complete turn and count the number of turns that the driveshaft makes. The number of turns that the driveshaft makes in one complete revolution of the rear wheel is an approximation of the rear axle ratio.

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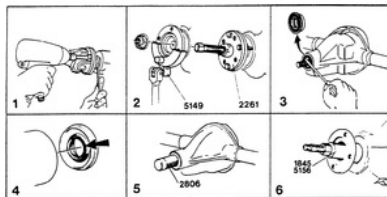
Except Multi-Link Suspension

1. Raise and safely support the vehicle.
2. Disconnect the driveshaft at the final drive unit (differential).
3. Loosen and remove the large center nut in the center of the pinion flange. The use of a counterhold device is highly recommended (Volvo 5149 or similar).
4. Use a puller to remove the flange from the housing.
5. Remove the old seal from the inside of the casing and discard it.
6. Clean and check the sealing surfaces. Replace the coupling flange if the sealing surface is worn.

To install:

7. Prepare the new seal by greasing the lip area and greasing the small spring to hold it in place during installation.
8. Install the seal using suitable drivers; do not crimp or gouge the seal during installation.
9. With an installation tool (Volvo 5156 or similar), reinstall the flange in the housing.
10. Install the center nut and tighten it to 145–180 ft. lbs. (197–245 Nm). Use a counterhold device to hold the flange while tightening.
11. Axles denoted by the S prefix in their serial number contain a compression sleeve within the differential housing. On these vehicles, install the center nut and finger-tighten, or carefully tighten to 16 inch lbs. (2 Nm). Make sure that the brakes are not applied and turn the flange at about 1 revolution per second so as to tighten the nut. As an alternative, the nut may be tightened with a wrench to at least 130 ft. lbs. (177 Nm).
12. Reinstall the driveshaft.
13. Check the oil level within the final drive and top up as necessary.
14. Lower the vehicle.

Fig. 1: Steps to replace the pinion seal



Multi-Link Suspension

1. Raise and safely support the vehicle.
2. Matchmark the driveshaft flange and the final drive (differential) flange.
3. Remove the bolts and separate the shaft from the final drive.
4. Loosen and remove the large center nut in the center of the pinion flange. The use of a counterhold device is highly recommended. (Volvo 5149 or similar). Remove the 1 additional bolt from the flange. This bolt is a weight which serves to balance the rotational forces of the driveshaft.
5. Matchmark the flange and its center shaft for reassembly.
6. Drain the oil from the housing.
7. Use a puller to remove the flange from the housing.
8. Remove the old seal from the inside of the casing and discard it.
9. Clean and check the sealing surfaces. Replace the coupling flange if the sealing surface is worn.

To install:

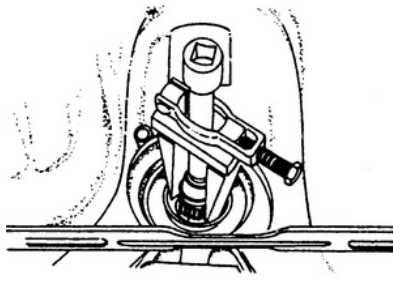
10. Prepare the new seal by greasing the lip area and greasing the small spring to hold it in place during installation. The use of a seal puller such as Volvo 5069 is highly recommended.
11. Install the seal using suitable drivers; do not crimp or gouge the seal during installation.
12. Position the flange so that the marks align.
13. With an installation tool (Volvo 5156 or similar), reinstall the flange in the housing.
14. Install a new, lightly oiled center nut and tighten it to 132–145 ft. lbs. (180–197 Nm).

WARNING

Do not overtighten the center nut. The pinion bearings will become overadjusted and fail prematurely.

15. Install the bolt for weight in its original position.
16. Install the driveshaft, observing correct placement as shown by the matchmarks. Use new nuts and bolts and tighten them to 36 ft. lbs. (49 Nm).
17. Refill the final drive unit with oil.
18. Lower the vehicle.

Fig. 2: Removing the pinion seal using puller 5069 or equivalent



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The rear axle is a special type of transmission that reduces the speed of the drive from the engine and transmission and divides the power to the rear wheels. Power enters the rear axle from the driveshaft via the companion flange. The flange is mounted on the drive pinion shaft. The drive pinion shaft and gear carries the power into the differential. The gear on the end of the pinion shaft drives a large ring gear the axis of rotation of which is 90 degrees away from the of the pinion. The pinion and gear reduce the gear ratio of the axle, and change the direction of rotation to turn the axle shafts which drive both wheels. The rear axle gear ratio is found by dividing the number of pinion gear teeth into the number of ring gear teeth.

The final drive is of the hypoid design, with the drive pinion lying below the ring gear. On solid axle models, each axle shaft is indexed into a splined sleeve for the differential side gears, and supported at its outer end in a tapered roller bearing. Bearing clearance is not adjustable by use of shims, but instead is determined by bearing thickness. Both sides of the axle bearings are protected by oil seals.

On vehicles with a multi-link suspension, the axles are actually halfshafts, bolted to the differential. Each halfshaft has a constant velocity (CV)-joint at each end, allowing a full range of motion as the vehicle passes over bumps and depressions.

The ring gear drives the differential case. The case provides the 2 mounting points for the ends of a pinion shaft on which are mounted two pinion gears. The pinion gears drive the 2 side gears, one of which is located on the inner end of each axle shaft (beam type axle) or inner driveshafts (multi-link axle).

By driving the axle shafts through the arrangement, the differential allows the outer drive wheel to turn faster than the inner drive wheel in a turn.

The main drive pinion and the side bearings, which bear the weight of the differential case, are shimmed to provide proper bearing preload, and to position the pinion and ring gears properly.

NOTE: The proper adjustment of the relationship of the ring and pinion gears is critical. It should be attempted only by those with extensive equipment and/or experience.

Limited-slip differentials include clutches which tend to link each axle shaft to the differential case. Clutches may be engaged either by spring action or by pressure produced by the torque on the axles during a turn. During turning on a dry pavement, the effects of the clutches are overcome, and each wheel turns at the required speed. When slippage occurs at either wheel, however, the clutches will transmit some of the power to the wheel which has the greater amount of traction. Because of the presence of clutches, limited-slip units require a special lubricant.

Type 1041 rear axle (beam type) is attached to the body by support arms, a torque arm and a torque arm frame. A Panhard rod is installed between the rear axle and crossmember. An anti-roll bar is also mounted between the support arms. The 1041 rear axle can be easily identified by its aluminum inspection cover.

Type 1035 and 1045 rear axles (multi-link) is attached to the body by a member consisting of an upper and lower section. The upper links extend from the upper member. The lower links and 2 track rods are mounted between the lower section of the axle member and the wheel bearing housings. The wheel bearing housings and body are connected by the support arms.

Certain rear axle variants are equipped with Automatic Differential Lock. The locking mechanism is controlled by a centrifugal governor. This device operates automatically when one of the drive wheels is spinning and the speed of the vehicle is less than 25 mph (40 km/h). When the vehicle is driven at a steady speed and both driveshafts are rotating at the same speed, the differential functions exactly as a conventional type.

Fig. 1: Example of a solid beam type of rear axle

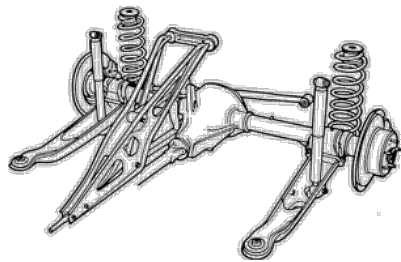


Fig. 2: Example of a multi-link (independent) suspension rear axle

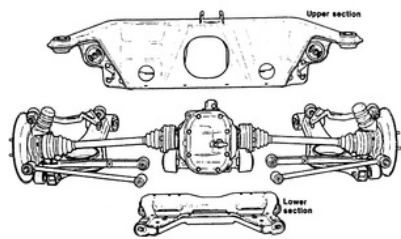


Fig. 3: Differential case of a multi-link rear suspension

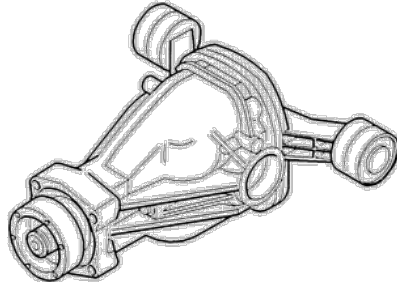


Fig. 4: Cutaway view of an Automatic Differential Lock rear differential

