

331 Rear Axle Differential

GENERAL	331-1
Rear differential and rear drive axles	331-1
Warnings and Cautions	331-2
REAR DIFFERENTIAL	331-2
Rear differential applications	331-1
Differential oil, draining and filling	331-2
Differential oil level, checking	331-3
Differential, removing and installing	331-3
Differential input shaft seal, replacing	331-4

Differential output shaft seal, replacing	331-7
Differential mounts, replacing	331-9

REAR DRIVE AXLES	331-10
Rear drive axle assembly	331-10
Rear drive axle, removing and installing	331-11
CV joint boots	331-12

TABLE

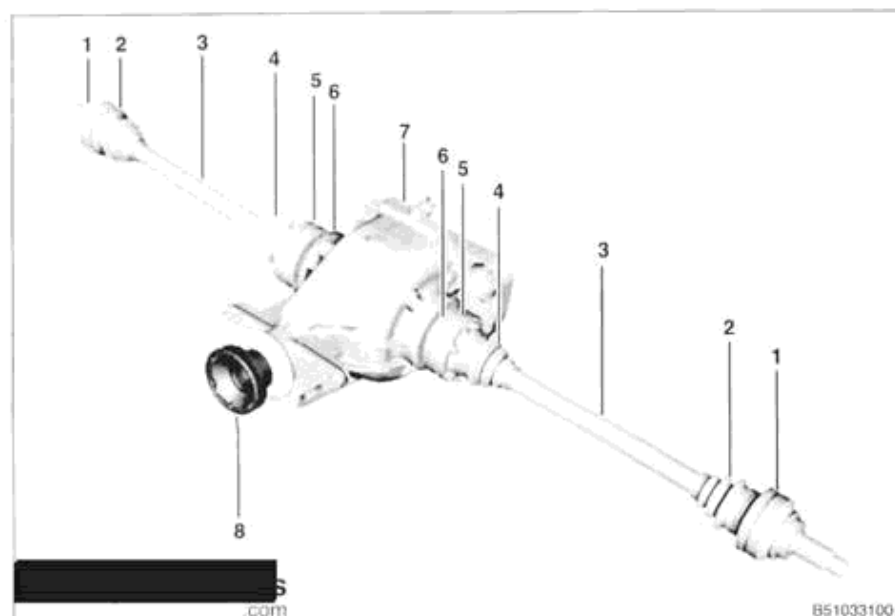
a. Rear differential applications	331-2
---	-------

GENERAL

This repair group covers removal and repair information for the rear differential (final drive), axle shafts, CV joints, CV joint boots, and differential seal replacement.

Internal repairs of the differential assembly are not covered in this manual.

Rear differential and rear drive axles



1. Outer CV joint
2. Outer CV joint boot
3. Drive axle
4. Inner CV joint boot
5. Inner CV joint
6. Differential output flange
7. Differential
8. Differential input flange

331-2 Rear Axle Differential

Warnings and Cautions

Warnings and Cautions

WARNING—

- Do not reuse self-locking fasteners.

CAUTION—

- Due to the chemical and corrosion characteristics of aluminum, follow these precautions when working with aluminum components:
 - Do not bring into contact with battery acid.
 - Do not use wire brushes with brass or iron bristles.
 - Do not expose to flying sparks.
 - Do not subject to steel welding splashes.
 - Do not expose to temperatures over 80°C (176°F), even for short periods. Paint shop temperatures are not a problem.
- Do not allow the vehicle to stand on its wheels when the EHC system is disabled or drained. Damage to air springs may result.
- When disconnecting and connecting EHC air lines, do not allow contamination to enter the lines.

REAR DIFFERENTIAL

Rear differential applications

Application information and oil fill capacities for rear differentials is in Table a.

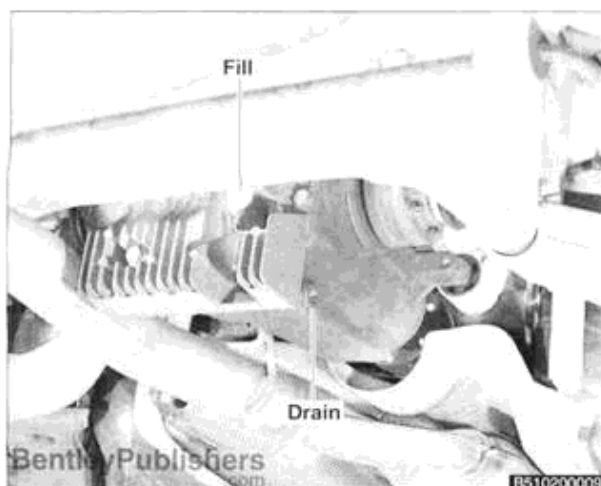
Table a. Rear differential applications

Engine	Transmission	Rear differential	Capacity
M54, N52	Manual, automatic	188L / 188LW	1.0 ltr (1.05 US qt)
N54	Automatic	188LW	1.0 ltr (1.05 US qt)
N54	Manual	215LW	1.2 ltr (1.27 US qt)
N62, N62 TU	Automatic	188L / 188LW	1.0 ltr (1.05 US qt)
N62, N62 TU	Manual	215K	1.4 ltr (1.48 US qt)

Differential oil, draining and filling

The 5 Series rear differential is filled with lifetime oil that ordinarily does not need to be changed. BMW recommends using only a specially formulated synthetic gear oil (SAF-XO) that is available through an authorized BMW dealer parts department. For additional information on this lubricant and any other lubricants that may be compatible, contact an authorized BMW dealer service department.

- Drive vehicle to warm differential oil.
- Remove differential **Drain** plug and drain oil into suitable container.



Rear Axle Differential 331-3

Differential oil level, checking

- Reinstall **Drain** plug.
 - Plug with sealing O-ring: Replace O-ring.
 - Plug without sealing O-ring: Replace plug.

Tightening torque

Drain plug to rear differential housing:

- Plug with sealing O-ring (replace O-ring)
- Plug without sealing O-ring (replace plug)

65 Nm (48 ft-lb)

60 Nm (44 ft-lb)

- Remove **Fill** plug and add rear differential oil and check level. See **Differential oil level, checking** in this repair group.
- Reinstall **Fill** plug.
 - Plug with sealing O-ring: Replace O-ring.
 - Plug without sealing O-ring: Replace plug.

Tightening torque

Fill plug to rear differential housing:

- Plug with sealing O-ring (replace O-ring)
- Plug without sealing O-ring (replace plug)

65 Nm (48 ft-lb)

60 Nm (44 ft-lb)

Differential oil level, checking

- Check lubricant level with vehicle on a level surface:
 - Remove differential **Fill** plug.
 - Level is correct when fluid just reaches edge of plug hole.
 - If necessary, top up fluid.
 - Plug with sealing O-ring: Replace O-ring.
 - Plug without sealing O-ring: Replace plug.
 - Install and tighten oil **Fill** plug when oil level is correct.

Tightening torque

Fill / drain plug to rear differential housing:

- Plug with sealing O-ring (replace O-ring)
- Plug without sealing O-ring (replace plug)

65 Nm (48 ft-lb)

60 Nm (44 ft-lb)

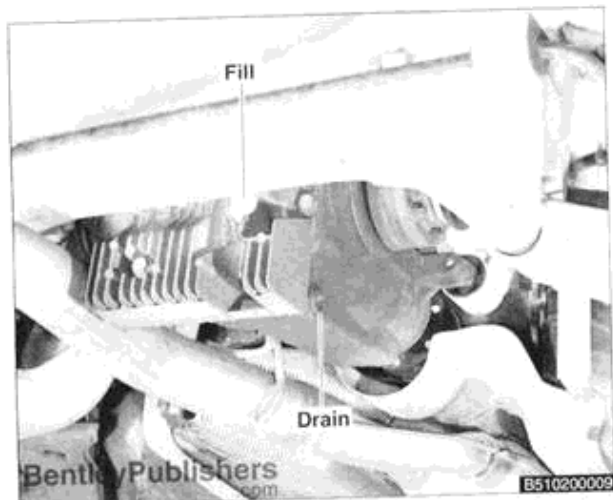
Differential, removing and installing

- Raise car and support safely.

WARNING —

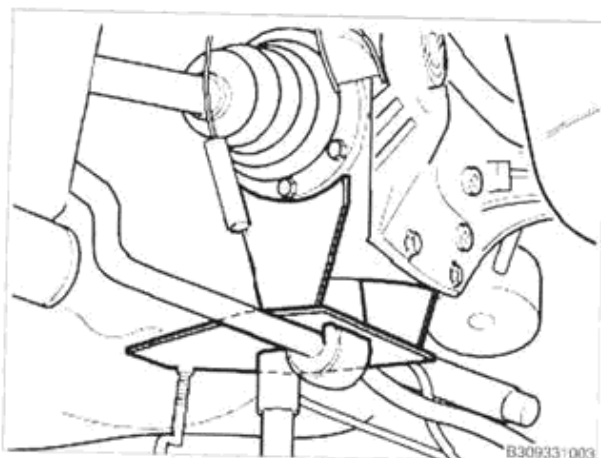
- Make sure the car is firmly supported on jack stands designed for the purpose. Place jack stands underneath structural chassis points, not underneath suspension parts.

- Disconnect rear driveshaft from differential. See **260 Driveshaft**.
- Remove drive axle CV joint bolts (**arrows**) at left and right sides. Suspend drive axles from body using stiff wire.



331-4 Rear Axle Differential

Differential input shaft seal, replacing



- ◀ Support differential with special support or suitable transmission jack. Make sure jack does not damage output flange dust covers:
 - Remove differential front mounting bolts.
 - Remove differential rear mounting bolt.
 - Remove vent line from differential.
 - Carefully lower differential unit.
- To install, lift differential into place:
 - Install mounting bolts finger tight.
 - Remove differential support.
 - Tighten both front mounting bolts.
 - Tighten rear mounting bolt.

Tightening torques

Differential to subframe	
• Front mounting bolts (M12)	100 Nm (74 ft-lb)
• Rear mounting bolt (M14)	165 Nm (122 ft-lb)

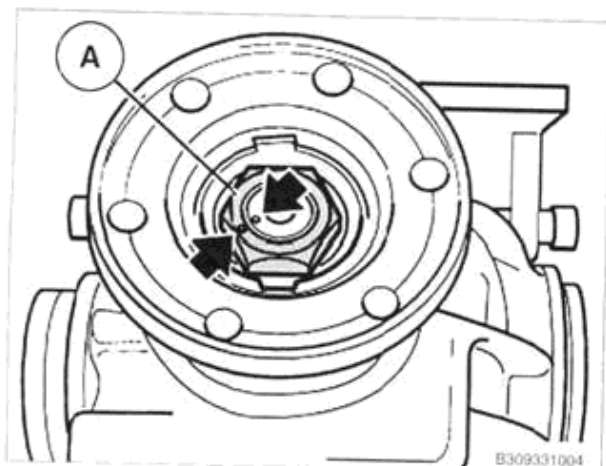
- Remainder of installation is reverse of removal. Remember to check differential oil. See **Differential oil level, checking** in this repair group.

Tightening torques

Drive axle to differential output flange (replace M10 x 43 mm ZNS3 Torx bolts with new)	80 Nm (59 ft-lb)
Rear driveshaft CV joint to differential input (replace M10 x 52 mm ZNS bolts with new)	20 Nm (15 ft-lb) additional 90°
• Stage 1	
• Stage 2	

Differential input shaft seal, replacing

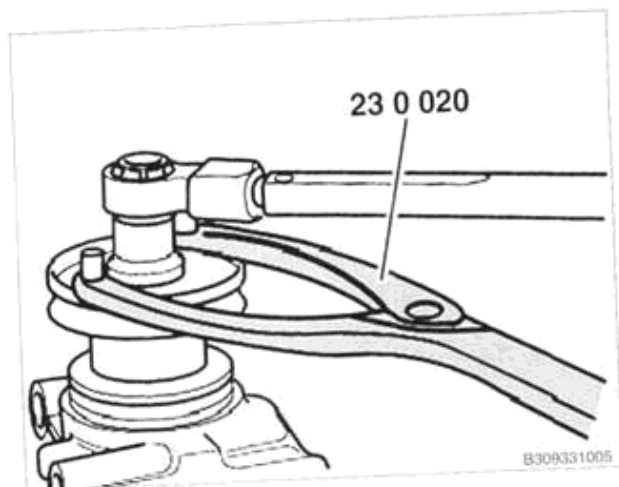
- Remove exhaust system. See **180 Exhaust System**.
- Remove drive shaft. See **260 Driveshaft**.
- Lift out differential input flange collar nut locking plate.
- ◀ Mark position of collar nut (A) on input flange with a center punch (arrows).



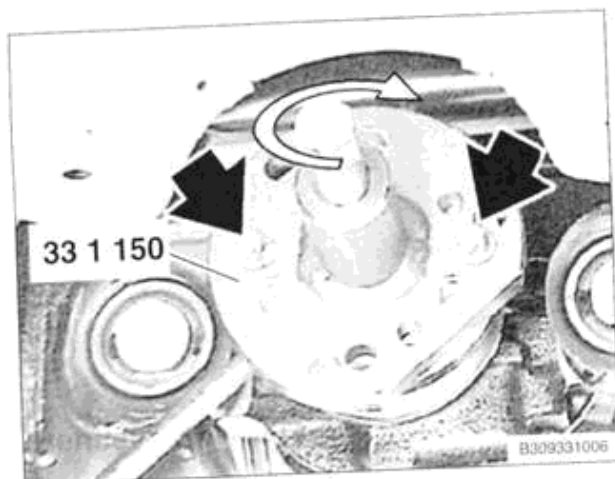
Rear Axle Differential 331-5

Differential input shaft seal, replacing

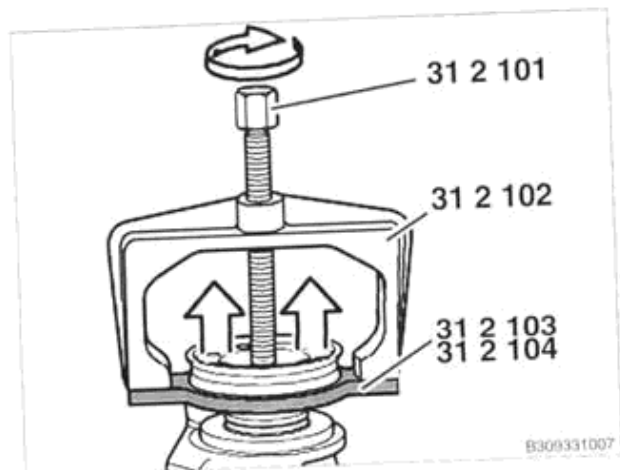
- ◀ Using BMW special tool 23 0 020 or equivalent, counterhold input flange and remove collar nut. For clarity, illustration shows differential removed.



- ◀ 188L / 188LW rear differential: Using BMW special tool 33 1 150 or equivalent puller, remove differential input flange.

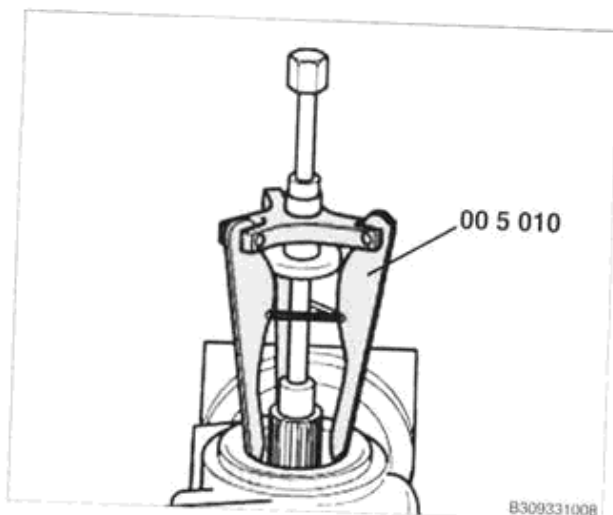


- ◀ 215K / 215L / 215LW rear differential: Using BMW special tools 31 2 101, 31 2 102, 31 2 103 and 31 2 104 or equivalent puller, remove differential input flange.

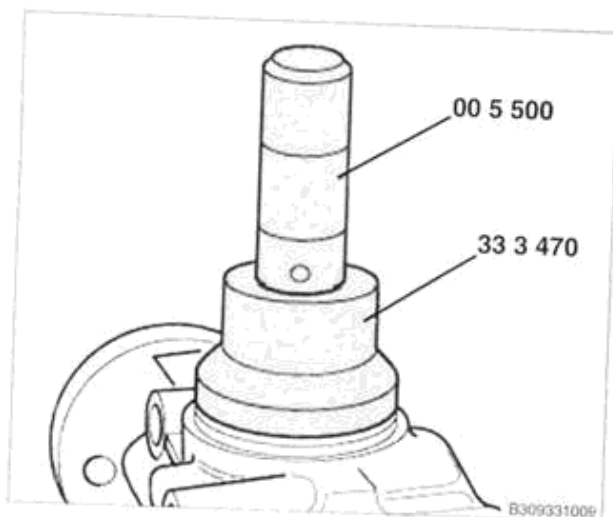


331-6 Rear Axle Differential

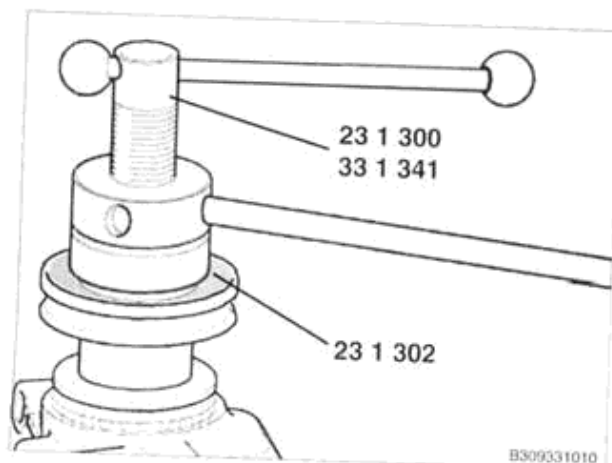
Differential input shaft seal, replacing



Using BMW special tool 00 5 010 or equivalent, remove seal from differential housing.



Using BMW special tools 00 5 500 and 33 3 470 or equivalent, drive new seal into place until fully seated.

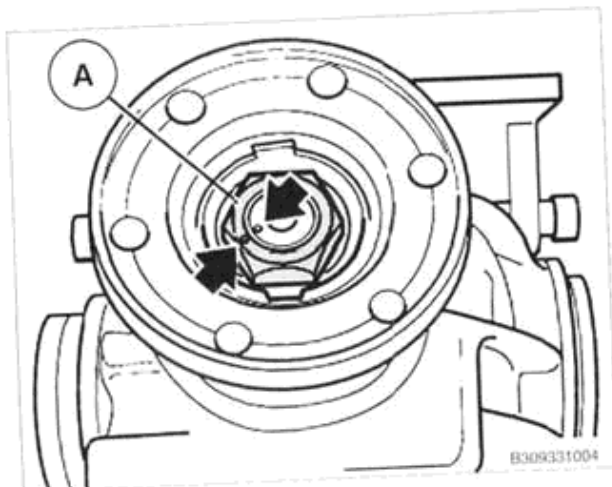


Coat drive flange sealing area and seal lip with differential oil:

- Install drive flange on pinion shaft.
- Using BMW special tools 23 1 300, 33 1 341 and 23 1 302, press drive flange on pinion shaft just far enough to allow collar nut to be installed.

Rear Axle Differential 331-7

Differential output shaft seal, replacing



- ⚡ Tighten collar nut (A) only until previously marked points are aligned (arrow).

CAUTION—

- Do not under any circumstances tighten collar nut beyond the marked points. Otherwise clamping sleeve inside differential housing may be damaged.

- Using a suitable drift pin punch, install new collar nut locking plate. Stake plate in place.
- Remainder of installation is reverse of removal.
- Check differential oil level. See **Differential oil level, checking** in this repair group.

Tightening torque

Rear driveshaft CV joint to differential input
(replace M10 x 52 mm ZNS bolts with new)

- Stage 1
- Stage 2

20 Nm (15 ft-lb)
additional 90°

Differential output shaft seal, replacing

- Remove exhaust system (if necessary). See **180 Exhaust System**.
- ⚡ Remove drive axle CV joint bolts (arrows). Suspend drive axle from body using stiff wire.

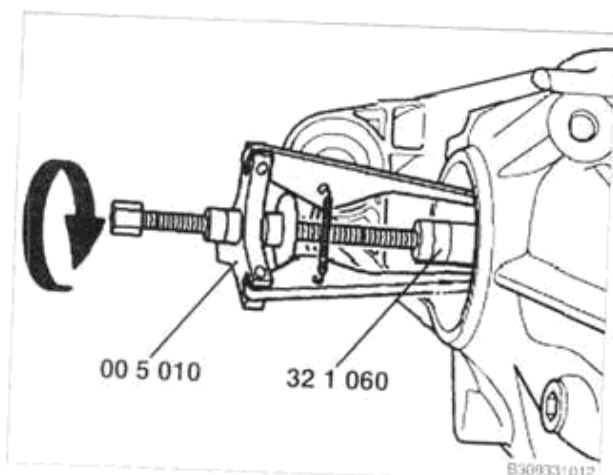


- ⚡ Use soft-faced hammer to drive output flange out of differential (arrow).

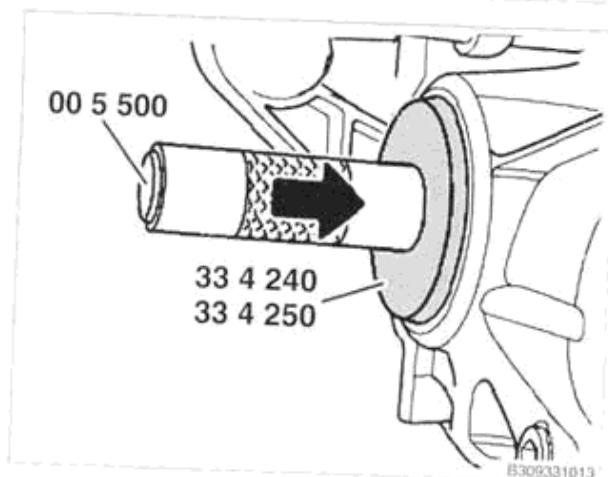
- If necessary, pry off dust cover.

331-8 Rear Axle Differential

Differential output shaft seal, replacing



- Remove seal using BMW special tools 00 5 010 and 32 1 060 / 33 1 308 or equivalent.

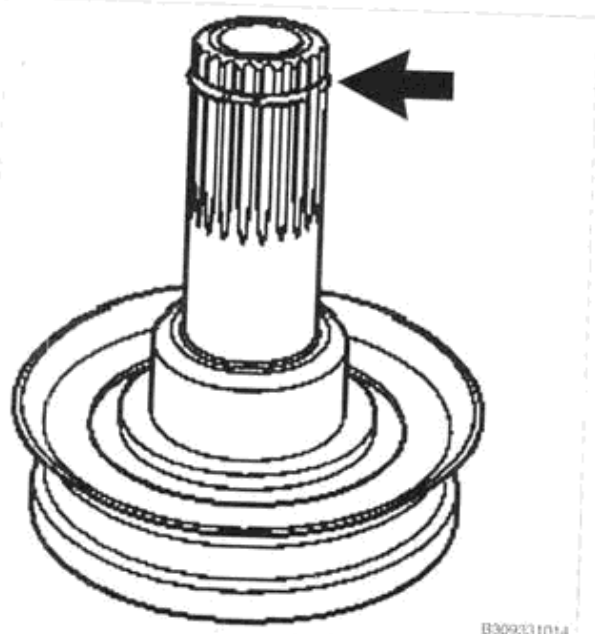


- Coat seal with differential oil and drive into place using BMW special tools 00 5 500 and 33 4 240 / 33 4 250 or equivalent.

Tool dimensions:

- 188L / 188LW differential: 33 4 240 (90 x 44 x 10 mm)
- 215k / 215L / 215LW differential: 33 4 250 (100 x 50 x 10 mm)

- Replace output flange dust cover (if applicable).



- Replace snap ring (**arrow**) on differential output flange shaft:
 - Coat output flange shaft with differential oil where it contacts shaft seal.
 - Push output flange into differential until flange splines engage splines of differential gear and snap ring can be heard to snap into place.
- Remainder of installation is reverse of removal. Remember to:
 - Check differential oil level. See **Differential oil level, checking** in this repair group.

Tightening torque

Drive axle to differential output flange (replace M10 x 43 mm ZNS3 Torx bolts with new)	80 Nm (59 ft-lb)
--	------------------

Rear Axle Differential 331-9

Differential mounts, replacing

Differential mounts, replacing

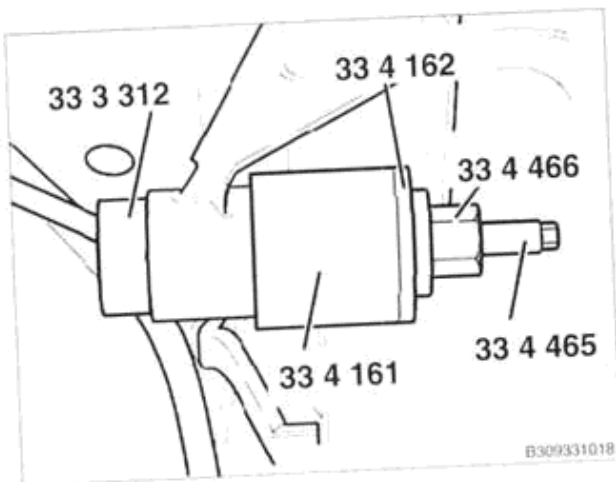
- Remove differential. See **Differential, removing and installing** in this repair group.

Rear differential mounts

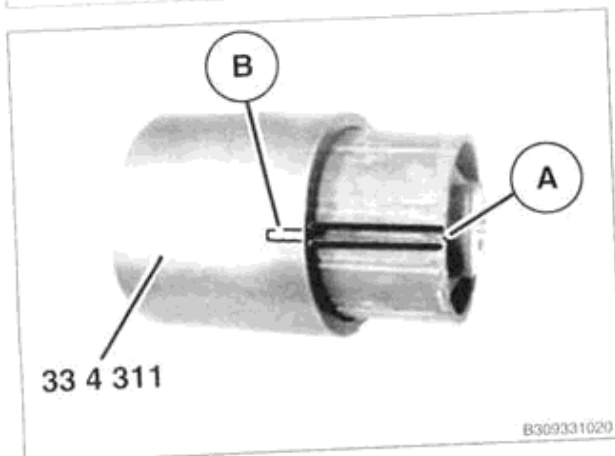
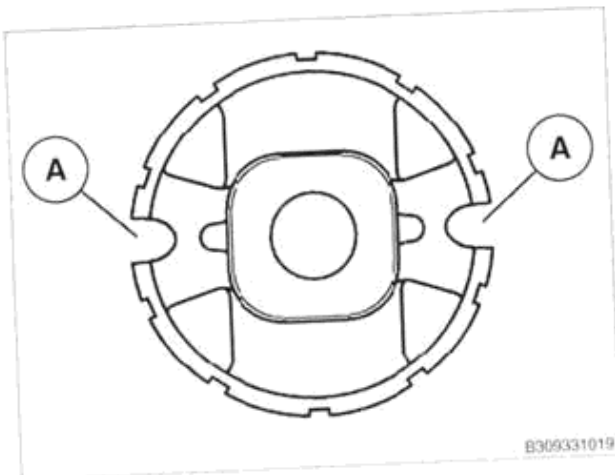
- Remove differential rear rubber mount using suitable puller.
- Coat new mount with Circolight® anti-friction agent and draw mount in firmly using suitable press.

Front differential mounts

- ◀ Using BMW special tools 33 3 312, 33 4 161, 33 4 162, 33 4 465 and 33 4 466, remove differential front mount.



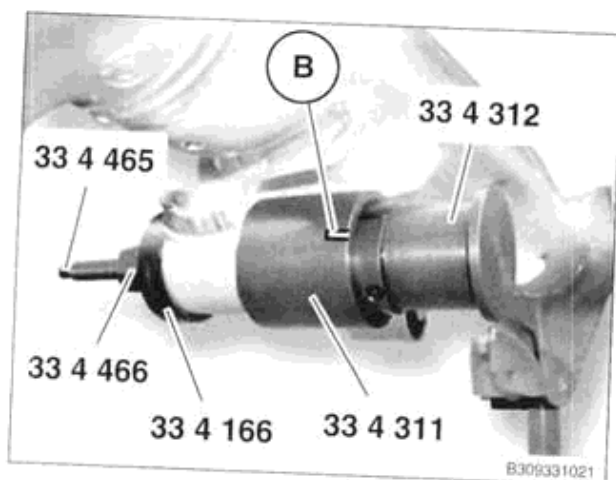
- ◀ Position slots (A) horizontally in rear subframe.



- ◀ Coat bearing sleeve in rear subframe and rubber mount with Circolight® anti-friction agent:
 - Slide rubber mount from side with large diameter into BMW special tool 33 4 311.
 - Slot A must line up with mark B.

331-10 Rear Axle Differential

Rear drive axle assembly



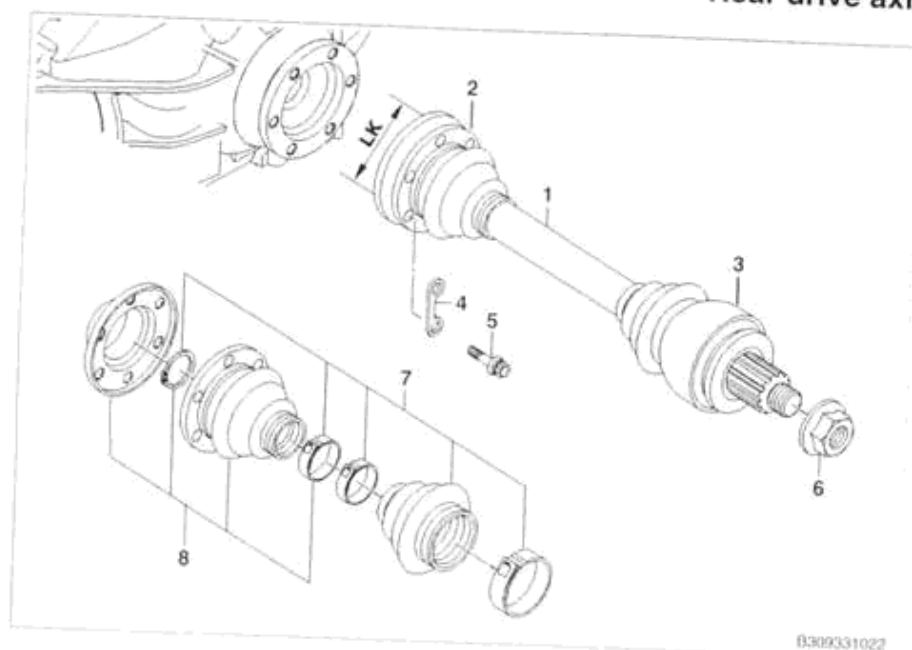
Using BMW special tools 33 4 166, 33 4 311, 33 4 312, 33 4 465 and 33 4 466, install front differential mount as far as it will go.

— Remainder of installation is reverse of removal.

REAR DRIVE AXLES

Drive axles use constant-velocity (CV) joints on both ends. For replacement parts, only CV joint boots or complete axles are offered by BMW.

Rear drive axle assembly



Rear Axle Differential 331-11

Rear drive axle, removing and installing

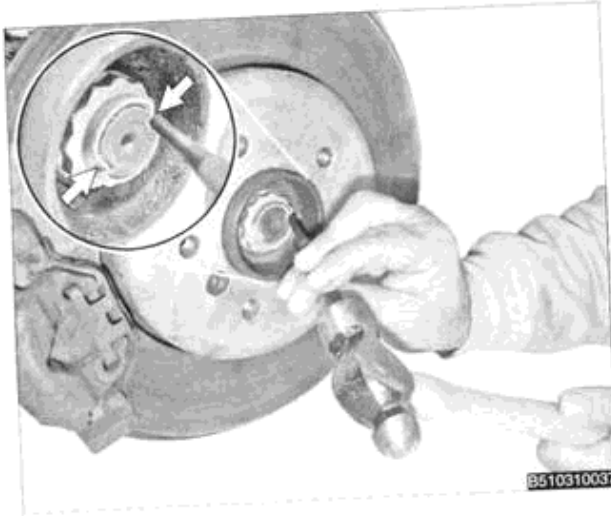
Rear drive axle, removing and installing

- Raise vehicle and remove rear wheel.

WARNING—

- Make sure the car is firmly supported on jack stands designed for the purpose. Place jack stands underneath structural chassis points, not underneath suspension parts.

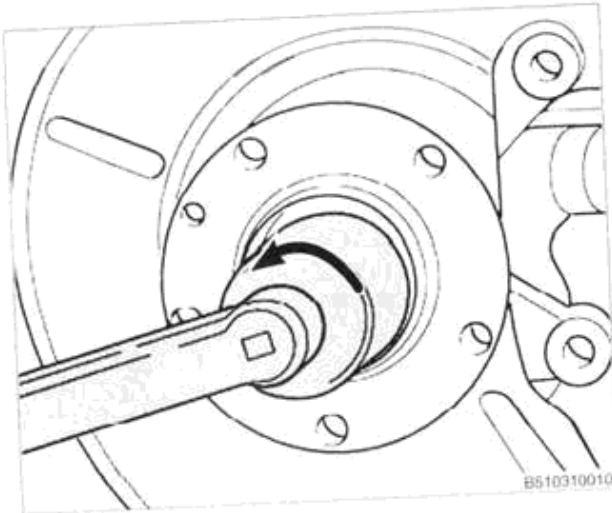
- Using a suitable punch, straighten staked sides of wheel hub collar nut (arrows).



- With an assistant holding down brake pedal, remove collar nut and discard.

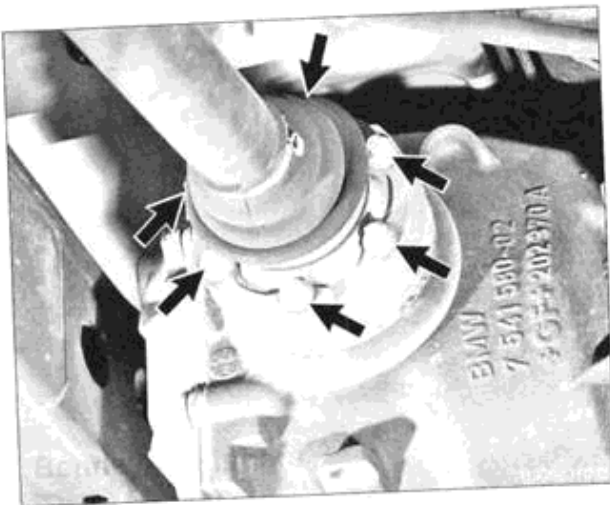
CAUTION—

- The drive axle collar nut is tightened to a high torque. If necessary, reinstall road wheel and place vehicle on floor before breaking collar nut free.



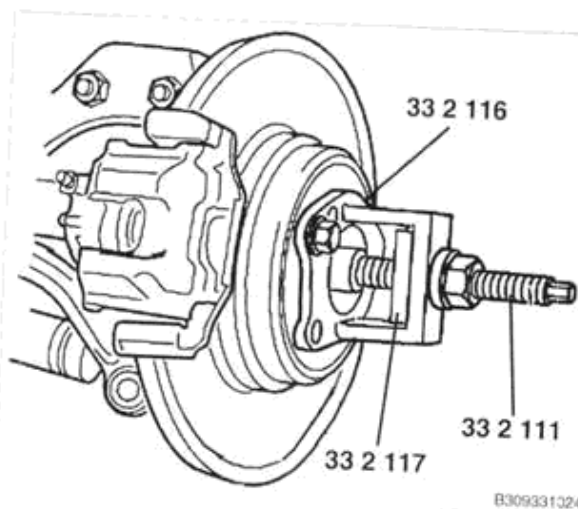
- Remove drive axle mounting bolts (arrows) from differential flange.

- Support rear wheel bearing carrier with a suitable jack.
- Using jack, lift wheel bearing carrier so that inboard side of drive axle clears differential.



331-12 Rear Axle Differential

CV joint boots



B309331024

- Press drive axle out of wheel hub. Remove drive axle towards center of vehicle.
- Installation is reverse of removal. Remember to:
 - Replace CV joint bolts and axle collar nut.
 - Tighten drive axle collar nut with wheel on the ground. Stake nut to axle end.

Tightening torques

Drive axle collar nut to wheel hub (replace M27 collar nut with new, lightly oil contact face, stake nut to axle end)	420 Nm (310 ft-lb)
Drive axle to differential output flange (replace M10 x 43 mm ZNS3 Torx bolts with new)	80 Nm (59 ft-lb)
Road wheel to hub	120 ± 10 Nm (89 ± 7 ft-lb)

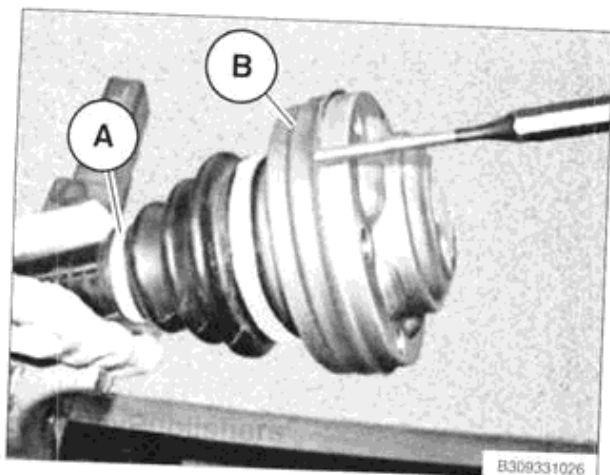
CV joint boots

When replacing CV boots, use a complete boot repair kit. The kit includes new boots, clamping bands, special lubricant and a new CV joint shaft circlip.

The outer CV joint cannot be removed from the axle shaft. In order to replace the outer CV boot, it is necessary to remove the inner joint and boot first.

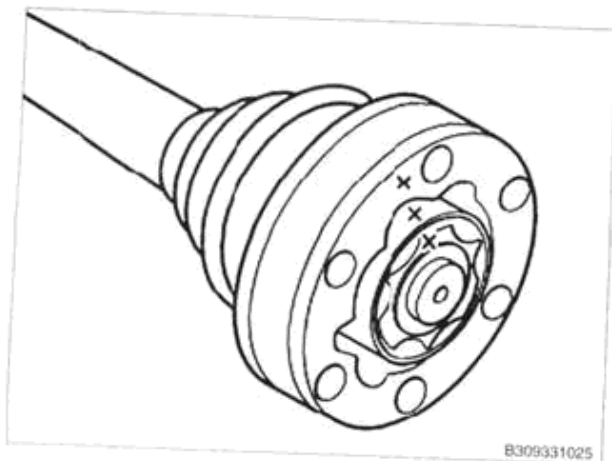
If the CV joints are worn or defective, a complete rebuilt axle shaft is available from an authorized BMW dealer parts department.

- Remove drive axle. See **Rear drive axle, removing and installing** in this repair group.
- Working with axle shaft on bench, cut off old boot clamps and remove boot (A) from inner joint (B) with suitable tool. Clean old grease off joint and shaft.
- Remove dust cover from inner CV joint.

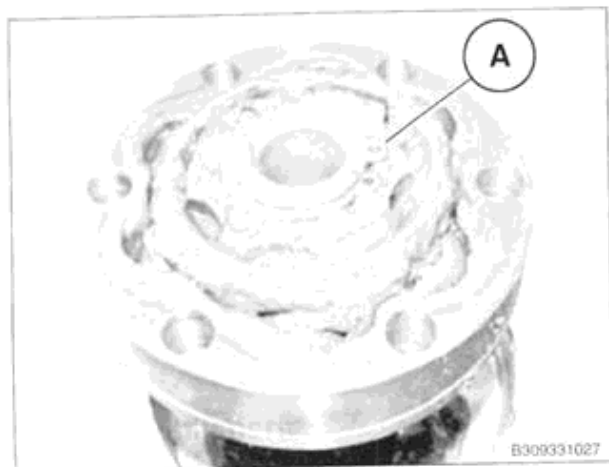


B309331026

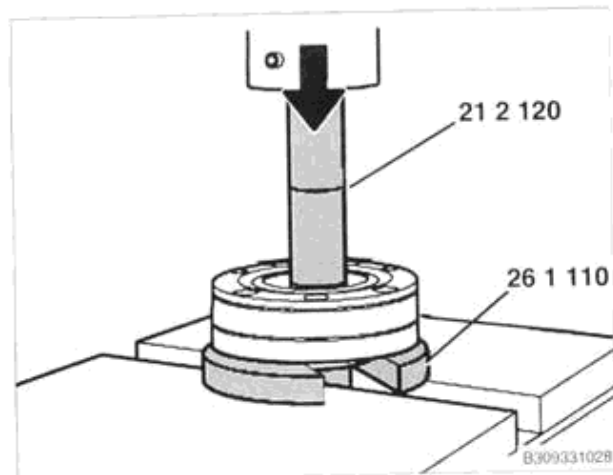
- Mark CV joint component positions in relation to each other. This aids in reassembly if CV joint comes apart.
 - Ball hub
 - Ball cage
 - CV joint



B309331025



Remove circlip (A).



Support inner hub with BMW special tool 26 1 110 and press axle shaft out of joint using BMW special tool 21 2 120.

— Clean all old lubricant off shaft splines and inner joint splines.

CAUTION—

• If the CV joint must be disassembled for cleaning and inspection, be sure to matchmark inner and outer race and intermediate ball cage. This allows reassembly of parts in their original positions.

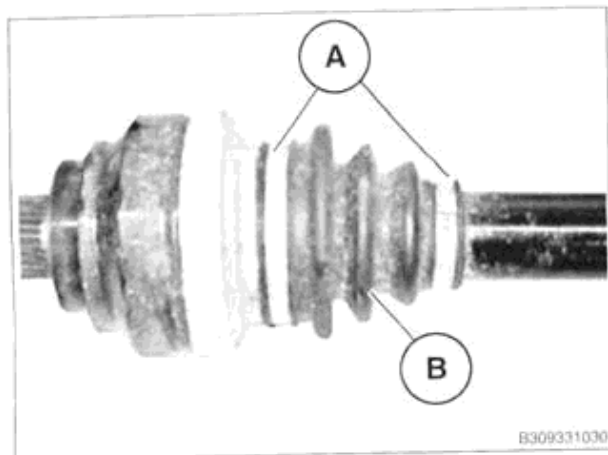
- To inspect a CV joint, clean away the grease and look for galling, pitting, and other signs of wear or physical damage.
- Polished surfaces or visible ball tracks alone are not necessarily cause for replacement.
- Discoloration due to overheating indicates lack of lubrication. Replace CV joint.

CAUTION—

• Do not let the ball hub pivot too far in the outer ring of the joint. The balls may fall out.

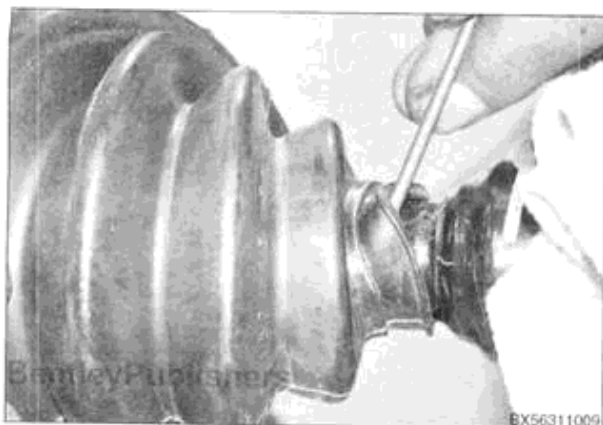
Working at outer CV joint boot, cut off old boot clamps (A) and remove boot (B) from outer CV joint. Clean old grease off CV joint.

— Slide new outer CV joint boot on axle shaft. Fill boot and joint with CV grease, then slide big end of boot over joint. Install big clamp.

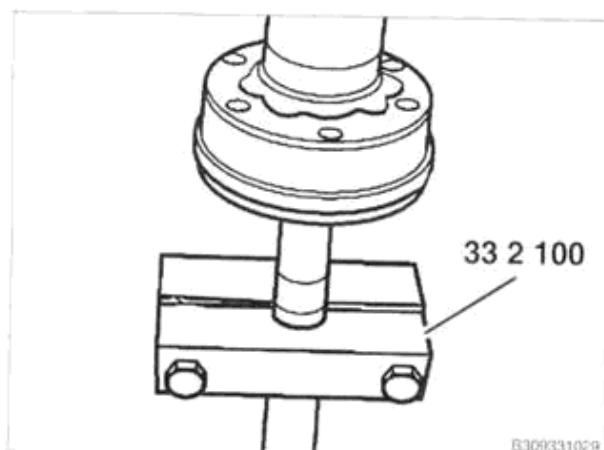


331-14 Rear Axle Differential

CV joint boots



- ◀ Before installing small boot clamp:
 - Flex CV joint as far over as it will go.
 - Insert small screw-driver between boot and axle-shaft to "burp" air from boot.
 - Install new small clamp.
- Slide inner CV joint boot on axle shaft.



- ◀ While supporting axle shaft with BMW special tool 33 2 100, press inner hub of CV joint onto shaft. Install a new circlip.
- Attach boot to CV joint and install new boot clamps. Be sure to "burp" air from boot.
- Use sealing gel to seal dust cover to CV joint prior to *reinstallation*.
- Installation is reverse of removal. See **Rear drive axle, removing and installing** in this repair group.

