

Wheel Drive Shafts

Specifications

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Wheel Intermediate Shaft Bracket Bolt	22 N•m	16 lb ft
Front Wheel Drive Shaft Nut	50 N•m + 60 degrees	37 lb ft + 60 degrees

Diagnostic Information and Procedures

Symptoms - Wheel Drive Shafts

Important: Complete the following steps prior to beginning the wheel drive shaft diagnosis.

1. Review the *Vibration Diagnosis, Starting Point, and Correction* on page 1-38.
2. Perform the *Vibration Analysis - Road Testing* on page 1-39 in order to effectively diagnose the concern.
3. Review the system operation in order to become familiar with the system function. Refer to *Wheel Drive Shafts Description and Operation* on page 7-18.

Visual/Physical Inspection

- Inspect for aftermarket equipment and modifications which could affect the operation of the wheel drive shafts or other rotating components.
- Inspect the easily accessible or visible system components for obvious damage or conditions which could cause the symptom.
- Thoroughly inspect the entire wheel drive shaft for visible damage, leaking joint seals, and missing seal clamps.
- Inspect the wheel drive shaft seals for cuts, tears, or other damage which may allow the loss of lubricant and the entry of contaminants.

Symptom List

After performing the Visual/Physical Inspection and no visual signs of damage or other interference impairing the wheel drive shaft function is apparent, it may be necessary to remove the wheel drive shaft from the vehicle and manipulate the joints manually. Any binding or otherwise impeded movement of the joints may indicate damage which could contribute to the concern. Refer to the following:

- *Click Noise In Turns* on page 7-3
- *Clunk When Accelerating from Coast* on page 7-3
- *Clunk Noise When Accelerating During Turns* on page 7-3
- *Shudder or Vibration During Acceleration* on page 7-4

Click Noise In Turns

A click noise occurring during turns may be caused by a worn or damaged wheel drive shaft outer joint. This may be more apparent while simultaneously turning and accelerating. This click is caused by wear and/or damage to the constant velocity joint bearings and/or races. Commonly, this damage or wear is caused by the loss of lubricating grease from the constant velocity joint and the entry of foreign material or contaminants.

Carefully inspect the wheel drive shaft seals for cuts, tears or other damage which may allow the lubricating grease to escape. The loss of this grease will cause damage to the wheel drive shaft constant velocity joint in a very short period of time.

If inspection reveals no visual evidence of wear or damage, inspect the wheel drive shaft. Refer to *Wheel Drive Shaft Outer Joint Inspection* on page 7-14.

Clunk When Accelerating from Coast

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

Carefully inspect the wheel drive shaft seal for cuts, tears or other damage that may allow the loss of the lubricating grease and/or the entry of contaminants.

If inspection reveals no visual evidence of wear or damage, inspect the wheel drive shaft. Refer to *Wheel Drive Shaft Inner Joint Inspection* on page 7-18.

Clunk Noise When Accelerating During Turns

A clunk noise that occurs while accelerating during turns may be caused by wear and/or damage to the inboard and the outboard joints in combination. The loss of lubricant and/or the presence of contaminants can cause damage to the internal components of the joints.

Carefully inspect the joint seals for cuts, tears or other damage. Joint seals that are damaged may allow lubricant leakage and the entry of contaminants.

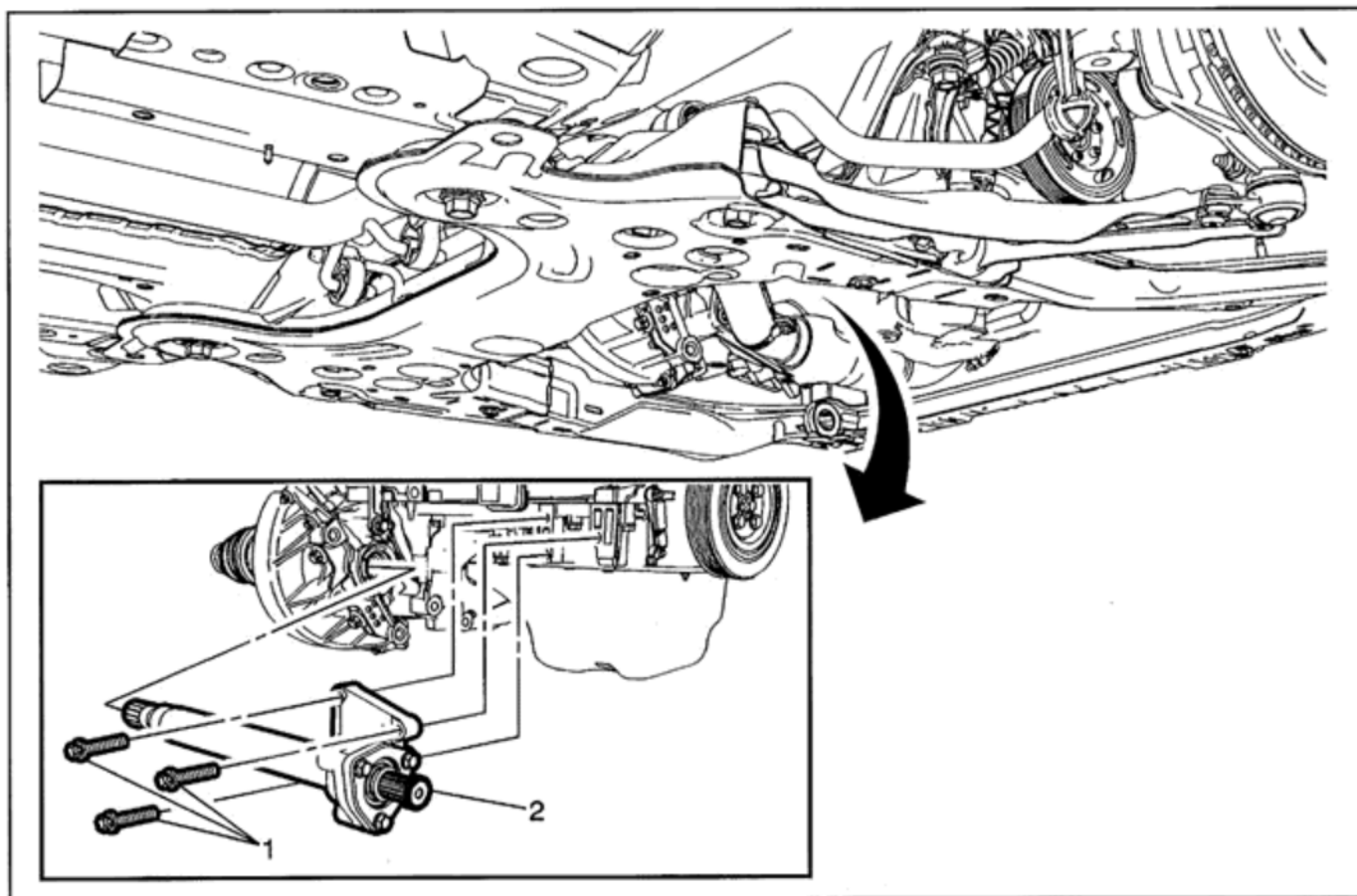
If inspection reveals no visual evidence of wear or damage, inspect the wheel drive shaft inner and outer joints. Refer to *Wheel Drive Shaft Outer Joint Inspection* on page 7-14 or *Wheel Drive Shaft Inner Joint Inspection* on page 7-18.

Shudder or Vibration During Acceleration

In order to diagnose a shudder or vibration during acceleration, refer to *Vibration Diagnosis, Starting Point, and Correction* on page 1-38.

Repair Instructions

Front Wheel Drive Intermediate Shaft Replacement



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Front Wheel Drive Intermediate Shaft Replacement

Callout	Component Name
Preliminary Procedure	
1. Raise and support the vehicle. Refer to <i>Lifting and Jacking the Vehicle</i> on page 1-31.	
2. Remove the wheel drive shaft assembly from the vehicle. Refer to <i>Front Wheel Drive Shaft Replacement</i> on page 7-5.	
1	Front Wheel Drive Intermediate Shaft Bracket Bolt (Qty: 3) Caution: Refer to <i>Fastener Caution</i> on page 0-8. Tighten 22 N•m (16 lb ft)
2	Front Wheel Drive Intermediate Shaft Procedure Check the transmission fluid level and fill to the proper level, if needed. Refer to <i>Transmission Fluid Level and Condition Check</i> on page 17-164.

Front Wheel Drive Shaft Replacement

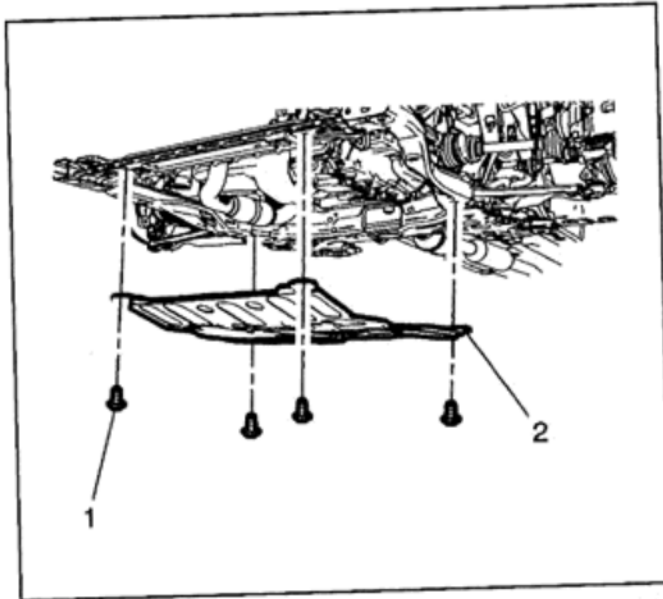
Special Tools

J-45859 Axle Remover

For regional equivalent tools, refer to *Special Tools* on page 7-19.

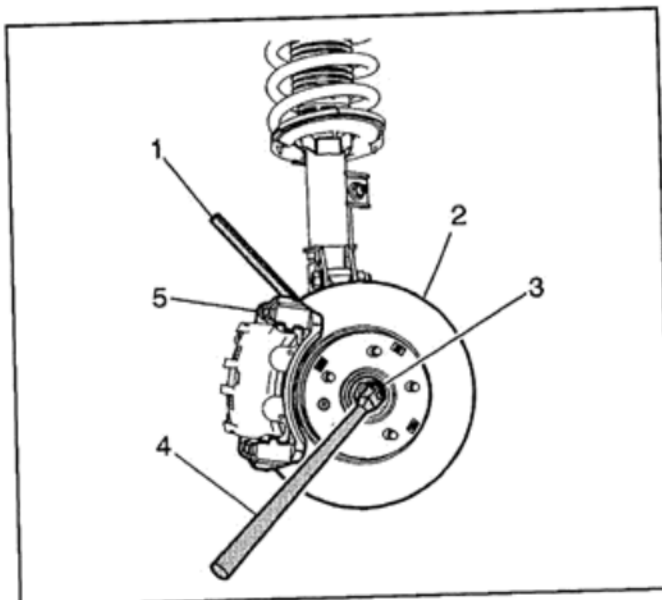
Removal Procedure

1. Raise and support the vehicle. Refer to *Lifting and Jacking the Vehicle* on page 1-31.



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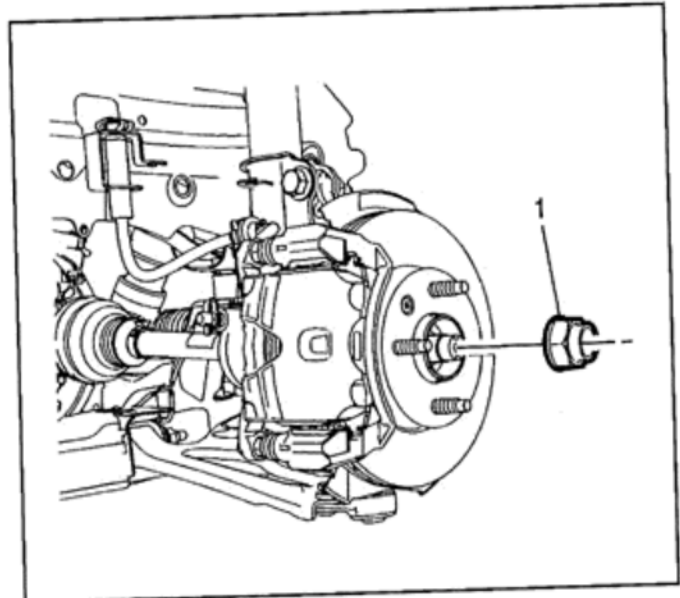
2. Remove the front suspension skid plate bolts (1) and the front suspension skid plate (2).
3. Remove the tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation* on page 16-60.



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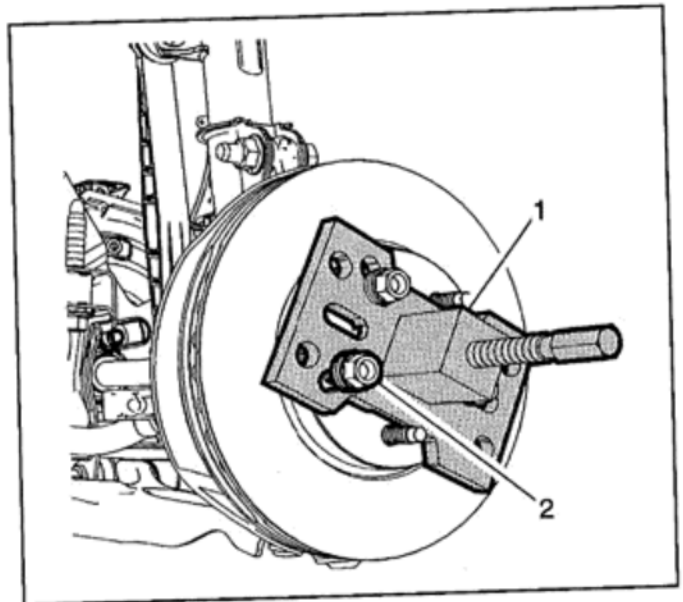
Caution: Make sure that the wheel drive shaft nut is fully un-staked to avoid damage to the wheel drive shaft threads during the removal of the wheel drive shaft nut. Failure to follow these instructions could result in wheel, nut, and/or stud damage.

4. Insert a brass drift or punch (1) in the cooling fins of the front brake rotor (2).
5. Rotate the brake rotor until it comes in contact with the brake caliper mount bracket (5).
6. Using the proper size socket (3) and a breaker bar (4), loosen the wheel drive shaft nut.



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



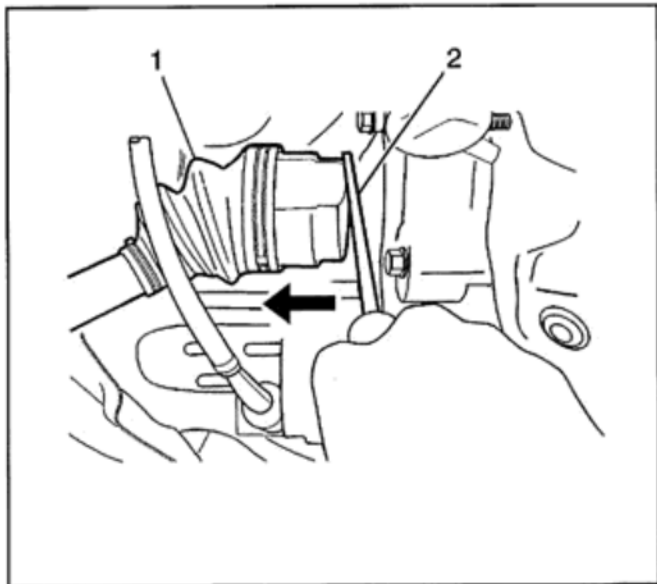
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Note: Reverse the wheel lug nuts and washers so the flat part of the wheel nut is facing the washers.

8. Attach the J-45859 remover (1) to the wheel hub using the wheel lug nuts (2).

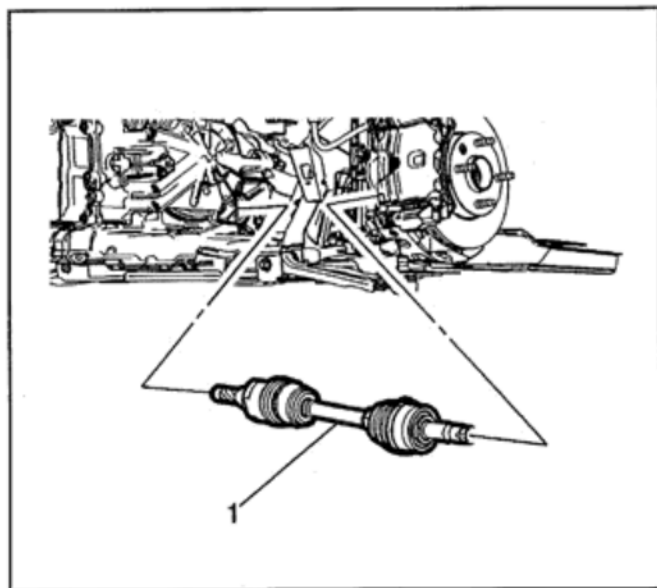
7-6 Wheel Drive Shafts

9. Using the J-45859 remover (1), separate the wheel drive shaft from the wheel bearing/hub.
10. Remove the stabilizer shaft link from the front strut. Refer to *Stabilizer Shaft Link Replacement* on page 16-8.
11. Remove the outer tie rod end from the steering knuckle. Refer to *Steering Linkage Outer Tie Rod Replacement* on page 15-17.
12. Remove the lower control arm bolt from the steering knuckle. Refer to *Lower Control Arm Replacement* on page 16-12.
13. With the aide of an assistant, move the steering knuckle to the side.



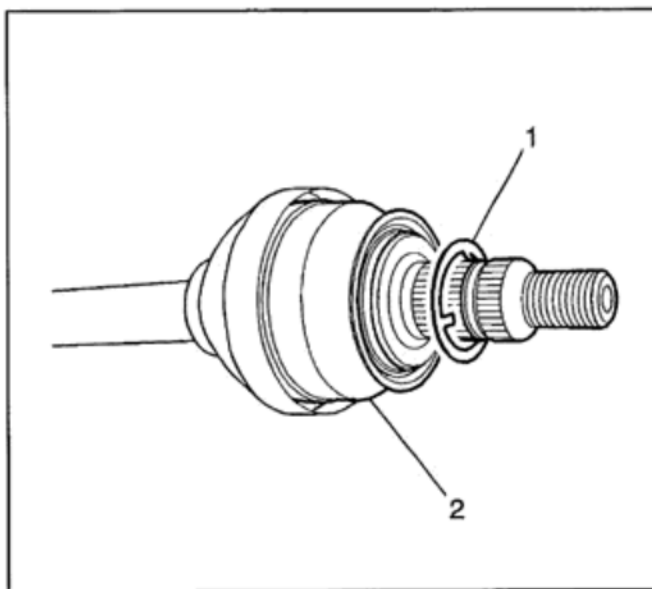
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14. Using a long screw driver (2), remove the wheel drive shaft (1) from the transmission.



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

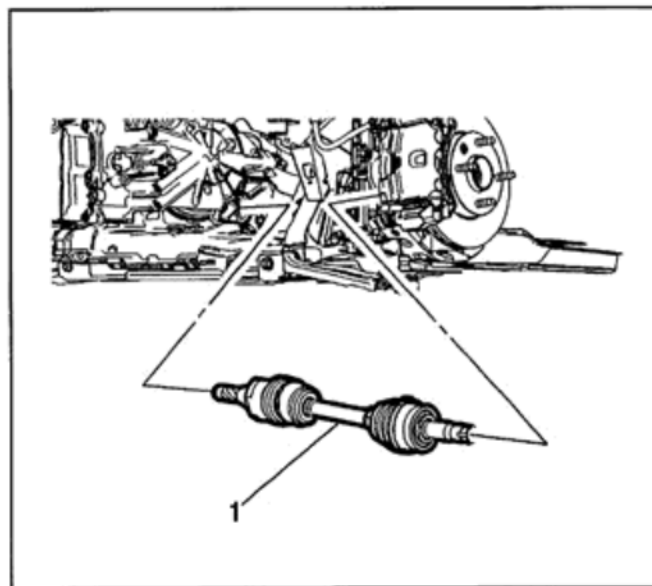


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Note: If there is no washer on the wheel drive shaft, install a NEW washer.

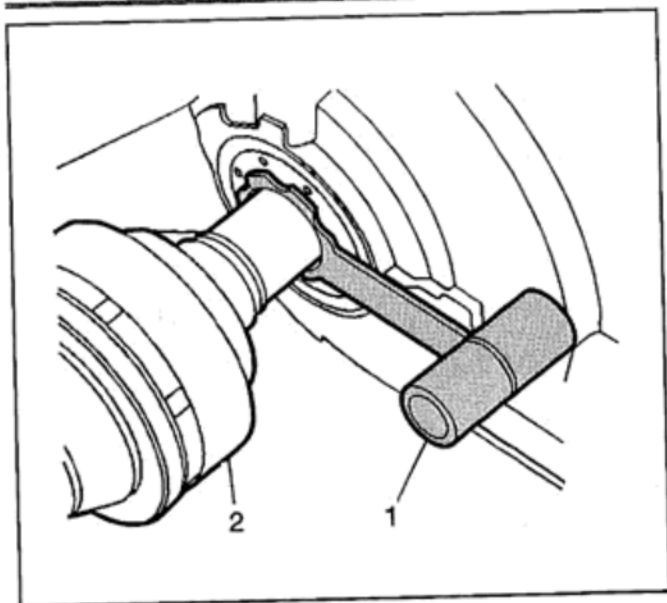
16. Remove and discard the washer (1) from the wheel drive shaft (2). Do not re-use the washer, replace with NEW only.

Installation Procedure



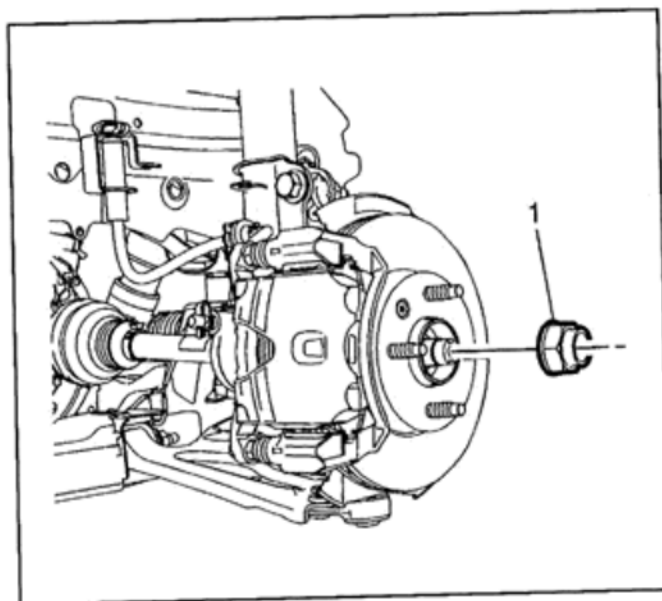
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1. Position the wheel drive shaft (1) in the vehicle.



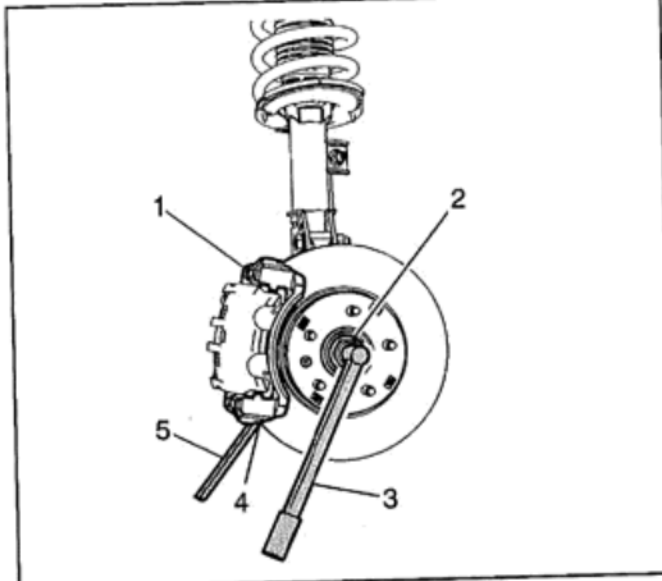
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2. Install the special tool (1) in the output shaft seal.
3. Install the wheel drive shaft (2).
4. Remove the special tool (1).
5. Install the lower control arm ball joint bolt to the steering knuckle. Refer to *Lower Control Arm Replacement* on page 16-12.
6. Install the stabilizer shaft link to the front strut. Refer to *Stabilizer Shaft Link Replacement* on page 16-8.
7. Install the outer tie rod to the steering knuckle. Refer to *Steering Linkage Outer Tie Rod Replacement* on page 15-17.



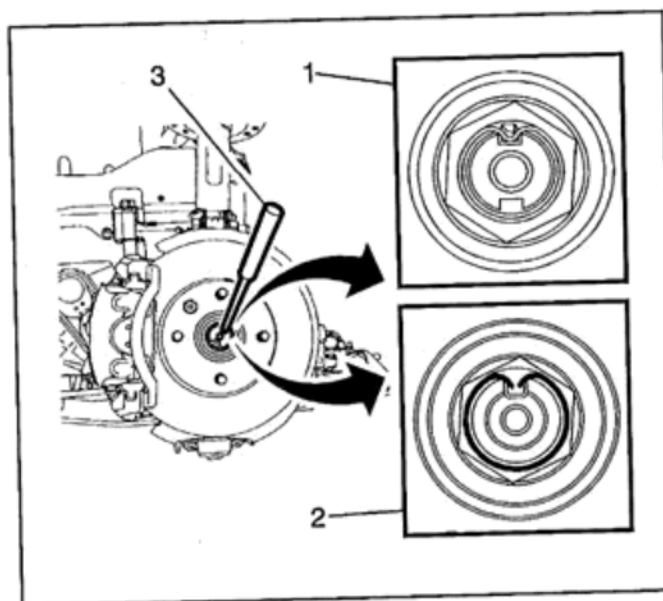
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8. Install the NEW wheel drive shaft nut (1).



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9. Insert a brass drift or punch (5) in the cooling fins of the front brake rotor (4).
10. Rotate the brake rotor until it comes in contact with the brake caliper mount bracket (1).



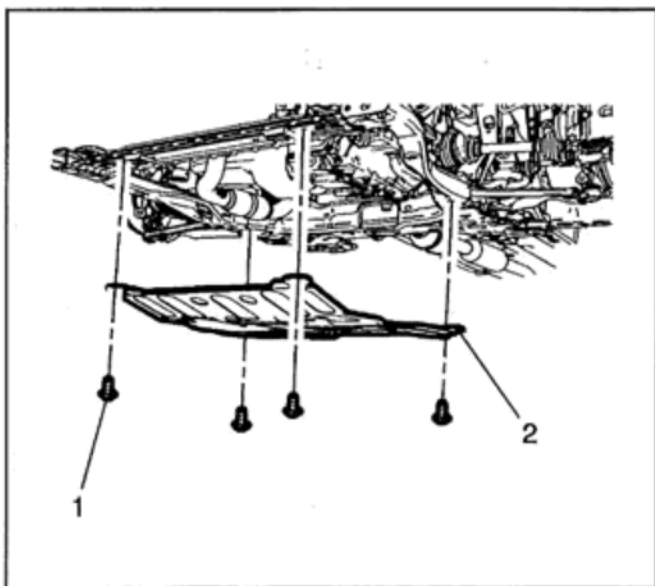
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Caution: Refer to *Fastener Caution* on page 0-8.

Note:

- There are two types of the wheel drive shaft nuts, which have different tightening torque specifications. Check the style nut that is on the vehicle when staking the nut.
- Style 1 nut has the thin collar (1.5 mm) thickness.
- Style 2 nut has the thick collar (2.7 mm) thickness.

11. Using the proper size socket and torque wrench, tighten the NEW wheel drive shaft nut to:
 - For Style 1, **330 N•m (244 lb ft)**
 - For Style 2, First Pass: **50 N•m (37 lb ft)**
 - For Style 2, Final Pass: **plus 60 degrees.**
12. Using appropriate tools (3), stake the wheel drive shaft nut collar into the slot on the wheel drive shaft.
 - Style 1: Stake the center of the wheel drive shaft nut (1) and ensure it is fully staked. DO NOT fracture the wheel drive shaft nut. Each side of the stake should be in contact with the slot in the wheel drive shaft. The gap between the bottom of the stake in the wheel drive shaft nut and the bottom of the slot in the wheel drive shaft should be less than **1 mm (0.039 in)**.
 - Style 2: Evenly split the center of the wheel drive shaft nut (2) and ensure that it is fully staked. Each side of the stake should be in contact and approximately 45° to each side of the slot in the wheel drive shaft.



13. Install the front suspension skid plate (2).
14. Install the front suspension skid plate bolts (1) and tighten to **22 N•m (16 lb ft)**.
15. Install the tire and wheel assembly. Refer to *Tire and Wheel Removal and Installation* on page 16-60.
16. Remove the support and lower the vehicle.

Front Wheel Drive Shaft Inner Joint and Boot Replacement

Special Tools

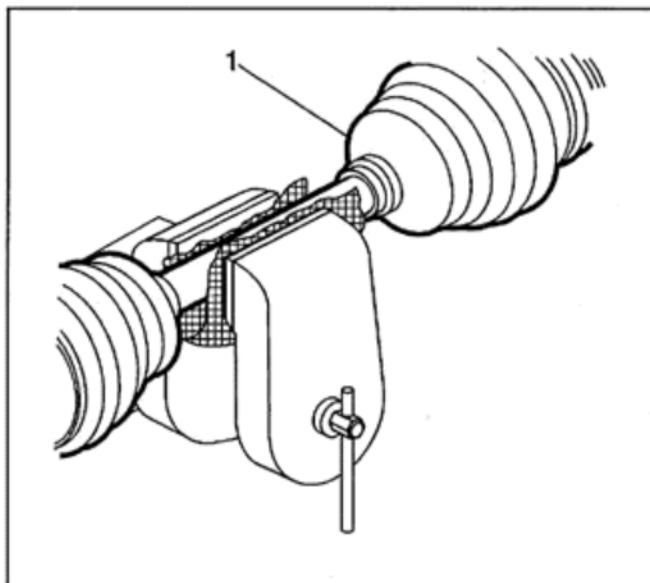
DT-35910 Drive Axle Boot Clamp Pliers

For equivalent regional tools, refer to *Special Tools* on page 7-19.

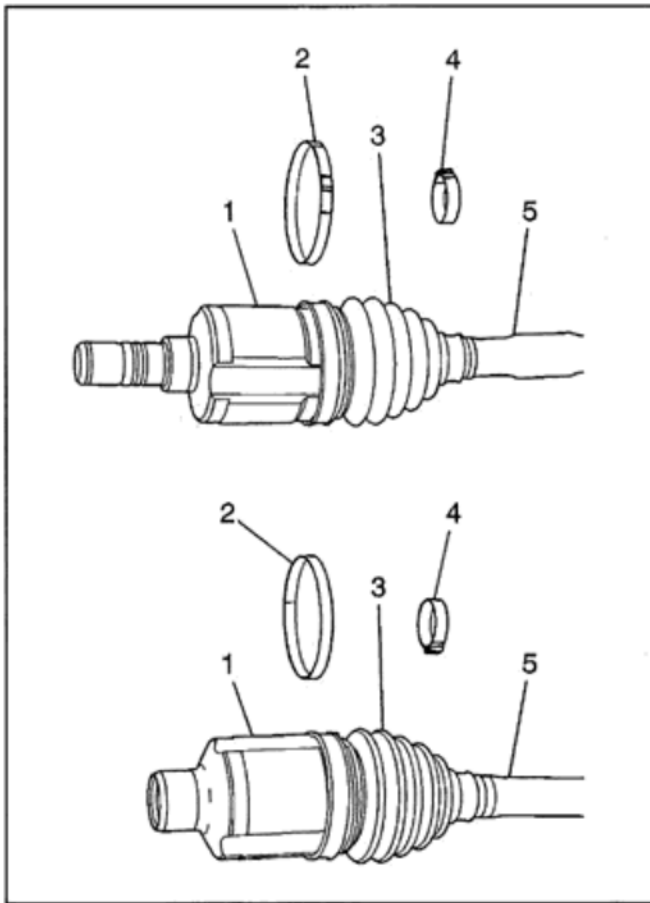
Disassemble Procedure

Note: There are types of inner joints available. If the inner joint is connected with the CV style joint, the inner joint is not serviced separately. The inner joint is serviced with the wheel drive shaft as an assembly. If the inner is a tripod type joint follow the procedure below.

1. Remove the wheel drive shaft from the vehicle. Refer to *Front Wheel Drive Shaft Replacement* on page 7-5.

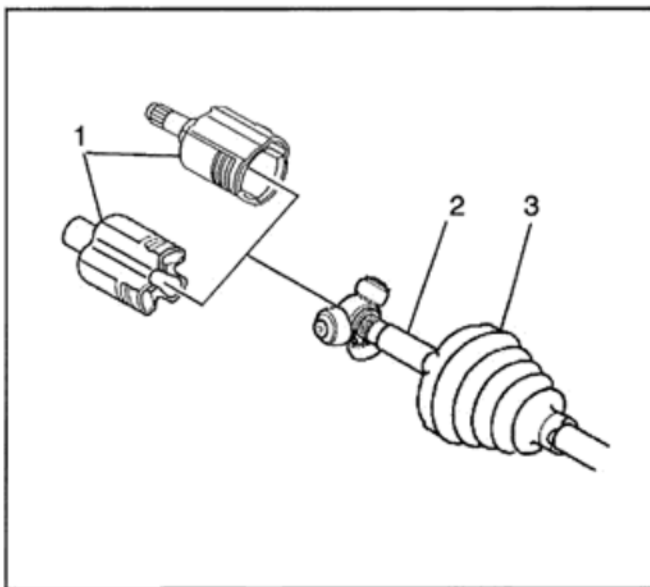


2. Install the wheel drive shaft in a soft jawed vise.



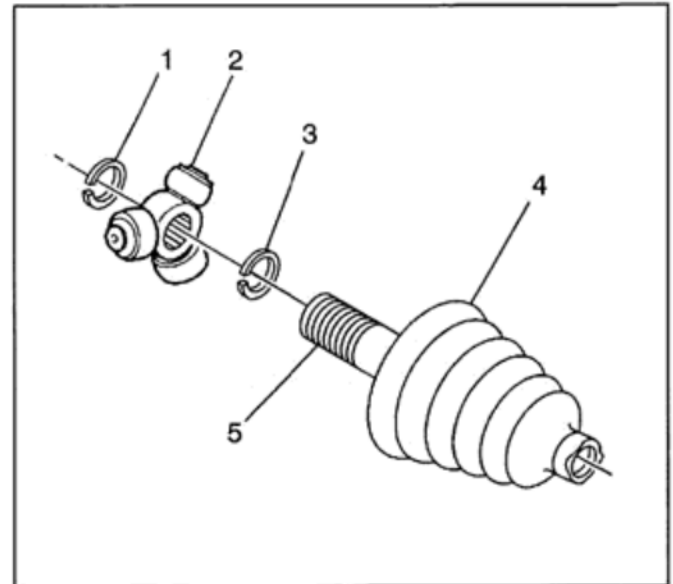
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3. Using a pair of side cutters, remove and discard the small boot clamp (4) from the boot (3).
4. Using the appropriate tool, remove and discard the large boot clamp (2) from the boot (3).



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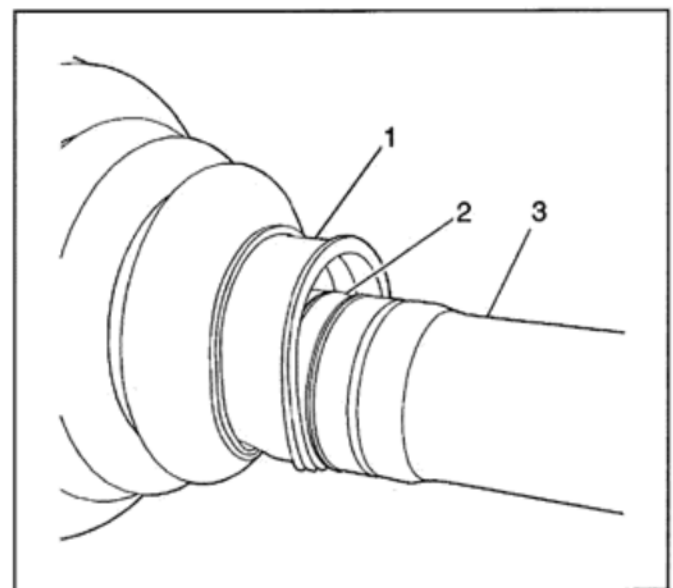
5. Remove the boot (3) from the from the tripot housing (1).
6. Remove the inner tripot housing (1) from the wheel drive shaft (3).



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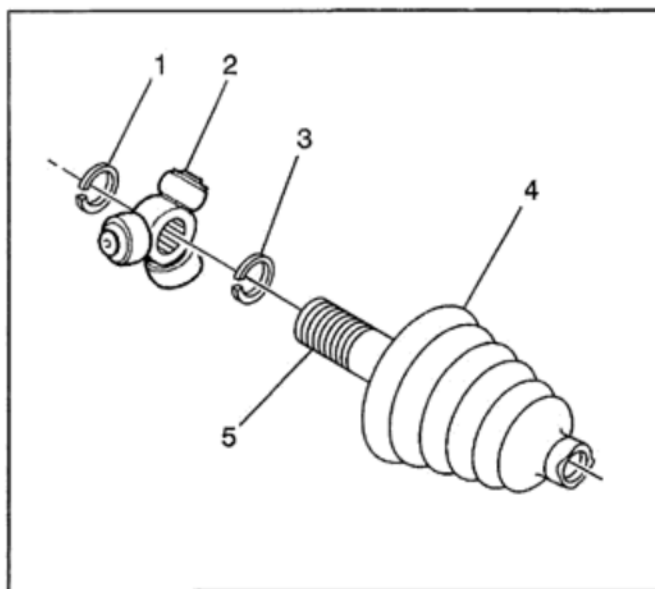
7. Using the appropriate tool, remove the outer tripot spider retaining ring (1) from the wheel drive shaft (5).
8. Remove the tripot spider (2) from the wheel drive shaft (5).
9. Using the appropriate tool, remove the inner tripot retaining ring (3), if equipped, from the wheel drive shaft (5).
10. Remove the wheel drive shaft boot (4) from the wheel drive shaft (5).
11. Inspect the wheel drive shaft inner joint. Refer to *Wheel Drive Shaft Inner Joint Inspection* on page 7-18.

Assemble Procedure



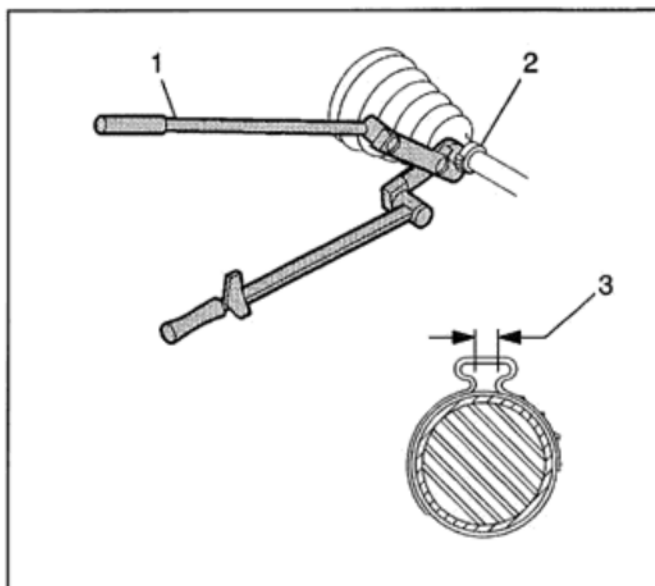
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1. Install the boot (1) on the wheel drive shaft (3).
2. Ensure that the boot (1) is properly seated in the groove (2) in the wheel drive shaft.



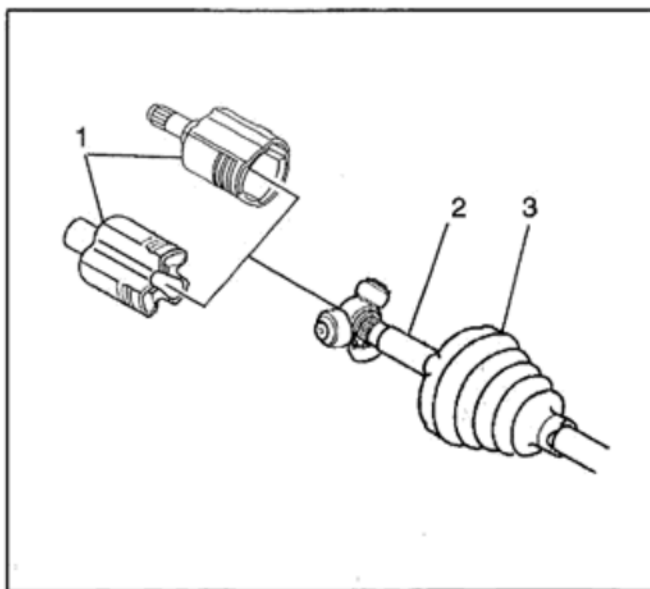
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3. Using the appropriate tool, install the inner tripot retaining ring (3), if equipped.
4. Install the tripot spider (2) until just touches the shoulder on the wheel drive shaft (5).
5. Using the appropriate tool, install the outer tripot spider retaining ring (1).



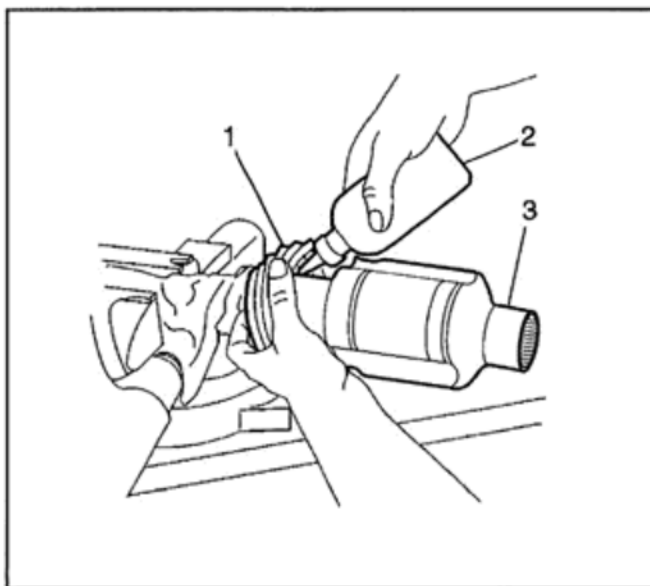
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6. Using the *DT-35910* drive axle boot clamp pliers with a ratchet wrench and a breaker bar (1), close the boot clamp (2) until the gap (3) measures **1.8 mm (0.07 in)**.



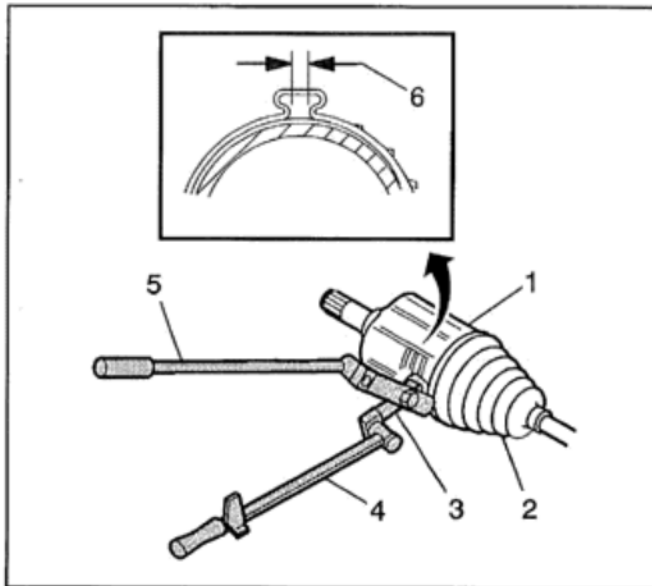
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7. Install the tripot housing (1) on the wheel drive shaft (3).
8. Install the wheel drive shaft boot (3) on the tripot housing (1).



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9. Place approximately half of the lubricant (2) in the boot (1) and the remaining half in the tripot housing (3).



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Note: Ensure that the boot clamp is properly positioned around the entire circumference of the boot.

10. Using the DT-35910 drive axle boot clamp pliers (3), a ratchet wrench (4) and a breaker bar (5), close the boot clamp (1) until the gap (6) measures 1.9 mm (0.07 in).
11. Remove any of the excess lubricant from the tripot housing and wheel drive shaft.
12. Move the tripot joint housing in a circular motion to distribute the lubricant in the tripot housing.
13. Remove the wheel drive shaft from the vise.
14. Install the wheel drive shaft in the vehicle. Refer to *Front Wheel Drive Shaft Replacement* on page 7-5.

Front Wheel Drive Shaft Outer Joint and Boot Replacement

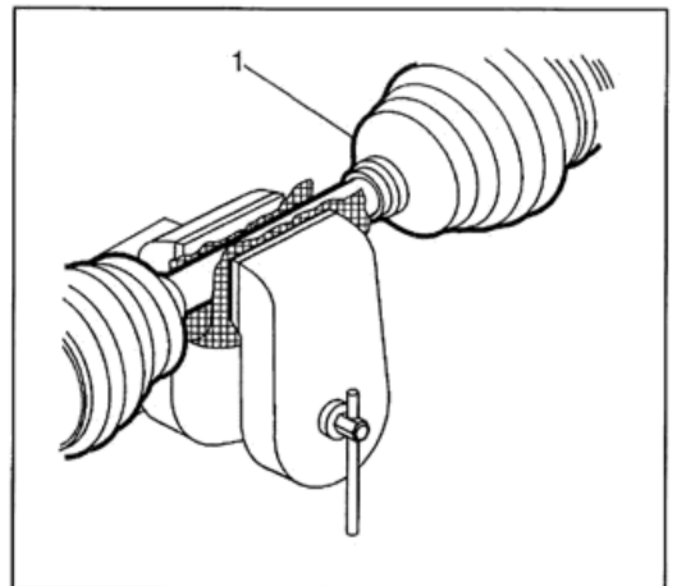
Special Tools

DT-35910 Drive Axle Boot Clamp Pliers

For equivalent regional tools, refer to *Special Tools* on page 7-19

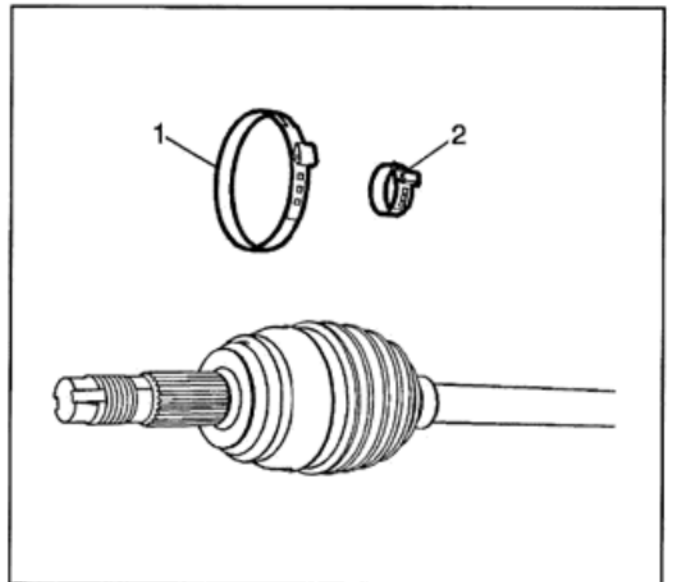
Disassemble Procedure

1. Remove the wheel drive shaft from the vehicle. Refer to *Front Wheel Drive Shaft Replacement* on page 7-5.



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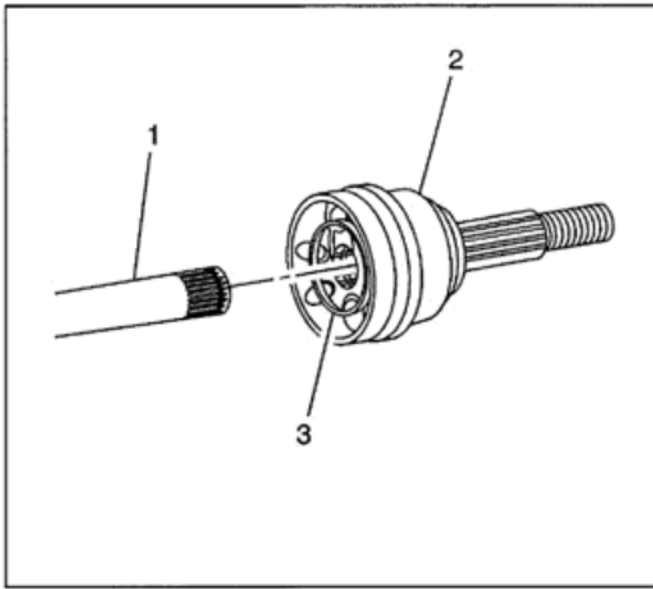
2. Install the drive axle shaft (1) in a soft jawed vise.



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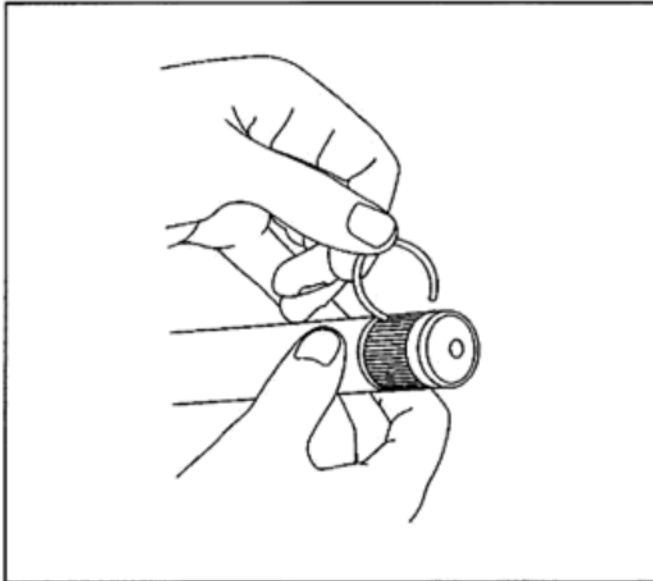
Caution: Do not cut through the wheel drive shaft inboard or outboard boot during service. Cutting through the boot may damage the sealing surface of the housing and the tripot or the constant velocity joint bushing. Damage to the sealing surface may lead to water and dirt intrusion and premature wear of the constant velocity joint.

3. Using a pair of side cutters, remove the outer boot clamp (1) and the inner boot clamp (2).
4. Discard the boot clamps (1) and (2). Use NEW clamps only.



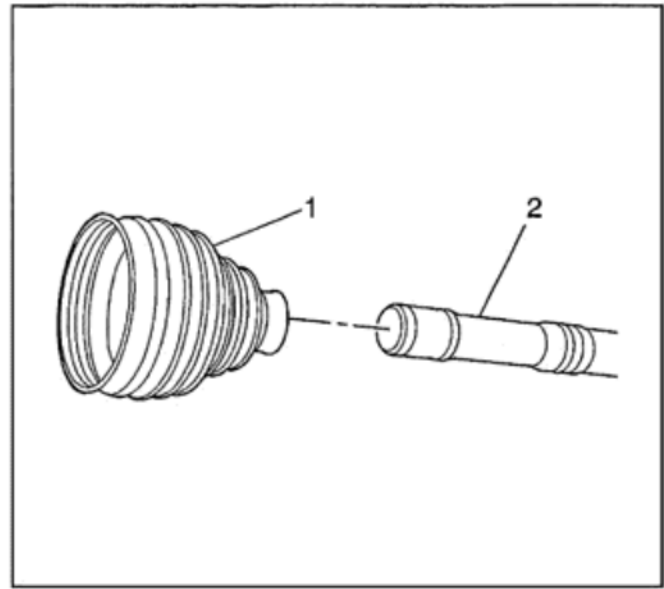
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5. Remove the CV joint (2) from the wheel drive shaft (1) while tapping the inner race (3) using a bronze bar and a hammer.



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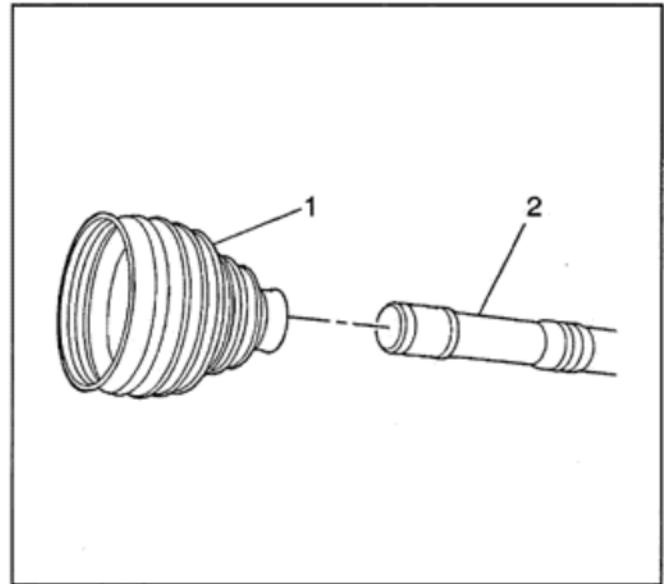
6. Using the appropriate tool, remove and discard the retaining clip.



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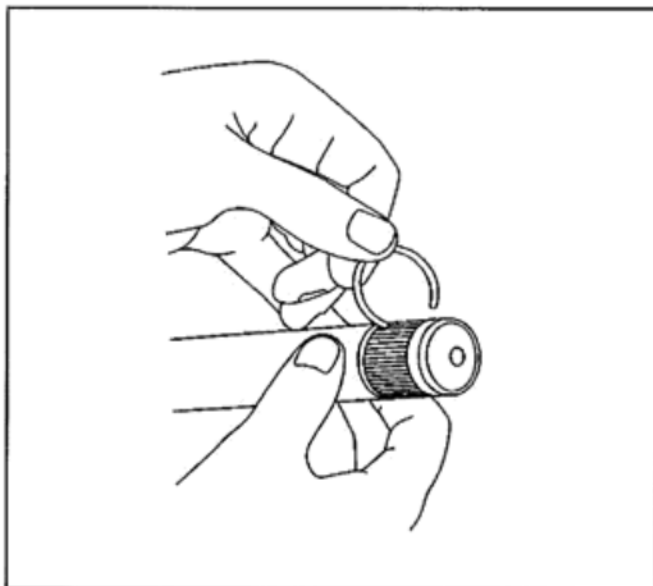
7. Remove the boot (1) from the wheel drive shaft (2).
8. Inspect the outer CV joint for damage and wear. Refer to *Wheel Drive Shaft Outer Joint Inspection* on page 7-14.

Assemble Procedure



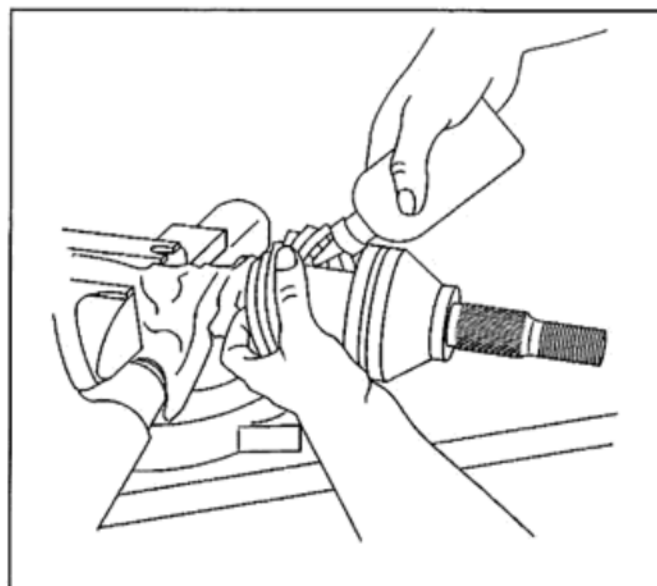
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1. Position the boot (1) on the wheel drive shaft (2).



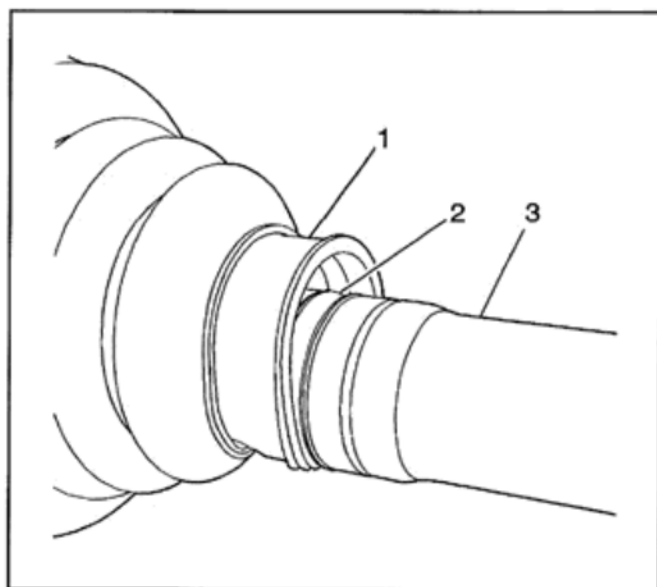
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2. Using the appropriate tool, install the NEW retaining clip.



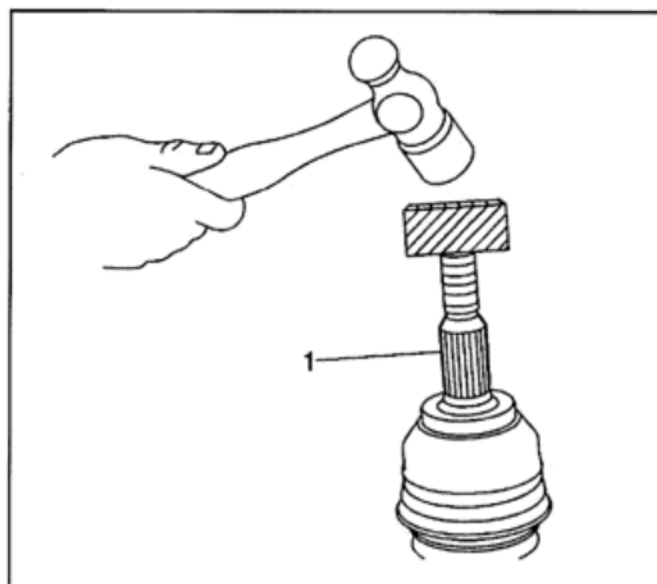
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4. Place approximately half the lubricant from the service kit inside the outboard boot and pack the CV joint with the remaining lubricant.



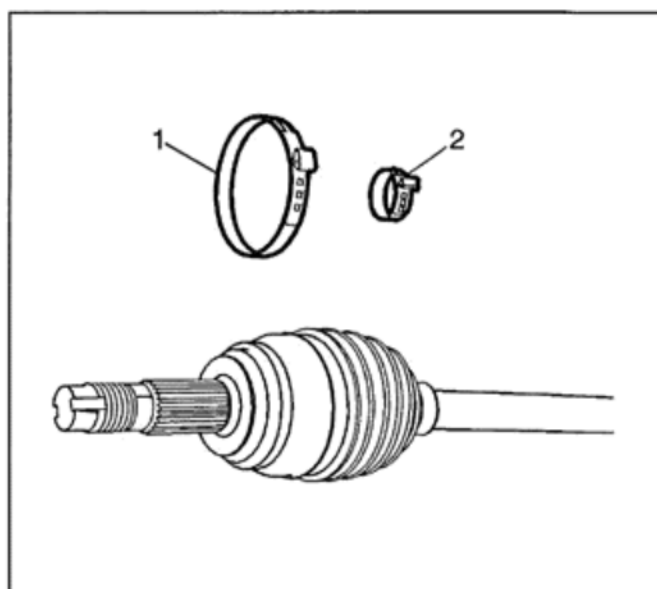
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3. Ensure that the boot (1) is properly seated in the grooved (2) wheel drive shaft (3).



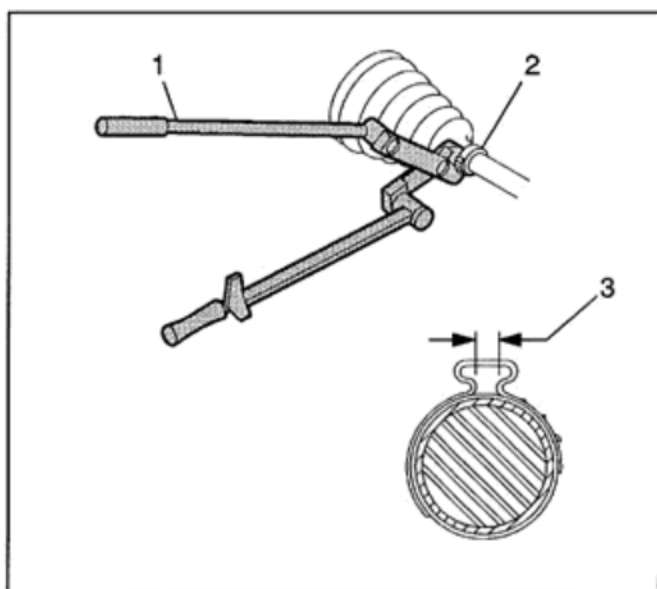
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5. Using a block of wood and a hammer, install the CV joint (1) on the wheel drive shaft.



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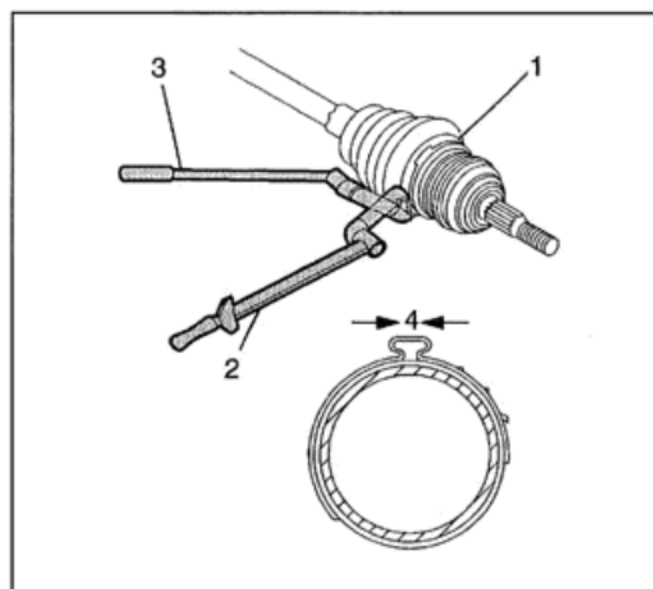
6. Install the inner boot clamp (2) and the outer boot clamp (1).



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Note: Ensure that the boot clamp is properly positioned around the entire circumference of the boot.

7. Using the DT-35910 pliers and a torque or ratchet wrench and breaker bar (1), close the boot clamp (2) until the gap (3) measures **1.9 mm (0.07 in)**.



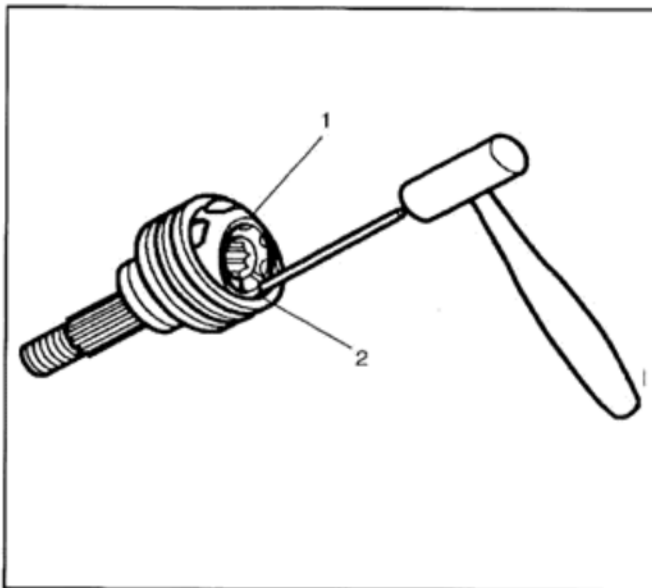
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8. Using the DT-35910 pliers and a torque or ratchet wrench (2) and breaker bar (3), close the boot clamp (1) until the gap (4) measures **1.7 mm (0.06 in)**.
9. Distribute the lubricant within the outer CV joint by moving it in a circular motion at least four to five times.
10. Remove the wheel drive shaft from the bench vise.
11. Install the wheel drive shaft assembly. Refer to *Front Wheel Drive Shaft Replacement* on page 7-5.

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 *Front Wheel Drive Shaft Replacement* on page 7-5.
2. Remove any lubricant from the CV joint.



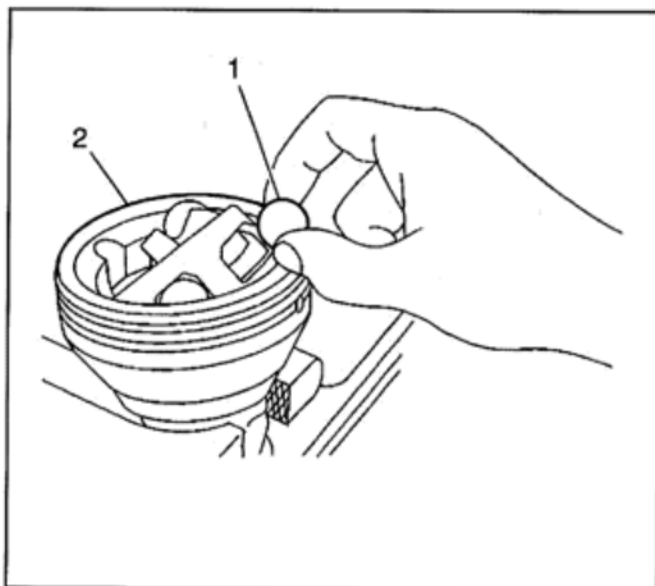
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Note: Position the cage and the inner race so they are level.

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

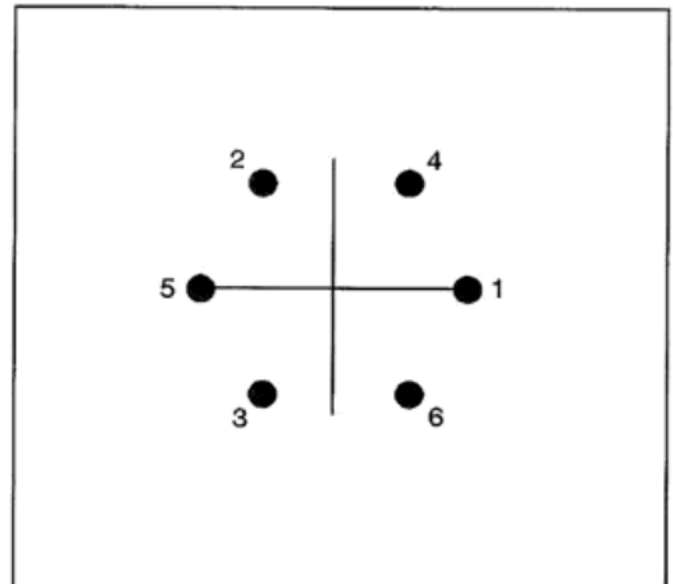
Note: The following procedure will have to be repeated until all the ball bearing are removed from the cage.

4. Using a brass drift (1), gentle tap the cage (2) until the ball bearing can be removed from the cage (2).



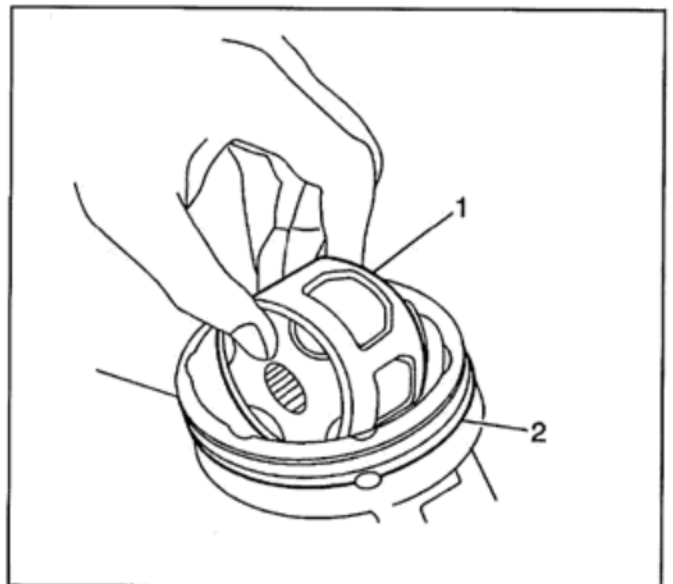
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5. Using a small screwdriver, remove the ball bearings (1) from the CV joint (2).



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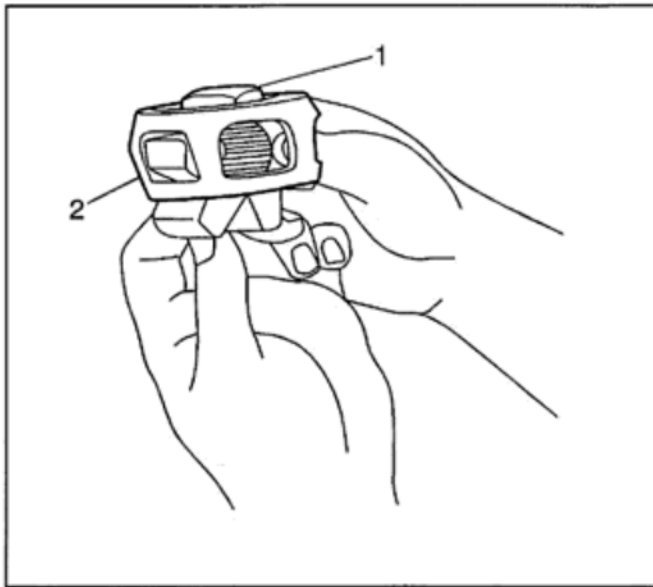
6. Remove the ball bearings from the CV joint in sequence.



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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).



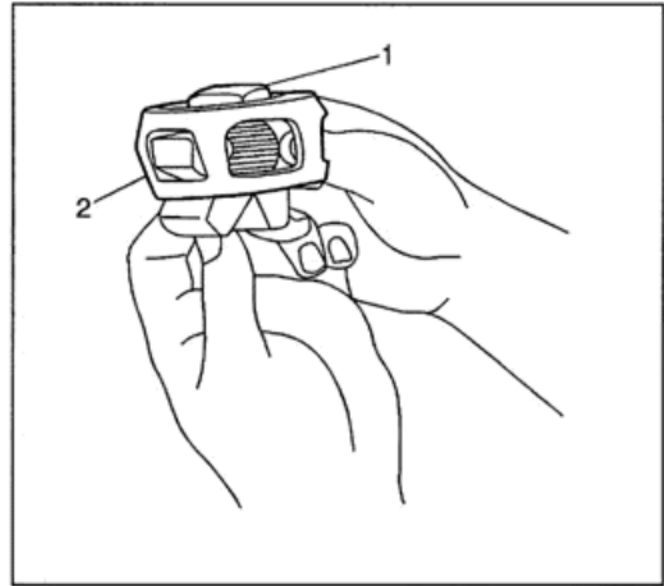
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10. Position the cage (2) and the inner race (1) so that the larger radius corners of the cage windows are up.
11. Rotate the inner race (1) 90 degrees to the center line of the cage (2).
12. Align the lands of the inner race (1) with the windows of 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.

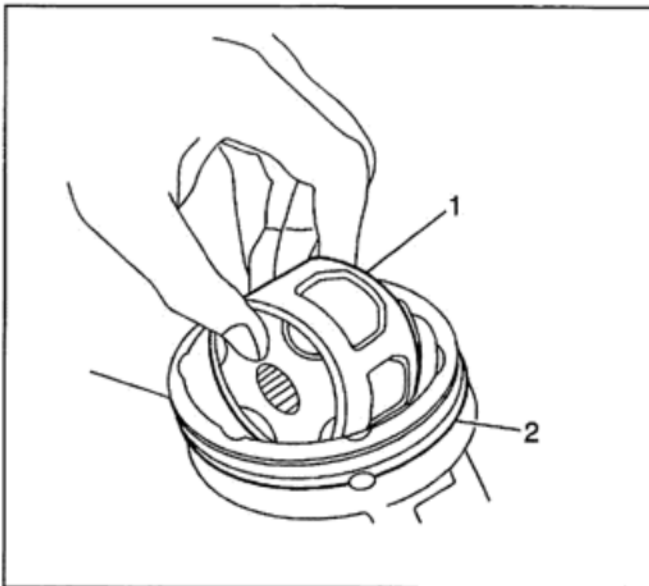
16. If any of the above items are found to have excessive wear or are damaged, replace the outer CV joint as an assembly.

Assembly Procedure



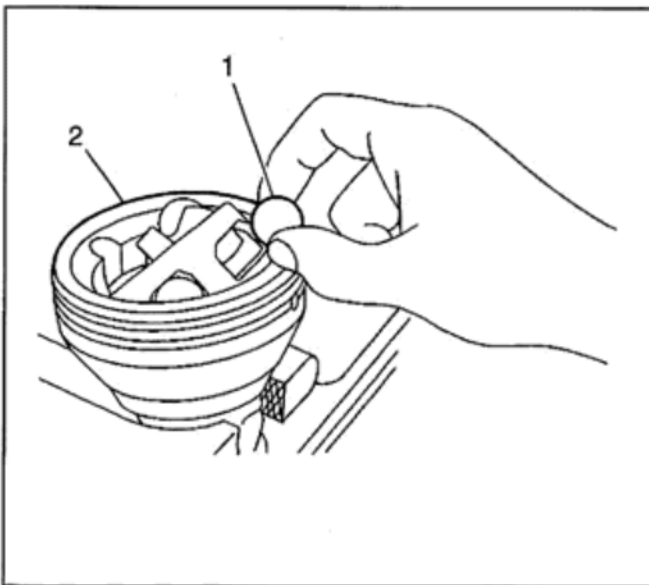
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1. Position the cage (2) so that the larger radius corners of the cage windows are up.
2. Position the inner race (1) 90 degrees to the centerline of the cage (2).
3. Insert the inner race (1) through the bottom of the cage (2).
4. Align the lands 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.



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9. Wrap a clean shop towel around the CV joint outer race spined 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).



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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.

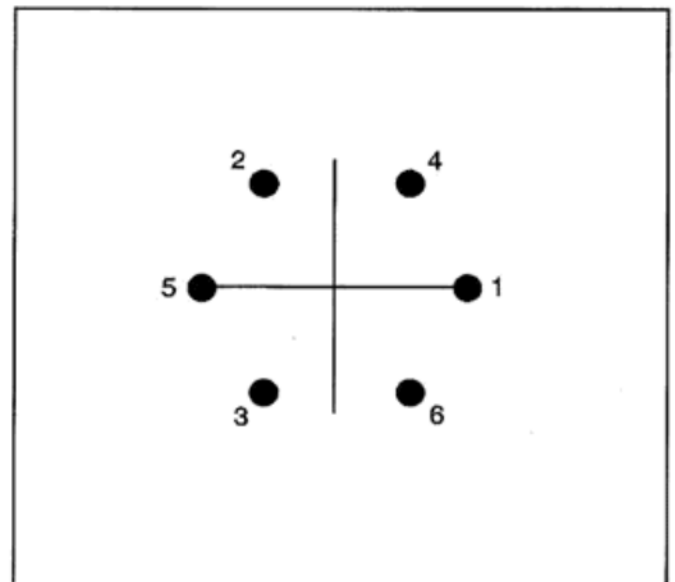
16. Press down on the cage following one of the outer race ball bearing (1) tracks.
17. Install the ball bearing through the cage window onto the inner race ball bearing (1) track.

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.



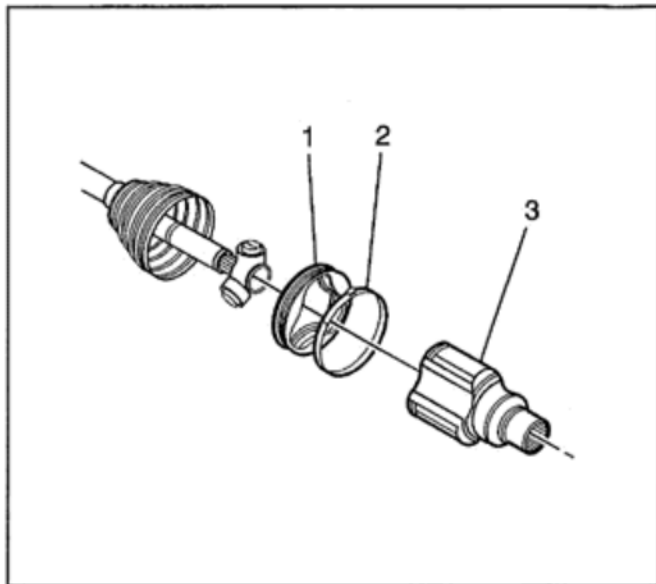
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21. Install the ball bearings in sequence.
22. Repeat steps 18 thru 20 until all the ball bearings are installed.
23. Install the outer CV joint and boot on the wheel drive shaft. Refer to *Front Wheel Drive Shaft Outer Joint and Boot Replacement* on page 7-11.

Wheel Drive Shaft Inner Joint Inspection

Inspection Procedure

1. Remove the front wheel drive shaft inner joint and boot. Refer to *Front Wheel Drive Shaft Replacement* on page 7-5.



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2. Remove the wheel drive shaft tripod bushing (1) from the tripod housing (3).
3. Remove the wheel drive shaft tripod housing (3) from the wheel drive shaft.
4. Remove the wheel drive shaft tripod joint boot bushing (1).
5. Using a suitable cleaner, remove the excess grease from the tripod assembly.
6. 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

7. If any of the internal parts are found to be excessively worn or damaged, replace the wheel drive shaft inner joint and boot. Refer to *Front Wheel Drive Shaft Inner Joint and Boot Replacement* on page 7-8.

Description and Operation

Wheel Drive Shafts Description and Operation

Front wheel drive axles are flexible assemblies.

Front wheel drive axles consist of the following components:

- A front wheel drive shaft tripod joint (inner joint)
- A front wheel drive shaft constant velocity joint (outer joint)
- A front wheel drive shaft

The front wheel drive shaft connects the front wheel drive shaft tripod joint and the front wheel drive shaft constant velocity joint.

The front wheel drive shaft tripod joint is completely flexible. The front wheel drive shaft tripod joint can move in and out.

The front wheel drive shaft constant velocity joint is flexible, but the front wheel drive shaft constant velocity joint cannot move in and out.

Boots And Clamps

The front wheel drive shaft constant velocity joint and the front wheel drive shaft tripod joint boots in the front wheel drive axle are made of a thermoplastic material.

The clamps in the front wheel drive axle are made of stainless steel.

The boot provides the following functions:

- Protection of the internal parts of the front wheel drive shaft constant velocity joint and the front wheel drive shaft tripod joint

The boot protects the grease from the following sources of damage:

 - Harmful atmospheric conditions, such as extreme temperatures or ozone gas
 - Foreign material, such as dirt or water
- Allows angular movement and the axial movement of the front wheel drive shaft tripod joint
- Allows angular movement of the front wheel drive shaft constant velocity joint

Note: Protect the boots from sharp tools and from the sharp edges of the surrounding components. Any damage to the boots or the clamps will result in leakage. Leakage will allow water to leak into the front wheel drive shaft tripod joint and the front wheel drive shaft constant velocity joints. Leakage will also allow grease to leak out of the front wheel drive shaft tripod joints and the front wheel drive shaft constant velocity joints. Leakage may cause noisy front wheel drive axle operation and eventual failure of the internal components.

The clamps provide a leak proof connection for the front wheel drive shaft tripot joint and the front wheel drive shaft constant velocity joint at the following locations:

- The housing
- The front wheel drive shaft

The thermoplastic material performs well under normal conditions and normal operation. However, the material is not strong enough to withstand the following conditions:

- Abusive handling
- Damage from sharp objects, such as sharp tools or any sharp edges of the surrounding components in the vehicle

Front Wheel Drive Shaft Tripot Joint (Inner Joint)

The front wheel drive shaft tri-pot joint is made with the tripot design without an over-extension limitation retainer.

The joint is constructed as follows for vehicles that are equipped with an automatic transmission:

- The left front wheel drive axle has a female spline. The female spline installs over a stub shaft that protrudes from the transaxle.
- The right front wheel drive axle has a female spline. The right front wheel drive axle uses barrel type snap rings in order to interlock with the intermediate shaft.

Front Wheel Drive Shaft Constant Velocity Joint (Outer Joint)

The front wheel drive shaft constant velocity joint is made with the Rzeppa joint design.

The shaft end (which mates with the knuckle/hub) has a helical spline. The helical spline ensures a tight, press-type fit.

This design prevents end play between the hub bearing and the front wheel drive axle.

Special Tools and Equipment

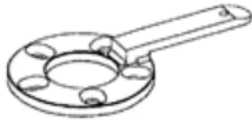
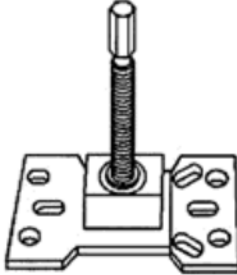
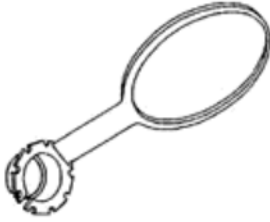
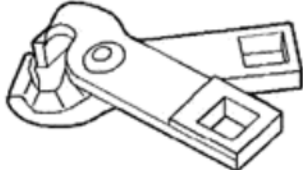
Illustration	Tool Number / Description
 2026185	CH-49376 Holding Wrench

Illustration	Tool Number / Description
 870410	CH-49400 J-45859 Hub Spindle Remover
 813914	DT-6332 Seal Protector
 5625	DT-35910 CH-8904 J-35910 Drive Axle Boot Clamp Pliers
 2329961	DT-50186 Wheel Hub Holding Tool
 2026182	EN-956-1 KM-956-1 Extension