

260 Driveshaft

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GENERAL

The two-piece driveshaft is joined in the center by a sliding splined coupling. This coupling compensates for fore and aft movement of the drive line. The driveshaft is connected to the transmission by a rubber flex-disc and to the final drive by a universal joint. It is supported in the middle by a center support bearing. The bearing is mounted in rubber to isolate vibration. See Fig. 1.

TROUBLESHOOTING

The source of driveline vibrations and noise can be difficult to pinpoint. Engine, transmission, rear axle, or wheel vibrations can be transmitted through the driveshaft to the car body. Noises from the rear of the car may be caused by final drive problems, or by faulty wheel bearings, drive axles, or even worn or improperly inflated tires.

NOTE —

For rear drive axle repair information, see **330 Rear Suspension**.

Driveshaft noise or vibration may be caused by worn or damaged components. Check the universal joints for play. With the driveshaft installed, pull and twist the driveshaft while watching the joint. The BMW specification for play is very small, so almost any noticeable play could indicate a problem.

Check the torque of the fasteners at the flange connections. Check the rubber of the flex-disc and center bearing for deterioration or tearing and check for preload at the center bearing with a visual inspection. Check the driveshaft for broken or missing balance weights. The weights are welded tabs on the driveshaft tubes. In addition to inspecting for faulty driveshaft parts, the installed angles of the driveshaft should also be considered.

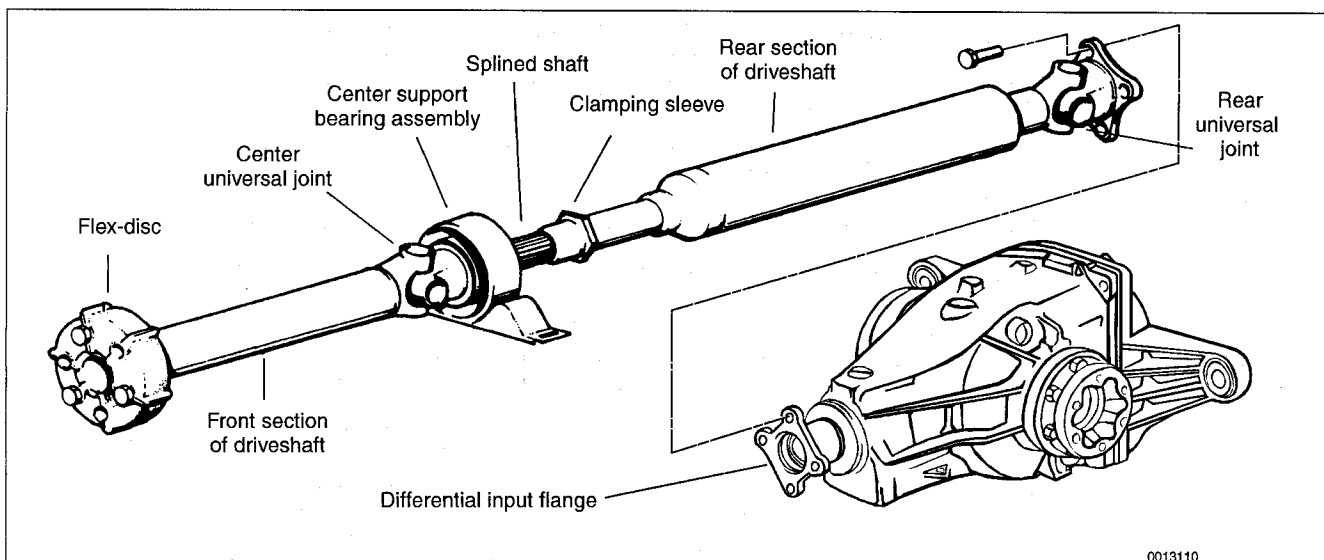


Fig. 1. Driveshaft and final drive assembly.

TROUBLESHOOTING

Further inspection requires removal of the driveshaft. Check the front centering guide on the transmission output flange for damage or misalignment. Also check runout at the transmission output flange and output shaft, and at the final drive input flange. Check the bolt hole bores in the flange for wear and elongation.

Driveshaft flange runout (max. allowable)

- Transmission output flange
 - axial play 0.10 mm (0.004 in.)
 - radial play 0.07 mm (0.003 in.)
- Final drive input flange radial play (measured at driveshaft centering lip) 0.07 mm (0.003 in.)

Spin the center bearing and check for the smooth operation without play. Check that the splines of the sliding coupling move freely. Clean and lubricate the splines with molybdenum disulfide grease (Molykote® Longterm 2 or equivalent).

Check the universal joints for wear or binding. If any joint is difficult to move or binds, the driveshaft section should be replaced.

NOTE —

With the driveshaft installed, the actual amount that the universal joints pivot is limited. For the most accurate test, check universal joints in their normal range of movement.

If inspection reveals nothing wrong with the driveshaft, it may need to be rebalanced. This can be done by a speciality driveshaft repair shop. Also, check the alignment of the driveshaft as described below.

NOTE —

Minor driveshaft vibrations can often be corrected simply by disconnecting the driveshaft at the final drive, and repositioning the driveshaft 90°, 180° or 270° in relation to the final drive input flange.

Table a lists symptoms of driveshaft problems and their probable causes. Most of the repair information is contained within this repair group.

Table a. Driveshaft Troubleshooting

Symptom	Probable cause	Corrective action
1. Vibration when starting off (forward or reverse).	a. Incorrect preload of center bearing.	a. Check preload of center bearing. Readjust preload. See Fig. 6.
	b. Center bearing rubber deteriorated.	b. Inspect center bearing and rubber. Replace if necessary.
	c. Flex-disc damaged or worn.	c. Inspect flex-disc. Replace if necessary.
	d. Engine or transmission mounts faulty.	d. Inspect engine and transmission mounts. Align or replace, if necessary.
	e. Front centering guide worn, or driveshaft mounting flanges out of round.	e. Check front centering guide and replace if necessary. Check runout of driveshaft flanges.
	f. Universal joints worn or seized.	f. Check universal joint play and movement. Replace driveshaft if necessary.
	g. Sliding coupling seized.	g. Remove driveshaft and check movement of sliding coupling. Clean coupling splines and replace parts as necessary.
	h. Driveshaft misaligned.	h. Check driveshaft alignment.
2. Noise during on/off throttle or when engaging clutch.	a. Final drive components worn or damaged (excessive pinion-to-ring-gear clearance).	a. Remove final drive and repair.
	b. Drive axle or CV joint faulty.	b. Inspect drive axles and CV joints. Repair or replace as necessary.
	c. Sliding coupling seized.	c. Remove driveshaft and check movement of sliding coupling. Clean coupling splines and replace parts as necessary.
3. Vibration at 25 to 30 mph (40 to 50 km/h).	a. Front centering guide worn, or driveshaft mounting flanges out of round or damaged.	a. Check front centering guide and replace if necessary. Check runout of driveshaft mounting flanges.
	b. Universal joints worn or seized.	b. Check universal joint play and movement. Replace driveshaft if necessary.
	c. Flex-disc damaged or worn.	c. Inspect flex-disc. Replace if necessary.
	d. Center bearing rubber deteriorated.	d. Inspect center bearing. Replace if necessary.
	e. Sliding coupling seized.	e. Remove driveshaft and check movement of sliding coupling. Clean coupling splines and replace parts as necessary.
	f. Misaligned installed position.	f. Check driveshaft alignment.

TROUBLESHOOTING

Table a. Driveshaft Troubleshooting (continued)

Symptom	Probable cause	Corrective action
4. Vibration, audible rumble over 35 mph (60 km/h).	a. Front centering guide worn, or driveshaft mounting flanges out of round or damaged.	a. Check front centering guide and replace if necessary. Check runout of driveshaft mounting flanges.
	b. Mounting flange bolts loose or holes worn.	b. Remove driveshaft and check transmission output flange and final drive input flange. Replace if necessary.
	c. Driveshaft unbalanced.	c. Check driveshaft for loose or missing balance weights. Have driveshaft rebalanced or replace if necessary.
	d. Universal joints worn or seized.	d. Check universal joint play and movement. Replace driveshaft if necessary.
	e. Sliding coupling seized.	e. Remove driveshaft and check movement of sliding coupling. Clean coupling splines or replace parts as necessary.
	f. Incorrect preload of center bearing.	f. Check preload of center bearing. Readjust if necessary.
	g. Center bearing faulty.	g. Replace center bearing.
	h. Final drive rubber mount faulty.	h. Inspect final drive rubber mount and replace if necessary.
	i. Driveshaft misaligned.	i. Check driveshaft alignment.

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Repair kits for the universal joints are not available, and it is not common practice to repair the universal joints on BMW driveshafts. Worn or damaged universal joints usually require replacement of that section of the driveshaft.

The driveshaft is balanced to close tolerances. Whenever it is to be removed or disassembled, the mounting flanges and driveshaft sections should be marked with paint or a punch before proceeding with work. This will ensure that the driveshaft can be reassembled or installed in exactly the same orientation.

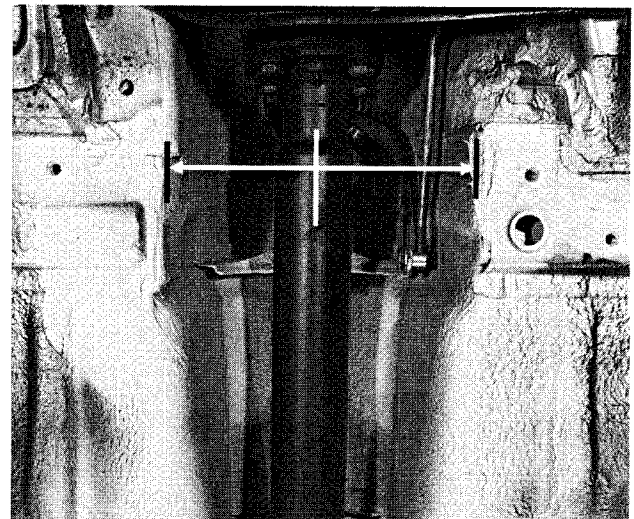
Universal joint play

- Maximum allowable 0.15 mm (0.006 in.)

Driveshaft, aligning

The alignment of the driveshaft does not normally need to be checked unless the engine/transmission or the final drive have been removed and installed. If, however, all other parts of the driveshaft have been inspected and found to be okay, but there is still noise or vibration, driveshaft alignment should be checked.

There are two important driveshaft alignment checks. The first is to make sure that the driveshaft runs straight from the transmission to the final drive, without any variation from side-to-side caused by misalignment of the engine/transmission in its mounts. Make a basic check by sighting along the driveshaft from back to front. Any misalignment should be apparent from the center bearing forward. To adjust the side-to-side alignment, loosen the transmission or engine mounts to reposition them, then retighten the mounts. The driveshaft should be exactly centered in the driveshaft tunnel. See Fig. 2.



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Fig. 2. Driveshaft side-to-side alignment. Driveshaft should be centered in driveshaft tunnel.

The second important driveshaft alignment check is more complicated. It checks the amount the driveshaft is angled vertically at the joints. This angle is known as driveshaft deflection.

In general, there should be little deflection in the driveshaft between the engine, the center bearing, and the final drive. Precise checks require the use of a large protractor or some other means of measuring the angle of the engine and the final drive and comparing these angles to the angle of the driveshaft sections.

To change the deflection angle, shims can be placed between the center bearing and the body or between the transmission and its rear support. When using shims to change a deflection angle, keep in mind that the angle of adjacent joints will also change. Deflection angles should be as small as possible.

CAUTION —

The maximum allowable change in height of the center bearing or transmission support using shims is 3 mm (0.12 in.).

Driveshaft, removing
WARNING —

- Be sure the wheels are off the ground before removing the driveshaft. Set the parking brake before removing the driveshaft.
- Once the driveshaft has been removed, the vehicle can roll regardless of whether the transmission is in gear or not.
- The driveshaft is mounted to the transmission and final drive with self-locking nuts. These nuts are designed to be used only once and should be replaced during reassembly.

1. Disconnect oxygen sensor electrical connectors and remove complete exhaust system. See **180 Exhaust System**.
2. Remove exhaust heat shield and heat shield cross-member.
3. Matchmark front and rear driveshaft connections at transmission and final drive.
4. Remove driveshaft mounting bolts. See Fig. 3. Discard old nuts.

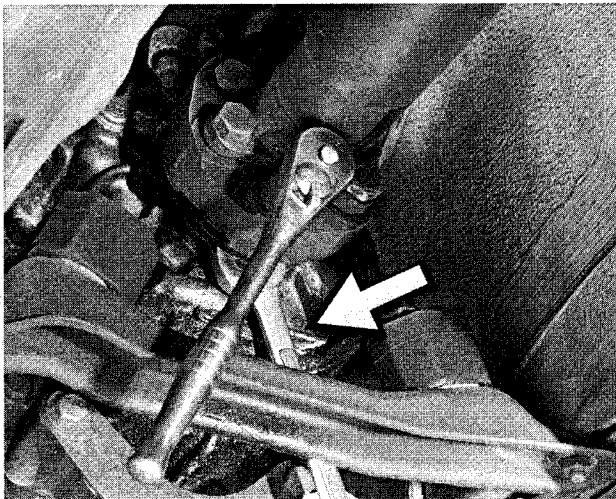


Fig. 3. Front driveshaft to transmission mounting bolt being removed. Note open-end wrench (arrow) being used to counterhold bolt.

5. Loosen threaded clamping sleeve on driveshaft a few turns. See Fig. 4.

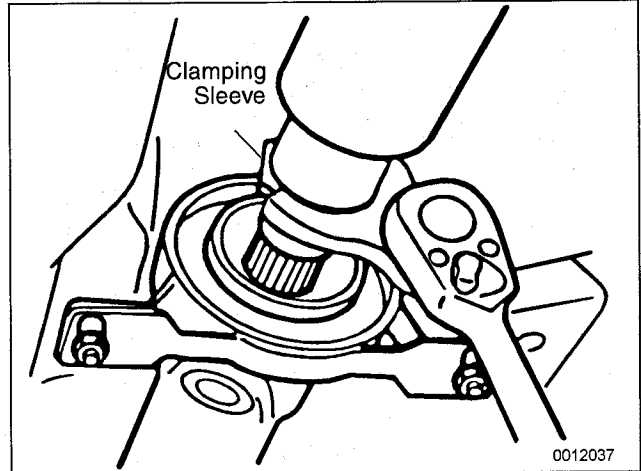


Fig. 4. Threaded clamping sleeve nut being loosened.

6. Support driveshaft and remove center support bearing mounting bolts.
7. Remove driveshaft but do not separate two halves. Pull down on center of driveshaft to facilitate removal.

NOTE —

If driveshaft halves were separate and not match-marked, assemble driveshaft as shown in drawing. If a vibration occurs, disassemble driveshaft and rotate one section 180°. See Fig. 5.

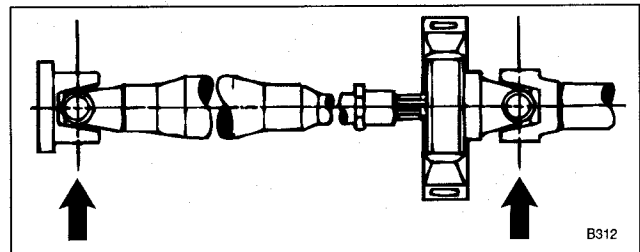


Fig. 5. Driveshaft alignment. Centerlines of universal joints (arrows) must be parallel or at 90° to each other.

Driveshaft, installing

1. Align driveshaft matchmarks at final drive and then at transmission flange. Start attaching nuts. Use new self-locking nuts.
2. Position center support bearing and start attaching nuts. Use new self-locking nuts.
3. Tighten flange nuts while preventing bolts from twisting in coupling. Tighten final drive flange first, then tighten coupling at transmission.
4. Preload center support bearing by pushing bearing forward 4-6 mm (0.16-0.24 in.) from center. See Fig. 6. Tighten attaching bolts.

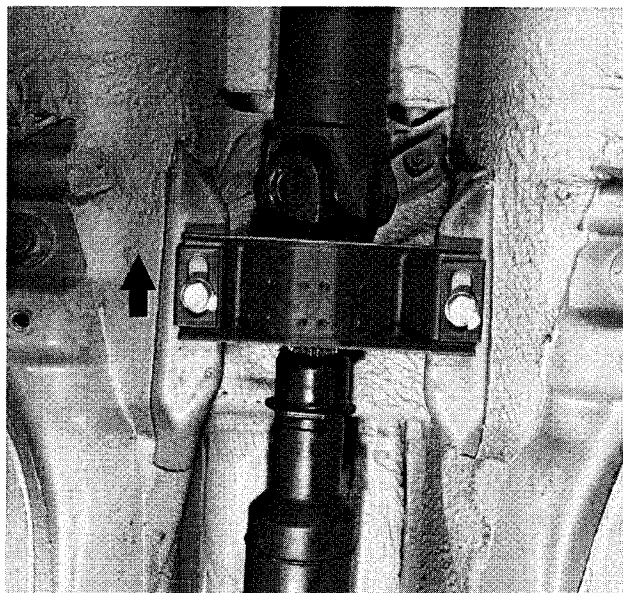


Fig. 6. Preload center bearing toward front 4-6 mm (arrow).

5. Tighten threaded sleeve on driveshaft to proper torque.
6. Install heat shield and heat shield crossmember.
7. Install exhaust system. See **180 Exhaust System**. Connect wiring harness to oxygen sensors.
8. Road test vehicle to check for noise or vibration.

WARNING —

- Do not reuse self-locking nuts. These nuts are designed to be used only once.
- Avoid stressing the flex-disc when torquing the bolts. Do this by holding the bolts steady and turning the nuts on the flange side.

Tightening Torques

- Driveshaft center mount to body 21 Nm (16 ft-lb)
- Driveshaft clamping sleeve 10 Nm (89 in-lb)
- Driveshaft to final drive flange
 - With CV joint (M8) 32 Nm (23 ft-lb)
 - With U-joint (M10 ribbed nut) 80 Nm (59 ft-lb)
 - With U-joint (M10 compressed nut) . . 60 Nm (44 ft-lb)
- Flex-disc to driveshaft or transmission flange
 - M10 (8.8 grade) 48 Nm (35 ft-lb)
 - M10 (10.9 grade) 64 Nm (47 ft-lb)
 - M12 (8.8 grade) 81 Nm (60 ft-lb)
 - M12 (10.9 grade) 100 Nm (74 ft-lb)
 - M12 (10.9 grade) (M3 models). 115 Nm (85 ft-lb)
- Transmission crossmember to body (M8) 21 Nm (16 ft-lb)

NOTE —

Bolt grade is marked on the bolt head. When replacing bolts, only use bolts of the same strength and hardness as the originals installed.

Flex-disc, replacing

The flex-disc between the front section of the driveshaft and the output flange of the transmission should be checked for cracks, tears, missing pieces, or distortion. Check for worn bolt hole bores in the flange.

1. Remove driveshaft as described in **Driveshaft, removing**.

NOTE —

It is possible to only partially remove the driveshaft, leaving it connected to the final drive. The driveshaft can be tilted down in the center and slid off the transmission flange once the clamping sleeve is loosened and the center bearing bracket is unbolted. Suspend the driveshaft using stiff wire in as close to the installed position as possible. If the driveshaft hangs unsupported, the rear universal joint may be damaged.

2. Unbolt flex-disc from driveshaft.

NOTE —

Removal and installation of the bolts may be made easier by placing a large hose clamp around the flex-disc, and tightening the clamp slightly to compress the coupling.

3. Install new flex-disc using new self-locking nuts. Molded arrows on coupling should face flange arms. See Fig. 7.

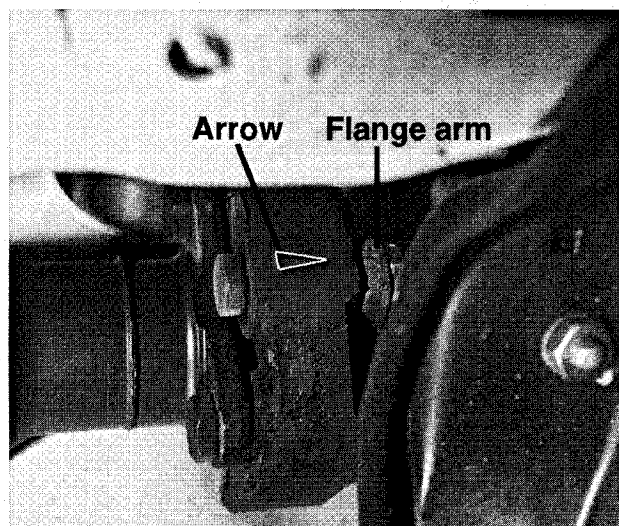


Fig. 7. When attaching flex-disc, molded arrows must point toward flange arms.

4. Install driveshaft as described in **Driveshaft, installing**.

NOTE —

Torque only the nuts while holding the bolt heads. This will prevent damaging or fatiguing the rubber.

Tightening Torques

- Driveshaft center mount to body 21 Nm (16 ft-lb)
- Driveshaft clamping sleeve 10 Nm (89 in-lb)
- Driveshaft to final drive flange
 - With CV joint (M8) 32 Nm (23 ft-lb)
 - With U-joint (M10 ribbed nut) 80 Nm (59 ft-lb)
 - With U-joint (M10 compressed nut) . . 60 Nm (44 ft-lb)
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 - M12 (10.9 grade) 100 Nm (74 ft-lb)
 - M12 (10.9 grade) (M3 models) 115 Nm (85 ft-lb)
- Transmission crossmember to body (M8) 21 Nm (16 ft-lb)

Center bearing assembly, replacing

To replace the center bearing assembly, the driveshaft must be removed from the car. The center bearing assembly consists of a grooved ball bearing in a rubber mount. The bearing assembly is pressed onto the front section of the driveshaft and secured by a circlip. See Fig. 8.

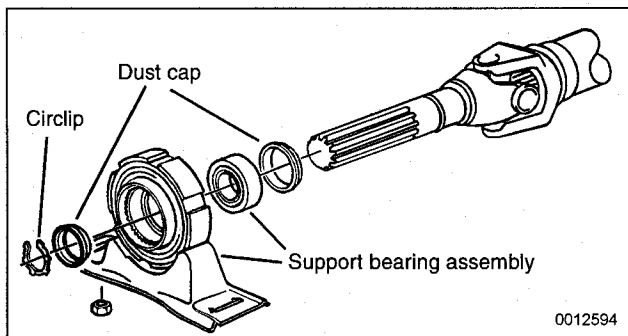
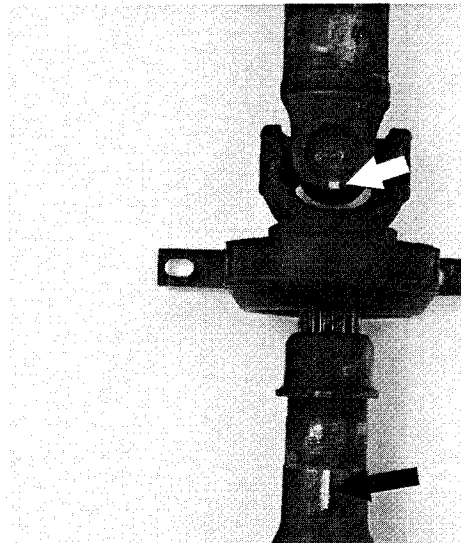


Fig. 8. Exploded view of driveshaft support bearing assembly.

1. Remove driveshaft. See **Driveshaft, removing**.
2. Make matching marks on front and rear driveshaft sections. See Fig. 9.
3. Loosen clamping sleeve fully and pull driveshaft sections apart. Remove rubber bushing, washer, and clamping sleeve from front section.

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Fig. 9. Before pulling apart driveshaft sections, make matching marks as shown.

4. Inspect condition of rubber bushing for splined coupling. Replace worn or damaged parts.
5. Remove center bearing circlip and dust guard. See Fig. 10. Remove bearing from driveshaft using puller.



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Fig. 10. Center bearing circlip (arrow) to be removed. Driveshaft shown installed.

NOTE —

Install puller so that it pulls on inner hub of bearing. Pulling on outer ring of mount may tear rubber, and entire bearing assembly will need to be replaced.

6. Before installation, make sure dust guard is on driveshaft, and then press center mount onto driveshaft flush with dust guard.
7. Place clamping sleeve, washer, and rubber bushing on front driveshaft section. Lubricate splines with molybdenum disulfide grease (Molykote® Longterm 2 or equivalent) and then reassemble driveshaft.

NOTE —

Do not retighten clamping sleeve until driveshaft is installed.

8. Install driveshaft. See **Driveshaft, installing**.
9. Tighten clamping sleeve.

Tightening Torque

- Clamping sleeve. 10 Nm (7.5 ft-lb)

Front centering guide, replacing

The front centering guide centers the driveshaft in relation to the transmission. The guide is press-fit into a cavity in the front of the driveshaft and slides onto the transmission output shaft.

No specifications are given for wear of the guide, but generally the guide should fit snugly on the transmission output shaft.

NOTE —

Some driveshafts have a dust cap installed on the end of the driveshaft, over the centering guide. The dust cap may become bent or distorted when the driveshaft is removed or installed. Damage to the dust cap should not affect the centering guide and should not be mistaken for guide wear.

1. Remove driveshaft. See **Driveshaft, removing**.

2. Pack cavity behind centering guide with heavy grease until grease is flush with bottom edge of guide.
3. Insert 14 mm (approximately ½ in.) diameter mandrel or metal rod into guide. Strike guide with hammer to force centering guide out.

NOTE —

The mandrel should fit snugly in the centering guide so that the grease cannot escape around the sides of the mandrel.

4. Remove old grease from driveshaft, lubricate new centering guide with molybdenum disulfide grease (Molykote® Longterm 2 or equivalent) and drive it into driveshaft.

NOTE —

The sealing lip of the guide should face outward and it should be driven into the driveshaft to a specified depth. See Fig. 11.

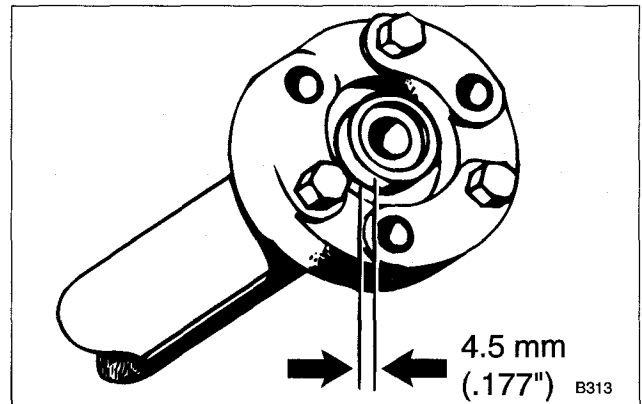


Fig. 11. When installing new driveshaft centering guide, drive guide in until its protrusion depth is as shown.

5. Install driveshaft. See **Driveshaft, installing**.



