

Driveline/Axle

Wheel Drive Shafts

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Front Wheel Drive Shaft Nut	215 N.m	158 lb ft
Rear Wheel Drive Shaft Nut	215 N.m	158 lb ft
Rear Wheel Drive Shaft to Drive Flange Bolt	80 N.m	59 lb ft

ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

Adhesives, Fluids, Lubricants, and Sealers

Application	Type of Material	GM Part Number	Canadian Part Number
Wheel Drive Shaft Cap	Sealant	88861422	88861422
Wheel Drive Shaft Splines	Lubricant	01051344	993037
Wheel Drive Shaft Bolts	Threadlocker	89021297	10953488

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** .
2. Perform the **Vibration Analysis - Road Testing** 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**.

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**
- **Clunk When Accelerating from Coast**
- **Clunk Noise When Accelerating During Turns**
- **Shudder or Vibration During Acceleration**

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, it may be necessary to remove the wheel drive shaft from the vehicle and manipulate the outer joint manually. Any binding or impeded movement of the joint may indicate damage which could contribute to the concern.

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, it may be necessary to remove the wheel drive shaft from the vehicle and manipulate the inner joint manually. Do not allow the joint to separate from the wheel drive shaft bar. Any binding or impeded movement of the joint may indicate damage which could contribute to the concern.

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, it may be necessary to remove the wheel drive shaft from the vehicle and manipulate the joints manually. Do not allow the joints to separate from the wheel drive shaft bar. Any binding or impeded movement of the joints may indicate damage which could contribute to the concern.

SHUDDER OR VIBRATION DURING ACCELERATION

In order to diagnose a shudder or vibration during acceleration, refer to **Diagnostic Starting Point - Vehicle** .

REPAIR INSTRUCTIONS

FRONT WHEEL DRIVE SHAFT REPLACEMENT - LEFT SIDE

Special Tools

- **J 2619-O1** Slide Hammer With Adapter
- **J 29794** Extension
- **J 42943** Drive Axle Separator
- **J 42129** Wheel Hub Remover

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the left front tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the left outer tie rod from the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD)** , **Steering Linkage Outer Tie Rod Replacement (AWD)** .

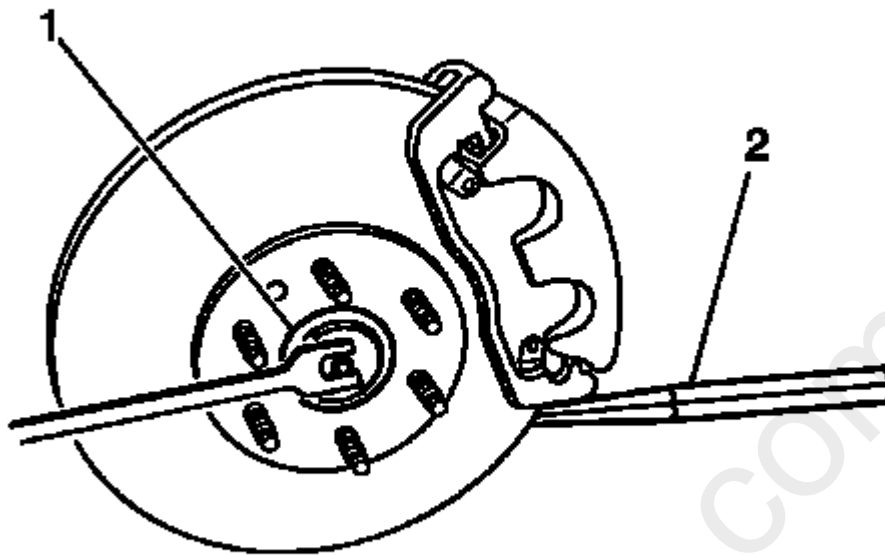


Fig. 1: View Of Wheel Drive Shaft Spindle Nut & Punch
Courtesy of GENERAL MOTORS COMPANY

4. Insert a drift or punch (2) in the brake rotor against the brake caliper mounting bracket.
5. Using a breaker bar and the proper size socket (1), loosen the wheel drive shaft nut.

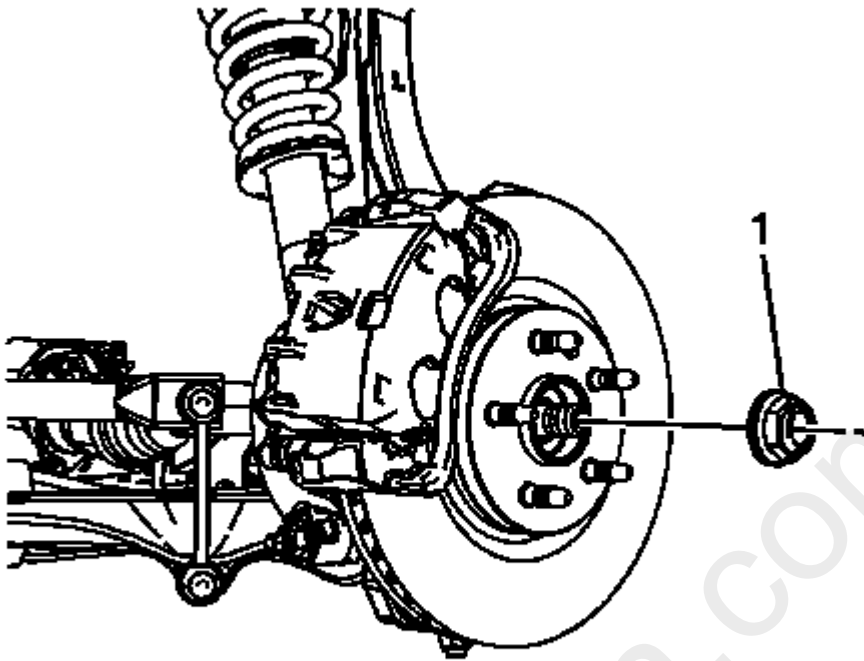


Fig. 2: View of Wheel Drive Shaft Nut and Brake Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: **DO NOT** reuse the wheel drive shaft nut, replace with a **NEW** wheel drive shaft nut.

6. Remove and discard the wheel drive shaft nut (1).
7. Remove the front left wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** , **Front Wheel Speed Sensor Replacement (RWD)** .

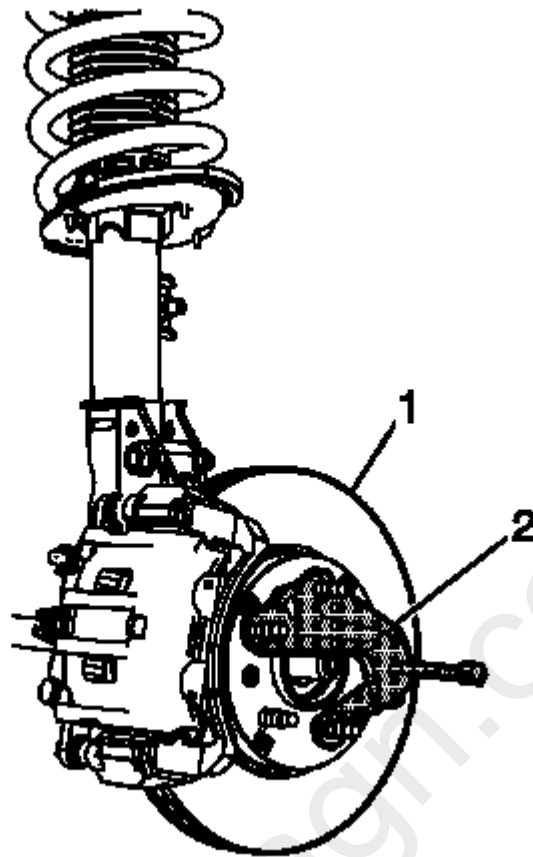


Fig. 3: Separating Wheel Drive Shaft & Steering Knuckle
Courtesy of GENERAL MOTORS COMPANY

NOTE: When servicing components other than the wheel drive shaft, ensure that the wheel drive shaft is supported with mechanics wire or equivalent or wrap the boot with a clean shop towel so as not to damaged the wheel drive shaft boot.

8. Using the **J 42129** remover (2), separate the wheel drive shaft from the wheel hub/bearing (1).
9. Remove the left upper control arm from the knuckle. Refer to **Shock Absorber and Spring Removal and Installation** .

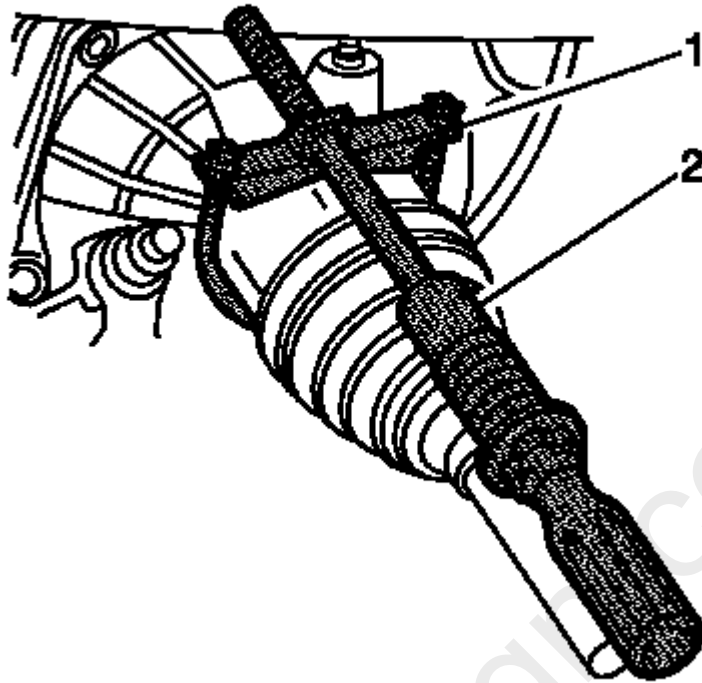


Fig. 4: Disengaging Wheel Drive Shaft From Intermediate Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

10. Using the J 2619-O1 adapter , J 29794 extension , and the J 42943 separator , remove the wheel drive shaft from the intermediate wheel drive shaft.

NOTE: If the wheel drive shaft seals are found to have any defects, replace the wheel drive shaft seals.

11. Remove the wheel drive shaft from the vehicle.

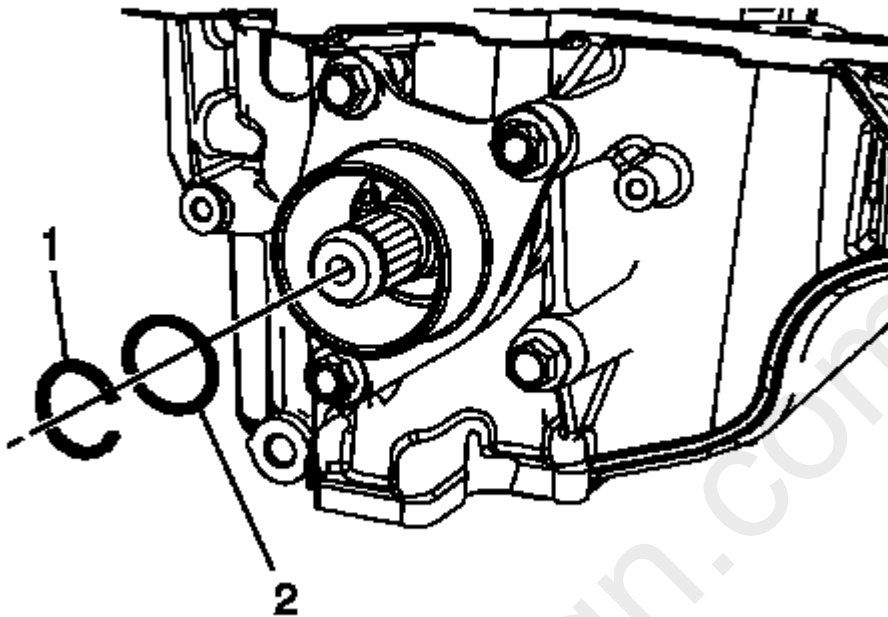


Fig. 5: View of Drive Shaft Retaining Ring Assembly
Courtesy of GENERAL MOTORS COMPANY

12. Remove the intermediate wheel drive shaft retaining ring (1).
13. Remove the intermediate wheel drive shaft O-ring (2).

Installation Procedure

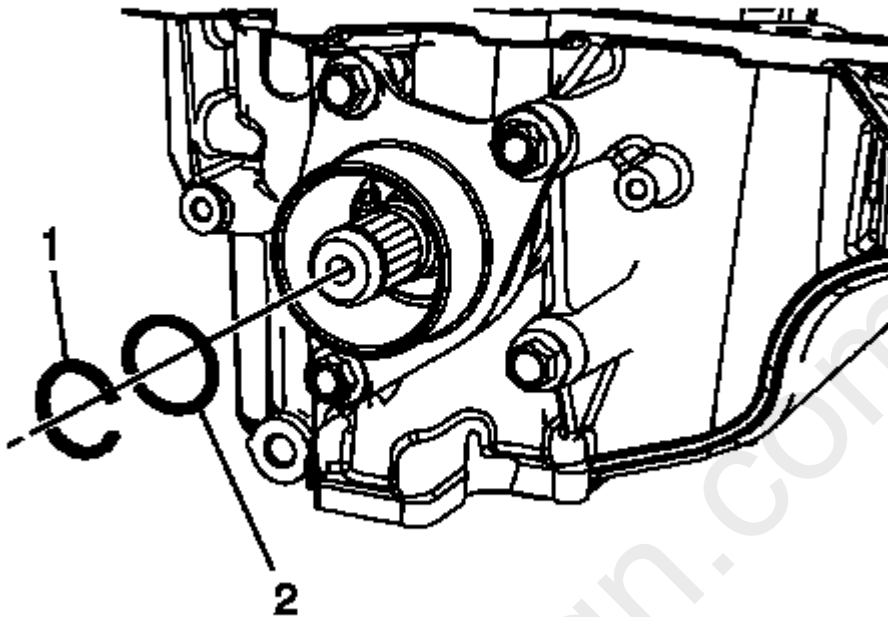


Fig. 6: View of Drive Shaft Retaining Ring Assembly
Courtesy of GENERAL MOTORS COMPANY

1. Install the new O-ring (2) on the intermediate shaft.
2. Install the new retaining ring (1) on the intermediate shaft.
3. Apply a small amount of grease to the intermediate wheel drive shaft splines. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.
4. Install the left front wheel drive shaft in the intermediate shaft.
5. To ensure that the wheel drive shaft is installed properly, grasp the inner tripod housing and pulling it outward. DO NOT pull on the axle shaft.
6. Install the wheel drive shaft in the front knuckle.
7. Install the left upper control arm on the knuckle. Refer to **Shock Absorber and Spring Removal and Installation** .

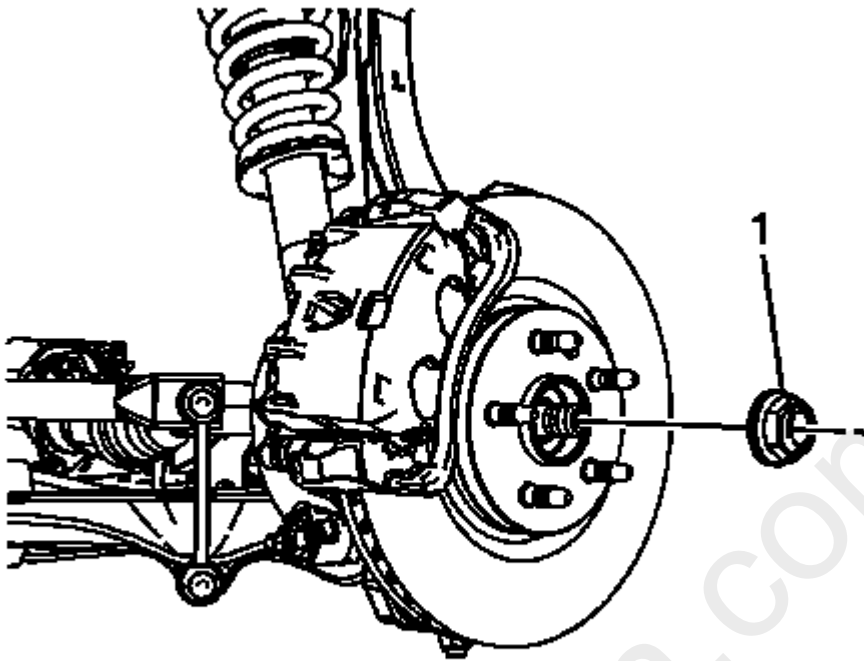


Fig. 7: View of Wheel Drive Shaft Nut and Brake Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse the wheel drive shaft nut. Discard and replace with NEW only.

8. Hand start the NEW wheel drive shaft nut (1).

NOTE: Ensure that there are no gaps in the threadlocker along the length of the filled area of the wheel drive shaft. Allow the threadlocker to cure approximately 10 minutes before installation of the wheel drive shaft nut.

9. Apply thread locker to the wheel drive shaft nut (1). Refer to **Adhesives, Fluids, Lubricants, and Sealers**.
10. Using hand tools, tighten the NEW wheel drive shaft nut until the wheel drive shaft is fully seated in the wheel hub/bearing assembly.

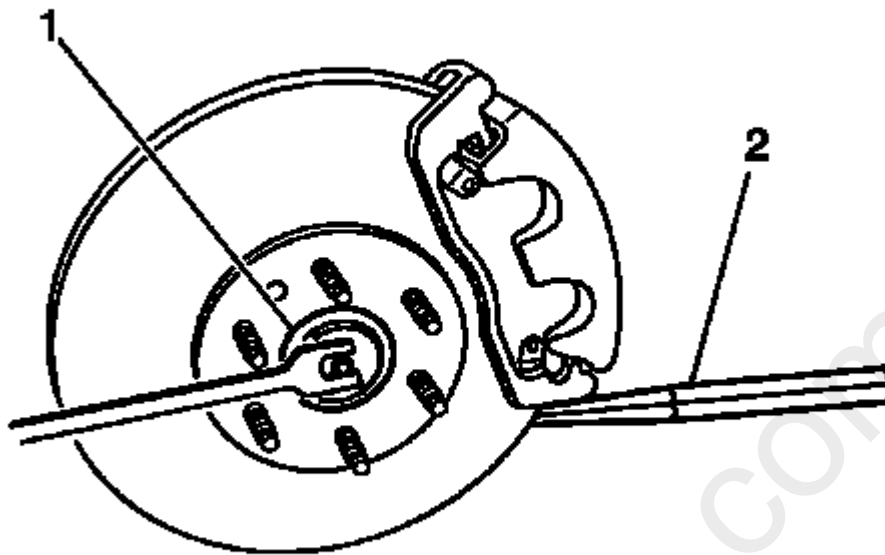


Fig. 8: View Of Wheel Drive Shaft Spindle Nut & Punch
 Courtesy of GENERAL MOTORS COMPANY

11. Insert a drift or punch (1) into the brake rotor and rotate the brake rotor until it rest against the caliper mounting bracket.

CAUTION: Refer to Fastener Caution .

12. Using a torque wrench and the proper size socket, tighten the wheel drive shaft nut to 215 N.m (158 lb ft).
13. Install the wheel speed sensor. Refer to Front Wheel Speed Sensor Replacement (AWD) , Front Wheel Speed Sensor Replacement (RWD) .
14. Install the left outer tie rod. Refer to Steering Linkage Outer Tie Rod Replacement (RWD) , Steering Linkage Outer Tie Rod Replacement (AWD) .
15. Install the left front tire and wheel. Refer to Tire and Wheel Removal and Installation .
16. Remove the support and lower the vehicle.

FRONT WHEEL DRIVE SHAFT REPLACEMENT - RIGHT SIDE

Special Tools

- **J 2619-01** Slide Hammer With Adapter
- **J 29794** Extension
- **J 42943** Drive Axle Separator
- **J 44394** Seal Protector
- **J 45859** Wheel Hub Remover

For equivalent regional tools, refer to **Special Tools**.

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the right front tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
3. Remove the right front outer tie rod from the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD)** , **Steering Linkage Outer Tie Rod Replacement (AWD)** .

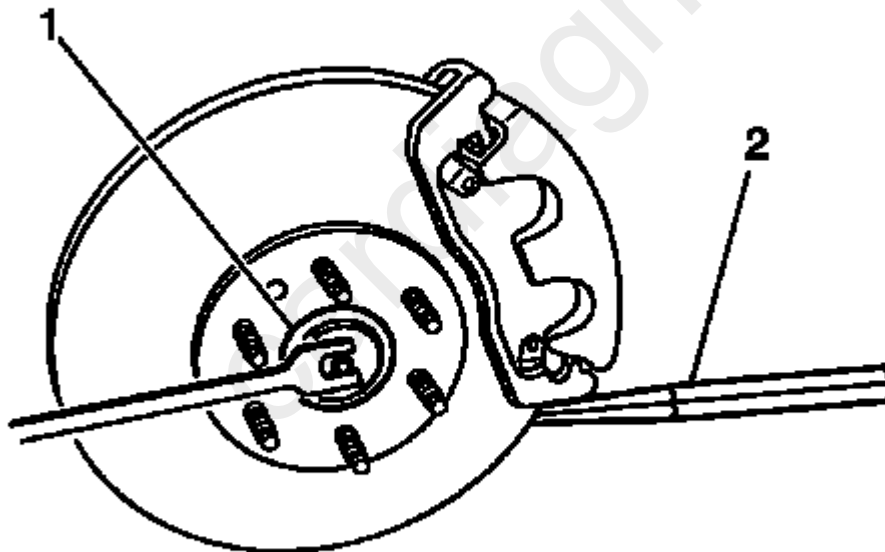


Fig. 9: View Of Wheel Drive Shaft Spindle Nut & Punch
 Courtesy of GENERAL MOTORS COMPANY

4. Using a breaker bar and the proper size socket (1), loosen the wheel drive shaft nut.

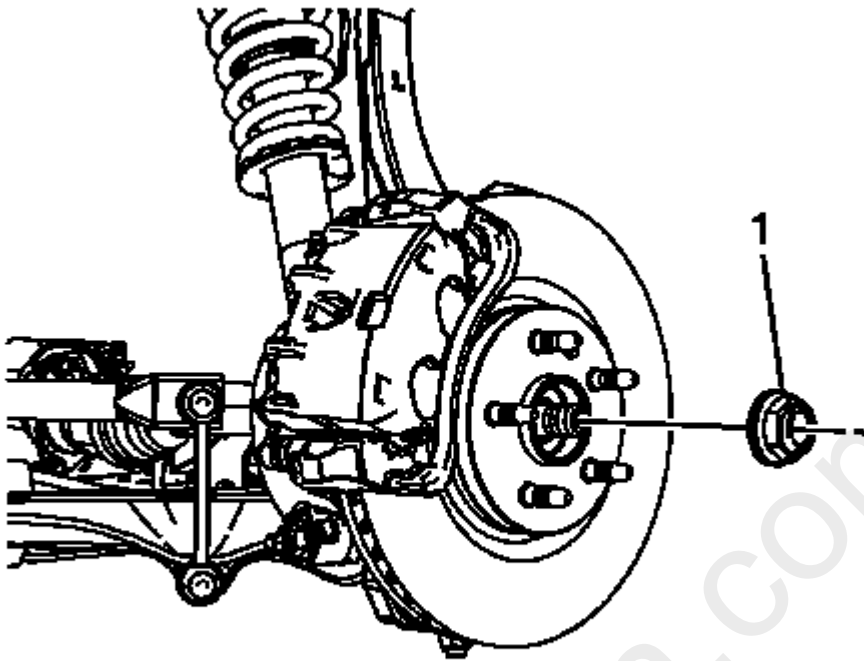


Fig. 10: View of Wheel Drive Shaft Nut and Brake Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse the wheel drive shaft nut, replace with a NEW wheel drive shaft nut.

5. Remove and discard the wheel drive shaft nut (1).
6. Remove the right front wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** , **Front Wheel Speed Sensor Replacement (RWD)** .
7. Separate the upper ball joint from the steering knuckle. Refer to **Shock Absorber and Spring Removal and Installation** .

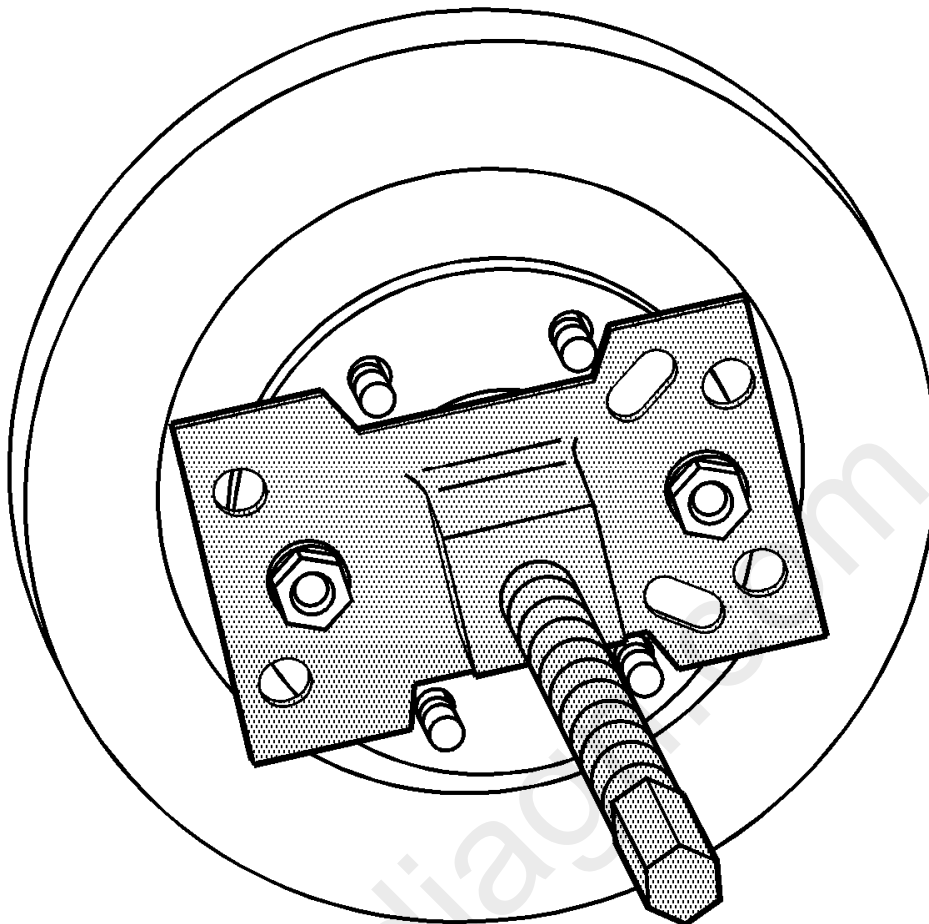


Fig. 11: Universal Hub Puller

Courtesy of GENERAL MOTORS COMPANY

NOTE: When servicing components other than the wheel drive shaft, ensure that the wheel drive shaft is supported with mechanics wire or equivalent or warp the boot with a clean shop towel so as not to damaged the wheel drive shaft boot.

8. Using the **J 45859** remover , remove the wheel drive shaft from the steering knuckle.
9. Remove the **J 45859** remover from the brake rotor.

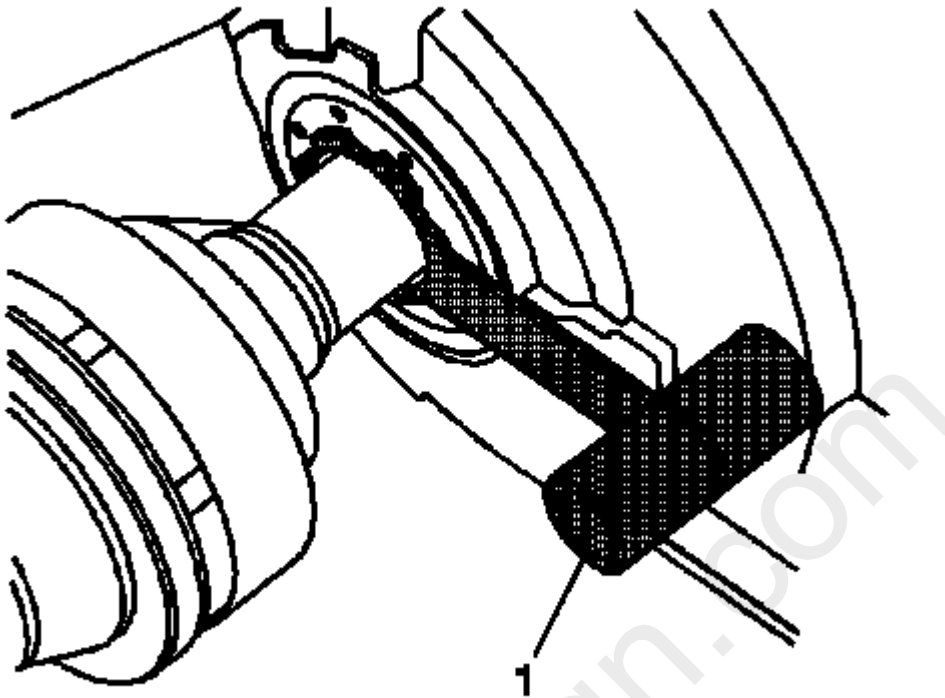


Fig. 12: Seal Protector Installed Into The Differential Output Shaft Seal
Courtesy of GENERAL MOTORS COMPANY

CAUTION: J-44394 must be installed into the differential output shaft seal prior to removing and installing the wheel drive shaft. Failure to install J-44394 as indicated may cause the splines of the wheel drive shaft to cut the differential output seal.

10. Using the J 2619-01 hammer , J 29794 extension , and the J 42943 separator , remove the wheel drive shaft from the differential enough to install J 44394 protector (1) .

NOTE: If the wheel drive shaft seal is found to be damage, replace the seal.

11. Remove the wheel drive shaft and the J 44394 protector from the vehicle.

Installation Procedure

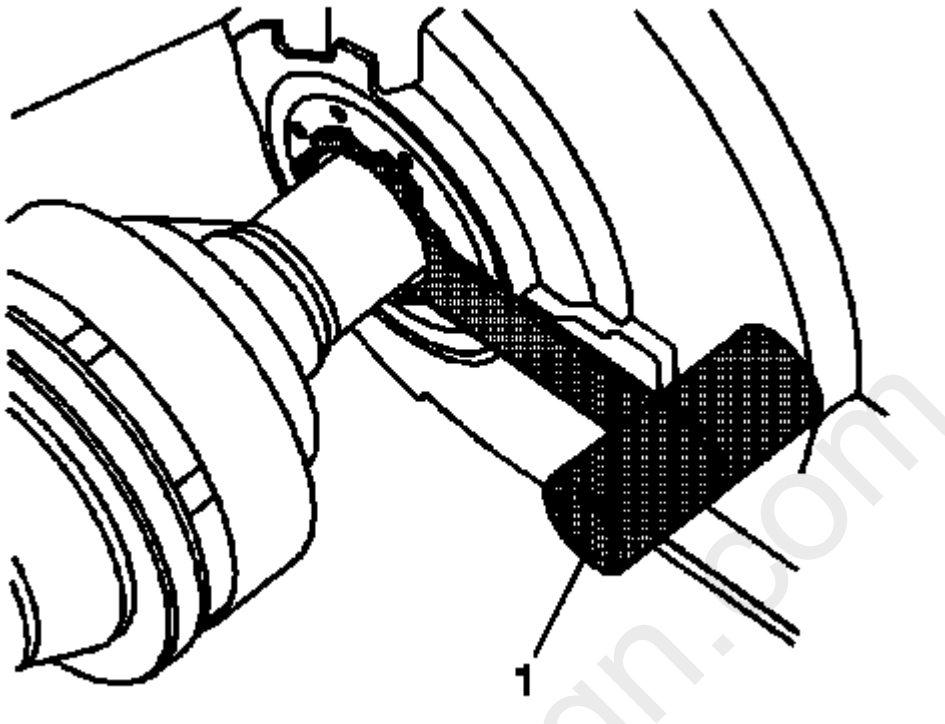


Fig. 13: Seal Protector Installed Into The Differential Output Shaft Seal
Courtesy of GENERAL MOTORS COMPANY

1. Install the **J 44394** protector (1) in the differential assembly.
2. Install the wheel drive shaft until the splines are past the **J 44394** protector.
3. Remove the **J 44394** protector from the wheel drive shaft and continue to install the drive shaft until it is fully seated.
4. To ensure that the wheel driver shaft is installed properly, grasp the inner tripod housing and pull it outward. DO NOT pull on the axle shaft.
5. Install the right front wheel drive shaft into the wheel hub/bearing assembly.
6. Install the upper ball joint in the steering knuckle. Refer to **Shock Absorber and Spring Removal and Installation** .

NOTE: Ensure that there are no gaps in the threadlocker along the length of the filled area of the wheel drive shaft. Allow the threadlocker to cure approximately 10 minutes before installation of the wheel drive shaft nut.

7. Apply thread locker to the wheel drive shaft nut (1). Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

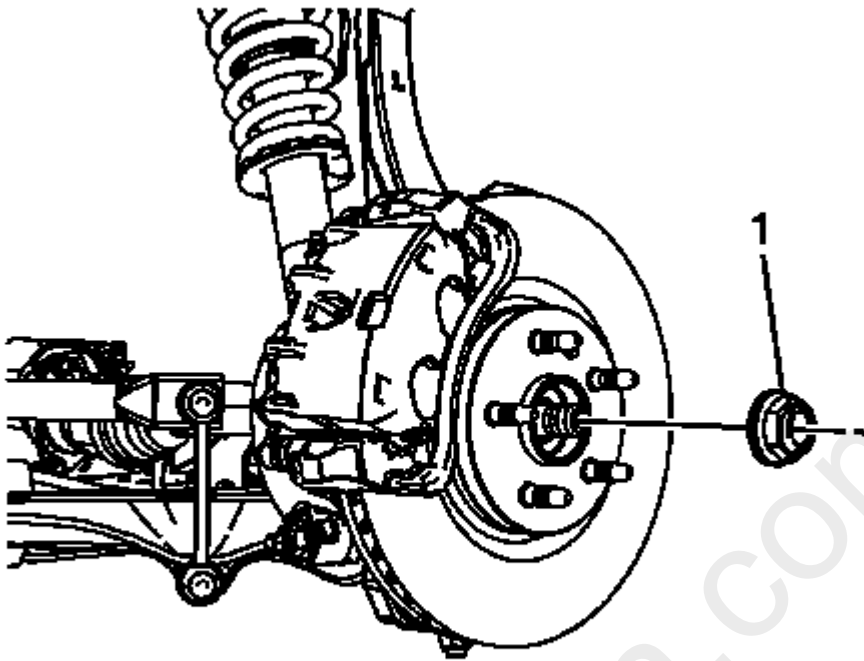


Fig. 14: View of Wheel Drive Shaft Nut and Brake Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse the wheel drive shaft nut. Discard and replace with NEW only.

8. Hand start the NEW wheel drive shaft nut (1).

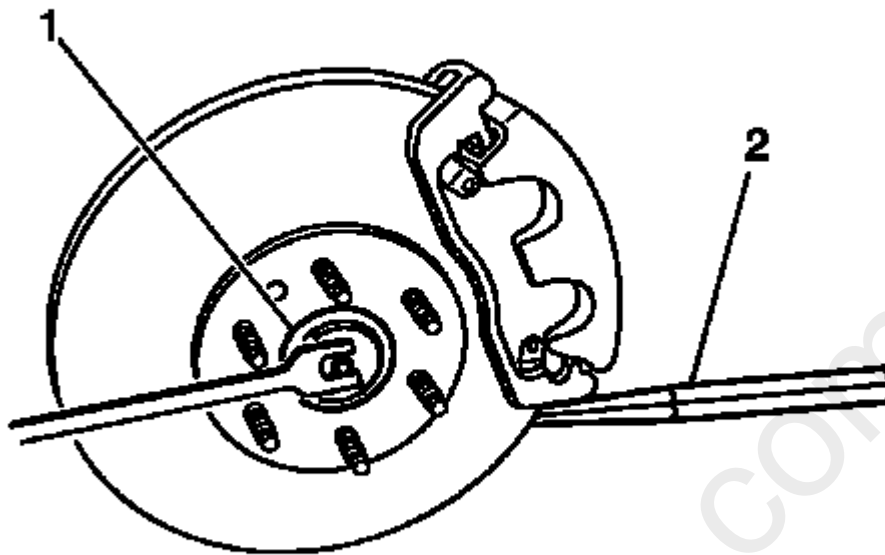


Fig. 15: View Of Wheel Drive Shaft Spindle Nut & Punch
Courtesy of GENERAL MOTORS COMPANY

9. Insert a drift or punch (2) in the cooling fins of the brake rotor.
10. Rotate the brake rotor until the drift or punch is resting against the brake caliper mounting bracket.

CAUTION: Refer to Fastener Caution .

11. Using a torque wrench and the proper size socket, tighten the wheel drive shaft nut to 215 N.m (158 lb ft).
12. Remove the drift or punch (2) and shop towel (4).
13. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement (AWD)** , **Front Wheel Speed Sensor Replacement (RWD)** .
14. Install the right outer tie rod end. Refer to **Steering Linkage Outer Tie Rod Replacement (RWD)** , **Steering Linkage Outer Tie Rod Replacement (AWD)** .
15. Install the right front tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
16. Remove the support and lower the vehicle.

REAR WHEEL DRIVE SHAFT REPLACEMENT

Special Tools

J 45859 Hub Puller

For the equivalent regional tools, refer to Special Tools .

Removal Procedure

1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the tire and wheel assembly. Refer to Tire and Wheel Removal and Installation .

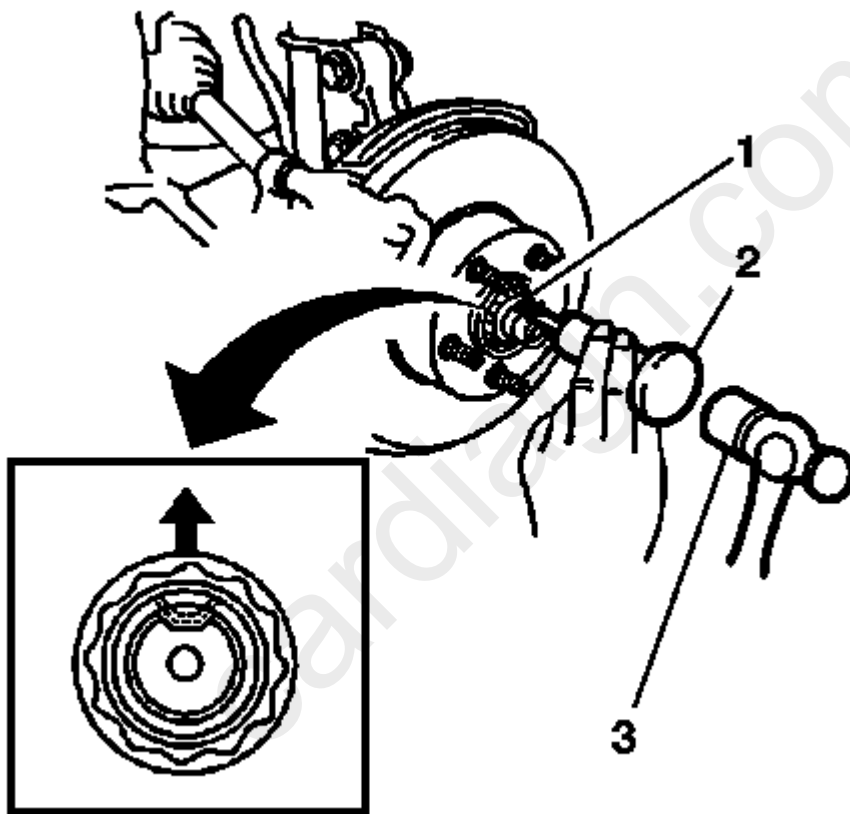


Fig. 16: Staking Locknut Using A Punch & Hammer
Courtesy of GENERAL MOTORS COMPANY

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.

3. Using a chisel tool and a hammer, unstake the drive shaft nut collar from the drive shaft slot.
4. For vehicles with RPO J56, proceed to step 7. For those without RPO J56, proceed to step 5.

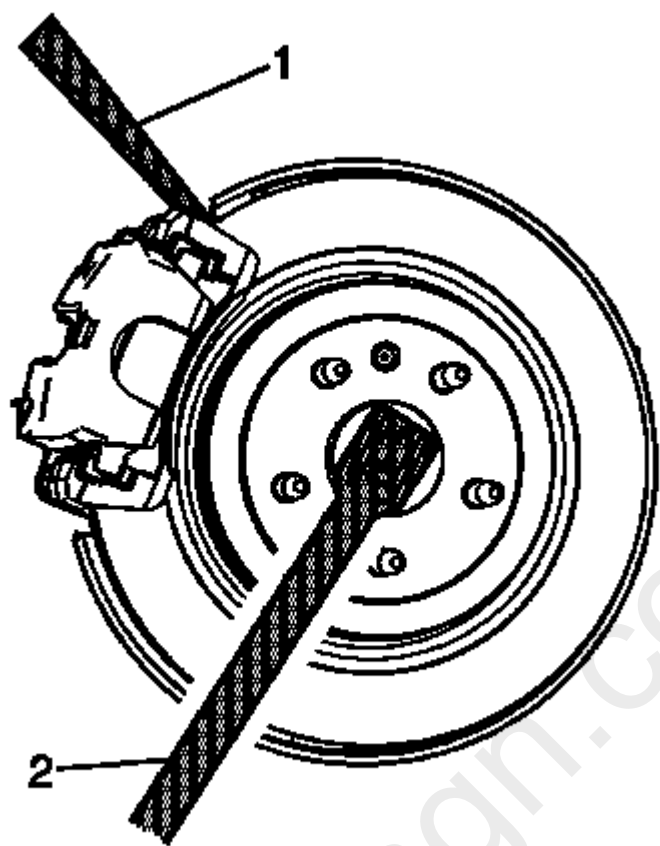


Fig. 17: View of Drift Punch and Breaker Bar
Courtesy of GENERAL MOTORS COMPANY

5. Insert a drift or punch (1) in the brake rotor and the brake caliper bracket.
6. Rotate the brake rotor until the drift or punch (1) is resting against the brake mounting bracket.

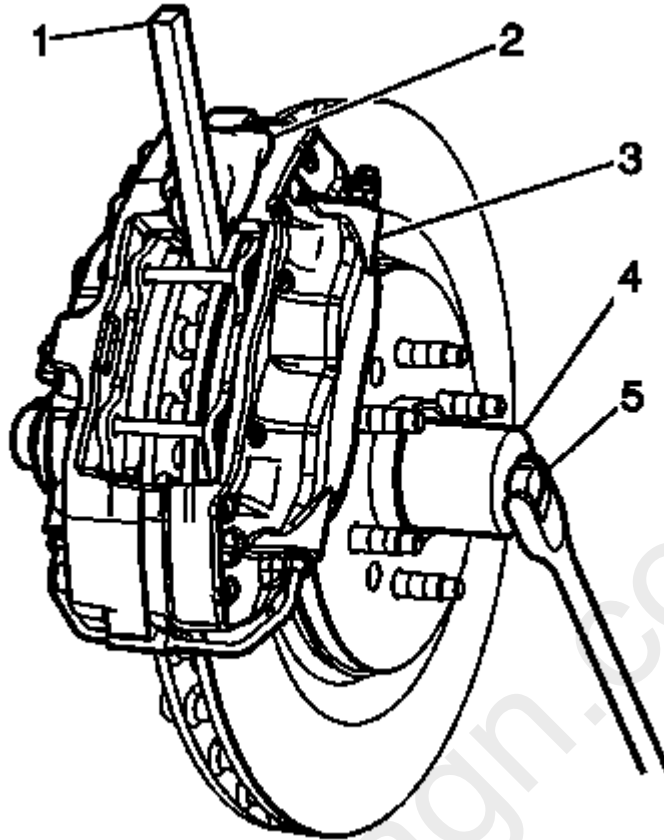


Fig. 18: View Of Brake Rotor Cooling Fins
Courtesy of GENERAL MOTORS COMPANY

7. Insert a drift or a punch (1) in the brake rotor cooling fins.
8. Place a clean shop towel (2) between the drift or punch and the brake caliper (3).
9. Rotate the brake rotor until the drift or punch (1) is resting against the brake caliper (3).

NOTE: **DO NOT use air tools to remove the wheel drive shaft nut. Damage to the wheel drive could occur. Use hand tool ONLY.**

10. Using a breaker bar (5) and the proper size socket (4), loosen the wheel drive shaft nut.

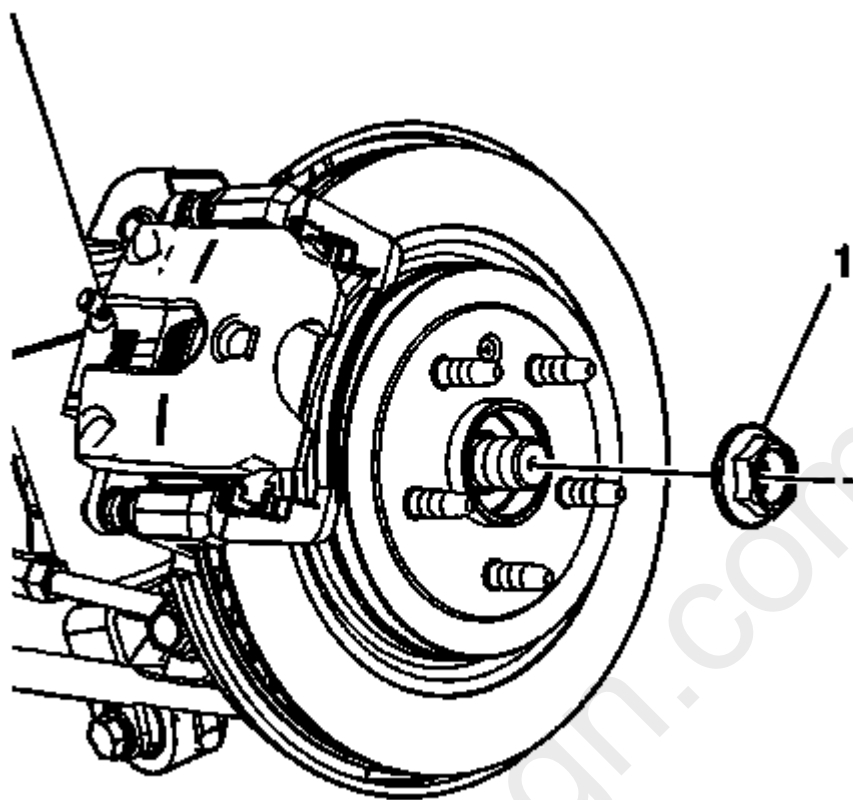


Fig. 19: Identifying Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft nut. Discard and replace with NEW only.

11. Remove and discard the wheel drive shaft retaining nut (1).

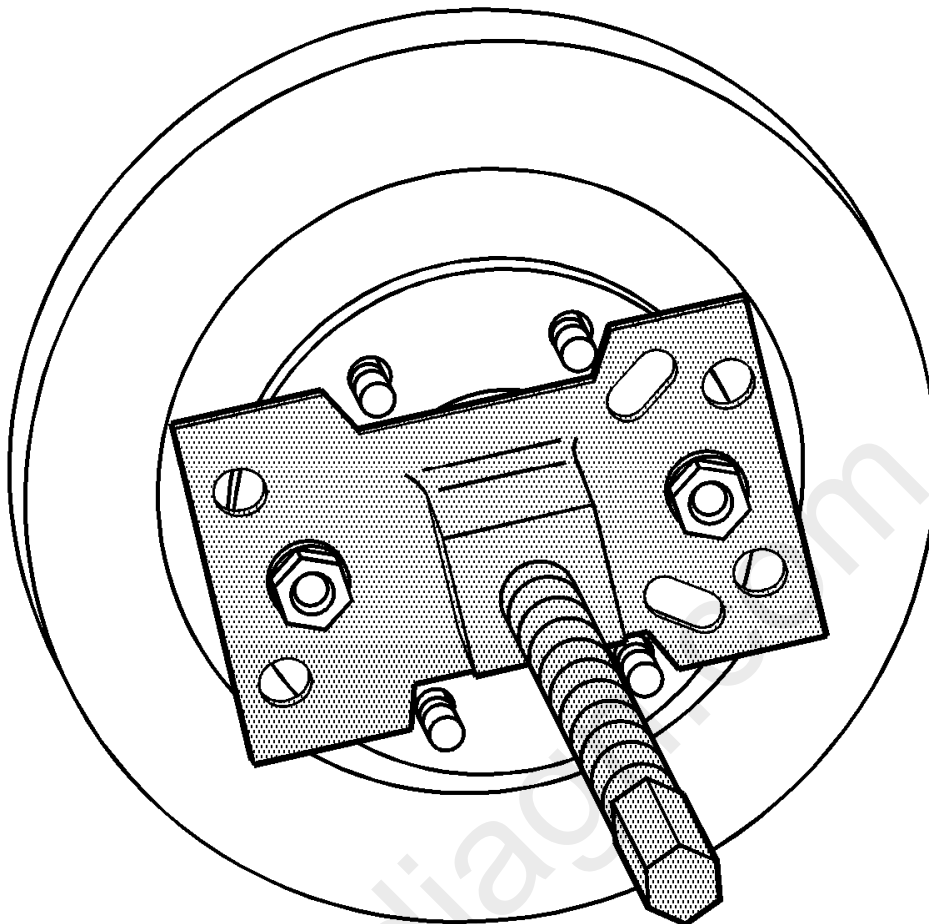


Fig. 20: Universal Hub Puller
Courtesy of GENERAL MOTORS COMPANY

12. Using the **J 45859** puller , separate the wheel drive shaft from the wheel bearing/hub assembly.

NOTE: **The following service procedure applies only to the CTSV series vehicles, ONLY.**

13. Remove the knuckle assembly. Refer to **Knuckle Replacement** .

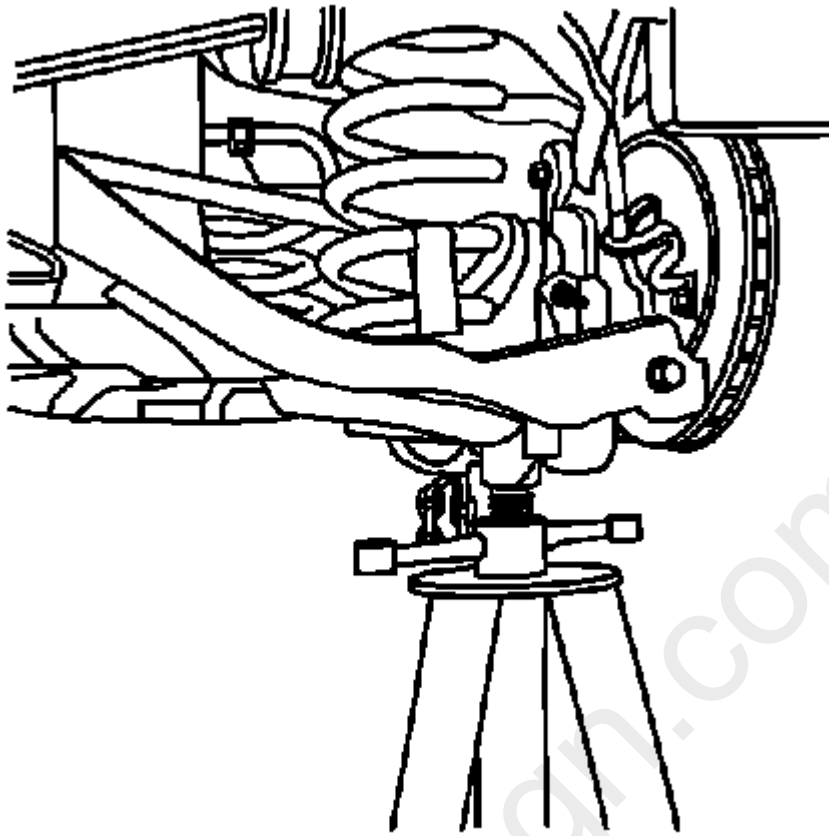


Fig. 21: Supporting Lower Control Arm
Courtesy of GENERAL MOTORS COMPANY

NOTE: Position the jack stand to the side to have enough access area to remove the wheel drive shaft.

14. Support the knuckle assembly with a jack stand.
15. Remove the lower control arm, if needed. Refer to **Lower Control Arm Replacement** .

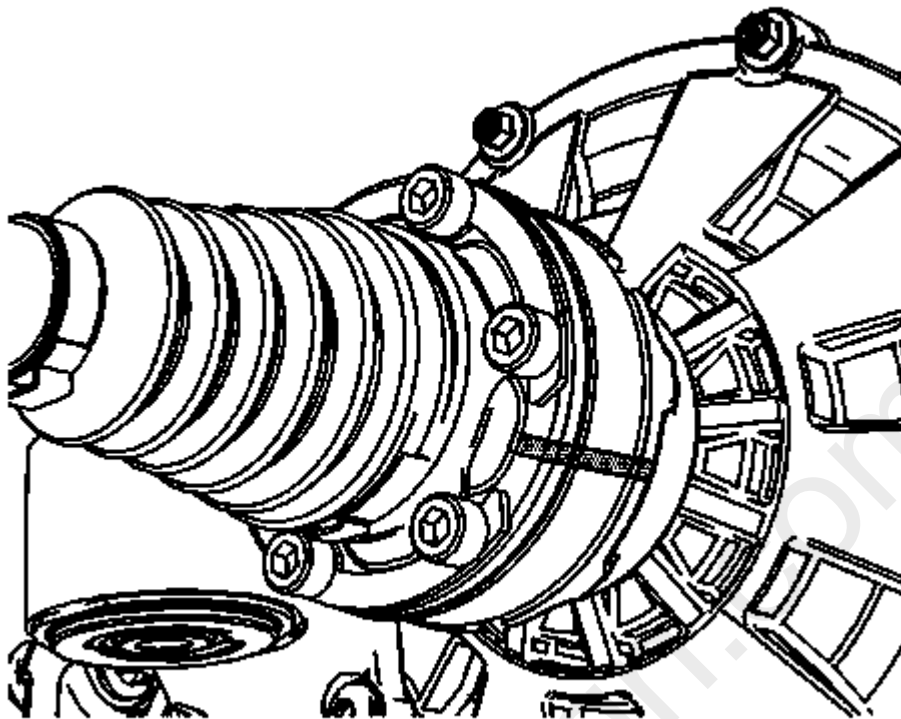


Fig. 22: View of Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

16. Mark the relationship of the wheel drive shaft to the output shaft flange.

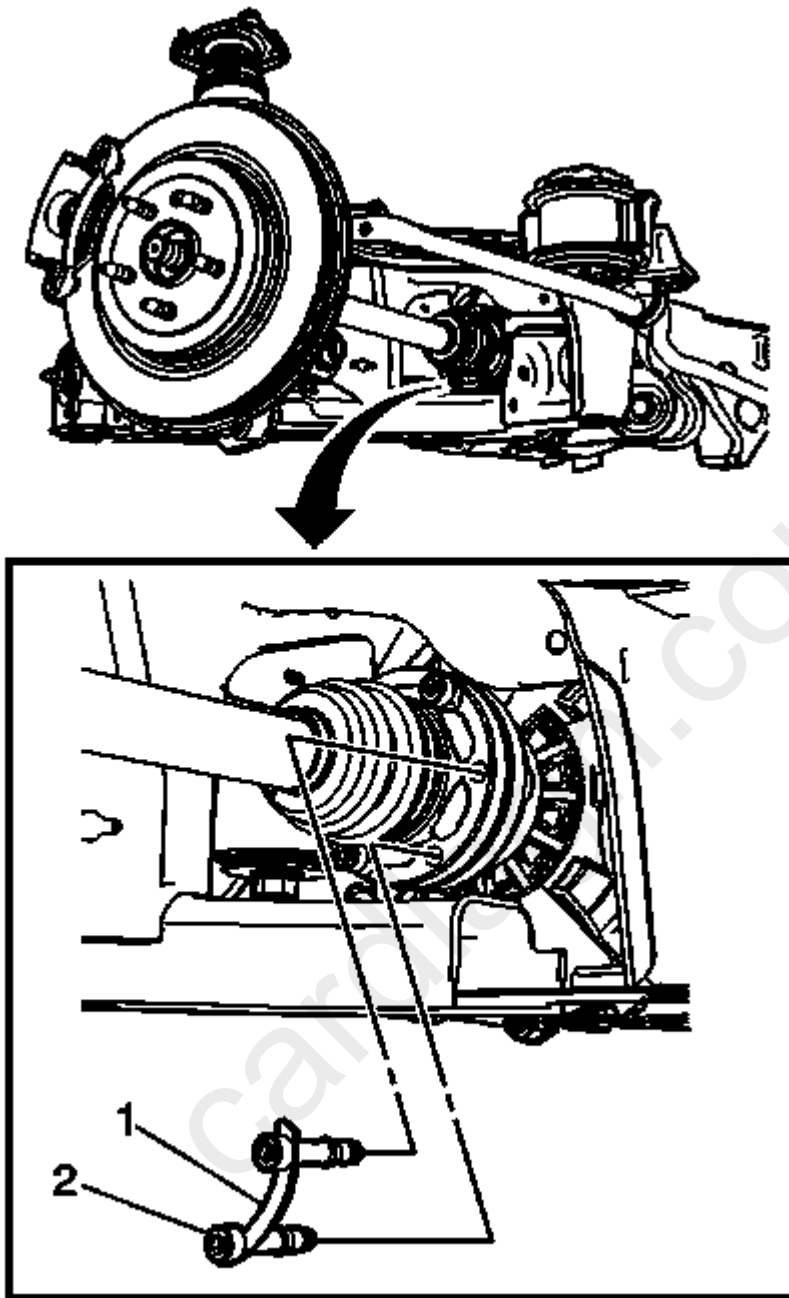


Fig. 23: Identifying Differential Drive Flange Mounting Bolts and Spacer
Courtesy of GENERAL MOTORS COMPANY

17. Remove the wheel drive shaft mounting bolts (2) and the spacer (1) from the differential drive flange.

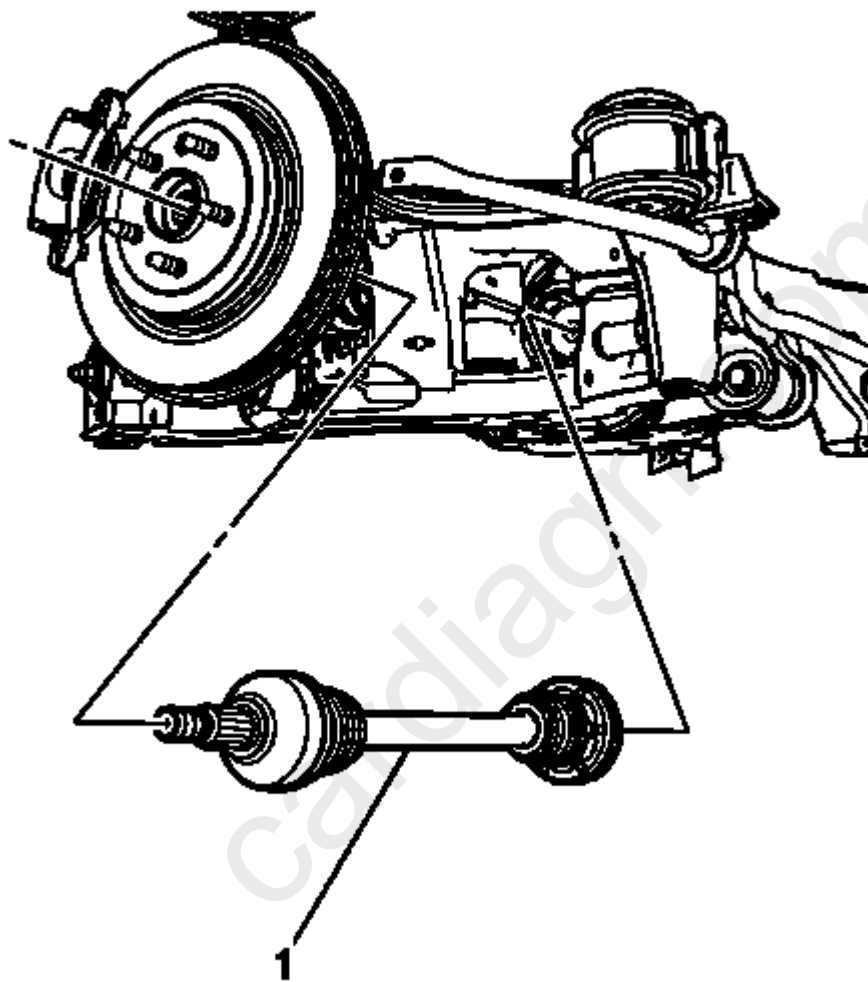


Fig. 24: View of Wheel Drive Shaft and Knuckle Assembly
Courtesy of GENERAL MOTORS COMPANY

NOTE: It may be necessary to use a flat bladed screw drive to separate the wheel drive shaft from the differential flange.

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

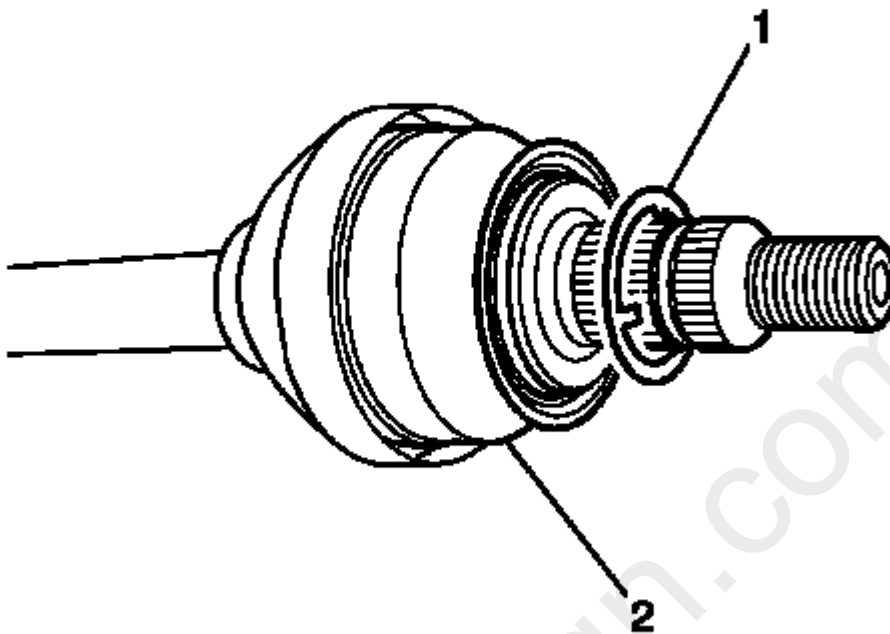


Fig. 25: Wheel Drive Shaft And Washer
Courtesy of GENERAL MOTORS COMPANY

NOTE:

- If there is no washer on the wheel drive shaft, install a NEW washer on the wheel drive shaft.
- If the washer is found to be excessively worn or damaged, discard and replace with NEW only.

19. Remove the washer (1) from the wheel drive shaft (2).

Installation Procedure

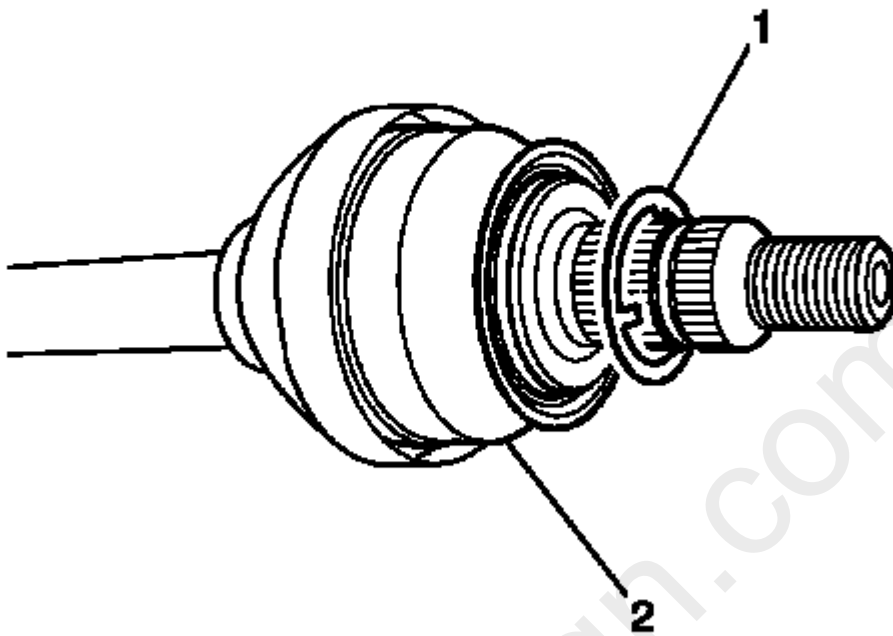


Fig. 26: Wheel Drive Shaft And Washer
Courtesy of GENERAL MOTORS COMPANY

1. Install the NEW washer (1) on the wheel drive shaft (2), if needed.

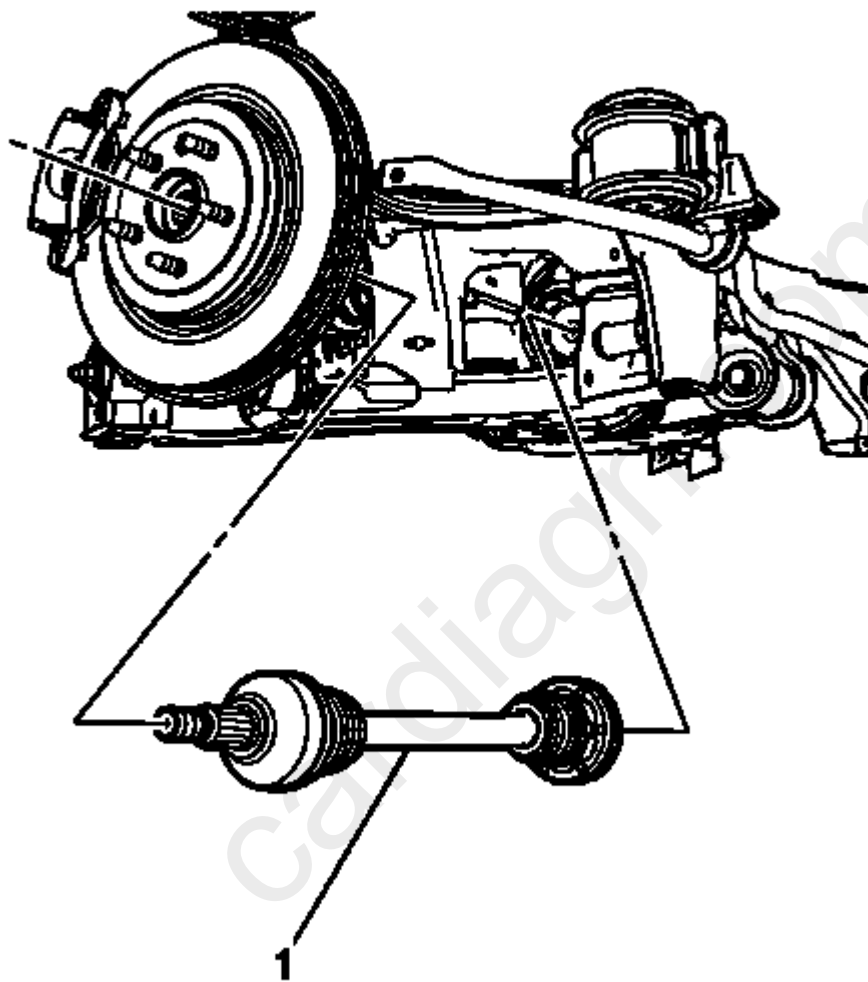


Fig. 27: View of Wheel Drive Shaft and Knuckle Assembly
Courtesy of GENERAL MOTORS COMPANY

2. Install the wheel drive shaft (1) in the vehicle.

NOTE: The following service procedure applies only to the CTSV series vehicles, ONLY.

3. Install the knuckle assembly. Refer to **Knuckle Replacement** .

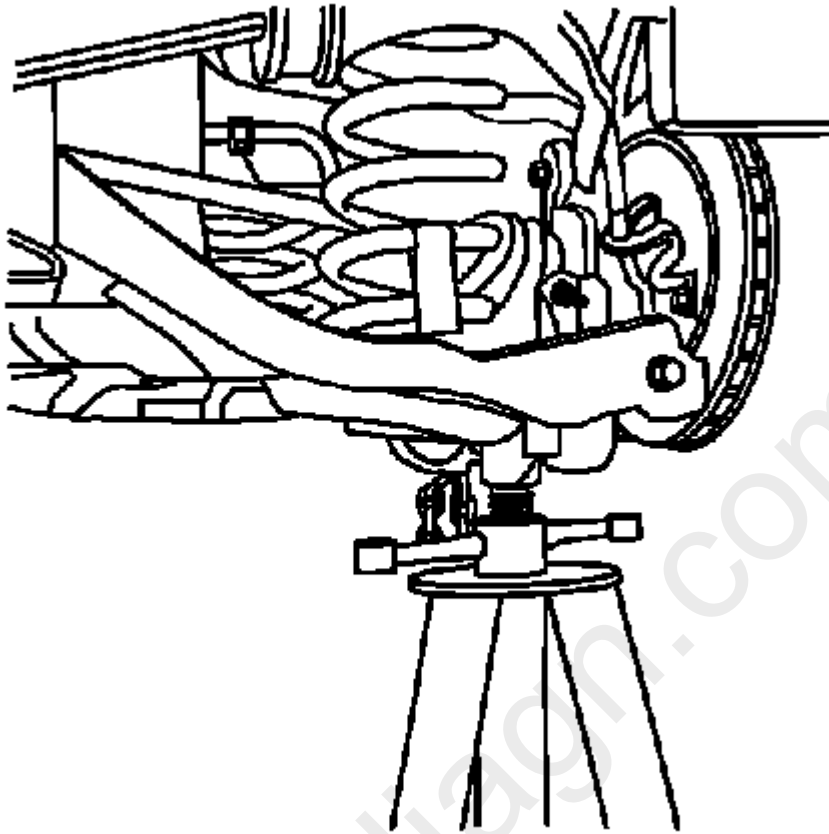


Fig. 28: Supporting Lower Control Arm
Courtesy of GENERAL MOTORS COMPANY

4. Remove the support from the knuckle.

NOTE: Ensure that there are no gaps in the threadlocker along the length of the filled area of the wheel drive shaft threads. Allow the threadlocker to cure approximately 10 minutes before installation of the wheel drive shaft nut.

5. Apply threadlocker to the wheel drive shaft threads (1). Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

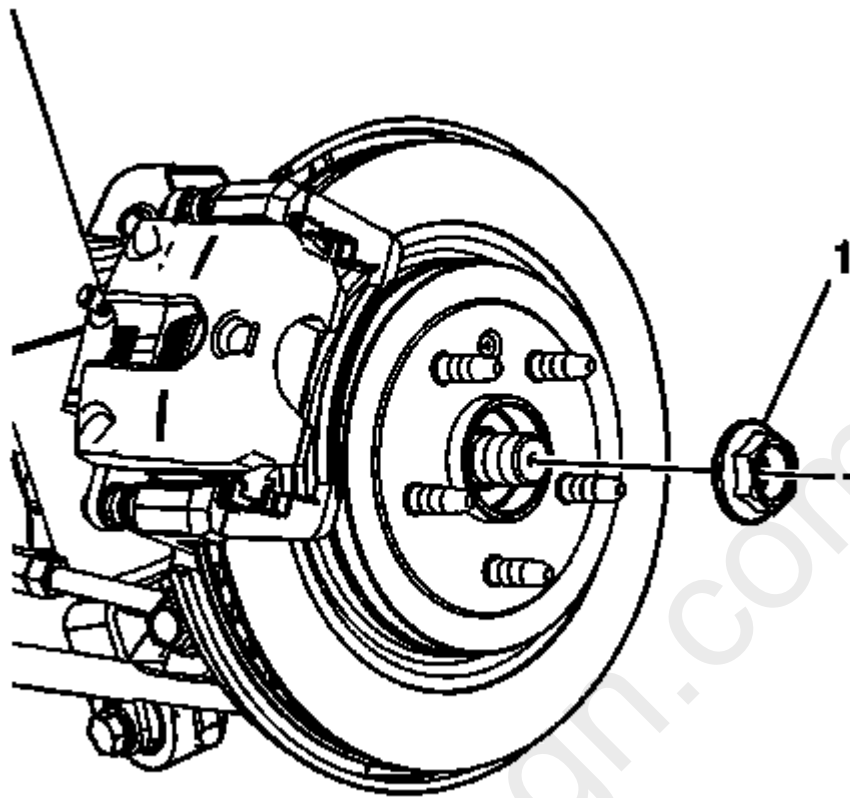


Fig. 29: Identifying Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft nut. Discard and replace with NEW only.

6. Hand start the NEW wheel drive shaft retaining nut (1).

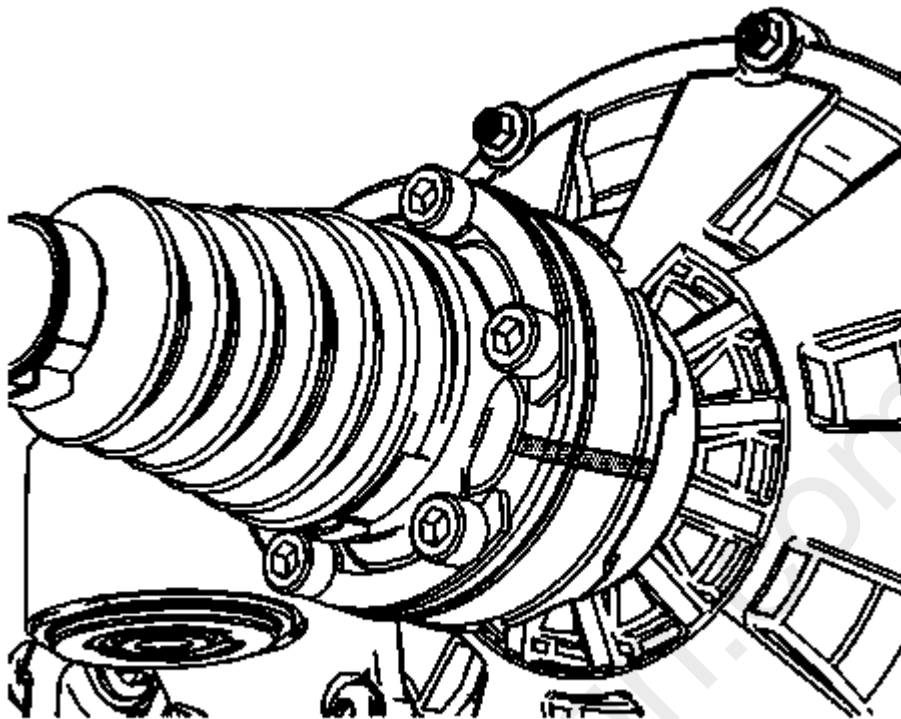


Fig. 30: View of Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

7. Align the reference marks on the wheel drive shaft and the output shaft flange.

NOTE: If reusing the wheel drive shaft bolts, the threads must be free of debris prior to the application of the threadlocker to ensure the proper adhesion and retention.

8. Thoroughly clean the threads using denatured alcohol or equivalent and allow to dry.

NOTE: Ensure that there are no gaps in the threadlocker along the length of the filled area of the bolt. Allow the threadlocker to cure approximately 10 minutes before installation of the bolts.

9. Apply threadlocker to the wheel drive shaft bolts. Refer to Adhesives, Fluids, Lubricants, and Sealers.

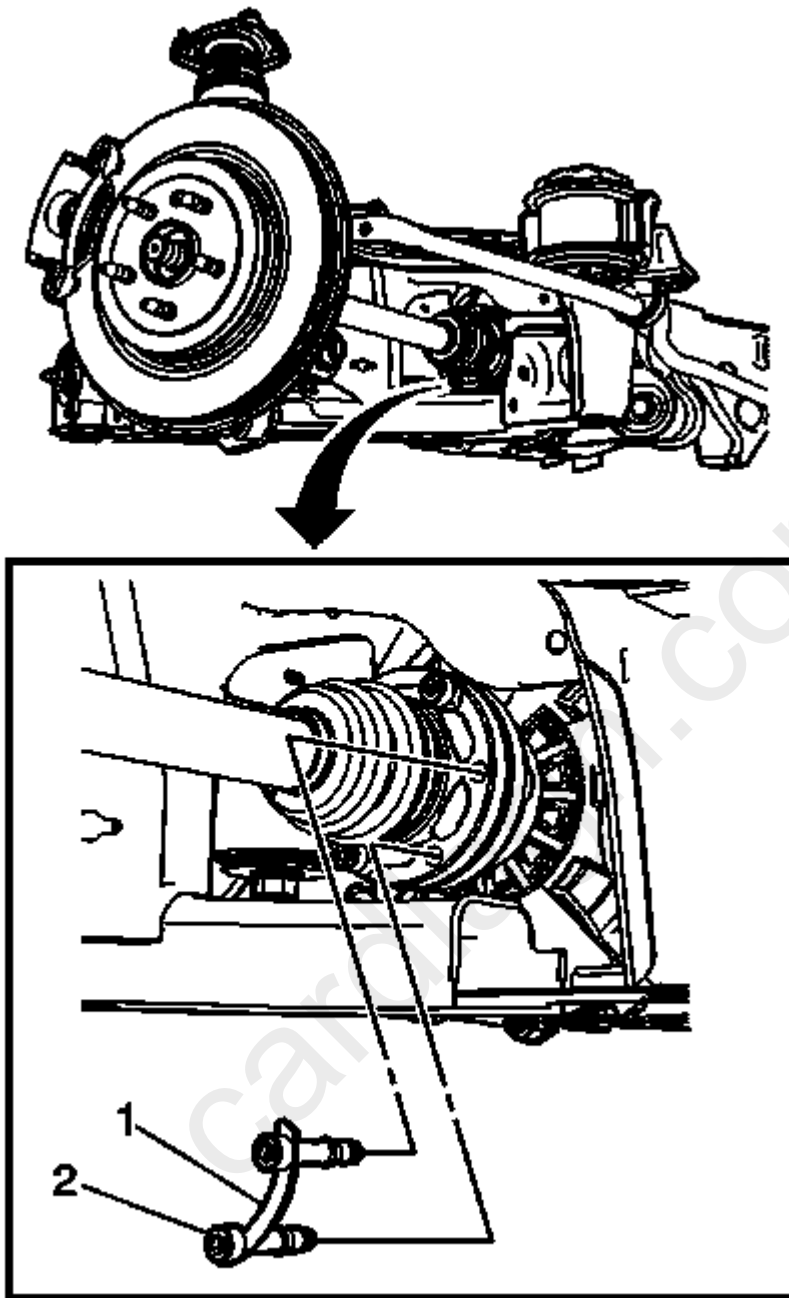


Fig. 31: Identifying Differential Drive Flange Mounting Bolts and Spacer
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

10. Install the mounting bolts (2) and spacer (1) on the differential drive flange and tighten to 80 N.m (59 lb ft).

11. For vehicles with RPO J56, proceed to step 12. For those without RPO J56, proceed to step 15.

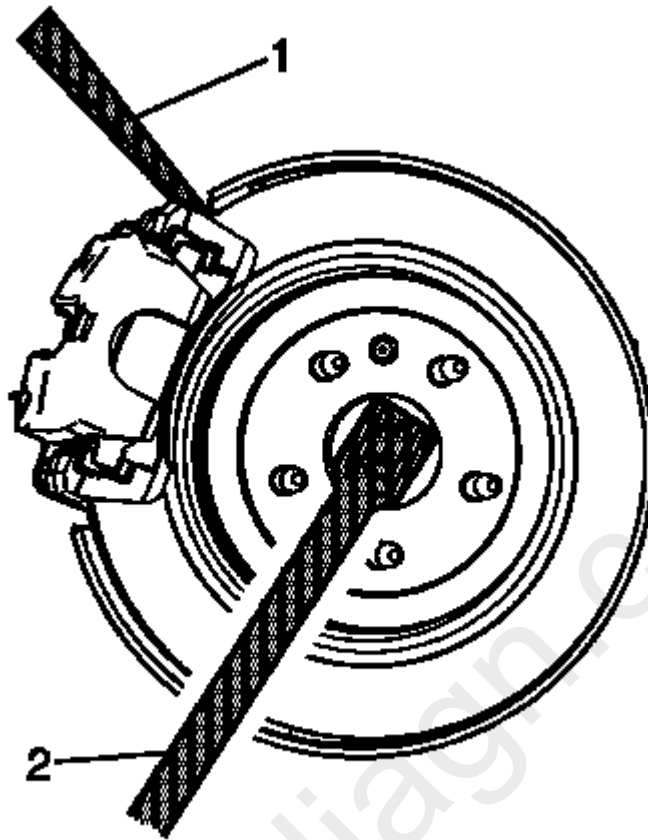


Fig. 32: View of Drift Punch and Breaker Bar
Courtesy of GENERAL MOTORS COMPANY

12. Insert a drift or punch (1) in the brake rotor and the brake caliper bracket.
13. Rotate the brake rotor until the drift or punch (1) is resting against the brake mounting bracket.

NOTE: **Tighten the wheel drive shaft nut slowly to draw the wheel drive shaft into the knuckle prior to tightening to specifications.**

14. For vehicles with RPO code J56, tighten the wheel drive shaft nut to 215 N.m (158 lb ft).

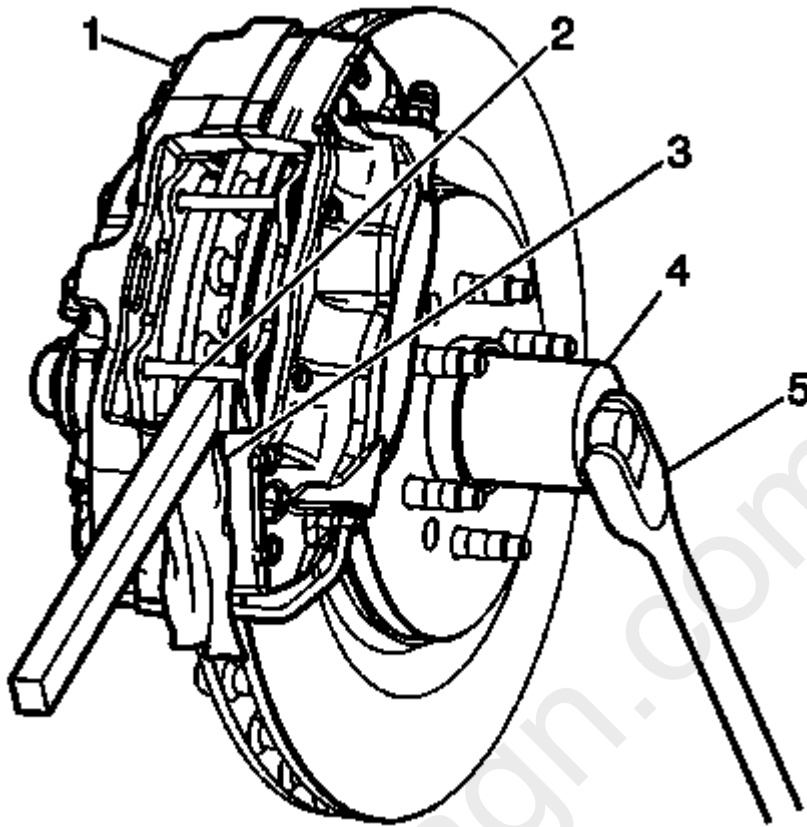


Fig. 33: Inserting Drift Or Punch In Brake Rotor Cooling Fins
Courtesy of GENERAL MOTORS COMPANY

15. Insert a drift or a punch (1) in the brake rotor cooling fins.
16. Place a clean shop towel (2) between the drift or punch and the brake caliper (3).

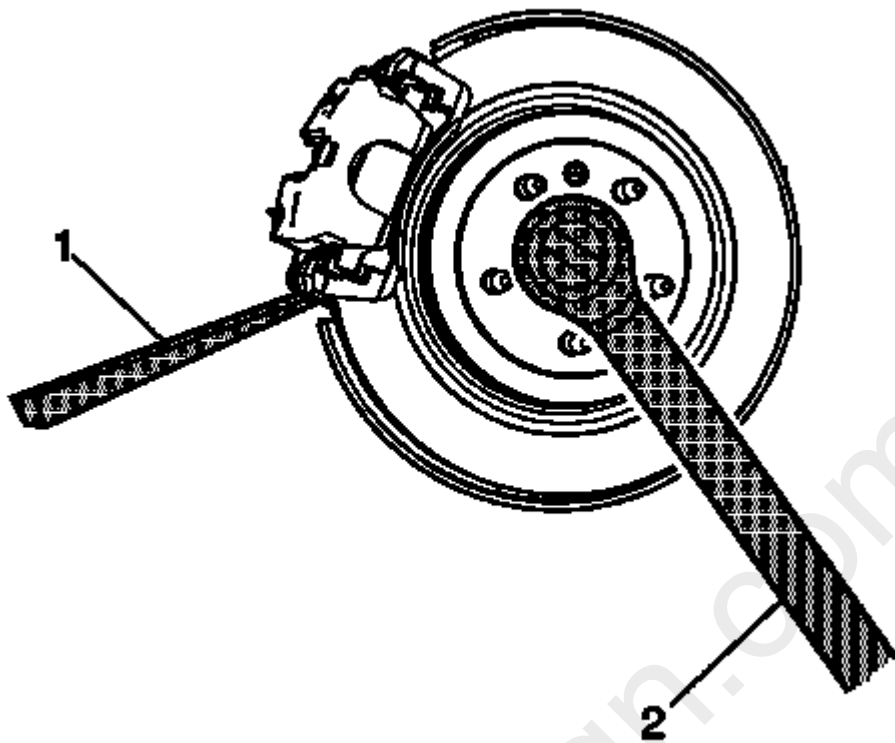


Fig. 34: Identifying Punch in Brake
Courtesy of GENERAL MOTORS COMPANY

17. Rotate the brake rotor until the drift or punch (1) is resting against the brake caliper (3).

NOTE: Tighten the wheel drive shaft nut slowly to draw the wheel drive shaft into the knuckle prior to tightening to specifications.

18. For vehicles without RPO code J56, tighten the wheel drive shaft nut to 230 N.m (170 lb ft).

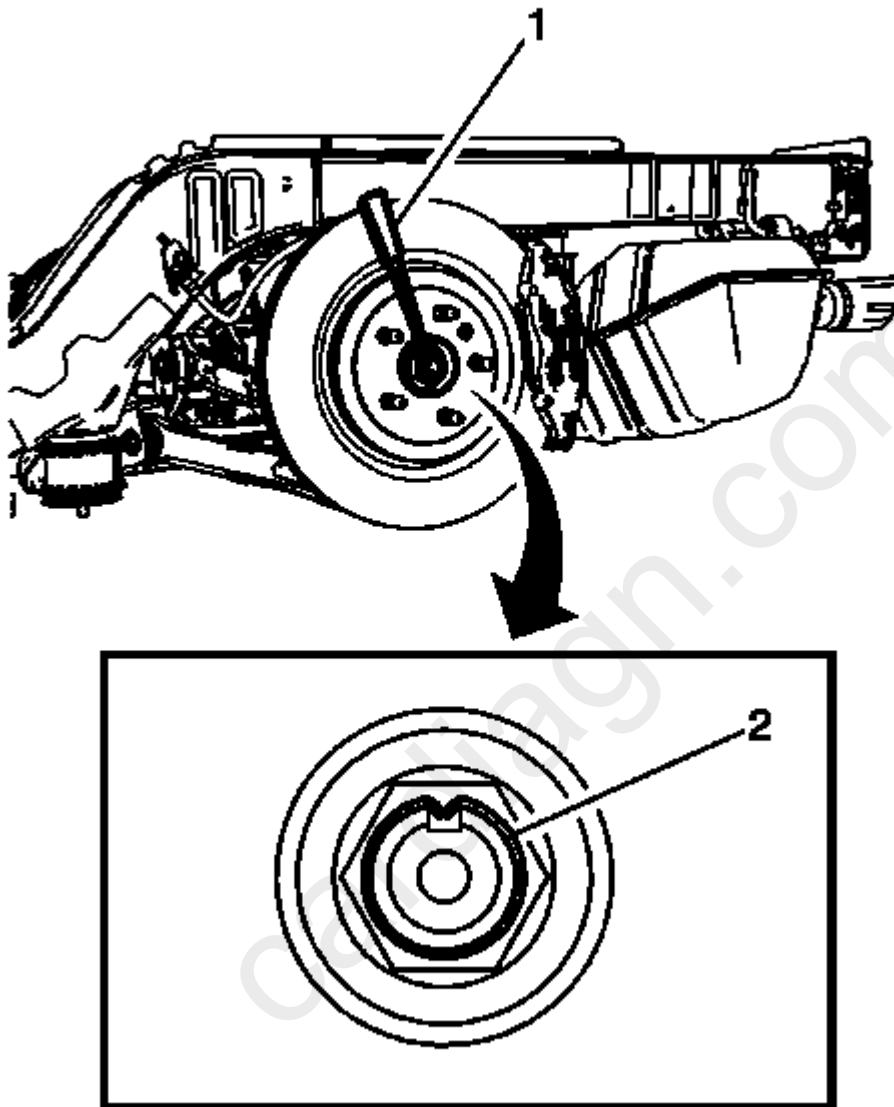


Fig. 35: Drive Shaft Nut Collar & Chisel Tool
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft nut collar should be fractured in the center of the slot of the wheel drive shaft. The fracture in the collar should be approximately 90 degrees to each other.

19. Using a hammer and a chisel (1), stake the wheel drive shaft nut (2) collar into the drive shaft slot.

20. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
21. Remove the support and lower the vehicle.

FRONT WHEEL DRIVE SHAFT INNER JOINT BOOT REPLACEMENT

Special Tools

- **J 35566** Earless Seal Clamp Tool
- **J 42572** Drive Shaft Seal Clamp Pliers

Disassemble Procedure

1. Remove the wheel drive shaft.
 - For the left front wheel drive shaft, refer to **Front Wheel Drive Shaft Replacement - Left Side**.
 - For the right front wheel drive shaft, refer to **Front Wheel Drive Shaft Replacement - Right Side**.

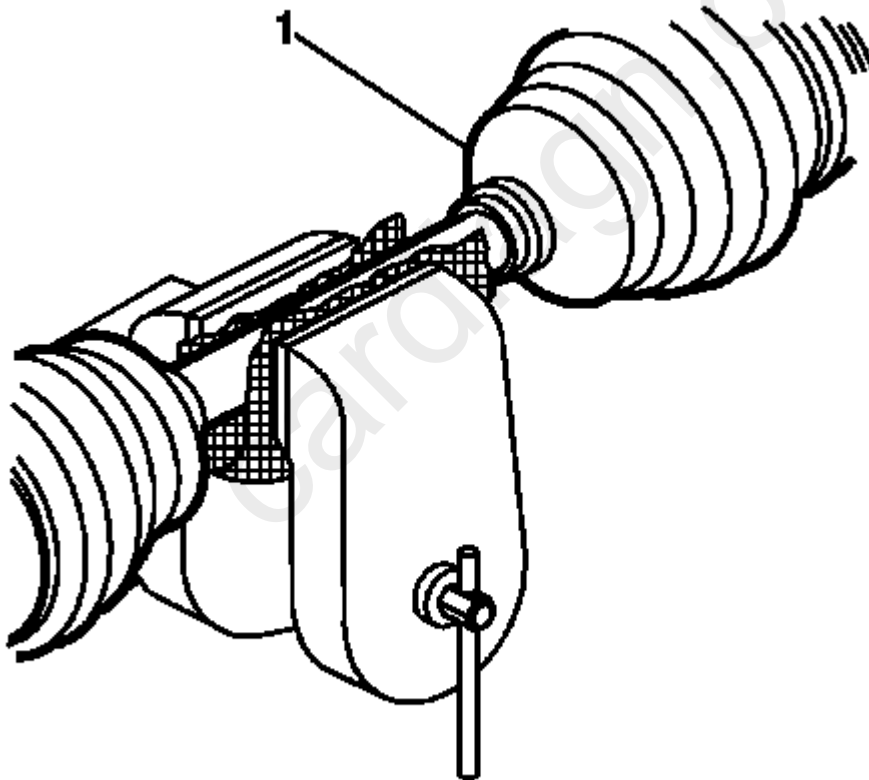


Fig. 36: View Of Front Wheel Drive Shaft Inner Joint
Courtesy of GENERAL MOTORS COMPANY

2. Position wheel drive shaft bar in a soft jawed vise and clamp securely.

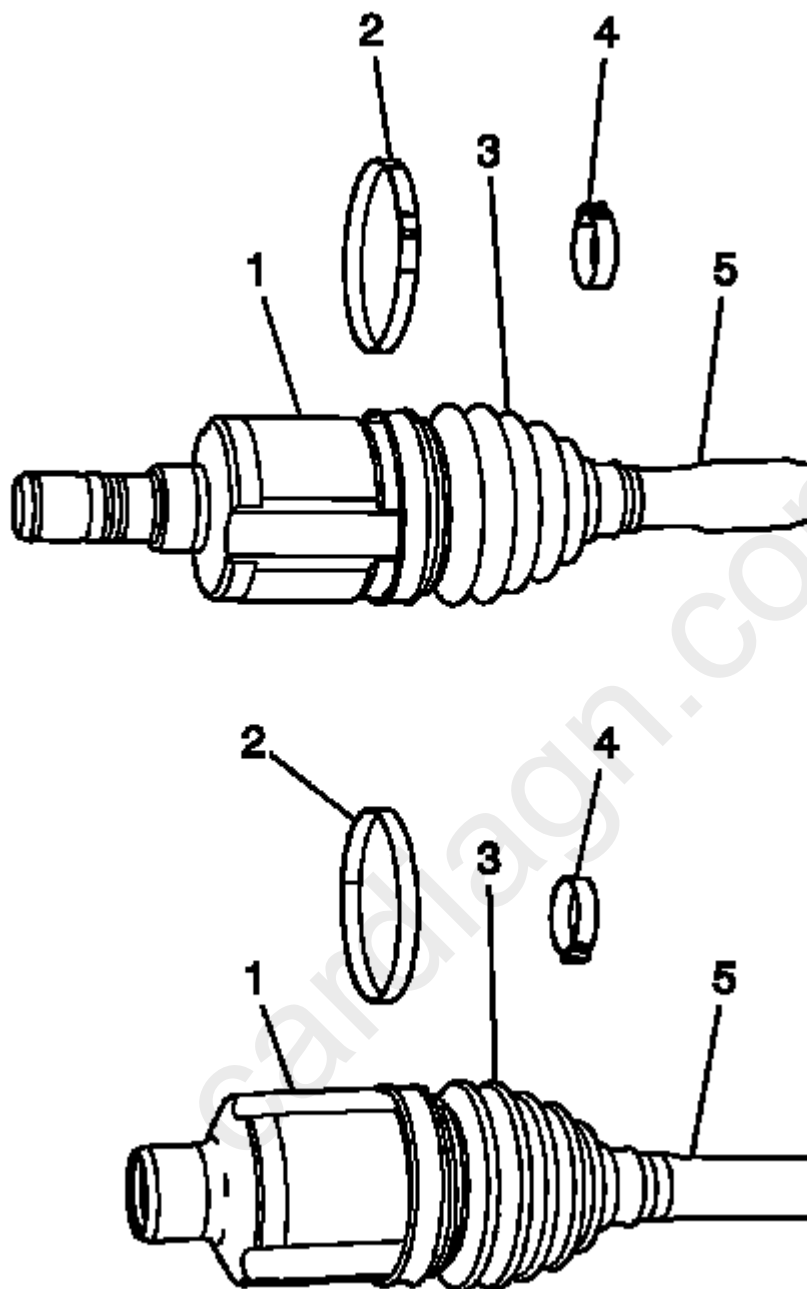


Fig. 37: View Of Wheel Drive Shaft Components
Courtesy of GENERAL MOTORS COMPANY

3. Using a flat-bladed tool, remove boot retaining clamp (2) from the boot (3) for the tripot housing (1).
4. Using side cutters, remove the boot clamp (4) from the boot (3) for the wheel drive shaft (5).

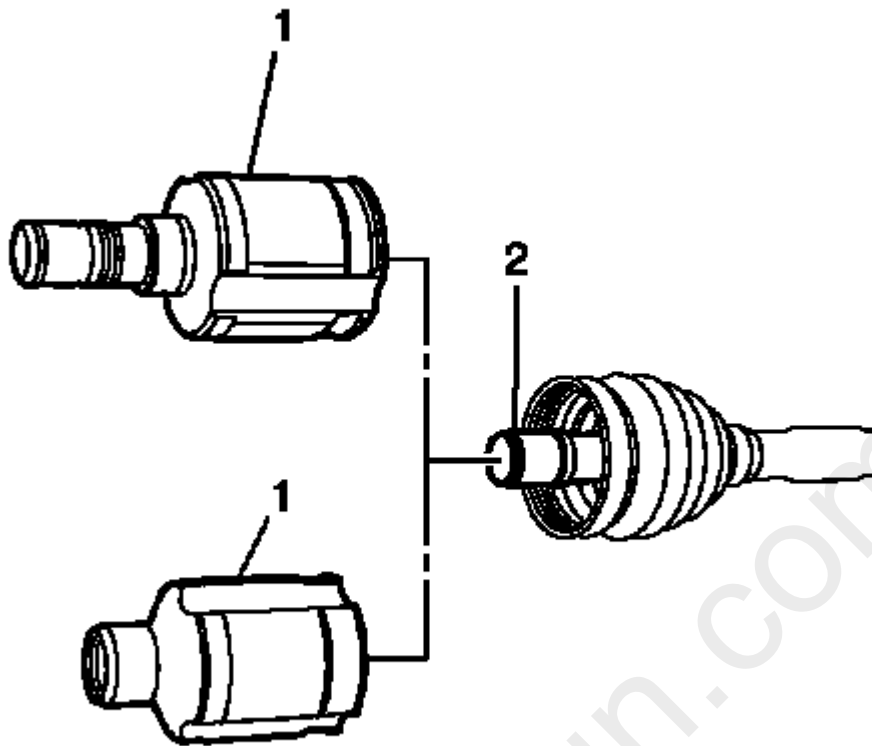


Fig. 38: Identifying Wheel Drive Shaft And Tripod Housing
Courtesy of GENERAL MOTORS COMPANY

5. Remove the tripod housing (1) from the wheel drive shaft (2).

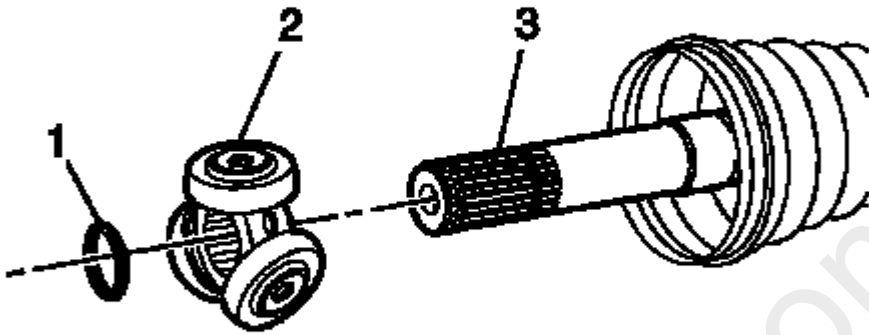


Fig. 39: View Of Wheel Drive Shaft, Tripod Spider And Retaining Clip
Courtesy of GENERAL MOTORS COMPANY

6. Using the appropriate tool, remove the retaining clip (1) and the tripod spider (2) from the wheel drive shaft (3).

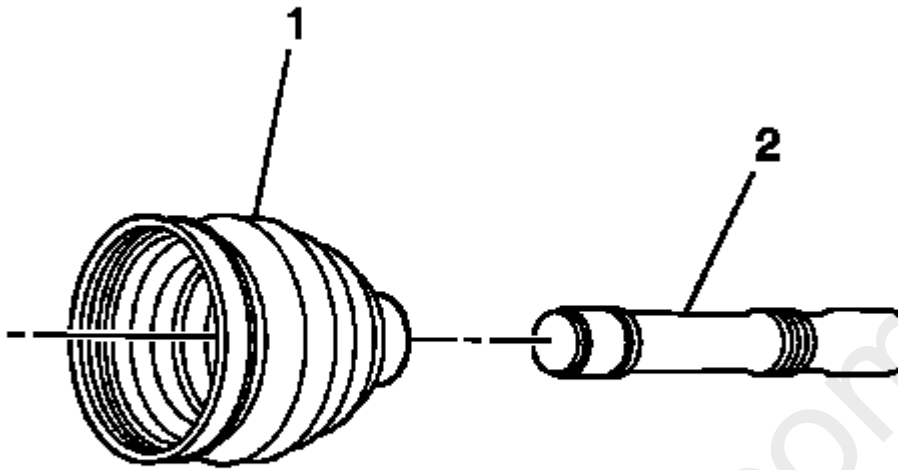


Fig. 40: Identifying Wheel Drive Shaft Boot
Courtesy of GENERAL MOTORS COMPANY

7. Remove the boot (1) from the wheel drive shaft (2).
8. Inspect the wheel drive shaft inner joint for damage and excessive wear. Refer to **Wheel Drive Shaft Inner Joint Inspection**.

Assemble Procedure

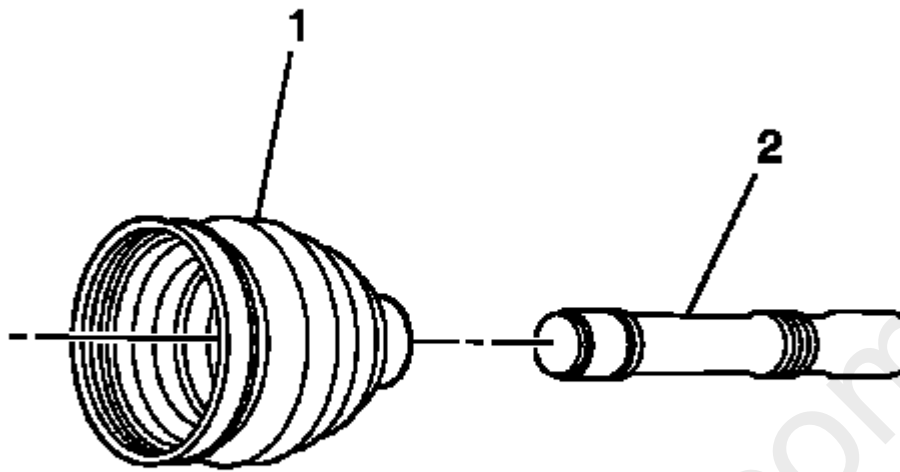


Fig. 41: Identifying Wheel Drive Shaft Boot
Courtesy of GENERAL MOTORS COMPANY

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

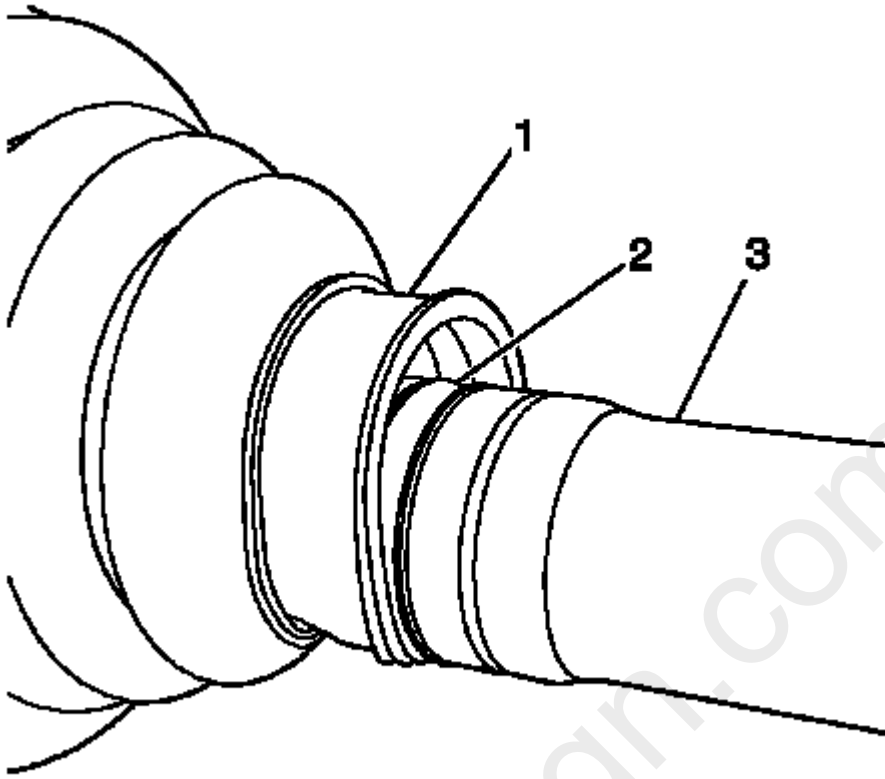


Fig. 42: Identifying Groove In Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

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

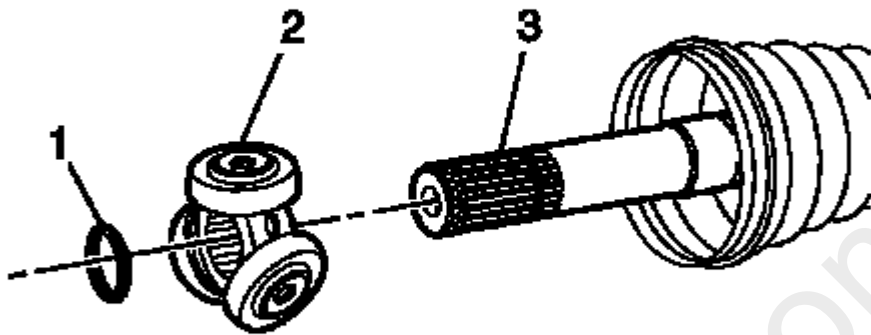


Fig. 43: View Of Wheel Drive Shaft, Tripod Spider And Retaining Clip
Courtesy of GENERAL MOTORS COMPANY

3. Install the tripod spider assembly (2) to the wheel drive shaft (3), until seated against shoulder.
4. Using the appropriate tool, install the retaining ring (1) in the wheel drive shaft.
5. Using the **J 42572** clamp tool , breaker bar and a ratchet wrench (1), close the boot clamp until the gap (3) measures 1.0 mm (0.040 in).

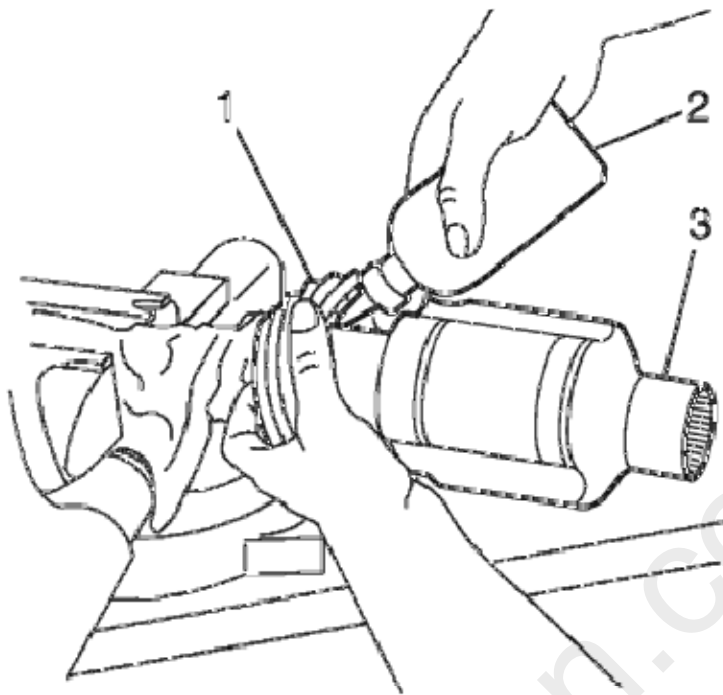


Fig. 44: Place Approximately Half Container Of Grease From Service Kit In Boot And Then Half In Tripod Housing

Courtesy of GENERAL MOTORS COMPANY

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

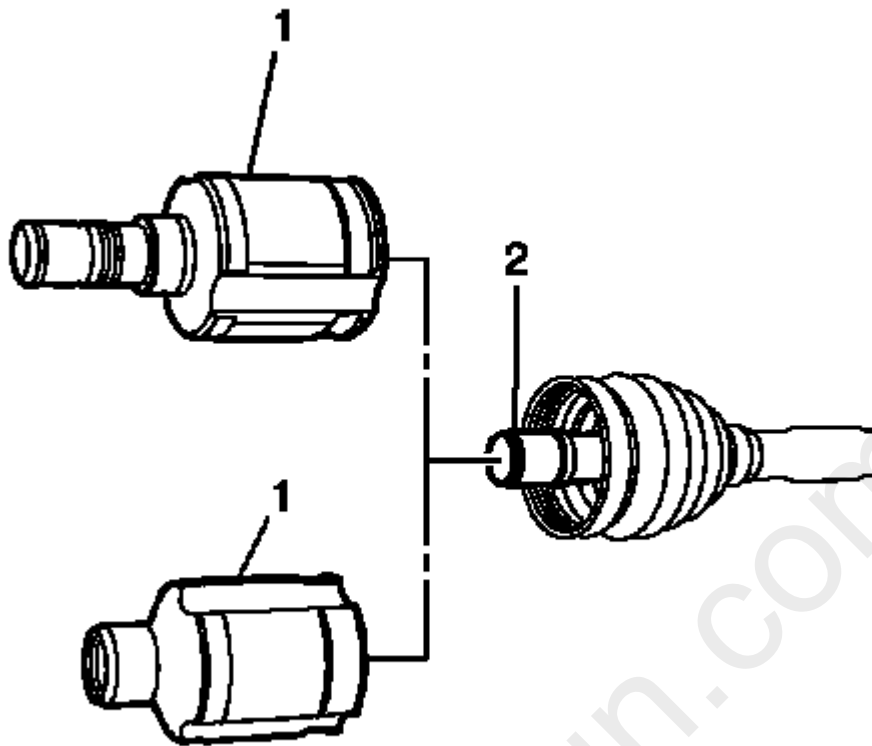


Fig. 45: Identifying Wheel Drive Shaft And Tripod Housing
Courtesy of GENERAL MOTORS COMPANY

7. Install the tripod housing (1) on the wheel drive shaft (2).

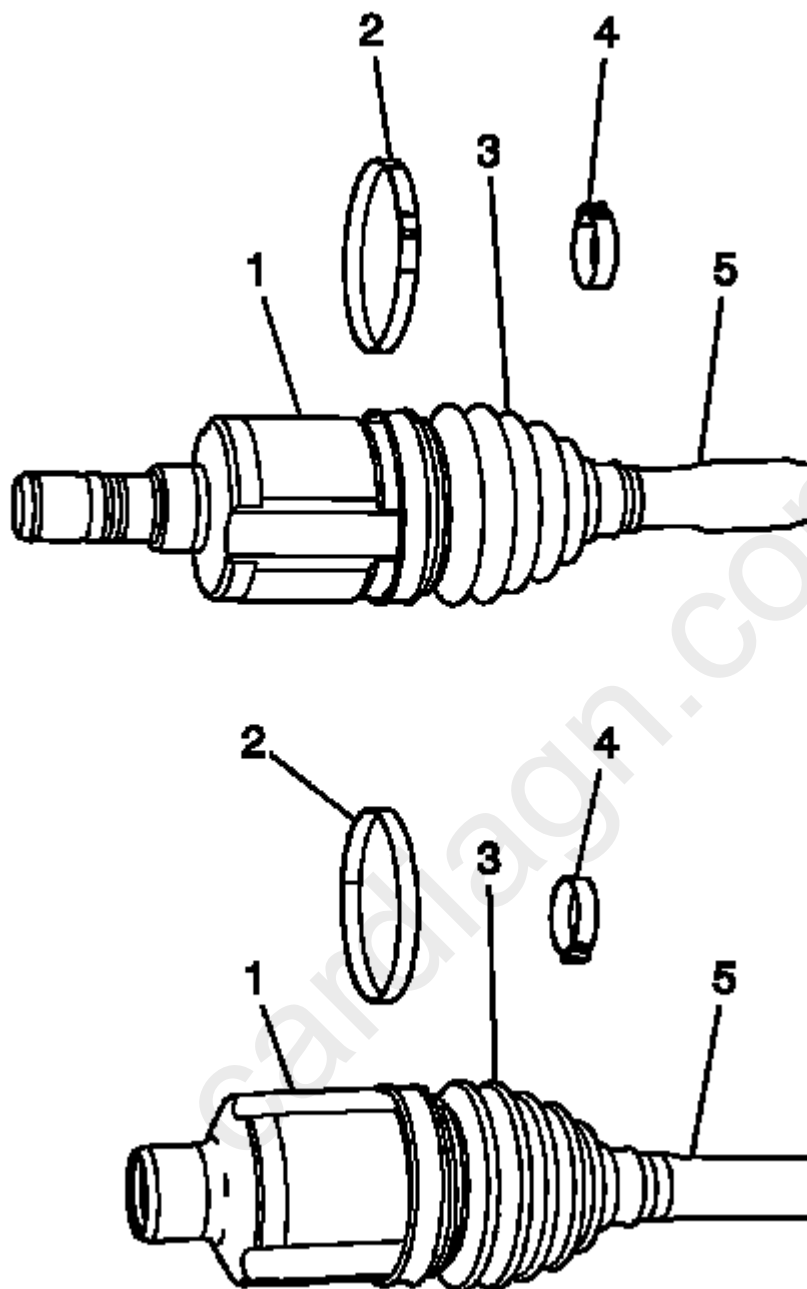


Fig. 46: View Of Wheel Drive Shaft Components
Courtesy of GENERAL MOTORS COMPANY

8. Install the boot clamp (2) on the boot (3) for the tripot housing (1).
9. Install the boot clamp (4) on the boot (3) for the wheel drive (5).

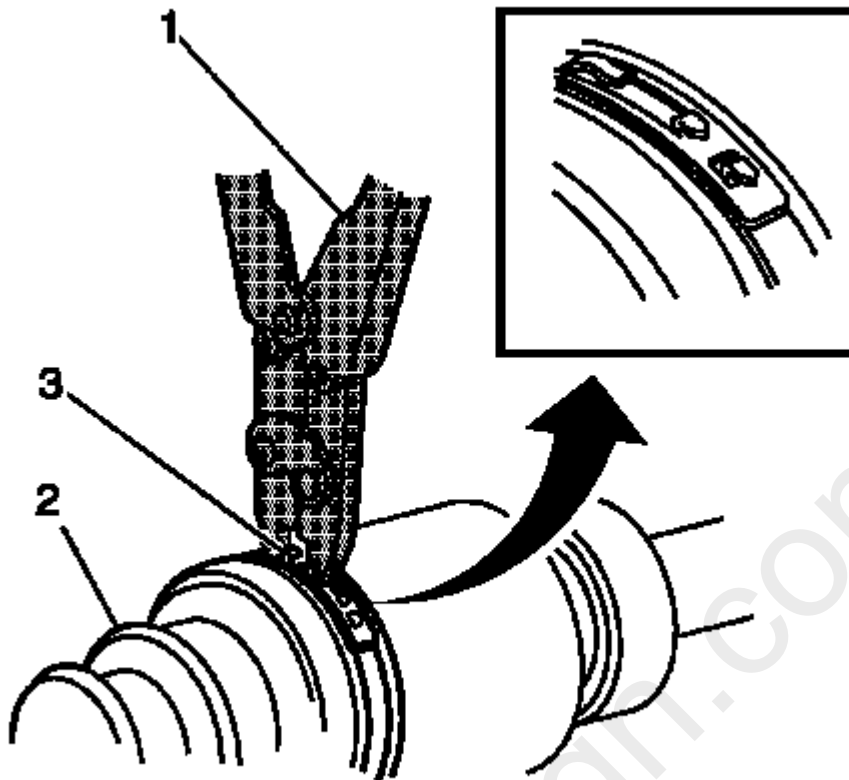


Fig. 47: Latching Large Seal Retaining Clamp
 Courtesy of GENERAL MOTORS COMPANY

10. Using the **J 35566** clamp tool (1), close the and lock boot clamp (3).
11. Remove any excess lubricant from the wheel drive shaft.
12. Move the tripot housing assembly in a manner in order to distribute the lubricant in the tripot joint.
13. Install the wheel drive shaft.
 - For the left front wheel drive shaft, refer to **Front Wheel Drive Shaft Replacement - Left Side.**
 - For the right front wheel drive shaft, refer to **Front Wheel Drive Shaft Replacement - Right Side.**

REAR WHEEL DRIVE SHAFT INNER JOINT BOOT REPLACEMENT

Special Tools

- **J 22928-B** Seal Installer
- **J 38734** Intermediate Spring Compressor.
- **J 42572** Drive Shaft Seal Clamp Pliers.

Disassemble Procedure

1. Remove the rear wheel drive shaft from the vehicle. Refer to Rear Wheel Drive Shaft Replacement.

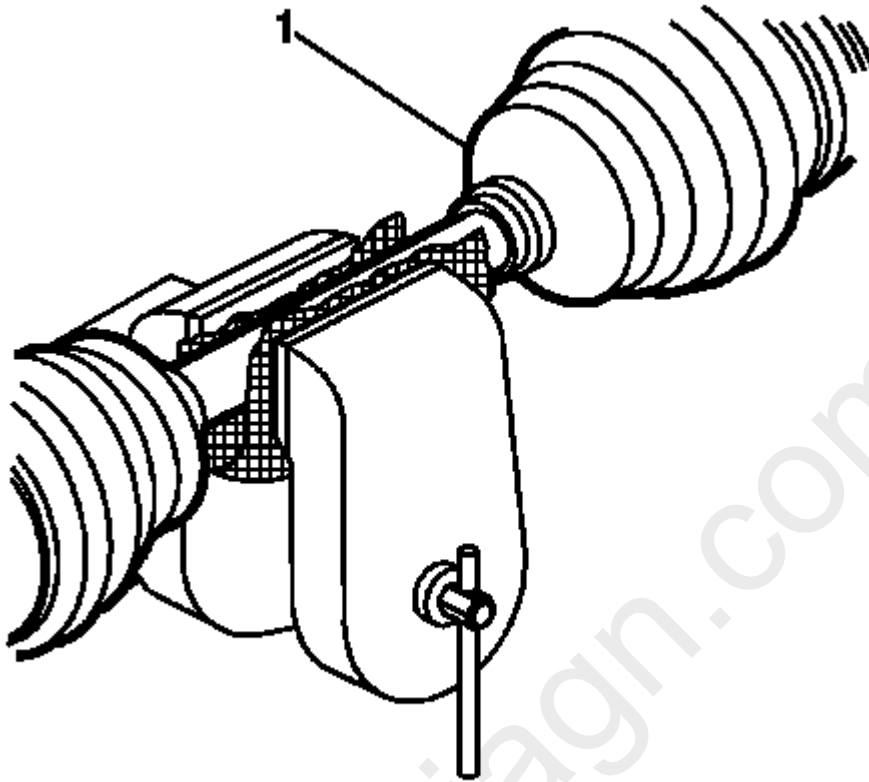


Fig. 48: View Of Front Wheel Drive Shaft Inner Joint
Courtesy of GENERAL MOTORS COMPANY

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

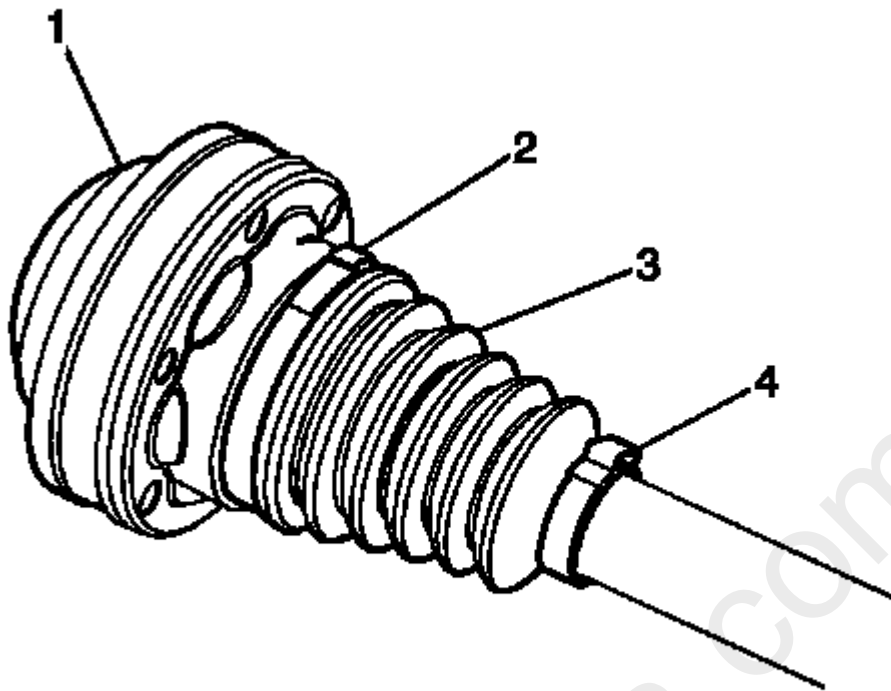


Fig. 49: Identifying Joint Boot with Clamps
Courtesy of GENERAL MOTORS COMPANY

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 side cutter or other suitable tool, remove and discard the boot clamps (2) and (4) from the boot (3).
4. Remove the boot (3) from the CV joint (1) and wheel drive shaft.

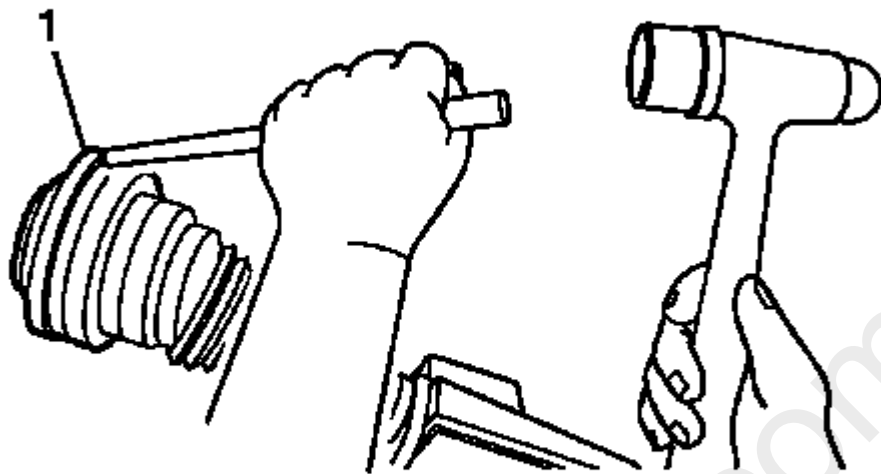


Fig. 50: View of Grease Cover of Joint
Courtesy of GENERAL MOTORS COMPANY

5. Using a hammer and a punch, remove and discard the cap (1) from the CV joint.

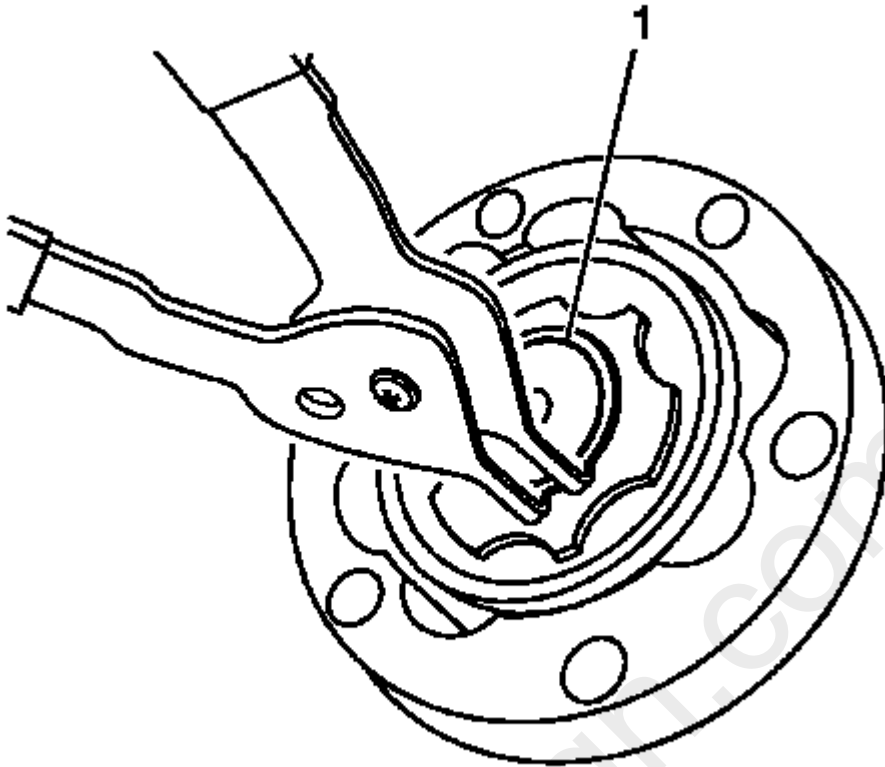


Fig. 51: View of Snap Ring Pliers & Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

NOTE: If water or any other contaminants are found to be in the inner components and the ball bearings have a dull or pitted finish to them, replace the rear wheel drive shaft assembly. None of the inner components are serviced.

6. Remove the grease from the face of the joint inner race, cage, balls, etc.
7. Using snap ring pliers, remove the joint race retaining ring (1).

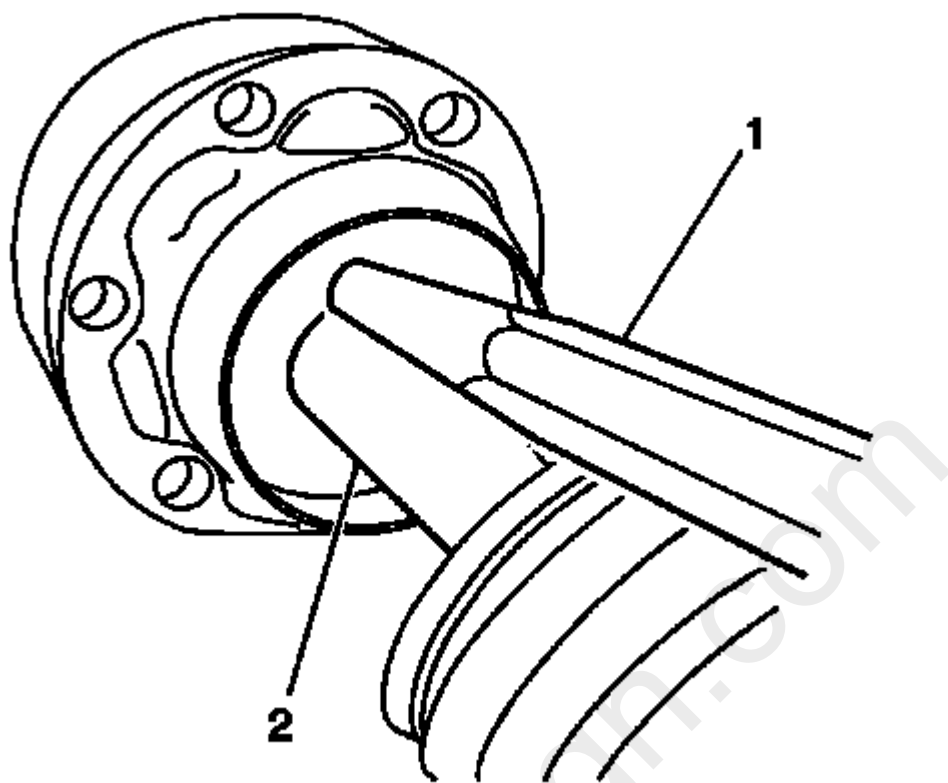


Fig. 52: Identifying Position of Brass Drift
Courtesy of GENERAL MOTORS COMPANY

8. Using a hammer and a brass drift, remove the inner CV joint assembly (2).
9. Remove the boot from the wheel drive shaft.
10. Inspect the inner CV joint. Refer to **Wheel Drive Shaft Inner Joint Inspection.**

Assemble Procedure

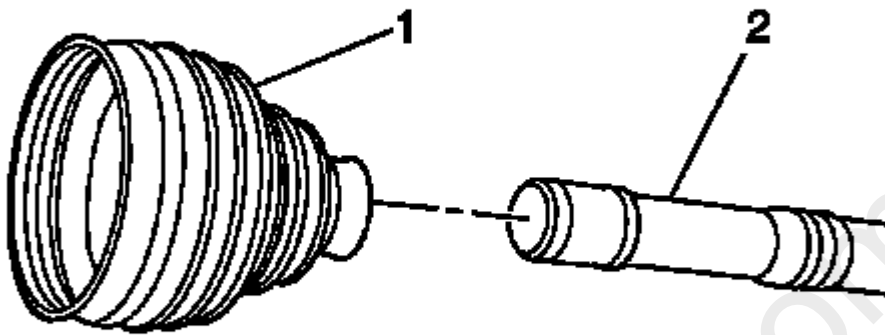


Fig. 53: Identifying Clamp & Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

NOTE: The boot clamps that are stamped 42.5 for the right side and 45.5 for the left are for the CTS-V ONLY.

1. Install the inner boot and clamp (1) and the wheel drive shaft (2).
2. Apply half of the lubricant from the service pack in the boot.

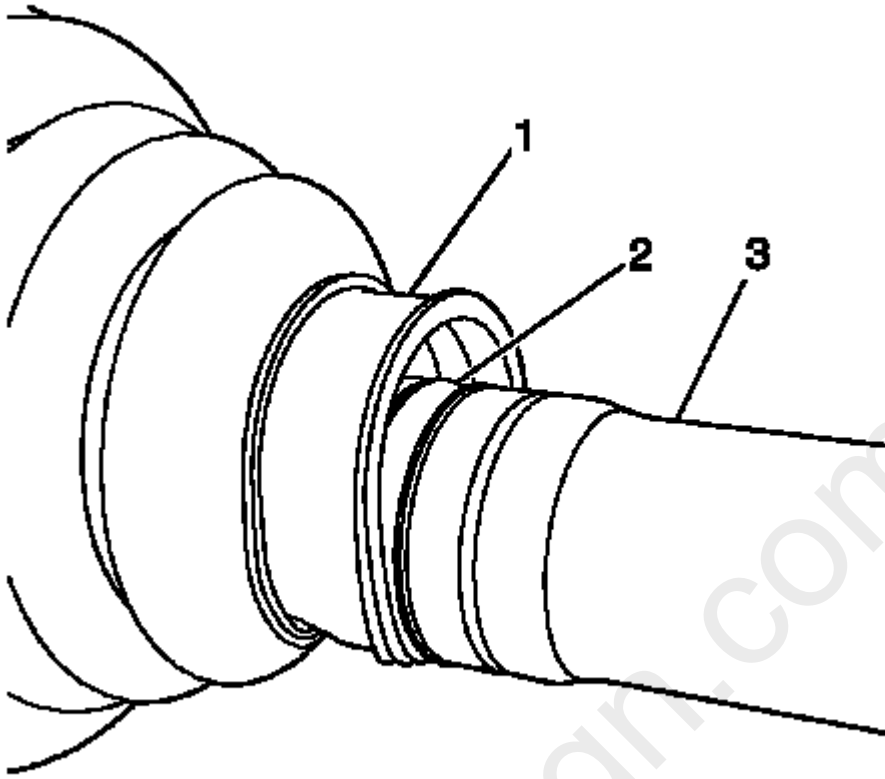


Fig. 54: Identifying Groove In Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

3. Ensure that the boot (1) is properly seated in the grooved (2) wheel drive shaft (3).
4. Using a block of wood or a brass drift, install the CV joint on the wheel drive shaft.

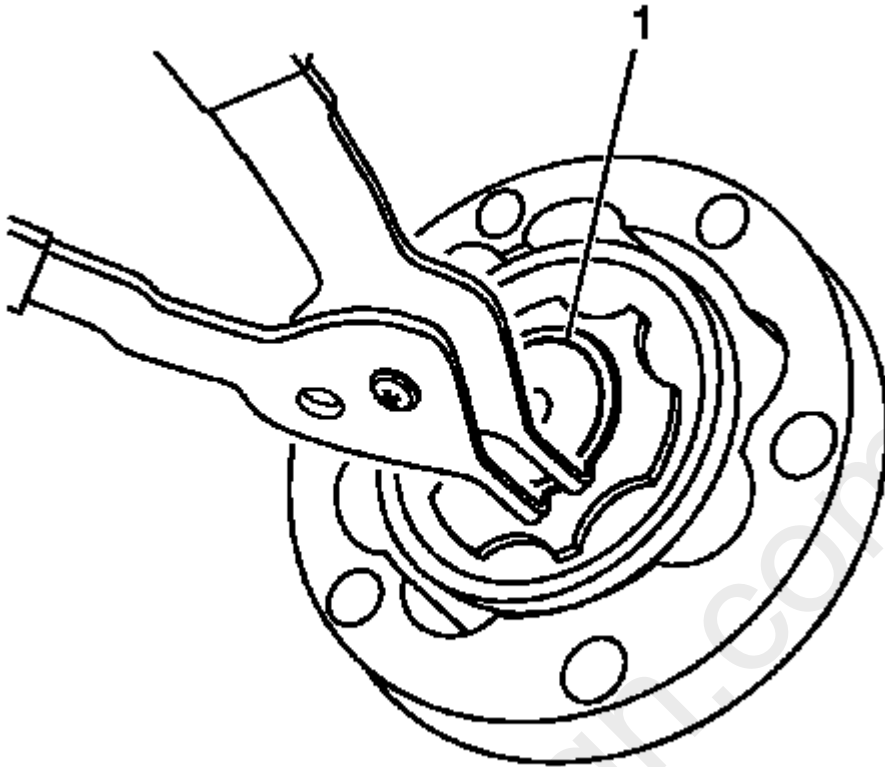


Fig. 55: View of Snap Ring Pliers & Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

5. Using a pair of snap ring pliers, install the new retaining ring (1) for the CV joint.

NOTE: **Ensure that all of the internal components are lubricated.**

6. Apply the remaining half of the lubricant in the ball bearings and the cage of the CV joint between the CV joint and the grease cap.

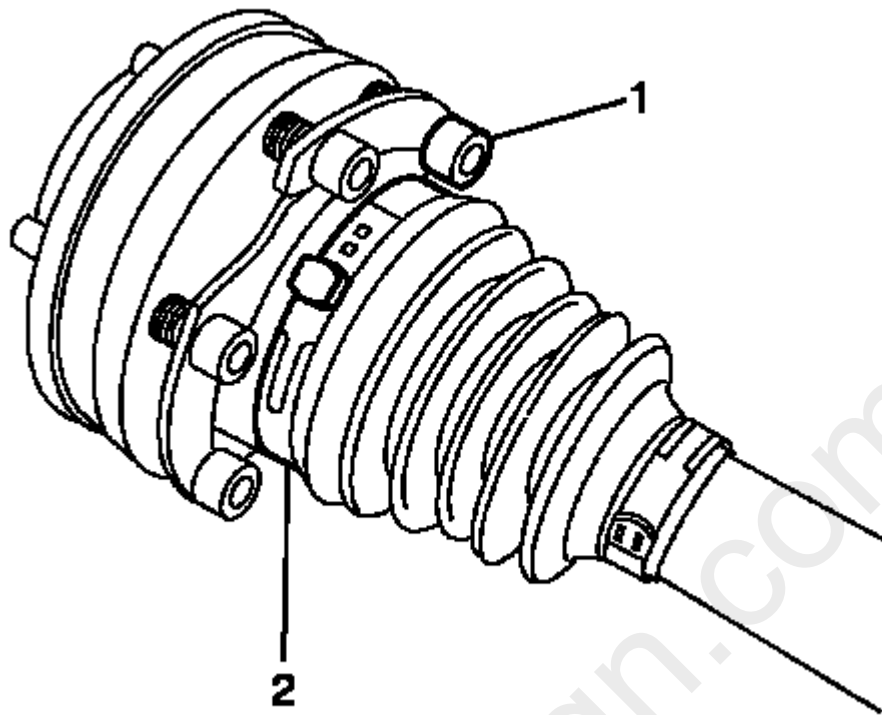


Fig. 56: Identifying Clamp on Boot Joint
Courtesy of GENERAL MOTORS COMPANY

NOTE: The outer boot clamps that are stamped 74.7 are for the CTS-V ONLY.

7. Install the outer boot clamp on the boot (2).
8. Before crimping the clamp (2), position the clamp between the bolts and washers (1) to allow for the bolt installation and removal.
9. Inspect the boot for the proper shape. If the boot is not shaped correctly, equalize the pressure in the boot by lifting the boot edge slightly and reshape the boot properly by hand.
10. Inspect the boot for damage. If the boot was damaged during assembly, replace the boot.

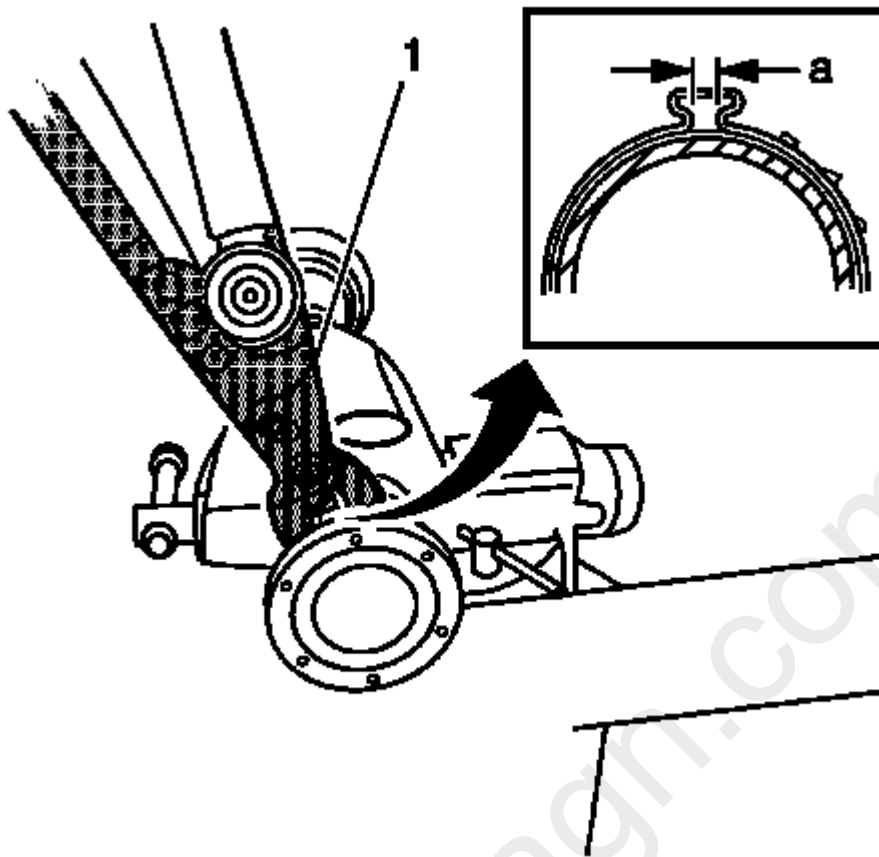


Fig. 57: View of Clamp on Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

11. Using the **J 42572** pliers (1), close the inner and outer boot clamps until the gap (a) in the clamp measures 1.0 (0.040 in).
12. Using an alcohol based solvent, remove any lubricant or sealant from the cap and allow to air dry.
13. Apply a 3 mm (0.118 in) bead of the sealant on the inside diameter of the of the CV joint face. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.
14. For the CTS proceed to step 15. For the CTS-V, proceed to step 16.

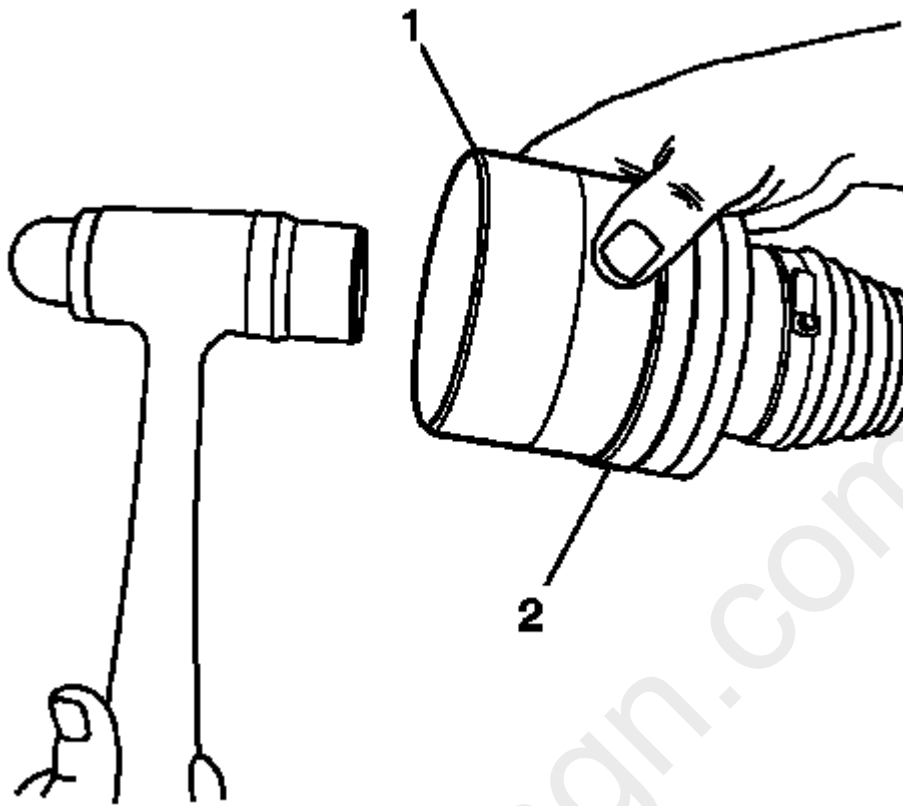


Fig. 58: Identifying Grease Cap And Inner Housing
Courtesy of GENERAL MOTORS COMPANY

15. Using the J 22928-B installer (1) and a hammer, install the grease cap (2) on the inner housing.

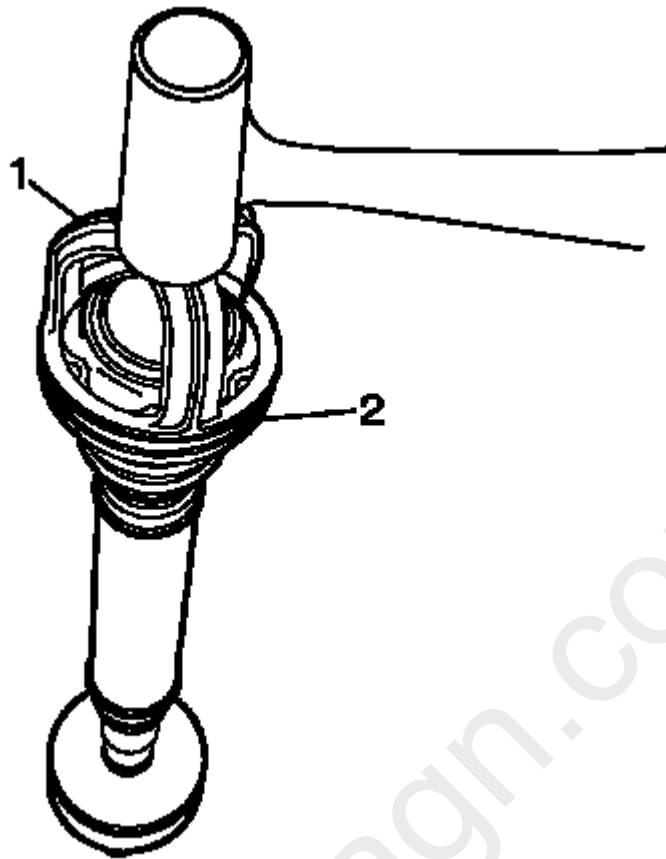


Fig. 59: View Of CV Joint Cap & Compressor
Courtesy of GENERAL MOTORS COMPANY

NOTE: **Align the holes for the mounting fasteners in the cap and the CV joint.**

16. Using the **J 38734** compressor (1) and a hammer, install the NEW CV joint cap (2).
17. Rotate the inner joint 4 or 5 times in a circular motion to distribute the lubricant and check the operation of the joint.
18. Remove any excess lubricant from the wheel drive shaft assembly.
19. Install the wheel drive shaft . Refer to **Rear Wheel Drive Shaft Replacement**.

FRONT WHEEL DRIVE SHAFT OUTER JOINT BOOT REPLACEMENT

Special Tools

J 42572 Drive Axle Seal Clamp Pliers

Disassemble Procedure

1. Remove the wheel drive shaft from the vehicle.

- For the left side, refer to **Front Wheel Drive Shaft Replacement - Left Side.**
- For the right side, refer to **Front Wheel Drive Shaft Replacement - Right Side.**

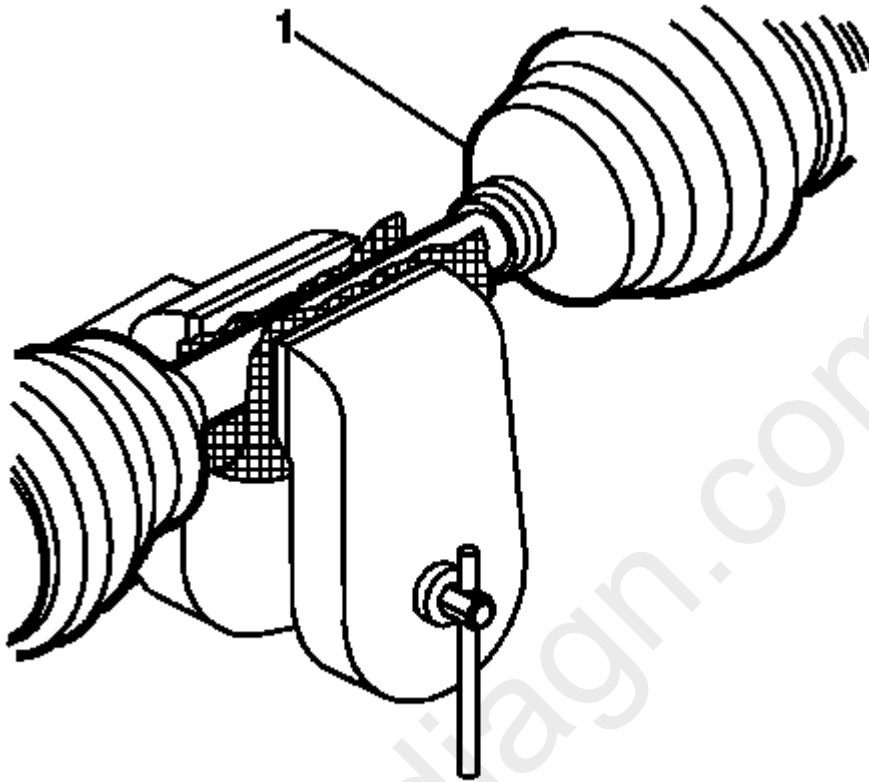


Fig. 60: View Of Front Wheel Drive Shaft Inner Joint
Courtesy of GENERAL MOTORS COMPANY

2. Install the drive axle shaft in a soft jawed vice.

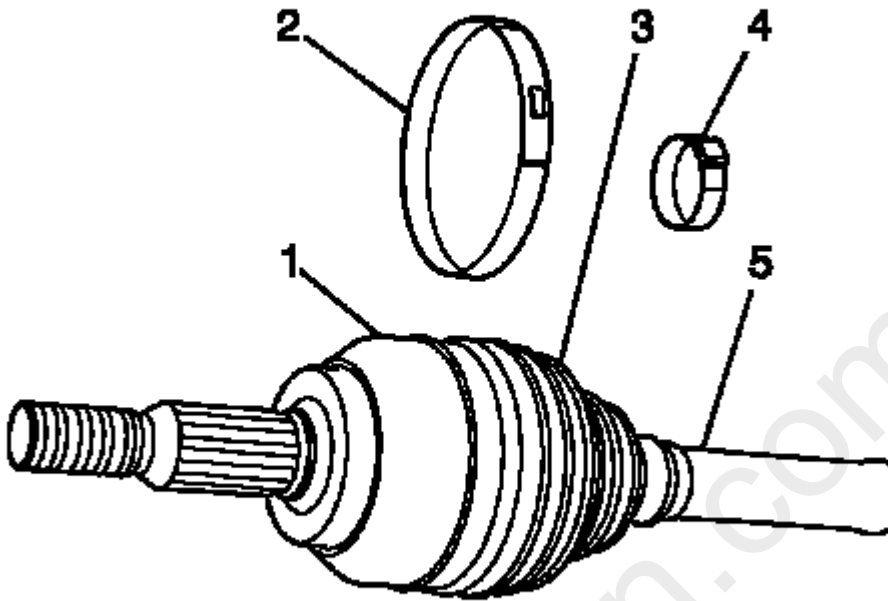


Fig. 61: Identifying Boot Clamps

Courtesy of GENERAL MOTORS COMPANY

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. Use a flat-bladed tool, remove the boot clamp (2) from the constant velocity (CV) joint (1) and the boot (3).
4. Using a pair of side cutters, remove the boot clamp (4) from the boot (3) and the wheel drive shaft (5).
5. Discard the boot clamps (2) and (4). Use NEW clamps only.

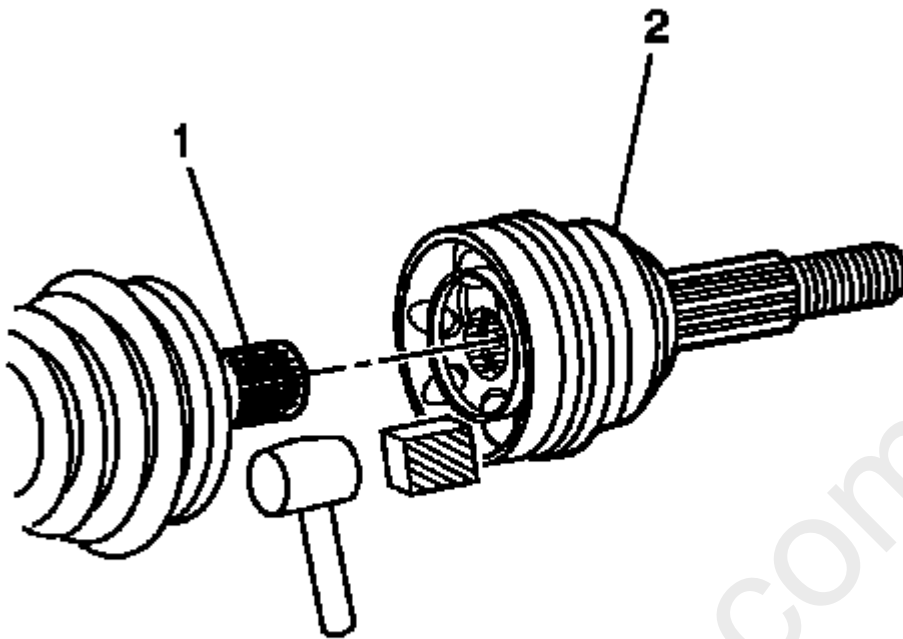


Fig. 62: Separating CV Joint From Axle Shaft
Courtesy of GENERAL MOTORS COMPANY

6. Using a block of wood and a hammer, remove the CV joint (2) from the wheel drive shaft (1).

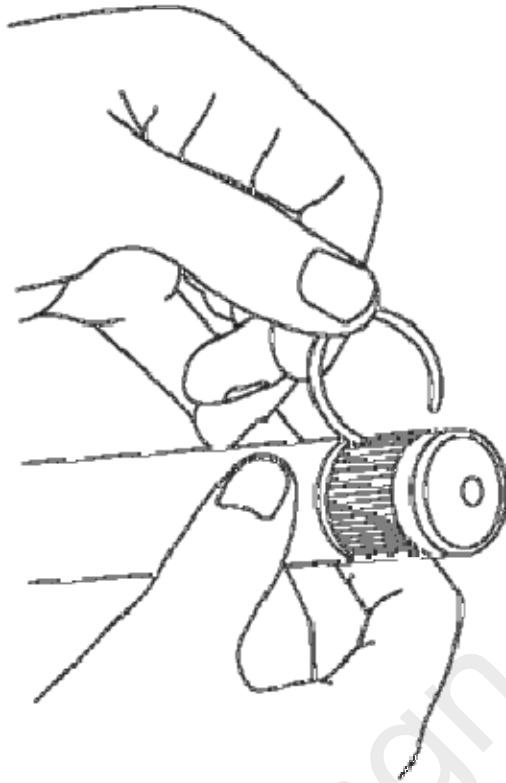


Fig. 63: View Of Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

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

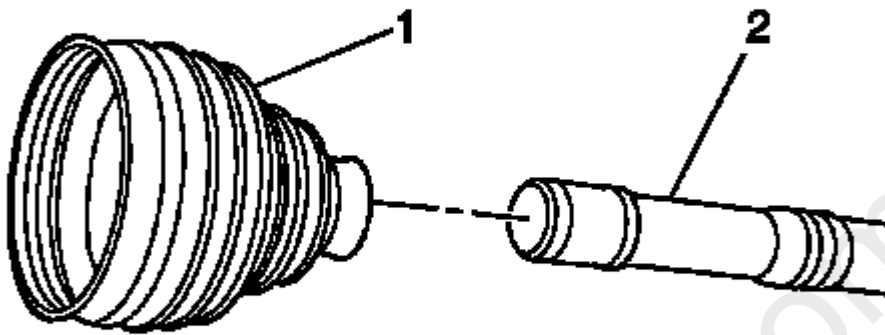


Fig. 64: Identifying Clamp & Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

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

Assemble Procedure

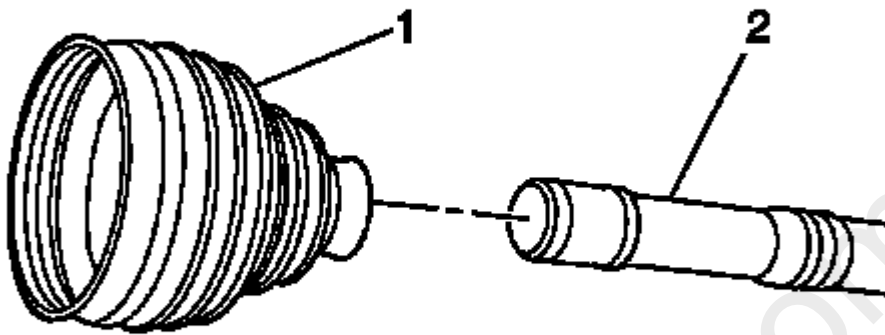


Fig. 65: Identifying Clamp & Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

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

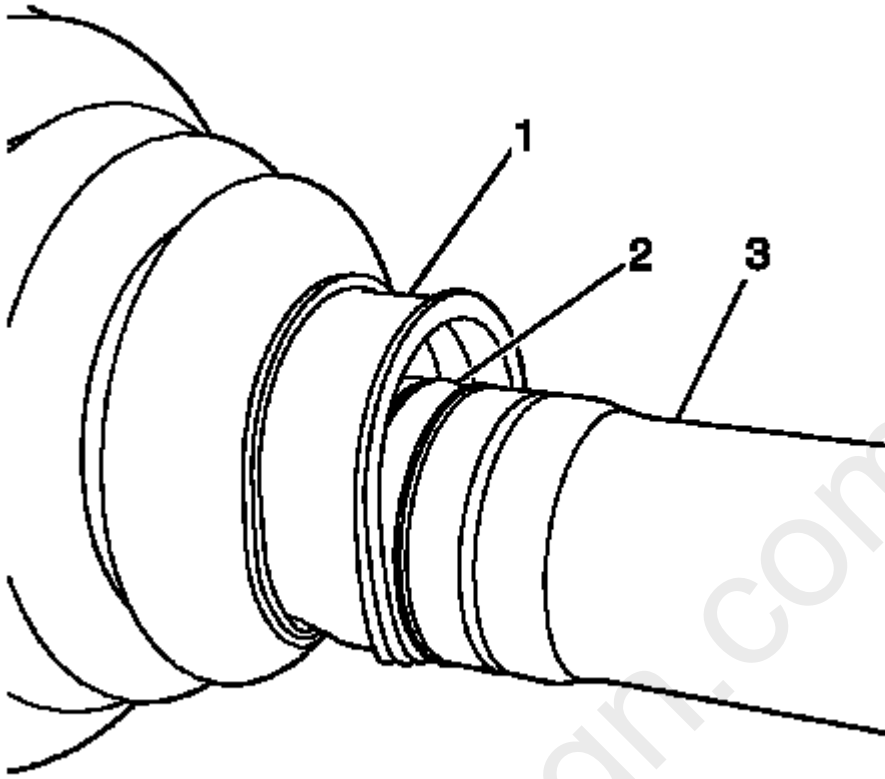


Fig. 66: Identifying Groove In Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

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

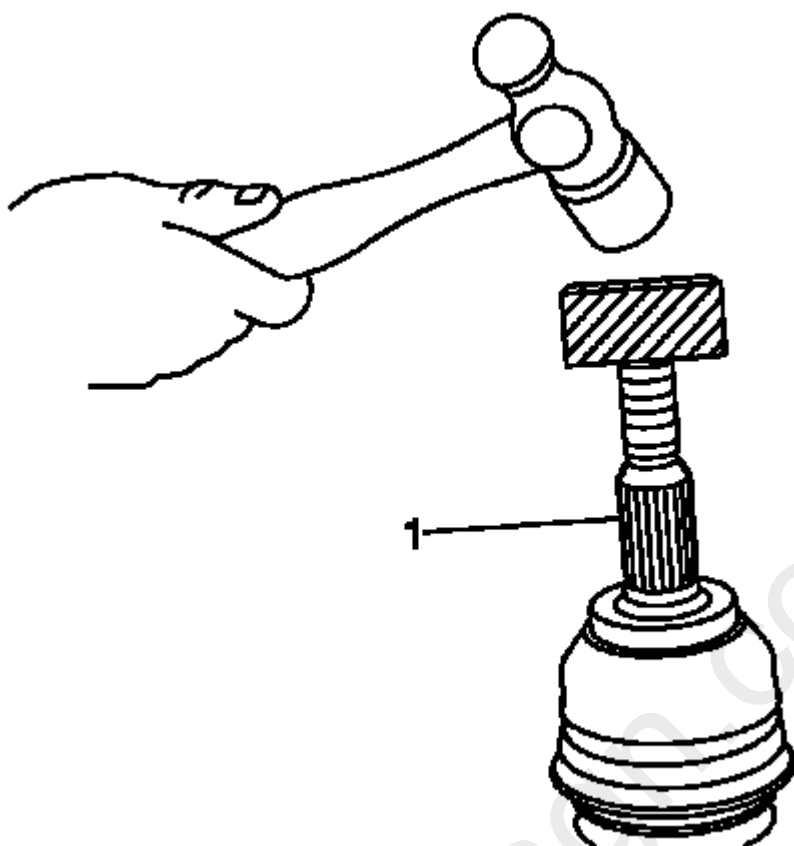


Fig. 67: Installing CV Joint

Courtesy of GENERAL MOTORS COMPANY

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

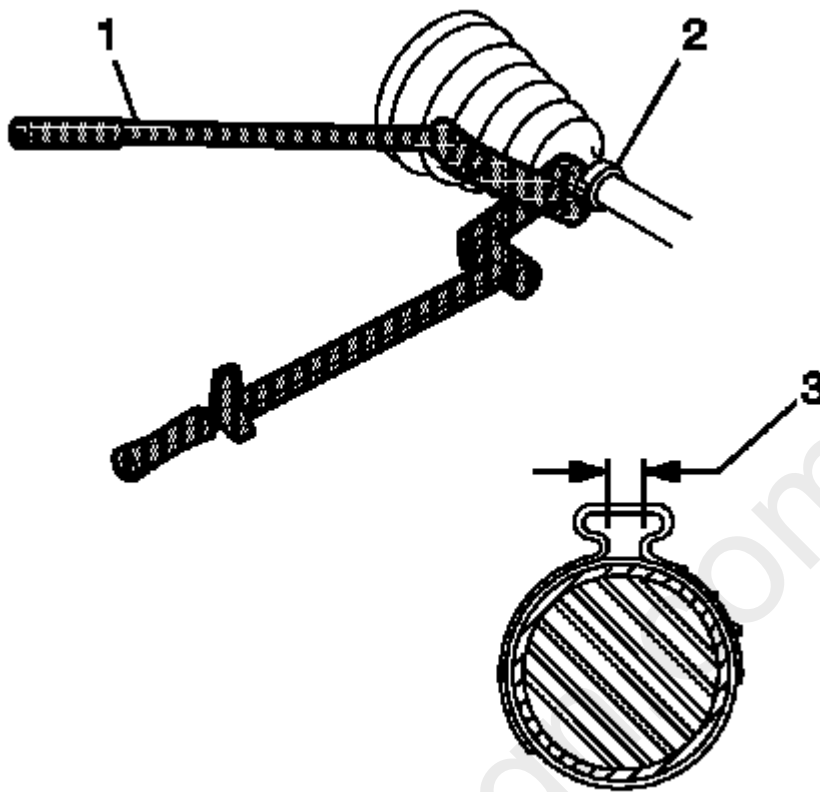


Fig. 68: Identifying Pliers Breaker Bar, Torque Wrench, Ratchet & Gap Measurement
Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure that the gap measurement does not exceed 1.0 mm (0.040 in).

4. Using the J 42572 pliers (1), close the boot clamp (2) until the gap (3) in the clamp measure 1.0 mm (0.040 in).

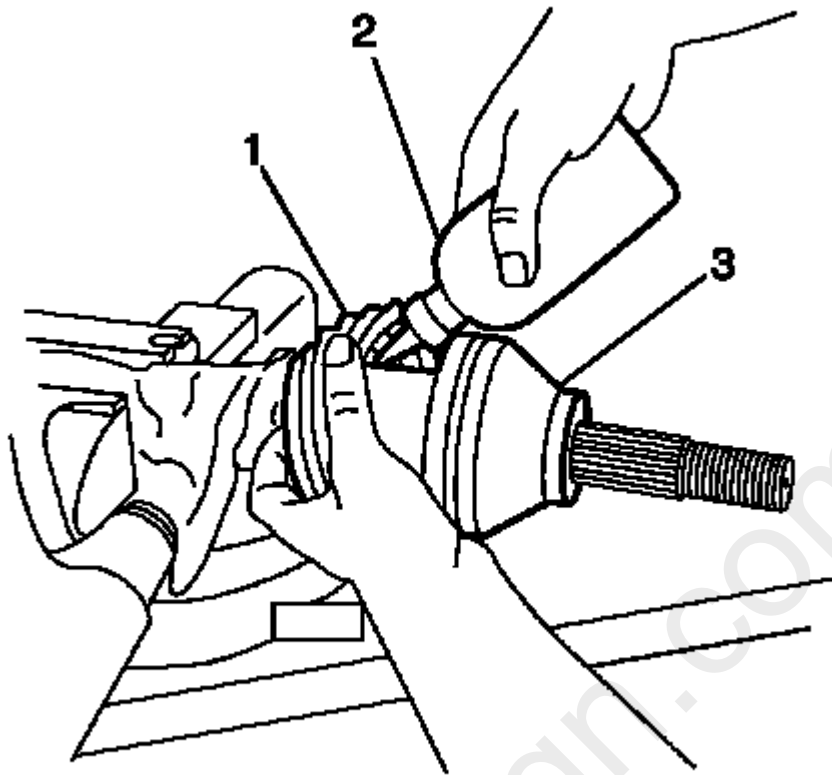


Fig. 69: Lubricating Boot Of Tripot Housing
Courtesy of GENERAL MOTORS COMPANY

5. Place approximately half the lubricant (2) in the boot (1) and the remaining half in the CV joint housing (3).

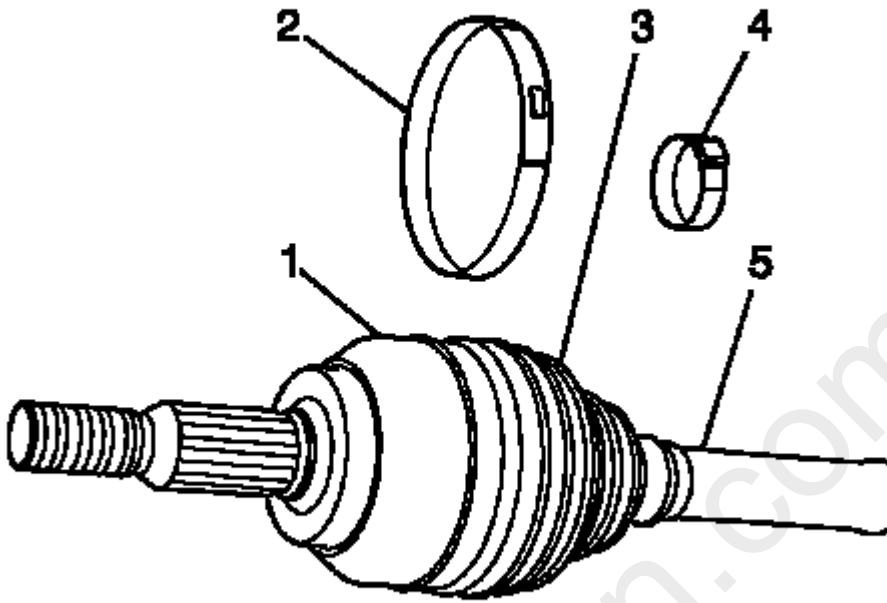


Fig. 70: Identifying Boot Clamps
Courtesy of GENERAL MOTORS COMPANY

6. Install the boot clamp (4) on the boot (3) and the wheel drive shaft (5).
7. Install the boot clamp (2) on the boot (3) and the CV joint housing (1).

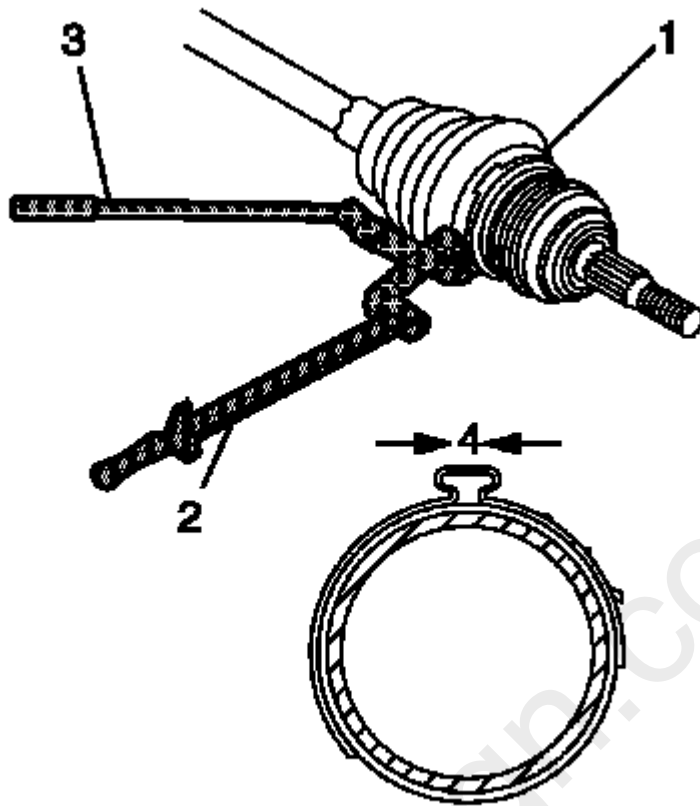


Fig. 71: View Of Outboard Seal, Large Seal Retaining Clamp & CV Joint Outer Race
 Courtesy of GENERAL MOTORS COMPANY

NOTE: Ensure the boot clamp is securely closed and seated properly on the boot.

8. Using the **J 42572** pliers (3) and a ratchet wrench (2), close the boot clamp (1) until the gap (4) measures 1.0 mm (0.040 in)..
9. Move the CV joint in a circular motion four to five times to the distribute the lubricant within the CV joint.
10. Remove the wheel drive shaft from the bench vise.
11. Remove any excess lubricant from the wheel drive shaft.
12. Install the wheel drive shaft assembly.
 - For the left side, refer to **Front Wheel Drive Shaft Replacement - Left Side**.
 - For the right side, refer to **Front Wheel Drive Shaft Replacement - Right Side**.

REAR WHEEL DRIVE SHAFT OUTER JOINT BOOT REPLACEMENT (CTS)

Special Tools

J 42572 Drive Shaft Seal Clamp Pliers

Disassembly Procedure

1. Remove the wheel drive shaft. Refer to Rear Wheel Drive Shaft Replacement.

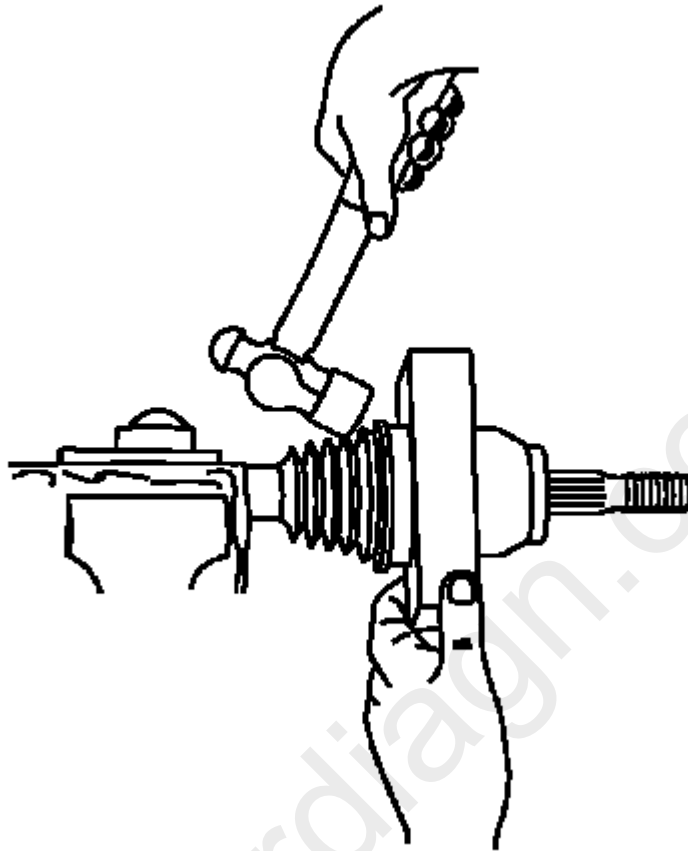


Fig. 72: Removing Outer Joint From Axle
Courtesy of GENERAL MOTORS COMPANY

2. Wrap a shop towel around the axle shaft.
3. Place the wheel drive shaft horizontally in a bench vise.

NOTE: DO NOT reuse the retaining clamps. Replace with new.

4. Using a side cutter or other suitable tool, remove the retaining clamps from the outer boot. Discard retaining.
5. Remove the boot from the CV joint housing.
6. Remove the grease from the CV joint inner race, cage, and balls.
7. Remove the outer CV joint from the axle shaft using the following steps:
 1. Hold the outer joint housing horizontally to the shaft.
 2. Position a wood block between the seal and the joint, on the joint face.
 3. Using a block of wood and hammer, remove the CV joint from the wheel drive shaft. If the CV

joint does not move, use a brass drift and a hammer to remove the CV joint from the wheel drive shaft.

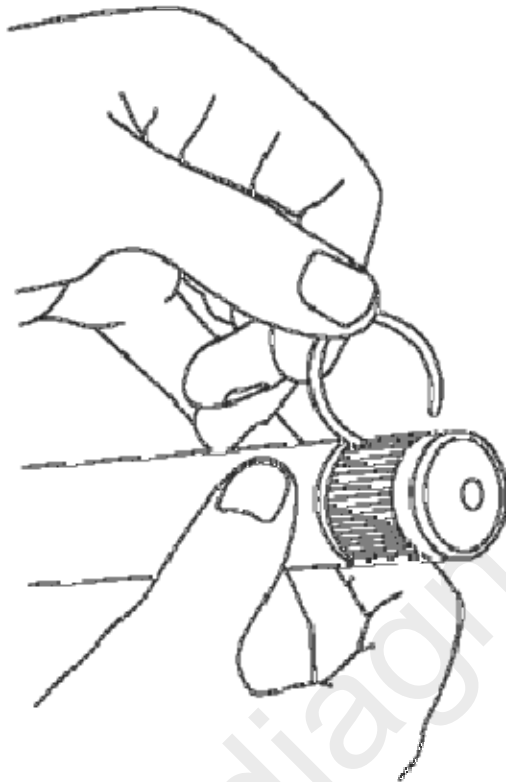


Fig. 73: View Of Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

8. Remove and discard the axle shaft retaining ring from the axle shaft.

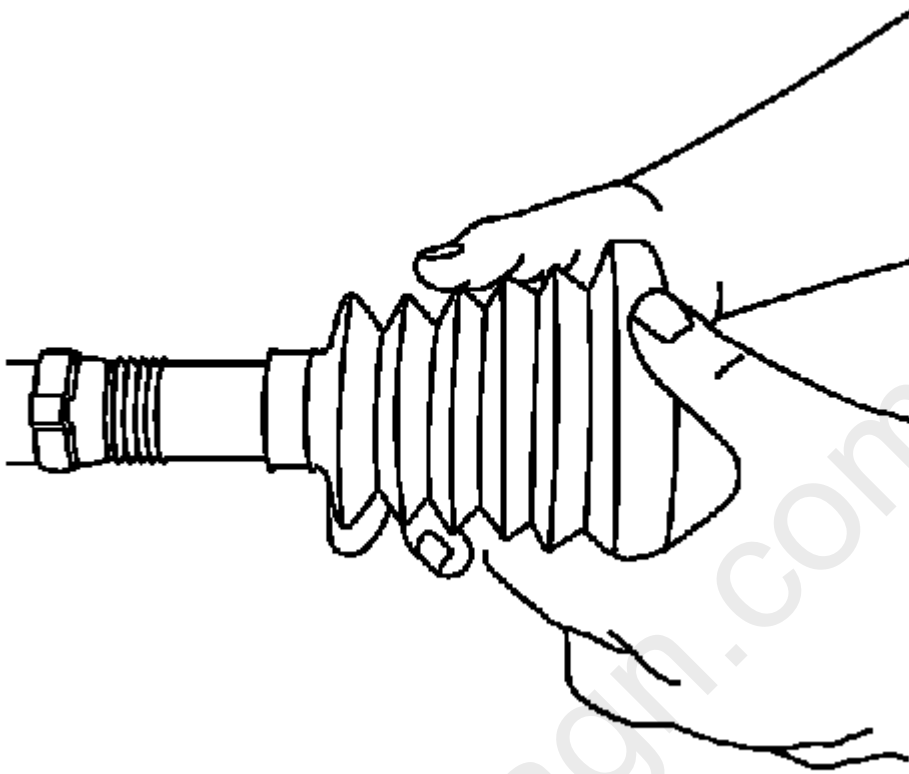


Fig. 74: View Of Axle Shaft Boot Seal
Courtesy of GENERAL MOTORS COMPANY

9. Remove the boot from the axle shaft.
10. Remove the wheel drive shaft from the vise.

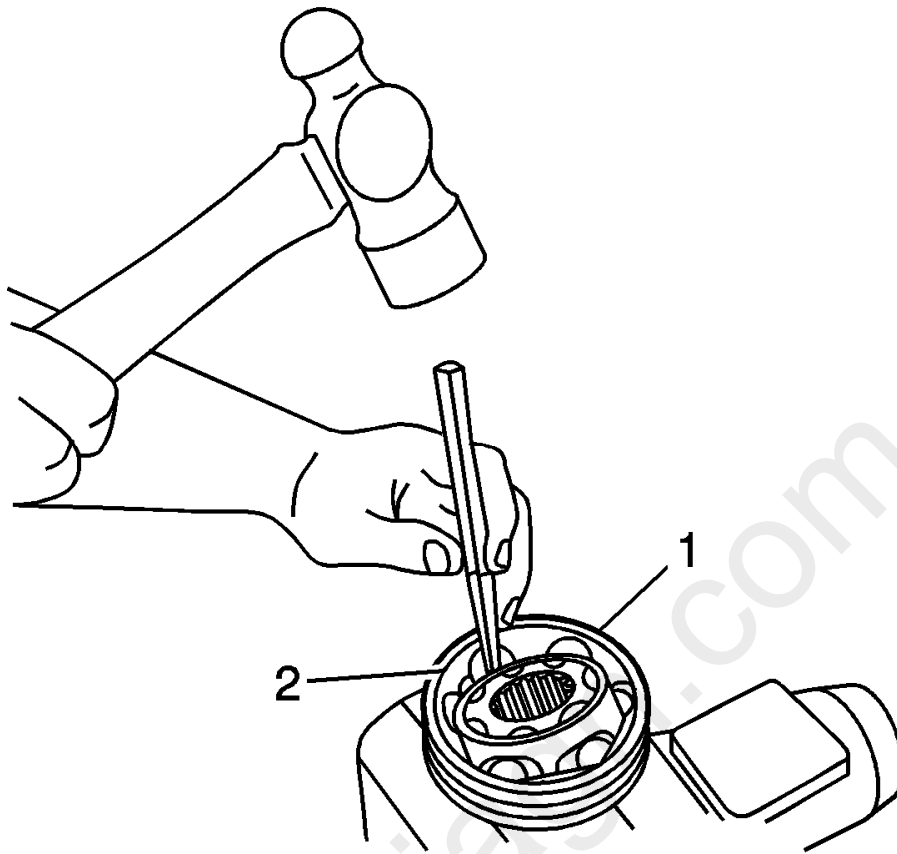


Fig. 75: Removing Ball With Brass Drift
Courtesy of GENERAL MOTORS COMPANY

11. Wrap a shop towel around the joint outer race splined shaft.
12. Place the outer race vertically in a bench vise.
13. Using a brass drift and hammer, gently tap on the wheel drive shaft joints inner cage (2), until it is tilted enough to remove the first ball.

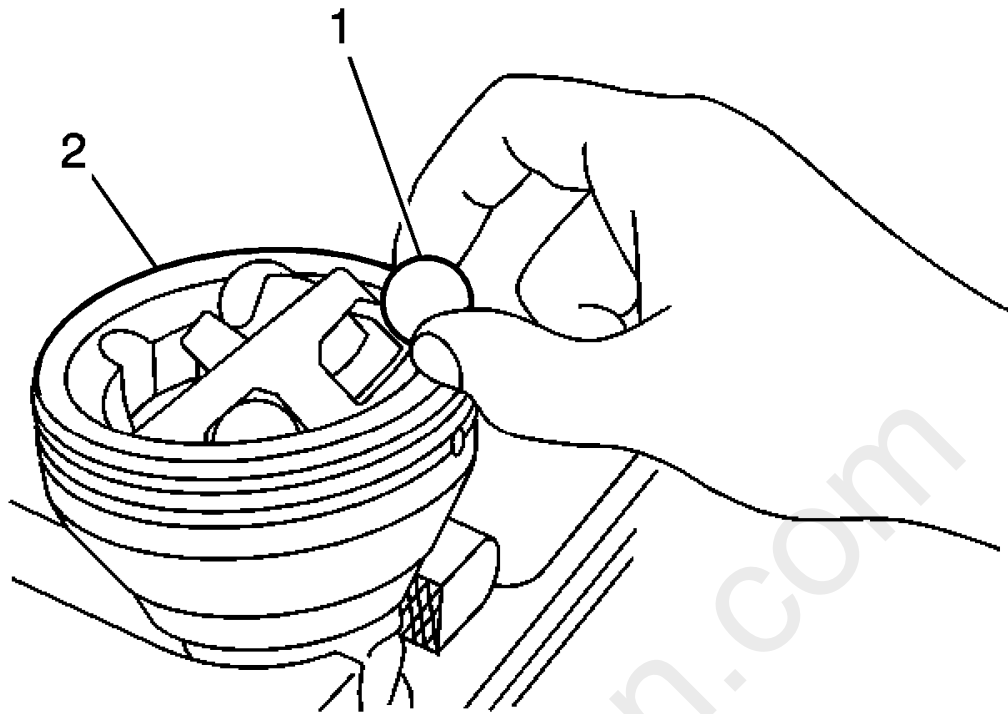


Fig. 76: Identifying Ball, Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

14. Remove the exposed ball (1). It maybe necessary to use a small screwdriver to remove the ball.
15. Position the cage and inner race so they are level.

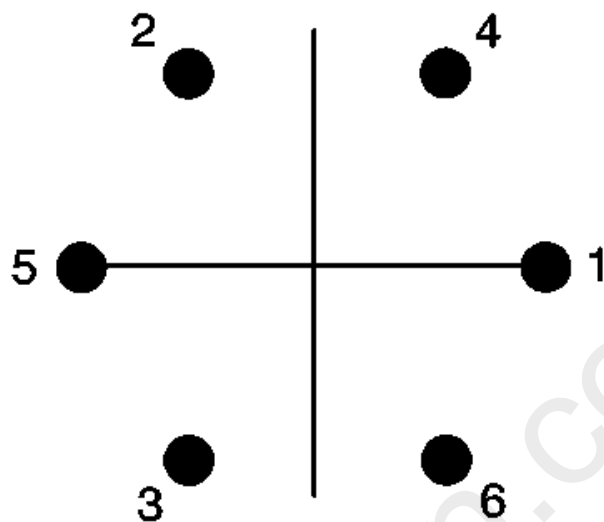


Fig. 77: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

16. Repeat steps 14-16 in the removal sequence as shown until all of the balls are removed.

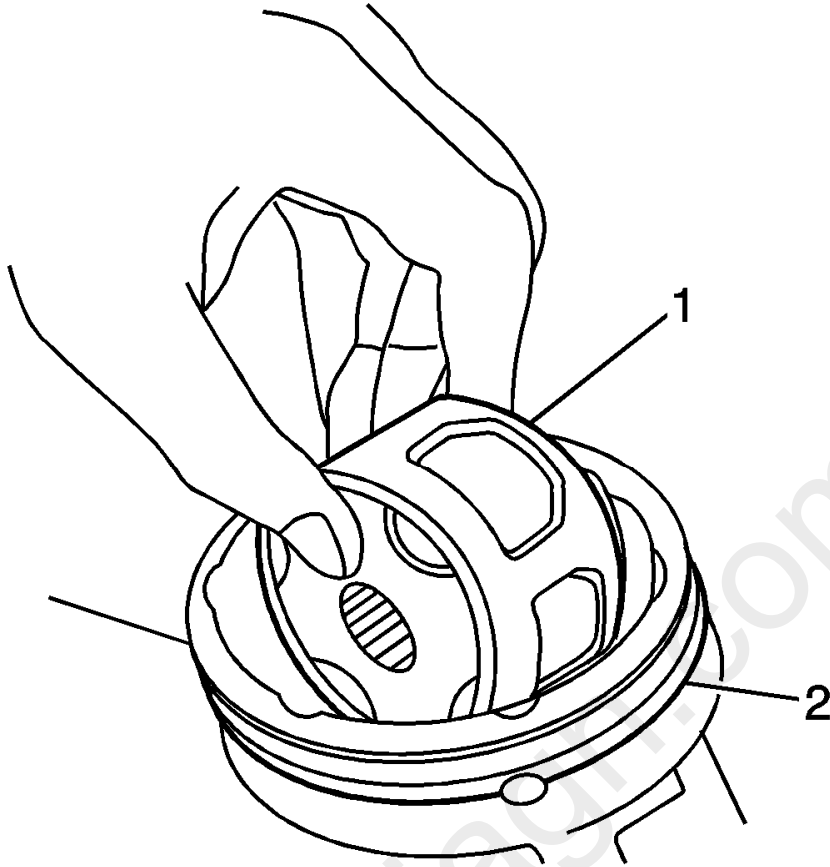


Fig. 78: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

17. Position the cage and the inner race (1) 90 degrees to the centerline of the outer race (2).
18. Align the cage windows with the lands of the outer race.
19. Lift to remove the cage and the inner race from the outer race.

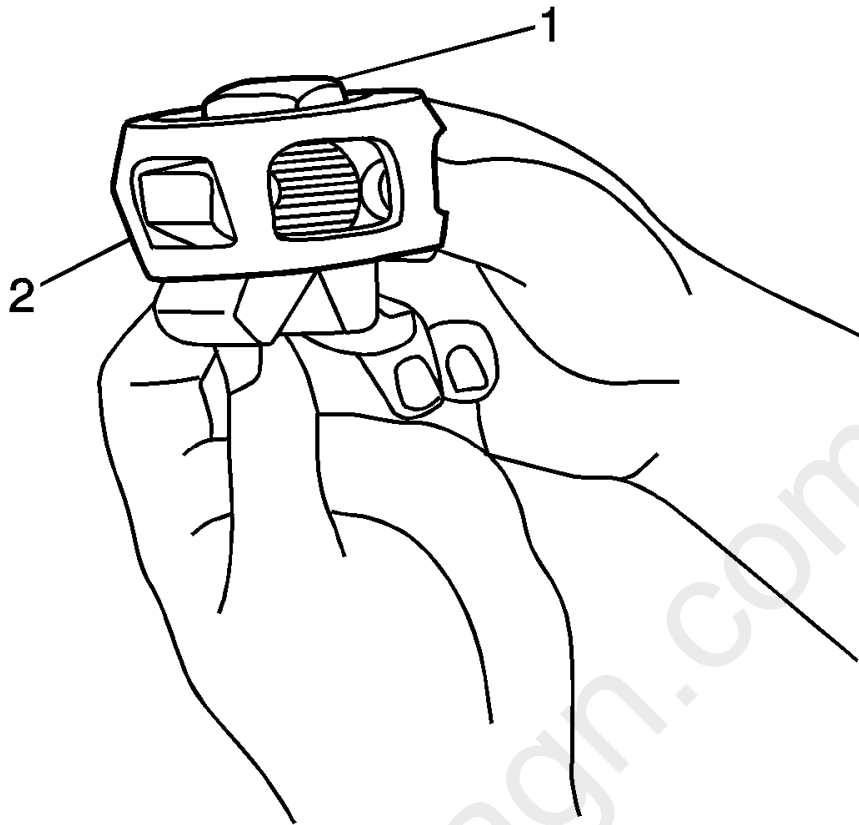


Fig. 79: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

20. Position the cage and inner race so that the larger radius corners of the cage windows are up.
21. Rotate the inner race (1) 90 degrees to the centerline of the cage.
22. Align the lands of the inner race with the windows of the cage.
23. Insert an inner race land into a cage window.
24. Pivot the inner race down and remove it from the cage.

NOTE: All traces of old grease and any contaminates must be removed.

25. Clean the following parts thoroughly with clean solvent:
 - The inner race
 - The outer race
 - The cage
 - The balls

- The axle shaft exposed end
26. Thoroughly air dry all of the parts.
 27. If any of the inner parts are found to be defective, replace the wheel drive shaft.

Assembly Procedure

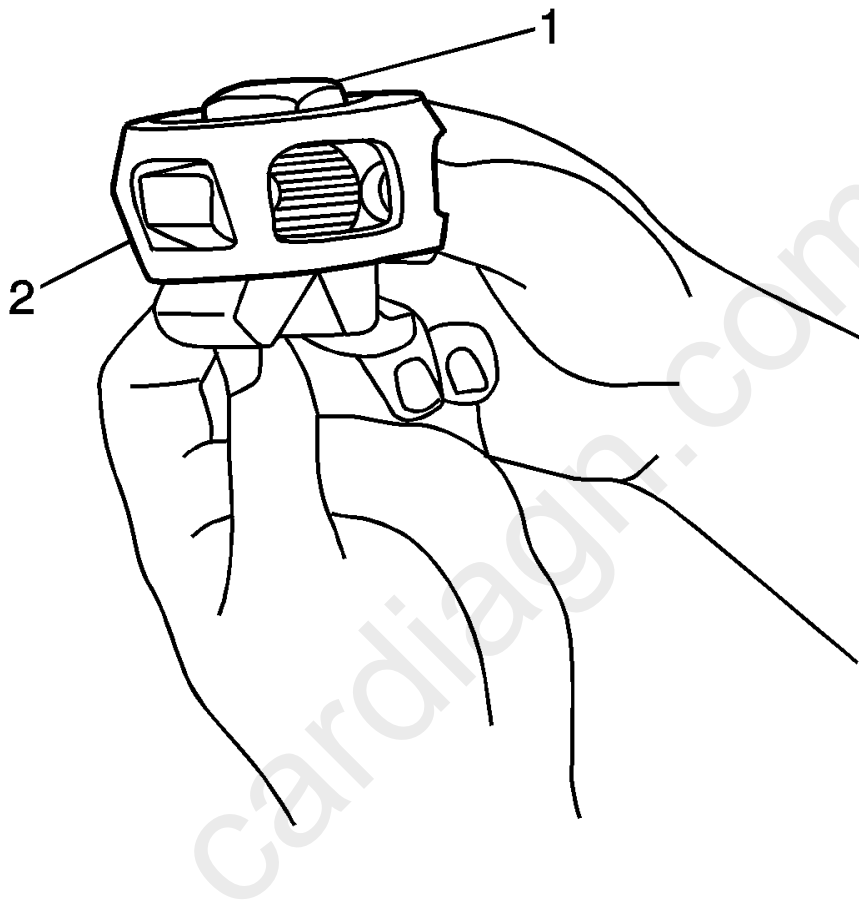


Fig. 80: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

1. Position the cage so 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. Begin to insert the inner race up through the bottom of the cage.
4. Align a land of the inner race to a window of the cage.
5. Insert the inner race land into the cage window.
6. Rotate the remainder of the inner race into the cage.
7. Rotate the inner race within the cage so that the grooved surface of the inner race is facing up.

NOTE: Ensure that the inner race is fully assembled into the cage.

8. Align the inner race ball tracks with the cage windows.

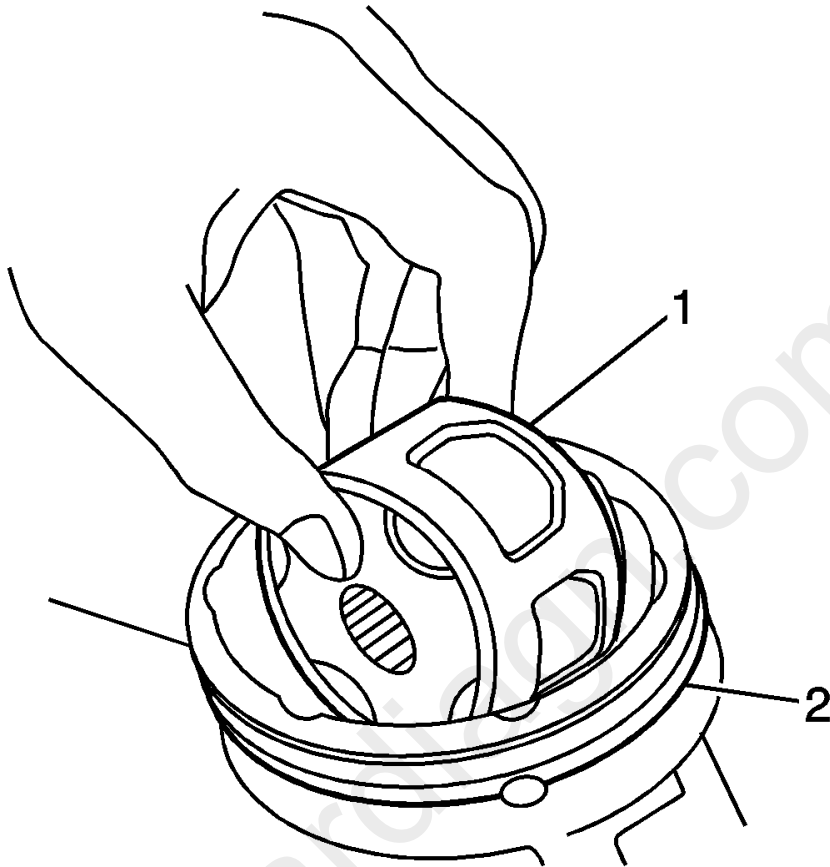


Fig. 81: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

9. Wrap a shop towel around the joint outer race splined shaft.
10. Place the outer race vertically in a bench vise.
11. Position the cage and inner race (1) 90 degrees to the centerline of the outer race (2).
12. Align 2 cage windows at 0 and 180 degrees, within the outer race.

Rotate the inner race and cage assembly downward in the vertical plane.

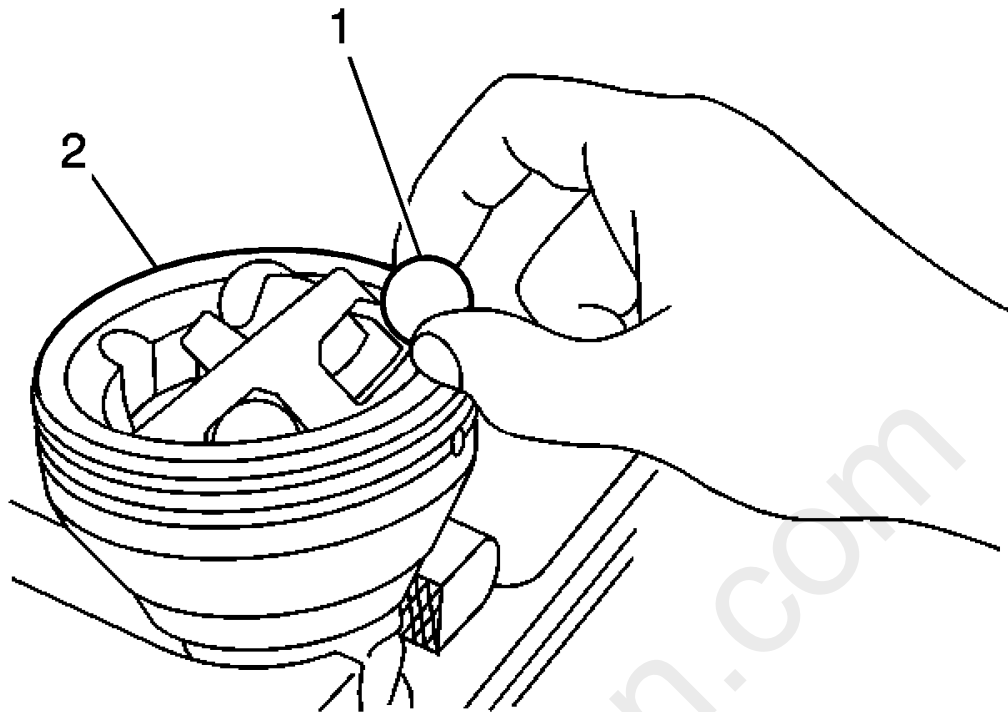


Fig. 82: Identifying Ball, Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

NOTE: The inner race ring groove must be positioned down.

13. Position the cage and inner race so they are level.
14. Align the cage windows and inner race ball (1) tracks with the outer race ball tracks (2).
15. Position a cage window and inner race ball track for ball installation.
 1. Press down on the cage following one of the outer race ball tracks. The opposing cage window and inner race ball track will be accessible for ball installation.
 2. After installing the first ball, use a brass drift and a hammer to tap gently on the cage, in order to drive the cage and inner race down completely.

NOTE: No gap should exist between the ball and the inner race ball track.

16. Insert a ball through the cage window onto the inner race ball track.

Tap the ball lightly with a plastic tipped hammer.

17. Position the cage and inner race so they are level.

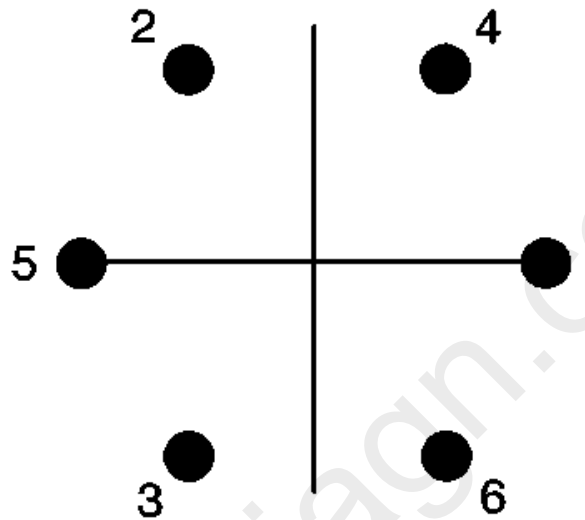


Fig. 83: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

NOTE: The ball installation sequence must be followed as shown.

18. Repeat steps 17-19 in the installation sequence as shown, until all of the balls are installed.

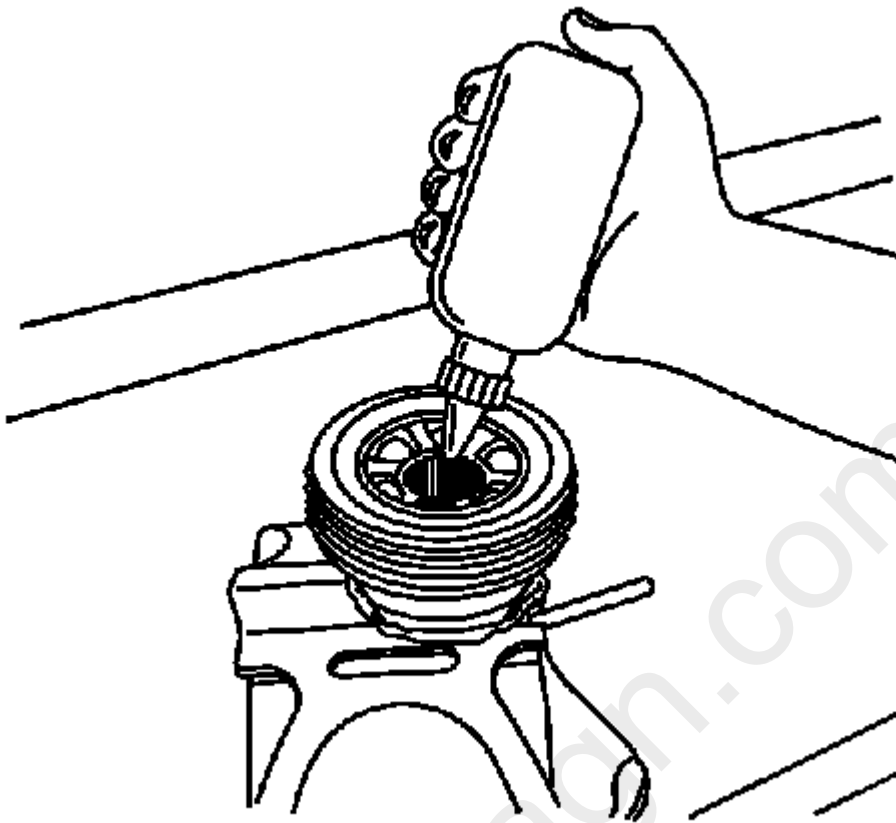


Fig. 84: Applying Grease To Outer Joint
Courtesy of GENERAL MOTORS COMPANY

19. Insert approximately 60 percent of the grease from the service kit into the outer joint.
 1. Spread 60 percent of the grease onto the ball tracks, the balls, the cage and the inner race.
 2. Spread the remainder of the grease into the bottom of the outer race.
20. Remove the outer joint from the bench vise.

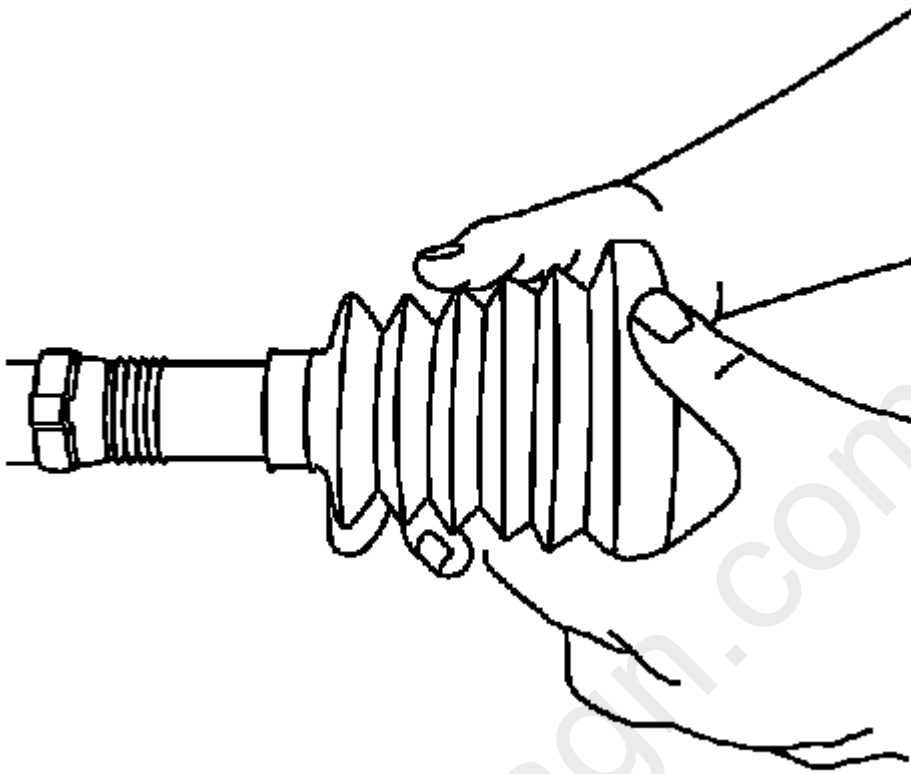


Fig. 85: View Of Axle Shaft Boot Seal
Courtesy of GENERAL MOTORS COMPANY

21. Wrap a shop towel around the axle shaft.
22. Place the wheel drive shaft horizontally in a bench vise.
23. Install a new small seal retaining clamp onto the axle shaft.
24. Install the seal onto the axle shaft.

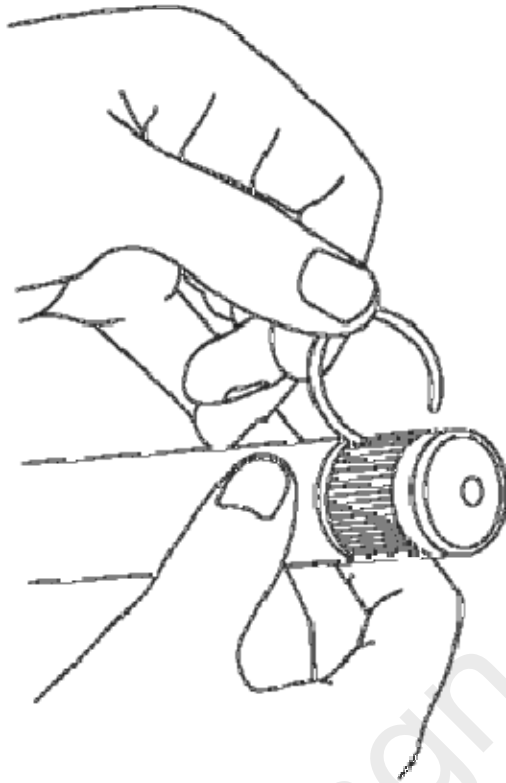


Fig. 86: View Of Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

25. Install a new retaining ring to the axle shaft.

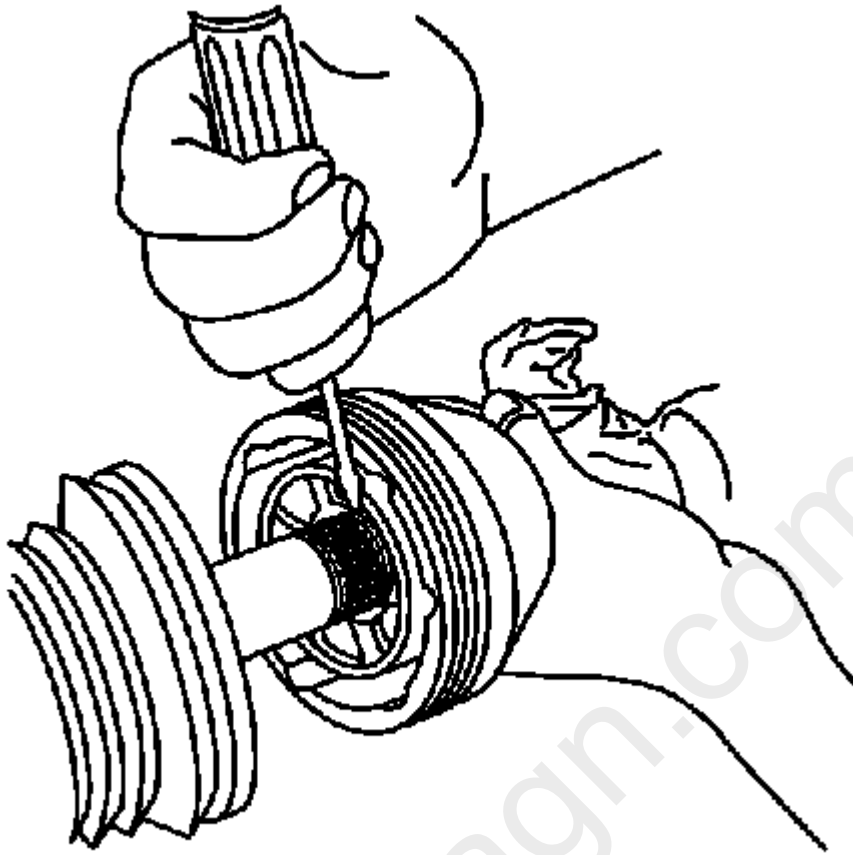


Fig. 87: View Of Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

26. Position the outer joint horizontally.
27. Engage the inner race splines onto the axle shaft splines.
28. Compress the axle shaft retaining ring.
 1. Press the end of the retaining ring, using a flat-bladed tool, into the axle shaft groove while firmly pressing the outer joint onto the axle shaft.
 2. Continue to work around the retaining ring, until it is compressed.

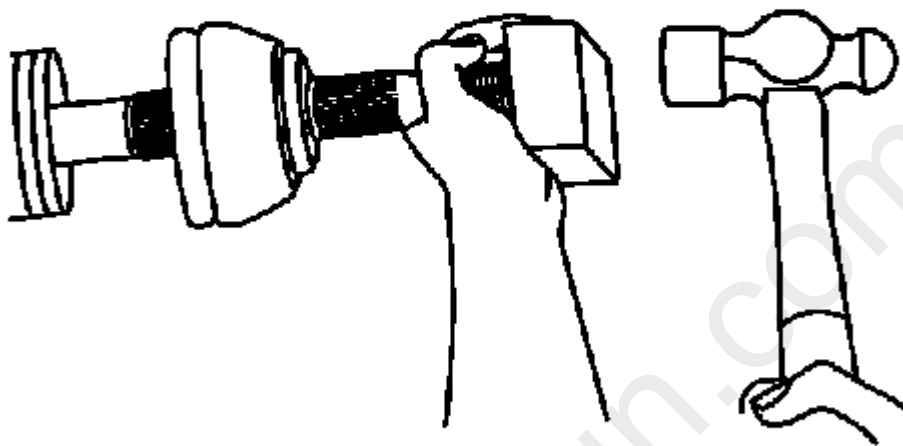


Fig. 88: Identifying Outer Joint Threaded Shaft
Courtesy of GENERAL MOTORS COMPANY

NOTE: The axle shaft and inner race must be fully seated to each other.

29. Install the outer joint to the axle shaft.
 1. Position a wood block over the end of the outer joint threaded shaft.
 2. Use a hammer to drive the outer joint onto the shaft.
 3. Continue to drive the outer joint until the outer joint seats fully onto the axle shaft.

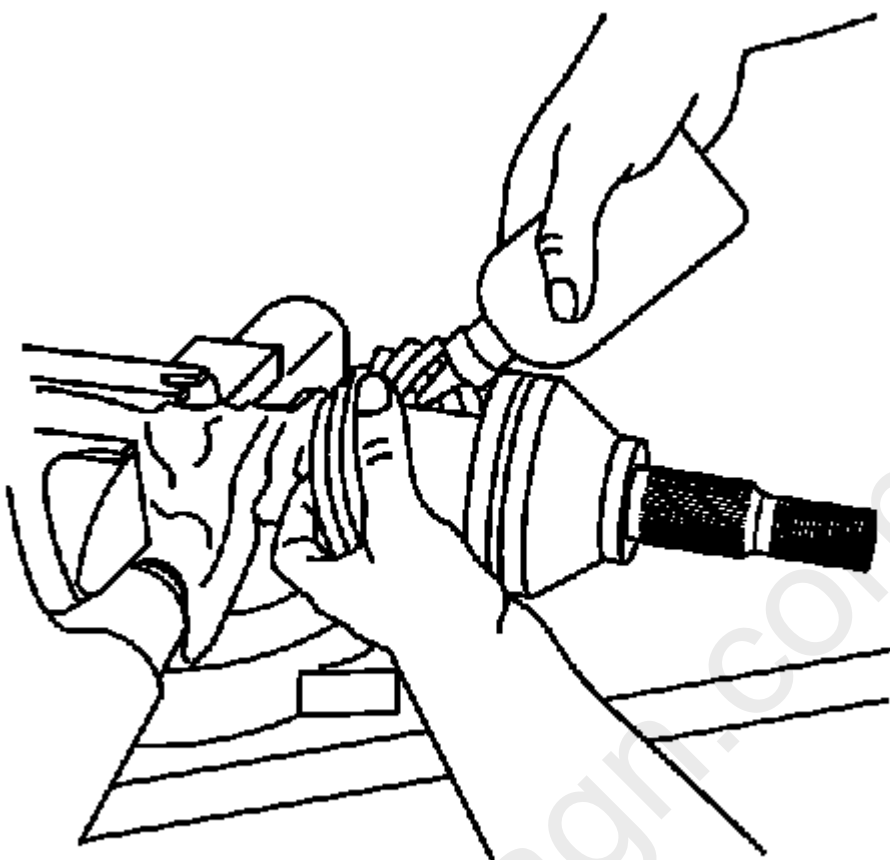


Fig. 89: Inserting Remaining Grease From Service Kit Into Seal
Courtesy of GENERAL MOTORS COMPANY

30. Insert the remaining grease from the service kit into the seal.

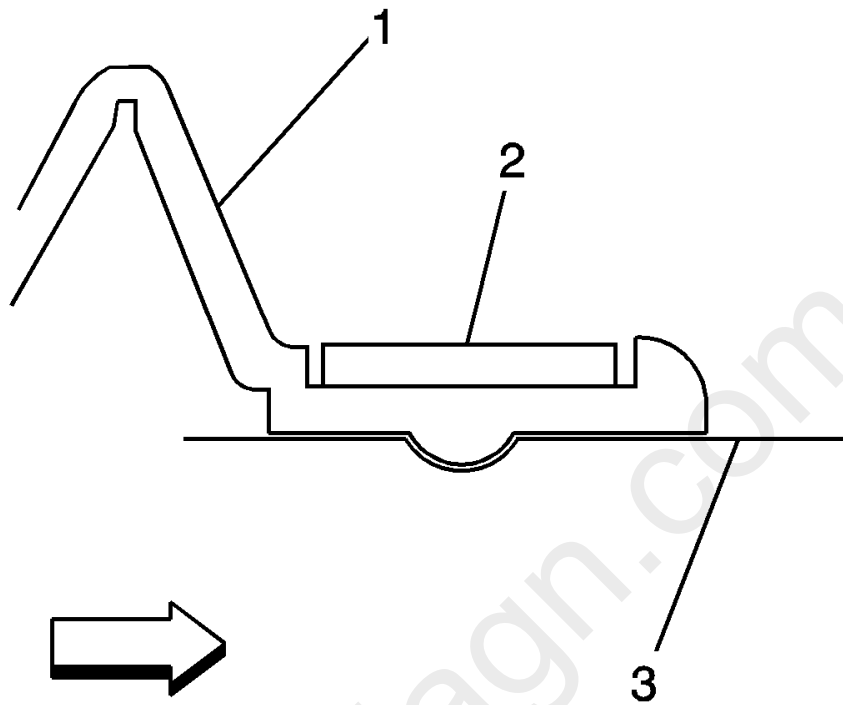


Fig. 90: Inner Joint Seal, Small Seal Clamp, & Inner Joint Seal Groove
Courtesy of GENERAL MOTORS COMPANY

31. Position the small seal retaining clamp (2) into the boot groove.
32. Position the boot and small retaining clamp to the axle shaft boot groove (3) as shown.

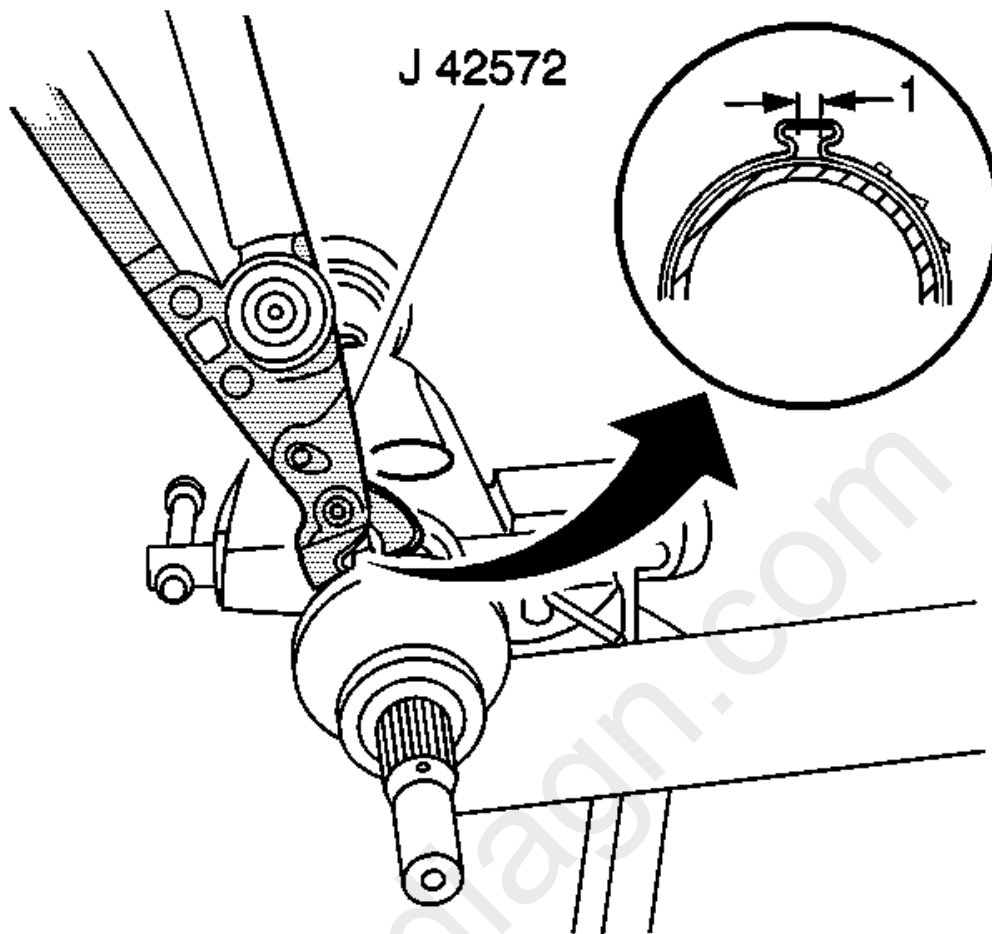


Fig. 91: Crimping Seal Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

CAUTION: Refer to Fastener Caution .

NOTE: The seal retaining clamp must not be over-tightened or under-tightened.

33. Using the J 42572 drive shaft seal clamp pliers , crimp the small seal retaining clamp and tighten until there is a gap of 1 mm (0.039 in) (1) .

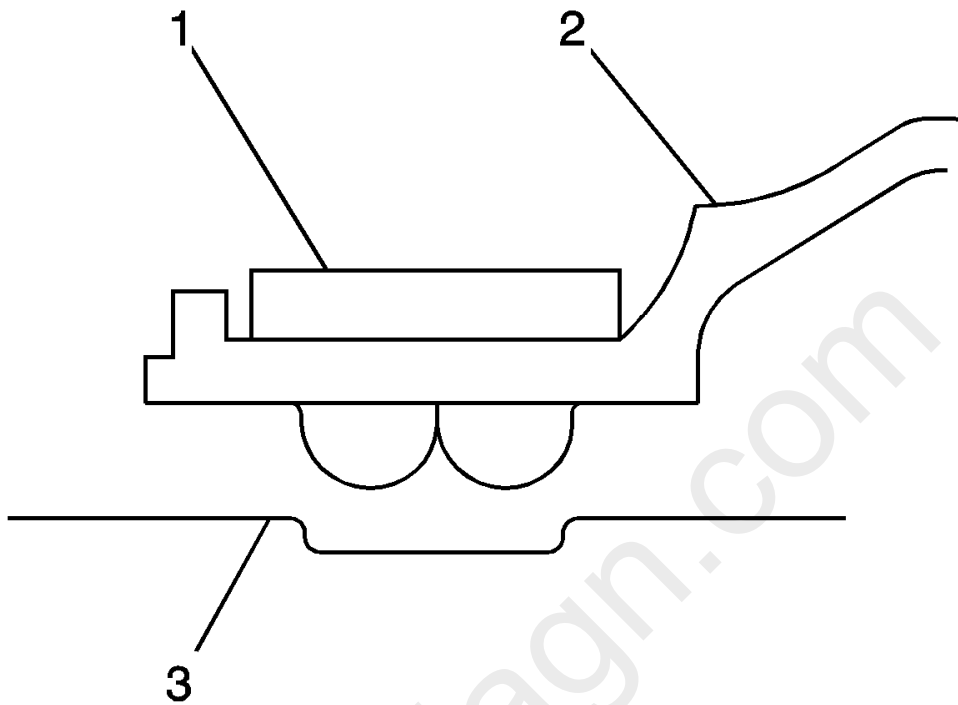


Fig. 92: View Of Large Seal Retaining Clamp, Seal & Boot Groove
Courtesy of GENERAL MOTORS COMPANY

34. Position the large seal retaining clamp (1) onto the seal (2).
35. Position the seal and large retaining clamp to the joint outer race (3) as shown.

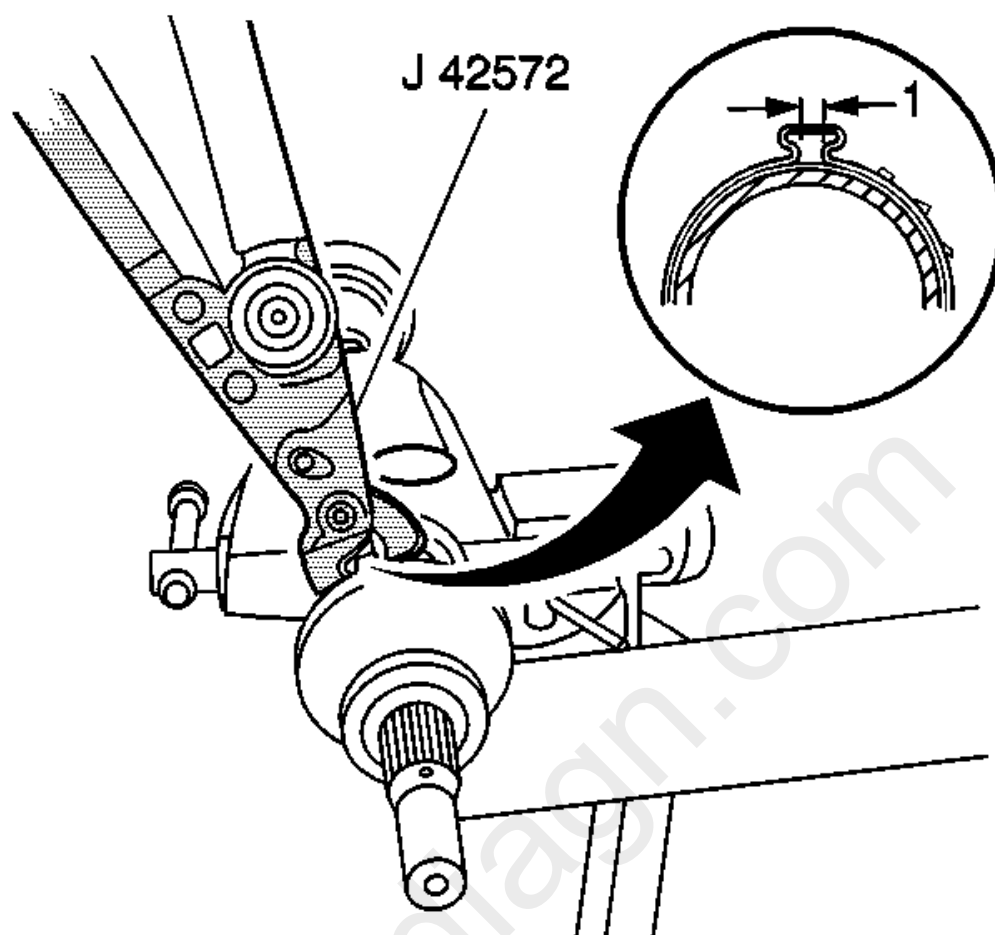


Fig. 93: Crimping Seal Retaining Clamp
 Courtesy of GENERAL MOTORS COMPANY

NOTE: The seal must not be dimpled, stretched or otherwise deformed.

36. Inspect the boot for proper shape.

If the boot is not shaped correctly, equalize the pressure in the boot by lifting the boot edge slightly and shape the properly by hand.

37. Inspect the boot for damage.

If the boot has been cut or punctured during assembly, you must discard and replace the boot.

NOTE: The seal retaining clamp must not be over-tightened or under-tightened.

38. Using the J 42572 drive shaft seal clamp pliers , crimp the large seal retaining clamp and tighten until

there is a gap of 1 mm (0.039 in) (1) .

The clamping hold time must be no less than 2 seconds.

39. Inspect the outer joint for smooth operation. This will also distribute the grease within the joint.
 1. Hold the wheel drive shaft vertically, with the outer joint at the bottom.
 2. Rotate the wheel drive shaft 4 or 5 times in a circular motion.
40. Install the wheel drive shaft. Refer to **Rear Wheel Drive Shaft Replacement**.

REAR WHEEL DRIVE SHAFT OUTER JOINT BOOT REPLACEMENT (CTS V)

Special Tools

J 42572 Drive Shaft Seal Clamp Pliers

Disassembly Procedure

1. Remove the wheel drive shaft. Refer to **Rear Wheel Drive Shaft Replacement**
2. Remove the rear inner joint boot. Refer to **Rear Wheel Drive Shaft Inner Joint Boot Replacement**.
3. Using the appropriate tool, remove the boot clamps from the outer boot and discard.
4. Remove the boot from the CV joint housing and the wheel drive shaft.

NOTE: **If any of the internal components are found to have excessive wear or are damaged, replace the wheel drive shaft.**

5. Remove any debris and lubricant from the CV joint inner components.
6. Thoroughly air dry all of the components.

Assembly Procedure

1. Install the boot on the wheel drive shaft.

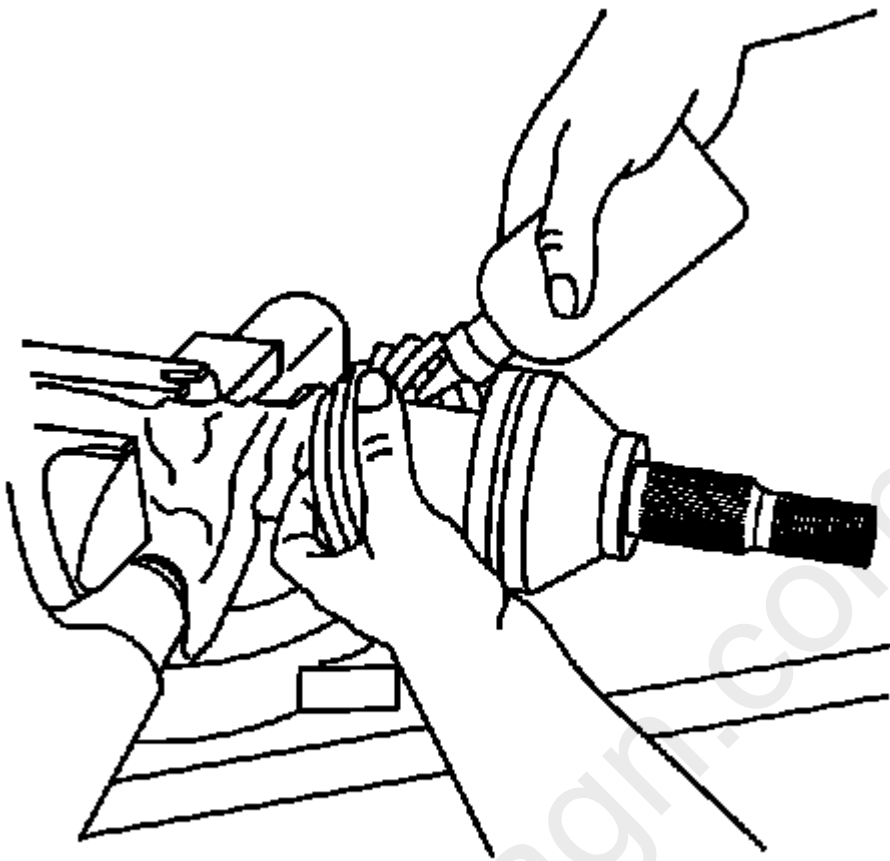


Fig. 94: Inserting Remaining Grease From Service Kit Into Seal
Courtesy of GENERAL MOTORS COMPANY

2. Insert the part of the lubricant in the outer joint.
3. Insert the remaining lubricant in the boot.

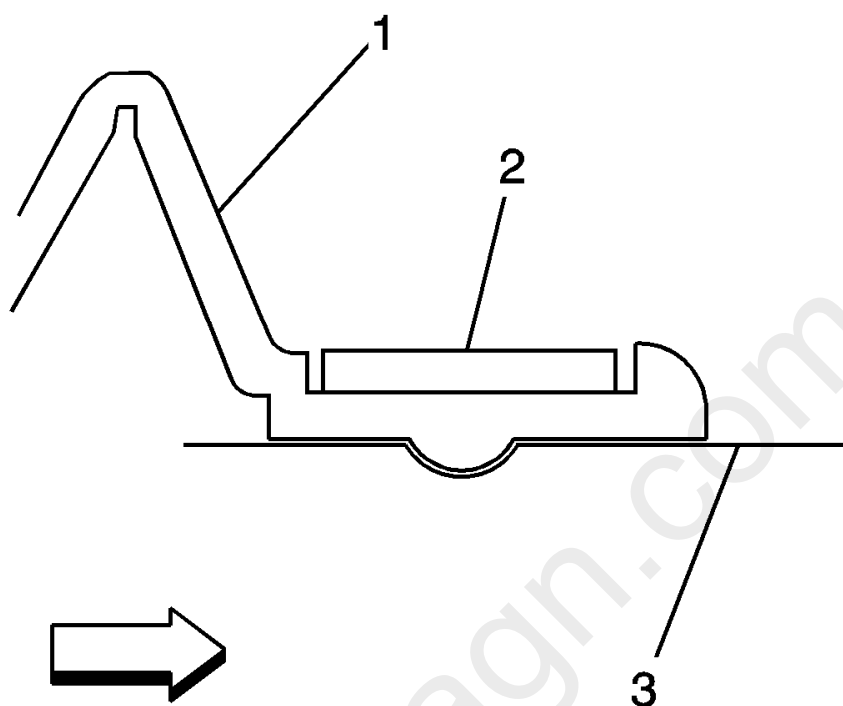


Fig. 95: Inner Joint Seal, Small Seal Clamp, & Inner Joint Seal Groove
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use the small boot clamp stamped with 42.5.

4. Position the small boot clamp (2) groove.
5. Position the boot and the clamp to the axle shaft groove (3).

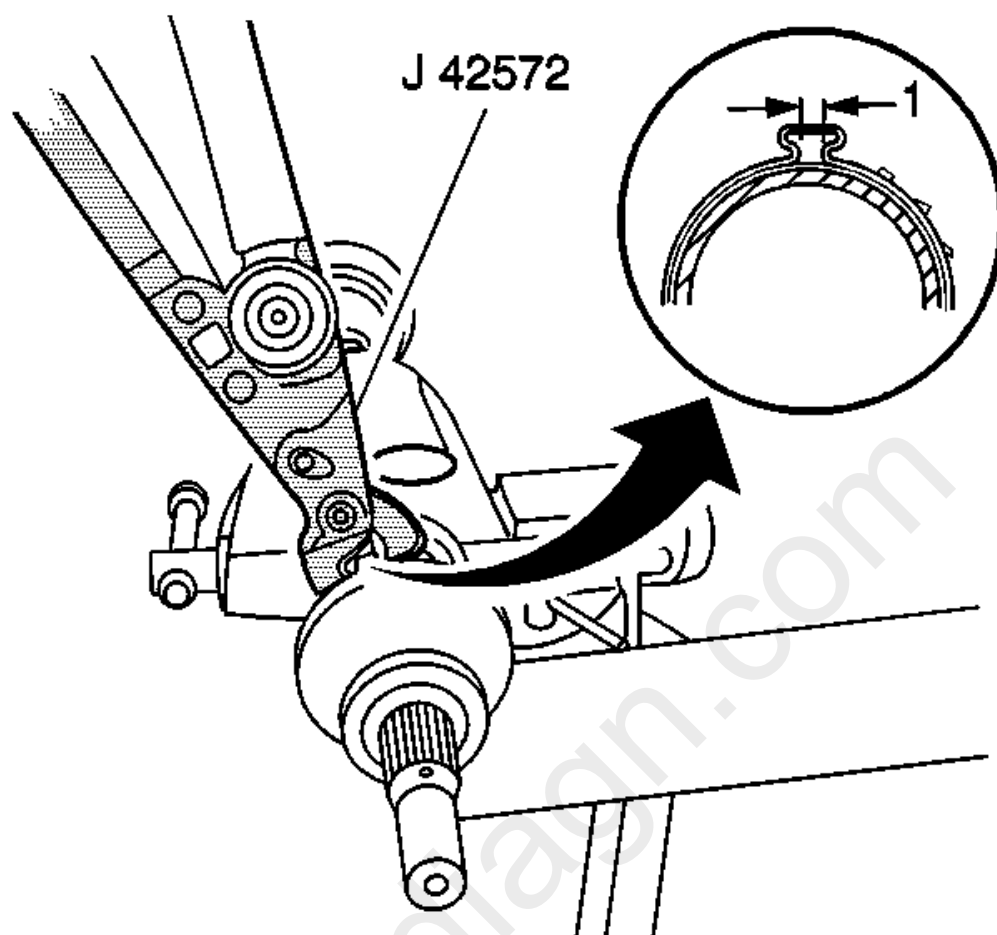


Fig. 96: Crimping Seal Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

6. Using the J 42572 pliers , close the boot clamp until there is a gap of 1 mm (0.039 in) (1).

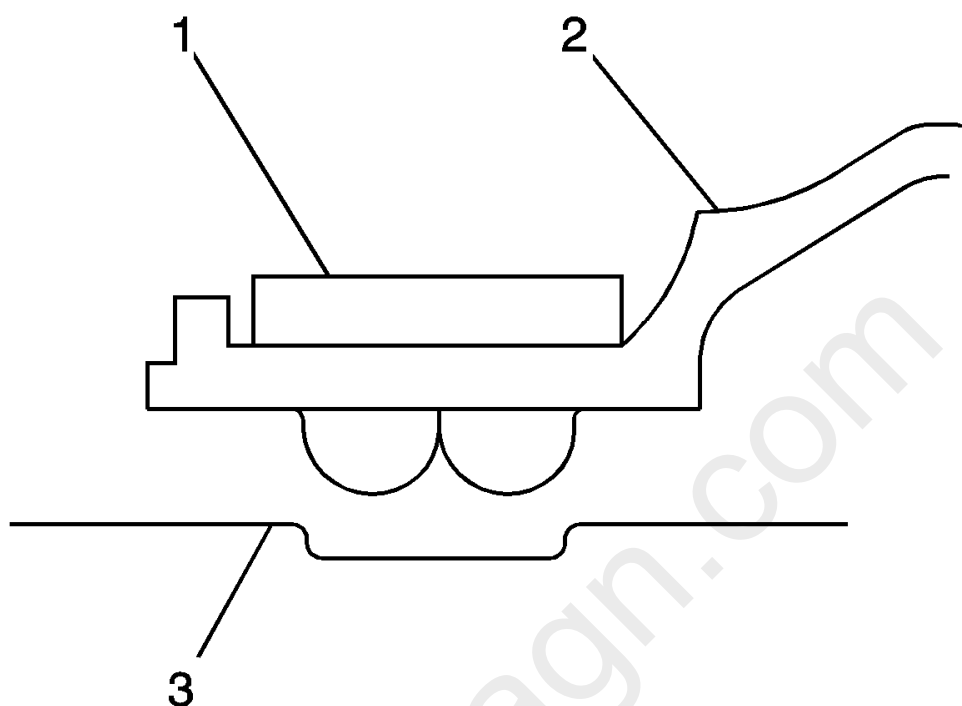


Fig. 97: View Of Large Seal Retaining Clamp, Seal & Boot Groove
Courtesy of GENERAL MOTORS COMPANY

NOTE: Use the large boot clamp stamped with 74.7.

7. Install the large boot clamp (1) onto the boot (2).

NOTE: Ensure that the boot is properly seated and not deformed before closing the boot clamp.

8. Install the boot (2) and the clamp (1) in the outer race (3).

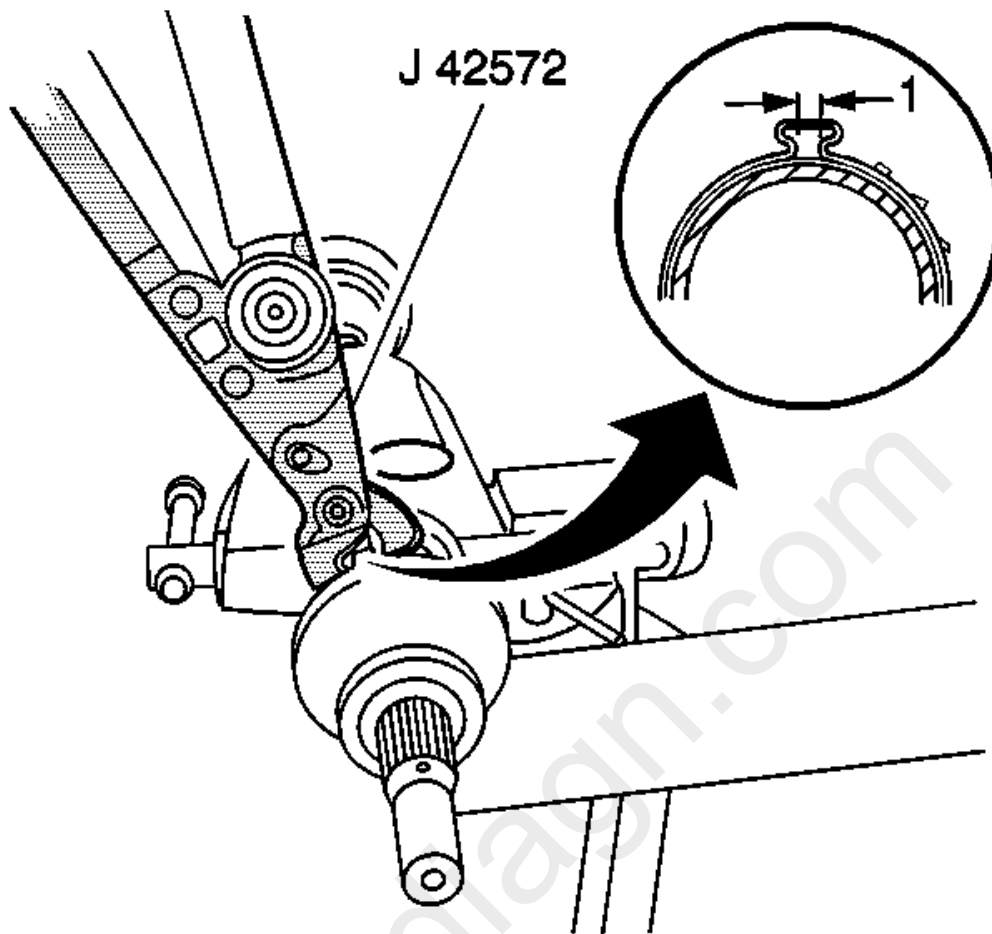


Fig. 98: Crimping Seal Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

9. Using the J 42572 pliers , close the boot clamp until there is a gap of 1 mm (0.039 in)(1).
10. Rotate the joint 4 or 5 times in a circular motion to distribute the lubricant and check the operation of the joint.

NOTE: **Ensure that the boots are not damaged during installation. If the boots have been damaged replace the boots.**

11. Remove any excess lubricant from the wheel drive shaft assembly.
12. Install the rear inner joint boot. Refer to **Rear Wheel Drive Shaft Inner Joint Boot Replacement**.
13. Install the wheel drive shaft. Refer to **Rear Wheel Drive Shaft Replacement**

WHEEL DRIVE SHAFT OUTER JOINT INSPECTION

Disassembly Procedure

1. Remove the outer constant velocity (CV) joint and boot from the wheel drive shaft.
 - For the front wheel drive shaft, refer to **Front Wheel Drive Shaft Outer Joint Boot Replacement**.
 - For the rear wheel drive shaft, Refer to **Rear Wheel Drive Shaft Outer Joint Boot Replacement (CTS V)**, **Rear Wheel Drive Shaft Outer Joint Boot Replacement (CTS)**
2. Remove any lubricant from the CV joint.

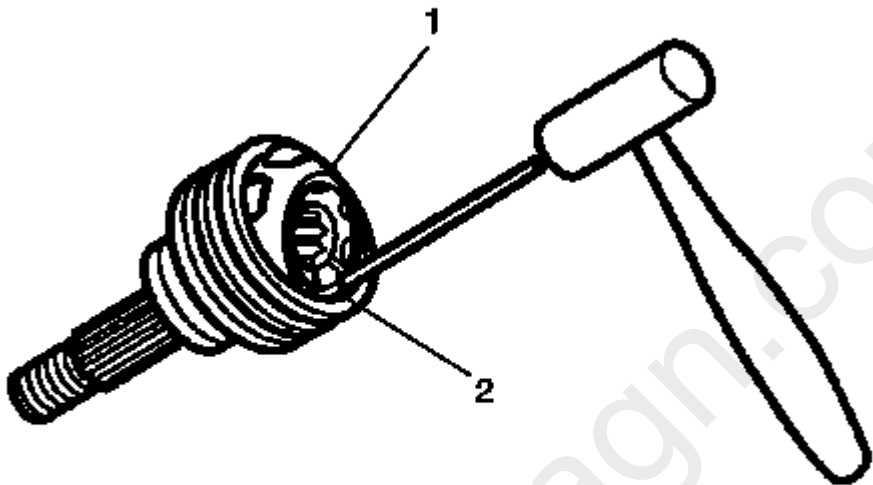


Fig. 99: Taping Gently On Brass Drift With A Hammer In Order To Tilt Cage
Courtesy of GENERAL MOTORS COMPANY

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, gentle tap the cage (2) until the ball bearing can be removed from the cage.

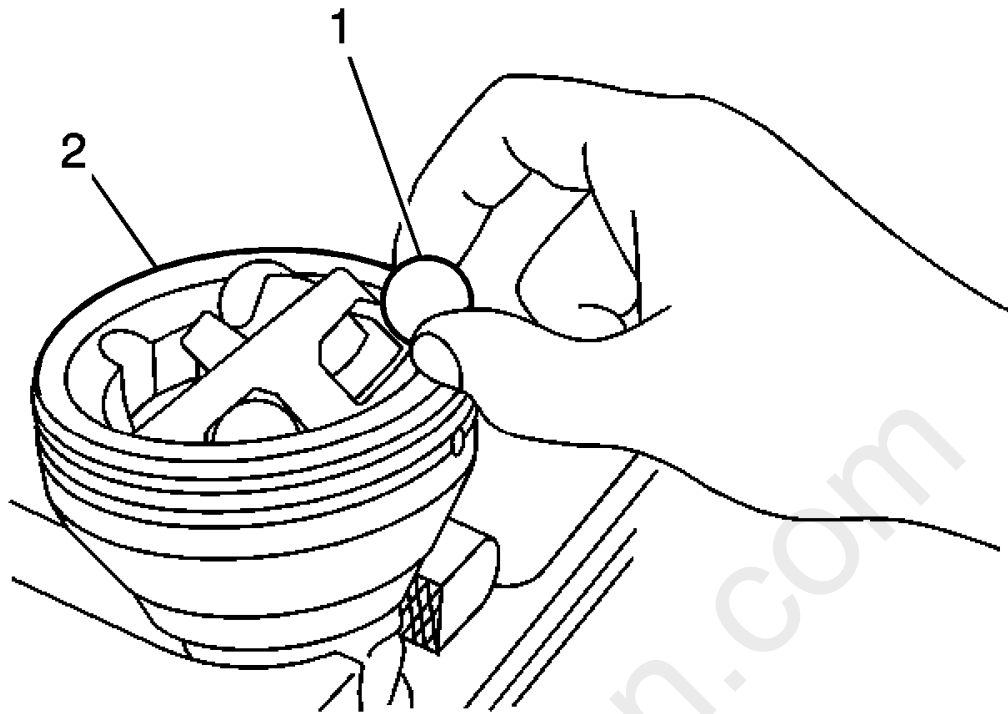


Fig. 100: Identifying Ball, Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

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

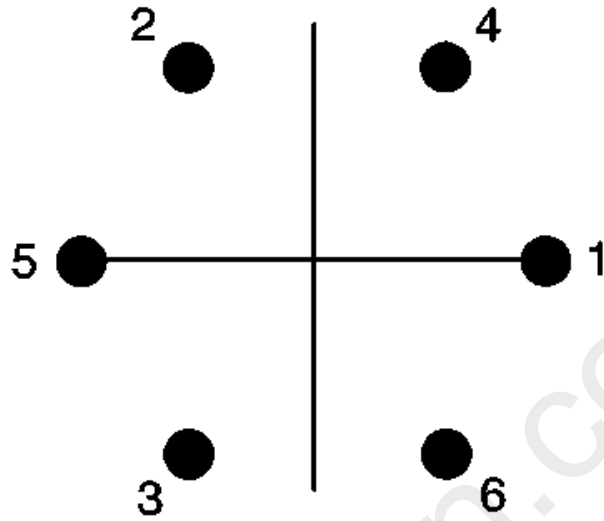


Fig. 101: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

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

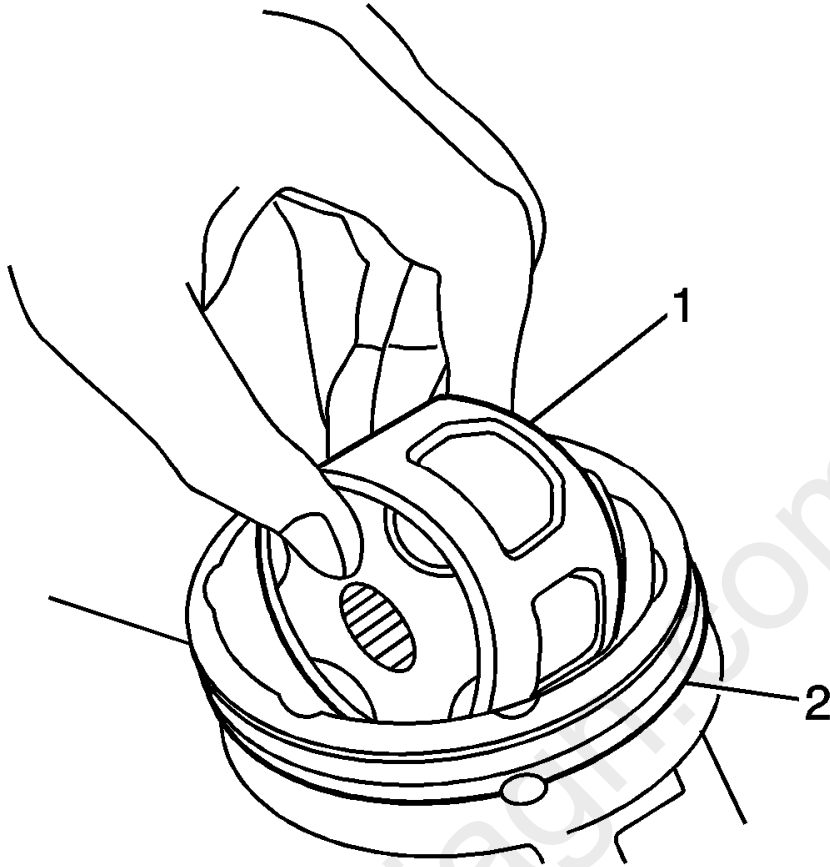


Fig. 102: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

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

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

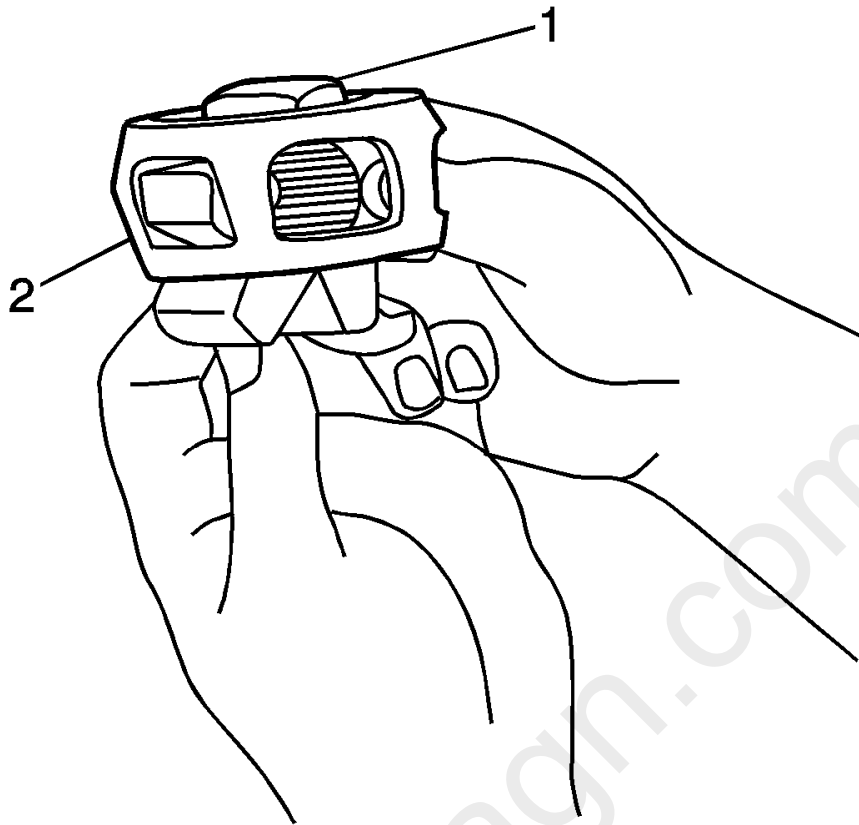


Fig. 103: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

10. Position the cage and the inner race 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.
12. Align the lands of the inner race with the windows of the cage.
13. Move the inner race land into the cage window.
14. Rotate the inner race down and remove it from the cage.
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

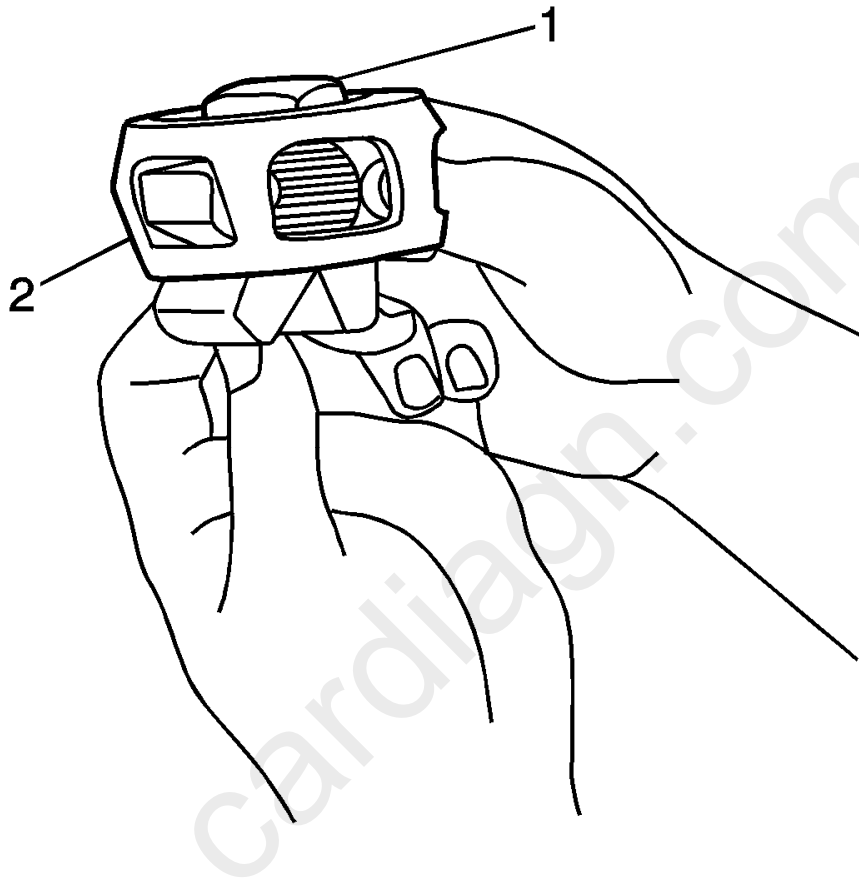


Fig. 104: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

1. Position the cage 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 through the bottom of the cage.
4. Align the lands of the inner race with the windows of the cage.
5. Move the inner race land into the cage window.
6. Rotate the inner race down and remove it from the cage.
7. Rotate the inner race within the cage so that the grooved surface of the inner race is facing up.

8. Align the inner race ball bearing tracks with the cage windows.

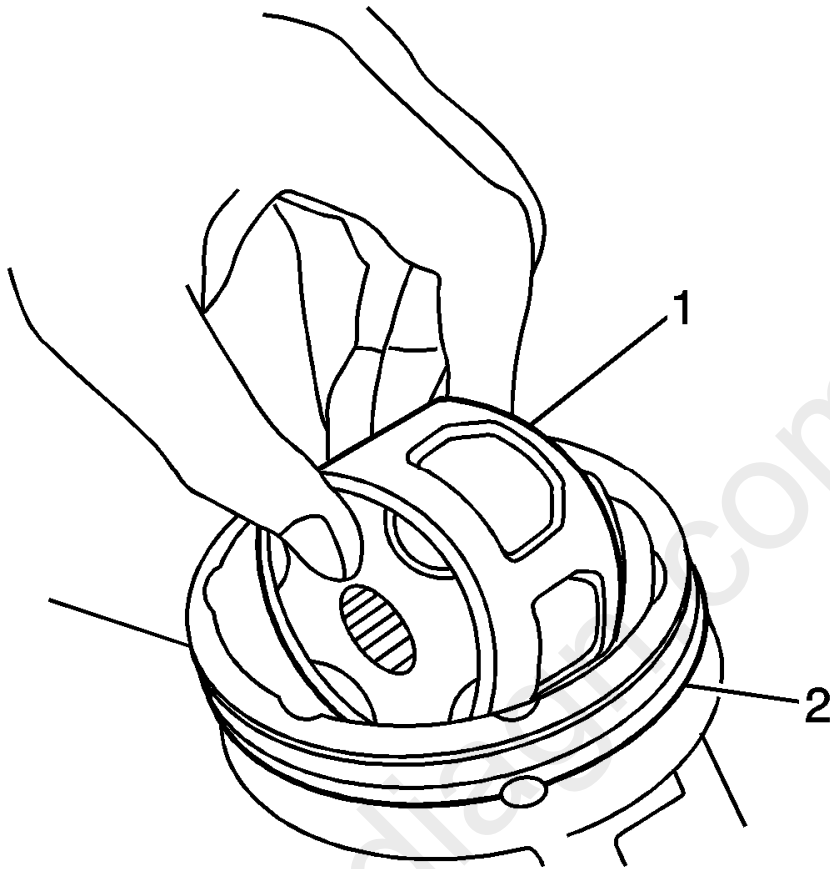


Fig. 105: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

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

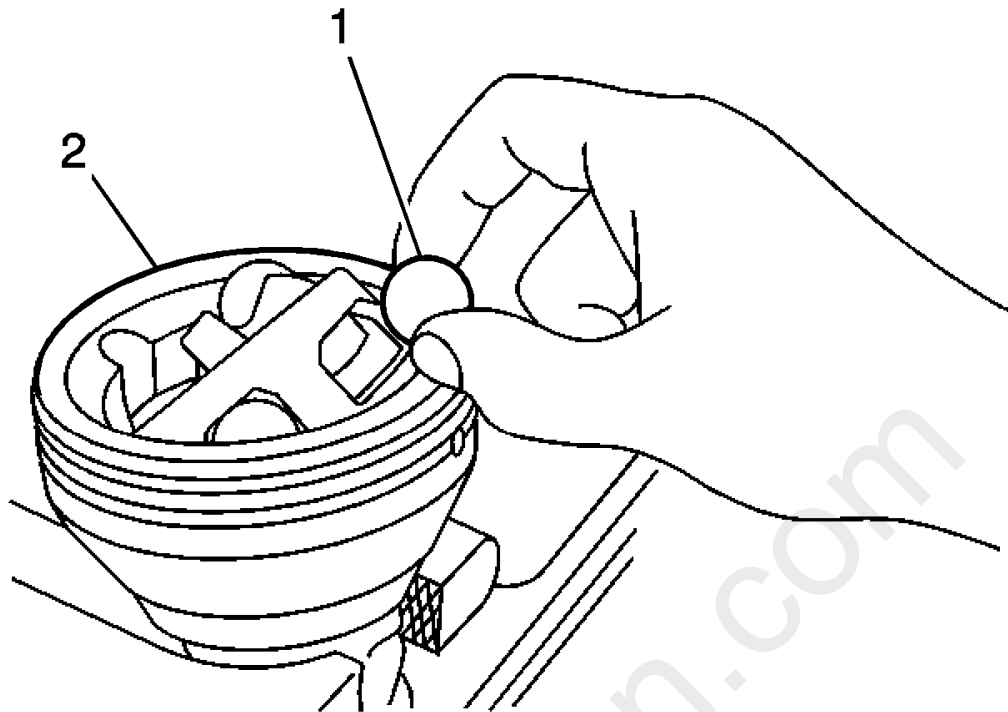


Fig. 106: Identifying Ball, Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

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 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 (1) bearing tracks with the outer race ball bearing tracks (2).
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 window and the inner ball bearing track will be accessible for the ball bearing installation.

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

NOTE: The following service procedure will have to be performed after each ball bearing has been installed.

18. After the first ball bearing 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 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 into place.

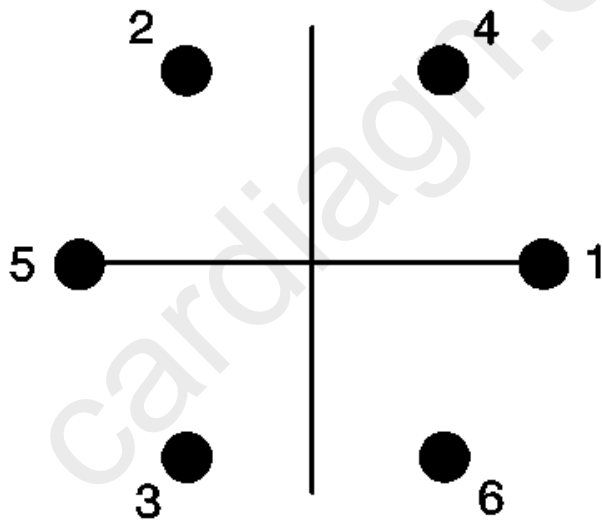


Fig. 107: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

21. Install the ball bearings in sequence.
22. Repeat steps 18-20 until all the ball bearings are installed.

23. Install the outer CV joint and boot on the wheel drive shaft.

- For the front wheel drive shaft, refer to **Front Wheel Drive Shaft Outer Joint Boot Replacement**.
- For the rear wheel drive shaft, refer to **Rear Wheel Drive Shaft Outer Joint Boot Replacement (CTS V)**, **Rear Wheel Drive Shaft Outer Joint Boot Replacement (CTS)**.

WHEEL DRIVE SHAFT INNER JOINT INSPECTION

Inspection Procedure

1. Remove the wheel drive shaft inner joint and boot.

- For the front wheel drive shaft inner joint, refer to **Front Wheel Drive Shaft Inner Joint Boot Replacement**
- For the rear wheel drive shaft inner joint, refer to **Rear Wheel Drive Shaft Inner Joint Boot Replacement**

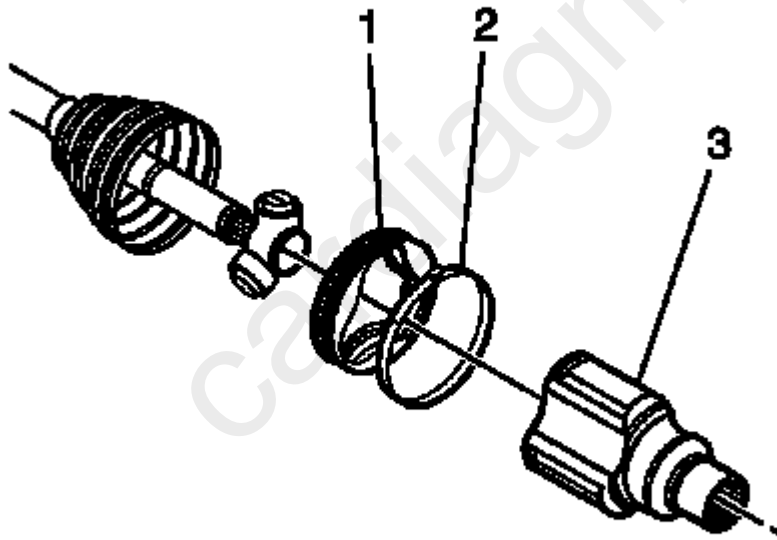


Fig. 108: Identifying Wheel Drive Shaft Inner Joint Inspection Areas
Courtesy of GENERAL MOTORS COMPANY

2. Remove the wheel drive shaft tripod bushing (1) from the tripod housing (3).
3. Remove the wheel drive shaft tripod housing (1) 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. Steps 7-10 are for those vehicles that are equipped with a CV type inner joint.

NOTE: All traces of the old lubricant and any contaminates must be removed.

8. Clean and inspect the following parts thoroughly with clean solvent:
 - The inner race
 - The outer race
 - The cage
 - The wheel drive shaft exposed end
9. Thoroughly air dry all of the parts.
10. Inspect the internal components for excessive wear, damage and smoothness of operation.
11. If any of the internal parts are found to be excessively worn or damaged, replace the wheel drive shaft inner joint and boot.
12. If any of the internal parts are found to be excessively worn or damaged, replace the wheel drive shaft inner joint and boot.
 - For the front wheel drive shaft inner joint, refer to **Front Wheel Drive Shaft Inner Joint Boot Replacement**
 - For the rear wheel drive shaft inner joint, refer to **Rear Wheel Drive Shaft Inner Joint Boot Replacement**

DESCRIPTION AND OPERATION

WHEEL DRIVE SHAFTS DESCRIPTION AND OPERATION

Wheel drive shaft assemblies are flexible assemblies consisting of an inner and outer constant velocity joint connected by an axle shaft. The inner joint is completely flexible and can move in and out. The outer joint is also flexible, but cannot move in and out.

Boot and Clamp

Rear wheel drive shaft assemblies use inboard and outboard joint boots made of thermoplastic material, and clamps made of stainless steel. The thermoplastic material performs well against normal handling and operational wear and conditions. However, it is not strong enough to withstand abusive handling or damage due to objects such as sharp tools or the sharp edge of any other surrounding component in the vehicle.

IMPORTANT: The boots should be protected from sharp tools and from the sharp edges of surrounding components. Any damage to the boots or clamps will result in leakage. Leakage will allow grease to leak out of the inboard and outboard joints. Leakage will allow water to leak into the inboard and outboard joints. This leads to noisy wheel drive shaft operation, and eventually, failure of the internal components.

The functions of the boot are as follows:

- To protect the internal parts of the inboard and outboard joint by protecting the grease from surrounding detrimental atmospheric conditions such as extreme temperatures, ozone gas, etc.
- To protect the internal parts of the inboard and outboard joint by protecting the grease from foreign materials such as stones, dirt, water, salt, etc.
- Facilitate angular and axial movement of the inboard joint.
- Facilitate angular movement of the outboard joint.

The function of the clamps is to provide a leak proof connection at the housing and the axle shaft for the inboard and outboard joints.

Inner Joint

The inner joints use the cross-groove joint design with an adapter for the inboard seal. The wheel drive shafts incorporate a male spline and interlock with the differential gears using barrel type snap rings.

Outer Joint

The outer joints use the constant velocity (CV) joint design. The shaft end mating with the knuckle/hub, incorporates a helical spline to assure a tight, press type fit. The design provides a no end play condition between the hub bearing and the wheel drive shaft.

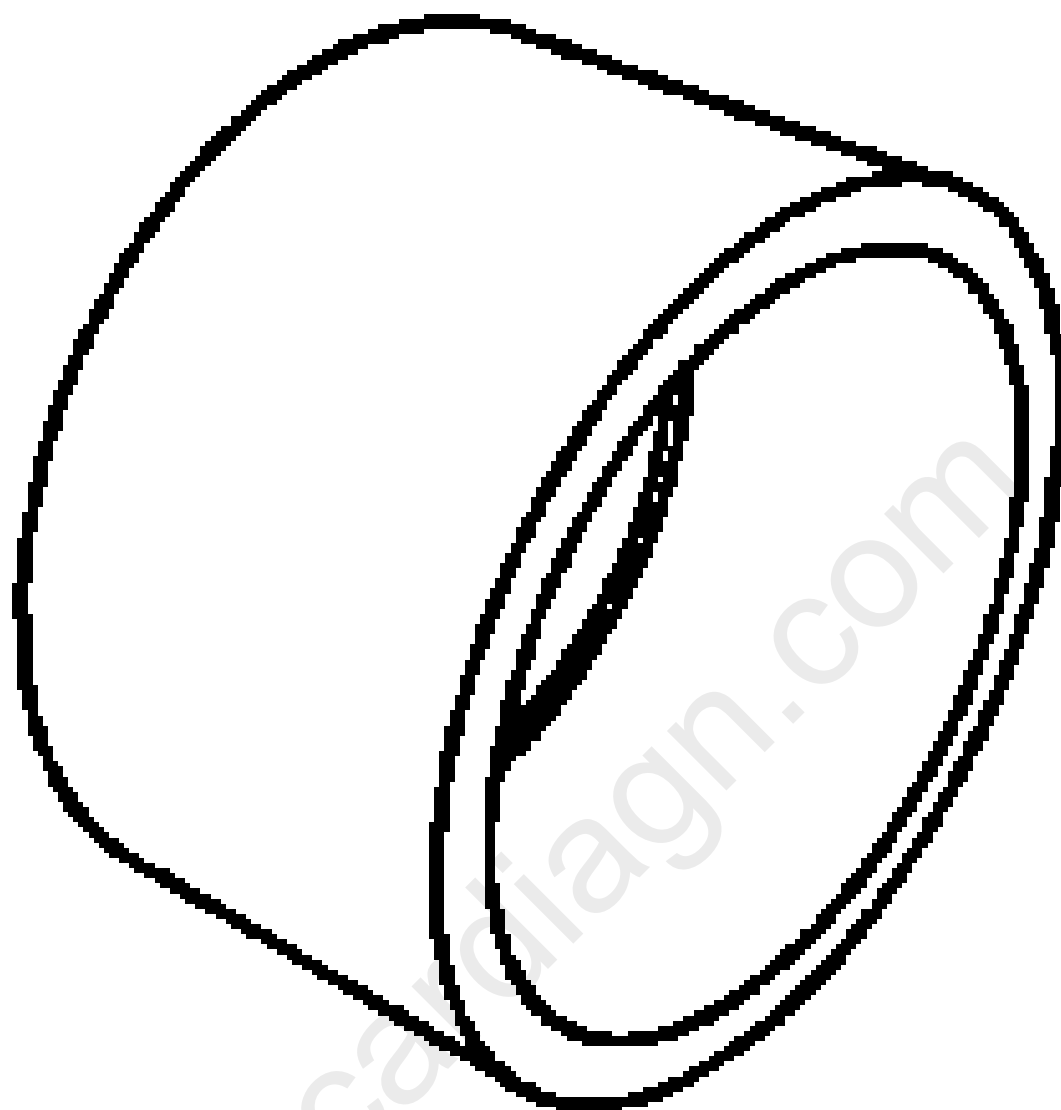
SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

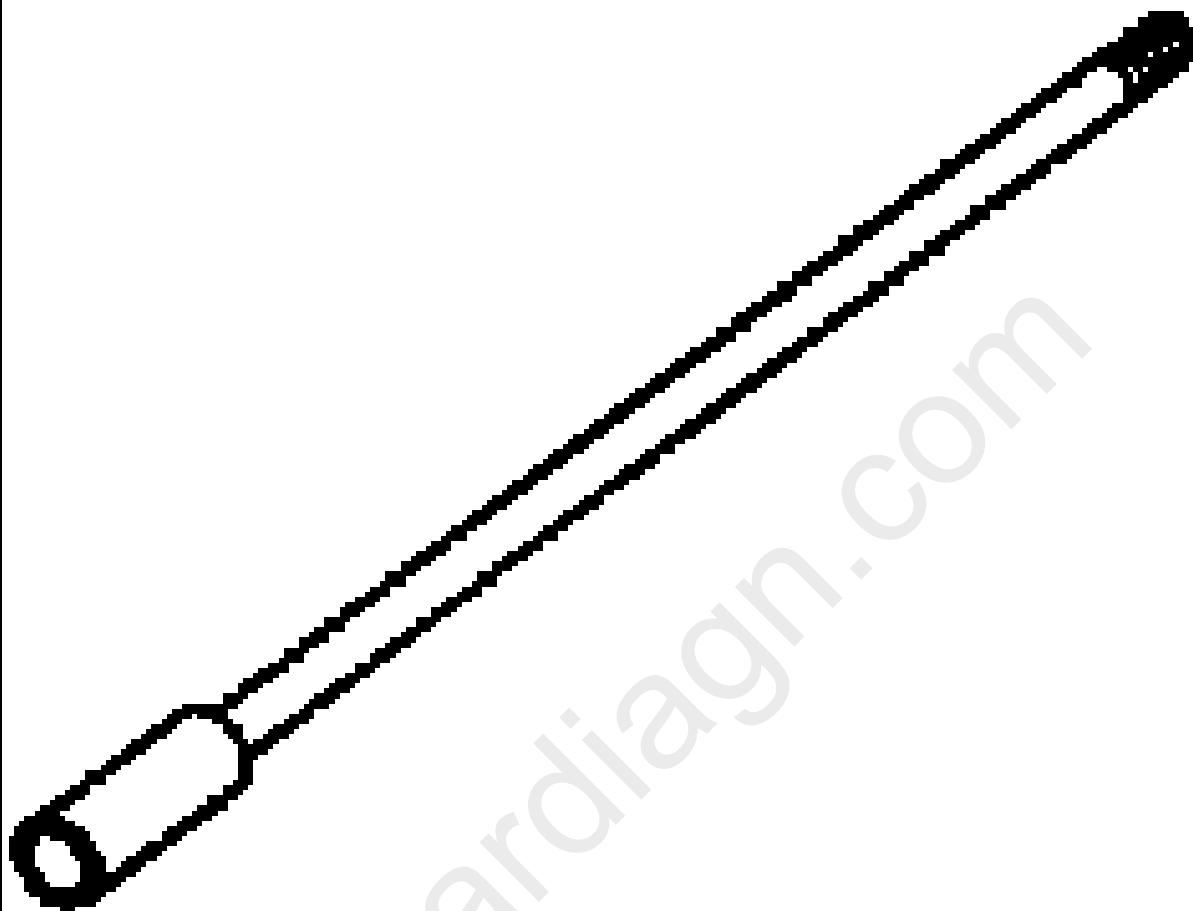
Illustration	Tool Number/ Description



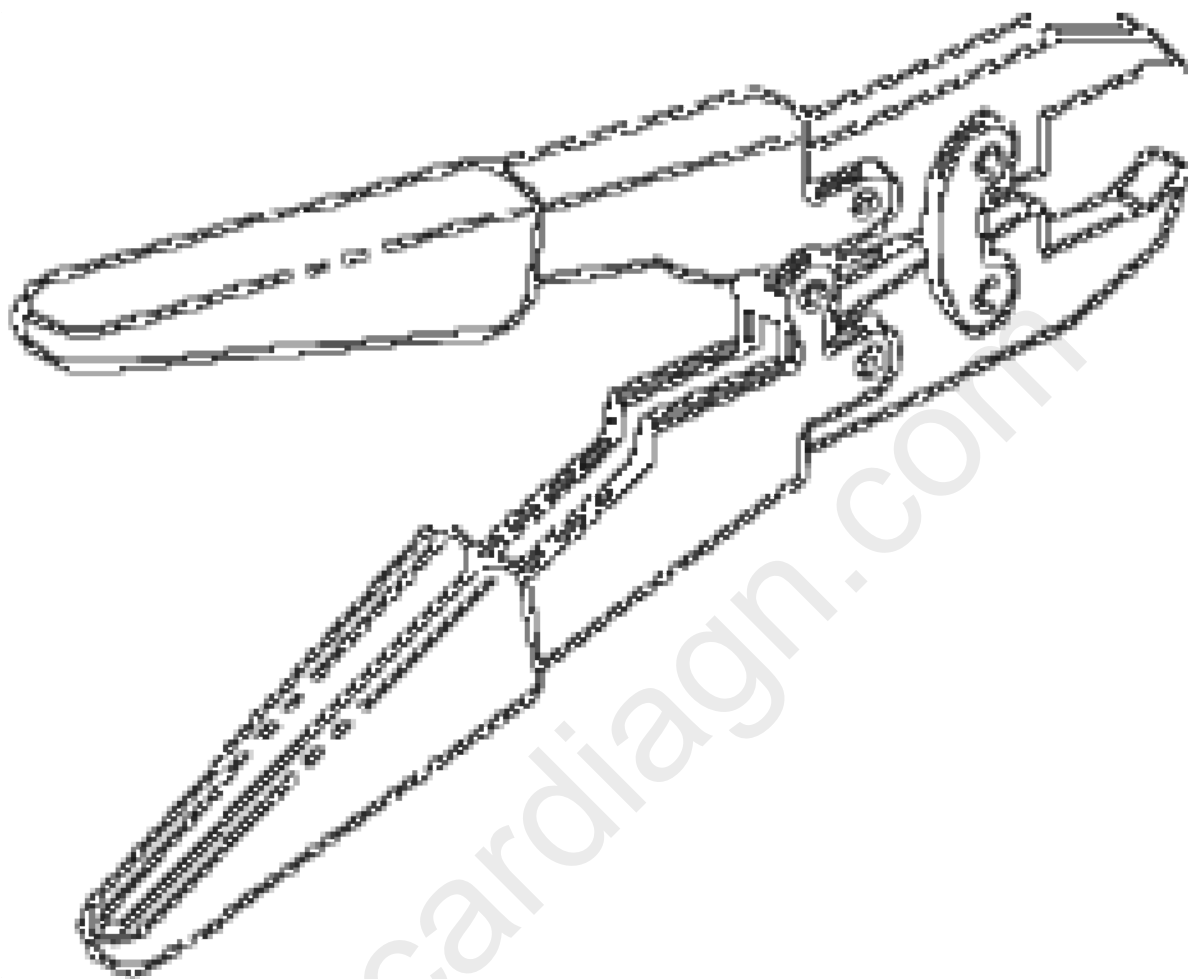
J 2619-01
Slide
Hammer



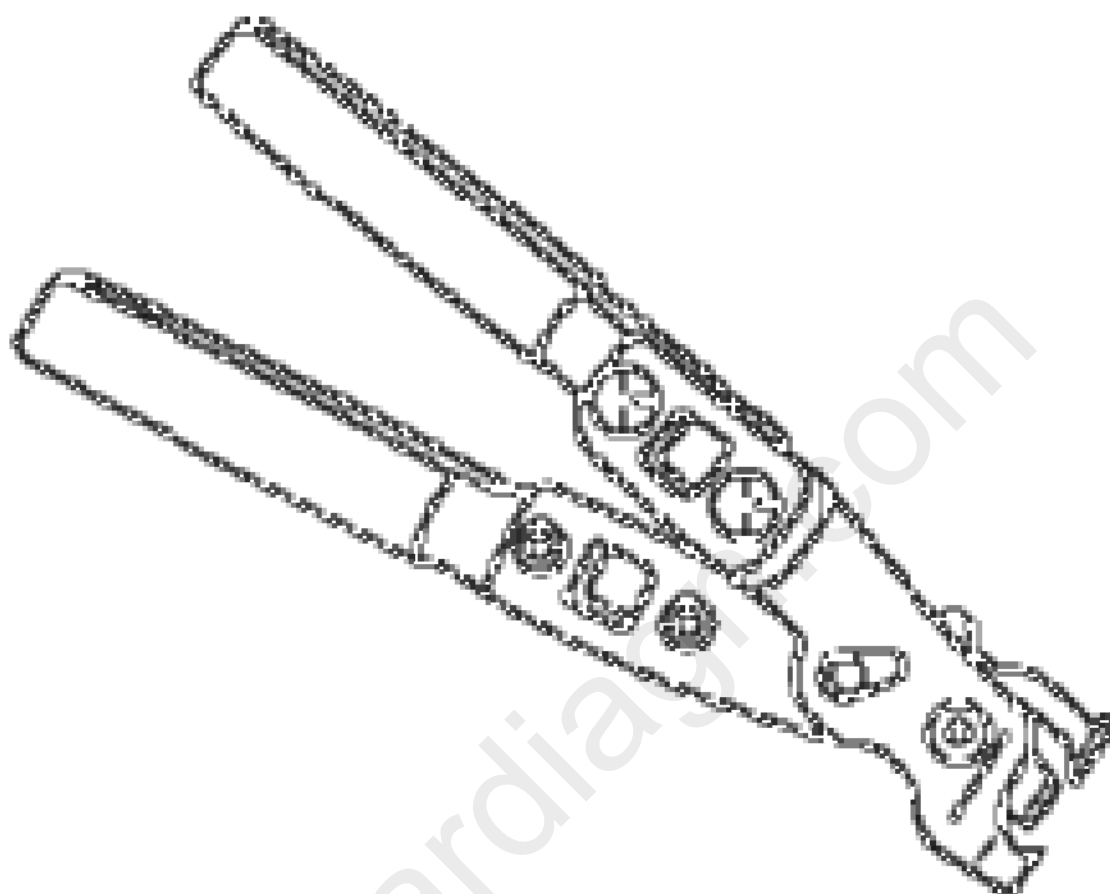
J 22928-B
Seal
Installer



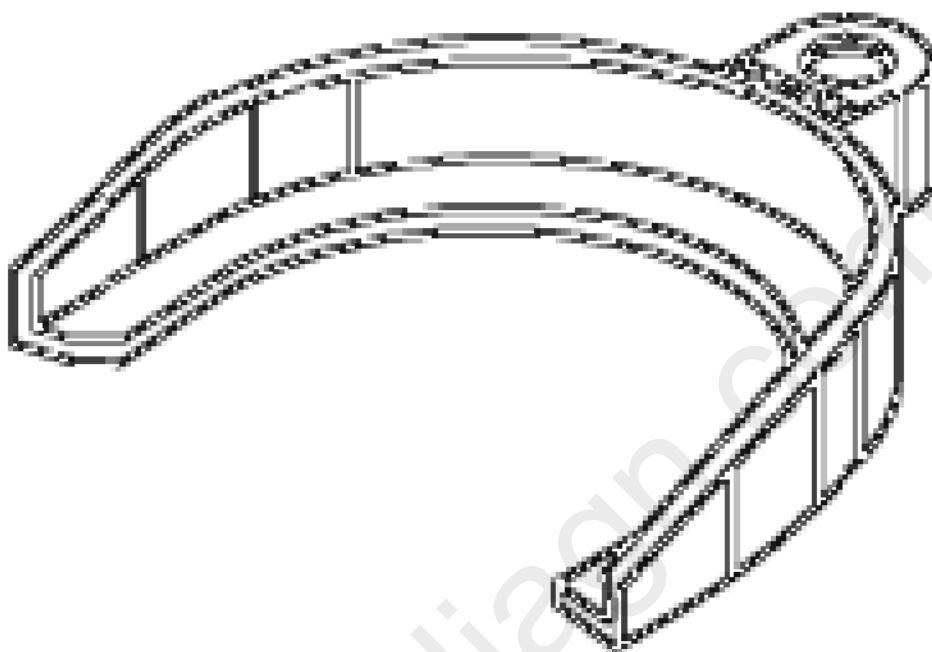
J 29794
Axle Shaft
Remover
Extension



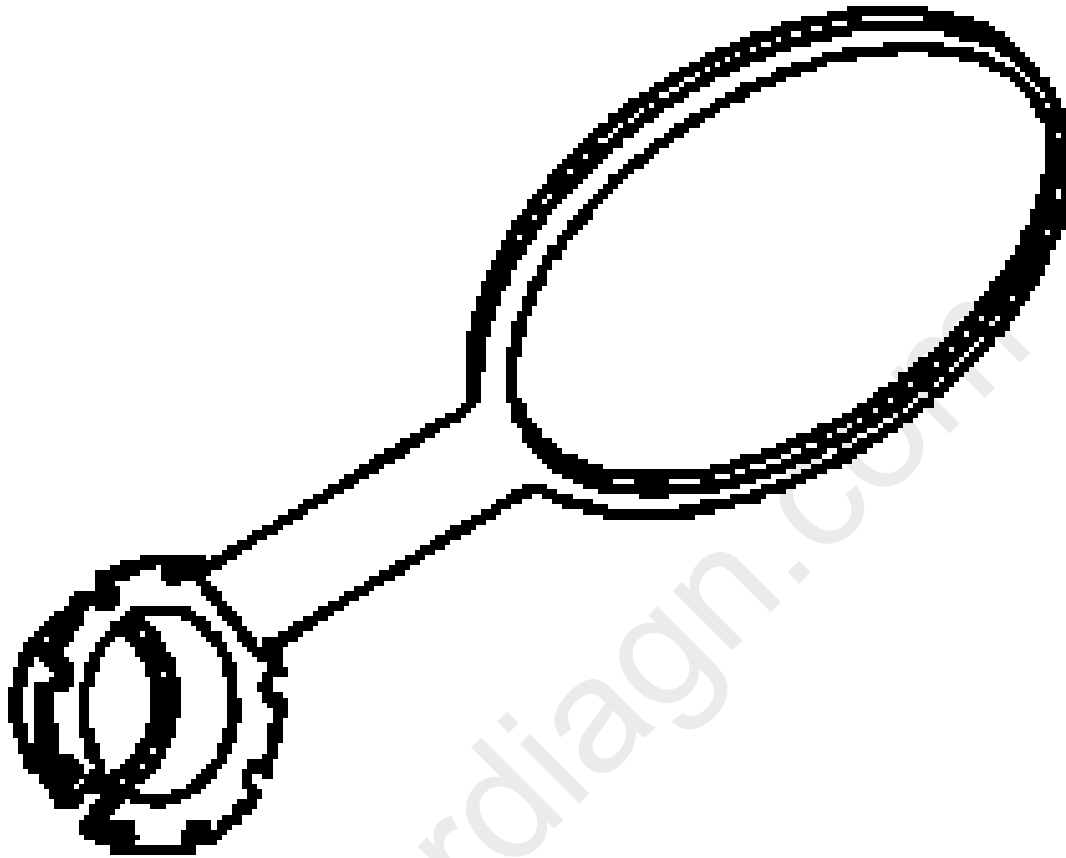
J 35566
Drive Axle
Seal Clamp
Pliers



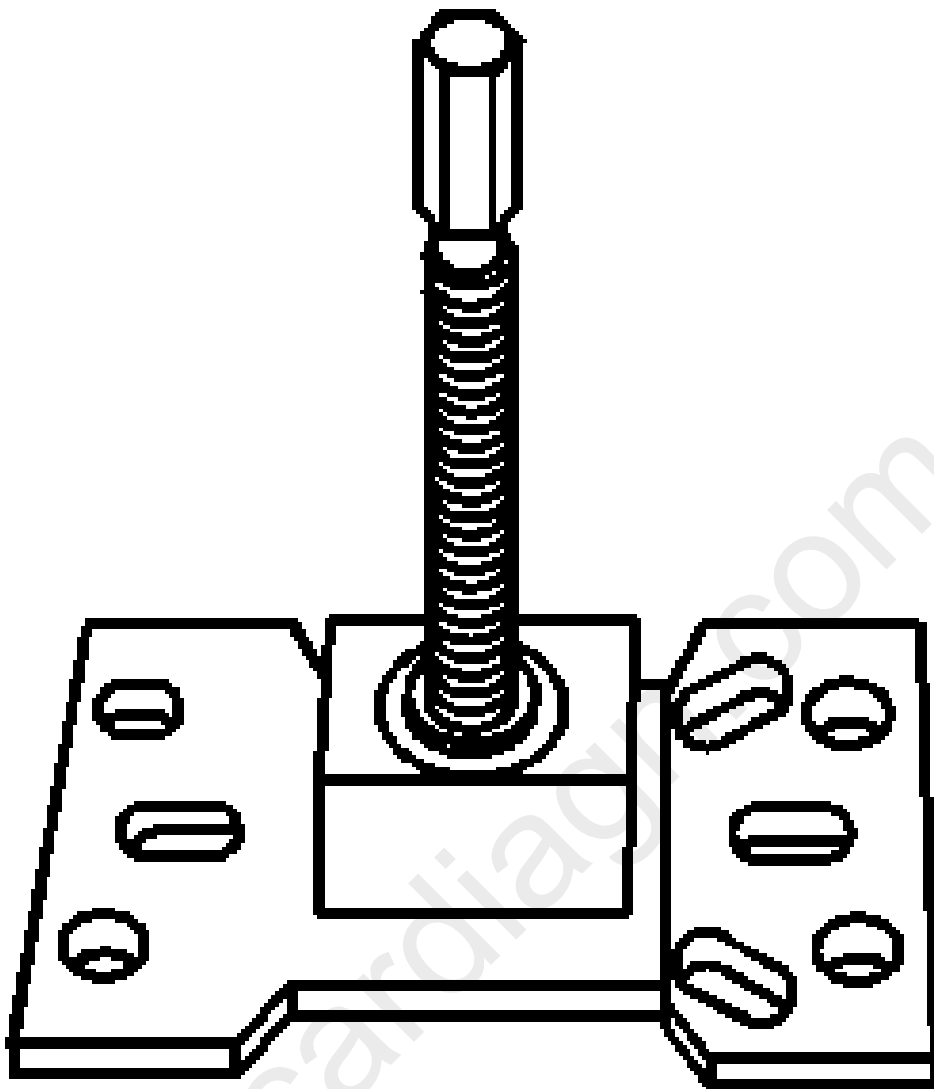
J 42572
Drive Shaft
Seal Clamp
Pliers



J 42943
Drive Axle
Separator



J 44394-A
Seal
Protector



J 45859
Wheel Hub
Remover