

## Driveline/Axle

### Front Drive Axle - CTS Coupe & Wagon

## SPECIFICATIONS

### FASTENER TIGHTENING SPECIFICATIONS

#### Fastener Tightening Specifications

| Application                                          | Specification |           |
|------------------------------------------------------|---------------|-----------|
|                                                      | Metric        | English   |
| Differential Housing Cover Bolts                     | 29 N.m        | 21 lb ft  |
| Differential Support Mounting Bolts                  | 110 N.m       | 81 lb ft  |
| Drain Plug                                           | 39 N.m        | 29 lb ft  |
| Fill Plug                                            | 39 N.m        | 29 lb ft  |
| Pinion Housing Bolts                                 | 29 N.m        | 21 lb ft  |
| Pinion Nut                                           | 235 N.m       | 173 lb ft |
| Propeller Shaft Coupler-to-Differential Flange Bolts | 30 N.m        | 22 lb ft  |

### LUBRICATION SPECIFICATIONS

#### Lubrication Specifications

| Application                                                                            | Quantity |         |
|----------------------------------------------------------------------------------------|----------|---------|
|                                                                                        | Metric   | English |
| Synthetic Differential Lubricant GL-5 75W90 GM P/N 89021677<br>(Canadian P/N 89021678) | 0.7 L    | 0.74 qt |

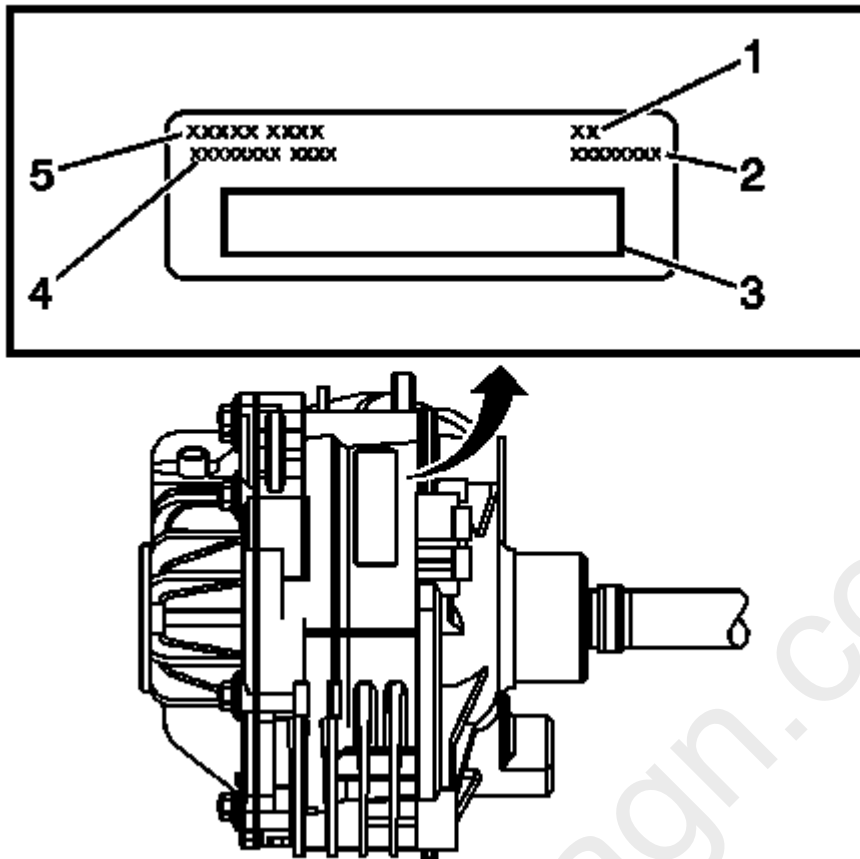
### ADHESIVES, FLUIDS, LUBRICANTS, AND SEALERS

#### Adhesives, Fluids, Lubricants, and Sealers

| Application | Type of Material | GM Part Number |          |
|-------------|------------------|----------------|----------|
|             |                  | US             | Canada   |
| Pinion Nut  | Thread Locker    | 12345382       | 10953489 |

## VISUAL IDENTIFICATION

### FRONT AXLE IDENTIFICATION



**Fig. 1: Front Axle Identification**  
 Courtesy of GENERAL MOTORS COMPANY

| Callout | Component Name       |
|---------|----------------------|
| 1       | GM Logo              |
| 2       | GM Part Number       |
| 3       | Bar Code             |
| 4       | Getrag Serial Number |
| 5       | Getrag Logo          |

## DIAGNOSTIC INFORMATION AND PROCEDURES

### SYMPTOMS - FRONT DRIVE AXLE

#### Strategy Based Diagnostics

Review the system operations in order to familiarize yourself with the system functions. Refer to **Front Drive Axle Description and Operation**, and **Wheel Drive Shafts Description and Operation**, . All diagnosis on a vehicle should follow a logical process. Strategy based diagnostics is a uniform approach for repairing all systems. The diagnostic flow may always be used in order to resolve a system problem. The diagnostic flow is the place to start when repairs are necessary. For a detailed explanation, refer to **Strategy Based Diagnosis** .

## Visual/Physical Inspection

- Inspect for aftermarket devices, which could affect the operation of the vehicle. Refer to **Checking Aftermarket Accessories** .
- Inspect the easily accessible or visible system components for obvious damage or conditions, which could cause the symptom.
- Inspect for the correct lubricant level and the proper viscosity.
- Verify the exact operating conditions under which the concern exists. Note factors such as vehicle speed, road conditions, ambient temperature, and other specifics.
- Compare the driving characteristics or sounds, if applicable, to a known good vehicle and ensure you are not trying to correct a normal condition.

## Intermittent

Test the vehicle under the same conditions that the customer reported in order to verify the system is operating properly.

## Symptom List

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

- **Diagnostic Starting Point - Vehicle**
- **Symptoms - Propeller Shaft**
- **Noisy in Drive**
- **Noisy When Coasting**
- **Intermittent Noise**
- **Constant Noise**
- **Noisy on Turns**
- **Front Axle Lubricant Leak Diagnosis**

## NOISY IN DRIVE

### Noisy in Drive

| Cause                                                                                                                                       | Correction                                                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <b><u>Front Axle Lubricant Level Inspection</u></b> . |                                                                                                                        |
| Transmission noise                                                                                                                          | Repair or replace as required. Refer to <b><u>Noise and Vibration Analysis</u></b> for the 6L50/6L80/6L90 transmission |
| Driveline assembly noise                                                                                                                    | Repair or replace as required. Refer to <b><u>Symptoms - Propeller Shaft</u></b> .                                     |
| Worn axle shaft constant velocity joints                                                                                                    | Replace the constant velocity joints as required.                                                                      |
| Worn, loose, or damaged axle mount and/or bracket                                                                                           | Repair or replace the axle mount and/or bracket as required.                                                           |

|                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bearing noise within the differential assembly        | <p>A grinding or roar type noise will increase or decrease relative to the vehicle speed.</p> <ol style="list-style-type: none"> <li>1. Inspect for the proper fluid level. Fill as required.</li> <li>2. If the noise continues, replace the carrier unit. Refer to <b><u>Differential Carrier Assembly Replacement</u></b>.</li> </ol>                                                                                                                                                  |
| Gear set whine noise within the differential assembly | <p>A whine type noise will increase or decrease relative to the vehicle speed, approximately 80-96 km/h (50-60 mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth.</p> <ol style="list-style-type: none"> <li>1. Inspect for the proper fluid level. Fill as required.</li> <li>2. Replace the carrier unit. Refer to <b><u>Differential Carrier Assembly Replacement</u></b>.</li> </ol> |

## NOISY WHEN COASTING

### Noisy When Coasting

| Cause                                                                                                                                                           | Correction                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IMPORTANT:</b><br><b>Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Front Axle Lubricant Level Inspection</u>.</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Worn axle shaft constant velocity joints                                                                                                                        | Replace the constant velocity joints as required.                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Worn, loose, or damaged axle mount and/or bracket                                                                                                               | Repair or replace the axle mount and/or bracket as required.                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Bearing noise within the differential assembly                                                                                                                  | <p>A grinding or roar type noise will increase or decrease relative to the vehicle speed.</p> <ol style="list-style-type: none"> <li>1. Check for the proper fluid level. Fill as required.</li> <li>2. If the noise continues, replace the carrier unit. Refer to <b><u>Differential Carrier Assembly Replacement</u></b>.</li> </ol>                                                                                                                                                  |
| Gear set whine noise within the differential assembly                                                                                                           | <p>A whine type noise will increase or decrease relative to the vehicle speed, approximately 80-96 km/h (50-60 mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth.</p> <ol style="list-style-type: none"> <li>1. Check for the proper fluid level. Fill as required.</li> <li>2. Replace the carrier unit. Refer to <b><u>Differential Carrier Assembly Replacement</u></b>.</li> </ol> |

## INTERMITTENT NOISE

### Intermittent Noise

| Cause                                                                                                                                                     | Correction                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>IMPORTANT:</b><br>Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Front Axle Lubricant Level Inspection</u> . |                                                                                                 |
| Worn, loose, or damaged axle mount and/or bracket                                                                                                         | Repair or replace the axle mount and/or bracket as required.                                    |
| Incorrect gear oil                                                                                                                                        | Replace with the correct gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> . |

## CONSTANT NOISE

### Constant Noise

| Cause                                                                                                                                                     | Correction                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IMPORTANT:</b><br>Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Front Axle Lubricant Level Inspection</u> . |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Low gear oil levels                                                                                                                                       | Faulty oil seals or other type leaks may contribute to lower than required fluid levels. Refer to <u>Front Axle Lubricant Leak Diagnosis</u> .<br>Fill to the proper level with the correct gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> , and <u>Front Axle Lubricant Level Inspection</u> .                                                                                                                                                         |
| Worn, loose, or damaged axle mount and/or bracket                                                                                                         | Repair or replace the axle mount and/or bracket as required.                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Bearing noise within the differential assembly                                                                                                            | A grinding or roar type noise will increase or decrease relative to the vehicle speed.<br><br><ol style="list-style-type: none"><li>1. Check for the proper fluid level. Fill as required.</li><li>2. If the noise continues, replace the carrier unit. Refer to <u>Differential Carrier Assembly Replacement</u>.</li></ol>                                                                                                                                                  |
| Gear set whine noise within the differential assembly                                                                                                     | A whine type noise will increase or decrease relative to the vehicle speed, approximately 31-37 km/h (19-23 mph). Typical causes of a gear set whine type noise may include incorrect backlash and/or pinion depth adjustment or worn or scored gear set teeth.<br><br><ol style="list-style-type: none"><li>1. Check for the proper fluid level. Fill as required.</li><li>2. Replace the carrier unit. Refer to <u>Differential Carrier Assembly Replacement</u>.</li></ol> |

## NOISY ON TURNS

## Noisy on Turns

| Cause                                                                                                                                                     | Correction                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IMPORTANT:</b><br>Inspect for the proper gear oil levels prior to performing system diagnosis. Refer to <u>Front Axle Lubricant Level Inspection</u> . |                                                                                                                                                                     |
| Worn or loose rear axle mount and/or bracket                                                                                                              | Repair or replace as required.                                                                                                                                      |
| Worn axle shaft constant velocity joints                                                                                                                  | Replace the constant velocity joints as required.                                                                                                                   |
| Worn wheel bearings                                                                                                                                       | Replace the wheel bearings as required.                                                                                                                             |
| Incorrect gear oil                                                                                                                                        | Fill to the proper level with the correct gear oil. Refer to <u>Adhesives, Fluids, Lubricants, and Sealers</u> , and <u>Front Axle Lubricant Level Inspection</u> . |

## FRONT AXLE LUBRICANT LEAK DIAGNOSIS

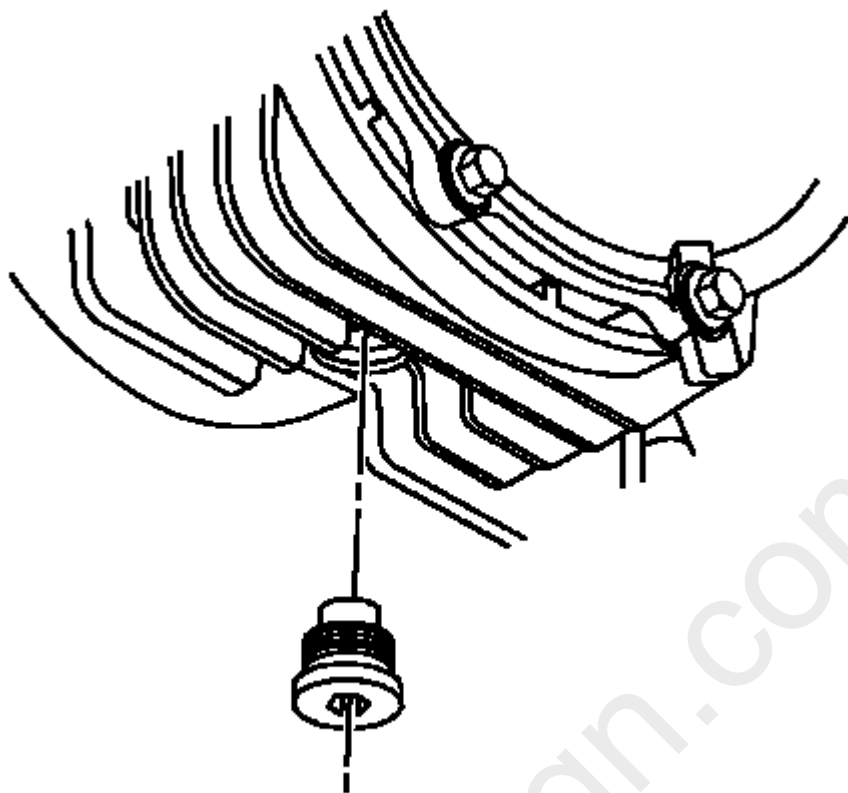
### Front Axle Lubricant Leak Diagnosis

| Cause                                                                                                                                                                                                           | Correction                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>IMPORTANT:</b><br>Upon completion of all repairs, refill the axle with the proper amounts of axle lubricant. Refer to <u>Front Axle Lubricant Level Inspection</u> , and <u>Lubrication Specifications</u> . |                                                                                                  |
| Restricted or damaged vent valve assembly                                                                                                                                                                       | Repair or replace the vent valve as required.                                                    |
| Right side cover O-ring seal                                                                                                                                                                                    | Replace the side cover O-ring seal as required.                                                  |
| Worn or damaged axle shaft oil seals                                                                                                                                                                            | Replace the axle shaft oil seals as required.                                                    |
| Housing or side cover porosity                                                                                                                                                                                  | Replace the carrier. Refer to <u>Differential Carrier Assembly Replacement</u> .                 |
| Loose Drain or Fill Plug                                                                                                                                                                                        | Tighten to specification                                                                         |
| Pinion Housing Assembly O-ring                                                                                                                                                                                  | <ul style="list-style-type: none"><li>• Pull Housing Assembly</li><li>• Replace O-ring</li></ul> |

## REPAIR INSTRUCTIONS

### FRONT AXLE LUBRICANT REPLACEMENT

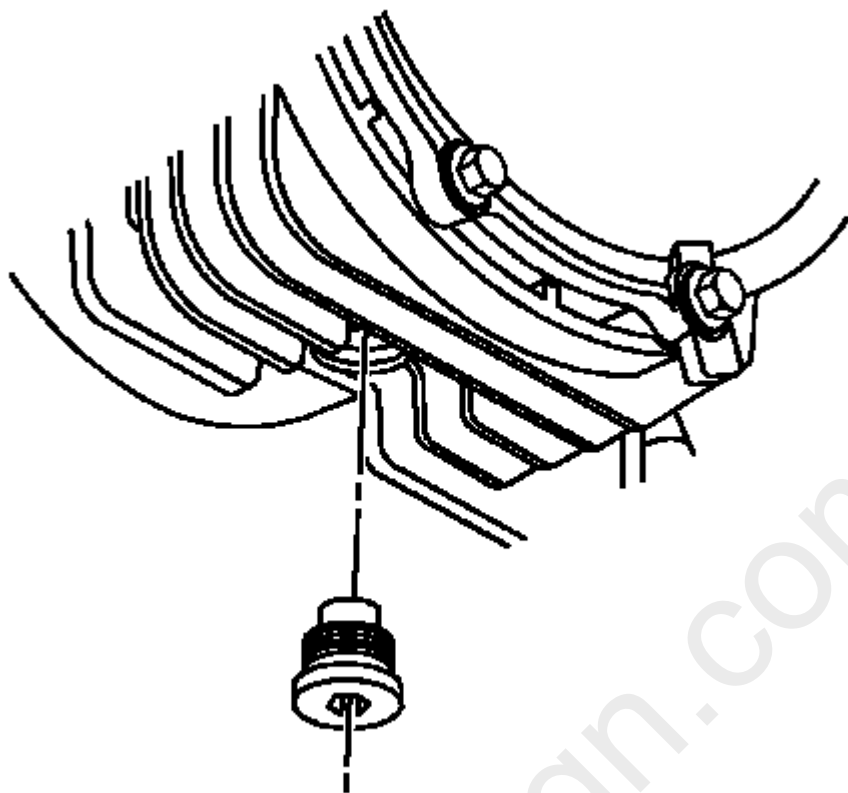
#### Draining Procedure



**Fig. 2: View Of Differential Drain Plug**  
Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Clean any dirt from around the differential drain plug.
3. Position a drain pan under drain plug.
4. Remove the drain plug from the differential and drain the fluid.

#### **Filling Procedure**



**Fig. 3: View Of Differential Drain Plug**  
Courtesy of GENERAL MOTORS COMPANY

**CAUTION:** Refer to Fastener Caution .

1. Install the drain plug to the differential and tighten to 39 N.m (29 lb ft).



**Fig. 4: View Of Differential Fill Plug**  
Courtesy of GENERAL MOTORS COMPANY

2. Clean any dirt from around the differential fill plug.
3. Remove the fill plug from the differential.
4. Fill the differential with 75W90 synthetic axle lubricant , GM P/N 12378261 (Canadian P/N 10953455) or equivalent. Refer to **Approximate Fluid Capacities** .
5. Inspect the gear lubricant level to ensure it is even with the bottom of the fill plug hole to no lower than 6 mm (0.25 in) below the opening.
6. Install the fill plug to the differential and tighten to 39 N.m (29 lb ft).
7. Lower the vehicle.

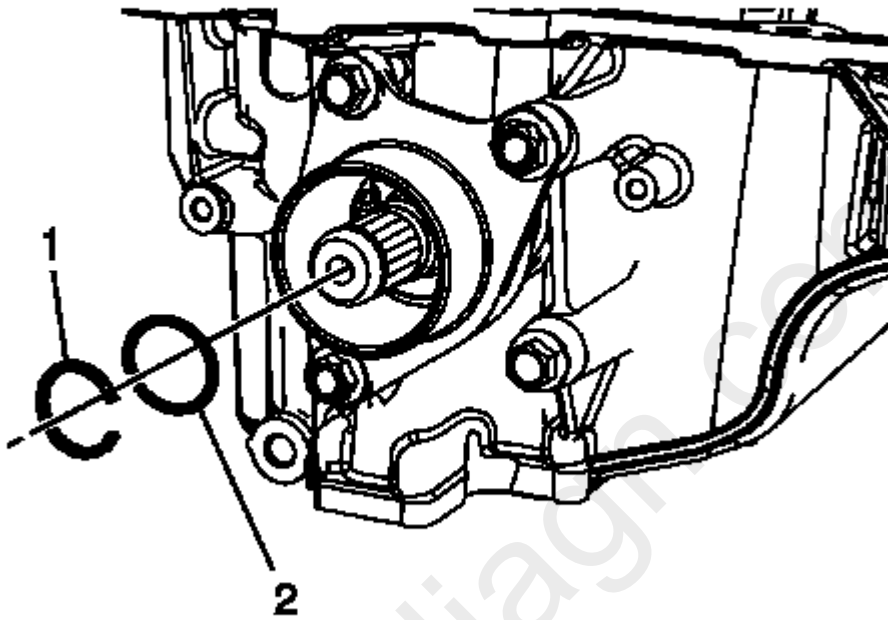
## **FRONT WHEEL DRIVE INTERMEDIATE SHAFT BEARING REPLACEMENT**

### **Special Tools**

- **J 21474-20** Bushing Installer
- **J 45019** Flange and Pinion Cage Remover

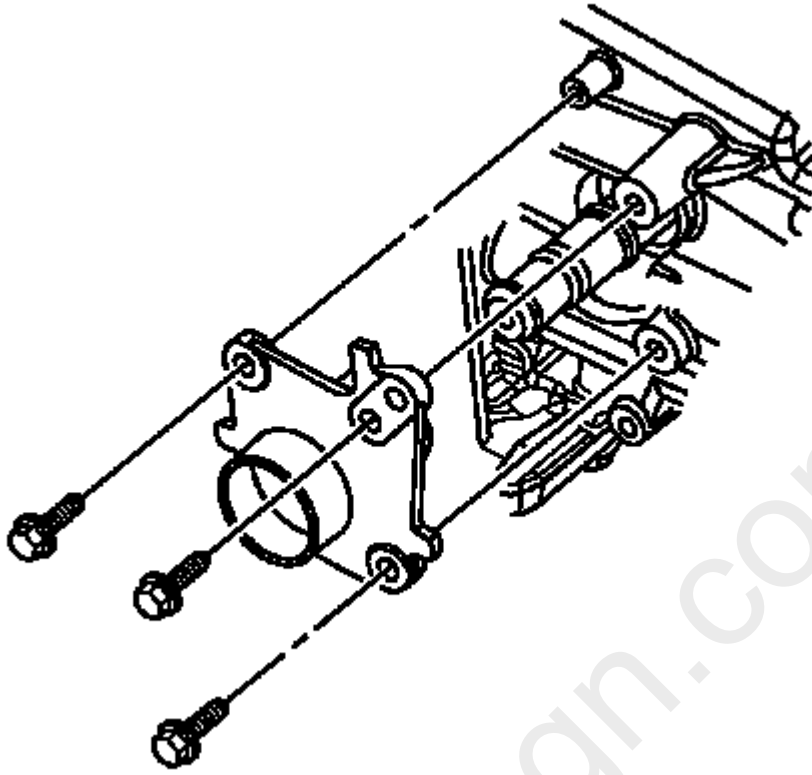
### **Removal Procedure**

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the left front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Left Side** .



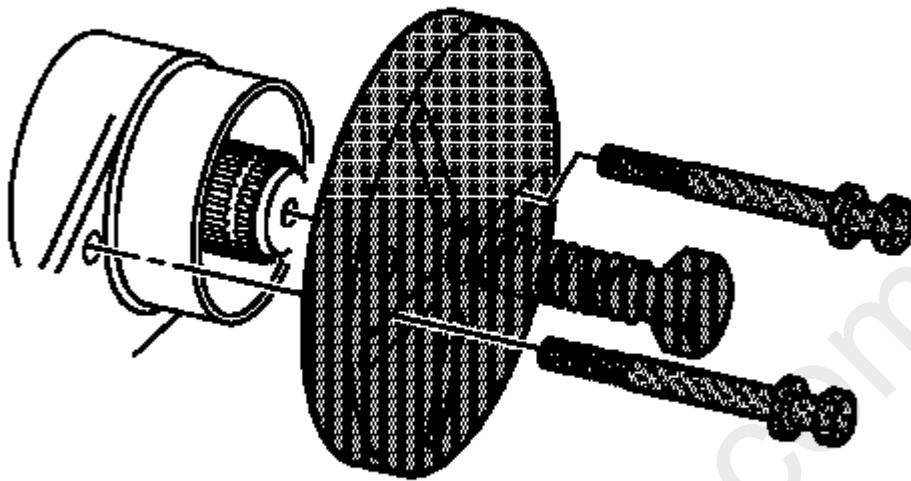
**Fig. 5: View of Drive Shaft Retaining Ring Assembly**  
Courtesy of GENERAL MOTORS COMPANY

3. Remove and discard the intermediate wheel drive shaft retaining ring (2) and the O-ring (1).



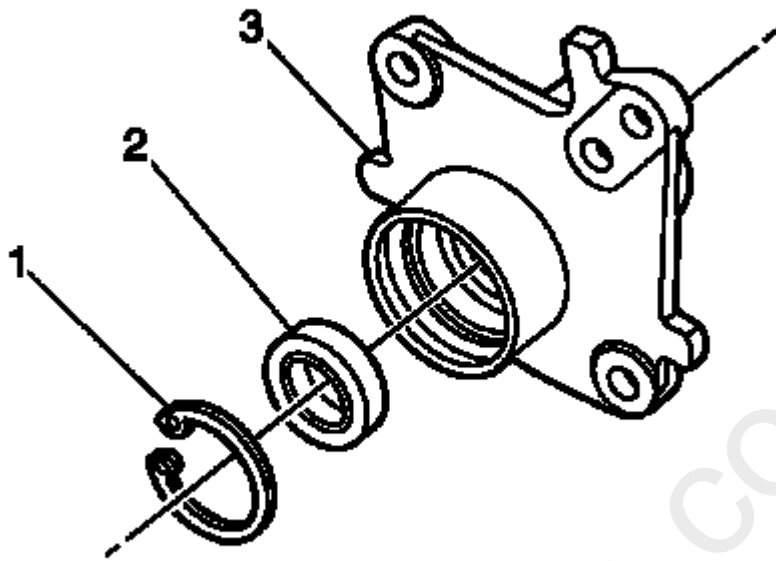
**Fig. 6: View Of Intermediate Shaft Bearing Assembly**  
**Courtesy of GENERAL MOTORS COMPANY**

4. Remove the intermediate shaft bearing assembly mounting bolts.



**Fig. 7: Flange and Pinion Cage Remover**  
**Courtesy of GENERAL MOTORS COMPANY**

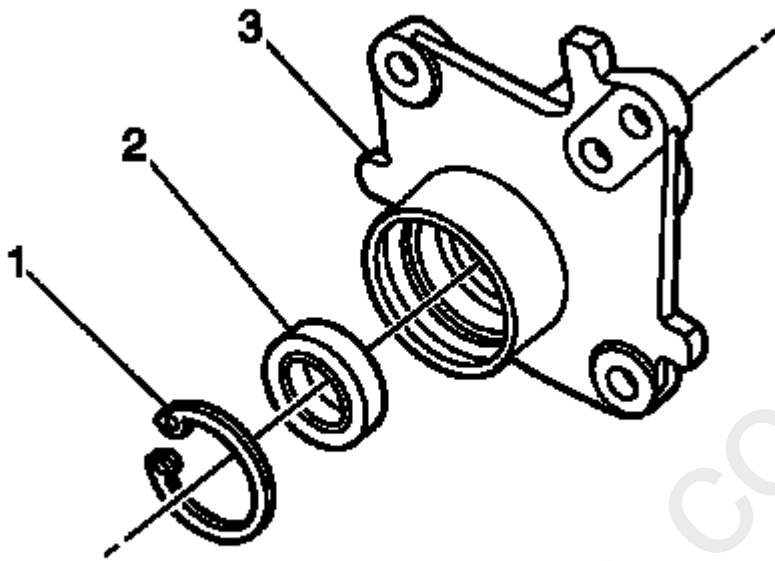
5. Install **J 45019** flange and pinion cage remover into the threaded holes in the intermediate shaft bearing assembly.
6. Using the **J 45019** flange and pinion cage remover , remove the intermediate shaft bearing assembly.
7. Remove **J 45019** flange and pinion cage remover from the intermediate shaft bearing housing.



**Fig. 8: View Of Intermediate Shaft Bearing Housing, Shaft Bearing & Snap Ring**  
**Courtesy of GENERAL MOTORS COMPANY**

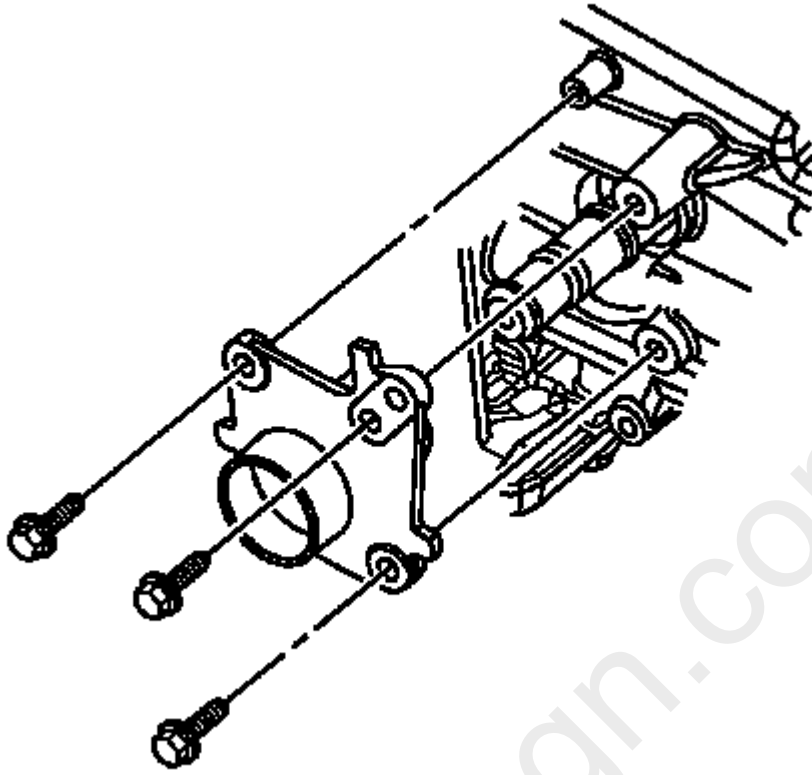
8. Remove the snap ring (1) from the intermediate shaft bearing housing (3).
9. Using a hammer and a brass drift, remove the intermediate shaft bearing (2) from the intermediate shaft bearing housing (3).
10. Thoroughly clean the intermediate shaft bearing housing.
11. Inspect the intermediate shaft bearing housing for damage, if damaged replace the intermediate shaft bearing housing.

#### **Installation Procedure**



**Fig. 9: View Of Intermediate Shaft Bearing Housing, Shaft Bearing & Snap Ring**  
**Courtesy of GENERAL MOTORS COMPANY**

1. Install the intermediate shaft bearing (2) to the intermediate shaft bearing housing (3).
2. Using the **J 21474-20** bushing installer and a hydraulic press, install intermediate shaft bearing (2) to the intermediate shaft bearing housing (3).
3. Install the snap ring (1) in the intermediate shaft bearing housing (3).

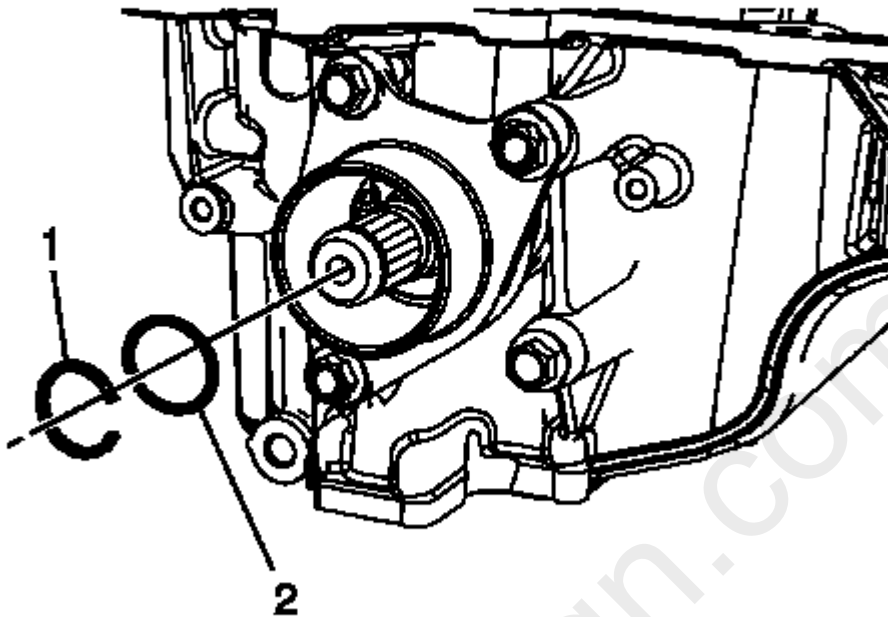


**Fig. 10: View Of Intermediate Shaft Bearing Assembly**  
Courtesy of GENERAL MOTORS COMPANY

4. Install the intermediate shaft bearing assembly to the intermediate wheel drive shaft.

**CAUTION: Refer to Fastener Caution .**

5. Install the intermediate shaft bearing housing mounting bolts to the oil pan. Tighten the intermediate shaft bearing assembly mounting bolts to 60 (44 lb ft).



**Fig. 11: View of Drive Shaft Retaining Ring Assembly**  
Courtesy of GENERAL MOTORS COMPANY

6. Apply a small amount of grease GM P/N 01051344, (Canadian P/N 993037) to the intermediate wheel drive shaft splines.
7. Install a new O-ring (1) and the new wheel drive shaft retaining ring (2).
8. Install the left front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Left Side** .
9. Lower the vehicle.

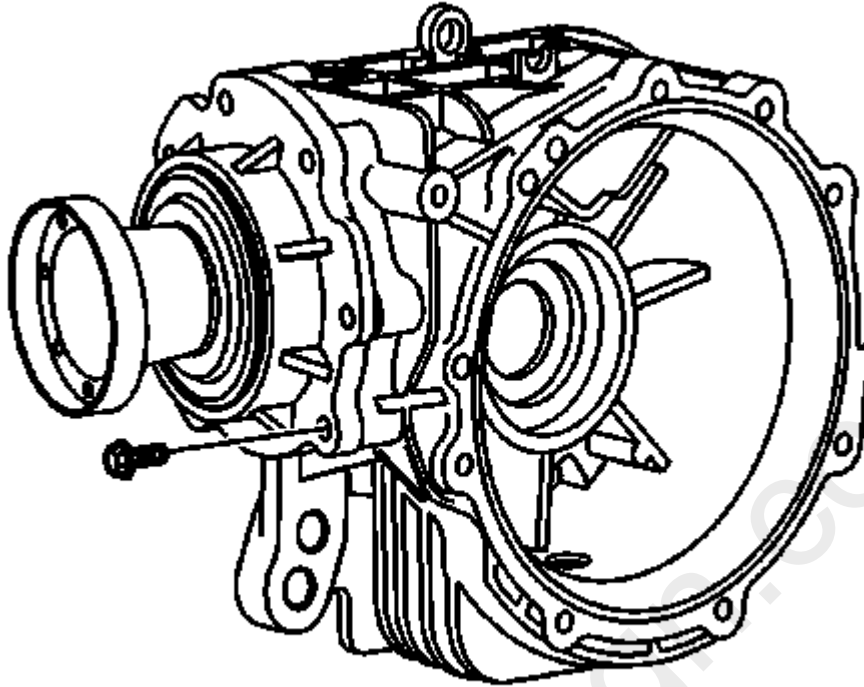
## **OUTPUT SHAFT SEAL REPLACEMENT - LEFT SIDE**

### **Special Tools**

- **GE-8092** Driver Handle
- **J 25070** Heat Gun
- **J 45017** Seal Installer
- **J 45019** Flange and Pinion Cage Remover
- **J 46265** Stub Shaft Seal Installer

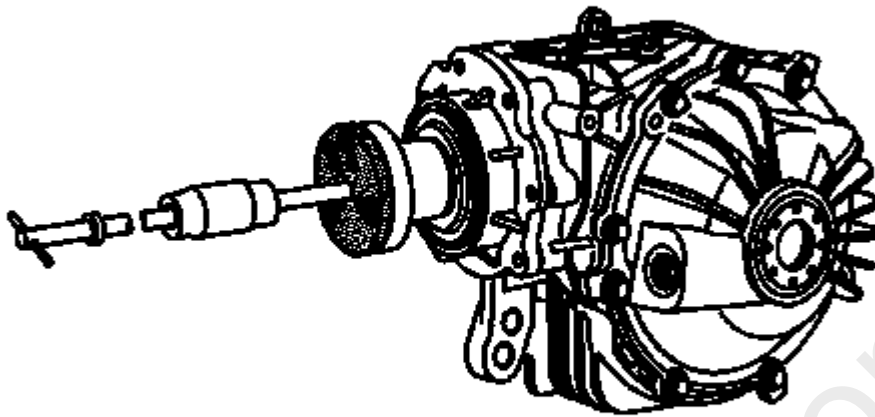
### **Removal Procedure**

1. Remove the carrier from the vehicle. Refer to Differential Carrier Assembly Replacement.



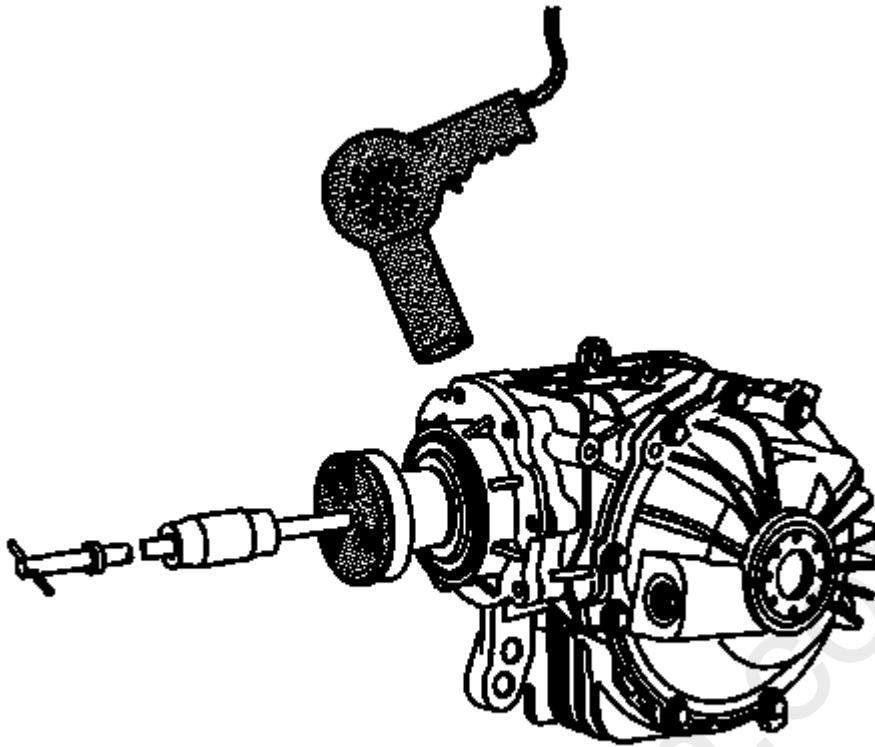
**Fig. 12: View Of Pinion Housing Bolts**  
Courtesy of GENERAL MOTORS COMPANY

2. Remove the bolts from the pinion bearing housing.



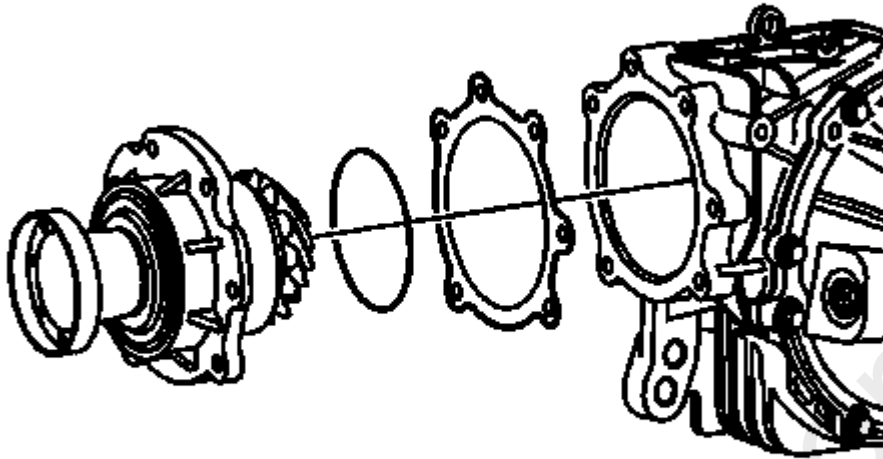
**Fig. 13: Flange & Pinion Cage Remover & Slide Hammer**  
Courtesy of GENERAL MOTORS COMPANY

3. Install the **J 45019** flange and pinion cage remover and slide hammer.



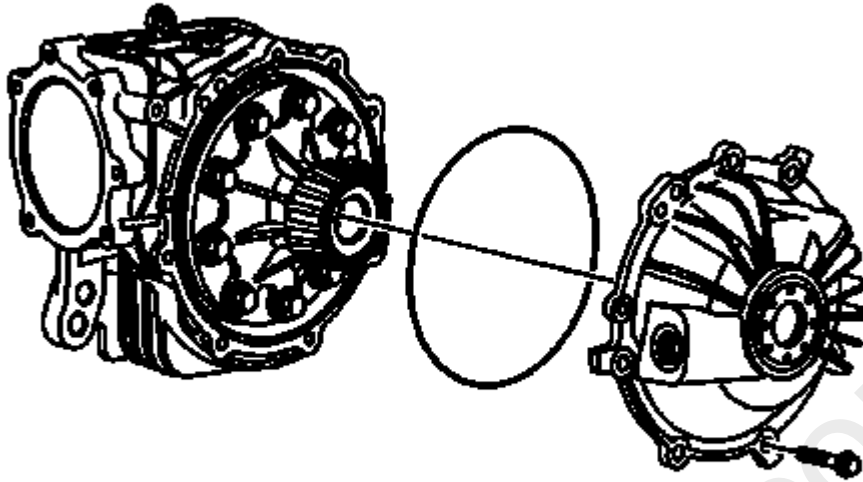
**Fig. 14: Heating Around Pinion Housing**  
Courtesy of GENERAL MOTORS COMPANY

4. Using the **J 25070** heat gun , apply heat around the pinion housing to ease removal.
5. Remove the **J 45019** flange and pinion cage remover from the flange.



**Fig. 15: View Of Pinion Assembly, O-Ring & Shims**  
Courtesy of GENERAL MOTORS COMPANY

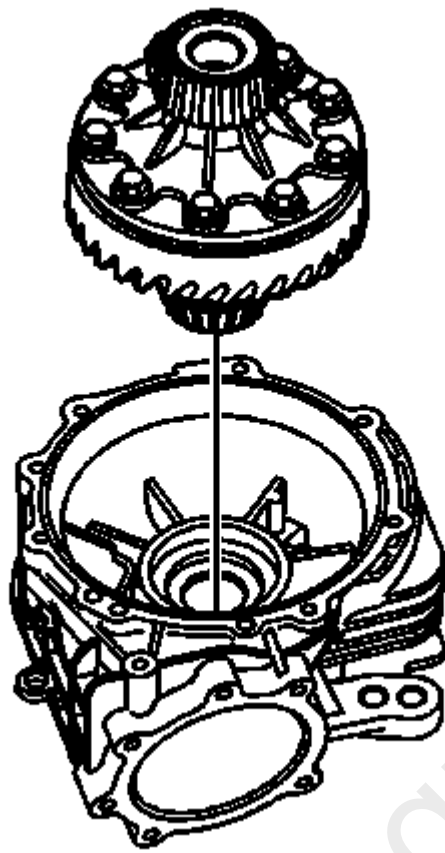
6. Remove the pinion assembly, O-ring, and the shims from the from differential carrier.



**Fig. 16: View Of Carrier Cover**

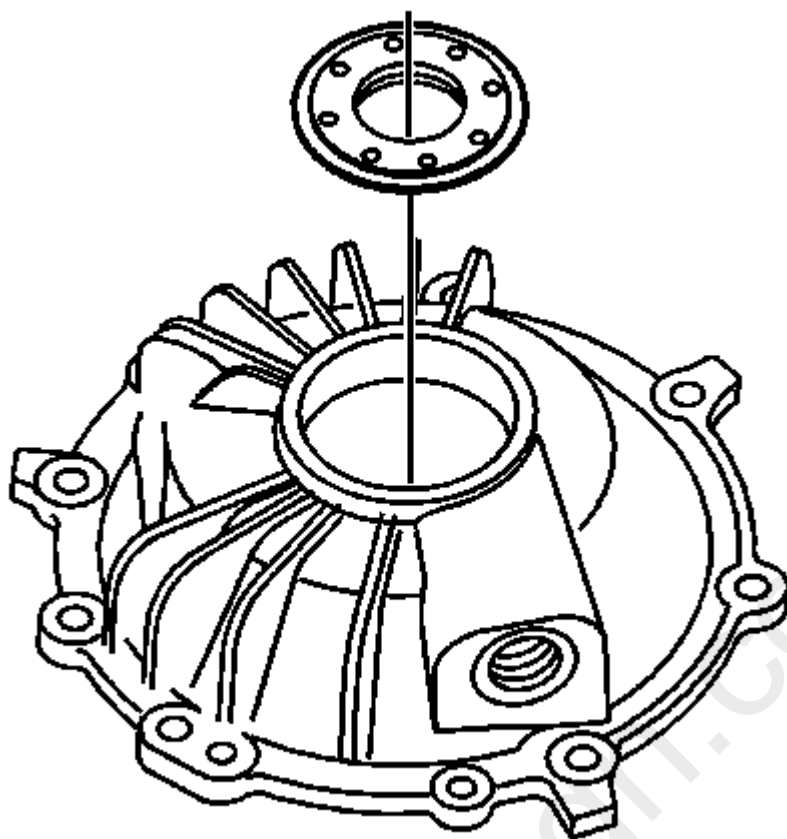
**Courtesy of GENERAL MOTORS COMPANY**

7. Remove the carrier side cover bolts.
8. Using the appropriate tool in the pry tabs, remove the carrier side cover.
9. Remove the O-ring from the side cover.



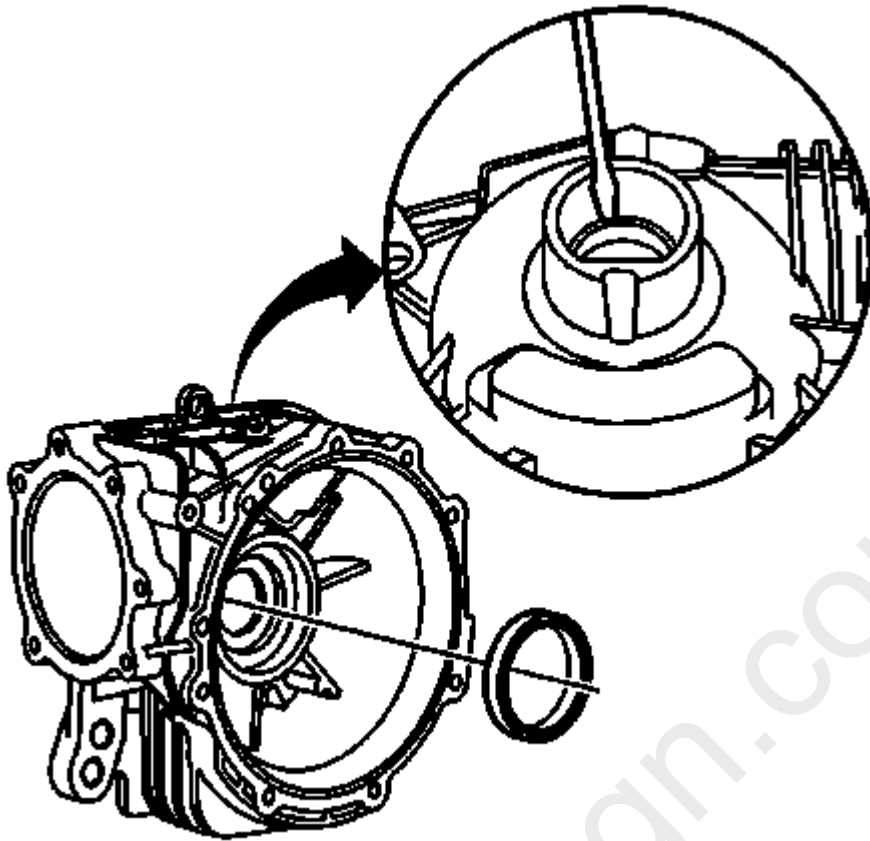
**Fig. 17: View Of Differential Assembly**  
Courtesy of GENERAL MOTORS COMPANY

10. Remove the differential assembly from the carrier.



**Fig. 18: View Of Right Output Shaft Seal**  
**Courtesy of GENERAL MOTORS COMPANY**

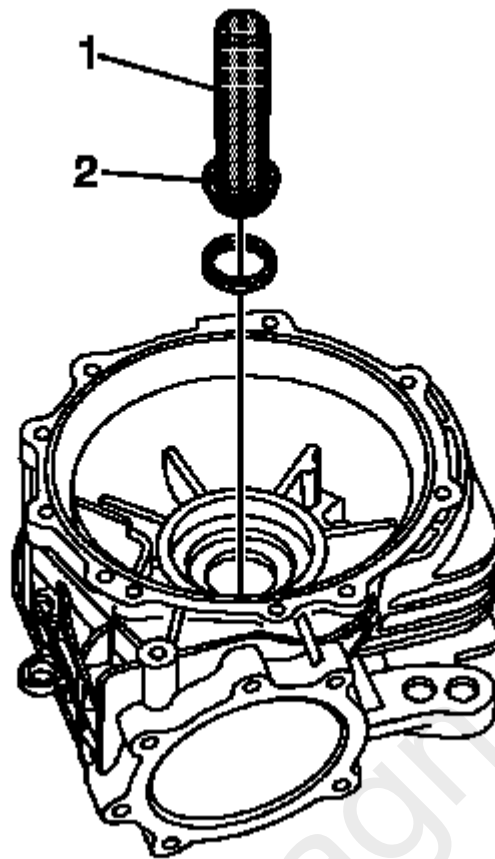
11. Remove the right output shaft seal from the cover.



**Fig. 19: View Of Left Output Shaft Oil Seal**  
Courtesy of GENERAL MOTORS COMPANY

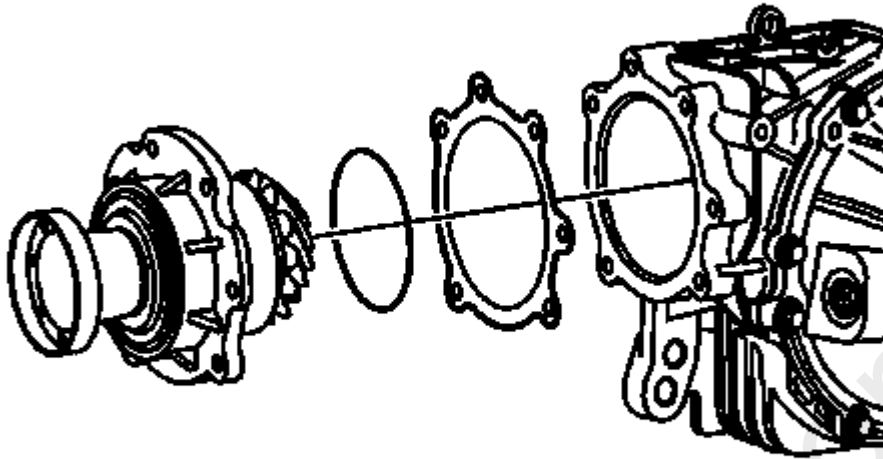
12. Using a suitable tool, remove the left output shaft oil seal from the carrier.

#### **Installation Procedure**



**Fig. 20: View of Shaft Seal Assembly**  
**Courtesy of GENERAL MOTORS COMPANY**

1. Using the **J 46265** stub shaft seal installer (2) and **GE-8092** driver handle (1), install the left output shaft seal.

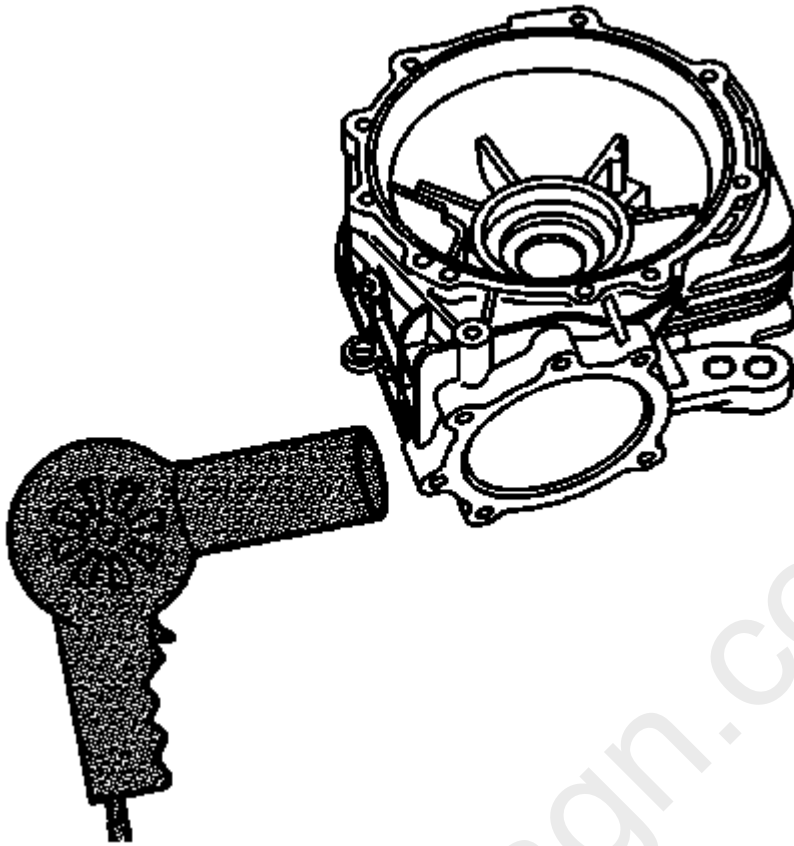


**Fig. 21: View Of Pinion Assembly, O-Ring & Shims**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the selected shims and the NEW O-ring on the pinion housing.

**NOTE:**        **Inspect the bearing housing for nicks and burrs. Remove if necessary.**

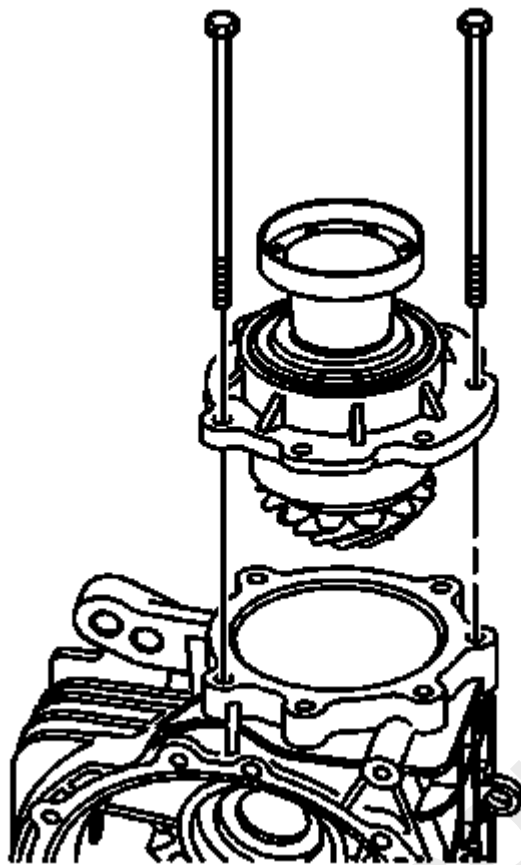
3. Apply a light coat of gear lube to the bearing housing to ease installation.



**Fig. 22: Heating Carrier Pinion Housing**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:**        Inspect the carrier pinion housing bore for nicks or burrs. Remove if necessary.

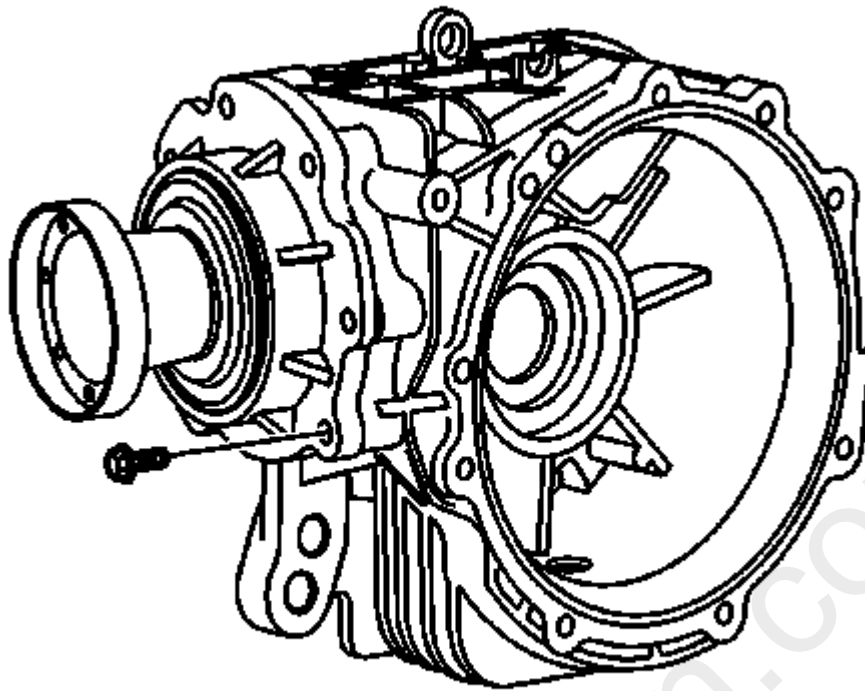
4. Apply a light coat of gear lube into the pinion housing bore of the carrier.
5. Using the **J 25070** heat gun , apply heat to the differential carrier.



**Fig. 23: View Of Pinion Housing**

**Courtesy of GENERAL MOTORS COMPANY**

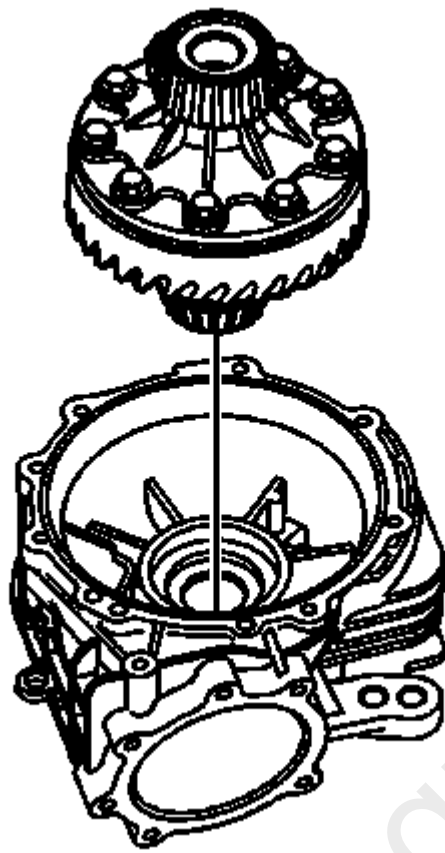
6. Using the two long bolts from **J 45019** flange and pinion cage remover as guides, align the housing bolt holes to the carrier bolt holes.
7. Hand tighten the guide bolts.
8. Applying even pressure, push the housing evenly into the differential housing.
9. Remove the long bolts.



**Fig. 24: View Of Pinion Housing Bolts**  
Courtesy of GENERAL MOTORS COMPANY

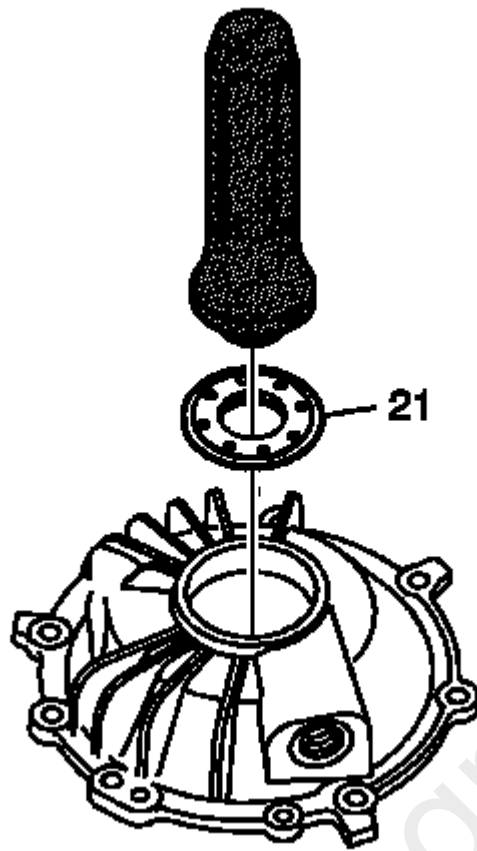
**CAUTION: Refer to Fastener Caution .**

10. Install the pinion housing bolts and tighten to 29 (21 lb ft).



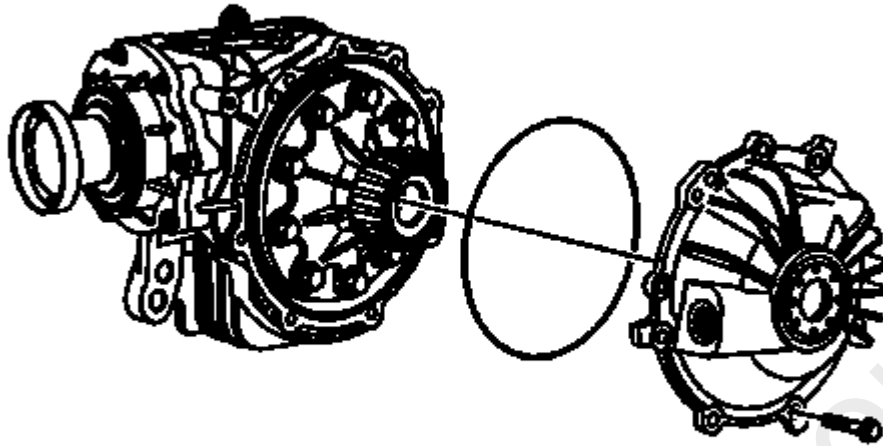
**Fig. 25: View Of Differential Assembly**  
Courtesy of GENERAL MOTORS COMPANY

11. Install the differential assembly into the differential carrier.



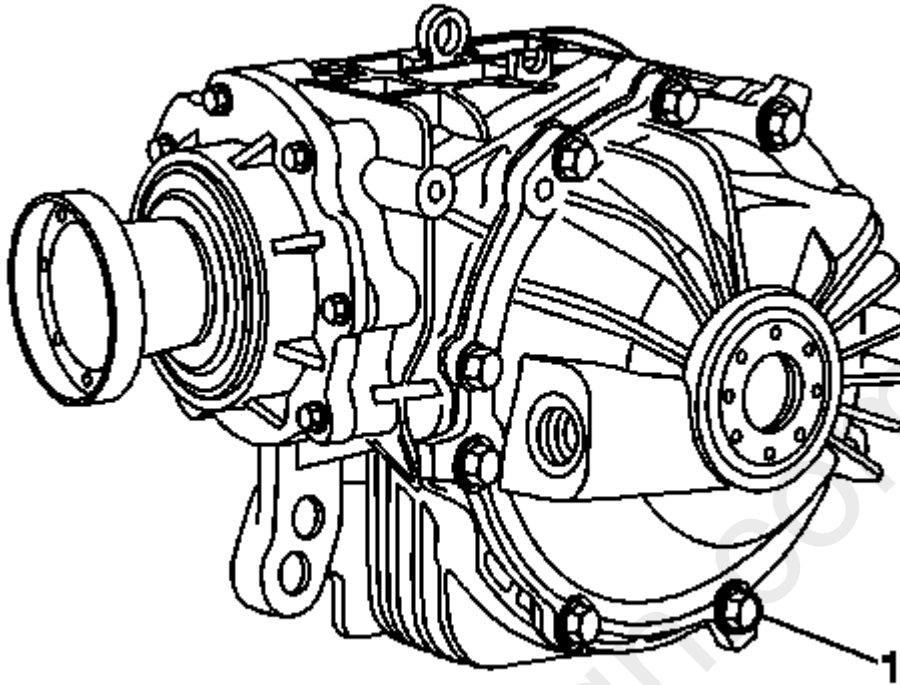
**Fig. 26: View of Right Output Shaft Oil Seal**  
**Courtesy of GENERAL MOTORS COMPANY**

12. Lightly lube the outside diameter of the oil seal with axle lube.
13. Using the **J 45017** seal installer , install the right output shaft oil seal (21).



**Fig. 27: View Of Carrier Cover**  
**Courtesy of GENERAL MOTORS COMPANY**

14. Install a NEW carrier cover O-ring into the groove.
15. Apply a light coat of gear lube to the O-ring area.
16. Align the bolt holes and push cover onto the differential carrier evenly.
17. Start the cover bolts in the holes by hand.



**Fig. 28: View of Differential Carrier Cover and Bolts**  
Courtesy of GENERAL MOTORS COMPANY

18. Install the side cover mounting bolts (1) and tighten to 29 (21 lb ft) in a criss-cross pattern.
19. Install the drain plug. Refer to **Axle Lubricant Change (w/o Differential Cooler)** , **Axle Lubricant Change (w Differential Cooler)** .
20. Install the carrier into the vehicle. Refer to **Differential Carrier Assembly Replacement**.
21. Fill the differential with fluid. Refer to **Front Axle Lubricant Replacement**.

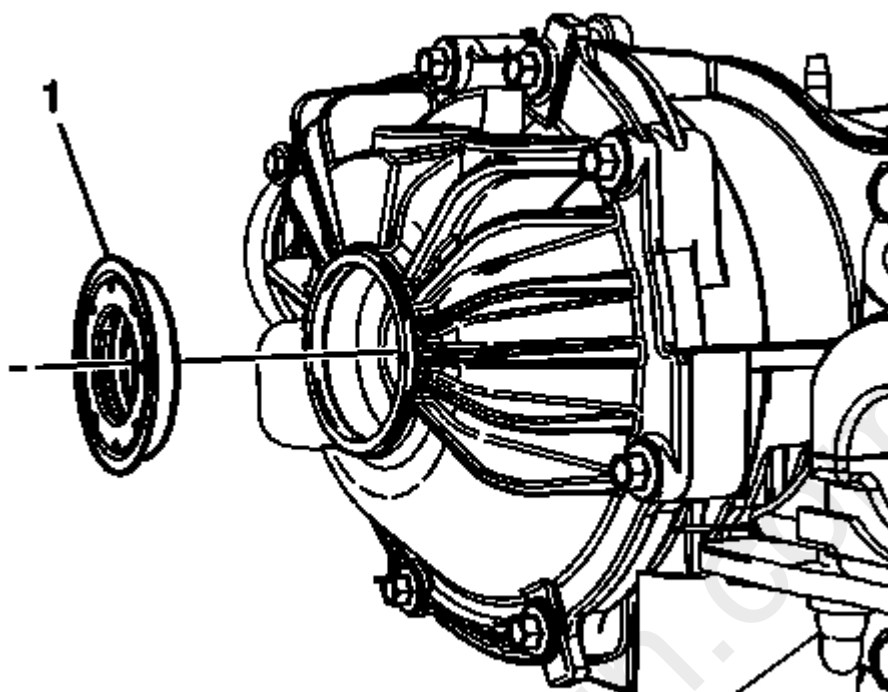
## **OUTPUT SHAFT SEAL REPLACEMENT - RIGHT SIDE**

### **Special Tools**

**J 45017** Output Shaft Seal Installer

### **Removal Procedure**

1. Raise and suitably support the vehicle. Refer to **Lifting and Jacking the Vehicle** .
2. Remove the right front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Right Side** .

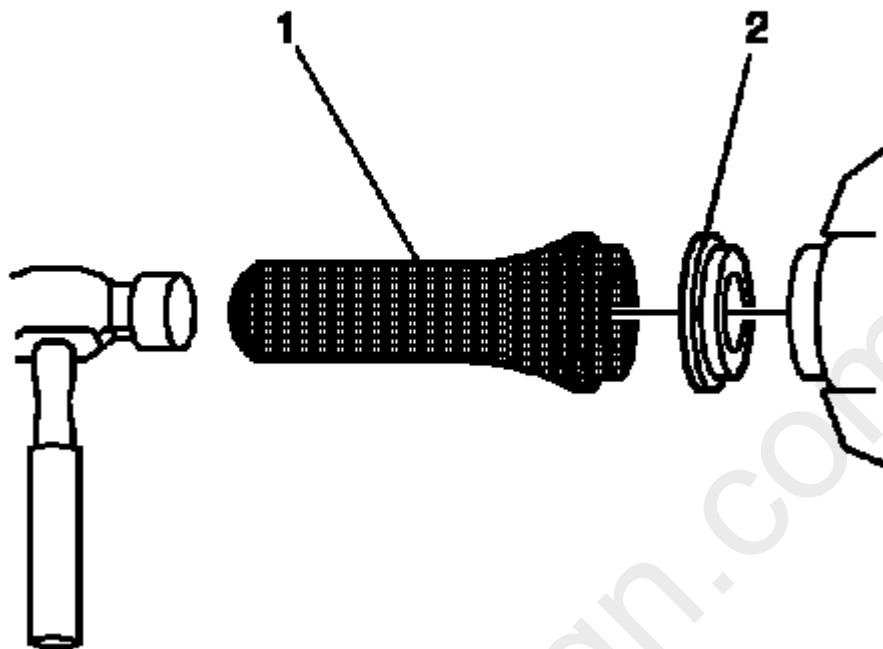


**Fig. 29: View of Right Differential Output Shaft Seal Assembly**  
Courtesy of GENERAL MOTORS COMPANY

3. Using a flat-bladed tool, remove the right differential output shaft seal (1).

#### **Installation Procedure**

1. Lubricate the wheel drive shaft sealing surface of the oil seal with 75W90 synthetic axle lubricant, GM P/N 12378261 (Canadian P/N 10953455) or equivalent.



**Fig. 30: Installing Right Differential Output Shaft Seal**  
Courtesy of GENERAL MOTORS COMPANY

2. Install the right differential output shaft seal (2) to the **J 45017** output shaft seal installer.
3. Using the **J 45017** output shaft seal installer (1), install the right differential output shaft seal (2).
4. Remove **J 45017** output shaft seal installer (1) from the right differential output shaft seal (2).
5. Install the right front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Right Side** .
6. Inspect the fluid level. Refer to **Rear Axle Lubricant Level Inspection** .
7. Lower the vehicle.

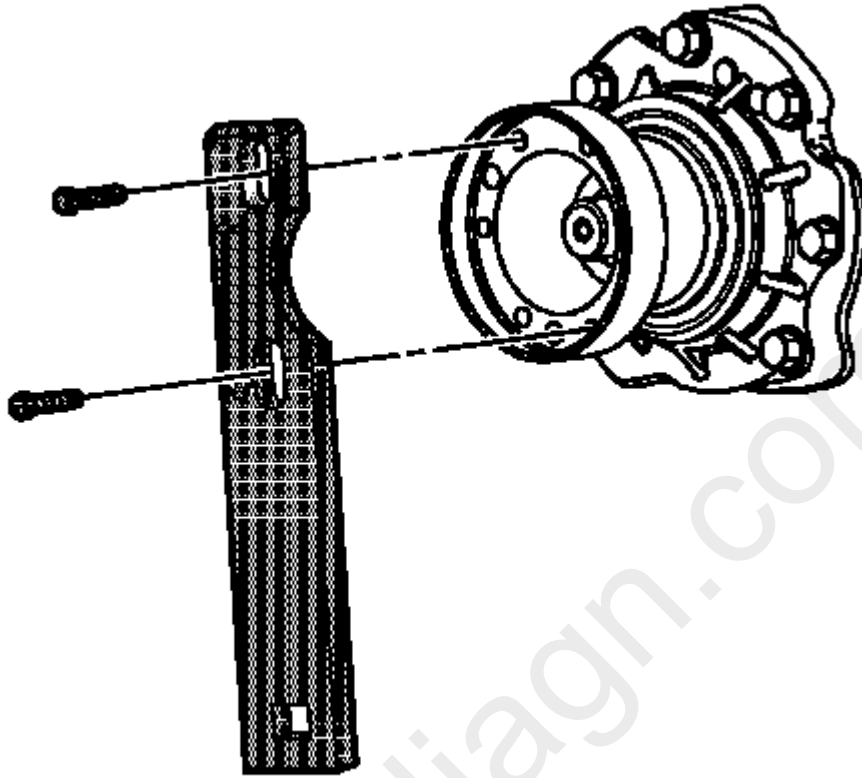
## **FRONT DIFFERENTIAL DRIVE PINION GEAR YOKE REPLACEMENT**

### **Special Tools**

- **DT-48075** Seal Installer
- **J 8614-01** Flange and Pulley Holding Tool
- **J 45012** Holding Fixture

### **Removal Procedure**

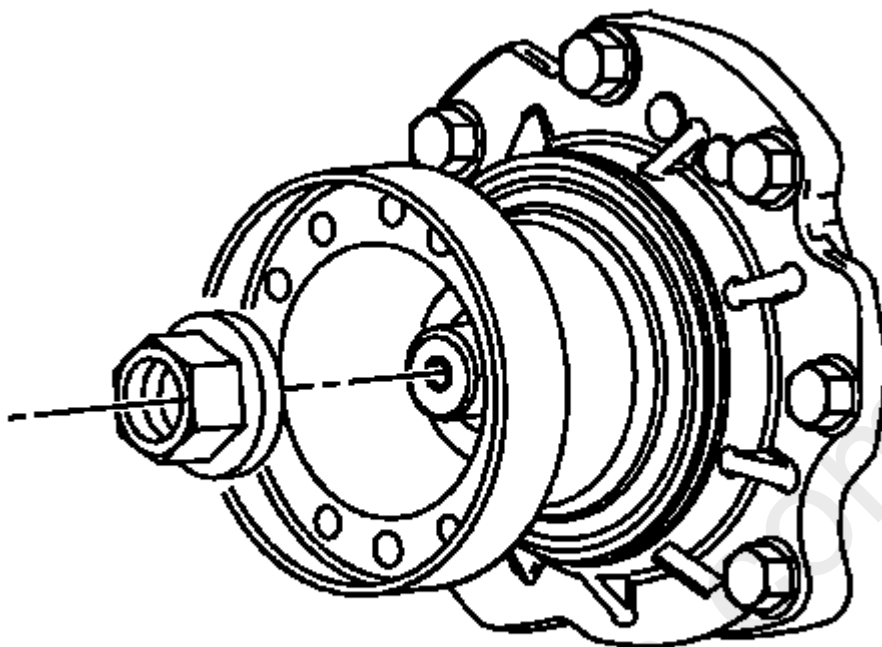
1. Raise and support vehicle. Refer to Lifting and Jacking the Vehicle .
2. Remove the front propeller shaft. Refer to Front Propeller Shaft Replacement .



**Fig. 31: Holding Fixture**

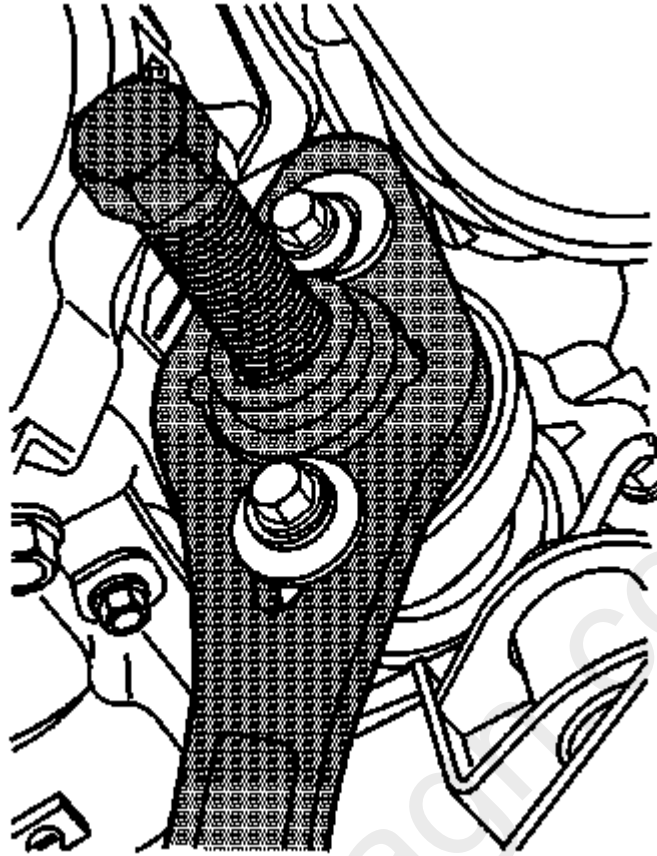
Courtesy of GENERAL MOTORS COMPANY

3. Install the J 45012 holding fixture to the drive pinion flange.



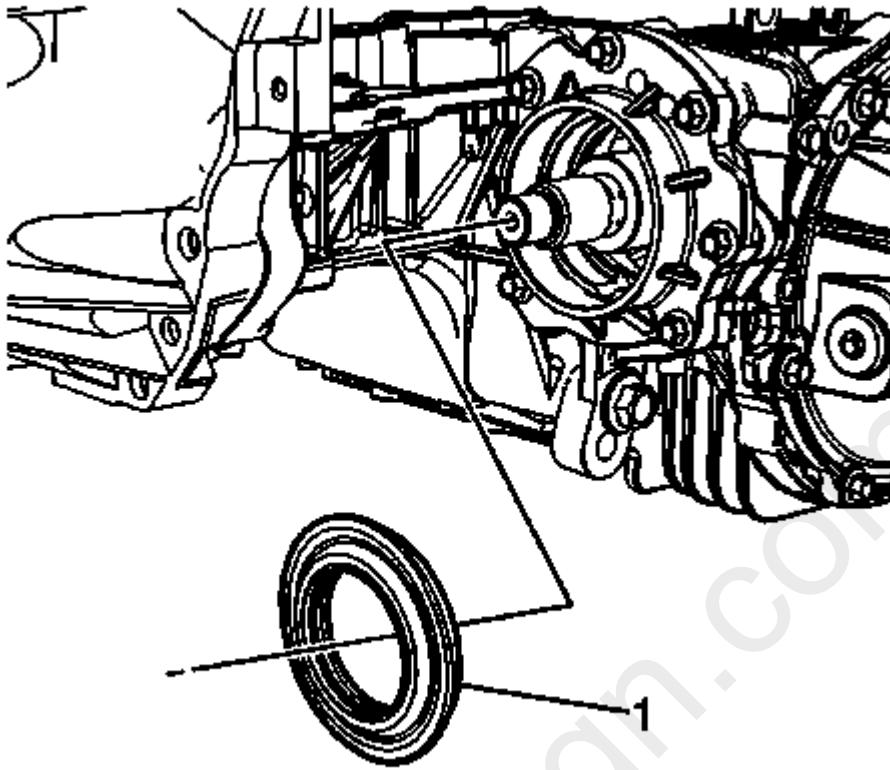
**Fig. 32: View Of Drive Pinion Flange Nut**  
Courtesy of GENERAL MOTORS COMPANY

4. Using the appropriate size socket and a breaker bar, remove the drive pinion flange nut.
5. Remove **J 45012** holding fixture from the drive pinion flange.



**Fig. 33: View Of Drive Pinion Flange**  
Courtesy of GENERAL MOTORS COMPANY

6. Install the **J 8614-01** flange and pulley holding tool to the drive pinion flange.
7. Using the **J 8614-01** flange and pulley holding tool , remove the drive pinion flange.
8. Remove the **J 8614-01** flange and pulley holding tool from the drive pinion flange.

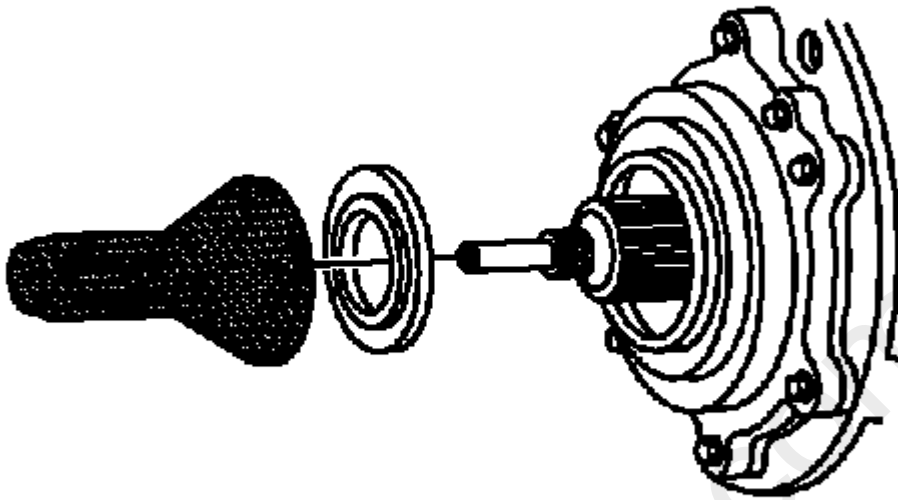


**Fig. 34: View of Drive Pinion Seal Assembly**  
Courtesy of GENERAL MOTORS COMPANY

9. Using a flat-bladed tool, remove the drive pinion seal (1). Take care not to damage any sealing surfaces.

#### **Installation Procedure**

1. Lubricate the drive pinion flange sealing surface of the drive pinion seal with synthetic gear oil GM P/N 12378514 (Canadian P/N 88901045) or equivalent.

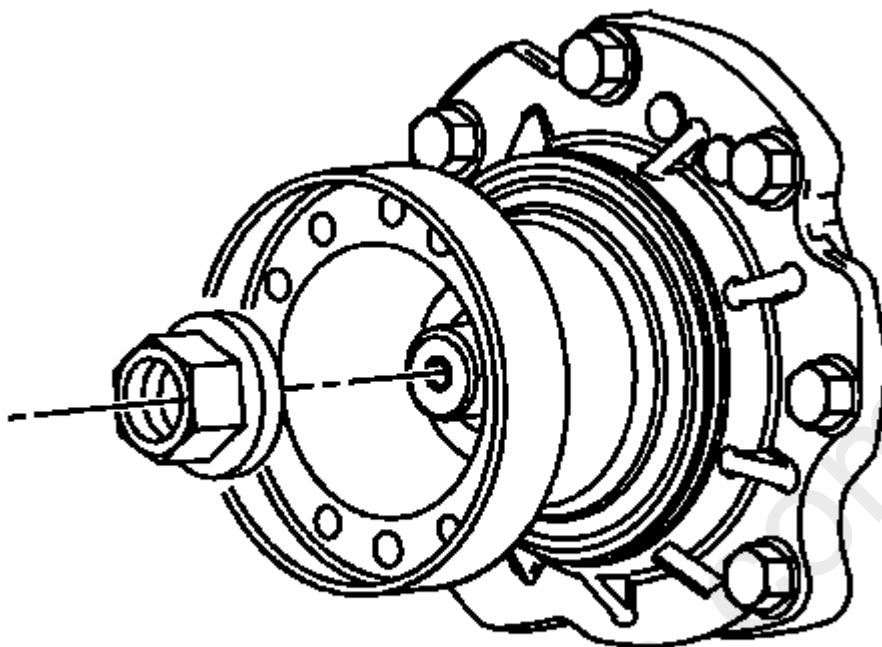


**Fig. 35: View Of Drive Pinion Seal**  
Courtesy of GENERAL MOTORS COMPANY

2. Using the **DT-48075** seal installer , install the new drive pinion seal in the pinion housing.
3. Remove the **DT-48075** seal installer from the pinion housing.
4. Install the pinion flange to the drive pinion shaft.

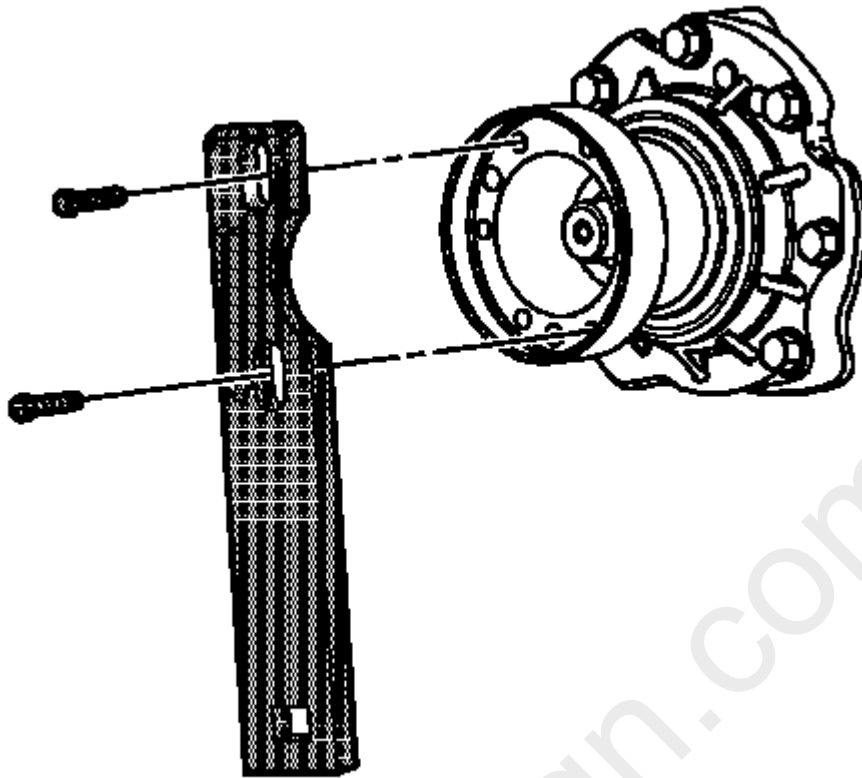
**NOTE:**        **The pinion shaft threads and the pinion flange nut must be free of residue and debris prior to application of threadlocker in order to ensure proper adhesion and fastener retention.**

5. Prepare the pinion shaft threads and the pinion flange nut for assembly:
  1. Thoroughly clean the residue from the pinion shaft threads by using denatured alcohol or equivalent and allow to dry.
  2. Thoroughly clean the residue from the pinion flange nut by using denatured alcohol or equivalent and allow to dry.
6. Apply threadlocker GM P/N 12345382 (Canadian P/N 10953489) or equivalent to 2/3 of the threaded length of the pinion shaft threads. Ensure that there are no gaps in the threadlocker along the length of the filled area of the pinion shaft threads.
7. Allow the threadlocker to cure approximately ten minutes before installation.



**Fig. 36: View Of Drive Pinion Flange Nut**  
Courtesy of GENERAL MOTORS COMPANY

8. Install the drive pinion flange nut to the pinion shaft.



**Fig. 37: Holding Fixture**

Courtesy of GENERAL MOTORS COMPANY

9. Install the J 45012 holding fixture to the drive pinion flange.

**CAUTION:** Refer to Fastener Caution .

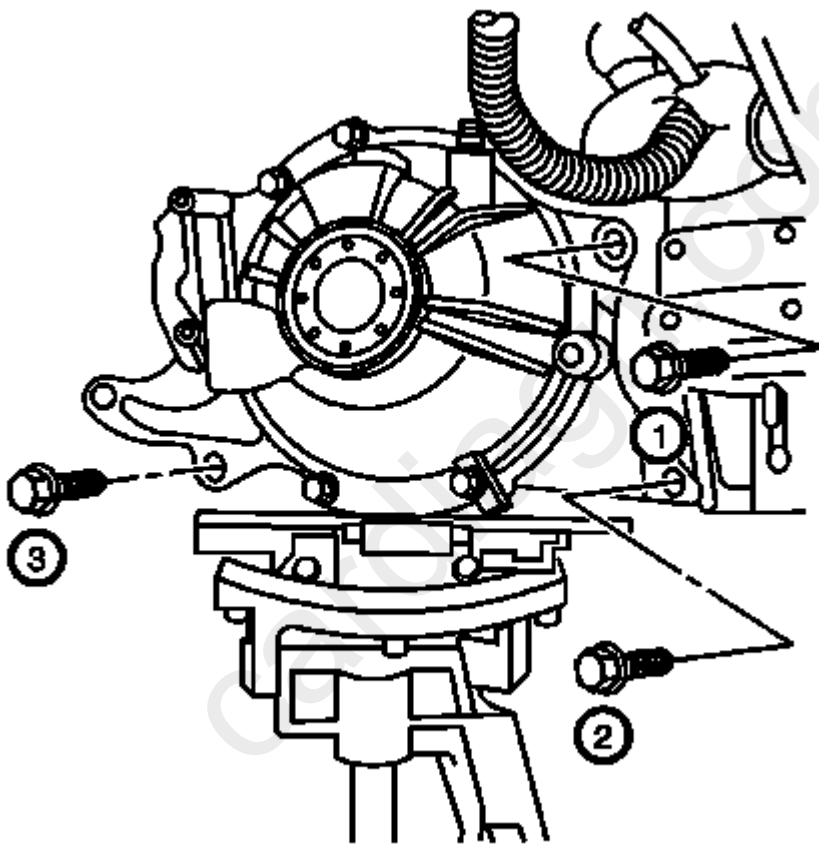
10. While holding the J 45012 holding fixture , tighten the drive pinion nut to 235 (173 lb ft).
11. Remove the J 45012 holding fixture from the pinion flange.
12. Install the propeller shaft. Refer to Front Propeller Shaft Replacement .
13. Inspect the fluid level. Refer to Front Axle Lubricant Level Inspection.
14. Lower the vehicle.

## **DIFFERENTIAL CARRIER ASSEMBLY REPLACEMENT**

### **Removal Procedure**

**NOTE:** The intermediate wheel drive shaft and the differential are to be installed and removed as a assembly.

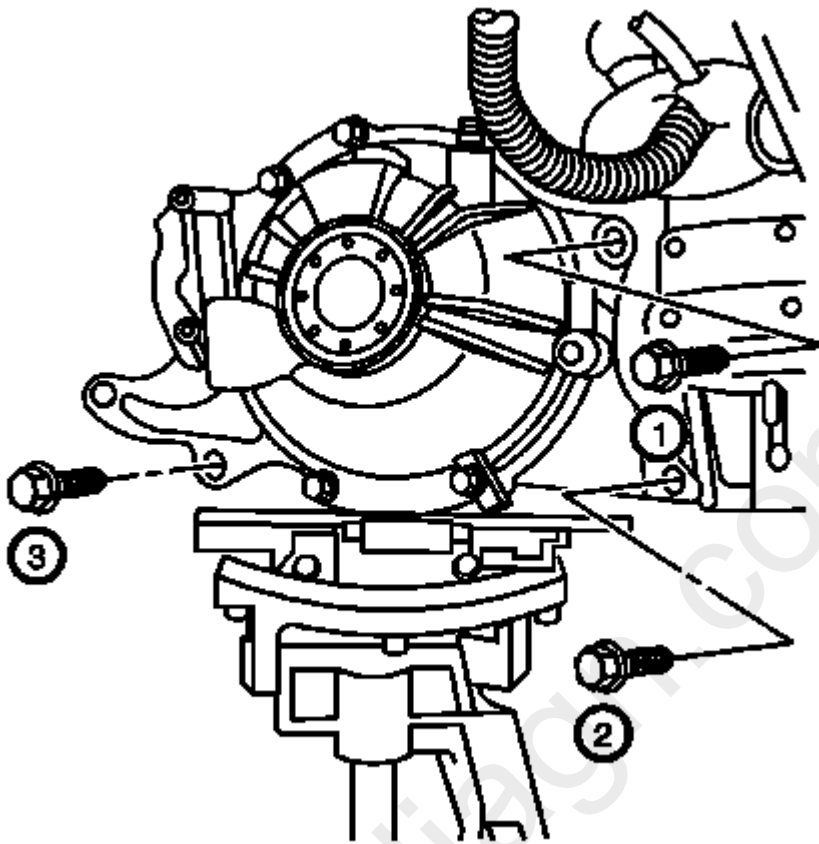
1. Raise and support the vehicle. Refer to Lifting and Jacking the Vehicle .
2. Lower the front frame assembly. Refer to Drivetrain and Front Suspension Frame Replacement (All Wheel Drive) , Drivetrain and Front Suspension Frame Replacement (Rear Wheel Drive) .
3. Remove front propeller shaft from the differential and position out of the way. Refer to Front Propeller Shaft Replacement .
4. Remove the right front wheel drive shaft. Refer to Front Wheel Drive Shaft Replacement - Left Side .
5. Remove the left front wheel drive shaft. Refer to Front Wheel Drive Shaft Replacement - Right Side .
6. Remove the intermediate wheel drive shaft support bearing. Refer to Front Wheel Drive Intermediate Shaft Bearing Replacement.



**Fig. 38: View Of Front Differential-To-Oil Pan Mounting Bolts**  
 Courtesy of GENERAL MOTORS COMPANY

7. Position a transmission jack beneath the differential.
8. Firmly secure the differential to the transmission jack.
9. Remove the front differential to oil pan mounting bolts.
10. Remove the intermediate wheel drive shaft and the front differential from the oil pan.
11. Remove the differential assembly from the vehicle.

## Installation Procedure



**Fig. 39: View Of Front Differential-To-Oil Pan Mounting Bolts**  
Courtesy of GENERAL MOTORS COMPANY

**NOTE:**

- The intermediate wheel drive shaft and the differential are to be installed removed as a assembly.
- In order to prevent lubricant leaks, use care when installing the wheel drive shaft to the differential. Do not damage the oil seal. Replace the oil seal if it becomes nicked, distorted, or is otherwise damaged.

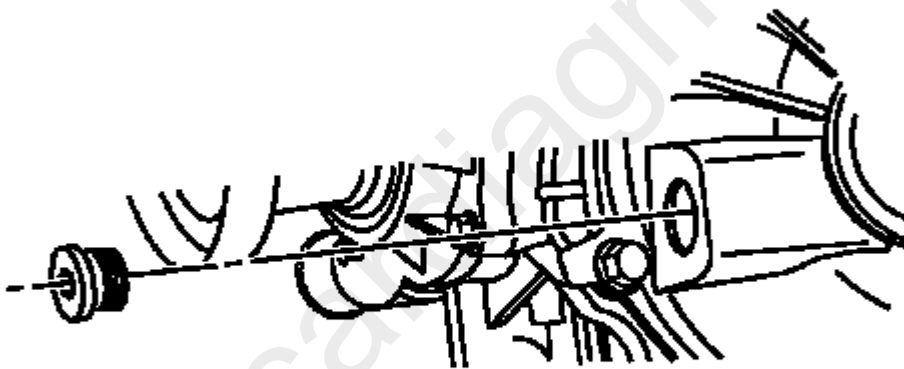
1. Position the differential on a transmission jack.
2. Firmly secure the differential to the transmission jack.
3. With the differential firmly attached to the jack, install the intermediate wheel drive shaft and the front differential to the oil pan.

**CAUTION:** Refer to Fastener Caution .

4. Install the front differential to oil pan mounting bolts and tighten in sequence (1-3) to 110 N.m (81 lb ft).

5. Remove the transmission jack from the differential.
6. Install the intermediate wheel drive shaft support bearing. Refer to **Front Wheel Drive Intermediate Shaft Bearing Replacement**.
7. Install the left front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Right Side**.
8. Install the right front wheel drive shaft. Refer to **Front Wheel Drive Shaft Replacement - Right Side**.
9. Install the front propeller shaft to the differential. Refer to **Front Propeller Shaft Replacement**.
10. Inspect the differential lubricant level. Refer to **Front Axle Lubricant Level Inspection**.
11. Install the front frame assembly. Refer to **Drivetrain and Front Suspension Frame Replacement (All Wheel Drive)**, **Drivetrain and Front Suspension Frame Replacement (Rear Wheel Drive)**.
12. Lower the vehicle.

### FRONT AXLE LUBRICANT LEVEL INSPECTION



**Fig. 40: View Of Differential Fill Plug**  
Courtesy of GENERAL MOTORS COMPANY

1. Raise and support the vehicle. Refer to **Lifting and Jacking the Vehicle**.
2. Clean any dirt from around the differential fill plug.
3. Remove the fill plug from the differential and drain the fluid.

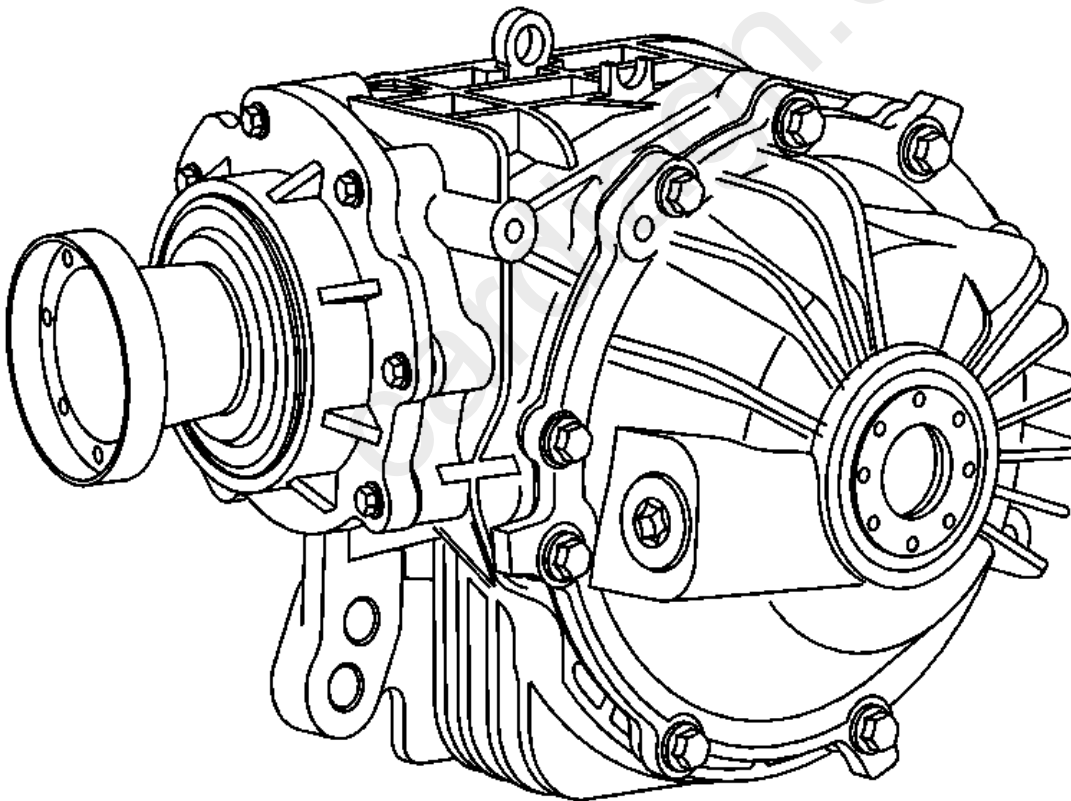
4. Check the differential fluid level, it should be even with the bottom of the fill plug hole to no lower than 6 mm (0.25 in) below the opening.
5. Add new fluid if necessary.
6. Fill the differential with 75W90 synthetic axle lubricant , GM P/N 12378261 (Canadian P/N 10953455) or equivalent. Refer to **Approximate Fluid Capacities** .

**CAUTION:** Refer to **Fastener Caution** .

7. Install the differential fill plug to the differential and tighten to 39 N.m (29 lb ft).
8. Lower the vehicle.

## DESCRIPTION AND OPERATION

### FRONT DRIVE AXLE DESCRIPTION AND OPERATION



**Fig. 41: Front Drive Axle**

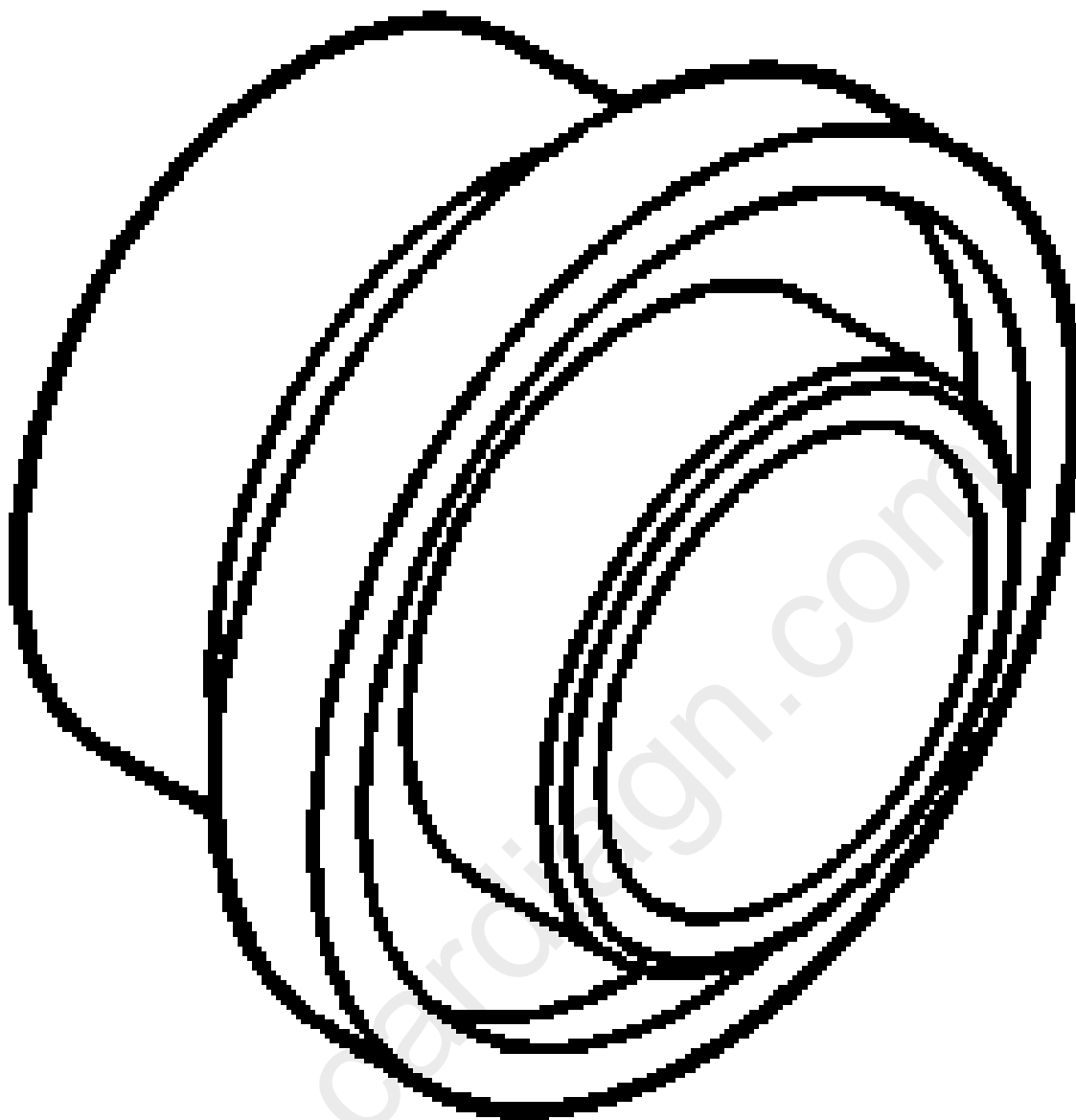
Courtesy of GENERAL MOTORS COMPANY

The differential housing, side cover and pinion housing are constructed of cast aluminum. The internal components incorporate a hypoid gear set, ring and pinion, carrier assembly and pinion housing assembly. The pinion is supported in a pinion housing by a tapered roller bearings. The pinion is positioned forward of the ring gear centerline. All models have a 7 5/8 inch ring gear.

SPECIAL TOOLS AND EQUIPMENT

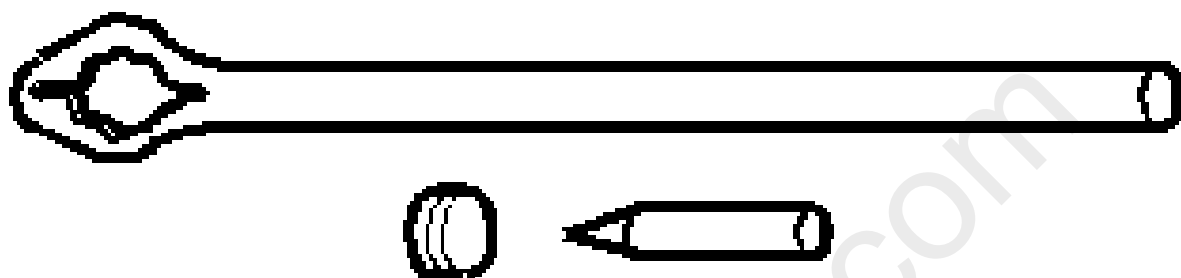
SPECIAL TOOLS

| Illustration | Tool<br>Number/<br>Description |
|--------------|--------------------------------|
|              | DT 48075<br>Seal<br>Installer  |



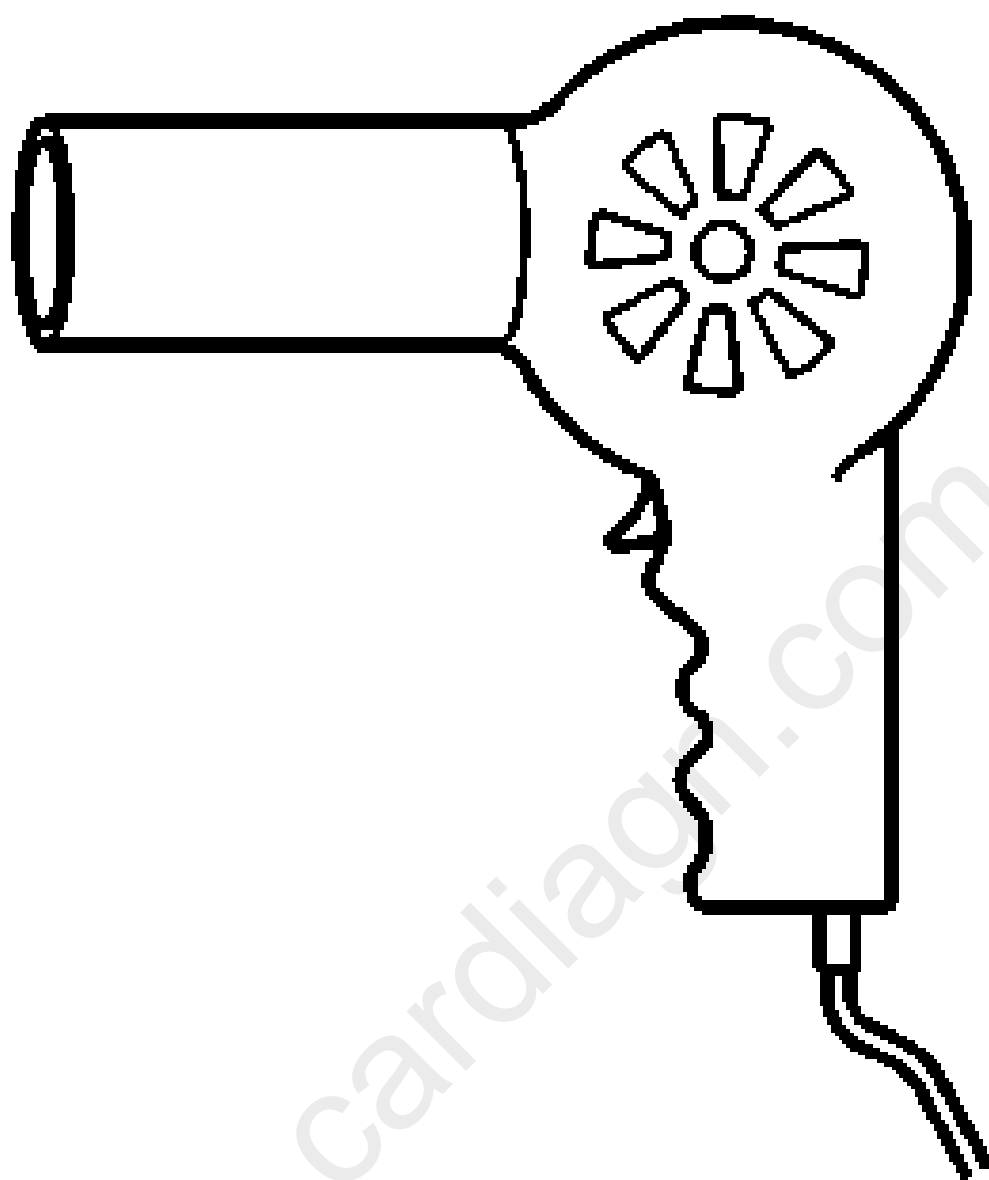
J 8092  
Driver  
Handle

J 8614-01  
Flange and  
Pulley  
Holding  
Tool



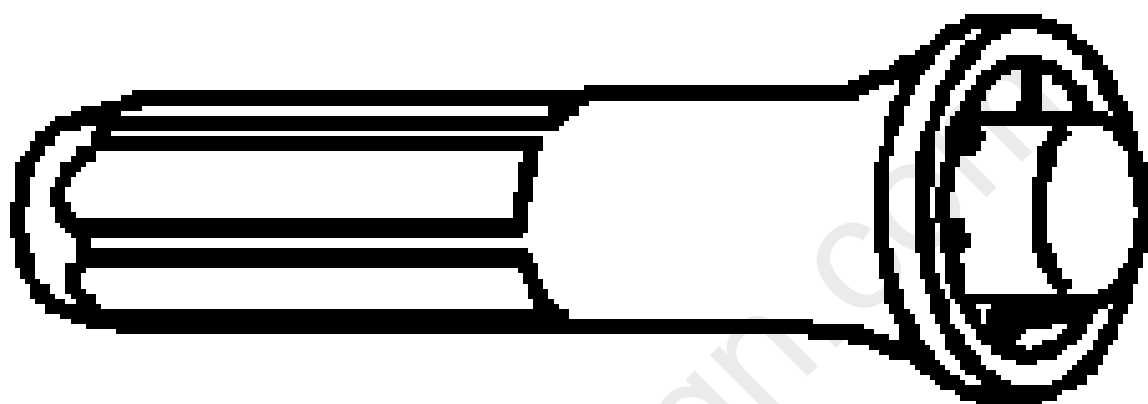
J 21474-01  
Bushings  
Installer Kit

J 25070  
Heat Gun



J 45012  
Seal  
Protector

J 45017  
Rear Wheel  
Drive Shaft  
Removal  
Tool



cardiagn.com

J 45019  
Wheel Hub  
Remover

J 46265  
Stub Shaft  
Seal  
Installer

