

DRIVELINE/AXLES Wheel

Drive Shafts - CTS Sedan

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 (EL-38792-A Electronic Vibration Analyzer) , Vibration Analysis - Road Testing (CH-51450-NVH Oscilloscope) 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-45341** Axle Shaft Remover
- **GE-47829** Extension
- **J-2619-A** Slide Hammer
- **J-34826** Hub Nut Wrench

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 (AWD)** , **Steering Linkage Outer Tie Rod Replacement (RWD)** .

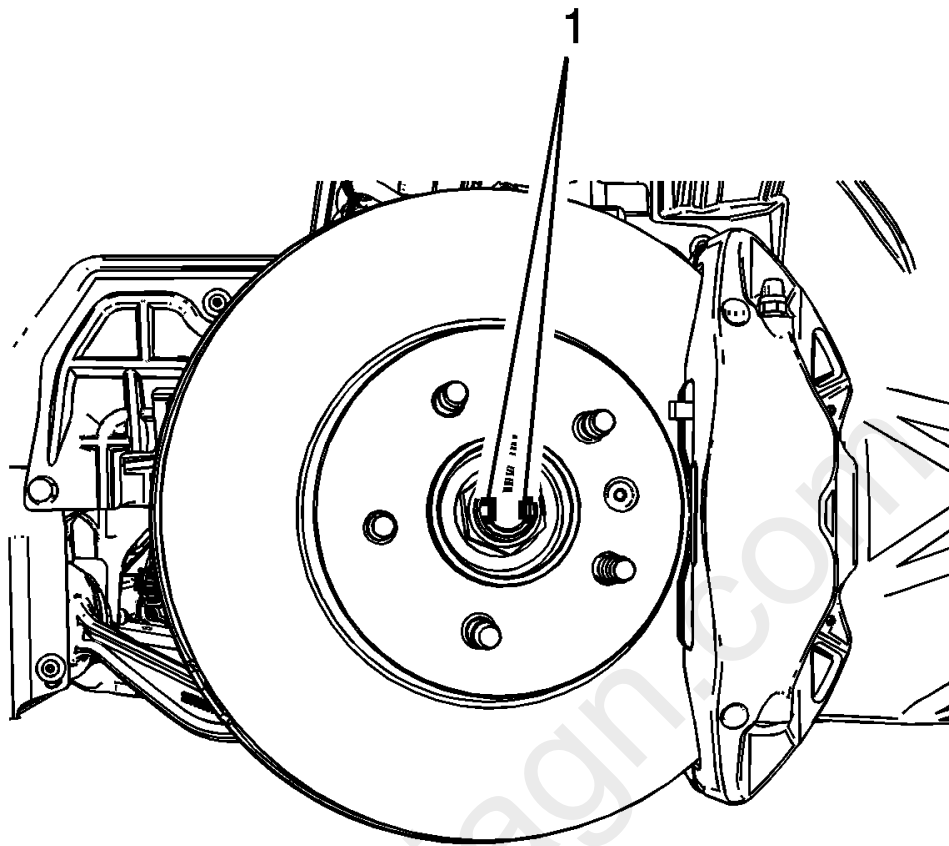


Fig. 1: Identifying Drive Shaft Slots
Courtesy of GENERAL MOTORS COMPANY

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.

4. Using a suitable punch and a hammer, unstake the drive shaft nut collar from the drive shaft slots (1).

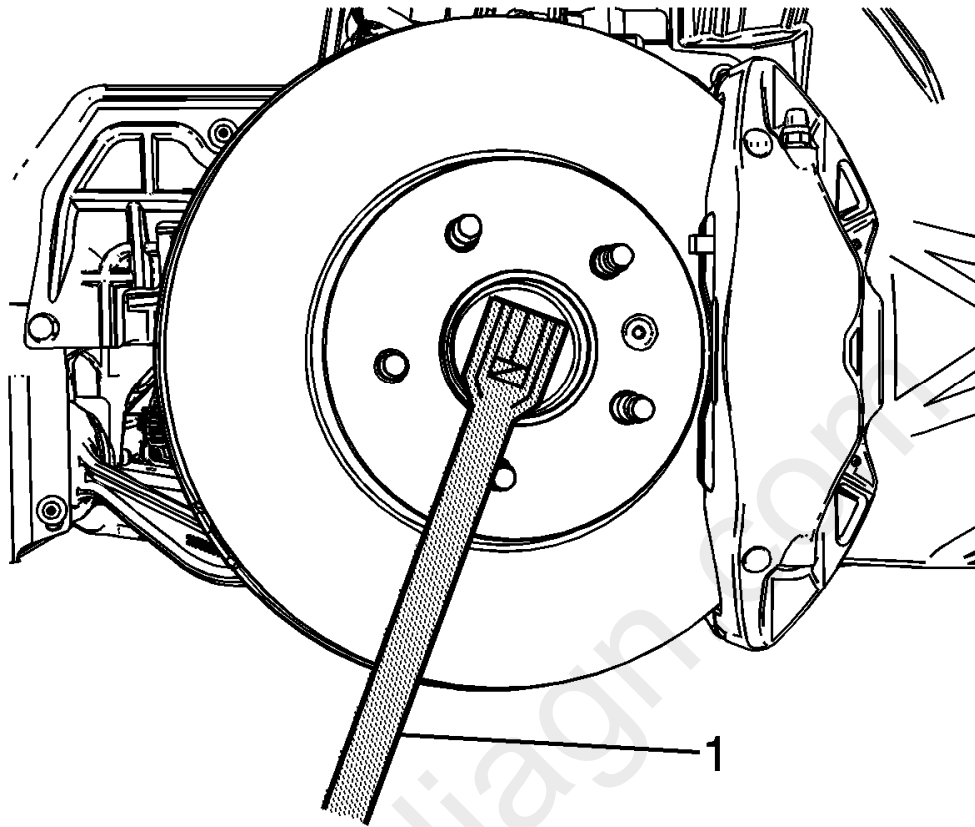


Fig. 2: Wheel Drive Shaft Nut & Breaker Bar
Courtesy of GENERAL MOTORS COMPANY

5. With the aid of an assistant holding the brake pedal down, use a breaker bar (1) and **J-34826** hub nut wrench loosen the wheel drive shaft nut.

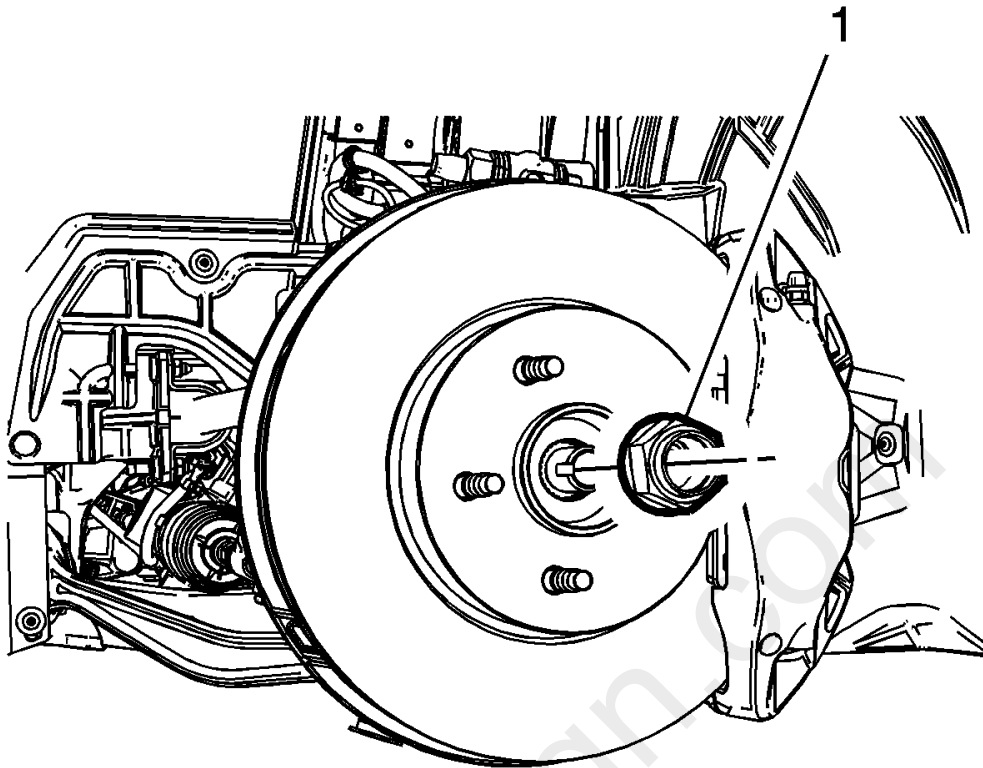


Fig. 3: Wheel Drive Shaft Nut
Courtesy of GENERAL MOTORS COMPANY

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** .

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 a brass drift and a hammer, tap the shaft to disengage the wheel drive shaft from the wheel hub/bearing assembly.

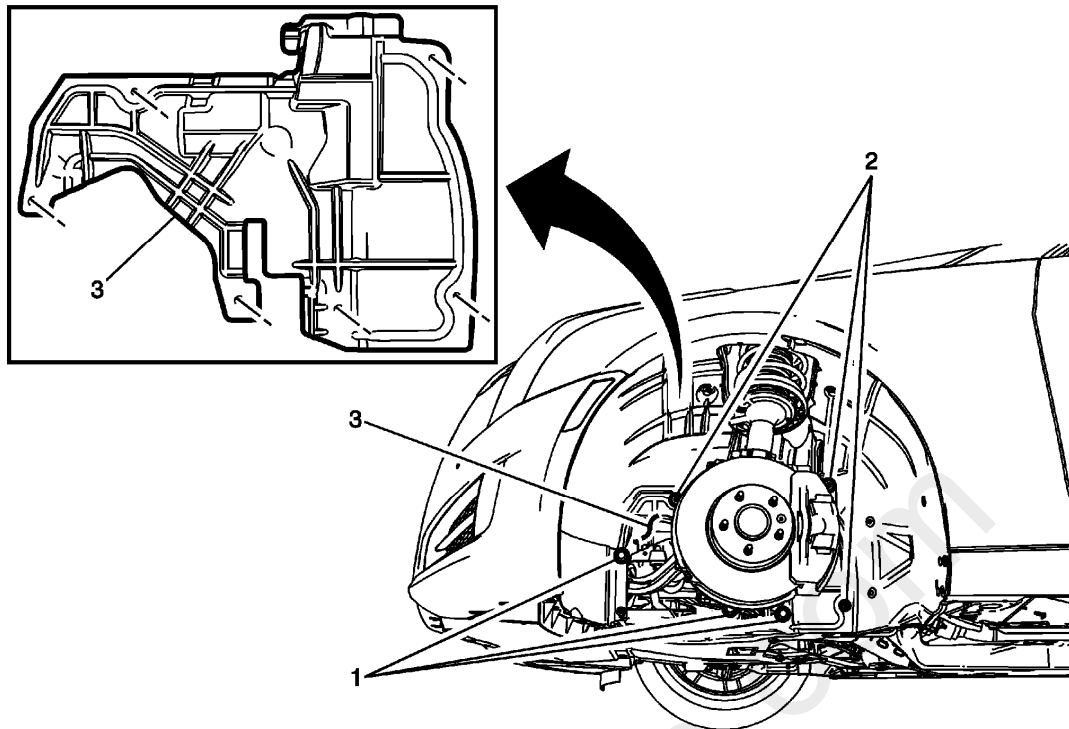


Fig. 4: Front Wheelhouse Panel Splash Shield & Mounting Components
Courtesy of GENERAL MOTORS COMPANY

9. Remove the front wheelhouse panel splash shield (3). Refer to **Engine Lower Front Splash Shield Replacement** .

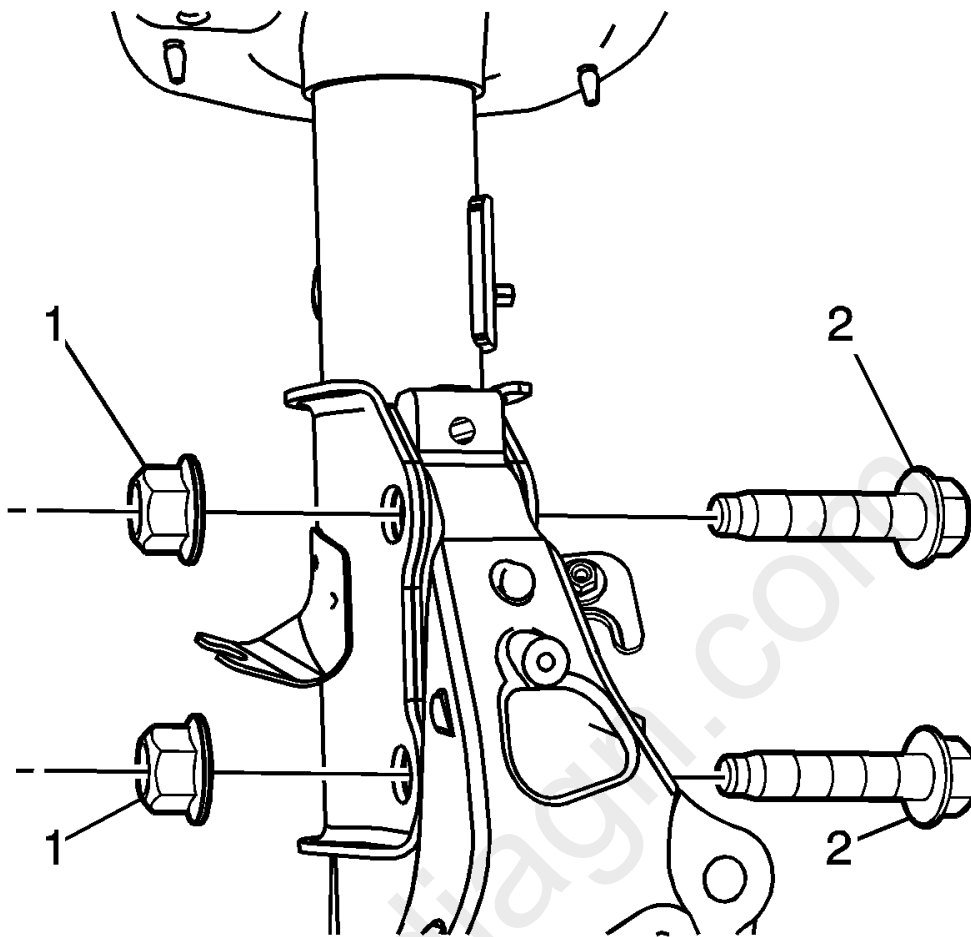


Fig. 5: Front Strut Nuts & Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Remove the strut fasteners (1 and 2). Refer to **Strut Assembly Removal and Installation (FE2 Base)** , **Strut Assembly Removal and Installation (FE2 or FE3 With F55 Magnetic Ride Suspension)** .

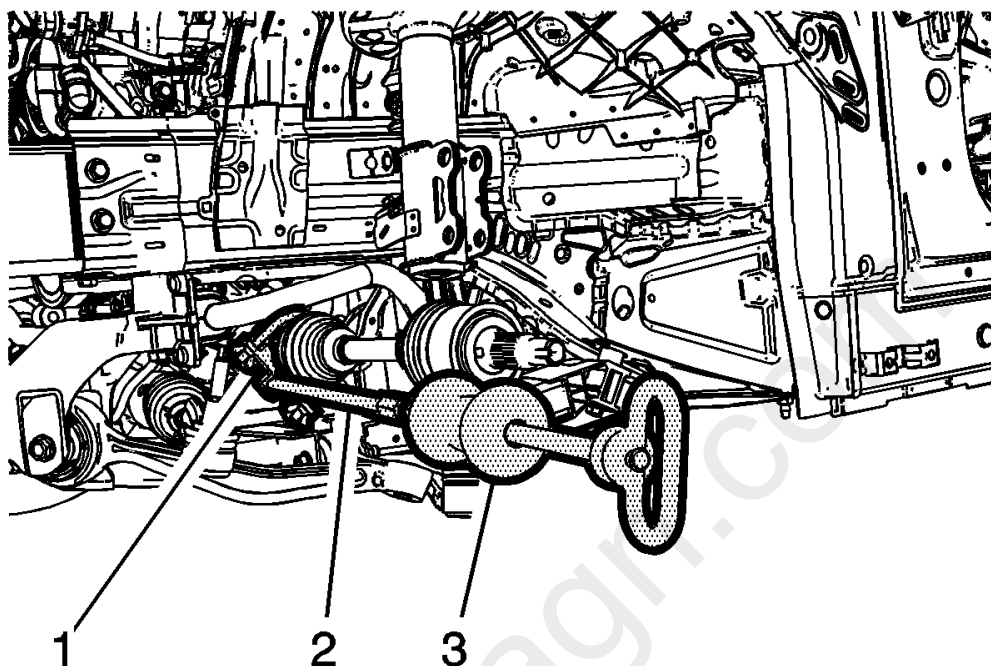


Fig. 6: Axle Shaft Removal Tools

Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft has a groove designed in to it to hold the axle shaft remover tool (1).

11. Using the **J-45341** axle shaft remover (1) **GE-47829** extension (2) **J-2619-A** slide hammer remove the wheel drive shaft.

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

12. Remove the wheel drive shaft from the vehicle.

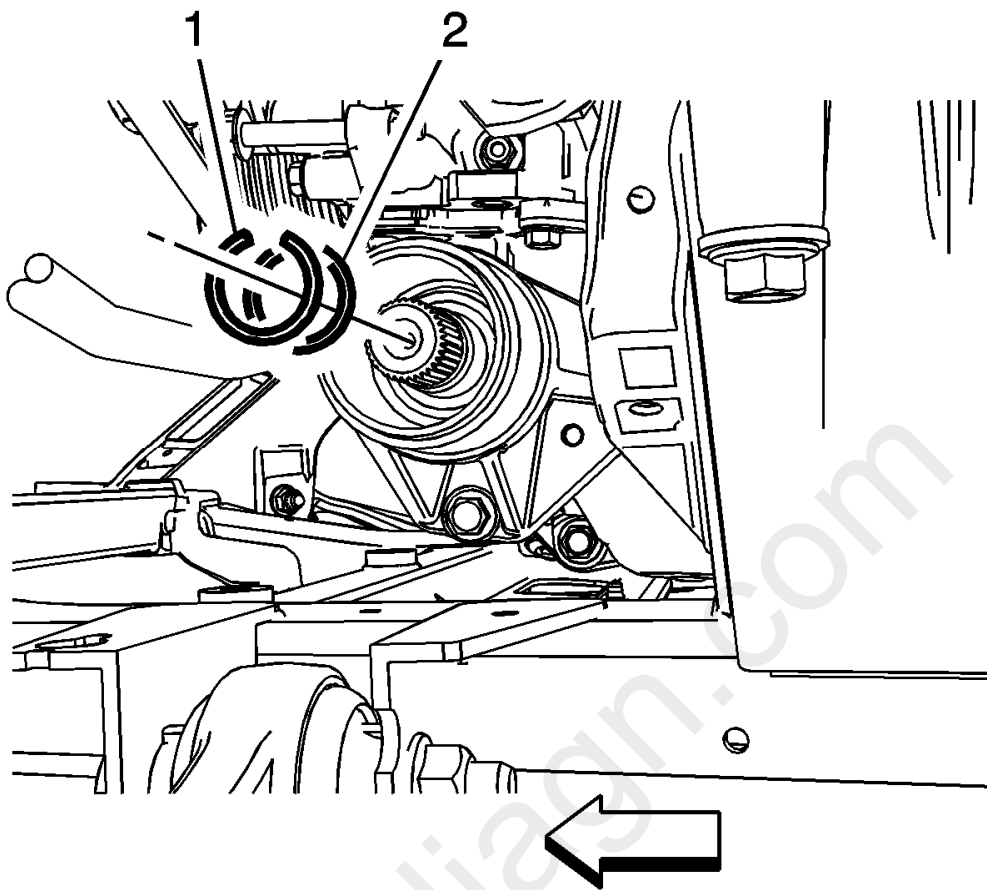


Fig. 7: Wheel Drive Shaft Retaining Ring & O-ring
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

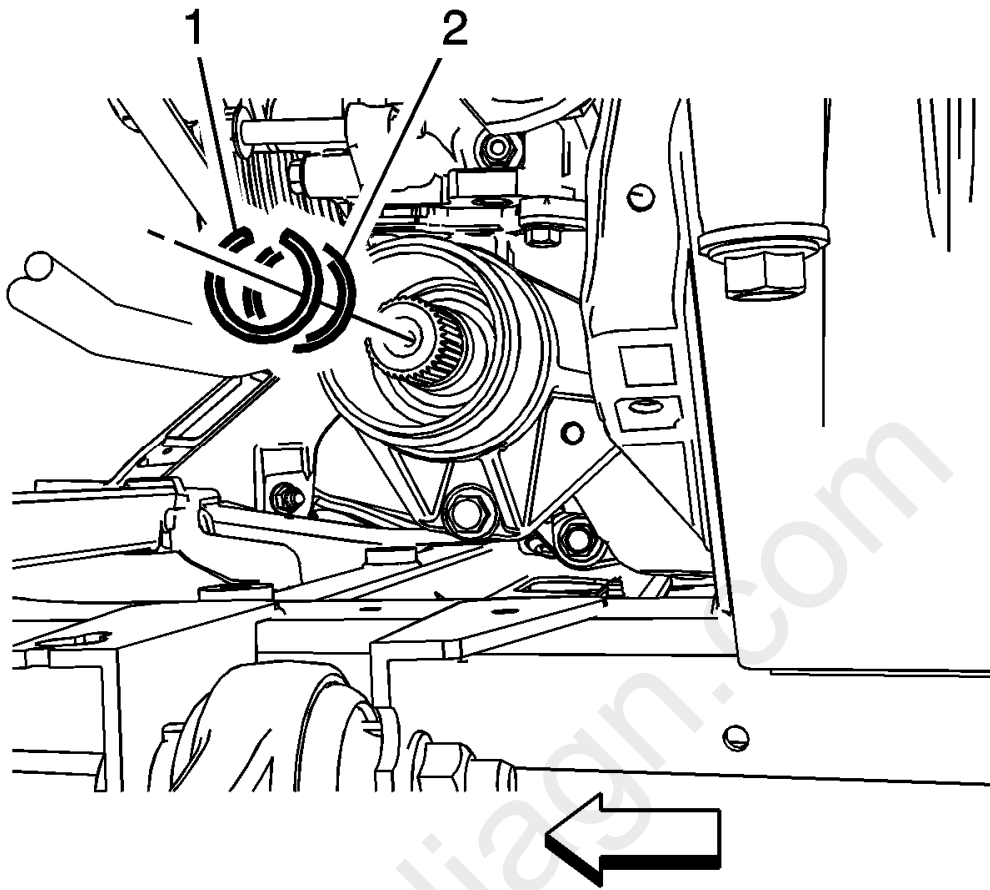


Fig. 8: Wheel Drive Shaft Retaining Ring & O-ring
Courtesy of GENERAL MOTORS COMPANY

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 housing and onto the intermediate shaft until engaged on the retaining ring.
5. To ensure that the wheel drive shaft is installed properly, grasp the inner tripod housing and pull outward to ensure it is engaged on the retaining ring. DO NOT pull on the axle shaft.
6. Install the wheel drive shaft through the wheel hub/bearing assembly.

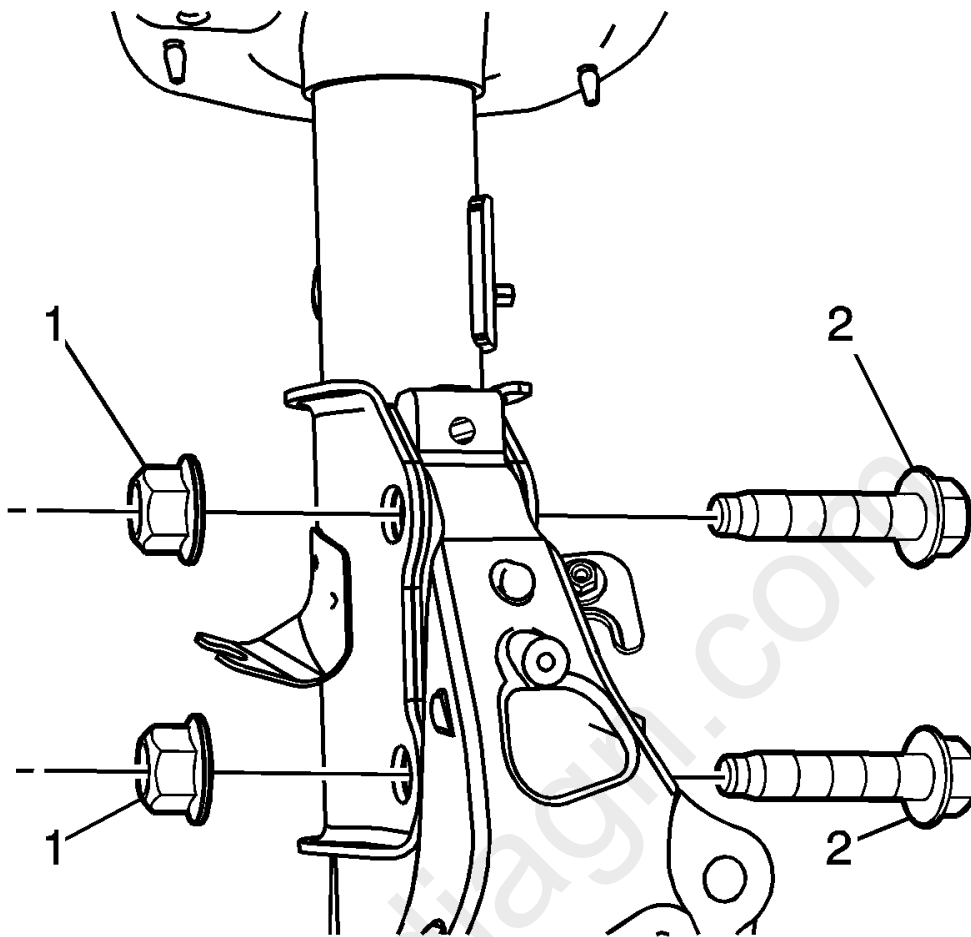


Fig. 9: Front Strut Nuts & Bolts

Courtesy of GENERAL MOTORS COMPANY

7. Install the strut fasteners (1 and 2). Refer to **Strut Assembly Removal and Installation (FE2 Base)** , **Strut Assembly Removal and Installation (FE2 or FE3 With F55 Magnetic Ride Suspension)** .

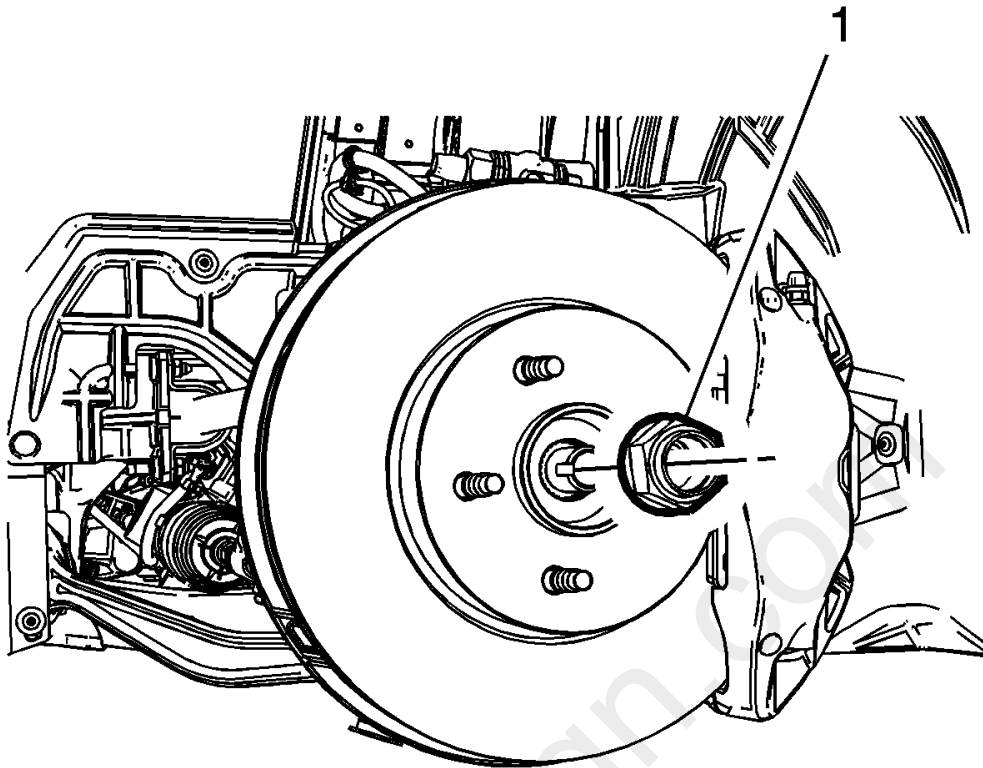


Fig. 10: Wheel Drive Shaft Nut
Courtesy of GENERAL MOTORS COMPANY

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).
9. Using **J-34826** hub nut wrench tighten the NEW wheel drive shaft nut until the wheel drive shaft is fully seated in the wheel hub/bearing assembly.

CAUTION: Refer to **Fastener Caution** .

10. With the aid of an assistant holding the brake pedal down, tighten the wheel drive shaft nut to 250 (184 lb ft).

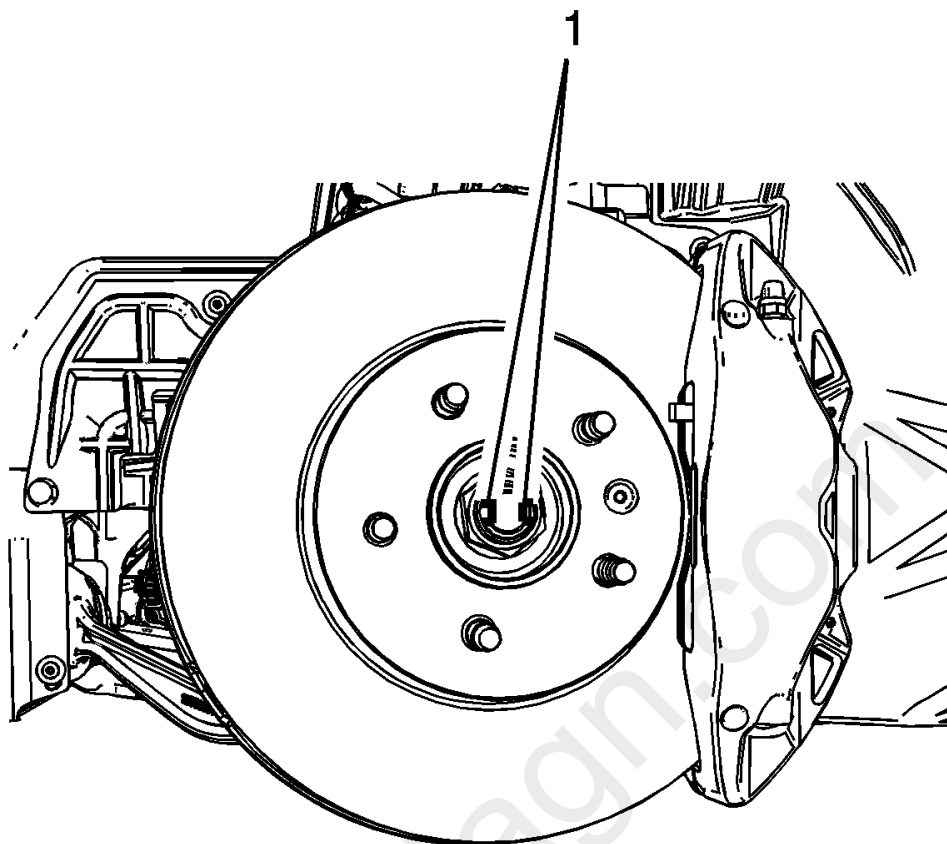


Fig. 11: Identifying Drive Shaft Slots
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft nut collar should be fractured in the center of each slot of the wheel drive shaft.

11. Using a hammer and a suitable punch, stake the wheel drive shaft nut collar into the drive shaft slots (1).

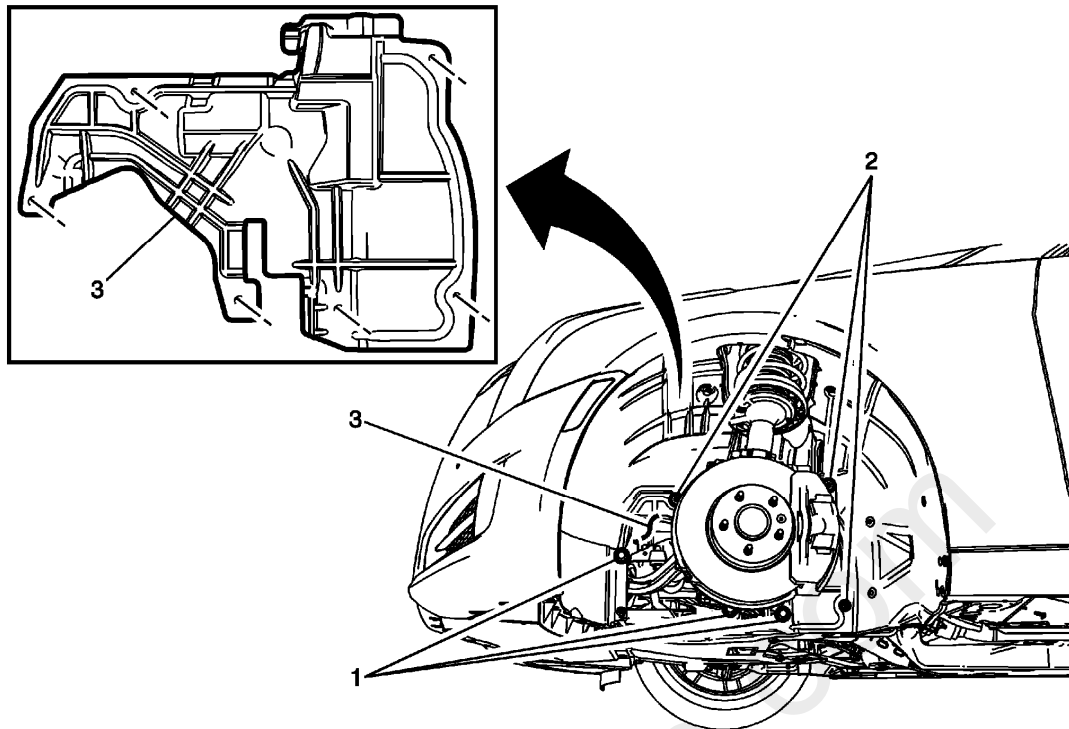


Fig. 12: Front Wheelhouse Panel Splash Shield & Mounting Components
Courtesy of GENERAL MOTORS COMPANY

12. Install the front wheelhouse panel splash shield (3). Refer to **Engine Lower Front Splash Shield Replacement** .
13. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement** .
14. Install the left outer tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement (AWD)** , **Steering Linkage Outer Tie Rod Replacement (RWD)** .
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

- **GE-47829** Extension
- **J-2619-A** Slide Hammer
- **J-34826** Hub Nut Wrench
- **J-45341** Axle Shaft Remover

Removal Procedure

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

3. Remove the right outer tie rod from the steering knuckle. Refer to **Steering Linkage Outer Tie Rod Replacement (AWD)** , **Steering Linkage Outer Tie Rod Replacement (RWD)** .

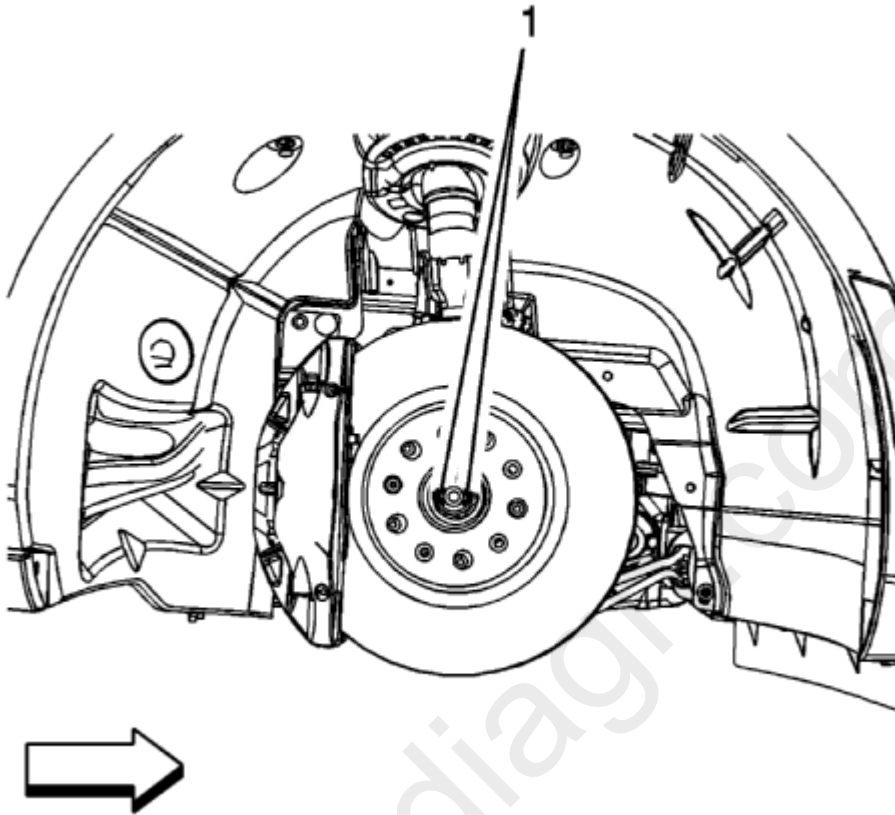


Fig. 13: Identifying Drive Shaft Slots
Courtesy of GENERAL MOTORS COMPANY

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.

4. Using a suitable punch and a hammer, unstake the drive shaft nut collar from the drive shaft slots (1).

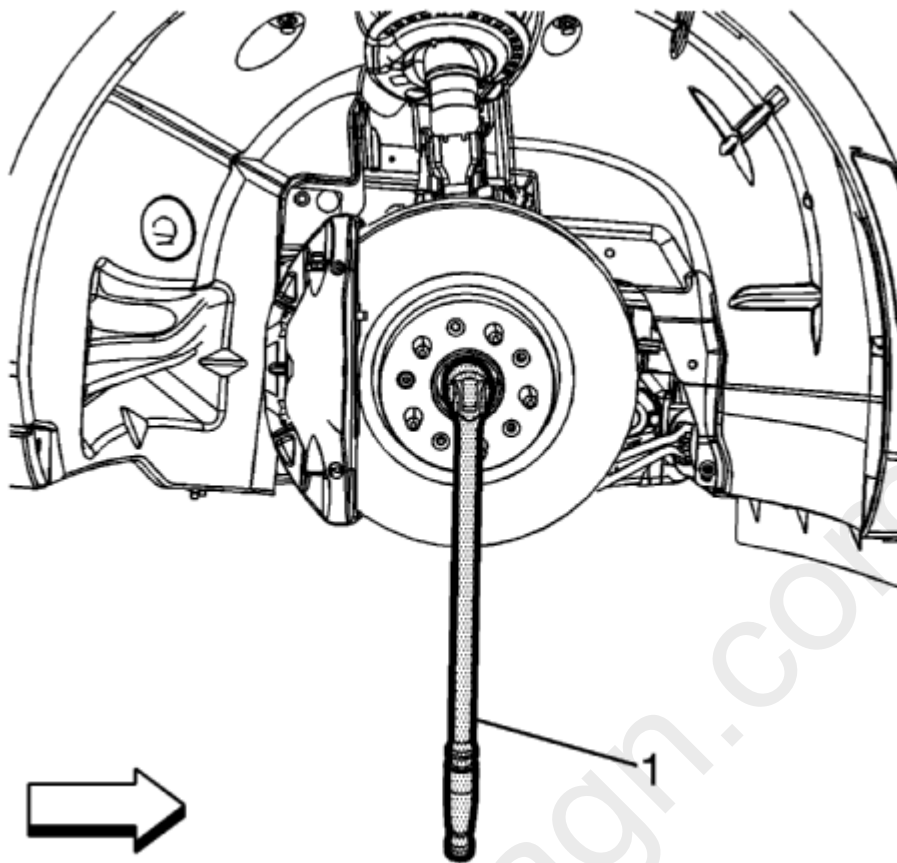


Fig. 14: Wheel Drive Shaft Nut & Breaker Bar
Courtesy of GENERAL MOTORS COMPANY

5. With the aid of an assistant holding the brake pedal down, use a breaker bar (1) and **J-34826** hub nut wrench loosen the wheel drive shaft nut.

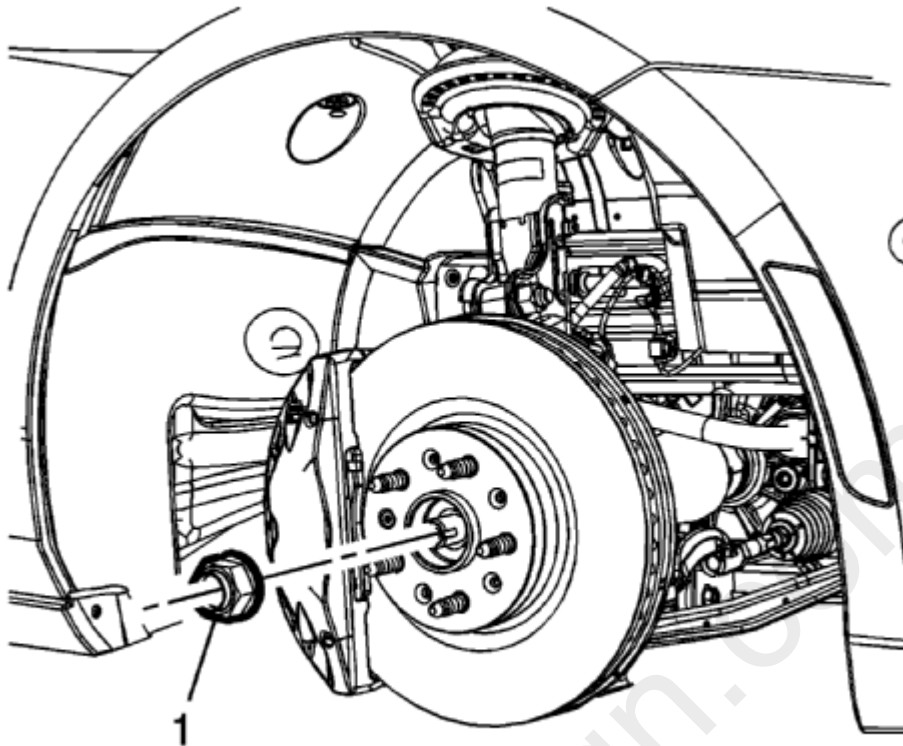


Fig. 15: Wheel Drive Shaft Nut
Courtesy of GENERAL MOTORS COMPANY

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 right wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement** .

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 a brass drift and a hammer, tap the shaft to disengage the wheel drive shaft from the wheel hub/bearing assembly.
9. Remove the front wheelhouse panel splash shield (3). Refer to **Engine Lower Front Splash Shield Replacement** .

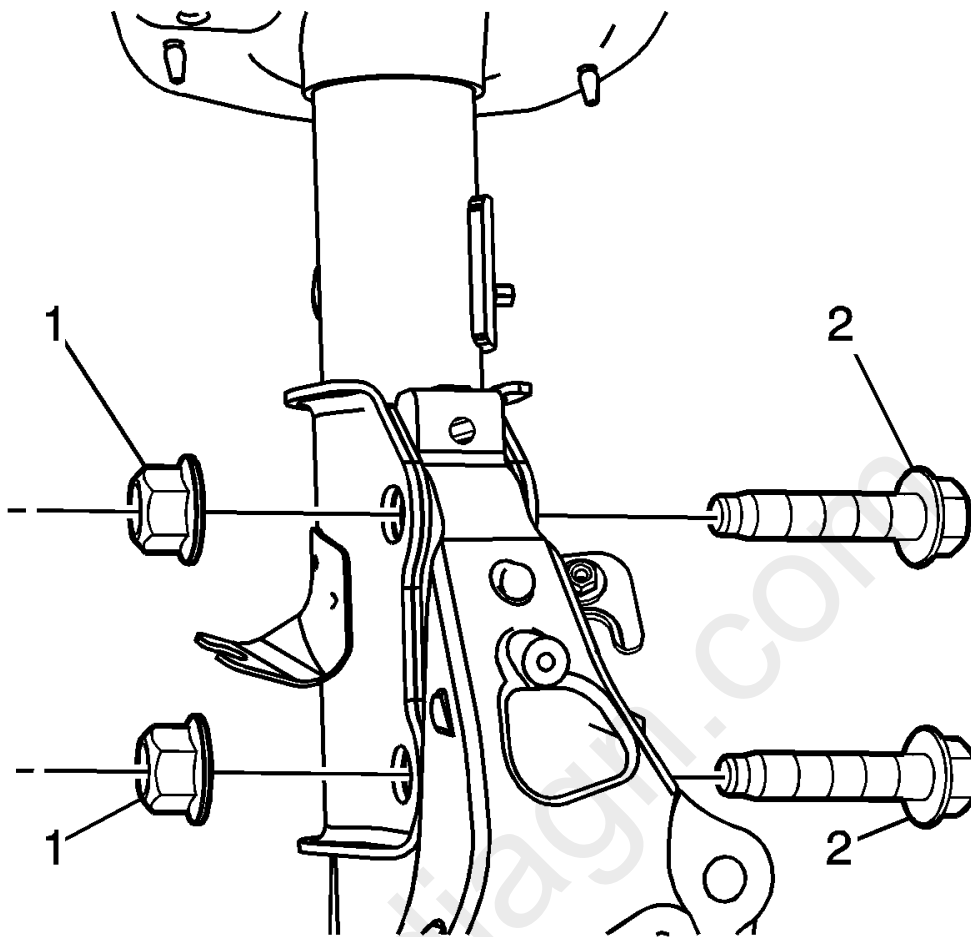


Fig. 16: Front Strut Nuts & Bolts
Courtesy of GENERAL MOTORS COMPANY

10. Remove the strut fasteners (1 and 2). Refer to **Strut Assembly Removal and Installation (FE2 Base)** , **Strut Assembly Removal and Installation (FE2 or FE3 With F55 Magnetic Ride Suspension)** .

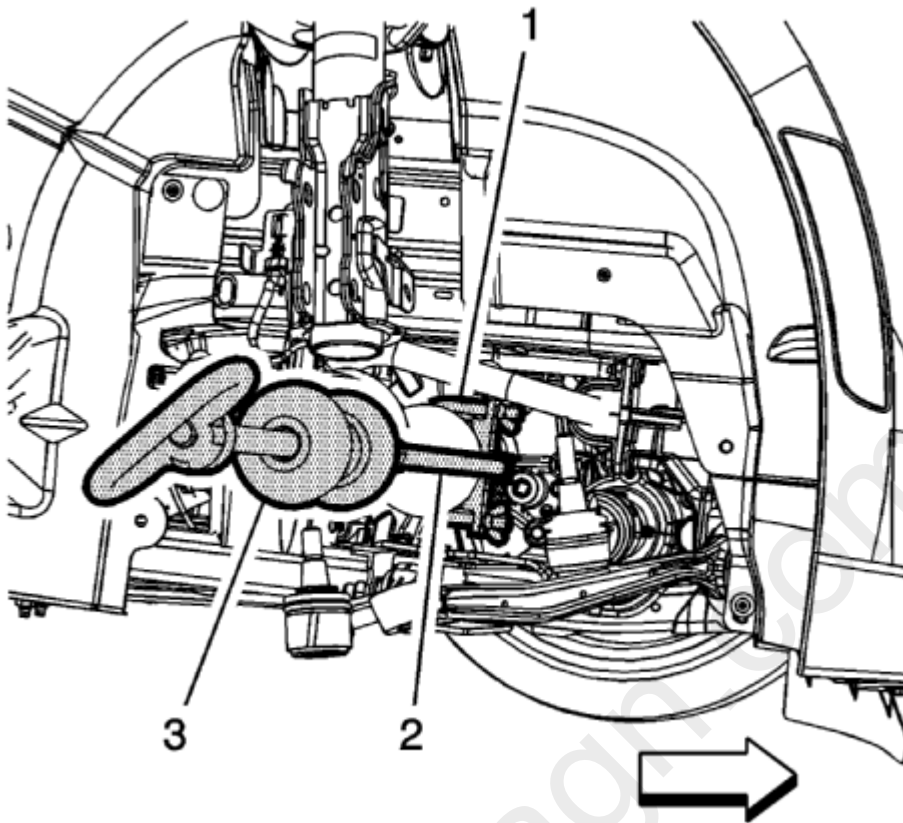


Fig. 17: Removing Wheel Drive Shaft Using Slide Hammer
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft has a groove designed in to it to hold the axle shaft remover tool (1)

11. Using the **J-45341** axle shaft remover (1) **GE-47829** extension (2) **J-2619-A** slide hammer remove the wheel drive shaft.

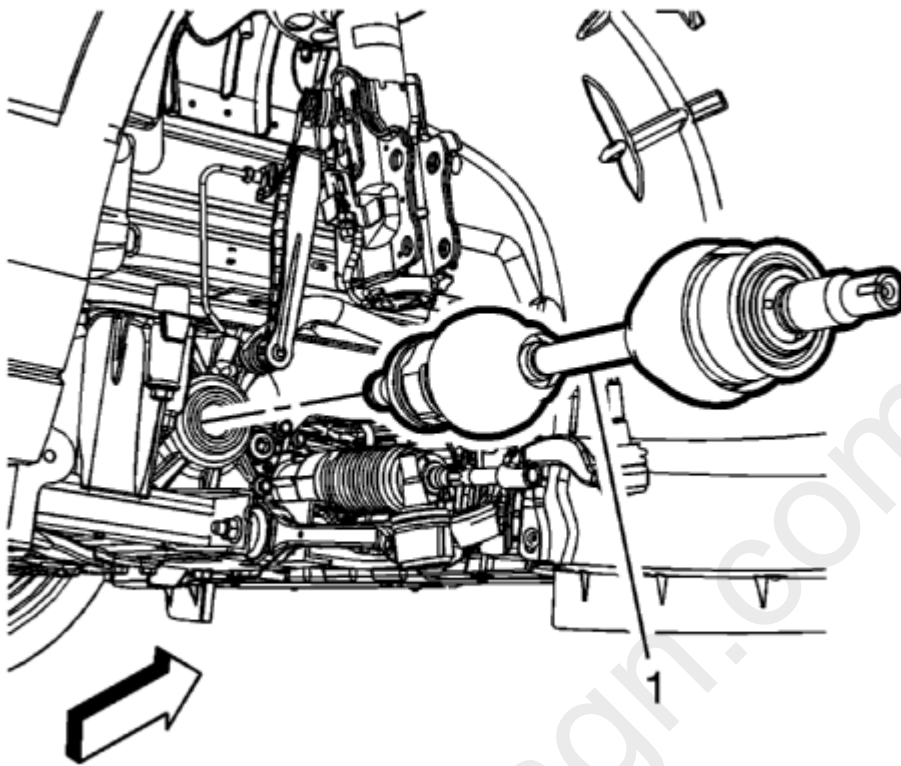


Fig. 18: Wheel Drive Shaft
Courtesy of GENERAL MOTORS COMPANY

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

Installation Procedure

1. Apply a small amount of grease to the wheel drive shaft splines and axle seal. Refer to **Adhesives, Fluids, Lubricants, and Sealers**.

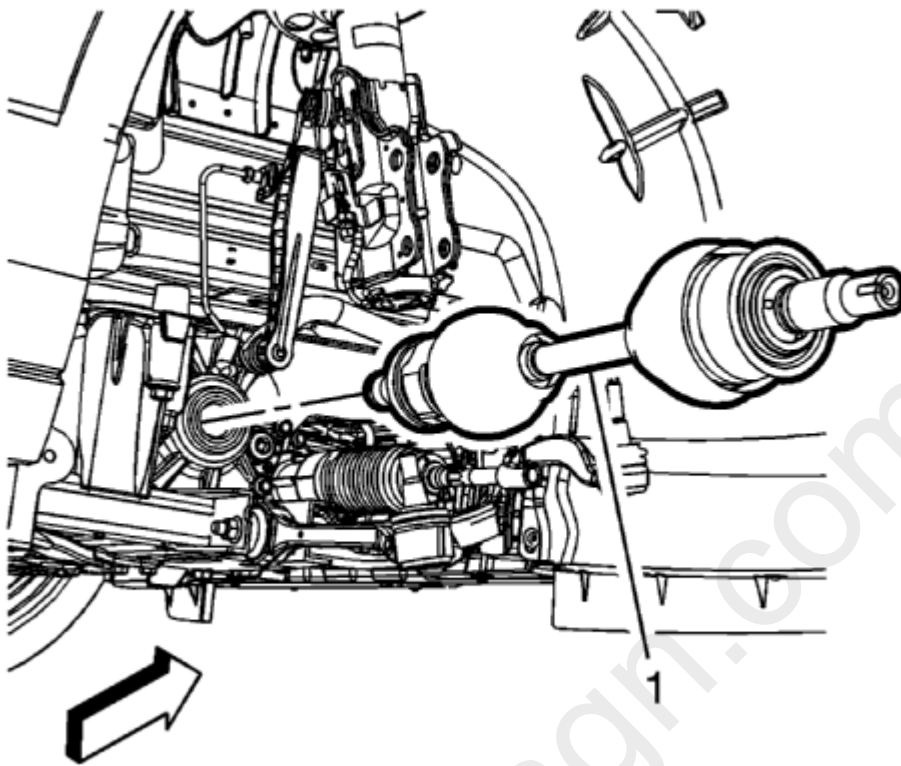


Fig. 19: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

2. Install the right front wheel drive shaft (1) into the transfer unit until engaged on the retaining ring.
3. To ensure that the wheel drive shaft is installed properly, grasp the inner tripod housing and pull outward to ensure it is engaged on the retaining ring. DO NOT pull on the axle shaft.
4. Install the wheel drive shaft through the wheel hub/bearing assembly.

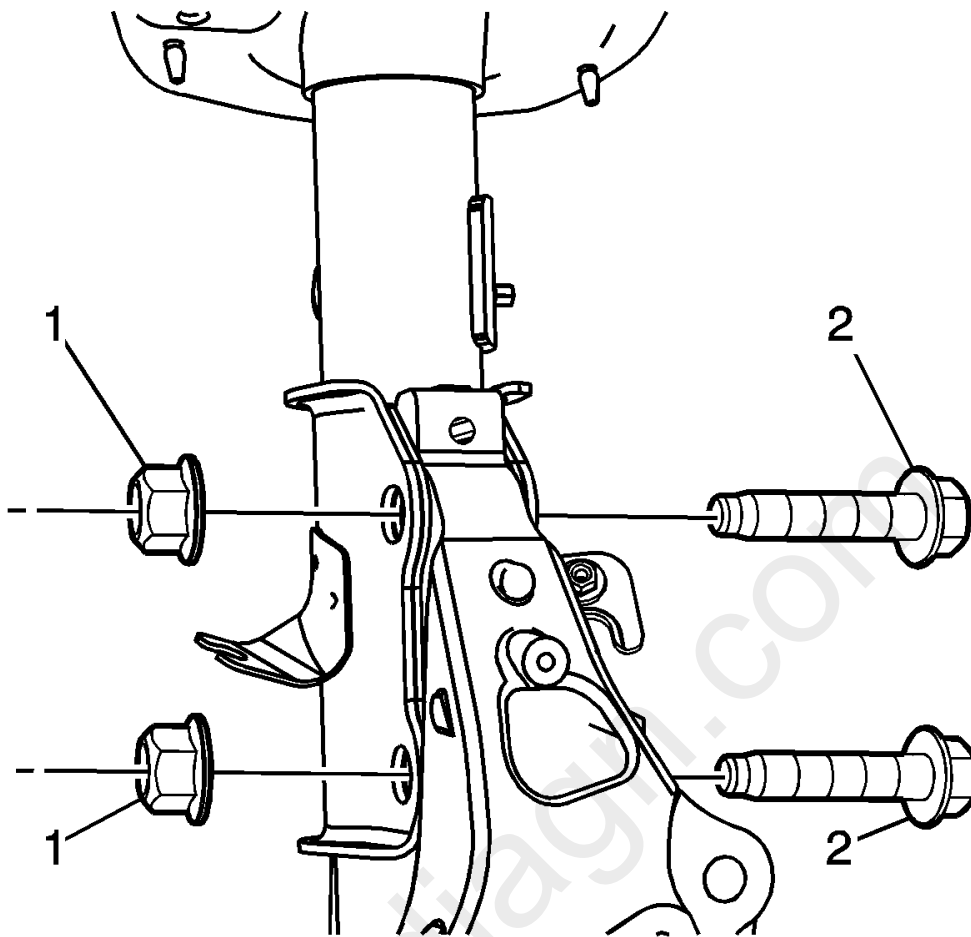


Fig. 20: Front Strut Nuts & Bolts
Courtesy of GENERAL MOTORS COMPANY

5. Install the strut fasteners (1 and 2). Refer to **Strut Assembly Removal and Installation (FE2 Base)** , **Strut Assembly Removal and Installation (FE2 or FE3 With F55 Magnetic Ride Suspension)** .

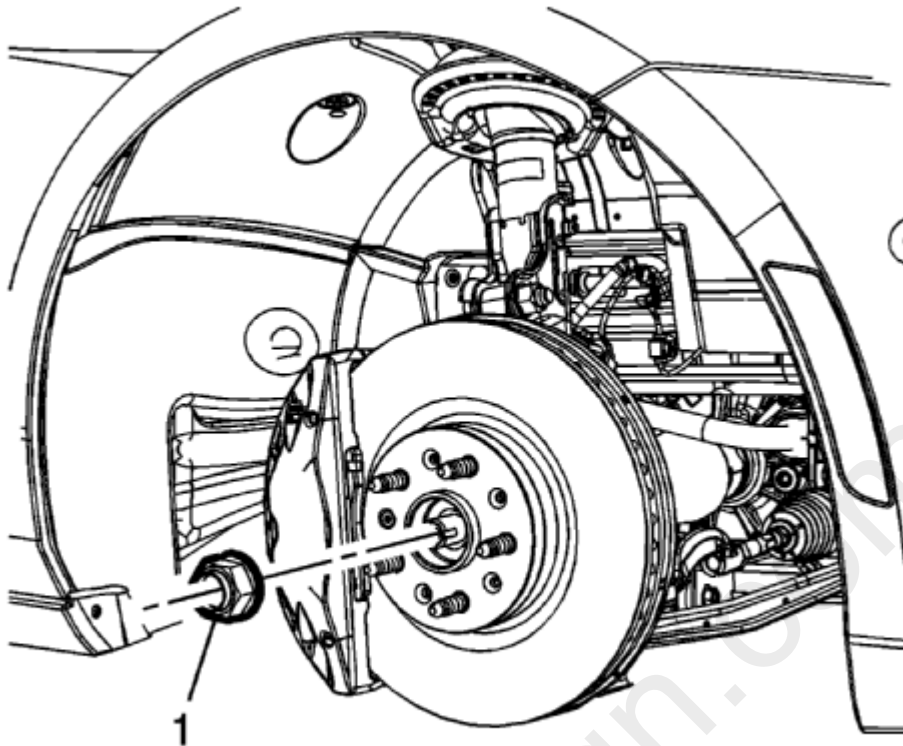


Fig. 21: Wheel Drive Shaft Nut
Courtesy of GENERAL MOTORS COMPANY

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

6. Hand start the NEW wheel drive shaft nut (1).
7. Using **J-34826** hub nut wrench tighten the NEW wheel drive shaft nut until the wheel drive shaft is fully seated in the wheel hub/bearing assembly.

CAUTION: Refer to **Fastener Caution** .

8. With the aid of an assistant holding the brake pedal down, tighten the wheel drive shaft nut to 250 N.m (184 lb ft).

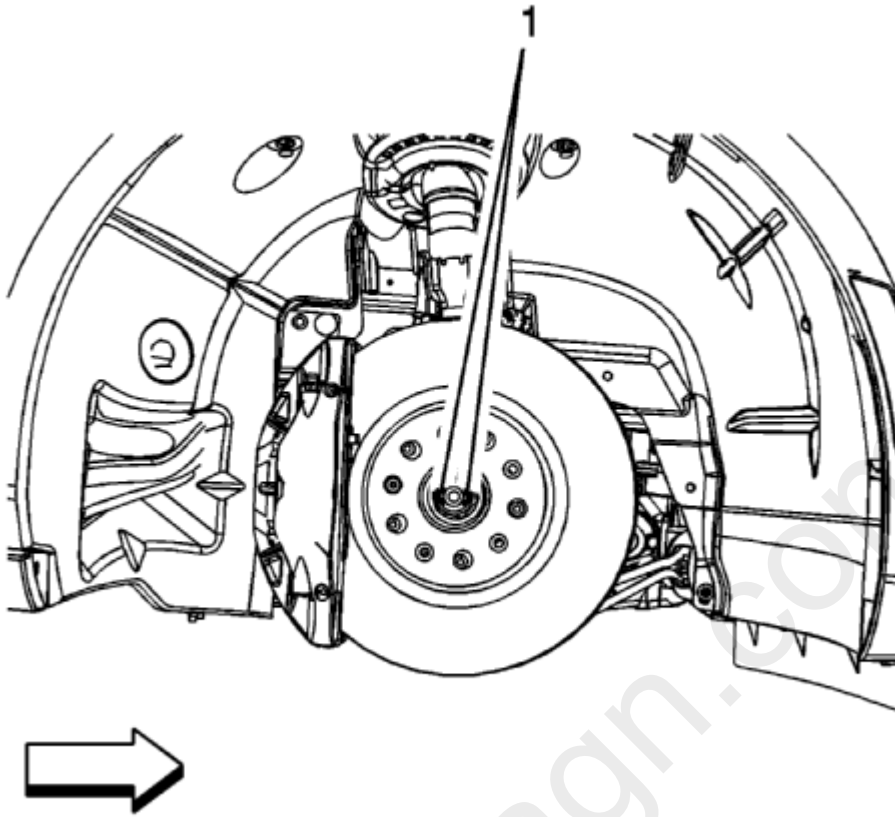


Fig. 22: Identifying Drive Shaft Slots
Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft nut collar should be fractured in the center of each slot of the wheel drive shaft.

9. Using a hammer and a suitable punch, stake the wheel drive shaft nut collar into the drive shaft slots (1).

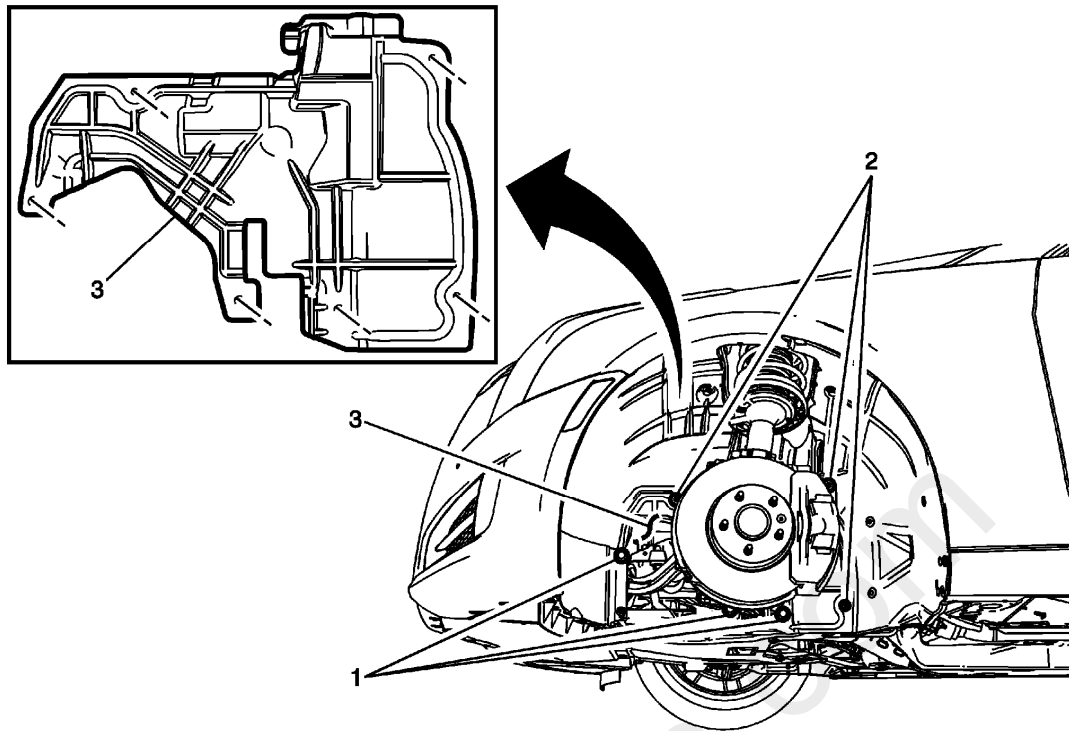


Fig. 23: Front Wheelhouse Panel Splash Shield & Mounting Components
Courtesy of GENERAL MOTORS COMPANY

10. Install the front wheelhouse panel splash shield (3). Refer to **Engine Lower Front Splash Shield Replacement** .
11. Install the wheel speed sensor. Refer to **Front Wheel Speed Sensor Replacement** .
12. Install the right outer tie rod. Refer to **Steering Linkage Outer Tie Rod Replacement (AWD)** , **Steering Linkage Outer Tie Rod Replacement (RWD)** .
13. Install the right front tire and wheel. Refer to **Tire and Wheel Removal and Installation** .
14. Remove the support and lower the vehicle.

REAR WHEEL DRIVE SHAFT REPLACEMENT (LFX,LF3)

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** .
3. Remove the exhaust system. Refer to **Exhaust System Replacement (LF3)** , **Exhaust System Replacement (LFX)** .

4. Remove the upper control arm bolt at the knuckle. Refer to Upper Control Arm Replacement .
5. Remove the trailing arm bolt at the knuckle. Refer to Trailing Arm Replacement (Upper) , Trailing Arm Replacement (Lower) .

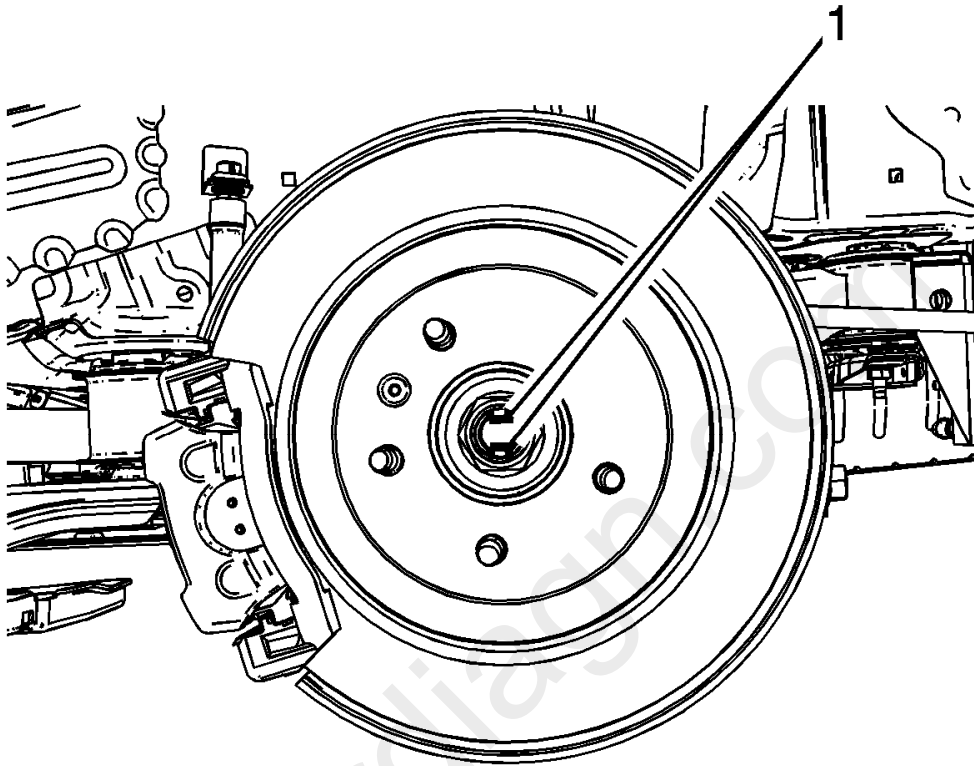


Fig. 24: Drive Shaft Slots
Courtesy of GENERAL MOTORS COMPANY

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.

6. Using a suitable punch and a hammer, unstake the drive shaft nut collar from the drive shaft slots (1).

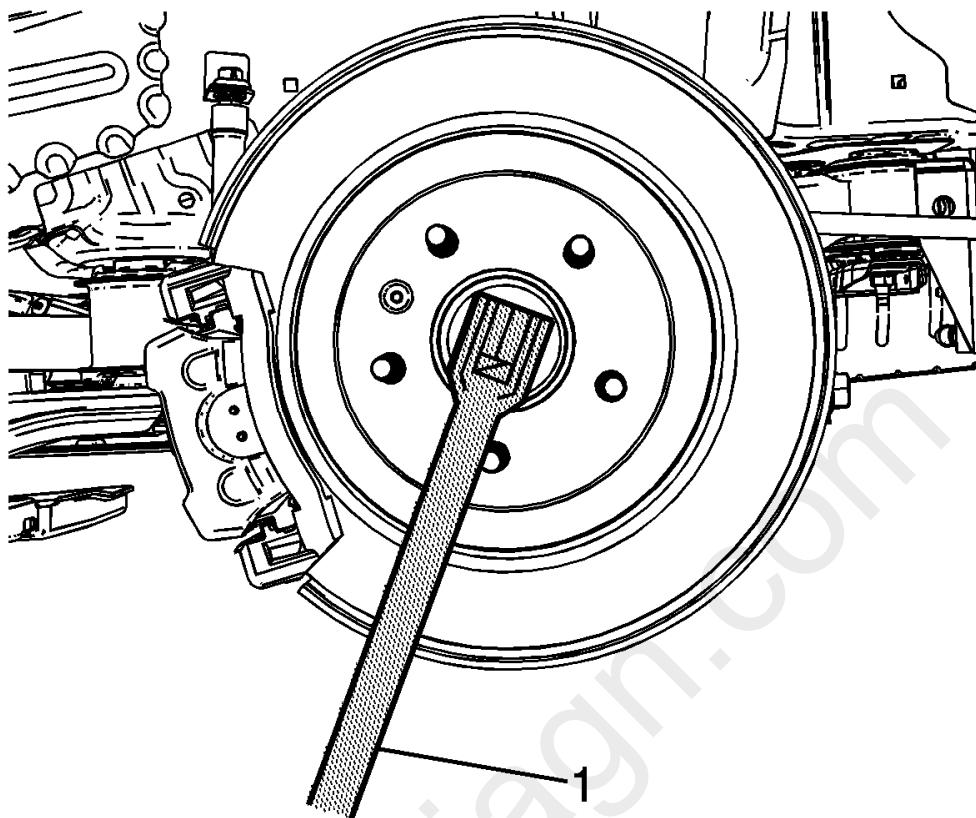


Fig. 25: Breaker Bar

Courtesy of GENERAL MOTORS COMPANY

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

7. With the aid of an assistant holding the brake pedal down, use a breaker bar (1) and the proper size socket to loosen the wheel drive shaft nut.

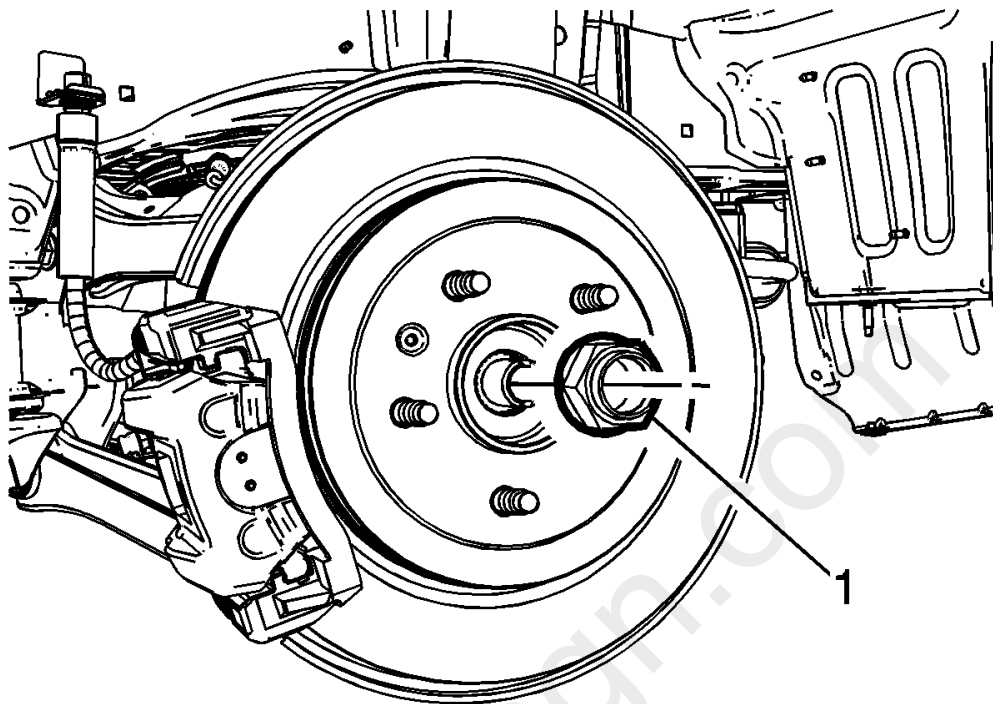


Fig. 26: Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

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

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

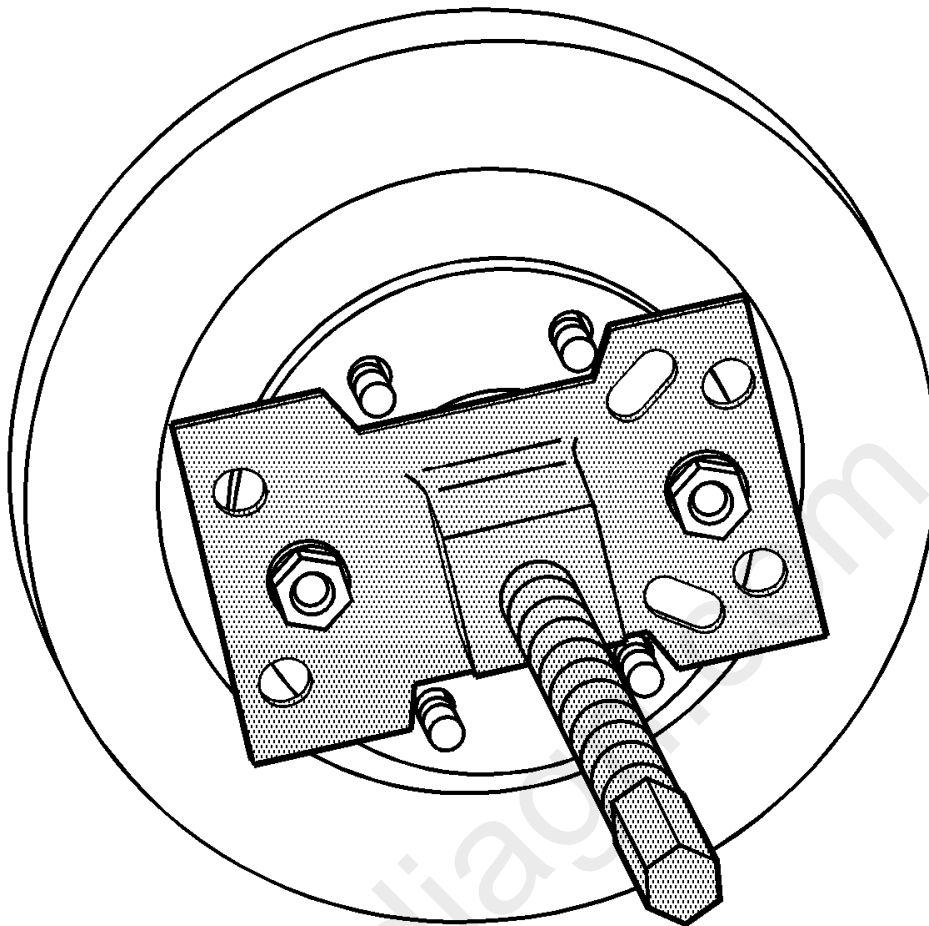


Fig. 27: View Of J 45859 Installed Onto The Wheel Hub
Courtesy of GENERAL MOTORS COMPANY

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

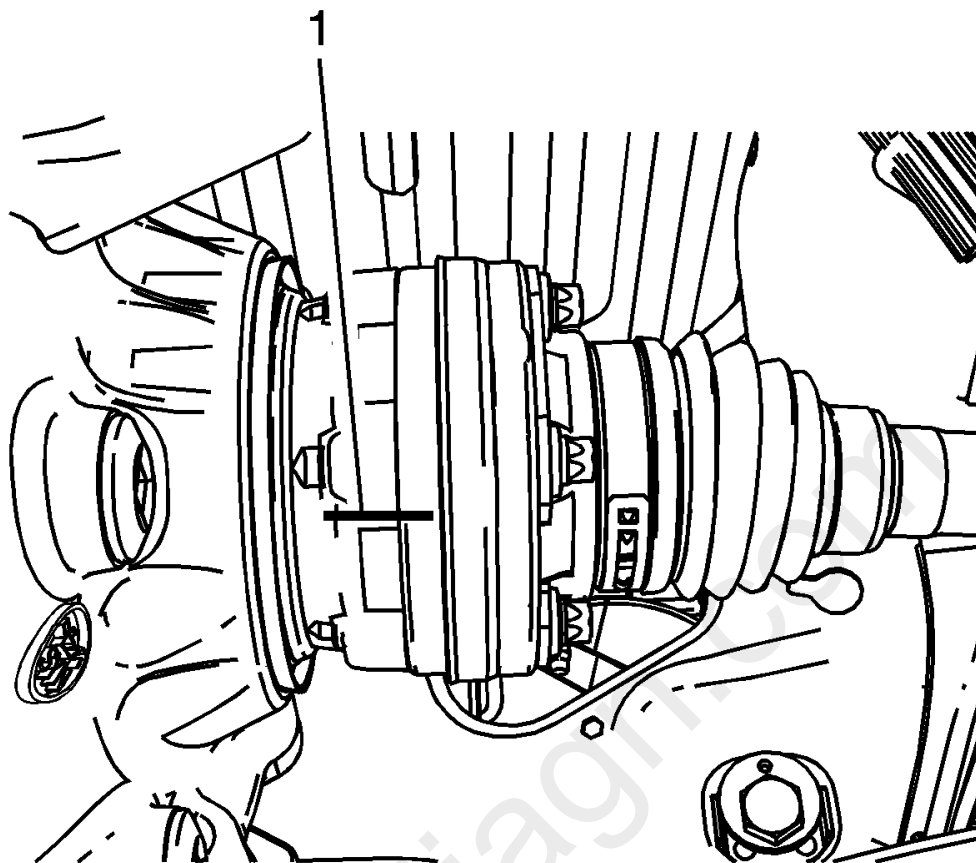


Fig. 28: Wheel Drive Shaft/Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

10. Mark the relationship (1) of the wheel drive shaft to the output shaft flange.

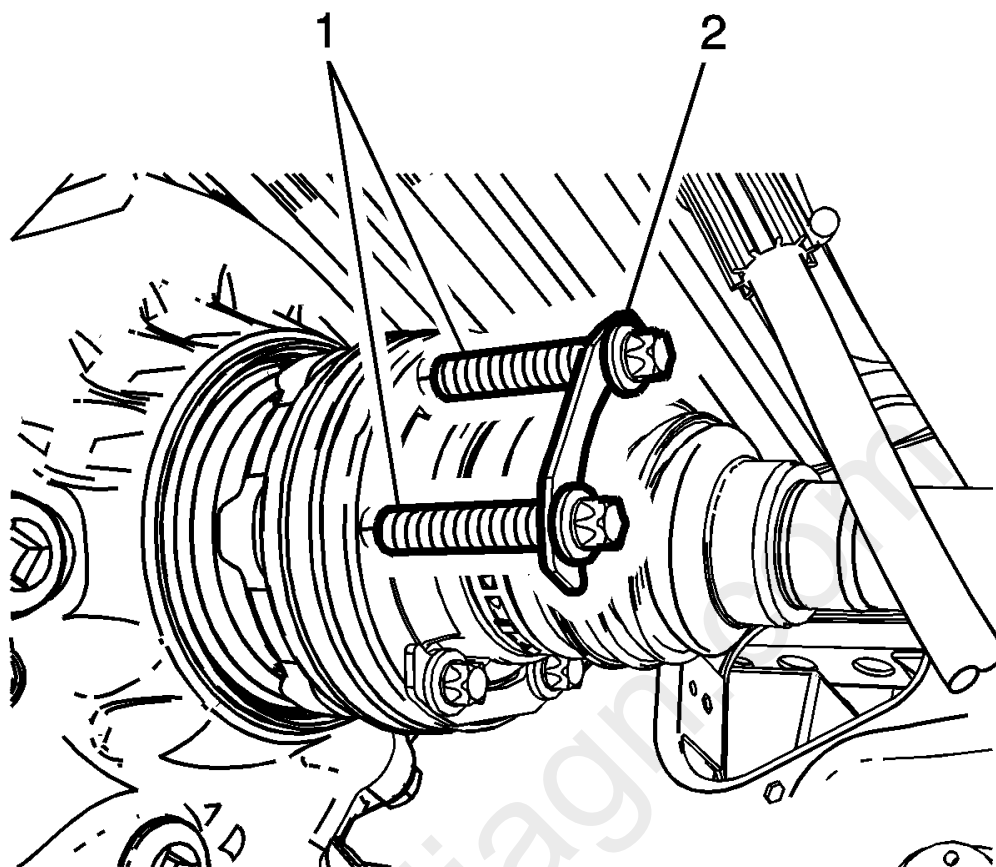


Fig. 29: Wheel Drive Shaft Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

NOTE: The bolts may be reused but the washers are a one time use item and must be discarded each time the bolts are removed.

11. Remove the wheel drive shaft mounting bolts (1) and the washers (2) from the differential drive flange. Discard the washers (2).

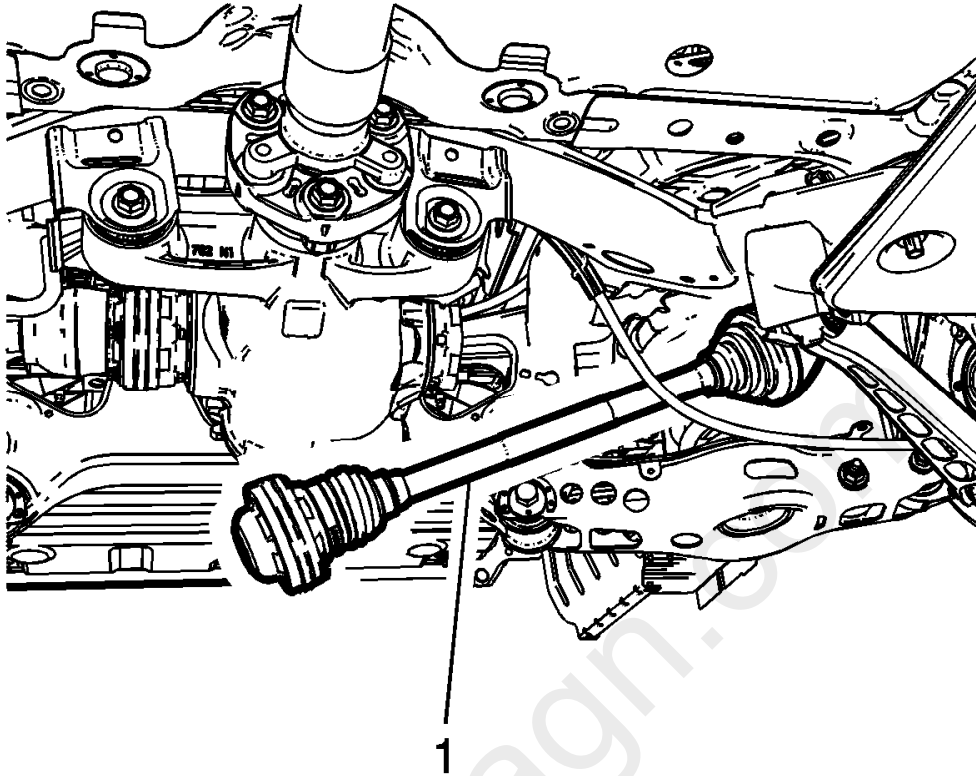


Fig. 30: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

NOTE: Reposition the knuckle to allow the inner joint to pass the rear differential flange. It may be necessary to use a flat bladed tool to separate the wheel drive shaft from the differential flange.

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

Installation Procedure

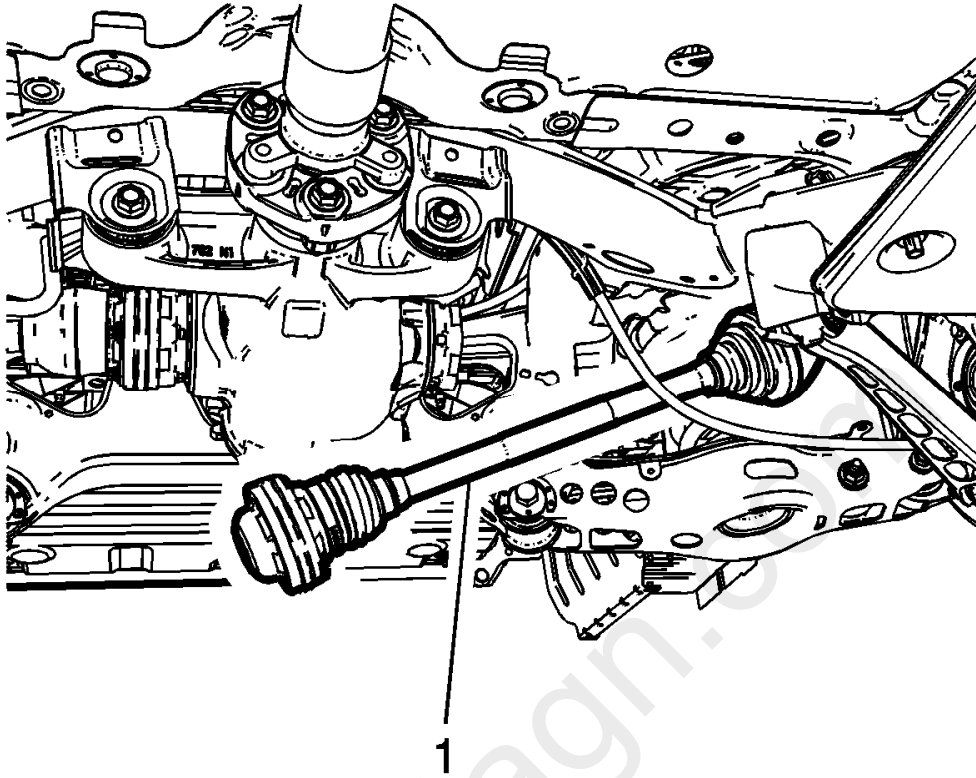


Fig. 31: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

1. Install the wheel drive shaft (1) in the vehicle and through the wheel bearing/hub assembly.

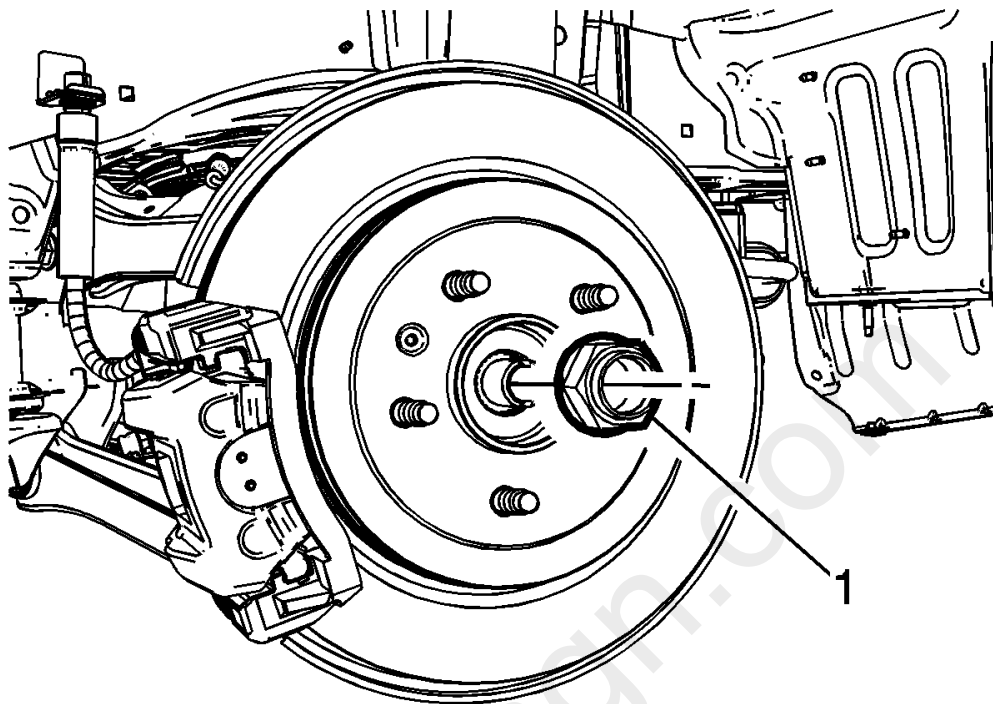


Fig. 32: Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft nut. Use a NEW nut only.

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

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

3. 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.

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

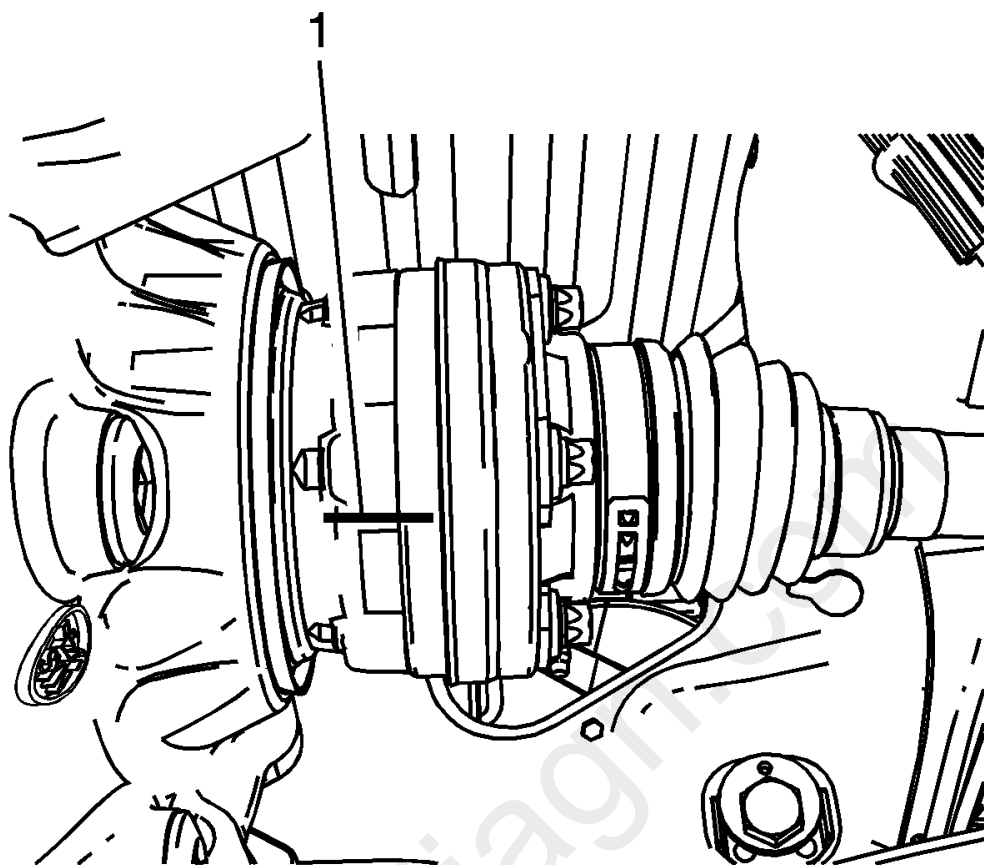


Fig. 33: Wheel Drive Shaft/Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

5. Align the reference mark (1) on the wheel drive shaft and the output shaft flange.

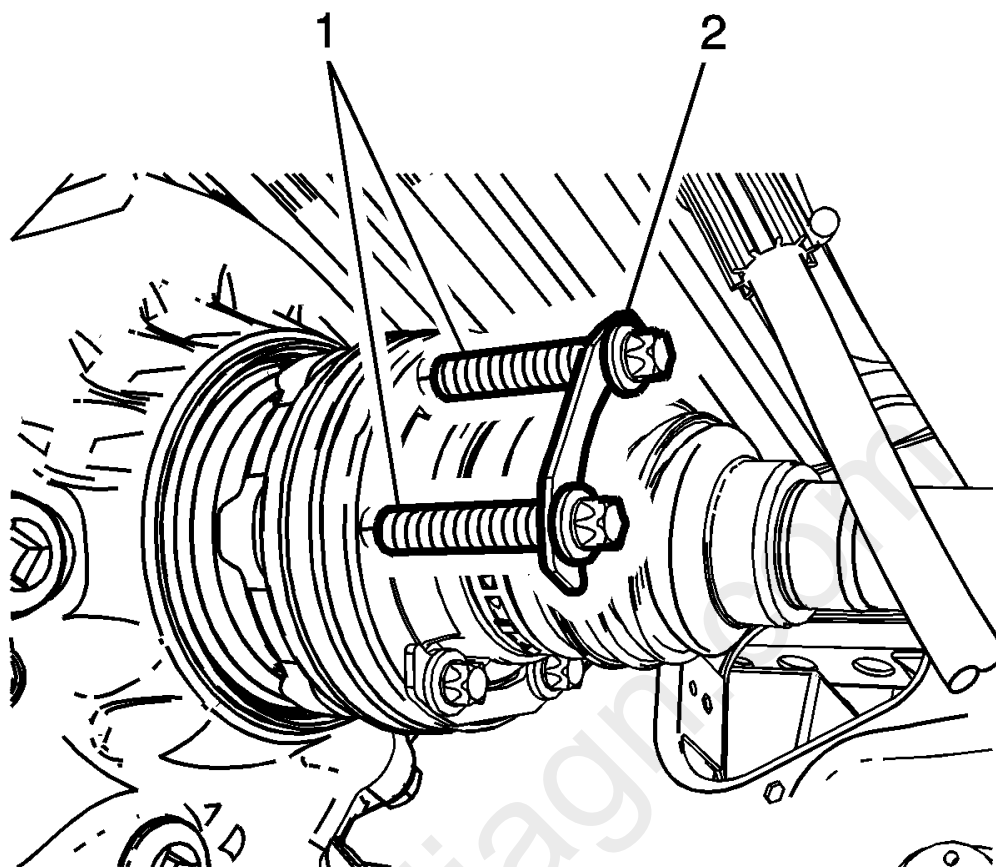


Fig. 34: Wheel Drive Shaft Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft bolt washers. Use a NEW washers only.

6. Install NEW washers (2) and the wheel drive shaft bolts (1) and hand tighten.

CAUTION: Refer to Fastener Caution .

7. Tighten the wheel drive shaft bolts to 58 N.m (43 lb ft).

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

8. With the aid of an assistant holding the brake pedal down, tighten the wheel drive shaft nut to 250 N.m (184 lb ft).

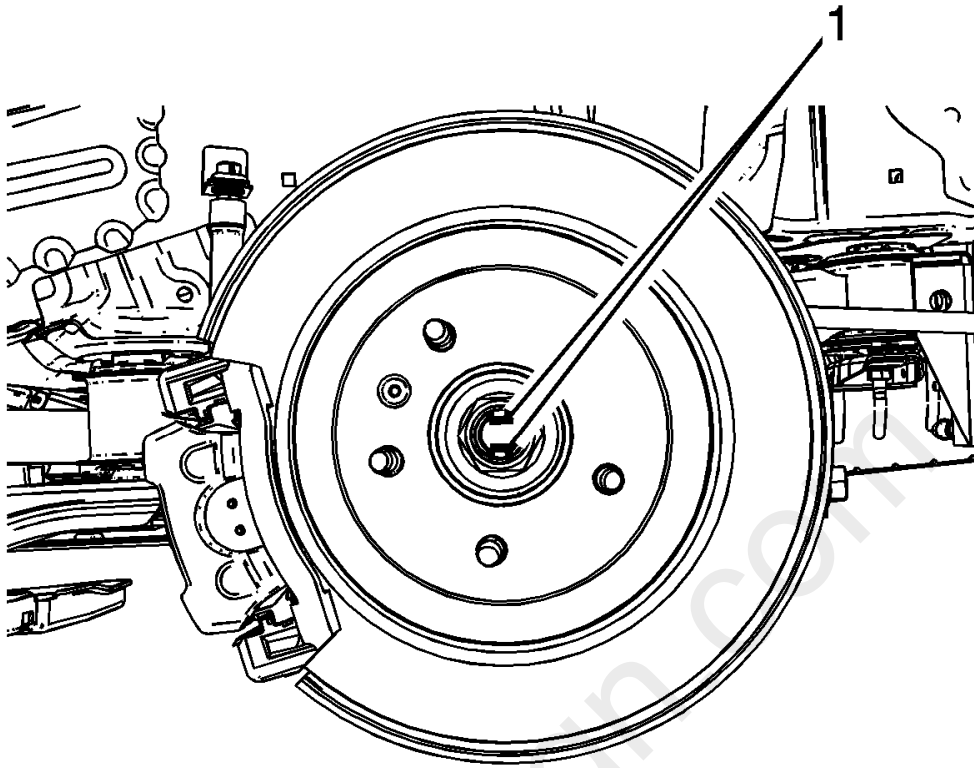


Fig. 35: Drive Shaft Slots

Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft nut collar should be fractured in the center of each slot of the wheel drive shaft.

9. Using a hammer and a suitable punch, stake the wheel drive shaft nut collar into the drive shaft slots (1).
10. Install the trailing arm bolt at the knuckle. Refer to **Trailing Arm Replacement (Upper)** , **Trailing Arm Replacement (Lower)** .
11. Install the upper control arm bolt at the knuckle. Refer to **Upper Control Arm Replacement** .
12. Install the exhaust system. Refer to **Exhaust System Replacement (LF3)** , **Exhaust System Replacement (LFX)** .
13. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
14. Remove the support and lower the vehicle.

REAR WHEEL DRIVE SHAFT REPLACEMENT (LTG)

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 .
3. Remove the exhaust system for refer to Exhaust Muffler Replacement (LTG) .
4. Remove the upper control arm bolt at the knuckle. Refer to Upper Control Arm Replacement .
5. Remove the trailing arm bolt at the knuckle. Refer to Trailing Arm Replacement (Upper) , Trailing Arm Replacement (Lower) .

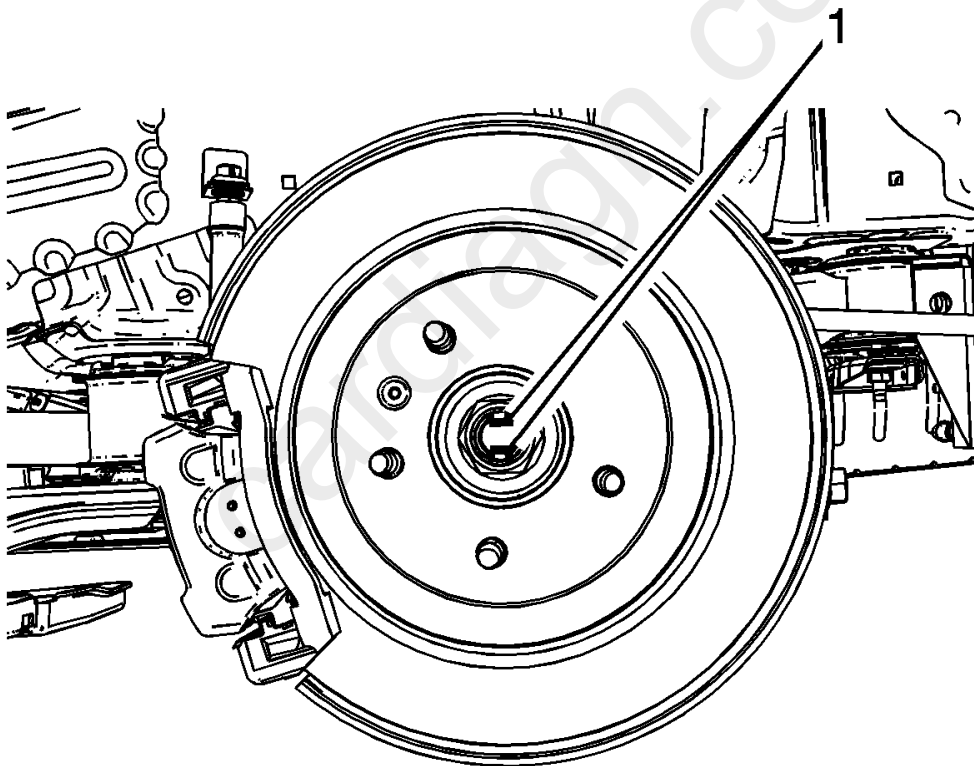


Fig. 36: Drive Shaft Slots

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.

6. Using a suitable punch and a hammer, unstake the drive shaft nut collar from the drive shaft slots (1).

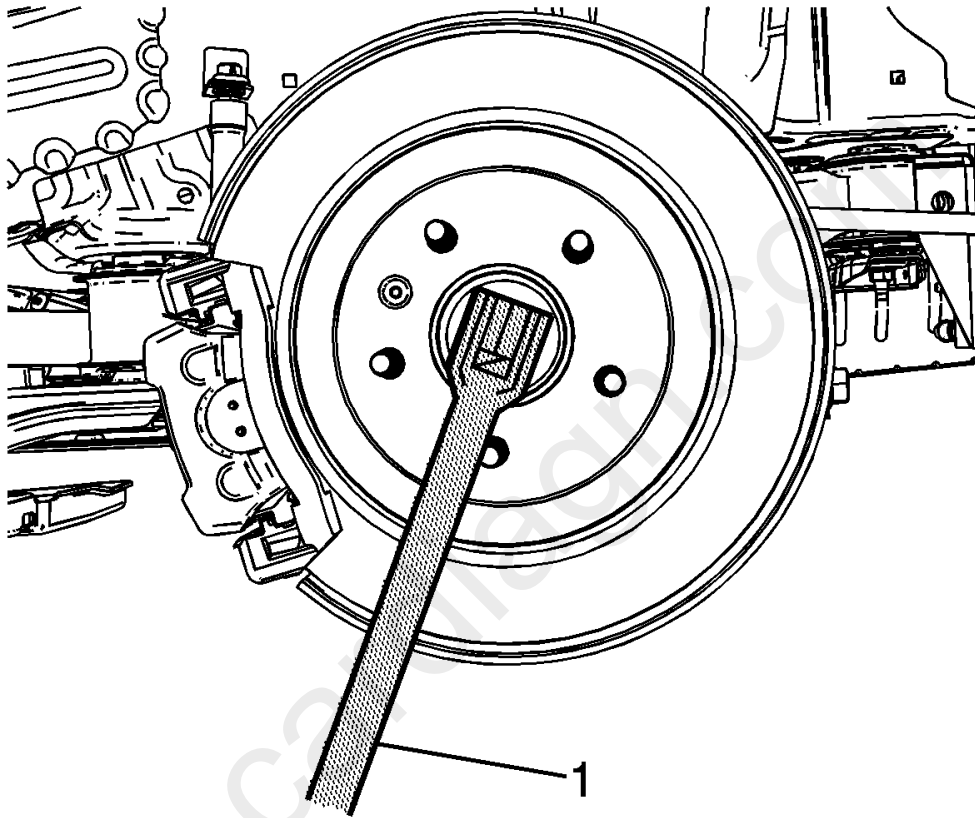


Fig. 37: Breaker Bar

Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT use air tools to remove the wheel drive shaft nut. Use hand tools ONLY.

7. With the aid of an assistant holding the brake pedal down, use a breaker bar (1) and the proper size socket to loosen the wheel drive shaft nut.

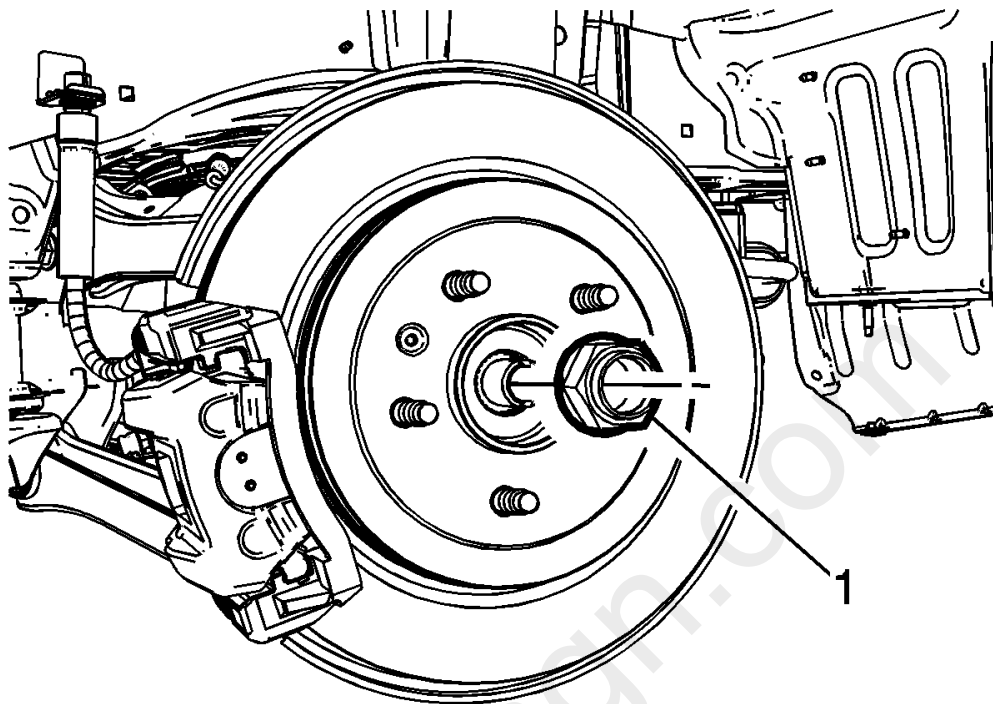


Fig. 38: Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

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

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

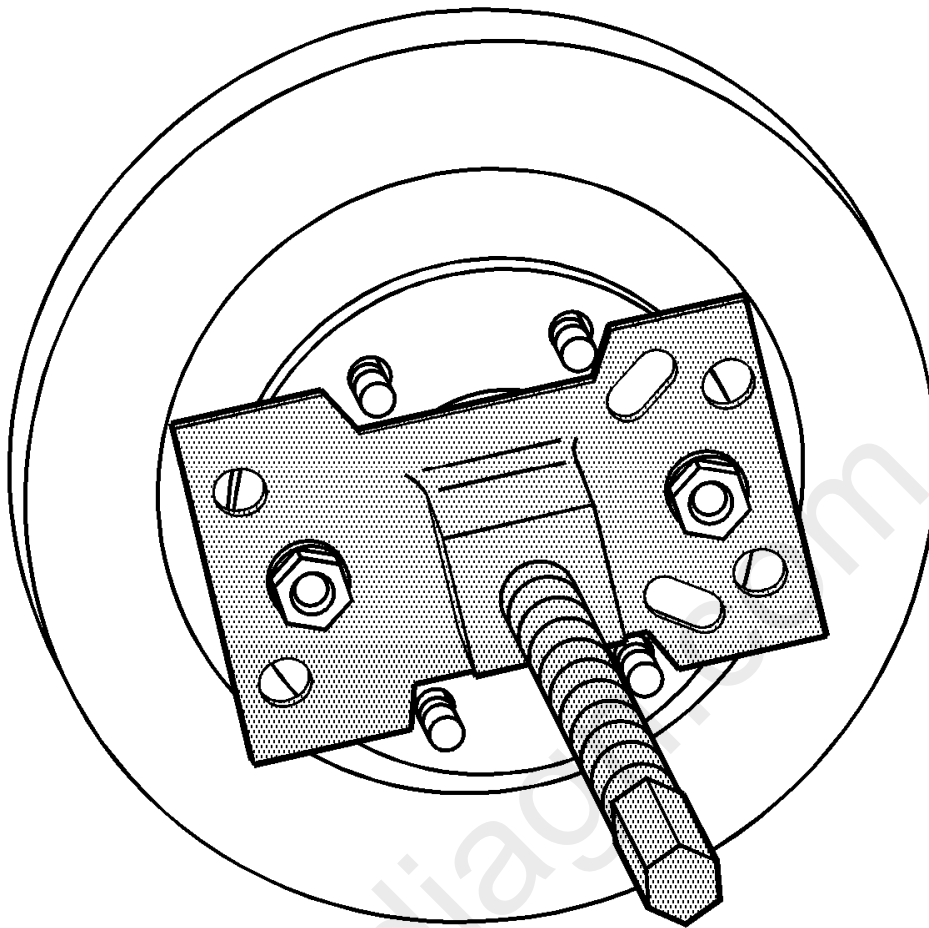


Fig. 39: View Of J 45859 Installed Onto The Wheel Hub
Courtesy of GENERAL MOTORS COMPANY

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

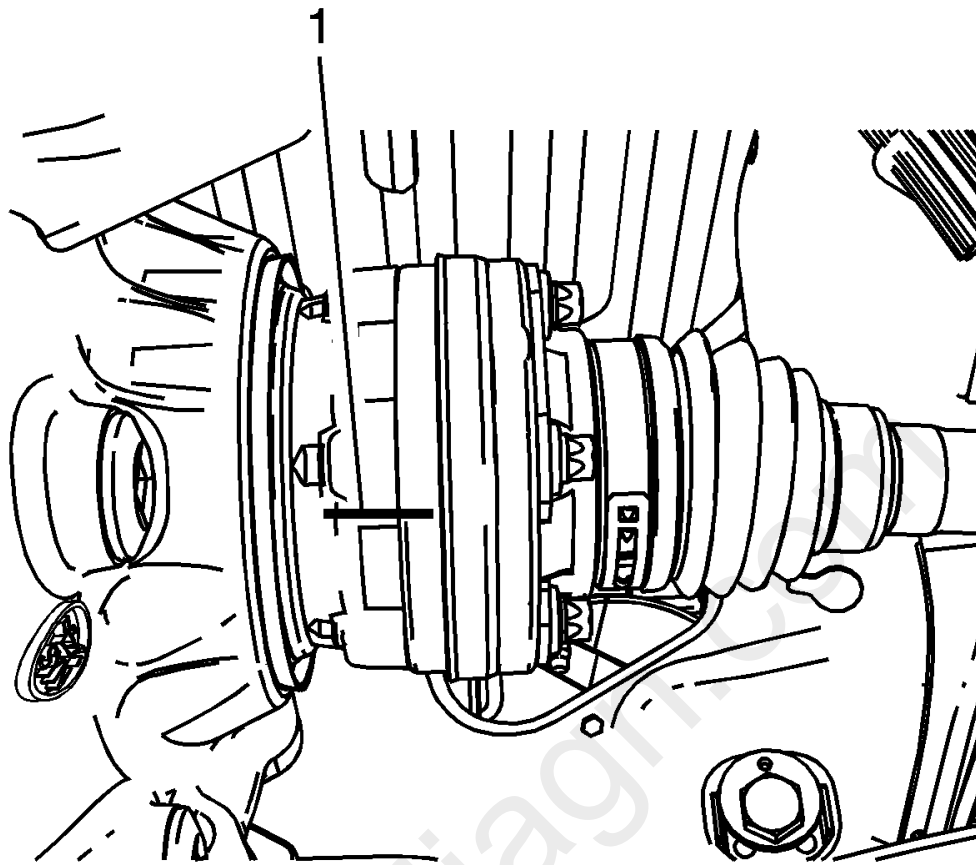


Fig. 40: Wheel Drive Shaft/Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

10. Mark the relationship (1) of the wheel drive shaft to the output shaft flange.

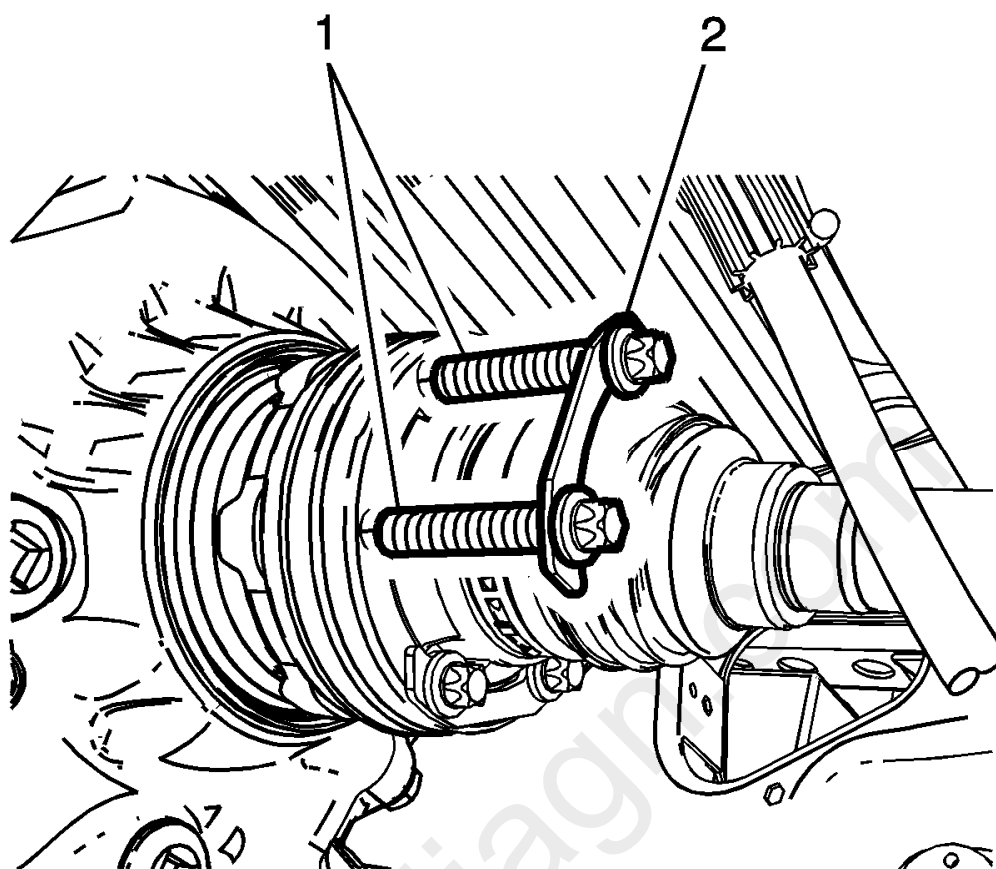


Fig. 41: Wheel Drive Shaft Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

NOTE: The bolts may be reused but the washers are a one time use item and must be discarded each time the bolts are removed.

11. Remove the wheel drive shaft mounting bolts (1) and the washers (2) from the differential drive flange. Discard the washers (2).

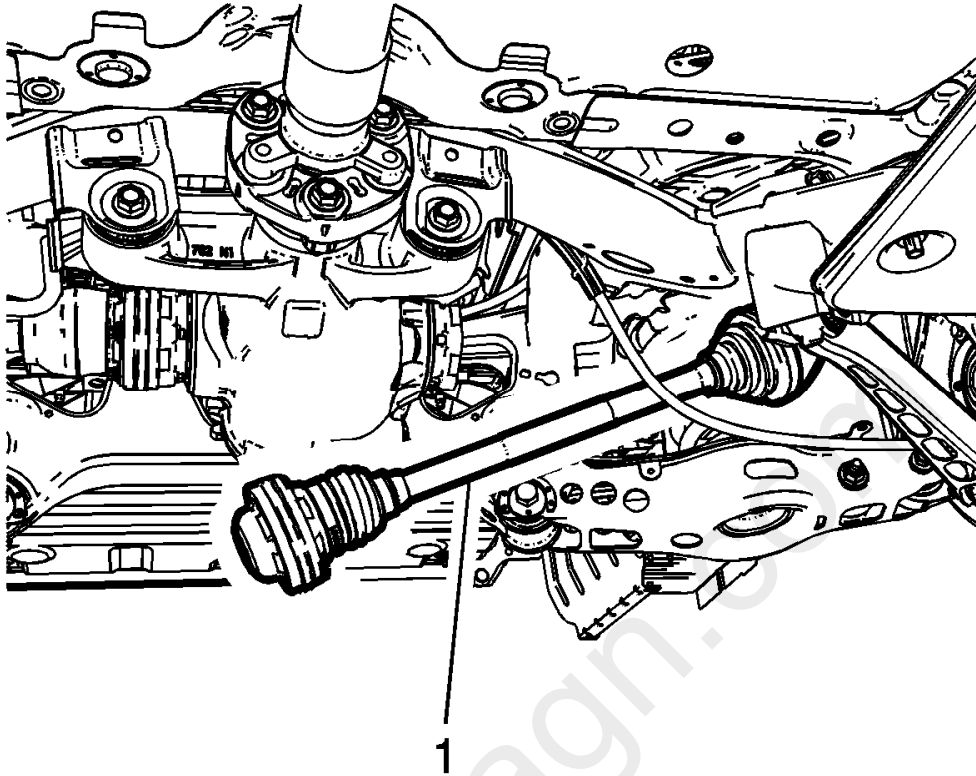


Fig. 42: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

NOTE: Reposition the knuckle to allow the inner joint to pass the rear differential flange. It may be necessary to use a flat bladed tool to separate the wheel drive shaft from the differential flange.

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

Installation Procedure

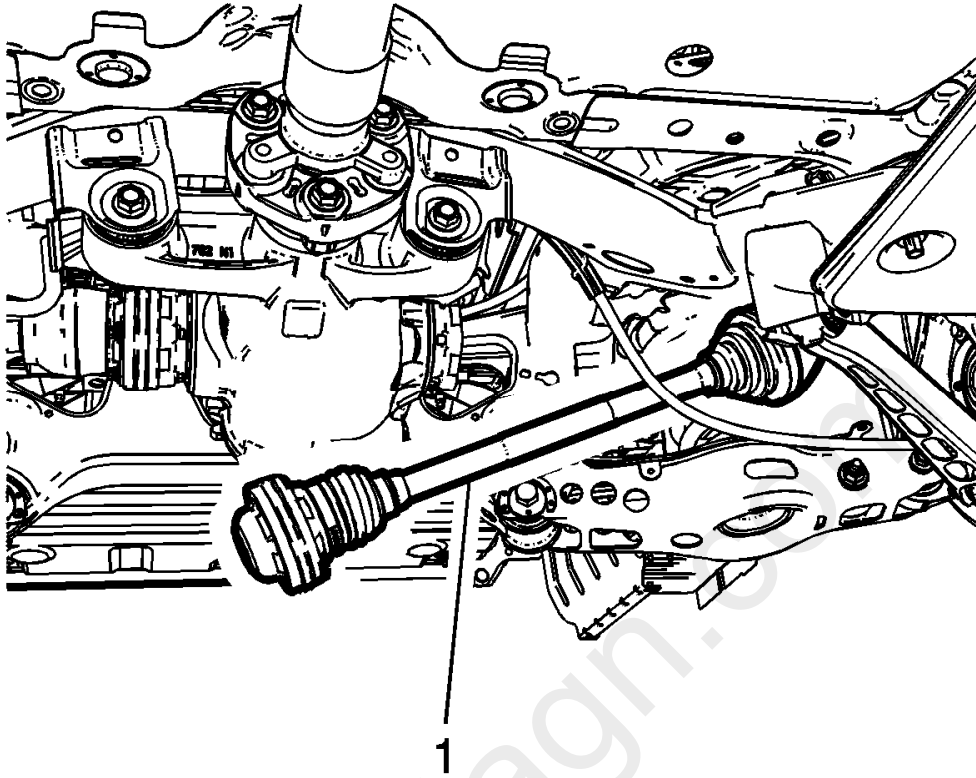


Fig. 43: Wheel Drive Shaft

Courtesy of GENERAL MOTORS COMPANY

1. Install the wheel drive shaft (1) in the vehicle and through the wheel bearing/hub assembly.

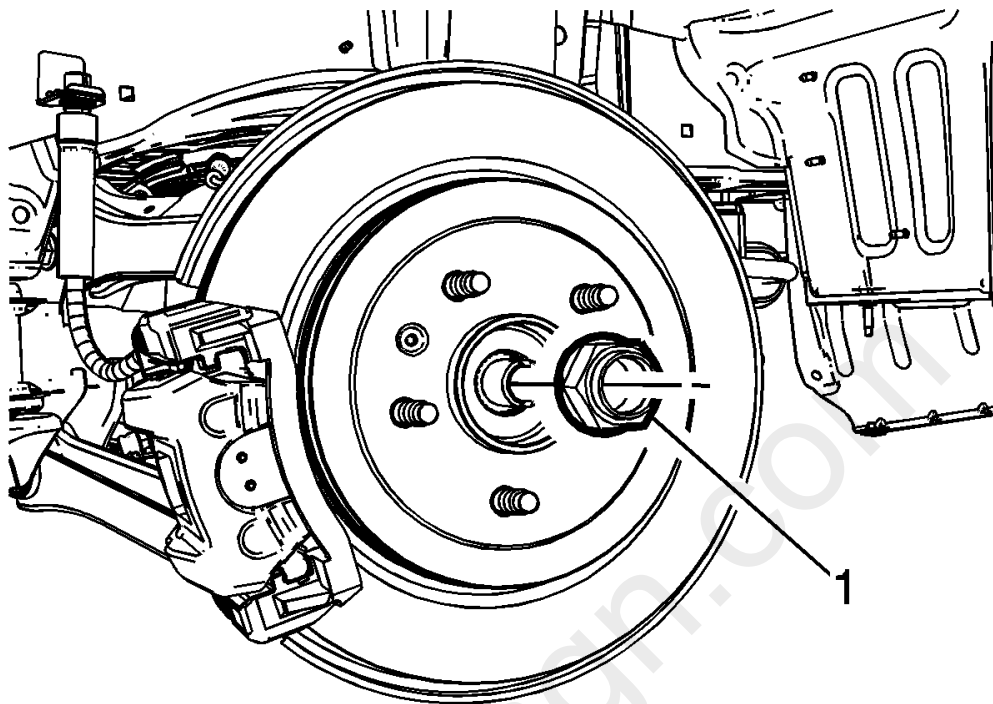


Fig. 44: Wheel Drive Shaft Retaining Nut
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft nut. Use a NEW nut only.

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

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

3. 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.

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

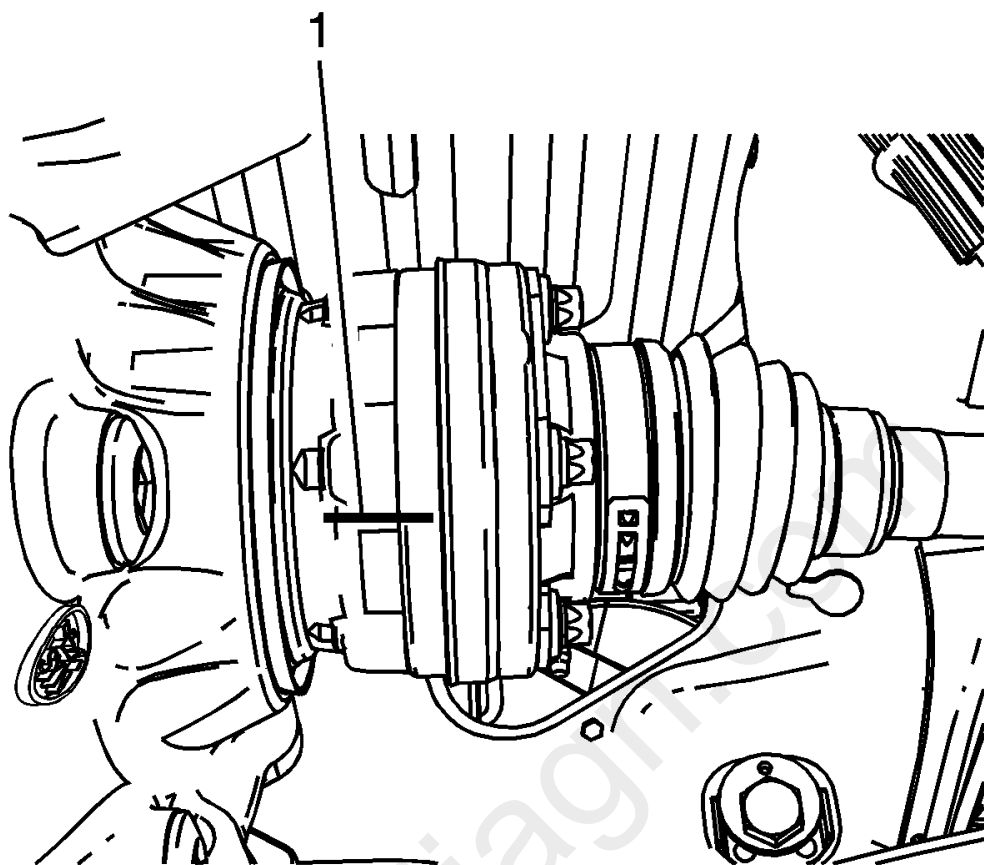


Fig. 45: Wheel Drive Shaft/Output Flange Relationship Mark
Courtesy of GENERAL MOTORS COMPANY

5. Align the reference mark (1) on the wheel drive shaft and the output shaft flange.

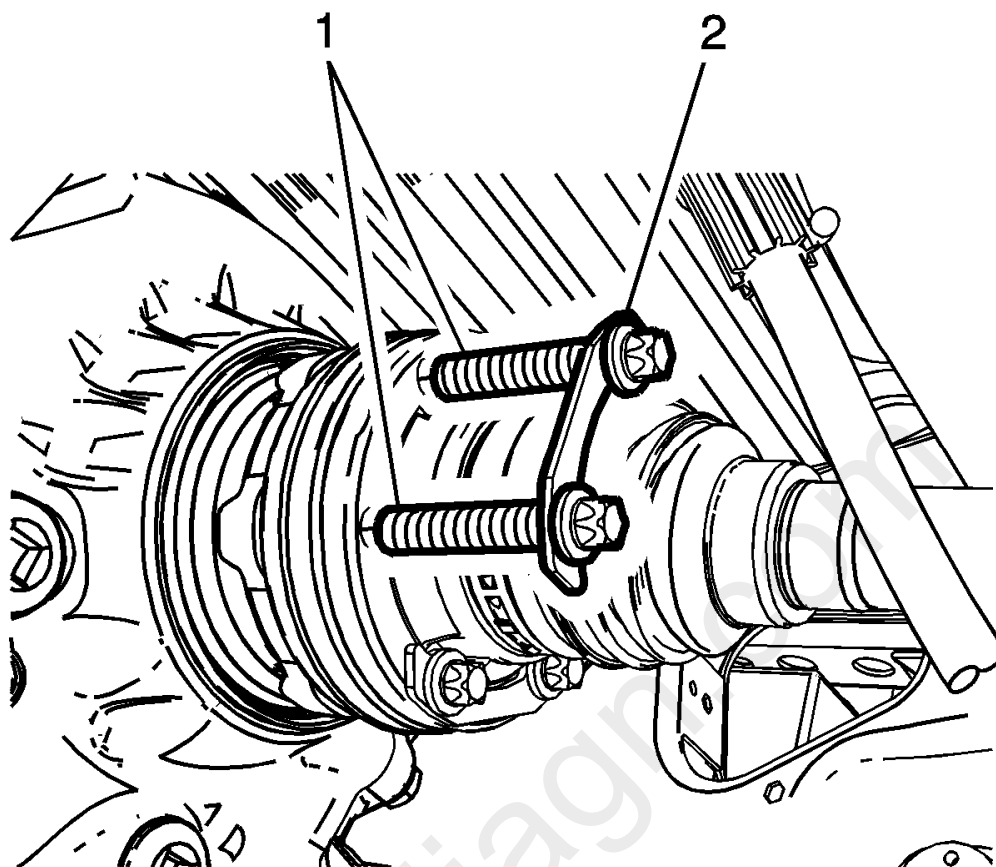


Fig. 46: Wheel Drive Shaft Mounting Bolts & Washers
Courtesy of GENERAL MOTORS COMPANY

NOTE: DO NOT reuse wheel drive shaft bolt washers. Use a NEW washers only.

6. Install NEW washers (2) and the wheel drive shaft bolts (1) and hand tighten.

CAUTION: Refer to Fastener Caution .

7. Tighten the wheel drive shaft bolts to 58 N.m (43 lb ft).

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

8. With the aid of an assistant holding the brake pedal down, tighten the wheel drive shaft nut to 250 N.m (184 lb ft).

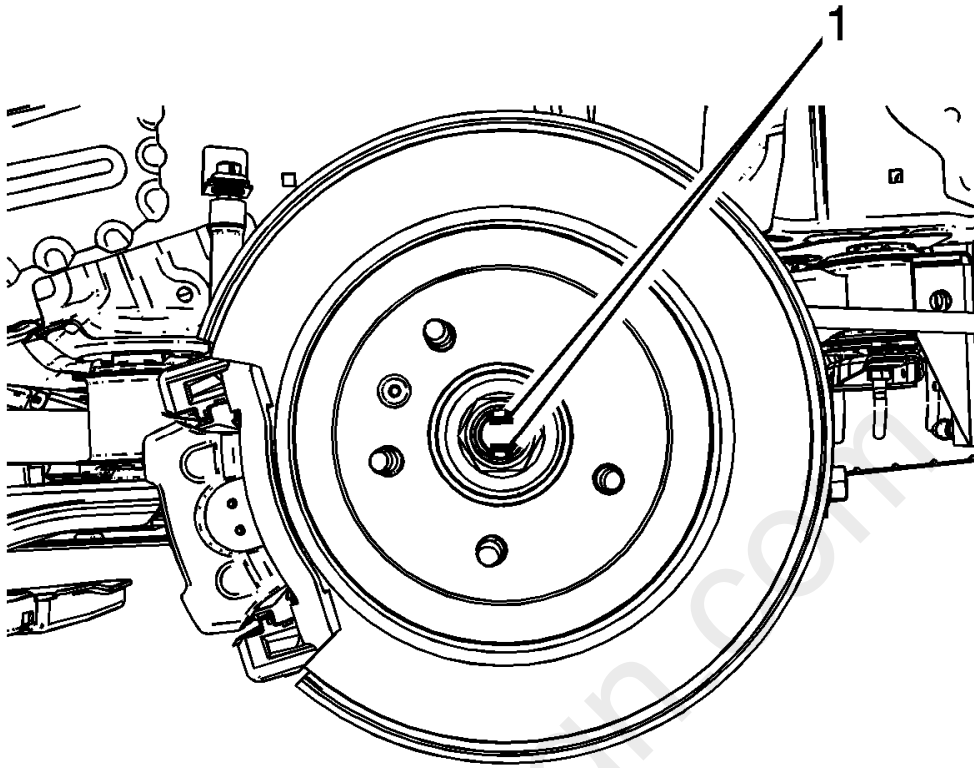


Fig. 47: Drive Shaft Slots

Courtesy of GENERAL MOTORS COMPANY

NOTE: The wheel drive shaft nut collar should be fractured in the center of each slot of the wheel drive shaft.

9. Using a hammer and a suitable punch, stake the wheel drive shaft nut collar into the drive shaft slots (1).
10. Install the trailing arm bolt at the knuckle. Refer to **Trailing Arm Replacement (Upper)** , **Trailing Arm Replacement (Lower)** .
11. Install the upper control arm bolt at the knuckle. Refer to **Upper Control Arm Replacement** .
12. Install the exhaust system refer to **Exhaust Muffler Replacement (LTG)** .
13. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** .
14. Remove the support and lower the vehicle.

REAR WHEEL DRIVE SHAFT OUTER JOINT AND BOOT REPLACEMENT

Special Tools

J 42572 Drive Shaft Seal Clamp Pliers

Disassembly Procedure

1. Remove the wheel drive shaft. Refer to Rear Wheel Drive Shaft Replacement (LFX,LF3), Rear Wheel Drive Shaft Replacement (LTG).

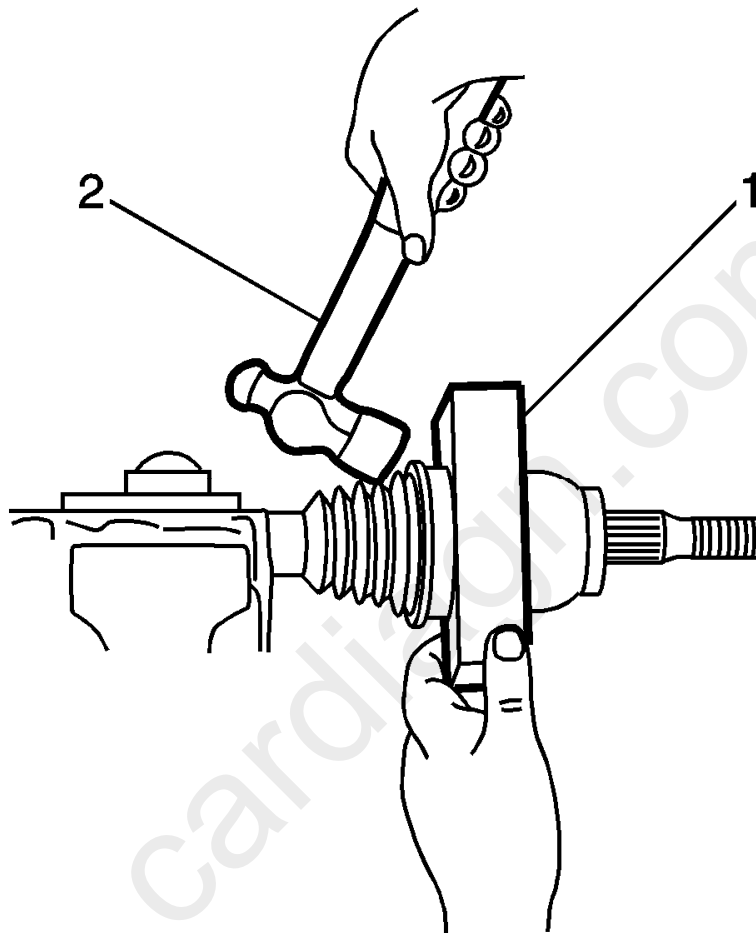


Fig. 48: CV Joint Removal Procedure Using Wood & Hammer
Courtesy of GENERAL MOTORS COMPANY

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 (1) between the seal and the joint, on the joint face.
 3. Using a block of wood (1) and hammer (2), 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.

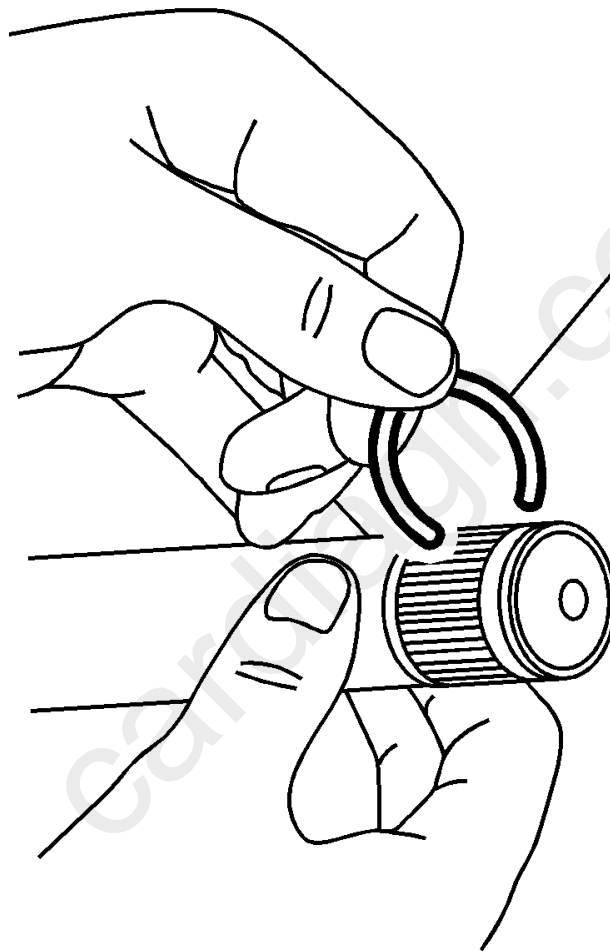


Fig. 49: New Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

8. Remove and discard the axle shaft retaining (1) ring from the axle shaft.

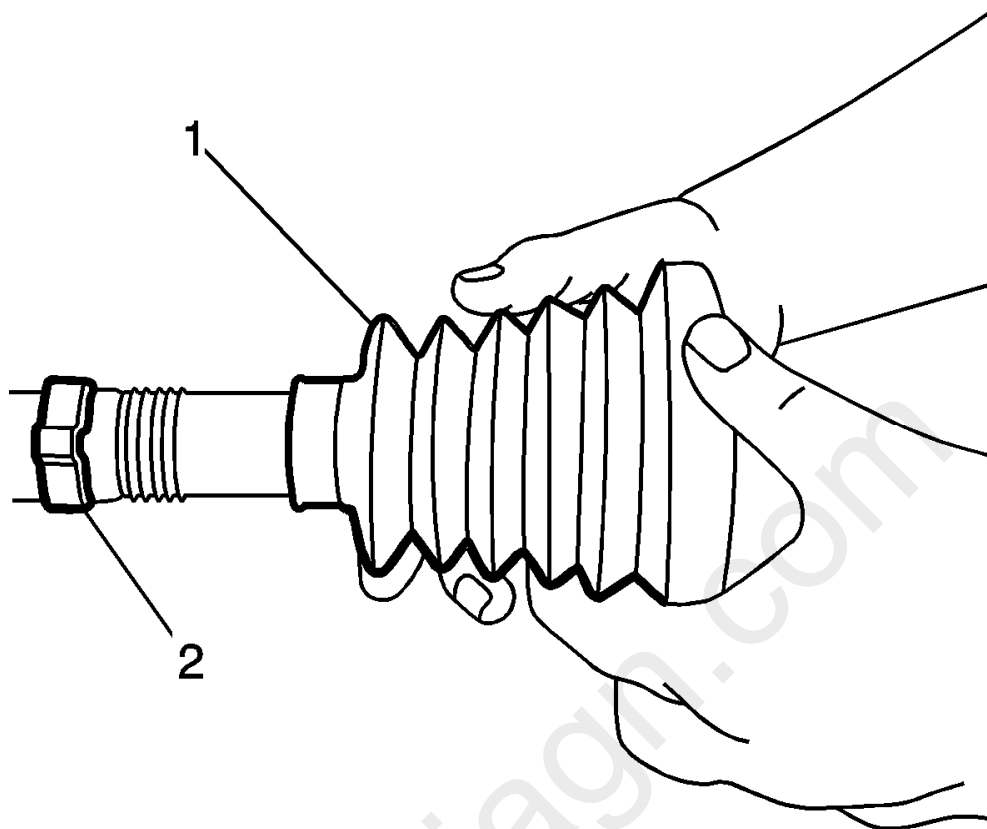


Fig. 50: Axle Shaft Seal & Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

9. Remove the boot (1) from the axle shaft.
10. Remove the wheel drive shaft from the vise.

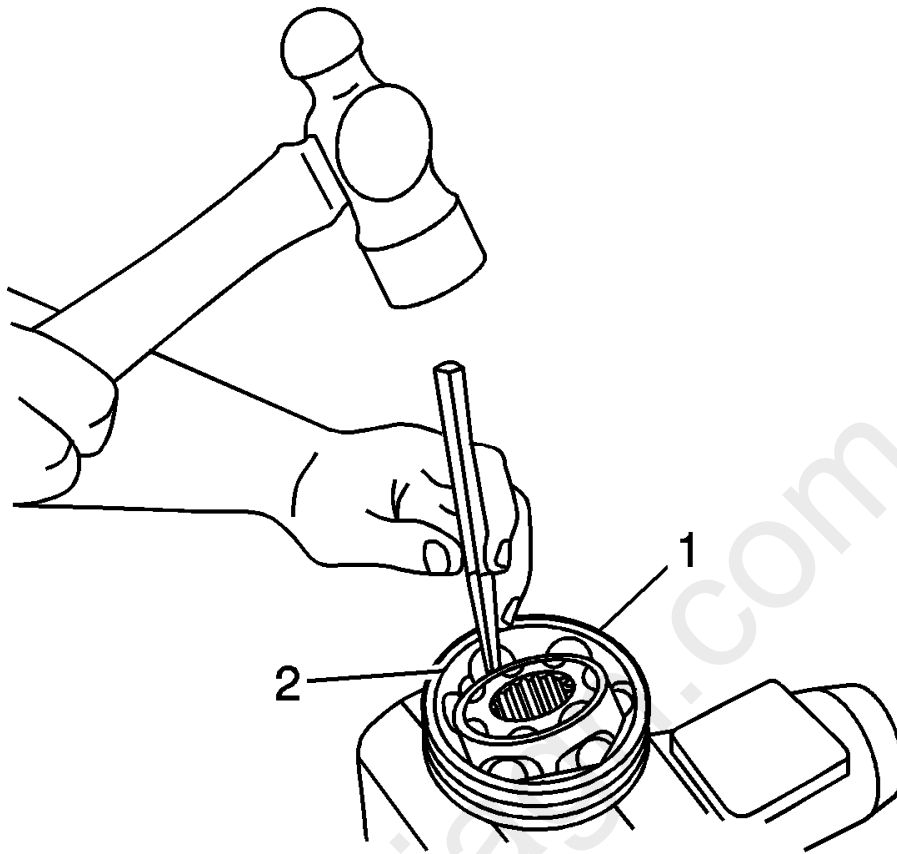


Fig. 51: Removing Ball With Brass Drift
Courtesy of GENERAL MOTORS COMPANY

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.

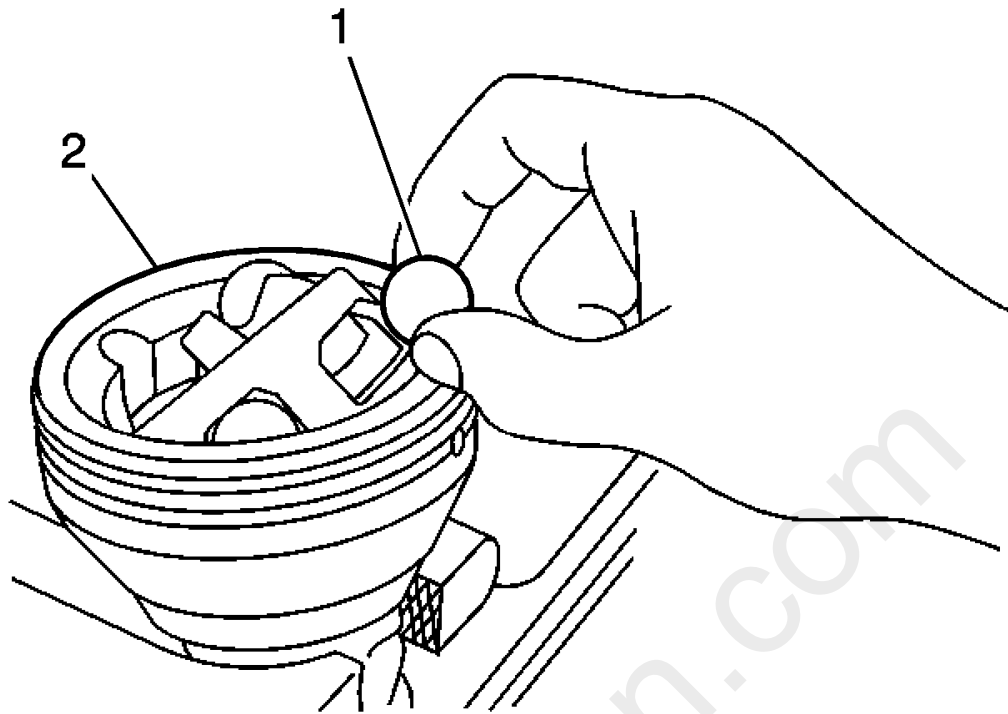


Fig. 52: Removing/Installing Ball From Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

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

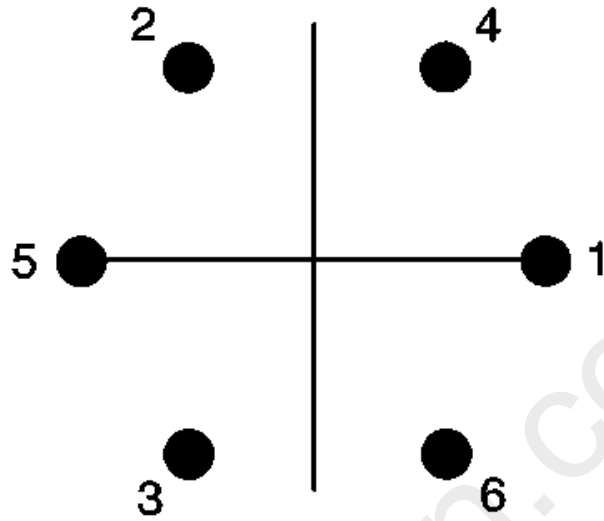


Fig. 53: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

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

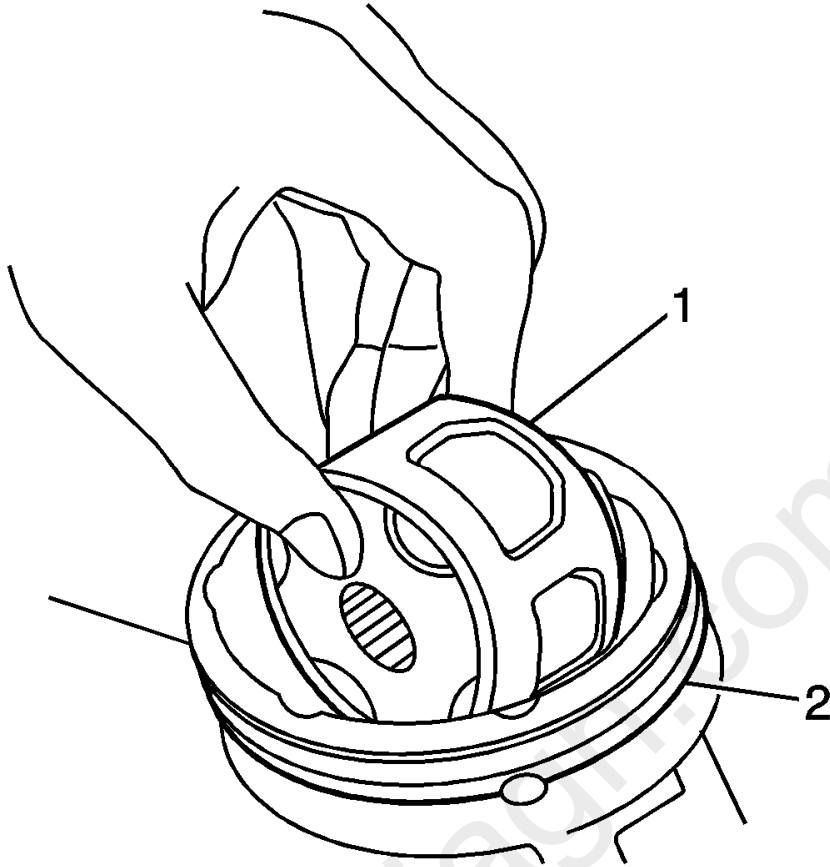


Fig. 54: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

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.

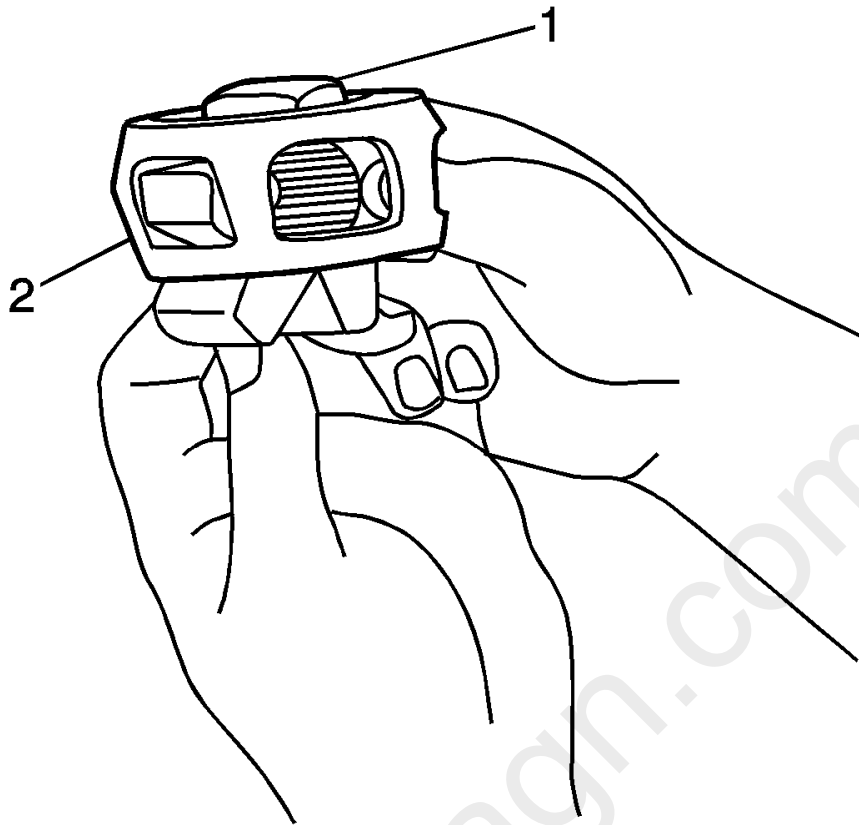


Fig. 55: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

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

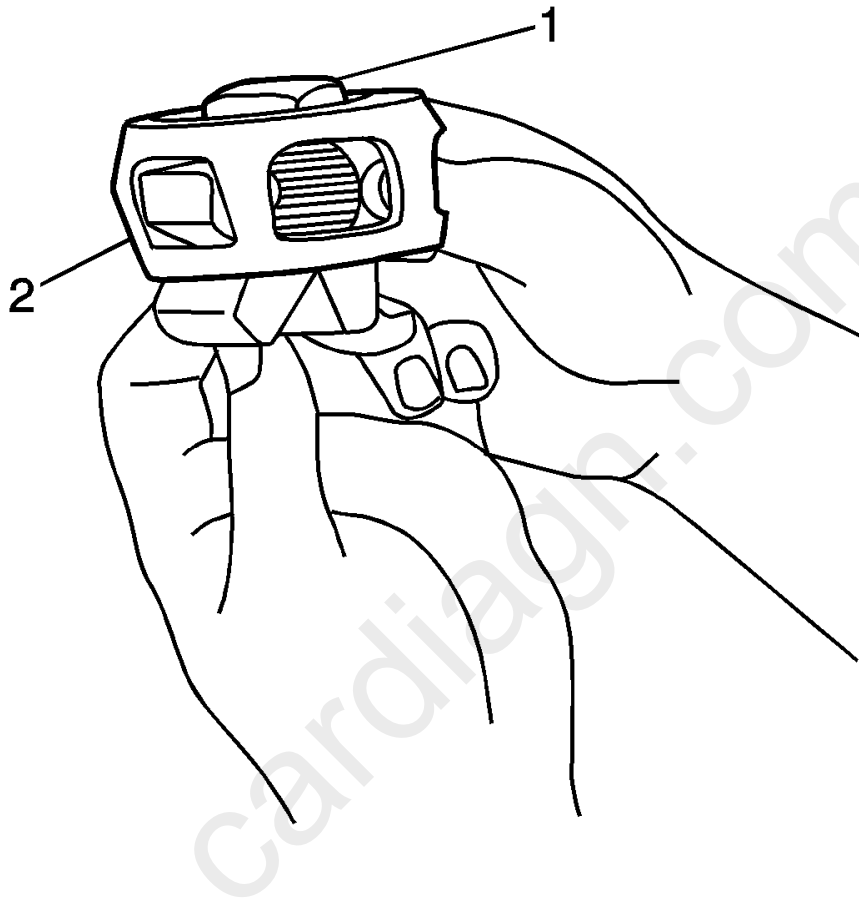


Fig. 56: Positioning Cage So Larger Radius Corners Of Cage Windows Are Up
Courtesy of GENERAL MOTORS COMPANY

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.

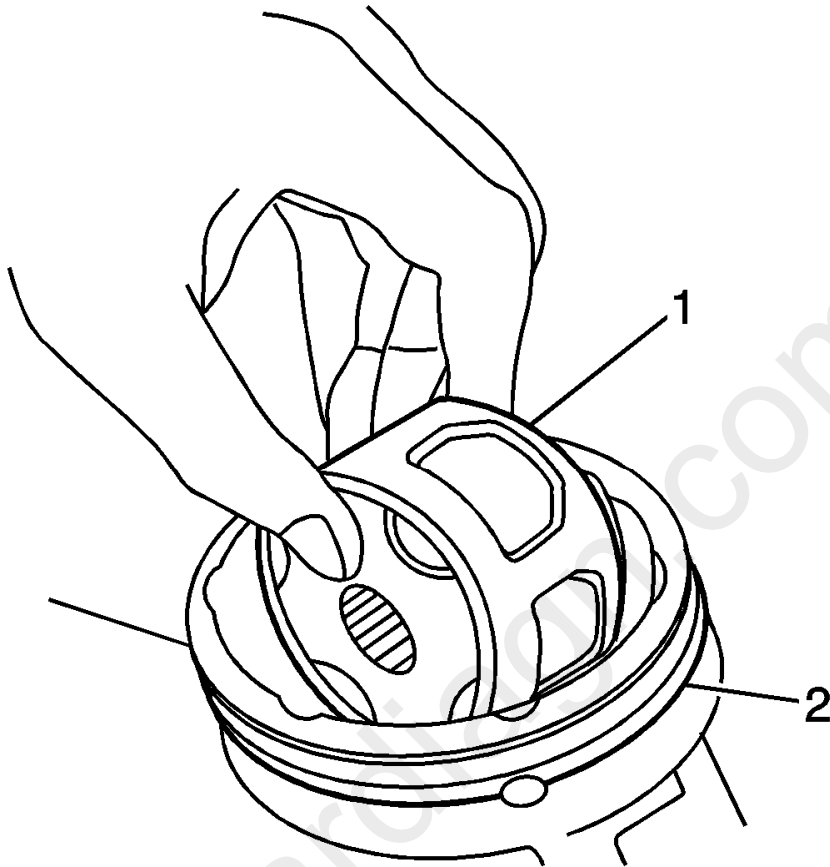


Fig. 57: Positioning Cage & Inner Race 90 Degrees To Centerline Of Outer Race
Courtesy of GENERAL MOTORS COMPANY

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.

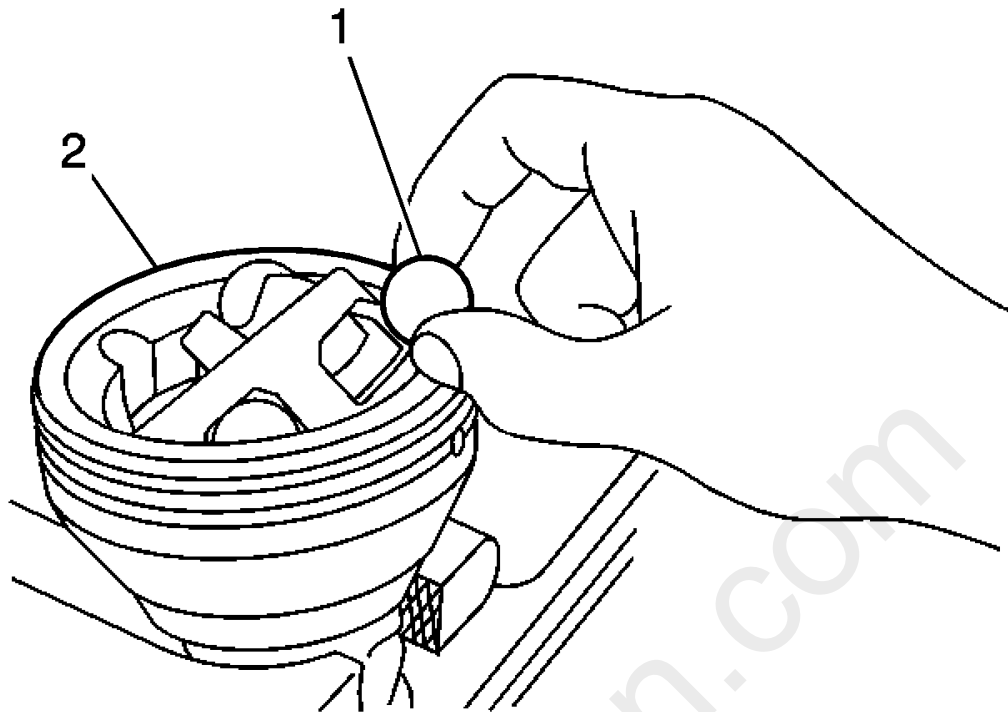


Fig. 58: Removing/Installing Ball From Cage & Inner Race
Courtesy of GENERAL MOTORS COMPANY

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.

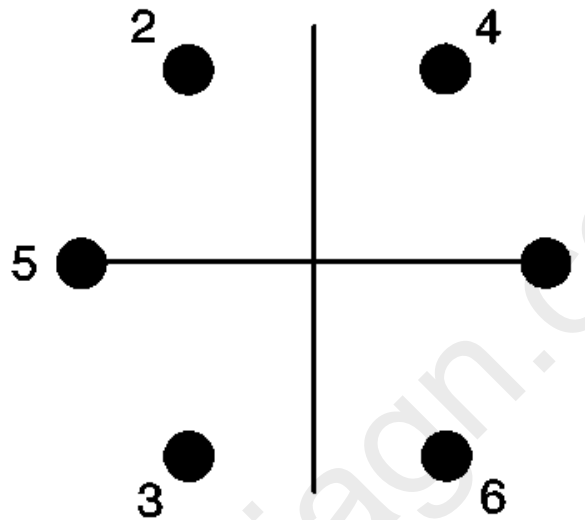


Fig. 59: View Of Ball Removal/Installation Sequence
Courtesy of GENERAL MOTORS COMPANY

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.

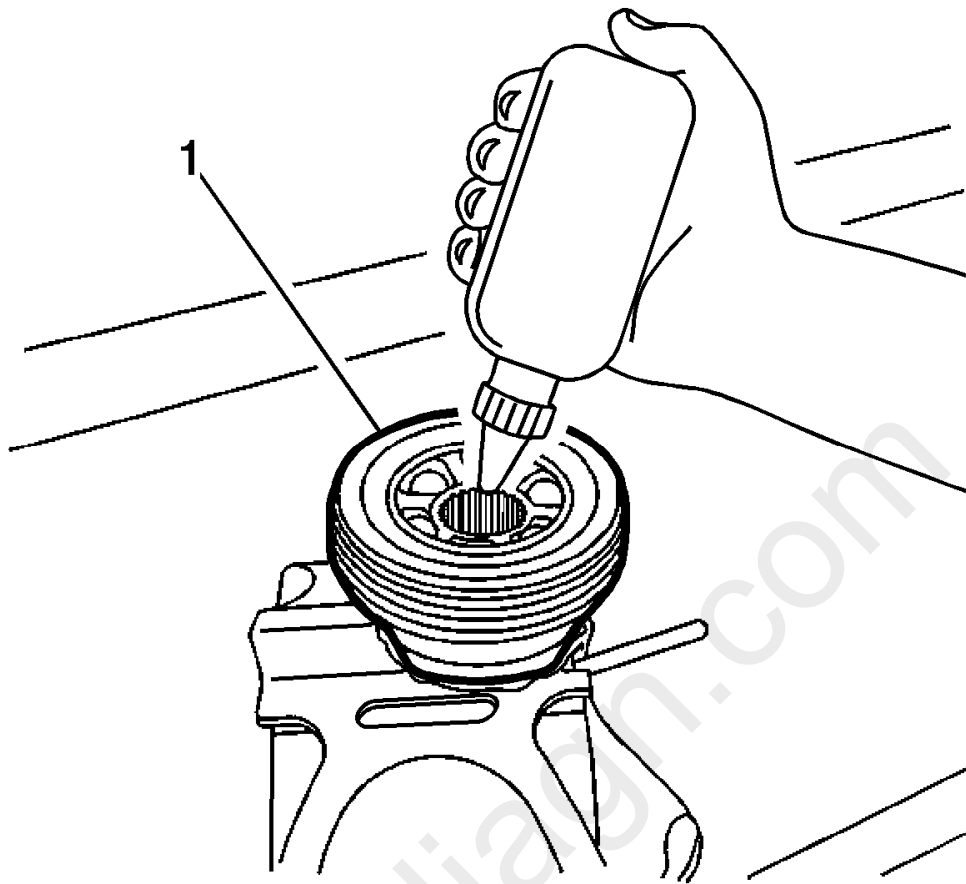


Fig. 60: Greasing Outer Joint

Courtesy of GENERAL MOTORS COMPANY

19. Insert approximately 60 percent of the grease from the service kit into the outer joint (1).
 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.

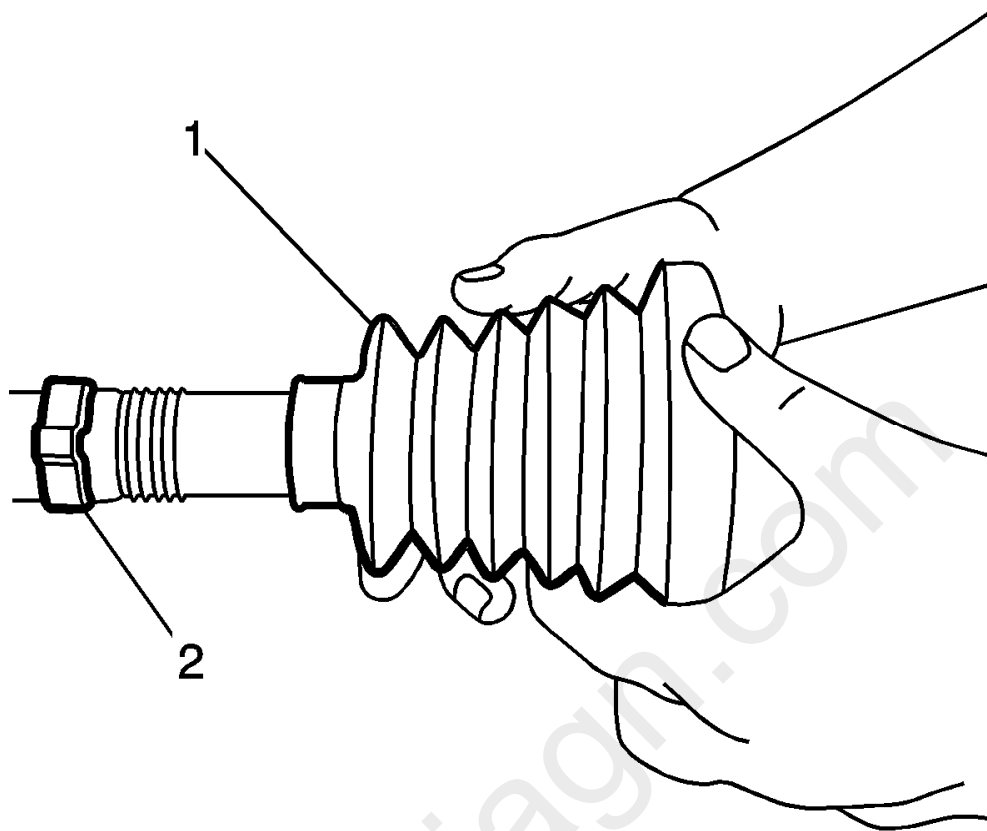


Fig. 61: Axle Shaft Seal & Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

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 (2) onto the axle shaft.
24. Install the seal (1) onto the axle shaft.

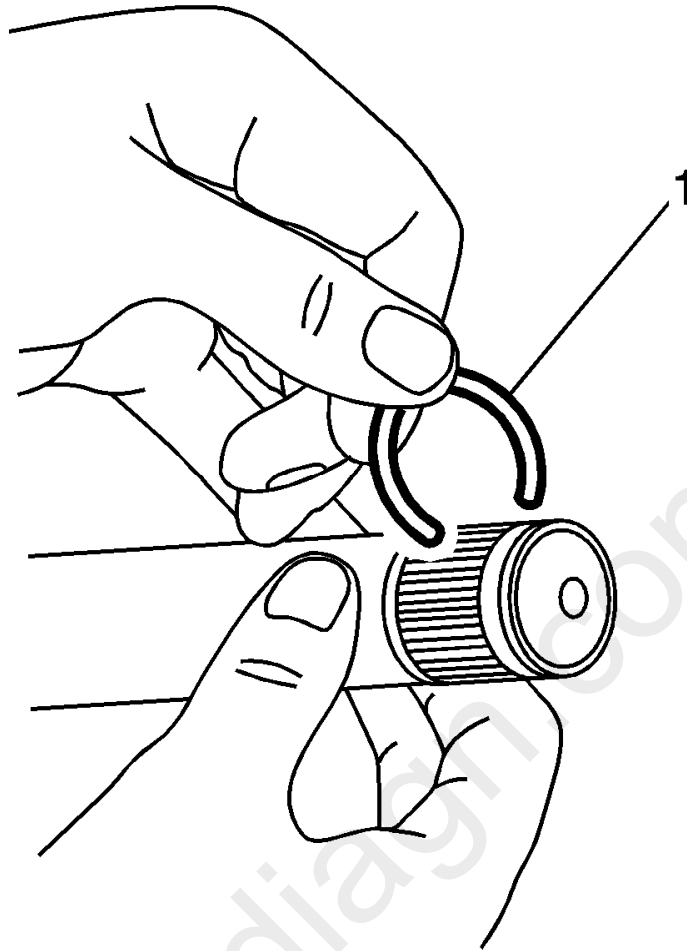


Fig. 62: New Axle Shaft Retaining Ring
Courtesy of GENERAL MOTORS COMPANY

25. Install a new retaining ring (1) to the axle shaft.

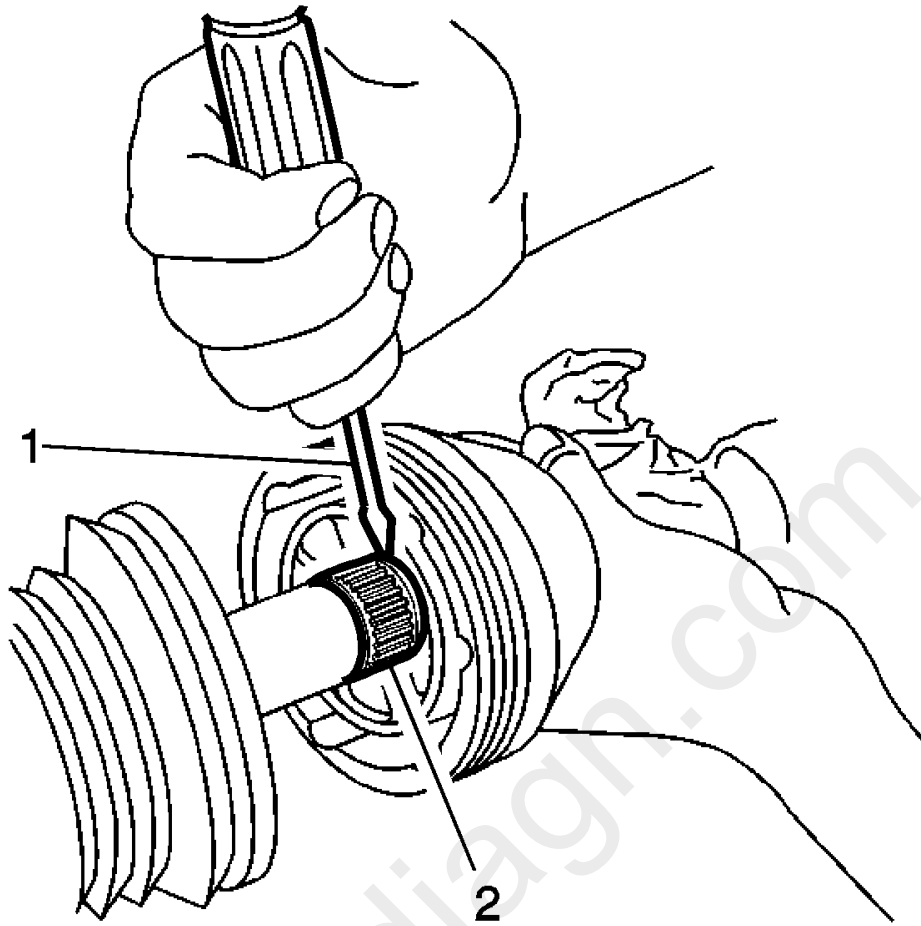


Fig. 63: Compressing Axle Shaft Retaining Ring With Flat Bladed Tool
Courtesy of GENERAL MOTORS COMPANY

26. Position the outer joint horizontally.
27. Engage the inner race splines onto the axle shaft splines (2).
28. Compress the axle shaft retaining ring.
 1. Press the end of the retaining ring, using a flat-bladed tool (1), 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.

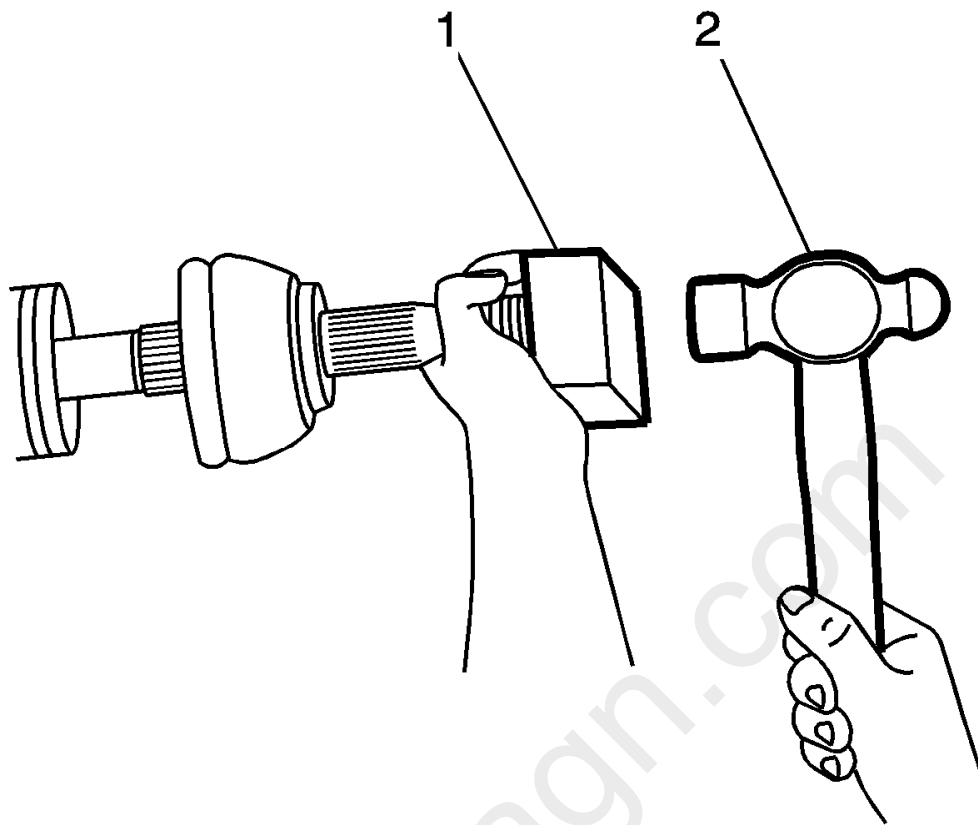


Fig. 64: Driving Outer Joint Onto Axle Shaft
Courtesy of GENERAL MOTORS COMPANY

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 (1) over the end of the outer joint threaded shaft.
 2. Use a hammer (2) 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.

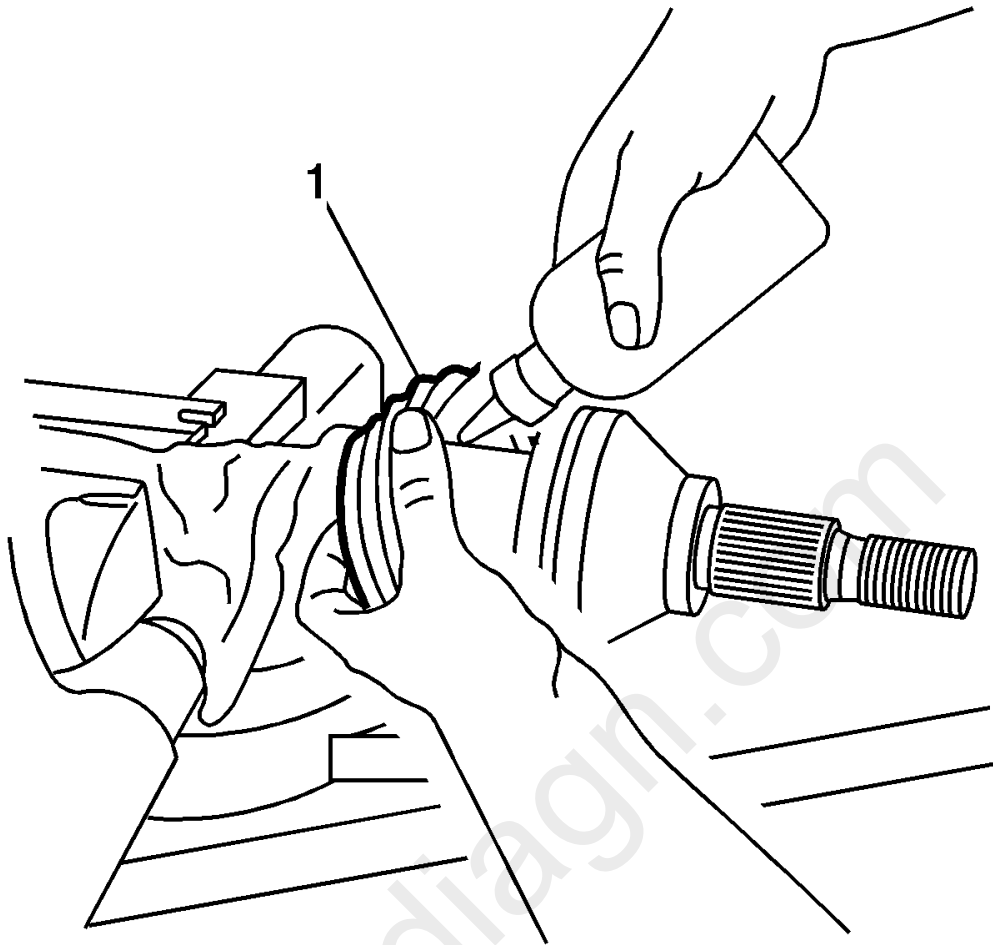


Fig. 65: Greasing Seal
Courtesy of GENERAL MOTORS COMPANY

30. Insert the remaining grease from the service kit into the seal (1).

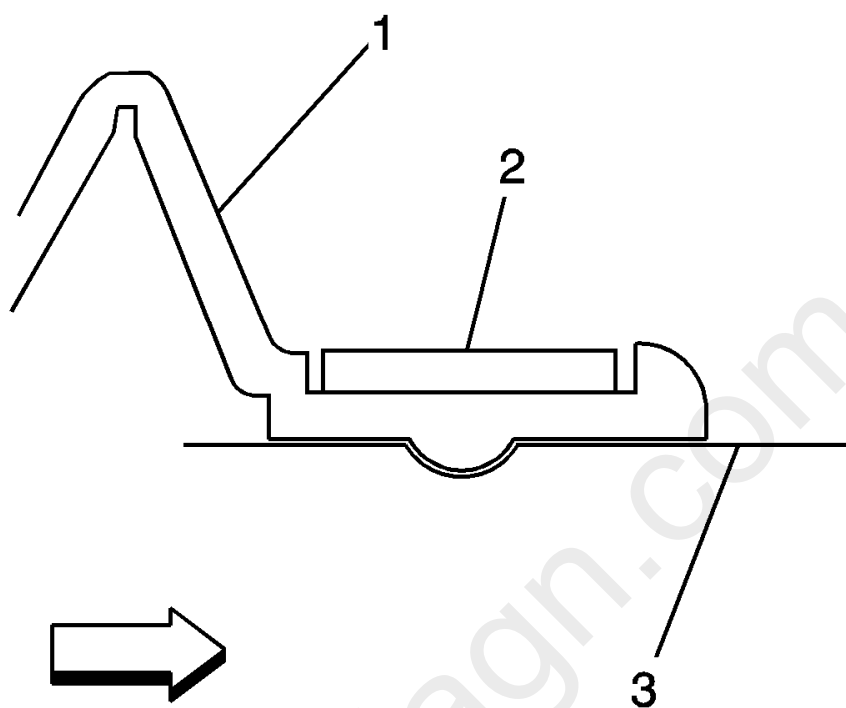


Fig. 66: Inner Joint Seal, Small Seal Clamp, & Inner Joint Seal Groove
Courtesy of GENERAL MOTORS COMPANY

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.

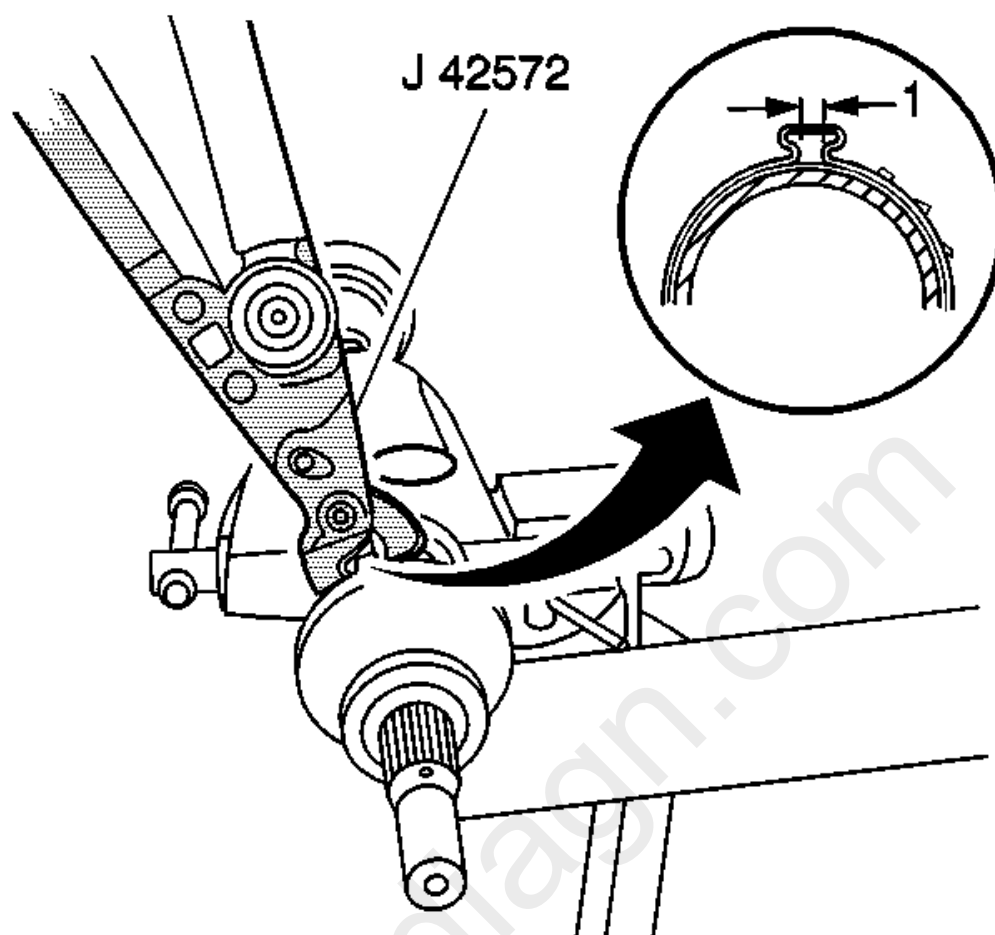


Fig. 67: Crimping Seal Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

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) .

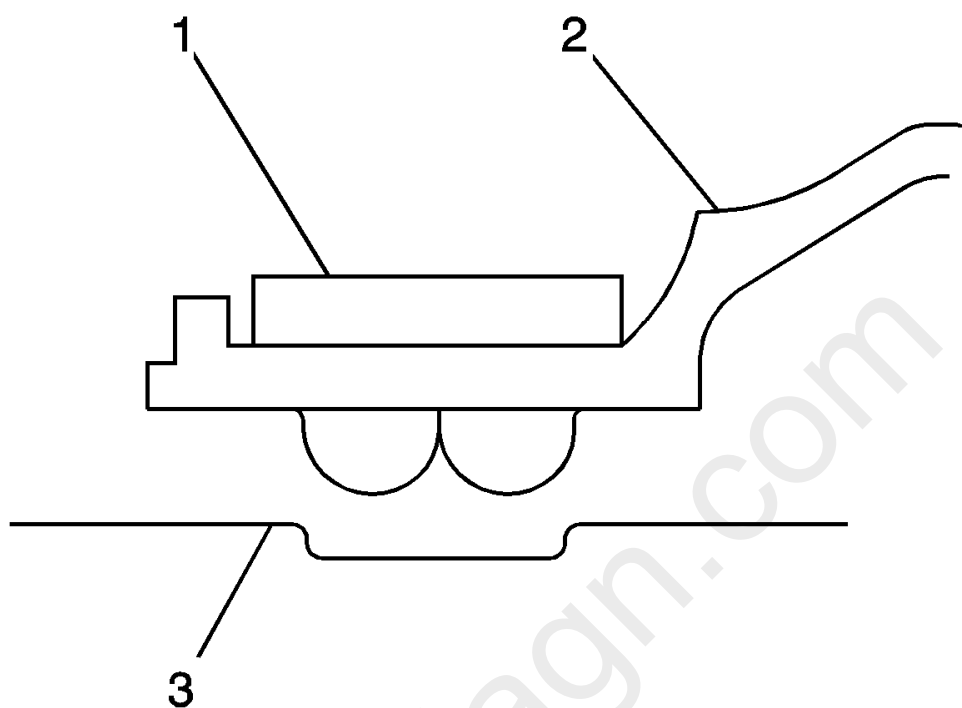


Fig. 68: View Of Large Seal Retaining Clamp, Seal & Boot Groove
Courtesy of GENERAL MOTORS COMPANY

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.

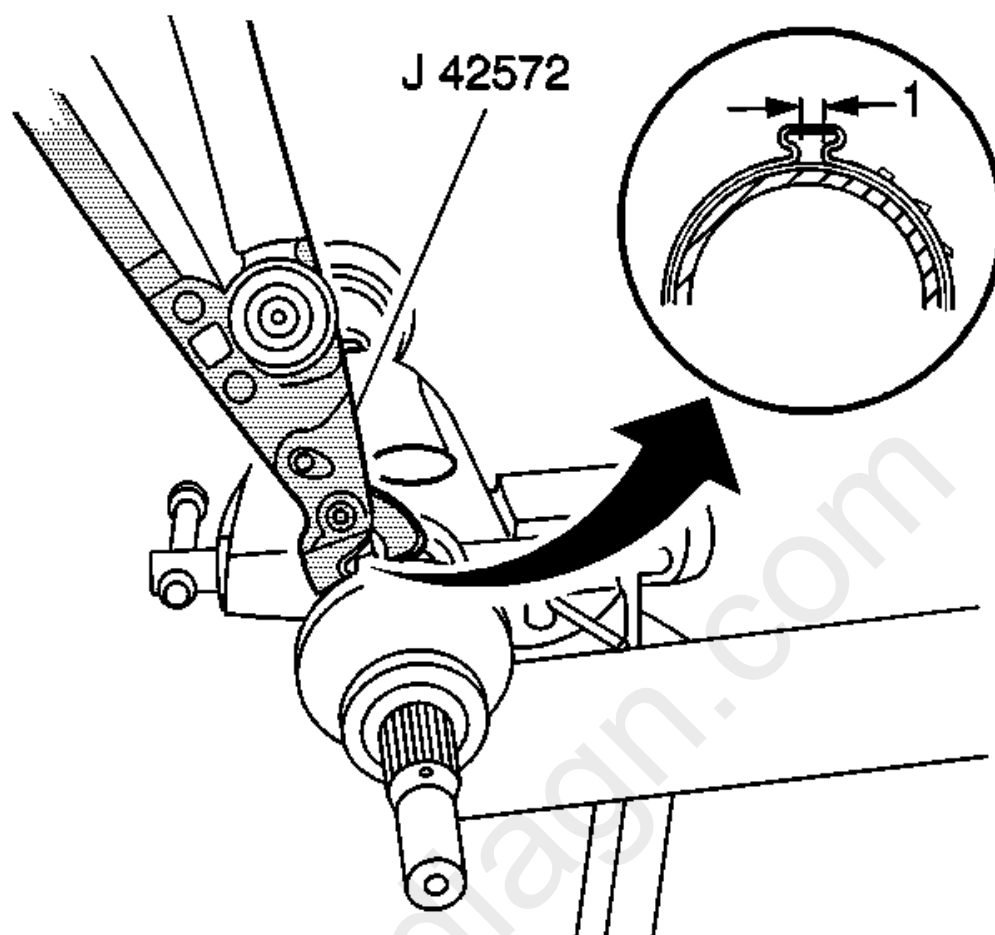


Fig. 69: Crimping Seal Retaining Clamp
Courtesy of GENERAL MOTORS COMPANY

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 (LFX,LF3), Rear Wheel Drive Shaft Replacement (LTG)**.

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

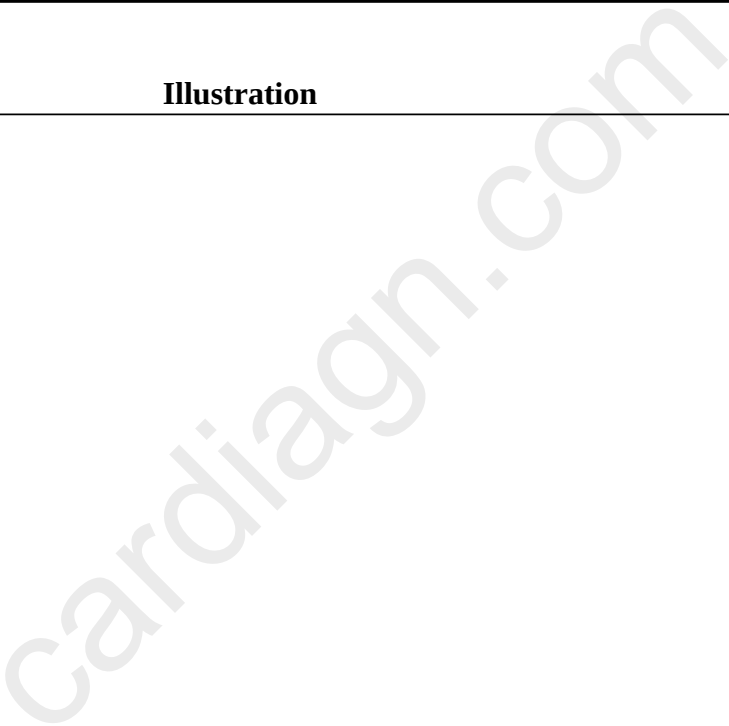
The inner joints use the cross-groove joint design with an adapter for the inboard seal. The wheel drive shafts incorporate a male spline and interlock with the differential gears using barrel type snap rings.

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

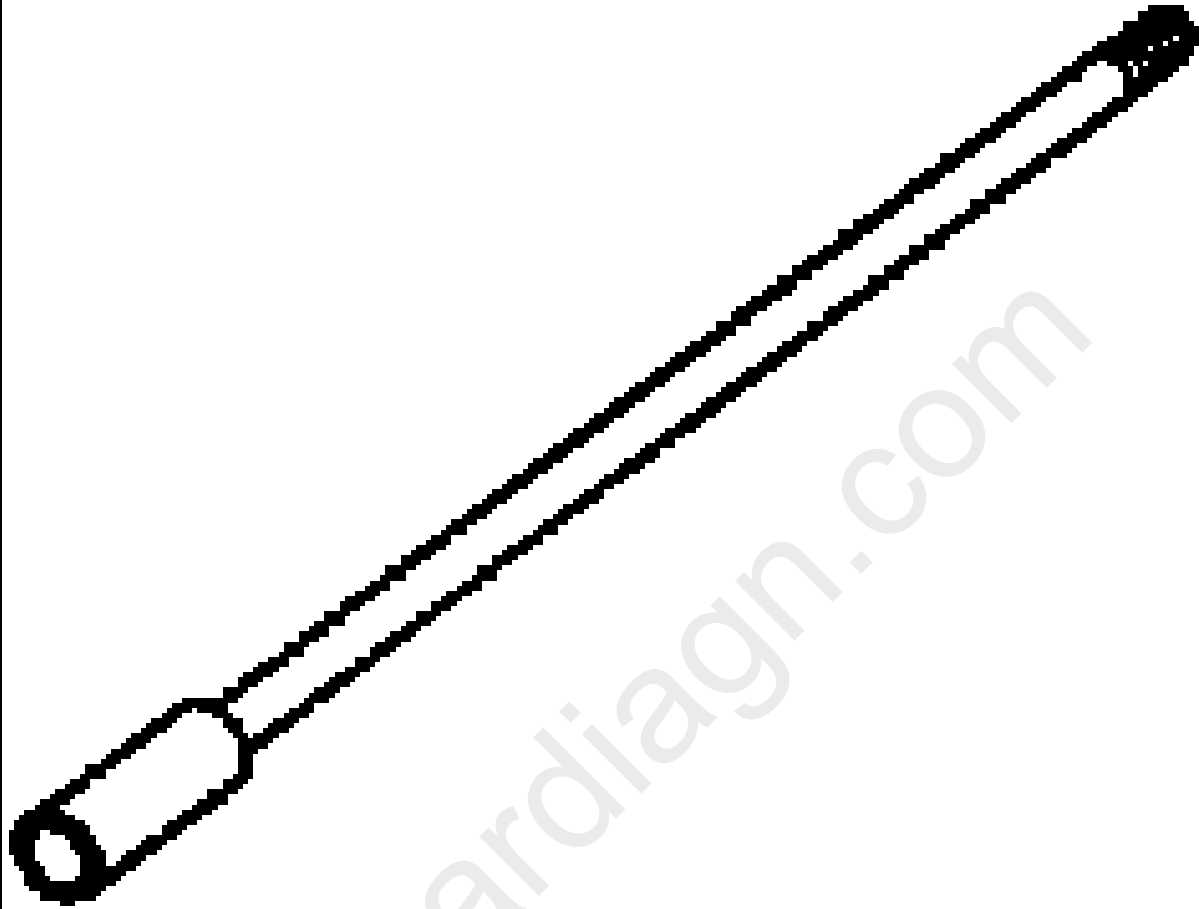
SPECIAL TOOLS

Illustration	Tool Number/ Description
	J 2619-01 Slide Hammer



J 22928-B
Seal
Installer

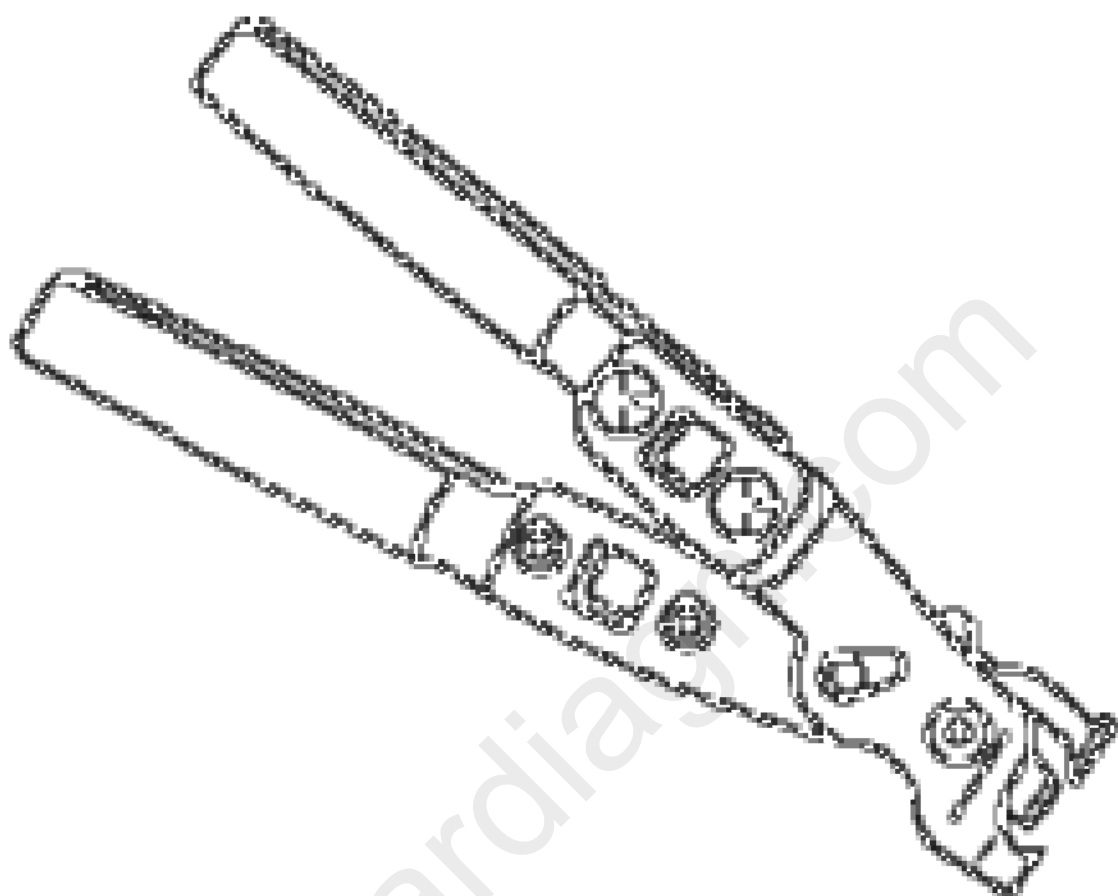
J 29794
Axle Shaft
Remover
Extension



cardiagn.com

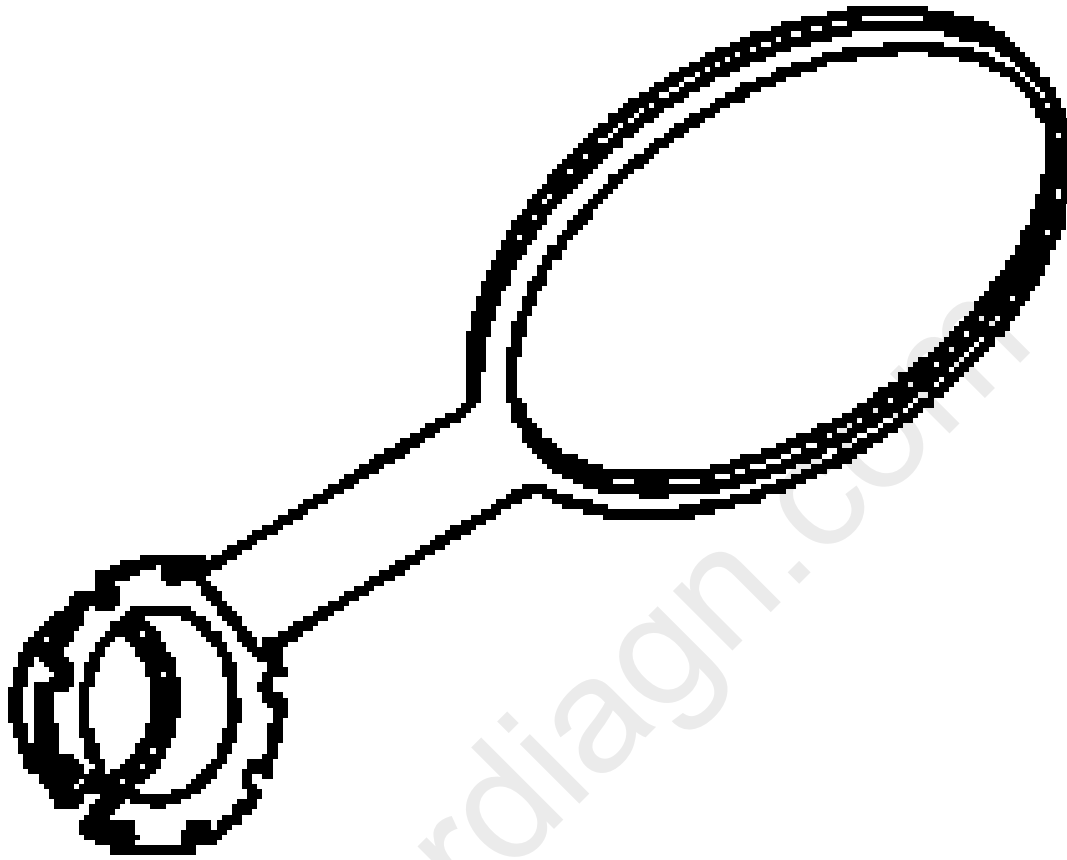
J 35566
Drive Axle
Seal Clamp
Pliers

J 42572
Drive Shaft
Seal Clamp
Pliers



J 42943
Drive Axle
Separator

J 44394-A
Seal
Protector



J 45859 Wheel Hub Remover

cardiagn.com