

Wheel Drive Shafts Description and Operation

The wheel drive shaft assemblies are flexible assemblies consisting of an inner and outer constant velocity joint connected by a interconnecting shaft. The inner constant velocity joint is flexible and can move in and out. The inner constant velocity joint is not replaceable. The outer constant velocity joint is flexible, but cannot move in or out. The outer constant velocity joint is pressed onto the interconnecting shaft and is replaced as a complete outer constant velocity joint and interconnecting shaft assembly. Both constant velocity joints use rubber joint boots to protect and seal the constant velocity joints from dirt, water, and atmospheric conditions. The joint boots also contain lubricating grease required by the constant velocity joints for lubrication and quiet operation. The Inner joint boot kits are not available for the raised bar drive shaft design, but are replaceable on the straight bar drive shaft design. The outer joint boot kits are available and can be replaced individually as required. The inner constant velocity joints incorporate a male spline and interlock with the differential gears using barrel type snap rings. The snap rings are replaced after removal. The outer constant velocity joint is secured to the wheel/hub assembly with a locking nut and washer. The nut must be peened over into the keyway of the outer constant velocity joint stem to secure. The nut is discarded after removal. The wheel drive shafts transmit power from the differential to the wheel hubs. The constant velocity joints enable the wheel drive shafts to transmit the power with a flexible and quiet operation.

Symptoms - Wheel Drive Shafts

Before beginning diagnosis, review the system description and operation in order to familiarise yourself with the system function. Refer to [Wheel Drive Shafts Description and Operation](#).

Classifying the Symptom

Wheel drive shaft symptoms can usually be classified into the following categories:

- Noises.
- Vibrations.

Visual/Physical Inspection

- Inspect the system components for obvious damage or conditions which could cause the symptom.
- Inspect the system for aftermarket devices which could affect the operation of the wheel drive shaft.

Symptom List

Refer to a symptom diagnostic procedure from the following list in order to diagnose the symptom:

- [Clunk When Accelerating from Coast](#).
- [Shudder or Vibration During Acceleration](#).

Clunk When Accelerating from Coast

A clunk noise when accelerating from coast or a standing start may be caused by a worn or damaged constant velocity joint. The common cause of constant velocity joint damage is the loss of lubricating grease and/or the presence of foreign material and contaminants in the constant velocity joint. This usually occurs as a result of a torn or damaged joint boot.

Carefully inspect the joint boot for cuts, tears or other signs of damage that may allow the loss of the lubricating grease and/or the entry of contaminants. If there is no damage to the joint boots, remove the wheel drive shaft from the vehicle and inspect the constant velocity joints. Rotate the constant velocity joints in a circular motion. Do not allow the constant velocity joint inner races to become disengaged from the outer race housings, or damage to the constant velocity joints will occur. The movement of the constant velocity joints should be smooth and even. If any binding or impeded motion is felt, the constant joint requires replacement.

Shudder or Vibration During Acceleration

A shudder/vibration, or a groan/scraping noise during acceleration may be caused by a worn or damaged constant velocity joint. The common cause of constant velocity joint damage is the loss of lubricating grease and/or the presence of foreign material and contaminants in the constant velocity joint. This usually occurs as a result of a torn or damaged constant velocity joint boot.

Carefully inspect the joint boot for cuts, tears or other signs of damage that may allow the loss of the lubricating grease and/or the entry of contaminants. If the boot is torn check for contact with foreign matter or other parts in the surrounding area. If there is no damage to the joint boots, remove the wheel drive shaft from the vehicle and inspect the constant velocity joints. Rotate the constant velocity joints in a circular motion. Do not allow the constant velocity joint inner races to become disengaged from the outer race housings, or damage to the constant velocity joints will occur. The movement of the constant velocity joints should be smooth and even. If any binding or impeded motion is felt, the constant velocity joint requires replacement.

Rear Wheel Drive Shaft Replacement

Special Tools

- 7208 Rear Axle Remover
- J 22610 Keystone Pliers
- J 22912-B Rear Pinion and Axle Bearing Remover
- KM-468-C Holding Tool

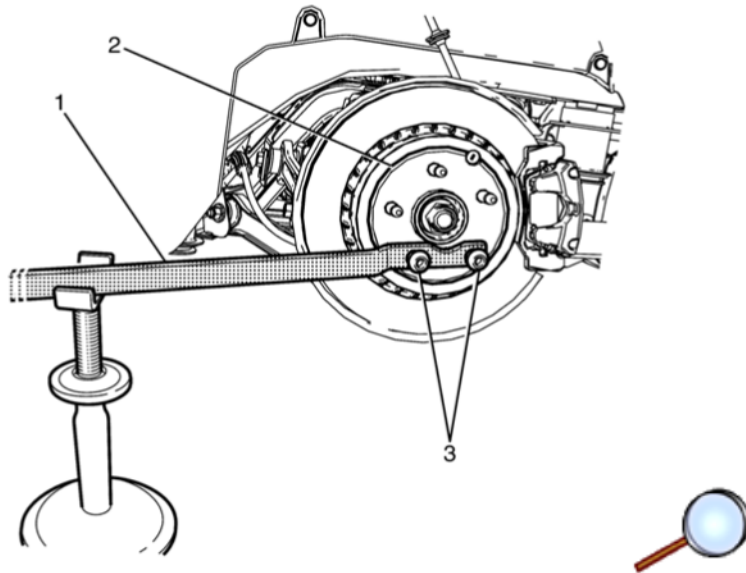
For regional tool equivalent, refer to [Special Tools](#).

Removal Procedure

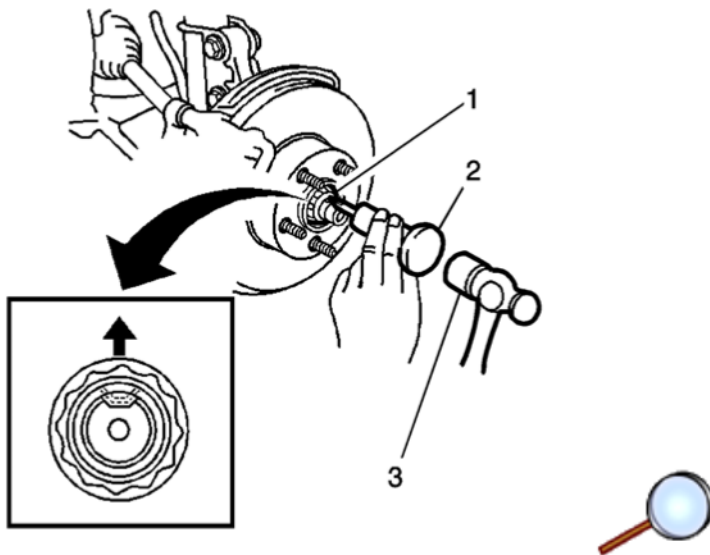
Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

1. Perform the parking brake cable adjuster disabling procedure. Refer to [Parking Brake Cable Adjuster Disabling](#).
2. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
3. Remove the rear tire and wheel assemblies. Refer to [Tire and Wheel Removal and Installation](#).

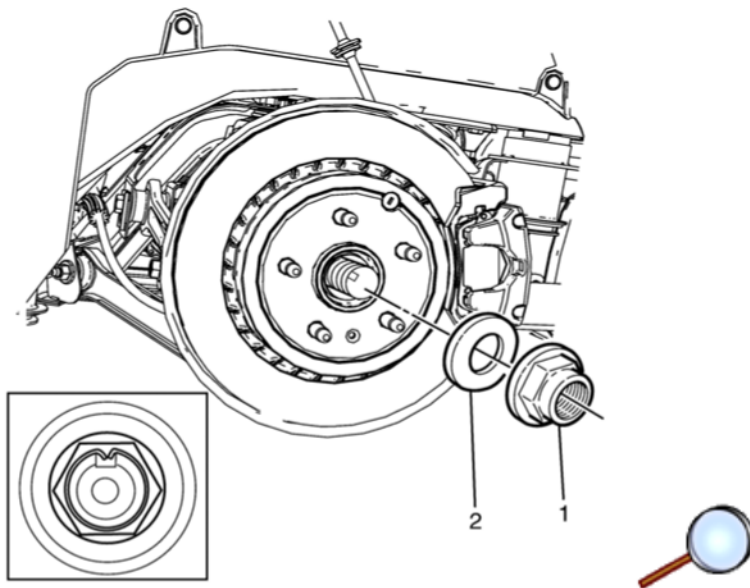


4. Install the KM-468-C holding tool (1) to the wheel hub (2) with two inverted wheel nuts (3).
5. Support the KM-468-C holding tool (1) outer end on a safety stand.



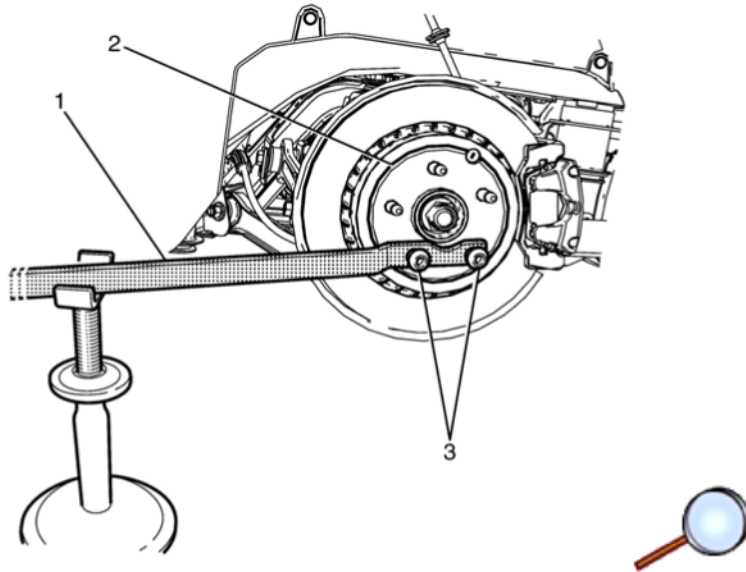
Caution: Make sure that the wheel drive shaft nut is fully un-staked to avoid damage to the wheel drive shaft threads during the removal of the wheel drive shaft nut. Failure to follow these instructions could result in wheel, nut, and/or stud damage.

6. Using a chisel (2) and a hammer (3), un-stake the drive shaft nut collar (1).

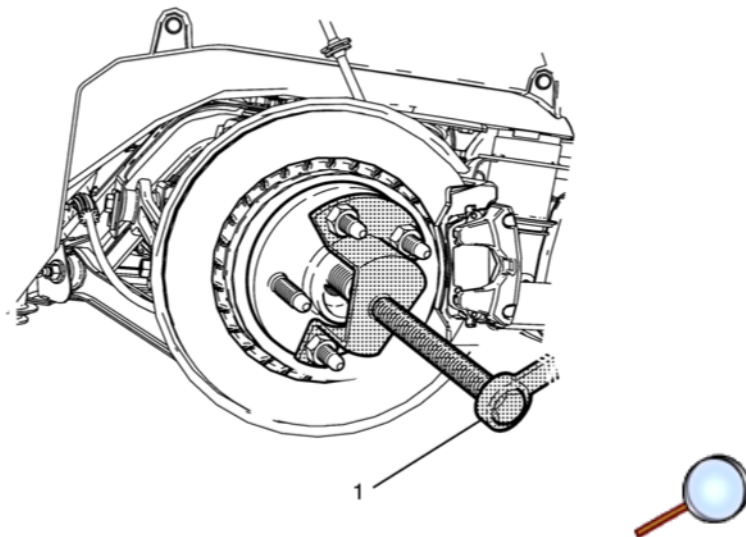


Note: DO NOT re-use the wheel drive shaft retaining nut must be discarded after removal.

7. Remove and discard the wheel drive shaft retaining nut (1) and the washer (2). Replace with NEW only.

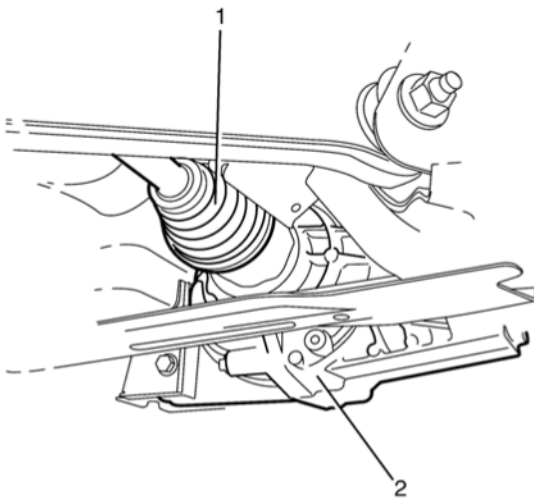


8. Remove the KM-468-C holding tool (1) from the wheel hub.
9. Remove the wheel speed sensor electrical connector from the speed sensor. Refer to [Rear Wheel Speed Sensor Replacement](#)
10. Remove the rear park brake cable from the knuckle. Refer to [Parking Brake Rear Cable Replacement - Left Side](#) or [Parking Brake Rear Cable Replacement - Right Side](#).
11. Remove the lower control arm from the knuckle. Refer to [Rear Axle Lower Control Arm Replacement](#).
12. Remove the trailing arm from the knuckle. Refer to [Trailing Arm Replacement](#).



Note: Do not hammer the end of the wheel drive shaft to remove use 7208 rear axle remover.

13. Using the 7208 remover (1), remove the wheel drive shaft from the wheel hub assembly.
14. Place a suitable container under the differential in order to collect draining fluid.



Caution: When removing or installing the drive axle, use extreme care not to nick or cut the drive axle oil seal.

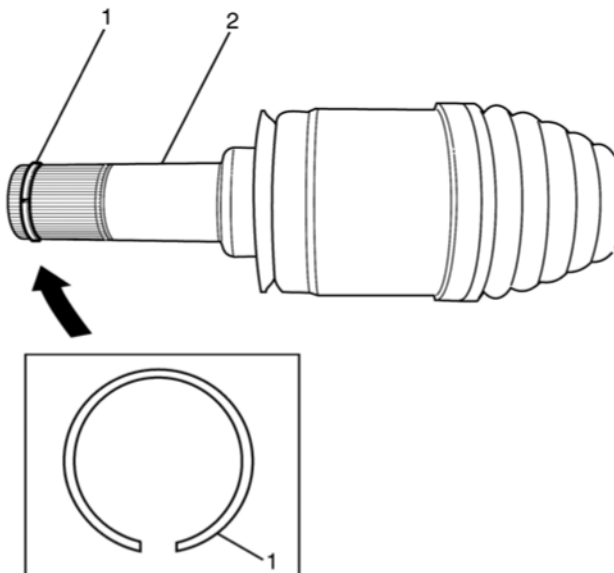
Note:

- Do not pull on the interconnecting shaft as it will pull apart the inboard joint.
- Use a suitable tool to pry the inner constant velocity joint out of the differential to release the snap ring.
- Support the wheel drive shaft when removing as the rear sub-frame may cut the inner constant velocity boot.

15. Disconnect the wheel drive shaft (1) from the differential (2).

Caution: When removing or installing the drive axle, use extreme care not to nick or cut the drive axle oil seal.

16. Remove the wheel drive shaft (1) from the vehicle.



Note: The snap ring (1) is a single use part and must be discarded after removal.

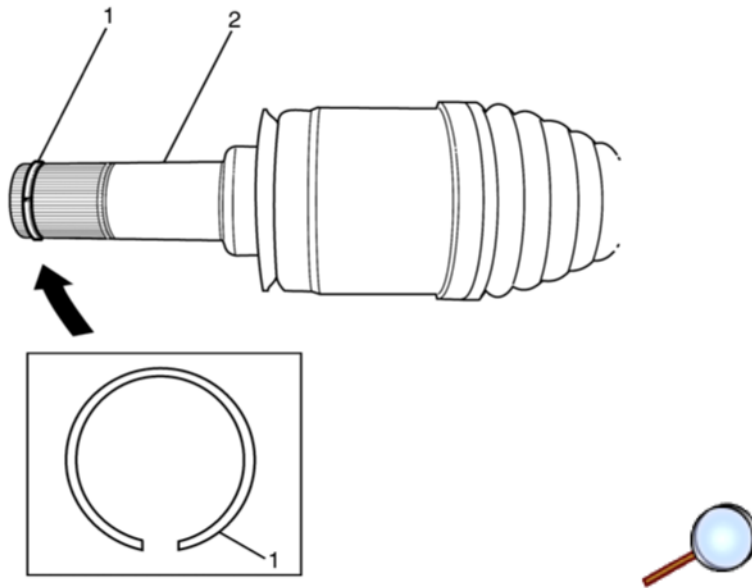
17. Remove and discard the snap ring (1) from the inner constant velocity joint (2). DO NOT re-use, replace with NEW only.

18. Inspect the wheel drive shaft assembly for excessive wear and/or damage. Inspect the following:

- Wheel Drive Shaft.
- Inner Joint Boot. For replacement refer to [Wheel Drive Shaft Inner Joint Inspection](#).
- Inner Constant Velocity Joint. For replacement refer to [Rear Wheel Drive Shaft Inner Joint and Boot Replacement](#).

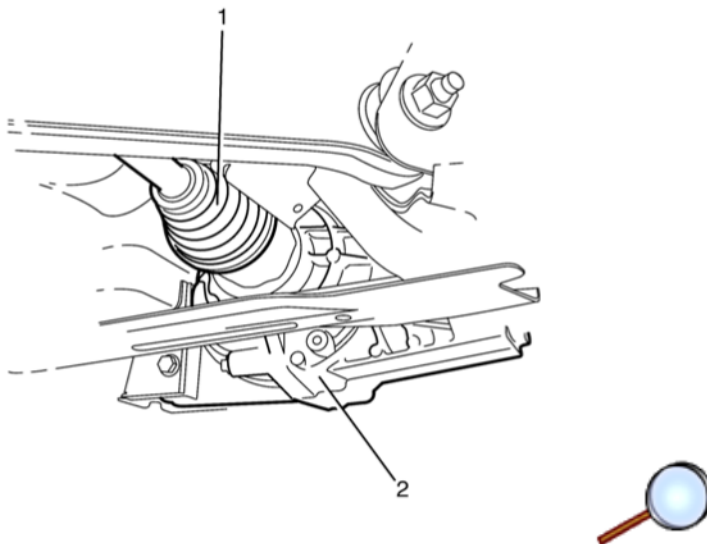
- Outer Joint Boot. For replacement refer to [Rear Wheel Drive Shaft Outer Joint Boot Replacement](#).
- Outer Constant Velocity Joint, if the outer joint failed inspection it is necessary to replace the drive shaft and joint as an assembly.

Installation Procedure



Note: Ensure that the gap in the snap ring (1) must be at the bottom.

1. Install the NEW snap ring (1) to the wheel drive inner constant velocity joint (2).

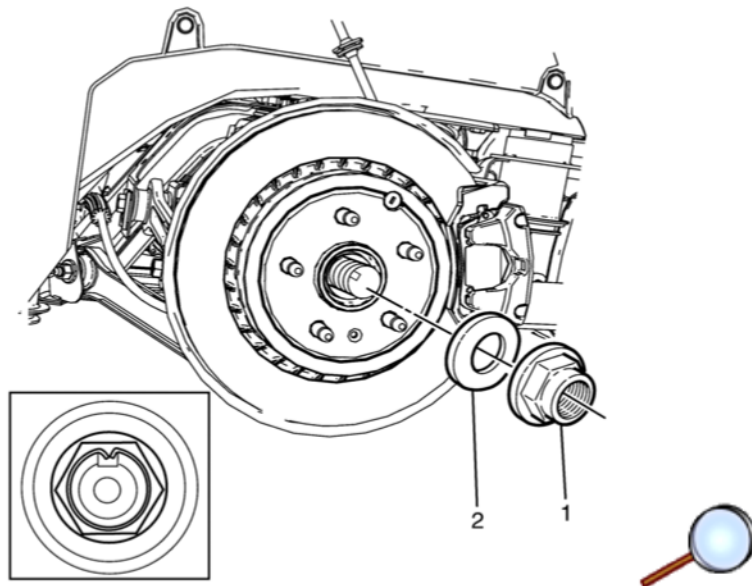


Caution: When removing or installing the drive axle, use extreme care not to nick or cut the drive axle oil seal.

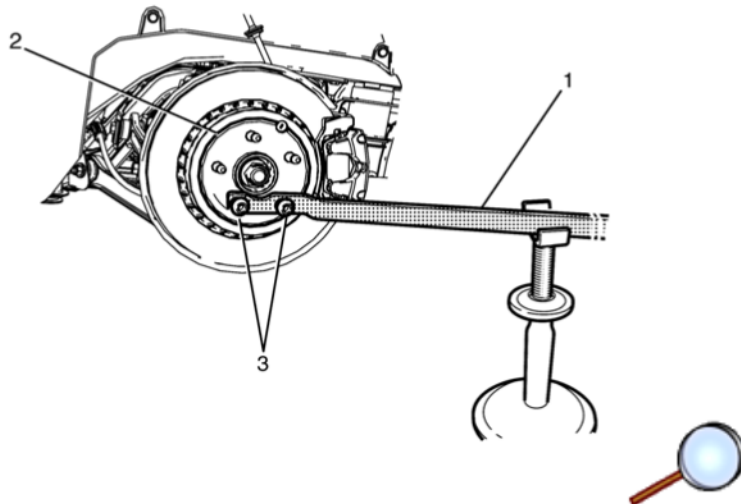
2. Install the wheel drive shaft (1) to the differential (2).

Note: Pull the wheel hub assembly outwards to position the wheel drive shaft through the wheel hub assembly.

3. Position the wheel drive shaft through the wheel hub assembly.
4. Install the lower control arm to knuckle. Refer to [Rear Axle Lower Control Arm Replacement](#).
5. Install the rear park brake cable. Refer to [Parking Brake Rear Cable Replacement - Left Side](#) or [Parking Brake Rear Cable Replacement - Right Side](#).
6. Install the trailing arm to the knuckle. Refer to [Trailing Arm Replacement](#).
7. Install the wheel speed sensor electrical connector to the speed sensor. Refer to [Rear Wheel Speed Sensor Replacement](#).



8. Install the NEW wheel drive shaft washer (2) and nut (1).



9. Install the KM-468-C holding tool (1) to the wheel hub assembly (2) with two inverted wheel nuts (3).

10. Support the KM-468-C holding tool (1) outer end on a safety stand.

Note: There are two suitable methods of tightening the wheel drive shaft retaining nut. DO NOT EXCEED THE SPECIFIED TIGHTENING VALUES, otherwise premature bearing failure may result.

11. Preferred Method:

- First Pass: 350 N•m (258 lb ft).
- Second Pass: loosen 180 degrees.
- Final Pass: 350 N•m (258 lb ft).

12. Alternate Method:

- First Pass: 150 N•m (111 lb ft).
- Second Pass: loosen 180 degrees.
- Third Pass: 50 N•m (37 lb ft).
- Final Pass: plus 30 degrees.

13. Remove the KM-468-C holding tool (1).

Note: The collar should contact the bottom of the drive shaft slot or be evenly split into the center of the drive shaft slot. Holding the rotor from turning will ease the process.

14. Use a suitable tool to stake the NEW wheel drive shaft nut to the wheel drive shaft keyway.
15. Install the rear wheel. Refer to [Tire and Wheel Removal and Installation](#).
16. Check the differential fluid level. Refer to [Rear Axle Lubricant Level Inspection](#).
17. Perform the parking brake adjuster enabling procedure. Refer to [Parking Brake Cable Adjuster Enabling](#).
18. Remove the safety stands.
19. Lower the vehicle to the ground.

Rear Wheel Drive Shaft Inner Joint and Boot Replacement

Special Tools

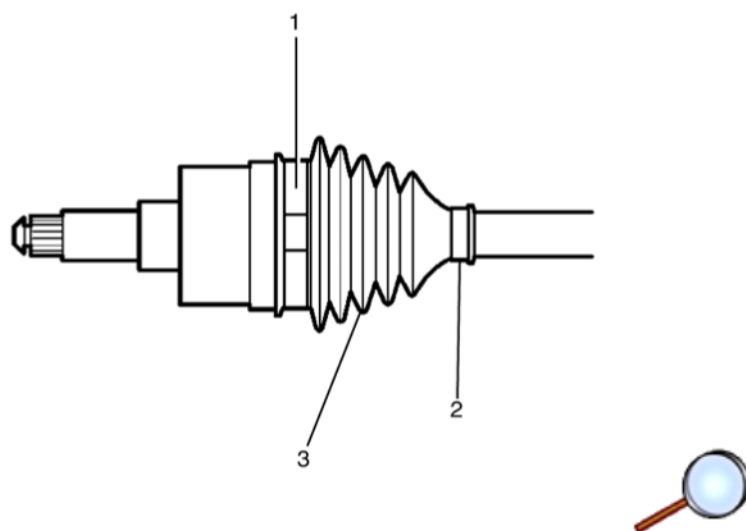
J 22610 Keystone Pliers

Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

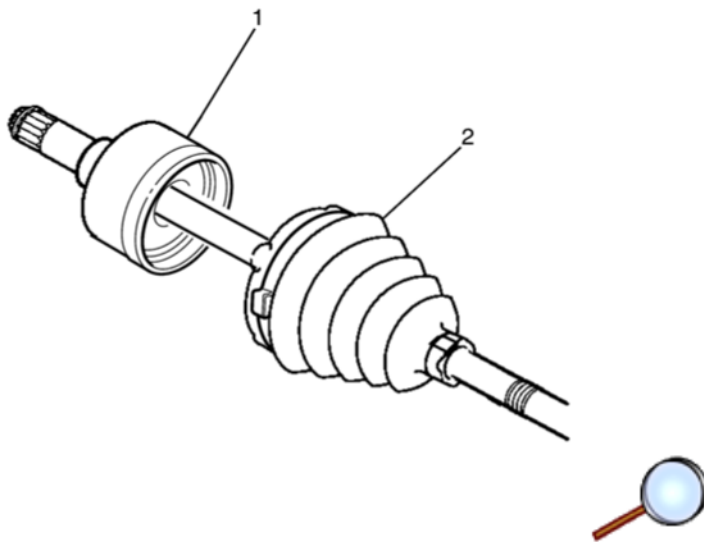
Warning: Refer to [Safety Glasses Warning](#).

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the rear wheel drive shaft from the vehicle. Refer to [Rear Wheel Drive Shaft Replacement](#).

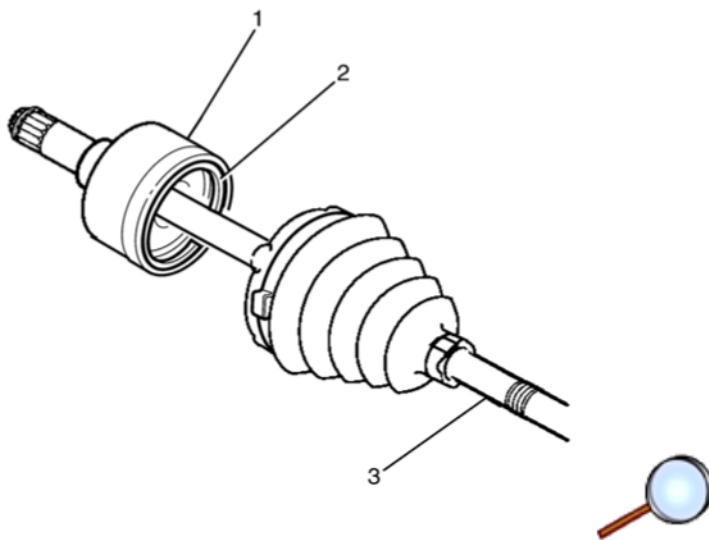


Note: The inner joint boot small retaining clamp (2) and the inner joint boot large retaining clamp (1) are single use parts and must be discarded after use.

3. Remove the inner joint boot small retaining clamp (1) and the large retaining clamp (2) from the inner joint boot (3).
Discard the clamps.



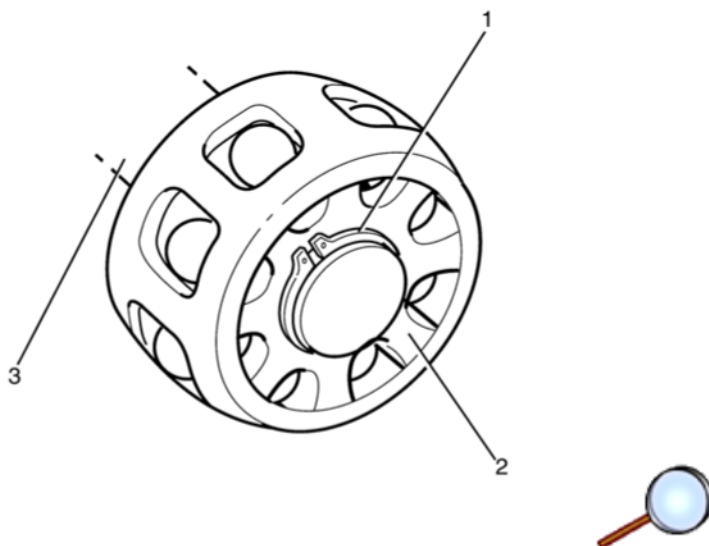
4. Move the inner joint boot (2) from the inner constant velocity joint (1) along the interconnecting shaft.



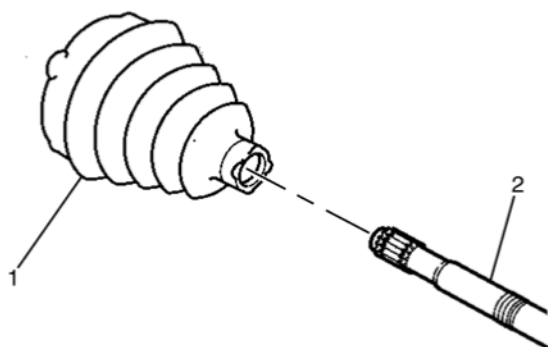
5. Remove the circlip (2) from the outer race of the inner constant velocity joint (1).

Note: Take care as inner constant velocity balls can fall out when the inner constant velocity joint outer race (1) is removed.

6. Remove the inner constant velocity joint outer race (1) from the interconnecting shaft (3).

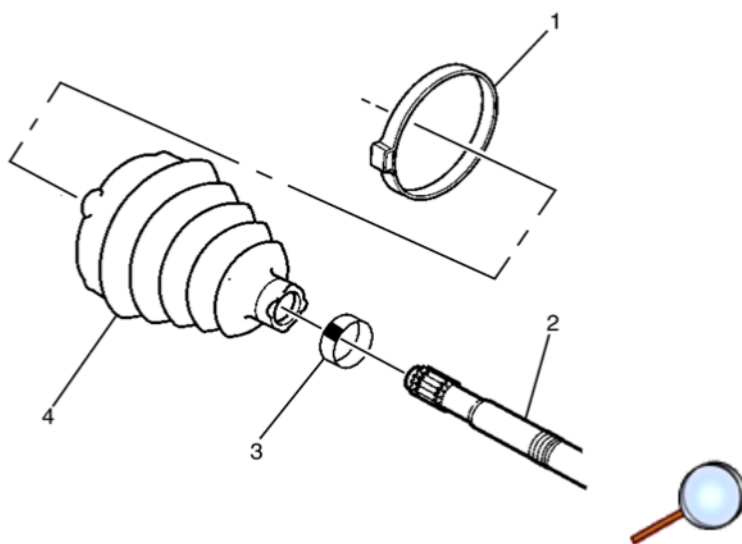


- Note:** The circlip (1) is a single use part and must be discarded after use.
7. Remove the circlip (1) from the inner constant velocity joint inner race (2).
Discard the circlip.
 8. Remove the inner constant velocity joint inner race (2) from the interconnecting shaft (3).

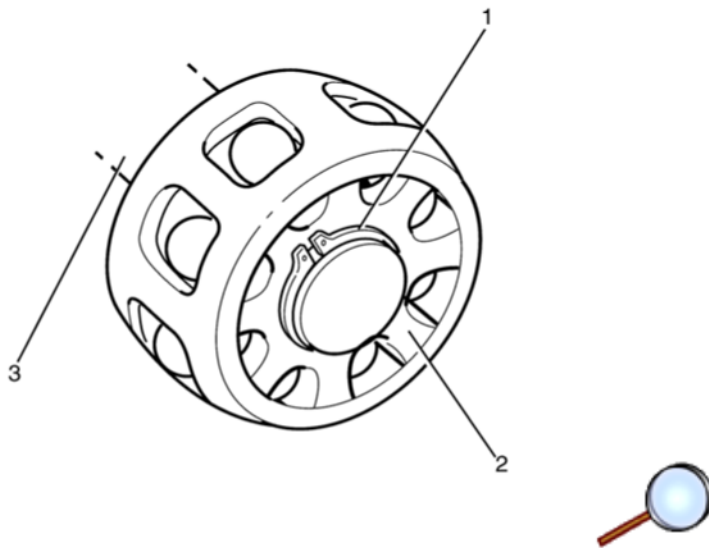


9. Remove the inner joint boot (1) from the interconnecting shaft (2).
- Note:** All traces of old grease and any contaminates must be removed.
10. Clean the grease from the interconnecting shaft (2).

Installation Procedure

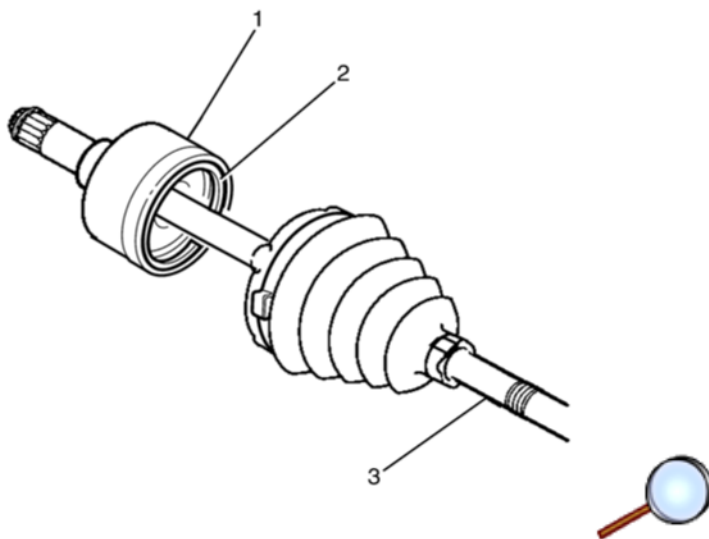


- Note:** The NEW inner joint boot large retaining clamp (1) and the NEW inner joint boot small retaining clamp (3) must not be fully tightened at this stage.
1. Install the NEW inner joint boot large retaining clamp (1) and the NEW inner joint boot small retaining clamp (3) to the NEW inner joint boot (4).
Do not fully tighten clamps.
 2. Install the NEW inner joint boot (4) along the interconnecting shaft (2).

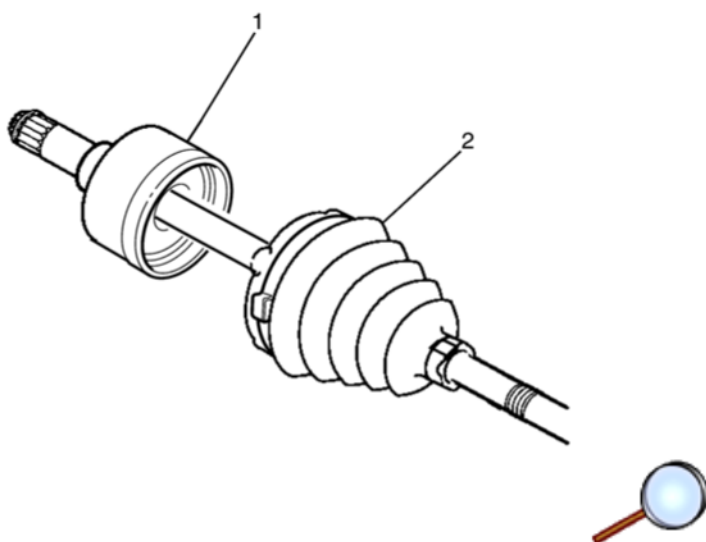


Note: Pack grease around the inner constant velocity balls to aid in holding in place. Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

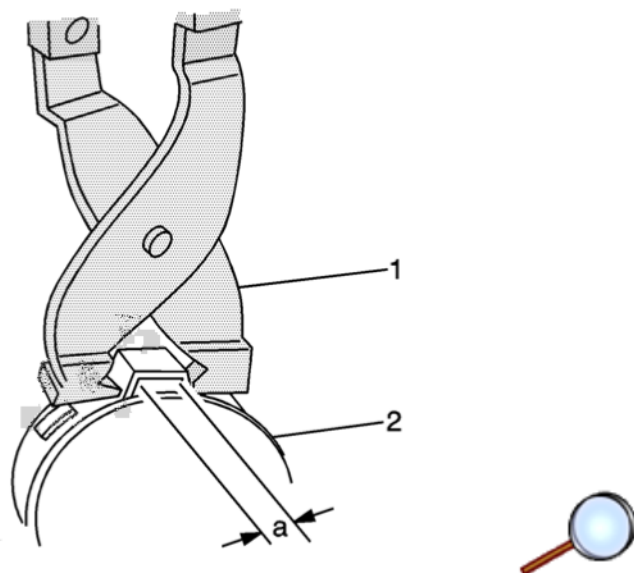
3. Install the inner race (2) to the interconnecting shaft (3).
4. Install the NEW inner race circlip (1) to the interconnecting shaft (3).



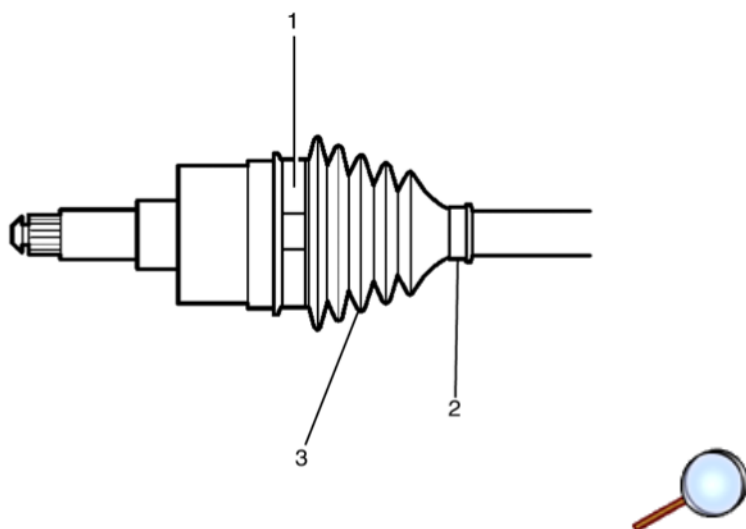
5. Install the inner constant velocity joint outer race (1) to the interconnecting shaft (3).
6. Install the NEW inner constant velocity joint outer race circlip (2) to the outer race of the inner constant velocity joint (1).



- Note:** Install grease into the inner constant velocity joint (1) and the NEW inner joint boot (2). Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).
7. Install the NEW inner joint boot (2) to the constant velocity joint (1).

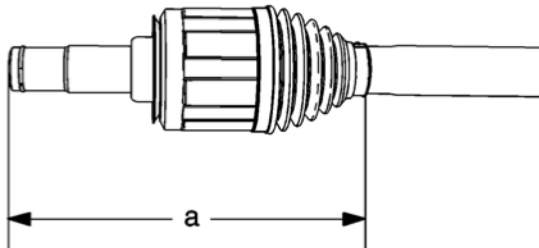


8. Use J 22610 keystone pliers (1) to crimp retaining clamp (2). The crimped distance (A) must be between 1.2–4mm.



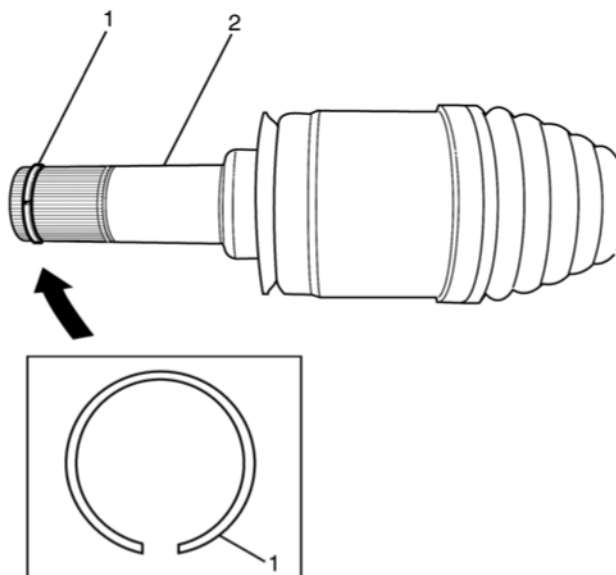
Caution: Refer to [Fastener Caution](#).

9. Crimp the NEW inner joint boot large retaining clamp (1) and NEW inner joint boot small retaining clamp (2) to the NEW inner joint boot (3).



Note: The NEW inner joint boot must not be dimpled, stretched, or deformed. Always equalize the air pressure in the NEW inner boot with the joint in the center of its plunge position and shape correctly by hand.

10. The inner constant velocity joint dimension (A) is 280.3 mm (11.04 in) for V8 and 281.8 mm (11.09 in) for V6.



11. Install the NEW circlip (1) to the inner constant velocity joint (2).
12. Fully cycle the inner constant velocity joint (2) several times to disperse grease throughout the inner constant velocity joint (2).
13. Install the wheel drive shaft to the vehicle. Refer to [Rear Wheel Drive Shaft Replacement](#).
14. Remove the safety stands.
15. Lower the vehicle to the ground.

Rear Wheel Drive Shaft Outer Joint Boot Replacement

Special Tools

J 22610 Keystone Pliers

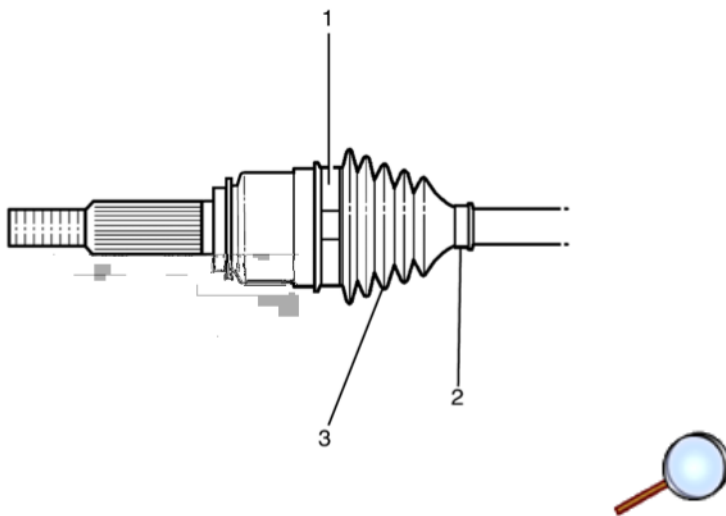
Removal Procedure

Danger: To avoid any vehicle damage, serious personal injury or death when major components are removed from the vehicle and the vehicle is supported by a hoist, support the vehicle with jack stands at the opposite end from which the components are being removed and strap the vehicle to the hoist.

Warning: Refer to [Safety Glasses Warning](#).

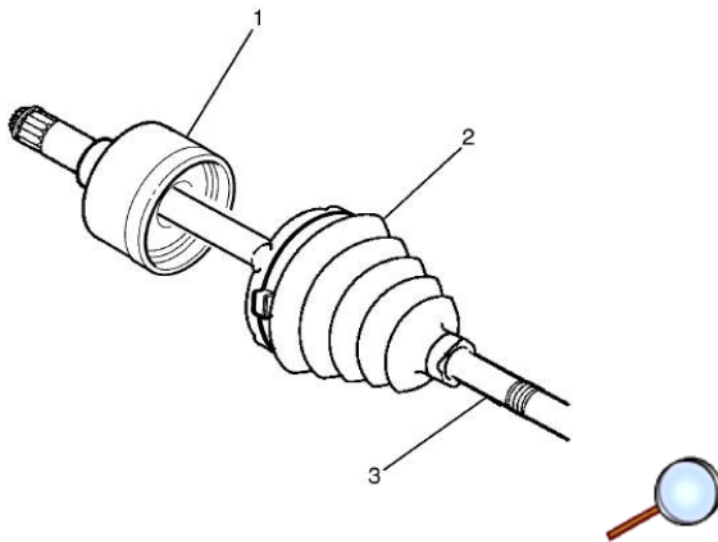
Note: When the outer joint boot is replaced the inner joint boot must always be replaced.

1. Raise and support the vehicle. Refer to [Lifting and Jacking the Vehicle](#).
2. Remove the rear wheel drive shaft from the vehicle. Refer to [Rear Wheel Drive Shaft Replacement](#).
3. Remove inner constant velocity joint and joint boot. Refer to [Rear Wheel Drive Shaft Inner Joint and Boot Replacement](#).



Note: The outer joint boot small retaining clamp (2) and outer joint boot large retaining clamp (1) are single use parts and must be discarded after use.

4. Remove the outer joint boot large retaining clamp (1) and the outer joint boot small retaining clamp (2) from the outer joint boot (3).
Discard the clamps.



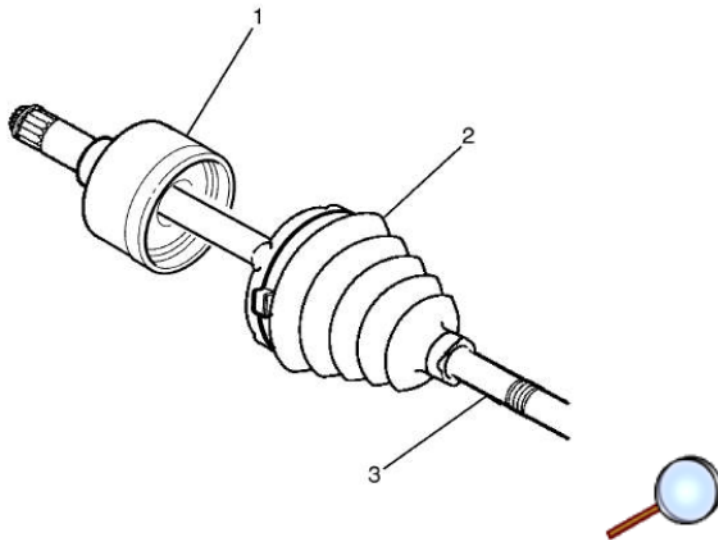
5. Remove the outer joint boot (2) from the outer constant velocity joint (1) along the interconnecting shaft (3).

Discard the outer joint boot.

Note: All traces of old grease and any contaminants must be removed.

6. Clean the grease from the interconnecting shaft (3) and outer constant velocity joint (1).

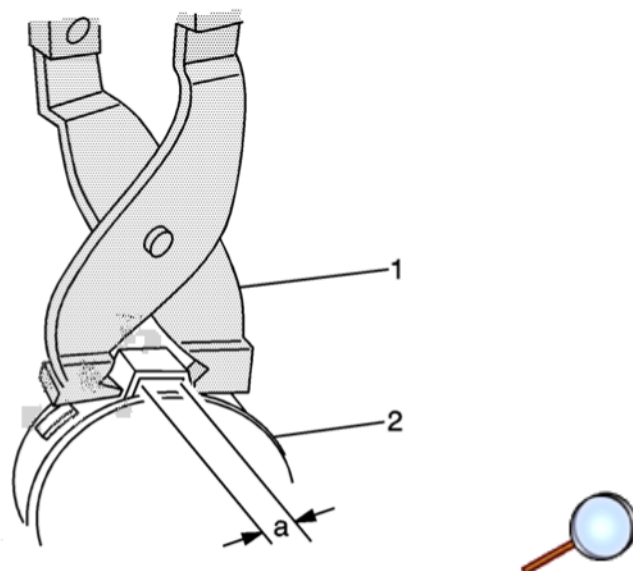
Installation Procedure



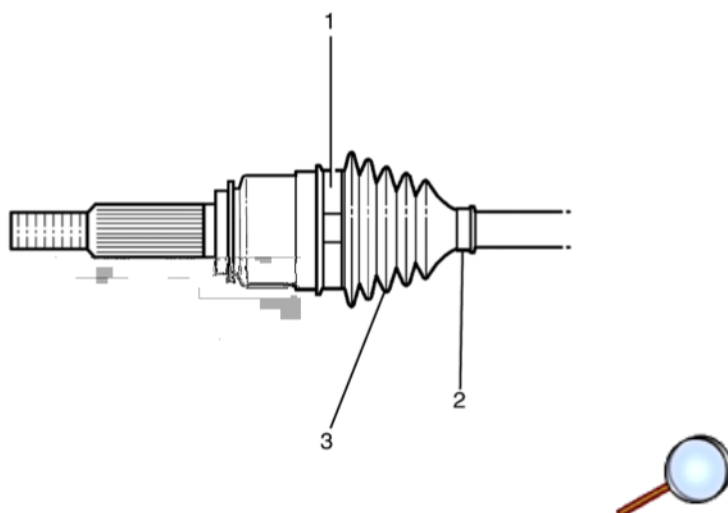
1. Install the NEW outer joint boot (2) along the interconnecting shaft (3).

Note: Install grease into the outer constant velocity joint (1) and the NEW outer joint boot (2). Refer to [Adhesives, Fluids, Lubricants, and Sealers](#).

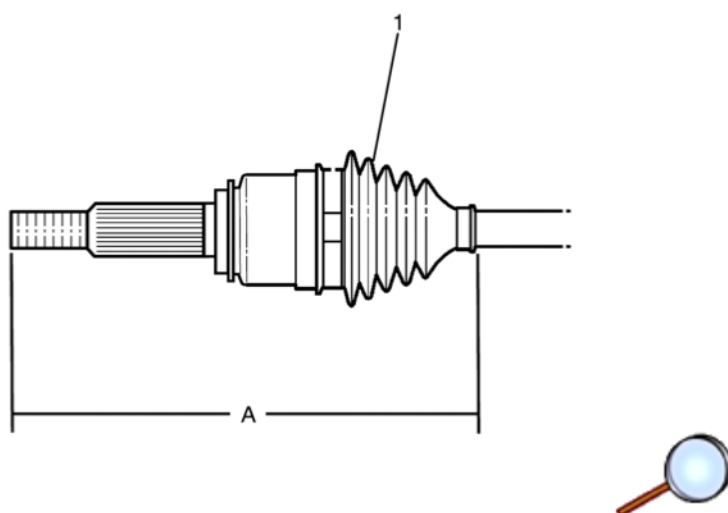
2. Install the NEW outer joint boot (2) to the outer constant velocity joint (1).



3. Use J 22610 keystone pliers (1) to crimp retaining clamp (2). The crimped distance (A) must be between 1.2–4mm.



4. Position the NEW outer joint boot large retaining clamp (1) and the NEW outer joint boot small retaining clamp (2) to the NEW outer joint boot (3).
5. Crimp the NEW outer joint boot large retaining clamp (1) and NEW outer joint boot small retaining clamp (2) to the NEW outer joint boot (3).



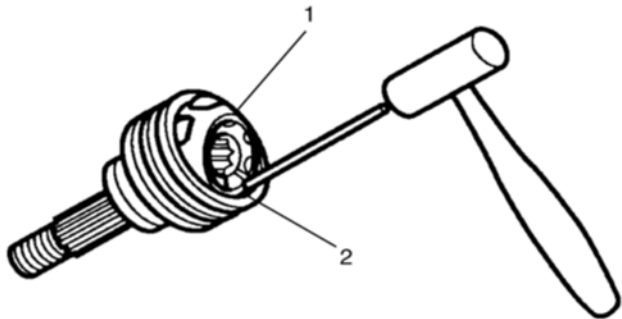
Note: The NEW outer joint boot (1) must not be dimpled, stretched, or deformed. Always equalise the air pressure in the NEW outer joint boot with the joint in the centre of its plunge position and shape properly by hand.

6. The outer constant velocity joint dimension A is 248 mm (9.8 in) for V6 and 254.3 mm (10 in) for V8.
7. Fully cycle the outer constant velocity joint several times to disperse grease throughout the outer constant velocity joint.
8. Install the inner constant velocity joint and joint boot. Refer to [Rear Wheel Drive Shaft Inner Joint and Boot Replacement](#).
9. Install the rear wheel drive shaft to the vehicle. Refer to [Rear Wheel Drive Shaft Replacement](#).
10. Remove the safety stands.
11. Lower the vehicle to the ground.

Wheel Drive Shaft Outer Joint Inspection

Disassembly Procedure

1. Remove the outer constant velocity (CV) joint and boot from the wheel drive shaft. Refer to [Rear Wheel Drive Shaft Outer Joint and Boot Replacement](#).
2. Remove any lubricant from the CV joint.

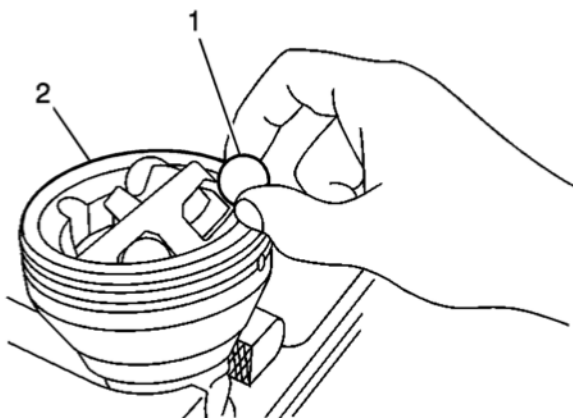


Note: Position the cage and the inner race so they are level.

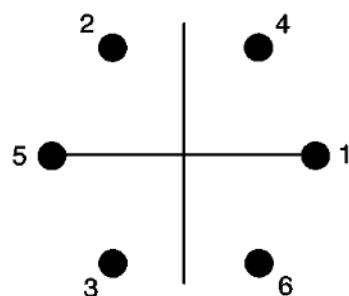
3. Install the outer CV joint assembly in a soft jawed vise.

Note: The following procedure will have to be repeated until all the ball bearing are removed from the cage.

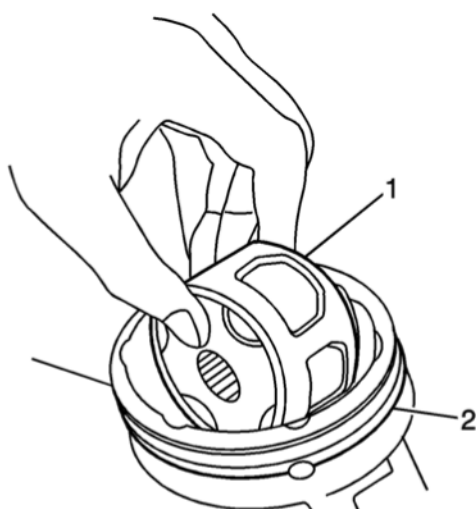
4. Using a brass drift (2), gentle tap the cage until the ball bearing can be removed from the cage.



5. Using a small screwdriver, remove the ball bearings (1) from the CV joint (2).

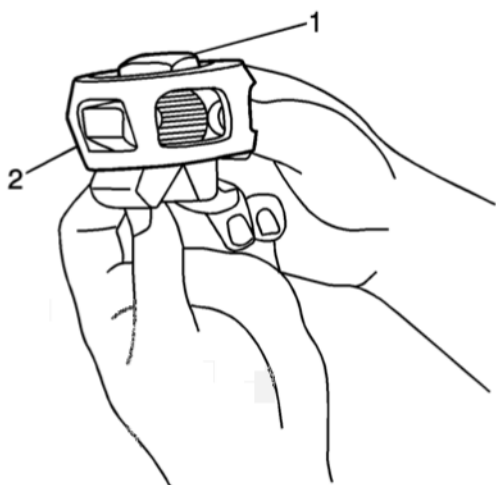


6. Remove the ball bearings from the CV joint in sequence.



Note: Position the cage so that the larger radius corners of the cage windows are facing up.

7. Position the cage (1) at a 90 degrees to the centerline of the outer race (2).
8. Align the cage windows with the lands of the outer race (2).
9. Lift and remove the cage (1) and the inner race from the outer race (2).

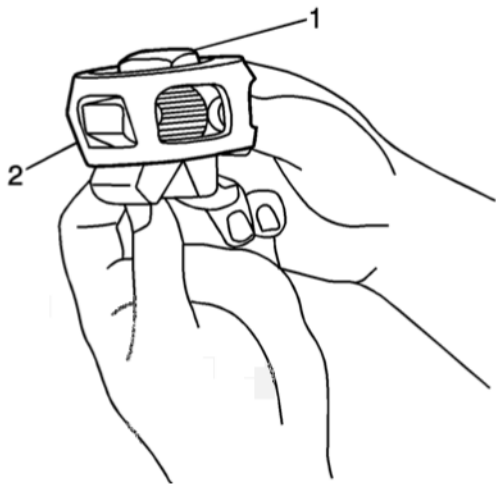


10. Position the cage (2) and the inner race (1) so that the larger radius corners of the cage windows are up.
11. Rotate the inner race (1) 90 degrees to the center line of the cage (2).
12. Align the lands of the inner race (1) with the windows of the cage (2).
13. Move the inner race (1) land into the cage window (2).
14. Rotate the inner race (1) down and remove it from the cage (2).
15. Clean the following items thoroughly with the proper cleaning solvent:
 - The inner race
 - The outer race
 - The cage
 - The ball bearings
 - The exposed end of the wheel drive shaft

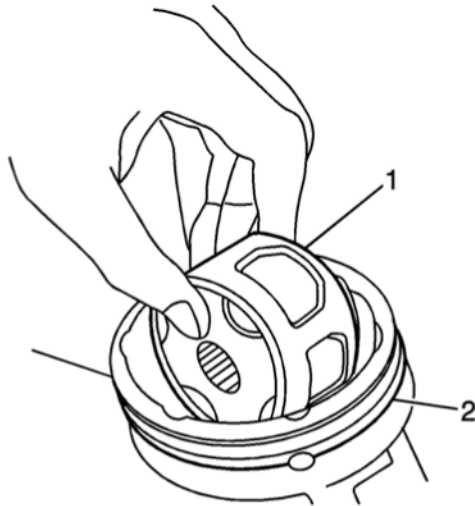
Note: The internal parts of the CV joint are NOT SERVICED separately. The outer CV joint is serviced as an assembly.

16. If any of the above items are found to have excessive wear or are damaged, replace the outer CV joint as an assembly.

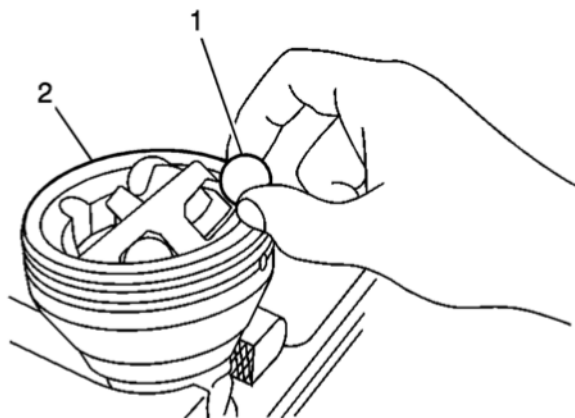
Assembly Procedure



1. Position the cage (2) so that the larger radius corners of the cage windows are up.
2. Position the inner race (1) 90 degrees to the centerline of the cage (2).
3. Insert the inner race (1) through the bottom of the cage (2).
4. Align the lands of the inner race (1) with the windows of the cage (2).
5. Move the inner race (1) land into the cage window (2).
6. Rotate the inner race (1) down and remove it from the cage (2).
7. Rotate the inner race (1) within the cage (2) so that the grooved surface of the inner race (1) is facing up.
8. Align the inner race (1) ball bearing tracks with the cage (2) windows.



9. Wrap a clean shop towel around the CV joint outer race splined shaft.
10. Place the outer race (2) vertically in a bench vise.
11. Position the cage (1) and the inner race at a 90 degrees to the centerline of the outer race (2).
12. With the inner race and the cage (1) assembly in a vertical position, insert the cage and the inner race into the outer race (2).



Note: The larger radius corners of the cage windows should be positioned up and the grooved surface of the inner race should be visible.

13. Position the cage (2) and the inner race so that they are level in the vise.
14. Rotate the appropriate component(s), and align the cage windows and the inner race ball bearing (1) tracks with the outer race ball bearing tracks.
15. Position a cage window and the inner race ball bearing track for the ball bearing installation.

Note: When performing the following procedure, the opposing cage (2) window and the inner ball bearing (1) track will be accessible for the ball bearing installation.

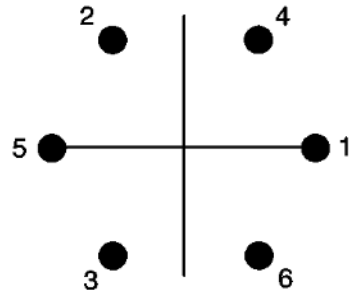
16. Press down on the cage following one of the outer race ball bearing (1) tracks.
17. Install the ball bearing through the cage window onto the inner race ball bearing (1) track.

Note: The following service procedure will have to be performed after each ball bearing (1) has been installed.

18. After the first ball bearing (1) has been installed, use a brass drift and a hammer and gently tap the cage in order to drive the cage and the inner race down completely in the outer race.

Note: After the ball bearing (1) has been installed, there should be NO GAP between the ball bearing and the inner race.

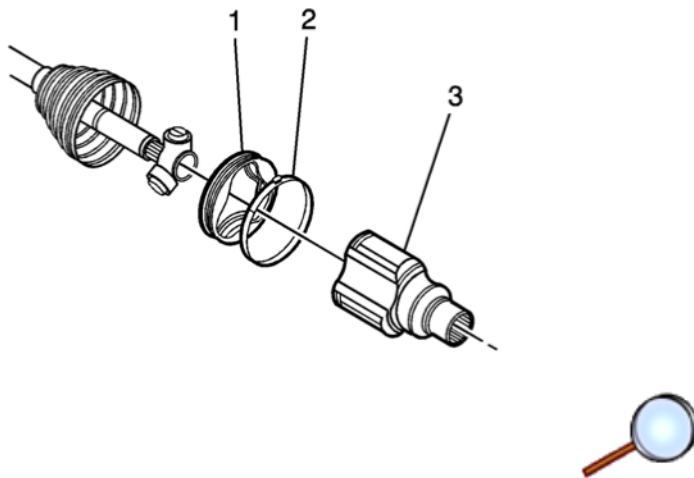
19. Position the cage and the inner race so that they are level.
20. Using a plastic hammer, lightly tap the ball bearing (1) into place.



21. Install the ball bearings in sequence.
22. Repeat steps 18 through 20 until all the ball bearings are installed.
23. Install the outer CV joint and boot on the wheel drive shaft. Refer to [Rear Wheel Drive Shaft Outer Joint and Boot Replacement](#).

Wheel Drive Shaft Inner Joint Inspection

Inspection Procedure



1. Remove the wheel drive shaft boot clamp (2) from the boot.
2. Remove the wheel drive shaft tripod housing (3) from the wheel drive shaft.
3. Remove the wheel drive shaft tripod joint boot bushing (1).
4. Using a suitable cleaner, remove the excess grease from the tripod assembly.
5. Inspect the following items for damage or excessive wear:
 - The wheel drive shaft tripod boot
 - The wheel drive shaft tripod assembly
 - The wheel drive shaft tripod joint housing
 - The wheel drive shaft tripod joint bushing
 - The wheel drive shaft
6. If any of the items in step 5 are found to be defective, replace those items that are serviceable. Refer to [Rear Wheel Drive Shaft Replacement](#).

Fastener Tightening Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Rear Drive Shaft to Rear Hub Retaining Nut		
There are two alternate methods of achieving the required Rear Hub Retaining Nut torque. Important: DO NOT EXCEED THE SPECIFIED TIGHTENING VALUES, otherwise premature bearing failure may result.		
Preferred Method		
• First Pass	350 N•m	258 lb ft
• Loosen	loosen 180 Degrees	
• Final Pass	350 N•m	258 lb ft
Alternate Method		
• First Pass	150 N•m	110 lb ft
• Loosen	loosen 180 Degrees	
• Second Pass	50 N•m	37 lb ft
• Final Pass	30 Degrees	

[2014 Holden VF Sedan](#) | [VF/WN - Sedan, Ute, Sportwagon, Caprice, Lumina, HSV Service Manual 5617662](#) | [Driveline/Axle](#) |
[Wheel Drive Shafts](#) | [Specifications](#) | **Document ID: 1992456**

Adhesives, Fluids, Lubricants, and Sealers

Adhesives, Fluids, Lubricants, and Sealers

Constant Velocity Joint	Lubricant– Inboard Wheel Drive shaft	Lubricant– Outboard Wheel Drive shaft
V8	NTN: NKG205 170 grams	NTN: NTG2218-M 160 grams
V6	NTN: NKG205 145 grams	NTN: NTG2218-M 125 grams

Special Tools

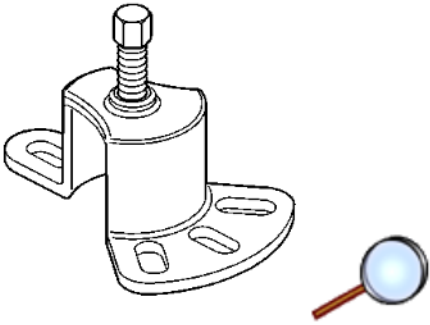
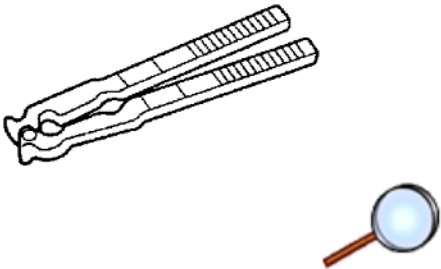
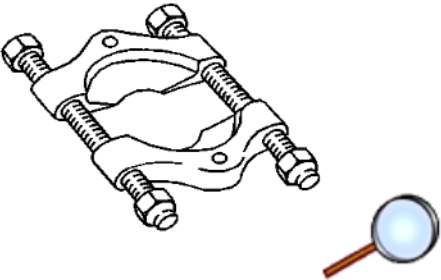
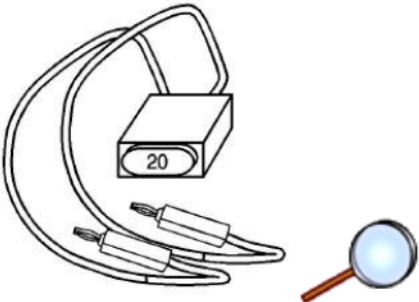
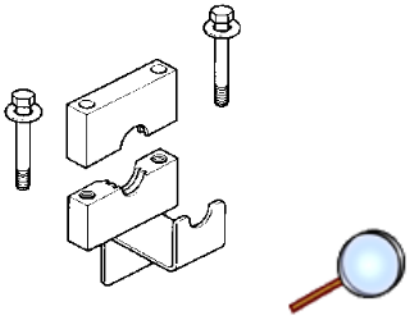
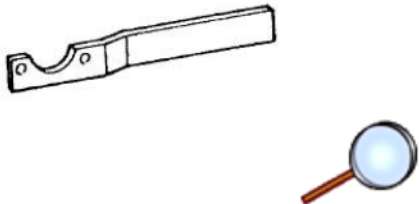
Illustration	Tool Number/Description
	J 42192 Wheel Hub Remover
	J 22610 Keystone Pliers
	J 22912-B Rear Pinion and Axle Bearing Remover
	J 35616-E GM-Approved Terminal Test Kit
	J 36169-A Fused Jumper Wire

Illustration	Tool Number/Description
	J 41048 Drive Axle Swage Ring Clamp
	KM 468-C Holding Bar