2005 Driveline/Axle

Rear Drive Axle - GTO

SPECIFICATIONS

FASTENER TIGHTENING SPECIFICATIONS

Fastener Tightening Specifications

Application	Specification	
	Metric	English
Drain Plug	27 N.m	20 lb ft
Fill Plug	27 N.m	20 lb ft
Differential Rear Mount to Underbody Bolts		
• First Pass	35 N.m	26 lb ft
• Second Pass	+ 60 degrees	
Differential Rear Mount to Differential Cover Bolts	95 N.m	70 lb ft
Differential Crossmember Mount Bolts		
• First Pass	90 N.m	66 lb ft
• Second Pass	+ 38 degrees	
Wheel Drive Shaft to Axle Stub Shaft		
• First Pass	50 N.m	37 lb ft
• Second Pass	+ 67 degrees	

DIFFERENTIAL CARRIER ASSEMBLY SPECIFICATIONS

Differential Carrier Assembly Specifications

Application	Specification	
	Metric	English
Pinion Flange Rotational Torque	0.23-0.45 mm	2-4 lb in

LUBRICATION SPECIFICATIONS

Lubrication Specifications

Application	Specification	
	Metric	English
Differential Housing Oil Capacity (Drain and Refill)	1.6 liters	3.38 pts
	1.6 liters 75W-140W GL-5 final	

Differential Housing Oil Capacity (Drain and Synthetic Lubricant	drive lubricant GM P/N 89021809
Limited Slip Differential Friction Modifier 7098	0.25 ml (1.0 oz.) GM P/N 89021958

COMPONENT LOCATOR

DIFFERENTIAL CARRIER ASSEMBLY DISASSEMBLED VIEWS

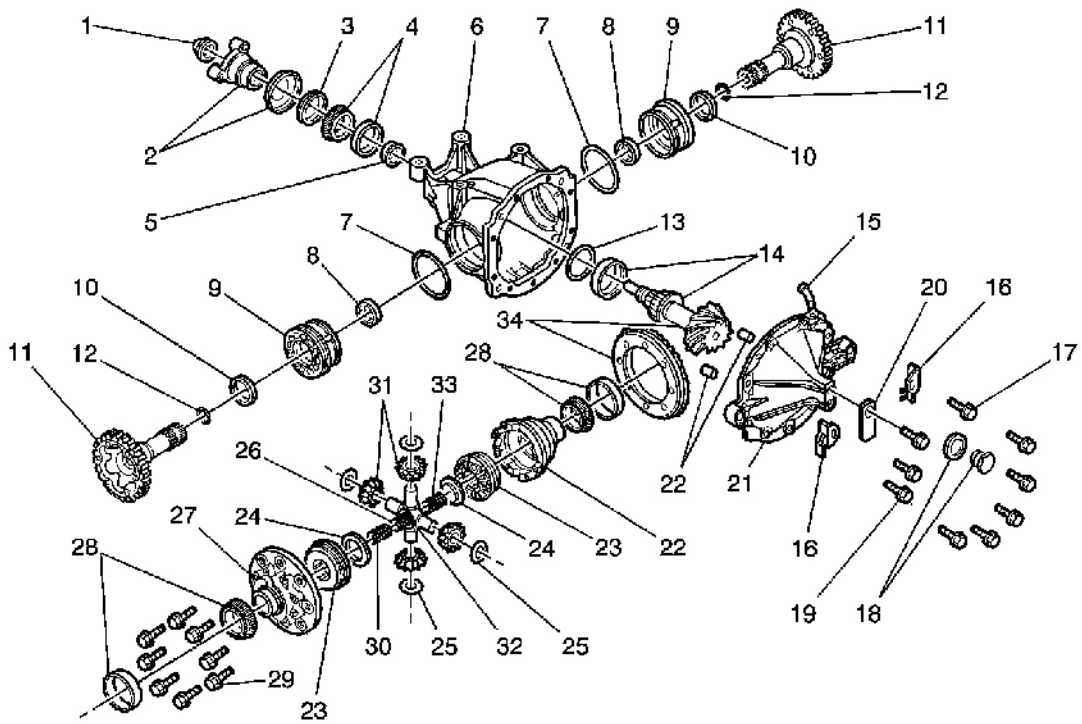


Fig. 1: Exploded View Of Differential Carrier Assembly
Courtesy of GENERAL MOTORS CORP.

Callouts For Fig. 1

Callout	Component Name
1	Pinion Nut
2	Pinion Flange Assembly
3	Pinon Oil Seal
4	Front Pinon Bearing
5	Pinon Bearing Spacer
6	Differential Carrier
7	Screw Adjuster O-ring
8	Inner Axle Shaft Bearing Assembly
9	Side Bearing Adjusting Screw Bearing Assembly

10	Differential Carrier
11	Inner Axle Shaft Seal
12	Screw Adjuster
13	Inner Axle Shaft Retaining Clip
14	Rear Pinion Bearing Assembly
15	Differential Breather Assembly
16	Screw Adjuster Lock Plate
17	Rear Cover Attaching Bolts
18	Differential Filler Plug and Gasket
19	Differential Drain Plug
20	Lubrication Tag
21	Differential Housing Cover
22	Dowel Pins
23	Side Gear Clutch Cone
24	Thrust Spring Plate
25	Differential Pinion Gear Thrust Washer
26	Differential Pre-load Spring - Middle
27	Differential Case
28	Differential Side Bearing Assembly
29	Differential Case Cover Bolts
30	Differential Spring Pre-load - Inner
31	Differential Pinon Gears
32	Pinion Cross Shaft
33	Differential Pre-load Spring - Outer
34	Ring and Pinon Gear

DIAGNOSTIC INFORMATION AND PROCEDURES

DIAGNOSTIC STARTING POINT - REAR DIFFERENTIAL CARRIER

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 Differential Carrier** in order to identify the correct procedure for diagnosing the system and where the procedure is located.

SYMPTOMS - REAR DIFFERENTIAL CARRIER

Review the system and operation in order to familiarize yourself with the system functions.

Refer to **Differential Carrier Assembly Description** .

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:

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

NOISE DIAGNOSIS - REAR DRIVE AXLE

Many noises thought to be coming from the rear axle may actually be originating from other sources such as the following:

- Tires
- Road surfaces
- Wheel bearings
- Engine
- Transmission
- Body

Because noise is a major factor in determining or diagnosing a rear axle problem, a thorough and careful check should be made to determine the source of the noise before proceeding with rear axle repair.

Road Noise

Some road surfaces, such as brick or rough-surfaced concrete, cause noise which may be mistaken for tire or rear axle noise. Driving the vehicle on varying types of road surfaces such as smooth asphalt or dirt will help in determining whether road surface is the cause of the

noise. Noise caused by road surface should be the same in drive or coast.

Tire Noise

Tire noise can be easily mistaken for rear axle noise. Because noise can transmit or dissipate through the vehicle body, noise coming from the front tires can also be mistaken for rear axle noise. Tires showing uneven wear, or that are underinflated, are usually noisy and may produce vibrations which can appear at other places on the vehicle. This is particularly true with low tire pressure. For tire inspection procedures, Refer to **Tire and Wheel Inspection** in Vibration Diagnosis and Correction.

Engine and Transmission Noise

The engine or transmission may sometimes produce noises which may be mistaken for rear axle noise. To determine which unit is actually causing the noise, run the following tests:

1. Record the speed, RPM and other conditions at which the noise is most pronounced.
2. Stop the vehicle in a quiet place to avoid interference with other extraneous noises.
3. With the transmission in neutral, slowly run the engine speed up and down to the engine speeds that correspond with the vehicle speed at which the noise was most pronounced. If the noise is produced with the vehicle at a standstill, the problem lies in the engine or transmission and not in the rear axle.

Brake Noise

Most noises caused by the front or rear brakes are rotational and occur once every wheel revolution. During a road test, duplicate the conditions under which the noise is most pronounced and gently apply the brakes. If the noise immediately appears or disappears when lightly depressing the brake pedal, the noise may be caused by an out of round brake rotor. For brake diagnosis, refer to **Diagnostic Starting Point - Disc Brakes** in Disc Brakes.

Body Boom Noise or Vibration

Objectionable body boom noise or vibration usually occurs at 90-100 km/h (55-65 mph) and can be caused by the following:

- An out of balance propeller shaft
- Excessive looseness at the propeller shaft
- Excessive wear at the propeller shaft
- Excessive yoke splines may also cause a propeller shaft to be unbalanced

If all indications point to a rear axle noise after making a comprehensive check of the vehicle, it is necessary to determine what component in the rear axle is at fault. True rear axle noise generally falls into one of the two following categories:

- Bearing noise
- Gear noise

Drive Shaft Bearings

Drive shaft bearings that are rough or pitted can be responsible for a growling noise which may sound like differential noise.

The noise however, does not very in drive or coast and still persists when coasting with the transmission in neutral.

Frequently the noise can be identified by the sound being irregular or intermittent as the noise can fade for a short period.

To confirm the diagnosis of a drive shaft noise :

- Raise and support the vehicle
- Remove the rear wheels and brake disc.
- Start the engine and put the highest gear.
- Run the engine at a fast idle.
- Using a stethoscope, determine which bearing has a noticeable difference in noise.

Pinion Bearing Noise

Pinion bearing failures can be distinguished because pinion bearings rotate at a higher rate of speed than the differential side bearings or drive axles. Rough or excessively worn pinion bearings produce a continuous low pitched whirring or scraping noise on low speed acceleration from a stop.

Side Bearing Noise

Side bearings, when worn, produce a constant rough noise at a lower pitch than with pinion bearing noise. Side bearing noise may also fluctuate with drive axle shaft noise.

Side Gear and Differential Pinion Gear Noise

Side gears and differential pinion gears rarely cause noise. This is due mainly to their lack of movement during straight ahead driving. Noise produced by these gears will be most pronounced on turns.

Ring and Pinion Gear Noise

There are two types of gear noise. One type is produced by broken, bent, overheated or forcibly damaged gear teeth. This noise is usually quite audible through all speed ranges and can easily be diagnosed upon visual inspection. For example, hypoid gear tooth scoring

generally results from the following:

- Insufficient lubricant
- Improper or contaminated lubricant
- Insufficient gear backlash
- Improper pinion depth
- Improper ring and pinion gear alignment
- Improper pinion bearing preload

The scoring will progressively lead to complete erosion of the gear teeth and, eventually, a fracture will result if the initial scoring condition is not corrected. Another common cause of hypoid gear tooth fracturing is extended overloading or shock loading - causing the differential pinion gears and shaft to seize. This can result from lubrication breakdown caused by excessive wheel spin. The second type of gear noise pertains to the contact pattern of the ring and pinion gear teeth. This form of abnormal gear noise can be recognized because it produces a cycling pitch (whine). This whine will be very pronounced at the speed range in which it occurs. Gear noises in the differential can occur under one or all of the following conditions:

- Drive - Under acceleration or heavy pull. The pinion gear riding on the drive side of the ring gear.
- Float - Only enough throttle to keep the engine from pulling the vehicle (between Drive and Coast). The vehicle slows down gradually with the engine pulling only slightly.
- Coast - Throttle is closed and the vehicle in gear. The pinion gear riding on the coast side of the ring gear.

Gear noises tend to peak at a narrow speed range or ranges and tend to remain constant in pitch. Bearing noises will vary in pitch with vehicle speeds. For further diagnosis, refer to the noise diagnosis tables.

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.

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

Inspect	Causes
Rear Axle Lubricant	Low lubricant level contamination

NOISY WHEN COASTING

Noisy When Coasting

Inspect	Causes
Wheels or Tires	Imbalance or improper inflation
Front Wheel Bearings	Wear or damage
Propeller Shaft	Excessive drive line angle

Inspect	Causes
Ring and Pinion Gears	• Incorrect backlash • Incorrect pinion depth • Wear or damage
Wheels or Tires	Imbalance or improper inflation
Front Wheel Bearings	Wear or damage
[illegible]	[illegible]

INTERMITTENT NOISE

Intermittent Noise

Inspect	Causes
Wheels and Tires	Imbalance or improper inflation
Rear Axle Shafts	Excessive end play
Pinion Shaft or Pinion Bearing	Wear or damage
Differential Case Side Gear Hub	Worn, oversized or damage
Universal Joint	Wear or damage

CONSTANT NOISE

Constant Noise

Inspect	Causes
Pinion Bearings	Wear or damage

NOISY ON TURNS

Noisy on Turns

Inspect	Causes
Differential Side Gears and Pinion Gears	• Wear or damage • Excessive backlash

REPAIR INSTRUCTIONS

LUBRICANT CHANGE

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Place a drain pan or suitable container under the rear axle housing.

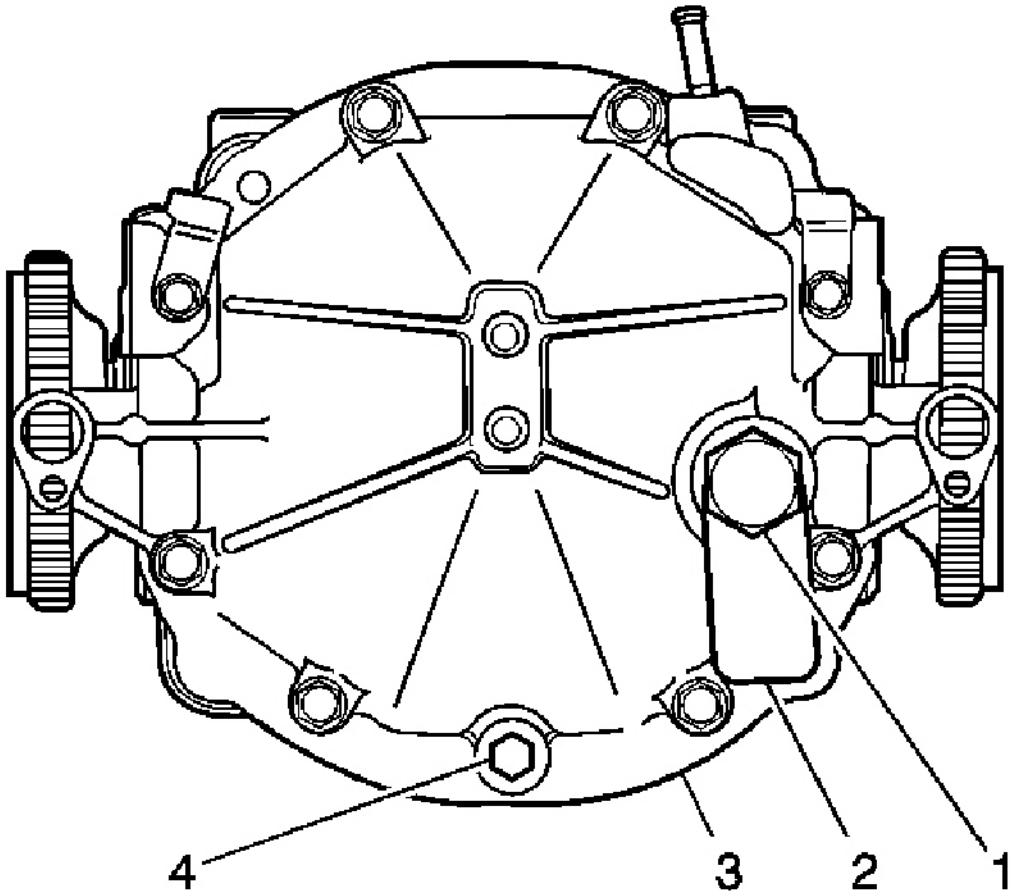


Fig. 2: View Of Oil Level Fill Plug & Drain Plug
Courtesy of GENERAL MOTORS CORP.

3. Remove the rear axle housing oil level fill plug (1) from the rear axle housing.
4. Remove the rear axle housing drain plug (4) from the rear axle housing and drain the rear axle housing.

NOTE: Refer to Fastener Notice in Cautions and Notices.

5. After the rear axle housing has completely drained, install the rear axle housing drain plug (4) into the rear axle housing.

   Tighten: Tighten the rear axle housing oil level filler plug to 27 N.m (20 lb ft).

6. Refill the rear axle housing with approximately 1.0 liter (1.0 qt) of Synthetic Gear Oil 75W-140 GM P/N 89021809.

7. Using a graduated measuring cup, add 25 ml (1.0 oz.) of Limited Slip Differential Friction Modifier GM P/N 89021958 to the rear axle housing.
8. Fill the rear axle housing with the remaining 0.575 liter (0.644 qt) of Synthetic Gear Oil 75W-140 GM P/N 89021809. The oil level should be even with the bottom of the rear axle housing oil level filler plug hole.
9. Install the rear axle housing oil level fill plug (1) with a new gasket and the lubricant tag (2) into the rear axle housing.

   Tighten: Tighten the rear axle housing oil level fill plug to 27 N.m (20 lb ft).

10. Remove the drain pan from under the rear axle housing.
11. Lower the vehicle.

DIFFERENTIAL CARRIER ASSEMBLY MOUNT REPLACEMENT

Tools Required

J 45059 Angle Meter

CH-46839 Rear Crossmember Centering Tool

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the rear exhaust system. Refer to **Muffler Replacement (Front)** or **Muffler Replacement (Rear)** in Engine Exhaust.
3. Remove the propeller shaft. Refer to **Propeller Shaft Replacement - Two Piece** in Propeller Shaft.

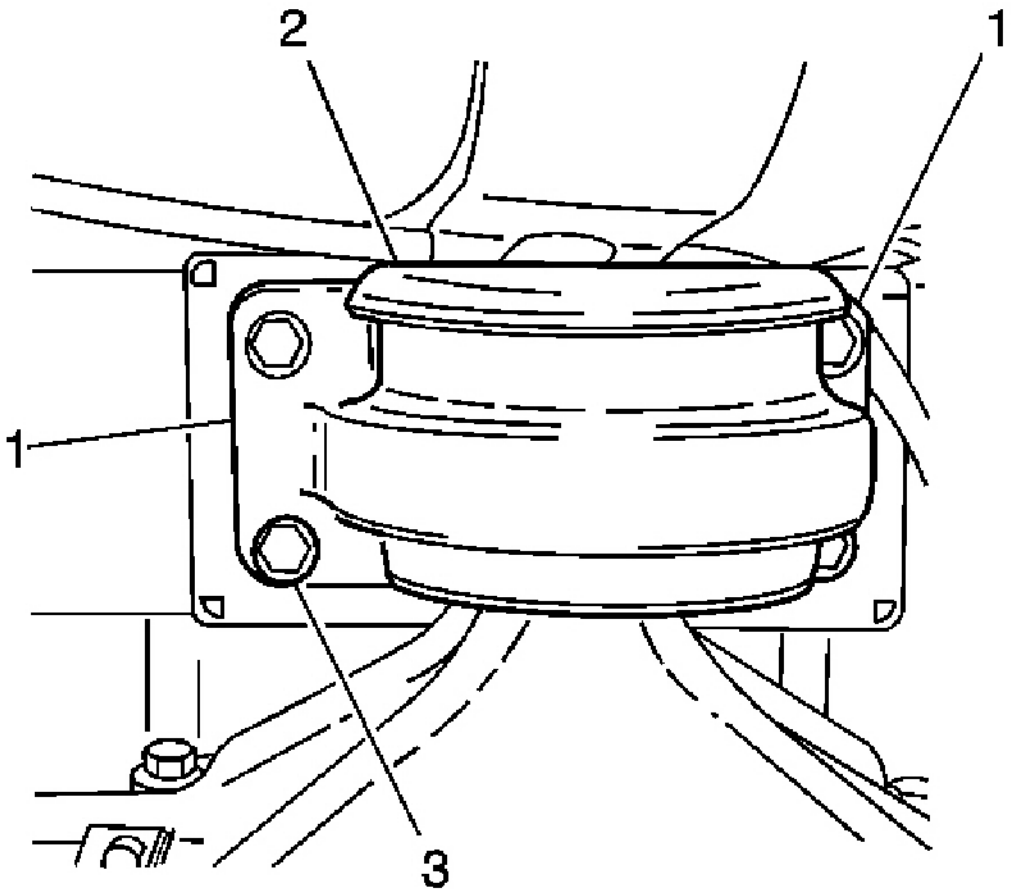


Fig. 3: View Of Alignment Locations & Underbody Bolts
Courtesy of GENERAL MOTORS CORP.

4. Using a scribe, mark the rear mount (2) to the vehicle under body location (1), this will assist in the rear suspension support alignment on installation.
5. Support the differential carrier.

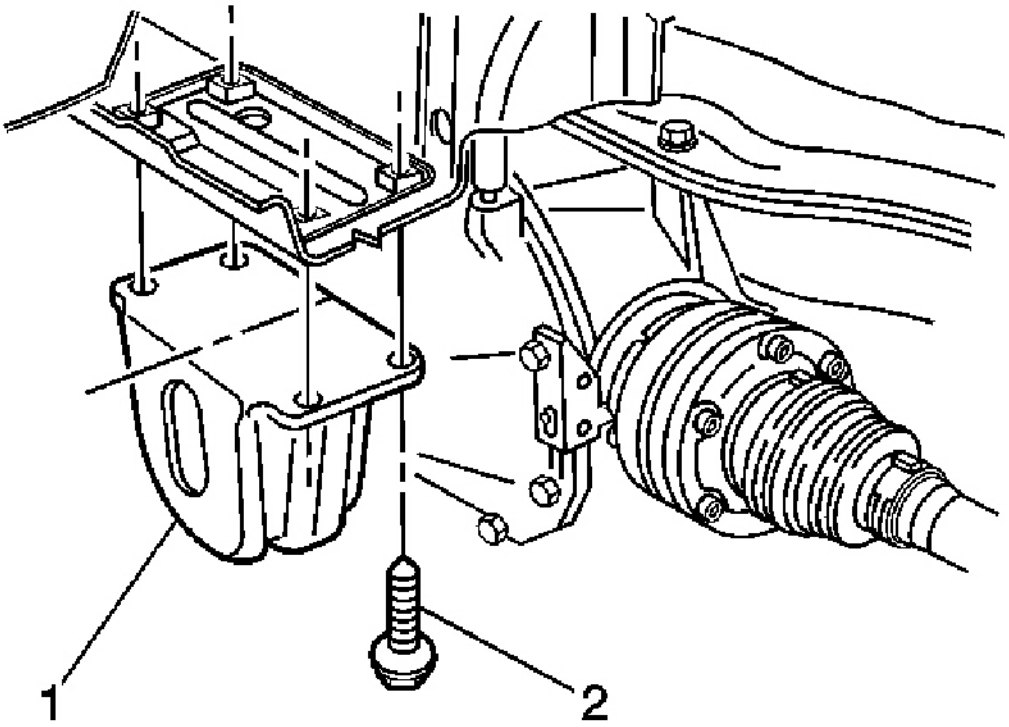


Fig. 4: View Of Rear Mount & Underbody Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the rear mount (1) to underbody bolts (2) and discard.
7. Lower the differential carrier and rear suspension crossmember at least 60 mm (2.4 in).

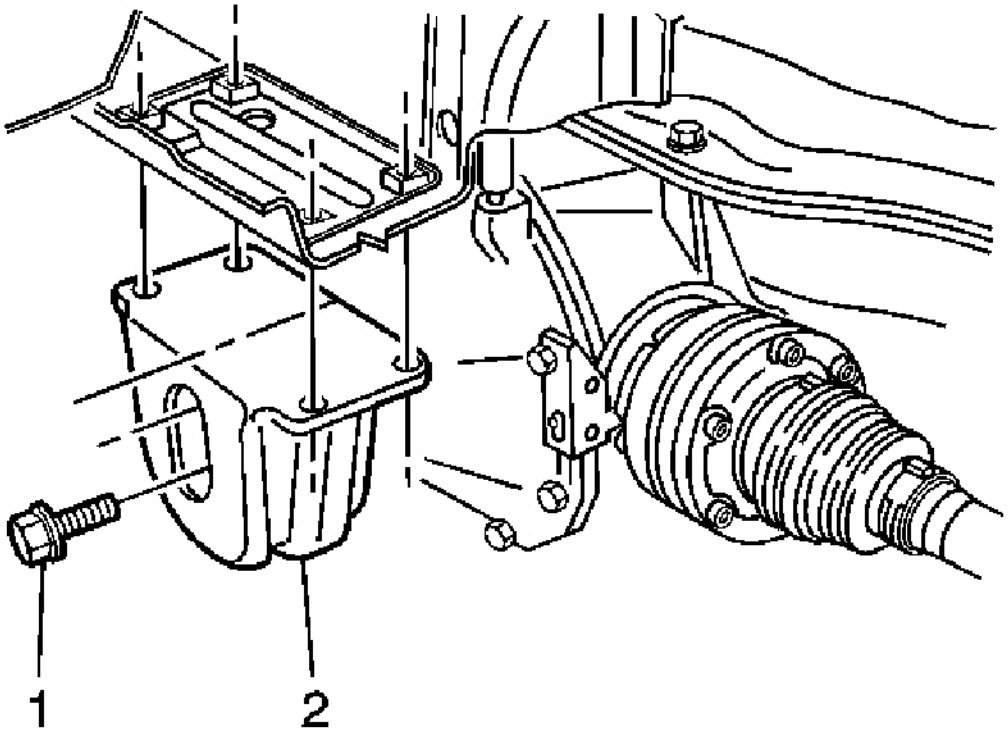


Fig. 5: View Of Rear Mount & Differential Carrier Cover Bolts
Courtesy of GENERAL MOTORS CORP.

8. Remove the rear mount to (2) differential carrier cover bolts (1) and discard.
9. Remove the rear mount.

Installation Procedure

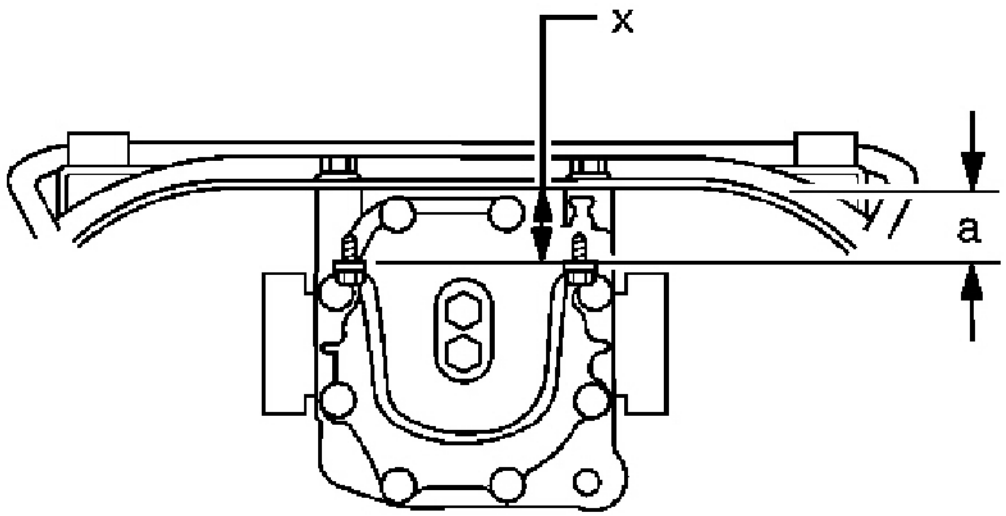


Fig. 6: Mount Alignment Mark
Courtesy of GENERAL MOTORS CORP.

1. When tightening the mount bolts, ensure the mount does not twist. The mount should remain parallel (X) with the rear suspension support.

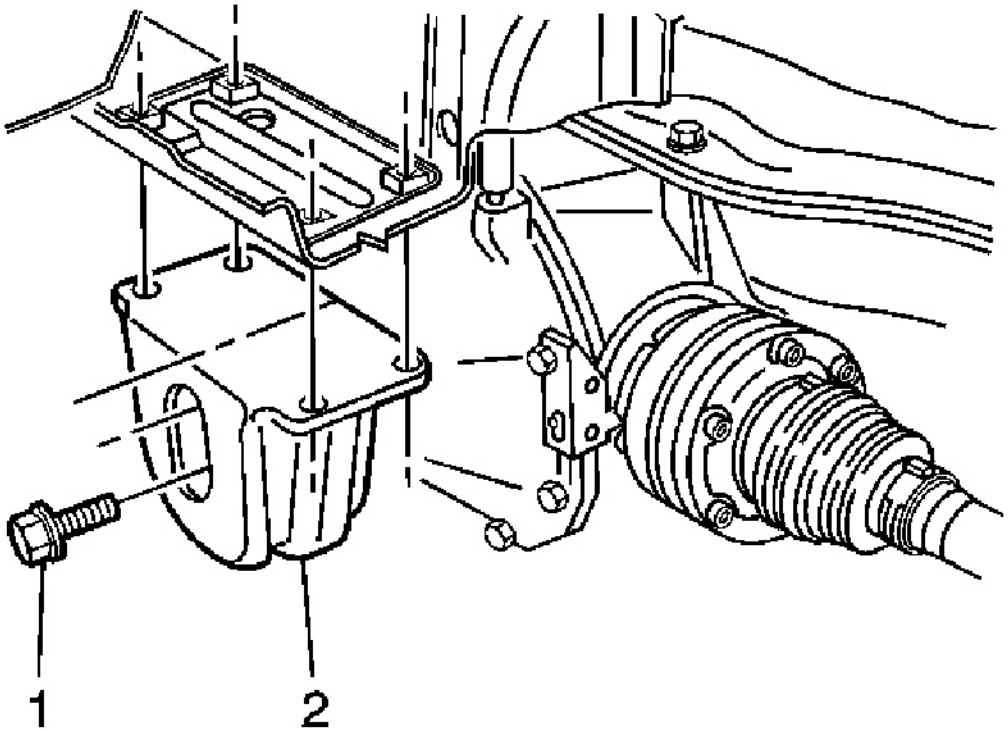


Fig. 7: View Of Rear Mount & Differential Carrier Cover Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

2. Using new bolts, (1) install the rear mount (2) to the differential carrier cover.

   Tighten: Tighten the bolts to 95 N.m (70 lb ft).

3. Tighten the rear mount to differential carrier cover bolts (1).

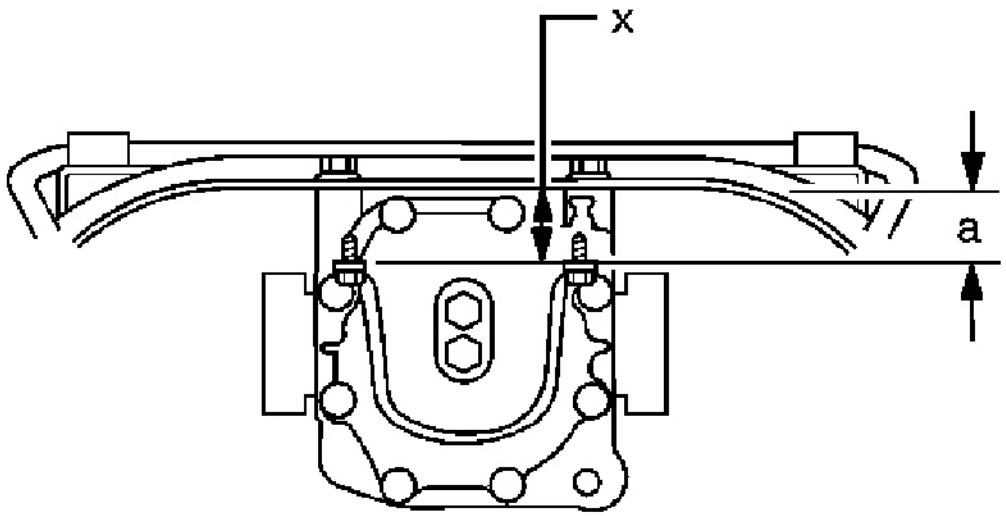


Fig. 8: Mount Alignment Mark
Courtesy of GENERAL MOTORS CORP.

IMPORTANT: Ensure the underbody and the rear mount are parallel. Dimension (a) should be 56.7 mm (2.2 in).

4. Raise the differential until it contacts the underbody.

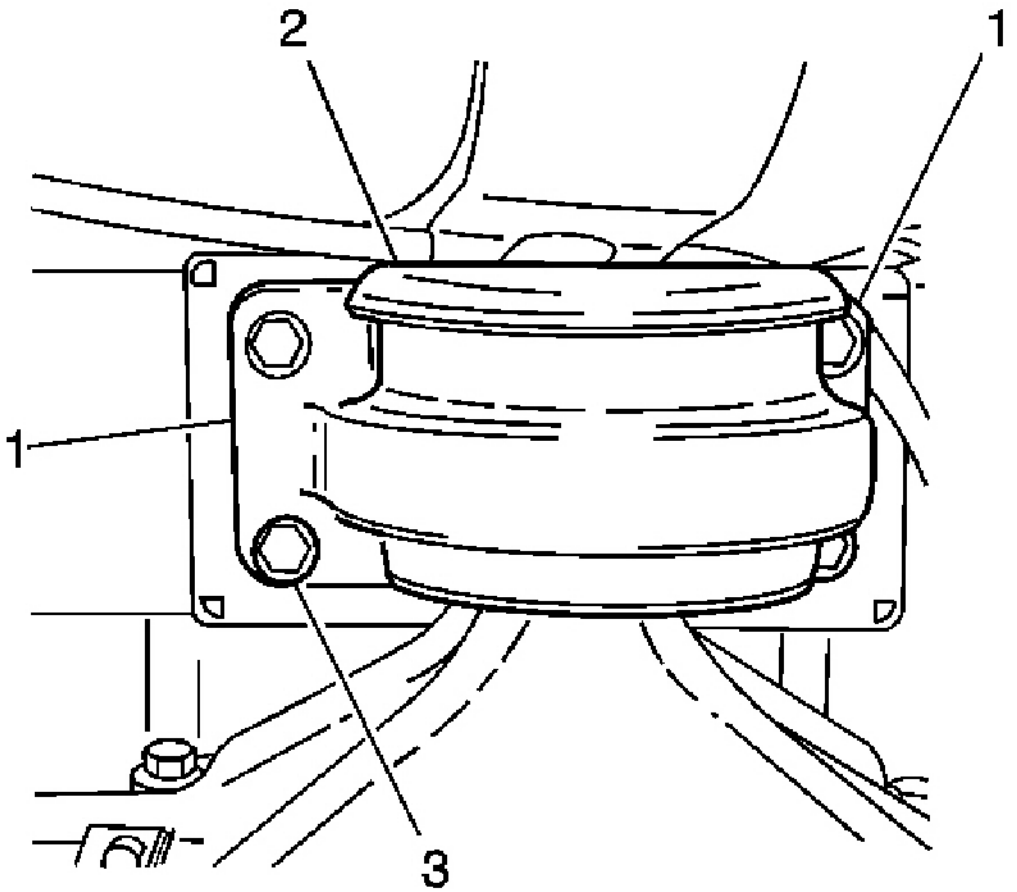


Fig. 9: View Of Alignment Locations & Underbody Bolts
Courtesy of GENERAL MOTORS CORP.

5. Align the marks (1) and install the rear mount (2) to underbody bolts (3) finger tight.

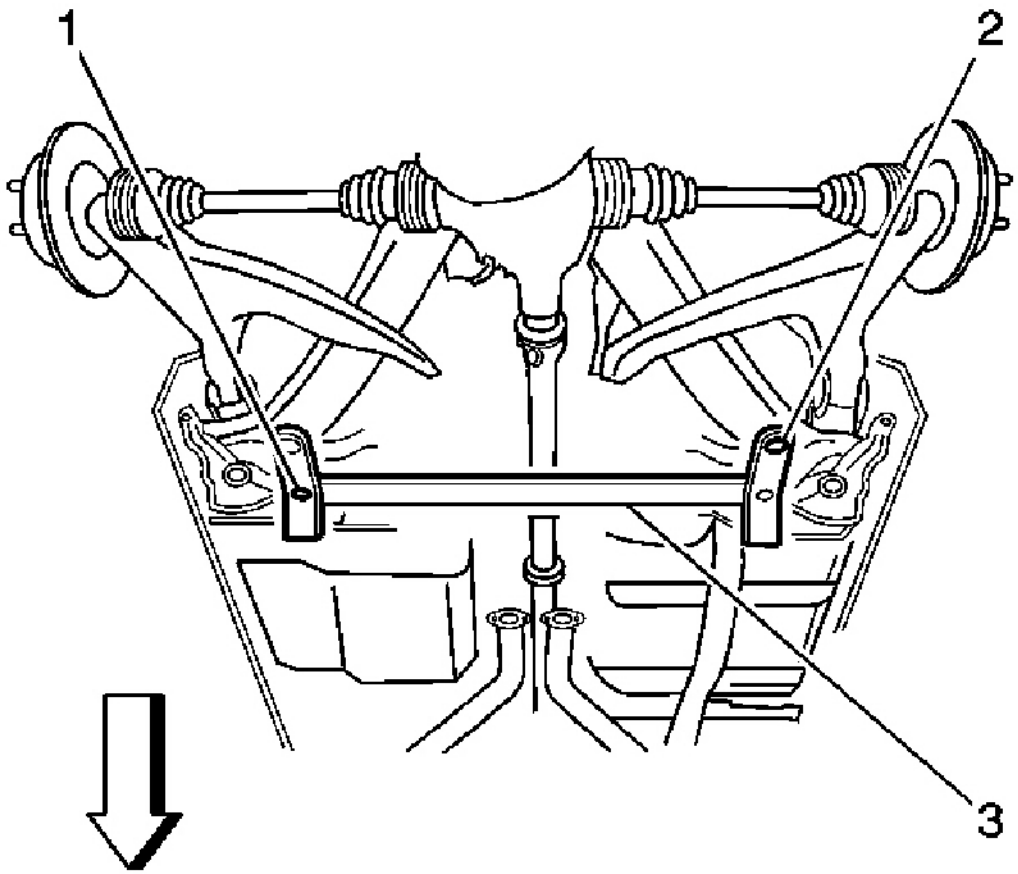


Fig. 10: View Of Body Datum Holes, Rear Crossmember Centering Tool & Locations Pins
Courtesy of GENERAL MOTORS CORP.

6. Fit the **CH-46839** to the underbody.
7. The rear crossmember centering tool (3) locates into 19 mm (0.74 in) diameter body datum holes (1) positioned forward of the rear suspension support.
8. With the aid of an assistant position the rear crossmember centering tool (3) location pins (2) to engage the alignment holes on the rear suspension support assembly.
9. If the alignment holes on the rear suspension do not align with the crossmember centering tool location pins, the crossmember must be aligned. To align the crossmember, refer to **Support Replacement - Rear** in Frame and Underbody.
10. With the marks aligned (1), tighten the rear mount (2) to underbody bolts (3).

Tighten:

1. Tighten mount bolts to 90 N.m (66 lb ft).

2. Using the **J 45059** , apply an additional 60 degrees of torque

11. Install the propeller shaft. Refer to **Propeller Shaft Replacement - Two Piece** in Propeller Shaft.
12. Install the rear exhaust system. Refer **Muffler Replacement (Front)** or **Muffler Replacement (Rear)** in Engine Exhaust.
13. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

REAR AXLE SHAFT REPLACEMENT

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Position a drain pan under the axle.

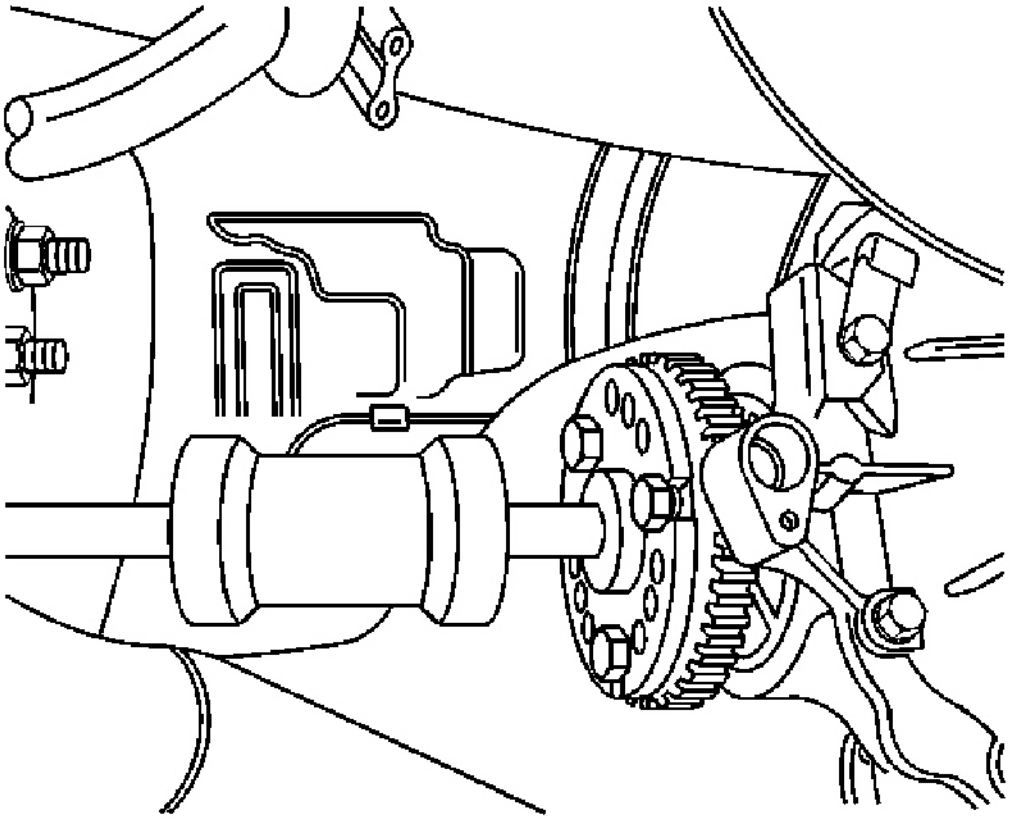


Fig. 11: Removing Inner Axle

Courtesy of GENERAL MOTORS CORP.

3. Remove the inner axle using a slide hammer and puller plate.

Installation Procedure

1. Clean the area around the axle bore and housing.
2. Inspect the seal lip for damage, replace if damaged.
3. Lubricate the seal lip with Lithium grease.
4. Inspect the retainer ring on the end on the axle for damage and that it moves freely, replace if damaged.

IMPORTANT: Ensure the axle shaft splines or the retainer ring do not damage the axle seal when installing the axle.

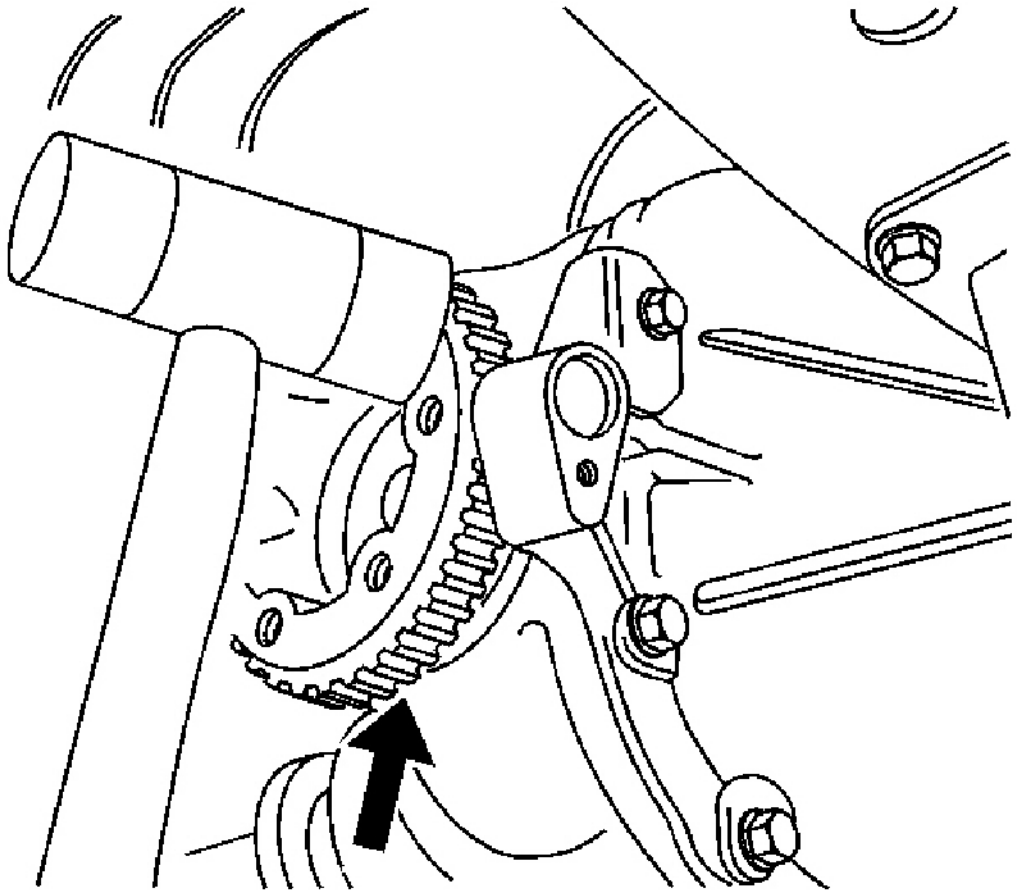


Fig. 12: Installing Axle Shaft

Courtesy of GENERAL MOTORS CORP.

5. Install the axle shaft into the axle shaft bore.
6. Lightly hit the end of the axle with a soft faced hammer until the retainer clip snaps into place.
7. Check and fill the differential as required. Refer to **Lubricant Change** in Rear Drive Axle.
8. Install the drive shaft. Refer to **Rear Axle Shaft Replacement** .
9. Remove the drain pan.
10. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

REAR AXLE SHAFT SEAL REPLACEMENT - LEFT

Tools Required

DT-47544 Seal Installer. See **Special Tools** .

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Place a drain pan under the differential.

IMPORTANT: The rear axle lubricant must be completely drained to ensure the proper friction modifier fill specification.

3. Remove the rear axle housing drain plug from the axle housing.
4. Remove the rear axle housing fill plug from the axle housing.
5. Remove the drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
6. Remove the axle shaft. Refer to **Rear Axle Shaft Replacement** .
7. Clean the area around the axle shaft seal.

IMPORTANT: Do not damage the aluminum screw adjuster housing. Damage to the screw adjuster can cause leaks.

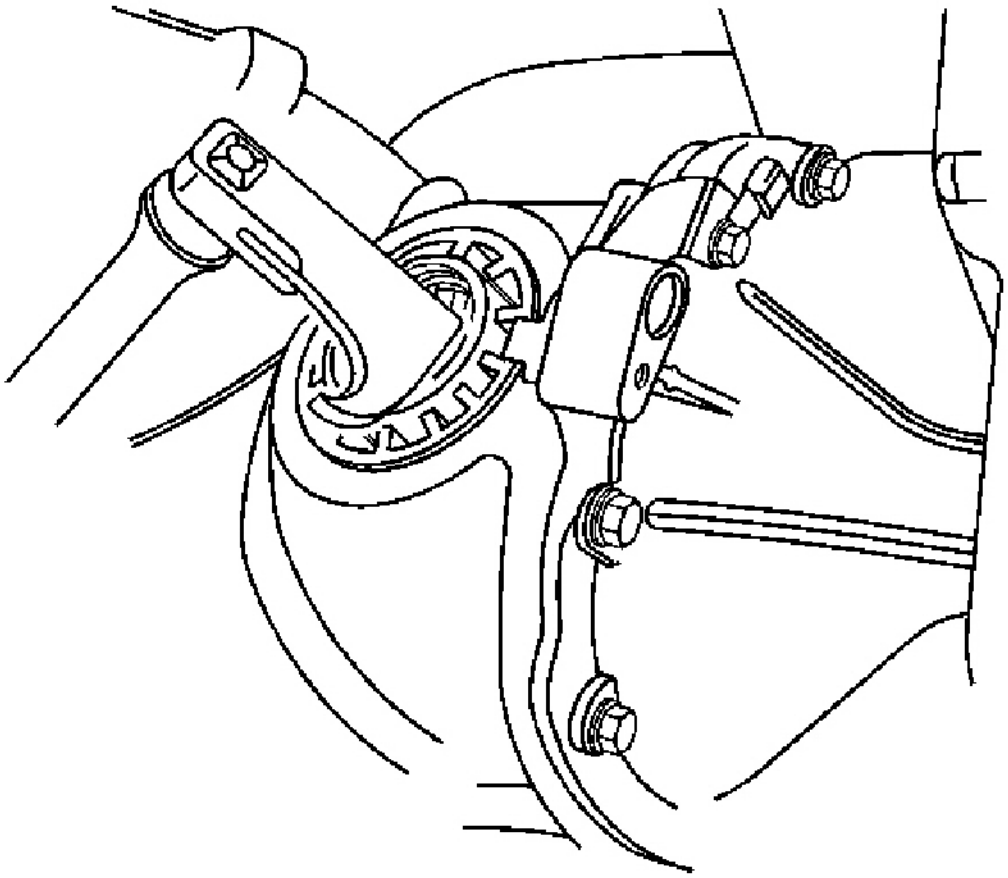


Fig. 13: Removing Axle Shaft
Courtesy of GENERAL MOTORS CORP.

8. Remove the axle shaft seal with a seal removal tool.

Installation Procedure

1. Inspect the screw adjuster seal bore for nicks and burrs. Minor nicks and burrs can be removed with a crocus cloth.
2. Inspect the axle shaft seal surface for nicks and burrs. Minor nicks and burrs can be removed with crocus cloth. If damaged, replace the axle shaft.
3. Lubricate the seal bore and the seal lip with lithium grease.

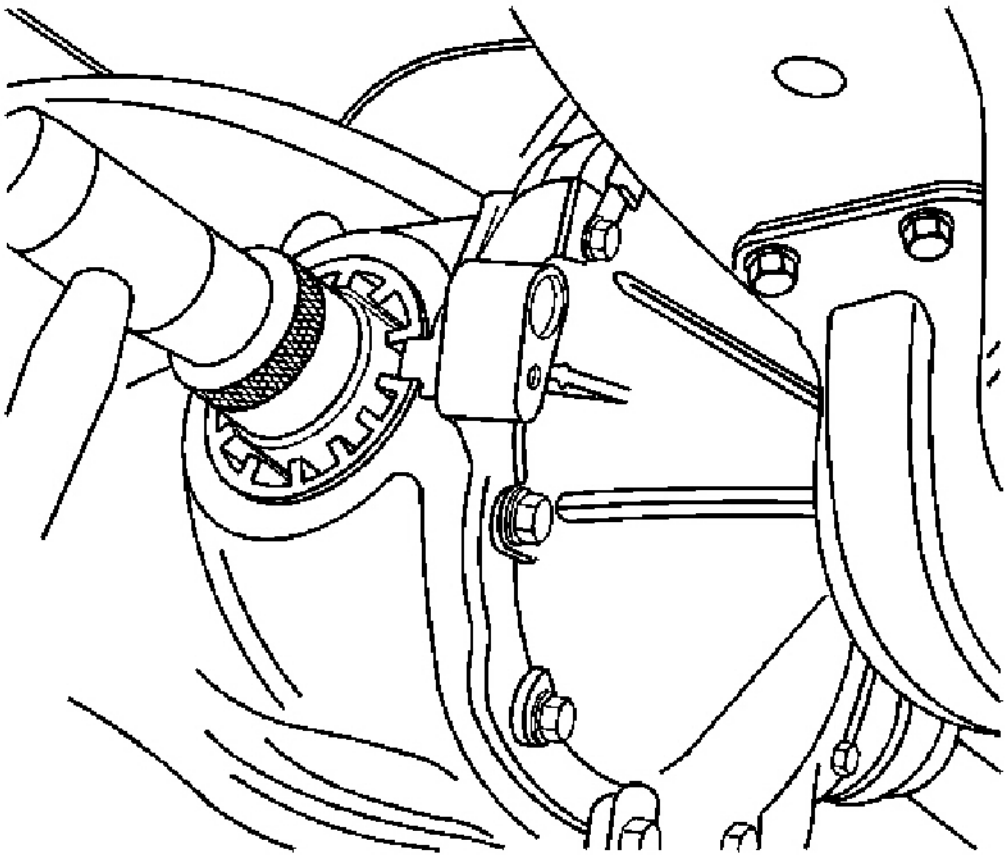


Fig. 14: Installing Axle Shaft Seal
Courtesy of GENERAL MOTORS CORP.

4. Install the seal using a **DT-47544** until the seal is fully seated in the bore. See **Special Tools** .
5. Install the axle shaft. Refer to **Rear Axle Shaft Replacement** .
6. Install the drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

NOTE: Refer to Fastener Notice in Cautions and Notices.

7. Install the drain plug.

   Tighten: Tighten the drain plug to 27 N.m (20 lb ft).

8. Refill the rear axle housing with 1.0 liter (1.0 qt) of Synthetic Gear Oil 75W-140 GM

P/N 890211809.

9. Using a graduated measuring cup, add 25 ml (1.0 oz.) of Limited Slip Differential Friction Modifier GM P/N 89021958 to the rear axle housing.
10. Fill the rear axle housing with the remaining 0.575 liter (0.644 qt) of Synthetic Gear Oil 75W-140 GM P/N 890211809.

    The oil level should be even with the bottom of the rear axle housing filler plug hole.

11. Install the rear axle housing oil level fill plug with a new gasket and the lubricant tag into the rear axle housing.

    Tighten: Tighten the fill plug to 27 N.m (20 lb ft).

12. Remove the drain pan.
13. Lower the vehicle.

REAR AXLE SHAFT SEAL REPLACEMENT - RIGHT

Tools Required

DT-47544 Seal Installer. See **Special Tools** .

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Place a drain pan under the differential.

IMPORTANT: The rear axle lubricant must be completely drained to ensure the proper friction modifier fill specification.

3. Remove the rear axle housing drain plug from the axle housing.
4. Remove the rear axle housing fill plug from the axle housing.
5. Remove the drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.
6. Remove the axle shaft. Refer to **Rear Axle Shaft Replacement** .
7. Clean the area around the axle shaft seal.

IMPORTANT: Do not damage the aluminum screw adjuster housing. Damage to the screw adjuster can cause leaks.

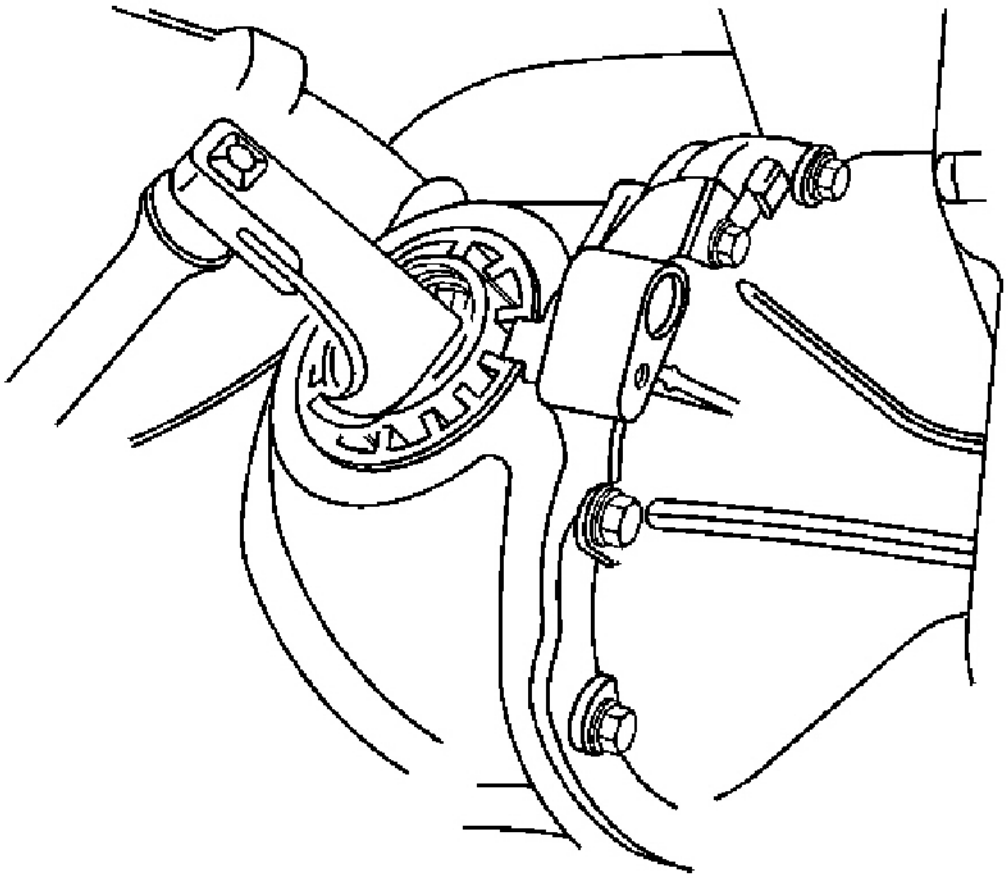


Fig. 15: Removing Axle Shaft
Courtesy of GENERAL MOTORS CORP.

8. Remove the axle shaft seal with a seal removal tool.

Installation Procedure

1. Inspect the screw adjuster seal bore for nicks and burrs. Minor nicks and burrs can be removed with crocus cloth.
2. Inspect the axle shaft seal surface for nicks and burrs. Minor nicks and burrs can be removed with crocus cloth. If damaged, replace the axle shaft.
3. Lubricate the seal bore and the seal lip with lithium grease.

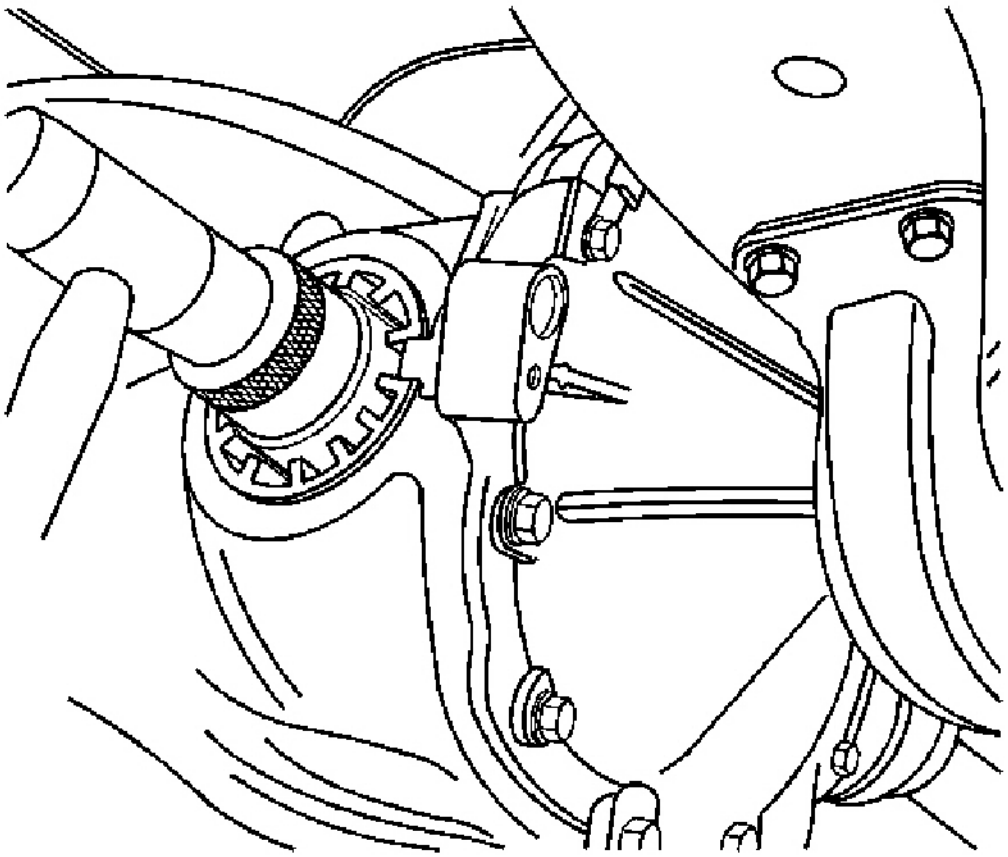


Fig. 16: Installing Axle Shaft Seal
Courtesy of GENERAL MOTORS CORP.

4. Install the seal using **DT-47544** until the seal is fully seated in the bore. See **Special Tools** .
5. Install the axle shaft. Refer to **Rear Axle Shaft Replacement** .
6. Install the drive shaft. Refer to **Wheel Drive Shaft Replacement** in Wheel Drive Shafts.

NOTE: Refer to Fastener Notice in Cautions and Notices.

7. Install the drain plug.

   Tighten: Tighten the drain plug to 27 N.m (20 lb ft).

8. Refill the rear axle housing with 1.0 liter (1.0 qt) of Synthetic Gear Oil 75W-140 GM

P/N 890211809.

9. Using a graduated measuring cup, add 25 ml (1.0 oz.) of Limited Slip Differential Friction Modifier GM P/N 89021958 to the rear axle housing.
10. Fill the rear axle housing with the remaining 0.575 liter (0.644 qt) of Synthetic Gear Oil 75W-140 GM P/N 890211809.

    The oil level should be even with the bottom of the rear axle housing filler plug hole.

11. Install the rear axle housing oil level fill plug with a new gasket and the lubricant tag into the rear axle housing.

    Tighten: Tighten the fill plug to 27 N.m (20 lb ft).

12. Remove the drain pan.
13. Lower the vehicle.

DRIVE PINION FLANGE/YOKE AND/OR OIL SEAL REPLACEMENT

Tools Required

- **J 45059** Angle Meter
- **J-42094-A** Remover/Installer Kit. See **Special Tools** .
- **DT-46853** Pinion Oil Seal Installer. See **Special Tools** .
- **DT-47735** Flange Holder. See **Special Tools** .
- **DT-47736** Flange Remover. See **Special Tools** .

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the left and right mufflers. Refer to **Muffler Replacement (Front)** or **Muffler Replacement (Rear)** in Engine Exhaust.
3. Remove the propeller shaft. Refer to **Propeller Shaft Replacement - Two Piece** in Propeller Shaft.
4. Place a drain pan under the pinion flange.

IMPORTANT: The rear axle lubricant must be completely drained to ensure the proper friction modifier fill specification.

5. Remove the rear axle housing drain plug from the axle housing.
6. Remove the rear axle housing fill plug from the axle housing.

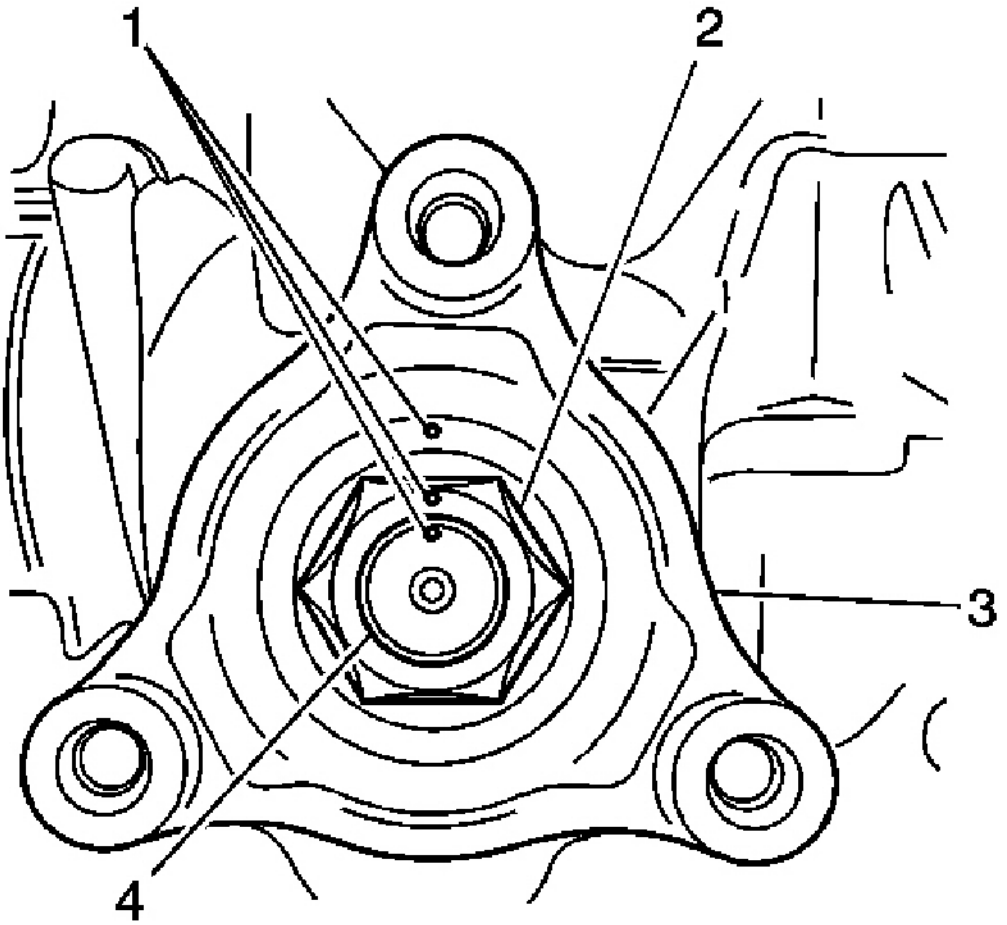


Fig. 17: View Of Pinion Flange Nut & Alignment Marks
Courtesy of GENERAL MOTORS CORP.

7. Center punch alignment marks (1) on the pinion flange, the pinion flange nut (2), and the pinion shaft end.

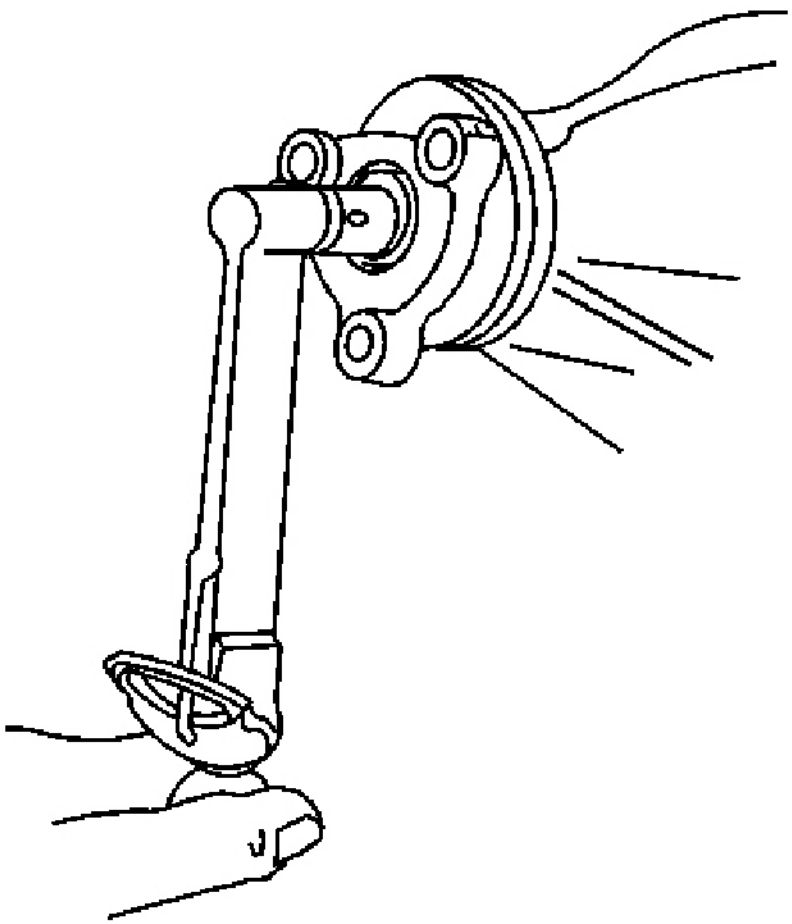


Fig. 18: Checking Torque On Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

8. Using an inch pound torque wrench, check and record the rotational torque on the pinion shaft. Torque should be between 2 and 4 lb in.

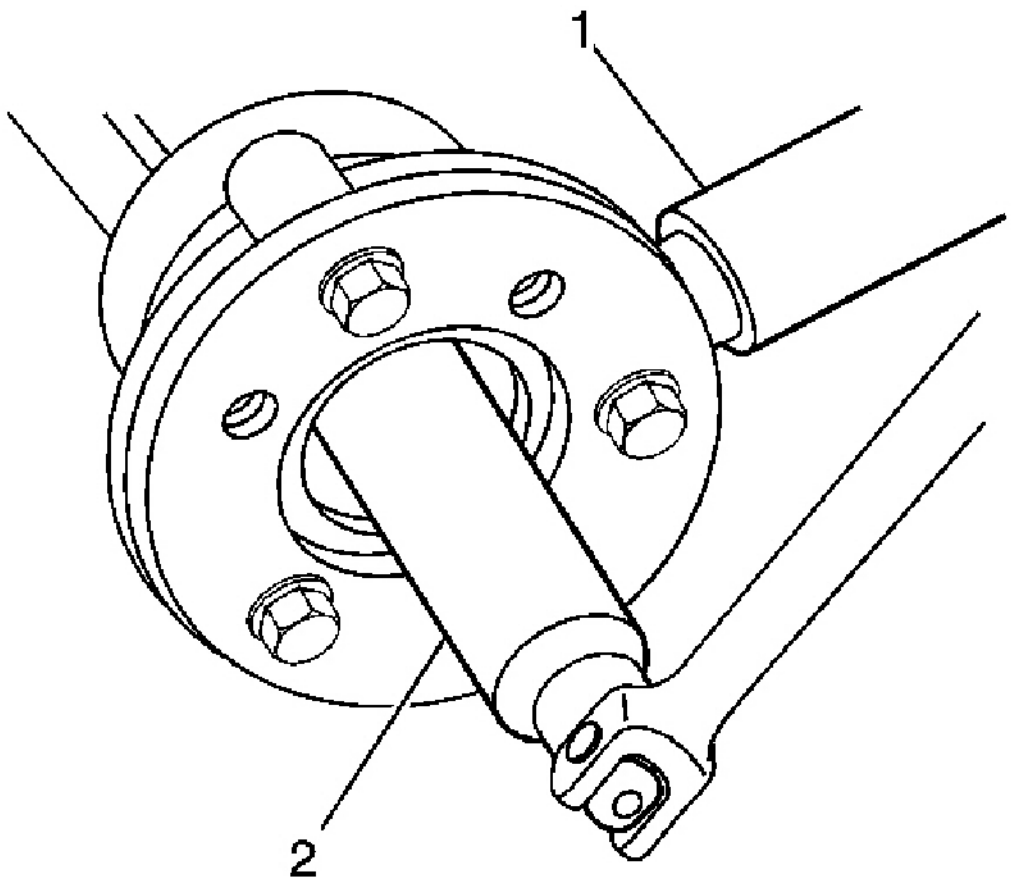


Fig. 19: Installing DT-47735 On Pinion Flange
Courtesy of GENERAL MOTORS CORP.

9. Install the **DT-47735** on the pinion flange. See **Special Tools** .
10. Remove the pinion flange nut.

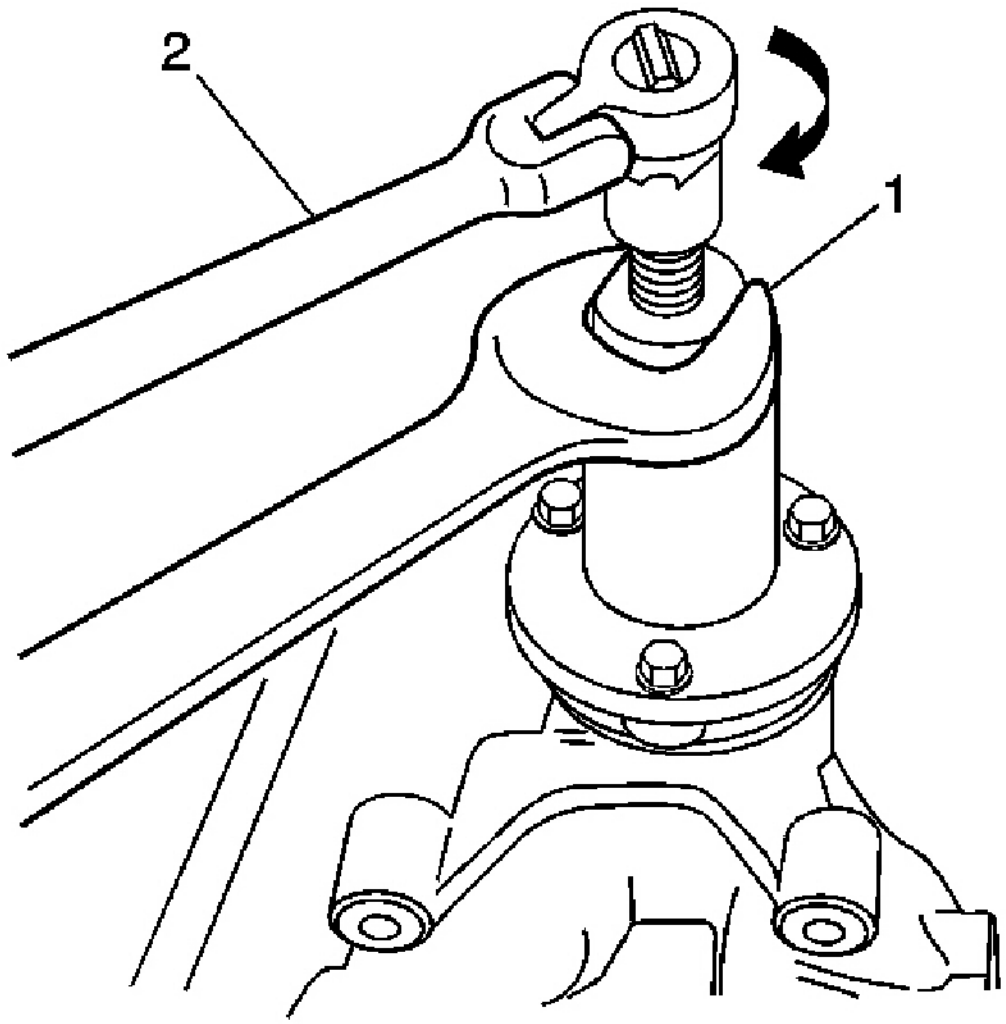


Fig. 20: Removing Pinion Flange
Courtesy of GENERAL MOTORS CORP.

11. Using the **DT-47736** , remove the pinion flange. See **Special Tools** .

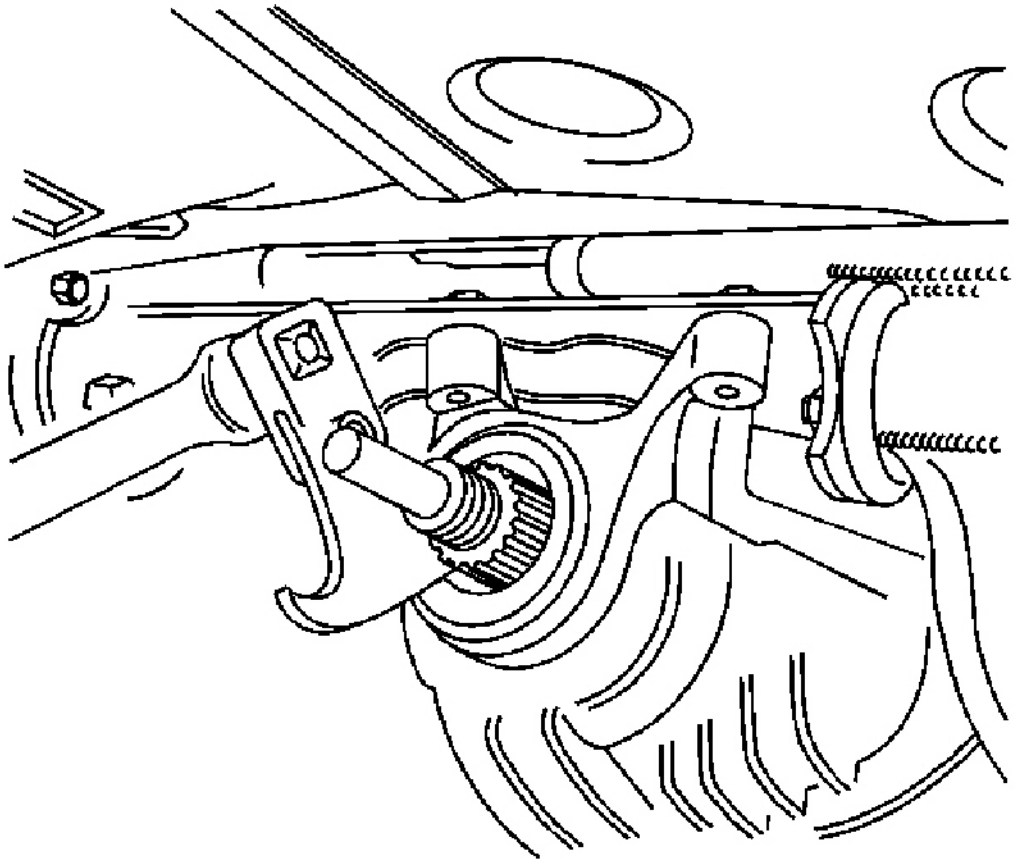


Fig. 21: Removing Pinion Seal
Courtesy of GENERAL MOTORS CORP.

12. Using a seal puller, remove the pinion seal.

Installation Procedure

1. Inspect the pinion shaft seal surface for nicks and burrs. Minor nicks and burrs can be removed with crocus cloth. If damaged, replace the pinion flange.
2. Clean the threads on the pinion shaft and pinion nut.
3. Coat the pinion shaft splines with recommended gear oil.
4. Lubricate the seal with the recommended gear oil.

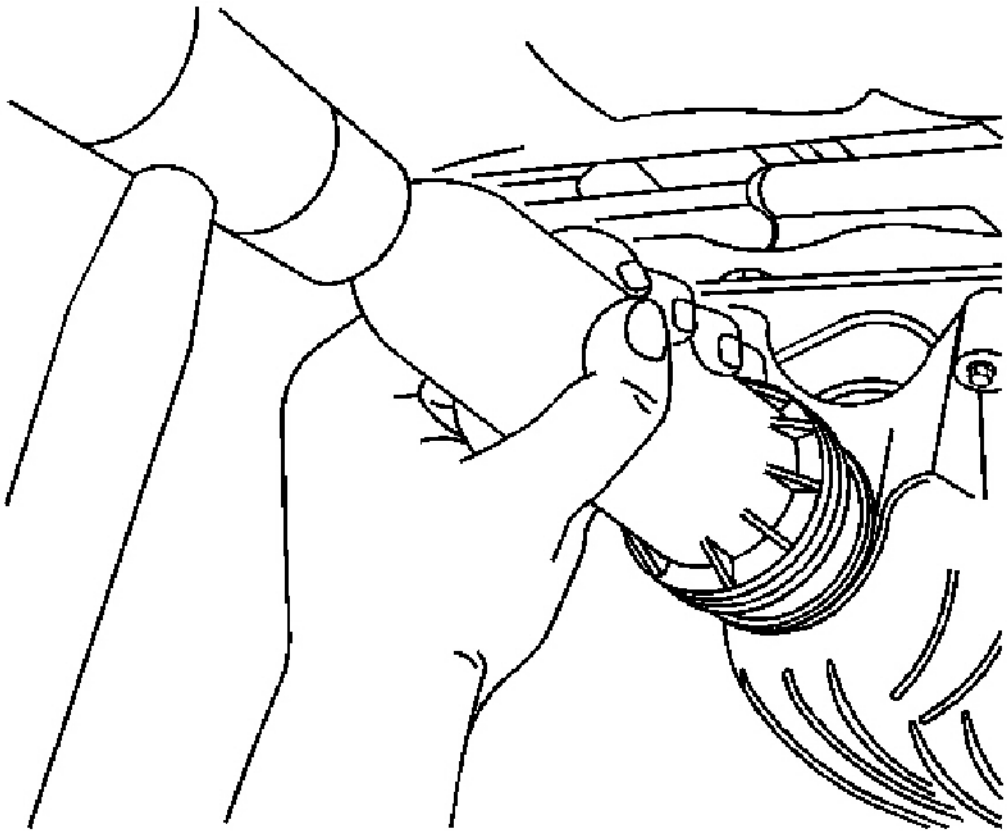


Fig. 22: Installing New Pinion Shaft Seal
Courtesy of GENERAL MOTORS CORP.

5. Using **DT-46853** , install the new pinion shaft seal until the seal is flush with the differential housing. See **Special Tools** .
6. Install the pinion flange on to the pinion shaft aligning the punch marks.

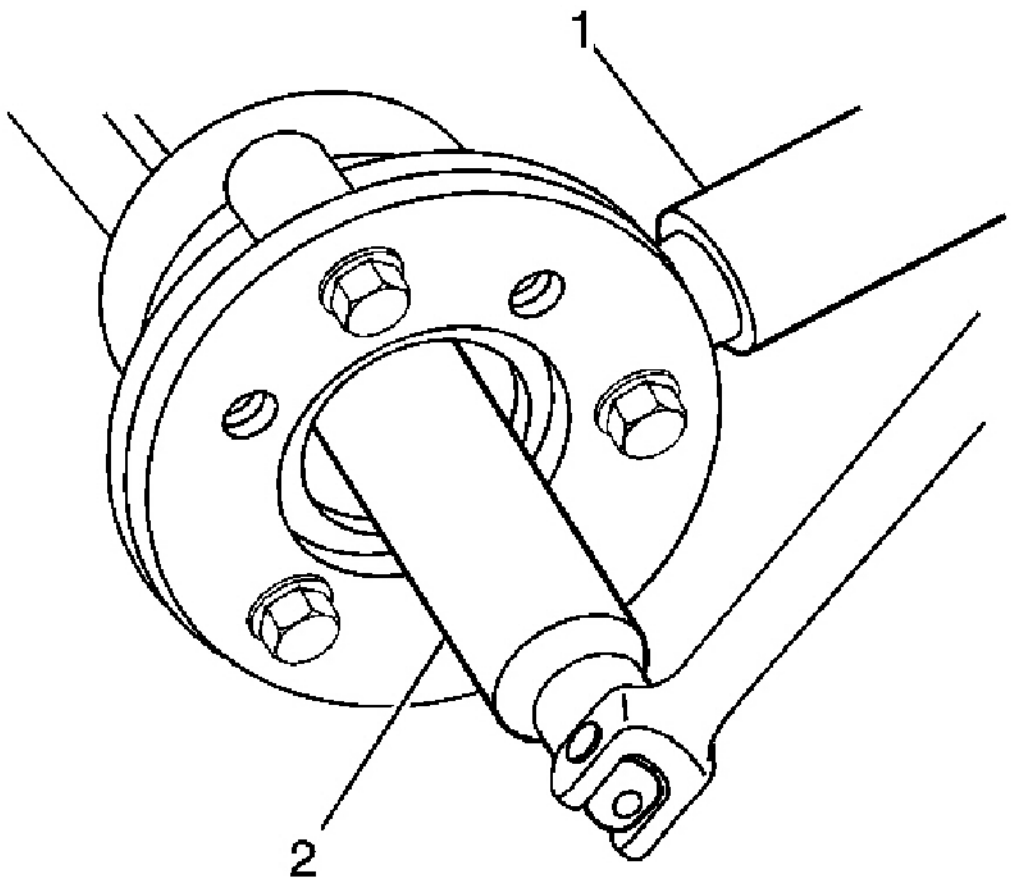


Fig. 23: Installing DT-47735 On Pinion Flange
Courtesy of GENERAL MOTORS CORP.

7. Install the **DT-47735** on the pinion flange. See **Special Tools** .
8. Apply thread locking compound onto the threads of the pinion shaft.

NOTE: Refer to Fastener Notice in Cautions and Notices.

IMPORTANT: Do not overtighten the pinion nut. If the nut is overtightened the preload will be exceeded and the differential will have to be changed.

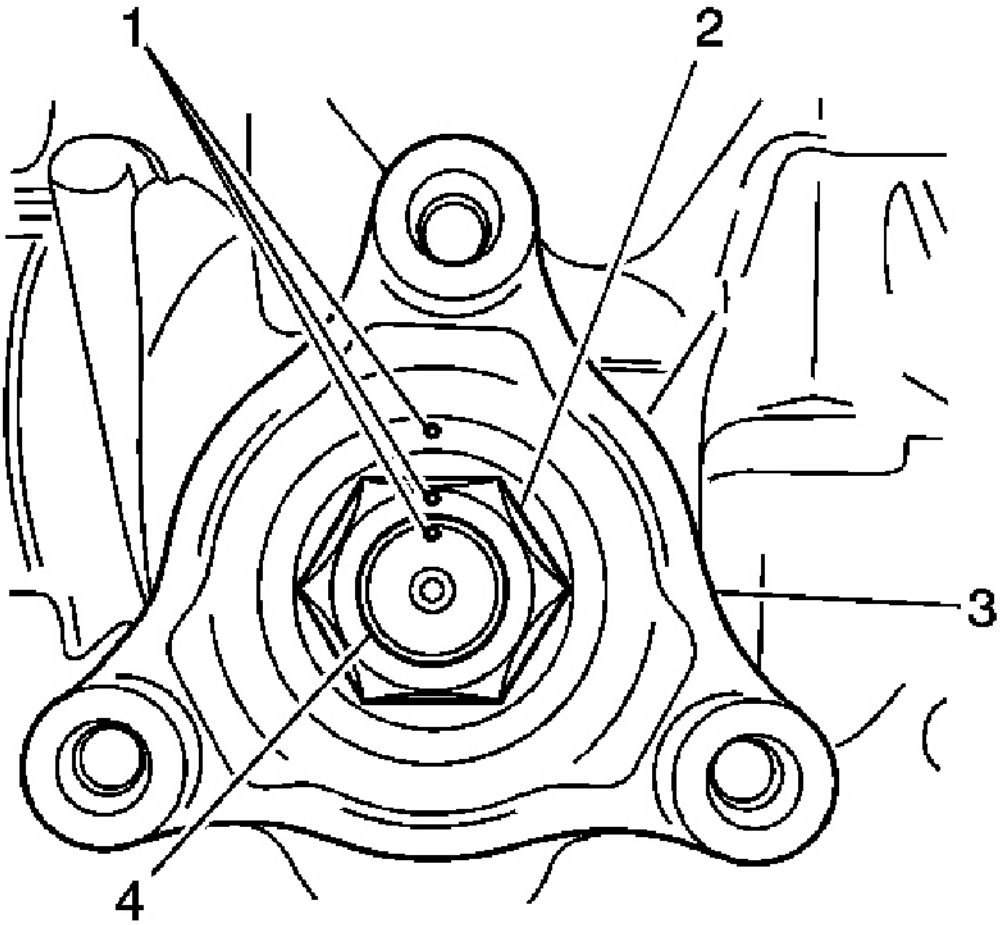


Fig. 24: View Of Pinion Flange Nut & Alignment Marks
Courtesy of GENERAL MOTORS CORP.

9. Tighten the pinion nut until the three punch marks are aligned.

   Tighten: Using **J 45059** , tighten the nut to a position no more than 5 degrees past the punch marks.

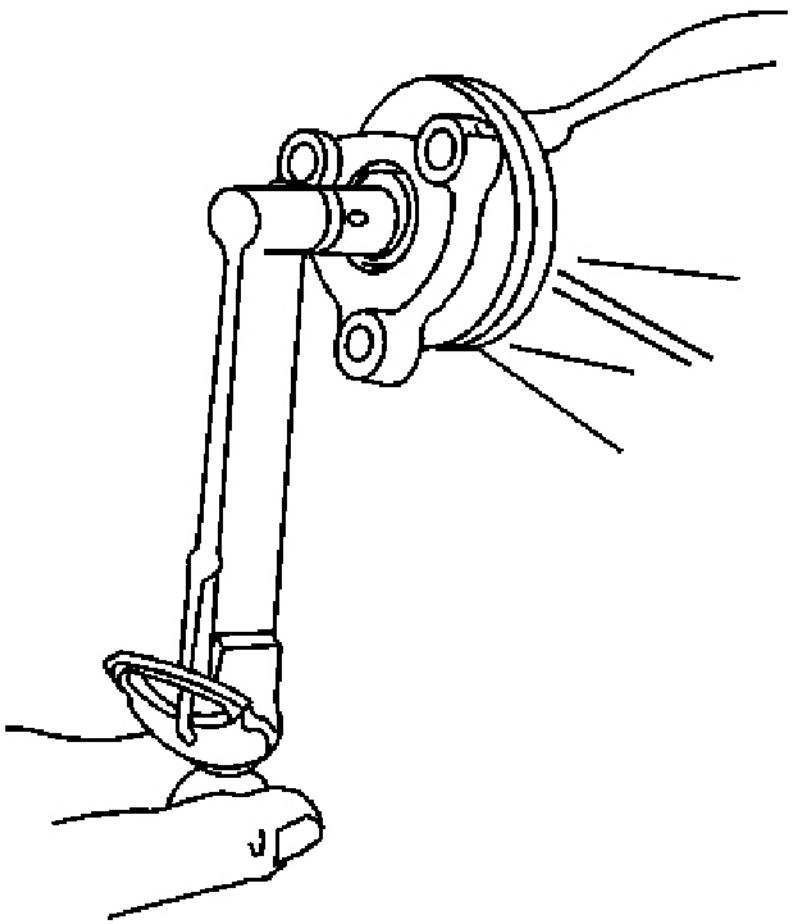


Fig. 25: Checking Torque On Pinion Shaft
Courtesy of GENERAL MOTORS CORP.

10. Using a inch pound torque wrench, recheck the rotational torque on the pinion shaft. The torque should be between 2 and 4 lb in.
11. Install the drain plug.

    Tighten: Tighten the drain plug to 27 N.m (20 lb ft).

12. Refill the rear axle housing with 1.0 liter (1.0 qt) of Synthetic Gear Oil 75W-140 GM P/N 890211809.
13. Using a graduated measuring cup, add 25 ml (1.0 oz.) of Limited Slip Differential Friction Modifier GM P/N 89021958 to the rear axle housing.
14. Fill the rear axle housing with the remaining 0.575 liter (0.644 qt) of Synthetic Gear Oil

75W-140 GM P/N 890211809.

The oil level should be even with the bottom of the rear axle housing filler plug hole.

15. Install the rear axle housing oil level fill plug with a new gasket and the lubricant tag into the rear axle housing.

    Tighten: Tighten the fill plug to 27 N.m (20 lb ft).

16. Remove the drain pan.
17. Install the propeller shaft. Refer to **Propeller Shaft Replacement - Two Piece** in Propeller Shaft.
18. Install the left and right mufflers. Refer to **Muffler Replacement (Front)** or **Muffler Replacement (Rear)** in Engine Exhaust.
19. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.

DIFFERENTIAL CARRIER ASSEMBLY REPLACEMENT

Tools Required

J 45059 Angle Meter

Removal Procedure

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** in General Information.
2. Remove the rear suspension support. Refer to **Support Replacement - Rear** in Frame and Underbody.

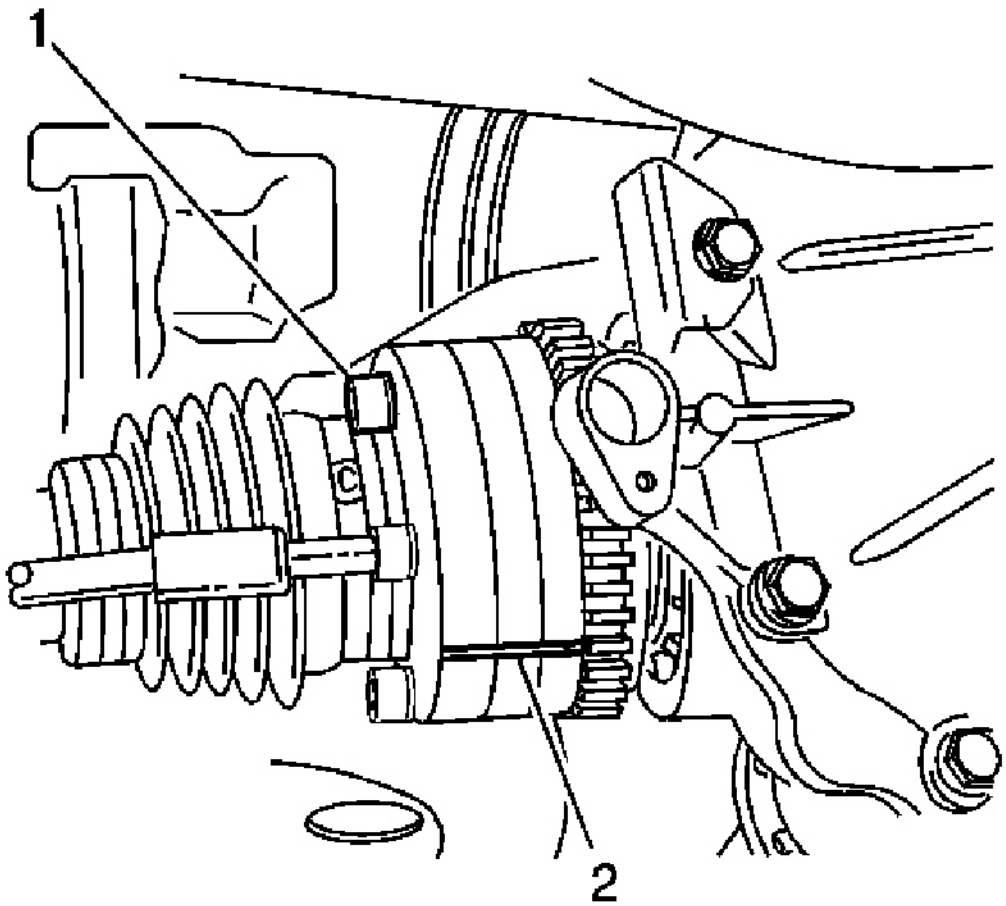


Fig. 26: Aligning Inner Constant Velocity Joint & Inner Axle
Courtesy of GENERAL MOTORS CORP.

3. Mark the relationship of the inner constant velocity joints to the axle shafts (2).

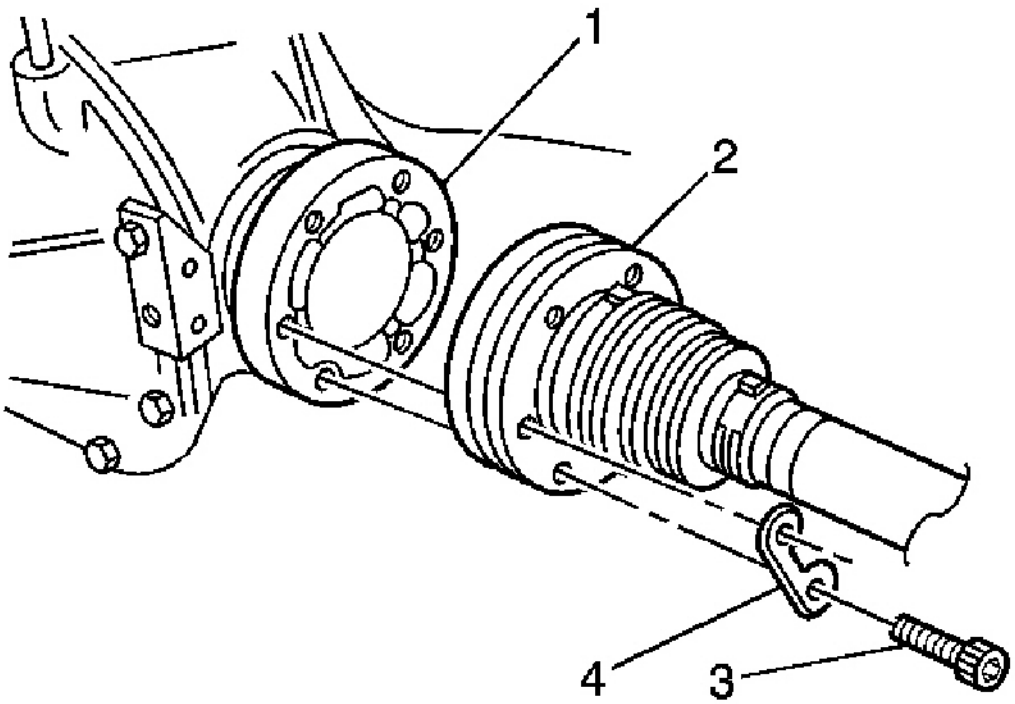


Fig. 27: View Of Inner Constant Velocity Joint Retaining Plates & Bolts
Courtesy of GENERAL MOTORS CORP.

4. Remove the inner drive shaft constant velocity joint bolts (3) and retainer plates (4). Support the drive shafts so they do not hang.

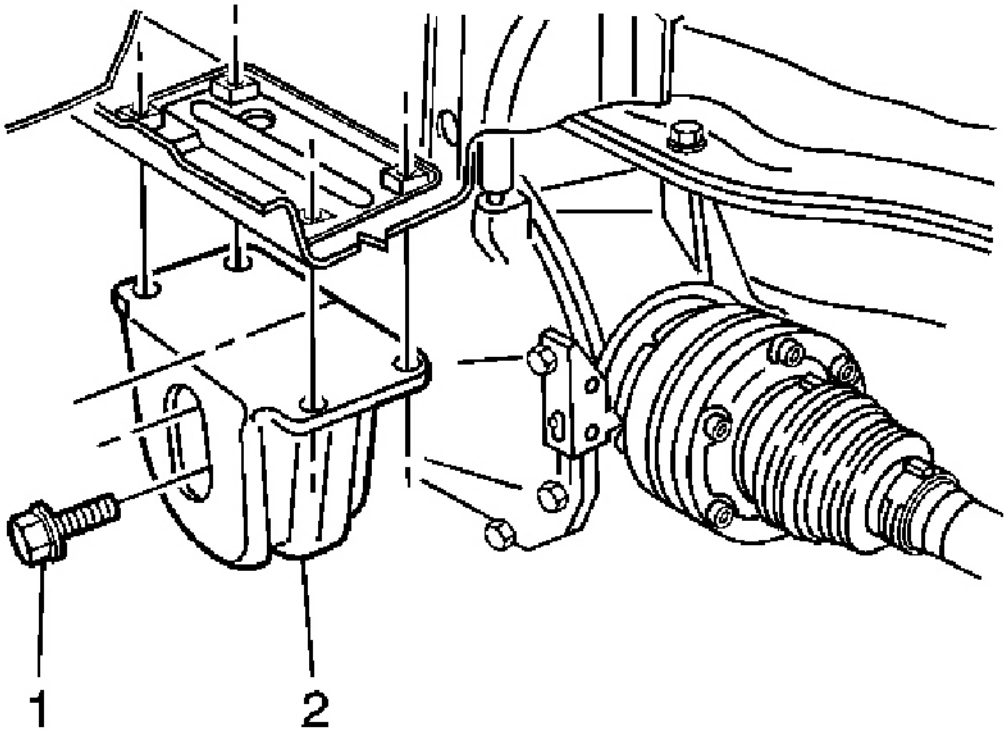


Fig. 28: View Of Rear Mount & Differential Carrier Cover Bolts
Courtesy of GENERAL MOTORS CORP.

5. Remove the rear differential mount bolts from the differential cover.

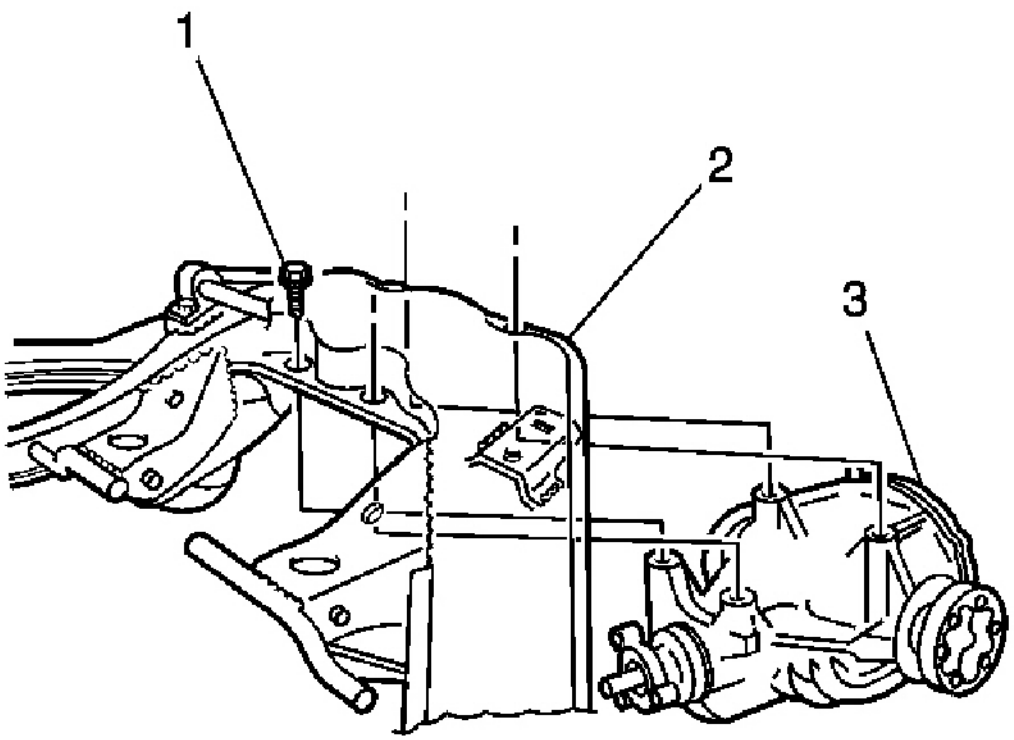


Fig. 29: Removing Differential Carrier Bolts
Courtesy of GENERAL MOTORS CORP.

6. Remove the differential carrier attach bolts from the crossmember.
7. Remove the differential carrier.

Installation Procedure

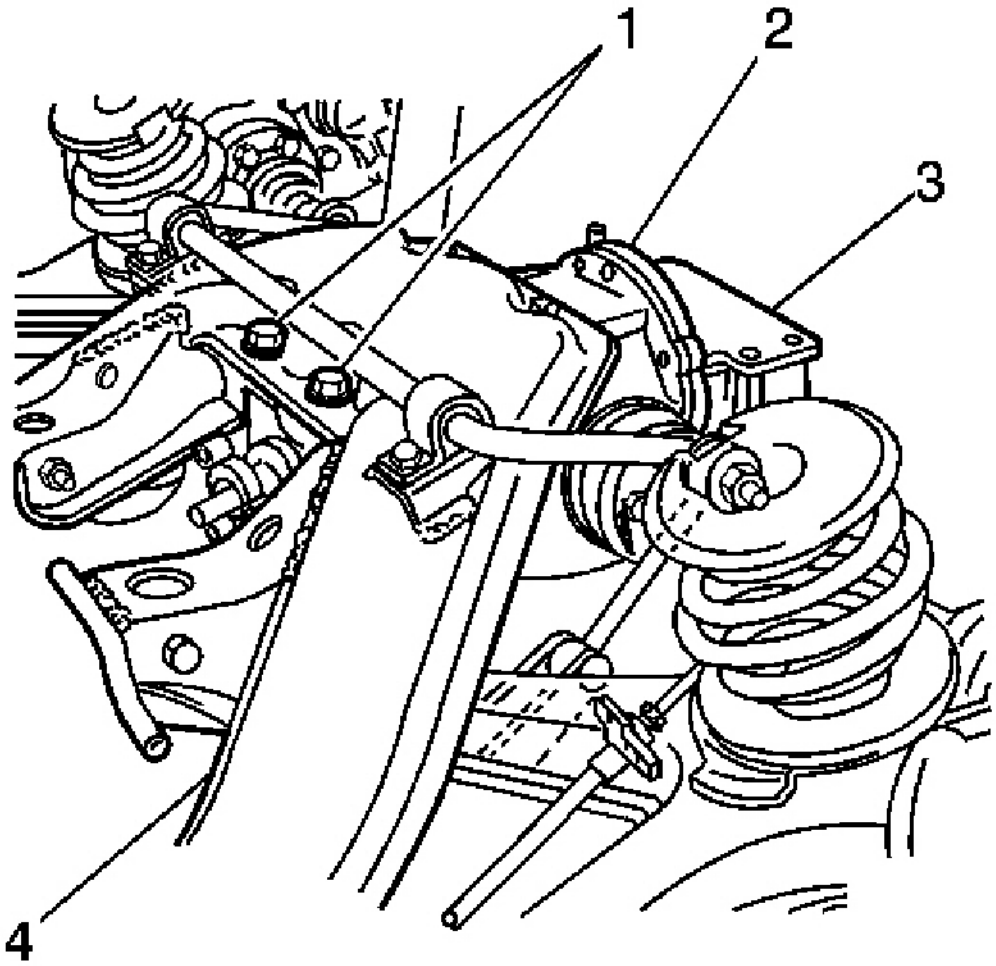


Fig. 30: Installing Differential Carrier Bolts
Courtesy of GENERAL MOTORS CORP.

NOTE: Refer to Fastener Notice in Cautions and Notices.

1. Using 4 new bolts (1) install in the cross-member to the differential carrier bolts.

Tighten:

1. Tighten the bolts to 90 N.m (66 lb ft).
2. Using the **J 45059** , tighten the bolts an additional 68 degrees.

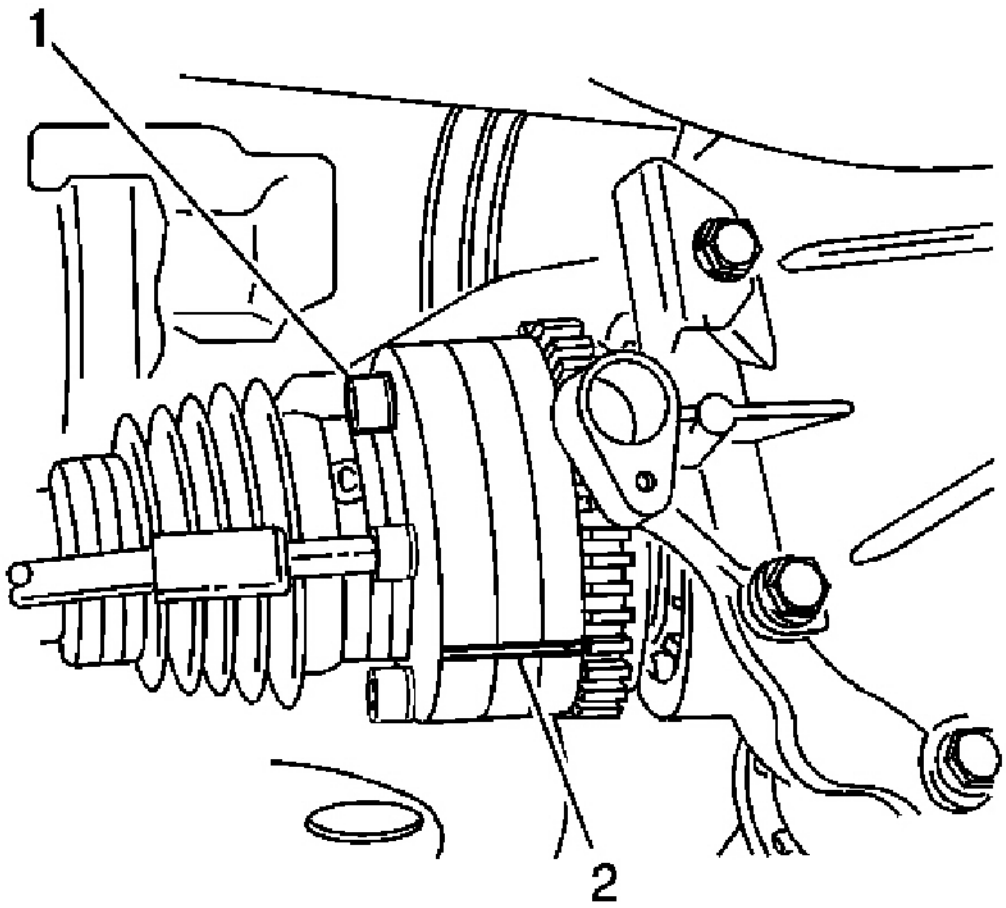


Fig. 31: Aligning Inner Constant Velocity Joint & Inner Axle
Courtesy of GENERAL MOTORS CORP.

2. Align the marks on the inner constant velocity joint and the axle shaft.
3. Install the inner constant velocity joints to the axle shaft bolts and retaining plates.

Tighten:

1. Tighten bolts to 50 N.m (37 lb ft).
2. Using the **J 45059** , tighten the bolts an additional 68 degrees.

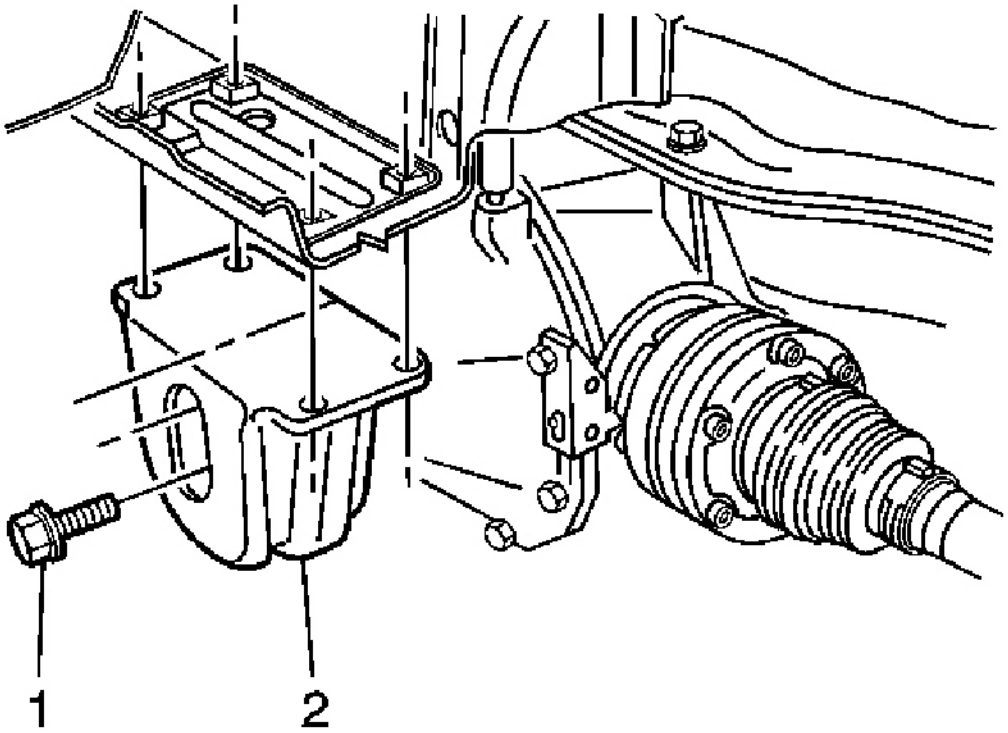


Fig. 32: View Of Rear Mount & Differential Carrier Cover Bolts
Courtesy of GENERAL MOTORS CORP.

4. Install the differential rear mount to the differential cover.

   Tighten: Tighten the differential rear mount bolts to 95 N.m (70 lb ft).

5. Install the rear suspension support. Refer to **Support Replacement - Rear** in Rear Suspension.
6. Lower the vehicle. Refer to **Lifting and Jacking the Vehicle** In General Information.

DESCRIPTION AND OPERATION

DIFFERENTIAL CARRIER ASSEMBLY DESCRIPTION

The differential assembly, is a four pinion type limited slip differential final drive assembly mounted to and independent rear suspension. The differential is mounted directly to the crossmember which is rubber mounted to the underbody. The differential case and drive pinon are mounted in opposed taper roller bearing in the carrier. Differential case side bearing preload adjustment is provided by screw adjusters in the sides of the case. Pinon bearing pre-

load is provided by a collapsible spacer. Torque is transferred from the propeller shaft to the differential via the pinon flange which is splined to the hypoid pinon. The torque is then transferred from the pinon through the ring gear, differential case, differential pinon cross shafts, differential pinons, side gears, and then via splines to the inner axle shafts and the drive shafts.

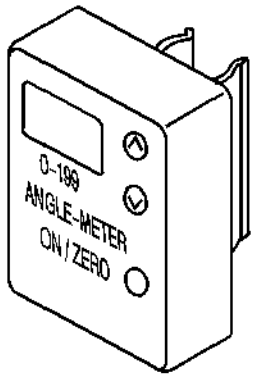
The limited slip differential performs the same functions as the conventual type differential. However, should the opposite wheel begin to spin, it transfers driving force to the wheel with traction. The differential case houses a cone type clutch pack that is an integral part of the side gears. The four pinon type limited slip differential has three pre-load springs enclosed in the center pinon cross shaft. The limited slip differential directs the major driving force to the wheel with greater amount of traction, but will not interfere with steering characteristics of differential action. The partial locking action, due to the spring load on the cones, is automatically increased by the inherent separating forces between the side gears and pinon, which progressively increases the resistance in the differential as applied torque is increased.

When the rear wheels are under extremely unbalanced conditions, such as one wheel on dry road and the other in mud or snow, with a standard differential, wheel spin easily occurs if over acceleration is attempted. However, with a limited slip differential, when the tendency for wheel spin occurs friction generated inside the case transfers driving force to the non-spinning wheel. In the event of continued spinning, a whirring sound from the over-running cones is produced, but this condition/sound does not indicate a failure of the unit.

SPECIAL TOOLS AND EQUIPMENT

SPECIAL TOOLS

Special Tools

Illustration	Tool Number/Description
	J-45059 Angle Meter

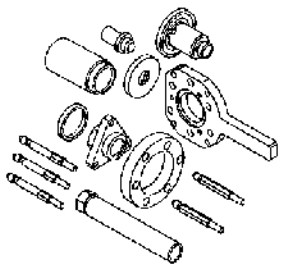
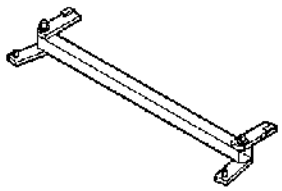
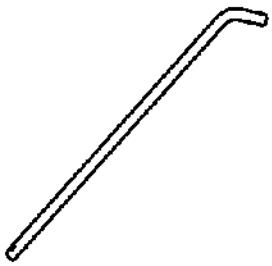
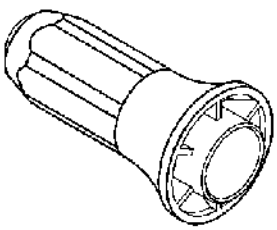
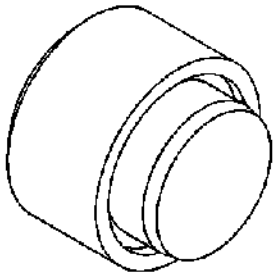
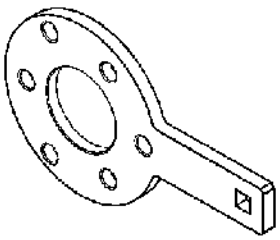
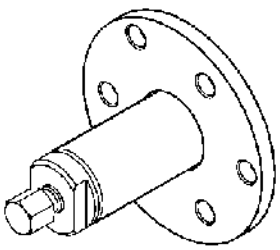
	J-42094 A Remover/ Installer Kit
	CH-46839 Rear Crossmember Centering Tool
	DT-46435 Mainshaft Socket Handle
	DT-46853 Pinion Oil Seal Installer
	DT-47544 Seal Installer

Illustration	Tool Number/Description
	J-45059 Angle Meter
	DT-47735 Flange Holder
	DT-47736 Flange Remover

2005 Pontiac GTO

2005 Driveline/Axle Rear Drive Axle - GTO

2005 Pontiac GTO

2005 Driveline/Axle Rear Drive Axle - GTO