Rear Drive Axle - Hummer H2

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Bearing Cap Bolts	85 N.m	63 lb ft
Brake Backing Plate Bracket to Axle Flange Mounting Nuts	135 N.m	100 lb ft
Brake Caliper Mounting Bracket Bolts	165 N.m	122 lb ft
Brake Crossover Pipe Bracket Bolts	22 N.m	16 lb ft
Brake Hose Bracket Bolt	22 N.m	16 lb ft
Brake Pipe Junction Block Bolt	22 N.m	16 lb ft
Differential Bearing Adjuster Nut Lock Bolts	26 N.m	19 lb ft
Differential Housing Cover Bolts	39 N.m	29 lb ft
Pinion Shaft Lock Bolt	50 N.m	37 lb ft
Plug, Drain and Fill	33 N.m	24 lb ft
Propeller Shaft Yoke Retainer Bolts	25 N.m	18 lb ft
Ring Gear Bolts	140 N.m	103 lb ft
Shock Absorber Nuts - Lower	105 N.m	77 lb ft
Stabilizer Shaft Insulator Bracket Bolts	33 N.m	24 lb ft
Track Bar Nut	105 N.m	77 lb ft
Wheel Speed Sensor Bolt	14 N.m	10 lb ft

DIFFERENTIAL ADJUSTMENT SHIM SPECIFICATIONS

Differential Adjustment Shim Specifications

# of Stripes	Color	Specification	
		Metric	English
1	Orange	5.59 mm	0.220"
2	Orange	5.64 mm	0.222"
3	Orange	5.69 mm	0.224"
4	Orange	5.74 mm	0.226"
5	Orange	5.79 mm	0.228"
1	Yellow	5.84 mm	0.230"
2	Yellow	5.89 mm	0.232"
3	Yellow	5.94 mm	0.234"
4	Yellow	5.99 mm	0.236"

5	Yellow	6.05 mm	0.238"
1	White	6.10 mm	0.240"
2	White	6.15 mm	0.242"
3	White	6.20 mm	0.244"
4	White	6.25 mm	0.246"
5	White	6.30 mm	0.248"
1	Green	6.35 mm	0.250"
2	Green	6.40 mm	0.252"
3	Green	6.45 mm	0.254"
4	Green	6.50 mm	0.256"
5	Green	6.55 mm	0.258"

AXLE PRELOAD AND BACKLASH SPECIFICATIONS

Axle Preload and Backlash Specifications

Application	Specification	
	Metric	English
Backlash	0.08-0.25 mm	0.003-0.010 in
Backlash (Preferred)	0.13-0.18 mm	0.005-0.007 in
Pinion Bearing Preload, New Bearings	1.7-3.4 N.m	15-30 lb in
Pinion Bearing Preload, Used Bearings	1.1-2.3 N.m	10-20 lb in
Pinion and Differential Case Bearing Preload, New Bearings	3.4-6.2 N.m	30-55 lb in
Pinion and Differential Case Bearing Preload, Used Bearings	2.8-5.1 N.m	25-45 lb in

SEALERS, ADHESIVES, AND LUBRICANTS

Sealers, Adhesives, and Lubricants

Application	Type of Material	GM Part Number
Rear Drive Axle	Lubricant	12378261 (Canadian P/N 10953455) or equivalent meeting GM Specification 9986115
Pinion Yoke Splines	Sealant	12346004 (Canadian P/N 10953480) or equivalent

COMPONENT LOCATOR

REAR AXLE DISASSEMBLED VIEWS

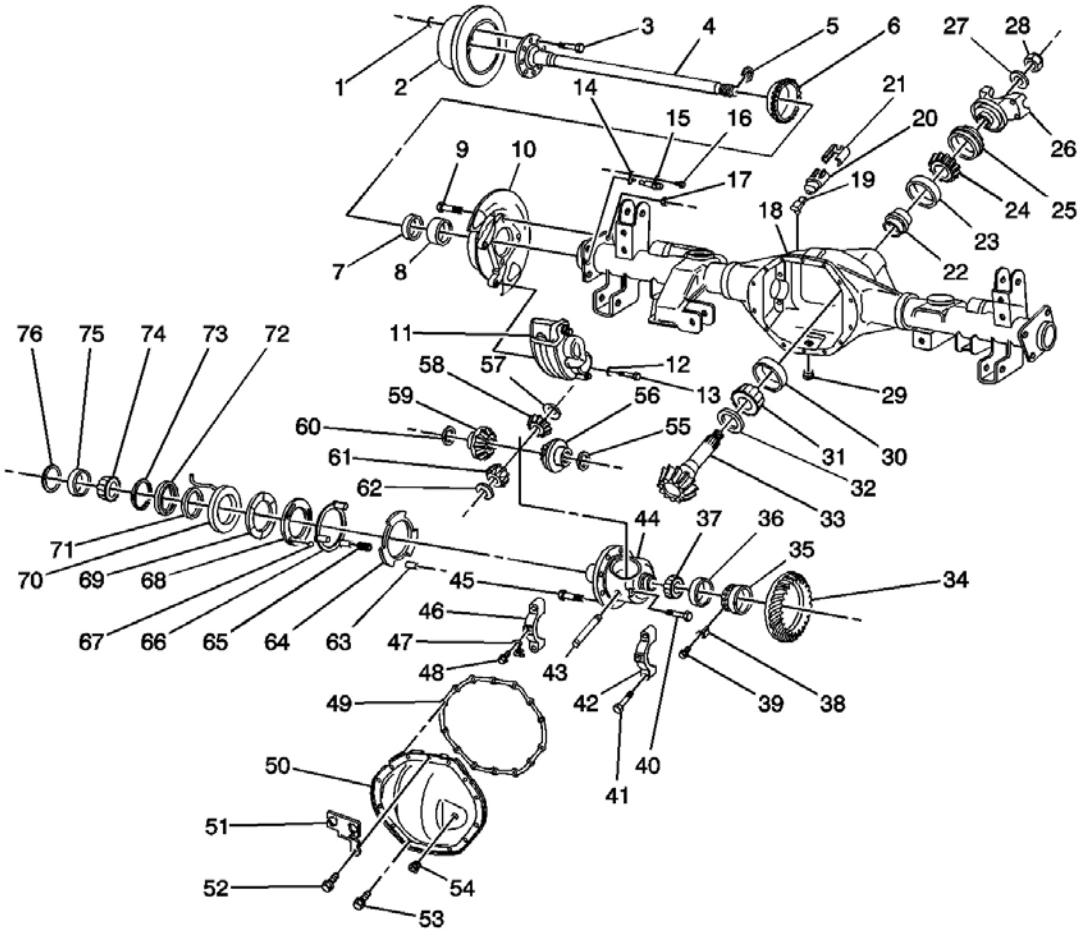


Fig. 1: Rear Axle Component Views
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Wheel Nut
2	Brake Rotor
3	Wheel Stud
4	Rear Axle Shaft
5	Axle Shaft Lock
6	Exciter Ring
7	Rear Axle Shaft Seal
8	Rear Axle Shaft Bearing
9	Bolt
10	Brake Shoe Guide Plate
11	Brake Caliper

12	Washer
13	Bolt
14	Wheel Speed Sensor Shim
15	Wheel Speed Sensor
16	Bolt
17	Nut
18	Rear Axle Housing
19	Clip
20	Connector
21	Connector
22	Differential Drive Pinion Gear Bearing Spacer
23	Differential Drive Pinion Gear Outer Bearing Cup
24	Differential Drive Pinion Gear Outer Bearing
25	Differential Drive Pinion Gear Oil Seal
26	Differential Drive Pinion Gear Yoke
27	Differential Drive Pinion Gear Washer
28	Differential Drive Pinion Gear Nut
29	Differential Carrier Drain Plug
30	Differential Drive Pinion Gear Inner Bearing Cup
31	Differential Drive Pinion Gear Inner Bearing
32	Differential Drive Pinion Gear Bearing Shim
33	Differential Drive Pinion Gear
34	Differential Ring Gear
35	Differential Bearing Adjuster Nut
36	Differential Bearing Cup
37	Differential Bearing
38	Differential Bearing Adjuster Nut Lock
39	Bolt
40	Differential Pinion Gear Shaft Lock Bolt
41	Differential Bearing Cap Bolt
42	Differential Bearing Cap
43	Differential Pinion Gear Shaft
44	Differential Case
45	Bolt
46	Differential Bearing Cap
47	Differential Coil Lock
48	Bolt
49	Rear Axle Housing Cover Gasket
50	Rear Axle Housing Cover
51	Brake Pipe Clip
52	Bolt

53	Bolt
54	Differential Carrier Fill Plug
55	Differential Side Gear Thrust Washer
56	Differential Side Gear
57	Differential Pinion Gear Thrust Washer
58	Differential Pinion Gear
59	Differential Side Gear
60	Differential Side Gear Thrust Washer
61	Differential Pinion Gear
62	Differential Pinion Gear Thrust Washer
63	Differential Carrier Lock Pin
64	Locking Differential Clutch Spring Retainer
65	Locking Differential Clutch Spring
66	Locking Differential Ball Bearing Plate - Inboard
67	Locking Differential Ball Bearing Assembly
68	Locking Differential Ball Bearing Plate - Outboard
69	Locking Differential Coil Plate
70	Locking Differential Coil Assembly
71	Differential Bearing Assembly
72	Differential Bearing Race
73	Differential Bearing Retainer Ring
74	Differential Bearing
75	Differential Bearing Cup
76	Differential Bearing Shim

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - REAR DRIVE AXLE

Begin the system diagnosis by reviewing the system Description and Operation. Reviewing the Description and Operation information will help you determine the correct symptom diagnostic procedure when a malfunction exists. Reviewing the description and Operation information will also help you determine if the condition described by the customer is normal operation. Refer to **Symptoms - Rear Drive Axle** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SYMPTOMS - REAR DRIVE AXLE

Review the system and operation in order to familiarize yourself with the system functions. Refer to **Rear Drive Axle Description and Operation** .

Rear Axle Noise

The proper diagnosis is an important part of rear axle repair. In axle work, one of the most difficult conditions

to diagnose is noise. Locating a broken axle shaft or broken differential gear presents little or no problems, but locating and isolating axle noise can be an entirely different matter.

Any gear driven unit, especially an automotive drive axle where the engine torque multiplication occurs at a 90 degree turn in the driveline, produces a certain amount of noise. Therefore, an interpretation must be made for each vehicle in order to determine where the noise is normal or if a problem actually exists. A certain amount of noise must be expected and cannot be eliminated by conventional repairs or adjustment.

Normal axle noise can be described as a slight noise heard only at a certain speed or under unusual or remote conditions. For example, the noise tends to reach a peak at speeds from 60-100 km/h (40-60 mph) depending on road and load conditions, or on gear ratio and tire size. This slight noise is in no way indicative of trouble in the axle assembly.

Driveline noises may confuse even the best technician. Vehicle noises coming from tires, transmission, propeller shaft, universal joints, and front or rear wheel bearings are often mistaken for axle noise.

Visual/Physical Inspection

- Inspect the system for loose or missing fasteners.
- Inspect the system for leaking components.
- Inspect the system for obvious damage or conditions which may cause the symptom.

Symptom List

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

- **Rear Drive Axle Noises**
- **Noisy in Drive**
- **Noisy When Coasting**
- **Intermittent Noise**
- **Constant Noise**
- **Noisy on Turns**

REAR DRIVE AXLE NOISES

Gear Noise

Gear noise or whine is audible from 32-89 km/h (20-55 mph) under 4 driving conditions:

- Drive- Acceleration or heavy pull
- Road Load-Vehicle driving load or constant speed
- Float-Using enough throttle to keep the vehicle from driving the engine, the vehicle slows down gradually but the engine still pulls slightly
- Coast-Throttle is closed and the vehicle is in gear

Gear noise most frequently has periods where the noise is more prominent, usually between 48-64 km/h (30-40 mph) and 80-85 km/h (50-53 mph). Gear whine is corrected by either ring and pinion gear replacement or adjustment, depending on the mileage of the gearset.

Bearing Noise

Faulty bearings produce a rough growl or grating sound, rather than the whine typical of gear noise. Bearing noise/hum will pulsate at a constant vehicle speed. This indicates a bad pinion or a bad rear axle side bearing. This noise can be confused with rear wheel bearing noise. Inspect and replace the bearings and the affected components as required.

Rear Wheel Bearing Noise

A rough rear wheel bearing produces a noise which continues with the car coasting at low speed and the transmission in neutral. The noise may diminish some when the brakes are gently applied. The noise may also change when performing side-to-side maneuvers with the vehicle.

A rough/noisy rear wheel bearing can be heard by spinning the rear wheels by hand and listening at the hubs for the noise. Inspect and replace the bearings and the affected components as needed.

Knock at Low Speeds

A low speed knock can be caused by a differential case side gear bore that has worn oversize. Inspect the side gears and differential case and replace the components as necessary.

Backlash Clunk

Excessive backlash clunk under acceleration or deacceleration can be caused by any of the following:

- Worn differential pinion shaft
- Worn differential pinion and/or side gear teeth
- Worn thrust washers
- Excessive clearance between the side gears and the axle shafts
- Excessive clearance between differential side gears and the bore in the case
- Excessive drive pinon and ring gear backlash

Inspect, adjust or replace the affected components as necessary.

NOISY IN DRIVE

Noisy in Drive

Checks	Action
Excessive pinion to ring gear backlash	Adjust the pinion to ring gear backlash. Refer to **Backlash Adjustment** .
Worn pinion and ring gear	Replace the pinion and the ring gear. Refer to **Drive Pinion and Ring Gear**

	Replacement .
Worn pinion bearings	Replace the pinion bearings. Refer to **Drive Pinion Bearings Replacement** .
Loose pinion bearings	Adjust the pinion bearings preload. Refer to **Pinion Depth Adjustment** .
Excessive pinion end play	Adjust the pinion end play. Refer to **Pinion Depth Adjustment** .
Worn differential bearings	Replace the differential bearings. Refer to **Differential Side Bearings Replacement** .
Loose differential bearings	Adjust the differential bearing preload. Refer to **Differential Side Bearing Preload Adjustment** .
Excessive ring gear runout	Replace the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** .
Low oil level	Fill the fluid level to specifications with the proper lubricant. Refer to **Lubricant Level Inspection - Rear Drive Axle** .
Wrong or poor grade oil	Drain and refill the system with the proper lubricant. Refer to **Lubricant Replacement - Rear Drive Axle** .
Bent axle housing	Replace the axle housing. Refer to **Rear Axle Housing Replacement** .

NOISY WHEN COASTING

Noisy When Coasting

Checks	Action
DEFINITION: Noise is audible when slowing down and disappears when driving.	
Worn pinion and ring gear	Adjust or replace the pinion and the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** .
Pinion and ring gear too tight	Adjust the pinion and the ring gear backlash. Refer to **Backlash Adjustment** .

INTERMITTENT NOISE

Intermittent Noise

Checks	Action
Warped ring gear	Replace the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** .
Loose differential case bolts	Tighten differential case bolts to specifications. Refer to **Fastener Tightening Specifications** .

CONSTANT NOISE

Constant Noise

Checks	Action
Flat spot on the pinion or the ring gear teeth	Replace the pinion and the ring gear. Refer to **Drive Pinion and Ring Gear Replacement** .
Flat spot on the pinion bearing	Replace the bearing. Refer to **Drive Pinion Bearings Replacement** .
Worn pinion splines	Replace the pinion. Refer to **Drive Pinion and Ring Gear Replacement** .

Worn axle shaft dowel holes	Replace the axle shaft. Refer to **Rear Axle Shaft Replacement** .
Worn hub studs	Replace the wheel studs. Refer to **Wheel Stud Replacement** in Rear Suspension.

NOISY ON TURNS

Noisy on Turns

Checks	Action
Worn differential side gears, pinion gears, thrust washers and/or pinion shaft.	Replace the differential components as necessary. Refer to the following procedures: • **Locking Differential Disassemble** in Rear Drive Axle - Locking/Limited Slip Rear Axle • **Locking Differential Assemble** in Rear Drive Axle - Locking/Limited Slip Rear Axle
Worn axle shaft splines	Replace the axle shaft. Refer to **Rear Axle Shaft Replacement** .

WHEEL BEARING WEAR - REAR DRIVE AXLE (TAPERED)

Tapered Roller Bearing Diagnosis

Consider the following factors when diagnosing bearing condition:

- General condition of all parts during disassembly and inspection
- Classify the failure with the aid of the illustrations.
- Determine the cause.
- Make all repairs following recommended procedures.

Abrasive Roller Wear

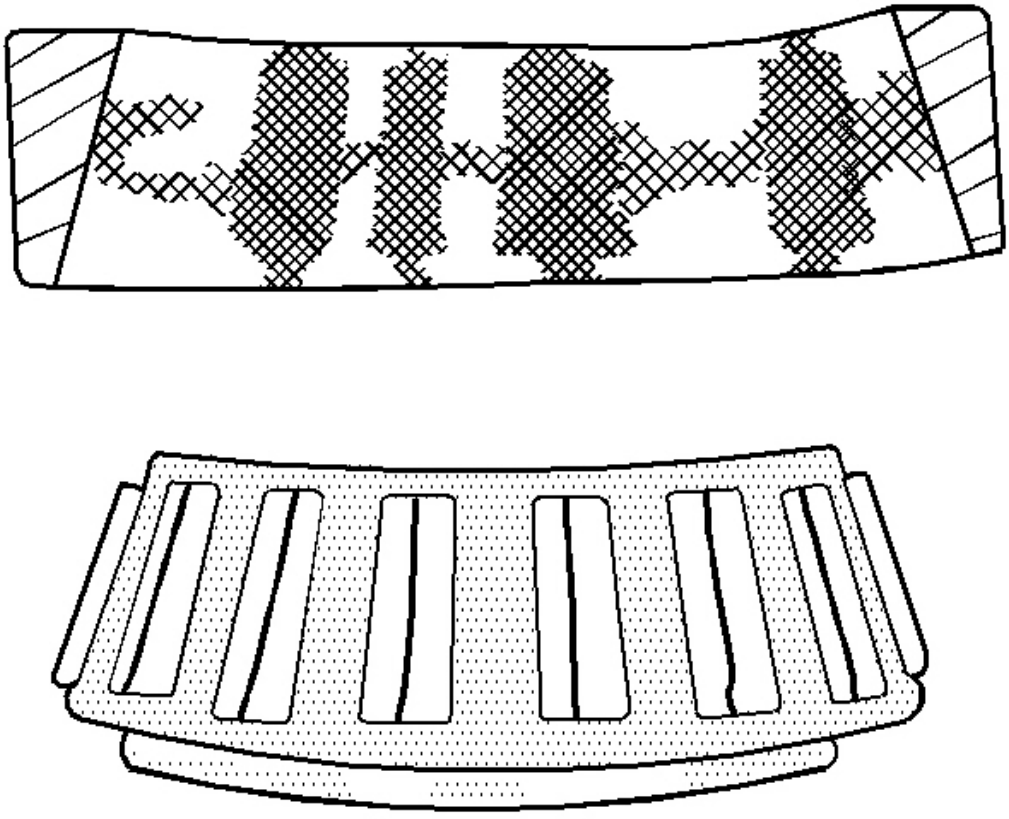


Fig. 2: Abrasive Roller Wear
Courtesy of GENERAL MOTORS CORP.

Pattern on the races and the rollers caused by fine abrasives. Clean all of the parts and the housings. Check the seals and the bearings. Replace any leaky, rough, or noisy bearings.

Abrasive Step Wear

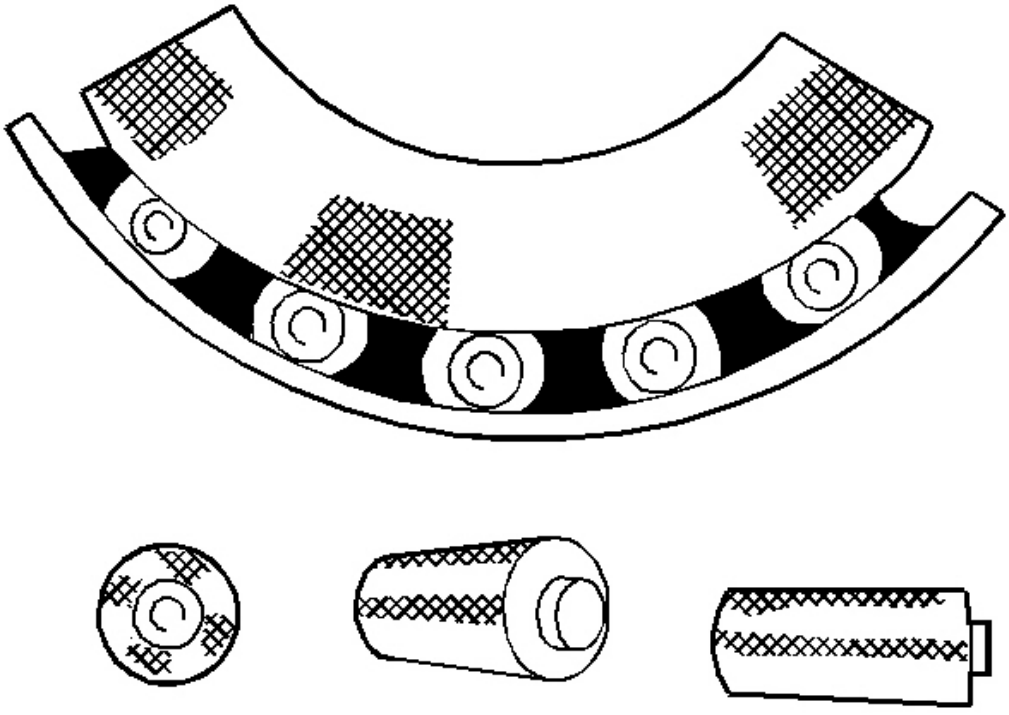


Fig. 3: Abrasive Step Wear
Courtesy of GENERAL MOTORS CORP.

Pattern on the roller ends caused by fine abrasives. Clean all of the parts and the housings. Check the seals and the bearings. Replace any leaky, rough, or noisy bearings.

Galling

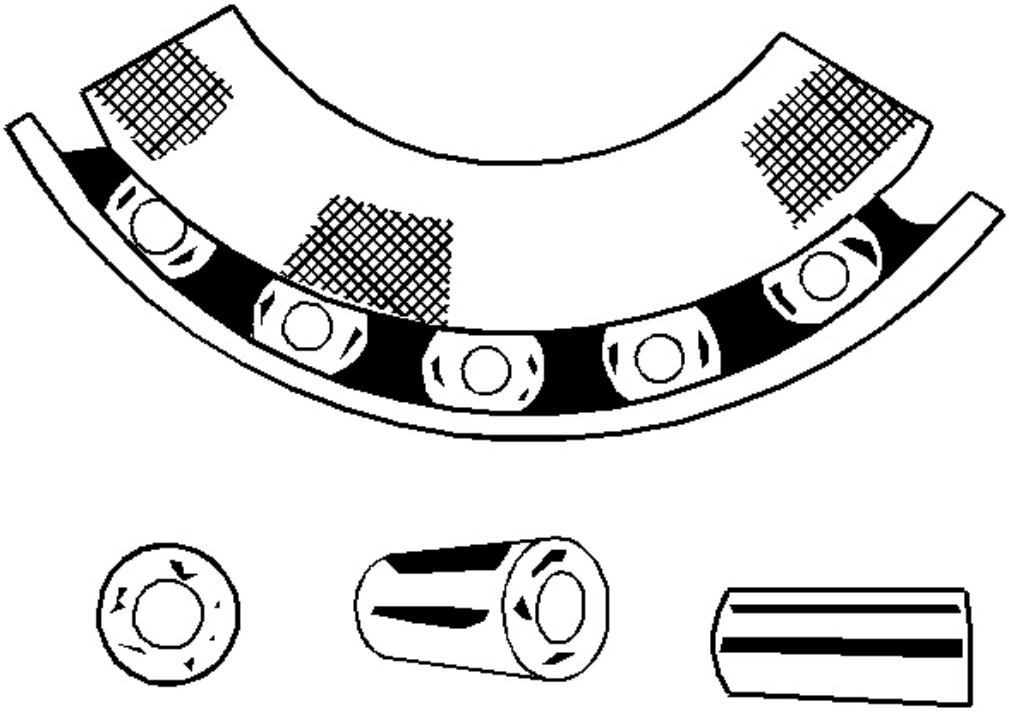


Fig. 4: Galling
Courtesy of GENERAL MOTORS CORP.

Metal smears on the roller ends due to overheating, lubricant failure, or lubricant overload. Replace the bearing. Check the seals. Check for proper lubrication.

Etching

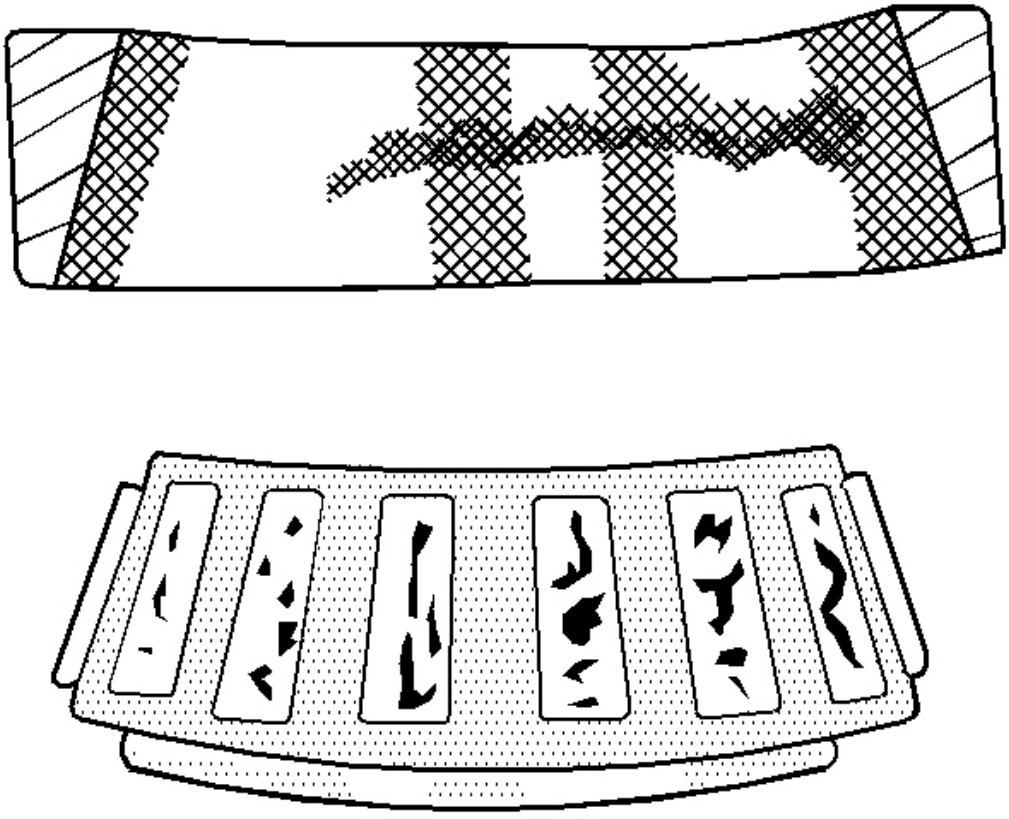


Fig. 5: Etching
Courtesy of GENERAL MOTORS CORP.

Bearing surfaces appear gray or grayish black in color, with related etching away of material usually at roller spacing. Replace the bearings. Check the seals. Check for proper lubrication.

Bent Cage

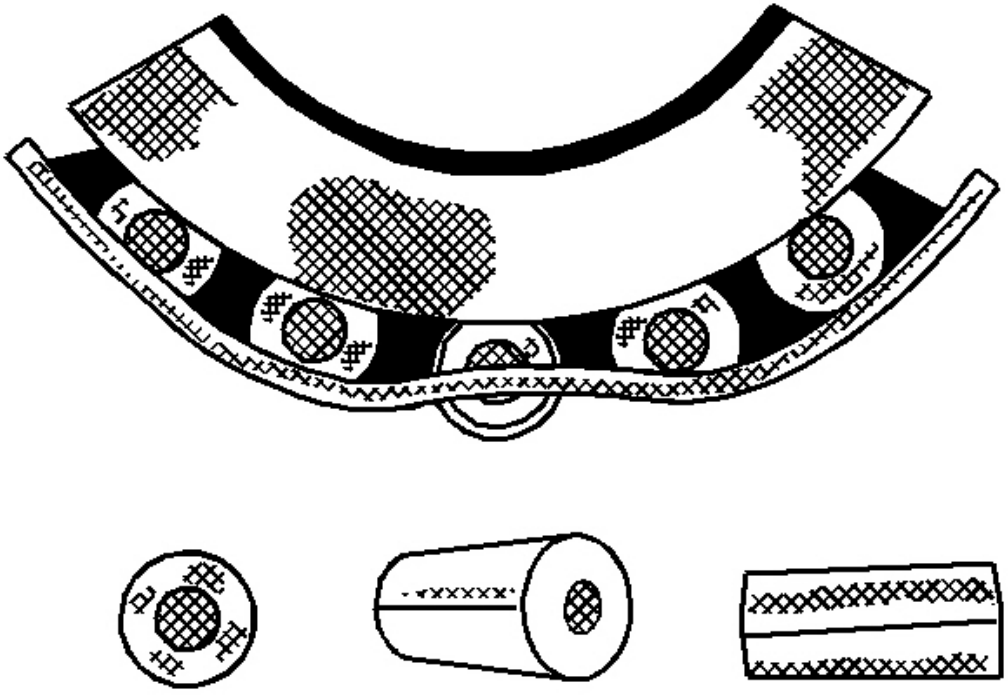


Fig. 6: Bent Cage
Courtesy of GENERAL MOTORS CORP.

A damaged cage due to improper handling or improper tool usage. Replace the bearing.

Cage Wear

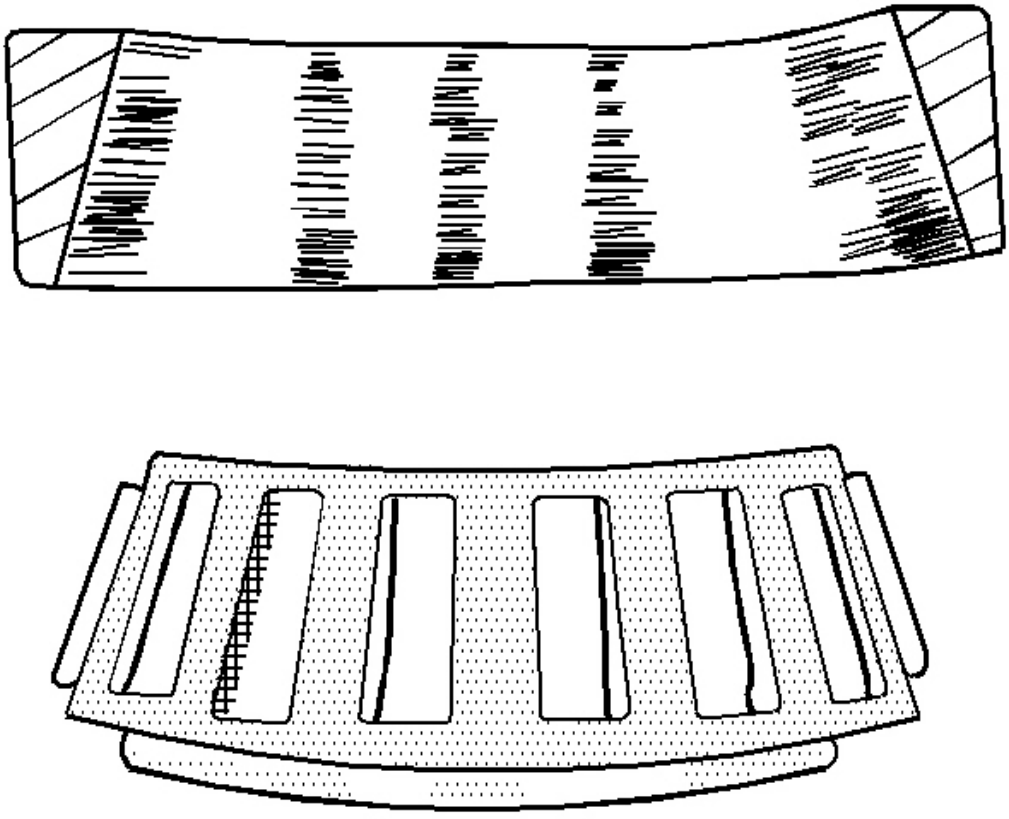


Fig. 7: Cage Wear
Courtesy of GENERAL MOTORS CORP.

Wear around the outside diameter of the cage and the roller pockets caused by abrasive material. Wear caused from inefficient lubrication. Clean the related parts and the housings. Check the seals. Replace the bearings.

Indentations

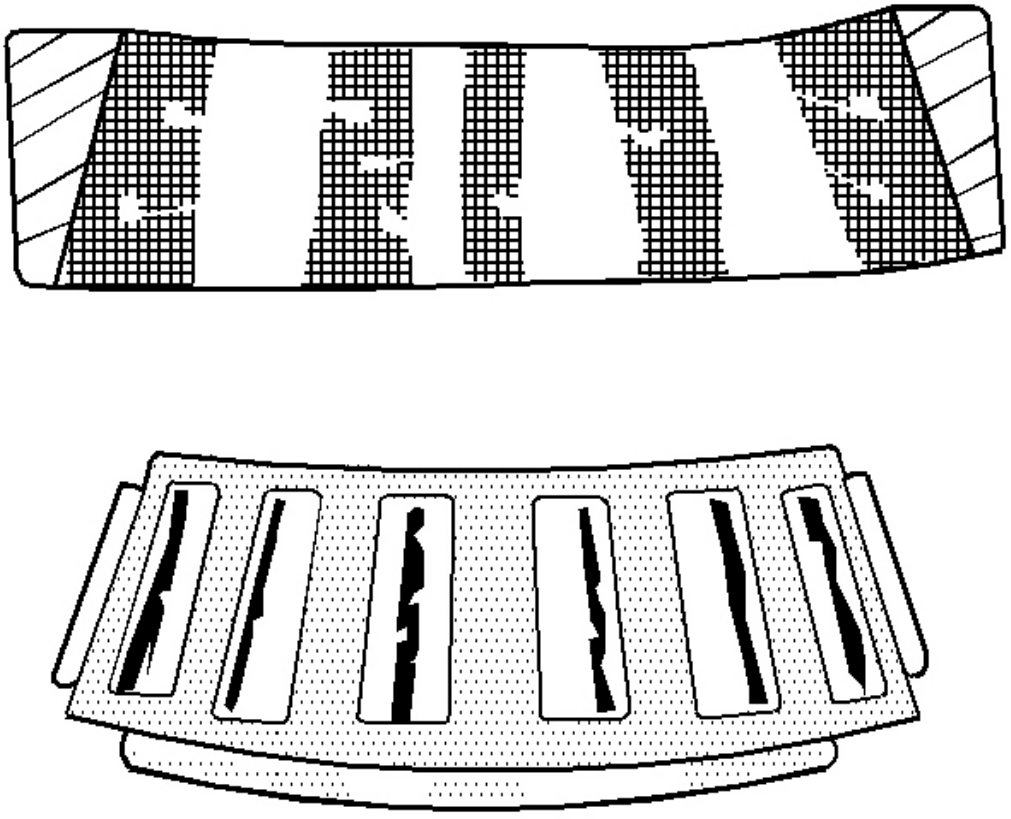


Fig. 8: Damaged Areas
Courtesy of GENERAL MOTORS CORP.

Surface depressions on the race and the rollers caused by hard particles of foreign matter. Clean all the parts and the housings. Check the seals. Replace rough or noisy bearings.

Frettage

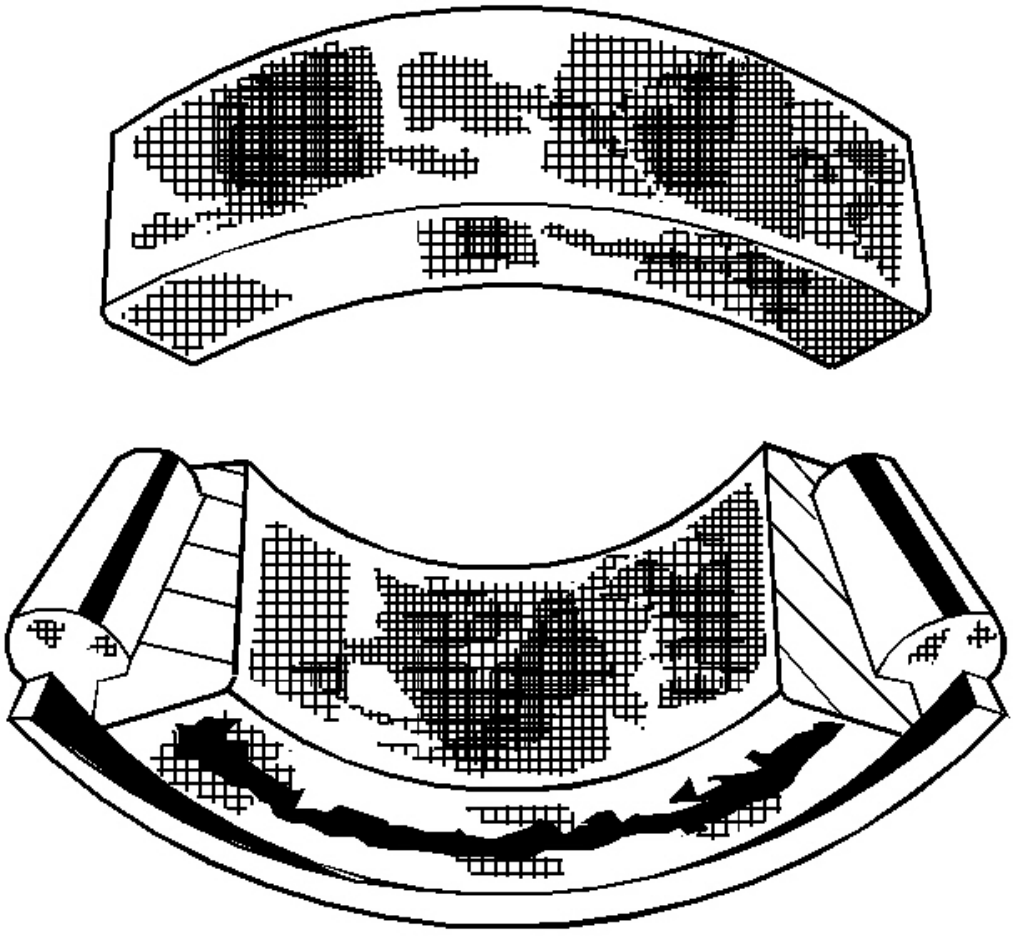


Fig. 9: Frettage
Courtesy of GENERAL MOTORS CORP.

Corrosion caused by small relative movement of parts with no lubrication. Replace the bearing. Clean the related parts. Check the seals. Check for proper lubrication.

Smears

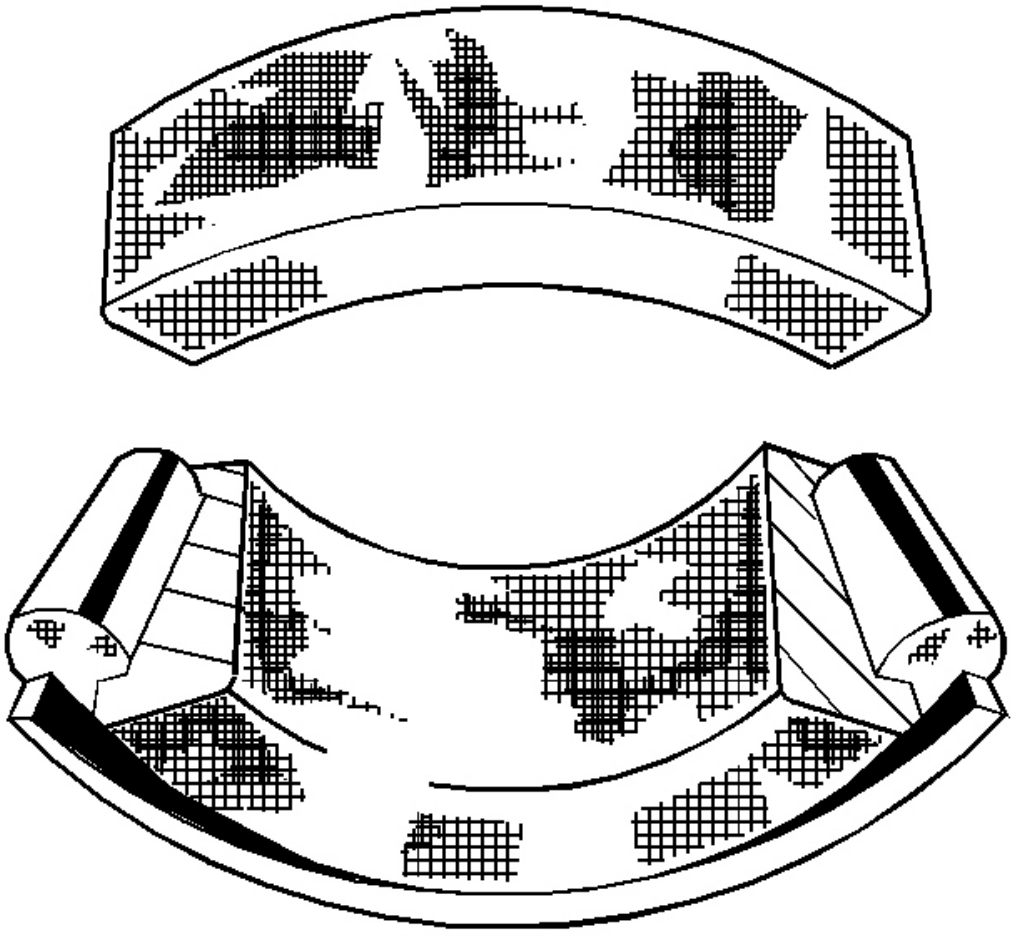


Fig. 10: Smears
Courtesy of GENERAL MOTORS CORP.

Smearing of the metal due to slippage. Slippage can be caused by the following factors:

- Poor fits
- Lubrication
- Overheating
- Overloads
- Handling damage

Replace the bearings. Clean the related parts. Check for proper fit and lubrication.

Stain Discoloration

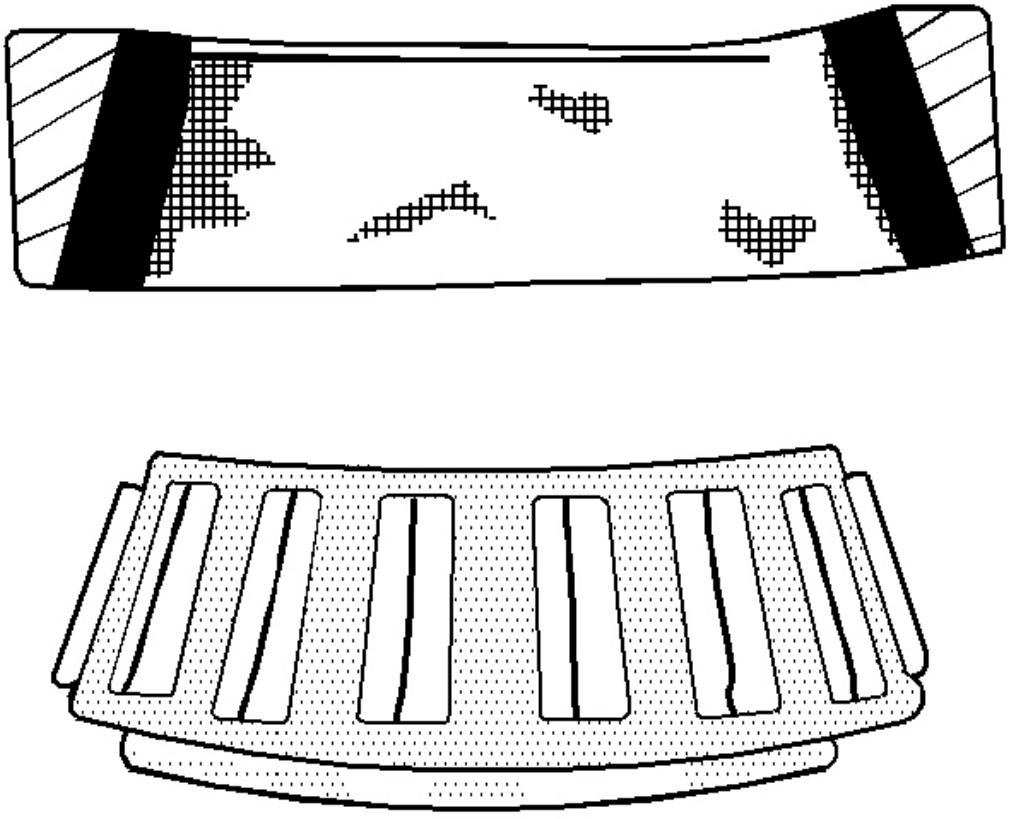


Fig. 11: Stain Discoloration
Courtesy of GENERAL MOTORS CORP.

Discoloration ranging from light brown to black. This discoloration is caused from incorrect lubrication or moisture. Reuse the bearing if you can remove the stains with light polishing. Reuse the bearing if there is no evidence of overheating. Check the seals and the related parts for damage.

Heat Discoloration

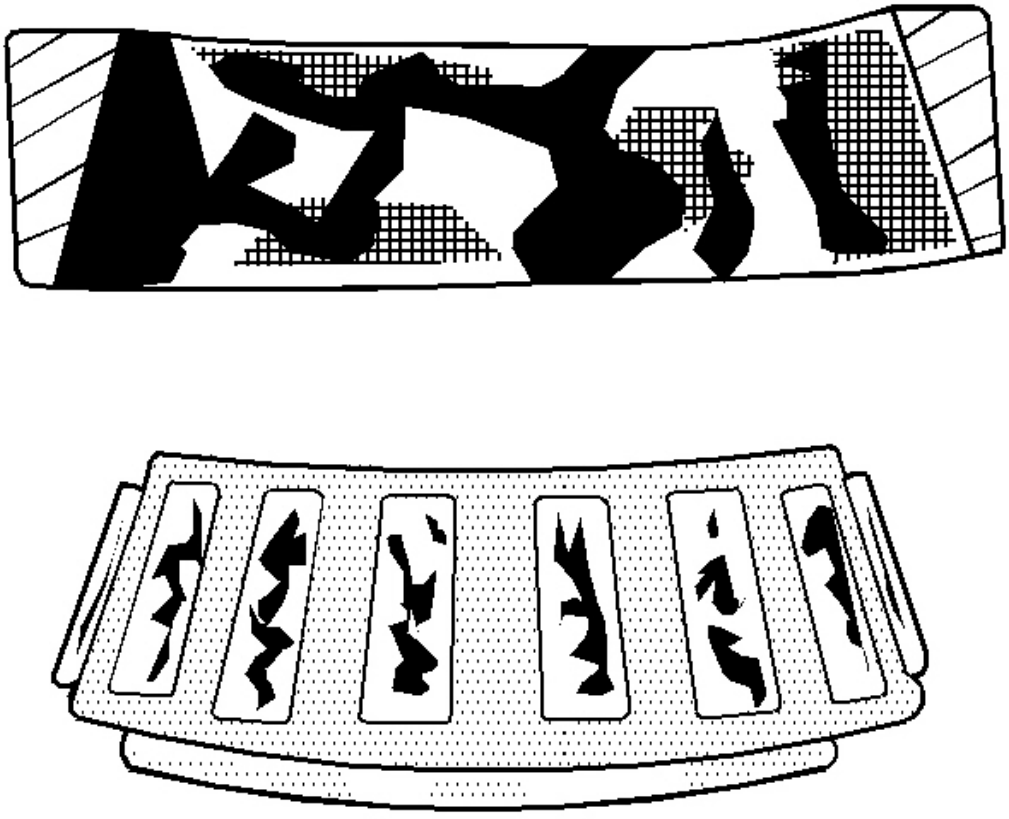


Fig. 12: Heat Discoloration
Courtesy of GENERAL MOTORS CORP.

Heat discoloration ranges from faint yellow to dark blue. This discoloration results from overload or an incorrect lubricant. Excessive heat causes softening of the races or the rollers. In order to check for loss of temper on the races and the rollers, perform a file test. A file drawn over a tempered part will grab and cut the metal. A file drawn over a hard part will glide readily with no metal cutting. Replace the bearings if overheating damage is indicated. The tempered part will fail the file test. Check the seals and the other related parts.

Misalignment

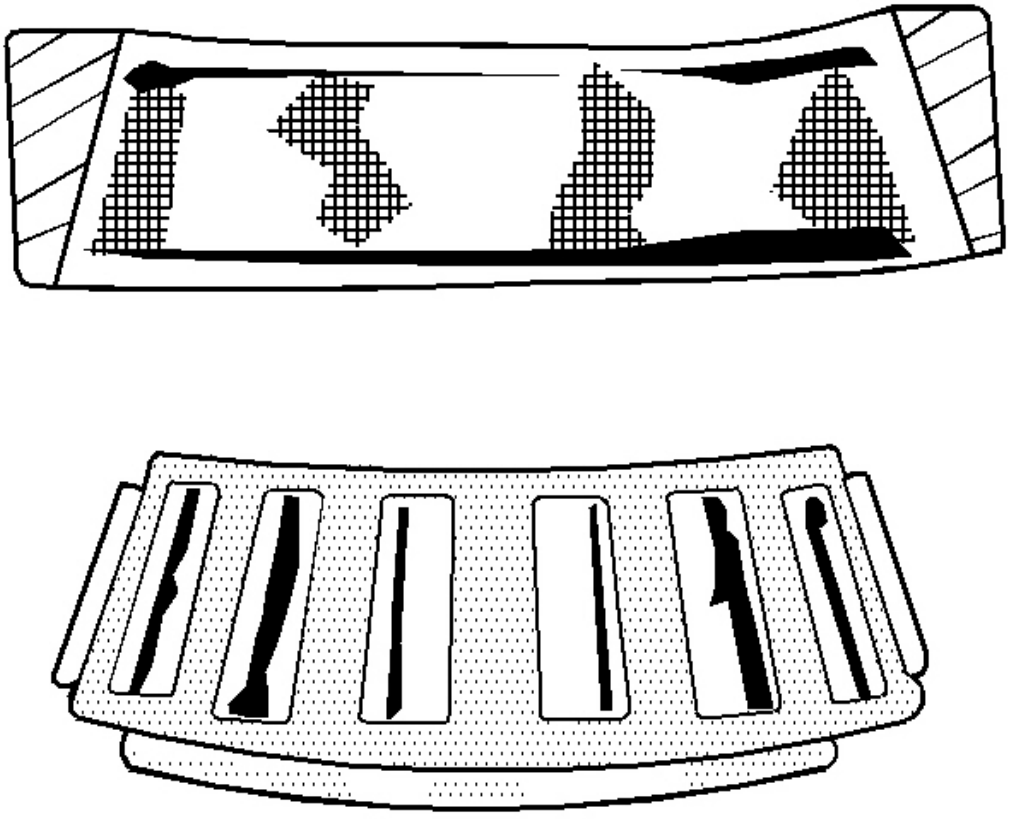


Fig. 13: Misalignment
Courtesy of GENERAL MOTORS CORP.

A misaligned outer race due to a foreign object. Clean the related parts. Replace the bearing. Ensure the races are properly sealed.

Cracked Inner Race

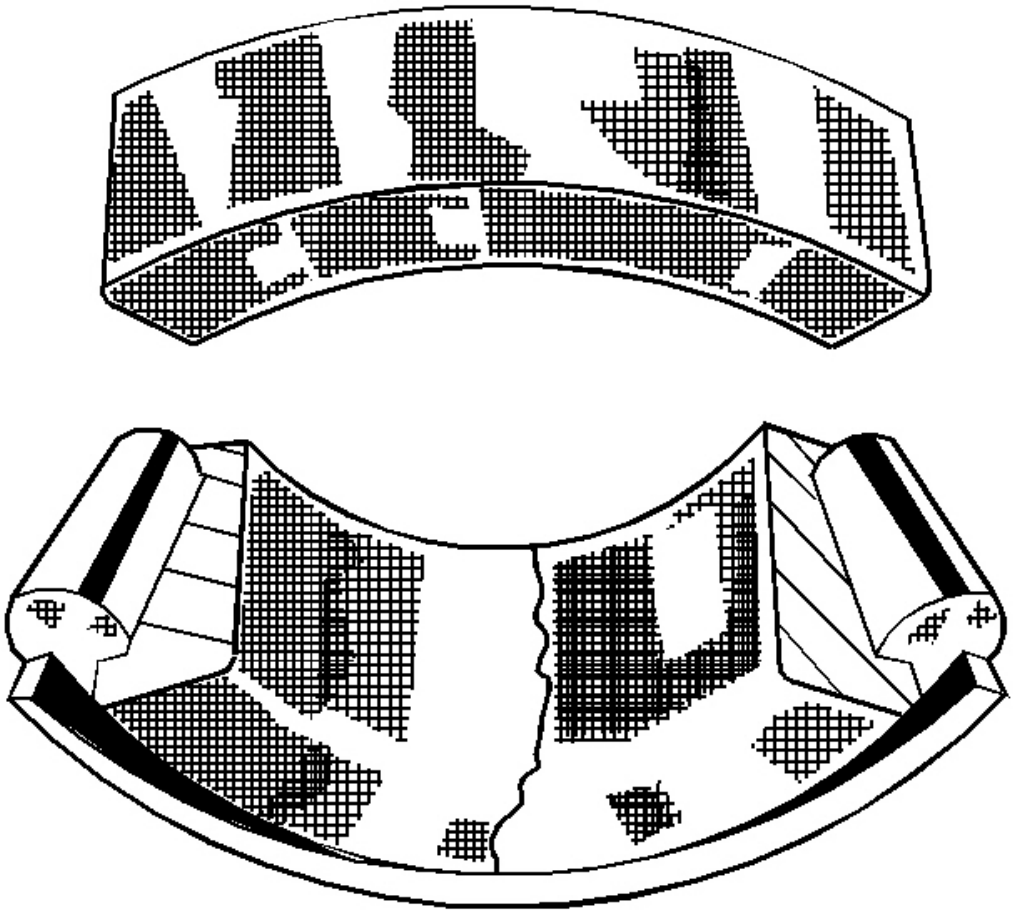


Fig. 14: Cracked Inner Race
Courtesy of GENERAL MOTORS CORP.

Cracked race due to improper fit, cocking, or poor bearing seats. Replace the bearing. Correct bearing seats.

Fatigue Spalling

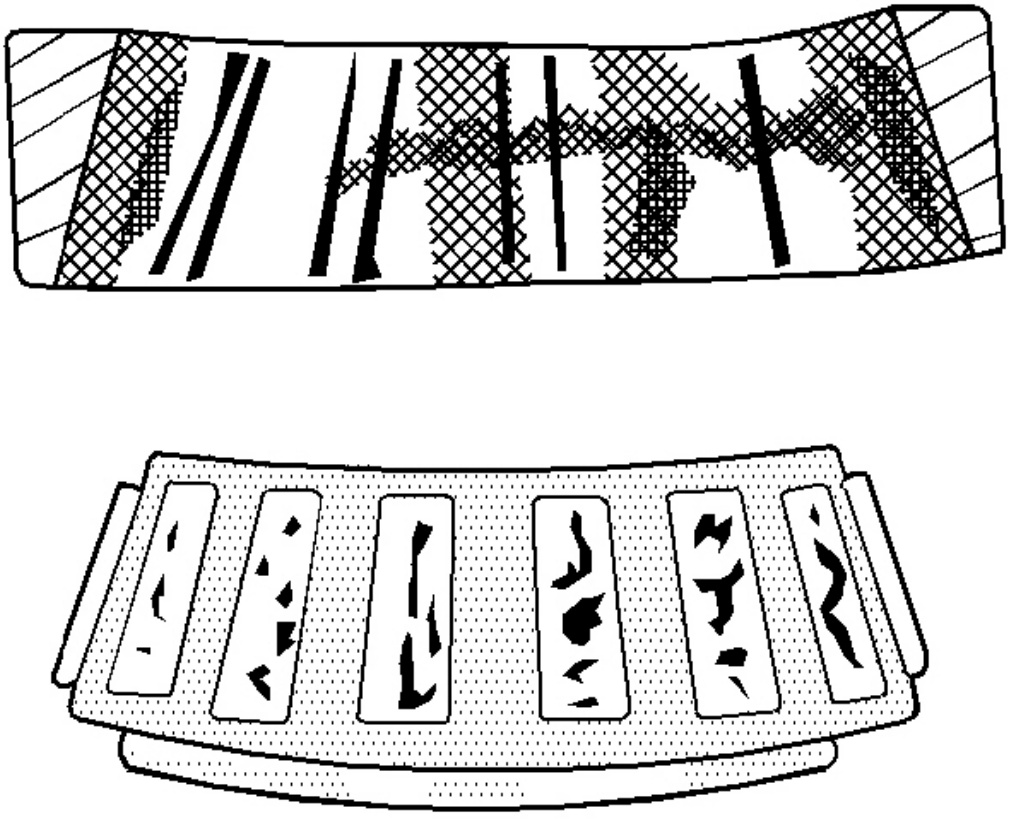


Fig. 15: Fatigue Spalling
Courtesy of GENERAL MOTORS CORP.

Flaked surface metal that results from fatigue. Replace the bearing. Clean all related parts.

Brinelling

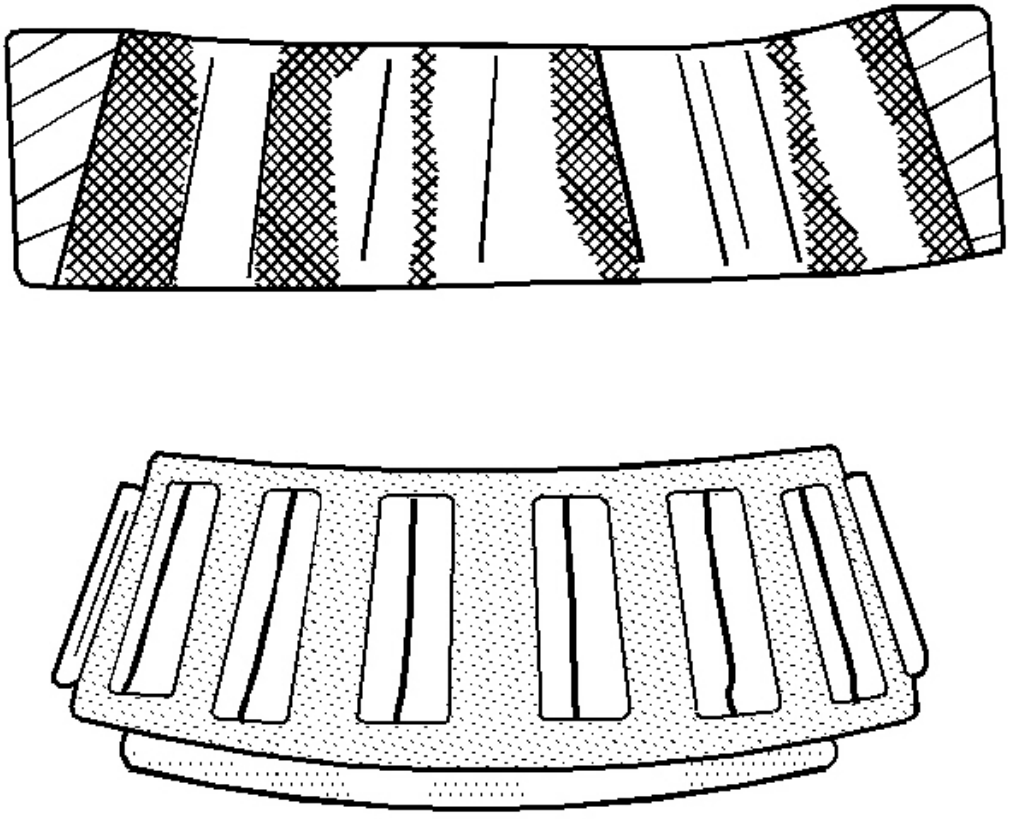


Fig. 16: Brinelling
Courtesy of GENERAL MOTORS CORP.

Surface indentations in the race way caused by the rollers under impact loading or caused from vibration while the bearing is not rotating. Replace a rough or noisy bearing.

WHEEL BEARING WEAR - REAR DRIVE AXLE (STRAIGHT)

Straight Roller Bearing Diagnosis

Consider the following factors when diagnosing a bearing condition:

- Note the general condition of all parts during disassembly and inspection.
- Classify the failure with the aid of the illustrations.
- Determine the cause.
- Make all repairs following recommended procedures.

Wear (Minor)

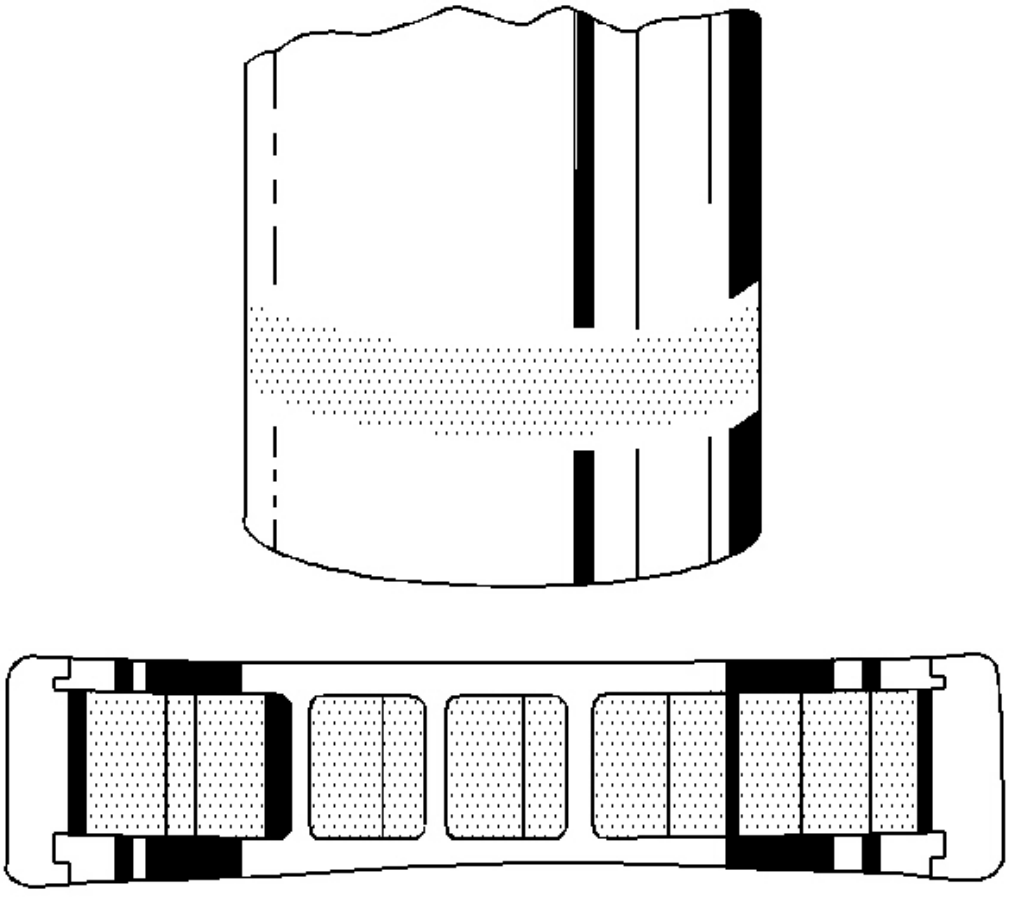


Fig. 17: Minor Wear
Courtesy of GENERAL MOTORS CORP.

Light pattern on races and rollers can be caused by fine abrasives. Clean all of the parts including the housings. Check the seals. Replace the bearings if rough or noisy. Replace the shaft if damaged.

Wear (Major)

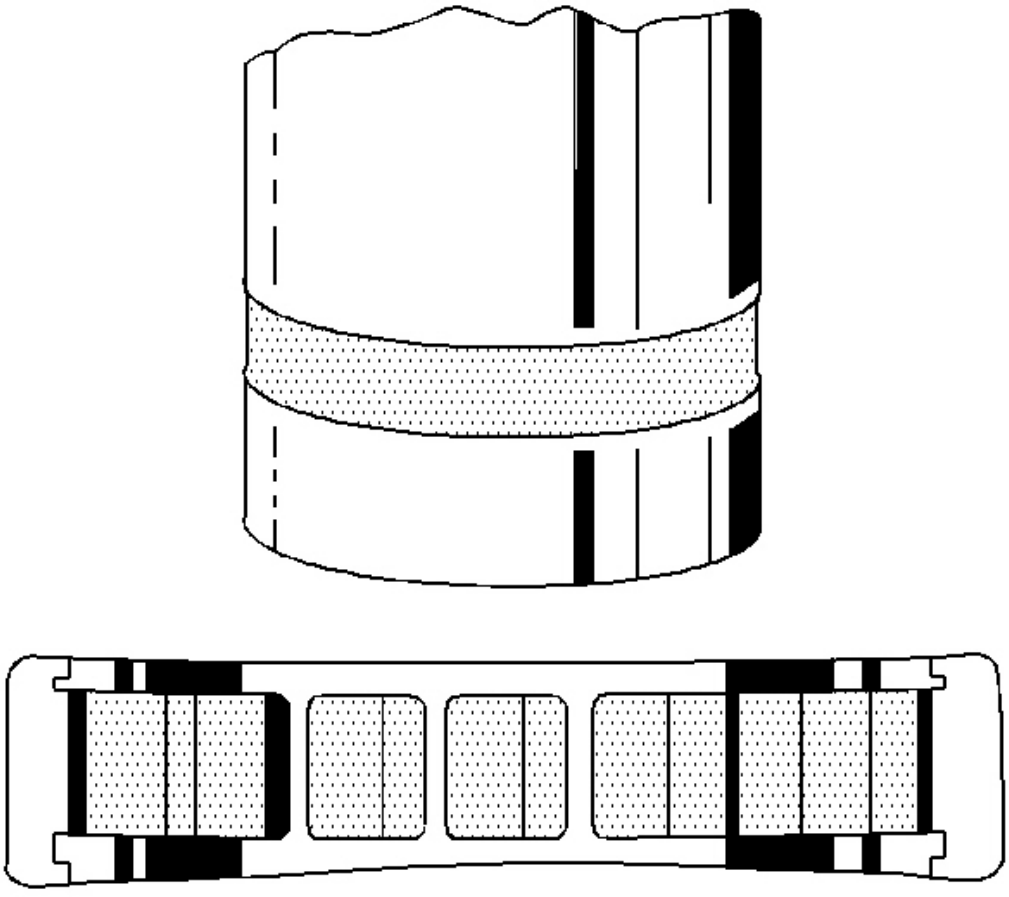


Fig. 18: Major Wear
Courtesy of GENERAL MOTORS CORP.

Heavy pattern on races and rollers can be caused by fine abrasives. Clean all of the parts including the housing. Check the seals. Replace the bearings if rough or noisy. Replace the shaft if damaged.

Brinelling

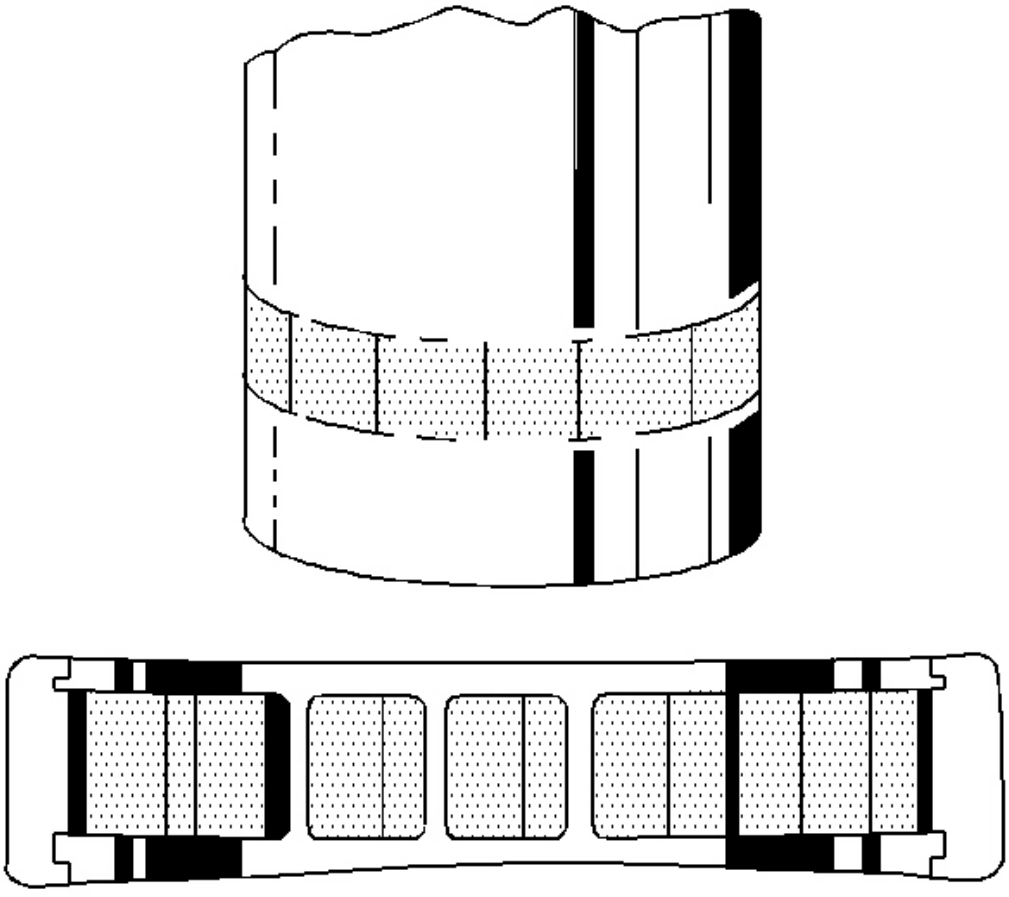


Fig. 19: Brinelling
Courtesy of GENERAL MOTORS CORP.

Surface indentations in the raceway can be caused by roll either under impact loading or vibration while the bearing is not rotating. Replace the bearing if rough or noisy. Replace the shaft if damaged.

Indentations

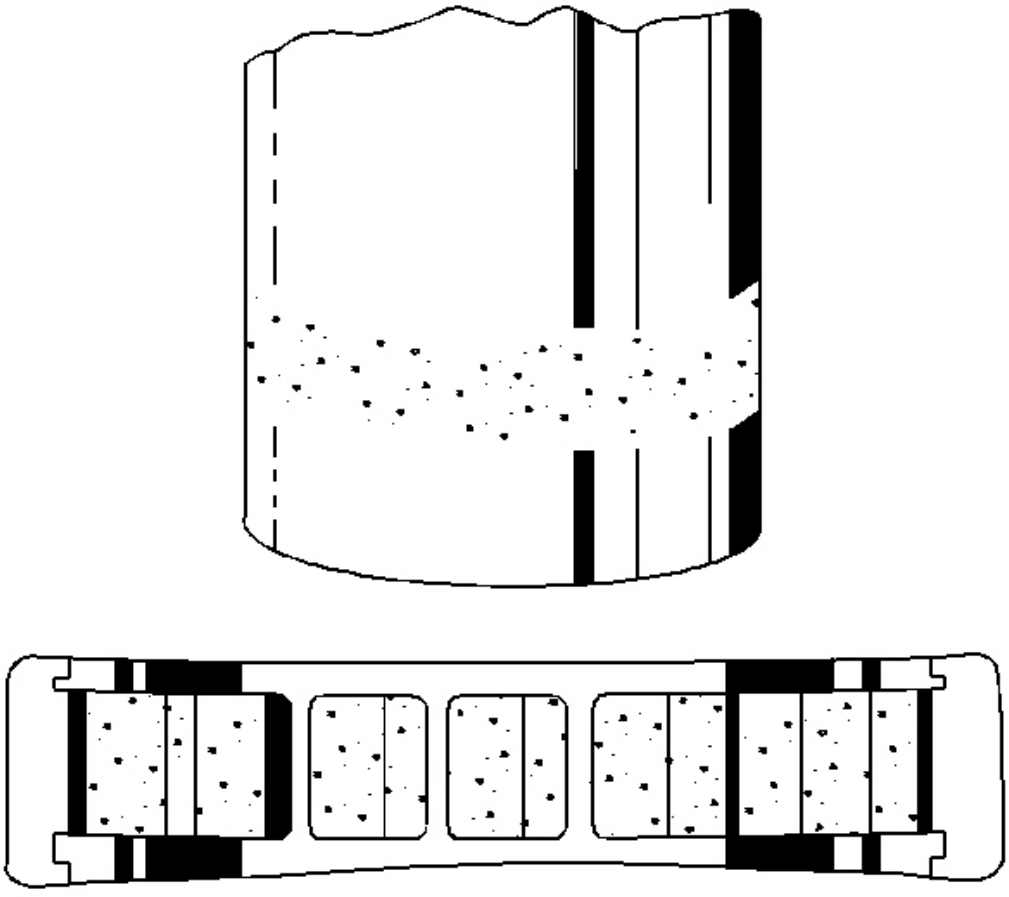


Fig. 20: Indentations
Courtesy of GENERAL MOTORS CORP.

Surface depressions on race and rollers can be caused by hard particles of foreign material. Clean all of the parts, including the housing. Check the seals. Replace the bearings if rough or noisy. Replace the shaft if damaged.

Single Edge Pitting

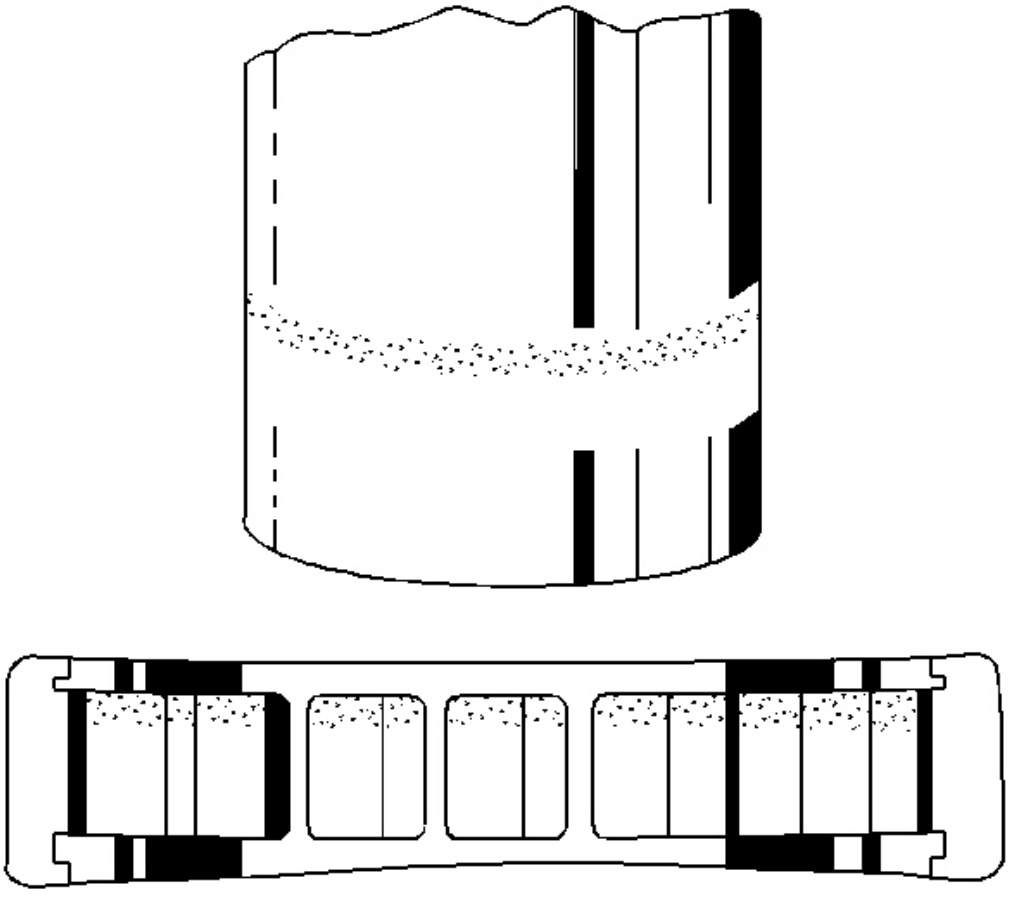


Fig. 21: Single Edge Pitting
Courtesy of GENERAL MOTORS CORP.

Flaking of surface metal results from fatigue, usually at one edge of race and rollers. Replace the bearing. Clean all related parts. Replace the shaft if damaged.

Double Edge Pitting

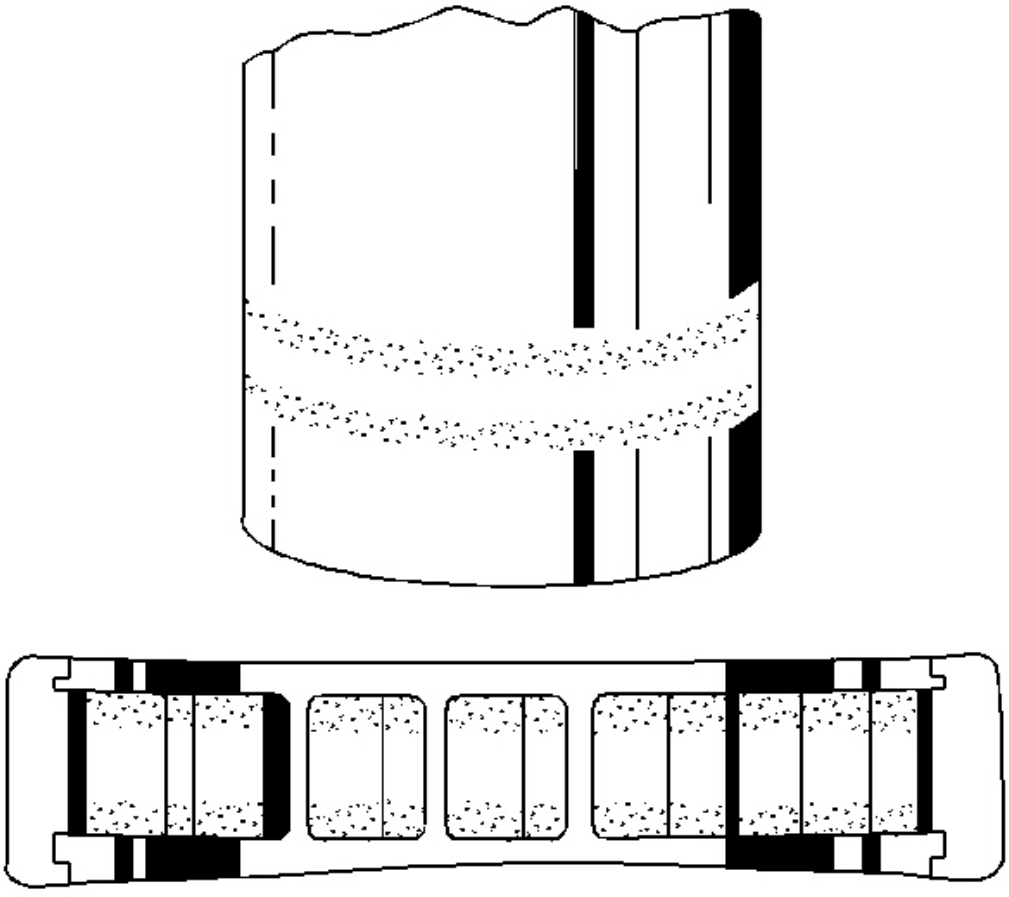


Fig. 22: Double Edge Pitting
Courtesy of GENERAL MOTORS CORP.

Flaking of surface metal results from fatigue, usually at both edges of the race and rollers. Replace the bearing. Clean all related parts. Replace the shaft if damaged.

Misalignment

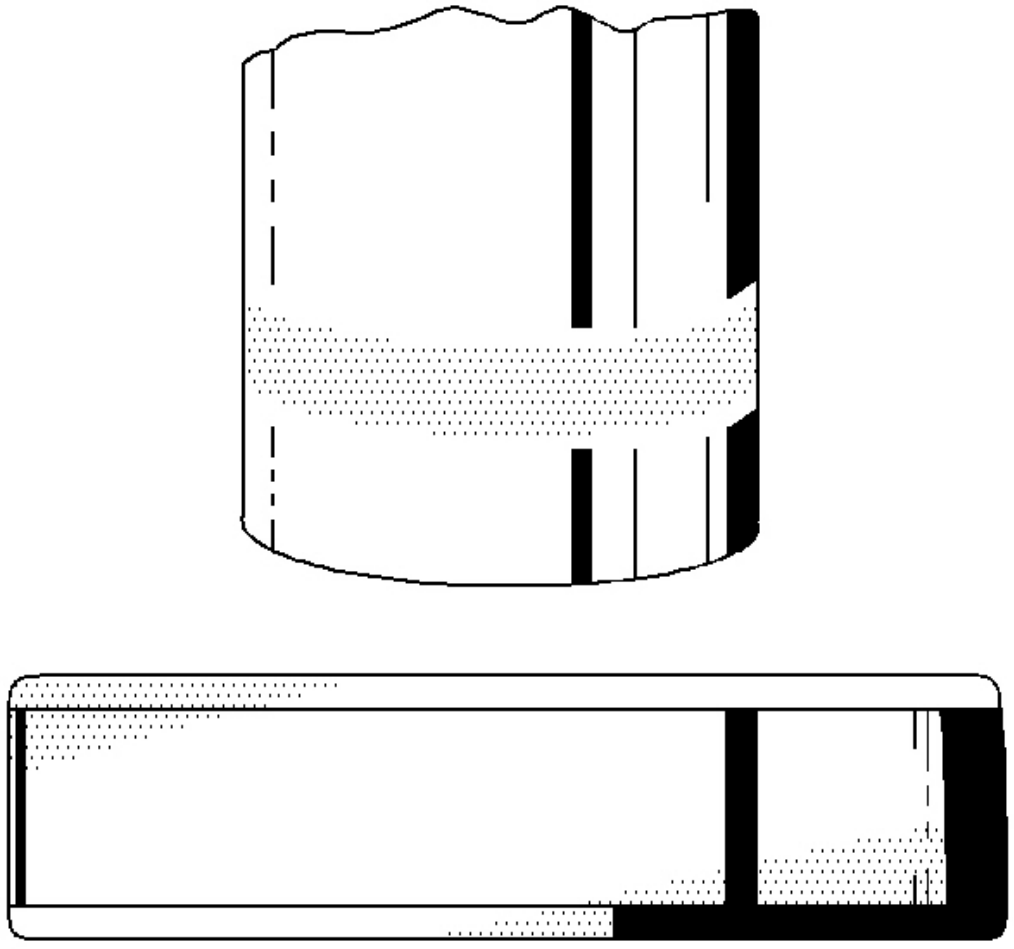


Fig. 23: Misalignment
Courtesy of GENERAL MOTORS CORP.

Outer misalignment due to a foreign object. Replace the bearing. Ensure races are properly seated. Replace the shaft if the bearing operating surface is damaged.

Frettage

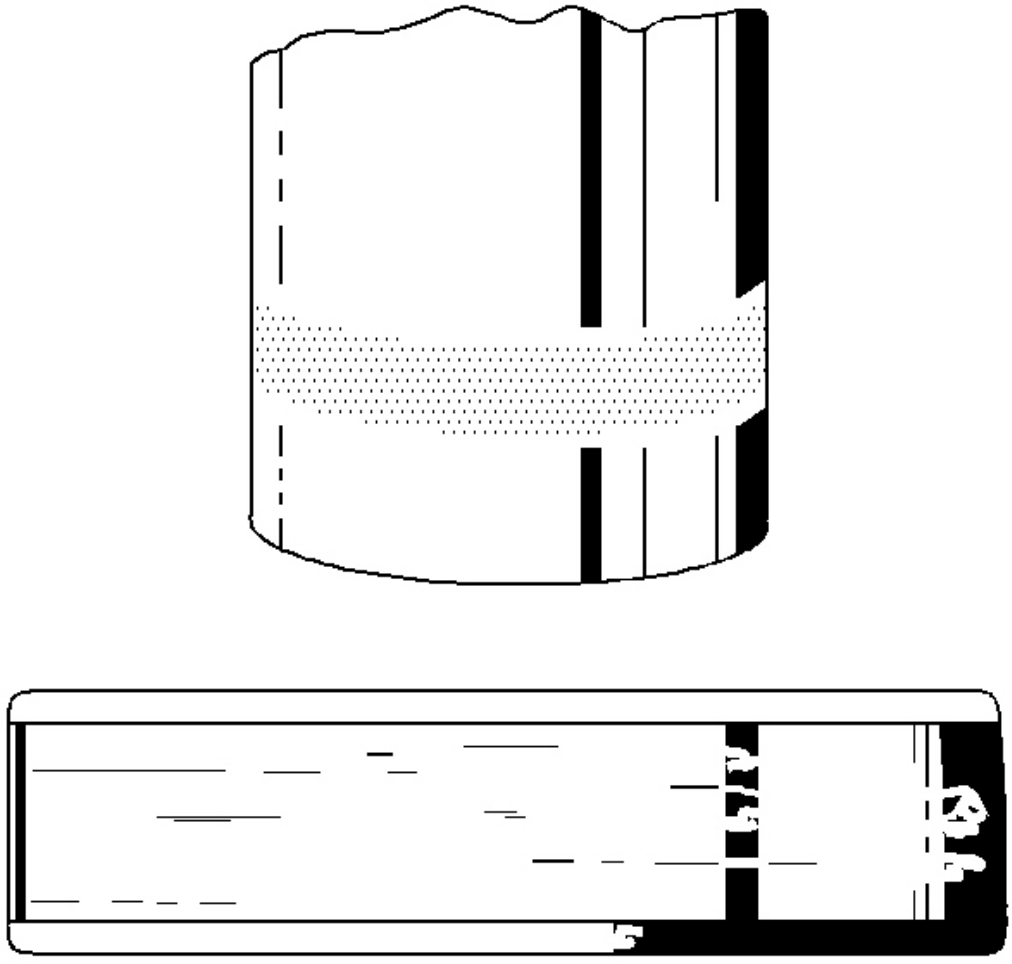


Fig. 24: Frettage
Courtesy of GENERAL MOTORS CORP.

Corrosion set up by a small relative movement of parts with no lubrication. Replace the bearing. Clean all the relative parts. Check the seals. Check for proper fit and lubrication. Replace the shaft if damaged.

Smears

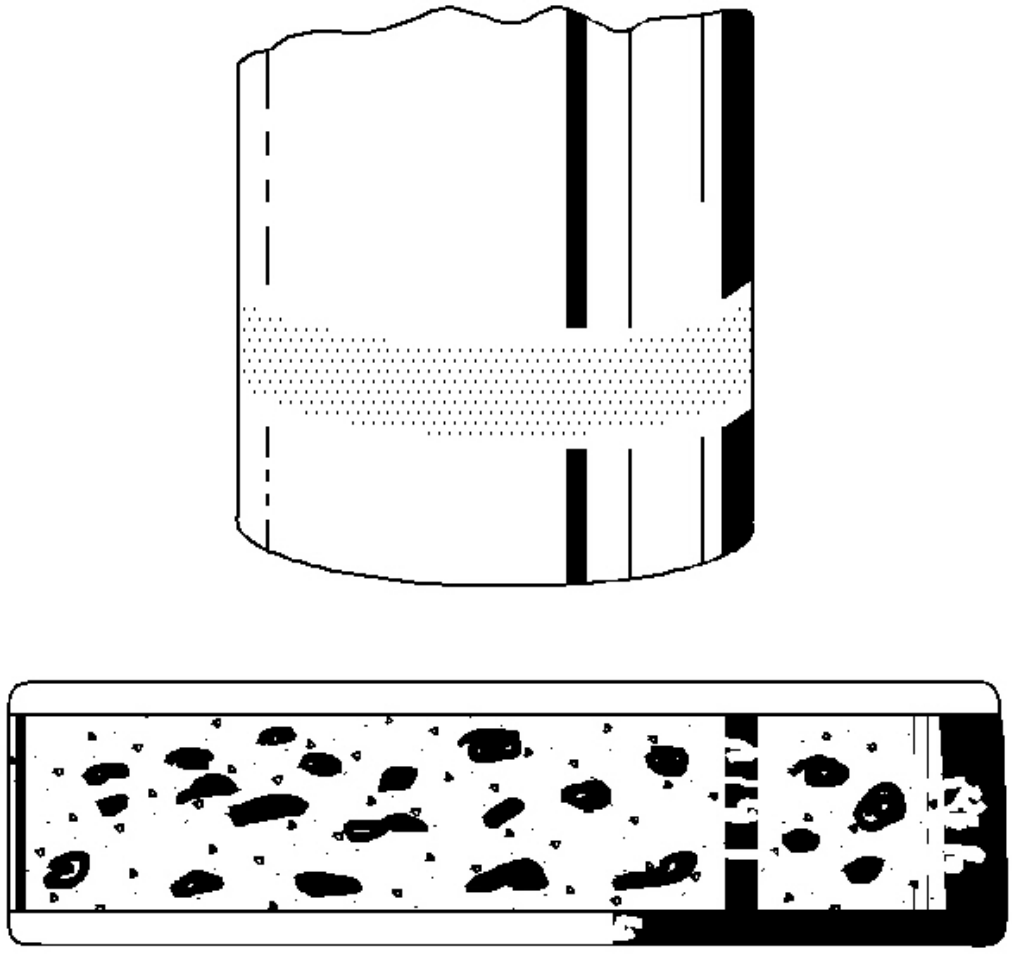


Fig. 25: Smears
Courtesy of GENERAL MOTORS CORP.

Smearing of metal due to slippage. Slippage can be caused by poor fits, lack of lubrication, overheating, overloads or handling damage. Replace the bearing. Clean all the related parts. Check for proper fit and lubrication.

REAR AXLE LUBRICANT LEAK DIAGNOSIS

Rear axle lubricant leaks can occur at the following locations:

- Axle tube to differential carrier housing joint
- Axle shaft oil seal

- Axle housing porosity
- Differential housing cover gasket
- Drain plug
- Fill plug
- Pinion yoke oil seal
- Vent tube

Determining the Cause

While most rear axle leaks may be easy to find, determining the cause may not be. A thorough inspection of the area around the leak may assist in determining the cause of the leak.

Oil Seals

Lubricant leaks from a oil seal may be caused by any of the following:

- An improperly installed seal
- A distorted seal
- A worn seal
- A worn shaft
- A brittle seal lip
- A hardened seal lip

To determine the actual cause of the leak, clean the area around the leak. Observe the area of the leak and determine the if the seal or another component is causing the leak. A worn seal surface will cause a leak at the sealing lip while a misaligned seal or a seal installed into a housing with an excessive bore will cause the seal to leak at the outside surface of the seal. Hardened or cracked seal lips usually indicate the axle is operating beyond the normal temperature limits for the axle. A seal whose sealing surface has been nicked or cut may indicate that the shaft has a rough, burred, or gouged surface and will need to be inspected before the seal can be replaced.

Gaskets

A leak at a gasket is usually caused by a poor fit of the components on each side of the gasket surface. Inspect each component for distortion and for nicks or gouges that may prohibit the gasket from sealing properly.

Rear Axle Housing

Rear axle housing lubricant leaks usually occur at the following locations:

- Drain Plug
- Fill Plug

Drain and fill plug leaks are usually caused by a loose plug. These leaks can by repaired by either tightening the

plug or by using an approved sealer on the threads on the plug.

Other leaks such as axle tube to differential carrier housing or porosity leaks require the replacement of the rear axle housing.

REPAIR INSTRUCTIONS

LUBRICANT LEVEL INSPECTION - REAR DRIVE AXLE

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Make sure the vehicle is level.
3. Inspect the rear axle for leaks. Repair as necessary.
4. Clean the area around the rear axle fill plug.

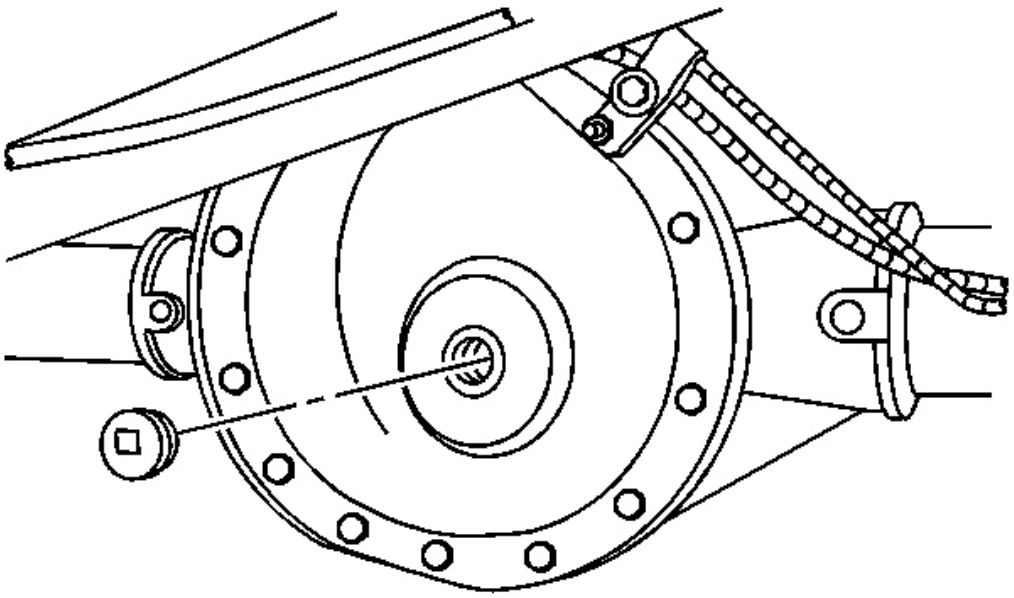


Fig. 26: Rear Drive Axle Fill Plug
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear axle fill plug.
6. Inspect the lubricant level.

Specification: The lubricant level should be between 0-10 mm (0-0.4 in) below the fill plug opening.

7. If the level is low, add lubricant until the level is even with the bottom edge of the fill plug opening. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

NOTE: Refer to Fastener Notice in Cautions and Notices.

8. Install the rear axle fill plug.

   Tighten: Tighten the rear axle fill plug to 33 N.m (24 lb ft).

9. Lower the vehicle.

LUBRICANT REPLACEMENT - REAR DRIVE AXLE

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

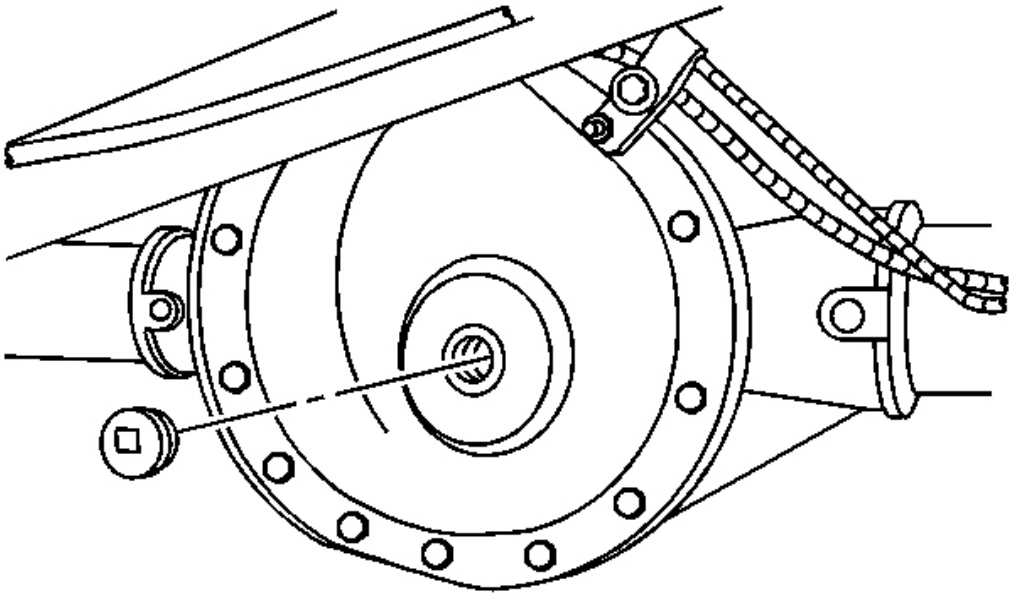


Fig. 27: Rear Drive Axle Fill Plug
Courtesy of GENERAL MOTORS CORP.

2. Remove the rear axle fill plug.

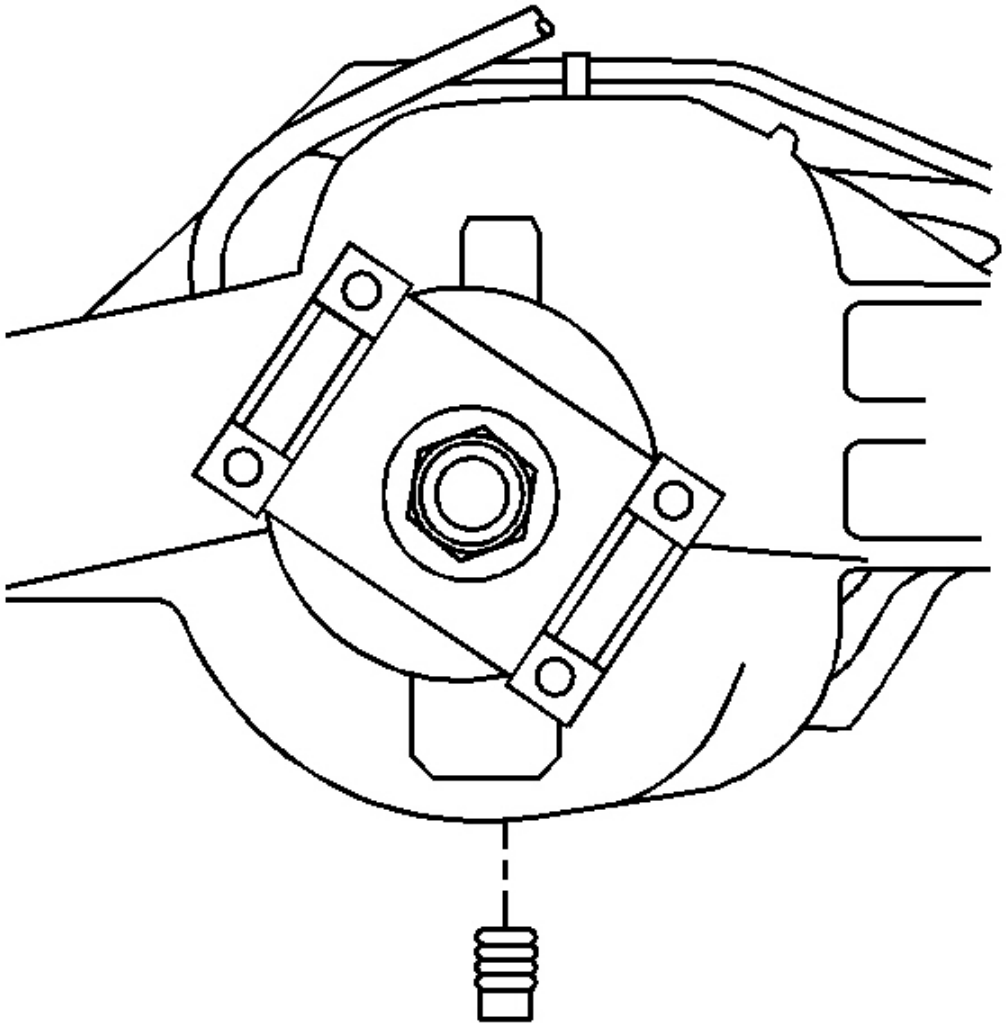


Fig. 28: Rear Drive Axle Drain Plug
Courtesy of GENERAL MOTORS CORP.

3. Remove the rear axle drain plug.
4. Drain the lubricant into a suitable container.
5. Inspect the drain plug for excessive metal particle accumulation. This accumulation is symptomatic of extreme wear.
6. Clean the drain plug.

Installation Procedure

NOTE: **Refer to Fastener Notice in Cautions and Notices.**

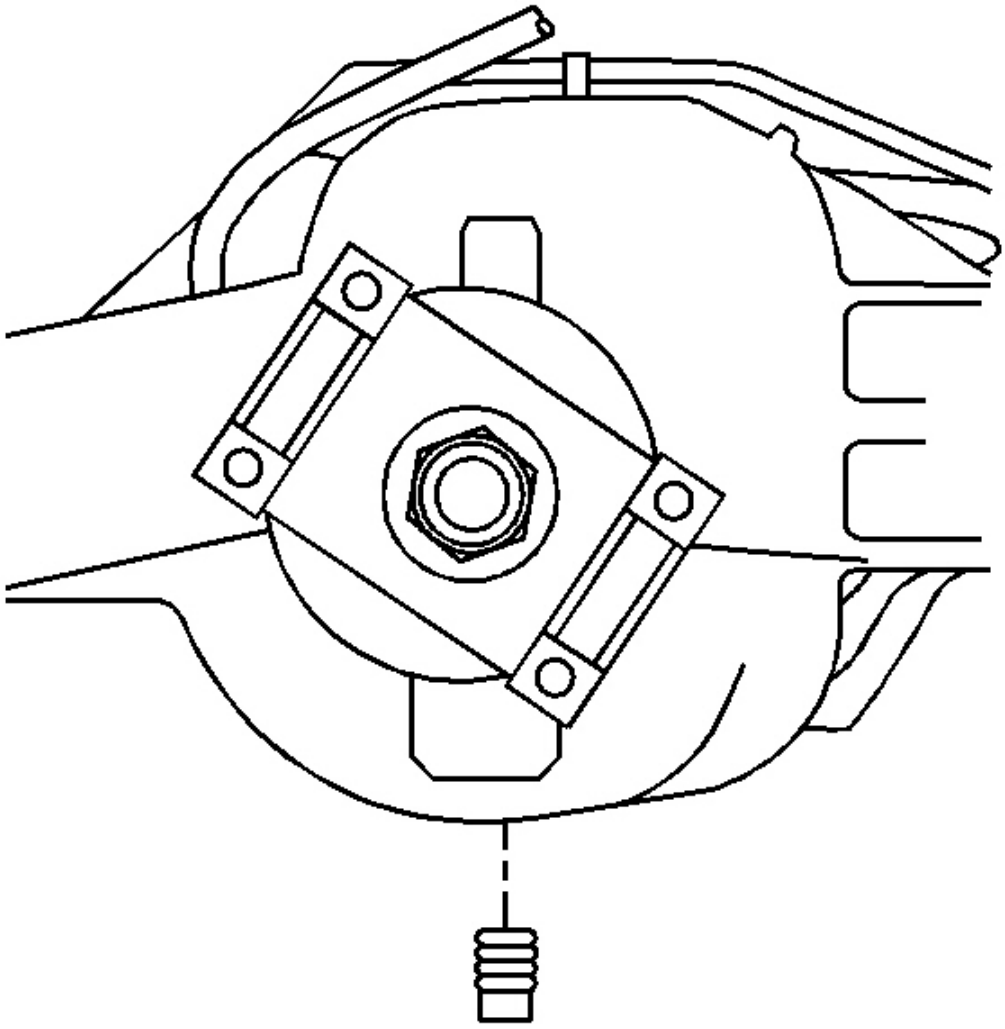


Fig. 29: Rear Drive Axle Drain Plug
Courtesy of GENERAL MOTORS CORP.

1. Install the rear axle drain plug.

   Tighten: Tighten the rear axle drain plug to 33 N.m (24 lb ft).

2. Fill the rear axle. Use the proper fluid. Refer to **Capacities - Approximate Fluid** and **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

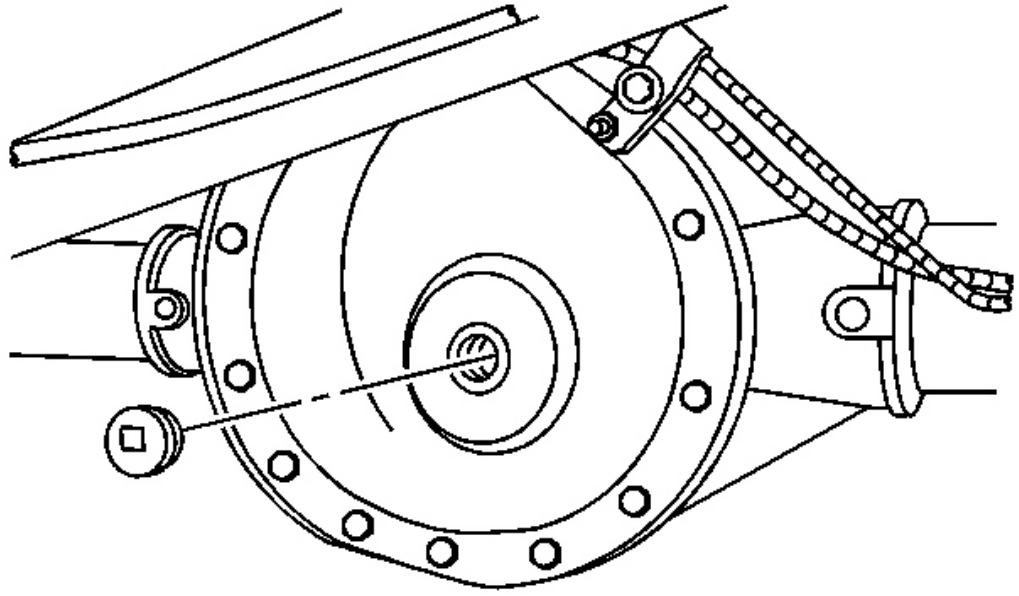


Fig. 30: Rear Drive Axle Fill Plug
Courtesy of GENERAL MOTORS CORP.

3. Install the rear axle fill plug.

   Tighten: Tighten the rear axle fill plug to 33 N.m (24 lb ft).

4. Lower the vehicle.

VENT HOSE REPLACEMENT

Removal Procedure

IMPORTANT: Make note of the routing in order to aid in reassembly.

1. Raise and support the vehicle.

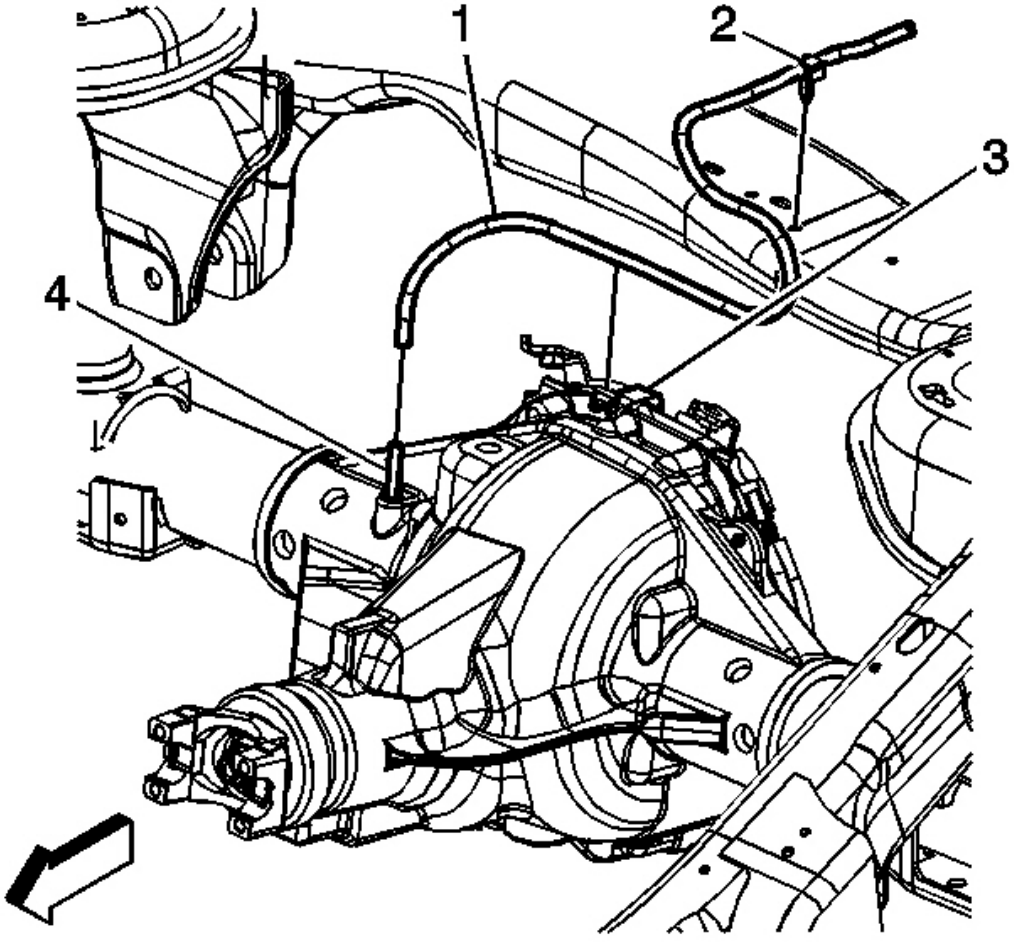


Fig. 31: Rear Axle Vent Hose & Vent Tube
Courtesy of GENERAL MOTORS CORP.

2. Remove the vent hose (1) from the clip at the top of the rear axle (3).
3. Remove the vent hose (1) from the vent tube (4).

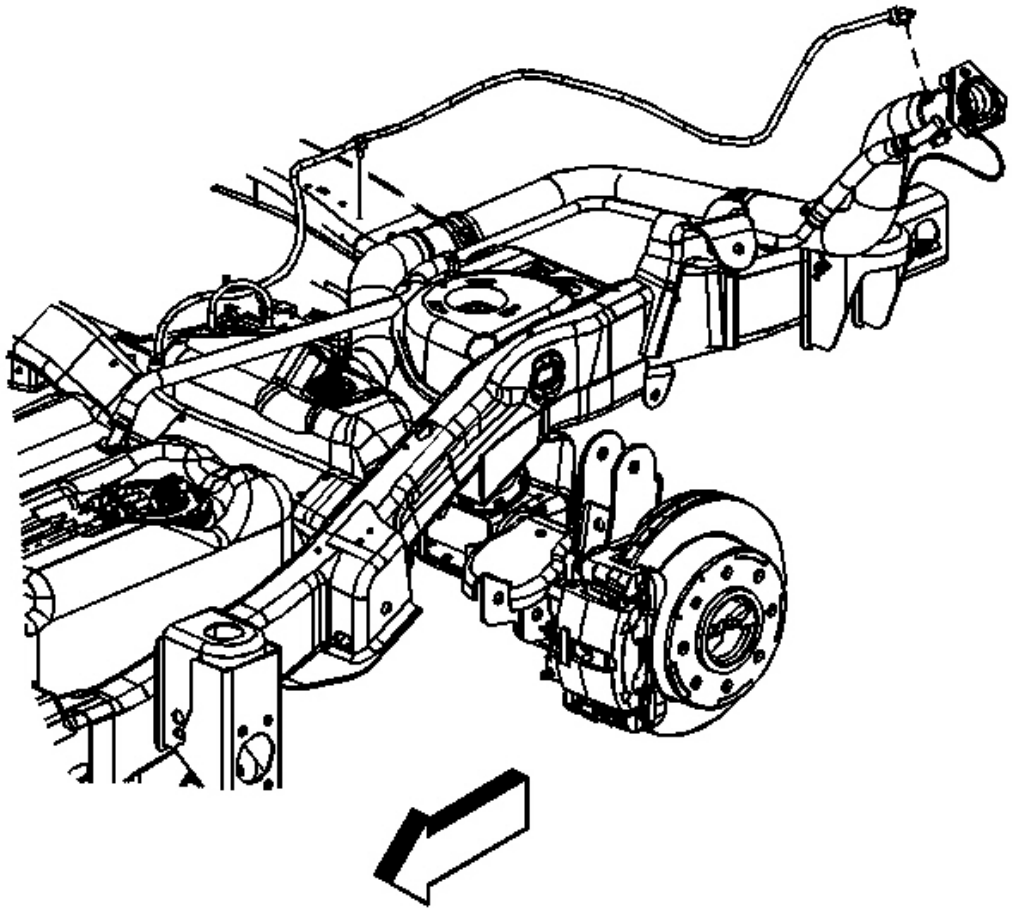


Fig. 32: Rear Axle Vent Hose Clip
Courtesy of GENERAL MOTORS CORP.

4. Remove the vent hose clip from the frame.

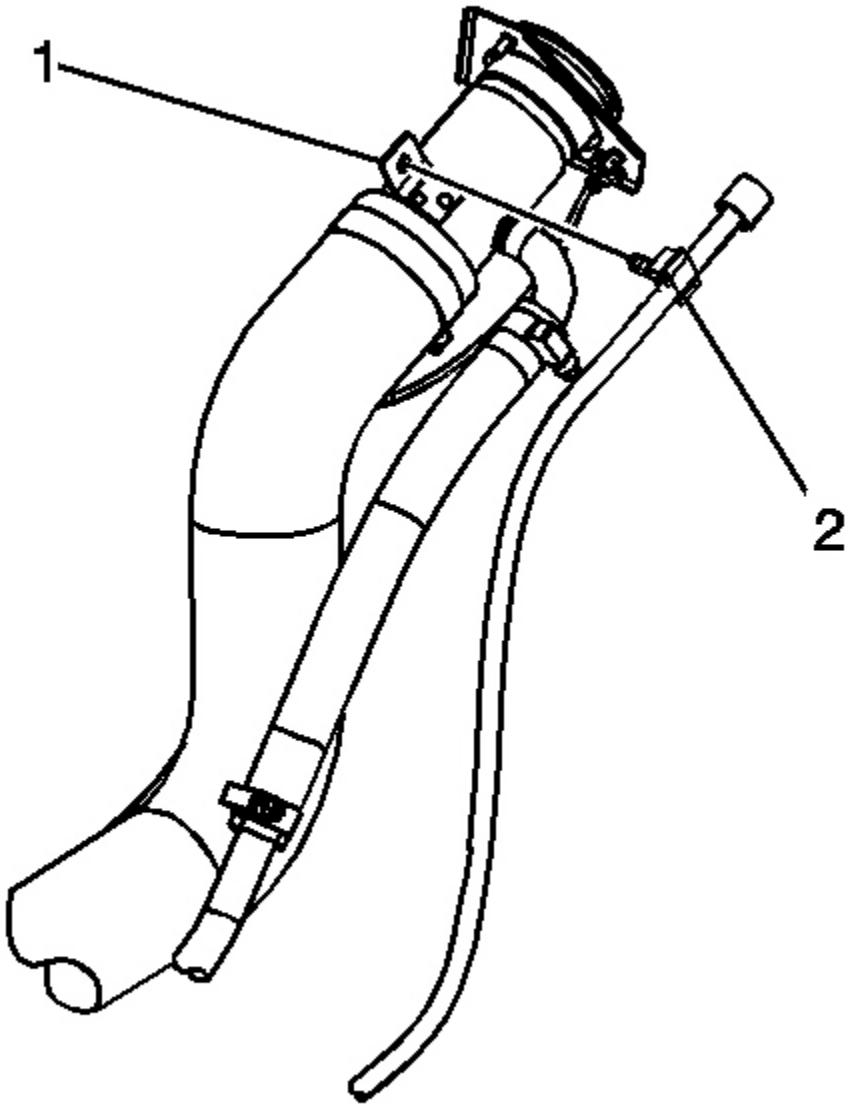


Fig. 33: Rear Axle Vent Hose
Courtesy of GENERAL MOTORS CORP.

5. Remove the vent hose clip (2) from the tab on the filler neck (1).
6. Remove the vent hose from the vehicle.

Installation Procedure

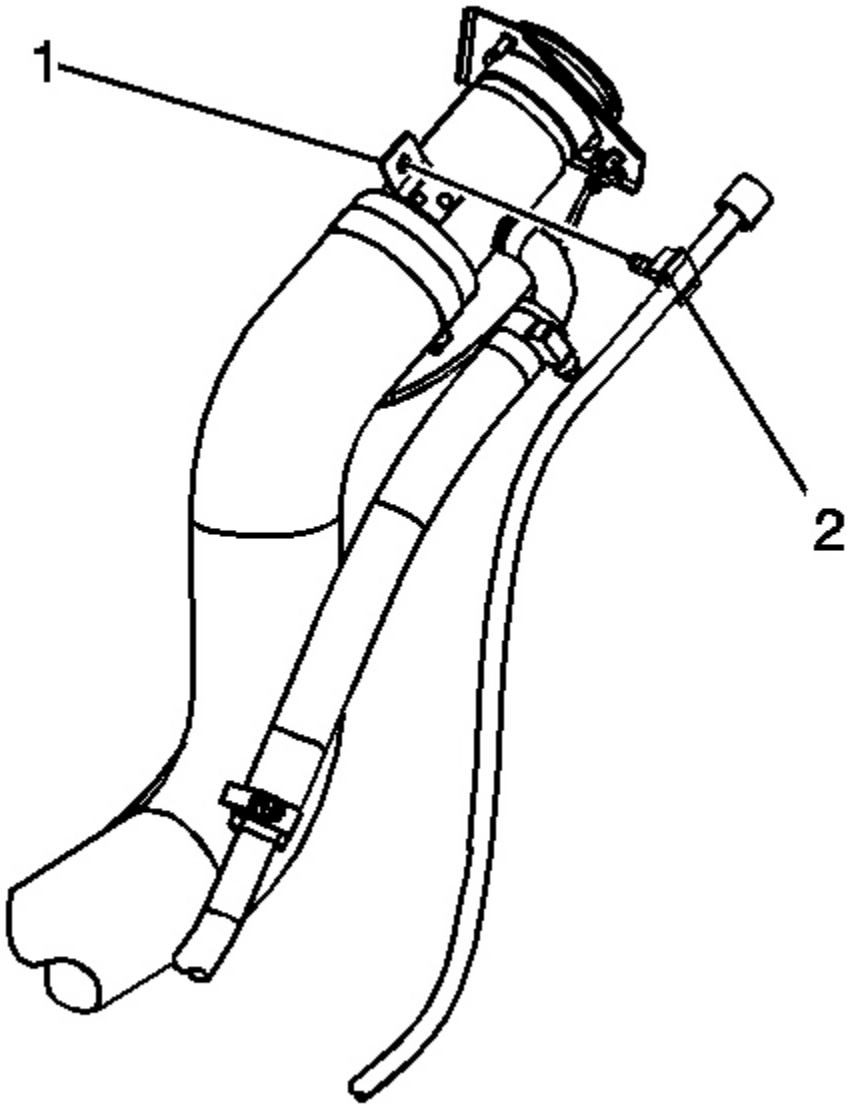


Fig. 34: Rear Axle Vent Hose
Courtesy of GENERAL MOTORS CORP.

1. Install the vent hose to the vehicle.
    - Route the same way as when removed.
    - Ensure that the hose is free of kinks and is routed clear of sharp objects.
    - Ensure that the vent is not plugged.

2. Install the vent hose clip (2) to the tab on the filler neck (1).

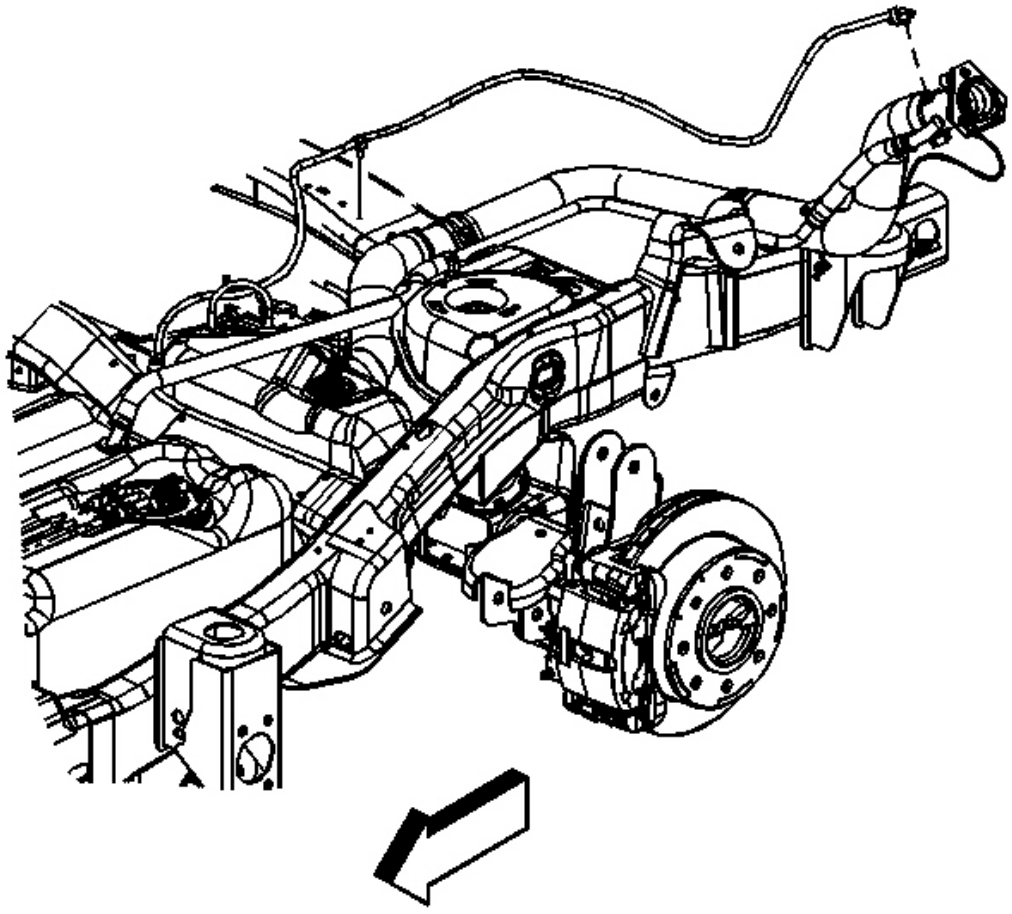


Fig. 35: Rear Axle Vent Hose Clip
Courtesy of GENERAL MOTORS CORP.

3. Install the vent hose clip to the frame.

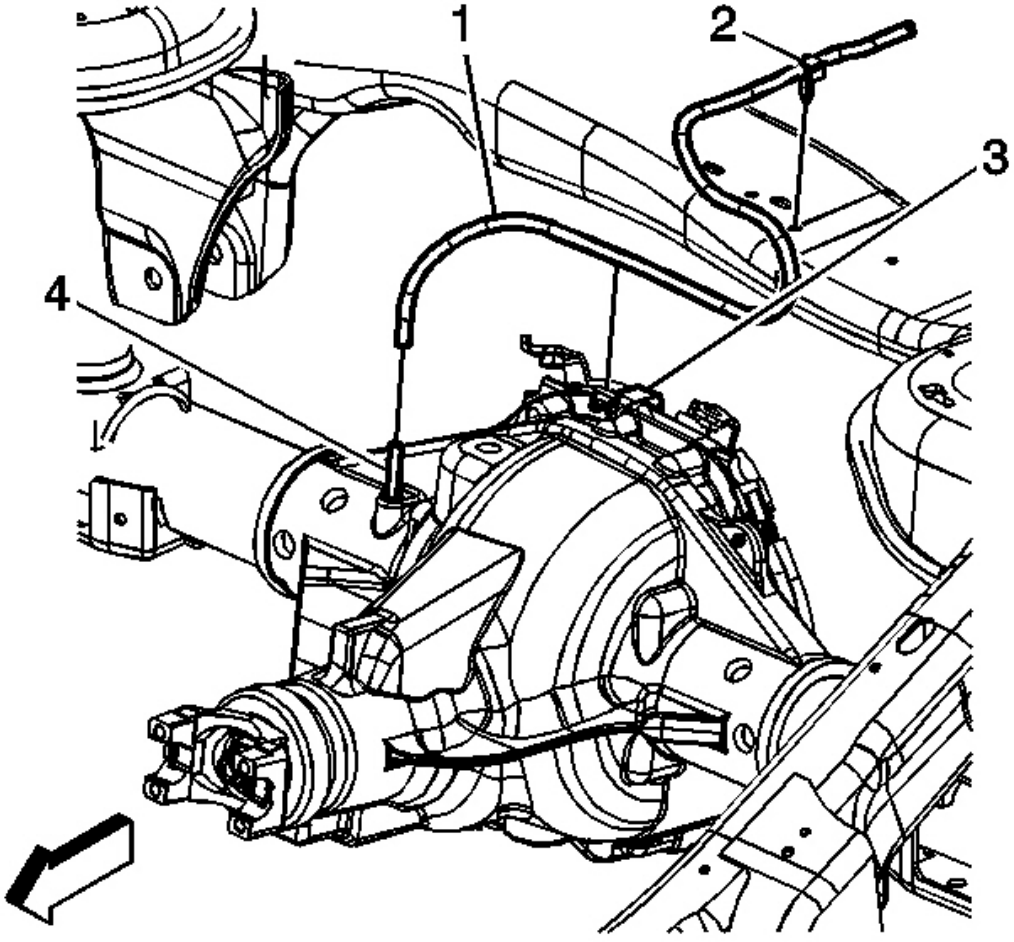


Fig. 36: Rear Axle Vent Hose & Vent Tube
Courtesy of GENERAL MOTORS CORP.

4. Install the vent hose (1) to the vent tube (4).
5. Install the vent hose (1) to the clip at the top of the rear axle (3).
6. Remove the supports and lower the vehicle.

REAR AXLE HOUSING COVER AND GASKET REPLACEMENT

Removal Procedure

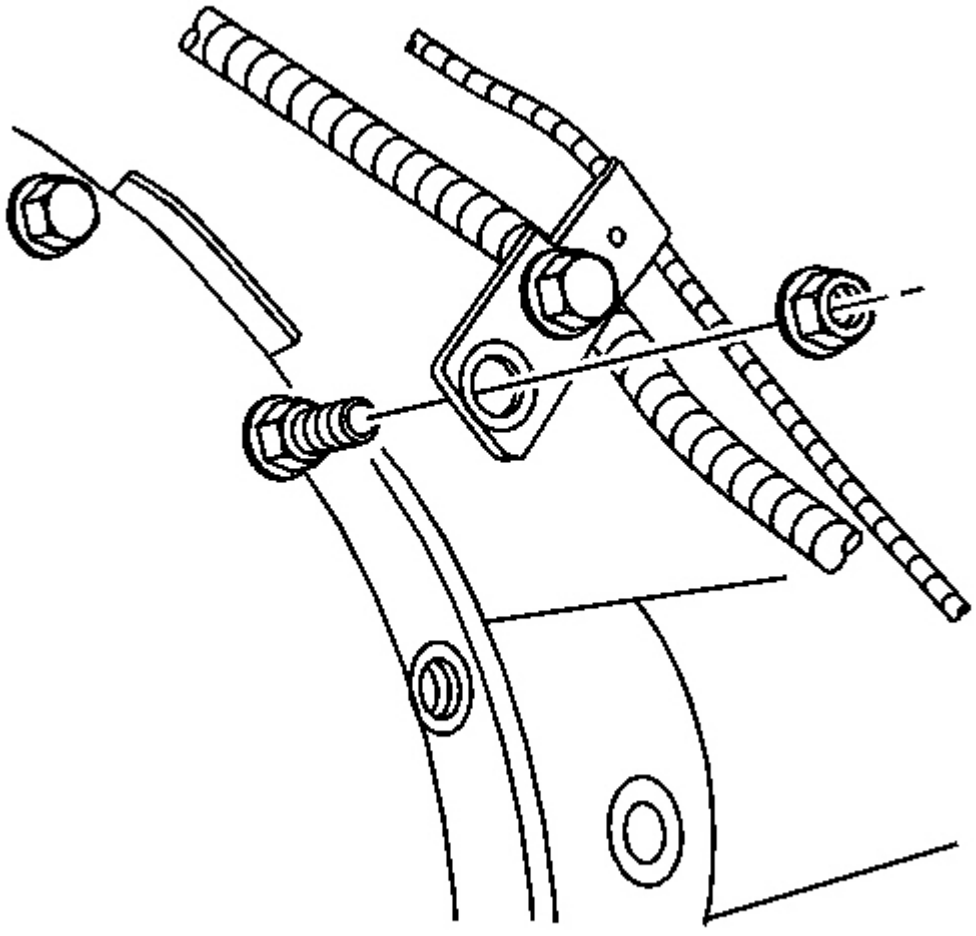


Fig. 37: Brake Pipe/Harness Bracket & Nut
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Drain the rear axle. Refer to **Lubricant Replacement - Rear Drive Axle** .
3. Remove the nut and brake pipe/harness bracket from the stud.

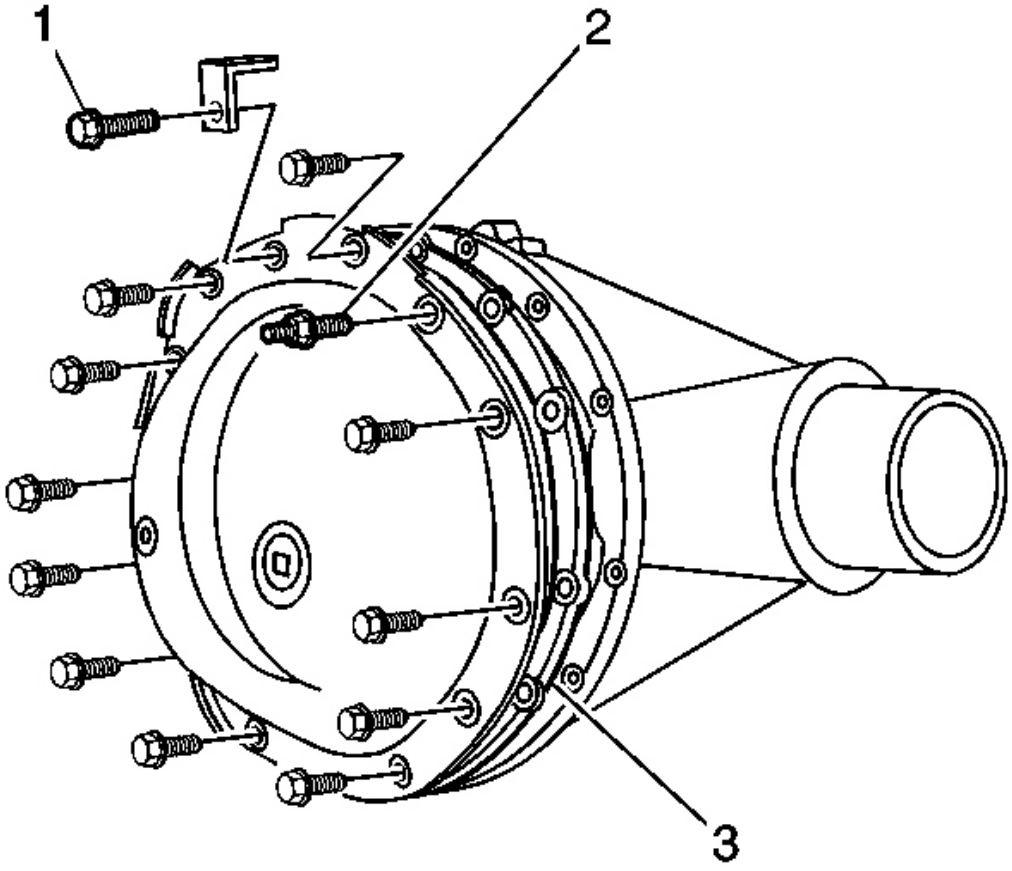


Fig. 38: Rear Axle Housing Cover & Gasket
Courtesy of GENERAL MOTORS CORP.

4. Note the location of the jounce hose bracket bolt (1) and the brake pipe/harness bracket stud (2) before removal.
5. Remove the rear axle housing cover bolts (4).

   Discard the rear axle housing cover bolts.

6. Remove the rear axle housing cover and gasket (3) from the axle housing.
   1. Catch the oil in a drain pan.
   2. Remove any gasket material from the rear axle housing and/or the rear axle housing cover.

Installation Procedure

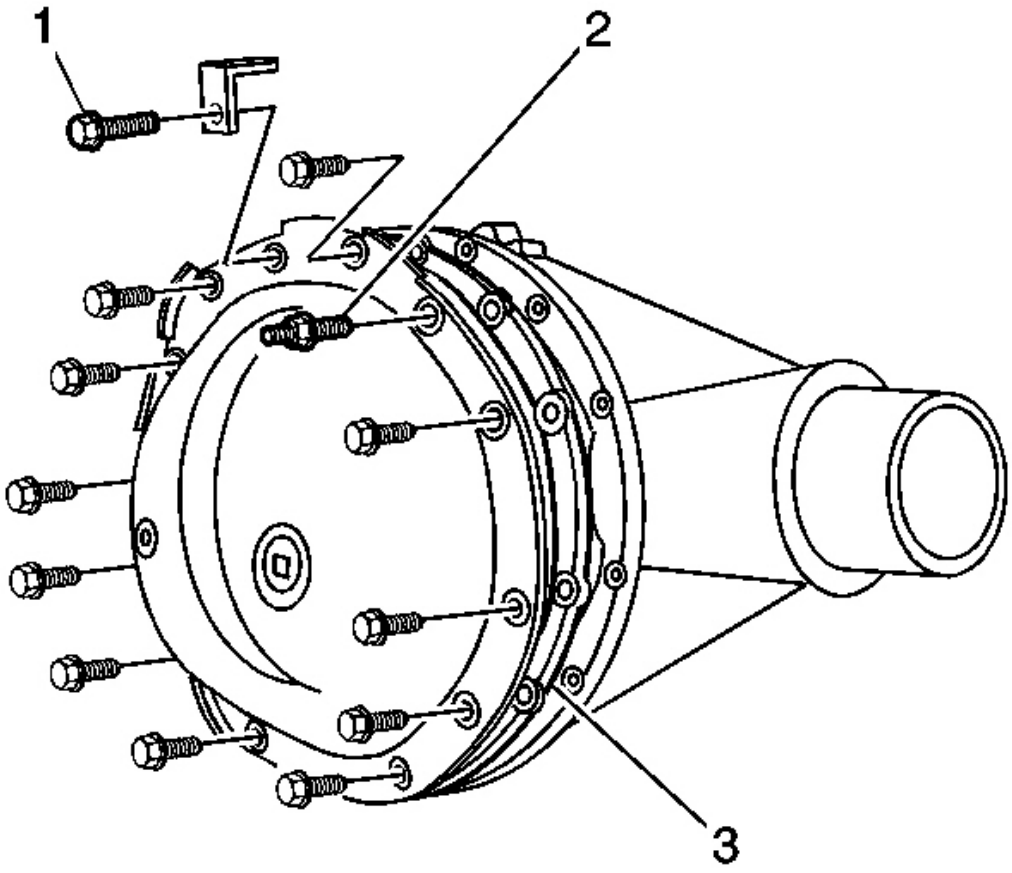


Fig. 39: Rear Axle Housing Cover & Gasket
Courtesy of GENERAL MOTORS CORP.

1. Install the gasket (3) and the rear axle housing cover.

IMPORTANT: Do not reuse the rear axle housing cover bolts.

2. Install the jounce hose bracket with a new bolt (1) and the new brake pipe/harness bracket stud (2) in their proper locations. Do not tighten.

NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Install the remaining new rear axle housing cover bolts.

Tighten: Tighten all the rear axle housing cover bolts in a crosswise pattern to 40 N.m (30 lb ft).

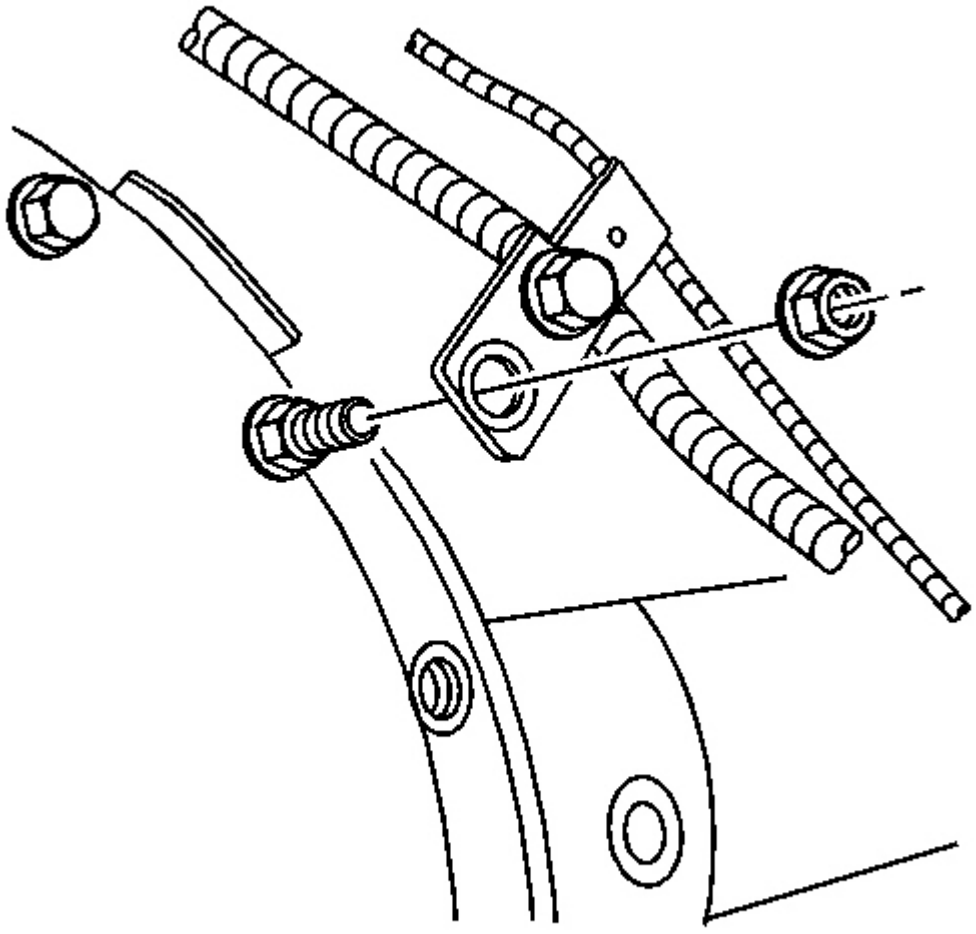


Fig. 40: Brake Pipe/Harness Bracket & Nut
Courtesy of GENERAL MOTORS CORP.

4. Install the brake pipe/harness bracket and nut to the stud.

   Tighten: Tighten the nut to 40 N.m (30 lb ft).

5. Fill the rear axle. Refer to **Lubricant Replacement - Rear Drive Axle** .
6. Lower the vehicle.

REAR AXLE SHAFT REPLACEMENT

Removal Procedure

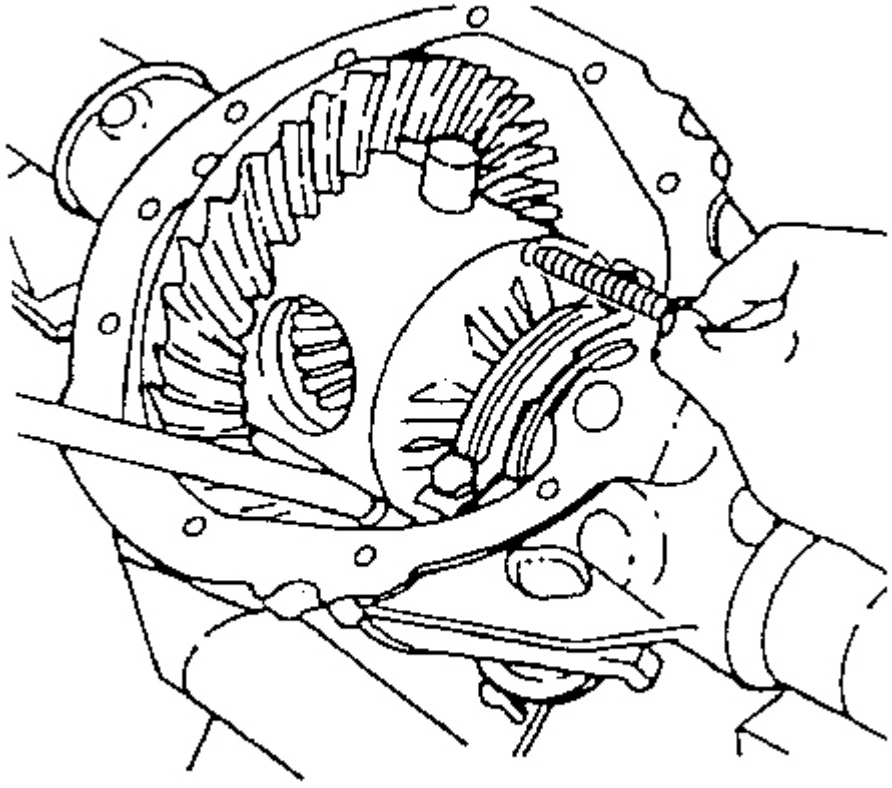


Fig. 41: Pinion Shaft Locking Bolt
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake rotor. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
4. Remove the rear cover and the gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
5. Remove the rear wheel speed sensor. Refer to **Wheel Speed Sensor Replacement - Rear** in Anti-lock Brake System.
6. Remove the pinion shaft lock bolt.

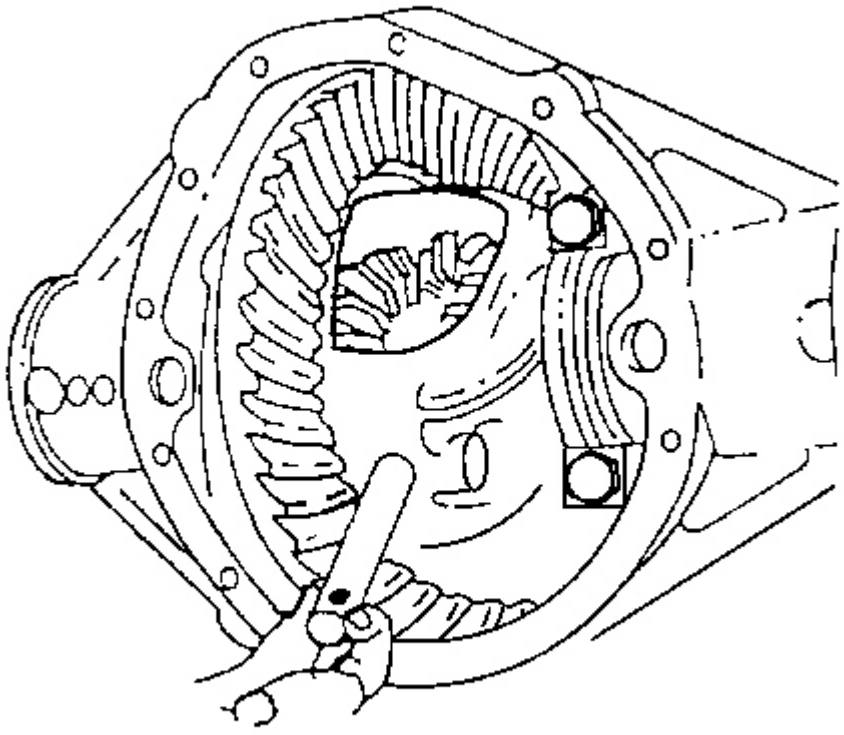


Fig. 42: Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

7. Remove the pinion shaft.

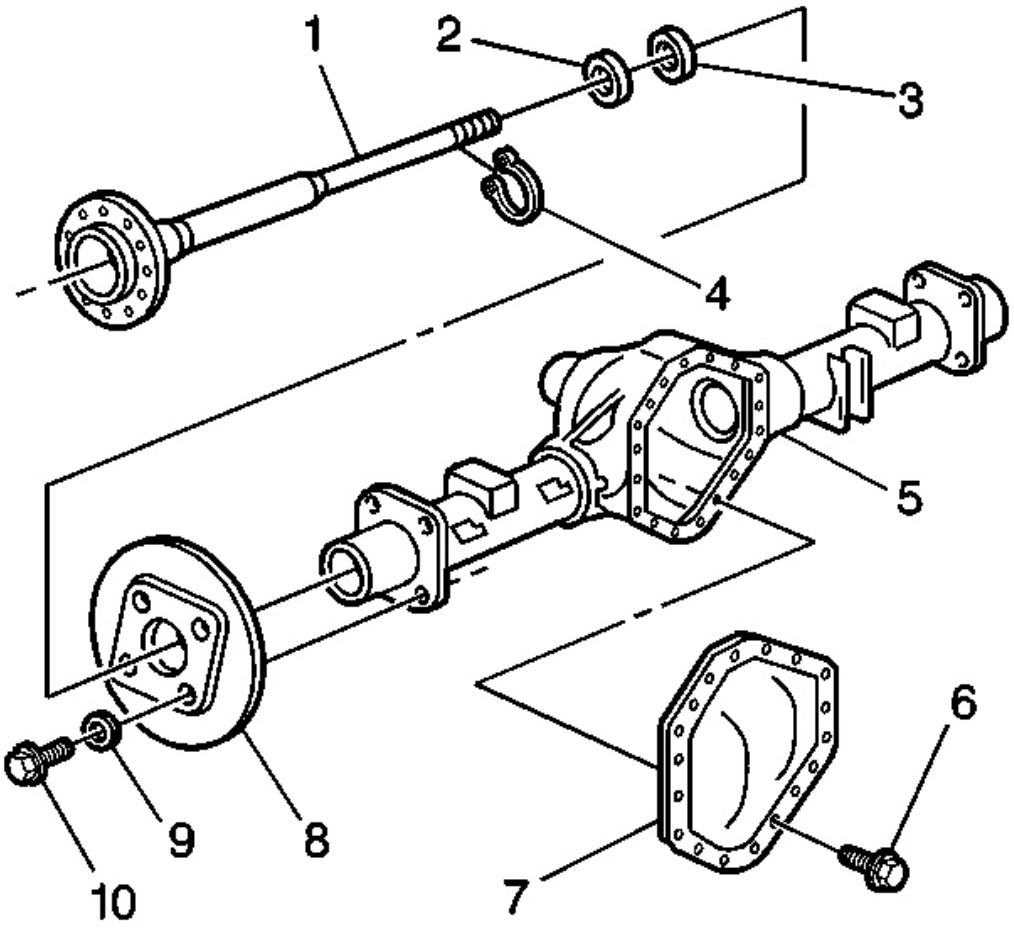


Fig. 43: Rear Axle Shaft Housing & Components
Courtesy of GENERAL MOTORS CORP.

8. Push the flange of the axle shaft (1) toward the differential.
9. Remove the C-lock (4) from the button end of the axle shaft (1).

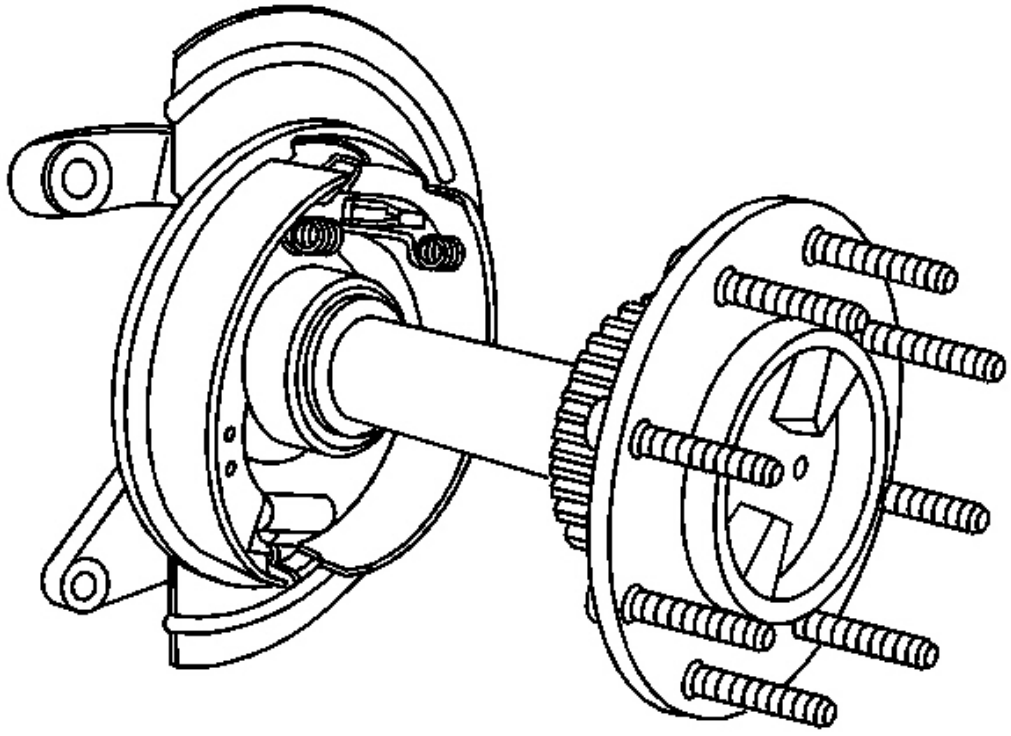


Fig. 44: Rear Axle Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: When removing the axle shaft, do not rotate the shaft. Rotating the shaft will misalign the gears. Misaligning the gears will make assembly difficult.

10. Remove the axle shaft from the housing.

Installation Procedure

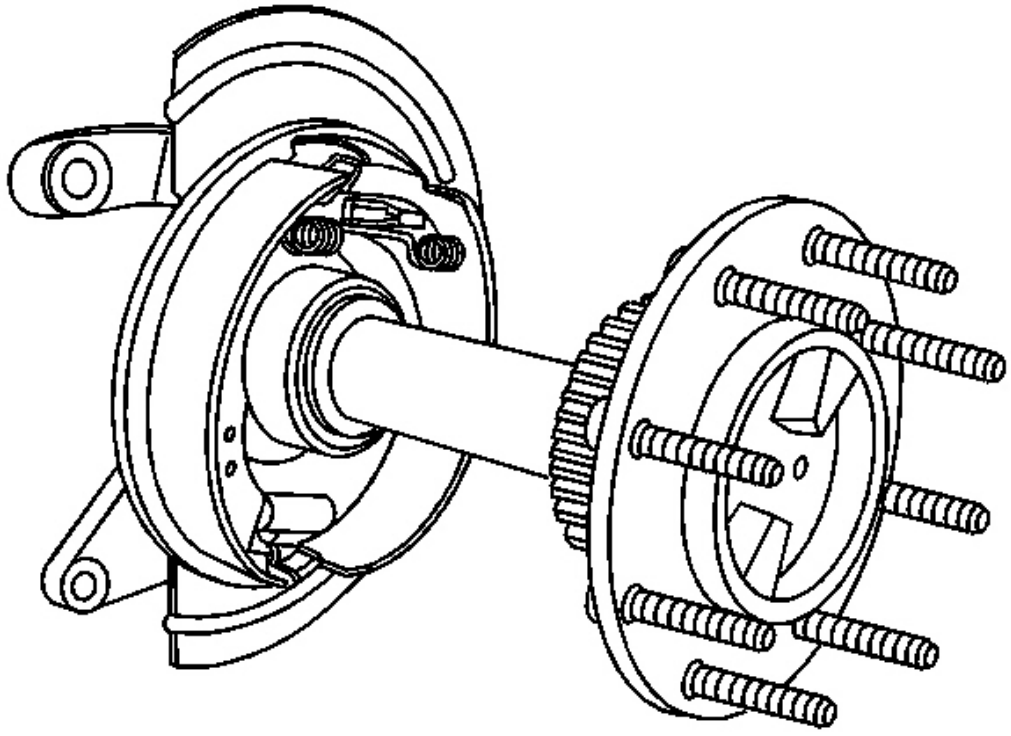


Fig. 45: Rear Axle Housing
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Carefully insert the axle shaft in order to not damage the seal.

1. Install the axle shaft into the rear axle housing.
2. Slide the axle shaft into place allowing the splines to engage the differential side gear.

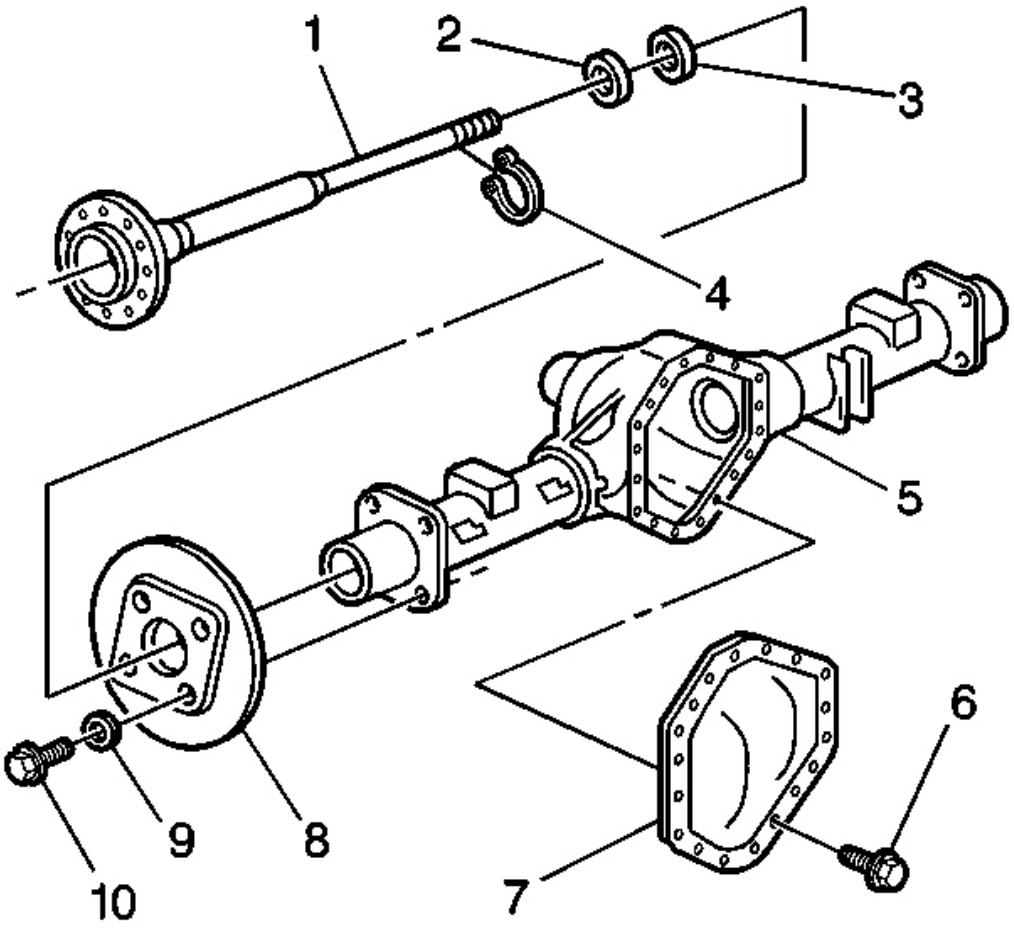


Fig. 46: Rear Axle Shaft Housing & Components
Courtesy of GENERAL MOTORS CORP.

3. Place the lock (4) on the button end of the axle shaft (1).
4. Pull the shaft flange outward in order to seat the lock in the differential gear.

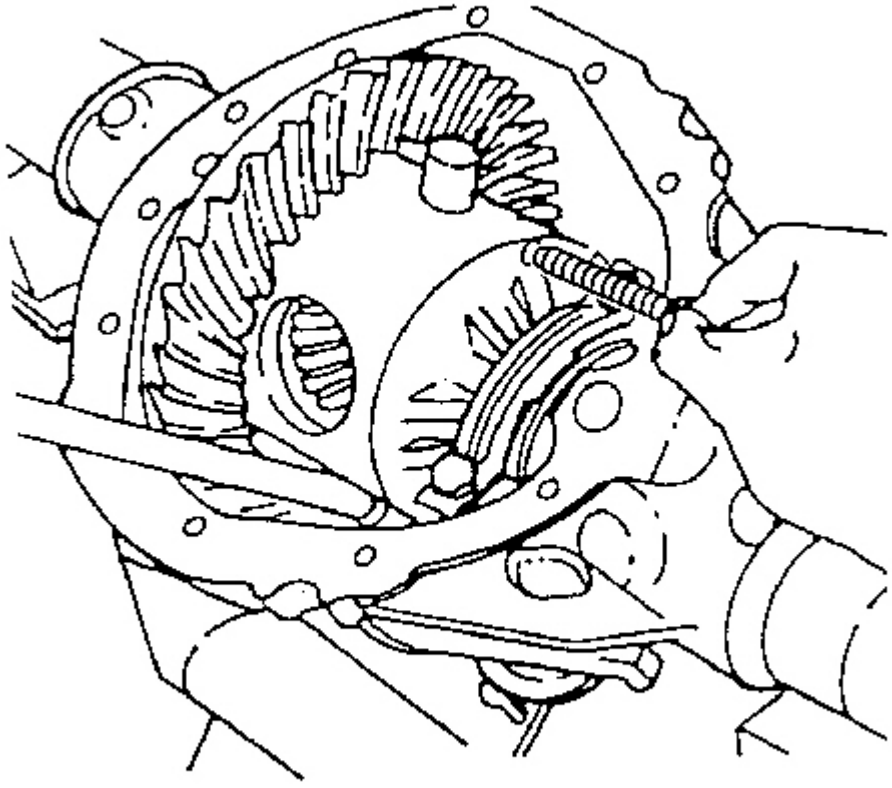


Fig. 47: Pinion Shaft Locking Bolt
Courtesy of GENERAL MOTORS CORP.

5. Align the hole in the pinion shaft with the bolt hole in the differential case.

NOTE: Refer to Fastener Notice in Cautions and Notices.

6. Install the new pinion shaft locking bolt.

Tighten: Tighten the pinion shaft locking bolt to 53 N.m (39 lb ft).

7. Install the rear cover and the gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
8. Install the rear wheel speed sensor. Refer to **Wheel Speed Sensor Replacement - Rear** in Anti-lock Brake System.
9. Install the brake rotor. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
10. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and

Wheels.

11. Fill the rear axle. Refer to **Lubricant Replacement - Rear Drive Axle** .
12. Lower the vehicle.

REAR AXLE SHAFT SEAL AND/OR BEARING REPLACEMENT

Tools Required

- **J 8092** Driver Handle
- **J 2619-01** Slide Hammer
- **J 29709** Wheel Bearing Installer (9.5 inch Axle)
- **J 29713** Axle Seal Installer (9.5 inch Axle)
- **J 44685** Rear Axle Seal and Bearing Remover. See **Special Tools and Equipment** .

Removal Procedure

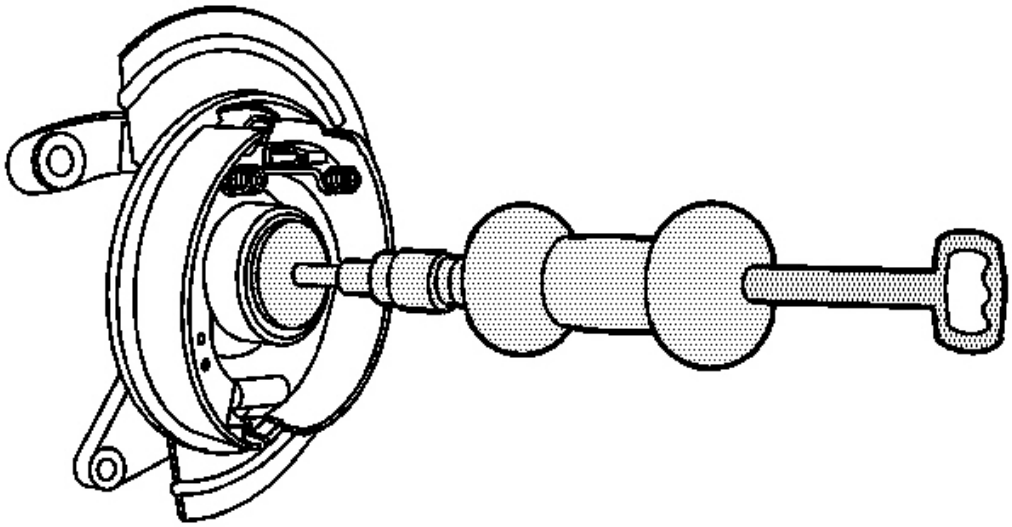


Fig. 48: Removing Axle Shaft Seal & Bearing From Axle Housing Using J 2619-01 & J 44685
Courtesy of GENERAL MOTORS CORP.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Drain the rear axle lubricant. Refer to **Lubricant Replacement - Rear Drive Axle** .

4. Remove the rear axle housing cover. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
5. Remove the axle shaft. Refer to **Rear Axle Shaft Replacement** .
6. Remove the axle shaft seal and the bearing from the axle housing using the **J 2619-01** and the **J 44685** . See **Special Tools and Equipment** .

Installation Procedure

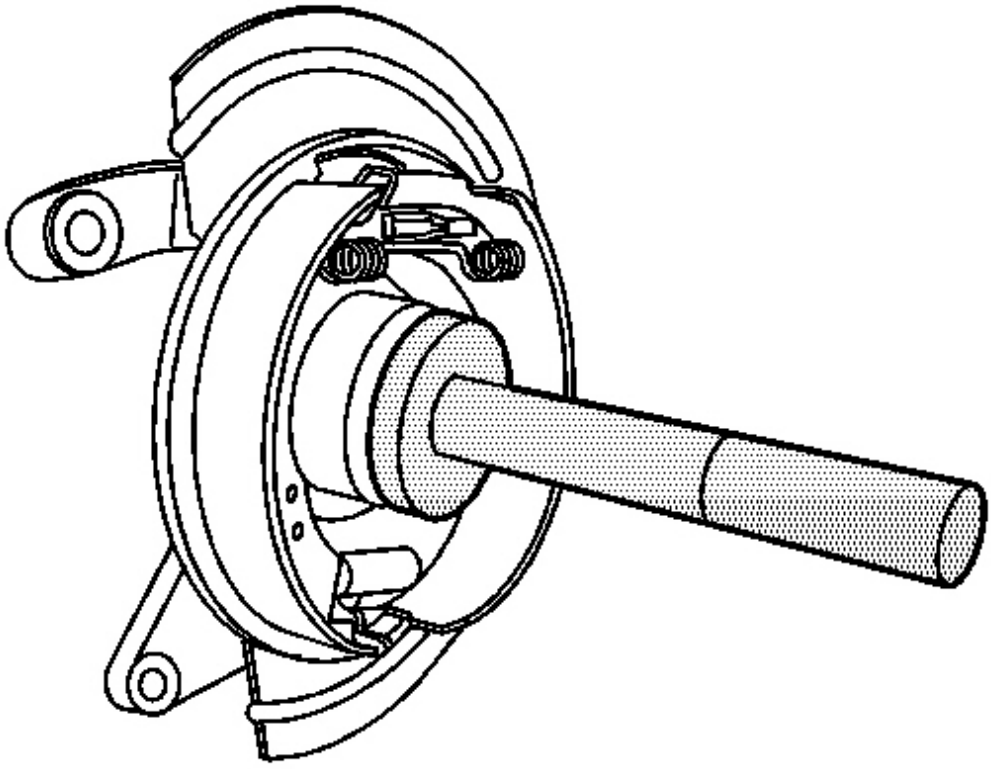


Fig. 49: Installing Axle Shaft Bearing Using J 29709 & J 8092
Courtesy of GENERAL MOTORS CORP.

1. Install the axle shaft bearing using the **J 29709** and the **J 8092** . See **Special Tools and Equipment** .
2. Drive the axle shaft bearing into the axle housing until the tool bottoms against the tube.

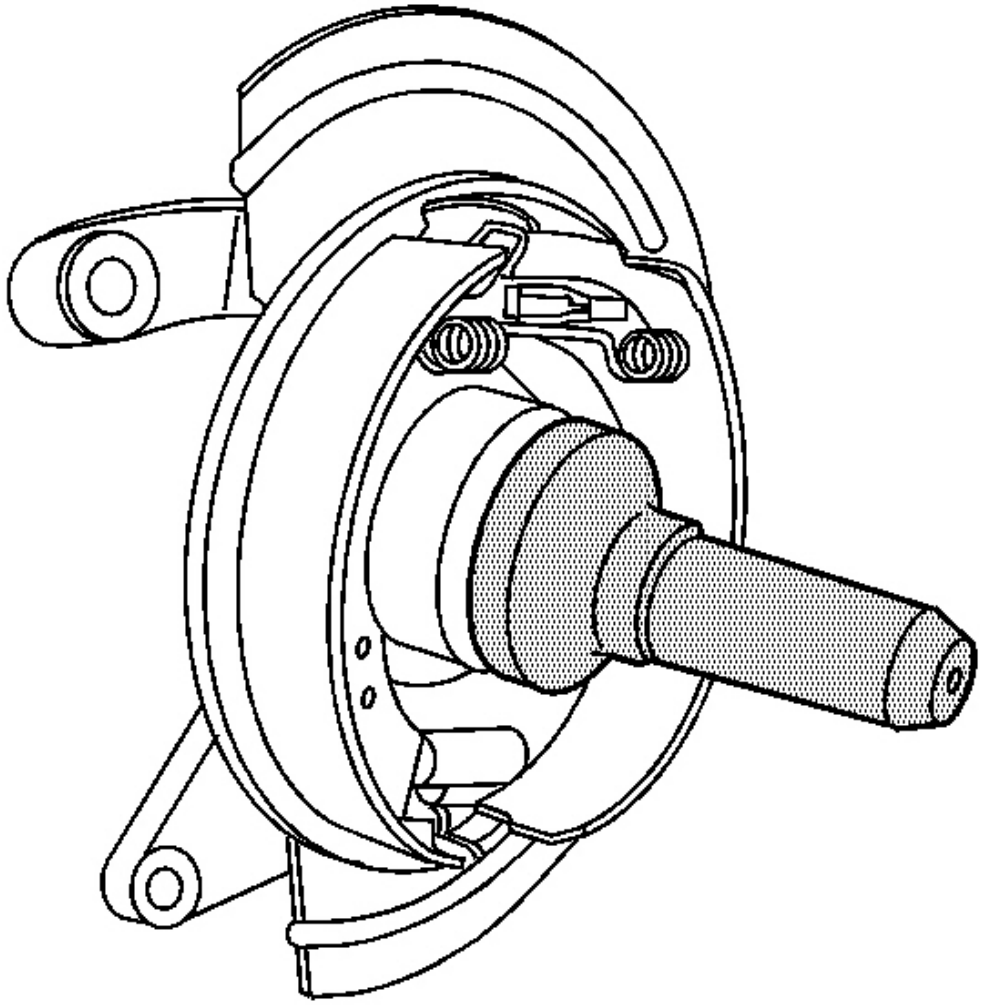


Fig. 50: Installing Axle Shaft Seal Using J 29713
Courtesy of GENERAL MOTORS CORP.

3. Install the axle shaft seal using the **J 29713** . See **Special Tools and Equipment** .
4. Drive the tool into the bore until the axle shaft seal bottoms flush with the tube.
5. Install the axle shaft. Refer to **Rear Axle Shaft Replacement** .
6. Install the rear axle housing cover. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
7. Install the tire and wheel assembly. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.

8. Fill the rear axle with lubricant. Refer to **Lubricant Replacement - Rear Drive Axle** .
9. Lower the vehicle.

DRIVE PINION FLANGE/YOKE AND/OR OIL SEAL REPLACEMENT

Tools Required

- **J 8614-01** Flange/Pulley Holding Tool
- **J 22388** Pinion Oil Seal Installer - Rear. See **Special Tools and Equipment** .

Removal Procedure

IMPORTANT: Observe and mark the positions of all the driveline components, relative to the propeller shaft and the axles, prior to disassembly. These components include the propeller shafts, drive axles, pinion flanges, output shafts, etc. Reassemble all the components in the exact places in which you removed the parts. Follow any specifications, torque values, and any measurements made prior to disassembly.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake calipers and rotors. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.

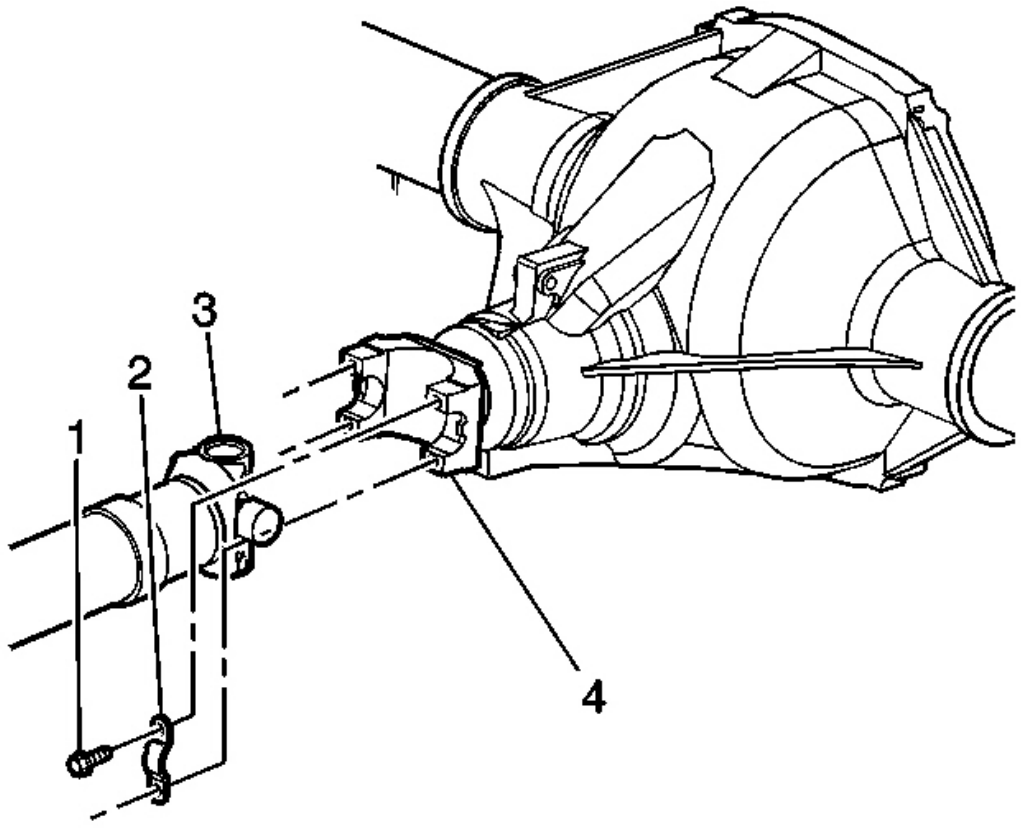


Fig. 51: Rear Propeller Shaft & Rear Axle Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

4. Reference mark the rear propeller shaft (3) to the rear axle pinion yoke (4).
5. Disconnect the propeller shaft from the axle.

Wrap the bearing caps with tape in order to prevent the loss of bearing rollers.

Support the propeller shaft as necessary.

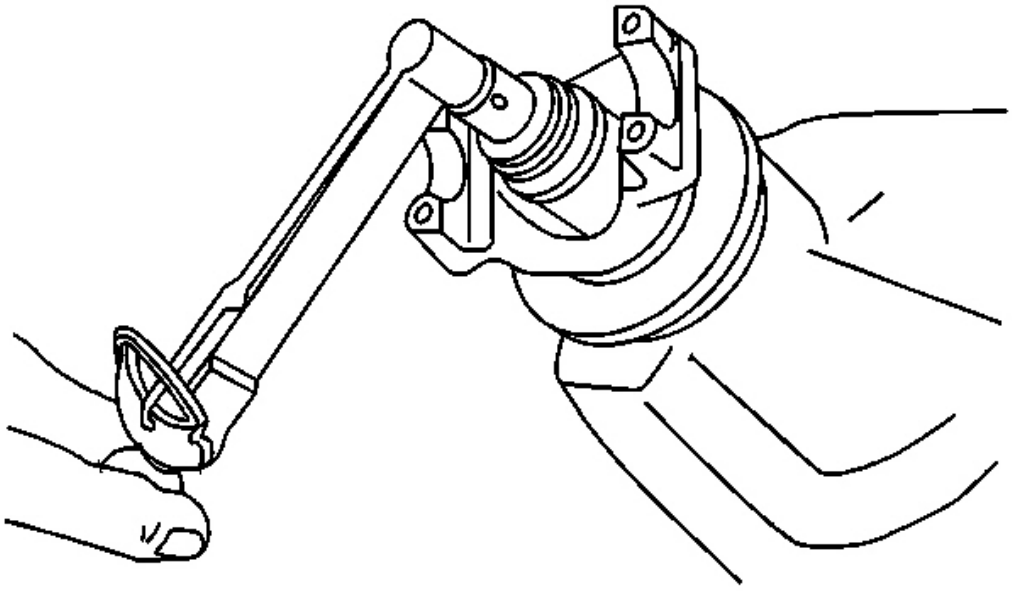


Fig. 52: Measuring Pinion Rotation Torque
Courtesy of GENERAL MOTORS CORP.

6. Measure the amount of torque required to rotate the pinion. Use an inch-pound torque wrench. Record this measurement for reassembly. This will give the combined preload for the following components:
    - The pinion bearings
    - The pinion oil seal
    - The differential case bearings
    - The axle bearings
    - The axle seals

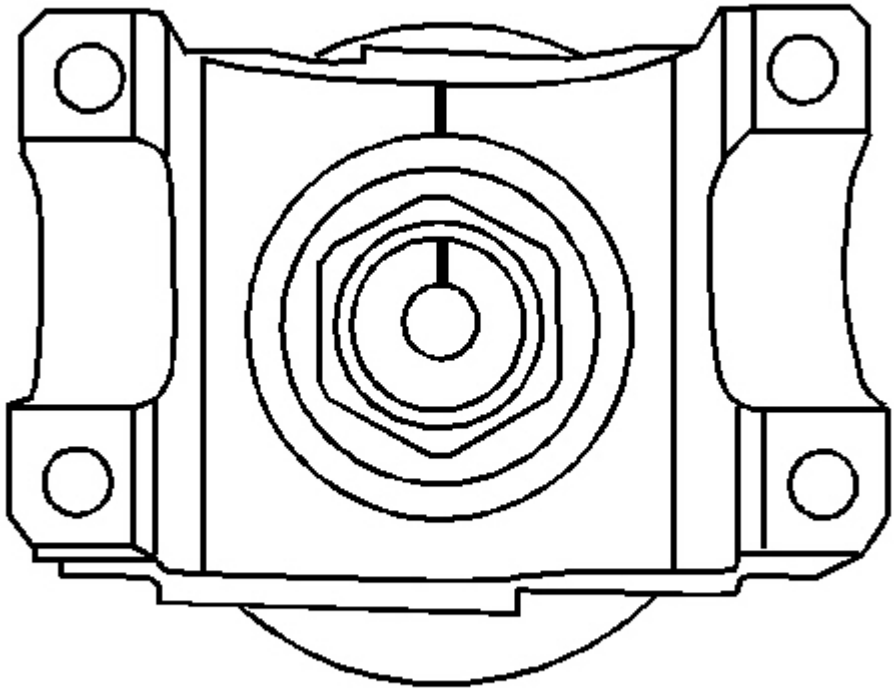


Fig. 53: Aligning Marks On Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

7. Place an alignment mark between the pinion and the pinion yoke.

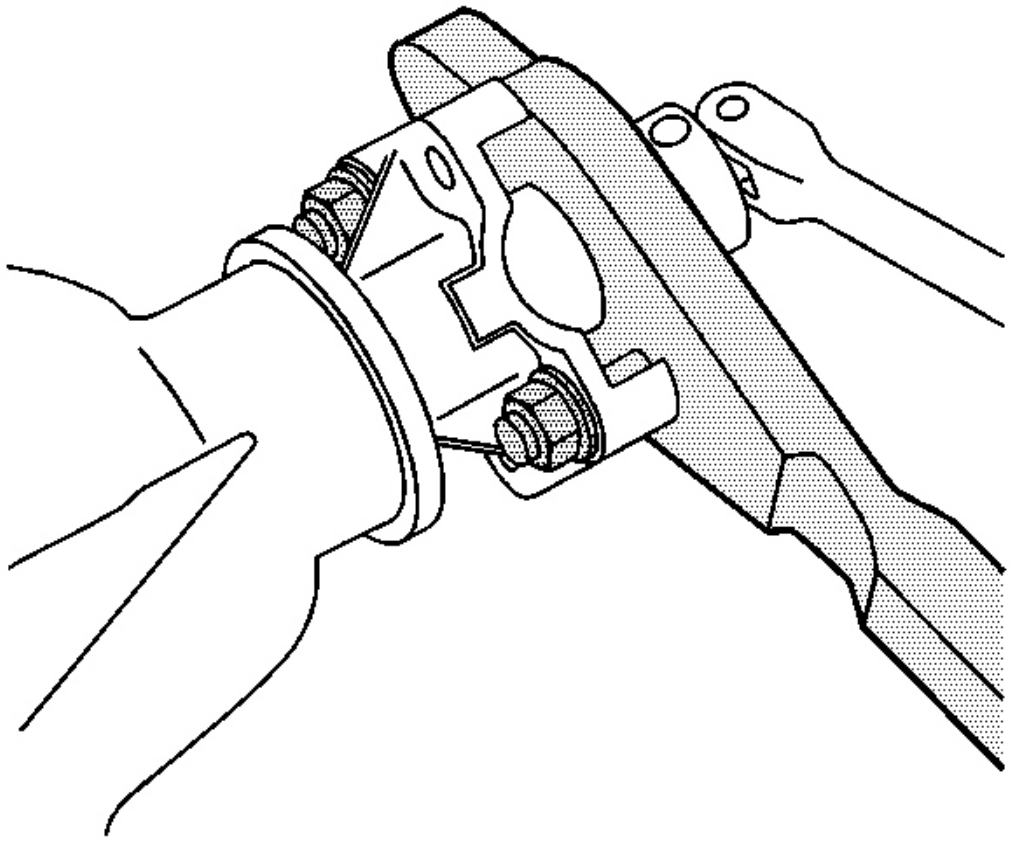


Fig. 54: Installing J 8614-01
Courtesy of GENERAL MOTORS CORP.

8. Install the **J 8614-01** as shown.
9. Remove the pinion nut while holding the **J 8614-01** .
10. Remove the washer.

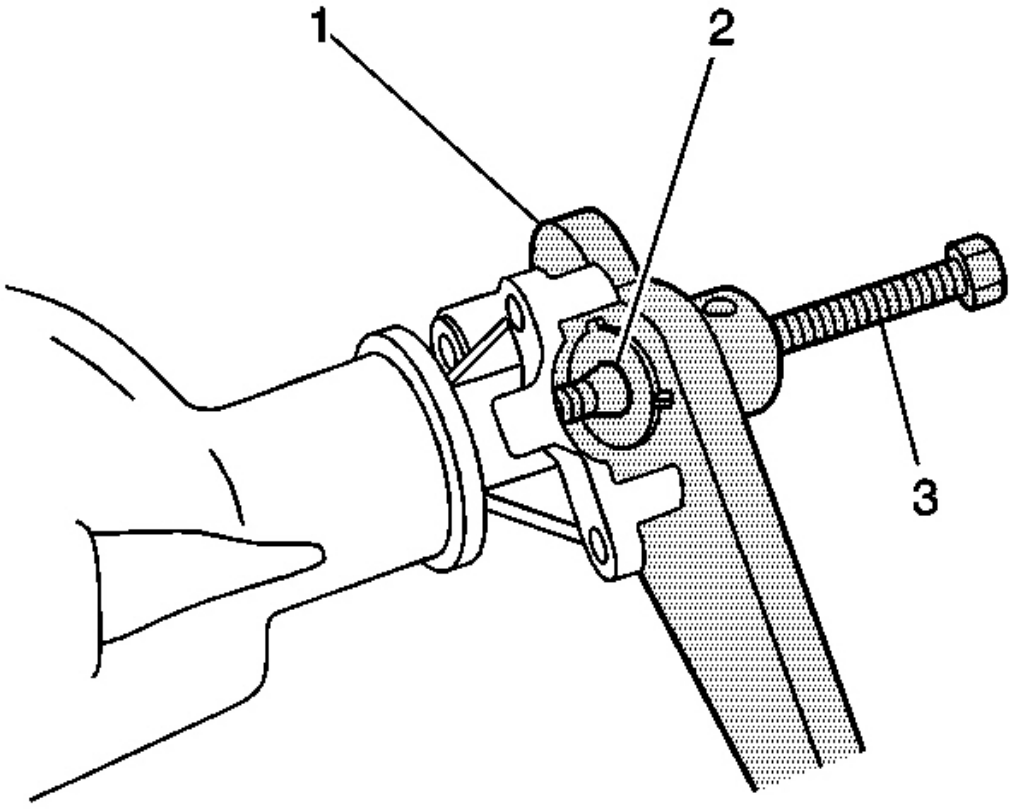


Fig. 55: J 8614-01, J 8614-2 & J 8614-3
Courtesy of GENERAL MOTORS CORP.

11. Install the J 8614-2 (2) and the J 8614-3 (3) into the **J 8614-01** (1) as shown.
12. Remove the pinion yoke by turning the J 8614-3 (3) clockwise while holding the **J 8614-01** (1).

    Use a container in order to retrieve the lubricant.

13. Remove the pinion oil seal. Use a suitable seal removal tool. Do not damage the housing.

Installation Procedure

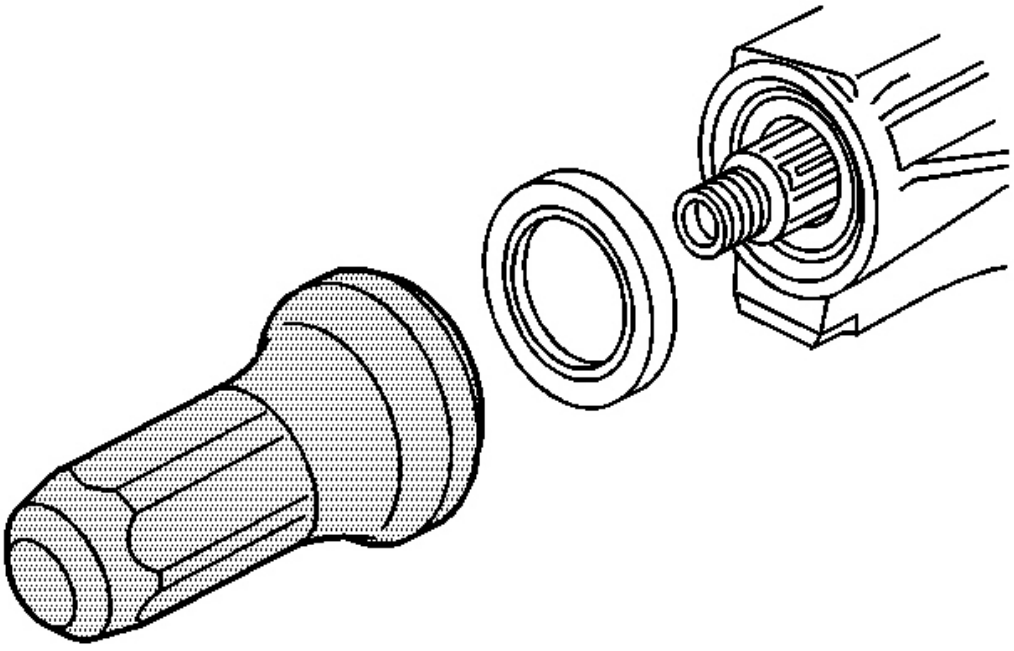


Fig. 56: Installing New Pinion Oil Seal Using J 22388
Courtesy of GENERAL MOTORS CORP.

1. Install a new pinion oil seal using the **J 22388** or the J 44414 . See **Special Tools and Equipment**
2. Apply sealant, GM P/N 12346004 (Canadian P/N 10953480) or equivalent, to the splines of the pinion yoke.
3. Install the pinion yoke.

   Align the marks made during removal.

   NOTE: Do not hammer the pinion flange/yoke onto the pinion shaft. Pinion components may be damaged if the pinion flange/yoke is hammered onto the pinion shaft.

4. Seat the pinion yoke onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft threads show through the yoke.
5. Install the washer and a new pinion nut.

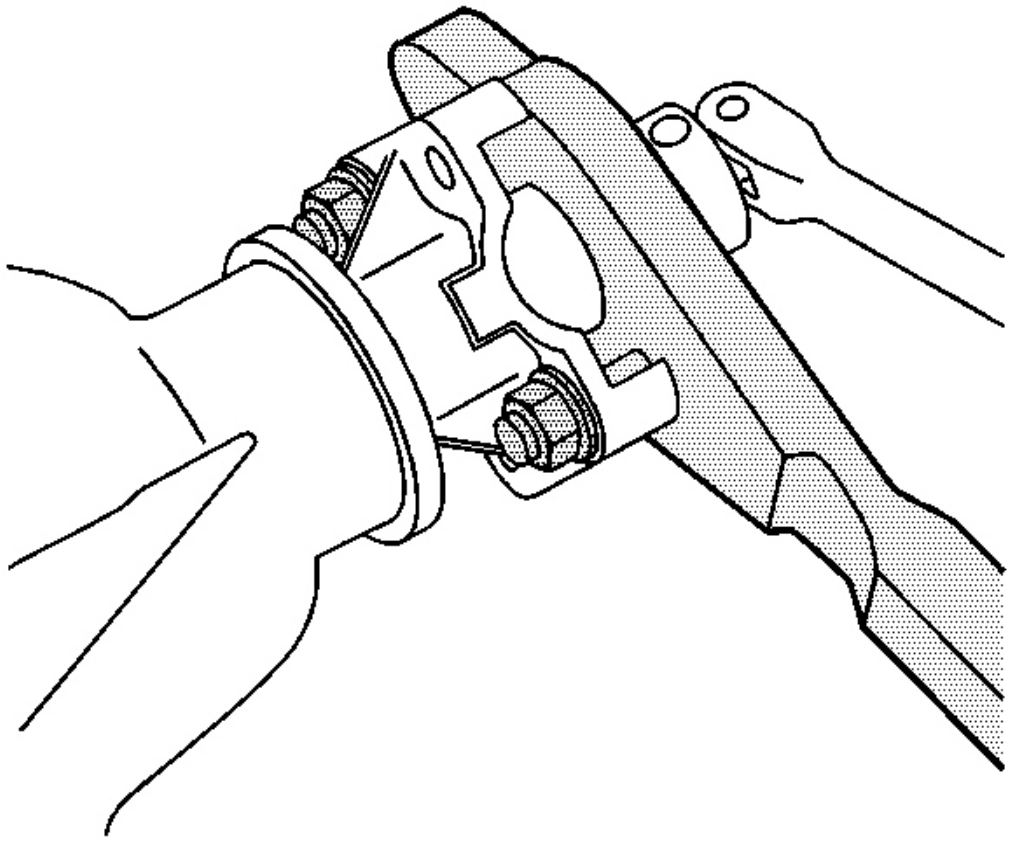


Fig. 57: Installing J 8614-01
Courtesy of GENERAL MOTORS CORP.

6. Install the **J 8614-01** onto the pinion yoke as shown.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: If the rotating torque is exceeded, the pinion will have to be removed and a new collapsible spacer installed.

7. Tighten the pinion nut while holding the **J 8614-01** .

Tighten: Tighten the nut until the pinion end play is just taken up. Rotate the pinion while tightening the nut to seat the bearings.

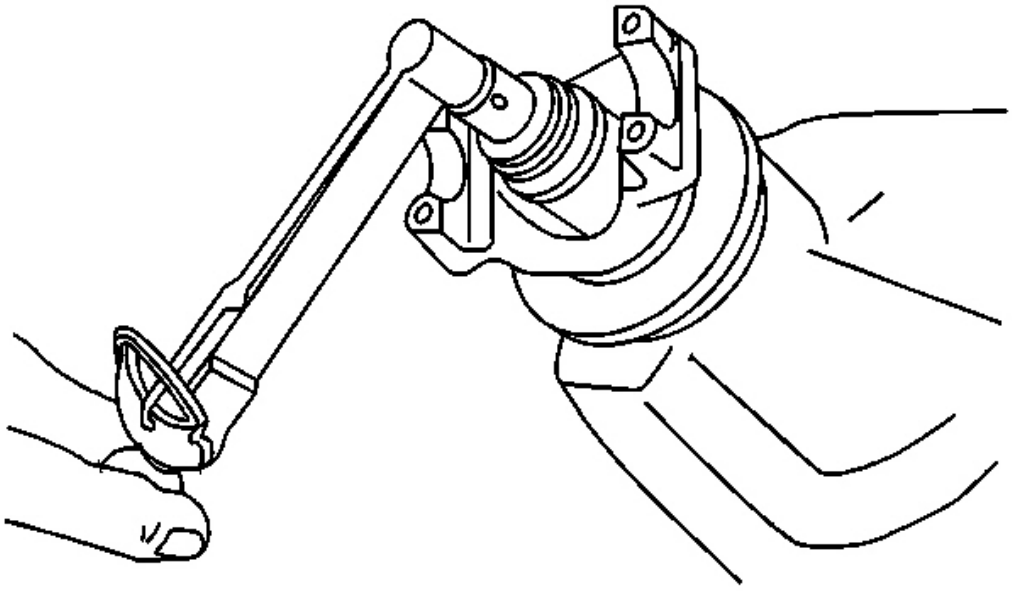


Fig. 58: Measuring Pinion Rotation Torque
Courtesy of GENERAL MOTORS CORP.

8. Measure the rotating torque of the pinion. Compare this measurement with the rotating torque recorded during removal.

   Tighten: Tighten the nut in small increments, as needed, until the rotating torque is 0.40-0.57 N.m (3- 5 lb in) greater than the rotating torque recorded during removal.

9. Once the specified torque is obtained, rotate the pinion several times to ensure the bearings have seated. Recheck the rotating torque and adjust if necessary.

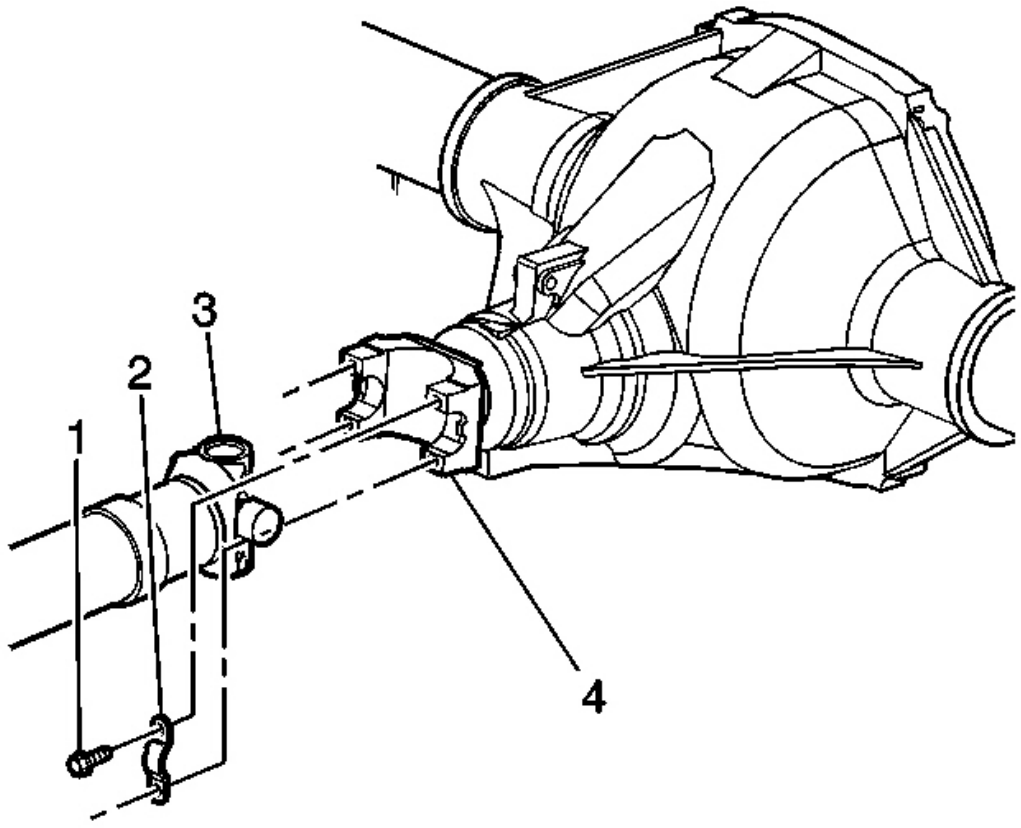


Fig. 59: Rear Propeller Shaft & Rear Axle Pinion Yoke
Courtesy of GENERAL MOTORS CORP.

10. Install the propeller shaft (3) to the pinion yoke (4).

    Align the reference marks made during removal.

11. Install the propeller shaft yoke retaining clamps and the bolts.

    Tighten: Tighten the propeller shaft yoke retaining clamp bolts to 25 N.m (18 lb ft).

12. Install the brake rotors and calipers. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
13. Install the tire and the wheel. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
14. Inspect and add axle lubricant to the axle housing, if necessary. Refer to **Lubricant Level Inspection - Rear Drive Axle** .
15. Lower the vehicle.

DRIVE PINION AND RING GEAR REPLACEMENT

Tools Required

- **J 8614-01** Flange and Pulley Holding Tool
- **J 22536** Pinion Driver. See **Special Tools and Equipment** .
- **J 22388** Pinion Oil Seal Installer - Rear. See **Special Tools and Equipment** .

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
4. Remove the brake rotors. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
5. Remove the axle shafts. Refer to **Rear Axle Shaft Replacement** .
6. Remove the differential. Refer to **Differential Replacement** .
7. Remove the pinion yoke and the seal. Refer to **Drive Pinion Flange/Yoke and/or Oil Seal Replacement** .

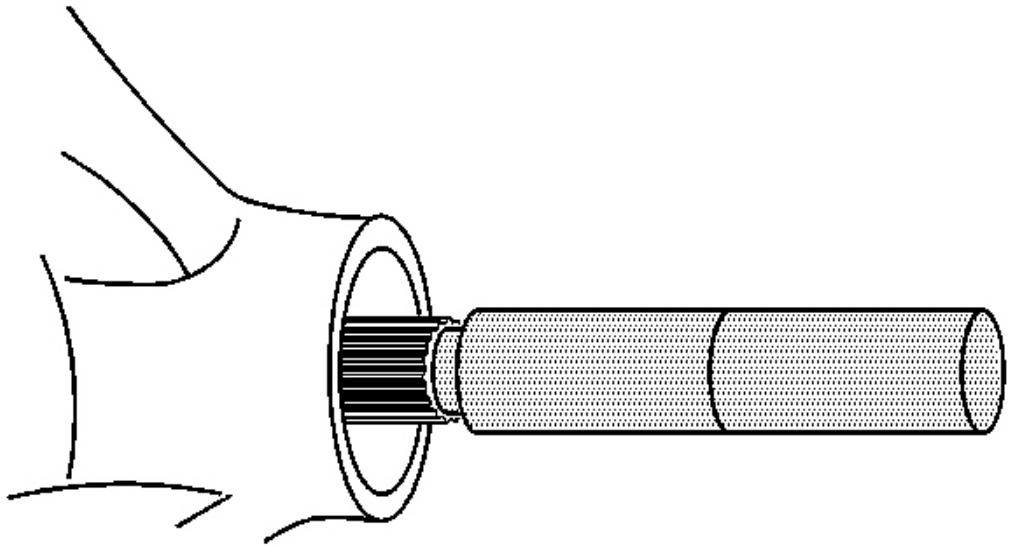


Fig. 60: Installing J 22536 To Pinion
Courtesy of GENERAL MOTORS CORP.

8. Install the **J 22536** as shown. See **Special Tools and Equipment** .

   Ensure that the **J 22536** is firmly seated on the pinion. See **Special Tools and Equipment** .

9. Drive the pinion out using the **J 22536** and a hammer. See **Special Tools and Equipment** .

   Strike the **J 22536** slowly. See **Special Tools and Equipment** . Do not let the pinion fall out of the rear axle housing.

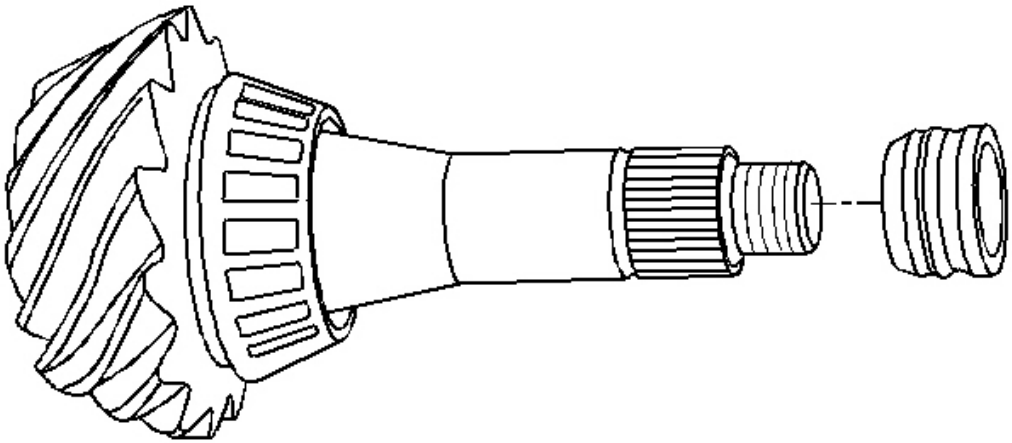


Fig. 61: Collapsible Spacer From Pinion
Courtesy of GENERAL MOTORS CORP.

10. Remove the collapsible spacer from the pinion. Discard the spacer.
11. Remove the pinion bearings and the cups. Refer to **Drive Pinion Bearings Replacement** .

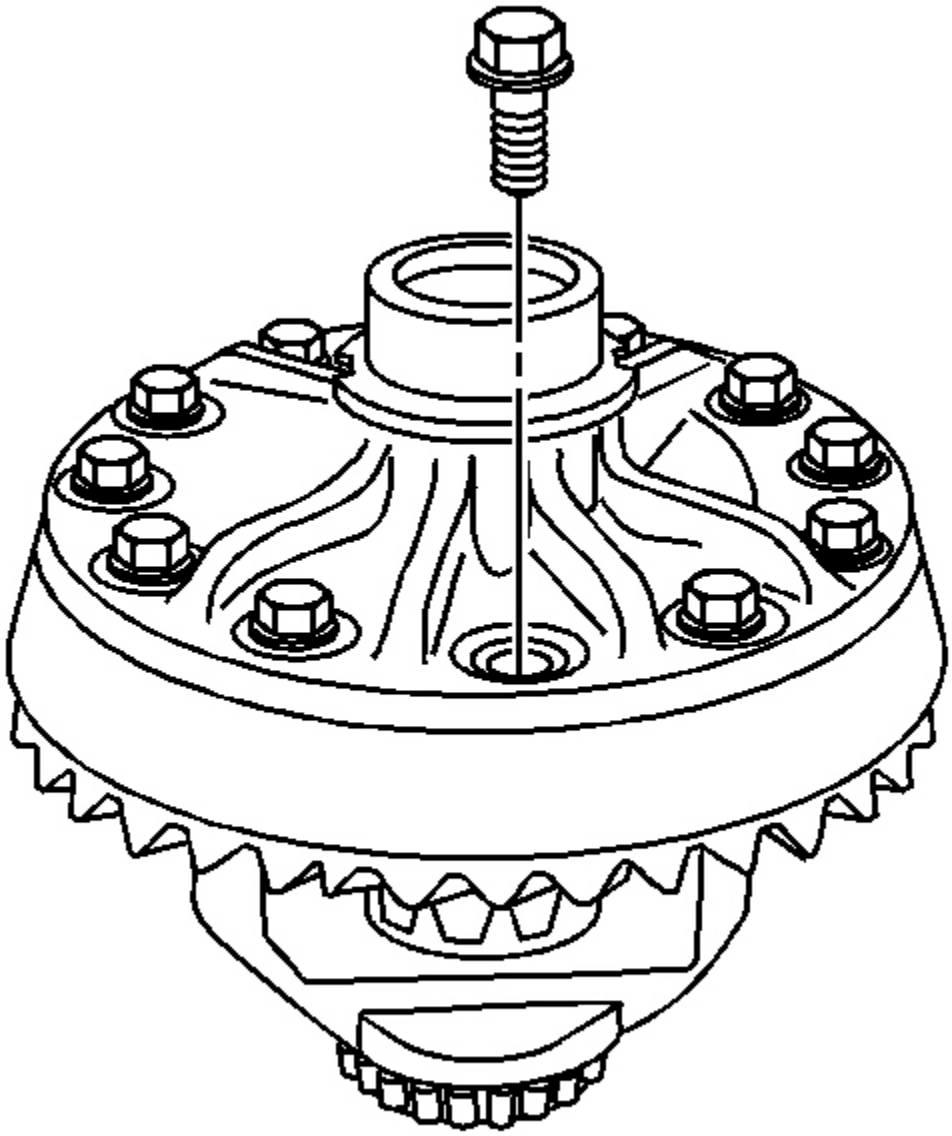


Fig. 62: Identifying Ring Gear Bolts
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The ring gear bolts have left-hand threads.

12. Remove the ring gear bolts. Discard the bolts.

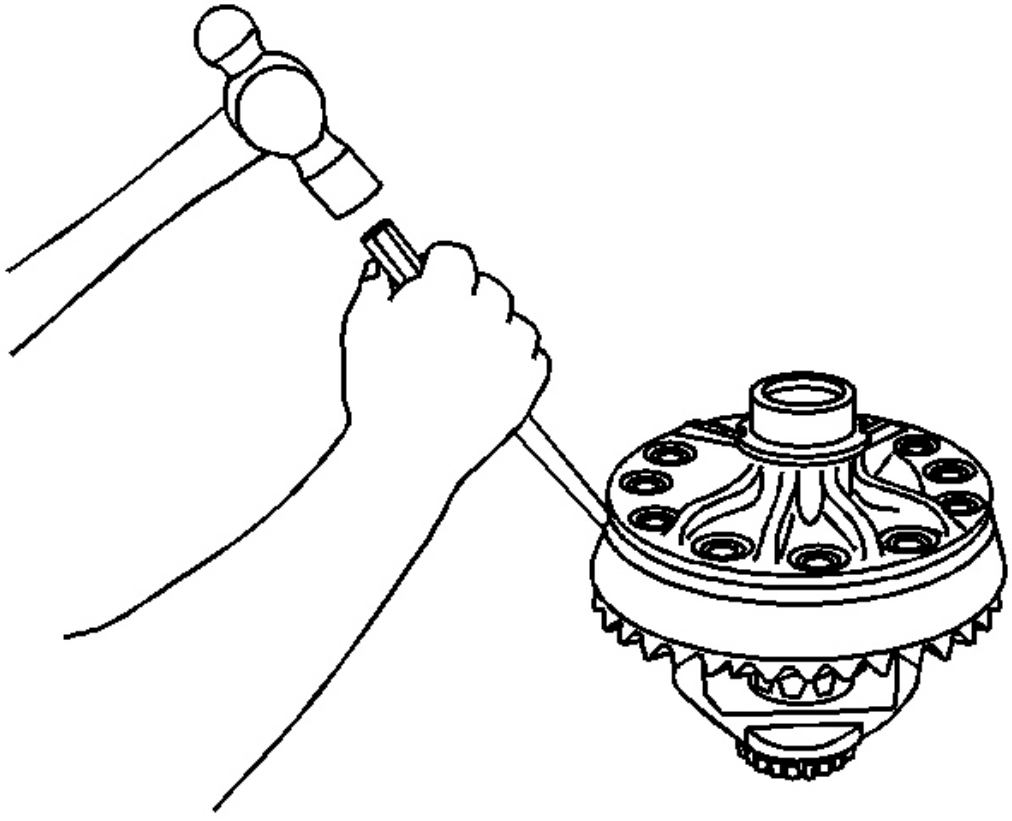


Fig. 63: Removing Ring Gear From Differential Case
Courtesy of GENERAL MOTORS CORP.

NOTE: Do not pry the ring gear from the differential case. Prying the ring gear from the differential case may cause damage to the ring gear and/or the differential case.

13. Remove the ring gear from the differential. Drive the gear off with a brass drift if necessary.

Installation Procedure

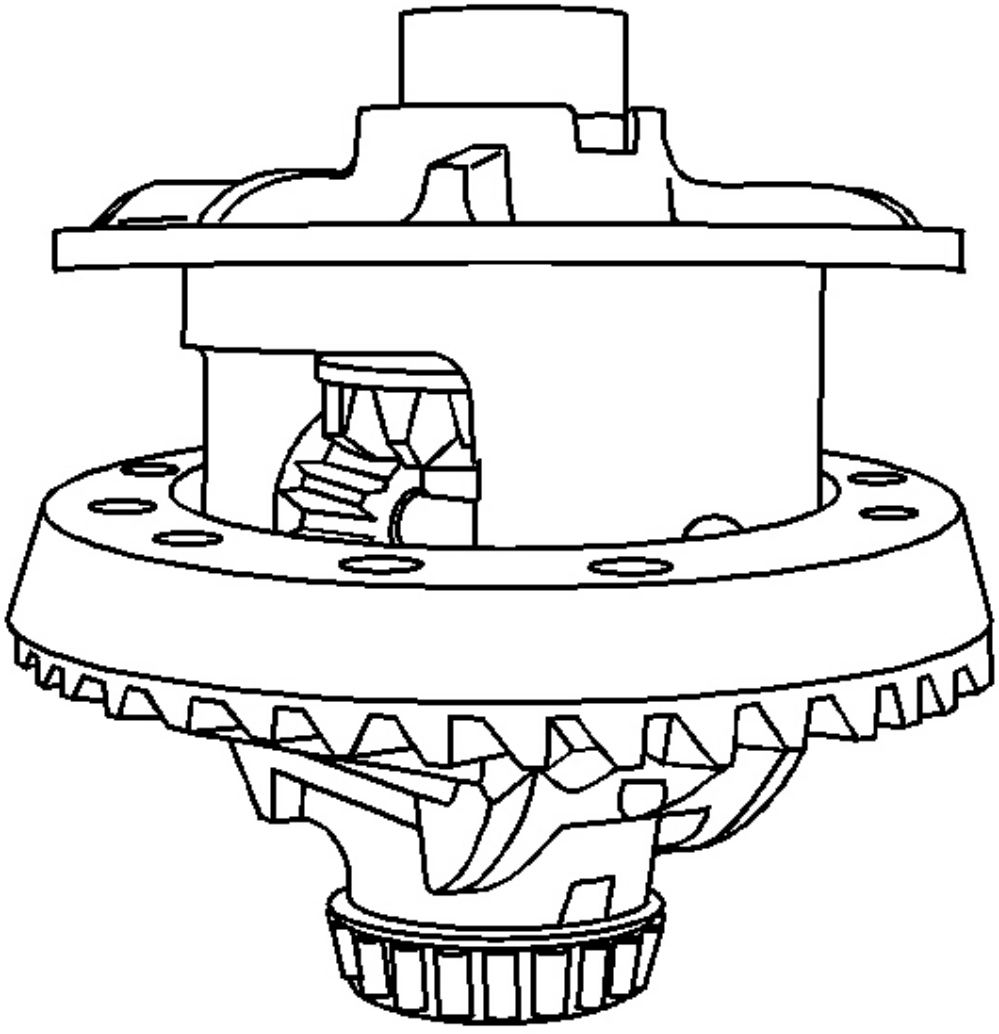


Fig. 64: Installing Ring Gear Onto Differential Case
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: The mating surface of the ring gear and the differential case must be clean and free of burrs before installing the ring gear.

1. Install the ring gear to the differential case.

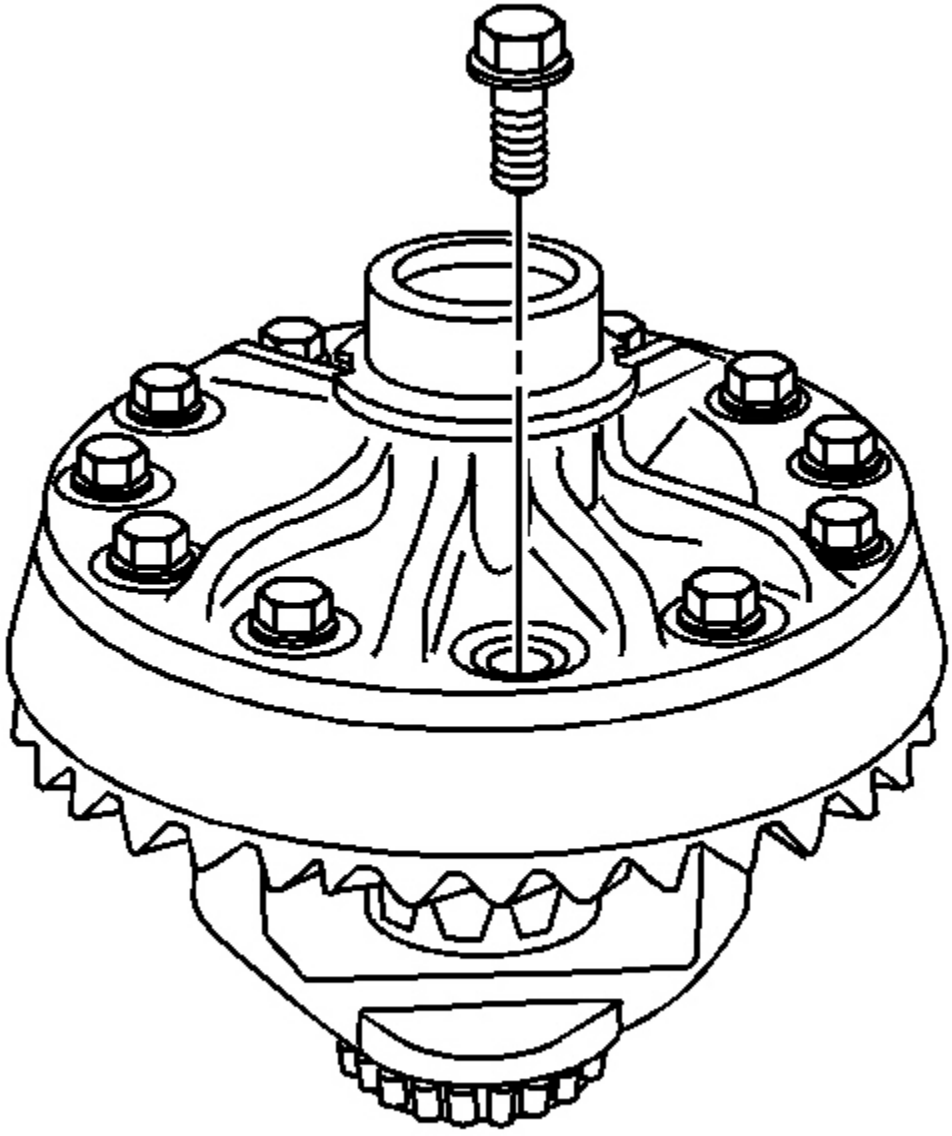


Fig. 65: Identifying Ring Gear Bolts
Courtesy of GENERAL MOTORS CORP.

2. Install the new left-hand ring gear bolts.

   Hand start each bolt in ensure the ring gear is properly installed to the differential case.

NOTE: **Refer to Fastener Notice in Cautions and Notices.**

3. Tighten the ring gear bolts alternately and in stages, gradually pulling the ring gear onto the differential case.

   Tighten: Tighten the ring gear bolts in sequence to 140 N.m (103 lb ft).

4. Install the pinion bearing cups. Refer to **Drive Pinion Bearings Replacement** .
5. Determine the selective shim thickness for the pinion gear. Refer to **Pinion Depth Adjustment** .
6. Install the selective shim onto the drive pinion.
7. Install the inner pinion bearing to the pinion. Refer to **Drive Pinion Bearings Replacement** .

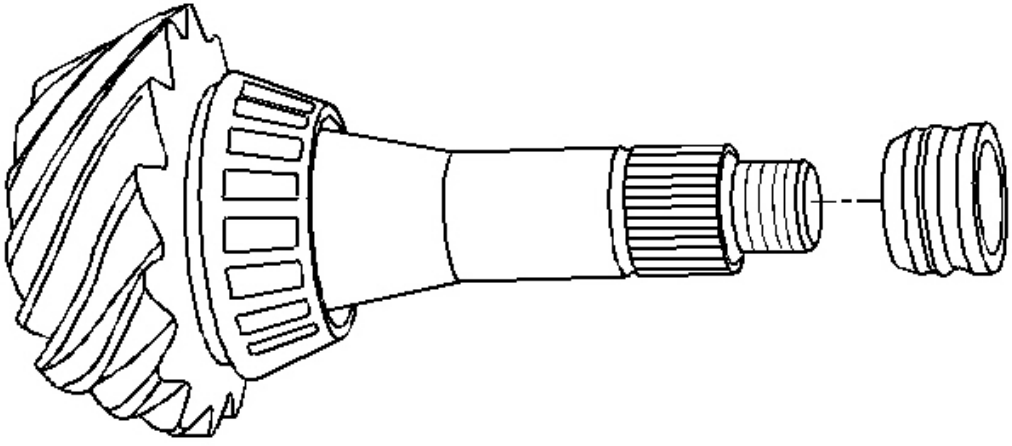


Fig. 66: Collapsible Spacer From Pinion
Courtesy of GENERAL MOTORS CORP.

8. Install a new collapsible spacer.
9. Lubricate the pinion bearings with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.
10. Install the drive pinion into the axle housing.
11. Install the outer pinion bearing onto the drive pinion.

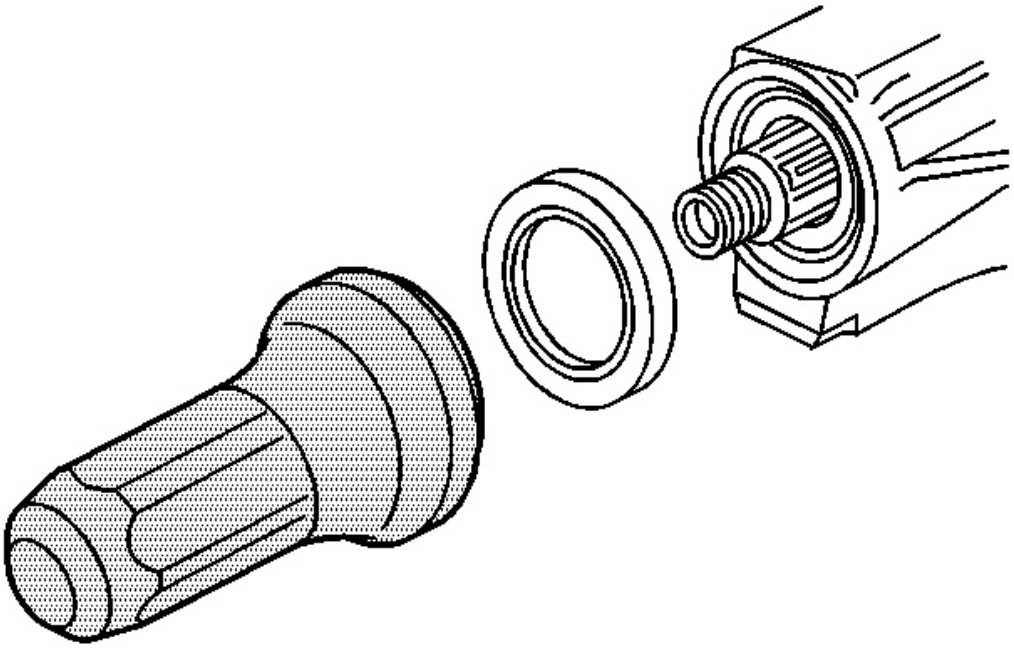


Fig. 67: Installing New Pinion Oil Seal Using J 22388
Courtesy of GENERAL MOTORS CORP.

12. Install a new pinion oil seal using the **J 22388** . See **Special Tools and Equipment** .
13. Apply sealant, GM P/N 12346004 (Canadian P/N 10953480) or equivalent, to the splines of the pinion yoke.
14. Install the pinion yoke.

NOTE: Do not hammer the pinion flange/yoke onto the pinion shaft. Pinion components may be damaged if the pinion flange/yoke is hammered onto the pinion shaft.

15. Seat the pinion yoke onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft threads show through the yoke.
16. Install the washer and a new pinion nut.
17. Install the **J 8614-01** onto the pinion yoke.

IMPORTANT: If the rotating torque is exceeded, the pinion will have to be removed and a new collapsible spacer installed.

18. Tighten the pinion nut while holding the **J 8614-01** .

    Tighten: Tighten the nut until the pinion end play is just taken up. Rotate the pinion while tightening the nut to seat the bearings.

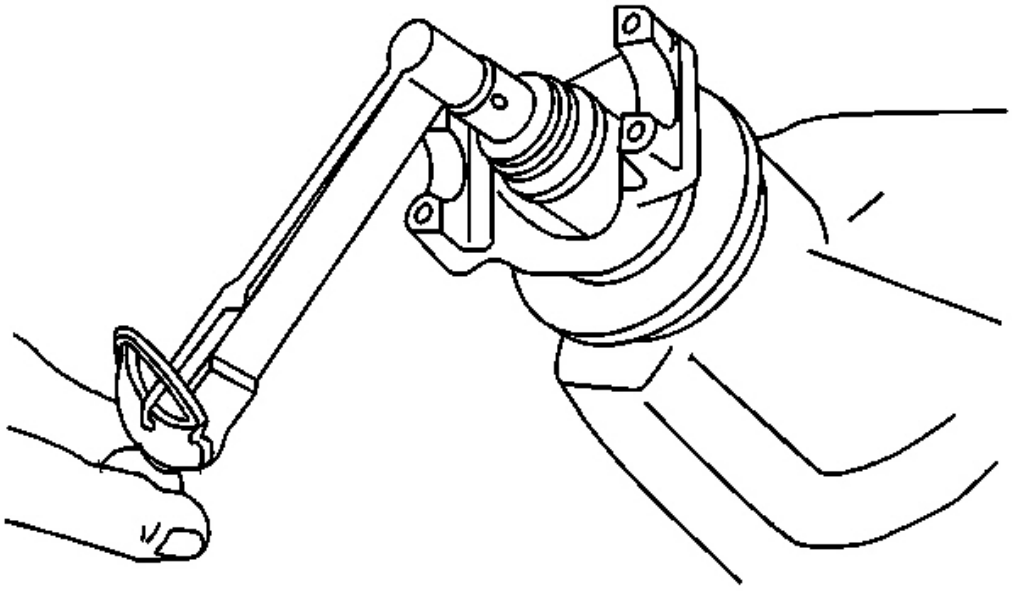


Fig. 68: Measuring Pinion Rotation Torque
Courtesy of GENERAL MOTORS CORP.

19. Measure the rotating torque of the drive pinion using an inch-pound torque wrench.

    Specification: The rotating torque of the drive pinion should be 1.7-3.4 N.m (15-30 lb in) for new bearings or 1.1-2.3 N.m (10-20 lb in) for used bearings.

20. If the rotating torque of the drive pinion is less than 1.7 N.m (15 lb in) for new bearings or 1.1 N.m (10 lb in) for used bearings, continue to tighten the pinion nut until the specified torque is obtained.

    Rotate the pinion several times to ensure the bearings have seated. Recheck the rotating torque and adjust if necessary.

21. If the rotating torque of the drive pinion is greater than 3.4 N.m (30 lb in) new bearings or 2.3 N.m (20 lb in) for used bearings, remove the drive pinion and replace the collapsible spacer and re-install the drive pinion following the steps above.
22. Install the differential assembly. Refer to **Differential Replacement** .

23. Perform a gear tooth contact pattern check on the drive pinion and the ring gear. Refer to **Gear Tooth Contact Pattern Inspection** .
24. Install the axle shafts. Refer to **Rear Axle Shaft Replacement** .
25. Install the brake rotors. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
26. Install the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
27. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
28. Fill the axle with lubricant. Use the proper fluid. Refer to **Lubricant Replacement - Rear Drive Axle** .
29. Lower the vehicle.

DRIVE PINION BEARINGS REPLACEMENT

Tools Required

- **J 7818** Inner Bearing Race Installer. See **Special Tools and Equipment** .
- **J 8092** Driver Handle
- **J 22306** Rear Pinion Cup Bearing Installer. See **Special Tools and Equipment** .
- **J 22388** Pinion Oil Seal Installer - Rear. See **Special Tools and Equipment** .
- **J 22912-01** Split Plate Bearing Puller
- **J 36614** Inner Pinion Bearing Installer

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
4. Remove the brake rotors. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
5. Remove the axle shafts. Refer to **Rear Axle Shaft Replacement** .
6. Remove the differential. Refer to **Differential Replacement** .
7. Remove the drive pinion from the axle. Refer to **Drive Pinion and Ring Gear Replacement** .

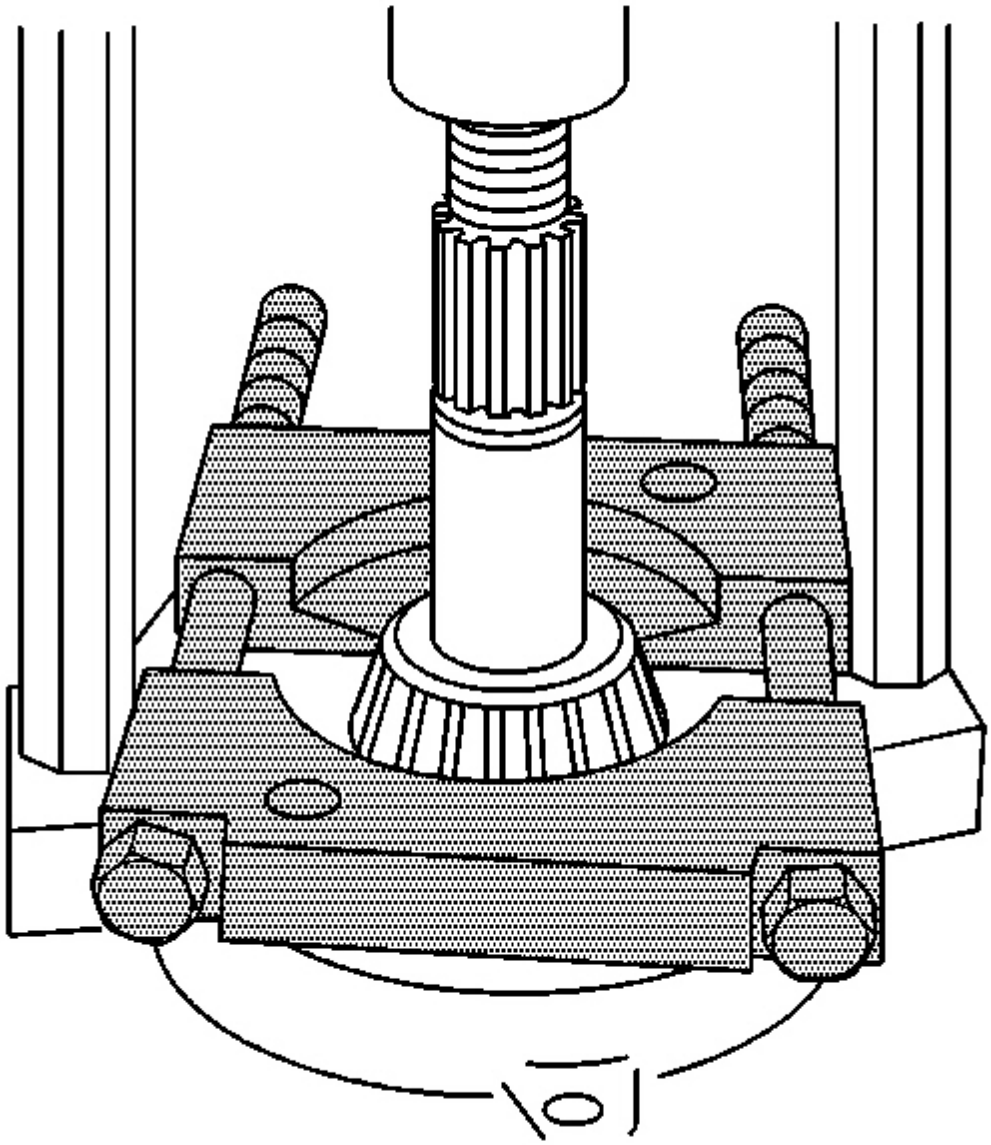


Fig. 69: Removing The Inner Pinion Bearing Using J 22912-01
Courtesy of GENERAL MOTORS CORP.

8. Press the bearing off of the pinion using the **J 22912-01** .
9. Remove the shim.
10. Remove the pinion bearing cups from the axle housing using a hammer and a brass drift in the slots

provided. Move the drift back and forth between one side of the cup and the other in order to work the cups out of the housing evenly.

Installation Procedure

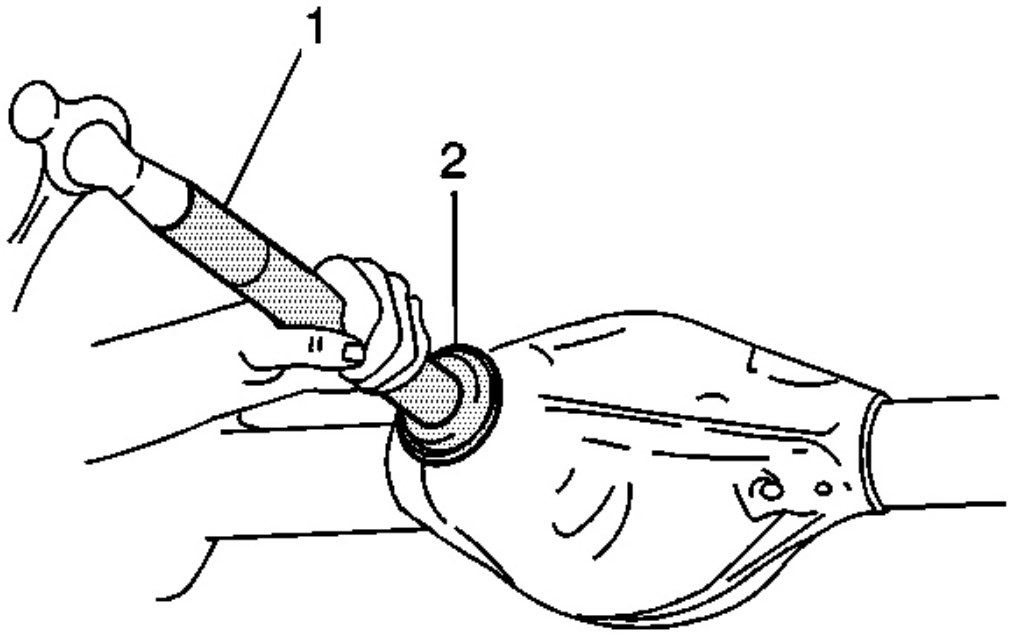


Fig. 70: Installing Outer Pinion Bearing Cup Using J 7818 & J 8092
Courtesy of GENERAL MOTORS CORP.

1. Install the outer pinion bearing cup using the **J 7818** (2) and the **J 8092** (1). See **Special Tools and Equipment** .

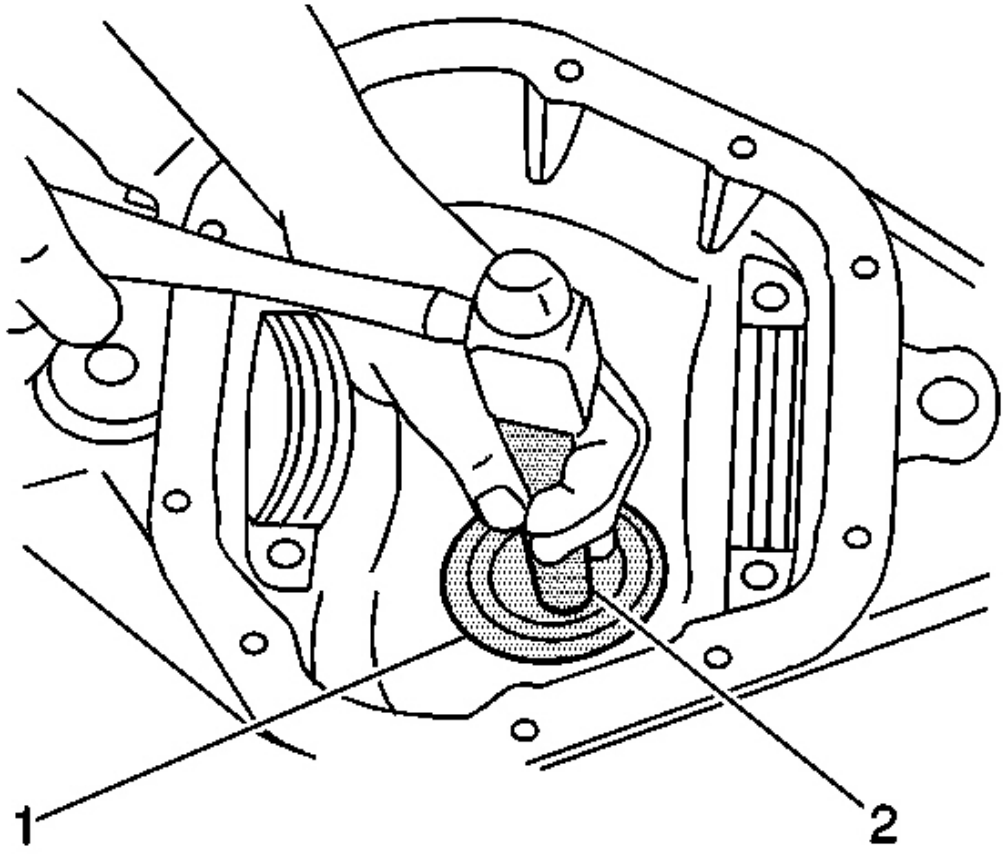


Fig. 71: Installing Inner Pinion Bearing Cup Using J 45900, J 22306, J 44417 & J 8092
Courtesy of GENERAL MOTORS CORP.

2. Install the inner pinion bearing cup using the **J 22306** (2) and the **J 8092** (1). See **Special Tools and Equipment** .
3. Determine the selective shim thickness for the pinion. Refer to **Pinion Depth Adjustment** .

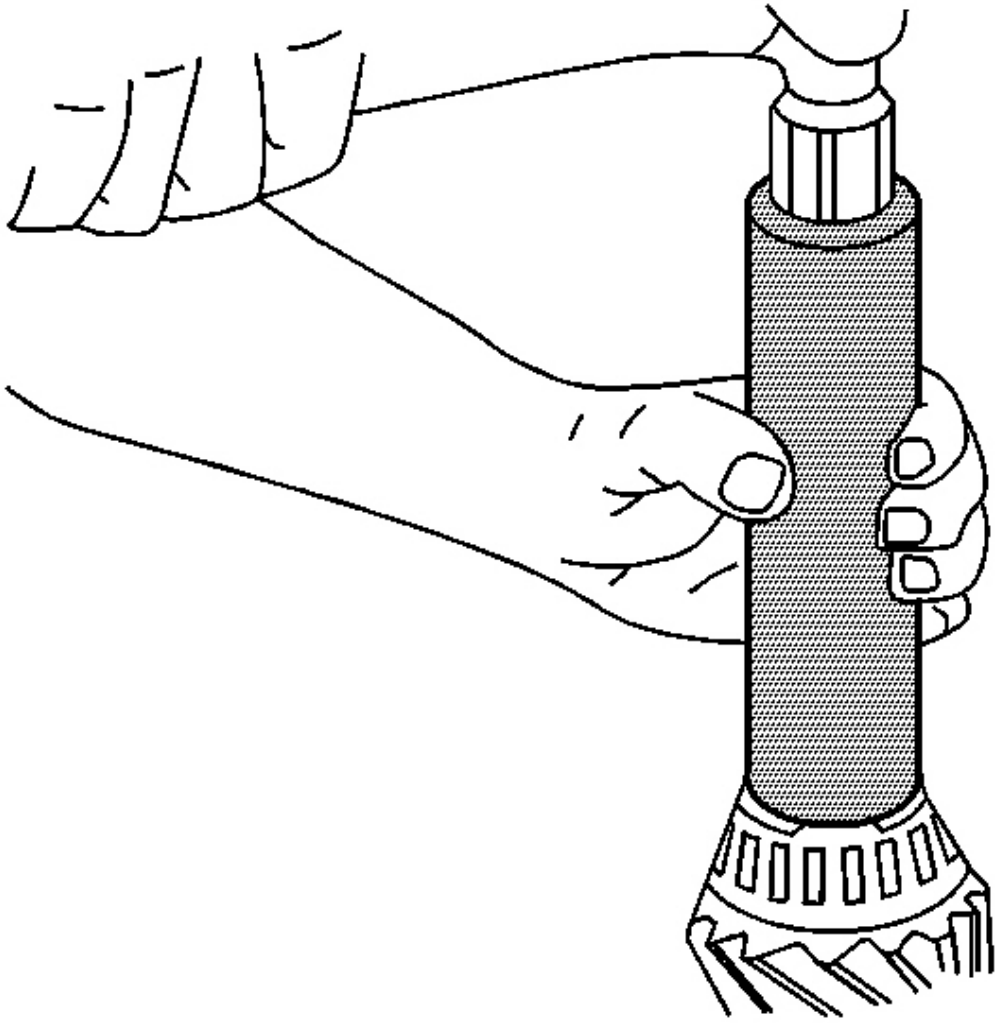


Fig. 72: Installing Inner Pinion Bearing
Courtesy of GENERAL MOTORS CORP.

4. Install the selective shim between the inner pinion bearing and the shoulder on the gear.
5. Install the inner pinion bearing using the **J 36614** .

   Press the bearing on until the cone seats on the pinion shim.

6. Install a new collapsible spacer.
7. Lubricate the pinion bearings with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant**

Recommendations in Maintenance and Lubrication.

8. Install the drive pinion into the axle housing.
9. Install the outer pinion bearing onto the pinion.

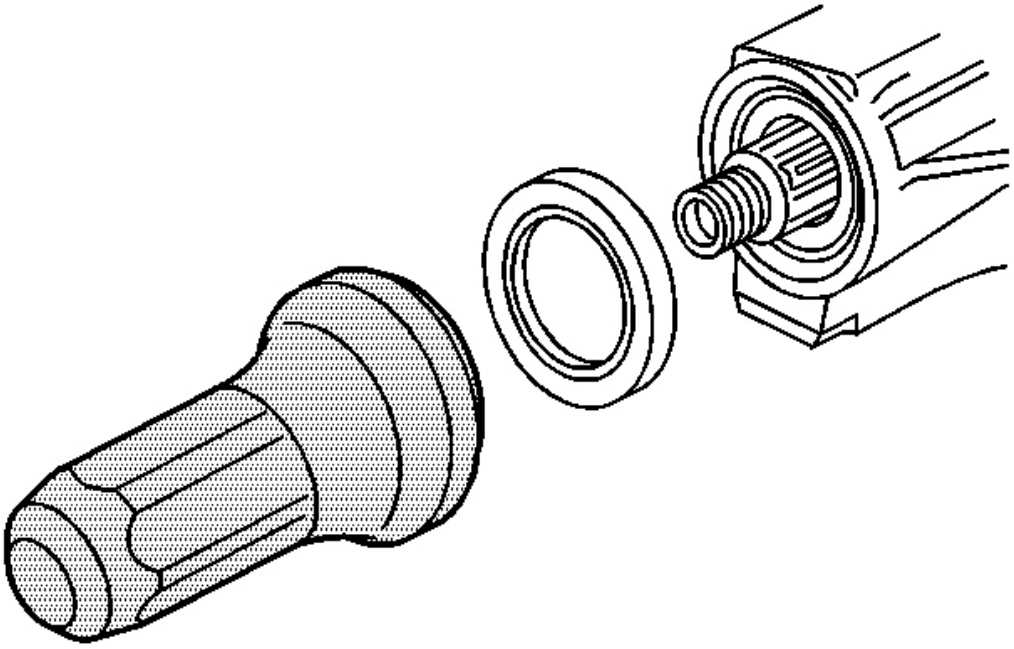


Fig. 73: Installing New Pinion Oil Seal Using J 22388
Courtesy of GENERAL MOTORS CORP.

10. Install a new pinion oil seal using the **J 22388** . See **Special Tools and Equipment** .
11. Apply sealant, GM P/N 12346004 (Canadian P/N 10953480) or equivalent, to the splines of the pinion yoke.
12. Install the pinion yoke.

NOTE: Do not hammer the pinion flange/yoke onto the pinion shaft. Pinion components may be damaged if the pinion flange/yoke is hammered onto the pinion shaft.

13. Seat the pinion yoke onto the pinion shaft by tapping it with a soft-faced hammer until a few pinion shaft threads show through the yoke.
14. Install the washer and a new pinion nut.
15. Install the **J 8614-01** onto the pinion yoke.

NOTE: **Refer to Fastener Notice in Cautions and Notices.**

IMPORTANT: If the rotating torque is exceeded, the pinion will have to be removed and a new collapsible spacer installed.

16. Tighten the pinion nut while holding the **J 8614-01** .

    Tighten: Tighten the nut until the pinion end play is just taken up. Rotate the pinion while tightening the nut to seat the bearings.

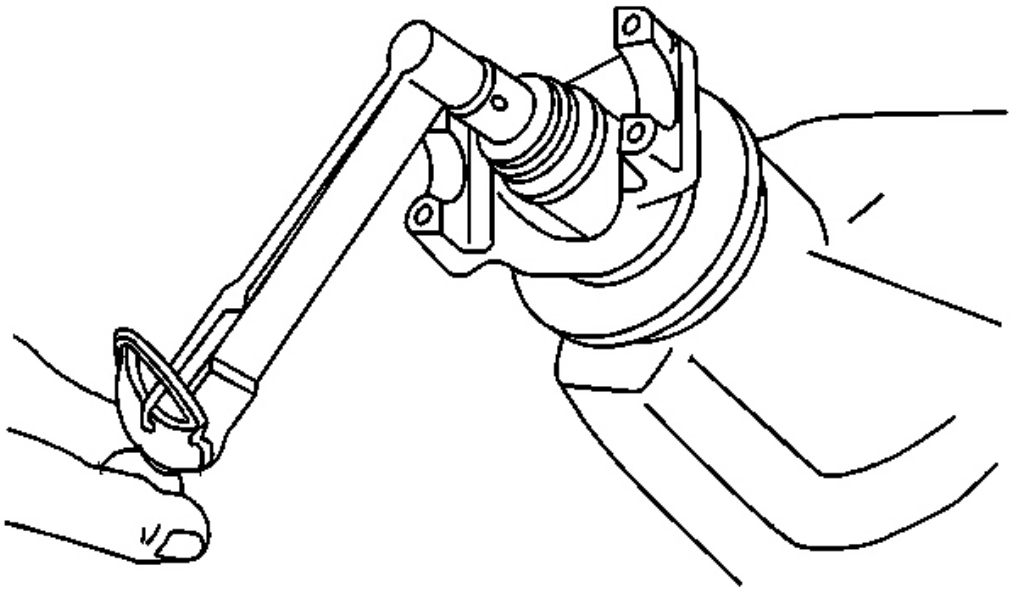


Fig. 74: Measuring Pinion Rotation Torque
Courtesy of GENERAL MOTORS CORP.

17. Measure the rotating torque of the drive pinion using an inch-pound torque wrench.

    Specification: The rotating torque of the drive pinion should be 1.7-3.4 N.m (15-30 lb in).

18. If the rotating torque of the drive pinion is less than 1.7 N.m (15 lb in), continue to tighten the pinion nut until the specified torque is obtained.

    Rotate the pinion several times to ensure the bearings have seated. Recheck the rotating torque and adjust if necessary.

19. If the rotating torque of the drive pinion is greater than 3.4 N.m (30 lb in), remove the drive pinion and replace the collapsible spacer and re-install the drive pinion following the steps above.
20. Install the differential assembly. Refer to **Differential Replacement** .
21. Install the brake rotors. Refer to **Brake Rotor Replacement - Rear** in Disc Brakes.
22. Install the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
23. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
24. Fill the axle with lubricant. Use the proper fluid. Refer to **Lubricant Replacement - Rear Drive Axle** .
25. Lower the vehicle.

DIFFERENTIAL REPLACEMENT

Tools Required

- **J 24429** Side Bearing Backlash Spanner. See **Special Tools and Equipment** .
- **J-38125** Terminal Repair Kit

Removal Procedure

IMPORTANT: Group and mark the shims together as originally removed. If you remove or replace the ring gear and drive pinion, the differential side bearing preload, backlash, and gear tooth contact pattern check procedures must be performed in order to ensure proper contact of the gears. If you re-install or replace the differential assembly without replacing any other component (i.e. drive pinion and ring gear, differential side bearings, etc.) then you may reinstall the differential assembly with the original shims in their original locations. Always perform a gear tooth contact pattern check, even when you remove only the differential assembly.

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the tires and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
3. Remove the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
4. Remove the rear axle housing cover and the gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
5. Remove the axle shafts. Refer to **Rear Axle Shaft Replacement** .
6. Disconnect the electronic locking differential coil harness connector.

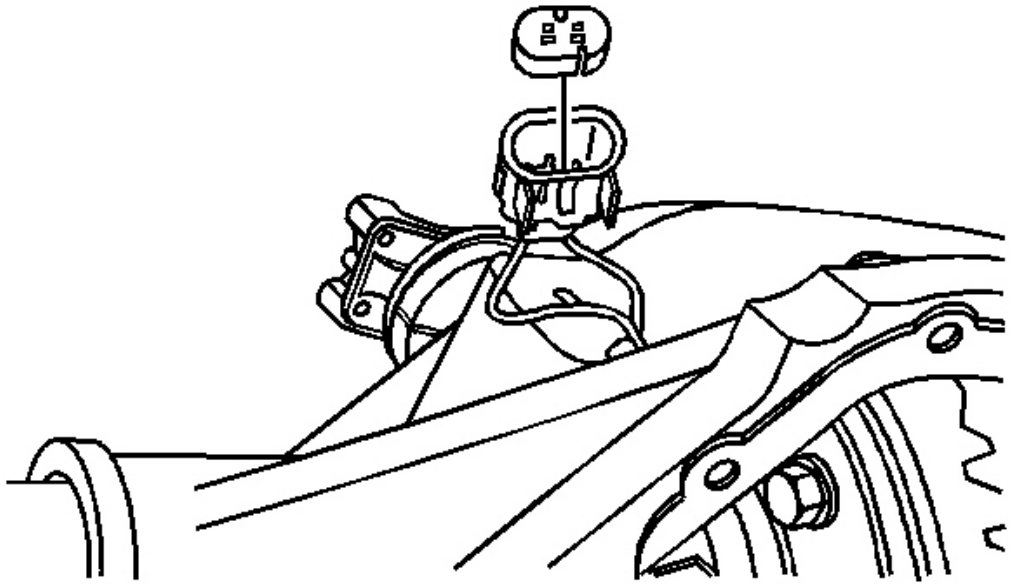


Fig. 75: Positive Terminal Lock Reinforcer
Courtesy of GENERAL MOTORS CORP.

7. Remove the positive terminal lock reinforcer using the J 38125-552.

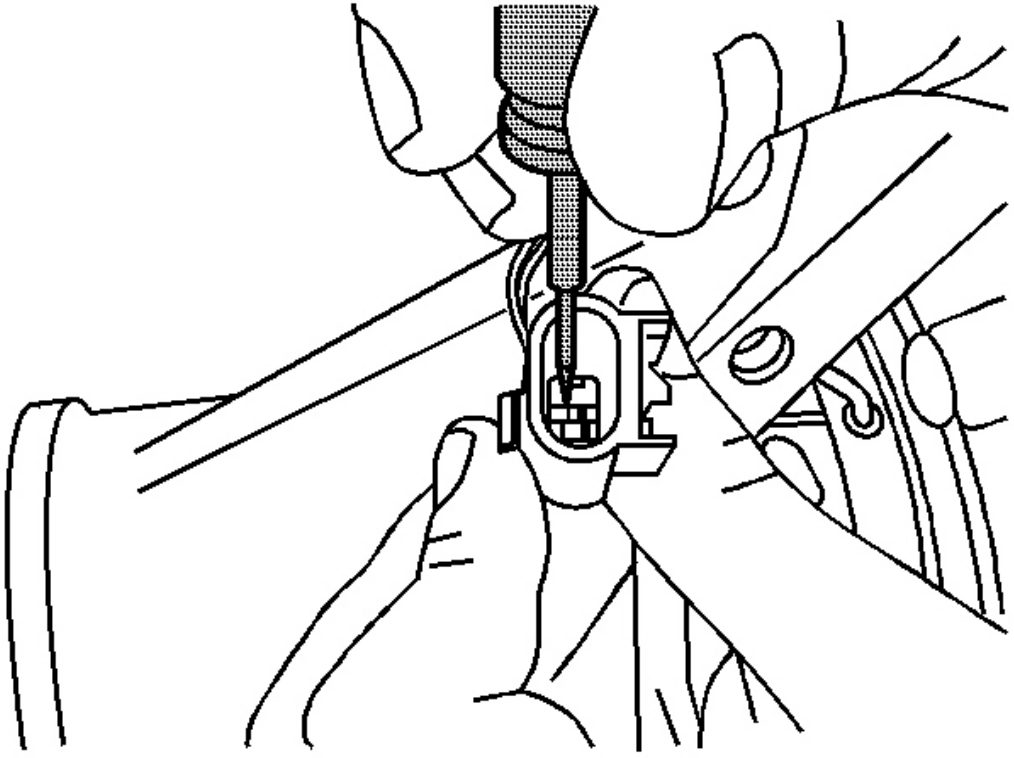


Fig. 76: Pushing On Terminal Release Tabs Within Connector Housing Using J 38125-12A
Courtesy of GENERAL MOTORS CORP.

8. Disconnect the terminals from the electronic locking differential coil connector by pushing on the terminal release tabs within the connector housing using the J 38125-12A.

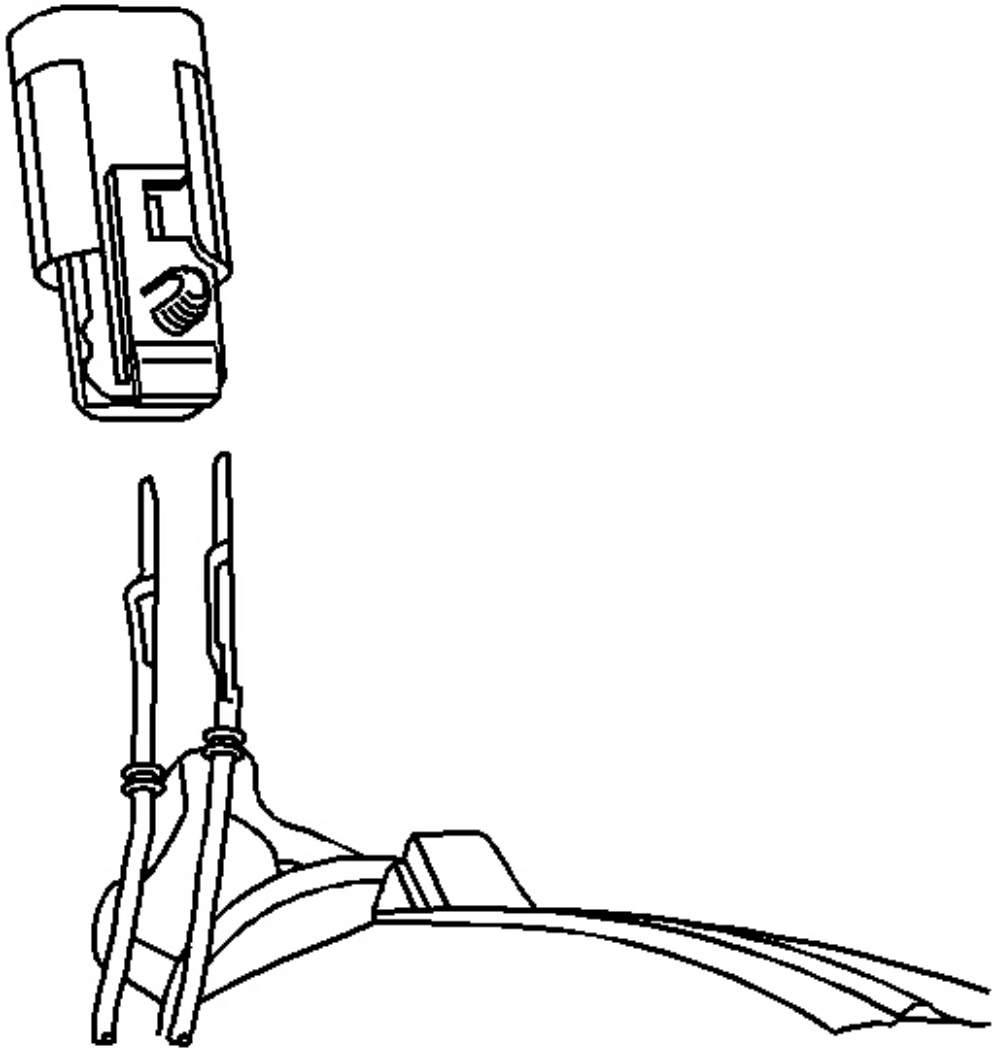


Fig. 77: Electronic Locking Differential Coil Connector Housing
Courtesy of GENERAL MOTORS CORP.

9. Remove the electronic locking differential coil connector housing.

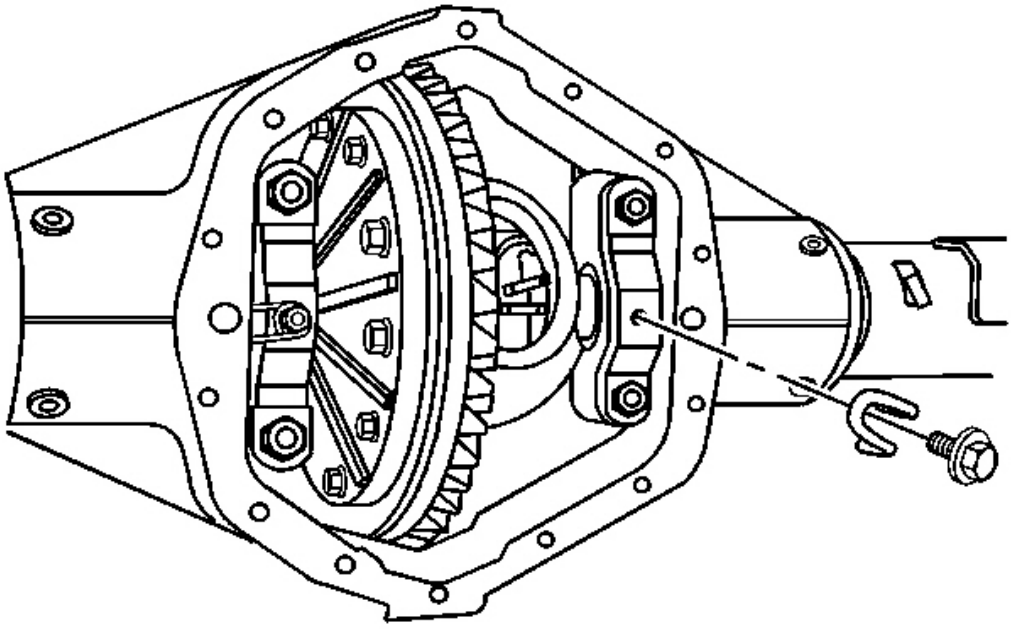


Fig. 78: Right Side Differential Bearing Adjuster Nut Lock
Courtesy of GENERAL MOTORS CORP.

10. Remove the right side differential bearing adjuster nut lock.

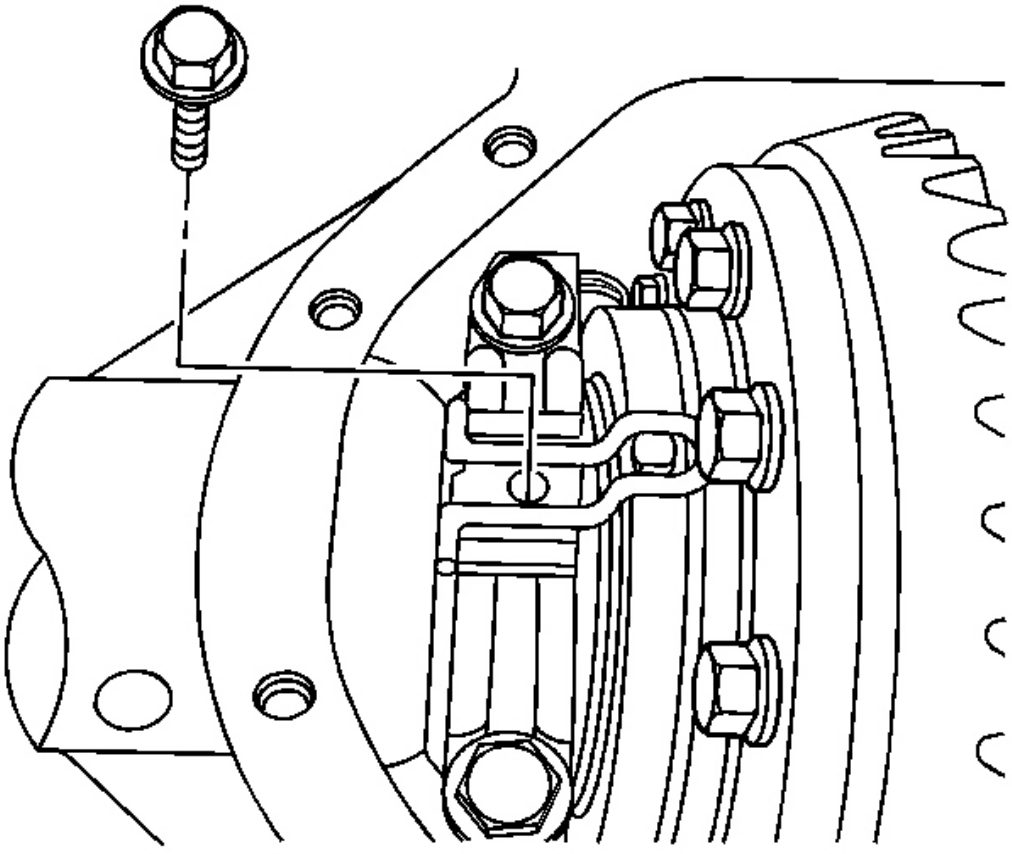


Fig. 79: Locking Differential Coil Assembly Lock Bolt
Courtesy of GENERAL MOTORS CORP.

11. Remove the locking differential coil assembly lock bolt.

    Do nut reuse the bolt.

12. Remove the locking differential coil assembly lock.

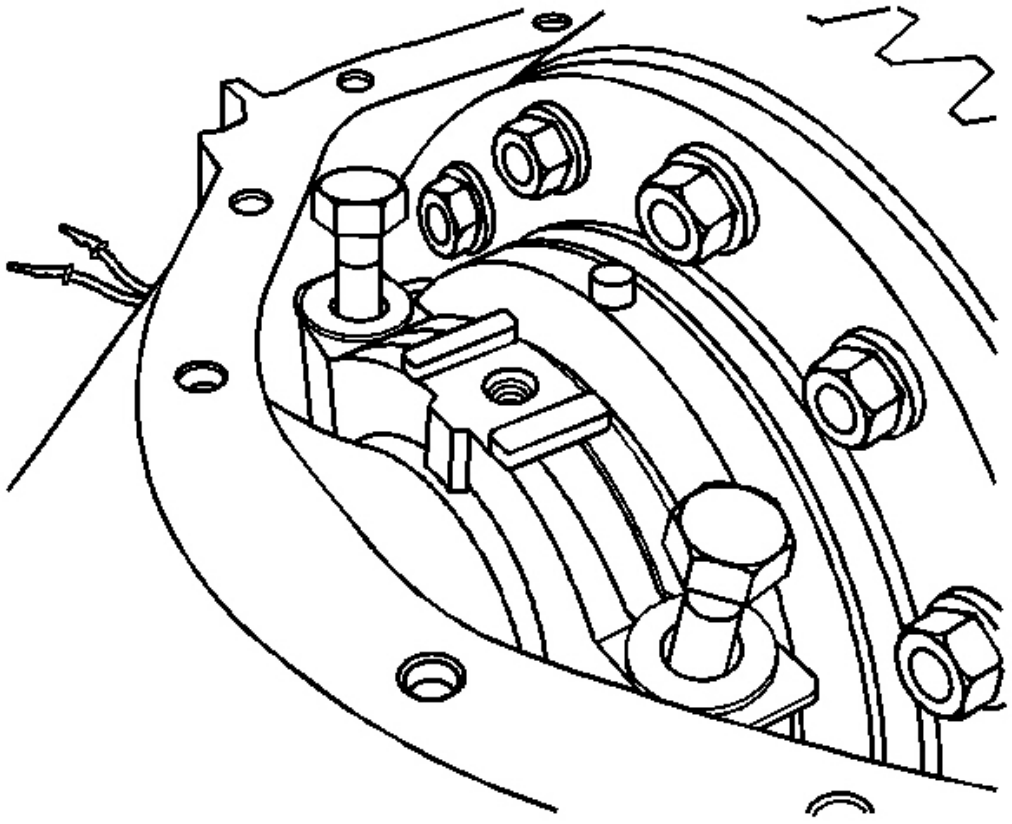


Fig. 80: Left Side Differential Bearing Bolts
Courtesy of GENERAL MOTORS CORP.

13. Remove the left side differential bearing bolts.
14. Remove the left side differential bearing cap.

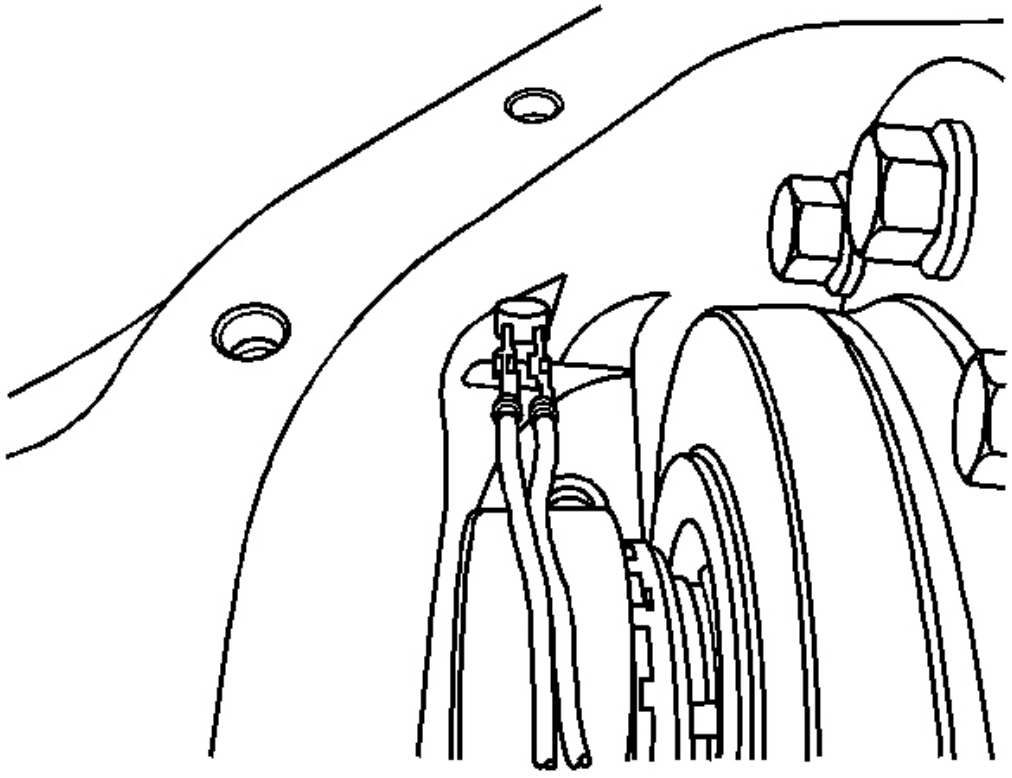


Fig. 81: Locking Differential Coil Assembly Wiring From Axle Housing
Courtesy of GENERAL MOTORS CORP.

15. Remove the locking differential coil assembly wiring from the axle housing.

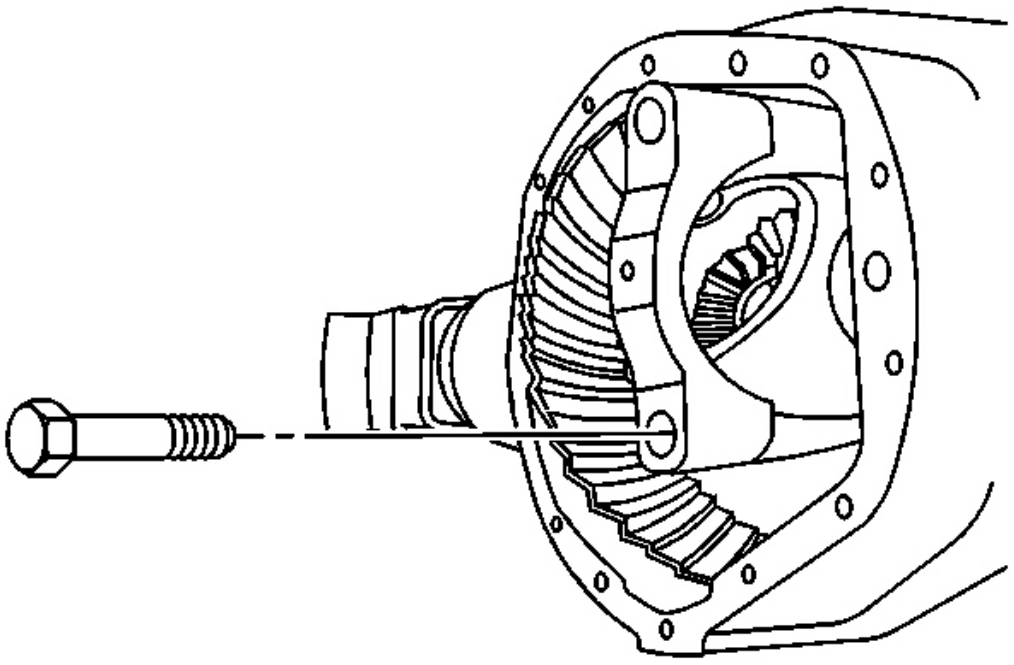


Fig. 82: Identifying Bearing Cap Bolt
Courtesy of GENERAL MOTORS CORP.

CAUTION: To prevent personal injury and/or component damage, support the differential case when removing the case from the axle housing. If the case is not supported, the differential case could fall and cause personal injury or damage to the differential case.

16. Remove the right side differential bearing cap bolts.
17. Remove the right side differential bearing cap.
18. Loosen the differential bearing adjuster nut using the **J 24429** . See **Special Tools and Equipment** .

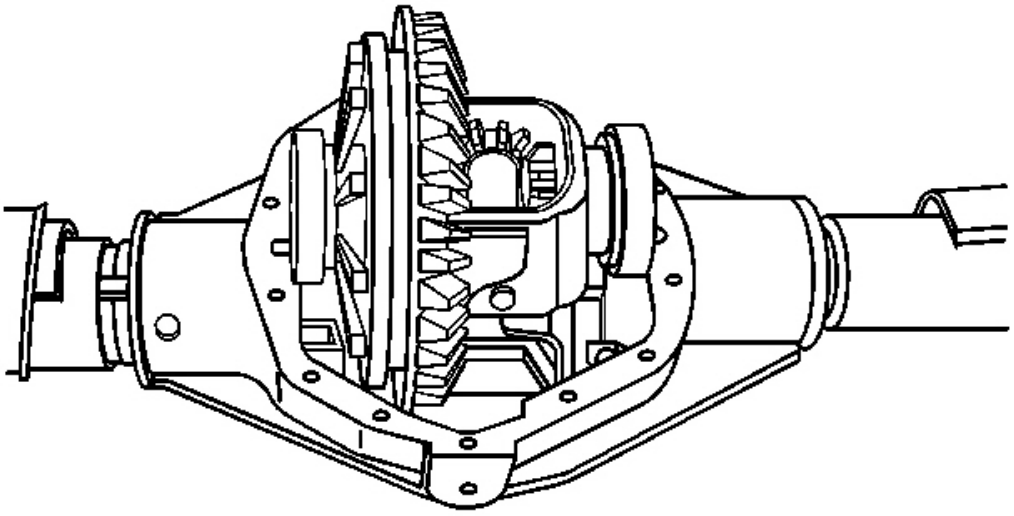


Fig. 83: Differential Case & Axle Housing
Courtesy of GENERAL MOTORS CORP.

NOTE: When removing the differential case from the axle housing, do not damage the cover gasket surface. If the cover gasket surface is damaged, lubricant may leak from the axle and cause premature failure of the axle assembly.

19. Remove the differential assembly.
20. Remove the shim and the differential side bearing cups.

    Mark the differential side bearing cups left and right. Place the differential side bearing cups with the differential bearing caps.

21. Remove the differential side bearings, if necessary. Refer to **Differential Side Bearings Replacement** .
22. Remove the ring gear, if necessary. Refer to **Drive Pinion and Ring Gear Replacement** .

Installation Procedure

1. Install the ring gear, if necessary. Refer to **Drive Pinion and Ring Gear Replacement** .
2. Install the differential side bearings, if necessary. Refer to **Differential Side Bearings Replacement** .
3. Lubricate the differential side bearings with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

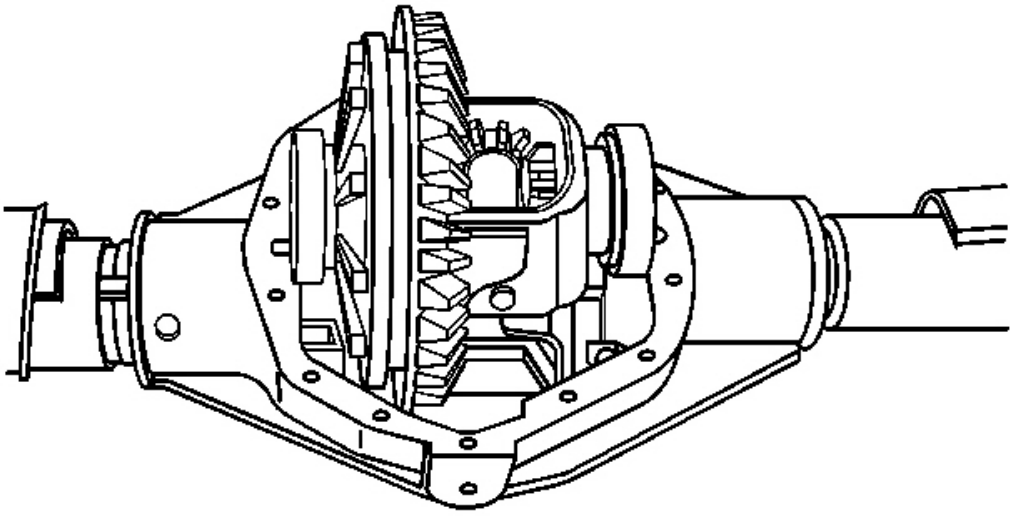


Fig. 84: Differential Case & Axle Housing
Courtesy of GENERAL MOTORS CORP.

4. Install the differential assembly into the axle housing by performing the following steps:
    1. Position the locking differential coil assembly wiring harness towards the rear axle housing cover, parallel to the drive pinion.
    2. Place the case, with the bearing cups installed, into the axle housing.

       Support the case in order to keep the case from falling out of the axle housing.

    3. If the differential assembly cannot be installed, turn the differential side bearing adjuster nut into the axle housing until the differential assembly can be installed.
    4. Route the wiring of the locking differential coil assembly away from the left side differential bearing cap mounting surface.

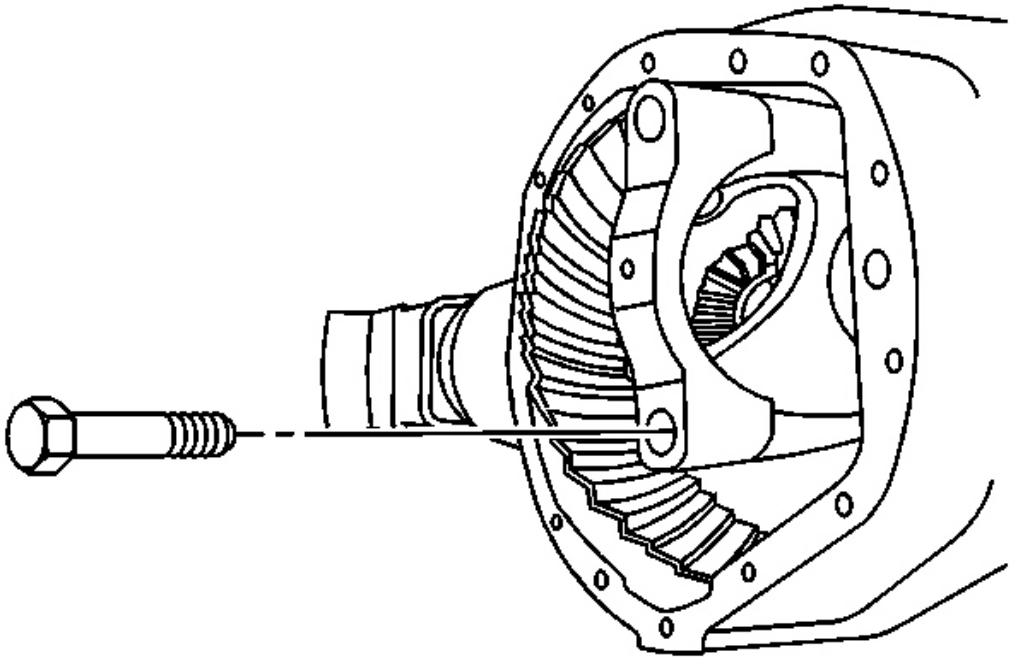


Fig. 85: Identifying Bearing Cap Bolt
Courtesy of GENERAL MOTORS CORP.

5. Install the bearing caps and the bolts.

   Do not torque the bearing cap bolts at this time.

6. Adjust the differential side bearing preload. Refer to **Differential Side Bearing Preload Adjustment** .
7. Adjust the backlash. Refer to **Backlash Adjustment** .
8. Once backlash and bearing preload is correct, perform a gear tooth contact pattern check in order to ensure proper alignment between the ring and pinion gears. Refer to **Gear Tooth Contact Pattern Inspection** .

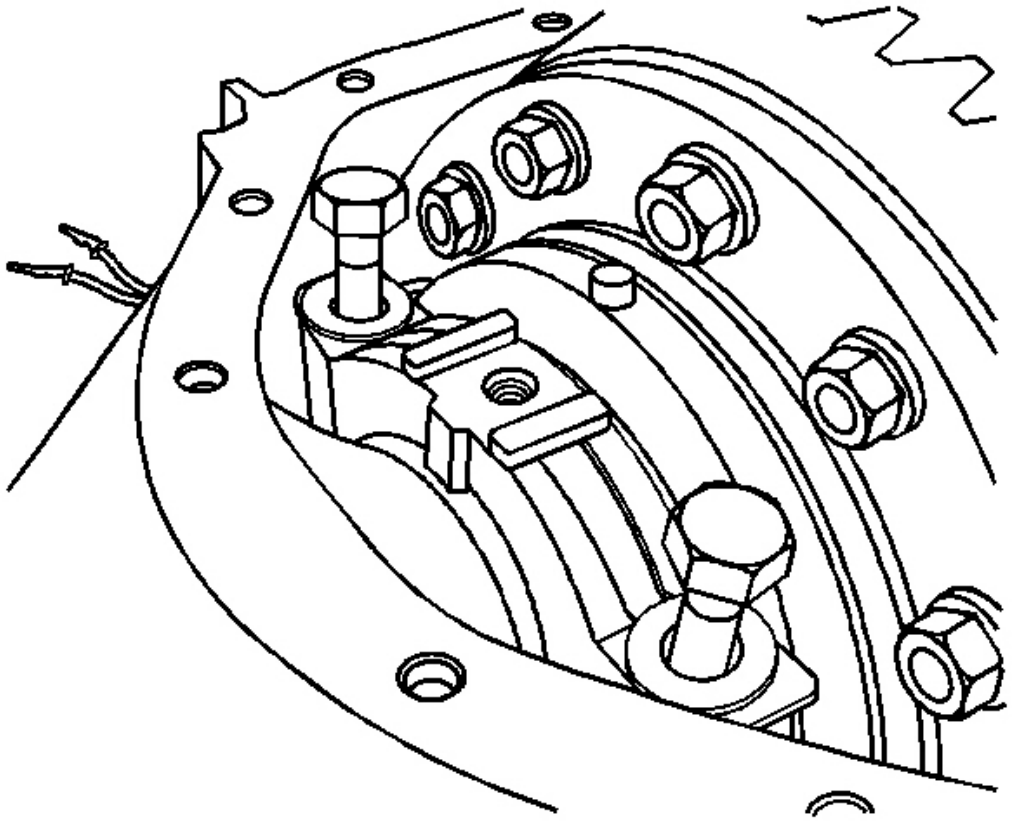


Fig. 86: Left Side Differential Bearing Bolts
Courtesy of GENERAL MOTORS CORP.

9. Remove the left side bearing cap bolts.
10. Remove the left side bearing cap.
11. Rotate the locking differential coil assembly wiring harness towards the top of the axle housing in order to align the locking differential coil assembly lock tab with the top of the differential bearing cap.

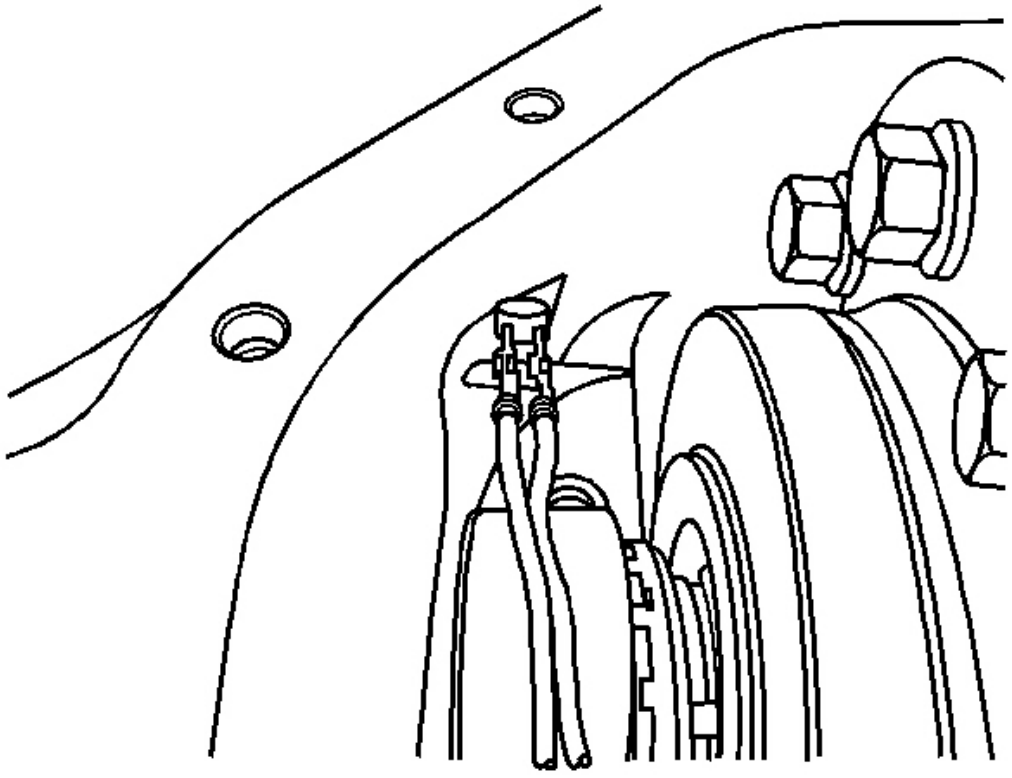


Fig. 87: Locking Differential Coil Assembly Wiring From Axle Housing
Courtesy of GENERAL MOTORS CORP.

12. Install the locking differential coil assembly wiring through the axle housing opening.

    Push the wiring grommet through the axle housing opening until fully seated.

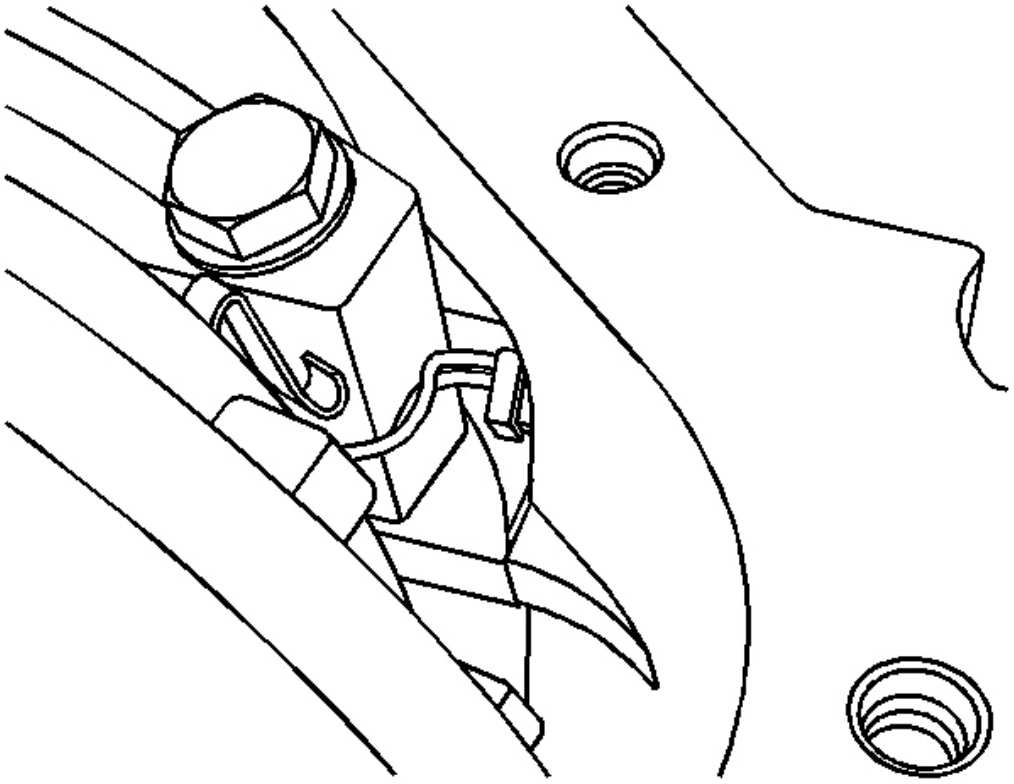


Fig. 88: Left Side Differential Bearing Cap Bolts
Courtesy of GENERAL MOTORS CORP.

13. Install the left side differential bearing cap.

    Route the locking differential coil assembly wires around the differential bearing cap.

14. Install the left side differential bearing cap bolts.

    NOTE: Refer to Fastener Notice in Cautions and Notices.

15. Tighten the bearing cap bolts.

    Tighten: Tighten the bearing cap bolts to 85 N.m (63 lb ft).

16. Install the locking differential coil assembly lock.

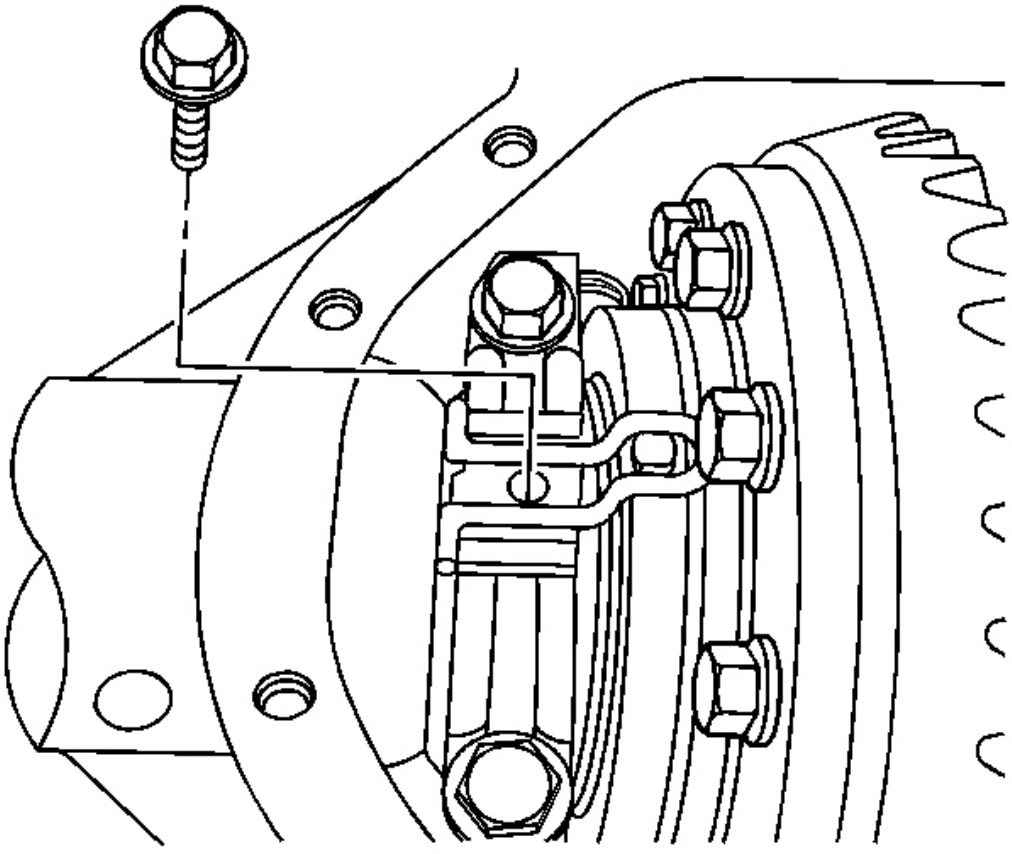


Fig. 89: Locking Differential Coil Assembly Lock Bolt
Courtesy of GENERAL MOTORS CORP.

17. Install the new locking differential coil assembly lock bolt.

    Tighten: Tighten the locking differential coil assembly lock bolt to 26 N.m (19 lb ft).

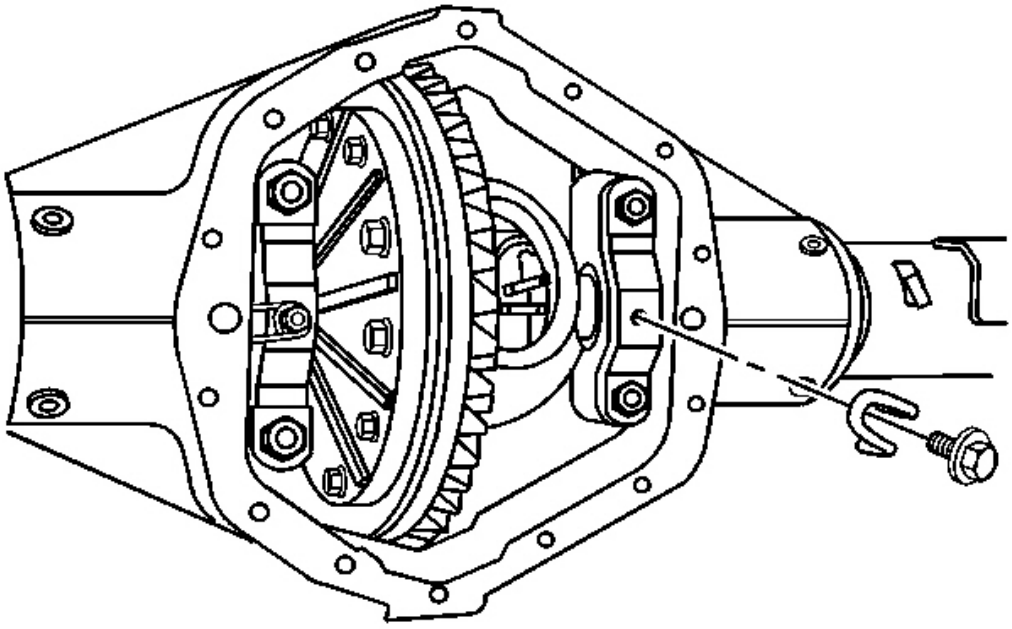


Fig. 90: Right Side Differential Bearing Adjuster Nut Lock
Courtesy of GENERAL MOTORS CORP.

18. Install the right side differential bearing adjuster nut lock.
19. Install the differential bearing adjuster nut lock bolt.

Tighten: Tighten the differential bearing adjuster nut lock bolt to 26 N.m (19 lb ft).

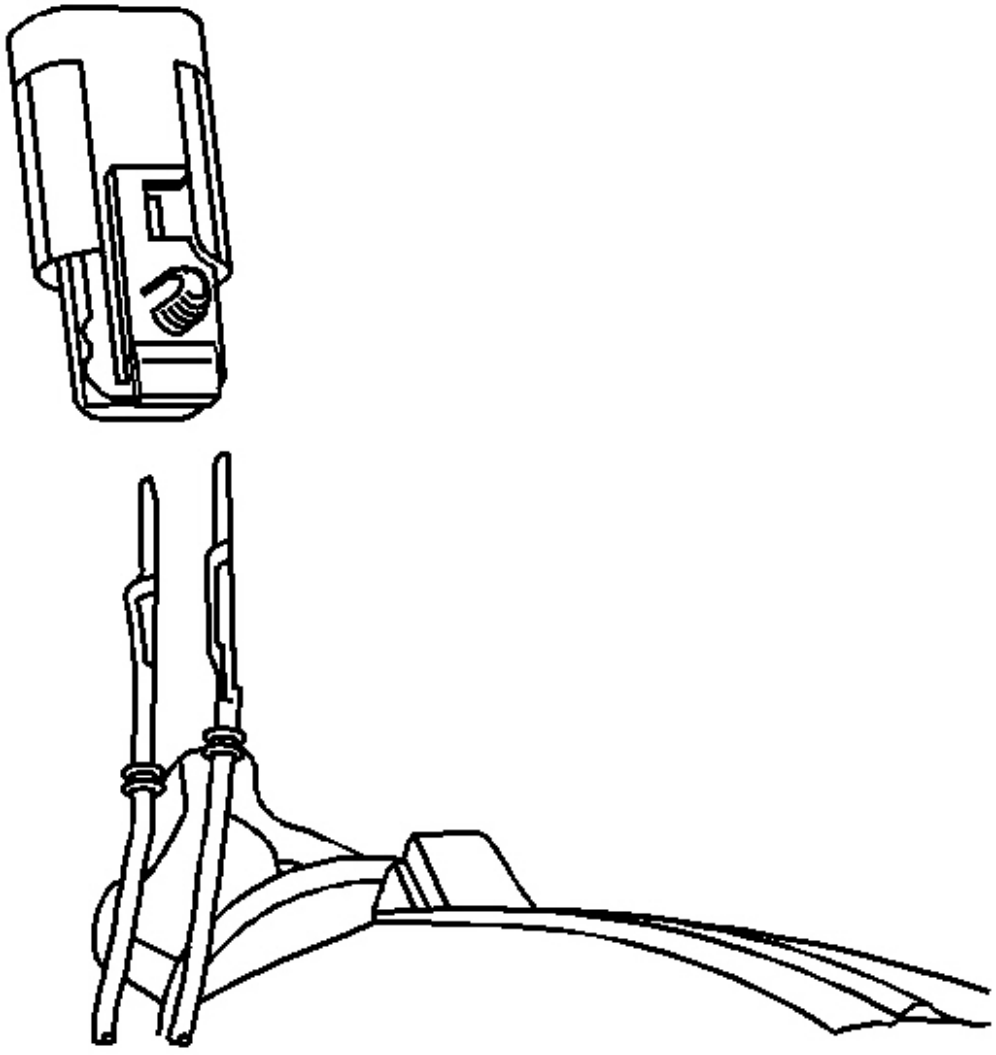


Fig. 91: Electronic Locking Differential Coil Connector Housing
Courtesy of GENERAL MOTORS CORP.

20. Install the locking differential coil assembly wires to the locking differential coil connector.

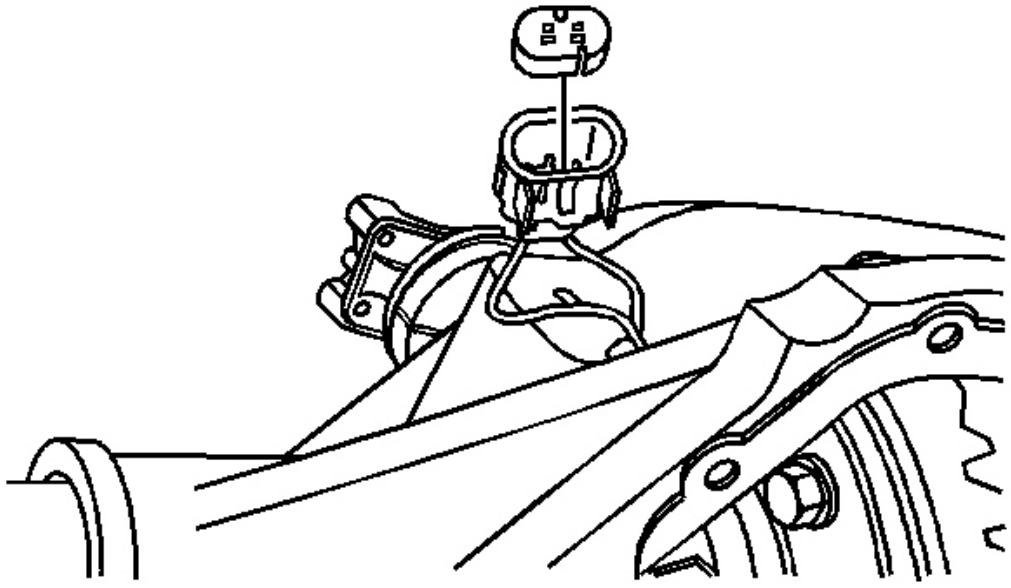


Fig. 92: Positive Terminal Lock Reinforcer
Courtesy of GENERAL MOTORS CORP.

21. Install the positive terminal lock reinforcer.
22. Connect the locking differential coil connector to the wire harness.
23. Install the axle shafts. Refer to **Rear Axle Shaft Replacement** .
24. Install the rear axle housing cover and a new gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
25. Install the brake calipers. Refer to **Brake Caliper Replacement - Rear** in Disc Brakes.
26. Install the tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
27. Fill the axle with lubricant. Use the proper fluid. Refer to **Lubricant Replacement - Rear Drive Axle** .
28. Lower the vehicle.

DIFFERENTIAL SIDE BEARINGS REPLACEMENT

Tools Required

- **J 22912-01** Split Plate Bearing Puller
- **J 29710** Differential Side Bearing Installer
- **J 36597** Side Bearing Puller Pilot - 9.25 inch Axle

- **J 45766** Differential Side Bearing Remover. See **Special Tools and Equipment** .
- **J 8092** Universal Driver Handle - 3/4 in - 10
- **J 8433** Two Jaw Puller. See **Special Tools and Equipment** .

Removal Procedure

1. Remove the differential assembly. Refer to **Differential Replacement** .

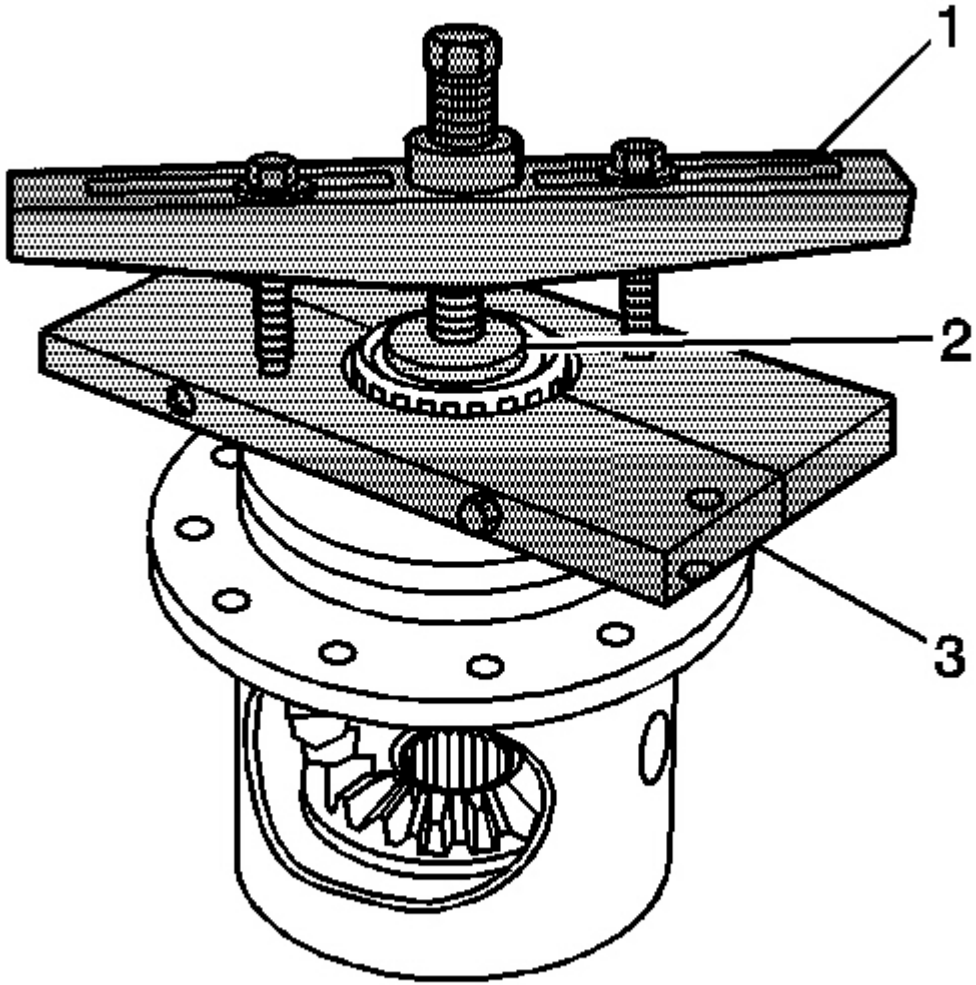


Fig. 93: Removing Left Side Differential Side Bearing
Courtesy of GENERAL MOTORS CORP.

2. Remove the left side differential side bearing by performing the following steps:
    1. Install the **J 45766** (3), **J 36597** (2), and the **J 8433** (1) as shown. See **Special Tools and Equipment** .
    2. Mount the **J 8433** into a vise. See **Special Tools and Equipment** .
    3. Remove the differential side bearing by turning the J 8433-3 clockwise.

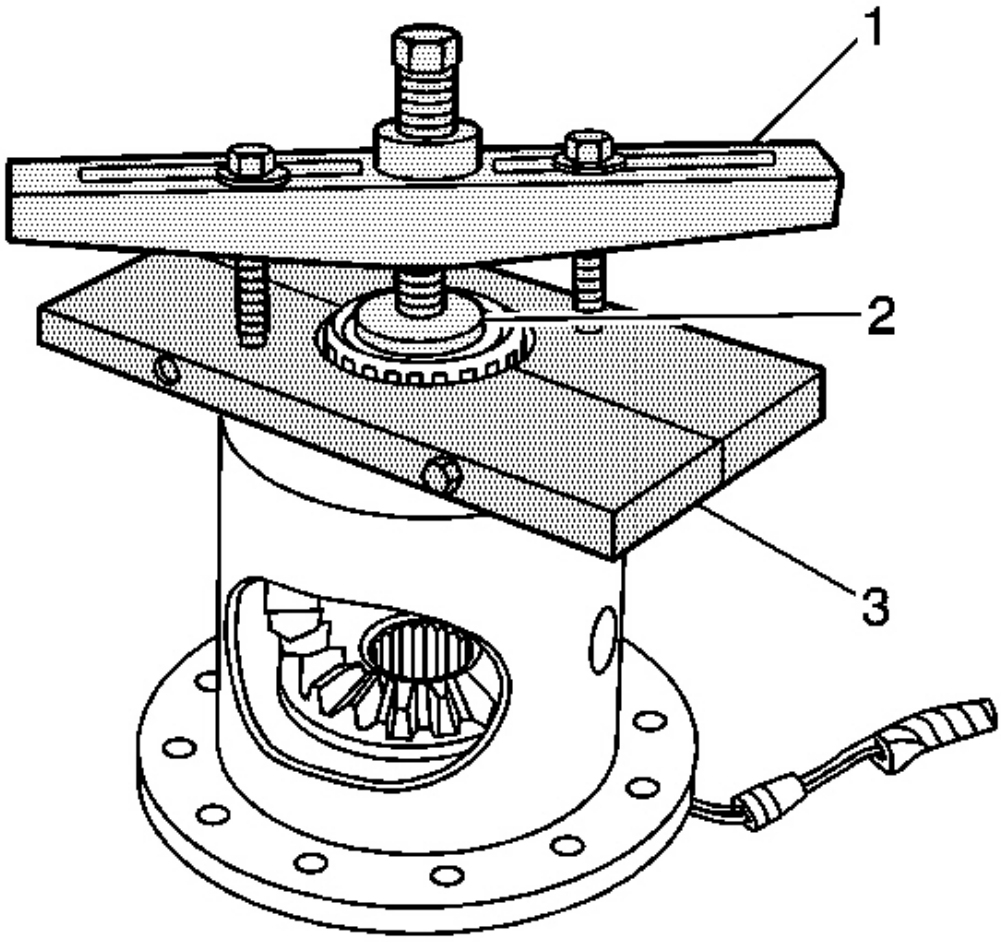


Fig. 94: Removing Right Side Differential Side Bearing
Courtesy of GENERAL MOTORS CORP.

3. Remove the right side differential side bearing by performing the following steps:
    1. Install the **J 45766** (3), **J 36597** (2), and the **J 8433** (1) as shown. See **Special Tools and Equipment** .

2. Mount the **J 8433** into a vise. See **Special Tools and Equipment** .
3. Remove the differential side bearing by turning the J 8433-3 clockwise.

Installation Procedure

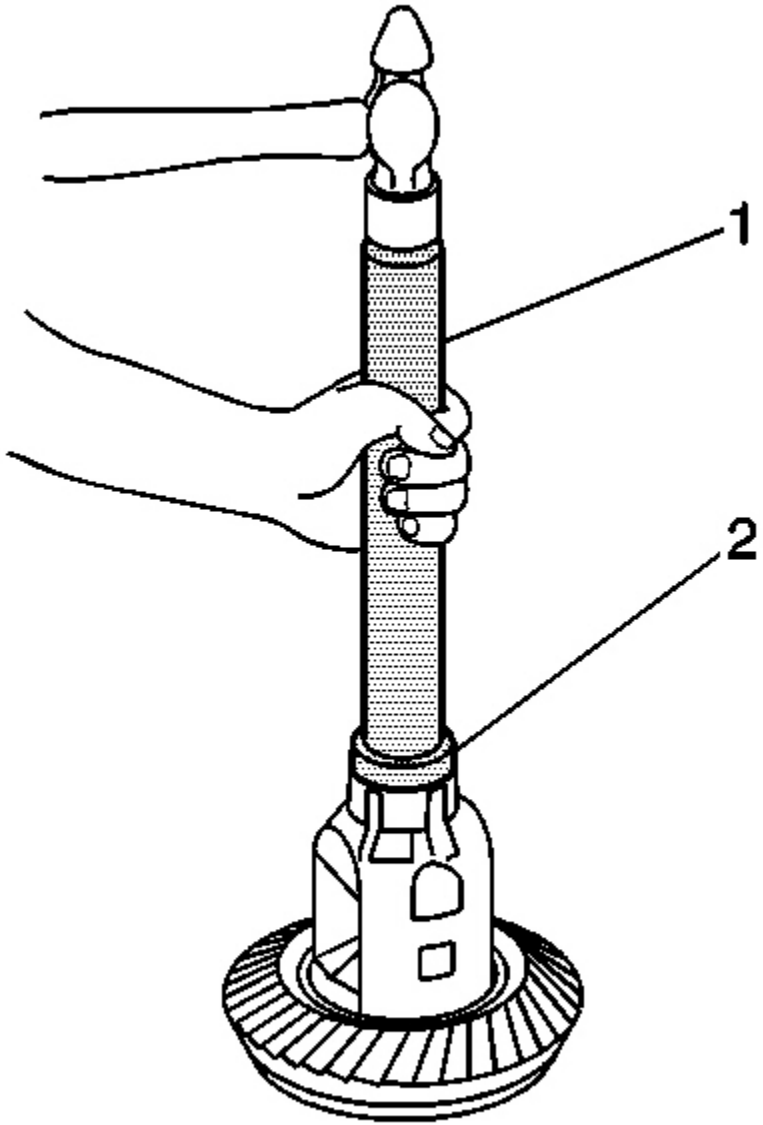


Fig. 95: Installing Differential Side Bearings
Courtesy of GENERAL MOTORS CORP.

1. Install the differential side bearings by doing the following:
    1. In order to protect the differential case, install the **J 36597** in the case on the side opposite the bearing installation.
    2. Install the **J 29710** (2) and the **J 8092** (1) onto the differential case bearing as shown.
    3. Drive the bearing onto the case using the **J 29710** and the **J 8092** .
2. Install the differential assembly. Refer to **Differential Replacement** .

REAR AXLE REPLACEMENT

Removal Procedure

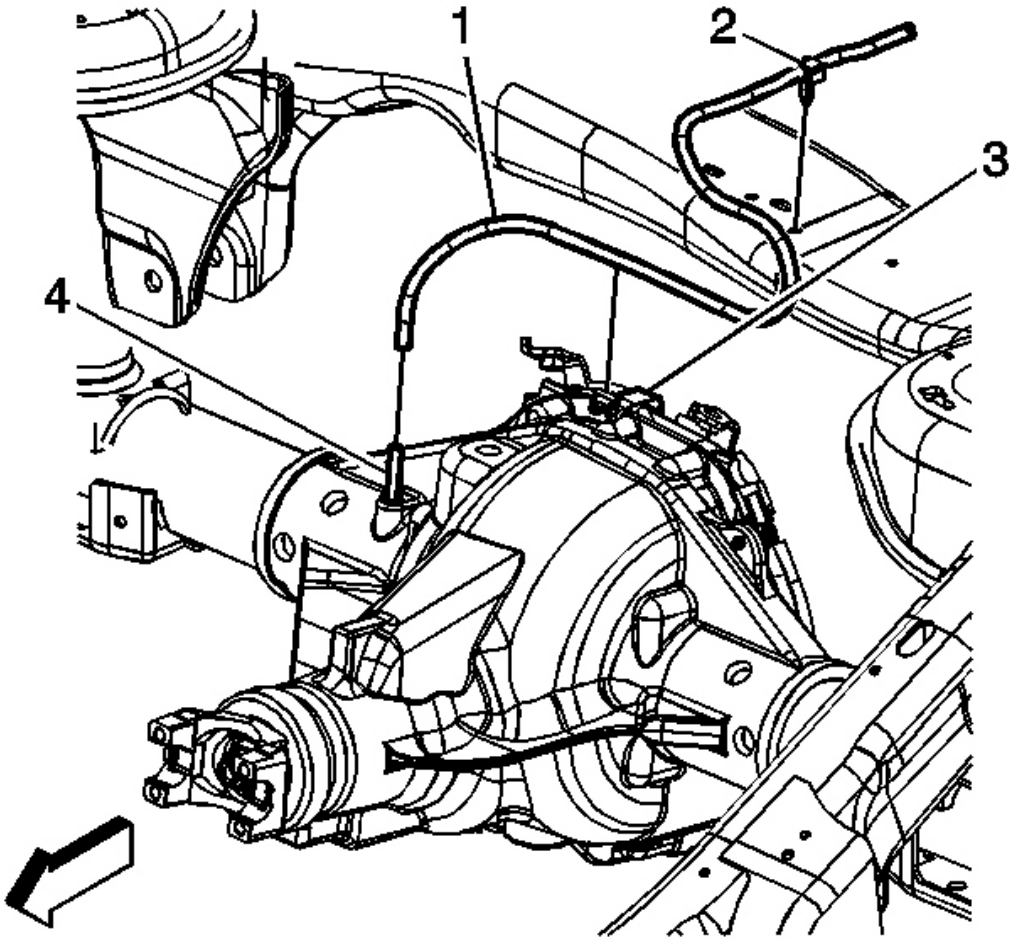


Fig. 96: Rear Axle Vent Hose & Vent Tube
Courtesy of GENERAL MOTORS CORP.

1. Depressurize the air suspension system, if equipped. Refer to **Air Suspension Depressurization Procedure** in Air Suspension.
2. Disable the park brake cable automatic adjuster. Refer to **Disabling the Park Brake Cable Automatic Adjuster** in Park Brake.
3. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
4. Place jack stands at the front of the vehicle.
5. Support the rear axle with jack stands.
6. Remove the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
7. Disconnect the rear axle vent tube (1).
8. Remove the rear propeller shaft. Refer to **Propeller Shaft Replacement - Rear** in Propeller Shaft.

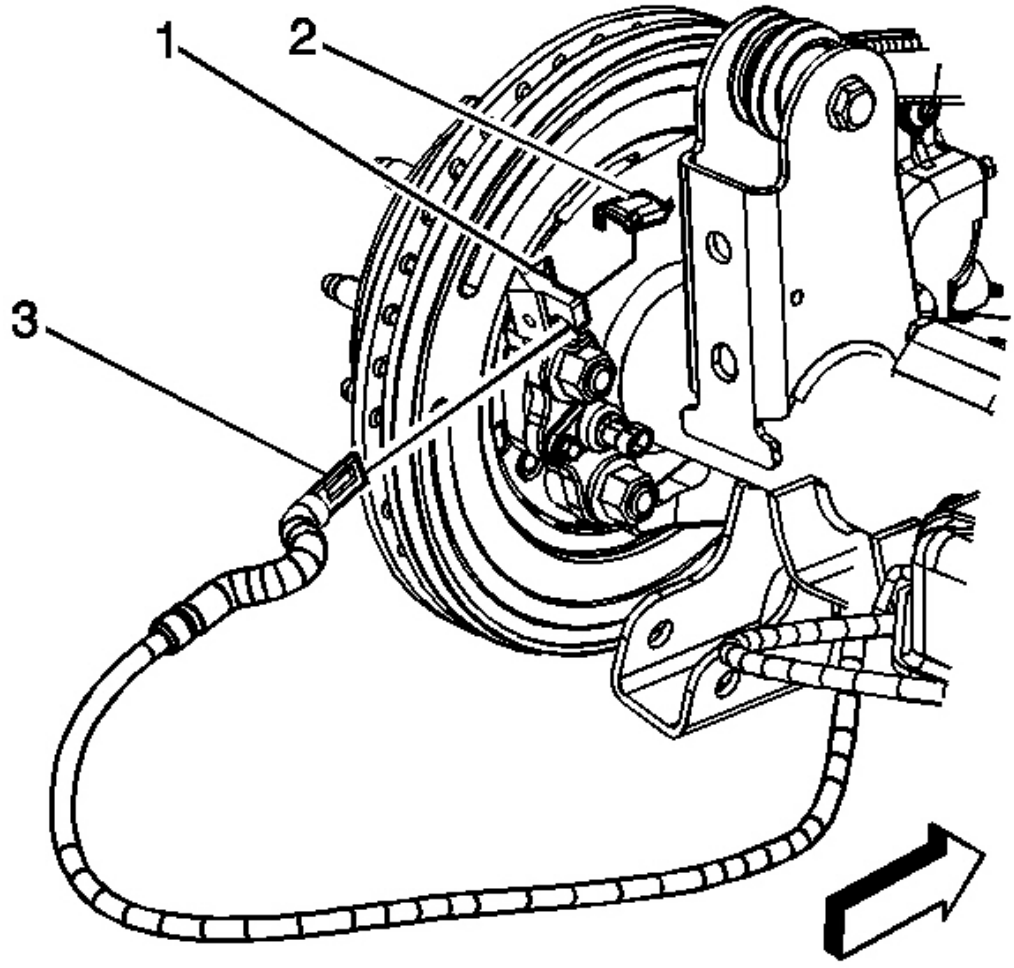


Fig. 97: Left-Rear Park Brake Cable, Backing Plate, Park Brake Actuator & Cable Guide
Courtesy of GENERAL MOTORS CORP.

9. Disconnect the left-rear park brake cable (3) from the backing plate (1), the park brake actuator (2), and the cable guide at the rear axle.

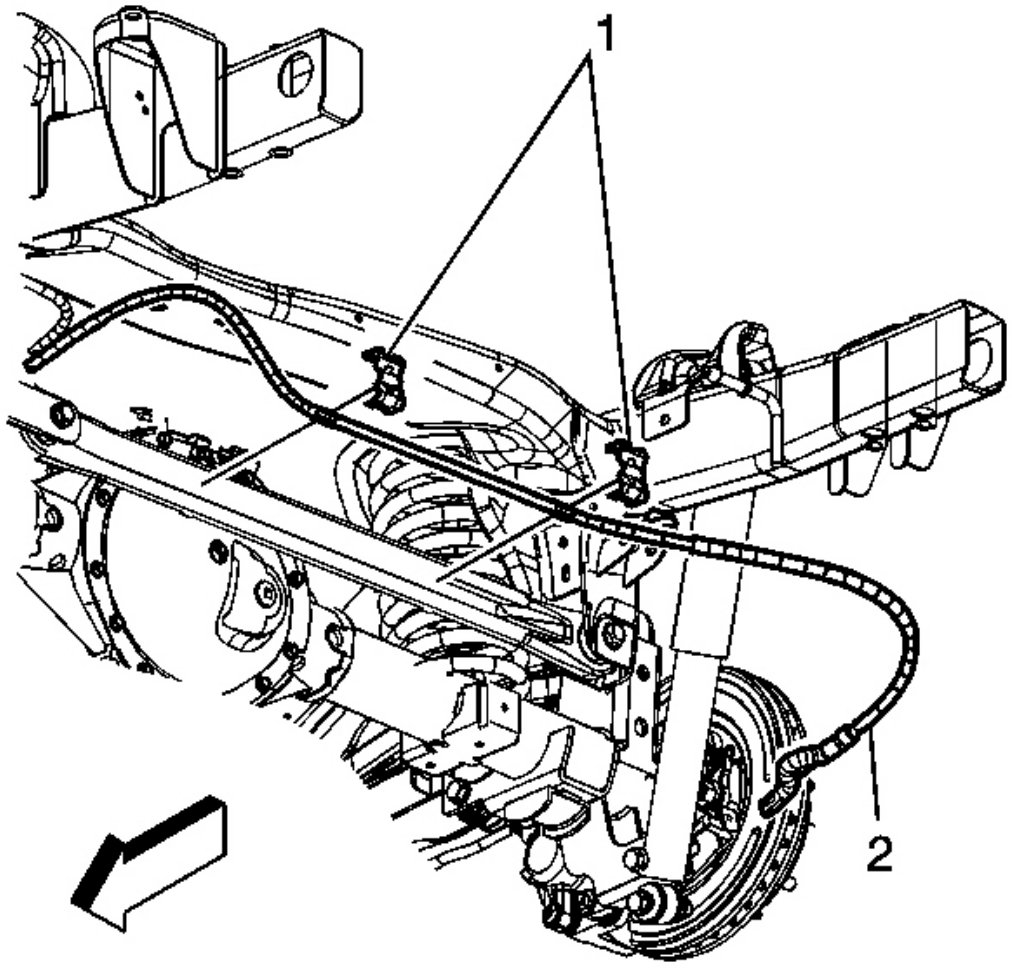


Fig. 98: Right-Rear Park Brake Cable, Backing Plate, Park Brake Actuator & Cable Guide
Courtesy of GENERAL MOTORS CORP.

10. Remove the park brake cable clips (1) from the track bar.
11. Disconnect the right-rear park brake cable (2) from the backing plate, the park brake actuator, and from the cable guide at the rear axle.

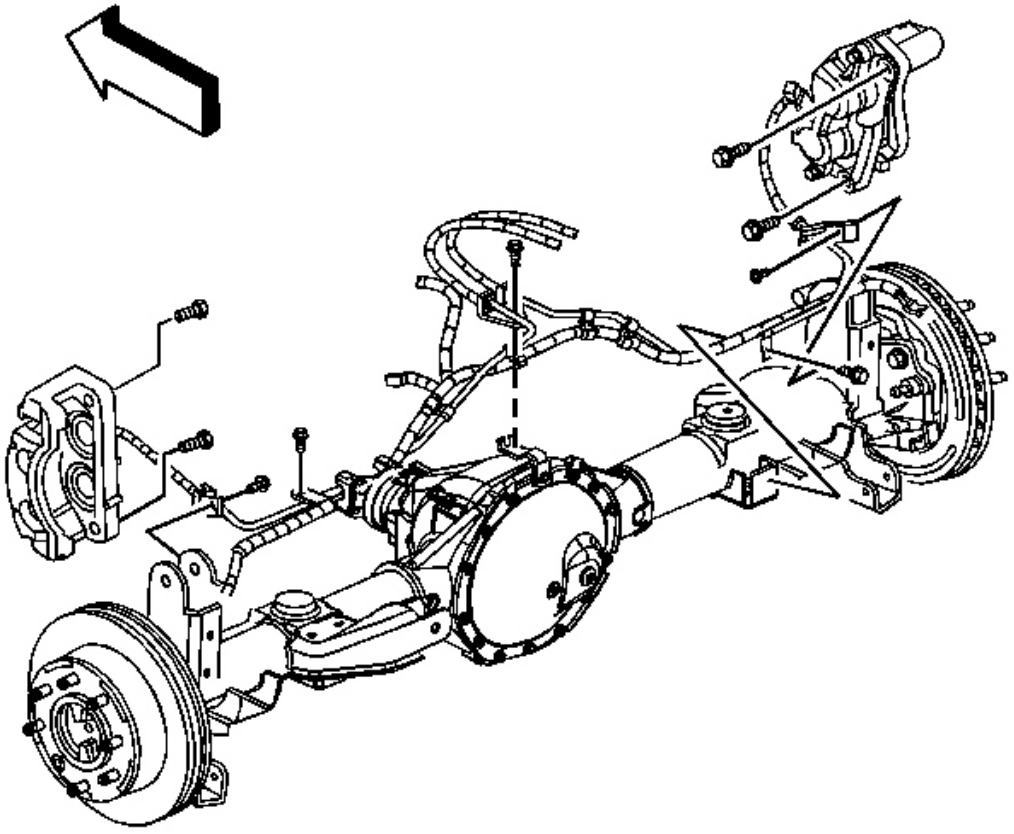


Fig. 99: Brake Crossover Pipe, Wheel Speed Sensor Harness & Electronic Locker Harness
Courtesy of GENERAL MOTORS CORP.

12. Remove the brake crossover pipe bracket bolt.
13. Remove the brake crossover pipe, wheel speed sensor harness, and electronic locker harness from the rear axle and secure them to the body or frame.

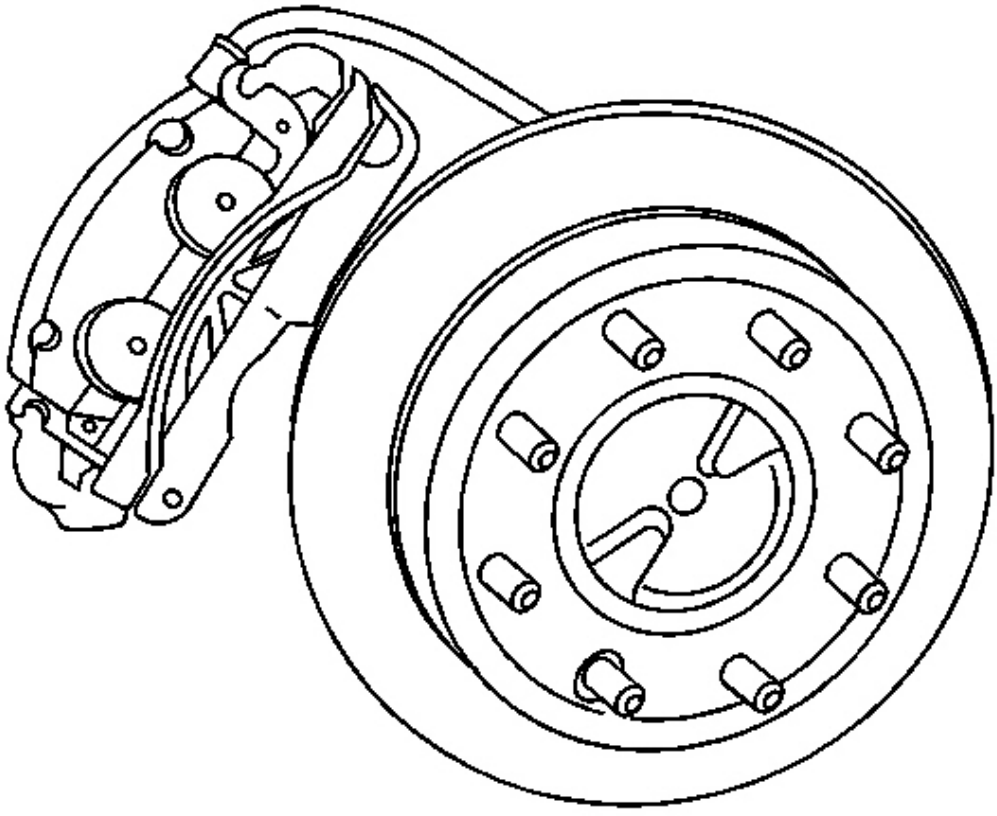


Fig. 100: Brake Caliper & Bracket - Rear (Except Dual Wheels or NYS)
Courtesy of GENERAL MOTORS CORP.

NOTE: Support the brake caliper with heavy mechanic's wire, or equivalent, whenever it is separated from its mount and the hydraulic flexible brake hose is still connected. Failure to support the caliper in this manner will cause the flexible brake hose to bear the weight of the caliper, which may cause damage to the brake hose and in turn may cause a brake fluid leak.

14. Remove the brake caliper and bracket assemblies from the rear axle and support them with heavy mechanics wire or equivalent. DO NOT disconnect the hydraulic brake flexible hose from the caliper.

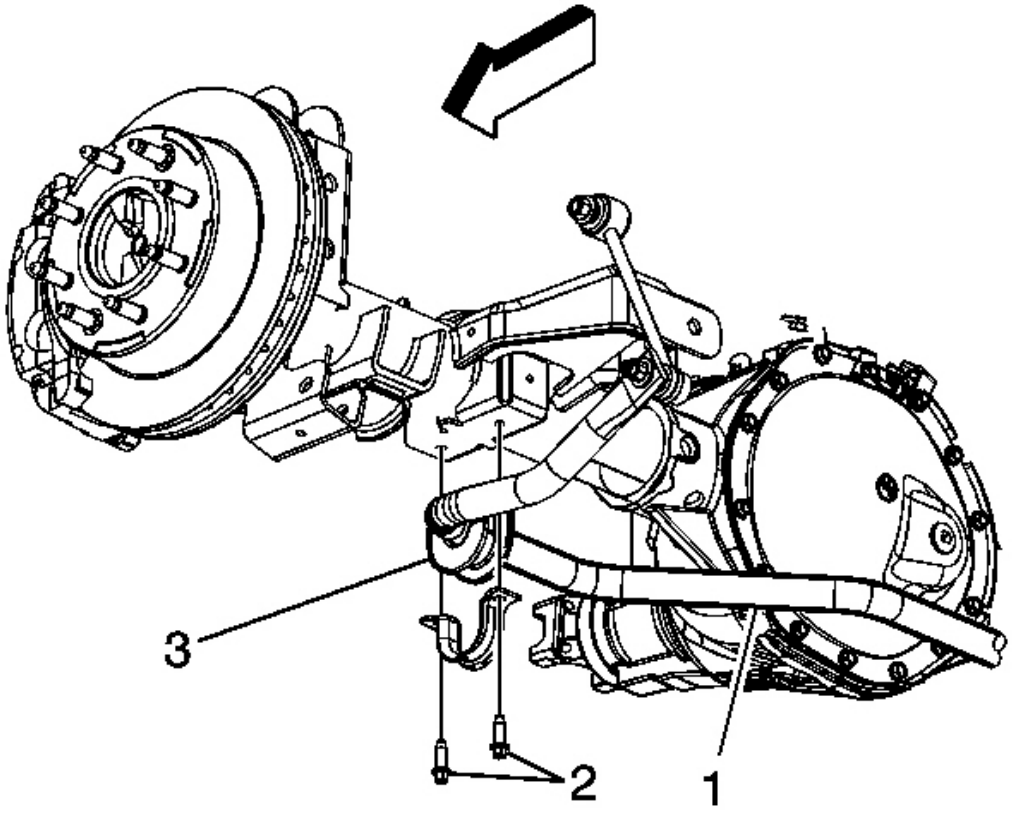


Fig. 101: Rear Stabilizer Shaft Insulator Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

15. Remove the rear stabilizer shaft insulator bracket bolts (2) from the rear axle.
16. Pivot the stabilizer shaft (1) to the rear and secure it out of the way.

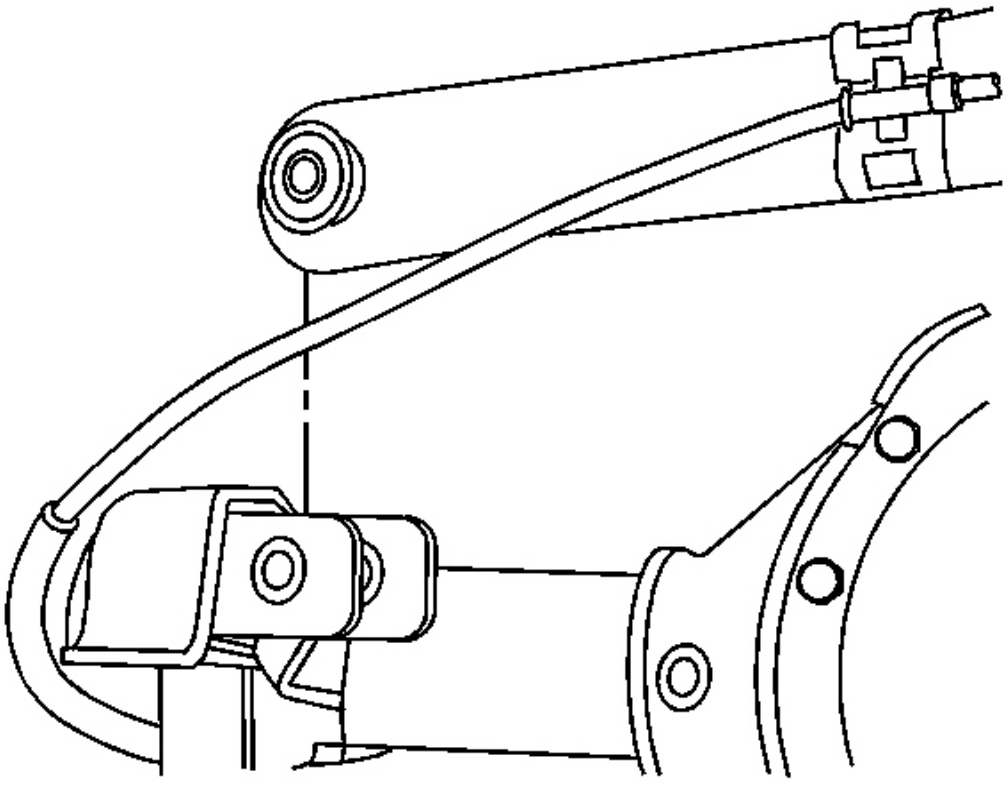


Fig. 102: Track Bar & Rear Axle
Courtesy of GENERAL MOTORS CORP.

17. Disconnect the track bar from the rear axle and suspend it out of the way.
18. Disconnect the lower control arms from the rear axle. Refer to **Rear Axle Lower Control Arm Replacement** in Rear Suspension.
19. Disconnect the upper control arms from the rear axle. Refer to **Rear Axle Upper Control Arm Replacement** in Rear Suspension.
20. Remove the lower shock nuts and bolts from the rear axle shock bracket.
21. Remove the coil springs, if equipped. Refer to **Coil Spring Replacement** in Rear Suspension.

    If equipped with air suspension, the air springs will remain attached to the frame and will not need to be removed.

22. Remove the rear axle assembly from the vehicle.

Installation Procedure

1. Install the rear axle assembly to the vehicle.
2. Install the coil springs, if equipped. Refer to **Coil Spring Replacement** in Rear Suspension.

   If equipped with air suspension, ensure that the air springs are seated properly on the rear axle.

   NOTE: Refer to Fastener Notice in Cautions and Notices.

3. Position the bottoms of the rear shocks in the rear axle shock brackets and install the lower shock bolts and nuts.

   Tighten: Tighten the nuts to 105 N.m (77 lb ft).

4. Connect the upper control arms to the rear axle. Refer to **Rear Axle Upper Control Arm Replacement** in Rear Suspension.
5. Connect the lower control arms to the rear axle. Refer to **Rear Axle Lower Control Arm Replacement** in Rear Suspension.

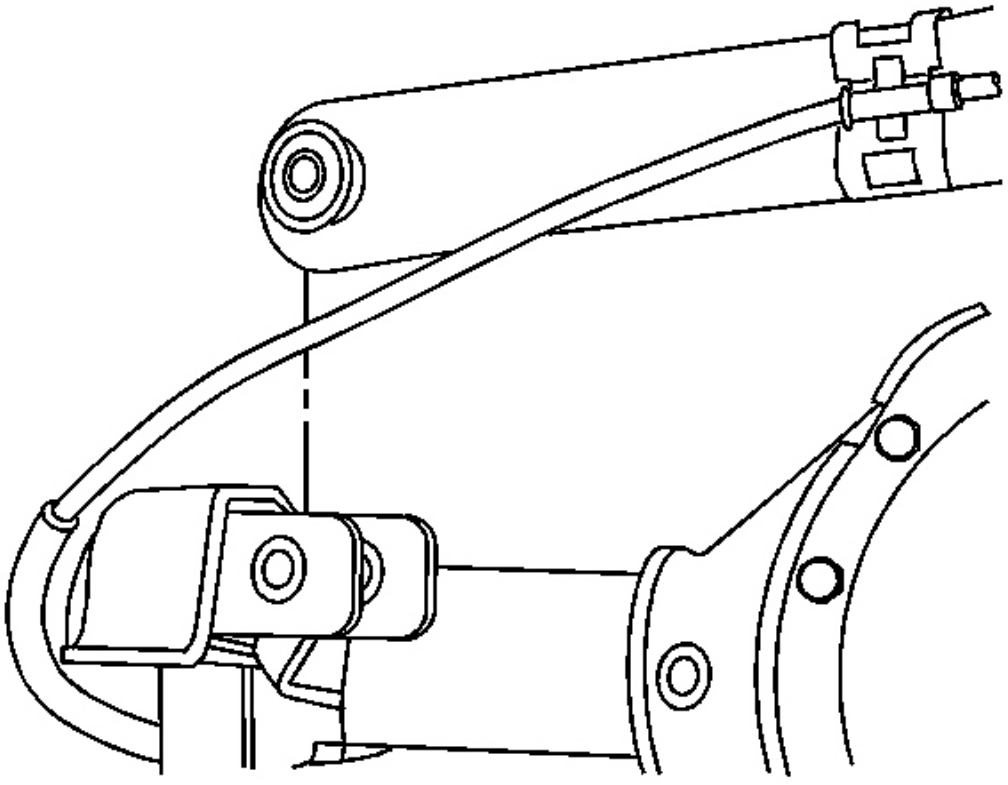


Fig. 103: Track Bar & Rear Axle
Courtesy of GENERAL MOTORS CORP.

6. Position the track bar in the bracket and install the bolt and nut.

   Tighten: Tighten the nut to 105 N.m (77 lb ft).

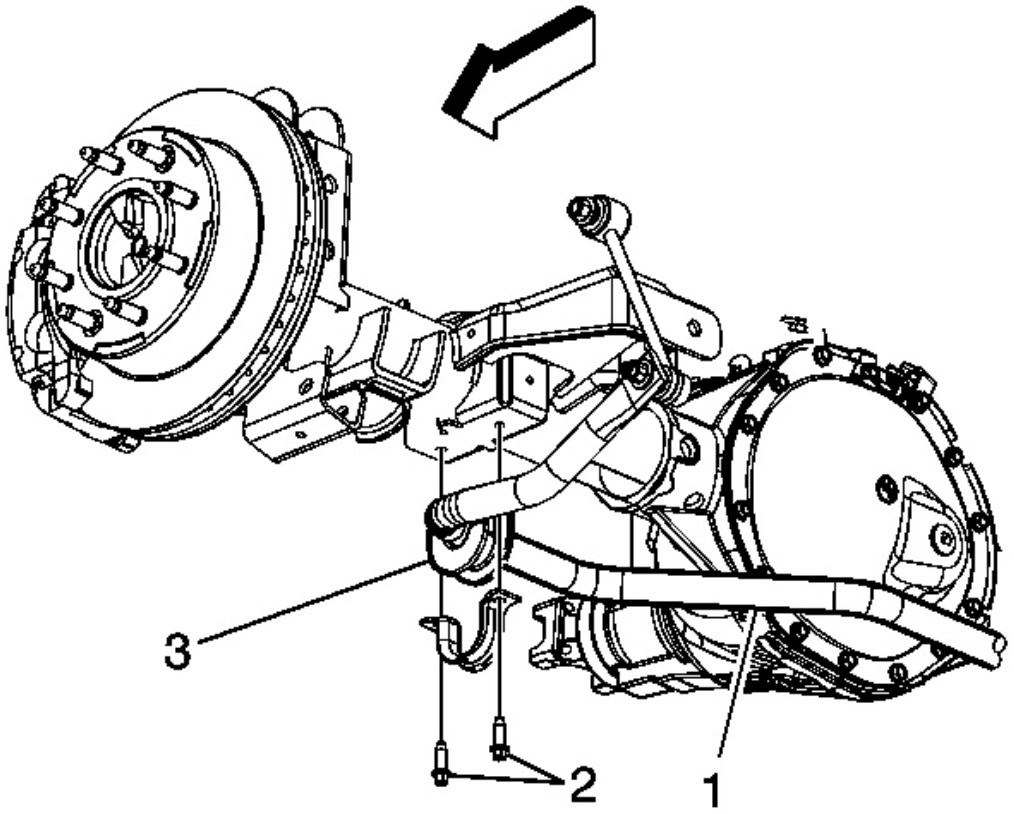


Fig. 104: Rear Stabilizer Shaft Insulator Bracket Bolts
Courtesy of GENERAL MOTORS CORP.

7. Pivot the stabilizer shaft (1) forward and position the insulator brackets to the rear axle.
8. Install the stabilizer shaft insulator bracket bolts (2).

   Tighten: Tighten the bolts to 33 N.m (24 lb ft).

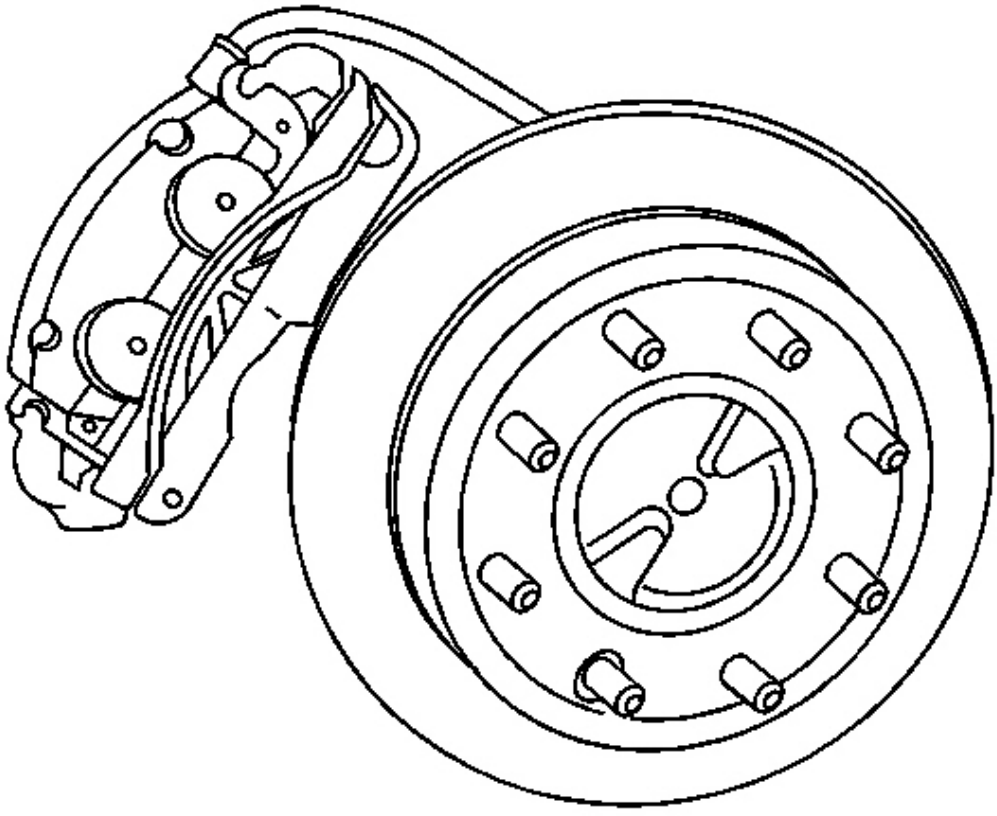


Fig. 105: Brake Caliper & Bracket - Rear (Except Dual Wheels or NYS)
Courtesy of GENERAL MOTORS CORP.

9. Install the caliper and bracket assemblies to the rear axle.

   Tighten: Tighten the brake caliper bracket bolts to 165 N.m (122 lb ft).

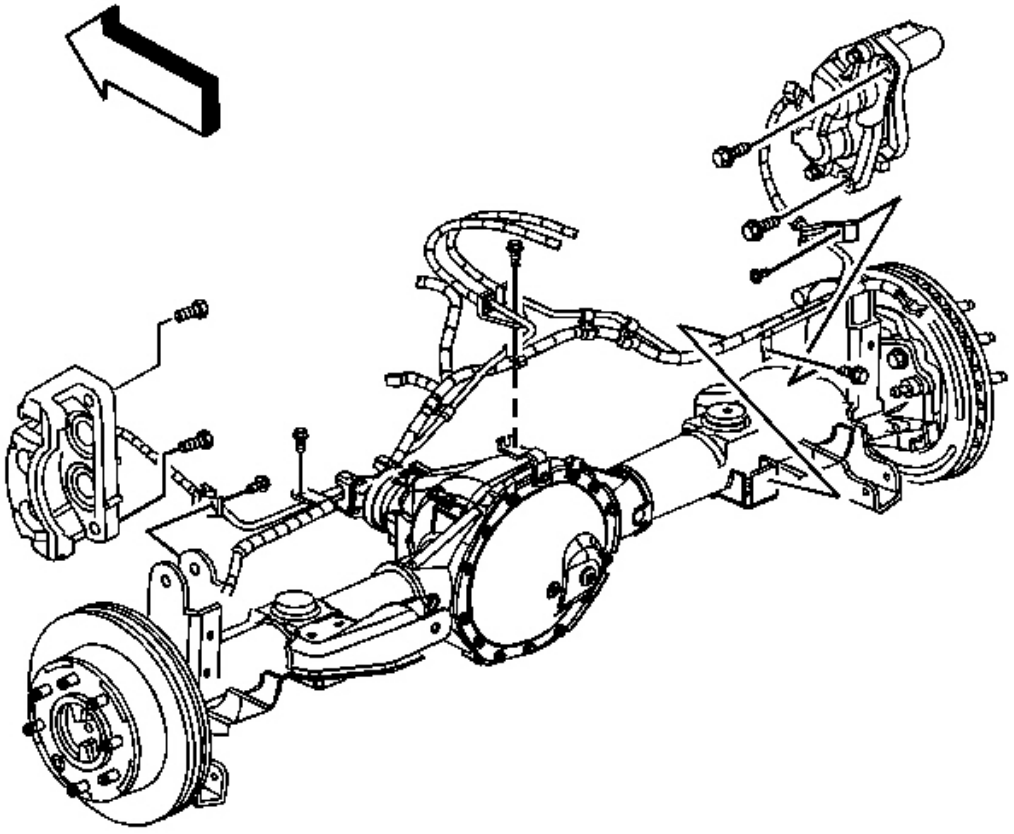


Fig. 106: Brake Crossover Pipe, Wheel Speed Sensor Harness & Electronic Locker Harness
Courtesy of GENERAL MOTORS CORP.

10. Install the electronic locker harness, wheel speed sensor harness, and the brake crossover pipe to the rear axle.

    Tighten: Tighten the brake crossover pipe bracket bolt to 22 N.m (16 lb ft).

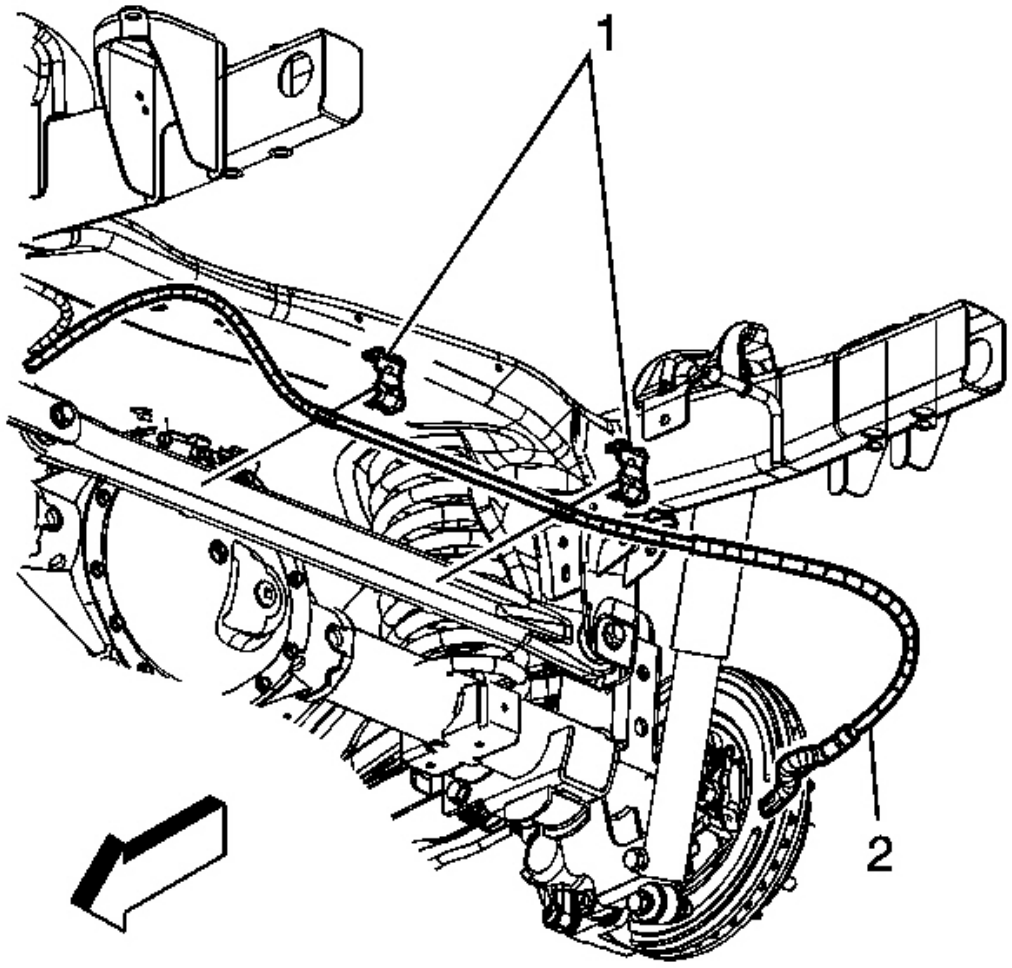


Fig. 107: Right-Rear Park Brake Cable, Backing Plate, Park Brake Actuator & Cable Guide
Courtesy of GENERAL MOTORS CORP.

11. Install the right-rear park brake cable (2) to the cable guide, the park brake actuator, and the backing plate.
12. Install the park brake cable clips (1) to the track bar.

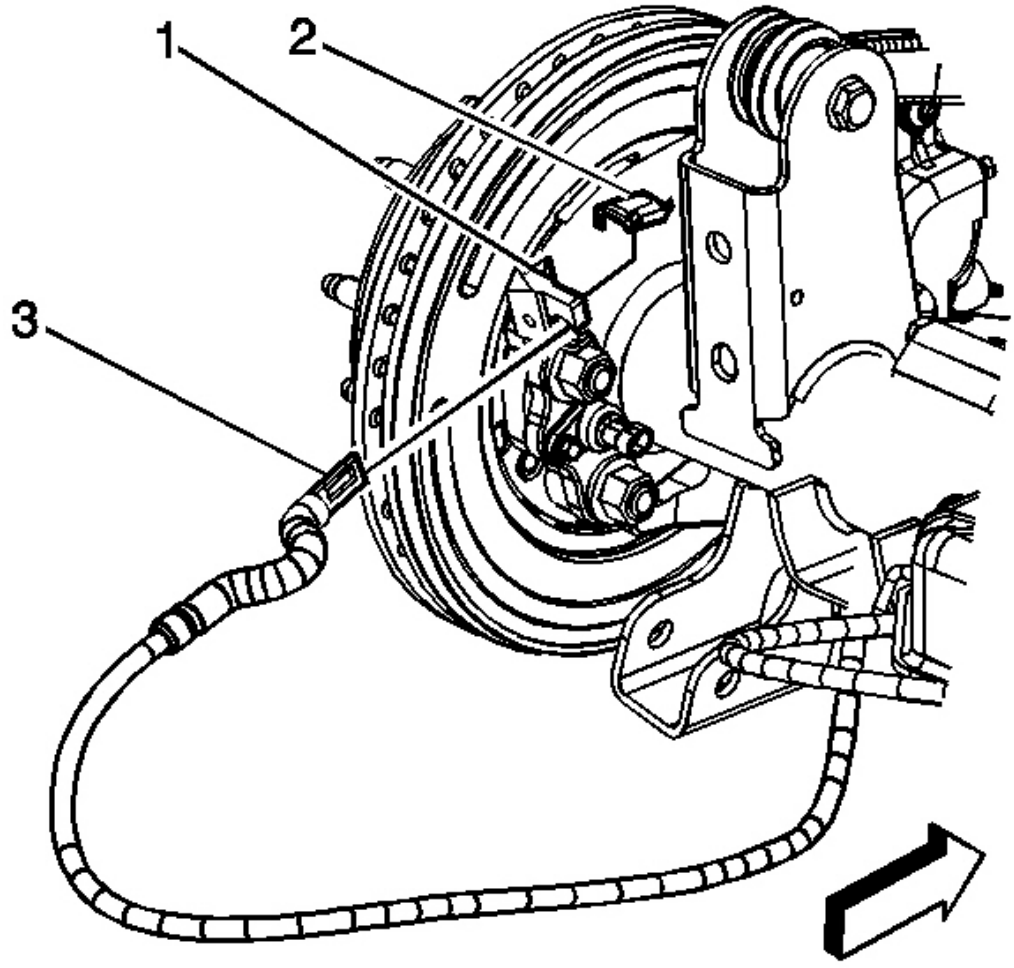


Fig. 108: Left-Rear Park Brake Cable, Backing Plate, Park Brake Actuator & Cable Guide
Courtesy of GENERAL MOTORS CORP.

13. Connect the left-rear park brake cable (3) to the cable guide, the park brake actuator (2), and the backing plate (1).
14. Install the rear propeller shaft. Refer to **Propeller Shaft Replacement - Rear** in Propeller Shaft.

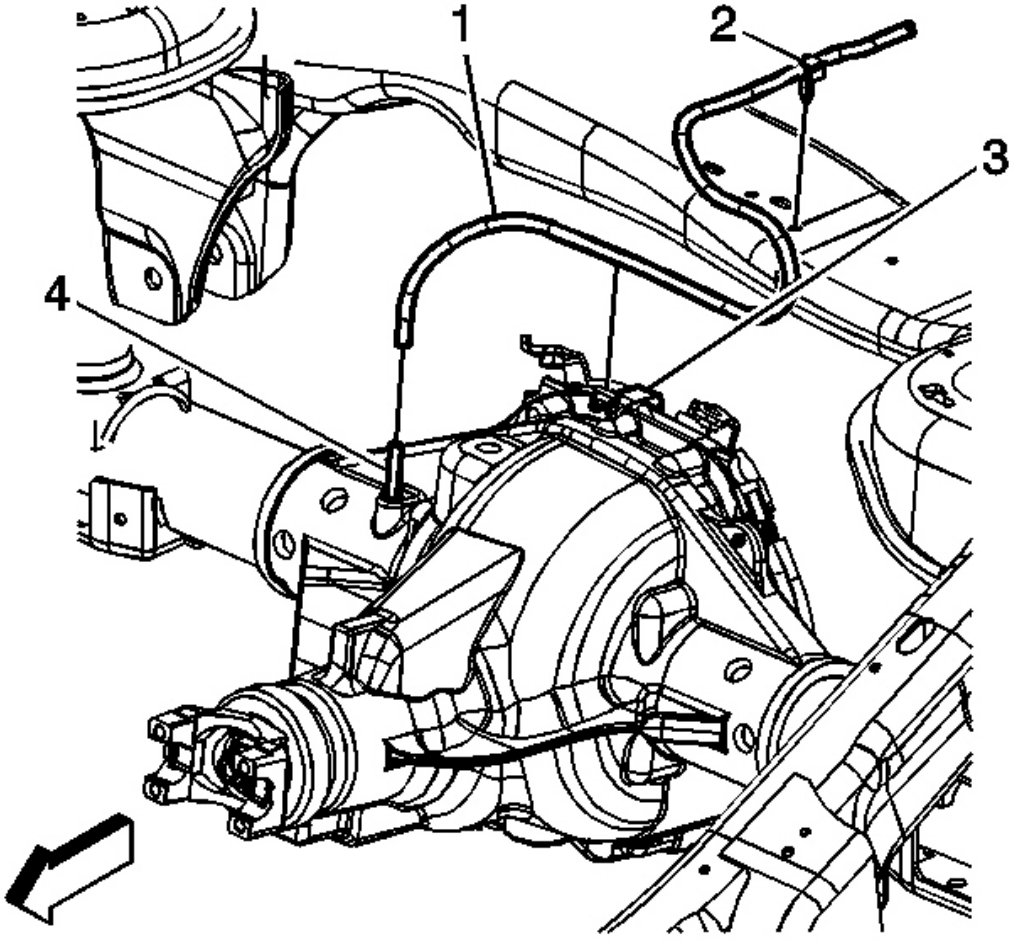


Fig. 109: Rear Axle Vent Hose & Vent Tube
Courtesy of GENERAL MOTORS CORP.

15. Connect the rear axle vent tube (1).
16. Install the rear tire and wheel assemblies. Refer to **Tire and Wheel Removal and Installation** in Tires and Wheels.
17. Inspect and add axle lubricant, if necessary. Refer to **Lubricant Level Inspection - Rear Drive Axle** .
18. Remove the jack stands.
19. Lower the vehicle. If equipped with air suspension, ensure the air springs seat properly as the vehicle is being lowered.
20. Enable the park brake cable automatic adjuster. Refer to **Enabling the Park Brake Cable Automatic Adjuster** in Park Brake.

21. If equipped with air suspension, start the vehicle and run for approximately 2 minutes to ensure the air spring leveling system is functioning properly.

REAR AXLE HOUSING REPLACEMENT

Removal Procedure

1. Raise the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the rear axle assembly. Refer to **Rear Axle Replacement** .
3. Remove the rear axle cover housing and gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
4. Remove the axle shafts. Refer to **Rear Axle Shaft Replacement** .
5. Remove the brake caliper brackets. Refer to **Brake Caliper Bracket Replacement - Rear** in Disc Brakes.
6. Remove the axle shaft seals and the axle shaft bearings. Refer to **Rear Axle Shaft Seal and/or Bearing Replacement** .
7. Remove the differential assembly. Refer to **Drive Pinion and Ring Gear Replacement** .
8. Remove the drive pinion shaft yoke and the seal. Refer to **Drive Pinion Flange/Yoke and/or Oil Seal Replacement** .
9. Remove the drive pinion. Refer to **Drive Pinion and Ring Gear Replacement** .

Installation Procedure

1. Install the new drive pinion bearing cups into the axle housing. Refer to **Drive Pinion Bearings Replacement** .
2. Install the drive pinion. Refer to **Drive Pinion and Ring Gear Replacement** .
3. Install the differential assembly. Refer to **Drive Pinion and Ring Gear Replacement** .
4. Adjust the backlash. Refer to **Backlash Adjustment** .
5. Adjust the differential side bearing preload. Refer to **Differential Side Bearing Preload Adjustment** .
6. Perform a gear tooth contact pattern check. Refer to **Gear Tooth Contact Pattern Inspection** .
7. Install the new axle shaft bearings and the axle shaft seals. Refer to **Rear Axle Shaft Seal and/or Bearing Replacement** .
8. Install the brake caliper brackets. Refer to **Brake Caliper Bracket Replacement - Rear** in Disc Brakes.
9. Install the axle shafts. Refer to **Rear Axle Shaft Replacement** .
10. Install the rear axle housing cover and gasket. Refer to **Rear Axle Housing Cover and Gasket Replacement** .
11. Install the rear axle. Refer to **Rear Axle Replacement** .
12. Lower the vehicle.

BEARINGS INSPECTION

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for

wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

IMPORTANT: The differential bearings and the bearing cups are matched sets. Replace both the bearing and the cup when either part requires replacement.

- Lubricate the bearings with axle lubricant. Inspect the bearings for smooth rotation.
- Inspect the bearing rollers for wear.
- Inspect the bearing cups for wear, cracks, brinelling, and scoring.

PINION AND RING GEAR INSPECTION

Ring and pinion gears are matched sets. When replacement of one or the other is necessary, both the ring and pinion gear must be replaced.

- Check the pinion and ring gear teeth for cracking, chipping, scoring, or excessive wear.
- Check the pinion gear splines for wear.
- Check the pinion flange/yoke splines for wear.
- Check the fit of the pinion gear splines on the pinion flange/yoke.
- Check the sealing surface of the pinion flange/yoke for nicks, burrs or rough tool marks that could damage the seal and cause an oil leak.
- Check for worn or broken parts and replace as necessary.

REAR AXLE HOUSING INSPECTION

Carefully and thoroughly inspect all drive unit parts before assembly. Thorough inspection of the drive parts for wear or stress with subsequent replacement of worn parts eliminates costly drive component repair after assembly.

- Inspect for nicks or burrs that could prevent the outer diameter of the pinion seal from sealing. Remove any burrs.
- Inspect the bearing cup bores for nicks or burrs. Remove any burrs that are found.
- Inspect the housing for cracks. Replace the housing if any cracks are found.
- Inspect the housing for foreign material such as metal chips, dirt, or rust.

SHIMS INSPECTION

IMPORTANT:

- **Do not reinstall the original cast iron production shims, if removed. Once the cast iron shims are removed from the axle housing, they must be replaced with service shims and spacers.**
- **If service shims were previously installed, the shims can be reused.**

Inspect the shims for cracks and chips. Replace the damaged shims.

PINION DEPTH ADJUSTMENT

Tools Required

- **J 21777-85** Gauge and Plate. See **Special Tools and Equipment** .
- **J 21777-86** Side Bearing Disc, 2 Required. See **Special Tools and Equipment** .
- J 34925 Pinion Setting Gauge and Components

IMPORTANT: Make sure all of the tools, the differential side bearing bores, and the pinion bearing cups are clean before proceeding.

1. Lubricate the pinion bearings with axle lubricant. Use the proper fluid. Refer to **Fluid and Lubricant Recommendations** in Maintenance and Lubrication.

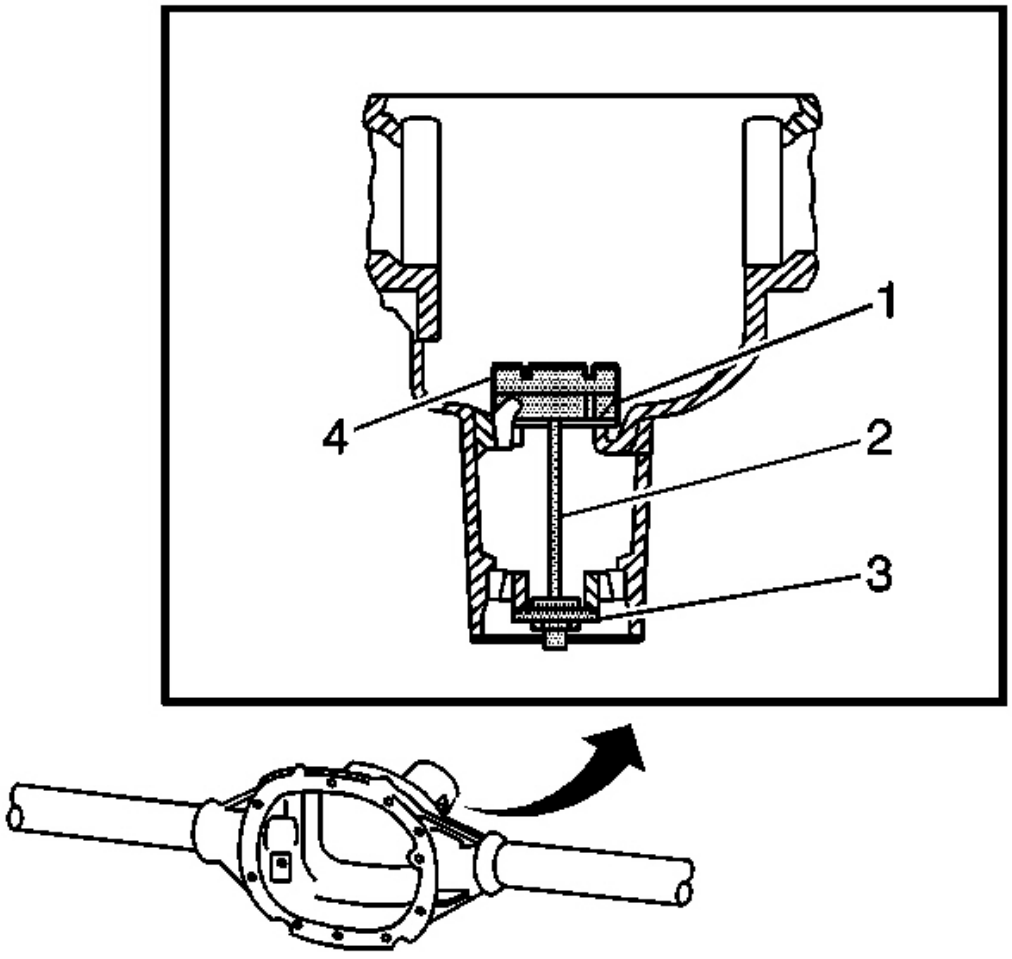


Fig. 110: Assembling J 21777-35, J 21777-43, J 21777-42 & J 45230
Courtesy of GENERAL MOTORS CORP.

2. Assemble the following components into the axle housing:
    1. Install the pinion bearings into the axle housing.
    2. Assemble the J 21777-8 (1), the J 21777-43 (2), the J 21777-42 (3), and the J 21777-85 (4) as shown.
3. While holding the J 21777-43 stationary, slowly tighten the nut of the J 21777-43 until a rotating torque of approximately 1.1-2.2 N.m (10-20 lb in) is obtained.
4. Rotate the assembly several times in both directions in order to seat the pinion bearings.
5. Measure the rotating torque of the assembly using an inch-pound torque wrench.

Specification: The rotating torque of the assembly should be 1.1-2.3 N.m (10-20 lb in).

6. If the rotating torque of the assembly is less than 1.1 N.m (10 lb in), continue to tighten the nut on the J 21777-43 until a rotating torque of 1.1-2.3 N.m (10-20 lb in) is obtained.

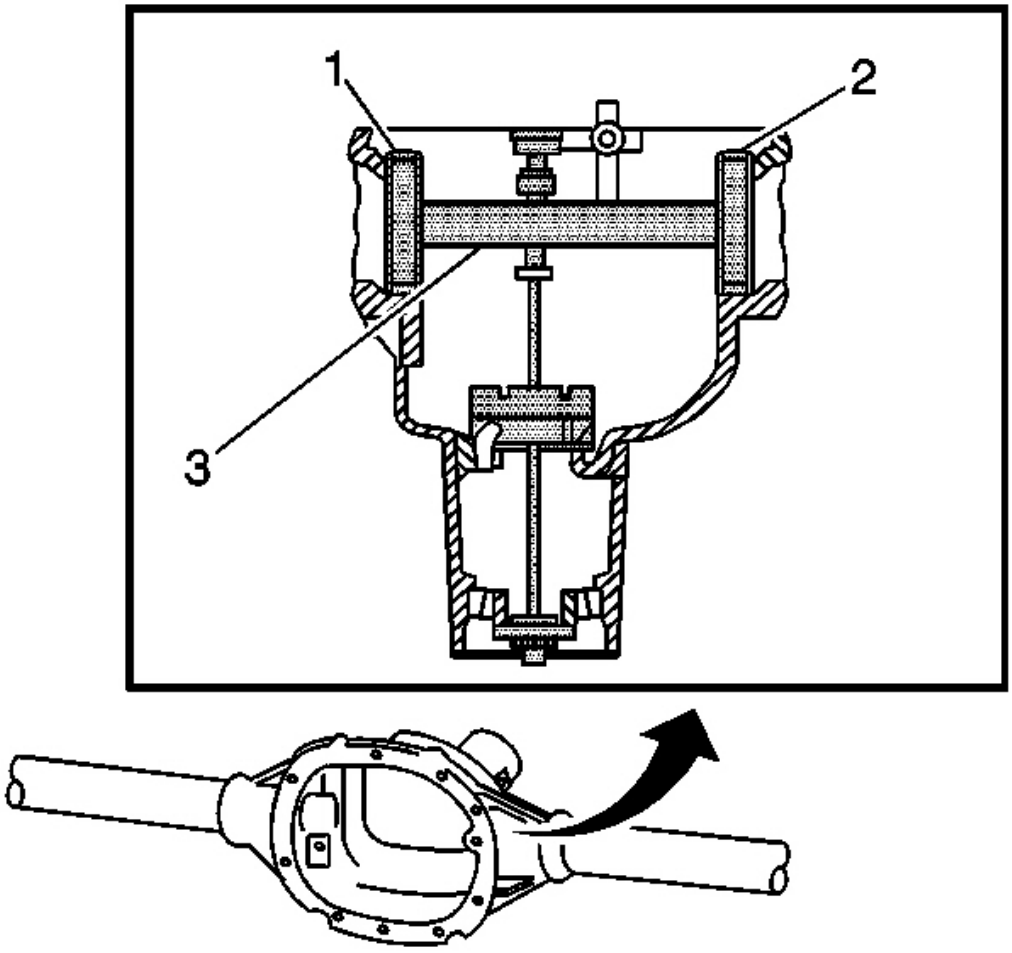


Fig. 111: Assembling J 21777-86 To J 21777-1
Courtesy of GENERAL MOTORS CORP.

7. Assemble the J 21777-86 (1, 2) to the J 21777-1 (3) and install into the differential carrier bore of the axle housing as shown.
8. Install the bearing caps.

NOTE: Refer to Fastener Notice in Cautions and Notices.

9. Install the bearing cap bolts.

   Tighten: Tighten the bearing cap bolts to 85 N.m (63 lb ft).

10. Rotate the J 21777-1 within the J 21777-86. The J 21777-1 must rotate back and forth freely within the discs. If the J 21777-1 does not rotate freely, disassemble the components, inspect for proper seating and/or mis-aligned components and re-assemble.

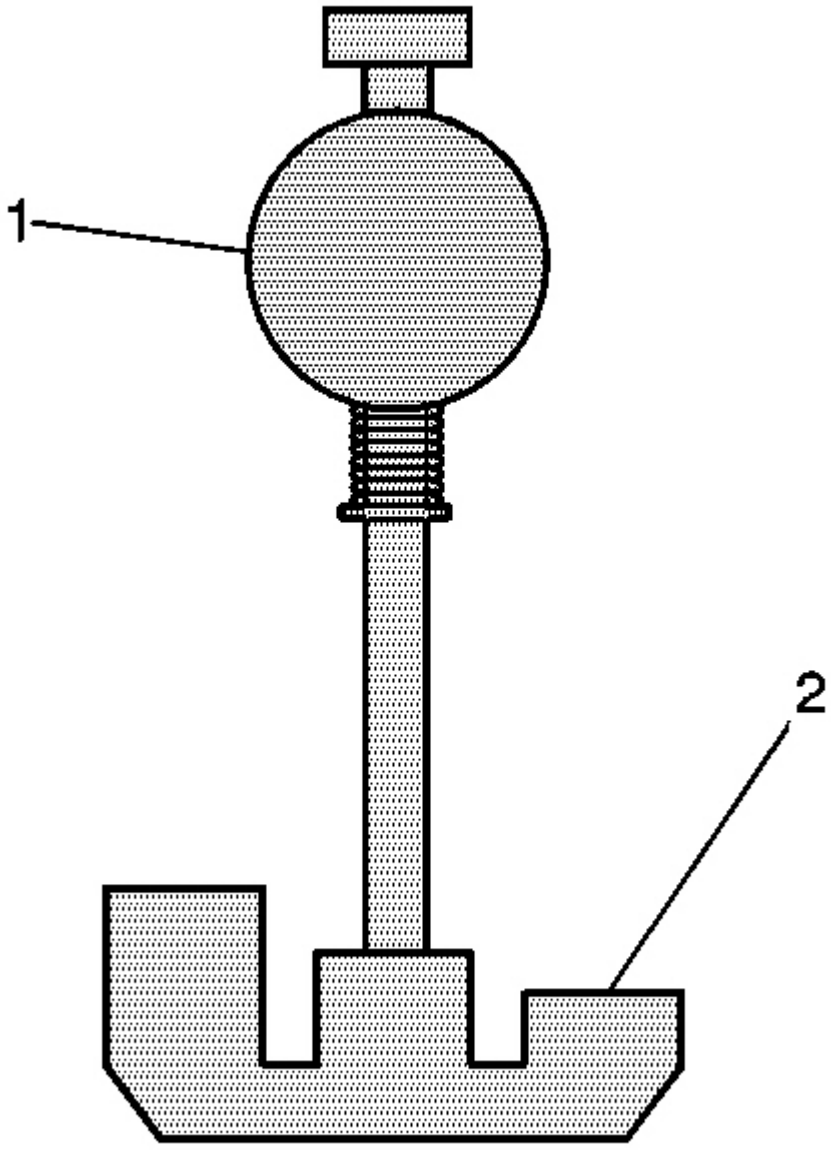


Fig. 112: Aligning Plunger Of J 21777-1 To J 21777-85
Courtesy of GENERAL MOTORS CORP.

11. Align the plunger of the J 21777-1 (1) to the **J 21777-85** (2). See **Special Tools and Equipment** .
12. Install the J 8001-3 to the J 21777-1 as follows:
    1. Loosely clamp the J 8001-2 onto the stem on the J 21777-1.

2. Install the J 8001-3 onto the J 8001-2.
3. Place the contact pad of the J 8001-3 onto the mounting post of the J 21777-1.
4. With the contact pad of the J 8001-3 touching the mounting post of the J 21777-1, loosen the lock nut on the J 8001-2 and push down on the J 8001-3 until the needle the J 8001-3 has turned 3/4 of a turn clockwise.
5. Tighten the clamp on the J 8001-2 finger tight.

13. Move the plunger of the J 21777-1 back and forth until the needle of the J 8001-3 indicates the greatest amount of deflection.

    The greatest amount of deflection is the point where the needle changes direction.

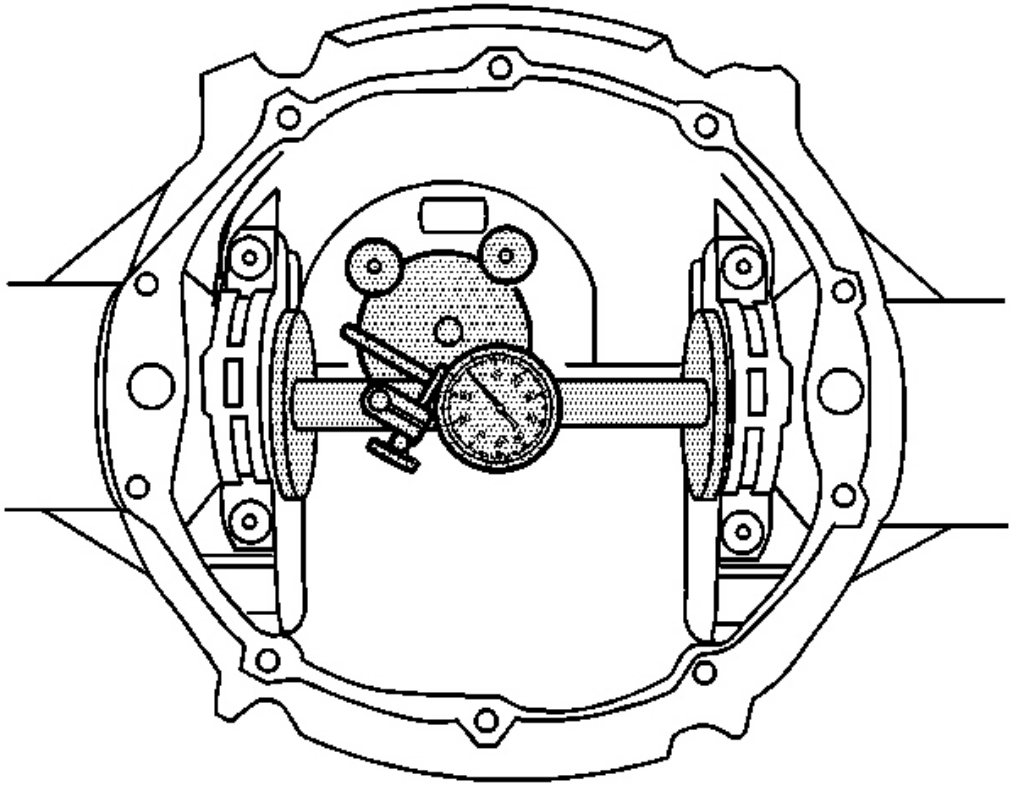


Fig. 113: Measuring Necessary Shim Thickness
Courtesy of GENERAL MOTORS CORP.

14. At the greatest point of deflection, move the housing of the J 8001-3 until the needle indicates ZERO.
15. Move the plunger of the J 21777-1 back and forth again to verify the zero setting. Adjust the housing of

the J 8001-3 as necessary to set the needle to ZERO.

16. Rotate the plunger of the J 21777-1 away from the J 21777-85 until it no longer touches the J 21777-85.
17. The value indicated on the J 8001-3 is the thickness of the shim needed in order to set the depth of the pinion.
18. Select the shim that indicates the proper thickness. Measure the shim with a micrometer in order to verify that the thickness is correct.
19. Remove the pinion depth setting tools.
20. Remove the pinion bearings.
21. Install the pinion shim between the pinion gear and the inner pinion bearing. Refer to **Drive Pinion Bearings Replacement** .

DIFFERENTIAL SIDE BEARING PRELOAD ADJUSTMENT

Tools Required

- **J 8001** Dial Indicator Set
- **J 22779** Side Bearing Backlash Gauge. See **Special Tools and Equipment** .
- **J 24429** Side Bearing Backlash Spanner. See **Special Tools and Equipment** .
- **J 25025** Guide Pins. See **Special Tools and Equipment** .

IMPORTANT:

- **Ensure that the side bearing surfaces in the axle housing are clean and free of burrs. If the original bearings are to be reused, the original bearing cups must also be used.**
- **The drive pinion bearing preload must be within specifications before the differential side bearing preload adjustment can be performed.**
- **The differential side bearings must be initially preloaded in order to determine the backlash of the gear set. After the backlash is set, the final bearing preload is set.**

1. Disconnect the propeller shaft from the rear axle and support as necessary. Refer to **Propeller Shaft Replacement - Rear** in Propeller Shaft.

   CAUTION: To prevent personal injury and/or component damage, support the differential case when removing the case from the axle housing. If the case is not supported, the differential case could fall and cause personal injury or damage to the differential case.

2. Remove the differential assembly from the axle housing, if necessary.
3. Measure the rotating torque of the drive pinion bearing using an inch-pound torque wrench.

   Specification: The rotating torque of the drive pinion should be 1.7-3.4 N.m (15-30 lb in) for new bearings or 1.1-2.3 N.m (10-20 lb in) for used bearings.

4. If the rotating torque of the drive pinion is less than 1.7 N.m (15 lb in) for new bearings or 1.1 N.m (10 lb in) for used bearings, tighten the pinion in small increments until the specified rotating torque is obtained.
5. If the rotating torque of the drive pinion is greater than 3.4 N.m (30 lb in) for new bearings or 2.3 N.m (20 lb in) for used bearings, remove the drive pinion and replace the collapsible spacer and re-install the drive pinion. Refer to **Drive Pinion Bearings Replacement** .
6. Install the differential assembly into the axle housing, if necessary.
7. Support the differential assembly in order to prevent the differential assembly from falling out of the axle housing.

IMPORTANT: Do not force the ring gear into contact with the drive pinion.

8. Slide the differential case assembly towards the right side axle housing until the ring gear contacts the drive pinion.

   This is the ZERO backlash point.

   If the ZERO backlash cannot be obtained, turn the differential bearing adjuster nut into the axle housing using the **J 24429** until the ring gear fully contacts the drive pinion to obtain the ZERO backlash. See **Special Tools and Equipment** .

9. While holding the ring gear against the pinion, turn the differential bearing adjuster nut out from the axle housing using the **J 24429** until it contacts the differential side bearing. See **Special Tools and Equipment** .
10. Turn the adjuster nut out from the axle housing an additional 2 slots using the **J 24429** in order to obtain the initial backlash adjustment. See **Special Tools and Equipment** .

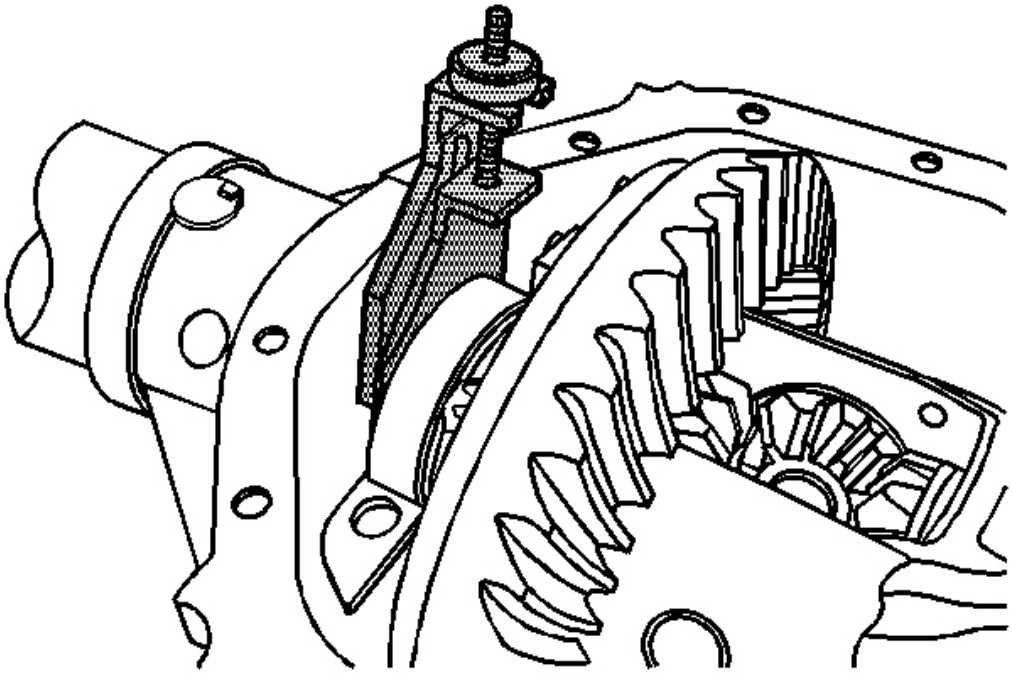


Fig. 114: Installing J 22779 Into Left Side Axle Housing
Courtesy of GENERAL MOTORS CORP.

11. Install the **J 22779** into the left side axle housing between the differential bearing bore and the differential bearing cup. See **Special Tools and Equipment** .

IMPORTANT: Over-tightening may spread the axle housing and result in incorrect shim selection.

12. Tighten the knob of the **J 22779** until there is moderate drag when the **J 22779** is moved. See **Special Tools and Equipment** .
13. Remove the **J 22779** . See **Special Tools and Equipment** .
14. Measure the **J 22779** in 3 locations. See **Special Tools and Equipment** .
15. Calculate the average of the 3 measurements.

    The resulting value is the shim thickness required in order to set the initial backlash of the differential assembly.

16. Select a service shim of approximately the same thickness to install into the axle housing.

Verify the thickness of the service shim using a micrometer.

17. Install the service shim into the axle housing between the differential bearing bore and the differential bearing cup.
18. Install the left and the right side differential bearing caps.
19. Install the left and the right side differential bearing cap bolts.

    Tighten the differential bearing cap bolts finger-tight. Do not torque the bolts at this time.

20. Firmly tighten the differential bearing adjuster nut using the **J 24429** in order to force the differential case assembly into solid contact with the service shim. See **Special Tools and Equipment** .
21. Rotate the pinion several times in order to seat the bearings.
22. Loosen the differential bearing adjuster nut using the **J 24429** until the nut is free from the differential side bearing. See **Special Tools and Equipment** .
23. Tighten the differential bearing adjuster nut using the **J 24429** until the differential bearing adjuster nut contacts the bearing. See **Special Tools and Equipment** .
24. Once the right differential bearing adjuster contacts the differential bearing, tighten the differential bearing adjuster nut using the **J 24429** the following additional amounts:

    Tighten:

    - For new bearings, tighten the differential bearing adjuster nut an additional 3 slots.
    - For used bearings, tighten the differential bearing adjuster nut an additional 2 slots.

25. Install the right differential bearing adjuster nut lock.
26. Install the right differential bearing adjuster nut lock bolt.

    Do not torque the bolt at this time.

    NOTE: Refer to Fastener Notice in Cautions and Notices.

27. Tighten the bearing cap bolts.

    Tighten: Tighten the bearing cap bolts to 85 N.m (63 lb ft).

28. Measure the drive pinion and differential case side bearing preload using an inch-pound torque wrench.

    Rotate the pinion several times to ensure the bearings have seated.

    Specification: The rotating torque of the drive pinion and differential case bearings should be 3.9-6.2 N.m (30-55 lb in) for new bearings or 2.8-5.1 N.m (25-45 lb in) for used bearings.

    Record the measurement.

29. Calculate the differential side bearing preload by subtracting the drive pinion preload, measured in Step 2,

from the drive pinion and differential case bearing preload, measured in Step 35.

Multiply the value obtained by the axle ratio.

Specification: The differential case side bearing preload should be 1.7-4.0 N.m (15-35 lb in).

30. If the differential case side bearing preload is too low, tighten the differential bearing adjuster nut in 1 slot increments until the specified rotating torque is obtained.
31. If the differential case side bearing preload is too high, loosen the differential bearing adjuster nut in 1 slot increments until the specified rotating torque is obtained.
32. Once the differential side bearing preload is correct, measure the drive pinion to differential assembly backlash and adjust, if necessary. Refer to **Backlash Adjustment** .

Differential side bearing shims are available in the following sizes:

Shim Sizes:

- 5.59 mm (0.220 in)
- 5.64 mm (0.222 in)
- 5.69 mm (0.224 in)
- 5.74 mm (0.226 in)
- 5.79 mm (0.228 in)
- 5.84 mm (0.230 in)
- 5.89 mm (0.232 in)
- 5.94 mm (0.234 in)
- 5.99 mm (0.236 in)
- 6.05 mm (0.238 in)
- 6.10 mm (0.240 in)
- 6.15 mm (0.242 in)
- 6.20 mm (0.244 in)
- 6.25 mm (0.246 in)
- 6.30 mm (0.248 in)
- 6.35 mm (0.250 in)
- 6.40 mm (0.252 in)
- 6.45 mm (0.254 in)
- 6.50 mm (0.256 in)
- 6.55 mm (0.258 in)

BACKLASH ADJUSTMENT

Tools Required

- **J 8001** Dial Indicator Set
- **J 22779** Side Bearing Backlash Gauge. See **Special Tools and Equipment** .
- **J 24429** Side Bearing Backlash Spanner. See **Special Tools and Equipment** .
- **J 25025** Guide Pins. See **Special Tools and Equipment** .

IMPORTANT:

- **Ensure that the side bearing surfaces in the axle housing are clean and free of burrs. If the original bearings are to be reused, the original bearing cups must also be used.**
- **The differential side bearings must be initially preloaded in order to determine the backlash of the gear set. After the backlash is set, the final bearing preload is set.**

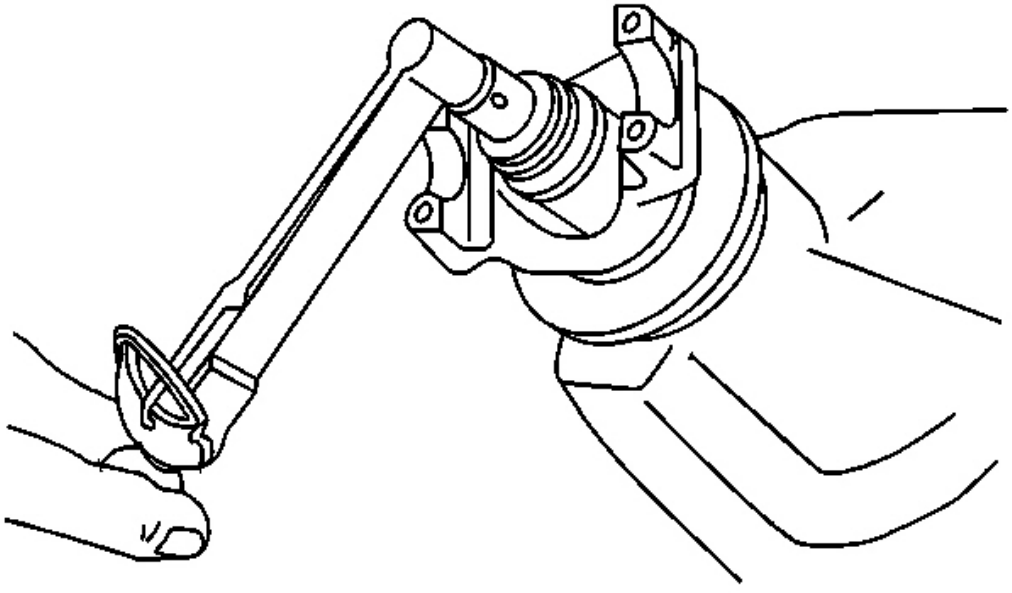


Fig. 115: Measuring Pinion Rotation Torque
Courtesy of GENERAL MOTORS CORP.

1. Measure the rotating torque of the drive pinion and differential assembly using an inch-pound torque wrench.

   Specification: The rotating torque of the drive pinion and differential assembly should be 3.4-6.2 N.m (30-55 lb in) for new bearings or 2.8-5.1 N.m (25-45 lb in) for used bearings.

2. If the rotating torque is too low, tighten the differential bearing adjuster nut in 1 slot increments until the

specified rotating torque is obtained.

3. If the rotating torque is too high, loosen the differential bearing adjuster nut in 1 slot increments until the specified rotating torque is obtained.
4. If the specification for the rotating torque of the drive pinion and differential assembly cannot be obtained by adjusting the differential bearing adjuster nut, remove the differential assembly, measure the rotating torque of the drive pinion and adjust as necessary. Refer to **Differential Replacement** and **Drive Pinion Bearings Replacement** .

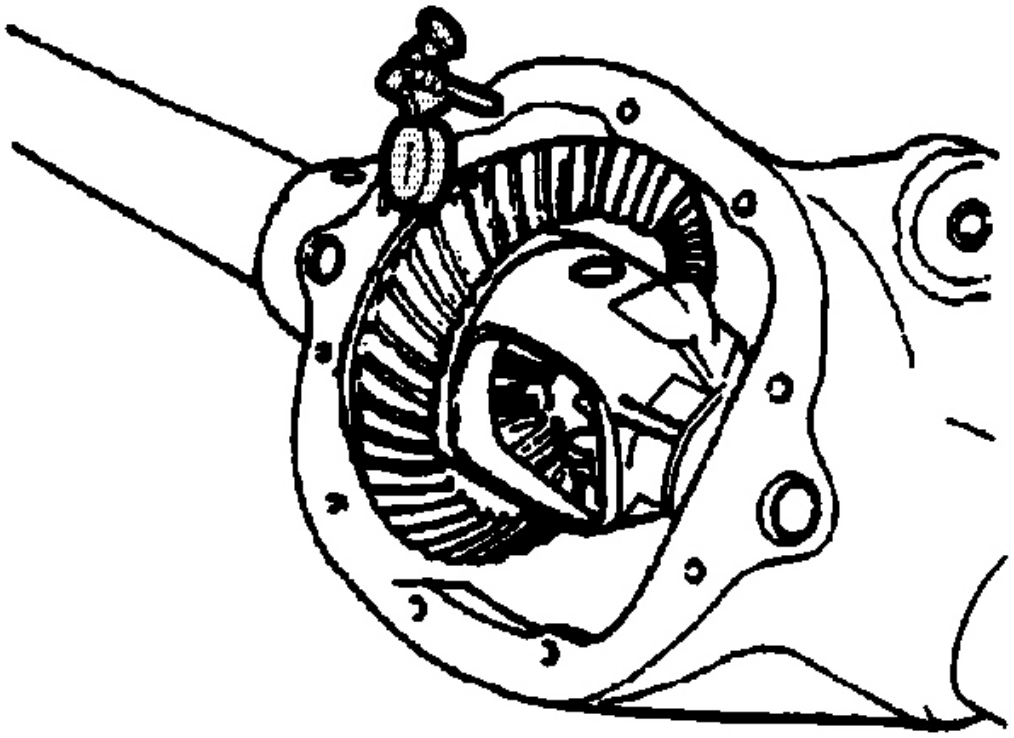


Fig. 116: Installing J 25025-1 & J 8001
Courtesy of GENERAL MOTORS CORP.

5. Install the **J 25025-1** and the J 8001-3 to the axle housing as shown.
6. Place the indicator stem of the J 8001-3 at the heel end of a gear tooth.
7. Set the J 8001-3 so that the stem is aligned with the gear rotation and perpendicular to the tooth angle.
8. Preload the dial of the J 8001-3 approximately 3/4 of a turn.

Align the needle and the dial face of the J 8001-3 to ZERO.

9. While holding the drive pinion stationary, move the ring gear back and forth.

   Measure and record the backlash.

10. Repeat the measuring procedure at eight points around the ring gear.

    Specification: The difference between the backlash at all of the measuring points should not vary by more than 0.05 mm (0.002 in).

11. If the difference between the backlash at all of the measuring points varies by more than 0.05 mm (0.002 in), inspect for the following conditions:
    - Burrs
    - A distorted case flange
    - Uneven bolting
12. If the difference between all the measuring points is within specifications, the backlash at the minimum lash point measured should be:

    Specification: The backlash between the ring gear and the drive pinion should be between 0.08-0.25 mm (0.003-0.010 in) with a preferred backlash of 0.13-0.18 mm (0.005-0.007 in).

IMPORTANT:
- **Do not use the original cast iron production shim to adjust the backlash. Use service shims instead.**
- **Increasing or decreasing the shim thickness by 0.05 mm (0.002 in) will change the backlash adjustment approximately 0.03 mm (0.001 in).**

13. If the backlash is too small, increase the backlash using the following procedure:
    1. Support the differential assembly in order to prevent the differential assembly from falling out of the axle housing.
    2. Loosen the right side bearing cap bolts.
    3. Loosen the left side bearing cap bolts.

       Do not remove the bearing cap bolts.

    4. Loosen the differential bearing adjuster nut using the **J 24429** . See **Special Tools and Equipment** .
    5. Remove the differential side bearing shim.
    6. Measure the thickness of the shim.

       Measure the shim in 3 locations.

    7. Calculate the average of the 3 measurements.

Record the measurement.

8. Select a smaller shim than the one that was removed. For example, to increase the backlash by 0.05 mm (0.002 in), select a shim that is 0.10 mm (0.004 in) thinner than the shim that was removed.

14. If the backlash is too large, decrease the backlash using the following procedure:
    1. Support the differential assembly in order to prevent the differential assembly from falling out of the axle housing.
    2. Loosen the right side bearing cap bolts.
    3. Loosen the left side bearing cap bolts.

       Do not remove the bearing cap bolts.

    4. Loosen the differential bearing adjuster nut using the **J 24429** . See **Special Tools and Equipment** .
    5. Remove the differential side bearing shim.
    6. Measure the thickness of the shim.

       Measure the shim in 3 locations.

    7. Calculate the average of the 3 measurements.

       Record the measurement.

    8. Select a larger shim than the one that was removed. For example, to increase the backlash by 0.05 mm (0.002 in), select a shim that is 0.10 mm (0.004 in) thicker than the shim that was removed.
15. Install the new service shim.
16. Tighten the differential bearing adjuster nut using the **J 24429** until the differential bearing adjuster nut contacts the bearing. See **Special Tools and Equipment** .
17. Once the differential bearing adjuster contacts the differential bearing, tighten the differential bearing adjuster nut using the **J 24429** the following additional amounts:

    Tighten:
    - For used bearings, tighten the differential bearing adjuster nut an additional 2 slots.
    - For new bearings, tighten the differential bearing adjuster nut an additional 3 slots.

18. Tighten the right side differential bearing cap bolts.

    Tighten: Tighten the right side bearing cap bolts to 85 N.m (63 lb ft).

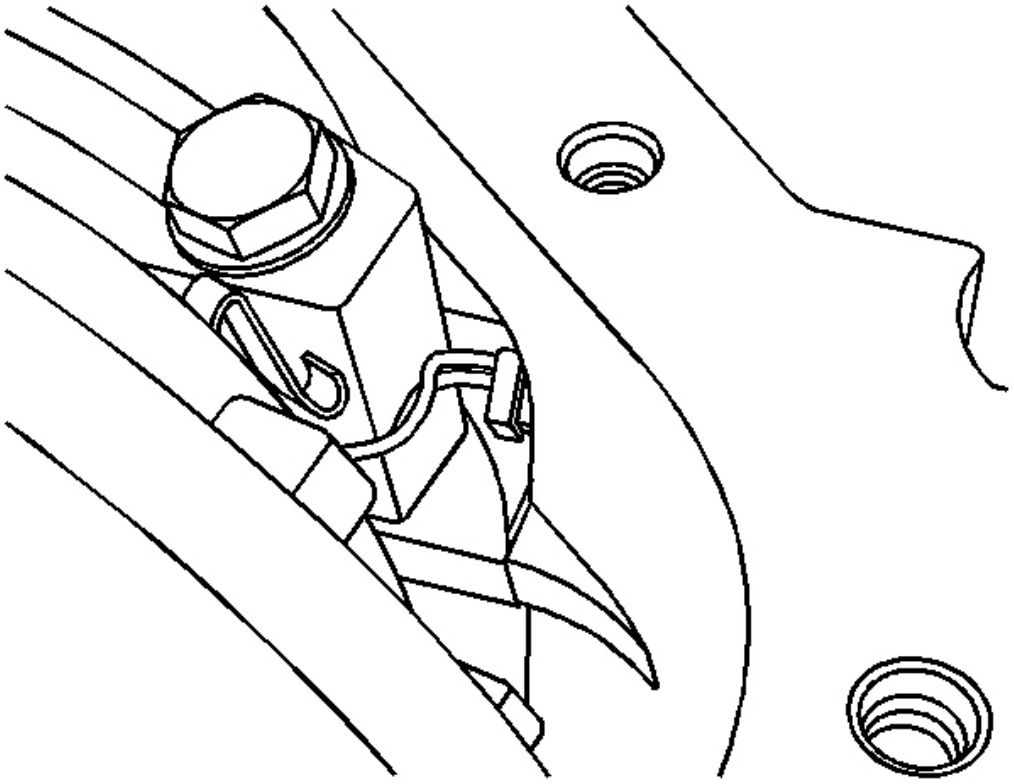


Fig. 117: Left Side Differential Bearing Cap Bolts
Courtesy of GENERAL MOTORS CORP.

19. Tighten the left side differential bearing cap bolts.

    Ensure that the locking differential coil assembly wires are routed away from the differential bearing cap.

    Tighten: Tighten the left side bearing cap bolts to 85 N.m (63 lb ft).

20. Measure the drive pinion and differential case side bearing preload and adjust, if necessary. Refer to **Differential Side Bearing Preload Adjustment** .
21. Recheck the backlash and adjust, if necessary.
22. Once backlash and bearing preload is correct, perform a gear tooth contact pattern check in order to ensure proper alignment between the ring and pinion gears. Refer to **Gear Tooth Contact Pattern Inspection** .
23. Complete the installation of the differential into the axle housing. Refer to **Differential Replacement** .

GEAR TOOTH CONTACT PATTERN INSPECTION

The gear contact pattern check is not a substitute for adjusting the pinion depth and backlash. Use this method in order to verify the correct running position of the ring gear and the drive pinion. Gear sets which are not positioned properly may be noisy and/or have a short life span. A pattern check ensures that when best contact has been obtained between the ring gear and the drive pinion, the system will produce low noise and have a long life.

Drive Pinion and Ring Gear Identification

Production drive pinion and ring gears are manufactured by using a 2-cut or a 5-cut method. The 2-cut drive pinions and ring gears can be identified by having a groove cut into the outside edge of the ring gear and a ring on the stem of the drive pinion. The gear tooth contact patterns that are produced from each style of gear set differ slightly. A 2-cut gear will produce a pattern that is bias from the toe to the heel of the tooth (drive side), while a 5-cut gear set will produce a square pattern from the toe to the heel of the tooth (drive side). When diagnosing the gear tooth contact pattern, regardless of what type of gear set it is, a correct pattern will be centered within the area of the tooth, from toe to heel and from top to bottom.

Gear Tooth Nomenclature

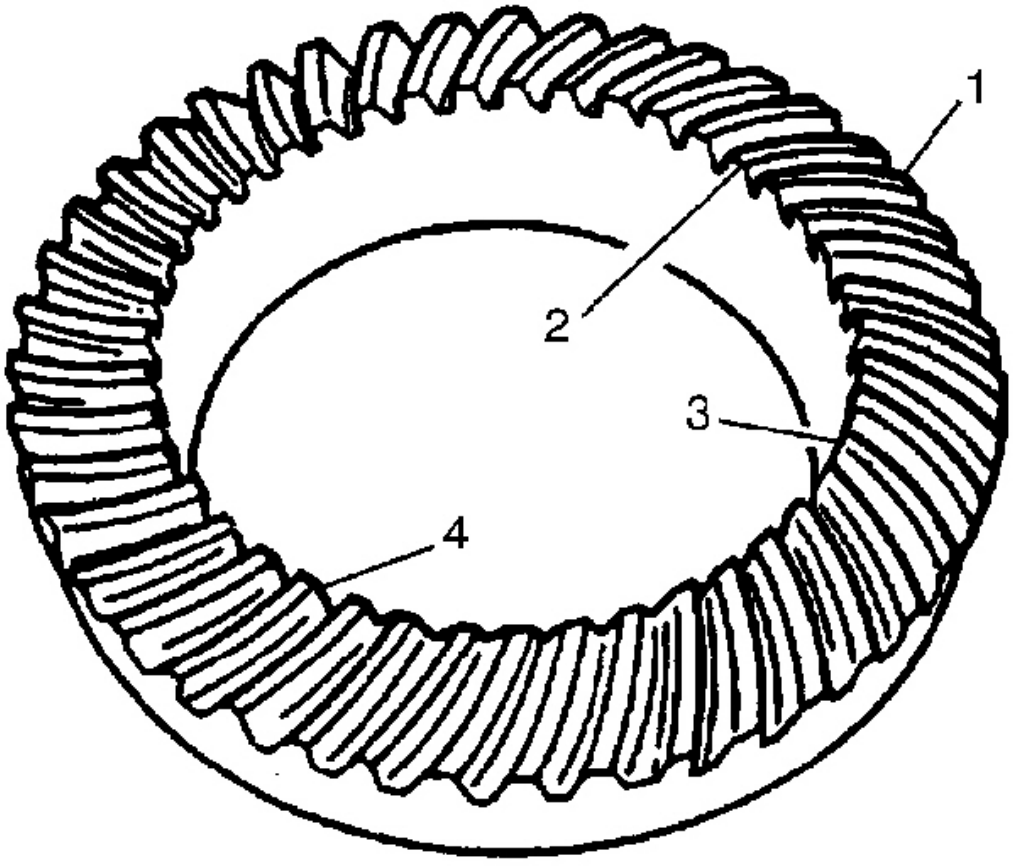


Fig. 118: Gear Tooth Nomenclature
Courtesy of GENERAL MOTORS CORP.

The side of the ring gear tooth which curves outward, or is convex, is the drive side (4). The concave side is the coast side (3). The end of the tooth nearest the center of the ring gear is the toe end (2). The end of the tooth farthest away from the center is the heel end (1).

Adjustments Affecting Tooth Contact

The following 2 adjustments affect the tooth contact pattern:

- Backlash adjustment
- Pinion depth adjustment

The effects of bearing preloads are not readily apparent on hand-loaded tooth contact pattern tests. However, bearing preloads should be within specifications before proceeding with backlash and pinion depth adjustments.

Backlash Adjustment

The backlash can be adjusted by either varying the thickness of the side bearing shims from side to side or by moving the adjuster sleeve(s) in or out, or both. By adjusting the shim thickness or moving the adjuster sleeve (s), the case and ring gear assembly will move closer to or further away from the pinion. In most cases, adjusting the backlash will correct an abnormal contact pattern. This adjustment will also be used to set the side bearing preload.

- If the thickness of the right shim is increased or the adjuster sleeve is moved in (if applicable), along with an equal decrease in the thickness of the left shim or the adjuster sleeve is moved out (if applicable), the backlash will increase.
- If the thickness of the left shim is increased or the adjuster sleeve is moved in (if applicable), along with an equal decrease in the thickness of the right shim or the adjuster sleeve is moved out (if applicable), the backlash will decrease.

Pinion Depth Adjustment

Adjust the position of the pinion by increasing or decreasing the distance between the pinion head and the centerline of the ring gear. Decreasing the distance moves the pinion closer to the centerline of the ring gear. Increasing the distance moves the pinion farther away from the centerline of the ring gear.

Testing Procedure

1. Wipe clean the differential case, the ring gear and the axle housing of lubricant. Carefully clean each tooth of the ring gear.

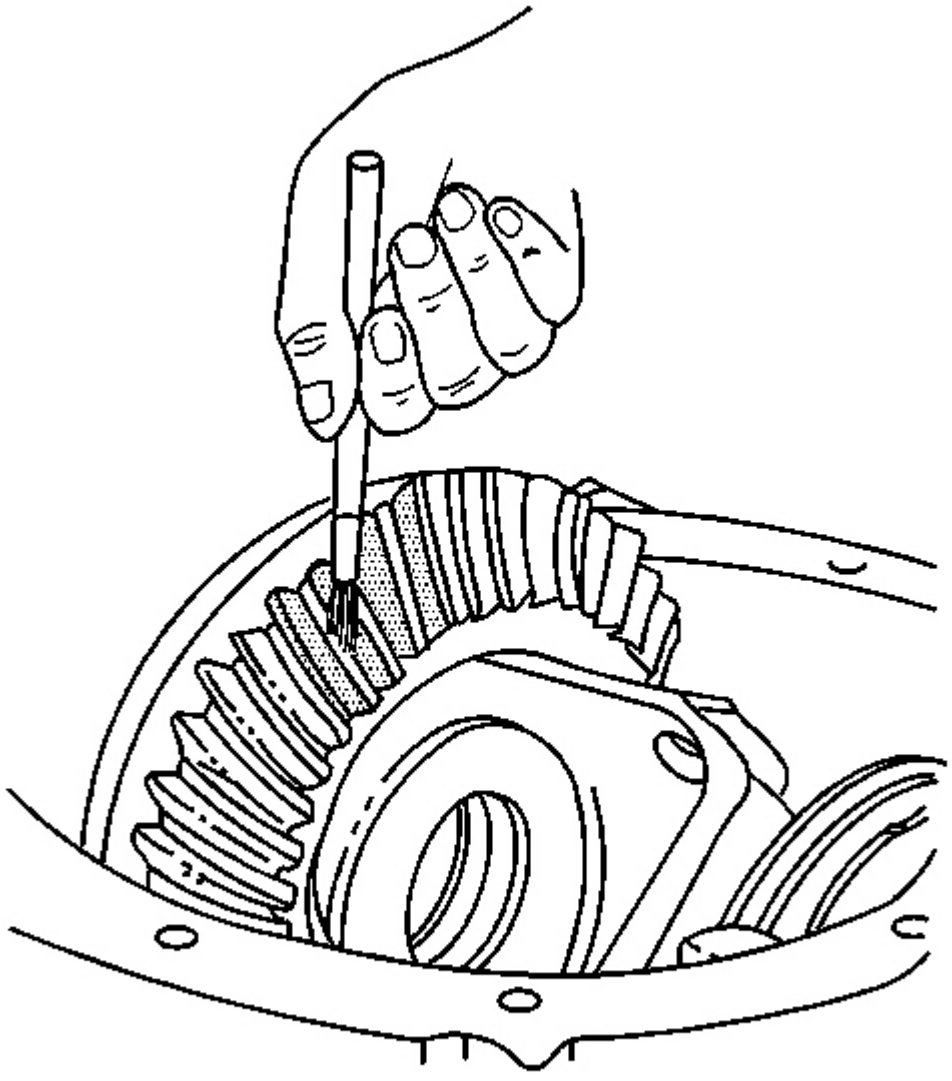


Fig. 119: Applying Gear Marking Compound To Ring Gear Teeth
Courtesy of GENERAL MOTORS CORP.

2. Use a medium stiff brush in order to sparingly apply gear marking compound, GM P/N 1052351 (Canadian P/N 10953497) or equivalent, to all of the ring gear teeth.
3. Torque the bearing caps bolts to specification.

IMPORTANT: Performing a test without loading the gears will not produce a satisfactory

pattern.

4. Apply the park brake until a torque load of 14 N.m (10 lb ft) is required in order to turn the pinion.

IMPORTANT: Avoid turning the ring gear excessively.

5. Using a wrench, turn the drive pinion flange/yoke so that the ring gear rotates 3 full revolutions.
6. Turn the drive pinion flange/yoke in the opposite direction so that the ring gear rotates 3 full revolutions in the opposite direction.
7. Observe the pattern on the ring gear teeth. Compare the pattern with the following illustrations.

Correct Contact Pattern

Condition

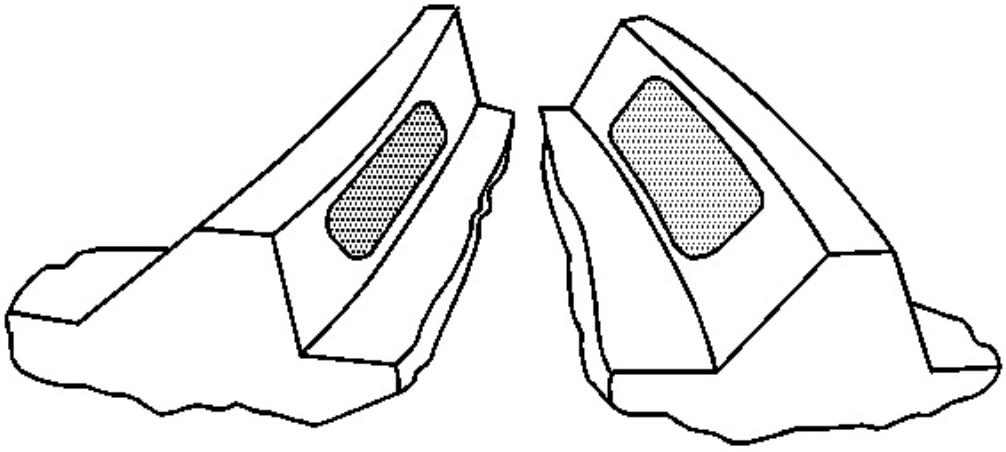


Fig. 120: Correct Contact Pattern
Courtesy of GENERAL MOTORS CORP.

The backlash and pinion depth is correct.

Correction

None required.

Service Hints

Loose bearings on the drive pinion or in the differential case may cause patterns that vary. If the contact pattern varies, inspect the following preload settings:

- Total assembly
- Differential case
- Pinion

If these settings are correct, inspect for damage or incorrectly assembled parts.

Drive Side Heel - Coast Side Toe Contact Pattern

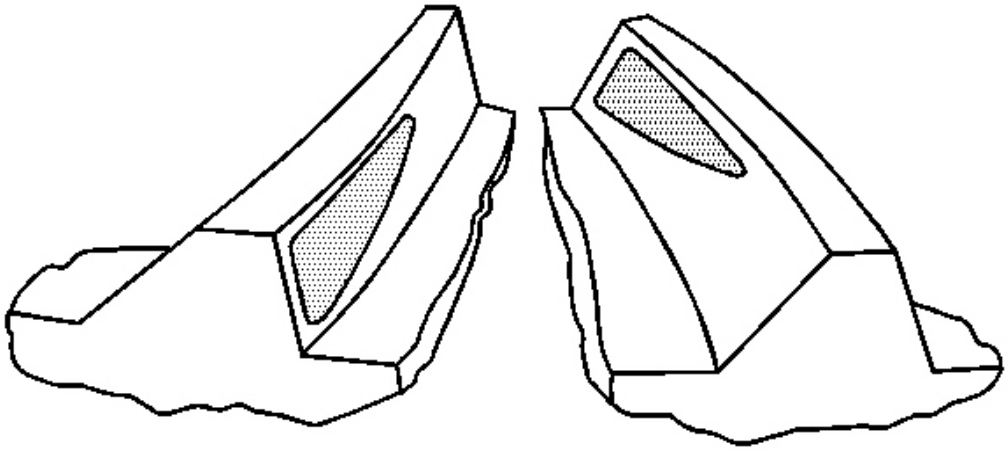


Fig. 121: Drive Side Heel - Coast Side Toe Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The backlash is incorrect. The ring gear is too far away from the pinion.

Correction

Decrease the backlash. Move the ring gear closer to the pinion by adjusting the side bearing shim thickness or the adjuster sleeve(s). Refer to **Backlash Adjustment** .

Drive Side Toe - Coast Side Heel Contact Pattern

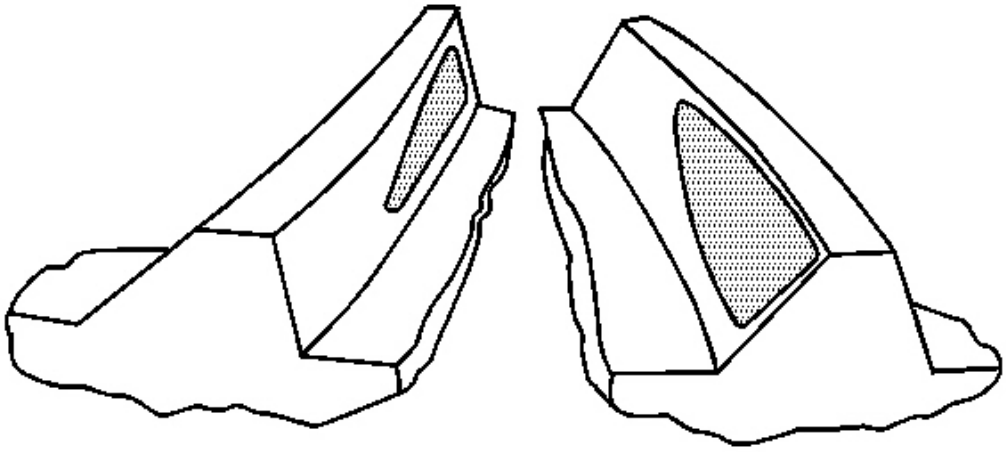


Fig. 122: Drive Side Toe - Coast Side Heel Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The backlash is incorrect. The ring gear is too close to the drive pinion.

Correction

Increase the backlash. Move the ring gear away from the pinion by adjusting the side bearing shim thickness or the adjuster sleeve(s). Refer to **Backlash Adjustment** .

Drive Side Heel - Coast Side Heel Contact Pattern

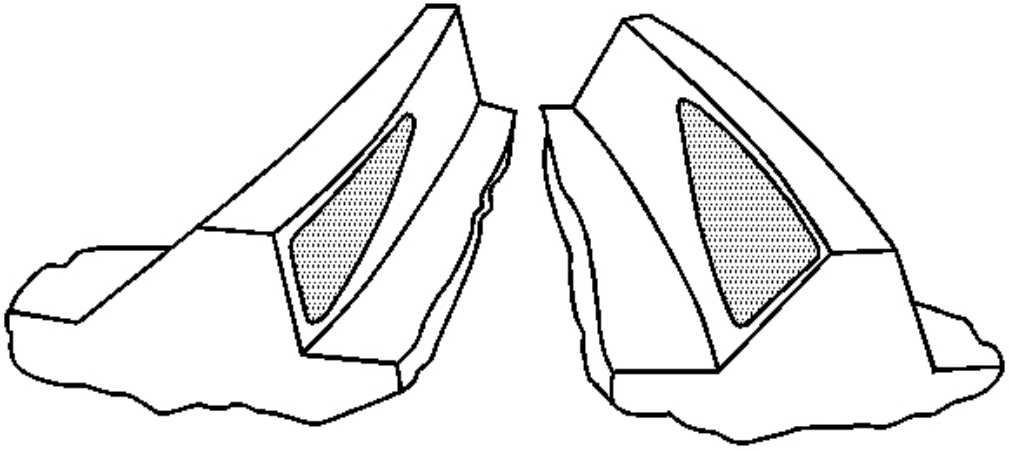


Fig. 123: Drive Side Heel - Coast Side Heel Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The backlash is incorrect. The ring gear is too far away from the pinion.

Correction

Decrease the backlash. Move the ring gear closer to the pinion by adjusting the side bearing shim thickness or the adjuster sleeve(s). Refer to **Backlash Adjustment** .

Drive Side Toe - Coast Side Toe Contact Pattern

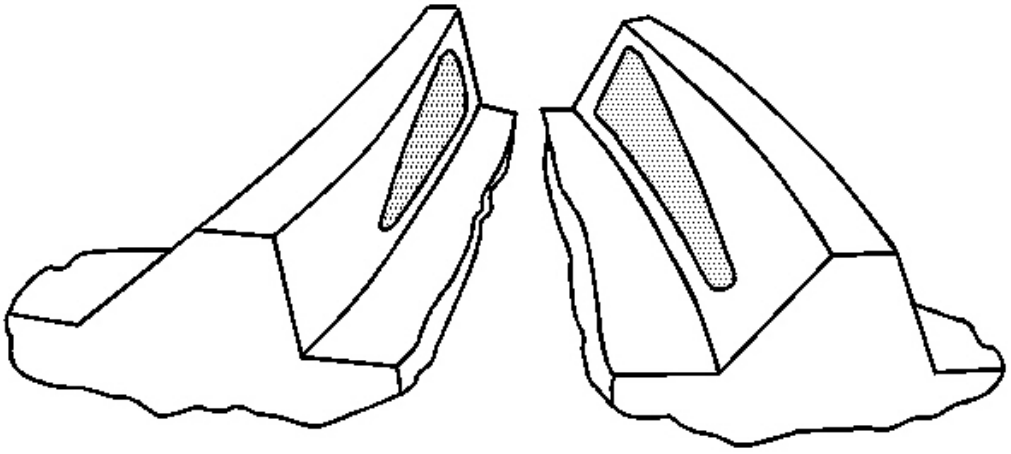


Fig. 124: Drive Side Toe - Coast Side Toe Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The backlash is incorrect. The ring gear is too close to the drive pinion.

Correction

Increase the backlash. Move the ring gear away from the pinion by adjusting the side bearing shim thickness or the adjuster sleeve(s). Refer to **Backlash Adjustment** .

High Flank Contact Pattern

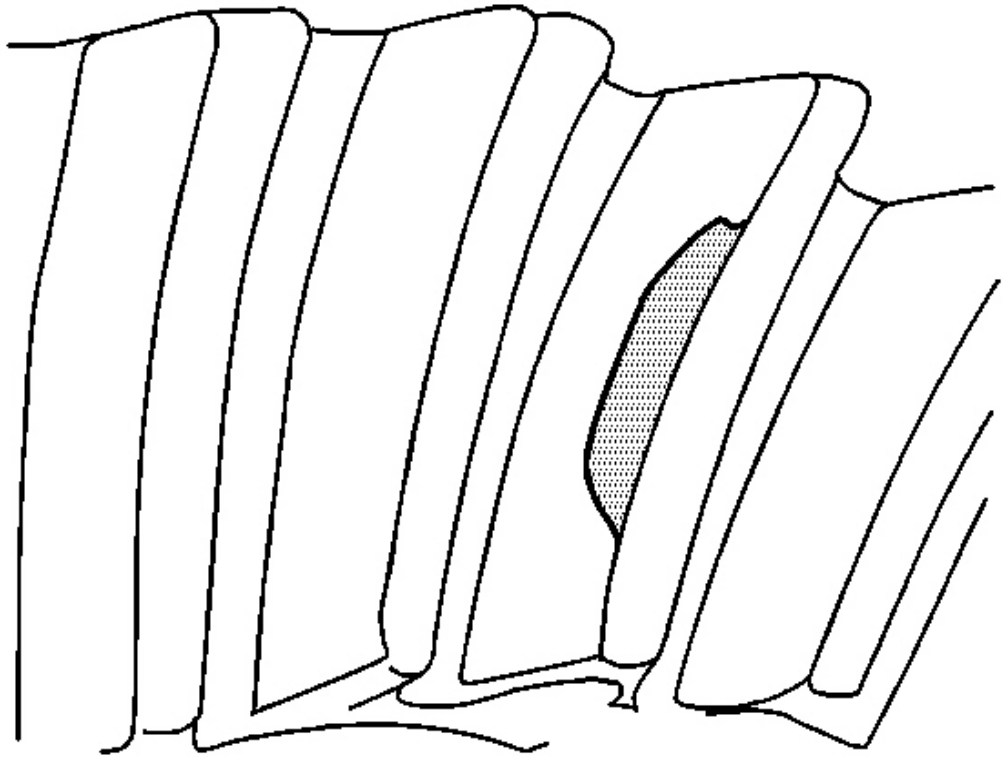


Fig. 125: High Flank Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The pinion depth is incorrect. The pinion gear is too far away from the ring gear.

Correction

Increase the pinion depth. Move the pinion gear closer to the ring gear by increasing the pinion shim thickness. Refer to **Pinion Depth Adjustment** .

Low Flank Contact Pattern

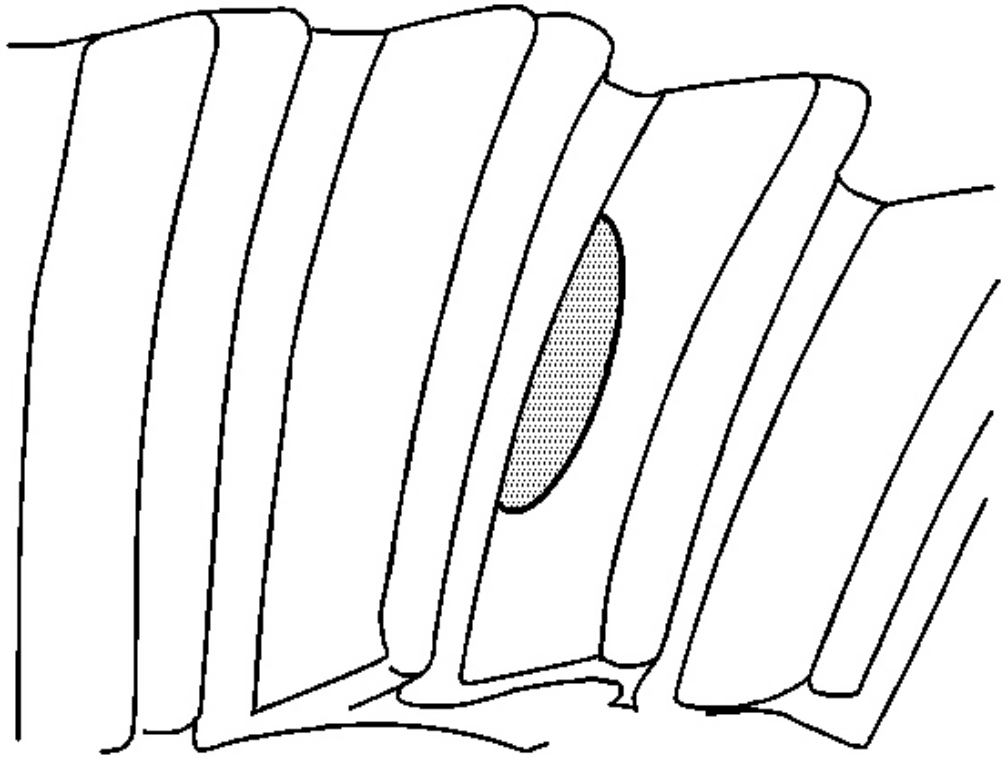


Fig. 126: Low Flank Contact Pattern
Courtesy of GENERAL MOTORS CORP.

Condition

The pinion depth is incorrect. The pinion gear is too close to the ring gear.

Correction

Decrease the pinion depth. Move the pinion gear away from the ring gear by decreasing the pinion shim thickness. Refer to **Pinion Depth Adjustment** .

DESCRIPTION AND OPERATION

REAR DRIVE AXLE DESCRIPTION AND OPERATION

Rear Axles for this vehicle consist of the following components:

- Differential Axle Housing
- Differential Carrier
- Electronic Locking Mechanism
- Right and left Axle tubes
- Right and left axle shafts

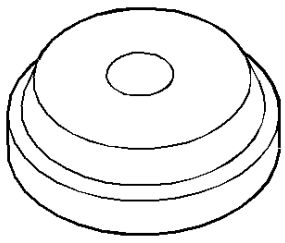
The H2 uses the 9.50 inch ring gear axle. This type of the axle can be identified by the stamping on the right side axle tube. It may also be identified by the ring gear size. The locking differential information for this rear axle can be located in the locking differential section.

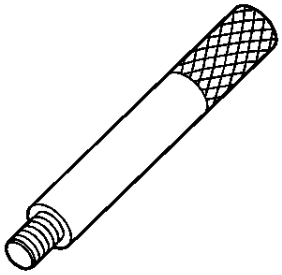
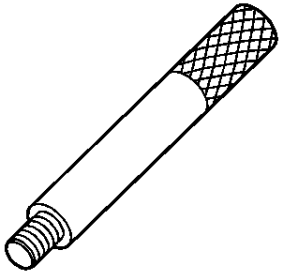
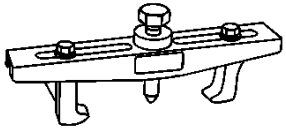
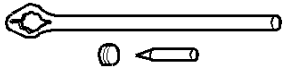
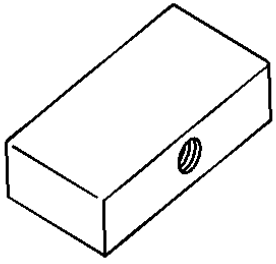
This differential has a set of 4 gears. 2 are side gears and 2 are pinion gears. Each side gear is splined to an axle shaft so each axle shaft turns when its side gear rotates. The pinion gears are mounted on a differential pinion shaft, and the gears are free to rotate on this shaft. The pinion shaft is fitted into a bore in the differential case and is at right angles to the axle shafts. Power is transmitted through the differential as follows: The drive pinion rotates the ring gear which is bolted to the differential case assembly. The differential pinion, as it rotates with the case, forces the pinion gears against the side gears. When both wheels have equal traction, the pinion gears do not rotate on the pinion shaft because the input force on the pinion gear is equally divided between the 2 side gears. Therefore the pinion gears revolve with the pinion shaft; but do not rotate around the shaft itself. The side gears; being splined to the axle shafts, and in mesh with the pinion gears rotate the axle shafts. When the vehicle turns a corner the inner wheel turns slower than the outer wheel which slows the rear axles' side gear. The rear axle pinion gears will roll around the slower moving rear axle side gear; driving the rear axle side gear wheel faster.

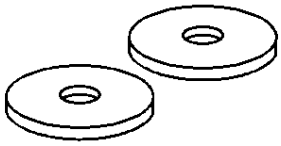
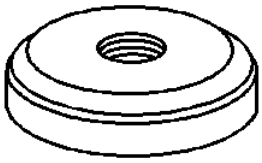
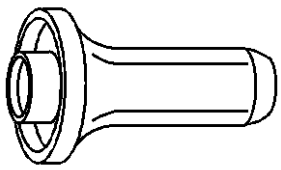
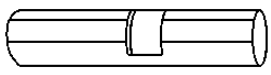
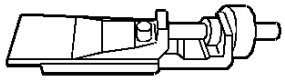
SPECIAL TOOLS AND EQUIPMENT

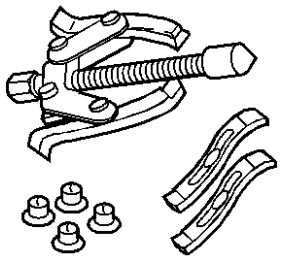
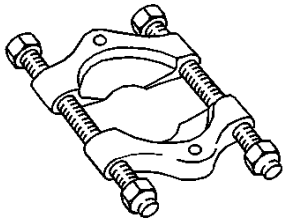
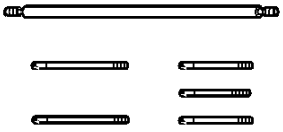
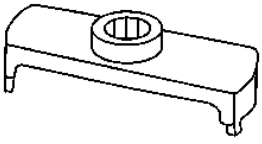
SPECIAL TOOLS

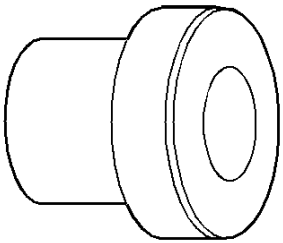
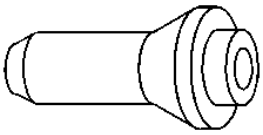
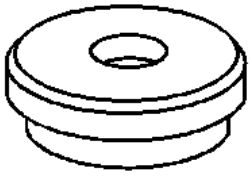
Special Tools

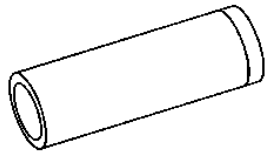
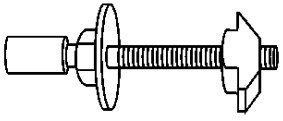
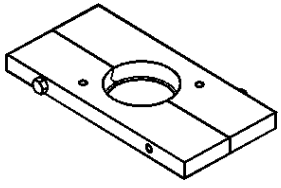
Illustration	Tool Number/Description
	J 2619-01 Slide Hammer
	J 7818 Inner Bearing Race Installer

	J 8001 Dial Indicator Set
	J 8092 Universal Driver Handle - 3/4 in - 10
	J 8433 Two Jaw Puller
	J 8614-01 Flange and Pulley Holding Tool
	J 21777-85 Gauge and Plate (9.5 in Axle)

	J 21777-86 Side Bearing Disc (2 Required) (9.5 in Axle)
	J 22306 Pinion Cup Bearing Installer - rear
	J 22388 Pinion Oil Seal Installer-Rear
	J 22536 Pinion Driver
	J 22779 Side Bearing Backlash Gauge
	J 22888-D Side Bearing Remover Kit

	
	J 22912-01 Split-Plate Bearing Puller
	J 24429 Side Bearing Backlash Spanner
	J 25025 Guide Pins
	J 29709 Wheel Bearing Installer

	J 29710 Differential Side Bearing Installer
	J 29713 Axle Seal Installer (9.5 in Axle)
	J 34925 Pinion Setting Gauge and Components
	J 36597 Side Bearing Puller Pilot - 9.25 in Axle
	J 36614

	Inner Pinion Bearing Installer (9.5 in Axle)
	J 38125-B Terminal Repair Kit
	J 44685 Rear Axle Seal and Bearing Remover
	J 45766 Differential Side Bearing Remover